Draft

# Clean Water Act Section 404(b)(1) Analysis

## After-Action Webbers Falls Pool and Robert S. Kerr Pool Emergency Dredging and Open Water Disposal

Arkansas River Basin
Rogers, Wagoner, Cherokee, Muskogee, Haskell, Sequoyah, and Le Flore Counties,

Oklahoma

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Tulsa District
U.S. Army Corps of Engineers

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# Section 1. Project Description

This Clean Water Act (CWA) Section 404(b)(1) Analysis has been prepared by the U.S. Army Corps of Engineers (USACE) Tulsa District (SWT) to evaluate the Webbers Falls Pool and Robert S. Kerr Pool Emergency Dredging and Open Water Disposal. This Section 404(b)(1) Analysis. In addition to this analysis, SWT has prepared an Environmental Assessment (EA). It has been prepared in accordance with 33 Code of Federal Regulations (CFR) § 230 and the 1978 Council on Environmental Quality (CEQ) regulations 40 CFR § 1500-1508, as amended in 1986 and 2005, as reflected in the USACE Engineering Regulation (ER) 200-2-2. In fulfillment of these and all other legal, regulatory, and policy requirements, the EA describes the purpose and need for the action, the range of alternatives considered, and discloses the environmental impacts of the alternatives.

## 1.1 Purpose and Need

Record rainfall in May and June 2019 in southern and southeastern Kansas and in northeastern Oklahoma caused approximately 15 USACE reservoirs in the Upper Arkansas River Basin, Verdigris River Basin, and Grand (Neosho) River Basin (all within Tulsa District), to fill to or exceed the top floodpool elevation. While Tulsa District (SWT) worked diligently to lessen the effects of flooding downstream, significant and in some cases catastrophic flooding was unavoidable.

River flows, measured in cubic feet per second (cfs), were overwhelming within large portions of the river system. Below Keystone Dam, west of Tulsa, Oklahoma, the rate of river flow approached 300,000 cfs at its maximum volume. Approximately 50 miles southeast of Tulsa, Oklahoma on the Arkansas River below Muskogee, Oklahoma - downstream from the Arkansas River confluence with the Verdigris River and the Grand (Neosho) River at the location known locally as "Three Forks" - the flow eclipsed 600,000 cfs in volume.

The Arkansas River within the Webbers Falls Pool, at a sustained volume of well over 600,000 cfs over a duration of more than a week, was carrying an enormous volume of sediment which was eroded from the three upstream feeder river basins and was passed through upstream dams and into the Navigation System, where much of it was subsequently deposited.

On May 23, 2019 two fully-loaded barges moored in Muskogee, Oklahoma tore loose and were carried downstream, where they collided with Webbers Falls Lock and Dam and sunk. After sinking the barges were forced against three of the structure's gates which had been fully open for the high river flow; because the two barges impeded the operation of the gates, those gates could not be closed. Removal of the barges/operation of the Webbers Falls gates was dependent on the emergency dredging action, specifically the portion within the Robert S. Kerr Pool. A tow barge was required to perform the extraction of the barges at Webbers Falls Lock and Dam 16, and the tow barge had to travel the channel upstream from Arkansas through the Robert S. Kerr Pool. The inability for vessels to safely navigate also delayed the removal of the barges. The barges were removed in 2019, but the impacts of the subsequent water draw-down resulting from their placement were significant. However,

it is the opinion of USACE, that the water draw-down and subsequent impacts were not a result of the Federal emergency actions and therefore, will not be evaluated within the Clean Water Act Section 404(b)(1) Analysis.

The sediment prohibited the safe passage of barge and similar size draft vessels between Robert S. Kerr Pool Lock and Dam and Webbers Falls Pool Lock and Dam. The purpose of the Emergency Action was to remove the sediment impounded resulting from the May and June 2019 floods.

## 1.2 Location

This project described in this report, otherwise known as the Emergency Action, is located in the McClellan Kerr Arkansas River Navigation System (MKARNS) located in northeastern Oklahoma (Figure 1). The section of the MKARNS impacted by U.S. Army Corps of Engineers (USACE) actions, as a result of the 2019 flooding, extends from the City of Tulsa (river mile [RM] 444.5) to approximately 8.5 miles upstream of Fort Smith, Arkansas (RM 319). The action impacts throughout the system were either “approved,” “proposed,” or were not discussed (“not approved”) in the 2005 Arkansas River Navigation Study Environmental Impact Statement (EIS). Although dredging and disposal occurred throughout the study area, it is assumed impacts resulting from the USACE action were focused within the Webbers Falls Pool and Robert S. Kerr Pool. Disposal within the Webbers Falls Pool and Roberts S. Kerr Pool occurred without approval from the 2005 EIS.


**Figure 1. McClellan-Kerr Arkansas River Navigation System Study Area, Oklahoma**

### 1.3 Project Authority

The development of the Arkansas River for navigation, flood control, hydroelectric power generation, and other purposes; was authorized by the Rivers and Harbor Act of July 24, 1946. Construction of the system began in 1949 with the construction of emergency bank stabilization and the system was declared open to commercial traffic in December 2, 1970. Public Law 91-649, passed by Congress in 1971, designated it as the McClellan –Kerr Arkansas River Navigation System.

The Emergency Action was conducted under the Council of Environmental Quality (CEQ) regulation 40 Code of Federal Regulations (CFR) 1506.12, which provides guidance for alternative arrangements for National Environmental Policy Act (NEPA) compliance. Immediate action by USACE was necessary to secure lives and safety of citizens and to protect valuable resources. In addition, USACE has prepared an Environmental Assessment to evaluate the potential adverse effects of the Emergency Action in accordance with 40 CFR parts 1500-1508.

## Section 2. Alternatives Evaluation

### 2.1 Alternatives

The alternative evaluation is split between the No Action Alternative and the Emergency Action Alternative.

#### *2.1.1 No Action Alternative*

Under the No Action Alternative, the USACE would not have dredged or disposed of sediment as a result of the 2019 flooding. USACE would allow the sediment impoundment to prohibit the safe passage of barge and similar size draft vessels between Robert S. Kerr Pool and Webbers Falls Pool along the MKARNS ship channel. The No Action Alternative would have led to the continued delay of the removal of the two barges at Webbers Falls Pool Lock and Dam and the dam flood gates would have remained open. This would have led to operational issues and a continued pool drain, creating significant adverse impacts to the human environment.

#### *2.1.2 Emergency Action Alternative*

The Emergency Action efforts included extensive dredging for an approximate total of 1.6 million cubic yards (cys). The dredged material was placed in locations within 1500 feet of dredging operations, with some variation depending on local conditions in the channel and pool. Each disposal area was located within the active historic Arkansas River channel and primarily consists of existing sediment buildup deposited over time. Some dredged material would extend above-water portions of these disposal locations into the Robert S. Kerr and Webbers Falls Pools, increasing the area and volume of sediment in those locations above the normal pool elevation. A water quality certification waiver was provided to USACE by the Oklahoma Department of Environmental Quality (DEQ) on July 10, 2019 (Attachment B) for approximately 1.25 million cys of sediment dredge and 550 acres of impacts to Waters of the U.S.

Selection of dredging equipment and method used to perform the dredging, as described in Engineering Manual M1110-2-5025 “Engineering and Design – Dredging and Dredged Material Disposal”, depends on the following factors:

- Physical characteristics of material to be dredged,
- Quantities of material to be dredged,
- Dredging depth,
- Distance to disposal area,
- Physical environment of the dredging and disposal areas,
- Contamination level of sediments,
- Method of disposal,
- Production required,
- Type of dredges available, and
- Cost.

The Emergency Action Alternative was implemented in 2019 and continued into 2021. The dredging and disposal listed below in Table 1 is a summary of the work that has been conducted within the MKARNS. A map of each project location is provided in Attachment A – Project and Mitigation Area Maps.

**Table 1. Sediment Dredge and Disposal Locations**

| Location | River Mile | Cubic Yards Dredged | Disposal Location | Acres Impacted by Disposal | EIS Approved Disposal Location |
|---|---|---|---|---|---|
| Sandtown Bottom | 346-349 | 778,330 | Open Water | 97.7 | No |
| | | | Emergent Wetland | 16.4 | No |
| Below Lock 16 | 366 | 70,322 | Bottomland Hardwood Forest | 10 | No |
| Spaniard Creek | 375 | 110,635 | Open Water | 146 | No |
| Salt Creek | 380 | 259,322 | Open Water | 1.3 | No |
| | | | Emergent Wetland | 7.4 | No |
| | | | Forested Wetland | 2.4 | No |
| Stoney Point | 355 | 76,444 | Open Water | 4.9 | No |
| | | | Emergent Wetland | 7.6 | No |
| San Bois Creek | 6.5 - 8 | 161,639 | Open Water | 30 | No |

| Location | River Mile | Cubic Yards Dredged | Disposal Location | Acres Impacted by Disposal | EIS Approved Disposal Location |
|---|---|---|---|---|---|
| Kerr Lake (RM 343) | 343 | 55,586 | Open Water | 8.3 | No |
| Three Forks | 394.5 – 395 | 23,578 | Disposal Site 16B | 14.6 | Yes |
| RM 400 | 400 | 13,875 | Disposal Site 16A-1 | 14 | Yes |
| Below Lock 18 | 421 | 35,688 | Disposal Site 17A | 30.3 | Yes |
| Above Lock 18 | 422 – 422.5 | 37,367 | Disposal Site 18C | 11.6 | Yes |
| Catoosa | 445 | 14,525 | Disposal Site 18B | 11.5 | Yes |
| Below Lock 14 | 319 | 21,578 | Disposal Site 13A | 1.5 | Yes |

In total, there were 10 acres of bottomland hardwood forest, 2.4 acres of forested wetland, 31.4 acres of emergent wetland, and 288.2 acres of open water habitat impacted by the Emergency Action. Because this action was used to address the sedimentation of the MKARNS, many adverse impacts were unavoidable.

Due to the disposal of sediment within emergent wetlands, forested wetlands, and bottomland hardwoods forest; compensatory mitigation will be required and enacted in accordance with Section 404 of the Clean Water Act (CWA) and Section 10 of the River and Harbors Act. The mitigation standard for this project falls under 33 CFR § 332.

In coordination with SWT Regulatory Office (RO), Table 2 displays the ratios required to compensate the adverse impacts as well as the resulting acres required to mitigate the action.

Table 2. Habitat Type, Acres Impacted, Ratio, and Required Mitigation Acreage Associated with the Emergency Action Alternative

| Habitat Type | Impacted Acres | Mitigation Ratio | Required Mitigation Acres | Mitigation Method |
|---|---|---|---|---|
| Bottomland Hardwood | 10 | 1.5:1 | 15 | Creation |
| Forested Wetland | 2.4 | 4.5:1 | 10.8 | Creation |
| Emergent Wetland | 31.4 | 2.5:1 | 78.5 | Creation |
| Open Water | 288.2 | 1:1 | 288.2 | Self-Mitigating |

The objective of the bottomland hardwood and wetland mitigation is to create a minimum of 15 acres of bottomland hardwood, 10.8 acres of forested wetland, and 78.5

acres of emergent wetland habitat in areas that would not be adversely impacted by creation of habitat and would be self-sustaining upon completion of mandatory monitoring and adaptive management guidelines. The mitigation sites included as part of this project are owned in fee by USACE and are currently used for agricultural practices such as haying and grazing, leaving them devoid of significant vegetation. However, the sites show appropriate characteristics for emergent wetland, forested wetland, and bottomland hardwood forest habitat based on their topography and soils.

The objectives of SWT Operations Division to compensate the loss of bottomland hardwood forest and wetland habitat are listed below.

- Establishment of native plant communities for wildlife.
- Bottomland hardwood - Planting of herbaceous vegetation, shrubs, and trees
- Forested Wetland - Planting of emergent wetland vegetation along with shrubs and trees
- Emergent wetland - Planting of emergent wetland vegetation
- Develop and maintain hydrologic characteristics for created habitats

Some of the open water disposal sites in Webbers Falls Pool and Robert S. Kerr Pool extend above the water, increasing the area and volume of sediment above the normal pool elevation. It is assumed by USACE that the open water impacts as described above are self-mitigating; therefore, mitigation of open water will not occur as part of this project.

It was determined by USACE that the Emergency Action was the most practicable alternative compared to No Action, because it met the overall purpose and need of the project. However, it is understood there are still major adverse impacts to wetlands and Waters of the U.S. resulting from the Emergency Action.

### 2.2 Impacts to Jurisdictional Wetlands/Waters of the U.S.

As part of the alternative evaluation process, a semi-quantitative assessment of permanent impacts to wetlands, streams, and open water was conducted for the Emergency Action to allow for a relative comparison of impacts.

Habitat types affected by sediment dredge and disposal include emergent wetlands, forested wetlands, open water, and riparian forest. A site visit was conducted to ensure the accuracy of habitat assumptions and acreage associated with disposal. Open water and wetland disposal locations were verified via boat and Maxar Global Enhanced GEOINT Delivery (G-EGD).

Based on the field analysis and documentation submitted by the SWT Operations Branch, the estimated impact to aquatic habitats from the permanent placement of fill materials is 1.6 million cys. As a result of this investigation, it was determined that there were approximately 228.2 acres of open water, 31.4 acres of emergent wetland, and 2.4 acres of forested wetland impacted by the Emergency Action (Table 2).

## Section 3. Least Environmentally Damaging Practicable Alternative

It was determined by USACE that the Emergency Action Alternative was the Least Environmentally Damaging Practicable Alternative compared to the No Action Alternative, because only the Emergency Action Alternative met the overall purpose and need of the project. However, it is understood there are still major adverse impacts to wetlands and Waters of the U.S. resulting from the Emergency Action.

Due to the disposal of sediment within emergent wetlands, forested wetlands, and bottomland hardwoods; compensatory mitigation will be required and enacted in accordance with Section 404 of the CWA and Section 10 of the River and Harbors Act. The mitigation standard for this project falls under 33 CFR § 332.

In total, there were 10 acres of bottomland hardwood, 2.4 acres of forested wetland, 31.4 acres of emergent wetland, and 288.2 acres of open water habitat impacted by the Emergency Action. Because this action was used to address the sedimentation of the MKARNS, many adverse impacts were unavoidable. In coordination with SWT Regulatory Office (RO), Table 2 displays the ratios required to compensate the adverse impacts as well as the resulting acres required to mitigate the action. It is assumed by SWT that the open water disposal sites are self-mitigating due to the fact that those sediments already existed within the Arkansas River and were altered to compensate for passage within the MKARNS.

## Section 4. Recommended Plan

### 4.1 Project Description

Based on the alternative comparison, the Emergency Action was selected as the Recommended Plan and was enacted by USACE. This plan met the purpose of 40 CFR 1506.12 to respond to immediate threats to human health or safety and valuable natural resources.

The objective of the bottomland hardwood and wetland mitigation is to create a minimum 15 acres of bottomland hardwood, 10.8 acres of forested wetland, and 78.5 acres of emergent wetland in areas that would not be adversely impacted by creation of habitat and would be self-sustaining upon completion of mandatory monitoring and adaptive management guidelines. The mitigation sites are not existing wetlands and would be created in areas affected by agricultural practices. The objectives of SWT Operations Division to compensate the loss of bottomland hardwood and wetland habitat are listed below.

- Establishment of native plant communities for wildlife.
    - Bottomland hardwood - Planting of herbaceous vegetation, shrubs, and trees
    - Forested Wetland - Planting of emergent wetland vegetation along with shrubs and trees
    - Emergent wetland - Planting of emergent wetland vegetation
- Develop and maintain hydrologic characteristics for created habitats

## 4.2 General Description of Dredged or Fill Material

### *4.2.1 General Characteristics of Material*

Material dredged from the ship channel within the MKARNS is composed primarily of sand and other naturally occurring inert material. This material would have been carried downstream in the Arkansas River due to the 2019 flooding event. Therefore, it is assumed that materials dredged from and disposed into the channel already existed within the Arkansas River.

### *4.2.2 Quantity of Material*

The quantity of dredged or fill material varies throughout the channel. The most significant amount of sediment dredged was at Sandtown Bottom with a total of 778,330 cys while the least amount dredged was at RM 400 for a total of 13,875 cys (see Table 1).

Existing agricultural areas will be excavated to expand existing hydrologic conditions to other areas designated for mitigation use. Upon completion of excavation the removed soil will be used to enhance the mitigation site through berms to protect the area from adjacent land uses or will be taken to a commercial disposal site.

## 4.3 Description of the Discharge Site(s)

### *4.3.1 Location*

There are several discharge sites that are applicable to a CWA evaluation. The sites listed as Salt Creek, Spaniard Creek, San Bois Creek, Stoney Point, Sandtown Bottom, and Kerr Lake RM 343 (Table 1) are under evaluation as discharge sites in this Section 404(b)(1) Analysis. The discharge site locations can be found in Attachment A – Project and Mitigation Area Maps.

Because there will be more material cut (excavated) from the mitigation areas; it is assumed that the net cy loss of material will be greater than the net cy increase of material.

### *4.3.2 Size*

The combined total of discharge is 1.6 million cys and impacts to 288.2 acres of open water, 31.4 acres of emergent wetland, and 2.4 acres of forested wetland.

A minimum of 78.5 acres of emergent wetland and 10.8 acres of forested wetland habitat will be created to compensate for the impacts of the discharge listed above.

### *4.3.3 Type(s) of Sites*

All aquatic sites impacted by sediment discharge are within approximately 1500 feet of the dredge locations and include emergent wetland, forested wetland, bottomland hardwood, and open water habitat.

### *4.3.4 Type(s) of Habitat*

As discussed, upland sites in previously approved disposal locations were utilized during the Emergency Action. However, a substantial amount of open water, emergent wetland, forested wetland, and bottomland hardwood forest habitat was affected by

disposal operations. It is assumed there was a net loss of emergent and forested wetland habitats as a result of the sediment discharge.

#### *4.3.5 Waters and Wetlands*

All waters within the project's dredge and disposal operations are considered jurisdictional and were either temporarily or permanently impacted due to the Emergency Action.

#### *4.3.6 Timing and Duration of Discharge*

The timing and duration of discharge is varied for each location. However, it can be assumed that discharge occurred throughout the fall and winter of 2019, the entirety of 2020, and early 2021. It should be noted that multiple locations required separate cuts, so the list below will reflect separate begin and end dates.

- Sandtown Bottom:
    - August 2, 2019 to September 30, 2019
    - October 3, 2019 to October 24, 2019
    - October 28, 2019 to November 20, 2019
    - November 25, 2019 to December 8, 2019
    - December 10, 2019 to December 19, 2019
    - November 13, 2020 to December 22, 2020
- Below Lock 16:
    - September 6, 2019 to October 1, 2019
    - October 11, 2020 to October 15, 2020
- Spaniard Creek:
    - October 21, 2019 to January 13, 2020
    - September 6, 2020 to October 3, 2020
- Salt Creek:
    - February 1, 2020 to March 7, 2020
- Stoney Point:
    - October 21, 2020 to November 9, 2020
- San Bois Creek:
    - January 31, 2021 to April 21, 2021
- Kerr Lake:
    - January 21, 2021 to January 24, 2021
- Three Forks:
    - March 13, 2020 to March 25, 2020

    - August 17, 2020 to August 28, 2020
- RM 400:
    - March 29, 2020 to May 20, 2020
- Below Lock 18:
    - June 9, 2020 to June 27, 2020
- Above Lock 18:
    - July 1, 2020 to July 17, 2020
    - July 20, 2020 to July 24, 2020
- Catoosa:
    - July 30, 2020 to August 9, 2020
- Below Lock 14
    - February 25, 2021 to March 10, 2021

Construction associated with mitigation areas will be timed to occur during low flow periods to minimize impacts to adjacent wetland systems.

### 4.4 Description of Disposal Method

The project used hydraulic dredging to remove loosely compacted sediment materials from the navigation channel. Hydraulic dredges remove and transport sediment in liquid slurry form. They are usually barge mounted and carry diesel or electric-powered centrifugal pumps with discharge pipes ranging from six to 48 inches in diameter. The pump produces a vacuum on its intake side, and atmospheric pressure forces water and sediments through the suction pipe. The slurry was transported by pipeline to a disposal area (see Figure 2). Pipeline dredges are commonly used for open water disposal adjacent to channels. Material from this dredging operation consists of a slurry with solids concentration ranging from a few grams per liter to several hundred grams per liter (USACE, 2018).

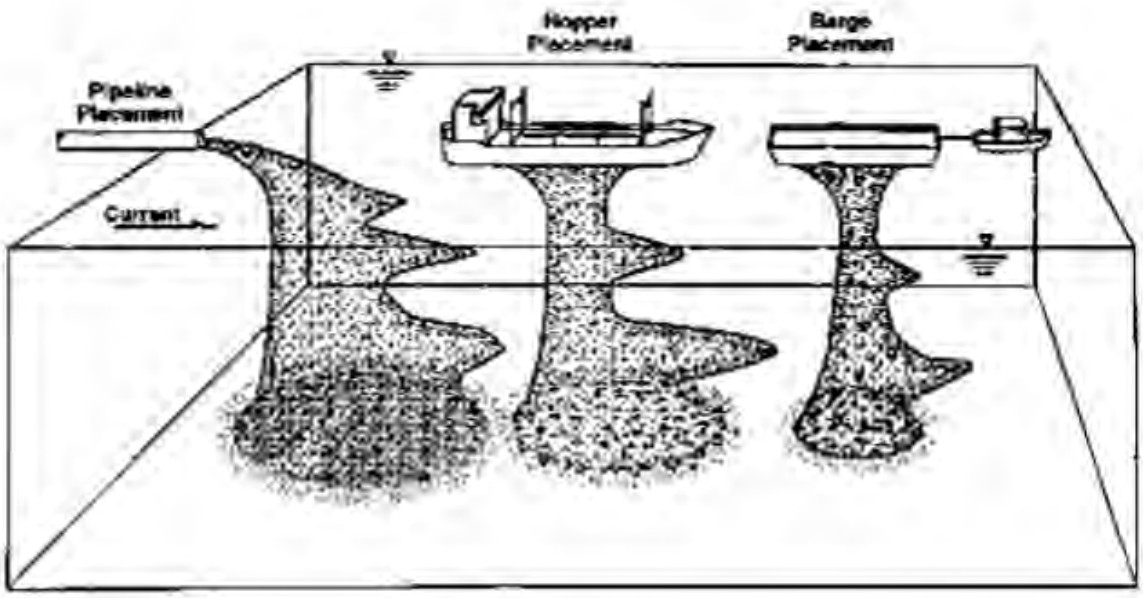


**Figure 2. Plume Shape by Dredge Type**

Heavy construction vehicles and equipment would be needed to excavate areas for wetland creation. The vehicles and equipment would operate outside of existing wetlands and drainages to the extent possible.

An assortment of wheeled and tracked equipment necessary to handle large loads of soil, such as backhoes, track hoes, bulldozers, dump trucks, and front-end loaders, could be used for construction. All suitable on-site material excavated, would be used as fill material for the construction of the project's habitat creation features. Unsuitable or excess materials would be hauled off and disposed of properly. Project work would take place during safe and low flow conditions.

The temporary staging and storage of construction materials and vehicles would be situated in areas that are currently disturbed or are recommended to be cleared from the construction of the project components described above. All staging and storage areas would be outside of biological wetlands. Best management practices (BMPs) in staging areas would include erosion control and spill prevention measures.

## 4.5 Factual Determinations

### *4.5.1 Physical Substrate Determinations*

#### 4.5.1.1 Substrate Elevation and Slope

The MKARNS has been channelized and stabilized with dikes and revetments to improve navigation on the system. This channelization has reduced the historic breadth of the floodplain in these areas. The placement of levees along the system to retain floodwaters and control normal flood events has also impacted the systems' historic floodplain (USACE, 2005).

The substrate dredged and disposed within the Arkansas River is attributed to upstream sedimentation. The flooding of 2019 washed the sediment existing within the channel to the locations described in Table 1. This substrate is similar in size and shape of the existing substrate within the project areas because it can be attributed to the overall study area.

Open water disposal altered the bottom elevation of the Arkansas River; however, these effects are not considered permanent. Their placement does not match existing channel flows and it is likely the sediment will be pushed downstream over an extended period of time. The deposition of the dredge material has created underwater islands that are suitable for wading, loafing, and foraging for birds and in low flows can be utilized for interior least tern (*Sterna antillarum*) nesting habitat.

Disposal operations are generally left in one place, which would lead to mounding even in open water habitats. Due to the amount of sediment discharged within open water, it can be assumed there will be some minor to major scouring around the edges of the disposal site. Over time, this will decrease as the sediment is pushed downstream.

The elevation and slope of the constructed mitigation areas would be impacted in minor amounts due to contouring and excavation. These impacts are considered beneficial in the long-term because they will enhance the structure and function of the newly created wetlands.

#### 4.5.1.2 Sediment Type

The predominant soil types in the study area are Austin Silty Clay (AuC) and Eckrant Cobbly Clay (TaB) which cover most of the developed area to the east and west of Huebner Creek. The other dominant soil types are Houston Black Clay (HsB) and Whitewrightht Austin Complex (BsC).

During periods of high river flows, water velocities are reached that cause river sediments in the form of silt and sand, to be carried in suspension. As river flow decreases and velocities slow, the heavier suspended materials are dropped and shoals develop in eddies and slower moving water. These shoals, when they occur in the navigation channel, are removed by dredging to maintain the MKARNS to authorized depths and dimensions. Under normal conditions, dredged materials are disposed of in designated disposal areas on shore adjacent to the river or behind bank stabilization and channel alignment structures. The material dredged from the Arkansas River is normally sand. Dredged material is most likely to be free of contaminants if the material is composed primarily of sand, gravel, or similar materials and is found in areas of high current or wave action.

#### 4.5.1.3 Dredge/Fill Material Movement

Approximately 1.6 million cys of sediment were removed from the MKARNS. The cubic yards were disposed and split between previously approved upland disposal sites and unapproved bottomland hardwood forest, open water, emergent wetland, and forested wetland habitat. It is assumed the Arkansas River will continue to flow freely through wetland and open water disposal sites. Water velocities associated with the river will carry deposited sediments further downstream. The rate of transport will be dependent

upon future rain events. Extreme precipitation events, such as a 100-year flood are more likely to force water and sediment at a faster rate downstream, as compared to a two- or five-year flood.

#### 4.5.1.4 Physical Effects on Benthos

Excavation of sediments removes and buries benthic organisms, whereas placement of dredged material and structures smothers or buries benthic communities. Dredging and placement activities may cause ecological damage to benthic organisms due to physical disturbance, mobilization of sediment contaminants, and increasing concentrations of suspended sediments (Montagna et al., 1998)

Implementation of the Emergency Action attributed to unavoidable impacts to open water, emergent wetland, and forested wetland habitats. It is likely that the discharges in these habitat types smothered bottom-dwelling immobile organisms and required mobile benthos to migrate to areas unaffected by disposal. However, it is likely benthic forms would recolonize discharge sites that have appropriate elevations within the water because the discharge would be very similar to sediments found throughout the project due to regularly occurring sedimentation.

It is assumed that lateral displacement of the dredged material would adversely affect all the open water disposal sites due to the regular water velocity in the Arkansas River. Emergent and forested wetland disposal sites may experience less frequent lateral dispersal due to their location above the water's surface. However, it is expected high flow events will eventually carry less compacted sediments further downstream over time.

#### 4.5.1.5 Other Effects

Temporary impacts to aquatic organisms and fish are expected to occur during dredging and disposal activities with the potential for temporary sedimentation and water quality degradation within the river. However, the aquatic organisms would be expected to return upon completion of the restoration.

#### 4.5.1.6 Actions Taken to Minimize Impacts

Actions taken to minimize impacts were the main focus of implementing the Emergency Action Alternative. Although major impacts to wetlands and open water habitat occurred, significant adverse impacts resulting from the No Action SIternative would have resulted in a permanent drawdown of Webbers Falls Pool.

Actions would be minimized to the extent possible by scheduling mitigation construction to coincide with low flow periods. Silt fences and geotextile filters would be placed to minimize sediment transport downstream. Staging and construction access areas would avoid wetlands and aquatic habitats to minimize temporary disturbances and provide distance between aquatic habitats and exposed sediments.

### *4.5.2 Water Circulation, Fluctuation, and Salinity Determinations*

#### 4.5.2.1 Salinity

The project would not impact salinity within the Arkansas River.

#### 4.5.2.2 Water Chemistry

Dredging and disposal actions resulted in short-term and localized impacts and would not be expected to degrade the long-term water quality within the project area. These patterns should return to their previous condition following completion of dredging. Temporary changes to dissolved oxygen (DO), nutrients, turbidity, and contaminant levels may occur due to sediment disturbance and mixing during dredging. Temporary DO decreases may also happen from aerobic decomposition from short-term increases in organic matter suspended within the water column.

#### 4.5.2.3 Clarity

There would be some temporary increase in local turbidity during dredging and placement operations. Water clarity is expected to return to normal background levels shortly after operations were completed.

#### 4.5.2.4 Color

Water immediately surrounding the construction area was discolored temporarily due to disturbance of the sediment during dredging and placement actions but is expected to return to normal after operations cease.

#### 4.5.2.5 Odor

The dredged materials are not expected to have been anoxic, so there should not have been odors associated with the dredging or its placement.

#### 4.5.2.6 Taste

Water within the Webbers Falls Pool is used as an emergency water supply, while the water in Robert S. Kerr Pool is used for public and private water supply. There would be some temporary adverse impacts to taste due to increased turbidity during dredging and placement.

#### 4.5.2.7 Dissolved Gas Levels

Negligible amounts of hydrogen sulfide may be expected. Hydrogen sulfide and other gases like methane are associated with high amounts of decaying organic matter, which are not expected to be present in excavated and placed materials. Disposed sediments may be very low in total organic carbon, an indicator of organic content. Dissolved gases have not been identified as a problem with maintenance material of the current channel. Localized oxygen reductions associated with dredging for the Emergency Action are expected to be short lived and would return to normal soon after the work is complete.

#### 4.5.2.8 Nutrients

Nutrient levels may have been slightly and temporarily elevated during dredging and near the disposal areas since it is possible the material had organics.

#### 4.5.2.9 Eutrophication

Nutrients were not expected to reach levels high enough for periods long enough to lead to eutrophication of the surrounding waters.

### *4.5.3 Current Patterns and Circulation*

#### 4.5.3.1 Current Patterns and Flow

The Van Buren gauging station is used as the control point for river stages on the MKARNS. River flows are defined as follows:

- Optimum river flows are defined as less than 61,000 cfs. This definition correlates to optimum conditions for commercial navigation on the MKARNS;
- Moderate river flows are defined as those between 61,000 cfs and 100,000 cfs. Flooding of some fields along the main stem of the Arkansas River in western Arkansas begins at flows greater than 61,000 cfs;
- High river flows are defined as those between 100,000 cfs and 175,000 cfs. The 100,000 cfs level is considered critical because any flow above 100,000 cfs renders the navigation system non-navigable for commercial barge traffic; and
- Very high river flows are defined as those greater than 175,000 cfs. A flow of 175,000 cfs is notable because that is the point in the modeled condition data above which no appreciable difference is shown from the baseline or between alternatives.

Any impacts from dredging are expected to be minimal because the MKARNS is regularly dredged for maintenance purposes.

Long-term adverse impacts to current patterns and flow have occurred due to disposal. Large amounts of sediment placed within wetlands have displaced water. The wetlands at Salt Creek and Stoney Point were naturally designed to allow river flow through the center of the island landmass. Due to disposal, the islands no longer have open water flow and are disconnected from one side of the island to the other. Open water disposal is assumed to have impacts to current patterns and flow. The amount of disposal located off the main navigation channel produced drastic changes in substrate elevation. New bottom levels would impact pattern by reducing the capacity of water flow within that area.

#### 4.5.3.2 Velocity

There were no substantial impacts to velocity.

#### 4.5.3.3 Stratification

There were adverse impacts to stratification resulting from dredge disposal in wetlands and open water. The emergent and forested wetland habitats have been filled in and lack any traces of water. The open water disposal sites either expanded the boundary of an existing island, creating additional land space, or were added to sites that created brand new islands. The dredge disposal has disrupted the water stratification by removing the hypolimnion, thermocline, and epilimnion layers from the water column.

#### 4.5.3.4 Hydrologic Regime

No impacts are expected to have occurred. Navigation channel modification by dredge or disposal would not alter the overall volume of streamflow or precipitation patterns within the Arkansas River.

#### 4.5.3.5 Normal Water Level Fluctuations

A significant characteristic of the river hydraulics in the project area are high-frequency, large amplitude flow fluctuations resulting from large rain events. Flows within the study area regularly fluctuate from little to no water to large flows from storms.

#### 4.5.3.6 Salinity Gradients

The water is slightly saline due to large, natural salt beds in Oklahoma and Kansas that the Arkansas River traverses. However, there would be no impacts to salinity gradients.

#### 4.5.3.7 Actions Taken to Minimize Impacts

Existing upland disposal sites were used in areas where open water and wetland disposal could be avoided.

### *4.5.4 Suspended Particulate and Turbidity Determinations*

#### 4.5.4.1 Expected Changes in Suspended Particulates/Turbidity Levels in Vicinity of Disposal Site

An increase in suspended particulates and the concomitant turbidity levels is expected to have occurred during dredging and placement operations of material removed from the navigation channel.

A Stormwater Pollution Prevention Plan (SWPPP) would be prepared before construction of the mitigation action occurs, which would outline site-specific BMPs to minimize the erosion and the potential for sediment to enter receiving waters during construction activities. Best Management Practices, such as silt curtains could be used to reduce impacts. Surplus material that cannot be used for restoration activities would be disposed of appropriately.

#### 4.5.4.2 Effects (degree and duration) on Chemical and Physical Properties of the Water Column

**Light Penetration:** Changes to light penetration would have occurred during dredge and disposal. These impacts would be associated with turbidity increases. Conditions are anticipated to return to normal levels of light penetration following project completion, except in areas where water is no longer present.

**Dissolved Oxygen:** Temporary DO decreases associated with extended periods of dredge and dredged material disposal may have occurred from aerobic decomposition from short-term increases in organic matter suspended within the water column.

**Toxic Metals and Organics:** No water testing was conducted in the project area. Sediments are not expected to contain toxic metals and organics. Results of previous sediment testing in regard to the MKARNS can be found in the *Arkansas River Navigation Study Feasibility Report and Environmental Impact Statement (EIS) August 2005* (USACE, 2005).

**Pathogens:** Sediments are not expected to contain or influence pathogens.

**Others as Appropriate:** A hazardous, toxic, and radioactive waste (HTRW) review was performed. It has been concluded that there are no known high or low impact HTRW expected from the dredging activity (see Section 2 of the EA for the Webbers Falls Pool and Robert S. Kerr Pool Emergency Dredging and Open Water Disposal).

#### 4.5.4.3 Effects on Biota

**Primary Production, Photosynthesis:** Permanent loss to wetland biota are expected to occur as a result of disposal. Sediment was placed within wetland habitats,

suffocating any existing vegetation. Water has been displaced by sediment, so reestablishment of vegetation in the wetland sites is not likely to occur.

Any vegetation within open water disposal sites would also be suffocated by sediment but is likely to return. Primary producers would be restored over time within these disposal locations.

**Suspension/Filter Feeders:** Permanent loss to suspension and filter feeders are expected to have occurred due to open water disposal. It can be expected any suspension/filter feeders that were located adjacent to disposal would simply disperse to undisturbed areas. However, it can be assumed that there were adverse impacts to those individuals that may have been immobile or trapped during disposal. Upon final disposal in areas, suspension and filter feeders are expected to repopulate to existing levels. The total area of impact, 288.2 acres, could be expected to have minor to major impacts on these aquatic species dependent upon the discharge area.

**Sight Feeders:** Sight feeders would be temporarily displaced during dredging and disposal activities. Sight feeders are expected repopulate to the current extent upon completion of the Emergency Action. Some net loss of sight feeders can be anticipated, but these affects are not assumed to be major.

#### 4.5.4.4 Actions Taken to Minimize Impacts

### *4.5.5 Contaminant Determinations*

Dredging within the navigation channel will not introduce or increase contaminants. Chemical constituents in bottom sediments dredged are already subject to relocation and redistribution through currents, and other natural climatic and weather-related forces in the Arkansas River. Hydraulic dredging, the primary dredging method, and tend to limit the size of turbidity plumes due to the suction nature of the dredging. Only short term and localized increases in turbidity will be temporary and limited in size. The main effect at the dredge site would be the removal of sediments with relocation to proposed dredged material disposal sites. For use of existing disposal areas, the material would be placed to raise or repair existing dikes, or otherwise placed within dikes. In addition, the materials were also placed within wetland and open water sites.

The potential impacts from hazardous, toxic, and radioactive waste (HTRW) related to dredging activities was considered in accordance with USACE ER 1165-2-132, "*Hazardous, Toxic, and Radioactive Waste (HTRW) Guidance for Civil Works Projects*", dated June 26, 1992. Per the ER, Section 4.a.(1), "Dredged material and sediments beneath navigable waters proposed for dredging qualify as HTRW only if they are within the boundaries of a site designated by the EPA or a state for a response action (either a removal action or a remedial action) under Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), or if they are a part of a National Priority List (NPL) site under CERCLA." The ER does not require a specific method for performing this HTRW surveys but does require that HTRW concerns be assessed and impacts and their costs reported and/or approximated, as necessary for each Civil Works project. The full American Society for Testing and Materials (ASTM) Phase I environmental site assessment or All Appropriate Inquiry (AAI) procedure was not followed and Recognized Environmental Conditions (RECS) were not identified for any

HTRW concerns/impacts while preparing this report. Therefore, none of the following was performed: site specific reconnaissance/property visit; Sanborn Maps; historical aerial photos and topographic maps; personal property owner interviews; search of a commercial CERCLA/Resource Conservation and Recovery Act (RCRA)/other local/state pollutants environmental database; City Directory.

In addition, two barges impacted Webber Falls Lock and Dam 16 causing them to overturn and deposit approximately 3,800 tons of phosphate fertilizer in the river on May 23, 2019. Because of the high solubility of the fertilizer, biodegradability of its contents, and high river flow rate from flood conditions, there is little to no concern for HTRW impact from the barge contents on the dredged materials.

There may be unknown HTRW or pollutant impacts to the study area which were not fully disclosed and listed. These types of unknown HTRW impacts could also consist of newly discovered HTRW or buried historical type HTRW that is not observed on the land surface or not found from CERCLA databases. Newly discovered HTRW can sometimes be derived from residual (leftover) forms of contamination existing within the soils, soil vapor, air, surface water and groundwater media from releases of HTRW from known and listed HTRW sites. This occurs when undefined portions of the remaining known residual HTRW releases are encountered at known HTRW properties.

The survey conducted in this report is based on information available from the EPA and the ODEQ on response actions under CERCLA. The survey was conducted on land within ¼ mile of the river starting at the start of the Verdigris River at Tulsa, OK and ending at Fort Coffee, OK along the Arkansas River. Review of the EPA NPL and RCRA database found no sites within the study area (Figure 3). Review of the ODEQ RCRA Corrective Action, Brownfield, and Solid/Hazardous Waste Permit facilities found no sites within the study area (Figure 4).

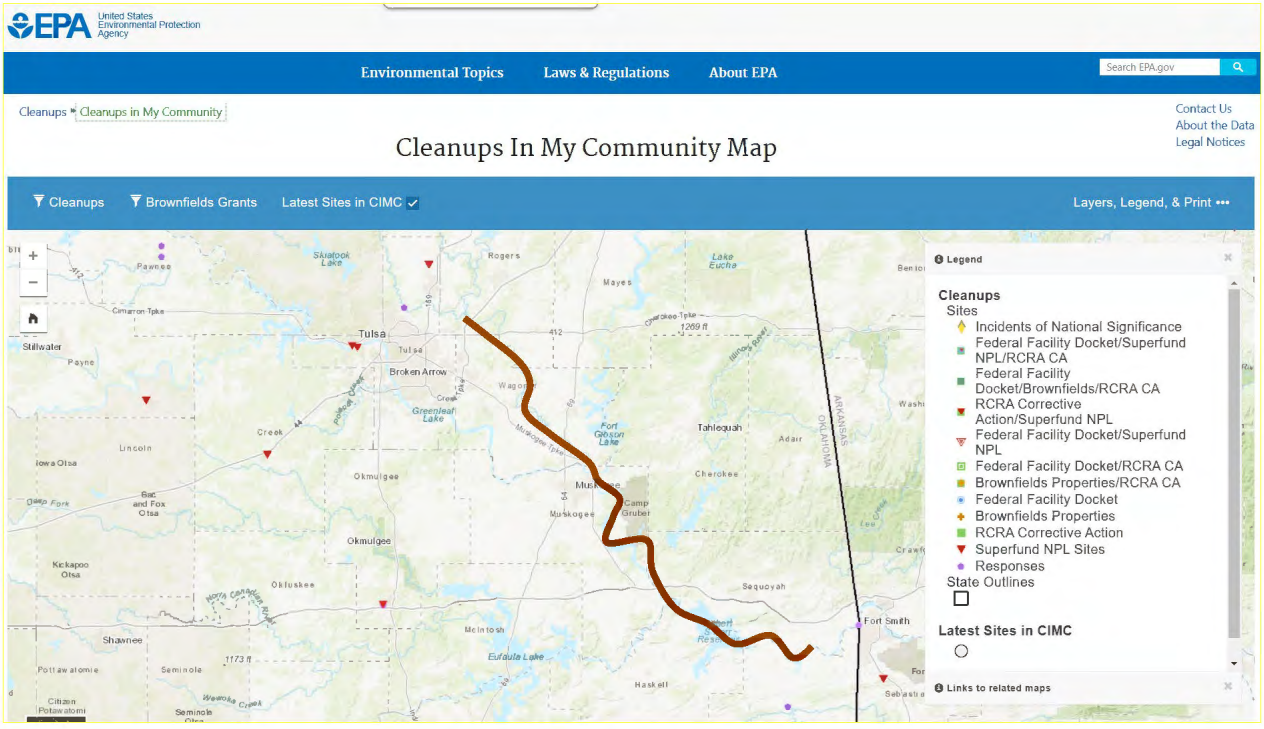

Figure 3. EPA, NPL, and RCRA Sites with Approximate Survey Area (EPA, 2021)

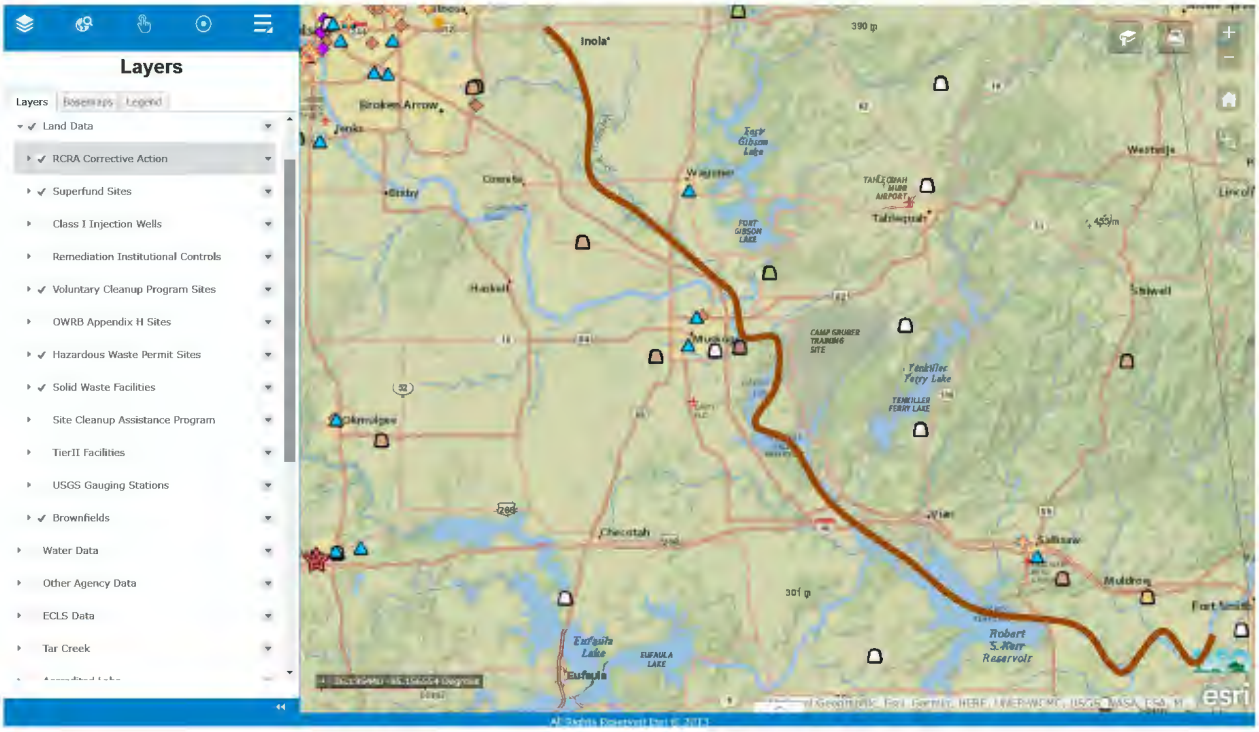


Figure 4. ODEQ, RCRA, and Waste Facility Sites with Approximate Survey Area Drawn as Green Line (ODEQ, 2021)

### *4.5.6 Aquatic Ecosystem and Organism Determinations*

#### 4.5.6.1 Effects on Plankton and Nekton

Plankton and nekton that occupied the sediments and water columns in the existing sites of the project features would be adversely impacted by disposal activities, but it is anticipated that the impact would be temporary and short-term as these species would recolonize the sites once disposal is complete.

Impacts to free-floating or limited-mobility nekton were temporary during dredging, and minor. These impacts, such as entrainment into cutterheads or vessel cooling water intakes and discharges would be temporary and minor, because the amount of water exchange involved is volumetrically insignificant compared to the navigation channel, and the ubiquity and high turnover in populations of these types of fauna would quickly replace any impacted organisms. Finfish would be readily able to avoid impacts given their mobility. No permanent or long-term impacts on nekton would have resulted from the Emergency Action and the disposal of maintenance material.

Turbidity from total suspended solids tends to reduce light penetration and thus reduce photosynthetic activity by phytoplankton (Wilber and Clarke, 2001). Such reductions in primary productivity would be localized around the immediate area of the dredging and placement operations. This reduced productivity may be offset by an increase in

nutrients released into the water column during dredging activities that can increase productivity in the area surrounding the dredging activities (Newell et al., 1998; Wilber and Clarke, 2001). In past studies of impacts of dredged material placement from turbidity and nutrient release, the effects are both localized and temporary (May, 1973). Due to the capacity and natural variation in phytoplankton populations, the impacts to phytoplankton from the emergency action, dredging within the project area, and dredged material placement of material would be temporary

#### 4.5.6.2 Effects on Benthos

There would be direct impacts to benthic organisms, which would be buried or removed during dredging and wetland/open water disposal. Excavation of sediments removes and buries benthic organisms, whereas placement of dredged material and structures smothers or buries benthic communities. Dredging and disposal activities may cause ecological damage to benthic organisms due to ecosystem physical disturbance, mobilization of sediment contaminants making them more bio-available, and increasing concentrations of suspended sediments (Montagna et al., 1998).

#### 4.5.6.3 Effects on Aquatic Food Web

The discharge of sediment on wetland and open water habitats are expected to have adversely impacted fish, crustaceans, mollusks and other organisms. Immobile organisms or species too slow to move out of the disposal areas were most likely killed by the smothering sediments. Changes to the water column in the open water sites would also cause permanent adverse impacts to species dependent upon substrates. Suspended particulates would also have caused adverse impacts to the aquatic food web; however, these impacts would be temporary as sediments begin to settle after disposal occurred.

#### 4.5.6.4 Effects on Special Aquatic Sites

**Sanctuaries and Refuges:** The Sequoyah National Wildlife Refuge is 20,800 acres of open water, wetland, and bottomland hardwood habitat spread throughout USACE fee-owned property (USFWS, 2020) (Figure 5). Lands were designated for the refuge to replace wildlife habitat and waterfowl hunting opportunities lost due to the construction of the Robert S. Kerr Pool (USACE, 2015). The primary management practice within the Sequoyah National Wildlife Refuge is the establishment of large food plots within the refuge to attract large concentrations of migrating and wintering waterfowl. The principal crops which are grown on these plots are corn, grain sorghums, wheat, soybeans, millet, and buckwheat. Another highly successful management practice within the refuge is the construction and maintenance of large, controlled water level marshes. These marshes can be drained during the growing season; planted to crops; and then reflooded in the fall. Due to the nonfluctuating water level of the navigation project, the crops on the refuge produce a good yield every year.

Migrating birds regularly use the refuge as an important nesting and stopover destination (USFWS, 2020). There are approximately 250-plus species of birds that are likely to use bottomland hardwood forests in eastern Oklahoma. The refuge is

intensively managed for wading bird, shorebird, and waterfowl food production and are actively managed to provide an appropriate food source during winter months.

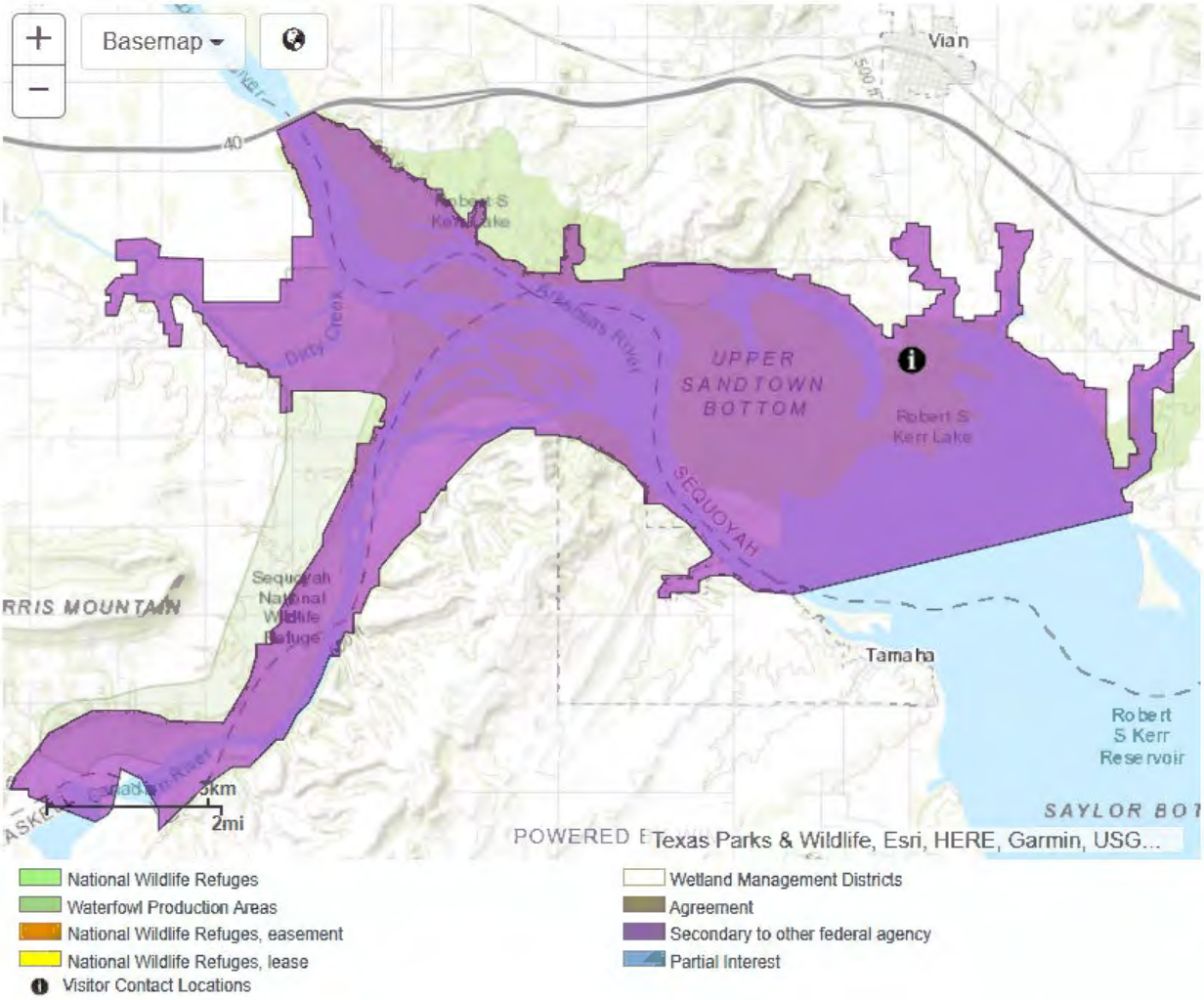


**Figure 5. Sequoyah National Wildlife Refuge (USFWS, 2020)**

As described above, this refuge is an area designate under Federal law to be managed principally for the preservation and use of fish and wildlife resources. The discharge of dredge material is changed the balance of water and land areas needed to provide cover, food, and other fish and wildlife habitat requirements.

There were direct impacts to the Sequoyah National Wildlife Refuge due to disposal within the Robert S. Kerr Pool, specifically Stoney Point with approximately 76,444 cys of sediment disposed. The disposal at Stoney Point; however, will provide minor benefits for shorebirds and interior least tern. Although the interior least tern has been delisted from the Federally threatened and endangered species, it was Endangered at the time of dredging and disposal at Stoney Point. The sediment on Stoney Point will be contoured to smooth the consolidated piles on the island. Vegetation will likely suffocate over time from the sediment, which will provide a larger area of sand for shorebirds. USACE will continue to manage the altered island with herbicide to promote interior least tern habitat. Although open water disposal can have adverse effects to water

quality, this action provided beneficial wading bird habitat by increasing the abundance of islands beneath the water surface.

**Wetlands:** There was a net loss in high quality wetlands as a result of the Emergency Action. Discharge of fill material destroyed habitat and adversely affected the biological productivity of individual wetland ecosystems by smothering, dewatering, and altering substrate elevation and water movement. The Emergency Action led to the destruction of wetland vegetation, which is assumed to lead to an advancement of upland species unless properly treated with chemical or mechanical controls. Current patterns and velocities were altered within the wetland systems and in some cases eliminated the mechanism to flush, circulate, and filtrate aggravating materials. In addition, the modification of these wetlands may have adversely affected the ability to retain and store floodwaters and protect upland areas from erosion.

There were 31.4 acres of emergent wetland impacts and 2.4 acres of forested wetland impacts. Compensatory mitigation will be required and enacted in accordance with Section 404 of the CWA and Section 10 of the River and Harbors Act. The mitigation standard for this project falls under 33 CFR § 332. A minimum of 78.5 acres of emergent wetland and 10.8 acres of forested wetland habitat will be created within USACE fee-owned land, previously impacted by haying and grazing activities.

**Mudflats:** There are no mudflats that occur within the project area.

**Vegetated Shallows:** As discussed above, there would have been adverse impacts to vegetated shallows as a result of wetland and open water disposal. It is assumed that any vegetation within those project areas would have been smothered by sediments. As a result of the Emergency Action, these vegetated shallows will no longer be available for use by aquatic or terrestrial species.

**Riffle and Pool Complexes:** There are no riffle and pool complexes within the project area.

**Threatened and Endangered Species:** There are federally listed threatened and endangered species within the project areas, additional discussion can be found in Section 2 of the EA for the Webbers Falls Pool and Robert S. Kerr Pool Emergency Dredging and Open Water Disposal.

**Other Wildlife:** Wildlife inhabiting the aquatic habitats within the project area were permanently displaced during dredging and disposal. Mobile species would emigrate to nearby adjacent habitats. Although sessile species would be impacted during construction activities, they would be expected to return to suitable habitat areas following construction.

In addition to immediate habitat loss, these species would also be impacted by the loss of breeding and nesting areas, escape cover, travel corridors, and preferred food sources for resident and transient wildlife species associated emergent and forested wetland and open water habitats.

4.5.6.5 Other Effects

**Land Use, Transportation, and Utilities:** Temporary, adverse impacts to land use and transportation were temporary in nature. Additional discussion about the environmental consequences to these uses can be found in Section 2 of the EA for the Webbers Falls Pool and Robert S. Kerr Pool Emergency Dredging and Open Water Disposal.

**Cultural Resources:** The Emergency Action dredging and disposal did not involve ground preparation. Thus, there is a further reduction in any perceived potential to affect historic properties. When analyzed in full, these considerations – both concerning the project specifications and the river geomorphology as it relates to archaeological site potential – lead to a firm determination that the action did not have the potential to affect historic properties and that no further work, regarding dredge and disposal, is necessary under Section 106.

However, activities associated with the mitigation plan include maximizing the hydrologic footprint of existing wet soils. There is the potential for direct and indirect impacts from ground disturbance associated with the compensatory habitat mitigation. The mitigation proposed does not impact known historic properties based on background research; however, the areas proposed have not been previously culturally surveyed to identify historic, pursuant to 36 CFR 800.4; the potential to encounter newly identified historic properties is high.

### *4.5.7 Disposal Site Determinations*

#### 4.5.7.1 Mixing Zone Determination

Mixing zones were not designated at the time of the Emergency Action and subsequent dredging and disposal.

#### 4.5.7.2 Determination of Compliance with Applicable Water Quality Standards

Impacts on water quality were likely to occur during the Emergency Action. However, the goal of the mitigation plan is to compensate for those adverse impacts and improve wildlife habitat conditions by creating new emergent and forested wetlands. Implementation of the mitigation plan will bring this project into compliance with standards set by the CWA.

In addition, the development and use of the SWPPP for construction and post-construction operation will bring this project into compliance with standards set by the Clean Water Act by identifying the potential stormwater pollution sources, which could include grading and excavation operations, material storage areas, and staging areas, and reduce the potential of those pollutants entering nearby waterways. It is assumed that the mitigation plan would result in minor beneficial impacts to water quality.

#### 4.5.7.3 Potential Effects on Human Use Characteristics

**Municipal and Private Water Supply:** No apparent private, public, or industrial water wells registered with the Oklahoma Water Resources Board (2021) were destroyed and/or affected by the Emergency Action.

**Recreational and Commercial Fisheries:** No significant adverse or long-term effects to other recreational or commercial fisheries are anticipated as a result of the Emergency Action.

**Water Related Recreation:** Minor long-term adverse impacts would be associated with dredged material disposal on areas used for hunting, fishing, or other recreational activities. However, given the number of recreational opportunities in the area, this would be a minor adverse impact. Once at capacity, dredged disposal has the potential to create wildlife habitat, which would have indirect beneficial effects on recreation if they enhanced hunting, fishing, or wildlife viewing opportunities.

**Aesthetics:** Minor permanent adverse impacts to aesthetics occurred as a result of the Emergency Action. Sediment placed within wetland habitat is not pleasing to the eye. However, the effects are considered minor due to the proximity of other wetland habitats that can be observed within the MKARNS.

**Parks, National and Historic Monuments, National Seashores, Wilderness Areas, Research Areas, and Similar Preserves:** No parks, national or historic monuments, national seashores, wilderness areas, or research sites were negatively impacted by the project.

## Section 5. Determination of Cumulative Effects of the Aquatic Ecosystem

The Emergency Action is not expected to have had significant adverse cumulative effects on the aquatic environment. Most impacts would have been localized within the disposal areas. Movement and dispersal of sediment is likely to occur over time. Some cumulative impacts would be attributed to the loss of wetland and open water habitat within the Arkansas River.

## Section 6. Determination of Secondary Effects on the Aquatic Ecosystem

No significant adverse secondary effects on the aquatic ecosystem occurred from implementing the Emergency Action or use of existing disposal areas. It is expected that wetlands adversely effected by disposal have the potential to be utilized by USACE as disposal locations because they have already been destroyed. These areas are not planned for development into other land uses outside of their current condition.

## Section 7. Summary of 404(b)(1) Analysis, Findings of Compliance or Non-Compliance with Restrictions on Discharge

Section 404(b)(1) of the CWA of 1972 requires that any recommended discharge of dredged or fill material into Waters of the U.S. must be evaluated using the guidelines developed by the Administrator of the U.S. Environmental Protection Agency (EPA) in conjunction with the Secretary of the Army. These guidelines are in Title 40, Part 230 of the CFR. The Section 404(b)(1) evaluation in this report analyzes all activities associated with the Emergency Action that involve the discharge of dredged or fill material into Waters of the U.S. Under the 404(b)(1) guidelines, no discharge of dredged or fill material shall be permitted if there is a practicable alternative to the recommended discharge which would have less adverse impact on the aquatic

ecosystem, so long as the alternative does not have other significant adverse environmental consequences. An alternative is practicable if it is available and capable of being done after taking into consideration cost, existing technology, and logistics in light of overall project purposes. The DEQ provided a water quality certification waiver to USACE on July 10, 2019 for 1.25 million cys of sediment dredge and 550 acres of adverse impacts to Waters of the U.S. It is the intention of USACE to seek water quality certification of the approximately 350,000 cys of sediment dredge not included in the 2019 waiver, as well as certification for the 33.8 acres of wetland impacts.

An alternatives analysis was done as part of the Emergency Action. The SWT Operations Division determined there were two practicable alternatives, including the No Action Alternative as discussed in Section 2.1. Only these alternatives sufficiently meet the overall project purposes to be considered practicable.

Implementation of the Emergency Action involved the dredging of 1.6 million cys of the navigation channel. This dredge would not violate established State water quality standards or the Toxic Effluent Standards of Section 307 of the CWA of 1977, as amended, nor harm any endangered species or their critical habitat. However, the disposal of sediment outside of the existing approved disposal areas are in violation of the Clean Water Act of 1977.

Implementation of the Emergency Action did not result in significant adverse effects on human health and welfare, including municipal and private water supplies, or recreation and commercial fishing.

The SWT Operations Division has prepared a mitigation plan that will adequately address the adverse impacts of the wetland and open water disposal impacts. This mitigation plan is addressed in Attachment C. Construction of any future mitigation as a result of the Emergency Action will follow appropriate regulations in Oklahoma. In Oklahoma, DEQ is the permitting authority and administers the National Pollutant Discharge Elimination System. Operators of construction activities that disturb five or greater acres must prepare a SWPPP, submit a Notice of Intent to DEQ and obtain authorization under OKR10, conduct onsite posting and periodic self-inspection, and follow and maintain the requirements of the SWPPP. During construction, the operator shall assure that measures are taken to control erosion, reduce litter and sediment carried offsite (silt fences, hay bales, sediment retention ponds, litter pick-up, etc.), promptly clean-up accidental spills, utilize BMPs onsite, and stabilize site against erosion before completion.

Upon completion of the EA, where more details will be developed regarding placement of project features, all resource agencies, including the DEQ, will be invited to review updated figures, designs, and alignments to ensure mitigation plans are sufficient and appropriate permits will be obtained prior to construction of mitigation features.

## Section 8. References

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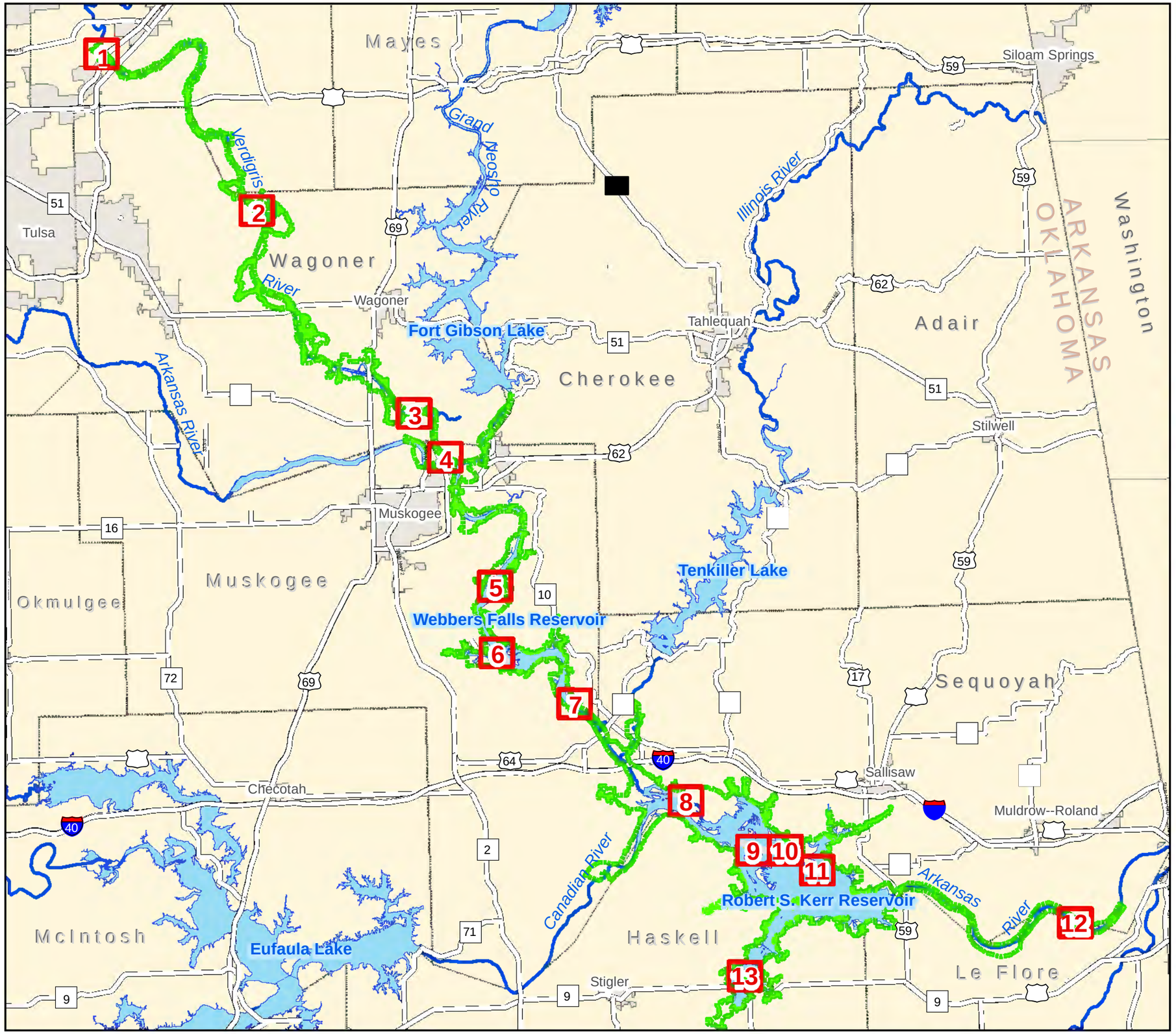
## Section 9. List of Preparers

Justyss Watson – Biologist, Regional Planning and Environmental Center; 6 years USACE experience.

# ATTACHMENT A





INDEX GRID
DREDGE AREA
STUDY AREA
DMMP DISPOSAL SITE

**ADVERSE IMPACT**

BOTTOMLAND HARDWOOD DISPOSAL SITE
EMERGENT WETLAND DISPOSAL SITE
FORESTED WETLAND DISPOSAL SITE
OPEN WATER DISPOSAL SITE

**U.S. ARMY CORPS OF ENGINEERS**
**TULSA DISTRICT**

# MCCLELLAN-KERR ARKANSAS RIVER NAVIGATION SYSTEM

## AFTER ACTION ENVIRONMENTAL ASSESSMENT

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0 3.75 7.5 15 Miles

DATE: MARCH 2021

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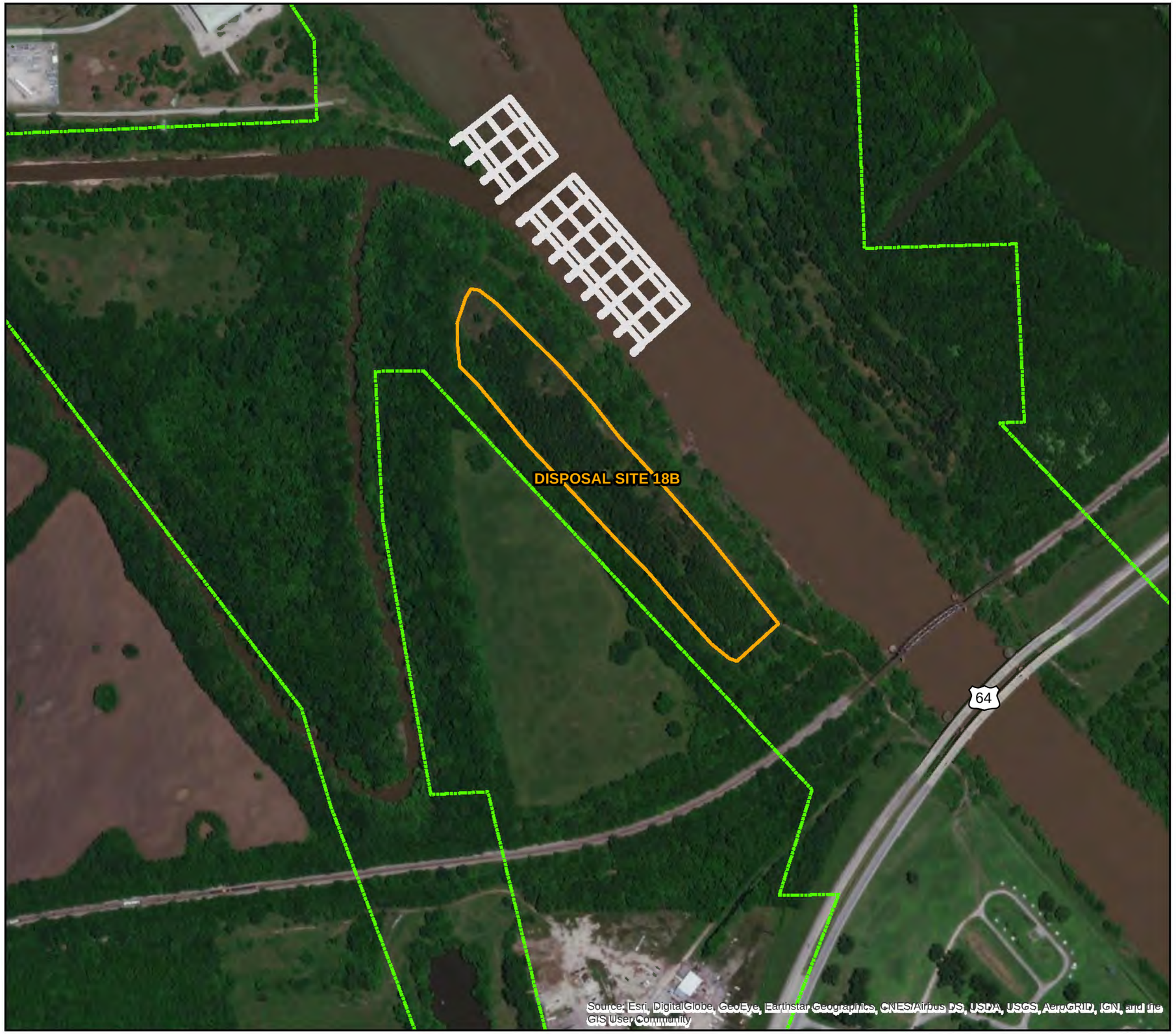


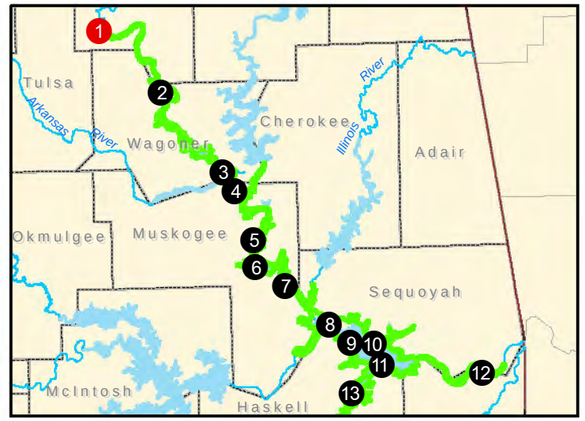


DREDGE AREA

STUDY AREA

DMMP DISPOSAL SITE

**U.S. ARMY CORPS OF ENGINEERS**
**TULSA DISTRICT**

# MCCLELLAN-KERR ARKANSAS RIVER NAVIGATION SYSTEM

## AFTER ACTION ENVIRONMENTAL ASSESSMENT

INDEX SHEET 01

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| DATE: | MAP NO. |
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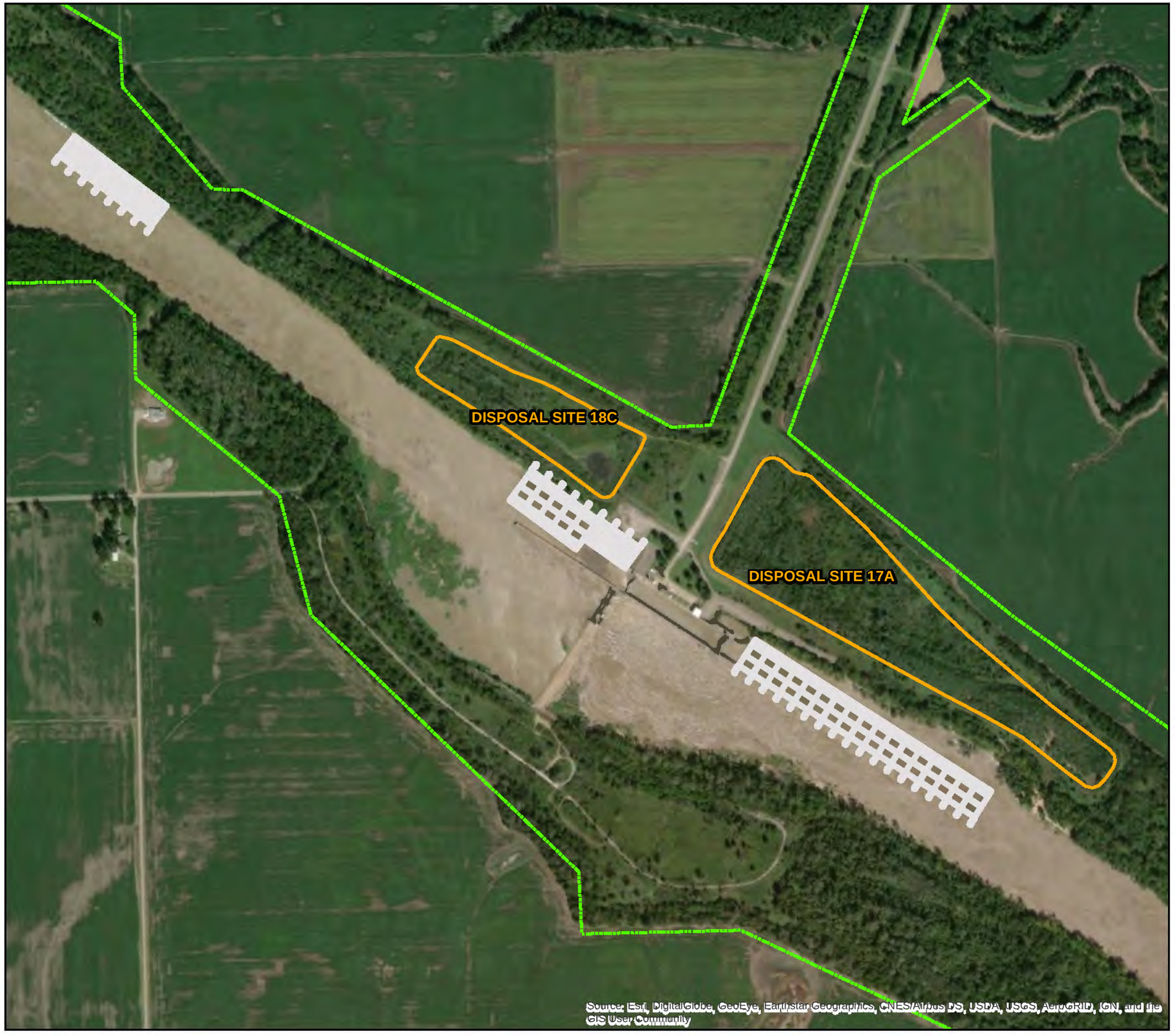


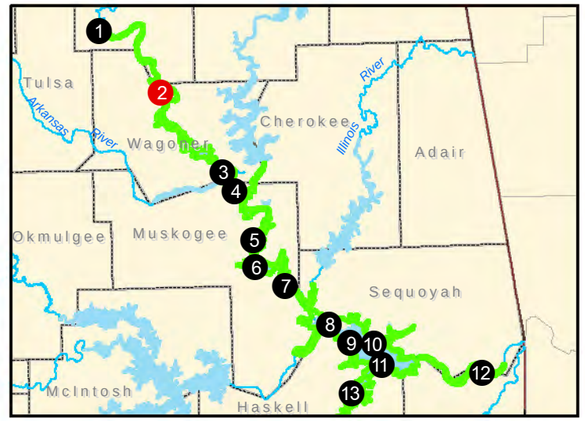


DREDGE AREA
STUDY AREA
DMMP DISPOSAL SITE

**U.S. ARMY CORPS OF ENGINEERS**
**TULSA DISTRICT**

MCCLELLAN-KERR ARKANSAS RIVER NAVIGATION SYSTEM

AFTER ACTION ENVIRONMENTAL ASSESSMENT

INDEX SHEET 02

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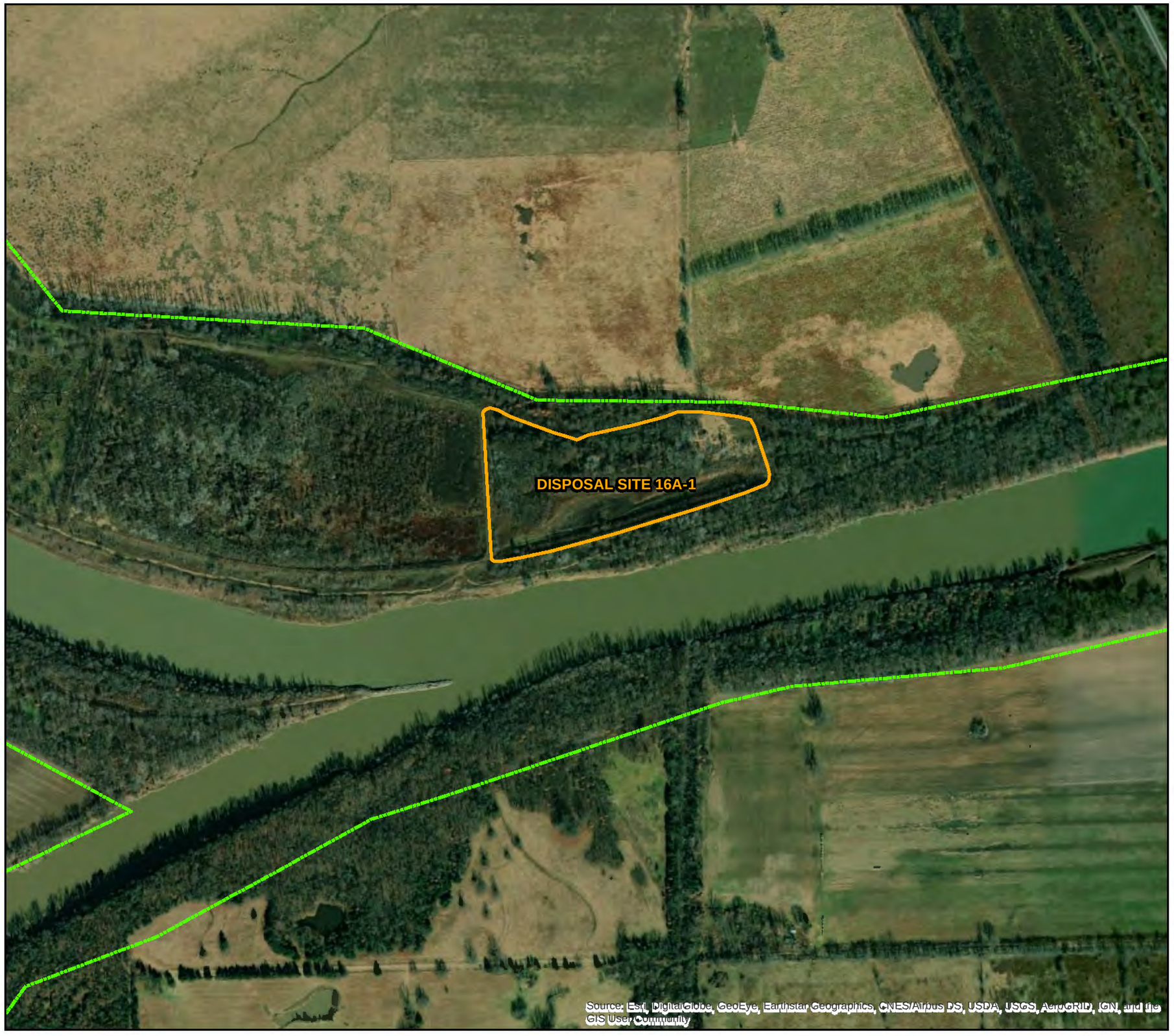


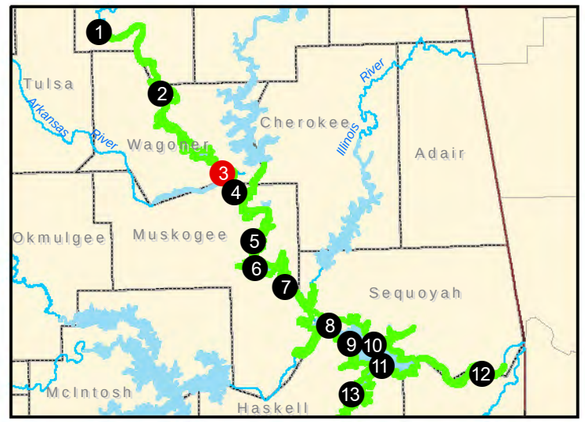


STUDY AREA

DMMP DISPOSAL SITE

**U.S. ARMY CORPS OF ENGINEERS**
**TULSA DISTRICT**

# MCCLELLAN-KERR ARKANSAS RIVER NAVIGATION SYSTEM

## AFTER ACTION ENVIRONMENTAL ASSESSMENT

INDEX SHEET 03

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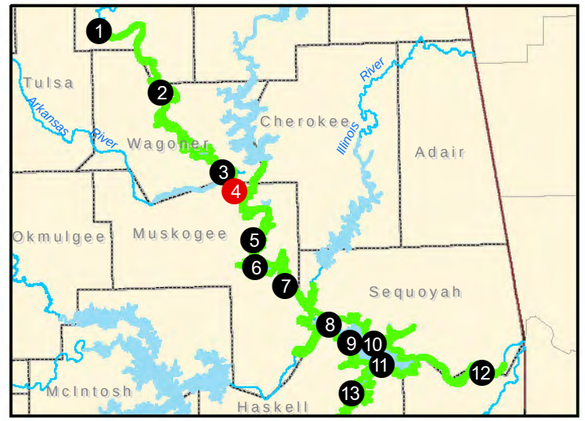



STUDY AREA

DMMP DISPOSAL SITE

**U.S. ARMY CORPS OF ENGINEERS**
**TULSA DISTRICT**

MCCLELLAN-KERR ARKANSAS RIVER NAVIGATION SYSTEM

AFTER ACTION ENVIRONMENTAL ASSESSMENT

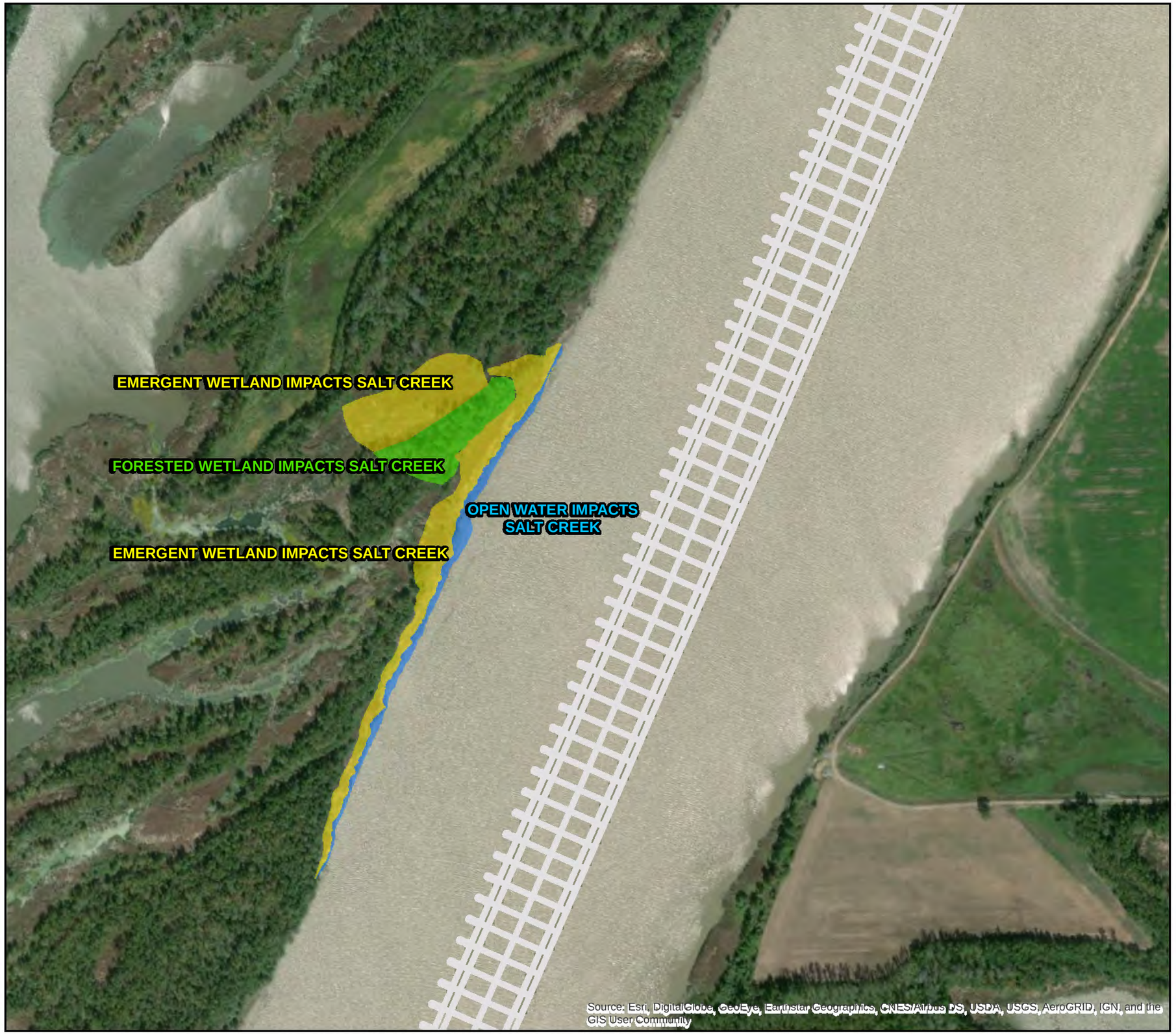
INDEX SHEET 04

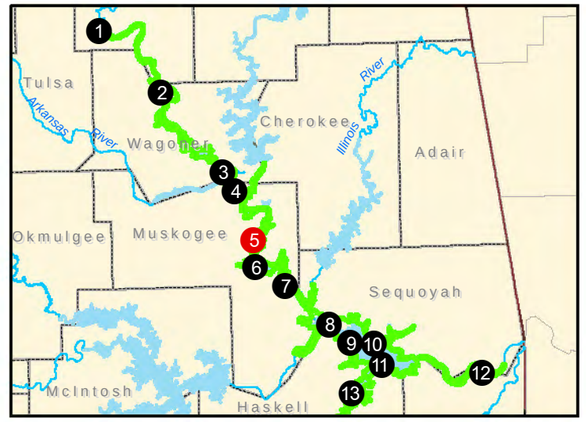
N

0 200 400 800 Feet

DATE: MARCH 2021

MAP NO. MKARNS-EA-04




DREDGE AREA

STUDY AREA

**ADVERSE IMPACT AREAS**

EMERGENT WETLAND DISPOSAL SITE

FORESTED WETLAND DISPOSAL SITE

OPEN WATER DISPOSAL SITE

**U.S. ARMY CORPS OF ENGINEERS**
**TULSA DISTRICT**

MCCLELLAN-KERR ARKANSAS RIVER NAVIGATION SYSTEM

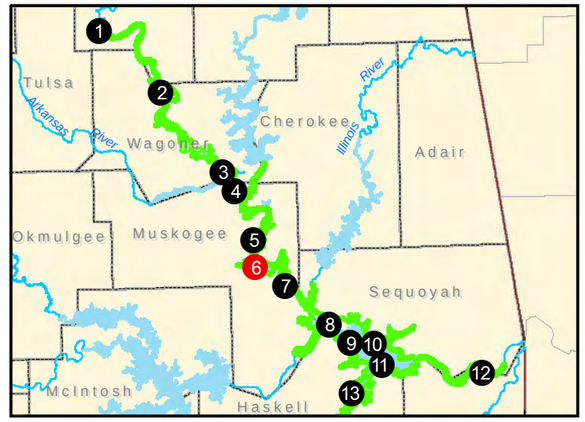
AFTER ACTION ENVIRONMENTAL ASSESSMENT

INDEX SHEET 05

N

0 250 500 1,000 Feet

| DATE: | MAP NO. |
|---|---|
| MARCH 2021 | MKARNS-EA-05 |


DREDGE AREA

STUDY AREA

**ADVERSE IMPACT AREAS**

OPEN WATER DISPOSAL SITE

**U.S. ARMY CORPS OF ENGINEERS**
**TULSA DISTRICT**

MCCLELLAN-KERR ARKANSAS RIVER NAVIGATION SYSTEM

AFTER ACTION ENVIRONMENTAL ASSESSMENT

INDEX SHEET 06

N

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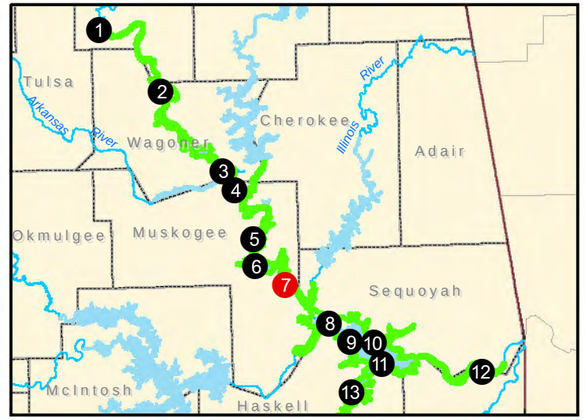
| DATE: | MAP NO. |
|---|---|
| MARCH 2021 | MKARNS-EA-06 |


DREDGE AREA

**ADVERSE IMPACT AREAS**

BOTTOMLAND HARDWOOD DISPOSAL SITE

**U.S. ARMY CORPS OF ENGINEERS**
**TULSA DISTRICT**

MCCLELLAN-KERR ARKANSAS RIVER NAVIGATION SYSTEM

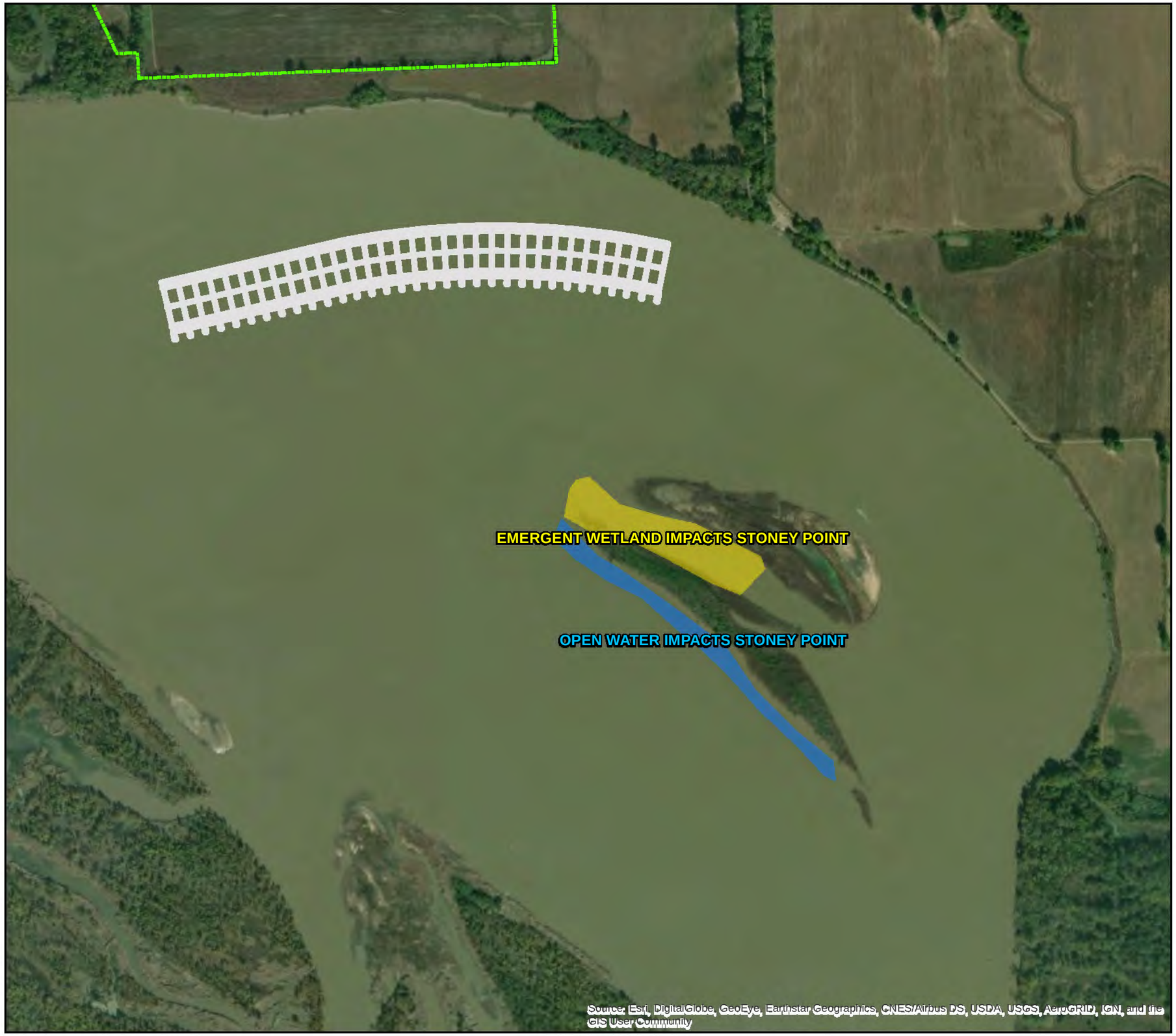
AFTER ACTION ENVIRONMENTAL ASSESSMENT

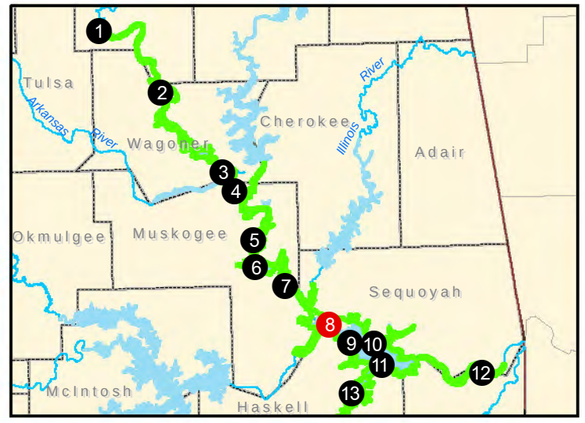
INDEX SHEET 07

N

0 300 600 1,200 Feet

| DATE: | MAP NO. |
|---|---|
| MARCH 2021 | MKARNS-EA-07 |




DREDGE AREA

STUDY AREA

**ADVERSE IMPACT AREAS**

EMERGENT WETLAND DISPOSAL SITE

OPEN WATER DISPOSAL SITE

**U.S. ARMY CORPS OF ENGINEERS**
**TULSA DISTRICT**

MCCLELLAN-KERR ARKANSAS RIVER NAVIGATION SYSTEM

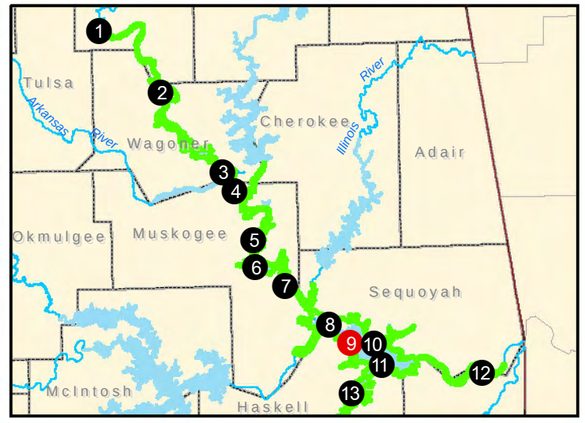
AFTER ACTION ENVIRONMENTAL ASSESSMENT

INDEX SHEET 08

N

0 350 700 1,400 Feet

| DATE: | MAP NO. |
|---|---|
| MARCH 2021 | MKARNS-EA-08 |


DREDGE AREA

STUDY AREA

**ADVERSE IMPACT AREAS**

EMERGENT WETLAND DISPOSAL SITE

OPEN WATER DISPOSAL SITE

**U.S. ARMY CORPS OF ENGINEERS**
**TULSA DISTRICT**

MCCLELLAN-KERR ARKANSAS RIVER NAVIGATION SYSTEM

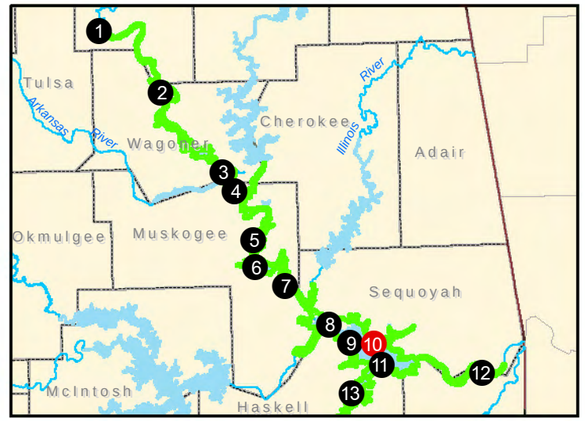
AFTER ACTION ENVIRONMENTAL ASSESSMENT

INDEX SHEET 09

N

0 500 1,000 2,000 Feet

| DATE: | MAP NO. |
|---|---|
| MARCH 2021 | MKARNS-EA-09 |


DREDGE AREA

STUDY AREA

**ADVERSE IMPACT AREAS**

OPEN WATER DISPOSAL SITE

**U.S. ARMY CORPS OF ENGINEERS**
**TULSA DISTRICT**

MCCLELLAN-KERR ARKANSAS RIVER NAVIGATION SYSTEM

AFTER ACTION ENVIRONMENTAL ASSESSMENT

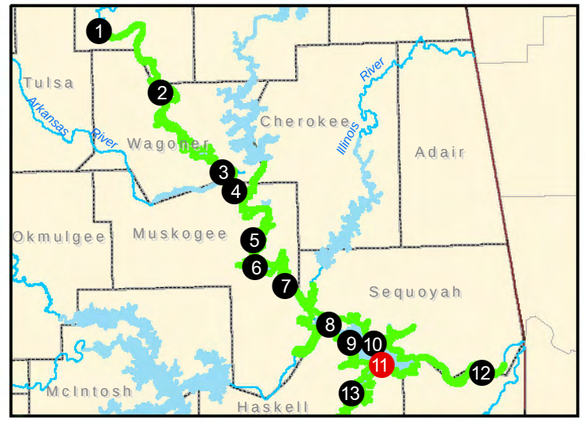
INDEX SHEET 10

N

0 450 900 1,800 Feet

DATE: MARCH 2021

MAP NO. MKARNS-EA-10


DREDGE AREA

STUDY AREA

**ADVERSE IMPACT AREAS**

OPEN WATER DISPOSAL SITE

**U.S. ARMY CORPS OF ENGINEERS**
**TULSA DISTRICT**

MCCLELLAN-KERR ARKANSAS RIVER NAVIGATION SYSTEM

AFTER ACTION ENVIRONMENTAL ASSESSMENT

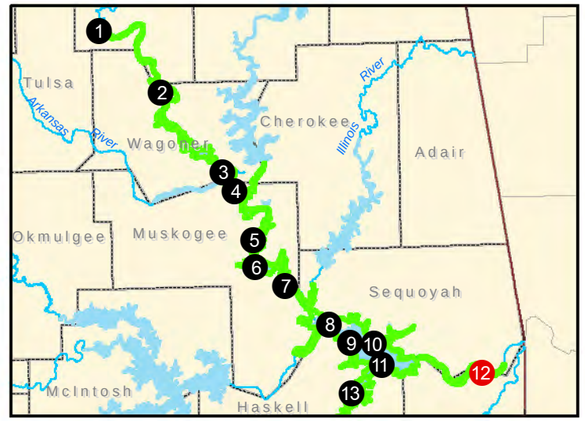
INDEX SHEET 11

N

0 250 500 1,000 Feet

DATE: MARCH 2021

MAP NO. MKARNS-EA-11


DREDGE AREA
STUDY AREA
DMMP DISPOSAL SITE

**U.S. ARMY CORPS OF ENGINEERS**
**TULSA DISTRICT**

MCCLELLAN-KERR ARKANSAS RIVER NAVIGATION SYSTEM

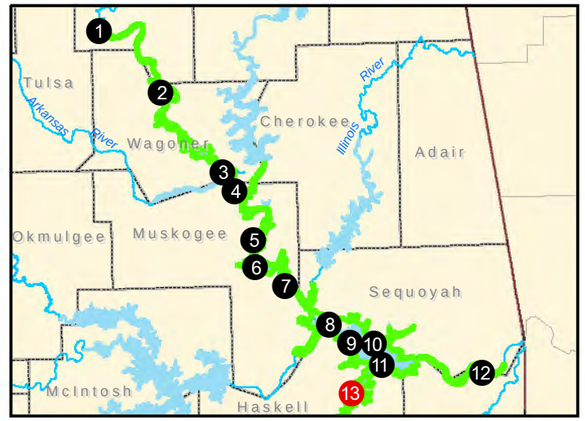
AFTER ACTION ENVIRONMENTAL ASSESSMENT

INDEX SHEET 12

N

0 250 500 1,000 Feet

| DATE: | MAP NO. |
|---|---|
| MARCH 2021 | MKARNS-EA-12 |


DREDGE AREA

STUDY AREA

**ADVERSE IMPACT AREAS**

OPEN WATER DISPOSAL SITE

**U.S. ARMY CORPS OF ENGINEERS**
**TULSA DISTRICT**

MCCLELLAN-KERR ARKANSAS RIVER NAVIGATION SYSTEM

AFTER ACTION ENVIRONMENTAL ASSESSMENT

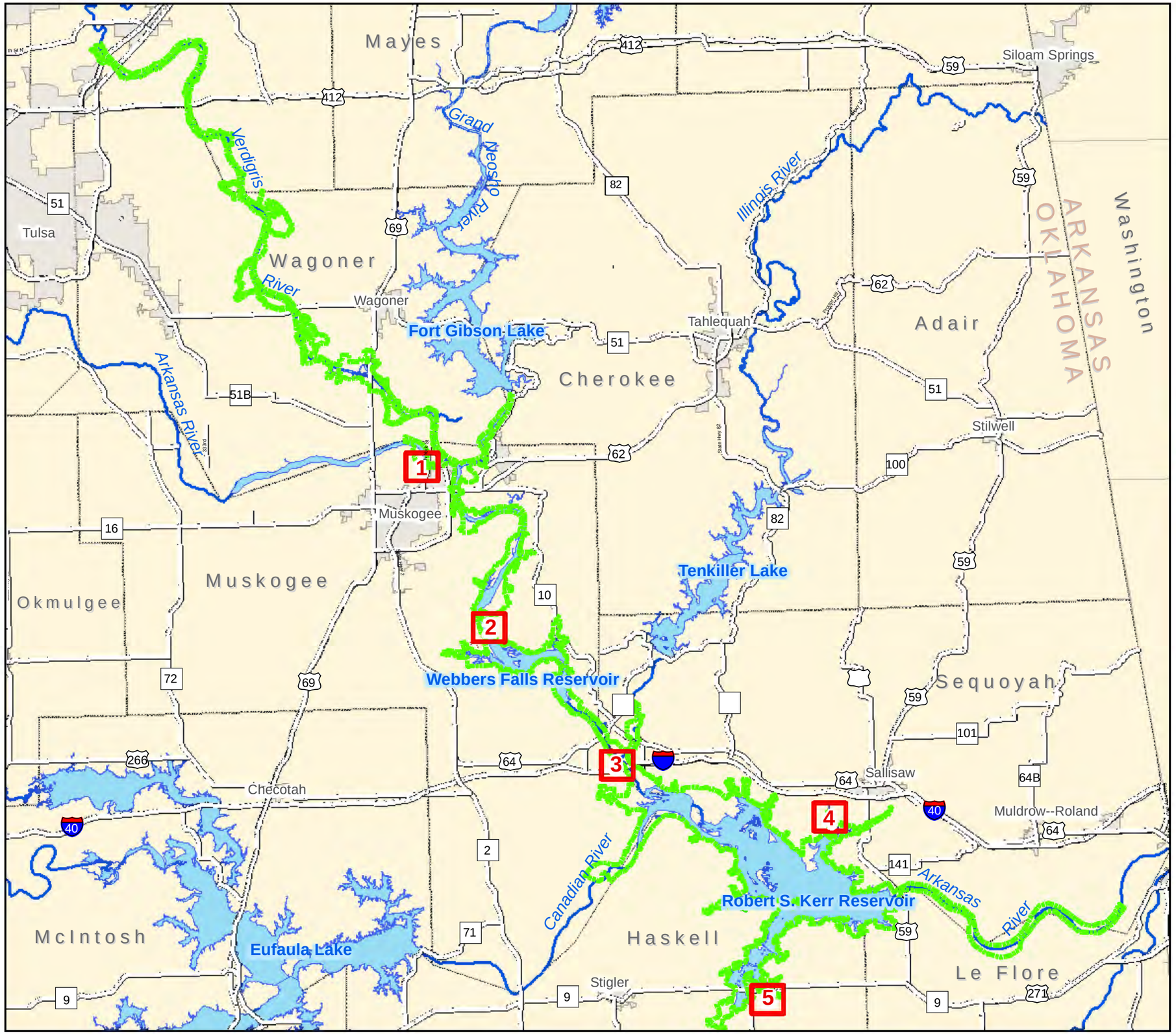
INDEX SHEET 13

N

0 450 900 1,800 Feet

DATE: MARCH 2021

MAP NO. MKARNS-EA-13





SECURITY FENCE
INDEX GRID
STUDY AREA
BOTTOMLAND HARDWOOD MITIGATION
EMERGENT WETLAND MITIGATION
FORESTED WETLAND MITIGATION

**U.S. ARMY CORPS OF ENGINEERS**
**TULSA DISTRICT**

# MCCLELLAN-KERR ARKANSAS RIVER NAVIGATION SYSTEM

## AFTER ACTION MITIGATION SITES

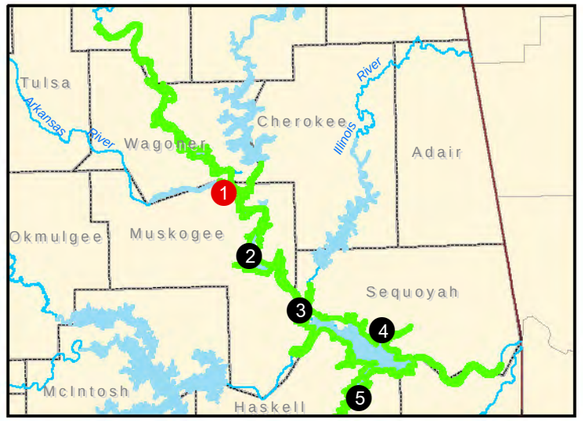
## INDEX SHEET

N

0 3.75 7.5 15 Miles

| DATE: | MAP NO. |
|---|---|
| JUNE 2021 | MKARNS-MI-00 |

# WEST OF MUSKOGEE TURNPIKE MITIGATION SITE




SECURITY FENCE

STUDY AREA

BOTTOMLAND HARDWOOD MITIGATION

EMERGENT WETLAND MITIGATION

FORESTED WETLAND MITIGATION

Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

**U.S. ARMY CORPS OF ENGINEERS**
**TULSA DISTRICT**

MCCLELLAN-KERR ARKANSAS
RIVER NAVIGATION SYSTEM

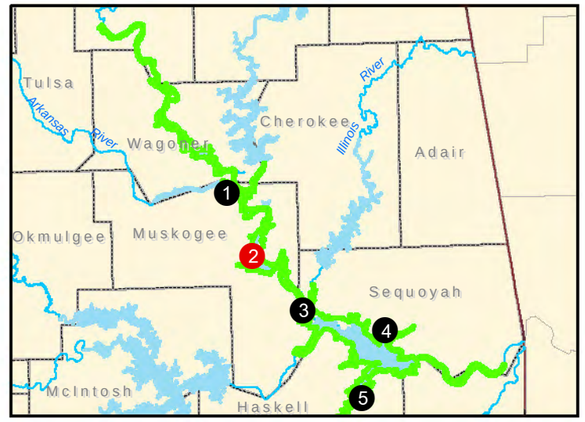
AFTER ACTION
MITIGATION SITES

INDEX SHEET 01

N

0 150 300 600
Feet

| DATE: | MAP NO. |
|---|---|
| JUNE 2021 | MKARNS-MI-01 |


SECURITY FENCE
STUDY AREA
BOTTOMLAND HARDWOOD MITIGATION
EMERGENT WETLAND MITIGATION
FORESTED WETLAND MITIGATION

**U.S. ARMY CORPS OF ENGINEERS**
**TULSA DISTRICT**

MCCLELLAN-KERR ARKANSAS
RIVER NAVIGATION SYSTEM

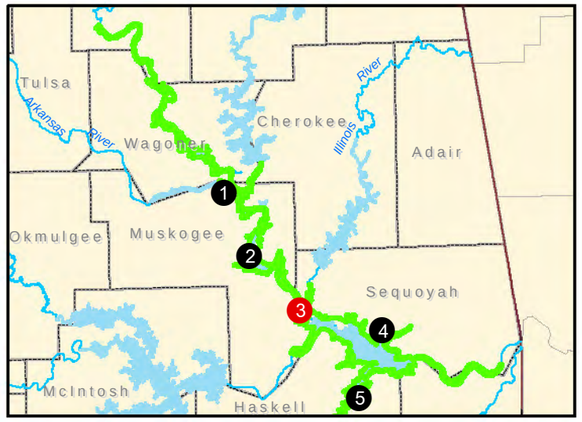
AFTER ACTION
MITIGATION SITES

INDEX SHEET 02

N
0 250 500 1,000
Feet

| DATE: | MAP NO. |
|---|---|
| JUNE 2021 | MKARNS-MI-02 |

# NORTH I-40 MITIGATION SITE




SECURITY FENCE
STUDY AREA
BOTTOMLAND HARDWOOD MITIGATION
EMERGENT WETLAND MITIGATION
FORESTED WETLAND MITIGATION

Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

**U.S. ARMY CORPS OF ENGINEERS**
**TULSA DISTRICT**

MCCLELLAN-KERR ARKANSAS RIVER NAVIGATION SYSTEM

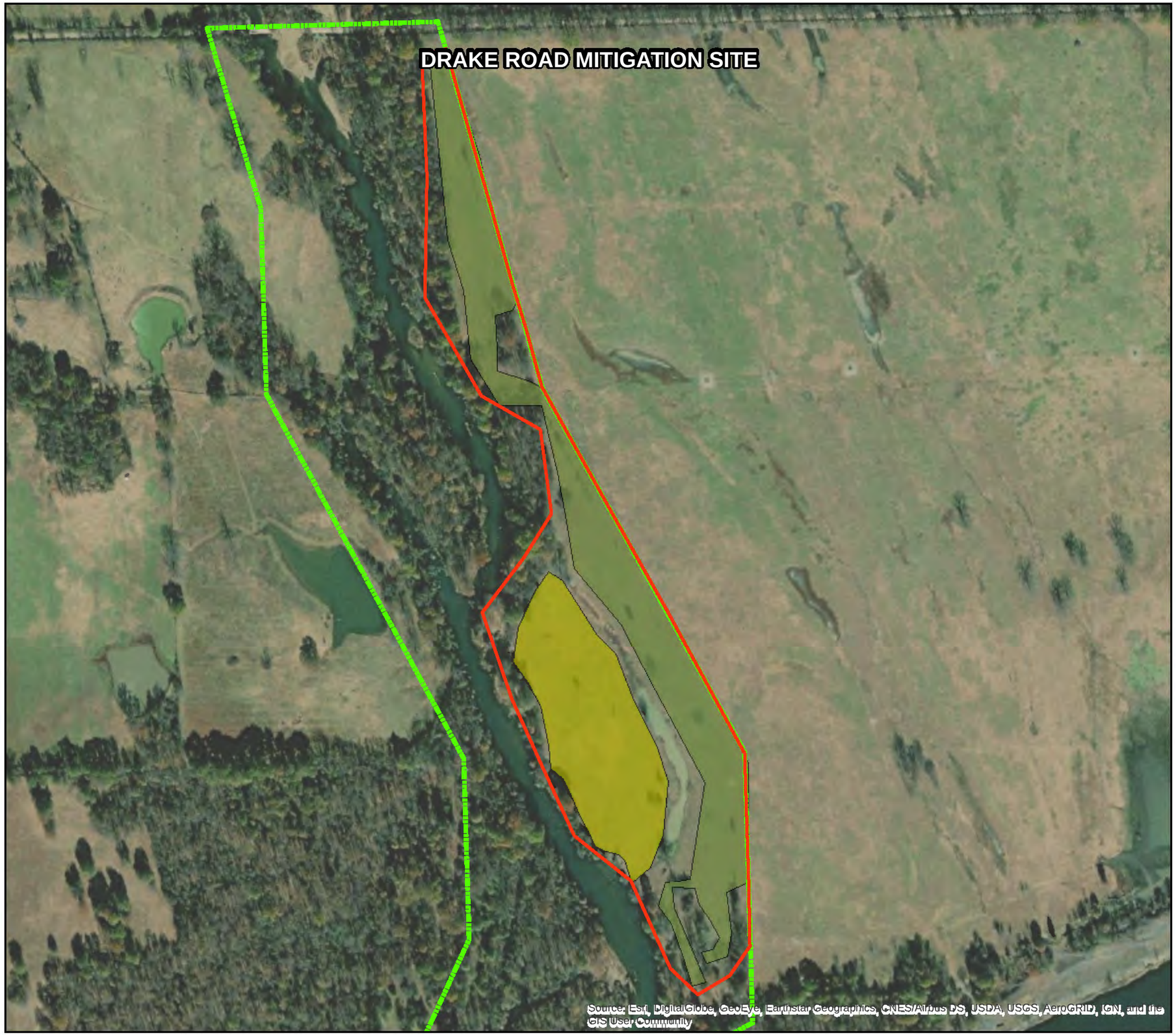
AFTER ACTION MITIGATION SITES

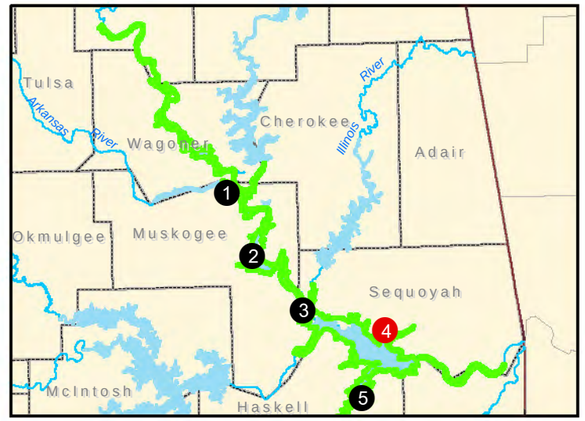
INDEX SHEET 03

N

0 125 250 500 Feet

| DATE: | MAP NO. |
|---|---|
| JUNE 2021 | MKARNS-MI-03 |




SECURITY FENCE
STUDY AREA
BOTTOMLAND HARDWOOD MITIGATION
FORESTED WETLAND MITIGATION

**U.S. ARMY CORPS OF ENGINEERS**
**TULSA DISTRICT**

MCCLELLAN-KERR ARKANSAS
RIVER NAVIGATION SYSTEM

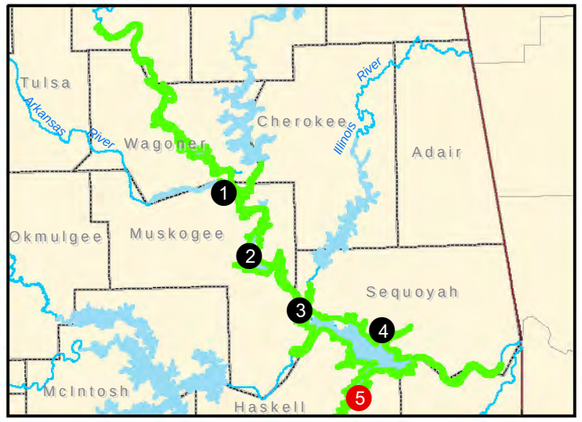
AFTER ACTION
MITIGATION SITES

INDEX SHEET 04

N
0 225 450 900
Feet

| DATE: | MAP NO. |
|---|---|
| JUNE 2021 | MKARNS-MI-04 |

# MISSOURI PACIFIC RAILROAD EAST AND WEST MITIGATION SITE




SECURITY FENCE
STUDY AREA
BOTTOMLAND HARDWOOD MITIGATION
EMERGENT WETLAND MITIGATION
FORESTED WETLAND MITIGATION

Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

**U.S. ARMY CORPS OF ENGINEERS**
**TULSA DISTRICT**

MCCLELLAN-KERR ARKANSAS RIVER NAVIGATION SYSTEM

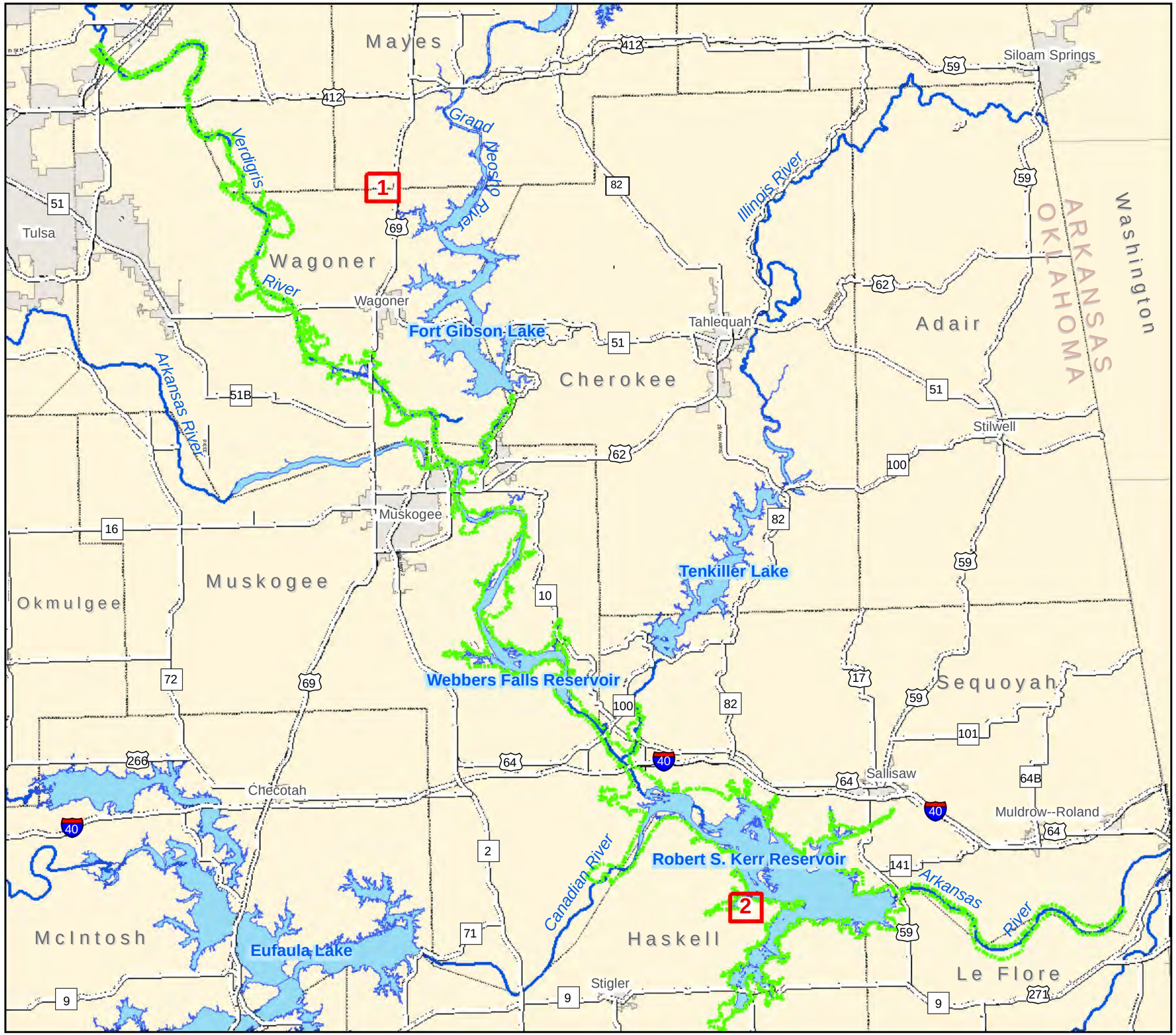
AFTER ACTION MITIGATION SITES

INDEX SHEET 05

N

0 250 500 1,000 Feet

| DATE: | MAP NO. |
|---|---|
| JUNE 2021 | MKARNS-MI-05 |





INDEX GRID

STUDY AREA

**U.S. ARMY CORPS OF ENGINEERS**
**TULSA DISTRICT**

MCCLELLAN-KERR ARKANSAS RIVER NAVIGATION SYSTEM

AFTER ACTION
BACKUP MITIGATION SITES

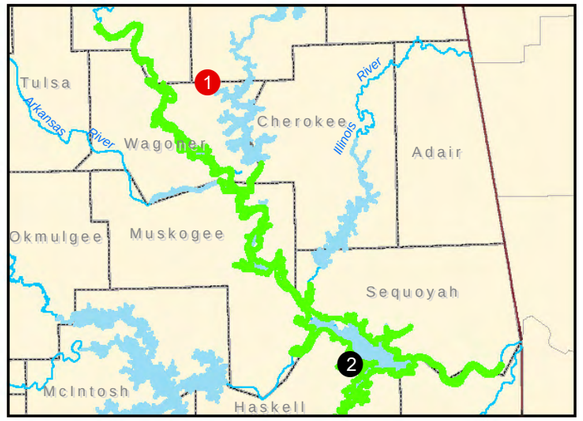
INDEX SHEET

N

0 3.75 7.5 15 Miles

| DATE: | MAP NO. |
|---|---|
| AUGUST 2021 | MKARNS-BM-00 |

# TRACT 1304 MITIGATION SITE




SECURITY FENCE

EMERGENT WETLAND MITIGATION

Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

**U.S. ARMY CORPS OF ENGINEERS**
**TULSA DISTRICT**

MCCLELLAN-KERR ARKANSAS
RIVER NAVIGATION SYSTEM

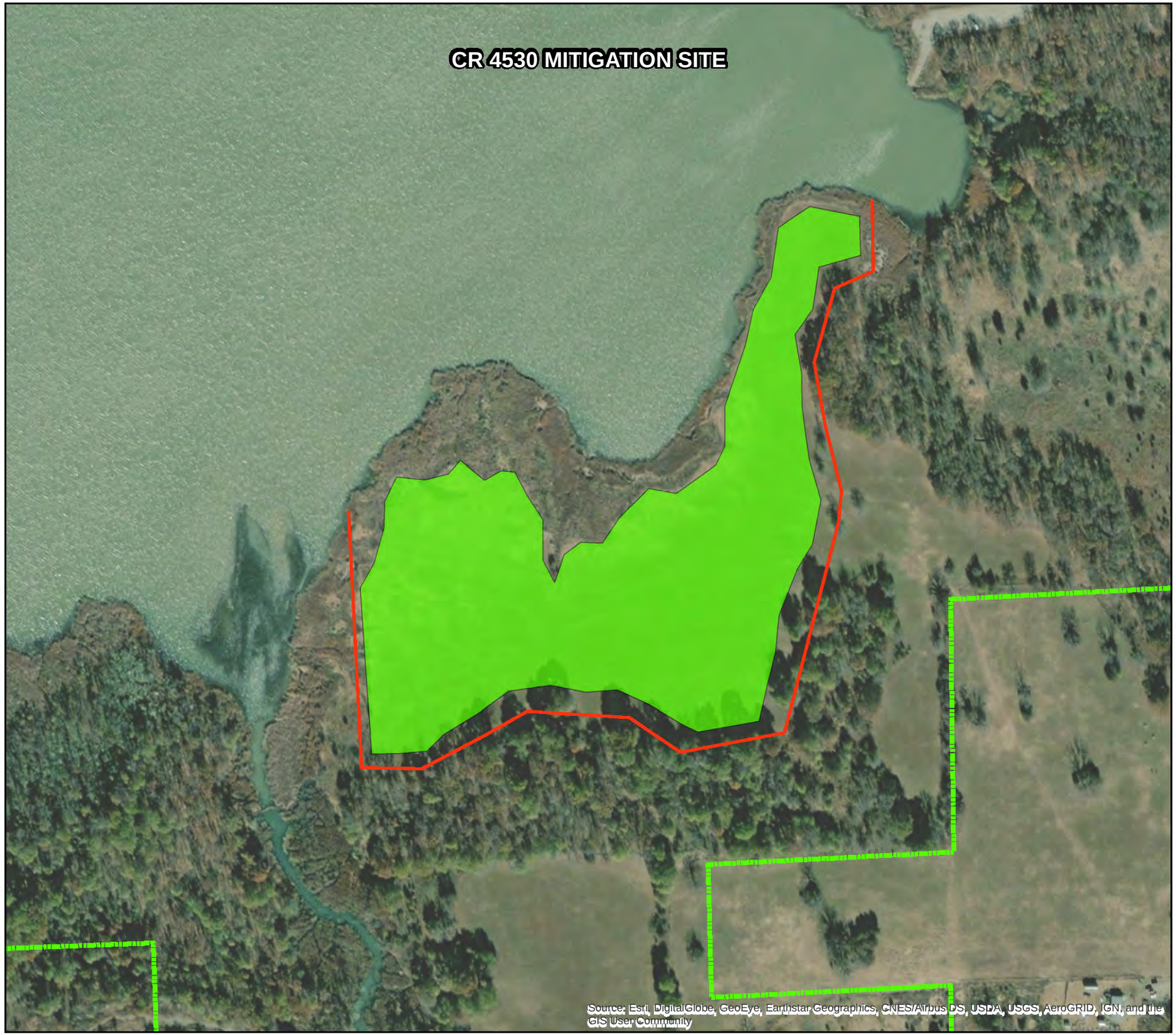
AFTER ACTION
BACKUP MITIGATION SITES

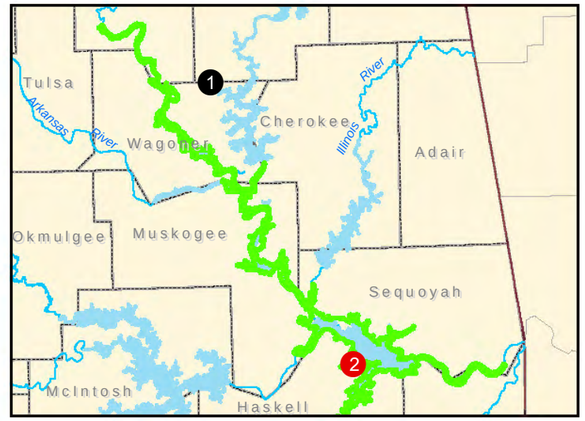
INDEX SHEET 01

N

0 50 100 200 Feet

| DATE: | MAP NO. |
|---|---|
| AUGUST 2021 | MKARNS-BM-01 |




SECURITY FENCE
EMERGENT WETLAND MITIGATION
STUDY AREA

**U.S. ARMY CORPS OF ENGINEERS**
**TULSA DISTRICT**

MCCLELLAN-KERR ARKANSAS RIVER NAVIGATION SYSTEM

AFTER ACTION
BACKUP MITIGATION SITES

INDEX SHEET 02

N

0 125 250 500 Feet

| DATE: | MAP NO. |
|---|---|
| AUGUST 2021 | MKARNS-BM-02 |

# ATTACHMENT B

SCOTT A. THOMPSON
Executive Director

OKLAHOMA DEPARTMENT OF ENVIRONMENTAL QUALITY

KEVIN STITT
Governor

July 10, 2019

Mr. Rex Ostrander
Chief Operations Division
Tulsa District Corps of Engineers
2488 E. 81st Street
Tulsa, Oklahoma 74137-429

RE: McClellan–Kerr Arkansas River Navigation System (MKARNS) Emergency Dredge Operation, SWT-2019-391

Dear Mr. Ostrander:

Your office has informed DEQ that due to excessive sedimentation in the MKARNS channel caused by recent flooding, the MKARNS is closed to barge traffic between Robert S. Kerr Lock & Dam at Sallisaw, OK and Muskogee, OK on the upper end of Webbers Falls Reservoir, upstream of Webbers Falls Lock & Dam. Until barge traffic is restored, additional economic losses will occur to local and regional economies that have already been deeply economically damaged by this flooding.

The approximate amount of dredged material is 1.25 million cubic yards and you are proposing three disposal areas that comprise nearly 550 acres of waters of the U.S. These waters are Robert S. Kerr Lake, OK220200020020_00, Webbers Falls Lake, OK120400010070_00, and Star Oxbow Lake, OK120400010230_00.

Your office has informed DEQ that under the circumstances, the Tulsa District Corps of Engineers is undertaking an emergency authorization, under the Section 404 permit program, to begin dredging operations as soon as possible and is requesting that DEQ make an expedited 401 Water Quality Certification decision by Thursday, July 11, 2019.

DEQ recognizes the need of this work to be started and completed as soon as possible. Given the emergency situation and the lack of review time, DEQ is waiving the WQC for this project.

DEQ recommends that the Tulsa District undertake dredging and sediment disposal in a manner that will minimize potential impacts on aquatic resources. DEQ understands your office will complete an environmental assessment and a public notice on the action as soon as possible after authorizing the dredging operation.

Please inform DEQ of any changes or environmental impact assessments of this project. If you have any questions concerning this matter, please contact Elena Jigoulina at 405-702-8200.

Sincerely,

Terence Lyhane

Terence Lyhane, P.E.
Assistant Division Director
Water Quality Division

cc: Ed Parisotto, Regulatory Branch, U.S. Army Corps of Engineers, Tulsa
Barry Bolton, Fisheries Chief, Oklahoma Department of Wildlife Conservation
Bill Cauthron, Chief, Water Quality Programs Division, Oklahoma Water Resources Board
Brooks Tramell, Monitoring, Assessment and Wetlands Programs, Oklahoma Conservation Commission
Lauren Poulos, Life Scientist, Ecosystems Protection Branch, U.S. EPA Region 6
Jennifer Lewis, Assistant Attorney General, Oklahoma Office of the Attorney General

# ATTACHMENT C

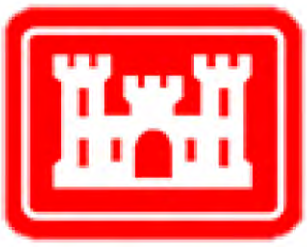
# Draft
# Mitigation Plan

## Webbers Falls Pool and Robert S. Kerr Pool Emergency Dredging and Open Water Disposal

Arkansas River Basin
Rogers, Wagoner, Cherokee, Muskogee, Haskell, Sequoyah, and Le Flore Counties,

Oklahoma

August 2021



Tulsa District

U.S. Army Corps of Engineers

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# List of Tables



# List of Attachments

# 1 Introduction

This Compensatory Mitigation Plan has been prepared by the United States Army Corps of Engineers (USACE), Tulsa District (SWT) to assess and relay the mitigation, monitoring, and adaptive management requirements of the McClellan-Kerr Arkansas River Navigation System (MKARNS) Emergency Action. The Plan has been prepared as part of the after-action assessment of the work conducted by SWT to dredge and dispose of sediment from the MKARNS. Additional information about the work conducted for the Emergency Action can be found in the Draft Environmental Assessment.

The Emergency Action occurred in the Arkansas River Basin in Rogers, Wagoner, Cherokee, Muskogee, Haskell, Sequoyah, and Le Flore counties in Oklahoma (Figure 1).

This Plan describes the ecological objectives, the methods to accomplish the objectives, baseline and mitigation site information, performance standards associated with accomplishing the objectives, monitoring, adaptive management, and long-term maintenance.


**Figure 1. McClellan-Kerr Arkansas River Navigation Study Area**

Tulsa District Regulatory Office (RO), in implementing USACE or permit applicant obligations under Section 404 of the Clean Water Act (CWA) or Section 10 of the Rivers and Harbors act, utilizes regulations under 33 Code of Federal Regulations (CFR) Part 332. The purpose of 33 CFR 332 is “to establish standards and criteria for the use of all types of compensatory mitigation, including on-site and off-site permittee-responsible mitigation, mitigation banks, and in-lieu fee mitigation to offset unavoidable impacts to waters of the United States authorized through issuance of Department of the Army (DA) permits pursuant to section 404 of the Clean Water Act (CWA) (33 U.S.C. 1344) and/or sections 9 or 10 of the Rivers and Harbors Act of 1899 (33 U.S.C. 401, 403).”

While Part 332 is written as a forward looking mitigation planning tool, predicated on the idea that permit applicants will complete mitigation analysis as part of the 404 permit process, SWT RO regularly applies these regulations as part of the Section 404 CWA permit process. Application of part 332 through standard RO processes are in place to allow for determinations of appropriate mitigation strategies and requirements on an after-the-fact basis. Because this project is being funded with supplemental Operations and Maintenance funding, the use of 33 CFR 332 is legally sufficient regarding mitigation.

# 2 Objectives

The mitigation of the Emergency Action will require a multitude of actions to adequately compensate the ecosystem of the MKARNS. In coordination with SWT RO, Table 1 displays the ratio required to compensate the adverse impacts as well as the resulting acres required to mitigate the action.

There has been a major temporal loss associated with impacts to forested wetlands and the amount of time that the mitigation will take to fully develop, SWT RO recommended that the impacts to this habitat type should be higher than the normal 1.5:1 ratio minimum typically required based on the *Compensatory Mitigation for Losses of Aquatic Resources* [33 CFR 332]. For restoration or enhancement, a 4.5:1 ratio would result in a net gain of 8.4 acres of forested wetlands for a total of 10.8 acres. Preservation is not applicable to this habitat type because the area impacted was already preserved/protected as a State Wildlife Management Area (WMA) under ODWC.

The information above also applies to emergent wetlands. For restoration or enhancement, a minimum of 2.5:1 ratio would be appropriate. This ratio would result in a net gain of 47.1 acres of emergent wetland for a total of 78.5 acres. Preservation is not applicable to this habitat type because the areas associated with the adverse impact were located within a State WMA or the Sequoyah National Wildlife Refuge (NWR).

The SWT RO Mitigation and Monitoring Guidelines addresses “Lake Impacts” which will require a minimum mitigation ratio of 1:1 where the area of impact exceeds 1/10$^{th}$ of an acre. Mitigation may be achieved through enhancements of existing lake areas, environs, water quality, or aquatic habitat function (creation of threatened and endangered species habitat, maintenance herbicide spraying, etc.). It is not necessary to physically manipulate the adjoining landscape to enlarge open water areas.

Although open water disposal did occur, the transport of this material was an unavoidable natural phenomenon and sediment was moved from one place within the MKARNS to another to allow continued navigation within the channel. This action created new interior least tern (*Sterna antillarum athalassos*) nesting habitat, replaced lost nesting sandbar islands, and increased the degree of aquatic habitat heterogeneity (e.g., water depths, shallow water habitat, flow refugia) relative to that present before the 2019 flood. The open water impacts as described are considered self-mitigation by the SWT Operations Division. The interior least tern was a listed species at the time of the flood and nesting habitat creation was a major focus of dredge disposal during the planning and mitigation phases of the emergency dredging. Therefore, open water mitigation will not occur as a result of the Emergency Action and will not be described in further detail.

In total, there were 10 acres of bottomland hardwood forest, 2.4 acres of forested wetland, 31.4 acres of emergent wetland, and 288.2 acres of open water habitat impacted by the Emergency Action. Because this action was used to address the sedimentation of the MKARNS, many adverse impacts were unavoidable.

**Table 1. Habitat Type, Acres Impacted, Ratio, and Required Mitigation Acreage Associated with the Emergency Action**

| Habitat Type | Impacted Acres | Mitigation Ratio | Required Mitigation Acres | Mitigation Method |
|---|---|---|---|---|
| Bottomland Hardwood | 10 | 1.5:1 | 15 | Creation |
| Forested Wetland | 2.4 | 4.5:1 | 10.8 | Creation |
| Emergent Wetland | 31.4 | 2.5:1 | 78.5 | Creation |
| Open Water | 288.2 | 1:1 | 288.2 | Self-Mitigating |

The objective of the bottomland hardwood and wetland mitigation is to create a minimum 15 acres of former bottomland hardwood forest, 10.8 acres of forested wetland, and 78.5 acres of emergent wetland in an area that would not be adversely impacted by creation of this habitat and would be self-sustaining upon completion of mandatory monitoring and adaptive management guidelines. The objectives of SWT Operations Division to compensate the loss of bottomland hardwood and wetland habitat are listed below.

- Establishment of native plant communities for wildlife.
    - Bottomland hardwood - Planting of herbaceous vegetation, shrubs, and trees
    - Forested Wetland - Planting of emergent wetland vegetation along with shrubs and trees
    - Emergent wetland - Planting of emergent wetland vegetation
- Develop and maintain hydrologic characteristics for created habitats

# 3 Impacted Habitat Types

Habitat types impacted by the Emergency Action include bottomland hardwood, forested wetlands, emergent wetlands, and open water. A description of each habitat type is discussed below.

The bottomland hardwood forest community occurs within the floodplain of the Arkansas River or in riparian areas immediately adjacent to small streams. The dominant bottomland hardwood trees include cottonwood (*Populus deltoides*), sycamore (*Platanus occidentalis*), green ash (*Fraxinus pennsylvanica*), pecan (*Carya illinoensis*), box elder (*Acer negundo*), river birch (*Betula nigra*), black willow (*Salix nigra*), silver maple (*Acer saccharinum*), black walnut (*Julgans nigra*), sugarberry (*Celtis laevigata*), water oak (*Quercus nigra*), overcup oak (*Quercus lyrata*), and willow oak (*Quercus phellos*). Bald cypress (*Taxoidium distichum*) is also common.

Emergent wetlands provide food and shelter for fish and wildlife species, including macroinvertebrates, which make up the foundation of the aquatic food chain, and habitat for various amphibians, reptiles, birds, and insects. Frogs and salamanders use emergent wetlands for breeding grounds and egg laying. Ducks and migratory birds use them for resting areas on migration routes and for nesting. Abundant aquatic insects provide a food source for fish, aquatic invertebrates, amphibians, reptiles, and birds, and break down organic material present in riverine and riparian wetland areas. Since these wetland communities are found in lower elevations, or are associated with more permanent open water habitats, they have been the

most susceptible to disruptive and unnatural flow regimes resulting from the construction and operation of the lock and dam system within the MKARNS. Emergent wetland vegetative species within the project areas included cattail (*Typha spp*.), smartweed (*Polygonum spp*.), nutsedge (*Cyperus spp*.), soft rush (*Juncus effusus*), and other unidentified rushes.

Forested wetlands are open, occasionally flooded areas dominated by shrub and hardwood saplings mixed with emergent herbaceous vegetation. Forested wetlands provide shelter, food, and nesting habitat for a variety of wildlife. These wetland communities are found at elevations slightly above emergent wetland communities and adjacent to riverbanks where less frequent inundation by flows and reduced scour allows shrub and sapling strata to establish. Forested wetland tree species included American sycamore, elm (*Ulmus spp*.), green ash, and black willow. Emergent wetland vegetation within the forested wetland habitats included soft rush, and shrubby species like buttonbush (*Cephalanthus occidentalis*).

Open water areas are characterized by deep water where light does not generally penetrate all the way to the bottom of the river or lake. The productivity of this zone largely depends upon the organic content of the sediment, the amount of physical structure, and in some cases upon the rate of fish predation. Sandy substrates contain relatively little organic matter (food) for organisms and poor protection from predatory fish. Higher plant growth is typically sparse in sandy sediment, because the sand is unstable and nutrient deficient. A rocky bottom has a high diversity of potential habitats offering protection (refuge) from predators, substrate for attached algae (periphyton on rocks), and pockets of organic "ooze" (food). A flat mucky bottom offers abundant food for benthic organisms but is less protected and may have a lower diversity of structural habitats, unless it is colonized by higher plants. The euphotic zone is also found within this deep-water region and is the layer of water below the surface where sunlight is still sufficient for photosynthesis to occur.

# 4 Site Selection and Baseline Information

Several rationales were considered while identifying potential sites for compensatory mitigation, which include:

- Site should be owned by USACE and available for bottomland hardwood and wetland mitigation.
- Site must be easily accessible by vehicle, all-terrain vehicle, or utility terrain vehicle.
- Site must either be large enough or be within close proximity to other mitigation sites.
- Site must be within the Arkansas River Watershed and be within close proximity to habitats adversely impacted by emergency dredging.
- Site must have appropriate soil characteristics, topography, and hydrologic conditions to achieve objectives for bottomland hardwood, forested wetland, and emergent wetland habitats.
- Site must be able to remain self-sufficient upon implementation of mitigation.

The proposed mitigation sites are within proximity of the bottomland hardwood and wetland impact areas, so replacement of lost habitat functions and values would occur locally. Photos of the impacted project areas and proposed mitigation areas can be found in Attachment A – Project and Mitigation Area Photos.

## 4.1 Preferred Mitigation Sites

The sites described below meet these conditions and were chosen for consideration for their suitability in meeting the rationales and needs of the compensatory mitigation. The field investigation into the mitigation sites provided awareness of the most appropriate habitat type for each area. As shown in Figure 2 through Figure 7, each site was segmented into one of the three habitat types based on the soil, existing vegetation, and topography.

- **West of Muskogee Turnpike** (Figure 2) – This site is west of the Muskogee Turnpike Toll Road or Highway 351 in Muskogee, Oklahoma. It can be accessed by North York Street and N4310. The site is located on USACE fee-owned property and is currently utilized by the general public for illegal haying activities. The site is a total of 11.2 acres. The site has Verdigris silt loam, 0 to 1 percent slopes, frequently flooded soils (California Soil Resource Lab [CSRL], 2008). The site is low-lying in elevation between approximately 496 feet (‘) mean sea level (msl) and 504’ msl. It borders the southern edge of a small tributary of the Arkansas River and is approximately 370’ from the Arkansas River.

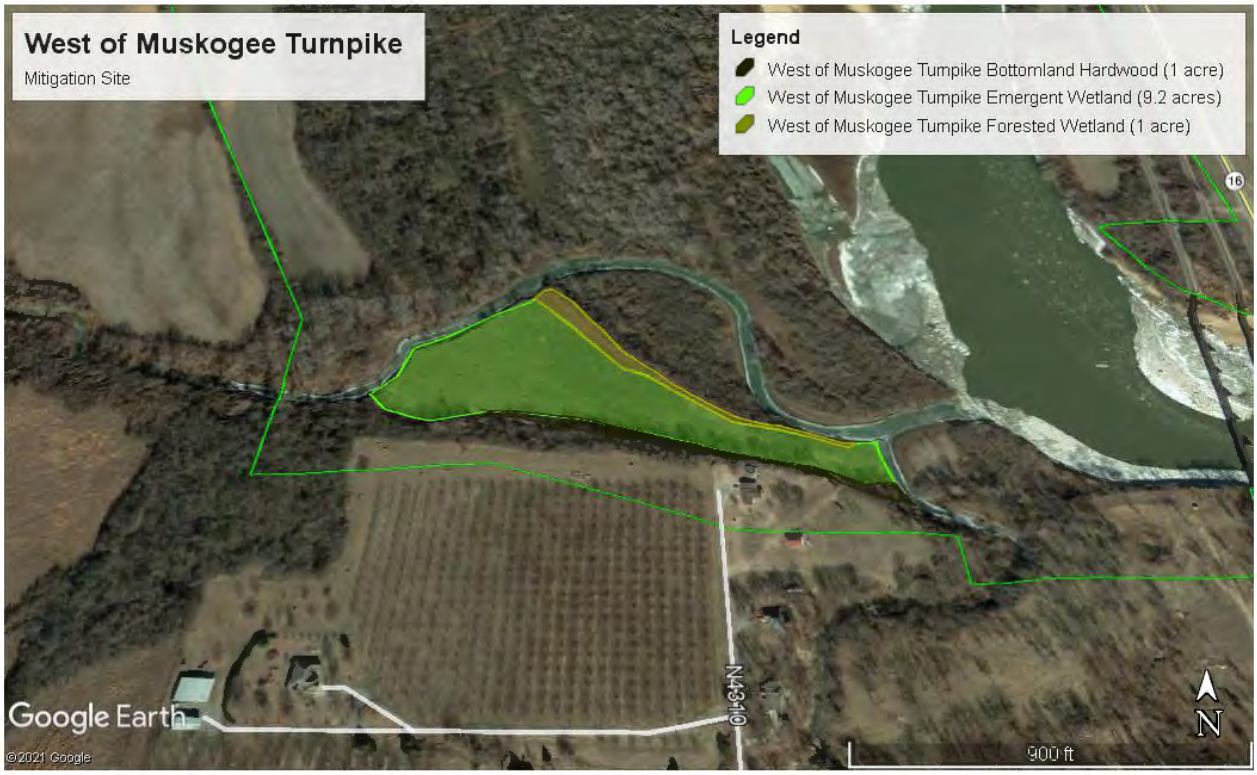


**Figure 2. West of Muskogee Turnpike Mitigation Site**

- **E0960** (Figure 3) – This site is west of U.S. Highway 10 and can be accessed by E0960 in River Bottom, Oklahoma. The site is located on USACE fee-owned property and is a total of 58.2 acres. Approximately half of the site has been maintained for agriculture use while the other half is still somewhat natural and undisturbed. The site has Kiomatia fine sandy loam, 0 to 2 percent slopes, frequently flooded; Kiomatia fine sandy loam, 0 to 2 percent slopes, rarely flooded; Roxana very fine sandy loam, 1 to 3 percent slopes, rarely flooded; Roxana very fine sandy loam, 0 to 1 percent slopes, rarely flooded; and Severn very fine sandy loam, 2 to 6 percent slopes, rarely flooded soils (CSRL, 2008). The site ranges in elevation from approximately 491’ msl to 502’ msl. The site is immediately adjacent to the Arkansas River on its eastern boundary.


**Figure 3. E0960 Mitigation Site**

- **North I40** (Figure 4) – This site is 0.3 miles north of Interstate Highway 40 and can be accessed by E1050 Road in Webbers Falls, Oklahoma. The site is located entirely on USACE fee-owned property but has been adversely impacted by illegal agricultural activities in the past. It is a total of 24.5 acres with some areas located within existing agricultural leases and another section located in a low-lying area with limited wetland vegetation. The site has Severn very fine sandy loam, 2 to 6 percent slopes, rarely flooded; Roxana very fine sandy loam, 1 to 3 percent slopes, rarely flooded; and Roebuck clay, 0 to 1 percent slopes, frequently flooded soils. The site is approximately 470’ msl to 474’ msl and is immediately southwest of the Arkansas River.


**Figure 4. North I40 Mitigation Site**

- **Drake Road** (Figure 5) – This site is 1.5 miles south of Interstate Highway 40 and can be accessed by South Kerr Boulevard to Drake Road near Salisaw, Oklahoma. It is about 18.9 acres and located on USACE fee-owned property. It is illegally grazed by the public and has been adversely effected by those actions. The proposed mitigation site has Mason silt loam, 0 to 1 percent slopes, rarely flooded soil. The entire site is approximately 467’ msl to 472’ msl and is adjacent to Salisaw Creek.


**Figure 5. Drake Road Mitigation Site**

- **Missouri Pacific Railroad East** (Figure 6) – This site is 0.10 miles south of U.S. Highway 9 in Keota, Oklahoma and can be accessed by N4550 Road. It is approximately 30.1 acres but has been adversely affected by illegal agriculture activities. The entire site is located on USACE fee-owned property. The site displays significant promise for emergent wetland vegetation. It is approximately 461’ msl to 467’ msl throughout the area. The soil types include Rexor silt loam, 0 to 1 percent slopes, occasionally flooded; Counts-Dela complex, 0 to 20 percent slopes; Rexor silt loam, 0 to 3 percent slopes, frequently flooded; and Water. This site is located off of San Bois Creek.


**Figure 6. Missouri Pacific Railroad East Mitigation Site**

- **Missouri Pacific Railroad West** (Figure 7) – This site is 0.3 miles southwest of U.S. Highway 9 in Keota, Oklahoma and can be accessed by East 1220 Road. It is approximately 17.3 acres and has also been adversely impacted by illegal agriculture activities. The site is fee-owned by USACE. The site ranges in elevation from approximately 463' msl to 466' msl. The soil type is Cupco silt loam, 0 to 1 percent slopes, occasionally flooded. This site is located off of San Bois Creek.

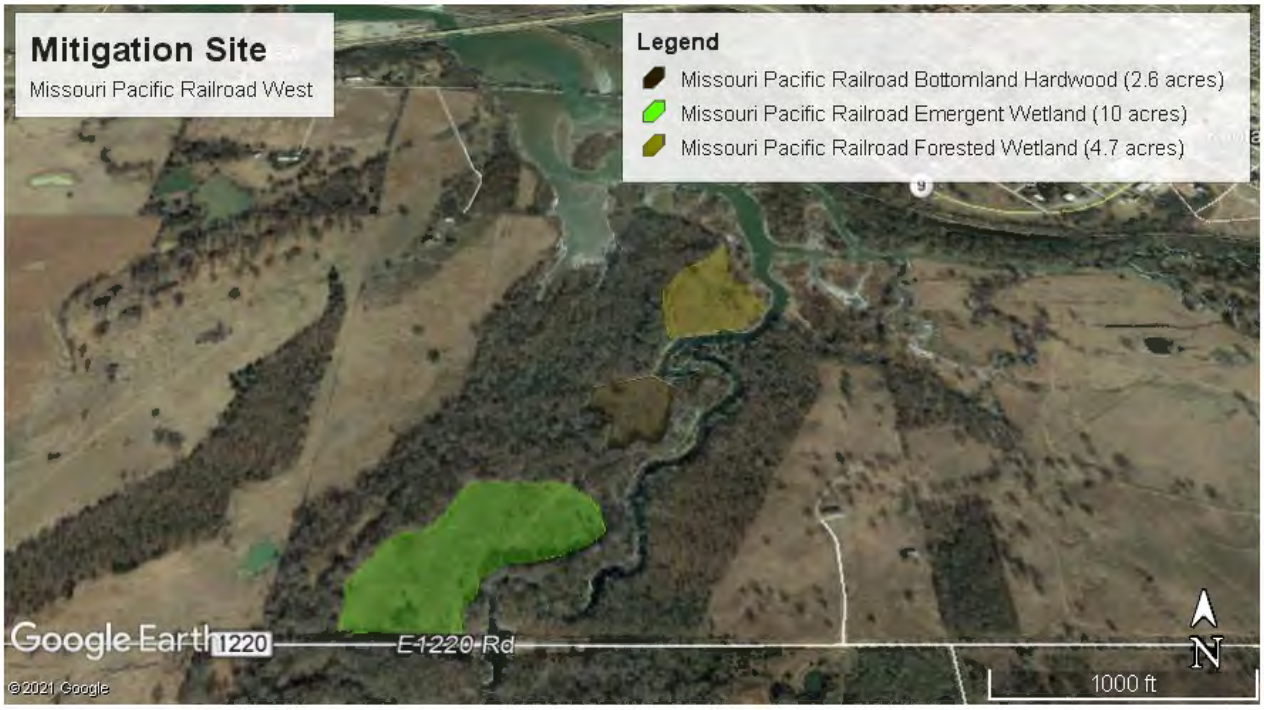


**Figure 7. Missouri Pacific Railroad West Mitigation Site**

## 4.2 Cultural Resources Effects and Standby Mitigation Sites

All potential mitigation sites will be completely investigated for cultural resources during the planning phase, and prior to any ground disturbing activity. Cultural resources that are identified will be avoided, either by establishing a sufficiently protective "buffer zone" around the cultural resources site boundary and monitoring for complete avoidance, or if necessary, by abandoning the proposed mitigation site (location) altogether. If mitigation sites must be abandoned or if they are otherwise significantly reduced in size because of the discovery of cultural resources, it is an option to utilize "Standby Mitigation Sites," which are alternative locations identified for this purpose. As a precaution, the areas described below were selected for standby mitigation to supplement emergent wetland mitigation if any preferred mitigation sites must be avoided to comply with Federal cultural resources laws and regulations. They meet the conditions described in Section 4 and were selected for consideration due to suitability in meeting the rationales and needs of the compensatory mitigation. All alternative locations will be included in the cultural resources investigations of all potential mitigation sites.

- **CR 4530** (Figure 8) – This site is 0.2 miles west of County Road 4530 and 0.7 miles north of County Road 1160 in Haskell County, Oklahoma. The site proposed is approximately 16.3 acres in size and is located on USACE fee-owned property. The site has Rexor silt loam, 0 to 1 percent slopes, occasionally flooded and Porum fine sandy loam, 3 to 5 percent slopes, eroded soils (CSRL, 2008). The site is low-lying in elevation as compared to the surrounding area 460' to 462' msl. It is located off of a small cove within the Robert S. Kerr Pool.


**Figure 8. CR 4530 Standby Mitigation Site**

- **Tract 1304** (Figure 9) – This site is one mile west of Highway 69 and 0.07 miles north of E0650 Road in Mayes County, Oklahoma. The site proposed is approximately 0.8 acres in size and is located on USACE fee-owned property. The site has Eram-Verdigris complex, 0 to 12 percent slopes (CSRL, 2008). The site is moderately low-lying in elevation as compared to the surrounding area at 584' to 587' msl.


**Figure 9. Tract 1304 Standby Mitigation Site**

## 4.3 Proposed Mitigation Site Protection

All of the proposed locations are owned and operated by SWT and will be protected in perpetuity by use of the existing deed. Restrictions on these sites will be coordinated with the SWT Real Estate Branch to ensure the mitigation restrictions are recorded and documentation is complete. Leases on these sites will no longer be provided to the public to protect the property from incompatible uses such as grazing, haying, clear cutting, mineral extraction, etc. Any changes to the real estate instrument or management plan must contain a provision requiring 60-day advance notification to the district engineer before any action is taken. If there are changes in statute, regulation, agency needs, or if mitigation results in an incompatible use, USACE will be responsible for providing alternative compensatory mitigation that is acceptable to the district engineer for any loss in functions resulting from the use.

## 4.4 Mitigation Work Plan

Mitigation efforts will primarily entail restoration of habitat. Mitigation bank availability is limited in the region. Purchasing mitigation bank credits will be considered should mitigation requirements remain for this project after all practicable USACE fee-owned property has been utilized for mitigation purposes. The ecological mitigation work will be done in-house by USACE's Engineering Research and Design Center. Grading and permanent fence installation will be necessary to create the most-appropriate site conditions for emergent and forested wetlands. The proximity to agricultural properties is a risk to mitigation success, so five-string barbed wire fence will be installed to protect the areas from cattle and adjacent land uses. A Grading Plan can be found in Attachment B while security fence specifications are shown in Attachment C.

The mitigation sites will be designed to improve habitat by introducing native vegetation, managing exotic invasive or nuisance species, creating microtopography appropriate for wetlands, and diversifying vertical stratification through herbaceous vegetation, shrubs, and trees upon the conclusion of grading and fencing.

As more information is made available, the following efforts will be completed, in coordination with the appropriate agencies and tribes during the planning phase:

- In accordance with Section 106 of the National Historic Preservation Act (as amended) (NHPA) and under an Archaeological Resources Protection Act (ARPA) permit issued by SWT, develop a Cultural Resources research design, conduct intensive surveys of all project components, and perform deep testing in areas where grading and contouring are proposed
- Develop haul route plan and haul schedule that avoids school zones and school bus stops during pickup and drop off periods. Identify areas for temporary traffic control, if needed; and
- Develop site security plans to secure construction, staging, and laydown areas so they do not create child or public safety concerns.

Upon completion of planning, additional mitigation efforts will be required to be complete prior to construction. Those efforts include:

- Ensure all construction staff are familiar with protected and natural resources to avoid unnecessary impacts;
- Develop avoidance and protection measures, as needed, based on results of cultural resources survey conducted during the planning phase, in coordination with the SHPO and Tribal Nations;
- Delineate areas to be avoided, including archaeological sites with surrounding buffer zones, such that construction equipment may not impact avoidance areas;
- Delineate construction areas with flagging, reflective tape, and fencing for child and public safety and to limit construction impacts, where appropriate;
- Ensure a Storm Water Pollution Prevention Plan (SWPPP) is prepared; and
- Submit a Notice of Intent to the Oklahoma Department of Environmental Quality and obtain authorization under OKR10.

During construction, ongoing efforts may be needed to avoid and limit adverse impacts. Those efforts include but are not limited to:

- Conduct cultural resources surveys of areas in which any changes to design or additional ground disturbance must occur to ensure no cultural resources will be adversely impacted.
- Ensure a cultural resources monitor will be onsite, if necessary, during ground disturbance activities, as determined necessary by USACE in consultation with the Oklahoma State Historic Preservation Office and Tribes;
- Revegetate all disturbed areas with native species, where appropriate;
- Ensure all environmental and cultural resource compliance efforts have been met;
- Ensure no insecticides or pesticides are used within or adjacent to natural areas;
- Limit herbicide use to only areas dominated by invasive species;
- Implement the SWPPP;
- Implement and follow all BMPs as directed under OKR10;
- Implement construction and staging site boundary marking and safety measures;
- Implement traffic flagging and haul route restrictions, where appropriate, to minimize safety concerns;
- Implement avoidance techniques where practicable for vegetation removal, if vegetation removal cannot be avoided it will occur outside of the migratory bird nesting and breeding season if surveys indicate presence; and
- Additional conservation measures can be found in Attachment D – Nationwide Standard Conservation Measures.

The mitigation sites shall be designed, to the maximum extent practicable, to be self-sustaining once performance standards have been achieved. The dependence on engineering features such as water control structures, pumps, stop-logs, and irrigation will be limited to ensure natural hydrology will support long-term sustainability. In addition, control of invasive species will be limited to the monitoring and adaptive management period. Upon establishment of native vegetation, invasive species propagation is expected to be limited, unless future unknown natural disturbances occur.

#### 4.4.1 Grading Plan

The objective of the grading plan is to adjust the topography of mitigation sites to accommodate emergent and forested wetland vegetation. Grading will establish the proper subgrade elevations associated with wetland communities. Some of the mitigation sites will require six inches to six feet of soil to be adjusted or moved to accommodate better hydrologic conditions for wetland plants (Attachment A – Grading Plan). The proposed sites requiring grading are listed below. Once the soil has been contoured, the remaining topsoil will be spread on the graded areas to create a substrate for native vegetation seeding and planting.

- West of Muskogee Turnpike
- E0960
- Missouri Pacific Railroad East
- Missouri Pacific Railroad West

### 4.4.2 Desired Plant Community

A combination of species will be planted at each mitigation site. Because there are three habitat types that will have to be mitigated because of the Emergency Action, there will be varying wetland and bottomland hardwood forest species. The bottomland hardwood forest species will work as a buffer for the emergent wetland and forested wetland habitats, protecting them from potential adjacent land use pollution and adverse stormwater runoff, as well as serving as the need for mitigation. The vegetation list below represents the priority plants used for USACE's mitigation efforts. This list is preliminary, and species may be added or removed from it during design and implementation of the mitigation features.

**Table 2. Desired Plant Community for the Mitigation Plan**

| Scientific name | Common name | Growth form | Habitat* |
|---|---|---|---|
| **Aquatic, wetland, and grassland herbaceous** | | | |
| *Acmella oppositifolia var. repens* | Oppositeleaf spotflower | Emergent | E |
| *Andropogon glomeratus* | Bushy bluestem | Graminoid | E |
| *Asclepias sp.* | Milkweeds | Herb/wildflower | E |
| *Bacopa monnieri* | Water hyssop | Emergent | E |
| *Carex sp.* | Sedges | Emergent | E, FW |
| *Chasmanthium latifolium* | Inland sea oats | Graminoid | E, BLH |
| *Echinodorus berteroi* | Tall burhead | Emergent | E, FW |
| *Echinodorus subcordatum* | Creeping burhead | Emergent | E, FW |
| *Eleocharis acicularis* | Slender spikerush | Emergent | E |
| *Eleocharis macrostachya* | Flatstem spikerush | Emergent | E |
| *Eleocharis quadrangulata* | Squarestem spikerush | Emergent | E |
| *Equisetum* | Horsetail | Emergent | E |
| *Heteranthera dubia* | Water stargrass | Submerged | E |
| *Juncus spp.* | Soft rush | Emergent | E |
| *Justicia americana* | Water willow | Emergent | E |
| *Nymphaea mexicana* | Mexican water lily | Floating-leaved | E |
| *Nymphaea odorata* | American water lily | Floating-leaved | E |
| *Panicum virgatum* | Switchgrass | Graminoid | E |
| *Peltandra virginica* | Arrow arum | Emergent | E, FW |
| *Phyla lanceolata* | Lanceleaf frogfruit | Herb/wildflower | E, FW |
| *Polygonum hydropiperoides* | Water smartweed | Emergent | E, FW |
| *Pontederia cordata* | Pickerelweed | Emergent | E |
| *Potamogeton illinoensis* | Illinois pondweed | Submerged | E |
| *Potamogeton nodosus* | American pondweed | Submerged | E |
| *Sagittaria platyphylla* | Delta arrowhead | Emergent | E |
| *Sagittaria latifolia* | Arrowhead | Emergent | E, FW |
| *Schoenoplectus californicus* | Giant bulrush | Emergent | E |
| *Schoenoplectus pungens* | American bulrush | Emergent | E |
| *Schoenoplectus tabernaemontani* | Softstem bulrush | Emergent | E |
| *Tripsacum dactyloides* | Eastern gamagrass | Graminoid | E |

| Scientific name | Common name | Growth form | Habitat* |
|---|---|---|---|
| *Vallisneria americana* | Wild celery | Submerged | E |
| | ***Woody*** | | |
| *Acer negundo* | Box elder | Tree | FW, BLH |
| *Acer saccharinum* | Silver maple | Tree | BLH |
| *Betula nigra* | River birch | Tree | FW, BLH |
| *Callicarpa americana* | American beautyberry | Shrub | BLH |
| *Carya cordiformis* | Bitternut hickory | Tree | BLH |
| *Carya illinoinensis* | Pecan | Tree | BLH |
| *Carya ovata* | Shagback hickory | Tree | BLH |
| *Carya tomentosa* | Mockernut hickory | Tree | BLH |
| *Catalpa speciosa* | Northern catalpa | Tree | BLH |
| *Celtis laevigata* | Sugarberry | Tree | FW, BLH |
| *Cephalanthus occidentalis* | Buttonbush | Shrub | FW, BLH |
| *Cercis canadensis* | Eastern redbud | Tree | BLH |
| *Cornus drummondii* | Roughleaf dogwood | Shrub | FW, BLH |
| *Crataegus spp.* | Hawthorn | Tree | BLH |
| *Diospyros virginiana* | Common persimmon | Tree | FW, BLH |
| *Fraxinus pennsylvanica* | Green ash | Tree | FW, BLH |
| *Ilex decidua* | Deciduous holly | Tree | BLH |
| *Juglans nigra* | Black walnut | Tree | BLH |
| *Maclura pomifera* | Osage-orange | Tree | BLH |
| *Morus rubra* | Red Mulberry | Tree | FW, BLH |
| *Nyssa sylvatica* | Blackgum | Tree | FW, BLH |
| *Platanus occidentalis* | American sycamore | Tree | FW, BLH |
| *Populus deltoides*** | Cottonwood | Tree | FW |
| *Prunus mexicana* | Mexican plum | Tree | BLH |
| *Prunus serotina* | Black cherry | Tree | BLH |
| *Quercus macrocarpa* | Bur oak | Tree | FW, BLH |
| *Quercus muehlenbergii* | Chinquapin oak | Tree | BLH |
| *Quercus nigra* | Water oak | Tree | FW, BLH |
| *Quercus phellos* | Willow oak | Tree | FW, BLH |
| *Quercus shumardii* | Shumard oak | Tree | BLH |
| *Salix nigra*** | Black willow | Tree | FW |
| *Sambucus nigra* | Elderberry | Shrub | FW, BLH |
| *Sideroxylon lanuginosum* | Gum bumelia | Tree | BLH |
| *Ulmus americana* | American elm | Tree | BLH |

**E = emergent wetland, FW = forested wetland, BLH = bottomland hardwood forest*

***Expecting recruitment and will monitor; may not transplant*

Any desirable plants or wildlife structures, such as snags, will be left in place where practical. A final review of the planting areas will occur after completion of contouring to ensure soil, topographic, and hydrologic conditions are appropriate.

The draft design of the plant community will be structured as shown below:

- Emergent Wetlands
    - Seeding in disturbed/graded/appropriate areas
        - Estimated 30 acres needed for seeding
    - Transplants estimated 10 - 15-foot centers at appropriate depths
    - One submerged aquatic vegetation founder colony installation per tract/site
- Forested Wetlands & Bottomland Hardwoods
    - 100 (one to two years old, 0.6 gallon) transplants per acre
    - Stakes/germinated-acorns/bare-root seedlings as appropriate
        - Estimated >50 per acre average

### 4.4.3 Control of Invasive Species

Prevalent invasive species at the mitigation sites include alligator weed (*Altemanthera philoxeroides*), callery pear (*Pyrus calleryana*), Chinese privet (*Ligustrum sinense*.), and multiflora rose (*Rosa multiflora*).

Alligator Weed

Alligator weed originated in South America. It is able to spread and reproduced rapidly through stems and leaf cuttings. It is difficult to eradicate because it can grow from the small portions left behind. It is normally found spread across bodies of water but can also be found in terrestrial areas around gardens or between row crops. Stems are pink and hollow and can reach lengths of one meter with opposite narrow elliptical leaves. The flowers are white in color, have thin petals, and are held on stems approximately four to five inches away from the main plant (Texas Invasive Species Institute [TISI], 2014a).

Alligator weed can be physically removed, but 100 percent success is not likely. There are currently no biological control methods to eradicate alligator weed. Chemical controls containing fluridone or imazapyr have been the most successful (TISI, 2014a).

Callery Pear

Callery pear is a resprouting invasive tree native to China and Vietnam. Seeds can remain viable for at least 11 years, indicating that a prominent seed bank might exist in invaded sites (Serota and Culley, 2019). Prescribed fire alone kills seeds and one-year-old seedlings, but only top-kills trees two years and older which each resprout with three to four new stems following burning. Fire and cut and spray methods may also be effective (Warrix and Marshall, 2018). Recommended herbicides and treatment methods include triclopyr or a combination of triclopyr and aminopyralid for basal bark application, or glyphosate or imazapyr for foliar application (Vogt et al., 2020) In summary, a combination of prescribed fire, followed by mechanical treatment and herbicide, might be most effective where possible. Where prescribed fire is not a possibility, cutting and grinding down followed by a foliar glyphosate or imazapyr treatment after resprouting might be most effective, as well as monitoring and following up with repeat treatments as needed.

Chinese Privet

Chinese privet is an evergreen shrub with spreading branches. It can be found near streams and in old fencerows. Leaves on the shrub are opposite with short petioles; blades up to two inches long, ovate to elliptic, normally rounded at the tip, tapering to the base, and with smooth margins. Flowers are white, fragrant and about 3/8$^{th}$ inches wide and up to four inches long. The flowers appear from March to May (TISI, 2014b).

Herbicide application is best from August to December. Leaves should be thoroughly wet in water with a surfactant which can be glyphosate 3% solution (12 ounces per three-gallon mix) or Arsenal Applicators Concentrate 1% solution (four ounces per three-gallon mix). Stems that are too tall for foliar sprays can be applied with Garlon 4 as a 20% solution in commercially available basal oil, diesel fuel, or kerosene (2.5 quarts per three-gallon mix) with a penetrant (check with herbicide distributor) to young bark as a basal spray. Large cut stems can be treated with Arsenal Applicators Concentrate or Velpar Liquid Herbicide as a 10% solution in water (one quart per three-gallon mix) with a surfactant. Safety to surrounding vegetation will be extremely important with implementation of the mitigation plan, so Chinese privet can immediately have stumps and cut stems with Garlon 3A or a glyphosate herbicide as a 20% solution in water (2.5 quarts per three-gallon mix) with a surfactant (TISI, 2014b).

Multiflora Rose

Multiflora rose is an invasive shrub native to China, Japan, and Korea. Multiflora rose exhibits high seed production and good seed viability. Individual plants may produce as many as 500,000 seeds per year, and seeds stay viable in the soil bank for 10 to 20 years depending upon soil conditions (Munger, 2002). It also reproduces vegetatively, sprouting from broken stems and even rooting from stems if they have soil contact. Leaves emerge very early in the spring, and the plant holds onto its leaves longer than most native plants. It flowers May to June, and fruits in August. Fruits persist into the winter months. Timing of control measures seems quite important, given the long fruiting/seed production period.

Smaller multiflora rose plants should be hand-pulled or dug up prior to August (fruit production). Hard to pull or dig plants can be cut to a one-inch stump, and glyphosate immediately applied to the stump, in July, August, or September. Alternatively, plant can be cut to six to 12 inches above the ground in the spring or early summer, allowed to resprout, and then cut again to one inch above the ground in July, August, or September and glyphosate applied. A first cutting earlier in the year allows the resprout to draw reserves away from the roots, making the cut-stump glyphosate application more effective. For very large, established plants or colonies of plants, foliar application of glyphosate works best, from July to mid-September. A final recommended method is cold-weather stump application of glyphosate; when temperatures are 15.8 to 46.4 degrees Farenheit, the risk of contaminating non-target plants is apparently reduced.

# 5 Maintenance Plan

The proposed mitigation sites have demonstrated that they are capable of naturally supporting wetlands as described in Section 4. Grading and contouring within some of the mitigation areas will provide a lower base elevation and create a minor impoundment. The slight modification of the areas will create hydrologic conditions on a larger scale and add to the duration of water inundation, as well as the establishment of native vegetation.

Upon completion of initial construction, the mitigation sites will be monitored as described in Section 7 of this plan. Corrective actions in addition to those described in the previously mentioned sections may be required and can include:

- Maintaining security fencing;
- Maintaining mitigation site information signs;
- Protecting mitigation sites from human disturbances, such as encroachments, illegal agriculture use, and vandalism; and
- Any other actions that may be triggered by the adaptive management plan described in Section 9.

# 6 Performance Standards

The following discussion outlines the performance standards associated with the monitoring plan that will support the MKARNS Emergency Action mitigation. The plan identifies performance measures along with desired outcomes and monitoring design in relation to specific objectives. A performance measure includes specific feature(s) to be monitored to determine project performance. Additional monitoring is identified as supporting information needs that will help further understand interrelationships of restoration features and external environmental variability and to corroborate project effects.

Such criteria, or decision-making triggers, are related to each performance measure and desired outcome and identify the need to discuss potential implementation of adaptive management actions.

Overall, monitoring results will be used to evaluate the progress of habitat mitigation toward meeting project objectives and to inform the need for adaptive management actions to ensure successful restoration is achieved.

***Performance Measure 1:*** Establish 15 acres of bottomland hardwood habitat, 78.5 acres of emergent wetland habitat, and 10.8 acres of forested wetland habitat.

*Success Criteria:* One year following completion of final construction activities achieve 85% survival of planted woody species on 15 acres of bottomland hardwood habitat. The 85% survival criteria would continue to five years after construction.

One year following completion of final construction activities achieve 85% survival of planted emergent wetland species on 78.5 acres of emergent wetland habitat. The 85% survival criteria would continue to five years after construction.

One year following completion of final construction activities achieve 50% survival of bottomland hardwood forest species and 85% survival of emergent wetland species on 10.8 acres of emergent wetland habitat continuing 5 years after completion of project construction

*Monitoring Design and Rationale:* Planted woody and emergent wetland species will be assessed each year during site surveys to determine what percentage of each species the plants have survived. Sites will be evaluated annually from post-construction until success is determined. To determine the increase in acreage, satellite and aerial imagery will be used to identify change pre- and post-construction in years 1-5. Vegetated habitats should be classified using digital aerial imagery and field observation.

***Performance Measure 2:*** Average cover of 75% of desired vegetation on mitigation sites at year 5 compared to pre-construction.

*Success Criteria:* One year following completion of final construction activities achieve a minimum average cover of 25%, comprised of native herbaceous species. Three years following construction, achieve a minimum average cover of 75% native emergent wetland, forested wetland, and bottomland hardwood species (according to appropriate site). Five years following construction, achieve a minimum average cover of 50% herbaceous species.

*Monitoring Design and Rationale:* Vegetation will be sampled annually, at the six mitigation sites. Permanent vegetation monitoring stations will be established for assessing the vegetation community at each site. Sites will be sampled annually post-construction until success is determined.

***Performance Measure 3:*** Establish overall site biodiversity through increasing plant species taxa richness.

*Success Criteria:* One year following completion of final construction activities achieve a minimum of a 25% increase in plant species taxa richness depending on initial site conditions, comprised of native species. Five years following construction, maintain or increase level of taxa richness achieved during vegetation establishment efforts during construction phase, comprised of native species.

*Monitoring Design and Rationale:* The species composition of each site will be sampled annually at the permanent vegetation monitoring sites. Sites will be sampled annually post construction until success is determined. Diversity metrics may consist of species richness, species evenness, and/or other species diversity metrics such as the Shannon Weiner or Simpson Index.

***Performance Measure 4:*** Manage non-native invasive vegetation within mitigation sites.

*Success Criteria* One year following completion of final construction activities achieve less than 25% average cover of non-native invasive species. Years 2 to 5 following completion of final construction activities achieve average cover of less than 5% non-native invasive species with no area greater than 0.25 acres in size with greater than 10% non-native invasive species.

*Monitoring Design and Rationale:* Vegetation will be sampled annually, at the mitigation site. Permanent vegetation monitoring stations will be established for assessing the vegetation community at each site. Sites will be sampled annually post-construction until success is determined. Initial control/removal of unwanted plants will be evaluated, and determinations made on an annual or semi-annual basis on whether additional action will be needed.

Vegetation: Vegetation sampling will occur annually within the mitigation unit for the duration of the monitoring period. Sampling will occur during spring months, at the peak of the growing season. Permanent 1/10th-acre, field monitoring plots will be located randomly within the mitigation plot. Monitoring will measure percent cover of native and non-native plant species and structural diversity. Photograph stations are also important for documenting vegetation conditions. All plots and photograph stations staked and will be documented via Global Positioning System (GPS) coordinates to reoccupy in each year of sampling.

General observations, such as fitness and health of plantings, survival, growth, soil moisture, precipitation, phenology, native plant species recruitment, and signs of drought stress should be noted during the surveys. Additionally, potential soil erosion, flood damage, vandalism and

intrusion, trampling, and pest problems would be qualitatively identified. Efficacy of invasive plant management will also be monitored.

A general inventory of all wildlife species observed and detected using the project area would be documented. Nesting sites, roosting sites, animal burrows, and other signs of wildlife use of the newly created habitat and habitat structures would be recorded. The notes would be important for early identification of species colonization patterns.

# 7 Monitoring

An effective monitoring program will be required to determine if the project outcomes are consistent with original project goals and objectives. The power of a monitoring program developed to support adaptive management lies in the establishment of feedback between continued project monitoring and corresponding project management. A carefully designed monitoring program is the central component of the project adaptive management program as it supplies the information to assess whether the project is functioning as planned.

Monitoring must be closely integrated with the adaptive management components because it is the key to the evaluation of adaptive management needs. Objectives must be considered to determine appropriate indicators to monitor. In order to be effective, monitoring must be able to distinguish between ecosystem responses that result from project implementation (i.e. management actions) and natural ecosystem variability.

In general, monitoring will be established for no less than five years after mitigation construction completion for emergent wetland habitats. A longer monitoring period must be required for aquatic resources with slow development rates, such as forested wetlands so the monitoring will be no less than 10 years for forested wetland and bottomland hardwood forest habitat. However, following project implementation, the district engineer may reduce or waive the remaining monitoring requirements upon a determination that compensatory mitigation has achieved its performance standards. Annual monitoring reports will be submitted to the district engineer by USACE SWT Operations Division.

The USACE SWT Operations Division is the responsible party for ensuring monitoring is conducted. The USACE SWT Operations Division will delegate monitoring and adaptive management to the USACE Lewisville Aquatic Ecosystem Restoration Facility (LAERF) upon repositioning of funding but USACE SWT Operations Division will remain the responsible party for achieving compensatory mitigation requirements.

Monitoring reports must include the progress of the compensatory mitigation and can include plans, maps, and photographs to illustrate site conditions at the time of the report. They may also include the results of functional, condition, or other assessments used to provide quantitative or qualitative measures of the functions provided by the compensatory mitigation site. Permanent locations for photographic documentation will be established to provide a visual record of habitat development over time. The locations of photo points will be identified in the pre-construction monitoring report. Photographs taken at each photo point will be included in monitoring reports. Any reports submitted to the district engineer must be provided to Federal, Tribal, state, and local resource agencies, and the public, upon request.

Any Cultural Resources that are avoided within a selected mitigation site must be monitored for compliance with Federal cultural resources laws and regulations. The USACE SWT Operations Division is the responsible party for ensuring monitoring is conducted and reported annually for no less than 10 years, after which the sites will be monitored as part of regular SWT cultural resources management activities. Site condition assessments, including detailed documentation of any impacts to cultural resources, including but not limited to inadvertent project impacts,

natural impacts, or vandalism/looting must be included in cultural resources monitoring reports. Photographs must be taken, and photo points and direction documented. Cultural Resources monitoring reports should not be included in any report provided to the public, per the Archaeological Resources Protection Act (ARPA). Distribution of Cultural Resources monitoring reports will be determined by USACE SWT Operations Division cultural resources personnel, and may include distribution to Federal, Tribal, and state agencies.

# 8 Long-term Management Plan

The party responsible for ownership and all long-term management of the compensatory mitigation project is USACE SWT Operations Division. The funding for long-term maintenance will be identified by USACE SWT Operations Division as needs are identified and appropriated by Congress each fiscal year. The funding for maintenance is established by the fiscal year and will be dependent on the extent of any future needs. Intensive long-term management is not anticipated beyond the required monitoring and maintenance period because all mitigation associated with the MKARNS Emergency Action is designed for self-sustainment. The MKARNS Emergency Action mitigation plan does not include long-term diversion of water, wetland cell pumps, stop-logs, or any other common water control structures. Impacts to the mitigation site as a result of public disturbance can be addressed under USACE's Title 36 – Parks, Forests, and Public Property. The rules and regulations govern the public use of water resources development projects administered by the Chief of Engineers and all visitors are bound by these Title 36 regulations.

Impacts to Cultural Resources within mitigation sites will be addressed under the appropriate legislation, regulations, and executive orders, including, but not limited to the National Historic Preservation Act (NHPA) of 1966, as amended, the ARPA of 1979 (as amended), and the Native American Graves Protection and Repatriation Act (NAGPRA) of 1990 (as amended) and their implementing regulations. The ARPA compels federal land-holding agencies to protect archaeological sites and artifacts on government land from looting, vandalism, and trafficking, impose and enforce penalties, both Civil and Criminal, against violators of the Act, and better manage archeological sites on public land. The NAGPRA directs federal land-holding agencies to protect Native American burials and burial sites on federal fee lands.

Any wetlands created as an act of compensatory mitigation will fall under regulatory jurisdiction of Section 404 of the Clean Water Act.

# 9 Adaptive Management Plan

Results of monitoring will be assessed in comparison to project objectives and decision-making triggers to evaluate whether the project is functioning as planned and whether adaptive management actions are needed to achieve project objectives. The results of the monitoring will be provided to the USACE SWT Operations Division and SWT RO, who will evaluate and compare data to project objectives and decision-making triggers. The USACE will use the monitoring results to assess habitat responses to management, evaluate overall project performance, and make recommendations for adaptive management actions as appropriate. If monitoring results, as compared to desired outcomes and decision-making triggers show that project objectives are not being met, USACE will evaluate causes of failure and recommend adaptive management actions to remedy the underlying problems.

Decision criteria, also referred to as adaptive management triggers, are used to determine if and when adaptive management should be implemented. They can be qualitative or quantitative based on the nature of the performance measure and the level of information necessary to

make a decision. Desired outcomes can be based on reference sites, predicted values, or comparison to historic conditions. Several potential decision criteria are identified below, based on the project objectives and performance measures. More specific decision criteria, possibly based on other parameters such as hydrology, geomorphology, and vegetation dynamics.

If assessments show that any of these triggers are met, USACE would decide whether an adaptive management action is warranted, and if so, what that action will entail. Investigations may be required to determine the cause of need for action to inform the type of adaptive management response that should be implemented, if needed. Additionally, prior to enacting any adaptive management measures, USACE would assess whether supplemental environmental analyses (including Cultural Resources review) are required.

***Performance Measure 1:*** Establish 15 acres of bottomland hardwood habitat, 78.5 acres of emergent wetland habitat, and 10.8 acres of forested wetland habitat.

*Success Criteria:* One year following completion of final construction activities achieve 85% survival of planted woody species on 15 acres of bottomland hardwood habitat. The 85% survival criteria would continue to five years after construction.

One year following completion of final construction activities achieve 85% survival of planted emergent wetland species on 78.5 acres of emergent wetland habitat. The 85% survival criteria would continue to five years after construction.

One year following completion of final construction activities achieve 50% survival of bottomland hardwood species and 85% survival of emergent wetland species on 10.8 acres of emergent wetland habitat continuing 5 years after completion of project construction

*Monitoring Design and Rationale:* Planted woody and emergent wetland species will be assessed each year during site surveys to determine what percentage of each species the plants have survived. Sites will be evaluated annually from post-construction until success is determined. To determine the increase in acreage, satellite and aerial imagery will be used to identify change pre- and post-construction in years 1-5. The same requirements for wood species will be required in years 6-10. Vegetated habitats should be classified using digital aerial imagery and field observation.

*Trigger:* By year 1, the number of surviving woody and emergent plant species is below 85% for bottomland hardwood and emergent wetland habitats. By year 1, the number of surviving woody species is below 50% and surviving emergent wetland species are below 85% for forested wetland habitats. Volunteer plant species may replace unsuccessful planting, but only if the species is consistent with the species diversity goals and is not a dominant component of the restoration target composition.

*Possible Causes for Not Meeting Success Criteria Potential*: Failure mechanisms for the successful establishment for the habitats mentioned above may include drought or extreme storm events, predators (invertebrates and vertebrates), incompatible plant species selection, wetland design errors/flaws resulting in inadequate hydrology, and/or reinfestation of non-native invasive and native noxious species.

*Potential Adaptive Management Measures:* Adaptive management measure would include irrigation or soil amendments during drought conditions; predator control (i.e., enclosures) to ensure the vitality and survival of the plantings; changing the target plant species to those be more tolerant of site specific abiotic conditions; and modifying the active ingredient/surfactant or application rates of herbicides, changing the treatment methodology (chemical, mechanical, or biocontrol), reinitiating grading, and/or the

refinement of the integrated pest management strategy to manage invasive and noxious plant species in the restoration areas. Prior to initiation of adaptive management measures, review by SWT Operations Division Cultural Resources personnel must be conducted to ensure that avoided cultural resources are not impacted, and that required measures are consistent with the level of cultural resources investigations previously conducted.

***Performance Measure 2:*** Average cover of 75% of desired vegetation on mitigation sites at year 5 compared to pre-construction.

*Success Criteria:* One year following completion of final construction activities achieve a minimum average cover of 25%, comprised of native herbaceous species. Three years following construction, achieve a minimum average cover of 75% native emergent wetland, forested wetland, and bottomland hardwood species (according to appropriate site). Five years following construction, achieve a minimum average cover of 50% herbaceous species.

*Monitoring Design and Rationale:* Vegetation will be sampled annually, at the six mitigation sites. Permanent vegetation monitoring stations will be established for assessing the vegetation community at each site. Sites will be sampled annually post-construction until success is determined.

*Trigger:* The percent canopy cover of native herbaceous species is less than 50% after one year, 75% after two years, or 85% after three years.

*Possible Causes for Not Meeting Success Criteria Potential:* Failure mechanisms for the successful establishment of mitigation sites may include drought, predators (invertebrates and vertebrates), incompatible plant species selection, wetland design errors/flaws resulting in inadequate hydrology, and/or reinfestation of non-native invasive and native noxious species.

*Potential Adaptive Management Measures:* Adaptive management measures would include irrigation or soil amendments during drought conditions; predator control (i.e., enclosures) to ensure the vitality and survival of the plantings; changing the target plant species to those be more tolerant of site specific abiotic conditions; and modifying the active ingredient/surfactant or application rates of herbicides, changing the treatment methodology (chemical, mechanical, or biocontrol), reinitiating grading, and/or the refinement of the integrated pest management strategy to manage invasive and noxious plant species in the restoration areas Prior to initiation of adaptive management measures, review by SWT Operations Division Cultural Resources personnel must be conducted to ensure that avoided cultural resources are not impacted, and that required measures are consistent with the level of cultural resources investigations previously conducted.

***Performance Measure 3:*** Establish overall site biodiversity through increasing plant species taxa richness.

*Success Criteria:* One year following completion of final construction activities achieve a minimum of a 25% increase in plant species taxa richness depending on initial site conditions, comprised of native species. Five years following construction, maintain or increase level of taxa richness achieved during vegetation establishment efforts during construction phase, comprised of native species.

*Monitoring Design and Rationale:* The species composition of each site will be sampled annually at the permanent vegetation monitoring sites. Sites will be sampled annually

post construction until success is determined. Diversity metrics may consist of species richness, species evenness, and/or other species diversity metrics such as the Shannon Weiner or Simpson Index.

*Trigger:* The target increase in species diversity is not achieved within one year of construction.

*Possible Causes for Not Meeting Success Criteria Potential:* Failure mechanisms associated with meeting the species diversity performance measure includes those listed above for performance measures 1 and 2.

*Potential Adaptive Management Measures:* Potential adaptive management measures include those listed above for performance measures 1-2; however, modifying the plant species used to replace unsuccessful plantings would be the most likely adaptive management measures. This is especially the case when survival of a species is significantly lower than other species planted in the restoration area. Prior to initiation of adaptive management measures, review by SWT Operations Division Cultural Resources personnel must be conducted to ensure that avoided cultural resources are not impacted, and that required measures are consistent with the level of cultural resources investigations previously conducted.

***Performance Measure 4:*** Manage non-native invasive vegetation within mitigation sites.

*Success Criteria* One year following completion of final construction activities achieve less than 25% average cover of non-native invasive species. Years 2 to 5 following completion of final construction activities achieve average cover of less than 5% non-native invasive species with no area greater than 0.25 acres in size with greater than 10% non-native invasive species.

*Monitoring Design and Rationale:* Vegetation will be sampled annually, at the mitigation site. Permanent vegetation monitoring stations will be established for assessing the vegetation community at each site. Sites will be sampled annually post-construction until success is determined. Initial control/removal of unwanted plants will be evaluated, and determinations made on an annual or semi-annual basis on whether additional action will be needed.

*Trigger:* Non-native invasive species percent cover exceeds 25% after one year, 15% after two years, and/or 10% after 3 years.

*Possible Causes for Not Meeting Success Criteria Possible:* Failure modes for invasive species management include ineffective treatment of the invasive species, root sprouting of the invasive plant, reestablishment of invasive species from the seed bank in the restoration areas, or immigration of invasive species seeds from animals or floodwaters.

*Potential Adaptive Management Measures:* Adaptive management measures to address failures in invasive species control include modifying the active ingredient/surfactant or application rates of herbicides, changing the treatment methodology (chemical, mechanical, or biocontrol), or modifying the integrated pest management strategy. Should ground disturbing methods be selected, review by SWT Operations Division Cultural Resources personnel must be conducted prior to implementation to ensure that avoided cultural resources are not impacted, and that required measures are consistent with the level of cultural resources investigations previously conducted.

This mitigation plan involves active manipulation (as needed) to sustain project goals and objectives, primarily by applying an iterative process of assessing and learning from the results of management actions. The application of adaptive management principals in this project will provide decision support tools to address site changes that may occur as the project progresses, as well as integrate additional project resources or technologies as needed. In some cases additional resources may be needed to address issues that occur (such as management of new infestations of invasive species), but in most cases reallocation of resources (e.g., modifying planting lists/species selection based upon successes and failure of earlier plantings) can be used to meet or exceed project goals as defined by tree, shrub, vine, and herbaceous plant establishment combined with nuisance plant control.

In contrast, periodic monitoring of performance criteria which contain trigger values informs the iterative process of implementing specified adaptive management measures to help achieve ecological success. However, the project area is susceptible to several uncertainties that could significantly impact the ecological success of constructed restoration features as described.

Decisions on the implementation of adaptive management actions are informed by the assessment of monitoring results. The information generated by the monitoring plan will be used by USACE to guide decisions on adaptive management that may be needed to ensure that the mitigation achieves success.

# 10 Financial Assurances

The funds necessary to carry out this mitigation plan will come from Maintenance and Operations (M&O) funds allocated for the USACE SWT Operations Division. In total, an estimated $3,348,000 would be needed to complete the mitigation plan, see Table 3 below for line item estimates.

**Table 3. Mitigation Plan Costs**

| **Task** | **Cost ($)** |
|---|---|
| Planning, Design, and Initial Site Preparation | 15,000 |
| Propagule, Materials Acquisition, and Plant Production | 648,000 |
| Plantings | 806,000 |
| Monitoring | 225,000 |
| Adaptive Management | 282,000 |
| Reporting and Operations & Maintenance | 96,000 |
| **Task** | **Cost ($)** |
| Grading and Contouring | 441,000 |
| Security Fencing | 1,425,000 |
| **Total** | **3,938,000** |

# 11 References

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Warrix AR, Myers AL, Marshall JM. 2017. Estimating invading Callery pear (*Pyrus calleryana*) age and flowering probability in an Indiana managed prairie. Proc Indiana Acad Sci 126:153–15

# 12 List of Preparers

Justyss Watson – Biologist, Regional Planning and Environmental Center; 6 years USACE experience.

# Attachment A

# PROJECT AREA PHOTOS

North – Below Lock 16

East – Below Lock 16

South – Below Lock 16

West – Below Lock 16

North – Salt Creek

East – Salt Creek

South – Salt Creek

West – Salt Creek

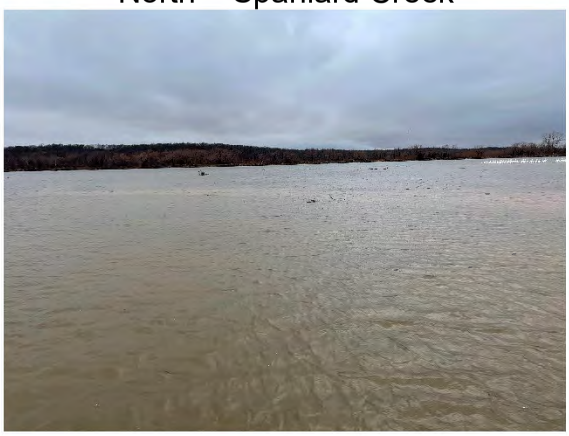
North – Sandtown Bottom

East – Sandtown Bottom

South – Sandtown Bottom

West – Sandtown Bottom

North – Spaniard Creek



South – Spaniard Creek

West – Spaniard Creek

North – Kerr Lake (RM 343)

East – Kerr Lake (RM 343)

South – Kerr Lake (RM 343)

North – Stoney Point

East – Stoney Point

South – Stoney Point

West – Stoney Point

San Bois Creek

San Bois Creek

San Bois Creek

San Bois Creek

## PROPOSED MITIGATION AREA PHOTOS

West of Muskogee Turnpike

West of Muskogee Turnpike

West of Muskogee Turnpike

West of Muskogee Turnpike

E0960

E0960

E0960

E0960

North of I40

North of I40

North of I40

North of I40

Drake Road

Drake Road

Drake Road

Drake Road

Missouri Pacific Railroad East

Missouri Pacific Railroad East

Missouri Pacific Railroad East

Missouri Pacific Railroad East

Missouri Pacific Railroad West

Missouri Pacific Railroad West

Missouri Pacific Railroad West

Missouri Pacific Railroad West

CR4530

CR4530

CR4530

CR4530

Tract 1304

Tract 1304

Tract 1304

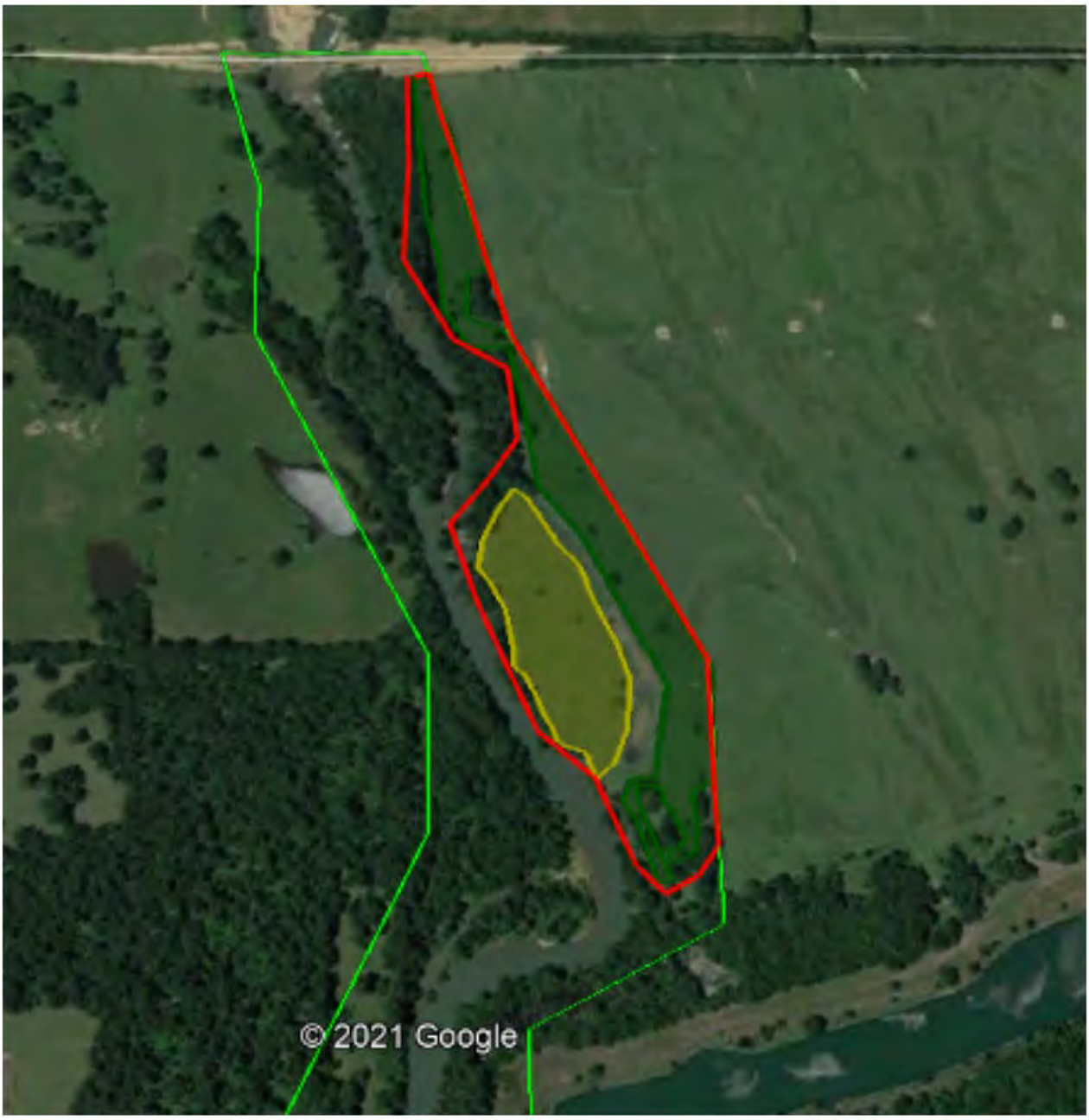
Tract 1304

# Attachment B


West Muskogee Turnpike: This site will need minor grading around the edges of the neon green polygon. There is a slight increase in elevation ~3 feet.


E0960: Grading in the area within the blue circle to match the rest of the green polygon. Approximate change in elevation between 4 to 9 feet. Approximately 1.0 miles of fencing.


North I40: No grading required.

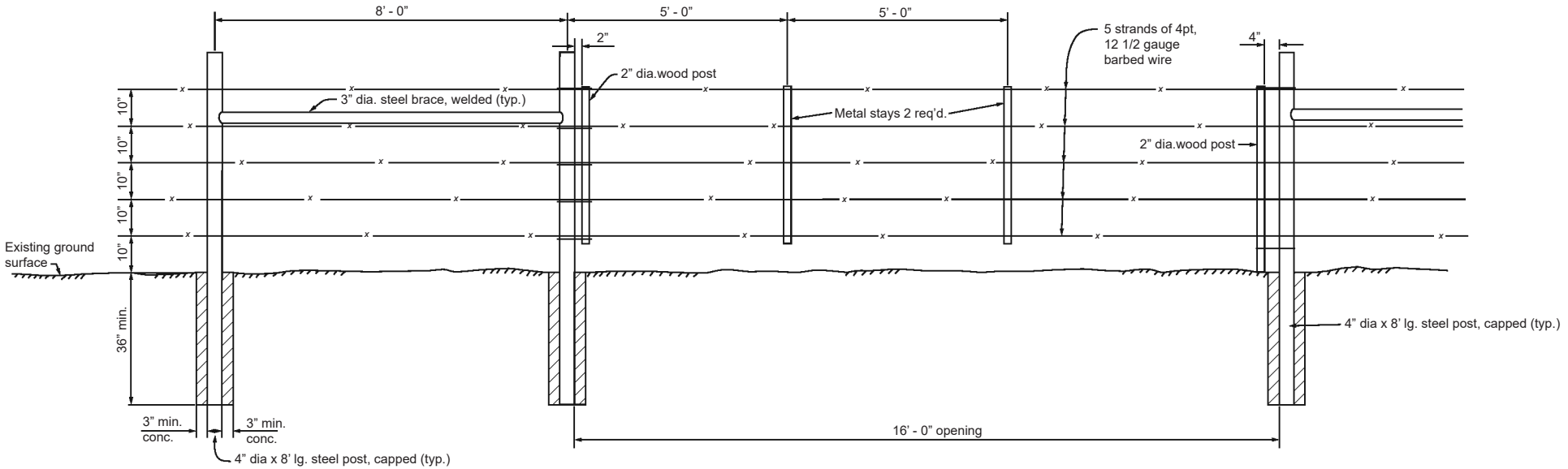



Drake Road: No grading required.


Missouri Pacific Railroad East: Light pockets of grading within neon green and yellowish polygon. No steep slopes, only enough to create minor sumps or depressions.

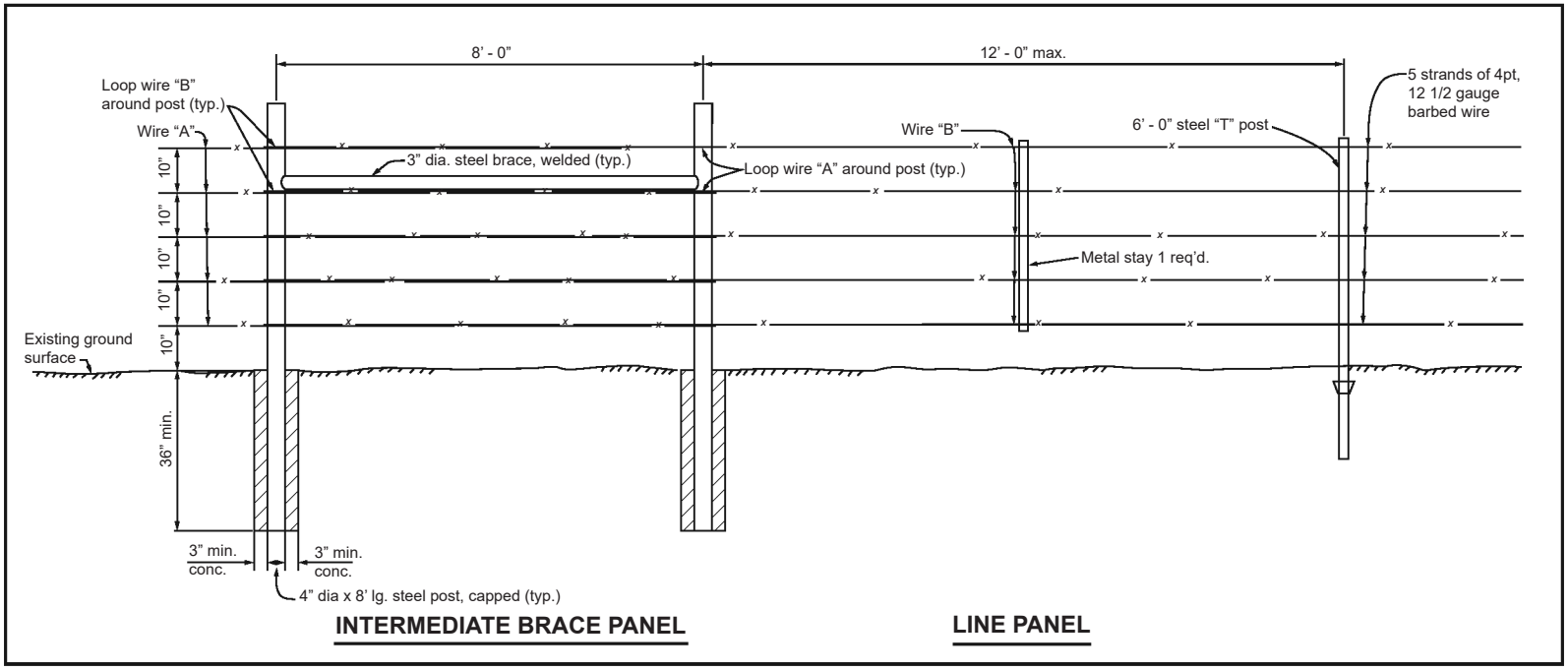

Missouri Pacific Railroad West: Minor grading, perhaps 10’x10’ or 20’x20 to allow for better drainage to the rest of the site.

# Attachment C



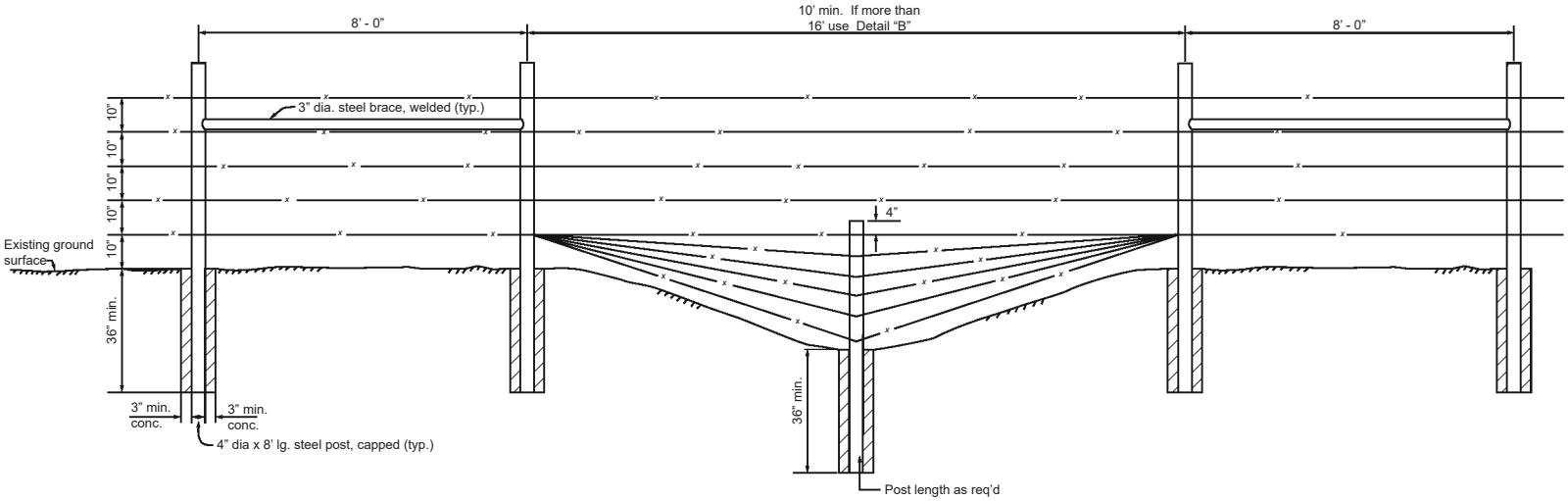

**END (GATE) BRACE PANEL**

**FIELD GATE**

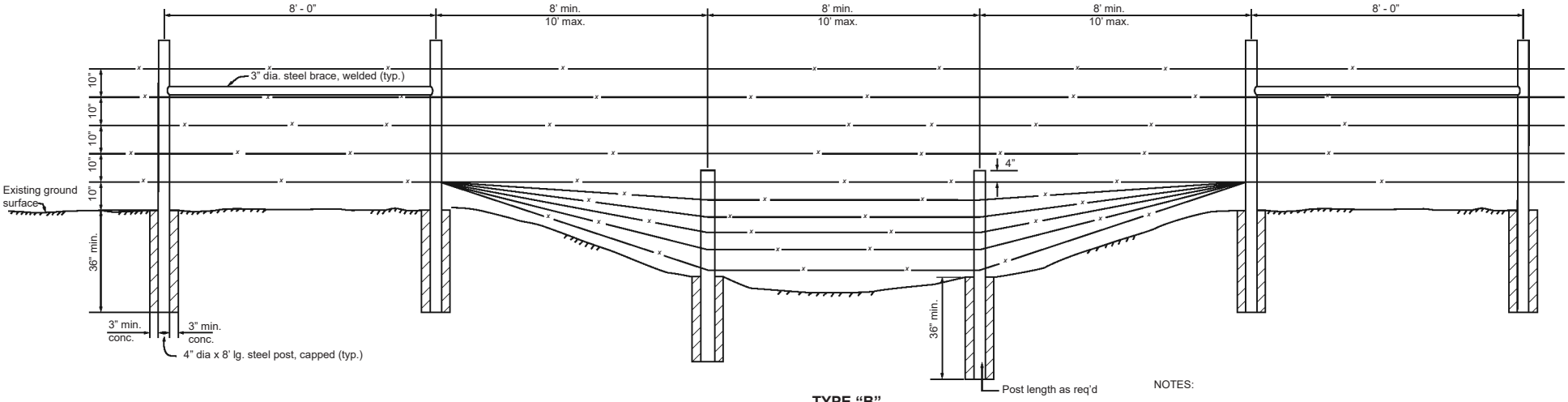



**INTERMEDIATE BRACE PANEL**

**LINE PANEL**




**TYPE "A"**

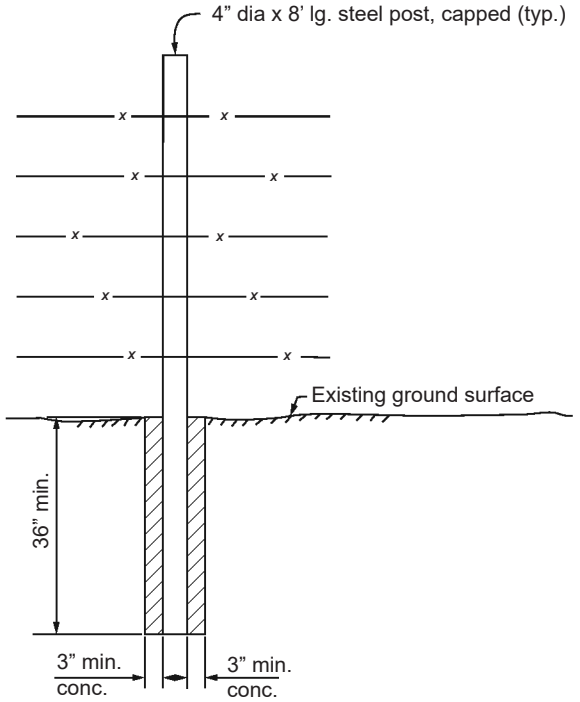



**TYPE "B"**

**WATER GAP DETAILS**

NOTES:

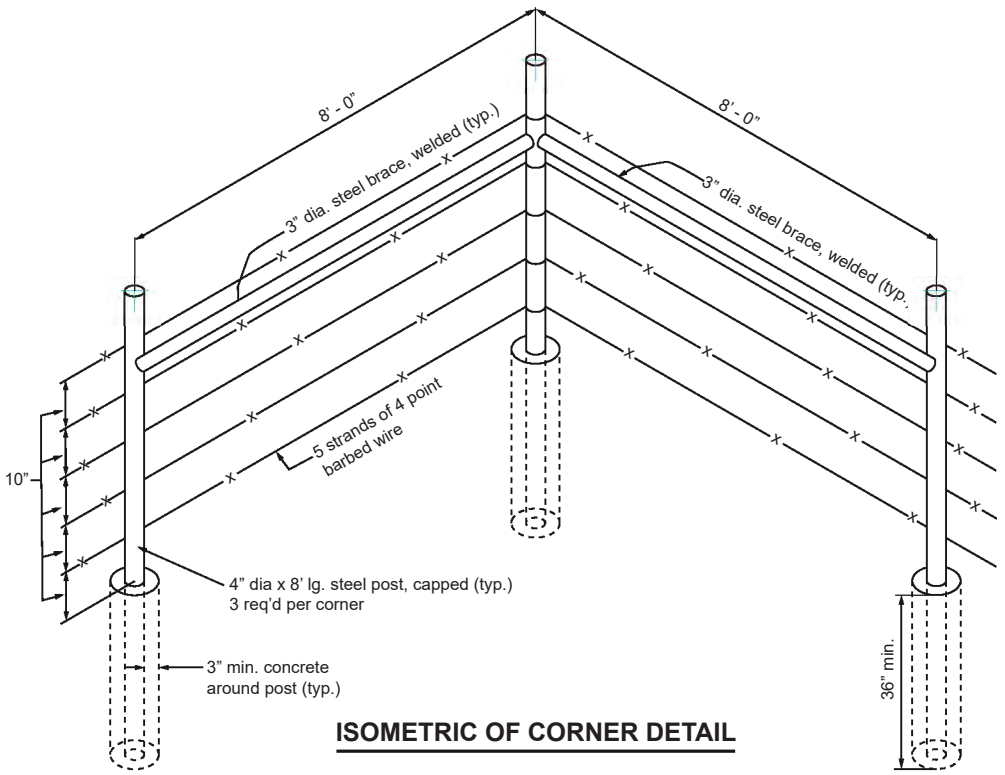
1. Used where fence alignment changes are 5 degrees or greater, but less than 10 degrees.
2. Used at bottom of sharp vertical breaks to prevent uplift from removing normally set post.




## ANCHOR POST

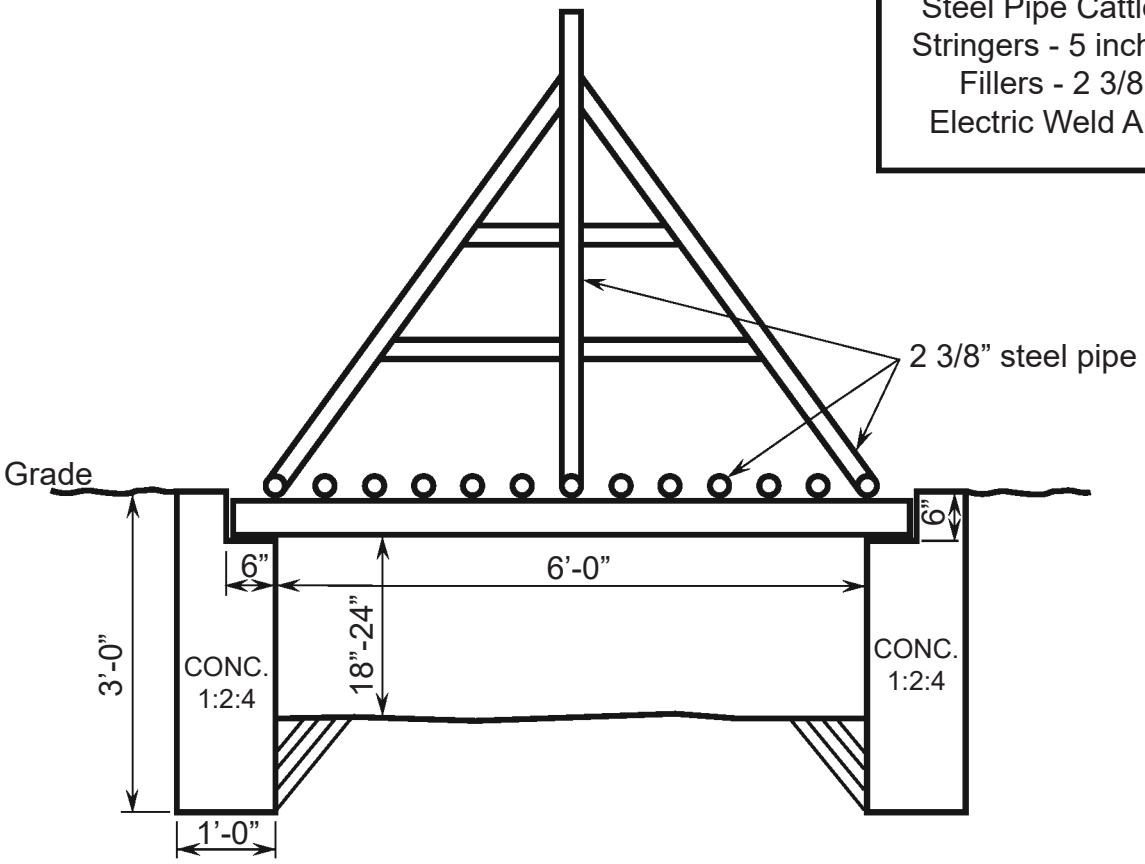
NOTES:

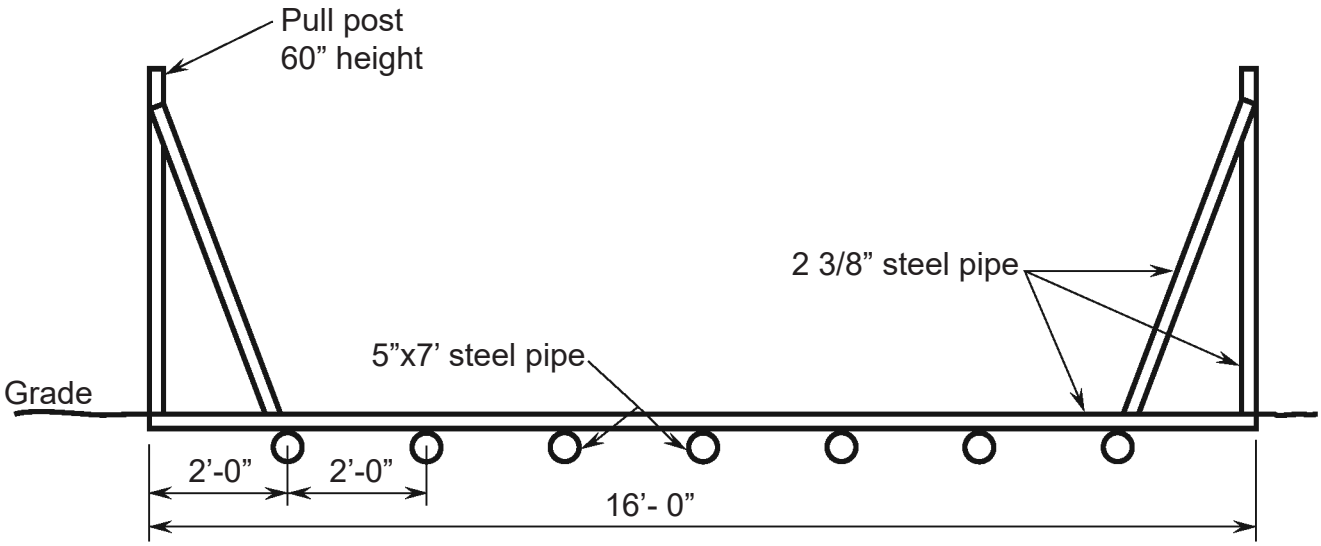
1. Used where fence alignment changes are 5 degrees or greater, but less than 10 degrees.
2. Used at bottom of sharp vertical breaks to prevent uplift from removing normally set post.




## ISOMETRIC OF CORNER DETAIL

SPECIFICATIONS
Steel Pipe Cattle Guard
Stringers - 5 inch x 7 foot
Fillers - 2 3/8 inch
Electric Weld All Joints



# Attachment D

NATIONWIDE STANDARD CONSERVATION MEASURES

Listed below are effective measures that should be employed at all project development sites nationwide with the goal of reducing impacts to birds and their habitats. These measures are grouped into three categories: General, Habitat Protection, and Stressor Management. These measures may be updated through time. We recommend checking the Conservation Measures website regularly for the most up-to-date list.

1. **General Measures**

a. Educate all employees, contractors, and/or site visitors of relevant rules and regulations that protect wildlife. See the Service webpage on Regulations and Policies for more information on regulations that protect migratory birds.

b. Prior to removal of an inactive nest, ensure that the nest is not protected under the Endangered Species Act (ESA) or the Bald and Golden Eagle Protection Act (BGEPA). Nests protected under ESA or BGEPA cannot be removed without a valid permit. i. See the Service Nest Destruction Policy

c. Do not collect birds (live or dead) or their parts (e.g., feathers) or nests without a valid permit. Please visit the Service permits page for more information on permits and permit applications.

d. Provide enclosed solid waste receptacles at all project areas. Non-hazardous solid waste (trash) would be collected and deposited in the on-site receptacles. Solid waste would be collected and disposed of by a local waste disposal contractor. For more information about solid waste and how to properly dispose of it, see the EPA Non-Hazardous Waste website.

e. Report any incidental take of a migratory bird, to the local Service Office of Law Enforcement.

f. Consult and follow applicable Service industry guidance.

2. **Habitat Protection**

a. Minimize project creep by clearly delineating and maintaining project boundaries (including staging areas).

b. Consult all local, State, and Federal regulations for the development of an appropriate buffer distance between development site and any wetland or waterway. For more information on wetland protection regulations see the Clean Water Act sections 401 and 404.

c. Maximize use of disturbed land for all project activities (i.e., siting, lay-down areas, and construction).

d. Implement standard soil erosion and dust control measures. For example: i. Establish vegetation cover to stabilize soil ii. Use erosion blankets to prevent soil loss iii. Water bare soil to prevent wind erosion and dust issues

3. Stressor Management

Stressor: Vegetation Removal

**Conservation Goal:** Avoid direct take of adults, chicks, or eggs.

**Conservation Measure 1:** Schedule all vegetation removal, trimming, and grading of vegetated areas outside of the peak bird breeding season to the maximum extent practicable. Use available resources, such as internet-based tools (e.g., the FWS's Information, Planning and Conservation system and Avian Knowledge Network) to identify peak breeding months for local

bird species; or, contact local Service Migratory Bird Program Office for breeding bird information.

**Conservation Measure 2:** When project activities cannot occur outside the bird nesting season, conduct surveys prior to scheduled activity to determine if active nests are present within the area of impact and buffer any nesting locations found during surveys.

1) Generally, the surveys should be conducted no more than five days prior to scheduled activity.

2) Timing and dimensions of the area to be surveyed vary and will depend on the nature of the project, location, and expected level of vegetation disturbance.

3) If active nests or breeding behavior (e.g., courtship, nest building, territorial defense, etc.) are detected during these surveys, no vegetation removal activities should be conducted until nestlings have fledged or the nest fails or breeding behaviors are no longer observed. If the activity must occur, establish a buffer zone around the nest and no activities will occur within that zone until nestlings have fledged and left the nest area. The dimension of the buffer zone will depend on the proposed activity, habitat type, and species present and should be coordinated with the local or regional Service office.

4) When establishing a buffer zone, construct a barrier (e.g., plastic fencing) to protect the area. If the fence is knocked down or destroyed, work will suspend wholly, or in part, until the fence is satisfactorily repaired.

5) When establishing a buffer zone, a qualified biologist will be present onsite to serve as a biological monitor during vegetation clearing and grading activities to ensure no take of migratory birds occurs. Prior to vegetation clearing, the monitor will ensure that the limits of construction have been properly staked and are readily identifiable. Any associated project activities that are inconsistent with the applicable conservation measures, and activities that may result in the take of migratory birds will be immediately halted and reported to the appropriate Service office within 24 hours.

6) If establishing a buffer zone is not feasible, contact the Service for guidance to minimize impacts to migratory birds associated with the proposed project or removal of an active nest. Active nests may only be removed if you receive a permit from your local Migratory Bird Permit Office. A permit may authorize active nest removal by a qualified biologist with bird handling experience or by a permitted bird rehabilitator.

**Conservation Measure 3:** Prepare a vegetation maintenance plan that outlines vegetation maintenance activities and schedules so that direct bird impacts do not occur.

Stressor: Invasive Species Introduction

**Conservation Goal:** Prevent the introduction of invasive plants.

**Conservation Measure 1:** Prepare a weed abatement plan that outlines the areas where weed abatement is required and the schedule and method of activities to ensure bird impacts are avoided.

**Conservation Measure 2:** For temporary and permanent habitat restoration/enhancement, use only native and local (when possible) seed and plant stock.

**Conservation Measure 3:** Consider creating vehicle wash stations prior to entering sensitive habitat areas to prevent accidental introduction of non-native plants.

**Conservation Measure 4:** Remove invasive/exotic species that pose an attractive nuisance to migratory birds.

## Stressor: Artificial Lighting

**Conservation Goal**: Prevent increase in lighting of native habitats during the bird breeding season.

**Conservation Measure 1:** To the maximum extent practicable, limit construction activities to the time between dawn and dusk to avoid the illumination of adjacent habitat areas.

**Conservation Measure 2:** If construction activity time restrictions are not possible, use down shielding or directional lighting to avoid light trespass into bird habitat (i.e., use a 'Cobra' style light rather than an omnidirectional light system to direct light down to the roadbed). To the maximum extent practicable, while allowing for public safety, low intensity energy saving lighting (e.g. low pressure sodium lamps) will be used.

**Conservation Measure 3:** Minimize illumination of lighting on associated construction or operation structures by using motion sensors or heat sensors.

**Conservation Measure 4**: Bright white light, such as metal halide, halogen, fluorescent, mercury vapor and incandescent lamps should not be used.

## Stressor: Human Disturbance

**Conservation Goal:** Minimize prolonged human presence near nesting birds during construction and maintenance actions.

**Conservation Measure 1:** Restrict unauthorized access to natural areas adjacent to the project site by erecting a barrier and/or avoidance buffers (e.g., gate, fence, wall) to minimize foot traffic and off-road vehicle uses.

## Stressor: Collision

**Conservation Goal:** Minimize collision risk with project infrastructure and vehicles.

**Conservation Measure 1:** Minimize collision risk with project infrastructure (e.g., temporary and permanent) by increasing visibility through appropriate marking and design features (e.g., lighting, wire marking, etc.).

**Conservation Measure 2:** On bridge crossing areas with adjacent riparian, beach, estuary, or other bird habitat, use fencing or metal bridge poles (Sebastian Poles) that extend to the height of the tallest vehicles that will use the structure.

**Conservation Measure 3:** Install wildlife friendly culverts so rodents and small mammals can travel under any new roadways instead of over them. This may help reduce raptor deaths associated with being struck while tracking prey or scavenging road kill on the roadway.

**Conservation Measure 4:** Remove road-kill carcasses regularly to prevent scavenging and bird congregations along roadways.

**Conservation Measure 5:** Avoid planting “desirable” fruited or preferred nesting vegetation in medians or Rights of Way.

**Conservation Measure 6:** Eliminate use of steady burning lights on tall structures (e.g., >200 ft).

## Stressor: Entrapment

**Conservation Goal:** Prevent birds from becoming trapped in project structures or perching and nesting in project areas that may endanger them.

**Conservation Measure 1:** Minimize entrapment and entanglement hazards through project design measures that may include:

1. Installing anti-perching devices on facilities/equipment where birds may commonly nest or perch

2. Covering or enclosing all potential nesting surfaces on the structure with mesh netting, chicken wire fencing, or other suitable exclusion material prior to the nesting season to prevent birds from establishing new nests. The netting, fencing, or other material must have no opening or mesh size greater than 19 mm and must be maintained until the structure is removed.

3. Cap pipes and cover/seal all small dark spaces where birds may enter and become trapped.

**Conservation Measure 2:** Use the appropriate deterrents to prevent birds from nesting on structures where they cause conflicts, may endanger themselves, or create a human health and safety hazard.

1. During the time that the birds are trying to build or occupy their nests (generally , between April and August, depending on the geographic location), potential nesting 5 surfaces should be monitored at least once every three days for any nesting activity, especially where bird use of structures is likely to cause take. It is permissible to remove non-active nests (without birds or eggs), partially completed nests, or new nests as they are built (prior to occupation). If birds have started to build any nests, the nests shall be removed before they are completed. Water shall not be used to remove the nests if nests are located within 50 feet of any surface waters.

2. If an active nest becomes established (i.e., there are eggs or young in the nest), all work that could result in abandonment or destruction of the nest shall be avoided until the young have fledged or the nest is unoccupied. Construction activities that may displace birds after they have laid their eggs and before the young have fledged should not be permitted. If the project continues into the following spring, this cycle shall be repeated. When work on the structure is complete, all netting shall be removed and properly disposed of.

Stressor: Noise

**Conservation Goal:** Prevent the increase in noise above ambient levels during the nesting bird breeding season.

**Conservation Measure 1:** Minimize an increase in noise above ambient levels during project construction by installing temporary structural barriers such as sand bags

**Conservation Measure 2:** Avoid permanent additions to ambient noise levels from the proposed project by using baffle boxes or sound walls.

Stressor: Chemical Contamination

**Conservation Goal:** Prevent the introduction of chemicals contaminants into the environment.

**Conservation Measure 1:** Avoid chemical contamination of the project area by implementing a Hazardous Materials Plan. For more information on hazardous waste and how to properly manage hazardous waste, see the EPA Hazardous Waste website.

**Conservation Measure 2:** Avoid soil contamination by using drip pans underneath equipment and containment zones at construction sites and when refueling vehicles or equipment.

**Conservation Measure 3:** Avoid contaminating natural aquatic and wetland systems with runoff by limiting all equipment maintenance, staging laydown, and dispensing of fuel, oil, etc., to designated upland areas.

**Conservation Measure 4:** Any use of pesticides or rodenticides shall comply with the applicable Federal and State laws.

1. Choose non-chemical alternatives when appropriate

2. Pesticides shall be used only in accordance with their registered uses and in accordance with the manufacturer's instructions to limit access to non-target species.

3. For general measures to reducing wildlife exposure to pesticides, see EPA's Pesticides: Environmental Effects website.

Stressor: Fire

**Conservation Goal:** Minimize fire potential from project-related activities.

**Conservation Measure 1:** Reduce fire hazards from vehicles and human activities (e.g., use spark arrestors on power equipment, avoid driving vehicles off road).

**Conservation Measure 2**: Consider fire potential when developing vegetation management plans by planting temporary impact areas with a palate of low-growing, sparse, fire resistant native species that meet with the approval of the County Fire Department and local FWS Office.