DEPARTMENT OF THE ARMY
U.S. ARMY CORPS OF ENGINEERS, VICKSBURG DISTRICT
4155 CLAY STREET
VICKSBURG, MS 39183-3435

SUBJECT: ARKABUTLA DAM SAFETY MODIFICATION STUDY
ARKABUTLA LAKE, DESOTO COUNTY, MISSISSIPPI
EA# EAXX-202-00-B4P-1729611288.

PUBLIC NOTICE

To Whom It May Concern:

A draft Finding of No Significant Impact (FONSI), along with the draft Environmental Assessment (EA) for the Arkabutla Dam Safety Modification Study Project in DeSoto County, Mississippi is enclosed for your review and comment. The purpose of the proposed project is to reduce the risk of Arkabutla dam breaching. USACE needs to lower this risk in order to prevent damages that would occur if an uncontrolled breach occurred and to continue properly operating Arkabutla Dam and Lake for their authorized flood prevention and recreational purposes. The proposed project would involve construction of a new outlet works and outlet channel downstream of the existing outlet works. Please provide comments by 30 March 2025.

If you have any questions or comments concerning the draft FONSI or draft EA, please contact Mr. Taylor Piefke of this office by telephone (601) 631-5087 or email Taylor.Piefke@usace.army.mil.

Sincerely,

SMITH.MARK.R.1219443621
Digitally signed by SMITH.MARK.R.1219443621
Date: 2025.02.27 14:04:15 -06'00'

Mark Smith
Chief, Environmental Compliance Branch
Regional Planning and Environment Division South

Enclosure

Arkabutla Dam (MS01496)

Coldwater River, Mississippi
Embankment, Outlet Works, Spillway

APPENDIX E
Environmental Documentation

Mississippi Valley Division
Vicksburg District

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DRAFT FINDING OF NO SIGNIFICANT IMPACT

ARKABUTLA DAM SAFETY MODIFICATION STUDY
ARKABUTLA LAKE, DESOTO COUNTY, MISSISSIPPI
EA# EAXX-202-00-B4P-1729611288

The U.S. Army Corps of Engineers, Vicksburg District (Corps) has conducted an environmental analysis in accordance with the National Environmental Policy Act of 1969, as amended, and all coordinating statutes, regulations, policies, and executive orders. The final Environmental Assessment (EA) dated X, for the Arkabutla Dam Safety Modification Study (DSMS) addresses the possible impacts associated with repairing backwards eroding piping within Arkabutla Dam, in DeSoto County, Mississippi. The final recommendation is contained in the report of the Dam Safety Modification Report, dated TBD.

The Draft EA, incorporated herein by reference, evaluated various alternatives that would provide long term repairs for Arkabutla Dam in the study area. The recommended plan is the Least Environmentally Damaging Practicable Alternative (LEDPA).

This alternative includes construction of a new outlet works downstream at approximately River Station 175+00. The new outlet works would consist of new state-of-the-practice reinforced concrete intake structure; reinforced concrete control house with vertical lift gates and an emergency gate; a bridge connecting the control house to the top of the dam; reinforced concrete conduit; and a reinforced concrete stilling basin. This plan also includes excavation of a new discharge channel with riprap scour protection to direct water towards the existing discharge channel.

In compliance with Water Resource Development Act (WRDA) 2007 as amended, this mitigation plan proposes for the Corps to acquire and actively reforest 58.5 acres of frequently flooded agricultural land to mitigate for unavoidable impacts to wildlife habitat resulting from the proposed project actions. All mitigation would be completed prior to or concurrently with construction. Multiple measures (listed below) were taken to avoid and minimize impacts to environmental resources.

In addition to a "No Action" plan, 4 other alternatives were evaluated in the EA. The alternatives included:

Table 1: Description of Alternatives

Alternative	Name	Description	EA Section
1	No Action (required)	No actions would be taken, and the dam would not be repaired.	2.2.2
2	Outlet Works in New Location	Construct a new dam outlet works in a nearby location and decommission the current outlet works.	2.2.3
6	Conduit Liner + New Stilling Basin	Install a steel liner in the conduit and construct a new stilling basin downstream of the current stilling basin.	2.2.4
7	Conduit Liner + Stilling Basin Rehabilitation	Install a steel liner in the conduit and install foundation grouting.	2.2.5
9	Partial Cutoff Wall + Conduit Liner + New Stilling Basin	Install a steel liner in the conduit, construct a new stilling basin downstream of the current stilling basin, and add a partial cutoff wall to the dam.	2.2.6

Alternatives 2, 6, 7, and 9 had similar minor impacts on environmental resources within the project area. There were significant differences in terrestrial and wetland impacts between alternatives with Alternative 2 having the largest impacts (Table 2). However, Alternatives 6, 7, and 9 are incapable of being done after taking into consideration the associated costs, existing technologies, and logistics in light of the overall project purpose. Therefore, alternative 2 is the LEDPA. Alternatives 2, 6, and 9 would require mitigation to compensate for these terrestrial and wetland impacts. With mitigation these impacts would be considered minor. Mitigation information can be found in Section 4.4 of the accompanying EA (EAXX-202-00-B4P-1729611288).

Table 2: Unavoidable Wildlife Habitat Impacts Comparison

Alternative	Impacted Acres	AAHU Loss	Cause of Impacts
No Action (Non-breach)	0	0	NA
Alternative 2	31	54.6*	New Channel Construction
Alternative 6	0.8	1.8	Bypass Channel
Alternative 7	0	0	NA
Alternative 9	0.8	1.8	Bypass Channel

*AAHUs still requiring compensatory mitigation after accounting for the 15.7 AAHUs provided by the natural succession of the backfilled channel.

For the Proposed Action Plan (Alternative 2), the potential effects were evaluated, as appropriate. A summary assessment of the potential effects of the recommended plan are listed in Table 3:

Table 3: Summary of Potential Effects of the Recommended Plan

	Insignificant effects	Insignificant effects as a result of mitigation	Resource unaffected by action
Recreation and Aesthetics	☐	☒	☐
Air quality	☒	☐	☐
Aquatic resources/wetlands	☒	☐	☐
Invasive species	☐	☐	☒
Fish and wildlife habitat	☐	☒	☐
Threatened/Endangered species/critical habitat	☒	☐	☐
Historic properties	☐	☒	☐
Other cultural resources	☐	☒	☐
Floodplains	☒	☐	☐
Hazardous, toxic & radioactive waste	☒	☐	☐
Hydrology	☒	☐	☐
Land use	☐	☐	☒
Navigation	☐	☐	☒
Noise levels	☒	☐	☐
Public infrastructure	☒	☐	☐
Soils	☒	☐	☐
Tribal trust resources	☐	☐	☒
Water quality	☒	☐	☐

All practicable and appropriate means to avoid or minimize adverse environmental effects were analyzed and incorporated into the recommended plan. The following best management practices (BMPs) would be implemented to minimize environmental impacts:

- Tree clearing would not occur during bat maternity season which runs from May 15th - July 31st.
- Any construction involving abandoning the current outlet works would not take place during bat hibernation season which runs from November 16th- March 14th.
- On-bank construction efforts for the current channel would need to be concentrated to mid-September through mid-April to reduce impacts to alligator snapping turtles.
- Backfilling of the channel would occur during warmer months when the average water temperatures are above 50°F.
- Vegetation removal would be minimized where possible to avoid impacts to terrestrial and aquatic organisms and native vegetation would be used for reseeding.

- Multiple placement locations for the new outlet structure were analyzed during the study. The chosen location in Alternative 2 was selected to reduce impacts to wetlands and avoid impacts to a known cultural site.
- When determining the best way to acquire the borrow material required for the cofferdams in each alternative, commercial sources were compared to potential USACE borrow areas. For Alternatives 6 and 9 commercial sources were selected to avoid the need to clear forested borrow areas.
- A potential borrow area was selected for Alternative 2 since it would require significantly more borrow material than Alternatives 6 and 9. When selecting the potential borrow area multiple locations were investigated. The proposed borrow location was chosen due to the lack of wetland and terrestrial impacts compared to the other potential locations.
- A wetland delineation was performed on the project site. Based on the results, a Do Not Disturb area was added to the Alternative 2 site plan to minimize wetland and terrestrial impacts.
- 8 acres of the backfilled channel would be left at a slightly lower elevation than the surrounding area to allow wetlands in the area to regrow through natural succession leading to an overall increase in functional capacity units (FCU). Additionally, the regrowth would provide 15.7 average annual habitat units (AAHU) of wildlife habitat.

More information on BMPs can be found in Section 3.3.4.1 and Section 4.1 of the EA (EAXX-202-00-B4P-1729611288) accompanying this FONSI.

The recommended plan will result in unavoidable adverse impacts to 31 acres of wildlife habitat. Impacts to wildlife habitat was analyzed using Habitat Evaluation Procedures (HEP) to determine average annual habitat units (AAHU). To mitigate for these unavoidable adverse impacts, the Corps will acquire and actively reforest 58.5 acres of frequently flooded agricultural land. More mitigation details can be found in Section 4 of the accompanying EA (EAXX-202-00-B4P-1729611288). All mitigation will be accomplished either prior to or concurrently with construction.

Public review of the draft EA and FONSI was completed on TBD. All comments submitted during the public review period will be responded to in the Final EA and FONSI.

Pursuant to section 7 of the Endangered Species Act of 1973, as amended, the U.S. Army Corps of Engineers utilized the Information for Planning and Consultation (IPaC) tool, developed by the U.S. Fish and Wildlife Service (USFWS) which identified 4 federally threatened or endangered species that are either known to or may possibly occur in proposed project areas: Northern Long-eared Bat (*Myotis septentrionalis*), Tricolored Bat (*Perimyotis septentrionalsis*), Alligator Snapping Turtle (*Macrochelys temminckii*)*, and* Monarch Butterfly (*Danaus plexippus*). It was determined that the recommended plan may affect but is not likely to adversely affect the following federally listed species or their designated critical habitat: Northern Long-eared bat and the Tricolored bat, and Alligator Snapping Turtle. It was determined that the recommended plan

would have no effect on the other federally listed species. The U.S. Fish and Wildlife Service (FWS) concurred with the Corps' determination on 14 August 2024.

Pursuant to the Clean Water Act of 1972, as amended, the discharge of dredged or fill material associated with the recommended plan has been found to be compliant with section 404(b)(1) Guidelines (40 CFR 230). The Clean Water Act Section 404(b)(1) Guidelines evaluation is found in Section 3.3.3.1 of the accompanying EA (EAXX-202-00-B4P-1729611288).

A water quality certification pursuant to section 401 of the Clean Water Act will be obtained from the Mississippi Department of Environmental Quality (MDEQ) during the Preconstruction, Engineering, and Design (PED) phase of the project and prior to construction. The Mississippi Department of Environmental Quality has agreed to this approach. All conditions of the water quality certification will be implemented in order to minimize adverse impacts to water quality. More information on water quality certification can be found in Section 3.2.2.1 of the accompanying EA (EAXX-202-00-B4P-1729611288).

In accordance with Section 106 of the NHPA (16 U.S.C. § 470f.) and its implementing regulations (36 C.F.R. § 800), USACE has elected to fulfill its Section 106 obligations through the execution and implementation of a Programmatic Agreement (PA) per § 800.14(b) with the Mississippi State Historic Preservation Office, Absentee-Shawnee Tribe of Indians of Oklahoma, The Alabama-Coushatta Tribe of Texas, The Alabama-Quassarte Tribal Town, The Caddo Nation of Oklahoma, The Chickasaw Nation, Chitimacha Tribe of Louisiana, The Coushatta Tribe of Louisiana, The Jena Band of Choctaw Indians, The Mississippi Band of Choctaw Indians, The Muscogee (Creek) Nation, The Quapaw Nation, The Seminole Nation of Oklahoma, The Seminole Tribe of Florida, The Tunica-Biloxi Tribe of Louisiana, and The United Keetoowah Band of Cherokee Indians. All terms and conditions resulting from the agreement shall be implemented to avoid, minimize, and/or mitigate adverse impacts to historic properties. More information on Cultural Resources and the programmatic agreement can be found in Section 3.4 of the accompanying EA (EAXX-202-00-B4P-1729611288).

Technical, environmental, and economic criteria used in the formulation of alternative plans were those specified in the Water Resources Council's 1983 Economic and Environmental Principles and Guidelines for Water and Related Land Resources Implementation Studies. All applicable laws, executive orders, regulations, and local government plans were considered in evaluation of alternatives. Based on this report, the reviews by other Federal, State, and local agencies, Tribes, input of the public, and the review by my staff, it is my determination that the recommended plan would not cause significant adverse effects on the quality of the human environment; therefore, preparation of an Environmental Impact Statement is not required.

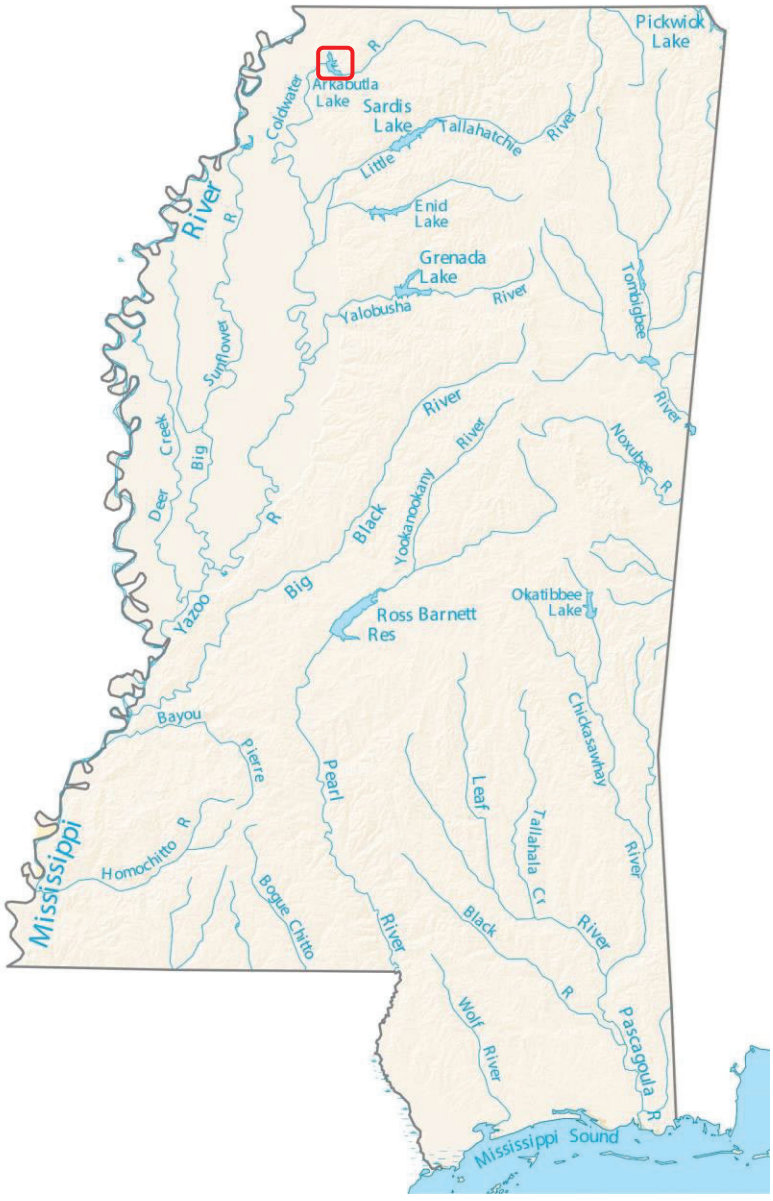
_____ _____

Jeremiah A. Gipson
Colonel, Corps of Engineers
District Commander

Date

DRAFT ENVIRONMENTAL ASSESSMENT

ARKABUTLA DAM SAFETY MODIFICATION STUDY
ARKABUTLA LAKE, DESOTO COUNTY, MISSISSIPPI
EA# EAXX-202-00-B4P-1729611288



U.S. Army Corps of Engineers
Vicksburg District
Regional Planning and Environment Division South
Vicksburg Planning Branch

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DRAFT ENVIRONMENTAL ASSESSMENT
ARKABUTLA DAM SAFETY MODIFICATION STUDY
ARKABUTLA LAKE, DESOTO COUNTY, MISSISSIPPI
EA # EAXX-202-00-B4P-1729611288

1 INTRODUCTION

The United States Army Corps of Engineers (USACE), Mississippi River Valley Division (MVD), Regional Planning and Environment Division South (RPEDS), Vicksburg District (MVK) has prepared this Draft Environmental Assessment (EA) to evaluate the potential environmental, cultural, and socioeconomic impacts of alternatives for the Arkabutla Dam Safety Modification Study (DSMS). The purpose of the DSMS is to identify and recommend a Risk Management Plan (RMP) that reduces dam safety risks.

This Draft EA has been prepared in accordance with the National Environmental Policy Act of 1969 (NEPA) and the Council on Environmental Quality's (CEQ's) Regulations, as reflected in the USACE Engineering Regulation ER 200-2-2 and provides sufficient information about the potential adverse and beneficial environmental effects to allow a USACE Commander to make an informed decision on the appropriateness of an Environmental Impact Statement (EIS) or a Finding of No Significant Impact (FONSI).

1.1 Project Location

Arkabutla Dam is located in Desoto County, Mississippi with portions of the Lake extending into Tate County, Mississippi. The dam is located on the Coldwater River, a tributary of the Tallahatchie River, that stores floodwater to provide flood damage reduction in the Yazoo Basin (Figure 1). The dam is located approximately 4.25 miles north of Arkabutla, Mississippi and approximately 35 miles south of Memphis, Tennessee.

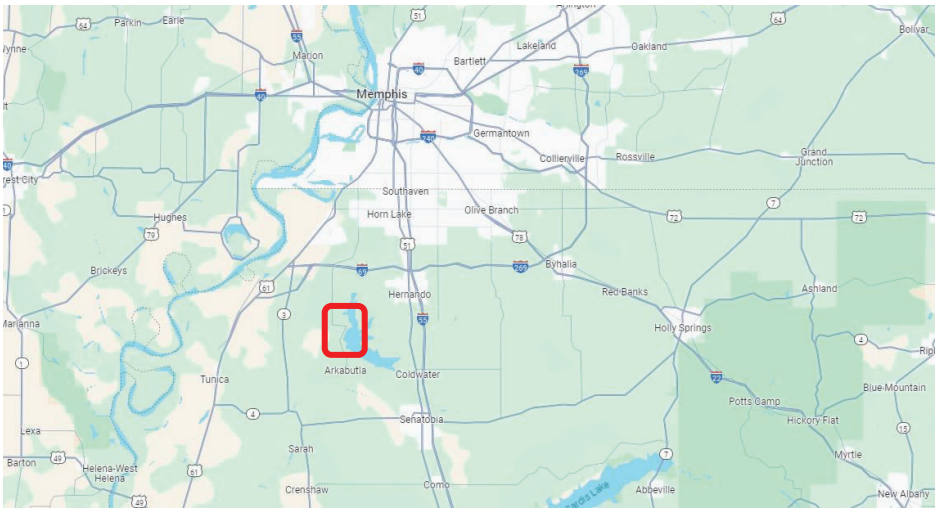

Figure 1: Project location.

1.2 Project Area Description

Arkabutla Lake is one of the four Yazoo Basin Lakes that were authorized, designed, and constructed for flood control of the downstream areas in the Yazoo Basin. The other three flood control dams are Enid on the Yocona River, Sardis on the Little Tallahatchie River, and Grenada on the Yalobusha River. The Yazoo Basin Lakes are regulated in accordance with an approved Yazoo Basin Lakes Water Control Plan.

The dam consists of an embankment, intake tower, and gated outlet works, an uncontrolled broad-crested ogee weir spillway, and two abutment closure dikes (Figure 2). The main embankment is constructed of rolled earth fill, and it is approximately 10,700 feet in length, including 3,500 feet in the length of the abutment dikes. It also contains approximately 4,500,000 cubic yards of earth fill material. The outlet works consist of a three-gated, reinforced concrete intake tower, a single reinforced concrete conduit, a reinforced concrete stilling basin, and an outlet channel. A service bridge connects the intake tower with the crown of the main embankment. The spillway, located in a natural saddle north of the dam, is an uncontrolled overflow spillway. It consists of a reinforced concrete approach apron, weir, chute, walls, and stilling basin as well as a riprap lined outlet channel. The spillway has overtopped twelve times since the dam began operation in 1943.

The authorized project purposes include flood control and recreation. There are no non-federal sponsor operation, maintenance, repair, replacement, and rehabilitation (OMRRandR) responsibilities associated with the project. The Arkabutla Lake Project was designed by the Vicksburg District and construction started on 1 August 1940. The dam, outlet works, spillway, closure dikes, and appurtenances were completed on 1 June 1943.

Figure 2: Arkabutla Dam location and features, DeSoto County, MS.

1.3 Dam Safety Modification Study Process

The USACE Dam Safety Program uses risk to inform how it manages the approximately 740 dams it operates and maintains, with life safety as the highest priority. This approach is a best practice adopted to evaluate, prioritize, and justify dam safety decisions. Using risk information allows USACE to repair its dams in the most effective manner.

Risk is comprised of the following three elements: the likelihood that natural events will take place, the performance of the infrastructure during these events, and the consequences of poor performance. Risk allows USACE to look at the project in terms of its purposes; ecosystems; constrained budgets; the uncertainty of future events and current knowledge; past design decisions; and combinations of these factors.

A risk assessment is a systematic approach to quantify and describe the hazard, likelihood of something going wrong, and consequences if something does go wrong. It is used to define safety issues, evaluate remediation options, and measure effectiveness of repairs. It enhances decision-making for setting short and long-term priorities for studies, investigations, and repairs. Risk assessments are performed on a continuous basis because risk can change over time.

An Issue Evaluation Study (IES) for Arkabutla Dam was completed in November 2021. Six potential failure modes (PFM) were developed during the IES, but only two were identified as the primary risk drivers:

- PFM 8: Backward Erosion Piping into the Outlet Works Drainage System
- PFM 10: Backward Erosion Piping into the Conduit

The risk was re-evaluated in July 2023 following the formation a downstream sinkhole and a review of data from newly installed automated foundation piezometers. The risk was found to have increased based on the identification of the following additional unfavorable factors:

- A sinkhole formed near the downstream end of the conduit.
- Continued material loss was observed into the stilling basin during dewatering.
- A hydraulic jump occurs at the outlet drains which likely results in negative pressures on the stilling basin drainage system that pull foundation sand up through the outlet drains.
- New automated piezometer data indicates the average foundation gradients are higher than estimated during the IES.

The risk associated with PFM 8 is the primary risk driving failure mode.

1.4 Study Purpose and Need

The USACE has developed a Dam Safety Action Classification (DSAC) system to provide consistent and systematic guidelines to address dam safety issues and deficiencies at USACE projects. DSAC ratings, which reflect the degree of urgency in taking action, are informed by the probability of breach and incremental risk associated with the project. The incremental risk is the risk

associated with the presence of a dam or project that can be attributed to its breach prior or subsequent to overtopping, or due to component malfunction or maloperation. By definition, incremental risk excludes non-breach risk, which is the risk to the affected areas that remains even if the dam or levee functions as intended. The classification scale ranges from 1 to 5, with 1 being the most urgent and 5 being the least urgent. Arkabutla has a DSAC 1 rating. Dams with this rating are considered to have a higher incremental risk of breaching.

The area of concern is the outlet works drainage system. The existing condition risk assessment (ECRA) was re-evaluated as part of this study and based on the results of recent dye testing backward erosion piping risks were found to be even higher. Dye was introduced into piezometer just upstream of the crest and within two hours was observed in the tailrace. The faster than expected travel time suggests the increased permeability of the foundation material beneath the conduit because of past material loss through open joints into the conduit and through the outlet drains into the stilling basin. The open joints into the conduit were repaired in 2020 and leakage into the conduit has not been observed since, although the condition of these joints is expected to degrade with time. An unfiltered exit through the outlet drains into the stilling basin remains. As a result, backward erosion piping beneath the conduit with an exit into the stilling basin (PFM 8) is the primary risk-driver.

The purpose of the proposed project is to reduce the risk of Arkabutla dam breaching. USACE needs to lower this risk in order to prevent damages that would occur if an uncontrolled breach occurred and to continue properly operating Arkabutla Dam and Lake for their authorized flood prevention and recreational purposes.

1.5 Authority

The Flood Control Act of 15 May 1928, as amended by the Acts of 15 June 1936 and 28 June 1938, authorized the construction of the Arkabutla Dam and Reservoir Project, which is included in the approved program for flood control under the appropriation “Flood Control Mississippi River and Tributaries”, Act of 1939.

Development of recreation and public-use areas on USACE reservoir areas was authorized by Section 4 of the Flood Control Act of 22 December 1944, as amended by Section 209 of the Flood Control Act of 3 December 1954. Construction of the project began in August 1940 and was completed in June 1943. The authorized project purposes include flood control and recreation.

1.6 National Environmental Policy Act Scoping

The regulations for implementing NEPA require the USACE to perform scoping as an early and open process to identify concerns from the public, organizations, and agencies. In July 2024 Public NEPA scoping letters requesting comments or concerns were sent to interested parties, agencies, and tribes (Attachment 1). Letters were sent to the United States Fish and Wildlife Service, Mississippi Department of Environmental Quality, Mississippi Department of Wildlife Fisheries and Parks, Mississippi State Historic Preservation Office (MS SHPO), and 15 Tribal

governments including: Absentee-Shawnee Tribe of Indians of Oklahoma, The Alabama-Coushatta Tribe of Texas, The Alabama-Quassarte Tribal Town, The Caddo Nation of Oklahoma, The Chickasaw Nation, Chitimacha Tribe of Louisiana, The Choctaw Nation of Oklahoma, The Coushatta Tribe of Louisiana, The Jena Band of Choctaw Indians, The Mississippi Band of Choctaw Indians, The Muscogee (Creek) Nation, The Quapaw Nation, The Seminole Nation of Oklahoma, The Seminole Tribe of Florida, The Tunica-Biloxi Tribe of Louisiana, and The United Keetoowah Band of Cherokee Indians.

Environmental scoping comments were received from USFWS requesting that specific best management practices be used during construction to reduce the potential impacts to threatened and endangered species and bald eagles. The specific best management practices can be found in Section 3.3.4.1 of this EA and in Attachment 2.

No cultural comments were received during the scoping period. Additional cultural correspondence can be found in Attachment 8.

2 ALTERNATIVES

CEQ Regulation Section 1502.14 requires the Environmental Analysis to evaluate reasonable alternatives to the proposed action, and for alternatives that were eliminated from more detailed study to briefly discuss the reasons for their elimination. Reasonable alternatives include those that are technically and economically feasible and meet the purpose and need for the proposed action, rather than simply desirable from the standpoint of the applicant. No specific number of alternatives is required or prescribed to be carried forward for detailed analysis in the EA (36 CFR 220.7(b)(2)).

2.1 Alternative Development

Risk management measures are methods of addressing risk that can either be stand alone or combined to form an array of Risk Management Plans (RMPs). For this study, risk management measures were focused primarily on the risk-driving failure modes identified as part of the IES – PFM 8 (Backward Erosion Piping into Outlet Works Drainage System) and PFM 10 (Backward Erosion Piping into the Conduit). To address these PFMs, risk management measures were developed. The initial array of risk management measures contains a few mandatory measures including No Action (or Future Without Action Condition); removing the structure; and replacing the structure as identified in the USACE Safety of Dams – Policy and Procedures (ER 1110-2-1156). Measures can be divided into two general categories – structural measures and nonstructural/operational measures. Structural measures are ways to address risk by structurally modifying the dam, and nonstructural/operational measures are ways to address risk without structurally modifying the dam.

2.1.1 Initial Array of Risk Management Measures

This section describes the initial array of potential risk management measures that were considered to address the primary risk PFMs and the rationale for the initial screening decision. The initial array of risk management measures was identified by the project delivery team and screened against the study objective, keeping in mind the dam safety issues, opportunities, and constraints. The retained measures were assessed to determine which would likely meet the study objectives as stand-alone RMPs and which measures would need to be combined with another measure to make a complete RMP. The initial array included 10 potential risk management measures (Table 1).

Specific screening criteria included cost/efficiency, effectiveness, environmental impacts, constructability/ implementability, Operations and Maintenance (O&M) considerations, time to risk reduction, resiliency, redundancy, and robustness, as prescribed by ER 1105-2-10.

Table 1: Initial Array of Risk Management Measures and Screening Decisions.

Risk Management Measure	Description	Screening Decision
1	No Action (required)	Retained - required
2	Outlet Works in New Location	Retained for evaluation
3	Dam Removal	Screened due to the highly uncertain cost of construction, prohibitive cost estimate, increased flood risk for downstream communities, and excessive time to incremental risk reduction.
4	Cutoff Wall + Stilling Basin Rehab	Screened due to risk during construction in terms of keeping the outlet operable. In addition, the plan would require replacement of joints multiple times over the project life.
5	Stilling Basin Rehab + Downstream Filer Filter + Additional Wells	Screened due to cost, incompletes, and less risk reduction compared to other plans.
6	Conduit Liner + New Stilling Basin	Retained for evaluation
7	Conduit Liner + Stilling Basin Rehab	Retained for evaluation
8	Stilling Basin Rehab + Downstream Filter	Screened due to low resiliency, redundancy, and robustness. Additionally screened due to insufficient risk reduction.
9	Partial Cutoff Wall + Conduit Liner + New Stilling Basin	Retained for evaluation
10	Permanent Pool Reduction	Screened due to exceeding the Average Annual Life Loss guideline, not correcting design deficiencies, impacts to other reservoirs in the Yazoo Basin, and significant human and natural environmental impacts.

2.2 Alternatives Carried Forward for NEPA Evaluation

2.2.1 Final Array of Risk Management Plan Alternatives

Risk management plans were further examined and developed into the final array shown in Table 2. The evaluation of the final array of RMPs was conducted using primary evaluation criteria. Primary evaluation criteria included those that were anticipated to be instrumental to the selection of the recommended plan. The primary evaluation criteria included effectiveness, efficiency, environmental impacts, and the increased O&M burden. This evaluation also considered other factors related to the four Principals and Guidelines accounts (National Economic Development (NED), Regional Economic Development (RED), Environmental Quality (EQ), and Other Social Effects (OSE)) that were not included in the primary evaluation criteria.

The RMPs were also evaluated using secondary evaluation criteria, which included completeness, acceptability, robustness, redundancy, resiliency, and the concept of "Do No Harm". As a result of this evaluation RMP 2 was identified as the Proposed Action Alternative (PAA).

Table 2: Final Array of Risk Management Plans.

Alternative	Name	Description
1	No Action (required)	No actions would be taken, and the dam would not be repaired.
2	Outlet Works in New Location	Construct a new dam outlet works in a nearby location and decommission the current outlet works.
6	Conduit Liner + New Stilling Basin	Install a steel liner in the conduit and construct a new stilling basin downstream of the current stilling basin.
7	Conduit Liner + Stilling Basin Rehabilitation	Install a steel liner in the conduit and install foundation grouting.
9	Partial Cutoff Wall + Conduit Liner + New Stilling Basin	Install a steel liner in the conduit, construct a new stilling basin downstream of the current stilling basin, and add a partial cutoff wall to the dam.

2.2.2 Alternative 1- No Action

The National Environmental Policy Act (NEPA), ER 1110-2-1156, and ER 1105-2-100, require that the No Action Alternative (NAA) be included in a final array of alternatives. The NAA is assessed to determine the potential impacts of not implementing the proposed actions. Under NEPA, the NAA is used as a baseline against which all other alternatives are evaluated for environmental impacts. Additionally, the NAA is the risk condition to which all RMPs must be compared.

Under the No Action Alternative, the intolerable safety risks associated with the degradation of the Arkabutla Dam outlet works and stilling basin would continue. The following predictions were made by the Project Delivery Team (PDT) regarding future trends associated with the project over the next 50 years (the USACE standard period of project evaluation) without federal action:

Basic Assumptions

- Risk would continue to increase over time due to continued degradation of the outlet works conduit and stilling basin.
- The Arkabutla Dam would continue to be operated in accordance with the Water Control Manual and O&M Manual.
- The NAA includes implementation of Interim Risk Reduction Measures (IRRMs), future operation and maintenance of the structure, and future flood fighting and surveillance.
- The NAA does not include a pool restriction. Arkabutla Dam is currently under a short term five-year Major Water Control Deviation. If the restriction were to remain in place, a re-authorization of the project would be necessary. A government action of this level is not considered a reasonable action over the 50-year analysis. This is due to changes in the authorized purpose of flood control. Pool restriction and related deviations would have to be made permanent through government action and included in the Water Control Manual.
- USACE would take actions (for example, periodic outlet works and conduit grouting, relief well pumping, and normal flood fighting procedures including sand boil mitigation) in the future, if necessary, to intervene against potential risks during high pool events. The likelihood of intervention assumed in the ECRA included this level of monitoring and potential for intervention.

Population Changes

- There would not be significant changes in downstream population/land use through the end of the period of analysis (50 years).

IRRMs

- Complete a DSMS to support dam safety actions to achieve reduction in safety risk, economic risk, and environmental risks.
- Develop a comprehensive communication plan that includes elements related to public awareness and education, risk communication, and stakeholder involvement.
- Update the existing emergency action plan and complete an emergency exercise.
- Repair of existing stilling basin drainage system.
- Instrumentation data review, processing, and visualization.
- Develop inundation mapping.
- Conduct on-going conduit inspections.
- Annually conduct conduit and stilling basin wall surveys.
- Epoxy injections to joints.
- Conduct drone video and Light Detection and Ranging (LiDAR) survey.
- Conduct geophysical and dye testing.

Climate Assessment Report

- One of the factors considered for changes to the Future Without Action (FWAC) hydrologic loading is associated with climate variation. A Climate Assessment Report was completed for the DSMS in accordance with ECB 2018-14. The Climate Assessment analyzed the current and projected climate conditions. From this assessment, there was a strong increase in temperature and a mild increase in precipitation. However, the report notes that there are no significant trends in observed stream flow datasets or climate vulnerabilities for the Coldwater River Basin. The Vulnerability Assessment shows no significant changes over time and is considered not relatively vulnerable to climate variation impacts for the flood risk reduction business line.

Downstream Warning Preparedness

- Implementation of a Risk Communication Plan would continue but would not substantially impact life loss consequences.

While the IRRMs are successful in lowering project risks in the short term for both PFM 8 and 10, given the poor historic performance of grouting at the project and unrepaired foundation damage that will still exist after interim stilling basin repairs, without eventual intervention, there is a greater risk of a dam breach that would lead to flooding the surrounding areas causing adverse impacts (Figure 3). This could result in losses to human life and severe damage to natural resources, personal and private property, and infrastructure. The NAA would fail to fulfill the purpose and need as described in Section 1.4.

Figure 3: Inundation map of first 60 miles showing a breach at the Top of Active Storage El. 238.6 NAVD88.

2.2.3 Alternative 2- Construct Outlet Works in a New Location

This alternative includes construction of a new outlet works downstream at approximately STA 175+00. The new outlet works would consist of new reinforced concrete intake structure; reinforced concrete control house with vertical lift gates and an emergency gate; a bridge connecting the control house to the top of the dam; reinforced concrete conduit; and a reinforced concrete stilling basin. Multiple placement locations for the new outlet structure were analyzed during the study. The chosen location in this alternative was selected to reduce impacts to wetlands and avoid impacts to a known cultural site.

This plan also includes excavation of a new discharge channel with riprap scour protection to direct water towards the existing discharge channel. See Figure 4 below for the location of the new outlet works and proposed discharge channel.

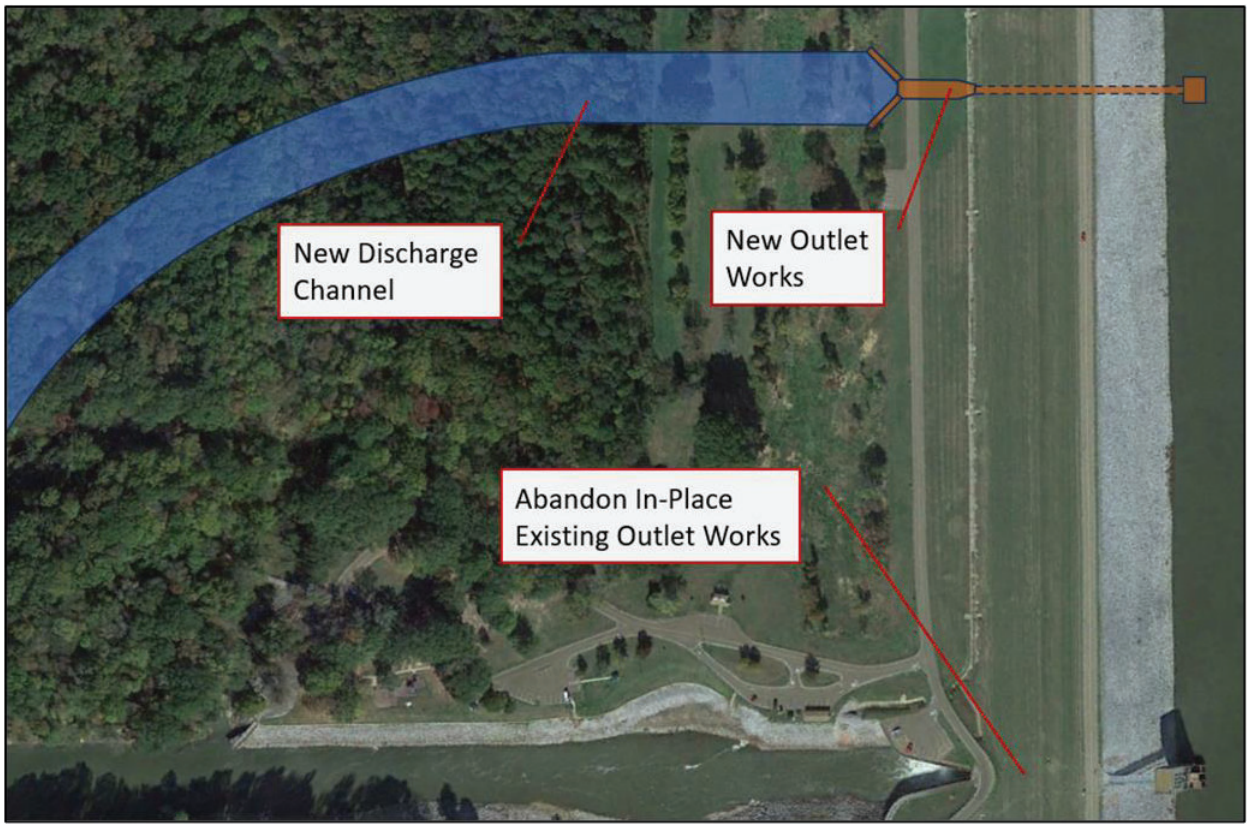

Figure 4: Proposed new outlet works and channel location.

The conduit diaphragm filter is 16-feet thick, 100-feet wide, rises eight feet above the top of the conduit at monolith ten, and extends five feet below the base of the conduit through the well-graded aggregate base material. The filter also relieves excess porewater pressure through a gravel drain connected to a gravity collector pipe that discharges into the outlet channel through a network of lateral drains. A horizontal collector pipe would be stubbed in the diaphragm filter to collect seepage and discharge through a network of laterals and manholes into the outlet channel.

A series of five permanent relief wells would be installed along each side of the stilling basin for a total of ten wells, serving as a pressure relief system for the stilling basin and gravity discharge into the outlet works through the wingwalls. Dewatering of substratum sands under the excavation area would be completed through a system of 17 12-inch relief wells extending to an El. 130 feet.

To protect against potential channel scour, this alternative includes installation of sheet pile approximately 20-feet in depth from the base to the downstream end of the stilling basin. A sheet pile cutoff would be driven through the upstream pervious blanket ten feet below the blanket bottom. Additionally, a total of eight dewatering wells (four on the north slope and four on the south slope) would be installed to control seepage. Compacted clay fill, replacing the existing pervious blanket, would be placed along the excavation side of the sheet pile for additional stability.

A zoned soil embankment cofferdam would be constructed "in the wet" around the excavation with 1:3 side slopes to protect and dewater the excavation area (Figure 5). The embankment would have a clay core with cohesionless outer shells grading from fine to coarse towards the outer edges. The downstream end of the cofferdam would have a toe filter and a pervious stability berm 10 feet thick from the base of the dam and 40 feet in length. The cofferdam would be removed after construction and the material would be returned to the borrow area.

When deciding the best method for acquiring borrow material required for the cofferdam, commercial sources were compared to potential borrow areas. It was determined that sand borrow material would be obtained from a commercial source and clay borrow material would be obtained from the borrow area shown in Figure 5. When selecting the potential borrow area multiple locations were investigated. The proposed borrow location was chosen due to the lack of wetland and terrestrial impacts when compared to the other potential locations.

Additionally, the following best management practices (BMP) would be implemented during sediment removal to reduce the potential for impacts:

- Provide 100-ft naturally vegetated buffers adjacent to any streams, ditches, or drainages consisting of trees, shrubs, and grasses, or other herbaceous species to protect surface waters from soil runoff and mining contaminants.
- Inspect BMP structures within 24 hours of each significant rainfall event and take immediate corrective action if erosion or soil runoff is observed.
- Monitor water quality (especially turbidity or total suspended solids) to assure that discharges/runoff do not increase stream turbidity above background levels.
- Execute any work that results in exposed earth on slopes leading to wetlands or surface waters during periods when significant rainfall is not predicted.
- Maintain the State's standard for pH at all times.

Following construction of the new outlet works, complete abandonment of the existing outlet works would occur. Along with the abandonment, the existing outlet channel would be backfilled to just below the existing ground level starting from the old outlet works and continuing to the confluence of the new outlet channel. Implementation duration including the Pre-Construction Engineering and Design (PED) phase and construction is estimated at nine years.

The following conservation measures would be implemented to minimize environmental impacts:

- Tree clearing would not occur during bat maternity season which runs from May 15th - July 31st.
- Any construction involving abandoning the current outlet works would not take place during bat hibernation season which runs from November 16th- March 14th.
- On-bank construction efforts for the current channel would need to be concentrated to mid-September through mid-April to reduce impacts to alligator snapping turtles.
- Backfilling of the channel would occur during warmer months when the average water temperatures are above 50°F.
- Vegetation removal would be minimized where possible to avoid impacts to terrestrial and aquatic organisms and native vegetation would be used for reseeding.
- 8 acres of the backfilled channel would be left at a slightly lower elevation than the surrounding area to allow wetlands in the area to regrow through natural succession leading to an overall increase in functional capacity units (FCU). Additionally, the regrowth would provide 15.7 average annual habitat units (AAHU) of wildlife habitat.

Construction of the new outlet channel would result in unavoidable adverse impacts to 31 acres (54.8 AAHU) of terrestrial wildlife habitat that would require mitigation (See Sections 3.3.2 Terrestrial Resources and 3.3.3 Wetlands). A wetland delineation was performed on the project site to determine the quality and size of the impacted resources. In addition, a Do Not Disturb area was added to the Alternative 2 site plan to minimize wetland and terrestrial impacts (Figure 5). Mitigation would require the acquisition and active reforestation of 58.5 acres of occasionally flooded farmland (See Section 4 Mitigation).

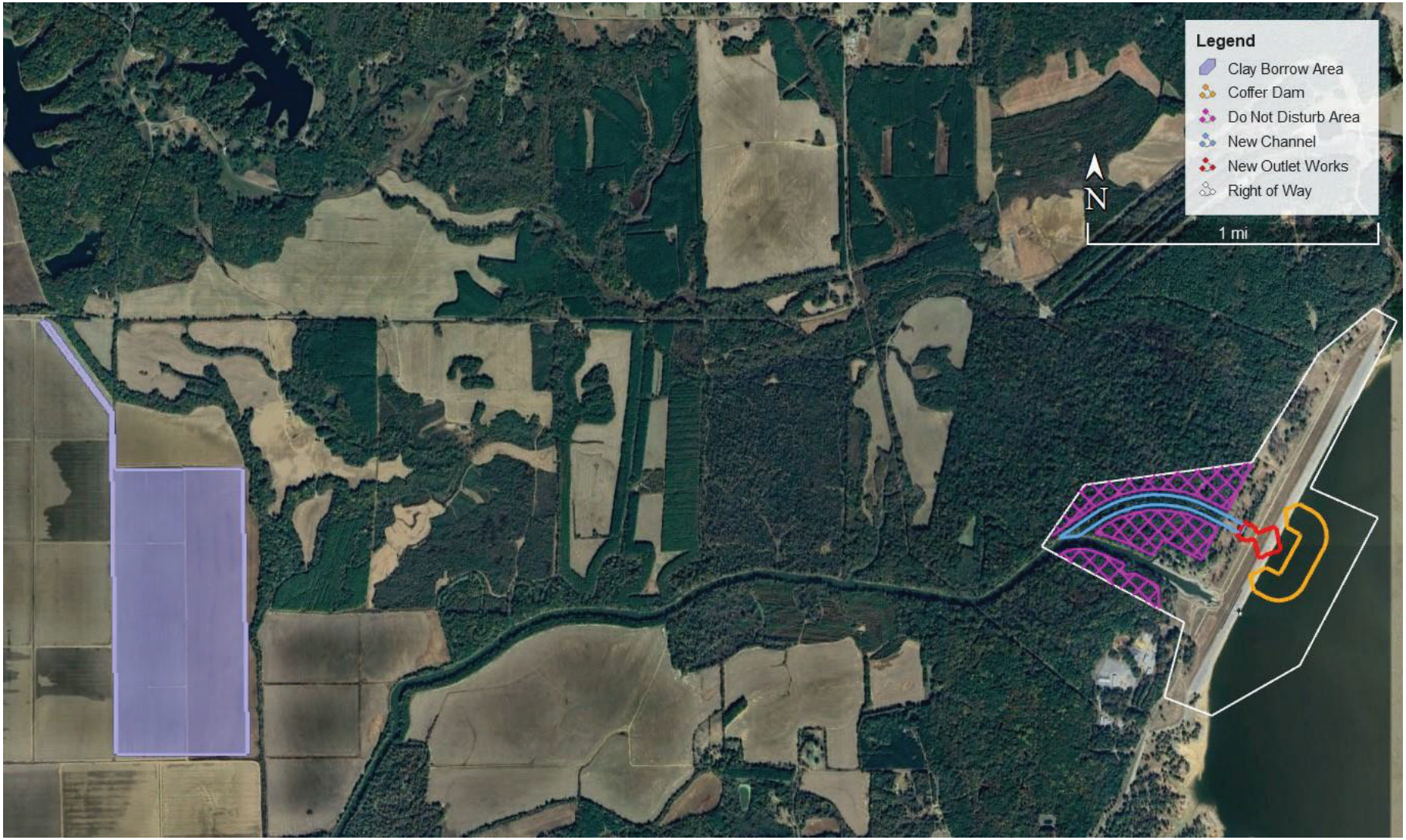

Figure 5: Project site map for Alternative 2 including clay borrow area.

2.2.4 Alternative 6 – Conduit Liner and New Stilling Basin

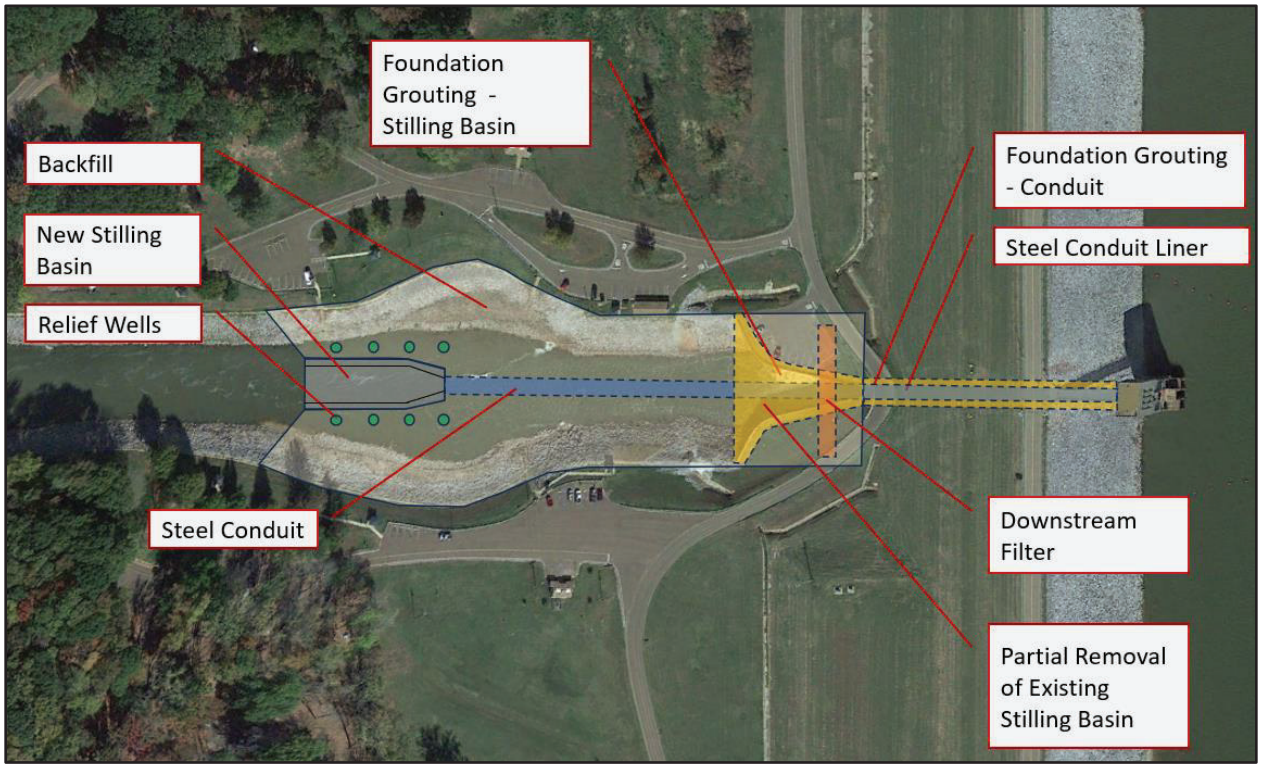

Figure 6: Aerial View of Alternative 6 site plan.

This alternative would include construction of 14.5-foot diameter by 7/8-inch circular steel liner sections, approximately 25-feet in length each, within the conduit (Figure 6). The liner would extend from the upstream transition monolith to the downstream headwall and would include a steel face plate at each end to seal and secure the liner. Each liner section would be anchored to the concrete conduit with fabricated steel saddles. Prior to installing the steel liner, grouting underneath the existing conduit, and stilling basin would be required to fill voids and reduce potential for BEP. Steel liner and annulus grouting would prevent water movement across the existing monolith joints.

A new stilling basin would be constructed approximately 600 feet downstream of the existing basin. One monolith of the existing stilling basin would be removed, and the diaphragm filter would be installed below the existing stilling basin floor drains that extends 60 feet out laterally from the centerline of the stilling basin and is approximately 25-feet thick upstream to downstream. The graded filter would be installed in the area between the existing stilling basin and the new stilling basin. Figure 7 below shows the new plan in relation to the existing structures. To dewater the proposed excavation area for the new outlet works, 101 dewatering wells would be installed.

Water would be diverted around the new stilling basin during construction using a bypass channel. The bypass channel would use vertical side slopes retained by driven sheet piling and would include riprap scour protection along the entire length. The diversion of water around the new construction would also require earthen cofferdams upstream and downstream of the new stilling basin. The cofferdams would require sand and clay borrow material. All required borrow material would be obtained from commercial sources to avoid environmental impacts. Following construction the bypass channel would be deconstructed.

Additionally, eight permanent relief wells would be installed to allow for maintenance dewatering of the structure in the future and control seepage. These eight wells would have a 305 feet lateral drainage system with a 1 percent slope on each side of the outlet works. In addition, a total of six manholes for maintenance and monitoring of the drainage system would be installed. The upstream end of the lateral collector pipe would be at elevation 177.05 feet and the end discharging into the outlet channel would have an elevation of 174 feet.

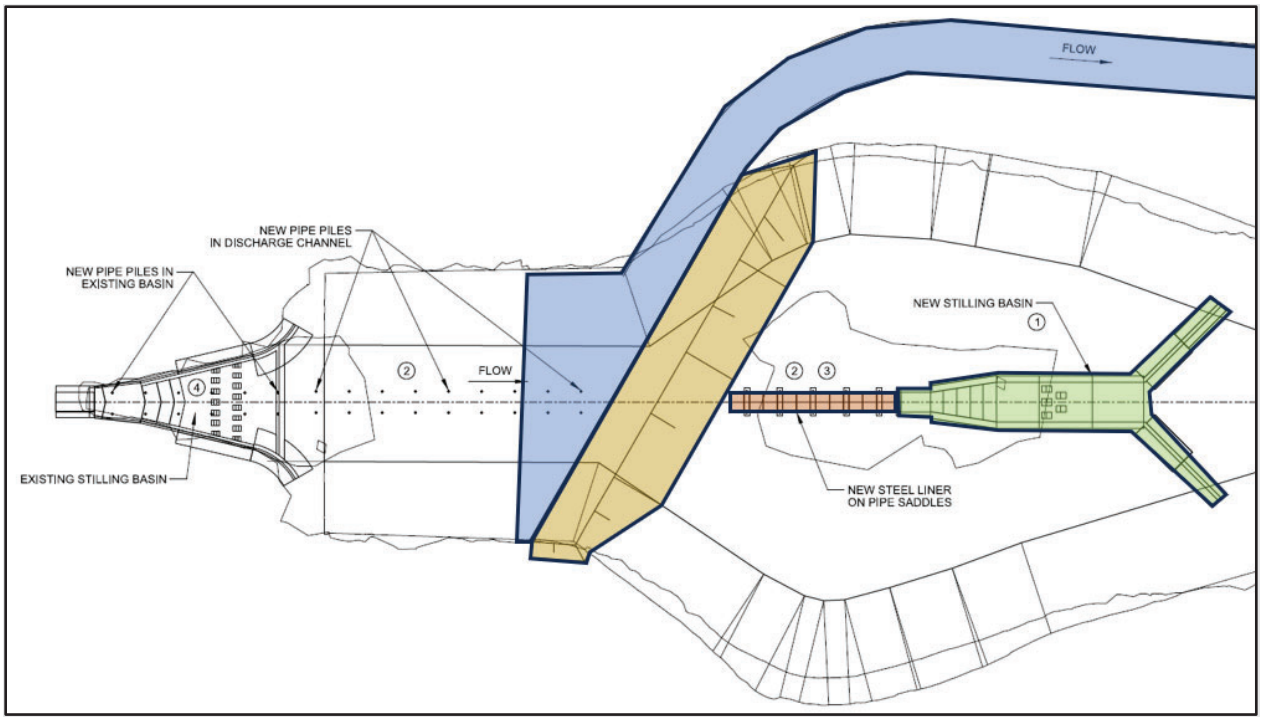

Figure 7: New Stilling Basin Plan showing New Stilling Basin (Green), Bypass Channel (Blue), Upstream Cofferdam (Brown) and New Steel Liner Sections (Red).

The new stilling basin would also consist of reinforced concrete U-shaped monoliths and would include a parabolic drop invert from elevation 175-feet to 160-feet and two rows of baffle blocks to dissipate energy. The structure would consist of five monoliths: the upstream headwall monolith, the parabolic drop invert monolith, and three stilling basin monoliths. The overall length of the basin would be 187-feet, and the channel width would vary from 14.5-feet at the upstream headwall to 30-feet at the downstream end. The walls would have a top elevation of 201-feet, which is equal to the existing stilling basin.

Steel liner sections would carry water from the existing stilling basin to the new stilling basin. These liner sections would consist of steel 14.5-feet outside diameter tubes and extend from the last downstream liner to the new stilling basin. Installation of the steel liner would occur over multiple construction seasons and require temporary bypass pumping to meet minimum flows. Any unexpected inflows could cause delays and further extend the liner installation and overall construction duration by years.

Following construction of the alternative, the existing stilling basin would be decommissioned and capped with 4-feet of concrete from the bottom of the stilling basin floor to seal any flaws. The remainder of the stilling basin would be backfilled with a 3-feet layer of sand above the concrete and native soil to the top of the wingwalls.

The following conservation measures would be implemented to minimize environmental impacts:

- Tree clearing would not occur during bat maternity season which runs from May 15th - July 31st.
- On-bank construction efforts for the current channel would need to be concentrated to mid-September through mid-April to reduce impacts to alligator snapping turtles.
- Vegetation removal would be minimized where possible to avoid impacts to terrestrial and aquatic organisms and native vegetation would be used for reseeding.

Construction of the bypass channel would result in unavoidable adverse impacts to 0.8 acres (1.8 AAHU) of terrestrial forest habitat that would require mitigation (See Section 3.3.2 Terrestrial Resources). Mitigation would require the acquisition and active reforestation of 1.7 acres of occasionally flooded farmland (See Section 4 Mitigation).

2.2.5 Alternative 7- Conduit Liner and Stilling Basin Rehab

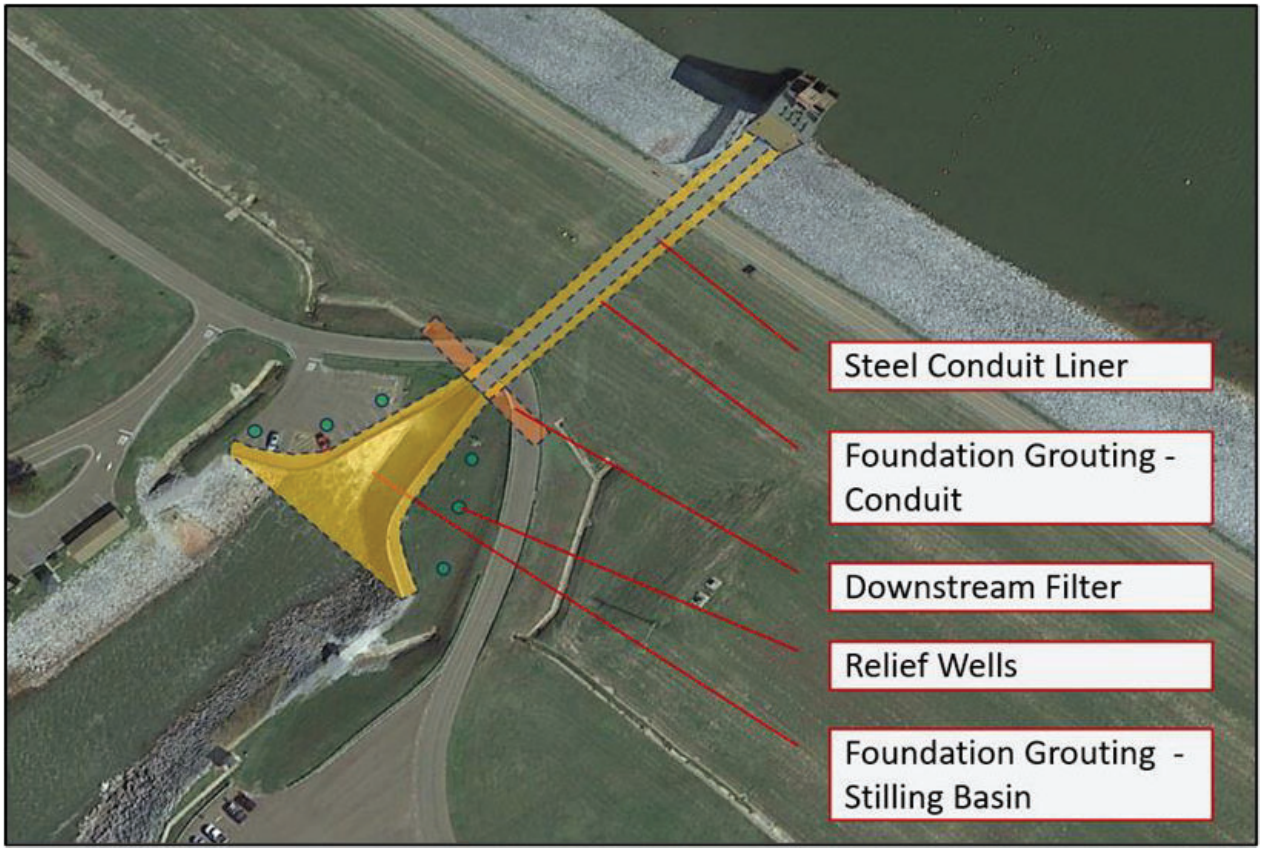

Figure 8: Aerial View of Alternative 7.

This alternative would include construction of a 14.5-foot diameter by 7/8-inch circular steel liner sections, approximately 25-feet in length each, within the conduit (Figure 8). The liner would extend from the upstream transition monolith to the downstream headwall and would include a steel face plate at each end to seal and secure the liner. Each liner section would be anchored to the concrete conduit with fabricated steel saddles. Prior to installing the steel liner, grouting underneath the existing conduit, and stilling basin would be required to fill voids and reduce potential for BEP. Steel liner and annulus grouting would prevent water movement across the existing monolith joints. Temporary bypass pumping at the spillway would be required during construction.

A new graded filter at the downstream end of the conduit would be constructed. This filter would consist of graded gravel and sand and extend a total length of 120 feet, which is 60 feet from each side of the conduit centerline perpendicular to the conduit. The filter would be 25 feet in width and extend approximately 15 feet below the bottom of the existing concrete conduit. A linear sheet pile cofferdam would be constructed to brace the excavation for the filter material. To place fill beneath the existing conduit, the steel liner would be installed through the conduit, the existing concrete conduit would be partially demolished, and the liner supported using crane slings and support beams. Once the steel conduit liner is installed and externally supported, the

concrete monolith would be removed, and excavation beneath could proceed. Bracing the excavation near the conduit would require stability grouting below the existing concrete conduit and use of a trench box beneath the existing conduit.

A system of eight new relief wells, extending to EL.130.5 feet and located adjacent to the existing conduit and stilling basin would be installed. The water exiting the wells would be deposited into a gravity fed lateral pipe exiting into the outlet channel. The lateral pipe would be sloped to drain with filter material surrounding the pipe and would be placed via an excavated trench with a sheet pile cofferdam, like that used in the downstream filter placement.

The following conservation measures would be implemented to minimize environmental impacts:

- Tree clearing would not occur during bat maternity season which runs from May 15th - July 31st.
- On-bank construction efforts for the current channel would need to be concentrated to mid-September through mid-April to reduce impacts to alligator snapping turtles.
- Vegetation removal would be minimized where possible to avoid impacts to terrestrial and aquatic organisms and native vegetation would be used for reseeding.

This alternative would not require mitigation.

2.2.6 Alternative 9- Partial Cutoff Wall, Conduit Liner, and New Stilling Basin

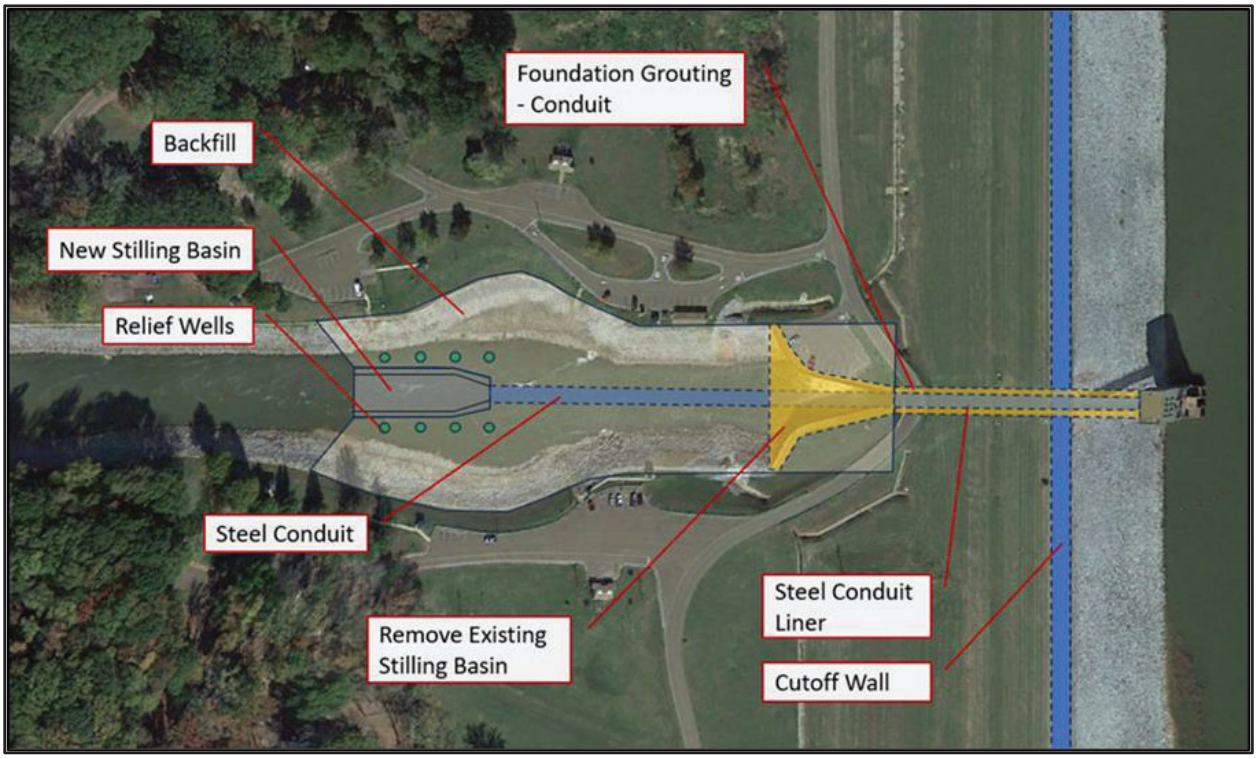

Figure 9: Aerial View of Alternative 9.

This alternative would include construction of a 2,500-foot-long partial seepage cutoff wall into the dam foundation from STA 170+00 to STA 195+00 (Figure 9). The cutoff wall construction must occur before the conduit lining. The partial length cutoff wall would be composed of lean concrete or self-hardening slurry. The wall would be required to have a minimum two-foot continuous width and extend 135 feet into the dam foundation, terminating in foundation tertiary clays. Site restoration would include work platform removal, road reconstruction and paving, and guardrail installation.

Following installation of the partial cutoff wall, a 14.5-foot diameter by 7/8-inch circular steel liner sections, approximately 25 feet in length each, within the conduit would be constructed. The liner would extend from the upstream transition monolith to the downstream headwall and would include a steel face plate at each end to seal and secure the liner. Each liner section would be anchored to the concrete conduit with fabricated steel saddles. Prior to installing the steel liner, grouting underneath the existing conduit and stilling basin would be required to fill voids and reduce potential for BEP.

A new stilling basin would be constructed approximately 600 feet downstream of the existing basin. One monolith of the existing stilling basin would be removed, and the diaphragm filter would be installed below the existing stilling basin floor drains that extends 60 feet out laterally from the centerline of the stilling basin and is approximately 25 feet thick upstream to downstream. The graded filter would be installed in the area between the existing stilling basin and the new stilling basin.

The new stilling basin would also consist of reinforced concrete U-shaped monoliths. The basin would also include a parabolic drop invert from elevation 175 feet to 160 feet and two rows of baffle blocks to dissipate energy. The structure would consist of five monoliths: the upstream headwall monolith, the parabolic drop invert monolith, and three stilling basin monoliths. The overall length of the basin is 187 feet, and the channel width varies from 14.5 feet at the upstream headwall to 30 feet at the downstream end. The walls would have a top elevation of 201 feet, which is equal to the existing stilling basin. Following construction of the new stilling basin, the existing stilling basin would be decommissioned.

Water would be diverted around the new stilling basin during construction using a bypass channel. The bypass channel would use vertical side slopes retained by driven sheet piling and would include riprap scour protection along the entire length. The diversion of water around the new construction would also require earthen cofferdams upstream and downstream of the new stilling basin. The sand and clay materials required for the cofferdams would be obtained from commercial sources to avoid environmental impacts. Upon completion of the new stilling basin, the bypass channel would be deconstructed.

Steel liner sections would carry water from the existing stilling basin to the new stilling basin. These liner sections would consist of steel 14.5 feet outside diameter tubes and extend from the last downstream liner to the new stilling basin.

Additionally, eight permanent relief wells would be installed to allow for maintenance dewatering of the structure in the future. These eight wells would have a 305 feet lateral drainage system with a 1 percent slope on each side of the outlet works. In addition, a total of six manholes for maintenance and monitoring of the drainage system would be installed. The upstream end of the lateral collector pipe would be at elevation 177.05 feet and the end discharging into the outlet channel would have an elevation of 174 feet.

The following conservation measures would be implemented to minimize environmental impacts:

- Tree clearing would not occur during bat maternity season which runs from May 15th - July 31st.
- On-bank construction efforts for the current channel would need to be concentrated to mid-September through mid-April to reduce impacts to alligator snapping turtles.
- Vegetation removal would be minimized where possible to avoid impacts to terrestrial and aquatic organisms and native vegetation would be used for reseeding.

Construction of the bypass channel would result in unavoidable adverse impacts to 0.8 acres (1.8 AAHU) of terrestrial forest habitat that would require mitigation (See Section 3.3.2 Terrestrial Resources). Mitigation would require the acquisition and active reforestation of 1.7 acres of occasionally flooded farmland (See Section 4 Mitigation).

2.2.7 Least Environmentally Damaging Practicable Alternative

Amongst the action alternatives considered, Alternatives 6, 7, and 9 have fewer environmental impacts than Alternative 2; however, Alternatives 6, 7, and 9 are incapable of being done after taking into consideration the associated costs, existing technologies, and logistics in light of the overall project purpose. Therefore, Alternative 2 was selected as the Proposed Action Alternative (PAA). Additionally, when considering mitigation to compensate for unavoidable project impacts, Alternative 2 would only have temporary, minor impacts to environmental resources and is therefore also the Least Environmentally Damaging Practicable Alternative (LEDPA).

3 AFFECTED ENVIRONMENT AND ENVIRONMENTAL IMPACTS

This section describes the relevant existing biological, physical, economic, and social conditions in the proposed project areas, which are referred to under the NEPA process as the Affected Environment.

In evaluating the significance of a project's effects, NEPA requires a consideration of both context and intensity. Context means that the significance must be analyzed in several contexts, such as the human environment, affected region, affected interests, and the local setting. The intensity of a potential impact relates to the impact's severity and includes consideration of beneficial and adverse effects, the level of controversy associated with a project's impacts on human health, whether the action establishes a precedent for future actions with significant effects, the level of uncertainty about project impacts, and whether the action threatens to violate federal, state, or local laws established for the protection of the human and natural environment.

USACE uses quantitative and qualitative analyses, as appropriate, to determine the level of a potential impact caused by the proposed alternatives. Based on the results of the analyses, this EA identifies whether a particular potential impact would have a significant effect on a resource and whether or not the impact would be adverse or beneficial. The CEQ regulations also require that a proposed action's cumulative impact be addressed as part of a NEPA document. Cumulative impacts are discussed in Section 3.5 below.

Qualitative definitions/descriptions of impacts as used in this section of the report include:

- Intensity
  - Negligible - No noticeable effects to the resource in the project area.
  - Minor: A measurable effect on a resource. A slight impact that may not be readily obvious and is within accepted levels for permitting, continued resource sustainability, or human use.
  - Significant- A measurable and adverse effect to a resource. A major impact that is readily obvious and is not within accepted levels for permitting, continued resource sustainability, or human use. Impacts likely result in the need for mitigation.
- Duration
  - Short Term - Temporary effects caused by the construction and/or implementation of a selected alternative.
  - Long Term - Lasting effects caused by an alternative after the action has been completed and/or after the action is in full and complete operation.

3.1 Relevant Ecological Resources

The resources described in this section are those recognized as significant by laws, executive orders, regulations, and other standards of national, state, or regional agencies and organizations; technical or scientific agencies, groups, or individuals; and the general public.

Based on input from scoping and the ecological features present in the proposed project area, this EA addresses the following resources:

- Geology, Topography, and Soils
- Air Quality
- Water Quality
- Wetlands
- Noise
- Hazardous, Toxic, and Radioactive Waste
- Aquatic Resources and Fisheries
- Terrestrial Resources and Wildlife
- Threatened, Endangered, and Protected Species
- Cultural resources
- Aesthetics and Recreation
- Traffic

3.1.1 Resources Not Evaluated in Detail

This EA considered relevant environmental resources that would potentially be impacted by the proposed alternatives and eliminated resources from further evaluation that were either not in the area of potential effect or would not be impacted by any of the alternatives. These resources include:

- Wild and Scenic Rivers (No designated wild and scenic rivers in or near the study area)
- Coastal Zones (No coastal areas in the project area)
- Prime and Unique Farmland

3.1.2 Environmental Setting and Consequences

The sections below discuss the existing conditions by resource category and any potential environmental impacts associated with the No Action Alternative (NAA) and those associated with implementation of Alternative 2- Proposed Action Alternative (PAA), Alternative 6, Alternative 7, and Alternative 9.

3.2 PHYSICAL RESOURCES

3.2.1 Geology, Topography, and Soils

The geology of the study area is heavily influenced by the Lower Mississippi River. Relief, like that in other parts of the Lower Mississippi River flood plain, ranges from level to sloping, with a large part being level or nearly level. Soils in the project area are mostly comprised of made land soils that were placed when the levee and dam were constructed. These soils are poorly drained, have very low permeability, and slopes of 0-8 percent. Part of the project area also contains Memphis silt loams that are highly eroded, well drained with high permeability, and have 17 to 40 percent slopes.

Future Conditions with No Action

Under the No Action Alternative, IRRMs would be performed on the Arkabutla Dam structures. The geological formations beneath DeSoto County would not be altered from their present state due to the No Action Alternative. Soil types and soil composition at Arkabutla Lake would not be altered. The overall topography of the area is unlikely to change from existing slope/relief of the land. Topography, geology, and soils would not be affected by the No Action Alternative.

Future Conditions with Alternative 2- PAA

Under the PAA impacts to the local topography of the project area would be minor and short term. Topography may change in the area of the proposed clay borrow pits as material is removed for construction of the new outlet works, cofferdam, and backfilling the channel. However, this would not affect the topography in the surrounding area. The underlying geology of DeSoto County would not be altered from existing conditions. Material for the cofferdam would be returned to the borrow area after construction is complete.

Soil composition may change minorly as a result of material placed for the new outlet works. However, since the clay material would come from a nearby source, it is anticipated to be similar to soils in the project area. Sand for the cofferdam would need to be acquired from a commercial source. Backfilling of the channel would likely be completed with local material. Local soil compaction could result from the use of vehicles and equipment during installation. Existing access would be used when available to avoid unnecessary soil disturbance.

Geology would not be affected by the PAA. Impacts to topography would be minor and short term due to removal of material from clay borrow pits. Impacts to soils would be negligible.

Future Conditions with Alternatives 6 and 9

Under Alternative 6 and 9, impacts to the local topography would be negligible. The underlying geology of DeSoto County would not be altered from the existing conditions.

Soil composition is unlikely to change from the proposed actions since most of the work occurs within the existing dam and any clay and sand brought in from commercial sources would likely have similar compositions to the local soils. Local soil compaction could result from the use of vehicles and equipment during installation. Existing access would be used when available to avoid unnecessary soil disturbance.

Geology and topography would not be affected by Alternatives 6 and 9. Impacts to soils would be negligible.

Future Conditions with Alternative 7

Under Alternative 7, impacts to the local topography of the project area would be negligible. Since the cofferdam would be built using sheet piles, no borrow material would be required. The underlying geology of DeSoto County would not be altered from existing conditions.

Soil composition is unlikely to change from the proposed actions since most of the work occurs within the existing dam and any soil used would come from nearby commercial sources. Local soil compaction could result from the use of vehicles and equipment during installation. Existing access would be used when available to avoid unnecessary soil disturbance.

Geology would not be affected by Alternative 7. Impacts to topography and soils would be negligible.

3.2.2 Water Quality

The Clean Water Act (CWA) is a piece of environmental legislation in the United States, enacted in 1972 to address the widespread degradation of the nation's water bodies. Its primary aim is to restore and maintain the integrity of the nation's waters by regulating pollutant discharges, setting water quality standards, and ensuring the protection of aquatic ecosystems. The CWA empowers the Environmental Protection Agency (EPA) and state agencies to enforce stringent controls over industrial, municipal, and agricultural waste, thereby safeguarding public health and preserving natural habitats.

Water Quality Standards (WQS) are the foundation of the CWA and water pollution control programs are designed to protect the beneficial uses of the water resources. Each state has the responsibility to set water quality standards that protect these beneficial uses, also called "designated uses." The Mississippi Department of Environmental Quality (MDEQ) is responsible for setting water quality standards to protect designated uses and for issuing state environmental permits. Mississippi waters are designated for a variety of uses including recreation, public water supply, ephemeral water bodies, fish and wildlife area, and shellfish harvesting. Arkabutla Lake is designated for recreational use.

Section 303(d) of the CWA requires states to identify water bodies that are considered impaired due to not meeting one or more applicable water quality standards. According to the EPA's Waterway website Arkabutla Lake, its watershed, and the Coldwater River are not listed as impaired (Figure 10) and meet all water quality standards. On the watershed health scale, where 0 is unhealthy and 1 is healthy, Arkabutla Dam's watershed has a score of 0.71.

However, three creeks that connect to Arkabutla Lake are considered impaired due to degraded aquatic life caused by low dissolved oxygen and high phosphorus, nitrogen, ammonia, and sediment levels (Table 3). The are no scenic and wild rivers within the project area.

Table 3: Impaired Bodies of Water Near Arkabutla Lake.

Water Body	Status	Reason for Impairment
Arkabutla Lake	Not Impaired	NA
Hurricane Creek	Impaired	High Ammonia, Low Oxygen
Mussacunna Creek	Impaired	High Nitrogen/Phosphorus Sedimentation Low Oxygen
Cane Creek	Impaired	High Nitrogen/Phosphorus Sedimentation Low Oxygen

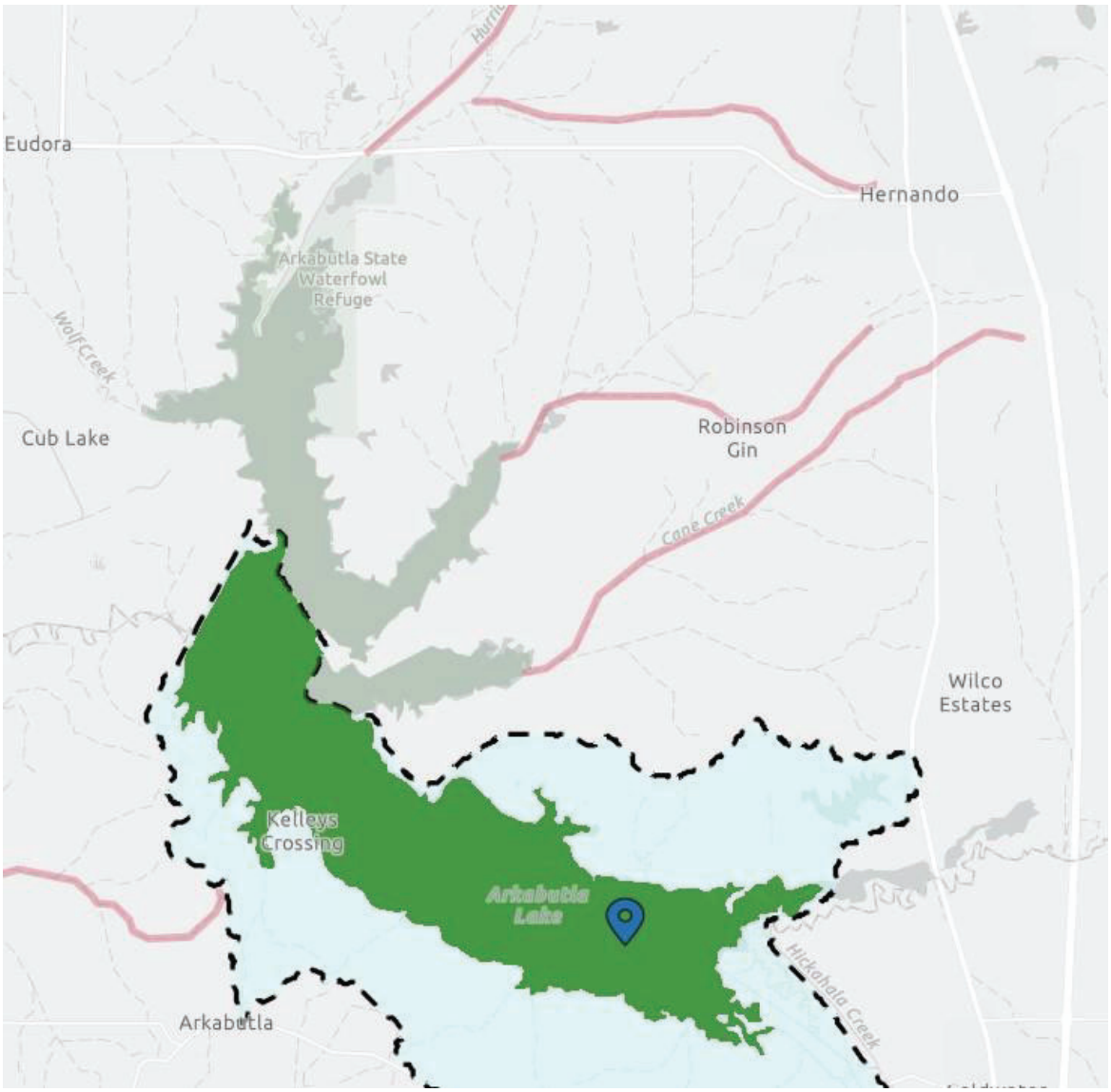

Figure 10: Impaired bodies of water in the project area DeSoto County, MS.

Future Conditions with No Action

The No Action Alternative would not have direct impacts on water quality at Arkabutla Lake and the Coldwater River in the short-term since the existing conditions would be maintained. However, the risk of a breach would remain and is expected to slightly increase over time due to continued degradation of the outlet works conduit and stilling basin. If the dam were to breach, the flooding would result in a large reduction in lake pool level and area that would significantly adversely impact Arkabutla Lake's water quality. The shallow lake pool would likely experience increased temperatures and reduced dissolved oxygen that could impair aquatic life. These impacts would be expected to continue until the dam could be repaired and the water level returned to normal.

Future Conditions with Alternative 2- PAA

The PAA would have minor temporary impacts on water quality in the project area. Turbidity and suspended solids would be increased as a result of runoff from cleared areas around the current and new channel, the construction of the cofferdam, and backfilling the current channel. The impacts to water quality are expected to be minor and temporary since the cofferdam material would be removed from the lake and sediment would settle after construction is completed, returning turbidity to normal levels. Similarly, turbidity levels downstream of the dam would likely minorly increase during the backfilling of the channel but would not increase enough to impair the downstream habitat or flow.

All proposed actions would occur within non-impaired watersheds and the nearby impaired creeks would not be affected by the proposed actions.

Since more than an acre of land would be disturbed, a National Pollutant Discharge Elimination System (NPDES) permit and erosion and sedimentation control plan would be required before construction begins to help avoid and reduce construction impacts.

Future Conditions with Alternative 6 and 9

The proposed project actions would have minor temporary impacts on water quality in the project area. Construction of the cofferdams around the new stilling basin would likely minorly increase turbidity and suspended solids downstream of the new stilling basin. However, after construction is complete and the cofferdams have been removed from around the new stilling basin, the aquatic environment and turbidity levels are expected to return to normal preconstruction levels. Because of this the impacts to water quality are anticipated to be minor and temporary.

All proposed actions would occur within non-impaired watersheds and the nearby impaired creeks would not be affected by the proposed actions.

Since more than an acre of land would be disturbed, a National Pollutant Discharge Elimination System (NPDES) permit and erosion and sedimentation control plan would be required before construction begins to help avoid and reduce construction impacts.

Future Conditions with Alternative 7

The proposed project actions would have minor temporary impacts on water quality in the project area. Turbidity and suspended solids would be likely increased around the spillway and downstream during bypass pumping. Once construction and bypass pumping are complete turbidity levels and water quality are expected to return to normal.

All proposed actions would occur within non-impaired watersheds and the nearby impaired creeks would not be affected by the proposed actions.

Since more than an acre of land would be disturbed, a National Pollutant Discharge Elimination System (NPDES) permit and erosion and sedimentation control plan would be required before construction begins to help avoid and reduce construction impacts.

3.2.2.1 401 Water Quality Certification

Section 401 of the CWA requires projects that result in a discharge of fill material into waters of the United States to obtain a water quality certification (WQC) or waiver from a certifying authority. The Mississippi Department of Environmental Quality serves as the certifying authority for activities within the boundaries of the state of Mississippi. A water quality certification is used to determine whether an activity, as described in the federal license or permit, will comply with applicable provisions of Sections 301, 302, 303, 306, and 307 of the CWA.

All the proposed alternatives would require a WQC. For Alternative 2, a more refined design of the new outlet channel including additional hydrologic modeling is required to collect the necessary data needed to complete the WQC process. The design refinement and modeling are scheduled to be completed during the Preconstruction, Engineering, and Design (PED) phase, which begins after the completion of the Feasibility phase. MDEQ has agreed to work in conjunction with USACE to complete the WQC process during the PED phase (Attachment 3). During PED, MDEQ will be provided with the necessary information listed in Attachment 3 to complete the WQC process. USACE will ensure the WQC is issued prior to the initiation of construction.

In addition, a 404(b)(1) evaluation was performed to evaluate the impacts of placing fill material into the lake and outlet channel (Attachment 4). For more information regarding the status of the water quality certification issuance, please contact the MVK RPEDS department.

3.2.3 Air Quality

The Clean Air Act of 1963 requires EPA to designate National Ambient Air Quality Standards (NAAQS). The EPA has identified standards for six criteria pollutants: ozone, particulate matter (PM10 = less than 10 microns; and PM2.5 = less than 2.5 microns in diameter), sulfur dioxide, lead, carbon monoxide, and nitrogen dioxide. The air quality of the proposed project location is considered “good”. Currently, DeSoto County, MS is in attainment, meets all air quality standards, and has a current air quality index value of 40.

Future Conditions with No Action

Under the NAA, air quality at the project location would remain similar to existing conditions. No additional air quality impacts are anticipated, and sources of impairment would remain unchanged.

Future Conditions with Alternatives 2, 6, 7 and 9

Air quality would be minorly and temporarily impacted during construction due to dust-related sources and the use of internal combustion engines and heavy machinery that produce greenhouse gas emissions. Effects to air quality from construction would be localized, minor, and short term, limited to the hours and site of construction. These impacts would not be expected to violate any state or federal standards or cause the region to be classified as being in nonattainment. Furthermore, the environmental conditions of the region favor rapid dispersal of the pollutants and thus would not allow concentrations to accumulate.

3.2.3.1 Greenhouse Gasses

The CEQ introduced interim guidance on Greenhouse Gas (GHG) and how agencies are able to compute GHG emissions for their projects. USACE, in coordination with USACEHQ, developed a methodology to analyze the components for GHG and incorporate them within National Environmental Policy Act (NEPA) documents. The components that are analyzed within GHG are Carbon dioxide (CO2), Methane (CH4), and Nitrous Oxide (N20). Primary sources of CO2 can be natural sources like decomposition of organic material and anthropogenic sources like burning of fossil fuel (Carbon Dioxide 101, 2023). For CH4, emissions can come from a variety anthropogenic process including flora and fauna sources (Crutzen etc all, 1986). For N20, majority of the point source revolves around agricultural processes: fertilization (Nitrous Oxide Emissions, 2023).

Within this evaluation, two alternatives have been considered for GHG emission: No Action and Alternative 2- PAA. The total GHG emissions for the lifetime of the project have been calculated using the type, quantity, horsepower, total hours, and associated emission factors of the equipment used for construction.

Future Conditions with No Action

There would be direct emissions from the No Action Alternative. Under this alternative no action would be taken to repair the dam and the lake would be raised back to normal pool levels. Greenhouse gas emissions were calculated based on a dam breach at high pool. Emissions produced from dam repairs, repairs to structures due to flooding, flood emergency response, and commuting for locals until homes are repaired were considered.

Total GHG Emissions for No Action Alternative (Pounds)				
Emissions	**CO_2**	**CH_4**	**N_2O**	**CO_{2eq}**
Total (Pounds)	89,830,476	3,691	735	90,141,684

Future Conditions with Alternative 2- PAA

There would be direct emissions from construction activities for Alternative 2. All the different components of constructing a new outlet works and channel in a new location were considered for this analysis including the clearing of wetlands and the use on construction equipment and on-road vehicles.

Total GHG Emissions from Alternative 2 (Pounds)				
Emissions	**CO_2**	**CH_4**	**N_2O**	**CO_{2eq}**
Total (Pounds)	75,088,193	-76,581	476	73,315,618

Comparison of Alternatives:

The total greenhouse gas emissions of the two alternatives within this analysis were compared in the below tables.

Total GHG Emissions by Project Alternative (Pounds)				
	CO_2	**CH_4**	**N_2O**	**CO_2e**
No-Action Alternative	89,830,476	3,691	735	90,141,684
Alternative 2	75,088,193	-76,581	476	73,315,618
Net Emissions with Project	**-14,742,283**	**-80,272**	**-259**	**-16,826,066**

3.2.4 Noise

Inadequately controlled noise presents a risk for adverse impact to humans and animals. Sound is measured in decibels (dB). A whisper is about 30 dB, normal conversation is about 60 dB, and a motorcycle engine running is about 95 dB. Noise levels above 70 dB over a prolonged period may start to damage human hearing. Noise levels above 120 dB can cause immediate harm to human ears. The U.S. Environmental Protection Agency (EPA) and the World Health Organization (WHO) recommend maintaining environmental noises below 70 dBA over 24-hours (75 dBA over 8-hours) to prevent noise-induced hearing loss.

Noise levels at the Arkabutla Lake are characteristic of rural, domestic, and recreational areas. Human made and nature sounds such as bird calls comprise a large part of the regular ambient soundscape around Arkabutla Lake and the clay borrow pit. Boating, recreation activities, and vehicle traffic across the dam generate higher than ambient noise levels compared to the surrounding rural farming areas. Additionally, vegetation management activities may occasionally also contribute to higher-than-normal noise levels.

Future Conditions with No Action

Under the No Action Alternative, noise levels would remain similar to existing conditions. No additional noise producing activities are anticipated, and typical sources of noise would remain unchanged.

Future Conditions with Alternatives 2, 6, 7, and 9

Under all alternatives minor short-term increases in noise levels would occur due to the use of construction equipment and increased traffic in the area. Noise impacts would be limited to the hours and local vicinity of the construction and would return to normal levels after construction is complete.

3.3 BIOLOGICAL RESOURCES

3.3.1 Aquatic Resources and Fisheries

3.3.1.1 Description of Watershed

The Yazoo is the largest river basin in Mississippi, with over 13,000 square miles draining all or parts of 30 counties. It makes up 30 percent of the state and is home to one-fifth of the population of Mississippi. Winding through this basin are about 25,000 miles of streams and rivers. The project is located in the Bluff Hills area. This is the hilly upland area of Yazoo River basin where the streams originate among oak and hickory forests, and where pastures dominate the rural landscape.

3.3.1.2 Aquatic Resources

Aquatic resources within the vicinity of the project area consist of the Arkabutla Lake and the current Coldwater River channel that is within the project area. The pool at Arkabutla Lake follows a Guide Curve each year, where the summer pool is held at 220 ft from 15 May through 31 August, and the winter pool is held at 210 ft (same as the conservation pool) from 01 December through 01 May (Figure 11). Transitional stages occur between these periods. Arkabutla Lake and the current channel support diverse forms of phytoplankton, zooplankton, aquatic insects, crustaceans, amphibians, reptiles, fish, and mollusks.

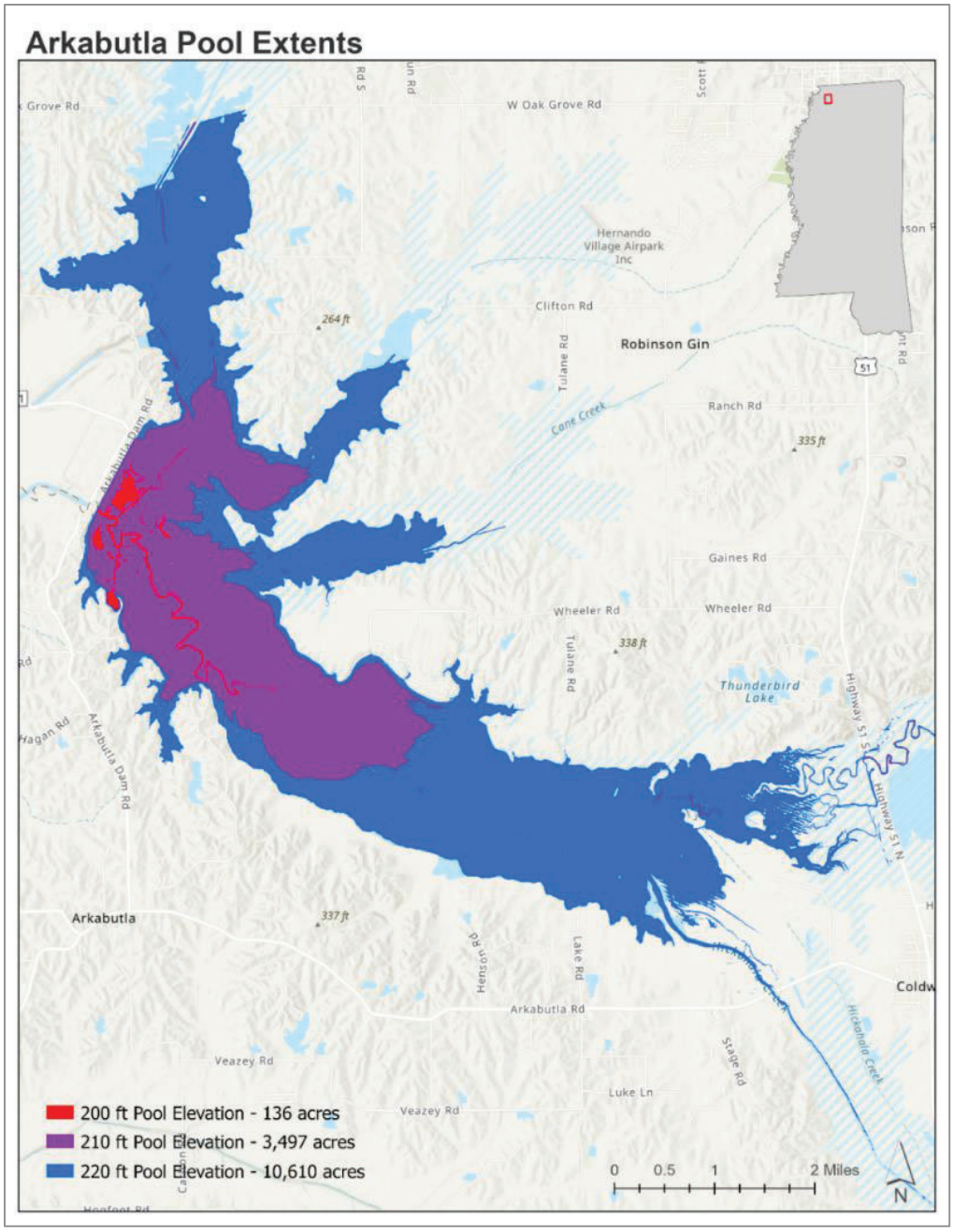

Figure 11: Arkabutla Pool Levels and Associated Acreages of Aquatic Habitat, Desoto County, MS.

3.3.1.3 Fisheries

Arkabutla Lake and the Coldwater River are home to a diverse array of fish species native to Mississippi waters, including Largemouth Bass (*Micropterus nigricans*), Smallmouth Bass (*Micropterus dolomieu*), Spotted Bass (*Micropterus punctulatus*), Bluegill (*Lepomis macrochirus*), Green sunfish (*Lepomis cyanellus*), Alligator Gar (*Atractosteus spatula*), Bream spp., Catfish spp., and Crappie spp. The main lake body, lake channels, and seasonal flooding of wooded areas provides spawning and feeding habitats for a many of these fish and other aquatic species.

In addition to fish, a variety of aquatic and semi-aquatic reptile and amphibian species are expected to inhabit the areas in and around the lake, river, and wetlands. Many species of aquatic turtles, watersnakes, salamanders, and frogs use these areas for shelter, feeding, and reproduction. Turtle species that are may be present in the project area include the Alligator Snapping Turtle (*Macrochelys temminckii*), Common Snapping Turtle (*Chelydra serpentina*), River Cooter (*Pseudemys concinna*), Southern Painted Turtle (*Chrysemys picta dorsalis*), Red-eared Slider (*Trachemys scripta*), and Spiny Softshell Turtle *(Apalone spinifera)*. Semi-aquatic snake wildlife such as species of garter snake, ribbon snake, watersnake, and pit viper are also likely present, utilizing the lake and its associated wetlands for reproduction and foraging. These aquatic habitats are also used by the American Toad (*Anaxyrus americanus*), Spring Peeper (*Pseudacris crucifer*), Green Frog (*Lithobates clamitans*), Bullfrog (*Lithobates catesbeianus*), and Mississippi Slimy Salamander (*Plethodon mississippi*).

Future Conditions with No Action

The No Action Alternative would not have direct impacts on aquatic resources or fisheries around Arkabutla Lake and the Coldwater River during the short-term since the currently existing conditions would be maintained. However, the risk of a breach occurring would remain and is expected to slightly increase over time due to continued degradation of the outlet works conduit and stilling basin. If the dam were to breach, the flooding would result in a large reduction in lake pool area that would significantly adversely impact fish and the aquatic environment around the lake (Figure 11). With a severely reduced pool area, there would be much less habitat for fish and other aquatic species to utilize. This would lead to increased levels of mortality and high levels of stress as competition for habitat and food increases. In addition, if the water drains from the lake too quickly high aquatic species mortality would be expected. With a shallower lake pool, the aquatic habitat is also expected to increase in temperature and decrease in dissolved oxygen. With a continuing risk of breaching, there is potential for significant impacts to aquatic organisms and their habitat under the No Action Alternative. These impacts would be expected to continue until the dam could be repaired and the water level returned to normal.

Future Conditions with Alternative 2- PAA

The proposed actions would have temporary minor impacts on the aquatic habitat and fisheries. Construction of the new outlet works and new channel would involve building a cofferdam within the lake and altering the aquatic environment temporarily. Due to noise generated by construction and the novelty of the cofferdam being placed in the water, fish and other mobile aquatic species are likely to avoid the area during the proposed actions but are expected to return to normal utilization of the area and to colonize the newly constructed channel shortly after the project is completed. Since the cofferdam would be removed after the new outlet works is completed, only temporary minor impacts to the aquatic habitat would occur.

There would be minor adverse long-term aquatic habitat impacts to the portion of the existing channel that would be backfilled after construction of the new channel is complete. Backfilling the current channel would impact approximately 2,415 linear feet of aquatic habitat. This impact is considered long-term since backfilling the channel would permanently prevent aquatic species from accessing this portion of the river. However, with the completion of the new channel, fish passage from Arkabutla Lake to the Coldwater River would be unchanged, and beneficially, the new channel would create approximately 3,414 linear feet of new aquatic habitat, an increase of 1,002 linear feet compared to the current channel. Aquatic species are expected to colonize and utilize the newly created habitat in the new channel similarly to the habitat in the current channel. There may be minor fish and invertebrate mortality as the channel is backfilled, but most mobile aquatic species are expected to leave the area during construction. Mortality of individuals in the backfilled channel would have negligible impacts on overall species population sizes in the project area. Since the overall habitat use would be unchanged and habitat availability would increase after construction is complete, overall impacts to aquatic resources and fisheries are considered temporary and minor.

Future Conditions with Alternatives 6 and 9

Alternatives 6 and 9 would have temporary minor impacts on the aquatic habitat and fisheries immediately downstream of the current outlet works. Construction of the new stilling basin would involve building cofferdams and a bypass channel in the area of the current stilling basin. This diversion of water would maintain flow to downstream aquatic environments during construction. Due to the change in environment and noise generated by construction, fish and other mobile aquatic species are expected to avoid the area during the project. However, these species are expected to return to normal utilization of the area shortly after the project is completed and the cofferdams are removed. Immobile species and invertebrates in the current stilling basin may experience increased mortality when the current stilling basin is capped and filled after construction of the new stilling basin is complete. These impacts would be considered minor since the mortality rates of the immobile species and invertebrates within the current stilling basin would not be high enough to impact the stability of local populations.

Future Conditions with Alternative 7

Alternative 7 would have temporary minor impacts on the aquatic habitat and fisheries in the project area. Part of construction requires blocking the conduit with a steel sheet cofferdam, preventing the flow of water. Bypass pumping from the lake across the spillway would be required to maintain water flows downstream of the dam. The bypass pumping would necessitate multiple barges pumping water 24 hours a day until construction is complete. Flows would need to be maintained to at least 1,000 cfs. Noise and movement generated by the barges would minorly impact mobile aquatic species in the lake. Species are likely to avoid the area near the spillway while, barges are first present. However, species are expected to return to the area around the spillway as they adapt to the novelty of the barges being present and when the b sheet pile is removed after construction is complete.

3.3.2 Terrestrial Resources and Wildlife

3.3.2.1 Terrestrial Resources

Much of the terrestrial habitat in the surrounding area is forested, but other areas consist of a low elevation occasionally flooded herbaceous/shrub zone, developed recreational areas, and farmland. The forest habitat near the project area consists of oaks, cottonwood, sycamores, elms, maples, and ashes including water oak (*Quercus nigra*), cedar elm (*Ulmus crassifolia*), sweetgum (*Liquidambar styraciflua*), American hophornbeam (*Ostrya virginica*), red maple (*Acer rubrum*), American elm (*Ulmus americana*), green ash (*Fraxinus pennsylvanica*), Japanese stiltgrass (*Microstegium vimineum*), Pennsylvania smartweed (*Polygonum pensylvanicum*), and zarzaparilla (*Smilax bona-nox*).

Wildlife in vicinity of the proposed actions includes those typical for the southern United States and the usual compliment of wildlife species pursued by the public such as white-tailed deer (*Odocoileus virginianus*), squirrels (*Sciuridae spp.*), rabbits (Sylvilagus spp.), as well as other terrestrial mammals such as raccoons (*Procyon lotor*). Various species of birds including the Northern Bobwhite, Great Blue Heron, and Red-eyed Vireo may also occur in the project area. Multiple species of reptiles and amphibians including the American Box Turtle (*Terrapene carolina*), Ring-necked snake (*Diadophis punctatus*), Hognose Snake (*Heterodon platirhinos*), Timber Rattlesnake (*Crotalus horridus*), and those listed in Fisheries (Section 3.3.1.3) can be found within the forested areas and utilizing the edges of the lake and river and for foraging, reproduction, and shelter.

The Habitat Evaluation Procedures (HEP), USFWS (1980), was used to evaluate potential impacts of project alternatives on terrestrial wildlife habitat. The HEP is an accounting system for quantifying and displaying availability index (Habitat Suitability Index (HSI)) models that quantitatively describe the habitat requirements of a species or group of species. HSI models use measurements of appropriate variables to rate the habitat on a scale of zero (unsuitable) to 1.0 (optimal). Habitat units (HU) are the basic unit of HEP to measure project effects on wildlife and are calculated by multiplying the evaluation species' HSI and the acreage of available habitat at a given target year. Changes in habitat quality (HSI) and quantity (i.e., acreages) are predicted for selected target years over the project's period of analysis for future without-project and future with-project conditions. Values are then annualized over the period of analysis for the project providing average annual habitat units (AAHUs). The following 5 HSI models were utilized to determine wildlife habitat impacts:

- Barred Owl (Allen 1987)
- Gray Squirrel (Allen 1982)
- Carolina Chickadee (Schroeder 1983a modified per USFWS Memo dated Oct 29, 1989)
- Pileated Woodpecker (Schroeder 1983b)
- Wood Duck (Sousa and Farmer 1983c)

Due to the increased risk of breach at Arkabutla Dam, the need to complete repairs in a timely manner, and the seasonality requirements of HEP and Hydrogeomorphic (HGM) analyses, proxy HSI and FCI values from a recent Mississippi Rivers and Levee Project Supplemental Environmental Impact Statement II (MRL SEIS II) were utilized in the impact analysis. The proxy site selected was chosen based on similarity of dominant vegetation and a consistent forest type with the area impacted by the proposed project actions. Based on available data and similar project analysis conducted in the region, it is a reasonable assumption that the habitat variables used in the impact analysis are within acceptable range/degree of certainty for planning purpose application and decision making. To verify that these assumptions are accurate, site specific HIS values would be collected during the PED stage and, if necessary, impacts and mitigation amounts would be updated accordingly.

Future Conditions with No Action

The No Action Alternative would not have direct impacts on wildlife and terrestrial habitats around Arkabutla Lake and the Coldwater River during the short-term since the currently existing conditions would be maintained. However, the risk of a breach occurring would remain and is expected to slightly increase over time due to continued degradation of the outlet works conduit and stilling basin. If the dam were to breach, the flooding would significantly adversely impact wildlife and terrestrial resources around the lake (Figure 11). Many terrestrial habitats downstream of the dam would be flooded and possibly destroyed and wildlife in the flood area that cannot quickly escape would experience high mortality rates. In addition, due to the reduced pool size, wetlands around the lake would be inundated with water less often or not at all and wildlife would have to likely travel further and across exposed lakebed areas to access water. These impacts would be significant and temporary if the impacted areas are left to regrow after the damage.

Future Conditions with Alternative 2- PAA

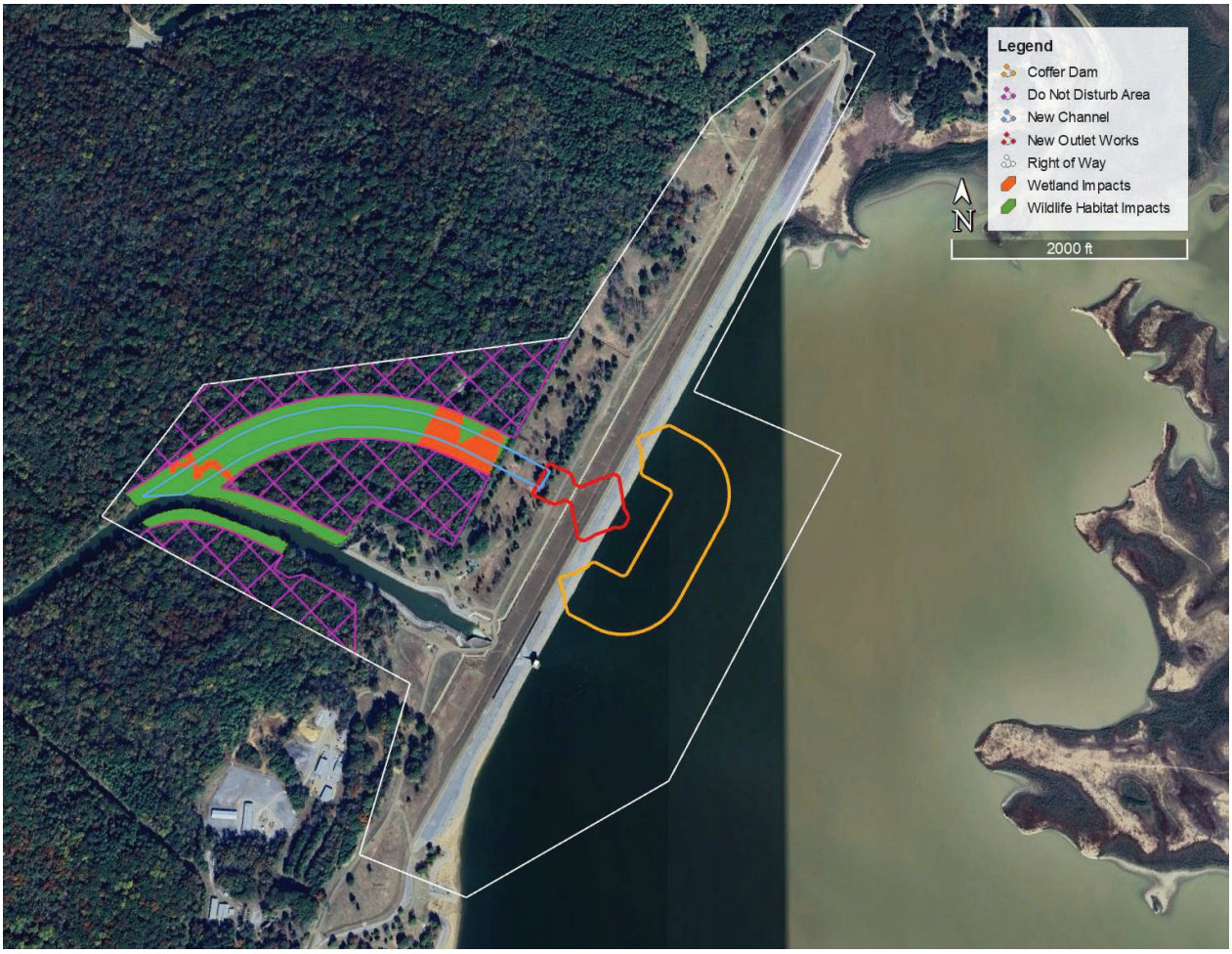

Figure 12: Alternative 2 Terrestrial Impacts Arkabutla Dam, DeSoto County, MS.

The proposed actions would have significant long-term adverse impacts on approximately 31.0 acres (70.4 AAHU) of terrestrial wildlife habitat and 5.2 acres (5.1 FCU) of wetlands (Table 4). Most of the impacts would occur where the new channel would be constructed and along the current channel during backfilling (Figure 12). These impacts would be caused by clearing and grubbing these areas for construction and access. To reduce impacts to terrestrial resources Do Not Disturb (DND) areas were added to the surrounding forest and wetlands. To further reduce impacts, two proposed sand borrow areas that would have involved clearing over 200 acres of forest were removed from the site plan. Commercial sand would be used as an alternative source.

Beneficially, the backfilled channel (approximately eight acres) would be left at a slightly lower elevation than the surrounding area to allow suitable hydrologic conditions for wetland establishment as well as allowing vegetative regrowth through natural succession. The regrown area would produce 6.1 FCUs; therefore, an overall increase in wetland FCUs with project is noted. The regrowth would also provide 15.7 AAHUs of wildlife habitat.

The remaining impacts to these terrestrial resources would require in-kind mitigation. The terrestrial impact avoidance, reduction, and mitigation requirements are discussed in Section 4.0 of this EA. After avoidance, reduction, and mitigation efforts the unavoidable impacts to terrestrial resources would be considered minor and temporary.

Table 4: Comparison of Terrestrial Impacts

Alternative	Wildlife Habitat Impacts	AAHU Loss	Wetland Impacts	FCU Loss
No Action (Non-breach)	0 acres	0	0 acres	0
Alternative 2	31 acres	70.4	5.2 acres	5.1
Alternative 6	0.8 acres	1.8	0 acres	0
Alternative 7	0 acres	0	0 acres	0
Alternative 9	0.8 acres	1.8	0 acres	0

Terrestrial species within and around the project area may experience minor temporary disturbances due to the noise generated by construction. Mobile wildlife would likely relocate during construction activities and clearing; however, these species are expected to return to normal utilization of the area after construction is complete. Due to the abundance of similar forest habitat in the vicinity and the fragmented nature of the area being cleared impacts to wildlife are anticipated to be minor and short-term. In compliance with USFWS's best management practice (BMP) and guidance, tree clearing would not occur during bat maternity season which lasts from May 15th through July 31st (Attachment 2).

Future Conditions with Alternatives 6 and 9

The proposed actions would have significant long-term adverse impacts on approximately 0.8 acres (1.8 AAHU) of non-wetland terrestrial habitat (Table 4). These impacts would be caused by clearing near the current stilling basin to create the temporary bypass channel required for construction and installation of the conduit liner (Figure 13). The bypass channel would be removed after construction is complete.

Figure 13: Alternative 6 and 9 Terrestrial Impacts, DeSoto County Arkabutla.

Impacts to these terrestrial resources would require in-kind mitigation. The terrestrial impact avoidance, reduction, and mitigation requirements are discussed in Section 4.0 of this EA. After avoidance, reduction, and mitigation efforts the unavoidable impacts to terrestrial resources would be considered minor and temporary.

Terrestrial species within and around the construction area at the dam may experience minor temporary disturbances due to the noise generated by construction. Mobile wildlife would likely relocate during construction activities; however, these species are expected to return to normal utilization of the area after construction is complete. Wildlife in the new channel construction area would have a slightly reduced habitat area due to clearing. However, with the abundance of similar forest habitat in the vicinity, impacts to wildlife are anticipated to be minor. In compliance with USFWS's best management practice (BMP) and guidance, tree clearing would not occur during bat maternity season which lasts from May 15th through July 31st (Attachment 2).

Future Conditions with Alternative 7

The proposed actions would have minimal impacts on the terrestrial habitat in the project area (Table 4). Little to no tree clearing would be required for construction since all work takes place within the existing dam structures.

Impacts to wildlife in the project area would be temporary and minimal. Terrestrial species within and around the construction area at the dam may experience minor disturbances due to the noise generated by construction. Mobile wildlife would likely relocate during construction activities; however, these species are expected to return to normal utilization of the area after construction is complete.

3.3.3 Wetlands

Inland wetlands are referred to as palustrine habitats or wetlands associated with riverine or lake systems. The Palustrine System includes all nontidal wetlands dominated by trees, shrubs, emergent mosses or lichens, forest vegetation and all such wetlands that occur in tidal areas where salinity due to ocean-derived salts is below 0.5 ppt. It also includes wetlands lacking such vegetation, but with all the following four characteristics: (1) area less than 8 ha (20 acres); (2) active wave-formed or bedrock shoreline features lacking; (3) water depth in the deepest part of basin less than 2.5 m (8.2 ft) at low water; and (4) salinity due to ocean-derived salts less than 0.5 ppt. (USFWS National Inventory -https://fwsprimary.wim.usgs.gov/wetlands/apps/wetlands-mapper/).

The USFWS National Wetland Inventory (NWI) database was used to identify possible wetlands in the project area. According to the NWI most of the wetlands around Arkabutla Lake are comprised of freshwater forested and shrub habitat but with a few small emergent wetlands located on the eastern side of the lake (Figure 14). The trees in these wetlands are characterized as deciduous and broad leaved deciduous with relatively wide, flat leaves that are shed during the cold or dry season making the canopy leafless sometime during the year. Wetlands around the lake range from being temporarily flooded for brief periods (from a few days to a few weeks) during the growing season to being semi-permanently flooded with surface water persisting throughout the entire growing season.

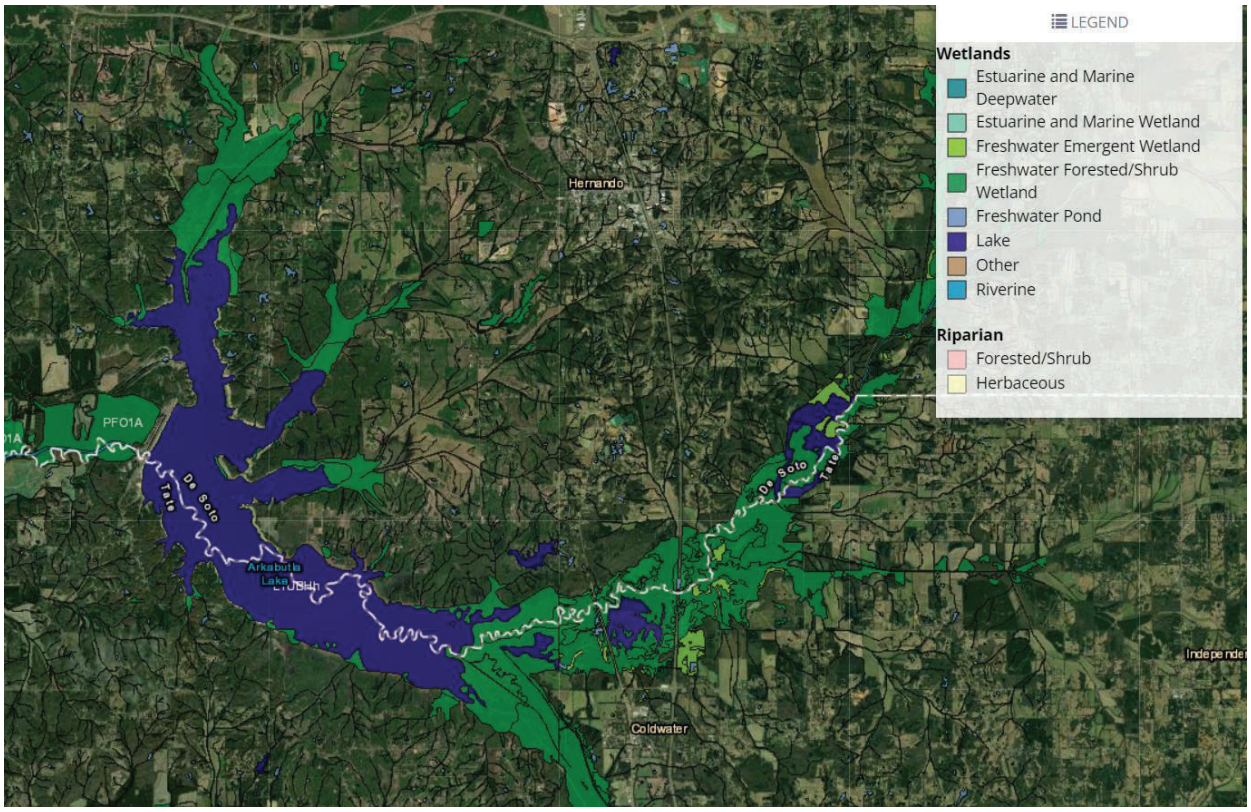

Figure 14: Wetlands at Arkabutla Lake, DeSoto county, MS.

According to the NWI the potential wetlands in the construction areas are comprised of forested areas that contain mostly broad-leafed deciduous trees. These wetlands are temporarily flooded each year with surface water present for brief periods (from a few days to a few weeks) during the growing season, but the water table usually lies well below the ground surface for most of the season.

To accurately determine the quality and quantity of wetlands within the project area a wetland delineation was performed following the standard methods outlined in the 1987 Wetland Delineation Manual and the Atlantic and Gulf Coastal Plain Wetland Delineation Supplement (Attachment 5). A total of 14.7 acres of wetlands were located within the proposed project area (Figure 15). Species observed during the delineation include water oak (*Quercus nigra*), cedar elm (*Ulmus crassifolia*), sweetgum (*Liquidambar styraciflua*), American hophornbeam (*Ostrya virginica*), red maple (*Acer rubrum*), American elm (*Ulmus americana*), green ash (*Fraxinus pennsylvanica*), Japanese stiltgrass (*Microstegium vimineum*), Pennsylvania smartweed (*Polygonum pensylvanicum*), and zarzaparilla (*Smilax bona-nox*).

Figure 15: Wetland delineation results at project site, DeSoto County, MS.

In an effort to minimize impacts to wetlands in the project area two large sand borrow areas containing wetlands that would have been cleared for Alternatives 2, 6, and 9 were removed from the project footprint. Sand required for the project would be acquired from a commercial borrow source instead.

Wetland impacts were calculated using HGM analysis and proxy FCI data from a nearby similar MRL SEIS II site (See Section 3.3.2.1). To verify that these assumptions are accurate, site specific FCI values would be collected during the PED stage and, if necessary, impacts and mitigation amounts would be updated accordingly.

Future Conditions with No Action

The No Action Alternative would not have direct impacts on wetlands around Arkabutla Lake and the Coldwater River during the short-term since the currently existing conditions would be maintained. However, the risk of a breach occurring would remain and is expected to slightly increase over time due to continued degradation of the outlet works conduit and stilling basin. If the dam were to breach, the flooding would result in a large reduction in lake pool area that

would significantly adversely impact wetlands around the lake (Figure 11). With a severely reduced pool area, the wetlands would likely be inundated with water less often or not at all which would lead to a decline in wetland health over time. These impacts would be expected to continue until the dam could be repaired and the water level returned to normal.

Future Conditions with Alternative 2- PAA

Based on the wetland delineation the proposed action alternative would have significant long-term adverse impacts on approximately 5.2 acres of wetlands (Table 5). Impacts to wetlands would be caused by clearing the area for the new channel. To reduce potential impacts to wetlands in the area a DND boundary showing where clearing is not allowed was added to the project site plan for Alternative 2 (Figure 16). No wetlands or trees would be cleared within the DND areas.

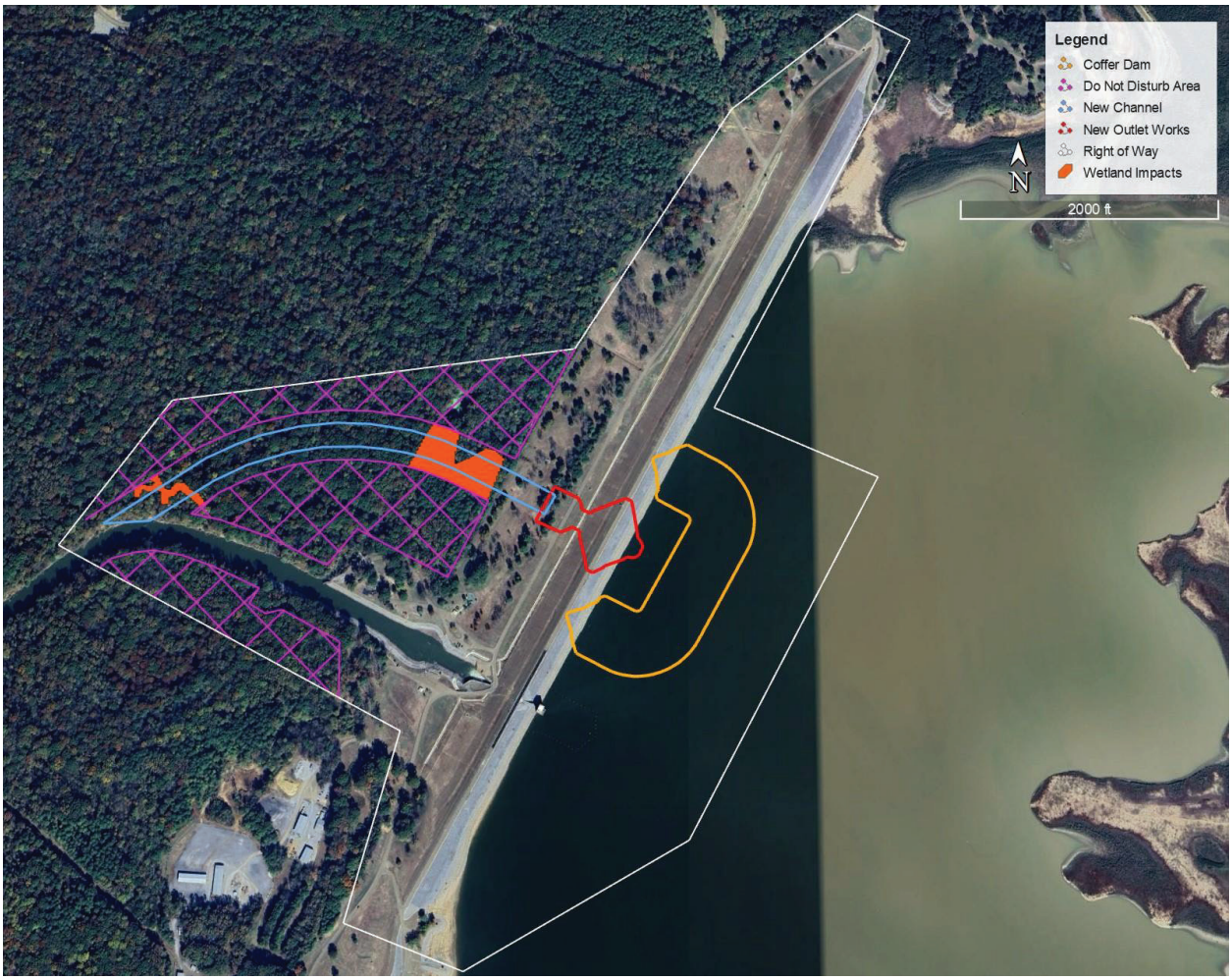

Figure 16: Alternative 2 impacted wetlands and DND Areas, DeSoto County MS.

Table 5: Comparison of Wetland Impacts

Alternative	Wetland Area Impacted
No Action (Non-breach)	0 acres
Alternative 2	5.2 acres
Alternative 6	0 acres
Alternative 7	0 acres
Alternative 9	0 acres

Impacts to wetlands around the current channel that would be backfilled would be short-term and significant. Fifty feet of clearing would be required on either side of the current channel to backfill it after the new channel is complete. During construction the current channel flow would continue to inundate the surrounding wetlands with water. Once, the newly constructed channel is complete it would provide the necessary inundation for the existing surrounding wetlands.

Additionally, approximately 8 acres of the backfilled channel would be left at a slightly lower elevation than the surrounding area to allow suitable hydrologic conditions for wetland establishment as well as allowing vegetative regrowth through natural succession. This would produce 6.1 FCUs, a net gain of 1 FCU compared to impacts.

With the regrowth of the backfilled channel, there would not be overall impacts to wetlands would be considered minor and temporary.

Future Conditions with Alternatives 6 and 9

Based on the delineation Alternatives 6 and 9 would not impact wetlands in the project area (Table 5). Since all borrow material would come from a commercial source and all construction would take place within the exiting dam structure, no wetlands would need to be cleared and are unlikely to be impacted. Bypass pumping around the current stilling basin would be required during construction to maintain downstream flows. This bypass pumping would help provide the existing wetlands with the necessary downstream flows and seasonal water inundation.

Future Conditions with Alternative 7

Alternative 7 would have negligible impacts to wetlands (Table 5). Since little to no borrow material is required for Alternative 7 and all construction would take place within the exiting dam structure, no wetlands would need to be cleared and are unlikely to be impacted. Bypass pumping over the spillway would be required during construction to maintain downstream flows. The bypass pumping flows would help provide the existing wetlands with the necessary seasonal water inundation.

3.3.3.1 Section 404(b)(1) Considerations

This project has been reviewed in accordance with Section 10 Rivers and Harbors Act of 1899 and/or Section 404(b)(1) requirements per the CWA. A 404(b)(1) evaluation was completed (Attachment 4) and will be included with this EA during the 30-day public review period.

3.3.4 Threatened, Endangered, and Protected Species

In compliance with Section 7(c) of the Endangered Species Act of 1973, as amended, an official list of species and critical habitats potentially occurring in the vicinity of the proposed action areas was acquired from the USFWS Information for Planning and Conservation (IPaC) website at (https://ecos.fws.gov/ipac/) on 7 February 2025 (Attachment 6). The federally listed species are as follows:

Northern Long-eared Bat (*Myotis septentrionalis*)	Endangered
Tricolored Bat (*Perimyotis subflavus*)	Proposed Endangered
Alligator Snapping Turtle (*Macrochelys temminckii*)	Proposed Threatened
Monarch Butterfly (*Danaus plexippus*)	Proposed Threatened

A concurrence letter for USACE's determinations and a list of best management practice conservation measures for the project was received from USFWS on 16 August 2024 (Attachment 2). Any changes in project design and impacts would be coordinated with USFWS.

3.3.4.1 Conservation Measures

- Tree clearing would not occur during bat maternity season which runs from May 15th - July 31st.
- Any construction involving abandoning the current outlet works would not take place during bat hibernation season which runs from November 16th- March 14th.
- On-bank construction efforts for the current channel would need to be concentrated to mid-September through mid-April to reduce impacts to alligator snapping turtles.
- Backfilling of the channel would occur during warmer months when the average water temperatures are above 50°F.
- Vegetation removal would be minimized where possible to avoid impacts to terrestrial and aquatic organisms.
- Native vegetation would be used for reseeding.

3.3.4.2 Northern-Long Eared Bat

Legal Status:

The Northern Long-eared Bat is federally listed as "Endangered" and additional information regarding its legal status can be found on the ECOS species profile.

Life History Information:

The Northern Long-eared Bat (NLEB) is an endangered mammal species found throughout the continental US. During summer, NLEBs roost singly or in colonies underneath bark, in cavities, or in crevices of both live and dead trees. The NLEB seems opportunistic in selecting roosts, using tree species based on suitability to retain bark or provide cavities or crevices. NLEBs have also been found, albeit rarely, roosting in structures like barns and sheds. NLEBs are thought to predominantly overwinter in hibernacula that include caves and abandoned mines that have relatively constant, cooler temperatures, high humidity, and no strong currents. NLEBs are nocturnal foragers and feed on moths, flies, leafhoppers, caddisflies, arachnids, and beetles, with diet composition differing geographically and seasonally. Foraging occurs primarily 3-10 ft above the ground, above the understory but under the canopy on forested hillsides and ridges, rather than along riparian areas. Foraging also takes place over small forest clearings and water, and along roads **Invalid source specified.**. There are countless stressors affecting NLEB, however the primary factor influencing the viability of the NLEB is white-nose syndrome.

Potential Impacts:

The proposed actions would result in the loss of potential NLEB habitat in the project area. Forested areas suitable for NLEB roosting would be cleared and grubbed where the new channel is being constructed and in the proposed location of the bypass channel. Vegetation removal would be minimized where possible to reduce impacts and tree clearing would not occur during maternity roosting season which runs from May 15th - July 31st. There is also potential to impact bats that may use the current outlet works or conduit for hibernating in the winter. To reduce potential impacts, construction involving abandoning the current outlet works would occur outside of bat hibernation season which runs from November 16th- March 14th.

Effects Determination:

Future Conditions with No Action

The no action alternative would not have a direct impact on the NLEB in the short-term since the existing conditions would be maintained. However, the risk of a breach occurring would remain and is expected to slightly increase over time due to continued degradation of the outlet works conduit and stilling basin. If the dam were to breach, the flooding would result in the potential loss of a large amount of NLEB habitat in the downstream area and lake areas.

Future Conditions with Alternatives 2, 6, and 9

Based on the site-specific information which includes a potential for indirect adverse effects to individual northern long-eared bats, the USACE MVK has determined that alternatives 2, 6, and 9 "*may affect, but are not likely to adversely affect*" the northern long-eared bat. As part of the IPaC process a NLEB range wide determination key was completed (Attachment 7) and concurred with the USACE MVK determination.

Future Conditions with Alternative 7

Under Alternative 7, tree clearing would not be required and potential NLEB habitat would not be disturbed. Therefore, the USACE MVK has determined that Alternative 2 would have "No Effect" on the NLEB.

3.3.4.3 Tricolored Bat

Legal Status:

The tricolored bat is federally listed as "Proposed Endangered'' and additional information regarding its legal status can be found on the ECOS Species Profile.

Life History Information:

The tricolored bat is a small insectivorous bat that is distinguished by its unique tricolored fur and often appears yellowish to nearly orange. The once common species is wide ranging across the eastern and central United States and portions of southern Canada, Mexico, and Central America. During the winter, tricolored bats are often found in caves and abandoned mines, although in the southern United States, where caves are sparse, tricolored bats are often found roosting in road-associated culverts where they exhibit shorter torpor bouts and forage during warm nights. During the spring, summer, and fall, tricolored bats are found in forested habitats where they roost in trees, primarily among leaves of live or recently dead deciduous hardwood trees, but may also be found in Spanish moss, pine trees, and occasionally human structures. Tricolored bats mate during spring, fall, and sometimes in the winter. Maternity colonies begin forming in mid-April and females bear 1 to 2 pups by late May to mid-July. Tricolored bats face extinction due primarily to the range wide impacts of white-nose syndrome, a deadly disease affecting cave-dwelling bats across the continent. White-nose syndrome has caused estimated declines of more than 90 percent in affected tricolored bat colonies across the majority of the species range.

Potential Impacts:

The proposed actions would result in the loss of potential tricolored bat habitat in the in the proposed bypass channel location and where the new channel would be constructed. Trees in the new channel construction area would be cleared and grubbed. Vegetation removal would be minimized where possible to reduce impacts and tree clearing would not occur during maternity roosting season which runs from May 15th - July 31st. There is also potential to impact bats that may use the current outlet works or conduit for hibernating in the winter. To reduce potential impacts, construction involving abandoning the current outlet works would occur outside of bat hibernation season which runs from November 16th- March 14th.

Effects Determination:

Future Conditions with No Action

The no action alternative would not have a direct impact on the tricolored bat in the short-term since the existing conditions would be maintained. However, the risk of a breach occurring would remain and is expected to slightly increase over time due to continued degradation of the outlet works conduit and stilling basin. If the dam were to breach, the flooding would result in the potential loss of a large amount of tricolored bat habitat in the downstream and lake areas.

Future Conditions with Alternatives 2, 6, and 9

Based on the site-specific information which includes a potential for indirect adverse effects and the similarity to the life history of the NLEB, the USACE MVK has determined that the proposed project alternative "*may affect, but not likely to adversely affect*" the tricolored bat.

Future Conditions with Alternative 7

Under Alternative 7, tree clearing would not be required and potential tricolored bat habitat would not be disturbed. Therefore, the USACE MVK has determined that Alternative 7 would have "No Effect" on the tricolored bat.

3.3.4.4 Alligator Snapping Turtle

Legal Status:

The Alligator Snapping Turtle is federally listed as "Proposed Threatened" and additional information regarding its legal status can be found on the ECOS species profile.

Life History Information:

The alligator snapping turtle is proposed to be listed as endangered and is one of the largest freshwater turtles in the world, with adults sometimes exceeding two feet in shell length and a weight that can reach nearly 250 pounds. Its size and appearance give this creature a prehistoric likeness. The back of the shell is distinctly jagged, and the top of the shell (carapace) has three rows of "spikes" or knobs running lengthwise along entire length of the shell. These turtles inhabit large rivers, sloughs, and oxbow lakes where they spend almost their entire lives in water, normally venturing onto land only to lay eggs. While beneath the water's surface, these turtles are able to use their unique worm-like appendage located on the bottom of their mouth to lure in potential prey.

Potential Impacts:

The use of the habitat in the vicinity of the proposed project area by alligator snapping turtles (AST) is currently unknown. However, moderately suitable habitat does exist in the lake and within the current river channel. Nosie generated by construction and disturbances to the water caused by the bypass pumps would likely cause turtles to avoid the project area. Filling in the old channel may cause direct take of AST. Although this species does not currently receive federal

protections, USFWS requested avoiding impacts to both turtle nesting and to adult turtles. Nesting occurs in the spring and summer months in wetlands and along the banks of perennial water bodies, with nests sometimes detected on dams and other water control structures. Concentrating on-bank construction efforts to mid-September through mid-April would reduce impacts to AST. During the winter, adult AST generally congregate near woody debris in deep pools of waterbodies. To avoid impacts to adult turtles, in-stream work (i.e. filling in of the old channel below the existing outlet) would occur during the warmer months when turtles can flee the area. After the current channel is filled in AST's would no longer be able to utilize this area as habitat. However, once the new channel construction is completed ASTs would be able to return and inhabit the new channel. Construction of the bypass channel may also impact any turtles that are in the current stilling basin. USFWS will be contacted prior to beginning construction in case any AST relocation is necessary.

To further avoid impacts to ASTs, USFWS has recommended only filling in the old channel from the existing dam outlet to as far downstream as the lower end of the riprapped banks and leaving the remaining length of the old channel as-is to create backwater habitat which may serve as suitable habitat for ASTs. During the PED phase, USACE would investigate the feasibility of this recommendation while still maintaining proper downstream flows on the Coldwater River and preventing a breach after the current structure is abandoned.

Effects Determination:

Future Conditions with No Action

The no action alternative would not have a direct impact on the AST bat in the short-term since the existing conditions would be maintained. However, the risk of a breach occurring would remain and is expected to slightly increase over time due to continued degradation of the outlet works conduit and stilling basin. If the dam were to breach, the flooding would result in the significant impacts and potential loss of a large amount of AST habitat downstream of the dam and within Arkabutla Lake. Turtles in the aquatic environment that are unable to escape the flood are likely to have increased mortality rates. With the lake pool severely reduced there would also be less habitat for the AST to utilize until repairs to the dam could be completed and the water level returned to normal.

Future Conditions with Alternatives 2- PAA

Based on the site-specific information which includes a potential for indirect adverse effects to the turtle's habitat and potential for incidental take, the USACE MVK has determined that the proposed project alternative "*may affect but are not likely to adversely affect*" the alligator snapping turtle. While a portion of useable habitat would be destroyed, a larger area of similar habitat would be created nearby. Back filling would also occur outside of brumation season. Some construction activities may result in minor temporary indirect impacts, such as a slight increase in turbidity. However, turbidity is expected to return to normal after construction activities are complete.

Future Conditions with Alternatives 6 and 9

Based on the site-specific information which includes a potential for indirect adverse effects to the turtle's habitat, the USACE MVK has determined that the proposed project alternative "*may affect but are not likely to adversely affect*" the alligator snapping turtle. Building the bypass channel and cofferdams would temporarily prevent the turtles from accessing the current stilling basin. However, due to the shallow water and lack of underwater cover within the stilling basin it is unlikely that alligator snapping turtles would be inhabiting this area. Some construction activities may result in minor temporary indirect impacts, such as a slight increase in turbidity. However, turbidity is expected to return to normal after construction activities are complete.

Future Conditions with Alternatives 7

Based on the site-specific information which includes a potential for indirect adverse effects to the turtle's habitat, the USACE MVK has determined that the proposed project alternative "*may affect but are not likely to adversely affect*" the alligator snapping turtle. Performing bypass pumping from the lake across the spillway may disturb turtles within this area. Pumping would be required at all hours of the day leading to multiple disturbances to the water's surface in the area near the spillway. Turtles are expected to avoid this area during construction but would return once the barges are gone. Some construction activities may result in minor temporary indirect impacts, such as a slight increase in turbidity over the spillway. However, turbidity is expected to return to normal after construction activities are complete.

3.3.4.5 Monarch Butterfly

Legal Status:

The Monarch Butterfly is federally listed as "Proposed Threatened" and additional information regarding its legal status can be found on the ECOS species profile.

Natural History:

Adult monarch butterflies are large and conspicuous, with bright orange wings surrounded by a black border and covered with black veins. During the breeding season, monarchs lay their eggs on their obligate milkweed host plant and larvae emerge after two to five days. The main monarch host plant is Common Milkweed (*Asclepias syriaca*), but other common hosts include Swamp Milkweed (*Asclepias incarnata*), Butterflyweed (*Asclepias tuberosa*), Whorled Milkweed (*Asclepias verticillata*), and Poke Milkweed (*Asclepias exaltata*). Individual monarchs in temperate climates, such as eastern and western North America, undergo long-distance migration, and live for an extended period of time. In the fall, in both eastern and western North America, monarchs begin migrating to their respective overwintering sites.

Potential Impacts:

Potential impacts to larvae and adults would involve the removal of host milkweed plants, construction noise, and other disturbances. Habitat may be present in the proposed project areas. If present, milkweed may be disturbed or destroyed during construction activities and vegetation clearing.

Effects Determination:

Future Conditions with No-Action

The no action alternative would not have a direct impact on the monarch butterfly in the short-term since the existing conditions would be maintained. However, the risk of a breach occurring would remain and is expected to slightly increase over time due to continued degradation of the outlet works conduit and stilling basin. If the dam were to breach, the flooding would result in the potential loss of monarch butterfly habitat downstream of the dam. This impact would be minor and temporary as the milkweed in the area is expected to grow back.

Future Conditions with Alternatives 2, 6, 7 and 9

Based on the site-specific conditions, the USACE MVK has determined that the proposed actions are "*not likely to jeopardize the continued existence*" of the Monarch Butterfly.

3.3.4.6 Pondberry

Legal Status:

Pondberry is federally listed as "Endangered" and additional information regarding its legal status can be found on the ECOS species profile.

Natural History:

Pondberry (*Lindera melissifolia*), is a deciduous shrub, that occurs in seasonally flooded wetlands and swampy depressions, especially in forested areas growing. The size of pondberry ranges from less than 1 ft. to, infrequently, more than 6 ft. in height. Leaves are aromatic, alternate, elliptical, somewhat thin, and membranaceous, with entire margins. Pondberry plants are rhizomatous, frequently propagating by vegetative sprouts and forming clonal colonies, and dioecious with each plant being either a male or a female.

Pondberry produces clusters of small, yellow flowers in early spring prior to leaf development. Flowering occurs from March to April, with male flowers emerging prior to female flowers. Fruits, produced on female plants, are typically green throughout the summer months and turn bright red in the fall. Hermit thrushes (*Catharus guttatus*) are the only known animal dispersal agent of pondberry, although seeds have survived gut passage through other animal species.

The species historical range included Alabama, Arkansas, Florida, Georgia, Louisiana, Mississippi, Missouri, North Carolina, South Carolina. See below for information about where the species is known or believed to occur.

Potential Impacts:

Common threats to this species include habitat destruction, population fragmentation, and altered hydrologic regimes. Clearing the area for construction of the new channel could potentially impact pondberry. However, while seasonally flooded riparian wetlands are present in the project area, it is unlikely that pondberry would be present. Based on the USFWS ECOS database and the MDFWP Natural Heritage database, there are no known records of pondberry occurring in DeSoto or Tate counties. Additionally, no pondberry was encountered during the wetland delineation of the project area. A borrow area comprised of previously cleared agricultural land was chosen to avoid impacts to wetlands and pondberry.

Effects Determination:

Future Conditions with No-Action

The no action alternative would not have a direct impact on pondberry since the existing conditions would be maintained.

Future Conditions with Alternatives 2, 6, 7 and 9

Based on the lack of historical species presence, selection of borrow areas based on impact avoidance and minimization, and the results of the wetland delineation the USACE MVK has determined that the proposed actions would have "No Effect" on pondberry.

3.3.5 Migratory Birds

The Migratory Bird Treaty Act (MBTA) of 1918 provides protection for bird species native to North America. Arkabutla Lake is an important nesting and feeding area within the Mississippi Flyway for many migratory birds and waterfowl species. A variety of migratory birds might occur in the project areas, some as migrants and some as breeders. Waterfowl, wading birds, shorebirds, passerines, and raptors use the Yazoo watershed for resting, feeding, nesting, and for other life-history needs. A list of possible migratory species and the likelihood of their presence was provided during the USFWS IPaC process (Attachment 6).

Future Conditions with No Action

The no action alternative would not have a direct impact on the migratory birds in the short-term since the existing conditions would be maintained. However, the risk of a breach occurring would remain and is expected to slightly increase over time due to continued degradation of the outlet works conduit and stilling basin. If the dam were to breach, the flooding would result in significant impacts to a large amount of migratory habitat around the lake and downstream of the dam. The flooding would likely destroy some wooded areas and fields that many bird species use during migration. However, if left alone these areas would likely regrow over time. Because of the reduced lake pool area, there would also be less habitat for waterfowl to use until the dam could be repaired.

Future Conditions with Alternatives 2, 6, and 9

Under Alternatives 2, 6, and 9 the operation of loud equipment and increased construction traffic would cause a temporary minor adverse impact to migratory birds using the areas within the vicinity of the work. Additionally, direct adverse impacts would result from trees felled that are currently used by birds. The seasonal avoidance measures put into place for bats (no tree clearing from May 15th - July 31st) would also reduce potential impacts to nesting migratory birds.

Per the USFWS guidance, incidental take can result from the taking or killing of migratory birds that results from, but is not the purpose of, an activity. Based on avoiding tree removal during key migration seasons, the number of trees to be removed, and the amount of forest available in the vicinity, these impacts would be minor and short term.

Future Conditions with Alternative 7

Under Alternative 7 the operation of loud equipment and increased construction traffic would cause temporary minor impacts to migratory birds using the area around the dam. Migratory birds are likely to avoid this area during construction but would return after construction is complete. No migratory bird habitat would be removed.

3.3.5.1 Bald Eagles

Although the Bald Eagle (*Haliaeetus leucocephalus*) was removed from the federal list of threatened and endangered species in 2007, it continues to be protected under the Migratory Bird Treaty Act and the Bald and Golden Eagle Protection Act (BGEPA). The BGEPA prohibits unregulated take of Bald Eagles, including disturbance. Bald Eagles occur regularly in Mississippi as both migrants and breeders, with some populations of year-round residents along major rivers and reservoirs in the state. There are not currently known eagle nests within the project footprint. If a nest is later discovered within 660ft of the project area, then avoidance measures and permitting would be coordinated with USFWS.

3.4 CULTURAL AND SOCIAL RESOURCES

3.4.1 Cultural Resources

Cultural resources within the areas of potential effect (APEs), for borrow and construction activities here defined as the preliminary borrow and construction Right-of-Way (ROW) limits, and including the drawn-down lake, were identified based on a review of the National Register of Historic Places (NRHP), Mississippi Department of Archives and History's (MDAH, hereafter referred to as MS SHPO) Historical Site Management Tool (HSMT), historic aerial photography, historic map research, and a review of cultural resources survey reports. Areas within the vicinity of the APEs, specifically the bottom lands of the Coldwater River, as well as those of both Hurricane and Wolf creeks are rich in mostly prehistoric cultural remains, mostly found across natural elevations in the floodplain (lakebed) or along creekbanks and lake shoreline as attested by large-scale cultural resources reconnaissance surveys of the Lake in the second half of the

20th century (Broyles et al. 1982; Haag 1952; Johnson 1996). This effort revealed 67 known archaeological sites within the lakebed (see Attachment 8 for greater detail). No cultural resources were noted within proposed borrow APE, while two resources (one archaeological site (22Ta667] as well as the existing Arkabutla Dam and Reservoir [Historic Structures Inventory No. 137-ARK-1002], which includes the existing earthen dam, Gaging Station, Intake Tower, Outlet Channel, and Stilling Basin), were noted in the construction APE (Table 6).

Many of the known archaeological sites are associated with prehistoric occupations unattributed to any specific occupational time period(s), meaning that no artifacts diagnostic of any specific time period were recorded (n=46). Of those sites with known occupations, most are associated with the Woodland period (n=21), followed by much smaller numbers of Mississippi (n=5), Archaic (n=3), and Paleoindian (n=2) periods. Many (n=32) of the known archaeological sites have not been formally evaluated or assessed for listing in the NRHP. Of those archaeological sites that have been evaluated/assessed, nearly all (n=34) have been determined ineligible for listing in the NRHP; two archaeological sites (22Ta667 and 22Ta684) have been determined eligible for listing in the NRHP (see Table 6). Most of these sites have only minimal information listed, allowing for general statements regarding resource function and type. In situ human remains have been observed at one of these sites (22Ta684), located across the southern portion of the lakebed, but have not been subsequently revisited (Albertson 2006). Additionally, Arkabutla Dam and Reservoir has also been recommended as eligible for listing in the NRHP (see Table 6).

Furthermore, these reviews also identified three (3) previous cultural resources surveys within these initial APEs as well (Table 7). The 1982 effort conducted by the University of Mississippi consisted of a reconnaissance and sample level effort of resources within the lakebed. These efforts were conducted across the lakebed during winter pool conditions, encompassing an area approximately 3,500 acres in size, versus summer pool conditions (approximately 10,610 acres in size). An approximately 25 percent sample was randomly chosen for revisitation and assessment/evaluation, the data for which was used to generate some very basic cultural resources management guidelines and recommendations (Broyles et al. 1982:217-223). For Arkabutla Lake, the sampling reconnaissance efforts identified a one archaeological midden was identified (22Ds526 – located across the lake opposite the construction APE), though no *in situ* cultural remains were identified (Broyles et al 1982:24-25, 232). The 2013 and 2014 efforts focused on the southern portions of the construction APE and encompassed a total of 48.2 acres, approximately 92.2 percent of which (44.45 acres) fall within the construction APE. No cultural resources were identified within this survey footprint (Barnes and Quiggle 2014).

The entire Arkabutla Lake and Dam property encompasses an area approximately 38,500 acres in size. Excluding the single reconnaissance effort conducted across the lakebed discussed above, all other cultural resources efforts are restricted to upland ridge and terrace settings and were conducted between 1981 and 2019 (38 total cultural resources surveys). These efforts were either associated with USACE activities (e.g. construction, land transfer, and timber harvests/sales [n=27 or 71.1 percent]) or other federal/state agency activities (e.g. bridge replacements, cell towers, and utility work [n=11 or 28.9 percent]). Together, these efforts encompass approximately 6,200 acres, or 16.1 percent of the total property acreage.

Table 6: Previously known NRHP-Eligible cultural resources located within the initial APEs.

Resource Designation	Period(s)	Date Recorded	NRHP Status
22Ta667	Woodland Period	1999	Eligible
22Ta684	Middle-to-Late Mississippian Period	2006	Eligible
137-ARK-1002	Circa 1941 - Present	Not listed	Eligible

Table 7: Previously recorded cultural resources surveys conducted within the initial APEs.

Report No.	Title (Total Survey Acres/Acres within APE)	Author(s)/Principal Investigator	Date
82-087	A Cultural Resources Reconnaissance of the Four Corps Owned Lakes in Mississippi: Grenada Lake, Enid Lake, Sardis Lake, and Arkabutla Lake (**263,159.66/36,000.38**).	Bettye J. Broyles, Robert M. Thorne, and Harry P. Owens - Center for Archaeological Research, University of Mississippi	1982
	Phase I Cultural Resources Survey Report for the Sardis Lake Hydroelectric Project (FERC No. 13701), Grenada Lake Hydroelectric Project (FERC No. 13702), Enid Lake Hydroelectric Project (FERC No. 13703), and the Arkabutla Lake Hydroelectric Project (FERC No. 13704), DeSoto, Grenada, Panola, Tate, and Yalobusha Counties, Mississippi (**170/45**)	Cloy, C., A. Johnson, and J. Barnes – HDR, Inc.	10/2013
13-0711	Addendum to Cultural Resources Survey for the Proposed Yazoo River Basin Hydroelectric Power Projects, 13701-Sardis Lake, 13702-Grenada Lake, 13703-Enid Lake, and 13704-Arkabutla Lake, MDAH Project Log #04-010-14, (#11-098-13 and 04-171-13), DeSoto, Grenada, Panola, Tate, and Yalobusha Counties, Mississippi (Resurvey - **172.7/48.2**)	Jeanne Barnes and Robert Quiggle – HDR, Inc.	03/2014

Future Conditions with No Action

Without implementation of the proposed action, the conditions within the recreational environment would continue as they have in the past and would be dictated by the historic land use patterns and processes that have dominated the area since its construction in 1941. If the dam were to breach, the flooding would result in potential impacts to varying degrees to approximately 637 archaeological resources downstream of the dam and within Arkabutla Lake

(see Attachment 8). With the lake pool severely reduced, both previously recorded (n=67) and previously unrecorded archaeological resources would be at risk for both human (i.e. lotting) and natural (i.e. rain events triggering repeated rapid raising and lowering of lake water levels) impacts until repairs to the dam could be completed and the water level returned to normal. Additionally, as the existing historic structure (Historic Structures Inventory No. 137-ARK-1002) continues to age, the risk for additional structural compromises would continue, which could result in further loss of structural integrity, thereby impacting the characteristics/elements that qualify the property as historic.

Future Conditions with the Alternatives 2, 6, 7, and 9

All RMPs in the final array carry a high potential to impact cultural resources. First and foremost is the existing historic Arkabutla Dam and Reservoir (Historic Structures Inventory No. 137-ARK-1002). The characteristics and elements of this historic structure would be altered, in some cases permanently, with the selection and implementation of any of these RMPs. Additionally, within the initial APEs, the previously discussed archaeological resources (68 between those recorded within the proposed construction area and lakebed (see Table 4; Attachment 8) also would potentially be adversely impacted with the selection and implementation of any of these RMPs, especially in consideration of the likely extension of the current water level draw-down. Furthermore, degradation of the existing earthen dam may result in the discovery of previously unidentified cultural deposits/materials within the original construction fill given the lack of cultural oversight in federal project construction and planning prior to NEPA and NHPA.

USACE has determined that the proposed action constitutes an Undertaking as defined in 36 CFR § 800.16(y) and has the potential to cause significant effects on historic properties. Furthermore, citing 36 CFR § 800.14(b), USACE has determined that the effects on cultural resources could not be fully determined prior to approval given the undertaking's complexity and long length of time required to implement. Therefore, USACE elected to fulfill its Section 106 obligations through the execution and implementation of a Programmatic Agreement (PA) with the Mississippi State Historic Preservation Office (MS SHPO), and 15 Tribal governments including: Absentee-Shawnee Tribe of Indians of Oklahoma, The Alabama-Coushatta Tribe of Texas, The Alabama-Quassarte Tribal Town, The Caddo Nation of Oklahoma, The Chickasaw Nation, Chitimacha Tribe of Louisiana, The Choctaw Nation of Oklahoma, The Coushatta Tribe of Louisiana, The Jena Band of Choctaw Indians, The Mississippi Band of Choctaw Indians, The Muscogee (Creek) Nation, The Quapaw Nation, The Seminole Nation of Oklahoma, The Seminole Tribe of Florida, The Tunica-Biloxi Tribe of Louisiana, and The United Keetoowah Band of Cherokee Indians. All terms and conditions resulting from the programmatic agreement will guide efforts to properly identify, document, and assess cultural resources and avoid, minimize, and/or mitigate/offset any potential impacts prior to project construction.

Formal Section 106 consultation was initiated on 1, 21, and 25 July 2024, pursuant to 36 CFR § 800.3(c). Virtual meetings were held 30 July, 09 October, and 05 December 2024, and 05 February 2025, and was supplemented by a face-to-face meeting on 22 October 2024 to further these ongoing efforts. Written receipt confirming the intent to participate in development of a Section 106 PA was received from the MS SHPO on 31 July 2024. Furthermore, on that same date, the Choctaw Nation of Oklahoma provided email correspondence declining to participate in development the Section 106 PA, deferring to other Tribes participating in the Section 106 PA process (see Attachment 8). The Chickasaw Nation subsequently submitted email correspondence on 05 August 2024, declaring their desire to participate in the development of the Section 106 PA as well. Conversely, the Advisory Council on Historic Preservation (ACHP) submitted email correspondence on 25 November 2024 of their nonparticipation (see Attachment 8).

3.4.1.1 Tribal Concerns

Additionally, in compliance with USACE's 2023 Tribal Consultation Policy and E.O. 13175, the above engagements have provided Tribal parties a means to express and share Tribal concerns regarding the potential for the project to affect/impact Tribal resources. As contained in Attachment 8, our consulting Tribes have repeatedly expressed their primary concerns for the project include impacts to and exposure/vulnerability of both known and unknown cultural resources across the lake during implementation and construction of this project, the potential for cultural resources within proposed borrow areas, the synthesis of known cultural and historical contextual data to aid in cultural resources assessment and evaluation, and the potential for discovery of undocumented cultural deposits/materials in the existing earthen berm/embankment, especially in light on the potential for significant cultural deposit/material and/or human remains. These concerns, which are also of concern to the MS SHPO, are the primary drivers in development of the Section 106 PA (see Attachment 8 for more detailed information and copy of the draft agreement).

3.4.2 Socioeconomic Resources

USACE is directed federal agencies to identify and address any adverse human health or environmental effects, caused by federal actions that have a disproportionately high effect on disadvantaged communities or people/households with incomes below the federal poverty line.

Socioeconomic demographics in the project area were analyzed using United States Census data. Within DeSoto County, approximately 9.2% of the 185,314 residents have incomes below the federal poverty line and 42.2% of the population includes racial and ethnic minorities.

Future Conditions with No Action

The no action alternative would not have direct impacts on the local communities in the short-term since the existing conditions would be maintained. However, the risk of a breach occurring would remain and is expected to slightly increase over time due to continued degradation of the outlet works conduit and stilling basin. If the dam were to breach, the flooding would result in direct impacts to multiple communities downstream of the dam (Figure 11). The flooding from a breach would result in damage to property and the possible loss of human life within these communities.

Future Conditions with the Alternatives 2, 6, 7, and 9

Due to all the work being completed outside of residential areas, the proposed action alternatives would not result in disproportionately high adverse human health or environmental effects to local communities. All communities in the vicinity of the dam would benefit from a reduced dam safety risk.

3.4.3 Aesthetics and Recreation

Recreation is a secondary benefit for Arkabutla Lake. The primary mission of recreation is to provide a sustainable level of high-quality outdoor recreation opportunities within a safe and healthful environment that meets the needs of present and future generations. At Arkabutla Lake the surrounding aesthetics are important for recreational visitors that use the lake each day. It is for this reason that it is practical to consider both aesthetics and recreation together. The lake is regularly used for biking, hiking, photography, camping, boating, swimming, kayaking, fishing, and other outdoor recreational activities. Arkabutla Lake has 10 day-use recreation areas located around the lake that include amenities such as playgrounds, picnic areas, restrooms, fishing piers, basketball court, disc golf course, and nature trails. There are eight boat ramps that provide public access to the lake. Table 8 depicts the eight boat ramps at Arkabutla and the corresponding lowest elevation at which each boat ramp is usable. Currently all boat ramps except for the Coldwater River boat ramp are closed due to the lowered Arkabutla Lake pool level. The boat ramps would be reopened after repairs to the dam have been completed and the pool level is raised to normal.

Table 8: Boat Ramps at Arkabutla Lake, MS.

Arkabutla Boat Ramp	Lowest Usable Elevation
Dub Patton Day-Use Area	211
Hernando Point Day-Use Area	215
Bayou Point	209
Kelley's Crossing	211
Pleasant Hill	217
Coldwater Point	220
Highway 51 Landing	218
Current Outlet Channel	210 (Dec-Apr) 220 (May-Sep) 217 (Oct) 214 (Nov)

Future Conditions with No Action

Without implementation of the proposed action, direct or indirect adverse impacts to recreation and aesthetics may occur. Under the no action alternative, if a breach in the dam occurs it would likely flood the surrounding area destroying some of the recreation areas. Other areas would become unusable until the water drains from them. In addition, the lake pool would be too low to allow use the boat ramps. All areas around the lake including those for fishing and hiking would likely be closed until the dam could be repaired.

Future Conditions with Alternative 2- PAA

Under the PAA, activities associated with construction, especially tree clearing, would decrease the aesthetic appeal of the area in the vicinity of the new outlet works. However, since the trees that would be removed are a very small portion of the forest within the project area and an outlet works tower already exists, changes in aesthetics would be negligible. Additionally, aesthetics would improve over time as the filled in channel is reforested through natural succession.

Construction of the new outlets works would have significant adverse impacts on multiple recreational features around the current outlet works and dam that would require mitigation. Multiple recreational areas around the current dam would need to be closed for public safety or removed for construction of the new outlet works. During construction when the road is blocked the public would not be able to access the public use areas around the dam. However, these impacts are temporary. Once construction is complete these recreational areas would be accessible to the public again. Some recreational features would need to be removed for construction and replaced in-kind after the new outlet works and channel are complete. Features that would be impacted and would likely require replacement after construction include:

- North of Outlet Works: Restrooms, picnic area, fishing pier, picnic shelter, and playground.
- South of Outlet Works: Restrooms, day use area, fishing area, and boat ramp.
- Laydown/ Staging Area: Restrooms, basketball court, and disc golf course

There are two nature trails within the project area, The Coldwater River Nature Trail and the Big Oak Nature Trail, that would be temporarily adversely impacted by the proposed actions. The Coldwater River Nature Trail would be adversely impacted by the construction of the new outlet channel. The new channel would bifurcate a small part of the trail, with a majority of the trail unimpacted and still accessible to hikers from other entrances (Figure 17). After construction of the new dam is complete a new trail entrance would be constructed to provide the public with similar pre-project access to the Coldwater River Nature Trail. The Big Oak Nature Trail would be closed during construction but would not be physically altered.

With in-kind replacement of removed recreational features, impacts to recreation are considered minor and temporary since any recreational areas that would be closed or removed would be rebuilt and reopened after construction of the new outlet works and channel is complete. Beneficially, all boat ramps on Arkabutla Lake would be reopened to the public after repairs are complete and the water pool is returned to normal levels. The proposed action would also ensure safe future use of the recreational lake areas by decreasing the likelihood of a breach.

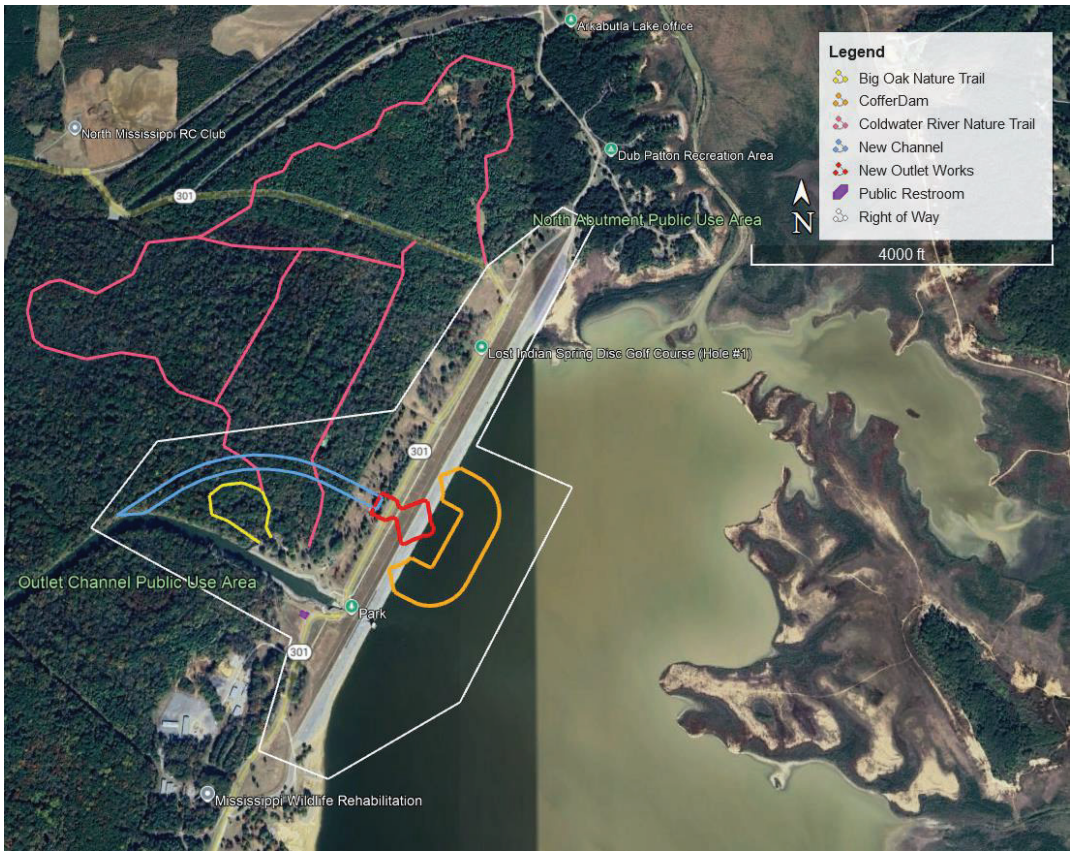

Figure 17: Alternative 2 recreational impacts, DeSoto County, MS.

Future Conditions with Alternatives 6 and 9

Under alternatives 6 and 9, activities associated with construction, especially tree clearing, would decrease the aesthetic appeal of the area of the proposed bypass channel. However, since the trees that would be removed are a very small portion of the forest within the project area, changes in aesthetics would be negligible.

Multiple recreational areas around the current dam would need to be closed for public safety during the project. While construction is occurring and the road is blocked, the public would not be able to access most of the recreational areas around the dam. However, these impacts are temporary. Once construction is complete these recreational areas would be accessible to the public again. Additionally, most of the trails would still be accessible for hiking using an alternative entrance. The proposed action would ensure safe future use of the recreational lake areas by decreasing the likelihood of a breach.

Impacts to recreation are considered minor and temporary since any recreational areas that are closed would be reopened after construction is complete.

Future Conditions with Alternative 7

No impacts would occur to aesthetics since no trees would be cleared and no new structures would be constructed.

While construction is occurring and the road is blocked, the public would not be able to access most of the recreational features around the dam. However, these impacts are temporary. Once construction is complete these recreational areas would be accessible to the public again. Additionally, most of the trails would still be accessible for hiking using an alternative entrance. The proposed action would also ensure safe future use of the recreational lake areas by decreasing the likelihood of a breach.

Impacts to recreation are considered minor and temporary since any recreational areas that are closed would be reopened after construction is complete.

3.4.4 Traffic

Access to Arkabutla Lake is facilitated by network of Interstate roadways, U.S. highways, state highways, and county roads located in DeSoto and Tate counties, Mississippi (Figure 18). Highway 301 (red line) runs across the dam past the current outlet works and the location of the new outlet works. This highway is used as one of the main roads to access and bypass Arkabutla lake. While Mississippi Department of Transportation (MDOT) did not have traffic information in the project area, there was data for the location marked on the map. The average annual traffic daily traffic for the marked location is 860 vehicles per day.

Future Conditions with No Action

Under the No Action Alternative, the dam would not be repaired and there would not be construction related activities or increased vehicle traffic that would cause negative impacts in the vicinity of Arkabutla Lake. However, if the dam is breached, delays and detours would occur since Highway 301 would likely have to be closed until the dam could be repaired.

Future Conditions with Alternatives 2, 6, 7, and 9

Under each of the proposed alternatives, traffic would increase around Arkabutla Dam during construction activities. The only road that would be impacted is Highway 301 that runs across the top of the dam's embankment (Figure 18). For safety, traffic would need to be rerouted away from the project area during parts of construction and would likely add 30 minutes of drive time for residents that use the highway to commute. More extensive project features, such as building a new outlet works, have longer construction durations and lead to higher increases in traffic. Since Alternatives 6, 7, and 9 have similar proposed actions they would also have similar durations for increases in traffic. Alternative 2 would require longer construction times to complete and would increase traffic for a longer period of time than the other alternatives. However, during construction of the cofferdam the road along the downstream toe of the dam would remain open. Investigations in how to further reduce traffic delays and keep the road open longer would be completed during the PED phase. With the availability of other roads in the area, these impacts are considered minimal and long-term. Regular traffic and road access would return to normal after construction is complete.

Figure 18: Road system around Arkabutla Lake. Construction area (red) and location of traffic data collection.

3.4.5 Hazardous, Toxic, and Radioactive Waste

To evaluate if potential HTRW concerns are present within the project area, a review of EPA's environmental databases of known facilities permitted to handle, treat, store, or dispose of hazardous waste was performed (Attachment 9). In addition, a review of reported spills, remediation projects and accidental releases of hazardous materials was also performed. The review was restricted to an area within the minimum search distances reported in the American Society for Testing and Materials, E1527-13, "Environmental Site Assessments: Phase I Environmental Site Assessment Process".

The database review was conducted utilizing EPA's EnviroMapper online query system for regulated facilities. A query of EPAs listed facilities for Superfund Sites (National Priorities List sites), Resource Conservation and Recovery Act sites (RCRA) and Comprehensive Environmental Response, Compensation and Liability Act sites (CERCLA), and National Pollutant Discharge Elimination System sites (NPDES) was performed on 26 June 2023.

EPA maintains the Comprehensive Environmental Response, Compensation, and Liability Information System (CERCLIS) which contains information on potentially hazardous waste sites that have been reported to EPA as required by the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). The CERCLIS contains facility information on sites which are proposed to be or are placed on the National Priorities List (NPL). The database also includes sites which are being assessed for possible inclusion on the NPL. No CERCLIS sites were identified within a 1-mile radius of the project area.

A query of facilities previously reported to the U.S. Environmental Protection Agency (USEPA) for having one or more toxic releases, Toxic Release Inventory (TRI), was conducted. No TRI sites were identified within a 1-mile radius of the project areas.

A query of facilities regulated by the USEPA that handle materials designated as hazardous waste was also conducted. Under the Resource Conservation and Recovery Act (RCRA), generators, transporters, treatment, storage, and disposers of hazardous waste (as defined by the federally recognized hazardous waste codes) must provide information concerning their activities to state environmental agencies. These agencies then provide the information to regional and national USEPA office. The database did not identify any RCRA facilities with a one-mile buffer of the project area.

The EnviroMapper query included a search for specific facilities regulated by the USEPA that discharge to United States waters. This includes municipal and industrial wastewater treatment facilities, which often discharge into rivers, streams, lakes, and other waterways. Under the National Pollutant Discharge Elimination System (NPDES), EPA regulates these discharges under permits regulating their discharge. Four NPDES permits were found to be maintained within a one-mile radius of the project areas. According to the EPA's database two of them are maintained by USACE for the recreational areas, one is maintained by MDOT for the Highway 51 S bridge crossing the Coldwater River, and the last is maintained by L and A contracting for sand and gravel construction.

The query also included a review of the EPA online records for Underground Storage Tanks (UST). Active USTs are storage tanks that are still in use. Inactive USTs are tanks that are not in use. The USTs were classified as closed release, no release, or open release. USTs classified as closed release are tanks which experienced a previous release that have been contained. USTs classified as no release are tanks that have no evidence of prior leakage. USTs classified as open release are tanks that have been documented for prior leakage and have not conducted remedial activity. One underground storage tank managed by USACE was located within a half mile radius of the project area.

3.4.5.1 Site Reconnaissance

A site reconnaissance of the work area was conducted in July 2024. The inspection was conducted on-foot and by vehicle in various locations around the ROW. Some household refuse and large collections of trash were observed, likely caused by the falling of the Arkabutla Lake, but no items of that may pose an HTRW concern were discovered during the site visits.

3.4.5.2 Findings and Recommendations

The following conclusions are based on, or are reasonably ascertainable from, published information and field observations:

- The environmental programs and underground storage tanks identified by the EPA's databases are not believed to be an HTRW concern.

Due to the results of the site reconnaissance, environmental records search and the ROW areas being located mostly on federal property, it is believed that no HTRW concerns would be encountered on this project. It is assumed that prior to construction activity any solid waste shall be removed by the contractor and properly disposed of according to local state and federal regulations.

Future Conditions with No Action

The HTRW Phase I ESA revealed no concerns with existing site conditions. The status of HTRW would not be expected to change as a result of taking no action.

Future Conditions with Alternatives 2, 6, 7, and 9

Given that the HTRW Phase I ESA revealed no concerns, the construction activities associated with all alternatives for this project are not expected to encounter any HTRW concerns. If any HTRW matters are encountered during construction of this project, USACE would be contacted to coordinate the proper handling and disposal of the material.

3.5 CUMULATIVE IMPACTS

Cumulative impacts as described by the CEQ for implementing NEPA are "the impact on the environment which results from the incremental impact of the actions when added to other past, present, and reasonably foreseeable future action regardless of what agency (federal or non-federal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time".

3.5.1 Spatial and Temporal Boundaries

The geographic boundary for the action area was defined as all lands and waters within the USACE project boundaries including the current outlet works and channel, the proposed new outlet works and channel location and borrow area. The temporal boundary for the cumulative effects analysis is the past 10 years, the present, and the next 50 years. Proposed activities would be implemented within the next ten years (funding dependent) and effects of these actions would be most evident during implementation and immediately upon completion.

3.5.2 Description of Cumulative Effects Analysis Area

The Cumulative Effects Analysis Area includes the dam embankment, intake tower, current gated outlet works, an uncontrolled broad-crested ogee weir spillway, two abutment closure dikes, the new outlet works and channel location and borrow area. Main land cover categories include built areas, forest, cropland, and water.

3.5.3 Past, Present, and Reasonably Foreseeable Future Actions

Historically, the project area was bottomland hardwood forest. Over the past 150-200 years, the alluvial valley and floodplain have been altered with forests being cleared and drained for agricultural, municipal, residential, and industrial purposes. However, land conversion from forest to agricultural use has become less frequent over time and land use in the project area is not expected to change in the future.

Past activities that may affect resources within the action area include passive and active management of the dam structures and forested areas around the lake. There would have been some tree removal and vegetation management in the past ten years. Additionally, maintenance and periodic inspections of dam structures would have occurred.

With the exception of the proposed dam modification activities in this EA, reasonably foreseeable future activities would be those of O&M and already authorized USACE projects in the area that would adhere to the same environmental policies. Other projects are not expected to result in cumulative impacts for the dam repairs. If no action is taken there would continue to be a higher risk of future dam breaches and flooding of the surrounding areas.

3.5.4 Cumulative effects Determination

Adverse cumulative effects are not anticipated due to the implementation of this Dam Safety Modification. USACE determined no adverse cumulative effects due to implementation of this project because with avoidance, minimization, and mitigation efforts the proposed actions would result in minimal or minor adverse impacts to Arkabutla Lake and the surrounding habitats. The project would reduce the dam safety risks to acceptable levels. A comparison of potential impacts between the No Action Alternative and the Proposed Action Plan can be found in Table 9.

Table 9: No Action and proposed Action Alternative Impact Comparison

No Action Alternative (Breach)					Symbols: X = Long-Term Effect T = Temporary Effect M = With Mitigation	**Proposed Action Alternative**				
BENEFICIAL			ADVERSE			BENEFICIAL			ADVERSE	
SIGNIFICANT	MINOR	NO EFFECT	MINOR	SIGNIFICANT	Affected Resource	SIGNIFICANT	MINOR	NO EFFECT	MINOR	SIGNIFICANT
					A. Physical Effects					
		X			Topography, Geology, and Soils			**X**		
		X			Land Use/Land Cover			**X**		
		X			Noise				**T**	
				X	Water Quality				**T**	
		X			Air Quality				**T**	
		X			Hazardous Waste			**X**		
					B. Biological Effects					
				X	Aquatic Habitat				**T**	
				X	Terrestrial Habitat				**M**	
		X			Bald Eagle			**X**		
		X			Migratory Birds				**T**	
		X			Invasive Species			**X**		
		X			Federally listed Species				**X**	
					C. Social Effects					
		X			Aesthetics			**X**		
			X		Recreation				**M**	
				X	Cultural Resources, Historic Prop.				M	
				X	Tribal Resources			**X**		
				X	Socioeconomic Resources			**X**		

4 MITIGATION

One of USACE's directives is to ensure that project-caused adverse impacts to ecological resources have been avoided or minimized to the extent practicable. Any remaining unavoidable impacts would require compensatory mitigation. Compensatory mitigation is the restoration, enhancement, or preservation of aquatic resources to offset the negative impacts of a project. This section discusses what mitigation would be required for unavoidable impacts and the plan for implementing these mitigation efforts.

The legal foundation for mitigation for ecological resources includes the CWA, Fish and Wildlife Coordination Act (FWCA), Migratory Bird Treaty Act of 1918, Estuary Protection Act of 1968, Endangered Species Act (ESA), Coastal Zone Management Act of 1972, Magnuson – Stevens Fishery Conservation and Management Act, NEPA, various Water Resources Development Acts, and other environmental laws. These laws are implemented and administered through rules, guidance, regulations, and policies issued by Executive Branch agencies.

4.1 Avoidance and Minimization Efforts

During the feasibility phase of this project the following efforts were made to avoid and minimize impacts to wetlands and forested areas within the project site:

- Multiple placement locations for the new outlet structure were analyzed during the study. The chosen location in Alternative 2 was selected to reduce impacts to wetlands and avoid impacts to a known cultural site.
- When determining the best way to acquire the borrow material required for the proposed cofferdams, commercial sources were compared to potential USACE borrow areas. For Alternatives 6 and 9, commercial sources were selected to avoid the need to clear forested borrow areas.
- As Alternative 2 would require greater quantities of material when compared to Alternatives 6 and 9, cost considerations determined a USACE selected borrow area would be required. When selecting the potential borrow area multiple locations were investigated. The proposed borrow location was chosen due to the lack of wetland and terrestrial impacts compared to the other potential locations.
- To determine the extent of wetlands in the project area, a wetland delineation was performed. In addition, a Do Not Disturb area was incorporated into the Alternative 2 plan to minimize wetland and terrestrial impacts.
- The backfilled channel (approximately eight acres) would be left at a slightly lower elevation than the surrounding area to allow suitable hydrologic conditions for wetland establishment as well as allowing vegetative regrowth through natural succession. Therefore, an overall increase in wetland functional capacity units (FCU) with project is noted. Additionally, the regrowth would provide 15.7 average annual habitat units (AAHU) of wildlife habitat.

4.2 Unavoidable Impacts to Natural Resources

While the preferred alternative incorporates environmental design features which reduce anticipated impacts to terrestrial and wetland resources, significant unavoidable impacts to wildlife habitat remain that would require mitigation. The impacted habitat is comprised of forested areas primarily containing oaks and elms. Although alternatives 6, 7, and 9 were carried forward for alternative analysis, due to historic issues (e.g., re-grouting), constructability concerns, risk potential, issues with bypass pumping, and potential to meet the originally

authorized purpose, these alternatives were deemed impracticable and are not included in the mitigation plan formulation. Table 10 compares the unavoidable impacts for each project alternative.

Table 10: Unavoidable Impacts Comparison

Alternative	Impacted Acres	AAHU Loss	Cause of Impacts
No Action (Non-breach)	0	0	NA
Alternative 2	31	54.6*	New Channel Construction
Alternative 6	0.8	1.8	Bypass Channel
Alternative 7	0	0	NA
Alternative 9	0.8	1.8	Bypass Channel

*AAHUs still requiring compensatory mitigation after accounting for the 15.7 AAHUs provided by the natural succession of the backfilled channel.

4.3 Mitigation Plan Formulation

An array of mitigation alternatives was analyzed to determine a recommended mitigation plan as part of the overall preferred alternative. For environmental planning, where traditional benefit-cost analysis is not possible because costs and benefits are expressed in different units (*e.g.*, AAHU, FCU) two analytical methods are used in the decision planning process. First, cost effectiveness analysis is conducted to identify the least cost solution for each possible level of environmental output. Subsequent incremental cost analysis of the cost-effective solutions is then performed to identify changes in costs for increasing levels of environmental outputs. Using these analyses makes it possible to compare mitigation alternatives and select the appropriate mitigation plan. More information about the cost analysis and mitigation plan selection can be found in the Mitigation Appendix (Attachment 10).

The three mitigation alternatives were considered for impacts of the PAA were considered in the analysis were 1) Acquisition of cleared agricultural land with natural succession, 2) Acquisition of cleared agricultural land with active reforestation, and 3) Purchase credits from a mitigation bank. Incremental cost analysis was used to rank different mitigation measures in order of cost effectiveness. Thus, selection of mitigation measures followed a sequence of cost effectiveness. Amongst the array of mitigation alternatives considered acquisition and active reforestation of frequently flooded agricultural lands was determined to be the most cost-effective alternative and was selected as the recommended mitigation plan.

4.4 Mitigation Implementation

Following a project decision, USACE would acquire mitigation lands in accordance with Federal law. Landowners in the same watershed as the project would be surveyed and lands would be acquired from willing sellers. Once a suitable tract, or tracts, available to be acquired are identified, preliminary information (*e.g.*, landscape position, hydrology, soils, etc.) would be gathered to implement the most beneficial and practicable means of restoration.

Upon acquisition, a draft, tract-specific mitigation plan would be developed. Applicable levee and drainage districts and other landowners would also be coordinated with during the completion of the tract-specific detailed mitigation plan. The tract-specific mitigation plan would contain baseline information, planned earthwork activities, hydrologic restoration features, and anticipated compensatory mitigation benefits quantified in a consistent manner in which impacts were quantified (HEP). Mitigation would progress prior to or concurrent with construction. USACE would develop and maintain a database of identifying its mitigation needs, approved mitigation plans, and construction-related impacts. In response to Section 2036(b) of the WRDA of 2007, as amended, USACE provides annual status reports on USACE construction projects requiring mitigation.

Avoidance, protection, or treatment of cultural resource sites would be included in the development of tract-specific detailed mitigation plans. USACE would consult with federally recognized Tribes, the Mississippi SHPO, and other interested parties following the provisions of the PA. As appropriate, mitigation sites would be surveyed to determine if historic properties are present in the proposed mitigation areas. Protection of cultural resources sites would be incorporated into the natural resource mitigation plan and long-term management of mitigation lands.

A Hazardous Toxic and Radioactive Waste (HTRW) site assessment would also be conducted on any potential mitigation tract to gather and evaluate data regarding the existence or potential for encountering HTRW. USACE is obligated under Engineer Regulation (ER) 1165-2-132 to assume responsibility for the reasonable identification and evaluation of all HTRW contamination within the vicinity of proposed actions. ER 1165-2-132 identifies that HTRW policy is to avoid the use of project funds for HTRW removal and remediation activities.

Mitigation would not be considered complete until all impacted habitat units have been compensated. Completion is not determined on a specific amount of mitigation acreage.

4.5 Mitigation Plan

This section presents a summary of the proposed plan for mitigating and monitoring the foreseeable effects of the proposed actions. For full plan details see Attachment 10 Mitigation Appendix. The approach entails plan development and implementation followed by monitoring and adaptive management. The information presented in this section and Attachment 10 serves as a compensatory mitigation plan prepared in accordance with Engineer Regulation 1105-2-100, Appendix C.

Mitigation requirements were calculated using the same HEP ecological models that were used to estimate project impacts (See Section 3.3.2). These ecological models were all certified or approved by the USACE Ecosystem Restoration National Planning Center of Expertise and used within their applicable ranges, in accordance with Engineer Circular EC 1105-2-412.

It was determined that the acquisition and active reforestation of 58.5 acres of land would be required to fully mitigate for wildlife habitat impacts. The HEP calculations for each species and the required mitigation acres are shown below in Table 11. These calculations include the 15.7 AAHUs that would be recovered from allowing 8.0 acres of the backfilled channel to regrow through natural succession. The ratio of impacted acres to necessary mitigation acres is just under 1:2. This is mostly being driven by the habitat requirements of the barred owl, which needs unfragmented tall old growth forests with a variety of prey and abundant hollows for nesting.

Table 11: Habitat Evaluation Calculations and Required Mitigation

	Impacted Acres	Existing HSI	Impacted AAHU (Loss)	Back Filled Channel Reforestation Acres	Back Filled Channel Reforestation HSI*	Back Filled Channel Reforestation AAHU (Gain)	Required Mitigation Acres	Active Reforestation Mitigation HSI**	Active Reforestation Mitigation AAHU (Gain)	Net Balance AAHU
Barred Owl	-31.0	0.7367	-22.84	8.0	0.3435	2.75	58.5	0.3435	20.09	0.01
Gray Squirrel		0.6953	-21.56		0.2595	2.08		0.4785	27.99	8.51
Carolina Chickadee		0.4015	-12.45		0.4680	3.74		0.4680	27.38	18.67
Pileated Woodpecker		0.4364	-13.53		0.2700	2.16		0.2700	15.80	4.43
Wood Duck		0.00	0.00		0.6270	5.02		0.6270	36.68	41.70
Total			-70.37			15.74				73.31

*Natural Succession, site entirely within 328 ft of a lake or stream that contains water for 6 months per year, or the site is forested wetland flooded for 6 months per year. This assumes the site is shallowly flooded during the March-to-May wood duck brood-rearing period, abundant over-water brood cover is present, and well-maintained nest boxes are provided.

**Active Reforestation, site entirely within 328 ft of a lake or stream that contains water for 6 months per year, or the site is forested wetland flooded for 6 months per year. This assumes the site is shallowly flooded during the March-to-May wood duck brood-rearing period, abundant over-water brood cover is present, and well-maintained nest boxes are provided.

In Federal Register Vol. 73, No. 70, April 10, 2008, specifically Part 332, § 332.4 (c)(1) Compensatory Mitigation for Losses of Environmental Resources, Planning and documentation, Mitigation Plan, Preparation and Approval, guidance was set forth requiring the preparation of a mitigation plan that would address the following 12 items: 1) objectives; 2) site selection; 3) site protection instrument; 4) baseline information; 5) determination of credits; 6) mitigation work plan; 7) maintenance plan; 8) ecological performance standards; 9) monitoring requirements; 10) long-term management plan; 11) adaptive management plan; 12) financial assurances; and other information.

Each of the twelve criteria is discussed the Mitigation Appendix (Attachment 10). Please note that if mitigation banks or in-lieu- fee credits are pursued during later phases, the mitigation plan only requires the baseline information and credit determination methodology for the purposes of purchasing credits.

Once a potential mitigation tract is identified, a tract-specific, detailed mitigation plan comprising the mitigation measures recommended below would be developed. Mitigation would not be considered complete until all impacted habitat units have been compensated. Mitigation sites would be monitored by USACE to verify mitigation benefits, and USACE is committed to adaptively managing the project should initial restoration efforts be determined unsuccessful.

5 COMPLIANCE WITH ENVIRONMENTAL LAWS AND REGULATIONS

Environmental compliance for the proposed action would be achieved based upon coordination of this draft EA and draft FONSI with all appropriate agencies, organizations, and individuals for their review and comments. Compliance with environmental laws can be found below in Table 12.

Table 12: Project Compliance with Environmental Laws

Federal Policy	Compliance Status
National Environmental Policy Act, 42 USC 4321-4347	Partial[1]
Water Resources Development Acts of 1986, 1990, 2000 and 2007	Full
Migratory Bird Treaty Act of 1918, 16 USC 703-712	Full
Comprehensive Environmental Response, Compensation, and Liability Act, 42 USC 9601-9675	Full
Resource Conservation and Recovery Act, 42 USC 6901-6987	Full
Farmland Protection Policy Act, 7 USC 4201-4208	Full
Endangered Species Act, 16 USC 1531-1543	Full
National Historic Preservation Act, 16 USC 470 et seq.	Partial[2]
Noise Control Act, 42 USC 7591-7642	Full
Clean Air Act, 42 USC 7401-7542	Full
Prevention, Control, and Abatement of Air and Water Pollution at Federal Facilities (EO 11282 as amended by EOs 11288 and 11507)	Full
Protection and Enhancement of the Cultural Environment (EO 11593)	Full
Floodplain Management (EO 11988 as amended by EO 12148)	Full
Protection of Wetlands (EO 11990 as amended by EO 12608)	Full
Protection and Enhancement of Environmental Quality (EO 11991)	Full
Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations (EO 12898) through January 21, 2025, until the issuance of Executive Order 14173, at which time such efforts were discontinued to maintain compliance with EO 14173.	Full[3]
Protection of Migratory Birds (EO 13186)	Full
Bald and Golden Eagle Protection Act, 42 USC 4151-4157	Full
Clean Water Act, 33 USC 1251-1375	Partial[4]
Rivers and Harbors Act, 33 USC 401-413	Full
Fish and Wildlife Coordination Act, 16 USC 661-666c	Full

[1] Full compliance after submission for public comments and signing of FONSI.
[2] Full compliance and programmatic agreement signature after submission for public comment and prior to signing of FONSI.
[3] Full compliance during the applicability of EO 12898. Environmental Justice considerations were discontinued on 21 January 2025, pursuant to Executive Order 14173.
[4] Required WQC permit will be completed during PED.

6 COORDINATION AND PUBLIC REVIEW

Notification of this Draft Environmental Assessment and unsigned Finding of No Significant Impact will be sent to interested officials, agencies, organizations, and individuals for review and comment before a FONSI is received. Additionally, an electronic copy will be available on the U.S. Army Corps of Engineers Vicksburg District's website during the public review period at:

https://www.mvk.usace.army.mil/Missions/Programs-and-Project-Management/Regional-Planning-Environment-Division-South/

Please note that the Section 106 PA (see Attachment 8) and Finding of No Significant Impact will be unsigned during the public review period. These documents are to be signed into effect only after having carefully considered any comments that are received as a result of the public review.

To assure compliance with the National Environmental Policy Act, National Historic Preservation Act, Endangered Species Act, and other applicable environmental laws and regulations, coordination with these agencies will continue as required throughout the PED and construction phases of the proposed project.

7 PREPARED BY

This EA (EAXX-202-00-B4P-1729611288) and the associated FONSI were prepared by a Biologist from the U.S. Army Corps of Engineers, New Orleans District, Regional Planning and Environment Division South, with relevant sections prepared by an MVK Archeologist (Cultural Resources) and MVK Civil Engineer (HTRW). The address of the preparers is:

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Vicksburg, Mississippi 39183-3435

8 ATTACHMENTS

1. Agency Correspondence
2. USFWS Concurrence Letter
3. MDEQ WQC Agreement
4. 404(b)(1) Evaluation
5. Wetland Delineation Results
6. USFWS IPaC Species List
7. NLEB Concurrence Letter
8. Cultural (Additional Cultural Resources Data: Draft 106 Programmatic Agreement and Supporting Documentation included following cultural data)
9. Hazardous Toxic and Radioactive Waste Report
10. Mitigation Appendix

9 REFERENCES

2009 Cultural Resources Survey of the Tulane Road and Rifle Range Road Timber Management Areas, De Soto and Tate Counties, Mississippi. Report submitted to the U.S. Army Corps of Engineers, Vicksburg District. Report on file at the MDAH, Jackson, Mississippi (MDAH Report No. 09-1246).

Albertson, Eric S. 2006 Archaeological Site Delineation of the Kelley's Crossing Site (22TA684), Kelley's Crossing Recreation Area, Arkabutla Lake, Tate County, Mississippi. Report submitted to the U.S. Army Corps of Engineers, Vicksburg District. Report on file at the MDAH, Jackson, Mississippi (MDAH Report No. 06-434).

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