FINDING OF NO SIGNIFICANT IMPACT

Kentucky River, Beattyville Kentucky, Flood Risk Management Feasibility Study

The U.S. Army Corps of Engineers, Louisville District (USACE) has conducted an Environmental Assessment (EA) in accordance with the National Environmental Policy Act of 1969, as amended, for the Kentucky River, Beattyville Kentucky, Flood Risk Management Investigation Feasibility Study, which addresses potential means of flood risk management within Beattyville, Kentucky.

The EA, incorporated herein by reference, evaluated various alternatives that would provide flood risk management to the community of Beattyville, Kentucky. The Recommended Plan is Alternative 5C, which consists of nonstructural measures for essential community assets and historical structures, a flood warning and emergency evacuation plan (FWEEP), restoration of the acquired floodplain land via native plantings, and the construction of a new recreational trail. Nonstructural measures include the following:

- Acquisition of property for removal from the floodplain
- Dry floodproofing of structures
- Wet floodproofing of structures
- Raising structures in place
- FWEEP

In addition to Alternative 1, a “no action alternative”, twelve action alternatives were evaluated. Alternatives 2A, 2B, 2C, and 2D each consisted of flood wall alignments with nonstructural components outside of the floodwalls combined with a FWEEP, with each alternative being designed for different flood stages including 672.2 ft., 669.2 ft., 666.5 ft., and 663.0 ft. respectively. Alternatives 3A, 3B, 3C, and 3D consisted of only nonstructural measures combined with a FWEEP, with each alternative being designed for different flood stages including 672.2 ft., 669.2 ft., 666.5 ft., and 663.0 ft. respectively. Alternative 4 consisted of only implementing a FWEEP. Alternatives 5A, 5B, and 5C included a FWEEP with incremental nonstructural measures added. Alternative 5A was a FWEEP with floodplain acquisitions. Alternative 5B was a FWEEP with floodplain acquisitions and floodproofing for essential community assets and services. Alternative 5C was a FWEEP with floodplain acquisitions, floodproofing of essential community assets and services, and floodproofing of historical structures. Comparison of alternatives and selection of the Recommended Plan are addressed in Section 5 of the feasibility report with integrated EA.

For all alternatives, the potential effects were evaluated, as appropriate. A summary assessment of the potential effects of the Recommended Plan are listed in Table i. For the complete evaluation see Section 4 of the appended report.

Table i. Summary of Potential Effects of the Recommended Plan

	Insignificant effects	Insignificant effects due to mitigation	No effects	Positive Effects
Climate Resiliency	☐	☐	☐	☒
Soil Associations	☒	☐	☐	☐
Surface Water	☐	☐	☐	☒
Groundwater	☐	☐	☒	☐
Floodplains	☐	☐	☐	☒
Wetlands	☒	☐	☐	☐
Terrestrial Habitats and Fauna	☐	☐	☒	☐
Aquatic Habitats and Fauna	☐	☐	☐	☒
Federally Listed Species	☐	☐	☐	☒
State Listed Species	☐	☐	☐	☒
Designated Critical Habitat	☐	☐	☐	☒
Migratory Birds	☒	☐	☐	☐
Local Recreational, Scenic, and Aesthetic Resources	☐	☐	☐	☒
Regional Recreational, Scenic, and Aesthetic Resources	☐	☐	☐	☒
Historic Properties	☐	☐	☐	☒
Tribal Resources		☐	☒	☐
Other Cultural Resources	☐	☐	☒	☐
Air quality	☒	☐	☐	☐
Invasive species	☐	☐	☐	☒
Noise levels	☒	☐	☐	☐
Transportation and traffic	☒	☐	☐	☐
Hazardous, toxic & radioactive waste	☐	☐	☐	☒
Socioeconomics	☐	☐	☐	☒

All practical and appropriate means to avoid or minimize adverse environmental effects were analyzed and incorporated into the Recommended Plan. Best management practices (BMPs) as detailed in the EA will be implemented, if appropriate, to minimize impacts. BMPs include, but are not limited to, a stormwater pollution prevention plan (SWPPP).

No compensatory mitigation is required as part of the Recommended Plan.

Public review of the draft EA and Finding of No Significant Impact (FONSI) was completed on September 13, 2024. No public comments were received during the public review period.

Pursuant to Section 7 of the Endangered Species Act of 1973, as amended, USACE determined that the Recommended Plan may affect but is not likely to adversely affect the following federally listed species or their designated critical habitat: fanshell, snuffbox, longsolid, round hickorynut, clubshell, rabbitsfoot, and salamander mussel. The U.S. Fish and Wildlife Service concurred with USACE's determinations on October 3, 2024.

Pursuant to Section 7 of the Endangered Species Act of 1973, as amended, USACE determined that the Recommended Plan would have no effect on the following federally listed species or their designated critical habitat: Virginia big eared bat, grey bat, northern long-eared bat, Indiana bat, and monarch butterfly.

Pursuant to Section 106 of the National Historic Preservation Act of 1966, as amended, the USACE determined that historic properties would not be adversely affected by the recommended plan. The Kentucky State Historic Preservation Officer concurred with the determination on 15 January 2025**.**

All applicable environmental laws have been considered and coordination with appropriate agencies and officials has been completed.

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.

Date

L. Reyn Mann
Colonel, U.S. Army
District Commander

Integrated Feasibility Report and Environmental Assessment

Kentucky River, Beattyville, Kentucky Flood Risk Management Feasibility Study

Beattyville, Kentucky during the March 2021 flood event

August 2025

US Army Corps
of Engineers®
Louisville District

Executive Summary

1. INTRODUCTION

In March of 2021, the City of Beattyville, Kentucky (Beattyville) suffered a severe flood event that impacted significant portions of the downtown area. It is estimated that the event was a 50-year or 2% annual exceedance probability (AEP) event, which crested at approximately 666.5 feet (ft) North American Vertical Datum of 1988 (NAVD88).

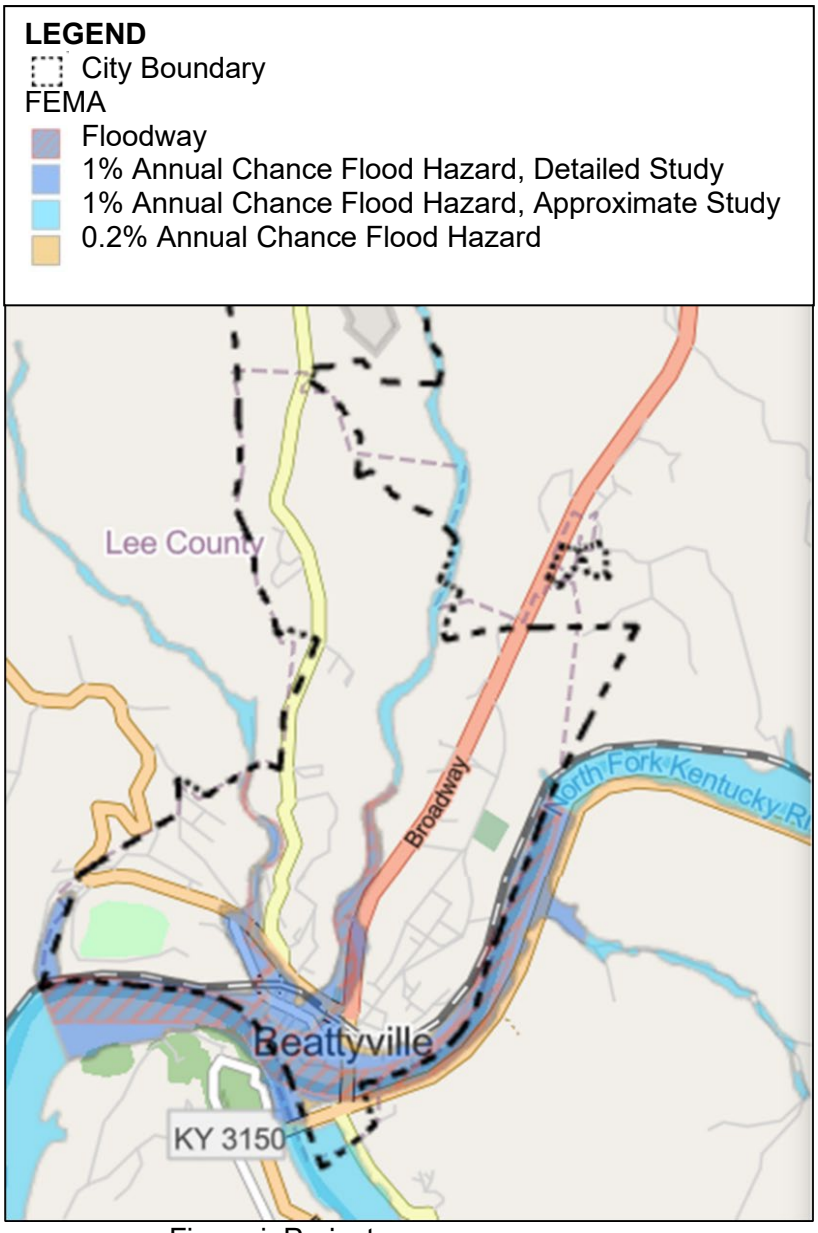

Figure i. Project area.

This General Investigation feasibility study researched potential flood risk management measures and methods, evaluated these measures, and generated alternatives that sought to meet the objectives of the study. The goal was to provide a recommendation for an optimal solution to

reduce flood damages from the Kentucky River and increase resilience within the community of Beattyville throughout the 50-year period of analysis. The study focused on Beattyville, Kentucky, near the confluence of the North and South forks of the Kentucky River. Beattyville is the county seat of Lee County, Kentucky. Lee County is the project's non-Federal Sponsor.

The United States Army Corps of Engineers (USACE) planning process, which was used in this study, follows the six-step process defined in the USACE Principles and Guidelines (P&G). This process is a structured approach to problem solving which provides a rational framework for sound decision making.

2. PURPOSE AND NEED

The purpose of this feasibility study is to evaluate flooding concerns in the area and identify potential alternatives that 1) increase life safety, 2) decrease flood risk, and 3) support community cohesion for Beattyville. The need for this feasibility study is the continued flooding of the town of Beattyville, with the most recent floods occurring in March of 2021 and in February of 2025. These reoccurring flooding disasters pose a threat to life safety, cause economic hardship due to flood damages, and have resulted in the loss of occupation and investment in downtown Beattyville. The compounded effects of Beattyville's location near the convergence of the three forks of the Kentucky River (the North, Middle, and South forks) and the increased frequency and intensity of precipitation predicted for the area, caused by changing conditions, further support the need for a flood risk management investigation in Beattyville.

3. PLAN FORMULATION

A general overview of the plan formulation sequence and strategy for this study is presented in the following approach.

Management Measure Identification: Project stakeholders and the study team identified ten distinct structural measures and six nonstructural measures to address flood risk in the study area. Management measures were grouped based on the following categories:

- Structural Measures: reduce or avoid damages by modifying the nature and/or extent of the flood hazard.
- Nature Based Solutions: protect, conserve, restore, sustainably use, and manage natural or modified ecosystems to enhance flood control systems.
- Nonstructural Measures: reduce the consequences of flooding rather than reducing the probability of flooding. This category of measures includes physical measures such as structural modifications, acquisition, and relocation, and non-physical measures such as emergency response.

Management Measure Screening: Measures were screened based on effectiveness, efficiency, and acceptability. Specific considerations for screening included whether the measure effectively reduced flood risk, the rough order of magnitude cost, and whether there were significant environmental concerns. Nine measures were screened from further consideration.

Initial Array Formulation and Evaluation: The remaining nine measures were combined into an initial array of alternatives - combinations of management measures that aim to reduce risk throughout the study area.

- No Action

- Floodwall Alignment and Flood Warning and Emergency Evacuation Plan (FWEEP)
- Complete Nonstructural and FWEEP
- FWEEP Only

The initial array was evaluated based on the following evaluation criteria: effectiveness, efficiency, completeness, acceptability, identified planning objectives, operation and maintenance (O&M) costs, and significant environmental concerns. Based on this evaluation, all three action alternatives were carried forward for further consideration.

Additional Alternative Development and Evaluation: The initial array of alternatives was expanded to include a subset of alternatives for the Floodwall Alignment and Complete Nonstructural alternatives, which coincided with four flood elevations relevant to Beattyville. The result was ten alternatives inclusive of No Action.

1 No Action
2 Floodwall Alignment Alternatives (Includes FWEEP)
    3A: 672.1' NAVD88
    3B: 669.1' NAVD88
    3C: 666.5' NAVD88
    3D: 663.0' NAVD88
3 Complete Nonstructural (Includes FWEEP)
    3A: 672.1' NAVD88
    3B: 669.1' NAVD88
    3C: 666.5' NAVD88
    3D: 663.0' NAVD88
4 FWEEP

The expanded array of alternatives was evaluated based on the following evaluation criteria: effectiveness, efficiency, completeness, acceptability, environmental effects, and social considerations. Alternatives were also evaluated with respect to the four accounts as outlined in the P&G. The four accounts are National Economic Development (NED), Regional Economic Development (RED), Environmental Quality (EQ), and Other Social Effects (OSE).

This evaluation eliminated all the Floodwall Alignment Alternatives from further consideration. Alternative 3A was determined to be the best plan of the expanded array as it maximized life safety and yielded the highest annual economic benefits of all nonstructural plans. Alternative 4 (FWEEP) also delivered comparatively high life safety benefits as a standalone alternative. As a result, both Alternative 3A and Alternative 4 were carried forward for further consideration, which ultimately resulted in an incremental nonstructural alternative, described below.

Incremental Nonstructural Alternative Formulation: Collaboration with community partners and stakeholders provided specific, critical input that informed categorization of structures based on factors such as life safety, frequency of flooding, location within floodway, necessity for civic functionality, and the intrinsic historic significance.

Using this information, three additional nonstructural alternatives were developed as discrete, standalone alternatives. The sequence began with the FWEEP (Alternative 4); followed by targeted floodway acquisitions with recreational beneficial reuse of acquired land (Alternative 5A); voluntary floodproofing of essential facilities (Alternative 5B); and voluntary floodproofing of historically significant structures (Alternative 5C).

Final Array Formulation and Comparison: The final array retained Alternative 3A and Alternative 4 and added Alternative 5A, 5B, and 5C for further evaluation and comparison. Below is a summary of the five action alternatives.

- **Alternative 3A** represents a comprehensive nonstructural plan that encompasses nearly all structures within the floodplain, along with the implementation of a FWEEP.

  The remaining four action alternatives are designed to refine Alternative 4 and incrementally build upon one another:

- **Alternative 4** includes only the FWEEP (nonstructural, non-physical measures).
- **Alternative 5A** builds upon Alternative 4 by adding floodway acquisition and a recreation plan that promotes the beneficial reuse of the acquired floodway.
- **Alternative 5B** further expands on Alternative 5A by incorporating floodproofing of essential structures.
- **Alternative 5C** adds floodproofing of historic structures to the scope already covered in Alternatives 4, 5A, and 5B.

The five action alternatives within the final array were evaluated and compared using the same criteria and accounts as the expanded array. The final array was also evaluated for the extent to which alternatives met the planning objectives, as well as remaining risk and uncertainty.

The NED Plan is Alternative 5A as it maximizes net NED benefits ($131,000) and has a 1.25 benefit-to-cost ratio (BCR). NED benefits associated with 5A are derived from quantity (visitation) and quality (experience) gains in recreation associated with the beneficial re-use of the acquired floodway lands. NED benefits from a project's recreation features are measured in terms of a visitor's 'willingness to pay' for the recreation opportunity.

However, Alternative 5C represents the plan that reasonably maximizes benefits across all four P&G accounts (i.e., NED, RED, OSE, and EQ). Therefore, Alternative 5C was selected as the Recommended Plan, which provides -$703,000 in net NED benefits with a BCR of 0.53. Net NED benefits represent average annual equivalent NED benefits less average annual equivalent NED costs, which were estimated using FY25 prices, the FY25 federal discount rate (3.0%), and 50-year period of analysis with a 2030 base year.

Alternative 5C is recommended as the comprehensive net benefits plan. 5C includes application of nonstructural measures to an additional 41 structures beyond those included in the NED plan—structures located within the economically disadvantaged and vulnerable community that are characterized by low resilience in the face of future flood risk. By acquiring flood-prone structures and promoting open space reuse, Alternative 5A produces the greatest net NED benefits. However, Alternative 5C builds upon 5A by reducing flood risk to both vulnerable essential structures (16) and historic structures (25), reducing flood risk to a greater number of structures and reducing the associated environmental impacts. As such, the incremental cost difference between the NED and Recommended Plan provides benefit to nearly four times as many structures. This approach enhances long-term recovery, reduces downtime after flood events, and helps preserve the cultural fabric of the community. It provides the highest EQ benefits, aligns with Beattyville's vision for the floodplain, and reinforces both community identity and resilience. It is the only alternative that combines flood risk reduction, cultural preservation, recreational

development, and regional economic growth into a cohesive, long-term strategy. As such, this policy exception was requested to allow for a recommended plan to be justified by comprehensive net benefits as captured in the EQ and OSE account—in this case, benefits that would increase resilience, reduce risk to life safety, protect culturally and historically significant structures, promote community cohesion, and support communal identity within the at-risk community of Beattyville. In accordance with ER 1105-2-103, the USACE comprehensively evaluated the benefits, impacts, and costs of alternative plans. The Recommended Plan, Alternative 5C, provides superior comprehensive benefits and meets the criteria for a justified NED exception, approved by the ASA(CW) on December 23, 2024.

Justification Highlights for NED Exception:

- Resilience: Enhances long-term recovery and protects critical infrastructure.
- Life Safety: Matches the NED plan in reducing expected annual life loss by 30%.
- Cultural Preservation: Floodproofs 25 historic downtown buildings.
- Community Functionality: Safeguards 16 essential services and businesses.
- Regional Economic Development: In total, $25M in construction spending will support 210 jobs in Lee County, KY – and generate $11.8M in value added in Lee County, KY, $21M in Kentucky and $40M nationally. This exceeds the NED plan's impact due to greater construction costs.
- Policy Alignment: Supported by local stakeholders and consistent with USACE guidance.
- Environmental Quality: Maximizes open space and environmental improvements.
- Equity: Ensures voluntary, community-driven participation outside the floodway.

4. RECOMMENDED PLAN

As noted above, the Recommended Plan maximizes total net benefits and includes four specific increments. The first increment is a base plan utilizing applicable FWEEP elements that provide a cost-effective improvement to life safety and support community resilience through installation of a USGS river gage, flood sirens, inundation modeling/mapping, and evacuation planning. The second increment is floodway acquisitions (12 structures on 7 parcels) in the Kentucky River floodway with beneficial reuse through recreation features including a walking trail, playground, parking, a kayak launch, and native plantings that enhance the riverfront's aesthetics. The third increment addresses essential and anchor assets and services, including police stations, courthouses, health centers, groceries, and cultural hubs, which will be floodproofed (8 dry, 8 wet) to maintain critical community functions post-flood. The fourth increment involves the protection of historical structures in the Beattyville Historic District through floodproofing (2 dry, 22 wet) and elevation. The estimated project first cost is $32,918,000 (FY25 price level), with a Federal share of $27,677,000 (84%) and a non-Federal share of $5,241,000 (16%). Approximately $2,226,000 in Lands, Easements, Rights of Way, Relocations, and Disposal Areas (LERRD) is creditable toward the Sponsor's share.

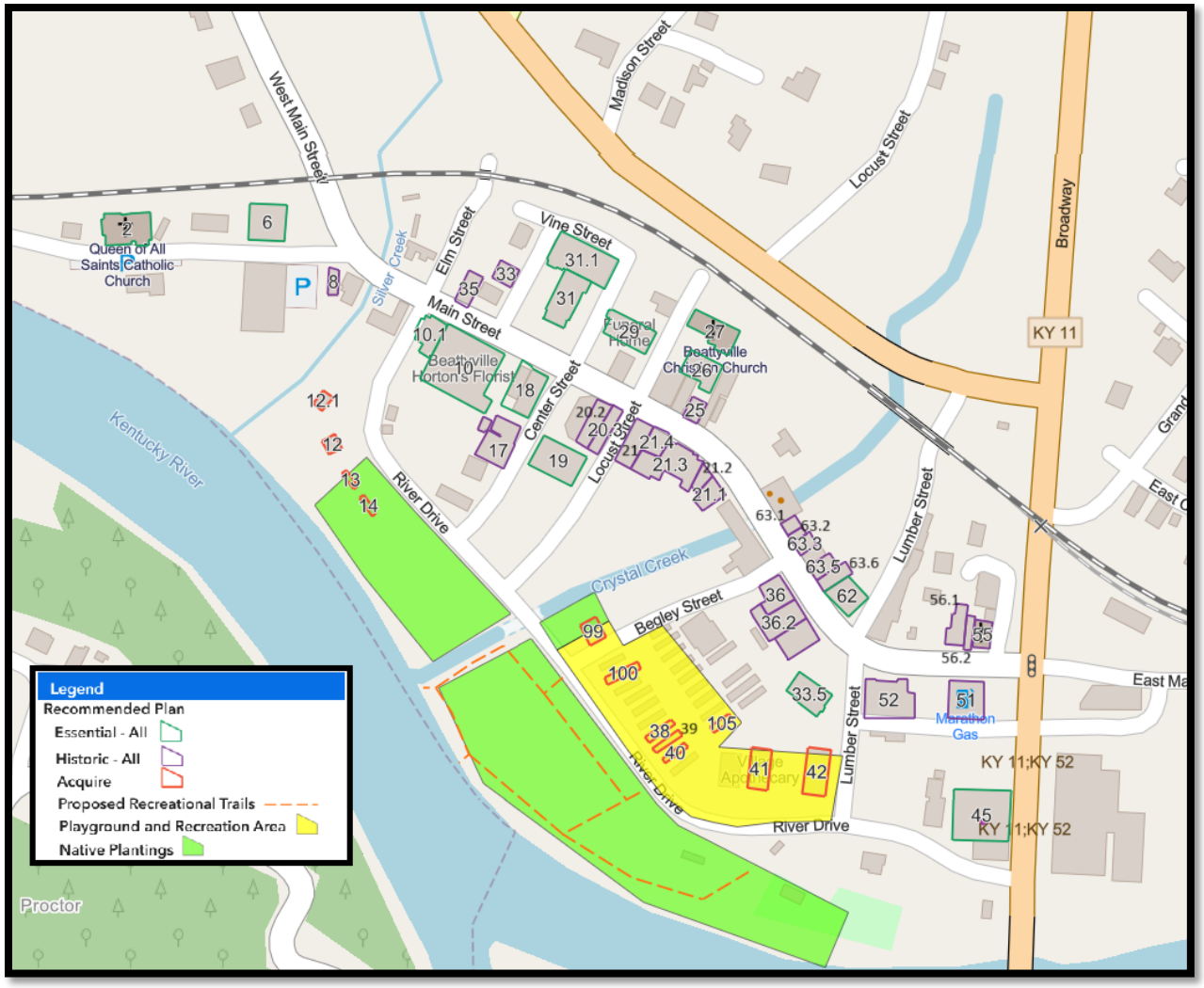

Figure ii. Recommended Plan - Alternative 5C Incremental Nonstructural Plan

5. SIGNIFICANT RESOURCES / ENVIRONMENTAL CONSIDERATIONS

An environmental assessment (EA) was integrated into this feasibility study. The EA was originally prepared in accordance with NEPA of 1969 as amended (42 U.S.C. § 4321 et seq.), the USACE NEPA implementing regulations (33 C.F.R. part 230), and 2023 NEPA implementing regulations of the Council on Environmental Quality (CEQ) (40 C.F.R. parts 1500 – 1508). However, since the release of the draft of this document for public review the CEQ has rescinded the NEPA regulations at 40 C.F.R. Parts 1500 – 1508, and several Executive Orders (EO) have been rescinded as per EO 14148. As such, this EA has been updated to reflect current Federal guidelines.

Significant environmental resources in the area include Kentucky arrow darter (*Etheostoma spilotum*) designated critical habitat along Silver Creek, as well as jurisdictional waters of the United States represented by the Kentucky River, Silver Creek, and Crystal Creek. Additionally, coordination with the U.S. Fish and Wildlife Service (USFWS) revealed that an additional 12 federally threatened, endangered, or candidate species have ranges that overlap the project area

(Figure i). All elements of the Recommended Plan (Figure ii) avoid direct impacts to surface waters including those designated as critical habitat for the Kentucky arrow darter. All elements of the Recommended Plan also avoid direct adverse impacts to listed species. Endangered Species Act (16 U.S.C. §§ 1531–1544) (ESA), Section 7 consultation is complete and the USFWS concurred with all effect determinations in a letter dated October 3, 2024. Overall, it is expected that the Recommended Plan would only result in negligible or minor short-term impacts due to construction but would otherwise serve to provide long-term moderate beneficial impacts to environmental resources, through the removal of structures within the regulated floodway and the reduction in catastrophic flood damages.

The Beattyville Historic District is included within the project area. This district includes 37 contributing historic structures, and the project includes 28 of these contributing structures and four non-contributing. Of the 28 contributing structures included in the Recommended Plan, 22 will be wet floodproofed, two will be dry flood proofed, and the last one will be raised-in-place. Wet floodproofing measures will not adversely affect structures in the Beattyville Historic District. Constraints will be implemented for the dry floodproofing and raise-in-place measures that require external updates to match the existing external characteristics of the structures receiving these measures. If matching the external characteristics becomes problematic, wet floodproofing will be used in lieu of these other measures. The Recommended Plan was determined to result in no adverse effects to historic properties.

6. PLAN IMPLEMENTATION

Interested property owners will be informed of the details of implementation of the nonstructural features of the project, including inspections and related USACE engineering and management requirements by written notice. It is anticipated the Recommended Plan will occur over a phased implementation period of approximately 117 months. However, the scale of the project is highly dependent upon the participation rate for implementation and the amount of funding allocated in any given year. If an owner of a structure eligible for a voluntary nonstructural measure does not want to participate in the project, USACE and the non-Federal Sponsor would defer any further action on that structure until such time as the structure owner elects to participate or until the period of eligibility ends. The eligibility period would be jointly determined by USACE and the NFS and would be outlined in the implementation plan and included in the project partnership agreement during Preconstruction Engineering & Design (PED).

Following the completion of preliminary requirements for individual structures including receipt of proof of recordation of the required documentation, the signed mitigation agreement, Hazardous Toxic and Radioactive Waste (HTRW) assessment and mitigation, and structural assessment, the implementation of the nonstructural mitigation measure on the structure will commence. Structure owners, having completed the application process and meeting eligibility requirements, would work with individual contractors to perform the mitigation activities as defined in the mitigation agreement. The structure owner’s contractor will be responsible for all work associated with implementation of the agreed upon nonstructural measure, from approval of the plans and specifications for each structure to final inspection.

The authority in Section 204 of Water Resources Development Act (WRDA) 1986, as amended (“Section 204”) allows the non-Federal Sponsor to carry out water resource projects and be reimbursed by the USACE for the Federal share of the Project costs, when Federal funds are made available. Section 204 allows for reimbursement upon completion of a project, separable

element, or identified discrete segments of a project defined as a physical portion of a project that the non-Federal Sponsor can operate and maintain, independently and without creating a hazard, in advance of final completion of the project or separable element.

The FWEEP, recreation features, and floodway acquisitions would be one separable element. The essential structures would be a second separable element, and the historic structures would be a third separable element. A discrete segment would be an individual structure. Separable elements two and three will be considered complete when all eligible structures are completed, or the owners have opted to not participate in the program.

The non-Federal sponsor supports this implementation plan.

7. VIEWS OF THE PUBLIC, AGENCIES, STAKEHOLDERS, AND TRIBES

Early into the planning process, USACE held an interagency meeting with state and Federal agencies and Federally Recognized Nations American Tribes on August 7, 2023. Participants of this meeting included the United States Environmental Protection Agency, the Kentucky Division of Water, and the Osage Nation. The Osage Nation commented that USACE should not consider non-response from tribes as indicative of non-interest. See Appendix B for all coordination and responses. Tribes, participating agencies, stakeholders, and the public were notified of the availability to review a draft of this document on August 13, 2024. No public comments were received during the review period. The Environmental Protection Agency submitted a single agency comment and provided recommendations that are incorporated into the final draft of the document.

USACE consulted the KY-SHPO and Tribal Nations regarding the area of potential effects (APE) and the necessary level of effort (LOE) on March 15, 2024. The KY-SHPO concurred with the APE and LOE on April 15, 2024. The Osage Nation provided a letter on April 22, 2024, requesting USACE to provide any draft cultural reports for their review. Tribal Nations were consulted about indigenous knowledge of the project area on April 29, 2024. The Delaware Nation responded with a letter stating Lee County is not within their area of interest and deferred future involvement on May 6, 2024. No other tribal input was received. On January 15, 2025, the SHPO concurred with the USACE determination of No Adverse Effect to Historic Properties.

Lee County Judge Executive Steve Mays and Beattyville Mayor Scott Jackson have both expressed support for the Recommended Plan, especially the recreation plan for beneficial reuse of land acquired in the floodway.

8. REVIEWS

This feasibility study has been reviewed in accordance with the Major Subordinate Command (MSC) approved and publicly posted review plan. USACE Louisville District completed a district quality control (DQC) review of the draft report and the final report. An agency technical review (ATR) was completed on the draft report and the final report. A Project Guidance Memorandum (PGM) was finalized by the policy and legal compliance review team. The PGM documents the draft and final review of the report. An Independent External Peer Review (IEPR) is not required for this study. All reviews have been completed in accordance with ER 1165-2-217, civil works review policy.

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APPENDICES

1 INTRODUCTION

1.1 INTRODUCTION

The U.S. Army Corps of Engineers (USACE) Louisville District completed a General Investigation feasibility study that researched potential flood risk management measures and methods, evaluated these measures, and generated alternatives that sought to meet the objectives of the study. The goal was to provide a recommendation for an optimal solution to reduce flood damages from the Kentucky River and increase resilience within the community of Beattyville, Kentucky, over the 50-year period of analysis. Potential recommendations consisted of structural measures including, but not limited to, impoundments, floodwalls, levees, pumping stations, and diversions as well as a wide array of nonstructural measures, including but not limited to, floodproofing, acquisitions, elevating in place, relocations, and flood warning and emergency evacuation planning.

The study focused on Beattyville, Kentucky, near the confluence of the North and South forks of the Kentucky River. Beattyville is the county seat of Lee County, Kentucky. Lee County is the project's non-Federal Sponsor (NFS).

1.2 USACE PLANNING PROCESS

The USACE planning process, which was used in this study, follows the six-step process defined in the USACE Principles –and Guidelines, USACE, 1983 (P&G). This process is a structured approach to problem solving which provides a rational framework for sound decision making. The six-step process is used for all planning studies conducted by USACE. The six steps are:

Step 1 - Identifying Problems and Opportunities

Step 2 - Inventorying and Forecasting Conditions

Step 3 - Formulating Alternative Plans

Step 4 - Evaluating Alternative Plans

Step 5 - Comparing Alternative Plans

Step 6 - Selecting Recommended Plan

USACE decision-making is generally based on the accomplishment and documentation of all these steps. It is important to stress the iterative nature of this process. As more information is acquired and developed, it may be necessary to reiterate some of the previous steps. The six steps, though presented and discussed in a sequential manner for ease of understanding, usually occur iteratively and sometimes concurrently. Iterations of steps are conducted as necessary to formulate efficient, effective, complete, and acceptable plans.

In addition, this feasibility study includes an integrated Environmental Assessment (EA), in accordance with the National Environmental Policy Act (NEPA) and Finding of No Significant Impacts (FONSI). Fundamental to the USACE planning process is the identification of the Problems, Opportunities, Objectives and Constraints (POOCs). These elements of the study have

been developed through the initial scoping effort in coordination with local stakeholders during the kickoff charette.

1.3 Study Authority

Authority for the Kentucky River, Beattyville, Kentucky General Investigation Feasibility Study is as follows:

> *Section 6 of the Flood Control Act of 1939, PL 76-396 authorizes the Secretary of the Army to perform examinations and studies for flood control on the Kentucky River and its Tributaries, Kentucky, and the Consolidated Appropriations Act of 2022 (PL 117-103), Division D, Title 1, through an explanatory statement, authorized funds for a flood control study at Beattyville Kentucky.*
>
> *Section 105(a) of the Water Resources Development Act of 1986, Public Law 99-662, as amended (33 U.S.C. 2215(a)), specifies the cost-sharing requirements.*

1.4 Study Area (Planning Area)

1.4.1 Study Area

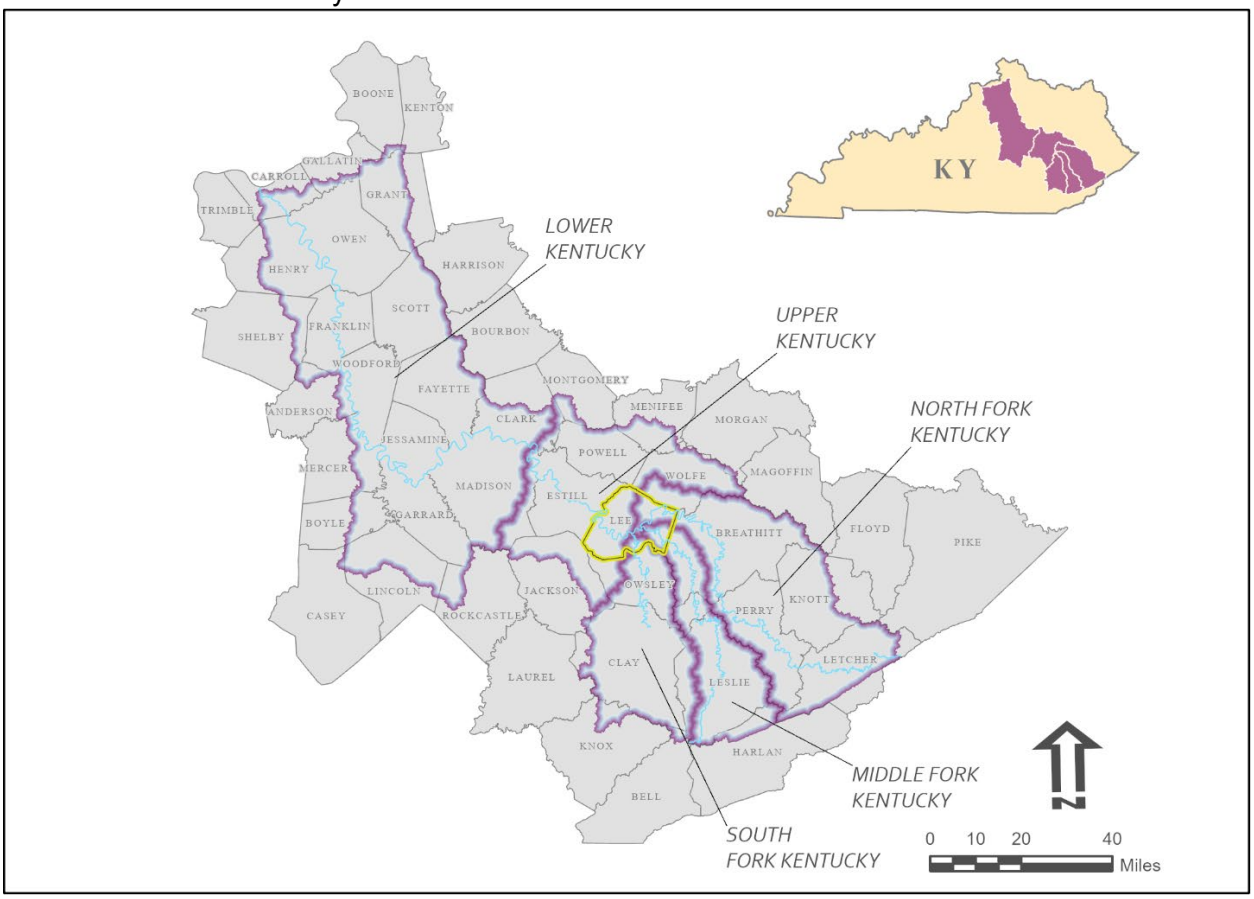

Figure 1. General location map showing the greater Kentucky River watershed and Lee County, Kentucky

The study area encompasses Beattyville in Lee County, Kentucky (Figure 1). The main stem of the Kentucky River is formed in Beattyville by the confluence of the North and South forks. In addition to the North and South Fork, the confluence of Silver Creek and Crystal Creek joins the Kentucky River after they divide downtown Beattyville into three areas. From Beattyville, the Kentucky River flows 250 miles to the northwest to join the Ohio River in Carrollton, Kentucky. The North Fork Kentucky River headwaters are located in Letcher County. From there, the river flows 168 miles northwest through the communities of Whitesburg, Hazard, and Jackson before reaching Beattyville, where it joins with the South Fork. The Carr Fork, a tributary of the North Fork, is impounded to form Carr Creek Lake, a USACE reservoir. About five miles upstream of Beattyville, the Middle Fork Kentucky River enters the North Fork. The Middle Fork is about 105 miles long and rises in the Appalachian Mountains in southernmost Leslie County, Kentucky. In Buckhorn, the Middle Fork is impounded to form USACE's Buckhorn Lake reservoir. The South Fork Kentucky River is approximately 45 miles long and is formed in Clay County, Kentucky. The South Fork flows generally north in a meandering course before joining the North Fork in Beattyville.

The NFS for this effort is Lee County, Kentucky. USACE Louisville District developed and executed the Feasibility Cost Share Agreement (FCSA) on January 3, 2023. Lee County is located in Kentucky's 5th Congressional District. The Congressional Representative is Hal Rogers.

1.4.2 Project Area

The project area is the city limits of Beattyville. The portion of the community most affected by flood damages is the downtown area of Beattyville (Figure 2).

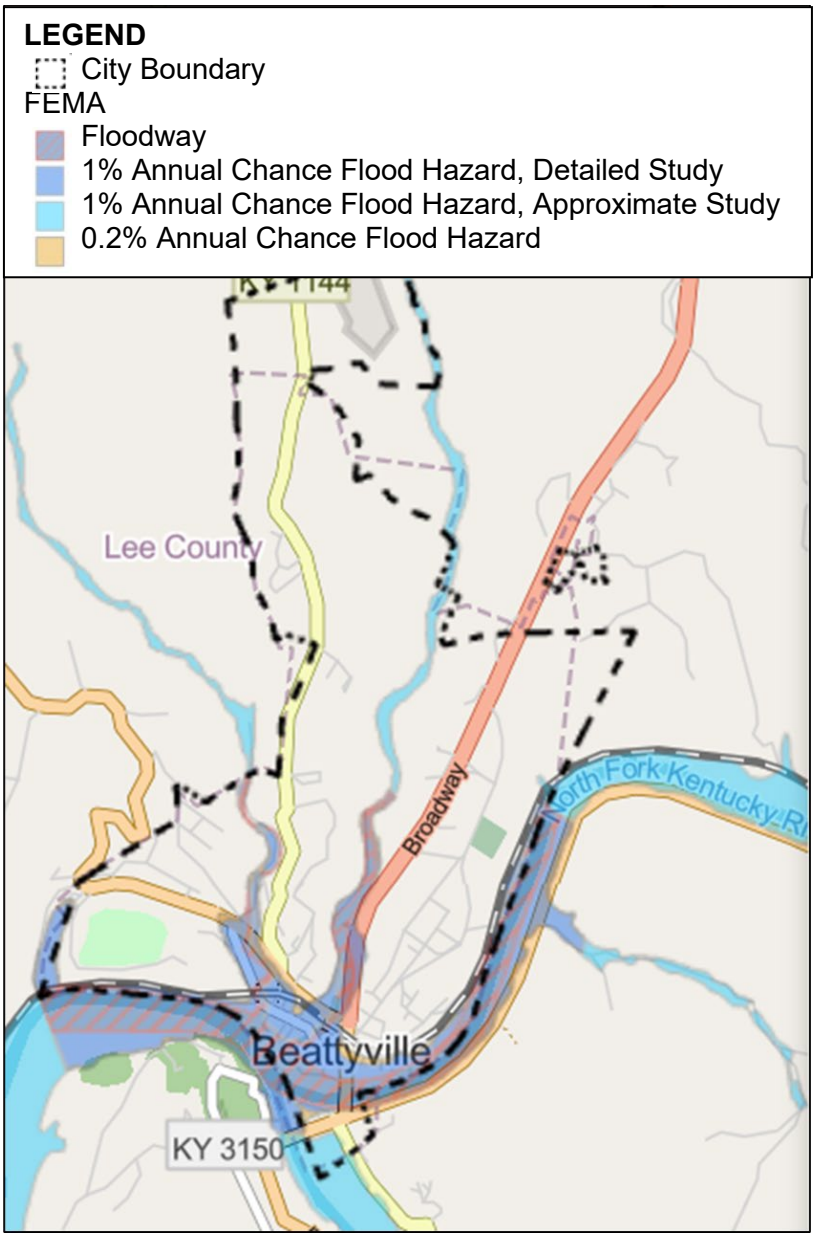

Figure 2. Flood Zones within the project area.

1.5 Background and History

In March of 2021, the City of Beattyville (Beattyville) suffered a severe flood event, estimated to have been a 50-year or 2% annual exceedance probability (AEP) event, which crested at approximately 666.5 feet (ft) North American Vertical Datum of 1988 (NAVD88), and impacted significant portions of the downtown area. On April 23, 2021, a Presidential Major Disaster Declaration (4595-DR-KY) was declared for nine Kentucky counties, including Lee County. This declaration opened the Federal Emergency Management Agency's (FEMA) Individual Assistance (IA) and Public Assistance (PA) programs.

Due to the development pattern of Beattyville and its proximity to the Kentucky River, most of the businesses are in a high-risk flood area and some are located in the floodway. The recurrent

flooding threatens life, causes loss of access to parts of downtown, and has lasting adverse economic impacts for this already disadvantaged area. Additionally, frequent flooding creates a negative impact on the community structure and its identity, damages essential structures and infrastructure, and serves as a repetitive hazard to recreational facilities, activities, and tourism.

One of the most severe floods occurred in January 1957. During this event, floodwaters in downtown Beattyville reached depths of six feet, inundating approximately 70 commercial and 20 residential structures. The 1957 flood remains a benchmark in the town's history, often referenced when assessing the severity of subsequent floods.

The catastrophic March 2021 flood event, with water levels cresting at 35 feet, surpassed the 1957 flood by a few inches. The rapid escalation from a moderate flood alert to a major flooding event within five hours left the entire town submerged by the morning of March 1. Although there were no fatalities, most if not all businesses in downtown Beattyville suffered water damage and were closed for some time after the event (WYKT, 2021). The flooding threat to human life, property damage, and economic loss for government, local businesses, and residents was substantial.

More recently, in February 2025, Beattyville faced yet another significant flood. Overnight rains caused the Kentucky River to rise swiftly, leading to widespread inundation of downtown areas. Residents were evacuated, and emergency services conducted multiple rescues as floodwaters turned streets into rivers. Again in this event, the President issued a Major Disaster Declaration (4860-DR-KY), making Lee County eligible for FEMA IA and PA programs.

These recurring floods have had lasting impacts on the community, both economically and emotionally. Business owners and residents continue to grapple with the challenges of rebuilding and the anxiety of potential future floods. The town's history underscores the importance of effective flood management and preparedness strategies to mitigate the effects of such natural disasters.

1.6 Purpose and Need

The purpose of this feasibility study is to evaluate flooding concerns in the area and identify potential alternatives that 1) increase life safety, 2) decrease flood risk, and 3) support community cohesion for Beattyville. The need for this feasibility study is the continued flooding of Beattyville, with the most recent floods occurring in March of 2021 and February of 2025. These reoccurring flooding disasters pose a threat to life safety, cause economic hardship due to flood damages, and have resulted in the loss of occupation and investment in downtown Beattyville. The compounded effects of Beattyville’s location near the convergence of the three forks of the Kentucky River (the North, Middle, and South forks) and the increased frequency and intensity of precipitation predicted for the area further supports the need for a flood risk management investigation in Beattyville.

1.7 Problems and Opportunities

A two-day planning charette was held in Beattyville April 18-19, 2023 (see Section 7.2 for additional information). During the charette, the USACE project delivery team, local sponsor, vertical team, and various stakeholders and agencies identified the main problems.

Problem Statement

Beattyville, Kentucky, is at risk of repeated flooding, resulting in economic decline, social hardship to an already at-risk community, and potential life safety risk.

Problem Narrative

Beattyville is located at the confluence of the North and South Forks of the Kentucky River, just downstream of the confluence with the Middle Fork of the Kentucky River. Due to its complicated hydrology at the confluence of multiple forks, Beattyville is at risk of flooding and has experienced numerous major floods in the past century, as well as frequent nuisance flooding throughout the floodplain. The flooding results in damages to structures and the contents therein, many of which are entirely within the floodway. In addition, there is currently a lack of comprehensive, effective floodplain management. Inadequate data, warning systems, and emergency response plans adversely impact the community. Repeated flood events contribute to decreased economic activity in this already underserved community.

Opportunities

Successful completion of this study and identification of a federally justified project have the potential to enable USACE to realize the following identified opportunities (i.e., chance to create a future condition that is desirable through project implementation):

- Reduce flood risk and cost of flood insurance with respect to the National Flood Insurance Program (NFIP), improve flood insurance mapping (FIM), and the potential for FEMA certification and reducing costly nuisance flooding along the Kentucky River streambank.
- Improve flood response through better flood forecasting infrastructure and risk communication and through increased resilient Floodplain Management, local zoning and building regulations, and land use and development.
- Increase economic vitality and activity in Beattyville through improved recreational and ecological tourism opportunities along the streambank and in-stream, which will also promote placemaking and brand identity.

1.8 Objectives and Constraints

WRDA 2007 established the Federal Objectives for water resource investments. Federal water resource investments must reflect national priorities, encourage economic development, and protect the environment. Discussions during the planning charette resulted in the development of the following project specific objectives and identification of the following project specific constraints associated with the project.

1.8.1 Planning Objectives

Life Safety - Over the 50-year period of analysis, reduce risks to life and community safety associated with riverine flooding from the Kentucky River, Silver Creek, and Crystal Creek in Beattyville.

- There was no loss of life during the March 2021 event. However, the flood occurred at night when few people were present in downtown Beattyville, an area composed primarily of commercial structures. If a similar flood occurred in Beattyville during the day, life safety

risk would increase. Improvement to life safety risk can be measured by life loss modeling, reduction of flood depths on roadways and in structures, emergency response and warning times, and maintenance of critical routes.

- Updated flood maps would help guide future emergency management efforts, evacuation routes, and land use and building code regulations. Improvement can be measured by the development of more accurate and current flood mapping.
- Flood risk preparedness could be improved by more accurate gage and flood level data, which could strengthen emergency action plans and provide better warning systems for citizens. Improvement can be measured by more accurate flood data and updates to emergency action plans.

Flood Risk Management - Over the 50-year period of analysis, reduce flood damages associated with riverine flooding from the Kentucky River, Silver Creek, and Crystal Creek to commercial, residential, and public properties, as well as public infrastructure in Beattyville.

- The flood event of March 2021 is estimated to have been in the range of the 50-year (2% AEP) event and resulted in approximately $149,000 spent on cleanup efforts (including payroll). Several commercial structures and public buildings (for instance the Lee County Courthouse and the Lee County Health Center) experienced damages from flooding. After the March 2021 flood, of the 51 businesses, seven business tenants left Main Street, four owner occupied businesses relocated from Beattyville permanently and three relocated to a different location within Beattyville. Don Begley Auto Sales, located in downtown Beattyville, lost 120 cars. As of the planning charette in April 2023, there were 11 empty structures on Main Street. Four mobile homes did not return to the mobile home park on River Drive. The local IGA (grocery store) was flooded. Combined with the cost of damages resulting from the flood, economic recovery has been difficult. Improvement can be measured by reduction in flood damages expressed through improved national economic development (NED) and regional economic development (RED) benefits.
- Beattyville does not have zoning or land use regulations to guide the city's development, so many structures are built in flood prone areas with no structural measures to resist potential flooding. Additionally, Silver Creek and Crystal Creek lack a cohesive management strategy for debris clearing and culvert maintenance, resulting in the buildup of debris and sediment. This objective seeks to provide planning and land use guidance to the NFS. Improvement can be measured by updated floodplain management plans and resilience measures for existing structures.

Community Cohesion - Over the 50-year period of analysis, enhance community connections (physical and cultural) to the Kentucky River, Silver Creek, and Crystal Creek to promote health, access, and community identification (place-making).

- The March 2021 flood event and the threat of recurrence, along with the frequent nuisance flooding along the Kentucky River streambank has negatively impacted development in Beattyville that would otherwise provide connections between the river and the city. A public park near the river experiences yearly flood events that require sediment removal, which has become such a financial burden that Beattyville is planning to relocate the park. A recreational vehicle campground developed on the streambank was flooded, leaving only a few camping spaces; reestablishment of the lost spaces does not seem likely. The

old police station, located in the floodway, was damaged during the March 2021 event and is in such a state of disrepair that the building has been abandoned, and the police station relocated to a building on Main Street.

- Beattyville is located in an area of topographically rugged relief. Hillsides are steep and there is a lack of level, developable ground where communities can gather. The popularity of the recently developed Happy Top Park, a mountain top removal project converted into a community park, indicates the demand and enthusiasm for community areas. However, the Kentucky River streambank is underutilized and is not functioning at its full potential as a place for the community to gather, enjoy recreational activities, and create connections to the river. This objective seeks to establish more resilient and sustainable connections to the Kentucky River and streambank.
- Silver Creek and Crystal Creek, tributaries of the Kentucky River that run through Beattyville, experience backwater flooding when the Kentucky River is high. This, combined with the buildup of debris and sediment, creates obstacles for connection to the creeks. This objective seeks to improve access to and maintenance of Silver Creek and Crystal Creek.

1.8.2 Planning Constraints/Considerations

A constraint is a restriction that limits the extent of the planning process. Successful identification of study constraints helps to avoid undesirable outcomes. The following study specific constraint and considerations were identified:

Constraint

Avoid / minimize disproportionate impacts to incorporating the needs and considerations of all at risk communities in the study area from proposed Flood Risk Management (FRM) features.

Considerations

- Impacts to CSX Transportation (CSXT) rail, which follows an east-west path through the northern portion of Beattyville, or using the raised rail line as a levee requires considerable work with CSXT (time and resource intensive).
- Any suggested changes to downstream or upstream locks and dams would need to involve the Kentucky River Authority and may involve historic properties.
- Minimize/avoid negative environmental impacts.
- Measures that impact the floodway may present difficulties with permitting (such as FEMA); in Kentucky, the only nonstructural measure allowed in the floodway are buyouts (which must be mandatory).
- Local resources to fund the construction and to operate and maintain the project are limited.
- Avoid / minimize inducing flooding in the surrounding communities.

1.9 STUDY SCOPE

This General Investigation Feasibility Study researched all available flood risk management measures and methods, evaluated measures, and generated alternatives that met the objectives of the study, conducted financial analysis, and provided recommendations for the optimal solutions for the City of Beattyville to alleviate flooding from Silver Creek, Crystal Creek, and the Kentucky River.

1.10 Relevant Prior Studies and Reports

USACE - Buckhorn Dam project, situated on the Middle Fork of the Kentucky River near Buckhorn, Kentucky, was authorized under the Flood Control Act of 1938 as part of the U.S. Army Corps of Engineers' comprehensive plan for flood risk mitigation within the Ohio River Basin. Designed and constructed by the Louisville District, the dam's primary purpose was to reduce flood damages downstream. Construction commenced with ground-breaking on September 29, 1956, and the dam was officially dedicated on September 10, 1960. The resulting Buckhorn Lake encompasses 1,230 acres and serves multiple functions, including flood control, water supply, and recreational opportunities. The dam itself is an earthen structure, standing 162 feet high and extending 1,020 feet in length at its crest. Its maximum storage capacity is 167,900 acre-feet, with a normal storage of 32,100 acre-feet. The project has been instrumental in managing flood risks and supporting the surrounding communities.

USACE - Carr Creek Dam project, Knott County, Kentucky, was developed by the USACE as part of a comprehensive strategy to mitigate flooding in the Ohio River Basin. Situated 8.8 miles above the mouth of Carr Fork—a tributary of the North Fork of the Kentucky River—the dam was designed to control floodwaters, enhance water quality, and provide recreational opportunities. The project's completion in 1976 led to the creation of Carr Creek Lake, encompassing 710 acres, that has since become integral to the region's flood control infrastructure.

USACE - Booneville Lake project, Kentucky, Condition of Improvement, 30 September 1995 – Project Maps and Data Sheets, Volume 2 – Multiple Purpose Projects. This proposed multipurpose project was originally designed to be located on the South Fork Kentucky River, 7.5 miles upstream from Booneville, Kentucky. The project was designed to operate as a unit in the comprehensive plan for flood risk mitigation in the Ohio River Basin, featuring over 403,000 acre-feet of storage capacity. This project was never constructed.

2 Affected Environment, Existing and Future Without Project Conditions

This chapter outlines the existing conditions and provides a forecast for the "Future Without Project" (FWOP) condition. For the purposes of NEPA this section covers the affected environment. The existing conditions encompass the general environment, including relevant factors such as climate, flooding, and socioeconomic conditions that could influence or be impacted by the potential project alternatives. The FWOP condition represents the expected state if no Federal action is taken (the "No Action Alternative"). The information presented in this chapter establishes the baseline for evaluating the alternatives.

2.1 Period of Analysis

The planning horizon encompasses the planning study period, project implementation, period of economic analysis, and the effective life of the project. The period of economic analysis for this feasibility study is 50 years as required by ER 1105-2-103, Chapter 2, Section 2-4. For this study, the duration of the project is from 2030 to 2080 and would begin accruing benefits after the second increment is completed.

2.2 General Setting

2.2.1 Climate

The climate within the project area is continental in nature and characterized by a wide range of temperature and precipitation totals. The average annual temperature is in the upper 50s with temperature extremes above 100 degrees Fahrenheit and below 0 degrees Fahrenheit. Precipitation primarily comes from storms distributed throughout the year, which generally move in an easterly or northeasterly direction. The most severe storm events occur in mid-winter or early spring (USACE, 1980; USACE, 1995). The USACE performed a synthesis of historic and projected climate trends for the project using the climate hydrology assessment tool (CHAT), time series toolbox (TST), and National Oceanic and Atmospheric Administration data sources, Civil Works Vulnerability Assessment Tool, and various scientific literature including the Fourth National Climate Assessment (USACE, 2023a). Analysis of historic trends were inconclusive, though a slight decrease in temperature and a slight increase in precipitation were indicated in certain historical data sets. It is hypothesized that the reason for the conflicting data is that the project area lies within a transition zone between northern and southern Appalachia, which are impacted by changing conditions in different and often opposite ways. Projected trends indicate increases in temperature and precipitation. However, trends in projected streamflow are weaker and were not strongly supported in the analysis offering little consensus. While trends for typical streamflow were inconclusive, greater consensus exists for increases in extreme precipitation events. Therefore, project features impacted from extreme precipitation such as interior drainage structures may expect increases in the future. While project features impacted from increases in streamflow can be assumed to not be significantly impacted during the project's lifecycle, it should be noted that substantial uncertainty exists for projected conditions (USACE, 2023a). For the full detailed long-term assessment of hydrometeorological conditions, please refer to Appendix F and Section 2.7 below.

2.2.2 Soils and Geology

2.2.2.1 Geology and Physiography

The Kentucky Geologic map service, published by the Kentucky Geological Survey – University of Kentucky indicates that the project site is underlain by alluvium. The information on the geology at the project site is based on the descriptions provided on the Beattyville geologic quadrangle.

The alluvium on-site consists of silt, clay, sand, and gravel, all intergrading and intertonguing chiefly on the floodplain of the Kentucky River and its major tributaries. Alluvium predominantly consists of yellowish brown clayey and sandy silt that contains lenses of light gray, very fine to fine quartz sand that commonly weathers grayish yellow (USGS, 2023a). Pebbles, cobbles, and boulders of sandstone are locally common, especially in northern one-third of quadrangle. The formation includes older alluvium on terraces. Contacts are generally indistinct and are approximately located. The unit commonly grades into colluvium along valley walls.

The Grundy Formation of the Breathitt Group is mapped underlying the alluvium deposits. The Grundy Formation consists of siltstone (30-50%), shale (30-50%), sandstone (10-30%), coal, and underclay.

Artificial fill is mapped along the rail alignments and generally follows the interface of the Grundy Formation and the alluvium in the Beattyville area.

The topography of the area is that of rugged sandstone capped ridges with steep cliffs and shale-formed valleys with gentle slopes. The project area contains two stream valleys, Silver Creek and Crystal Creek, that connect to the North Fork Kentucky River valley at the southern end of the project area, where Beattyville is located (UKY, 2023).

2.2.2.2 Soil Associations

Desktop analysis conducted via the National Resources Conservation Service's (NRCS) web soil survey application indicates there are seven soil map units and one miscellaneous unit within the project area (Table 1). Of the seven soil map units, none are defined as hydric or having hydric components. Of the seven soil map units, three are defined as prime farmland. For a full soil map and detailed soil descriptions, please refer to the NRCS soil report in Appendix B (NRCS, 2023).

Table 1. NRCS soil map units and their characteristics (NRCS, 2023)

Map Unit Symbol	Map Unit Name	Hydric	Prime Farmland	Acres in Project Area	Proportion of Area of Interest
UuD	Urban land-Udorthents complex, 0-20% slopes	No	Not prime farmland	87.8	48.7%
W	Water	N/A	N/A	33.3	18.5%
GvB	Grigsby-Rowdy complex, 0-4% slopes, occasionally flooded	No	All areas prime farmland	28.8	16.0%
GyF	Shelocta-Gilpin complex, 20-65% slopes, sto	No	Not prime farmland	18.1	10.0%
SgF	Chagrin-Grigsby complex, 0-6% slopes, occasionally flooded	No	Not prime farmland	10.0	5.5%
EIA	Elk silt loam, 0-2% slopes, rarely flooded	No	All areas prime farmland	2.0	1.1%
GaD	Gilpin silt loam, 12-20% slopes	No	Not prime farmland	0.3	0.2%
uChgB	Chargin-Grigsby complex, 0-6% slopes, occasionally flooded	No	All areas prime farmland.	0.0[1]	0.0%
Totals for project area				**180.3**	**100.0%**

[1]Soil map unit is less than 0.1 acres and was rounded down to 0.

2.3 NATURAL ENVIRONMENT

2.3.1 Surface Water and Other Aquatic Resources

2.3.1.1 Surface Water

The project area falls within three distinct hydrologic units code (HUC) 12 watersheds, all of which drain into the Kentucky River. The western portion falls within the Contrary Creek-Kentucky River

watershed (051002040503) and contains both Silver Creek and Crystal Creek. The eastern portion of the project area falls within the Hell Creek-North Fork Kentucky River (051002010707) watershed. The extreme southwestern portion falls within the Lower Buffalo Creek-South Fork Kentucky River watershed (051002030607; USGS, 2023b).

Section 303(d) of the Federal Water Pollution Control Act, 33 U.S.C. §§ 1251–1388 (commonly known as the Clean Water Act) (CWA) requires States, Territories, and authorized Tribes to list and prioritize waters for which point source pollution control limits alone do not ensure attainment of water quality standards. The CWA and the United Sates Environmental Protection Agency (USEPA) regulations require that Total Maximum Daily Load (TMDL) be developed for all waters on the section 303(d) lists. A TMDL is a calculation of the maximum amount of a pollutant that a waterbody can receive and still meet water quality standards, and an allocation or attribution of that amount to the pollutant's sources. Lists of 303(d) waters are submitted to the USEPA via a state monitoring program conducted by the Kentucky Department of Water (KDOW) and are made available to the public. The process of formulating TMDLs for specific pollutants is a method by which impaired water body segments are identified and restoration solutions are developed. Ultimately, the goal of TMDL process is full attainment of biological and chemical Water Quality Standards (WQS) and, subsequently, removal of water bodies from the 303(d) list (USEPA, 2009).

The USEPA “How’s my Waterway” web application has two stream water quality reports within the project area. Crystal Creek is a CWA listed 303(d) waterbody, which is impaired for warm water aquatic habitat due to high levels of organic enrichment. High levels of nitrates and phosphates indicates agricultural runoff or sewage discharge as possible sources (USEPA, 2023A; USEPA, 2023b). North Fork Kentucky River-river mile (RM) 0.0 to 2.3 is impaired for recreational use due to fecal coliform contamination, however, it is not currently listed under CWA 303(d). This waterbody was removed from the 303(d) list after a TMDL was developed and implemented (USEPA, 2023a; USEPA, 2023b).

2.3.1.2 Groundwater

Within Lee County, approximately 75% of residents obtain their water from the North Fork Kentucky River. Of the remaining residents, 33% (approximately 650 people) make use of wells for their water needs. Within Beattyville, most residences obtain their water from Beattyville Water Works, which withdraws from the North Fork Kentucky River (KADD, 1999). Groundwater features within the project include two springs located along Silver Creek at the northwest end of the project area and 30 monitoring wells. Groundwater quality varies but common issues in the region are high levels of iron and manganese, as well as salt contamination from abandoned oil/gas wells. In addition, groundwater within the area has historically been impacted by pollution stemming from runoff related contamination due to commercial mining, commercial logging, and other construction activities (UKY, 2023).

2.3.1.3 Floodplains

Executive Order (EO) 11988, as amended, requires Federal agencies to avoid to the extent possible the long and short-term adverse impacts associated with the occupancy and modification of floodplains and to avoid direct or indirect support of floodplain development wherever there is a practicable alternative. FEMA defines the floodway and floodplain as follows:

Regulatory Floodway: The regulatory floodway is the channel of a river or other watercourse and the adjacent land areas that must be reserved to discharge the base flood without cumulatively increasing the water surface elevation more than a designated height.

100-year Floodplain: Also known as the base flood, a flood having a 1.0% (1 in 100) chance of being equaled or exceeded in any given year.

500-Year Floodplain: A flood having a 0.2% (1 in 500) of being equaled or exceeded in any given year.

Analysis of the USEPA NEPAssist website and FEMA floodplain maps indicate that the majority of the project area is within the floodway of Silver Creek, Crystal Creek, and North Fork Kentucky River. The remaining project area falls within the 100-year and 500-year floodplains. (USEPA, 2023c; FEMA, 2023a). Within the project area, 127 structures are located in the 100-year floodplain.

2.3.1.4 Wetlands

Wetlands are considered for Federal projects under CWA Section 404 and EO 11990. Wetlands are defined as “those areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support and that under normal circumstances, do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps marshes, bogs, and similar areas.” (USACE, 1987).

Desktop analysis conducted via the United States Fish and Wildlife Service’s (USFWS) National Wetland Inventory (NWI) web mapper indicates that palustrine emergent (PEM) wetland habitat exists along the fringe of North Fork Kentucky River near its confluence with Crystal Creek. NWI designated palustrine scrub-shrub (PSS) habitat exists along portions of Silver Creek and Crystal Creek near the CSXT rail line (USFWS, 2023a). PEM wetlands are defined as freshwater wetland habitat consisting of less than 30% aerial coverage of woody tree and shrub species. Common species within a PEM wetland include cattails (*Typha spp.*), sedges (*Carex spp.*), bulrushes (*Scirpus spp.*), and other semi aquatic species. PSS wetlands are defined as having greater than 30% aerial coverage of woody shrub species and immature tree species. Common woody species within PSS include buttonbush (*Cephalantus occidentalis*), immature water oak (*Quercus nigra*), and immature red maple (*Acer rubrum*) (FGDC, 2013). For a full overview of NWI mapped wetlands, their size, and location related to the proposed project, please refer to the USFWS NWI map in Appendix B.

2.3.2 Fish and Wildlife Habitats

2.3.2.1 Terrestrial Habitats and Fauna

Given that the project area is urban, there is no significant or otherwise outstanding terrestrial habitat found in the project area, and the surrounding region contains much higher quality terrestrial habitat. The project falls within the Ohio/Kentucky Carboniferous Plateau level 4 ecoregion, which is within the Western Allegheny Plateau level 3 ecoregion (USEPA, 2023d). Historically, the area was mostly forested with mixed oak forests on slopes with mixed mesophytic forests in river valleys. The region is still mostly forested with mixed oak forests. Low lying areas in the region contain hemlock-hardwood forests and red maple-ash swamps (bplant, 2023). The project area primarily contains urban development within the North Fork Kentucky River valley. Due to this, ornamental trees, invasive species, and cultivated grass species are expected to be

common, along with the remnants of species that inhabited the area prior to the establishment of Beattyville.

Since the project area falls in and around the Beattyville city boundary, the terrestrial fauna is limited to those species typically found in an urban rural environment within the region, including various songbirds, raptors, grey squirrels (*Sciurus carolinensis*), mice, whitetail deer (*Odocoileus virginianus*), coyotes (*Canis latrans*), and other common urban species. Various species of bats also likely use the stream corridors for feeding and there is potential that listed bat species use the project area in some way (See Section 2.3.3.1 for a discussion of listed species). Otherwise, riparian habitat within the project area could have various turtle, snake, and lizard species that are associated with the streams in the area, although none are of conservation concern (City of Beattyville, 2023). These include the eastern fence lizard (*Sceloporus undulatus*) and the timber rattlesnake (*Crotalus horridus*) (HerpAtlas, 2024).

2.3.2.2 Aquatic Habitats and Fauna

The project area contains the North Fork Kentucky River, the South Fork Kentucky River, and the headwaters of the Kentucky River after the former pair's confluence. The North Fork Kentucky is a medium sized stream that contains species like muskellunge (*Elox masquinongy*), spotted bass (*Micropterus punctulatus*), smallmouth bass (*Micropterus dolomieu)*, channel catfish (*Ictalurus punctatus*), and rock bass (*Ambloplites rupestris*) (KDFWR, 2023a). It is a modified stream with historical uses for barge traffic. However, with the closure of multiple downstream dams, it is no longer used for this purpose (Christensen, 2022). Local areas within Lee County have habitat for the spotted salamander (*Ambystoma maculatum*) (HerpAtlas, 2024).

Crystal Creek and Silver Creek are two perennial streams that empty into North Fork Kentucky River and flow through the project area. Crystal Creek is known to suffer from nutrient contamination, as described in Section 2.3.1.1 (USEPA, 2023a). However, Silver Creek is classified as designated critical habitat (defined in Section 2.3.3.2) for the Kentucky arrow darter, which is typically observed in upland streams with cool, sluggish pools and riffle habitat (NatureServe 2023). For further discussion of this designated critical habitat and the Kentucky arrow darter, refer to Sections 2.3.3.1 and 2.3.3.2. In addition to stream habitat, USFWS NWI mapping indicates PEM and PSS habitat as being present within the project area (USFWS, 2023a). For detailed discussion of wetland habitat, refer to Section 2.3.1.4.

2.3.3 Endangered and Threatened Species

2.3.3.1 Federal and State Listed Species

Desktop analysis conducted via the USFWS's Information for Planning and Consultation (IPaC) web tool indicates that 13 endangered, threatened, proposed endangered, and candidate species have ranges that intersect the project area (Table 2). The Kentucky Department of Fish and Wildlife Resources' (KDFWR) Threatened & Endangered species list for Lee County indicates that 20 state endangered, threatened, and special concern species are within the same county as the project area (KDFWR, 2023b).

Table 2. Federal and State Listed Species with potential to occur within the project area.

Type	Scientific Name	Common Name	US Status	KY Status
Fish	Etheostoma spilotum	Kentucky Arrow Darter	T	T
Fish	Lethenteron appendix	American Brook Lamprey	-	T
Salamander	Cryptobranchus alleganiensis alleganiensis	Eastern Hellbender	-	S
Bird	Accipiter striatus	Sharp-shinned Hawk	-	S
Bird	Certhia americana	Brown Creeper	-	T
Bird	Junco hyemalis	Dark-eyed Junco	-	S
Freshwater mussel	Cyprogenia stegaria	Fanshell	E	-
Freshwater mussel	Epioblasma triquetra	Snuffbox	E	E
Freshwater mussel	Fusconaia subrotunda	Longsolid	T	S
Freshwater mussel	Obovaria subrotunda	Round Hickorynut	T	T
Freshwater mussel	Pleurobema clava	Clubshell	E	-
Freshwater mussel	Quadrula cylindrica cylindrica	Rabbitsfoot	E	-
Freshwater mussel	Simpsonaias ambigua	Salamander Mussel	PE	-
Insect	Danaus Plexippus	Monarch Butterfly	C	-
Insect	Dryobius sexnotatus	Sixbanded Longhorn Beetle	-	T
Crayfish	Cambarus guenteri	Redbird Crayfish	-	S
Crayfish	Cambarus taylori	Cutshin Crayfish	-	S
Mammal	Corynorhinus rafinesquii	Rafinesque's Big-eared Bat	-	S
Mammal	Corynorhinus townsendii virginianus	Virginia Big-eared Bat	E	E
Mammal	Myotis austroriparius	Southeastern Myotis	-	S
Mammal	Myotis grisescens	Gray Myotis	E	T
Mammal	Myotis leibii	Eastern Small-footed Myotis	-	T
Mammal	Myotis lucifugus	Little Brown Bat	-	T
Mammal	Myotis septentrionalis	Northern Long-Eared Bat	T	E
Mammal	Myotis sodalis	Indiana Bat	E	E

E=Endangered, T=Threatened, S=Special Concern, C=Candidate, PE=Proposed Endangered

The gray bat was listed as endangered by the USFWS in 1976. The gray bat is a cave obligate species that occurs in areas of the southeastern and midwestern United States with limestone karst. Unlike some *Myotis* species in the Midwest and Southeast, gray bats roost on the ceilings of caves and rear young in places where humans can disturb them with their presence through physical touch, noise, and artificial lighting. At the time of listing, the main threats to the gray bat were human disturbance to roosting bats, environmental contamination, impoundment of waterways, and roost modification or destruction. The species is also negatively impacted by cave commercialization, improper gating, and natural calamities like cave-ins and flood events (USFWS, 1997).

The Indiana bat was listed by USFWS as endangered in 1967. Indiana bats hibernate during winter in caves. For hibernation, they require cool, humid caves with stable temperatures under 50° F but above freezing. Very few caves within the range of the species have these conditions.

If bats are disturbed or cave temperatures increase during hibernation, more energy is needed, and hibernating bats may starve (USFWS, 2006). In the spring, Indiana bats emerge from hibernation and migrate to summer roost sites where they usually roost under loose tree bark of dead or dying trees. During summer, males roost alone or in small groups, while females roost in larger groups of up to 100 bats or more. Indiana bats forage in or along the edges of forested areas. Indiana bats are found over most of the eastern half of the United States. Almost half of all Indiana bats (207,000 in 2005) hibernate in caves in southern Indiana. The 2005 population estimate was about 457,000 Indiana bats, half as many as when the species was listed as endangered in 1967 (USFWS, 2006). Loss and fragmentation of forest habitat are among the major threats to Indiana bat populations. Other threats include white-nose syndrome, winter disturbance, and environmental contaminants (USFWS, 2006).

The Virginia big-eared bat was listed by USFWS as endangered in 1979. It Is a colonial species that congregates in cave and cave like habitats during the summer. This species specializes in foraging moth species, which make up more than 80% of their prey. Forage activities occur within a few miles of roost sites and normally include forested habitat interspersed with open fields, cliff lines, and outcrops. Individuals can make use of different hibernacula during different seasons and can migrate upwards of 40 miles between sites. This species hibernates during the winter months, with the vast majority hibernating in 10 hibernacula, largely due to the narrow band of climatic conditions necessary for this species. Threats to this species include fragmentation of foraging areas, barriers to migration, and direct mortality from predation, wind turbine strikes, and brine pits. Of note, this species is particularly susceptible to disturbance within hibernacula, which can lead to increased mortality and abandonment of hibernacula (USFWS, 2019). This species ranges within Virginia, North Carolina, Kentucky, and West Virginia. Within Kentucky and within Lee County, Stillhouse Cave is one of the 10 major hibernacula for this species (CBD, 2023). While within the county, Stillhouse Cave is not within or near the project area.

The northern long-eared bat was listed as threatened by USFWS in 2015 and later reclassified as endangered on November 30, 2022. The bats spend the winter months hibernating in caves and mines. During the summer months, the bats roost singly or in colonies underneath bark or in cavities or crevices of both snags and live trees (USFWS, 2015). The primary threat to this species is white nose syndrome, which caused severe population losses in all hibernacula that were infected. Additional threats include loss of summer habitat, which includes roosting trees and other forested areas, and wind turbine strikes (USFWS, 2015).

The Kentucky arrow darter is a small benthic fish that typically occupies rocky pools in headwater streams of the upper Kentucky River drainage in eastern Kentucky. The species once occurred in small streams throughout the drainage, but it has now been eliminated from large portions of its historical range, including 35 of 74 historical streams (HUC 4 watersheds). The Kentucky arrow darter currently occupies 52 small stream systems across 10 Kentucky counties (USFWS, 2022). However, most remaining populations are isolated and restricted to short stream reaches and of the species' 52 extant streams, USFWS considers 27 of these populations to be "vulnerable" to extirpation. The species faces ongoing threats from poor water quality and altered habitats caused by coal mining, oil and gas exploration, logging, agriculture, poor land use practices, and development (USFWS, 2022). The species' fragmented distribution, lack of gene flow, and low genetic diversity increases its vulnerability to extirpation from chemical spills, habitat disturbance, and catastrophic weather events (e.g., drought, floods). Catastrophic flooding in the summer of

2022 across the upper Kentucky River drainage caused a great deal of damage to many streams occupied by the arrow darter but the effect on the species is currently unknown.

Listed as endangered by USFWS in 1993, the clubshell mussel prefers clean, loose sand and gravel in medium to small rivers and streams and will bury itself in the bottom substrate to depths of up to four inches. Reproduction requires stable, undisturbed habitat and a sufficient population of fish hosts to complete the mussel's larval development. Once found all over the eastern United States, it is now only known to occur in 13 streams (Haag and Cicerello, 2016). Reasons for its decline in the upper Ohio and Wabash watersheds are mainly due to pollution from agricultural run-off and industrial wastes, as well as extensive impoundments for navigation (USFWS, 1997). The only surviving natural population in Kentucky is in the upper Green River (Green County) where it is rare (Haag and Cicerello, 2016). While the project area exists outside of the surviving population's range, USFWS still protects suitable habitat within historical ranges for the potential reintroduction of the species. In addition, much of this species' original reach has not been surveyed and populations may still exist in areas where data are lacking.

The fanshell mussel, listed as endangered in 1990, is found in medium to large rivers. It buries itself in sand or gravel in deep water of moderate current, with only the edge of its shell and its feeding siphons exposed. Reproduction requires a stable, undisturbed habitat and a sufficient population of fish hosts to complete the mussel's larval development. The species is known to be reproducing in the Clinch River in Tennessee and Virginia, as well as the Green and Licking Rivers in Kentucky. The damming of rivers has degraded most of this mussel's habitat, reducing its gravel and sand habitat and affecting the distribution of its fish hosts. Impoundment of larger river habitat, dredging for channel maintenance, and erosion caused by strip mining, as well as logging and farming have been known to destroy or degrade fanshell habitat. Other threats include pollution from agricultural and industrial runoff (USFWS, 1997). The largest populations of the fanshell occur in the Green and Licking rivers. Small, isolated populations of this species are known from the Barren River (Haag and Cicerello, 2016).

The longsolid mussel was listed as threatened by USFWS on March 9, 2023. This species prefers sand and gravel within small rivers; however, it can also be found in coarse gravel and cobble in larger rivers. It is typically found in small streams at a depth of less than 2 ft but can be found at depths of over 20 ft in larger streams. Similar to most other mussel species, it relies on a host fish for glochidia to mature into adult mussels. Host species are currently unknown but likely candidates include minnow species within the genera *Campostoma*, *Cyprinella*, *Notropis*, and *Luxilus*, as well as sculpins within the genus *Cottus*. This species is currently found in the Ohio River, Cumberland River, and Tennessee River basins. Known threats to this species include habitat fragmentation from dams and other barriers, degraded water quality from chemical contamination due to poorly managed development, direct mortality from dredging, and the proliferation of invasive mussel species like the zebra mussel (*Dreissena polymorpha*; USFWS 2023d).

The rabbitsfoot mussel was listed as threatened by USFWS in 2013. Historically, the rabbitsfoot occurred in 137 streams in 15 states, including the following watersheds: the lower Great Lakes sub-basin, Ohio River system, Cumberland River system, Tennessee River system, lower Mississippi River sub-basin, White River system, Arkansas River system, and Red River system. It is found throughout the Ohio River drainage from headwaters in Pennsylvania to the mouth of the Ohio River (Cummings and Mayer, 1992). Based on historical and current data, the rabbitsfoot is declining range-wide and is now extant only in 46 of 137 streams of historical occurrence,

representing a 66% decline. Further, in the streams where it is extant, populations with few exceptions are highly fragmented and restricted to short reaches (Butler, 2005). The chief causes of this species' decline are impoundments, channelization, chemical contaminants, mining, and sedimentation (Haag and Cicerello, 2016).

The round hickorynut mussel was listed as threatened by USFWS on March 9, 2023. It is typically found in sand or gravel in riffle, run, and pool habitats within medium to large streams. They also thrive in shallow habitats with a depth of less than 1 ft and abundant American water-willow (*Dianthera americana*). In larger streams, they are commonly found in depths up to 6.5 ft. The primary threats to this species are habitat loss, degraded water quality from chemical contamination/erosion, and direct mortality from dredging activities (USFWS, 2023e).

The salamander mussel was proposed as endangered on August 21, 2023. As a proposed endangered species, it does not currently have full protection under the ESA, however, proposed impacts must not jeopardize the species. This species ranges throughout Kentucky drainages including the Ohio River, Green River, and Kentucky River basins. No records of this species have been reported from the Tennessee and Cumberland River drainages (Haag and Cicerello, 2016). This species is found in upland streams ranging in size from the largest river to small creeks. It is restricted to streams that support its only host, the mudpuppy (*Necturus maculosus*). It prefers habitat within fine sediments under large non-embedded flat rocks in deeper water or slow current areas. It can also be found in gravel riffles within beds of water willow (*Justicia americana*; Haag and Cicerello, 2016).

The monarch butterfly is a candidate species, and therefore has no formal protections under the ESA. Monarch butterflies are an iconic species with an annual, multigenerational, migratory life cycle and a cross-continental migratory range covering portions of Canada, the United States, and Mexico. To complete their life cycle, monarch caterpillars must feed on milkweed plants (*Asclepias* spp.) while adults feed on nectar from a variety of blooming plants. Monarch butterfly populations are in decline and are threatened by habitat loss, changing conditions, pesticide applications, natural enemies, and other abiotic and biotic stressors (USFWS, 2023c). This species migrates to its breeding locations in Mexico and California starting November and lasting until early March (Monarch Joint Venture, 2023).

2.3.3.2 Designated Critical Habitat

The USFWS defines designated critical habitat as the specific areas within the geographic area, occupied by the species at the time it was listed, that contain the physical or biological features that are essential to the conservation of endangered and threatened species and that may need special management or protection. Designated critical habitat may also include areas that were not occupied by the species at the time of listing but are essential to its conservation (USFWS, 2024).

Silver Creek is designated critical habitat from its headwaters to its confluence with the Kentucky River for the Kentucky Arrow Darter (USFWS, 2022).

2.3.3.3 Migratory Birds

The Migratory Bird Treaty Act (MBTA) of 1918 (16 U.S.C. §§ 703-712) implements the 1916 Convention between the United States (U.S.) and Great Britain (for Canada) for the protection of migratory birds. Later amendments implemented additional treaties between the U.S. and Mexico (1936), the U.S. and Japan (1972), and the U.S. and the former Union of Soviet Socialistic

Republics (1976). These four treaties and their enabling legislation established Federal responsibilities for the protection of nearly all species of migratory birds, their parts, eggs, and nests. Under the provisions of the MBTA, it is unlawful to "...pursue, hunt, take, capture, kill, attempt to take, capture or kill, possess, offer for sale, sell, offer to purchase, purchase, deliver for shipment, ship, cause to be shipped, deliver for transportation, transport, cause to be transported, carry, or cause to be carried by any means whatever, receive for shipment, transportation or carriage, or export, at any time, or in any manner, any migratory bird or any part, nest, or egg of any such bird..."(16 U.S.C. 703).

The term "take" means "...to pursue, hunt, shoot, wound, kill, trap, capture, or collect, or attempt to pursue, hunt, shoot, wound, kill, trap, capture, or collect..." (50 Code of Federal Regulation [CFR] 10.12). Intentional take is a take that is the purpose of the action. Unintentional take (incidental take) is a take that is not the purpose of the action but occurs as a result of an otherwise legal action. The MBTA makes no mention of habitat modification or destruction, unlike the ESA that identifies habitat modification or destruction as "harm" under the definition of "take."

The USFWS IPaC report identified three birds of conservation concern (BCC) with ranges that intersect the project area including the chimney swift (*Chaetura pelagica*), prairie warbler (*Setophaga discolor*), and wood thrush (*Hylocichla mustelina*) (USFWS, 2023b). These species are listed as BCCs range wide indicating that care should be taken to not negatively affect these birds wherever they are found.

No bald or golden eagles, which are protected under the Bald and Golden Eagle Protection Act, were identified by IPaC to be within the project area.

2.4 Physical Environment

2.4.1 Recreational, Scenic, and Aesthetic Resources

2.4.1.1 Local Resources

Beattyville is situated alongside the North Fork Kentucky River, which provides opportunities for wildlife viewing, fishing, and boating. Beattyville has a public launch ramp on the northern side of the North Fork Kentucky River (KDFWR, 2023a). Structures in Beattyville are characterized as having primarily masonry architecture with a prevalent use of yellow brick with smooth-face textures for building walls and cut-stone blocks for foundations. Beattyville is home to multiple shopping opportunities and local restaurants. At the northeastern end of the project area, the Three Forks Historical Center provides insight into the region's history (Google Earth, 2023).

2.4.1.2 Regional Resources

The region around Beattyville has a wealth of recreational opportunities. Tourism is important in the area and ziplining, horseback riding, paddling, fishing, and other tourist attractions are common. The region is also a hotspot for rock climbing with approximately 1000 acres set aside for the sport. In addition to recreational resources, the region also has a wealth of scenic beauty with the valleys of Red River Gorge and the land bridge at Natural Bridge State Park, north of Beattyville (City of Beattyville, 2023). Additionally, Beattyville is near the Daniel Boone National Forest, offering views of deciduous forests and opportunities for camping (City of Beattyville, 2023). As a whole, the region has rugged topography with steep cliffs capped by sandstone peaks, with river valleys in between. The region is largely forested when not developed, consisting mostly of mixed oak with red maple understories (bplant, 2023). River views are common

throughout the region as most development occurred nearby the Kentucky River and its tributaries.

2.4.2 Cultural Resources

Several steps were taken to identify cultural resources within the project area. USACE searched the online database of the National Register of Historic Places (NRHP) maintained by the National Park Service, the Kentucky Heritage Council (KHC), the Kentucky Office of State Archaeology, and USACE Geographic Information System (GIS) files to identify any previously recorded archaeological sites and above ground structures located within the project area. Currently, there have been six (n=6) archaeological surveys (Table 3) within portions of the project area and fifteen (n=15) identified archaeological sites (Table 4) within a two-kilometer radius. The Real Estate Inventory identified a total of 127 structures that could potentially be historic buildings within the project area. USACE determined that the undertaking would potentially affect 53 structures within the project area. Of these 53 structures, 32 (28 contributing and 4 non-contributing) are included in the Beattyville Historic District and the remaining 21 are non-historic.

The Beattyville Historic District (SG100010769) was listed on the NRHP on September 5, 2024, under Criterion A (Brandenburg 2024). The district includes thirty-seven (n=37) contributing resources and sixteen (n=16) non-contributing resources throughout the downtown area of Beattyville. The district's significance stems from historic functions related to commerce, local government, transportation, and social cohesion between the local community to its downtown landscape. The district retains integrity related to location, setting, materials, design, and association. In regard to the aspect of integrity related to materials and design, the Beattyville Historic District clearly states that the external characteristics of the contributing resources are what signify the district's significance, and more specifically the use of masonry on the front facades of these structures. Table 5 includes all structures within the Beattyville Historic District that are included in the project.

USACE consulted with the Kentucky State Historic Preservation Office (KY-SHPO), and Tribal Nations. An Interagency and Stakeholder meeting was held on August 7, 2023, and the KY-SHPO and federally recognized Tribal Nations were invited to participate in this meeting. Representatives from the Osage Nation were present during this meeting and requested that multiple avenues of communication should be considered for future Tribal consultation and that USACE should not assume that no response means the Tribes are not interested in the project. On March 15, 2024, USACE provided updated letters on the area of potential effects (APE) and level of effort (LOE) to KY-SHPO and Tribal Nations. The APE consisted of the 500-year flood-plain and identified above-ground structures assessed for this study. The KY-SHPO concurred with the APE and LOE on April 15, 2024, and the Osage Nation was the only Tribal Nation that responded. See Appendix B for KY-SHPO and Tribal Nations consultation and responses.

USACE consulted with Tribal Nations on April 29, 2024 regarding Traditional Cultural Properties and indigenous knowledge. The Delaware Nation responded on May 6, 2024 stating Lee County was not an area of interest. No additional indigenous knowledge or comments was received from the Tribal Nations. USACE consulted with the KY-SHPO and Tribal Nations Tribes on October 4, 2024 regarding the 53 structures included within the project area. On October 7, 2024, the KY-SHPO responded by stating that they agree that the floodproofing measures identified are appropriates means of minimizing or avoiding adverse effects to Beattyville's historic properties. They requested to be provided any future cultural survey reports for their review. The archaeological survey report was provided to the KY-SHPO and Osage Nation on Dec 20, 2024.

No response was received from Tribal Nations including the Osage Nation and the KY-SHPO concurred on January 15, 2025.

Table 3. Previous Archaeological Investigations that occurred within the project area of the Beattyville Flood Risk Management General Interest Study

Author	Date	Title
Sheldon, Gregory A.	1990	A Phase One Archeological Assessment of the Proposed Falcon Ridge Apartments Near Beattyville, Lee County Kentucky
Uecker, Steve P. and Steven A Creasman	2002	An archaeological Survey of 3.8 Linear Miles (Targeting Areas of High Archaeological Potential) within the proposed KY 11 Relocation Project Boundaries in Lee and Owsley Counties Kentucky.
Bundy, Paul D.	2003	Assessment of Archaeological Potential for the KY 11 Relocation Project in Lee and Owsley Counties, Kentucky
Crider, Andrea	2003	
Moore, Rose G.	2004	An Archaeological Survey of the Beattyville and Heidelberg Tipples and Barge Loading Facility
Loughlin, Michael	2007	Phase I Archaeological Survey of a 2,100-foot Segment of a Project Electrical Power Transmission Line.
Brandenburg, Dedra	2024	National Register of Historic Places Registration Form for the Beattyville Historic District. Ms on file with the National Park Service.

Table 4. Previously recorded archaeological sites located within or adjacent to the project area. Data taken from Kentucky Office of State Archaeology, database accessed January 24, 2024

Site Number	Cultural Affiliation/ Site Type	NRHP Status
15Le30	Indeterminant Precontact / Rockshelter	Unevaluated
15Le31	Woodland Period / Rockshelter	Unevaluated
15Le216	Historic Euro-American / Cemetery	Unevaluated
15Le247	Historic Euro-American / Historic farm; residence	Unevaluated
15Le248	Historic Euro-American / Historic farm; residence	Unevaluated
15Le250	Indeterminant Precontact / Rockshelter	Unevaluated
15Le251	Historic Euro-American / Historic farm; residence	Unevaluated
15Le252	Indeterminant Precontact / Open habitation without mounds	Not Eligible
15Le253	Indeterminant Precontact / Rockshelter	Unevaluated
15Le254	Historic Euro-American / Cemetery	Not Eligible
15Le259	Historic Euro-American / Historic farm; residence	Unevaluated
15Le276	Historic Euro-American / Other	Not Eligible
15Le30	Indeterminant Precontact / Rockshelter	Unevaluated
15Le31	Woodland Period / Rockshelter	Unevaluated
15Le216	Historic Euro-American / Cemetery	Unevaluated

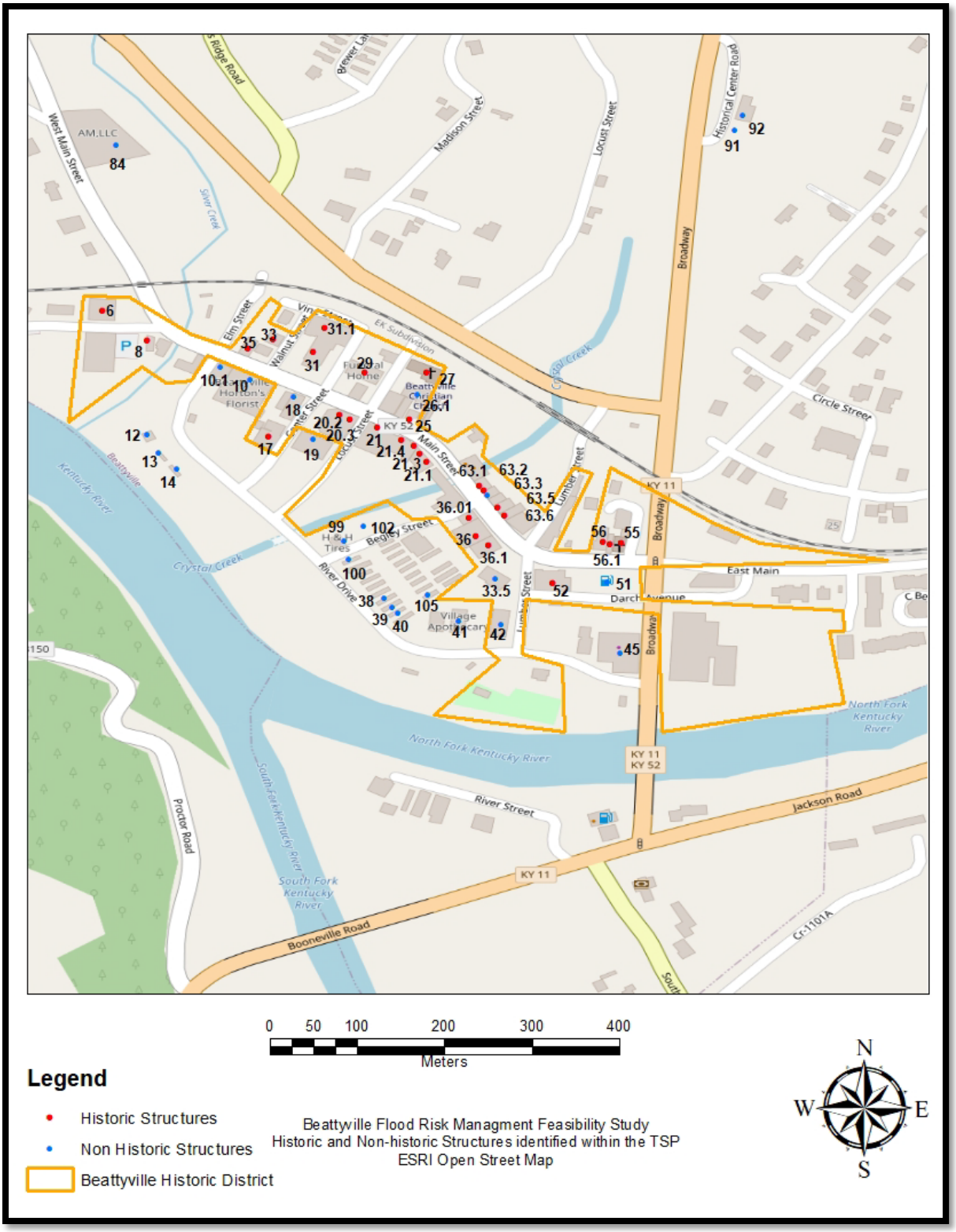

Figure 3. Identified historic structures within the project area.

Table 5. Structures included within project area that are within the Beattyville Historic District.

Structure No.	BHD No.	Action	Site No.	Address	Description
6	1	WFP	LEB 109	28 Railroad Street	Beattyville City Hall
35	2	WFP	LEB 110	290 Main Street	Charles Berry Jackson Building
33	4	Elevate / WFP	LEB 111	21 Walnut Street	Adams Residence
31 & 31.1	5	WFP	LEB 14	256 Main Street	Lee County Courthouse
29	9	WFP	LEB 101	108 Center Street	Newman Funeral Home
27	10	WFP	LEB 102	145 Locust Street	Beattyville Christian Church
26.1	11*	DFP	LEB 115	130 Locust Street	Beattyville Church Activity Center
25	13	DFP	LEB 117	186 and 190 Main Street	Tom Hollon Law Office
63.1	16	WFP	LEB 120	130 Main Street	Ray Shuler Building
63.2	17	WFP	LEB 121	124 Main Street	Catholic Thrift Store
63.3	18	WFP	LEB 122	118 Main Street	Ray Shuler Building
63.5	20	WFP	LEB 124	106 Main Street	Lee County Farm Bureau Building
63.6	21	WFP	LEB 125	100 Main Street	Lucas Building
56	24	WFP	LEB 128	30, 32,34 Main Street	Sharon Bush Building
56.1	25	WFP	LEB 129	28 Main Street	Army Surplus Building
55	26	WFP	LEB 130	22 Main Street	McGuire Memorial Presbyterian Church
51	31	WFP	LEB 133	25, 29, 33 Main Street	Kentucky Food Storage Building
52	32	WFP	LEB 134	59 Main Street	Huda Jones - Boone Jones Building
42	34*	Acquire	LEB 135	23 Lumber Street	The Gumm building
33.5	35*	DFP	LEB 136	79 Main Street	Valero Gas Station
36.1	36	WFP	LEB 137	87,89, 91 Main Street	Masonic Lodge of Proctor #213
36	37	WFP	LEB 138	101 Main Street	Barry Jackson Storage Building
36.01	38	WFP	LEB 139	105,109, 113 Main Street	Hargas Ross Building
21.1	40	WFP	LEB 103	169 Main Street	Beattyville Florist and Burgess Building
21.2	41	WFP	LEB 104	167 Main Street	Cox Building, old Burgess Building
21.3&21.4	42	WFP	LEB 105	187 Main Street	Don Begley Auto Shop
21	43	WFP	LEB 106	203 Main Street	Congleton Hardware Building
20.3	44	WFP	LEB 3	217 Main Street	Peoples Exchange Bank

Structure No.	BHD No.	Action	Site No.	Address	Description
20.2	45	WFP	LEB 108	223 Main Street	Peoples Exchange Bank - Movie Theatre
17	48	WFP	LEB 143	45 Center Street	Lee County Fiscal Court - THE HUB
18	49*	DFP	LEB 144	263 Main Street	Rose Brothers Dept Store
8	52	WFP	LEB 29	343 Main Street	Deal Building

NOTE 1: (*) identifies structures that are non-contributing to the Beattyville Historic District.

2.4.3 Air Quality

The Clean Air Act, 42 U.S.C. §§ 7401–7671q (CAA) mandates that the USEPA set air quality standards for pollutants considered harmful to public health and welfare. The National Ambient Air Quality Standards (NAAQS) set limits to protect public health, including the health of sensitive populations such as asthmatics, children, and the elderly. These standards have been established for six criteria pollutants including carbon monoxide (CO), lead (Pb), nitrogen dioxide (NO2), ozone (O3), particulate matter (PM10 and PM2.5), and sulfur dioxide (SO2), and each state is required to develop implementation plans for each pollutant. Areas are generally designated as being either in “attainment” of the standards for the pollutants listed above or in “nonattainment.”

Nonattainment areas are required by the CAA to comply with the NAAQS standards through the evaluation and development of a maintenance plan. The USEPA makes a conformity determination to assure that the actions within the maintenance plan conform to the respective state’s implementation plan for each nonattainment pollutant.

Desktop analysis conducted via the USEPA’s Green Book web application indicates that Lee County is in attainment for all criteria pollutants (USEPA 2023e).

2.4.4 Invasive species

Invasive species possess characteristics that allow them to spread easily into native communities and often displace and outcompete native flora and fauna (Kentucky Exotic Pest Plant Council, 2013). The Kentucky Exotic Pest Plant Council provides a list of exotic plant species’ that pose a significant threat to native plant communities (Table 6). The proposed project site does not have an existing site-specific inventory of invasive species, and their presence is not well known; however, it is anticipated that invasive species will be abundant due to the urbanized nature of the project area.

Table 6. Invasive Species listed as Severe Threat for Kentucky (Kentucky Exotic Pest Plant Council 2013)

Scientific Name:	Common Name:
Achyranthes japonica	Japanese chaff flower
Ailanthus altissima	Tree-of-heaven
Alliaria petiolata	Garlic mustard
Ampelopsis brevipedunculata	Porcelain berry
Arthraxon hispidus	Hairy jointgrass
Carduus nutans	Musk thistle
Celastrus orbiculatus	Oriental bittersweet
Cirsium arvense	Canada thistle
Clematis terniflora	Leatherleaf clematis
Conium maculatum	Poison hemlock
Securigera varia	Crown vetch
Dioscorea polystachya	Chinese yam
Elaeagnus umbellata	Autumn olive
Euonymus alatus	Burning bush
Euonymus fortunei	Wintercreeper
Festuca arundinacea	Kentucky 31 fescue
Glechoma hederacea	Ground ivy
Lespedeza cuneata	Sericea lespedeza
Kummerowia stipulacea	Korean lespedeza
Ligustrum sinense, L. vulgare	Privet
Lonicera japonica	Japanese honeysuckle
Lonicera maackii, L. fragrantissima, L. standishii	Bush honeysuckles
Lysimachia nummularia	Moneywort
Lythrum salicaria	Purple loosestrife
Melilotus alba	White sweet clover
Melilotus officinalis	Yellow sweet clover
Microstegium vimineum	Japanese stiltgrass
Miscanthus sinensis	Chinese silver grass
Paulownia tomentosa	Princess tree
Phragmites australis	Common reed
Polygonum cuspidatum	Japanese knotweed
Pyrus calleryana	Callery pear
Pueraria lobata	Kudzu
Ranunculus ficaria	Lesser celandine
Rhamnus cathartica	European buckthorn
Rosa multiflora	Multiflora rose
Sorghum halepense	Johnson grass
Stellaria media	Chickweed

2.4.5 Noise

Noise in the vicinity of the project area is generated by a variety of sources including light traffic along Kentucky Highway (KYHWY) 11 and 52, lawncare equipment and household power tools, and local businesses.

Noise is measured as Day Night average noise levels in “A-weighted” decibels (dBA) that the human ear is most sensitive to. There are no Federal standards for allowable noise levels. The USACE Safety and Health Requirements Manual provides criteria for short-term permissible noise exposure levels for consideration of hearing protection or the need to administer sound reduction controls, which is concurrent with Occupational Safety and Health Administration (OSHA) standards (USACE 2024) (Table 7).

Table 7. Non-Department of Defense Continuous Noise Exposures (OSHA Standard)

Duration/day (hours)	Noise level (dBA)
8	85
4	88
2	91
1	94
0.5	97
0.25	100

2.4.6 Transportation and Traffic

Two two-lane highways cross the project area. KYHWY 11 bisects the project running north and south while KYHWY 52 runs west from its intersection with KYHWY 11. The rest of the project area contains urban city streets for both business and residential use. It is anticipated that traffic levels would be light, even at peak hours, due to the rural nature of the project area. The KYHWY 11 bridge at the southern end of the project area is one of the few methods of crossing the North Fork Kentucky River with the closest alternative crossing being approximately 4 miles west by southwest of the project area at Heidelberg. In addition to vehicular traffic, a CSXT class 1 rail line crosses the southern end of the project area running from east to west (Google Earth 2023, Kentucky.gov 2017). Class 1 rail lines are classified as freight rail lines owned and operated by companies with an operation revenue of more than $272 million dollars (SCMEDU 2023). Finally, the north Fork Kentucky River is not currently used for commercial navigation, though it is used for recreational boating with one boat launch ramp being present within the project area (Kentucky.gov, 2023b; KDFWR, 2023a).

2.4.7 Hazardous and Toxic Substances

The Hazardous and Toxic Substances section of this EA addresses the identification and assessment of Hazardous, Toxic, and Radioactive Waste (HTRW) resources within the project area. HTRWs encompass a wide array of substances that pose significant risks to human health and the environment due to their inherent toxicity, flammability, corrosiveness, or potential for contamination. These substances are subject to stringent regulations aimed at safeguarding public health and the environment.

At the Federal level, the Resource Conservation and Recovery Act of 1976, 42 U.S.C. §§ 6901–6992k (RCRA) and Comprehensive Environmental Response, Compensation, and Liability Act of

1980, 42 U.S.C. §§ 9601–9675. (CERCLA), commonly known as Superfund, are the primary legislative frameworks governing the management and cleanup of hazardous substances. RCRA regulates the generation, transportation, treatment, storage, and disposal of hazardous waste, while CERCLA provides the authority and funds for the cleanup of hazardous waste sites, including those posing imminent threats to public health or the environment.

Additionally, state regulations play a crucial role in overseeing HTRW management and remediation efforts. In Kentucky, the Department for Environmental Protection (KDEP) administers regulations and programs related to hazardous waste, contaminated sites, and underground storage tanks. These regulations complement Federal laws and ensure that HTRW resources are properly managed and remediated to protect human health and the environment.

A comprehensive search of applicable Federal and state databases revealed the presence of various HTRW sites within the vicinity of the project area. These resources include RCRA hazardous waste generators, and facilities, as well as KDEP Superfund sites (Table 8). Additionally, according to the KDEP underground storage tank statewide report, there are active underground storage tanks present at the IGA grocery store, Valero gas station, and Shell gas station which are located at the following Beattyville, KY addresses respectively: 285 Main St.; 79 Main St.; and 17 KYHWY 11 South. For a complete list of underground storage tanks, including removed storage tanks see Appendix B.

Table 8. Federal and State HTRW Records search results (KDEP 2023a-b, kentucky.gov 2023b, USEPA 2023l)

Site Type	Location	Notes	Latitude	Longitude
RCRA Generator List	Family Dollar 484	Very small quantity generator	37.571203	-83.706515
RCRA Generator List	Omnicare Beattyville	Very small quantity generator	37.582797	-83.701277
RCRA Generator List	Beattyville Asphalt Plant	Used oil program	37.568451	-83.707051
KDEP Superfund Site	Lee County State Maintenance Garage	Managed petroleum spill cleanup	37.55278	-83.71250
KDEP Superfund Site	Lee County Maintenance Garage	Minor petroleum release cleanup	37.57977	-83.71957
KDEP Superfund Site	White Ash Road Dump	Abandoned drums, closed	37.56856	-83.72790
KDEP Superfund Site	Beattyville Housing Development Property	Meth lab cleanup, closed	37.59815	-83.70750

Site Type	Location	Notes	Latitude	Longitude
RCRA Hazardous Waste Facility	Former City Hall	Engineering Controls in place. Also, on Brownfield list for lead-based paint and asbestos	37.573707	-83.711176

2.5 Economic Environment

2.5.1 Socioeconomics

Beattyville is located in the heart of Appalachia, a region of the United States that has been subjected to over a century of resource extraction in support of the overall economic vitality of the country. Resource extraction, particularly coal mining, has deeply impacted Appalachian communities in several ways. Economically, it has been a double-edged sword, providing jobs and economic stability while also creating cycles of boom and bust. The industry's decline has left many communities, including Beattyville, struggling with unemployment and poverty. Mountaintop removal mining has resulted in significant changes to landscapes, including deforestation, water quality impacts, and alterations to habitats. Additionally, health issues like black lung disease and other respiratory ailments are prevalent among miners, and communities suffer from higher rates of poverty, substance abuse, and inadequate infrastructure as a result of the industry's dominance and decline. Table 9 shows a summary of key socioeconomic metrics for Beattyville compared with the State of Kentucky and the United States.

Table 9. Socioeconomic data for Beattyville Kentucky compared with the State of Kentucky and the United States.

Socioeconomic Metric	Beattyville	Kentucky	United States
Median Household Income	$37,226	$61,118	$77,719
% Poverty	26.6	16.4	12.5
% High School Education	74.4	89.5	89.7
% Employment	37.1	57.4	60.6
% Without Healthcare Coverage	6.1	5.4	7.9
% Disabled	27.9	18.1	13.6
% 65 Years or Older	15.9	17.8	17.7

Census data reveals that Beattyville has lower income, higher rates of poverty, lower rates of education, lower employment rates, and a higher percentage of disabled citizens than state or national averages (U.S. Census Bureau, 2025).

2.5.2 Executive Order 13045 Protection of Children

EO 13045 “Protection of Children from Environmental Health Risks and Safety Risks” was issued in 1997. This order applies to economically significant rules under EO 12866 “Regulatory Planning and Review” that concerns an environmental health or safety risk that the USEPA has reason to believe may disproportionately affect children. Environmental health risks or safety risks refer to risks to health or to safety that are attributable to products or substances that children are likely

to come in contact with or ingest (such as the air we breathe, the food we eat, the water we drink or use for recreation, the soil we live on, and the products we use or are exposed to).

2.6 Most Probable Future Without Project (FWOP) Condition

In the absence of a Federal project, Beattyville will experience flood events similar to and greater than the March 2021 event. If similar flooding occurs, Beattyville may have difficulty retaining citizens and businesses due the frequency and severity of damages incurred, cleanup costs from multiple inundations, and risk of potential imminent flood events. It is assumed that as a result of neglecting these risks, insurance rates will increase, and current and potential residents and business owners will be less inclined to remain and/or relocate in Beattyville. If Beattyville loses residents and long-standing businesses, visitation, and economic activity in and surrounding the study area will decrease. A reduction in population, commerce, and tourism would be expected to cause a concomitant reduction in the local tax base which would make it difficult for Beattyville to maintain infrastructure and quality of life for its citizens. This instability will adversely impact the recreational tourism industry of the area and would contribute to continued economic struggles for the already at-risk community. Table 10 is a record of high-water events at each of the USGS river gages along the Kentucky River including the three forks upstream of Beattyville. Descriptions of FWOP conditions for all relevant resources are provided in Section 4, Environmental Effects and Consequences when describing impacts related to the NAA. For brevity, this section provides a high-level assessment of future flood risk and how that risk affects socioeconomic conditions in Beattyville.

Table 10. Major Flood Events

Date	***Peak Inflow (cubic feet per second)***	***Elevation (ft-NAVD88)***	***Gage Height (ft)***
USGS Gage 03280000 – North Fork			
July 29, 2022*	54,400	739.70	42.00
May 8, 1984*	53,500	739.67	41.97
January 30, 1957	53,500	738.11	40.41
USGS Gage 03281000 – Middle Fork			
January 30, 1957	52,700	684.88	43.33
February 1939	37,300	682.05	40.50
February 2, 1951	35,300	681.62	40.07
USGS Gage 03281500 – South Fork			
January 30, 1957	66,100	685.31	43.40
February 28, 1962	54,700	682.65	40.74
May 8, 1984	51,600	683.03	41.12
USGS Gage 03282000 – Kentucky River Lock 14			
February 04, 1939	120,000	660.99	35.60
January 30, 1957	116,000	660.39	35.00
March 24, 1929	113,000	659.79	34.40
USGS Gage 03284000 – Kentucky River Lock 10			
December 10, 1978*	101,000	596.25	40.15
February 05, 1939	92,400	590.90	34.80
March 01, 1962*	91,500	592.17	36.07
USGS Gage 03287500 – Kentucky River Lock 4			

Date	*Peak Inflow (cubic feet per second)*	*Elevation (ft-NAVD88)*	*Gage Height (ft)*
December 09, 1978*	118,000	510.05	48.47
January 25, 1937	115,000	509.04	47.46
February 16, 1989*	105,000	505.75	44.17

**Events occurred after regulation of the respective USGS gage*

2.7 Long-term Assessment of Hydrometeorological Conditions

A Tier 1 qualitative long-term assessment of hydrometeorological conditions was completed as required by USACE Engineering and Construction Bulletin (ECB) 2018-14. This was a screening-level assessment that documents the qualitative effects of changing conditions on hydrology in the region and informs the Beattyville, KY General Investigation of the potential impacts and risk drivers which can potentially be attributed to changing conditions. The assessment included a literature review, nonstationarity detection and trends in observed hydrologic site data, projected future results, a vulnerability assessment, and a residual risk matrix.

The literature presents conflicting evidence regarding the hydrologic trends expected in the future. In general, the following statements represent the probable hydrologic future that can be expected within the Kentucky River Basin:

- Winter and spring precipitation could potentially increase while future trends of summer and fall precipitation are uncertain (Runkle, 2022). Projected increases fall during the typical flood season, which is likely to further increase peak streamflow and reservoir levels. This projection emphasizes the continued need of flood risk management projects into the future. The associated increases in flows on the rivers in the Kentucky River Basin may lead to more frequent and higher loading of levees and other flood infrastructure in the region during the winter and spring flood season.
- The frequency and intensity of extreme precipitation events could potentially increase, making current infrastructure that is designed for historical climate conditions more vulnerable for future flood events (National Climate Assessment 5, 2023).
- Projected future temperatures are anticipated to increase moderately over historic norms. This has various hydrologic implications including increased atmospheric moisture, evapotranspiration rates, frequency of droughts, and water supply demand (National Climate Assessment 5, 2023).

Due to changing conditions over time, it is recommended that precipitation, temperature, and streamflow be reevaluated periodically to determine how projected trends manifest themselves in future observations. Depending on the results of these future analyses, additional flood risk reduction measures may be required. Based on the current Beattyville long-term assessment of hydrometeorological conditions (Appendix F), it is recommended that the potential, future effects of changing conditions be treated as occurring within the uncertainty range calculated for the current hydrologic analysis. If this assumption proves to be inadequate when future observations or more refined projections become available, then a quantitative evaluation and revision of these results may be required.

3 PLAN FORMULATION AND EVALUATION

This chapter describes the development, evaluation, and selection of alternative plans that address the study objectives. Alternative plans are made up of individual or combinations of management measures. Management measures help prevent or reduce flood risk by using either structural or nonstructural means or a combination of the two.

3.1 PLANNING FRAMEWORK

A general overview of the plan formulation sequence and strategy for this study is presented in the following approach.

1. Management Measure Identification – Initial management measures were identified through collaboration between project stakeholders and the study team. These measures were initially developed to address flood risk along streambanks, leveraging the expertise of USACE while adhering to policy and authority constraints. The following measures have been implemented in past floodplain management projects within the USACE Great Lakes and Ohio River Division (LRD) and were developed such that rough order of magnitude costs could be applied for plan formulation purposes:

    - Structural Measures: reduce or avoid damages by modifying the nature and/or extent of the flood hazard.
    - Nature Based Solutions: protect, conserve, restore, sustainably use, and manage natural or modified ecosystems to enhance flood control systems.
    - Nonstructural Measures: reduce the consequences of flooding rather than reducing the probability of flooding. This category of measures includes physical measures such as structural modifications, acquisition, and relocation, and non-physical measures such as emergency response.

2. Management Measure Screening – Screening determined which management measures should be included in the initial array of alternatives based on their effectiveness, efficiency, and acceptability, as outlined by Principles & Guidelines (USACE, 1983). Specific considerations for screening included whether the measure effectively reduced flood risk, the rough order of magnitude cost, and whether there were environmental concerns.

3. Initial Array Formulation and Evaluation – The remaining measures were combined into an initial array of alternatives - combinations of management measures that aim to reduce risk throughout the study area. The initial array was evaluated based on the following evaluation criteria: effectiveness, efficiency, completeness, acceptability, identified planning objectives (Section 1.8.1), operation and maintenance (O&M) costs, and environmental effects/sustainability. Alternatives in the initial array were either retained for further consideration/reformulation in the expanded array or screened from further consideration.

4. Expanded Array Formulation and Evaluation – The remaining alternatives were combined into an expanded array of alternatives - variations of alternatives presented

in an initial array that expanded the scope to include multiple target elevations for both structural and nonstructural alternatives. The expanded array of alternatives was evaluated based on the following evaluation criteria: effectiveness, efficiency, completeness, acceptability, environmental effects, and social considerations. Alternatives were also evaluated with respect to the four accounts as outlined in the P&G. The four accounts are National Economic Development (NED), Regional Economic Development (RED), Environmental Quality (EQ), and Other Social Effects (OSE). Alternatives in the expanded array were either retained for further consideration/reformulation in the final array or screened from further consideration.

5. Final Array Formulation and Comparison – Alternatives retained for further consideration were reformulated into the final array of alternatives. Alternatives within the final array were then evaluated and compared using the same criteria and accounts discussed in step 4. The final array was also evaluated for the extent to which alternatives met the planning objectives, as well as remaining risk and uncertainty.

3.1.1 Initial Structural and Nonstructural Measures

Local and regional solutions to the flood risk problem were evaluated and ten distinct structural measures and six nonstructural measures were identified for consideration. Detailed descriptions of the measures are provided in Appendix A, Section 9.1.1.

Structural Measures

- Booneville Dam/Reservoir to impound water on the South Fork of the Kentucky River
- Cut-through to create a new channel so water bypasses a specific area prone to flooding
- Levee at Silver Creek consisting of a compacted earthen berm that acts as a flood barrier
- Floodwall that acts as a flood barrier
- Pump station utilizing pump(s) to move interior water beyond a flood barrier
- Pressure pipe used to pass water through a leveed area
- Change in operation of upstream USACE dams to reduce flooding in the project area
- Channel widening to cut back the riverbanks to allow more flow
- Dredging to deepen the channel to allow more flow
- Restoring the Kentucky River channel to remove fill placed near the streambank by the CSXT railroad

Nonstructural Measures

- Elevation/raise in place
- Relocation
- Acquisition
- Dry floodproofing
- Wet floodproofing
- Flood Warning and Emergency Evacuation Plan (FWEEP)

3.1.2 Screening of Initial Measures

A Qualitative Assessment of these 18 measures (provided in Section 3.1.1) was performed.

Measures were screened based on the following criteria:

1. Effectiveness in Reducing Flood Risk - This criterion evaluates the degree to which a measure reduces flood hazards for people, property, and infrastructure within the project area. Measures must demonstrate a clear and measurable reduction in flood frequency, depth, duration, or extent. Consideration is also given to the scale and sustainability of the risk reduction provided.
2. Estimated Cost (Rough Order of Magnitude) - This considers the approximate cost of implementing the measure based on conceptual-level designs and comparable project data. It includes construction, real estate, operations and maintenance, and potential mitigation costs. Measures with disproportionately high costs relative to their benefits or limited scalability may be screened out.
3. Environmental Concerns - This evaluates the potential for a measure to cause significant adverse impacts on environmental resources, including wetlands, habitat, water quality, endangered species, and cultural resources. Measures that would likely trigger major permitting obstacles or require extensive mitigation may be considered less viable at the screening stage.

The nine measures shown in Table 11 were screened out.

Five measures were screened due to their ineffectiveness with flood risk mitigation (cut-through, restoring the Kentucky River channel, channel widening, dredging, and change in operation of USACE dams upstream) and two were considered not to be efficient as the cost of those measures were orders of magnitude higher than the competing measures (levee at pump station, and dam). Notably, a reservoir was considered, and while it was determined that flood risk could be substantially reduced in Beattyville, it was also understood to involve extremely high cost to construct, high cost to operate and maintain, generated serious environmental concerns, and created real estate acquisition concerns associated with the subsequent displacement of a community. In addition to the dam measure, the levee at Silver Creek and pressure pipe were also screened. During the screening process, they both had high environmental costs including impacts to critical habitats.

Table 11: Measures screened from further consideration

Measures	**Flood Risk Reduction (Effectiveness)**	**Cost (Efficiency)**	**Environmental**	**Notes**
Dam	Yes	$$$$$	Extreme concerns – habitat, endangered species	Real estate acquisitions, displacement of community
Cut-through	No	$$$$	Presence of abandoned mine	
Restoring the Kentucky River channel	No	$$$	Removed fill material would likely have to be disposed of (not reusable)	

Measures	Flood Risk Reduction (Effectiveness)	Cost (Efficiency)	Environmental	Notes
Channel widening	No	$$$$$	Potential habitat and endangered species	
Dredging	No	$$$$	Potential habitat and endangered species	Would have to be repeated, material would have to be disposed of
Levee at Silver Creek	Not as a standalone measure	$$	Silver Creek is critical habitat for threatened and endangered species	Only targets structures in a specific area
Pump Station	Not as a standalone measure	$$$$	No	The NFS has limited resources available for O&M
Pressure Pipe	Not as a standalone measure	$	High concern; would turn Crystal Creek into a tunnel/pipe	
Change in operation of USACE dams upstream	No	$$$$	Potential changes to riverine habitat	

Based on the Beattyville long-term assessment of hydrometeorological conditions (Appendix F), any recommended nonstructural measures should, where practical, be designed to withstand increased 100-year inundation depths to accommodate inundation rises at a quicker rate than existing conditions. If a floodwall measure is recommended, the floodwall height should increase to accommodate potential streamflow increases. These factors were taken into consideration during alternative formulation.

3.2 Formulation and Evaluation of the Initial Array of Alternatives

Ultimately three action alternatives were formulated from the measures that were carried forward: Structural, Nonstructural (Physical), and FWEEP.

Structural and FWEEP: Floodwall

Nonstructural (Physical) and FWEEP: Potential nonstructural measures include:

- Elevation - Raising a structure and its contents above flood heights and allowing flood waters to flow under the newly elevated first floor.

- Dry floodproofing – Measure designed to prevent water from entering a structure or to minimize damages once water has entered a structure (backflow valves, closures, seals, etc).
- Wet floodproofing – Combination of measures to reduce damage to finishes, utilities, and equipment while allowing water to enter a structure. All materials below level must be resilient.
- Relocation – Process of acquiring the land on which an at-risk structure is located and physically relocating the structure
- Acquisition – Process of acquiring the land on which an at-risk structure is located and subsequent demolition of structure.

FWEEP: Inundation mapping, evacuation planning, floodplain management plan, flood sensors/gage, and flood sirens

3.2.1 Alternative Plans Descriptions

Each of the measures carried forward meets the objectives of the study and is likely to reduce flood risk. The measures carried forward were combined into four alternative plans (including No Action) as the initial array of alternatives.

Alternative 1: No Action

Alternative 1 is the No Action Alternative (NAA). USACE planning policy (Engineering Regulation 1105-2-103) and NEPA require consideration of a NAA. The NAA is the basis for the FWOP and assumes no measures would be implemented by the Federal government to achieve the planning objectives. The FWOP serves as a baseline for future conditions assumed to take effect in the study area in the absence of Federal action. This baseline serves as the foundation of comparison against which all subsequent alternatives are evaluated.

The NAA would not reduce flood risk within the study area, including economic damages associated with inundation of structures and impacts to commerce, and it also has no impact with respect to the life safety risk currently experienced in the community. No action would result in Beattyville being less resilient to potential increases in precipitation and streamflow that are projected to occur because of changing conditions to hydrology in the region. Repetitive inundation within this socially vulnerable community could contribute to continuing decline of population in Beattyville and a loss of community cohesion.

Alternative 2: Floodwall Alignment

Alternative 2 includes two floodwall segments that do not cross either Silver Creek or Crystal Creek. Nonstructural measures would be applied in areas where the floodwall does not reduce damages. Figure 4 shows the floodwall segments with structures identified for nonstructural applications. This alternative also includes a FWEEP.

The floodwall alignments were chosen to prioritize protection of as many structures as possible while also avoiding the Kentucky River Regulatory Floodway, utilities, and minimizing demolition of existing structures. A floodwall is more desirable than a levee in this downtown project area due to its reduced footprint which results in fewer property acquisitions. In addition, when compared to levees, floodwalls also involve relatively less intrusion into the public space, which produces less negative impact on the area's visual aesthetics, such as viewshed and overall

character. This alternative avoids environmental concerns (endangered species and designated critical habitat in Silver Creek) and does not require costly pump stations.

With no loss of life resulting from the March 2021 event, at this point in the plan formulation process, it was difficult to determine if certain measures and alternatives exacerbate or mitigate life safety risk. The flooding occurred during the night in an area that is largely commercial, so fewer people would be expected downtown as opposed to an event taking place during the day or in a residential area.

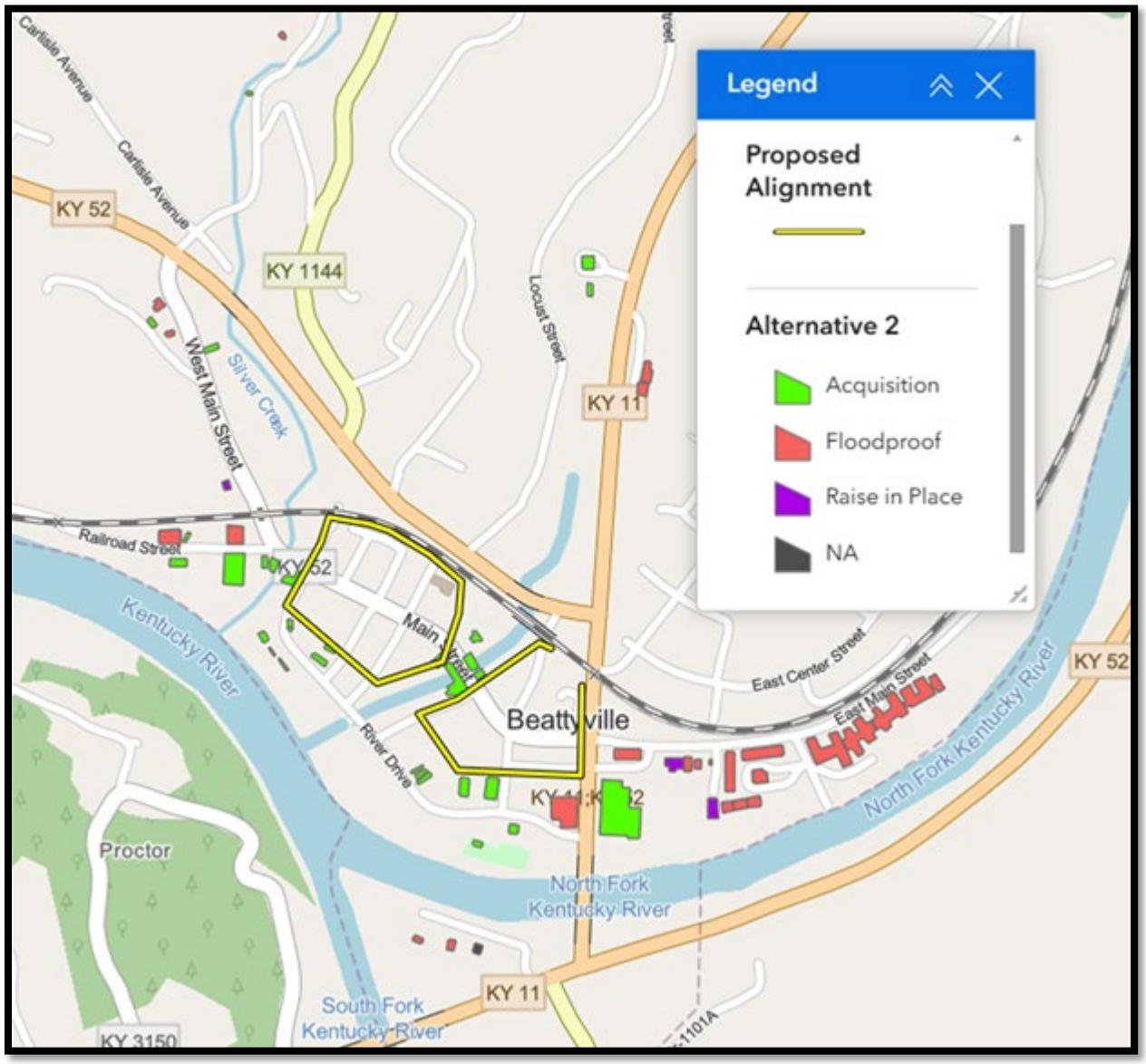

Figure 4. Alternative 2: Floodwall Alignment

Alternative 3: Complete Nonstructural

A project consisting entirely of nonstructural measures, listed in Section 3.2.1, was also carried forward for consideration (inclusive of a FWEEP). Due to a lack of parametric costs at this stage of the formulation process, there was tremendous uncertainty associated with the cost for

nonstructural measures. Nonstructural measures were aggregated by grouping the structures in Beattyville into nonstructural measures including acquisition, dry floodproofing, wet floodproofing, and elevation. This aggregation was completed by examining known details related to each structure including occupancy type, foundation type, and first floor elevation. The complete nonstructural plan is presented in Figure 5.

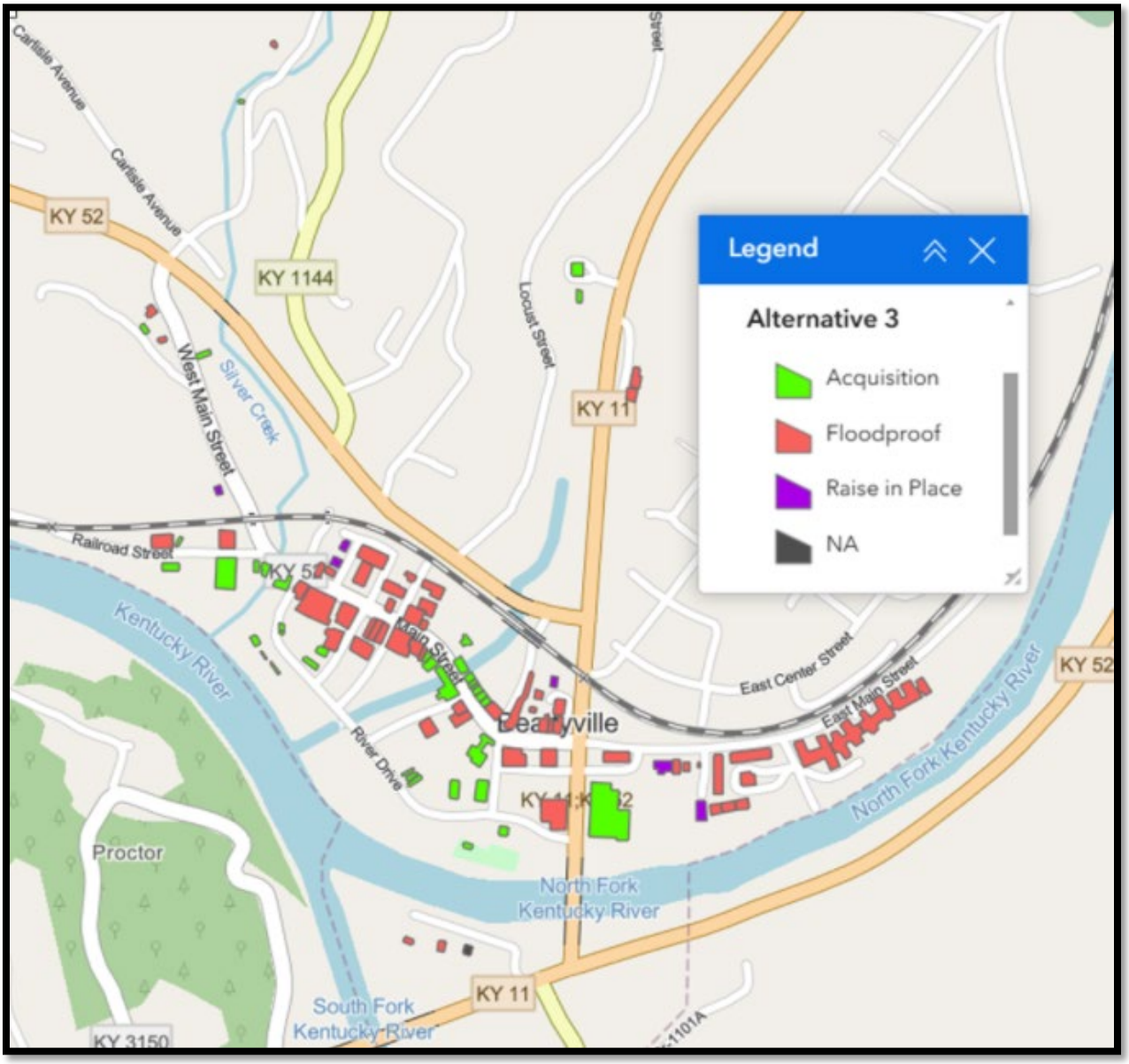

Figure 5. Alternative 3: Complete Nonstructural Plan Showing Selected Measures

Alternative 4: FWEEP

A project consisting of only a FWEEP. This alternative would provide the NFS with a plan to support emergency management and evacuation efforts, as well as suggested improvements to local development and zoning regulations.

The primary goals of the FWEEP are:

- Identification of flood threat
- Dissemination of information to residents as a warning or advisory
- Signal need for emergency services
- Promote better understanding of flood risks
- Plans for response, inclusive of an evacuation plan, are known in advance

The following are descriptions of FWEEP components:

- *Flood Inundation Mapping (FIM)*: FIM maps show the spatial extent and depth of flooding at specific stage intervals along an individual stream section. USACE will acquire the data, existing conditions hydrologic analysis, and hydraulic modeling to support the development of flood inundation maps in a format that is best suited to the NFS's intended use. Potential uses of the maps are for local Emergency Management response, or for uploading on a third-party website such as the U.S. Geological Survey (USGS).
- *Evacuation planning*: This provides a safe exit strategy for those in flood prone areas. USACE will provide supporting technical data and information for the development of an evacuation plan. Examples of data include identifying flood water levels at various stages that would create ingress and egress problems (road blockages) and determining exit routes for designated areas of Beattyville. Development of the evacuation plan will be contracted to a qualified vendor.
- *Flood Plain Management Plan (FPMP):* The FPMP is a plan for implementing measures, practices, and policies to reduce loss of life, injuries, damages to property and facilities, public expenditures, and other adverse impacts associated with flooding. It also preserves and enhances natural floodplain values and should also address measures which will help preserve levels of protection provided by the USACE flood damage reduction project (USACE 1997). Policy Guidance Letter (PGL) No. 52, Flood Plain Management Plans (USACE 1997) provides policy on Section 202 (c), Flood Plain Management Plans, of the Water Resources Development Act (WRDA) of 1996. USACE policy is to promote floodplain management at the non-Federal level by encouraging a NFS to develop its FPMP during the preparation of the feasibility study. This ensures compatibility of the FPMP with the USACE project. The NFS has not started the FPMP.
- *Flood sirens*: Flood sirens are simply audible flood warning devices. While flood sirens might not provide early enough warning to protect property (compared to the warning time provided by flood sensors and gages), they would provide life safety benefits. The benefits of a downtown sound system were evaluated versus the costs of installing flood sirens.

3.2.2 Principles & Guidelines Criteria Evaluation

An analysis of the initial array of alternatives compared the alternatives against the objectives and the P&G criteria. The team also compared alternatives based on two criteria specific to this project: the NFS constraint of a lack of funding for ongoing O&M after project completion and the alternative's level of environmental effect and sustainability.

P&G criteria comparisons:

- Completeness: A measure of the extent to which the necessary investments and actions, both Federal and non-Federal, have been considered and provided for.

- Effectiveness: The extent to which each alternative plan contributes to achieving the planning objectives.
- Efficiency: A measure of the cost effectiveness of each alternative to meet the project objectives.
- Acceptability: The extent to which the alternative plans are acceptable in terms of applicable laws, regulations, and public policies.

The following matrix (Table 12) was utilized to develop systematic, relative comparisons between the four initial alternatives. The screening criteria were assigned a qualitative score from 1-3 to differentiate between alternative plans:

1 – Does not meet the objective / criteria

2 – Meets the objective / criteria with some limitations / concerns

3 – Meets the objective / criteria

Table 12. Alternatives P&G Criteria Screening Matrix

FORMULATION		OBJECTIVES			P&G CRITERIA				OTHER	
Alternative	Description	1	2	3	Complete	Effective	Efficient	Acceptable	O&M	Env/Sust
1. No Action Alternative	No Federal action taken	1	1	1	2	1	2	2	1	2
2. Floodwall Alignment	Two floodwall segments that do not cross either creek + NS + FWEEP	3	3	1	3	2	2	2	2	2
3. Complete Nonstructural	A project consisting of only the nonstructural measure carried forward for consideration + FWEEP	3	2	2	2	2	2	3	2	3
4. FWEEP	A project consisting of only the FWEEP a non-physical, nonstructural measure.	3	2	2	2	2	3	3	2	3

Alternative 4 FWEEP scored highest on the P&G criteria comparison. The inclusion of a FWEEP in each alternative likely affects the scores of Alternatives 2 and 3.

3.3 Additional Alternatives Development and Analysis

The three initial action alternatives were further developed based on elevations at approximately three-foot intervals, which coincided with four flood elevations relevant to Beattyville. These different design elevations were applied to Alternatives 2 and 3 to provide a standardized way for the team to develop and analyze project design options and identify the most optimal plan. The elevations were:

- 663.0 ft NAVD88 (lowest elevation where damages still occur)
- 666.5 ft NAVD88 (reoccurrence of the March 2021 flood event)
- 669.2 ft NAVD88 (FEMA Base Flood Elevation)
- 672.2 ft NAVD88 (FEMA Base Flood Elevation +3 feet)

Terminology for the flood elevations is provided in Section 3.3.1.

3.3.1 Terminology

Base Flood Elevation (BFE): FEMA established the BFE for most of Beattyville as the elevation 669.1 ft NAVD88. However, as the model moves upstream, this elevation increases. For the purposes of this study, a BFE of 669.2 ft NAVD88 was selected for all of Beattyville for consistency. USACE Hydrology & Hydraulics (H&H) modeling determined the 100-year flood for Beattyville as 672.08 ft NAVD88, which was rounded for simplicity and the purposes of this report to match the BFE plus 3 ft elevation of 672.2 ft NAVD88. In summary, for the purposes of this study, FEMA's BFE for the study area was assumed to be 669.2 ft NAVD88, and the BFE plus 3 ft was assumed to be 672.2 ft NAVD88. See Section 3.3.2, 4.1.4, and 4.9.3 for more information on the various elevations used for this study. It should be noted that updating the FEMA model and BFE is outside the scope of our study, see Section 4.10.6.2 in the Engineering Appendix for further information.

3.3.2 Additional Alternatives Development

Alternative 2 Floodwall Alignment: Hydraulic analysis of four potential floodwall heights based on the flood elevations were described previously in Section 3.2.1, all with the same horizontal floodwall alignment. This created three additional floodwall alternatives (Figure 6):

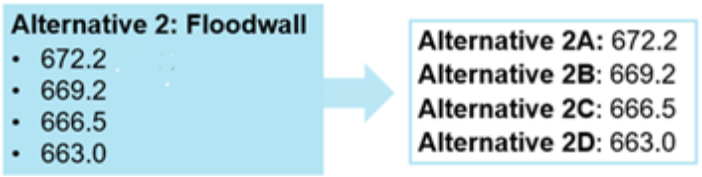

Figure 6. Floodwall Alternatives 2A, 2B, 2C, 2D

Alternative 3 Complete Nonstructural: Alternative 3 was also evaluated at the same four flood elevations (above), creating three additional nonstructural alternatives (Figure 7):

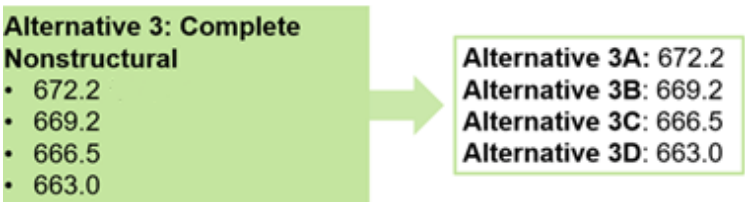

Figure 7. Nonstructural Alternatives 3A, 3B, 3C, 3D

3.3.3 Expanded Array of Alternatives Evaluation

This exercise resulted in four variations of floodwall alternatives and four variations of nonstructural alternatives. Therefore, at this stage in the formulation process, the expanded array of alternatives represented a total of 10 alternatives. Aside from the No Action Alternative, each of the 10 alternatives listed below includes a FWEEP as a component.

- No Action Alternative
- 2A. Floodwall Alignment 672.2 ft NAVD88
- 2B. Floodwall Alignment 669.2 ft NAVD88
- 2C. Floodwall Alignment 666.5 ft NAVD88
- 2D. Floodwall Alignment 663.0 ft NAVD88
- 3A. Complete Nonstructural 672.2 ft NAVD88
- 3B. Complete Nonstructural 669.2 ft NAVD88
- 3C. Complete Nonstructural 666.5 ft NAVD88
- 3D. Complete Nonstructural 663.0 ft NAVD88
- 4. Nonstructural (Non-physical) FWEEP

In compliance with section 4-4 of ER 1105-2-103 regarding comprehensive benefit analysis, an evaluation of the expanded array of alternatives based on the NED, RED, EQ and OSE accounts was completed. These 10 alternatives were evaluated both quantitatively [Hydrologic Engineering Center-Flood Damage Analysis (HEC-FDA) 2.0, LifeSim 2.1.3, and Regional Economic System (RECONS) 2.0] and qualitatively (positive impact - low, medium, and high) across each of the four accounts as shown in the Table 13. Due to underwhelming economic performance associated with each of the floodwall alignments (2A-2D) presented in HEC-FDA, these alternatives were screened prior to RECONS or LifeSim analysis. As a result, RED estimates and expected annual life loss calculations for these alternatives are presented qualitatively in Table 13.

Table 13. Expanded Array Alternatives Evaluation

			NED				RED	EQ		OSE		
Metrics	Number of Structures Eligible - Structural / NonStructural	Construction Cost (million) (FY24)	Project Total First Cost (million) (FY24)	Annual NED Benefits (includes rec)	BCR	Net Benefits	RED Benefits (millions)	Environmental	Cultural	Average Annual Life Loss	Social Connectedness	Communal Identity
1. No Action	0/0	0	0	0	N/A	0	LOW	MED	MED	0.135	LOW	LOW
2A. Floodwall Alignment 672.2	45/64	98	133	698,704	0.12	-4,852,980	HIGH	LOW	LOW	MED	LOW	LOW
2B. Floodwall Alignment 669.2	45/60	78	107	424,509	0.09	-4,041,243	HIGH	LOW	LOW	MED	LOW	LOW
2C. Floodwall Alignment 666.5	45/51	52	73	341,623	0.1	-2,715,776	MED	LOW	LOW	MED	MED	MED
2D. Floodwall Alignment 663.0	45/36	29	42	51,793	0.01	-1,633,571	MED	LOW	MED	MED	MED	MED
3A. Complete Nonstructural 672.2	0/109	54	79	787,458	0.23	-2,542,379	145.9	MED	LOW	0.092	MED	MED
3B. Complete Nonstructural 669.2	0/105	45	67	681,965	0.23	-2,137,904	121	MED	LOW	0.094	MED	MED
3C. Complete Nonstructural 666.5	0/96	31	48	536,276	0.26	-1,476,376	83.37	MED	LOW	0.097	MED	MED
3D. Complete Nonstructural 663.0	0/81	13	21	182,180	0.2	-716,187	35.31	MED	MED	0.114	MED	MED
4. FWEEP	0/0	2	3	0	0	0	0	LOW	MED	0.126	MED	MED
FY24 price levels	LOW	Unfavorable result, Low RED Benefits, negative EQ and OSE impacts										
	MED	Moderate results when compared to the alternative array.										
	HIGH	Positive or Beneficial results when compared to the alternative array.										

Table 13 displays the expanded array alternative evaluation summary, which evaluated alternatives based on NED, RED, Environmental Quality (EQ), and Other Social Effects (OSE) accounts in accordance with ER 1105-2-103. Included in the summary table are sub-categories ensuring benefits are captured but not duplicated. The summary table is further explained below. Each subcategory is explained under the broader comprehensive benefits accounts.

NED – National Economic Development (additional information included in Appendix D)

- Total Investment Cost, which includes project first cost and interest during construction, (FY24 price level) for each alternative
- Annual NED Benefits – a measure presenting the annualized value of damages prevented
- Benefit-to-Cost Ratio (BCR) – a measure of the annualized benefits of the project divided by the annualized cost
- Net Benefits – difference between annualized benefits and annualized costs

RED – Regional Economic Development (additional information included in Appendix D)

- Registers changes in the distribution of regional economic activity that result from each alternative plan. Evaluations of regional effects are calculated using nationally consistent projections of income, employment, and population

EQ – Environmental Quality

- Environmental – a measure of the degree to which the alternative impacts the environmental habitat
- Cultural – a measure of the degree to which the alternative impacts the area's cultural resources

OSE – Other Social Effects

- Expected Annual Life Loss – the degree to which the alternative reduces expected life loss due to riverine flooding

- Social Connectedness – a measure of the degree to which the alternative supports community cohesion and opportunities for connection
- Communal Identity – a measure of the degree to which the alternative supports community traditions, lifestyle, and values

3.3.4 Evaluation Observations

All 10 alternatives in the expanded array scored below unity (or 1.0) within the BCR metric of the NED account. Alternatives with a BCR below unity are not considered to be economically viable. Additional information relating to the economic analysis of the expanded array of alternatives can be found in Appendix D - Economics.

Subsequent evaluation of the expanded array of alternatives yielded three significant observations.

1. The floodwall alternatives, when compared to the nonstructural alternatives, were not as efficient or effective at each increment across the NED, OSE, and EQ accounts. In a head-to-head evaluation, the performance of the nonstructural alternatives was superior across the board. For this reason, floodwalls were screened from further consideration. As this screening decision was clear, a qualitative approach for the RED and life safety evaluations of the four floodwall alternatives was used moving forward.
2. The FWEEP positively impacted life safety in the nine alternatives it was included in. However, standing as its own alternative, it scored poorly in the NED, RED, and EQ accounts.
3. The initial nonstructural alternative variations were formulated with floodwalls in mind and eligibility for each building was based on each building's first floor elevation only. This approach lent itself to nonstructural plans which were too large in scope to accommodate the significant costs associated with them.

Based on poor economic performance and these additional observations, a strategy for development of a new alternative with an incremental approach was established. To properly and logically aggregate the structure inventory, the eligibility criteria were revised to consider how the nonstructural alternative could have a more targeted approach. Alternative 3A was considered the best plan of the expanded array as it maximized life safety (benefiting the OSE account), yielded the highest annual NED benefits of all nonstructural plans, and scored highest of all nonstructural plans in the RED account.

Alternative 4—a stand-alone FWEEP—and Alternative 3A were carried forward for further consideration.

3.4 Incremental Nonstructural Alternative

In addition to first-floor elevation-based alternatives, incremental nonstructural alternatives were developed using a step-by-step approach, as illustrated in Figure 8. This incremental method allowed for the development of a tailored plan that aligned with the vision and values of Beattyville's leaders and stakeholders. That vision is most clearly reflected in the study objectives, which were collaboratively developed during the Beattyville charrette in April 2023. These objectives, listed in order of importance, are:

1. Life and community safety
2. Flood damage reduction (buildings, contents, infrastructure)

3. Enhance community cohesion (physical and cultural)

The study objectives were consistently referenced during the identification and evaluation of each increment. Increments were selected and assessed with careful attention to sequencing and performance against these objectives. Collaboration with community partners and stakeholders provided specific input that informed iterative adjustments to the scale and scope of each increment, ensuring alignment with the shared vision. To differentiate this process from the original nonstructural approach, the structure aggregation methodology for the incremental nonstructural alternative was more focused and refined. The original aggregations, outlined in Section 3.2.1 and based primarily on flood characteristics and first-floor elevations, were abandoned. The revised approach grouped structures based on factors such as life safety, frequency of flooding, location within the floodway, necessity for civic functionality, and the intrinsic historical significance.

It is important to note that each increment within the incremental nonstructural alternative was developed as a discrete, standalone alternative. The sequence began with the FWEEP (Alternative 4), followed by targeted floodway acquisitions with recreational beneficial reuse of acquired land (Alternative 5A), then voluntary floodproofing of essential facilities (Alternative 5B), and lastly, voluntary floodproofing of historically significant structures (Alternative 5C). Each increment presented is inclusive of the features highlighted in the previous increments. Figure 8 displays the overall logic, or roadmap, behind the incremental approach, and subsequent sections outline each increment in detail, including a summary of the associated annual benefits and costs of the suite of alternatives. Note that calculations underpinning this alternatives comparison were completed at FY24 prices and were not recalculated to account for price level changes. The final analysis of the Recommended Plan is presented at current price levels.

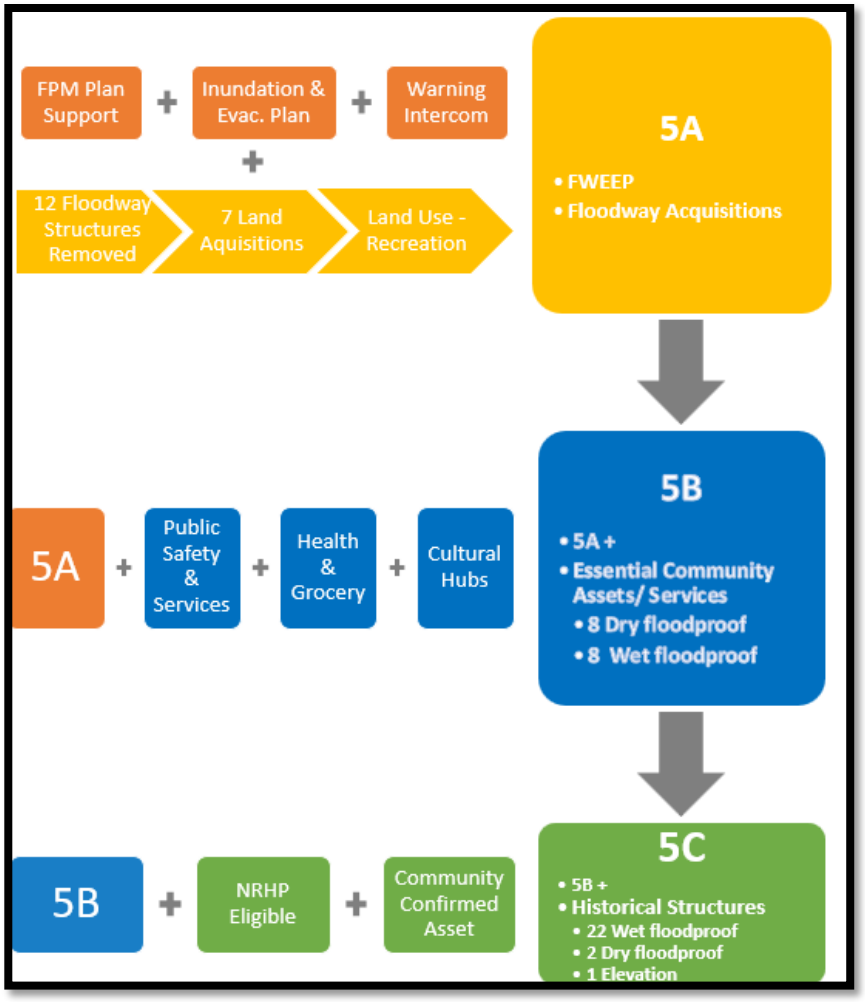

Figure 8. Incremental Nonstructural Alternative Roadmap

3.4.1 Increment 1 – FWEEP (Alternative 4)

This is a base plan utilizing applicable and appropriate FWEEP elements. Given that life safety and community protection are primary objectives, the implementation of a FWEEP is a critical component for the community of Beattyville. It would provide improved warning time with respect to when flood conditions are likely to occur, allowing citizens to take steps to ensure their own safety and minimize potential damages to their home, businesses, and personal property. This is the base plan because it provides the greatest improvement to life safety risk and supports resilience through floodplain management and improved response to flood events.

Economic analysis on the FWEEP only alternative was not performed as its impact on the NED account is anticipated to be negligible; however, it can reasonably be expected that some FRM benefits would exist as citizens will have more warning time to remove valuable contents and vehicles from the threatened area. Additional discussion of the FWEEP analysis can be found in the Economics appendix.

3.4.2 Increment 2 – Acquisitions in the Kentucky River floodway (Alternative 5A)

With the implementation of the FWEEP addressing the primary objective of life and community safety, subsequent planning efforts focused on the remaining objectives (flood risk management and community cohesion) to determine the next appropriate increment within the tailored approach. Given that the floodway typically experiences the highest concentration of flood damages within a floodplain, targeted acquisitions along the Kentucky River floodway were identified as the next logical increment in the development of the incremental approach. The acquisition and removal of structures located within the floodway is generally the most direct and effective nonstructural measure for mitigating existing flood damages in areas where such structures are present. In addition, acquisitions along the floodway also support components of the FWEEP that restrict future development in the frequently inundated floodway.

In pursuit of the most effective, efficient, and acceptable floodway acquisition strategy, an in-person meeting with city and county officials, historic preservation representatives, and additional key community stakeholders to discuss this incremental strategy was completed. During this meeting, all Beattyville stakeholders present went through the entire structure inventory on an individual basis. If a structure's footprint was at least 50% in the FEMA regulatory floodway, then the decision was made to either acquire the property or take no action. The take no action option was applied if the property was found to have specific local significance or importance and would cause a detriment if acquired or removed. With this deliberate approach, acquisition suggestions and decisions were discussed and confirmed with the support and advisement from Beattyville stakeholders in real time. As a result of this approach, Beattyville confirmed seven tracts would be acquired in fee. These tracts contain 12 structures that will be removed from the floodway (7 by demolition, 5 by relocation). These structures are highlighted in red and shown on the map below in Figure 9. This effort removes most but not all structures currently in the Kentucky River floodway. Two structures were excluded from the acquisition plan due to the historical significance of the buildings, three structures were excluded because they were only partially in the floodway, and a carwash was excluded as it is already a flood resilient structure.

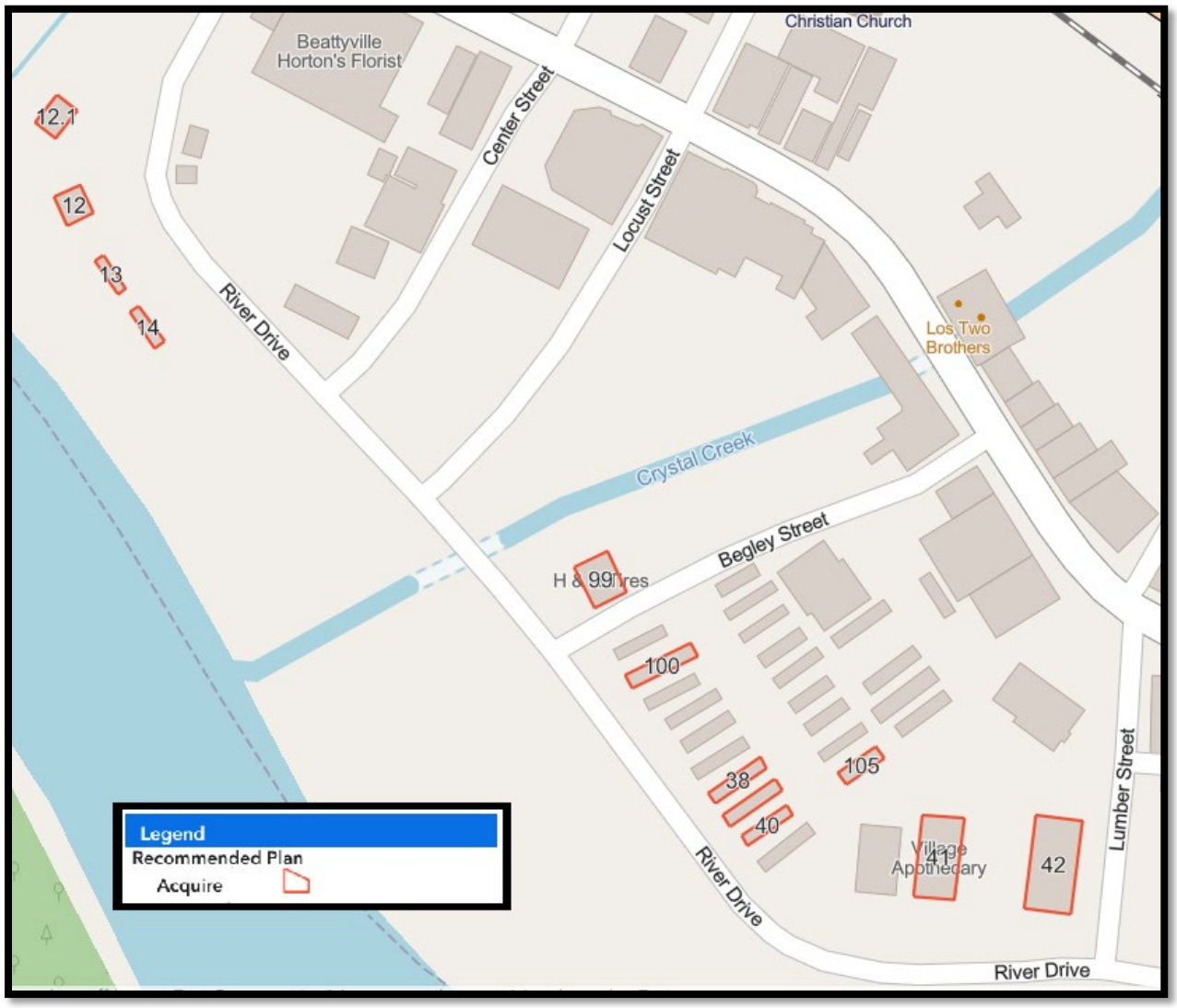

Figure 9. Increment 2 Acquisitions in the Kentucky River Floodway

Recreation Component

An additional and ultimately substantial benefit associated with the floodway acquisitions identified in Alternative 5A is that once these structures are removed, the open area left behind serves as a large, uninhabited, contiguous land area that is available for beneficial re-use. According to ER 1105-2-103, Para. 4-7.b.(2), "Alternative use of land is an integral part in planning for acquisition or permanent relocations of structures. USACE policy allows for inclusion of aquatic ecosystem restoration and recreation benefits when justifying permanent relocations or evacuations. Further, unlike structural alternatives, incrementally justified recreation use in conjunction with permanent relocation or evacuations may account for more than 50% of project justification. All permanent acquisition or relocation or evacuation recommendations must give proper consideration and documentation to alternative use of land." Section 8-4.f of the ER provides that USACE may participate in recreation facilities at non-reservoir FRM projects if the recreation activities have a strong, direct relationship to the proposed FRM measures, such as trails along the channel or levee right-of-way."

Recreation was identified as an opportunity for beneficial re-use of the floodway. Beattyville stakeholders identified multiple recreation features that could be included in the development of the incremental approach through the beneficial re-use of the floodway. Those features include, but are not necessarily limited to:

- Walking/exercise trail (mixture of both an elevated boardwalk and asphalt path)
- Construction of a new playground (the existing playground elevation is too low and too close to Kentucky River and, as such, incurs extremely frequent inundation)
- Picnic tables
- Historical markers and educational/point of interest signs
- Parking lot

These features align with city's own pre-existing vision for this specific area exactly, as depicted in their "Riverside Park Master Plan" (which was drafted in Feb 2023, by Bell Engineering) and the NFS desire to maintain a "walkable" downtown. Additionally, these initiatives also align with the strategic goals identified in the 2020 Kentucky Statewide Comprehensive Outdoor Recreation Plan, wherein respondents to a public participation survey indicated that they had visited a beach, lake, or river (89.3%); walked for pleasure, exercised, or leisurely enjoyed the outdoors (84.2%); or visited parks or historical sites (80.1%). Roughly two out of every three respondents indicated that they viewed scenery (67.5%), attended an outdoor fair or festival (62.7%), or went swimming or hiked on trails (56.0%). Other notable activities that respondents listed included driving for pleasure (49.5%) and fishing in freshwater from the bank or from a pier (47.8%)."

Mostly passive recreation features were recommended to keep long-term operation and maintenance costs as low as possible. The proximity of the proposed trail(s) to the Kentucky River will support the community's desire to positively re-engage Beattyville with the Kentucky River.

Recreation benefits for Increment 5A were captured via utilization of the Unit Day Value (UDV) Methodology presented in ER 1105-2-103 and values as presented in Economic Guidance Memorandum (EGM) 25-04 – Unit Day Values for Recreation for FY2025.

Figure 10 presents the highly disturbed and barren existing condition of the Kentucky River Floodway in Beattyville where the proposed acquisitions and beneficial re-use components are planned.

Figure 10. Existing Conditions of the Kentucky River Floodway

A depiction of the proposed location of some of these recreation features is provided in Figure 11.

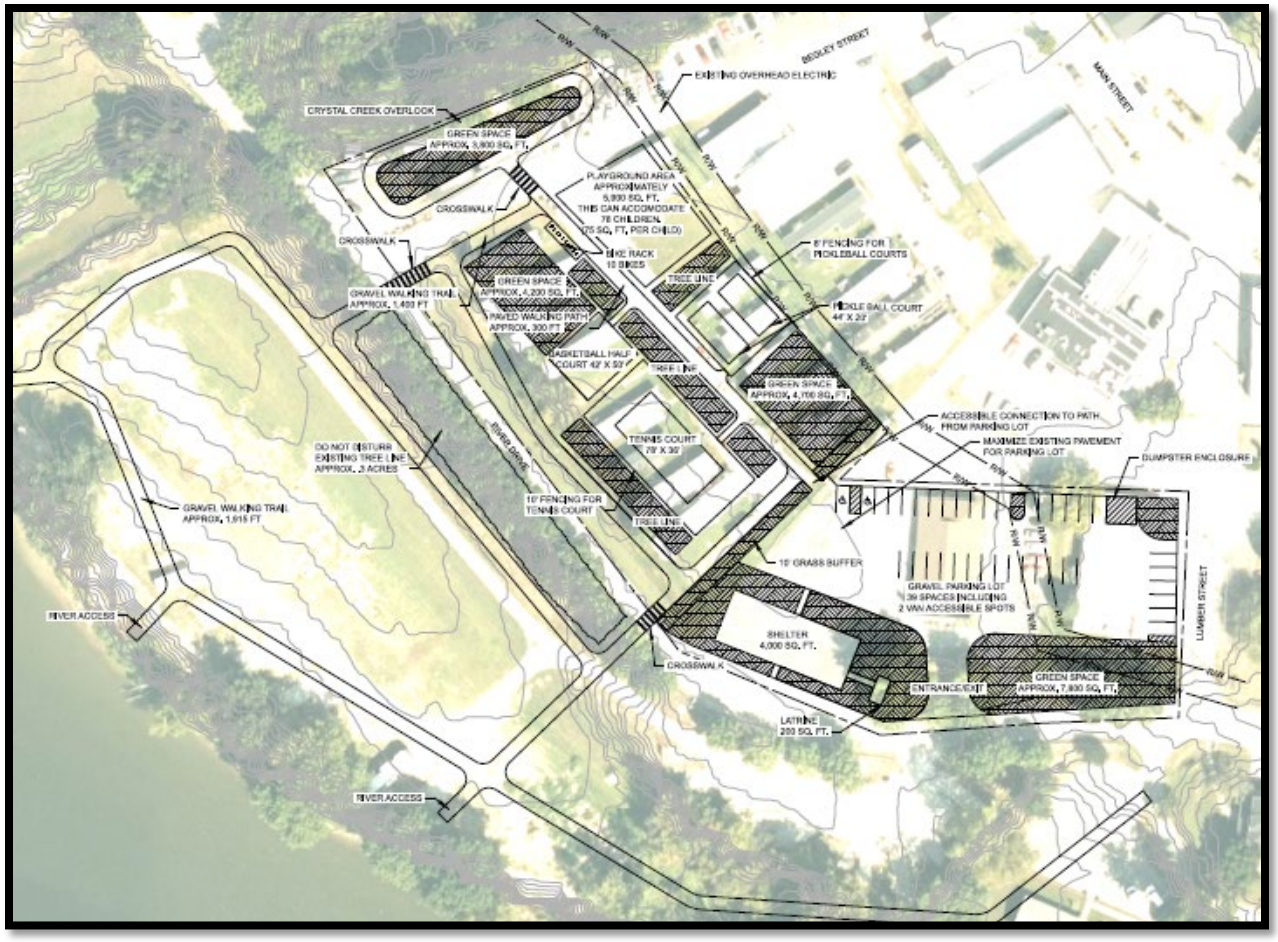

Figure 11. Proposed Locations of Recreation Features

Native Planting Component

To enhance the recreational aspects of the project, the area surrounding the proposed new walking trail will be stabilized with native plantings (Figure 12). This would entail plantings with native plant species on approximately 6 acres of currently highly disturbed, mostly bare, ground along the Kentucky River (Figure 10). These native plantings would have a significant positive aesthetic impact on the surrounding area. Conceptually, the intent of the native plantings is to strictly support and build upon the recreation features mentioned previously. As such, the benefits associated with these native plantings are captured in the recreation economic analysis through their contribution to UDV calculations. The qualitative positive environmental impact of converting highly disturbed bare soils to native plants is apparent and is discussed in more detail in Chapter 4. However, the area would be developed strictly for passive recreation, which would allow Beattyville more opportunity and flexibility to manage their riverfront floodplain to meet the needs of their community. As such, ecosystem restoration, as defined in ER 1105-2-103 is not a viable beneficial re-use of the floodway.

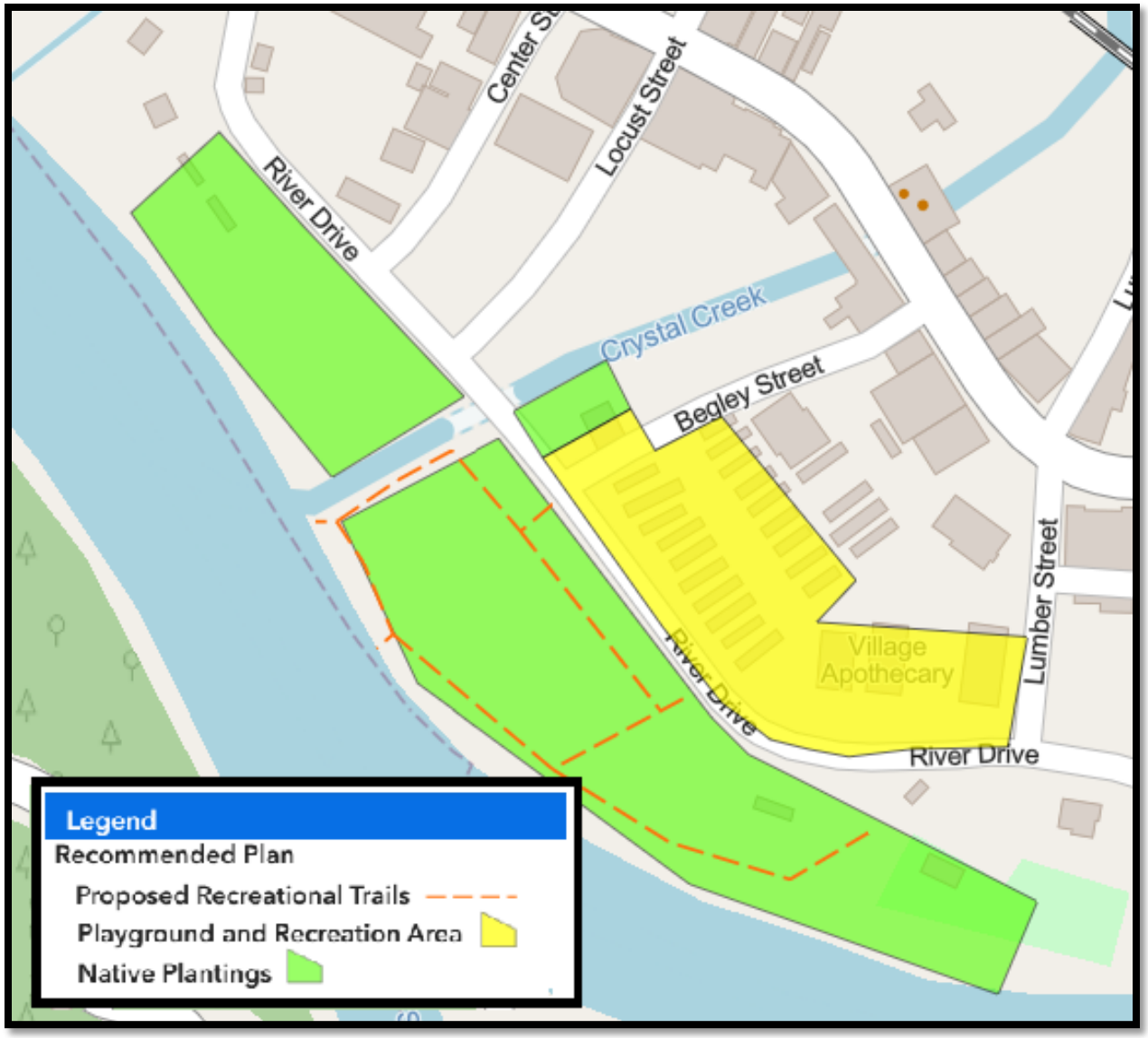

Figure 12. Proposed Locations for Native Plantings and Trails

Increment 2 (Alternative 5A), including acquisitions, FWEEP, recreation, and native planting components (unquantified) via beneficial re-use of land acquisition yields $131,021 in annual net benefits and a BCR of 1.25.

3.4.3 Increment 3 – Essential/Anchor Assets and Services (Alternative 5B)

Beattyville is commonly referred to as the “Birthplace of the Kentucky River.” Beattyville was incorporated in 1872 and has served as the county seat of Lee County ever since. With an estimated population of approximately 2,200 residents, Beattyville also represents the largest city in Lee County. Further, according to stakeholders from Kentucky River Area Development District (KRADD), “Beattyville’s identity is Lee County’s identity.” In effect, the heart of the entire county resides on Main Street in downtown Beattyville. The heart of any city, much less a county seat in a rural region of the state, requires the existence and reliable availability of essential structures or anchor establishments for basic functionality and community viability. These buildings are considered by the Beattyville and Lee County leaders, stakeholders and elected officials to serve as the community anchors: the grocery store, police station, city hall, health services, senior center, museum, and multiple churches.

This increment involves dry floodproofing 8 structures (to reduce flood damages to the structure exterior and contents) and wet floodproofing 8 additional structures (primarily for exterior protection). These structures are highlighted in light and dark green in Figure 13. Floodproofing these structures will support community resilience by reducing flood risk to the services and providing consistency that will allow the town to bounce back after a flood event. The selected mitigation measure for each structure was first identified based on building type and function and was coordinated with several members of the community during an in-person meeting between USACE and representatives of the NFS.

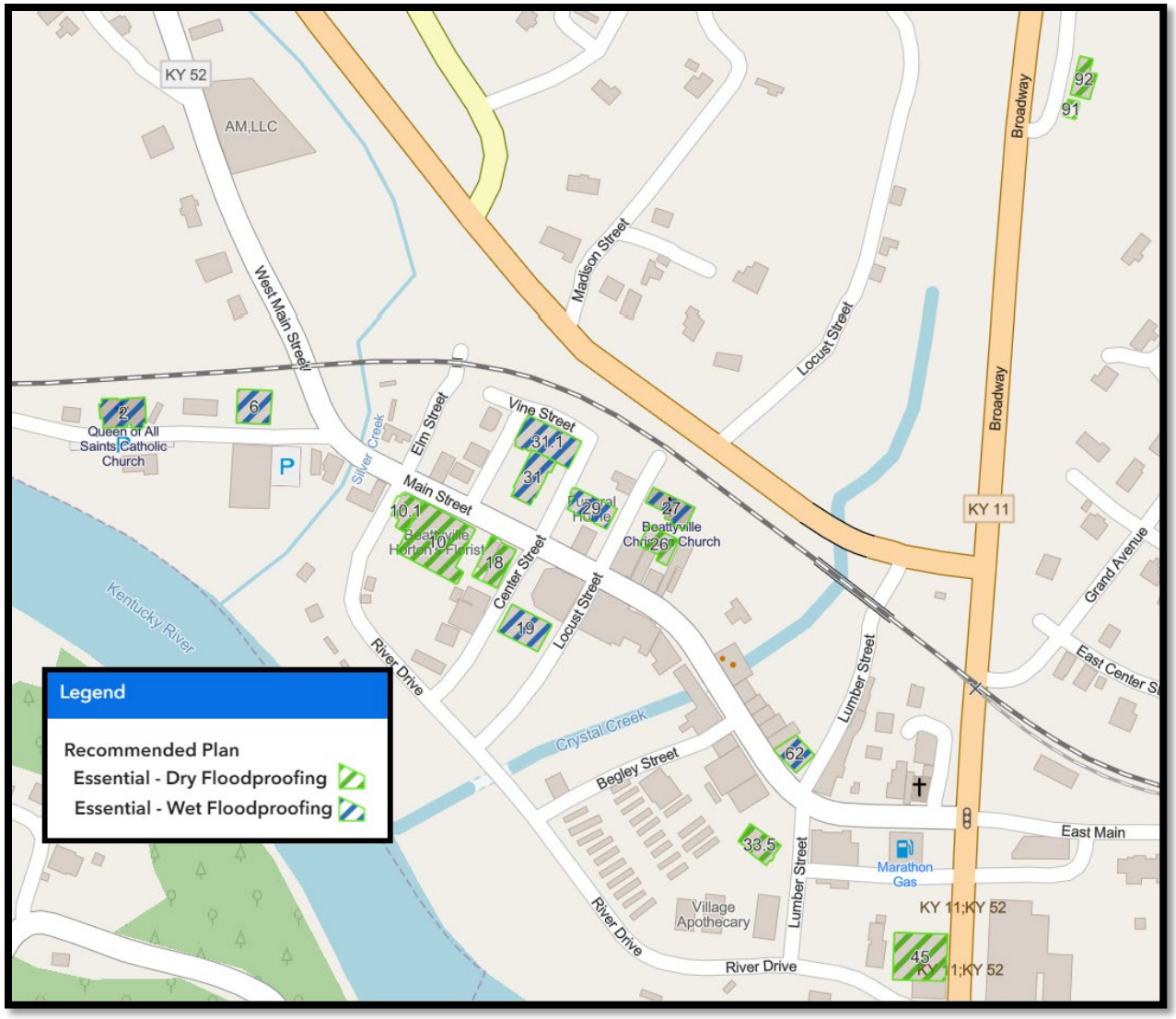

Figure 13. Increment 3 Essential/Anchor Assets and Services

Increment 3, inclusive of the previous two increments has benefits were below unity with a BCR of 0.85.

3.4.4 Increment 4 – Historical Structures (Alternative 5C)

Beattyville's Main Street is a state and nationally accredited Main Street Program, and it is currently listed on the NRHPs as a historic district. With several historic sites already listed in the NRHP and a regional history museum, Beattyville has a deep connection to the history of Eastern Kentucky. This iteration is intended to preserve and maintain the built environment of downtown Beattyville. The structures included on Beattyville's NRHP submission for the downtown commercial area as a historic district will be either dry or wet floodproofed. Floodproofing these structures supports community identity by preserving Beattyville's aesthetic characteristics and sense of community pride and history. Beattyville's submission of this NRHP form indicates that these structures are a priority.

Alternative 5C improves upon 5B by applying nonstructural FRM measures to 25 historical structures, the majority of which will be wet floodproofed (22). Of the three remaining historical structures, two will be dry floodproofed and the final structure will be elevated. This wet floodproofing is viewed to be a critical component to increase resilience of the community and reduce the recovery time long term from future inundation events.

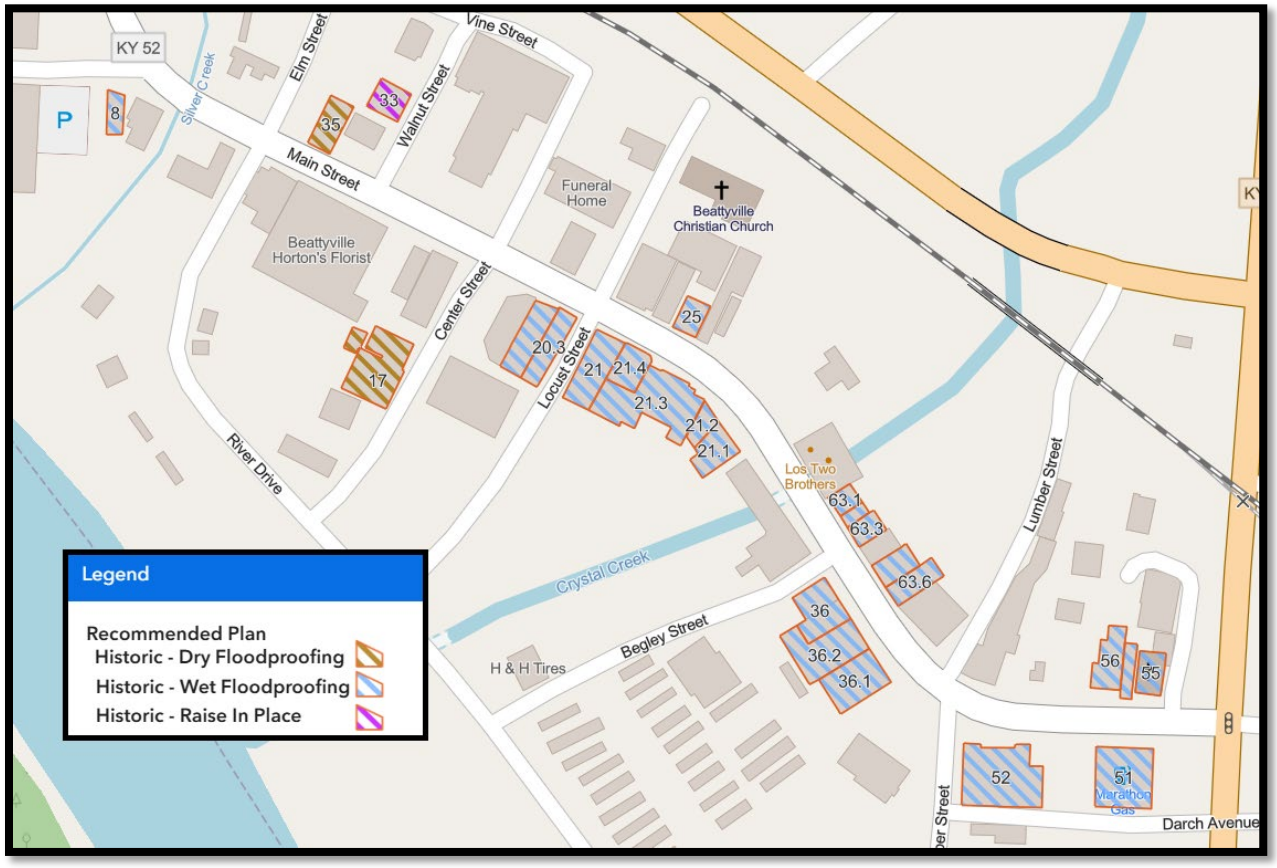

Figure 14. Increment 4 Historical Structures

For this increment, inclusive of the preceding increments, benefits were below unity with a BCR of 0.57.

3.4.5 Summary of Annual Benefits and Costs

Table 15 displays the summary of annual benefits and costs across each of the four increments in a cumulative fashion. FWEEP is FWEEP only. 5A is inclusive of the FWEEP. 5B is inclusive of 5A. 5C is inclusive of 5B.

Table 15. Summary of Annual Benefits and Costs for Incremental Analysis

Beattyville, KY
General Investigation
Summary of Annual Benefits and Costs
FY 2024 Price Levels
2.75% Interest Rate

	FWEEP Only	5A: FWEEP + Floodway Acquisition + Recreation Features	5B: 5A + Nonstructural Measures for Essential Structures	5C: 5B + Nonstructural Measures for Historic Structures
Project Cost				
Project First Cost	2,466,750	13,318,506	22,357,055	35,776,694
Interest During Construction	68,146	367,935	617,632	988,360
Total	2,534,896	13,686,441	22,974,687	36,765,054
Average Annual Equivalent Costs				
Project Implementation	93,895	506,958	851,004	1,361,811
Operation & Maintenance	5,000	15,000	15,000	15,000
Total	98,895	521,958	866,004	1,376,811
Average Annual Equivalent Benefits				
Flood Risk Management	0	56,569	142,564	188,072
Recreation	0	596,410	596,410	596,410
Total	0	652,979	738,974	784,482
Benefit vs. Cost Ratio	**0.00**	**1.25**	**0.85**	**0.57**
Net Benefits	-98,895	131,021	-127,029	-592,329

Assumptions
$5K O&M for FWEEP and $10K for 2nd Increment
24 month construction period for all increments
50 year period of analysis, Base Year 2030

3.4.6 Increment Impacts to Project Objectives

Table 16 displays the impact of each increment on the project objectives, along with the alternative's cumulative impact on damages, benefits, and residual risk. This increment impact table is structured to present not only the benefits gained with the addition of each increment, in

terms of objective impact, but also to display the risk that will still exist within the community if the incremental approach is cut short at any particular increment. Note that the following table was created at the time of the Tentatively Selected Plan (TSP); thus, there are minor discrepancies between it and the summary of annual costs and benefits presented immediately before.

Table 16. Increment Impacts on Project Objectives

	Objective Impact					
	1	2	3			
Iteration/Description	Life and community safety	Reduce flood damages	Enhance community connection	Total Damages	Total Benefits (inc REC)	Residual Risk
Future Without Project	None	None	None	$795,674	$0	$795,674
FWEEP ONLY	Significant	Minor	Minor	N/A	Minor	Significant
Floodway Acquistion	Minor	Significant	Significant	N/A	$655,838	$736,247
Essential Structures	Minor	Significant	Significant	N/A	$741,313	$650,771
Historical Structures	None	Minor	Significant	N/A	$784,649	$607,435

As depicted in the table above, the FWEEP yields significant improvement to Objective 1, Life and Community Safety, with minor (yet uncalculated) positive improvements to Objectives 2 and 3 (Reduce Flood Damages and Enhance Community Connection).

With the addition of the floodway acquisition increment, significant positive impacts have been added to Objectives 2 and 3, while producing minor, yet positive, impacts to Objective 1. In addition, total benefits (inclusive of recreation), have seen a significant jump from uncalculated, but minor, to over $650,000 annually. Finally, and somewhat unexpectedly, flood risk has been reduced, but only by $60,000 and annual residual risk is still well above $700,000.

The addition of the Essential Structures increment yields significant positive impacts to Objectives 2 and 3 again, while producing minor, yet positive, impacts to Objective 1. Additionally, total benefits (inclusive of recreation), have seen another jump from $655,000 to $741,000 annually. Flood risk has been reduced by an additional $80,000 and annual residual risk has been lowered to $650,000.

Finally, the Historical Structures increment adds significant positive impacts to Objective 3 again, while producing minor, yet positive, impacts to Objective 2. In addition, total benefits (inclusive of recreation), have seen another jump from $741,000 to $785,000 annually. Finally, flood risk has been reduced by an additional $40,000 and annual residual risk has been lowered to $607,000, which represents a 24% decrease from Future Without Project Conditions.

3.5 Final Array of Alternatives

The final array includes six alternatives, including the No Action Alternative.

- **Alternative 3A** represents a comprehensive nonstructural plan that encompasses nearly all structures within the floodplain, along with the implementation of a FWEEP.

The remaining four action alternatives are designed to incrementally build upon one another:

- **Alternative 4** includes only the FWEEP (nonstructural, non-physical measures).

- **Alternative 5A** builds upon Alternative 4 by adding floodway acquisition and a recreation plan that promotes the beneficial reuse of the acquired floodway.
- **Alternative 5B** further expands on Alternative 5A by incorporating floodproofing of essential structures.
- **Alternative 5C** adds floodproofing of historic structures to the scope already covered in Alternatives 4, 5A, and 5B.

These six alternatives are further evaluated in the following chapters:

Chapter 4 assess each alternative's environmental effects and compliance with the laws and policies required under the NEPA review process.

Chapter 5 compares the alternatives against each other and evaluates them using the four accounts from the P&G to ensure a comprehensive and balanced evaluation and comparison of water resources projects.

4 ENVIRONMENTAL EFFECTS AND CONSEQUENCES

This EA was originally prepared in accordance with the National Environmental Policy Act (NEPA) of 1969 as amended (42 U.S.C. § 4321 et seq.), the USACE NEPA implementing regulations (33 C.F.R. part 230), and the CEQ's 2023 NEPA implementing regulations (40 C.F.R. parts 1500 – 1508). However, since the release of the draft of this document for public review the Council on Environmental Quality (CEQ) has rescinded the NEPA regulations at 40 C.F.R. Parts 1500 – 1508, and several Executive Orders (EO) have been rescinded as per EO 14148. As such, this EA has been updated to reflect current Federal guidelines.

This section presents all reasonably foreseeable adverse and beneficial environmental effects of the No Action Alternative as well as all action alternatives that were carried forward to the focused array of alternatives considered for the project. The affected environment is described in detail in section 2 of this report. When action alternatives have been determined to have the same effects to the environment, they are discussed together in a single section labeled "Action Alternatives". Conversely, when an action alternative has been determined to have effects that are different than the other action alternatives considered, it is discussed separately under a section labeled by the alternative name.

All potentially relevant resource areas were initially considered for analysis in this EA. Some resource topics are not discussed, or the discussion is limited in scope, due to the lack of anticipated effect from the alternatives on the resource or because that resource is not located within the affected environment, including critical habitat, wetlands, wild and scenic rivers, and traffic.

The section is organized by resource topic, with the effects of alternatives discussed under each resource topic. Impacts are quantified whenever possible. Qualitative descriptions of impacts are explained by accompanying text where used.

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

Degree:

- No Effect, or Negligible – a resource would not be affected, or the effects would be at or below the level of detection, and changes would not be of any measurable or perceptible consequence.
- Minor – effects on a resource would be detectable, although the effects would be localized, small, and of little consequence to the sustainability of the resource. Mitigation measures, if needed to offset adverse effects, would be simple and achievable.
- Moderate – effects on a resource would be readily detectable, localized, and measurable. Mitigation measures, if needed to offset adverse effects, would be extensive and likely achievable.
- Significant – effects on a resource would be obvious and would have substantial consequences. The resource would be severely impaired so that it is no longer functional in the project area. Mitigation measures to offset the adverse effects would be extensive, and success of the mitigation measures would not be guaranteed.

Duration:

- Short-term – temporary effects caused by the construction and/or implementation of a selected alternative.
- Long-term – caused by an alternative after construction has been completed and/or when it is in full and complete operation.

4.1 Environmental Consequences

4.1.1 Hydrometeorological Conditions and Resilience

A long-term assessment of hydrometeorological conditions of Beattyville was conducted to satisfy the requirements of Engineering Circular Bulletin (ECB) 2018-14 and provide helpful information to the decision-making process about current and projected climatological trends in the project area. A summary of the Beattyville long-term assessment of hydrometeorological conditions is presented in Section 2.7 and the complete assessment can be found in Appendix F.

No Action

It is expected that the NAA would result in Beattyville being less resilient to potential increases in precipitation and streamflow that are projected to occur to regional hydrology as a result of changing conditions in the region. As discussed in Section 2.6, repeated flooding is resulting in economic decline and social hardship to an already at-risk community, as well as presenting potential life safety risks to the community. The result of the NAA would be that Beattyville would be less resilient to the risk of flooding, flooding could potentially be more frequent, and flood depths could be potentially deeper. Life safety would see moderate adverse impacts as the frequency and severity of flooding potentially increase.

5C – FWEEP, Acquisitions in Kentucky River Floodway, Essential/Anchor Structures, and Historical Structures

It is expected that Alternative 5C would result in moderate long-term beneficial impacts to flood resiliency for Beattyville. Up to 12 structures would be removed from the floodway, up to ten structures would be dry floodproofed, up to 30 structures would be wet floodproofed, and one structure would be raised in place, in addition to a FWEEP being implemented. These actions would increase flood resilience. Life safety would see long term moderate beneficial impacts as

structures would be removed from the floodway and structures within the floodplain would be better equipped to handle potential increases in the frequency and severity of flooding. Additionally, life safety would be further improved by the advance warning and flood emergency planning provided by the FWEEP.

4 - Nonstructural (Non-Physical) FWEEP Only

It is expected that Alternative 4 would improve life safety to residents in Beattyville by providing advance warning of flood events, however, it would not address vulnerabilities to infrastructure, leaving Beattyville less resilient to future flood events, which could potentially be more frequent and with greater flood depths.

5A - FWEEP and Acquisitions in Kentucky River Floodway

It is expected that Alternative 5A would result in moderate long-term beneficial impacts to flood resilience for Beattyville. Up to 12 structures would be removed from the floodway and a FWEEP would be implemented. These actions would increase flood resilience. Life safety would see long term moderate beneficial impacts as structures would be removed from the floodway and structures within the floodplain would be better equipped to handle potential increases in the frequency and severity of flooding. Additionally, life safety would be further improved by the advance warning and flood emergency planning provided by the FWEEP.

5B - FWEEP, acquisitions in Kentucky River Floodway, and Essential/Anchor Structures

It is expected that Alternative 5B would result in moderate long-term beneficial impacts to flood resiliency for Beattyville. Up to 28 structures would either be removed from the floodway, dry floodproofed, or wet floodproofed, in addition to a FWEEP being implemented. These actions would increase flood resilience. Life safety would see long term moderate beneficial impacts as structures would be removed from the floodway and structures within the floodplain would be better equipped to handle potential increases in the frequency and severity of flooding. Additionally, life safety would be further improved by the advance warning and flood emergency planning provided by the FWEEP.

3A - Complete Nonstructural 672.2 ft NAVD88

It is expected that Alternative 3A would result in moderate long-term beneficial impacts to flood resilience for Beattyville. Up to 120 structures below 672.2 ft NAVD88 would either be removed from the floodway, dry floodproofed, wet floodproofed, or raised in place, in addition to a FWEEP being implemented. These actions would increase flood resilience. Life safety would see long term moderate beneficial impacts as structures would be removed from the floodway and structures within the floodplain would be better equipped to handle potential increases in the frequency and severity of flooding.

4.1.2 Soils

4.1.2.1 Soil Associations

No Action

The NAA would have no effect on soils or prime farmland as no large-scale disturbance of soils would be expected to occur. While a small amount of erosion and deposition would be expected

to occur within certain areas of the impact area during high flow events, ongoing flooding is not expected to negatively impact soil profiles or farmlands within the project area.

5C – FWEEP, Acquisitions in Kentucky River Floodway, Essential/Anchor Structures, and Historical Structures

Alternative 5C entails removing up to 12 structures from the floodway (7 by demolition, 5 by relocation), regrading soils to match natural conditions, dry floodproofing up to 10 buildings, wet floodproofing of up to 30 structures, raising one structure in place, and the implementation of a FWEEP. The demolishing of structures would cause minor disturbances to soil due to heavy equipment operations and regrading. However, best management practices (BMPs) would be employed to limit impacts to local soils. Additionally, because land being disturbed for nonstructural measures would be within and immediately surrounding the foundations of structures, the project would have no effect to prime farmland. Construction impacts related to restoration activities, as well as the proposed hiking trail, would not permanently alter prime farmland soil map units, and therefore, would have no effect on them.

4 - Nonstructural (Non-physical) FWEEP Only

Alternative 4 entails the development of a FWEEP for the town of Beattyville. Since no ground would be disturbed, no impacts to soil associations are anticipated.

5A - FWEEP and Acquisitions in Kentucky River Floodway

Alternative 5A entails removing up to 12 structures from the floodway (7 by demolition, 5 by relocation), regrading soils to match natural conditions, and the implementation of a FWEEP. The demolishing of structures would cause minor disturbances to soil due to heavy equipment operations and regrading. However, BMPs would be employed to limit impacts to local soils. Additionally, because land being disturbed for nonstructural measures would be within and immediately surrounding the foundations of structures, the project would have no effect to prime farmland. Construction impacts related to restoration activities, as well as the proposed hiking trail, would not permanently alter prime farmland soil map units, and therefore, would have no effect on them.

5B - FWEEP, acquisitions in Kentucky River Floodway, and Essential/Anchor Structures

Alternative 5B entails nonstructural measures being implemented on up to 28 structures and the implementation of a FWEEP. The demolishing of structures would cause minor disturbances to soil due to heavy equipment operations and regrading. However, BMPs would be employed to limit impacts to local soils. Additionally, 636

3A - Complete Nonstructural 672.2 ft NAVD88

Alternative 3A entails nonstructural measures being implemented on up to 120 structures below 672.2 ft NAVD88 and the implementation of a FWEEP. The demolishing of structures would cause minor disturbances to soil due to heavy equipment operations and regrading. However, BMPs would be employed to limit impacts to local soils. Additionally, because land being disturbed for nonstructural measures would be within and immediately surrounding the foundations of structures, the project would have no effect to prime farmland.

4.1.3 Surface Water and Other Aquatic Resources

4.1.3.1 Surface Water

No Action

The NAA would have moderate, adverse impacts to surface waters over the long-term. Structures in the floodway and floodplain would continue to be inundated with water during flood events. These events cause damage to structures and release debris and other pollutants into the environment. Household chemicals, lead based paint, asbestos, plastics, and other substances likely to cause harm to aquatic organisms, would be expected to occur in structures in Beattyville, and would be expected to enter the waterway during a flooding event.

Additionally, impacts to surface water could be worsened if streamflow magnitude increases in the future due to changing conditions. The review of projected climate trends found little consensus regarding the projected streamflow trends, but the review noted substantial uncertainties regarding projected changes of streamflow due to changing conditions. As such, changing conditions are not expected to significantly further the impact to surface water.

5C – FWEEP, Acquisitions in Kentucky River Floodway, Essential/Anchor Structures, and Historical Structures

Alternative 5C entails removing up to 12 structures from the floodway (7 by demolition, 5 by relocation), regrading soils to match natural conditions, dry floodproofing up to 10 buildings, wet floodproofing of up to 30 structures, raising one structure in place, and the implementation of a FWEEP. These short-term construction and demolition activities could have a negligible short term adverse impact on surface waters due to increased turbidity caused by the disturbance and run-off of soil. However, these impacts would be expected to be successfully mitigated through an erosion control plan drafted prior to construction. As such, it would be expected that Alternative 5C would have long-term moderate beneficial impacts to surface waters. These beneficial impacts would be realized by the removal of structures from the floodway and via the utilization of nonstructural measures in the floodplain, which would moderately reduce the risk of the release of debris, trash, household chemicals, lead based paint, asbestos, and plastics into nearby surface waters. Furthermore, proposed native planting activities within the floodway would further filter sedimentation and other runoff, leading to long term moderate beneficial effects on nearby surface waters.

No activities are expected to occur below the Ordinary High-Water Mark. As such, the project would occur outside the jurisdiction of the CWA and would not require permitting for compliance with sections 401 or 404 of the act. Land disturbance would occur over an area that is larger than one acre, and as such would require that a National Pollution Discharge Elimination System (NPDES) stormwater discharge permit be acquired prior to construction.

4 - Nonstructural (Non-physical) FWEEP Only

Alternative 4 entails the development of a FWEEP for the town of Beattyville. The implementation of a FWEEP itself would not directly impact surface water resources, however, the lack of protection for structures would cause similar moderate long-term adverse impacts to those spelled out in the NAA.

5A - FWEEP and Acquisitions in Kentucky River Floodway

Alternative 5A entails removing up to 12 structures from the floodway (7 by demolition, 5 by relocation), regrading soils to match natural conditions, and the implementation of a FWEEP. These short-term construction and demolition activities could have a negligible impact on surface waters due to increased turbidity caused by the disturbance and run-off of soil. However, these impacts would be expected to be successfully mitigated through an erosion control plan drafted prior to construction. As such, it would be expected that Alternative 5A would have long-term moderate beneficial impacts to surface waters. These beneficial impacts would be realized by the removal of structures from the floodway and via the utilization of nonstructural measures in the floodplain, which would moderately reduce the risk of the release of debris, trash, household chemicals, lead based paint, asbestos, and plastics into nearby surface waters. Furthermore, proposed native planting activities within the floodway would further filter sedimentation and other runoff, leading to long term moderate beneficial effects on nearby surface waters.

No activities are expected to occur below the Ordinary High-Water Mark. As such, the project would occur outside the jurisdiction of the CWA and would not require permitting for compliance with sections 401 or 404 of the act. Land disturbance would occur over an area that is larger than one acre, and as such would require that a NPDES stormwater discharge permit be acquired prior to construction.

5B - FWEEP, acquisitions in Kentucky River Floodway, and Essential/Anchor Structures

Alternative 5B entails nonstructural measures being implemented on up to 28 structures and the implementation of a FWEEP. These short-term construction and demolition activities could have a negligible impact on surface waters due to increased turbidity caused by the disturbance and run-off of soil. However, these impacts would be expected to be successfully mitigated through an erosion control plan drafted prior to construction. As such, it would be expected that Alternative 5B would have long-term moderate beneficial impacts to surface waters. These beneficial impacts would be realized by the removal of structures from the floodway and via the utilization of nonstructural measures in the floodplain, which would moderately reduce the risk of the release of debris, trash, household chemicals, lead based paint, asbestos, and plastics into nearby surface waters. Furthermore, proposed native planting activities within the floodway would further filter sedimentation and other runoff, leading to long term moderate beneficial effects on nearby surface waters.

No activities are expected to occur below the Ordinary High-Water Mark. As such, the project would occur outside the jurisdiction of the CWA and would not require permitting for compliance with sections 401 or 404 of the act. Land disturbance would occur over an area that is larger than one acre, and as such would require that a NPDES stormwater discharge permit be acquired prior to construction.

3A - Complete Nonstructural 672.2 ft NAVD88

Alternative 3A entails nonstructural measures being implemented on up to 120 structures below 672.2 ft NAVD88 and the implementation of a FWEEP. These short-term construction and demolition activities could have a negligible impact on surface waters due to increased turbidity caused by the disturbance and run-off of soil. However, these impacts would be expected to be successfully mitigated through an erosion control plan drafted prior to construction. As such, it would be expected that Alternative 3A would have long-term moderate beneficial impacts to

surface waters. These beneficial impacts would be realized by the removal of structures from the floodway and via the utilization of nonstructural measures in the floodplain, which would moderately reduce the risk of the release of debris, trash, household chemicals, lead based paint, asbestos, and plastics into nearby surface waters.

No activities are expected to occur below the Ordinary High-Water Mark. As such, the project would occur outside the jurisdiction of the CWA and would not require permitting for compliance with sections 401 or 404 of the act. Land disturbance would occur over an area that is larger than one acre, and as such would require that a NPDES stormwater discharge permit be acquired prior to construction.

4.1.3.2 Groundwater

No Action

The NAA would have moderate, adverse impacts to ground water over the long-term. Structures in the floodway and floodplain would continue to be inundated with water following current and future trends. These flooding events cause damage to structures and have the potential to release debris and other pollutants into the environment that would degrade groundwater quality, including household chemicals, lead based paint, asbestos, plastics, and other substances.

5C – FWEEP, Acquisitions in Kentucky River Floodway, Essential/Anchor Structures, and Historical Structures

Alternative 5C entails removing up to 12 structures from the floodway (7 by demolition, 5 by relocation), regrading soils to match natural conditions, dry floodproofing up to 10 buildings, wet floodproofing of up to 30 structures, raising one structure in place, and the implementation of a FWEEP. These construction and demolition activities would be expected to have no effect on groundwater. Potential runoff during construction and demolition would be expected to be mitigated through an erosion control plan outlined in Appendix A. As such, it would be expected that Alternative 5C would have long-term moderate beneficial impacts to ground water. These beneficial impacts would be realized by the removal of structures from the floodway and via the utilization of nonstructural measures, which would moderately reduce the risk of the release of debris, trash, household chemicals, lead based paint, asbestos, and plastics into the environment which could eventually leach into groundwater resources.

4 - Nonstructural (Non-physical) FWEEP Only

Alternative 4 entails the development of a FWEEP for the town of Beattyville. While the development of a FWEEP would have no direct impacts to groundwater, the lack of protection for buildings would cause similar long term adverse impacts to the NAA.

5A - FWEEP and Acquisitions in Kentucky River Floodway

Alternative 5A entails removing up to 12 structures from the floodway (7 by demolition, 5 by relocation), regrading soils to match natural conditions, and the implementation of a FWEEP. These construction and demolition activities would be expected to have no effect on groundwater. Potential runoff during construction and demolition would be expected to be mitigated through an erosion control plan. As such, it would be expected that Alternative 5A would have long-term moderate beneficial impacts to ground water. These beneficial impacts would be realized by the removal of structures from the floodway and via the utilization of nonstructural measures, which would moderately reduce the risk of the release of debris, trash, household chemicals, lead based

paint, asbestos, and plastics into the environment which could eventually leach into groundwater resources.

5B - FWEEP, acquisitions in Kentucky River Floodway, and Essential/Anchor Structures

Alternative 5B entails nonstructural measures being implemented on up to 28 structures and the implementation of a FWEEP. These construction and demolition activities would be expected to have no effect on groundwater. Potential runoff during construction and demolition would be expected to be mitigated through an erosion control plan. As such, it would be expected that Alternative 5B would have long-term moderate beneficial impacts to ground water. These beneficial impacts would be realized by the removal of structures from the floodway and via the utilization of nonstructural measures, which would moderately reduce the risk of the release of debris, trash, household chemicals, lead based paint, asbestos, and plastics into the environment which could eventually leach into groundwater resources.

3A - Complete Nonstructural 672.2 ft NAVD88

Alternative 3A entails nonstructural measures being implemented on up to 120 structures below 672.2 ft NAVD88 and the implementation of a FWEEP. These construction and demolition activities would be expected to have no effect on groundwater. Potential runoff during construction and demolition would be expected to be mitigated through an erosion control plan. As such, it would be expected that Alternative 5B would have long-term moderate beneficial impacts to ground water. These beneficial impacts would be realized by the removal of structures from the floodway and via the utilization of nonstructural measures, which would moderately reduce the risk of the release of debris, trash, household chemicals, lead based paint, asbestos, and plastics into the environment which could eventually leach into groundwater resources.

4.1.3.3 Floodplains

No Action

The NAA would be expected to have moderate long-term adverse impacts to the floodplain. At least 45 structures would remain within the regulated floodway, leaving a high risk that these structures would continue to flood regularly. This maintains a scenario where there is an ongoing risk to life and property, as well as potential impacts to the floodplain environment caused by the release of debris and other pollutants during flooding disasters.

5C – FWEEP, Acquisitions in Kentucky River Floodway, Essential/Anchor Structures, and Historical Structures

Alternative 5C entails removing up to 12 structures from the floodway (7 by demolition, 5 by relocation), regrading soils to match natural conditions, dry floodproofing up to 10 buildings, wet floodproofing of up to 30 structures, raising one structure in place, and the implementation of a FWEEP. The removal of structures would allow the floodplain to function more naturally, allowing increased floodplain area for water to disperse during high water mark events. There would be a moderate reduction in the risk to life and property, due to the removal of structures in the floodway, and the protection of structures in the floodplain. This would also reduce environmental impacts to the floodplain caused by the release of debris and other pollutants during flooding disasters. Furthermore, native planting activities within the floodplain would further restore natural floodplain function by adding native riparian species, which would also increase resilience via the reduction of erosion. There would be negligible short-term adverse impacts to the environment during

construction and demolition. However, these impacts would be expected to be successfully mitigated by the erosion control plan outlined in Appendix A. Further, applicable floodplain construction permits would be acquired from the KDOW.

4 - Nonstructural (Non-Physical) FWEEP Only

Alternative 4 entails the development of a FWEEP for the town of Beattyville. While the development of a FWEEP itself would not directly impact the floodplain, moderate long-term adverse impacts would occur for the same reasons spelled out in the NAA's analysis.

5A - FWEEP and Acquisitions in Kentucky River Floodway

Alternative 5A entails removing up to 12 structures from the floodway (7 by demolition, 5 by relocation), regrading soils to match natural conditions, and the implementation of a FWEEP. The removal of structures would allow the floodplain to function more naturally, allowing increased floodplain area for water to disperse during high water mark events. There would be a moderate reduction in the risk to life and property, due to the removal of structures in the floodway. This would also reduce environmental impacts to the floodplain caused by the release of debris and other pollutants during flooding disasters. Furthermore, native planting activities within the floodplain would further restore natural floodplain function by adding native riparian species, which would also increase resilience via the reduction of erosion. There would be negligible short-term adverse impacts to the environment during construction and demolition. However, these impacts would be expected to be successfully mitigated by an erosion control plan. Further, applicable floodplain construction permits would be acquired from the KDOW.

5B - FWEEP, acquisitions in Kentucky River Floodway, and Essential/Anchor Structures

Alternative 5B entails nonstructural measures being implemented on up to 28 structures and the implementation of a FWEEP. The removal of structures would allow the floodplain to function more naturally, allowing increased floodplain area for water to disperse during high water mark events. There would be a moderate reduction in the risk to life and property, due to the removal of structures in the floodway, and the protection of structures in the floodplain. This would also reduce environmental impacts to the floodplain caused by the release of debris and other pollutants during flooding disasters. Furthermore, native planting activities within the floodplain would further restore natural floodplain function by adding native riparian species, which would also increase resilience via the reduction of erosion. There would be negligible short-term adverse impacts to the environment during construction and demolition. However, these impacts would be expected to be successfully mitigated by an erosion control plan. Further, applicable floodplain construction permits would be acquired from the KDOW.

3A - Complete Nonstructural 672.2 ft NAVD88

Alternative 3A entails nonstructural measures being implemented on up to 120 structures below 672.2 ft NAVD88 and the implementation of a FWEEP. The removal of structures would allow the floodplain to function more naturally, allowing increased floodplain area for water to disperse during high water mark events. There would be a moderate reduction in the risk to life and property, due to the removal of structures in the floodway, and the protection of structures in the floodplain. This would also reduce environmental impacts to the floodplain caused by the release of debris and other pollutants during flooding disasters. There would be negligible short-term adverse impacts to the environment during construction and demolition. However, these impacts

would be expected to be successfully mitigated by an erosion control plan. Further, applicable floodplain construction permits would be acquired from the KDOW.

4.1.3.4 Wetlands

No Action

Although wetland resources within Beattyville are minor, the NAA would be expected to have long-term moderate adverse impacts to wetlands. Structures in the floodway and floodplain would continue to be inundated with water on a routine basis. These flooding events cause damage to structures and release debris and other pollutants into the environment. Household chemicals, lead based paint, asbestos, plastics, and other substances that may occur in structures in Beattyville have the potential to enter wetland habitats during flooding events and cause harm to aquatic organisms.

5C – FWEEP, Acquisitions in Kentucky River Floodway, Essential/Anchor Structures, and Historical Structures

Alternative 5C entails removing up to 12 structures from the floodplain (7 by demolition, 5 by relocation), regrading soils to match natural conditions, dry floodproofing up to 10 buildings, wet floodproofing of up to 30 structures, raising one structure in place, and the implementation of a FWEEP. These construction and demolition activities could have a negligible short-term adverse impact on wetlands due to increased turbidity caused by the disturbance and run-off of sediment. However, these impacts would be expected to be successfully mitigated through an erosion control plan outlined in Appendix A. As such, it would be expected that Alternative 5C would have long-term moderate beneficial impacts to wetlands. These beneficial impacts would be realized by the removal of structures from the floodway via the utilization of nonstructural measures, which would moderately reduce the risk of the release of debris, trash, household chemicals, lead based paint, asbestos, and plastics into nearby wetlands. Furthermore, restoration activities would provide further buffer to riparian wetland habitat by filtering runoff from Beattyville, producing a minor long term beneficial effect.

No activities are expected to occur within the boundaries of existing wetlands. As such the project would occur outside the jurisdiction of the CWA and would not require permitting for compliance with sections 401 or 404 of the act. Land disturbance would occur over an area that is larger than one acre, and as such would require that a NPDES stormwater discharge permit be acquired prior to construction.

4 - Nonstructural (Non-physical) FWEEP Only

While the development of a FWEEP would not directly impact wetlands, long term moderate adverse impacts are anticipated for similar reason spelled out in the NAA's analysis due to the lack of protections to structures.

5A - FWEEP and Acquisitions in Kentucky River Floodway

Alternative 5A entails removing up to 12 structures from the floodway (7 by demolition, 5 by relocation), regrading soils to match natural conditions, and the implementation of a FWEEP. These construction and demolition activities could have a negligible short-term adverse impact on wetlands due to increased turbidity caused by the disturbance and run-off of sediment. However, these impacts would be expected to be successfully mitigated through an erosion control plan. As such, it would be expected that the Alternative 5A would have long-term moderate

beneficial impacts to wetlands. These beneficial impacts would be realized by the removal of structures from the floodway via the utilization of nonstructural measures, which would moderately reduce the risk of the release of debris, trash, household chemicals, lead based paint, asbestos, and plastics into nearby wetlands. Furthermore, restoration activities would provide further buffer to riparian wetland habitat by filtering runoff from Beattyville, producing a minor long term beneficial effect.

No activities are expected to occur within the boundaries of existing wetlands. As such the project would occur outside the jurisdiction of the CWA and would not require permitting for compliance with sections 401 or 404 of the act. Land disturbance would occur over an area that is larger than one acre, and as such would require that a NPDES stormwater discharge permit be acquired prior to construction.

5B - FWEEP, acquisitions in Kentucky River Floodway, and Essential/Anchor Structures

Alternative 5B entails nonstructural measures being implemented on up to 28 structures and the implementation of a FWEEP. These construction and demolition activities could have a negligible short-term adverse impact on wetlands due to increased turbidity caused by the disturbance and run-off of sediment. However, these impacts would be expected to be successfully mitigated through an erosion control plan. As such, it would be expected that the Alternative 5B would have long-term moderate beneficial impacts to wetlands. These beneficial impacts would be realized by the removal of structures from the floodway via the utilization of nonstructural measures, which would moderately reduce the risk of the release of debris, trash, household chemicals, lead based paint, asbestos, and plastics into nearby wetlands. Furthermore, restoration activities would provide further buffer to riparian wetland habitat by filtering runoff from Beattyville, producing a minor long term beneficial effect.

No activities are expected to occur within the boundaries of existing wetlands. As such the project would occur outside the jurisdiction of the CWA and would not require permitting for compliance with sections 401 or 404 of the act. Land disturbance would occur over an area that is larger than one acre, and as such would require that a NPDES stormwater discharge permit be acquired prior to construction.

3A - Complete Nonstructural 672.2 ft NAVD88

Alternative 3A entails nonstructural measures being implemented on up to 120 structures below 672.2 ft NAVD88 and the implementation of a FWEEP. These construction and demolition activities could have a negligible short-term adverse impact on wetlands due to increased turbidity caused by the disturbance and run-off of sediment. However, these impacts would be expected to be successfully mitigated through an erosion control plan. As such, it would be expected that the Alternative 3A would have long-term moderate beneficial impacts to wetlands. These beneficial impacts would be realized by the removal of structures from the floodway via the utilization of nonstructural measures, which would moderately reduce the risk of the release of debris, trash, household chemicals, lead based paint, asbestos, and plastics into nearby wetlands.

No activities are expected to occur within the boundaries of existing wetlands. As such the project would occur outside the jurisdiction of the CWA and would not require permitting for compliance with sections 401 or 404 of the act. Land disturbance would occur over an area that is larger than

one acre, and as such would require that a NPDES stormwater discharge permit be acquired prior to construction.

4.1.4 Fish and Wildlife Habitats

4.1.4.1 Terrestrial Habitats and Fauna

No Action

The NAA would be expected to have no effect on terrestrial habitats and fauna. The project area is urban and there is a lack of significant or otherwise outstanding terrestrial habitat within the proposed project area. Therefore, the reoccurrence of flooding within the area would not be expected to impact these resources.

5C – FWEEP, Acquisitions in Kentucky River Floodway, Essential/Anchor Structures, and Historical Structures

Alternative 5C would have no effect on terrestrial habitats and fauna. The project area is urban and there is a lack of significant or otherwise outstanding terrestrial habitat within the proposed project area. As such, the short-term disturbance caused by construction and demolition would not be expected to impact any habitats.

4 - Nonstructural (Non-physical) FWEEP Only

Alternative 4 would have no effect on terrestrial habitat and fauna as it lacks a construction component. The project area is urban and there is a lack of significant or otherwise outstanding terrestrial habitat within the proposed project area. Therefore, the reoccurrence of flooding within the area would not be expected to impact these resources.

5A - FWEEP and Acquisitions in Kentucky River Floodway

Alternative 5A would have no effect on terrestrial habitats and fauna. The project area is urban and there is a lack of significant or otherwise outstanding terrestrial habitat within the proposed project area. As such, the short-term disturbance caused by construction and demolition would not be expected to impact any habitats.

5B - FWEEP, acquisitions in Kentucky River Floodway, and Essential/Anchor Structures

Alternative 5B would have no effect on terrestrial habitats and fauna. The project area is urban and there is a lack of significant or otherwise outstanding terrestrial habitat within the proposed project area. As such, the short-term disturbance caused by construction and demolition would not be expected to impact any habitats.

3A - Complete Nonstructural 672.2 ft NAVD88

Alternative 3A would have no effect on terrestrial habitats and fauna. The project area is urban and there is a lack of significant or otherwise outstanding terrestrial habitat within the proposed project area. As such, the short-term disturbance caused by construction and demolition would not be expected to impact any habitats.

4.1.4.2 Aquatic Habitats and Fauna

No Action

The NAA would be expected to have moderate long-term adverse impacts to aquatic habitats and fauna including those of the Kentucky River, Crystal Creek, and Silver Creek. Structures in the floodway and floodplain would continue to be inundated with water on a routine basis. These flooding events cause damage to structures and have the potential to release debris and other pollutants into the environment. Household chemicals, lead based paint, asbestos, plastics, and other substances likely to cause harm to aquatic organisms, would be expected to occur in structures in Beattyville, and would be expected to enter the water way during a flooding disaster event.

5C – FWEEP, Acquisitions in Kentucky River Floodway, Essential/Anchor Structures, and Historical Structures

Alternative 5C entails removing up to 12 structures from the floodway (7 by demolition, 5 by relocation), regrading soils to match natural conditions, dry floodproofing up to 10 buildings, wet floodproofing of up to 30 structures, raising one structure in place, and the implementation of a FWEEP. These construction and demolition activities could have a negligible impact on surface waters due to increased turbidity caused by the disturbance of soils and run-off of sediment. However, these impacts would be expected to be successfully mitigated through an erosion control plan outlined in Appendix A. As such, it would be expected that Alternative 5C would have long-term moderate beneficial impacts to aquatic habitats and fauna. These beneficial impacts would be realized by the removal of structures from the floodway and via the utilization of nonstructural measures within the floodplain. This would moderately reduce the risk of the release of debris, trash, household chemicals, lead based paint, asbestos, and plastics into nearby surface waters. Furthermore, proposed native plantings in the floodway would cause moderate long-term beneficial impacts to aquatic habitats by providing habitat and acting as a filter for runoff from Beattyville.

4 - Nonstructural (Non-physical) FWEEP Only

Alternative 4 entails the development of a FWEEP for the town of Beattyville. While the development of a FWEEP would not impact aquatic habitats directly, moderate adverse long-term impacts, as spelled out in the analysis of the NAA, would occur due to the lack of protection for structures within the floodplain.

5A - FWEEP and Acquisitions in Kentucky River Floodway

Alternative 5A entails removing up to 12 structures from the floodway (7 by demolition, 5 by relocation), regrading soils to match natural conditions, and the implementation of a FWEEP. These construction and demolition activities could have a negligible impact on surface waters due to increased turbidity caused by the disturbance of soils and run-off of sediment. However, these impacts would be expected to be successfully mitigated through an erosion control plan. As such, it would be expected that Alternative 5A would have long-term moderate beneficial impacts to aquatic habitats and fauna. These beneficial impacts would be realized by the removal of structures from the floodway. This would moderately reduce the risk of the release of debris, trash, household chemicals, lead based paint, asbestos, and plastics into nearby surface waters. Furthermore, proposed native plantings in the floodway would cause moderate long-term

beneficial impacts to aquatic habitats by providing habitat and acting as a filter for runoff from Beattyville.

5B - FWEEP, acquisitions in Kentucky River Floodway, and Essential/Anchor Structures

Alternative 5B entails nonstructural measures being implemented on up to 28 structures and the implementation of a FWEEP. These construction and demolition activities could have a negligible impact on surface waters due to increased turbidity caused by the disturbance of soils and run-off of sediment. However, these impacts would be expected to be successfully mitigated through an erosion control plan. As such, it would be expected that Alternative 5B would have long-term moderate beneficial impacts to aquatic habitats and fauna. These beneficial impacts would be realized by the removal of structures from the floodway and via the utilization of nonstructural measures within the floodplain. This would moderately reduce the risk of the release of debris, trash, household chemicals, lead based paint, asbestos, and plastics into nearby surface waters. Furthermore, proposed native plantings in the floodway would cause moderate long-term beneficial impacts to aquatic habitats by providing habitat and acting as a filter for runoff from Beattyville.

3A - Complete Nonstructural 672.2 ft NAVD88

Alternative 3A entails nonstructural measures being implemented on up to 120 structures below 672.2 ft NAVD88 and the implementation of a FWEEP. These construction and demolition activities could have a negligible impact on surface waters due to increased turbidity caused by the disturbance of soils and run-off of sediment. However, these impacts would be expected to be successfully mitigated through an erosion control plan. As such, it would be expected that Alternative 3A would have long-term moderate beneficial impacts to aquatic habitats and fauna. These beneficial impacts would be realized by the removal of structures from the floodway and via the utilization of nonstructural measures within the floodplain. This would moderately reduce the risk of the release of debris, trash, household chemicals, lead based paint, asbestos, and plastics into nearby surface waters.

4.1.5 Endangered and Threatened Species

4.1.5.1 Federally Listed Species

No Action

The USACE determined that the NAA would have no effect on federally listed bat species that have ranges which overlap with the project area (see Table 2). There is little habitat for these species within the project footprint and continued flooding of Beattyville would not be expected to impact bat habitat or bat populations. Additionally, USACE determined that the NAA would have no effect on the monarch butterfly, as little habitat for this species is within the project area and continued flooding of Beattyville would not be expected to impact monarch habitat or populations.

The NAA has the potential to have significant, long-term adverse impacts to aquatic species that have ranges which overlap with the project area, including the Kentucky arrow darter and the seven listed mussel species (see Table 2). The Kentucky arrow darter is known to occur in Silver Creek. While it is not clear if there are extant populations of listed mussels within the Kentucky River downstream of the project area, the project area is included in the historical ranges of these species, and it is assumed that they could occur where suitable habitat is present. Impacts to these species would occur from the pollution caused during regularly reoccurring flooding

disasters. Household chemicals, lead based paint, asbestos, plastics, and other substances likely to cause harm to aquatic organisms, would be expected to occur in structures in Beattyville and would be expected to enter the water way during a flooding disaster event. The species listed are sensitive to pollution and impacts to water quality are known to impact all of the mussel species as well as the Kentucky arrow darter. Due to this, USACE determined that the NAA would likely adversely affect the Kentucky darter and seven mussel species.

5C – FWEEP, Acquisitions in Kentucky River Floodway, Essential/Anchor Structures, and Historical Structures

The USACE has determined under Section 7 of the ESA that Alternative 5C would have no effect on federally listed bat species that have ranges which overlap with the project area (see Table 2). There is little habitat for these species within the project area and no trees greater than 3-inches in diameter would be removed during construction or demolition activities. Additionally, Alternative 5C would have no effect on the monarch butterfly, as little habitat for this species is present within the project area.

The USACE has determined under Section 7 of the ESA that Alternative 5C may affect but is not likely to adversely affect the Kentucky arrow darter and the seven listed mussel species that have ranges which overlap with the project area (see Table 2) considering the expected moderate long-term beneficial improvements to water quality as well as the enhancement of riparian habitat in the floodway. The USFWS concurred with this determination in a letter dated October 3, 2024 (Appendix B).

It is expected that Alternative 5C would have moderate long-term, beneficial impacts to federally listed aquatic species. Alternative 5C entails removing up to 12 structures from the floodway (7 by demolition, 5 by relocation), regrading soils to match natural conditions, dry floodproofing up to 10 buildings, wet floodproofing of up to 30 structures, raising one structure in place, and the implementation of a FWEEP. These construction and demolition activities could have a negligible adverse impact on surface waters due to increased turbidity caused by the disturbance and run-off of soil. However, these impacts would be expected to be successfully mitigated through an erosion control plan outlined in Appendix A. The beneficial impacts would be realized by the removal of structures from the floodway and via the utilization of nonstructural measures, which would moderately reduce the risk of the release of debris, trash, household chemicals, lead based paint, asbestos, and plastics into nearby surface waters. Furthermore, the proposed native riparian plantings within the floodway would provide improved bank resilience as well as would improve water quality by acting as a natural buffer to pollutants. The long-term improvement of water quality in the area would reduce potential impacts to the federally listed aquatic organisms within the watershed.

4 - Nonstructural (Non-physical) FWEEP Only

The USACE determined that Alternative 4 would have no effect on federally listed bat species that have ranges which overlap with the project area (see Table 2). There is little habitat for these species within the project footprint and continued flooding of Beattyville would not be expected to impact bat habitat or bat populations. Additionally, Alternative 4 would have no effect on the monarch butterfly, as little habitat for this species is within the project area and continued flooding of Beattyville would not be expected to impact monarch habitat or populations.

Alternative 4 has the potential to have significant, long-term adverse impacts to aquatic species that have ranges which overlap with the project area, including the Kentucky arrow darter and the seven listed mussel species (see Table 2). The Kentucky arrow darter is known to occur in Silver Creek. While it is not clear if there are extant populations of listed mussels within the Kentucky River downstream of the project area, the project area is included in the historical ranges of these species, and it is assumed that they could occur where suitable habitat is present. Impacts to these species would occur from the pollution caused during regularly reoccurring flooding disasters. Household chemicals, lead based paint, asbestos, plastics, and other substances likely to cause harm to aquatic organisms, would be expected to occur in structures in Beattyville and would be expected to enter the water way during a flooding disaster event. The species listed are sensitive to pollution and impacts to water quality are known to impact all of the mussel species as well as the Kentucky arrow darter. Due to this, USACE determined that the Alternative 4 may affect, would likely adversely affect the Kentucky darter and seven mussel species.

5A - FWEEP and Acquisitions in Kentucky River Floodway

The USACE has determined that Alternative 5A would have no effect on federally listed bat species that have ranges which overlap with the project area (see Table 2). There is little habitat for these species within the project area and no trees greater than 3-inches in diameter would be removed during construction or demolition activities. Additionally, Alternative 5A would have no effect on the monarch butterfly, as little habitat for this species is present within the project area.

The USACE has determined that the Alternative 5A may affect but is not likely to adversely affect the Kentucky arrow darter and the seven listed mussel species that have ranges which overlap the project area (see Table 2) considering the expected moderate long-term beneficial improvements to water quality as well enhancement of riparian habitat in the floodway.

It is expected that Alternative 5A would have moderate long-term, beneficial impacts to federally listed aquatic species. Alternative 5A entails removing up to 12 structures from the floodway (7 by demolition, 5 by relocation), regrading soils to match natural conditions, and the implementation of a FWEEP. These construction and demolition activities could have a negligible impact on surface waters due to increased turbidity caused by the disturbance and run-off of soil. However, these impacts would be expected to be successfully mitigated through an erosion control plan. The beneficial impacts would be realized by the removal of structures from the floodway and via the utilization of nonstructural measures, which would moderately reduce the risk of the release of debris, trash, household chemicals, lead based paint, asbestos, and plastics into nearby surface waters. Furthermore, the proposed native riparian plantings within the floodway would provide improved bank resilience as well as would improve water quality by acting as a natural buffer to pollutants. The long-term improvement of water quality in the area would reduce potential impacts to the federally listed aquatic organisms within the watershed.

5B - FWEEP, acquisitions in Kentucky River Floodway, and Essential/Anchor Structures

The USACE has determined that Alternative 5B would have no effect on federally listed bat species that have ranges which overlap with the project area (see Table 2). There is little habitat for these species within the project area and no trees greater than 3-inches in diameter would be removed during construction or demolition activities. Additionally, Alternative 5B would have no effect on the monarch butterfly, as little habitat for this species is present within the project area.

The USACE has determined that the Alternative 5B may affect but is not likely to adversely affect the Kentucky arrow darter and the seven listed mussel species that have ranges which overlap the project area (see Table 2) considering the expected moderate long-term beneficial improvements to water quality as well enhancement of riparian habitat in the floodway.

It is expected that Alternative 5B would have moderate long-term, beneficial impacts to federally listed aquatic species. Alternative 5B entails nonstructural measures being implemented on up to 28 structures and the implementation of a FWEEP. These construction and demolition activities could have a negligible adverse short-term impact on surface waters due to increased turbidity caused by the disturbance and run-off of soil. However, these impacts would be expected to be successfully mitigated through an erosion control plan. The beneficial impacts would be realized by the removal of structures from the floodway and via the utilization of nonstructural measures, which would moderately reduce the risk of the release of debris, trash, household chemicals, lead based paint, asbestos, and plastics into nearby surface waters. Furthermore, the proposed native riparian plantings within the floodway would provide improved bank resilience as well as would improve water quality by acting as a natural buffer to pollutants. The long-term improvement of water quality in the area would reduce potential impacts to the federally listed aquatic organisms within the watershed.

3A - Complete Nonstructural 672.2 ft NAVD88

The USACE has determined that Alternative 3A would have no effect on federally listed bat species that have ranges which overlap with the project area (see Table 2). There is little habitat for these species within the project area and no trees greater than 3-inches in diameter would be removed during construction or demolition activities. Additionally, Alternative 3A would have no effect on the monarch butterfly, as little habitat for this species is present within the project area.

The USACE has determined that the Alternative 3A may affect but is not likely to adversely affect the Kentucky arrow darter and the seven listed mussel species that have ranges which overlap the project area (see Table 2) considering the expected moderate long-term beneficial improvements to water quality as well enhancement of riparian habitat in the floodway.

It is expected that Alternative 3A would have moderate long-term, beneficial impacts to federally listed aquatic species. Alternative 3A entails nonstructural measures being implemented on up to 120 structures below 672.2 ft NAVD88 and the implementation of a FWEEP. These construction and demolition activities could have a negligible impact on surface waters due to increased turbidity caused by the disturbance and run-off of soil. However, these impacts would be expected to be successfully mitigated through an erosion control plan. The beneficial impacts would be realized by the removal of structures from the floodway and via the utilization of nonstructural measures, which would moderately reduce the risk of the release of debris, trash, household chemicals, lead based paint, asbestos, and plastics into nearby surface waters. The long-term improvement of water quality in the area would reduce potential impacts to the federally listed aquatic organisms within the watershed.

4.1.5.2 State Listed Species

No Action

The NAA would have no effect on state listed bird or bat species that have ranges which overlap with the project area (see Table 2). No state-listed bird or bat species are known from the project footprint and there is little habitat for these species within the project area. Because the project

footprint is primarily urban, the continued flooding of Beattyville would not be expected to impact bird or bat habitat or populations. Additionally, the NAA would have no effect on the six-banded longhorn beetle, as little habitat for this species is present within the project area.

It is expected that the NAA could have significant long-term adverse impacts to state listed aquatic species (see Table 2). While the Kentucky Arrow Darter is known to occur in Silver Creek, it is not clear if there are extant populations of the other state listed species within the project area or downstream. However, the historical range includes the project area and without formal survey data, it is assumed that they could occur where suitable habitat is present. Impacts to these species would occur from the pollution caused during regularly reoccurring flooding disasters. Household chemicals, lead based paint, asbestos, plastics, and other substances likely to cause harm to aquatic organisms, would be expected to occur in structures in Beattyville and would be expected to enter the water way during a flooding disaster event. The species listed are sensitive to pollution and impacts to water quality are known to cause adverse impacts.

5C – FWEEP, Acquisitions in Kentucky River Floodway, Essential/Anchor Structures, and Historical Structures

Alternative 5C would have no effect on state listed bird or bat species that have ranges which overlap with the project area (see Table 2). Due the urban nature of Beattyville site, there is little habitat for these species within the project footprint and no trees greater than 3-inches in diameter would be removed during construction or demolition activities. Additionally, Alternative 5C would have no effect on the six-banded longhorn beetle, as little habitat for this species is present within the project footprint.

It is expected that Alternative 5C would have long-term moderate beneficial impacts to state listed aquatic species (see Table 2). Alternative 5C entails removing up to 12 structures from the floodway (7 by demolition, 5 by relocation) and regrading soils to match natural conditions, dry floodproofing up to 10 structures, wet floodproofing up to 30 structures, and the raising of one residential structure currently in the project footprint. These short-term construction and demolition activities could have a negligible impact on surface waters due to increased turbidity caused by the disturbance and run-off of soil. However, these impacts would be expected to be successfully mitigated through an erosion control plan outlined in Appendix A. The beneficial impacts to listed species would be realized by the removal of structures from the floodway and via the utilization of nonstructural measures, which would moderately reduce the risk of the release of debris, trash, household chemicals, lead based paint, asbestos, and plastics into nearby surface waters. Furthermore, the proposed native riparian plantings within the floodway would provide improved bank resilience as well as would improve water quality by acting as a natural buffer to pollutants. The long-term improvement of water quality in the area would result in a long-term beneficial impact to the state listed aquatic organisms within the watershed.

4 - Nonstructural (Non-physical) FWEEP Only

Alternative 4 would have no effect on state listed bird or bat species that have ranges which overlap with the project area (see Table 2). No state-listed bird or bat species are known from the project footprint and there is little habitat for these species within the project area. Because the project footprint is primarily urban, the continued flooding of Beattyville would not be expected to impact bird or bat habitat or populations. Additionally, Alternative 4 would have no effect on the six-banded longhorn beetle, as little habitat for this species is present within the project area.

It is expected that Alternative 4 could have significant long-term adverse impacts to state listed aquatic species (see Table 2). While the Kentucky Arrow Darter is known to occur in Silver Creek, it is not clear if there are extant populations of the other state listed species within the project area or downstream. However, the historical range includes the project area and without formal survey data, it is assumed that they could occur where suitable habitat is present. Impacts to these species would occur from the pollution caused during regularly reoccurring flooding disasters. Household chemicals, lead based paint, asbestos, plastics, and other substances likely to cause harm to aquatic organisms, would be expected to occur in structures in Beattyville and would be expected to enter the water way during a flooding disaster event. The species listed are sensitive to pollution and impacts to water quality are known to cause adverse impacts.

5A - FWEEP and Acquisitions in Kentucky River Floodway

Alternative 5A would have no effect on state listed bird or bat species that have ranges which overlap with the project area (Table 2). Due the urban nature of Beattyville site, there is little habitat for these species within the project footprint and no trees greater than 3-inches in diameter would be removed during construction or demolition activities. Additionally, Alternative 5A would have no effect on the six-banded longhorn beetle, as little habitat for this species is present within the project footprint.

It is expected that Alternative 5A would have long-term moderate beneficial impacts to state listed aquatic species (Table 2). Alternative 5A entails removing up to 12 structures from the floodway (7 by demolition, 5 by relocation), regrading soils to match natural conditions, and the implementation of a FWEEP. These short-term construction and demolition activities could have a negligible impact on surface waters due to increased turbidity caused by the disturbance and run-off of soil. However, these impacts would be expected to be successfully mitigated through an erosion control plan. The beneficial impacts to listed species would be realized by the removal of structures from the floodway and via the utilization of nonstructural measures, which would moderately reduce the risk of the release of debris, trash, household chemicals, lead based paint, asbestos, and plastics into nearby surface waters. Furthermore, the proposed native riparian plantings within the floodway would provide improved bank resilience as well as would improve water quality by acting as a natural buffer to pollutants. The long-term improvement of water quality in the area would result in a long-term beneficial impact to the state listed aquatic organisms within the watershed.

5B - FWEEP, acquisitions in Kentucky River Floodway, and Essential/Anchor Structures

Alternative 5B would have no effect on state listed bird or bat species that have ranges which overlap with the project area (Table 2). Due the urban nature of Beattyville site, there is little habitat for these species within the project footprint and no trees greater than 3-inches in diameter would be removed during construction or demolition activities. Additionally, Alternative 5B would have no effect on the six-banded longhorn beetle, as little habitat for this species is present within the project footprint.

It is expected that Alternative 5B would have long-term moderate beneficial impacts to state listed aquatic species (Table 2). Alternative 5B entails nonstructural measures being implemented on up to 28 structures and the implementation of a FWEEP. These short-term construction and demolition activities could have a negligible impact on surface waters due to increased turbidity caused by the disturbance and run-off of soil. However, these impacts would be expected to be successfully mitigated through an erosion control plan. The beneficial impacts to listed species

would be realized by the removal of structures from the floodway and via the utilization of nonstructural measures, which would moderately reduce the risk of the release of debris, trash, household chemicals, lead based paint, asbestos, and plastics into nearby surface waters. Furthermore, the proposed native riparian plantings within the floodway would provide improved bank resilience as well as would improve water quality by acting as a natural buffer to pollutants. The long-term improvement of water quality in the area would result in a long-term beneficial impact to the state listed aquatic organisms within the watershed.

3A - Complete Nonstructural 672.2 ft NAVD88

Alternative 3A would have no effect on state listed bird or bat species that have ranges which overlap with the project area (Table 2). Due the urban nature of Beattyville site, there is little habitat for these species within the project footprint and no trees greater than 3-inches in diameter would be removed during construction or demolition activities. Additionally, Alternative 3A would have no effect on the six-banded longhorn beetle, as little habitat for this species is present within the project footprint.

It is expected that Alternative 3A would have long-term moderate beneficial impacts to state listed aquatic species (Table 2). Alternative 3A entails nonstructural measures being implemented on up to 120 structures below 672.2 ft NAVD88 and the implementation of a FWEEP. These short-term construction and demolition activities could have a negligible impact on surface waters due to increased turbidity caused by the disturbance and run-off of soil. However, these impacts would be expected to be successfully mitigated through an erosion control plan. The beneficial impacts to listed species would be realized by the removal of structures from the floodway and via the utilization of nonstructural measures, which would moderately reduce the risk of the release of debris, trash, household chemicals, lead based paint, asbestos, and plastics into nearby surface waters. The long-term improvement of water quality in the area would result in a long-term beneficial impact to the state listed aquatic organisms within the watershed.

4.1.5.3 Designated Critical Habitat

No Action

The NAA has the potential to negatively impact Kentucky arrow darter designated critical Habitat within Silver Creek. It is expected that the NAA could have long-term significant adverse impacts to aquatic environments via the pollution caused during regularly reoccurring flooding disasters. Household chemicals, lead based paint, asbestos, plastics, and other substances likely to cause harm to aquatic organisms, would be expected to occur in structures in Beattyville and would be expected to enter the water way during a flooding disaster event. The Kentucky arrow darter is sensitive to pollution and impacts to water quality are known to cause adverse impacts.

5C – FWEEP, Acquisitions in Kentucky River Floodway, Essential/Anchor Structures, and Historical Structures

Alternative 5C has the potential to have a negligible short-term adverse impact on Kentucky arrow darter designated critical habitat due to construction runoff. However, it is expected that Alternative 5C would have moderate long-term beneficial impacts to aquatic environments. Alternative 5C entails removing up to 12 structures from the floodplain (7 by demolition, 5 by relocation), regrading soils to match natural conditions, dry floodproofing up to 10 buildings, wet floodproofing of up to 30 structures, raising one structure in place, and the implementation of a FWEEP. These construction and demolition activities could have a short-term negligible impact

on surface waters due to increased turbidity caused by the disturbance and run-off of soil. However, these impacts would be expected to be successfully mitigated through an erosion control plan outlined in Appendix A. The beneficial impacts would be realized by the removal of structures from the floodway and via the utilization of nonstructural measures in the floodplain, which would moderately reduce the risk of the release of debris, trash, household chemicals, lead based paint, asbestos, and plastics into nearby surface waters. Furthermore, the proposed native riparian plantings within the floodway would provide improved bank resilience as well as would improve water quality by acting as a natural buffer to pollutants. The improvement of local and regional water quality would have a long-term beneficial impact to Kentucky arrow darter Habitat.

The USACE has determined under Section 7 of the ESA that Alternative 5C may affect but is not likely to adversely affect the Kentucky arrow darter considering beneficial impacts to designated critical habitat through the long-term improvement in water quality as well as enhancement of riparian habitat in the floodway. The USFWS concurred with this determination on October 3, 2024 (Appendix B).

4 - Nonstructural (Non-physical) FWEEP Only

Alternative 4 has the potential to negatively impact Kentucky arrow darter critical habitat within Silver Creek. It is expected that Alternative could have long-term significant adverse impacts to aquatic environments via the pollution caused during regularly reoccurring flooding disasters. Household chemicals, lead based paint, asbestos, plastics, and other substances likely to cause harm to aquatic organisms, would be expected to occur in structures in Beattyville and would be expected to enter the water way during a flooding disaster event. The Kentucky arrow darter is sensitive to pollution and impacts to water quality are known to cause adverse impacts.

5A - FWEEP and Acquisitions in Kentucky River Floodway

Alternative 5A has the potential to have a negligible short-term adverse impact on Kentucky arrow darter designated critical habitat due to construction runoff. However, it is expected that Alternative 5A would have moderate long-term beneficial impacts to aquatic environments. Alternative 5A entails removing up to 12 structures from the floodway (7 by demolition, 5 by relocation), regrading soils to match natural conditions, and the implementation of a FWEEP. These construction and demolition activities could have a short-term negligible adverse impact on surface waters due to increased turbidity caused by the disturbance and run-off of soil. However, these impacts would be expected to be successfully mitigated through an erosion control plan. The beneficial impacts would be realized by the removal of structures from the floodway and via the utilization of nonstructural measures in the floodplain, which would moderately reduce the risk of the release of debris, trash, household chemicals, lead based paint, asbestos, and plastics into nearby surface waters. Furthermore, the proposed native riparian plantings within the floodway would provide improved bank resilience as well as would improve water quality by acting as a natural buffer to pollutants. The improvement of local and regional water quality would have a long-term beneficial impact to Kentucky arrow darter Habitat.

The USACE has determined that Alternative 5A may affect but is not likely to adversely affect the Kentucky arrow darter considering beneficial impacts to designated critical habitat through the long-term improvement in water quality as well as enhancement of riparian habitat in the floodway.

5B - FWEEP, acquisitions in Kentucky River Floodway, and Essential/Anchor Structures

Alternative 5B has the potential to have a negligible short-term adverse impact on Kentucky arrow darter designated critical habitat due to construction runoff. However, it is expected that Alternative 5B would have moderate long-term beneficial impacts to aquatic environments. Alternative 5B entails nonstructural measures being implemented on up to 28 structures and the implementation of a FWEEP. These construction and demolition activities could have a short-term negligible adverse impact on surface waters due to increased turbidity caused by the disturbance and run-off of soil. However, these impacts would be expected to be successfully mitigated through an erosion control plan. The beneficial impacts would be realized by the removal of structures from the floodway and via the utilization of nonstructural measures in the floodplain, which would moderately reduce the risk of the release of debris, trash, household chemicals, lead based paint, asbestos, and plastics into nearby surface waters. Furthermore, the proposed native riparian plantings within the floodway would provide improved bank resilience as well as would improve water quality by acting as a natural buffer to pollutants. The improvement of local and regional water quality would have a long-term beneficial impact to Kentucky arrow darter habitat.

The USACE has determined that Alternative 5B may affect but is not likely to adversely affect the Kentucky arrow darter considering beneficial impacts to designated critical habitat through the long-term improvement in water quality as well as enhancement of riparian habitat in the floodway.

3A - Complete Nonstructural 672.2 ft NAVD88

Alternative 3A has the potential to have a negligible short-term adverse impact on Kentucky arrow darter designated critical habitat due to construction runoff. However, it is expected that Alternative 3A would have moderate long-term positive impacts to aquatic environments. Alternative 3A entails nonstructural measures being implemented on up to 120 structures below 672.2 ft NAVD88 and the implementation of a FWEEP. These construction and demolition activities could have a short-term negligible adverse impact on surface waters due to increased turbidity caused by the disturbance and run-off of soil. However, these impacts would be expected to be successfully mitigated through an erosion control plan. The beneficial impacts would be realized by the removal of structures from the floodway and via the utilization of nonstructural measures in the floodplain, which would moderately reduce the risk of the release of debris, trash, household chemicals, lead based paint, asbestos, and plastics into nearby surface waters. The improvement of local and regional water quality would have a long-term beneficial impact to Kentucky arrow darter habitat.

The USACE has determined that Alternative 3A may affect but is not likely to adversely affect the Kentucky arrow darter considering beneficial impacts to designated critical habitat through the long-term improvement in water quality as well as enhancement of riparian habitat in the floodway.

4.1.5.4 Migratory Birds

No Action

As no construction would occur, no impacts to migratory birds would occur.

Action Alternatives

All action alternatives would have similar impacts to migratory bird species, with the exception of Alternative 4, which would have no effects. As very little habitat exists within the project area due

to its urban nature, adverse potential impacts to migratory birds are anticipated to be negligible and limited to disturbance during construction. Adult migratory birds would have the ability to escape any temporary construction disturbance. Furthermore, due to the urban nature of the project area, resident species would be acclimated to human activities. It is expected that contractors would follow best management practices outlined in the Nationwide Standard Conservation Measures and would coordinate with USFWS should any migratory bird nest or eggs be discovered on the property during any phase of construction.

4.1.6 Recreational, Scenic, and Aesthetic Resources

4.1.6.1 Local Resources

No Action

The NAA would have significant long-term adverse impacts to local recreational, scenic, and aesthetic resources. Flooding of the town would be expected to continue to occur, and buildings would continue to be damaged during disaster events. Many structures that have been recently flooded remain dilapidated and unoccupied, resulting in further degradation of the local aesthetic quality of Beattyville. Structures that are flooded again would release debris into the surrounding environment and would also degrade the local aesthetics of Beattyville as well as degrade wildlife viewing opportunities on the Kentucky River. Additionally, the Three Forks Historical Center would remain unprotected and would continue to experience damage, disrupting a local recreation opportunity.

5C – FWEEP, Acquisitions in Kentucky River Floodway, Essential/Anchor Structures, and Historical Structures

Alternative 5C would have long-term moderate beneficial impacts to local recreational, scenic, and aesthetic resources. Alternative 5C entails removing up to 12 structures from the floodway (7 by demolition, 5 by relocation), regrading soils to match natural conditions, dry floodproofing up to 10 buildings, wet floodproofing of up to 30 structures, raising one structure in place, and the implementation of a FWEEP. While the demolition of structures would cause short-term minor adverse impacts to the aesthetics of the project footprint, the long-term aesthetic character of the area would be improved by returning the impacted sites to a natural grade and their utilization as green space or for other appropriate community functions that align with proper use of floodplains. The riparian zone plantings and new hiking trail would provide new recreational opportunities as well as restore the floodplain to a more natural state. Additionally, this would tie into regional themes of natural tourism by providing natural floodplain habitat. Alternative 5C would improve the overall aesthetic of the community by removing dilapidated structures, reducing the debris deposited in Beattyville during flooding disasters, providing the opportunity for more recreation opportunities within the project area, and floodproofing existing commercial buildings that already provide local recreation opportunities and contribute to the aesthetic quality of Beattyville.

4 - Nonstructural (Non-physical) FWEEP Only

Alternative 4 entails the development of a FWEEP for the town of Beattyville. While the development of a FWEEP would have no direct impacts to local aesthetic resources, the lack of protections for town structures would cause significant long-term adverse impacts spelled out in the analysis of the NAA.

5A - FWEEP and Acquisitions in Kentucky River Floodway

Alternative 5A would have long-term moderate beneficial impacts to local recreational, scenic, and aesthetic resources. Alternative 5A entails removing up to 12 structures from the floodway (7 by demolition, 5 by relocation), regrading soils to match natural conditions, and the implementation of a FWEEP. While the demolition of structures would cause short-term minor adverse impacts to aesthetics of the project footprint, the long-term aesthetic character of the area would be improved by returning the impacted sites to a natural grade and their utilization as green space or for other appropriate community functions that align with proper use of floodplains. The riparian zone plantings and new hiking trail would provide new recreational opportunities as well as restore the floodplain to a more natural state. Additionally, this would tie into regional themes of natural tourism by providing natural floodplain habitat. Alternative 5A would improve the overall aesthetic of the community by removing dilapidated structures, reducing the debris deposited in Beattyville during flooding disasters, providing the opportunity for more recreation opportunities within the project area, and floodproofing existing commercial buildings that already provide local recreation opportunities and contribute to the aesthetic quality of Beattyville.

5B - FWEEP, acquisitions in Kentucky River Floodway, and Essential/Anchor Structures

Alternative 5B would have long-term moderate beneficial impacts to local recreational, scenic, and aesthetic resources. Alternative 5B entails nonstructural measures being implemented on up to 28 structures and the implementation of a FWEEP. While the demolition of structures would cause short-term minor adverse impacts to aesthetics of the project footprint, the long-term aesthetic character of the area would be improved by returning the impacted sites to a natural grade and their utilization as green space or for other appropriate community functions that align with proper use of floodplains. The riparian zone plantings and new hiking trail would provide new recreational opportunities as well as restore the floodplain to a more natural state. Additionally, this would tie into regional themes of natural tourism by providing natural floodplain habitat. Alternative 5B would improve the overall aesthetic of the community by removing dilapidated structures, reducing the debris deposited in Beattyville during flooding disasters, providing the opportunity for more recreation opportunities within the project area, and floodproofing existing commercial buildings that already provide local recreation opportunities and contribute to the aesthetic quality of Beattyville.

3A - Complete Nonstructural 672.2 ft NAVD88

Alternative 3A would have long-term moderate beneficial impacts to local recreational, scenic, and aesthetic resources. Alternative 3A entails nonstructural measures being implemented on up to 120 structures below 672.2 ft NAVD88 and the implementation of a FWEEP. While the demolition of structures would cause short-term minor adverse impacts to aesthetics of the project footprint, the long-term aesthetic character of the area would be improved by returning the impacted sites to a natural grade and their utilization as green space or for other appropriate community functions that align with proper use of floodplains. Alternative 3A would improve the overall aesthetic of the community by removing dilapidated structures, reducing the debris deposited in Beattyville during flooding disasters, providing the opportunity for more recreation opportunities within the project area, and floodproofing existing commercial buildings that already provide local recreation opportunities and contribute to the aesthetic quality of Beattyville.

4.1.6.2 Regional Resources

No Action

The NAA could have long-term minor adverse impacts to regional recreational, scenic, and aesthetic resources. As nature-based tourism continues to grow in the Red River Gorge and Natural Bridge State Park, long-term adverse impacts to Beattyville caused by flooding could prevent the community contributing to aspects of regional tourism. Degradation of the community as described in 4.1.6.1 would discourage visitation from regional recreators and discourage the development of recreation-based businesses within Beattyville.

5C – FWEEP, Acquisitions in Kentucky River Floodway, Essential/Anchor Structures, and Historical Structures

Alternative 5C would have long-term minor beneficial impacts to regional recreational, scenic, and aesthetic resources Alternative 5C entails removing up to 12 structures from the floodway (7 by demolition, 5 by relocation), regrading soils to match natural conditions, dry floodproofing up to 10 buildings, wet floodproofing of up to 30 structures, raising one structure in place, and the implementation of a FWEEP. The demolition of structures would cause temporary minor adverse impacts to aesthetics while the area remains disturbed. However, the areas would be returned to a natural grade and would be utilized as green space or for other appropriate community functions that align with proper use of floodplains. This would improve the long-term aesthetic character of the community by removing dilapidated structures, reducing the debris deposited in Beattyville during flooding disasters, providing the opportunity for more recreation opportunities within the project area, and floodproofing existing commercial buildings that already provide local recreation opportunities and contribute to the aesthetic quality of Beattyville. The native plantings and hiking trail would provide incentive for regional visitors to visit the area, increase its alignment with regional tourism values, and encourage the development of recreation-based businesses within Beattyville.

4 - Nonstructural (Non-physical) FWEEP Only

Alternative 4 entails the development of a FWEEP for the town of Beattyville. While the development of a FWEEP would have no direct effect on regional aesthetics, the lack of structural protection would lead to minor long-term adverse impacts as spelled out by the NAA's analysis.

5A - FWEEP and Acquisitions in Kentucky River Floodway

Alternative 5A would have long-term minor beneficial impacts to regional recreational, scenic, and aesthetic resources Alternative 5A entails removing up to 12 structures from the floodway (7 by demolition, 5 by relocation), regrading soils to match natural conditions, and the implementation of a FWEEP. The demolition of structures would cause temporary minor adverse impacts to aesthetics while the area remains disturbed. However, the areas would be returned to a natural grade and would be utilized as green space or for other appropriate community functions that align with proper use of floodplains. This would improve the long-term aesthetic character of the community by removing dilapidated structures, reducing the debris deposited in Beattyville during flooding disasters, and providing the opportunity for more recreation opportunities within the project area. The native plantings and hiking trail would provide incentive for regional visitors to visit the area, increase its alignment with regional tourism values, and encourage the development of recreation-based businesses within Beattyville.

5B - FWEEP, acquisitions in Kentucky River Floodway, and Essential/Anchor Structures

Alternative 5B would have long-term minor beneficial impacts to regional recreational, scenic, and aesthetic resources Alternative 5B entails nonstructural measures being implemented on up to 28 structures and the implementation of a FWEEP. The demolition of structures would cause temporary minor adverse impacts to aesthetics while the area remains disturbed. However, the areas would be returned to a natural grade and would be utilized as green space or for other appropriate community functions that align with proper use of floodplains. This would improve the long-term aesthetic character of the community by removing dilapidated structures, reducing the debris deposited in Beattyville during flooding disasters, providing the opportunity for more recreation opportunities within the project area, and floodproofing existing commercial buildings that already provide local recreation opportunities and contribute to the aesthetic quality of Beattyville. The native plantings and hiking trail would provide incentive for regional visitors to visit the area, increase its alignment with regional tourism values, and encourage the development of recreation-based businesses within Beattyville.

3A - Complete Nonstructural 672.2 ft NAVD88

Alternative 3A would have long-term minor beneficial impacts to regional recreational, scenic, and aesthetic resources. Alternative 3A entails nonstructural measures being implemented on up to 120 structures below 672.2 ft NAVD88 and the implementation of a FWEEP. The demolition of structures would cause temporary minor adverse impacts to aesthetics while the area remains disturbed. However, the areas would be returned to a natural grade and would be utilized as green space or for other appropriate community functions that align with proper use of floodplains. This would improve the long-term aesthetic character of the community by removing dilapidated structures, reducing the debris deposited in Beattyville during flooding disasters, providing the opportunity for more recreation opportunities within the project area, and floodproofing existing commercial buildings that already provide local recreation opportunities and contribute to the aesthetic quality of Beattyville.

4.1.6.3 Cultural Resources

No Action

Under the NAA, no Federal undertaking would affect cultural resources. No construction or demolition activities would occur that would impact the Beattyville Historic District or other known cultural resources within the community. However, this alternative would leave the Beattyville Historic District vulnerable to adverse effects from foreseeable future flooding. Effects could include damage to and abandonment of contributing structures.

5C – FWEEP, Acquisitions in Kentucky River Floodway, Essential/Anchor Structures, and Historical Structures

Alternative 5C would have long-term minor beneficial impacts to cultural resources. Alternative 5C entails removing up to 12 structures from the floodway (7 by demolition, 5 by relocation) and regrading soils to match natural conditions, dry floodproofing up to 10 structures, wet floodproofing up to 30 structures, and the raising of one residential structure currently in the project footprint. Of these total structures 33 are currently included in the Beattyville Historic District. Of these 33 structures, 30 have been identified for wet floodproofing, 2 has been identified for dry floodproofing, 1 has been identified for raise-in-place, and the remaining 4 will have no

action. Because the designation of *essential* takes precedence over a *historic* designation, structures that were identified as both were listed within the essential category only.

The effects associated with wet and dry floodproofing will be considered and consulted on during the continuation of the Section 106 process; however, these are unlikely to be considered adverse effects and will ultimately provide historic benefits to the community of Beattyville by ensuring minimal loss of historic integrity to the community. Furthermore, flood damages discourage local business and may result with abandonment of historic buildings. USACE has determined that the other structures (those not included in the Beattyville Historic District) included in this alternative are not eligible for the NRHP.

4 - Nonstructural (Non-physical) FWEEP Only

A FWEEP-only plan would not minimize or avoid adverse effects to the Beattyville Historic District related to future flooding and would have little to no beneficial effects to the historic district.

5A - FWEEP and Acquisitions in Kentucky River Floodway

This alternative would have little to no beneficial effect to the Beattyville Historic District or other cultural resources and would not minimize or avoid adverse effects to other cultural resources due to future flooding. Within this alternative twelve (n=12) structures/lots would be acquired. One (n=1) is a non-contributing resource of the Beattyville Historic District (LEB 135); whereas the remaining twelve (n=12) are less than 50-years of age. These structures/lots include mobile homes and commercial business.

5B - FWEEP, acquisitions in Kentucky River Floodway, and Essential/Anchor Structures

This alternative would have little to no beneficial effect to the Beattyville Historic District or other cultural resources and would not minimize or avoid adverse effects to other cultural resources due to future flooding. Within this alternative twelve (n=12) structures would be subject to floodproofing measures. Six (n=6) of these structures are included in the Beattyville Historic District as either contributing (n=3) or non-contributing (n=3). The three (n=3) contributing resources will be wet floodproofed and include the Lee County Courthouse. The remaining seven (n=7) structures not included in the historic district have been determined to not be eligible for the NRHP.

3A - Complete Nonstructural 672.2 ft NAVD88

This alternative would result in several historic buildings being demolished, which could be considered an adverse effect to the Beattyville Historic District. Furthermore, this alternative would have little to no beneficial effect to other cultural resources due to future flooding.

4.1.7 Air Quality

No Action

The NAA would have no effect on air quality. No construction activities would occur that could release ozone, carbon monoxide, or other particulates into the atmosphere. Additionally, it would not be expected that the continued flooding of Beattyville would result in impacts to air quality.

5C – FWEEP, Acquisitions in Kentucky River Floodway, Essential/Anchor Structures, and Historical Structures

Alternative 5C would cause short-term minor impacts to air quality. Temporary construction and demolition activities, including the operation of heavy equipment with diesel engines, would release carbon monoxide and ozone into the atmosphere. Additionally, it would be expected that some dust and other particulate matter would be released during implementation of Alternative 5C. However, activities would only occur during daylight hours, allowing air quality return to baseline during off hours. Given that Lee County is in attainment for all criteria pollutants, it is not expected that impacts to air quality would be significant or require mitigation.

4 - Nonstructural (Non-physical) FWEEP Only

Alternative 4 would have no effect on air quality. No construction activities would occur that could release ozone, carbon monoxide, or other particulates into the atmosphere. Additionally, it would not be expected that the continued flooding of Beattyville would result in impacts to air quality.

5A - FWEEP and Acquisitions in Kentucky River Floodway

Alternative 5A would cause short-term minor adverse impacts to air quality. Temporary construction and demolition activities, including the operation of heavy equipment with diesel engines, would release carbon monoxide and ozone into the atmosphere. Additionally, it would be expected that some dust and other particulate matter would be released during implementation of Alternative 5A. However, activities would only occur during daylight hours, allowing air quality return to baseline during off hours. Given that Lee County is in attainment for all criteria pollutants, it is not expected that impacts to air quality would be significant or require mitigation.

5B - FWEEP, acquisitions in Kentucky River Floodway, and Essential/Anchor Structures

Alternative 5B would cause short-term minor adverse impacts to air quality. Temporary construction and demolition activities, including the operation of heavy equipment with diesel engines, would release carbon monoxide and ozone into the atmosphere. Additionally, it would be expected that some dust and other particulate matter would be released during implementation of Alternative 5B. However, activities would only occur during daylight hours, allowing air quality return to baseline during off hours. Given that Lee County is in attainment for all criteria pollutants, it is not expected that impacts to air quality would be significant or require mitigation.

3A - Complete Nonstructural 672.2 ft NAVD88

Alternative 3A would cause short-term minor adverse impacts to air quality. Temporary construction and demolition activities, including the operation of heavy equipment with diesel engines, would release carbon monoxide and ozone into the atmosphere. Additionally, it would be expected that some dust and other particulate matter would be released during implementation of Alternative 3A. However, activities would only occur during daylight hours, allowing air quality return to baseline during off hours. Given that Lee County is in attainment for all criteria pollutants, it is not expected that impacts to air quality would be significant or require mitigation.

4.1.7.1 Quantitative Clean Air Act Analysis

No Action and Alternative 4 – FWEEP Only

Since the NAA and Alternative 4 do not address the protection of structures within the project area and do not have construction elements, it can be assumed that their emissions will be the same. While no emissions are anticipated with the NAA or Alternative 4 due to construction, it has been assumed that a moderate flood event would occur sometime within the 50-year study period. Due to this, the NAA and Alternative 4's emissions were based on a single moderate flood cleanup event within the study area. To estimate emissions, total mileages or total hours for each component were calculated and multiplied by an average gallons per hour/mile for a given vehicle category. This produced the total gallons of diesel and gasoline needed for the cleanup effort. These numbers were then converted to tons/grams of carbon dioxide (C02), methane (CH4), nitrous oxide (N2O), and for comparative purposes, carbon dioxide equivalents (C02e).

In addition to the cleanup effort, 12 structures would remain in the floodway and consume electricity. The exact amount of electricity consumption is unknown but is expected to be minor.

The full analysis results can be found in Appendix B or summarized in Table 17 below.

Action Alternatives

Analysis of the remaining four Action Alternative's emissions was separated into two parts, construction emissions and carbon sequestration. For the construction emissions calculation, the USACE estimated total fuel usages for gasoline and diesel from projected necessary equipment and hours of use. For carbon sequestration, published USFS tables documenting carbon sequestrating for nearby tree stands were referenced to calculate the total amount of carbon that would be captured by the proposed plantings over the planning period, converted to C02 (Hoover et a. 2021). Finally, the sequestration amounts were applied to Alternatives 5A, 5B, and 5C to produce the grand total in Table 17, which includes, C02, CH4, N20, and C02e.

While small amounts of O&M would be needed for maintenance of the plantings and hiking trail associated with Alternative 5C, 5A, and 5B during the study period, emissions amounts for these activities are likely too low to be calculable and are not covered in this analysis. The full analysis results can be found in Appendix B or summarized in Table 17 below.

Table 17. Net Emissions Analysis Tool (NEAT) results.

Base Emissions				
	C02	CH4	N20	C02e
Alternative 5C	568 metric tons	54,160 grams	50,069 grams	585 metric tons
Alternative 4	129 metric tons	2,285 grams	3,010 grams	130 metric tons
No Action	129 metric tons	2,285 grams	3,010 grams	130 metric tons

Base Emissions				
Alternative 5A	49 metric tons	4,780 grams	4,445 grams	50 metric tons
Alternative 5B	118 metric tons	10,766 grams	9,871 grams	121 metric tons
Alternative 3A	2,984 metric tons	293,897 grams	273,322 grams	3,072 metric tons
Carbon Sequestration for 5A,5B,5C				
	C02	CH4	N20	C02e
	-699 metric tons	0	0	-699 metric tons
Grand Total				
	C02	CH4	N20	C02e
Alternative 5C	-131 metric tons	54,160 grams	50,069 grams	-114 metric tons
Alternative 4	129 metric tons	2,285 grams	3,010 grams	130 metric tons
No Action	129 metric tons	2,285 grams	3,010 grams	130 metric tons
Alternative 5A	-650 metric tons	4,780 grams	4,445 grams	-649 metric tons
Alternative 5B	-581 metric tons	10,766 grams	9,871 grams	-578 metric tons
Alternative 3A	2,984 metric tons	293,897 grams	273,322 grams	3,072 metric tons

4.1.8 Invasive Species

No Action

The NAA would have no effect on invasive species. The project area is urban and invasive species are present. However, it is not expected that continued flooding would exacerbate invasive species issues above the level they are currently at. Additionally, the project area is not a natural

area where it would be expected that invasive species could damage natural plant or wildlife communities.

5C – FWEEP, Acquisitions in Kentucky River Floodway, Essential/Anchor Structures, and Historical Structures

Alternative 5C would have minor beneficial effects on invasive species. The project area is urban, and invasive species are already present. Temporary construction activities would cause ground disturbance. However, all disturbed ground would be promptly reseeded or repaired to the appropriate asphalt or concrete condition. Given that the project area is urban, seed mixtures would likely consist of common lawn species that would be most appropriate for the setting and routine maintenance expected for the area. Therefore, construction activities would have no effect to this resource. The native plantings in the floodway would cause a minor long term beneficial effect to this resource as invasive species would be replaced or displaced by native species.

4 - Nonstructural (Non-physical) FWEEP Only

Alternative 4 would have no effect on invasive species. The project area is urban and invasive species are present. However, it is not expected that continued flooding would exacerbate invasive species issues above the level they are currently at. Additionally, the project area is not a natural area where it would be expected that invasive species could damage natural plant or wildlife communities.

5A - FWEEP and Acquisitions in Kentucky River Floodway

Alternative 5A would have minor beneficial effects on invasive species. The project area is urban, and invasive species are already present. Temporary construction activities would cause ground disturbance. However, all disturbed ground would be promptly reseeded or repaired to the appropriate asphalt or concrete condition. Given that the project area is urban, seed mixtures would likely consist of common lawn species that would be most appropriate for the setting and routine maintenance expected for the area. Therefore, construction activities would have no effect to this resource. The native plantings in the floodway would cause a minor long term beneficial effect to this resource as invasive species would be replaced or displaced by native species.

5B - FWEEP, acquisitions in Kentucky River Floodway, and Essential/Anchor Structures

Alternative 5B would have minor beneficial effects on invasive species. The project area is urban, and invasive species are already present. Temporary construction activities would cause ground disturbance. However, all disturbed ground would be promptly reseeded or repaired to the appropriate asphalt or concrete condition. Given that the project area is urban, seed mixtures would likely consist of common lawn species that would be most appropriate for the setting and routine maintenance expected for the area. Therefore, construction activities would have no effect to this resource. The native plantings in the floodway would cause a minor long term beneficial effect to this resource as invasive species would be replaced or displaced by native species.

3A - Complete Nonstructural 672.2 ft NAVD88

Alternative 3A would have no effect on invasive species. The project area is urban, and invasive species are already present. Temporary construction activities would cause ground disturbance. However, all disturbed ground would be promptly reseeded or repaired to the appropriate asphalt or concrete condition. Given that the project area is urban, seed mixtures would likely consist of

common lawn species that would be most appropriate for the setting and routine maintenance expected for the area. As such, Alternative 3A is not expected to impact invasive species.

4.1.9 Noise

No Action

The NAA would have no effect on noise. No construction or demolition activities associated with the action alternatives would occur that would impact the current noise level of the community.

5C – FWEEP, Acquisitions in Kentucky River Floodway, Essential/Anchor Structures, and Historical Structures

Alternative 5C would have short-term minor adverse impacts to noise. Construction and demolition activities would create higher levels of noise for the community. However, it is not expected that noise levels would be significantly higher than typical noises found in urban communities and construction activities would only occur during daylight hours, thus limiting the disturbance caused to community members. Siren installation and testing would also create short-term adverse impacts but would be short in duration and limited to areas directly around the siren.

4 - Nonstructural (Non-physical) FWEEP Only

Alternative 4 would have minor short-term adverse impacts to noise. Power tools and other equipment used to install the sirens would create localized raised noise levels. However, it is not expected that noise levels would be significantly higher than typical noises found in urban communities. Occasional siren testing would create short term adverse impacts; however, these would be short in duration and limited to areas directly around the siren.

5A - FWEEP and Acquisitions in Kentucky River Floodway

Alternative 5A would have short-term minor adverse impacts to noise. Construction and demolition activities would create higher levels of noise for the community. However, it is not expected that noise levels would be significantly higher than typical noises found in urban communities and construction activities would only occur during daylight hours, thus limiting the disturbance caused to community members. Siren installation and testing would also create short-term adverse impacts but would be short in duration and limited to areas directly around the siren.

5B - FWEEP, acquisitions in Kentucky River Floodway, and Essential/Anchor Structures

Alternative 5B would have short-term minor adverse impacts to noise. Construction and demolition activities would create higher levels of noise for the community. However, it is not expected that noise levels would be significantly higher than typical noises found in urban communities and construction activities would only occur during daylight hours, thus limiting the disturbance caused to community members. Siren installation and testing would also create short-term adverse impacts but would be short in duration and limited to areas directly around the siren.

3A - Complete Nonstructural 672.2 ft NAVD88

Alternative 3A would have short-term minor adverse impacts to noise. Construction and demolition activities would create higher levels of noise for the community. However, it is not expected that noise levels would be significantly higher than typical noises found in urban communities and construction activities would only occur during daylight hours, thus limiting the

disturbance caused to community members. Siren installation and testing would also create short-term adverse impacts but would be short in duration and limited to areas directly around the siren.

4.1.10 Transportation and Traffic

No Action

The NAA would have no effect on transportation and traffic, as there would be no construction activities that would impact traffic.

5C – FWEEP, Acquisitions in Kentucky River Floodway, Essential/Anchor Structures, and Historical Structures

Alternative 5C would have short-term negligible adverse impacts to transportation and traffic. Minor detours or flaggers may be used to safely control traffic around temporary demolition and construction activities. However, given that heavy traffic is not an issue in Beattyville, it would not be expected to cause noticeable impacts to local transportation or traffic flow.

4 - Nonstructural (Non-physical) FWEEP Only

Alternative 4 would have no effect on transportation and traffic, as there would be no construction activities that would impact traffic.

5A - FWEEP and Acquisitions in Kentucky River Floodway

Alternative 5A would have short-term negligible adverse impacts to transportation and traffic. Minor detours or flaggers may be used to safely control traffic around temporary demolition and construction activities. However, given that heavy traffic is not an issue in Beattyville, it would not be expected to cause noticeable impacts to local transportation or traffic flow.

5B - FWEEP, acquisitions in Kentucky River Floodway, and Essential/Anchor Structures

Alternative 5B would have short-term negligible adverse impacts to transportation and traffic. Minor detours or flaggers may be used to safely control traffic around temporary demolition and construction activities. However, given that heavy traffic is not an issue in Beattyville, it would not be expected to cause noticeable impacts to local transportation or traffic flow.

3A - Complete Nonstructural 672.2 ft NAVD88

Alternative 3A would have short-term negligible adverse impacts to transportation and traffic. Minor detours or flaggers may be used to safely control traffic around temporary demolition and construction activities. However, given that heavy traffic is not an issue in Beattyville, it would not be expected to cause noticeable impacts to local transportation or traffic flow.

4.1.11 Hazardous and Toxic Substances

Section 2.4.7 outlines the known sites in the project area that constitute Recognized Environmental Conditions (RECs) that would correspond with hazardous and toxic substances. However, a complete Phase I Environmental Site Assessment for Beattyville has not been completed due to the limited ability to access all buildings and properties at this point in the planning phase of the study. Therefore, all RECs are not known. However, it can be assumed, given the typical age and type of structures in Beattyville, that lead-based paint and asbestos are present in many of the buildings. There is also potential for onsite storage of petroleum products that are currently unknown, as well as storage of household cleaners, pesticides, and other

chemicals commonly used for routine maintenance of vehicles and facilities. As per ER 1165-2-132, a Phase 1 environmental investigation will need to be performed for all alternatives that require buy outs and if any RECs are discovered, the property will need to be remediated and deemed safe prior to purchase.

No Action

It would be expected the NAA would have long-term moderate adverse impacts to hazardous and toxic substances. Impacts would result from hazardous and toxic substances being dispersed into the environment during flooding disasters along with other trash and debris.

5C – FWEEP, Acquisitions in Kentucky River Floodway, Essential/Anchor Structures, and Historical Structures

Alternative 5C entails removing up to 12 structures from the floodway (7 by demolition, 5 by relocation), regrading soils to match natural conditions, dry floodproofing up to 10 buildings, wet floodproofing of up to 30 structures, raising one structure in place, and the implementation of a FWEEP. As such, it would be expected that Alternative 5C would have moderate long-term, beneficial impacts to hazardous and toxic substances. These beneficial impacts would be realized by the removal of structures from the floodway and via the utilization of nonstructural measures in the floodplain, which would moderately reduce the risk of the release of debris, trash, household chemicals, lead based paint, asbestos, and plastics into nearby surface waters.

Prior to any construction or demolition activities a Phase I Environmental Site Assessment would be performed to fully identify any potential RECs at each structure that is included in Alternative 5C. All appropriate actions would be taken to remove or abate RECs prior to demolition or activities that could otherwise cause hazardous and toxic substances to be released into the environment. Life safety would receive minor to moderate long-term benefits as HTRW could potentially be reduced and the odds of debris getting into the human environment would also be reduced.

4 - Nonstructural (Non-physical) FWEEP Only

It would be expected that Alternative 4 would have long-term moderate adverse impacts to hazardous and toxic substances due to the lack of protection for town structures. Impacts would result from hazardous and toxic substances being dispersed into the environment during flooding disasters along with other trash and debris.

5A - FWEEP and Acquisitions in Kentucky River Floodway

Alternative 5A entails removing up to 12 structures from the floodway (7 by demolition, 5 by relocation), regrading soils to match natural conditions, and the implementation of a FWEEP. As such, it would be expected that Alternative 5A would have moderate long-term, beneficial impacts to hazardous and toxic substances. These beneficial impacts would be realized by the removal of structures from the floodway which would moderately reduce the risk of the release of debris, trash, household chemicals, lead based paint, asbestos, and plastics into nearby surface waters.

Prior to any construction or demolition activities a Phase I Environmental Site Assessment would be performed to fully identify any potential RECs at each structure that is included in Alternative 5A. All appropriate actions would be taken to remove or abate RECs prior to demolition or activities that could otherwise cause hazardous and toxic substances to be released into the

environment. Life safety would receive minor to moderate long-term benefits as HTRW could potentially be reduced and the odds of debris getting into the human environment would also be reduced.

5B - FWEEP, acquisitions in Kentucky River Floodway, and Essential/Anchor Structures

Alternative 5B entails nonstructural measures being implemented on up to 28 structures and the implementation of a FWEEP. As such, it would be expected that Alternative 5B would have moderate long-term, beneficial impacts to hazardous and toxic substances. These beneficial impacts would be realized by the removal of structures from the floodway and via the utilization of nonstructural measures in the floodplain, which would moderately reduce the risk of the release of debris, trash, household chemicals, lead based paint, asbestos, and plastics into nearby surface waters.

Prior to any construction or demolition activities a Phase I Environmental Site Assessment would be performed to fully identify any potential RECs at each structure that is included in Alternative 5B. All appropriate actions would be taken to remove or abate RECs prior to demolition or activities that could otherwise cause hazardous and toxic substances to be released into the environment. Life safety would receive minor to moderate long-term benefits as HTRW could potentially be reduced and the odds of debris getting into the human environment would also be reduced.

3A - Complete Nonstructural 672.2 ft NAVD88

Alternative 3A entails nonstructural measures being implemented on up to 120 structures below 672.2 ft NAVD88 and the implementation of a FWEEP. As such, it would be expected that Alternative 3A would have moderate long-term, beneficial impacts to hazardous and toxic substances. These beneficial impacts would be realized by the removal of structures from the floodway and via the utilization of nonstructural measures in the floodplain, which would moderately reduce the risk of the release of debris, trash, household chemicals, lead based paint, asbestos, and plastics into nearby surface waters. Life safety would receive minor to moderate long-term benefits as HTRW could potentially be reduced and the odds of debris getting into the human environment would also be reduced.

4.1.12 Socioeconomics

No Action

It is expected that the NAA would have moderate long-term adverse impacts to socioeconomics. Resource extraction, particularly coal mining, has had a dramatic impact on the community resulting in boom-and-bust cycles that have left Beattyville with inadequate infrastructure to support the existing community. The NAA would result in the community, already struggling with a poverty rate of 26.6% (Table 9), to continue to have to clean up destroyed buildings and debris after each flooding disaster. Many structures that have a high likelihood of containing lead-based paint and asbestos would remain in the floodway and would regularly be flooded and damaged during disaster events. All 65 commercial buildings representing much of the local economy of the area would continue to experience damage during flooding disasters, resulting in lost business and costly cleanups. Finally, risks to life and safety would remain elevated, as a flood warning system and emergency management plan would not be created for the community.

5C – FWEEP, Acquisitions in Kentucky River Floodway, Essential/Anchor Structures, and Historical Structures

Alternative 5C is expected to have moderate long-term beneficial impacts to socioeconomics. Alternative 5C entails removing up to 12 structures from the floodway (7 by demolition, 5 by relocation), regrading soils to match natural conditions, dry floodproofing up to 10 buildings, wet floodproofing of up to 30 structures, raising one structure in place, and the implementation of a FWEEP. Beneficial impacts would be realized by the removal of structures from the floodway and via the utilization of nonstructural measures, which would moderately reduce the risk of structures being damaged regularly during flooding events. By removing structures, this plan would remove a moderate amount of potential lead-based paint and asbestos from the community. Through reducing the risk of damages this plan would reduce the risk of lost business for the community and costly cleanups. The plantings and hiking trail would provide recreational opportunities for residents, increase business development within Beattyville, and increase community cohesion by providing common space for residents. The plantings would create a natural buffer for erosion as well as improve local water quality through its buffer effect. Finally, the development of the FWEEP, when paired with the removal of structures from the floodplain would result in lower risks to life and safety for the community.

4 - Nonstructural (Non-physical) FWEEP Only

It would be expected that Alternative 4 would have moderate long-term beneficial impacts and moderate long-term adverse impacts to socioeconomics. The implementation of a FWEEP would provide the population with advance warning and a plan during flood events, producing a moderate long-term beneficial impact in terms of the reduction of life loss. The FWEEP, however, would not address the damage done by flood events to businesses and residents. Resource extraction, particularly coal mining, has had a dramatic impact on the community resulting in boom-and-bust cycles that have left Beattyville with inadequate infrastructure to support the existing community. Alternative 4 would result in the community, already struggling with poverty, to continue to have to clean up destroyed buildings and debris after each flooding disaster. Many structures that have a high likelihood of containing lead-based paint and asbestos would remain in the floodway and would regularly be flooded and damaged during disaster events. All 65 commercial buildings representing much of the local economy of the area would continue to experience damage during flooding disasters, resulting in lost business and costly cleanups.

5A - FWEEP and Acquisitions in Kentucky River Floodway

Alternative 5A is expected to have moderate long-term beneficial impacts to socioeconomics. Alternative 5A entails removing up to 12 structures from the floodway (7 by demolition, 5 by relocation), regrading soils to match natural conditions, and the implementation of a FWEEP. Beneficial impacts would be realized by the removal of structures from the floodway and via the utilization of nonstructural measures, which would moderately reduce the risk of structures being damaged regularly during flooding events. By removing structures, this plan would remove a moderate amount of potential lead-based paint and asbestos from the community. Through reducing the risk of damages this plan would reduce the risk of lost business for the community and costly cleanups. The plantings and hiking trail would provide recreational opportunities for residents, increase business development within Beattyville, and increase community cohesion by providing common space for residents. The plantings would create a natural buffer for erosion as well as improve local water quality through its buffer effect. Finally, the development of the

FWEEP, when paired with the removal of structures in the floodplain, would result in lower risks to life and safety for the community.

5B - FWEEP, acquisitions in Kentucky River Floodway, and Essential/Anchor Structures

Alternative 5B is expected to have moderate long-term beneficial impacts to socioeconomics. Alternative 5B entails removing up to 12 structures from the floodway (7 by demolition, 5 by relocation), regrading soils to match natural conditions, and the implementation of a FWEEP. Beneficial impacts would be realized by the removal of structures from the floodway and via the utilization of nonstructural measures, which would moderately reduce the risk of structures being damaged regularly during flooding events. By removing structures, this plan would remove a moderate amount of potential lead-based paint and asbestos from the community. Through reducing the risk of damages this plan would reduce the risk of lost business for the community and costly cleanups. The plantings and hiking trail would provide recreational opportunities for residents, increase business development within Beattyville, and increase community cohesion by providing common space for residents. The plantings would create a natural buffer for erosion as well as improve local water quality through its buffer effect. Finally, the development of the FWEEP, when paired with the removal of structures in the floodplain, would result in lower risks to life and safety for the community.

3A - Complete Nonstructural 672.2 ft NAVD88

Alternative 3A is expected to have moderate long-term beneficial impacts to socioeconomics. Alternative 3A entails nonstructural measures being implemented on up to 120 structures below 672.2 ft NAVD88 and the implementation of a FWEEP. Beneficial impacts would be realized by the removal of structures from the floodway and via the utilization of nonstructural measures, which would moderately reduce the risk of structures being damaged regularly during flooding events. By removing structures, this plan would remove a moderate amount of potential lead-based paint and asbestos from the community. Through reducing the risk of damages this plan would reduce the risk of lost business for the community and costly cleanups. Finally, the development of the FWEEP, when paired with the removal of structures in the floodplain, would result in lower risks to life and safety for the community. While no formal estimation of benefits has been done for this alternative as it was initial, flood reduction management benefits are estimated to be similar to alternative 5C, but with no recreation benefits.

4.2 Summary of Impacts

A summary of impacts across all alternatives can be found below in Table 18.

Table 18. Summary Table of Environmental Effects

Resource	EA Section	Alternative 5C	No Action	Alternative 4	Alternative 5A	Alternative 5B	Alternative 3A
Hydro-meteorological Conditions and Resilience	4.1.1	Moderate Long-term Beneficial	Long-term Moderate Adverse	Long-term Moderate Adverse, Minor Long-Term Beneficial	Moderate Long-term Beneficial	Moderate Long-term Beneficial	Moderate Long-term Beneficial
Soil Associations	4.1.2.1	Negligible Short-Term Adverse	No Effect	No Effect	Negligible Short-Term Adverse	Negligible Short-Term Adverse	Negligible Short-Term Adverse
Surface Water	4.1.3.1	Negligible Short Term Adverse Long-Term Moderate Beneficial	Moderate Long-Term Adverse	Moderate Long-Term Adverse	Negligible Short Term Adverse Long-Term Moderate Beneficial	Negligible Short Term Adverse Long-Term Moderate Beneficial	Negligible Short Term Adverse Long-Term Moderate Beneficial
Groundwater	4.1.3.2	Moderate Long-Term Beneficial	Moderate Long-Term Adverse	Moderate Long-Term Adverse	Moderate Long-Term Beneficial	Moderate Long-Term Beneficial	Moderate Long-Term Beneficial
Floodplains	4.1.3.3	Negligible Short Term Adverse Long-Term Moderate Beneficial	Moderate Long-Term Adverse	Moderate Long-Term Adverse	Negligible Short Term Adverse Long-Term Moderate Beneficial	Negligible Short Term Adverse Long-Term Moderate Beneficial	Negligible Short Term Adverse Long-Term Moderate Beneficial

Resource	EA Section	Alternative 5C	No Action	Alternative 4	Alternative 5A	Alternative 5B	Alternative 3A
Wetlands	4.1.3.4	Negligible Short Term Adverse Long-Term Moderate Beneficial	Moderate Long-Term Adverse	Moderate Long-Term Adverse	Negligible Short Term Adverse Long-Term Moderate Beneficial	Negligible Short Term Adverse Long-Term Moderate Beneficial	Negligible Short Term Adverse Long-Term Moderate Beneficial
Terrestrial Habitats and Fauna	4.1.4.1	No effect	No effect	No effect	No effect	No effect	No effect
Aquatic Habitats and Fauna	4.1.4.2	Negligible Short Term Adverse Long-Term Moderate Beneficial	Moderate Long-Term Adverse	Moderate Long-Term Adverse	Negligible Short Term Adverse Long-Term Moderate Beneficial	Negligible Short Term Adverse Long-Term Moderate Beneficial	Negligible Short Term Adverse Long-Term Moderate Beneficial
Federally Listed Species	4.1.5.1	Moderate Long-Term Beneficial	Significant Long-Term Adverse	Significant Long-Term Adverse	Moderate Long-Term Beneficial	Moderate Long-Term Beneficial	Moderate Long-Term Beneficial
State Listed Species	4.1.5.2	Moderate Long-Term Beneficial	Significant Long-Term Adverse	Significant Long-Term Adverse	Moderate Long-Term Beneficial	Moderate Long-Term Beneficial	Moderate Long-Term Beneficial
Designated Critical Habitat	4.1.5.3	Negligible Short-Term Adverse	Significant Long-	Significant Long-Term Adverse	Negligible Short-Term Adverse	Negligible Short-Term Adverse	Negligible Short-Term Adverse

Resource	EA Section	Alternative 5C	No Action	Alternative 4	Alternative 5A	Alternative 5B	Alternative 3A
		Moderate Long-Term Beneficial	Term Adverse		Moderate Long-Term Beneficial	Moderate Long-Term Beneficial	Moderate Long-Term Beneficial
Migratory Birds	4.1.5.4	Negligible Short-Term Adverse	No Effect	No Effect	Negligible Short-Term Adverse	Negligible Short-Term Adverse	Negligible Short-Term Adverse
Local Recreation, Aesthetic, and Scenic Resources	4.1.6.1	Minor Short-Term Adverse Moderate Long-Term Beneficial	Significant Long-Term Adverse	Significant Long-Term Adverse	Minor Short-Term Adverse Moderate Long-Term Beneficial	Minor Short-Term Adverse Moderate Long-Term Beneficial	Minor Short-Term Adverse Moderate Long-Term Beneficial
Regional Recreation, Aesthetic, and Scenic Resources	4.1.6.2	Minor Short-Term Adverse Minor Long-Term Beneficial	Minor Long-Term Adverse	Minor Long-Term Adverse	Minor Short-Term Adverse Minor Long-Term Beneficial	Minor Short-Term Adverse Minor Long-Term Beneficial	Minor Short-Term Adverse Minor Long-Term Beneficial
Cultural Resources	4.1.6.3	Moderate Long-term Beneficial	Moderate Long-term Adverse	Minor Long-Term Adverse	Minor Long-Term Adverse	Minor Long-Term Adverse	Moderate Long-term Adverse
Air Quality	4.1.7	Minor Short-Term Adverse	No Effect	No Effect	Minor Short-Term Adverse	Minor Short-Term Adverse	Minor Short-Term Adverse

Resource	EA Section	Alternative 5C	No Action	Alternative 4	Alternative 5A	Alternative 5B	Alternative 3A
Invasive Species	4.1.8	Minor Long-Term Beneficial	No Effect	No Effect	Minor Long-Term Beneficial	Minor Long-Term Beneficial	Minor Long-Term Beneficial
Noise	4.1.9	Minor Short-Term Adverse	No Effect	Minor Short-Term Adverse	Minor Short-Term Adverse	Minor Short-Term Adverse	Minor Short-Term Adverse
Transportation and Traffic	4.1.10	Negligible Short-Term Adverse	No Effect	Negligible Short-Term Adverse	Negligible Short-Term Adverse	Negligible Short-Term Adverse	Negligible Short-Term Adverse
Hazardous, Toxic, and Radioactive Waste	4.1.11	Moderate Long-Term Beneficial	Long-Term Moderate Adverse	Long-Term Moderate Adverse	Moderate Long-Term Beneficial	Moderate Long-Term Beneficial	Moderate Long-Term Beneficial
Socioeconomics	4.1.12	Moderate Long-Term Beneficial	Moderate Long-Term Adverse	Moderate Long-Term Beneficial Moderate Long-Term Adverse	Moderate Long-Term Beneficial	Moderate Long-Term Beneficial	Moderate Long-Term Beneficial

4.3 Mitigation, Monitoring, and Adaptive Management

Mitigation can include avoiding, minimizing, rectifying, reducing over time, and/or compensating for impacts to the human environment.

During early scoping it was identified that designated critical habitat for the federally threatened Kentucky Arrow Darter occurred within the limits of Beattyville. Avoidance was determined to be the best method to mitigate impacts, and measures that resulted in direct impacts to critical habitat were screened from consideration.

It is expected that Alternative 5C would result in construction and demolition activities that would disturb greater than one acre of land. This disturbance could result in runoff that could impact surface waters, wetlands, and aquatic habitat. Minimization has been determined to be the best method to mitigate these impacts and a Storm Water Pollution Prevention Plan (SWPPP) would be developed to detail erosion control measures and best management practices that would be employed to reduce erosion to a point that impacts are not significant.

Alternatives involving buy outs and other potential economic impacts would be compensated in a way that is compliant with the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970, Public 91-646, as amended (Uniform Act).

5 Plan Comparison and Selection

5.1 Plan Comparison

The result of the plan formulation process was a Final Array of Alternatives with a total of six alternatives including the NAA. Criteria for plan comparison and a strategy for qualitative or quantitative evaluation of each of the four comprehensive benefit accounts and the potential effect category for USACE's primary mission areas was developed. The accounts and effect categories are listed below:

- Number of Structures eligible:
  - This category does not evaluate the alternatives across the four accounts it is just a quick access point to display the data.
- NED Benefits (additional information included in Appendix D - Economics):
  - Project First Cost (in FY24 dollars): includes the cost of design and management during construction.
  - Benefit-to-Cost Ratio (BCR): a measure of the average annual equivalent benefits (AAEB) of the project compared to the average annual equivalent costs (AAEC).
    - BCR = AAEB ÷ AAEC
  - Net NED Benefits: the difference between AAEB and AAEC.
    - Net Benefits = AAEB - AAEC
    - NED benefits are inclusive of both flood risk management (damages) and recreation (willingness to pay) gains/losses.
- RED Benefits (additional information included in Appendix D - Economics):
  - Registers changes in the distribution of regional economic activity that result from each alternative plan. In addition to the benefits accounted for within the NED account, the implementation of the Recommended Plan would result in local

economic activity which is accounted for within the RED account. The regional economic impact modeling tool, RECONS, was used to calculate RED benefits.
    - RED benefits, representing output, employment, value added, and labor income over the implementation period enhance regional economic vitality, but are not additive to NED benefits.
- EQ Benefits:
    - Environmental: a qualitative measure of the degree to which the alternative impacts the environmental habitat
    - Cultural: a qualitative measure of the degree to which the alternative impacts the area's cultural resources
- OSE Benefits:
    - Expected Annual Life Loss (additional information included in Appendix D - Economics): the degree to which the alternative reduces expected life loss due to riverine flooding.
    - Social Connectedness: a qualitative measure of the degree to which the alternative supports community cohesion and opportunities for connection
    - Community Identity: a qualitative measure of the degree to which the alternative supports community traditions, lifestyle, and values

The qualitative criteria were compared using a relative value of HIGH to LOW on the analysis of the final array of alternatives. LOW indicates an unfavorable result; MED indicates moderate results when compared to the alternative array; and HIGH indicates positive or beneficial results when compared to the alternative array.

Table 19 presents the final array alternative evaluation followed by discussion on plan comparison. Six alternatives in total were considered in this final evaluation across the four accounts (NED, RED, EQ, and OSE). RED values in this table represent total economic output in the U.S. generated by spending on project construction.

Table 19. Final Array Alternatives Evaluation

		NED			RED	EQ		OSE		
Alternative	Number of Structures Eligible	Project First Cost ($ million)	BCR	Net Benefits	RED Benefits ($ million)	Environmental	Cultural	Average Annual Life Loss	Social Connectedness	Communal Identity
1. No Action	0	0	N/A	0	0	MED	MED	0.135	LOW	LOW
3A. Complete Nonstructural 672.2	120	89	0.09	-3,007,659	145.9	MED	LOW	0.092	MED	MED
4. FWEEP	0	3	0	-98,895	5.3	LOW	MED	0.125	MED	LOW
5A. Incremental NS (FWEEP + FW AQ)	13	13.7	1.26	133,879	22.8	MED	MED	0.126	HIGH	MED
5B. FWEEP + FW AQ + ES	28	28	0.86	-124,690	24.4	MED	MED	0.126	HIGH	HIGH
5C. FWEEP + FW AQ + ES + HS	53	36.8	0.57	-592,162	50.7	MED	HIGH	0.126	HIGH	HIGH
FY24 Price Levels										
Nonstructural Plan										
NED Plan										
Total Net Benefits Plan / TRG Plan										

5.1.1 Comparison Across Alternatives

The following section presents an evaluation and comparison of the final array of flood risk management alternatives for Beattyville, Kentucky. Each alternative was assessed based on its economic, environmental, social, and life safety impacts to determine the most effective and comprehensive solution for long-term community resilience.

Alternative 3A – Complete Nonstructural

Alternative 3A represents a fully nonstructural approach. While it reduces expected annual life loss by 32%, it has a low benefit-cost ratio (BCR) of 0.09 and results in over $3 million in negative net NED benefits. Despite the life safety improvements, its high cost to save a statistical life (CSSL) ($58.99 million) makes it the least economically efficient.

Alternative 4 – Floodplain-Wide Emergency Evacuation Plan (FWEEP)

FWEEP offers the lowest cost to save a statistical life ($10.23 million). However, while it contributes significantly to life safety, it does not offer comprehensive flood risk reduction or resilience measures on its own. Therefore, FWEEP is valuable but insufficient as a standalone plan. Because there were no benefits quantified in the analysis of the FWEEP (though some minor FRM benefits do likely exist due to the additional warning time that might allow for removal of property from the area), the BCR is effectively zero and the net NED benefits are -$99,000.

Alternative 5A – National Economic Development (NED) Plan

Alternative 5A includes incremental nonstructural measures, FWEEP, recreation enhancements, and ecosystem restoration through beneficial reuse of acquired lands. It is the only alternative with a BCR greater than 1.0 (1.25) and delivers the highest net benefits ($131,000). It provides nearly as much reduction in expected annual life loss as alternative 3A (30%) and supports social connectedness by integrating new recreation amenities into the downtown core.

Alternative 5B – Enhanced Nonstructural Plan
Building on 5A, Alternative 5B adds floodproofing for 16 essential or community anchor structures—facilities critical for Beattyville's basic functionality and recovery. These enhancements strengthen community resilience and ensure continued operation of key services during and after flood events. The BCR for 5B is 0.85 and net NED benefits are -$127,000.

Alternative 5C – Total Net Benefits Plan (Recommended Plan)
Alternative 5C further expands on 5B by incorporating nonstructural floodproofing measures for 25 historic structures, primarily through wet floodproofing. This approach enhances long-term recovery, reduces downtime after flood events, and helps preserve the cultural fabric of the community. It provides the highest EQ benefits, aligns with Beattyville's vision for the floodplain, and reinforces both community identity and resilience. It is the only alternative that combines flood risk reduction, cultural preservation, recreational development, and regional economic growth into a cohesive, long-term strategy. The BCR for the recommended plan is 0.53 and -$703,000. (Note that because data were refined for the recommended plan after its selection, the final BCR and net benefits are slightly different than what is shown in the final array's summary of costs and benefits.)

These cumulative and cross-cutting benefits—particularly resilience, equity, and cohesion in an at-risk community—justify the selection of Alternative 5C as the Recommended Plan over the NED plan.

5.1.2 Comparison Across Specific Criteria

Note that all costs are reported in FY24 dollars for consistency and comparison purposes for plan formulation. Final costs reported for the Recommended Plan are in FY25 dollars.

Benefit-Cost Ratio (BCR)

- Highest BCR: Alternative 5A (1.26), the only plan exceeding unity.
- Other alternatives yield BCRs below 1.0 and therefore do not meet NED criteria.

Net Benefits

- Highest Net NED Benefits: Alternative 5A ($133,879).
- All other plans produce negative net benefits, with Alternative 3A being the lowest.

Regional Economic Development (RED) Benefits for Spending on Project Implementation:

- Highest RED Benefits (represented by total economic output in the nation): Alternative 3A ($145.9 million), despite its poor BCR.
- Lowest RED Benefits (represented by total economic output in the nation): FWEEP (Alternative 4) at $5.3 million.
- Magnitude of RED benefits are generally proportional to spending on project implementation.

Environmental Quality (EQ)

- By acquiring flood-prone structures and promoting open space reuse, Alternatives 5A, 5B, and 5C offer the highest environmental quality improvement of all alternatives considered
- These spaces offer potential for recreation and habitat restoration, especially along Silver Creek—a designated critical habitat for the Kentucky arrow darter.

Cultural Resources

- Alternative 5C is the only plan that aligns with the community's preservation goals and supports cultural continuity.

Expected Annual Life Loss (EALL)

- Under the No Action Alternative (NAA), EALL is estimated at 0.1354 lives per year—equivalent to nearly 7 deaths over a 50-year period from direct flood impacts.
- All alternatives reduce EALL by 8–32%, but cost-effectiveness varies:
    - Most effective: Alternative 3A (32% reduction in EALL)
    - Most efficient per life saved: Alternative 4 (8% reduction in EALL)
    - Highly effective and efficient: Alternative 5a, 5b, 5c (30% reduction in EALL)

Social Connectedness and Community Identity

- The NAA risks ongoing disruption to Beattyville's social fabric and community cohesion.
- Alternatives 5A, 5B, and 5C facilitate contiguous open space along the Kentucky River and Silver/Crystal Creeks, enabling recreational development.
- These improvements enhance local pride, economic activity, and quality of life for both residents and visitors.

5.2 Identification of The NED Plan

NED Plan: Reasonably maximizes NED benefits.

Alternative 5A is the NED Plan.

Nonstructural Plan: A primarily nonstructural alternative considered for FRM projects.

Alternative 3A is the nonstructural plan as it includes benefits for all structures in the base flood structure inventory.

Life Safety/Tolerable Risk Guidelines (TRG) Plan: An alternative that addresses life safety concerns and TRG 1 and TRG 4 (from Planning Bulletin 2019-04) for studies that involved existing or proposed dams and levees.

Alternative 5C is the Tolerable Risk Guidelines Plan as it includes a FWEEP involving components such as the Evacuation Plan and FPMP to promote flood awareness and safety, removes at-risk structures from floodway, elevates one structure, and floodproofs and additional 40 structures downtown.

Maximum Total Net Benefits Plan: The plan that maximizes total net benefits across all benefit categories.

> Alternative 5C is the Maximum Total Net Benefits Plan. It provides all the benefits of 5A and 5B but is the only plan which will increase resilience of the community and reduce the recovery time long term. It further improves upon 5B with its application of nonstructural FRM measure to 25 historical structures, the majority of which will be wet floodproofed. Additionally, 5C offers the highest impact to the EQ account. 5C best represents Beattyville's vison for the floodplain while also celebrating and preserving its identity for long term resilience.

Least Damaging Environmentally Practicable Alternative (LEDPA): Consistent with Section 404 of the CWA.

> The LEDPA is not applicable because no proposed alternative impacts Waters of the United States.

Locally Preferred Plan: If requested by the NFS, and not in one of the other listed plans in the guidance.

> The NFS has indicated that they are in support of Alternative 5C, and a Locally Preferred Plan was not developed.

5.3 Plan Selection

The Recommended Plan is Alternative 5C: Incremental Nonstructural Plan as it is the alternative which provides the most comprehensive benefits. Alternative 5C is not the plan with the highest NED benefits, therefore a NED waiver is required (see Section 5.4). Alternative 5C is a nonstructural plan consisting of acquisitions, recreation components, dry floodproofing, wet floodproofing, and raising in place, paired with a FWEEP.

5.4 Deviation From the NED

The NED Plan is Alternative 5A as it maximizes net NED benefits ($131,000) and has a 1.25 benefit-to-cost ratio (BCR). NED benefits associated with 5A are derived from quantity (visitation) and quality (experience) gains in recreation associated with the beneficial re-use of the acquired floodway lands. NED benefits from a project's recreation features are measured in terms of a visitor's 'willingness to pay' for the recreation opportunity.

However, on December 23, 2024, the USACE Louisville District received a policy exception from Engineer Regulation (ER) 1105-2-103, which states: "The National Economic Development, or NED, Plan for all project purposes except ecosystem restoration, the alternative plan that reasonably maximizes net economic benefits consistent with protecting the Nation's environment, the NED plan, shall be selected. The Assistant Secretary of the Army for Civil Works (ASA/CW) may grant an exception when there are overriding reasons for selecting another plan based upon comprehensive benefits or other Federal, State, local and international concerns." This policy exception was requested to allow for a Recommended Plan to be justified by comprehensive net benefits as captured in the EQ and OSE account—in this case, benefits that would increase resilience, reduce risk to life safety, protect culturally and historically significant structures,

promote community cohesion, and support communal identity within the at-risk community of Beattyville.

As such, Alternative 5C represents the plan that reasonably maximizes benefits across all four P&G accounts (i.e., NED, RED, OSE, and EQ). Therefore, Alternative 5C was selected as the Recommended Plan, which provides -$703,000 in net NED benefits with a BCR of 0.53. Net NED benefits represent average annual equivalent NED benefits less average annual equivalent NED costs, which were estimated using FY25 prices, the FY25 federal discount rate (3.0%), and 50-year period of analysis with a 2030 base year.

Alternative 5C is recommended as the comprehensive net benefits plan. 5C includes application of nonstructural measures to an additional 41 structures beyond those included in the NED plan—structures located within the economically disadvantaged and vulnerable community that are characterized by low resilience in the face of future flood risk. By acquiring flood-prone structures and promoting open space reuse, Alternative 5A produces the most significant improvement to the NED account. However, Alternative 5C builds upon 5A by reducing flood risk to both vulnerable essential structures (16) and historic structures (25), reducing flood risk to a greater number of structures and reducing the associated environmental impacts. As such, the incremental cost difference between the NED and Recommended Plan provides benefit to nearly four times as many structures. This approach enhances long-term recovery, reduces downtime after flood events, and helps preserve the cultural fabric of the community. It provides the highest EQ benefits, aligns with Beattyville's vision for the floodplain, and reinforces both community identity and resilience. It is the only alternative that combines flood risk reduction, cultural preservation, recreational development, and regional economic growth into a cohesive, long-term strategy. As such, this policy exception was requested to allow for a recommended plan to be justified by comprehensive net benefits as captured in the EQ and OSE account—in this case, benefits that would increase resilience, reduce risk to life safety, protect culturally and historically significant structures, promote community cohesion, and support communal identity within the at-risk community of Beattyville. In accordance with ER 1105-2-103, Section 4, USACE evaluated alternatives using a holistic framework that equally weighs economic, environmental, and social benefits. The Recommended Plan, Alternative 5C, provides superior comprehensive benefits and meets the criteria for a justified NED exception, approved by the ASA(CW) on December 23, 2024.

ER 1105-2-103 requires study teams consider the total net benefits of project alternatives, including consideration of economic, environmental, and social benefits, impacts, and costs when making decisions and recommendations. Through the comprehensive accounting of benefits, the USACE Louisville District is recommending a plan that incorporates comprehensive benefits and provides an at-risk community with much needed flood risk management assistance.

Selection of the Recommended Plan, based on the calculation of comprehensive benefits, is consistent with current guidance. Below is a summary of the justification for the NED Exception.

- Maximizes Resilience Across Multiple Dimensions: Alternative 5C is the only plan that meaningfully increases long-term community resilience by reducing flood damage recovery time and protecting critical infrastructure and services.
- Reduces Risk to Life Safety: While not the NED plan, Alternative 5C achieves the same 30% reduction in expected annual life loss as the NED plan, significantly improving safety outcomes for a historically underserved population.

- Preserves Historic and Cultural Identity: By floodproofing 25 historically significant downtown structures, the plan protects Beattyville's sense of place, identity, and cultural continuity, key elements of long-term community cohesion.
- Protects Essential Community Assets: The plan includes 16 essential services and anchor businesses—such as courthouses, health centers, and local grocery stores—ensuring critical post-flood recovery functions remain operational.
- Delivers Superior Regional Economic Development (RED) Benefits: Construction spending on Alternative 5C provides $68.9 million in economic output within the nation over the 10-year implementation period.
- Aligns with Local and State Priorities: The plan reflects the City of Beattyville's floodplain vision and has received explicit support from the non-Federal sponsor, demonstrating strong local ownership and alignment.
- Enhances Environmental Quality (EQ): By acquiring flood-prone structures and promoting open space reuse, Alternatives 5A, 5B, and 5C offer the highest environmental quality improvement of all alternatives considered. Alternative 5C builds upon both 5A and 5B by reducing risk to at-risk essential and historic structures, reducing flood risk to a greater number of structures and reducing the associated environmental impacts.
- Voluntary, Equitable Participation Approach: The plan allows for voluntary participation outside the floodway acquisitions, ensuring equity in implementation while still maximizing participation through community engagement.
- Meets USACE Policy Objectives: Although it does not maximize NED benefits, Alternative 5C fully aligns with regulations directing equal consideration of NED, RED, EQ, and OSE accounts, justifying a policy exception under ER 1105-2-103.

The (NED) plan policy exception was signed by the ASA (CW) on December 23, 2024.

6 THE RECOMMENDED PLAN

6.1 PLAN ACCOMPLISHMENTS

The Recommended Plan is a comprehensive plan which maximizes total net benefits. Table 20 provides a summary of the costs and benefits. The Recommended Plan includes the following:

FWEEP: A base plan utilizing applicable and appropriate FWEEP elements. This is the base plan because it provides a cost-effective improvement to life safety and supports resilience through floodplain management and improved response to flood events.

Floodway Acquisitions in the Kentucky River Floodway: Floodway acquisitions are the next increment as the floodway is the area where most flood damages naturally occur, and acquisitions will support the components of the FWEEP that restrict development in the floodway. If a structure's footprint is at least 50% in the FEMA regulatory floodway, then the decision was made to acquire the property or do nothing. The do-nothing option was applied if the property has specific local significance or importance and would cause a detriment if acquired or removed. The floodway acquisitions identified also provide a contiguous space where recreational features such as a walking trail, playground area, parking, and a kayak launch area for access to the Kentucky River will provide additional

project benefits. Additionally, native planting components may enhance the aesthetic qualities of the riverfront, although they have not been quantified for this effort. As of now, these native planting components (native grasses, plantings, and riparian trees) serve only to support the recreation features under consideration.

Essential/Anchor Assets and Services: Structures supporting local services, assets, and anchor businesses such as police stations, courthouses, health centers, groceries, and cultural hubs were considered essential/anchor community assets and services. Eight structures are to be dry flood proofed and eight structures are to be wet floodproofed. Floodproofing these structures will support community resilience by reducing flood risk to the services that will allow the town to bounce back after a flood event. (Note: three of the eight wet floodproofing Essential structures also fall under the Historic category; For purposes of this study, Essential designation takes precedence over Historic designation).

Historical Structures: The structures included in the Beattyville Historic District, will be either dry (2) or wet (22) floodproofed, raised-in-place (1), and with five structures that have no action. Floodproofing these structures supports community cohesion by helping to preserve Beattyville's aesthetic characteristics as well as its sense of community pride and history.

Table 20: Recommended Plan Summary of Annual Benefits and Costs

Beattyville, KY
General Investigation
Summary of Annual Benefits and Costs
FY 2025 Price Levels
3.0% Interest Rate

	5C: Recommended Plan
Investment Cost	
Construction First Cost	32,918,000
Interest During Construction	5,233,951
Total Investment Cost	38,151,951
Annual Costs	
Interest & Amortization	1,482,794
Operation & Maintenance	12,000
Total Annual Costs	1,494,794
Annual Benefits	
Flood Risk Management	180,805
Recreation	611,320
Total Annual Benefits	792,125
Benefit vs. Cost Ratio	**0.53**
Net Benefits	-702,669

Assumptions
[1]117 month construction duration
[2]50-year period of analysis; Base year is 2030
[3]Required maintenance is not expected to exceed $12,000 annually

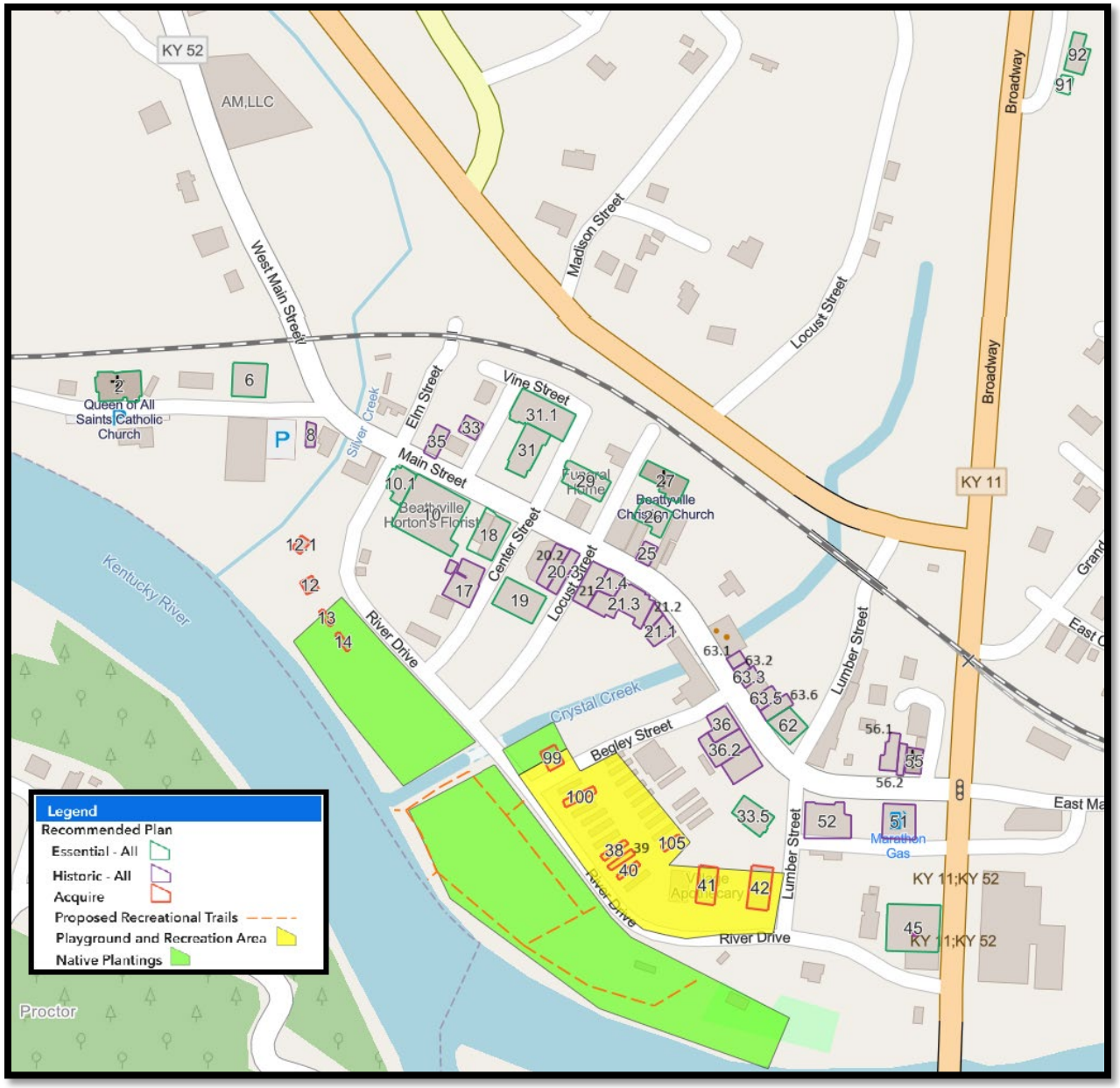

Figure 15. Recommended Plan - Alternative 5C Incremental Nonstructural Plan

Table 21. Recommended Plan – Eligible Structure Inventory

Structure Number	5A Floodway Acquisition	5B Essential	5C Historic	Protection Measure	Address	Property Type
2		YES		Wet Floodproofing	88 Railroad	Nonprofit
6		YES		Wet Floodproofing	28 Railroad Street	Nonprofit
8			YES	Wet Floodproofing	343 Main Street	Commercial
10		YES		Dry Floodproofing	285 West Main Street	Commercial
10.1		YES		Dry Floodproofing	301 West Main St	Commercial
12	YES			Acquisition	343 River Dr.	Commercial
12.1	YES			Acquisition	343 River Dr.	Commercial
13	YES			Acquisition	115 River Rd	Commercial
14	YES			Acquisition	115 River Rd	Commercial
17			YES	Dry Floodproofing	45 Center Street	Nonprofit
18		YES		Dry Floodproofing	263 Main Street	Commercial
19		YES		Wet Floodproofing	48 Center Street	Nonprofit
20.2			YES	Wet Floodproofing	223 Main Street	Commercial
20.3			YES	Wet Floodproofing	217 Main Street	Commercial
21			YES	Wet Floodproofing	203 Main Street	Commercial
21.1			YES	Wet Floodproofing	169 Main Street	Commercial
21.2			YES	Wet Floodproofing	167 Main Street	Commercial
21.3			YES	Wet Floodproofing	187 Main Street	Commercial
21.4			YES	Wet Floodproofing	187 Main Street	Commercial
25			YES	Dry Floodproofing	186 and 190 Main St.	Commercial
26		YES		Dry Floodproofing	130 Locust Street	Nonprofit
27		YES		Wet Floodproofing	145 Locust Street	Nonprofit
29		YES		Wet Floodproofing	108 Center Street	Commercial
31		YES		Wet Floodproofing	256 Main Street	Nonprofit
31.1		YES		Wet Floodproofing	256 Main Street	Nonprofit
33			YES	Raise in Place	21 Walnut Street	Residential
33.5		YES		Dry Floodproofing	79 Main Street	Commercial
35			YES	Wet Floodproofing	290 Main Street	Commercial
36			YES	Wet Floodproofing	101 Main Street	Commercial
36.1			YES	Wet Floodproofing	87, 89, 91 Main Street	Commercial
36.2			YES	Wet Floodproofing	111 Main Street	Commercial
38	YES			Acquisition	68 Begley Steet	Residential
39	YES			Acquisition	68 Begley Steet	Residential
40	YES			Acquisition	68 Begley Steet	Residential
41	YES			Acquisition	110 River Drive	Commercial
42	YES			Acquisition	23 Lumber Street	Commercial
45		YES		Dry Floodproofing	161 Broadway	Commercial
51			YES	Wet Floodproofing	25, 29, 33 Main Street	Commercial
52			YES	Wet Floodproofing	59 Main Street	Commercial
55			YES	Wet Floodproofing	22 Main Street	Nonprofit

Structure Number	5A Floodway Acquisition	5B Essential	5C Historic	Protection Measure	Address	Property Type
56			YES	Wet Floodproofing	30, 32, 34 Main Street	Commercial
56.1			YES	Wet Floodproofing	assur	Commercial
62		YES		Wet Floodproofing	88 Main Street	Commercial
63.1			YES	Wet Floodproofing	130 Main Street	Commercial
63.2			YES	Wet Floodproofing	124 Main Street	Commercial
63.3			YES	Wet Floodproofing	118 Main Street	Commercial
63.5			YES	Wet Floodproofing	106 Main Street	Commercial
63.6			YES	Wet Floodproofing	100 Main Street	Commercial
91		YES		Dry Floodproofing	1625 KY-52	Commercial
92		YES		Dry Floodproofing	1625 KY-52	Commercial
99	YES			Acquisition	224 River Road	Commercial
100	YES			Acquisition	Begley Street	Residential
105	YES			Acquisition	Begley Street	Residential

6.2 Nonstructural Component Descriptions

The nonstructural portion of the Recommended Plan will involve acquisition of 7 tracts and removal of 12 structures from the floodway (7 by demolition, 5 by relocation) and floodproofing of 40 structures. The tracts identified as acquisitions under this plan will be mandatory acquisitions. One additional structure will be elevated/raised-in-place. This study fully incorporates USACE Civil Works Guidance for Nonstructural Project Planning and Implementation memo, dated 22 JUL 24.

Modeling results assume 100% participation of voluntary nonstructural measures. Were the actual participation rate to be less than 100%, both benefits and costs would decrease. Notably, the NED plan includes only acquisitions among its proposed nonstructural measures, which are mandatory and thus, by their nature, would have 100% participation. The third and fourth increments of the Recommended Plan contain all of the voluntary measures. These increments have higher annual economic costs than annual economic benefits. If any number of the structure owners choose to not participate in the project the total project BCR would go up. This is true for one structure, and it is true for all 40 structures identified by increments three and four. This is made evident by the BCR of increment two in Table 15.

Acquisitions (also commonly referred to as buyouts) involve acquiring the land on which the at-risk structures are located. The structure is then demolished or, in the case of mobile homes, relocated.

Dry Floodproofing is a measure primarily designed to prevent water from entering a structure or to minimize damages once water has entered a structure. Dry floodproofing may include the use of one or more of the following methods:

- Temporary or permanent closures or watertight shields on doors, windows, stairwells, and/or vents.

- Rearranging or protecting damageable property, including relocating, or raising utilities.
- Sump pumps, sub-drains, and floor drains.
- Water resistant material, including waterproof membranes, adhesives, and sealants to reduce seepage of floodwater through walls.
- Installing measures to prevent sewer backup.
- Constructing veneer walls around structures.

Dry floodproofing occurs at the finished floor elevation (FFE) and reduces flood risk up to 3 ft above ground level.

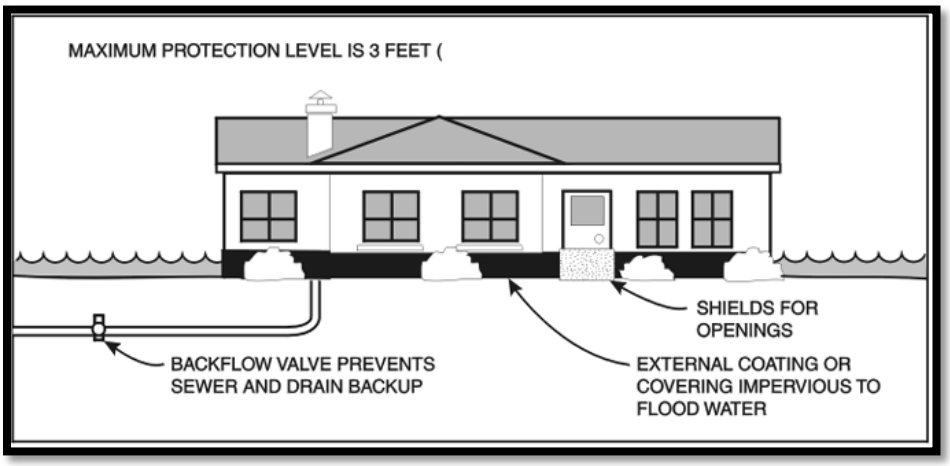

Figure 16. Depiction of Dry Floodproofing (FEMA 551, 2007)

Wet floodproofing is a combination of mitigation measures taken to reduce damage to finishes, utilities, and equipment while allowing water to enter the structure. Structures zoned as Commercial or Residential are eligible. All materials below the base flood elevation must be water resilient. To ensure resilience, interior finishes such as gypsum sheetrock wall board and carpet will be replaced.

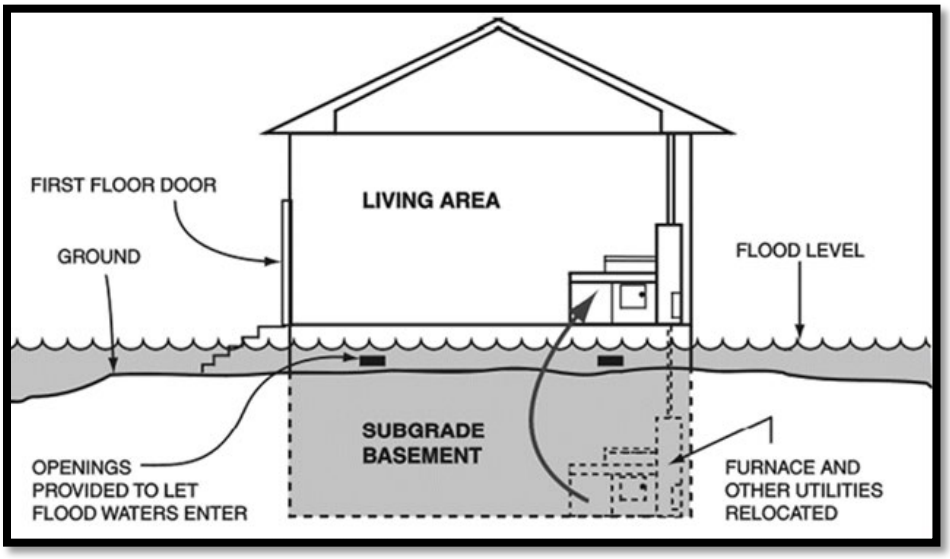

Figure 17. Depiction of Wet Floodproofing (FEMA 551, 2007)

Raising in Place (also commonly referred to simply as Elevation) is elevating a structure and its contents above flood heights and allowing flood waters to flow under the newly elevated first floor. Raising a structure creates a "basement area" that is designed to allow intentional flooding to equalize hydrostatic pressures. Structures are to be raised targeting the BFE.

The structure will be lifted and placed on a new foundation (i.e., columns, piers, posted or raised foundation walls) so that the lowest habitable finished floor is at or above the target design elevation. All utilities will be raised with the structure to required elevation. Outside Heating Ventilation and Air Conditioning (HVAC) condensers would be raised independently to required elevation. Flood vents will be installed, as appropriate. Areas below the lowest habitable floor elevation must be kept free of items that could be damaged during a flood. The final elevation should place the first habitable floor and associated ductwork, plumbing, mechanical and electrical systems above the base flood elevation.

Figure 18. Depiction of Raising in Place

FWEEP flood warning and preparedness planning relies upon stream gages, rain gages, and hydrologic computer modeling to determine the impacts of flooding for areas of potential flood risk. A flood warning system, when properly installed and calibrated, is able to identify the amount of time available for residents to implement emergency measures to protect valuables or to evacuate the area during serious flood events. Local officials are encouraged to develop and maintain a floodplain management plan (FPMP) that identifies hazards, risks, and vulnerabilities, and encourages the development of local flood risk mitigation. The FPMP should include the community's response to flooding, location of evacuation centers, evacuation routes, and flood recovery processes. USACE will assist the NFS in developing and implementing the FPMP as part of the FWEEP.

6.3 Nonstructural Measures Qualitative Analysis

The following measures are proposed to reduce flood risk and enhance resilience across the eligible structures. A qualitative assessment is provided for each, explaining the selected target elevation, the rationale behind that selection, and the reasons other potential elevations were not chosen.

Dry Floodproofing is a nonstructural measure applied exclusively to commercial buildings. It is designed to reduce flood damages up to a constructed *floodproofing top elevation*. However, if floodwaters exceed this elevation, the structure is likely to experience damages comparable to having no flood protection at all.

The maximum achievable floodproofing height is limited by the building's capacity to resist hydrostatic pressure and buoyant forces. As a general guideline, the National Nonstructural Committee recommends a standard height of three feet. During the study, each eligible structure will be individually assessed to determine the maximum depth of floodwater it can withstand. A conceptual design will then be developed to define the recommended floodproofing elevation for that structure.

Maximizing the floodproofing height offers the greatest economic benefit by minimizing the potential for flood damage. Reducing the target elevation slightly below the maximum provides only marginal cost savings. Most of the key features—such as flood barriers for all doors, wall panel reinforcements tied to the foundation, and floor drains to mitigate buoyancy—will still be required regardless of height. Thus, lowering the elevation does little to reduce overall project costs.

Structures recommended for dry floodproofing in this study have first-floor elevations ranging from 661.0 to 668.1 feet (NAVD88). Even buildings with first floors near the base flood elevation may still be eligible for dry floodproofing at the maximum allowable height.

Wet floodproofing is primarily applied to historic structures, with the aim of increasing flood resilience rather than eliminating all flood damage. Unlike dry floodproofing, this measure is not constrained by hydrostatic and buoyancy limitations, allowing for a higher *flood resilience top elevation*.

Typically, wet floodproofed structures will be designed to withstand flooding up to just below the ceiling of the first floor—generally about 8 feet. This approach includes replacing non-resilient materials such as interior doors, drywall, batt insulation, and flooring. Stopping just below the ceiling avoids the need to replace second-story components like electrical wiring, lighting, ceiling drywall, and flooring, which would significantly increase costs.

By contrast, only wet floodproofing to a height of one foot would still require replacement of most of the same materials—such as drywall and insulation—but would provide significantly less protection. Additionally, key mechanical systems like HVAC units, water heaters, sewer backflow valves, and low-mounted electrical outlets would still need to be relocated or replaced, and walls would require a non-uniform mix of flood-resilient and non-resilient materials. Floodproofing up to just below the first-floor ceiling offers a consistent and more complete level of protection, making it a more effective and efficient approach than partial interior treatments.

Raising in Place is a nonstructural measure that eliminates flood damages up to the design first-floor elevation. Unlike dry floodproofing, when flood stages exceed the design elevation, an elevated structure does not experience the full range of damages that would occur without the elevation. Among the nonstructural measures considered, Raising in Place provides the greatest reduction in economic damages when compared to wet floodproofing.

Per National Nonstructural Committee guidance, structures may not be elevated more than 12 feet. The Recommended Plan includes one structure identified for Raising in Place. This structure currently sits approximately five feet above the lowest adjacent grade.

While the design first-floor elevation typically targets the maximum allowable elevation (up to 12 feet above grade), this structure is historically significant. Because it is the only structure proposed for elevation, and to avoid negatively impacting its historic character, the proposed elevation will be limited to a height that maintains front-door access via steps. The Project Delivery Team (PDT) is targeting a 4.5-foot raise, which would result in a finished first-floor elevation of 669.59 feet NAVD88—approximately 10 feet above the adjacent grade.

Once elevation equipment is mobilized and lifting work is underway, the cost of increasing the raise height further would be minimal. Maximizing the elevation would align with plan formulation goals to reasonably maximize benefits, provided it does not compromise the structure's historic significance.

6.4 Cost Estimate

Table 22 presents a breakdown of the estimated project first cost in FY25 dollars. Table 24 presents the estimated first cost and apportionment for design and construction in FY25 dollars. The Cost Certification in Appendix C provides a breakdown of the Project First Cost.

Note that the project first cost for the recommended plan is presented at the FY25 price level throughout the main report and economic appendix. The cost certification shows the project first cost at the FY26 price level in preparation for submittal of the project for authorization in FY26.

Table 22. Estimated Project First Cost

Feature	**Project First Cost (FY25)**
Fish & Wildlife Facilities	$577,000
Cultural Resource Preservation	$75,000
Lands and Damages	$2,226,000
Preconstruction Engineering & Design (PED)	$3,070,000
Construction Management	$1,598,000
Engineering During Construction	$660,000
Phase 1 FWEEP	$1,620,000
Phase 2 F/W acquisition non-RE costs.	$918,000
Phase 2 Recreation	$1,908,000
Phase 3 Essential Nonstructural Measures	$10,001,000

Feature	Project First Cost (FY25)
Phase 4 Historic Nonstructural Measures	$10,265,000
TOTAL	$32,918,000

6.4.1 Recreation Cost

The construction cost of recreation is $1,908,000. The estimated cost for PED and Construction management brings the total recreation cost to $2,391,000 which is less than 50% of the total project cost and therefore acceptable according to ER 1105-2-103 Section 8-4 (e) ("Cost of recreation development for nonstructural acquisition or permanent relocations projects may not exceed 50% of the total project costs.")

6.4.2 Cultural Resource and Historic Properties Mitigation Cost

ER 1105-2-100, Appendix C, Section C-4(b)(10) limits the total cost for data recovery to 1% of the total appropriated amount. However, cultural resource or Historic Property mitigation, other than data recovery (i.e., protection of historic structures and engineering elements) are not subject to the 1% accounting established by Public Law 92-291. These potential mitigation costs shall be cost-shared between the USACE and the NFS at the same sharing percentages established under the project authority. Even though this project will implement measures and constraints to minimize or avoid adverse effects to historic properties, the need for mitigation cost is necessary in the event of unforeseeable adverse effects to the Beattyville Historic District. These costs will be necessary for additional consultation and implementation of mitigation requirements.

6.5 Lands, Easements, Rights-of-Way, Relocations and Disposal Areas

Real estate acquisitions will be required for the nonstructural portion of the Project as well as the FWEEP. The nonstructural portion of the plan includes mandatory acquisition of 7 tracts containing 12 structures, wet floodproofing of 30 non-residential structures, dry floodproofing of 10 non-residential structures, and elevation of one residential structure. The tracts identified as acquisitions will be mandatory with the expectation that the NFS would exercise their power of eminent domain if acquisition by negotiation is unsuccessful. Floodproofing measures are voluntary. Owners of structures identified for floodproofing that choose to participate will be required to grant the NFS a permanent real estate interest in the property; whether that is a restrictive covenant or permanent easement is to be determined. Should the FWEEP call for installation of any physical infrastructure, such as sirens or sensors, permanent easement acquisitions would be necessary. See the Real Estate Appendix F for a discussion of the required estates. All real estate acquisitions are the responsibility of the NFS. The table below summarizes the anticipated real estate acquisitions and required real estate instruments.

Table 23 Anticipated Real Estate Acquisitions

Measure	Acres	No. of Acquisitions	No. of Structures	Real Estate Instrument(s) Required
Acquisition (mandatory buyouts)	11.44	7	12	Fee Acquisition Deed
Wet Floodproofing	N/A	30	30	Rights of Entry (ROE), Floodproofing Mitigation Agreement, Permanent Easement / Restrictive Covenant
Dry Floodproofing (non-residential)	N/A	10	10	ROE, Floodproofing Mitigation Agreement, Permanent Easement / Restrictive Covenant
Elevation (residential)	N/A	1	1	ROE, Floodproofing Mitigation Agreement, Permanent Easement
FWEEP	UNK	UNK	0	Permanent Easement Deed

The estimated cost of real estate acquisitions and Public Law 91-646 residential and nonresidential relocations, including NFS incidental costs is approximately $2.2 million. Public Law 91-646 Relocation Assistance benefits are authorized for landowners, tenants, and businesses that are permanently displaced by mandatory acquisitions. There are 8 businesses and 5 residential tenants that will be permanently displaced by the mandatory buy-out portion of the plan. Only one residential structure is included in the floodproofing portion of the plan and will be elevated. The tenant of that structure is eligible for temporary relocation assistance if they will be displaced by construction. P.L. 91-646 allows for payment of relocation assistance benefits to businesses that will be shut down due to a project which requires the occupant to vacate the property, or which denies physical access to the property. Based on interior inspections of 22 of the 40 nonresidential structures eligible for floodproofing, businesses are not anticipated to require temporary relocation of the entire business; however, a few businesses may require temporary relocation of some building contents to storage for the duration of construction. Several nonresidential building occupants cannot temporarily relocate due to the public safety / public service nature of their operations (grocery store, emergency services dispatch, police station, health clinic, post office, etc.). Implementation of floodproofing measures in those structures will be phased and carefully coordinated to limit or prevent service interruptions.

Utility and facility relocations are expected to be negligible. Most utility impacts will not rise to the level of a relocation as they will involve either the permanent disconnection of utilities from structures being demolished or temporary service interruption to individual structures during implementation of floodproofing measures. Should any utilities be impacted in such a way as to rise to the level of relocation, an attorney's opinion of compensability will be prepared, and the NFS will be responsible for acquiring any real estate necessary to support the relocation and for performance of the relocation.

6.6 Operation, Maintenance, Repair, Replacement, and Rehabilitation

Operation, Maintenance, Repair, Replacement, and Rehabilitation (OMRR&R) costs associated with this Recommended Plan are considered 'de-minimis' (requiring only periodic surveillance by the NFS). Ultimately, each individual property owner will be responsible for maintenance of their elevated or floodproofed structure/home.

An Operation and Maintenance Manual will be developed by USACE at the completion of construction and all operation and maintenance responsibilities will be given to the NFS in perpetuity after completion of construction. The NFS should reserve an estimated amount of $12,000 annually for the continued maintenance of the project to be used on an as-needed basis with the assumption that this amount exceeds the cost of typical yearly maintenance, and any surplus should be reserved in case of future repairs. It should be noted that this annual amount includes the cost to operate and maintain the proposed river gauge. The project site should be maintained in accordance with Chapter 3 of the Flood Control Operations & Maintenance Policies (ER-1130-2-350).

The NFS is responsible for the enforcement of the requirements of the OMRR&R Manual, and the provisions of all nonstructural mitigation agreements. The NFS shall conduct periodic inspections at the intervals specified in the OMRR&R Manual to ensure that the owners, their heirs, and assignees, are in compliance with the terms and conditions of the executed agreements and shall provide written certification to USACE that the structures and lands have been inspected and that no violations have been found. With regards to elevated residential structures, the periodic inspections will determine that no part of the structure located below the BFE has been converted to habitable living area, or otherwise altered in any manner which would prevent the inundation by flood waters beneath the structure. The NFS will maintain a shareable database to track their periodic inspections and any violations that are found.

6.7 Project Risks

All risks are recorded in the Risk Register; those identified as high risk are detailed below:

1. Applicability and cost of nonstructural measures (scope risk)

   Risk: The process of optimizing nonstructural measures will likely determine that many structures in Beattyville (specifically, those in fair-poor condition) will not be eligible for application of certain nonstructural measures; in this case mandatory buyouts might be the only nonstructural option (if the structure is in the floodway, buyouts are always the only nonstructural option). Additionally, cost estimates for nonstructural measures are limited, and mostly apply to residential structures; in Beattyville the structures are primarily commercial.

   Risk Management: Reduction. 1) Prepare the NFS for mandatory buyouts. 2) Evaluation of individual structures during Design and Implementation (D&I) phase. 3) Inspections of 60% of the inventory were completed during the feasibility level design effort.

2. Participation rates in nonstructural measures (cost risk)

   Risk: Per the implementation plan, participation in the nonstructural floodproofing and elevation measures would be voluntary on the part of each property owner. There is risk and uncertainty surrounding how many property owners would agree to participate. Low

participation rates would reduce the project first cost, thus increasing net benefits. In addition, any potential future FEMA acquisitions under IA or PA pose minimal risk to the Recommended Plan. Properties associated with the FEMA acquisition would be demolished, eliminating the need for floodproofing measures. Additionally, since the floodproofing component currently has a benefit-cost ratio (BCR) below 1.0 (which required an NED waiver), removing these elements would reduce costs more than the loss of benefits, improving the overall project BCR.

Risk Management: Reduction. 1) Outreach efforts to individual property owners to gauge interest in participation. 2) Sharing information with the NFS and local property owners prior to design phase. 3) Continuing to monitor potential acquisitions in the project area under other Federal programs.

3. Lack of local FPMP

The Nonfederal sponsor is required to adopt a floodplain management plan (FPMP) within one year after signing a project partnership agreement and must implement the FPMP not more than one year after the construction of a project. (ER 1105-2-103 4-7,e) The drafting of the FPMP has been encouraged by USACE to be completed during the study so that USACE would be funded to support, however the plan has not made progress.

Risk Management: Mitigate. 1.) continued communication and support, 2.) continue identifying requirements and discussing the benefits of not waiting to complete the FPMP.

Consequences: If the PPA is signed and one year goes by without the implementation of a FPMP, then construction activities will stop until the plan is developed and adopted. This can be done in as little as 3 months. There will be lots of time to express eminent schedule risk prior to any actual delays.

4. Risk of dry floodproof installations not being properly installed (implementation risk)

Risk: If flood proof doors are not installed on a dry floodproof structure, the primary risk is that floodwater can easily enter the building through the door opening, negating the entire purpose of the dry floodproofing and potentially causing significant damage to the interior due to flooding; essentially, the structure becomes vulnerable to even low-level flood events, as doors are a primary entry point for water.

Risk Management:

Design and installation:

Properly designed and installed flood proof doors are essential to ensure effective protection against floodwaters.

Maintenance and inspection:

Regular maintenance and inspection of flood proof doors are crucial to ensure they function properly in the event of a flood.

Risk Communication:

Both USACE and the NFS will need to communicate effectively the need to plan for flooding by taking proper steps to secure the structure prior to potential flood events.

6.8 COST SHARING

An ability-to-pay analysis was conducted in accordance with EGM 19-04 (USACE, Directorate of Civil Works, 2019). The first step in determining eligibility is to determine the benefits-based floor (BBF). The BBF determines the maximum possible reduction in the level of non-Federal cost-sharing and is calculated by dividing the project's BCR by four and expressing that factor as a percentage. If the factor determined is less than the standard level of cost-sharing, projects may be eligible for either a reduction in the non-Federal share to the BBF, or for a partial reduction to a share between the standard level and the BBF, as determined by the eligibility factor in the second step below. In no case, however, will the non-Federal cost-share be less than 5%. The BBF for Beattyville is 0.53 (project BCR) divided by four which equals 0.1325. Expressed as a percentage the BBF is 13.25%.

For step two, the eligibility factor (EF) is determined as per the method outlined in EM 19-04 (USACE, Directorate of Civil Works, 2019). The EF is calculated using the formula below:

$$EF = a - (b_1 * state\ income\ index) - (b_2 * county\ income\ index)$$

Where:

State income index = the average over three years of the state per-capita income index (state per capita income divided by the national per capita income) for the state in which the project is located

County income index = the average over three years of the county per-capita income index (county per capita income divided by national per capita income) for the county in which the project is located

a=18.22

b_1=0.079

b_2=0.158

The values of the parameters a, b_1, and b_2 are determined by Headquarters USACE (USACE, Directorate of Civil Works, 2019).

Using these parameters, the calculation for Kentucky River, Beattyville, Flood Risk Management Feasibility Study was determined as follows:

EF = 18.22 – (0.079 * 79.61) – (0.158 * 53.79) = 3.43

18.22 – 6.289 - 8.49

If the EF is one or more, the project is eligible for the full reduction in cost-share to the BBF Using this methodology, the EF for the Beattyville study was determined to be greater than one, therefore, the project was eligible for the full reduction in cost-share to the BBF of 13.25%.

All estimates are at the 2025 price level and may change due to inflation prior to construction. The NFS has provided a self-certification of financial capability as required by USACE policy. Use of funds from other Federal programs, including any non-Federal contribution required as a matching share, to meet financial obligations of the NFS is not permitted unless USACE authorizes use of those funds in writing.

Project design and implementation costs are shared between the federal and non-federal sponsors. Based on an ability-to-pay analysis, the non-federal sponsor's (NFS) cost share for the flood risk management portion of the project is reduced from the standard 35% to 13.25%.

The NFS is also responsible for providing 100% of the Lands, Easements, Rights-of-Way, Relocations, and Disposal Areas (LERRDs), as identified in Tables 24 and 25 under "lands and damages." These contributions count toward the NFS's overall cost share.

Recreation features are cost-shared equally (50% federal / 50% non-federal) and are not subject to ability-to-pay adjustments.

Based on these requirements, the estimated non-federal contribution for the Recommended Plan is $5,240,000, which represents 16% of the project first cost. The federal share is estimated at $27,678,000, or 84% of the project first cost.

Beattyville FRM - Cost Sharing October 2024 Price Level **Cost ($000s)**			
Flood Risk Management			
Item	**Federal Cost (Fed %)**	**Non-Federal Cost (NF %)**	**Total Cost**
[B]FRM PED	$3,252	$223	$3,475
[A]Lands and Damages	$0 (0%)	$2,226 (100%)	$2,226
[B]FRM CM	$1,283	$88	$1,371
[B*]FRM Construction	$21,947	$1,507	$23,454
[C]FRM Subtotal	**$26,482 (86.75%)**	**$4,044 (13.25%)**	**$30,526**
[A] NFS is required to pay 100% Lands and Damages (LERRDS) [B] Calculated to keep cost share in balance and the total correct FRM Cost Share. [C] FRM Cost Share Percentage based on ability to pay calculation			
Recreation			
Item	**Federal Cost (Fed %)**	**Non-Federal Cost (NF %)**	**Total Cost**
Recreation PED	$128	$128	$256
Recreation CM	$114	$114	$228
Recreation Construction	$954	$954	$1,908
Recreation Subtotal	**$1,196 (50.00%)**	**$1,196 (50.00%)**	**$2,392**
Project Totals			
Item	**Federal Cost (Fed %)**	**Non-Federal Cost (NF %)**	**Total Cost**
Total First Costs	**$27,678 (84%)**	**$5,240 (16%)**	**$32,918**
*Fish and Wildlife Facilities; Cultural Resource Preservation; Buildings, Grounds and Utilities; and Permanent Operating Equipment (FWEEP) **Apportionment table utilizes project first costs from the TCPS.			

Table 24 Estimated Project First Costs and Apportionment

If the ability to pay rule did not apply, then the estimated non-Federal contribution for the Recommended Plan would be $11,881,000. Table 25 breaks down the project an apportionment of the Recommended Plan without the application of the ability to pay.

Beattyville FRM - Cost Sharing October 2024 Price Level **Cost ($000s)**			
Flood Risk Management			
Item	**Federal Cost (Fed %)**	**Non-Federal Cost (NF %)**	**Total Cost**
[B]FRM PED	$2,439	$1,036	$3,475
[A]Lands and Damages	$0 (0%)	$2,226 (100%)	$2,226
[B]FRM CM	$961	$410	$1,371
[B*]FRM Construction	$16,442	$7,013	$23,455
[C]FRM Subtotal	**$19,842 (65%)**	**$10,685 (35%)**	**$30,527**
[A] NFS is required to pay 100% Lands and Damages (LERRDS) [B] Calculated to keep cost share in balance and the total correct FRM Cost Share. [C] FRM Cost Share Percentage based on ability to pay calculation			
Recreation			
Item	**Federal Cost (Fed %)**	**Non-Federal Cost (NF %)**	**Total Cost**
Recreation PED	$128	$128	$256
Recreation CM	$114	$114	$228
Recreation Construction	$954	$954	$1,908
Recreation Subtotal	**$1,196 (50.00%)**	**$1,196 (50.00%)**	**$2,392**
Project Totals			
Item	**Federal Cost (Fed %)**	**Non-Federal Cost (NF %)**	**Total Cost**
Total First Costs	**$21,038 (64%)**	**$11,881 (36%)**	**$32,919**
*Fish and Wildlife Facilities; Cultural Resource Preservation; Buildings, Grounds and Utilities; and Permanent Operating Equipment (FWEEP) **Apportionment table utilizes project first costs from the TCPS.			

Table 25 Project First Costs and Apportionment If Ability to Pay were not Applied

6.9 Design and Construction

The plans for design and implementation are discussed in Appendix G Nonstructural Implementation Plan.

6.9.1 Project Schedule

Execution of the Project Partnership Agreement (PPA) and completion of subsequent project phases are contingent upon available funding. Separable elements to be implemented by the NFS through the authority in Section 204 of WRDA 1986 will be implemented utilizing design-build contracts between the NFS and contractors. Depending on funding availability, structures

will be made eligible based on each structure's flood risk. Design-build contracts will be utilized for each separable element. General request for proposal and contract and construction guidance documents for the NFS will be generated with the first available General Investigation (GI) or Construction General (CG) funding and provided for their implementation. For separable elements to be implemented in a traditional fashion, design is expected to take one year from receipt of GI or CG funding and the receipt of matching NFS funds. Implementation will be completed over an approximate 10-year period starting when CG funds become available. See figure 19 below for the implementation schedule.

The project implementation schedule entails four phases (or increments):

- Phase 1 (FWEEP): 11/2026-2/2028
- Phase 2 (Floodplain Acquisition & Recreation Facility): 5/2027-7/2029
- Phase 3 (Essential Structures): 6/2028-12/2032
- Phase 4 (Historic Structures): 5/2029-9/2036

Implementing in these phases will ensure that flood risk is reduced most efficiently. Actions that can be undertaken most expeditiously (e.g., FWEEP) and that address structures with the greatest risk (i.e., floodway acquisitions) will be undertaken first, followed by essential and historic structures. Implementation is expected to continue over the course of 117 months; however, project benefits will start to accrue following the completion of phase 2. Thus, the period of analysis is 2030-2080."

ID	Task Mode	Task Name	Duration	Start	Finish
1		**Feasibility Phase**	**0 days**	**Fri 12/12/25**	**Fri 12/12/25**
2		Chief's Report Signature	0 days	Fri 12/12/25	Fri 12/12/25
3		Project Partnership Agreement (PPA) Signed & Executed	0 days	Fri 11/13/26	Fri 11/13/26
4		**Design & Implementation Phase**	**2468 days**	**Fri 11/13/26**	**Fri 9/5/36**
5		**Contract/Phase #1 - FWEEP**	**307 days**	**Fri 11/13/26**	**Tue 2/1/28**
6		D/B RFP Development	6 mons	Fri 11/13/26	Thu 5/6/27
7		Contract Award to A/E Design Firm	0 days	Fri 7/2/27	Fri 7/2/27
8		Notice to Proceed (NTP) Issued	0 days	Fri 7/16/27	Fri 7/16/27
9		Design Phase	6 mons	Fri 7/16/27	Wed 1/5/28
10		Real Estate Acquisitions	3 mons	Fri 11/5/27	Tue 2/1/28
11		Construction Phase (Installation of Sirens)	88.89 hrs	Wed 1/12/28	Fri 1/28/28
12		**Contract/Phase #2 - Flood Plain Acquisition/Demolition with Recreation & Enviornmental Restoration**	**560.81 days**	**Fri 5/7/27**	**Fri 7/27/29**
13		**Pre-Construction**	**359 days**	**Fri 5/7/27**	**Thu 10/5/28**
16		**Construction Related Tasks**	**241.81 days**	**Thu 8/10/28**	**Fri 7/27/29**
47		**Contract/Phase #3 - Essential Structures - Dry/Wet Floodproof**	**1131 days**	**Fri 6/23/28**	**Fri 12/24/32**
48		**Pre-Construction**	**442 days**	**Fri 6/23/28**	**Thu 3/28/30**
51		**Construction Related Tasks**	**885 days**	**Fri 6/15/29**	**Fri 12/24/32**
70		**Contract/Phase #4 - Historic Structures - Dry/Wet Floodproof, Raise In Place**	**1830 days**	**Fri 5/25/29**	**Fri 9/5/36**
71		**Pre-Construction**	**706 days**	**Fri 5/25/29**	**Tue 3/23/32**
74		**Construction Related Tasks**	**1371 days**	**Fri 3/28/31**	**Fri 9/5/36**

Figure 19 Implementation Schedule.

6.10 Environmental Commitments

Mitigation can include avoiding, minimizing, rectifying, reducing over time, and/or compensating for impacts to the human environment.

During early scoping it was identified that designated critical habitat for the Federally threatened Kentucky Arrow Darter occurred within the limits of Beattyville. Avoidance was determined to be the best method to mitigate impacts, and measures that resulted in direct impacts to designated critical habitat were screened from consideration.

It is expected that the Recommended Plan would result in construction and demolition activities that would disturb greater than one acre of land, thus necessitating a stormwater discharge permit under the Kentucky Pollution Discharge Elimination System (KPDES). This disturbance could result in runoff that could impact surface waters, wetlands, and aquatic habitat. Minimization has been determined to be the best method to mitigate these impacts and a SWPPP will be developed to detail erosion control measures and best management practices that would be employed to reduce erosion to a point that impacts are not significant.

It is expected that the Recommended Plan would result in beneficial impacts to aquatic threatened and endangered species due to the reduction of erosion and the reduction of flood debris entering the ecosystem, in addition to any benefits the floodplain reuse would create. The USACE submitted a request for concurrence to USFWS for these beneficial impacts under Section 7 of the ESA. USFWS issued a concurrence letter for our endangered species impact determinations on October 3, 2024. Please refer to Appendix B for a copy of the concurrence letter.

The Recommended Plan would result in floodproofing historical structures listed on the NRHP. The KY-SHPO was consulted on the identified flood risk management measures outlined in the Recommended Plan and concurred that these measures would avoid or minimize any impacts to the historic resources individually or as a historic district as a whole and concluded that these measures would not compromise the integrity of the historic resources as a result of the project. Therefore, the KY-SHPO concurred with the USACE determination that the project would have no adverse effect to historic properties concluding Section 106 compliance. Please refer to Appendix B for a copy of the concurrence letter.

6.11 Project Specific Considerations

6.11.1 Description of Work for In-Kind Crediting

The local NFS may provide work as in-kind credit towards design and implementation costs. Work may include geotechnical investigations, cultural investigations, engineered designs, and specification writing. In-kind work will be described in the future PPA.

6.11.2 Sponsor Led Contracting

The authority in Section 204 of WRDA 1986, as amended (“Section 204”) allows the NFS to carry out water resource projects and be reimbursed by the USACE for the Federal share of the Project costs, when Federal funds are made available. The voluntary nonstructural measures included in the Recommended Plan will be executed through this authority. Refer to Appendix G for more information.

6.11.3 Environmental Operating Principals

The USACE’s Environmental Operating Principles (EOPs) were developed to ensure that USACE missions include totally integrated sustainable environmental practices. The EOPs provided corporate direction to ensure the workforce recognizes USACE's role in, and responsibility for, sustainable use, stewardship, and restoration of natural resources across the

nation. This study and the associated Recommended Plan maintain the USACE commitment to environmental stewardship by conforming to the following USACE Environmental Operating Principles:

- Foster sustainability as a way of life throughout the organization. The Recommended Plan fosters environmental sustainability by representing the plan with no significant or permanent environmental impacts.
- Proactively consider environmental consequences of all USACE activities and act accordingly. The study team coordinated with appropriate environmental agencies to identify all possible environmental impacts and sought avenues to minimize those impacts throughout the development and evaluation/comparison of alternative plans.
- Create mutually supporting economic and environmentally sustainable solutions. The Recommended Plan reduces flood risk to communities throughout the study area through the implementation of measures that have no significant or permanent environmental impacts.
- Continue to meet our corporate responsibility and accountability under the law for activities undertaken by USACE, which may impact human and natural environments. The study team is engaged in the activities necessary to assess and minimize impacts to the environment through NEPA via necessary surveys and agency coordination. It is expected that the Recommended Plan will be compliant with all applicable laws and policies.
- Consider the environment in employing a risk management and systems approach throughout the life cycles of projects and programs. Environmental risks were identified early in the study process and used to inform plan formulation decisions.
- Leverage scientific, economic, and social knowledge to understand the environmental context and effects of USACE actions in a collaborative manner. The study team worked with local and regional stakeholders and held multiple scoping meetings with the public to obtain all existing scientific, economic, and social knowledge regarding environmental context and used this information during the plan formulation process.
- Employ an open, transparent process that respects views of individuals and groups interested in USACE activities. The study team was open and transparent regarding the study process and possible outcomes during site visits and the public scoping meetings. A Communication Plan was developed and included in the Project Management Plan, to guide outreach efforts beyond local stakeholders engaged during the Planning Charette. This strategy aims to better understand community vulnerabilities and concerns, documented through further engagement and reflected in the feasibility report's analysis of current and future conditions. To reach a broader audience, various outreach activities, including social media updates via the Lee County Judge Executive, a booth at the local farmers market, and direct business engagement using project-specific business cards and an email account for periods were implemented. All feedback obtained during these outreach activities was incorporated into the planning process. The Recommended Plan will be reviewed and potentially modified during the PED phase. If changes to the project result in effects that have not been previously evaluated, then to the extent required by NEPA, USACE will prepare a separate NEPA document to address the changes and evaluate the associated effects. USACE and its contractors commit to avoiding, minimizing, and mitigating for adverse effects during construction activities.

6.11.4 Community Cohesion

Like many communities in Appalachia, Beattyville and Lee County struggle with unemployment and poverty, altered landscapes, health issues like black lung disease and other respiratory ailments, higher rates of poverty, substance abuse, and inadequate infrastructure.

Potential benefits of the Recommended Plan for the Community of Beattyville include:

- Decrease in expected building loss rate.
- Increased income due to improved community stability and job availability (both from the regional economic benefits of the Recommended Plan as well as expected future investments).
- Improved quality of life and positive health impacts (particularly life expectancy and heart disease) associated with convenient access to green space and multiple outdoor recreational activities.
- Improved quality of life due to removal of abandoned structures.
- Improved quality of life and life expectancy due to removal of lead-based paint and asbestos in structures where nonstructural measures are applied.

6.11.5 Community Growth and Demographics

Beattyville is striving to ignite growth within the city by working to raise funds for downtown developments such as a $1.25 million land grant for improvements to the town square, a $499,000 grant to restore a historically significant Works Progress Administration building, and a grant to update and rejuvenate Main Street. Additionally, in 2023, Beattyville created a plan for the riverfront which includes many recreational components that will be included in the Recommended Plan. A depiction of their plan can be seen in Figure 20.

Figure 20. Beattyville's Conceptual Plan for the Riverfront between Crystal Creek and Silver Creek (February 2023)

Beattyville has experienced an average of 13% gross rental revenue increase in the lodging industry since the creation of the local tourism commission in December 2011. In 2014, there

were three (3) inns offering 44 rooms and 24 cabins for a total of 68 units. By year's end 2023, there were 52 rooms, seven (7) campgrounds, and around 170 cabins/rental homes for a total of 229 units. The graph below shows gross annual sales from rentals in Lee County from 2012-2023 (Beattyville/Lee County Tourism, 2024). This growth in rentals indicates an influx of tourism in the area which will be supported by the Recommended Plan through improved community resilience and sense of stability, preservation of historic structures, which add aesthetic appeal and interest, and increased recreational opportunities in downtown Beattyville.

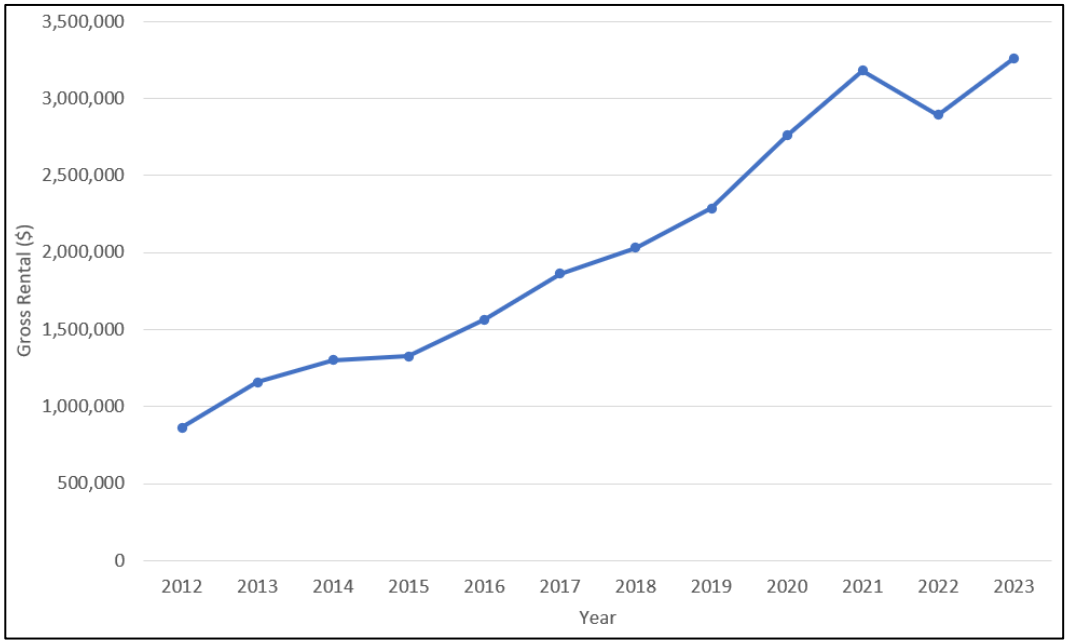

Figure 21. Gross Rental Revenue (in dollars) in Lee County, 2012-2023 (Beattyville/Lee County Tourism, 2024)

Between 2010 and 2022, Lee County has experienced a growth in the elderly population. Among six age groups (0 to 4, 5 to 19, 20 to 34, 35 to 49, 50 to 64, and 65 and older), the 65+ age group was the fastest growing between 2010 and 2022 with its population increasing 25.9% (USA Facts, 2024). The 35 to 49 age group declined the most dropping 20.7% between 2010 and 2022 (USA Facts, 2024). This information is depicted in Figure 22 below.

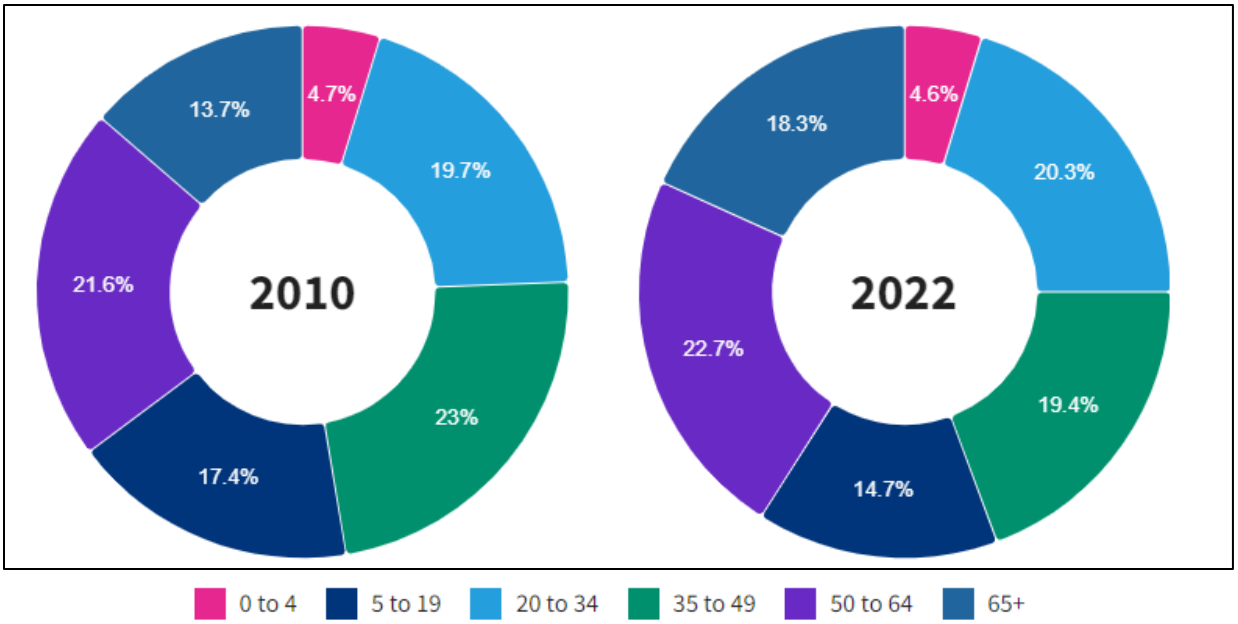

Figure 22. Change in Age in Lee County, 2010 to 2022 (USA Facts, 2024)

According to the World Health Organization (WHO), city planners should foster active aging by creating an age-friendly physical environment including but not limited to outdoor spaces and buildings, civic participation and employment, and social participation (Figure 23). The physical environment influences personal mobility and injury, crime, health behavior and social participation (WHO, 2007). Additionally, the entire community and local economy benefits from the patronage of older adult consumers and their participation in volunteer or paid work (WHO, 2007).

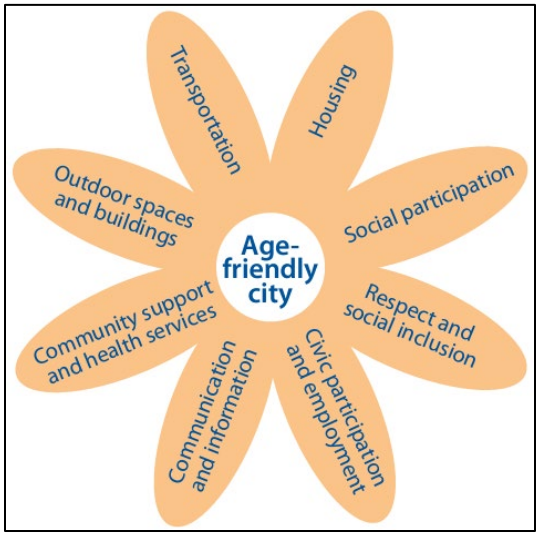

Figure 23: Age-friendly City Topic Areas (WHO, 2007)

The Recommended Plan will improve outdoor spaces and buildings for all of Beattyville's visitors and inhabitants. For the elderly population in particular, the Recommended Plan will positively impact mobility, independence, quality of life and the ability to "age in place."

6.12 Views of the Non-Federal Sponsor and Responsibilities

Lee County, Kentucky, the NFS, expresses continued interest in participating in the proposed project and has acknowledged their responsibilities as outlined below.

The NFS will perform all necessary steps to complete and execute a PPA for the design and implementation phase of the project. In addition, the NFS will provide the required non-Federal contribution. The County is working to secure non-Federal cost share funds from grants and loans. The NFS is also working to clarify potential in-kind contribution opportunities.

The NFS actively participated in the development of alternatives and the selection of the Recommended Plan. USACE Louisville District has actively reached out to the NFS throughout the duration of the feasibility phase. In addition, the NFS met with representatives from USACE Louisville District at the project site to discuss alternatives.

Once the project has been completed, the NFS will accept the project, along with their O&M responsibilities, including monitoring and performing routine maintenance to maintain its function.

7 Environmental Compliance

7.1 Environmental Compliance Table

The Recommended Plan is in compliance with all local, state, and Federal statutes as well as EOs. No local zoning laws or public planning ordinances are in place in the project area that would impact the Recommended Plan. Compliance is documented below in Table 26.

Table 26. Environmental Compliance Status

Statute/Executive Order	Full	Partial	N/A
National Environmental Policy Act (considered partial until the Finding Of No Significant Impact is signed)		X	
Fish and Wildlife Coordination Act			X
Endangered Species Act	X		
Clean Water Act	X		
National Historic Preservation Act	X		
Wild and Scenic Rivers Act			X
Clean Air Act	X		
Comprehensive, Environmental Response, Compensation and Liability Act	X		
Bald and Golden Eagle Protection Act	X		
Migratory Bird Treaty Act	X		

Statute/Executive Order	Full	Partial	N/A
Resource Conservation and Recovery Act	X		
Toxic Substances Control Act	X		
Quiet Communities Act	X		
Farmland Protection Act	X		
Executive Order 11988 Floodplain Management	X		
Executive Order 11990 Protection of Wetlands	X		
Executive Order 13045 Protection of Children from Environmental Health Risks and Safety Risks	X		
Executive Order 13122 Invasive Species	X		

7.2 PUBLIC INVOLVEMENT

There were several opportunities for public involvement throughout the study. The feasibility study charette was held on April 18-19, 2023, in Beattyville, Kentucky, which facilitated alignment with local and agency stakeholders regarding decisions critical to the study (e.g., types of measures, decision and screening criteria, stakeholder mapping, etc.) and participate in a site visit. A Communication Plan was developed and engaged in targeted outreach to the local community throughout the study as described in Section 6.11. This feasibility study report, integrated EA, and Finding of No Significant Impact (FONSI) were made available for public review and comment for a period of 30 days, which was completed on September 13, 2024. All Federal, state, and local agencies, as well as non-governmental organizations (NGO's), and Tribal Nations contacted for public review are listed in Table 27. All public review comments received are included in Appendix B. Additionally, the public was involved during outreach efforts as described in Section 7.2.1.

Table 27. Stakeholders Contacted for Public Review

Stakeholder Type	Stakeholder
Federal	U. S. Fish and Wildlife Service, Frankfort Field Office
	U. S. Environmental Protection Agency, Region 4 Office
	U. S. Geological Survey, Kentucky Water Science Center
State	Kentucky Department of Fish and Wildlife Resources
	Kentucky Department for Energy and Environment
	Office of Kentucky State Nature Preserves

Stakeholder Type	Stakeholder
	Kentucky Heritage Council
Local	Lee County Judge Executive
NGO	The Nature Conservancy of Kentucky
Federally Recognized Indian Tribes	Shawnee Tribe
	Cherokee Nation
	Eastern Shawnee Tribe of Oklahoma
	Osage Nation
	Absentee Shawnee Tribe of Oklahoma
	United Keetoowah Band of Cherokee Indians in Oklahoma
	Eastern Band of Cherokee Indians
	The Delaware Nation
	The Delaware Tribe of Indians Oklahoma

7.2.1 Agency and Tribal Coordination

Coordination with state and Federal resource agencies was conducted in conjunction with the preparation of the integrated Feasibility Report and EA. Scoping letters initiating NEPA and Section 106 were sent on July 18, 2023, to agencies listed in Table 27 to kickoff scoping activities and formally invite identified participating agencies to an interagency meeting. The USFWS and Kentucky SHPO were invited to be cooperating agencies for this study on December 19, 2024 but declined (See Appendix B for correspondence). The following state and Federal agencies and Tribal Nations were identified as participating agencies and formally invited to be participating agencies:

- U.S. EPA
- U.S. Fish and Wildlife Service
- U.S. Geological Survey
- National Resource Conservation Service
- Office of Kentucky Nature Preserves
- Kentucky Department of Fish and Wildlife Resources
- Kentucky State Historic Preservation Office
- Absentee Shawnee Tribe
- Shawnee Tribe
- Eastern Shawnee Tribe of Indians
- Cherokee Nation
- United Keetowah Band of Cherokee Indians

- Eastern Band of Cherokee Indians
- Delaware Tribe of Indians
- Delaware Nation
- Osage Nation

An interagency meeting with participating agencies was held on August 7, 2023, to discuss known project details and to acquire agency specific knowledge of the potential project area. Follow-up scoping letters were sent to participating agencies on March 12, 2024, to communicate the final array of alternatives being considered and to acquire any additional information prior to selection of the Recommended Plan. Subsequent Section 106 letters were provided to the KY-SHPO on March 15, 2024, to formally consult on the APE and LOE. KHC concurred with the APE and LOE on April 15, 2024. KY-SHPO concurred with the no adverse effect to historic properties on January 15, 2025. All correspondence can be found in Appendix B.

Agencies in Table 27 were provided with the draft integrated Feasibility Report and EA for review on August 13, 2024. The only agency to respond with comments was the EPA and included recommendations on endangered species, hazardous substances and contaminated sites and historic properties. However, all EPA's recommendations had already been incorporated into the study, so no revisions to the document were necessary.

Consultation with Tribal Nations occurred with THPOs, the District Tribal Liaison, and district archaeologists. All consultation records pertaining to tribal resources can be found in Appendix B. Federally recognized Indian Tribes (see Table 27) were invited to participate in the initial scoping meeting that was held on August 7, 2023. The Osage Nation was the only Tribal Nation that participated in this engagement. Subsequent Section 106 letters were provided to Tribal Nations on March 15, 2024, to formally consult on the APE and LOE. The Delaware Nation responded on May 6, 2024, stating Lee County was not an area of interest. The Osage Nation provided a letter on April 22, 2024, requesting USACE to provide any draft cultural reports for their review. The archaeological and cultural historic surveys were provided to the Osage Nation on December 20, 2024. No response was received within 30-days. All correspondence to date can be found in Appendix B. Furthermore, Section 106 Letters were provided to Tribal Nations on April 29, 2024, specifically to consult for their indigenous knowledge of the project area (see Appendix B for example). On May 6, 2024, the Delaware Nation responded with a letter stating Lee County is not within their area of interest and deferred future involvement. No other Tribal responses have been received.

8 DISTRICT ENGINEER RECOMMENDATION

I have given consideration to all significant aspects in the overall public interest as they relate to the proposed flood risk management project in Beattyville, Lee County, Kentucky. Those aspects include environmental, social, and economic effects, as well as engineering feasibility.

I recommend Alternative 5C, which includes four specific increments. The first increment is a base plan utilizing applicable FWEEP elements that provide a cost-effective improvement to life safety and support community resilience through installation of a USGS river gage, flood sirens, inundation modeling/mapping, and evacuation planning. The second increment is floodway acquisitions (12 structures on 7 parcels) in the Kentucky River floodway with beneficial reuse through recreation features including a walking trail, playground, parking, a kayak launch, and native plantings that enhance the riverfront's aesthetics. The third increment addresses essential and anchor assets and services, including police stations, courthouses, health centers, groceries, and cultural hubs, which will be floodproofed (8 dry, 8 wet) to maintain critical community functions post-flood. The fourth increment involves the protection of historical structures in the Beattyville Historic District through floodproofing (2 dry, 22 wet), one raised-in-place. The estimated project first cost is $32,918,000 (FY25 price level), with a Federal share of $27,678,000 (84%) and a non-Federal share of $5,240,000 (16%). Approximately $2,226,000 in LERRD is creditable toward the Sponsor's share. I further recommend the project be funded and constructed subject to cost-sharing and financing arrangements acceptable to the Chief of Engineers and the Secretary of the Army.

My recommendation is subject to cost sharing and other applicable requirements of Federal laws, regulations, and policies. Federal implementation of the project for nonstructural flood risk management with recreation features includes, but is not limited to, the following required items of local cooperation to be undertaken by the non-Federal sponsor in accordance with applicable Federal laws, regulations, and policies:

a. Provide 13.25% of construction costs allocated to nonstructural flood risk management and 50% of construction costs allocated to recreation, as further specified below:
    1. Provide, during design, 13.25% of design costs, in accordance with the terms of a design agreement entered into prior to commencement of design work for the project.
    2. Provide all lands, easements, rights-of-way, and placement areas and perform all relocations determined by the Federal government to be required for the project.
    3. Provide, during construction, any additional contribution necessary to make its total contribution equal to at least 13.25% of construction costs for nonstructural flood risk management and 50% of construction costs for recreation.
b. Prevent obstructions or encroachments on the project (including prescribing and enforcing regulations to prevent such obstructions or encroachments) that might reduce the level of flood risk reduction the project affords, hinder operation and maintenance of the project, or interfere with the project's proper function.
c. Keep the recreation features, access roads, parking areas, and other associated public use facilities, open and available to all on equal terms.
d. Inform affected interests, at least yearly, of the extent of risk reduction afforded by the flood risk management features; participate in and comply with applicable Federal floodplain management and flood insurance programs; prepare a floodplain management plan for the project to be implemented not later than one year after completion of

construction of the project; and publicize floodplain information in the area concerned and provide this information to zoning and other regulatory agencies for their use in adopting regulations, or taking other actions, to prevent unwise future development and to ensure compatibility with the project;

e. Operate, maintain, repair, rehabilitate, and replace the project or functional portion thereof at no cost to the Federal government, in a manner compatible with the project's authorized purposes and in accordance with applicable Federal laws and regulations and any specific directions prescribed by the Federal government.
f. Give the Federal government a right to enter, at reasonable times and in a reasonable manner, upon property that the NFS owns or controls for access to the project to inspect the project, and, if necessary, to undertake work necessary to the proper functioning of the project for its authorized purpose.
g. Hold and save the Federal government free from all damages arising from design, construction, operation, maintenance, repair, rehabilitation, and replacement of the project, except for damages due to the fault or negligence of the Federal government or its contractors.
h. Perform, or ensure performance of, any investigations for HTRW that are determined necessary to identify the existence and extent of any HTRW regulated under CERCLA, 42 U.S.C. 9601 et seq., RCRA, 42. U.S.C. 6901 et seq., and any other applicable law, that may exist in, on, or under real property interests that the Federal government determines to be necessary for construction, operation, and maintenance of the project;
i. Agree, as between the Federal government and the NFS, to be solely responsible for the performance and costs of cleanup and response of any HTRW regulated under applicable law that are located in, on, or under real property interests required for construction, operation, and maintenance of the project, including the costs of any studies and investigations necessary to determine an appropriate response to the contamination, without reimbursement or credit by the Federal government;
j. Agree, as between the Federal government and the NFS, that the NFS shall be considered the owner and operator of the project for the purpose of CERCLA liability or other applicable law, and to the maximum extent practicable shall carry out its responsibilities in a manner that will not cause HTRW liability to arise under applicable law; and
k. Comply with the applicable provisions of the Uniform Act and the Uniform Regulations contained in 49 C.F.R Part 24, in acquiring real property interests necessary for construction, operation, and maintenance of the project including those necessary for relocations, and placement area improvements; and inform all affected persons of applicable benefits, policies, and procedures in connection with said act.

_____ _____

Date

L. Reyn Mann
Colonel, U.S. Army
District Commander

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9.2 List of Preparers

Table 28. Project Delivery Team

PROJECT DELIVERY TEAM		
Name	**Office**	**Position**
Jacob Sinkhorn	PMC-M	Project Manager
Lacey Gabbard	PMC-P	Lead Planner, Responsible modeler for FRM NS Matrix, C-BEST Tool
Brennan Gregory	EDC-C	Engineer – Technical lead
Eric Allen	ED-H	H&H Team Lead, Responsible modeler for HEC-HMS, HEC RAS
Andrew Esarey	EDT-R	Risk Team Lead, Responsible modeler for HEC-SSP
Sarah Mattingly	PMC-P	Economist, Responsible modeler for HEC-FDA, RECONS, LifeSim, & TotalRisk
Christopher Wernick	PMC-E	Archaeologist
Steele McFadden	PMC-E	Biologist
Neal Ralston	EDM-C	Cost Engineer, Responsible modeler for MII
Jeremy Hudson	EDT-G	Geotechnical

PROJECT DELIVERY TEAM		
Name	**Office**	**Position**
Eleanor Carrico	ED-H	Climate / H&H Engineer
Lance Filiatreau	EDC-G	Geospatial GIS
Carrie A. Fry	REA	Real Estate
Mette Bahde	OC	Office of Counsel

Table 29. DQC Team

Name	**Office**	**Position**
Jared Barrett	PMC-P	DQC Lead
Laura Mattingly	PMC-P	Planner
Larissa Root	EDC-C	Civil
Lauren Alexander	ED-H	H&H
Lauren Alexander	ED-H	Risk
Ken Meffert	PMC-P	Economist
Jennifer Guffey	PMC-E	Cultural Resources
Jeff Hawkins	PMC-E	Environmental Resources
Jacob Dehn	EDM-C	Cost
Samantha Schardein	EDT-G	Geotechnical
Jason Meyer	REA	Real Estate
Lauren Alexander	ED-H	Hydrometeorological Conditions Assessment