

Swannanoa River Watershed Buncombe County, North Carolina

Section 205, Flood Risk Management

Detailed Project Report and Environmental Assessment

August 2017



**US Army Corps
of Engineers**
Nashville District

EXECUTIVE SUMMARY

STUDY INFORMATION

The purpose of this report is to analyze potential solutions for the flooding problems in the Swannanoa River watershed, Asheville, North Carolina. The report documents a Federal interest in implementation of a structural measure. This report has been prepared in response to the Section 205 authority of the Continuing Authorities Program (CAP) provided by the Flood Control Act of 1948. The report presents the flood risk management (FRM) problems and opportunities within the Swannanoa River watershed as well as the measures and alternatives considered to reduce damages within the region. The economic analysis for each management measure and alternative is documented and a tentatively selected plan (TSP) is recommended. USACE is required by the National Environmental Policy Act (NEPA) to consider the potential environmental effects of any proposed plan and its alternatives. Therefore, an Environmental Assessment (EA) is being conducted as part of this study, which includes an analysis of the effects of alternative plans on significant natural resources and the human environment. The EA is integrated with this report and asterisks (*) will identify sections required for NEPA documentation. The study was conducted by the City of Asheville, North Carolina (City of Asheville) serving as the non-Federal sponsor (NFS), and the U.S. Army Corps of Engineers (USACE).

PROBLEM

The City of Asheville, Buncombe County experiences damages from flooding due to encroachment into the floodplain. This encroachment causes a loss of flood storage capacity and insufficient flow capacity or flow restrictions along the Swannanoa and its tributaries. The area along the Swannanoa River is heavily urbanized and includes extensive infrastructure associated with commercial, industrial, and residential developments. As the loss of floodplain storage in the watershed continues to increase, each major flood incurs damages to a larger number of structures resulting in a larger economic impact to the region.

OBJECTIVES

The objective of the study is to reduce flood risk and improve the overall quality of life for the residents of the City of Asheville. The planning objectives are as follows:

- Reduce flood damages to structures in historic Biltmore Village by the year 2025
- Maintain or improve the environment, including aquatic habitat
- Reduce flood risk to critical infrastructure by the year 2025

PLANS CONSIDERED

A wide variety of forty eight FRM measures were developed that would address one or more of the planning objectives. These measures were then screened for efficiency and acceptability. Seven structural measures were evaluated in further detail along with non-structural measures. The final array of four measures were combined into alternatives.

RECOMMENDED PLAN

The National Economic Development (NED) Plan is the plan that provides the greatest net benefits. Biltmore 700 foot Cut (BAB 700) provides the greatest amount of net benefits. BAB700 maximizes net annual benefits and provides significant residual risk reduction while being cost effective. BAB 700 includes a bank modification upstream and downstream of Biltmore Avenue Bridge. North Carolina Department of Transportation (NCDOT) has already widened the bridge span so the structure would not be modified during this project.

PROJECT IMPACTS

Due to the highly developed, urban environment of the project footprint, the resulting environmental impacts for most components of the selected plan are minimal. There will be a loss of low quality riparian

vegetation however, the bench will be revegetated with native grasses, forbs, shrubs, and trees where appropriate. Temporary erosion and sedimentation impacts from construction will occur, however best management practices will lessen the impacts. The bench cut is above the ordinary high water elevation and therefore no Clean Water Act Section 404 (b)(1) analysis or Section 401 permits are required. There is also no mitigation planned for the Tentatively Selected Plan. Based on the Environmental Analysis in this report, the Tentatively Selected Plan would not be expected to have significant impacts on the human environment.

BENEFITS AND COST

The recommended plan, BAB 700, has a project first cost at fiscal year (FY) 2018 price levels of \$6,431,000 including interest during construction, an annual cost of \$263,200 including Operations, Maintenance, Repair, Rehabilitation and Replacement costs (OMRR&R); annual benefits of \$445,400, net annual benefits of \$182,200; and a benefit-to-cost ratio (BCR) of 1.7 at a discount rate of 2.750 percent, a 50-year period of analysis, and a 20-month construction period. The fully funded total project cost is estimated to be \$6,446,000 with a sponsor contribution of \$2,200,000 and a Federal contribution of \$4,085,000. The sponsor is responsible for 100 percent of the OMRR&R costs.

TIMELINE

The Final Report approval is anticipated by February 2018. Pending Appropriations; Preconstruction, Engineering, and Design of the Recommended Plan is scheduled for completion in 2020; and Construction of the measure could be completed by 2022.

TABLE OF CONTENTS

Executive Summary	i
Study Information	i
Problem	i
Objectives	i
Plans Considered.....	i
Recommended Plan	i
Project Impacts.....	i
Benefits and Cost.....	ii
Timeline	ii
List of Figures	vi
List of Tables	vii
Appendices.....	vii
1.0 Introduction.....	2
1.1 Study Purpose and Scope*	2
1.2 Location	2
1.2.1 Study Area	2
1.2.2 Project Area	6
1.3 Study Authority.....	8
1.4 Relevant Prior Studies and Reports	8
1.4.1 Lake Craig Dam	8
1.4.2 Carter-Burgess Study	8
1.4.3 PAS Study for Non-structural Flood Proofing in Biltmore Village.....	8
1.4.4 Brown and Caldwell Study	9
1.4.5 USACE Section 205 Project	10
1.4.6 McGill Associates Study of Lake Craig Dam.....	10
1.4.7 Relationship to Prior Studies and Existing Water Projects	10
2.0 Affected Environment – Existing Conditions*	11
2.1 History of Flooding.....	11
2.1.1 The 1916 Flood	11
2.1.2 The 1928 Flood	11
2.1.3 The 1940 Flood	12
2.1.4 Recent Floods.....	12
2.1.5 Study History	12
2.2 Climate	12
2.3 Soils and Geology	12
2.3.1 Geology and Physiography	12

2.3.2	Soils Associations	13
2.3.3	Hydric Soils	13
2.4	Surface Water and Other Aquatic Resources.....	13
2.4.1	Surface Water.....	13
2.4.2	Groundwater	14
2.4.3	Flood Plains	14
2.4.4	Wetlands	15
2.5	Fish and Wildlife Habitats	15
2.5.1	Fish.....	15
2.5.2	Wildlife	15
2.5.3	Terrestrial and Aquatic Vegetation	16
2.6	Endangered and Threatened Species.....	16
2.6.1	Federal.....	16
2.6.2	Critical Habitat.....	16
2.7	Recreational, Scenic, and Aesthetic Resources.....	16
2.7.1	Local Resources	16
2.7.2	Regional Resources.....	16
2.8	Cultural Resources	16
2.8.1	Cultural History.....	16
2.8.2	Previous Investigations	17
2.9	Air Quality	17
2.10	Noise	18
2.11	Transportation	18
2.12	Utilities.....	18
2.13	Hazardous, Toxic, Radioactive Waste - HTRW	18
2.14	Socioeconomic and Environmental Justice.....	20
2.14.1	EO 12898 Environmental Justice.....	20
2.14.2	EO 13045 Protection of Children.....	22
3.0	Plan Formulation.....	22
3.1	Problems and Opportunities.....	22
3.1.1	Planning Problems	22
3.1.2	Planning Opportunities	22
3.2	Objectives and Constraints.....	23
3.2.1	Planning Objectives	23
3.2.2	Planning Constraints	23
3.3	Most Probable Future Without Project Conditions.....	23
3.4	Measures to Achieve Planning Objectives*.....	23

3.4.1	Preliminary Structural and Non-Structural Measures	23
3.4.2	Structural Measures.....	25
3.4.3	Non-structural Measures	29
3.4.4	Excluded Measures	30
3.4.5	Alternative Plan Descriptions	30
3.4.6	Comparison of Alternative Plans	40
3.4.7	Risk and Uncertainty.....	43
3.5	Recommended Plan*	44
3.5.1	Recommended Plan Description	44
3.5.2	Estimated Project Costs and Schedule.....	47
3.5.3	Non-Federal Sponsor Responsibilities.....	48
4.0	Environmental Effects of Recommended Plan and No Action*.....	48
4.1	Flooding	48
4.2	Climate.....	48
4.2.1	Future Climate Impacts.....	49
4.3	Soils and Geology	50
4.4	Subsurface Waters and Other Aquatic Resources.....	51
4.4.1	Surface Water.....	51
4.4.2	Groundwater	51
4.4.3	Flood Plains	52
4.4.4	Wetlands	52
4.5	Fish and Willdlife Habitats	52
4.5.1	Fish.....	52
4.5.2	Wildlife	52
4.5.3	Terrestrial and Aquatic Vegetation	52
4.6	Endangered and Threatened Species.....	53
4.6.1	Federal.....	53
4.6.2	Critical Habitat.....	53
4.7	Recreational, Scenic and Aesthetic Resources.....	53
4.8	Cultural Resources	53
4.9	Air Quality	53
4.10	Noise	53
4.11	Transportation	54
4.12	Utilities.....	54
4.13	Hazardous, Toxic, Radioactive Waste - HTRW	55
4.14	Socioeconomics and Environmental Justice	55
4.15	Cumulative Effects.....	55

4.15.1	Past and Present Actions	55
4.15.2	Reasonably Foreseeable Future Actions	56
4.15.3	Combined Effects on Resources	56
5.0	Mitigation of Adverse Effects.....	56
6.0	Implementation Requirements	56
6.1	Project Participation Agreement	56
6.2	Lands, Easements, Rights-of-Way, Relocations and Disposal Areas	58
6.3	Operation, Maintenance, Repair, Replacement, and Rehabilitation	59
6.4	Regulatory Requirements*	59
6.4.1	Clean Water Act.....	59
6.4.2	Fish and Wildlife Coordination Act.....	59
6.4.3	Endangered Species Act.....	59
6.4.4	National Historic Preservation Act	59
6.4.5	Floodplain Management	60
7.0	Public Involvement*	61
7.1	Public Views and COmments	61
7.2	Stakeholder Agency Coordination	61
7.2.1	Federal Agencies.....	61
7.2.2	Federally Recognized Tribes	62
7.2.3	State Agencies.....	62
7.2.4	Local Agencies.....	63
7.2.5	Non-Governmental Organizations	63
7.3	PUBLIC MEETINGS	63
8.0	Recommendations*	63
9.0	List of Preparers	64
10.0	References.....	65
11.0	List of Acronyms	66

LIST OF FIGURES

Figure 1.	Swannanoa River Watershed in Eastern North Carolina.....	4
Figure 2.	Asheville City Limits and Swannanoa River Watershed.....	5
Figure 3.	Swannanoa 205 Project Area.....	6
Figure 4.	Required LERRDS to Implement the Recommended Plan.....	7
Figure 5.	City of Asheville, July 1916 Flood.....	11
Figure 6.	100-Year Existing Conditions Floodplain.....	14
Figure 7.	Structural Measure Locations.....	26
Figure 8.	Measures in Alternative Plans Locations.	31
Figure 9.	Conceptual Cross-section of BAB.....	32
Figure 10.	BAB Optimization.....	34
Figure 11.	Biltmore Village 700 foot Cut and Representative Water Surface Profiles	35
Figure 12.	Lake Craig Dam Existing Conditions.....	36

Figure 13. Lake Craig Dam Aerial View	37
Figure 14. Lake Craig Dam Rehabilitation Profile View	38
Figure 15. Warren Wilson Dry Dam Schematic	39
Figure 16. Warren Wilson Dry Dam Cross Section View	39
Figure 17. Typical BAB Downstream Cross Section	46
Figure 18. Typical BAB Upstream Cross Section	46
Figure 19. Nonstationarity Analysis - Biltmore Gage	50
Figure 20. Stage Duration at USGS Gage.....	51

LIST OF TABLES

Table 1. Streams Modeled for the Swannanoa 205 Feasibility Study	3
Table 2. Sampled Species	15
Table 3. Population Demographics.....	21
Table 4. Income Distribution	22
Table 5. Age Distribution	22
Table 6. Alternative Plan Comparison.....	40
Table 7. Estimated Flood Risk Management Benefits.....	41
Table 8. Preliminary LERRD Value Summary	41
Table 9. Preliminary Estimated Average Annual Costs.....	41
Table 10. Preliminary Cost-Benefit Analysis	42
Table 11. Probability and Consequence Ratings	43
Table 12. Summary of Key Assumptions and Associated Risks	44
Table 13. Flood Stage Reduction.....	47
Table 14. Estimated Project Costs and Apportionment	47
Table 15. Implementation Schedule.....	48
Table 16. Eight Steps in EO 11988.....	60
Table 17. Act/Executive Orders.....	61
Table 18. Project Delivery Team (PDT).....	64

APPENDICIES

A- H&H	AVAILABLE UPON REQUEST
B- Civil Design.....	AVAILABLE UPON REQUEST
C- HTRW	AVAILABLE UPON REQUEST
D- Real Estate.....	AVAILABLE UPON REQUEST
E- Cost Estimate.....	AVAILABLE UPON REQUEST
F- Economics.....	AVAILABLE UPON REQUEST
G- Environmental	
H- Cultural	
I- Screening of Measures.....	AVAILABLE UPON REQUEST

1.0 INTRODUCTION

1.1 STUDY PURPOSE AND SCOPE*

This study has been conducted to investigate measures that can address flood risk in the Swannanoa River Watershed, Asheville, North Carolina (Figure 1). Information about floods in the Swannanoa Valley extends back to 1791. In September 2004, communities in Western North Carolina were again devastated by flooding caused by remnant hurricanes Frances and Ivan. Floods produced by these hurricanes and subsequent heavy rainfall events clearly demonstrated the need to reduce flood risk within the watershed.

A Federal Interest Determination (FID) Report, approved by the U.S Army Corps of Engineers Great Lakes and Ohio River Division (LRD) on 5 January 2009, determined that there was Federal Interest in conducting a Feasibility Study to investigate FRM opportunities in the study area as authorized by Section 205 of the Flood Control Act of 1948 (P.L. 80-858), as amended. This report documents the additional investigations conducted by the U.S. Army Corps of Engineers (USACE) Nashville District (LRN) and the study Non-Federal Sponsor (NFS), the City of Asheville. The Feasibility Study investigated a range of alternatives and evaluated those alternatives to identify the Tentatively Selected Plan (TSP) alternative that satisfies the National Economic Development (NED) Plan requirements.

USACE is required by the National Environmental Policy Act (NEPA) to consider the potential environmental effects of any proposed plan. An Environmental Assessment (EA) is being conducted as part of this study, which includes an analysis of the effects of alternative plans on significant natural resources and the human environment. If the analysis performed for the EA provides sufficient information to determine that there are no significant impacts resulting from potential alternatives, preparation of an Environmental Impact Statement (EIS) is not necessary and a Finding of No Significant Impact (FONSI) can be prepared for construction of the proposed project.

NEPA and the Council on Environmental Quality (CEQ) implementing regulations require an early and open process for the public and agencies to provide input to the planning and environmental compliance analyses for major Federal projects. This process has been termed “scoping” and was initiated for this project by the widespread mailing of a Public Scoping Letter in June 2013. The scoping and subsequent coordination are documented in Section 7.0 and Appendix G.

1.2 LOCATION

1.2.1 Study Area

The Swannanoa Watershed is located in Buncombe County from the City of Asheville eastward to Black Mountain and Montreat (Figure 2). From the top of the mountains near Craggy Gardens to its confluence with the French Broad River, the Swannanoa Watershed contains 132 square miles of homes, farms, forests, towns, cities, and more. The Swannanoa River is part of the larger French Broad River Basin. These two rivers are essential to the citizens and economy of Buncombe County and the entire western North Carolina region.

The City of Asheville is the county seat of Buncombe County and home to the United States National Climatic Data Center (NCDC), the world’s largest active archive of weather data. As of a 2014 census of the City of Asheville metropolitan area in Buncombe County had a population of 247,442. There were 117,254 housing units of which 35% were renter occupied and 11% were vacant. The Health Services and Private Education sector makes up the largest percentage of total employment in the Asheville area.

The study area lies within the jurisdiction of the following Congressional Districts:

North Carolina: Senator Richard Burr (R)

North Carolina: Senator Thom Tillis (R)

North Carolina’s 11th District: Congressman Mark Meadows (R)

This area of western North Carolina is part of the Blue Ridge physiographic region of North Carolina. The watershed shares the usual qualities for this region with its deeply dissected mountains with numerous steep mountain ridges, intermountain basins and trench valleys. The elevations of the watershed vary from a high of 6,400 feet at the northwest boundary to the lowest elevation of 2,000 feet at the confluence with the French Broad River.

The Swannanoa River Watershed is located in the U.S. Geologic Survey Hydrologic Unit Code (HUC 061010506). The Swannanoa River is approximately 22 miles long and is a valuable resource to Buncombe County providing drinking water to the City of Asheville metropolitan area and numerous recreational opportunities. The major tributaries to the Swannanoa River are Sweeten Creek, Ross Creek, Haw Creek, Gashes Creek, Grassy Branch, Christian Creek, Bull Creek, Beetree Creek, Lower North Fork, Upper North Fork, Tomahawk Branch and Flat Creek. See Table 1 for a list and Figure 2 for locations of the streams that were modeled for the Swannanoa Section 205 Feasibility Study.

Table 1. Streams Modeled for the Swannanoa 205 Feasibility Study

Stream	Length (mi)
Bee Tree Creek	4.9
Flat Creek	2.9
Ross Creek	2.0
Swannanoa	24.9
Sweeten Creek	3.5
Sweeten Creek Trib	0.8
Tomahawk Branch	1.7

Swannanoa 205 Area

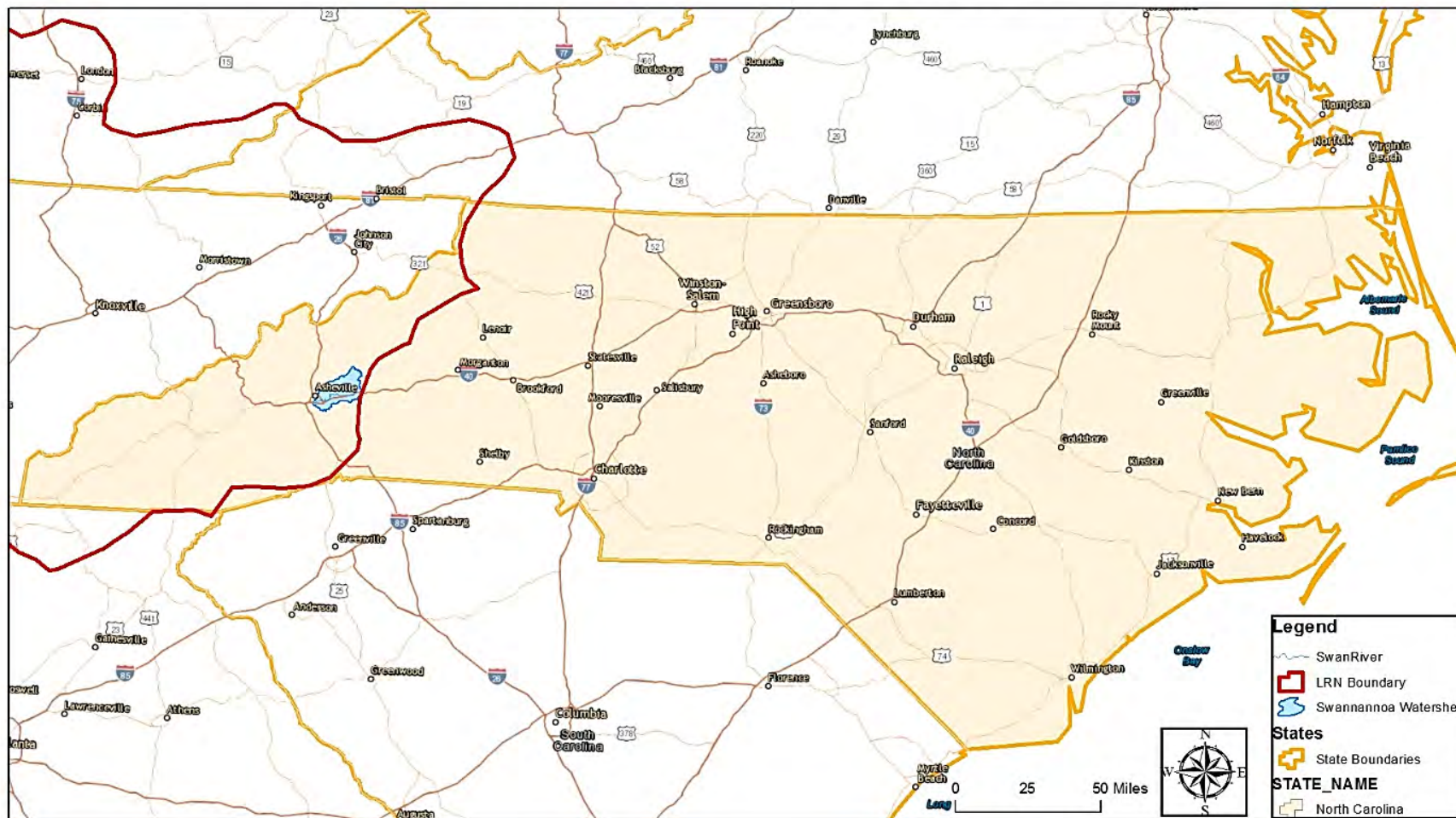


Figure 1. Swannanoa River Watershed in Eastern North Carolina

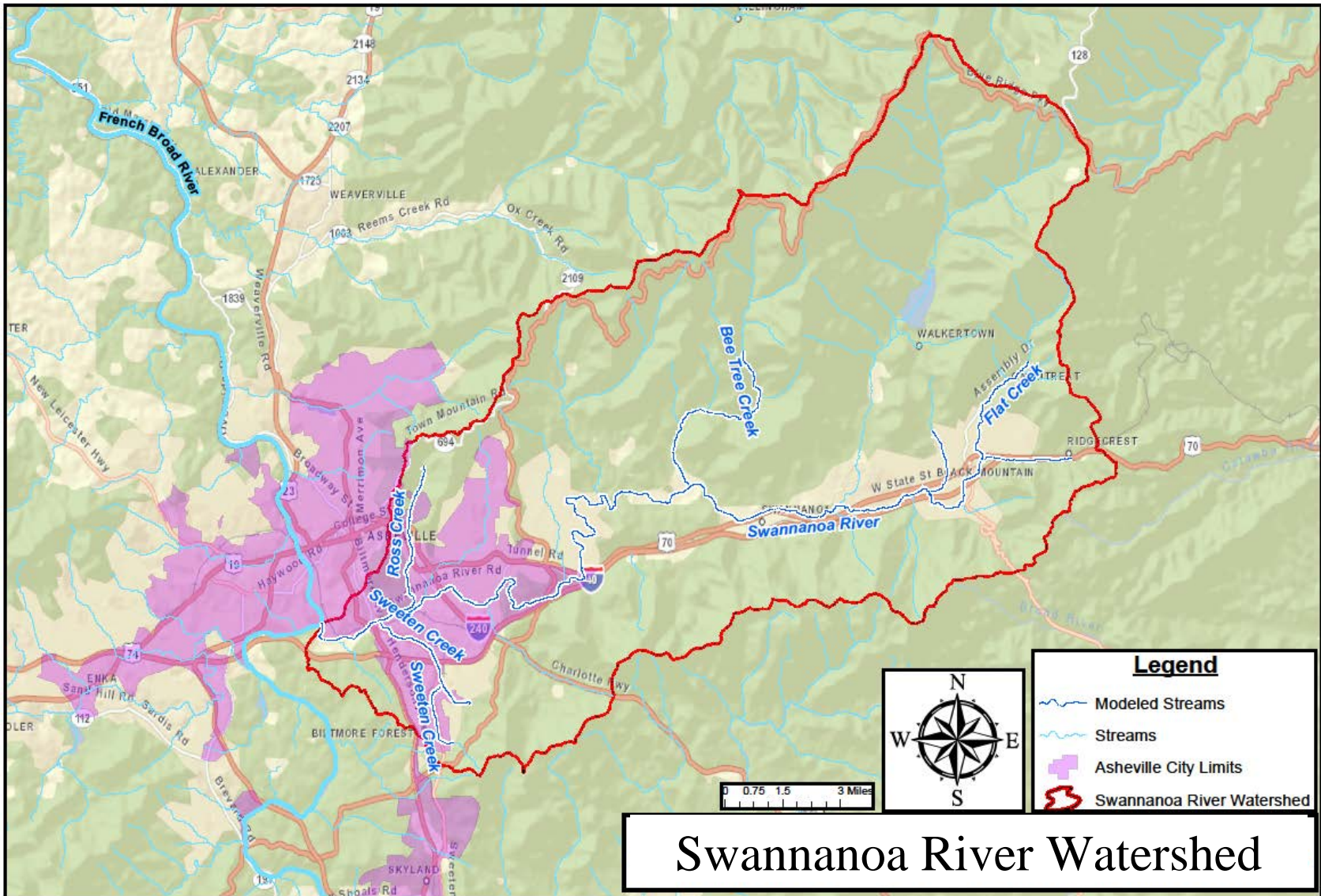


Figure 2. Asheville City Limits and Swannanoa River Watershed

1.2.2 Project Area

Biltmore Village is a historic, now commercial, area located in the Asheville City limits that receives significant flood damages on a regular basis (Figure 2). The project area is located adjacent to the Historic Biltmore Village on the Swannanoa River and the Sweeten Creek confluence (Figure 3). The Swannanoa 205 Project Area would require acquisition of lands, easements, right-of ways, relocation and disposal areas (LERRDs) to implement the Tentatively Selected Plan (Figure 4). The project area is in HUC 061010506.

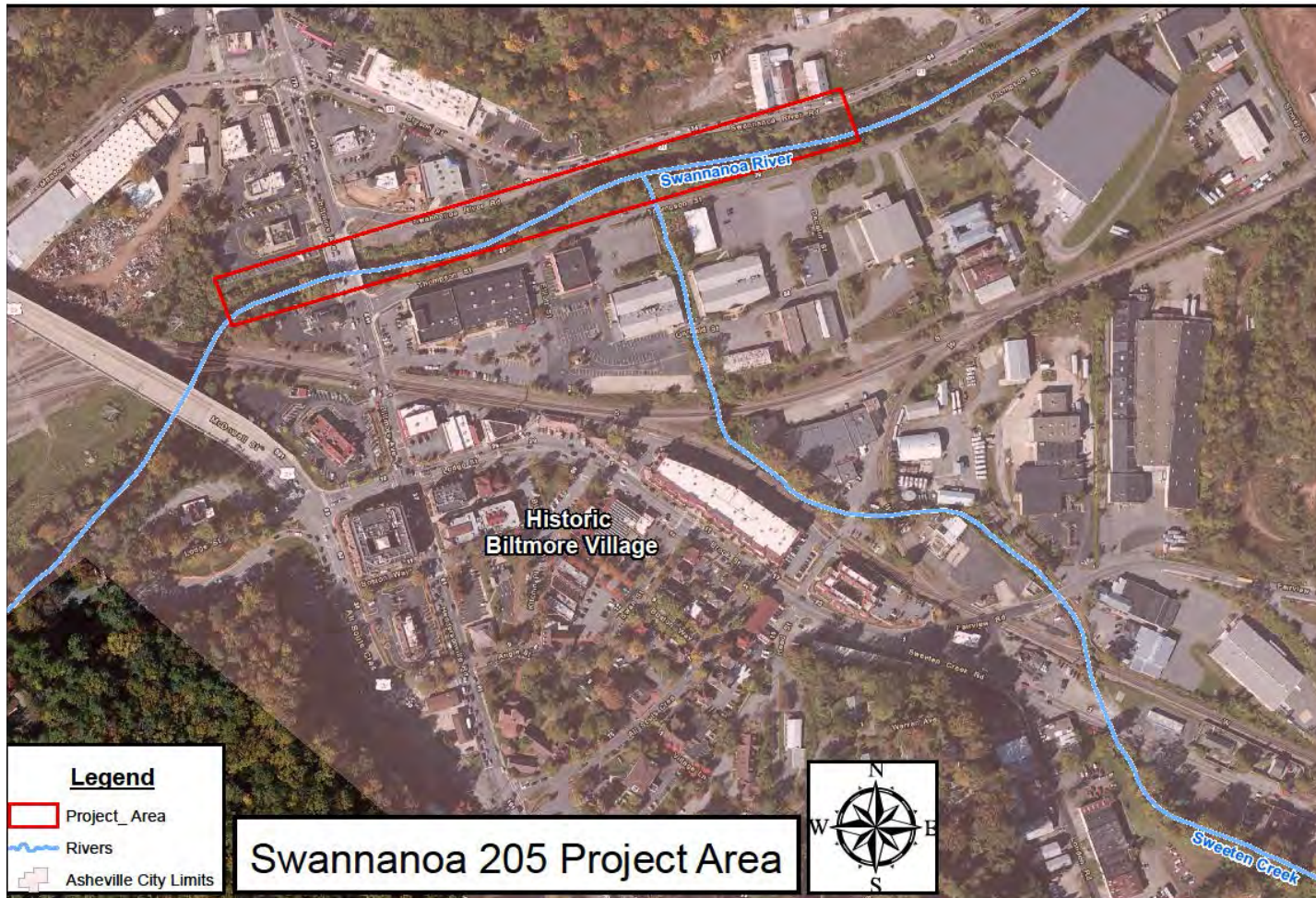


Figure 3. Swannanoa 205 Project Area



Figure 4. Required LERRDS to Implement the Recommended Plan

1.3 STUDY AUTHORITY

Section 205 of Flood Control Act of 1948, as amended - Flood Control. Projects implemented under this authority are formulated for structural or non-structural measures for flood risk management in accordance with current policies and procedures governing projects of the same type which are specifically authorized by Congress (see Section III of Appendix E of this regulation). Examples of non-structural measures included elevating buildings, use of water resistant materials, encircling buildings with a berm, relocation, flood warning system, and land use regulations. Examples of structural measures include dams, levees, floodwalls, and channel widening.

1.4 RELEVANT PRIOR STUDIES AND REPORTS

1.4.1 Lake Craig Dam

The Lake Craig Project Site is located about 3.5 miles east of the center of Asheville on property owned by the City of Asheville. The site drains a 68,550 acre area of the Swannanoa River watershed. (80% of watershed) Prior to 1885 the dam was constructed as a stone masonry dam for Montraville Patton's Grist Mill. In 1886, the City of Asheville constructed a pumping station at the site to be used as water supply. In the early 1920s, the dam was raised with concrete and a radial gate to form a recreation lake. The City installed hydropower generators in Bay 1. The lake was drained in 1952.

1.4.2 Carter-Burgess Study

In December 2005, the City of Asheville contracted with Carter-Burgess to conduct a planning study to identify and prioritize flood risk management projects for implementation in the community. This planning study included stakeholders from the City of Asheville, Biltmore Village and the Swannanoa watershed. The study was completed in September 2006. Top priority measures recommended for funding under Senate Bill 7 (SB7) for the Swannanoa watershed and the Biltmore Village area were:

- Implementation of unfunded recommendations from the City of Asheville River Redevelopment Plan;
- Funding for an Emergency Flood Response Plan specific to the Biltmore Village area;
- Removal of debris jams along the Swannanoa River identified by Buncombe County as threats during future flood events; and
- Completion of a watershed-wide program for comprehensive flood risk management. This program was to include modeling of economic impacts of flooding and future conditions floodplain mapping, as well as implementation of a variety of flood risk management measures recommended through the outcomes of these modeling efforts.

1.4.3 PAS Study for Non-structural Flood Proofing in Biltmore Village

In 2006, the City of Asheville and USACE LRN executed a Planning Assistance to the States (PAS) agreement to develop an Emergency Flood Response Plan for Biltmore Village, the main flood damage center in the watershed (Figure 3). The plan was completed in 2009. It provided 72 property owners in Biltmore Village recommendations for non-structural flood proofing measures to protect their buildings in future flood events. The recommended measures were specific enough to be implementable but were not in the form of plans and specifications. The non-structural measures were of two types – emergency and temporary, and long-term and permanent. The property owners were to implement the flood proofing measures on a voluntary basis and at their sole expense. The City of Asheville did not have documentation of property owners implementing these measures so they were not included in this Section 205 study analysis. This PAS project was one small step in reducing flood risk in the Swannanoa watershed.

1.4.4 Brown and Caldwell Study

In 2009, the City of Asheville contracted with Brown and Caldwell (B&C) for development of a feasibility report on flood risk management in the Swannanoa River watershed. Key objectives for B&C's work were to perform the watershed modeling, economic analysis, and project opportunity investigations necessary to identify additional measures that could be taken to reduce flood risks, and to prioritize the recommended measures in order to achieve flood risk reductions at the earliest feasible date. The intent of the B&C report was to meet USACE criteria for development of existing conditions and partially satisfy USACE criteria for evaluation of measures and alternatives.

In order to quantify flood damages under existing floodplain conditions and to quantify the benefits of various flood risk management alternatives, the assets within the Swannanoa River floodplain were inventoried, quantified and entered into a structure inventory geodatabase (SID). The damageable assets within the SID included:

- Structures (residential, commercial, industrial, public, etc.)
- Contents within structures
- Vehicles
- Road and railroad infrastructure
- Utilities and other critical community infrastructure, and
- Emergency/post-disaster costs.

Over 1100 structures were inventoried in the Swannanoa watershed's floodplains. For each structure the construction characteristics, the elevation of its lowest occupied floor, the elevation of the lowest land adjacent to the structure's foundation, overall condition, and current occupancy and use were recorded. Using methods developed by USACE, each structure received an estimated structural value and an estimate of the value of its contents. The number of vehicles at risk in the Swannanoa floodplain was estimated from the damage survey conducted by USACE after the 2004 floods and by observations made during the floodplain structures inventory. The amount of roadway and railroad investment in the floodplain was estimated from Geographic Information System (GIS) and flood damage curves. Utilities were estimated from published data and actual damages reported after the 2004 floods. Emergency and post-disaster costs were estimated from other USACE studies, including the business surveys conducted in the Swannanoa Valley after the 2004 floods.

All the above described investments and other flood damage cost components within the Swannanoa floodplains were entered in the SID and in turn evaluated using the Hydrologic Engineering Center Flood Damage Analysis (HEC-FDA) computer program. B&C determined the structure value of each building by using a replacement cost less depreciation (RCLD) value.

B&C then estimated flood damages and the damage reductions that can result from FRM measures by using hydrologic and hydraulic models to simulate a range of flood events with specific probabilities of occurrence. B&C used the Hydrologic Engineering Center Hydrologic Modeling System (HEC-HMS) to simulate the flood flows for eight (8) flood events from the storm with a 50 percent chance of occurring each year (the 2-year flood) to the storm that has a 0.02 percent chance of occurring each year (the 500-year flood). In turn, the Hydrologic Engineering Center River Analysis System (HEC-RAS) was used to estimate the depth of water at all locations along the river. The initial HEC-HMS and HEC-RAS models used in the study were those developed by the North Carolina Floodplain Mapping Program to develop the most recent Flood Insurance Study (FIS). The models were recalibrated and improved through the course of this project and represented the best currently available data for the distribution of flood flows and depths throughout the Swannanoa Valley.

B&C identified and analyzed 48 potential FRM measures. Each potential project was evaluated as a stand-alone project and then as a component of alternative watershed-wide plans. A recommended plan was developed that called for the implementation of multiple FRM measures. The plan recommended:

- Rehabilitation of Lake Craig Dam (LCD),
- Improvements to the river channel at the Biltmore Avenue Bridge,
- Modification of the privately-owned Busbee dam,
- Adoption of a Flood Operations Plan (FOP) for the City of Asheville's Bee Tree reservoir,
- The immediate installation of audible flood warning devices at four key locations in the watershed: two locations along the North Fork of the Swannanoa, one on Flat Creek above the Town of Black Mountain, and one in the vicinity of the John B. Lewis Soccer Complex at Azalea Park. The alarms, and associated informational signage, would serve the dual purposes of providing an improved flood warning system, building on the existing system,
- That the Swannanoa Valley jurisdictions cooperate in the Floodplain Signage program administered by the National Weather Service (NWS). In this program, the local NWS offices would coordinate with emergency management and other local officials to select the best locations for floodplain information signs. The U.S. Geological Survey would be involved as well, providing historical data and aiding with the surveying of high water mark signs in their districts, and
- Rehabilitation of the Lake Tomahawk dam. This would include removal of large trees from the embankment and, in order to avoid overtopping of the dam in severe storms, reconstructing the dam's emergency spillway to provide a higher discharge capacity.

1.4.5 USACE Section 205 Project

In July 2009, the City of Asheville and USACE LRN executed a CAP Section 205 Feasibility Cost Share Agreement (FCSA) calling for USACE to develop a DPR identifying the recommended FRM alternative for the watershed. The initial tasks for USACE was to work in parallel with the efforts of B&C (see previous section). USACE and B&C coordinated such that, to the greatest possible extent, B&C's work would be performed in accordance with USACE criteria. This would ensure that USACE could build upon B&C's deliverables with a minimum of revision to B&C's work and the City would receive the maximum allowable amount of work-in-kind contributions for B&C's efforts.

1.4.6 McGill Associates Study of Lake Craig Dam

In 2011, the City of Asheville contracted with McGill Associates to conduct a feasibility study of the LCD. The purpose of the study was to evaluate the feasibility of rehabilitating the dam or constructing a new dam which would provide FRM benefits. As with the B&C study, Nashville District coordinated with McGill to ensure that, to the maximum possible extent, their work was performed in accordance with USACE criteria.

1.4.7 Relationship to Prior Studies and Existing Water Projects

As previously stated, USACE LRN completed a PAS study for non-structural flood proofing measures in the Biltmore Village area. These measures could be self-implemented by the property owners. The study addressed only non-structural flood proofing and only considered structures in the Biltmore Village area, thus leaving the numerous other measures to be evaluated in the Section 205 project.

Nashville District and the Town of Black Mountain, NC completed a PAS study in September 2012 under which USACE performed dam safety inspections and developed Emergency Action Plans for two dams and reservoirs owned by the Town (Lake Tomahawk and the Black Mountain Water Supply Reservoir).

Regarding the watershed-wide evaluation of FRM measures, the Carter-Burgess study was the fore-runner of the USACE' Section 205 project and studies by B&C and McGill Associates. The B&C and McGill studies were conducted concurrently with the USACE Section 205, which incorporated their results and carried the watershed-wide study to completion. The City of Asheville has constructed recommendations

from the McGill Associates report of realigning the Swannanoa River downstream of Lake Craig Dam and removing floodplain fill above the dam. Five repetitive loss structures have been bought out and torn down by the City of Asheville using state funding received from the NC Hurricane Act of 2005 after the 2004 floods.

2.0 AFFECTED ENVIRONMENT – EXISTING CONDITIONS*

2.1 HISTORY OF FLOODING

Major flooding occurred in the French Broad and Swannanoa Valleys in 1791, 1916, 1928, 1940 and 2004. Estimated discharges in the Swannanoa River in the vicinity of Biltmore Village, about 1.6 miles upstream of its confluence with the French Broad River, were: 40,000 cfs in 1791, 23,000 cfs in 1916, 17,000 cfs in 1928, 18,400 cfs in 1940 and 13,000 cfs (Hurricane Francis) and 11,000 cfs (Hurricane Ivan) in 2004 (Federal Emergency Management Agency, FEMA, 2009).

2.1.1 The 1916 Flood

The July 1916 flood is the greatest flood of which there is definite record on the Swannanoa River and on the North Carolina portion of the French Broad River (Figure 5). The French Broad River reached a stage of 23.1 feet on the gage at Pearson Bridge. “The rainfall at Asheville was not excessive...but early Sunday morning the rushing waters of the French Broad and the Swannanoa flooded the entire lower part of the City of Asheville and all of the neighboring model village of Biltmore.” (1917, Southern Railway Company, The Floods of July 1916, p. 29).



Figure 5. City of Asheville, July 1916 Flood

2.1.2 The 1928 Flood

The August 1928 flood was approximately 10 feet lower than the 1916 flood. Although the total damage along the Swannanoa River was only about one-fourth of that in 1916, the industrial loss was nearly as great because of the influx of new industries in the 12 years after the 1916 flood.

2.1.3 The 1940 Flood

Two large floods occurred in August 1940, the first on August 13-14, resulting from a tropical storm whose center moved inland at Savannah, Georgia. The crest of the French Broad River was 11.5 feet lower than the 1916 flood. During the second flood, two weeks later, the rise of the French Broad was 0.5 foot higher (12 foot crest) than on the previous event, and damage was essentially a repetition of that in the earlier flood.

2.1.4 Recent Floods

More recent floods in the Swannanoa Watershed that caused significant damage occurred in October 1964 and November 1977. Then, almost in a repeat of what happened in 1940, in September 2004 western North Carolina was hit by floods and landslides caused by the remnants of two major hurricanes: Frances and Ivan. Along the Swannanoa River many homes and businesses were evacuated and emergency management personnel had to perform two swift water rescues. The cost of damages and other financial loss was high. A survey conducted by USACE in 2005 concluded that the cost of the two events in the Swannanoa Valley exceeded \$21.9 million to 116 commercial businesses. Total damages in the Valley likely exceeded \$30 million. In addition, many residents were displaced and homes were damaged. There was severe disruption to the lives of the Valley's residents and of the local economy, including a loss of tens of millions of dollars in tourism. In some small way the residents and businesses of the Swannanoa Valley were lucky, the worst of the flooding occurred in the eastern reaches of the Valley that are not as densely populated and do not have as many businesses at risk of direct flood damages. Whereas the 2004 flood event met or exceeded the 100-year flood in the eastern reaches of the Valley, it was substantially less severe by the time it reached the City of Asheville and neared the French Broad River. Since 2004, flooding has occurred almost yearly and sometimes several times a year. 2013 was the wettest year on record for the City of Asheville and there were several flood events.

2.1.5 Study History

In response to the flooding in 2004, the North Carolina Legislature approved The Hurricane Recovery Act of 2005, also known as SB7. The Act provided funding for a comprehensive planning study to achieve flood risk management in western NC communities. That study was completed in two phases: a preliminary planning study followed by a comprehensive analysis. The Act also earmarked additional funds for the implementation of flood risk management measures identified in these studies.

2.2 CLIMATE

The Swannanoa River Watershed is located within a mountainous area where the amount and intensity of precipitation can vary dramatically. One additional factor affecting precipitation in the watershed is its location along the historical path of tropical storms from the Gulf of Mexico. The Atlantic Hurricane Season begins on June 1st and ends on November 30th. The precipitation associated with the Hurricane Francis Storm Event on September 7-8, 2004 illustrates this spatial variability. During this event the daily estimated rainfall amount varied from approximately 15-inches in the watershed's upper most headwaters near Mount Mitchell to 4-inches in the City of Asheville. None of the actions considered in this report would affect the local and/or global climate.

2.3 SOILS AND GEOLOGY

2.3.1 Geology and Physiography

The study area is located in the Blue Ridge Physiographic Province. Generally, the virgin soils encountered in the area are residual product of in-place chemical weathering of the bedrock. The typical residual soil profile consists of silty and clayey soils near the surface where soil weathering is more advanced, the transition to silty sand and sandy silt with depth. The boundary between soil and rock is usually not sharply defined and there is a gradual transition from soil to rock. The bedrock in the region is faulted and folded by past tectonic movements. Fractures and joints in the rock facilitate weathering and depending how

resistant the rock types are to weathering the transition from weathered rock to sound rock can be erratic even over short distances. Boulders and lenses of hard rock can be found within the residuum material. In places, the soil and rock boundary is a transitional zone that contains saprolite, a weathered rock residuum that is soil in nature but maintains the rock characteristics of color and laminations. The area contains partially weathered rock (PWR) that is defined as residual materials with standard penetration resistances of over 100 blows per foot.

The majority of the study area is part of the Ashe Metamorphic Suite/Tallulah Falls Formation and is described by the U.S. Geologic Survey (USGS) as “a heterogeneous unit consisting of repetitive layers and lenses of laterally and vertically grading sedimentary and mafic volcanic rocks metamorphosed to sillimanite grade. The formation is subdivided and mapped based on dominant rock type into five map units.” The units are amphibolite, garnet mica schist, metaconglomerate, sillimanite-garnet-chlorite-mica schist, metagraywacke and schistose metagraywacke. Portions of the formation that contain muscovite-biotite gneiss, is considered locally sulfidic, meaning that exposures of rock may weather and result in acid drainage in run-off. Acid-producing rock (APR) considered a geologic hazard in western North Carolina. Well-established engineering practices can isolate or neutralize when encountering reactive rock during construction. The exploratory samples at Warren Wilson were tested and were considered potential-APR. The Biltmore Avenue Bridge site may not require excavation of bedrock so testing of the rock will not be necessary because it will not be exposed and/or disposed to where APR would be an issue.

2.3.2 Soils Associations

The soils of the Swannanoa River watershed are variable in nature. The measures evaluated as part of this study generally fell along the main stem of the Swannanoa River, where the soils are typical of an alluvial depositional environment with no APR.

At the Biltmore Avenue and Lake Craig Dam sites, the predominant soil unit is the Udorthents – Urban land complex, which is a well-drained sandy loam soil with a depth to rock typically greater than 6 feet. There is some variability to this soil, however, with clayey units and rock inclusions present.

The Warren Wilson College site consists of the Braddock clay loam and the Edneyville-Chestnut complex formations. The Braddock is derived from alluvial deposits and occurs in stream terraces and river bends where lower velocity causes fine sediment to drop out of suspension. The depth to rock is typically greater than 6 feet. The Edneyville-Chestnut complex is typically found on mountainous slopes and contains more rock than the other formations. It is characterized by a gravelly fine sandy loam soil in its uppermost stratum, underlain by loamy and sandy loamy soils lower in the profile. (Soil information adapted from Natural Resources Conservation Service (NRCS) Soil Survey of Buncombe County, North Carolina)

2.3.3 Hydric Soils

The proposed project at Biltmore Avenue Bridge consists of removing historic fill and overbank materials. Hydric soils are not anticipated to be encountered during the implementation phase of the project. Any unanticipated hydric soils encountered at the project site would be undercut, removed, and replaced with suitable material.

2.4 SURFACE WATER AND OTHER AQUATIC RESOURCES

2.4.1 Surface Water

Surface water in the Buncombe County study area includes the main stem of the Swannanoa River as well as its larger tributaries including: Sweeten Creek, Ross Creek, Tomahawk Creek, Flat Creek and Bee Tree Creek. The Swannanoa River originates at its headwaters in Black Mountain, North Carolina, and flows nearly 22 miles southwesterly through Buncombe County until meets the French Broad River near the Biltmore Estate in the City of Asheville. Additionally, there are two water supply reservoirs located on Bee Tree Creek and North Fork, respectively, two headwater tributaries of the Swannanoa River.

According to the US Environmental Protection Agency (EPA) in 2014, the Swannanoa River was listed as impaired for fish consumption due to mercury found in fish tissue. Sweeten Creek is a tributary to the Swannanoa and has its confluence with the Swannanoa inside the study area. Sweeten Creek is also listed as impaired for fish consumption due to Mercury.

2.4.2 Groundwater

Groundwater quality in the area of the project is unknown. Shallow groundwater resources and surface streams are often hydraulically connected; therefore, groundwater quality is vulnerable to surface-derived contaminants. The intensity of urban development in the region has likely contributed to groundwater quality degradation.

2.4.3 Flood Plains

The Swannanoa River runs directly through the historic Biltmore Village Area and is capable of inundating a wide swath of property through the area during flood events. Regular flooding of the Swannanoa River has been well documented through the area since the historic flood of 1916, which inundated nearly the entire Biltmore Village at the time. The 1916 flood event, much like the more recent September 2004 major flooding event, was the result of tropical systems (hurricanes) passing through western North Carolina.

The floodplain in the study area is highly developed. In the majority of the study area, development such as roads and buildings are near/directly up to the top of river bank. It is likely that the original floodplain was filled in to accommodate these structures.

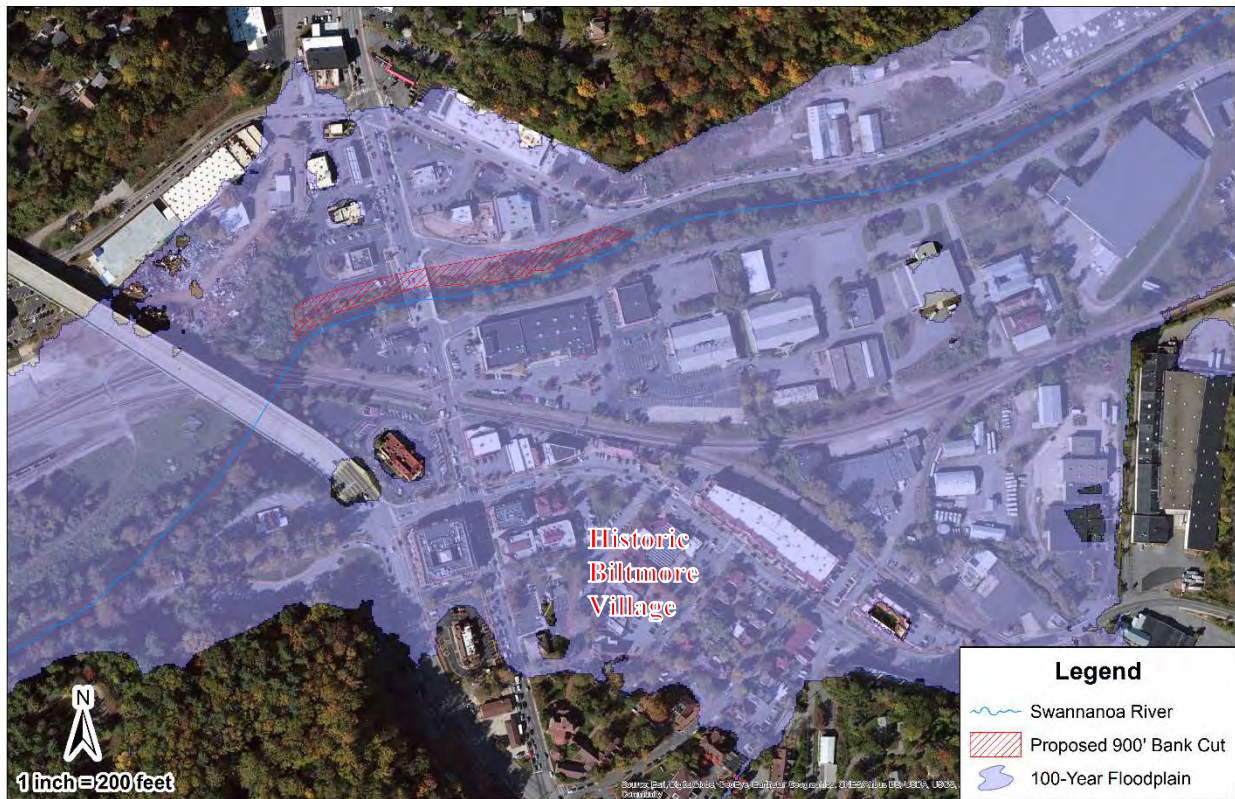


Figure 6. 100-Year Existing Conditions Floodplain

2.4.4 Wetlands

National Wetland Inventory Maps (NWI) were reviewed for the study area and a site reconnaissance was conducted to determine validity of NWI Maps. NWI maps indicated that there are no wetlands within the study area. The site reconnaissance also indicated no wetlands are located within the proposed project area.

2.5 FISH AND WILDLIFE HABITATS

2.5.1 Fish

The Swannanoa River watershed has been developed extensively. The River still provides habitat to warm and cool water species. According to a letter from the North Carolina Wildlife Resources Commission (NCWRC) (see appendix G), the Upper Swannanoa River and many of the large tributaries support wild rainbow (*Oncorhynchus mykiss*), brown (*Salmo trutta*), and/or brook (*Salvelinus fontinalis*) trout populations. In addition, much of the Swannanoa is designated as hatchery supported trout waters. However, summertime temperatures in the lower reach of the river where the study area is located is likely too high for trout. The following list of species (Table 2) were sampled by Tennessee Valley Authority (TVA) biologists in 2012, near the Biltmore Avenue Bridge approximately Swannanoa River mile 1.6.

Table 2. Sampled Species

Species (Common Name)	Scientific Name
Banded darter	<i>Etheostoma zonale</i>
Bigeye chub	<i>Hybopsis amblops</i>
Central stoneroller	<i>Campostoma anomalum</i>
Fantail darter	<i>Etheostoma flabellare</i>
Flat bullhead	<i>Ameiurus platycephalus</i>
Gilt darter	<i>Percina evides</i>
Greenside darter	<i>Etheostoma blennioides</i>
Northern hog sucker	<i>Hypentelium nigricans</i>
Redbreast sunfish	<i>Lepomis auritus</i>
Redline darter	<i>Etheostoma rufilineatum</i>
River chub	<i>Nocomis micropogon</i>
Rock bass	<i>Ambloplites rupestris</i>
Silver shiner	<i>Notropis photogenis</i>
Smallmouth bass	<i>Micropterus dolomieu</i>
Swannanoa darter	<i>Etheostoma swannanoa</i>
Tennessee shiner	<i>Notropis leuciodus</i>
Warpaint shiner	<i>Luxilus coccogenis</i>
Whitetail shiner	<i>Cyprinella galactura</i>

2.5.2 Wildlife

The study area is highly developed with very little riparian zone (vegetated area adjacent to a stream) along the stream corridor. Wildlife that would sparingly utilize the area would be generalists such as squirrels (*Sciurus spp.*), Virginia opossum (*Didelphis Virginian*), raccoon (*Procyon lotor*), etc. Various song birds, ducks, and shoreline birds such as the great blue heron (*Ardea Herodias*) likely would use the stream corridor for foraging, travel, and resting on occasion. Common species of reptiles and amphibians likely use the stream corridor for habitat. According to a letter from the NCWRC (see appendix G), rare species such as hellbenders (*Cryptobranchus alleganiensis*) and the French Broad River crayfish (*Cambarus reburus*) may occur in the Swannanoa River.

2.5.3 Terrestrial and Aquatic Vegetation

The study area is characterized as urban/developed (see Figure 3). Swannanoa River Road runs parallel to the Swannanoa River in many areas as close as 10 feet or less. The riparian zone is very sparse with mainly maintained turf, kudzu (*Pueraria sp.*), dense saplings such as box elder (*Acer negundo*), American sycamore (*Platanus occidentalis*), tree of heaven (*Ailanthus altissima*), and mimosa (*Albizia julibrissin*). Kudzu, tree of heaven, and mimosa are exotic, invasive species. The occasional mature sycamore or box elder occurs close to Biltmore Avenue Bridge but further up river along Swannanoa River Road, there is very little to no large trees and very thick vine growth. Due to the majority of the riparian zone being maintained turf and invasive exotics, and being very narrow (less than 10 feet), no habitat quality models were used to assess the habitat quality.

2.6 ENDANGERED AND THREATENED SPECIES

2.6.1 Federal

According to a letter dated July 15, 2013, The US Fish and Wildlife Service (USFWS) stated that no federally protected species are known to occur in the study area. Two federally listed bat species could occur in this region. These species are the Gray bat (*Myotis grisecens*) and the Northern long-eared bat (*Myotis septentrionalis*). A potential summer roosting habitat survey was conducted by USACE biologists in July 2015 in accordance with the USFWS 2015 Range-Wide Indiana Bat Summer Survey Guidelines. No habitat was observed in the study area. Additional site visits conducted in 2016 showed that habitat conditions had not changed. Also, according to the USFWS Information for Planning and Conservation (IPaC) review conducted February 2017, no critical habitat has been designated for these bat species in the project area.

2.6.2 Critical Habitat

No critical habitat is known to occur in the study area.

2.7 RECREATIONAL, SCENIC, AND AESTHETIC RESOURCES

2.7.1 Local Resources

Asheville is known for its vibrant art scene, mountainous terrain and historic architecture. A major highlight of this area is the Biltmore, which was constructed by George Vanderbilt in 1895 as a retreat reminiscent of the grand castles and states of France and Britain. The property is still owned by the Vanderbilt family and is open to the public for viewing. Downtown Asheville has many local business and restaurants along with the historic Biltmore Village. The area typically sees its peak tourism during the fall season.

2.7.2 Regional Resources

Asheville is in western North Carolina along the Appalachian Mountain chain. The region boasts over 200 waterfalls, an abundance of wildlife and eight national and state parks. The Blue Ridge Parkway provides 469 miles of scenic views of the Blue Ridge Mountains. The Great Smokey Mountains National Park and the Pisgah National Forest are great natural recreation resources of the region. Hiking, backpacking, canoeing, rock climbing, horseback riding, fishing, and other activities are available recreational opportunities in this mountainous region.

2.8 CULTURAL RESOURCES

2.8.1 Cultural History

People have lived in the Swannanoa River Valley for at least 12,000 years. The Cherokee and many archaeologists believe that the people that occupied the Southern Appalachians throughout prehistory are the ancestors of the Cherokee (Coco et al. 2011).

The earliest peoples in the area were mobile hunter-gatherers that lived in small groups subsisting on wild game and plants. As the climate warmed, hardwood forests flourished throughout the Appalachian Mountains. People exploited the aquatic resources of the rivers and floodplains, and the animal and nut resources of the upland deciduous forests for several thousands of years. Around 3,000 B.C. people in the Swannanoa River Valley were becoming more sedentary, living at or revisiting the same locations for longer periods throughout the year. The use of steatite to make cooking vessels led to a cooking revolution allowing for increased diversity of plants in the diet. Pottery vessels replaced steatite vessels about 1000 – 750 B.C. The trend toward sedentarism continued. People throughout the region remained linked through information and trade networks. People exchanged raw materials and trade goods, such as copper, shells, certain type of stone, associated with esoteric knowledge and prestige. The mortuary practice of mound building emerged and helped people connect to the land and their ancestors. By A.D. 1000, social organization shifted to rulership by a chief. People lived in villages with houses arranged around a central plaza or courtyard. Agriculture focused on the maize, beans, and squash. Later palisades fortified these villages.

In A.D. 1540, the Cherokee's first direct contact with Europeans occurred as the Hernando de Soto Expedition passed through the Swannanoa Valley. The introduction of European diseases led to significant population loss and social stress. By the colonial period, the Cherokee allied with the British and adopted many of the British lifeways including plantation economies (ncpedia.org). The nearby Qualla Boundary is the home of the Eastern Band of Cherokee Indians. Tribal members are the descendants of Cherokee that owned land and were not forcibly removed, hid in the mountains to evade relocation, or survived the Trail of Tears and returned home after arriving in Oklahoma.

Samuel Davis is believed to be the first permanent Anglo-American settler in the Swannanoa Valley. Buncombe County was created in 1791, and in 1797, the City of Asheville was incorporated as the county seat. Buncombe County remained fairly isolated until after the Civil War. In 1882 the Western North Carolina Railroad Company completed a rail link to the City of Asheville.

In 1888, George Vanderbilt began acquiring lands to develop the Biltmore Estate to be his winter residence. Richard Morris Hunt and Frederick Law Olmsted designed the estate and transformed the landscape. In addition, the Biltmore Village was also created to house and service the workers. Today the Biltmore Estate is open for visitation and provides the public an opportunity to perceive the life of the elite in the Gilded Age.

2.8.2 Previous Investigations

A review of prior studies was conducted to determine whether known cultural resources exist in the project area. The North Carolina Office of Archaeology did not have sites on record. Prior to the reconstruction of the Biltmore Avenue Bridge, archaeologist at the NCDOT determined the area to contain historic fill. NCDOT encountered an abandoned water pipe during inspection. Upon inspection by NCDOT archaeologist No significant archaeological deposits were identified (Matt Wilkerson, personal communication 2015).

2.9 AIR QUALITY

The Western North Carolina Regional Air Quality Agency (WNCRAQA) monitors and regulates Buncombe County's air quality to safeguard public health and the environment, while preserving the quality of life and economic vitality of the area. The Agency enforces Air Quality regulations in Buncombe County and the City of Asheville. Regulations cover everything from open burning to asbestos demolition, as well as industrial facilities. WNCRAQA also has an air monitoring program that measures ozone and particulate matter in the county. The City of Asheville has been found to have above average air quality for a city of its size. According to the Environmental Protection Agency (EPA) Buncombe County is designated as "in attainment" for all air pollutants of concern.

2.10 NOISE

Existing noise in the study area is associated with traffic from major roads in the area including Swannanoa River Road on the right bank, Thompson Street on the left bank, and Biltmore Avenue as well as local businesses. There are also active lines of the Norfolk Southern railroad in the area.

2.11 TRANSPORTATION

Existing transportation related assets within the study area include a 600 foot segment the Swannanoa River Road, Biltmore Avenue, and parking lots on the North bank of the river both upstream and downstream of the Biltmore Avenue Bridge. The parking lots support the office park immediately north of the Swannanoa River segment and Asaka Japanese Restaurant. Traffic appears primarily to entail local personnel traveling in and around the Biltmore Avenue Bridge area both for work and recreation.

2.12 UTILITIES

Existing utilities within the study area include a five foot diameter sewer line running approximately thirteen feet deep along the north bank of the Swannanoa River, electrical lines, fiber optic lines, telephone lines, and water lines networked throughout the general area. Power and phone lines pass over the Swannanoa River approximately 350 feet upstream of Biltmore Avenue.

2.13 HAZARDOUS, TOXIC, RADIOACTIVE WASTE - HTRW

A Phase Ia Environmental Site Assessment (ESA) was prepared by the Nashville District US Army Corps of Engineers in January 2016 at four structural measures which included Warren Wilson Dry Dam, Lake Craig Dam Rehabilitation, Biltmore Avenue Bridge Channel Modification and I-40 Construction Disposal Area. This ESA was performed to determine if there were any known environmental liabilities or recognizable environmental conditions (REC) that would interfere with implementation of the flood control project. For the sake of this report, only the findings related to the TSP, Biltmore Avenue Bridge Bank Modification will be discussed. The Phase Ia ESA site reconnaissance was conducted on 16 December 2015 and assessed 800 feet of riverbank adjacent to Biltmore Avenue Bridge spanning upstream and downstream. The Phase Ia ESA report (January 2016) is located within Appendix C, HTRW.

In addition, a Phase Ia ESA Addendum report (October 2016) assessed an additional 900 feet upstream from the original 800 feet, for a total of 1700 feet of river bank. The Phase I ESA Addendum report (October 2016) is located in Appendix C, HTRW. Both the Phase Ia and Phase Ia Addendum were performed in accordance with USACE ER-1165-2-132 (1992), ASTM E1527-13 (2013) and 40 CFR 312 US EPA FR Vol. 70, No. 210 (2005).

No sheen was seen in the Swannanoa River, nor up stream for 0.25 miles during either reconnaissance. During the July reconnaissance, the water was tan and opaque in color due to a recent storm event causing surface water runoff and sediment to be in the surface water. Up gradient from the proposed bank modification area are either asphalt paved roads or parking areas and heavily built commercial and retail areas. Approximately 0.15 miles north of the Biltmore Avenue Bridge is a Shell Gas Station and a Precision Tune Auto Care auto shop. Approximately 0.25 miles upstream from the proposed bank modification and adjacent to the Swannanoa River is an oil/fuel storage area with many 55-gallon drums stacked 3 high, many above ground storage tanks (ASTs) with some that do not look like they have secondary containment, and two industrial sized fuel tanker trailers. Five of the ASTs were rusted on the outside, and no enclosed secondary containment. No discoloration or sheen from uncontrolled releases was observed in the Swannanoa River adjacent or directly downstream of this oil/fuel storage area. Near the most upstream portion of the proposed bank modification, at approximately N35.5698 W-82.5404, and across the street from 48 Swannanoa River Road (Silverman Property) are flush mount well covers, demarked with blue paint. The blue paint indicates that the wells are part of the public potable water supply. There were no visible signs of illegal dumping of material or trash along this portion of the bank.

LRN contacted Environmental Data Resources (EDR) to perform a standard environmental database records search for Biltmore Avenue Bridge Bank Modification. EDR records date back to 1894. Additionally LRN contacted North Carolina Department of Environment and Natural Resources Brown Field Division for additional environmental records. The following RECs, identified in the environmental records search, could possibly impact the proposed work at the measure:

Asheville Mica Company is located directly upstream on the Swannanoa River within 0.25-miles of the Biltmore Avenue Bridge area. In 2002, trichloroethylene (TCE), a chlorinated solvent, was detected in groundwater under the Asheville Mica Company site in concentrations ranging from 5.1 – 120 ug/L. The Drinking Water standard for TCE is 5 ug/L (U.S. EPA, 2009). Asheville Mica Company is under a Brownfield agreement, suggesting that there may still be detectable levels of TCE on-site. Because Asheville Mica Company is directly upstream from Biltmore Avenue Bridge, and TCE was detected in groundwater greater than the TCE standard of 5 ug/L, it is possible that Asheville Mica Company could have leached TCE to the Biltmore Avenue Bridge area.

There is a North Carolina State registered brown field located at 801 Biltmore Ave, and is located on the right bank and adjacent to the downstream area of Biltmore Avenue Bridge. The environmental record does not say what constituents are in soil or groundwater from the previous use. It is possible that the former site at one time impacted the river bank and river in the Biltmore Avenue Bridge area.

The Silverman Property, which is located north and adjacent to the additional 900 feet of bank modification, is listed as a UST site and a state environmental site. During the July 2016 site reconnaissance, the Silverman Property was observed to have at least two active auto repair areas, five 55-gallon drums, 5-foot diameter cable reels, many cars in disrepair, two mobile homes, an earthen race track, and other debris seen on the property. From the record search, there are two registered USTs, one is gasoline, and the other is fuel oil. The gasoline UST was 550 gallons, single-wall steel construction and installed in 1966. Single-walled USTs provides no secondary containment. USTs in this area are subject to flood conditions. It is likely that a single-walled steel UST from the 1960s leaked product at some time during its time in use. In 1994 the UST was removed. The second UST is a 550-gallon single-walled steel UST use for storing heating oil, it was installed in 1968, and it is currently in use. It is likely that a single-walled steel UST has leaked product or is leaking product now. The Silverman property is listed as a Brownfield site. Past property uses include light manufacturing and auto repair with RECs that include lead from paint, as well as volatile organic compounds (VOCs) and semi-volatile organic compounds (SVOCs). A Phase I and Phase II ESA were conducted at the Silverman Property in 2008 and 2009 respectively. The Silverman Property Phase I ESA (2007) was conducted by Mountain Environmental Services, Inc. and identified numerous RECs. A second Phase I ESA (2008) was conducted by S&ME for the purpose of brownfield assessment and identified numerous RECs. A Silverman Property Phase II ESA (2009) was performed by S&ME and recommended further delineation and determining the extent of petroleum, oil and grease, antimony, lead, thallium, and PAHs which were detected; and add additional soil and groundwater sampling in the west portion of the Silverman Property because it was not investigated, so the nature and extent of impact in the west area was not determined. No further investigations or delineations are listed in the environmental records search, and it is assumed no further investigation has occurred. S&ME recommended reporting the petroleum TPH-DRO impacted soil results at the UST fill port pipe at the Fabrication and Storage Buildings to the NCDENR UST Section. NCDENR UST Section would likely require the UST(s) to be over-excavated to remove the source of petroleum TPH-DRO source, and to remove impacted soil. There is no record of this UST being removed or closed, so it is assumed to still be in place, and potentially still impacting soil and groundwater at the Silverman Property. The U.S. EPA Brownfield Property Profile for the Silverman Property states that no additional investigation, delineation or cleanup has occurred at the Silverman Property.

There are many other potential RECs including leaking underground storage tanks, gas stations, auto repair and other industries that may have impacted the proposed bank modification measure. There are four

leaking above ground fuel storage tanks, and 20 leaking underground fuel storage tanks registered to be within 1-mile and up gradient of the measure, and some of the leaking tanks may have impacted the measure. Other sites are listed in the EDR report in Appendix C, HTRW.

There are multiple leaking fuel storage tanks in the vicinity, there are brown fields near and adjacent to the measure, and there is an active environmentally listed site adjacent to the measure. Based on the findings of the Phase I ESA (January 2016) and the Phase I ESA Addendum (September 2016), a Phase II ESA was recommended for the Biltmore Avenue Bridge Bank Modification to determine if there is presence of the RECs, and if so what is the nature of the RECs in the measure.

In April 2017, the City of Asheville, North Carolina completed a Phase II ESA for the 1700 ft of proposed bank modification. The Phase II ESA included soil sampling at the proposed 1700 ft length of the measure. Twenty-four locations were sampled and analyzed for VOCs, SVOCs, and metals because of the RECs identified in the Phase I and Phase I Addendum which may have impacted the bank. All detected VOCs were less than the associated North Carolina Preliminary Soil Remedial Goal (October 2016). The highest concentrations of benzene, ethylbenzene, toluene and xylene (BTEX) are located in the most upstream sample location H13. BTEX are naturally occurring compounds in crude oil, gasoline, cigarette smoke, wood fires, coal tar, asphalt, and other sources. The five upstream sample locations (H9-H13) and three bank sample locations (HA1-3) are adjacent to the Silverman property, the known environmental site. Lead was detected in the most upstream (H13) sample location at 1920 mg/kg and 1650 mg/kg which exceeds both the industrial land use screening level and background range. Lead is naturally occurring and persistent in the environment. Sources of lead in soil include naturally occurring lead in soil, pipes, leaded gasoline, dyes, ceramic glazes, caulk, ammunition and other sources. Twenty-two SVOCs were detected at least once at the site, and each sample location had at least one SVOC detected. Benzo(a)pyrene, a SVOC, was detected in elevated concentrations in the most upstream sample location H13. Because lead levels in the most upstream sample location are greater than screening levels and normal background ranges, and because other detected chemicals including VOCs, SVOCs and other metals had a high or highest detection in the most upstream sample location and adjacent sample locations, it is recommended to avoid the most upstream 300 feet of the proposed measure. If this portion of land were to be used as part of the measure, remediation and associated cost will be the responsibility of the Non-Federal Sponsor.

2.14 SOCIOECONOMIC AND ENVIRONMENTAL JUSTICE

2.14.1 EO 12898 Environmental Justice

On February 11, 1994, President Clinton issued Executive Order 12898: Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations. The order focuses Federal attention on the relationship between the environment and human health conditions of minority communities and calls on agencies to make achieving environmental justice part of their mission. The order requires the EPA and all Federal and state agencies receiving Federal funds to identify and address disproportionately high and adverse human health or environmental effects of their programs, policies, and activities on minority and low-income populations. It also requires the agencies to develop strategies to address this problem.

2.14.1.1 Minority Population

As defined in Executive Order 12898 and the Council of Environmental Quality (CEQ) guidance, a minority population occurs where one or both of the following conditions are met within a given geographic area:

- The American Indian, Alaskan Native, Asian, Pacific Islander, Black, or Hispanic population of the affected area exceeds 50 percent.
- The minority population percentage of the affected area is meaningfully greater than the minority population percentage in the general population or other appropriate unit of geographic analysis.

A minority population also exists if more than one minority group is present and the aggregate minority percentage meets one of the above conditions. The selection of the appropriate unit of geographic analysis could be a governing body’s jurisdiction, a neighborhood, census tract, or other similar unit. Note that the Hispanic population is a multi-racial group which may overlap with other minority groups. A summary of the population demographics is shown in Table 3. Based on the demographics in the study area and Executive Order 12898 guidance, a minority population does not exist in the study area.

Table 3. Population Demographics

Population	City of Asheville Population	Percent of Asheville Population	Percent of NC Population
American Indian or Alaska Native	250	0.3%	1.3%
Asian	1,168	1.4%	2.2%
Black or African American	11,178	13.4%	21.5%
Native Hawaiian or other Pacific Islander	167	0.2%	0.1%
Hispanic or Latino	5,422	6.5%	8.4%
White	66,150	79.3%	68.5%
Total	83,417		

United States Census Bureau

2.14.1.2 Low-income Population

Executive Order 12898 does not provide criteria to determine if an affected area consists of a low-income population. For the purpose of this assessment, the CEQ criteria for defining a minority population has been adapted to identify whether or not the population in an affected area constitutes a low-income population. An affected geographic area is considered a low-income population (i.e., below the poverty level, for purposes of this analysis) where one or both of the following conditions are met within a given geographic area:

- The percentage of low-income persons is at least 50 percent of the total population.
- The percentage of low-income persons is meaningfully greater than the low-income population percentage in the general population or other appropriate unit of geographic analysis.

The EPA defines the poverty level at less than \$15,000 household income for these datasets. This analysis defines low-income as households earning less than \$25,000 per year. The income distribution is summarized in Table 4. Based on the 2010-2014 and 2008-2012 American Community Surveys, about 22 percent of households in the study area can be considered to be in poverty status, compared to about 14 percent in Buncombe County, North Carolina, and the United States. The study area does not meet either criterion as the percentages of low-income persons are substantially less than 50 percent and are not meaningfully greater than in the State of North Carolina as a whole.

In summary, the study area does not constitute an environmental justice community based on the minority, or low-income populations.

Table 4. Income Distribution

Population	Project Area¹	Buncombe County¹	North Carolina²	United States²
Total Households	1,627	101,645	3,775,581	116,926,305
< \$15,000	22%	14%	14%	13%
\$15,000 - \$25,000	20%	12%	12%	11%
\$25,000 - \$50,000	24%	28%	27%	24%
\$50,000 - \$75,000	14%	19%	18%	18%
\$75,000 +	19%	27%	18%	36%

¹2010 Census: accessed through EPA's EJSCREEN tool

²2010 Census and 2010-2014 American Survey 5-yr Estimates: access through American Fact Finder

2.14.2 EO 13045 Protection of Children

On April 23, 1997, President Clinton issued E.O. 13045, Protection of Children from Environmental Health Risks and Safety Risks. The order focuses Federal attention on the relationship between the environment and human health conditions that may disproportionately affect children and ensures all policies, programs, activities, and standards address risks to this vulnerable segment of the population. The age distribution is summarized in Table 5.

Table 5. Age Distribution

Population	Population Estimate	Percent of City of Asheville Population	Percent of North Carolina Population
Persons under 5 years	4,755	5.7%	6.6%
Persons under 18 years	15,432	18.5%	23.9%
Persons between 18 and 65 years	49,633	59.5%	56.6%
Persons 65 years and over	13,597	16.3%	12.9%

United States Census Bureau

3.0 PLAN FORMULATION

3.1 PROBLEMS AND OPPORTUNITIES

3.1.1 Planning Problems

- Recurrent flooding and damages along the Swannanoa River and its tributaries
- Many historic structures, infrastructure and critical facilities are flooded in Historic Biltmore Village

3.1.2 Planning Opportunities

- Reduce threat to life safety
- Potential to reduce damages to developed property and non-physical losses, using structural and non-structural measures
- Multiple sites exist for potential flood detention and channel modification reducing peak flow in damage centers

3.2 OBJECTIVES AND CONSTRAINTS

3.2.1 Planning Objectives

A key Federal objective of water resources and related land resource planning is to contribute to the national economic development. The study and its recommendation must be consistent with protecting the nation's environment, pursuant to national environmental statutes, with all Federal planning requirements. Contributions to NED are increases in the net value of the national output of goods and services, expressed in monetary units. Contributions to NED are the direct net benefits that accrue in the planning area and in the rest of the nation.

- Reduce flood damages to structures in historic Biltmore Village by the year 2025
- Reduce flood risk to critical infrastructure by the year 2025

3.2.2 Planning Constraints

- The project could have adverse effects on historic structures
- Maintain or improve the environment, including aquatic habitat
- Need to minimize relocation or acquisition of homes and businesses
- Avoid inducing flood damages caused by measures
- HTRW – avoid, minimize, or remediate if required

3.3 MOST PROBABLE FUTURE WITHOUT PROJECT CONDITIONS

Future land use and development projections for the Swannanoa River study area were obtained from a 2010 study performed by the Center for Applied GIScience (RENCI), an institute affiliated with the University of North Carolina. The study examined historical development patterns in western North Carolina (including Buncombe County) and projected future development to 2030 using population growth trends and a GIS-based spatial analysis of physical basin characteristics. A similar GIS-based approach was implemented to extrapolate the original RENCi data out to the required 50 year future period. The analysis was done by taking the rate of development found by evaluating GIS development layers from the 2010-2030 data and spatially extrapolating the area to represent likely development by 2065. In general, the urban subbasins saw an overall impervious area increase of 20% from existing conditions to 2065 future conditions, while expectedly the rural areas on average showed significantly less impervious area growth.

The resulting 2065 future conditions with no project present was used as the baseline for evaluating all potential measures and alternatives in the study. It should be noted that the future without project scenario was developed with the assumption that in the future the breached Lake Craig Dam would eventually fail or be removed and no longer function as it does in its current capacity as a dry dam. USACE analysis showed that at some point during the 50-year future period, a large storm event would likely cause either a complete breach of Lake Craig Dam or deteriorate the structure to the point that safety concerns would force its removal.

3.4 MEASURES TO ACHIEVE PLANNING OBJECTIVES*

3.4.1 Preliminary Structural and Non-Structural Measures

The identification and evaluation of potential FRM opportunities was initially conducted by the City's contractor, Brown & Caldwell. This was performed in several steps. First, the potential projects identified in the 2007 report completed for the North Carolina Division of Water Resources (NCDWR) were located and a GIS assessment was performed. The GIS assessment included examining the watershed area of each project, the project site, and the homes, businesses, roadways and other investments in the floodplain downstream of the site. During the GIS evaluation additional potential flood risk mitigation projects were identified, more than doubling the potential projects identified in the NCDWR report.

Some of the potential projects were eliminated from further consideration during the GIS analysis. The projects eliminated included potential stormwater detention locations that did not have enough contributing watershed to provide significant benefit, areas where retention of stormwater would have adversely impacted homes, businesses, or roads disproportionate to the potential benefits they could provide, and projects that may be technically feasible but did not have a significant amount of investment in the floodplain downstream of them for which they could provide some level of protection. A project evaluation matrix of the 48 measures can be found in Appendix I. The project evaluation matrix presents B&C's final assessment of the evaluation factors.

The evaluation matrix evaluated projects under four different criteria: Flood Mitigation potential, Economic Feasibility and Impacts, Environmental and Community Impacts, and Ability to Implement. Each of the four criteria was examined using a number of different evaluation factors as follows:

- Flood Mitigation Potential:
 - Likely has a beneficial impact on a “watershed scale”
 - Lowers flood stage along reaches where significant damages occur
 - Provides at least a 25-year level of service against overtopping of one or more public roadways
 - Provides at least a 100-year level of service against overtopping of one or more public roadways
 - Significantly reduces velocities at places of substantial human risk
 - Significantly increases warning and/or pre-event response time
 - Provides a significant net improvement in dam safety
 - Provides significant protection to critical public infrastructure

- Economic Feasibility and Impacts:
 - Provides net benefits to National Economic Account
 - Provides an NED Benefit/Cost Ratio > 1.0
 - Provides or protects opportunities for public recreation of a type that is limited in the area
 - Provides significant reductions to regional business and residential losses
 - Would provide significant regional employment for design/construction/maintenance
 - Would reduce employment losses during future flood events

- Environmental and Community Impacts:
 - Provides beneficial impacts upon water quality
 - Provides beneficial impacts upon riparian ecology
 - Provides beneficial impacts upon site ecology
 - Does not present significant adverse impacts to local transportation and congestion
 - Provides for development of public amenities

- Ability to Implement
 - Has no particularly difficult design or construction constraints
 - Likely to obtain land-owner and community support
 - Supports existing local government plans
 - Likely to attract environmental and/or conservation grant funding
 - Could be implemented with currently available SB7 funds
 - Could be implemented within funding limitation of Section 205
 - Does not require relocation of private residence or business
 - Does not require acquisition of private property

Stakeholder participation was a key component of the potential projects evaluation. After the GIS evaluation and initial site inspections, a joint meeting of the Swannanoa Flood Risk Management Project's (SFRMP) Plan Formulation Team (PFT) and its Technical Advisory Committee (TAC) was held to discuss

the project screening process. The potential projects that were recommended to be eliminated from further consideration were discussed as well as the key issues identified during field inspections of the projects that would be further evaluated.

The project evaluation matrix was updated and modified as information was generated about each of the potential projects. The matrix was posted on a publicly accessible website for six months being updated as new information and comment was received.

When work by B&C was completed a significant number of measures had been evaluated and narrowed down. B&C identified measures that reduced flood damages at a cursory level that were beneficial for preliminary analysis. USACE continued evaluation of the potential measures that had been identified to date with further analysis in concern to economics, project constraints, costs and design.

3.4.2 Structural Measures

B&C started with a list of 48 measures and narrowed those down through the process described in section 3.4.1. Following the initial analysis USACE and B&C worked together to narrow those measures down to 7 structural measures that were evaluated in more detail with locations shown in Figure 7. Below are descriptions of those 7 structural measures. Three of the measures were eliminated from further discussion. The remaining 4 measures were deemed viable and were combined into alternative plans.

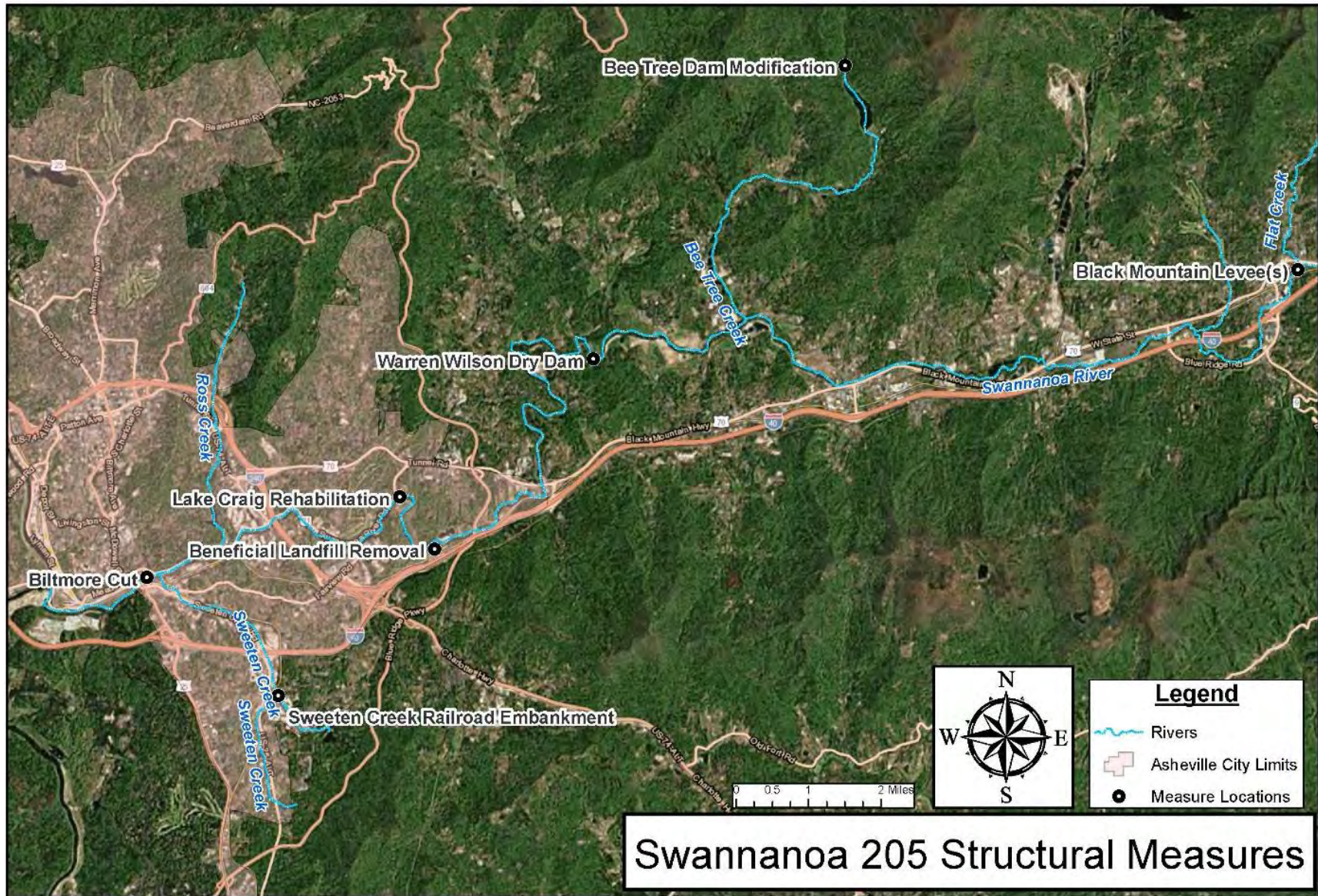


Figure 7. Structural Measure Locations

3.4.2.1 Biltmore Cut - BAB

The Biltmore Avenue Bridge provides access across the Swannanoa River in the Biltmore Village area. It is an important structure on a busy thoroughfare where heavy traffic and pedestrian congestion commonly occurs. Rapid growth in the Biltmore Village area rendered the aging bridge, which was in place at the beginning of this study, inadequate to convey increased traffic. The NCDOT replaced the bridge in 2010. Design of the new bridge was coordinated with the City of Asheville and incorporates features to minimize future flood damages. Unlike, the old bridge that had a pier at the approximate mid-point of the bridge founded in the river bed, the new bridge spans the river and does not have an intermediate pier. This improvement reduced the restriction that the bridge places on the Swannanoa River, which was updated in the existing conditions hydraulic modeling. However, immediately upstream and downstream of the bridge crossing, fill material exists on the north bank of the Swannanoa River to form a parking lot for nearby businesses. It is unclear exactly when the parking lots were constructed but the placement of this material restricts river flow, causing a rise in the local water surface elevation and erosion on the opposite bank. When the new bridge was constructed a small portion of this fill was removed but water conveyance remains severely restricted on both the approach to and exit from the new bridge. This measure would remove some of the fill material as well as natural streambank material from the approach to and/or exit from the bridge in order to increase the capacity and provide a significant reduction in flood damages.

The fill in the channel alters natural flow of the Swannanoa River by directing it toward the south bank. The constriction placed on flow in this area causes an increase in water surface elevation, velocity, and rate of erosion of the river banks. Removal of this material would improve conveyance of flow through the newly designed bridge and reduce erosive velocities in the river, thereby improving overall water quality and aquatic habitat.

3.4.2.2 Sweeten Creek Detention Structure

Sweeten Creek Detention Structure is located along Sweeten Creek, south of the Swannanoa River on the east side of Sweeten Creek Road and on the north edge of the Sweeten Creek Industrial Park. The location captures runoff from a 1,810 acre drainage area which encompasses the southern end of the Creek. Sweeten Creek empties into the Swannanoa River in the Biltmore Village area upstream of Biltmore Avenue Bridge.

A railroad embankment across the creek was identified as potentially providing detention for the creek. However, after further examination of the existing culvert in the railroad embankment, it was found that there was a significant bend in the culvert. The bend in the culvert provided such a constriction hydraulically it was determined that additional modification would not be beneficial to reduce flooding. The Sweeten Creek Detention Structure was determined to not be feasible based on the bend in the culvert already providing a significant hydraulic restriction and therefore was eliminated from further detailed consideration.

3.4.2.3 Warren Wilson Dry Dam – WW

Dry dams are designed to receive, temporarily hold, and control the release of flood water to protect areas from flooding. Several sites were considered on Warren Wilson College's Campus for a dry dam. The recommended site is the only site in the basin with capacity (largest amount of available storage area) and location above damage centers where rainfall can be captured to temporarily slow flood water. The structure would be capable of holding back up to 1460 acre-feet of water. A natural pinch point in the river was selected for the site location to limit the size of the structure. Warren Wilson Dry Dam would have minimal impacts to structures and roads upstream. Both roller compacted concrete (RCC) and earthen designs were considered for the site.

3.4.2.4 Lake Craig Dam Rehabilitation - LCD

The Lake Craig Project Site is located about 0.5 miles south of US Highway 70 and 3.5 miles east of the center of Asheville on property owned by the City of Asheville. Gashes Creek Road crosses the dam.

The site drains a 68,550 acre area of the Swannanoa River watershed. Lake Craig was originally constructed to provide water supply and hydropower for the City of Asheville, but the dam was eventually breached, draining the lake. Sediment deposited by floodwaters created a large fill area on which the current Asheville recreation soccer fields were constructed.

The dam is a composite structure consisting of a masonry and concrete spillway with a maximum height of approximately 40 feet and an earthen embankment on the left of the spillway. Based on height, it is an intermediate sized dam. However, based on both NC Dam Safety and the USACE criteria, the dam is considered a high hazard structure. A two-lane bridge for Gashes Creek Road is supported over the concrete portion of the dam by five concrete piers that divide the structure into six bays.

The dam was initially used for small scale hydroelectric operations. The long tailrace wall and the turbines and piping have been removed; leaving only two sluice gates with circular penetrations through the concrete headwall on the upstream face of the dam. A radial gate has been removed from the second bay (from the left) leaving a broad crested weir and stepped chute to pass water to the downstream channel. Bays 3, 4, and 5 are all similar: a concrete weir has been constructed on top of the masonry section between the bridge piers. The fifth bay includes a rectangular opening (approximately six feet wide by six feet high) through the lower masonry section that appears to have been a gated penetration to drain the reservoir. Currently, the gate has been removed and normal base flow is passed through the opening. Thus, during normal operation, the difference between the invert of this low opening and the downstream channel invert is about eight feet. The sixth bay on the right side of the spillway also has a concrete sill that is several feet higher in elevation than the weir in Bays 3, 4, and 5. The right side of the weir in Bay 6 is constructed against exposed bedrock of the right abutment. There are no known historic drawings of the structure, although several historic photos are available.

LCD required either removal of the “beneficial use” landfill upstream of Lake Craig Dam (See Section 3.4.2.7 below) or the acquisition of a significant amount of real estate on which the proposed inundation area of the project would induce damages.

3.4.2.5 Black Mountain Levee

Levees and/or floodwalls would be constructed along the confluence of Flat Creek and the Swannanoa River to reduce flood damages and life-safety concerns in the Town of Black Mountain, upstream of the City of Asheville. The damage center contains both commercial and residential structures within Black Mountain. There was limited area between existing structures and the creek which limits design options. After further evaluation it was determined that this measure, while protecting some structures would induce damages on others. The Black Mountain Levee was determined to not be feasible and therefore was eliminated from further detailed consideration.

3.4.2.6 Bee Tree Dam Modification

The Bee Tree Reservoir Project Site is located north of the Swannanoa River, northeast of Asheville. The Reservoir, owned by the City of Asheville, drains a 4,877 acre area within the Swannanoa River Watershed. The goal at this site was to seek additional storage capacity during high rainfall events to reduce downstream flooding. Two options were considered to accomplish this goal:

- Modification and/or improvements to the spillway system and operating policies to allow for early release of impounded water prior to an expected storm event; or
- Modification to the dam structure and surrounding area to provide additional storage above the current normal water surface elevation.

The amount of storage that could be reasonably evacuated in advance of a storm was investigated. It was determined that existing outlet works were insufficient to release the necessary volume, so different methods of evacuating the storage were investigated. Adding temporary pumps on top of the dam and

pumping water over the dam into the recently rehabbed emergency spillway was the most feasible. The cost estimate for this was \$9.5M, with a 0.42 BCR. In addition to not being economically justifiable, given that Bee Tree is the City's auxiliary water supply, the City expressed concerns regarding the water quality of the reservoir with the changed operations and the potential issue of water being evacuated and a storm never materializing.

Initial analysis suggests that raising the dam to create additional flood storage would not be economically feasible. Providing 441 acre-feet of flood storage (almost 30% of the existing storage capacity) provided only \$164,000 in benefits. For a BCR of 1.0 the total project cost would need to be less than \$3.5M. Given the pump option alone was triple that, detailed cost computations for raising of the structure and impacts to the environment were not calculated.

When the Bee Tree Dam Emergency Action Plan was updated in 2007, consideration was given to the development of a Flood Operations Plan (FOP) for Bee Tree Dam. It was determined that major structural changes (including construction of new outlet works) would be necessary to make a FOP feasible. Such modification would have been expensive and was unlikely to result in an acceptable benefit to cost ratio. For those reasons an FOP was not developed for Bee Tree Dam.

3.4.2.7 Removal of Portion of the Beneficial Landfill Area Upstream of Lake Craig Dam - LF

This measure removes a constriction on the Swannanoa River and provides additional storage upstream of Lake Craig Dam. The measure would consist of removing historic fill from I-40 construction disposal from the floodplain. Approximately 271,000 cubic yards of material would need to be hauled off site for disposal. The measures would help mitigate upstream impacts caused by the potential rehabilitation of Lake Craig Dam.

3.4.3 Non-structural Measures

Section 73 of the Water Resources Development Act (WRDA) of 1974 requires consideration of nonstructural alternatives in flood risk management studies. They can be considered independently or in combination with structural measures. Nonstructural measures reduce flood damages without significantly altering the nature or extent of flooding. Examples are flood proofing, elevation or relocation of structures, flood warning and preparedness systems (including associated emergency measures), and regulation of floodplain uses.

Planning Bulletin (PB) 2016-01, signed 22 December 2016, applies to all studies without a signed chief's report prior to that date.

PB 2016-01 defines nonstructural as:

- Nonstructural measures reduce human exposure or vulnerability to a flood hazard without altering the nature or extent of that hazard.
- Hazard, in this case refers to water associated with flooding in a coastal or riverine setting that can cause harm.
- Exposure is defined as who or what would be impacted by the hazard.
- Vulnerability is how susceptible exposed people and properties are to damage or harm of the hazard.

USACE LRN employed the services of the Non-Structural Flood Proofing Committee (NFPC) to identify frequently flooded structures for the analysis. The NFPC used HEC-FDA output and made numerous model runs adjusting the first floor elevation to account for various protection levels (50-year, 100-year and 500-year events). All structures in the structure inventory database (SID) were analyzed initially, which was approximately 866 structures from all occupancy types.

The largest damage center in the Swannanoa River Basin is the Biltmore Village where all structures are non-residential. The NFPC analysis identified 12 non-residential structures which appeared to have a positive benefit-to-cost ratio (BCR) 1.5 and positive net annual benefits \$396,000. While contingencies were incorporated into the costs it was determined that these did not cover the cost to purchase land in an acceptable location in the Biltmore Village area and relocate the businesses. The estimated cost to relocate these businesses increased the NS cost significantly and drove the BCR down to 1.0 with estimated net annual benefits of \$66,000. This cost does not account for expected HTRW cleanup costs expected to occur on at least two of the properties. For this reason the City of Asheville, NC and the Nashville District chose not to pursue a non-residential NS measure. In addition the NS measure did not meet the criteria outlined in PB 2016-01 in the sense of reducing human exposure and vulnerability to flooding. However, in an attempt to provide some type of NS measure the NFPC in conjunction with the Nashville District provided the City of Asheville, NC and businesses the “Biltmore Village Emergency Flood Response Plan March 2009”, which includes flood proofing measures for each structure in the Biltmore Village area.

A resounding majority of the residential structures were not justified by a NS measure. Upon further site visits and evaluation it was determined that the structures that initially appeared to have the best benefit cost ratios per structures fell into one of two categories: the structure was in such ill repair that it could not be raised and would not be beneficial to remove because of the historic nature. However, the City of Asheville, NC using funding provided by the State of North Carolina’s Division of Water Resources has purchased repetitive loss structures along the Swannanoa River. At last count the city had purchased 7 properties, demolishing all structures and will continue to pursue purchases of frequently flooded residential structures using this plan.

3.4.4 Excluded Measures

Following the management measure analysis, several items were established to form the basis of alternative development. Nonstructural, Sweeten Creek Railroad Embankment, Black Mountain Levees, and Bee Tree Dam Operation Modification measures were eliminated in the initial analysis, due to high costs and low net benefits or infeasibility to construct. After detailed economic evaluations, the remaining measures were combined with one another in various alternatives to compare damages prevented with costs of implementation.

The measures identified and not excluded from further detailed consideration in Section 3.4.2 were formulated into alternative plans. These alternatives represent a range of actions that could be taken to manage flood risk in the watershed.

3.4.5 Alternative Plan Descriptions

3.4.5.1 No Action Alternative*

In the no action plan no new FRM measures would be implemented. Consideration of the “No Action” alternative is required under NEPA (where no federal action or work would be done). The impacts of the “No Action” alternative are used as a baseline to compare impacts of alternatives considered including the TSP.

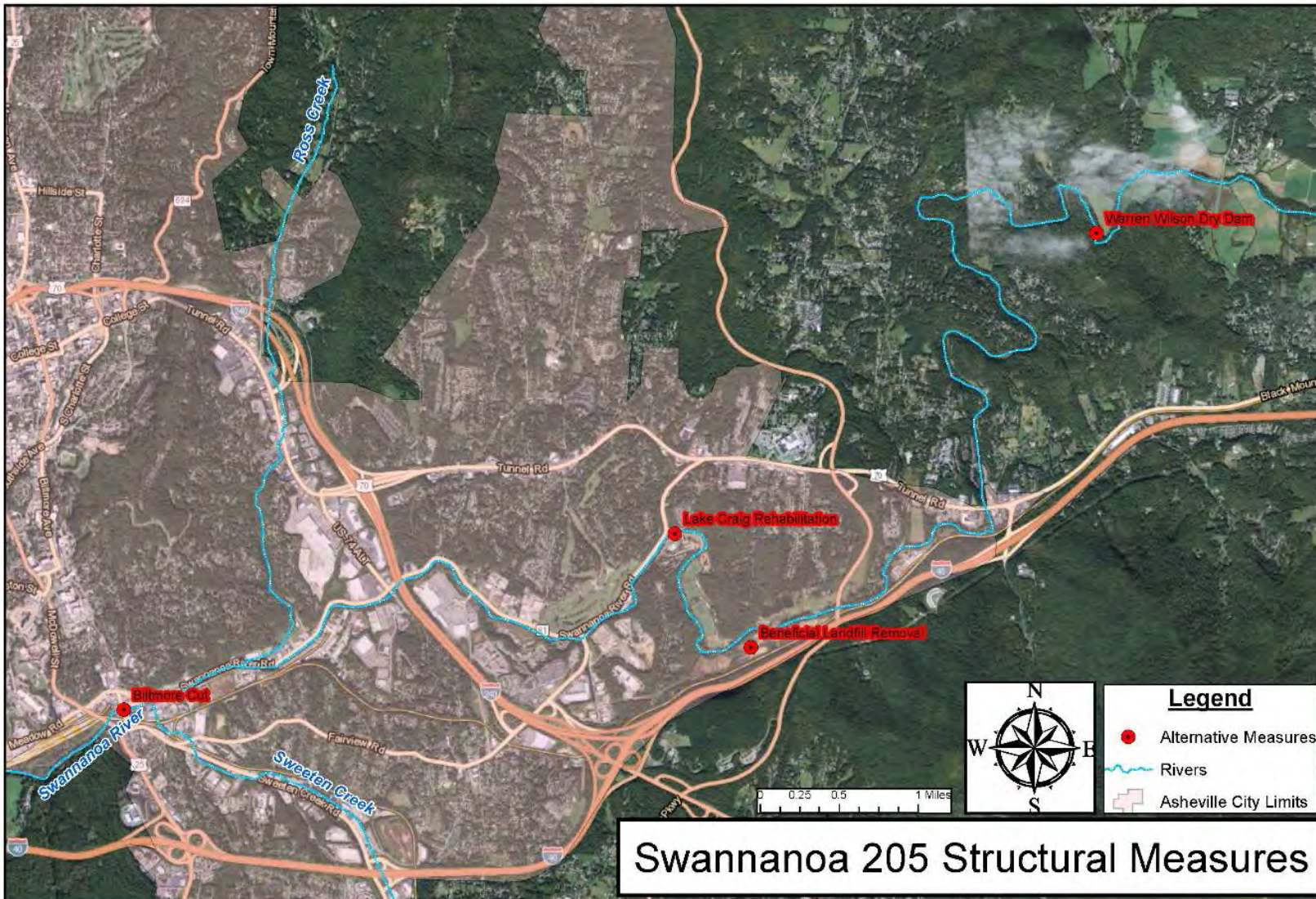


Figure 8. Measures in Alternative Plans Locations.

3.4.5.2 Biltmore Cut Alternative

This alternative would remove fill material along the right bank of the Swannanoa River upstream and downstream of Biltmore Avenue Bridge. The Biltmore Avenue Bridge opening was previously expanded by NCDOT to increase the flow capacity through the bridge opening. Now, the upstream and downstream right banks, which extend out blocking the newer, higher capacity bridge opening, serve as the constriction, instead of the bridge opening. This alternative would provide additional capacity reducing the water surface through the Biltmore Village area by cutting and benching the banks upstream and downstream of Biltmore Avenue Bridge.

The configuration of the cut being applied consists of constructing a conventional concrete retaining wall against Swannanoa River Road and creating a relatively flat bench at an elevation of approximately 1982' North American Vertical Datum of 1988 (NAVD 88). The current proposed cross-section, shown in Figure 9, is representative of the bank modification being evaluated.

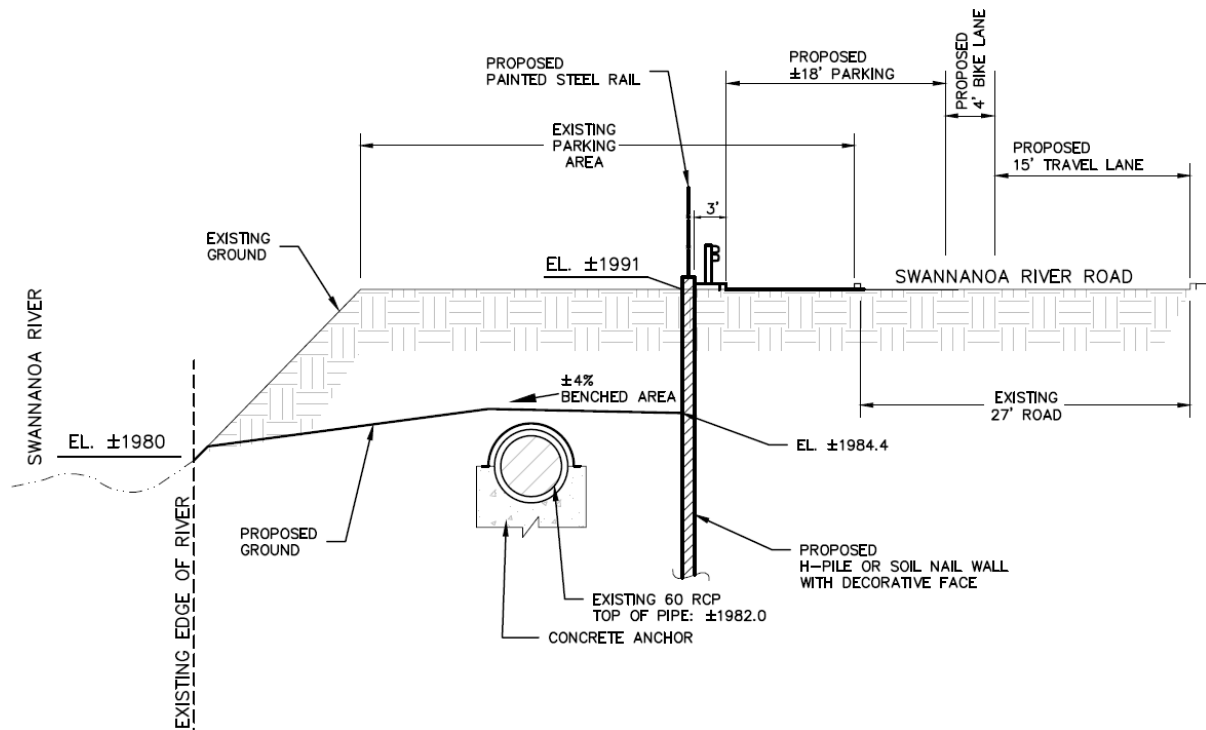


Figure 9. Conceptual Cross-section of BAB

In addition to evaluating the bank cut on the right bank, a cut on the left bank was also considered; however, the left bank is less substantial and provided only marginal reductions in the water surface profiles through the reach. In addition, the municipal sewer pipe that runs along the left bank is set at a higher elevation than the right bank, which reduces the depth at which the bench could be cut also limiting the reduction in water surface profiles that could be realized.

Several different iterations of bank modification lengths, including 700', 900', 1700', and 2500', were evaluated to maximize net annual benefits. Figure 10 illustrates the extent of the different lengths evaluated through the optimization. USACE analyzed the elevation of the bank cut for the proposed action alternative in relation to the water elevation duration curve (percentage of time the top of water elevation reaches various elevations) for the Swannanoa River. The bank cut for the proposed action alternative would be above the top of water more than 95% of time (see Figure 9). Based on this analysis and onsite field observations, USACE has determined that the bank cut would be above Ordinary High Water (OHW).

All proposed lengths of cut evaluated for the project include articulated block or rip-rap protection along the bench to mitigate any potential increase to channel velocities due to the retaining wall. The HEC-RAS modeling results show that the increase in velocities upstream or downstream of the proposed bank mod and armoring are marginal, and will likely not exacerbate the erosion that would take place under existing condition or future without project scenario.

Because this measure focuses on increasing capacity through the reach and specifically through the bridge opening, the benefits of this measure are primarily focused on the higher frequency events such as the 50% and 20% annual exceedance probability (AEP) events; however, benefits are also provided for the full range of events. After performing the optimization of maximum net benefits for the different bank modification lengths, it was determined that the 700 foot bank modification provides the maximum net annual benefits. Figure 11 illustrates the extent of the 700 foot bank cut and shows relative reductions in the water surface profile through the reach for the 50%, 20%, and 10% AEP events.

Site constraints at this location include existing utilities in the form of overhead and buried electrical and communications lines, underground sanitary sewer lines, and Swannanoa River Road along the top of the proposed cut area. These issues have been identified as part of the feasibility study and considered in the costs presented herein.

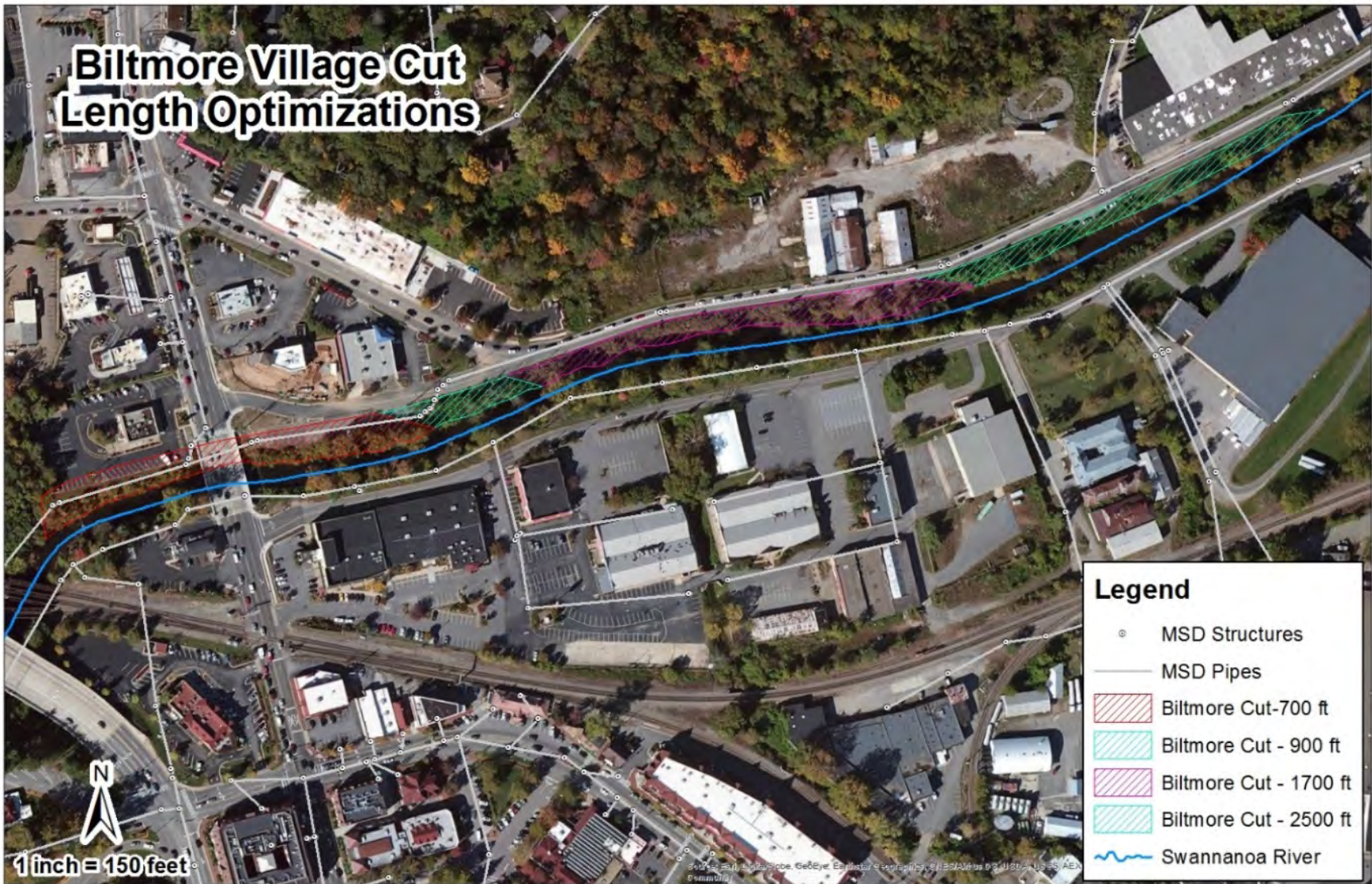


Figure 10. BAB Optimization

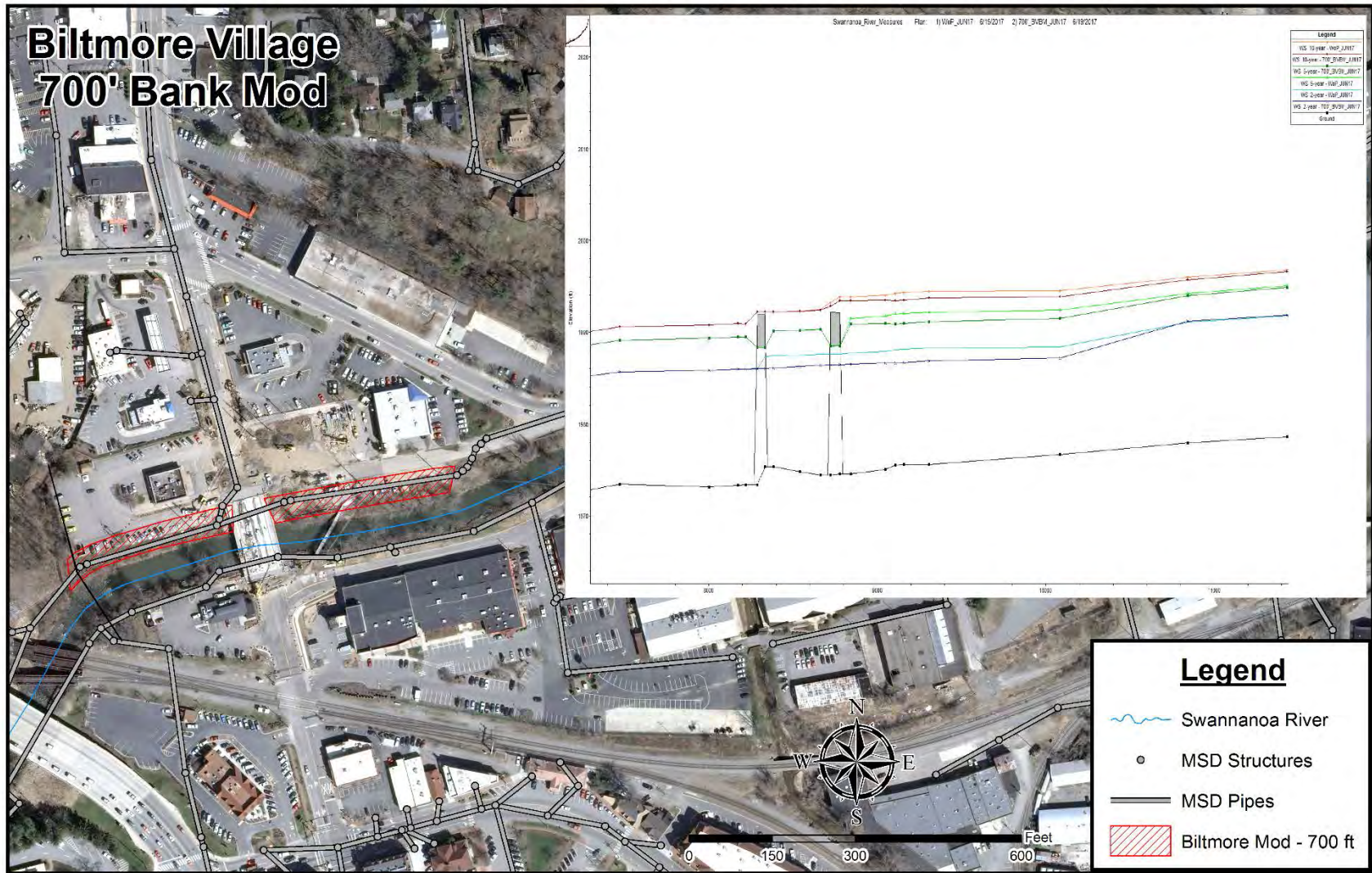


Figure 11. Biltmore Village 700 foot Cut and Representative Water Surface Profiles

3.4.5.3 Regional Plan Alternative

This alternative plan consists of a combination of BAB and LCD. BAB is described in detail above. LCD would be the rehabilitation of the existing structure for flood risk management purposes. Analysis of LCD was done as work in kind by Schabel Engineering and McGill and Associates. See Section 3.4.2.4 for a description of Lake Craig Dam Existing Conditions.



Figure 12. Lake Craig Dam Existing Conditions

Rehabilitation of the existing spillway structure would involve removing portions of the weir from Bay 3 in the center of the structure and raising the elevation of the remaining existing bays (Figure 14). Removal of the central section (Bay 3) would restore routine discharges closer to the center of the river channel and would assist with stabilization of the Swannanoa River. The low flow weir would be at elevation 2018. The width of this low flow weir would be less than the full width of the bay and a second higher stage would be provided on either side of the low flow weir within Bay 3. Raising the remaining weirs causes the dam to hold back more water during flooding events targeted by this project. Bays 2, 4, 5, and 6 would have a weir section constructed to 2040. The crest of the proposed weirs would be curved (ogee shaped) for hydraulic efficiency, and the control section would be located about 8 feet upstream of the bridge to provide a better hydraulic approach and entrance. The remnants of the hydropower bay (Bay 1) would be demolished and this bay would be used to construct another spillway section. The dimensions and elevations of the openings in Bay 3 and the hydropower bay are different for the two configurations evaluated.

Significant structural and foundational analysis would be required prior to design and construction to determine whether the existing dam structure is still fit for rehabilitation and if it would be able to withstand the loads from the higher head of flow it would be subjected to upon completion. The deposited material along the left descending bank immediately upstream of the dam would need to be excavated and the earthen portion of the dam on the upstream, and possibly the downstream, would need to be armored with riprap or articulated concrete block to minimize erosion and scouring from high water and overtopping events.



Figure 13. Lake Craig Dam Aerial View

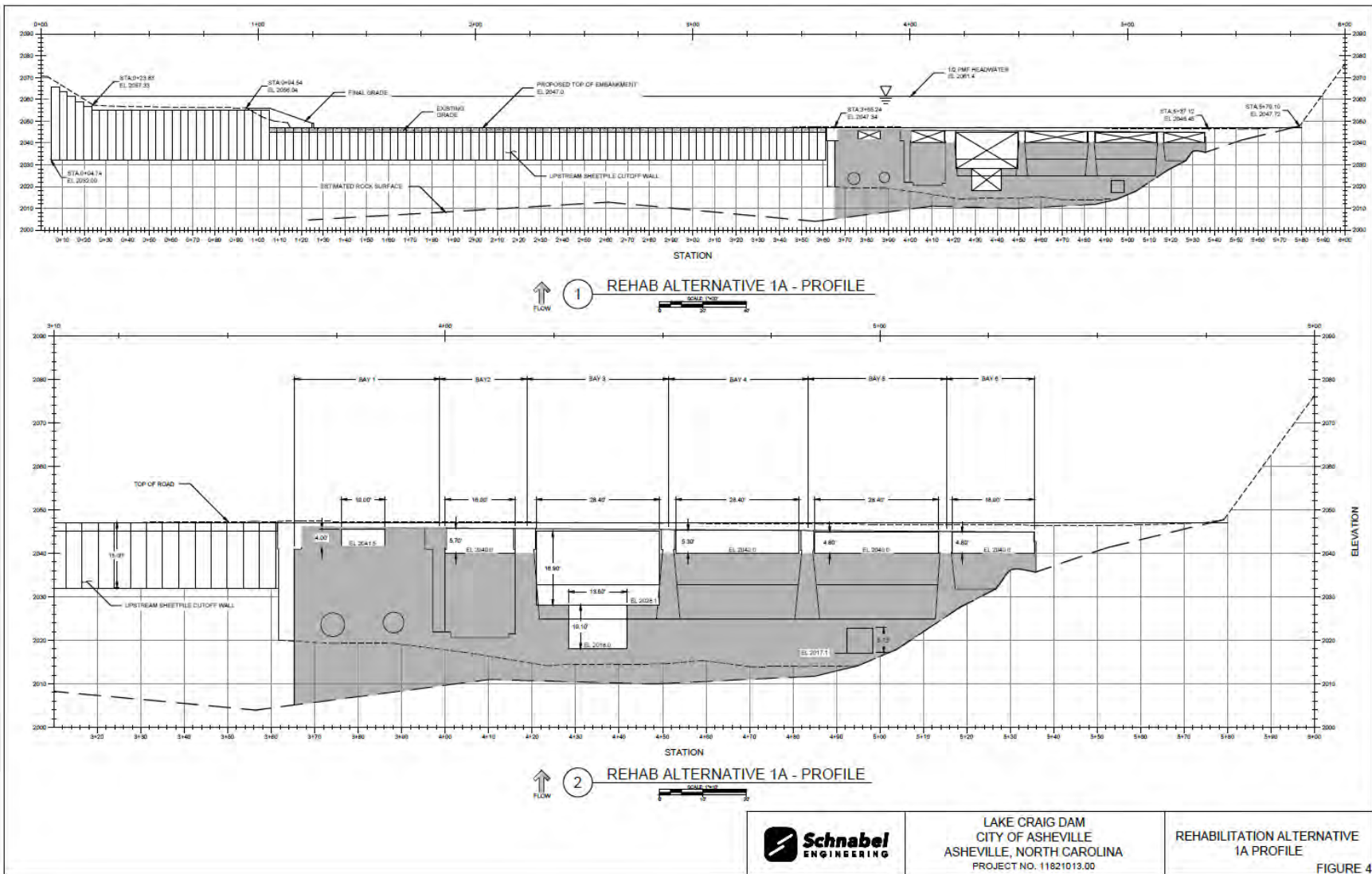


Figure 14. Lake Craig Dam Rehabilitation Profile View

3.4.5.4 Basin Plan Alternative

This alternative plan consists of a combination of BAB, LCD and WW. BAB and LCD are described in the alternative plans above. WW is located at a natural valley pinch point near Riverbend Field on the Warren Wilson College campus. The structure is 45 feet tall (elevation 3137-2092) and approximately 580 feet wide with a 24 foot by 12 foot low flow conspan outlet and an armored weir for overtopping events. The proposed dry dam at Warren Wilson College would be capable of storing up to 1460 acre-feet of water before entering uncontrolled free flow over the spillway, inundating upstream agricultural fields during significant flooding events. The dam structure itself would only occupy approximately 1.5 acres of land. Three different types of dams were evaluated at the Warren Wilson site: RCC, earthen dam with stone riprap armoring, and a combination RCC/earthen structure. Significant geological, hydrological and geotechnical analysis would be required to determine the impact and what structural measures would be necessary to mitigate increase flows immediately downstream of the dam caused by the outlet.

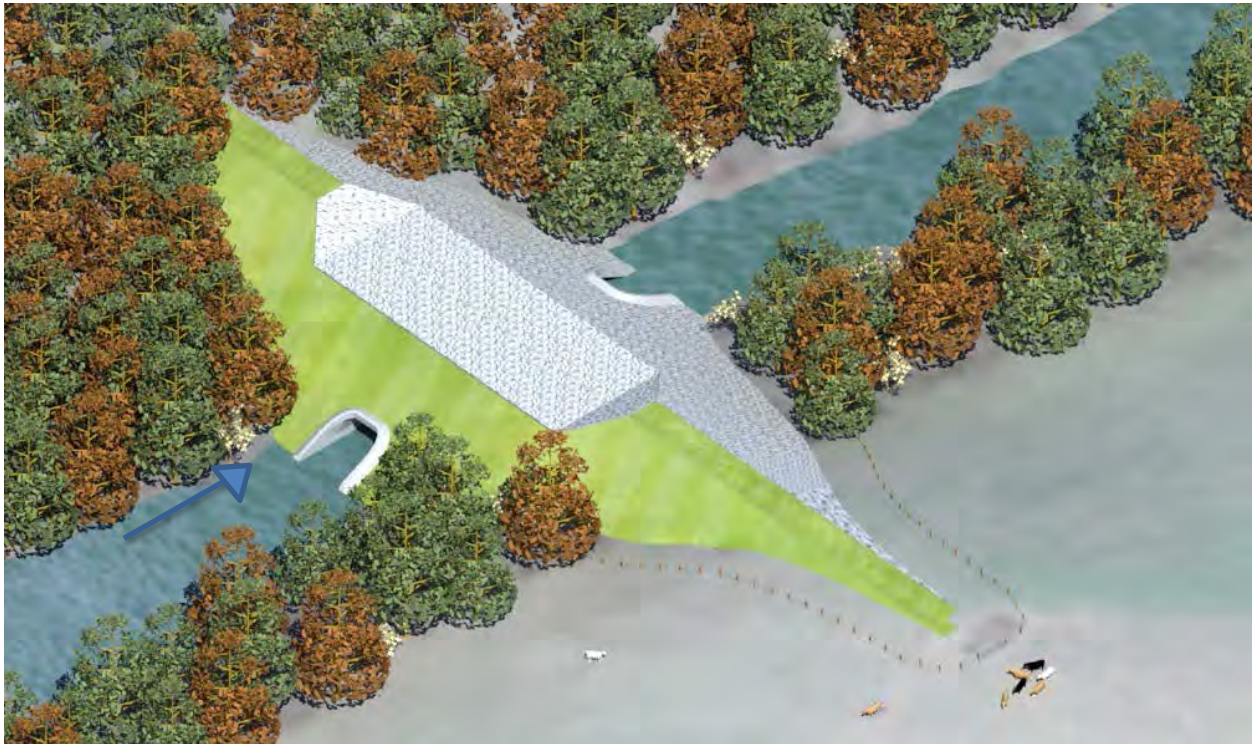


Figure 15. Warren Wilson Dry Dam Schematic

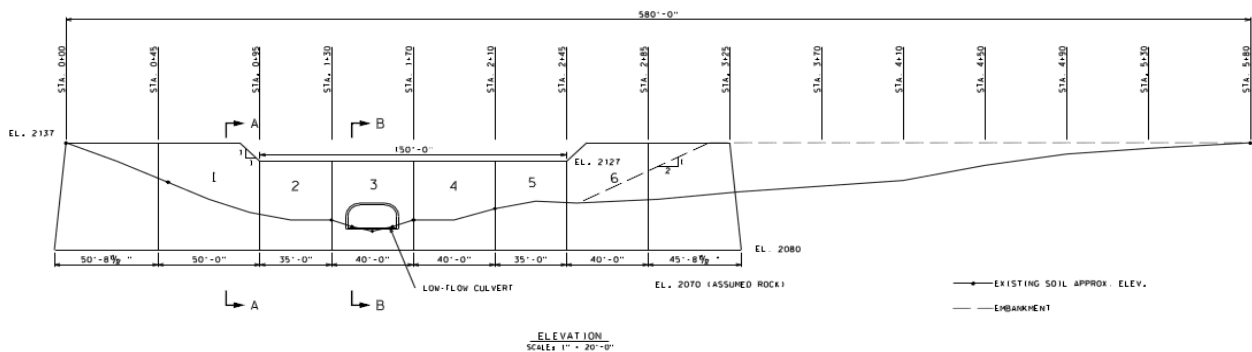


Figure 16. Warren Wilson Dry Dam Cross Section View

3.4.5.5 Locations for Disposal

Under all alternatives material would be disposed of in an existing permitted landfill. Two potential locations have been identified, the I-40 Construction Beneficial Disposal Area (recommended alternative) and the Buncombe County Landfill. The I-40 Construction Beneficial Disposal Area is located upstream from Lake Craig Dam and had been used in the past for disposal from the I-40 construction. The site is currently used by the city for composting disposal. Buncombe County Landfill is located at 81 Panther Branch Rd in Alexander, NC approximately 19 miles from the Biltmore Avenue Bridge.

3.4.6 Comparison of Alternative Plans

The FRM benefits considered for this evaluation include reductions in potential flood damages to residential, commercial, and public structures. These damage reductions are compared to the costs of project implementation. A project is considered economically justified if the total value of the average annual benefits exceeds the average annual costs.

To determine the TSP, the future without project condition and all alternatives plans were modeled in HEC-FDA and evaluated over a 50 year period, using the current Federal discount rate (2.875%). The plan which reasonably maximizes net annual benefits (average annual benefits minus average annual costs) in this initial analysis was then optimized to determine the configuration of that plan that further maximizes net benefits. This plan was identified as the NED Plan, recommended as the tentatively selected plan.

Each measure within a plan has to support itself with a benefit cost ratio (BCR) above 1.0. Therefore each measure was evaluated individually as well as a combined alternative plan. After the final array described in section 3.4.5, additional surveys and more in depth analysis were performed on the remaining measures. This detailed analysis led to the selection of the recommended plan.

The plans were evaluated against their ability to meet the study objectives and avoid the constraints. The plans were given a rating of “High,” “Medium,” or “Low” as outlined below:

High: The plan would successfully meet the objective or avoid the constraint.

Medium: The plan would partially meet the objective or avoid the constraint.

Low: The plan would not meet the objective or avoid the constraint.

Basin, Regional and Biltmore Cut meet the objectives and constraints as shown in Table 7.

Table 6. Alternative Plan Comparison

Alternative Plan	Objectives			Constraints			
	Reduce flood damages in historic Biltmore Village	Maintain or improve the environment	Reduce flood risk to critical infrastructure	Avoid adverse effects on historic structures	Minimize relocation or acquisition of homes and businesses	Avoid inducing flood damages	HTRW - avoid or minimize where possible
No Action	<i>Low</i>	<i>Medium</i>	<i>Low</i>	<i>High</i>	<i>High</i>	<i>High</i>	<i>High</i>
Basin	<i>High</i>	<i>Medium</i>	<i>High</i>	<i>High</i>	<i>Medium</i>	<i>Medium</i>	<i>Medium</i>
Regional	<i>Medium</i>	<i>Medium</i>	<i>High</i>	<i>High</i>	<i>Medium</i>	<i>Medium</i>	<i>Medium</i>
Biltmore Cut	<i>Medium</i>	<i>Medium</i>	<i>High</i>	<i>High</i>	<i>High</i>	<i>High</i>	<i>Medium</i>

3.4.6.1 Estimated Flood Risk Management Benefits

In the no action alternative there would be no changes to the existing conditions and the threat of flooding would remain the same. The estimated equivalent annual damages for the without project condition is \$7,329,100.

The estimated benefits are summarized in Table 8. Additional detail on the economic analysis can be found in Appendix C, the Economic Appendix.

Table 7. Estimated Flood Risk Management Benefits

	Biltmore 700 Cut	Regional	Basin
Without Project Average Annual Damages (\$1,000)	\$7,345,210	\$7,345,210	\$7,345,210
With Project Average Annual Damages (\$1,000)	\$6,899,780	\$6,133,710	\$5,111,710
Equivalent Annual Benefits (\$1,000)	\$445,430	\$1,211,500	\$2,233,500

3.4.6.2 Preliminary Estimate of Alternative Plan Costs

For the preliminary estimate of costs associated with the alternatives, several factors were taken into account:

Lands, Easements, Right-of-Way, Relocation and Disposal Areas (LERRDs) cost were calculated for each alternatives plan.

Table 8. Preliminary LERRD Value Summary

Plan	Requirements	Area (ac)	Estimated Value
Basin	Fee	18.20	\$1,546,390
	Flowage Easement	357.98	\$2,446,454
Regional	Fee	11.14	\$987,312
	Flowage Easement	88.50	\$603,668
Biltmore Cut	Fee	1.22	\$731,809
	Flowage Easement	N/A	N/A

Table 9. Preliminary Estimated Average Annual Costs

	Estimated Cost (\$1,000)		
	Basin	Regional	Biltmore 700 Cut
Construction	\$18,021	\$10,360	\$6,165
Engineering and Design (20%)	\$3,676	\$2,072	\$741
Construction Management (10%)	\$1,838	\$1,036	\$357
LERRDs	\$4,153	\$1,675	\$1,240
Project First Costs	\$27,688	\$13,468	\$6,165
Interest During Construction	\$3,124.8	\$1,514.2	\$89.9
Annualized First Costs	\$2,486.7	\$1,147.2	\$237.4
Annual OMRR&R	\$75.0	\$50.0	\$25.0
Average Annual Cost	\$2,561.7	\$1,197.2	\$262.4

3.4.6.3 Preliminary Cost-Benefit Analysis

Table 10. Preliminary Cost-Benefit Analysis

	Basin	Region	Biltmore 700 Cut
Equivalent Annual Benefits (\$1,000)	\$2,233.5	\$1,211.5	\$445.4
Average Annual Costs (\$1,000)	\$2,502.3	\$1,169.7	\$263.2
Net Annual Benefits (\$1,000)	(\$268.8)	\$41.8	\$182.2
Benefit-to-Cost	0.9	1.0	1.7

3.4.6.4 Basin Plan Alternative

The basin plan of WW, LCD and BAB showed significant flood risk management benefits along the Swannanoa River and in Historic Biltmore Village. During the initial array a rough cost was estimated. Once this plan came into the final array further investigations were performed to aid in the design and cost estimate.

The initial design for the WW assumed that the depth to competent rock was at 15feet. It was assumed that top of rock was near the streambed elevation and sloped up with the sloping terrain toward the right abutment of the proposed structure, which would have produced an average depth of 15 feet. Rock at this depth would allow for a cost effective RCC structure with a small footprint. Subsurface investigations were performed at the structure site to determine foundation design and cost. Rock was found to be significantly deeper than originally anticipated at 20 to 45 feet deep. This change increased the cost of the foundation so significantly for the original design that the cost now outweighed the benefits. Considerations were made for moving the structure to a different location in the area, however in other locations the overall cross sectional length of the structure increased, storage decreased or more structure buyouts were induced, still rendering the measure not cost effective. Alternate foundations types were considered for the RCC structure. Additional analysis was performed to switch the structure to an earthen structure. However, for an earthen structure of this size to be constructed in a way to meet dam safety regulations the cost exceeded the benefits.

The Basin Alternative would create \$2.2 million in equivalent annual benefits. Total project costs would be \$65.5 million with an annual costs of \$3.1 million. The Basin Alternative's BCR is 0.9 and has negative net annual benefits of -\$268,800.

After significant analysis it was determined that the WW's cost exceeded the benefits and the measure was no longer viable, therefore the Basin Plan Alternative was eliminated from further consideration.

3.4.6.5 Regional Plan Alternative

The regional plan consists of LCD and BAB measures. Removal of upstream detention of WW, results in the LCD storing a larger volume of water at all frequency events, ultimately inundating more structures upstream of the project. Because of the increase in water surface elevation at Lake Craig Dam in this plan, a combination of one of two adjustments had to be made to compensate. Either a significant amount of historic fill material had to be removed at the LF or an increase in real estate acquisition.

The initial plan was to remove the historic fill at the LF. However, upon further survey and analysis it was determined that the amount of material that would have to be hauled off site and the amount of construction debris within the fill material would increase the cost of the total project to exceed its benefits.

With the removal of the LF no longer being cost effective a takings analysis was performed for the upstream real estate by the Huntington District. 14 structures were evaluated that were considered to be potentially affected by the project. The amount and frequency of flooding to the first floor elevation of each structure was considered. It was determined that 11 of the 14 structures constituted a taking and therefore subsequent acquisition and relocation costs ensued. These properties included two recreational buildings, one commercial warehouse structure and associated outbuildings, and four residential structures. Upon completion of the takings analysis real estate cost were adjusted and it was determined that the cost to acquire the real estate upstream of Lake Craig Dam would drive the total measure cost above unity.

The Regional Alternative produces \$1.2 million in equivalent annual benefits. Total project cost of the Regional Alternative, including interest during construction, is \$30.2 million which equates to an annual cost of \$1.1 million. The BCR for the Regional Alternative is 1.0 and produces net annual benefits of \$41,800.

With LCD no longer being a viable standalone measure the Regional Plan Alternative was eliminated from further consideration.

3.4.6.6 Biltmore Cut - BAB

BAB was identified very early in the study as a measure with great potential. With the additional span incorporated into Biltmore Avenue Bridge during the NCDOT bridge replacement the removal of the upstream and downstream fill through the largest damage center remained part of every alternative considered.

BAB 700 creates \$445,400 in equivalent annual benefits. Total project cost including interest during construction (IDC) is \$6.2 million with an annual cost of \$263,200 including O&M costs. BAB 700 has a BCR of 1.7 and produces net annual benefits of \$182,200. Table 10 displays the cost-benefit analysis for structural measures. BAB-700 meets the NED plan requirements and provides the most benefit at the least cost. As a result, BAB-700 has been identified as the Tentatively Selected Plan (TSP) and is the only plan alternative along with the No Action alternative evaluated in detail in Section 4.0 Environmental Effects.

3.4.7 Risk and Uncertainty

Key uncertainties associated with the evaluation of alternative plans and associated risks are summarized in Table 12. The risks are qualitatively described in the table using the probability of negative consequences occurring and the expected magnitude of those consequences. The probability and consequence ratings define the level of risk as outlined in Table 11.

Table 11. Probability and Consequence Ratings

Risk Rating Computation Guide			
Likelihood Estimate	Consequence Estimate		
	High	Medium	Low
High	Very High	High	Medium
Medium	High	Medium	Low
Low	Medium	Low	Very Low

Consequence Rating Terms

High—the consequences of this undesirable result are unacceptable

Medium—the consequence of this risk can be tolerated.

Low—the consequence of this risk is insignificant.

Likelihood Rating Terms

High - the probability the undesirable result would occur is estimated to be greater than 70%.

Medium - the probability of the undesirable result occurring is approximately 50/50.

Low - the probability of undesirable result occurring is estimated to be less than 30%.

Certainty Rating Terms

High - there is significant relevant supporting factual data and/or evidence available to support the estimate.

Medium - there is some good evidence and some significant data gaps.

Low - there is little to no relevant factual data or evidence available to support the estimate.

Table 12. Summary of Key Assumptions and Associated Risks

Risk Area	Consequence	Likelihood	Risk Level
Unanticipated poor soil conditions would cause an increased cost due to added foundation and wall geometry. There is existing knowledge of soil characteristics and geotechnical borings are being done.	<i>Medium</i>	<i>Low</i>	<i>Low</i>
Coming across a utility that was not identified during feasibility. Coordination with utilities was done prior during feasibility and 411 dig was called prior to borings.	<i>Medium</i>	<i>Medium</i>	<i>Medium</i>
Sponsor identified disposal areas.	<i>Low</i>	<i>Low</i>	<i>Very Low</i>

3.5 RECOMMENDED PLAN*

Based on the analyses conducted and assessment of environmental impacts BAB 700 is the TSP. . This is the option that includes laying back the right descending channel banks and constructing a 700 foot retaining wall immediately upstream and downstream of the Biltmore Avenue Bridge. The plan, the estimated cost, schedule and implementation requirements are summarized in the following section.

3.5.1 Recommended Plan Description

The recommended plan, BAB 700, would remove fill material along the right bank of the Swannanoa River upstream and downstream of Biltmore Avenue Bridge. The Biltmore Avenue Bridge opening was previously expanded by NCDOT to increase the flow capacity through the bridge opening. Now, the upstream and downstream right banks, which extend out blocking the newer, higher capacity bridge opening, serve as the constriction, instead of the bridge opening. This alternative would provide additional capacity reducing the water surface through the Biltmore Village area by cutting and benching the banks upstream and downstream of Biltmore Avenue Bridge.

700 linear foot retaining wall would be constructed along the right descending bank of the Swannanoa River immediately upstream and downstream of Biltmore Avenue Bridge. Construction would include temporary lane closure of Swannanoa River Road, temporary relocation of electrical, communication and stormwater lines, in place protection of sewer lines, clearing and removal of existing trees and shrubs, partial demolition of existing asphalt lots along the bank, excavation of the right descending bank to provide adequate channel capacity, constructing erosion control and tie in measures along the toe and ends of the retaining wall to deter undermining and scouring, establishing safety measures along the wall to include railing, lighting and all other measures necessary for public safety, and reestablishing vegetation and aesthetic site features along

the wall upon construction completion. Articulated block protection would be along the bench to mitigate any potential increase to channel velocities due to the retaining wall. The HEC-RAS modeling results show that the increase in velocities upstream or downstream of the proposed bank mod and armoring are marginal, and will likely not exacerbate the erosion that would take place under existing condition or future without project scenario. The current proposed cross-section is shown below in Figure 17 and Figure 18.

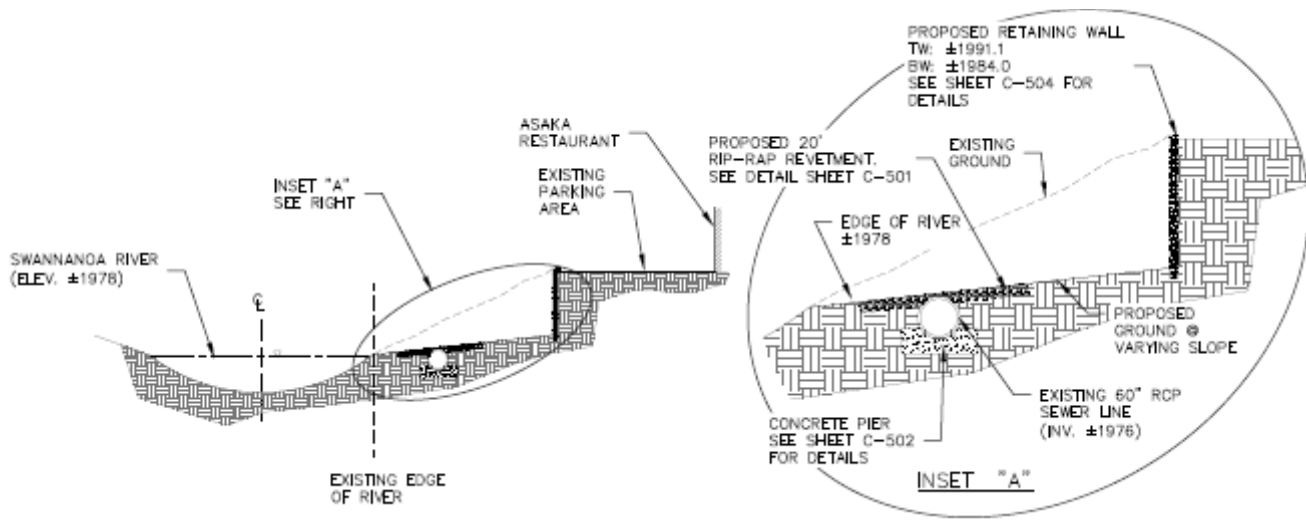


Figure 17. Typical BAB Downstream Cross Section

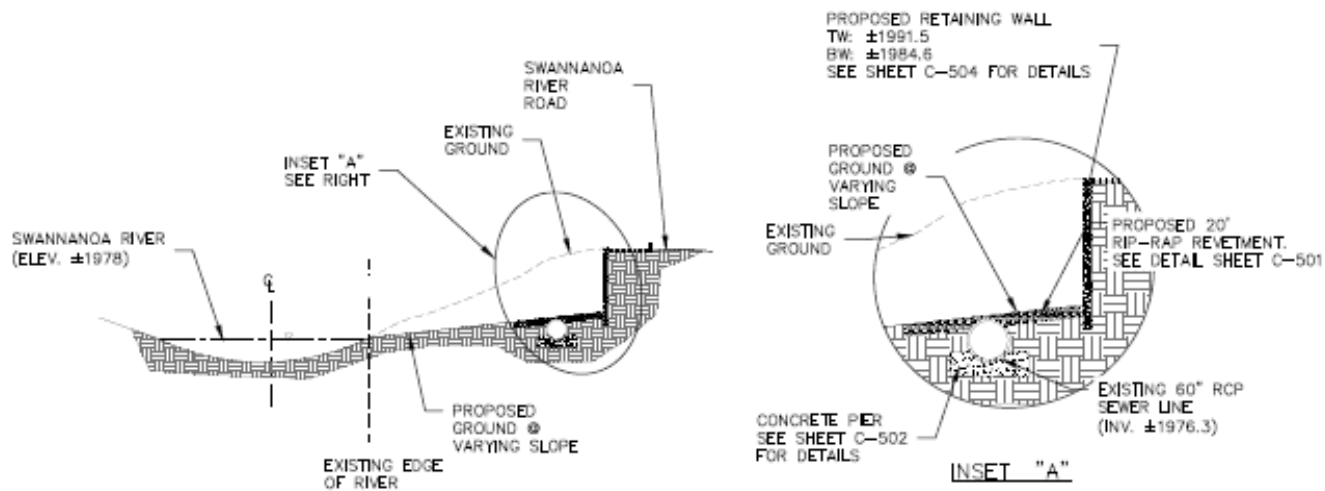


Figure 18. Typical BAB Upstream Cross Section

Because this measure focuses on increasing capacity through the reach and specifically through the bridge opening, the benefits of this measure are primarily focused on the higher frequency events such as the 50% and 20% annual exceedance probability (AEP) events; however, benefits are also provided for the full range of events. Table 13 shows reductions between with and without project conditions in the frequency profile elevations for existing conditions and future build out conditions. BAB 700 would provide additional capacity to reduce hydraulic profiles through the Biltmore Village area, reducing damages to historic structures and critical infrastructure.

Table 13. Flood Stage Reduction

700' Channel Modification Flood Stage Reductions in feet at XS 10091								
Conditions	2-Yr	5-Yr	10-Yr	25-Yr	50-Yr	100-Yr	200-Yr	500-Yr
Existing With Project	0.37	0.88	0.64	0.52	0.60	0.71	0.32	0
Future With Project	0.71	0.63	0.44	0.5	0.55	0.56	0.44	0.33

3.5.2 Estimated Project Costs and Schedule.

A detailed description of the estimate of project cost for implementation can be found in Appendix E.

Table 14. Estimated Project Costs and Apportionment

	FY2017 & Prior	FY2018	FY2019	FY2020	FY2021	Cumulative	Percentage
Feasibility Study Costs*							
FED share	\$ 2,361,000					\$ 2,361,000	51%
non-FED	\$ 2,261,000					\$ 2,261,000	49%
Design & Implementation Costs							
Design, Plans & Specs		\$ 370,620	\$ 370,620			\$ 741,240	
Mitigation			\$ 14,012			\$ 14,012	
LERRDs			\$ 1,240,165			\$ 1,240,165	
Construction Management				\$ 119,000	\$ 238,000	\$ 357,000	
Constructoin Contract				\$ 1,409,000	\$ 2,806,000	\$ 4,215,000	
FED share		\$ 240,903	\$ 384,632	\$ 1,528,000	\$ 2,130,800	\$ 4,284,335	65%
non-FED		\$ 129,717	\$ 1,240,165	\$ -	\$ 913,200	\$ 2,283,082	35%
non-FED cash/WIK		\$ 129,717		\$ -	\$ 913,200	\$ 1,042,917	
non-FED LERRD			\$ 1,240,165			\$ 1,240,165	
Cumulative Costs							
Total Project Cost	\$ 4,622,000	\$ 4,992,620	\$ 6,246,797	\$ 7,774,797	\$10,818,797	\$10,818,797	
FED share	\$ 2,361,000	\$ 2,601,903	\$ 2,745,632	\$ 4,273,632	\$ 6,404,432	\$ 6,404,432	59%
non-FED	\$ 2,261,000	\$ 2,390,717	\$ 3,501,165	\$ 3,501,165	\$ 4,414,365	\$ 4,414,365	41%

Table 15. Implementation Schedule

Implementation Schedule – (Scheduled and Actual Dates)		
Milestone	Scheduled	Actual
MSC Approved FID report	Jan-09	Jan-09
Execute Feasibility Cost Share Agreement	Jun-09	Jun-09
TSP Selected	Jun-16	Jun-16
Submit MDM Draft DPR	Aug-17	Aug-17
MSC Information Meeting	Aug-17	Aug-17
MSC Approved MDM Draft DPR	Oct-17	
DEA 30-Day Public Review	Dec-17	
Submit draft Final DPR	Jan-18	
MSC Approved Decision Document	Mar-18	
Sign FONSI	Mar-18	

3.5.3 Non-Federal Sponsor Responsibilities

A FCSA was entered into by the USACE LRN and the City of Asheville on 17 June 2009. The City of Asheville has been a significant contributor to the entire feasibility study; attending meetings, organizing the flood damage reduction task force, coordinating with local utilities and other entities and performing work-in-kind. The City of Asheville has concurred with the recommended plan of BAB 700 and have demonstrated partnership capability. The City of Asheville has expressed intent to execute a Project Partnership Agreement (PPA) after which they would provide clean LERRDs and participate in the design and O&M Plan. The City of Asheville intends to coordinate and perform design functions after the PPA is signed as work-in-kind. The City of Asheville would accept the completed project with intent to monitor, operate and maintain the complete project as specified in the O&M manual and PPA.

4.0 ENVIRONMENTAL EFFECTS OF RECOMMENDED PLAN AND NO ACTION*

This section will identify potential environmental effects of the No Action and Action alternatives. Due to various reasons presented in Section 3.0 above, the Biltmore Avenue Cut (BAB) was the only action alternative considered to be viable. Multiple lengths of cut were considered, however a length of 700 feet was shown to provide the most net benefits. Therefore, the effects outlined below will be for the BAB 700 cut alternative which is the action alternative as well as the TSP. However, environmental effects would be similar for all bank cut lengths, but would be increased according to increasing lengths. Under any alternative, material designated as disposal would be disposed of in a permitted beneficial use disposal area owned by the City of Asheville as described in section 3.4.5.5 above. The site is currently disturbed and used by the city for similar types of disposal. If this site was unavailable at the time of potential construction, the existing, permitted, Buncombe County Landfill located approximately 19 miles from the Biltmore Avenue Bridge location would accept the disposal.

4.1 FLOODING

The TSP alternative would reduce flooding and damages at the 50%, 20%, and 10% annual exceedance probability (AEP) events which correspond to a 2-year, 5-year, and 10-yr flood event respectively.

Under the No Action Alternative, no federal action would be taken to address flooding. Flood damages would be expected to continue to occur as seen in historic floods.

4.2 CLIMATE

The proposed action alternative would not involve any activity that could affect the environment in regard to climate change. The No Action alternative would maintain existing conditions for the study area, therefore no effects to climate change conditions are anticipated.

4.2.1 Future Climate Impacts

A cursory qualitative analysis was conducted to examine the potential future impacts of climate change on the TSP alternative. Figure 19 shows the results of the USACE developed Non-stationarity detection tool for stream gages. Stationarity, or the assumption that the statistical characteristics of hydrologic time series data are constant through time, enables the use of well-accepted statistical methods in water resources planning and design in which future conditions rely primarily on the observed record. However, recent scientific evidence shows that—in some places, and for some impacts relevant to the operations of the U.S. Army Corps of Engineers (USACE)—climate change and human modifications of the watersheds are undermining this fundamental assumption, resulting in nonstationarity.

No discernable trend was detected for the continuous record of annual peak stream flow data for the Biltmore gage from 1938-2014.

Although the Non-stationarity tool did not identify a trend in the peak flow measurements for the Biltmore gage, that doesn't necessarily mean that there is no future climate change driven hydrologic risks to the Swannanoa River basin. The NOAA National Centers for Environmental Information documents in its State Summary report for North Carolina that mean annual temperature has increased by under 1 degree Fahrenheit since the beginning of the 20th century. Under a high emissions pathway, historically unprecedented warming is projected by the end of the 21st century. The number of land falling hurricanes in North Carolina is highly variable from year to year. Hurricane associated storm intensity and rainfall rates are projected to increase as the climate warms.

Currently it is difficult to quantify the change in hydrologic risk due to potential future increases in hurricane frequency and intensity. Although increased hurricane strength and activity could potentially the future condition flow frequency statistical analysis, there is little to no impact to the design of the TSP proposed as part of the feasibility study. The bank modification alternative is constrained in design by underground utilities and roads adjacent to the river, an increase in magnitude of the future condition flow frequency events has no bearing on the final design as there is no additional capacity to increase the size of the channel modification.

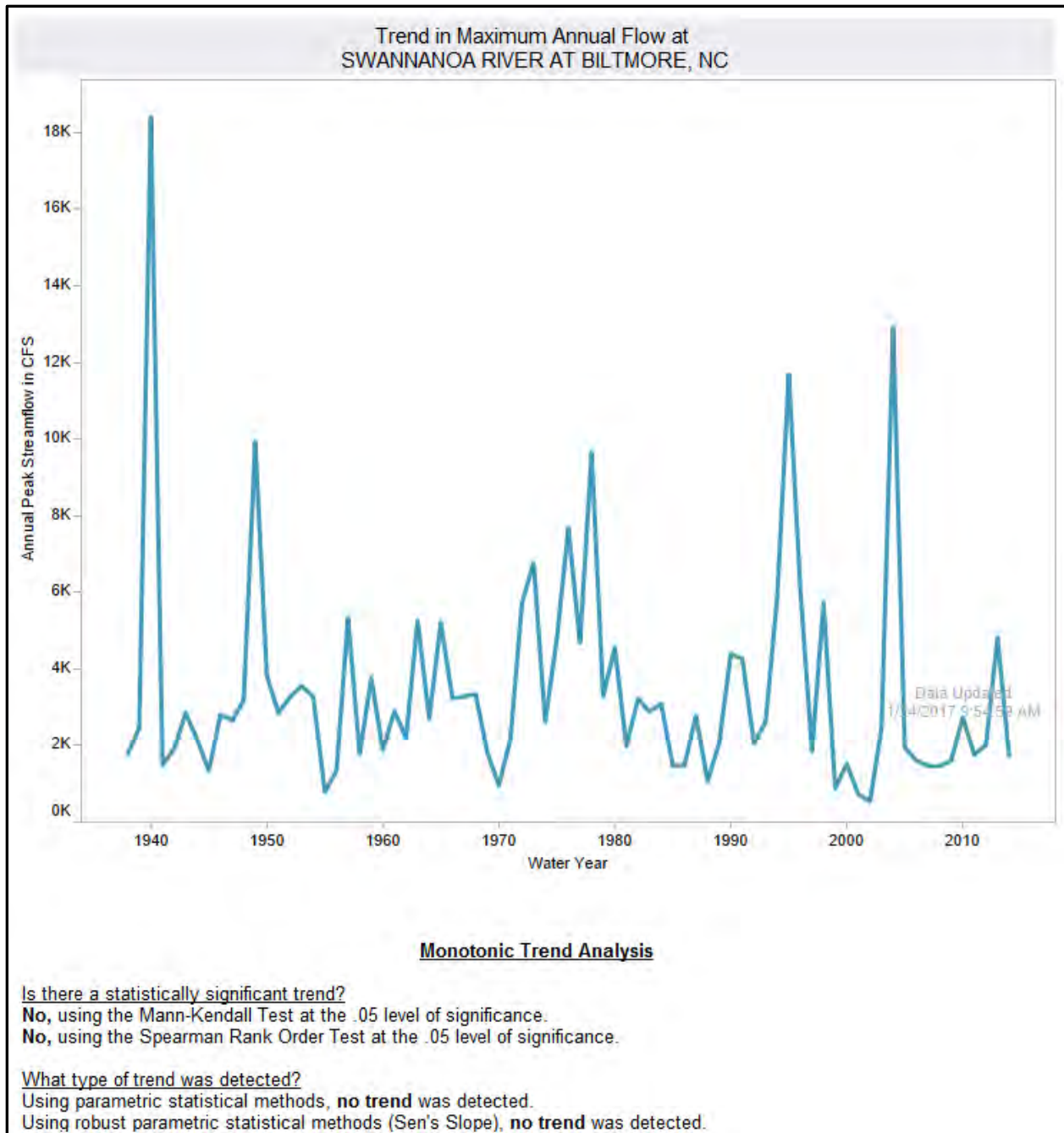


Figure 19. Nonstationarity Analysis - Biltmore Gage

4.3 SOILS AND GEOLOGY

The proposed action would remove historic fill from a portion of the floodplain adjacent to the Swannanoa River. It would be a benefit to the natural physiography and geology from partially restoring floodplain connectivity and elevation. Disposed material would be placed in an existing landfill and therefore would not have additional impacts to other areas. Therefore, no significant impacts are anticipated to the soils and geology.

The no action alternative would maintain the existing conditions and therefore no minor benefits to the physiography would be realized.

4.4 SUBSURFACE WATERS AND OTHER AQUATIC RESOURCES

4.4.1 Surface Water

USACE analyzed the elevation of the bank cut for the proposed action alternative in relation to the water elevation duration curve (percentage of time the top of water elevation reaches various elevations) for the Swannanoa River. The bank cut for the proposed action alternative would be above the water surface more than 95% of time (see Figure 19 below). Based on this analysis and onsite field observations, USACE has determined that the bank cut would be above OHW. During construction, there may be an additional amount of erosion and sedimentation to the stream. However, with the implementation of best management practices, sedimentation would be kept to a minimum. Once construction is complete, the bank/riparian would be revegetated with native grasses and forbs.

The No Action Alternative would maintain the existing riparian vegetation (maintained turf, invasive exotics, etc.). However, this low quality vegetation still maintains some filtering capabilities for the Swannanoa River. No other effects are anticipated.

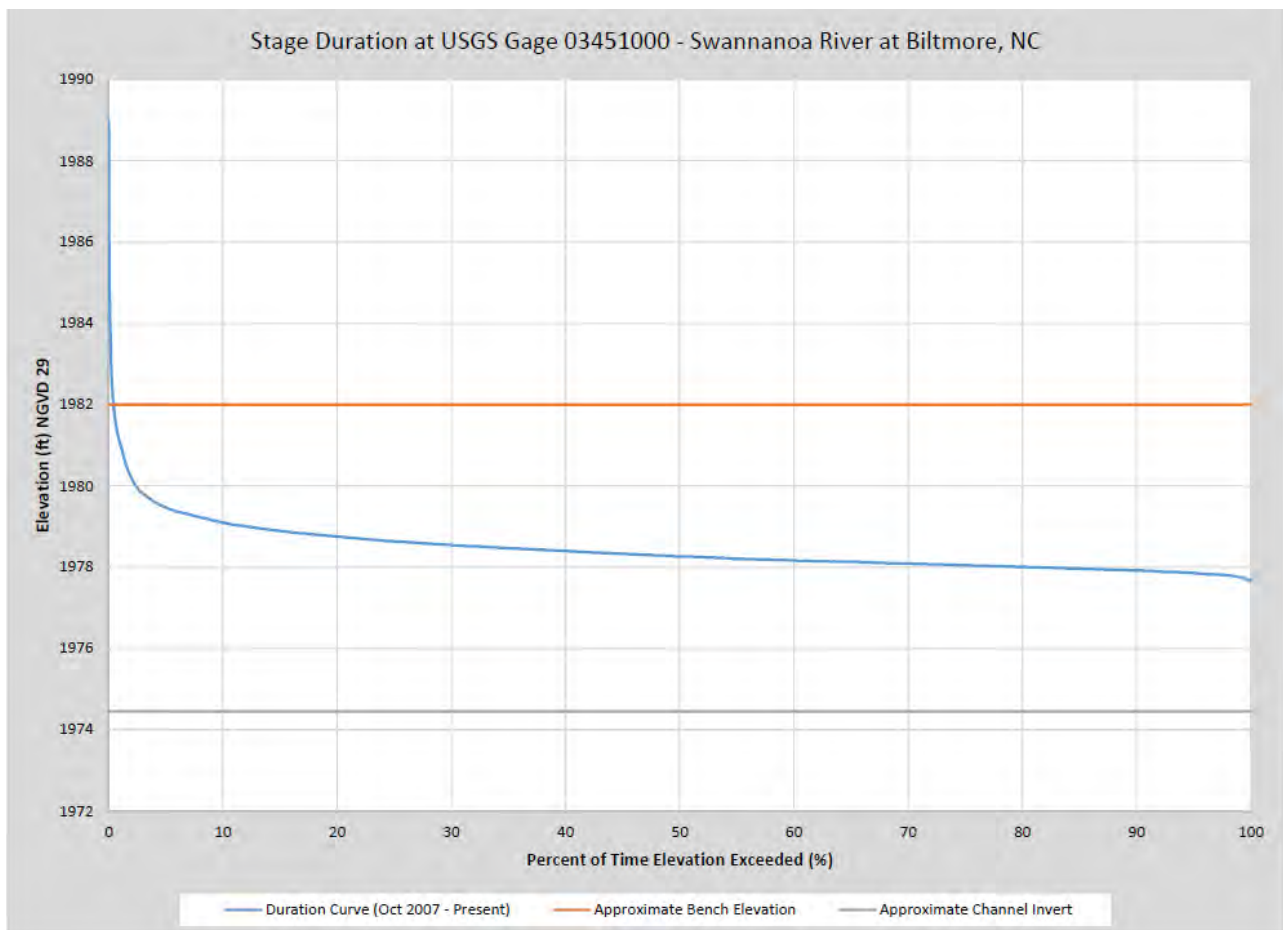


Figure 20. Stage Duration at USGS Gage

4.4.2 Groundwater

Neither the proposed action alternative nor the no action alternative are expected to have any effect on groundwater.

4.4.3 Flood Plains

The proposed action alternative would be located in the floodplain. The bank cut for the proposed project with the removal of material, would be restoring a more historic floodplain elevation in the immediate project footprint. The removal of material would benefit the floodplain incrementally. Due to the increased capacity on the left bank water surface elevations would be reduced.

Upon completion of construction of the recommended plan USACE will provide updated flood modeling and mapping to the City of Asheville, North Carolina which will be submitted to FEMA to update the Flood Insurance Rate Maps (FIRM) to show the new existing conditions.

The No Action Alternative would maintain fill currently in the floodplain. This fill would continue to induce elevated flood depths. No other impacts are expected.

4.4.4 Wetlands

No wetlands currently occur in the study area. Under the proposed action alternative, it is possible that wetlands could develop on the remaining streambank bench in isolated micro habitats. Once material is removed from the bank, it would be revegetated with floodplain tolerant, native forbs and grasses.

No effects from the No Action Alternative are anticipated.

4.5 FISH AND WILDLIFE HABITATS

4.5.1 Fish

The proposed action alternative would be a bank cut, removing material from above the OHW (see Figure 17 above). There would be temporary minor sediment and erosion impacts to the immediate adjacent stream reach, however, they would be kept to a minimum with proper construction best management practices. These minor negative impacts would be temporary in nature for aquatic populations such as fish, amphibians, and invertebrates. Mobile species would have the ability to relocate to upstream and downstream refugia, and return to the area following completion of construction.

No effects to fish are anticipated from the No Action Alternative.

4.5.2 Wildlife

The riparian zone in the study area is low quality, however it provides some habitat value to general wildlife that may use the stream corridor. With the proposed action alternative, any wildlife use would be displaced temporarily during construction. Habitat removal would only occur on one side of the stream, thereby reducing the impact to wildlife using the stream corridor for travel between other habitat areas. Once construction is complete, the remaining streambank bench would be revegetated with floodplain tolerant native forbs and grasses. The riparian zone in this reach would likely be higher quality than current. Therefore, there may be an incremental benefit to wildlife using the study area.

There are no effects anticipated from the No Action Alternative.

4.5.3 Terrestrial and Aquatic Vegetation

Under the proposed action alternative, the riparian vegetation currently in the study area would be removed for the bank cut. Once constructed, the remaining bench would be revegetated with floodplain tolerant, native forbs and grasses. Where space and soil depths allow, native riparian tree species would also be planted. Currently, the riparian in the study area is narrow and vegetated mainly with maintained turf and low quality species including invasive exotics such as kudzu, mimosa, and tree of heaven. With time for maturity, the new species used to revegetate the streambank bench would provide an incrementally better (non-maintained, native grasses and forbs) riparian zone within the study area.

No changes to existing conditions would be expected under the No Action Alternative.

4.6 ENDANGERED AND THREATENED SPECIES

4.6.1 Federal

No potential summer roosting habitat for federally listed bat species is known to occur in the study area based on a survey conducted by USACE biologists. The riparian on the right descending bank would be cleared for the construction of the bank cut. Native floodplain tolerant forbs and grasses would be replanted as part of the action alternative. Where space and soil depth allows, riparian trees would be replanted as well. In a letter dated July 15, 2013, the US Fish and Wildlife Service stated that no federally protected species are known to occur in the study area. USACE finds that the proposed project would have no adverse effect on federally listed species.

The No Action alternative would maintain the status quo of the area of low quality marginal riparian habitat.

4.6.2 Critical Habitat

No critical habitat occurs in the study area, therefore neither the No Action nor the proposed action alternative would have an effect on critical habitat.

4.7 RECREATIONAL, SCENIC AND AESTHETIC RESOURCES

The proposed action alternative would provide a restored floodplain bench area and, with maturity, there would be floodplain tolerant forbs and grasses that would provide additional aesthetics to the urban environment. Where space and soil depths allow, native tree species would provide depth and shade to the area. Overall there should be a benefit to aesthetics for the study area.

No changes to aesthetics are anticipated from the No Action Alternative.

4.8 CULTURAL RESOURCES

USACE is preparing a cultural resource assessment of the proposed Biltmore Avenue Channel Modification. Based on information from NC Division of Archaeology, NCDOT, historic maps, and site visits to the area, USACE has not identified any significant cultural resources that would be affected by the project. USACE initiated consultation with State, Tribal, and non-governmental organizations. USACE expects to conclude consultation under Section 106 of the National Historic preservation Act with a “no historic properties affected” determination. Appendix H presents a summary of consultation and the record of consultation.

4.9 AIR QUALITY

According to the Environmental Protection Agency, Buncombe County is designated as “in attainment” (maintaining applicable standards) for all criteria pollutants. As such, a conformity determination/analysis is not required. The proposed action alternative would not be a source of greenhouse gas emissions. During construction, heavy equipment would cause minor, temporary air quality impacts, however all equipment would comply with federal vehicle emission standards, and dust control measures would be implemented during construction. Temporary equipment emissions from this project would be de minimis in nature in terms of the National Ambient Air Quality Standards and the State Implementation Plan.

The No Action alternative would maintain status quo therefore would have no effect on air quality.

4.10 NOISE

The proposed action would cause temporary increases in noise from machinery and equipment during construction. These impacts would be temporary and would not result in significant or long-term adverse impacts. There are no sensitive noise receptors that would be impacted by the proposed project.

The No Action Alternative would have no effect on existing noise levels.

4.11 TRANSPORTATION

The proposed action would result in the temporary closure of the 600 foot segment the Swannanoa River Road as well as both parking lots for the duration of construction. Portions of the parking lots would be demolished and permanently removed as a result of the proposed action but redesign and restoration of the lots could result in maintaining their functionality as parking lots. During construction operations, Bryson Avenue can serve as a detour to accommodate the Swannanoa River Road Closure. This would result in an additional travel distance of approximately 1000 feet which is relatively insignificant. Temporary parking facilities and access would likely need to be provided for the office park immediately north of Swannanoa River Road to account for the loss of the parking lot on the North bank. The existing parking lot for Asaka should provide adequate parking capacity for patrons despite being partially closed for construction. Biltmore Avenue should be generally un-impacted with the exception of the presence of construction traffic to include hauling traffic and the possible presence of road guards. All roadways would need to be evaluated both before and after construction to determine if repaving is necessary. Due to the limited area in front of Zoe's and the amount of spaces eliminated with the channel modification, the City of Asheville is currently proposing parallel parking with an additional parking lot to be constructed to the east of FedEx Kinko's.

The No Action Alternative would result in no change in the existing transportation conditions. This means routine flooding of the existing transportation facilities which would likely result in more rapid deterioration of transportation facilities.

4.12 UTILITIES

Within the project area, there are several underground and overhead utilities of concern. The most notable of these is an overhead high voltage Duke Energy transmission line, overhead Duke Energy distribution line, a 60-inch Reinforced Concrete Pipe (RCP) sanitary sewer interceptor line owned by Metropolitan Sewer District of Buncombe County (MSD), a 24 inch RCP and a 30 inch RCP storm sewer line, a PSNC gas line (at this time believed to be a 4-inch diameter pipe line) and City of Asheville water lines. However, the water line crossing the Swannanoa River near the Biltmore Avenue Bridge appears to be abandoned.

With regards to the 60-inch sanitary sewer line, MSD requests no structures be placed within their easement, which is typically 30 feet centered on the pipe of a line this size. Currently given the current project goals it is not possible to accommodate this request, as the current retaining wall location is less than 15 feet from the centerline of the 60-inch sewer. Additionally, the wall will need to cross over the pipe. Additional geotechnical design will be required to "bridge" the 60-inch sewer line where the wall crosses over it. These items will be finalized as design and permitting progresses. USACE will submit final drawings to MSD for approval of the work in proximity to the existing sewer line.

Concrete anchors are being proposed as anti-floatation and differential settlement deterrent devices along the existing sewer line in the event that channel erosion undermines the existing pipe.

In discussion with Duke Energy, a 25-foot buffer between the retaining wall and the high voltage power line tower has been requested for maintenance access. Due to the reduced length of channel widening resulting in excavation beginning downstream of the tower, this requirement should prove easy to accommodate.

There are two light poles in the existing overflow parking area on the south side of

Swannanoa River road that will be demolished. At this time, it is believed that with the smaller parallel parking in this area, the remaining street lights will provide sufficient lighting such that new light poles will not be necessary.

NC One Call will need to be notified to locate any underground utilities prior to any excavation.

The No Action would result in no change in the existing utilities. Routine flooding would likely result in more rapid deterioration of these utilities.

4.13 HAZARDOUS, TOXIC, RADIOACTIVE WASTE - HTRW

A Phase I ESA (January 2016) and Phase I Addendum (October 2016) were conducted for the 1700 feet of bank cut associated with the proposed measure. There are leaking fuel storage tanks, brownfields and environmental HTRW sites within the vicinity of the measure. A Phase II ESA was recommended, and the City of Asheville completed a Phase II ESA in April 2017 to determine the nature and extent of HTRW in the measure. Results of the Phase I, Phase I Addendum and Phase II ESAs are summarized in Section 2.13 of this report.

Based on the results from the Phase II ESA, it is anticipated that the bank cut material will not be characterized as hazardous waste as defined in 40 CFR 261. The recommended plan includes bank modification of 700 ft which does not have a REC, and excludes the upstream 300 ft of bank that contains a REC. In accordance with ER 1165-2-132, the recommended plan avoids the HTRW REC identified upstream of the recommended plan. It is anticipated that the recommended plan 700 ft bank cut material will be stock piled and disposed of at a landfill which will accept bulky and rocky fill material. If a REC or a hazardous waste condition were to be uncovered during construction, the cost of remediation and disposal of the REC or hazardous waste will be 100% responsibility of the Non-Federal Sponsor.

The No Action alternative will maintain the status quo of bank material.

4.14 SOCIOECONOMICS AND ENVIRONMENTAL JUSTICE

The study area is determined to not contain a minority population or low income population as defined by Executive Order 12898. Also, the effect of the recommended plan would improve life safety and positively impact the quality of life for all residents within the project area. No negative effects would be borne disproportionately by minority or low-income populations by the proposed action alternative.

The No Action Alternative would continue to allow the same level of flood damages to occur in the future. This would continue to damage businesses and the public's well-being and negatively affect economics in the area.

4.15 CUMULATIVE EFFECTS

USACE must consider the cumulative effects of the proposed project on the environment as stipulated in the NEPA. Cumulative effects are "the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such actions". Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time (40 CFR Part 1508.7 Council on Environmental Quality [CEQ] Regulations).

Geographical boundaries for this discussion of cumulative impacts are the drainage of the Swannanoa River Watershed. Temporal boundaries established span from the turn of the 20th century to projections fifty years into the future.

4.15.1 Past and Present Actions

Based on the landscape and land use of the area, development of the floodplain and floodway zones became popular in the watershed many years ago; floodplains continue to receive pressure for structural development. With increasing community growth and decreasing flood storage capacities, increased flood damages to homes and business have occurred. Because of the pressure to develop in the floodplain, there

has been extensive impact to riparian vegetation and fauna. With the development, there has been pollution of the watershed and as a result many of the streams are listed on the 303d list for mercury pollution.

4.15.2 Reasonably Foreseeable Future Actions

Like many communities, it is anticipated that residential as well as commercial development within the Swannanoa Watershed would continue until carrying capacity is reached. It is expected that implementation and enforcement of zoning ordinances would be used as means to reduce damages associated with structural flooding and resource impacts. Other programs and education by watershed stakeholders may also occur as means to improve the quality of the natural resources.

4.15.3 Combined Effects on Resources

The construction of the proposed Biltmore Avenue Bank Cut would have temporary and minor negative effects to resources. Short term effects include sedimentation and erosion, increased noise, loss of riparian vegetation, equipment emissions, and displacement of wildlife. Long term, the proposed project would have a minor benefit to all resources. Restoration of floodplain elevations, restored native riparian vegetation, reduced pollutant input would all occur as part of the project. When combined with past, present, and foreseeable future actions, the benefits to the resources from the project would be considered minor or insignificant.

5.0 MITIGATION OF ADVERSE EFFECTS

No mitigation is proposed as a part of the proposed action alternative.

6.0 IMPLEMENTATION REQUIREMENTS

6.1 PROJECT PARTICIPATION AGREEMENT

The City of Asheville is the NFS for project implementation, as indicated in a letter of intent dated 10 September 2008. The requirements for non-Federal sponsorship are outlined below.

The NFSs must provide a minimum cash contribution equal to 5 percent of total project costs allocated to the project, as well as all LERRDs determined by the Government to be required for the project. Additional contributions may include work-in-kind. If the sum of the sponsor's total cash, work-in-kind, and LERRD contributions is less than 35 percent of the costs, the NFSs would pay the difference in cash. If it is greater than 35 percent, total non-Federal costs shall not exceed 50 percent of total project costs assigned to flood risk management. However, the NFS would be required to pay 100% of costs in excess of the federal per project limit of \$10 million, regardless of whether these costs exceed the 50% contribution. (See ER 1105-2-100, Appendix E, Paragraphs E-21 a and b)

Federal implementation of the recommended project would be subject to the NFSs agreeing to comply with applicable Federal laws and policies, including but not limited to:

- a. Provide a minimum of 35 percent, but not to exceed 50 percent of total flood damage reduction costs as further specified below:
 - a. Provide, during construction, a contribution of funds equal to 5 percent of total flood damage reduction costs;
 - b. Provide all lands, easements, and rights-of-way, including those required for relocations, the borrowing of material, and the disposal of dredged or excavated material; perform or ensure the performance of all relocations; and construct all improvements required on lands, easements, and rights-of-way to enable the disposal of dredged or excavated material

- all as determined by the Government to be required or to be necessary for the construction, operation, and maintenance of the flood damage reduction features;
- c. Provide, during construction, any additional funds necessary to make its total contribution for flood damage reduction equal to at least 35 percent of total flood damage reduction costs;
 - b. Shall not use funds from other Federal programs, including any non-Federal contribution required as a matching share therefore, to meet any of the non-Federal obligations for the project unless the Federal agency providing the Federal portion of such funds verifies in writing that expenditure of such funds for such purpose is authorized;
 - c. Not less than once each year, inform affected interests of the extent of protection afforded by the flood damage reduction features;
 - d. Agree to participate in and comply with applicable Federal floodplain management and flood insurance programs;
 - e. Comply with Section 402 of the WRDA of 1986, as amended (33 U.S.C.701b-12), which requires a non-Federal interest to prepare a floodplain management plan within one year after the date of signing a project cooperation agreement, and to implement such plan not later than one year after completion of construction of the flood damage reduction features;
 - f. 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 protection levels provided by the flood damage reduction features;
 - g. Prevent obstructions or encroachments on the project (including prescribing and enforcing regulations to prevent such obstructions or encroachments) such as any new developments on project lands, easements, and rights-of-way or the addition of facilities which might reduce the level of protection the flood damage reduction features afford, reduce the outputs produced by the ecosystem restoration features, hinder O&M of the project, or interfere with the project's proper function;
 - h. Comply with all applicable provisions of the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970, Public Law 91-646, as amended (42 U.S.C.4601-4655), and the Uniform Regulations contained in 49 CFR Part 24, in acquiring lands, easements, and rights-of-way required for construction, operation, and maintenance of the project, including those necessary for relocations, the borrowing of materials, or the disposal of dredged or excavated material; and inform all affected persons of applicable benefits, policies, and procedures in connection with said Act;
 - i. For so long as the project remains authorized, operate, maintain, repair, rehabilitate, and replace the project, or functional portions of the project, including any mitigation features, at no cost to the Federal Government, in a manner compatible with the project's authorized purposes and in accordance with applicable Federal and State laws and regulations and any specific directions prescribed by the Federal Government;
 - j. 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 for the purpose of completing, inspecting, operating, maintaining, repairing, rehabilitating, or replacing the project;
 - k. Hold and save the United States free from all damages arising from the construction, operation, maintenance, repair, rehabilitation, and replacement of the project and any betterments, except for damages due to the fault or negligence of the United States or its contractors;
 - l. Keep and maintain books, records, documents, or other evidence pertaining to costs and expenses incurred pursuant to the project, for a minimum of 3 years after completion of the accounting for which such books, records, documents, or other evidence are required, to the extent and in such detail as will properly reflect total project costs, and in accordance with the standards for financial management systems set forth in the Uniform Administrative Requirements for Grants and

Cooperative Agreements to State and Local Governments at 32 Code of Federal Regulations (CFR) Section 33.20;

- m. Comply with all applicable Federal and State laws and regulations, including, but not limited to: Section 601 of the Civil Rights Act of 1964, Public Law 88-352 (42 U.S.C.2000d) and Department of Defense Directive 5500.11 issued pursuant thereto; Army Regulation 600-7, entitled "Nondiscrimination on the Basis of Handicap in Programs and Activities Assisted or Conducted by the Department of the Army"; and all applicable Federal labor standards requirements including, but not limited to, 40 U.S.C.3141- 3148 and 40 U.S.C.3701 – 3708 (revising, codifying and enacting without substantial change the provisions of the Davis-Bacon Act (formerly 40 U.S.C.276a et seq.), the Contract Work Hours and Safety Standards Act (formerly 40 U.S.C.327 et seq.), and the Copeland Anti-Kickback Act (formerly 40 U.S.C.276c et seq.);
- n. Perform, or ensure performance of, any investigations for hazardous substances that are determined necessary to identify the existence and extent of any hazardous substances regulated under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), Public Law 96-510, as amended (42 U.S.C.9601-9675), that may exist in, on, or under lands, easements, or rights-of-way that the Federal Government determines to be required for construction, operation, and maintenance of the project. However, for lands that the Federal Government determines to be subject to the navigation servitude, only the Federal Government shall perform such investigations unless the Federal Government provides the NFS with prior specific written direction, in which case the NFS shall perform such investigations in accordance with such written direction;
- o. Assume, as between the Federal Government and the NFS, complete financial responsibility for all necessary cleanup and response costs of any hazardous substances regulated under CERCLA that are located in, on, or under lands, easements, or rights-of-way that the Federal Government determines to be required for construction, operation, and maintenance of the project;
- p. Agree, as between the Federal Government and the NFS, that the NFS shall be considered the operator of the project for the purpose of CERCLA liability, and to the maximum extent practicable, operate, maintain, repair, rehabilitate, and replace the project in a manner that will not cause liability to arise under CERCLA; and
- q. Comply with Section 221 of Public Law 91-611, Flood Control Act of 1970, as amended (42 U.S.C.1962d-5b), and Section 103(j) of the WRDA of 1986, Public Law 99-662, as amended (33 U.S.C.2213(j)), which provides that the Secretary of the Army shall not commence the construction of any water resources project or separable element thereof, until each non-Federal interest has entered into a written agreement to furnish its required cooperation for the project or separable element.

There are not anticipated to be any NFS constraints that would prevent execution of the LRD approved model PPA.

6.2 LANDS, EASEMENTS, RIGHTS-OF-WAY, RELOCATIONS AND DISPOSAL AREAS

In support of the TSP Alternative, BAB 700, the NFS will be required to acquire 1.22 acres in fee from two property owners for the permanent channel cut. These properties are commercial and include a portion of each businesses' parking areas. The NFS will be required to acquire 0.95 of an acre of Temporary Work Area Easement from three property owners for access to the construction as well as parking restoration. Two properties are commercial and the other property is Public Right of Way owned and maintained by the North Carolina Department of Transportation (NC DOT). Approximately 0.06 of an acre of channel improvement easement will be necessary for the area beneath Biltmore Avenue Bridge in order to construct the bank modification. This area is anticipated to be owned by NC DOT as well. Approximately 0.09 of an acre is needed on one of the commercial properties in order for the sponsor to have access for operation and maintenance of the project. A summary of the LERRDs required for the project can be found in Table 1 of the Real Estate Plan, Appendix D to this report. The capability assessment has been completed and

the NFS is considered moderately capable meaning they are financially capable, have the authority to hold title, and can provide with contractor support the necessary services required to provide LERRD. Under the No Action Alternative, there would be no LERRDs acquisition.

6.3 OPERATION, MAINTENANCE, REPAIR, REPLACEMENT, AND REHABILITATION

Once construction activities are completed, the project would be turned over to the NFS, the City of Asheville. Ongoing Operation, Maintenance, Repair, Replacement, and Rehabilitation (OMRR&R) of the bank modification project would be the responsibility of The City of Asheville. OMRR&R activities would include periodic inspections, mowing, debris removal and litter control, vermin control, maintenance and repair of proposed retaining wall, and other associated activities. The estimated annual cost of these activities is \$25,000.

6.4 REGULATORY REQUIREMENTS*

6.4.1 Clean Water Act

6.4.1.1 Section 404/401

Compliance with Section 404 of the Clean Water Act is required for discharges of dredged or fill material into the waters of the United States, including adjacent wetlands. All work for the project would take place above the OHW (See section 4.4.1 above for analysis). Therefore, the project does not require any additional compliance with the Act.

Best Management Practices would be implemented during construction to address erosion and sediment control as work was performed adjacent or near watercourses. If project plans change and work is required below the ordinary high watermark, then applicable permitting would be requested and received prior to construction.

6.4.1.2 National Pollutant Discharge Elimination System (NPDES)

A National Pollutant Discharge Elimination System (NPDES) permit for stormwater discharge is required when construction or land disturbance exceeds one acre. This permit would be requested prior to construction where necessary.

6.4.2 Fish and Wildlife Coordination Act

USACE is required to coordinate water resource project proposals with the USFWS and NCWRC under the Fish and Wildlife Coordination Act (FWCA) (48 Stat. 401, as amended; 16 U.S.C. 661 et seq.). Coordination with USFWS and NCWRC was initiated through a Scoping letter submitted June 13, 2013. Comments were received from both the USFWS and NCWRC. Comments are incorporated in this document and included in Appendix G. Coordination would continue with the review of this draft report and any comments would be included in the final report.

6.4.3 Endangered Species Act

The Endangered Species Act requires the determination of possible effects on or degradation of habitat critical to federally listed endangered or threatened species. In a letter dated July 15, 2013, the US Fish and Wildlife Service stated that no federally protected species or critical habitat are known to occur in the study area. Habitat surveys of the study area were completed by USACE biologists for potential federally listed bat species habitat. No potential summer roosting habitat was observed in the study area. Therefore, USACE finds that the proposed Biltmore Avenue Bank Cut is not likely to adversely affect federally listed species.

6.4.4 National Historic Preservation Act

Section 106 of the National Historic Preservation Act requires federal agencies to take into account the effects of their undertakings on historic properties and offer the Advisory Council on Historic Preservation

an opportunity to comment. USACE initiated Section 106 consultation in June, 2013. Investigations and coordination continued throughout the planning process. In a letter dated February 23, 2017 USACE presented the report *Cultural Resource Assessment of the Proposed Biltmore Avenue Channel Modification in association with the Swannanoa Section 205 Feasibility Study* to the SHPO and consulting tribes. The Consulting Parties that responded to USACE concurred with a “no historic properties affected” determination.

6.4.5 Floodplain Management

Executive Order (EO) 11988 (May 24, 1977) outlines the responsibilities of Federal agencies in the role of floodplain management. In accordance with this EO, USACE is required to evaluate the potential effects of actions on floodplains, and does not undertake actions that directly induce growth in the floodplain, unless no practical alternative exists. Construction of structures and facilities on floodplains must incorporate flood proofing and other accepted flood protection measures. Agencies must attach appropriate use restrictions to property proposed for lease, easement, right-of-way, or disposal to non-Federal public or private parties.

The eight steps associated with the decision making process in EO 11988 were considered in the evaluation of the selected alternative. See Table 16 for more detail on how each step was considered. Based on the findings and determination discussed in this report the selected alternative is in compliance with EO 11988. The Proposed Action would serve to reduce the damaging effects of flooding and improve the overall quality of the floodplain; it would not be directly encouraging growth within the floodplain.

Table 16. Eight Steps in EO 11988

Determine if a proposed action is in the base floodplain.	Yes, the proposed alternatives are within the base floodplain.
Conduct early public review, including public notice.	A scoping letter was posted in June 2013. Initial comments were received and logged as Appendix G. Additional Draft EA Review to be conducted.
Identify and evaluate practicable alternatives to locating in the base floodplain, including alternative sites outside of the floodplain.	See Section 3.0, Plan Formulation, for description and evaluation of each alternative considered.
Identify impacts of the proposed action.	See section 4.3 for description of impacts related to the selected alternative.
If impacts cannot be avoided, develop measures to minimize the impacts and restore and preserve the floodplain, as appropriate.	Beneficial impacts to the floodplain are anticipated. The selected alternative would help restore floodplain function and quality by removing fill and restrictions in the floodway. Potential sources of debris/wastes that follow floods would be reduced.
Reevaluate alternatives.	See Section 3.0
Present the findings and a public explanation.	This document would serve as a tool to present the findings and would provide the public a detailed explanation of how the selected plan was chosen. Upon approval to release the draft report, the NEPA public comment period would occur and include additional public input.
Implement the action.	This action would follow final approvals of the selected alternative.

Table 17. Act/Executive Orders

Act/Executive Order	Status	Compliance
Wetlands (EO 11990)	C	No Compensatory Mitigation Required
Floodplain Management (EO 11988)	C	Beneficial effect
Clean Water Act	C	Work above OHW
Section 404	C	Work above OHW
Section 401	C	Work above OHW
NPDES	O	As Necessary during construction
Fish and Wildlife Coordination Act	O	Coordination On-going
Endangered Species Act	O	Informal Consultation On-going
National Historic Preservation Act	O	Verbal Concurrence, Letter Pending
Environmental Justice (EO 12898)	C	No effect
Clean Air Act	C	No effect
Climate Change	C	No effect
CERCLA	C	Meets State and Federal Requirements
Resource Conservation and Recovery Act (RCRA)	C	Meets State and Federal Requirements
N/A—not applicable C—Complete O - Ongoing		

7.0 PUBLIC INVOLVEMENT*

Preparation of this integrated Detailed Project Report (DPR) and EA includes agency and public notification of the proposal and an opportunity for agency and public review and comment prior to agency decision making. A scoping letter was issued to the public for a 30 day comment period on June 13, 2013. Comments were received mostly from state and federal agencies. An additional 30 day public review and comment period of the draft DPR and EA will be conducted in the near future. Comments received at that time will be included in the final report.

7.1 PUBLIC VIEWS AND COMMENTS

To Be Determined

7.2 STAKEHOLDER AGENCY COORDINATION

The 2013 scoping letter was sent to agencies and stakeholders listed below and in Appendix G. Comments were received from the following stakeholders:

7.2.1 Federal Agencies

7.2.1.1 U.S. Fish and Wildlife Services (USFWS)

The USFWS provided opinions and suggestions regarding general impacts that could be caused by the proposed alternatives. They described records of species of concern that could be located within the watershed. They stated that according to their records, no listed species or their habitats occurred in the study area and therefore requirements under section 7 of the Act were met.

7.2.1.2 United States Department of Agriculture, Natural Resources Conservation Service

The NRCS provided websites where the current soil survey maps and relative data could be found.

7.2.2 Federally Recognized Tribes

7.2.2.1 Catawba Indian Nation

The Catawba Indian Nation requested a Phase I archaeological survey for locations of ground disturbance. In a letter dated February 23, 2017, USACE provided information on the proposed action. Catawba Indian Nation responded with a letter of concurrence on March 13, 2017.

7.2.2.2 Cherokee Nation

No comments were received from the Cherokee Nation.

7.2.2.3 Eastern Band of Cherokee Indians of North Carolina

The Eastern Band of Cherokee Indians of North Carolina expressed concerns regarding a project at Warren Wilson College via telephone on July 17, 2013. In a letter dated February 23, 2017, USACE provided information on the proposed action. EBCI responded with a letter of concurrence on March 14, 2017.

7.2.2.4 United Keetoowah Band of Cherokee Indians of Oklahoma

The United Keetoowah Band of Cherokee Indians of Oklahoma responded via email on June 16, 2013 with no comments or objections to the project. In a letter dated February 23, 2017 USACE provided UKBCI with a cultural resource assessment of the proposed project. No comment was received.

7.2.3 State Agencies

7.2.3.1 North Carolina Department of Transportation

Coordination occurred with the NCDOT regarding the Biltmore Avenue Bridge Modification, and traffic during surveys and construction.

7.2.3.2 North Carolina State Historic Preservation Office

Stated they looked forward to further consultation on the study. They would like additional information regarding impacts that could be caused by the alternative evaluated in the study to archeological sites. In a letter dated February 23, 2017, USACE provided NCSHPO with additional information. In a letter dated March 31, 2017 NCSHPO concurred with a “no historic properties affected” determination for Section 106 compliance.

7.2.3.3 North Carolina Department of Administration, State Environmental Review Clearinghouse

The Environmental Review Clearinghouse distributed USACE Scoping Letter to and compiled comments from various state agencies and departments. They stated that further environmental review documents prepared for the study should be forwarded to them for intergovernmental review.

7.2.3.4 North Carolina Wildlife Resources Commission

The NCWRC stated that many tributaries to the Swannanoa River near Black Mountain contained wild trout populations and that much of the watershed was supplemented with hatchery supported populations. They also stated that the Swannanoa supports rare species such as the hellbender, and French Broad crayfish. The agency stated that measures that restore floodplain and pre-development run-off conditions would benefit aquatic species. They stated that flood constraining structures eliminate or degrade stream and riparian habitat and have other negative impacts. They mentioned that the North Fork Swannanoa River was degraded due to historic mining and continues to be impacted by modified reservoir discharges.

7.2.3.5 North Carolina Department of Public Safety

The Department of Public Safety reminded USACE of the requirement to follow guidelines of Executive Order 11988, Floodplains. They also provided comments regarding each type of measure that was to be considered in the USACE study.

7.2.4 Local Agencies

7.2.4.1 City of Asheville

As the NFS there was significant coordination and contribution from the City of Asheville. They provided data, input, funding and work in-kind.

7.2.4.2 Historic Resources Commission of Ashville & Buncombe County

The Historic Resources Commission expressed in interest in flood proofing mechanism that would affect Biltmore village.

7.2.4.3 Buncombe County

The City of Asheville lies within Buncombe County. Buncombe County attended meeting on the progress of the project and provided input on any measures that were being considered in the county.

7.2.5 Non-Governmental Organizations

7.2.5.1 Warren Wilson College

A dry dam was considered as a measure in Riverbend Field on the Warren Wilson College campus. Meetings were held with the college to explain the potential measure and right of entry was attained for needed survey work at the site.

7.2.5.2 Flood Damage Reduction Task Force

After the hurricanes of 2004 a Flood Damage Reduction Task Force (FDRTF) was created of local leaders to address flood risks in the basin. USACE met with the FDRTF to get input on the project and to explain potential measures.

7.3 PUBLIC MEETINGS

Annual meetings were held with the local Flood Task Force which is a blue ribbon committee comprised of public stakeholders. An early scoping meeting was held at the Ashville Public Library where concerns were discussed and possible solutions were brainstormed. Also, a community meeting was held at Warren Wilson College to discuss possible measures.

8.0 RECOMMENDATIONS*

After considering the significant engineering, economic, environmental, and social aspects of the problems and solutions presented in this report, it is recommend that the Tentatively Selected Plan (BAB 700) be authorized as a Federal project with such modifications thereof as in the discretion of the Chief of Engineers may be advisable and in accordance with cost sharing and financing arrangements which are satisfactory to the President and congress. Also, based on the effects of the project documented previously in the report (section 4.0), the BAB 700 would not be expected to have significant impacts on the human environment.

The estimated total first cost of this project is \$6,165,000 (2018 prices). Federal first costs are estimated at \$4,007,250 and non-Federal first costs are estimated at \$2,157,750 (the costs of lands, easements, rights-of-way, and relocations plus a mandatory 5% cash contribution). Annual non-Federal operation and maintenance (O&M) costs are estimated at \$25,000. It is further recommend that implementation of the Tentatively Selected Plan be subject to the sponsor entering into a written agreement with the Secretary of the Army to carry out the required items of local cooperation in accordance with the Provisions of section 205 of Public Law 80-858.

The recommendations contained herein reflect the information available at this time and current Departmental policies governing formulation of individual projects. They do not reflect program and budgeting priorities inherent in the formulation of a national Civil Works construction program nor the perspective of higher review levels.

9.0 LIST OF PREPARERS

Table 18. Project Delivery Team (PDT)

Role	PDT Member
Project Manager / Planner	Lacey Thomason, P.E.
Project Engineer / Hydraulic Engineer	Jim Garner, P.E. Brantley Thames, P.E.
Biologist	Chip Hall
Structural Engineer	Frank Mills, P.E.
Geotechnical Engineer	Dylan Grissom, P.E.
Real Estate Specialist	Cathy Keith
GIS Coordinator	Bobby Sells
Cultural Resources	Dr. Valerie McCormack
Economist	Phillip Jones
Cost Estimator	Martin Lockard
HTRW	Lannae Long

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11.0 LIST OF ACRONYMS

APR	- Acid-producing Rock
ASTM	- American Society for Testing Materials
ASTs	- Above Ground Storage Tanks
ATR	- Agency Technical Review
BAB	- Biltmore Cut
BAB 900	- Biltmore Avenue 900 foot Cut
B&C	- Brown and Caldwell
BCR	- Benefit-to-cost Ratio
CAP	- Continuing Authorities Program
CEQ	- Council on Environmental Quality
CERCLA	- Comprehensive Environmental Response, Compensation, and Liability Act
CFR	- Code of Federal Regulations
City of Asheville	- City of Asheville, North Carolina
DPR	- Detailed Project Report
EA	- Environmental Assessment
EAD	- Equivalent Annual Damages
EDR	- Environmental Data Resources
EIS	- Environmental Impact Statement
EO	- Executive Order
EPA	- U.S. Environmental Protection Agency
ESA	- Environmental Site Assessment
FCSA	- Feasibility Cost Share Agreement
FDRTF	- Flood Damage Reduction Task Force
FEMA	- Federal Emergency Management Agency
FID	- Federal Interest Determination
FIRM	- Flood Insurance Rate Map
FIS	- Flood Insurance Study
FONSI	- Finding of No Significant Impact
FOP	- Floodplain Operation Plan
FRM	- Flood Risk Management
FWCA	- Fish and Wildlife Coordination Act
FY	- Fiscal Year
GIS	- Geographic Information Systems
HEC-FDA	- Hydrologic Engineering Center Flood Damage Analysis
HEC-HMS	- Hydrologic Engineering Center Hydrologic Modeling System
HEC-RAS	- Hydrologic Engineering Center River Analysis System
HTRW	- Hazardous, Toxic, Radioactive Waste
HUC	- Hydrologic Unit Code
LCD	- Lake Craig Dam Rehabilitation
LERRDs	- Lands, Easements, Right-of-Ways, Relocation and Disposal Areas
LF	- Beneficial Landfill
LRN	- Nashville District
LRD	- Lakes and River Division
NC	- North Carolina

NCDC	- National Climatic Data Center
NCDENR	- North Carolina Department of Environment and Natural Resources
NCDOT	- North Carolina Department of Transportation
NCDWR	- North Carolina Division of Water Resources
NCWRC	- North Carolina Wildlife Resources Commission
NED	- National Economic Development
NEPA	- National Environmental Policy Act
NFPC	- Non-structural Flood Proofing Committee
NFS	- Non-Federal Sponsor
NAVD 88	- North American Vertical Datum of 1988
NPDES	- National Pollutant Discharge Elimination System
NRCS	- Natural Resources Conservation Service
NS	- Non-structural
NWI	- National Wetland Inventory
O&M	- Operation and Maintenance
OHW	- Ordinary High Water
OMRR&R	- Operations, Maintenance, Repair, Rehabilitation and Replacement
PAHs	- Polycyclic Aromatic Hydrocarbons
PAS	- Planning Assistance to the States
PDT	- Project Delivery Team
PFT	- Plan Formulation Team
P.L.	- Public Law
PPA	- Project Partnership Agreement
RCC	- Roller Compacted Concrete
RCLD	- Replacement Cost Less Depreciation
RE	- Real Estate
REC	- Recognizable Environmental Condition
RENCI	- Center for Applied GIScience
SB7	- Senate Bill 7
SFRMP	- Swannanoa Flood Risk Management Project
SID	- Structure Inventory Geodatabase
SVOCs	- Semi-volatile Organic Compounds
TAC	- Technical Advisory Committee
TCE	- Trichloroethylene
TPH-DRO	- Total Petroleum Hydrocarbon - Diesel Range Organics
TSP	- Tentatively Selected Plan
TVA	- Tennessee Valley Authority
USACE	- U.S. Army Corps of Engineers
USFWS	- U.S. Fish and Wildlife Service
USGS	- U.S. Geologic Survey
UST	- Underground Storage Tank
VOCs	- Volatile Organic Compounds
WNCRAQA	- Western North Carolina Regional Air Quality Agency
WRDA	- Water Resources Development Act
WW	- Warren Wilson Dry Dam

Swannanoa River Watershed Buncombe County, North Carolina

Section 205, Flood Risk Management

Environmental – Appendix g

November 2017



**US Army Corps
of Engineers**
Nashville District

TABLE OF CONTENTS

- Corps Scoping Letter.....	2
- Public and Agency Responses to Scoping.....	5



DEPARTMENT OF THE ARMY
NASHVILLE DISTRICT, CORPS OF ENGINEERS
P.O. BOX 1070
NASHVILLE TN 37202-1070

REPLY TO
ATTENTION OF

Project Planning Branch

JUN 13 2013

TO ALL INTERESTED PARTIES:

The Corps of Engineers, Nashville District, will be preparing a Draft Integrated Detailed Project Report and Environmental Assessment (DPR/EA), evaluating measures and alternatives for a flood damage reduction study for the Swannanoa River Watershed near Asheville, North Carolina.

In addition to No Action (implementing no alternatives that would address flood damages), measures that will be evaluated and considered in the DPR/EA include:

- a. Detention Structures within or adjacent to streams to detain high water flows
- b. Fill removal/channel modification to pass higher flows
- c. Modification to existing reservoirs and operation plan changes
- d. Levees/flood walls
- e. Non-Structural Measures (actions such as raising a home's first floor elevation, demolish and replace options, commercial flood-proofing, floodplain evacuations, etc.)
- f. A Flood Warning and Emergency Evacuation Plan

By way of this letter, the Corps is initiating Scoping under the National Environmental Policy Act (NEPA). In accordance with NEPA, we are soliciting comments from the public; federal, state and local agencies and officials; Indian Tribes; and other interested parties concerning environmental issues that should be addressed in the course of the NEPA process. We also encourage public and agency comments regarding the proposal which may impact or influence community resources. We encourage comments not only about the immediate project area, but also of plans or proposals for any other development that may impact or influence the study or a proposed project.

This letter also serves to initiate public involvement requirements of Section 106 of the National Historic Preservation Act of 1966, as amended. Section 106, implemented by regulations at 36 CFR 800, requires the Corps to consider the effects of its undertakings on historic properties. If required, appropriate architectural and archaeological investigations will be conducted within those areas affected by the proposed activities and resulting findings will be coordinated with the North Carolina State Historic Preservation Officer and other offices as necessary.

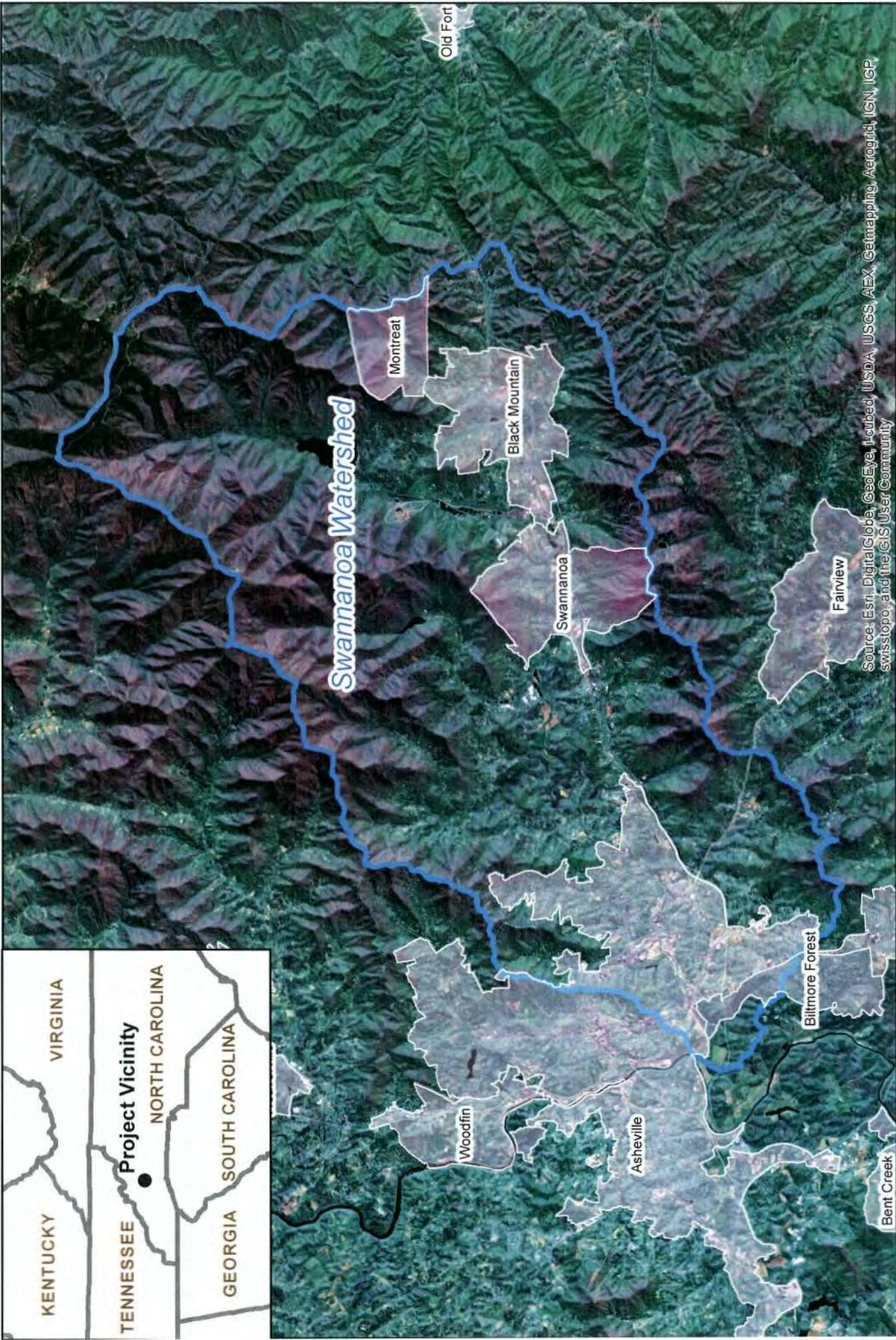
A map of the watershed is enclosed for your benefit. If you have any information, comments, or questions, please contact Chip Hall, Biologist, by writing to the above address or by calling (615) 736-7666. You may also e-mail Mr. Hall at chip.hall@us.army.mil. Please submit your comments no later than 30 days from the above date to assure evaluation and inclusion in the process. Your participation is appreciated.

Sincerely,

A handwritten signature in blue ink, consisting of several loops and a long horizontal stroke extending to the right.

Russ L. Rote, P.E., PMP, CFM
Chief, Project Planning Branch

Enclosure



Source: Esri, DigitalGlobe, GeoEye, iSat, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

Swannanoa Flood Damage Reduction Study

From: Smith, Chip - NRCS, Asheville, NC
To: Hall, Chip W LRN
Cc: Smith, Chip - NRCS, Asheville, NC
Subject: Swannanoa River
Date: Friday, June 21, 2013 8:45:43 AM

In reference to the Jun 13, 2013 letter from Russ L. Rote concerning the DPR/EA -- flood damage reduction study for the Swannanoa River Watershed, current soil survey maps and related soil interpretive data are available from 2 USDA web pages:

Download Soil interpretative data (tabular format) and GIS soils layer (spatial and tabular data) in "ARC and Access" formats
<http://soildatamart.nrcs.usda.gov/>

To view soil data/soil maps and to create and download soil reports
<http://websoilsurvey.nrcs.usda.gov/app/>

Please let me know if my office can be of further assistance.

Chip Smith
USDA, NRCS
Soil Survey Office Leader
MLRA 130B -- Southern Blue Ridge
Asheville, North Carolina
828.254.0916 x133

This electronic message contains information generated by the USDA solely for the intended recipients. Any unauthorized interception of this message or the use or disclosure of the information it contains may violate the law and subject the violator to civil or criminal penalties. If you believe you have received this message in error, please notify the sender and delete the email immediately.



North Carolina Department of Administration

Pat McCrory, Governor

Bill Daughtridge, Jr., Secretary

July 18, 2013

Mr. Chip Hall
Department of the Army
Nashville District
Corps of Engineers
Post Office Box 1070
Nashville, TN 37202-1070

Re: SCH File # 13-E-0000-0479; SCOPING; USACE is preparing a Draft Integrated Detailed Project Report and EA evaluating measures and alternatives for a flood damage reduction study for the Swannanoa River Watershed near Asheville, NC.

Dear Mr. Hall:

The above referenced environmental impact information has been submitted to the State Clearinghouse under the provisions of the National Environmental Policy Act. According to G.S. 113A-10, when a state agency is required to prepare an environmental document under the provisions of federal law, the environmental document meets the provisions of the State Environmental Policy Act. Attached to this letter for your consideration are the comments made by agencies in the course of this review.

If any further environmental review documents are prepared for this project, they should be forwarded to this office for intergovernmental review.

Should you have any questions, please do not hesitate to call.

Sincerely,

A handwritten signature in cursive script that reads "Crystal Best".

Crystal Best

State Environmental Review Clearinghouse

Attachments

cc: Region B

Mailing Address:
1301 Mail Service Center
Raleigh, NC 27699-1301

Telephone: (919)807-2425
Fax (919)733-9571
State Courier #51-01-00
e-mail state.clearinghouse@doa.nc.gov

Location Address:
116 West Jones Street
Raleigh, North Carolina



North Carolina Department of Environment and Natural Resources

Pat McCrory
Governor

John E. Skvarla, III
Secretary

MEMORANDUM

To: Crystal Best
State Clearinghouse

From: Lyn Hardison *Lyn*
Division of Environmental Assistance and Customer Service
Environmental Assistance and Project Review Coordinator

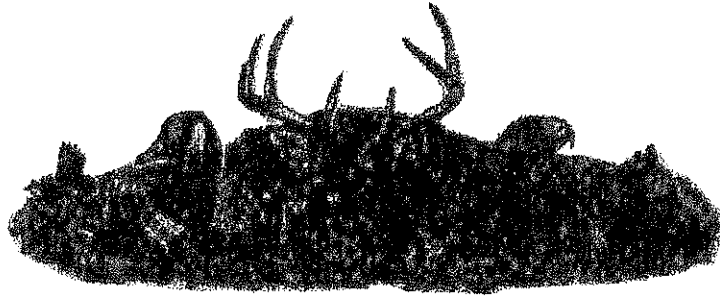
RE: 13-0479
Scoping – USACE is preparing a Draft Integrated Detailed Project Report and EA evaluating measures and alternatives for a flood damage reduction study for the Swannanoa River Watershed near Asheville, NC Buncombe County

Date: July 17, 2013

The Department of Environment and Natural Resources has reviewed the proposal for the referenced project. Based on the information provided, several of the agencies have identified permits that may be required. These comments are attached for the applicant review.

The Department will provide more specific comments during the environmental review process. Thank you for the opportunity to respond.

Attachments



☒ North Carolina Wildlife Resources Commission ☒

Gordon Myers, Executive Director

MEMORANDUM

TO: Lyn Hardison, Environmental Coordinator
Office of Legislative and Intergovernmental Affairs
North Carolina Department of Environment and Natural Resources

FROM: Dave McHenry, Habitat Conservation Biologist *DM*

DATE: July 12, 2013

SUBJECT: Department of the Army, Nashville District, Corps of Engineers
Scoping for Flood Damage Reduction Study of Swannanoa River Watershed
OLIA No. 13-0479

Biologists with the North Carolina Wildlife Resources Commission (NCWRC) reviewed the information from the Department of the Army, Nashville District, Corps of Engineers concerning preparation of an Environmental Assessment for a flood damage reduction study for the Swannanoa River Watershed. Comments from the NCWRC on this scoping effort are offered for your consideration under provisions of the Fish and Wildlife Coordination Act (48 Stat. 401, as amended; 16 U.S.C. 661 et seq.) and the North Carolina Environmental Policy Act (G.S. 113A-1 et seq., as amended; 1 NCAC-25).

The NCWRC offers the following comments and suggestions to assist with the project development:

1. The upper Swannanoa River near Black Mountain and some of the river's larger tributaries such as Bull Creek, Flat Creek, and the North Fork Swannanoa River above the water supply reservoir support wild rainbow, brown trout, and/or brook trout populations. Much of the Swannanoa River is designated as Hatchery Supported trout water by the NCWRC. It receives regular stockings of harvestable-sized fish in the spring and early summer in order to sustain a trout fishery.
2. The river supports some rare animals such as hellbenders (*Cryptobranchus alleganiensis*, US-SC and NC-SC) and French Broad River crayfish (*Cambarus reburus*, US-SC and NC SR).
3. Flood reduction measures that restore floodplain and pre-development storm run-off conditions would prevent further deterioration of and improve aquatic and riparian habitats in the watershed.

Mailing Address: Division of Inland Fisheries • 1721 Mail Service Center • Raleigh, NC 27699-1721
Telephone: (919) 707-0220 • **Fax:** (919) 707-0028

The river and many of its tributaries are degraded largely due to elevated stormwater inputs from urbanized areas and reduced flood storage capacities from historic and ongoing floodplain alterations, channelization, and filling. Construction of stormwater management structures, removal of floodplain fills and constrictions, and natural channel restoration, should be evaluated because they not only benefit aquatic habitats, but also can, in part, improve riparian areas for wildlife and create opportunities for greenway and trail system extensions in urban areas.

4. In contrast to restorative measures, flood constraining structures such as levees, flood walls, and impoundments eliminate or degrade stream and riparian habitats and in some cases may exacerbate downstream flooding. Impoundments fragment aquatic communities and can decrease base stream-flows, increase stream temperatures, and cause other water quality impairments. For example, impoundments caused an average stream temperature increase of about 13° F in a mid-summer study of 17 ponds and lakes (acreage range 0.5-100) in western North Carolina (Ratledge 1963). An impoundment (depending upon its size and function) on the Swannanoa River might convert it from a cold-water stream that can support trout to a warm-water system more typical of the North Carolina piedmont. The summertime temperatures are probably already too high for trout in the river's lower reach.
5. The North Fork Swannanoa River below the reservoir is degraded due to historic mining, but it continues to be affected by modified discharges from the reservoir. Use of the reservoir for flood damage control could be ecologically beneficial if the flow management also included minimum flow and flow ramping provisions.

The NCWRC appreciates the opportunity to provide initial comments on this study and looks forward to providing additional assistance as requested. Please call me at (828) 400-4223 if you would like to discuss these comments.

Citation

Ratledge, H.M. 1963. Journal of the Mitchell Society. Vol. 79:142-152.

cc:

D. Besler, J. Rash, C. Goudreau, S. Fraley, T. Russ, L. Williams, P. Wheeler, A. Bushon NCWRC

**Department of Environment and Natural Resources
Project Review Form**

Project Number: 13-0479

County: Buncombe

Date Received: 06/18/2013

Due Date: 7/12/2013

Project Description: Scoping - USACE is preparing a Draft Integrated Detailed Project Report and EA evaluating measures and alternatives for a flood damage reduction study for the Swannanoa River Watershed near Asheville, NC.

This Project is being reviewed as indicated below:

Regional Office	Regional Office Area	In-House Review	
<input checked="" type="checkbox"/> Asheville	<input checked="" type="checkbox"/> Air	<input type="checkbox"/> Air Quality	<input type="checkbox"/> Coastal Management
<input type="checkbox"/> Fayetteville	<input checked="" type="checkbox"/> Water	<input type="checkbox"/> Marine Fisheries	<input type="checkbox"/> Military Affairs
<input type="checkbox"/> Mooresville	<input checked="" type="checkbox"/> Aquifer Protection	<input checked="" type="checkbox"/> Parks & Recreation	<input type="checkbox"/> Water Quality
<input type="checkbox"/> Raleigh	<input checked="" type="checkbox"/> Land Quality Engineer	<input type="checkbox"/> Waste Mgmt	<input type="checkbox"/> Water Quality - DOT
<input type="checkbox"/> Washington	<input checked="" type="checkbox"/> UST	<input checked="" type="checkbox"/> Water Resources Mgmt	<input checked="" type="checkbox"/> Wildlife <u>Dave McHenry</u>
<input type="checkbox"/> Wilmington		<input type="checkbox"/> Water Supply Section	<input type="checkbox"/> Wildlife - DOT
<input type="checkbox"/> Winston-Salem			

Manager Sign-Off/Region: <i>Linda Starnes</i>	Date: 7-12-2013	In-House Reviewer/Agency:
--	--------------------	---------------------------

Response (check all applicable)

No objection to project as proposed. No Comment

Insufficient information to complete review Other (specify or attach comments)

RECEIVED
Asheville Regional Office

JUN 24 2013

NC Dept. of Environment & Natural Resources

If you have any questions, please contact:
Lyn Hardison at lyn.hardison@ncdenr.gov or (252) 948-3842
 943 Washington Square Mall Washington NC 27889
 Courier No. 16-04-01

INTERGOVERNMENTAL REVIEW - PROJECT COMMENTS

Project Number: 13-0479 Due Date: 6-24-2013

After review of this project it has been determined that the ENR permit(s) and/or approvals indicated may need to be obtained in order for this project to comply with North Carolina Law. Questions regarding these permits should be addressed to the Regional Office indicated on the reverse of the form. All applications, information and guidelines relative to these plans and permits are available from the same Regional Office.

PERMITS	SPECIAL APPLICATION PROCEDURES or REQUIREMENTS	Normal Process Time (statutory time limit)
<input type="checkbox"/> Permit to construct & operate wastewater treatment facilities, sewer system extensions & sewer systems not discharging into state surface waters.	Application 90 days before begin construction or award of construction contracts. On-site inspection. Post-application technical conference usual.	30 days (90 days)
<input type="checkbox"/> NPDES - permit to discharge into surface water and/or permit to operate and construct wastewater facilities discharging into state surface waters.	Application 180 days before begin activity. On-site inspection. Pre-application conference usual. Additionally, obtain permit to construct wastewater treatment facility-granted after NPDES. Reply time, 30 days after receipt of plans or issue of NPDES permit-whichever is later.	90-120 days (N/A)
<input type="checkbox"/> Water Use Permit	Pre-application technical conference usually necessary	30 days (N/A)
<input type="checkbox"/> Well Construction Permit	Complete application must be received and permit issued prior to the installation of a well.	7 days (15 days)
<input type="checkbox"/> Dredge and Fill Permit	Application copy must be served on each adjacent riparian property owner. On-site inspection. Pre-application conference usual. Filling may require Easement to Fill from N.C. Department of Administration and Federal Dredge and Fill Permit.	55 days (90 days)
<input type="checkbox"/> Permit to construct & operate Air Pollution Abatement facilities and/or Emission Sources as per 15 A NCAC (2Q.0100 thru 2Q.0300)	Application must be submitted and permit received prior to construction and operation of the source. If a permit is required in an area without local zoning, then there are additional requirements and timelines (2Q.0113).	90 days
<input type="checkbox"/> Permit to construct & operate Transportation Facility as per 15 A NCAC (2D.0800, 2Q.0601)	Application must be submitted at least 90 days prior to construction or modification of the source.	90 days
<input type="checkbox"/> Any open burning associated with subject proposal must be in compliance with 15 A NCAC 2D.1900	N/A	60 days (90 days)
<input type="checkbox"/> Demolition or renovations of structures containing asbestos material must be in compliance with 15 A NCAC 20.1110 (a) (1) which requires notification and removal prior to demolition. Contact Asbestos Control Group 919-707-5950.		
<input type="checkbox"/> Complex Source Permit required under 15 A NCAC 2D.0800		
<input checked="" type="checkbox"/> The Sedimentation Pollution Control Act of 1973 must be properly addressed for any land disturbing activity. An erosion & sedimentation control plan will be required if one or more acres to be disturbed. Plan filed with proper Regional Office (Land Quality Section) At least 30 days before beginning activity. A fee of \$65 for the first acre or any part of an acre. An express review option is available with additional fees.		20 days (30 days)
<input type="checkbox"/> Sedimentation and erosion control must be addressed in accordance with NCDOT's approved program. Particular attention should be given to design and installation of appropriate perimeter sediment trapping devices as well as stable stormwater conveyances and outlets.		(30 days)
<input type="checkbox"/> Mining Permit	On-site inspection usual. Surety bond filed with ENR. Bond amount varies with type mine and number of acres of affected land. Any acre mined greater than one acre must be permitted. The appropriate bond must be received before the permit can be issued.	30 days (60 days)
<input type="checkbox"/> North Carolina Burning permit	On-site inspection by N.C. Division Forest Resources if permit exceeds 4 days	1 day (N/A)
<input type="checkbox"/> Special Ground Clearance Burning Permit - 22 counties in coastal N.C. with organic soils	On-site inspection by N.C. Division Forest Resources required "if more than five acres of ground clearing activities are involved. Inspections should be requested at least ten days before actual burn is planned."	1 day (N/A)
<input type="checkbox"/> Oil Refining Facilities	N/A	90-120 days (N/A)
<input type="checkbox"/> Dam Safety Permit	If permit required, application 60 days before begin construction. Applicant must hire N.C. qualified engineer to: prepare plans, inspect construction, certify construction is according to ENR approved plans. May also require permit under mosquito control program. And a 404 permit from Corps of Engineers. An inspection of site is necessary to verify Hazard Classification. A minimum fee of \$200.00 must accompany the application. An additional processing fee based on a percentage of the total project cost will be required upon completion.	30 days (60 days)

PERMITS		SPECIAL APPLICATION PROCEDURES or REQUIREMENTS	Normal Process Time (statutory time limit)
<input type="checkbox"/>	Permit to drill exploratory oil or gas well	File surety bond of \$5,000 with ENR running to State of NC conditional that any well opened by drill operator shall, upon abandonment, be plugged according to ENR rules and regulations.	10 days N/A
<input type="checkbox"/>	Geophysical Exploration Permit	Application filed with ENR at least 10 days prior to issue of permit. Application by letter. No standard application form.	10 days N/A
<input type="checkbox"/>	State Lakes Construction Permit	Application fees based on structure size is charged. Must include descriptions & drawings of structure & proof of ownership of riparian property.	15-20 days N/A
<input type="checkbox"/>	401 Water Quality Certification	N/A	60 days (130 days)
<input type="checkbox"/>	CAMA Permit for MAJOR development	\$250.00 fee must accompany application	55 days (150 days)
<input type="checkbox"/>	CAMA Permit for MINOR development	\$50.00 fee must accompany application	22 days (25 days)
<input type="checkbox"/>	Several geodetic monuments are located in or near the project area. If any monument needs to be moved or destroyed, please notify: N.C. Geodetic Survey, Box 27687 Raleigh, NC 27611		
<input type="checkbox"/>	Abandonment of any wells, if required must be in accordance with Title 15A, Subchapter 2C.0100.		
<input checked="" type="checkbox"/>	Notification of the proper regional office is requested if "orphan" underground storage tanks (USTS) are discovered during any excavation operation.		
<input type="checkbox"/>	Compliance with 15A NCAC 2H 1000 (Coastal Stormwater Rules) is required.		45 days (N/A)
<input type="checkbox"/>	Tar Pamlico or Neuse Riparian Buffer Rules required.		
* Other comments (attach additional pages as necessary, being certain to cite comment authority)			

REGIONAL OFFICES

Questions regarding these permits should be addressed to the Regional Office marked below.

- | | | |
|--|--|--|
| <input type="checkbox"/> Asheville Regional Office
2090 US Highway 70
Swannanoa, NC 28778
(828) 296-4500 | <input type="checkbox"/> Mooresville Regional Office
610 East Center Avenue, Suite 301
Mooresville, NC 28115
(704) 663-1699 | <input type="checkbox"/> Wilmington Regional Office
127 Cardinal Drive Extension
Wilmington, NC 28405
(910) 796-7215 |
| <input type="checkbox"/> Fayetteville Regional Office
225 North Green Street, Suite 714
Fayetteville, NC 28301-5043
(910) 433-3300 | <input type="checkbox"/> Raleigh Regional Office
3800 Barrett Drive, Suite 101
Raleigh, NC 27609
(919) 791-4200 | <input type="checkbox"/> Winston-Salem Regional Office
585 Waughtown Street
Winston-Salem, NC 27107
(336) 771-5000 |
| | <input type="checkbox"/> Washington Regional Office
943 Washington Square Mall
Washington, NC 27889
(252) 946-6481 | |

NORTH CAROLINA STATE CLEARINGHOUSE
DEPARTMENT OF ADMINISTRATION
INTERGOVERNMENTAL REVIEW

Link Nguyen

COUNTY: BUNCOMBE

H12: OTHER

STATE NUMBER: 13-E-0000-0479

DATE RECEIVED: 06/17/2013

AGENCY RESPONSE: 07/12/2013

REVIEW CLOSED: 07/17/2013

MS CARRIE ATKINSON
CLEARINGHOUSE COORDINATOR
DEPT OF TRANSPORTATION
STATEWIDE PLANNING - MSC #1554
RALEIGH NC



REVIEW DISTRIBUTION

CC&PS - DIV OF EMERGENCY MANAGEMENT
DENR LEGISLATIVE AFFAIRS
DEPT OF CULTURAL RESOURCES
DEPT OF TRANSPORTATION
LAND OF SKY REGIONAL COUNCIL

PROJECT INFORMATION

APPLICANT: Department of the Army
TYPE: National Environmental Policy Act
Scoping

DESC: USACE is preparing a Draft Integrated Detailed Project Report and EA evaluating measures and alternatives for a flood damage reduction study for the Swannanoa River Watershed near Asheville, NC.

The attached project has been submitted to the N. C. State Clearinghouse for intergovernmental review. Please review and submit your response by the above indicated date to 1301 Mail Service Center, Raleigh NC 27699-1301.

If additional review time is needed, please contact this office at (919)807-2425.

AS A RESULT OF THIS REVIEW THE FOLLOWING IS SUBMITTED: NO COMMENT COMMENTS ATTACHED

SIGNED BY: _____

[Signature]

DATE: 6-27-13

NORTH CAROLINA STATE CLEARINGHOUSE
DEPARTMENT OF ADMINISTRATION
INTERGOVERNMENTAL REVIEW

COUNTY: BUNCOMBE

H12: OTHER

STATE NUMBER: 13-E-0000-0479

DATE RECEIVED: 06/17/2013

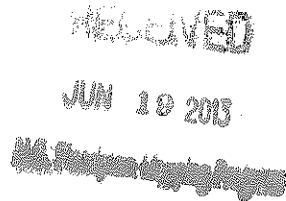
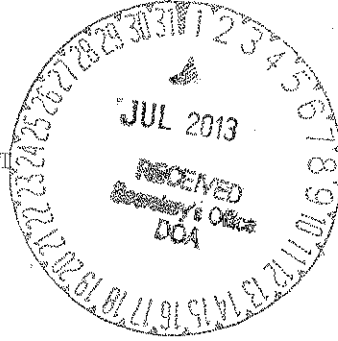
AGENCY RESPONSE: 07/12/2013

REVIEW CLOSED: 07/17/2013

MS CAROLYN PENNY
CLEARINGHOUSE COORDINATOR
CC&PS - DIV OF EMERGENCY MANAGEMENT
FLOODPLAIN MANAGEMENT PROGRAM
MSC # 4719
RALEIGH NC

REVIEW DISTRIBUTION

CC&PS - DIV OF EMERGENCY MANAGEMENT
DENR LEGISLATIVE AFFAIRS
DEPT OF CULTURAL RESOURCES
DEPT OF TRANSPORTATION
LAND OF SKY REGIONAL COUNCIL



PROJECT INFORMATION

APPLICANT: Department of the Army
TYPE: National Environmental Policy Act
Scoping

DESC: USACE is preparing a Draft Integrated Detailed Project Report and EA evaluating measures and alternatives for a flood damage reduction study for the Swannanoa River Watershed near Asheville, NC.

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If additional review time is needed, please contact this office at (919)807-2425.

AS A RESULT OF THIS REVIEW THE FOLLOWING IS SUBMITTED: NO COMMENT COMMENTS ATTACHED

SIGNED BY:

DATE:

6/27/13



North Carolina Department of Public Safety

Emergency Management

Pat McCrory, Governor
Kieran J. Shanahan, Secretary

Michael A. Sprayberry, Director

June 27, 2013

State Clearinghouse
N.C. Department of Administration
1301 Mail Service Center
Raleigh, North Carolina 27699-1301



Subject: Intergovernmental Review State Number: 13-E-0000-0479
Swannanoa River Flood Damage Reduction Study, Buncombe County

As requested by the North Carolina State Clearinghouse, the North Carolina Department of Public Safety Division of Emergency Management Office of Geospatial and Technology Management (GTM) reviewed the proposed project listed above and offer the following comments:

1. All federal agencies are required to follow the guidelines of Executive Order 11988, signed May 24, 1977. Any work within the Special Flood Hazard Area of studied streams, based on the current Flood Insurance Rate Map, should follow these guidelines in order to avoid to the extent possible the long and short term adverse impacts associated with the occupancy and modification of floodplains. The guidelines address an eight-step process that agencies should carry out as part of their decision-making on projects that have potential impacts to or within the floodplain. However, these steps and actions should be documented in the final environmental assessment document. The eight steps are summarized below.
 - a. Determine if a proposed action is in the base floodplain (that area which has a one percent or greater chance of flooding in any given year).
 - b. Conduct early public review, including public notice.
 - c. Identify and evaluate practicable alternatives to locating in the base floodplain, including alternative sites outside of the floodplain.
 - d. Identify impacts of the proposed action.
 - e. If impacts cannot be avoided, develop measures to minimize the impacts and restore and preserve the floodplain, as appropriate.
 - f. Reevaluate alternatives.

MAILING ADDRESS:
4218 Mail Service Center
Raleigh NC 27699-4218
www.ncem.org



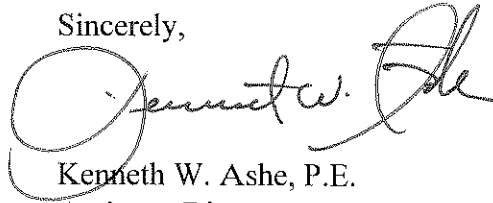
GTM OFFICE LOCATION:
4105 Reedy Creek Road
Raleigh, NC 27607
Telephone: (919) 825-2341
Fax: (919) 825-0408

- g. Present the findings and a public explanation.
 - h. Implement the action.
2. Because of the nature of this work, we encourage ongoing communication and coordination with the North Carolina Floodplain Mapping Program (NCFMP) regarding this project.
 3. Specific actions regarding the measures outlined in the scoping letter are listed below. These responses relate only to NCFMP issues. Other local, state, and federal agencies will have some degree of regulatory authority over elements of the work outlined in the scoping letter. For all options, any increases in flood elevation during the base flood discharge will require a Conditional Letter of Map Revision (CLOMR). No insurable structures may be impacted by increases in base flood elevation.
 - a. *Detention Structures within or adjacent to streams to detain high water flows;* New structures will likely change base flood elevations upstream and downstream of these structures. This option will likely require Physical Map Revisions (PMR) to show the revised base flood elevations. The design hydrology should ensure that the proposed detention does not lead to higher peak flows and base flood elevations downstream.
 - b. *Fill removal/channel modification to pass higher flows;* This option will require PMRs and/or Letters of Map Revision (LOMR) to document the revised base flood elevations based on the new channel geometry.
 - c. *Modification to existing reservoirs and operation plan changes;* Modifications to existing structures will likely change base flood elevations upstream and downstream of these structures. This option will likely require Physical Map Revisions (PMR) to show the revised base flood elevations. The design hydrology should ensure that the proposed changes in detention do not lead to higher peak flows and base flood elevations downstream.
 - d. *Levees/Flood Walls;* 44 CFR 65.10 outlines the certification requirements for Levees and Floodwalls in order to meet protection criteria under the National Flood Insurance Program. This option will require a LOMR.
 - e. *Non-Structural Measures;* Specific actions for non-structural mitigation will need to be evaluated on an individual basis. This option should be evaluated thoroughly, since mitigating the most at-risk buildings may prove to be less costly and problematic than large-scale structural flood control measures.

- f. *A Flood Warning and Emergency Evacuation Plan*; Coordination with state and local officials should remain ongoing to implement an effective flood warning system.

Thank you for your cooperation and consideration. If you have any questions concerning the above comments, please contact Dan Brubaker, P.E., CFM, the NC NFIP Engineer at (919) 825-2300, by email at dan.brubaker@ncdps.gov or at the address shown on the footer of this documents.

Sincerely,

A handwritten signature in black ink, appearing to read "Kenneth W. Ashe". The signature is written in a cursive style with a large initial "K".

Kenneth W. Ashe, P.E.

Assistant Director

Geospatial and Technology Management Office

cc: John Gerber, NFIP State Coordinator
Dan Brubaker, NFIP Engineer



North Carolina Department of Administration

Pat McCrory, Governor

Bill Daughtride, Jr., Secretary

July 31, 2013

Mr. Chip Hall
Department of the Army
Nashville District
Corps of Engineers
Post Office Box 1070
Nashville, TN 37202-1070

Re: SCH File # 13-E-0000-0479; SCOPING; USACE is preparing a Draft Integrated Detailed Project Report and EA evaluating measures and alternatives for a flood damage reduction study for the Swannanoa River Watershed near Asheville, NC.

Dear Mr. Hall:

The above referenced environmental impact information has been submitted to the State Clearinghouse under the provisions of the National Environmental Policy Act. According to G.S. 113A-10, when a state agency is required to prepare an environmental document under the provisions of federal law, the environmental document meets the provisions of the State Environmental Policy Act. Attached to this letter for your consideration are **additional comments** made by agencies in the course of this review.

If any further environmental review documents are prepared for this project, they should be forwarded to this office for intergovernmental review.

Should you have any questions, please do not hesitate to call.

Sincerely,

A handwritten signature in cursive script that reads "Crystal Best".

Crystal Best

State Environmental Review Clearinghouse

Attachments

cc: Region B

Mailing Address:
1301 Mail Service Center
Raleigh, NC 27699-1301

Telephone: (919)807-2425
Fax (919)733-9571
State Courier #51-01-00
e-mail state.clearinghouse@doa.nc.gov

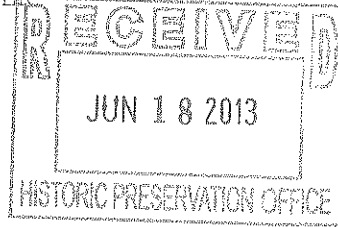
Location Address:
116 West Jones Street
Raleigh, North Carolina

NORTH CAROLINA STATE CLEARINGHOUSE
DEPARTMENT OF ADMINISTRATION
INTERGOVERNMENTAL REVIEW

COUNTY: BUNCOMBE

H12: OTHER

STATE NUMBER: 13-E-0000-0479
DATE RECEIVED: 06/17/2013
AGENCY RESPONSE: 07/12/2013
REVIEW CLOSED: 07/17/2013



MS RENEE GLEDHILL-EARLEY
CLEARINGHOUSE COORDINATOR
DEPT OF CULTURAL RESOURCES
STATE HISTORIC PRESERVATION OFFICE
MSC 4617 - ARCHIVES BUILDING
RALEIGH NC

REVIEW DISTRIBUTION

CC&PS - DIV OF EMERGENCY MANAGEMENT
DENR LEGISLATIVE AFFAIRS
DEPT OF CULTURAL RESOURCES
DEPT OF TRANSPORTATION
LAND OF SKY REGIONAL COUNCIL

PROJECT INFORMATION

APPLICANT: Department of the Army
TYPE: National Environmental Policy Act
Scoping

DESC: USACE is preparing a Draft Integrated Detailed Project Report and EA evaluating measures and alternatives for a flood damage reduction study for the Swannanoa River Watershed near Asheville, NC.

The attached project has been submitted to the N. C. State Clearinghouse for intergovernmental review. Please review and submit your response by the above indicated date to 1301 Mail Service Center, Raleigh NC 27699-1301.

If additional review time is needed, please contact this office at (919)807-2425.

AS A RESULT OF THIS REVIEW THE FOLLOWING IS SUBMITTED: NO COMMENT COMMENTS ATTACHED

SIGNED BY:

Renee Gledhill-Earley

DATE:

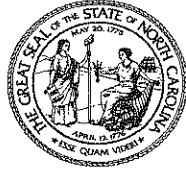
7-25-13

*EX 13-1150
See letter
A- LGH-88
7-15-13*

Due 7/3/13



JUN 19 2013



North Carolina Department of Cultural Resources

State Historic Preservation Office

Ramona M. Bartos, Administrator

Governor Pat McCrory
Secretary Susan Kluttz

Office of Archives and History
Deputy Secretary Kevin Cherry

July 16, 2013

Russ Rote
Nashville District, Corps of Engineers
PO Box 1070
Nashville, TN 37202-1070



Re: Flood Risk Management Project for the Swannanoa River Watershed, Buncombe County, ER 13-1150

Dear Mr. Rote:

Thank you for your letter of June 13, 2013, concerning the above project.

We look forward to further consultation as specific project details and their effects on archaeological resources become available. While the vast majority of the study area has not been surveyed to identify and evaluate archaeological resources, the Swannanoa River basin is extremely rich in prehistoric occupation sites. Several different types of archaeological sites have been recorded within the area, ranging from temporary hunting camps, to larger base camps, to more sedentary occupation sites.

We are interested in obtaining any information you may have, based on your experience in other areas, regarding the nature of adverse effects to archaeological sites from these types of projects.

The above comments are made pursuant to Section 106 of the National Historic Preservation Act and the Advisory Council on Historic Preservation's Regulations for Compliance with Section 106 codified at 36 CFR Part 800.

Thank you for your cooperation and consideration. If you have questions concerning the above comment, contact Renee Gledhill-Earley, environmental review coordinator, at 919-807-6579 or renee.gledhill-earley@ncdcr.gov. In all future communication concerning this project, please cite the above referenced tracking number.

Sincerely,

for Ramona M. Bartos

cc: State Clearinghouse

From: [Tompkins, Bryan](#)
To: [Hall, Chip W LRN](#)
Subject: Swannanoa River Watershed - Flood Damage Reduction Study
Date: Thursday, July 18, 2013 8:14:52 AM
Attachments: [12-003 Swannanoa Flood Damage Reduction EA.doc](#)

Chip,
Please accept the attached comments regarding the subject project. If you have any questions please feel free to let me know.
Thanks

Bryan Tompkins
US Fish and Wildlife Service
160 Zillicoa Street
Asheville, North Carolina 28801
828/258-3939 ext.240

July 15, 2013

Mr. Chip Hall
US Army Corps of Engineers
Nashville District
PO Box 1070
Nashville, Tennessee 37202-1070

Dear Mr. Hall:

Subject: Draft Integrated Detailed Project Report and Environmental Assessment (DPR/EA) for a Flood Damage Reduction Study of the Swannanoa River Watershed, in Asheville, Buncombe County, North Carolina

On June 17, 2013, we received a letter from Mr. Russ Rote of your office initiating Scoping under the National Environmental Policy Act (NEPA) and requesting our comments on the subject assessment. We have reviewed the information presented in the letter and are providing the following comments in accordance with the provisions of the Fish and Wildlife Coordination Act, as amended (16 U.S.C. 661-667e), NEPA (42 U.S.C. §4321 et seq.); the Clean Water Act (33 U.S.C. §1251 et seq.); and section 7 of the Endangered Species Act of 1973, as amended (16 U.S.C. 1531-1543) (Act).

According to the information provided in the letter, several measures and alternatives are being evaluated and considered in the DPR/EA. The Corps is seeking comments on the following measures and alternatives for the flood reduction study: 1) No Action or implementing no alternatives that would address flood damage reduction; 2) Detention structures within or adjacent to streams to detain high water flows; 3) fill removal/channel modification to pass higher flows; 4) modification to existing reservoirs and operation plan changes; 5) levees and flood wall construction; 6) non-structural measures (e.g. raising a building's first floor elevation, demolish and replace options, commercial flood proofing, floodplain evacuations, etc.); 7) development of a flood warning and emergency evacuation plan. No specific information or detailed plans were included in the Corps' letter for any of the above listed alternatives. The following comments are in the order that the alternatives were listed in the Corps' scoping letter.

No Action – Due to past development practices, much of the flood prone areas of the Swannanoa River watershed have been filled and/or developed. This is evident in the past and recent history of flood events that have occurred here. Two major flood events, occurring in 1916 and 2004, were results of 100-year storms. These floods in particular caused the most damage and even

loss of life. Other minor flood events have occurred in the watershed causing local travel problems, economic impacts, and structural damage.

Detention Structures – In past meetings that we have attended for this particular project, we are aware of the plans for an “off-line” detention structure to be constructed adjacent to the Swannanoa River directly behind the Lake Craig dam. Though no detailed plans were provided, we are skeptical of this type of detention structure being built adjacent to the river. In order to construct these types of structures, “pits” will be dug next to the river. This will require the removal of any existing riparian vegetation and will destabilize stream banks. We also believe that this type of detention structure will create problems similar to ones we have witnessed at mining sites that occur in floodplains. The potential detrimental effects of floodplain “pit” excavation are serious and numerous. For example, as streams rise and exit their banks, these “pits” can alter channel hydraulics during high flows; may reduce groundwater elevations, increase water temperature, and create potential for fish entrapment; and the destruction of the riparian zone during extraction operations can have multiple deleterious effects on the habitat for aquatic species.¹

Floodplains and terraces (former floodplains) are the sites of sediment storage in stream systems and can contain large quantities of sand and gravel. Floodplain excavation can disrupt the preexisting balance between sediment supply and transporting capacity, which results in channel incision and bed degradation. A floodplain detention structure may also become the nucleus of major instability in the adjacent stream channel when lateral channel movement or overbank flows redirect the active channel through the excavation pit. When floodplain pits “capture” the active channel, off-channel structures become in-stream structures that then produce the negative symptoms associated with in-stream excavation. Channel capture often happens abruptly and usually occurs where the excavation pit creates a path of least resistance, typically where the path is a shorter distance for flow to move down a valley. Captured pits that are large (relative to the stream channel) create lake-like environments that can locally change environmental conditions and therefore the biological community.

Several examples of channel capture by excavation pits have been documented. A gravel pit located in an inactive floodplain channel of Tujunga Creek in California captured the active channel during a flood and initiated two headcuts that moved 2,600 and 3,000 feet upstream with vertical incision up to 14 feet (Bull and Scott 1974,² Collins and Dunne 1990³); the pit trapped sediment arriving from upstream, and the hungry water exiting the pit continued the bed degradation downstream. Two gravel mine pits in the floodplain of the Yakima River in Washington captured the active channel during a flood, relocating the channel laterally nearly

¹North Carolina Chapter, American Fisheries Society. February 6, 2002. Position Paper on Instream Sand and Gravel Mining Activities in North Carolina, www.sdafs.org/ncafs/newsletters/March2002/InstreamMiningPosition.doc.

²W.B. Bull and K.M. Scott. 1974. Impact of mining gravel from urban stream beds in the southwestern United States: *Geology*, v. 2, pp. 171-174.

³B. Collins and T. Dunne. 1990. Fluvial geomorphology and river-gravel mining: a guide for planners, case studies included. California Department of Conservation, Division of Mines Geology. Spec. Pub. 98. 29 pp.

2,000 feet within a day (Dunne and Leopold 1978⁴). An off-channel pit captured the active channel of the Clackamas River in Oregon, causing 6 feet of channel incision over 3,000 feet upstream (Kondolf 1997⁵).

We have taken part in past meetings to discuss the viability of restructuring the Lake Craig dam to work as a flood control structure. It is difficult to provide specific comments without detailed plans and information regarding this option. The structure currently acts as a flood control feature to some extent. To provide additional comments on this option, we would need additional information including: 1) What will the impacts and damages to upstream resources be compared to impacts and damages of downstream flooding? 2) What storm event will the dam be built to retain? 3) What will the draw down time for upstream flooding be during different rain events? 4) Would longer retention times upstream of the dam create additional damage and costs? 5) What will the proposed upstream flood levels reach for certain rain events and what will the impacts be from the higher upstream flood levels?

Fill Removal/Channel Modification – We do not believe that objectives under this alternative should include projects that will channelize streams. Removal of material from stream channels or straightening of streams should not occur. We do believe that removing fill or excess sediment from floodplains (restoring floodplains and floodplain functions), in areas where this is possible, can help reduce the intensity, speed, and level of downstream flooding. A good example of an area where floodplain fill removal would be helpful is the area behind the old Lake Craig dam. However, we do recommend that vegetation and riparian buffers be restored in any areas where floodplain removal takes place.

We recommend that only stream channel restoration, using natural channel designs and materials, should be implemented. Straightening of streams should be avoided as this only increases the streams speed and flow level, thereby exacerbating flooding downstream. Any projects that include stream channel restoration should also include the preservation and/or restoration of riparian buffers to the greatest extent possible. Natural, forested riparian buffers are critical to the health of aquatic ecosystems. They accomplish the following:

1. catch and filter runoff, thereby helping to prevent nonpoint-source pollutants from reaching streams;
2. enhance the in-stream processing of both point- and nonpoint-source pollutants;
3. act as “sponges” by absorbing runoff (which reduces the severity of floods) and by allowing runoff to infiltrate and recharge groundwater levels (which maintains stream flows during dry periods);
4. catch and help prevent excess woody debris from entering the stream and creating logjams;
5. stabilize stream banks and maintain natural channel morphology;

⁴T. Dunne and L.B. Leopold. 1978. *Water in Environmental Planning*. W.H. Freeman and Company, New York.

⁵G.M. Kondolf. 1997. Hungry water: Effects of dams and gravel mining on river channels. *Environmental Management* 21(4):533-551.

6. provide coarse woody debris for habitat structure and most of the dissolved organic carbon and other nutrients necessary for the aquatic food web; and
7. maintain air and water temperatures around the stream.

Forested riparian buffers (a minimum 50 feet wide along intermittent streams and 100 feet wide along perennial streams [or the full extent of the 100-year floodplain, whichever is greater]) should be created and/or maintained along all aquatic areas. Within the watersheds of streams supporting endangered aquatic species, we recommend undisturbed, forested buffers that are naturally vegetated with trees, shrubs, and herbaceous vegetation and extend a **minimum** of 200 feet from the banks of all perennial streams and a **minimum** of 100 feet from the banks of all intermittent streams, or the full extent of the 100-year floodplain, whichever is greater.) Impervious surfaces, ditches, pipes, roads, utility lines (sewer, water, gas, transmission, etc.), and other infrastructures that require maintained, cleared rights-of-way and/or compromise the functions and values of the forested buffers should not occur within these riparian areas.

Modification to Existing Reservoirs and Operation Plans – In 2007, the City of Asheville implemented changes to operations at North Fork and Bee Tree Reservoirs that will provide flood control benefits downstream. We are not aware of any information or reports that have been produced to indicate the effectiveness of the Emergency Action Plan and Flood Action Plans for these reservoirs. However, given the amount of rainfall and large rain events that have occurred this year, only minor flooding and damage has occurred within the Swannanoa River watershed. Some roads were closed for short periods from rain events in January, May and July of this year; and flooding occurred upstream of the Lake Craig Dam in May causing about \$55,000 in damage to Azalea Park. Though these rain events were not close to rainfall from the storms in 2004, they were significant and we believe that flooding damages were probably reduced as a result of these plans being in place.

Levees/Flood Walls – We recommend that the construction of levees and flood walls should not be included as a viable alternative in any flood damage reduction plan. Levees and floodwalls may accomplish the goal of protecting a particular site, but they also constrict the flow of streams which creates higher flood events, stronger flows, and stream channel destabilization downstream. As has been shown in areas with extensive levees, they require extensive design, construction and maintenance, can fail and/or create major damage if overtopped, and can create a false sense of security. Levees and flood walls also diminish riparian vegetation and buffers further impacting water quality and stream channel stability. Rivers and streams will always find the weak point or openings around levees to reach floodplain and reduce pressure. This requires the question, “Where do you start and stop with levee construction?” Because of the high cost of construction and maintenance, and the issues listed above, we do not believe this is a viable or practicable alternative.

Non-Structural Measures – We believe that options under this category are potentially the most viable and practicable when considering cost and overall damage reduction. However, to this point, the City of Asheville has been reluctant to implement strong ordinances and take the actions necessary to begin limiting the amount of development in flood prone areas. We are aware that the City of Asheville has obtained some grant money in the past to conduct buyouts of structures in the floodplain though it has been quite limited in scope. Biltmore Village continues

to grow and the City continues to allow development in this flood prone area. To our knowledge the City implemented a building code disallowing construction in the floodway though construction in the floodplain is allowed if the bottom floor is built above the current/existing flood level. This in no way considers steadily rising flood levels due to excessive and continued floodplain in-fill and development. Within three years after the 2004 floods, the City was allowing floodplain in-fill and development. The current ordinance regulating floodway and floodplain in-fill was implemented in 2007-2008. We do not believe that the current ordinance is strong enough to adequately and sustainably protect floodplain functions or structures.

We also recommend that stronger storm water control measures and regulations be reviewed as a component of this project. We have witnessed events in the Biltmore Village area that was considered “flooding” and the streams and rivers were not overtopping their banks. The “flooding” was actually being caused by poor storm drainage, excessive impervious surface, and an absence of storm water abatement/retention measures in the area. The City of Asheville collects Storm Water Fees from city businesses and residents. The 2012 expenditure report for these fees indicated that the city used the fees to install additional pipes (culverts to help remove water from roadways) and street sweeping. There was no information that the money was used to actually construct measures to abate or retain storm water. We agree that water needs to be removed from the roadways however, it is equally important to control storm water rates and velocity. Otherwise the water is just being piped straight to streams quicker which overruns stream channels and increases the likelihood of flooding and higher flood levels.

Flood Warning and Emergency Evacuation Plan – From our understanding, the City of Asheville has already implemented a flood warning/evacuation plan. If this has not been completed, then we recommend that a plan be developed and implemented without delay. This is a direct responsibility of the City. We believe this should be developed regardless of the current flood damage reduction plan that the Corps is reviewing. We do not believe that this is even an alternative to the other measures listed above, but a responsibility that should be completed regardless of the decisions made by the Corps.

Federally Listed Species – According to our records, no listed species or their habitats occur on the site. We do not believe any endangered or threatened species or their habitats will be affected by the proposed project; therefore, the requirements under section 7 of the Act are fulfilled. However, obligations under section 7 of the Act must be reconsidered if: (1) new information reveals impacts of this identified action that may affect listed species or critical habitat in a manner not previously considered, (2) this action is subsequently modified in a manner that was not considered in this review, or (3) a new species is listed or critical habitat is determined that may be affected by the identified action.

We do have records of other rare species that occur within the Swannanoa watershed, including mountain blotched chub (*Erimystax insignis eristigma*), French Broad crayfish (*Cambarus reburus*), and hellbender (*Cryptobranchus alleganiensis*), all of which are currently listed as federal species of concern. Although the provisions of section 7 of the Act do not currently apply to federal species of concern, we would greatly appreciate your assistance in determining if they are present in streams near future flood damage reduction projects. If any are found

during surveys, we recommend that projects be planned and conducted in a manner that will avoid impacting these species.

After the flood in 2004, the Asheville City Council appointed a Flood Damage Reduction Task Force “to establish a regional approach in developing a long-range plan based on best practices models to protect our floodplains/floodways and manage our watershed.” In October 2007, the Flood Damage Reduction Task Force released its findings and recommendations to the City of Asheville. We have reviewed the report given to the City and believe that the recommended measures listed in that report such as increased riparian buffers, LID development requirements, storm water and floodplain ordinances, etc. are comprehensive yet reasonable. The measures noted in the report, if implemented thoroughly, would drastically reduce the amount of flood damage that occurs in the Swannanoa River watershed. These measures are in line with our recommendations and do not recommend the construction of dams or retention structures in the floodway. Development activities that further constrict the water courses or decrease the functionality of floodplains in the Swannanoa River watershed should not be allowed.

We appreciate the opportunity to provide these comments. If we can be of assistance or if you have any questions, please do not hesitate to contact Mr. Tompkins at 828/258-3939, Ext. 240. In any future correspondence concerning this project, please reference our Log Number 4-2-12-003.

Swannanoa River Watershed Buncombe County, North Carolina

Section 205, Flood Risk Management

Cultural Resources – Appendix H

November 2017



**US Army Corps
of Engineers**
Nashville District

TABLE OF CONTENTS

List of Tables	iii
1.0 Introduction	1
2.0 Section 106 initiation	1
3.0 Consultation on Warren Wilson Dry Dam measure (See Main report section 3.4.2.3)	2
4.0 Consultation on Biltmore Avenue Bridge (See Main report section 3.4.5.2)	4
5.0 Conclusion	4

LIST OF TABLES

Table H. 1. List of Agencies included in the Section 106 initiation outreach.	2
Table H. 2. Participants in Consulting Party Meeting addressing potential impacts on Warren Wilson College Property.	3
Table H. 3. Summary of Section 106 Consultation and report distribution for investigations at Warren Wilson College.....	3
Table H. 4. Summary of consultation on Biltmore Avenue Bridge.....	4

1.0 INTRODUCTION

Several laws and regulations require the U.S. Army Corps of Engineers to consider cultural resources during plan formulation and prior to implementing a project. Engineering Regulation 1105-2-100, Appendix C provides guidance for compliance with Corps Civil Works policy and for complying with applicable laws. In general, cultural resources are manmade objects or features that form the past and present built environment. The National Historic Preservation Act provides guidelines for institutional significance by defining characteristics and significance for buildings, structures, objects, archaeological sites, districts, or landscapes for inclusion in the National Register of Historic Places.

Section 904 of the Water Resources Development Act of 1986 instructs the Corps to take into the consideration of the preservation of cultural and historical values in the formulation and alternative plans. Information on cultural resources is typically collected through compliance with the National Environmental Policy Act and the National Historic Preservation Act. Both laws incorporate consultation with key stakeholders and the public.

Section 106 of the National Historic Preservation Act is the major piece of legislation that drives consideration of cultural resources in plan formulation. Section 106 requires federal agencies to consider the effects of their undertakings on historic properties and notify the Advisory Council on Historic Preservation. 36 C.F.R. 800 directs a four step process for federal agencies to follow to meet the intent of Section 106 process.

Step 1 – Establish the Undertaking, identify appropriate State Historic Preservation Officer and other consulting parties,

Step 2 – Determine the Scope of the Efforts, Identify Historic properties, Evaluate significance.

If area of potential effects lacks historic properties, and consulting parties agree, then the Section 106 process is complete.

Step 3 - if historic properties are present, then the federal agency evaluates the effects of the undertaking on the historic properties. If after consultation, all agree that there is no adverse effect to the historic properties, then the Section 106 process is complete

Step 4 - If evaluation of the historic property concludes with an adverse effect to historic properties, then the federal agency must notify and invite the Advisory Council on Historic Preservation to consultation, and resolve the adverse effects through a Memorandum of Agreement.

2.0 SECTION 106 INITIATION

USACE initiated Section 106 with the Advisory Council on Historic Preservation, State Historic Preservation Officer, Tribal governments, Non-governmental organizations, and landowners of potential project sites in June 2013. The Section 106 initiation letter identified the type of activities that would be needed to identify historic properties for several measures including: Biltmore Avenue Cut, Lake Craig Dam Rehabilitation, Landfill Removal, Warren Wilson Peak Flow Control Structure, Sweeten Creek Detention, Bee Tree Dam Modification, Black Mountain Levee/Floodwall, Non-Structural Flood proofing, and a Flood Warning and Emergency Evacuation Plan.

Consulting Parties were identified following the guidance of 36 CFR 800.2. Consulting Parties include the State Historic Preservation Officer, Tribal nations, and land owners of nearby historic resources. Table 1 summarizes the consultation and comments received.

Table H. 1. List of Agencies included in the Section 106 initiation outreach.

Consulting Party	USACE initiation letter	Response and date
North Carolina State Historic Preservation Office	June 13, 2013	July 16, 2013 – Note that the Swannanoa River basin is extremely rich in prehistoric occupation types, and look forward to continued consultation
North Carolina Western Office of Archives and History	June 13, 2013	
Eastern Band of Cherokee Indians	June 13, 2013	Informal telephone discussion about the overall project. EBCI expressed concerns about the proposed Warren Wilson Peak Flow control structure and potential impacts from the inundation.
Catawba Indian Nation	June 13, 2013	July 31, 2013 Comment that Phase I archaeological survey is required for ground disturbance in previously undisturbed areas.
United Keetoowah Band of Cherokee Indians	June 13, 2013	June 26, 2013 – No comments or objections on the project at this time.
Cherokee Nation	June 13, 2013	No comment
City of Asheville, Historic Resource Commission	June 13, 2013	July 5, 2013 City of Asheville is interested in flood proofing mechanism that would affect Biltmore village, recommends contacting Mr. Bill Alexander – landscape historian at Biltmore Estate and Mr. Jack Thomson, Executive Director of the Preservation Society of Asheville and Buncombe County.
Warren Wilson College	June 13, 2013	No comment
National Trust for Historic Preservation	June 13, 2013	No comment
Chief Engineer Bridges and Structures	June 13, 2013	No comment
Biltmore Estate	June 13, 2013	June 27, 2013- Request for additional time; July 19, 2013 – The Biltmore Company plans to develop the Busbee Reservoir for drinking water for Biltmore House and Estate is inconsistent with a flood control use. .

3.0 CONSULTATION ON WARREN WILSON DRY DAM MEASURE (SEE MAIN REPORT SECTION 3.4.2.3)

In early 2015, analysis indicated that a peak flow control structure on the Warren Wilson campus could significantly reduce flood risk in Biltmore Village and the Swannanoa Basin. Since this measure appeared promising, USACE consulted with organizations with interests in the property. On April 2, 2015 Corps archaeologists Valerie McCormack and EBCI Historic Preservation Specialist Tyler Howe discussed the project and agreed that a site visit would help inform definition of an Area of Potential Effects, historic property identification efforts, and possible alternatives.

On May 19, 2015, USACE, EBCI, Warren Wilson College, North Carolina Western Office of Archives and History met to discuss the project and historic property inventory and evaluation needs.

Table H. 2. Participants in Consulting Party Meeting addressing potential impacts on Warren Wilson College Property.

Organization	Staff/Representative	Position
U.S. Army Corps of Engineers	Valerie McCormack Charles (Chip) Hall Loren MacDonald Lacey Thomason	Archaeologist and Tribal Liaison Biologist Project Manager Project Manager
Eastern Band of Cherokee Indians	Russell Townsend Tyler Howe	Tribal Historic Preservation Officer Historic Preservation Specialist
North Carolina Western Office of Archives and History	Linda Hall	Assistant State Archaeologist
Warren Wilson College	David Moore	Professor, Archaeology Crew Supervisor

Information and concerns were incorporated into a Scope of Work for the investigation of the APE. USACE contracted with Panamerican, Inc. to complete a cultural resource investigation of Warren Wilson College. The report *Archaeological Survey at Warren Wilson College for the Swannanoa River Valley, Flood Risk Management Study, Buncombe County, North Carolina* presents the results.

The Warren Wilson Dry Dam measure was eliminated from further consideration once USACE determined the measure was not feasible due to the depth of the rock. The elimination of the Warren Wilson Dry Dam from further study was communicated with consulting parties. The draft archaeological survey report was shared for comments, and incorporated into the final report.

Table H. 3. Summary of Section 106 Consultation and report distribution for investigations at Warren Wilson College.

Consulting Party	USACE Report Transmission	Response and date
North Carolina State Historic Preservation Office	September 30, 2016	Given USACE recommendation for no construction, then concur with no further investigations. November 17, 2016 November 17, 2016
North Carolina Western Office of Archives and History	September 30, 2016	
Eastern Band of Cherokee Indians	September 30, 2016	Recommend avoidance of sites or Phase II site evaluation if ground disturbance would occur. November 1, 2017
Warren Wilson College	September 30, 2016	No comment.

4.0 CONSULTATION ON BILTMORE AVENUE BRIDGE (SEE MAIN REPORT SECTION 3.4.5.2)

In 2016, the Biltmore Avenue Bridge emerged as the Tentatively Selected Plan. Historic property identification involved a review of state files, archival maps, and the results of nearby historic preservation

studies. NC Department of Transportation completed an earlier review of historic properties prior to replacing the old the Biltmore Avenue Bridge.

Information suggest the presence of historic fill immediately upstream and downstream of the Biltmore Avenue Bridge. In addition, subterranean utilities present in the bank create prior disturbance. Corps archaeologists visited the project area on November 7, 2016 to examine the bank for the presence of archaeological resources and to document the viewshed. The results are documented in “Cultural Resource Assessment of the proposed Biltmore Avenue Channel Modification in Association with the Swannanoa Section 205 Feasibility Study.” No cultural resources were identified within the Area of Potential Effects. USACE proposed a determination of “no historic properties affected” and submitted the information to consulting parties. Table 4 presents the parties and response dates.

Table H. 4. Summary of consultation on Biltmore Avenue Bridge.

Consulting Party	USACE initiation letter	Response and date
North Carolina State Historic Preservation Office	February 23, 2017	Concur with USACE “no historic properties affected” determination. March 31, 2017
North Carolina Western Office of Archives and History	February 23, 2017	Concur with USACE “no historic properties affected” determination. March 31, 2017
Eastern Band of Cherokee Indians	February 23, 2017	Concur with USACE “no historic properties affected” determination. March 14, 2017
Catawba Indian Nation	February 23, 2017	Concur with USACE “no historic properties affected” determination. March 13, 2017
United Keetoowah Band of Cherokee Indians	February 23, 2017	No comment
Cherokee Nation	February 23, 2017	No comment
City of Asheville, Historic Resource Commission		
National Trust for Historic Preservation		
Biltmore Estate		

5.0 CONCLUSION

USACE concludes Section 106 consultation with a “no historic properties affected” determination. However, pursuant to §800.13 Post-Review discovers, should cultural resources be encountered during construction, work will stop and secure the find until consultation can occur and a path to avoid, minimize or mitigate adverse effects.