

**SUPPLEMENTAL WATERSHED WORK PLAN No. 10
AND ENVIRONMENTAL EVALUATION**

FOR

NESHAMINY CREEK WATERSHED

CORE CREEK DAM (PA-620)

(BUCKS COUNTY, PENNSYLVANIA)



PREPARED BY
USDA NATURAL RESOURCES CONSERVATION SERVICE

IN COOPERATION WITH
BUCKS COUNTY, PA

June 2018

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U.S. Department Agriculture Natural Resources Conservation Service May 2015 Watershed Rehabilitation Worksheet Sponsoring Local Organization(s): Bucks County Board of Commissioners Bucks County Administration Building 55 East Court Street Doylestown, PA 18901	Watershed:	Neshaminy Creek Watershed		
	County(s):	Bucks	State(s):	Pennsylvania
		Hydrologic Unit Code:	020402010303	
		Watershed Project Number:	422020	
		Watershed Site Number:	Core Creek Dam (PA-620)	
		NID Number:	PA00802	

A. Authority and Program Criteria

Original Program Authority:	Public Law 83-566					
Current Program Authority:	Section 14 of Public Law 83-566					
Current Hazard Classification:	High					
Design Hazard Classification:	High					
Status of Operation and Maintenance	There were no post construction changes to the structure that influence the safety of the dam. No road cuts, quarries or mining activities were observed in the vicinity of the dam or reservoir. At the time of the site walk, the dam and associated structures were found to be functional and operation and maintenance is current.					
Sedimentation (acre-feet/year) ^{1/}	Originally Planned	4.23	Actual	3.19	Future	2.10
Evaluation of Potential Rehabilitation Projects			Updated:	Yes		
Sponsor's Application Submission date	7/1/2014	NRCS acknowledges Valid Application:			7/8/2014	
Will upstream land rights be obtained to top-of-dam elevation per NWPM 505.36G? ^{2/}						Yes
Are basic assumptions and decisions (Investigation and Analysis) included in the administrative record?						Yes
Is the Investigation and Analysis (I&A) attached to the Plan-EE?						Yes
Does planning and analyses comply with 1983 P&G?						Yes

^{1/} If future sediment storage is provided for less than 100 years, explain rationale in Section L Additional Notes and Comments.

^{2/} Provide rationale for selected land rights elevation if below top-of-dam in Section L Additional Notes and Comments.

B. Purpose and Need for Action

Purpose and Need The purpose of the project (Project Purpose) includes the following: • Provide for a 1% annual chance flood event level of flood damage reduction by raising the auxiliary spillway crest to the maximum reservoir elevation. • Maintain the recreational and habitat values of Lake Luxembourg and adjacent riparian lands. • Comply with applicable design, performance and safety standards. • Maintain the water supply availability provided by the Core Creek Dam and Lake Luxembourg. The need for this federal action (Project Need) arises from the fact that an analysis of the existing Core Creek Dam, based on current NRCS design and safety criteria, determined that (1) the dam did not provide sufficient detention storage for the Principal Spillway Hydrograph to provide for a 1% annual chance flood event level of flood damage reduction; (2) the dam did not have adequate erosion resistance in the auxiliary spillway for the Stability Design Hydrograph; and (3) the dam would be overtopped during the Freeboard Hydrograph storm event. The dam was originally constructed in 1976 with a 100-year service life. The Natural Resources Conservation Service (NRCS) and the Pennsylvania Department of Environmental
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Protection (PADEP), Bureau of Waterways Engineering, have classified Core Creek Dam, as a High Hazard potential dam. The current hazard classification is based on the potential for loss of life due to the prevalence of 11 bridges, more than 20 roads and 1,300 buildings existing in the downstream dam breach inundation zone. The Project Need includes the following:

- Provide flood damage reduction for the 100-year recurrence interval flood event downstream from the dam and address applicable NRCS and Commonwealth of Pennsylvania standards and design criteria for public health and safety to reduce the risk of loss of human life.
- Continue supporting the recreational uses, an original PL83-566 purpose, and incidental aquatic and terrestrial wildlife habitat directly dependent upon Lake Luxembourg and its surrounding riparian lands.
- Continue providing 1,215 acre-feet of public water supply availability, an original PL83-566 purpose, from Core Creek Dam and Lake Luxembourg.

C. Watershed Rehabilitation Alternatives with Rationale for Level of Analysis

Alternative	Alternative Description and Major Feature	Cost	Carried Through Analysis	Rationale
No Action/Future Without Federal Project	Minimum constructed breach of the embankment to remove the storage function of the dam and restore the stream to a free-flowing state through the impoundment area and the footprint area of the dam. • Excavate an opening through the dam. • Remove the principal spillway inlet structure, conduit and impact basin. • Use the existing auxiliary spillway location for onsite disposal. • Connect the old stream bed to the downstream channel. • Resume normal stream flow. • Provide rock riprap slope protection. • Vegetate the accumulated sediment.	\$2,891,000	Yes	No Action
Decommissioning	Federally-assisted removal of the entire embankment and restore the stream and 100-year floodplain to a free-flowing state through the impoundment area and the footprint area of the dam. • Complete removal of the dam. • Restoration of dam site to original conditions. • Stabilizing the site. • Access to water-based recreational activities such as boating, kayaking, ice skating, ice fishing and fishing would be lost. Replacement cost of recreational activities was not included as the decommissioning costs are already exorbitant. • Land-based recreational activities such as picnic areas, trails, and a dog park would not be affected. • Loss of 1,215 acre-feet of water supply storage. Replacement cost of storage volume was not included as the decommissioning costs are already exorbitant. • Floodproof 58 Commercial and 284 Residential structures within the 100-yr floodplain that would have increased flood	\$5,819,000	No	Exorbitant costs and social disruptions.

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Doylestown, PA 18901					

	depths from decommissioning the dam in municipalities including Middletown, Northampton, Langhorne, Lower Southampton, Bensalem, Hulmeville, and Bristol.	<u>\$80,266,000</u>		
	Total Cost:	\$86,085,000		
Rehabilitation	Federally-assisted rehabilitation of the dam to NRCS and Commonwealth of Pennsylvania High Hazard Class dam design criteria. • Maintain existing dam at current location and crest Elevation 118.0. • Extend the service life for an additional 82 years plus 3 years for implementation. • Replace the auxiliary spillway control section with a labyrinth weir with crest raised 1.0 foot to Elevation 112.9 and having an effective weir length of 2,160 feet over 34 cycles within the existing 550-foot-wide auxiliary spillway. • Armor the auxiliary spillway downstream of the labyrinth weir with roller compacted concrete. • Construct an upstream cutoff wall, downstream scour protection, and a riprap apron. • Reinforce the downstream face of the embankment with fill at 3.75H:1V slope using material excavated from the auxiliary spillway modifications. • Extend the existing principal spillway conduit and the existing toe drain conduits. • Construct a new S.A.F. Basin at the outlet of the principal spillway conduit. • Decrease in principal spillway capacity, from 588.7 cubic feet per second to 575.6 cubic feet per second, due to lengthening of principal spillway conduit.	\$6,192,500	Yes	
Non-Structural Measures (Acquisition Relocation of Structures in Inundation Areas)	• Maintain dam at current configuration. • Acquire and/or relocate 1,199 residences and 178 commercial properties, including 1 preschool and a day camp within the breach inundation zone. • The affected municipalities are Middletown, Northampton, Langhorne, Lower Southampton, Bensalem, Hulmeville, and Bristol. • Prevent development in breach inundation area.	\$1,294,521,000	No	Exorbitant cost and Social Disruption
Non-Structural Measures (Floodproofing of Structures in Inundation Areas)	• Maintain dam at current configuration. • Construct 91,000 linear feet of levees and/or floodwalls. • Protect 928 residences and 123 commercial properties. • Acquire and/or relocate 271 residences and 55 commercial properties not protected by the levees and/or floodwalls. • The affected municipalities are Middletown, Northampton, Langhorne, Lower Southampton, Bensalem, Hulmeville, and Bristol. • Prevent development in breach inundation area.	\$427,459,000	No	Exorbitant cost and Social Disruption
			Choose an item.	

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D. National Economic Development (NED) Account

To open - RT click, select Worksheet Options, then Open to use this sheet	No Action	Rehabilitation
NED Benefits and Costs	Alt 1	Alt 2
Project Investment	\$2,891,000	\$6,192,000
NRCS		\$4,230,000
Sponsors	\$2,891,000	\$1,962,000
NED Plan3/		
Beneficial Annual		\$4,408,200
Adverse Annual		\$206,600
Net Beneficial	\$0	\$4,201,600
Benefit to Cost Ratio		21.3
Comparison of NED Benefits and Costs (Table 6) 4/	No Action	Rehabilitation
Agricultural Related		\$63,100
Non-Agricultural Related		\$254,600
Other - Cost Avoidance		\$88,300
Other Purpose - Recreation		\$3,369,700
Other Purpose - Municipal Water Supply		\$632,500
Other Purpose -		\$0
Total Benefits	\$0	\$4,408,200
Average Annual NED Costs (Table 4)	No Action	Rehabilitation
Amortized Installation	\$88,300	\$189,100
Other Direct Costs-		\$0
Operation, Maintenance, and Replacement		\$17,500
Total Adverse 5/	\$88,300	\$206,600
Average Annual Flood Damage Reduction (Table 5)	No Action	Rehabilitation
Agricultural		
Floodwater - Crop and Pasture		
Floodwater - Other Ag	\$99,300	\$36,200
Sediment and Erosion - Sediment		
Sediment and Erosion - Channel		
Other		
Sub-total Ag Damages	\$99,300	\$36,200
Non-Agricultural		
Floodwater - Urban	\$400,600	\$146,000
Other		
Indirect - Damage reduction benefit		
Sub-total Non-Ag Damages	\$400,600	\$146,000
Total Damages	\$499,900	\$182,200

ENTER ALL END NOTES (FOOTNOTES) FOR ABOVE TABLE IN SECTION L

3/ If NED plan is negative describe reasoning using NWPM 505.35B(1)(iv).

4/ Price Base 2018.

5/ Amortized over 85 years (82 years – service life and 3 years – implementation) at 2.75% discount rate.

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E. Regional Economic Development (RED) Account

The RED account was not evaluated in the plan since it was not identified as an issue during plan development.

F. Other Social Effects (OSE) Account

Record additional social effects of the alternatives to the human environment not covered in the P&G National Economic Development Account or in the NRCS-CPA-52.			
Resource Concerns (describe existing conditions)	No Action	Rehabilitation	
	Amount, Status, Description (Document both short and long term impacts)	Amount, Status, Description (Document both short and long term impacts)	Amount, Status, Description (Document both short and long term impacts)
Public Health and Safety	Choose an item.	Choose an item.	Choose an item.
See NRCS-CPA-52	See NRCS-CPA-52	See NRCS-CPA-52	
Floodplain Management	May Effect	May Effect	Choose an item.
- There are portions of the Core Creek project area that are located within FEMA's Flood Zone A. The one percent chance flood is the base flood. - Core Creek Dam reduces flood elevations downstream and reduces average annual flood damages by \$317,700.	- Residential, commercial and transportation resources will be a greater risk of flood damage. - Average annual flood damage reduction benefits of \$317,700 will be lost.	- Maintain flood damage reduction with an auxiliary spillway crest at the maximum reservoir elevation for one percent chance flood. - Increased capacity of auxiliary spillway outflows for floods exceeding one percent chance will have minimal change in impact from existing conditions as observed on maps for the 200-year and 500-year floods. - Average annual value estimated at \$317,700 plus \$98,900 of No-Action cost avoided.	
Parklands	May Effect	May Effect	Choose an item.
Core Creek Dam is located within Core Creek Park. Core	A controlled breach of the dam would result in	Temporary closure of sections of Core	

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Creek Park is administered by the Bucks County Department of Parks and Recreation. One other park downstream of Core Creek Dam and within the inundation zone include (Playwicki Park).	the draining of Lake Luxembourg, the current focal point of Core Creek Park. Playwicki Park downstream of Core Creek Dam would be at greater risk of flood damage.	Creek Park would be required during construction activities causing minor inconvenience to park users. Playwicki Park downstream of Core Creek Dam would retain its level of flood protection.	
Regional water resource plans	Choose an item.	Choose an item.	Choose an item.
See NRCS-CPA-52	See NRCS-CPA-52	See NRCS-CPA-52	
Recreation	May Effect	May Effect	Choose an item.
Annual recreation user days to Core Creek Park has increased through the years from approximately \$350,000 annually in the mid-eighties to more than \$1.2 million by 1992. The current estimate of annual recreation user days at Core Creek Park is assumed to have surpassed a value of over \$3.3 million. The park area is a significant portion of the remaining open space in Middletown Township with no nearby areas identified as possible replacements for the provided water-based recreation.	Water based recreation opportunities would be lost. Average annual benefits of \$3,347,100 will be lost.	Water based recreation opportunities would be maintained. Average annual recreation and municipal water supply benefits of \$3,894,800 will be maintained.	
Land Values	May Effect	May Effect	Choose an item.
- Some alternatives have the potential to effect land use. - Core Creek Dam was designed and constructed to prevent flood damage to the downstream areas. - Loss of the dam would adversely impact land use in the downstream benefit area.	- A controlled breach of Core Creek Dam would result in reduced land values in downstream benefit area. - Loss of Lake Luxembourg would result in decreased upstream private property land values that are associated with the scenic beauty provided by the lake.	- Rehabilitation of Core Creek Dam would result in maintained land values in downstream benefit area. - Rehabilitation of Core Creek Dam would not affect upstream private property land values.	

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	A controlled breach of Core Creek Dam would have no impact on upstream private property values that are not dependent on the scenic beauty relating to the lake.		
Groundwater/Sole Source Aquifer	Choose an item.	Choose an item.	Choose an item.
See NRCS-CPA-52	See NRCS-CPA-52	See NRCS-CPA-52	
Other: Public Water Supply	Choose an item.	Choose an item.	Choose an item.
The Lake Luxembourg was designed with 1,215 acre-feet of storage capacity for public water supply. This was an original PL83-566 authorized purpose of the dam.	Public water supply storage would be lost. Average annual municipal water supply benefits of \$628,300 will be lost.	Public water supply storage would be maintained. Average annual municipal water supply benefits of \$628,300 will be maintained.	

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G. Potential Modes, Parameters and Consequences of Failure

Modes of Dam Failure	Nonstorm Breach Reservoir Elev. (ft-NAVD88)	Peak Breach Discharge -cfs	Population at Risk	Potential
Stability	118.0	84,000	4,438	Low
Hydrologic	118.0	121,000	5,547	Medium
Seismic	111.9	65,000	2,774	Medium
Seepage	-	-	-	Low
Material Deterioration	-	-	-	Low
Other:				Choose an item.

Consequences and Other Notes:

Source: NRCS Evaluation of Potential Rehabilitation Projects, April 9, 2014.

CONSEQUENCES OF DAM FAILURE

Inundation due to dam failure potentially has the following consequences.

Loss of Life. The breach inundation study indicates that a dam failure may result in inundation of residential structures and transportation facilities. The estimated Population at Risk is 5,547 and the associated Failure and Risk Indexes respectively are 88 and 17,951. Each project sponsor application is assessed by a standardized ranking process that evaluates the condition of the dam and consequences of dam failure. This results in a "failure index" and "risk index" for each dam. NRCS funds only the highest ranked projects.

Release of Harmful Materials. Large volumes of sediment and eroded embankment material released to the stream would harm water quality, degrade aquatic habitat, and reduce downstream channel capacity. Further, the inundation area includes agricultural land uses that may store hazardous materials.

Infrastructure Destruction. Residential dwellings, fences, roads, bridges, public utilities, and farm equipment may be damaged or destroyed.

BREACH ASSUMPTIONS

The breach analysis used in this plan was provided by the PADEP, Division of Dam Safety. The breach analysis met all the PADEP, Division of Dam Safety's criteria and, provides an incremental breach analysis based on modeling of storage capacity and reservoir surface area for normal pool and maximum storage elevations. The peak breach discharge used for developing the inundation maps ranged from 96,223 cfs to 131,132 cfs using an incremental analysis. This exceeds the TR-60 upper bound condition of a 48,960 cfs minimum peak breach discharge considering dam embankments less than 103 feet tall. The hydrologic and hydraulic analyses were also approved by the PADEP. The NRCS State Conservation Engineer concurs with the high hazard classification assigned to this dam. The results of the breach were used to generate the flood inundation maps for the current Core Creek Dam Emergency Action Plan.

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H. Consultation, Coordination and Public Participation

Agency/Public Participation	Meeting/Contact	Date Complete	Site Visit	Date Complete
USFWS - ESA Sec 7/ Sec 12 PL -566	Letter	11/10/2016	No	N/A
USACE District – <i>Philadelphia District</i>	Other-Explain	Click here to enter a date.	No	N/A
PA Department of Conservation and Natural Resources	Other-Explain	6/29/2016	No	N/A
PA Game Commission	Other-Explain	6/29/2016	No	N/A
PA Fish and Boat Commission	Other-Explain	6/29/2016	No	N/A
PA Department of Environmental Protection, Division of Dam Safety	Other-Explain	8/10/2016	No	N/A
Commissioners of Bucks County	Public Meeting	10/20/2015	No	N/A
Monthly County Commission Meetings	Public Meeting	Monthly	No	N/A
Public Participation	Public Meeting	9/20/2016	No	N/A
Public Participation	Public Meeting	1/18/2017	No	N/A
Delaware River Basin Commission	Letter	10/26/2016	No	N/A
	Choose an item.	Click here to enter a date.	Choose an item.	Click here to enter a date.

Explanations:

NRCS, the Bucks County Board of Commissioners and members of the Project Team conducted a project kickoff meeting at the Bucks County General Services Office, 1265 Almshouse Rd, Doylestown, PA 18901, on October 20, 2015. Shortly after this meeting, a Public Participation Plan was prepared to serve as a guide for carrying out the activities related to consultation, coordination and public participation. The planning effort was conducted in close coordination with the PADEP's Bureau of Waterways Engineering Division of Dam Safety.

Public scoping open forums were conducted by the Bucks County Board of Commissioners at their regular meetings. The Bucks County Board of Commissioners received input, discussed problems and opportunities, and issued updates on progress. All meetings are open forums conducted in compliance with the Commonwealth of Pennsylvania Sunshine Act which requires public agencies to hold certain meetings and hearings open to the public.

The Project Team and NRCS met with the Bucks County Board of Commissioners at their regularly scheduled Work Session at the Bucks County Administration Building, 55 Court Street, Doylestown, PA 18901, on September 20, 2016. This meeting provided instruction and guidance on the project scope and the extent of activities required for developing the Supplemental Watershed Plan and Environmental Evaluation. The following topics were discussed:

- Problems and opportunities identified
- Sponsor objectives
- Alternatives considered
- Alternatives evaluated and comparison of effects

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The Project Team and NRCS met with the Bucks County Board of Commissioners at their regularly scheduled Commissioner Meeting at the Bucks County Administration Building, 55 Court Street, Doylestown, PA 18901, on January 18, 2017. This meeting provided additional review and update on the project scope and the extent of activities required for developing the Supplemental Watershed Plan and Environmental Evaluation. The Board of Commissioners agreed to move forward with the Rehabilitation Alternative.

The Sponsor allowed public input at all meetings prior to and during the planning process. The Draft Supplemental Watershed Plan Agreement No. 10 for Neshaminy Creek Watershed, Core Creek Dam (PA-620) was available upon request.

The following agencies and elected officials will receive the Draft Supplemental Watershed Plan Environmental Evaluation No. 10 Summary Sheet for Neshaminy Creek Watershed, Core Creek Dam (PA-620):

- Association of State Dam Safety Officials
- Bucks County Conservation District
- Bucks County Bureau of Environmental Health
- Bucks County Parks & Recreation Department
- Pennsylvania Department of Environmental Protection (PADEP) Division of Dam Safety, Bureau of Waterways, Engineering & Wetlands
- Delaware Valley Regional Planning Commission
- Delaware River Basin Commission
- Middletown Township Parks, Recreation & Community Service
- PA DEP Norristown Regional Office
- Pennsylvania Emergency Management Agency
- Pennsylvania Fish & Boat Commission
- Pennsylvania's Association of Floodplain Managers
- Pennsylvania's Governors Policy Office
- Pennsylvania Association of Soil Resource Conservation & Development Councils
- The Honorable John T. Galloway
- The Honorable Frank A. Farry
- The Honorable Tina M. Davis
- The Honorable Brian Fitzpatrick
- The Honorable Patrick Toomey
- The Honorable Robert B. Casey, Jr.
- USDA NRCS, Bucks County Field Office
- U.S. Fish & Wildlife Service, PA Ecological Services Field Office

No impacts to federally-listed species were identified within the Project study area based on the Pennsylvania Natural Diversity Inventory (PNDI) review. Consultation with U.S. Fish and Wildlife Service, as required by Section 12 of Public Law 83-566, was conducted and documented with correspondence dated November 10, 2016. No federally-listed Threatened or Endangered species were identified.

The PNDI online database was queried to determine if protected species or species proposed for protection ranged within the watershed. As documented in the NRCS-CPA-52 form, potential nesting habitat for the Eastern Redbelly Turtle, a threatened species in Pennsylvania, was identified by Pennsylvania Fish and Boat Commission (PFBC) in correspondence dated October 17, 2016. According to the correspondence, "the project site may contain accessible potential nesting habitat for the redbelly turtle, which occupies the lake above the dam. A survey to determine the use of the proposed work area by nesting redbelly turtles is recommended." Measures, as recommended by PFBC, will be implemented to avoid impacts to the redbelly turtle if the work area is determined to provide active nesting habitat. The correspondence from PFBC also stated, "Any drawdown to the lake could affect the redbelly turtle and will need to be reviewed in more detail. Drawdowns

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will have to take place during the active period of the redbelly turtle (April 15-October 15) in order to avoid stranding brumating turtles in the winter months, and enough water will need to remain in the lake to maintain sufficient habitat for the aquatic life therein. Please send more detailed project plans regarding the potential extent of any drawdowns associated with this project when they are available for our review.”

Based on the PNDI online database query, a permit for construction activities near Bald Eagle nests or a Bald Eagle Screening Form may be required from U.S. Fish and Wildlife Service. No other potential impacts were identified by the PNDI review.

According to correspondence received from Mr. John J. Krauter, Chief, Environmental and Geological Services Section, PADEP, dated November 17, 2016, “As presented, the project is considered a Non-Reporting Activity provided the impacts to "waters" at the site fall below the impact thresholds of the permit: less than one-half acre of impacts to waters and less than 250 linear feet of stream impacts; therefore, no further Section 404 permit coordination with the Corp is required at this time.”

As per the Pennsylvania State Programmatic General Permit (PASPGP-5) issued by the U.S. Army Corps of Engineers, the PADEP has been given the authority to review projects such as the Core Creek Dam (PA-620) for the Section 404 Clean Water Act requirements. Bucks County Board of Commissioners will be responsible for obtaining the necessary permits from the PADEP.

NRCS met with PA DEP Division of Dam Safety to discuss the proposed rehabilitation alternatives on August 10, 2016. This meeting provided instruction and guidance on the seven different rehabilitation alternatives and the extent of activities required for future permitting.

As required by the National Watershed Program Manual 502.42, a letter was sent to the Delaware River Basin Commission on October 26, 2016 to invite their coordination and review of this watershed project plan. No response was received.

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		NID Number:	PA00802	

Cultural Resources

Cultural Resources ^{7/}	Date
Literature Review conducted	11/20/2015
Pedestrian Survey conducted	9/19/2015
Consultation with State Historic Preservation Office	10/7/2016
Consultation with State Tribal Historic Preservation Office	Click here to enter a date.
Consultation with Tribes	Click here to enter a date.
Tribes Contacted: There are currently no federally recognized tribes in Pennsylvania.	
Cultural Resources Identified: Prior to construction of the dam, consultation with the State Historic Preservation Office (SHPO) determined that no archeological, historic, or cultural resources would be disturbed by the proposed dam construction. Since the dam was built in the footprint previously cleared for such resources, none of the proposed project alternatives pose a risk of impact to archeological or historic resources. A recent follow up review of the National Register of Historic Places website reconfirmed that while several historical sites are nationally listed for Bucks County, none occur in the area of potential effect for the Project. On October 7, 2016, the Pennsylvania Historical and Museum Commission confirmed there are no known archeological or historical sites in the area of potential effect.	
There are cultural resources downstream from the project site. There is one property on the National Historic Register and nine bridges of local historic significance within the project area. As concurred by PA-SHPO on 10/7/2016, the project will have no effect on cultural resources as no cultural resources are known in the proposed construction area. The preferred alternative will maintain reduction of flood damage to cultural resources downstream from the dam.	

^{7/} Consultation correspondence and agency letters reside in the administrative record file.

U.S. Department Agriculture Natural Resources Conservation Service May 2015 Watershed Rehabilitation Worksheet Sponsoring Local Organization(s): Bucks County Board of Commissioners Bucks County Administration Building 55 East Court Street Doylestown, PA 18901	Watershed:	Neshaminy Creek Watershed		
	County(s):	Bucks	State(s):	Pennsylvania
		Hydrologic Unit Code:	020402010303	
		Watershed Project Number:	422020	
		Watershed Site Number:	Core Creek Dam (PA-620)	
	NID Number:	PA00802		

I. Land Use in Drainage Area

Land Use/Resource Types	Existing Condition	No Action	Rehabilitation
To use Rt click, select Worksheet Object, then Open to enter data in Excel	Affect Area - acres		
Cropland	1403.52	810.09	810.09
Pasture and Rangeland	538.98	358.18	358.18
Forest	704.04	659.6	557.1
Farmstead			
Residential	1953.6	2301.7	2301.7
Commercial	1061.4	1634.5	1634.5
Transportation	59.4	59.4	59.4
Stream/channel *			
Lake/open water	216.7	114.2	216.7
Wetlands-herbaceous/fringe			
Wetlands-scrub/shrub			
Wetland - forested			
Other: Shrub/Scrub			
Other:			
Totals (Acres)**	5937.7	5937.7	5937.7
* Also indicate lengths (feet) in notes below. ** Totals will be red color until sum equals existing condition total.			
Notes: Stream length for Existing Condition and Rehabilitation - 30,873 feet Stream length for No Action - 39,916 feet			

U.S. Department Agriculture Natural Resources Conservation Service May 2015 Watershed Rehabilitation Worksheet Sponsoring Local Organization(s): Bucks County Board of Commissioners Bucks County Administration Building 55 East Court Street Doylestown, PA 18901	Watershed:	Neshaminy Creek Watershed		
	County(s):	Bucks	State(s):	Pennsylvania
		Hydrologic Unit Code:	020402010303	
		Watershed Project Number:	422020	
		Watershed Site Number:	Core Creek Dam (PA-620)	
	NID Number:	PA00802		

J. Risk and Uncertainty

Project risk and uncertainty primarily exist in the engineering and economics analyses of the Project alternatives. The Project Team based all preliminary designs and cost estimates on an additional 82 years of functional life plus 3 years for implementation using data from the as-built plans, available GIS data, recent topographic surveys, and bathymetry. Abbreviated geotechnical explorations were conducted, and the designs relied on minimal soil mechanics data from the original dam design, as-built plans, field observations and experience. Hydrologic data was measured using available GIS data, and field observations. Accuracy of the data impacts uncertainty of the reservoir operation levels, discharge capacities, breach inundation areas, flood damage area, design life, and structure function. Failure of the dam would most likely occur as a result of (1) breach of the embankment due to extreme storm events, or (2) a seismic event.

The Project Team used the Economics and Environmental Principles and Guidelines for Water and Related Land Resources Implementation Studies to account for flood control benefits associated with the alternatives. Predicting economic benefits by indexing of original benefits to current dollar values has uncertainty due to the older available data and the length of the timeframe for indexing. The economic analysis used an indexing approach to predict benefits. Uncertainty in the price of inputs, outputs, and the demand for agronomic crops produced will vary in the future. Consequently, the change in land value is the index that is most likely to reflect the value of preventing flood damage because changes in land value relates to the change in the land's use for various crops, which subsequently reflects the changes in price and productivity.

The benefits listed in Supplement 5 (1999 price base) for the Project were indexed to current dollars using applicable indexes. The scope of the study did not include re-evaluation or reconsideration of the original benefits, so the estimated average annual flood damage reduction benefits and intensification benefits may vary from those displayed.

Uncertainties with the analysis of environmental impacts lie with the identification of wetland areas, riparian habitat, and streams. Trained specialists identified environmentally-significant areas using standard, well-accepted protocols.

Within the context of this study, all alternatives were considered on a comparable basis. There does not appear to be any area that would have resulted in a different decision by using different procedures or conducting more intensive studies.

U.S. Department Agriculture Natural Resources Conservation Service May 2015 Watershed Rehabilitation Worksheet Sponsoring Local Organization(s): Bucks County Board of Commissioners Bucks County Administration Building 55 East Court Street Doylestown, PA 18901	Watershed:	Neshaminy Creek Watershed		
	County(s):	Bucks	State(s):	Pennsylvania
		Hydrologic Unit Code:	020402010303	
		Watershed Project Number:	422020	
		Watershed Site Number:	Core Creek Dam (PA-620)	
		NID Number:	PA00802	

K. List of Preparers

Name	Current Position - Years	Education	Experience (Years)	Applicable Certifications
NRCS				
Walter Hosea Latshaw, PE	State Conservation Engineer	BS Agricultural Engineering Pennsylvania State University	42 (retired effective 4/29/17)	
Heather L. Smeltz, PE	Civil Engineer/Cultural Resources Coordinator	BS Agricultural & Biological Engineering Pennsylvania State University MS Biological & Agricultural Engineering North Carolina State University	14	
Donald Murray	Agricultural Engineer	BS Agricultural Engineering Pennsylvania State University	38	
Tim Ridley, PE, PS	Dam Safety Engineer	BS Civil Engineering West Virginia University	38	
Jeff McClure, PG	Geologist	BA Biology, BA Geology, BS Geology West Virginia University	32	
Capital RC&D Council				
Jeffrey D. Mahood	Environmental Planning Specialist/Economist	BS Environmental Resource Management Pennsylvania State University	35	
KLA Environmental Services, Inc.				
Kevin L. Shamburg, PE	Project Administrator	BS Civil Engineering Kansas State University	38	
Frank C. Mercurio, PE	Senior Engineer	BS Environmental Resources Engineering Humboldt State University	39	
Elliott R. Harris, PE	Project Engineer	BS Fisheries and Wildlife Biology BS Agricultural Engineering Kansas State University	15	
Jarred D. Green, PE	Project Engineer	BS Civil Engineering Kansas State University	11	
Eldon R. Colson, Jr.	Project Technician	Natural Resources Hutchinson Community College	23	
Ramona V. Newsom	Technical Information Specialist	BS Business Administration Brown Mackie College	37	

U.S. Department Agriculture Natural Resources Conservation Service May 2015 Watershed Rehabilitation Worksheet Sponsoring Local Organization(s): Bucks County Board of Commissioners Bucks County Administration Building 55 East Court Street Doylestown, PA 18901	Watershed:	Neshaminy Creek Watershed		
	County(s):	Bucks	State(s):	Pennsylvania
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		Watershed Project Number:	422020	
		Watershed Site Number:	Core Creek Dam (PA-620)	
		NID Number:	PA00802	

Amec Foster Wheeler				
Timothy Dean, PE	Project Manager/Dam Engineer	BS Geography Pennsylvania State University M. EPC Soil Physics Pennsylvania State University	31	
Jeffery Wright, PE	Project Manager/H&H Engineer	BS Civil and Environmental Engineering Virginia Military Institute	20	
Mohamed Agnaou, PE	Dam Engineer	BS Civil and Environmental Engineering Temple University ME Water Resources Engineering Colorado State University	14	
James Barbis, PE, CFM	Senior Water Resource Engineer	BS, Sport Biology ME, Water Resources and Environmental Engineering Villanova University	6	
Douglas Tate, PE	Senior Geotechnical Engineer	BS Engineering, The University of Alabama in Birmingham	3	
Davide Motta, Ph.D.	H&H Modeler	Ph.D. Civil Engineering University of Illinois at Urbana-Champaign M.S. Civil Engineering University of Illinois at Urbana-Champaign Laurea (Equivalent to B.S. and M.S.) Environmental Engineering Politecnico di Milano, Italy	9	
Larry Sciple, PG	Project Geologist	BS Geology, The University of Tennessee MS Geology, Vanderbilt University	41	
Dan Bolender, PLS	Surveyor	B.Sc. Petroleum Engineering, University of Wyoming	29	
Todd Hunter, LIT	Surveyor	Associate of Applied Science, Architecture and Civil Engineering Technology, Central Maine Technical College	24	
Steven Mazza	Engineering Technician	BA History Franciscan University of Steubenville	15	
Sarah Dickert	Engineering Technician / GIS Analyst	BS Civil Engineering, Bucknell University	2	
Ashley Husted	Environmental Scientist	BS Environmental Studies, Minor in Biology Ursinus College	8	

U.S. Department Agriculture Natural Resources Conservation Service May 2015 Watershed Rehabilitation Worksheet Sponsoring Local Organization(s): Bucks County Board of Commissioners Bucks County Administration Building 55 East Court Street Doylestown, PA 18901	Watershed:	Neshaminy Creek Watershed		
	County(s):	Bucks	State(s):	Pennsylvania
		Hydrologic Unit Code:	020402010303	
		Watershed Project Number:	422020	
		Watershed Site Number:	Core Creek Dam (PA-620)	
	NID Number:	PA00802		

Ghazoll Motlagh, EIT, CFM	Engineering Technician	BS Civil Engineering –Water Resources Pennsylvania State University	9	
Brian Sariano	Environmental Scientist	BA in Geoenvironmental Science Shippensburg University	28	
Jennifer Poole, GIT	Project Geologist	BS-Environmental Science, University of North Carolina at Chapel Hill MS- Geological Sciences, University of Missouri-Columbia	7	
Nathan Long, PE, PG	Senior Geotechnical Engineer	BS Geological Engineering, The University of Mississippi	14	
Nathan Walker, AICP	Senior Water Resources Planner	BS-BS Earth and Environmental Sciences MS Community and Regional Planning - Temple University	19	

L. Additional Notes and Comments

Notes for Section A: - Sediment storage in the reservoir area is provided for 90 years based on the available storage and future sedimentation rate. This was determined by calculating the pool volume available to store sediment (i.e. not municipal water supply storage) from the 2013 bathymetric survey (166 acre-feet sediment pool volume ÷ 1.83 acre-feet/year future submerged sedimentation rate = 90 years useable sediment pool life remaining.) An 82-year project life for rehabilitation will be used based on that 90 years subtracting the five years that have passed since the bathymetric survey and three years of implementation for the rehabilitation work. The sediment pool life could be extended if dredging is performed or municipal water supply storage volume is reallocated to that purpose. Dredging is traditionally one of the most expensive ways to achieve additional sediment storage. The sponsor identified the need for the existing municipal water supply storage, an original PL82-566 purpose of Core Creek Dam. Notes for Section B: - Bucks County Board of Commissioners identified maintaining and providing the availability of the public water supply as an original PL83-566-authorized and current purpose and need for the Core Creek Dam. While the reservoir storage volume originally allocated to water supply is not currently being utilized, it is expected to be used in the future. Considerations during planning of reallocating water supply volume for other purposes were dismissed due to the negative impact that would be had on the recreation pool, no resulting cost savings for the alternatives from a reallocation, and unknown future costs of restoring the lost municipal water supply storage. Notes for Table A: - The horizontal datum was based on the North American Datum of 1983 (NAD83) using the Pennsylvania State Plane coordinate system, North Zone. The vertical datum is the National Geodetic Vertical Datum of 1929 (NGVD29) and is based on the principal spillway 60-inch diameter pipe invert and corresponding elevations on the inlet and outlet structures as depicted on as-built plans entitled "Neshaminy Creek Watershed, Multiple Purpose Dam PA-620, Bucks County, Pennsylvania", dated March 1971, Sheet No.17. NGVD 29 elevations may be converted to NAVD 88 by applying a -1.024 feet datum shift.
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U.S. Department Agriculture Natural Resources Conservation Service		May 2015	
Watershed Rehabilitation Worksheet		Watershed:	Neshaminy Creek Watershed
Sponsoring Local Organization(s):		County(s):	Bucks
Bucks County Board of Commissioners Bucks County Administration Building 55 East Court Street Doylestown, PA 18901		State(s):	Pennsylvania
		Hydrologic Unit Code:	020402010303
		Watershed Project Number:	422020
		Watershed Site Number:	Core Creek Dam (PA-620)
		NID Number:	PA00802

- Time of concentration for Existing is computed to the upstream end of Lake Luxembourg, and travel time through the water body is ignored per TR-55 guidance. No Federal Action Alternative is computed to the upstream end of Lake Luxembourg, and travel time through the water body is treated as a channelized flow since stream restoration is considered after removing the dam.
- The rehabilitation alternative has a structural auxiliary spillway that is resistant to erosion, so the stability design hydrograph (SDH) was not evaluated.
- Bathymetry and sedimentation rates are based on the 1964 Reservoir Sedimentation Design Summary (Form NRCS-ENG-309) and the Princeton Hydro (Reference 1) bathymetric assessment of Lake Luxembourg completed in May 2013. The assessment measured water depths, sediments thickness, and sediment physical and chemical characteristics.

U.S. Department Agriculture Natural Resources Conservation Service	May 2015	Watershed: Neshaminy Creek Watershed	
Watershed Rehabilitation Worksheet		County(s): Bucks	State(s): Pennsylvania
Sponsoring Local Organization(s):		Hydrologic Unit Code: 020402010303	
Bucks County Board of Commissioners Bucks County Administration Building 55 East Court Street Doylestown, PA 18901		Watershed Project Number: 422020	
		Watershed Site Number: Core Creek Dam (PA-620)	
		NID Number: PA00802	

Table 2 - Estimated Cost Distribution

Item Description	Installation Costs - Public Law 83-566 1/						Installation Costs - Other Funds 1/								Total Installation Cost
	Construction 3/	Engineering	Real Property Rights	Relocat Payments	Project Admin	Total Federal Cost	Construction 3/	Engineering 4/ 5/	Real Property Rights	Natural Resource Rights	Relocat Payments	Required Permits	Project Admin 2/	Total Non- Federal Cost	
Rehabilitation of dam	\$3,642,900	\$451,600	\$0	\$0	\$135,500	\$4,230,000	\$1,956,500	\$0	\$0	\$0	\$0	\$1,000	\$5,000	\$1,962,500	\$6,192,500
1/ Price Base:															Jun-2017
2/ Includes	\$0	for relocation assistance advisory service													
3/ Includes	\$0	of PL-566 funds and \$0 of non-federal funds for cultural resource protection and mitigation measures													
4/ Includes	\$0	for real property costs for mitigation													
5/ Includes	\$0	for surveys, legal fees, and other costs													

Watershed Rehabilitation Worksheet

Sponsoring Local Organization(s):

Bucks County Board of Commissioners
Bucks County Administration Building
55 East Court Street
Doylestown, PA 18901

Watershed:	Neshaminy Creek Watershed		
County(s):	Bucks	State(s):	Pennsylvania
Hydrologic Unit Code:		020402010303	
Watershed Project Number:		422020	
Watershed Site Number:		Core Creek Dam (PA-620)	
NID Number:		PA00802	

Table A – Comparison of Structural Options

Item	Unit	Existing	Alt 1 No Fed Action	Alt 2 Rehab Option A		
Preferred Alternative	-	-	☒	☒	☒	☒
Class of structure	-	High	N/A	High		
Seismic zone	-	1	1	1		
Uncontrolled drainage area	mi ²	9.28	9.28	9.28		
Controlled drainage area	mi ²	-	-	-		
Total drainage area	mi ²	9.28	9.28	9.28		
Runoff curve No. (1-day) (AMC II)	number	82.4	82.4	82.4		
Time of concentration (Tc)	hrs.	3.87	4.87	3.87		
Elevation top of dam ^{1/}	ft.	118.0 ^{4/}	N/A	118.00 ^{4/}		
Elevation crest auxiliary spillway	ft.	111.9 ^{4/}	N/A	112.90 ^{4/}		
Elevation crest high stage inlet	ft.	102.5 ^{4/}	N/A	102.5 ^{4/}		
Elevation crest low stage inlet	ft.	89.0 ^{4/}	N/A	89.0 ^{4/}		
Assumed hydrologic breach elevation	ft.	118.0 ^{4/}	N/A	118.0 ^{4/}		
Assumed static breach elevation	ft.	118.0 ^{4/}	N/A	118.0 ^{4/}		
Assumed seismic breach elevation	ft.	111.9 ^{4/}	N/A	111.9 ^{4/}		
Auxiliary spillway type	type	Earth	N/A	Labyrinth Weir		
Auxiliary spillway bottom width	ft.	550	N/A	550 ^{5/}		
Auxiliary spillway exit slope	percent	2.8	N/A	N/A		
Length of dam	ft.	825	N/A	825		
Maximum height of dam	ft.	47	N/A	47		
Volume of fill	yd ³	123,000	N/A	146,800		
Total capacity ^{2/}	acre ft.	3,564.6	N/A	3,895.5		
Sediment submerged	acre ft.	166	N/A	166		
Sediment aerated	acre ft.	24.3	N/A	24.3		
Sediment life remaining	years	90	N/A	90		
Beneficial use (identify use)	acre ft.	1,215, Water Supply	N/A	1,215 Water Supply		
Floodwater retarding	acre ft.	2,159.3	N/A	2,490.2		
Between high and low stage	acre ft.	N/A	N/A	N/A		
Surface area						
Sediment pool ^{2/}	acres	41.24	N/A	41.24		
Beneficial use pool (identify use)	acres	178.89 Recreation	N/A	178.89 Recreation		
Floodwater retarding pool ^{3/}	acres	310.45	N/A	330.66		

U.S. Department Agriculture Natural Resources Conservation Service Watershed Rehabilitation Worksheet Sponsoring Local Organization(s): Bucks County Board of Commissioners Bucks County Administration Building 55 East Court Street Doylestown, PA 18901	Watershed:	Neshaminy Creek Watershed		
	County(s):	Bucks	State(s):	Pennsylvania
		Hydrologic Unit Code:		020402010303
		Watershed Project Number:		422020
		Watershed Site Number:		Core Creek Dam (PA-620)
	NID Number:		PA00802	

Table A – Comparison Table of Structural Options (cont.)						
Principal spillway design						
Item	Unit	Existing	Alt 1 No Fed Action	Alt 2 Rehab Option 5		
Rainfall volume (1-day)	in	8.04	N/A	8.04		
Rainfall volume (10-day)	in	11.82	N/A	11.82		
Runoff volume (10-day)	in	5.00	N/A	5.00		
Capacity of low stage (max.)	ft ³ /s	588.7	N/A	575.6		
Capacity of high stage (max.)	ft ³ /s	N/A	N/A	N/A		
Dimensions of conduit	in	60	N/A	60		
Type of conduit	-	RCP	N/A	RCP		
Frequency of operation of auxiliary	%	<1	N/A	1		
Auxiliary spillway hydrograph						
Rainfall volume	in	11.05	N/A	See L		
Runoff volume	in	8.84	N/A	See L		
Storm duration	hrs.	6	N/A	See L		
Velocity of flow (Ve)	ft./s	13.10	N/A	See L		
Max. Reservoir water surface elev.	ft.	114.83 ^{4/}	N/A	See L		
Freeboard hydrograph						
Rainfall volume	in	34.82	N/A	34.82		
Runoff volume	in	32.38	N/A	32.38		
Storm duration	hrs.	24	N/A	24		
Max. Reservoir water surface elev.	ft.	119.79 ^{4/}	N/A	116.75 ⁴		
Capacity equivalents (watershed inches)						
Sediment volume	in	0.38	N/A	0.38		
Floodwater retarding volume	in	4.36	N/A	5.03		
Beneficial volume (identify use)	in	2.46 Recreation, Water Supply	N/A	2.46 Recreation, Water Supply		
^{1/} All elevations are to be recorded in North American Vertical Datum 1988 (NAVD88).						
^{2/} If reservoir contains beneficial storage or if sediment capacity will not store water, show area in parenthesis and footnote accordingly in Section L.						
^{3/} Crest of auxiliary spillway.						
^{4/} All Elevations recorded in National Geodetic Vertical Datum of 1929 (NGVD29). Disregard Footnote 1, above. See Section L for explanation and conversion.						
^{5/} The total length of the labyrinth weir crest, within the 550-foot wide auxiliary spillway, is 2,160 feet.						

Appendix A

COMMENTS AND RESPONSES

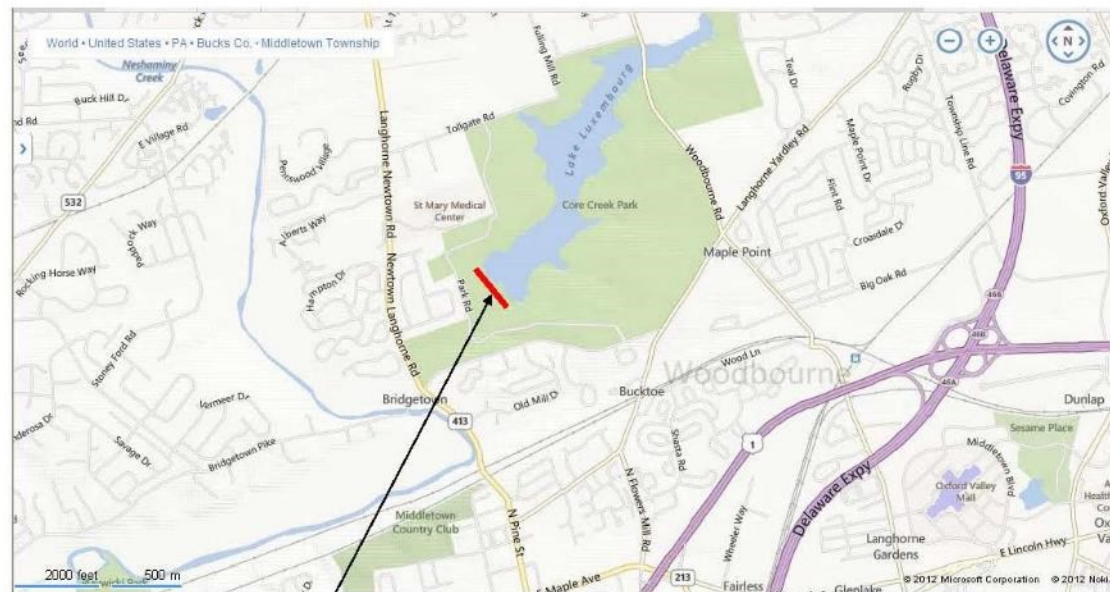
This activity is Categorically Excluded under the provisions of NEPA. Public and interagency input was received during project planning as described in Consultation, Coordination, and Public Participation. No comments were received on the draft document.

Appendix B

PROJECT MAP

Figure B-1 Project Location Map Core Creek Dam (PA-620)

Bucks County, PA



NID ID: PA00802 (PA-620)

Figure B-2
Project Watershed Map
Core Creek Dam (PA-620)

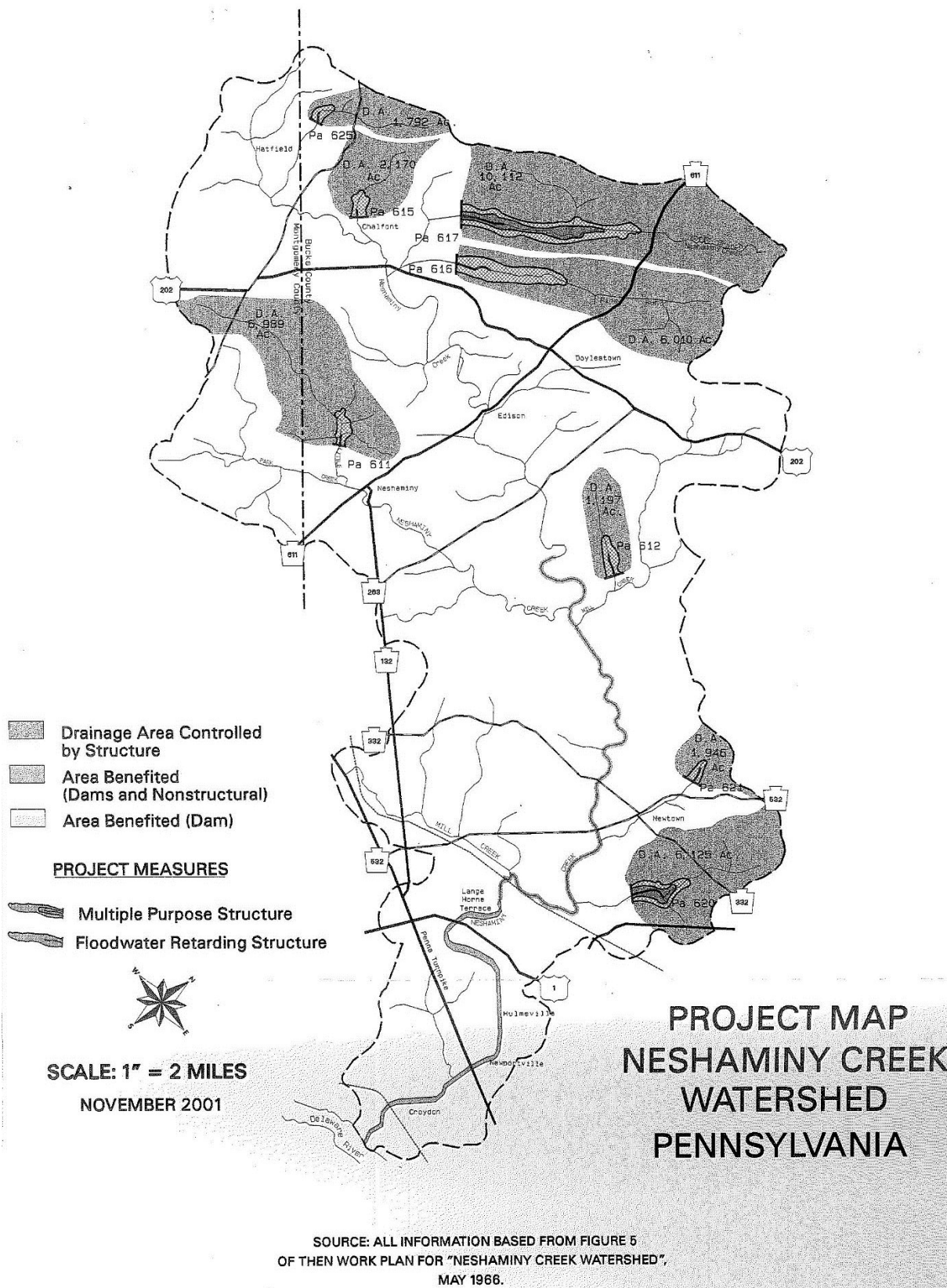
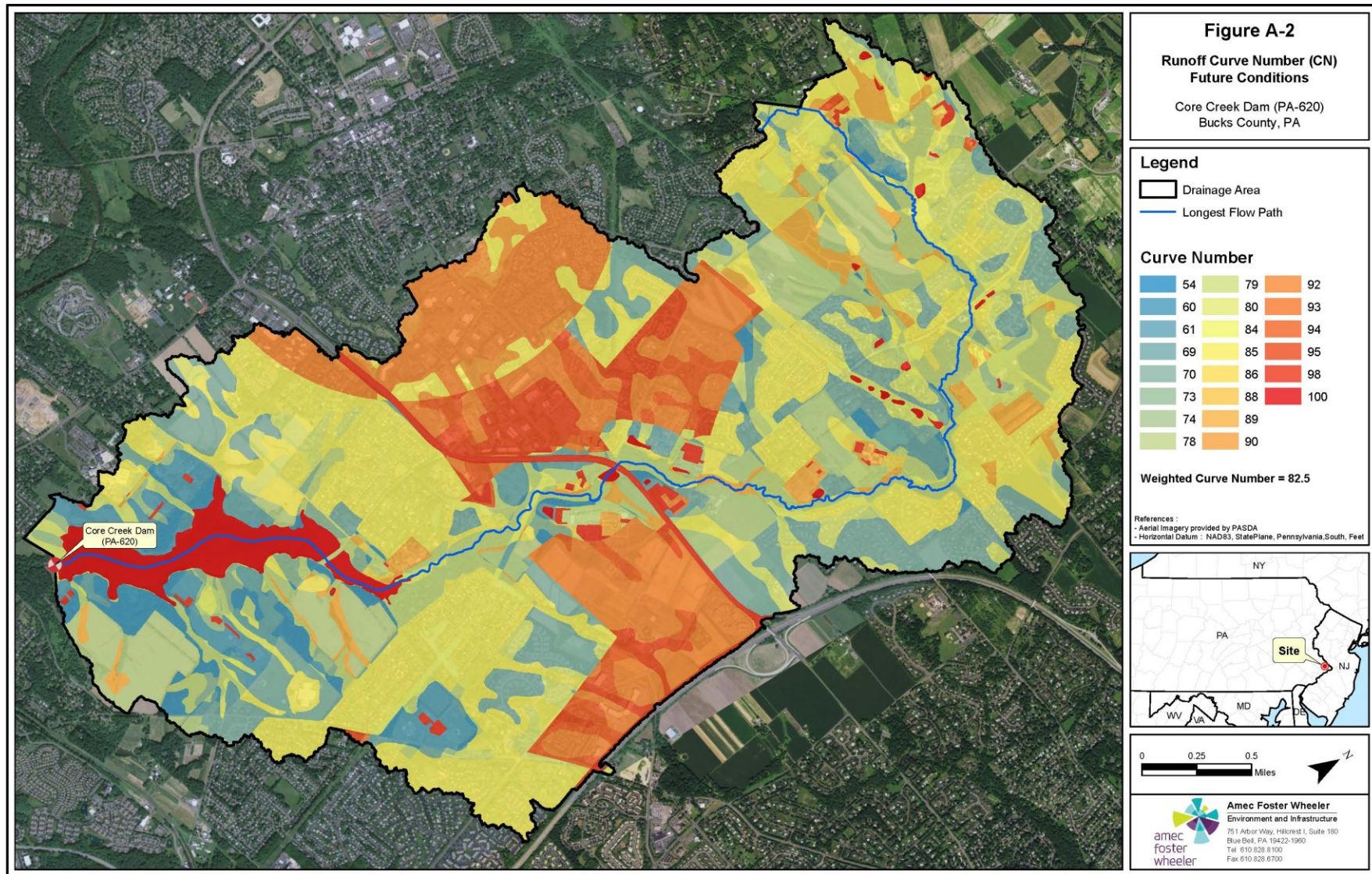


Figure B-3
Runoff Potential from Future Land Use in Drainage Area
Core Creek Dam (PA-620)



Appendix C

SUPPORT MAPS

Figure C-1
Core Creek Dam (PA-620) Rehabilitation Alternative Plan View

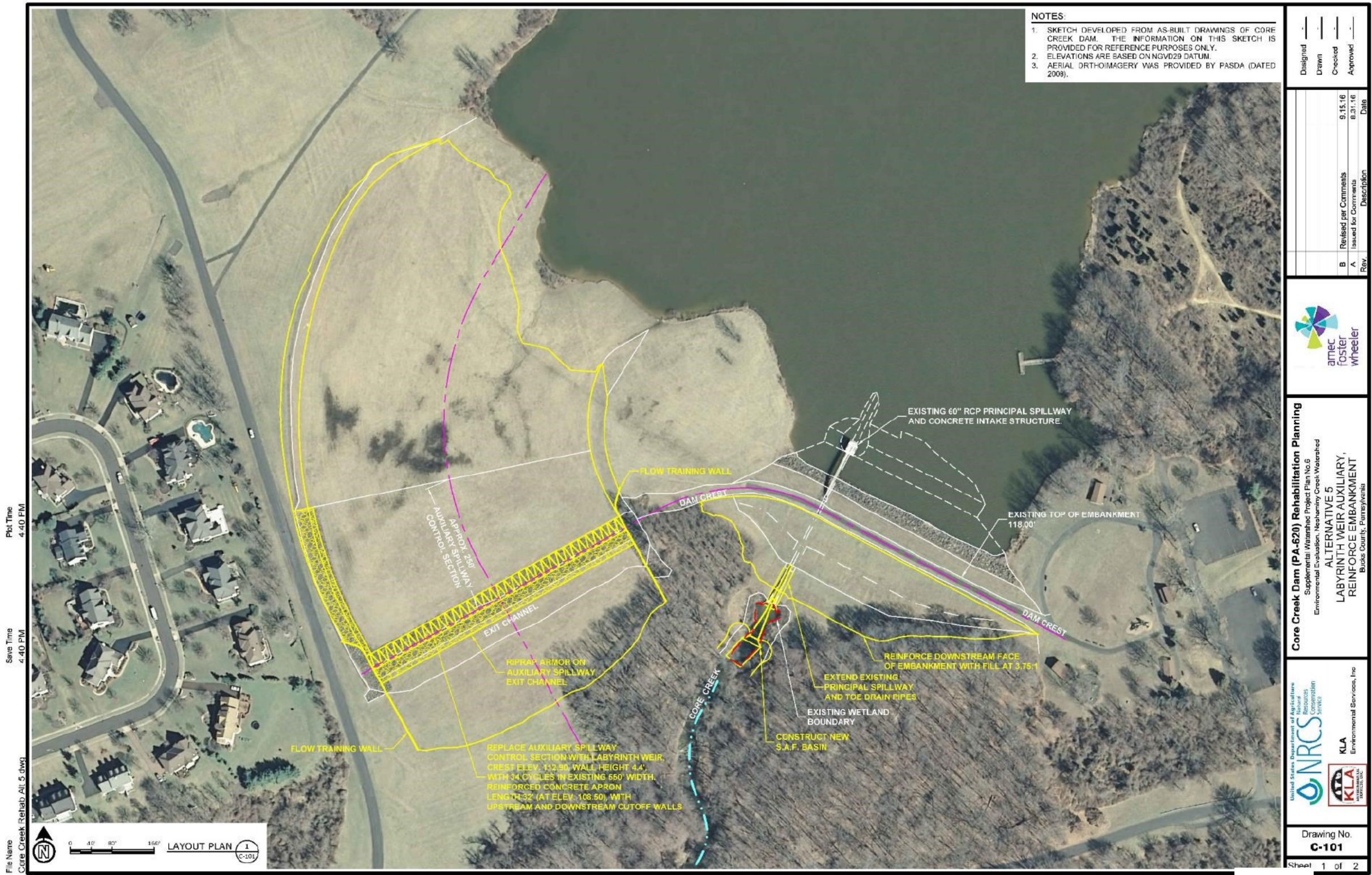


Figure C-2
Core Creek Dam (PA-620) Rehabilitation Alternative Profile View

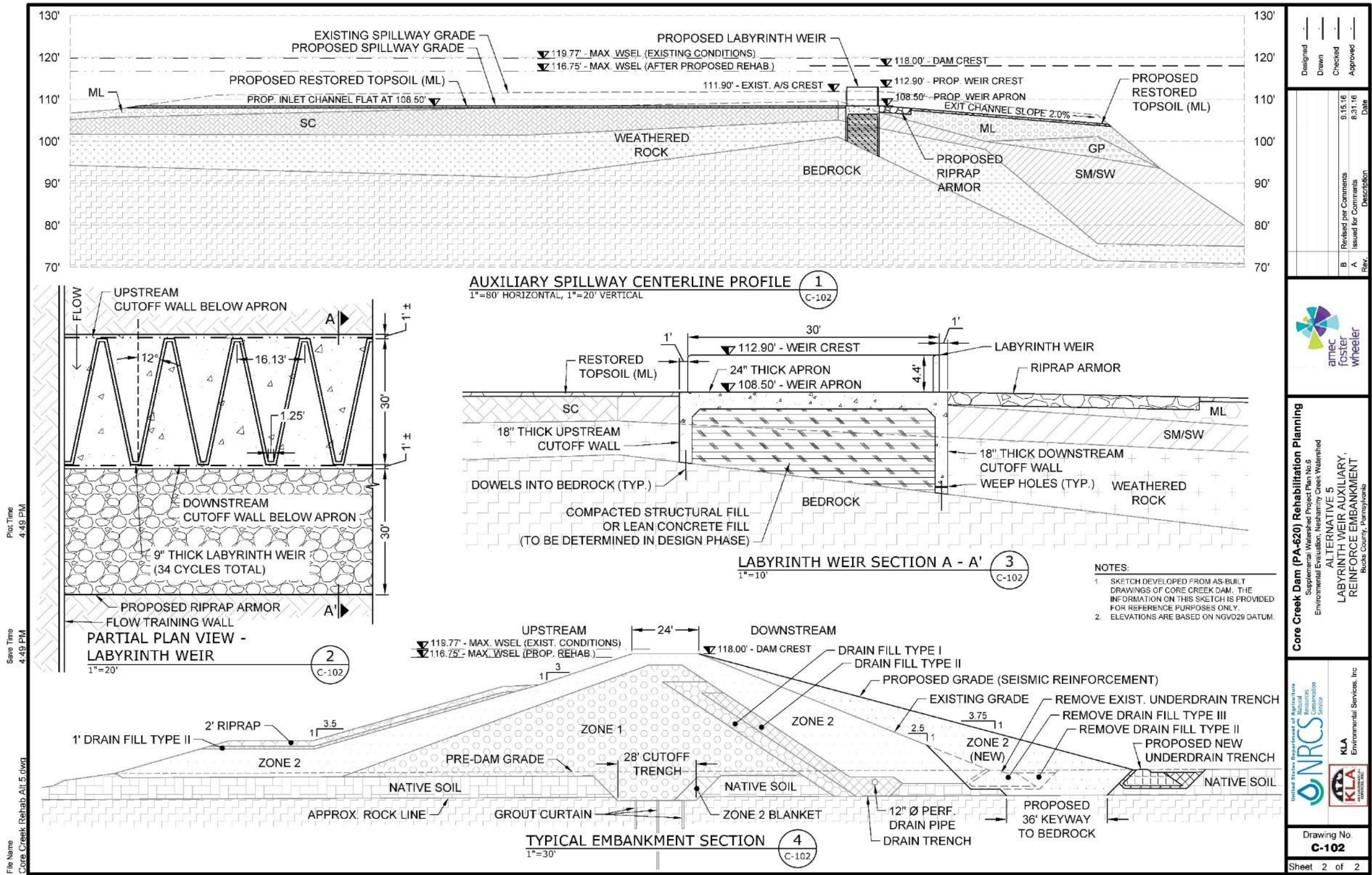


Figure C-3
Core Creek Dam (PA-620) Future Without Federal Project Alternative Plan View

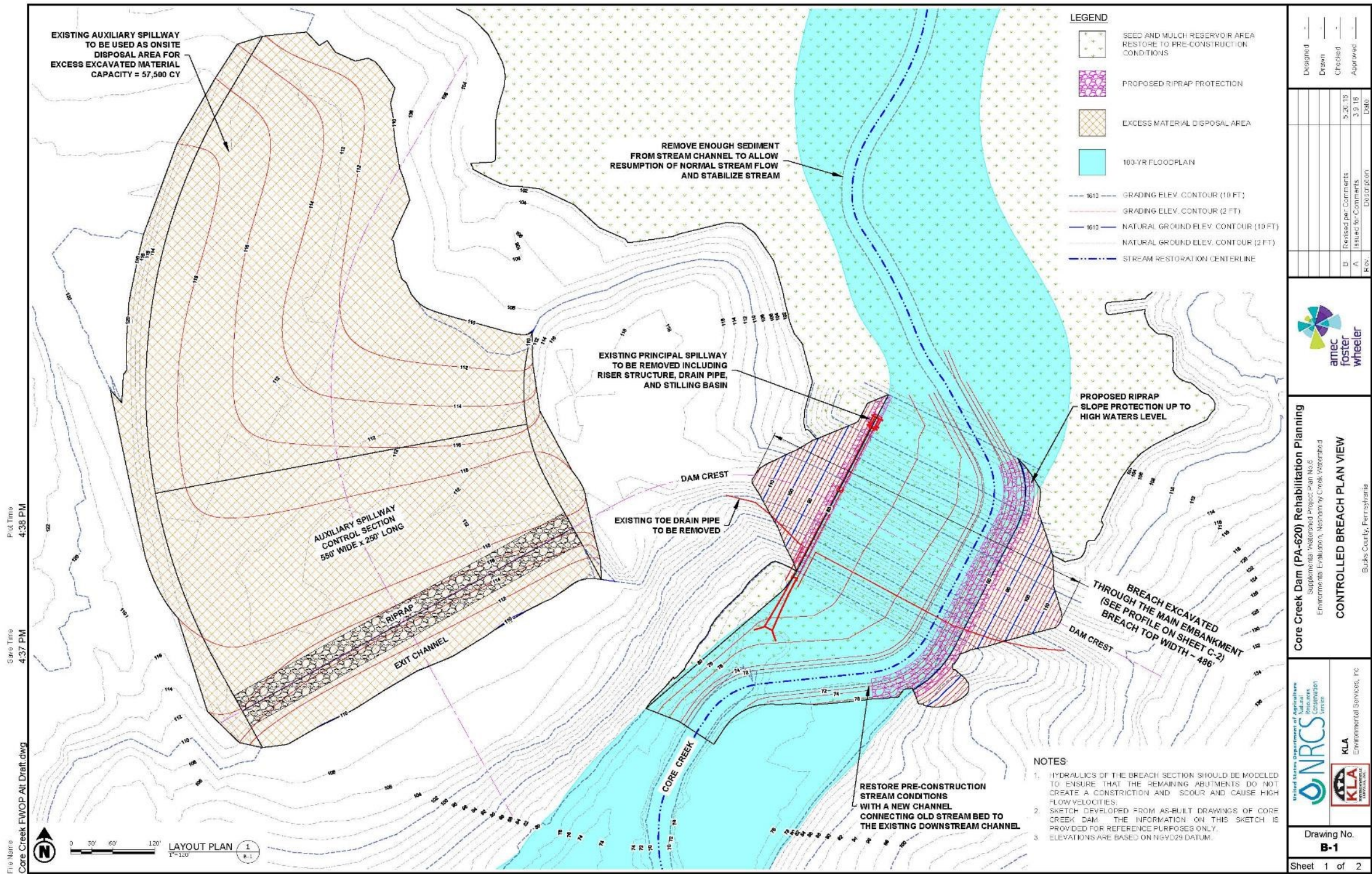


Figure C-4
Core Creek Dam (PA-620) Future Without Federal Project Alternative Profile View

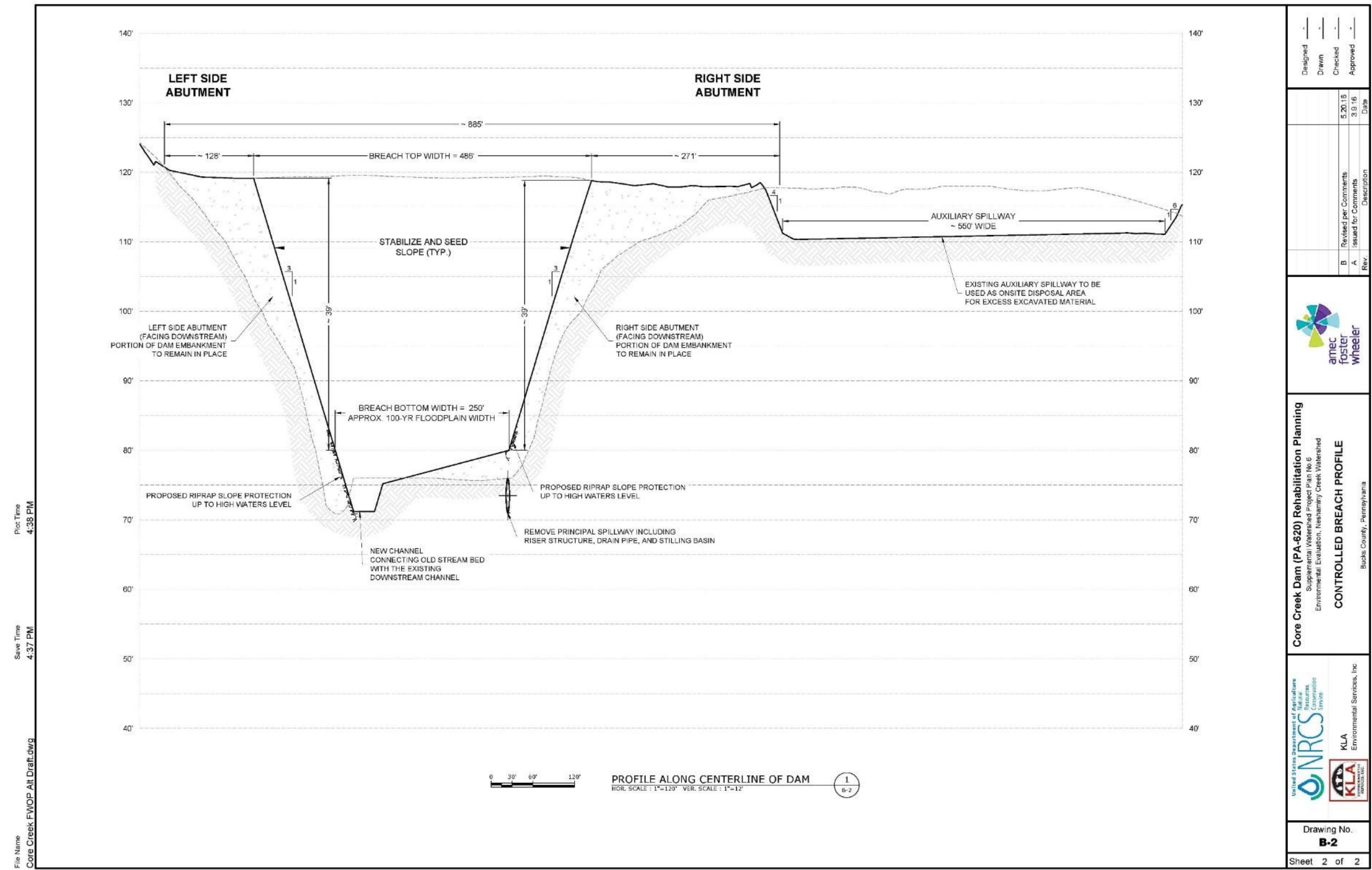


Figure C-5
Core Creek Dam (PA-620) Decommissioning Alternative Plan View

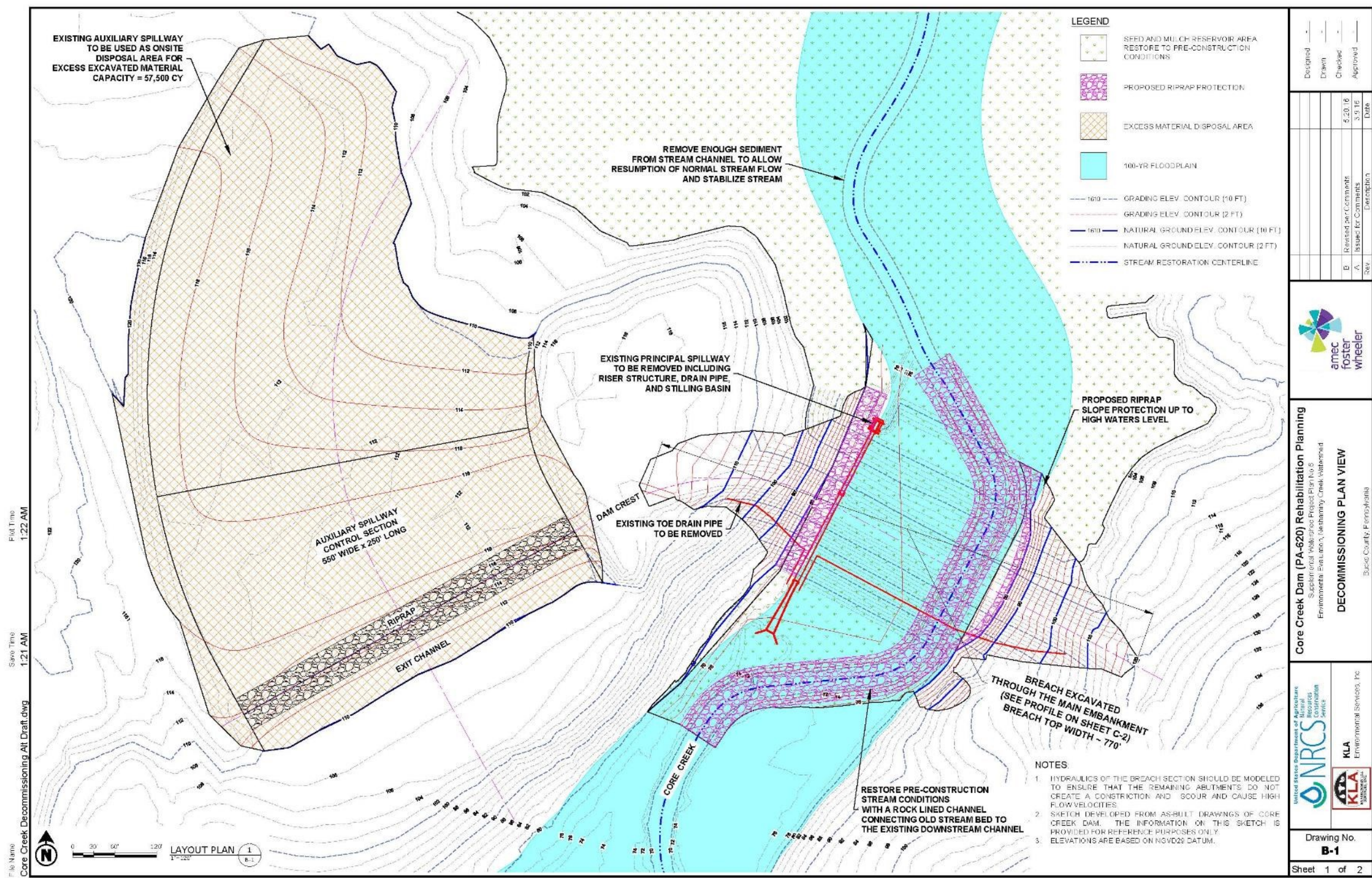


Figure C-6
Core Creek Dam (PA-620) Decommissioning Alternative Profile View

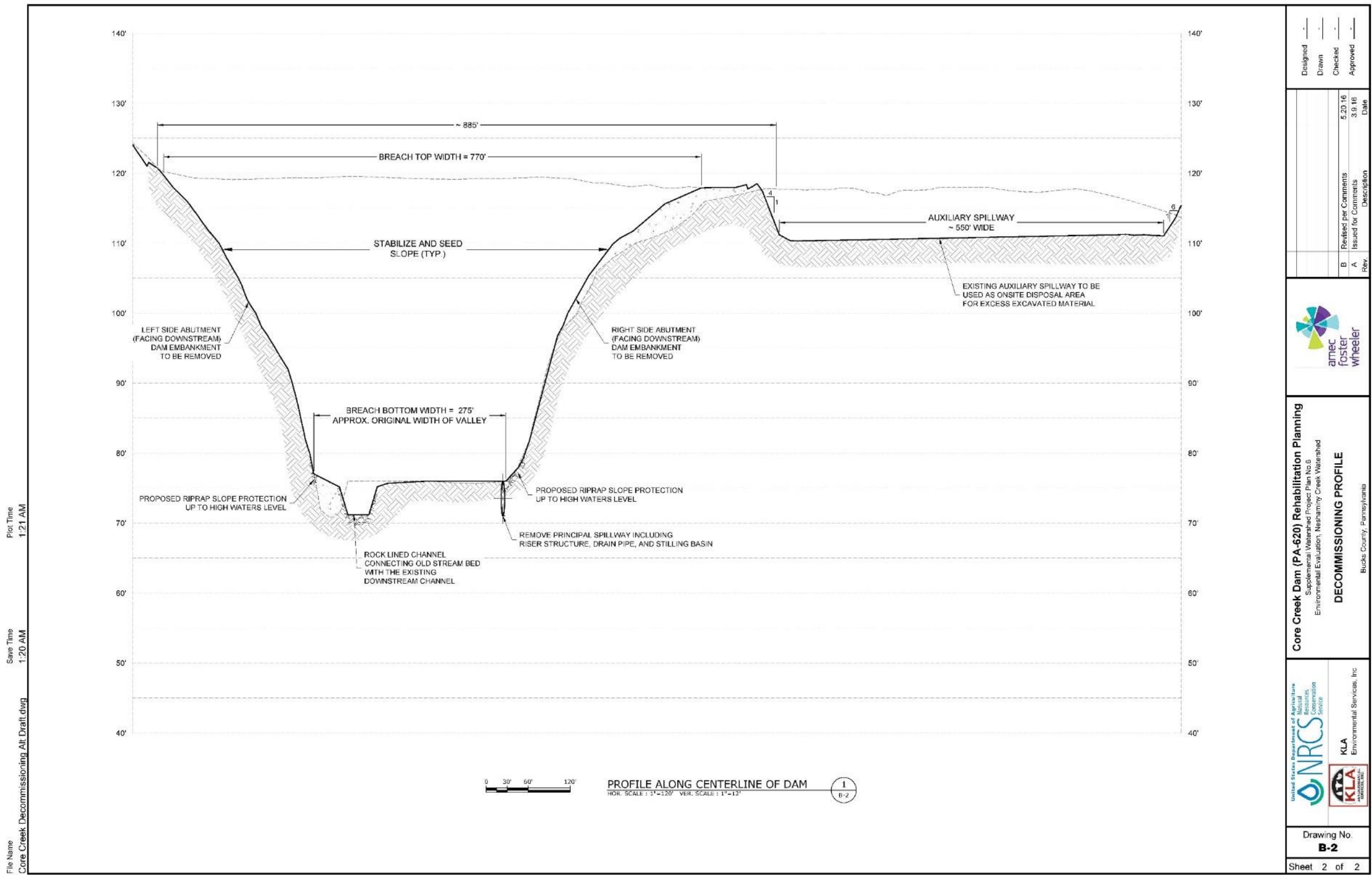


Figure C-7
Core Creek Dam (PA-620) Wetlands Map



Figure C-8A
Core Creek Dam (PA-620) Breach Inundation Map



Figure C-8B
Core Creek Dam (PA-620) Breach Inundation Map

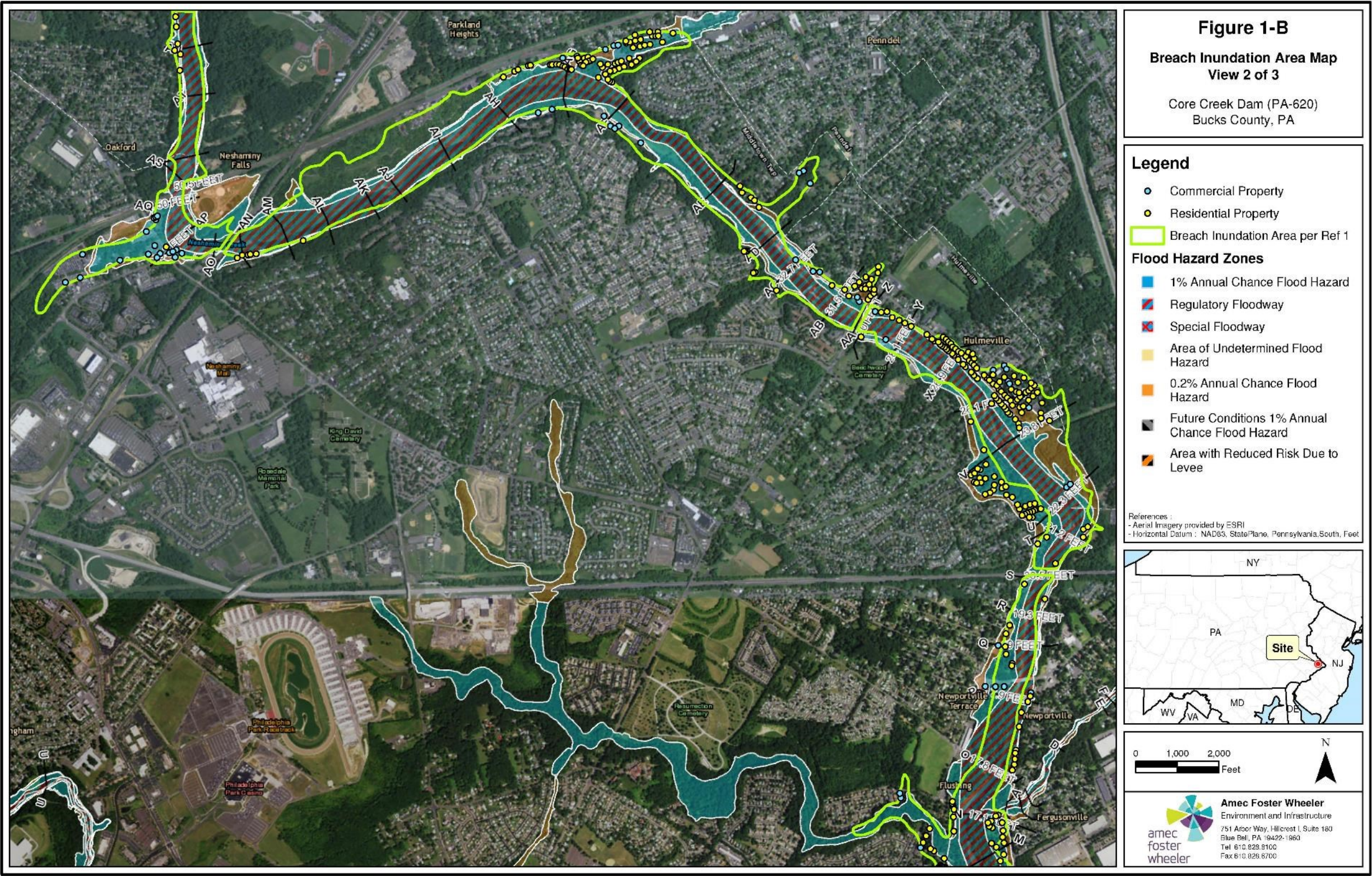


Figure C-8C
Core Creek Dam (PA-620) Breach Inundation Map

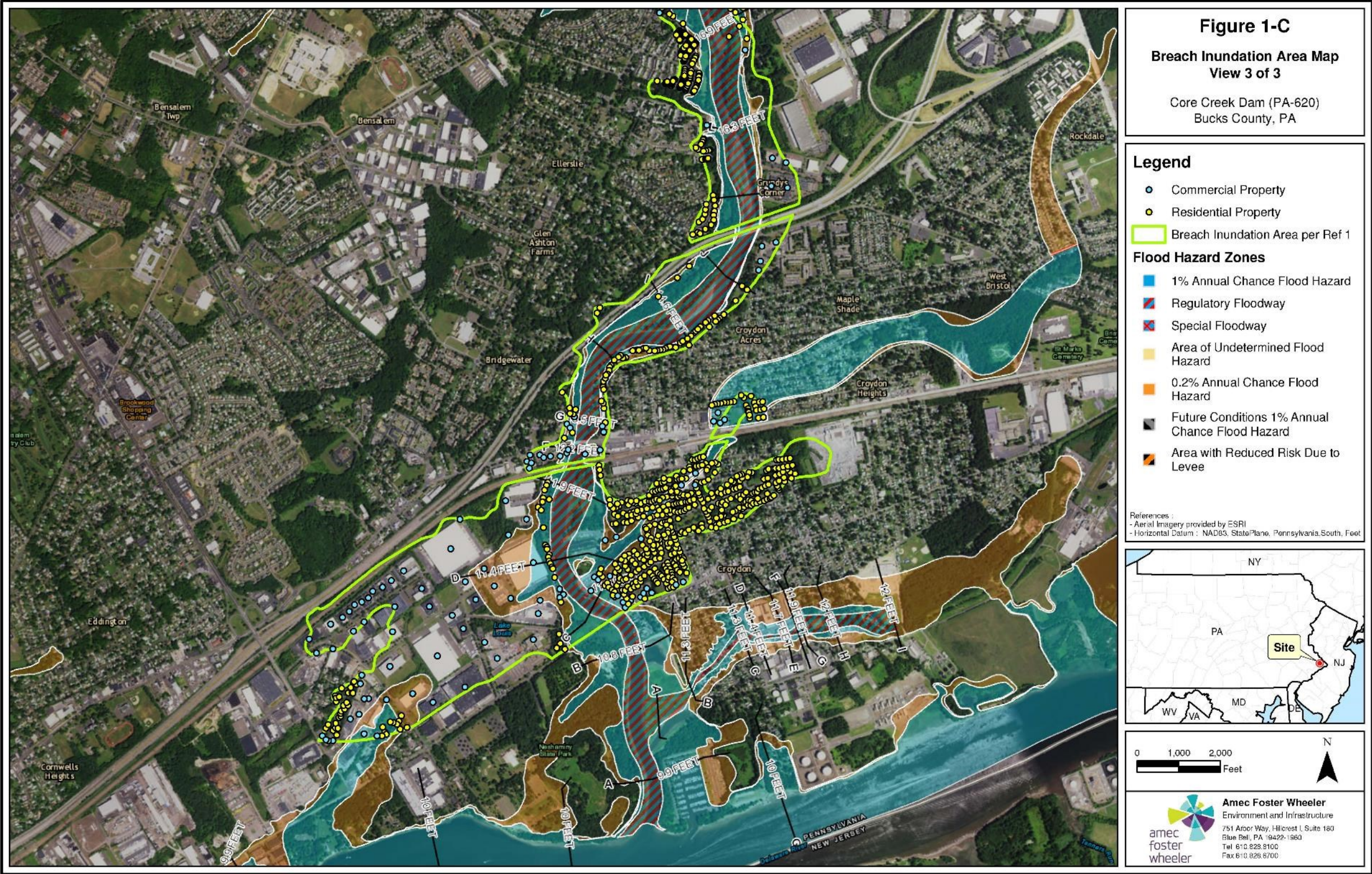


Figure C-9
Core Creek Dam (PA-620) FEMA Map

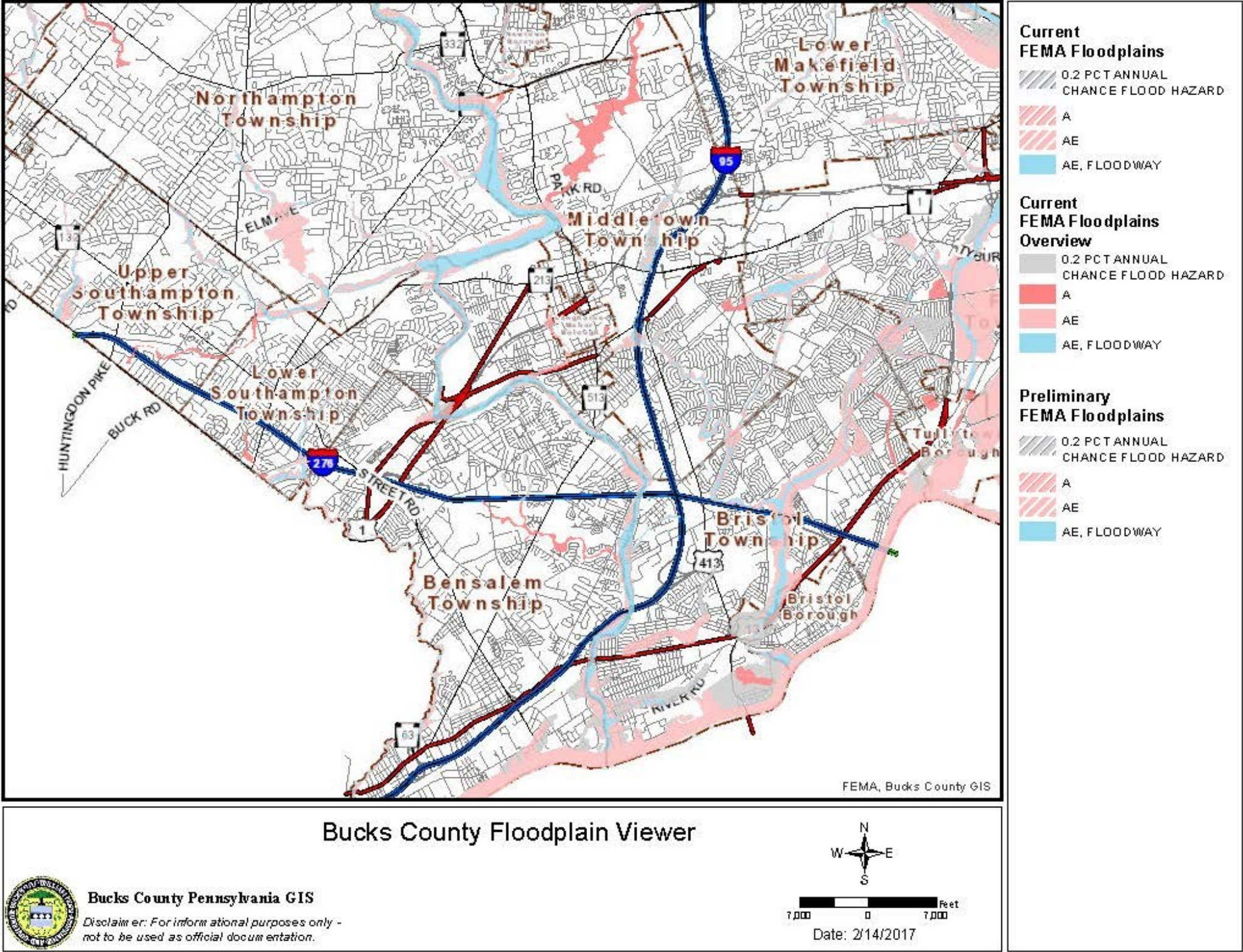


Figure C-10A
Core Creek Dam (PA-620) Existing and Rehabilitation Frequency Flood – 100-Year

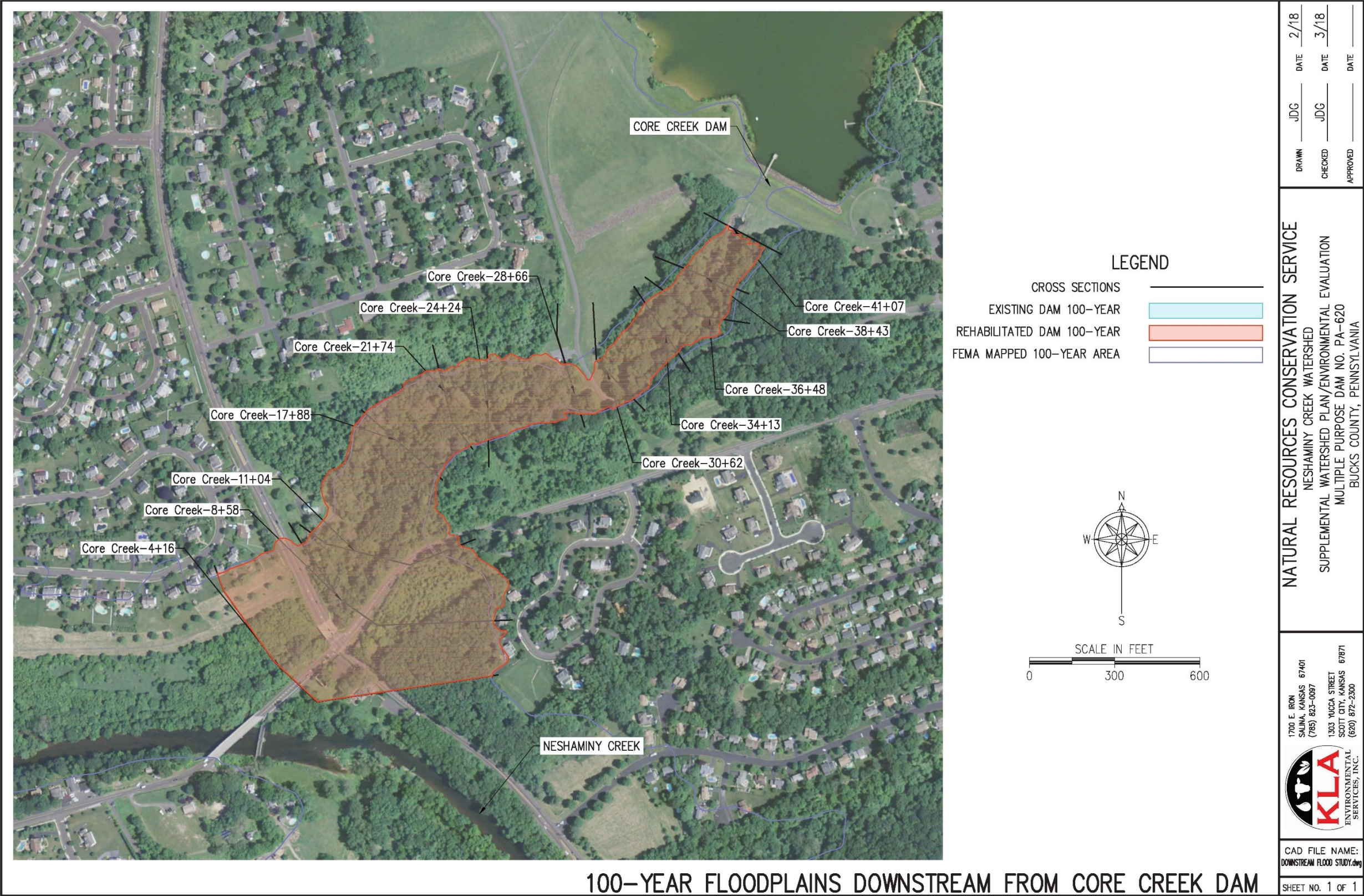


Figure C-10B
Core Creek Dam (PA-620) Existing and Rehabilitation Frequency Flood – 200-Year

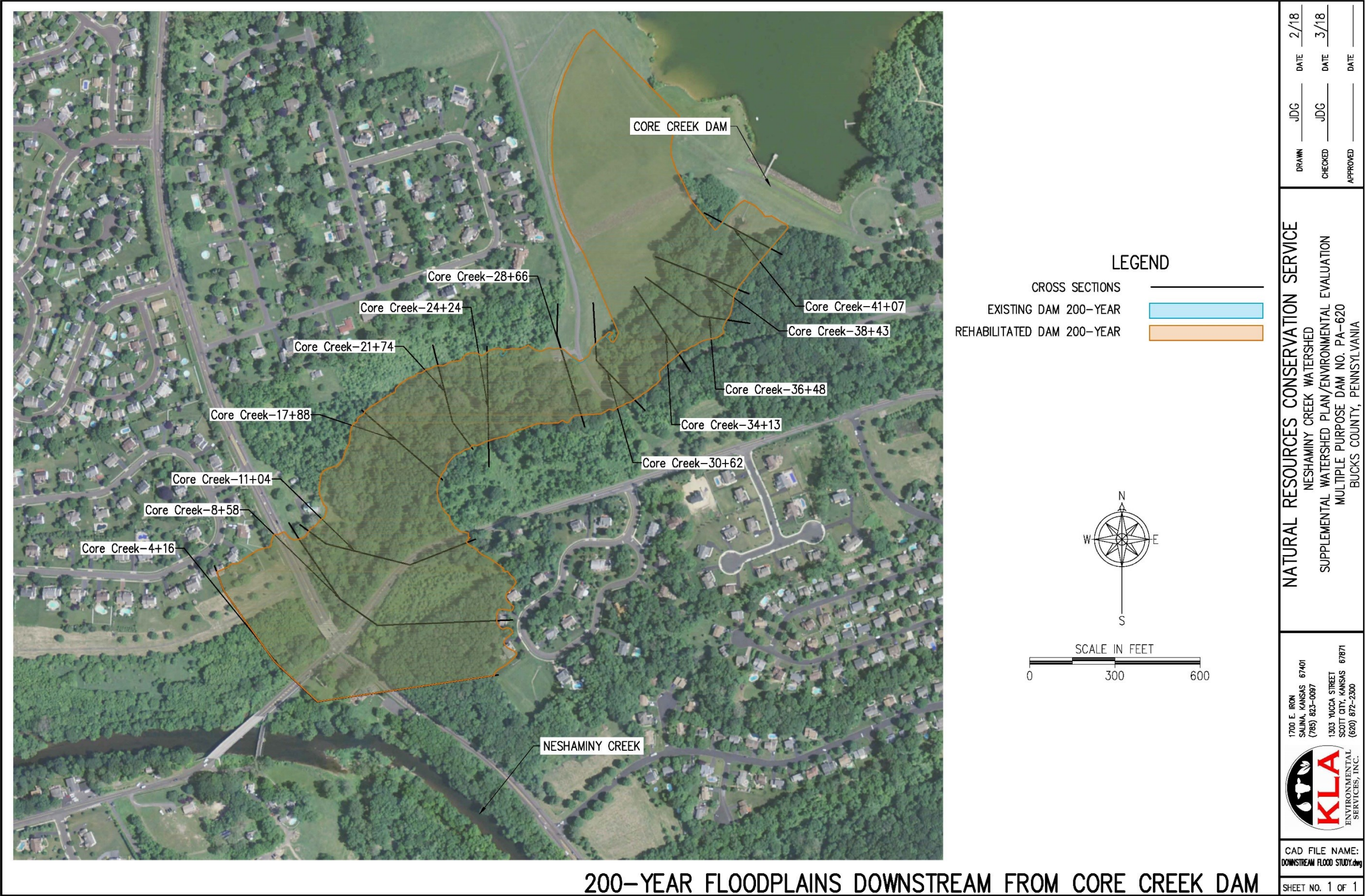


Figure C-10C
Core Creek Dam (PA-620) Existing and Rehabilitation Frequency Flood – 500-Year



Appendix D

INVESTIGATIONS AND ANALYSES REPORT

D.1 INTRODUCTION

This Appendix provides supplementary information regarding the investigations and analyses conducted for the project. The administrative record contains additional information relevant to each of the sections in this Appendix.

D.2 EXISTING DATA

NRCS provided the following existing data from its archived files to the Project Team:

- As-Built Plans
- Detailed Report of Geology Investigations
- Soil Mechanics Reports
- Breach Inundation Studies
- Stream Hydrology Studies
- Bathymetric Survey
- Design Documentation
- General Work Plan & Supplements
- Watershed Work Plans
- Supporting Documentation
- Environmental Studies

D.3 EFFECTS ANALYSIS

Ecological, cultural, and socio-economic effects of alternatives were evaluated using the NRCS-CPA-52 – Environmental Evaluation form. This analysis was conducted with consideration to the public participation scoping requirements set forth in the National Watershed Program Manual (NWPM) by considering the potential occurrences of and/or project impacts/risks to the list of 31 natural resources and other issues of concern presented in Section 501.24 Part B of the NWPM. The information presented in the Plan-EE is an overview of the relevant watershed characteristics compiled from existing information. In addition, various websites, as referenced, were used to provide information on natural resource conditions at the site. On-site observations were conducted to confirm and supplement the compiled site information presented in this report.

Once alternatives were formulated, the Project Team evaluated the effect of each alternative on relevant resource concerns and special environmental concerns. The Dam Rehabilitation alternative involves minimal changes to the existing features and functions of the dam and the construction will be confined to the existing dam and auxiliary spillway.

A Pennsylvania Natural Diversity Inventory search was completed to determine potential impacts to threatened and endangered species. Additional correspondence was exchanged with U.S. Fish and Wildlife Service (USFWS) and Pennsylvania Fish and Boat Commission (PAFBC) concerning the extent of the alternatives.

The USFWS National Wetlands Inventory (NWI) mapping tool was used to review NWI maps. Wetlands are present at the upper reaches of Lake Luxembourg and along Core Creek as it enters Lake Luxembourg. Wetlands are also mapped along a small unnamed tributary feeding into Lake Luxembourg. A wetland delineation was conducted in the immediate area along Core Creek downstream of the dam spillway in September 2015. An open water was observed within the auxiliary spillway outlet and was delineated at the high-water mark. No other wetlands were identified near the dam embankment and auxiliary spillway footprints.

The No Action/Future Without Federal Project (FWOP) includes removal of a portion of the existing embankment to allow flood flows to pass unimpeded as explained below in section D.5. The FWOP would impact the hydrology upstream and downstream from the dam resulting in transport of sediment downstream of the dam. The hydrologic changes would have some effect on wetlands located in the existing reservoir storage pool, by changing the depth and duration of floodwater. The change would also increase flood flow depth and duration downstream, including increased streambank erosion and increased flood damages. The portion of the dam removed with the FWOP has little or no habitat value, so the primary on-site effects will be small improvements in habitat value at the site of the embankment.

D.4 ECONOMIC AND SOCIAL EFFECTS

Service Life. The limiting factor for the anticipated service life of the rehabilitated structure is functional life of the principal spillway and auxiliary spillway structures. The anticipated life of the remaining sediment pool is approximately 85 years at the expected sedimentation rate. This supports a project service life of 82 years and allows up to 3 years for implementation.

Economic Analysis Summary. The Project Team observed the dam site and the flood impact zones below the dam. The predominant land uses in the benefit area were qualitatively inventoried and the changes observed from the original plan and supplements were noted. The benefits for the project were indexed from Supplemental Watershed Work Plan No. 5 to current dollars (2018) and prorated for Core Creek Dam based on the ratio of Average Annual Flood Prevention Benefits for each dam. Indexing was completed using procedures consistent with National Watershed Program Handbook 604.1 (B).

The results of this Project Benefit Analysis will be used to determine the relative benefit/cost ratio for each Project alternative by comparing the average annual benefit with the amortized rehabilitation costs.

The following is brief outline of the Project Benefit Analysis:

1. Inventory the previous Supplemental Watershed Plans and determine the most recently calculated benefits.
2. Allocate the Watershed Work Plan benefits to the appropriate project (Core Creek Dam).
3. Evaluate substantial changes in number of houses and businesses with reduced flood damages.
4. Determine the appropriate economic indices for each of the benefit items.
5. Calculate all economic indices for each price base.
6. Update the flood damage reduction benefits allocated to the Core Creek Dam to current values.
7. Calculate the value of remaining with and without flood damages.

The original benefits in the Neshaminy Creek Watershed Plan and supplements were assigned to each planned measure in the 1967 Watershed Plan based on a September 1957 Price Base. Supplemental Watershed Plan No. 5 in 2001 updated benefits to a 1999 Price Base. Therefore, the original benefits for Core Creek Dam will be based on Table 5 – Estimated Average Annual Benefits in Supplemental Watershed Work Plan No. 5. The remaining flood damages were based on values from the Environmental Assessment prepared for Supplemental Watershed Work Plan No. 5.

Although the benefit analysis described results in a large amount of uncertainty in the potential National Economic Development (NED) benefits and costs of the respective alternatives, the potential variation will not affect the NED plan selection, thus an abbreviated analysis can be used per Economic and Environmental Principles and Guidelines for Water and Related Land Resources Implementation Studies (P&G) section 1.7.2(a)(4)(ii) and 2.1.1(b)(2).

Population-At-Risk. The population-at-risk was estimated based on the dam breach inundation zone and affected structures from the Emergency Action Plan (EAP) and the Evaluation of Potential Rehabilitation Projects worksheet included in the NRCS Dam Rehabilitation Assessment Report, August 26, 2010.

Land Use Change Analyses. Changes to the land use composition of the downstream benefit area since the last supplement were considered. Small changes in the land use of less than one percent were identified within the downstream area. Since there is no significant change to the land use downstream from Core Creek Dam, no update will be made to the project benefits for land use changes. The observed increase in development, which relates to changes in agricultural land use, within the floodplain downstream from Core Creek dam since Supplemental Work Plan No. 4 is summarized in the table below:

Floodwater Retarding Structure	Observed Floodplain Development ^{1/}			
	2000 (Sq. Ft.)	2013 (Sq. Ft.)	2000 (Acres)	2013 (Acres)
PA-620	20,328,917	20,365,696	466.7	467.5

^{1/} Land use changes to development are insignificant.

It is not anticipated that there will be any significant changes in the future to the land uses in the benefit area downstream from the Core Creek Dam. It appears that the current land usage may be the build-out for the area below the dam.

Economic Index. P&G section 1.7.2(a)(4)(ii) and 2.1.1(b)(2) allows abbreviated procedures to evaluate project benefits. Consequently, indexing will be used instead of hydrologic and economic evaluation for updating the benefits for those areas where no substantial land use changes have occurred. The original and supplemented project benefits were indexed to Price Base 2018 consistent with the tools provided at the NRCS Economics Web Site:

<http://www.nrcs.usda.gov/wps/portal/nrcs/main/national/technical/econ/tools>

The project benefits were last updated in 2001 (Price Base 1999) in Supplemental Watershed Work Plan No. 5 for Neshaminy Creek Watershed.

Updated flood control benefits were calculated consistent with P&G and NREH Part 611. Benefits represent costs or damages that would occur in the absence of the Project. Indexing methods are described in P&G 2.1.1 (b)(2). The following table describes the benefits and the indexes used:

Benefit Item	Index	1999 Base	2018 Value	Index from 1999
Floodwater Damage				
Urban	Consumer Price Index	166.60	246.819	1.48
Agricultural	Prices received by farmers	95.00	157	1.65
Recreation	Consumer Price Index	166.60	246.819	1.48
Municipal Water Supply	Consumer Price Index	166.60	246.819	1.48

NED Analysis. The P&G was used to determine the NED Alternative. This alternative is defined as that which maximizes the net benefits consistent with protecting the Nation's environment. The economic evaluation was performed in accordance with Chapter 2, Section 4 of the P&G and the NRCS National Watershed Program Manual (Parts 501.11 A(2); 501.12 C; 505.35 B (1) (iii)-(1V); 505.35 E-F).

D.5 ENGINEERING

Surveys. To supplement data from available as-built drawings, the Project Team conducted a topographic field survey of the site October 2015 to supplement the data available from the as-built drawings. The survey included one profile along the centerline of the dam crest, one profile of the auxiliary spillway (inlet channel, control section, and exit channel) and one profile through the dam embankment at the principal spillway. Additional spot elevations were collected along the upstream and downstream faces of the dam embankment, auxiliary spillway, and around the outlet structure. Survey point elevations were obtained using a survey grade GPS receiver with an OPUS solution.

The horizontal datum for survey, GIS files and land use layers was based on the North American Datum of 1983 (NAD83) using the Pennsylvania State Plane coordinate system, North Zone. The vertical datum is the National Geodetic Vertical Datum of 1929 (NGVD29) and is based on the principal spillway 60-inch diameter pipe invert and corresponding elevations on the inlet and outlet structures as depicted on as-built plans entitled "Neshaminy Creek Watershed, Multiple Purpose Dam PA-620, Bucks County, Pennsylvania", dated March 1971, Sheet No.17.

The bathymetric and sediment survey of the permanent pool area was performed in May 2013 by Princeton Hydro, LLC in NAVD 88 vertical datum. Review and results of this survey are provided in the Sediment Survey & Storage Elevation Memorandum.

Breach Inundation Study. The breach analysis used in this plan was provided by the PADEP, Division of Dam Safety. The breach analysis met all the PADEP, Division of Dam Safety's criteria and, provides an incremental breach analysis based on modeling of storage capacity and reservoir surface area for normal pool and maximum storage elevations. The peak breach discharge used for developing the inundation maps ranged from 96,223 cfs to 131,132 cfs using an incremental analysis. This exceeds the TR-60 upper bound condition of a 48,960 cfs minimum peak breach discharge considering dam embankments less than 103 feet tall. The hydrologic and hydraulic analyses were also approved by the PADEP. The NRCS State Conservation Engineer concurs with the high hazard classification assigned to this dam. The results of the breach were used to generate the flood inundation maps for the current Core Creek Dam Emergency Action Plan.

Flood Storage Capacity. The flood storage curve for existing conditions was developed using the ArcGIS Surface-Volume Tool. The floodwater retarding storage capacity of Core Creek Dam was determined by evaluating the cumulative storage capacity below the auxiliary spillway crest and above the normal pool elevation.

Runoff Curve Number. The Runoff Curve Number (CN) development for the Core Creek Dam watershed was carried out by following the methodology from NRCS TR-55. ArcHydro GIS tools and the U.S. Army Corps of Engineers (USACE) HEC-GeoHMS software were used to combine the 2010 Land Cover data provided by Bucks County with the corresponding NRCS Soil Survey Geographic Database (SSURGO) soil types, to develop an area-weighted CN for the entire watershed.

Watershed boundary and drainage lines for the Core Creek Dam watershed were developed from the DEM obtained from the 3.2-foot LiDAR data using the Arc Hydro tools. The resulting drainage area is approximately 9.28 square miles, which is slightly less than the drainage area of 9.57 square miles indicated in the Final Design Report (Reference 2). The difference is likely due to the use of more accurate topographic data and state-of-the-art GIS tools. Further processing of available data included the joining of NRCS SSURGO soils data with tables indicating their corresponding Hydrologic Soil Groups based on soil type. Undesignated urban soil types and Hydrologic Soil Groups C/D were conservatively assigned to Hydrologic Soil Group D.

The 2010 land Cover classification was assumed representative of the current Land Cover conditions in the Core Creek Dam watershed. CN values were assigned based on a GIS layer obtained by merging (Geometric Union) soils and land cover data and a Curve Number Lookup Table, developed following NRCS TR-55 guidance.

The area-weighted CN for the Core Creek Dam watershed was calculated using the spatially distributed CN shapefile in ArcGIS (Attachment A-1). The computed area-weighted CN for the Core Creek Dam watershed is 81.2. The Final Design Report indicates two CN values, 82 (for 1-day rainfall duration) and 67 (for 10-day rainfall duration). The 10-day CN reported in the Final Design Report was obtained using Table 21.2 of the National Engineering Handbook, Section 4 - Hydrology, Chapter 21 - Design Hydrographs. This was replaced by NRCS TR-60, which was issued after the Final Design Report was completed.

The CN value for the projected future land cover conditions was developed based on the Future Land Cover map provided by Bucks County. Three additional Land Cover categories are present, "Town Center", "Employment Area", and "Emerging Suburban Area".

Time of Concentration. The Time of Concentration (Tc) for Subwatersheds A and B was developed using the segmental/velocity approach, described in TR-55, and the USACE HEC-GeoHMS software. An automated tool in HEC-GeoHMS uses the terrain to determine the paths with minimal slope for shallow concentrated flow, sheet flow, and open channel flow. The HEC-GeoHMS tool develops a preliminary longest flow path using the DEM, which can be adjusted as needed. The adjustments include identifying the locations of flow-type transitions from sheet flow to shallow concentrated flow, and from shallow concentrated flow to channel flow.

Precipitation Data. Precipitation data for the Core Creek Dam watershed was derived using the following sources:

- Hydrometeorological Report 51 – Probable Maximum Precipitation (PMP) Estimates, United States East of the 105th Meridian, which provides PMP values for various storm durations; and

- NOAA Atlas 14, Volume 2 (Ohio River Basin and Surrounding States) – Provides rainfall depth-duration-frequency data for 13 Mid-Atlantic and central states. The data can be accessed online at <http://hdsc.nws.noaa.gov/hdsc/pfds/>

Rainfall depth from the above-mentioned sources was used to develop design hydrographs and evaluate the principal spillway capacity; stability and integrity of auxiliary spillway; and dam capacity (top of dam elevation). The initial routing elevation for the Principal Spillway Hydrograph (PSH) simulations is the highest between the lowest ungated principal spillway inlet, the anticipated elevation of the sediment storage, or the water surface elevation associated with significant baseflow.

Technical Release 60 (TR-60) design criteria require that the principal spillway capacity be evaluated by routing the PSH with a combined 1-day/10-day 100-year return period rainfall. Two methods for estimating runoff volumes were considered: (1) the runoff curve number procedure and (2) runoff volumes based on stream gage studies (TR-60, Figures 2-1(a) and 2 1(b)). The procedure that results in the higher auxiliary spillway crest elevation, when the PSH is routed through the structure, will be used.

The initial routing elevation for the Stability Design Hydrograph (SDH) and Freeboard Hydrograph (FBH) simulations is the highest between the lowest ungated principal spillway inlet, the anticipated elevation of the sediment storage, the water surface elevation associated with significant baseflow, or the pool elevation after 10 days of drawdown from the maximum stage attained when routing the PSH.

The top of dam elevation and integrity of the auxiliary spillway (e.g., head-cutting and breaching) were evaluated by routing the FBH. For “High Hazard” dams, such as the Core Creek Dam, the FBH is generated by a PMP storm. A short duration (6-hour) and long duration (24-hour) storms were analyzed and the most critical result used. The stability of the auxiliary spillway (e.g., erosion and scour along the exit channel) was evaluated by routing the SDH.

The PADEP commonly requires the temporal distribution of the PMP to follow the Hydrometeorological Report 51/52 critically stacked distribution or, for drainage areas less than 10 square miles, a distribution based on USACE EM 1110-2-1411. For Core Creek Dam, the Project Team developed a HEC-1 model using the hydrologic inputs for the SITES model (RCN and Tc) to apply the EM 1110-2-1411 distribution.

The analysis of the existing Core Creek Dam, based on current NRCS design and safety criteria, found that the dam did not provide sufficient detention storage for the PSH, adequate erosion resistance in the auxiliary spillway for the SDH, and indicated that the dam would be overtopped during the FBH storm event.

Sediment Volume. The Project Team conducted a survey in October 2015 to supplement data from the available as-built drawings. According to the topographic survey, the top of dam elevation ranges from 118.07 feet NGVD29 and 120.51 feet NGVD29.

Based on the 1964 Reservoir Sedimentation Design Summary (Form NRCS-ENG-309), the original design included a conservation pool with a volume of 260.7 acre-feet for sediment storage, corresponding to a period of 100 years.

Princeton Hydro conducted a bathymetric assessment of Lake Luxembourg in May 2013 to measure water depths and sediments thickness, as well to evaluate sediment physical and chemical characteristics. The survey was conducted by establishing a set of pre-defined transects at 100’ intervals. Transects were subsequently surveyed utilizing a Knudsen Echosounder in conjunction with a Trimble ProXH GPS unit. The areas of the lake which were too shallow to obtain clean signals from the echosounder were surveyed utilizing a survey rod in conjunction with the Trimble ProXH GPS unit. Water depths were recorded with the survey rod and the rod was subsequently pushed through the sediments to a point of refusal for the measurement of unconsolidated sediments.

Based on the Princeton Hydro’s survey, the calculated storage volume below the normal pool elevation of 102.5 feet NGVD29 is 1,381.0 acre-feet. Based on Princeton Hydro’s survey and the publicly available 2008 LiDAR survey data from Pennsylvania Spatial Data Access (PASDA), the calculated storage volume below the design top of dam elevation of 118 feet NGVD29 is 5,831.3 acre-feet, the calculated detention storage capacity (between the auxiliary spillway crest elevation and the normal pool elevation) is 2,183.6 acre-feet, and the calculated surcharge storage capacity (between the design top of dam elevation and the auxiliary spillway crest elevation) is 2,266.7 acre-feet. The calculated total storage capacity up to the auxiliary spillway crest is 3,564.6.

Based on the Princeton Hydro's survey, the entire lake, including the portion of the lake east of Woodbourne Road, had approximately 190,000 cubic yards (118 acre-feet) of unconsolidated material below normal pool (submerged sediment) in 2013, with approximately 8.6% of the lake being filled in. The submerged sediment volume was lower than the 50-year and 100-year design submerged sediment storage, equal to 189.3 acre-feet and 233.3 acre-feet, respectively. At the time of Princeton Hydro's survey (2013), about 62% of the design 50-year sediment storage requirement was filled in after 74% of the 50-year period. The portion of the lake east of Woodbourne Road, which serves as a large settling basin upstream of the main body of the lake, had approximately 77,000 cubic yards (48 acre-feet) of unconsolidated submerged material (40% of all the unconsolidated material in Lake Luxembourg). The portion of the lake east of Woodbourne Road was approximately 69% filled.

Princeton Hydro's sediment survey and analysis was relative to the sediment storage capacity below normal pool volume, which represents the submerged sediment storage. The originally planned submerged sediment storage capacity for 100 years was 233.3 acre-feet. Based on Princeton Hydro's survey, the submerged sediment storage volume remaining below the normal pool volume was 166 acre-feet in 2013.

The 1964 Reservoir Sedimentation Design Summary (Form NRCS-ENG-309) reports the computation of the value of sediment storage required for the first 50 years of structure life, equal to 211.6 acre-feet, divided in 189.3 acre-feet of submerged sediment (85% of the total sediment) and 22.3 acre-feet of aerated sediment (15% of the total sediment). The document also reports the computation of the sediment storage required for the first 100 years of structure life, equal to 260.7 acre-feet, divided in 233.3 acre-feet of submerged sediment (85% of the total sediment) and 27.4 acre-feet of aerated sediment (15% of the total sediment). The value of 261 acre-feet, approximation of the value 260.7 acre-feet from the 1964 Reservoir Sedimentation Design Summary, is indicated by the Phase I Diagnostic/Feasibility Study of Lake Luxembourg as design conservation pool volume.

The sedimentation rate used for Rehabilitation includes 1.83 acre-feet/year for submerged sediment and 0.27 acre-feet/year for aerated sediment, resulting in a total sedimentation rate of 2.10 acre-feet per year. The sedimentation rate is based on typical soil loss rates for cultivated land using form SCS-ENG-309 and NEH Section 3, Chapter 8. The service life of the submerged sediment pool was determined to be approximately 90 years based on an available storage volume of 166.0 acre-feet, a submerged sedimentation rate of 1.83 acre-feet/ year, and the passage of five years since the bathymetric survey.

Total Storage Capacity. Based on the May 2013 bathymetric assessment performed by Princeton Hydro, the maximum water depth of Lake Luxembourg was 25.5 feet with a mean depth of 7.8 feet. The total water volume of Lake Luxembourg was 1,364 acre-feet. In general, the lake is shallowest in the northeastern end, in the portion of the lake east of Woodbourne Road. The lake increased in depth moving toward the spillway, where the maximum depth of 25.5 feet was located.

The bathymetric survey conducted by Princeton Hydro, below the normal pool elevation, was used in conjunction with the publicly available 2008 LiDAR survey data from Pennsylvania Spatial Data Access (PASDA), above the normal pool elevation, to develop a total stage-storage curve (bottom of pool to top of dam) reflecting the current conditions, using the Surface-Volume tool in ArcGIS. The tool calculates the area and the volume of a digital elevation model (DEM) surface above or below a given reference plane.

To supplement data from the available as-built drawings, Amec Foster Wheeler conducted a topographic field survey of the site in October 2015. The survey included one profile along the centerline of the dam crest, one profile of the auxiliary spillway (inlet channel, control section, and exit channel), and one profile through the dam embankment at the principal spillway. Additional spot elevations were collected along the upstream and downstream faces of the dam embankment, auxiliary spillway, and around the outlet structure. Survey point elevations were obtained using a survey grade GPS receiver with an OPUS solution. From the Amec Foster Wheeler survey, the lowest and highest top of dam elevations are 118.07 feet NGVD29 and 120.51 feet NGVD29, respectively.

Flood Storage Capacity. The flood storage capacity was determined by evaluating the storage capacity above the normal pool elevation of 102.5 feet NGVD29. Based on this evaluation, the current detention storage capacity (between the auxiliary spillway crest elevation and the normal pool elevation) is 2,183.6 acre-feet and the surcharge storage capacity (between the design top of dam elevation and the auxiliary spillway crest elevation) is $4,450.3 - 2,183.6 = 2,266.7$ acre-feet. The calculated total storage capacity up to the auxiliary spillway crest elevation is 3,564.6 acre-feet.

Site Walk. The Project Team conducted a site visit to document the current conditions of Core Creek Dam on October 8, 2015. The site visit included a visual review and photographic documentation of the exposed areas of the dam and associated structures.

Principal Spillway Video Inspection. The Project Team conducted a robotic Televideo (TV) inspection of the principal spillway, embankment drains, and auxiliary spillway drain as part of the documentation of the current conditions of Core Creek Dam (PA-620) on October 27, 2015. An IBAK® Proteus 360° Camera crawler was deployed to perform the principal spillway pipe inspection. The crawler was inserted into the pipe outlet at the SAF stilling basin and was remotely operated to crawl the length of the spillway and obtain photographs and video. The spillway was inspected to identify any deformities, sags, cracks, or other items of note.

Based on the visual inspection, the inlet and outlet of the principal spillway pipe are functioning as designed. The riser structure appears to have sufficient structural and hydraulic integrity to perform its function. The outlet pipe appears to be in good condition, with no indications of movement, significant cracks, deterioration, settlement, or erosion observed. The flow of water in the outlet pipe was approximately five-inches deep at the time of inspection. The water flowed freely through the 60-inch diameter pipe to the SAF stilling basin with no observable backup or loss through the pipe.

Toe Drain Video Inspection. A TV inspection of the Core Creek Dam toe drains was conducted on October 27, 2015. The objective of the inspection was to document the current condition and identify any potential issues of the toe drains. Amec Foster Wheeler used a VuTEK® Pipe Camera to perform the inspection. This equipment provided video inspection by manually pushing camera through the 12-inch diameter toe drainpipe.

Both toe drains (left and right) were flowing at the time of inspection with about two-inches of flow. The discharge from the left toe drain was constant and clear with no visible turbidity. The left toe drain pipe appeared clear with no observed blockages, pipe deformation, or deterioration. The right toe drain flow appears to have some turbidity and it was subject to some material buildup. The fragments we saw seem to be algae or bacterial bloom fragments floating in the water. They were flocked together and seemed to be neutrally buoyant. The heavier material could also be chemical precipitates like calcite. Some rust was observed along in both toe drains; however, the rust appeared surficial and there was no observable deterioration. Very fine silt, likely dust, has settled in the bottom of both toe drains in between the corrugations. The silt can be from initial construction, bits of rust, and detritus from previous minor algae or bacterial blooms. No significant sediment or larger particulates were observed.

The SAF stilling basin eight-inch diameter weep holes were inspected for potential clogging. The discharge from the four weep holes appears to be constant and clear with no visible siltation. Several attempts were made to reach the second 90° bend on each toe drain to be able to observe the straight run sections along the toe of the embankment. The Project Team was successful in obtaining observations up to 20 feet of the left toe drain and up to 26 feet of the right toe drain.

Due to the difficulty of navigating the pipe camera through the 90° elbows, we could not observe the conditions of more than 14 feet of the left toe drain (beyond the first 90°) and the conditions of more than 20 feet of the right toe drain (beyond the first 90°).

The principal spillway RCP was reported to be in good physical condition. The observable lengths of both toe drains for the dam are in good physical condition. The right drain appears to be subject to some bacterial blooms/silt build-up. Periodic inspection and cleanout should be performed.

Embankment and Foundation Geology. An abbreviated geologic investigation of the existing dam embankment was conducted. The geology investigation included borings on the dam embankment (2), borings in the auxiliary spillway (5), collection of samples, and testing. The geology of the dam and foundation are based on information acquired from the geology investigation and the investigations and analyses conducted during the original design of the dam.

Seismic Evaluation. The Project Team obtained and evaluated existing geologic, geophysical, and seismologic information available and prepare a seismotectonic evaluation of the area to determine that there are not “active” or “capable” faults at the site. The study included an assessment of the suitability of existing data to evaluate definitively the existence of faults at the site.

Additionally, the Project Team obtained a probabilistic seismic hazard curve for the site from the USGS Earthquakes Hazard Program and based the earthquake loading on an annual exceedance probability of 1×10^{-4} (e.g., a return period of about 10,000 years or an approximate probability of exceedance in 50 years of 0.5%).

The USGS bases the “U.S. Seismic Design Maps” tool upon the 2% probability of exceedance in 50 years (~2,500-year return). We used the USGS Geographic Deaggregation Seismic Hazard Program (GDSH) web tool to evaluate the 0.5% probability of exceedance in 50 years (i.e., ~10,000-year return) at the Core Creek Dam coordinates. The GDSH tool provided the Peak Ground Acceleration (PGA) of 0.328g at the bedrock “BC” boundary. However, the web tool does not provide correction of the PGA for amplification due to the overburden soil. We estimated the amplification factor F_{pga} for the soil overburden using USGS Design Maps (USGS, 2015) Detailed Report web tool for a Site Soil Classification “Site Class C” (very dense soil and soft rock), which gave $F_{pga} = 1.20$. Therefore, the corrected peak ground horizontal acceleration is $PGAM = 0.394g$.

Slope Stability. The Project Team estimated the slope stability of the existing dam by numerically modeling a two-dimensional section through the embankment and subgrade using Geo-Slope International’s Geo-Studio 2012 software entitled SLOPE/W and SEEP/W. The soil strength and seepage properties were obtained from the 1969 design report for Core Creek Dam.

The Project Team considered four general Conditions to evaluate the stability of the dam:

- Condition 1 – the low pool stage at the invert of the inlet pipe to evaluate end-of-construction conditions (Not evaluated due to the age of the dam).
- Condition 2 – sudden drawdown from the permanent pool to the lowest ungated stage.
- Condition 3 – the flood stage pool at the crest of the Auxiliary Spillway.
- Condition 4 – Pseudo- static Seismic analysis at permanent pool stage, downstream face using horizontal seismic acceleration of $PGAM = 0.394g$ for the site.

Condition 4 is modified from the 2005 TR-60. The Seismic and Stability Report provides a summary of the TR-60 stability analysis results for the cases analyzed. Graphic outputs were provided for each stability case as well as the graphic output for the simplified seepage analysis.

Additionally, for the 25 PA Code § 105.97 (Pennsylvania Code, 2011) criteria analyses, the Project Team analyzed the following four general cases to evaluate the stability of the dam.

- Case P1: Normal pool, Elevation 102.5 feet, with steady- state seepage conditions.
- Case P2: Maximum pool (crest of dam) (Elevation 118.0 feet NGVD29 per as- built plans).
- Case P3: Sudden Drawdown from permanent pool to lowest ungated discharge, Elevation 102.5 feet to Elevation 89.0 feet (upstream slope).
- Case P4: Pseudo- static Seismic analysis at permanent pool stage, Elevation 102.5 feet, downstream face using MCE horizontal seismic acceleration of $PGAM = 0.114g$ for the 2,500-year return period.

Because construction of the Core Creek Dam was completed 46 years ago (1971), the end-of-construction, Case P5 was not evaluated.

The Project Team mapped the location of two M4+ earthquakes that occurred since 1700 within a 100-kilometer radius of the site. Likewise, two faults, approximately 3.9 km south southeast and about 7.35 km north-west of the site were mapped. As there is no evidence of seismic activity associated with these faults, the Project Team considers these faults inactive and incapable. Using USGS web tools, the 10,000-year return earthquake event to have a $PGAM = 0.394g$ and the 2,500-year return earthquake event to have a $PGAM = 0.144g$ at Core Creek Dam.

Based upon the original design soil parameters and current studies and conservative assumed conditions, the seepage/stability analyses indicate that the dam does not meet the current NRCS TR-60 slope stability requirements for pseudo-static (earthquake) stability. It does meet TR-60 slope stability requirements for the flood case and for sudden drawdown. The dam meets the current 25 PA Code § 105.97 standard for static and earthquake stability at normal pool as well as for the flood case and for sudden drawdown.

The flattening of the downstream slope is required to meet TR-60 requirements. Flattening the downstream slope to an inclination of 3.75-horizontal to 1.0-vertical (3.75:1) to create a sloping buttress and creating a keyway extending down to bedrock beneath the toe of the sloping buttress to increase slope stability. The keyway extends horizontally

about 36 feet downstream from the existing toe-of-dam and down to bedrock, about 10 feet beneath the ground surface. The toe of the dam is shifted about 50 feet downstream. The material for the buttress and keyway in the model consists of dense graded shot rock fill. The proposed buttress material should be checked for and selected for compatibility with the embankment soil in accordance with filter criteria. A filter interval may be needed between the buttress and embankment soil.

Downstream Effects. The existing TR-20 Hydrologic Model for the Neshaminy Creek Watershed from Supplemental Watershed Plan No. 4 was imported into the NRCS WinTR-20 Hydrology program for modeling of downstream discharges. Information on the Core Creek Dam was updated based on the completed engineering studies for both the existing dam and a rehabilitated dam with labyrinth weir auxiliary spillway. Computed the hydrographs above and below the junction of Neshaminy and Core Creek for use with hydraulic modeling.

The USACE HEC-RAS version 5.03 hydraulic computer model was used to analyze the study reach of Core Creek downstream of the Core Creek Dam and the Neshaminy Creek above and below the junction. The developed HEC-RAS model considered two scenarios for the 100-, 200-, and 500-year storm events: 1) Core Creek Dam as it exists today and, 2) a rehabilitated Core Creek Dam. Cross sections for the HEC-RAS models were developed using Pennsylvania 1-meter DEM LiDAR elevation data and supplemented with aerial imagery collected in 2013. Stream centerlines were digitized from the available aerial photography. Manning's n values were estimated from aerial photography along with HEC-RAS User's Manual. Bank stations were set based on LiDAR data. HEC-RAS results for the 100-, 200-, and 500-year flood events were mapped based on the elevation data from the LiDAR 1-meter DEM.

The results of hydraulic study indicated that the downstream impact of both the existing Core Creek Dam and proposed rehabilitation are essentially the same, with no measurable impact to Neshaminy Creek and the flood area directly downstream from the Core Creek Dam.

Alternative Formulation. The Project Team completed a conceptual/preliminary engineering analysis to determine the alternatives to be evaluated in detail. The alternatives considered included the following:

Alternative 1 - Future Without Federal Project (FWOP) (No Action) – The FWOP Alternative was identified in coordination with NRCS and the Sponsor and is also known as the No Action Alternative. The FWOP Alternative is a minimum level Sponsor breach of the dam, as directed by PADEP. According to the National Watershed Program Handbook, FWOP is based on the course of action that the Sponsor is most likely to take in the event that no federally-financed rehabilitation works were to be undertaken.

Alternative 2 -Rehabilitation to Current High Hazard Class Dam Standards – Multiple rehabilitation options were considered during the engineering analysis and eliminated from detailed evaluation in consultation with the Sponsor. The rehabilitation options considered modifications to the auxiliary spillway, dam crest and/or principal spillway to upgrade the dam to Current NRCS High Hazard Class criteria. Changes included widening and raising the auxiliary spillway, raising the crest elevation, modifying the principal spillway, armoring the spillway and combinations thereof. Alternatives to convert water supply storage to flood storage and/or sediment storage were considered, but not moved forward due to not meeting the purpose and need of the Sponsor. All the rehabilitation options include extending the design life of the project an additional 85 years and upgrading the internal drainage controls in the dam. The preferred rehabilitation option, for detailed evaluation, was selected based on effectiveness, efficiency, constructability, and compatibility with the purpose and need for the project.

The Project Team formulated a matrix of dam features, deficiencies and potential solutions to explore options for dam rehabilitation. Options were evaluated in consultation with the Bucks County Commissioners and based on effectiveness, efficiency, constructability and compatibility with the purpose and need for the project. Rehabilitation options considered but dismissed from further evaluation included the following:

1. Widen the auxiliary spillway to 1,200 feet and raise the control section crest to Elevation 113.2 feet, while maintaining the design dam crest at Elevation 118.0 feet. Dismissed from further evaluation due to higher cost and social disruption.
2. Raise the dam embankment crest to Elevation 120.5 feet, while maintaining the existing width of the auxiliary spillway and raising the control section crest to Elevation 113.2 feet. Dismissed from further evaluation due to higher cost, from upstream property easements, relocations, and floodproofing.

3. Widen the auxiliary spillway to 800 feet and raise the control section crest to Elevation 113.2 feet, while raising the dam crest to Elevation 119.2 feet. Dismissed from further evaluation due to higher cost and social disruption.
4. Replace the principal spillway conduit with a new 108-inch diameter reinforced concrete pipe conduit. Construct a new concrete intake structure with a total weir length of 80 feet at the existing normal pool at Elevation 102.5 feet. Lower the existing auxiliary spillway crest to Elevation 110.5 feet while maintaining the dam crest at Elevation 118.0 feet. Dismissed from further evaluation due to higher cost and reduction in downstream flood protection.
6. Fill the existing auxiliary spillway with an earthen embankment. Excavate a portion of the dam crest (Elevation 118.0 feet) to create a new auxiliary spillway, armored with roller compacted concrete, at Elevation 108.7 feet. Construct a concrete labyrinth weir with a crest at Elevation 112.9 feet and a crest height of 4.2 feet. Apply roller compacted concrete armoring to the downstream face of the embankment and a portion of the valley floor to protect against erosion during overtopping events. Dismissed from further evaluation due to higher cost.
7. Lower the auxiliary spillway surface and install Fusegate® with a crest Elevation of 112.9 feet and a crest height of 4.20 feet, while maintaining the dam crest at Elevation 118.0 feet. Dismissed from further evaluation due to higher cost and higher operation costs.

The selected rehabilitation alternative for further evaluation in consultation with the Sponsor would upgrade the dam to Current NRCS High Hazard Class criteria. It would include:

5. A concrete labyrinth weir spillway with a crest elevation of 112.90 feet, and a weir height of 4.2 feet will allow for the passage of required FBH discharge, while maintaining the existing spillway width of 550 feet. This design will have the capacity to contain the full 24-hour 100-year rainfall event with a maximum WSEL of 112.78 feet without activating the auxiliary spillway, and pass the FBH without having to widen the existing auxiliary spillway footprint. The estimated FBH maximum water surface elevation is estimated to be 116.75 feet, which is approximately 1.75 feet below the design settled dam crest elevation of 118.00 feet.

Alternative 3 -Dam Decommissioning with Nonstructural and Other Measures – The Decommissioning Alternative was formulated to restore the stream by reconnecting the upstream and downstream channel in a non-erosive manner and restoring the stream/river. The entire dam embankment would be excavated to allow normal flows and up to 100-year flood flows through the site in a non-erosive manner. Accumulated sediment would not be removed.

The Decommission Alternative was developed in consideration of guidance in NRCS National Engineering Handbook, Part 653, Stream Corridor Restoration: Principles, Processes, and Practices. The Decommissioning Alternative would eliminate flood storage and protection provided by the dam, which could possibly expose downstream properties to an increased risk of flooding, property damage, and loss of life. As a result, the Decommissioning Alternative alone would not meet the objective to maintain the downstream flood damage reductions provided by the existing project. To meet this objective, the decommissioning alternative would have to be supplemented by other measures such as floodproofing or relocation of 342 structures (58 Commercial and 284 Residential) located within the 100-yr floodplain. The number of structures was estimated based on the Zone A 100-year floodplain of Neshaminy Creek from the junction with Core Creek to the Delaware River. The mapping was superimposed on the aerial imagery of the downstream areas. Based on the HEC-RAS modeling, there were not structures found to be within the 100-yr floodplain between Core Creek Dam and the junction with Neshaminy Creek. No critical structures were found to be within the 500-year floodplain of Core Creek below the dam.

Floodproofing of the structures does not cause the same social disruption as acquisition/relocation of the structures and elevation of the structures is estimated to be less costly than acquisition/demolition. Therefore, floodproofing was used to supplement the decommissioning alternative. Floodproofing would likely require elevating of the structures above the 100-year flood elevation to protect the structures from inundation and hydrodynamic loading associated with the flood wave.

Alternative 4 -Acquisition/Relocation of At-Risk Structures and Other Non-Structural Measures (Floodproofing in the Inundation Areas) – These alternatives were formulated to remove the downstream hazard and allows the Core Creek Dam to be reclassified as a Low Hazard Class dam. Land use restrictions were considered to prevent future upgrades to High Hazard Class dam due to downstream development within the breach inundation area. The threat to human life from sudden dam failure would be reduced by relocating the residential and commercial structures and raising and/or relocating the roadways within the potential breach inundation.

Cost Estimates. The Project Team prepared predictions of probable costs for all rehabilitation options. The predictions of probable costs are intended for comparing the options. Unless otherwise noted predictions of probable costs were prepared using the RS Means method for engineering cost estimation. Comparison of costs to the rehabilitation option selected for detailed study is shown in the table below.

Feature	Existing Condition	Option 1	Option 2	Option 3	Option 4	Option 5	Option 6	Option 7
Estimated Percent of Least Cost Alternative	N/A	655%	123%	226%	144%	100%	203%	156%

Appendix E

OTHER SUPPORTING INFORMATION

Public Law 83-566 Project Information Core Creek Dam (PA-620), Neshaminy Creek Watershed Supplemental Watershed Work Plan No.10 and Environmental Evaluation Bucks County, Pennsylvania	
Rehab General Description Data	
Project Number	422020
Hydrologic Unit Area:	020402010303
Longitude (decimal format):	-74.9191
Latitude (decimal format):	40.1963
Area of Project (acres):	5,938
Project Evaluation Life:	85 Years
Project Discount Rate:	2.75%
Price Base:	2018
B/C Ratio:	21.3 to 1.0
Total Cost (Table 1):	\$6,192,000
Total Public Law 83-566 Cost:	\$4,230,000
Dam Number	PA-620
National Inventory of Dams (NID):	PA00802
Congressional District of dam:	PA08
FIPS Code of dam:	017
# Single-Purpose Floodwater Retarding Structures Planned:	0
# Multi-Purpose Structures Planned:	1
Rehab Project Purposes:	Flood Damage Reduction, Recreation & Water Supply Storage

Public Law 83-566 Project Information Core Creek Dam (PA-620), Neshaminy Creek Watershed Supplemental Watershed Work Plan No.10 and Environmental Evaluation Bucks County, Pennsylvania	
Sponsor Data	
Organization:	Bucks County, PA
Sponsor Representative (optional):	Kevin Spencer
Sponsor Title:	Director of Operations
Sponsor Type:	County
Address:	Bucks County Administration Building, 55 East Court Street
City:	Doylestown
State:	Pennsylvania
Zip:	18901
Phone:	215-345-3951
Email:	ksspencer@buckscounty.org
O&M Responsibility (Yes/No):	Yes

Public Law 83-566 Project Information Core Creek Dam (PA-620), Neshaminy Creek Watershed Supplemental Watershed Work Plan No.10 and Environmental Evaluation Bucks County, Pennsylvania	
Rehab Budget Request Data	
Failure Index:	88
Population at Risk:	5,547
Price Base:	2018
Estimated Installation Cost (Watershed Agreement):	\$6,192,500
Priority - State Dam Safety Agency:	Low
Number of Municipal Water Supply Users:	0

Public Law 83-566 Project Information Core Creek Dam (PA-620), Neshaminy Creek Watershed Supplemental Watershed Work Plan No.10 and Environmental Evaluation Bucks County, Pennsylvania	
Rehab Subset of Benefits Data	
Price Base:	2018
Total Funds Needed (FA/TA) (Table 2): Public Law-83-566 NRCS	\$3,643,000/\$587,000
Other Than Public Law-83-566:	\$1,956,000
Agricultural Related Flood Damage Reduction Benefits (Average Annual):	\$63,100
Non-Agricultural Related Flood Damage Reduction Benefits (Average Annual):	\$254,600
Agricultural Related Non-Flood Damage Reduction Benefits (Average Annual):	\$4,002,200
Non-Agricultural Related Non-Flood Damage Reduction Benefits (Average Annual):	-
Beneficiaries (No.):	625,249
Visitor Days (Optional):	Not Evaluated
Farms and Ranches Benefited (No.):	Not Evaluated
Bridges Benefited (No.):	16
Public Facilities Benefited (No.):	3
Businesses Benefited (No.):	58
Homes Benefited (No.):	284
Reduced Erosion (Tons/Yr.):	0
Reduced Sedimentation (Tons/Yr.):	7,097
Streams/Corridors Enhanced/Protected (Miles):	14
Lakes/Reservoirs Enhanced/Projected (Surface Acres):	179
Domestic Water Supplies Benefited (No.):	1
Incidental Recreation Benefited (No. of Water Bodies/Stream Segments):	2
Groundwater Recharge (Acre-Feet):	0
Wetlands Created, Enhanced, or Restored (Acres):	0
Upland/Riparian Habitat Created/Enhanced (Acres):	0
Threatened and Endangered Species Benefited:	1
Population with Reduced Risk:	5,547

U.S. Department of Agriculture Natural Resources Conservation Service NRCS-CPA-52 4/2013		A. Client Name: County of Bucks																															
ENVIRONMENTAL EVALUATION WORKSHEET		B. Conservation Plan ID # (as applicable): Program Authority (optional): Section 14 Of PL 83-566, the Watershed Protection and Flood Prevention Act, as amended (16 U.S.C. Parts 1001-1008, 1010, 1012.)																															
D. Client's Objective(s) (purpose): • Maintain the current level of flood damage reduction of the designed 1% frequency auxiliary spillway use provided by the Core Creek Dam (PA-620) for public safety, bridges, roads, agricultural and other lands, buildings, structures, infrastructure, and other features. • Maintain the recreational and habitat values of Lake Luxembourg and adjacent riparian lands. • Comply with applicable design, performance and safety standards. • Maintain the water supply availability provided by the Core Creek Dam and Lake Luxembourg.		C. Identification # (farm, tract, field #, etc. as required): Core Creek Dam (NRCS PA-620) Middletown Township, Bucks County PA																															
E. Need for Action: • Providing flood damage reduction for the 100-year recurrence interval flood event downstream from the dam and address applicable NRCS and Commonwealth of Pennsylvania standards and design criteria for public health and safety to reduce the risk of loss of human life. • Continue supporting the recreational uses and aquatic and terrestrial wildlife habitat directly dependent upon Lake Luxembourg and its surrounding riparian lands. • Continue providing public water supply availability from Core Creek Dam and Lake Luxembourg.		H. Alternatives <table border="1"> <thead> <tr> <th>No Action</th> <th>✓ if RMS</th> <th>Alternative 1</th> <th>✓ if RMS</th> <th>Alternative 2</th> <th>✓ if RMS</th> </tr> </thead> <tbody> <tr> <td> Future Without Project (FWOP) - The FWOP is a Sponsor-controlled breach of the dam, such as the removal of a portion of the earthen embankment, as directed by the Pennsylvania Department of Environmental Protection (PADEP). </td> <td></td> <td> The recommended rehabilitation alternative involves the construction of a concrete labyrinth weir in the auxiliary spillway, flattening the back slope of the dam, extending the principal spillway pipe, and installing a new S.A.F. impact basin. This will lower the auxiliary spillway surface and construct a 4.2 foot tall labyrinth weir with the crest one foot higher than the existing auxiliary spillway. The labyrinth weir will provide a total crest length of 2,160 feet within the current auxiliary spillway width of 550 feet. This alternative will maintain the design settled dam crest. </td> <td></td> <td></td> <td></td> </tr> </tbody> </table>		No Action	✓ if RMS	Alternative 1	✓ if RMS	Alternative 2	✓ if RMS	Future Without Project (FWOP) - The FWOP is a Sponsor-controlled breach of the dam, such as the removal of a portion of the earthen embankment, as directed by the Pennsylvania Department of Environmental Protection (PADEP).		The recommended rehabilitation alternative involves the construction of a concrete labyrinth weir in the auxiliary spillway, flattening the back slope of the dam, extending the principal spillway pipe, and installing a new S.A.F. impact basin. This will lower the auxiliary spillway surface and construct a 4.2 foot tall labyrinth weir with the crest one foot higher than the existing auxiliary spillway. The labyrinth weir will provide a total crest length of 2,160 feet within the current auxiliary spillway width of 550 feet. This alternative will maintain the design settled dam crest.																					
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Concentrated flow	A controlled breach of the dam would result in the draining of Lake Luxembourg and exposing what is currently lake bottom. These newly exposed soils could be subject to increased concentrated flow (gully) erosion if it is not vegetated and stabilized quickly.	☐	No effect	☐	☐
Evidence of concentrated flow (gully erosion) was not observed in the project area.		NOT meet PC		NOT meet PC	NOT meet PC
Excessive bank erosion from streams, shorelines or water conveyance channels	Without the dam, there is the potential for an increase in downstream bank erosion with increased flood flows.	☐	No effect	☐	☐
There was little evidence of stream bank erosion observed in the project area. However, the Bucks County Conservation District did complete a repair in 2012 to 1,000 feet of shoreline along Lake Luxembourg that was severely eroding.		NOT meet PC		NOT meet PC	NOT meet PC
SOIL: SOIL QUALITY DEGRADATION					
Compaction	N/A	☐	N/A	☐	☐
There were no soil compaction issues observed.		NOT meet PC		NOT meet PC	NOT meet PC
Organic matter depletion	N/A	☐	N/A	☐	☐
There was no evidence of organic matter depletion noted or observed in the project area.		NOT meet PC		NOT meet PC	NOT meet PC
Other	N/A	☐	N/A	☐	☐
There were no soil degradation issues identified as a concern.		NOT meet PC		NOT meet PC	NOT meet PC
WATER: EXCESS / INSUFFICIENT WATER					
Excess (Ponding, flooding, seasonal high water table, seeps, etc.)	Residential, commercial and transportation resources will be at a greater risk of flood damage. Average annual flood damage reduction benefits of \$314,900 will be lost.	☐	The accepted alternative will maintain flood damage reduction downstream from the dam with an average annual value estimated at \$314,900.	☐	☐
The dam controls runoff and mitigates flooding. No evidence was observed of excessive seepage that would affect the normal pool elevation and pose a risk to the downstream community.					
The Neshaminy Creek Watershed Restoration Action Strategy (WRAS), updated in 2004, recommends that restoration efforts in the Neshaminy watershed should be directed towards seven activities, including better controls on stream flow variability.	Removal of the dam may increase Core Creek baseflow variability by allowing larger flows to travel downstream during storm events and by eliminating storage of runoff that could support baseflow by discharging over time during drier periods.	NOT meet PC	Dam rehabilitation will likely have no effect on baseflow variability.	NOT meet PC	NOT meet PC
Other	N/A	☐	N/A	☐	☐
There were no other water concerns noted.		NOT meet PC		NOT meet PC	NOT meet PC

WATER: WATER QUALITY DEGRADATION						
Excess nutrients in surface and ground waters The water bodies are subject to degradation primarily from large surface runoff non-point source pollutant originating from stormwater. Impairments recognized on the State's Integrated Water Quality and Monitoring & Assessment Report (303d List) lists include urban runoff/storm sewers and septic tanks and agriculture runoff. Runoff typically has high levels of phosphorus. Lake Luxembourg currently experiences high sedimentation rates and blue green algae blooms.	A controlled breach of the dam will cause nutrients currently trapped by the dam to be delivered downstream. Nutrient-laden sediment originating from upstream land use will flow through Core Creek to downstream stream segments without settling out in Lake Luxembourg.	☐ NOT meet PC	A temporary increase in sediment and nutrient loading may be observed downstream during construction and dam draw down events. Improvement of the dam would not permanently change the excess sediment and nutrients currently entering Lake Luxembourg. Erosion and sediment controls will be utilized during construction to reduce the impact of excess nutrient-laden sediment downstream.	☐ NOT meet PC		☐ NOT meet PC
Pesticides transported to surface and ground waters There is currently no concerns regarding the transportation of pesticides to surface ground waters.	No effect	☐ NOT meet PC	No effect	☐ NOT meet PC		☐ NOT meet PC
Excess pathogens and chemicals from manure, bio-solids or There was not an excess of pathogens and chemicals from manure, bio-solids or compost applications observed within the project area.	No effect	☐ NOT meet PC	No effect	☐ NOT meet PC		☐ NOT meet PC
Excessive sediment in surface waters Core Creek Dam and Lake Luxembourg have established TMDLs for sediment. Estimated sediment loading to Core Creek to meet water quality objectives is determined to be 1,474,723 lbs./yr.; and 855,111 lb./yr. for Lake Luxembourg. There were sedimentation accumulations behind the impounded observed at the site. The historical average sedimentation rate from 1976 to present is 3.19 acre-feet/year and is projected to be 2.10 acre-ft./year into the future.	A controlled breach of the dam will cause sediment currently trapped by the dam to be delivered downstream. Sediment originating from upstream land use will flow through Core Creek to downstream stream segments without settling out in Lake Luxembourg.	☐ NOT meet PC	No change upstream. A short-term increase in suspended sediment and turbidity downstream may occur during construction, but proper controls will minimize erosion. Projected annual sedimentation rate of the reservoir (expected after implementation of Alternative 1) is 2.10 acre-feet/year.	☐ NOT meet PC		☐ NOT meet PC
Elevated water temperature Elevated water temperatures have been recorded in Lake Luxembourg during the summer months. Some of the recorded temperatures are not supportive of cold water fishes. Lake Luxembourg was re-classified in 2004 from Cold Water Fishery (CWF) and Migratory Fishery (MF) water body to a Trout Stocking Fishery (TSF) and MF. The main inlet, Core Creek, is designated as a CWF and MF. Downstream of the dam, Core Creek to its confluence with Neshaminy Creek is designated as a Warm Water Fishery (WWF) and MF.	A controlled breach of the dam may return water quality in some sections of Core Creek where Lake Luxembourg currently is located, to be more consistent with a CWF MF designation.	☐ NOT meet PC	Improvements to the dam are not expected to result in any changes to the elevated water temperatures that develop in Lake Luxembourg during the summer months. No Effect.	☐ NOT meet PC		☒ NOT meet PC

Other				
SOLE SOURCE AQU FER- Core Creek Dam is not located in an area with an underlying Sole Source Aquifer. REGIONAL WATER RESOURCE PLANS- The Revised Restoration Management Plan for Lake Luxembourg/Core Creek Watershed, Core Creek Park was issued by the Bucks County Conservation District in March 2005. It provides recommendations for addressing TMDL pollutants. Delaware River Basin Commission (DRBC) developed several water management plans for the portions of the basin in which the Core Creek watershed lies. These plans include the Water Resources Plan for the Delaware River Basin (2004), the DRBC Comprehensive Plan (2001), the Pollutant Minimization Plan (2005). PA Dept. of Environmental Protection (PADEP) updated the Neshaminy Creek Watershed Restoration Action Strategy in 2004 with a summary of restoration needs that could be applied regionally across the watershed to address sources of stream impairment. Core Creek is subject to the Neshaminy Creek Act 167 Stormwater Management Plan. PADEP administers the Southeast Regional Coastal Nonpoint Pollution Program Management Area on the behalf of National Oceanic & Atmospheric Administration (NOAA) to provide grants promoting coastal program policies.	SOLE SOURCE AQU FER - No effect REGIONAL WATER RESOURCE PLANS - A controlled breach of Core Creek Dam would result in the draining of Lake Luxembourg. This would have implications to both the Revised Restoration Management Plan for Lake Luxembourg and to the Neshaminy Creek Stormwater Management Plan that would require these plans to be revisited and updated. Removing the dam may improve water quality in Core Creek by eliminating Lake Luxembourg and increasing the vegetated riparian buffer, which will reduce solar exposure to the stream and prevent excessive increases in water temperature and reductions in dissolved oxygen. When the Act 167 Plan is updated, the impact on downstream flow rates should be assessed through the watershed model. Flow rates up to and including the 100-year storm event will increase, negatively impacting the Act 167 Stormwater Management Plan. Entities eligible to receive Coastal Zone funds for projects within the Coastal Non-Point Pollution Boundary could apply for grants to reduce non-point sources of pollution within the riparian area along Core Creek.	SOLE SOURCE AQU FER - No effect REGIONAL WATER RESOURCE PLANS - Improvements to the dam would result in positive effects which may need to be reflected in an update to the Neshaminy Creek Stormwater Management Plan. It is anticipated that the effect of Alternative 1 will more effectively control the 100-year design storm when the watershed achieves the build-out condition. Improvements to the dam will likely have no impacts on water quality in Lake Luxembourg in Core Creek. When the Act 167 Plan is updated, the impact on downstream flow rates should be assessed through the watershed model. There will be no change to flow rates up to and including the 100-year storm event. No change is anticipated to the Act 167 Stormwater Management Plan. Entities eligible to receive Coastal Zone funds for projects within the Coastal Non-Point Pollution Boundary could apply for grants to reduce non-point sources of pollution within the riparian area along Core Creek.	NOT meet PC	NOT meet PC

AIR: AIR QUALITY IMPACTS					
Pennsylvania air quality non-attainment counties can be found					
PM 2.5: http://www.epa.gov/pmdesignations/2006standards/final/region3.htm Ozone: http://www.epa.gov/req3act/airquality/oxone8hrmainareas_2.htm					
Emissions of Particulate Matter (PM) and PM Precursors Bucks County, PA is within the Philadelphia-Wilmington-Trenton, PA-NJ-DE-MD nonattainment area.	There will be some short term minor air quality impacts during construction (dust and exhaust). BMPs will be utilized during construction to control dust.	☐ NOT meet PC	There will be some short term minor air quality impacts during construction (dust and exhaust). BMPs will be utilized during construction to control dust.	☐ NOT meet PC	☐ NOT meet PC
Emissions of Ozone Precursors Bucks County, PA is within the Philadelphia-Wilmington-Trenton, PA-NJ-DE-MD nonattainment area. There are no known air emission sources from Core Creek Dam.	There will be some short term minor air quality impacts during construction (dust and exhaust). BMPs will be utilized during construction to control dust.	☐ NOT meet PC	There will be some short term minor air quality impacts during construction (dust and exhaust). BMPs will be utilized during construction to control dust.	☐ NOT meet PC	☐ NOT meet PC
Objectionable odors No objectionable odors or odor sources were noted within the project area.	No effect	☐ NOT meet PC	No effect	☐ NOT meet PC	☐ NOT meet PC
Other - Construction-Related Dust No current dust issues.	There will be some short term minor air quality impacts during construction (dust and exhaust). BMPs will be utilized during construction to control dust.	☐ NOT meet PC	There will be some short term minor air quality impacts during construction (dust and exhaust). BMPs will be utilized during construction to control dust.	☐ NOT meet PC	☐ NOT meet PC
PLANTS: DEGRADED PLANT CONDITION					
Undesirable plant productivity and health Vegetation across the project area is generally healthy and well maintained. It does not appear to be in a degraded condition.	Flooding or super saturated conditions downstream of the current dam location may impact the health of surrounding vegetation. Disturbance of vegetation such as flooding may lead to the introduction of undesirable or noxious plant species.	☐ NOT meet PC	Approximately 13 acres of established grass vegetation on the dam, auxiliary spillway and adjacent areas will be disturbed during construction. Undesirable plants will be minimized with the replanting of native species and management of noxious plants.	☐ NOT meet PC	☐ NOT meet PC
Inadequate structure and composition There were no identified structural or compositional inadequacies noted in project area.	No effect	☐ NOT meet PC	No effect	☐ NOT meet PC	☐ NOT meet PC
Excessive plant pest pressure There were no excessive plant pest pressure observed or identified in project area.	No effect	☐ NOT meet PC	No effect	☐ NOT meet PC	☐ NOT meet PC
Other There were no other plant degradation concerns.	No effect	☐ NOT meet PC	No effect	☐ NOT meet PC	☐ NOT meet PC
ANIMALS: INADEQUATE HABITAT FOR FISH AND WILDLIFE					
Habitat degradation Habitat in and around the project area has been affected by nonpoint and point pollution sources. Lake Luxembourg is an impaired fishery due to poor habitat and competition with introduced fish species. Including Common carp, Gizzard shad and White perch.	A controlled breach of the dam would result in the draining of Lake Luxembourg, thus changing the current habitat for aquatic species currently in the lake and around the lake periphery. A controlled breach could also result in increased sedimentation and nutrient loading downstream, the elimination of stream obstruction for migratory fish passage, the elimination of lake ecosystem, reduced habitat value for waterfowl and an increase in the riparian corridor.	☐ NOT meet PC	Fish and waterfowl habitat may be impacted during construction due to the temporary drawdown of the sediment pool. The fish and wildlife impacts will be managed in accordance with PA Fish and Boat Commission (PFBC) requirements. Potential redbelly turtle habitat may be impacted by a temporary drawdown of the lake during construction. An approximate 42.8 acres would be impacted by a 2.5 foot drawdown. Measures, as recommended by PFBC, will be implemented to avoid impacts to nesting and to avoid stranding brumating turtles in the winter.	☐ NOT meet PC	☐ NOT meet PC

ANIMALS: LIVESTOCK PRODUCTION LIMITATION					
Inadequate feed and forage	N/A	☐	N/A	☐	
Inadequate feed or forage is not a concern within the project area.		NOT meet PC		NOT meet PC	NOT meet PC
Inadequate livestock water	N/A	☐	N/A	☐	
Inadequate livestock water is not a concern within the project area.		NOT meet PC		NOT meet PC	NOT meet PC
Other	N/A	☐	N/A	☐	
There were no other concerns related to animals associated with this project.		NOT meet PC		NOT meet PC	NOT meet PC
ENERGY: INEFFICIENT ENERGY USE					
Equipment and facilities	A controlled breach of the dam would result in a temporary increase in equipment and construction activities. Mowing and maintenance routines will be increased manage additional grass and vegetation in the former pool area.	☐	During construction an increase in equipment and facilities will be required. Normal mowing and maintenance routines will be reconvened following project completion.	☐	
Core Creek Dam is not used for energy production nor do operations there require consumption of energy except for the occasional mowing and general maintenance activities.		NOT meet PC		NOT meet PC	NOT meet PC
Farming/ranching practices and field operations	N/A	☐	N/A	☐	
Core Creek Dam is not used for farming or ranching practices or their associated field operations.		NOT meet PC		NOT meet PC	NOT meet PC
HUMAN: ECONOMIC AND SOCIAL CONSIDERATIONS					
Labor	Following the completion of the transition period when the dam is removed, staff time required to maintain the site will no longer be needed.	☐	No change in staff time needed to maintain the dam.	☐	
Core Creek Dam is owned and maintained by Bucks County. The labor needed to maintain the dam and associated recreation facilities is estimated as the equivalent of 0.5 staff years part time staff.		NOT meet PC		NOT meet PC	
Management Level	Following the completion of the transition period when the dam is removed, staff time required to manage the maintenance of the site will no longer be needed.	☐	No change in staff time needed to maintain the dam.	☐	
Management needed to maintain the dam and reservoir is estimated as the equivalent of 0.5 part time staff.		NOT meet PC		NOT meet PC	

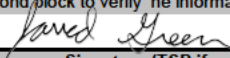
Public Health and Safety Core Creek Dam was designed and constructed to prevent flood damage downstream. It is classified as a High Hazard dam. There are approximately 1,199 homes and 178 businesses located within the inundation zone. Flooding downstream has been reduced by the dam for high frequency events up to and including the 100 year storm. This information is from a desktop survey completed during development of the Non-Structural alternatives.	Residential, commercial and transportation resources will be a greater risk of flood damage. Average annual flood damage reduction benefits of \$314,900 will be lost. Eliminates breach inundation risk to downstream residents.	☐ NOT meet PC	Maintain flood damage reduction downstream from the dam with an average annual value estimated at \$314,900. Reduced breach inundation risk to downstream residents.	☐ NOT meet PC	
PARKLANDS- Core Creek Dam is located within Core Creek Park. Core Creek Park is administered by the Bucks County Department of Parks and Recreation. One other park downstream of Core Creek Dam and within the inundation zone include (Playwicki Park). Annual recreation user days to Core Creek Park has increased through the years from approximately \$350,000 annually in the mid-eighties to in excess of \$1.2 million by 1992. The current estimate of annual recreation user days at Core Creek Park is assumed to have surpassed over \$3.3 million. Fishing and boating are the most popular activities. The park area is a significant portion of the remaining open space in Middletown Township with no nearby areas identified as possible replacements for the provided water-based recreation.	PARKLANDS - A controlled breach of the dam would result in the draining of Lake Luxembourg, the current focal point of Core Creek Park. Playwicki Park downstream of Core Creek Dam would be at greater risk of flood damage.	☐ NOT meet PC	PARKLANDS - Temporary closure of sections of Core Creek Park would be required during construction activities causing minor inconvenience to park users. Playwicki Park downstream of Core Creek Dam would retain its level of flood protection.	☐	
PUBLIC WATER SUPPLY - The Lake Luxembourg was designed with 1,215 acre-feet of storage capacity for surface water supply and as a storage reservoir for water pumped from the Delaware River. The water supply from the reservoir is currently unused.	PUBLIC WATER SUPPLY - Public water supply storage would be lost. Average annual municipal water supply benefits of \$632,500 will be lost.		PUBLIC WATER SUPPLY - Public water supply storage would be maintained. Average annual municipal water supply benefits of \$632,500 will be maintained.		

Special Environmental Concerns: Environmental Laws, Executive Orders, policies, etc.						
In Section "G" complete and attach Environmental Procedures Guide Sheets for documentation as applicable. Items with a "•" may require a federal permit or consultation/coordination between the lead agency and another government agency. In these cases, effects may need to be determined in consultation with another agency. Planning and practice implementation may proceed for practices not involved in consultation.						
G. Special Environmental Concerns (Document existing/ benchmark conditions)	J. Impacts to Special Environmental Concerns					
	No Action Document all impacts (Attach Guide Sheets as applicable)	✓ if needs further action	Alternative 1 Document all impacts (Attach Guide Sheets as applicable)	✓ if needs further action	Alternative 2 Document all impacts (Attach Guide Sheets as applicable)	✓ if needs further action
•Clean Air Act <i>Guide Sheet FS1 FS-2</i> Bucks County, PA is currently in nonattainment status for ozone and particulate matter 2.5 micrometers. There are no specific emission sources associated with the dam and the dam itself is currently in full compliance with the Clean Air Act.	May Effect There will be some temporary affects during construction including dust and exhaust. Control measures would be implemented during construction to minimize impacts. Construction equipment will conform to requirements, if any, of the Pennsylvania State Implementation Plan for Clean Air Act compliance.	☐	May Effect There will be some temporary affects during construction including dust and exhaust. Control measures would be implemented during construction to minimize impacts. Construction equipment will conform to requirements, if any, of the Pennsylvania State Implementation Plan for Clean Air Act compliance.	☐		☐
•Clean Water Act / Waters of the U.S. <i>Guide Sheet Fact Sheet</i> PADEP has determined that the designated use of Core Creek is Warm-Water Fishes-Migratory Fishes (WWF-MF). As the water bodies are listed on the list of impaired waters consistent with Section 303d of the Clean Water Act, Final TMDL studies have been approved for the Neshaminy Creek (2003, sediment) and Lake Luxembourg (1999, phosphorus and TSS). Watershed restoration activities are listed in the Neshaminy WRAS.	May Effect Sponsor will obtain the necessary permits and approvals from PADEP for earth disturbance and work near waterbodies. These will include Stream Obstruction and Encroachment Permits, the State Programmatic General Permit 5 (PASPGP-5), NPDES permit for earth disturbance greater than 1 acre, and erosion and sediment control plan approval. No wasteload allocations have been assigned for either TMDL for sediment or nutrients. Erosion and sedimentation controls consistent with an approved plan will be implemented to minimize discharge of sediment during temporary earth disturbance occurring during construction activities. Removal of the dam would not permanently change the excess sediment and nutrients currently entering Core Creek. The Neshaminy WRAS of 2004 includes watershed restoration recommendations.	☐	May Effect Sponsor will obtain the necessary permits and approvals from PADEP for earth disturbance and work near waterbodies. These will include Stream Obstruction and Encroachment Permits, the State Programmatic General Permit 5 (PASPGP-5), NPDES permit for earth disturbance greater than 1 acre, and erosion and sediment control plan approval. No wasteload allocations have been assigned for either TMDL for sediment or nutrients. Erosion and sedimentation controls consistent with an approved plan will be implemented to minimize discharge of sediment during temporary earth disturbance occurring during construction activities. Improvement of the dam would not permanently change the excess sediment and nutrients currently entering Lake Luxembourg or Core Creek. The Neshaminy WRAS of 2004 includes watershed restoration recommendations.	☐		☐
•Coastal Zone Management <i>Guide Sheet Fact Sheet</i> Although Core Creek Dam is not located within a designated Coastal Zone Management Area, the Delaware Estuary Coastal Zone Management Area boundary is less than 1 mile south of Core Creek Dam. In addition the Neshaminy Creek Watershed is included within the Delaware Estuary Coastal Watershed and the Southeast PA Coastal Nonpoint Pollution Program Management Area.	Erosion and sedimentation controls consistent with an approved plan will be implemented to minimize discharge of sediment during temporary earth disturbance occurring during construction activities. Sediment and nutrients stored in Lake Luxembourg will be transported downstream towards the Coastal Zone Management Area.	☐	Erosion and sedimentation controls consistent with an approved plan will be implemented to minimize discharge of sediment during temporary earth disturbance occurring during construction activities. Upgrade to the dam may allow for greater discharge during the largest storm events (i.e. greater than the 100-year storm).	☐		☐
Coral Reefs <i>Guide Sheet Fact Sheet</i> The project area is not subject to coral reef regulations.	No Effect N/A	☐	No Effect N/A	☐		☐

•Cultural Resources / Historic Properties <i>Guide Sheet Fact Sheet</i> The Pennsylvania Historical and Museum Commission confirmed in letter dated October 18, 2016 that there are no historic properties within the footprint of the proposed construction area. There is one property on the National Historic Register and nine bridges of local historic significance downstream from the project site.	May Effect The historic property and area bridges along with other downstream cultural resources may be impacted by flood waters above 100-year frequency events.	☐	May Effect The approved alternative will maintain reduction of flood damage to cultural resources downstream from the dam.	☐	☐
•Endangered and Threatened Species <i>Guide Sheet Fact Sheet</i> PA Dept. of Conservation and Natural Resources (DCNR) identified endangered and special concern plant species that may be within the immediate vicinity of Core Creek Dam. Correspondence with the PFBC (10/17/2016) identifies the threatened Eastern Redbelly Turtle as potentially affected. A permit for construction activities near Bald Eagle nests may be required from US Fish and Wildlife Service.	May Effect A controlled breach of the dam would result in earth disturbance, the draining of Lake Luxembourg, and potential elimination of wetland areas around the periphery of the lake and at the upper reaches of the lake. Future without project may potentially remove the habitat for these species of concern. Additional coordination is needed with DCNR, PFBC, and USFWS on whether or not habitat will be impacted and necessary protection measures.	☐	May Effect Construction activities have the potential to create temporary erosion and siltation issues that would adversely impact threatened and endangered species. No impacts to federally-listed species were identified within the Project study area based on the Pennsylvania Natural Diversity Inventory (PNDI) review. Consultation with U.S. Fish and Wildlife Service was conducted and documented with correspondence (11/10/2016). No federally-listed Threatened or Endangered species were identified. Potential nesting habitat for the Eastern Redbelly Turtle, a threatened species in Pennsylvania, was identified by Pennsylvania Fish and Boat Commission(PFBC.) Construction activities will be coordinated with PFBC to avoid/minimize impacts to the eastern redbelly turtle. Clearance letter for the proposed project area for this alternative has been received from DCNR (11/30/2016).	☐	☐
Environmental Justice <i>Guide Sheet Fact Sheet</i> The Core Creek Dam Inundation Zone's minority population is 17.2% and the percentage of population below the poverty line is 4.3%. These numbers are not higher in comparison to Bucks County (12.2% and 5.5% respectively) and the Commonwealth of Pennsylvania (20.5% and 12.3% respectively) and. However, socioeconomically disadvantaged persons do reside downstream.	May Effect No disproportionate adverse effects are anticipated to any ethnic, racial, or socioeconomically disadvantaged families or groups downstream of the dam. Removal of the dam would increase the risk of flooding downstream including to those socioeconomically disadvantaged populations that reside downstream. However the effects would not be disproportionately focused on the socioeconomically disadvantaged groups.	☐	May Effect No disproportionate adverse effects are anticipated to any ethnic, racial, or socioeconomically disadvantaged families or groups downstream of the dam. Improvement of the dam would reduce the risk of flooding downstream including to those socioeconomically disadvantaged populations that reside downstream. However the effects would not be disproportionately focused on the socioeconomically disadvantaged groups.	☐	☐
•Essential Fish Habitat <i>Guide Sheet Fact Sheet</i> There are no essential fish habitats in the project area or in Pennsylvania.	No Effect N/A	☐	No Effect N/A	☐	☐
Floodplain Management <i>Guide Sheet Fact Sheet</i> There are portions of the Core Creek project area that are located within FEMA's Flood Zone A. The one percent chance flood is the base flood.	May Effect Residential, commercial and transportation resources will be a greater risk of flood damage.	☐	May Effect Maintain flood damage reduction with an auxiliary spillway crest at the maximum reservoir elevation for one percent chance flood. Increased capacity of auxiliary spillway outflows for floods exceeding one percent chance will have minimal change in impact from existing conditions as observed on maps for the 200-year and 500-year floods.	☐	☐

Core Creek Dam reduces flood elevations downstream and reduces average annual flood damages by \$317,700. See NRCS-CPA-52	Average annual flood damage reduction benefits of \$317,700 will be lost.		Average annual value estimated at \$317,700 plus \$98,900 of No-Action cost avoided			
Invasive Species <i>Guide Sheet Fact Sheet</i> Invasive Species are a concern to the PA natural environment. A few of the invasive species that may be problematic at this site include Tree of Heaven, Bush Honeysuckle, Canada Thistle, and Multiflora Rose, among others. Invasive fish species include Common carp, Gizzard Shad, and White Perch.	May Effect A controlled breach of the dam would result in the exposure of bare soils that are presently lake bottom. Newly exposed bare soils may be subject to invasive plant growth. Invasive plant growth would be minimized by planting native species. Construction activities would be coordinated with the appropriate agencies to prevent the spread of invasive species from dam removal activities.	☐	May Effect Construction activities may introduce invasive plant species but replanting adaptive species will minimize the impact. Construction activities would be coordinated with the appropriate agencies to prevent the spread of invasive species from dam rehab activities.	☐		☐
•Migratory Birds/Bald and Golden Eagle Protection Act <i>Guide Sheet Fact Sheet</i> Lake Luxembourg and Core Creek Dam attract a variety of migratory water fowl. There is a Bald Eagle's nest in the northern end of Lake Luxembourg.	May Effect A controlled breach of the dam would result in the draining of Lake Luxembourg which would lower water levels above the dam potentially reducing wetland areas around the periphery of the lake and at the upper reaches of the lake. Reduction in open water and wetlands would alter or remove the current Bald Eagle habitat. Migratory birds and nesting activities could be temporarily disturbed during construction. The scheduling of construction activities would be coordinated with the appropriate wildlife agencies to avoid adverse impacts.	☐	May Effect The project alternative may temporarily impact migratory birds and nesting activities of the Bald Eagle during construction. Coordination of construction activities and avoidance measures will be implemented. The scheduling of construction activities would be coordinated with the appropriate wildlife agencies to avoid adverse impacts.	☐		☐
Natural Areas <i>Guide Sheet Fact Sheet</i> Areas of woodlands and wetlands exist within Core Creek Park.	May Effect A controlled breach of the dam would result in a change to the flow patterns in Core Creek. This could impact downstream plant communities and habitat by increasing stream baseflow variability and increasing peak flow rates during storms.	☐	May Effect Construction activities could affect the natural areas within the vicinity of the project area and Core Creek Park. Restoration efforts will return disturbed areas to their pre-existing conditions.	☐		☐
Prime and Unique Farmlands <i>Guide Sheet Fact Sheet</i> The project area is comprised of a majority of soil types designated as prime or unique farmlands and farmlands of statewide importance. However, no portion of the project area is located on lands that are or will be used for farming or agriculture.	No Effect A controlled breach of the dam could result in inundation or increased flooding of soil types designated as prime or unique farmlands downstream. However, it is noted that the majority of land use downstream is developed and not used for farming.	☐	No Effect Construction of the accepted alternative will result in disturbance of soil types categorized as prime and/or unique farmlands. However the land in question is already used as the auxiliary spillway, as such no actual removal of active prime and unique farmland would occur.	☐		☐
Riparian Area <i>Guide Sheet Fact Sheet</i> There are riparian areas within the project area that are forested wetlands. Riparian areas of Lake Luxembourg and the impoundment consists of wooded areas and agricultural fields. The riparian area at the impoundment consists primarily of mowed lawn. Riparian areas along Core Creek downstream of the impound consist of wooded land followed by residential properties.	May Effect With removal of the dam, downstream areas could be inundated with flood waters. In addition, riparian areas associated with the perimeter of Lake Luxembourg would be extended into Lake Luxembourg towards the course of Core Creek.	☐	May Effect There could be temporary effects to the riparian and wetland areas during construction. Restorative actions will be implemented prior to project completion.	☐		☐

Scenic Beauty Guide Sheet Fact Sheet The Core Creek Dam project area is located within view of the most heavily urbanized portion of Bucks County. Core Creek Dam substantially reduces the potential for negative visual impacts of flooding and damages to land, streams, buildings, roads, bridges, and other types of infrastructure. There is a scenic quality to the general landscape existent within the park but there is no formal scenic beauty plan.		May Effect Loss of aesthetic appeal of the lake, replaced by stream and riparian scene. Unattractive views may occur due to flood damage in downstream areas.	☐	May Effect The scenic quality of the landscape of Core Creek Park may be temporarily impacted during construction while the lake is drawn down. Unsightly construction equipment will temporarily be stored and utilized onsite. Long-term scenic beauty will be maintained.	☐		☐
Wetlands Guide Sheet Fact Sheet Wetlands are present in the immediate vicinity of Core Creek Dam specifically in the upper reaches and along a tributary of Lake Luxembourg. The open water wetlands at the stilling basin downstream of the impoundment is approximately 0.09 acres.		May Effect A controlled breach of the dam will adversely impact the wetlands within the immediate upstream vicinity of the dam and around the periphery of Lake Luxembourg at the upper reaches of Lake Luxembourg. Flooding may alter the function and composition of the wetland area downstream of the project area. The stilling basin would be removed and the 0.09 acres of wetlands would be inundated with water.	☐	May Effect The 0.09 acres of open water wetlands associated with the downstream stilling basin will be removed and shifted downstream as a result of the construction of the existing spillway extension and toe drain pipes. A State Programmatic General Permit, meeting Section 404 requirements may be required.	☐		☐
Wild and Scenic Rivers Guide Sheet Fact Sheet Core Creek is not a Federally or State listed wild and scenic river.		No Effect N/A	☐	No Effect N/A	☐		☐
K. Other Agencies and Broad Public Concerns		No Action		Alternative 1		Alternative 2	
Easements, Permissions, Public Review, or Permits Required and Agencies Consulted.		Sponsor will obtain the necessary permits and approvals from PADEP for earth disturbance and work near waterbodies. These will include Stream Obstruction and Encroachment Permits, the State Programmatic General Permit 5 (PASPGP-5), NPDES permit for earth disturbance, and erosion and sediment control plan approval. Estimated permitting fees of \$1,000.		Sponsor will obtain the necessary permits and approvals from PADEP for earth disturbance and work near waterbodies. These will include Stream Obstruction and Encroachment Permits, the State Programmatic General Permit 5 (PASPGP-5), NPDES permit for earth disturbance, and erosion and sediment control plan approval.			
Cumulative Effects Narrative (Describe the cumulative impacts considered, including past, present and known future actions regardless of who performed the actions)		Residential, commercial and transportation resources will be a greater risk of flood damage. Average annual benefits of \$4,338,300 (flood damage reduction, water supply, recreation & other) will be lost. A controlled breach of the dam would result in increased downstream delivery of sediment and nutrients, loss of wetland and lake habitats, change in riparian areas from shoreline to streams, and other effects. The breach inundation threat would be eliminated.		There are no adverse cumulative environmental, socioeconomic, or infrastructural impacts anticipated for the dam rehabilitation project.			
L. Mitigation (Record actions to avoid, minimize, and compensate)		Erosion and sediment and dust control measures will be utilized to minimize temporary effects. Erosion and sediment control measures would also be used to prevent sedimentation of adjacent and downstream wetlands. All work will be designed and performed to avoid and/or minimize impacts to wetlands. If required, the impacted wetlands will be mitigated.		Erosion and sediment and dust control measures will be utilized to minimize temporary effects. Erosion and sediment control measures would also be used to prevent sedimentation of adjacent and downstream wetlands. All work will be designed and performed to avoid and/or minimize impacts to wetlands. If required, the impacted wetlands will be mitigated.			
M. Preferred Alternative	Preferred alternative	☒		☒		☒	
	Supporting reason			Rehabilitation Alternative will meet Purpose and Need for Project and maintain flood damage reduction downstream from the dam with an average annual value estimated at \$314,900, \$3,921,700 in recreation and water supply benefits, and \$101,700 in No-Action cost avoided. This is the National Economic Development (NED) Alternative with net benefits of \$4,103,000 and a B:C ratio of 18.4 to 1 (see 5/23/2017 Economic Analysis).			

N. Context (Record context of alternatives analysis)		Neshaminy Creek	HUC 20402010303	Delaware River Watershed
The significance of an action must be analyzed in several contexts such as society as a whole (human, national), the affected region, the affected interests, and the locality.				
O. Determination of Significance or Extraordinary Circumstances				
Intensity: Refers to the severity of impact. Impacts may be both beneficial and adverse. A significant effect may exist even if the Federal agency believes that on balance the effect will be beneficial. Significance cannot be avoided by terming an action temporary or by breaking it down into small component parts.				
If you answer ANY of the below questions "yes" then contact the State Environmental Liaison as there may be extraordinary circumstances and significance issues to consider and a site specific NEPA analysis may be required.				
Yes	No			
☐	☒	• Is the preferred alternative expected to cause significant effects on public health or safety?		
☐	☒	• Is the preferred alternative expected to significantly affect unique characteristics of the geographic area such as proximity to historic or cultural resources, park lands, prime farmlands, wetlands, wild and scenic rivers, or ecologically critical areas?		
☐	☒	• Are the effects of the preferred alternative on the quality of the human environment likely to be highly controversial?		
☐	☒	• Does the preferred alternative have highly uncertain effects or involve unique or unknown risks on the human environment?		
☐	☒	• Does the preferred alternative establish a precedent for future actions with significant impacts or represent a decision in principle about a future consideration?		
☐	☒	• Is the preferred alternative known or reasonably expected to have potentially significant environment impacts to the quality of the human environment either individually or cumulatively over time?		
☐	☒	• Will the preferred alternative likely have a significant adverse effect on ANY of the special environmental concerns? Use the Evaluation Procedure Guide Sheets to assist in his determination. This includes, but is not limited to, concerns such as cultural or historical resources, endangered and threatened species, environmental justice, wetlands, floodplains, coastal zones, coral reefs, essential fish habitat, wild and scenic rivers, clean air, riparian areas, natural areas, and invasive species.		
☐	☒	• Will the preferred alternative threaten a violation of Federal, State, or local law or requirements for the protection of the environment?		
P. To the best of my knowledge, the data shown on this form is accurate and complete:				
In the case where a non-NRCS person (e.g. a TSP) assists with planning they are to sign the first signature block and then NRCS is to sign the second block to verify the information's accuracy.				
 Signature (TSP if applicable)		Project Engineer Title		6-20-2018 Date
Signature (NRCS)		Title		Date
If preferred alternative is not a federal action where NRCS has control or responsibility and this NRCS-CPA-52 is shared with someone other than the client then indicate to whom this is being provided.				
The following sections are to be completed by the Responsible Federal Official (RFO)				
NRCS is the RFO if the action is subject to NRCS control and responsibility (e.g., actions financed, funded, assisted, conducted, regulated, or approved by NRCS). These actions do not include situations in which NRCS is only providing technical assistance because NRCS cannot control what the client ultimately does with that assistance and situations where NRCS is making a technical determination (such as Farm Bill HEL or wetland determinations) not associated with the planning process.				
Q. NEPA Compliance Finding (check one)				
The preferred alternative:			Action required	
☐	1) is not a federal action where the agency has control or responsibility.		Document in "R.1" below. No additional analysis is required	
☒	2) is a federal action ALL of which is categorically excluded from further environmental analysis AND there are no extraordinary circumstances as identified in Section "O".		Document in "R.2" below. No additional analysis is required	
☐	3) is a federal action that has been sufficiently analyzed in an existing Agency state, regional, or national NEPA document and there are no predicted <u>significant adverse environmental effects or extraordinary circumstances</u> .		Document in "R.1" below. No additional analysis is required.	
☐	4) is a federal action that has been sufficiently analyzed in another Federal agency's NEPA document (EA or EIS) that addresses the proposed NRCS action and its' effects <u>and has been formally adopted by NRCS</u> . NRCS is required to prepare and publish its own Finding of No Significant Impact for an EA or Record of Decision for an EIS when adopting another agency's EA or EIS document. (Note: This box is not applicable to FSA)		Contact the State Environmental Liaison for list of NEPA documents formally adopted and available for tiering. Document in "R.1" below. No additional analysis is required	
☐	5) is a federal action that has NOT been sufficiently analyzed or may involve predicted significant adverse environmental effects or extraordinary circumstances and may require an EA or EIS.		Contact the State Environmental Liaison. Further NEPA analysis required.	

R. Rationale Supporting the Finding							
R. Findings Documentation							
R.2 Applicable Categorical Exclusion(s) (more than one may apply)	(14) Repairing or maintaining principal spillways and appurtenances associated with existing serviceable dams, originally constructed to NRCS standards, in order to meet current safety standards. Work will be confined to the existing footprint of the dam, and no major change in reservoir or downstream operations will result;						
7 CFR Part 650 <i>Compliance With NEPA</i> , subpart 650.6 <i>Categorical Exclusions</i> states prior to determining that a proposed action is categorically excluded under paragraph (d) of this section, the proposed action must meet six sideboard criteria. See NECH 610.116.	(15) Repairing or improving (deepening/widening/armoring) existing auxiliary/emergency spillways associated with dams, originally constructed to NRCS standards, in order to meet current safety standards. Work will be confined to the dam or abutment areas, and no major change in reservoir or downstream operation will result;						
	(16) Repairing embankment slope failures on structures, originally built to NRCS standards, where the work is confined to the embankment or abutment areas;						
<i>I have considered the effects of the alternatives on the Resource Concerns, Economic and Social Considerations, Special Environmental Concerns, and Extraordinary Circumstances as defined by Agency regulation and policy and based on that made the finding indicated above.</i>							
S. Signature of Responsible Federal Official: <table border="1"> <tr> <td></td> <td></td> <td></td> </tr> <tr> <td>Signature</td> <td>Title</td> <td>Date</td> </tr> </table>					Signature	Title	Date
Signature	Title	Date					
Additional notes							