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Pittsburgh District

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Final Draft
Feasibility Study and Environmental Assessment

Canonsburg Lake
Washington County, PA
Section 206 Aquatic Ecosystem Restoration Project

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EXECUTIVE SUMMARY

The Canonsburg Lake Dam was built between 1941 and 1943 by the Alcoa Corporation in order to impound a section of Little Chartiers Creek for use as a manufacturing water supply. Ownership of the lake and surrounding land was transferred to the Commonwealth of Pennsylvania in 1958. It is now managed by the Pennsylvania Fish and Boat Commission (PFBC) as a natural resource, as well as a recreational destination for fishing and boating.

Since its creation in the 1940's, Canonsburg Lake has been steadily filling in with sediment from the surrounding watershed. During a PFBC survey conducted in 1974 (Weirich, Boyer, and Mantzell, 1974), the maximum depth of the lake was listed as 7.5 meters (24.6 feet). By 1986, most of the upper portion of the lake was less than 2 meters deep (6.56 feet) (Smith and Lorson, 2000). This has significantly decreased the overall volume and area of the lake, as well as reduced lake depth. This has also reduced the available fish habitat of the lake (Smith and Lorson, 2000). As spawning and deep water habitats continue to fill in with sediment, the lake will become increasingly unable to support a self-sustaining, diverse fish population. Impairments to the fish community within the lake can have a secondary negative effect on piscivorous birds and mammals within the study area.

Turbidity is generally high within open water portions of the lake due to suspended sediments. A study performed in 1987 by the Pennsylvania Department of Environmental Protection (PA DEP) showed impairments due to nutrient loading (phosphorous) within the lake as well. The lake impairments have secondary negative effects on avian and upland species that depend on the lake for foraging. In addition, the recreational value of the lake is also being degraded as angling opportunities are threatened and boating access is diminished by the prevalence of shallow, sediment-laden areas within the lake.

An assessment of the existing habitat conditions suggests that the ecosystem within the upper portion of Canonsburg Lake is evolving in two ways: 1) the original riverine condition is beginning to develop from the lacustrine environment; and 2) significant portions of the lake have developed to a condition representative of a wetland or riparian environment and other portions of the lake are trending in that direction. With no significant action taken to address the evolving ecosystem condition within the lake, the aquatic and vegetative habitat will change. The current trend for that change in the lake does not suggest a well-balanced habitat condition, considering notable impairments to the fishery and wetland/riparian habitats. The nature of some of the impairments within the lake (e.g., mudflats) provides for ample opportunities to supplement the lake ecosystem through a combination of dredging (for aquatic habitat enhancement) and dredge material redistribution within the lake (for wetland/riparian zone enhancement).

Fish species that are more tolerant of highly turbid, eutrophic conditions, such as common carp and gizzard shad, have a survival advantage over more sensitive species, such as crappie and pumpkinseed. Gizzard shad and the non-native carp are nuisance species in the Canonsburg Lake that can adapt to these conditions better and deprive many other fish species of resources, especially under environmental conditions that are stressful to the other fish. This competitive pressure can decrease fish species diversity within Canonsburg Lake over time. This effect is already evident when one compares the fish survey performed by the PFBC in 1974 (Weirich, Boyer, and Mantzell, 1974) with

the most recent survey of Canonsburg Lake in 2000 (Smith and Lorson, 2000). The comparison shows that the fish population within Canonsburg Lake is changing as the lake continues to become shallower and more turbid. Populations of species requiring deeper water habitat are declining, while species that flourish in shallow and/ or turbid conditions are thriving. This trend is anticipated to continue until the lake eventually becomes too shallow to support a fish community. Increasing spawning habitat for predators of the gizzard shad, including largemouth bass, may increase predator numbers. Increased predation would help keep the gizzard shad population in check and reduce competitive pressure on panfish species, which in tandem with improved spawning and overwintering habitat, could help increase the diversity of the beneficial fish population within the lake.

The PFBC and the Washington County Watershed Alliance (WCWA), the non-Federal project sponsors, have asked the U.S. Army Corps of Engineers, Pittsburgh District (USACE) for assistance in ameliorating the ecological impairments to Canonsburg Lake. The Canonsburg Lake Ecosystem Restoration Project is being conducted under the authority of Section 206 of the Water Resources Development Act of 1996 (WRDA 1996), Public Law 104-303. Section 206 provides the Corps with the authority to restore aquatic ecosystems. This combined feasibility study and environmental assessment will document that the Canonsburg Lake Ecosystem Restoration Project meets all the criteria for Section 206 approval.

Restoration Goals

The overall objective of the plan formulation process for the Canonsburg Lake ecosystem restoration project is to develop project alternatives that address the degraded ecosystem within the lake, considering the existing impairments (problems) and opportunities to reverse those impairments or otherwise enhance the current habitat conditions. Successfully achieving this objective will require a focus on the natural integrity, productivity, stability and biological diversity of the lake and immediately surrounding areas. The specific objectives related to achieving the goal of ecosystem restoration and providing for the opportunities listed above are summarized below.

- Remove accumulated sediment materials from the lake bottom in areas that will most likely benefit aquatic habitat, with the focus on fish spawning habitat.

- Enhance emerging wetland and riparian zone habitats within and adjacent to the perimeter of the lake, attempting to establish a diverse and native vegetative community.

- Reduce the likelihood of sediment deposition within the upper portion of the lake that would counter any proposed habitat enhancement.

- Improve the ability of the lake environment to assimilate pollutants conveyed within the lake water column.

Providing both suitable shallow water (spawning) habitat **and** deep water (refugia) habitat within Canonsburg Lake is essential to establishing and maintaining a viable reproducing fish population.

In addition to the obvious environmental benefits, ecosystem restoration within Canonsburg Lake should also address the functional uses of the lake that are preferred by the local sponsor. Without detracting from the environmental benefits of the various restoration opportunities, the use of the lake by the adjoining property owners and the regional population is a factor for consideration. Furthermore, the practical cost of implementing the restoration activities and then maintaining them for the life of the project is also a significant consideration when identifying restoration opportunities. For these reasons, not all restoration opportunities have been considered in the detailed analysis of project alternatives and certain project alternatives are formulated specifically to reduce the ultimate costs of the project.

Evaluation of Project Alternatives

When considering the restoration opportunities for the lake, there were three essential considerations: 1) lake dredging for submerged aquatic habitat; 2) dredge material redistribution within the lake for wetland/riparian zone habitat; and 3) sediment trapping for the reduction of the sediment loading to the lake. A number of restoration scenarios were considered for Canonsburg Lake during the feasibility study phase, including a 'No Action' alternative and several mitigation alternatives. The restoration options underwent a 'screening' process to allow for a more focused and thorough evaluation of project alternatives that are practical and meet the goals of the project. Some alternatives were screened out immediately because they were determined to be infeasible. Those that remained were evaluated with respect to the total environmental benefits, expressed as habitat units, which they could generate. A cost effectiveness analysis and incremental cost analysis (CEA/ICA) was performed using the US Army Corps of Engineers Institute for Water Resources (IWR) Planning Suite Decision Support software to identify the most cost effective restoration plans, essentially characterized by the most environmentally beneficial alternatives with the least costs.

Selected Plan

Twenty-five out of an original thirty-six possible action alternatives identified during the course of this feasibility study were included in a cost-effective analysis with the intent of identifying cost-effective alternatives and the 'best buy' alternative(s) for ecosystem restoration within Canonsburg Lake. The results of the CEA/ICA process identified nine cost-effective alternatives, of which four were determined to be 'best buys'. Identification of the Selected Plan reflects the priorities and preferences of the Federal Government, the non-Federal sponsors and other stakeholder groups. Representatives of the U.S. Army Corps of Engineers, Pittsburgh District, the Pennsylvania Fish and Boat Commission and the Washington County Watershed Alliance met on December 5, 2007 to review information relative to the cost-effective alternatives and the best-buy alternatives. Based upon the attributes of the alternatives identified as 'best buys', a consensus was reached among the representatives that Alternative 36 was the most preferred option amongst the four best buys, largely due to the inclusion of deep-water habitat, a highly desired feature for the local sponsors and the local stakeholder groups.

The Selected Plan (Alternative 36) would create 13.48 acres of shallow water submerged aquatic habitat, 2.02 acres of wetland habitat, 0.97 acres of riparian zone habitat and 10.27 acres of deep water submerged aquatic habitat. The Selected Plan is the only best buy alternative that includes a deep water habitat component, which is enhanced through the installation of fish cover structures. Dredging of the proposed deep water

channel will promote fish travel up and down the lake and Little Chartiers Creek. More importantly, deep water habitat provides essential refugia for fish during seasonal temperature extremes, which allows adult fish to survive within the lake from year to year. Deep water habitat will function in tandem with shallow submerged aquatic habitat to promote a self-sustaining fish population within Canonsburg Lake. Based on the information available regarding the existing water depths and sediment depositional rates, the limited amount of existing deep water within the upper portion of Canonsburg Lake will continue to diminish over time. If no dredging occurs, substantial portions of the existing deep water habitat within the upper portion of the lake will be lost within 10 years and entirely exhausted within approximately 25 years.

The total project cost obtained through the Micro-Computer Aided Cost Estimating System (MCACES) estimating process for the Selected Plan is $5,651,339. This figure includes the costs associated with lands and damages, planning and engineering design, construction and construction management. The present worth of the cost of Operations and Maintenance dredging to be conducted in year 25 of the project is estimated in the MCACES analysis to have a present value of $1,180,301. The addition of the present value of shallow water enhancements, not included in the MCACES analysis, would represent a present worth of the cost of all Operations and Maintenance to be conducted in year 25 to $1,221,598.

General Van Antwerp's "Actions for Change" program, which groups General Strock's 12 Actions for change into four general comprehensive themes, and USACE's 7 Environmental Operating Principles are interrelated. The Canonsburg Lake project was considered in a system-wide ecosystem context that evaluated the interrelationships of terrestrial, wetland and aquatic systems. The goal of the project, which utilized the 6-step Planning Process, is a sustainable restored aquatic ecosystem that would become part of a greater watershed planning initiative that is being pursued by Washington County. This comprehensive systems approach, the consideration of risk and uncertainty as to whether the project can meet its objectives, and the open coordination between the local sponsor and interested stakeholders meets all of the General's "Actions for Change". The project, by its very nature, meets the Environmental Operating principles by striving to achieve environmental sustainability, considering the interdependence of the physical environment, seeking ways to restore degraded ecosystem structure and function, minimizing any impacts of construction, and consulting with and obtaining the views of the local sponsors and state agencies to help formulate a project that solves ecosystem problems in a manner that is scientifically sound in the most cost effective manner.

This integrated Feasibility Study and Environmental Assessment fulfills the USACE reporting requirements for feasibility level reports as well as its reporting and coordination responsibilities established under the National Environmental Policy Act (NEPA).

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1.0 INTRODUCTION

1.1 Study Authority

The Canonsburg Lake Ecosystem Restoration Project is being conducted under the authority of Section 206 of the Water Resources Development Act of 1996 (WRDA 1996), Public Law 104-303. Section 206 provides the U.S. Army Corps of Engineers (USACE) with the authority to restore aquatic ecosystems. A project is considered acceptable only when the Secretary of the Army finds it to be:

- Environmentally acceptable (will improve the quality of the environment);
- in the public interest;
- technically feasible, as demonstrated by a Feasibility Study;
- cost effective, as determined by a Cost Effectiveness Analysis; and
- complete within itself, not part of a larger project.

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Formal assurance of local cooperation in the form of a Project Cooperation Agreement (PCA) must be executed with the local sponsoring agency. The agreement formalizes the responsibility of the local sponsor to:

- provide without cost to the United States all lands, easements, rights-of-way, relocations and dredge material disposal areas necessary for the construction and subsequent maintenance of the project, and
- maintain and operate the project after completion without cost to the United States.

The PCA also confirms the funding sources for the project. The entire local sponsor's share of project costs may be provided as "work-in-kind" contributions. Credit for work-in-kind may not result in any reimbursement to the local sponsor. If the value of the sponsor's contributions is less than 35% of the project cost, the sponsor must pay the additional amount necessary so that the sponsor's total contribution equals 35% of the project costs. The Federal government provides the remaining 65% of project funding. A model PCA is included as Appendix F.

PENNSYLVANIA FISH & BOAT COMMISSION

Washington County Watershed Alliance

This combined feasibility study and environmental assessment will document that the Canonsburg Lake Ecosystem Restoration Project meets all the above criteria for Section 206 approval. The project will restore the aquatic habitat within the lake using a cost effective strategy. The Pennsylvania Fish and Boat Commission (PFBC) and the Washington County Watershed Alliance (WCWA), the non-Federal project sponsors, will cost share the project with the USACE, Pittsburgh District.

1.2 Project Purpose and Need and Significance of Canonsburg Lake

1.2.1 Purpose and Need

The purpose of this project is to improve aquatic habitat structure and function within Canonsburg Lake. Agriculture, mining and urban development have significantly modified the hydrology, water quality and overall ecosystem integrity of the Little Chartiers Creek watershed which, in turn, has impacted the lake through significant sediment accumulation. These watershed modifications and the resultant changes to the natural variability of water flow have resulted in loss of aquatic function and fish habitat in the upstream reaches of the lake, affecting species sustainability within the entire lake area. Furthermore, as portions of the lake evolve to emergent ecosystems, the colonization of invasive and less diverse vegetation has become a limiting factor on the beneficial impact of those features.

1.2.2 Ecological Significance of Canonsburg Lake

The significance of a proposed aquatic ecosystem restoration project must be demonstrated in order to compete for Section 206 funding during the budget process. Significant environmental resources are defined as those that are *institutionally, publicly, or technically recognized as important*, according to IWR Report 96-R-7. Specific guidelines for determining significance are also given in ER 1105-2-100 and EC 11-2-193. The general significance of Canonsburg Lake itself is discussed in the following paragraphs. A specific discussion of the significance of the Selected Plan is provided under Section 5.0.

Canonsburg Lake is a relatively large aquatic ecosystem positioned within a rapidly urbanizing area of southwestern Pennsylvania. Much of the adjacent area and contributory watershed have been substantially altered for human purposes, initially for agriculture and more recently for residential and urban/ industrial development. These changes have greatly reduced the amount of available upland and aquatic habitat, including wetlands, for local wildlife and native plants and put considerable stress on the ecological integrity of remaining habitat areas such as Canonsburg Lake. Agricultural practices within the watershed have contributed large amounts of sediment and nutrients to the lake. More recently, urbanization of the surrounding area and the commensurate increase in impervious surfaces has also exacerbated sedimentation and eutrophication within the lake. The lake has effectively functioned as a sediment sink, retaining suspended solids and nutrients from runoff before they can enter the 0.37 miles of Little Chartiers Creek downstream from the dam that flows into Chartiers Creek. While this action has protected the downstream waters from some of the degrading effects of agricultural and urban runoff, it has also resulted in the reduction of the overall lake volume and maximum depths available to support aquatic wildlife and decreased water quality within Canonsburg Lake. Shallow, turbid conditions favor tolerant fish species like carp and gizzard shad while hindering more sensitive species such as pumpkinseed and crappie, reducing the overall diversity of the fish population. Decades of sediment accumulation have also resulted in the development of several shallow, unvegetated 'mudflat' areas, as well large stands of invasive cattails and reed canarygrass, which offer limited habitat value. Currently the Commonwealth has no plans to remove the dam, so the lake is expected to remain as an impoundment of Little

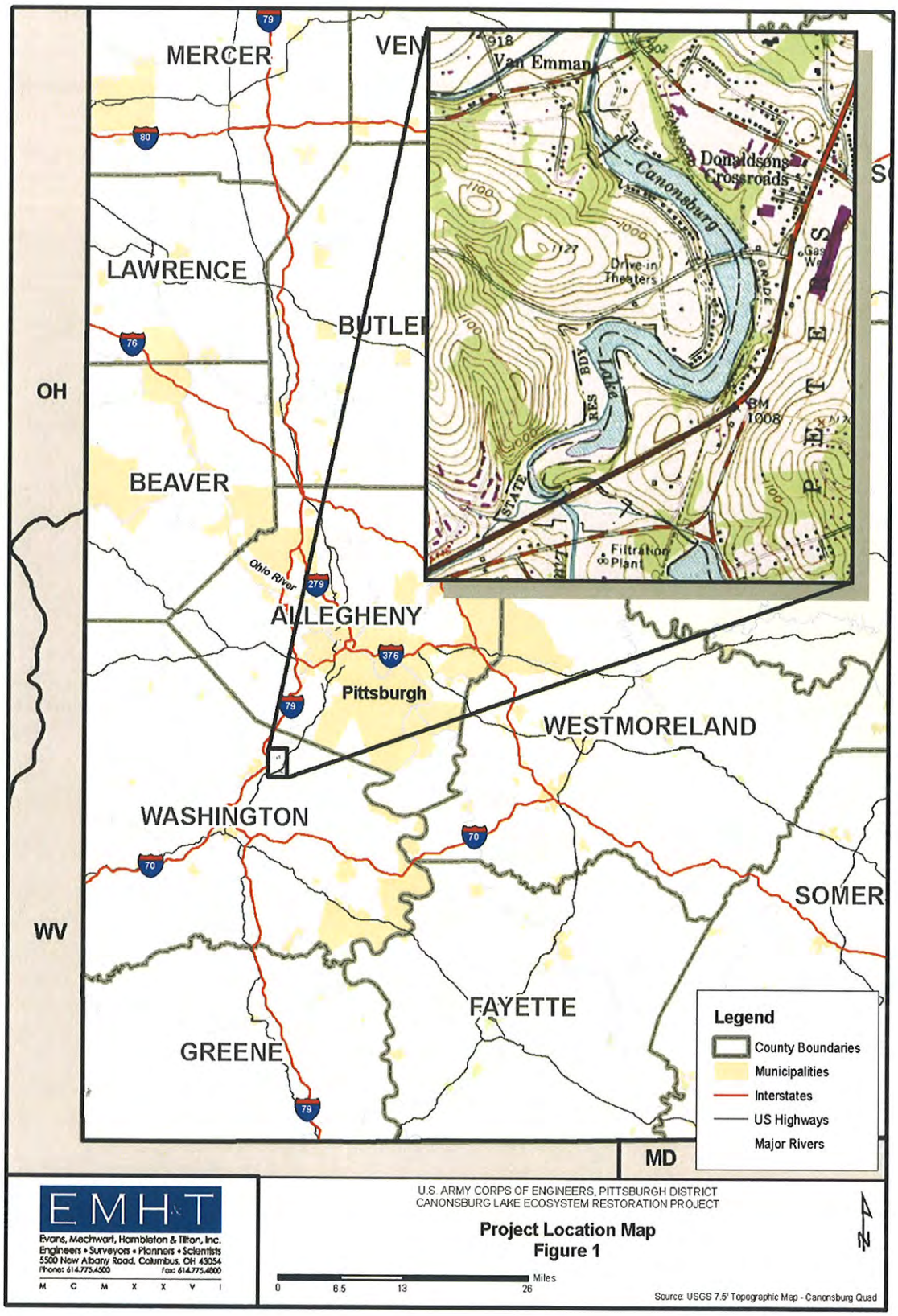
Chartiers Creek for the foreseeable future. Without intervention in the form of ecological restoration, the lake is anticipated to continue to fill in with sediment and the current trend of habitat degradation and decreased diversity will continue.

The ongoing development of surrounding areas which makes Canonsburg Lake an increasingly unique watershed feature is also the very thing that is degrading the existing aquatic habitat and threatening the future sustainability and diversity of the lake ecosystem. Canonsburg Lake is one of only two lakes in Washington County and the only lake within the Chartiers Creek watershed owned or managed by the PFBC, Pennsylvania Division of Conservation and Natural Resources (PA DCNR) and USACE, according to the PFBC. The lake is located within the Atlantic Flyway route and is used by numerous avian species (discussed further in Section 2.5.2) that are protected by the Migratory Bird Treaty Act of 1918 (50 CFR §10.13). The *North American Waterfowl Management Plan* of 1986 identifies the loss and degradation of habitat as the major waterfowl management problem in North America and promotes the protection, restoration and management of such habitat. As stated within the Section 206 Preliminary Restoration Plan for Canonsburg Lake (USACE, 2006), it is essential to preserve and improve the integrity of lacustrine quality of Canonsburg Lake so that it might serve as a functional refugia for a diverse assemblage of native wildlife and vegetation within a rapidly urbanizing area.

The non-Federal project sponsors (WCWA and PFBC) wish to restore functional aquatic habitat within the lake to the extent possible, to promote a self-sustaining fish population and extend the viable lifespan of the lacustrine ecosystem. The value of Canonsburg Lake has been recognized and promoted by various public groups and local planning organizations. In addition to its ecological importance, the lake is a state recreational destination for sport fishing and boating, uses which are increasingly limited by the accumulation of sediment within the lake. A group of local residents organized the Save Canonsburg Lake Committee to actively promote the restoration of the lake as an important recreational, ecological and aesthetic resource. The *Planning for the Future of Canonsburg Lake* program was developed by the Chartiers Creek Watershed Association (ChCWA) out of concern for the management and protection of the lake as an ecological and recreational resource. Working with the WCWA and the PFBC, the group developed a *Master Plan for Recreational Improvements to Canonsburg Lake* in 2007 (discussed further in Section 1.5.3.3). The goal of the Master Plan is to establish a number of improvements within the lake property, including nature trails, fishing areas and a Wetland Interpretation Center. These planned improvements emphasize the importance of Canonsburg Lake to the local community and are dependent upon the ecological health of the aquatic resource. The significance of the lake has also been recognized at the county level. The 2006 *Washington County Greenways Plan* identifies Canonsburg Lake as a destination that would have a large population interested in enjoying its ecological and recreational benefits (a Greenway 'hub'). The plan is discussed further in Section 1.5.9.

1.3 Project Location

The proposed project is located in North Strabane and Peters Townships, in north-central Washington County, Pennsylvania (Figure 1). Canonsburg Lake is located on Little Chartiers Creek, a tributary of Chartiers Creek. Chartiers Creek is a tributary of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CANONSBURG LAKE ECOSYSTEM RESTORATION PROJECT
Project Location Map
Figure 1
Miles
0 6.5 13 26
Source: USGS 7.5' Topographic Map - Canonsburg Quad

the Ohio River. The lake is located within the 14-digit Hydrologic Unit Code (HUC) 05030101010002. Canonsburg Lake is located south of West McMurray Road and northwest of US Route 19 (Washington Road). The lake is bisected by a causeway that takes McDowell Road across the lake.

1.4 Project Sponsors

The PFBC and the WCWA are the local sponsors of the restoration project. A PCA will be executed during the Plans and Specifications phase of the project study. The local sponsors will provide their share of the project cost to the District after PCA execution. A model PCA is included as Appendix F.

1.5 Prior Studies

1.5.1 Section 206 Preliminary Restoration Plan

The problems and opportunities for restoration within Canonsburg Lake were first identified in the Section 206 Preliminary Restoration Plan for Canonsburg Lake, issued by the USACE in May 2006 (USACE, 2006). The report noted impairments to the lake were due primarily to years of sedimentation, which has had a negative impact on fish and benthic habitat and water quality. The plan proposed improvements to the lake to achieve new benthic habitat, improved water quality, restoration of 1.2 miles of stream thalweg to reconnect the lacustrine and riverine portions of Little Chartiers Creek, restoration of gravel and cobble substrate for benthic and fish species, and creation of 11 acres of wetlands. The information and proposed alternatives for restoration within the Preliminary Restoration Plan were considered during the development and assessment of project alternatives within this Feasibility Study and Environmental Assessment.

1.5.2 Canonsburg Lake Management Report

In November 2000, the PFBC prepared the *Management Report for Canonsburg Lake* (Smith and Lorson, 11/2000). The report made several management recommendations for the lake based upon a fish population survey that was conducted by the PFBC during May 2000. The survey found an abundant population of largemouth bass (*Micropterus salmoides*), many of quality size, and the report recommends continued efforts to inform anglers of the bass fishing opportunities in the lake. Crappie (*Pomoxis* spp.) and bluegill (*Lepomis macrochirus*) were limited by competition from gizzard shad. These species will be managed by statewide regulations. The lake is a good catfish fishery (*Ameiurus nebulosus* and *Ictalurus punctatus*), and the PFBC recommends increased stocking of catfish to maintain this fishery. Muskellunge (*Esox masquinongy*) and tiger muskellunge populations (*Esox lucius* x *Esox masquinongy*) were found to be low, indicating that these stocked species are not thriving in the lake. Stocking of muskellunge will be discontinued per the report recommendations. The report also recommends reduction of non-point source pollution within the lake watershed, particularly that of nutrient enrichment contributing to the accelerated eutrophication of the lake.

1.5.3 Chartiers Creek Watershed Association Studies

The Chartiers Creek Watershed Association (ChCWA) represents the upper Chartiers Creek Watershed in

Washington County, Pennsylvania. Membership in the ChCWA is open to anyone living within the watershed, as well as individuals, businesses and organizations that own property or are actively involved within the boundaries of the Watershed. The ChCWA is a member of the WCWA, which is a nonprofit, umbrella organization for Washington County designed to coordinate and enhance the efforts of individual watershed associations. The WCWA is also a local sponsor of the Canonsburg Lake restoration project. Study data and conservation/ management plans related to the Chartiers Creek watershed and Canonsburg Lake, made available by the ChCWA, are summarized in the following sections.

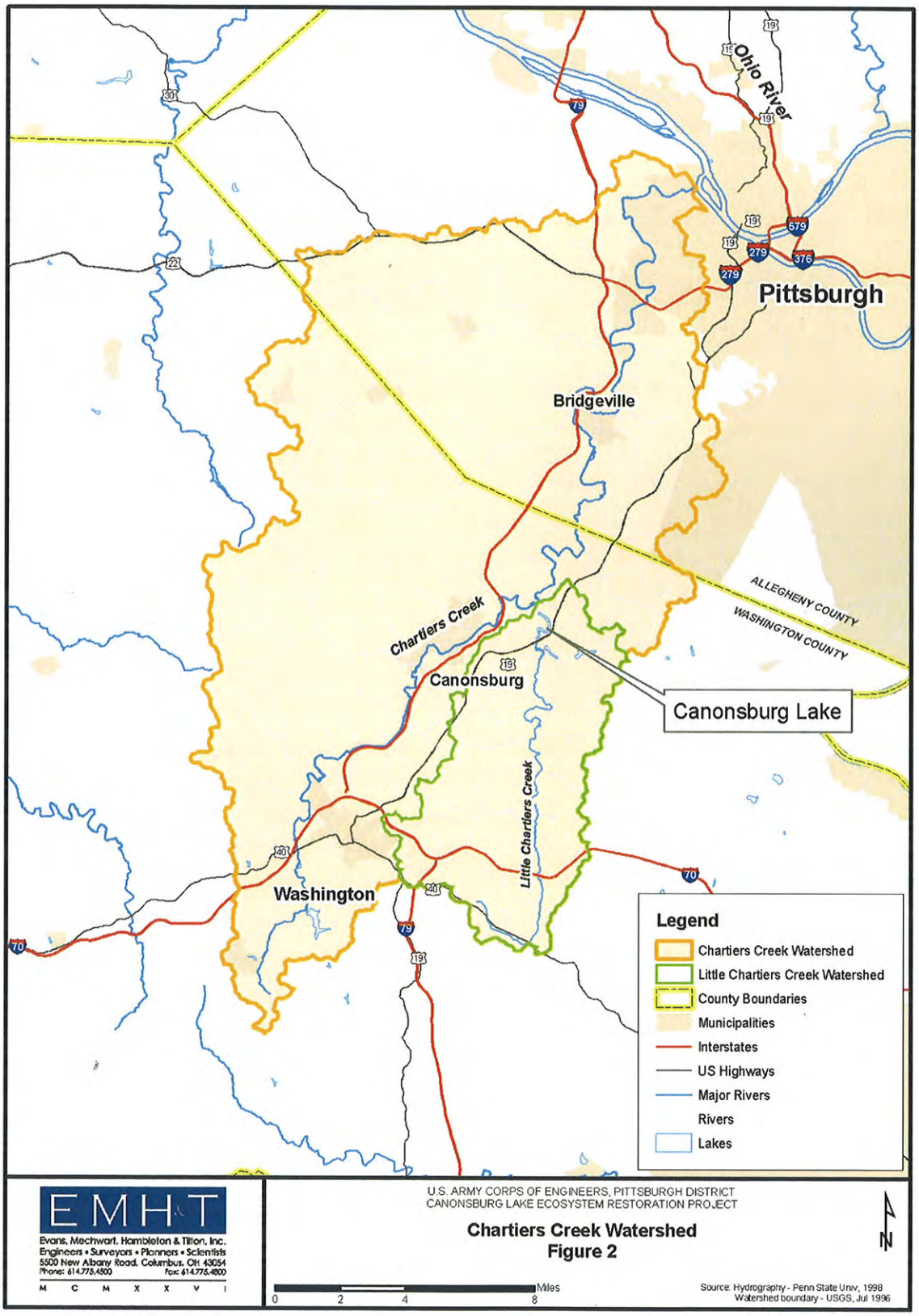
1.5.3.1 Little Chartiers Creek Water Quality and Macroinvertebrate Data

The ChCWA has performed water quality sampling at a site on Little Chartiers Creek near the intersection of Linden Road and Linden Creek Road several times a year since 2001. This site is approximately 2 to 2.6 miles to the south of Canonsburg Lake and is upstream from the lake. The parameters assessed were temperature, pH, specific conductivity, dissolved oxygen, acidity, alkalinity, chloride, nitrate, phosphate, sulfate, iron, manganese and aluminum. In addition, the ChCWA sampled the creek for aquatic macroinvertebrates on a semi-annual basis.

The parameters of dissolved oxygen, nitrate and phosphate concentrations were examined by EMH&T for trends. Nutrients like nitrates and phosphates boost primary productivity in lakes and can result in eutrophic conditions. Eutrophic lakes are typically deficient in dissolved oxygen, which can negatively affect certain fish species. Hypereutrophic conditions were documented within Canonsburg Lake by the Pennsylvania Department of Environmental Protection Lake Phosphorous Study (PA DEP, 1987). The ChCWA water sampling data shows general upward trends for both nitrate and phosphate concentrations at the sample location on Little Chartiers Creek between 2001 and 2006. Increased nutrient loads within Little Chartiers Creek are likely exacerbating the eutrophic conditions within Canonsburg Lake. Dissolved oxygen levels at the sample location do not show a recognizable trend, however the samples indicated that DO levels at the sample site are above the minimum criteria for High Quality Warm Water Fishery (HQ-WWF) waters (5.0 mg/L) listed in §93.7 of the Pennsylvania Code.

1.5.3.2 River Conservation Plan for the Upper Chartiers Creek Watershed

The ChCWA and the WCWA published the *River Conservation Plan for the Upper Chartiers Creek Watershed* in January, 2003. The plan was designed as a dynamic planning tool for local and multi-municipal planning efforts to improve and protect the water resources within the watershed. The Chartiers Creek watershed is depicted in Figure 2. The River Conservation Plan contains information about the characteristic resources of the Upper Chartiers Creek Watershed. The report identifies potential planning and project activities and presents model codes and ordinances to assist communities in protecting resources and improving developmental activities. The report also identifies potential technical and funding sources to assist individuals, organizations and municipalities to implement specific projects.


Ohio River
Pittsburgh
Bridgeville
Chartiers Creek
Canonsburg
ALLEGHENY COUNTY
WASHINGTON COUNTY
Canonsburg Lake
Little Chartiers Creek
Washington
Legend
Chartiers Creek Watershed
Little Chartiers Creek Watershed
County Boundaries
Municipalities
Interstates
US Highways
Major Rivers
Rivers
Lakes
EMHT
Evans, Mechwart, Hambleton & Tilton, Inc.
Engineers • Surveyors • Planners • Scientists
5500 New Albany Road, Columbus, OH 43054
Phone: 614.775.4500 Fax: 614.775.4800
M C M X X V I
U.S. ARMY CORPS OF ENGINEERS, PITTSBURGH DISTRICT
CANONSBURG LAKE ECOSYSTEM RESTORATION PROJECT
Chartiers Creek Watershed
Figure 2
Miles
0 2 4 8
Source: Hydrography - Penn State Univ, 1998
Watershed boundary - USGS, Jul 1996

The River Conservation Plan recommends a number of management activities for the watershed. Some of the recommendations that may have a specific impact on Canonsburg Lake are listed below.

- Development of model land-use ordinances that are protective of agricultural soils, steep slopes, open space, riparian buffers, parks and floodplain resources.
- Initiation of a largemouth bass tournament at Canonsburg Lake.
- Completion of a Pennsylvania Act 167 Stormwater Management Plan in Washington and Allegheny Counties and completion of local stormwater management ordinances (implementation of stormwater management plans could ultimately reduce the sediment load entering Canonsburg Lake).

1.5.3.3 Recreational Improvements to Canonsburg Lake

The ChCWA instituted a project specific to the lake, **Planning for the Future of Canonsburg Lake**, which was funded by a grant through the Pennsylvania Department of Conservation and Natural Resources. The purpose of the project was to look at recreation at the lake today and suggest possible recreation improvements for the future, with a focus on control of future sediment deposition. Under this project, the ChCWA released the *Master Plan Recreational Improvements to Canonsburg Lake* (ChCWA et al., March 2007). The plan was a combined effort of the ChCWA, the Washington County Conservation District, and the PFBC. The plan suggests various improvements to the lake area, including a system of nature trails and boardwalks, pedestrian bridges, access roads and parking, picnic areas, restroom facilities, a Wetland Interpretation Center, boat launches and fishing areas. The Master Plan also recognizes that a number of significant factors may affect the future existence of Canonsburg Lake, including the status/ condition of the existing dam, continuing influx of sediment, residual damage from flooding caused by Hurricane Ivan in 2004, surrounding land development, and the potential crossing of the upper portion of the lake with the proposed Southern Beltway roadway alignment by the Pennsylvania Turnpike Commission. The recommended recreational improvements are very dependent upon how these factors affecting the health and longevity of the lake are resolved.

1.5.4 Canonsburg Lake Dam Assessment

A technical assessment of the Canonsburg Lake dam was performed and published in a report entitled *Canonsburg Dam Assessment, Washington County, Pennsylvania,* dated December 1996. The report was prepared by Schnabel Engineering on behalf of the PFBC to examine both the hydraulic capacity and physical integrity of the dam. The Commonwealth of Pennsylvania operates a dam safety program that assesses and classifies dams in

Canonsburg Lake Dam, 2007

terms of their risk to the general population and public infrastructure, and imposes standards for reducing the risk of dam failure. The December 1996 report was prepared to assess that risk and presented the conclusions noted below. The report also notes that the Canonsburg Lake dam is classified as "intermediate in size and of high hazard potential".

- The dam spillway is not capable of passing the design flood event given the risk classification of the dam. In this case, some portion of that flood event will pass over the non-overflow sections of the dam.
- The concrete of the dam is in good condition; however, surfacial degradation is apparent and the spillway (and non-spillway) portions of the dam may require some stabilization against 'sliding'.
- There is no low-level outlet for the dam, although a suction line is (was) apparent.

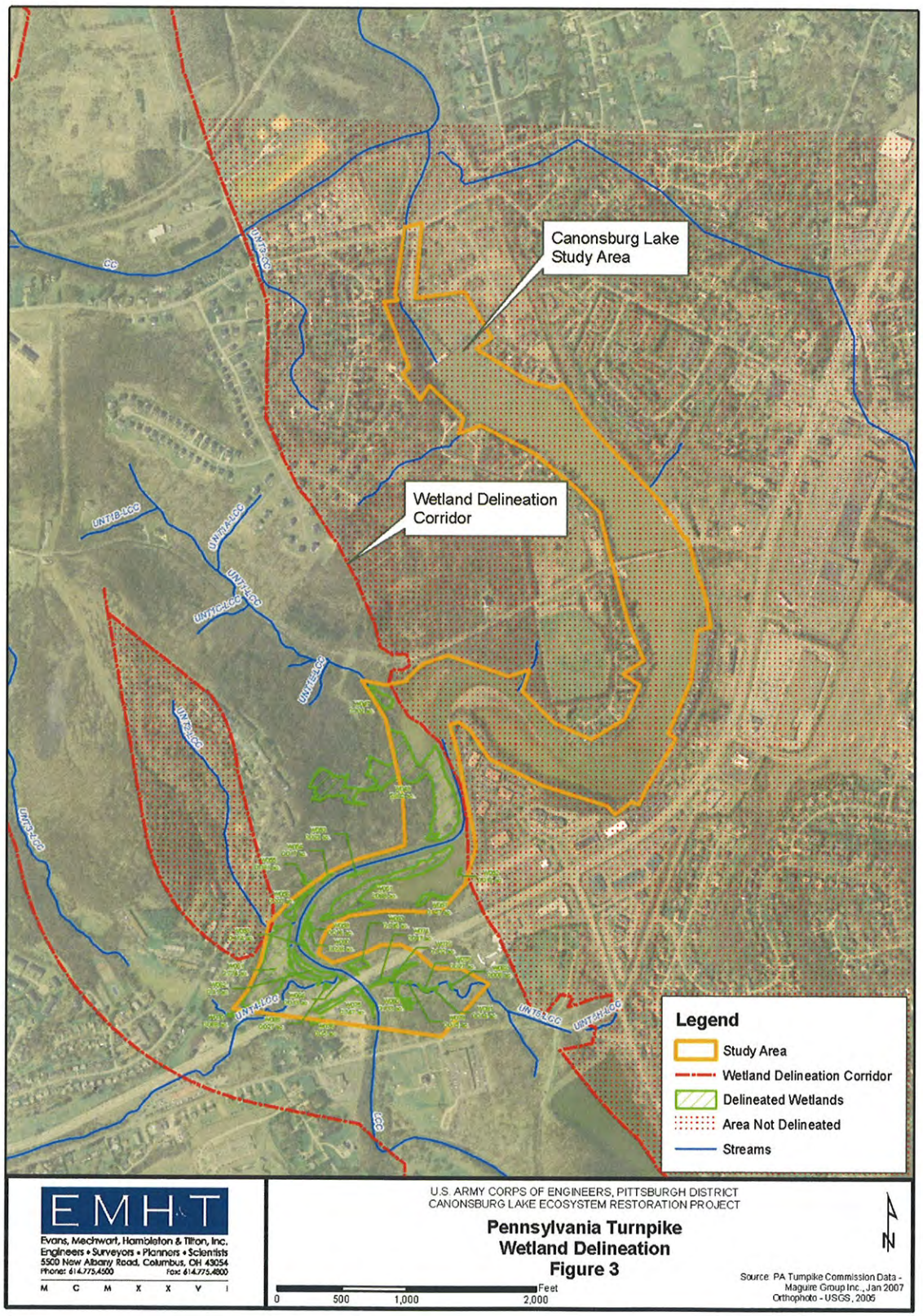
More recent information gathered from the PFBC suggests that funding sources are being considered for implementing the necessary physical improvements to the dam. There is no indication that the Commonwealth of Pennsylvania is considering an abandonment/ removal of the dam in response to the dam safety concerns noted in the study.

1.5.5 Pennsylvania Turnpike Commission Wetland Delineation

The Pennsylvania Turnpike Commission is evaluating a proposed 30-mile limited access highway known as the Southern Beltway that would be located between Pennsylvania Route 60 and the Mon/ Fayette Expressway (Pennsylvania Route 43). The Southern Beltway is divided into three project areas, one of which (Interstate 79 to the Mon/ Fayette Expressway) could cross over Canonsburg Lake. As part of the environmental documentation for the Southern Beltway project, the Pennsylvania Turnpike Commission performed a wetland delineation which included a portion of the Canonsburg Lake project area, as shown in Figure 3. Approximately 13.07 acres of emergent, forested and shrub-scrub wetland were delineated within the potential alignment study area across Canonsburg Lake (Maguire Group Inc., 2000-2001). The Pennsylvania Turnpike delineation is addressed further within Appendix G.

1.5.6 Canonsburg Lake TMDL

The Pennsylvania Department of Environmental Protection (PA DEP) prepared a Draft Total Maximum Daily Load (TMDL) for nutrients in Canonsburg Lake dated February, 2004 (PA DEP, 2/2004). The TMDL was submitted to the U.S. Environmental Protection Agency (USEPA) on July 12, 2004 for final agency review. According to Pennsylvania Code Title 25, Chapter 93 – *Water Quality Standards*, Little Chartiers Creek is listed as a High Quality Warm Water Fishery (HQ-WWF) from the headwaters to the Alcoa Dam on Canonsburg Lake. The TMDL report indicates that a Lake Phosphorous Study conducted by Proch in 1987 states that the Little Chartiers Creek watershed received this designation for the sole purpose of protecting the lake. Canonsburg Lake was identified on Pennsylvania's 1996 Section 303(d) list as failing to support its aquatic life use, being impaired by nutrients from non-point agricultural sources.


Canonsburg Lake Study Area
Wetland Delineation Corridor
UNTCLCC
UNTBLCC
UNTALCC
CC
Legend
Study Area
Wetland Delineation Corridor
Delineated Wetlands
Area Not Delineated
Streams
EMHT
Evans, Mechwart, Hambleton & Tilton, Inc.
Engineers • Surveyors • Planners • Scientists
5500 New Albany Road, Columbus, OH 43054
Phone: 614.775.4500 Fax: 614.775.4800
M C M X X V I
U.S. ARMY CORPS OF ENGINEERS, PITTSBURGH DISTRICT
CANONSBURG LAKE ECOSYSTEM RESTORATION PROJECT
Pennsylvania Turnpike
Wetland Delineation
Figure 3
Feet
0 500 1,000 2,000
N
Source: PA Turnpike Commission Data - Maguire Group Inc., Jan 2007
Orthophoto - USGS, 2005

The overall goal of the TMDL is to improve the trophic status of the lake by addressing these elevated nutrient concentrations, as Pennsylvania did not have numeric water quality criteria for nutrients at the time the TMDL was published. A TMDL was established only for phosphorous, as it was determined to be the limiting nutrient in the lake system. The existing phosphorous load in Canonsburg Lake was found to be 7,424 kg/ year. The TMDL for phosphorous that the PA DEP determined would allow the lake to meet its aquatic life use is 4,316 kg/ year, which equates to a reduction of 42% from the existing load.

The TMDL for the lake recommends that both agricultural and urban Best Management Practices (BMPs) be implemented in affected areas to achieve the loading reduction goal. Specifically, the report mentions riparian plantings, contour strips, and cover crops, which have 20% to 70% efficiency for phosphorous reduction. Additional BMPs include improved animal waste management systems, reinforced cattle crossings to prevent bank erosion, and stream bank stabilization and fencing. The TMDL report is made available online by the USEPA at the following website address: http://www.epa.gov/reg3wapd/tmdl/pa_tmdl/CanonsburgLake/CanonsburgLkDR.pdf.

1.5.7 Chartiers Creek Watershed TMDL

A TMDL study for the Chartiers Creek Watershed was completed and published by the PA DEP and the USEPA in April 2003. The objective of this study was to develop TMDLs that address the three primary metals associated with acid mine drainage (iron, manganese, and aluminum) for impaired waterbodies in the Chartiers Creek watershed (PA DEP and USEPA., 4/03).

The TMDL lists one still-active permitted mine within the watershed. The mine is allowed to discharge stormwater within the upper portion of the Little Chartiers Creek watershed under an individual NPDES permit. In addition, the watershed has several abandoned mines that were considered in the analysis to determine pollutant potential within the watershed. All of these discharge points are upstream of Canonsburg Lake (PA DEP and USEPA., 4/03).

1.5.8 Washington County Comprehensive Plan

The *Washington County Comprehensive Plan* was developed by the Washington County Planning Commission and adopted on November 23, 2005. The plan guides the future growth of the county and its resources. County development objectives include protection of natural resources to promote ecological balance and sustain the resources. The document also indicates that the PFBC has classified Little Chartiers Creek and Canonsburg Lake as Approved Trout Waters, which means they can be stocked with trout to promote sport fishing.

1.5.9 Washington County Greenways Plan

A draft of the *Washington County Greenways Plan* was published by the Washington County Planning Commission in October 2006. The plan identifies Canonsburg Lake as being within the Little Chartiers Creek Natural Area on the Greenway Plan. The plan recommends *"best management practices for Growing Greener conservation subdivisions in municipal ordinances, such as establishing riparian buffers, preserving*

fertile and active agricultural lands, implementing access management ordinances to lessen fragmentation of habitat, preserving open space, and managing storm water from new developments" for this greenway area (Washington County Planning Commission, 10/06). The lake itself is identified as a Greenway 'hub', or *a "destination that would have a large population interested in enjoying the ecological and recreational benefits of greenways".*

1.6 Study Assumptions

The formulation of alternatives, including the development of project costs, is based on a number of assumptions, both explicit and implicit, that have been made during the course of this study. The assumptions are necessary to account for a lack of readily available data concerning the volume, loading rate and composition of sediment within the lake.

The following are the assumptions made for this study:

- Future sedimentation rates within Canonsburg Lake will be consistent with average historical rates. As discussed in Appendix A, the average historical rate is based on a determination of the amount of accumulated sediment within the lake. More detailed information regarding annual sediment loading rates and sediment constituency within the lake was not available. Rates of sedimentation will be uniformly distributed throughout the 10-year floodplain (water surface and adjacent riparian zone) of the lake (921.8 ft, NGVD 1929. Due to lack of sediment data, an analysis of sediment transport within the lake was not performed.
- Sediments within the lake do not contain contaminants that would restrict their use, reuse, transport, and/or disposal. This conclusion is supported by the limited available physical data discussed later this report.
- Sediments within the lake do not contain constituents and/or physical characteristics that would prohibit or significantly restrict the establishment of vegetation within areas of placement.
- Sediments within the lake do not contain constituents and/or physical characteristics that would prohibit or significantly restrict removal through hydraulic dredging means.
- Sediments within the lake do not contain constituents and/or physical characteristics that would prohibit or significantly restrict placement of dredged sediments within tubes constructed of geosynthetic membranes (i.e. geotubes).
- Dredging of lake sediments will not result in impairment of water quality in the lake, excepting in the immediate vicinity of the dredge, as a result of suspension of or dissolution of constituents within the sediments.
- The Green Alternate, Option 1-A, of the Pennsylvania Turnpike Commission will be the recommended plan for the new highway that will span Canonsburg Lake. This conclusion is the result of coordination with both the Turnpike Commission and their environmental consultant, The Maguire Group, but is subject to a further review and approval process.

Additional information may become available in the future that would change the estimate of the volume of accumulated sediment and, therefore, the annual rate of sediment

deposition within the lake. Or, additional acquired information may change the assumptions regarding the constituency (grain size and pollutants) of the sediment that could affect the plan in terms of dredge and material placement methods. In either case, the feasibility and costs of certain project alternatives, presented in Appendix G and Section 3 of this report, may need to be re-evaluated to reflect the additional information.

1.7 Agency Consultation and Public Coordination

1.7.1 Agency Consultation

Consultation with the U.S. Fish and Wildlife Service (USFWS), the PA DCNR Bureau of Forestry, the PFBC, and the Pennsylvania Game Commission (PGC) was completed via the Pennsylvania Natural Diversity Inventory (PNDI) Project Planning and Environmental Review Tool for the Canonsburg Lake Ecosystem Restoration Project. The agencies were consulted regarding status of the following issues related to the project site:

- USFWS – consulted in accordance with the U.S. Fish and Wildlife Coordination Act and Section 7 of the Endangered Species Act.
- PA DCNR – consulted regarding State-listed plants, natural communities, terrestrial invertebrates and geologic features.
- PFBC – consulted regarding State-listed fish, reptiles, amphibians and aquatic organisms. The PFBC is a non-Federal public sponsor with has management responsibility for Canonsburg Lake. The project team has coordinated with this agency in developing this study.
- PGC – consulted regarding State-listed birds and mammals.

The PNDI Environmental Review Receipt is included as Attachment 1. In addition, documentation of additional coordination with the USFWS and PA DCNR resulting from the PNDI Environmental Review is included in Attachments 2 and 3. No potential impacts to species or resources were indicated by the USFWS, PFBC or PGC. One potential project impact related to State-listed rare and threatened species was identified by the PA DCNR and is discussed further in Section 2.10.2.

Coordination was conducted with the Natural Resources Conservation Service (NRCS) in accordance with the Farmland Protection Policy Act (FPPA) using the Farmland Conversion Impact Rating (FCIR) Form AD-1006. A copy of the completed FCIR form is included as Attachment 4, and further discussion of the FCIR form is provided under Section 4.2.3. The PA DEP and the Pennsylvania Turnpike Commission have also been a part of the agency involvement for the project. Since the Turnpike Commission has been planning a possible toll road through the upper end of the lake, the commission has also completed formal consultation with other state and Federal agencies such as the USFWS and the LRP Corps regulatory office.

1.7.2 Public Coordination

The project has two non-Federal sponsors, the PFBC and the WCWA. The WCWA includes numerous other partners and stakeholders involved with the project including Washington County Conservation District, Washington County office of Planning, ChCWA, Peters Township Planning Commission, North Strabane Township, and the Save Canonsburg Lake Committee. Since the Detailed Project Report (feasibility) phase

of the project was begun in Fiscal Year 06, there have been numerous meetings with the steering committee (WCWA). There was a kick-off meeting with the steering committee conducted on October 4, 2006, during which project goals and objectives were discussed. The kick-off meeting was also attended by representatives of the Pittsburgh District and the A-E consultant team.

Another meeting with the project sponsors was held as part of a presentation by the A-E at the Pittsburgh District to present the possible alternatives and "best-buy" solutions to the project in December 2007. This meeting was attended by the USACE Pittsburgh District, the USACE Great Lakes and Ohio River Division Office (via teleconference), representatives from Congressman Tim Murphy's office, members of the steering committee, and the A-E consultant team.

In January of 2008, a meeting was held with the stakeholders of the project to present project alternatives and best-buy solutions. In addition to the non-Federal sponsors and Corps, the meeting included Congressman Tim Murphy, two of the three Washington County Commissioners, several Legislators from the Commonwealth of Pennsylvania, and various local elected officials from the two townships, and members of the various individual groups which comprise the steering committee. Total attendance at the January 2008 meeting was approximately 200 people.

In addition to this formal coordination, the A-E and representatives of the USACE Pittsburgh District have discussed project-related issues with the non-Federal project sponsors throughout the study process. As an example, these discussions were related to the gathering of baseline data, opportunities for disposal of dredged material within the Canonsburg Lake area and the consideration of local regulations and policies impacting the watershed.

The Feasibility Study and Environmental Assessment will be circulated among the aforementioned agencies and public entities, as well as any other interested parties, for review. Any comments received from reviewers will be considered in reaching a final decision for the Canonsburg Lake Ecosystem Restoration Project.

2.0 EXISTING CONDITIONS OF THE STUDY AREA

2.1 General Description of Study Area

2.1.1 History of Canonsburg Lake

Canonsburg Lake was built between 1941 and 1943 by the Alcoa Corporation as a manufacturing water supply. The lake's reinforced concrete gravity dam is approximately 525 feet long and 45 feet high, impounding water from the Little Chartiers Creek basin. Historically the lake had a surface area of approximately 76 acres, a volume of 775 acre/ feet, a mean depth of 9.2 feet and a maximum depth of 42.6 feet (PA DEP, 2/2004).

Due to years of heavy siltation, the maximum and average depth and total volume have decreased considerably according to an internal study conducted by the PA DEP in 1987. According to the PFBC, the lake was found to have a maximum depth of approximately 11.5 feet during the 1980's. The total volume of the lake is currently

estimated to be approximately 322 acre/ feet, which represents a 58% reduction in holding capacity from the lake's original volume. Currently, the surface area of the lake is approximately 63 acres, a reduction of 17% since 1943.

In 1958 the lake was donated to the Commonwealth of Pennsylvania. The Commonwealth owns and controls approximately 138 acres in the vicinity of the lake, including the lake itself, the dam, and associated shoreline. The Commonwealth controls the lake through the PFBC, who currently manage the lake for recreational sport fishing and limited boating. Appendix E contains information describing the real estate needs of the project, including temporary and permanent easements within and adjacent to the Canonsburg Lake Study Area.

2.1.2 Watershed Characteristics and Land Use

Canonsburg Lake is an impoundment of Little Chartiers Creek, which provides the lake with a 46 square mile watershed. Little Chartiers Creek is a tributary to Chartiers Creek, which in turn flows into the Ohio River. The Chartiers Creek Watershed includes portions of Pittsburgh and its suburbs, Canonsburg, and Washington, Pennsylvania. Figure 4A presents the 2000 land use distribution for the 46 square mile watershed that feeds Canonsburg Lake, and Figure 4B provides a closer view of land use adjacent to the lake. The watershed is predominately agricultural in nature, with 22.8% of lands in row crops and 16.7% in hay pasture. Nearly 40% of the watershed is covered by various forest types. Low density urban development and transitional areas round out the main land uses within the lake watershed.

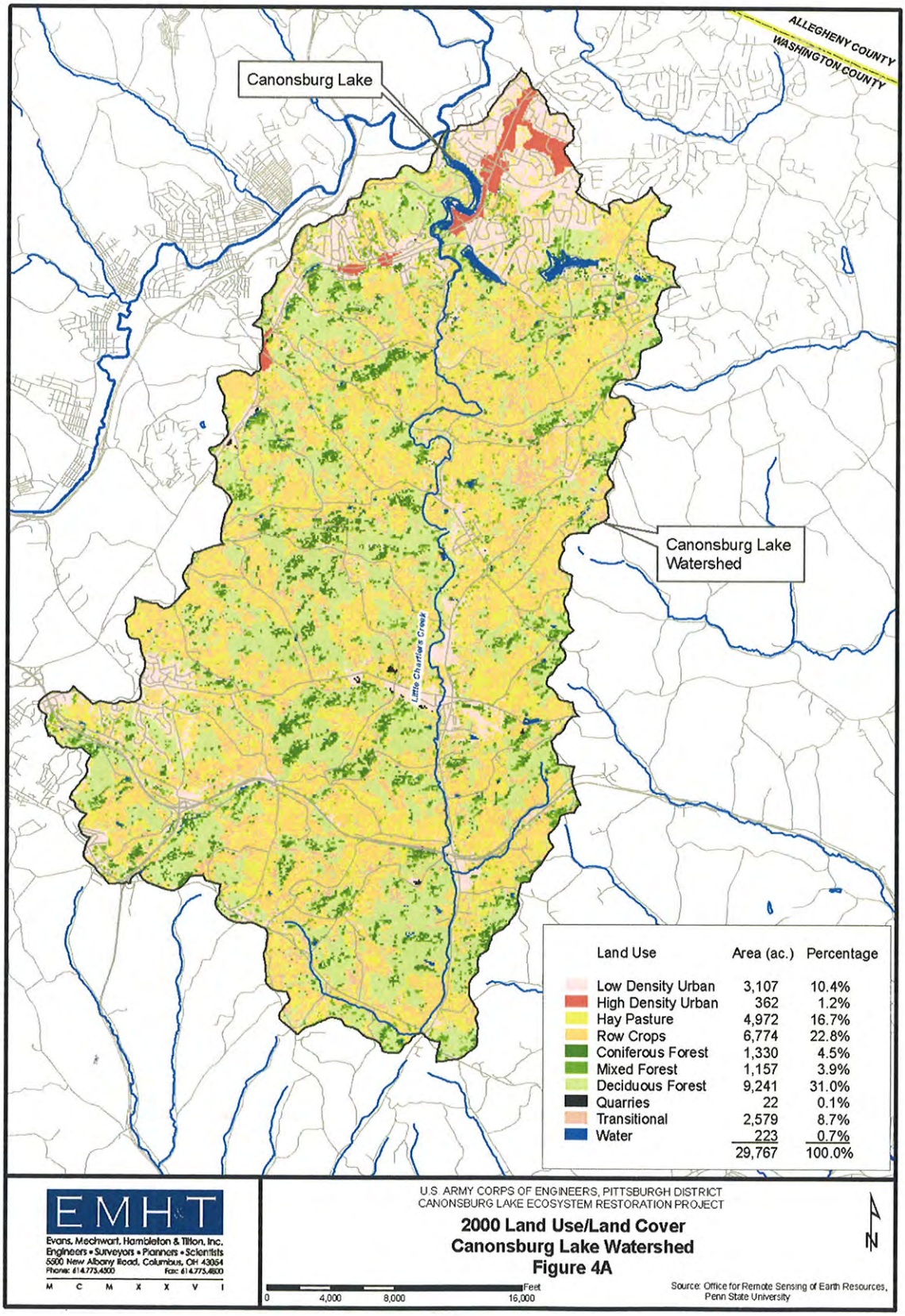
2.1.3 Climate

National climate data is published by the National Oceanic and Atmospheric Administration (NOAA). For the area surrounding Canonsburg Lake and affecting the larger watershed, the published data for the City of Pittsburgh, Pennsylvania is presented in summary fashion in Table 1.

TABLE 1
Summary of Climatology Data

	Annual Values [1]	**Comments**
Temperature Data (degrees, Fahrenheit)		
Highest Recorded Value [2]	103	July recording
Lowest Recorded Value [2]	-22	January recording
Normal Daily Maximum [4]	60.4	Ranges between 35.1 in Jan. and 82.7 in July
Normal Daily Minimum [4]	41.5	Ranges between 19.9 in Jan. and 62.4 in July
Normal Daily Mean [4]	50.9	Ranges between 27.5 in Jan. and 72.6 in July
Mean Number of Days ≤ 32° [3]	120 days	Values recorded between Oct. and April
Mean Number of Days ≥ 90° [3]	8 days	Values recorded between June and Sept.
Precipitation Data		
Normal Values [4]	37.85 in.	Ranges between 2.25 in Oct. and 4.12 in June
Mean Number of Days ≥ 0.01 in. [2]	152 days	Ranges between 9 days in Aug. and 16 days in Jan.
Average Total of Snowfall [2]	43.8 in.	Values recorded between Oct. and May

[1] *Comparative Climatic Data for the US through 2006*, NOAA
[2] 54 years of record [3] 47 years of record [4] 30 years of record


ALLEGHENY COUNTY
WASHINGTON COUNTY
Canonsburg Lake
Canonsburg Lake Watershed
Little Chartiers Creek
Land Use | Area (ac.) | Percentage
Low Density Urban | 3,107 | 10.4%
High Density Urban | 362 | 1.2%
Hay Pasture | 4,972 | 16.7%
Row Crops | 6,774 | 22.8%
Coniferous Forest | 1,330 | 4.5%
Mixed Forest | 1,157 | 3.9%
Deciduous Forest | 9,241 | 31.0%
Quarries | 22 | 0.1%
Transitional | 2,579 | 8.7%
Water | 223 | 0.7%
29,767 | 100.0%
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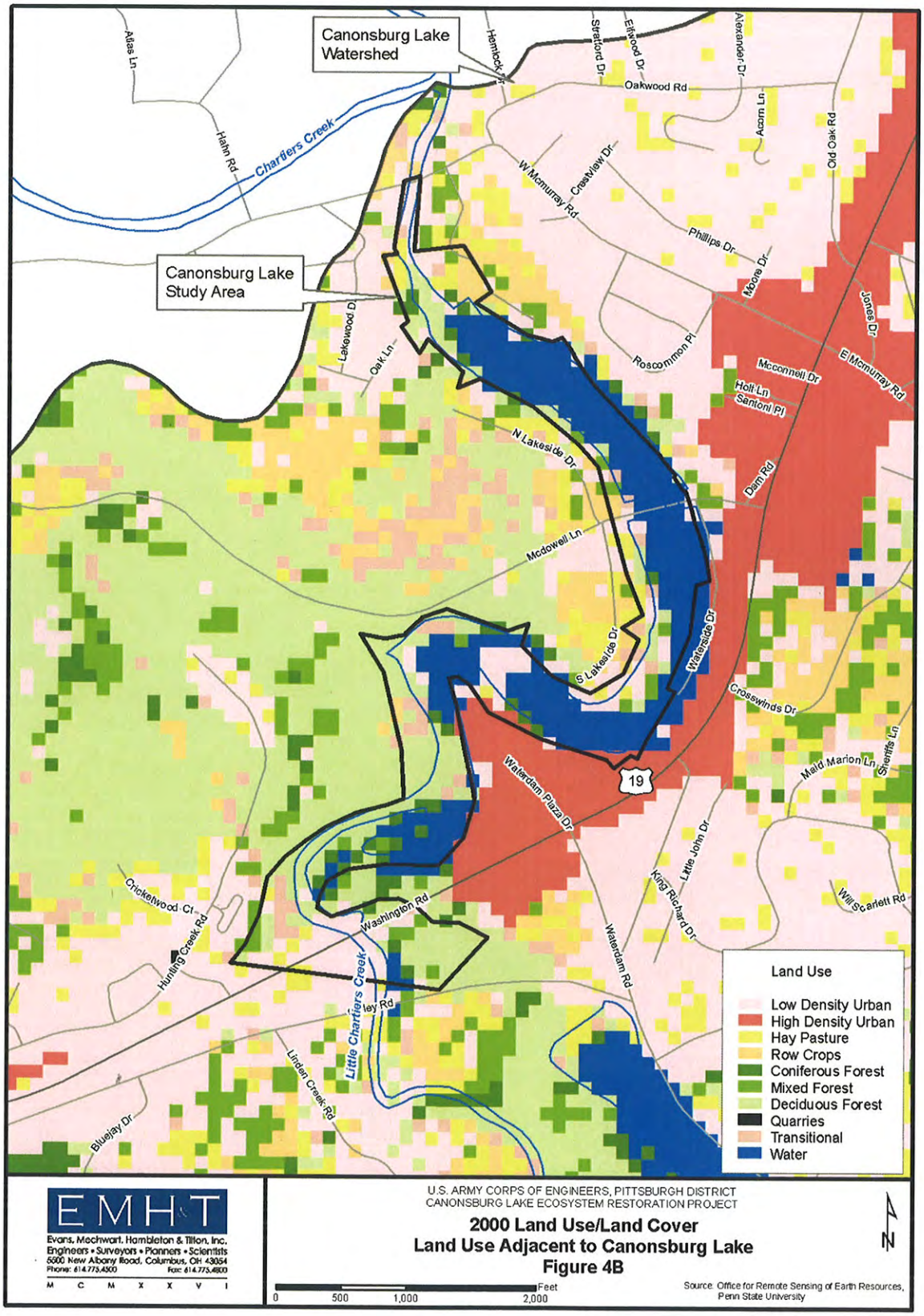
Phone: 614.775.4300 Fax: 614.775.4800
M C M X X V I
U.S. ARMY CORPS OF ENGINEERS, PITTSBURGH DISTRICT
CANONSBURG LAKE ECOSYSTEM RESTORATION PROJECT
2000 Land Use/Land Cover
Canonsburg Lake Watershed
Figure 4A
N
0 4,000 8,000 16,000 Feet
Source: Office for Remote Sensing of Earth Resources, Penn State University


Canonsburg Lake Watershed
Canonsburg Lake Study Area
Chartiers Creek
Little Chartiers Creek
Oakwood Rd
W Mcmurray Rd
E Mcmurray Rd
Phillips Dr
Moore Dr
Jones Dr
Mcconnell Dr
Holt Ln
Santoni Pl
Roscommon Pl
Crestview Dr
Old Oak Rd
Acorn Ln
Alexander Dr
Stratford Dr
Ellwood Dr
Hemlock Dr
Atlas Ln
Hahn Rd
Lakewood Dr
Oak Ln
N Lakeside Dr
S Lakeside Dr
Mcdowell Ln
Dam Rd
Waterside Dr
Crosswinds Dr
Maid Marion Ln
Sherrifs Ln
Waterdam Plaza Dr
Little John Dr
King Richard Dr
Will Scarlett Rd
Waterdam Rd
19
Washington Rd
Cricketwood Ct
Hunting Creek Rd
Linden Creek Rd
Bluejay Dr
Land Use
Low Density Urban
High Density Urban
Hay Pasture
Row Crops
Coniferous Forest
Mixed Forest
Deciduous Forest
Quarries
Transitional
Water
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U.S. ARMY CORPS OF ENGINEERS, PITTSBURGH DISTRICT
CANONSBURG LAKE ECOSYSTEM RESTORATION PROJECT
2000 Land Use/Land Cover
Land Use Adjacent to Canonsburg Lake
Figure 4B
N
0 500 1,000 2,000 Feet
Source: Office for Remote Sensing of Earth Resources, Penn State University

2.1.4 Physiology and Drainage

Canonsburg Lake is located within the Pittsburgh Low Plateau section of the Appalachian Plateaus physiographic province. The Pittsburgh Low Plateau section is characterized by broad, rolling interfluves separated by relatively narrow, steep-walled incised valleys. The bedrock is nearly horizontal, with broad folds of very low amplitude. Upland surfaces are nearly horizontal true plateaus. Maximum elevations within this region are typically less than 1,600 feet above mean sea level; local relief is approximately 400 feet.

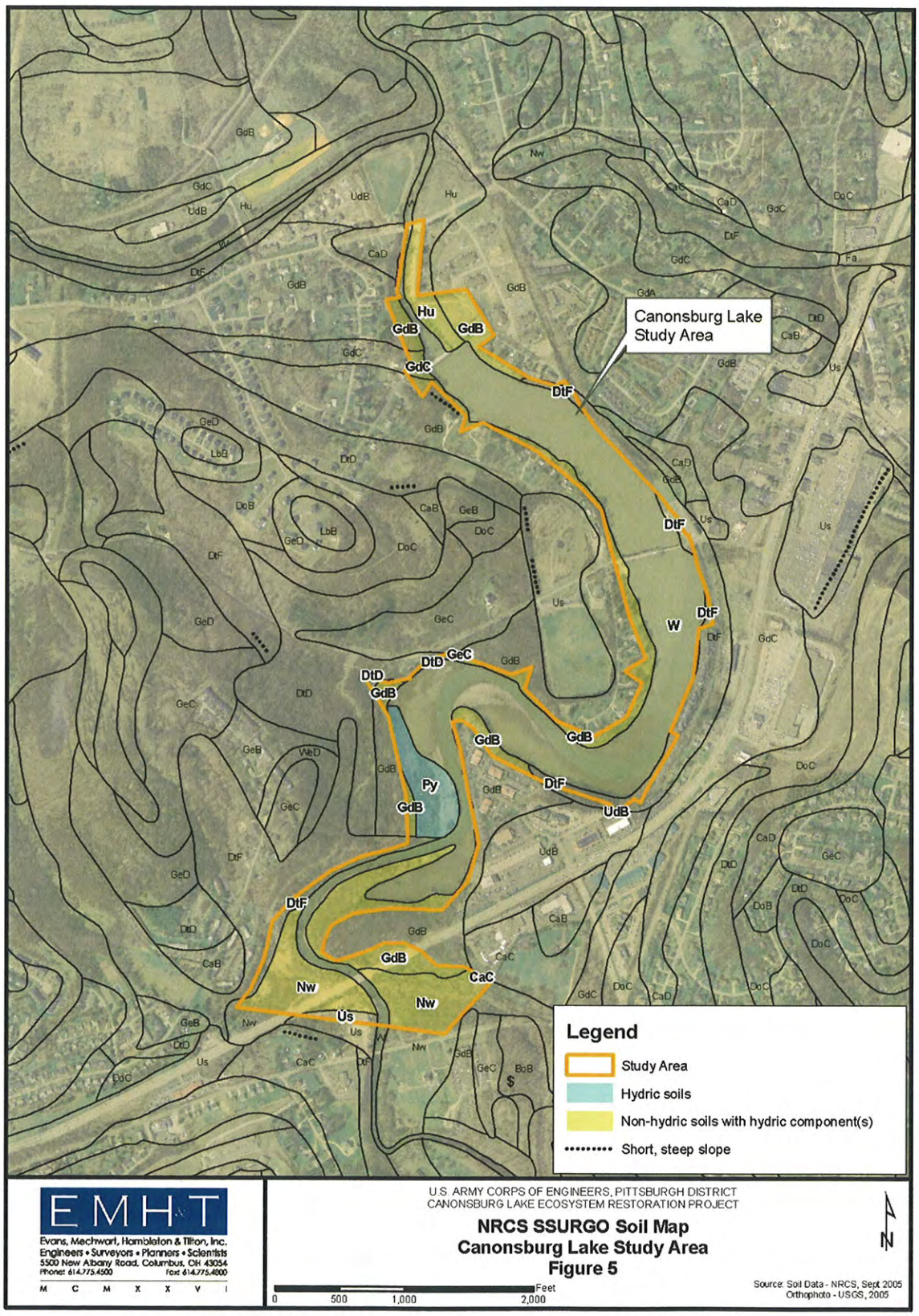
Canonsburg Lake is an online impoundment on Little Chartiers Creek, which flows approximately in a south-north direction. Little Chartiers Creek is a tributary to Chartiers Creek, a perennial tributary to the Ohio River. Chartiers Creek flows for approximately 35 miles mainly through Washington County, but also extends into Allegheny County. Chartiers Creek confluences with the Ohio River at McKees Rocks in Allegheny County.

2.1.5 Geology

The bedrock underlying Canonsburg Lake consists of the nearly horizontal sedimentary rocks of the Dunkard Group. The Dunkard Group is transitional Pennsylvanian-Permian in age and is composed of interbedded sandstone, siltstone, shale limestone and coal. Individual lithologic units are varied in thickness and areal extent throughout the region.

Canonsburg Lake is located within the Pittsburgh Plateau soil region (Duiker, 2006). The Pittsburgh Plateau is dominated by soils developed in acid clay shales and interbedded shales and sandstones, with a predominantly silt loam surface texture. Guernsey, Dormont, Culleoka, Westmoreland, Clarksburg, and Neward soil series are common (Woods et al., 1999). Soils in the regions are usually well drained. Erosion is of concern in the Pittsburgh Plateau region due to the steep slopes typical of the landscape. The southwest portion of the region is the most agriculturally productive, as the soils in this portion of the region are typically deeper and have greater water-holding capacity (Duiker, 2006).

Natural Resource Conservation Service Soil Survey Geographic Database (NRCS-SSURGO) soils mapping for the project area is shown in Figure 5. Primary soil associations are Gilpin Dormant Culleoka (6%) and Dormant Culleoka Guernsey (94%). A hydric soil is a soil that is saturated, flooded, or ponded long enough during the growing season to develop anaerobic conditions that favor the growth and regeneration of hydrophytic vegetation (USDA, 1985). A summary of soils mapped within the study area, including hydric soils, is provided in Table 2.


Canonsburg Lake Study Area
Hu
GdB
GdC
DtF
W
DtD
GeC
Py
UdB
Nw
Us
CaC
Legend
Study Area
Hydric soils
Non-hydric soils with hydric component(s)
Short, steep slope
EMH&T
Evans, Mechwart, Hambleton & Tilton, Inc.
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CANONSBURG LAKE ECOSYSTEM RESTORATION PROJECT
NRCS SSURGO Soil Map
Canonsburg Lake Study Area
Figure 5
Feet
0 500 1,000 2,000
N
Source: Soil Data - NRCS, Sept 2005
Orthophoto - USGS, 2005

TABLE 2
Study Area Soils

Soil Symbol	Soil Type	Moisture Capacity	Drainage
CaC	Culleoka silt loam, 8-15% slopes	Non-hydric with hydric components	Well drained
DtD	Dormont-Culleoka silt loam, 15-25% slopes	Non-hydric	Moderately well drained
DtF	Dormont-Culleoka silt loam, 25-50% slopes	Non-hydric	Moderately well drained
GdB	Glenford silt loam, 3-8% slopes	Non-hydric with hydric components	Moderately well drained
GdC	Glenford silt loam, 8-15% slopes	Non-hydric with hydric components	Moderately well drained
GeC	Guernsey silt loam, 8-15%	Non-hydric	Moderately well drained
Hu	Huntington silt loam	Non-hydric with hydric components	Well drained
Nw	Newark silt loam	Non-hydric with hydric components	Somewhat poorly drained
Py	Purdy silt loam	Hydric	Poorly drained
Us	Urban land	Non-hydric	N/A

2.2 Air Quality

The USEPA Green Book website (www.epa.gov/oar/oaqps/greenbk/index.html) provides information regarding regional attainment of the national ambient air quality standards. The air quality standards contain criteria for ozone, carbon monoxide, nitrogen dioxide, sulfur dioxide, particulate matter and lead concentrations. Canonsburg, Pennsylvania was not identified as being in non-attainment of any air quality criteria. Washington County, which is part of the Pittsburgh-Beaver Valley area, was listed as being in non-attainment for 8-hour ozone (2004-2007) and in non-attainment for particulate matter-2.5 (2005-2007). The National Ambient Air Quality (NAAQ) standard for 8 hour ozone is 0.08 ppm, and 15.0 µg/m3 annually (arith. mean) or 35 µg/m3 within a 24 hour period for particulate matter- 2.5. These standards were obtained from the US EPA Air and Radiation website: http://www.epa.gov/air/criteria.html, last updated on 2/6/08 (USEPA, 2008).

2.3 Noise

Canonsburg Lake is situated in a primarily residential and wooded setting, with some adjacent commercial land use. The majority of background noise within the study area is generated by automobile traffic using McDowell Lane, which crosses over the lake, and US Route 19 to the east and southeast.

2.4 Vegetation and Wetlands

Urban development and associated maintained landscaping is currently present along much of the east side of Canonsburg Lake. To the west, deciduous forest and residential properties are present. South of the causeway, the open water portion of the lake is bounded by areas of wetlands and mudflats that have developed from decades of accumulation of sediment within the lake.

2.4.1 National Wetland Inventory

According to National Wetland Inventory (NWI) mapping for the study area (Figure 6), the site contains seven NWI features as summarized in Table 3 below.

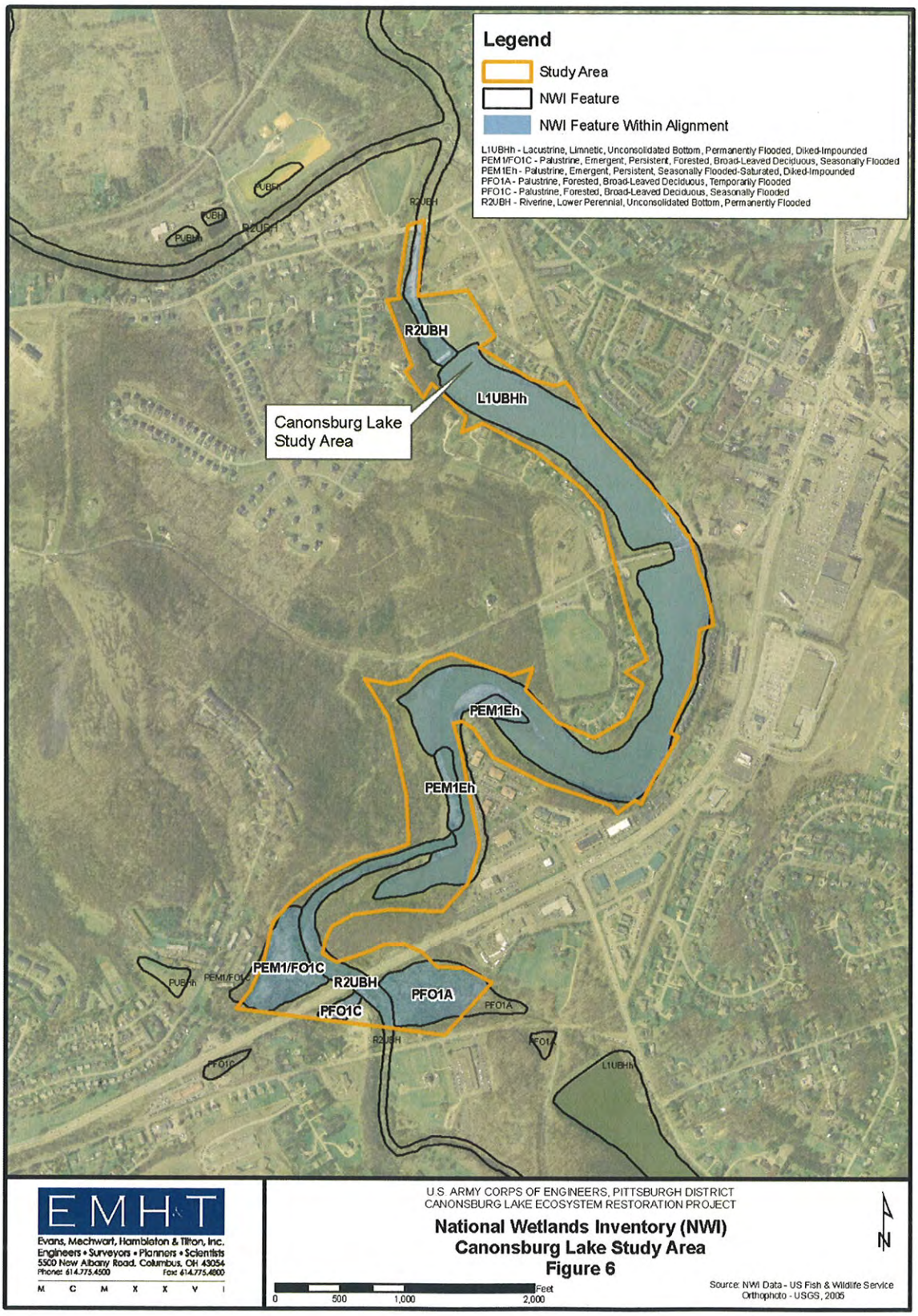
TABLE 3
NWI Features Within Study Area

NWI Code	NWI Wetland Type	Number of Features
L1UBHh	Lacustrine, limnetic, unconsolidated bottom, permanently flooded, diked/ impounded	1 (corresponds to main lake body)
R2UBH	Riverine, lower perennial, unconsolidated bottom, permanently flooded	1 (corresponds to narrow upstream portion of lake and Little Chartiers Creek)
PEM1Eh	Palustrine, emergent, persistent, seasonally flooded/ saturated, diked/ impounded	2
PFO1A	Palustrine, forested, broad-leaved deciduous, temporarily flooded	1
PFO1C	Palustrine, forested, broad-leaved deciduous, seasonally flooded	1
PEM1/FO1C	Palustrine, emergent, persistent AND forested, broad-leaved deciduous, seasonally flooded	1

2.4.2 Pennsylvania Turnpike Commission Wetland Delineation

Approximately 13.07 acres of forested, emergent and scrub-shrub wetlands were previously delineated within the Canonsburg Lake portion of the potential alignment of the Southern Beltway Project, as shown previously on Figure 3. The Turnpike delineation that occurred in 2000 and 2001 did not include the entire lake vicinity.

According to wetland delineation forms prepared for the Southern Beltway delineation (Maguire Group Inc., 2000-2001), *Salix nigra* (black willow) and *Acer negundo* (boxelder) were the dominant trees present within the delineated wetlands. Roses and dogwoods were the primary shrub species observed, specifically *Rosa multiflora* (multiflora rose), *Rosa palustris* (swamp rose), *Cornus amomum* (silky dogwood) and *Cornus stolonifera* (red-osier dogwood). A diversity of herbaceous wetland species were identified during the turnpike delineation, such as *Acorus calamus* (sweetflag), *Impatiens* sp. (impatiens), *Epilobium coloratum* (purpleleaf willowherb), *Boehmeria cylindrica* (false nettle), *Carex* sp. (sedge), *Leersia oryzoides* (rice cutgrass), and *Polygonum sagittatum.*


Legend
Study Area
NWI Feature
NWI Feature Within Alignment
L1UBHh - Lacustrine, Limnetic, Unconsolidated Bottom, Permanently Flooded, Diked-Impounded
PEM1/FO1C - Palustrine, Emergent, Persistent, Forested, Broad-Leaved Deciduous, Seasonally Flooded
PEM1Eh - Palustrine, Emergent, Persistent, Seasonally Flooded-Saturated, Diked-Impounded
PFO1A - Palustrine, Forested, Broad-Leaved Deciduous, Temporarily Flooded
PFO1C - Palustrine, Forested, Broad-Leaved Deciduous, Seasonally Flooded
R2UBH - Riverine, Lower Perennial, Unconsolidated Bottom, Permanently Flooded
Canonsburg Lake Study Area
R2UBH
L1UBHh
PEM1Eh
PEM1Eh
PEM1/FO1C
R2UBH
PFO1A
PFO1C
PUBHh
PEM1/FO1C
PFO1A
R2UBH
PFO1C
L1UBHh
EMH&T
Evans, Mechwart, Hambleton & Tilton, Inc.
Engineers • Surveyors • Planners • Scientists
5500 New Albany Road, Columbus, OH 43054
Phone: 614.775.4500 Fax: 614.775.4800
M C M X X V I
U.S. ARMY CORPS OF ENGINEERS, PITTSBURGH DISTRICT
CANONSBURG LAKE ECOSYSTEM RESTORATION PROJECT
National Wetlands Inventory (NWI)
Canonsburg Lake Study Area
Figure 6
0 500 1,000 2,000 Feet
Source: NWI Data - US Fish & Wildlife Service
Orthophoto - USGS, 2005
N

A cattail-dominated wetland within Canonsburg Lake

Most of the wetlands identified exhibited partial to dominant coverage by invasive *Phalaris arundinacea* (reed canarygrass). Most of the wetlands were also documented to contain *Typha latifolia* (broadleaf cattail), which is a native species. *Typha angustifolia* (narrowleaf cattail) was also observed within the study area during a site visit conducted on 6/18/07 by EMH&T and Rosemary Reilly of the USACE Pittsburgh District. As both *Typha latifolia* and *Typha angustifolia* have been observed with the study area, it is feasible that the hybrid *Typha* x*glauca* is also present. According to *Flora of North America* (FNA) Volume 22 *Typhaceae* (FNA, 1993+): *Protogeny and slight differences in flowering dates* (among the three North American species of cattail: *Typha angustifolia, Typha latifolia, and Typha domingensis*) *favor interspecific pollination. Hybrid seedlings are likely wherever two species form mixed stands and bare wet soil is available for seed germination and seedling establishment. T. latifolia x T. angustifolia (= xT.glauca* Godr., pro sp.*), often called "hybrid cattail," is abundant throughout most of the region of sympatry of the parents except along the southeast coast, where it is uncommon.* Spreading by rhizomes, cattails are aggressive colonizers of wetlands, especially exposed mudflats and disturbed areas.

2.4.3 Habitat Assessment

Due to the limited study area and amount of time that had elapsed since the Pennsylvania Turnpike Commission delineation, it was determined to be likely that other wetland areas may exist within the Canonsburg Lake study area. This prompted a site review by representatives of EMH&T and the USACE, Pittsburgh District in June 2007, which revealed additional potential jurisdictional wetlands outside the footprint of the Pennsylvania Turnpike Commission Delineation. In addition, several areas of unvegetated mudflats were also observed and documented. The findings of this field reconnaissance are discussed in further detail within the Habitat Assessment and Plan Formulation appendix (Appendix G).

The majority of the Canonsburg Lake Study area was walked to assess habitat types and quality. Based upon the site reconnaissance and previous studies, the following habitat types were categorized within the Canonsburg Lake assessment area: Open Water, Unvegetated Mudflat, Wetland, *Typha* spp./ *Phalaris arundinacea* Monoculture Wetland, and Active Riparian Floodplain. These existing habitat types are defined and the approximate acreage of each quantified in Table 4 on the following page, and described further in Appendix G.

TABLE 4
Existing Habitat Summary

Habitat Type	Description	Ecological Value	Approximate Acreage Within PFBC Boundary†	Approximate Acreage Outside PFBC Boundary
Open Water	Areas with average water depths >0.5'. Shallower portions (<3') have potential to be developed as preferred fish spawning areas with structural cover added. Vegetation in these areas is unlikely.**	Provides habitat for fish species (foraging, travel, overwintering, spawning, etc.).	25.06 ac	N/A
Unvegetated Mudflat	Areas of sediment accumulation with water depths <0.5' which are currently unvegetated. Sediment is unstable and easily disturbed (high turbidity).	Limited ecological value. Not utilized by fish. May provide some habitat for invertebrates and foraging habitat for wading birds.	15.80 ac	N/A
Wetlands*	Vegetated wetlands containing a diversity of native wetland plant species. May include emergent, shrub-scrub, and/ or forested wetland habitat. Soil saturation evident at depth of 12 inches or above.	High biodiversity. Supports a diverse community of insects, mammals, and birds. Offers a benefit to water quality and helps to stabilize deposited sediment.	Previously Verified: 7.52 ac Not Verified: 1.24 ac	Previously Verified: 2.56 ac Not Verified: 0.01 ac
Typha spp./ *Phalaris arundinacea* Monoculture Wetland*	Vegetated wetlands dominated by aggressive *Typha* spp. and/ or *Phalaris arundinacea*. Not biodiverse. These wetlands appear to have developed more recently on areas of previous sediment accumulation. Soil saturation evident at depth of 12 inches or above.	Offers a benefit to water quality and helps to stabilize sediment. Lack of plant diversity within these areas will support a less diverse community of insects and animals than diverse wetlands.	Previously Verified: 3.00 ac Not Verified: 1.23 ac	Previously Verified: 0.00 ac Not Verified: 0.44 ac
Active Riparian Floodplain/ Riparian Zone	Non-aquatic areas dominated by woody vegetation adjacent to the lake proper, that are located within the 10-year floodplain (4 feet above normal pool and below). ††	Buffers the lake from adjacent land uses. Provides some filtration of runoff (nutrient and sediment uptake). Provides habitat for wildlife.	14.15 ac	N/A

* Includes wetlands previously delineated by Maguire Group in 2000-2001 and verified as jurisdictional by the Corps, and new (approximate) areas identified by EMH&T and the Corps in June, 2007 (not verified).

** No submersed aquatic wetland beds were identified within the lake in June, 2007. Such habitat is likely being precluded by high turbidity levels.

†Acreage within PFBC property boundary, south of McDowell Lane.

††Elevation of 10-year floodplain within lake based on HEC-HMS model of Little Chartiers Creek watershed and stage-storage rating curve for lake taken from *Canonsburg Dam Assessment* (Schnabel Engineering, Dec. 1996) N/A: Not Applicable – this type of habitat was not found in the described area

2.5 Fauna

2.5.1 Fish Species

Canonsburg Lake is maintained by the PFBC, which regularly supplements the fish population within the lake. The PFBC Fisheries Management Division performed a fish survey in the lake in 2000, which resulted in the Canonsburg Lake (820F) Management Report (Smith and Lorson 11/2000). The report indicated that the PFBC currently manages the fish populations within the lake with statewide regulations. The PFBC stocks catchable trout species including *Oncorhynchus mykiss* (rainbow trout), *Salmo trutta* (brown trout), and trophy golden rainbow trout, which are stocked in the preseason. Additional rainbow and brown trout are stocked nine times in season. The 2000 fish survey identified 14 species of fish within Canonsburg Lake, as listed in Table 5.

TABLE 5
Fish Species Within Canonsburg Lake*

Common Name	Scientific Name
Black crappie	*Pomoxis nigromaculatus*
Bluegill	*Lepomis macrochirus*
Brown bullhead	*Ameiurus nebulosus*
Brown trout (hatchery)	*Salmo trutta*
Channel catfish	*Ictalurus punctatus*
Common carp	*Cyprinus carpio*
Gizzard shad	*Dorosoma cepedianum*
Golden shiner	*Notemigonus crysoleucas*
Green sunfish	*Lepomis cyanellus*
Largemouth bass	*Micropterus salmoides*
Pumpkinseed	*Lepomis gibbosus*
Rainbow trout (hatchery)	*Oncorhynchus mykiss*
White crappie	*Pomoxis annularis*
White sucker	*Catostomus commersoni*

*Smith and Lorson, 11/2000

Largemouth Bass (*Micropterus salmoides*)
Illustration by Ted Walke

Of the fish species collected, largemouth bass was the primary gamefish found. Black and white crappies and bluegill were the primary panfish species collected. An abundance of gizzard shad was also collected in trap nets used during the survey. The Habitat Assessment portion of Appendix G provides a detailed discussion of the habitat requirements of the fish species found within the lake.

2.5.2 Avian Species

The predominant avian species noted within the Canonsburg Lake proper consist of wading birds and waterfowl, including great blue herons (*Ardea herodias*), mallards (*Anas platyrhynchos*), wood ducks (*Aix sponsa*), mergansers (Subfamily *Merginae*) and Canada geese (*Branta canadensis*) (Canonsburg Lake Master Plan, March 2007). The great blue heron has been identified as a Species of Special Concern by the Pennsylvania Game Commission. A heron rookery is known to be located within the Upper Chartiers River Watershed, within the boundaries of the *Canonsburg, Pennsylvania* USGS quad map (ChCWA et al., March 2007). It is likely that Canonsburg Lake helps to support the inhabitants of the rookery by offering foraging opportunities.

Potential great blue heron/ great egret hybrid observed by local bird watchers to inhabit Canonsburg Lake
(CHCWA et al., 3/07)

The forests adjacent to the lake are home to a number of upland bird species, including wild turkey (*Meleagris gallopavo*), blue jay (*Cyanocitta cristata*), chickadee (*Parus* spp.), sparrow (Family *Passeridae*), cardinal (*Cardinalis cardinalis*), white-breasted nuthatch (*Sitta carolinensis*), and wood thrush (*Hylocichla mustelina*). The forests also provide potential nesting habitat for wood ducks and mergansers (ChCWA et al., March 2007).

One unusual avian sighting has been recorded at Canonsburg Lake. Local bird watchers have observed what they describe as a potential heron/ great egret (*Ardea alba*) hybrid, which has inhabited the lake for several years. According to the master recreational plan for the lake:

"This particular bird has been identified as a possible hybrid between a blue heron and a great egret. This bird has been observed at Canonsburg Lake for several years, and has created quite a stir among bird watchers. The bird features characteristics and coloration from each species, prompting most birder to date to conclude that it's a hybrid. Such a creature would be rare. No such hybrid has ever before been documented in birding literature." (ChCWA et al., 3/07)

2.5.3 Mammals

A variety of mammalian species, typical of upland forests and aquatic habitats, have been documented at Canonsburg Lake. These include the white-tailed deer (*Odocoileus virginianus*), raccoon (*Procyon lotor*), Virginia opossum (*Didelphis virginiana*), Eastern gray squirrel (*Sciurus carolinensis*), Eastern chipmunk (*Tamias striatus*), beaver (*Castor canadensis*), and muskrat (*Ondatra zibethicus*) (ChCWA et al., 3/07).

Beaver (*Castor canadensis*)

2.6 Prime Farmlands

The Natural Resources Conservation Service (NRCS) of the U. S. Department of Agriculture (USDA) defines Prime Farmland as:

"*land that has the best combination of physical and chemical characteristics for producing food, feed, forage, fiber, and oilseed crops. It must also be available for these uses. It has the soil quality, growing season, and moisture supply needed to produce economically sustained high yields of crops when treated and managed according to acceptable farming methods, including water management. In general, prime farmlands have an adequate and dependable water supply from precipitation or irrigation, a favorable temperature and growing season, acceptable acidity or alkalinity, acceptable salt and sodium content, and few or no rocks. They are permeable to water and air. Prime farmlands are not excessively erodible or saturated with water for a long period of time, and they either do not flood frequently or are protected from flooding*" - NRCS Soil Survey Staff, 1993.

Lists of Prime Farmland soils and Farmland of Statewide Importance for Washington County, Pennsylvania provided by the NRCS were reviewed to determine if soils indicated within the study area were listed under these classifications. Glenford silt loam on 3-8% slopes (GdB) and Huntington silt loam (Hu) were the only soils indicated as Prime Farmland. Approximately 28.94 acres of Prime Farmland soils are mapped within the study area. An additional 1.46 acres of the GdB Prime Farmland unit are indicated for a portion of a proposed sediment dewatering and storage area (described in Section 3.0 Plan Formulation), which extends outside of the study area boundaries. In addition, Culleoka silt loam on 8-15% slopes (CaC), Guernsey silt loam on 8-15% slopes (GeC), Newark silt Loam (Nw) and Glenford silt loam on 3-8% slopes (GdC) are listed as soils that qualify as additional Farmland of Statewide Importance. Approximately 15.8986 acres of Farmland of Statewide Importance are mapped within the project study area. The locations of these soil units can be observed on Figure 5.

2.7 Cultural Resources

A preliminary literature review was completed to determine if any previously recorded archaeological sites, historic building sites or previous Cultural Resource Management surveys were present within the potential areas to be impacted (project area).

Appendix J contains the cultural resources literature review. The review was conducted according to the methodology prescribed within the USACE *Planning Guidance Notebook* (ER 1105-2-100), dated April 22, 2000. Following the literature review, a Phase I Cultural Resources Management Investigation was conducted by the Corps Archaeologist within the Pittsburgh District for an area of proposed sediment dewatering and storage (discussed further in Section 3.0 Plan Formulation). A copy of this report is included as an attachment within Appendix J.

The literature review indicates that there are three previously recorded archaeological sites (36-Wh-169, -204, and -470) are located in or adjacent to the project limits. Site 33-Wh-169 is a lithic scatter of unknown density with artifacts dating to the Early Woodland time period. The site form indicates that this site has since been 100% destroyed as a result of development. Site 36-Wh-204 is an isolated find that was identified in an inundated portion of Canonsburg Lake. Site 36-Wh-470 is a small prehistoric lithic scatter that was identified by an amateur archaeologist. At this time it is not known if this site possesses the potential to be included on the National Register of Historic Places as there is relatively little information known concerning the site and its contents; however, this site is outside of the areas where activities associated with ecosystem restoration activities are currently proposed.

The Phase I archaeological testing of the proposed sediment dewatering and storage area conducted by the Corps located two previously unknown archaeological sites, 36-Wh-1436 and 36-Wh-1437. Both sites are small lithic scatters containing only debitage. It is the opinion of the Corps Archaeologist that neither site is potentially eligible for the National Register of Historic places and no further study is required. The field report is being reviewed by the Pennsylvania State Historic Preservation Office (PASHPO) and the Corps is confident that the PASHPO will concur with this assessment.

2.8 Socioeconomic Conditions

2.8.1 Population

According to 2000 census data from the US Census Bureau (USBC, 2000), Washington County had a total population of 202,897 individuals, 52% of whom were female and 48% male. Approximately 17.9% of the population is age 65 or older. The median age of individuals in Washington County is 40.8. The majority of the population of the county is white (95.3%), for individuals reporting only one race. African Americans make up 3.3% of the population; 0.8% report that they are two or more races; 0.4% are of Asian ancestry; 0.2% are some other race; and 0.1% are American Indian or Alaska natives. Approximately 0.6% of the population were Latino or Hispanic. People of Hispanic origin may be of any race. A total of 81,130 households existed in Washington County in 2000, with an average household size of 2.44 people.

Year 2000 US Census Bureau information for North Strabane Township indicates a total population of 10,057 individuals, 51.3% of whom were female and 48.7% male. Approximately 16.2% of the population is age 65 or older. The median age of individuals in North Strabane is 40.4. The majority of the population of the township is white (96.5%), for individuals reporting only one race. African Americans make up 2.1% of the population; 0.8% are of Asian ancestry; 0.4% report that they are two or more

races; 0.2% are some other race; one individual is an American Indian or Alaska native; and two individuals are native Hawaiians or other Pacific Islanders. Approximately 0.6% of the population were Latino or Hispanic. A total of 3,975 households existed in North Strabane in 2000, with an average household size of 2.45 people (USBC, 2000).

Year 2000 US Census Bureau information for Peters Township indicates a total population of 17,566 individuals, 51.5% of whom were female and 48.5% male. Approximately 13.0% of the population is age 65 or older. The median age of individuals in Peters Township is 40.6. The majority of the population of the township is white (97.8%), for individuals reporting only one race. African Americans make up 0.5% of the population; 1.1% are of Asian ancestry; 0.4% report that they are two or more races; 0.2% are some other race; five individuals are American Indians or Alaska natives; and five individuals are native Hawaiians or other Pacific Islanders. Approximately 0.7% of the population were Latino or Hispanic. A total of 6,026 households existed in Peters Township in 2000, with an average household size of 2.87 people (USBC, 2000).

2.8.2 Environmental Justice

This restoration project is subject to Executive Order 12898, *Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations*, which requires that disproportionately high and adverse human health or environmental effects on minority and low-income populations must be identified, addressed, and avoided. The Council on Environmental Quality (CEQ) provides guidance on addressing environmental justices issues within the document *Environmental Guidance: Guidance Under the National Environmental Policy Act* (CEQ, 12/10/1997).

The CEQ defines minorities as "*Individual(s) who are members of the following population groups: American Indian or Alaskan Native; Asian or Pacific Islander; Black, not of Hispanic origin; or Hispanic.*" The percentages of minorities within North Strabane (3.5%), Peters Township (2.3%) and Washington County (4.7%) are significantly lower than the overall state minority population (approximately 14.6%), and the national population (approximately 24.9%) (USBC, 2000). Table 6 on the following page summarizes the percentage break-down of the populations of Washington County, North Strabane Township and Peters Township by race. Percentages for the State of Pennsylvania and national populations are provided for comparison.

Low-income populations are identified by using statistical poverty thresholds as reported by the US Census Bureau (USBC, 2000). The 2000 poverty threshold was an annual income of $17,761 for a family of four. This threshold is a weighted average based on family size and ages of family members. In 1999, there were 3,873 families (6.9%) living below the poverty level in Washington County, 99 (3.4%) in North Strabane Township and 58 (1.1%) in Peters Township. These figures are less than the state percentage of 7.8%, and even less than the national percentage of families below the poverty level (9.2%). Table 7 on the following page summarizes the percentages of the low-income families within Washington County, North Strabane Township and Peters Township. Percentages for the State of Pennsylvania and national populations are provided for comparison.

TABLE 6
Comparison of Population Distribution by Race

Location	Percentage of Population by Race						
	White	Black or African American	American Indian and Alaska Native	Asian	Native Hawaiian and Other Pacific Islander	Some Other Race	2 or More Races
United States	75.14%	12.32%	0.88%	3.64%	0.14%	5.46%	2.43
Pennsylvania	85.37%	9.97%	0.15%	1.79%	0.03%	1.53%	1.16%
Washington County	95.3%	3.3%	0.1%	0.4%	0.0%	0.2%	0.8%
North Strabane Twp.	96.5%	2.1%	-	0.8%	-	0.2%	0.4%
Peters Twp.	97.8%	0.5%	-	1.1%	-	0.2%	0.4%

- Represents zero or rounds to zero
Source: USBC, 2000

TABLE 7
Comparison of Families Living Below Poverty Level

Location	Families	Number of Families Below Poverty Level	% Families Below Poverty Level
United States	72,261,780	6,620,945	9.2%
Pennsylvania	3,225,707	250,296	7.8%
Washington County	56, 052	3,873	6.9%
North Strabane Twp.	2,898	99	3.4%
Peters Twp.	5,089	58	1.1%

Source: USBC, 2000

2.8.3 Economics and Employment

2000 US Census employment rates are tabulated for individuals aged 16 and older. In Washington County, 58.9% were identified as being in the labor force. Leading industries were educational, health and social services (21.1%), manufacturing (14.9%), and retail (13.3%). The majority (19.4%) of households within Washington County had an income between $50,000 and $74,999 in 1999, and the median household income was $37,607 (USBC, 2000).

Economic and employment data for North Strabane Township were somewhat similar to that of Washington County. Within North Strabane Township, 2000 US Census data indicated that 64.1% of the population aged 16 and older were in the work force.

Leading industries were educational, health and social services (18.7%), manufacturing (12.3%), retail (11.9%), and professional, scientific, management, administrative and waste management services (9.9%). The majority (19.4%) of households within North Strabane had an income between $50,000 and $74,999 in 1999. The median household income was $50,754 (USBC, 2000).

Economic and employment data for Peters Township were somewhat similar to that of Washington County. Within Peters Township, 2000 US Census data indicated that 63.2% of the population aged 16 and older were in the work force. Leading industries were educational, health and social services (20.5%), professional, scientific, management, administrative and waste management services (12.1%), manufacturing (11.4%), and retail (11.3%). Income ranges of $50,000 to $74,999 (19.4%) and $100,000 to 149,000 (19.4%) reflected the majority of households in 1999. The median household income was $77,442 (USBC, 2000).

2.8.4 Housing

In 2000, Washington County had 87,267 housing units, the majority of which (40.6%) were valued between $50,000 to $99,999. Most (73.0%) were single unit detached structures. A total of 81,130 units (93%) were occupied. Most of these are older units, with 81.7% built in 1970 or earlier and 32.2% built in 1939 or earlier. The median monthly housing costs for specified mortgaged owners was $890, $274 for non-mortgaged owners, and $423 for renters (USBC, 2000) .

In 2000, North Strabane Township had 4,156 housing units, the majority of which (34.8%) were valued between $50,000 to $99,999. Most (76.1%) were single unit detached structures. A total of 3,975 units (95.6%) were occupied. Most of these are older units, with 65% built in 1970 or earlier and 13.4% built in 1939 or earlier. The median monthly housing costs for specified mortgaged owners was $1,039, $297 for non-mortgaged owners, and $579 for renters (USBC, 2000).

In 2000, Peters Township had 6,221 housing units, the majority of which were valued between $150,000 to $199,999 (23.8%) or $200,000 to $299,999 (23.9%). Most (88.7%) were single unit detached structures. A total of 6,026 units (96.9%) were occupied. Most of these are older units, with 62.9% built in 1970 or earlier and 6.1% built in 1939 or earlier. The median monthly housing costs for specified mortgaged owners was $1,509, $402 for non-mortgaged owners, and $741 for renters (USBC, 2000).

2.8.5 Transportation

According to the *Washington County Comprehensive Plan* (Washington County Planning Commission, 11/23/05), two interstates, I-70 and I-79, serve the county and should be considered significant transportation routes for all county subregions. I-79 traverses the North-Central Region, which includes the

U.S. Route 19 bridge over Little Chartiers Creek

Canonsburg Lake study area. U.S. Route 19 crosses Little Chartiers Creek at the southern terminus of the study areas.

U.S. Route 19 runs parallel to I-79 through the region, and both roadways provide access to the City of Washington and adjacent Allegheny and Greene Counties. Access across Canonsburg Lake is provided by the McDowell Lane causeway, a small two-lane local roadway.

McDowell Lane causeway crossing Canonsburg Lake

2.9 Hazardous Waste

A Hazardous, Toxic and Radioactive Waste Assessment (HTRW) document for the Canonsburg Lake study area is included as Appendix I. A search of Federal and state environmental databases was conducted in order to assess the likelihood of the presence of environmental contamination within the project area. The results of this search do not suggest the presence of hazardous, toxic, or radioactive wastes within the project area.

A site reconnaissance was performed in order to determine if there were any visual indications of environmental impairment within the project area and to ascertain if activities being conducted on adjacent properties were likely to result in any such impairment. The results of this reconnaissance do not suggest the presence of hazardous, toxic, or radioactive wastes within the project area or conditions and/or activities that would likely result in environmental impairment within the project area.

Historical aerial photographs and historical topographic maps were reviewed in order to determine if there were any visual indications of natural or anthropogenic conditions that might be suggestive of environmental impairment. The review did not reveal such conditions nor suggest the presence of hazardous, toxic, or radioactive wastes within the project area.

Available site-specific environmental data was reviewed in order to assess the likelihood of the presence of environmental contamination within the project area. The available data was limited in both nature and extent, but did not suggest the likely presence of hazardous, toxic, or radioactive wastes within the project area.

2.10 Threatened and Endangered Species

2.10.1 Federal Resources

According to the US Fish and Wildlife Service (USFWS) list of *Federally Listed, Proposed, and Candidate Species in Pennsylvania* (revised August 15, 2007), no Federally listed Threatened or Endangered Species are known to occur within Washington County. Sheepnose (*Plethobasus cyphyus*), a Federal Candidate species, was historically documented within the Monongahela River in Washington County but has not been found recently. The Chartiers Creek watershed does not have a nexus with the Monongahela River until both systems enter the Ohio River; therefore, it is unlikely that any sheepnose populations would have migrated into the Chartiers Watershed and Canonsburg Lake through this route. Additionally, the sheepnose is indicated as a river species that inhabits sand and gravel substrates (Waters, 1995), and is therefore unlikely to be found in Canonsburg Lake.

A Pennsylvania Natural Diversity Inventory (PNDI) Environmental Review was completed for the project area. The PNDI Environmental Review service is provided on the Pennsylvania Natural Heritage Program website that can be found at the URL provided: (http://www.naturalheritage.state.pa.us/). The PNDI is a project planning and environmental review tool that enables the public to perform online PNDI searches for potential impacts to special concern species and resources in Pennsylvania. A PNDI ER Tool web-site inquiry generates on-line search results concerning the potential impacts of a project to special concern species and resources. Four government agencies have jurisdiction over the protection of these resources:

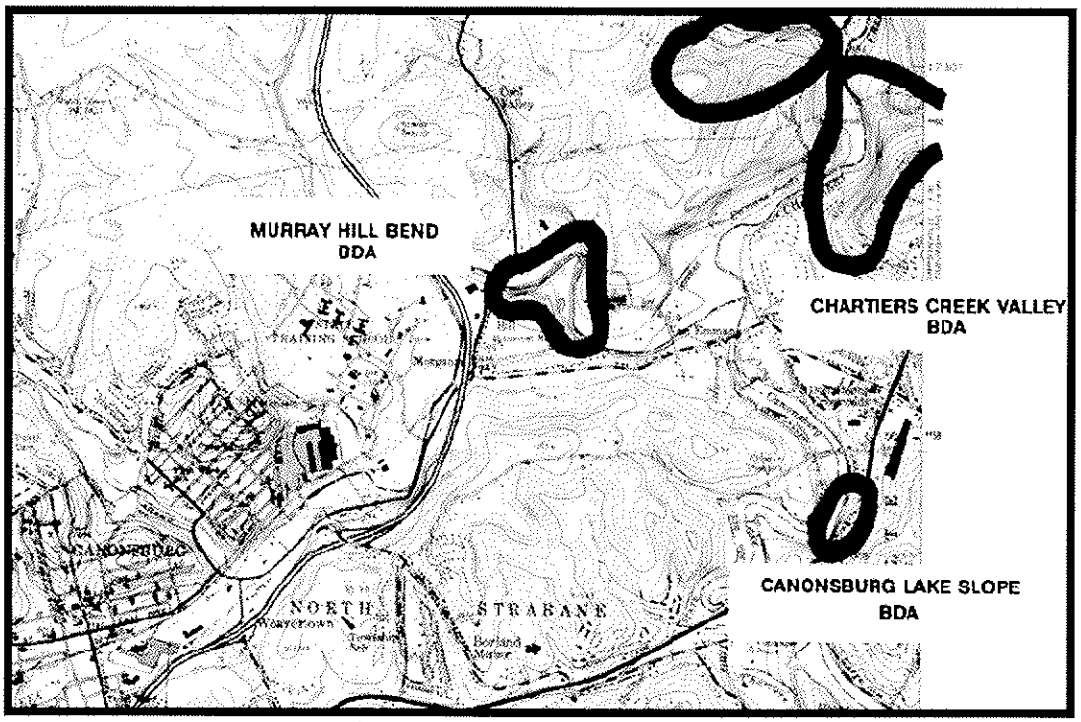
- USFWS - Listed, proposed & candidate species under the Federal Endangered Species Act
- PGC - Pennsylvania State-listed birds and mammals
- PFBC - Pennsylvania State-listed fish, reptiles, amphibians and aquatic organisms
- PA DCNR - Pennsylvania State-listed plants, natural communities, terrestrial invertebrates and geological features

The PNDI Environmental Review receipt is included as Attachment 1 at the end of this report. The PNDI search returned no results for any USFWS listed species and stated that no further coordination is required. This was confirmed via e-mail by Pamela Shellenberger, the Fish and Wildlife Biologist with the USFWS Endangered Species Program in State College, Pennsylvania. A copy of this correspondence has been included as Attachment 2.

2.10.2 State Resources

According to species distribution maps available on the PGC website (Pennsylvania Game Commission, 12/12/06), no State-listed threatened or endangered species are indicated for Washington County. According to the *Washington County Natural Heritage Inventory* (Wagner, 1994), one Biological Diversity Area (BDA) is located within the project boundaries. The Canonsburg Lake Slope BDA is located between U.S. 19 and the lake, just south of Donaldsons Crossroads. It consists of a small band of

forested slope that supports many spring wildflowers, including one species of special concern in Pennsylvania (the species name is not indicated within the report). The report advises that this area be protected from disturbance or clearing. The Canonsburg Lake Slope BDA is indicated on the map below, excerpted from the *Washington County Natural Heritage Inventory.*



Canonsburg Lake Slope BDA
Washington County Natural Heritage Inventory, 1994

No potential impacts to resources under the jurisdiction of the Pennsylvania Game Commission or the PFBC were identified by the PNDI Environmental Review performed for the study area. The PNDI Environmental Review indicated one possible impact falling under the jurisdiction of the PA DCNR and recommended further coordination be conducted with this agency. The recommended coordination information was been submitted to the Ecological Services Section of the PA DCNR. The PA DCNR recommended that a survey should be conducted for *Trillium nivale* (snow trillium), a State-listed rare species, and *Camassia scilloides* (wild hyacinth), a State-listed threatened species (proposed endangered). Both species grow within moist woods. The correspondence indicates that if this land type does not exist on the site, a survey will not be necessary. Some wooded wetland areas are present within portions of the PFBC property surrounding the lake; however, these areas have been prioritized for avoidance for the lake restoration project. While it is unlikely that the project will result in impacts to these state-listed species, the appropriate follow-up coordination will need to be conducted as required within the PA DCNR correspondence, included as Attachment 3, as part of any future implementation of the project.

2.11 Aquatic Resources and Water Quality

Canonsburg Lake is formed by a concrete gravity dam structure that was completed in 1943 by the Alcoa Company. The dam has a single spillway that controls the normal pool elevation of the lake. Pennsylvania distinguishes lake systems from streams by a minimum 14 day hydraulic residence time for lakes. Canonsburg Lake has a hydraulic residence time of approximately 6 days and functions somewhere between a lake and a slow moving stream (PA DEP, 2/2004). Appendix B contains additional information related to the hydrology and hydraulics of Canonsburg Lake.

According to an internal study (*The Lake Phosphorous Study*) conducted by the PA DEP in 1987, the volume of Canonsburg Lake had decreased significantly since its construction, mainly due to siltation from non-point sources. Agricultural sources were identified as the primary source of sediment loading to the lake. Canonsburg Lake was subsequently placed on the Pennsylvania Section 303d list in 1996 for impairments caused by nutrients from agricultural sources (PA DEP, 2/2004). According to the Canonsburg Lake TMDL (PA DEP, 2/2004), the Lake Phosphorous Study states that the entire Little Chartiers Creek watershed was designated as a High Quality Warm Water Fishery (HQ-WWF) for the sole purpose of protecting the lake. Data taken for the 1987 phosphorous study showed an average total phosphorous concentration of 0.12 mg/L within the lake, evidencing a hypereutrophic condition. Despite the previously documented hypereutrophic conditions attributed to high phosphorous levels, there is no current evidence of low dissolved oxygen levels within the lake. The lake currently continues to support fish populations during the summer season, when water depths are typically the most shallow and water temperatures highest. Pennsylvania does not have specific water quality criteria for suspended solids or nutrients; therefore, the goal of the TMDL was to improve the trophic status of the lake.

The 1987 Lake Phosphorous Study also indicated that the lake was being further degraded by algal blooms resulting from excessive nutrients in the system. In lacustrine systems, algae tends to outcompete aquatic plants when high nutrient concentrations are available. Subsequent plant and algae die-off results in increased numbers of bacteria. which feed off the dead material as part of the decomposition process. The multiplying bacteria deplete oxygen levels within the lake, resulting in 'dead areas' where fish and other aquatic organisms cannot survive. In contrast to the indication in the 1987 study, the PA DEP's 2004 TMDL report for the lake indicated Canonsburg Lake's relatively short detention time (approximately 6 days) and decreased settling rates due to advective flow velocities cause algae to be flushed from the system before algal blooms can occur (PA DEP, 2/2004) No algal blooms were observed within the lake during the various site reconnaissance events conducted by the project team during 2006 and 2007. Based on the findings of the PA DEP and observations of the lake during the study process, it does not appear that the reported high levels of phosphorous are negatively affecting dissolved oxygen levels so as to preclude aquatic life.

The Chartiers Creek Watershed TMDL (PA DEP and USEPA, 2003) identified known impairments based on water quality constituents such as metals (e.g., aluminum, iron and manganese), nutrients and suspended solids. In addition to existing point sources for such pollutants, the watershed has several abandoned mines and one still-active permitted mine within the watershed. The mine is allowed to discharge stormwater

within the upper portion of the Little Chartiers Creek watershed under an individual National Pollutant Discharge Elimination System (NPDES) permit, along with seven other point-source NPDES permit holders. All of these discharge points are upstream of Canonsburg Lake.

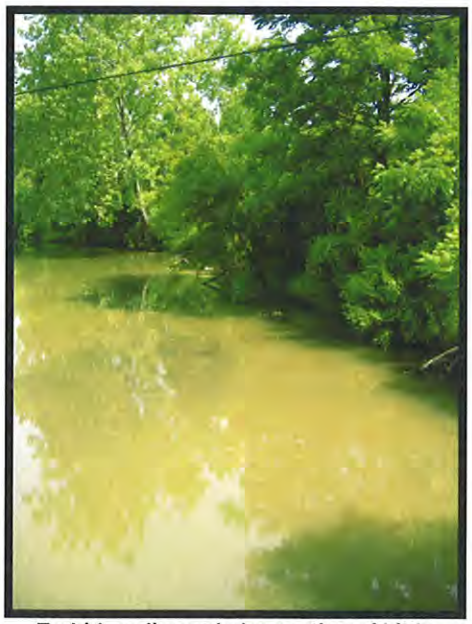
In addition to the fish community data described in Section 2.5.1, limited water quality data was collected by the PFBC in May, 2000 and noted in the *Canonsburg Lake (820F) Management Report* (Smith and Lorson 11/2000). Table 8 summarizes the findings of this sampling and compares them to the Pennsylvania specific water quality criteria for HQ-WWF streams, listed in §93.7 of the Pennsylvania Code.

TABLE 8
PFBC Water Quality Sampling Summary
(May 2000)

Parameter	Measurement	Pennsylvania Specific Water Quality Criteria
Temperature	19 – 21 degrees Celsius	17.8 – 22.2 degrees Celsius (May)
pH	8.4 SU	6.0 – 9.0 SU
Total Alkalinity	173 mg/L	Minimum 20 mg/L as $CaCO_3$
Total Hardness	240 mg/L	Not listed
Specific Conductance	701 umhos	Not listed
Total Dissolved Solids	473 mg/L	500 mg/L as a monthly average value; maximum 750 mg/L

2.12 Sedimentation

Sedimentation of Canonsburg Lake has been a continuous, though non-uniform, process that began in 1943 upon initial impoundment of sediment laden waters of Little Chartiers Creek. Land uses within the contributory watershed impact the rate of soil and channel/bank erosion and, thereby, largely determine sediment loading rates to the lake. Deposition of sediments within the lake is influenced by the complex flow dynamics within the reservoir. . Upon construction of the dam, the sediment transport capabilities of the impounded reach of Little Chartiers Creek became diminished, leading to the inevitable consequence of sedimentation. The progression of sediment accumulation within the lake from the upper portions toward the dam has been continuous. This has resulted in the continued development of bars and spits within the lake to the point of significant emergence above the water level, the evolution of shallow mudflats in the



Turbid, sediment-laden portion of Little Chartiers Creek, just upstream from Canonsburg Lake

slackwater areas behind these areas, and the overall reduction of water depths throughout the lake particularly above McDowell Lane located near the middle of the lake. The Preliminary Restoration Plan (USACE, 2006) noted that the upper two thirds of Canonsburg Lake are heavily silted-in, with remaining water depths ranging from a few inches to less than two feet.

2.12.1 Sedimentation Processes

Sedimentation within the lake occurs as the result of settling of suspended solids contained within inflow waters and, to an unknown extent, the transport of sediment in the form of bed load from Little Chartiers Creek. The settling of sediments can be categorized according to four basic processes: discrete settling, flocculent settling, zone settling, and compression settling. Discrete settling is the process wherein particles, generally sand-sized and larger, settle without any change in size, shape, or density. Flocculent settling is the process wherein particles, generally silt-sized and smaller, agglomerate during settling with a change in physical properties and settling rate. Zone settling is the process wherein the flocculent suspension forms a lattice structure and settles as a mass. The high solids concentration associated with zone settling partially blocks the release of water and hinders the settling of discrete particles, and results in a distinct interface between the sediment "mass" and the supernatant. Compression settling is the process wherein settling occurs as the result of compression of the lattice structure. All four sedimentation processes can occur simultaneously. Discrete settling of bed load materials and suspended sand-sized particles likely is most prevalent in the uppermost portions of Canonsburg Lake where inflows first enter the lake and flow velocities first slow. Flocculent and zone settling, however, are likely the most prevalent settling processes in both the upper and lower portions of Canonsburg Lake as evidenced by the generally high level of turbidity present throughout the lake. Compression settling is a limited factor throughout much of the lake as a result of the rather low pressure applied by the relatively shallow depths of water and accumulated sediments. Compression settling is a more significant factor in the upper portions of the lake where sediment is exposed above the normal lake pool elevation and, as excess pore pressures develop in the lower sediment layers, water is expelled and the excess pore pressure is dissipated, resulting in compression of the sediment layer.

2.12.2 Sediment Quality

The PA DEP collected grab sediment samples in the upper six inches of lake sediments at three locations in Canonsburg Lake on April 3, 2002 (PA DEP, 2002). These samples were analyzed for a suite of twenty-four elements including the eight metals regulated by the Resource Conservation and Recovery Act (RCRA) of 1976 and subsequent amendments. No organic compounds or nutrients were included in the analyses. The results of the analyses of these sediment samples indicates the sediment contained high concentrations of iron, calcium, and aluminum with moderate concentrations of potassium, magnesium, and manganese and low or non-detectable concentrations of the suite of trace metals. The concentrations of almost all of the parameters (excepting arsenic and cobalt) increased from the upper end of the lake toward the causeway. None of the eight RCRA metals (arsenic, barium, cadmium, chromium, lead, mercury, selenium, and silver) were at concentrations high enough to suggest the potential presence of toxic leaching procedure (TCLP) toxicity. The concentration of arsenic at

one sampling location (20.9 mg/kg) exceeded the Safe Fill Standard for Residential Direct Contact and/or Residential Generic Value (12 mg/kg) promulgated under 25 Pa. Code Chapter 250.

2.12.3 Sediment Quantity

No detailed sediment surveys or bathymetric studies have been conducted on Canonsburg Lake, so no data is available to accurately determine the rate of sediment accumulation or the total volume of sediments that have thus far accumulated within the lake. In the absence of such data, two different methods, which are discussed in detail in Appendix A, were utilized to estimate the volume of accumulated sediments in Canonsburg Lake. The first method involved estimating lake sediment depths and volumes and then computing an average annual rate of sedimentation based on the age of the lake. The second method involved estimating the amount of soil erosion that would be anticipated given the land cover within the Little Chartiers Creek watershed through the use of the Revised Universal Soil Loss Equation (RUSLE). These methods have resulted in similar values for estimated potential sediment volumes. When considering the 63 years that the dam has existed (between 1943 and 2006/07), the estimated volume of deposited sediment equates to an average annual sedimentation rate of 11,905 cubic yards/year or an average of about 0.1 feet per year of deposited sediment over the entire impounded surface.

The application of a uniform annual rate of sedimentation applied throughout the entire lake area is a broad assumption based on the limited available data concerning actual volumes of accumulated sediment within the lake, no recorded annual sediment loading rates and no data regarding the gradation of the sediment. Due to the limited nature of the available data, no detailed sediment transport analysis was performed.

3.0 PLAN FORMULATION

3.1 Plan Formulation Summary

The information in Appendix G outlines the process of identifying and evaluating various options for ecosystem restoration, and the resultant formulation of project alternatives for Canonsburg Lake. Each project alternative and the no-action alternative have been included in an ICA/CEA analysis with the intent of identifying the 'best buy' alternative(s) for ecosystem restoration within Canonsburg Lake, using the IWR-Plan software. These steps are essential to developing a Selected Plan as part of the Feasibility Study process.

Plan formulation activities have been conducted following the six step planning process specified in Chapter 2 of ER 1105-2-100. Specifically, the plan formulation efforts include the considerations listed below.

1. Identification of the water and related land resource problems and opportunities for the study area, reflecting the priorities and preferences of the Federal Government, the non-Federal sponsors and other stakeholder groups.

2. Inventory, forecast and analysis of the critical resources within the planning area, including a quantitative and qualitative description of these resources, and

considering existing and future "without project" conditions for the area over the planning period.

3. Identification and formulation of alternatives plans to address the problems and opportunities of the study area and contribute to federal objectives for ecosystem restoration. Alternative plans are formulated in consideration of the essential criteria described in EP 1165-2-502: significance, acceptability, completeness, effectiveness, efficiency and reasonableness of costs. Appendix G contains additional discussion of these criteria.

4. Evaluating alternative plans to determine the environmental impacts and benefits of the ecosystem restoration alternative actions, considering the criteria listed within Step 3 and characterizing the beneficial and adverse impacts in terms of magnitude, location, timing and duration.

5. Comparison of the alternative actions plans with the no-action plan and with each other, focusing on the difference between each plan in terms of their beneficial and adverse impacts and contributions to the planning objectives, including monetary and non-monetary benefits and costs.

6. Identification of the most cost effective plan after consideration of the array of alternative actions and receipt of public input.

The process of Plan Formulation looks at relevant environmental problems, restoration opportunities, and planning objectives and constraints. The problems and opportunities for ecosystem restoration within Canonsburg Lake are documented within Appendix G and are also summarized below. Planning objectives are also identified within that appendix. Planning constraints include those items that are expected to restrict or limit the choices available to planners in formulating solutions to the specific water and related land resource problems and opportunities of the planning area.

Identified Problems:

The fluvial geomorphology of Little Chartiers Creek through the reach impounded by the Canonsburg Lake dam has been significantly altered as a riverine environment was converted to a lacustrine environment. Even though the hydraulic residence time of Canonsburg Lake is significantly less than the 14-day minimum described for lakes in the Commonwealth of Pennsylvania (refer to Appendix B for additional discussion), the sediment transport process within the lake is substantially degraded simply by the fact that the dam creates a static normal lake pool throughout the reach of the project. The lake is likely only capable of transporting suspended solids, such as the finer silts and clay materials, through the project reach. Larger materials, including sands and bed load material supplied by the watershed, eventually deposit within the lake.

As a result of the sedimentation process, a substantial amount of the upper portion of the lake (south of McDowell Lane) has essentially been lost as open water. It is reasonable to assume that this condition will only progress if left unaltered and the process of sediment deposition will continue to diminish lake areas and depths. The aquatic environment associated with the lake has suffered related impairments such as a loss of a sustainable and diverse fish habitat, as well as a lack of diversity in the

emerging ecosystem surrounding the remaining open water portions of the lake. These environmental impacts are summarized below.

- Areas most beneficial for fish spawning and protection of juvenile fish populations are essentially non-existent in the upper portion of the lake.

- Natural channel substrate materials (e.g., gravels and cobble-sized material) have been smothered by the deposition of fine-grained sediments within the lake, impacting benthic habitat and the organisms that are important to the aquatic food chain.

- Shallow waters and lack of shade result in higher water temperatures and lowered dissolved oxygen content.

- Turbidity related to high concentrations of suspended solids is detrimental to native fish and macroinvertebrate populations.

- Unvegetated mudflats and emergent wetland areas with low diversity and/or dominance by exotic invasive plant species occur in the areas of the lake lost due to sediment accumulation.

The problems noted above are not entirely unique to the upper portion of the lake. As noted in Appendix A, a significant amount of sediment deposition has occurred within the lower portion of the lake, between the McDowell Lane bridge and the dam. However, no lake area has been lost due to sediment accumulation in this lower portion and the lake depths are sufficient to support a sustainable fish habitat. Based on the calculated sediment deposition rate within the lake, the lower portion of the lake would continue to contribute to the overall aquatic ecosystem throughout the life of the project without conducting ecosystem restoration activities in that area.

Identified Opportunities:

As mentioned previously, the evolution of the lake attributed to sedimentation points to opportunities for restoration. The pattern of sedimentation and emerging landforms within the lake has created partially isolated embayments. These backwater areas, not within the main flowpath of the lake, are now more prone to sediment accumulation and will eventually become emergent features. Information in Appendix G addresses the evolution of habitat within the lake over time and suggests that existing mudflats will evolve into wetland habitat within 10-years. The emergent features also reinforce the pattern of the original Little Chartiers Creek channel as the main flow path though the upper portion of the lake, although the original channel flowline has been impacted by accumulated sediment.

With these notable conditions affecting the upper portion of Canonsburg Lake, there are many restoration opportunities that would benefit the aquatic ecosystem. Some of the basic ecosystem restoration concepts that should be considered in this study are listed below.

- Lake dredging to restore shallow and deep water aquatic habitat. The location of dredging within the lake and the identification of supplemental habitat features

(e.g., fish structures) has been closely examined in the formulation of project alternatives.

- Redistribution of dredge material to isolated areas of the lake to enhance emergent wetland and riparian habitats. Beneficial re-use of dredge material will reduce the amount of material that needs to be hauled away from the project area, reducing overall project costs. As with lake dredging, supplemental activities to promote the intended habitat condition (e.g., planting) will be considered in the formulation of project alternatives.

Reinforcing the emerging pattern of Little Chartiers Creek within the upper portion of the lake as a means to encourage the transport of sediment through the project area. This will protect the isolated embayments from rapid aggradation while the documented lower hydraulic residence time within the lake should assist in reducing the deposition of those transported sediments within the lower portion of the lake. In addition to the obvious environmental benefits, ecosystem restoration within Canonsburg Lake can also be compatible with the functional uses of the lake that are preferred by the local sponsor. Without detracting from the environmental benefits of the various restoration opportunities, the use of the lake by the adjoining property owners and the regional population is a factor for consideration. Furthermore, the practical cost of implementing the restoration activities and then maintaining them for the life of the project is also a consideration when identifying restoration opportunities. As such, project alternatives are formulated to reduce the ultimate cost of the project.

Planning Objectives:

The overall objective of the plan formulation process for the Canonsburg Lake ecosystem restoration project is to develop project alternatives that address the degraded ecosystem within the lake, considering the existing impairments (problems) and opportunities to reverse those impairments or otherwise enhance the current habitat conditions. Successfully achieving this objective will require a focus on the natural integrity, productivity, stability and biological diversity of the lake and immediately surrounding areas. The specific objectives related to achieving the goal of ecosystem restoration and that provide for the opportunities listed above can be summarized as indicated below.

- Remove accumulated sediment materials from the lake bottom areas that will most likely benefit aquatic habitat, with the focus on fish spawning habitat.
- Enhance emerging wetland and riparian habitat within and adjacent to the perimeter of the lake, attempting to establish a diverse and native vegetative community.
- Reduce the likelihood of sediment deposition within the upper portion of the lake that would counter any proposed habitat enhancement.
- Improve water quality through assimilation of pollutants.

Generally, the planning objectives should recognize the current management of the lake by the PFBC and the use of the lake by the surrounding land owners and the regional population. Regarding that consideration, information has been provided by the project

local sponsors regarding a draft Recreational Master Plan for the lake (Washington County Watershed Alliance, 2006). The master plan identified opportunities for alternative uses of portions of the lake that had already emerged as landforms or were too shallow to be used for other water-related recreational activities. The essential components of the plan are listed below.

1. An integrated pedestrian path surrounding portions of the lake and connecting areas both upstream and downstream of McDowell Lane.
2. A pedestrian bridge crossing Canonsburg Lake approximately midway between McDowell Lane and U.S. Route 19.
3. Apparent landscaping improvements to at least some of the emergent landforms within the lake to enhance pedestrian use of those areas.

While ecosystem restoration project alternatives cannot include specific recreational opportunities, it is apparent from the master planning effort that the local sponsors seek to continue the use of the lake for that purpose. As such, one of the planning objectives of ecosystem restoration can be to reinforce or at least not detract from those opportunities.

Planning Constraints:

Planning constraints include those items that are expected to restrict or limit the choices available to planners in formulating solutions to the specific water and related land resource problems and opportunities of the planning area. Several planning constraints are evident when considering ecosystem restoration activities within Canonsburg Lake, as listed below. The relevance of these constraints to the project is explained in Appendix G.

- Impacts to jurisdictional waters of the U.S. (e.g., wetlands, streams, lakes) must be limited to the extent practical and must comply with Sections 401 and 404 of the federal Clean Water Act.
- The various ecosystem restoration activities cannot reduce the habitat value of the lake and adjoining areas.
- The creation of wetland or riparian habitat within the lake must comply with the minimum flood hazard protection regulations of the National Flood Insurance Program (NFIP) and the Commonwealth of Pennsylvania, as enforced by both Peters and North Strabane Townships.
- Dredging and material redistribution activities should be performed in a manner that reduces the potential for re-suspension of sediments that would be transported to the downstream segments of Little Chartiers Creek.
- The creation of emergent wetland and riparian habitat areas should avoid the proliferation of invasive or monoculture dominated vegetation that would limit the beneficial aspects of those features.
- The various ecosystem restoration activities must be sustainable throughout the life of the project.
- The various ecosystem restoration activities should not impair the current use of

the private lands adjoining the lake. Furthermore, the use of the lake by a larger regional population should not be impaired.

- Existing utilities around the perimeter of the lake may limit certain restoration opportunities. A sanitary sewer system, including a pump station and force main, has been constructed within North Strabane Township that traverses the PFBC-owned property south of U.S. Route 19 and continues west and then north across property immediately adjacent to the PFBC land surrounding Canonsburg Lake.
- The Pennsylvania Turnpike Commission has been planning a *Southern Beltway Transportation Project* through this region. *The Green Alternative – Option 1A* alignment developed for the Turnpike Commission's consideration crosses Canonsburg Lake a short distance downstream of U.S. Route 19. Information provided by the Turnpike Commission's consultant, The Maguire Group, demonstrates a proposed project right-of-way that consumes almost all of the PFBC-owned property south of U.S. Route 19 and a significant portion of the land adjacent to PFBC property, located west of Canonsburg Lake and south of McDowell Lane.

Screening of Ecosystem Restoration Options:

As part of the Plan Formulation process, initial 'screening' was performed of certain elements related to ecosystem restoration activities. Appendix G provides a detailed discussion of the screening process. A summary is provided below of the fundamental ecosystem restoration activities and how they are considered through the screening process.

- Lake dredging: The screening process determined that the dredging area would be confined to the portion of the lake upstream of McDowell Lane. The process of removing sediment from the lake in selected areas would be accomplished through hydraulic dredging and geotubes would be used as a method to confine the dredge material. The reason for confining lake dredging to the upper portion of the lake is that the lower portion has sufficient depth to sustain the necessary habitat conditions and those conditions are anticipated to prevail throughout the life of the project. As a result, to dredge the lower portion of the lake will increase project costs without providing substantial environmental benefits.

  Despite hypereutrophic conditions documented within the lake by the 1987 Lake Phosphorous Study, the lake currently appears to support a fish population even during the hottest and driest periods of the year. Due to Canonsburg Lake's relatively short detention time (approximately 6 days) and decreased settling rates due to advective flow velocities, algae is flushed from the system before algal blooms and subsequent reductions in dissolved oxygen can occur (PA DEP, 2/2004). Therefore, it is expected that additional/ improved deep water habitat created by the project will successfully support a fish population despite high phosphorous levels that may persist.
- Dredge material placement: Re-distribution within the lake is acceptable for purpose of ecosystem enhancement, with excess dredge material disposed of in areas identified as near-lake and off-site disposal. A location for near-lake

disposal is identified that is partially on PFBC land and partially beyond that land (Areas F1/ F2 on Figures 7 through 12). The land affected by the near-lake disposal and not owned by the PFBC is owned by Bayard Crossings Corporation, identified within the Real Estate Plan contained in Appendix E . Off-site disposal would occur at the Arden Landfill owned and operated by Waste Management, located at 100 Arden Road in Washington, Pennsylvania, approximately 10 roadway miles from the Canonsburg Lake project site (refer to Figure G-5 in Appendix G). Re-distribution of dredge material within the lake will reduce project costs by reducing the amount of material subject to off-site disposal and will introduce the opportunity to create a diversity of habitats within the original lake area.

- Sediment trapping: The use of sediment trapping methods as an isolated activity is not considered to be ecosystem restoration, but will be considered as part of potential long-term Operation and Maintenance (O&M) activities. Sediment trapping, in and of itself, does not create habitat opportunities, but does have the potential to sustain habitat over the project life by reducing the amount of sediment transported to the lake. Appendix G contains a detailed analysis of the potential benefits of sediment trapping as an O&M activity. The analysis determines that the volume of sediment required to be removed from the trap during the project life exceeds the reduced amount of O&M dredging required in the restored lake area, thereby increasing (not decreasing) the cost of O&M for the project throughout the project life. As such, sediment trapping is eliminated from consideration as part of this project.

Formulation of Alternatives:

In accordance with Corps policy (EC 1105-2-210, Ecosystem Restoration in the Civil Works Program), ecosystem restoration projects are evaluated based on a cost effectiveness and incremental cost analysis (CEA/ICA) to identify the most cost effective restoration plan, essentially characterized by the most environmentally beneficial alternative with the least costs. The benefits associated with ecosystem restoration activities cannot be measured in monetary terms; instead, they are characterized and quantified in terms of a particular habitat type. The habitat types may vary within a single project area but should be representative of and feasible within the existing natural environment of the project area.

Appendix G of this document contains a detailed explanation of the various habitat types associated with the action alternatives, defined specifically within the context of the Canonsburg Lake Ecosystem Restoration project. They are summarized below in terms of their primary physical characteristics.

- Submerged Aquatic Habitat: Area that is submerged below the normal pool of Canonsburg Lake. This area provides a variety of habitat benefits for fish throughout their life cycle. This habitat consists of both shallow (less than 3.0 feet of depth) and deep water (more than 3.0 feet in depth) areas that are both essential to a sustainable year-round fish habitat. With the introduction of "fish structures" conceived by the PFBC, the shallow water areas will benefit fish spawning and provide cover for juvenile fish.

- Emergent or Shrub Wetland Habitat: Emergent landform area between the normal pool elevation of Canonsburg Lake and 1.0 ft. above that elevation. By limiting the vertical zone of wetland habitat to 1.0 ft. above the normal lake pool elevation, this area will have sufficient hydrology to achieve the wetland classification. With the planting of appropriate vegetation, the area will provide habitat for a variety of terrestrial species and also filter suspended solids from entering the lake water column.
- Riparian Habitat: Emergent landform between 1 ft. and 4 ft. above the normal pool of Canonsburg Lake, characterized as a vegetated buffer to the aquatic and wetland environments that extends to the 10-year flood elevation. The 10-year flood elevation is established through the hydrologic/hydraulic analysis contained in Appendix B.

The project alternatives consider shallow submerged aquatic habitat within the existing mudflat areas of the lake, while the deep water habitat is proposed for the open water (channel) portion of the lake. The project alternatives also consider emergent wetland and riparian habitat in some of the existing mudflat areas, accomplished through the placement of dredge material within those areas. Submerged aquatic habitat is enhanced through the placement of PFBC-identified fish structures, while both the emergent wetland and riparian habitats are enhanced through the appropriate native plantings. Geotubes will be used to establish the perimeter of the various habitat enhancement areas within the lake and will, in effect, create a new 'shoreline' within the lake that defines the main channel waterway in the upper portion of the lake.

A detailed explanation of the various habitat types and corresponding habitat units associated with this project is contained in Section 4.0 of Appendix G. Table 9 below contains a summary of the various habitat types and assigned habitat unit values that were derived according to the process discussed in that section. Table 9 also contains the abbreviations for the various habitat types that are used in subsequent tables.

TABLE 9
Summary of Habitat Units

Habitat Type		SI	SF	SI x SF
Submerged Aquatic Habitat (below normal pool)				
Unvegetated Mudflat (0.0 to 0.5 ft. depth)	MF	1	1	1
Shallow water with cover (up to 3.0 ft. depth)	SW+	10	4	40
Shallow water without cover (up to 3.0 ft. depth)	SW-	5	4	20
Deep water with cover (greater than 3.0 ft. depth)	DW+	7	4	28
Deep water without cover (greater than 3.0 ft. depth)	DW-	5	4	20
Wetland Habitat (between normal pool and 1.0 ft. above)				
Emergent or Shrub Wetland	EW	10	4	40
Typha spp./Phalaris arundinacea Monoculture	MW	1	2	20
Riparian Habitat (between 1.0 and 4.0 ft. above normal pool)				
≥ 2 active channel widths (≥124 feet)	RH	10	3	30
Between 1 and 2 active channel widths (62–123 feet)	RH	8	3	24
Between 0.5 and 1 active channel width (31 – 61 feet)	RH	5	2	10
Between .33 and .5 active channel width (21 -- 30 feet)	RH	3	2	6
≤0.33 active channel width (0 – 20 feet)	RH	1	2	2

Utilizing the method outlined in the Corps of Engineers' draft document, entitled *Environmental Sustainability, Standardized Output Measurement Process*, the total environmental benefits associated with the project alternatives have been computed using the formula described below. The Standardized Output Unit (SOU) is determined for each habitat type associated with a project alternative and then the SOUs for each habitat type within that project alternative are added together.

Acres of Habitat x SI x SF = SOU

SF – Significance Factor SI – Standardized Index

Total SOUs for a Given Project Alternative = SOUs (submerged aquatic habitat) + SOUs (emergent wetlands) + SOUs (riparian)

Table 10 on the following page provides a summary of the various habitat types identified for the Canonsburg Lake ecosystem restoration project and how they are being considered within the context of project alternatives. Table 10 illustrates that the restoration activities are broken up into the distinct preferred habitat categories for the lake, with six different options for dredging to restore submerged aquatic habitat, five different options for redistribution of dredge material to restore wetland habitat and five different options for redistributing dredge material to restore riparian habitat. All of these actions would occur within the original limits of Canonsburg Lake and would predominantly seek to restore habitat to areas with noted impairments. The activity of dredging to restore submerged aquatic habitat would occur in existing mudflats (restoring shallow submerged aquatic habitat) and in existing open water (restoring deep water aquatic habitat). The activity of redistributing dredge material for wetland and riparian habitat would also occur in existing mudflats and a limited area of open water. Within each category of habitat, an option is provided related to no-action. The individual options outlined in Table 10 can be combined in different variations to form project alternatives that include multiple restoration activities.

The individual options described in Table 10 have been combined to form a total of 37 project alternatives (including no-action) were developed to address the restoration of Canonsburg Lake and are presented in Table 11 on page 48. Eleven of these alternatives were determined to not meet all of the 'Guiding Principles' for the formulation of project alternatives outlined in Appendix G. Specifically, certain alternatives were eliminated because they do not generate enough dredge material to accomplish the intended redistribution for both wetland and riparian habitat restoration. In addition, Guiding Principle No. 4 (described in Appendix G) requires that restoration activities in areas D1 and D2 be accomplished together. Alternatives including restoration in only one of these areas were eliminated from further consideration. The 25 remaining action alternatives were retained for further evaluation, along with the no-action alternative, for further consideration using a cost effectiveness analysis. The restoration areas referenced in Table 11 (Areas A thru E) are depicted on Figure 7 on page 49. Figure 7 also indicates the location of proposed sediment dewatering and storage areas F1 and F2.

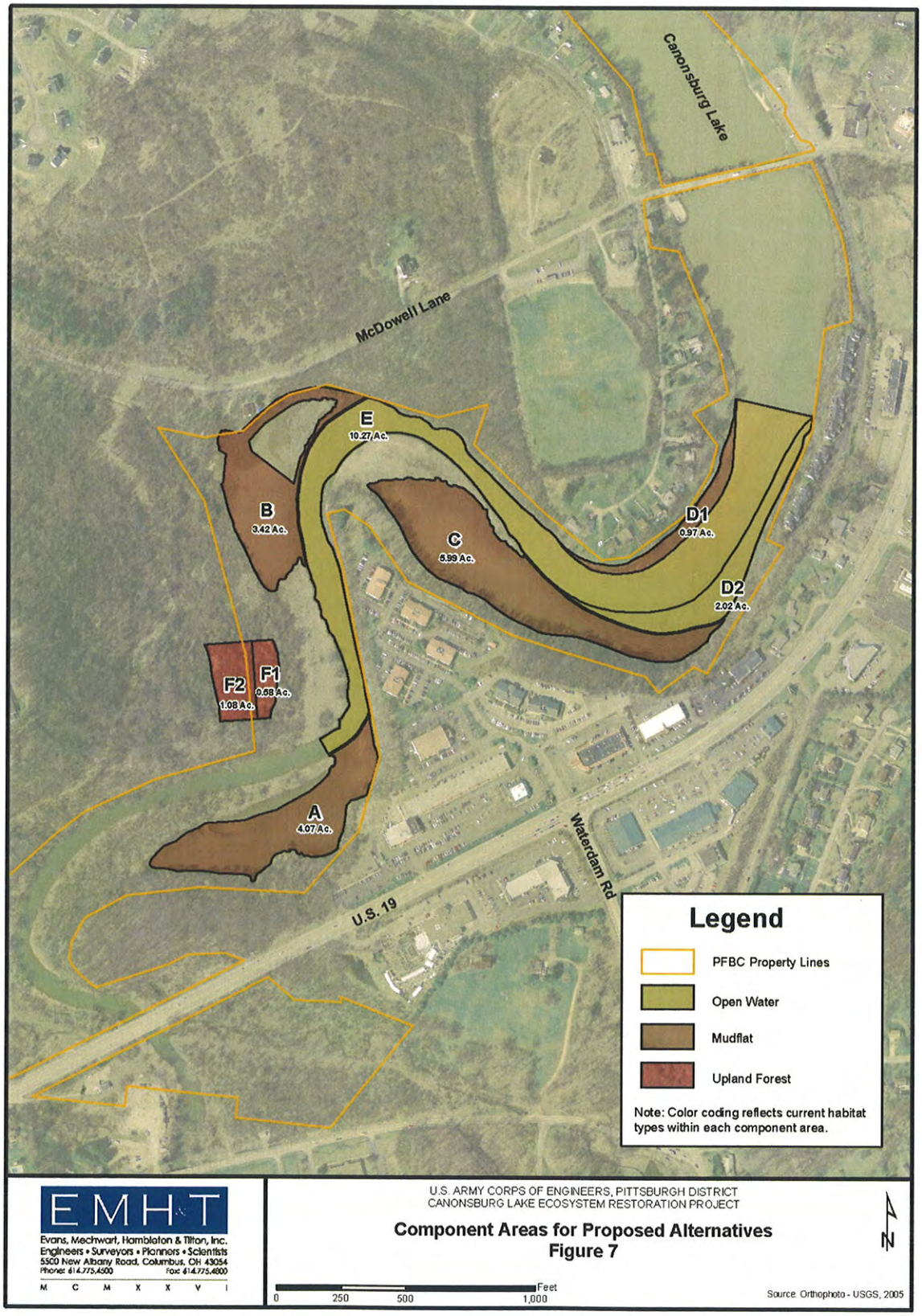
TABLE 10
Summary of Restoration Actions and Areas

Option I.D.	Restoration Action	Restoration Area	Existing Habitat Type	Restored Habitat Condition
Submerged Aquatic Habitat				
s0	None	No Action	N/A	N/A
s1	Dredge	Area A	Mudflats	Shallow Submerged Aquatic Habitat
s2	Dredge	Area A+B	Mudflats	Shallow Submerged Aquatic Habitat
s3	Dredge	Area A+B+C	Mudflats	Shallow Submerged Aquatic Habitat
s4	Dredge	Area A+E	Mudflats + Open Water	Shallow and Deepwater Submerged Aquatic Habitat
s5	Dredge	Area A+B+E	Mudflats + Open Water	Shallow and Deepwater Submerged Aquatic Habitat
s6	Dredge	Area A+B+C+E	Mudflats + Open Water	Shallow and Deepwater Submerged Aquatic Habitat
Wetland Enhancement				
w0	None	No Action	N/A	N/A
w1	Re-distribution	Area C	Mudflat	Emergent or Scrub/Shrub Wetland
w2	Re-distribution	Area B+C	Mudflats	Emergent or Scrub/Shrub Wetland
w3	Re-distribution	Area C+D2	Mudflats + Open Water	Emergent or Scrub/Shrub Wetland
w4	Re-distribution	Area B+C+D2	Mudflats + Open Water	Emergent or Scrub/Shrub Wetland
w5	Re-distribution	Area D2	Open Water	Emergent or Scrub/Shrub Wetland
Riparian Enhancement				
r0	None	No Action	N/A	N/A
r1	Re-distribution	Area C	Mudflat	Riparian
r2	Re-distribution	Area C+D1+D2	Mudflats + Open Water	Riparian
r3	Re-distribution	Area C+B+D1+D2	Mudflats + Open Water	Riparian
r4	Re-distribution	Area D1	Mudflat	Riparian
r5	Re-distribution	Area D1+D2	Mudflat + Open Water	Riparian

TABLE 11
List of Alternatives Considered

Alternative	Alternative Number	Restoration Areas (acreage)					
		A (4.07 ac.)	B (3.42 ac.)	C (5.99 ac.)	D1 (0.97 ac.)	D2 (2.02 ac.)	E (10.3 ac.)
s0 w0 r0	1	No-Action					
s1 w1 r0	2	SW+		EW			
s1 w0 r1	3	SW+		RH			
s1 w2 r0	4	SW+	EW	EW			
s1 w3 r4	5	SW+		EW	RH	EW	
s1 w4 r4	6	SW+	EW	EW	RH	EW	
s2 w1 r0	7	SW+	SW+	EW			
s2 w0 r1	8	SW+	SW+	RH			
s2 w3 r0	9*	SW+	SW+	EW		EW	
s2 w3 r4	10	SW+	SW+	EW	RH	EW	
s3 w0 r0	11	SW+	SW+	SW+			
s3 w5 r0	12*	SW+	SW+	SW+		EW	
s3 w5 r4	13	SW+	SW+	SW+	RH	EW	
s3 w0 r5	14	SW+	SW+	SW+	RH	RH	
s4 w0 r0	15	SW+					DW+
s4 w0 r1	16	SW+		RH			DW+
s4 w0 r2	17	SW+		RH	RH	RH	DW+
s4 w0 r3	18	SW+	RH	RH	RH	RH	DW+
s4 w1 r0	19	SW+		EW			DW+
s4 w2 r0	20	SW+	EW	EW			DW+
s4 w2 r5	21	SW+	EW	EW	RH	RH	DW+
s4 w3 r4	22	SW+		EW	RH	EW	DW+
s4 w4 r0	23*	SW+	EW	EW		EW	DW+
s4 w4 r4	24	SW+	EW	EW	RH	EW	DW+
s5 w0 r0	25	SW+	SW				DW+
s5 w1 r0	26	SW+	SW	EW			DW+
s5 w0 r1	27	SW+	SW	RH			DW+
s5 w3 r0	28*	SW+	SW+	EW		EW	DW+
s5 w3 r4	29	SW+	SW+	EW	RH	EW	DW+
s5 w5 r1	30*	SW+	SW+	RH		EW	DW+
s5 w0 r2	31	SW+	SW+	RH	RH	RH	DW+
s5 w1 r5	32	SW+	SW+	EW	RH	RH	DW+
s6 w0 r0	33	SW+	SW+	SW+			DW+
s6 w0 r4	34*	SW+	SW+	SW+	RH		DW+
s6 w5 r0	35*	SW++	SW+	SW+		EW	DW+
s6 w5 r4	36	SW+	SW+	SW+	RH	EW	DW+
s6 w0 r5	37	SW+	SW+	SW+	RH	RH	DW+

Legend:
SW - Shallow Water Submerged Aquatic Habitat
EW - Emergent Wetland Habitat
RH - Riparian Habitat
DW - Deep Water Submerged Aquatic Habitat
Alternatives not considered feasible - insufficient amount of dredge material
* Alternatives not considered feasible - fail to meet Guiding Principal # 4


Canonsburg Lake
McDowell Lane
E
10.27 Ac.
B
3.42 Ac.
C
5.99 Ac.
D1
0.97 Ac.
D2
2.02 Ac.
F2
1.08 Ac.
F1
0.68 Ac.
A
4.07 Ac.
Waterdam Rd
U.S. 19
Legend
PFBC Property Lines
Open Water
Mudflat
Upland Forest
Note: Color coding reflects current habitat types within each component area.
EMH&T
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M C M X X V I
U.S. ARMY CORPS OF ENGINEERS, PITTSBURGH DISTRICT
CANONSBURG LAKE ECOSYSTEM RESTORATION PROJECT
Component Areas for Proposed Alternatives
Figure 7
N
0 250 500 1,000 Feet
Source: Orthophoto - USGS, 2005

As described previously, a successful ecosystem restoration project will be able to accomplish long-term sustainability of the environmental benefits attributed to the project. For the purpose of this analysis, a project life of 50 years will be considered when evaluating the total benefits, measured in habitat units, for the various project alternatives. In actuality, environmental sustainability requires that the project include some element of O&M to preserve the intended habitat functions of a project alternative. Section 6.6 of Appendix G provides a detailed discussion of the O&M considerations related to the ecosystem restoration alternatives for Canonsburg Lake. For the purpose of this study, it is assumed that shallow-water submerged aquatic habitat will be re-dredged to maintain its function and use within the lake. The same consideration is not given to the emergent wetland and riparian habitats, as they will become heavily vegetated within the timeframe of the project life. As such, re-dredging (and re-planting) them to sustain their defined habitat uses could ultimately be more detrimental to the natural environment than the resulting effects of the sediment accumulation.

The evolution of habitat units over the 50-year project life is depicted in Table 12 on the following page. The information in this table does not account for the maintenance dredging that will occur within the areas of shallow water submerged aquatic habitat required to maintain project sustainability; however, the affect of maintenance dredging to sustain certain habitat areas is accounted for in the cost effective analysis described in the following section. The change from one habitat to another as depicted in the table is based on the uniform application of the historical annual sediment deposition rate (0.1 ft./year) throughout the project area. The determination of this annual sediment deposition rate is established through an analysis contained in Appendix A.

The uniform application of the sediment deposition rate does not account for differential settlement of sediment throughout the upper portion of Canonsburg Lake that may occur as the result of varying flow velocity regimes. This approach is conservative with respect to the sustainability of certain areas of the project, namely Area E, which is the only area of deep water submerged aquatic habitat associated with the various project alternatives. In this way, the calculation of environmental output and the CEA/ICA process described in the following section do not exaggerate the sustainability of this aspect of the project.

TABLE 12

Evolution of Habitat Units Over Time

Habitat Type	Table Symbol	Position	Habitat Progression During Project Life										
			Initial	Yr 5	Yr 10	Yr 15	Yr 20	Yr 25	Yr 30	Yr 35	Yr 40	Yr 45	Yr 50
Deep Water Submerged Aquatic with Enhancement [1]	DW+	Water Depths greater than 3 ft.	DW+	DW+	DW+	DW+	DW+	SW+	SW+	SW+	SW+	SW+	MF
Deep Water Submerged Aquatic without Enhancement [2]	DW-	Water Depths greater than 3 ft.	DW-	DW-	DW-	DW-	DW-	SW-	SW-	SW-	SW-	SW-	MF
Shallow Water Submerged Aquatic with Enhancement [1]	SW+	Water Depths of 0.5 to 3 ft.	SW+	SW+	SW+	SW+	SW+	SW+	MF	MW	MW	RH	RH
Shallow Water Submerged Aquatic without Enhancement [2]	SW-	Water Depths of 0.5 to 3 ft.	SW-	SW-	SW-	SW-	SW-	SW-	MF	MW	MW	RH	RH
Mud Flat Submerged Aquatic Habitat	MF	Water Depths of 0.0 to 0.5 ft.	MF	MF	MW	MW	RH	RH	RH	RH	RH	RH	UA
Emergent Wetland Habitat	EW	Between 0.0 and 1.0 ft. above lake normal pool	EW	EW	EW	RH	RH	RH	RH	RH	RH	UA	UA
Monoculture Wetland Habitat	MW	Between 0.0 and 1.0 ft. above lake normal pool	MW	MW	MW	RH	RH	RH	RH	RH	RH	UA	UA
Riparian Habitat	RH	Between 1.0 and 4.0 ft. above lake normal pool .	RH	RH	RH	RH	RH	RH	RH	UA	UA	UA	UA

[1] With artificial fish habitat structures
[2] Without artificial fish habitat structures
UA – Upland Area; not considered a quantifiable habitat for this project

Cost Effective Analysis:

The cost effectiveness analysis is a method for comparing alternative plans that produce various environmental outputs and for determining which plan can produce the largest quantity of output for a given cost, or produce the same or greater quantity of output for less cost. Incremental cost analysis builds on the findings of the cost effectiveness analysis. This is accomplished by comparing the increase in costs with the increase in outputs associated with advancing from one output level (one cost effective alternative) to the next higher output level (another cost effective alternative).

The output associated with each alternative plan is measured using the habitat evaluation criteria documented in Appendix G (refer to Table G-9). Using the Standard Output Measurement process established by the USACE to determine Standardized Output Units (SOU), cumulative output for each alternative plan were computed over the 50-year project life, using the evolution of habitat units as described above. The cost associated with each alternative plan is based on the screening level cost analysis contained in Appendix D.

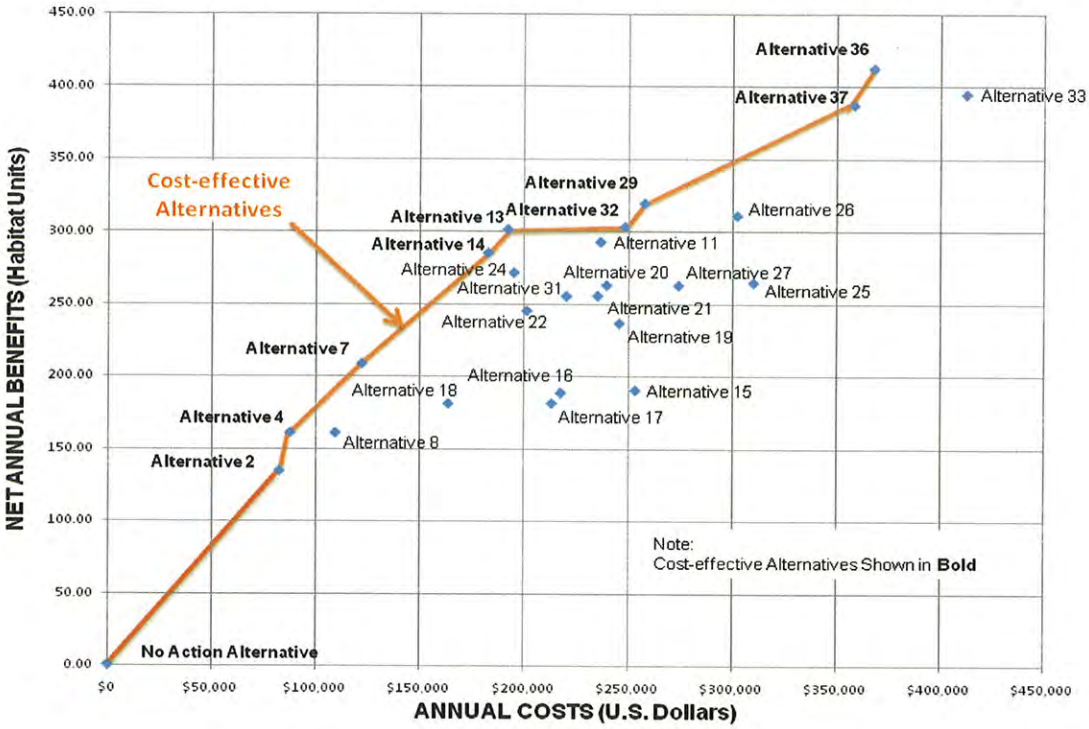
The cost effectiveness and incremental cost analyses have been conducted in accordance with guidelines contained in EC 1105-2-206, entitled *Project Modification for Improvement of the Environment*, which is the same guidance as EC 1105-2-210, dated June 1, 1995, entitled *Ecosystem Restoration in the Civil Works Program;* EC 1105-2-214, dated October 3, 1998, entitled *Project Modifications for Improvement and Aquatic Ecosystem Restoration;* and Institute for Water Resources report *Evaluation of Environmental Investments Procedures Manual Interim: Cost Effectiveness and Incremental Cost Analyses*, dated May 1995 (IWR Report 95-R-1).

The Institute for Water Resources (IWR) has developed IWR Planning Suite Decision Support Software to assist with the formulation and comparison of alternative plans of environmental restoration projects. IWR Planning Suite assists in plan formulation by combining solutions to planning problems and calculating the additive effects of each alternative or combination of alternatives. IWR Planning Suite also assists in plan formulation and comparison of alternatives by conducting cost effectiveness and incremental cost analyses, and has been used for the Canonsburg Lake Ecosystem Restoration Project.

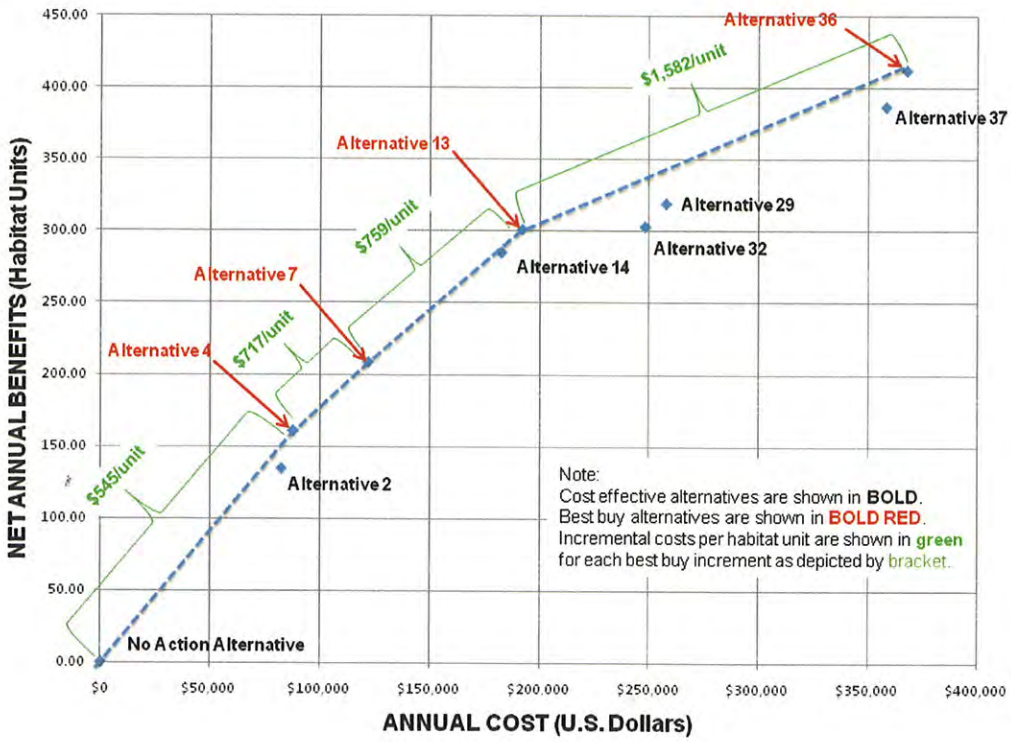
The cost analysis of the alternative plans described in Appendix G has developed average annual costs (refer to Table G-15) and average annual environmental output (Table G-16). To develop cost effective project alternatives, both the calculated output and costs are compared to develop average costs per net output (Table G-17), enabling a comparison between alternatives to determine those that produce the same amount of environmental output for less cost or a larger quantity of output for the same or less cost. The first graph on the following page illustrates the cost-effective alternatives with respect to all of the project alternatives.

Incremental cost analysis illustrates the increase in costs associated with advancing from one output level to the next higher output level. This analysis compares the cost effective alternatives to each other to determine which are considered "best buy" alternatives. Of the 9 cost effective alternatives, Alternatives 4, 7, 13, and 36 were determined to be "best buy" alternatives (refer to Table G-18). The four best buy alternatives range in initial construction cost from $1.38 Million (Alternative 4) to $6.05 Million (Alternative 36). Details regarding the actions proposed under each of the best buy Alternatives are provided within Section 4.0. The second graph on the following page illustrates the best buy alternatives with respect to the determined cost-effective alternatives.

Comparison of Cost-Effective Alternatives to All Project Alternatives



Comparison of Best Buy Alternatives to Cost-Effective Alternatives



All four best buy alternatives include either shallow water submerged aquatic habitat or emergent wetland habitat in Areas A, B and C. Two of the alternatives (Alternatives 13 and 36) include riparian habitat. Only one best buy alternative (Alternative 36) includes deep water submerged aquatic habitat in Area E, the main channel through the upper portion of the lake. The four different best buy alternatives provide the opportunity to determine a selected plan based on which alternative meets the overall goals of the project and with sufficient environmental justification to support that plan. Table 13 repeats the information from Table G-19 (Appendix G) for the four best-buy alternatives.

TABLE 13
Summary Description of Best-Buy Alternatives

Alternative Number	Restoration Areas						Total Construction Costs	Annual O&M Costs
	A (4.04 ac.)	B (3.42 ac.)	C (5.99 ac.)	D1 (0.97 ac.)	D2 (2.02 ac.)	E (10.3 ac.)		
4	SW+	EW	EW				$1,382,811	$13,320
7	SW+	SW	EW				$1,820,433	$24,150
13	SW+	SW+	SW+	RZ	EW		$2,775,135	$43,117
36	SW+	SW+	SW+	RZ	EW	DW+	$6,047,463	$43,117

Legend:
SW+ - Shallow Water Submerged Aquatic Habitat with cover (fish structures)
EW - Emergent Wetland Habitat
RZ - Riparian Zone Habitat
DW+ - Deep Water Submerged Aquatic Habitat with cover (fish structures)

3.2 Future Without Project Conditions

There is no indication that the Commonwealth of Pennsylvania is considering an abandonment/ removal of the Canonsburg Lake dam in response to the safety concerns noted in the 1996 dam assessment prepared by Schnabel Engineering. Therefore, it can be assumed that the lake shall continue to exist as an impoundment of Little Chartiers Creek for the foreseeable future. The Future Without Project Conditions assessment discusses the evolution of Canonsburg Lake over time as an impoundment, and does not address reversion to a riverine system through dam removal. This assessment considers how both internal and external factors are likely to affect the lake ecosystem without the benefit of the proposed ecosystem restoration. The purpose of this assessment is to determine if the lake ecosystem will degrade or improve over time as a result of other factors not related to the specific ecosystem restoration activities described in this report.

3.2.1 Evolution of Canonsburg Lake

Based upon existing data and trends observed within Canonsburg Lake, certain assumptions can be made as to how the lake ecosystem will evolve if no restoration action is taken. Significant changes to the physical composition of submerged aquatic habitat, fish community dynamics, wetlands and riparian floodplain habitats are anticipated as described in the following sections. Table 14 contains graphical depiction of the change in habitat types with the various areas of Canonsburg Lake, considering both the no-action alternative (future without project) and a chosen action alternative for

comparison. The information in Table 14 illustrates the trend of changing habitat over the 50-year project life as the result of continued sediment deposition. As an example, the current mudflat areas (Areas A, B and C) will evolve to a wetland habitat dominated by a monoculture vegetative community (with a low habitat value), then to riparian habitat and then to upland areas that are considered to have no habitat value in this context of this project. In contrast, Area D2 is currently deepwater submerged aquatic habitat, with no fish cove and will evolve to shallow submerged aquatic habitat (with no fish cover), and then to mudflats, a monoculture wetland habitat and riparian habitat.

TABLE 14

Comparison of Change in Habitat Type With and Without Project

Project Life (Year)	Area A		Area B		Area C		Area D1		Area D2		Area E	
	No Action	With Project	No Action	With Project	No Action	With Project	No Action	With Project	No Action	With Project	No Action	With Project
1	MF	SW+	MF	SW+	MF	SW+	MF	RH	DW-	EW	DW-	DW+
	MW		MW		MW		MW		SW-			
	RH		RH		RH		RH		MF	RH	SW-	
									MW			
50	UA	SW+	UA	SW+	UA	SW+	UA	UA	RH	UA	MF	DW+

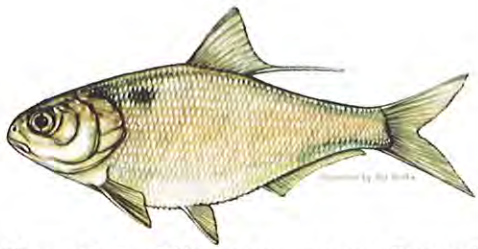
3.2.1.1 Aquatic Environment and Fish Species

Since its creation in the 1940's, Canonsburg Lake has been steadily filling in with sediment from the surrounding watershed. This has significantly decreased the overall volume and area of the lake, and reduced the lake depth. Under the Future Without Project Conditions scenario, the existing sediment within the lake will remain. This will be compounded by additional sediment entering the system, although the rate of sedimentation may decrease as the result of stormwater management regulations and local conservation practices, discussed further in the following sections. As spawning and deep water habitats continue to fill in with sediment, the lake will become increasingly unable to support a self-sustaining, diverse fish population. Impairments to the fish community within the lake will have a secondary negative effect on piscivorous birds and mammals within the study area.

Fish species that are more tolerant of highly turbid, eutrophic conditions, such as common carp and gizzard shad, will have a distinct survival advantage over more sensitive species, such as crappie and pumpkinseed. Gizzard shad and the non-native carp are nuisance species in the Canonsburg Lake that can adapt to these conditions

White crappie (*Pomoxis annularis*)
Illustration by Ted Walke

better and deprive many other fish species of resources especially under environmental conditions that are stressful to the other fish. This competitive pressure will further decrease fish species diversity within Canonsburg Lake. This effect is already evident when one compares an earlier fish survey performed by the PFBC in 1974 (Weirich, Boyer, and Mantzell, 1974) with the most recent survey of Canonsburg Lake (2000). The 1974 survey indicates that white crappie were the most prevalent species in the lake (54%), followed by brown bullhead, white sucker and bluegill. Only two largemouth bass were collected in the trap nets. White crappie and brown bullhead typically prefer to inhabit deeper waters than largemouth bass, who prefer shallow areas for nesting and foraging. In the 2000 survey, largemouth bass was the primary game fish collected. Gizzard shad had the highest percentage of the total trap net catch (51%), and were noted to be limiting panfish (crappie and bluegill) abundance and growth (Smith and Lorson, 11/2000). White crappie made up only 27% of the total trap net catch in 2000, and brown bullhead numbers were also reduced (Smith and Lorson, 11/2000).



Gizzard shad (*Dorosoma cepedianum*)
Illustration by Ted Walke

Gizzard shad is commonly associated with highly turbid waters and prefer shallow, muddy areas which are currently prevalent in the lake. As indicated within the PFBC 2000 report: *Gizzard shad can drive zooplankton populations to very low levels, thus affecting growth, survival, abundance, and recruitment of fishes such as bluegill that depend on these food resources (Dettmers and Stein, 1992; DeVries and Stein, 1992; Dettmers and Stein 1996.)... However, age-0 gizzard shad can still survive and grow when zooplankton are eliminated because they are "opportunistic omnivores."... Even though gizzard shad are preferred prey for many predators, their high fecundity, fast growth, and large adult size limit their vulnerability to predators. The abundance of predators in Canonsburg Lake are probably consuming only a small percentage of age-0 gizzard shad before the gizzard shad reach a large size... Winter mortality is probably not reducing the adult gizzard shad population.*

Based upon the comparison of the two fish surveys, it appears that the fish population within Canonsburg Lake is changing as the lake continues to become shallower and more turbid. Populations of species requiring deeper water habitat are declining, while species that do well in shallow and/ or turbid conditions are thriving. This trend is anticipated to continue until the lake eventually becomes too shallow to support a fish community.

Areas that are currently characterized as "Open Water" will continue to accumulate sediment without the benefit of the Canonsburg Lake Ecosystem Restoration Project. Existing deep water areas (greater than 3 feet) will eventually become too shallow to allow for overwintering or to provide cool water refugia for adult fish during warmer temperatures. Similarly, shallow water (0.5 to 3 feet), which are typically highly productive, will become too shallow to be suitable for fish spawning and fry/juvenile development. These areas will eventually be transformed through continued sedimentation into unvegetated mudflats comparable to those presently existent in the upper portions of the lake.

3.2.1.2 Wetlands and Riparian Floodplain

Without the benefit of the Canonsburg Lake Ecosystem Restoration Project, areas that are currently characterized as unvegetated mudflats will continue to accumulate sediment, eventually becoming shallow enough to allow germination of plants. These areas will likely be colonized by invasive and/ or aggressive species, such as *Typha* spp. (cattails) and *Phalaris arundinacea* (reed canarygrass), often resulting in the development of vegetative monocultures lacking diversity. This will hinder or prevent the development of more vegetatively diverse wetlands which would offer better quality habitat for wildlife. Areas that are currently wetland within the lake boundary would also continue to collect sediment until they eventually surface to an elevation above water that would not support wetland hydrology. These areas would then meet the definition of Riparian Zone Habitat as described in Appendix G. Continued sediment accumulation will eventually transform these riparian zone areas into upland areas that are sufficiently elevated above normal pool so as to be above the ten-year flood level and hence disconnected from the lake ecosystem.

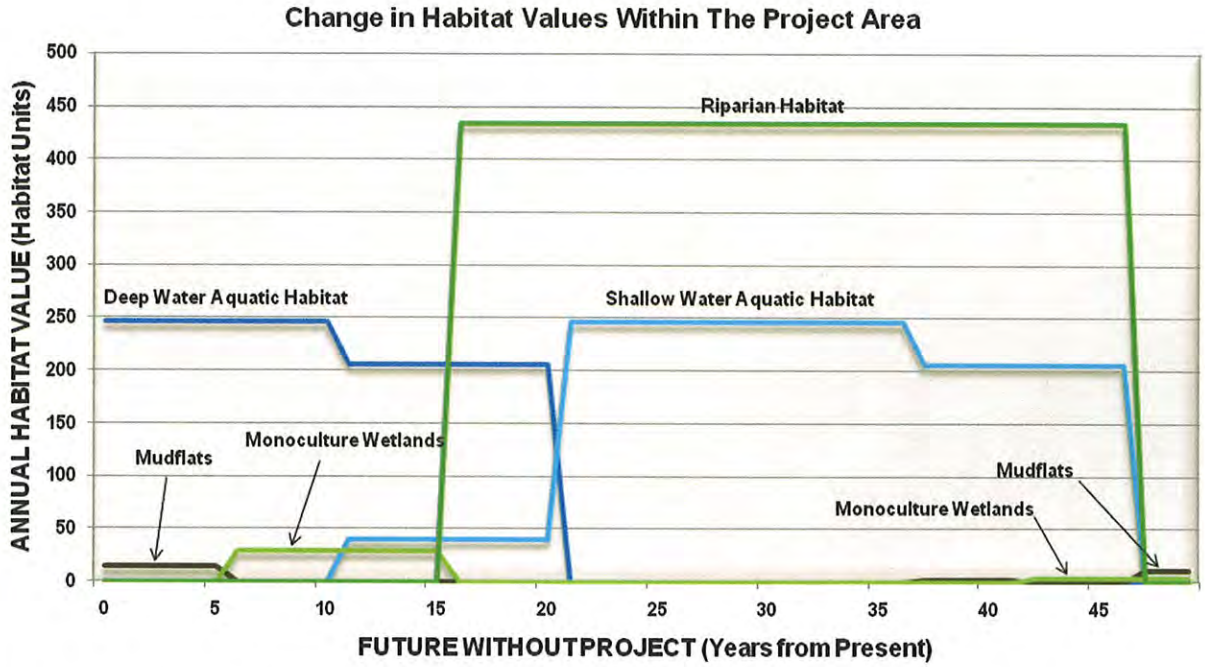
3.2.1.3 Change in Habitat Values Over Time

As discussed in Sections 3.2.1.1 and 3.2.1.2, the habitat within the project area will undergo a progression of changes over time as the consequence of the continued accumulation of sediments:

- deep water will become shallow water;
- shallow water will become mudflats;
- mudflats will become monoculture wetlands;
- monoculture wetlands will become riparian areas; and, eventually,
- riparian areas will become upland areas.

The six discrete areas (A, B, C, D1, D2, and E) within Canonsburg Lake that have been proposed for action alternatives comprise a total of 26.74 acres. Of this, 12.32 acres are currently deep water habitat (10.3 acres at 5.0 feet deep and 2.02 acres at 4.0 feet deep) and 14.42 acres are currently mudflats (0.5 feet deep). As shown on the following graph, the habitat values in these areas will change over time without the project. The 2.02 acres of deep water will become shallow water (3 feet) in approximately ten years under current rates of sediment accumulation. By year twenty, the remaining 10.3 acres of deep water will also have become shallow water. These shallow water areas will continue to accumulate sediments until they revert entirely to mudflats by year 37 and

47, respectively, and thence to monoculture wetlands, riparian areas, and, ultimately, upland areas. The 14.42 acres of existing mudflats will undergo simultaneous transformation. By year five, the areas will have accumulated sufficient sediment to emerge, whereupon monoculture wetlands will become established. The continuing accumulation of sediments in these areas will continue to elevate the surface, alter the hydrology, and transform these areas into riparian areas by year fifteen. By year 47, these areas will have accumulated sufficient additional sediments to elevate the surface above the 10-year floodplain, becoming upland areas and, hence, becoming disconnected from the lake ecosystem and therefore having no aquatic benefits.



As illustrated in the chart above, the annual habitat value of the six action areas, which total about 260 habitat units per year under existing conditions, will peak at about 680 habitat units per year in years 21 to 36 and will drop to less than 15 habitat units per year after year 47.

3.2.2 Watershed Considerations

In defining the Future Without Project Conditions, one must also consider how changes within the contributory watershed may affect Canonsburg Lake, and whether these changes will resolve the ecological impairments within the lake without external assistance. Currently, there are no other plans to address the sedimentation that presently exists within the lake; however, improvements to stormwater management as well as BMPs for agricultural and commercial/ residential development within Washington County and the local municipalities may affect future sedimentation rates. These effects are discussed in the following sections.

3.2.2.1 Stormwater Management

The Commonwealth of Pennsylvania has enacted Act 167 in response to the NPDES program promulgated through the USEPA. Act 167 provides for statewide criteria related to stormwater management that is regulated by the PA DEP. As part of this program, the DEP, Bureau of Watershed Management, has developed and published the Pennsylvania Stormwater Best Management Practices Manual, dated December 2006, which includes provisions for the rate, volume and quality of surface stormwater runoff associated with development.

The implementation of Act 167 (NPDES program) within Pennsylvania requires that political jurisdictions of sufficient population adopt specific stormwater management criteria that are at least consistent with the minimum statewide standards. Under this program, the Washington County Conservation District (WCCD) and the DEP maintain the authority to review and issue stormwater permits throughout the County. These stormwater permits include both construction phase erosion and sediment control and post-construction stormwater management.

Under Phase II of the NPDES program, Washington County is acting on behalf of the various political jurisdictions (e.g., cities, towns and townships) within the County to develop a comprehensive ordinance and design manual for the purpose of regulating stormwater management in conjunction with future development. The purpose of this effort is to provide for more consistency between the various communities within the County and create a more rigorous standard that will meet all of the statewide criteria for stormwater management. The countywide effort is being guided by the Washington County Planning Commission and a steering committee that includes the WCCD.

Once all of the stormwater management criteria are developed and fully enacted, the benefits to the watershed listed on the following page would be foreseeable.

- There will be less impact to watercourses throughout the County that would otherwise result from development activities. The countywide provisions for reducing both the rate and volume of stormwater runoff associated with development sites will address the most obvious detrimental impact of development. While these criteria should prevent additional stress on watercourses, they would not necessarily address existing instabilities that may be contributing to channel bank erosion and mass wasting of sediments within the various waterways.
- Water quality provisions within these criteria will seek to reduce the release of pollutants commonly associated with urbanizing areas. As land use within a watershed changes from agriculture to urban uses, it is common to see a reduction in sediment and nutrient loading to waterways within that watershed; however, there are a variety of other pollutants that would be introduced to the watershed that can be equally detrimental to overall water quality. Various stormwater management features can be implemented in conjunction with development to reduce the release of those pollutants.
- Erosion and sediment control measures, and oversight and enforcement, may become more rigorous. The implementation of a comprehensive program for

managing development construction sites will reduce the likelihood of sediment-laden runoff impacting waterways.

- Education and outreach that are commonly associated with comprehensive stormwater management program will create a broader awareness throughout the community of the issues pertaining to protecting natural resources, particularly streams and rivers.

3.2.2.2 Washington County Comprehensive Plan

As discussed in Section 1.5.8, Washington County has adopted a Comprehensive Plan which guides the growth and development of the county. The plan emphasizes the preservation of agricultural lands, which are an important part of the local economy and heritage. As of April 2005, 2,455 acres of agricultural land were preserved in the county under the Pennsylvania Agricultural Conservation Easement Program. In addition, approximately 60,000 acres were included in Agricultural Security Areas as provided for under the Agricultural Area Security Law of 1981. This represents 11% of the total landmass of the county. Furthermore, the Pennsylvania Municipalities Planning Code (2003) requires that municipalities enact zoning regulations that encourage the development and viability of agricultural operations.

Along with this emphasis on preserving agricultural lands, the various programs promote the use of agricultural Best Management Practices (BMPs), such as stream bank fencing and protection of riparian buffers. The Nutrient Management Act further requires the development of Nutrient Management Plans for agricultural operations. The county is responsible for working with farmers to complete these plans, which outline BMPs that will be employed to address nutrient runoff. These efforts are anticipated to help reduce the sediment and nutrient loads to the various watersheds within the county, including Little Chartiers Creek and Canonsburg Lake.

While the Comprehensive Plan promotes the preservation of agriculture within Washington County, it also recognizes the need and desire for development within the individual municipalities. North Strabane and Peters Townships both have individual comprehensive plans, which specify goals related to commercial and residential development within the communities. They also emphasize the implementation of various conservation practices, such as Conservation Subdivision Design, to protect the environmental integrity of the communities. These conservation practices are also anticipated to reduce pollutant and sediment loads to the Little Chartiers Creek/ Canonsburg Lake watershed.

Retention basins are one type of stormwater BMP

While the implementation of stormwater management measures specified under NPDES and the Washington County Comprehensive Plan is anticipated to reduce the overall sediment and nutrient load to Little Chartiers Creek and Canonsburg Lake, they will do nothing to reduce the existing amount of sediment accumulation within the Lake. Under the Future Without Project Conditions, the lake would continue to become shallower due to sedimentation, albeit at a slower rate.

3.2.3 Conclusions

Based on consideration of the anticipated evolution of the lake habitat, how future conditions within the Little Chartiers Creek watershed would be affected by the County's on-going stormwater management program, and the currently enacted county and local comprehensive plans, it is foreseeable that the conditions listed below could occur.

- The Canonsburg Lake dam will not be removed by the Commonwealth of Pennsylvania, thereby maintaining the impoundment of Little Chartiers Creek.
- The rate of sediment loading from the watershed to the lake may decline, but sediment related to various land uses and attributed to stream bank erosion will continue to impact the lake, as will sediment that is already in Little Chartiers Creek and in the process of being periodically transported toward the lake when storm events occur that produce stream flows that are capable of transporting sediment. Submerged aquatic habitat will continue to become shallower, reducing the available habitat for fish and other aquatic species.
- Fish population numbers and diversity will decline as available submerged aquatic habitat is reduced.
- Areas currently identified as unvegetated mudflats will eventually evolve into monotypic cattail/ reed canarygrass-dominated wetlands exhibiting poor habitat quality.
- Areas currently identified as wetland within the lake will eventually become part of the riparian zone as sediment continues to accumulate.
- The nature of water quality impairments within Little Chartiers Creek and Canonsburg Lake may change and may also be reduced in magnitude. It is reasonable to expect that nutrient loading to Canonsburg Lake would be reduced due to changing land uses and stormwater best management practices. Other potential pollutants associated with urbanization of the watershed may ultimately increase within the watershed and the lake, although a comprehensive stormwater management program may reduce this impact.

Based on this summary of Future Without Project Conditions, it is foreseeable that the amount of sediment transported to and deposited within Canonsburg Lake would not increase and could potentially decrease over time; however, **the amount of sediment currently deposited within the lake and the resulting ecological impacts would not be mitigated, aquatic habitat conditions will decline as continued sediment deposition impacts the lake, and the value of the habitat over time will diminish as a consequence of the transition of existing open water areas to mudflats.**

4.0 ENVIRONMENTAL ASSESSMENT

4.1 General Discussion

The purpose of the Environmental Assessment is to identify the potential environmental impacts of each of the four Best Buy project alternatives, as well as the No Action Alternative, discussed in Section 3.0 and Appendix G. As represented in Table 13, the determined Best Buy alternatives are numbers 4, 7, 13 and 36. This section of the report provides an analysis of the potential impacts to the existing Canonsburg Lake project area and the surrounding community.

4.2 Environmental Parameters Unlikely to be Affected

Some facets of the Canonsburg Lake environment would not likely be impacted by the project, regardless of which alternative is implemented. The following sections discuss these specific environmental and socioeconomic parameters relative to the various project alternatives discussed in Section 3.0 and Appendix G.

4.2.1 Air Quality

None of the project alternatives are anticipated to have a direct or significant impact to the air quality within the project area. The project will not result in the generation of any airborne pollutants that would affect air quality.

4.2.2 Noise

The project alternatives are anticipated to have a negligible effect on noise levels within the project area. The use of hydraulic dredge equipment proposed under the various Action Alternatives may result in some temporary increase of noise levels; however, this would only be experienced in the immediate vicinity of the lake while the equipment is working.

4.2.3 Prime Farmland

As discussed within Section 2.6, approximately 28.9 acres of Prime Farmland soils are mapped within the study area. An additional 1.5 acres of the GdB Prime Farmland unit are indicated for a portion of a proposed sediment dewatering and storage area (described in Section 3.0 Plan Formulation), which extends outside of the study area boundaries. In addition, approximately 15.9 acres of Farmland of Statewide Importance are mapped within the project study area. The locations of these soil units can be observed on Figure 5.

Under the various Action Alternatives, approximately 2.1 acres of Prime Farmland will be directly converted for the establishment of a sediment dewatering and storage area (indicated within the green outline on Figure 2). Approximately 15.0 acres of mapped Prime Farmland and 6.3 acres of mapped Farmland of Statewide Importance would be indirectly converted, as they would be part of the ecosystem restoration area and thus unavailable for farming.

The project area is confined to the Canonsburg Lake proper and immediately adjacent riparian areas, and very little disturbance to upland soils is anticipated. The surrounding land uses include deciduous forest, residential and commercial properties. No agricultural properties are located adjacent to the site. Therefore, the effect of the Action Alternatives on actual farmland is anticipated to be negligible; however, as Prime Farmland soils and Farmland of Statewide Importance are indicated for the site, formal coordination with the local NRCS office was conducted with the District Conservationist at the NRCS Meadowlands Service Center to comply with the Farmland Protection and Policy Act. This coordination included the submittal of a Farmland Conversion Impact Rating (FCIR) form (Form AD-1006), with Parts I and III of the form initially completed as directed by the instructions for completing the form. The NRCS responded on July 29, 2008 and indicated that less than 0.0001% of farmland in the County or local government unit would be converted for the project. This confirms that the impact on farmland is extremely negligible. A copy of the NRCS correspondence is included as Attachment 4.

No effect to Prime Farmlands would occur under the No Action Alternative.

4.2.4 Population and Employment

None of the project alternatives are anticipated to affect population, and no significant impacts to employment would be realized. The project would not result in the relocation or loss of any residents or businesses. Short term employment opportunities may be provided during the construction and planting phases of the Action Alternatives; however, the completed project will not result in any permanent jobs within the local area.

4.2.5 Environmental Justice

This project is subject to Executive Order 12898, in which disproportionately high and adverse human health or environmental effects on minority and low-income populations must be identified, addressed and avoided. Census data from 2000, summarized in Section 2.8, was used to identify minority and low-income populations within the project area. Based upon the fact that the project is focused on the lake proper and immediately adjacent forested areas, disproportionately high and adverse human health or environmental effects on minority and low-income populations are not anticipated.

4.2.6 Cultural Resources

The literature review provided in Appendix J indicates that the Canonsburg Lake project area does not contain any known National Register properties and that there are three previously recorded sites adjacent to the project area. The archaeological testing of the proposed sediment dewatering and storage area (Appendix J) yielded two previously unrecorded archaeological sites, 36Wh1436 and 36Wh1437. Pending concurrence of the PASHPO, it is the opinion of the Corps Archaeologist that neither of these sites are potentially eligible for the National Register of Historic Places. Therefore, there are no potentially significant historic properties that will be impacted by any of the proposed alternatives herein described to meet the ecosystem restoration goals of this project.

4.2.7 Threatened and Endangered Species

As discussed in Section 2.10, no Federal or State-listed Threatened or Endangered Species are known to occur within Washington County; therefore, no impacts to Threatened or Endangered species are expected as a result of this project.

The PNDI Environmental Review performed for the study area indicated one possible impact, which falls under the jurisdiction of the Pennsylvania Department of Conservation and Natural Resources. The Environmental Review Receipt (Attachment 1) does not indicate the specific location or nature of this potential impact. The Environmental Review Receipt recommended further coordination with the Pennsylvania Department of Conservation and Natural Resources regarding this potential impact. The recommended coordination information has been submitted to the Ecological Services Section of the Pennsylvania Department of Conservation and Natural Resources. The PA DCNR recommended that a survey should be conducted for *Trillium nivale*, a State-listed rare species, and *Camassia scilloides*, a State-listed threatened species (proposed endangered). Both species grow within moist woods. The correspondence indicates that if this land type does not exist on the site, a survey will not be necessary. Some wooded wetland areas are present within portions of the PFBC property surrounding the lake; however, these areas have been prioritized for avoidance for the lake restoration project. While it is unlikely that any of the project alternatives would result in impacts to these State-listed species, the appropriate follow-up coordination will be conducted as required within the PA DCNR correspondence, included as Attachment 3. No potential impacts to resources under the jurisdiction of the USFWS, PGC or the PFBC were identified by the PNDI Environmental Review.

The Canonsburg Lake Slope BDA is located between U.S. 19 and the lake, just south of Donaldsons Crossroads. The *Washington County Natural Heritage Inventory* (Wagner, 1994) advises that this area be protected from disturbance or clearing. As this BDA is located along the wooded lake slope, it would not be impacted by the project alternatives.

4.3 Impacts of the Formulated Alternatives

The primary goal of this project is to improve aquatic habitat structure and function within Canonsburg Lake. All restoration measures have been designed to improve the quality and long term health of these habitats, which have the potential to support diverse and important species. Other benefits of the ecosystem restoration project include recreation and environmental education opportunities.

4.4 Alternative 1 (No Action)

4.4.1 Aquatic Environment

The Habitat Assessment portion of Appendix G contains a description of the current conditions of the aquatic environment of Canonsburg Lake. Essentially, the lake is an impoundment of Little Chartiers Creek that has been steadily filling in with sediment since it was created in the 1940s. This sedimentation has been reducing the overall open water area, volume and average depth of the lake and will continue to do so under the No Action Alternative.

A shallow mudflat area containing debris and garbage, typical of the upper portion of Canonsburg Lake.

As sediment accumulates within Canonsburg Lake, deep water areas will disappear, leaving the fish community no refuge for overwintering or to escape the summer heat. Loss of deep areas will especially impact adult brown bullhead and channel catfish, both of which prefer deep water areas as their primary habitat. Shallows that currently serve as potential spawning habitat will continue to fill in with sediment, eventually becoming emerging mudflats that do not support fish reproduction. The lake will become increasingly unable to support a self-sustaining fish population. Impairments to the fish community within the lake will have a secondary negative effect on piscivorous birds and mammals within the study area.

Fish species that are more tolerant of highly turbid, eutrophic conditions, such as common carp and gizzard shad, will have a distinct survival advantage over more sensitive species, such as crappie and pumpkinseed. Gizzard shad and the non-native carp are nuisance species in Canonsburg Lake that can adapt to these conditions better and deprive many other fish species of resources, especially under environmental conditions that are stressful to the other fish. This competitive pressure will further decrease fish species diversity within Canonsburg Lake.

4.4.2 Wetland Habitat

A cattail monoculture in Canonsburg Lake

The overall acreage of jurisdictional wetland habitat within Canonsburg Lake is likely to increase under the No Action alternative, as current mudflat areas surface and become vegetated. It is likely, however, that these newly surfaced areas will be quickly colonized by invasive cattails and reed canarygrass, which is already evident in several areas within the lake. Development of these monotypic stands will prevent the development of more vegetatively diverse wetland habitat (FNA, 1993+). This, in turn, will severely limit the type and diversity of fauna that can use the wetlands for foraging and nesting. As sedimentation within the lake continues over time, these wetlands will further emerge into riparian floodplain habitat.

4.4.3 Terrestrial Environment

While the No Action alternative is not anticipated to have a direct effect on the terrestrial environment adjacent to the lake, it may negatively impact foraging opportunities for some terrestrial wildlife species. As the lake continues to fill in with sediment and the amount of aquatic habitat decreases, it would logically follow that the amount of fish and other lacustrine species would also decrease. This could have some negative impact on terrestrial species, such as raccoons, which feed on aquatic species.

4.4.4 Hazardous, Toxic, and Radiological Waste

The No Action alternative would have no impact regarding hazardous, toxic or radiological waste, as no work or disturbance to aquatic or terrestrial areas would occur.

4.4.5 Aesthetics

Due to decades of sediment accumulation, portions of Canonsburg Lake are already aesthetically unappealing to local residents. These unvegetated mudflats often collect debris and garbage that enters the lake, as shown in the photos on this page. This condition will not improve and is likely to become worse under the No Action alternative, as additional sediment continues to enter the system.

4.4.6 Recreation

The No-Action alternative would result in the continued decline of the availability and quality of fish habitat within Canonsburg Lake, which is currently a sport-fishing destination. This decline in habitat would eventually result in a decline in the diversity and amount of fish that the lake can support, which would decrease angling opportunities and make Canonsburg Lake a less attractive destination for fishermen and other outdoor enthusiasts. In addition, the No Action Alternative would leave decades of accumulated sediment within the lake. The sediments have severely limited the portion of the lake that is accessible to boaters, as many areas are too shallow to support even small canoes. Residents abutting the lake who could previously launch boats from their own property can do so no longer due to the build-up of sediment. Sediment-laden areas may be dangerous to people who enter the lake while fishing or boating. The deep mud is difficult to negotiate, and those who enter it may easily become 'stuck'.

Area of sediment accumulation within Canonsburg Lake, adjacent to a South Lakeside Drive residence

4.4.7 Traffic and Transportation

No impacts to traffic or transportation would occur under the No Action Alternative.

4.5 Alternative 4

Alternative 4 would result in the creation of shallow submerged aquatic habitat and wetland habitat within Canonsburg Lake. As depicted on Figure 8 on the following page, sediment would be dredged to create shallow submerged aquatic habitat in Area A. The dredged sediment would be applied within the mudflat Areas B and C and planted with native hydrophytic vegetation to establish the areas as emergent or scrub-shrub wetlands.

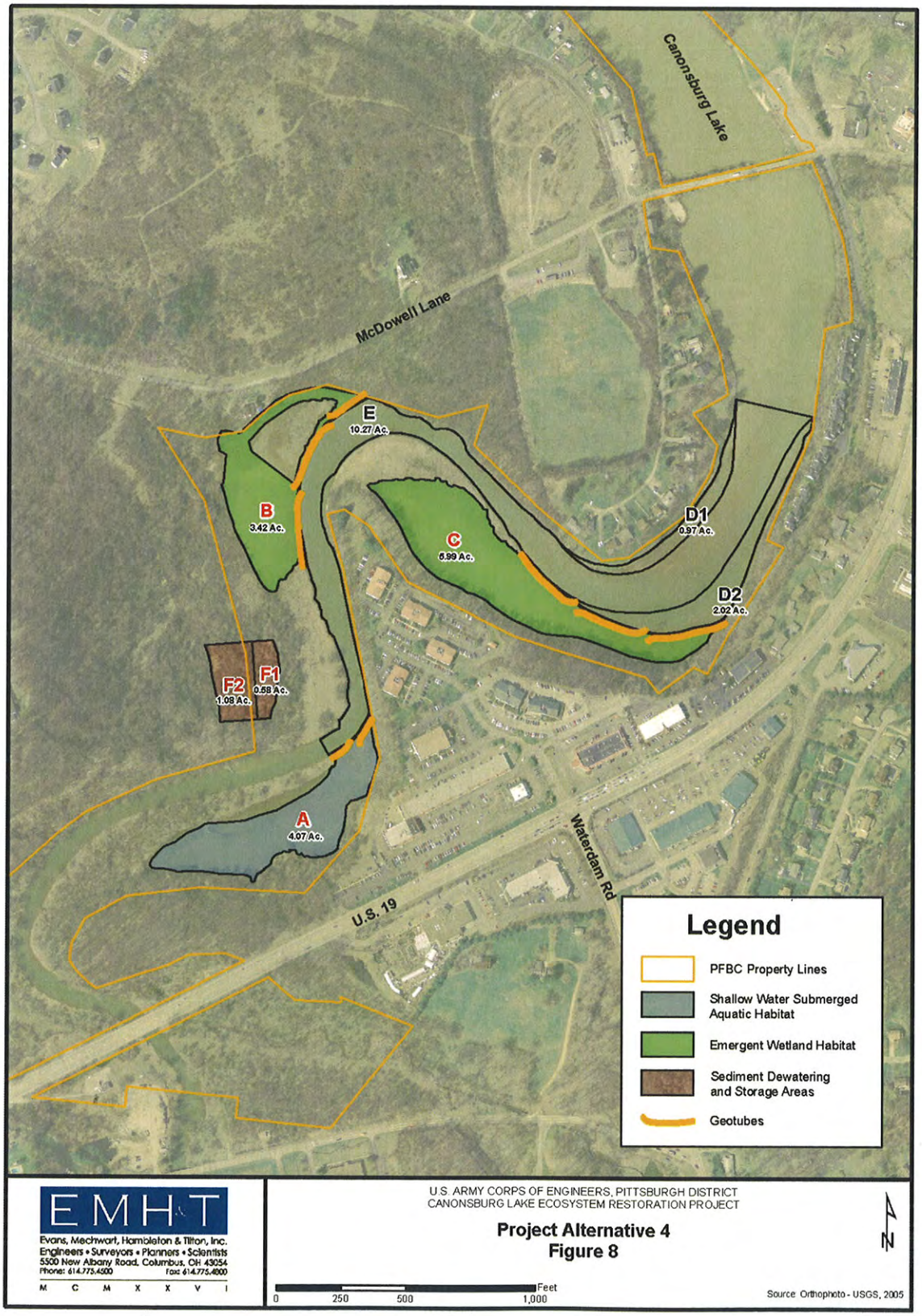
4.5.1 Aquatic Environment

Under Alternative 4, approximately 4.07 acres of shallow submerged aquatic habitat would be created through dredging of an area currently characterized as mudflat (Area A). Following dredging of the area, a number of fish cover structures (detailed in Appendix G, Attachment G-1) would be installed. Development of shallow littoral areas with sufficient cover will provide habitat necessary for fish spawning and juvenile development. The cover structures can also provide enhanced habitat for aquatic macroinvertebrates and turtles. Shallows would also provide foraging opportunities for many piscivorous bird species, such as the great blue heron and belted kingfisher (*Ceryle alcyon*).

4.5.2 Wetland Habitat

As described in Appendix G, dredge material from Area A would be used to convert approximately 9.41 acres of low-quality mudflats (Areas B and C) into higher-quality wetland habitat. Native wetland herbs and/ or shrubs would be installed within these areas to help prevent colonization by less desirable invasive species and create a diverse habitat. This diverse wetland habitat would provide shelter, foraging and nesting opportunities for wetland-dependent species. Development of high-quality wetland habitat would also have a positive effect on the water quality of Canonsburg Lake, by helping to stabilize sediment present within the lake and by filtering various contaminants contributed by non-point runoff from adjacent developed areas.

A very small amount of impact to existing scrub-shrub/ emergent wetland would be required under Alternative 4, in order to establish vehicular access to areas F1 and F2 (Figure 9). This impact is estimated to be approximately 0.01 acre, which is negligible compared to the amount of wetland habitat which will be generated for the project.


Canonsburg Lake
McDowell Lane
E
10.27 Ac.
B
3.42 Ac.
C
6.99 Ac.
D1
0.97 Ac.
D2
2.02 Ac.
F2
1.08 Ac.
F1
0.58 Ac.
A
4.07 Ac.
U.S. 19
Waterdam Rd
Legend
PFBC Property Lines
Shallow Water Submerged Aquatic Habitat
Emergent Wetland Habitat
Sediment Dewatering and Storage Areas
Geotubes
EMHT
Evans, Mechwart, Hambleton & Tilton, Inc.
Engineers • Surveyors • Planners • Scientists
5500 New Albany Road, Columbus, OH 43054
Phone: 614.775.4500 Fax: 614.775.4800
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U.S. ARMY CORPS OF ENGINEERS, PITTSBURGH DISTRICT
CANONSBURG LAKE ECOSYSTEM RESTORATION PROJECT
Project Alternative 4
Figure 8
N
Feet
0 250 500 1,000
Source: Orthophoto - USGS, 2005

4.5.3 Terrestrial Environment

The improvements proposed under Alternative 4 would result in some impact to the terrestrial (upland) environment, specifically the forested area located to the west of Canonsburg Lake. As shown on Figure 9 on the following page, approximately 6 acres of this forested area would have to be cleared to allow for vehicular access to the sediment dewatering and storage areas (Areas F1 and F2), as well as for the development of the storage areas themselves. A portion of this area was previously cleared for the installation of a sewer line.

Terrestrial habitat that would be impacted for development of sediment handling areas.

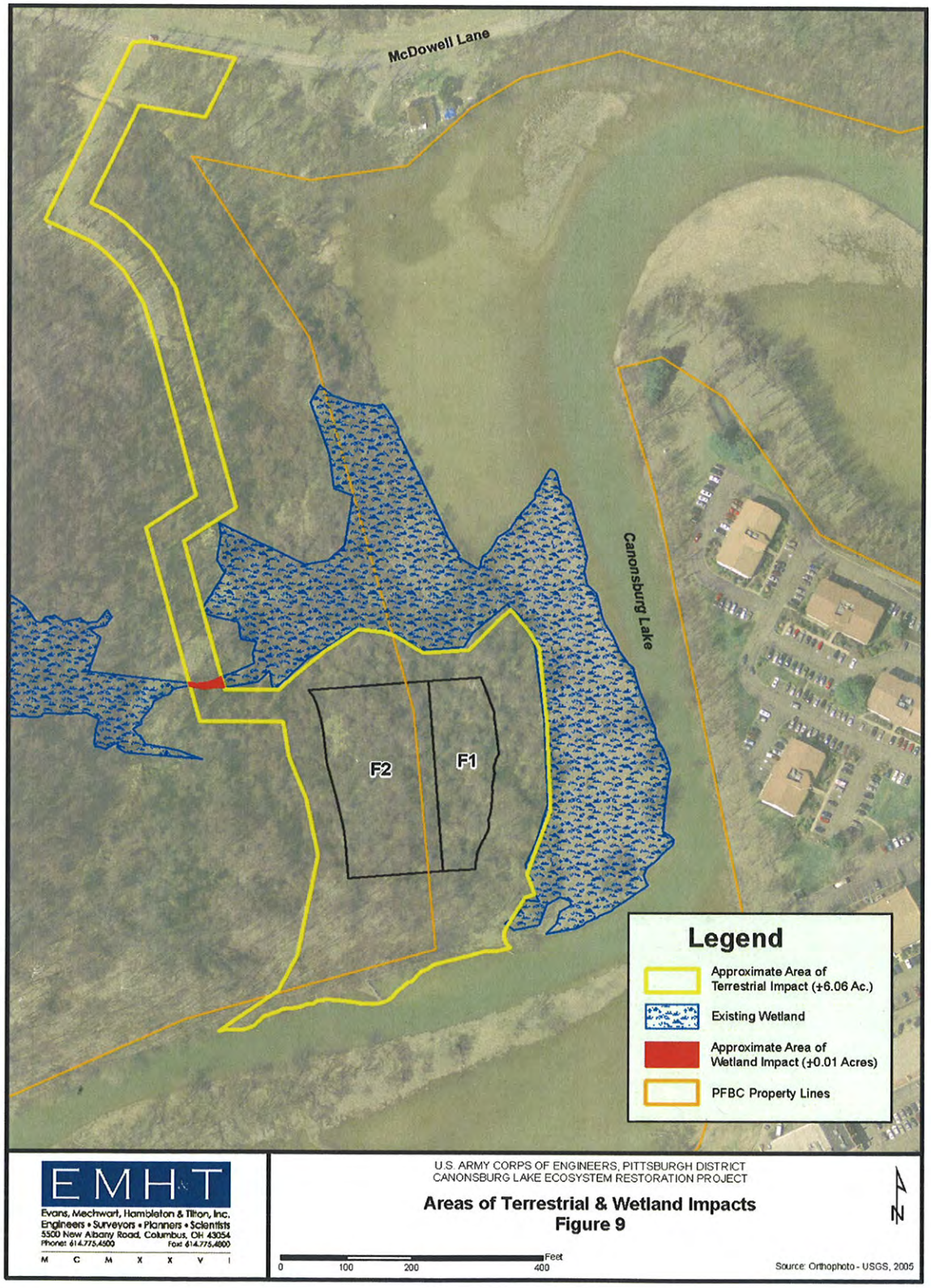
Alternative 4 will have a positive impact upon the adjacent terrestrial habitat by increasing opportunities for some terrestrial wildlife species that forage within the improved aquatic habitats.

4.5.4 Hazardous, Toxic, and Radiological Waste

Alternative 4 would involve the hydraulic dredging of lake sediments and the subsequent hydraulic placement of dredge material within geotubes and within geotube constrained areas. In addition, dredging of shallow-water submerged aquatic habitat is assumed as part of the O&M for the project. Only limited information is available with respect to the physical and chemical properties of the lake sediments. Dredging activities could result in sediment exposure to humans and the environment. Cursory assessments of human health risks and ecological risks, in general conformance with guidance provided in EP 200-1-15, are discussed in the following sections. Appendix I contains the complete HTRW study for the project area.

4.5.4.1 Cursory Human Health Risk Assessment

The population group with the highest reasonable exposure (i.e. the receptor group) for the proposed activities would be the dredge operators and the workers performing coupling activities on the geotubes. The most likely exposure pathway would be adsorption through direct dermal contact. Maximum exposure duration would be 8 hours per day for the duration of the project. The limited data available related to the chemical constituents contained in the lake sediments do not suggest such exposure would result in any carcinogenic or non-carcinogenic effects on the receptor group. This cursory assessment has a relatively high attendant uncertainty due to the very limited chemical data base available for the site.


McDowell Lane
Canonsburg Lake
F2
F1
Legend
Approximate Area of Terrestrial Impact (±6.06 Ac.)
Existing Wetland
Approximate Area of Wetland Impact (±0.01 Acres)
PFBC Property Lines
EMHT
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Areas of Terrestrial & Wetland Impacts
Figure 9
N
0 100 200 400 Feet
Source: Orthophoto - USGS, 2005

4.5.4.2 Cursory Ecological Risk Assessment

The potential for adverse ecological effects ascribable to site contamination and the proposed project activities is largely speculative due to the limited extent of available chemical data and the lack of specific information relative to the existing aquatic and benthic communities within Canonsburg Lake. Given the fact that the lake has historically been subjected to excessive phosphorus loading, it can reasonably be presumed that the lake sediments may contain significant concentrations of phosphorus and other nutrients. It is therefore likely that dredging activities may result in the release of phosphorus and other nutrients either directly during the dredging process or as return flows from sediment dewatering. Such releases could result in excessive algae growth and the chemical and/or biological reduction in dissolved oxygen within affected waters. The impacts upon the ecosystem would be dependent upon the extent of such releases as well as upon the tolerance of the impacted species within the aquatic and benthic communities and the effectiveness of any mitigating measures that might be employed during project activities. This cursory assessment has a relatively high attendant uncertainty due to the very limited chemical database available for the site and, with the exception of a fish survey conducted in 2000 by the PFBC, the lack of specific information relative to the existing aquatic and benthic communities.

4.5.4.3 HTRW Recommendations

Additional information relative to the chemical characterization of water and the physical and chemical characterization of the sediments within Canonsburg Lake is necessary to assess potential environmental impacts of dredging. These data needs are discussed in detail in Appendix I.

The results of sediment and water analyses from such additional investigations can be utilized to determine the potential for contaminant release from sediments during dredging operations and the ability of existing lake water to assimilate potential releases. Best management practices (BMPs) can then be selected and implemented to appropriately minimize the severity of effects both in the lake and downstream.

4.5.5 Aesthetics

Alternative 4 is anticipated to have a positive impact on the aesthetic quality of Canonsburg Lake. Generally speaking, the current mudflat areas are the least aesthetically pleasing features within the lake, as they are muddy, unvegetated, and often collect debris and trash. Alternative 4 proposes to convert several acres of mudflat into shallow submerged aquatic habitat and emergent/ scrub-shrub wetland. These habitats are generally more aesthetically pleasing and 'natural-looking' compared to mudflats caused by non-point source sediment pollution. Also, these diverse habitats are likely to increase the amount and diversity of native insects, amphibians, fish and other wildlife attracted to the lake, further enhancing the overall natural aesthetic.

4.5.6 Recreation

By creating additional fish spawning habitat, Alternative 4 would increase the angling opportunities within Canonsburg Lake for local fishermen. In addition, the enhancements to fish spawning areas and creation of diverse wetland would likely

attract resident and migratory aquatic bird species to the area, which would enhance bird-watching opportunities. The proposed improvements could also result in educational opportunities for local schools by making Canonsburg Lake a field-trip destination, to study the improved shallows and wetland areas.

4.5.7 Traffic and Transportation

The alternatives presented in this Feasibility Study involve ecosystem restoration work, which would be restricted to Canonsburg Lake proper and the adjacent undeveloped lands owned by the PFBC or proposed for temporary or permanent access easements. Plate G-1 within Appendix G illustrates the various access points, work easements, and staging areas that are applicable to all of the Action Alternatives. Under the Action Alternatives, hydraulic dredge equipment would enter the lake at the northwest corner of the upper portion off McDowell Lane. An access point for construction equipment and materials would be established further west along McDowell Road, which would allow equipment to access the upland sediment dewatering and storage areas (F1 and F2). The removal of excess dredge material is to an off-site location at the Arden Landfill in Washington, Pennsylvania, as discussed in Appendix G. It is likely that the trucks would take either U.S. Route 19 or I-79 from the project site to the landfill. The exact route that the trucks would take to the landfill would be determined through the consideration of road weight limits, seasonal restrictions and other factors.

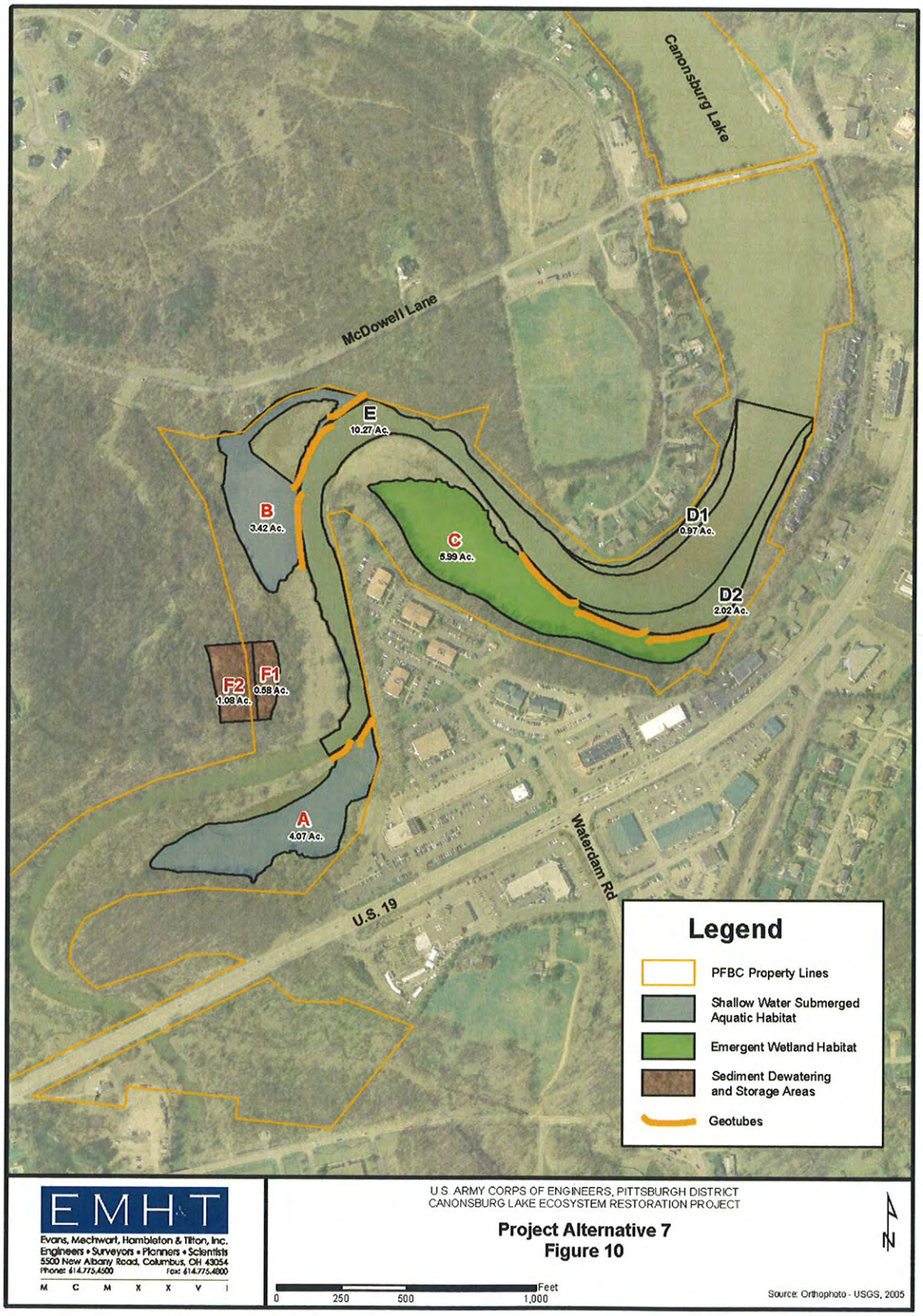
During the initial construction of the project, Alternative 4 would have no impact to traffic or transportation, as no offsite disposal of dredged sediment would be required. However, maintenance dredging and removal of approximately 16,416 cubic yards of sediment in Year 25 would temporarily increase traffic volume along the route from the sediment storage area to the Arden Landfill. Assuming that the trucks used to haul sediment from the site will have a load capacity of 6 cubic yards, approximately 2,736 truckloads of sediment would be transported along this route. The number of loads could be reduced if trucks with greater load capacities are used. Further details regarding the hauling of dredged sediment offsite are provided in Appendix H. No temporary or permanent diversion or obstruction to local traffic patterns would occur as a result of this Alternative 4.

4.6 Alternative 7

Alternative 7 would result in the creation of shallow submerged aquatic habitat and wetland habitat within Canonsburg Lake. As depicted on Figure 10, sediment would be dredged to create shallow submerged aquatic habitat in Areas A and B. The dredged sediment would be applied within the mudflat Area C and planted with native species to establish the area as emergent or scrub-shrub wetland.

4.6.1 Aquatic Environment

Under Alternative 7, approximately 7.49 acres of shallow submerged aquatic habitat would be created through dredging of two areas currently characterized as mudflat (Areas A and B). As proposed under Alternative 4, these areas would be further enhanced through the installation of fish habitat structures, to promote spawning and development of juveniles and provide habitat for other aquatic species.


Canonsburg Lake
McDowell Lane
E
10.27 Ac.
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D2
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F2
1.08 Ac.
F1
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A
4.07 Ac.
Waterdam Rd
U.S. 19
Legend
PFBC Property Lines
Shallow Water Submerged Aquatic Habitat
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Project Alternative 7
Figure 10
N
Feet
0 250 500 1,000
Source: Orthophoto - USGS, 2005

4.6.2 Wetland Habitat

Dredge material from Areas A and B would be used to convert approximately 5.99 acres of low-quality mudflat into higher-quality wetland habitat (Area C). Native wetland herbs and/ or shrubs would be installed within these areas to help prevent colonization by less desirable, invasive species and create a diverse habitat. As described under Alternative 4, conversion of an unvegetated mudflat into a diverse wetland habitat would increase the potential to support a diverse assemblage of wetland-obligate wildlife and would provide greater water quality benefit for the Little Chartiers Creek and Chartiers Creek watersheds. Approximately 0.01 acre of wetland impact would be necessary to establish vehicular access to Areas F1 and F2 as previously described.

4.6.3 Terrestrial Environment

Positive and negative impacts to the terrestrial environment required under Alternative 7 would be identical to those proposed under Alternative 4.

4.6.4 Hazardous, Toxic and Radiological Waste

The potential human health and ecological risks with regard to hazardous, toxic and radiological waste associated with Alternative 7 would be identical to those discussed within Section 4.5.4.

4.6.5 Aesthetics

Alternative 7 would have a similar positive effect on the aesthetics of Canonsburg Lake as described for Alternative 4 (Section 4.5.5).

4.6.6 Recreation

Like Alternative 4, Alternative 7 would enhance the recreational potential of Canonsburg Lake by increasing angling opportunities by improving fish spawning habitat. Improved bird-watching and educational possibilities could also be realized with the addition of diverse wetland habitat.

4.6.7 Traffic and Transportation

Proposed site access points and the route to be used to transport dredged material to the Arden Road Landfill are discussed under Section 4.5.7. During the initial construction of Alternative 7, approximately 3,186 cubic yards of sediment would be dredged from the lake and disposed of at the Arden Road Landfill. Transportation of the dredged sediment would result in a temporary increase to traffic along the route from the sediment storage area to the landfill. Assuming that the trucks used to haul sediment from the site will have a load capacity of 6 cubic yards, approximately 531 truckloads of sediment would be transported along this route. Maintenance dredging and removal of approximately 30,210 cubic yards of sediment in Year 25 would require approximately 5,035 truckloads of sediment to be transported along this route. No temporary or permanent diversion or obstruction to local traffic patterns would occur as a result of this Alternative 7.

4.7 Alternative 13

Alternative 13 would result in the creation of shallow submerged aquatic habitat, wetland habitat and riparian habitat within Canonsburg Lake. As depicted on Figure 11 on the following page, sediment would be dredged to create shallow submerged aquatic habitat in Areas A, B and C. Some of the dredged sediment would be applied within open water Area D2 and planted to establish the area as an emergent or scrub-shrub wetland. Dredged sediment would also be applied to the mud flat Area D1 and planted with native trees and shrubs characteristic of local riparian areas to develop riparian habitat in this area.

4.7.1 Aquatic Environment

Impacts to the aquatic environment anticipated under Alternative 13 are similar to those described for Alternatives 4 and **7**. Under Alternative 13, approximately 13.48 acres of shallow submerged aquatic habitat would be created through dredging of areas currently characterized as mudflats (Areas A, B and C) and installation of fish habitat structures. These improvements would increase habitat for fish spawning and juvenile development, aquatic macroinvertebrates and turtles, as well as foraging opportunities for piscivorous species.

4.7.2 Wetland Habitat

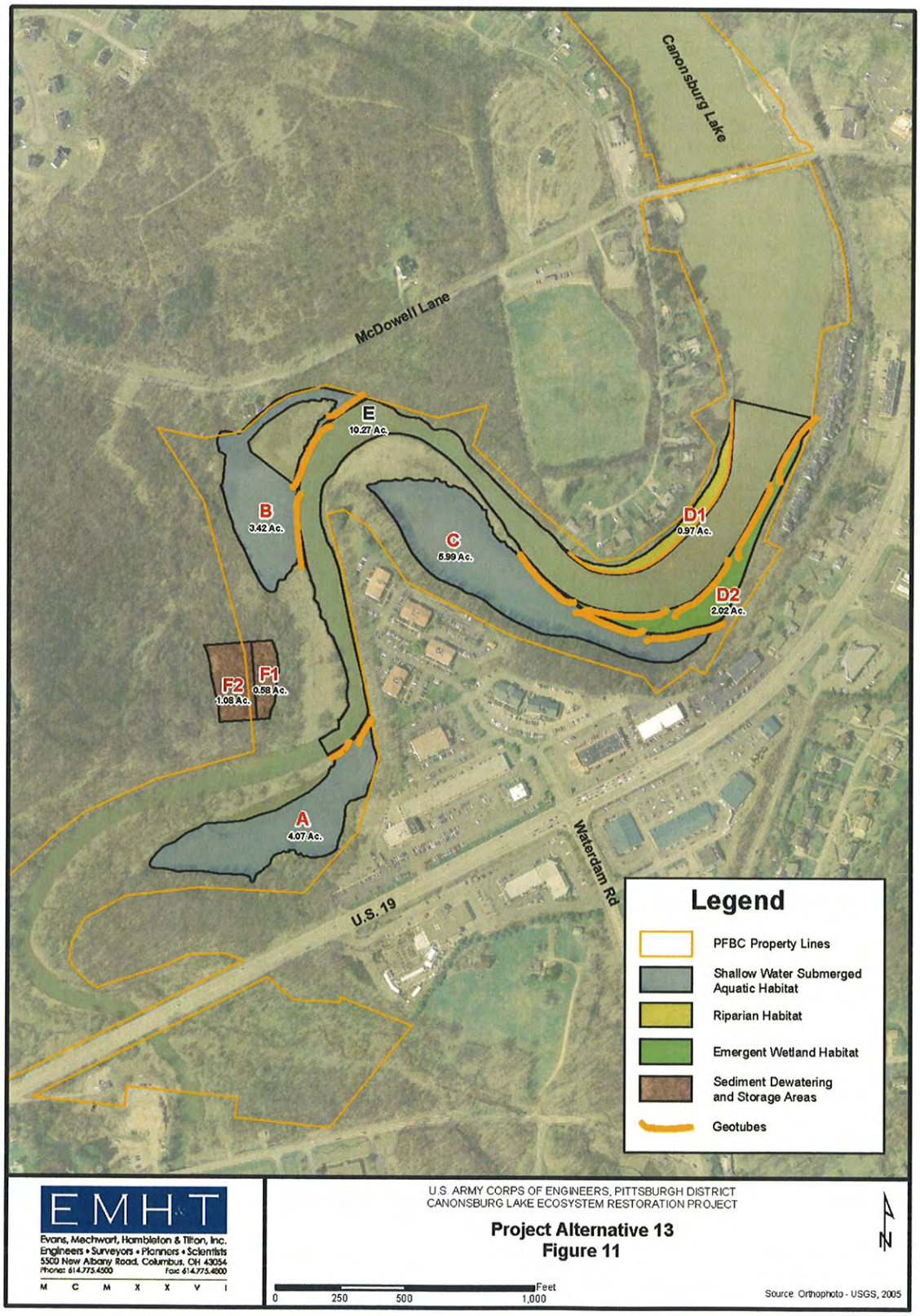
Spoil from Areas A, B and C would be placed within an open water area (Area D2) to elevate this area so as to make it suitable for native wetland plantings. Approximately 2.02 acres of emergent or scrub-shrub wetland would be achieved in this manner, which would provide wildlife and water quality benefits for the lake and watershed, as described under the previous alternatives. Approximately 0.01 acre of wetland impact would be necessary to establish vehicular access to Areas F1 and F2.

4.7.3 Terrestrial Environment

As with the previously described alternatives, Alternative 13 would require some impact (approximately 6 acres) to the adjacent upland forest to the west of Canonsburg Lake for the establishment of sediment handling areas. Alternative 13 would have the additional, positive impact of developing approximately 0.97 acre of riparian habitat through the application of sediment spoils to area D1. This would result in a 30 to 50 foot-wide buffer between the lake and adjacent residential properties in this area. The riparian zone would be planted with native trees and shrubs to promote the eventual development of a mature wooded buffer approximately 1,000 feet in length along the lake floodplain.

Besides providing habitat for a number of terrestrial species, the riparian zone buffer would also positively impact Canonsburg Lake itself. Some of the benefits that may be realized are:

- Filtration of overland flow, removing some sediment and nutrients from non-point sources before they enter the lake
- Contribution of leaf litter from riparian plantings, the basis of the aquatic food web
- Protection from bank erosion


Canonsburg Lake
McDowell Lane
E
10.27 Ac.
B
3.42 Ac.
C
5.99 Ac.
D1
0.97 Ac.
D2
2.02 Ac.
F2
1.08 Ac.
F1
0.58 Ac.
A
4.07 Ac.
U.S. 19
Waterdam Rd
Legend
PFBC Property Lines
Shallow Water Submerged Aquatic Habitat
Riparian Habitat
Emergent Wetland Habitat
Sediment Dewatering and Storage Areas
Geotubes
EMHT
Evans, Mechwart, Hambleton & Tilton, Inc.
Engineers • Surveyors • Planners • Scientists
5500 New Albany Road, Columbus, OH 43054
Phone: 614.775.4500 Fax: 614.775.4800
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U.S. ARMY CORPS OF ENGINEERS, PITTSBURGH DISTRICT
CANONSBURG LAKE ECOSYSTEM RESTORATION PROJECT
Project Alternative 13
Figure 11
N
0 250 500 1,000 Feet
Source: Orthophoto - USGS, 2005

4.7.4 Hazardous, Toxic, and Radiological Waste

The potential human health and ecological risks with regard to hazardous, toxic and radiological waste associated with Alternative 13 would be identical to those discussed within Section 4.5.4.

4.7.5 Aesthetics

Alternative 13 would have a similar positive effect on the aesthetics of Canonsburg Lake as described for Alternative 4 (Section 4.5.6), with the additional benefit of riparian plantings within Area D1.

4.7.6 Recreation

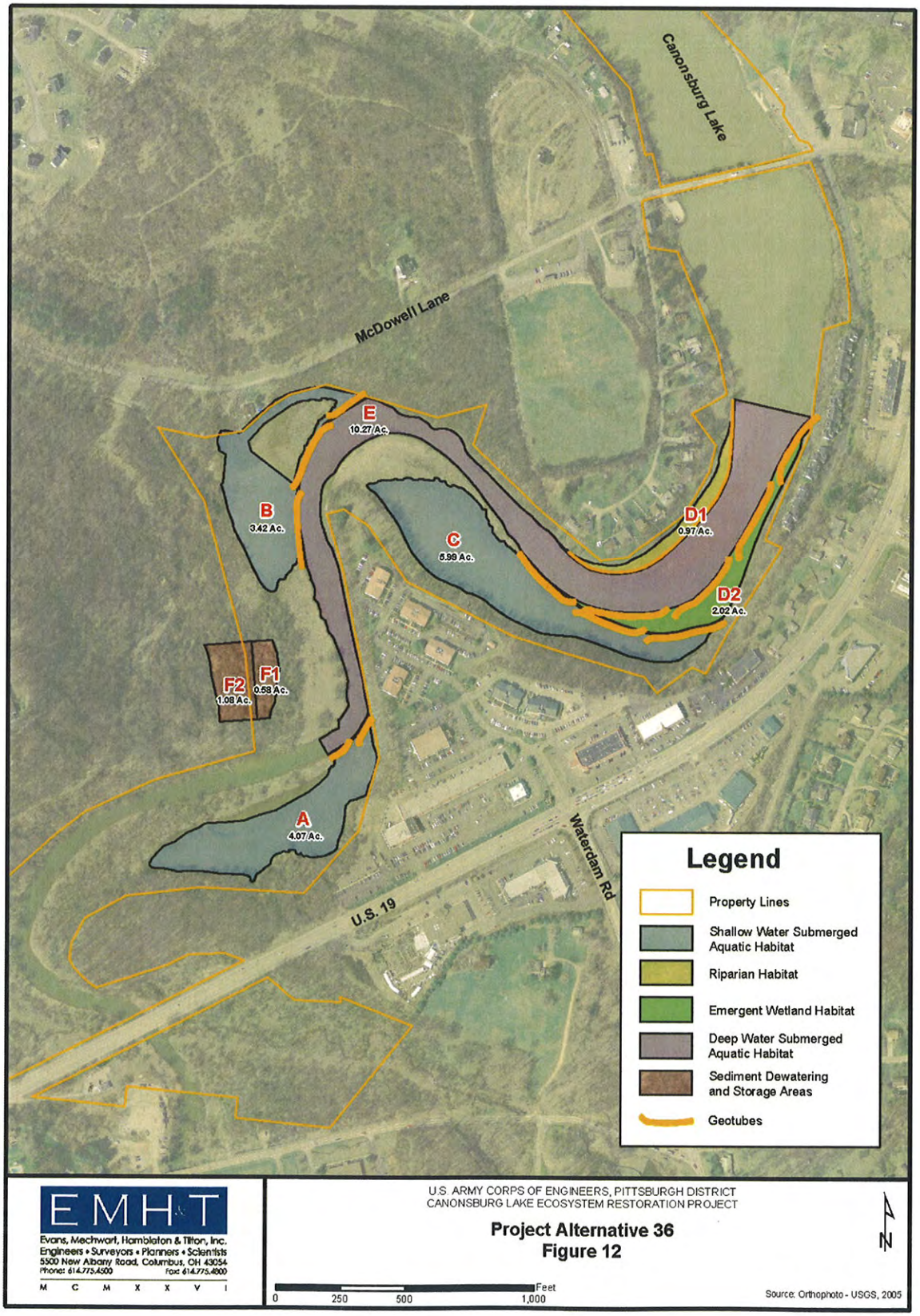
As with the previous alternatives, Alternative 13 would enhance the recreational potential of Canonsburg Lake by increasing angling opportunities via improved fish spawning habitat. The addition of a riparian buffer area could provide another access point for anglers as well. Improved bird-watching and educational possibilities could also be realized with the addition of diverse wetland and riparian habitats.

4.7.7 Traffic and Transportation

Proposed site access points and the route to be used to transport dredged material to the Arden Road Landfill are discussed under Section 4.5.7. During the initial construction of Alternative 13, approximately 14,096 cubic yards of sediment would be dredged from the lake and disposed of at the Arden Road Landfill. Transportation of the dredged sediment would result in a temporary increase to traffic along the route from the sediment storage area to the landfill. Assuming that the trucks used to haul sediment from the site will have a load capacity of 6 cubic yards, approximately 2,350 truckloads of sediment would be transported along this route. Maintenance dredging and removal of approximately 54,369 cubic yards of sediment in Year 25 would require approximately 9,062 truckloads of sediment to be transported along this route. The number of loads could be reduced if trucks with greater load capacities are used. Further details regarding the hauling of dredged sediment offsite are provided in Appendix H. No temporary or permanent diversion or obstruction to local traffic patterns would occur as a result of this Alternative 13.

4.8 Alternative 36

Alternative 36 would result in the creation of shallow submerged aquatic habitat, wetland habitat, riparian habitat and deep water habitat within Canonsburg Lake. Alternative 36 is the only Best Buy alternative that includes a deep water component. As depicted on Figure 12, sediment would be dredged to create shallow submerged aquatic habitat in Areas A, B and C. The open water Area E would be dredged to establish a deep water 'channel' in the upper portion of Canonsburg Lake. Some of the dredged sediment would be applied within open water Area D2 and planted with native species to establish the area as an emergent or scrub-shrub wetland. Dredged sediment would also be applied to the mudflat Area D1 and planted with appropriate native trees and shrubs to develop riparian habitat in this area.


Canonsburg Lake
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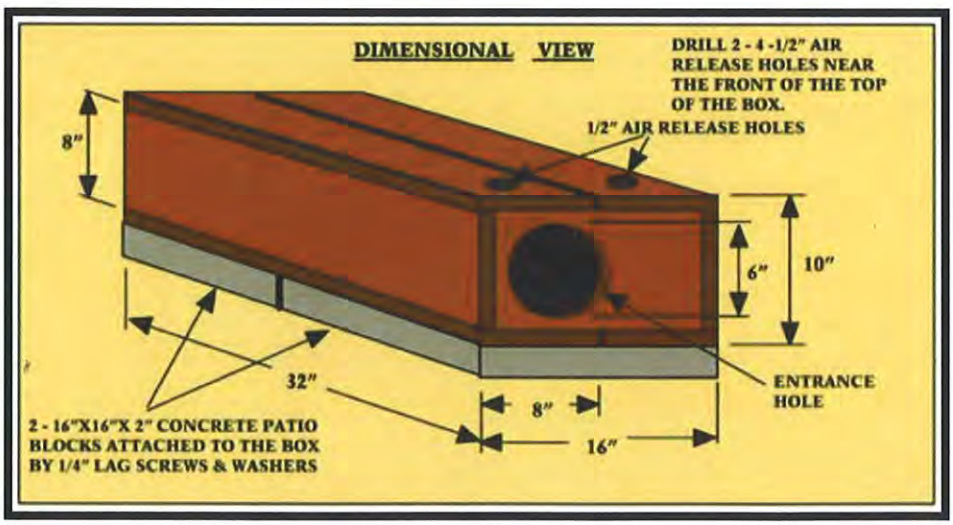
M C M X X V I
U.S. ARMY CORPS OF ENGINEERS, PITTSBURGH DISTRICT
CANONSBURG LAKE ECOSYSTEM RESTORATION PROJECT
Project Alternative 36
Figure 12
N
0 250 500 1,000 Feet
Source: Orthophoto - USGS, 2005

4.8.1 Aquatic Environment

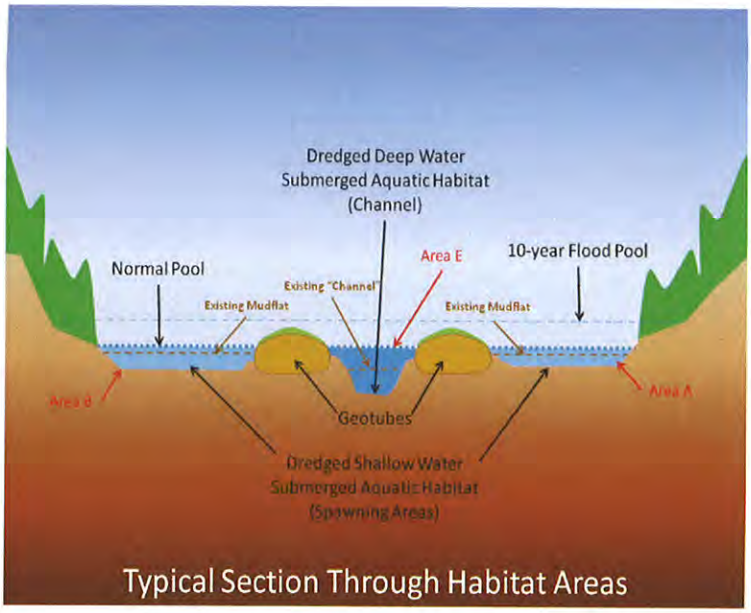
Impacts to the aquatic environment anticipated under Alternative 36 are similar to those described for the previous alternatives. Under Alternative 36, approximately 13.48 acres of shallow submerged aquatic habitat would be created through dredging of areas currently characterized as mudflats (Areas A, B and C on Plate G-1) and installation of fish habitat structures. These improvements would increase habitat for fish spawning and juvenile development, aquatic macroinvertebrates and turtles, as well as foraging opportunities for piscivorous species.

Alternative 36 would have the additional benefit of the creation of 10.27 acres of deep water habitat. This would be achieved through the dredging of Area E, as shown on Plate G-1. Dredging this area would create a long 'channel' of deep water, which would help establish better connectivity between the upper and lower potions of the lake. This would promote fish travel up and down the lake, and between the lake and Little Chartiers Creek. Establishment of deep water habitat would provide refugia for fish to escape high summer temperatures and to overwinter, thereby promoting a self-sustaining fish population within Canonsburg Lake. The deep water habitat would be enhanced through the addition of fish habitat structures (Attachment G-1), which would provide cover and resting places.

According to Rick Lorson of the Pennsylvania Fish and Boat Commission, Canonsburg Lake does not currently have a reproducing channel catfish population (Personal Conversation with Rick Lorson, 12/13/06). Mr. Lorson expressed that this species may benefit from the development of adequate shallows habitat that would promote spawning, which are provided under Alternative 36. The deep water habitat proposed under this alternative would also help to promote the channel catfish and also brown bullhead, which prefer to reside in areas of greater depth.



The cross-section schematic at right depicts the dredging of Area E and the application of geotubes adjacent to that area as part of the adjoining habitat restoration activities. This dredging activity increases the conveyance area of the main channel of Little Chartiers Creek through the upper portion of the lake; however, it decreases the total area of the cross-section due to the isolation of the main channel and the remaining portion of the lake through the placement of the geotubes.



4.8.2 Wetland Habitat

As under Alternative 13, Alternative 36 would provide 2.02 acre of wetland habitat through application of spoil sediment and native plantings within Area D2. This would provide wildlife habitat and water quality improvements to the lake ecosystem as previously discussed. The created wetland would border a portion of the deepwater habitat created in Area E, which would allow for direct interaction between the two habitats. Approximately 0.01 acre of wetland impact would be necessary to establish vehicular access to Areas F1 and F2.

4.8.3 Terrestrial Environment

As under Alternative 13, Alternative 36 includes the creation of 0.97 acre of planted riparian zone buffer within Area D1, providing the benefits described previously. Area D1 would border the deepwater 'channel' established in Area E. As with the previously described alternatives, Alternative 36 would require some impact (approximately 6 acres) to the adjacent upland forest to the west of Canonsburg Lake for the establishment of sediment handling areas.

4.8.4 Hazardous, Toxic, and Radiological Waste

The potential human health and ecological risks with regard to hazardous, toxic and radiological waste associated with Alternative 36 would be identical to those discussed within Section 4.5.4.

4.8.5 Aesthetics

Aesthetic improvements under Alternative 36 would be similar to those anticipated for Alternative 13.

4.8.6 Recreation

As with the previous alternatives, Alternative 36 would enhance the recreational potential of Canonsburg Lake by increasing angling opportunities by improving fish spawning habitat. The addition of a riparian buffer area could provide another access point for fishermen as well. Establishment of a deepwater channel within Area E would provide a significant improvement to boating access within the lake, which is currently impaired by the prevalence of shallow, un-navigable mudflats. Improved bird-watching and educational possibilities could also be realized with the addition of diverse wetland and riparian habitats.

4.8.7 Traffic and Transportation

Proposed site access points and the route to be used to transport dredged material to the Arden Road Landfill are discussed under Section 4.5.7. During the initial construction of Alternative 36, approximately 61,294 cubic yards of sediment would be dredged from the lake and disposed of at the Arden Road Landfill. Transportation of the dredged sediment would result in a temporary increase to traffic along the route from the sediment storage area to the landfill. Assuming that the trucks used to haul sediment from the site will have a load capacity of 6 cubic yards, approximately 10,216 truckloads of sediment would be transported along this route. Maintenance dredging and removal of approximately 54,369 cubic yards of sediment in Year 25 would require approximately 9,062 truckloads of sediment to be transported along this route. The number of loads could be reduced if trucks with greater load capacities are used. Further details regarding the hauling of dredged sediment offsite are provided in Appendix H. No temporary or permanent diversion or obstruction to local traffic patterns would occur as a result of this Alternative 36.

4.9 Summary of Environmental Effects

The anticipated effects of the Best Buy alternatives on various facets of the environment are summarized in Table 15 on the following page. The environmental effects of the No Action alternative are included for comparison.

4.10 Cumulative Impact Assessment

The Council on Environmental Quality (CEQ) has developed regulations (40 CFR §§ 1500 – 1508) implementing the procedural provisions of the National Environmental Policy Act (NEPA) of 1969, as amended (42 USC §§ 4321 et seq.) which define cumulative effects as: *the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions* (40 CFR § 1508.7). These impacts may be beneficial or detrimental in nature. The CEQ manual *Considering Cumulative Effects Under the National Environmental Policy Act* (January 1997), which provides guidance on preparing cumulative impact assessments, was consulted in the preparation of the following cumulative impact assessment for the Canonsburg Lake Ecosystem Restoration Project.

TABLE 15
Summary of Environmental Effects by Alternative

Environmental Parameter	Alternative 4	Alternative 7	Alternative 13	Alternative 36	No Action
Air Quality	No effect	No effect	No effect	No effect	No effect
Noise	No effect	No effect	No effect	No effect	No effect
Prime Farmland	<0.0001% of farmland in County or local government unit to be converted. 2.1 ac of direct impact on soils with Prime Farmland designation; 15.04 ac of soils with Prime Farmland designation and 6.3025 acres of soils with Farmland of Statewide Importance designation indirectly impacted.*	<0.0001% of farmland in County or local government unit to be converted. 2.1 ac of direct impact on soils with Prime Farmland designation; 15.04 ac of soils with Prime Farmland designation and 6.3025 acres of soils with Farmland of Statewide Importance designation indirectly impacted.*	<0.0001% of farmland in County or local government unit to be converted. 2.1 ac of direct impact on soils with Prime Farmland designation; 15.04 ac of soils with Prime Farmland designation and 6.3025 acres of soils with Farmland of Statewide Importance designation indirectly impacted.*	<0.0001% of farmland in County or local government unit to be converted. 2.1 ac of direct impact on soils with Prime Farmland designation; 15.04 ac of soils with Prime Farmland designation and 6.3025 acres of soils with Farmland of Statewide Importance designation indirectly impacted.*	No effect
Population and Employment	Negligible effect - May result in temporary construction jobs	Negligible effect - May result in temporary construction jobs	Negligible effect - May result in temporary construction jobs	Negligible effect - May result in temporary construction jobs	No effect
Environmental Justice	No effect	No effect	No effect	No effect	No effect
Threatened and Endangered Species	No effect**	No effect**	No effect**	No effect**	No effect
Traffic and Transportation	Temporary increase to traffic along haul route between sediment storage area and Arden Road Landfill during maintenance dredging (2,736 loads)†	Temporary increase to traffic along haul route between sediment storage area and Arden Road Landfill during initial construction (531 loads) and maintenance dredging (5,035 loads) †	Temporary increase to traffic along haul route between sediment storage area and Arden Road Landfill during initial construction (2,350 loads) and maintenance dredging (9,062 loads) †	Temporary increase to traffic along haul route between sediment storage area and Arden Road Landfill during initial construction (10,216 loads) and maintenance dredging (9,062 loads) †	No effect
Aquatic Environment	4.07 ac shallow submerged aquatic habitat generated	7.49 ac shallow submerged aquatic habitat generated	13.48 ac shallow submerged aquatic habitat generated	13.48 ac shallow submerged aquatic habitat and 10.27 ac deep water habitat generated	Continued loss of fish spawning habitat and seasonal refugia due to sedimentation
Wetland Habitat	9.41 ac wetland habitat generated ±0.01 ac wetland impact	5.99 ac wetland habitat generated ±0.01 ac wetland impact	2.02 ac wetland habitat generated ±0.01 ac wetland impact	2.02 ac wetland habitat generated ±0.01 ac wetland impact	Continued development of invasive monoculture wetlands on mudflats
Terrestrial Environment	±6.06 ac of upland forest impacted	±6.06 ac of upland forest impacted	0.97 ac riparian habitat generated ±6.06 ac of upland forest impacted	0.97 ac riparian habitat generated ±6.06 ac of upland forest impacted	Decrease in foraging opportunities for piscivorous species
HTRW	Insufficient data (possible impacts to aquatic habitat attributed to likely nutrient re-suspension)	Insufficient data (possible impacts to aquatic habitat attributed to likely nutrient re-suspension)	Insufficient data (possible impacts to aquatic habitat attributed to likely nutrient re-suspension)	Insufficient data (possible impacts to aquatic habitat attributed to likely nutrient re-suspension)	No effect
Cultural Resources	No effect	No effect	No effect	No effect	No effect
Aesthetics	Improved natural aesthetic	Improved natural aesthetic	Improved natural aesthetic	Improved natural aesthetic	Continued degradation
Recreation	Increased angling, birding and educational opportunities	Increased angling, birding and educational opportunities	Increased angling, birding and educational opportunities	Increased angling, birding, boating and educational opportunities	Decline in angling opportunities, birding, boating and other outdoor activities

* It should be noted that the project area is confined to the Canonsburg Lake proper and immediately adjacent riparian areas, and very little disturbance to upland soils is anticipated. Correspondence with the NRCS indicated that less than 0.0001% of farmland would be converted for the project. The surrounding land uses include deciduous forest, residential and commercial properties. No agricultural properties are located adjacent to the site. Therefore, the effect of the Action Alternatives on actual farmland is anticipated to be negligible.

** The PA DCNR recommended surveys for the State-listed *Trillium nivale* (rare) and *Camassia scilloides* (threatened; proposed endangered). While it is unlikely that any of the project alternatives would result in impacts to these State-listed species, the appropriate follow-up coordination will be conducted as required within the PA DCNR correspondence

† Assumes truck load capacity of 6 cubic yards. Number of loads could be reduced if larger capacity trucks are used.

4.10.1 Assessment Scope

For the purposes of this Cumulative Impact Assessment, the area considered includes the Canonsburg Lake watershed (as indicated on Figure 4A) with particular focus on the lake itself and immediately adjacent areas (Figure 4B). The Canonsburg Lake watershed includes a portion of Little Chartiers Creek, of which Canonsburg Lake is an impoundment. Therefore, factors affecting Little Chartiers Creek are also considered, as they have the potential to ultimately affect the lake. The timeframe from construction of the Canonsburg Lake Dam in 1943 to the end of the 50-year project life (approximately 2059) has been evaluated for the Cumulative Impact Assessment.

The cumulative impact assessment has been confined to those parameters which are expected to realize greater than negligible impacts from the lake restoration project. The project is anticipated to primarily impact ecological resources including aquatic habitat and water quality, wetlands and the terrestrial (upland) features. Secondary impacts to recreation and aesthetics will also be realized. The cumulative impacts to these features are discussed within the following sections.

4.10.2 Aquatic Habitat and Water Quality

Historical and on-going activities that have affected the current state of the Canonsburg Lake watershed include agricultural land use, development of portions of the watershed into residential and urban/ commercial land uses, subsurface (deep) coal mining, and wind and flooding damage that resulted from Hurricane Ivan in 2004. Historical aerial photographs (provided in Appendix I, Attachment D) indicate that until the 1950s - 1960s, the area surrounding Canonsburg Lake was predominantly agricultural with some forested areas. Sediment and nutrient runoff from agriculture had an observable negative impact on the lake, which has been filling in with sediment over time. From the mid-1950s to the late 1960s, residential development began gradually replacing agriculture. The aerial photographs indicate that commercial/ urban development began in the area in the late 1960s and continues to the present day. Land clearing, construction activities, and storm sewer and wastewater discharges related to this development have also resulted in impairments to Little Chartiers Creek and Canonsburg Lake. Historic and current subsurface coal mining activities have caused further impairments to Little Chartiers Creek through discharges of high pH water, metals, sulfates and suspended solids via Acid Mine Drainage (AMD). Habitat within the lake was notably altered when Hurricane Ivan passed through the area in 2004. High winds and flooding redistributed sediment and vegetation within the lake.

The *Watershed Restoration Action Strategy (WRAS) State Water Plan Subbasin 20F – Chartiers Creek Watershed* report (PA DEP, Updated 9/2003) lists sources of impairments for streams within the Chartiers Creek watershed. Impairments within Little Chartiers Creek include: nutrients, siltation, suspended solids, organic enrichment/ low dissolved oxygen from urban runoff/ storm sewers, construction, habitat modification, removal of vegetation, small residential runoff, other causes, land development, golf courses, combined sewer overflow, crop and grazing related AG; metals and suspended solids from Acid Mine Drainage. Effects of these impairments are also observable in Canonsburg Lake, particularly deposition of silt/ sediment and nutrient enrichment. The DEP Lake Phosphorous study (1987) found that the lake was in a hypereutrophic

condition due to high phosphorous concentrations. Canonsburg Lake is currently on the 303(d) list due to nutrients from agricultural sources.

As discussed within Section 3.2, there is no indication that the Canonsburg Lake dam will be removed within the timeframe of the project life. Therefore, the lake will remain a lacustrine system and not revert to its historical riverine condition. Currently, there are no other future plans to address the existing sedimentation within the lake. North Strabane and Peters Townships have comprehensive plans that specify goals related to decreasing sedimentation from commercial and residential development. Increasing urbanization and residential development adjacent to the lake and within the watershed will introduce a variety of potential pollutants, including sediment runoff from construction and stream bank erosion attributed to higher runoff quantities, nutrients from lawn fertilizers, road salt and other pollutants. These potential contaminants will be mitigated through the implementation of State and Federal mandated stormwater controls as discussed in Section 3.2 In addition, the North Strabane and Peters Township comprehensive plans emphasize the implementation of various conservation practices, such as Conservation Subdivision Design, which would further reduce overall pollutant loads to the watershed and the lake.

While development within the watershed is anticipated, agriculture is expected to remain an important industry within Washington County according to the county Comprehensive Plan. Initiatives such as the Pennsylvania Agricultural Conservation Easement Program, the Agricultural Area Security Law of 1981, and the Pennsylvania Municipalities Planning Code (2003) all emphasize the preservation of agricultural lands. They also promote the use of agricultural BMPs to reduce soil and stream bank erosion and sediment runoff. The Nutrient Management Act further requires the development of Nutrient Management Plans for Agricultural Operators. Implementation of agricultural BMPs within the Little Chartiers Creek/ Canonsburg Lake watersheds is expected to reduce the overall sediment and nutrient loads reaching the lake compared to historical conditions.

The Surface Mining Control and Reclamation Act (SMCRA) was enacted in 1977 to address the environmental concerns related to mining operations. SMCRA created programs for regulating active coal mines and reclaiming abandoned mine lands. SMCRA programs help to reduce the impacts of mining on water quality. In addition, the NPDES program provides regulatory requirements for the treatment of discharge from mines. Implementation of discharge limits for mines prescribed in the 2003 TMDL for the Chartiers Creek watershed are also expected to reduce impacts to water quality from coal mining. The *River Conservation Plan for the Upper Chartiers Creek Watershed* recommends an inventory of AMD sites and prioritization of these sites with the most significant impacts to the watershed. This could result in land development constraints surrounding priority areas to preserve land for the installation of future AMD treatment systems. These regulations and potential remedial efforts could help to address the AMD impairments noted in Little Chartiers Creek, which would also help to protect Canonsburg Lake.

The restoration activities proposed within Canonsburg Lake will both help to correct the degradation within the lake attributed to continued agricultural and urban runoff within the watershed and complement current and future efforts and regulations meant to

minimize these effects. A substantial amount of accumulated sediment will be dredged from the lake and either removed for disposal or redistributed to create wetland and riparian habitat within the lake proper. Dredging and installation of artificial cover structures will create over 10 acres of shallow (spawning) aquatic habitat and nearly 13.5 acres of deep water (refugia) aquatic habitat within the lake, thereby significantly improving aquatic habitat and promoting a self-sustaining and diverse fish population. Sediment removal and redistribution within Canonsburg Lake is expected to significantly extend the viable life of the lake as a functional lacustrine habitat.

While some resuspension of sediments is anticipated during the construction phase, appropriate construction BMPs will be employed to prevent the downstream migration of this sediment thereby protecting Little Chartiers Creek and Chartiers Creek from additional degradation. The construction of approximately two acres of wetland within the lake may provide a water quality benefit to the lake and downstream waterways through sediment entrainment and nutrient/ pollutant uptake. Coupled with the aforementioned initiatives to reduce point and non-point source pollution within the watershed, the Canonsburg Lake project is anticipated to have a net benefit to aquatic resources and water quality.

4.10.3 Wetlands

The loss of wetland habitat is a nationally recognized issue which led to the protection of these resources at the State and Federal level under Sections 404 and 401 of the Clean Water Act. Over one half of the wetlands historically present within Pennsylvania have been filled (Myers et al., 2000), with wetland loss in the southern counties at 90% according to the *Pennsylvania Comprehensive Wildlife Conservation Strategy v. 1.0* (PGC and PFBC, 9/2005). Loss of historic wetlands can be largely attributed to conversion for farming and urban and suburban development. North Strabane and Peters Townships are primarily urban communities which make up much of the Canonsburg Lake watershed. While most of Washington County has experienced a gradual population decline since 1960, North Strabane and Peters Townships both realized significant increases in population (23.3% and 21.4%, respectively) between 1990 and 2000 (Washington County Planning Commission, 10/2006). This growth has led to increased residential and commercial development within these areas and subsequent impacts to previously undeveloped land, including wetlands. Development has also resulted in the degradation of remaining wetlands due to increased sediment and pollutant runoff from impervious surfaces.

The restoration proposed for Canonsburg Lake will require a negligible impact (approximately 0.01 acre) to an existing wetland adjacent to the lake for the installation of a sediment haul road. This modest impact will be more than offset by the planned creation of approximately 2 acres of wetland habitat within the lake. The creation of characteristic native wetland habitat will also help to offset historic wetland losses within the urbanizing watershed. The importance of urban wetlands as wildlife habitat and water quality features is well documented, for example in the PA DEP publication *Urban Wetlands: Generously Gifting Our Cities* (PA DEP, 10/2007)

4.10.4 Terrestrial Habitat

According to *Pennsylvania's Wildlife Action Plan* (PGC and PFBC, 5/2008), *habitat loss, caused by development and sprawl, as well as direct and indirect habitat degradation are the primary causes of species decline in Pennsylvania.* Conversion of undeveloped areas to suburban and urban uses within the commonwealth is resulting in a loss of over 300 acres terrestrial wildlife habitat daily (Goodrich et al., 2002). This development sprawl and concomitant habitat loss and degradation is currently the primary threat to wildlife in Pennsylvania (PGC and PFBC, 5/2008). The Canonsburg Lake watershed is no exception to this trend of sprawl, as evidenced by the substantial population increase and commensurate expansion of residential and commercial development in North Strabane and Peters Township discussed previously in Section 4.10.3.

Construction of the Canonsburg Lake Ecosystem Restoration Project would result in approximately six acres of impact to forested terrestrial habitat to be used as a processing and storage area for dredged sediment. The impact would occur within a larger wooded area present to the east of the lake. Wildlife displaced by this loss of habitat would be easily able to relocate out of the immediate impact area and into the surrounding forest. Some of the impact to terrestrial habitat would be offset by the development of nearly one acre of planted wooded riparian habitat along a portion of the lake.

4.10.5 Recreation and Aesthetics

According to the PFBC, Pennsylvania anglers take 21 million fishing trips each year, spending $1.35 billion. Canonsburg Lake is a very popular destination for anglers as well as other outdoor recreation enthusiasts such as boaters and bird watchers. These activities and other passive recreational uses are commonly enjoyed throughout the Chartiers Creek and Little Chartiers Creek watersheds within Washington County. Washington County has a well developed and maintained parks and recreation system encompassing approximately 5,500 acres. The *Washington County Comprehensive Plan* (Washington County Planning Commission, 10/2006) recommends continued maintenance and improvement of the parks system, including the development of countywide trails and greenways plans. Canonsburg Lake was identified as a greenway hub for the recreational and ecological opportunities it affords. The *River Conservation Plan for the Upper Chartiers Creek Watershed* (WCWA and ChCWA, 1/2003) also recognizes the importance of Canonsburg Lake as a recreational feature and recommends the initiation of a largemouth bass fishing tournament at the lake. The ChCWA instituted the Planning for the Future of Canonsburg Lake project to look at recreation at the lake today and suggest possible recreation improvements for the future. Under this project, the ChCWA released the *Master Plan Recreational Improvements to Canonsburg Lake* (ChCWA et al., March 2007). The plan suggests various improvements to the lake area, including a system of nature trails and boardwalks, pedestrian bridges, access roads and parking, picnic areas, restroom facilities, a Wetland Interpretation Center, boat launches and fishing areas. The aforementioned plans support the preservation of Canonsburg Lake as a recreational resource as part of an existing and expanding parks and greenways system within the watershed and Washington County.

The proposed ecological restoration of Canonsburg Lake will have dramatic positive impact on the lake as a recreational resource. The plan's emphasis on improving fish habitat will help to maintain the lake as a recreational angling destination. Creating a diversity of spawning habitat and deep water refugia replete with artificial cover structures will promote a self-sustaining fish population within the lake. The project may even decrease the need for fish stocking within the lake by the PFBC, as the indigenous population becomes more self-sustaining. The creation of deep water habitat through dredging will also improve boat access within the lake, which is currently severely impaired due to the abundance of sediment and shallow slackwater areas. The overall lake aesthetics will be improved as unvegetated sediment mudflats, prone to collecting trash and debris, are redeveloped as submerged aquatic, wetland, or riparian habitat. Greater fish foraging opportunities and creation of additional wetland habitat may attract migratory birds and waterfowl, thereby improving birding opportunities. These improvements to Canonsburg Lake will not negate any other reasonably foreseeable recreational efforts within the watershed or Washington County; rather, they will promote the documented desire to maintain the lake as a fishing resource and future countywide greenway hub.

4.10.6 Cumulative Impacts Summary

In general, the Canonsburg Lake Ecosystem Restoration Project will provide a net benefit to aquatic habitat and water quality, wetlands, recreation and aesthetics within the watershed. In order to realize these benefits, however, a small net decrease in terrestrial habitat will be necessary for the sediment processing and disposal area.

The restoration alternatives proposed for Canonsburg Lake are anticipated to have positive effects that will help to ameliorate some of the historical and current symptoms of degradation within the lake. Dredging of sediment-laden areas and installation of habitat structures within the lake will create deep water refugia and spawning areas for fish. Redistribution of some of the dredged sediment will allow for the development of new wetland areas, which will be planted with native vegetation to preclude colonization by invasive species and provide habitat for a variety of wildlife. Development of new wetland areas, coupled with preservation of existing wetlands will have a beneficial effect on the lake water quality. The wetlands will help to stabilize sediment, thereby reducing turbidity levels. Wetlands will also improve water quality through nutrient uptake and adsorption of other contaminants. Creation of additional riparian buffer would also provide water quality benefits through filtration of overland flow, as well as stabilization of a portion of the lake bank. The proposed habitat improvements will result in a more harmonious and diverse lake ecosystem, with the additional benefits of improved aesthetics and recreational opportunities.

Future improvements to stormwater management, implementation of conservation development practices by communities within the watershed, and agricultural BMPs will likely result in a decrease in sediments and nutrients entering the lake. This will help to preserve the integrity of the improved habitats to be established under the action alternatives. The project may be further enhanced through the future implementation of improvements recommended within the *Master Plan Recreational Improvements to Canonsburg Lake* (ChCWA et al., March 2007), discussed previously in Section 1.5.3.3. The Master Plan includes improvements to overall accessibility within the Canonsburg

Lake study area, as well as a Wetland Interpretation Center. These planned improvements would increase the use and appreciation of Canonsburg Lake as an important ecological resource.

4.11 Risk and Uncertainty Analysis

With any ecosystem restoration project, there is typically some uncertainty as to what the exact final outcome will be and whether the project objectives will ultimately be achieved. This is due to the inherent variability of natural systems, as well as potential flaws or deficiencies in the information used to develop the project alternatives. For the Canonsburg Lake project, the majority of the uncertainty or risk relates to a lack of specific information related to the nature of the sediment within the lake. Information regarding the rate of sedimentation throughout the lake, the presence of contaminants within the sediments, and the physical consistency (particle size) of the sediment is largely deficient or non-existent.

As described previously in Section 1.6, the assumption was made that the quality of the sediment would not hinder the planned hydraulic dredging or utilization of geotubes for the project. Furthermore, it was assumed that the sediments do not contain contaminants that would create an ecological or human health risk when resuspended during dredging. It was also assumed that sediment would continue to enter the lake at a constant rate, and would settle uniformly within the lake. Additional information may become available in the future that would change the estimate of the volume of accumulated sediment and, therefore, the annual rate of sediment deposition within the lake. Or, additional acquired information may change the assumptions regarding the constituency (grain size and pollutants) of the sediment that could affect the plan in terms of dredge and disposal methods. In either case, the feasibility and costs of certain project alternatives may need to be re-evaluated to reflect the additional information.

There is risk and uncertainty associated with the calculated sediment rates that were derived by computing the volume between the original lake bottom contours and the current lake bottom contours inferred through visual observations and limited soundings. In order to reduce this risk and uncertainty, the volume of soil erosion that would be anticipated for the same period of time from the contributory watershed, given the land cover within the Little Chartiers Creek watershed, was computed through the use of the Revised Universal Soil Loss Equation (RUSLE). These volumes were in close agreement. Even though there would not necessarily be a correlation between sediment deposition rates in the lake and erosion potential within the watershed, it was determined that the derived rate of sedimentation of the lake was reasonable based on the analyses performed.

It is recognized that there is the potential that an extreme weather event or series of events could pass through the project area following implementation of the project alternative. Such events could potentially redistribute sediment within Canonsburg Lake, or introduce additional sediment deposition, and thereby change the character of the proposed habitat features. The future potential for sediment movement or deposition related to extreme weather conditions is unpredictable and could impact the sustainability of certain aspects of the project.

A further assumption made for the Canonsburg Lake project is that the Green Alternate, Option 1-A, of the Pennsylvania Turnpike Commission, will be the recommended plan for the new highway that will span Canonsburg Lake. This alternate would not have any direct effect upon the Canonsburg Lake project area. The alternate includes some excess land located to the west of the lake and south of McDowell Road, adjacent to lands owned by the PFBC, which are likely to be acquired by the Pennsylvania Turnpike Commission. Through coordination with the Turnpike Commission's consultant (The Maguire Group Inc.), it is understood that the balance of this land that is not consumed by the turnpike project right-of-way would be conveyed to the PFBC. The project alternatives assume that this land will be available to the project.

It should be noted that there is some degree of risk that the plantings proposed to establish wetland and riparian habitat areas may not exhibit long-term success. Improper installation, damage caused by animals, humans or weather, or plant diseases could potentially destroy the plantings. This could leave the areas vulnerable to an infestation of invasive species. Proper care taken during and after planting will help minimize this risk.

An additional uncertainty is whether the fish present within the lake will actually utilize the planned fish habitat structures for spawning and cover. Different species have varying cover requirements, and it will be important to keep this in mind as the specific habitat structures models are selected for use in the lake.

Canonsburg Lake currently serves no flood control function. The proposed project will neither exasperate nor ameliorate flooding that might occur around the lake or downstream. Similarly, because the project does not propose actions that might alter the historical sedimentation rates for Canonsburg Lake, the project is not anticipated to have any significant downstream sedimentation impacts.

5.0 SELECTED PLAN

General Van Antwerp's "Actions for Change" program, which groups General Strock's 12 Actions for change into four general comprehensive themes, and USACE's 7 Environmental Operating Principles are interrelated. The Canonsburg Lake project was considered in a system-wide ecosystem context that evaluated the interrelationships of terrestrial, wetland and aquatic systems. The goal of the project, which utilized the 6-step Planning Process, is a sustainable restored aquatic ecosystem that would become part of a greater watershed planning initiative that is being pursued by Washington County. This comprehensive systems approach, the consideration of risk and uncertainty as to whether the project can meet its objectives, and the open coordination between the local sponsor and interested stakeholders meets all of the General's "Actions for Change". The project, by its very nature, meets the Environmental Operating principles by striving to achieve environmental sustainability, considering the interdependence of the physical environment, seeking ways to restore degraded ecosystem structure and function, minimizing any impacts of construction, and consulting with and obtaining the views of the local sponsors and State agencies to help formulate a project that solves ecosystem problems in a manner that is scientifically sound in the most cost effective manner.

Alternative 36 was the only best-buy alternative that included a deep water habitat component, which was further enhanced through the installation of fish cover structures.

Dredging of the proposed deep water channel in Alternative 36 would promote fish travel up and down the lake and provide year-round fish habitat throughout the lake. The deep water habitat created in this alternative would provide essential refugia for fish during seasonal temperature extremes, which would allow adult fish to survive within the lake from year to year. Deep water habitat in this alternative would function in tandem with shallow submerged aquatic habitat to promote a self-sustaining fish population within Canonsburg Lake. Based on the available information regarding the existing water depths and sediment depositional rates, the limited amount of existing deep water within the upper portion of Canonsburg Lake would continue to diminish over time and, if no dredging were to occur, substantial portions of the existing deep water habitat within the upper portion of the lake would be lost within 10 years and entirely exhausted within approximately 25 years. Due to these increased ecosystem benefits, Alternative 36 was designated as the Selected Plan for ecosystem restoration of Canonsburg Lake. With respect to Alternative 36 as the Selected Plan:

- The Selected Plan is Significant. It makes a justified contribution to address the problems and opportunities within Canonsburg Lake. The Selected Plan is the only best buy alternative which includes the establishment of deep water habitat. Deep water areas with cover structures support adult fish populations by providing them important refugia during seasonal temperature extremes, allowing for a viable self-supporting fish community year after year. The planned deep water dredging would also establish a better connection between the lake and the upstream portion of Little Chartiers Creek, allowing for improved movement of fish and other aquatic organisms between the two ecosystems. In addition to establishing deep water habitat, the Selected Plan also includes the development of additional shallow submerged aquatic (spawning) habitat, wetlands and riparian areas. This is the most diverse combination of habitats afforded by any of the best buy alternatives. The significance of the Selected Plan with respect to institutional recognition, public recognition, technical recognition, scarcity, representativeness, status and trends, connectivity, special status species, biodiversity, and hydrologic character is discussed in detail in Section 5.4 of the main document.

- The Selected Plan is the most complete of all the best buy alternatives. It will provide and account for all necessary actions to ensure the realization of the intended environmental outputs and it is the only best buy alternative that establishes deep water habitat.

- The Selected Plan is the most effective of the best buy alternatives. It restores important ecosystem structures and functions to meaningful degrees. It is the only best buy alternative that assures connectivity of the shallow water spawning areas with the remainder of the lake through the establishment of a deep water channel area.

- The Selected Plan is efficient. The amount of environmental output provided by the Selected Plan cannot be produced more cost-effectively by any other alternative.

- The Selected Plan exhibits reasonableness of costs. Although the Selected Plan is the most expensive of all the best buy alternatives, it also produces the greatest environmental benefit. It is the only best buy alternative that includes the establishment of deep water habitat, which is important as refugia for adult fish during seasonal temperature extremes and which assures connectivity of the shallow water spawning areas with the remainder of the lake through the establishment of a deep water channel area. It creates the most extensive and diverse habitat and thereby supports conditions conducive to the greatest biodiversity within the project area. The Selected Plan results in environmental benefits that are not achievable with any other best buy alternatives and that are worth the costs.

- The Selected Plan has acceptability. It is workable and viable with respect to the U.S. Army Corps of Engineers, Pittsburgh District, and the Pennsylvania Fish and Boat Commission, has public acceptance, and is compatible with existing laws, regulations and public policy.

Identification of the Selected Plan reflects the priorities and preferences of the Federal Government, the non-Federal sponsors and other stakeholder groups. Twenty-five out of an original thirty-six possible action alternatives identified during the course of this feasibility study were included in a cost-effective analysis with the intent of identifying cost-effective alternatives and the 'best buy' alternative(s) for ecosystem restoration within Canonsburg Lake. The results of the CEA/ICA process identified nine cost-effective alternatives, of which four were determined to be 'best buys'. Representatives of the U.S. Army Corps of Engineers, Pittsburgh District, the Pennsylvania Fish and Boat Commission and the Washington County Watershed Alliance met on December 5, 2007 (Attachment H-1 in Appendix H) and again on October 26, 2008 to review information relative to the cost-effective alternatives and the best-buy alternatives. Based upon the attributes of the alternatives identified as 'best buys', a consensus was reached among the representatives that Alternative 36 was the most preferred option amongst the four best buys, largely due to the inclusion of deep-water habitat, a highly desired feature for the local sponsors and the local stakeholder groups.

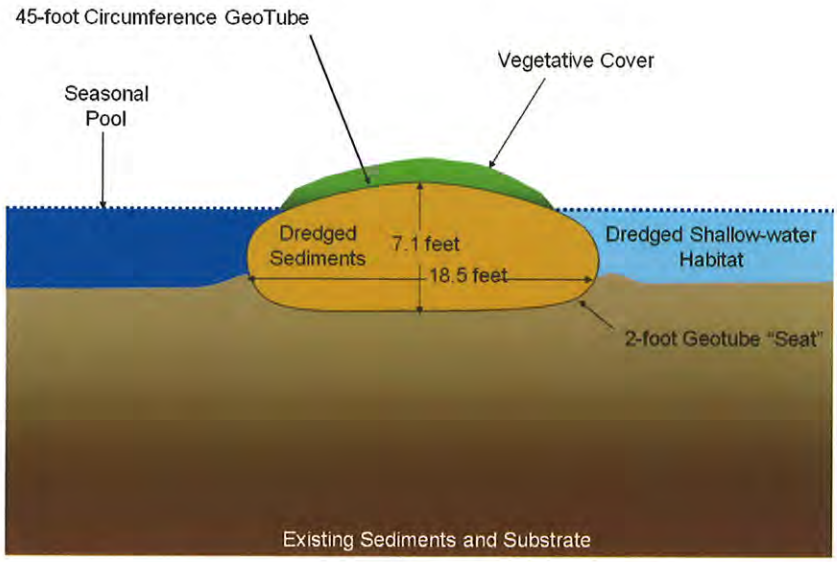
5.1 Description of Selected Plan

The Selected Plan, as shown in Figure H-1 in Appendix H, would create shallow water submerged aquatic habitat in Areas A, B, and C, emergent or shrub-scrub wetland habitat in Area D2, riparian zone habitat in Area D1, and deep water submerged aquatic habitat in Area E. This plan would thus create 13.48 acres of shallow water submerged aquatic habitat (4.07 acres in Area A, 3.42 acres in Area B, and 5.99 acres in Area C); 2.02 acres of wetland habitat; 0.97 acres of riparian habitat, and 10.27 acres of deep water submerged aquatic habitat. The total project cost obtained through the MCACES estimating process for the Selected Plan was $65,651,339. This figure includes the costs associated with lands and damages, planning and engineering design, construction and construction management. The hydraulic dredging required for

implementation of the Selected Plan, as discussed in detail in Section 4.2.3 of Appendix A, would be limited to the "environmental window" of July through November of typical years.

5.1.1 Shallow Water Submerged Aquatic Habitat

The shallow water submerged aquatic habitat in Area A would be created by removing approximately 16,415 cubic yards (CY) of accumulated sediments within existing mud flats by means of a hydraulic dredge with a horizontal auger assembly to create a shallow water area with water depths of approximately 3 feet and structural bottom features perpendicular to the shoreline.



Approximately 758 CY of the initial dredged material would be placed into geotube segments 45 feet in circumference and totaling 200 linear feet (LF) in length. These geotube segments would be placed between the dredge area and the adjacent channel with a gap to facilitate entry into the area, but with overlap to reduce future sedimentation within the restoration area. The balance of the dredged materials (15,657 CY) would be used elsewhere in the project for needed fill or would be placed into large geotubes (75 feet in circumference) in the sediment dewatering areas (F1 and F2) and subsequently exported off-site to be used as needed fill at a local landfill (Arden Road Landfill). Fish structures, as described in Appendix G, would be placed throughout Area A as shelters and to promote spawning.

The shallow water submerged aquatic habitat in Area B would be created by similarly dredging approximately 13,794 CY of accumulated sediments within the existing mud flats to create a shallow water area with water depths of approximately 3 feet and structural bottom features perpendicular to the shoreline. Approximately 2,653 CY of dredged material would be placed into geotube segments 45 feet in circumference and totaling 700 LF in length. These geotube segments would be placed between the dredge area and the adjacent channel with gaps to facilitate entry into the area, but with overlaps to reduce future sedimentation within the restoration area. The balance of the dredged materials (11,141 CY) would be used elsewhere in the project for needed fill or would be placed into large geotubes in the sediment dewatering areas and subsequently exported off-site to be used as needed fill at a local landfill. Fish structures would be placed throughout Area B as shelters and to promote spawning.

The shallow water submerged aquatic habitat in Area C would be created by similarly dredging approximately 24,159 CY of accumulated sediments within the existing mud flats to create a shallow water area with water depths of approximately 3 feet and structural bottom features perpendicular to the shoreline. Approximately 3,032 CY of dredged material would be placed into geotube segments 45 feet in circumference and totaling 800 LF in length. These geotube segments would be placed between the dredge area and the adjacent channel with gaps to facilitate entry into the area, but with overlaps to reduce future sedimentation within the restoration area. The balance of the dredged materials (21,127 CY) would be used elsewhere in the project for needed fill or would be placed into large geotubes in the sediment dewatering areas and subsequently exported off-site to be used as needed fill at a local landfill. Fish structures would be placed throughout Area C as shelters and to promote spawning.

5.1.2 Wetland Habitat

The wetland habitat in Area D2 would be created by placing and filling geotube segments 45 feet in circumference and totaling 1,300 LF in length between the wetland habitat area and the adjacent channel area and then placing dredged materials behind the geotubes until the surface within the area was approximately at normal lake level. Approximately 4,927 CY of dredged material would be placed into the geotube segments and approximately 13,035 CY of dredged materials would be placed behind the geotubes. These dredged materials would be derived as excess materials from Areas A, B, C, or E. Area D2 would be planted with a diverse selection of native wetland trees, shrubs, and herbaceous plants.

5.1.3 Riparian Habitat

The riparian habitat in Area D1 would be created by placing and filling geotube segments 15 feet in circumference and totaling 1,000 LF in length between the riparian habitat area and the adjacent channel area and then placing dredged materials behind the geotubes until the area was filled approximately 1.0 feet above normal lake level. Approximately 422 CY of dredged material would be placed into the geotube segments and approximately 2,347 CY of dredged materials would be placed behind the geotubes. These dredged materials would be derived as excess materials from Areas A, B, C, or E. Area D1 would be planted with a diverse selection of native riparian trees, shrubs, and herbaceous plants.

5.1.4 Deep Water Submerged Aquatic Habitat

The deep water submerged aquatic habitat in Area E would be created by dredging approximately 49,851 CY of accumulated sediments between Areas D1 and D2 and within the upstream existing channel area past Areas C and B to Area A to create a deep water area with water depths of approximately 8 feet. This deep water area would be constrained by the existing banks and the geotubes placed adjacent to Areas A, B, C, D1 and D2. Any dredged materials not used elsewhere in the project for needed fill or for placement into confining geotubes would be placed into large geotubes in the sediment dewatering areas and subsequently exported off-site to be used as needed fill at a local landfill. Fish structures would be placed throughout Area E as shelters.

5.2 Operation, Maintenance, Repair, Rehabilitation and Replacement

Operation and Maintenance (O&M) is considered an integral part of environmental sustainability for the ecosystem restoration project. Information regarding the frequency of required dredging is provided in Appendix G. Dredging of the shallow water submerged aquatic habitat areas would be necessary after 25 years of the project in order to sustain its purpose, function and habitat value. Re-dredging of the shallow water submerged aquatic habitat would occur using the same methods and techniques used to establish those habitat areas. It should be noted that re-dredging of the deep water submerged habitat would not be required because the initial depth of dredging in those areas was designed to be sufficient to still meet the deep water criteria after the 50-year project life under historical sedimentation rates for Canonsburg Lake. The present worth of the cost of Operations and Maintenance dredging to be conducted in year 25 of the project is estimated by US Cost, Inc. to have a present value of $1,180,301, as detailed within Appendix H. The addition of the present value of shallow water enhancements, not included in the MCACES analysis, would represent a present worth of the cost of all Operations and Maintenance to be conducted in year 25 to $1,221,598.

5.3 Summary of Environmental Effects

The Selected Plan is anticipated to have a number of significant environmental benefits. The Plan will result in a significant increase in suitable fish spawning habitat (shallow submerged aquatic habitat), which will be enhanced through the installation of cover structures. This improvement may also benefit aquatic macroinvertebrates and turtles.

The Selected Plan is the only best-buy alternative that includes a deep water habitat component, which is enhanced through the installation of fish cover structures. Dredging of the proposed deep water channel will promote year-round fish habitat throughout the lake. Deep water habitat provides essential refugia for fish during seasonal temperature extremes, which allows adult fish to survive within the lake from year to year. Deep water habitat will function in tandem with shallow submerged aquatic habitat to promote a self-sustaining fish population within Canonsburg Lake. Based on the information available regarding the existing water depths and sediment depositional rates, the limited amount of existing deep water within the upper portion of Canonsburg Lake will continue to diminish over time. If no dredging occurs, substantial portions of the existing deep water habitat within the upper portion of the lake will be lost within 10 years and entirely exhausted within approximately 25 years.

The combination of deep water submerged aquatic habitat and shallow water submerged aquatic habitat areas provides a diverse habitat for fish species within the project area. As noted in Appendix G, a total of 14 fish species were observed during a fish survey of the lake in May of 2000 performed by PFBC. Two species identified in the survey, brown trout and rainbow trout are not indigenous to warmwater, lacustrine environments like Canonsburg Lake; rather, they customarily inhabit cool or coldwater streams. The management report indicated that these are hatchery species stocked regularly by the PFBC. Of the warmwater fish species found within Canonsburg Lake, all utilize shallows for spawning and development of embryos and fry. Shallows are particularly suitable for fish reproduction when they include some type of cover, such as

rubble and boulders, logs and stumps, submerged brush and terrestrial vegetation, or cavities and burrows in the case of brown bullhead and channel catfish. Canonsburg Lake reportedly does not currently have a reproducing channel catfish population. This species would be expected to benefit from the development of adequate shallows habitat that would promote spawning. Several adults species are also known to inhabit shallows areas, including black crappie, bluegill, green sunfish and pumpkinseed. Adult fish species that inhabit shallows areas typically move to deeper areas to escape high summer temperatures and to overwinter. Species such as brown bullhead, channel catfish, gizzard shad, and largemouth bass can typically be found in deep water areas once they mature into adulthood. Some species, such as largemouth bass, travel between shallows and deep water areas more regularly. Deep water areas are also enhanced by the presence of cover structures, which allow the fish secluded placed to rest and hide from predators.

As discussed in detail in Appendix G, providing both suitable shallow water (spawning) habitat and deep water (refugia) habitat within Canonsburg Lake is essential to establishing and maintaining a viable reproducing fish population. Since its creation in the 1940s, Canonsburg Lake has been steadily filling in with sediment from the surrounding watershed. During a PFBC survey conducted in 1974, the maximum depth of the lake observed was 24.6 feet. By 1986, most of the upper portion of the lake was less than 6.5 feet. This has significantly decreased the overall volume and area of the lake, as well as reducing lake depth. This has also reduced the available fish habitat of the lake. As spawning and deep water habitats continue to fill in with sediment, the lake will become increasingly unable to support a self-sustaining, diverse fish population. Impairments to the fish community within the lake can have a secondary negative effect on piscivorous birds and mammals within the study area.

Fish species that are more tolerant of highly turbid, eutrophic conditions, such as common carp and gizzard shad, have a survival advantage over more sensitive species, such as crappie and pumpkinseed. Gizzard shad and the non-native carp are nuisance species in the Canonsburg Lake that can adapt to these conditions better and deprive many other fish species of resources, especially under environmental conditions that are stressful to the other fish. This competitive pressure can decrease fish species diversity within Canonsburg Lake over time. This effect, as discussed in detail in Appendix G, is already evident when one compares the fish survey performed by the PFBC in 1974 with the most recent survey of Canonsburg Lake in 2000. The 1974 survey indicates that white crappie were the most prevalent species in the lake (54%), followed by brown bullhead, white sucker and bluegill. Only two largemouth bass were collected in the trap nets. White crappie and brown bullhead typically prefer to inhabit deeper waters than largemouth bass, who prefer shallow areas for nesting and foraging. In the 2000 survey, gizzard shad made up the majority of the trap net catch (51%), and largemouth bass was the primary game fish collected. Gizzard shad are commonly associated with highly turbid waters and prefer shallow, muddy areas. White crappie made up only 27% of the total trap net catch in 2000, and brown bullhead numbers were also reduced. Based upon the comparison of the two fish surveys, it appears that the fish population within Canonsburg Lake is changing as the lake continues to become shallower and more turbid.

Populations of species requiring deeper water habitat are declining, while species that thrive in shallow and/ or turbid conditions are thriving. This trend is anticipated to continue until the lake eventually becomes too shallow to support a fish community. Increasing spawning habitat for predators of the gizzard shad, including largemouth bass, may increase predator numbers. Increased predation would help keep the gizzard shad population in check and reduce competitive pressure on panfish species, which in tandem with improved spawning and overwintering habitat, could help increase the diversity of the beneficial fish population within the lake. Brown bullhead, non-native carp and gizzard shad, are tolerant of low dissolved oxygen conditions and are also noted to be tolerant of and even seem to prefer high turbidity levels, while the other species in the lake generally prefer or require clearer water in order to thrive. The common carp, in fact, is known to exacerbate turbid conditions by disturbing bottom sediments as they feed. This activity can have a negative effect on other fish species, as the suspended silt decreases light penetration, inhibiting aquatic plant growth and smothering fish eggs. Low dissolved oxygen and high turbidity levels are indicative of eutrophication and heavy sediment loading, such as is likely to be the case of Canonsburg Lake.

The creation of areas of both deep water submerged aquatic habitat and shallow water submerged aquatic habitat within the southern portion of Canonsburg Lake will create both refugia areas and spawning areas and will promote a self-sustaining fish population of desirable native species.

The addition of wetland and riparian habitat vegetated with native species will promote wildlife usage and improve the overall natural aesthetic of the lake, and may also some water quality benefit. These habitats may increase avian usage of the site and improve birding and educational opportunities.

As with all other action alternatives evaluated, the Selected Plan will result in the loss of approximately 6 acres of upland forest habitat for the installation of sediment handling areas. This will also result in a negligible (0.01 acre) negative impact to an existing wetland area. These losses will be offset by the numerous ecological benefits that will be realized through the restoration of Canonsburg Lake

5.4 Significance of Selected Plan

The significance of a proposed aquatic ecosystem restoration project must be demonstrated according to the guidelines within IWR Report 96-R-7, ER 1105-2-100 and EC 11-2-193 in order to compete for Section 206 funding during the budget process. The general significance of Canonsburg Lake itself was discussed in Section 1.2.2. The significance of the Selected Plan with respect to Institutional, Public and Technical Recognition is discussed in the following sections.

5.4.1 Institutional Recognition

According to ER 1105-2-100, *Significance based on institutional recognition means that the importance of an environmental resource is acknowledged in the laws, adopted plans, and policy statements of public agencies, tribes or public groups.* The Selected Plan will restore and enhance a public resource (Canonsburg Lake) owned

by the Commonwealth of Pennsylvania and managed through the PFBC. The 2006 Washington County Greenways Plan published by the Washington County Planning Commission recognizes Canonsburg Lake as a destination that would have a large population interested in enjoying the ecological and recreational benefits (a Greenway 'hub').

Canonsburg Lake is located within the Atlantic Flyway route and is used by numerous avian species that are protected by the Migratory Bird Treaty Act of 1918 (50 CFR §10.13). The North American Waterfowl Management Plan of 1986 identifies the loss and degradation of habitat as the major waterfowl management problem in North America and promotes the protection, restoration and management of such habitat. The Selected Plan will result in significant improvements to fish spawning and adult habitat within Canonsburg Lake, which is anticipated to increase fish species diversity and abundance. This improvement will result in greater foraging opportunities for piscivorous avian species such as the great blue heron, a State Species of Special Concern that has been observed to use the lake. The Selected Plan also includes the creation of emergent wetland areas within the lake which will provide additional habitat for the great blue heron and other waterfowl.

5.4.2 Public Recognition

Public recognition means that *some segment of the general public recognizes the importance of an environmental resource, as evidenced by people engaged in activities that reflect and interest or concern for that particular resource* (ER 1105-2-100). The value of Canonsburg Lake has been recognized and promoted by public groups for its ecological, recreational and aesthetic value. The lake is promoted by the PFBC as a recreational destination for sport fishing and boating within the Commonwealth of Pennsylvania, uses which will be enhanced through the activities proposed under the Selected Plan. Improvements to shallow and deep water habitat will promote a healthy, sustainable fish community for anglers. Currently, much of the lake is choked with sediment and too shallow to be accessed by boaters. The proposed dredging will significantly increase average water depths within the lake and establish a deep water channel running the length of the project, which will allow boaters unfettered access from the upstream portions of Little Chartiers Creek to the McDowell Lane causeway.

The local residents that make up the Save Canonsburg Lake Committee promote the restoration of the lake as an integral feature of the community. Committee member have been actively involved in the feasibility study process and have attended stakeholder meetings for the proposed project.

The Planning for the Future of Canonsburg Lake program was developed by the ChCWA out of concern for the management and protection of the lake as an ecological and recreational resource. Working with the WCWA and the PFBC, the group developed a Master Plan for Recreational Improvements to Canonsburg Lake. The goal of the Master Plan is to establish a number of improvements within the lake property, including nature trails, fishing areas and a Wetland Interpretation Center. These planned improvements emphasize the importance of Canonsburg Lake to the local community and are dependent upon the ecological health of the aquatic resource. The Selected Plan promotes the Master Plan for the lake by:

- significantly improving fish habitat and subsequently improving angling opportunities;
- creating wetland areas that can be used as an educational resource via the Wetland Interpretation Center;
- creating a riparian buffer area which will provide shade; and
- improving the overall aesthetic appeal and accessibility of the lake by removing substantial areas of sediment accumulation.

5.4.3 Technical Recognition

Technical recognition means that *the resource qualifies as significant based on its "technical" merits, which are based on scientific knowledge or judgment of critical resource characteristics* (ER 1105-2-100). The Selected Plan for the Canonsburg Lake restoration project fulfills much of the technical recognition criteria specified within ER 1105-2-100 and EC 11-2-193, including Scarcity of the habitat to be restored, Representativeness of natural habitat, Status and Trends of the resource over time, Connectivity, Special Status Species, Biodiversity, and appropriate Hydrologic Character. The Selected Plan is discussed with respect to each of these criteria in the following sections.

5.4.3.1 Scarcity

Canonsburg Lake is one of only two lakes within Washington County and the only lacustrine habitat within the Chartiers Creek watershed owned or managed by the PFBC, PA DCNR or USACE and is therefore unique. The amount of useful submerged aquatic habitat is currently limited due to years of sediment accumulation. The Selected Plan proposes to improve the lacustrine habitat by developing habitat areas of varying depths suitable for fish spawning (shallows) and refuge from seasonal temperature extremes (deep water). This will involve a substantial amount of sediment removal and redistribution within the lake, which will extend the useful life of the resource.

The Selected Plan will also create over two acres of wetland habitat planted with native species within the lake. The loss of wetland habitat is a nationally recognized issue which led to the protection of these resources at the State and Federal level under Sections 404 and 401 of the Clean Water Act. Over one half of the wetlands historically present within Pennsylvania have been filled, with wetland loss in the southern counties at 90% according to the Pennsylvania Comprehensive Wildlife Conservation Strategy v. 1.0 (PGC and PFBC, 9/2005). The development of additional wetland habitat within Canonsburg Lake will help to offset these historic losses.

5.4.3.2 Representativeness

Representativeness is *a measure of a resources ability to exemplify the natural habitat or ecosystems within a specified range* (ER 1105-2-100). The primary goal of the Canonsburg Lake restoration project is to establish habitat conditions more suitable to the lacustrine fish population than presently exist due to decades of sediment accumulation. Suitable spawning and adult refugia will be created by dredging and

placement of rock piles and wooden habitat structures that mimic natural cover. In addition, wetland areas planted with a diversity of native forbs and shrubs will be established. Care will be taken in the final selection of planted wetland species to represent the vegetative communities typical of high-quality wetlands within the region and preclude invasion by non-native species.

5.4.3.3 Status and Trends

The lacustrine habitat of Canonsburg Lake is currently in a severely degraded condition due to decades of sedimentation and nutrient runoff from the watershed. The progression of sediment accumulation within the lake from the upper portions toward the dam has been continuous. This has resulted in the continued development of bars and spits within the lake to the point of significant emergence above the water level, the evolution of shallow mudflats in the slackwaters behind these areas and the overall reduction of water depths above McDowell Lane which is located near the middle of the lake. The Preliminary Restoration Plan (USACE, 2006) noted that the upper two thirds of Canonsburg Lake are heavily silted-in, with remaining water depths ranging from a few inches to less than two feet.

As spawning and deep water habitats continue to fill in with sediment, the lake will become increasingly unable to support a self-sustaining, diverse fish population. Impairments to the fish community within the lake will have a secondary negative effect on piscivorous birds and mammals within the study area. Fish species that are more tolerant of highly turbid, eutrophic conditions, such as common carp and gizzard shad, will have a distinct survival advantage over more sensitive species, such as crappie and pumpkinseed. As discussed previously in 3.2.1.1, this effect is already evident when one compares an earlier fish survey performed by the PFBC in 1974 (Weirich, Boyer, and Mantzell, 1974) with the most recent survey of Canonsburg Lake (2000). Based upon the comparison of the two fish surveys, it appears that the fish population within Canonsburg Lake is changing as the lake continues to become shallower and more turbid. Populations of species requiring deeper water habitat are declining, while species that do well in shallow and/ or turbid conditions are thriving. This trend is anticipated to continue until the lake eventually becomes too shallow to support a fish community.

When the lake was constructed in 1943, it had a surface area of 76 acres, a maximum depth of 42.6 feet and a volume of 775 acre/ feet (PA DEP, 2/2004). The current lake surface area is approximately 63 acres, a 17% reduction compared to historic conditions. Similarly the maximum depth has steadily decreased over time, having been measured at 24.6 feet in 1974 (Weirich, Boyer, and Mantzell, 1974) and 11.5 feet in the 1980's (Smith and Lorson, 2000). Most of the upper portion of the lake had a maximum depth less than 6.56 feet by 1986 (Smith and Lorson, 2000). The current volume of the lake is estimated at 322 acre/ feet, a 58% reduction from original conditions. Despite the implementation of stormwater regulations intended to reduce the amount of sediment and nutrients entering waterways, the lake will continue to fill in with sediment, albeit at a potentially slower rate. It is extremely unlikely that conditions within the lake will improve without direct human intervention. The Selected Plan will address these impairments by dredging approximately 104,200 cubic yards of sediment from the lake and installing habitat structures to create shallow and deep water fish habitat.

Approximately 27,200 cubic yards of dredged material will be redistributed within the lake to create wetland and riparian habitat. The remaining 77,000 cubic yards of dredged sediment will be dewatered in an upland location adjacent to the site (Areas F1 and F2). Approximately 15,700 cubic yards of dewatered sediment will remain within area F2, and 61,300 cubic yards will be hauled offsite for disposal at a landfill. No material will remain in area F1 after dewatering. Additional maintenance dredging planned for Project Year 25 will remove approximately 54,400 cubic yards of sediment from the lake for disposal at a landfill.

5.4.3.4 Connectivity

Connectivity refers to the potential for movement and dispersal of species throughout a given area or ecosystem (ER 1105-2-100). The Selected Plan is the only project alternative that incorporates the development of a deep water 'channel' within the upper portion of Canonsburg Lake. This channel will facilitate movement of fish species between the lake and Little Chartiers Creek upstream and promotes connectivity through this dammed portion of the creek.

5.4.3.5 Special Status Species

The Selected Plan will improve habitat for migratory birds protected under the Migratory Bird Treaty Act by improving foraging opportunities. The previously discussed improvements to fish habitat are intended to preserve and improve the diversity and abundance of the lake's fish population, which will serve as a food source for piscivorous species such as the great blue heron and merganser. The great blue heron is a listed Pennsylvania Species of Concern with a documented rookery within the Chartiers Creek Watershed in proximity to Canonsburg Lake. The lake and its adjacent wooded areas provide a desirable habitat for species like the merganser and wood duck, and its marsh wetlands benefit the great blue heron and mallard. The development of additional wetland and riparian habitat will further encourage use of the lake by migratory waterfowl for nesting and foraging. The useful life of the lake will be extended significantly by the Selected Plan, ensuring that Canonsburg Lake will continue to support these species for years to come.

5.4.3.6 Biodiversity

As stated previously, the diversity of the fish population within Canonsburg Lake is threatened by constant accumulation of sediment and subsequent reduction in water depths. The Selected Plan will help to reverse this affect by developing spawning shallows and deep water refugia by dredging and placement of cover structures. By creating additional wetland and riparian habitat planted with an assortment of native species, the overall habitat and vegetative diversity of the lake will be increased as well.

5.4.3.7 Hydrologic Character

Canonsburg Lake is an impoundment of Little Chartiers Creek. The lake has effectively functioned as a sediment sink, retaining suspended solids and nutrients from runoff before they can enter the 0.37 miles of Little Chartiers Creek downstream from the dam that flows into Chartiers Creek. As there is no indication that the Commonwealth of Pennsylvania is considering the removal of the dam, it can be

assumed that the lake shall continue to exist as an impoundment for the foreseeable future. Therefore, it is beyond the scope of the Selected Plan to restore the original riverine hydrologic condition to the aquatic system. However, the Selected Plan will result in considerable improvements to the hydrologic character of the lacustrine ecosystem. The selected plan includes the removal of a substantial amount of accumulated sediment from the lake, thereby increasing the overall volume. Several slackwater areas choked with sediment will be dredged to develop shallows suitable as spawning habitat. Dredging of the shallow and deep water habitat areas within the upper portion of the lake will increase the average depth of the lake. Dredging to create deep water habitat is an element unique to the Selected Plan. In addition, over two acres of emergent/ shrub wetland habitat will be developed by the redistribution of sediment to elevations appropriate to maintain suitable wetland hydrology.

6.0 STATUS OF COMPLIANCE WITH ENVIRONMENTAL PROTECTION STATUTES

Table 16 on the following page lists the Federal Statutes with which the USACE must comply. The table indicates the compliance status of the No-Action alternative and the Selected Plan for each statute.

To meet the requirements of Section 404 of the Clean Water Act, a Preliminary Section 404(b)(1) Evaluation has been prepared which considers the effects of the discharge of fill materials, including the redistribution of dredged sediment to create habitat features and installation of artificial fish habitat structures. The Preliminary 404(b)(1) Evaluation is included as Attachment 5.

The PNDI Environmental Review performed for the study area, discussed in 2.10.1, returned no results for any USFWS listed species and stated that no further coordination is required. The USFWS confirmed that no impacts to Federally protected threatened or endangered species would occur as a result of the Canonsburg Lake Ecosystem Restoration Project. Similarly, no potential impacts to resources under the jurisdiction of the PGC or the PFBC were identified.

Regarding the requirements of the Fish and Wildlife Coordination Act and Section 7 of the Endangered Species Act, the Pittsburgh District coordinated with the State College field office of the USFWS early in the feasibility phase of the project by telephone. The USFWS indicated that they did not wish to participate at that time due to insufficient personnel. This position was reaffirmed by Mr. David Densmore of the State College field office on October 23, 2008 via a telephone call with the USACE Pittsburgh District. As stated previously, this Feasibility Study and Environmental Assessment document will be circulated among pertinent regulatory agencies, including the USFWS, as well as other interested parties for review. The USFWS review of the document at that time will complete the necessary coordination under the Fish and Wildlife Coordination Act and Section 7 of the Endangered Species Act.

TABLE 16
Compliance with Federal Statutes

FEDERAL STATUTES	No-action	Selected Plan
Archeological and Historic Preservation Act as amended, 16 U.S.C. 469, et seq.	FC	FC[1]
Clean Air Act as amended, 42 U.S.C. 7401, et seq.	FC	FC
Clean Water Act (Federal Water Pollution Control Act) as amended, 33 U.S.C. 1251, et seq.	FC	FC[2]
Endangered Species Act as amended, 16 U.S.C. 1531, et seq.	FC	FC[3]
Federal Water Project Recreation Act as amended, 16 U.S.C. 406-1 (12), et seq.	FC	FC
Fish and Wildlife Coordination Act as amended, 16 U.S.C. 661, et seq.	FC	FC[3]
Land and Water Conservation Fund Act as amended, 16 U.S.C. 4601-4601-11, et seq.	FC	FC
National Environmental Policy Act as amended, 42 U.S.C. 4321, et seq.	FC	FC[4]
National Historic Preservation Act as amended, 16 U.S.C. 470a, et seq.	FC	FC[1]
Rivers and Harbors Act, 33 U.S.C. 401, et seq.	FC	FC
Watershed Protection and Flood Prevention Act, 16 U.S.C. 1001, et seq.	FC	FC
Wild and Scenic Rivers Act as amended, 16 U.S.C. 1271, et seq.	NA	NA
EXECUTIVE ORDERS, MEMORANDA, ETC.		
Floodplain Management (E.O. 11988)	FC	FC[5]
Protection of Wetlands (E.O. 11990)	FC	FC
Protection of Children (E.O. 13045)	FC	FC
Environmental Justice in Minority Populations and Low-Income Populations (E.O.12898)	FC	FC
Analysis of Impacts on Prime and Unique Farmland	FC	FC
State And Local Policies	FC	FC

FC - full compliance; NA - not applicable

[1] Full compliance achieved when PASHPO concurs with the USACE Phase I CRM assessment

[2] Full compliance achieved when the District receives Section 401 Water Quality Certification from the Commonwealth of Pennsylvania

[3] Full compliance achieved when USFWS completes review of the Feasibility Study and Environmental Assessment document for the project

[4] Full compliance achieved after the District Engineer signs the FONSI

[5] Full compliance with the local floodplain management regulations may require a detailed flood hazard analysis to determine if the project increases 100-year flood elevations

The PNDI Environmental Review performed for the study area indicated one possible impact falling under the jurisdiction of the PA DCNR. Upon consultation, the PA DCNR recommended that a survey should be conducted for *Trillium nivale*, a State-listed rare species, and *Camassia scilloides*, a State-listed threatened species (proposed endangered) if the typical habitat for these species (moist woods) is present on the site. The correspondence indicates that if this land type does not exist on the site, a survey will not be necessary. Some wooded wetland areas are present within portions of the PFBC property surrounding the lake; however, these areas have been prioritized for avoidance for the lake restoration project. While it is unlikely that any of the project alternatives would result in impacts to these State-listed species, the appropriate follow-up coordination will be conducted as part of future project implementation.

The requirements of Section 106 of the National Historic Preservation Act and the Archeological and Historic Preservation Act of 1974 is being fulfilled by the Pittsburgh District's coordination with the Pennsylvania State Historic Preservation Officer and the consideration of the effects of the project on extant cultural resources. It is the opinion of the Corps Archaeologist that neither of the sites identified during the USACE Pittsburg District's Phase I testing of the proposed sediment dewatering and storage area are potentially eligible for the National Register of Historic places and no further study is required. The field report is being reviewed by the PASHPO and the Pittsburgh District is confident that the PASHPO will concur with this assessment.

To meet the requirements of the floodplain use regulations of both North Strabane and Peters Townships, coordination with the local floodplain administrators will be required as part of future project implementation. Although the project is designated as an approximate 100-year (Zone A) floodplain on the FEMA-published flood maps, the local floodplain administrator may require a flood hazard impact analysis to determine the impact of the placement of material in the lake protruding above the normal pool lake level.

7.0 PLAN IMPLEMENTATION

7.1 Institutional Requirements

Prior to initiation of construction, Congress must appropriate funds for the Federal share of project costs. Requirements for non-Federal participation must also be met prior to initiation of construction. This includes the execution of a PCA between the local sponsor and the Federal government and the provision of all funds and/or work necessary to satisfy the cost sharing requirements in effect at the time of PCA execution. Upon completion of construction, the project will become the responsibility of the local sponsor for operation and maintenance.

7.2 Division of Plan Responsibilities

The PFBC and the Washington WCWA are the non-Federal (local) sponsors for the project. A Project Cooperation Agreement specifying the responsibilities of all parties must be consummated prior to initiation of design. The Corps of Engineers will complete the plans and specifications, provide funds and actually construct the project, and conduct an annual inspection of the completed project. The estimated

total cost is $6,078,339, in FY '09 dollars, of which 65% is Federal cost and the non-Federal cost is 35%. The present worth of O&M dredging and installation of new fish habitat structures in year 25 of the project is estimated by U.S. Cost, Inc. at $1,180,301. This is a grandfathered 206 project and, consequently, no FCSA was executed for the current feasibility study. The local cost share of the feasibility study will be paid during construction. The total project costs are detailed in Table 17 below.

TABLE 17

Total Project Costs

Description	Federal Cost (65%)	Non-Federal Cost (35%)	Total Cost
Detailed Project Report	$277,550	$149,450*	$427,000*
Lands and Damages	$0	$121,200	$121,200
Planning and Engineering Design	$557,042	$299,945	$856,987
Construction Management	$208,891	$112,480	$321,371
Construction	$2,828,658	$1,523,123	$4,351,781
Total	**$3,872,141**	**$2,206,198**	**$6,078,339**

*Initially fully federally funded; local cost share paid during construction.

Note: The present worth of maintenance dredging, a Local Sponsor obligation to be conducted in Year 25, is $1,180,301.

As detailed in the Real Estate Plan, Appendix E, there are a total of 52.194 acres for this project, all of which are owned in fee simple or will be owned in fee simple by the PFBC. The PFCB and the WCWA are co-sponsors of this project. The Sponsors currently own 47.994 acres of the land in fee simple and they will acquire 4.20 acres of fee through the Pennsylvania Turnpike Commission, an agency capable of acquiring lands. The Pennsylvania Turnpike Commission will be acquiring neighboring lands for the Southern Expressway, a four-lane highway that goes from Elizabeth to the Pittsburgh International Airport. For crediting purposes, the acreage breakdown is as follows and the Sponsors will receive credit for these estates.

- A total of 49.76 acres of permanent channel improvement easement is located in the lake.
- A total of 0.701 acres of temporary work area easements outside of the lake will be required for staging, and support areas.
- A total of 1.733 acres of permanent road easement will be required for access to the lake and for maintenance during the life of the project.

The acreage, as well as the Federal and non-Federal costs associated with these estates, are shown in Table 18 on the following page.

TABLE 18
Summary of Real Estate Costs

Estate	Area	Federal Costs	Non-Federal Costs
Permanent Channel Improvement Easement	49.76 acres	$0	$34,832
Temporary Work Area Easement	0.701 acres	$0	$393
Permanent Road Easement	1.733 acres	$0	$5,459
Total	**52.194 acres**	**$0**	**$40,684**

A model PCA is included as Appendix F. The following is a summary of the operation, maintenance, and management responsibilities of the non-Federal sponsors that will be contained in the PCA:

a. Provide 35% of the total project costs.

b. For so long as the project remains authorized; operate, maintain, repair, replace, and rehabilitate the completed project or functional portion of the project, at no cost to the Federal Government, in accordance with applicable Federal and State laws and any specific directions prescribed by the Federal Government.

c. Give the Federal Government a right to enter, at reasonable times and in a reasonable manner, upon land that the non-Federal sponsors own or control for access to the project for the purpose of inspection and, if necessary, after failure to perform by the non-Federal sponsors, for the purpose of completing, operating, maintaining, repairing, replacing, or rehabilitating the project.

d. Hold and save the United States free from all damages arising from the construction, operation, maintenance, repair, replacement, and rehabilitation of the project and any project-related betterments, except for damages due to the fault or negligence of the United States or its contractors.

e. Keep and maintain books, records, documents, and other evidence pertaining to costs and expenses incurred pursuant to the project in accordance with the standards for financial management systems set forth in the Uniform Administrative Requirements for Grants and Cooperative Agreements to State and Local Governments at 32 Code of Federal Regulations (CFR), Section 33.20.

f. Perform, or cause to be performed, any investigations for hazardous substances as are determined necessary to identify the existence and extent of any hazardous substances regulated under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), 42 U.S.C. 9601-9675, that may exist in, on, or under lands, easements, or rights-of-way that the Federal Government determines to be required for the operation, maintenance, repair, replacement and rehabilitation of the project. However, for lands that the Federal Government determines to be subject to the navigation servitude, only the Federal Government shall perform such investigations unless the Federal Government provides the non-Federal sponsors with prior specific written direction, in which case the non-Federal sponsors shall perform such investigations in accordance with such written direction.

g. Assume complete financial responsibility, as between the Federal Government and the non-Federal sponsors, for all necessary cleanup and response costs of any CERCLA regulated materials located in, on, or under lands, easements, or rights-of-way that the Federal Government determines to be required for the operation, maintenance, repair, replacement, or rehabilitation of the project.

h. As between the Federal Government and the non-Federal sponsors, the non-Federal sponsors shall be considered the operators of the project for the purpose of CERCLA liability. To the maximum extent practical, operate maintain, repair, replace, and rehabilitate the project in a manner that will not cause liability to arise under CERCLA.

i. Comply with the applicable provisions of the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970, Public Law 91-646, as amended by Title IV of the Surface Transportation and Uniform Relocation Assistance Act of 1987 (Public Law 100-17), and the Uniform Regulations contained in 49 CFR, Part 24, in acquiring lands, easements, and rights-of-way required for the operation maintenance repair, replacement, and rehabilitation of the project, including those necessary for relocations, borrow materials, and dredged or excavated material disposal, and inform all affected persons of applicable benefits, policies, and procedures in connection with said act.

j. Comply with all applicable Federal and State laws and regulations including, but not limited to, Section 601 of the Civil Rights Act of 1964, Public Law 88-352 (42 U.S.C. 2000d), and Department of Defense Directive 5500.11 issued pursuant thereto, as well as Army Regulation 600-7, entitled Nondiscrimination on the Basis of Handicap in Programs and Activities Assisted or Conducted by the Department of the Army, and Section 402 of the Water Resources Development Act of 1986, as amended (33 U.S.C. 701b-12), requiring non-Federal preparation and implementation of floodplain management plans.

k. Provide 5 percent of that portion of total cultural resources preservation, mitigation and data recovery costs attributed to the project that are in excess of 1 percent of the total amount authorized to be appropriated for the project.

l. Participate in and comply with applicable Federal floodplain management and flood insurance programs.

m. Prescribe and enforce regulations to prevent obstruction of or encroachment on the project that would reduce the level of protection it affords or that would hinder operation and maintenance of the project.

n. Comply with Section 221 of Public Law 91-611, as amended, and Section 103 of Public Law 99-662, as amended, which provides that the Secretary of the Army shall not commence the construction of any water resources project or separable element thereof, until the non-Federal sponsors have entered into a written agreement to furnish its required cooperation for the project or separable element.

o. Provide and maintain necessary access roads, parking areas and other public use facilities, open and available to all on equal terms.

p. Not use Federal funds to meet the non-Federal sponsors' share of total project costs unless the Federal granting agency verifies in writing that the expenditure of such funds is expressly authorized by statute.

7.3 Views of the Non-Federal Sponsors

Coordination with the non-Federal sponsor has been on-going throughout the duration of the project, beginning with the original kick-off meeting at Canonsburg Lake and at the offices of the WCCD on October 4, 2006, and concluding with the project meeting to present the Technical Appendices on December 5, 2007, in the Pittsburgh District offices. At the kick-off meeting, the non-Federal sponsors provided information related to the lake master planning effort that was on-going at that time. There was also a discussion of the efforts of the watershed stakeholders to find solutions to the degradation of the lake related to sediment deposition.

Further coordination with the non-Federal sponsor occurred during the course of the study to investigate dredge material disposal. Gary Stokum with the WCCD contacted local landfill operators and identified the Arden Road landfill, operated by Waste Management, Inc., as a candidate for off-site disposal. Representatives of the non-Federal sponsor were involved in other discussions of project alternatives during the plan formulation process.

The presentation of project alternatives at the December 5th meeting described the best-buy alternatives that are presented in this report. The most notable feedback from the non-Federal sponsor was that the dredging of Area E for deepwater would be important to maintain support of the project among the local stakeholders. Project Alternative 36 is the only best-buy alternative that contains dredging for deep water habitat in Area E.

Locally Preferred Alternative

In the December 5, 2007 meeting and in a subsequent conversation with Gary Stokum, questions were asked about the feasibility of project Alternative 29, which also contains the dredging of Area E for deep water habitat. Alternative 29 is a cost effective alternative as described in Appendix G; however, it is not a best-buy alternative. Alternative 29 provides most of the same habitat features as Alternative 36, the difference being in Area C where there would be emergent wetland habitat instead of shallow water submerged aquatic habitat. Alternative 29 is less expensive than 36, both to construct and to maintain, as noted in Table 19. Alternative 29 is not a best-buy alternative primarily because emergent wetland areas are not redredged during the project life and generate less cumulative habitat units.

In a January 29, 2008 letter addressed to the Pittsburgh District, the PFBC provided their feedback on the review of the draft report and pertaining to their preferences for the project alternatives.

- They would not be in favor of any project alternative that did not include the deep water submerged aquatic habitat in Area 'E'. They also recommended that the maintenance re-dredging associated with shallow water aquatic habitat areas also be applied to the deep water habitat.

- They do not prefer the determined restoration activities in Areas D1 and D2; they would prefer to see those areas as shallow water (D1) and deep water (D2) habitat, as opposed to the riparian and emergent wetland habitat of the Selected Plan.
- They recommend Alternative 36 (the Selected Plan), but would prefer to see Area D1 restored as shallow water aquatic habitat as opposed to riparian habitat.
- They offer the preferred "next best" alternatives (in priority order) would be Alternatives 33, 26 and 25.

The "next best" alternatives identified in the PFBC letter contain a variety of restoration activities in Areas 'A', 'B' and 'C' (refer to Table 19 below). All of them contain the deep water submerged aquatic habitat in Area 'E' and do not include any restoration activities in Areas 'D1' and 'D2'. The costs associated with these other project alternatives are also included in Table 19. None of the "next best" project alternatives identified by the PFBC are either best buy or cost effective alternatives (refer to Table G-18 in Appendix G for the cost effective alternatives). The primary reason these project alternatives are not considered cost effective when compared to the other alternatives is that they have very little redistribution of dredged material within the lake, or none at all. This increases project costs related to disposal of the dredge material in the near-lake or off-site location, without providing additional habitat value to the project.

TABLE 19
Comparison of Project Alternatives 29 and 36

Alternative Number	Restoration Areas						Total Construction Costs*	Annual O&M Costs*
	A (4.07 ac.)	B (3.42 ac.)	C (5.99 ac.)	D1 (0.97 ac.)	D2 (2.02 ac.)	E (10.3 ac.)		
25	SW	SW				DW	$5,326,233	$24,150
26	SW	SW	EW			DW	$5,181,622	$24,150
29	SW	SW	EW	RH	EW	DW	$4,352,721	$24,150
33	SW	SW	SW			DW	$6,876,364	$43,117
36	SW	SW	SW	RH	EW	DW	$6,047,463	$43,117

Legend:

SW - Shallow Water Submerged Aquatic Habitat
EW - Emergent Wetland Habitat
RH - Riparian Habitat
DW - Deep Water Submerged Aquatic Habitat

* Note: For the purposes of a direct comparison, these total construction costs are taken from the screening level cost estimates represented in Appendices D and G; the MCACES-based cost estimate for Alternative 36 is $6,144,122.

8.0 CONCLUSIONS AND RECOMMENDATIONS

8.1 Conclusions

This ecosystem restoration report and its attendant appendices have presented an in-depth analysis of existing conditions at Canonsburg Lake. To restore the habitat that has been severely degraded by decades of sedimentation stemming from past agricultural activities and ongoing urban development will require extensive ecosystem treatment. The restoration options carefully considered in this report, if implemented, will restore shallows and deep water aquatic habitat, emergent wetlands and riparian habitat, and improve the overall ecological, recreational, and aesthetic characteristics of the lake.

8.2 Recommendations

The presentation of project alternatives at the project coordination meeting on December 5, 2007 described the best-buy alternatives that are presented in this report. The most notable feedback from the non-Federal sponsor was that the dredging of Area E for deepwater would be important to maintain support of the project among the local stakeholders. Project Alternative 36 (Selected Plan) is the only best-buy alternative that contains dredging for deep water habitat in Area E.

In the December 5, 2007 meeting and in a subsequent conversation with Gary Stokum of the WCCD, questions were asked about the feasibility of project Alternative 29, which also contains the dredging of Area E for deep water habitat. Mr. Stokum expressed the non-Federal sponsor's preference for Alternative 29 at this meeting, a preference which was reiterated at a subsequent meeting on October 26, 2008. Alternative 29 is a cost effective alternative as described in Appendix G; however, it is not a best-buy alternative. Alternative 29 provides most of the same habitat features as Alternative 36, the difference being in Area C where there would be emergent wetland habitat instead of shallow water submerged aquatic habitat. Alternative 29 is less expensive than 36, both to construct and to maintain. Alternative 29 is not a best-buy alternative primarily because emergent wetland areas are not redredged during the project life and generate less cumulative habitat units. Although Alternative 29 is preferred by the non-Federal sponsor, they have indicated their willingness to support the implementation of the Selected Plan (Alternative 36) as they are committed to the restoration of Canonsburg Lake.

Alternative 36, the Selected Plan, as presented in this report is the most cost effective alternative that produces maximum benefits for the least cost. The cost of the Selected Plan is within the statutory Federal cost sharing limits. Having considered the biological deficiencies of Canonsburg Lake and the feedback provided by the non-Federal sponsor, the District recommends approval of this Feasibility Study and Integrated EA in order to allow the Selected Plan described herein to move into the next phases, Plans and Specifications and Construction.

Note: The recommendations contained herein reflect the information available at this time and current Departmental policies governing formulation of individual projects. They do not reflect program and budgeting priorities inherent in the formulation of a

national Civil Works construction program nor the perspective of higher review levels within the Executive Branch. Consequently, the recommendations may be modified before they are transmitted to the Congress as proposals for authorization and implementation funding. However, prior to transmittal to Congress, the sponsor, the States, interested Federal agencies, and other parties will be advised of any modifications and will be afforded an opportunity to comment further.

Date

Michael P. Crall
Colonel, Corps of Engineers
District Engineer

9.0 CITATIONS

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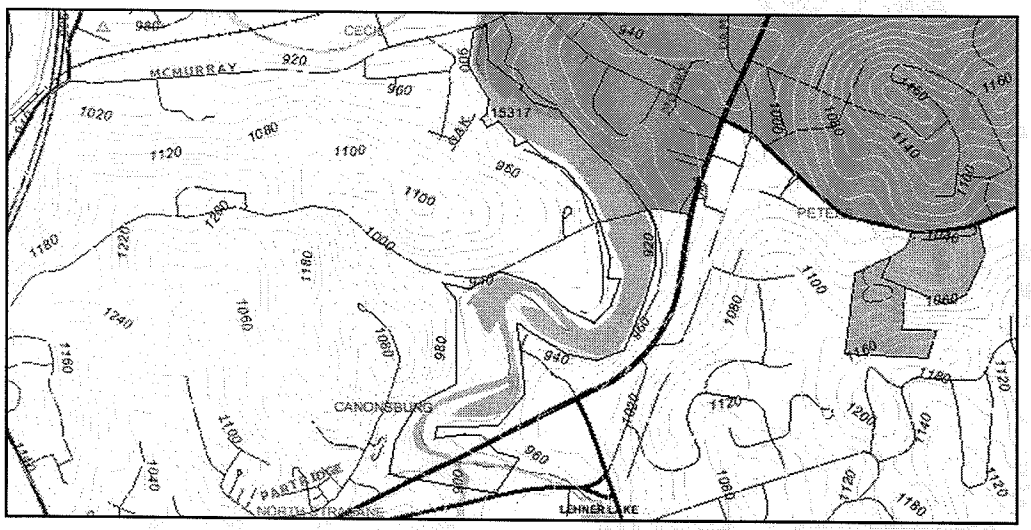
ATTACHMENT 1

PNDI Environmental Review Receipt

PNDI Project Environmental Review Receipt
Project Search ID: 20080417137100
Project Name: Canonsburg Lake FSEA
Date: 4/17/2008 4:25:55 PM

Project Location



Project Name: Canonsburg Lake FSEA
On Behalf Of: Self
Project Search ID: 20080417137100
Date: 4/17/2008 4:25:49 PM
# of Potential Impacts: 1
Jurisdictional Agency:
Pennsylvania Department of Conservation and Natural Resources
Project Category: Habitat Conservation and Restoration,Other
Project Location
Decimal Degrees: 40.27622 N, -80.13842 W
Degrees Minutes Seconds: 40° 16' 34.4" N, 80° 8' 18.3" W
Lambert: -596107.75351166, 468581.92842141 ft
ZIP Code: 15317
County: Washington
Township/Municipality: PETERS,NORTH STRABANE
USGS 7.5 Minute Quadrangle ID: 198
Quadrangle Name: CANONSBURG
Project Area: 138.2 acres

Location Accuracy

Project locations are assumed to be both precise and accurate for the purposes of environmental review. The creator/owner of the Project Review Receipt is solely responsible for the project location and thus the correctness of the Project Review Receipt content.

1 Potential Impacts

Under the Following Agencies' Jurisdiction: Pennsylvania Department of Conservation and Natural Resources

 APPLICANT INITIALS: _____

PNDI Project Environmental Review Receipt

Project Search ID: 20080417137100
Project Name: Canonsburg Lake FSEA
Date: 4/17/2008 4:25:55 PM

Pennsylvania Natural Diversity Inventory (PNDI) records indicate there are potential impacts on special concern species and resources within the project area. If the project is pursued, the jurisdictional agency/agencies indicated require that the instructions below regarding potential impacts and/or avoidance measures be followed in their entirety.

These determinations were based on the project-specific information you provided, including the exact project location; the project type, description, and features; and any responses to questions that were generated during this search. If any of the information you provided does not accurately reflect this project, or if project plans change, DEP and the jurisdictional agencies require that another PNDI review be conducted.

This response represents the most up-to-date summary of the PNDI data files and is good for one(1) year from the date of this PNDI Project Environmental Review Receipt.

1 potential impact
The Applicant should MAIL/FAX a copy of this Project Environmental Review Receipt, a cover letter with project narrative, acreage to be impacted, how construction/maintenance activity is to be accomplished, township/municipality and county where project is located, and a USGS 7.5 minute quadrangle with project boundary and quad name marked on the map.

Ecological Services Section
Pennsylvania Department of Conservation and Natural Resources
Bureau of Forestry
P.O. Box 8552
Harrisburg, PA 17105-8552
FAX Number: (717) 772-0271

Based on the project-specific information you provided, no impacts to federally listed, proposed, or candidate species are anticipated. Therefore, no further consultation under the Endangered Species Act (87 Stat. 884, as amended; 16 U.S.C. 1531 *et seq.* is required with the U.S. Fish and Wildlife Service. Because no take of federally listed species is anticipated, none is authorized. For a list of species that could occur in your project area (but have not been documented in PNDI), please see the county lists of threatened, endangered, and candidate species. A field visit or survey may reveal previously undocumented populations of one or more threatened or endangered species with a project area. If it is determined that any federally listed species occur in your project area, the U.S. Fish and Wildlife Service requires that you initiate consultation to identify and resolve any conflicts. This response does not reflect potential Fish and Wildlife Service concerns under the Fish and Wildlife Coordination Act or other authorities.

DISCLAIMER

The PNDI environmental review website is a preliminary environmental screening tool. It is not a substitute for information obtained from a field survey of the project area conducted by a biologist. Such surveys may reveal previously undocumented populations of species of special concern. In addition, the PNDI only contains information about species occurrences that have actually been reported to the Pennsylvania Natural Heritage Program.

TERMS OF USE

Upon signing into the PNDI environmental review website, and as a condition of using it, you agreed to certain terms of use. These are as follows:

The web site is intended solely for the purpose of screening projects for potential impacts on resources of special concern in accordance with the instructions provided on the web site. Use of the web site for any other purpose or in any other way is prohibited and subject to criminal prosecution under federal and state law, including but not limited to the following:

 APPLICANT INITIALS: _____

Computer Fraud and Abuse Act of 1986, as amended, 18 U.S.C. Â§ 1030; Pennsylvania Crimes Code, Â§ 4911 (tampering with public records or information), Â§ 7611 (unlawful use of computer and other computer crimes), Â§ 7612 (disruption of service), Â§ 7613 (computer theft), Â§ 7614 (unlawful duplication), and Â§ 7615 (computer trespass).

The PNHP reserves the right at any time and without notice to modify or suspend the web site and to terminate or restrict access to it.

The terms of use may be revised from time to time. By continuing to use the web site after changes to the terms have been posted, the user has agreed to accept such changes.

This review is based on the project information that was entered. The jurisdictional agencies and DEP require that the review be redone if the project area, location, or the type of project changes. If additional information on species of special concern becomes available, this review may be reconsidered by the jurisdictional agency.

PRIVACY and SECURITY

This web site operates on a Commonwealth of Pennsylvania computer system. It maintains a record of each environmental review search result as well as contact information for the project applicant. These records are maintained for internal tracking purposes. Information collected in this application will be made available only to the jurisdictional agencies and to the Department of Environmental Protection, except if required for law enforcement purposesâ€"see paragraph below.

This system is monitored to ensure proper operation, to verify the functioning of applicable security features, and for other like purposes. Anyone using this system consents to such monitoring and is advised that if such monitoring reveals evidence of possible criminal activity, system personnel may provide the evidence to law enforcement officials. See Terms of Use.

In order for this project to be considered for subsequent review, a signed and initialed copy of this receipt is required by the agency or agencies indicated. DEP requires that a signed and initialed copy of this receipt, along with any required documentation from jurisdictional agencies concerning resolution of potential impacts, be submitted in applications for permits requiring PNDI review. See DEP PNDI policy at www.naturalheritage.state.pa.us or visit the following websites for further information.

Regional Offices
Http://www.dep.state.pa.us/dep/deputate/fieldops/map.pdf

District Mining Operations
Http://www.dep.state.pa.us/dep/deputate/minres/Districts/homepage/Default.htm

Oil and Gas Management
Http://www.dep.state.pa.us/dep/deputate/minres/OILGAS/CustomerNeeds.htm

Print this Project Review Receipt using your Internet browser's print function and keep it as a record of your search.

Signature: _____

Date: _____

Project applicant on whose behalf this search was conducted:

APPLICANT

 APPLICANT INITIALS: _____

PNDI Project Environmental Review Receipt
Project Search ID: 20080417137100
Project Name: Canonsburg Lake FSEA
Date: 4/17/2008 4:25:55 PM

Contact Name: _____ FAX Number: (717) 772-0271

Address: _____

City, State, Zip: _____

Phone: _____

Email: _____

PERSON CONDUCTING SEARCH (if not applicant)

Contact Name: _____

Address: _____

City, State, Zip: _____

Phone: _____

Email: _____

The following contact information is for the agencies involved in this Pennsylvania Natural Diversity Inventory environmental review process. Please read this entire receipt carefully as it contains instructions for how to contact these agencies for further review of this particular project.

Ecological Services Section
Pennsylvania Department of Conservation and Natural Resources
Bureau of Forestry
P.O. Box 8552
Harrisburg, PA 17105-8552

 APPLICANT INITIALS: _____

ATTACHMENT 2

USFWS Correspondence

Queen Darby, Melissa

From: Pamela_Shellenberger@fws.gov
Sent: Monday, April 28, 2008 10:27 AM
To: Queen Darby, Melissa
Cc: Hebert, Miles
Subject: Re: Canonsburg Lake

Your 'no impacts' PNDI receipt should serve as a no impacts response from our agency. No further coordination with the USFWS is necessary for this project. Thank you,

Pamela Shellenberger
Fish and Wildlife Biologist
Endangered Species Program
U.S. Fish and Wildlife Service
315 South Allen Street, Suite 322
State College, PA 16801
814-234-4090 x241
814-234-0748 Fax

"Queen Darby, Melissa" <mqueendarby@emht.com>
04/22/2008 01:40 PM

To <Pamela_Shellenberger@fws.gov>
cc "Hebert, Miles" <mhebert@emht.com>
Subject Canonsburg Lake

Hi Pam,

Thank you for attempting to reach me today - I was out in the field earlier. I thought I would try email this time! I just wanted to get your advice on how to go about conducting coordination with your agency for the Canonsburg Lake Ecosystem Restoration project in Washington County, PA.
This is a Section 206 project we are working on with the USACE Pittsburgh. We currently are in the Feasibility Study/ Environmental Assessment phase of this project, and have examined several restoration alternatives. In general, the alternatives would involve dredging of lake sediments in order to reestablish shallows and deep water areas, using the sediment to fill geotubes and create planted wetland and riparian areas. Fish habitat structures would be used to improve spawning and deepwater habitat.

We recently performed a PNDI search for the project area, which returned no USFWS listings. The PNDI review receipt indicates that no impacts to federally listed, proposed or candidate species are anticipated, and no further coordination with USFWS is required. We have further noted that no federally listed species are indicated for Washington County with the exception of sheep nose (C), which was indicated for the Monongahela River and not near our project. I would like to get your input as to whether any further coordination with your agency could be necessary for the project, and if so, how would you recommend this coordination be conducted.

Thank you for your input!

Melissa

Melissa Queen Darby
Environmental Scientist
Environmental Department

Evans, Mechwart, Hambleton, & Tilton, Inc. (EMH&T) Engineers, Surveyors, Planners, Scientists 5500 New Albany Road Columbus, Ohio 43054
614.775.4517 Direct
614.775.4802 Fax
emht.com

ATTACHMENT 3

PA DCNR Correspondence

EMH&T
Evans, Mechwart, Hambleton & Tilton, Inc.
Engineers, Surveyors, Planners, Scientists

May 9, 2008

Ecological Services Section
PA Department of Conservation and Natural Resources
Bureau of Forestry
P.O. Box 8552
Harrisburg, PA 17105-8552

Subject: Project Environmental Review for Canonsburg Lake Ecosystem Restoration Project

To Whom It May Concern,

On behalf of the U.S. Army Corps of Engineers - Pittsburg District (USACE), Evans, Mechwart, Hambleton & Tilton, Inc. (EMH&T) is submitting this letter to initiate environmental coordination with your agency for the Section 206 Canonsburg Lake Ecosystem Restoration Project. Canonsburg Lake is located in North Strabane and Peters Townships, in north-central Washington County, Pennsylvania, primarily within lands owned by the Pennsylvania Fish and Boat Commission (PFBC). The project location is indicated on the enclosed USGS 7.5 minute Canonsburg, PA (USGS, 1979) quadrangle. A Pennsylvania Natural Diversity Inventory (PNDI) Environmental Review Receipt for the project is also enclosed. The PNDI indicated one (1) potential impact to a resource under the jurisdiction of your agency. We are submitting this information to satisfy National Environmental Policy Act (NEPA) requirements for the project.

Project Background

Canonsburg Lake was built between 1941 and 1943 by the Alcoa Corporation as a manufacturing water supply. The lake dam is approximately 525 feet long and 45 feet high, impounding water from the Little Chartiers Creek basin. Historically the lake had a surface area of approximately 76 acres, a volume of 775 acre/feet, a mean depth of 9.2 feet and a maximum depth of 42.6 feet (PA DEP, 2/2004).

Due to years of heavy siltation, the maximum and average depth and total volume have decreased considerably according to an internal study conducted by the Pennsylvania Department of Environmental Protection (PA DEP) in 1987. According to the PFBC, the lake was found to have a maximum depth of approximately 11.5 feet during the 1980's. The total volume of the lake is currently estimated to be in the region of 322 acre/feet, which represents a 58% reduction in holding capacity from the lake's original volume. Currently, the surface area of the lake is approximately 63 acres, a reduction of 17% since 1943.

The overall objective of the plan formulation process for the Canonsburg Lake ecosystem restoration project is to develop project alternatives that address the degraded ecosystem within the lake, considering the existing impairments (problems) and opportunities to reverse those impairments or otherwise enhance the current habitat conditions. Successfully achieving this objective will require a focus on the natural integrity, productivity, stability and biological diversity of the lake and immediately surrounding areas. The specific objectives related to achieving the goal of ecosystem restoration and providing for the opportunities listed above are summarized below.

- Remove accumulated sediment materials from the lake bottom in areas that will most likely benefit aquatic habitat, with the focus on fish spawning habitat.
- Enhance emerging wetland and riparian zone habitats within and adjacent to the perimeter of the lake, attempting to establish a diverse and native vegetative community.
- Reduce the likelihood of continued sediment deposition within the upper portion of the lake that would counter any proposed habitat enhancement.
- Improve the ability of the lake environment to assimilate pollutants conveyed within the lake water column.

Proposed Restoration Activities

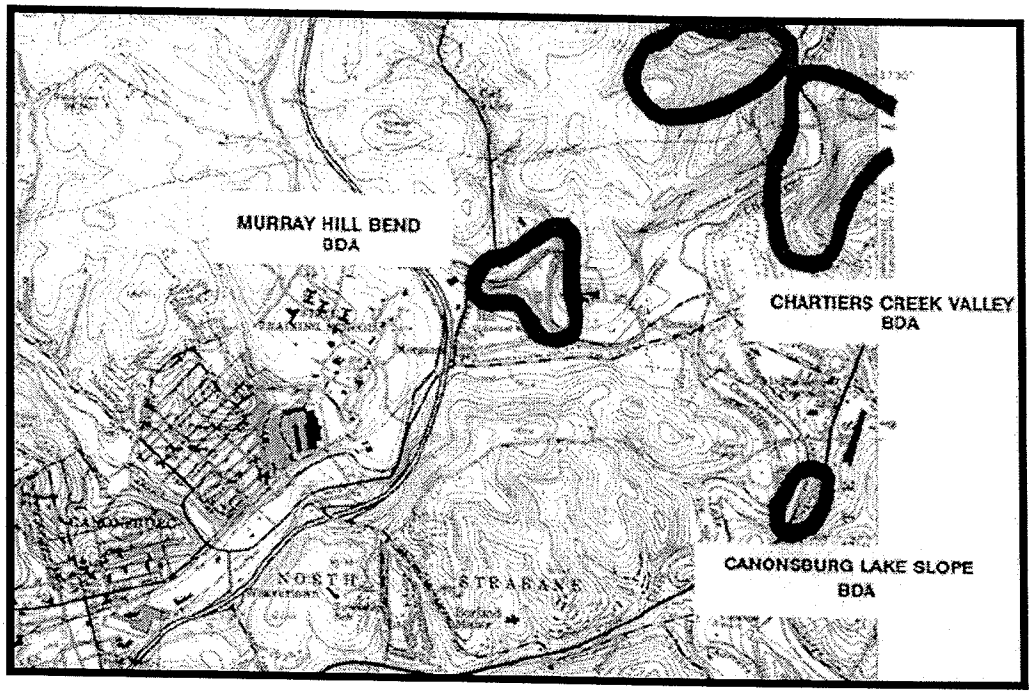
We currently are in the Feasibility Study/Environmental Assessment phase of this project, and have examined several restoration alternatives. The overwhelming majority of the proposed restoration work would occur within the footprint of Canonsburg Lake itself, and all work will occur south of the McDowell Lane causeway which crosses the lake. In general, the alternatives would involve hydraulic dredging of lake sediments in order to reestablish shallows and deep water areas, using the sediment to fill geotubes and create planted wetland and riparian areas. Some sediment would be dewatered and temporarily stored within an upland area on the western portion of the site (indicated within the green boundary on the enclosed USGS map). The project study area, including the entire PFBC property and the adjacent proposed sediment handling area, is approximately 140 acres.

State Resources

According to species distribution maps available on the Pennsylvania Game Commission website (Pennsylvania Game Commission, 12/12/06), no State-listed threatened or endangered species are indicated for Washington County. According to the *Washington County Natural Heritage Inventory* (Wagner, 1994), one Biological Diversity Area (BDA) is located within the project boundaries. The Canonsburg Lake Slope BDA is located between SR 19 and the lake, just south of Donaldsons Crossroads. It consists of a small band of forested slope that supports many spring wildflowers, including one species of special concern in Pennsylvania (the species name is not indicated within the report). The report advises that this area be protected from disturbance or clearing. The proposed restoration project for Canonsburg Lake would not require work/ disturbance within or in close proximity to the Canonsburg Slope BDA.

The Canonsburg Lake Slope BDA is indicated on the map on the following page, excerpted from the *Washington County Natural Heritage Inventory*.

May 9, 2008



Canonsburg Lake Slope BDA
Washington County Natural Heritage Inventory, 1994

We would appreciate a response in writing indicating whether further coordination with the Department of Conservation and Natural Resources will be necessary for the Canonsburg Lake Project. Please contact me at 614-775-4517 if you have any questions about the enclosed information. Thank you for your assistance in this matter.

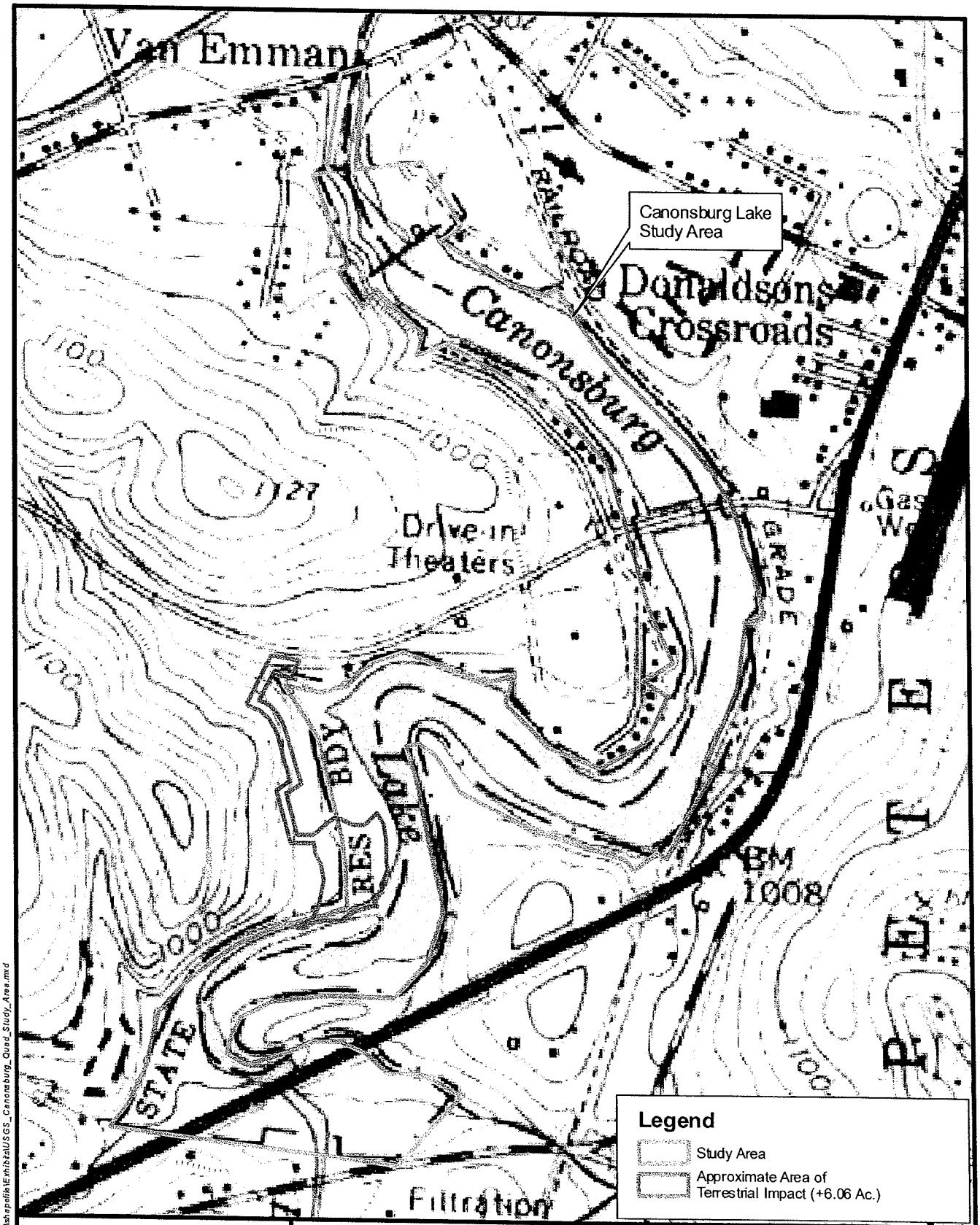
Sincerely,

EVANS, MECHWART, HAMBLETON & TILTON, INC.

Melissa Queen Darby

Melissa Queen Darby
Environmental Scientist
Environmental Department

Enclosures: 2



EMH&T
Evans, Mechwart, Hambleton & Tilton, Inc.
Engineers • Surveyors • Planners • Scientists
5500 New Albany Road, Columbus, OH 43054
Phone: 614.775.4500 Fax: 614.775.4800
M C M X X V I

U.S. ARMY CORPS OF ENGINEERS, PITTSBURGH DISTRICT
CANONSBURG LAKE ECOSYSTEM RESTORATION PROJECT

1

USGS Canonsburg Quadrangle
Canonsburg Lake Study Area

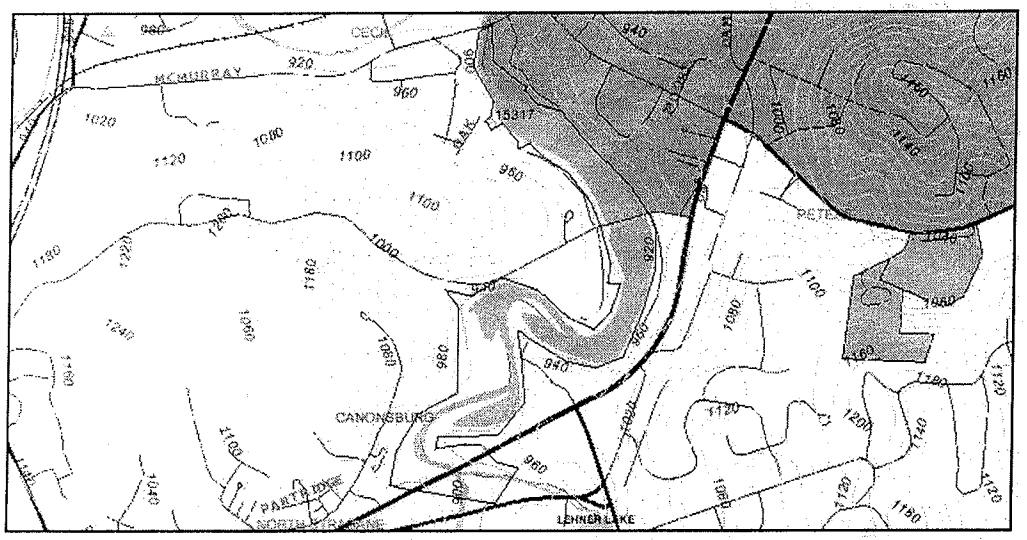
0 250 500 1,000 Feet

Source: MapTech - Canonsburg USGS Quad, Edition Date 1979

O:\PRO\JEC\120082115.ENV\shapefile\Exhibits\USGS_Canonsburg_Quad_Study_Area.mxd

PNDI Project Environmental Review Receipt
Project Search ID: 20080417137100
Project Name: Canonsburg Lake FSEA
Date: 4/17/2008 4:25:55 PM

Project Location



Location Accuracy

Project locations are assumed to be both precise and accurate for the purposes of environmental review. The creator/owner of the Project Review Receipt is solely responsible for the project location and thus the correctness of the Project Review Receipt content.

1 Potential Impacts

Under the Following Agencies' Jurisdiction: Pennsylvania Department of Conservation and Natural Resources

Project Name: Canonsburg Lake FSEA
On Behalf Of: Self
Project Search ID: 20080417137100
Date: 4/17/2008 4:25:49 PM
# of Potential Impacts: 1
Jurisdictional Agency:
Pennsylvania Department of Conservation and Natural Resources
Project Category: Habitat Conservation and Restoration,Other
Project Location
Decimal Degrees: 40.27622 N, -80.13842 W
Degrees Minutes Seconds: 40° 16' 34.4" N, 80° 8' 18.3" W
Lambert: -596107.75351166, 468581.92842141 ft
ZIP Code: 15317
County: Washington
Township/Municipality: PETERS,NORTH STRABANE
USGS 7.5 Minute Quadrangle ID: 198
Quadrangle Name: CANONSBURG
Project Area: 138.2 acres

 APPLICANT INITIALS: MAD

PNDI Project Environmental Review Receipt

Project Search ID: 20080417137100
Project Name: Canonsburg Lake FSEA
Date: 4/17/2008 4:25:55 PM

Pennsylvania Natural Diversity Inventory (PNDI) records indicate there are potential impacts on special concern species and resources within the project area. If the project is pursued, the jurisdictional agency/agencies indicated require that the instructions below regarding potential impacts and/or avoidance measures be followed in their entirety.

These determinations were based on the project-specific information you provided, including the exact project location; the project type, description, and features; and any responses to questions that were generated during this search. If any of the information you provided does not accurately reflect this project, or if project plans change, DEP and the jurisdictional agencies require that another PNDI review be conducted.

This response represents the most up-to-date summary of the PNDI data files and is good for one(1) year from the date of this PNDI Project Environmental Review Receipt.

1 **potential impact**
The Applicant should MAIL/FAX a copy of this Project Environmental Review Receipt, a cover letter with project narrative, acreage to be impacted, how construction/maintenance activity is to be accomplished, township/municipality and county where project is located, and a USGS 7.5 minute quadrangle with project boundary and quad name marked on the map.

Ecological Services Section
Pennsylvania Department of Conservation and Natural Resources
Bureau of Forestry
P.O. Box 8552
Harrisburg, PA 17105-8552
FAX Number: (717) 772-0271

Based on the project-specific information you provided, no impacts to federally listed, proposed, or candidate species are anticipated. Therefore, no further consultation under the Endangered Species Act (87 Stat. 884, as amended; 16 U.S.C. 1531 *et seq.* is required with the U.S. Fish and Wildlife Service. Because no take of federally listed species is anticipated, none is authorized. For a list of species that could occur in your project area (but have not been documented in PNDI), please see the county lists of threatened, endangered, and candidate species. A field visit or survey may reveal previously undocumented populations of one or more threatened or endangered species with a project area. If it is determined that any federally listed species occur in your project area, the U.S. Fish and Wildlife Service requires that you initiate consultation to identify and resolve any conflicts. This response does not reflect potential Fish and Wildlife Service concerns under the Fish and Wildlife Coordination Act or other authorities.

DISCLAIMER

The PNDI environmental review website is a preliminary environmental screening tool. It is not a substitute for information obtained from a field survey of the project area conducted by a biologist. Such surveys may reveal previously undocumented populations of species of special concern. In addition, the PNDI only contains information about species occurrences that have actually been reported to the Pennsylvania Natural Heritage Program.

TERMS OF USE

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 APPLICANT INITIALS: MGD

PNDI Project Environmental Review Receipt

Project Search ID: 20080417137100
Project Name: Canonsburg Lake FSEA
Date: 4/17/2008 4:25:55 PM

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This review is based on the project information that was entered. The jurisdictional agencies and DEP require that the review be redone if the project area, location, or the type of project changes. If additional information on species of special concern becomes available, this review may be reconsidered by the jurisdictional agency.

PRIVACY and SECURITY

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This system is monitored to ensure proper operation, to verify the functioning of applicable security features, and for other like purposes. Anyone using this system consents to such monitoring and is advised that if such monitoring reveals evidence of possible criminal activity, system personnel may provide the evidence to law enforcement officials. See Terms of Use.

In order for this project to be considered for subsequent review, a signed and initialed copy of this receipt is required by the agency or agencies indicated. DEP requires that a signed and initialed copy of this receipt, along with any required documentation from jurisdictional agencies concerning resolution of potential impacts, be submitted in applications for permits requiring PNDI review. See DEP PNDI policy at www.naturalheritage.state.pa.us or visit the following websites for further information.

Regional Offices
Http://www.dep.state.pa.us/dep/deputate/fieldops/map.pdf

District Mining Operations
Http://www.dep.state.pa.us/dep/deputate/minres/Districts/homepage/Default.htm

Oil and Gas Management
Http://www.dep.state.pa.us/dep/deputate/minres/OILGAS/CustomerNeeds.htm

Print this Project Review Receipt using your Internet browser's print function and keep it as a record of your search.

Signature: Melissa Quen Daly

Date: 5/9/08

Project applicant on whose behalf this search was conducted:

APPLICANT

 APPLICANT INITIALS: MQD

PNDI Project Environmental Review Receipt
Project Search ID: 20080417137100
Project Name: Canonsburg Lake FSEA
Date: 4/17/2008 4:25:55 PM

Contact Name: Melissa Queen Darby, EMH+T FAX Number: (717) 772-0271

Address: 5500 New Albany Road

City, State, Zip: Columbus, OH 43054

Phone: 614-775-4517

Email: mqueendarby@emht.com

PERSON CONDUCTING SEARCH (if not applicant)

Contact Name: _____

Address: _____

City, State, Zip: _____

Phone: _____

Email: _____

The following contact information is for the agencies involved in this Pennsylvania Natural Diversity Inventory environmental review process. Please read this entire receipt carefully as it contains instructions for how to contact these agencies for further review of this particular project.

Ecological Services Section
Pennsylvania Department of Conservation and Natural Resources
Bureau of Forestry
P.O. Box 8552
Harrisburg, PA 17105-8552

 APPLICANT INITIALS: MQD

Pennsylvania Department of Conservation and Natural Resources

Bureau of Forestry

June 17, 2008

Melissa Queen Darby
Evans, Mechwart, Hableton & Tilton, Inc.
FAX: 614-775-4800 (hard copy will NOT follow)

Pennsylvania Natural Diversity Inventory Review, PNDI Number **20080417137100**
Canonsburg Lake FSEA
Peters, North Strabane Twps; Washington County

Dear Ms. Darby,

This responds to your request about a Pennsylvania Natural Diversity Inventory (PNDI) ER Tool "Potential Impact" or species of special concern impact review. **We screened this project for potential impacts to species and resources of special concern under Department of Conservation and Natural Resources' responsibility, which includes plants, natural communities, terrestrial invertebrates and geologic features only.**

☒ ***POTENTIAL PROJECT IMPACT***

Based on our PNDI map review we determined potential impacts to species and/or resources of special concern. Therefore, further coordination with this office is necessary to avoid potential impacts to the above listed resources.

☐ Please provide the following information so that a more accurate determination can be made:

☒ A survey for the following should be conducted at the appropriate time of year by a qualified botanist:

- ***Trillium nivale*** **(Snow Trillium) (PA Rare) – Moist woods; flowers late March – April**
- ***Camassia scilloides*** **(Wild Hyacinth) (PA Threatened; Proposed Endangered) – Moist woods; flowers April – May**

If the land type(s) does not exist on site, a survey will not be necessary. If the land cover listed above is not on site, please submit a report to our office informing us that the habitat is not onsite and describe the current land cover and species found on the site.
If the habitat is present, please have the botanist fill out the field survey form: www.naturalheritage.state.pa.us/InternetFieldSurveyForm.pdf. The botanist may contact us prior to the survey for additional information. All PA listed species should be searched for during the site visit and occurrences reported to our office. Survey results should be submitted to our office for review and comment. Mitigation measures and monitoring may be requested if species or communities of special concern are found on or adjacent to site. If you need a list of qualified surveyors, contact our office.

COMMENTS: Please have your botanist conduct a survey for these species during the appropriate time of the year. While conducting the search, make sure to include all areas that could potentially be disturbed.

This response represents the most up-to-date summary of the PNDI data files and is good for one (1) year from the date of this letter. An absence of recorded information does not necessarily imply actual conditions on-site. A field survey of any site may reveal previously unreported populations. Should project plans change or additional information on listed or proposed species become available, this determination may be reconsidered.

To complete your review of state and federally-listed species of special concern (those NOT under DCNR's responsibility), please be sure the U.S. Fish and Wildlife Service, the PA Game Commission and the Fish and Boat Commission have been contacted regarding this project either directly or by performing a search with the online PNDI ER Tool found at www.naturalheritage.state.pa.us.

Richard Shockey, Environmental Review Specialist
DCNR/BOF/PNDI, PO Box 8552, Harrisburg, PA 17105 ~ Ph: 717-772-0263 ~ F: 717-772-0271 ~ c-rshockey@state.pa.us

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AA

ATTACHMENT 4

NRCS Correspondence

EMH&T
Evans, Mechwart, Hambleton & Tilton, Inc.
Engineers, Surveyors, Planners, Scientists

May 1, 2008

Rennie Stoy
District Conservationist
NRCS – Meadow Lands Service Center
2800 Main Street, Suite 1
Washington, PA 15301

Subject: FCIR Form for Canonsburg Lake Ecosystem Restoration Project

Dear Rennie,

On behalf of the U.S. Army Corps of Engineers - Pittsburg District (USACE), Evans, Mechwart, Hambleton & Tilton, Inc. (EMH&T) is submitting the enclosed Farmland Conversion Impact Rating (FCIR) form for the Section 206 Canonsburg Lake Ecosystem Restoration Project. Canonsburg Lake is located in North Strabane and Peters Townships, in north-central Washington County, Pennsylvania (Figure 1), primarily within lands owned by the Pennsylvania Fish and Boat Commission. We are submitting this information to satisfy National Environmental Policy Act (NEPA) requirements for the project.

We currently are in the Feasibility Study/Environmental Assessment phase of this project, and have examined several restoration alternatives. In general, the alternatives would involve dredging of lake sediments in order to reestablish shallows and deep water areas, using the sediment to fill geotubes and create planted wetland and riparian areas. Some sediment would be dewatered and temporarily stored within an upland area on the western portion of the site.

Soil survey mapping for the site is attached as Figure 2. Two Prime Farmland soil types are indicated within the project area: Glenford silt loam on 3-8% slopes (GdB) and Huntington silt loam (Hu). Approximately 28.94 acres of Prime Farmland soils and 15.8986 acres of Farmland of Statewide Importance are mapped within the project study area. Of this, approximately 2.1 acres of Prime Farmland will be directly converted for the establishment of a sediment dewatering and storage area (indicated within the green outline on Figure 2). Approximately 15.04 acres of Prime Farmland and 6.3025 acres of Farmland of Statewide Importance would be indirectly converted, as they would be part of the ecosystem restoration area and thus unavailable for farming. As indicated on Figure 2, no restoration activities or impacts are proposed within the study area north of McDowell Lane or south of State Route 19. No portions of the study area are currently in agricultural production. Table 1 on the following page summarizes the conversion of Prime Farmland and Farmland of Statewide Importance.

TABLE 1
Conversion Summary

Soil Unit	Acres Within Study Area	Acres Converted Directly	Acres Converted Indirectly
Prime Farmland			
Glenford silt loam on 3-8% slopes (GdB)	25.61	2.1	15.04
Huntington silt loam (Hu)	3.33	0	0
TOTAL PRIME FARMLAND	**28.94**	**2.1**	**15.04**
Farmland of Statewide Importance			
Culleoka silt loam, 8-15% slopes (CaC)	0.0061	0	0
Guernsey silt loam, 8-15% slopes (GeC)	0.0025	0	0.0025
Newark Silt Loam (Nw)	15.17	0	6.30
Glenford silt loam, 3-8% slopes (GdC)	0.72	0	0
TOTAL FARMLAND OF STATEWIDE IMPORTANCE	**15.8986**	**0**	**6.3025**
COMBINED TOTAL	***44.8386***	***2.1***	***21.3425***

Parts I and III have been filled out on the enclosed FCIR form to initiate coordination with the NRCS. Please contact me at 614-775-4517 if you have any questions about the enclosed information. Thank you for your assistance in this matter.

Sincerely,

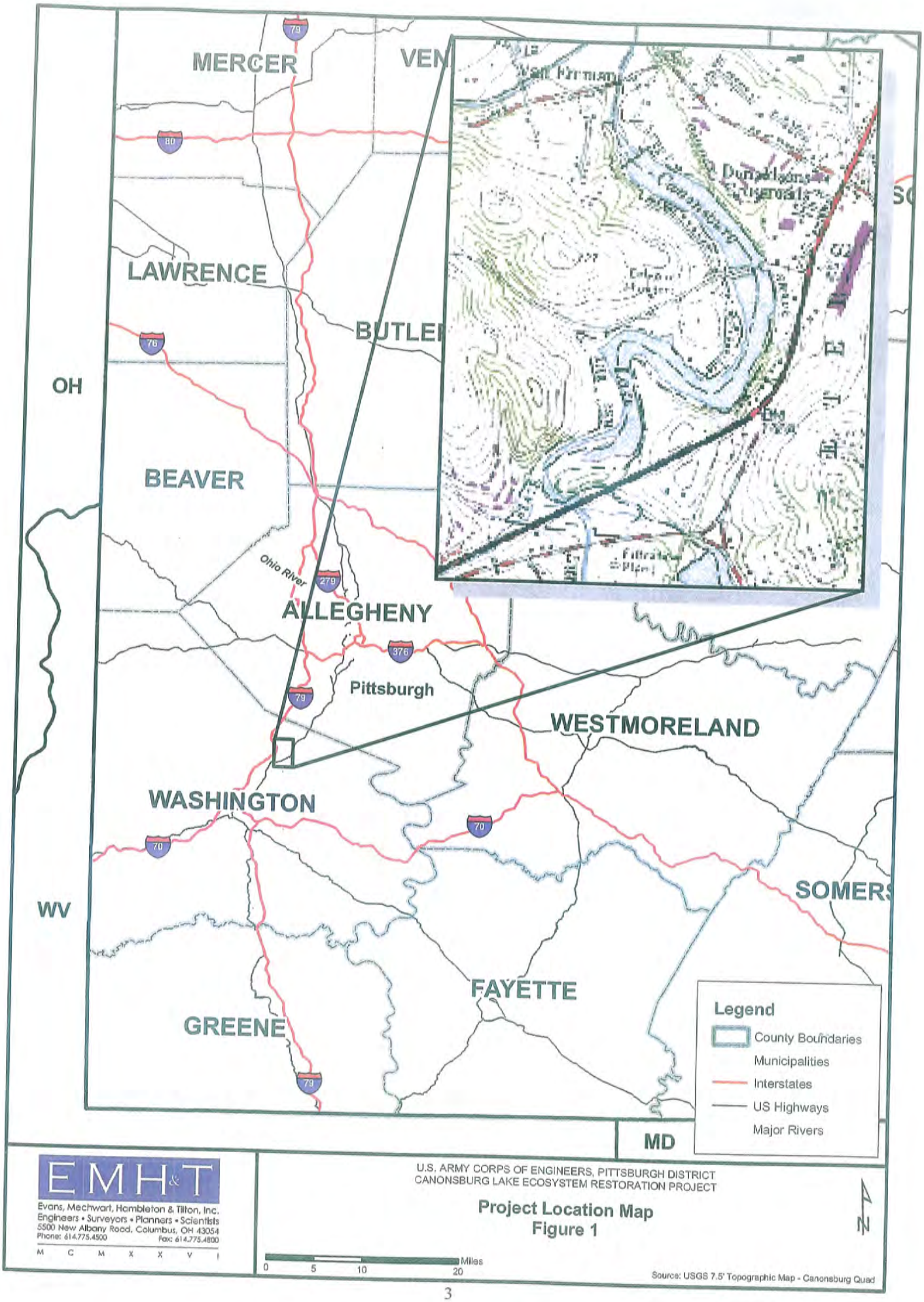
EVANS, MECHWART, HAMBLETON & TILTON, INC.

Melissa Queen Darby

Melissa Queen Darby
Environmental Scientist
Environmental Department

Enclosures: 2

Copies:



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Evans, Mechwart, Hambleton & Tilton, Inc.
Engineers • Surveyors • Planners • Scientists
5500 New Albany Road, Columbus, OH 43054
Phone: 614.775.4500 Fax: 614.775.4800

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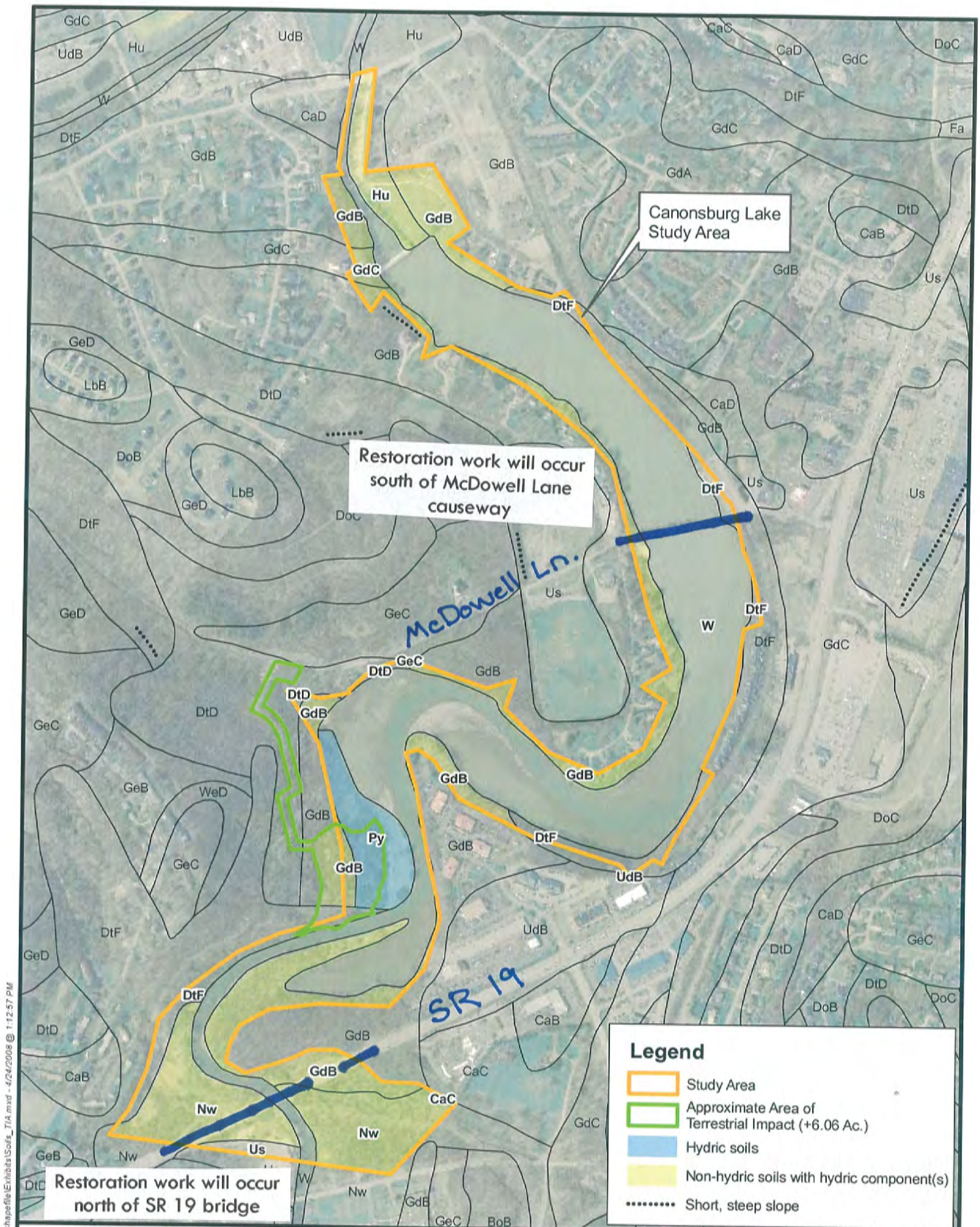
CANONSBURG LAKE ECOSYSTEM RESTORATION PROJECT

Project Location Map
Figure 1

Source: USGS 7.5' Topographic Map - Canonsburg Quad



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NRCS SSURGO Soil Map
Canonsburg Lake Study Area

FIGURE 2

Source: Soil Data - NRCS, Sept 2005
Orthophoto - USGS, 2005

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U.S. Department of Agriculture

FARMLAND CONVERSION IMPACT RATING

PART I *(To be completed by Federal Agency)*		Date Of Land Evaluation Request	5/1/08
Name of Project	Canonsburg Lake FS/EA	Federal Agency Involved	USACE- Pittsburgh Dist.
Proposed Land Use	Ecosystem Restoration	County and State	Washington, PA
PART II *(To be completed by NRCS)*		Date Request Received By NRCS	Person Completing Form:
Does the site contain Prime, Unique, Statewide or Local Important Farmland? *(If no, the FPPA does not apply - do not complete additional parts of this form)*	YES ☐ NO ☐	Acres Irrigated	Average Farm Size
Major Crop(s)	Farmable Land In Govt. Jurisdiction Acres: %	Amount of Farmland As Defined in FPPA Acres: %	
Name of Land Evaluation System Used	Name of State or Local Site Assessment System	Date Land Evaluation Returned by NRCS	

PART III *(To be completed by Federal Agency)*	Alternative Site Rating			
	Site A	Site B	Site C	Site D
A. Total Acres To Be Converted Directly	2.1			
B. Total Acres To Be Converted Indirectly	21.3425			
C. Total Acres In Site	44.8386			
PART IV *(To be completed by NRCS)* Land Evaluation Information				
A. Total Acres Prime And Unique Farmland				
B. Total Acres Statewide Important or Local Important Farmland				
C. Percentage Of Farmland in County Or Local Govt. Unit To Be Converted				
D. Percentage Of Farmland in Govt. Jurisdiction With Same Or Higher Relative Value				
PART V (To be completed by NRCS) Land Evaluation Criterion Relative Value of Farmland To Be Converted (Scale of 0 to 100 Points)				

PART VI *(To be completed by Federal Agency)* Site Assessment Criteria *(Criteria are explained in 7 CFR 658.5 b. For Corridor project use form NRCS-CPA-106)*	**Maximum Points**	Site A	Site B	Site C	Site D
1. Area In Non-urban Use	(15)				
2. Perimeter In Non-urban Use	(10)				
3. Percent Of Site Being Farmed	(20)				
4. Protection Provided By State and Local Government	(20)				
5. Distance From Urban Built-up Area	(15)				
6. Distance To Urban Support Services	(15)				
7. Size Of Present Farm Unit Compared To Average	(10)				
8. Creation Of Non-farmable Farmland	(10)				
9. Availability Of Farm Support Services	(5)				
10. On-Farm Investments	(20)				
11. Effects Of Conversion On Farm Support Services	(10)				
12. Compatibility With Existing Agricultural Use	(10)				
TOTAL SITE ASSESSMENT POINTS	160				
PART VII ***(To be completed by Federal Agency)***					
Relative Value Of Farmland *(From Part V)*	100				
Total Site Assessment *(From Part VI above or local site assessment)*	160				
TOTAL POINTS ***(Total of above 2 lines)***	260				

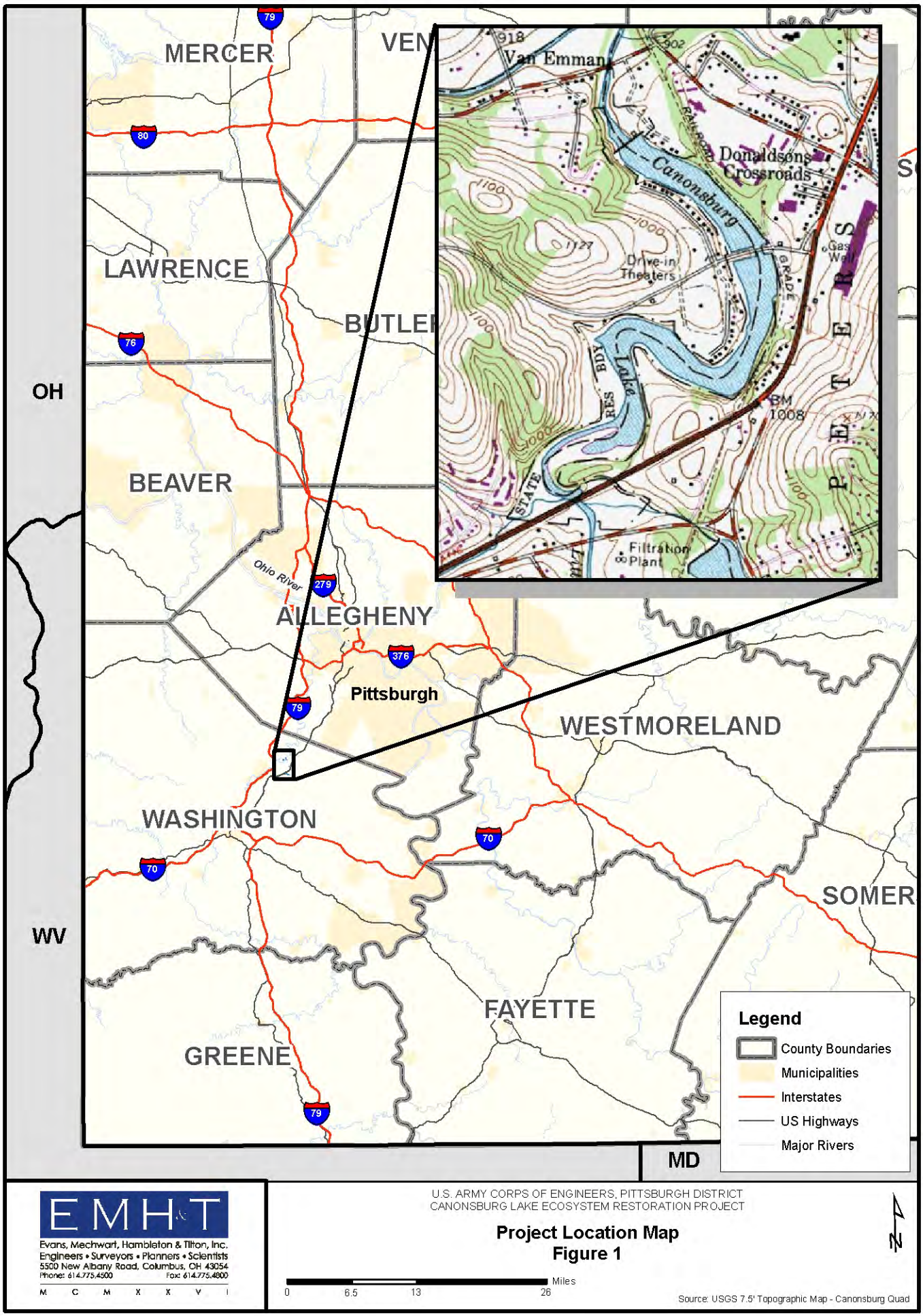
Site Selected:	Date Of Selection	Was A Local Site Assessment Used? YES ☐ NO ☐
Reason For Selection:		
Name of Federal agency representative completing this form:		Date:

(See Instructions on reverse side)

Form AD-1006 (03-02)

ATTACHMENT 5

404(b)(1) Evaluation



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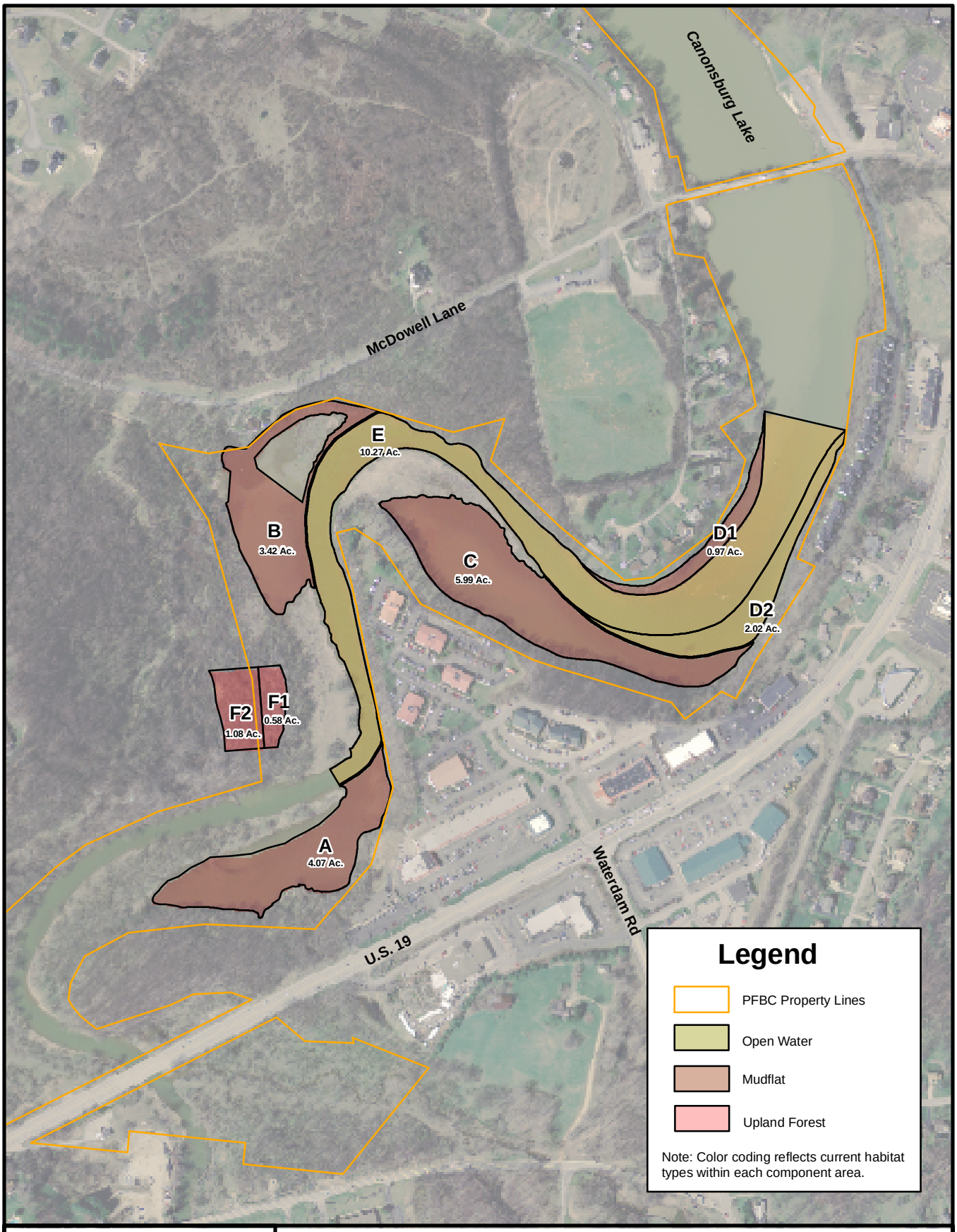
CANONSBURG LAKE ECOSYSTEM RESTORATION PROJECT

Project Location Map
Figure 1

Source: USGS 7.5' Topographic Map - Canonsburg Quad



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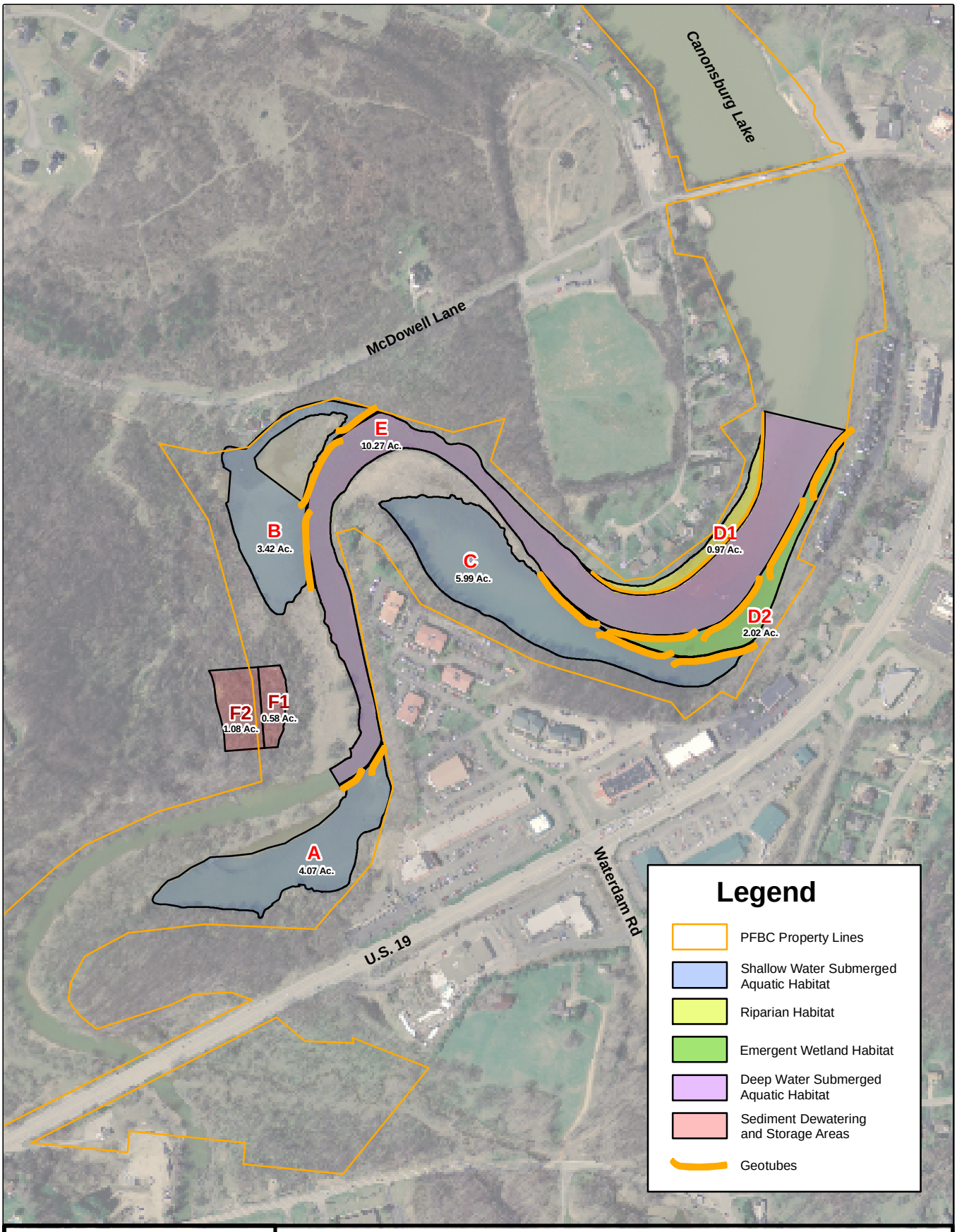
1

Component Areas for Proposed Alternatives
Figure 2

0 250 500 1,000 Feet

Source: Orthophoto - USGS, 2005



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Selected Plan
Figure 3

1

Feet
0 250 500 1,000

Source: Orthophoto - USGS, 2005