Final Draft
Feasibility Study
And
Environmental Assessment

APPENDIX B

HYDROLOGY AND HYDRAULICS

November 2008

Canonsburg Lake
Washington County, PA
Section 206 Aquatic Ecosystem Restoration Project
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- Figure B-1 Chartiers Creek Watershed Area
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# List of Attachments

**Attachment B-1:**
- FIRM Number 422151 (N. Strabane Township), panel 0005 B, dated February 15, 1980
- FBFM Number 422151 (N. Strabane Township), panel 005B, dated February 15, 1980
- FIRM Number 422152 (Peters Township), panel 0005 A, dated November 1, 1979

**Attachment B-2:**
- Electronic HEC-HMS File
- Watershed Work Map from the 1996 Dam Assessment Report
1.0 INTRODUCTION

The information in this Appendix pertains to a general characterization of the water resource issues impacting the Canonsburg Lake watershed. There is information presented regarding both Little Chartiers Creek and the larger Chartiers Creek watersheds. Water resource issues, such as water quality, climate conditions and the function/operation of the Canonsburg Lake dam are important to understand the natural resource potential of the lake. In addition, issues related to published flood hazard information must be considered in terms of future permitting requirements related to ecosystem restoration activities.

Canonsburg Lake resides within the Little Chartiers Creek watershed, which is a sub-basin of the Chartiers Creek watershed. Chartiers Creek watershed (Watershed F) resides within the Ohio Basin (Sub-basin Number 20) of the Commonwealth of Pennsylvania’s watershed inventory. The total watershed area to Canonsburg Lake is 46 square miles, of which the land use composition is estimated to be 54% forested, 39% agriculture and 7% development. (Canonsburg Lake TMDL, PA DEP). Canonsburg Lake has been listed on the Commonwealth of Pennsylvania’s 303(d) list for impairments attributed to nutrients from agricultural sources. In addition, fish advisories have been issued for Little Chartiers Creek related to PCBs and chlordane (WRAS – State Water Plan Subbasin 20F, PA DEP).

Canonsburg Lake is formed by the lake dam that was completed in 1943 by the Alcoa Company. The lake and dam were donated to the Commonwealth of Pennsylvania in 1958 and were placed under the administration of the Pennsylvania Fish and Boat Commission (PFBC). The original dam impoundment of Little Chartiers Creek created a lake area of approximately 76 acres, with a maximum depth of approximately 40 feet. Subsequent sediment deposition within the lake has reduced the lake area to approximately 62 acres, with most of the lost lake area occurring in the upper portion of the lake, south of McDowell Lane. Although there is no definitive determination of current lake depths, it is estimated that the accumulated sediment has reduced the maximum water depth of the lake (near the dam) to less than 15 feet. Upstream of McDowell Lane, where sedimentation has had the most profound impact on the lake, it is estimated that maximum water depths range from less than 8 feet (near McDowell Lane) to less than 3 feet (upstream of U.S. Route 19). Upstream of McDowell Lane, significant portions of the lake have water depths less of than 1.0 foot.

Canonsburg Lake is surrounded by a mix of low to high density development comprised of both residential and commercial uses. A number of private residences immediately adjoin the lake. The lake is used by individuals throughout the region for boating and fishing activities. The PFBC seasonally stocks the lake to promote the recreational fishing opportunities.

The only apparent previous hydrologic/hydraulic studies related to Canonsburg Lake and/or Little Chartiers Creek are the Flood Insurance Study (FIS) and Flood Insurance Rate Map (FIRM) for Peters and North Strabane Townships, published by the Federal Emergency Management Agency (FEMA) as well as a Canonsburg Dam Assessment report prepared by Schnabel Engineering for the PFBC.

Other studies conducted for the watershed and the lake include a Total Maximum Daily Load (TMDL) report for the Chartiers Creek watershed, a Watershed Restoration Action
Strategy (WRAS) report for the Chartiers Creek watershed and a TMDL report for Canonsburg Lake, all published by the Pennsylvania Department of Environmental Protection (DEP). The DEP has also collected and published a sediment sampling data related to Canonsburg Lake and the Chartiers Creek Watershed Association has released Chemical Monitoring and Water Quality Data for Little Chartiers Creek.

2.0 PROJECT AREA

2.1 Chartiers Creek Watershed

Chartiers Creek has a 296 square mile drainage area and is labeled as Watershed F of the Ohio subbasin (20) of the statewide watershed inventory. The watershed is part of the 8-digit Ohio North watershed (HUC 05030101). The watershed is situated within Washington and Allegheny Counties. Chartiers Creek flows for 35 miles from its headwaters near Lagonda, PA., to the confluence with the Ohio River. Little Chartiers Creek has a total watershed area of 46.7 square miles. The Canonsburg Lake dam is located along Little Chartiers Creek approximately 0.4 miles upstream of the confluence with Chartiers Creek and has a watershed area of 46 square miles. Figure B-1 shows the location of the watershed, along with the Little Chartiers Creek sub-watershed and Canonsburg Lake. Figure B-2 shows the boundaries of the Little Chartiers Creek watershed and the political subdivisions within or adjacent to that watershed. The consolidated land use distributions for both the Chartiers Creek and Little Chartiers Creek watershed are provided in Table B-1.

<table>
<thead>
<tr>
<th>Watershed</th>
<th>% Consolidated Land Use Type</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Forested</td>
<td>Agriculture</td>
</tr>
<tr>
<td>Chartiers Creek</td>
<td>49</td>
<td>33</td>
</tr>
<tr>
<td>Little Chartiers Creek</td>
<td>54</td>
<td>39</td>
</tr>
</tbody>
</table>

Note: land use percentages are considered approximate and were taken from published TMDLs; data sources may be as much as 10-years old. Consolidated Land Use Percentages for Chartiers Creek do not include approx. 3% attributed to natural features (e.g., open water, wetlands), quarries and major transportation.

2.2 Geology and Soils

The Chartiers Creek watershed is located within the Western Allegheny Plateau Ecoregion. The upper third of the basin is in the Permian Hills (70a) subsection and the lower portion in the Monongahela Transition Zone (70b) subsection. Strata are comprised of sequences of sandstone, shale, limestone and coal. The commercially valuable Pittsburgh coal underlies the entire subbasin. The upper basin was extensively deep mined starting in the 1800’s. The region supplied coal and coke for the numerous steel plants in the Pittsburgh region. More recent mines are far beneath the surface and employ the newer technique called longwall mining. The second most valuable coal is the Waynesburg coal, which is surface mined in the upper basin in Washington County. Significant extractions of the Upper Freeport coal also occurred. Oil and gas reserves were also located in the subbasin. Washington County was once a large producer of oil in Pennsylvania. Soils in this basin are derived from noncarbonated sedimentary rocks.
The infiltration rates are moderate, which allows for good hydrologic characteristics. The hilly terrain has shallow well-drained soils. [Excerpted from the WRAS Report, DEP]

The watershed of Canonsburg Lake lies within the Pittsburgh Low Plateau Section of the Appalachian Plateau Province. This section consists of a smooth undulating upland surface cut by numerous, narrow, relatively shallow valleys. Elevations range from 274 to 394 meters (899 to 1,293 feet) above mean sea level. Primary soil associations are Gilpin Dormant Culleoka (6%) and Dormant Culleoka Guernsey (94%), and the dominant hydrologic soil group is ‘C’; this soil is characterized as having a slow infiltration rate when thoroughly wetted. The rock-type of the watershed is exclusively interbedded sedimentary. [Excerpted from the Canonsburg Lake TMDL, DEP]

2.3 Water Quality and Aquatic Habitat

A TMDL study was completed and published by the DEP and the US Environmental Protection Agency (EPA) in April 2003 and identified known impairments based on water quality constituents such as metals (e.g., aluminum, iron and manganese). In addition to existing point sources for such pollutants, the watershed has several abandoned mines that were considered in the analysis to determine pollutant potential within the watershed (Chartiers Creek TMDL, DEP/EPA).

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, along with seven other point-source NPDES permit holders. All of these discharge points are upstream of Canonsburg Lake. Beginning in 1996, portions of Little Chartiers Creek main stem are included in the 303(d) list as impaired, attributed to siltation and nutrients, as well as metals and suspended solids. The watercourse has an aquatic life use designation of Warm Water Fishes (WWF) and is considered a High Quality Stream (HQ) from the headwaters extending down to the Canonsburg Lake Dam (WRAS, DEP). The HQ-WWF designation appears to be for the purpose of protecting Canonsburg Lake (Canonsburg Lake TMDL, DEP). Within the Commonwealth of Pennsylvania, the WWF designation implies a ‘maintenance and propagation of fish species and additional flora and fauna which are indigenous to a warm water habitat’. Along the main stem, approximately 15 miles are considered impaired and approximately 7.5 miles in attainment of the aquatic like use designation noted above (WRAS, DEP).

In addition to the 303(d) impairments listed above, a fish consumption advisory has been issued for 0.7 miles of Little Chartiers Creek related to PCBs and Chlordane (WRAS, DEP). The published 2006 advisory indicates that it applies only to the portion of Little Chartiers Creek downstream of the Canonsburg Lake dam. Beginning with a lake phosphorous study in 1987, it was determined that non-point sources of nutrient loading to Little Chartiers Creek were causing water quality impairments within Canonsburg Lake (Canonsburg Lake TMDL, DEP). To achieve desired water quality goals for the lake, it was determined that a 48% reduction of Total Phosphorous (TP) loading to the lake was necessary. However, due to the non-point sources attributed to the loading of TP (e.g., agriculture), no apparent restrictions have been recommended for permitted point-source dischargers within the watershed.
Sediment samples were collected within Canonsburg Lake by the DEP in 2002. The sediment samples cover 3 separate locations and the analysis included a range of metals. The findings were compared to the DEP safe fill numeric standards for metals. The summary of this information is contained in Appendix A. The Chartiers Creek Watershed Association has collected water samples and tested them for a variety of general water quality parameters. The stream monitoring appears to be at a specific location and the information acquired as part of this study extends between 2001 and 2006. Beginning in 2003, the stream monitoring data includes macroinvertebrate sampling. No analysis of this data or conclusions is apparent from the acquired information; therefore, the data is not presented in this report.

2.4 Canonsburg Lake and Dam

Canonsburg Lake is formed by a concrete gravity dam structure. Physical data and other information related to the dam are included in Table B-2. The dam has a single spillway that controls the normal pool elevation of the lake. A technical assessment of the 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 lake. The Commonwealth of Pennsylvania operates a dam safety program that assesses and classifies dams in terms of their risk to the general population and public infrastructure, and imposes standards for reducing the risk of dam failure.

<table>
<thead>
<tr>
<th>Item</th>
<th>Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>Owner</td>
<td>PFBC</td>
</tr>
<tr>
<td>Location</td>
<td>Canonsburg, Washington, Co., PA.</td>
</tr>
<tr>
<td>Dam Safety Classification</td>
<td>Class B size, Category I structure</td>
</tr>
<tr>
<td>Year Completed</td>
<td>1943</td>
</tr>
<tr>
<td>Latitude</td>
<td>40° 16’ 40”</td>
</tr>
<tr>
<td>Longitude</td>
<td>80° 08’ 25”</td>
</tr>
<tr>
<td>Watershed Area</td>
<td>46 square miles (sq. mi.)</td>
</tr>
<tr>
<td>Normal Pool Elevation</td>
<td>918 feet 1</td>
</tr>
<tr>
<td>Top of Dam Elevation</td>
<td>929 feet 1</td>
</tr>
<tr>
<td>Area at Normal Pool</td>
<td>76 acres 2</td>
</tr>
<tr>
<td>Type of Spillway/Length</td>
<td>Single stage ogee crest/225 ft. 1</td>
</tr>
<tr>
<td>Volume of Impoundment at Normal Pool</td>
<td>683 acre-feet (ac.-ft.) 1</td>
</tr>
<tr>
<td>Total Spillway Capacity</td>
<td>32,400 cubic feet per second (cfs) 2</td>
</tr>
<tr>
<td>Top of Dam Storage</td>
<td>2,170 ac.-ft. 3</td>
</tr>
</tbody>
</table>

1 National Geodetic Vertical Datum (NGVD), 1929  
2 Original Lake Area  
3 As reported in the Canonsburg Dam Assessment report  
4 Interpolated from data included in the Canonsburg Dam Assessment report
The December 1996 report was prepared to assess that risk and presented the conclusions noted on the following page. 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 above. Other relevant information concerning Canonsburg Lake is that it is determined to have a hydraulic residence time of approximately 6 days, which is shorter than the 14-day hydraulic residence time that commonly distinguishes a lake from flowing waters, a standard established by the US EPA (Canonsburg TMDL, DEP).

### 2.5 USGS Gage Data

There is a single USGS gage station along Chartiers Creek, located at Carnegie, PA., (Station #03085500) 8.9 miles upstream from the confluence with the Ohio River. The stream gage has been in operation since 1919, with data collection interrupted between 1933 and 1940. The reported watershed area to the gage is 257 square miles. The maximum daily mean discharge found in the published gage records is a value of 18,500 cubic feet per second recorded on September 18, 2004. This date corresponds with the rainfall events associated with Hurricane Ivan, which has been cited as the single storm event that had the most profound impact on the sedimentation within Canonsburg Lake. Interviews with residents at the lake suggest that the evidence of sediment and debris within the lake increased (or became more obvious) following this event. There is no USGS gage station nor other published flow records along Little Chartiers Creek that were found as part of this study. A hydrologic analysis to determine the 100-year peak discharge to Canonsburg Lake is discussed later in this appendix.

### 3.0 CLIMATOLOGY

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, PA is presented in summary fashion in Table B-3. The purpose of the presented information is to demonstrate that the geographic area within which the study area resides is subject to wide variations in temperature and is seasonally subject to significant amounts of rainfall. These weather-related factors can be considered when determining if certain ecological settings will be likely to succeed or fail.
TABLE B-3
Summary of Climatology Data

<table>
<thead>
<tr>
<th>Reported Annual Values ¹</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Temperature Data (degrees, Fahrenheit)</td>
<td></td>
</tr>
<tr>
<td>Highest Recorded Value ²</td>
<td>103</td>
</tr>
<tr>
<td>Lowest Recorded Value ²</td>
<td>-22</td>
</tr>
<tr>
<td>Normal Daily Maximum ⁴</td>
<td>60.4</td>
</tr>
<tr>
<td>Normal Daily Minimum ⁴</td>
<td>41.5</td>
</tr>
<tr>
<td>Normal Daily Mean ⁴</td>
<td>50.9</td>
</tr>
<tr>
<td>Mean Number of Days ≤ 32º³</td>
<td>120 days</td>
</tr>
<tr>
<td>Mean Number of Days ≥ 90º³</td>
<td>8 days</td>
</tr>
</tbody>
</table>

Precipitation Data

<table>
<thead>
<tr>
<th>Reported Annual Values ¹</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normal Values ⁴</td>
<td>37.85 in.</td>
</tr>
<tr>
<td>Mean Number of Days ≥ 0.01 in. ²</td>
<td>152 days</td>
</tr>
<tr>
<td>Average Total of Snowfall ²</td>
<td>43.8 in.</td>
</tr>
</tbody>
</table>

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

4.0 PUBLISHED FLOOD HAZARD INFORMATION

For the reach of Little Chartiers Creek impounded by the Canonsburg Lake dam, the stream (or centerline of the lake) is also the boundary between North Strabane and Peters Townships. The Federal Emergency Management Agency (FEMA) has published an FIS and FIRM for North Strabane Township, dated August 1979 and February 1980, respectively; and for Peters Township, dated May 1979 and November 1979, respectively. The FIRM for both jurisdictions show an approximate 100-year (Zone A) floodplain along Little Chartiers Creek, extending between the confluence with Chartiers Creek and U.S. Route 19. This reach of Little Chartiers Creek includes the vast majority of the Canonsburg Lake impoundment area. The Zone A flood hazard designation implies that a 100-year flood elevation has not been calculated for that area.

Beginning at U.S. Route 19, Little Chartiers Creek no longer follows the township boundary and it is confined to North Strabane Township. The FIRM for North Strabane Township shows a detailed 100-year (numbered A Zone) floodplain. The detailed flood hazard information includes a computed flood discharge for the 10, 50-, 100- and 500-year flood events, corresponding flood profile elevations and a regulatory floodway. The regulatory floodway is shown separately on a Flood Boundary and Floodway Map (FBFM), dated February 1980. The portion of the referenced FIRM and FBFM for North Strabane and the FIRM for Peters Township showing the study area are included as Attachments to this Appendix.

4.1 Hydrologic Analysis

The published FIS for North Strabane Township cites the use of a ‘multiple regression method’ developed by the Corps of Engineers to establish the peak discharge – flood
frequency relationship for Little Chartiers Creek (reference no. 11 in the published FIS). This method was used to estimate the peak flood discharge value for the 10-, 50-, 100- and 500-year events. These values were calculated at the mouth of Little Chartiers Creek (at Chartiers Creek confluence) and also at U.S. Route 19, upstream of the confluence of the tributary stream at that location. Table B-4 has a summary of the hydrologic information compiled in the FIS that is relevant to the study area. The values in Table B-4 were used to calculate flood profiles for Little Chartiers Creek starting at U.S. Route 19.

### TABLE B-4
Summary of FIS Discharges and Estimated Lake Flood Elevations

<table>
<thead>
<tr>
<th>Location</th>
<th>Drainage Area (sq. mi.)</th>
<th>Estimated Peak Discharge Value (cfs.)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>10-year</td>
</tr>
<tr>
<td>At mouth</td>
<td>46</td>
<td>3,680</td>
</tr>
<tr>
<td>Above confluence of tributary at U.S. Route 19</td>
<td>39.0</td>
<td>3,200</td>
</tr>
<tr>
<td>Starting water surface elevation</td>
<td>--</td>
<td>920.3</td>
</tr>
</tbody>
</table>

1 cubic feet per second
2 from FIS Flood Profile, North Strabane Township (see discussion in Sec. 4.2); NGVD 1929

### 4.2 Hydraulic Analysis

The published FIS for North Strabane Township describes that the flood profiles were calculated using the Corps of Engineers HEC-2 hydraulic computer program. The FIS cites that the starting water surface elevation for establishing the flood profiles along Little Chartiers Creek are based on a “discharge versus elevation curve for the Canonsburg Lake spillway and dam” (N. Strabane Twp. FIS, FEMA). The referenced rating curve was not available; however, a review of the Flood Profile from the published FIS for North Strabane Township reveals approximate values for these starting water surface elevations (flood elevations associated with Canonsburg Lake), listed in Table B-4.

### 5.0 HYDROLOGIC MODELING

Subsequent to the publication of the FISs and FIRMs for North Strabane and Peters Townships that established peak discharge values and estimated lake flood elevations, the Canonsburg Dam Assessment report prepared for the PFBC in 1996 provided a more detailed analysis of the Little Chartiers Creek watershed hydrology and the capacity of the Canonsburg Lake spillway. However, the 1996 report analyzed design storm frequencies associated with dam safety regulations, based on the Probable Maximum Flood (PMF) principle. In order to estimate flood elevations for the more common recurrence intervals, a separate analysis had to be prepared that relied on the watershed information from the modeling contained in the 1996 report, but which used different rainfall and rainfall distribution information.

### 5.1 Canonsburg Dam Assessment Report

For reference in this discussion, the watershed area map from the 1996 Canonsburg Dam Assessment report has been provided within Attachment B-2 of this Appendix. The
hydrology and hydraulic appendix of the Canonsburg Dam Assessment report contains
detailed Time of Concentration (T_C), converted to lag-time (T_L), and Runoff Curve
Number (RCN) computations. These values were computed using the Natural Resource
Conservation Service’s (NRCS) TR-55 methodology. The appendix of the 1996 report
also includes a detailed computation of the stage-discharge-storage volume rating curve
for the dam spillway and lake impoundment area. These values are summarized and
discussed below.

- **RCN**: The RCN values for both subwatershed areas that are tributary to
  Canonsburg Lake (refer to the watershed area map in Attachment B-2) are 88.
  The values were computed assuming Antecedent Moisture Condition (AMC) II
  and were then converted to AMC III for use in the hydrologic modeling.
- **T_L**: The lag-time values are 3.8 and 2.5 hours for subbasins 1 and 2,
  respectively.
- **Stage-discharge-storage volume rating curve**: The values presented below are
  truncated to represent the portion of the full rating curve that includes the normal
  pool of the lake up to the calculated 100-year flood elevation. The values for
  storage volume were taken from the output portion of the HEC-1 model.

<table>
<thead>
<tr>
<th>Elevation (ft, NGVD '29)</th>
<th>Discharge (cfs)</th>
<th>Storage Volume (ac-ft)</th>
</tr>
</thead>
<tbody>
<tr>
<td>918.0</td>
<td>0.0</td>
<td>682.67*</td>
</tr>
<tr>
<td>920.0</td>
<td>2,156</td>
<td>863.76</td>
</tr>
<tr>
<td>922.0</td>
<td>6,390</td>
<td>1,114.41</td>
</tr>
<tr>
<td>924.0</td>
<td>12,227</td>
<td>1,386.99</td>
</tr>
<tr>
<td>926.0</td>
<td>19,505</td>
<td>1,682.41</td>
</tr>
</tbody>
</table>

cfs – cubic feet per second; ac-ft – acre feet; * volume below the normal lake pool

The hydrologic analysis represented in this report utilizes the Corps of Engineers’ HEC-
1 hydrologic computer program. Due to the nature of the analysis, which was to evaluate
the suitability of the dam with respect to the Commonwealth of Pennsylvania’s dam
safety regulations, the rainfall information in the HEC-1 analysis is based on an
evaluation of the Probable Maximum Storm (PMS) and PMF using the Corps of
Engineers’ HMR-52 computer program. The result of this analysis were separate HEC-1
model executions that looked at the consequences of a sunny-day (no watershed runoff)
dam failure and a PMF-related watershed event, with and without dam failure. The
results of the dam failure analysis were used to affirm the risk-based classification of the
dam. The results of the PMF-related analysis (without dam failure) determined the
adequacy of the dam spillway under that flood event. As mentioned previously, the
report suggests that the dam will be overtopped during the PMF event.

5.2 Revised Hydrologic Analysis

The HEC-1 modeling prepared for the 1996 report was the basis for an effort to compute
the 1-year through 100-year peak flood discharge values and flood elevations
associated with Canonsburg Lake, under existing conditions. The watershed sub-areas,
including the T_L and RCN values, are repeated for this revised analysis. Also repeated is
the stage-discharge-storage volume rating curve for the lake and dam spillway, and the
reach routing of sub-basin 1 to Canonsburg Lake. The revised analysis of existing
conditions was developed using the Corps of Engineer’s HEC-HMS hydrologic computer
program. The rainfall depth information included in the revised analysis is based on the information published in NOAA Atlas 14, *Precipitation-Frequency Atlas of the United States* (available on-line at [http://hdsc.nws.noaa.gov/hdsc/pfds/index.html](http://hdsc.nws.noaa.gov/hdsc/pfds/index.html)). The rainfall distribution is based on the NRCS standard Type II distribution. The electronic file associated with the HEC-HMS model is included within Attachment B-2 of this Appendix. Table B-5 is a summary of the hydrologic information for Canonsburg Lake developed from the revised analysis. The calculated 10-year flood elevation has been used to establish the limits of the riparian zone utilized in the Habitat Assessment for this project, described in detail within Appendix G.

**TABLE B-5**

<table>
<thead>
<tr>
<th>Hydrologic Information</th>
<th>Recurrence Interval</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1-year</td>
</tr>
<tr>
<td>Rainfall Amounts (in.)</td>
<td>1.99</td>
</tr>
<tr>
<td>Peak Discharge at Dam Spillway (cfs.)</td>
<td>2,700</td>
</tr>
<tr>
<td>Calculated Flood Elevation (ft., NGVD '29)</td>
<td>920.3</td>
</tr>
</tbody>
</table>

### 6.0 CONCLUSIONS

The revised hydrologic analysis is only for the existing conditions within the watershed and within Canonsburg Lake, as represented in the 1996 dam assessment report. However, the RCN values adjusted for AMC III represent a conservative estimate of stormwater runoff potential within the watershed and are more suggestive of future land use conditions, with a higher amount of impervious area. A separate hydrologic analysis to look at the impact of the ecosystem restoration activities within Canonsburg Lake has not been performed. The total volume of storage within the lake, up to the calculated 100-year flood elevation, is 636 ac-ft (1,026,150 cubic yards). The redistribution of dredge material within the lake, above the normal lake pool elevation, would represent less than 1% of this total storage volume and is unlikely to impact calculated flood elevations.

The revised hydrologic analysis did not consider the PMF event and dam breach analyses that were originally part of the 1996 dam assessment report. It is not anticipated that the ecosystem restoration activities within the lake would impact those analyses and the resulting dam assessment. Lake dredging will increase storage volume behind the dam and below the normal lake pool elevation, which is a consideration in the dam breach analysis; however, the storage volume would continue to be less than what was originally available behind the dam.

The results of the revised hydrologic modeling differ considerably from the flood discharge values published in the FIS. As noted in the discussions above, the computational methods associated with the different analyses are not the same and this is likely the primary reason for the different results.
The calculated 10-year flood elevation of 921.8 represents a water depth of 3.8 feet above the normal lake pool elevation. Due to the approximate nature and uncertainty associated with this analysis, a water depth value of 4 feet is applied to the definition of riparian habitat within Appendix G.
7.0 REFERENCES


NOAA. 2006. Comparative Climate Data For the United States through 2006; National Oceanic and Atmospheric Administration; National Climate Center; Asheville, NC.


PA DEP. September 2003 (Updated). Watershed Restoration Action Strategy (WRAS), State Water Plan Subbasin 20F, Chartiers Creek Watershed (Ohio River), Washington and Allegheny Counties; Commonwealth of Pennsylvania Department of Environmental Protection.


ATTACHMENT B-1

FIRM Number 422151 (N. Strabane Township), panel 0005 B, dated February 15, 1980
FBFM Number 422151 (N. Strabane Township), panel 005B, dated February 15, 1980
FIRM Number 422152 (Peters Township), panel 0005 A, dated November 1, 1979
ATTACHMENT B-2

Electronic HEC-HMS File
Watershed Work Map from the 1996 Dam Assessment Report
FIGURES
Chartiers Creek Watershed
Figure B-1

Legend
- Chartiers Creek Watershed
- Little Chartiers Creek Watershed
- County Boundaries
- Municipalities
- Interstates
- US Highways
- Major Rivers
- Rivers
- Lakes

Source: Hydrography - Penn State Univ, 1998
Watershed boundary - USGS, Jul 1996

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