ORIO RIVER BASIN
JACOBS CREEK, WESTMORELAND COUNTY
PA-657 DAM
(ACME DAM)
NDI ID. PA-9828
PENNDER ID. 65-133

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

Jun 79

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PREPARED FOR
DEPARTMENT OF THE ARMY
Baltimore District, Corps of Engineers
Baltimore, Maryland 21208

PREPARED BY
GAI CONSULTANTS, INC.
570 BEATTY ROAD
MONROEVILLE, PENNSYLVANIA 15146
JUNE 1979

Bernard M. Mihalcin

DA079049

ADA079049
This report is prepared under guidance contained in the Recommended Guidelines for Safety Inspection of Dams, for Phase I investigations. Copies of these guidelines may be obtained from the Office of Chief of Engineers, Washington, D.C. 20314. The purpose of a Phase I investigation is to identify expeditiously those dams which may pose hazards to human life or property. The assessment of the general condition of the dam is based upon available data and visual inspections. Detailed investigation, and analyses involving topographic mapping, subsurface investigations, testing, and detailed computational evaluations are beyond the scope of a Phase I investigation; however, the investigation is intended to identify any need for such studies.

In reviewing this report, it should be realized that the reported condition of the dam is based on observations of field conditions at the time of inspection along with data available to the inspection team.

It is important to note that the condition of a dam depends on numerous-and constantly changing internal and external conditions, and is evolutionary in nature. It would be incorrect to assume that the present condition of the dam will continue to represent the condition of the dam at some point in the future. Only through frequent inspections can unsafe conditions be detected and only through continued care and maintenance can these conditions be prevented or corrected.

Phase I inspections are not intended to provide detailed hydrologic and hydraulic analyses. In accordance with the established guidelines, the spillway design flood is based on the estimated "Probable Maximum Flood" for the region (greatest reasonably possible storm runoff), or fractions thereof. The spillway design flood provides a measure of relative spillway capacity and serves as an aid in determining the need for more detailed hydrologic and hydraulic studies, considering the size of the dam, its general condition, and the downstream damage potential.
PHASE I REPORT  
NATIONAL DAM INSPECTION PROGRAM  

ABSTRACT

PA-657 Dam (Acme Dam): NDI I.D. No. PA-00828

Owner: Westmoreland County Commissioners  
State Located: Pennsylvania  
County Located: Westmoreland  
Stream: Jacobs Creek  
Inspection Date: 4 May 1979  
Inspection Team: GAI Consultants, Inc.  
570 Beatty Road  
Monroeville, Pennsylvania 15146

Based on a visual inspection, past performance, and available engineering data, the facility is considered to be in good condition. The size classification of the facility is intermediate and the hazard classification is considered to be high. The emergency spillway is capable of discharging the peak inflow resulting from a storm of PMF intensity and is, therefore, considered adequate.

It is recommended that the owner:

(a) Repair the damaged pond drain gate control and replace the missing manhole cover atop the service spillway riser. Consideration should be given to redesigning the gate control mechanism to protect it from future vandalism.

(b) Consult with the U.S.D.A., Soil Conservation Service, to assess the erosion on the upstream slope in the area of the service spillway riser and implement any remedial measures deemed necessary.

(c) Curtail the unauthorized vehicular travel across the embankment and repair and reseed any damaged (bare) areas. If control of unauthorized travel is not practical, some provision should be made to protect the embankment from rutting and erosion by placing a layer of gravel or stone across the crest.
d. Develop a formal operation and maintenance manual to ensure the continued proper care of the facility. In addition, a formal warning system should be implemented which provides detailed procedures to protect the lives and property of downstream residents. Included in the plan should be provisions for around-the-clock surveillance of the facility during periods of unusually heavy precipitation.
GAI Consultants, Inc.  

Approved by:

Bernard M. Mihalcin, P.E.

JAMES W. PECK  
Colonel, Corps of Engineers  
District Engineer

Date  13 August 1979
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APPENDIX G - REGIONAL VICINITY AND WATERSHED BOUNDARY MAP
1.0 Authority.

The Dam Inspection Act, Public Law 92-367, authorized the Secretary of the Army, through the Corps of Engineers, to initiate a program of inspection of dams throughout the United States.

1.1 Purpose.

The purpose is to determine if the dam constitutes a hazard to human life or property.

1.2 Description of Project.

a. Dam and Appurtenances. PA-657 Dam, locally known as Acme Dam, is an earth embankment approximately 500 feet in length with a maximum field measured height of 33 feet. The structure is essentially a standard U. S. Department of Agriculture, Soil Conservation Service (SCS) design and is equipped with both service and emergency spillways (see Overview Photograph and Figure 3). The service spillway is located on the upstream face near the center of the embankment. It is a single-stage, reinforced concrete drop inlet, vertical riser connected to a 30-inch diameter, horizontal concrete conduit at its base. The emergency spillway is a vegetated earth channel of trapezoidal cross-section with a base width of 100 feet excavated in the left abutment. The facility is provided with a pond drain consisting of a 16-foot long section of 18-inch diameter reinforced concrete pipe with intake at the upstream toe and discharge outlet at the base of the service spillway riser (see Figures 7 and 8).

b. Location. PA-657 Dam is located across Jacobs Creek in Mount Pleasant Township, Westmoreland County, Pennsylvania. The community of Acme, Pennsylvania, is located about one mile northwest of the facility along Pennsylvania Route 31, three miles west of Pennsylvania Turnpike Interchange 9 at Donegal, Pennsylvania. The dam, reservoir, and watershed are contained within the Donegal, Westmoreland County, Pennsylvania.
Pennsylvania, U.S.G.S. 7.5 minute topographic quadrangle (see Appendix G). The coordinates of the dam are N40° 7.8' and W79° 25.4'.

c. Size Classification. Intermediate (33 feet high, 1,540 acre-feet total storage capacity at top of dam).

d. Hazard Classification. High (see Section 3.1.e).

e. Ownership. Westmoreland County Commissioners Court House Greensburg, Pennsylvania 15601

f. Purpose of Dam. Recreation and flood retardation.

g. Historical Data. PA-657 Dam was designed by the U. S. Department of Agriculture, Soil Conservation Service, as part of a flood control system in the Jacobs Creek Watershed, which was to consist of three dams and a stream channel improvement project. Construction of the facility began in July 1972. Correspondence indicates that four contractors managed the project until it was finally completed in July 1975, by Five-R Excavating, Inc., from New Florence, Pennsylvania. No major modifications have been made to the structure since its completion. Plans to develop the area surrounding the facility into a park have not been finalized; however, boating and fishing are presently allowed. Thus, the facility currently is used for both flood control and recreation.

1.3 Pertinent Data.

a. Drainage Area (square miles). 2.6

b. Discharge at Dam Site. Daily records of reservoir levels and discharges are not recorded at this facility. The owner is obligated by contract with the SCS to inspect the facility annually and after major storms and to report on any damage incurred. An estimate of high water is usually included. Discussions with the local SCS representative, present during the inspection, indicated that, to this date, the emergency spillway has never discharged.

Discharge Capacity of the Service Spillway (pool at top of dam elevation 1844.1) = 120 cfs (design value).

Discharge Capacity of the Emergency Spillway (pool at top of dam elevation 1844.4) = 10,450 cfs (see Appendix C, Sheet 7).
c. **Elevation (feet above mean sea level).** The following elevations are based on available drawings by the U.S.D.A., Soil Conservation Service, dated 10-71. These elevations have been roughly verified by field measurements; however, no formal survey was performed (see Appendix F).

<table>
<thead>
<tr>
<th>Description</th>
<th>Field/Elevation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Top of Dam</td>
<td>1844.4 (field)</td>
</tr>
<tr>
<td></td>
<td>1844.1 (design)</td>
</tr>
<tr>
<td>Maximum Design High Water</td>
<td>1838.2</td>
</tr>
<tr>
<td>Maximum Pool of Record</td>
<td>Not known</td>
</tr>
<tr>
<td>Normal Pool</td>
<td>1827.5</td>
</tr>
<tr>
<td>Service Spillway Crest</td>
<td>1827.5</td>
</tr>
<tr>
<td>Emergency Spillway Crest</td>
<td>1835.0</td>
</tr>
<tr>
<td>Pond Drain Upstream Invert</td>
<td>1815.6</td>
</tr>
<tr>
<td>Pond Drain Downstream Invert</td>
<td>1815.6</td>
</tr>
<tr>
<td>Streambed at Dam Center</td>
<td>1815.0</td>
</tr>
<tr>
<td>Streambed at Downstream Toe</td>
<td>1811.4 (field)</td>
</tr>
<tr>
<td>Maximum Tailwater</td>
<td>Not known</td>
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d. **Reservoir Length (feet).**

<table>
<thead>
<tr>
<th>Description</th>
<th>Footage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Top of Dam</td>
<td>5000</td>
</tr>
<tr>
<td>Normal Pool</td>
<td>3000</td>
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e. **Storage (acre-feet).**

<table>
<thead>
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<th>Description</th>
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<tbody>
<tr>
<td>Top of Dam</td>
<td>1540</td>
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<tr>
<td>Normal Pool</td>
<td>93</td>
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<tr>
<td>Emergency Spillway Crest</td>
<td>460</td>
</tr>
<tr>
<td>Design Surcharge</td>
<td>1080</td>
</tr>
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f. **Reservoir Surface (acres).**

<table>
<thead>
<tr>
<th>Description</th>
<th>Footage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Top of Dam</td>
<td>145</td>
</tr>
<tr>
<td>Normal Pool</td>
<td>25</td>
</tr>
<tr>
<td>Emergency Spillway Crest</td>
<td>75</td>
</tr>
</tbody>
</table>

g. **Dam.**

<table>
<thead>
<tr>
<th>Description</th>
<th>Footage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>Zoned earth</td>
</tr>
<tr>
<td>Length</td>
<td>500 feet</td>
</tr>
<tr>
<td>Height</td>
<td>33 feet (field measured - crest to downstream toe)</td>
</tr>
<tr>
<td>Top Width</td>
<td>12 feet (field measured)</td>
</tr>
<tr>
<td></td>
<td>14 feet (design)</td>
</tr>
<tr>
<td>Feature</td>
<td>Details</td>
</tr>
<tr>
<td>-------------------------------</td>
<td>--------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Upstream Slope</td>
<td>2.5H:1V</td>
</tr>
<tr>
<td>Downstream Slope</td>
<td>2.5H:1V</td>
</tr>
<tr>
<td>Zoning</td>
<td>Four zones described in detail on Figure 4.</td>
</tr>
<tr>
<td>Impervious Core</td>
<td>Zone I material; carried to elevation 1835.0; 1H:1V side slopes with a 10-foottop width.</td>
</tr>
<tr>
<td>Cutoff</td>
<td>Provided along embankment center-line; 1H:1V side slopes with a 12-foot bottom width.</td>
</tr>
<tr>
<td>Grout Curtain</td>
<td>None indicated.</td>
</tr>
<tr>
<td>h. Pond Drain</td>
<td>18-inch diameter reinforced concrete pipe with intake at the upstream toe and discharge outlet at the base of the service spillway riser.</td>
</tr>
<tr>
<td>Type</td>
<td>16 feet</td>
</tr>
<tr>
<td>Length</td>
<td>Provided by an 18-inch diameter slide gate mounted on the inside face of the service spillway riser.</td>
</tr>
<tr>
<td>Closure</td>
<td>Located at the base of the service spillway riser, the pond drain is accessible through the riser itself. However, no ladder or other means of reaching the riser base is provided by the design.</td>
</tr>
</tbody>
</table>
i. **Service Spillway.**

Type

Single-stage, reinforced concrete, drop inlet, vertical riser connected to a 30-inch diameter reinforced concrete discharge conduit which discharges into a standard SCS reinforced concrete impact basin.

Crest Elevation

1827.5

Upstream Channel

Not applicable.

Downstream Channel

20-foot long, riprap-lined, trapezoidal-shaped channel.

j. **Emergency Spillway.**

Type

Unlined vegetated channel excavated in the left abutment.

Crest Elevation

1835.0

Channel Width

100 feet

Breadth of Control Section

30 feet

Upstream Channel

Curved, unlined channel with 2 percent slope.

Downstream Channel

Discharge from the emergency spillway is directed over the left abutment hillside and into the natural stream several hundred feet downstream of the embankment toe.
SECTION 2
ENGINEERING DATA

2.1 Design.

a. Design Data Availability and Sources.

1. Hydrology and Hydraulics. Hydrologic and hydraulic design data are contained within a comprehensive design report prepared by the SCS and available at their Harrisburg and Washington, Pennsylvania offices.

2. Embankment. Comprehensive design data are contained within the SCS report mentioned above.

3. Appurtenant Structures. Same as above.

b. Design Features. Available construction drawings and design data indicate that the dam is a zoned earthfill structure consisting of approximately 26,000 cubic yards of fill. The structure is comprised of four zones as shown in Figure 4.

Zone I is composed of impervious material placed at the core and carried up to elevation 1835.0. Zone II material is slightly more pervious and makes up the shells on either side of Zone I. The outer shells of the fill are composed of Zone III material which consists of sandstone excavated from the emergency spillway and oversized material raked from Zones I and II. Zone IV material consists of topsoil placed on the exposed outer slopes.

The plans indicate the embankment has been constructed with a cutoff trench located along the centerline of the embankment foundation. The design calls for the trench to have been excavated between Station 3+65 and Station 7+10 with 1H:1V side slopes and a 12-foot bottom width.

A drainage system has been designed under the downstream portion of the earth fill to control the phreatic line and seepage (see Figures 4 and 6).

2. Appurtenant Structures.

a) Service Spillway. The service spillway is a single-stage, drop inlet structure consisting of a reinforced concrete riser and a 30-inch diameter reinforced concrete discharge conduit (see Figures 7, 8, 9, and 10).
b) **Emergency Spillway.** The emergency spillway is a trapezoidal channel cut into the left abutment. The control section has a crest length of 100 feet and is 30 feet wide (see Figures 3 and 5).

c) **Pond Drain.** The lake can be drained via an 18-inch diameter reinforced concrete pipe that discharges into the base of the service spillway riser and ultimately through the 30-inch diameter discharge conduit. The pond drain is regulated by means of an 18-inch diameter slide gate mounted on the inside face of the riser and operated manually from atop the riser (see Figures 7 and 8).

c. **Specific Design Data and Criteria.**

1. **Hydrology and Hydraulics.** The hydrologic and hydraulic design of this facility was based on criteria, data, and methods established in the "National Engineering Handbook" of the U. S. Department of Agriculture, Soil Conservation Service. Specific data and criteria are listed in Section 5, herein.

2. **Embankment.** All aspects of the embankment design were prepared by the Soil Conservation Service. Available design information includes all the basic elements of earth dam design. Embankment materials and local soils classifications, moisture-density relationship, consolidation, permeability, and shear strength are all discussed in various memoranda and correspondence contained in SCS files.

   Stability analysis was performed using the SCS stability computer program. The dam was analyzed with a center core section using total stress shear strength parameters of $\phi = 14.5^\circ$ and $C = 700$ psf and effective stress parameters of $\phi = 33.5^\circ$ and $C = 0$ psf. The shell section had shear parameters of $\phi = 35^\circ$ and $C = 0$ psf. Shear parameters of $\phi = 35.5^\circ$ and $C = 875$ psf were used for the surface 6 feet of the foundation.

   No data were available that could confirm the above design parameters were indeed attained during construction.

   A full drawdown analysis of the upstream 2.5H:1V slope with a 10-foot berm at elevation 1827.5 gave a safety factor of 2.2. The steady seepage analysis of the downstream slope, assuming free draining material in the shell, gave a safety factor of 1.94.

3. **Appurtenant Structures.** The appurtenant structures incorporated into the facility are, for the most part, proven standard SCS designs. Design data are presented within the design report available from the SCS.
2.2 **Construction Records.**

Construction records including bi-weekly construction status reports, dated photographs and memorandum, and pertinent correspondence are contained in PennDER files. A daily construction narrative prepared by the on-site representative of the SCS is available at the SCS Harrisburg office.

2.3 **Operational Records.**

No records of the day-to-day operation of this facility are maintained.

2.4 **Other Investigations**

No formal investigations have been performed on this facility subsequent to its construction.

2.5 **Evaluation.**

Engineering data were provided by the Pennsylvania Department of Environmental Resources and the U. S. Department of Agriculture, Soil Conservation Service. Sufficient data are available to indicate the structure was formally designed and constructed in accordance with accepted modern engineering practice.
SECTION 3
VISUAL INSPECTION

3.1 Observations.

a. General. The general appearance of this project suggests the dam and its appurtenances are currently in good condition.

b. Embankment. Observations made during the visual inspection reveal the embankment to be in good condition. Some minor erosion was observed along the upstream embankment face directly behind the service spillway riser (see Photograph 3). Unauthorized vehicular traffic across the embankment has left an unprotected rutted strip, void of vegetative cover, along the crest and across the emergency spillway channel (see Photograph 1). Otherwise, no evidence of sloughing, seepage, animal burrows, excess settlements or signs of maintenance neglect were observed.

c. Appurtenant Structures.

1. Service Spillway. The drop inlet, reinforced concrete riser appears to be in excellent condition. No cracks or signs of weathering were observed on either the interior or exterior concrete surfaces of the structure (see Photograph 3). The cover over the manhole that provides access to the interior of the structure from atop the riser was found missing on the day of the inspection.

2. Pond Drain. The pond drain was observed discharging during the inspection. The gate valve controlling flow through the pond drain is apparently stuck in a partially open position and cannot be closed as the valve control located atop the service spillway riser has been recently vandalized and rendered inoperable (see Photograph 4).

d. Reservoir Area. The general area surrounding the reservoir is characterized by gentle to moderate slopes that are partially wooded. PA-657 Dam is designed to be a multi-purpose recreational and flood control facility and is intended to eventually include various picnic and boating facilities along the shoreline.

e. Downstream Channel. The channel downstream of PA-657 Dam is characterized as a broad valley with steep wooded slopes to the right and gentle grassy slopes to the left. Jacobs Creek, in this area, is a small winding stream. At a distance approximately 1/2 mile downstream of the embankment, Jacobs Creek passes through a culvert beneath PA
Route 31. Two commercial establishments are located in this area sufficiently close to the streambed to possibly be affected by an embankment breach. The number of persons which could be potentially involved is dependent on the day and time of failure; however, more than a few can be reasonably assumed. Thus, the hazard classification of the facility is considered "high".

3.2 Evaluation.

The overall condition of the facility is considered good. Immediate repairs to the gate valve control are needed along with a replacement of the missing manhole cover. Consideration should be given to redesigning the present gate valve control to make it more vandalproof and to locking the manhole cover in place. Positive measures should be taken to curtail unauthorized vehicular travel across the crest and through the emergency spillway. All bare areas should be repaired and reseeded.
4.1 Normal Operational Procedures.

PA-657 Dam, in its flood control role, is essentially a self-regulating facility. Excess inflow passes through the service spillway and is discharged into the stream below. Inflows in excess of the capacity of the service spillway are stored and/or discharged through the emergency spillway.

According to the PennDER permit for the facility, the owner, via accurate measuring devices, is to maintain a continuous flow in Jacobs Creek immediately below the dam of not less than 0.39 cubic feet per second (252,000 gallons per day). When inflow to the reservoir is less than 252,000 gallons per day, outflow to Jacobs Creek can be reduced to equal reservoir inflow.

Under normal pool conditions a 6-inch diameter outflow line provides cold water discharge (see Figure 10). At the time of inspection, the slide gate on the pond drain was in an open position and the downstream discharge was estimated at 3 to 4 cubic feet per second.

No formal operating manual is available.

4.2 Maintenance of Dam.

The dam as designed requires only limited maintenance which is performed by Westmoreland County personnel in accordance with an agreement with the U.S.D.A., Soil Conservation Service; however, no formal maintenance program has been established. The agreement contains provisions requiring the annual inspection and maintenance of the entire facility and surrounding reservoir area. The owner is required to prepare a report after each inspection and to furnish a copy to the SCS. In addition, a record of all maintenance work performed is required to be readily available for review by the SCS or other authorized agency.

Review of SCS files indicate that yearly inspections have been performed by the SCS and/or owner's personnel during which the condition of the facility was found to be satisfactory.
4.3 **Maintenance of Operating Facilities.**

Maintenance of the operating facilities is carried out by Westmoreland County personnel on an informal basis and in accordance with the provisions of the agreement discussed in Section 4.2. It is reported that the gate valve is opened several times a year to insure its operability; however, on the day of the inspection, it was found to be inoperable, having recently been vandalized.

4.4 **Warning Systems.**

There are no formal warning systems in effect.

4.5 **Evaluation.**

The facility is designed to be self-regulating and requires minimal maintenance. There are no established formal operation and/or maintenance procedures; however, provisions for such procedures are contained within the standard agreement between the SCS and the owner. Nevertheless, formal manuals are recommended to ensure the continued proper care of the facility. A formal warning system should be incorporated into the manuals providing detailed procedures to protect downstream residents and provisions for around-the-clock surveillance during periods of unusually heavy precipitation.
SECTION 5
HYDROLOGIC/HYDRAULIC EVALUATION

5.1 Design Data.

A complete hydrologic/hydraulic analysis as prepared by
the U.S.D.A., Soil Conservation Service, is available from
SCS files. The report includes design criteria and proce-
dures, stage curves, hydrograph data, and complete routing
analysis.

According to this report, the crest of the service
spillway is set at elevation 1827.5, which is the elevation
required to store 100 years of wet sediment (33 acre-feet)
plus recreation storage (60 acre-feet). PennDER's "C" Curve
criteria (explained in PennDER Publication No. 41, "Con-
struction or Repair of Dams" 1975) establishes that the dam
should have spillway facilities capable of discharging a
flow of 3120 cfs.

The dam was designed in accordance with the principles
outlined in the National Engineering Handbook of the U. S.
Department of Agriculture, Soil Conservation Service. The
following is a synopsis of the hydrologic principles devel-
oped for this project.

a. The crest of the riser was set at elevation 1827.5
to provide for a 25-acre recreation pool and sediment storage.

b. The crest of the emergency spillway, 1834.9 (field
measured to be 1835), was established by routing the runoff
from the 100-year frequency, one-day and ten-day storm
rainfalls. This resulted in a storage capacity for flood-
water retardation of 3.65 acre-feet equivalent to 2.60
inches of runoff.

c. The design high water elevation, 1838.2, was
established by routing the runoff from a rainfall of 10.0
inches. This runoff was 7.27 inches with a maximum dis-
charge of 1565 cubic feet per second.

d. The top of dam elevation, 1844.1 (field measured
to be 1844.4), was established by routing the runoff from a
rainfall of 26.0 inches. Maximum discharge realized in this
routing was 8,650 cubic feet per second.
5.2 **Experience Data.**

No data pertaining to emergency spillway performance are available as it is reported that the emergency spillway has never discharged. The general appearance of the facility indicates adequate past performance of the service spillway.

5.3 **Visual Observations.**

On the date of the inspection, no conditions were observed that would indicate either the service or emergency spillways could not operate satisfactorily during a flood event. It is noted that the pond drain valve control has been recently rendered inoperable by vandals and left in a partially open position.

5.4 **Method of Analysis.**

The facility has been analyzed in accordance with the procedures and guidelines established by the U. S. Army, Corps of Engineers, Baltimore District, for Phase I hydrologic and hydraulic evaluations. The analysis has been performed utilizing a modified version of the HEC-1 program developed by the U. S. Army, Corps of Engineers, Hydrologic Engineering Center, Davis, California. Analytical capabilities of the program are briefly outlined in the preface contained in Appendix C.

5.5 **Summary of Analysis.**

a. **Spillway Design Flood (SDF).** In accordance with procedures and guidelines contained in the National Guidelines for Safety Inspection of Dams, for Phase I investigations, the SDF for this facility is the PMF (Probable Maximum Flood). That is, based on the relative size (intermediate) and hazard potential (high) of PA-657 Dam, the facility is required to have sufficient spillway and storage capabilities to safely discharge the PMF without overtopping the embankment.

b. **Results of Analysis.** PA-657 Dam was evaluated under near normal operating conditions. That is, the PA-657 Dam reservoir was initially at its normal or recreation pool elevation of 1827.5 feet (MSL) prior to the inflow of the PMF, with the service spillway assumed to be non-functional for the purpose of analysis. Design information concerning the reservoir's elevation-storage relationship was available and used in the evaluation. Design information was also
available regarding the elevation-discharge relationship of the emergency spillway, but this data was felt to be too conservative for analysis and was not used. The emergency spillway is a vegetated chute channel with a flat, vegetated critical control crest. All pertinent engineering calculations relative to the evaluation of this facility are provided in Appendix C.

Overtopping analysis (using the Modified HEC-1 Computer Program) showed that the discharge/storage capacity of PA-657 Dam can safely accommodate the PMF. That is, the peak PMF inflow of about 5580 cfs (Appendix C, Summary Input/Output Sheets, Sheet B) can be safely discharged and/or stored without overtopping the earth embankment. The peak PMF outflow of about 4760 cfs raises the reservoir water level to approximately elevation 1840.8 feet (Summary Input/Output Sheets, Sheet C). This reservoir level corresponds to about 3.6 feet below the field measured low top of the dam elevation of 1844.4 feet.

5.6 Spillway Adequacy.

Since the emergency spillway of PA-657 Dam is capable of discharging the inflow resulting from a storm of PMF magnitude, the spillway is deemed adequate.
SECTION 6
EVALUATION OF STRUCTURAL INTEGRITY

6.1 Visual Observations.

a. Embankment. Based on visual observations, the embankment appears to be in good structural condition. No evidence of seepage or structural deficiencies were detected during the inspection. Some minor erosion was observed along the upstream embankment face directly behind the service spillway riser. Conversations with the local SCS representative, who accompanied the field team during the inspection, revealed that no riprap was placed along the upstream slope as the material comprising the outer shell (Zone III) was considered sufficiently coarse and did not warrant further protection. It is noted that the Zone III material was covered with topsoil (Zone IV) and the erosion, as observed, may be confined to the Zone IV layer (see Figure 4). Nevertheless, the condition should be assessed and corrected if necessary.

b. Appurtenant Structures. The appurtenant structures of this facility appear to be well designed. All were found in excellent condition during the inspection except for the pond drain operator located atop the service spillway riser. The exposed portion of the mechanism was apparently the recent object of vandalism and was found to be inoperable by the field team.

6.2 Design and Construction Techniques.

Available design data and information obtained from SCS and PennDER files indicate that, for the most part, the facility has been adequately designed in conformance with modern accepted engineering practice. Many of its features have been repeatedly incorporated into similar SCS designs and proven their reliability.

Review of construction progress reports contained in PennDER files indicate that although the duration of construction was lengthy, the work was performed in accordance with the plans and specifications. SCS representatives monitored the work on a full-time basis.

6.3 Past Performance.

According to SCS personnel, the facility has operated virtually problem-free and has functioned as designed.
6.4 **Seismic Stability.**

The dam is located within Seismic Zone No. 1 and it is thought that the static stability of the structure is sufficient to withstand minor earthquake induced dynamic forces. However, no calculations, and/or investigations, were performed to confirm this belief.
SECTION 7
ASSESSMENT AND RECOMMENDATIONS FOR REMEDIAL MEASURES

7.1 Dam Assessment.

a. Safety. The visual inspection, operational history, and available engineering data suggest that the facility is adequately maintained and in good condition. Hydraulic and hydrologic calculations indicate that the spillway is capable of discharging the peak flow resulting from a storm of PMF intensity and, therefore, the spillway is considered adequate.

b. Adequacy of Information. The available data are considered sufficient to make an accurate assessment of the facility.

c. Urgency. It is suggested that the recommendations listed below be implemented as soon as possible.

d. Necessity for Additional Investigations. No additional investigations are deemed necessary at this time.

7.2 Recommendations/Remedial Measures.

It is recommended that the owner:

a. Repair the damaged pond drain gate control and replace the missing manhole cover atop the service spillway riser. Consideration should be given to redesigning the gate control mechanism to protect it from future vandalism.

b. Consult with the U.S.D.A., Soil Conservation Service, to assess the erosion on the upstream slope in the area of the service spillway riser and implement any remedial measures deemed necessary.

c. Curtail the unauthorized vehicular travel across the embankment and repair and reseed any damaged (bare) areas. If control of unauthorized travel is not practical, some provision should be made to protect the embankment from rutting and erosion by placing a layer of gravel or stone across the crest.

d. Develop a formal operation and maintenance manual to ensure the continued proper care of the facility. In addition, a formal warning system should be implemented which provides detailed procedures to protect the lives and property of downstream residents and provisions for around-the-clock surveillance during periods of unusually heavy precipitation.
APPENDIX A

CHECK LIST - ENGINEERING DATA
<table>
<thead>
<tr>
<th>ITEM</th>
<th>REMARKS</th>
</tr>
</thead>
<tbody>
<tr>
<td>REGIONAL VICINITY MAP</td>
<td>See Appendix G (U.S.G.S. 7.5 minute topographic quadrangle Donegal, Pennsylvania).</td>
</tr>
<tr>
<td>CONSTRUCTION HISTORY</td>
<td>Mr. Bowers represented the SCS during construction of this facility. Conversations with him indicated that four general contractors were used before the structure was finally completed. However, he also stated that strict specification compliance was achieved.</td>
</tr>
<tr>
<td>AVAILABLE DRAWINGS</td>
<td>Complete drawing sets by the SCS are available from both the PennDER and SCS offices in Harrisburg and Washington, Pennsylvania.</td>
</tr>
<tr>
<td>TYPICAL DAM SECTIONS</td>
<td>See Figures 4, 6, and 7, Appendix F.</td>
</tr>
<tr>
<td>OUTLETS: PLAN DETAILS DISCHARGE RATINGS</td>
<td>See Figure 3, Appendix F.</td>
</tr>
<tr>
<td></td>
<td>See Figure 7, Appendix F.</td>
</tr>
<tr>
<td></td>
<td>None available.</td>
</tr>
<tr>
<td>ITEM</td>
<td>REMARKS</td>
</tr>
<tr>
<td>------</td>
<td>---------</td>
</tr>
<tr>
<td><strong>SPILLWAY:</strong></td>
<td></td>
</tr>
<tr>
<td>Plan</td>
<td>See Figure 3, Appendix F.</td>
</tr>
<tr>
<td>Section</td>
<td>See Figures 5 and 7, Appendix F.</td>
</tr>
<tr>
<td>Details</td>
<td>See Figures 8, 9 and 10, Appendix F.</td>
</tr>
<tr>
<td><strong>OPERATING EQUIPMENT PLANS AND DETAILS</strong></td>
<td>See Figures 9 and 10, Appendix F.</td>
</tr>
<tr>
<td><strong>DESIGN REPORTS</strong></td>
<td>Complete design folder as prepared by the U.S.D.A., Soil Conservation Service is available from SCS offices in Harrisburg and Washington, PA.</td>
</tr>
<tr>
<td><strong>GEOLOGY REPORTS</strong></td>
<td>Contained in design folder (see above)</td>
</tr>
<tr>
<td><strong>DESIGN COMPUTATIONS:</strong></td>
<td>Contained in design folder (see above)</td>
</tr>
<tr>
<td>Hydrology and Hydraulics</td>
<td></td>
</tr>
<tr>
<td>Stability Analyses</td>
<td></td>
</tr>
<tr>
<td>Seepage Analyses</td>
<td></td>
</tr>
<tr>
<td><strong>MATERIAL INVESTIGATIONS:</strong></td>
<td>Contained in design folder (see above)</td>
</tr>
<tr>
<td>Boring Records</td>
<td>Also, see Figures 2 and 5, Appendix F.</td>
</tr>
<tr>
<td>Laboratory Testing</td>
<td>Also, see drawings 27-30 (not included in Appendix F).</td>
</tr>
<tr>
<td>Field Testing</td>
<td></td>
</tr>
<tr>
<td>ITEM</td>
<td>REMARKS</td>
</tr>
<tr>
<td>------------------------------------</td>
<td>---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>BORROW SOURCES</td>
<td>See Figure 2, Appendix F.</td>
</tr>
<tr>
<td></td>
<td>Note: Drawing 1 of 30 &quot;Cover Sheet&quot; (not included in Appendix F) indicates total volume of fill equal to approximately 26,000 cubic yards.</td>
</tr>
<tr>
<td>POST CONSTRUCTION DAM SURVEYS</td>
<td>None.</td>
</tr>
<tr>
<td>POST CONSTRUCTION ENGINEERING STUDIES AND REPORTS</td>
<td>Yearly inspection reports prepared by the owner (Westmoreland County Commissioners) are available from PennDER.</td>
</tr>
<tr>
<td>HIGH POOL RECORDS</td>
<td>No formal records. Mr. Bowers estimated highest pool to date at about 2 or 3 feet above normal pool.</td>
</tr>
<tr>
<td>MONITORING SYSTEMS</td>
<td>None.</td>
</tr>
<tr>
<td>MODIFICATIONS</td>
<td>None.</td>
</tr>
<tr>
<td>ITEM</td>
<td>REMARKS</td>
</tr>
<tr>
<td>------------------------------</td>
<td>-------------------------------------------------------------------------</td>
</tr>
<tr>
<td>PRIOR ACCIDENTS OR FAILURES</td>
<td>Recent vandalism evident by the present condition of the pond drain gate control.</td>
</tr>
<tr>
<td>MAINTENANCE: RECORDS MANUAL</td>
<td>None</td>
</tr>
<tr>
<td>OPERATION: RECORDS MANUAL</td>
<td>None</td>
</tr>
<tr>
<td>OPERATIONAL PROCEDURES</td>
<td>No formal procedures. See &quot;Operation and Maintenance Agreement&quot; available from owner, SCS, and PennDER.</td>
</tr>
<tr>
<td>WARNING SYSTEM AND/OR COMMUNICATION FACILITIES</td>
<td>No formal warning systems are in effect.</td>
</tr>
<tr>
<td>MISCELLANEOUS</td>
<td></td>
</tr>
</tbody>
</table>
SIZE OF DRAINAGE AREA: 2.6 square miles

ELEVATION TOP NORMAL POOL: 1827.5 STORAGE CAPACITY: 93 acre-feet
ELEVATION TOP FLOOD CONTROL POOL: 1835.0 STORAGE CAPACITY: 460 acre-feet
ELEVATION MAXIMUM DESIGN POOL: 1838.2 STORAGE CAPACITY: 850 acre-feet
ELEVATION TOP DAM: 1844.4 STORAGE CAPACITY: 1540 acre-feet

SPILLWAY DATA

CREST ELEVATION: (service) 1827.5; (emergency) 1835.0
TYPE: (service) single-stage drop inlet; (emergency) vegetated earth channel
CREST LENGTH: (emergency) 100 feet
CREST LENGTH: (service) 13.3 feet
SPILLOVER LOCATION: (service) embankment center; (emergency) left abutment

NUMBER AND TYPE OF GATES: None

Pond Drain

TYPE: 18-inch diameter reinforced concrete pipe
LOCATION: intake at upstream toe, outlet at base of service spillway riser.
ENTRANCE INVERTS: 1815.6
EXIT INVERTS: 1815.6
EMERGENCY DRAWDOWN FACILITIES: 18-inch diameter slide gate mounted on inside face of service spillway riser.

HYDROMETEOROLOGICAL GAGES

TYPE: None
LOCATION: --
RECORDS: --

MAXIMUM NON-DAMAGING DISCHARGE: Not known
APPENDIX B

CHECK LIST - VISUAL INSPECTION
CHECK LIST
VISUAL INSPECTION
PHASE 1

NAME OF DAM    PA-657 Dam (Acme Dam)
STATE        Pennsylvania

NDI# PA    828
PENNDER#  65-133

COUNTY    Westmoreland

TYPE OF DAM    Zoned earth
SIZE        Intermediate
DATE(S) INSPECTION    4 May 1979
WEATHER    Overcast with drizzle

POOL ELEVATION AT TIME OF INSPECTION    1827.5 M.S.L.
TAILWATER AT TIME OF INSPECTION    N/A M.S.L.

HAZARD CATEGORY    High
TEMPERATURE    45° 0 10:00 a.m.

INSPECTION PERSONNEL
B. M. Mihalcin
W. J. Veon
D. L. Bonk

OWNER REPRESENTATIVES
W. Bowers (U.S.D.A. Soil Conservation Service - Washington, PA office)

OTHERS
L. Busack (PennDER)

RECORDED BY    D. L. Bonk
<table>
<thead>
<tr>
<th>ITEM</th>
<th>OBSERVATIONS AND/OR REMARKS</th>
</tr>
</thead>
<tbody>
<tr>
<td>SURFACE CRACKS</td>
<td>None observed.</td>
</tr>
<tr>
<td>UNUSUAL MOVEMENT OR CRACKING AT OR BEYOND THE TOE</td>
<td>None observed.</td>
</tr>
<tr>
<td>SLOUGHING OR EROSION OF EMBANKMENT AND ABUTMENT SLOPES</td>
<td>Minor erosion of upstream face at about normal pool level directly behind service spillway riser. Unauthorized vehicular travel has resulted in a bare rutted roadway across the entire crest and through the emergency spillway.</td>
</tr>
</tbody>
</table>
| VERTICAL AND HORIZONTAL ALIGNMENT OF THE CREST | Vertical - Good.  
Horizonal - Good. |
<p>| RIPRAP FAILURES                           | No riprap.                   |
| JUNCTION OF EMBANKMENT AND ABUTMENT, SPILLWAY AND DAM | Good.                        |</p>
<table>
<thead>
<tr>
<th>ITEM</th>
<th>OBSERVATIONS AND/OR REMARKS</th>
</tr>
</thead>
<tbody>
<tr>
<td>DAMP AREAS (IRREGULAR VEGETATION LUSH OR DEAD PLANTS)</td>
<td>None observed along the embankment or the immediate downstream toe.</td>
</tr>
<tr>
<td>ANY NOTICEABLE SEEPAGE</td>
<td>None observed.</td>
</tr>
<tr>
<td>STAFF GAGE AND RECORDER</td>
<td>None.</td>
</tr>
<tr>
<td>DRAINS</td>
<td>12-inch diameter corrugated metal toe drains located in wingwalls of impact basin. Left drain dry; right drain discharging at about 1 gpm. Rock drain located approximately 10 feet below impact basin serves to drain right abutment hillside.</td>
</tr>
<tr>
<td>ITEM</td>
<td>OBSERVATIONS AND/OR REMARKS</td>
</tr>
<tr>
<td>-------------------------------------------</td>
<td>---------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td><strong>INTAKE STRUCTURE</strong></td>
<td>Submerged, not observed.</td>
</tr>
<tr>
<td><strong>OUTLET CONDUIT (CRACKING AND SPALLING OF CONCRETE SURFACES)</strong></td>
<td>18-inch diameter reinforced concrete pond drain (submerged, not observed). 30-inch diameter reinforced concrete outlet conduit discharges at downstream toe. No signs of deterioration were observed on exposed surfaces.</td>
</tr>
<tr>
<td><strong>OUTLET STRUCTURE</strong></td>
<td>Standard SCS impact basin design. Good condition, no signs of cracking or spalling of concrete surfaces.</td>
</tr>
<tr>
<td><strong>OUTLET CHANNEL</strong></td>
<td>Trapezoidal-shaped channel riprap lined for 20 feet beyond impact basin.</td>
</tr>
<tr>
<td><strong>GATE(S) AND OPERATIONAL EQUIPMENT</strong></td>
<td>18-inch diameter slide gate mounted on the inside face of the service spillway riser and manually operated from atop the riser. Gate control mechanism has been subjected to recent vandalism and presently is inoperable. The gate was observed to be partially open during the inspection allowing the pond drain to discharge at an estimated rate of 3-4 cfs.</td>
</tr>
<tr>
<td>ITEM</td>
<td>OBSERVATIONS AND/OR REMARKS</td>
</tr>
<tr>
<td>-------------------------------------------</td>
<td>-------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>TYPE AND CONDITION</td>
<td>Unlined vegetated earth channel with a trapezoidal cross-section cut into the left abutment.</td>
</tr>
<tr>
<td>APPROACH CHANNEL</td>
<td>Curved section of the above described channel.</td>
</tr>
<tr>
<td>SPILLWAY CHANNEL AND SIDEWALLS</td>
<td>Good condition.</td>
</tr>
<tr>
<td>STILLING BASIN PLUNGE POOL</td>
<td>Not applicable.</td>
</tr>
<tr>
<td>DISCHARGE CHANNEL</td>
<td>Discharge is diverted over the left abutment hillside and into the stream located at the base of the valley downstream.</td>
</tr>
<tr>
<td>BRIDGE AND PIERS</td>
<td>None.</td>
</tr>
<tr>
<td>EMERGENCY GATES</td>
<td>None.</td>
</tr>
<tr>
<td>ITEM</td>
<td>OBSERVATIONS AND/OR REMARKS</td>
</tr>
<tr>
<td>----------------------</td>
<td>---------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>TYPE AND CONDITION</td>
<td>Standard SCS single-stage, drop inlet riser. Good condition. No visible signs of concrete deterioration observed.</td>
</tr>
<tr>
<td>APPROACH CHANNEL</td>
<td>Not applicable.</td>
</tr>
<tr>
<td>OUTLET STRUCTURE</td>
<td>Standard SCS impact basin design. Good condition. No visible signs of concrete deterioration observed.</td>
</tr>
<tr>
<td>DISCHARGE CHANNEL</td>
<td>See Sheet 4 of 8 &quot;Outlet Channel&quot;.</td>
</tr>
<tr>
<td>ITEM</td>
<td>OBSERVATIONS AND/OR REMARKS</td>
</tr>
<tr>
<td>------------------</td>
<td>-----------------------------</td>
</tr>
<tr>
<td>MONUMENTATION SURVEYS</td>
<td>None observed.</td>
</tr>
<tr>
<td>OBSERVATION WELLS</td>
<td>None observed.</td>
</tr>
<tr>
<td>WEIRS</td>
<td>None observed.</td>
</tr>
<tr>
<td>PIZZOMETERS</td>
<td>None observed.</td>
</tr>
<tr>
<td>OTHERS</td>
<td></td>
</tr>
<tr>
<td>ITEM</td>
<td>OBSERVATIONS AND/OR REMARKS</td>
</tr>
<tr>
<td>-----------------------------------------------------</td>
<td>------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>SLOPES: RESERVOIR</td>
<td>Gentle to moderate and partially wooded.</td>
</tr>
<tr>
<td></td>
<td>Partial agricultural development in evidence within the watershed.</td>
</tr>
<tr>
<td>SEDIMENTATION</td>
<td>None observed.</td>
</tr>
<tr>
<td>DOWNSTREAM CHANNEL (OBSTRUCTIONS, DEBRIS, ETC.)</td>
<td>About 1/2 mile and 1-1/2 miles downstream of PA-657 Dam, Jacobs Creek passes beneath PA Route 31 and the Pennsylvania Turnpike, respectively.</td>
</tr>
<tr>
<td>SLOPES: CHANNEL VALLEY</td>
<td>The valley downstream of PA-657 Dam is broad and thickly vegetated with small trees and brush. The valley side slopes are steep and wooded to the right and gentle and grassy to the left.</td>
</tr>
<tr>
<td>APPROXIMATE NUMBER OF HOMES AND POPULATION</td>
<td>Two commercial establishments are located along the stream about 1/2 mile downstream of the embankment at PA Route 31. They are sufficiently close to the stream to likely be affected by an embankment breach. The number of persons who could be potentially involved is dependent on the day and time of failure; however, more than a few can be reasonably assumed.</td>
</tr>
</tbody>
</table>
APPENDIX C

HYDROLOGY AND HYDRAULICS
PREFACE

The modified HEC-1 program is capable of performing two basic types of hydrologic analyses: (1) the evaluation of the overtopping potential of the dam; and (2) the estimation of the downstream hydrologic-hydraulic consequences resulting from assumed structural failures of the dam. Briefly, the computational procedures typically used in the dam overtopping analysis are as follows:

a. Development of an inflow hydrograph(s) to the reservoir.

b. Routing of the inflow hydrograph(s) through the reservoir to determine if the event(s) analyzed would overtop the dam.

c. Routing of the outflow hydrograph(s) from the reservoir to desired downstream locations. The results provide the peak discharge(s), time(s) of the peak discharge(s), and the maximum stage(s) of each routed hydrograph at the downstream end of each reach.

The evaluation of the hydrologic-hydraulic consequences resulting from an assumed structural failure (breach) of the dam is typically performed as outlined below.

a. Development of an inflow hydrograph(s) to the reservoir.

b. Routing of the inflow hydrograph(s) through the reservoir.

c. Development of a failure hydrograph(s) based on specific breach criteria and normal reservoir outflow.

d. Routing of the failure hydrograph(s) to desired downstream locations. The results provide estimates of the peak discharge(s), time(s) to peak, and maximum water surface elevation(s) of the failure hydrograph(s) for each location.
DAM STATISTICS

HEIGHT OF DAM = 33 FT

MAXIMUM POOL STORAGE CAPACITY = 1540 ACF (SEE SHEET 3)
2 TOP OF DAM

NORMAL POOL STORAGE CAPACITY = 92 ACF (SEE SHEET 1)
2 TOP OF RECREATION POOL

DRAINAGE AREA = 2.6 22 MI.

NOTE 1: NORMAL POOL STORAGE CAPACITY DETAILLED FROM THE
"REPORT UPON THE APPLICATION OF THE COMMISSIONERS OF
WESTMORELAND COUNTY [TO CONSTRUCT AND MAINTAIN,
A DAM ACROSS JACOBS CREEK IN WESTMORELAND TOWNSHIP,
WESTMORELAND COUNTY]" (11597) [AS IN PROD DBF FILES]; AND ADJUST FOR
INFORMATION AS PRESENTED ON SHEET 3

DAM CLASS - INTERMEDIATE
(DUE TO STORAGE CAPACITY)

HAZARD CLASSIFICATION - HIGH

CONSTRUCTION COST - AMF
HYDROGRAPH PARAMETERS

LENGTH OF LONGEST WATERFALLS ≈ 3.0 m

LCA ≈ 1.4 m  (MEASURED ALONG THE LONGEST WATERFALLS FROM THE DAM CREST TO THE CENTER OF THE EARTH)

NOTE 2: VALUES OF L AND LCA ARE MEASURED FROM THE USGS 7.5 MINUTE DONEGAL, PA QUAD. ALL HYDROGRAPH VARIABLES ARE DEFINED IN REF 2 IN THE SECTION ENTITLED "SNYDER SYNTHETIC UNIT HYDROGRAPH".

Cₚ = 1.0  (SUPPLIED BY C.E. ZINN & C.P. OHIO RIVER B.A.I.V.

Tₐ = 1.0  (STANDARD TIME = 1.0 (L/LCA)^0.6)

Tₐ = 1.0 (L/LCA)^0.5  ≈ 1.64 hrs

STORAGE RELATIONSHIP

The storage relationship for the dam was defined from the 50% design flood and is presented on Sheet 3. This relationship will be used in the analysis.
Stage vs Storage
EA - DAM IN PLACE
Note - Change to EB insignificant SCG-55s
(Can office get of plan)

(This plot was obtained
from the design files
for the dam through
the Washington, PA office
of the SCG.)

Measured
top of dam EL 154 ft.

= 11540 ACFFT
OF AVAIL. STORAGE

Emergency spillway lift
EL 132.5 ft. 490 ACFFT
OF AVAIL. STORAGE

Normal pool EL 127.5
= 93 ACFFT OF AVAIL. CAPAC.
PMD CALCULATION:

- APPROXIMATE RAINFALL INDEX = 2.4 IN (REF 2, FIG. 1)
  (CORRESPONDING TO A DURATION OF 24 HOURS AND AN AREA OF 200 SQ MI IN SOUTHWESTERN PENNSYLVANIA)

- DEPTH-AREA-DURATION ZONE #7 (REF 3, FIG. 1)

- DRAINAGE AREA = 2.6 SQ MI. ⇒ ASSUME THAT DATA CORRESPONDING TO A 10 SQ MI. AREA IS REPRESENTATIVE OF THIS BASIN:

<table>
<thead>
<tr>
<th>DURATION (H)</th>
<th>PERCENT OF INDEX RAINFALL (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td>132</td>
</tr>
<tr>
<td>12</td>
<td>120</td>
</tr>
<tr>
<td>24</td>
<td>130</td>
</tr>
<tr>
<td>48</td>
<td>140</td>
</tr>
</tbody>
</table>

- HURRICANE FACTOR (ADJUSTMENT TO BASIN SHAPE AS WELL IN FIRE THE LEFT-LEADING EDGE OF A CYCLONE BLOW CENTERED OVER A SMALLER BASIN) COULD BE:
  A DAY = 2.6 SQ MI (< 10 SQ MI) ⇒ COULD IMPACT BAY
SPILLWAY CAPACITY (SERVICE)

The principal spillway is a conventional SCS drop-inlet, vertical riser structure with a 30" outlet pipe. According to Delta Informaton (obtained from the SCS), the capacity of the service or principal spillway is only about 12,000 cfs prior to overtopping of the embankment. Ignore the effects of the service spillway.

SPILLWAY CAPACITY (EMERGENCY)

- Profile of emergency spillway (not to scale)
  Vegetated earth side wall

- Cross-section of emergency spillway (not to scale)

Critical linking down at Embankment spillway.
ASSUME THAT THE WATER SURFACE PROFILE PASSES THROUGH CRITICAL DEPTH @ 2 (AS SHOWN ON SHEET 3): EQUATION BETWEEN 1 AND 2 ⇒

\[ Y_m + \frac{u^2}{2g} + z_1 = Y_c + \frac{u^2}{2g} + z_2 + \frac{H}{g} \]

WHERE
- \( u \) = RESERVOIR APPROACH VELOCITY =>
- \( z_1 \) = ELEVATION @ 1 IN FT,
- \( u_c \) = CRITICAL VELOCITY @ 1 IN FP,
- \( z_2 \) = ELEVATION @ 2 IN FT, AND
- \( H \) = HEAD LOSS BETWEEN 1 AND 2 => 0 FT

SINCE \( z_1 - z_2 = 0 \) (ROMLocated ON FLAT SURFACE STRUCTORE)

\[ Y_m = 9.4 \text{ ft} = Y_c + \frac{u^2}{2g} \]

FOR A TRAPEZOIDAL SHAPED CONTROL SECTION WITH CRITICAL DEPTH ⇒

\[ \frac{Ac}{h} = \frac{A_c}{Y_c} = \frac{A_c}{h} \]

WHERE
- \( A_c \) = OPPosite HATCHED DEPTH = FLOW AREA:
- \( h \) = FLOW DEPTH

\[ A_c = 100Y_c + \frac{1}{2} (2Y_c + Y_c) = \frac{1}{2} (25Y_c + Y_c) \]

\[ W_c = 100 + 25Y_c + 2.5Y_c = 100 + 5.5Y_c \]

\[ A_c = \frac{9.4 - Y_c}{0.5} = \frac{A_c}{Y_c} = \frac{125Y_c + 25Y_c^2}{4.5} \]

SOLVE FOR \( Y_c \) ⇒

\[ 9.4 (500 + 5.5Y_c) = Y_c (25Y_c + 25) \]

\[ \begin{align*}
9.4 (500 + 5.5Y_c) &= Y_c (25Y_c + 25) \\
9.4 &= \frac{Y_c (25Y_c + 25)}{500 + 5.5Y_c}
\end{align*} \]
$\gamma_c = 0.5 \text{ ft}$ (via the quadratic equation)

$A_c = \frac{720}{13.4^2} = 2.5 \text{ ft}^2$

$v_c = 13.4 \text{ fps}$

$Q = A_c \gamma_c = \left( \frac{720}{13.4^2} \right) (13.4) = 1245 \text{ cfs}$

- Check to see if critical flow actually occurs. Control $\Rightarrow$ channel slope will be from control section should be a supercritical slope ($> \text{critical slope}$)

Critical slope can be defined by Manning's equation (Ref 12, pg 142):

$S_c \approx \left( \frac{v_c^{2/3}}{1.49 A_c^{1/3}} \right)^{2/3}$

Where $S_c$ = critical slope corresponding to a flow with velocity $v_c$

$n = \text{roughness factor} \approx 0.038$ for 600 cfs

$P_e = 75$ and $V_e = \text{vegetative}$

$R_e = \text{hydraulic radius} = \text{flow area}/

\text{wetted perimeter} \approx \frac{720}{1245} \approx 1.79$

$s = \left[ \frac{(1.79)^{1/4}}{1.49 \cdot 0.038} \right]^{2/3} \approx 0.51 \text{ ft}$

$Q < Q_{crit} = \frac{720}{1.79} = 402 \text{ cfs}$

Critical flow occurs and emergency spillway capacity $= 1245 \text{ cfs}$, $Q_{crit} = 402 \text{ cfs}$
Spillway Rating Curve (Emergency)

Computed internally by HEC-1 via the Trapezoidal Rating Curve Routine, based on the spillway geometry as presented on Sheet 5. The Trapezoidal Routine calculates critical control discharges in a way similar to that outlined on Sheets 6 and 7 (see Summary Input/Output Sheets).
SUMMARY_INPUT/OUTPUT SHEETS

DAK SAFETY INSPECTION PA-637 (SCS DAQ) OVERTOPPING ANALYSIS
10-MINUTE TIME STEP AND 48-HOUR STORM DURATION

JOB SPECIFICATION
Wdh Hrh Hmin lday ini ini HCIP ITFRT NSHAN
200 0 10 0 0 0 0 0 0

MULTI-PLAN ANALYSES TO BE PERFORMED
NPALN= 1 NRTI= 1 LOCI= 1

RTIUS= 1.00

**************

SUB-AREA RUNOFF COMPUTATION

INFLOW INTO RESERVOIR

ISTAQ HCON HPIT NPRT INAME ISTAGE IAUTO
1 0 0 0 0 1 0 0

HYDROGRAPH DATA

HYDG HUNG TASA SNAP TSDDA TSPPC RAOH LOGHS ISCME ILOCAL
1 1 2.60 0.00 2.60 0.00 0.00 0.00 0.00 1 0

PREDICTION DATA

SPFE PMNS NR ML2 ML4 ML8 ML22 ML29 ML29 ML29 ML29 ML29
0.00 24.00 102.00 120.00 130.00 140.00 0.00 0.00 0.00

THSPC COMPUTED BY THE PROGRAM IS .900

LOSS DATA

LOMF SINKH DLIHRT HLIH SINKH RTUK STRR CLSTR ALSHK RTMP
0.00 0.00 0.00 0.00 0.00 1.00 1.00 0.05 0.00 0.00

UNIT HYDROGRAPH DATA

TP= 1.54 CP= .40 NTA= 0

FACE FLOW PARAMETER

SIMP= 1.50 ONCON= .05 RTIUS= 2.00

RECESSION DATA

APPROXIMATE CLARK COEFFICIENTS FROM GIVEN SHOBER CP AND TP ARE TC= 9.67 AND R=17.26 INTERVALS
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<th>END-OF-PERIOD FLOW</th>
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**HYDROGRAPH ROUTING**

**WATER THROUGH RESERVOIR**

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<th>ICOMP</th>
<th>IECON</th>
<th>ITAPE</th>
<th>JPLT</th>
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**CAPACITY**

| CAPACITY | 0.93 | 140. | 240. | 360. | 460. | 740. | 1100. | 1540. |

**ELEVATION**


**CREL**

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**PEAK OUTFLOW IS 4758, AT TIME 42.67 HOURS**

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**SUMMARY OF DAM SAFETY ANALYSIS**

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**CONTRACTS**

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LIST OF REFERENCES


12. "Hydraulics of Bridge Waterways," BPR, 1970, Discharge Coefficient Based on Criteria for Embankment Shaped Weirs, Figure 24, page 46.


APPENDIX D

PHOTOGRAPHS
PHOTOGRAPH 1  View of the embankment as seen from the left abutment atop the left channel wall of the emergency spillway. Note the unprotected vehicle path that runs across the emergency spillway and embankment crest.

PHOTOGRAPH 2  View of the embankment as seen from the right abutment hillside.

PHOTOGRAPH 3  View of the service spillway riser and upstream face of embankment. Note the minor erosion of the unprotected slope behind the riser.

PHOTOGRAPH 4  Close-up view of the pond drain gate control situated atop the service spillway riser. The mechanism was the apparent object of recent vandalism which has rendered it inoperable.
PHOTOGRAPH 5  View through the manhole opening of the interior of the service spillway riser. The manhole cover was missing on the day of the inspection.

PHOTOGRAPH 6  View of the impact basin energy dissipator located at the downstream embankment toe at the outlet end of the service spillway discharge conduit.

PHOTOGRAPH 7  View looking downstream from the crest of the embankment.

PHOTOGRAPH 8  View of the embankment as seen from several hundred feet downstream.
APPENDIX E

GEOLOGY
Geology

PA-657 Dam is located in the Allegheny Mountain Section of the Appalachian Plateaus Physiographic Province of western Pennsylvania. In this area, the Allegheny Mountain Section is characterized by gently folded sedimentary rock strata of Pennsylvanian age. Major structural axes strike from southwest to northeast with flanking strata dipping northwest and southeast.

The dam site is located about 0.5 mile east of the crest of the Chestnut Ridge Anticline. The rock strata at the dam site dip east-southeast at approximately 6 degrees. The site is underlain by sandstone, siltstone, clays, shales, and coals of the Allegheny Group of Pennsylvanian age. Drilling and test pit data indicate a residual sandy silt and silty sand blanket on both abutments, being 3 to 9 feet thick on the left abutment and 1 to 2 feet thick on the right abutment.

Bedrock was encountered in all of the foundation drill-holes and consists of interbedded sandstone, siltstone, and clay. Sandstone is the predominant rock type present and weathering depths range from about 10 feet on the left abutment to about 25 feet on the right abutment. About 5 percent of the original left abutment slope was covered with boulders in excess of one cubic yard in size.

The Jacobs Creek floodplain is covered with interbedded alluvial sediments classified as silts, clays, and sandy

E-1
silts with occasional large boulders. Permeability tests in the alluvial sediments generally showed permeability rates to be less than 1.0 foot per day.


2Engineering data presented in this section have been taken from the "Jacobs Creek Watershed Project (Design Manual)," prepared by the U. S. Department of Agriculture, Soil Conservation Service, 1971.
APPENDIX F

FIGURES
<table>
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<tr>
<th>Figure</th>
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<tr>
<td>1</td>
<td>General Plan (field inspection notes)</td>
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<tr>
<td>2</td>
<td>Plan of Storage Area</td>
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<tr>
<td>3</td>
<td>Plan of Structural Works</td>
</tr>
<tr>
<td>4</td>
<td>Field Placement</td>
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<td>5</td>
<td>Profile Along Centerline of Dam</td>
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<td>Service Spillway</td>
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<td>Riser Accessories</td>
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<td>10</td>
<td>Cold Water Release</td>
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FIGURE 1 - PA-657 DAM
GENERAL PLAN
FIELD INSPECTION NOTES
JACOBS CREEK WATERSHED
MULTIPLE PURPOSE DAM  PA 567
ALLEGHENY & FAYETTE COUNTIES, PENNA
PLAN OF STORAGE AREA
U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

FIGURE 2
NOTES
1 For logs of test holes see sheets 27 thru 28
2 For foundation excavation details see sheet 6.

JACOBS CREEK WATERSHED
MULTIPLE PURPOSE DAM PA-657
WILLIAMSTOWN & FAYETTE COUNTIES, PENNA
PLAN OF STRUCTURAL WORKS
U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

FIGURE 3
### Typical Section of Dam

**Zone I**
- **Material**: Materials as represented by Lab sample 78K-56, TP 302 (CL-ML)
- **Max. Muck Size**: 6"
- **Max. Lift (H)**: 9"
- **Redd Water Content**: Optimum + 1% to + 2%
- **Compaction**: 95% Max. density by ASTM D-698, Method A

**Zone II**
- **Material**: Materials as represented by Lab sample 78K-56, TP 302 (CL-ML)
- **Max. Muck Size**: 6"
- **Max. Lift (H)**: 9"
- **Redd Water Content**: Optimum + 2% to + 2%
- **Compaction**: 95% Max. density by ASTM D-698, Method A

**Zone III**
- **Material**: Gravel excavated from Emergency Spillway and over-sized material taken from Zones I and II
- **Max. Muck Size**: 12"
- **Max. Lift (H)**: 18"
- **Redd Water Content**: As designated by the Engineer
- **Compaction**: Compressed with minimum pressure of 450 p.s.i. using vibrating roller per lift

**Zone IV**
- **Material**: Topsoil
- **Max. Muck Size**: -
- **Max. Lift (H)**: 12"
- **Redd Water Content**: As designated by the Engineer
- **Compaction**: Compressed with minimum pressure of 450 p.s.i. using vibrating roller or by an equivalent method

---

1. **Selectiv Placement**: Materials as represented by Lab sample 78K-56, TP 302 (CL-ML)
2. **Max. Muck Size**: 6"
3. **Max. Lift (H)**: 9"
4. **Redd Water Content**: Optimum + 1% to + 2%
5. **Compaction**: 95% Max. density by ASTM D-698, Method A
6. **Selectiv Placement**: Materials as represented by Lab sample 78K-56, TP 302 (CL-ML)
7. **Max. Muck Size**: 6"
8. **Max. Lift (H)**: 9"
9. **Redd Water Content**: Optimum + 2% to + 2%
10. **Compaction**: 95% Max. density by ASTM D-698, Method A
11. **Selectiv Placement**: Gravel excavated from Emergency Spillway and over-sized material taken from Zones I and II
12. **Max. Muck Size**: 12"
13. **Max. Lift (H)**: 18"
14. **Redd Water Content**: As designated by the Engineer
15. **Compaction**: Compressed with minimum pressure of 450 p.s.i. using vibrating roller per lift
16. **Selectiv Placement**: Topsoil
17. **Max. Muck Size**: -
18. **Max. Lift (H)**: 12"
19. **Redd Water Content**: As designated by the Engineer
20. **Compaction**: Compressed with minimum pressure of 450 p.s.i. using vibrating roller or by an equivalent method

---

**NOTES**

- **Cons**: 1 Cons
- **For**: 2 For
TYPICAL SECTION OF DAM

SCALE

M0D WATER

CONTENT CLASS DEFINITION

Optimum 1.6% w + 2%

A 95% Max. density by ASTM D-698, Method "A"

Optimum 1.8% w + 2%

A 95% Max. density by ASTM D-698, Method "A"

Designated by the Engineer

C Compact with minimum stress of 450 psi by vibratory roller

Designated by the Engineer

C Compact with minimum stress of 450 psi by vibratory roller or by static compaction method

CONSTRUCTION NOTES

1. Constructed Slides are
   2.43' i. upstream
   2.43' i. downstream

2. For construction fill elevations see sheet 5.

JACOBS CREEK WATERSHED
MULTIPLE PURPOSE DAM PA-657
WESTMORELAND & FAYETTE COUNTIES, PA

FILL PLACEMENT

U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

FIGURE 4
CONSTRUCTION NOTES
1. For list of test holes see sheet 22 thru 28
2. C. Dam = Cutoff Trench
3. For foundation excavation limits see plan view or 11's sheet
Erosion Limits for Drain Fill

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Approx Bottom of Drain Trench

Profile Along E-D

Section A-A

Section B-B

Section D-D

Section E-E

Typical Section - Blanket Drain

Section C-C

Typical from Site 6426.92 to Site 6474.42 E Principal Spillway
**RISER STEEL SCHEDULE**

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**PLATE CONSTRUCT JOIN T**

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<tr>
<td>No. 7 Bars 1575, Ft x 321, 9 Lbs</td>
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<tr>
<td>CONCRETE</td>
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<td>Class 4000, 221 Cu Yds Reinforced</td>
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**NOTES**

1. Portland Cement type I-A or I with an air-entraining admixture shall be used.
2. When not otherwise shown, thickness of concrete over reinforcing steel shall be 3" in formed surfaces and 3" in unformed surfaces.
3. All exposed edges of concrete to have a 3" chamfer unless otherwise noted.
4. Bar dimensions are out to out of bar.
5. Trash rack details sheet 16.
7. Slide gate notes sheet 16.
8. Riser bottom of riser to stop 6" from inside of upstream end.

**SCALE**

1:123,456,768

**JA COB S CREEK WATERSHED**

**MULTIPLE PURPOSE DRAINAGE SYSTEM**

**WASHOE COUNTY, NEVADA, AND RANCHO COUNTY, OHIO**

**RISER STRUCTURAL DETAILS**

**U.S. DEPARTMENT OF AGRICULTURE**

**SOIL CONSERVATION SERVICE**

**FIGURE 8**
SPLITTER WALL ELEVATION

CHANNEL

"L" BOLT DETAIL

1. Channel in transit Spec. 581 for
2. Aluminum surface with 3 circle of an alloy-rod before installed.

RISER TRASH

BILL OF MATERIALS

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<tr>
<td>&quot;L&quot; Bolt</td>
<td>16</td>
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1/4" Dia Stainless Steel "L" Bolt Thread 2" of each end

SUPPLIED WITH HEX NUTS AND FLAT ANCHORS ASTM A 276
ENDWALL ELEVATION

BILL OF MATERIAL

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<td>8'-10&quot;</td>
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<td>&quot;C&quot; Bolt</td>
<td>¾&quot; Dia</td>
<td>6½&quot;x12&quot;</td>
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CONSTRUCTION NOTES
1. Channel in trash rack shall conform to Spec 581 for aluminum alloy.
2. Aluminum surfaces to be placed in contact with concrete shall be given a heavy coat of an alkali-resistant bituminous paint before installation.

SLIDE GATE NOTES
1. Slide gate, 18" Dia., type M-3-2 (Material Spec 572)
2. Class 5-15, flat back frame.
4. Fully adjustable stem guides.
5. N-W-M-I-E, stainless steel stem. Stem guides and gate lift device sizes and spacing according to manufacturer's recommendations.
6. Paint in accordance with paint system A (Spec 82).
7. Distance F in centerline of gate to top of riser lower slab = 35.08'

RISER TRASH RACK
Approx 112.5' of 6" dia. cold water release pipe, galvanized, standard weight, flanged couplings & fittings. Paint outside in accordance with point system 6 - Spec 82 Spec. 553 and 582 apply.

UPSTREAM ELEVATION

SIDE ELEVATION
PIPE STRAP NOTES

1. Pipe straps and braces are 1/4" x 3" and shall conform to Spec 581 for structural carbon steel plates.
2. All 90° bends are 1/4" radius.
3. Straps, braces, bolts, nuts and washers to be galvanized in accordance with Spec 582, and painted in accordance with paint system G: Spec 82.
4. Pipe straps fastened to riser by 5/16" dia expansion bolts.

JACOBS CREEK WATERSHED
MULTIPLE PURPOSE DAM PA 657
WESTMORELAND & FAYETTE COUNTIES, PENNA
COLD WATER RELEASE
U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

FIGURE 10
APPENDIX G

REGIONAL VICINITY
AND
WATERSHED BOUNDARY MAP