This report has been 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. In cases where the reservoir was lowered or drained prior to inspection, such action, while improving the stability and safety of the dam, removes the normal load on the structure and may obscure certain conditions which might otherwise be detectable if inspected under the normal operating environment of the structure.

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.
Based on the visual inspection, past performance and the available engineering data, the dam and its appurtenant structures appear to be in fair condition.

In accordance with the Corps of Engineers' evaluation guidelines, the size classification of this dam is small and the hazard classification is high. These classifications indicate that the Spillway Design Flood (SDF) should be in the range of one-half the Probable Maximum Flood (PMF) to the full PMF. The recommended SDF for this structure is the PMF. The spillway capacity is adequate for passing 51 percent of the PMF peak inflow without overtopping the dam. The spillway, therefore, is considered to be inadequate, but not seriously inadequate.

The following recommendations are presented for immediate action by the owner:

1. That the spillway walls be closely observed. If further deterioration or wall movement occurs, steps should be taken to replace or repair these walls.
2. That all brush and cuttings be removed from the embankment. Trees within ten feet of the toe should be removed. This area and the embankment should be maintained on a regular basis.
3. That the scarred areas be reseeded to provide an adequate cover against erosion.
4. That additional riprap be placed at the downstream wingwalls to prevent scour.
5. That the valve on the outlet pipe be maintained and operated at least once each year.

6. That the low area on the right side of the spillway be filled.

7. That a formal surveillance and downstream warning system be developed for use during periods of high or prolonged rainfall.

8. That an operation and maintenance manual be prepared for guidance in the operation of the dam during normal and emergency conditions, and that a schedule be developed for the annual inspection of the dam and its appurtenant structures.

SUBMITTED BY:

BERGER ASSOCIATES, INC.
HARRISBURG, PENNSYLVANIA

DATE: August 1, 1980

APPROVED BY:

JAMES W. PECK
Colonel, Corps of Engineers
District Engineer
DATE 30 August 1980

HENDRIK JONGSMA

[Stamp]
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APPENDIX A - CHECK LIST OF VISUAL INSPECTION REPORT  
APPENDIX B - CHECK LIST OF ENGINEERING DATA  
APPENDIX C - PHOTOGRAPHS  
APPENDIX D - HYDROLOGY AND HYDRAULIC CALCULATIONS  
APPENDIX E - PLATES  
APPENDIX F - GEOLOGIC REPORT
1.1 GENERAL

A. 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 inspections of dams throughout the United States.

B. Purpose

The purpose of this inspection is to determine if the dam constitutes a hazard to human life and property.

1.2 DESCRIPTION OF PROJECT

A. Description of Dam and Appurtenances

Note: Spillway crest elevation on the design drawings is shown as elevation 1232.0. The U.S.G.S. Quadrangle shows a reservoir elevation of 1237. The U.S.G.S. elevation is used as the spillway crest elevation in this report. All design elevations must be increased by five feet for comparison.

Lake Hamilton Dam, previously known as Lake Charlotte Dam, is an earthfill structure with a total length of 370 feet, including a 50 foot spillway. Maximum embankment height is about 15 feet. The spillway is located near the center of the dam and consists of a broad crested weir at an elevation 6.5 feet below the top of the spillway abutment walls (low point of dam). A drawdown facility is located to the left of the spillway and consists of an 18-inch corrugated metal pipe controlled at the upstream end with a slide gate. The gate control is accessible by boat or by wading through water only.
B. **Location:**

Buckingham Township, Wayne County
U.S.G.S. Quadrangle - Lake Como, PA-NJ
Latitude 41°-50.9', Longitude 75°-15.1'
Appendix E, Plates I & II

C. **Size Classification:**

Small: Height - 15 feet
Storage - 354 acre-feet

D. **Hazard Classification:**

High (Refer to Section 3.1.E.)

E. **Ownership:**

Ms. Lavanda L. Lyman, Executive Director
Rolling Hill Girl Scout Council
733 Route 202
Bridgewater, NJ 08807

F. **Purpose:**

Recreation

G. **Design and Construction History**

In 1948 a dam was constructed at this site without a permit. The dam was only about 5 feet high and 60 feet long. The Pennsylvania Department of Environmental Resources (PennDER) ordered this dam breached in December, 1948. Mr. Albert J. Huber, property owner, requested Mr. L.F. Burlein, P.E., Honesdale, Pennsylvania, to prepare plans for a new dam. A permit for construction of a dam in accordance with these plans (Plates III, IV & V, Appendix E) was issued on April 11, 1951. Construction started in 1952 and was completed in 1954. A final inspection on December 1, 1954, showed that plans were not followed. A resident engineer had not been used during the construction. The designed ogee section was replaced with a broad crested weir. The spillway depth was 5.33 feet instead of 6.0 feet. The embankment was two feet below crest elevation at several points, and the downstream slope was 1 vertical to 1 horizontal near the outlet pipe and there were no apparent cutoff walls behind the spillway walls.

In 1955 the walls were raised 1.33 feet by excavating behind the walls and pouring new walls behind the existing walls. The new walls were dowelled into the existing concrete. The existing spillway weir crest was removed and a new weir was poured, raising the normal pool level by three inches. In 1959 the outlet was extended downstream and additional fill was placed to flatten the embankment slope in this area.

The upstream right wingwall of the spillway was replaced in 1968 by Lester Soden & Sons, Honesdale, Pennsylvania, under supervision of Mr. Mark Zimmer. The repairs were designed by Mr. L.F. Burlein.
H. Normal Operating Procedures

The reservoir is used for boating and swimming and it is desired to maintain a pool level at spillway crest elevation. All inflow above this level is discharged over the spillway. The drawdown facilities are only used to lower the reservoir for maintenance work on beaches, shores and the dam structure.

1.3 PERTINENT DATA

A. Drainage Area (square miles)

From files: 3.4
Computed for this report: 3.5
Use: 3.5

B. Discharge at Dam Site (cubic feet per second)
See Appendix D for hydraulic calculations

Maximum known flood (estimated from records of U.S.G.S. gage on nearby North Branch Calkins Creek) 722

Outlet works low-pool outlet at pool Elev. 1231.0 10
Outlet works at pool level Elev. 1237.0 (spillway crest) 23
Spillway capacity at pool Elev. 1243.5 (low point of dam) 2734

C. Elevation (feet above mean sea level)

Top of dam (design) 1243.0
Top of dam (low point as surveyed) 1243.5
Spillway crest 1237.0
Upstream portal invert (slide gate opening) 1229.0
Downstream portal invert 1228.25
Streambed at downstream toe of dam (estimate) 1228.0
D. Reservoir (miles)
Length of normal pool 0.6
Length of maximum pool 0.6

E. Storage (acre-feet)
Spillway crest (Elev. 1237) 86
Top of dam (Elev. 1243.5) 354

F. Reservoir Surface (acres)
Top of dam (Elev. 1243.5) 47.5
Spillway crest (Elev. 1237) 30.3

G. Dam
Refer to Plate III in Appendix E for plan and section.
Type: Homogeneous earthfill.
Length: 370 feet.
Height: 15 feet.
Top Width: Design - 10 feet; Survey - 15 feet.

<table>
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<th>Side Slopes</th>
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</tr>
<tr>
<td>Downstream</td>
<td>2H to IV</td>
<td>3.0H to IV</td>
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Zoning: None.
Cutoff: Trench excavated on centerline of embankment and backfilled with embankment material. Trench width eight feet, with depth to impervious foundation.
Grouting: None.

H. Outlet Facilities
Type: 18" diameter pipe with 21" high by 29" wide box culvert at downstream end.
Location: Near left abutment.
Closure: Slide gate on upstream end.
Upstream Invert: 1229

I. Spillway
Type: Concrete broad crested weir.
Length: 50 feet.
Crest Elevation: 1237
Location: Near center of dam.

J. Regulating Outlet
See Section 1.3.H.
SECTION 2 - ENGINEERING DATA

2.1 DESIGN

A. Embankment

The engineering data for Lake Hamilton Dam are not very extensive. The design and construction of the dam was of great concern to the people living in Equinunk, where extensive damage occurred in 1942 during a period of heavy rain. The present dam is located at the site of an older, lower dam. The available design information is limited to the design drawings reproduced in Appendix E as Plates III, IV and V, and the report upon the application for construction prepared by PennDER.

B. Hydrology and Hydraulics

A preliminary design for this dam was prepared in 1948 by a Mr. Ernest Appert, C.E., Hawley, Pennsylvania. This design provided for a spillway design discharge capacity of 1900 cfs. This was not acceptable to PennDER, who insisted on a capacity of 2700 cfs. In 1950 Mr. L.F. Burlein prepared a new design to accommodate a design discharge capacity of 2700 cfs.

2.2 CONSTRUCTION

The available construction data indicate that the dam and its appurtenant structures were constructed without field supervision of a professional engineer. Construction started in 1952 and the owner reported completion of construction in 1954. A final inspection by PennDER on December 1, 1954, discovered that the construction did not follow the design drawings. The ogee section of the spillway was replaced by a broad crested weir, the spillway depth was reduced from six feet to 5.33 feet. The embankment profile was irregular and the length of the outlet pipe was shortened, causing a steep (1H to 1V) downstream slope near this pipe.

2.3 OPERATION

Formal records of operation are not maintained by the owner. Maximum discharges over the spillway are unknown. Persons living downstream of the dam apparently, without authorization, opened the slide gate on the outlet structure quite regularly hoping that the dam would function as a flood control structure. It appears that the outlet was left open from 1956 until 1960, when final completion of the dam was approved by PennDER. Since 1960, the reservoir was lowered several times for maintenance work on beaches and shoreline, and for repairs to the dam.
2.4 EVALUATION

A. Availability

The only available engineering data are contained in the files of PennDER, Harrisburg, Pennsylvania.

B. Adequacy

The available engineering data and construction data, combined with a visual inspection, are considered sufficiently adequate for making a reasonable assessment of the dam.

C. Operating Records

Operating records, including maximum pool levels, have not been maintained. Letters in the files indicate that failure of the right spillway wall occurred and that erosion at the downstream end of the spillway slab has been a problem.

D. Post Construction Changes

Several changes were made to the structure after its completion in 1954. In 1955 the spillway abutment walls were raised 1.33 feet by excavating behind the walls and pouring new walls behind the existing walls. Letters indicate that these walls were doweled together. The top part of the existing broad crested weir was modified by raising the crest three inches. In 1959 the outlet pipe was extended at the downstream end by 16 feet and additional fill was placed to flatten this slope. At that time, the crest was brought to a level condition, and the public road at the east side was raised, thus preventing overflow in the left abutment.

In 1968, the upstream right wingwall was replaced (Plate VI, Appendix E), and in 1979 heavy riprap was placed along the downstream edge of the spillway slab.
SECTION 3 - VISUAL INSPECTION

3.1 FINDINGS

A. General

The general appearance of Lake Hamilton Dam is fair. The embankment appears to be stable. There were no signs of sloughage or seepage. Maintenance work is required on the downstream slope. The spillway approach and slab are in good condition. The spillway walls are severely cracked and some displacement was noticed. Additional riprap is required at the ends of the wingwalls.

The visual inspection check list and sketches of the general plan and profile of the dam, as surveyed during the inspection, are presented in Appendix A of this report. Photographs of the facilities taken during the inspection are reproduced in Appendix C.

Mr. Jon Wysong, ranger, represented the owners and accompanied the inspectors during the inspection.

B. Embankment

The horizontal alignment of the embankment is good. The vertical profile of the dam (Plate A-II, Appendix A), indicates that the crest of the dam is above the design elevation.

The upstream slope is protected with riprap at the left side of the spillway only (Photograph No. 1). The crest of the dam is in good condition and has a good grass mat protection. The downstream slope has a growth of high weeds and trees are located close to the toe. Some brush had been cut. The cuttings were, however, left on the slope and should be removed. Construction equipment has scarred the downstream slope left of the spillway. This area should be reseeded to prevent erosion. Seepage was not detected during the inspection. An area adjacent to the right spillway wall is low due to erosion. Although the cutoff wall provides protection against overtopping, this area should be backfilled.

C. Appurtenant Structures

The spillway is located near the center of the embankment length and consists of a 50 foot long broad crested weir. The approach to the spillway is unobstructed. The weir and a 30 foot long downstream slab are in good condition. A cutoff wall is located at the end of this slab. Erosion of the channel exposed this cutoff wall in 1979; heavy riprap was placed in this area (Photograph No. 8). To prevent erosion at the end of the spillway walls, it is recommended that riprap be placed on these slopes.
The left spillway wall is deteriorated and has several cracks (Photograph No. 5). The right spillway wall (Photographs No. 6 and No. 7) also has many cracks. A 1/4-inch displacement was noticed at one of the cracks. It is recommended that regular close observations be made of the wall to detect if further movement is occurring.

The intake control structure, located at the upstream toe, consists of a concrete tower with a slide gate (Photograph No. 1). The gate has not been operated for several years and was not opened on the day of inspection. Access to the gate operating stem is via a narrow concrete wall extending upstream from the embankment to the upstream end of the outlet pipe. This wall is submerged by about one foot when normal pool level exists. The outlet at the downstream toe is a rectangular concrete box, partially obstructed with debris (Photograph No. 10). Some seepage water was noticed at the outlet. The amount was negligible and the origin could not be determined. A leaking seal on the slide gate could be the cause.

D. Reservoir Area

The reservoir area has flat to moderate slopes and the reservoir banks appear to be stable. Most of the banks are wooded, except at the upper end of the reservoir where grassed areas are used for the summer camp activities. A road parallels the left side of the reservoir. Siltation from runoff does not appear to be a problem.

E. Downstream Channel

The immediate downstream channel of the spillway was excavated into the right hillside and joins the original streambed about 150 feet below the dam. From this point, the channel is a typical mountain stream with a steep, rock lined creek bed. The village of Equinunk is located approximately 7,000 feet downstream from the dam. About 6 homes are situated close to the stream. State Route 191 crosses the stream in this village. Access from Equinunk to the dam is over a dirt road paralleling the creek. During periods of high discharges, vehicular access to the dam is doubtful.

A potential hazard to loss of life exists downstream if the dam fails. The hazard category is therefore considered to be "High."

3.2 EVALUATION

The overall visual evaluation of the facilities indicates that Lake Hamilton Dam is in fair condition. Even though the embankment appears to be stable and no seepage was detected, several maintenance items require attention. It is recommended that brush be removed from the embankment slopes. Trees and brush within 10 feet of the toe of the dam should be removed, and the embankment scars need to be reseeded. The
walls of the spillway should be closely observed and repaired if any further displacement occurs. Additional riprap should be placed at the end of the wingwalls to prevent erosion.
4.1 PROCEDURES

The dam and reservoir were constructed for use as a recreational facility. The reservoir is maintained at the normal pool level (top of spillway). All inflow is discharged over the spillway. The drawdown facility was last used several years ago to lower the pool level for maintenance of beaches.

4.2 MAINTENANCE OF DAM

The downstream slope on the left side of the spillway has some high brush and some cuttings from a previous cleanup. All brush and cuttings should be removed. The toe and the immediate area beyond the toe has not been kept clear of trees and brush.

4.3 MAINTENANCE OF OPERATING FACILITIES

The only operating facility is the drawdown gate located on the intake structure. This gate is only operated occasionally, and there is no program for regular maintenance of the facility.

4.4 WARNING SYSTEM

There is no formally organized surveillance and downstream warning system in existence at the present time.

4.5 EVALUATION

The operational procedures for Lake Hamilton Dam are minimal. It is recommended that a program be developed for regular maintenance of the dam, which should include the removal of brush and trees, the reseeding of the embankment and the regular operation and maintenance of the slide gate.

A formal surveillance plan and downstream warning system should be developed for implementation during periods of heavy or prolonged precipitation.
SECTION 5 - HYDROLOGY/HYDRAULICS

5.1 EVALUATION OF FEATURES

A. Design Data

The hydrologic and hydraulic analysis available from PennDER for Lake Hamilton Dam was not very extensive. No area-capacity curve, frequency curve, unit hydrograph, design storm, design flood hydrograph, or flood routings were available.

B. Experience Data

There are no records of flood levels at Lake Hamilton Dam. Based on records of the U.S.G.S. stream gage on North Branch Calkins Creek at nearby Damascus, Pennsylvania, the maximum inflow to Lake Hamilton is estimated to be 722 cfs. This flood was passed without reported difficulties.

C. Visual Observations

On the date of the inspection, no conditions were observed that would indicate that the appurtenant structures of the dam could not operate satisfactorily until the dam is overtopped. A beaver dam was located a short distance upstream of Lake Hamilton. This impoundment was not included in the calculations contained in Appendix D.

D. Overtopping Potential

Lake Hamilton Dam has a total storage capacity of 354 acre-feet and an overall height of 15 feet above streambed. These dimensions indicate a size classification of "Small." The hazard classification is "High" (see Section 3.1.E.).

The recommended Spillway Design Flood (SDF) for a dam having the above classifications is in the range of one-half the Probable Maximum Flood (PMF) to the full PMF. Because of the number of homes downstream of this dam, the recommended SDF is the full PMF. For this dam, the PMF peak inflow is 5673 cfs (see Appendix D for HEC-1 inflow computations).

Comparison of the estimated PMF peak inflow of 5673 cfs with the estimated spillway discharge capacity of 2734 cfs indicates that a potential for overtopping of the Lake Hamilton Dam exists.

An estimate of the storage effect of the reservoir and routing of the computed inflow hydrograph through the reservoir shows that this dam does not have the necessary storage available to pass the full PMF.
without overtopping. The spillway-reservoir system can pass a flood event equal to 51% of a PMF without overtopping based on the low point of the dam profile.

E. Spillway Adequacy

The small size and high hazard categories, in accordance with the Corps of Engineers criteria and guidelines, indicates that the SDF for this dam should be in the range of one-half PMF to the full PMF. The recommended SDF for this dam is the full PMF.

Calculations show that the spillway discharge capacity and reservoir storage capacity, based on the present low point in the dam profile, combine to handle 51% of the PMF (refer to Appendix D).

Since the total spillway discharge and reservoir storage capacity cannot pass the full PMF, but can pass more than one-half PMF without overtopping, the spillway is considered to be inadequate, but not seriously inadequate.

The hydrologic analysis for this investigation was based upon existing conditions of the watershed. The effects of future development were not considered.
SECTION 6 - STRUCTURAL STABILITY

6.1 EVALUATION OF STRUCTURAL STABILITY

A. Visual Observations

1. Embankment

The visual inspection of Lake Hamilton Dam did not detect any signs of embankment instability. The field survey indicates that the embankment slopes approximately match the design slopes, and they appear to be adequate for the height of dam under consideration. The field survey indicates that the crest of the dam is above the design elevation except the spillway walls which are at design crest elevation.

2. Appurtenant Structures

The spillway weir and slab appear to be in good condition. Heavy riprap has been placed at the downstream side to prevent further erosion. The spillway walls are of some concern due to severe deterioration and cracking. It appears that a quarter inch of movement has occurred in the right wall. Close observation of these walls is required. The observed condition of the walls indicates the need for probable rehabilitation within the next few years.

B. Design and Construction Data

The design of the embankment was limited to a typical cross section drawing. Stability or seepage calculations were not made. A cutoff trench is indicated on Plate III, Appendix E. Records of subsurface investigation and construction are not available. Several variations to the design drawings were made during the construction period. Some of these were corrected after construction was completed (see Section II). These variations indicate that engineering construction supervision did not exist. The ogee section with upstream and downstream cutoff walls, was replaced with a broad crested weir. It is unknown how deep the foundation of the weir was excavated. The details of the spillway walls (Plate IV, Appendix E) indicate a four foot wide footing with a maximum footing depth at twelve feet below top of wall. This does not appear to be adequate. Reinforcing in the walls are 5/8-inch bars at 13-inch centers.

The right forebay wall was replaced with a new wall in 1968 (Plate VI, Appendix E). Although the footing width design appears adequate, cracks have occurred, indicating possible settlement.
There is no operator's platform on the intake structure. The outlet pipe details show two anti-seepage collars. The 18-inch CMP was apparently extended in 1958 with a concrete culvert.

C. Operating Records

Operating records for this dam have not been maintained by the owner.

D. Post Construction Changes

Letters and inspection reports in the files of PennDER indicate that construction details did not follow design drawings. Reference is made to Section II of this report. Several changes were made to spillway walls, spillway weir, outlet pipe and embankment slope.

E. Seismic Stability

This dam is located in Seismic Zone 1 and it is considered that the static stability is sufficient to withstand minor earthquake-induced dynamic forces. No studies or calculations have been made to confirm this assumption.
SECTION 7 - ASSESSMENT AND RECOMMENDATIONS

7.1 DAM ASSESSMENT

A. Safety

The visual inspection and the review of the construction drawings indicate that Lake Hamilton Dam is in fair condition. The embankment appears to be stable. The small flow of water at the outlet pipe is not considered to be serious at the present time. The main concern is the condition of the spillway walls, which need close observation. Maintenance procedures should be improved.

The hydrologic and hydraulic computations indicate that the combination of storage capacity and the discharge of the spillway is sufficient to pass 51 percent of the PMF with the existing condition. The spillway is considered to be inadequate, but not seriously inadequate.

B. Adequacy of Information

The design information contained in the files, combined with the visual inspection, are considered to be sufficiently adequate for making a reasonable assessment of this dam.

C. Urgency

The recommendations presented below should be implemented immediately.

D. Additional Studies

Additional studies are not required at this time.

7.2 RECOMMENDATIONS

In order to assure the continued satisfactory operation of this dam, the following recommendations are presented for implementation by the owner:

1. That the spillway walls be closely observed. If further deterioration or wall movement occurs, steps should be taken to replace or repair these walls.

2. That all brush and cuttings be removed from the embankment. Trees within ten feet of the toe should be removed. This area and the embankment should be maintained on a regular basis.
3. That the scarred areas be reseeded to provide an adequate cover against erosion.

4. That additional riprap be placed at the downstream wingwalls to prevent scour.

5. That the valve on the outlet pipe be maintained and operated at least once each year.

6. That the low area on the right side of the spillway be filled.
APPENDIX A

CHECKLIST OF VISUAL INSPECTION REPORT
### Check List

**Phase I - Visual Inspection Report**

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<td>Earth embankment with ogee spillway</td>
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<td><strong>Wayne County, Pennsylvania</strong></td>
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<td><strong>Inspectors:</strong></td>
<td>R. Houseal (Recorder)</td>
<td><strong>Owner's Representative(s):</strong></td>
</tr>
<tr>
<td></td>
<td>R. Shireman</td>
<td></td>
</tr>
<tr>
<td></td>
<td>A. Bartlett</td>
<td></td>
</tr>
<tr>
<td><strong>Normal Pool Elevation:</strong></td>
<td>1237.0 (U.S.G.S.)</td>
<td><strong>At Time of Inspection:</strong></td>
</tr>
<tr>
<td><strong>Breast Elevation:</strong></td>
<td>1243.0 (Design)</td>
<td><strong>Pool Elevation:</strong></td>
</tr>
<tr>
<td><strong>Spillway Elevation:</strong></td>
<td>1237.0 (U.S.G.S.)</td>
<td><strong>Tailwater Elevation:</strong></td>
</tr>
<tr>
<td><strong>Maximum Recorded Pool Elevation:</strong></td>
<td>Unknown</td>
<td></td>
</tr>
<tr>
<td><strong>General Comments:</strong></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

---

A-1
**VISUAL INSPECTION**

**EMBANKMENT**

<table>
<thead>
<tr>
<th>A. SURFACE CRACKS</th>
<th>OBSERVATIONS AND REMARKS</th>
</tr>
</thead>
<tbody>
<tr>
<td>None observed.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>B. UNUSUAL MOVEMENT BEYOND TOE</th>
<th>None observed.</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>C. SLOUGHING OR EROSION OF EMBANKMENT OR ABUTMENT SLOPES</th>
<th>None observed. Construction equipment caused scars to the left of the spillway on downstream slope. Needs reseeding.</th>
</tr>
</thead>
</table>

| D. ALIGNMENT OF CREST:  
HORIZONTAL: | Horizontal - Tangent section.  
VERTICAL: | Refer to profile for vertical (Plate A-II). |
|--------------------------------------------------|--------------------------------------------------------------------------------|

<table>
<thead>
<tr>
<th>E. RIPRAP FAILURES</th>
<th>None observed. Riprap on upstream slope.</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>F. JUNCTION EMBANKMENT &amp; ABUTMENT OR SPILLWAY</th>
<th>Junctions with wing walls and natural ground appear sound. A low area is adjacent to the right spillway wall. The cutoff wall provides protection.</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>G. SEEPAGE</th>
<th>None on embankment slope or at toe. Only seepage appears to be through the outlet facility, and this is minor.</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>H. DRAINS</th>
<th>None observed.</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>J. GAGES &amp; RECORDER</th>
<th>None.</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>K. COVER (GROWTH)</th>
<th>Grass cover on slopes with some riprap on upstream slope in the area of the intake gate. Brush on downstream slope left side.</th>
</tr>
</thead>
</table>
**VISUAL INSPECTION**

**OUTLET WORKS**

<table>
<thead>
<tr>
<th>OBSERVATIONS AND REMARKS</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>A. INTAKE STRUCTURE</strong></td>
</tr>
<tr>
<td>Slide gate upstream from upstream slope and to left of spillway. Gate controls flow through concrete rectangular outlet pipe. Opened several years ago to drawdown lake in order to remove sediment from the beach areas.</td>
</tr>
<tr>
<td><strong>B. OUTLET STRUCTURE</strong></td>
</tr>
<tr>
<td>End wall for rectangular concrete pipe.</td>
</tr>
<tr>
<td><strong>C. OUTLET CHANNEL</strong></td>
</tr>
<tr>
<td>Excavated swale joining natural stream several hundred feet downstream.</td>
</tr>
<tr>
<td><strong>D. GATES</strong></td>
</tr>
<tr>
<td>Gate upstream control.</td>
</tr>
<tr>
<td><strong>E. EMERGENCY GATE</strong></td>
</tr>
<tr>
<td>Same as D. above.</td>
</tr>
<tr>
<td><strong>F. OPERATION &amp; CONTROL</strong></td>
</tr>
<tr>
<td>None.</td>
</tr>
<tr>
<td><strong>G. BRIDGE (ACCESS)</strong></td>
</tr>
<tr>
<td>None.</td>
</tr>
</tbody>
</table>
### Visual Inspection

#### Spillway

<table>
<thead>
<tr>
<th>OBSERVATIONS AND REMARKS</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>A. Approach Channel</strong></td>
</tr>
<tr>
<td>Approach to spillway is directly from the reservoir - unobstructed.</td>
</tr>
<tr>
<td><strong>B. Weir:</strong></td>
</tr>
<tr>
<td>Crest Condition</td>
</tr>
<tr>
<td>Cracks</td>
</tr>
<tr>
<td>Deterioration</td>
</tr>
<tr>
<td>Foundation</td>
</tr>
<tr>
<td>Abutments</td>
</tr>
<tr>
<td><strong>C. Discharge Channel:</strong></td>
</tr>
<tr>
<td>Lining</td>
</tr>
<tr>
<td>Cracks</td>
</tr>
<tr>
<td>Stilling Basin</td>
</tr>
<tr>
<td><strong>D. Bridge &amp; Piers</strong></td>
</tr>
<tr>
<td><strong>E. Gates &amp; Operation Equipment</strong></td>
</tr>
<tr>
<td><strong>F. Control &amp; History</strong></td>
</tr>
</tbody>
</table>
## VISUAL INSPECTION

<table>
<thead>
<tr>
<th>INSTRUMENTATION</th>
<th>OBSERVATIONS AND REMARKS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Monumentation</td>
<td>None.</td>
</tr>
<tr>
<td>Observation Wells</td>
<td>None.</td>
</tr>
<tr>
<td>Weirs</td>
<td>None.</td>
</tr>
<tr>
<td>Piezometers</td>
<td>None.</td>
</tr>
<tr>
<td>Staff Gauge</td>
<td>None.</td>
</tr>
<tr>
<td>Other</td>
<td>None.</td>
</tr>
</tbody>
</table>

### RESERVOIR

<table>
<thead>
<tr>
<th>Slopes</th>
<th>Mostly wooded, moderate slopes.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sedimentation</td>
<td>Upstream end of reservoir was dredged out about 5 years ago.</td>
</tr>
<tr>
<td>Watershed Description</td>
<td>All wooded. Two ponds upstream. Part of ponding of these natural lakes caused by beaver dams.</td>
</tr>
</tbody>
</table>

### DOWNSTREAM CHANNEL

<table>
<thead>
<tr>
<th>Condition</th>
<th>Natural mountain stream. Many rocks and steep.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Slopes</td>
<td>Rocky and steep.</td>
</tr>
<tr>
<td>Approximate Population</td>
<td>20</td>
</tr>
<tr>
<td>No. Homes</td>
<td>About 6 homes and businesses close to stream and Pennsylvania State Highway No. 191.</td>
</tr>
</tbody>
</table>
APPENDIX B

CHECKLIST OF ENGINEERING DATA
## CHECK LIST
### ENGINEERING DATA

**PA DER # 64-157**

**NDI NO. PA-01030**

**NAME OF DAM** LAKE HAMILTON DAM

<table>
<thead>
<tr>
<th><strong>ITEM</strong></th>
<th><strong>REMARKS</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>AS-BUILT DRAWINGS</strong></td>
<td>None.</td>
</tr>
<tr>
<td><strong>REGIONAL VICINITY MAP</strong></td>
<td>U.S.G.S. Quadrangle - Lake Como, PA-NJ See Plate II, Appendix E</td>
</tr>
<tr>
<td><strong>GENERAL PLAN OF DAM</strong></td>
<td>Plate III, Appendix E.</td>
</tr>
<tr>
<td><strong>TYPICAL SECTIONS OF DAM</strong></td>
<td>Plate III, Appendix E.</td>
</tr>
<tr>
<td><strong>OUTLETS:</strong></td>
<td><img src="image_url" alt="Image" /></td>
</tr>
<tr>
<td><strong>PLAN DETAILS</strong></td>
<td><img src="image_url" alt="Image" /></td>
</tr>
<tr>
<td><strong>CONSTRAINTS</strong></td>
<td><img src="image_url" alt="Image" /></td>
</tr>
<tr>
<td><strong>DISCHARGE RATINGS</strong></td>
<td>None.</td>
</tr>
</tbody>
</table>

Plate IV, Appendix E.
<table>
<thead>
<tr>
<th>ITEM</th>
<th>REMARKS</th>
</tr>
</thead>
<tbody>
<tr>
<td>RAINFALL &amp; RESERVOIR RECORDS</td>
<td>No records.</td>
</tr>
<tr>
<td>DESIGN REPORTS</td>
<td>None.</td>
</tr>
<tr>
<td>GEOLOGY REPORTS</td>
<td>None.</td>
</tr>
<tr>
<td>DESIGN COMPUTATIONS: HYDROLOGY &amp; HYDRAULICS</td>
<td>None.</td>
</tr>
<tr>
<td>DAM STABILITY</td>
<td></td>
</tr>
<tr>
<td>SEEPAGE STUDIES</td>
<td></td>
</tr>
<tr>
<td>MATERIALS INVESTIGATIONS: BORING RECORDS</td>
<td>None.</td>
</tr>
<tr>
<td>LABORATORY FIELD</td>
<td></td>
</tr>
<tr>
<td>FIELD</td>
<td></td>
</tr>
<tr>
<td>POST CONSTRUCTION SURVEYS OF DAM</td>
<td>None.</td>
</tr>
<tr>
<td>BORROW SOURCES</td>
<td>Unknown. Possible from hillside at left abutment.</td>
</tr>
<tr>
<td>ITEM</td>
<td>REMARKS</td>
</tr>
<tr>
<td>------------------------------------------------</td>
<td>-------------------------------------------------------------------------</td>
</tr>
<tr>
<td>MONITORING SYSTEMS</td>
<td>None.</td>
</tr>
<tr>
<td>MODIFICATIONS</td>
<td>Broad crested weir constructed in 1953, changed to modified ogee section in 1955. Spillway walls raised 1.33 feet in 1955 to conform to original plans.</td>
</tr>
<tr>
<td>HIGH POOL RECORDS</td>
<td>Unknown.</td>
</tr>
<tr>
<td>POST CONSTRUCTION ENGINEERING STUDIES &amp; REPORTS</td>
<td>Repairs in 1968, Plate VI, Appendix E.</td>
</tr>
<tr>
<td>PRIOR ACCIDENTS OR FAILURE OF DAM</td>
<td>None.</td>
</tr>
<tr>
<td>Description:</td>
<td></td>
</tr>
<tr>
<td>Reports:</td>
<td></td>
</tr>
<tr>
<td>MAINTENANCE &amp; OPERATION RECORDS</td>
<td>Not available.</td>
</tr>
<tr>
<td>SPILLWAY PLAN, SECTIONS AND DETAILS</td>
<td>Plate IV, Appendix E. Not built as per plan. Modified in 1955.</td>
</tr>
<tr>
<td>ITEM</td>
<td>REMARKS</td>
</tr>
<tr>
<td>--------------------------------------------------</td>
<td>-------------------------------------------------------------------------</td>
</tr>
<tr>
<td>OPERATING EQUIPMENT, PLANS &amp; DETAILS</td>
<td>Plate V, Appendix E.</td>
</tr>
<tr>
<td>CONSTRUCTION RECORDS</td>
<td>No records.</td>
</tr>
<tr>
<td>PREVIOUS INSPECTION REPORTS &amp; DEFICIENCIES</td>
<td>Concern of citizens in Equinunk required many visits by PennDER representatives.</td>
</tr>
<tr>
<td>MISCELLANEOUS</td>
<td></td>
</tr>
</tbody>
</table>
CHECK LIST
HYDROLOGIC AND HYDRAULIC
ENGINEERING DATA

DRAINAGE AREA CHARACTERISTICS: Wooded

ELEVATION:

TOP NORMAL POOL & STORAGE CAPACITY: Elev. 1237 Acre-Feet 85.9
TOP FLOOD CONTROL POOL & STORAGE CAPACITY: Elev. 1234.5 Acre-Feet 354
MAXIMUM DESIGN POOL: Elev. 1243.0
TOP DAM: Elev. 1243.5

SPILLWAY:

a. Elevation 1237
b. Type Broad crested weir
c. Width 50 feet
d. Length --
e. Location Spillover Near center of dam
f. Number and Type of Gates None

OUTLET WORKS:

a. Type 18" diameter pipe with slide gate on upstream end
b. Location Near left abutment
c. Entrance inverts 1229
d. Exit inverts 1229.25
e. Emergency drawdown facilities 18" diameter pipe

HYDROMeteorological GAGES:

a. Type None
b. Location

c. Records

MAXIMUM NON-DAMAGING DISCHARGE: 2734 cfs
OVERVIEW FROM LEFT ABUTMENT - NO. 2

DOWNSTREAM SLOPE - NO. 3
OVERVIEW FROM RIGHT ABUTMENT - NO. 4

LEFT SPILLWAY WALL - NO. 5

PA-01030
Plate C-111
RIPRAP PROTECTION AT END OF SPILLWAY SLAB - NO. 8

DOWNSTREAM CHANNEL OF SPILLWAY - NO. 9
DOWNSTREAM END OF OUTLET - NO. 10

RESERVOIR AREA - NO. 11
APPENDIX D

HYDROLOGY AND HYDRAULIC CALCULATIONS
SUMMARY DESCRIPTION
OF
FLOOD HYDROGRAPH PACKAGE (HEC-1)
DAM SAFETY VERSION

The hydrologic and hydraulic evaluation for this inspection report has employed computer techniques using the Corps of Engineers computer program identified as the Flood Hydrograph Package (HEC-1) Dam Safety Version.

The program has been designed to enable the user to perform two basic types of hydrologic analyses: (1) the evaluation of the overtopping potential of the dam, and (2) the capability to estimate the downstream hydrologic-hydraulic consequences resulting from assumed structural failures of the dam. A brief summary of the computation procedures typically used in the dam overtopping analysis is shown below.

- Development of an inflow hydrograph to the reservoir.
- Routing of the inflow hydrograph(s) through the reservoir to determine if the event(s) analyzed would overtop the dam.
- Routing of the outflow hydrograph(s) of the reservoir to desired downstream locations. The results provide the peak discharge and maximum stage of each routed hydrograph at the outlet of the reach.

The output data provided by this program permits the comparison of downstream conditions just prior to a breach failure with that after a breach failure and the determination as to whether or not there is a significant increase in the hazard to loss of life as a result of such a failure.

The results of the studies conducted for this report are presented in Section 5.

For detailed information regarding this program refer to the Users Manual for the Flood Hydrograph Package (HEC-1) Dam Safety Version prepared by the Hydrologic Engineering Center, U.S. Army Corps of Engineers, Davis, California.
SPILLWAY RATING

\[ Q = C \cdot L \cdot H^{3/2} \]

\[ H = 1243.5 - 1237 = 6.5' \]

\[ Q = 3.3 \times 50 \times (6.5)^{3/2} \]

\[ = 2734 \text{ cfs} \]
SPILLWAY RATING CURVE

ELEV.

12.44
12.43
12.42
12.41
12.40
12.39
12.38
12.37

DISCHARGE - CFS

0 500 1000 1500 2000 2500
DISCHARGE THRU OUTLET WORKS

18" DIAMETER C.M.F WITH SLIDING GATE UPSTREAM

\[ Q = \frac{0.6}{C} \]

\[ INVEAT = 12.29 \]

\[ Q = CA \sqrt{2gH} \]

AT POOL LEVEL 12.37

\[ H = 12.37 - 12.29.75 = 0.75 \]

\[ Q = 0.6 \times \pi \times \left(\frac{18}{4}\right)^2 \times (2 \times 32.2 \times 7.25)^{0.5} \]

\[ = 23 \text{ cfs} \]

AT LOW POOL LEVEL 12.31

\[ H = 12.31 - 12.29.75 = 0.75 \]

\[ Q = 0.6 \times \pi \times \left(\frac{18}{4}\right)^2 \times (2 \times 32.2 \times 1.25)^{0.5} \]

\[ = 10 \text{ cfs} \]
## EMBANKMENT RATING

\[ Q = C L H^{3/2} \]

**At ELEV 12.49**

<table>
<thead>
<tr>
<th>Term</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>( 2.7 \times 3 \times (0.5)^{1.5} )</td>
<td>3</td>
</tr>
<tr>
<td>( 2.7 \times 4 \times (0.25)^{1.5} )</td>
<td>2</td>
</tr>
<tr>
<td>( 2.7 \times 25 \times (0.15)^{1.5} )</td>
<td>5</td>
</tr>
<tr>
<td>( 2.7 \times 15 \times (0.3)^{1.5} )</td>
<td>11</td>
</tr>
<tr>
<td>( 2.7 \times 25 \times (0.35)^{1.5} )</td>
<td>14</td>
</tr>
<tr>
<td>( 2.7 \times 20 \times (0.2)^{1.5} )</td>
<td>9</td>
</tr>
<tr>
<td>( 2.7 \times 6 \times (0.25)^{0.5} )</td>
<td>2</td>
</tr>
<tr>
<td>( 2.7 \times 37 \times (0.1)^{1.5} )</td>
<td>3</td>
</tr>
<tr>
<td>( 2.7 \times 5 \times (0.05)^{1.5} )</td>
<td>2</td>
</tr>
<tr>
<td>( 2.7 \times 15 \times (0.15)^{1.5} )</td>
<td>2</td>
</tr>
<tr>
<td>( 2.7 \times 6 \times (0.1)^{1.5} )</td>
<td>1</td>
</tr>
</tbody>
</table>

**At ELEV 12.45**

<table>
<thead>
<tr>
<th>Term</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>( 2.7 \times 3 \times (1.5)^{1.5} )</td>
<td>15</td>
</tr>
<tr>
<td>( 2.7 \times 4 \times (1.25)^{1.5} )</td>
<td>16</td>
</tr>
<tr>
<td>( 2.7 \times 15 \times (1.1)^{1.5} )</td>
<td>49</td>
</tr>
<tr>
<td>( 2.7 \times 25 \times (1.15)^{1.5} )</td>
<td>83</td>
</tr>
<tr>
<td>( 2.7 \times 25 \times (1.3)^{1.5} )</td>
<td>156</td>
</tr>
<tr>
<td>( 2.7 \times 25 \times (1.35)^{1.5} )</td>
<td>106</td>
</tr>
<tr>
<td>( 2.7 \times 25 \times (1.15)^{1.5} )</td>
<td>83</td>
</tr>
<tr>
<td>( 2.7 \times 25 \times (1.1)^{1.5} )</td>
<td>52</td>
</tr>
<tr>
<td>( 2.7 \times 7 \times (1.2)^{1.5} )</td>
<td>25</td>
</tr>
<tr>
<td>( 2.7 \times 19 \times (1.05)^{1.5} )</td>
<td>52</td>
</tr>
<tr>
<td>( 2.7 \times 25 \times (1.1)^{1.5} )</td>
<td>78</td>
</tr>
<tr>
<td>( 2.7 \times 25 \times (2)^{1.5} )</td>
<td>37</td>
</tr>
<tr>
<td>( 2.7 \times 30 \times (1.9)^{1.5} )</td>
<td>115</td>
</tr>
<tr>
<td>( 2.7 \times 15 \times (0.95)^{1.5} )</td>
<td>39</td>
</tr>
<tr>
<td>( 2.7 \times 15 \times (1.15)^{1.5} )</td>
<td>30</td>
</tr>
<tr>
<td>( 2.7 \times 20 \times (0.9)^{1.5} )</td>
<td>42</td>
</tr>
<tr>
<td>( 2.7 \times 6 \times (1.25)^{1.5} )</td>
<td>7</td>
</tr>
</tbody>
</table>

**At ELEV 12.46**

<table>
<thead>
<tr>
<th>Term</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>( 2.7 \times 4 \times (1.3)^{1.5} )</td>
<td>3</td>
</tr>
</tbody>
</table>

**At ELEV 12.47**

<table>
<thead>
<tr>
<th>Term</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>( 2.7 \times 6 \times (1.25)^{1.5} )</td>
<td>2</td>
</tr>
</tbody>
</table>

\[ E = 50 \text{ cm}^2 \]

\[ E = 8.77 \]

\[ E = 2.415 \]

\[ E = 4.509 \]
# Discharge Summary

<table>
<thead>
<tr>
<th>Elev.</th>
<th>Spillway Q (cfs)</th>
<th>Embankment Q (cfs)</th>
<th>E-Q (cfs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>123.7</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>123.75</td>
<td>58</td>
<td>0</td>
<td>58</td>
</tr>
<tr>
<td>123.8</td>
<td>165</td>
<td>0</td>
<td>165</td>
</tr>
<tr>
<td>123.85</td>
<td>303</td>
<td>0</td>
<td>303</td>
</tr>
<tr>
<td>123.9</td>
<td>467</td>
<td>0</td>
<td>467</td>
</tr>
<tr>
<td>124.0</td>
<td>851</td>
<td>0</td>
<td>851</td>
</tr>
<tr>
<td>124.1</td>
<td>1320</td>
<td>0</td>
<td>1320</td>
</tr>
<tr>
<td>124.2</td>
<td>1845</td>
<td>0</td>
<td>1845</td>
</tr>
<tr>
<td>124.25</td>
<td>2275</td>
<td>0</td>
<td>2275</td>
</tr>
<tr>
<td>124.3</td>
<td>2734</td>
<td>0</td>
<td>2734</td>
</tr>
<tr>
<td>124.4</td>
<td>3096</td>
<td>50</td>
<td>3106</td>
</tr>
<tr>
<td>124.5</td>
<td>3734</td>
<td>877</td>
<td>4611</td>
</tr>
<tr>
<td>124.6</td>
<td>4405</td>
<td>2416</td>
<td>6823</td>
</tr>
<tr>
<td>124.7</td>
<td>5218</td>
<td>4604</td>
<td>9722</td>
</tr>
</tbody>
</table>
MAXIMUM KNOWN FLOOD AT DAM SITE

There are no records of pool levels for this dam. Based on the records of the gaging station for North Branch Elkton Creek at nearby Damascus, PA. (D.A. = 7.02 sq. mi.) the maximum discharge at the gage occurred in March 1978 when a discharge of 1260 cfs was observed. The maximum inflow to Lake Hamilton is estimated to be:

\[ Q = \left( \frac{3.5}{7.02} \right)^{0.8} \times 1260 \]

\[ = 722 \text{ cfs} \]

DESIGN FLOOD

SIZE CLASSIFICATION
Maximum storage = 354 acre-feet
Maximum height = 15 feet
Size classification is "small"

HAZARD CLASSIFICATION
Village of Equinunk is located along the downstream channel.
Use "high"

RECOMMENDED SPILLWAY DESIGN FLOOD
The above classifications indicate use of an SDF equal to ten times DAF to the probable maximum flood.
SPILLWAY CAPACITY CURVE

TOP OF DAM
LOW POINT

51% OF P.M.E

ELEV.

12.45

12.43

12.41

12.39

12.37

0  20  40  60  80  100

% OF P.M.E
HYDROLOGY AND HYDRAULIC ANALYSIS
DATA BASE

NAME OF DAM: LAKE HAMILTON DAM  RIVER BASIN: DELAWARE
PROBABLE MAXIMUM PRECIPITATION (PMP) = 20.9 INCHES/24 HOURS

(FOR FOOTNOTES SEE NEXT PAGE)

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(1) For footnotes see next page.
(1) **Hydrometeorological Report 33** (Figure 1), U.S. Army, Corps of Engineers, 1956.

(2) **Hydrometeorological Report 33** (Figure 2), U.S. Army, Corps of Engineers, 1956.

(3) Hydrological zone defined by Corps of Engineers, Baltimore District, for determining Snyder's Coefficients ($C_p$ and $C_e$).

(4) Snyder's Coefficients.

(5) $L =$ Length of longest water course from outlet to basin divide.
    $L_{ca} =$ Length of water course from outlet to point opposite the centroid of drainage area.

(6) Planimetered area encompassed by contour upstream of dam.

(7) PennDER files.

(8) Computed by conic method.
## Inflow Hydrograph

| M | 1 | 1 | 3.5 |

| P | 20.9 | 111 | 123 | 133 | 142 |

| T | 1 | .05 |

## Runoff Hydrograph

| W | 2.59 | .45 |

| X | -1.5 | 2 |

| K | 1 | 2 | 1 |

## Reservoir Routing

| V | 1 |

## Preview of Sequence of Stream Network Calculations

- Runoff Hydrograph: 1
- Route Hydrograph: 2
- End of Network

---

**Flood Hydrograph**

**Package (HEC-11)**

**DAM SAFETY VERSION: JULY 1978**

**Last Modification: 26 Feb 79**

---

**Run:** 03:37 AM 07/03.  
**Time:** 11:26.38.

**Lake Hamilton Dam: Factory Creek**

**Buckingham Twp., Wayne County, PA.**  
**NDI: PA-01030**  
**PA DER: 64-157**

### Job Specification

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### Multi-Plan Analyses to be Performed

- IFHAN: 9  FRT: 1
- RT10-5: 1.00  .85  .70  .60  .50  .40  .30  .20  .10
MULTI-PLAN ANALYSES TO BE PERFORMED

**RTPOS**
- 1.00
- .85
- .70
- .60
- .50
- .40
- .30
- .20
- .10

**SUB-AREA RUNOFF COMPUTATION**

**INFLOW HYDROGRAPH**

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**HYDROGRAPH DATA**

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**UNIT HYDROGRAPH DATA**

- TF = 2.59
- CF = .45
- NTA = 0

**RECESSION DATA**

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**UNIT HYDROGRAPH 93 END-OF-PERIOD ORDINATES, LAG = 2.61 HOURS, CF = .45 VOL = 1.00**

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**END-OF-PERIOD FLOW**

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**HYDROGRAPH ROUTING**

**RESERVOIR ROUTING**

**SUM 23.74 21.36 2.38 11.74 45.**

- (603.11 543.11 61.11 5452.83)
### Hydrograph Routing

#### Reservoir Routing

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#### Peak Outflow

- 5620.00 at Time 42.75 Hours
- 4750.00 at Time 42.75 Hours
- 3861.00 at Time 43.00 Hours
- 3224.00 at Time 43.25 Hours
- 2619.00 at Time 43.50 Hours
- 2092.00 at Time 43.50 Hours
- 1547.00 at Time 43.50 Hours
- 1015.00 at Time 43.50 Hours
- 496.00 at Time 43.75 Hours
PEAK FLOW AND STORAGE (END OF PERIOD) SUMMARY FOR MULTIPLE PLAN-RATIO ECONOMIC COMPUTATIONS

FLOWS IN CUBIC FEET PER SECOND (CUBIC METERS PER SECOND)

AREA IN SQUARE MILES (SQUARE KILOMETERS)

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HYDROGRAPH AT

1.00 3.50 1 5673. 4922. 3971. 3404. 2837. 2269. 1702. 1135. 567.
( 9.06) (160.65) (156.55) (112.46) (96.39) (60.33) (42.16) (32.13) (16.07)

ROUTED TO

2.00 3.50 1 5620. 4750. 3861. 3224. 2619. 2083. 1547. 1045. 496.
( 9.06) (159.13) (134.51) (109.32) (91.29) (74.15) (58.95) (43.82) (28.75) (14.04)

SUMMARY OF DAM SAFETY ANALYSIS

PLAN 1

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RATIO OF RESERVOIR MAXIMUM DEPTH MAXIMUM STORAGE MAXIMUM OUTFLOW OVER TOP OR MATION TIME OF MAX OUTFLOW FAILURE

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<th>MAXIMUM RESERVOIR</th>
<th>MAXIMUM DEPTH</th>
<th>MAXIMUM STORAGE</th>
<th>MAXIMUM OUTFLOW OVER TOP</th>
<th>OR MATION</th>
<th>TIME OF MAX OUTFLOW</th>
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COI ENCOUNTERED.
APPENDIX E

PLATES
LAKE CHARLOTTE
FORMERLY
ADAMS LAKE

AREA 18.35 ACRES
ELEV. 1226.0 (ASSUMED)
APRIL 11, 1921

SITE OF PROPOSED DAM
AND SPILLWAY
SCALE: 1"=20 ft.

PROFILE ALONG CENTER LINE OF DAM
SCALE:
HORIZ. 1"=20 ft.
VERT. 1"=10 ft.
Entire embankment to be made of impervious material placed in successive layers of 6'-deep. Each layer compacted by rolling with 12-ton power roller.

CUT OFF TRENCH TO BE EXCAVATED TO IMPERVIOUS MATERIAL AND REFILLED WITH IMPERVIOUS MATERIAL PLACED IN SUCCESSIVE LAYERS OF 6'. EACH LAYER THOROUGHLY COMPACTED BY 12-TON ROLLER.

Typical Cross Section Thru Embankment
Scale: 1/2 ft.

Location Map of Proposed Dam
Scale: 1 to 62500

Proposed
Dam & Spillway: Lake Charlotte, Formerly Adams Lake. Located at Equinunk, Penna.
A.J. Huber, Owner
Dec. 18, 1980

PA-01030
PLATE III
NEW CHANNEL TO BE CUT FROM DISCHARGE OF
SPILLWAY TO PRESENT CREEK BED BELOW DAM-
SIDES AS WELL AS BOTTOM
OF CHANNEL TO BE STONE
RIP-RAP

LARGE STONES AT LEAST 24 IN DEEP
IMBEDDED IN DISCHARGE
CHANNEL (STONES ON END)

6 STEEL REINFORCING
BARS HORIZONTAL BARS
13" TO 10" SPACED 24" APART
VERTICALLY
VERTICAL BARS 24" TO 10" SPACED 13" APART.

SECTION THRU WINEWALL AT A-A
SCALE: 1/1 FT.

PROPOSED
DAM & SPILLWAY - LAKE CHARLOTTE, FORMERLY
ADAMS LAKE-LOCATED AT EQUINOX, PENNA
A.J. HUBER, OWNER

DEC. 15, 1930
L.J. Buchman, By Eng.
SCALE: AS SHOWN
PLATE IV

PA-01030
PROPOSED
DAM & SPILLWAY: LAKE CHARLOTTE, FORMERLY
ADAMS LAKE - LOCATED AT EQUINUNK, PENNA
A.J. HUBER, OWNER
DEC. 15, 1950
Scale: As Shown
L.F. BURKETT, Eng.
REPAIR TO
WAY-LAKE
MAY 1968
PROPOSED
REPAIR TO NORTHWEST WING WALL ON SPILLWAY - LAKE CHARLOTTE-EQUINUNK, WAYNE CO., PA.

MAY 1968

L.E. BUBLIN, R.E., P.E.

REVISED SECTION 6-12-69

STEEL PLAN - NEW WING WALL

CONCRETE MIX SHALL COMPLY WITH ASTM J-100, FOR 3000 PSI COMPRESSION STRENGTH AT 28 DAYS.
REINFORCING STEEL - 3/8 DEFORMED BARS.
APPENDIX F

GEOLOGIC REPORT
GEOLOGIC REPORT

Bedrock - Dam and Reservoir

Formation Name: Catskill Formation, undifferentiated.

Lithology: The Catskill Formation consists of red shale interbedded with gray, cross-bedded sandstone, with some conglomerate, some red sandstone and gray to olive green shale.

Structure

The dam is located in the Pocono Plateau area and the beds are essentially flat lying. The regional dip is to the west.

Air photo fracture traces trend: N60°W and N-S.

Overburden

The site is within the limits of Pleistocene glaciation and variable thicknesses of glacial till and outwash sediments are present in the area. No boring or test pit information is available.

Aquifer Characteristics

The rocks of the Catskill Formation are essentially impermeable and ground water movement is entirely along bedding planes and fractures. The most permeable aquifers in the area are the sands and gravel of the glacial outwash commonly found in the valleys.

Discussion

Plans for this dam show that a cutoff trench was to have been dug a "Minimum of three feet into impervious material." In this case that probably would be glacial till (clay) or bedrock. In either case, some leakage under the dam along the N60°W fracture trace is possible.

Sources of Information


GEOLOGIC MAP - Lake Hamilton Dam

Catskill Fm. - undifferentiated

--- air photo fracture trace

SCALE 1:24000

--- Mile

--- Kilometer

--- Foot

--- Interval 20 Feet