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NATIONAL DAM INSPECTION PROGRAM. LAKE HAMILTON DAM (NDI-ID NUMB--ETC(U)
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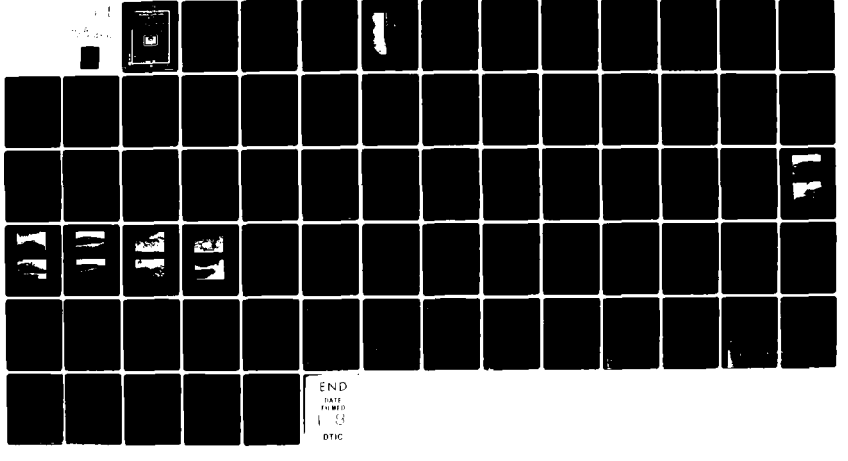

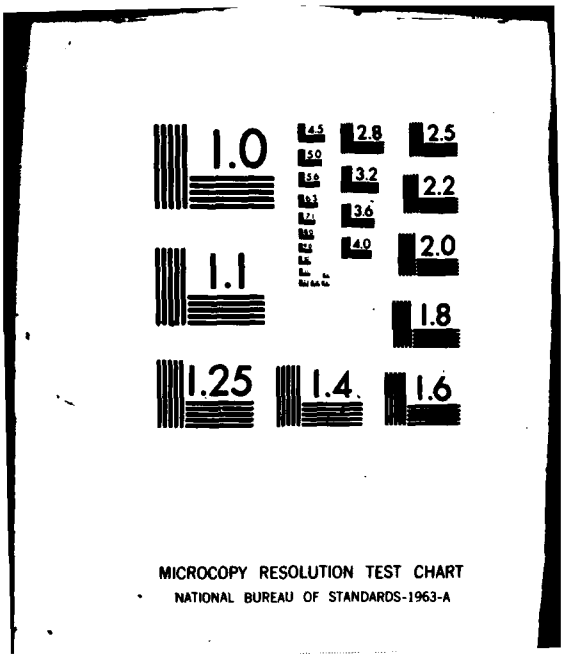
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PREFACE

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.

PHASE I REPORT

NATIONAL DAM INSPECTION PROGRAM

BRIEF ASSESSMENT OF GENERAL CONDITIONS
AND RECOMMENDATIONS

Name of Dam: LAKE HAMILTON DAM

State & State No.: PENNSYLVANIA, 64-157

County: WAYNE

Stream: FACTORY CREEK

Date of Inspection: May 7, 1980

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.

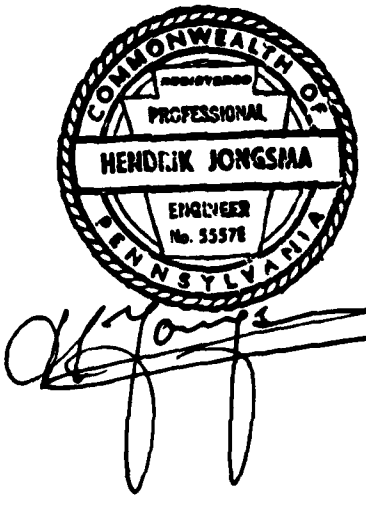
7. That a formal surveillance and downstream warning system be developed for use during periods of high or prolonged rainfall.

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

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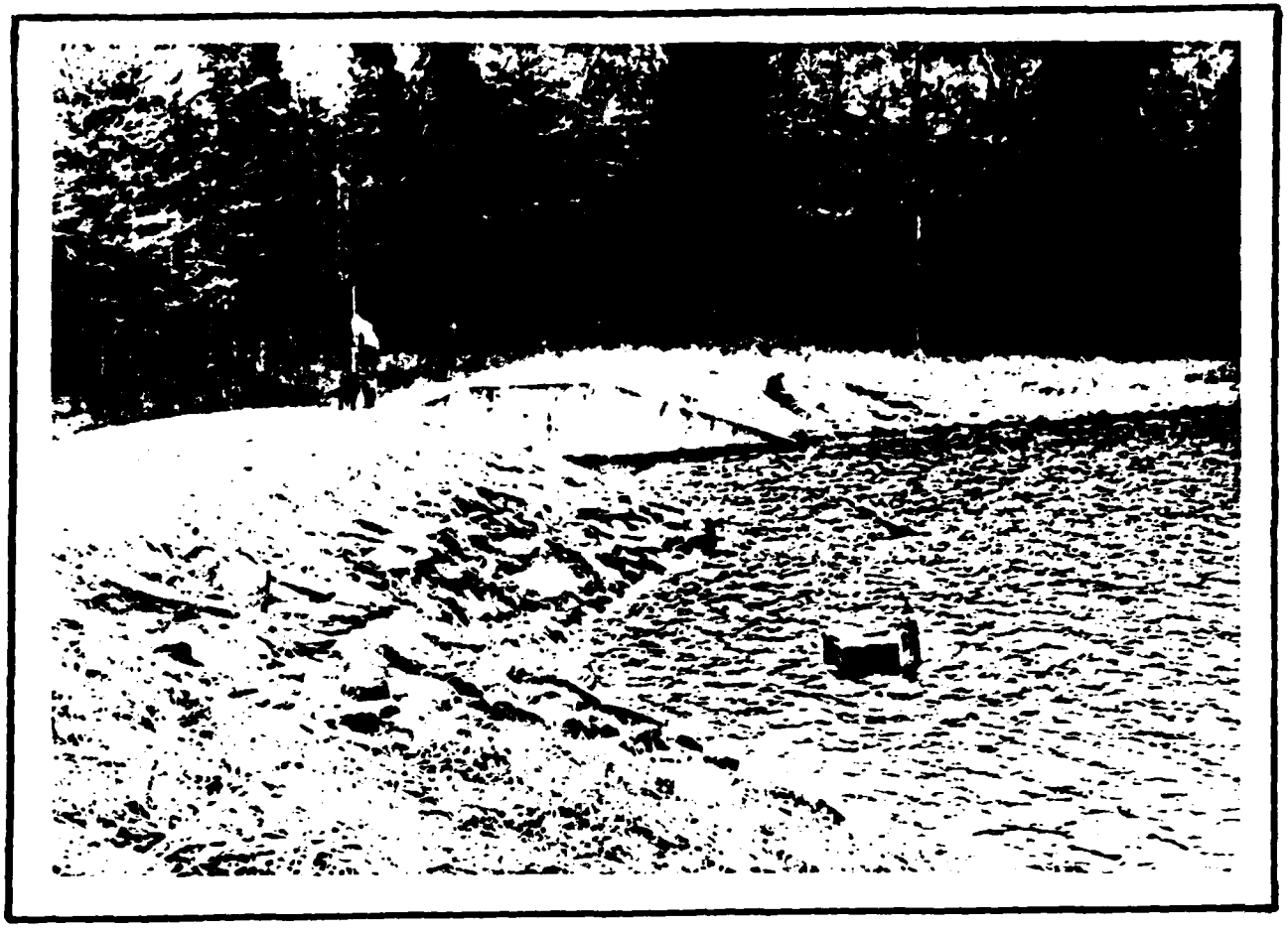

OVERVIEW

HAMILTON LAKE DAM

Photograph No. 1

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(6) PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

Number

LAKE HAMILTON DAM

NDI-ID PA-0103
DER-ID 64-157

Delaware River Basin

SECTION 1 - PROJECT ~~INFORMATION~~ Phase I Inspection Report

1.1 GENERAL

A. Authority (15) DACW31-80-C-0017

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.

411003

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 doweled 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.

Side Slopes:	Design	Surveyed
Upstream	2H to 1V	1.7H to 1V
Downstream	2H to 1V	3.0H to 1V

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 accomodate 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 negligable 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 parallelling 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.

SECTION 4 - OPERATIONAL PROCEDURES

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

PA DER # 64-157 NDI NO. PA-01030

NAME OF DAM LAKE HAMILTON DAM HAZARD CATEGORY High

TYPE OF DAM Earth embankment with ogee spillway

LOCATION Buckingham TOWNSHIP Wayne COUNTY, PENNSYLVANIA

INSPECTION DATE 5/7/80 WEATHER cloudy TEMPERATURE 50's

INSPECTORS: R. Houseal (Recorder) OWNER'S REPRESENTATIVE(s):

H. Jongsma Jon Wysong, Ranger

R. Shireman

A. Bartlett

NORMAL POOL ELEVATION: 1237.0 (U.S.G.S.) AT TIME OF INSPECTION:

BREAST ELEVATION: 1243.0 (Design) POOL ELEVATION: 1237.1

SPILLWAY ELEVATION: 1237.0 (U.S.G.S.) TAILWATER ELEVATION:

MAXIMUM RECORDED POOL ELEVATION: Unknown

GENERAL COMMENTS:

NDI NO. PA-01030

VISUAL INSPECTION
EMBANKMENT

	OBSERVATIONS AND REMARKS
A. SURFACE CRACKS	None observed.
B. UNUSUAL MOVEMENT BEYOND TOE	None observed.
C. SLOUGHING OR EROSION OF EMBANKMENT OR ABUTMENT SLOPES	None observed. Construction equipment caused scars to the left of the spillway on downstream slope. Needs reseeding.
D. ALIGNMENT OF CREST: HORIZONTAL: VERTICAL:	Horizontal - Tangent section. Refer to profile for vertical (Plate A-II).
E. RIPRAP FAILURES	None observed. Riprap on upstream slope.
F. JUNCTION EMBANKMENT & ABUTMENT OR SPILLWAY	Junctions with wing walls and natural ground appear sound. A low area is adjacent to the right spillway wall. The cutoff wall provides protection.
G. SEEPAGE	None on embankment slope or at toe. Only seepage appears to be through the outlet facility, and this is minor.
H. DRAINS	None observed.
J. GAGES & RECORDER	None.
K. COVER (GROWTH)	Grass cover on slopes with some riprap on upstream slope in the area of the intake gate. Brush on downstream slope left side.

NDI NO. PA- 01030

VISUAL INSPECTION
OUTLET WORKS

	OBSERVATIONS AND REMARKS
A. INTAKE STRUCTURE	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.
B. OUTLET STRUCTURE	End wall for rectangular concrete pipe.
C. OUTLET CHANNEL	Excavated swale joining natural stream several hundred feet downstream.
D. GATES	Gate upstream control.
E. EMERGENCY GATE	Same as D. above.
F. OPERATION & CONTROL	None.
G. BRIDGE (ACCESS)	None.

NDI NO. PA-01030

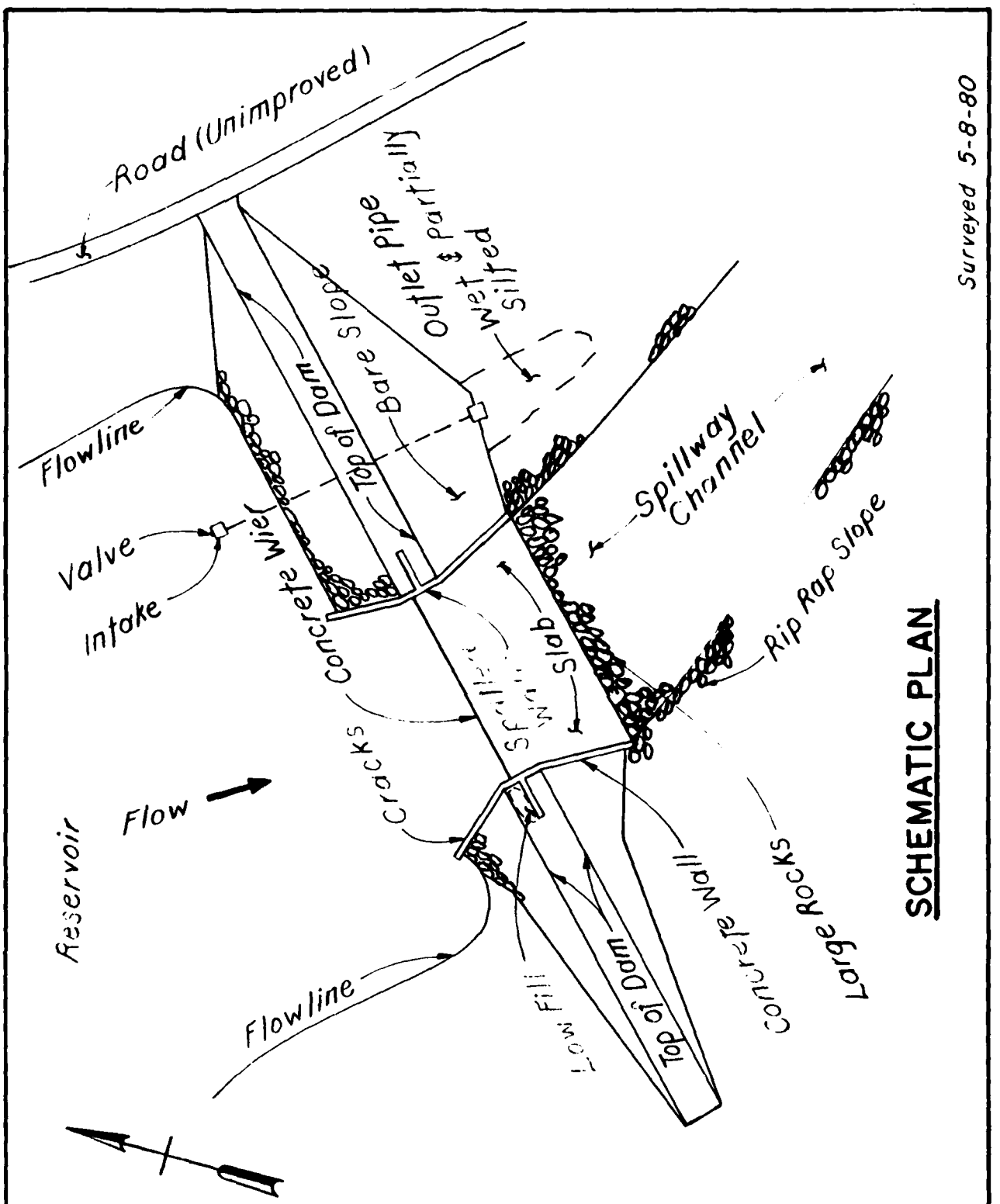
VISUAL INSPECTION
SPILLWAY

	OBSERVATIONS AND REMARKS
A. APPROACH CHANNEL	Approach to spillway is directly from the reservoir - unobstructed.
B. WEIR: Crest Condition Cracks Deterioration Foundation Abutments	Concrete broad crested weir with concrete wing walls. Walls are cracked through. Right wall shows about 1/4" movement at crack. Concrete surface spalled on the left side and also shows cracks.
C. DISCHARGE CHANNEL: Lining Cracks Stilling Basin	Concrete sloping slab carries discharge from weir to natural stream. Heavy large size rocks and boulders have been recently placed at the end of the slab. Natural stream channel is stone lined. No stilling basin.
D. BRIDGE & PIERS	None.
E. GATES & OPERATION EQUIPMENT	None.
F. CONTROL & HISTORY	None.

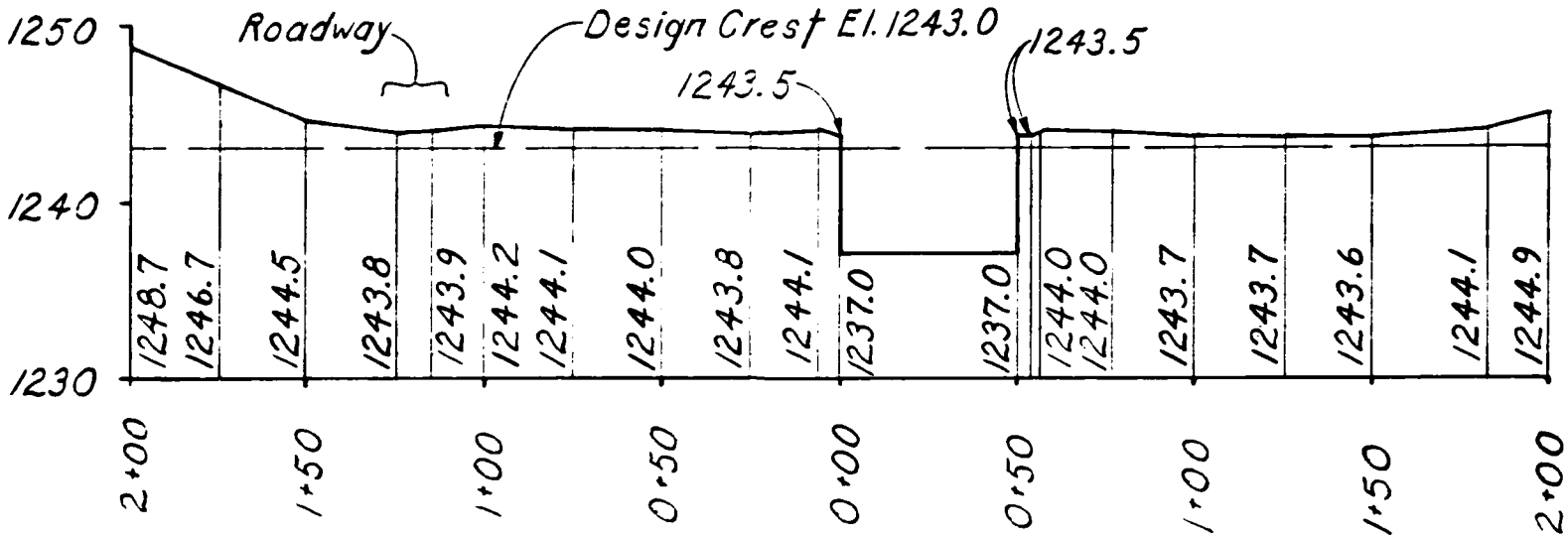
NDI NO. PA- 01030

VISUAL INSPECTION

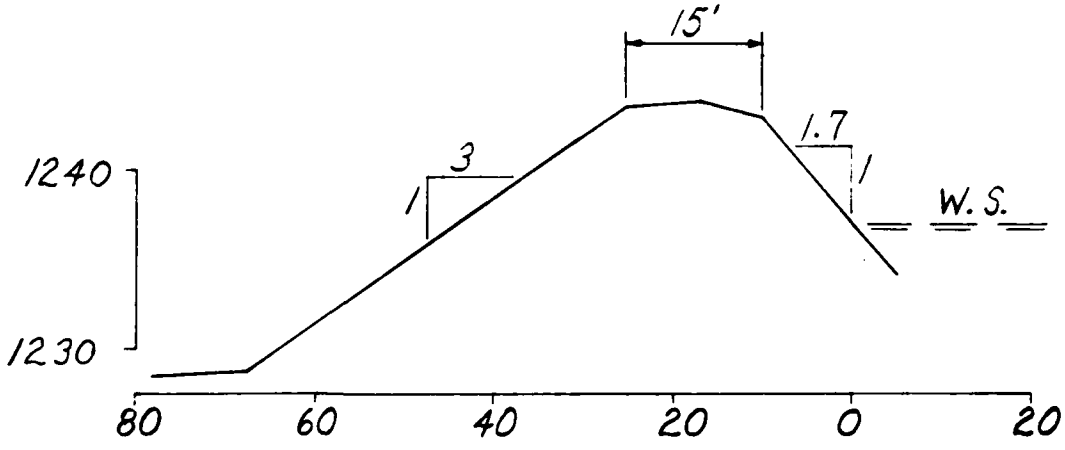
	OBSERVATIONS AND REMARKS
INSTRUMENTATION Monumentation	None.
Observation Wells	None.
Weirs	None.
Piezometers	None.
Staff Gauge	None.
Other	None.
RESERVOIR Slopes	Mostly wooded, moderate slopes.
Sedimentation	Upstream end of reservoir was dredged out about 5 years ago.
Watershed Description	All wooded. Two ponds upstream. Part of ponding of these natural lakes caused by beaver dams.
DOWNSTREAM CHANNEL Condition	Natural mountain stream. Many rocks and steep.
Slopes	Rocky and steep.
Approximate Population	20
No. Homes	About 6 homes and businesses close to stream and Pennsylvania State Highway No. 191.



LAKE HAMILTON DAM
PA.-01030
INSPECTION SURVEY
PLATE A-I



EMBANKMENT PROFILE



EMBANKMENT SECTION
STA. 0+50 LEFT

Surveyed 5-8-80

HAMILTON LAKE DAM
PA.-01030
INSPECTION SURVEY
PLATE A-II

APPENDIX B

CHECKLIST OF ENGINEERING DATA

CHECK LIST
ENGINEERING DATA

PA DER # 64-157 NDI NO. PA- 01030

NAME OF DAM LAKE HAMILTON DAM

ITEM	REMARKS
AS-BUILT DRAWINGS	None.
REGIONAL VICINITY MAP	U.S.G.S. Quadrangle - Lake Como, PA-NJ See Plate II, Appendix E
CONSTRUCTION HISTORY	Permit issued April 11, 1951. Construction started in 1952. Completed in 1954. Not built in accordance with plans. Corrections made over next 4 years. Right abutment wingwall rebuilt in 1968.
GENERAL PLAN OF DAM	Plate III, Appendix E.
TYPICAL SECTIONS OF DAM	Plate III, Appendix E.
OUTLETS: PLAN DETAILS CONSTRAINTS DISCHARGE RATINGS	Plate IV, Appendix E. None.

NDI NO. PA- 01030

ENGINEERING DATA

ITEM	REMARKS
RAINFALL & RESERVOIR RECORDS	No records.
DESIGN REPORTS	None.
GEOLOGY REPORTS	None.
DESIGN COMPUTATIONS: HYDROLOGY & HYDRAULICS DAM STABILITY SEEPAGE STUDIES	None.
MATERIALS INVESTIGATIONS: BORING RECORDS LABORATORY FIELD	None.
POST CONSTRUCTION SURVEYS OF DAM	None.
BORROW SOURCES	Unknown. Possible from hillside at left abutment.

ENGINEERING DATA

ITEM	REMARKS
MONITORING SYSTEMS	None.
MODIFICATIONS	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.
HIGH POOL RECORDS	Unknown.
POST CONSTRUCTION ENGINEERING STUDIES & REPORTS	Repairs in 1968, Plate VI, Appendix E.
PRIOR ACCIDENTS OR FAILURE OF DAM Description: Reports:	None.
MAINTENANCE & OPERATION RECORDS	Not available.
SPILLWAY PLAN, SECTIONS AND DETAILS	Plate IV, Appendix E. Not built as per plan. Modified in 1955.

NDI NO. PA- 01030

ENGINEERING DATA

ITEM	REMARKS
OPERATING EQUIPMENT, PLANS & DETAILS	Plate V, Appendix E.
CONSTRUCTION RECORDS	No records.
PREVIOUS INSPECTION REPORTS & DEFICIENCIES	Concern of citizens in Equinunk required many visits by PennDER representatives.
MISCELLANEOUS	

NDI NO. PA- 01030

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 1228.25

e. Emergency drawdown facilities 18" diameter pipe

HYDROMETEOROLOGICAL GAGES:

a. Type None

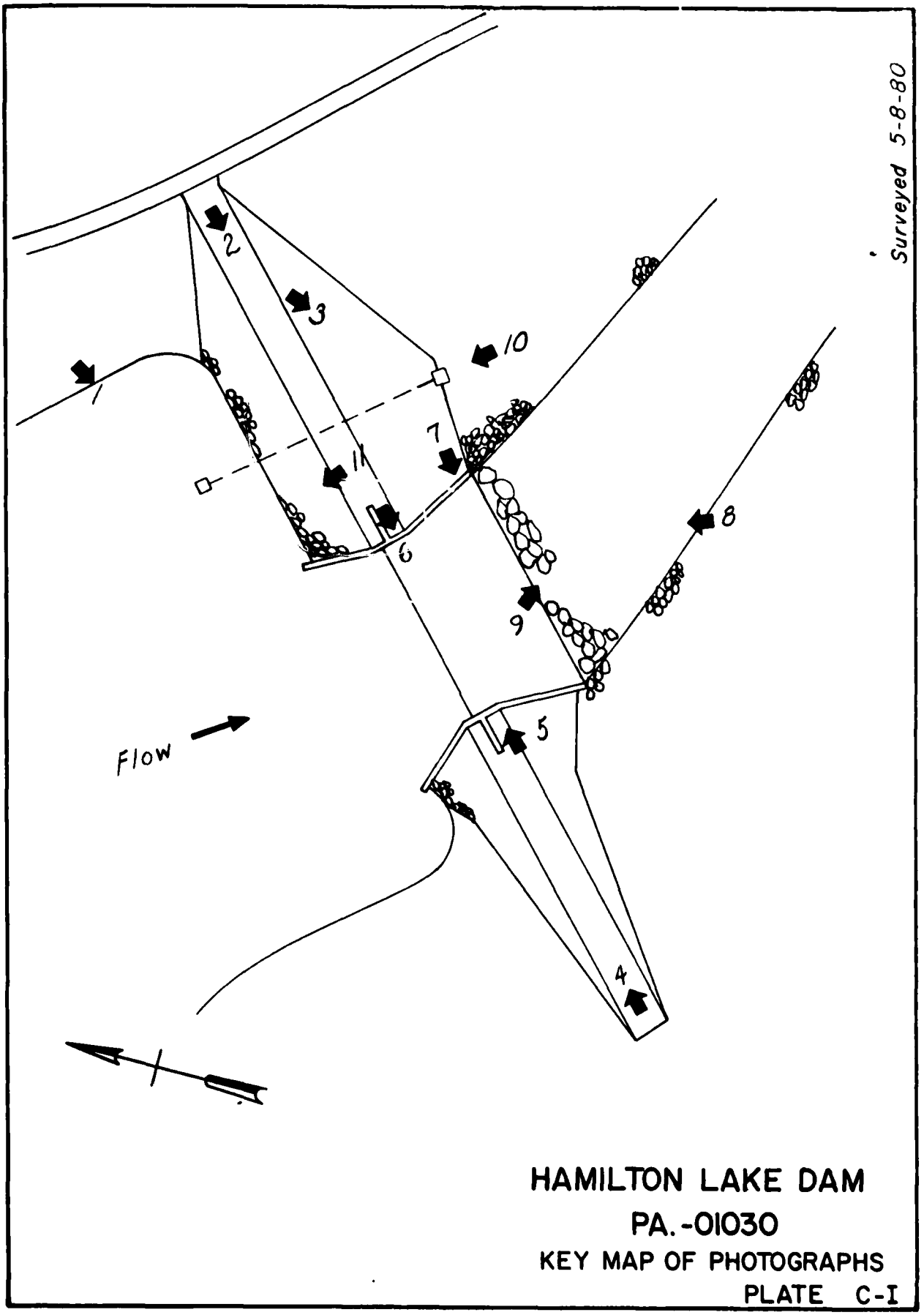
b. Location

c. Records

MAXIMUM NON-DAMAGING DISCHARGE: 2734 cfs

APPENDIX C

PHOTOGRAPHS

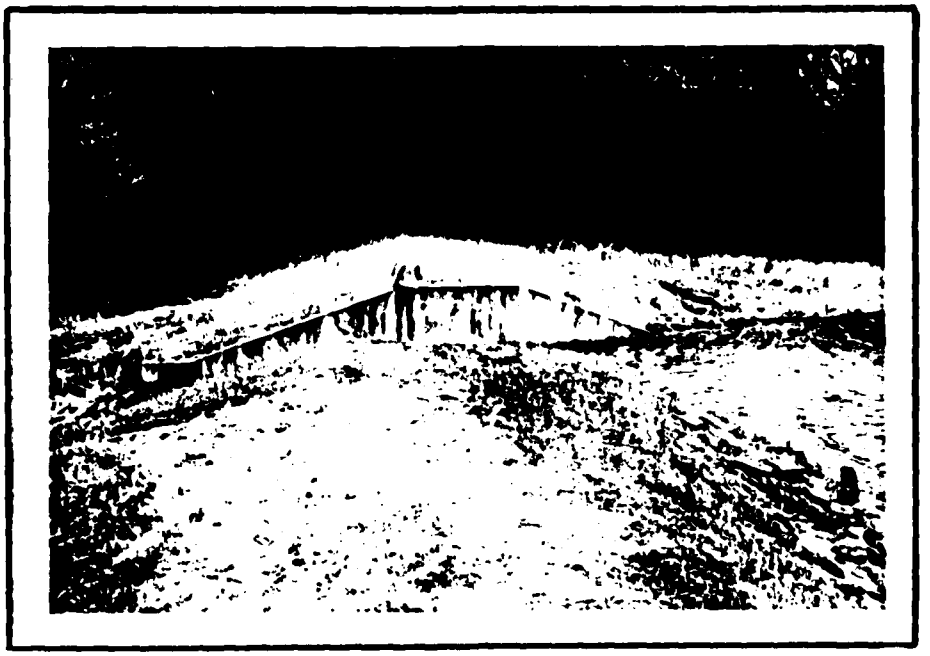


HAMILTON LAKE DAM

PA.-01030

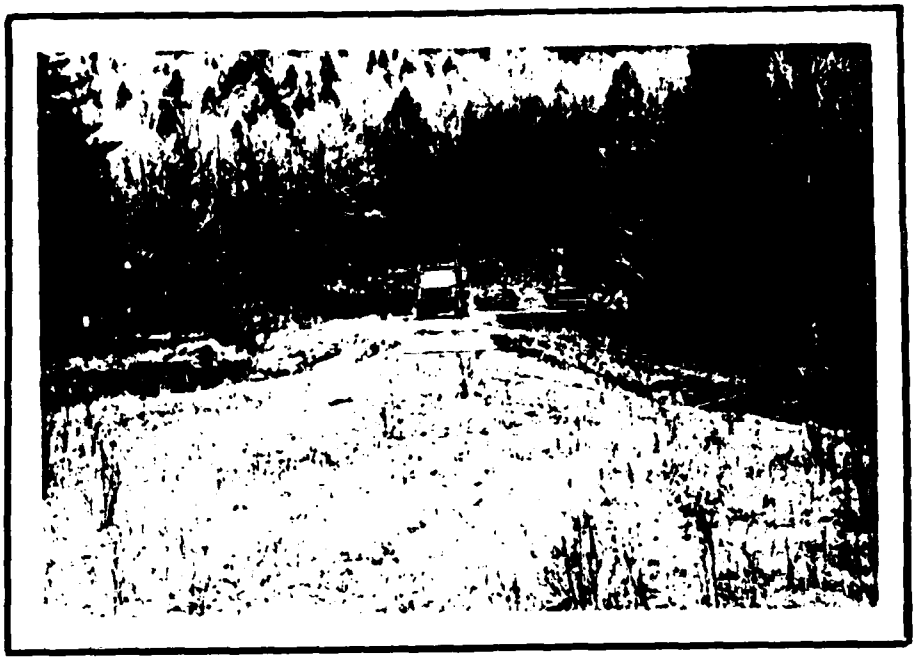
KEY MAP OF PHOTOGRAPHS

PLATE C-I

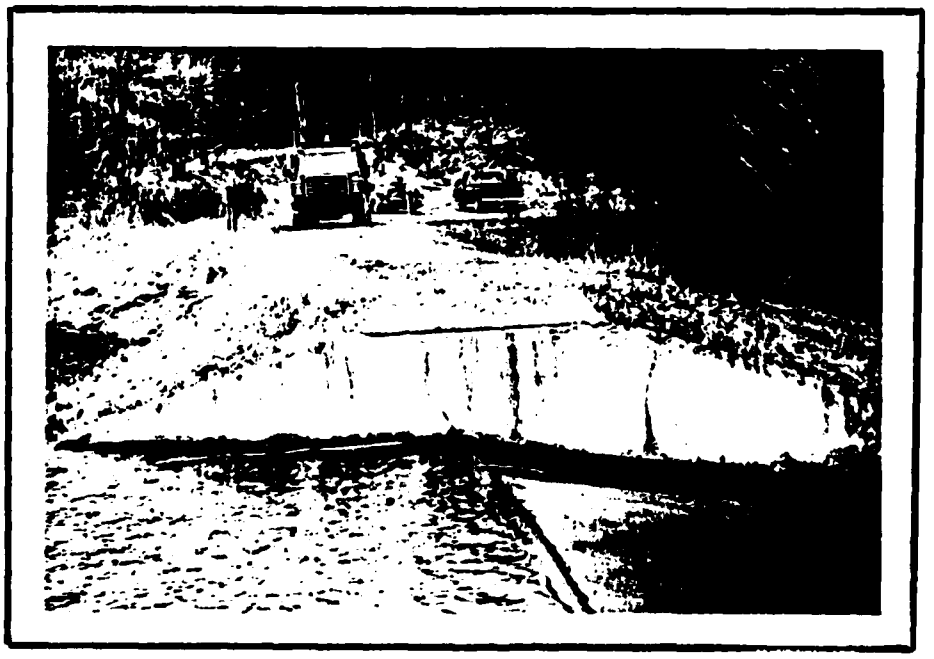


OVERVIEW FROM LEFT ABUTMENT - NO. 2

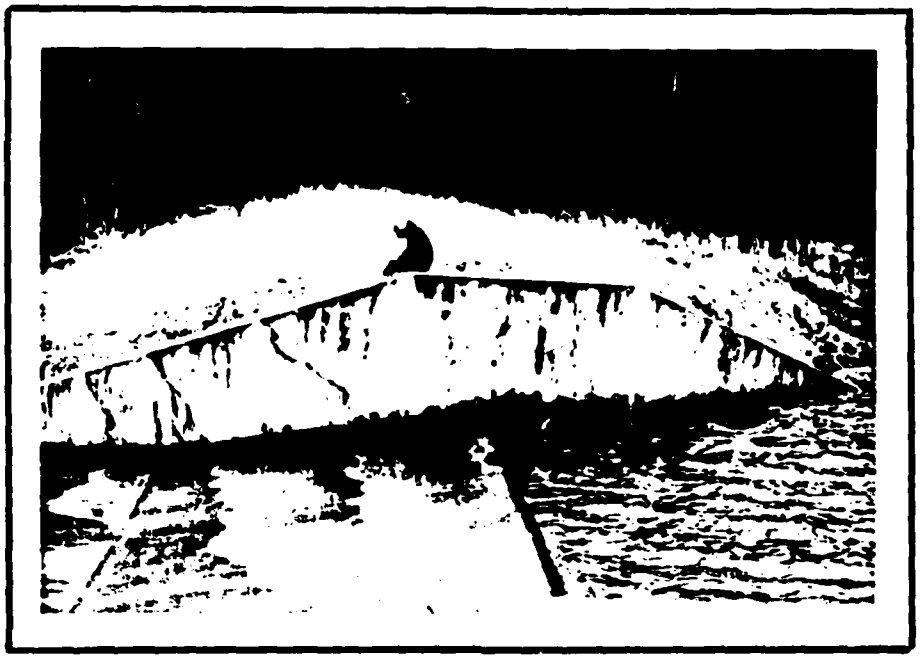
DOWNSTREAM SLOPE - NO. 3



OVERVIEW FROM RIGHT ABUTMENT - NO. 4



LEFT SPILLWAY WALL - NO. 5

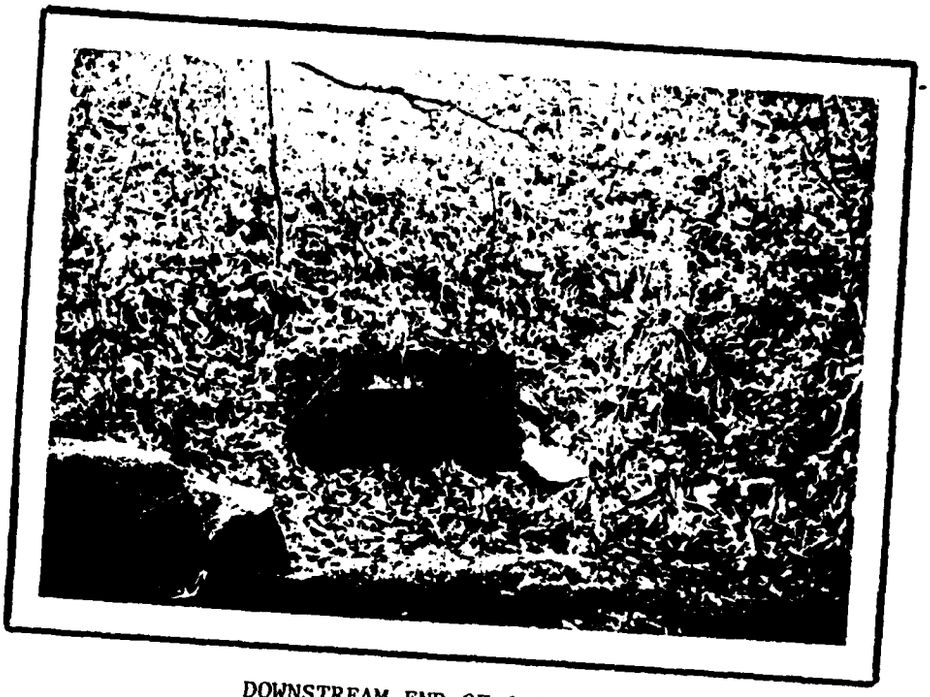


RIGHT SPILLWAY WALL - NO. 6

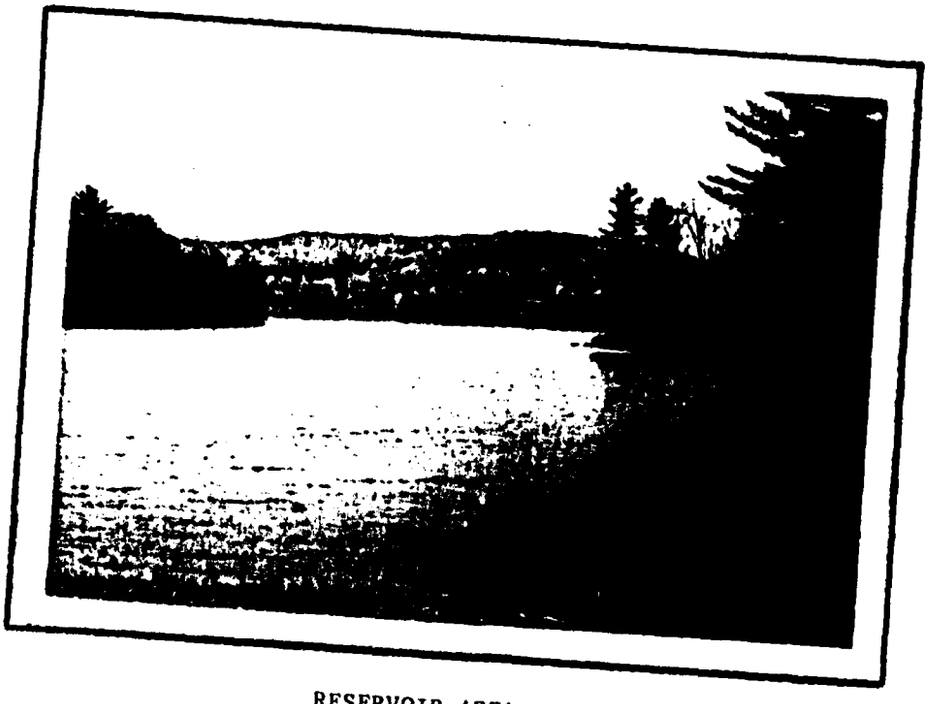
DOWNSTREAM SLAB OF SPILLWAY - NO. 7

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.

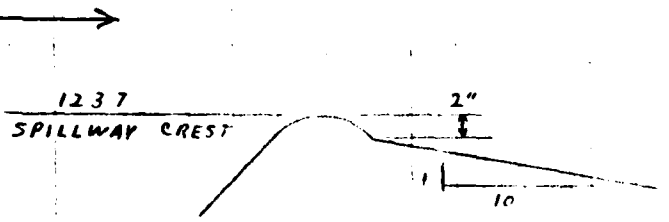
The output data provided by this program permits the comparison of downstream conditions just prior to a breach failure with that after a breach failure and the determination as to whether or not there is a significant increase in the hazard to loss of life as a result of such a failure.

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

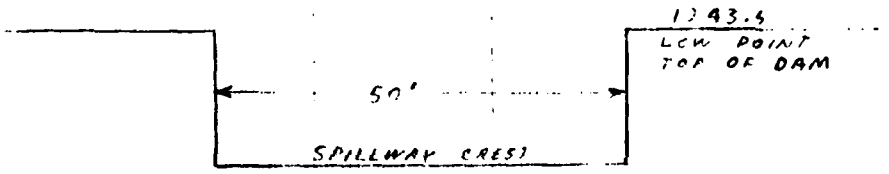
For detailed information regarding this program refer to the Users Manual for the Flood Hydrograph Package (HEC-1) Dam Safety Version prepared by the Hydrologic Engineering Center, U.S. Army Corps of Engineers, Davis, California.

BY RLS DATE 7/24/80 **BERGER ASSOCIATES** SHEET NO. 1 OF
CHKD. BY DATE PROJECT [illegible]
SUBJECT LAKE HAMILTON

SPILLWAY RATING



BROAD CRESTED WEIR
C = 3.3 (KING'S HDBK.)



$Q = C L H^{3/2}$

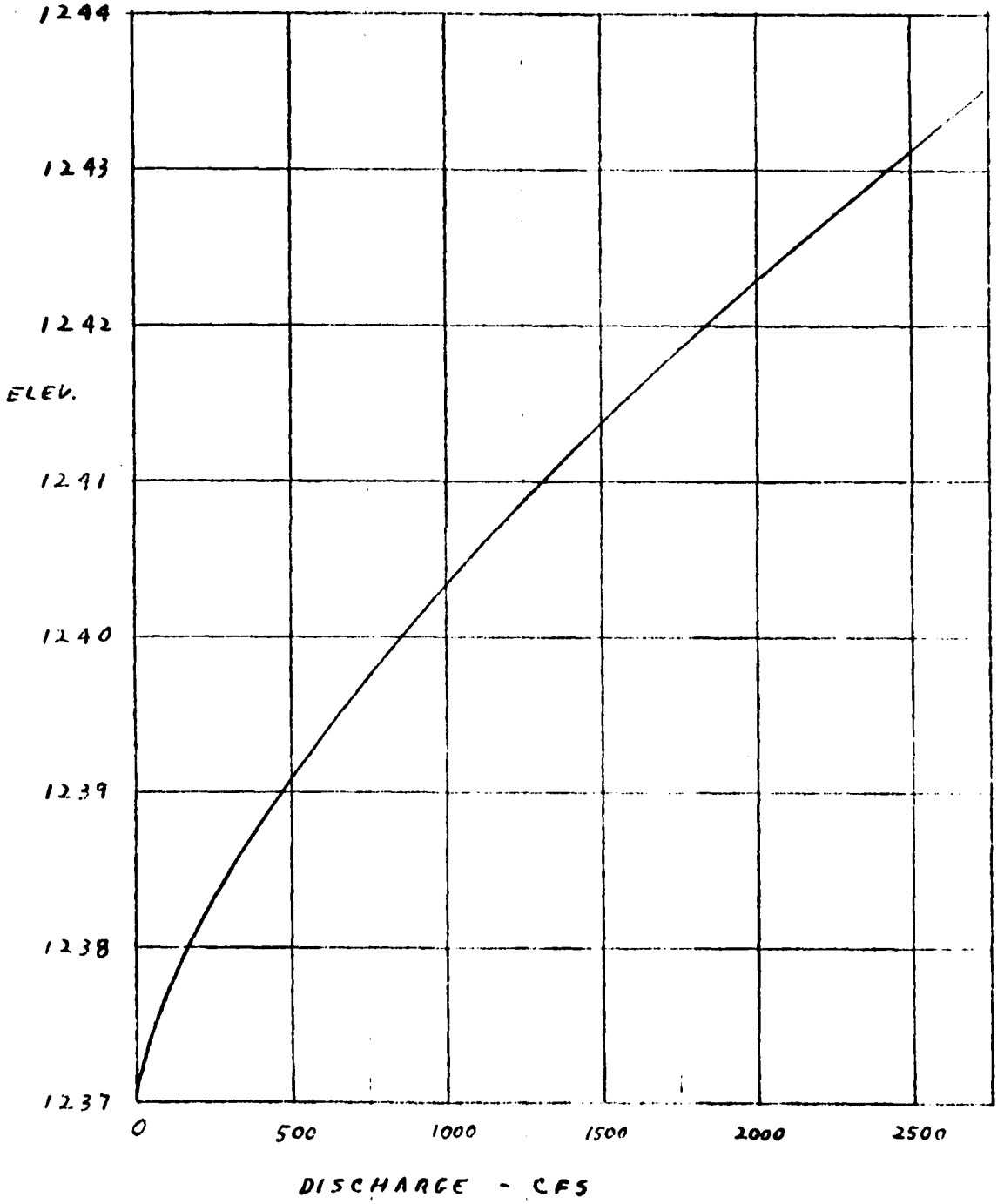
$H = 1243.5 - 1237 = 6.5'$

$Q = 3.3 \times 50 \times (6.5)^{1.5}$

$= 2734$ CFS

BY RLS DATE 1/3/80 BERGER ASSOCIATES SHEET NO. 01
CHKD. BY DATE PROJECT
SUBJECT LAKE HAMILTON

SPILLWAY RATING CURVE



BY KLS DATE 7/3/80 **BERGER ASSOCIATES** SHEET NO. OF
CHKD. BY DATE PROJECT
SUBJECT LAKE HAMILTON

DISCHARGE THRU OUTLET WORKS

18" DIAMETER CMP WITH SLUICE GATE UPSTREAM

$C = 0.6$

INVERT = 1229

$Q = CA\sqrt{2gH}$

AT POOL LEVEL 1237

$H = 1237 - 1229.75 = 7.25$

$Q = 0.6 \times \pi \times \frac{(1.5)^2}{4} \times (2 \times 32.2 \times 7.25)^{0.5}$

$= 23$ CFS

AT LOW POOL LEVEL 1231

$H = 1231 - 1229.75 = 1.25$

$Q = 0.6 \times \pi \times \frac{(1.5)^2}{4} \times (2 \times 32.2 \times 1.25)^{0.5}$

$= 10$ CFS

BY RLS DATE 7/31/80 BERGER ASSOCIATES SHEET NO. OF
CHKD. BY DATE PROJECT
SUBJECT LAKE HAMILTON

EMBANKMENT RATING

$Q = C L H^{3/2}$ $C = 2.7$

AT ELEV 1244

$2.7 \times 3 \times (.5)^{1.5}$	=	3
$2.7 \times 4 \times (.25)^{1.5}$	=	1
$2.7 \times 25 \times (.15)^{1.5}$	=	4
$2.7 \times 25 \times (.3)^{1.5}$	=	11
$2.7 \times 25 \times (.35)^{1.5}$	=	14
$2.7 \times 20 \times (.2)^{1.5}$	=	9
$2.7 \times 6 \times (.25)^{1.5}$	=	2
$2.7 \times 37 \times (.1)^{1.5}$	=	3
$2.7 \times 5 \times (.05)^{1.5}$	=	
$2.7 \times 15 \times (.15)^{1.5}$	=	2
$2.7 \times 6 \times (.1)^{1.5}$	=	1

Σ = 50 CFS

AT ELEV 1245

$2.7 \times 3 \times (1.5)^{1.5}$	=	15
$2.7 \times 4 \times (1.25)^{1.5}$	=	15
$2.7 \times 18 \times (1)^{1.5}$	=	49
$2.7 \times 25 \times (1.15)^{1.5}$	=	83
$2.7 \times 25 \times (1.3)^{1.5}$	=	108
$2.7 \times 25 \times (1.35)^{1.5}$	=	106
$2.7 \times 25 \times (1.15)^{1.5}$	=	83
$2.7 \times 25 \times (.9)^{1.5}$	=	24
$2.7 \times 7 \times (1.2)^{1.5}$	=	25
$2.7 \times 18 \times (1.05)^{1.5}$	=	52
$2.7 \times 25 \times (1.1)^{1.5}$	=	78
$2.7 \times 50 \times (.9)^{1.5}$	=	115
$2.7 \times 15 \times (.95)^{1.5}$	=	38
$2.7 \times 15 \times (1.15)^{1.5}$	=	50
$2.7 \times 20 \times (.95)^{1.5}$	=	42
$2.7 \times 6 \times (.25)^{1.5}$	=	2

Σ = 877

AT ELEV 1246 Σ = 2915

AT ELEV 1247 Σ = 4504

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FROM COPY FURNISHED TO DDC

BY ____ DATE ____ BERGER ASSOCIATES SHEET NO. ____ OF ____
CHKD. BY ____ DATE ____ PROJECT ____
SUBJECT LAKE HAMILTON

DISCHARGE SUMMARY

ELEV.	SPILLWAY Q (cfs)	EMBANKMENT Q (cfs)	Σ Q (cfs)
1237	0	0	0
1237.5	58	0	58
1238	165	0	165
1238.5	303	0	303
1239	467	0	467
1240	851	0	851
1241	1320	0	1320
1242	1845	0	1845
1242.75	2275	0	2275
1243.9	2734	0	2734
1244	3056	50	3106
1246	3734	877	4611
1246	4455	2418	6873
1247	5218	4504	9722

THIS PAGE IS BEST QUALITY PRACTICABLE

BY RLS DATE 7/3/80 **BERGER ASSOCIATES** SHEET NO. 6 OF
CHKD. BY DATE PROJECT
SUBJECT LAKE HAMILTON

MAXIMUM KNOWN FLOOD AT DAMSITE

THERE ARE NO RECORDS OF POOL LEVELS FOR THIS DAM. BASED ON THE RECORDS OF THE GAGING STATION FOR NORTH BRANCH CALKINS 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:

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

$$= 722 \text{ CFS}$$

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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"

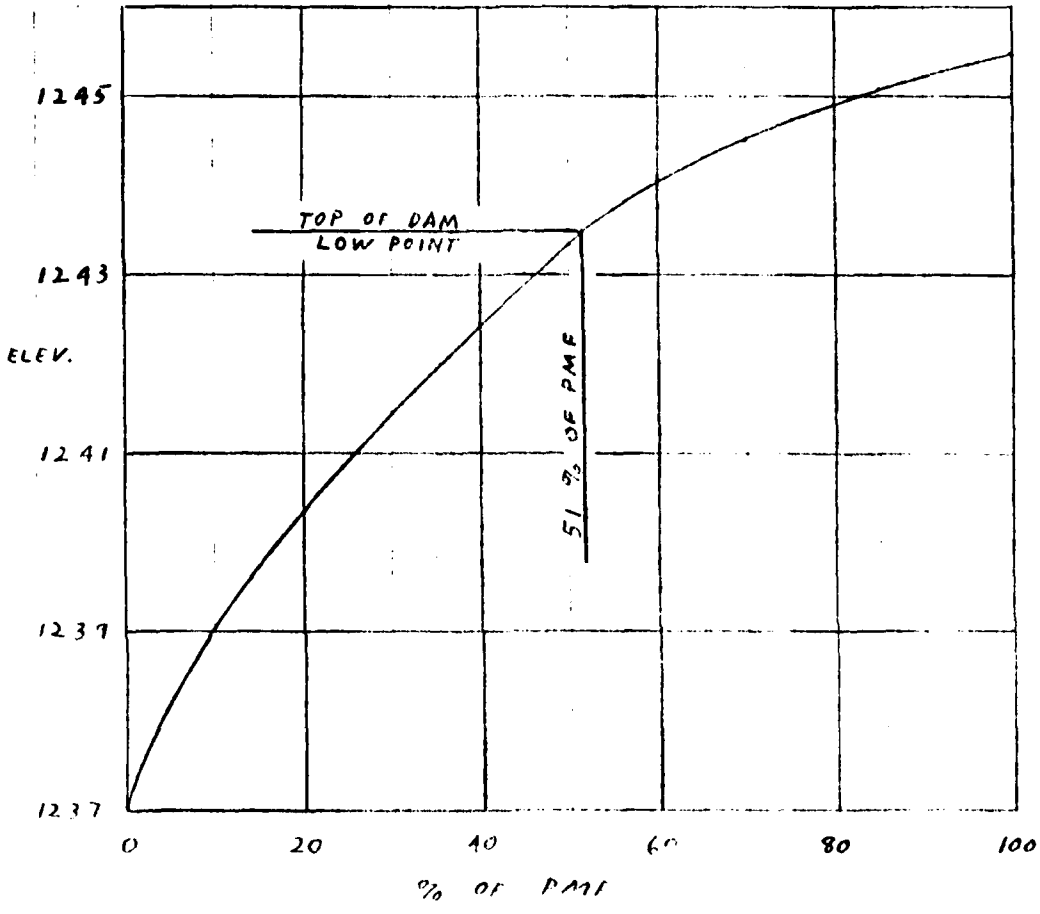
RECOMMENDED SPILLWAY DESIGN FLOOD
THE ABOVE CLASSIFICATIONS INDICATE USE OF AN SDF EQUAL TO ONE HALF PMF TO THE PROBABLE MAXIMUM FLOOD.

BY R.L.S. DATE 1/31/80 **BERGER ASSOCIATES** SHEET NO. 1 OF

CHKD. BY DATE PROJECT C-1622

SUBJECT LAKE HAMILTON

SPILLWAY CAPACITY CURVE



AVAILABLE

HYDROLOGY AND HYDRAULIC ANALYSIS
DATA BASE

NAME OF DAM: LAKE HAMILTON DAM RIVER BASIN: DELAWARE

PROBABLE MAXIMUM PRECIPITATION (PMP) = 20.9 INCHES/24 HOURS[1]

(FOR FOOTNOTES SEE NEXT PAGE)

STATION		1	2	3	4
STATION DESCRIPTION		LAKE HAMILTON	LAKE HAMILTON DAM		
DRAINAGE AREA (SQUARE MILES)		3.5			
CUMULATIVE DRAINAGE AREA (SQUARE MILE)		3.5	3.5		
ADJUSTMENT OF PMP FOR DRAINAGE AREA (%)[2]	6 HOURS	111			
	12 HOURS	123			
	24 HOURS	133			
	48 HOURS	142			
	72 HOURS	--			
	Zone 1				
SNYDER HYDROGRAPH PARAMETERS	ZONE[3]	1			
	C_p / C_t[4]	.45/1.23			
	L (MILES)[5]	4.93			
	L_{ca} (MILES)[5]	2.44			
	$T_p = C_t (L \cdot L_{ca})^{0.3}$ (hours)	2.59			
SPILLWAY DATA	CREST LENGTH (FT.)		50		
	FREEBOARD (FT.)		6.5		
	DISCHARGE COEFFICIENT		3.3		
	EXPONENT		1.5		
	ELEVATION		1237		
AREA[6] (ACRES)	NORMAL POOL	30.3			
	ELEV. 1240	43.2			
	ELEV. 1260	68			
STORAGE (ACRE-FEET)	NORMAL POOL[7]	85.9			
	ELEV. 1228.5[8]	0			
	ELEV. ____[8]				
	ELEV ____[8]				

(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_t).

(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 encompased by contour upstream of dam.

(7) PennDER files.

(8) Computed by conic method.

```
1             A1       LAKE HAMILTON DAM    ####    FACTORY CREEK
2             A2       BUCKINGHAM TWP., WAYNE COUNTY, PA.
3             A3       NDI # PA-01030        PA DER # 64-157
4             R   300      0     15      0      0      0      0      0     -4      0
5             B1    5
6             J     1      9      1
7             J1    1   .85     .7     .6     .5     .4     .3     .2     .1
8             K           1                                   1
9             K1                INFLOW HYDROGRAPH
10            M     1      1    3.5
11            P           20.9    111    123    133    142
12            T                                          1    .05
13            W  2.59    .45
14            X  -1.5   -.05      2
15            K     1      2                                   1
16            K1                RESERVOIR ROUTING
17            Y                              1
18            Y1    1                                        65.9     -1
19            Y4 1237   1237.5   1239 1238.5   1239   1240   1241   1242 1242.75 1243.5
20            Y4 1244   1245     1246   1247
21            Y5    0     58     165    303    467    851   1320   1845   2275   2734
22            Y5 3106   4611   6873   9722
23            $A    0   30.3   43.2     68
24            $E1228.5  1237   1240   1260
25            $$ 1237
26            $D1243.5
27            K    99
1                        PREVIEW OF SEQUENCE OF STREAM NETWORK CALCULATIONS

                              RUNOFF HYDROGRAPH AT          1
                              ROUTE HYDROGRAPH TO           2
                              END OF NETWORK


1**********************************
 FLOOD HYDROGRAPH PACKAGE (HEC-1)
 DAM SAFETY VERSION     JULY 1978
   LAST MODIFICATION  26 FEB 79
 **********************************

 RUN  DATE# 80/07/03.
      TIME# 11.26.38.


                              LAKE HAMILTON DAM    ####    FACTORY CREEK
                              BUCKINGHAM TWP., WAYNE COUNTY, PA.
                              NDI # PA-01030        PA DER # 64-157

                                        JOB SPECIFICATION
                    NQ     NHR    NMIN    IDAY     IHR    IMIN   METRC    IFLT    IPRT   NSTAN
                   300       0      15       0       0       0       0       0      -4       0
                                       JOPER     NWT   LROPT   TRACE
                                           5       0       0       0


                                   MULTI-PLAN ANALYSES TO BE PERFORMED
                                       NPLAN= 1 NRTIO= 9 LRTIO= 1
                          RTIOS=   1.00    .85    .70    .60    .50    .40    .30    .20    .10
```

MULTI-PLAN ANALYSES TO BE PERFORMED
NPLAN= 1 NRTIO= 9 LRTIO= 1
RTIOS= 1.00 .85 .70 .60 .50 .40 .30 .20 .10

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

SUB-AREA RUNOFF COMPUTATION

INFLOW HYDROGRAPH

ISTAO	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
1	0	0	0	0	0	1	0	0

HYDROGRAPH DATA

IHYDG	IUHG	TAREA	SNAP	TRSDA	TRSPC	RATIO	ISNOW	ISAME	LOCAL
1	1	3.50	0.00	3.50	0.00	0.000	0	0	0

PRECIP DATA

SPFE	PMS	R6	R12	R24	R48	R72	R96
0.00	20.90	111.00	123.00	133.00	142.00	0.00	0.00

TRSPC COMPUTED BY THE PROGRAM IS .800

LOSS DATA

LROPT	STRKR	DLTKR	RTIOL	ERAIN	STRKS	RTIOK	STRTL	CNSTL	ALSMX	RTIMP
0	0.00	0.00	1.00	0.00	0.00	1.00	1.00	.05	0.00	0.00

UNIT HYDROGRAPH DATA
TP= 2.59 CP= .45 NTA= 0

RECESSION DATA
STRTQ= -1.50 QRCSN= -.05 RTIOR= 2.00

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

10.	39.	81.	130.	184.	242.	297.	341.	375.	396.
401.	387.	364.	343.	322.	303.	285.	268.	253.	239.
223.	210.	198.	186.	175.	165.	155.	146.	137.	129.
121.	114.	107.	101.	95.	89.	84.	79.	74.	70.
66.	62.	58.	55.	52.	48.	46.	43.	40.	38.
36.	34.	32.	30.	28.	26.	25.	23.	22.	21.
19.	18.	17.	16.	15.	14.	13.	13.	12.	11.
11.	10.	9.	9.	8.	8.	7.	7.	6.	6.
6.	5.	5.	5.	4.	4.	4.	4.	4.	3.
3.	3.	3.							

0 END-OF-PERIOD FLOW

MO.DA	HR.MN	PERIOD	RAIN	EXCS	LOSS	COMP Q	MO.DA	HR.MN	PERIOD	RAIN	EXCS	LOSS	COMP Q

SUM 23.74 21.36 2.38 1[illegible]65.
(603.)(543.)(61.)(5452.83)

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

HYDROGRAPH ROUTING

RESERVOIR ROUTING

HYDROGRAPH ROUTING

RESERVOIR ROUTING

ISTAO	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
2	1	0	0	0	0	1	0	0

ROUTING DATA

QLOSS	CLOSS	AVG	IRES	ISAME	IOPT	IPMP	LSTR
0.0	0.000	0.00	1	0	0	0	0

NSTPS	NSTDL	LAG	AMSKK	X	TSK	STORA	ISPRAT
1	0	0	0.000	0.000	0.000	86.	-1

STAGE	1237.00	1237.50	1238.00	1238.50	1239.00	1240.00	1241.00	1242.00	1242.75	1243.5
	1244.00	1245.00	1246.00	1247.00						
FLOW	0.00	58.00	165.00	303.00	467.00	851.00	1320.00	1845.00	2275.00	2734.0
	3106.00	4611.00	6873.00	9722.00						
SURFACE AREA=	0.	30.	43.	68.						
CAPACITY=	0.	86.	196.	1298.						
ELEVATION=	1229.	1237.	1240.	1260.						

CREL	SPWID	COOW	EXPW	ELEVL	COOL	CAREA	EXPL
1237.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

DAM DATA

TOPEL	COOD	EXPD	DAMWID
1243.5	0.0	0.0	0.

PEAK OUTFLOW IS 5620. AT TIME 42.75 HOURS

PEAK OUTFLOW IS 4750. AT TIME 42.75 HOURS

PEAK OUTFLOW IS 3861. AT TIME 43.00 HOURS

PEAK OUTFLOW IS 3224. AT TIME 43.25 HOURS

PEAK OUTFLOW IS 2619. AT TIME 43.50 HOURS

PEAK OUTFLOW IS 2082. AT TIME 43.50 HOURS

PEAK OUTFLOW IS 1547. AT TIME 43.50 HOURS

PEAK OUTFLOW IS 1015. AT TIME 43.50 HOURS

PEAK OUTFLOW IS 496. AT TIME 43.75 HOURS

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

1

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)

				RATIOS APPLIED TO FLOWS								
OPERATION	STATION	AREA	PLAN	RATIO 1	RATIO 2	RATIO 3	RATIO 4	RATIO 5	RATIO 6	RATIO 7	RATIO 8	RATIO 9
				1.00	.85	.70	.60	.50	.40	.30	.20	.10
HYDROGRAPH AT	1	3.50	1	5673.	4822.	3971.	3404.	2837.	2269.	1702.	1135.	567.
	(	9.06)	(	160.65)(	136.55)(	112.46)(	96.39)(	80.33)(	64.26)(	48.20)(	32.13)(	16.07
ROUTED TO	2	3.50	1	5620.	4750.	3861.	3224.	2619.	2082.	1547.	1015.	496.
	(	9.06)	(	159.13)(	134.51)(	109.32)(	91.29)(	74.15)(	58.95)(	43.82)(	28.75)(	14.04

1 SUMMARY OF DAM SAFETY ANALYSIS

PLAN 1 .....

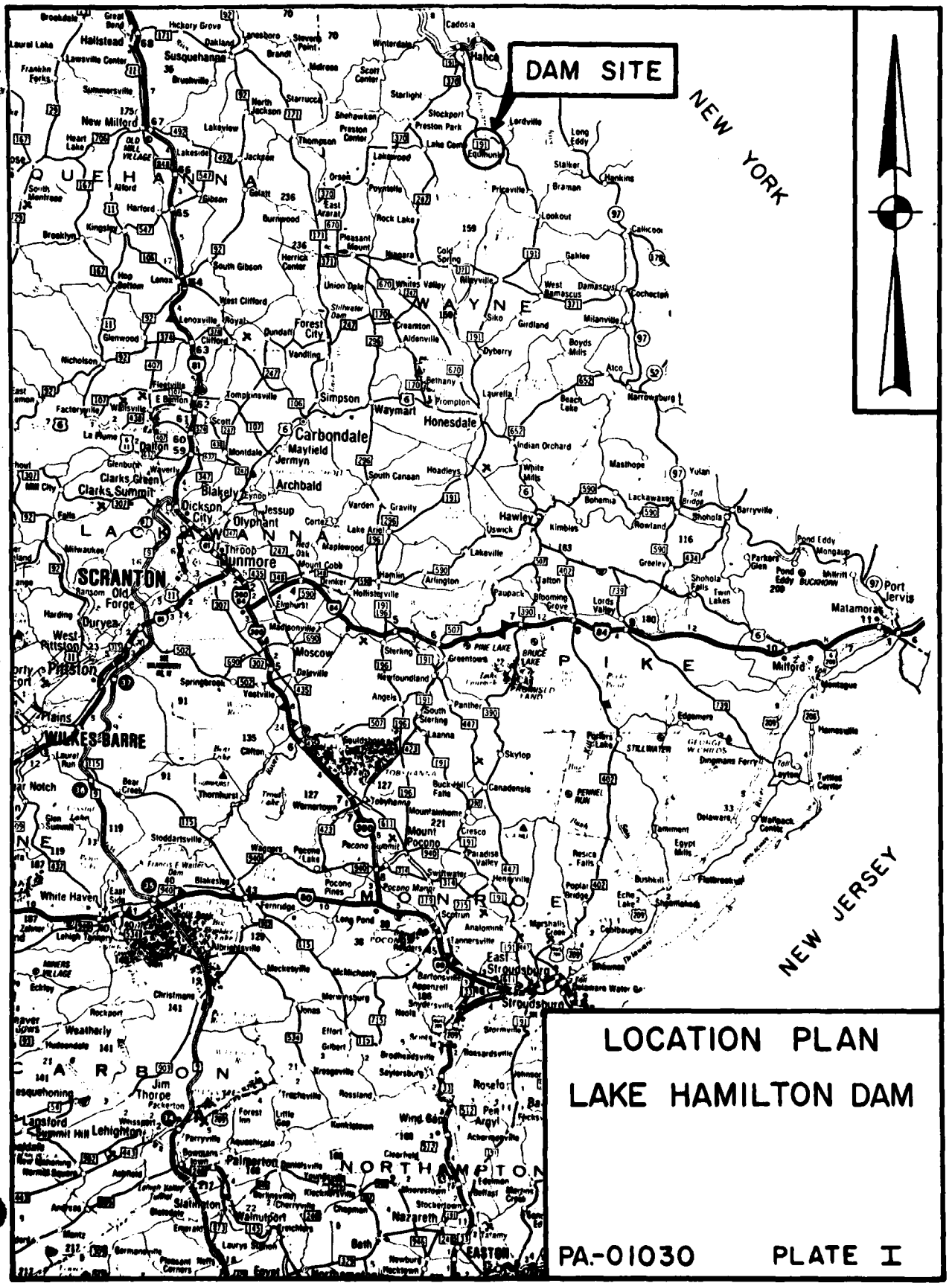
	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
ELEVATION	1237.00	1237.00	1243.50
STORAGE	86.	86.	354.
OUTFLOW	0.	0.	2734.

RATIO OF PMF	MAXIMUM RESERVOIR W.S.ELEV	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
1.00	1245.45	1.75	447.	5620.	6.50	42.75	0.00
.85	1245.06	1.56	429.	4750.	5.25	42.75	0.00
.70	1244.50	1.00	401.	3861.	4.00	43.00	0.00
.60	1244.08	.58	381.	3224.	2.75	43.25	0.00
.50	1243.51	0.00	345.	2619.	0.00	43.50	0.00
.40	1242.41	0.00	303.	2082.	0.00	43.50	0.00
.30	1241.43	0.00	259.	1547.	0.00	43.50	0.00
.20	1240.35	0.00	211.	1015.	0.00	43.50	0.00
.10	1239.07	0.00	158.	496.	0.00	43.75	0.00

EOI ENCOUNTERED.

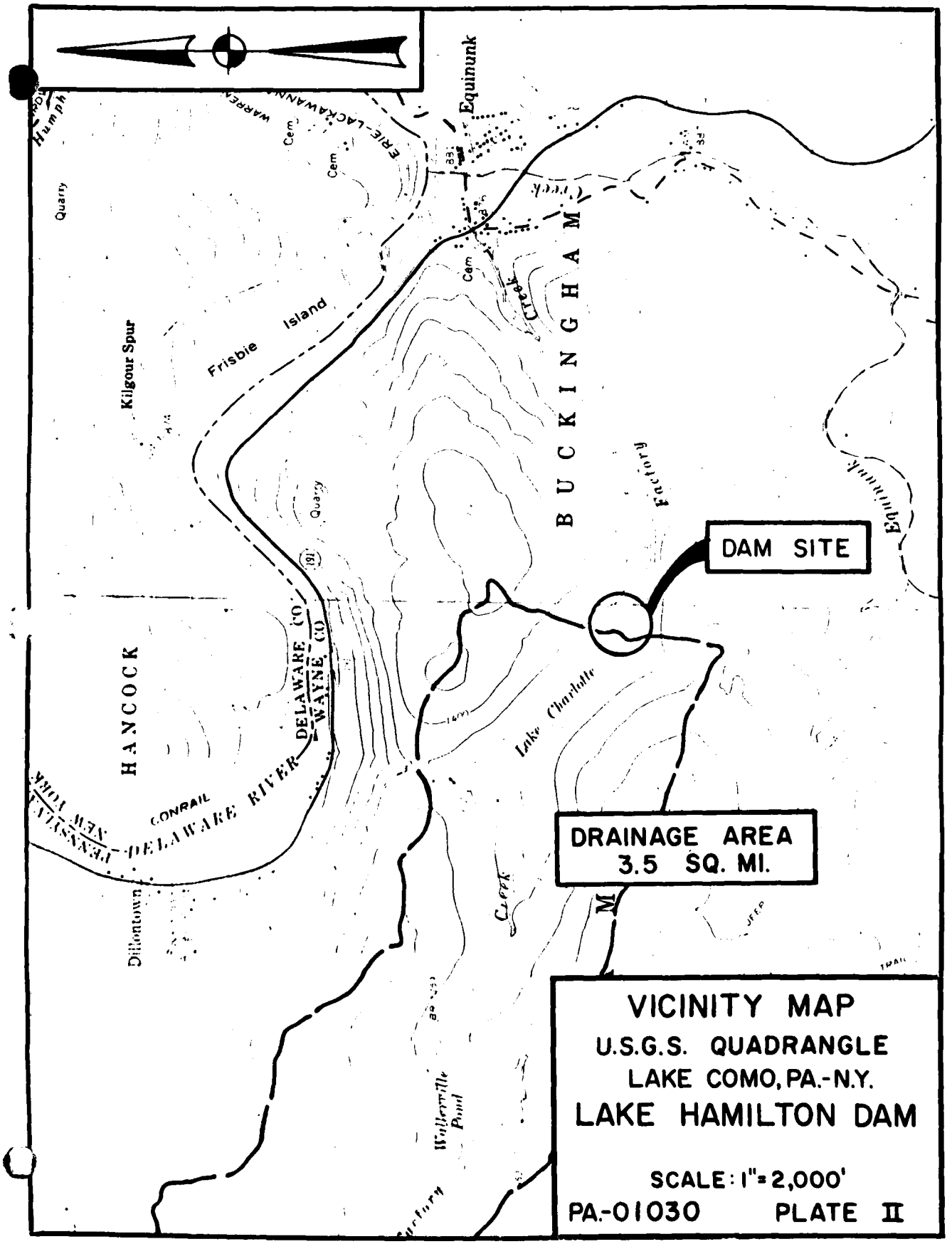
APPENDIX E

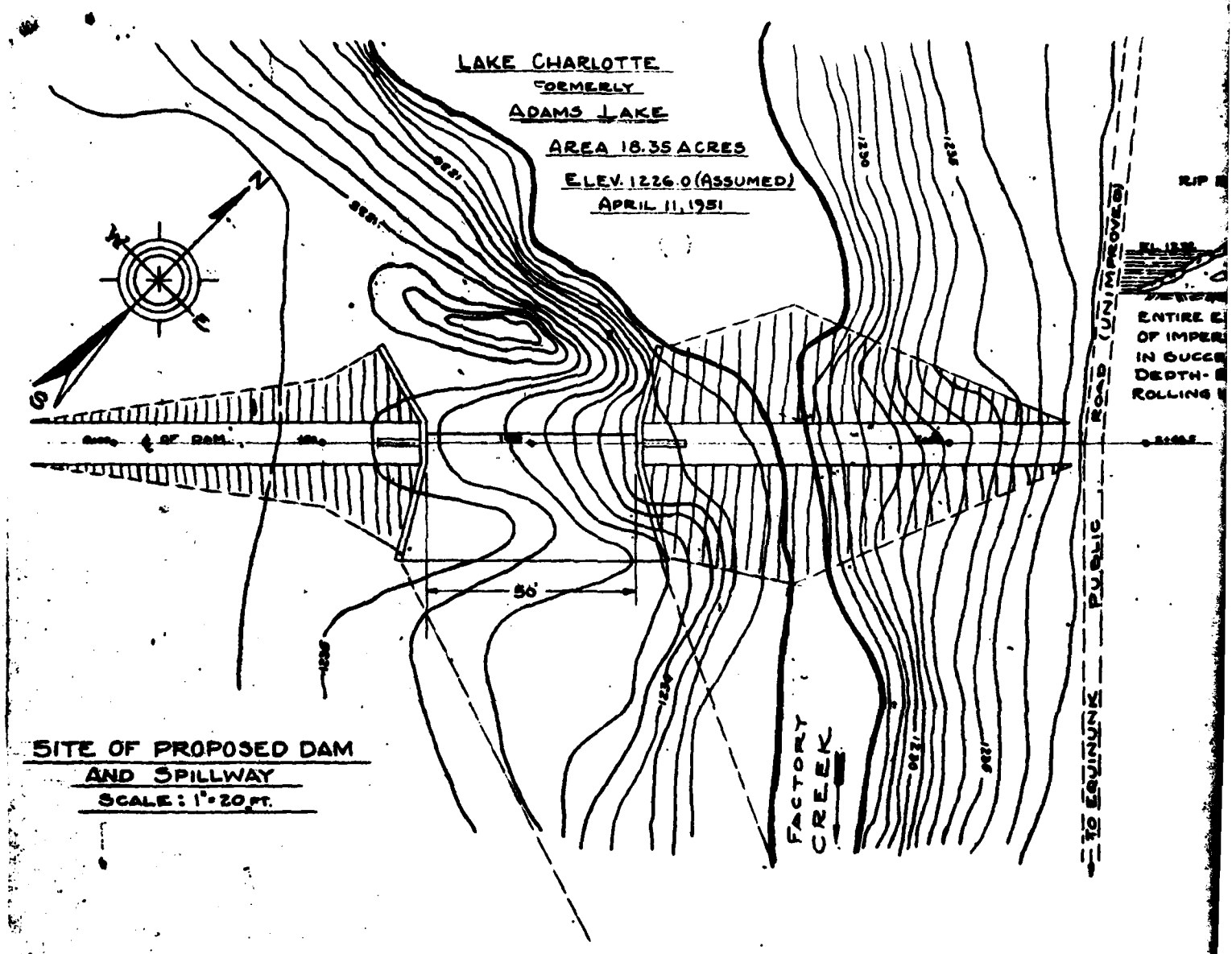
PLATES



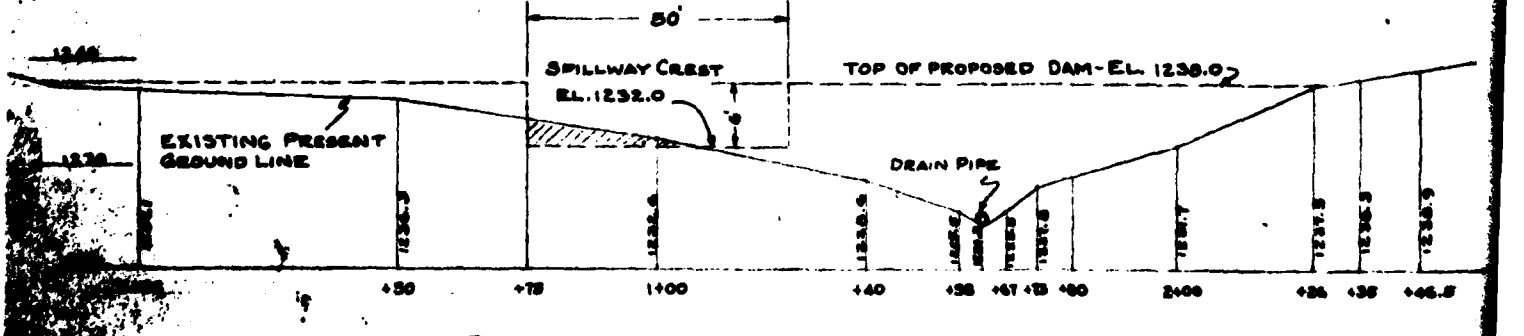
LOCATION PLAN
LAKE HAMILTON DAM

PA-01030 PLATE I


Equinunk
Quarry
Cem
Cem
Cem
Creek
Frisbie Island
Kilgour Spur
BUCKINGHAM
Factory
DAM SITE
Equinunk
Quarry
HANCOCK
DELAWARE CO.
WAYNE CO.
Lake Charlotte
CONRAIL
DELAWARE RIVER
DRAINAGE AREA
3.5 SQ. MI.
Creek
Dillontown
Wallenpaupack Creek
VICINITY MAP
U.S.G.S. QUADRANGLE
LAKE COMO, PA.-N.Y.
LAKE HAMILTON DAM
SCALE: 1"= 2,000'
PA.-01030 PLATE II

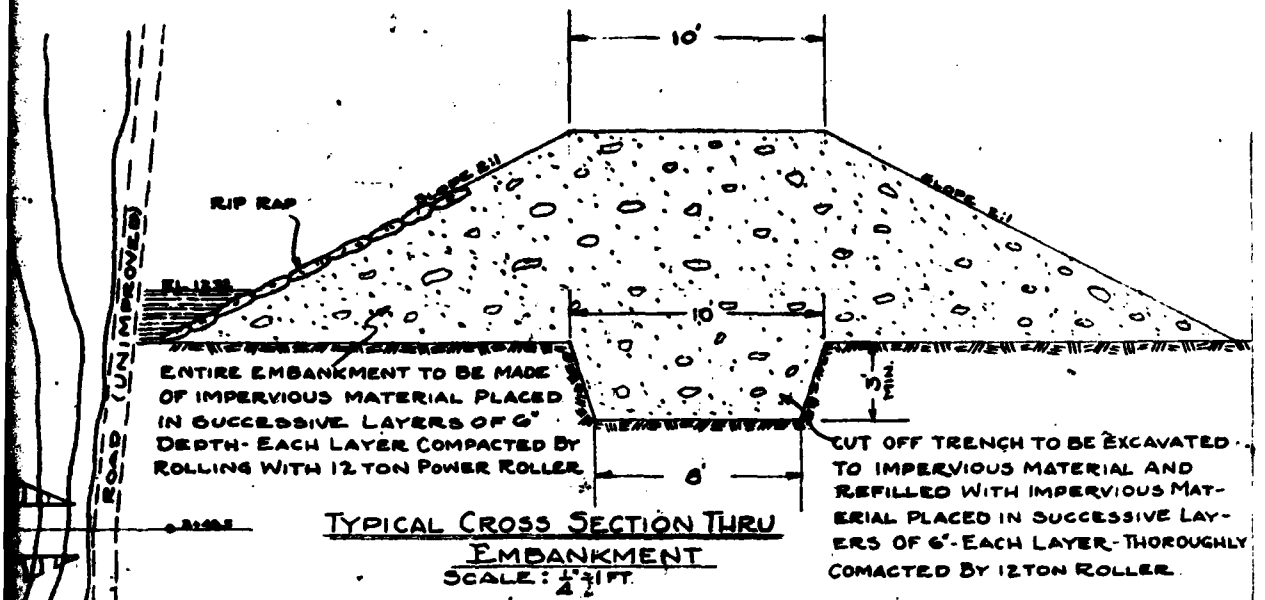


SITE OF PROPOSED DAM
AND SPILLWAY
SCALE: 1" = 20 FT.

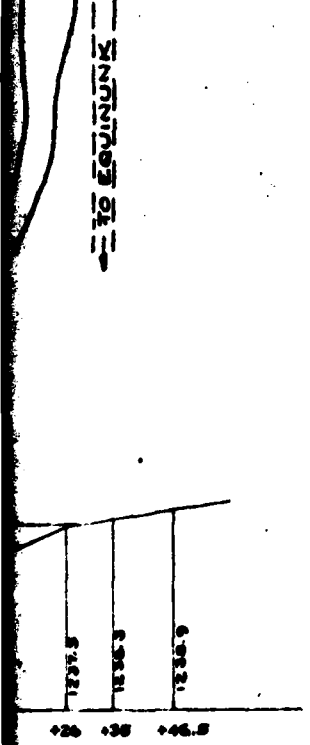


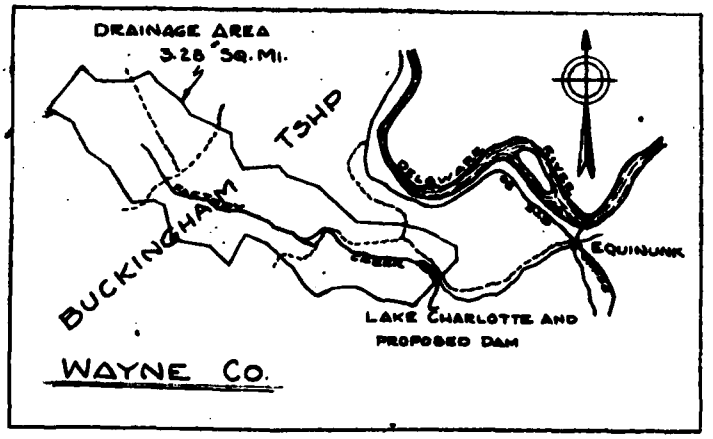
PROFILE ALONG CENTER LINE OF DAM

SCALE: HORIZ. 1" = 20 FT
VERT. 1" = 10 FT



TYPICAL CROSS SECTION THRU EMBANKMENT
SCALE: 1" = 4' FT.





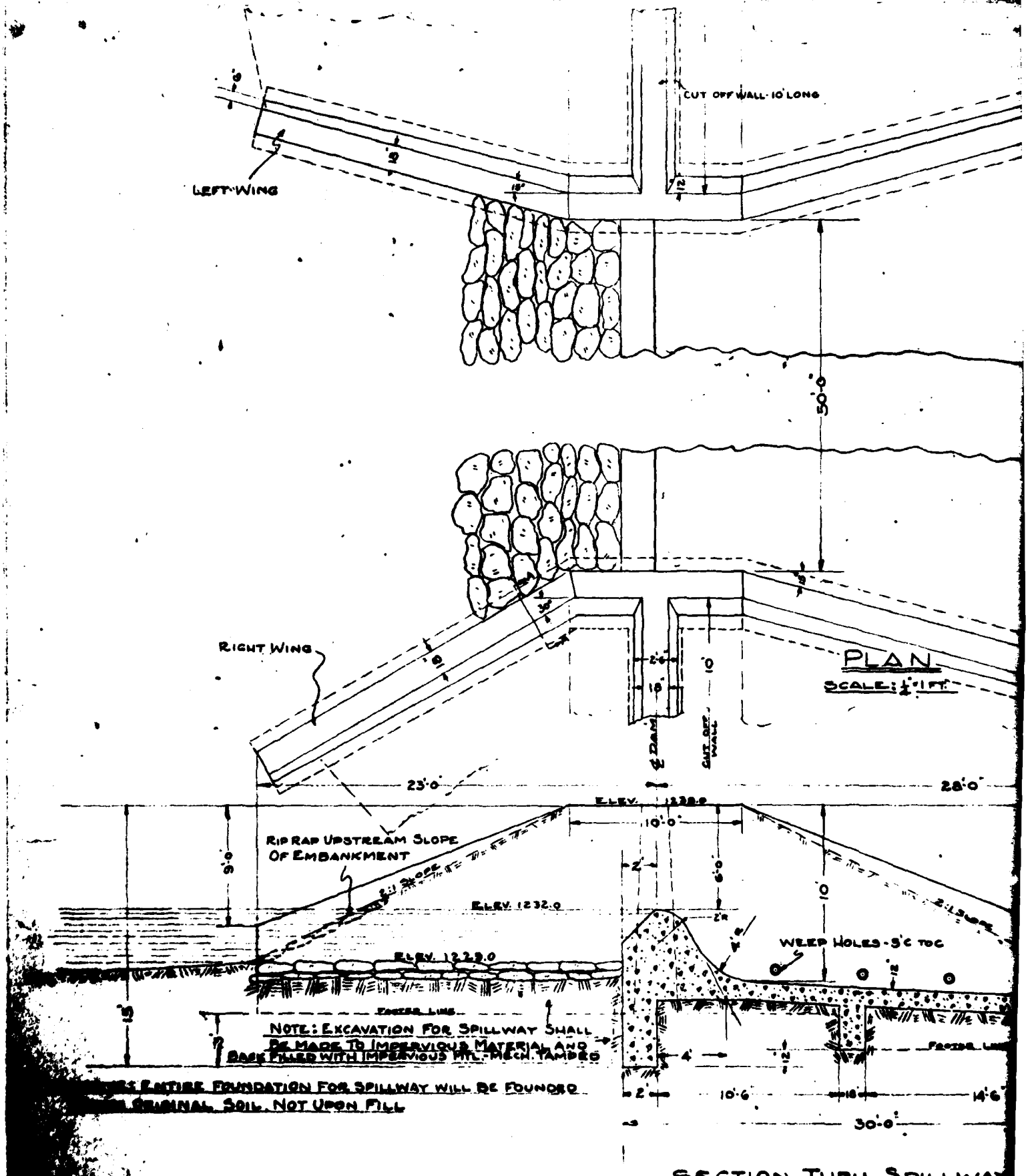
LOCATION MAP OF PROPOSED DAM
SCALE: 1 TO 62500

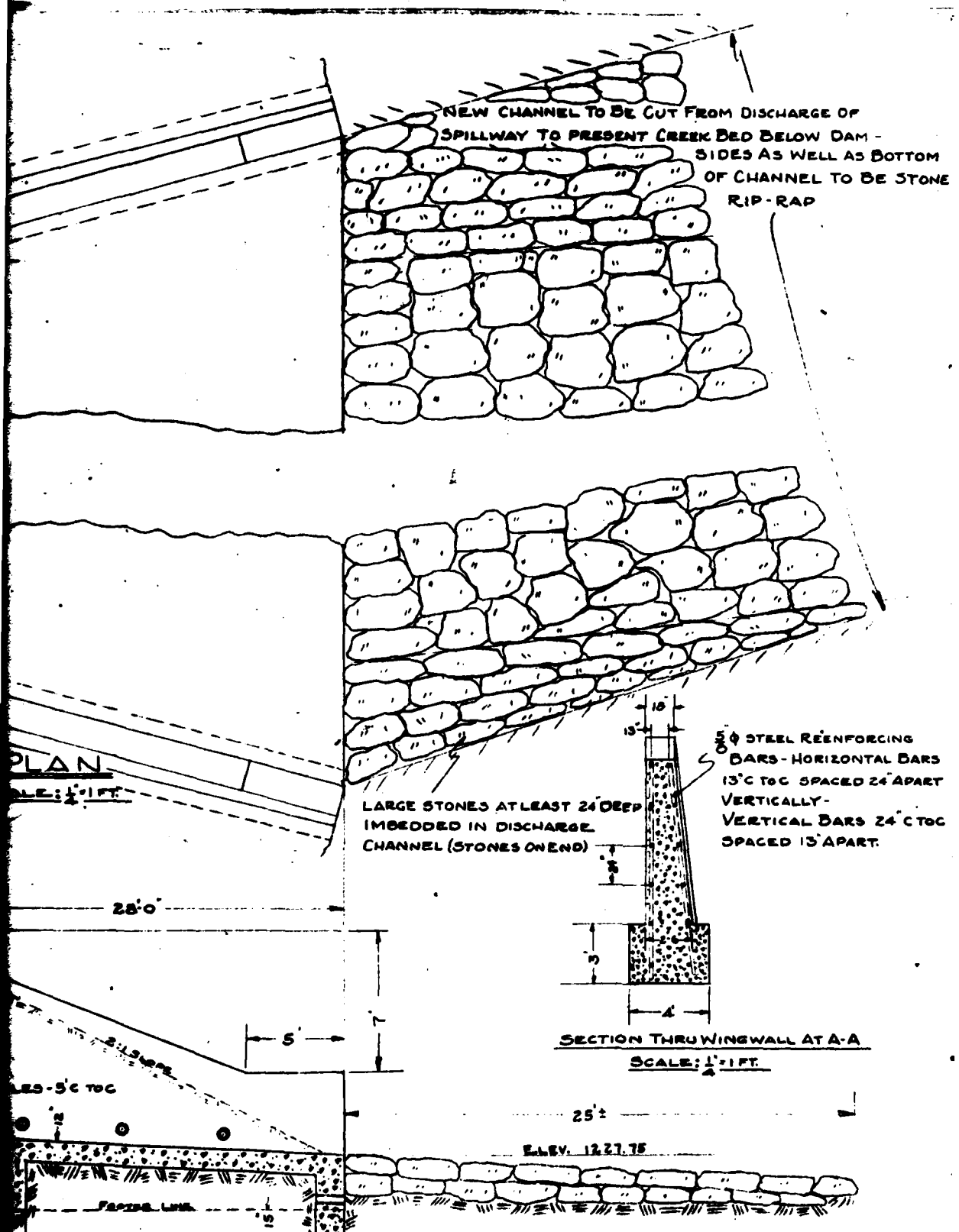
PROPOSED
DAM & SPILLWAY- LAKE CHARLOTTE, FORMERLY ADAMS LAKE- LOCATED AT EQUINUNK, PENNA.
A.J. HUBER, OWNER
DEC. 18, 1950 SCALE: AS SHOWN
L.F. Burlen Jr, Reg Engr

PA-01030
PLATE III

12

DD-30


CUT OFF WALL-10' LONG
LEFT WING
RIGHT WING
50'-0
PLAN
SCALE: 1" = 1 FT.
23'-0
28'-0
ELEV. 1238.0
10'-0
RIP RAP UPSTREAM SLOPE OF EMBANKMENT
ELEV. 1232.0
ELEV. 1229.0
WEEP HOLES - 5'C TOC
NOTE: EXCAVATION FOR SPILLWAY SHALL BE MADE TO IMPERVIOUS MATERIAL AND BACK FILLED WITH IMPERVIOUS FILL-MECH. TAMPED
ENTIRE FOUNDATION FOR SPILLWAY WILL BE FOUNDED ORIGINAL SOIL. NOT UPON FILL
10'-6
14'-6
30'-0
SECTION THRU SPILLWAY
SCALE: 1" = 1 FT.



SECTION THRU WINGWALL AT A-A

SCALE: 1/4" = 1 FT.

PROPOSED

DAM & SPILLWAY - LAKE CHARLOTTE, FORMERLY ADAMS LAKE - LOCATED AT EQUINUNK, PENNA

A. J. HUBER, OWNER

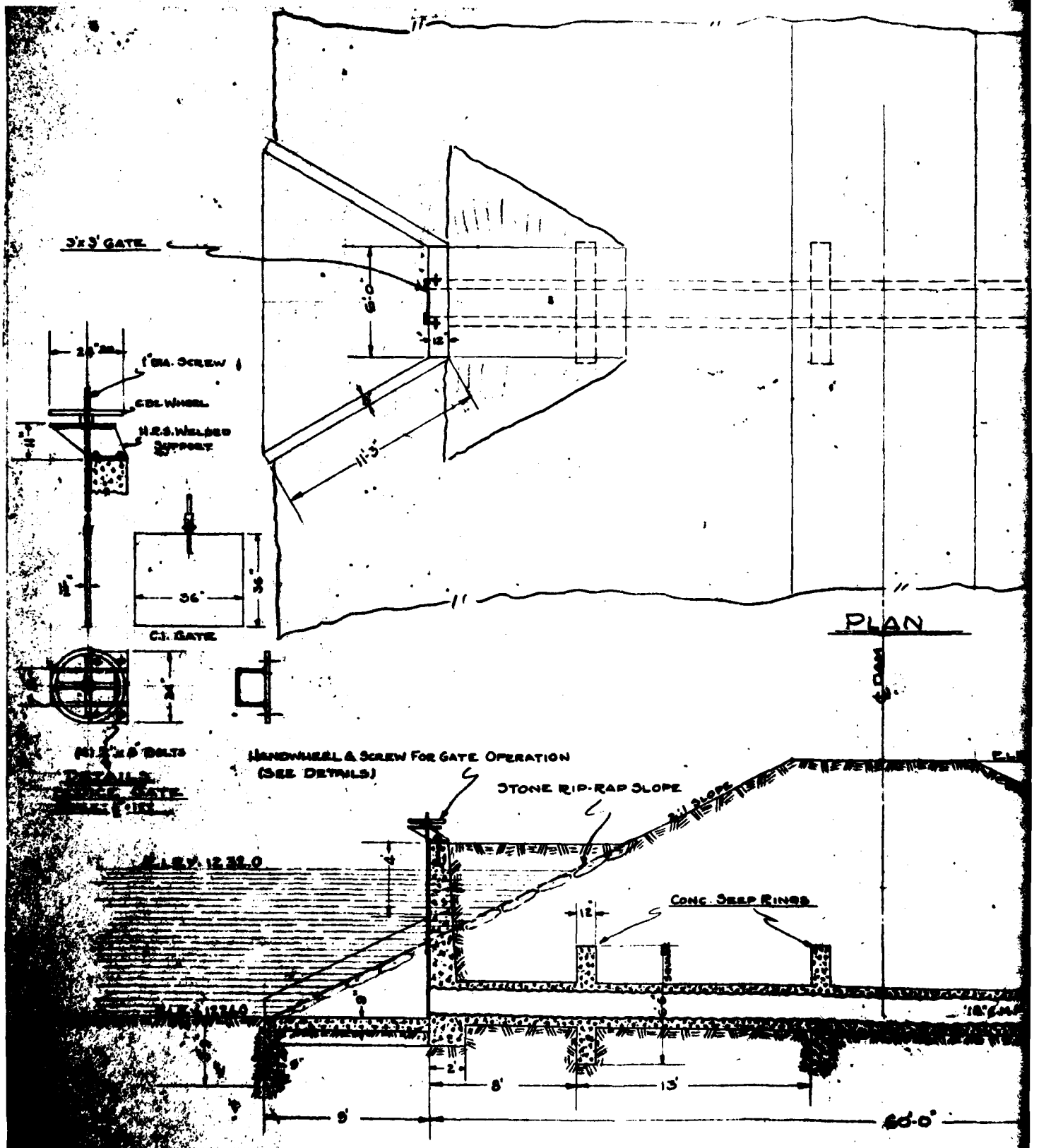
DEC. 15, 1950 SCALE: AS SHOWN

L. F. Burlein, Ry Engr.

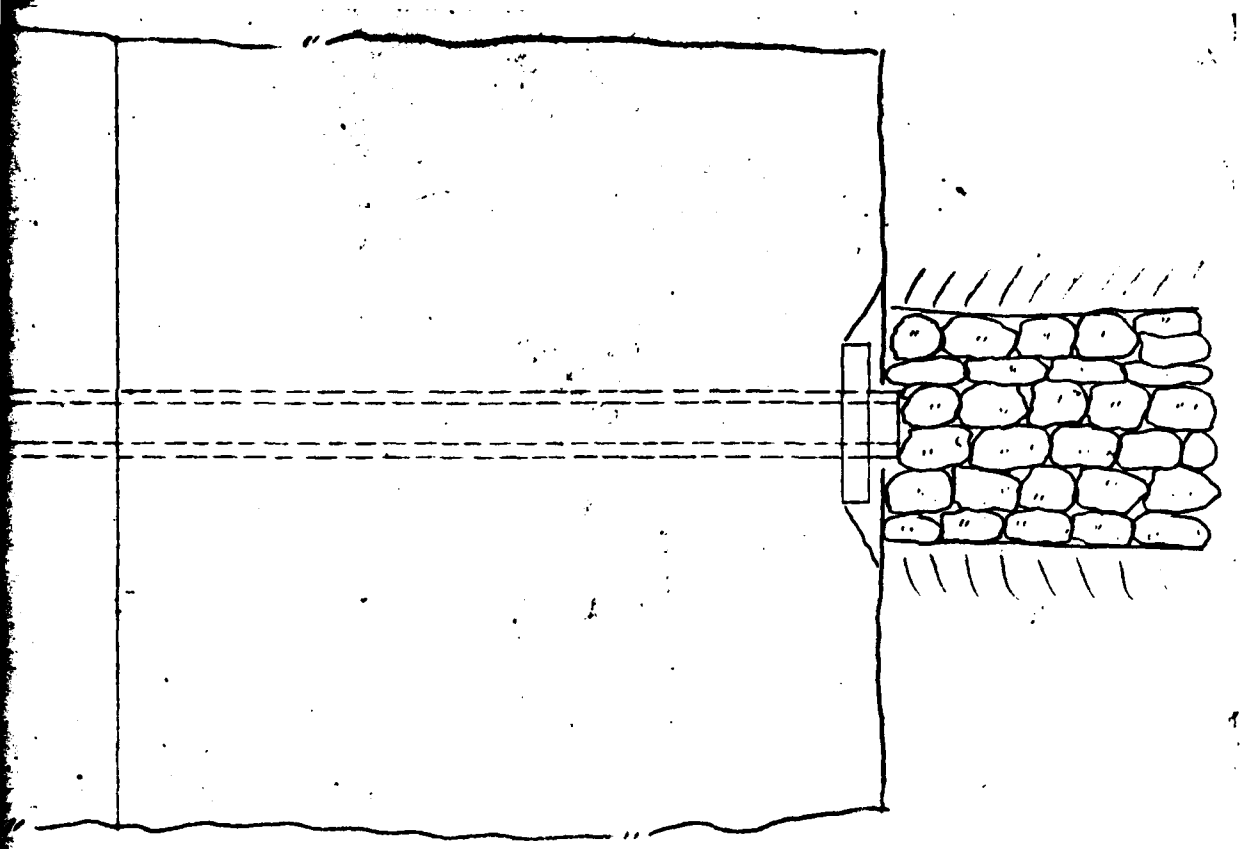
DD-302

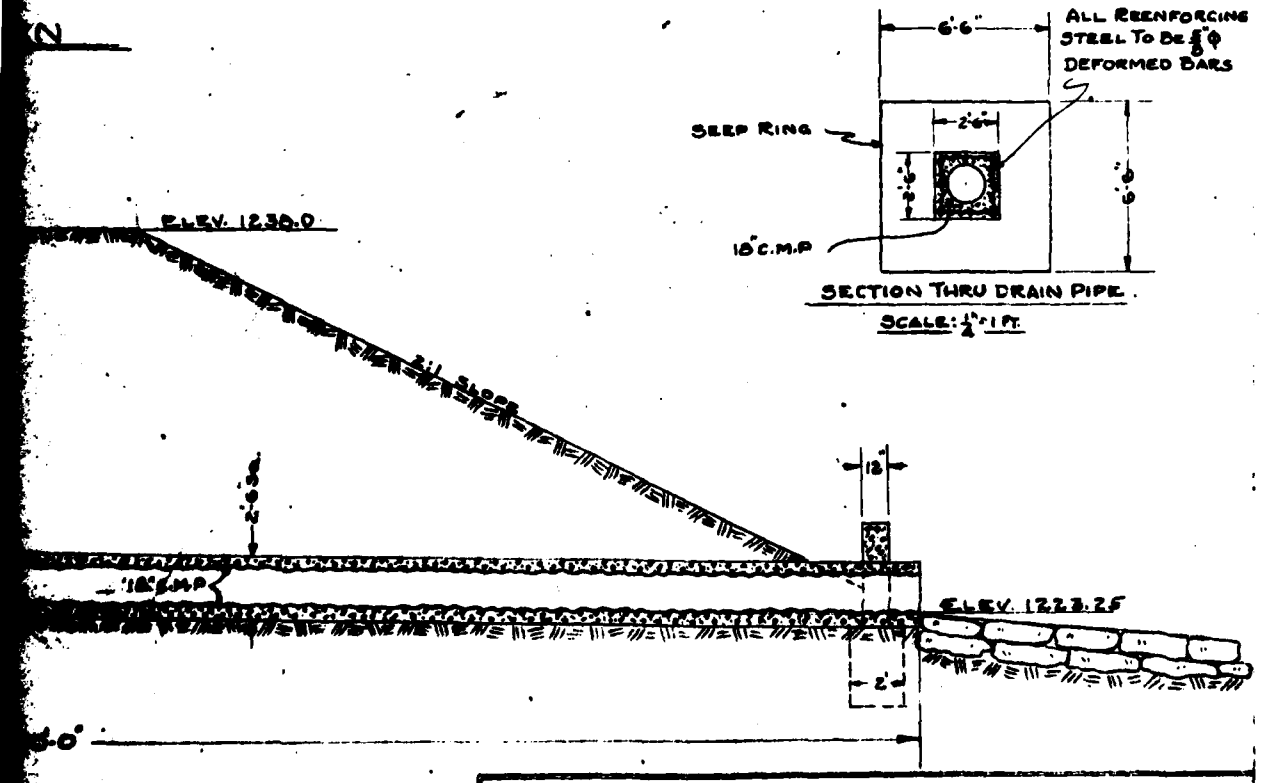
PA-01030

PLATE IV



SECTION THRU DAM AN



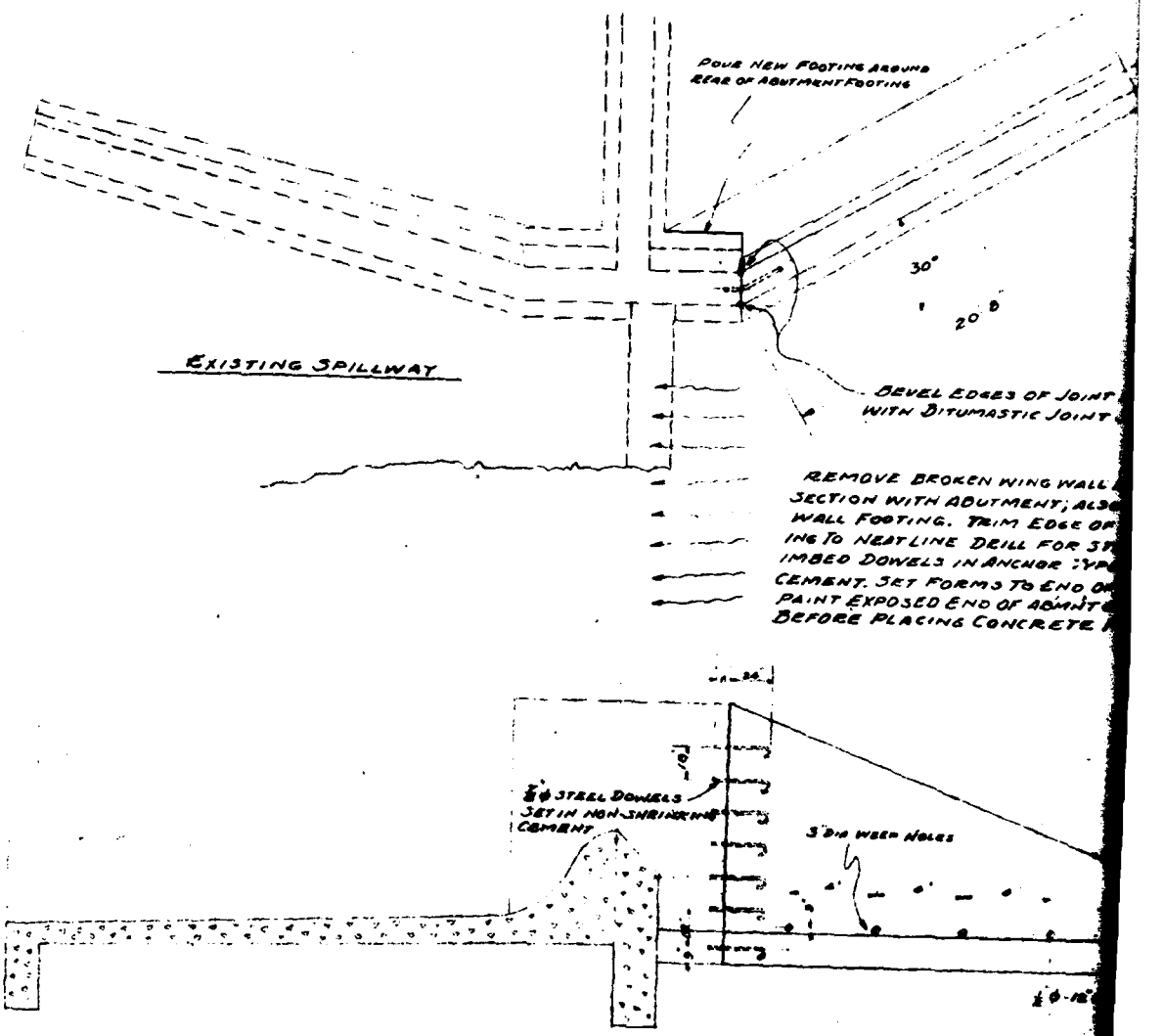


SECTION THRU DRAIN PIPE.
SCALE: ½" = 1 FT.

DAM AND DRAIN PIPE
½" = 1 FT.

PROPOSED
DAM & SPILLWAY - LAKE CHARLOTTE, FORMERLY ADAMS LAKE - LOCATED AT EQUINUNK, PENNA
A. J. HUBER, OWNER
DEC. 15, 1950 SCALE: AS SHOWN
L. F. Burleson, Reg. Engr.
DD-303

PA-01030
PLATE V



REPAIR TO

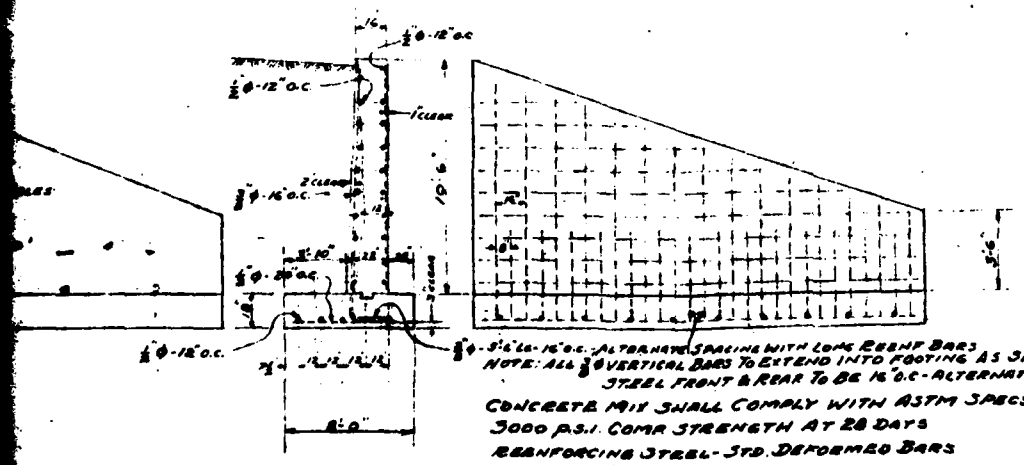
WAY - LAKE

MAY 1968

20°

EDGES OF JOINT AND SEAL
TUMASTIC JOINT SEALER

OKEN WING WALL AT POINT OF INTER-
N ABUTMENT; ALSO REMOVE WING
6. TRIM EDGE OF ABUTMENT & FOOT-
NE. DRILL FOR STEEL DOWELS AND
3 IN ANCHOR TYPE NON-SHRINKING
FORMS TO END OF ABUTMENT.
D END OF ABMNT & FOOTING WITH EPOXY RESIN
ING CONCRETE FOR NEW WALL



#6 @ 5'-6" LL - 16" o.c. - ALTERNATE SPACING WITH LONG REINF BARS
NOTE: ALL #6 VERTICAL BARS TO EXTEND INTO FOOTING AS SHOWN IN SECTION
STEEL FRONT & REAR TO BE 16" O.C. - ALTERNATE SPACING AS SHOWN

CONCRETE MIX SHALL COMPLY WITH ASTM SPECS. FOR
3000 P.S.I. COMP STRENGTH AT 28 DAYS
REINFORCING STEEL - STD. DEFORMED BARS

STEEL PLAN - NEW WING WALL

PROPOSED

REPAIR TO NORTHWEST WING WALL - ON SPILL-
WAY - LAKE CHARLOTTE - EQUINUNK, WAYNE CO., PA.

MAY 1968 SCALE: 1/2" = 1'-0"

L. F. BUBLEIN, E&S ENG.

REVISED SECTION 6-22-68

PA-01030
PLATE VI

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.

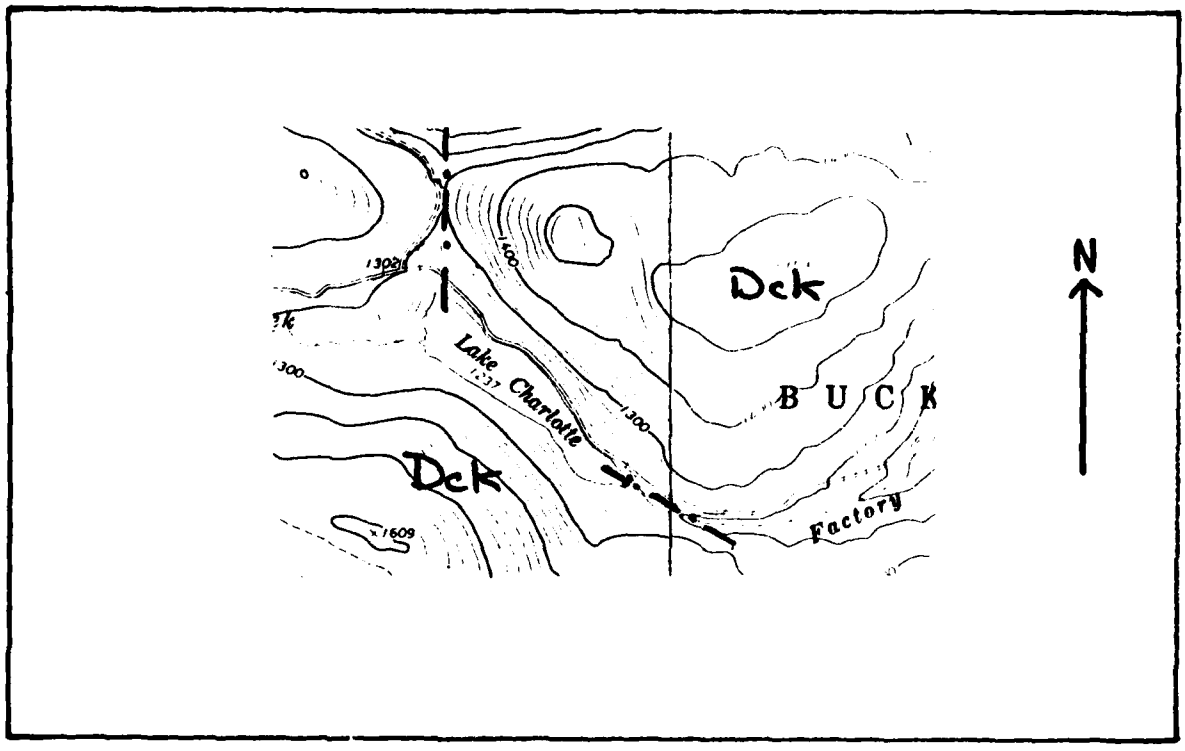
Sources of Information

1. Manuscript geologic map of the Lake Como Quadrangle, in open file, Pa. Geologic Survey, Harrisburg, Pa.

2. Air photographs, dated 1966. Scale 1:40,000.

3. Plans and reports in file.

GEOLOGIC MAP - Lake Hamilton Dam



Dck — Catskill Fm.- undifferentiated

—•—•— air photo fracture trace

SCALE 1:24000

1 MILE

1000 0 1000 2000 3000 4000 5000 6000 7000 FEET

1 KILOMETER

CONTOUR INTERVAL 20 FEET