

SUSQUEHANNA RIVER BASIN,
TRIBUTARY TO HUNTINGTON CREEK, LUZERNE COUNTY,

1

PENNSYLVANIA.

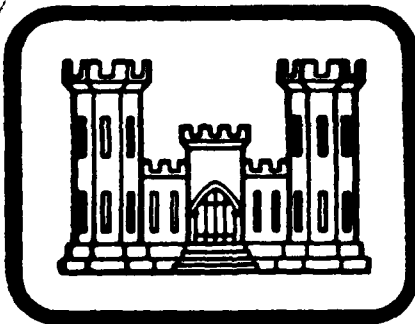
6) National Dam Inspection Program,
LAKE PINECREST DAM

Number
(NDS ID NO PA-641,
DER ID NO 40-200),
Number

LAKE PINECREST SPORTSMANS CLUB ←

PHASE I INSPECTION REPORT,
~~NATIONAL DAM INSPECTION PROGRAM~~

11) Sep 80



12) 651

15) DAZW 31-80-2-003.0

Prepared By

L. ROBERT KIMBALL & ASSOCIATES
CONSULTING ENGINEERS & ARCHITECTS
EBENSBURG, PENNSYLVANIA
15931

FOR
DEPARTMENT OF THE ARMY
BALTIMORE DISTRICT CORPS OF ENGINEERS
BALTIMORE, MARYLAND
21203

SEPTEMBER, 1980

DISTRIBUTION STATEMENT A

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PREFACE

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

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

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PHASE I REPORT
NATIONAL DAM INSPECTION REPORT

NAME OF DAM	Lake Pinecrest Dam
STATE LOCATED	Pennsylvania
COUNTY LOCATED	Luzerne
STREAM	Pine Creek
COORDINATES	Lat: 41° 11' Long: 76° 14.7'
DATE OF INSPECTION	May 20, 1980 and July 30, 1980

ASSESSMENT

The assessment of Lake Pinecrest Dam is based upon visual observations made at the time of inspection, review of available records and data, hydraulic and hydrologic computations and past operational performance.

In general, Lake Pinecrest Dam appears to be in fair condition. No seepage was noted on the downstream slope or along the toe of the dam. Several wet areas were observed along the downstream toe of the dam.

The spillway is in a deteriorating condition. Several cracks were observed in the spillway walls. Discharges from the spillway are eroding the outlet of the structure.

Lake Pinecrest Dam is a high hazard-small size dam. The spillway design flood for a dam of this size and classification is in the range of 1/2 PMF to PMF. The spillway design flood for this dam was selected as the PMF based on the downstream potential for loss of life and property damage. The spillway and reservoir are capable of controlling approximately 66% of the PMF without overtopping the earthen embankment. Based on criteria established by the Corps of Engineers, the spillway is termed inadequate.

The following recommendations and remedial measures should be instituted immediately.

1. The concrete spillway should be repaired.
2. Erosion protection should be provided at the spillway outlet. Additional riprap should be placed beyond the spillway to protect the downstream toe adjacent to the spillway discharge outlet.
3. Small animal burrows and erosion located on the embankment and downstream slope should be repaired on a regular basis.

LAKE PINECREST DAM
PA 572

4. Recently cut brush and small trees which litter the downstream slope should be removed. The crest and downstream slope should be regularly cleared of brush and trees.
5. The two 8" siphons should be evaluated as to their ability to function as a reservoir drain. If it is determined that they are operable they should be operated on a regular basis to ensure their usefulness. If the siphons are determined to be inoperable, facilities should be developed to provide a reservoir drain which meets current guidelines and requirements.
6. The wet areas located along the toe of dam should be visually monitored on a regular basis.
7. A warning system should be developed to warn downstream residents of large spillway discharge, or imminent failure of the dam.
8. A safety inspection program should be implemented with inspections at regular intervals by qualified personnel.



R. ROBERT KIMBALL & ASSOCIATES
CONSULTING ENGINEERS AND ARCHITECTS

A handwritten signature in cursive script that reads "R. Jeffrey Kimball, P.E.".

Date

R. Jeffrey Kimball, P.E.

APPROVED BY:

24 Sep 1980

A handwritten signature in cursive script that reads "James W. Peck".

Date

JAMES W. PECK
Colonel, Corps of Engineers
District Engineer



Overview of Lake Pinecrest.

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PHASE I
NATIONAL DAM INSPECTION PROGRAM
LAKE PINECREST DAM
NDI. I.D. NO. PA 641
DER I.D. NO. 40-200

SECTION I
PROJECT INFORMATION

1.1 General.

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

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

1.2 Description of Project.

a. Dam and Appurtenances. Lake Pinecrest Dam is an earth-fill dam, 15 feet high and 1150 feet long. The crest width is 26 feet. The upstream slope is 1H:1V to 5H:1V and grass covered. The downstream slope is 1.75H:1V and grass covered.

The reservoir drain consists of two 8" diameter cast iron pipe siphons. The siphons are located approximately 220 feet from the right abutment.

It was reported by the owners that a 12" concrete pipe which design drawings show to exit through the embankment has been plugged.

The spillway is a concrete flume, located at the right abutment. An I-beam stringer bridge exists across the spillway. The flume is straight for about 55 feet and then makes an angle for its remaining distance of 25 feet, discharging into Pine Creek below the dam.

b. Location. The dam is located on Pine Creek, Luzerne County, Pennsylvania. Lake Pinecrest Dam can be located on the Shickling, U.S.G.S. 7.5 minute quadrangle.

c. Size Classification. Lake Pinecrest Dam is a small size structure (16 feet high, 748 acre-feet).

d. Hazard Classification. Lake Pinecrest Dam is a high hazard dam. Downstream conditions indicate that the loss of more than a few lives is probable should the structure fail.

Several homes are located within a distance of 2 miles downstream of the dam. One home is located approximately 1.5 miles downstream of the dam.

e. Ownership. Lake Pinecrest Dam is owned by the Lake Pinecrest Sportsmans Association. Correspondence should be addressed to:

Mr. Gary Ernst
President
Lake Pinecrest Sportsman Association
Main Street
Conyngham, Pennsylvania 18219
717-864-3126

f. Purpose of Dam. Lake Pinecrest Dam is used for recreation.

g. Design and Construction History. An application for a permit to construct the dam was made in 1954 but it appears as though the construction of the dam was not completed until - October of 1959. No information exists concerning the actual construction of the dam. The dam was originally owned by a Mr. J.D. Kile, and a Mr. R.A. LeVan, both of Bloomsburg, Pennsylvania. The present owners (The Lake Pinecrest Sportsmans Club) report that the engineer for the original design was a Mr. Shulty of Berwick, Pennsylvania.

The design drawings located in the PennDER files indicate that both the upstream and downstream slope were to be 2H:1V. The crest width was to be 30 feet. The drawings also show a 12" concrete pipe reservoir drain through the embankment section. The pipe was to be encased in 6" of concrete and two concrete anti-seep collars were to be installed. The drawing also shows a concrete headwall at either end of the pipe. It was reported by the owner's that this pipe has been plugged.

The spillway was to be a concrete flume, 4 feet deep, with a 6" thickness of concrete floor paving. The retaining walls were to be 18 feet apart and an I-beam stringer bridge was to be placed over a 30 foot section of the spillway.

h. Normal Operating Procedures. No operations are conducted at the dam. Excess inflow to the reservoir is discharged through the spillway at the right abutment. The siphons have not been operated for at least 18 years.

1.3 Pertinent Data.

a. Drainage Area. 0.60 square miles

b. Discharge at Dam Site (cfs).

Maximum flood at dam site	Unknown
Drainline capacity at normal pool	Unknown
Spillway capacity at top of dam	380
Discharge capacity of siphons	Unknown

c. Elevation (U.S.G.S. Datum) (feet). - Field survey based on an assumed normal pool elevation 955.0 feet obtained from U.S.G.S. quadrangle.

Top of dam - low point	958.9
Top of dam - design height	Unknown
Maximum pool - design surcharge	Unknown
Normal pool	955.0
Spillway crest	955.0
8" siphon inverts - downstream	940.9 and 942.6
Maximum tailwater	Unknown
Toe of dam	941

d. Reservoir (feet).

Length of maximum pool	3500
Length of normal pool	3200

e. Storage (acre-feet).

Normal pool	466
Top of dam	748

f. Reservoir Surface (acres).

Top of dam	43
Normal pool	35
Spillway crest	35

g. Dam.

Type	Earthfill
Length	1150 feet
Height	18 feet
Top width	26 feet

Side slopes - upstream	1H: 1V to 5H: 1V
upstream (design)	2H: 1V
- downstream	1.75H: 1V
downstream (design)	2H: 1V
Zoning	Unknown
Impervious core	Unknown
Cutoff	Unknown
Grout curtain	Unknown

h. Reservoir Drain (12" concrete pipe plugged).

Type	Two 8" siphons
Length	Unknown
Closure	N/A
Access	Downstream toe
Regulating facilities	None

i. Spillway.

Type	Concrete chute
Length (weir)	17 feet
Crest elevation	955.0
Upstream channel	Concrete approach (unrestricted)
Downstream channel	Chute to Pine Creek

SECTION 2
ENGINEERING DATA

2.1 Design. Review of information in the files of the Commonwealth of Pennsylvania, Department of Environmental Resources revealed that some correspondence, design drawings, and permit information were available for review. All this information was reviewed for the purposes of this report.

2.2 Construction. Construction of Lake Pinecrest Dam was completed in 1959. No other information is available on the construction of the dam.

2.3 Operation. No operations are conducted at the dam.

2.4 Evaluation.

a. Availability. Engineering data were provided by PennDER, Bureau of Dams and Waterway Management. The dam is owned by the Lake Pinecrest Sportsmans Club and several representatives of the organization accompanied the inspection team during the inspection of the dam and were interviewed in regards to operation and maintenance of the dam.

b. Adequacy. This Phase I Report is based on the visual inspection and the hydrologic and hydraulic analysis. Sufficient information exists to complete a Phase I Report.

SECTION 3
VISUAL INSPECTION

3.1 Findings.

a. General. The onsite inspection of Lake Pinecrest Dam was conducted by personnel of L. Robert Kimball and Associates on May 20, and July 30, 1980. The inspection consisted of:

1. Visual inspection of the retaining structure, abutments and toe.
2. Examination of the spillway facilities, exposed portion of any outlet works and other appurtenant works.
3. Observations affecting the runoff potential of the drainage basin.
4. Evaluation of the downstream area hazard potential.

b. Dam. The dam appears to be in fair condition. From a brief survey conducted during the inspection, it was noted that a low spot exists on the embankment crest approximately 700 feet from the right abutment. The crest of the dam is used as a roadway and is oiled periodically. The upstream slope of the dam ranges from 1H:1V to 5H:1V. The downstream slope 1.75H:1V and is grass covered. Several small animal burrows and erosion gullies were visible on the downstream slope.

No seepage was visible on the downstream slope or along the toe of the dam. Several areas of ponded water was observed beyond the toe of dam. No flow was noted from these wet areas. The recently cut brush littered the downstream slope and should be removed so as not to hamper future efforts to detect seepage. The upstream slope is grass covered and the riprap on the upstream slope appeared to be minimal. Some over steepening of the upstream slope near the waterline was observed and is possibly due to wave action.

c. Appurtenant Structures. The concrete spillway is in a deteriorating condition. Several cracks were observed in the chute walls and erosion at the outlet of the chute is beginning to undercut the section.

Spillway modifications were in progress during the July 30th, 1980 inspection. Work included repair of cracks in the spillway wingwalls.

d. Reservoir Area. The watershed consists almost entirely of fields. The pond surface area represents approximately 1/3 of the total drainage area. The head waters for the drainage area begin at an elevation almost equal to the top of dam elevation. The reservoir slopes are very gentle and do not appear susceptible to massive landslides which would affect the storage volume of the storage reservoir or cause overtopping of the dam by displacing water.

e. Downstream Channel. The downstream channel of Lake Pinecrest Dam is relatively broad for a distance of approximately 1 mile below the dam. Approximately 1 mile below the dam the stream channel narrows and parallels Pennsylvania State Route 239. Lake Pinecrest Dam is located on the headwaters to Pine Creek.

3.2 Evaluation. The embankment appeared to be in fair condition. No seepage was noted on the downstream slope. The concrete chute spillway is in a deteriorating condition and several cracks were noted on the spillway wingwalls. Discharges through the chute are eroding the outlet and are beginning to undercut the end section.

SECTION 4
OPERATIONAL PROCEDURES

4.1 Procedures. Water level is maintained at the spillway crest elevation, 955.0.

4.2 Maintenance of the Dam. Maintenance at Lake Pinecrest Dam consists of yearly removal of brush on the downstream slope and mowing of the grass on the upstream slope and road berms. No maintenance is conducted on the concrete chute spillway other than the removal of brush and debris from the spillway on an unscheduled basis.

4.3 Maintenance of Operating Facilities. No operations are conducted at the dam.

4.4 Warning System in Effect. There is no warning system in effect to warn downstream residents of large spillway discharges or imminent failure of the dam.

4.5 Evaluation. The condition of the dam is considered fair. There was no warning system in effect to warn downstream residents at the time of inspection. Maintenance of the concrete chute spillway is considered poor. Maintenance of the embankment crest and downstream slope is considered good.

SECTION 5
HYDRAULICS AND HYDROLOGY

5.1 Evaluation of Features.

a. Design Data. No calculations or design data pertaining to hydrology were available.

b. Experience Data. No rainfall, runoff or reservoir level data were available. The spillway reportedly has functioned adequately in the past.

c. Visual Observations. The concrete chute spillway appeared to be in poor condition. The spillway crest control section is not well defined and is considered to be a high point located on the chute directly beneath the roadway bridge. Several cracks were observed on the channel walls which create the chute for the discharge channel. Flows discharging through the spillway are beginning to erode the outlet of chute channel.

A low spot was noted on the dam embankment approximately 700 feet from the right abutment.

The two 8" siphons which exist through the dam embankment appear to be in a deteriorating condition and it was reported by representatives of the owner that the siphons had not been used since 1962.

d. Overtopping Potential. Overtopping potential was investigated through the development of the probable maximum flood (PMF) for the watershed and the subsequent routing of the PMF and fractions of the PMF through the reservoir and spillway.

The Corps of Engineers, Baltimore District, has directed that the HEC-1 Dam Safety Version systemized computer program be utilized. The program was prepared by the Hydrologic Engineering Center (HEC), U.S. Army Corps of Engineers, Davis, California, July, 1978. The major methodologies or key input data for this program are discussed briefly in Appendix D.

5.2 Evaluation Assumptions. To enable us to complete the hydraulic and hydrologic analysis for this structure, it was necessary to make the following assumptions.

1. The pool elevation in the reservoir prior to the storm is 955.0.

2. For the overtopping analysis a top of dam elevation of 958.9 (low spot) was considered the top of dam.

3. For the purposes of this analysis it was assumed that the southern most point of the drainage area boundary line is greater than elevation 960.0.

4. The pipe supports beneath the bridge which spans the spillway crest were not considered as affecting spillway discharges.

5.3 Summary of Overtopping Analysis. Complete summary sheets for the computer output are presented in Appendix D.

Peak inflow (PMF)	1494 cfs
Spillway capacity	380 cfs

a. Spillway Adequacy Rating. The Spillway Design Flood (SDF) for this dam is in the range of 1/2 PMF to the PMF. The SDF is based on the hazard and size classification of the dam. The SDF for this dam was selected to be the PMF based on the downstream potential for loss of life. Based on the following definition provided by the Corps of Engineers, the spillway is rated as inadequate as a result of our hydrologic analysis.

Inadequate - All high hazard dams which do not pass the spillway design flood (PMF).

The spillway and reservoir are capable of controlling approximately 66% of the PMF without overtopping the embankment.

5.4 Summary of Dam Breach Analysis. As the subject dam is capable of passing 50% of the PMF (based on our analysis) it was not necessary to perform the dam breach analysis and downstream routing of the flood wave.

SECTION 6
STRUCTURAL STABILITY

6.1 Evaluation of Structural Stability.

a. Visual Observations. A few erosion gullies were observed on the downstream embankment slope at the time of inspection. A roadway exists across the embankment crest which is oiled periodically. Brush and small trees which had been growing on the downstream slope of the dam had been recently cut and the remains of the clearing were piled on the downstream slope of the dam. No seepage was visible on the downstream slope or along the toe of the dam during the inspection.

b. Design and Construction Data. A design drawing shows a plan and section of the embankment. The upstream and downstream slopes of the embankment were designed to have slopes equal to 2H:1V. The crest width is shown to be 30 feet.

c. Operating Records. No operations are conducted at the dam.

d. Post Construction Changes. No post construction changes are known to have occurred since the structure was built in 1959.

e. Seismic Stability. No obvious signs of instability were noted during the inspection. The dam is located in seismic zone 1. No seismic stability analyses has been performed. Normally, it can be considered that if a dam in this zone is stable under static loading conditions, it can be assumed safe for any expected earthquake loading. No known stability analysis have been conducted to document the stability of the structure.

SECTION 7
ASSESSMENT AND RECOMMENDATIONS/REMEDIAL MEASURES

7.1 Dam Assessment.

a. Safety. The dam appears to be in fair condition. There was no evidence of seepage on the downstream slope or at the toe of the dam. Several erosion gullies were noted on the downstream slope.

The siphons have not been operated for at least 18 years. Design drawings located in the PennDER files indicate that a 12" reinforced concrete pipe, encased in 6" of concrete with concrete anti-seep collars and concrete endwalls was to be incorporated in the design but the existence of the concrete pipe and the concrete endwall structure was not observed during the inspection. No control valves were incorporated in the original design for the 12" concrete pipe.

It was reported (by the owners) during the July 30th, 1980 inspection that the 12" concrete pipe had been plugged.

The spillway is in a deteriorating condition and several cracks were noted on the spillway walls. Flow through the spillway is beginning to erode the natural ground at the discharge point at the channel.

The visual observations, review of available information, hydrologic and hydraulic calculations and past operations and performance indicate that the Lake Pinecrest's spillway is inadequate. The spillway and reservoir are capable of controlling 66% of the PMF without overtopping the earth embankment.

b. Adequacy of Information. Sufficient information is available to complete a Phase I Report.

c. Urgency. The recommendations suggested below should be implemented immediately.

d. Necessity for Further Investigation. In order to accomplish some of the recommendations/remedial measures outlined below, further investigations will be required.

7.2 Recommendations/Remedial Measures.

1. The concrete spillway should be repaired.
2. Erosion protection should be provided at the spillway outlet. Additional riprap should be placed beyond the spillway outlet to protect the downstream toe adjacent to the spillway discharge outlet.

3. Small animal burrows and erosion located on the embankment and downstream slope should be repaired on a regular basis.

4. Recently cut brush and small trees which litter the downstream slope should be removed. The crest and downstream slope should be regularly cleared of brush and trees.

5. The two 8" siphons should be evaluated as to their ability to function as a reservoir drain. If it is determined that they are operable they should be operated on a regular basis to ensure their usefulness. If the siphons are determined to be inoperable, facilities should be developed to provide a reservoir drain which meets current guidelines and requirements.

6. The wet areas located along the toe of dam should be visually monitored on a regular basis.

7. A warning system should be developed to warn downstream residents of large spillway discharges or imminent failure of the dam.

8. A safety inspection program should be implemented with inspections at regular intervals by qualified personnel.

APPENDIX A
CHECKLIST, VISUAL INSPECTION, PHASE I

CHECK LIST
VISUAL INSPECTION
PHASE I

NAME OF DAM Lake Pinecrest Dam COUNTY Luzerne STATE Pennsylvania ID# 572
TYPE OF DAM Earthfill HAZARD CATEGORY High
DATE(S) INSPECTION May 20, 1980
July 30, 1980 WEATHER cloudy and warm TEMPERATURE 50° on 5/20/80
POOL ELEVATION AT TIME OF INSPECTION 955.0 M.S.L. TAILWATER AT TIME OF INSPECTION None M.S.L.

INSPECTION PERSONNEL:

R. Jeffrey Kimball, P.E. - L. Robert Kimball and Associates
James T. Hockensmith - L. Robert Kimball and Associates
O.T. McConnell - L. Robert Kimball and Associates
Cameron K. Mock - L. Robert Kimball and Associates

James T. Hockensmith RECORDER

EMBANKMENT

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SURFACE CRACKS	None noted.	
UNUSUAL MOVEMENT OR CRACKING AT OR BEYOND THE TOE	None noted.	
SLOUGHING OR EROSION OF EMBANKMENT AND ABUTMENT SLOPES	None noted.	
VERTICAL AND HORIZONTAL ALIGNMENT OF THE CREST	Horizontal alignment appears to be good. Vertical, low spot located approximately 700 feet from the right abutment.	
RIPRAP FAILURES	None.	

EMBANKMENT

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
VEGETATION	Small trees and brush on the downstream slope were recently cut. The recently cut brush is littering the downstream slope and should be removed.	
JUNCTION OF EMBANKMENT AND ABUTMENT, SPILLWAY AND DAM	Appears to be good.	
ANY NOTICEABLE SEEPAGE	No seepage noted during the inspection. Several wet areas observed along the downstream toe but the condition was considered to be due to some backwater from a small beaver dam located downstream of Lake Pinecrest.	
STAFF GAUGE AND RECORDER	None.	
DRAINS	None.	

CONCRETE/MASONRY DAMS

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
ANY NOTICEABLE SEEPAGE	Not applicable.	
STRUCTURE TO ABUTMENT/EMBANKMENT JUNCTIONS	Not applicable.	
DRAINS	Not applicable.	
WATER PASSAGES	Not applicable.	
FOUNDATION	Not applicable.	

CONCRETE/MASONRY DAMS

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SURFACE CRACKS CONCRETE SURFACES	Not applicable.	
STRUCTURAL CRACKING	Not applicable.	
VERTICAL AND HORIZONTAL ALIGNMENT	Not applicable.	
MONOLITH JOINTS	Not applicable.	
CONSTRUCTION JOINTS	Not applicable.	
STAFF GAUGE OR RECORDER	Not applicable.	

OUTLET WORKS

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CRACKING AND SPALLING OF CONCRETE SURFACES IN OUTLET CONDUIT	Not applicable.	
INTAKE STRUCTURE	Not applicable.	
OUTLET STRUCTURE	Not applicable.	
OUTLET CHANNEL	Not applicable.	
EMERGENCY GATE	Not applicable.	

UNGATED SPILLWAY

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONCRETE WEIR	Broad crested weir formed by the concrete chute type spillway.	
APPROACH CHANNEL	Six inch thick concrete approach with concrete wingwalls.	
DISCHARGE CHANNEL	Six inch thick concrete channel with concrete walls. The concrete is deteriorating and surface cracks were observed during the inspection. Modifications observed during the July 30, 1980 inspection.	
BRIDGE AND PIERS	A bridge spans the spillway and is formed by an I-beam stringer type bridge. Three 4" steel pipes serve to support the midsection of the structure.	

GATED SPILLWAY

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONCRETE SILL	Not applicable.	
APPROACH CHANNEL	Not applicable.	
DISCHARGE CHANNEL	Not applicable.	
BRIDGE AND PIERS	Not applicable.	
GATES AND OPERATION EQUIPMENT	Not applicable.	

DOWNSTREAM CHANNEL

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
<p align="center">CONDITION (OBSTRUCTIONS, DEBRIS, ETC.)</p>	<p>Lake Pinecrest Dam forms the headwaters for Pine Creek. A small beaver dam is located immediately downstream of Lake Pinecrest.</p>	
<p align="center">SLOPES</p>	<p>Appear to be stable.</p>	
<p align="center">APPROXIMATE NO. OF HOMES AND POPULATION</p>	<p>1 home located approximately 1 mile downstream of Lake Pinecrest Dam - 4 people. Several additional homes located approximately 1.5 miles downstream of Lake Pinecrest.</p>	

RESERVOIR

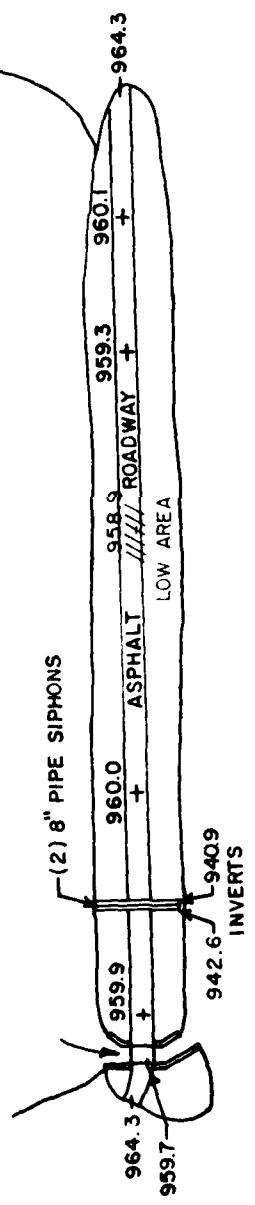
VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SLOPES	Moderate.	
SEDIMENTATION	Unknown.	

INSTRUMENTATION

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
MONUMENTATION/SURVEYS	None.	
OBSERVATION WELLS	None.	
WEIRS	None.	
PIEZOMETERS	None.	
OTHER	None.	

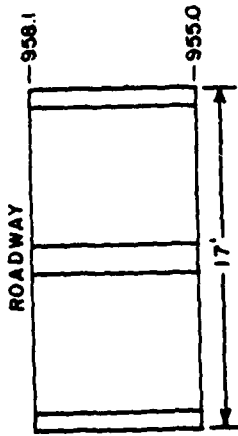


LAKE ELEV. 955.0

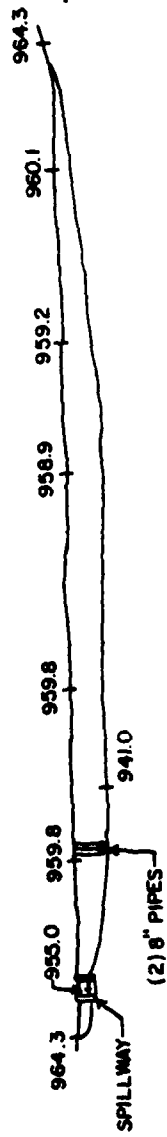


LAKE PINECREST DAM

Scale: 1" = 200'



SPILLWAY SECTION



PROFILE
LOOKING UPSTREAM

Scale: Horiz. 1" = 200'
Vert. 1" = 100'



LAKE PINECREST DAM

APPENDIX B
CHECKLIST, ENGINEERING DATA, DESIGN, CONSTRUCTION, OPERATION,
PHASE I

CHECK LIST
ENGINEERING DATA
DESIGN, CONSTRUCTION, OPERATION
PHASE I

NAME OF DAM Lake Pinecrest Dam
 ID# 641

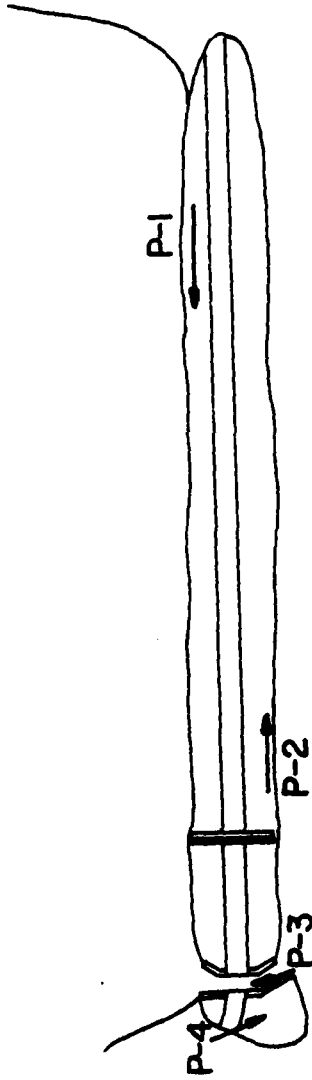
ITEM	REMARKS
AS-BUILT DRAWINGS	None.
REGIONAL VICINITY MAP	U.S.G.S. 7.5 minute quadrangle.
CONSTRUCTION HISTORY	None.
TYPICAL SECTIONS OF DAM	Appendix E.
OUTLETS - PLAN - DETAILS - CONSTRAINTS - DISCHARGE RATINGS RAINFALL/RESERVOIR RECORDS	None. None. None. None. None.

ITEM	REMARKS
DESIGN REPORTS	None.
GEOLOGY REPORTS	None.
DESIGN COMPUTATIONS HYDROLOGY & HYDRAULICS DAM STABILITY SEEPAGE STUDIES	None.
MATERIALS INVESTIGATIONS BORING RECORDS LABORATORY FIELD	Unknown. Some subsurface information available on drawing in Appendix E.
POST-CONSTRUCTION SURVEYS OF DAM	Unknown.
BORROW SOURCES	Unknown.

ITEM	REMARKS
MONITORING SYSTEMS	None.
MODIFICATIONS	Unknown.
HIGH POOL RECORDS	None.
POST CONSTRUCTION ENGINEERING STUDIES AND REPORTS	None.
PRIOR ACCIDENTS OR FAILURE OF DAM DESCRIPTION REPORTS	Unknown.
MAINTENANCE OPERATION RECORDS	None.

ITEM	REMARKS
<p style="text-align: center;">SPILLWAY PLAN SECTIONS DETAILS</p>	<p style="text-align: center;">Appendix E.</p>
<p style="text-align: center;">OPERATING EQUIPMENT PLANS & DETAILS</p>	<p style="text-align: center;">None.</p>

APPENDIX C
PHOTOGRAPHS



C-1



PHOTO INDEX
LAKE PINECREST DAM
SCALE: 1" = 200'

P - INDICATES PHOTO LOCATION

LAKE PINECREST DAM
PA 641

Sheet 1

Front

- (1) Upper left - Crest and upstream slope.
- (2) Upper right - Crest and downstream slope.
- (3) Lower left - Spillway (Note bridge which spans the spillway section).
- (4) Lower right - Spillway discharge channel.

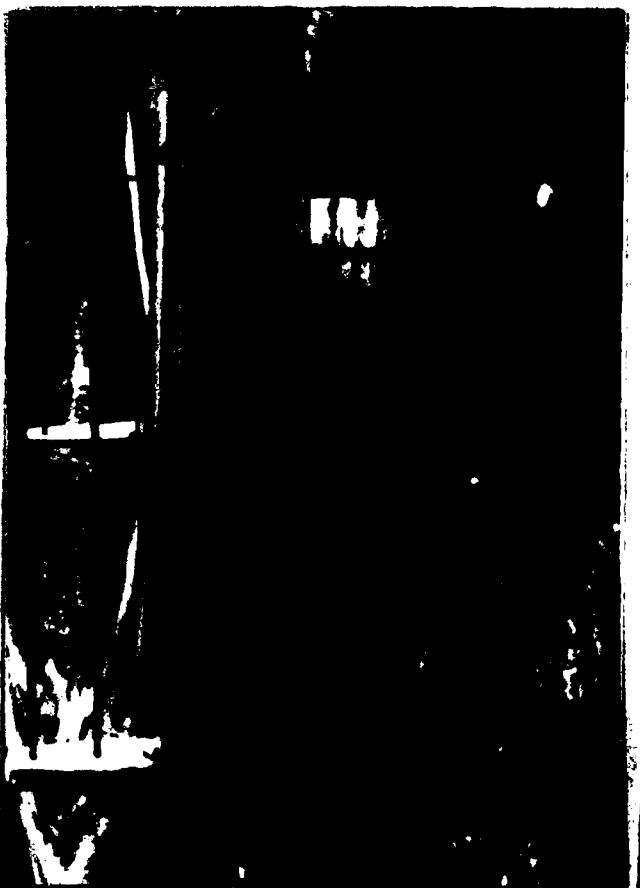
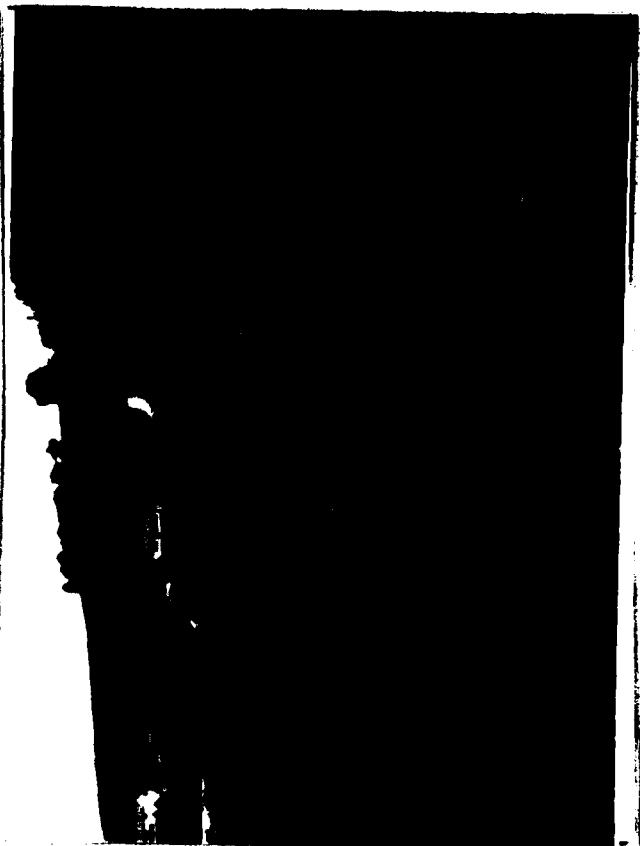
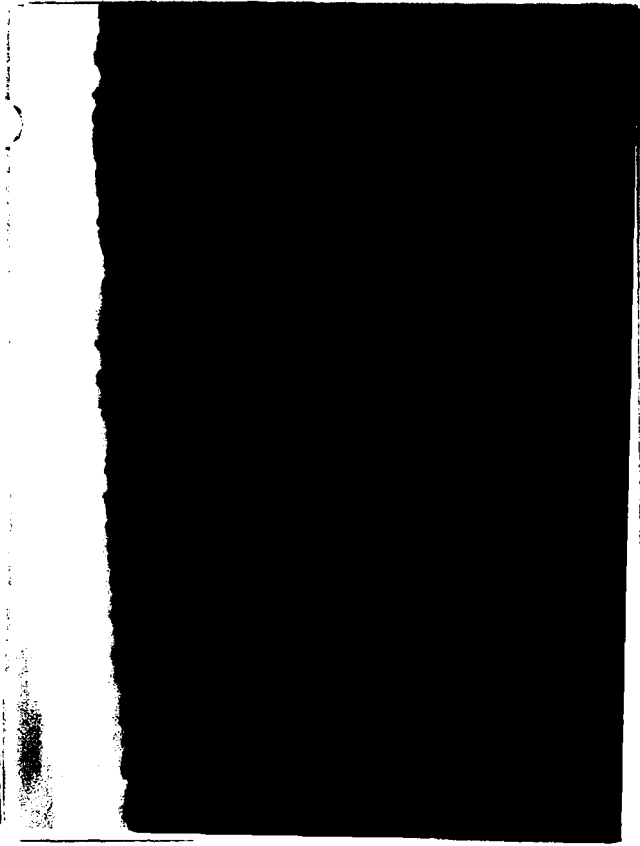
Sheet 1

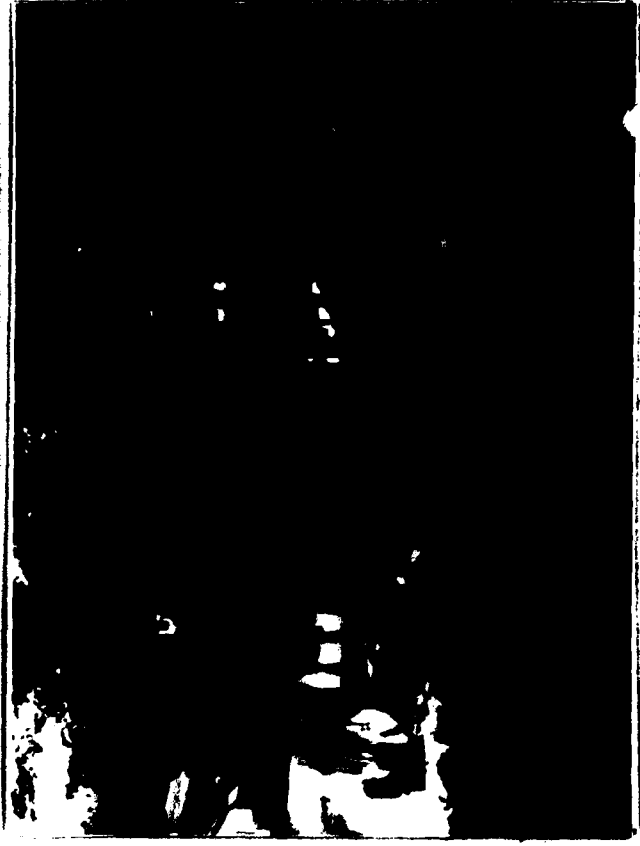
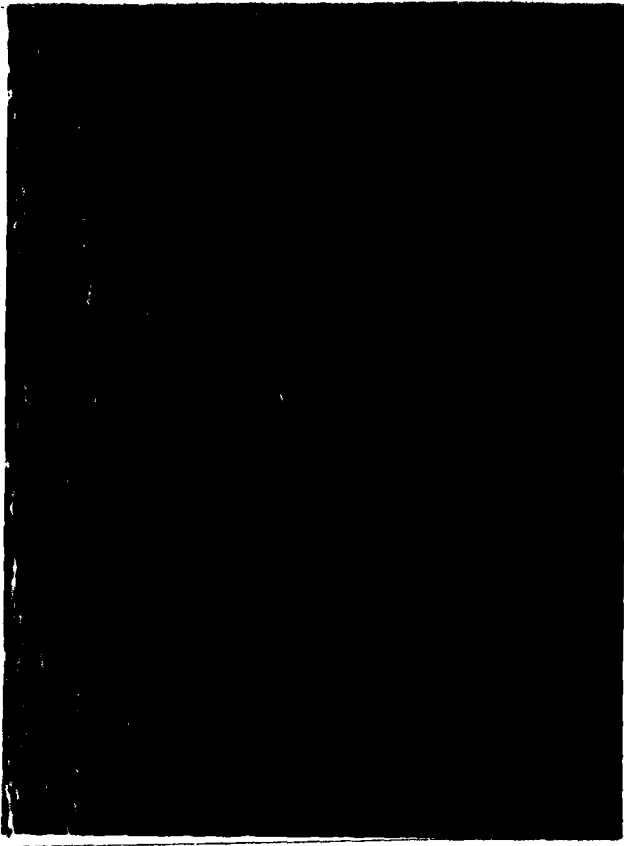
Back

- (5) Upper left - Two 8" siphons on upstream slope.
- (6) Upper right - Downstream exposure.

TOP OF PAGE

1	2
3	4





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APPENDIX D
HYDROLOGY AND HYDRAULICS

APPENDIX D
HYDROLOGY AND HYDRAULICS

Methodology. The dam overtopping and breach analyses were accomplished using the systemized computer program HEC-1 (Dam Safety Investigation), September, 1978, prepared by the Hydrologic Engineering Center, U.S. Army Corps of Engineers, Davis, California. A brief description of the methodology used in the analysis is presented below.

1. Precipitation. The Probable Maximum Precipitation (PMP) is derived and determined from regional charts prepared from past rainfall records including "Hydrometeorological Report No. 40" prepared by the U.S. Weather Bureau.

The index rainfall is reduced from 10% to 20% depending on watershed size by utilization of what is termed the HOP Brook adjustment factor. Distribution of the total rainfall is made by the computer program using distribution methods developed by the Corps.

2. Inflow Hydrograph. The hydrologic analysis used in development of the overtopping potential is based on applying a hypothetical storm to a unit hydrograph to obtain the inflow hydrograph for reservoir routing.

The unit hydrograph is developed using the Snyder method. This method requires calculation of several key parameters. The following list gives these parameters their definition and how they were obtained for these analysis.

Parameter	Definition	Where Obtained
Ct	Coefficient representing variations of watershed	From Corps of Engineers*
L	Length of main stream channel miles	From U.S.G.S. 7.5 minute topographic
Lca	Length on main stream to centroid of watershed	From U.S.G.S. 7.5 minute topographic
Cp	Peaking coefficient	From Corps of Engineers*
A	Watershed size	From U.S.G.S. 7.5 minute topographic

*Developed by the Corps of Engineers on a regional basis for Pennsylvania.

3. Routing. Reservoir routing is accomplished by using Modified Plus routing techniques where the flood hydrograph is routed through reservoir storage. Hydraulic capacities of the outlet works, spillways and the crest of the dam are used as outlet controls in the routing.

The hydraulic capacity of the outlet works can either be calculated and input or sufficient dimensions input and the program will calculate an elevation discharge relationship.

Storage in the pool area is defined by an area - elevation relationship from which the computer calculates storage. Surface areas are either planimetered from available mapping or U.S.G.S. 7.5 minute series topographic maps or taken from reasonably accurate design data.

4. Dam Overtopping. Using given percentages of the PMF the computer program will calculate the percentage of the PMF which can be controlled by the reservoir and spillway without the dam overtopping.

5. Dam Breach and Downstream Routing. The computer program is equipped to determine the increase in downstream flooding due to failure of the dam caused by overtopping. This is accomplished by routing both the pre-failure peak flow and the peak flow through the breach (calculated by the computer with given input assumptions) at a given point in time and determining the water depth in the downstream channel. Channel cross-sections taken from U.S.G.S. 7.5 minute topographic maps were used in the downstream flood wave routing. Pre and post failure water depths are calculated at locations where cross-sections are input.

HYDROLOGY AND HYDRAULICS ANALYSIS
DATA BASE

NAME OF DAM: Lake Pinecrest Dam

PROBABLE MAXIMUM PRECIPITATION (PMP) = 22.2 (0.99) = 21.98 inches

STATION	1	2	3
---------	---	---	---

Station Description	Lake Pinecrest
---------------------	----------------

Drainage Area (square miles)	0.60
---------------------------------	------

Cumulative Drainage Area (square miles)	0.60
--	------

Adjustment of PMF for Drainage Area (%) ⁽¹⁾	
6 hours	117
12 hours	127
24 hours	136
48 hours	142
72 hours	145

Snyder Hydrograph

Parameters	
Zone ⁽²⁾	13
C _p ⁽³⁾	0.50
C _t ⁽³⁾	1.85
L (miles) ⁽⁴⁾	1.17
L _{ca} (miles) ⁽⁴⁾	0.57
t _p = C _t (L _x L _{ca}) 0.3 hrs.	1.64

Spillway Data

Crest Length (ft)	17
Freeboard (ft)	3.90
Discharge Coefficient	3.1
Exponent	1.5

(1) Hydrometeorological Report 40 (Figure 1), U.S. Army Corps of Engineers, 1965.

(2) Hydrological zone defined by Corps of Engineers, Baltimore District, for determining Snyder's coefficients (C_p and C_t).

(3) Snyder's Coefficients.

(4) 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.

CHECK LIST
HYDROLOGIC AND HYDRAULIC
ENGINEERING DATA

DRAINAGE AREA CHARACTERISTICS: D.A.=0.60 mi² - moderate slopes

ELEVATION TOP NORMAL POOL (STORAGE CAPACITY): 466 ac-ft

ELEVATION TOP FLOOD CONTROL POOL (STORAGE CAPACITY): 748 ac-ft

ELEVATION MAXIMUM DESIGN POOL: Unknown

ELEVATION TOP DAM: 958.9

SPILLWAY CREST:

- a. Elevation 955
- b. Type Concrete chute
- c. Width 17 feet
- d. Length Channel approximately 100 feet
- e. Location Spillover Right abutment
- f. Number and Type of Gates None

OUTLET WORKS:

- a. Type Two 8" siphons
- b. Location 220 feet from right abutment
- c. Entrance inverts Unknown
- d. Exit inverts 942.6 and 940.9
- e. Emergency draindown facilities Two 8" siphons

HYDROMETEOROLOGICAL GAUGES:

- a. Type None
- b. Location None
- c. Records None

MAXIMUM NON-DAMAGING DISCHARGE: Unknown



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CONSULTING ENGINEERS & ARCHITECTS
EBENSBURG PENNSYLVANIA

DAM NAME LAKE PINECREST

I.D. NUMBER 641

SHEET NO. 1 OF 5

BY CAB DATE 7-7-60

LOSS RATE AND BASE FLOW PARAMETERS

AS RECOMMENDED BY THE CORPS OF ENGINEERS,
BALTIMORE DISTRICT.

STRTL = 1 INCH

CNSTL = .05 IN/HR

STRTRQ = 1.5 CFS/MI²

QRCSN = .05 (5% OF PEAK FLOW)

RTIOR = 2.0

ELEVATION-CAPACITY RELATIONSHIPS

FROM U.S.G.S. 7.5 MIN. QUAD. DER FILES, AND FIELD
INSPECTION DATA.

ELEV (FT)	AREA (SQ IN)	AREA (AC)	AVG. AREA (AC)	ΔH (FT)	Δ STORAGE (AC-FT)	STORAGE (AC-FT)
939	.04	.08				0
941	.98	1.84	.96	2	1.92	1.92
943	5.82	7.17	4.51	2	9.01	10.93
945	8.80	16.52	11.85	2	23.69	34.62
947	15.11	28.37	22.45	2	44.89	79.51
949	20.76	38.98	33.68	2	67.35	146.66
951	26.25	49.29	44.14	2	88.27	235.13



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DAM NAME LAKE PINECREST

I.D. NUMBER 641

SHEET NO. 2 OF 5

BY CAB DATE 7-7-80

953	30.65	57.55	53.42	2	106.84	341.97
955	35.37	66.42	61.98	2	123.97	465.94
957	38.83	72.91	69.67	2	139.33	605.27
959	42.54	79.88	76.39	2	152.79	758.06

ES	0	11	80	235	466	605
EE	939	943	947	951	955	957

74B	75B	825
95B.9	959	960

OVERTOP PARAMETERS

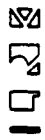
TOP OF DAM (LOW SPOT) = 958.9

LENGTH OF DAM (EXCLUDING SPILLWAY) = 933

COEFFICIENT OF DISCHARGE = 3.0

\$L	50	75	375	540	933	1008
\$V	958.9	959	959.5	959.75	960	960.5

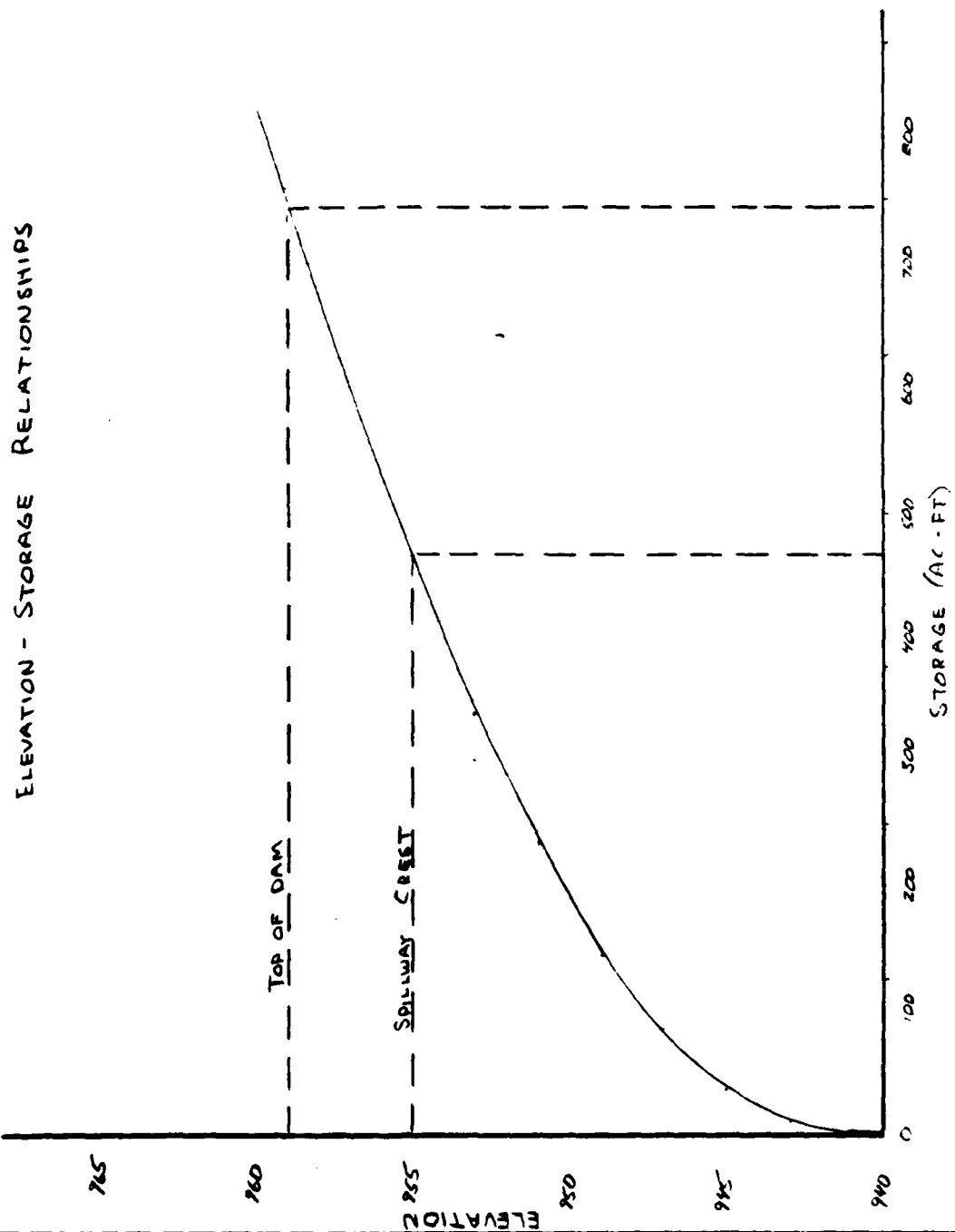
1027	1058
96	962



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DAM NAME PINECREST
I.D. NUMBER 641

SHEET NO. 3 OF 5
BY CAB DATE 7-7-50





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 EBENSBURG PENNSYLVANIA

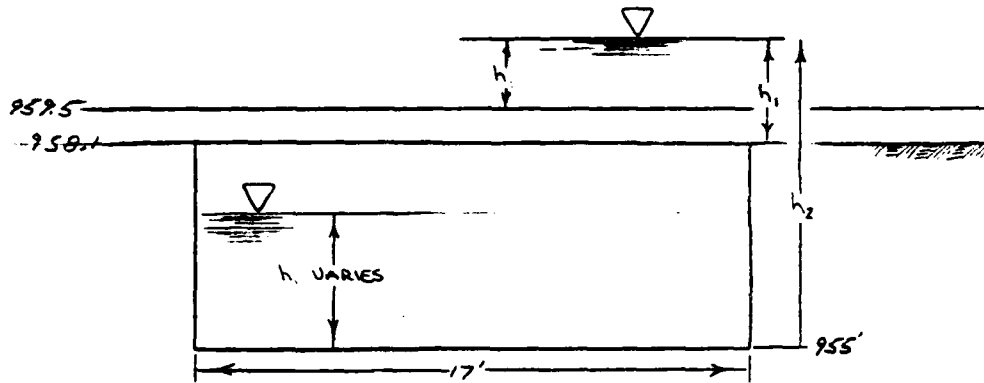
DAM NAME PINECREST

I.D. NUMBER 641

SHEET NO. 4 OF 5

BY CAB DATE 7-9-80

DISCHARGE RATING CURVE



ELEV. (FT)	WEIR		ORIFICE		Q _{TOTAL} (CFS)
	h ₁ (FT)	Q _w (CFS)	h ₁ (FT)	Q _o (CFS)	
955.0	0	0			0
956.0	1	50			50
957.0	2	150			150
958.0	3	275			275
958.1	3.1	285			285
958.5			.4	340	340
959.0			.9	390	390
959.5			1.4	430	430
960.0	.5	20	1.9	470	490
961.0	1.5	95	2.9	530	625
962.0	2.5	210	3.9	590	800

*VALUES ROUNDED TO NEAREST 5CFS

WEIR FLOW FROM:

$$Q = CLh^{1.5}$$

WHERE C = 3.1 L = 17'



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EBENSBURG PENNSYLVANIA

DAM NAME P. NECREST

I.D. NUMBER 641

SHEET NO. 5 OF 5

BY CAB DATE 7-8-80

ORIFICE FLOW FROM:

$$Q = \frac{2}{3} C \sqrt{2g} L (h_2^{3/2} - h_1^{3/2})$$

WHERE $C = .6$ $L = 17$ $g = 32.2$

SOURCE: WATER AND WASTEWATER ENGINEERING,
BY: FAIR, GEYER, OKUM 1966

HANDBOOK OF APPLIED HYDRAULICS,
BY: DAVIS, SORENSEN

Y4	955	956	957	958	958.1	958.5
Y5	0	50	150	275	285	340

959	959.5	960	961	962
390	430	490	625	800

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

A1 ANALYSIS OF DAM OVERTOPPING USING RATIOS OF THE PMF
 A2 HYDROLOGIC-HYDRAULIC ANALYSIS OF SAFETY OF LAKE PINECREST DAM
 A3 RATIOS OF THE PMF ROUTED THROUGH THE RESERVOIR (641)

4	0	288	0	18	0	0	0	0	0
5	0	0	0	0	0	0	0	0	0
6	0	0	0	0	0	0	0	0	0
7	0	0	0	0	0	0	0	0	0
8	0	0	0	0	0	0	0	0	0
9	0	0	0	0	0	0	0	0	0
10	0	0	0	0	0	0	0	0	0
11	0	0	0	0	0	0	0	0	0
12	0	0	0	0	0	0	0	0	0
13	0	0	0	0	0	0	0	0	0
14	0	0	0	0	0	0	0	0	0
15	0	0	0	0	0	0	0	0	0
16	0	0	0	0	0	0	0	0	0
17	0	0	0	0	0	0	0	0	0
18	0	0	0	0	0	0	0	0	0
19	0	0	0	0	0	0	0	0	0
20	0	0	0	0	0	0	0	0	0
21	0	0	0	0	0	0	0	0	0
22	0	0	0	0	0	0	0	0	0
23	0	0	0	0	0	0	0	0	0
24	0	0	0	0	0	0	0	0	0
25	0	0	0	0	0	0	0	0	0
26	0	0	0	0	0	0	0	0	0
27	0	0	0	0	0	0	0	0	0
28	0	0	0	0	0	0	0	0	0
29	0	0	0	0	0	0	0	0	0

P-10

 FLOOD HYDROGRAPH PACKAGE (HEC-1)
 DAM SAFETY VERSION JULY 1976
 LAST MODIFICATION 26 FEB 79

RUN DATE= 80/07/10.
 TIME= 08.21.13.

ANALYSIS OF DAM OVERTOPPING USING RATIOS OF THE PMF
 HYDROLOGIC-HYDRAULIC ANALYSIS OF SAFETY OF LAKE PINECREST DAM
 RATIOS OF THE PMF ROUTED THROUGH THE RESERVOIR (641)

NO NWR MMIN IDAY JMR IMIN METRC IPLT JPRT NSTAN
 288 0 15 0 0 0 0 0 0 0 0 0 0
 JOVER NWT LROPT TRACE
 5 0 0 0

MULTI-PLAN ANALYSES TO BE PERFORMED
 NPLAN= 1 NRATIO= 5 LRATIO= 1

RTIOS= .30 .40 .50 .60 1.00

 SUB-AREA RUNOFF COMPUTATION

INFLOW TO LAKE PINECREST

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

HYDROGRAPH DATA
 IHYDQ IUMG IAREA SNAP TRSDA TRSPC RATIO ISNOW ISAME LOCAL
 1 1 .60 0.00 .60 0.00 0.000 0 1 0

PRECIP DATA
 SPFE PMS R6 R12 R48 R72 R96
 0.00 21.98 117.00 127.00 136.00 142.00 145.00 0.00

TRSPC COMPUTED BY THE PROGRAM IS .800

LOSS DATA
 LROPT STHR DLTKH RTIOL ERAIN STNKS RTIOK SINTL CNSL ALSMX RTIMP
 0 0.00 0.00 1.00 1.00 0.00 1.00 1.00 1.00 0.05 0.00 0.00

[Empty rectangular box]

UNIT HYDROGRAPH DATA

TP= 1.04 CP= .50 NTA= 0

RECESSION DATA

APPROXIMATE CLARK COEFFICIENTS FROM GIVEN SHYDER CP AND TP ARE TC= 7.08 AND R= 9.00 INTERVALS

START= -1.50 ORCSM= -.05 RTIOR= 2.00

UNIT HYDROGRAPH 52 END-OF-PERIOD ORDINATES, LAG= 1.65 HOURS, CP= .50 VOL= 1.00

6. 23. 72. 46. 81. 72. 58. 52. 112. 119. 113. 101. 91. 30.

27. 24. 21. 19. 17. 15. 14. 12. 11. 10.

9. 8. 7. 6. 6. 5. 4. 4. 4. 3.

3. 3. 2. 2. 2. 2. 1. 1. 1. 1.

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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 (SQARE KILOMETERS)

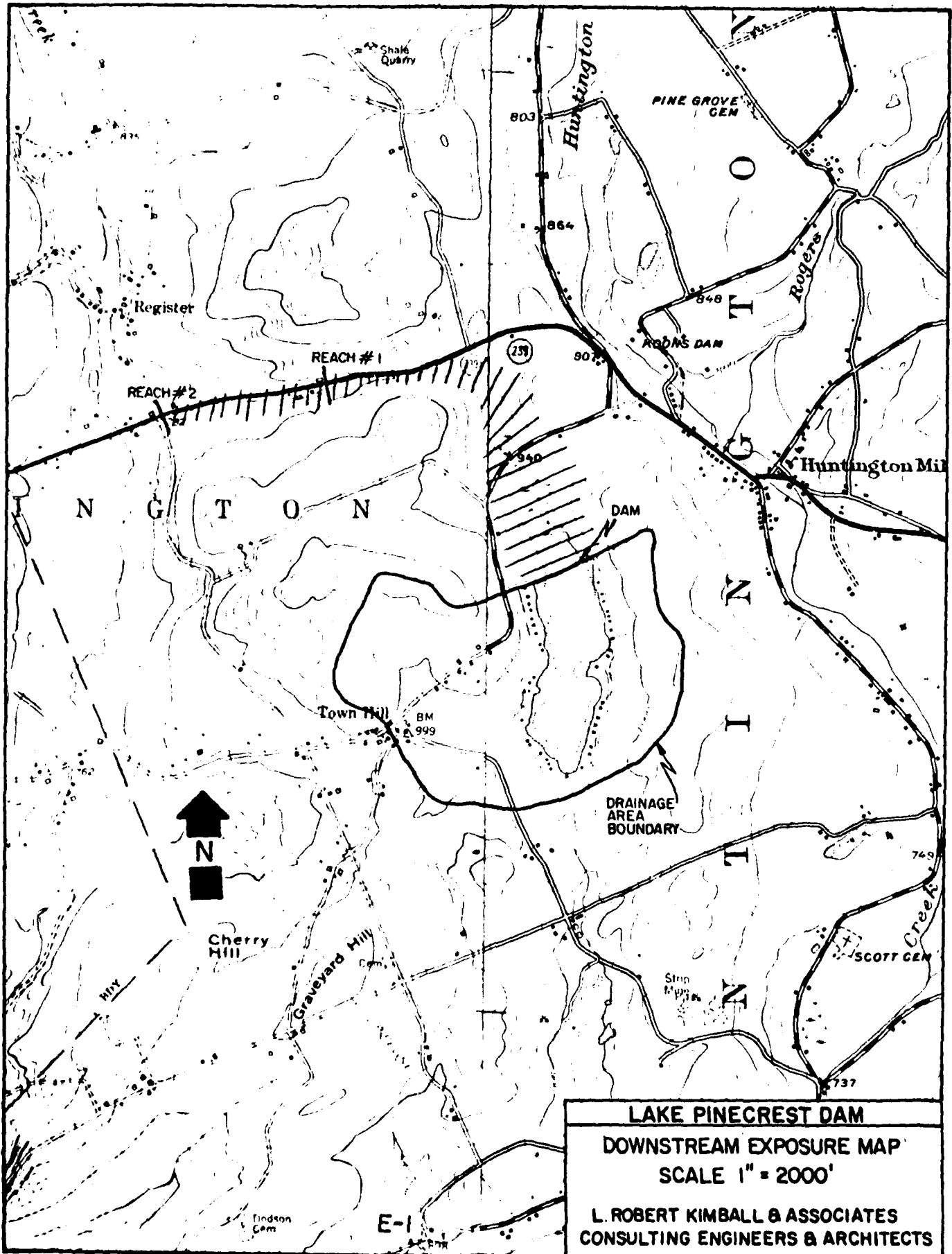
| OPERATION | STATION | AREA | PLAN RATIO | RATIOS APPLIED TO FLOWS | | | | |
|-----------|---------|------|------------|-------------------------|---------|---------|---------|---------|
| | | | | RATIO 1 | RATIO 2 | RATIO 3 | RATIO 4 | RATIO 5 |
| | 1 | 660 | 1 | 448. | 598. | 747. | 896. | 1494. |
| | | | | 170971 | 230271 | 281371 | 332471 | 393571 |
| | | | | 214. | 279. | 344. | 409. | 474. |
| | | | | 6.0711 | 7.8911 | 9.7111 | 11.5311 | 13.3511 |

SUMMARY OF DAM SAFETY ANALYSIS

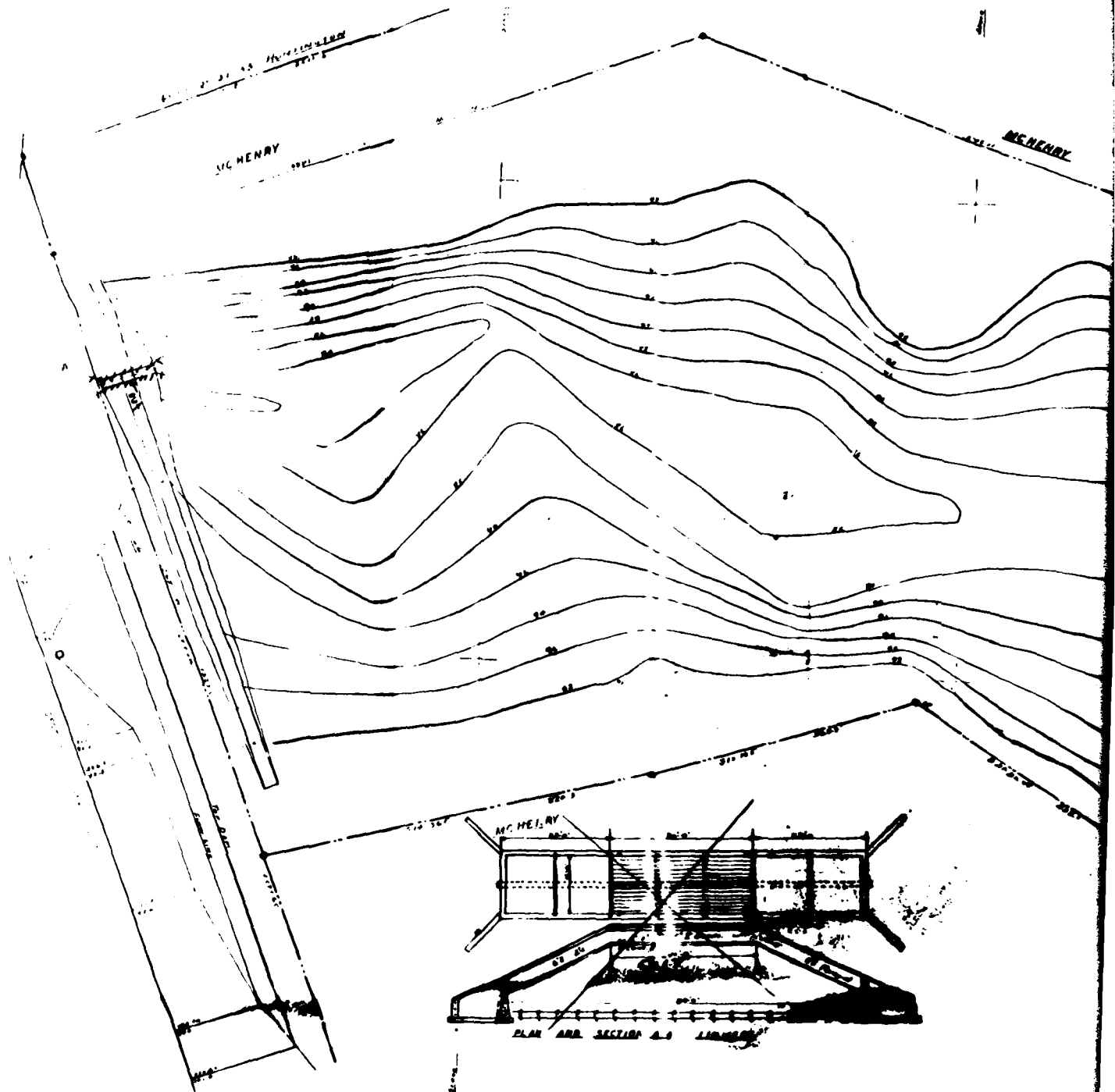
| PLAN | ELEVATION | INITIAL VALUE | SPILLWAY CREST | TOP OF DAM |
|------|-----------|---------------|----------------|------------|
| | 955.00 | 955.00 | 958.90 | 958.90 |
| | 466. | 466. | 748. | 748. |
| | 0. | 0. | 380. | 380. |

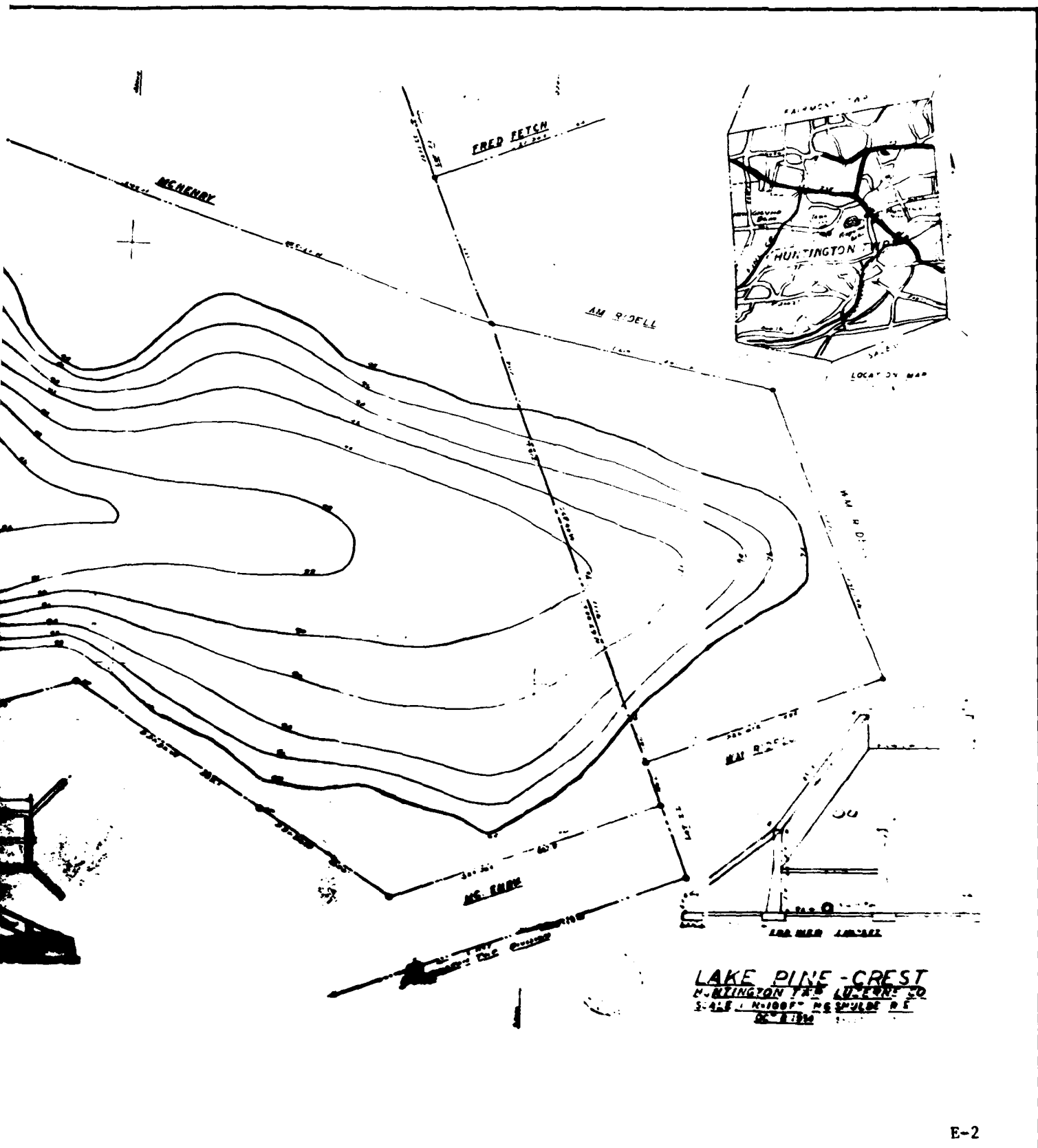
| RATIO OF PLAN | MAXIMUM RESERVOIR STORAGE | MAXIMUM DEPTH OVER DAM | MAXIMUM STORAGE AC-FT | MAXIMUM OUTFLOW CFS | DURATION OVER TOP HOURS | TIME OF MAX OUTFLOW HOURS | TIME OF FAILURE HOURS |
|---------------|---------------------------|------------------------|-----------------------|---------------------|-------------------------|---------------------------|-----------------------|
| .30 | 956.98 | 0.00 | 604. | 148. | 0.00 | 45.00 | 0.00 |
| .40 | 957.51 | 0.00 | 644. | 214. | 0.00 | 45.00 | 0.00 |
| .50 | 958.04 | 0.00 | 683. | 279. | 0.00 | 44.75 | 0.00 |
| .60 | 958.55 | 0.00 | 722. | 345. | 0.00 | 44.75 | 0.00 |
| 1.000 | 959.81 | .91 | 812. | 1088. | 6.25 | 43.00 | 0.00 |

**APPENDIX E
DRAWINGS**



LAKE PINECREST DAM
DOWNSTREAM EXPOSURE MAP
SCALE 1" = 2000'
L. ROBERT KIMBALL & ASSOCIATES
CONSULTING ENGINEERS & ARCHITECTS





LAKE PINE - CREST
 HUNTINGTON TWP LUCIEN CO
 SCALE 1" = 100' N.E. SPOULDE R.E.
 25-8-1914

E-2

L. ROBERT KIMBALL & ASSOCIATES
 CONSULTING ENGINEERS & ARCHITECTS

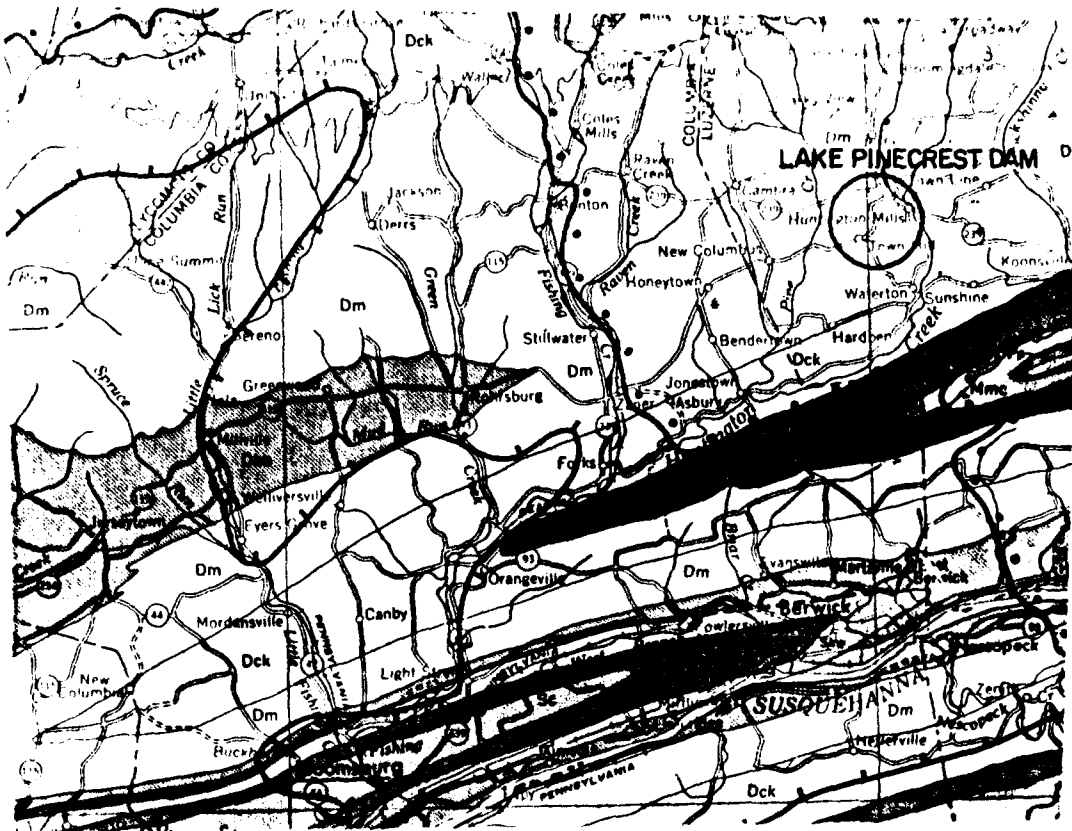
17

APPENDIX F
GEOLOGY

General geology

Lake Pinecrest and its dam lie within the Appalachian Mountain Section of the Valley and Ridge Physiographic Province. This region is characterized by overturned and assymmetric folds, local shearing and large, low-angle thrust faults. The only faulting in the vicinity of the dam is about eight miles to the southwest.

The rocks underlying the lake and dam are of the Devonian aged Susquehanna Group. This is a complex unit of conglomerate, sandstone and shale. The usually well developed bedding ranges in thickness from less than one to over fifteen feet. The well developed joints are regular and closely spaced in the shales and siltstones. They are vertical or steeply dipping and usually form a blocky or platy pattern. The shales disintegrate rapidly, but the siltstone, sandstone and conglomerate are fairly resistant to weathering. The rocks of the Susquehanna Group form a good foundation for heavy structures if excavated to sound material and the shales and siltstones are kept water free. The interstitial porosity of the coarser rocks is low, but joint development has created a medium level of total effective porosity.



GEOLOGIC MAP OF THE AREA AROUND LAKE PINECREST DAM



Oswayo Formation

Brownish and greenish gray, fine and medium grained sandstones with some shales and scattered calcareous lenses. Includes red shales which become more numerous eastward. Relation to type Oswayo not proved.



Catskill Formation

Chiefly red to brownish shales and sand stones, includes gray and greenish sandstone tongues named Elk Mountain, Honesdale Shale, and Delaware River in the east.



Marine beds

Gray to olive brown shales, graywackes, and sandstones contains Chemung beds and Potomac beds including Buckel, Hazell, Haskell, and Trimmers Rock. Tully Limestone at base.



Susquehanna Group

Barbed line is "Chemung-Catskill" contact of Second Pennsylvania Survey County reports, barbs on "Chemung" side of line.

SCALE 1:250,000