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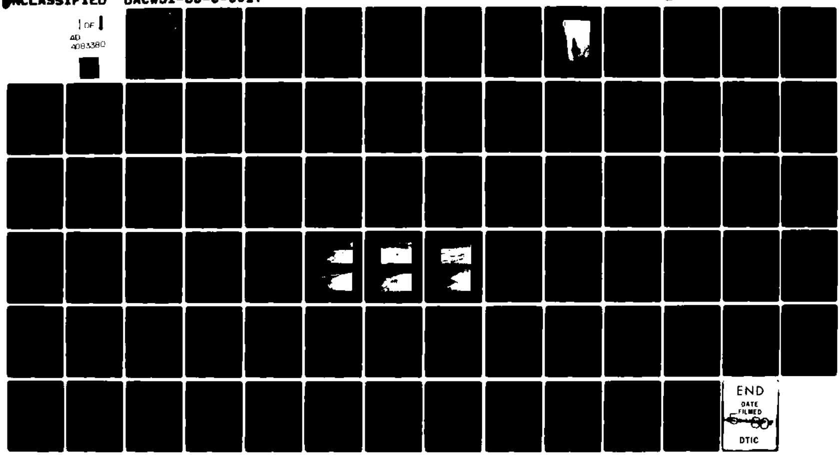

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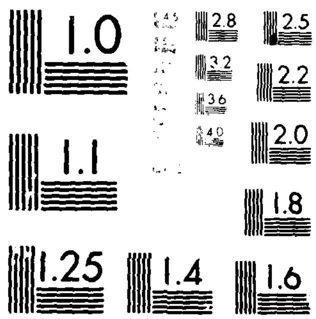

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DELAWARE RIVER BASIN
STOFFLE-DENMARK CREEK, PIKE COUNTY

PENNSYLVANIA

MAPLE LAKE DAM

NDI ID NO. PA-00766
DER ID NO. 52-170

PINE RIDGE COMMUNITY ASSOCIATION

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

Prepared by
GANNETT FLEMING CORDDRY AND CARPENTER, INC.
Consulting Engineers
Harrisburg, Pennsylvania 17105

For
DEPARTMENT OF THE ARMY
Baltimore District, Corps of Engineers
Baltimore, Maryland 21203

FEBRUARY 1980

DELAWARE RIVER BASIN

STOFFLE-DENMARK CREEK, PIKE COUNTY

PENNSYLVANIA

MAPLE LAKE DAM

(NDI ID ~~No.~~ Number PA-~~00~~766,
DER ID ~~No.~~ Number 52-170),

PINE RIDGE COMMUNITY ASSOCIATION.

PHASE I INSPECTION REPORT,

NATIONAL DAM INSPECTION PROGRAM

Prepared by

DACW31-80-C-0017

GANNETT FLEMING CORDDRY AND CARPENTER, INC.
Consulting Engineers
P.O. Box 1963
Harrisburg, Pennsylvania 17105

For

DEPARTMENT OF THE ARMY
Baltimore District, Corps of Engineers
Baltimore, Maryland 21203

FEBRUARY 1980

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.

DELAWARE RIVER BASIN

STOFFLE-DENMARK CREEK, PIKE COUNTY

PENNSYLVANIA

PRELIMINARY

MAPLE LAKE DAM

NDI ID No. PA-00766
DER ID No. 52-170

PINE RIDGE COMMUNITY ASSOCIATION

PHASE I INSPECTION REPORT

NATIONAL DAM INSPECTION PROGRAM

FEBRUARY 1980

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APPENDICES

On file

A

PHASE I INSPECTION REPORT

NATIONAL DAM INSPECTION PROGRAM

BRIEF ASSESSMENT OF GENERAL CONDITION

AND

RECOMMENDED ACTION

Name of Dam:	Maple Lake Dam NDI ID No. PA-00766 DER ID No. 52-170
Size:	Small (35 feet high; 128 acre-feet)
Hazard Classification:	High
Owner:	Pine Ridge Community Association Adam Skarzenski, Board Member R.D. 1 Box 224 Bushkill, Pa. 18324
State Located:	Pennsylvania
County Located:	Pike
Stream:	Stoffle-Denmark Creek
Date of Inspection:	24 October 1979

Based on visual inspection, available records, calculations, past operational performance, and according to criteria established for these studies, Maple Lake Dam is judged to be in good condition. Based on existing conditions, the main and auxiliary spillways will pass an approximate minimum of 48 percent of the Probable Maximum Flood (PMF) before overtopping of the dam occurs. The PMF is the Spillway Design Flood (SDF) for Maple Lake Dam. The SDF is based on the criteria and the downstream conditions. It is judged that the dam could withstand the depth and duration of overtopping that would occur for the 1/2 PMF. Since the dam cannot pass its SDF but would not fail by overtopping during the 1/2 PMF, the spillway capacity is rated as inadequate, but not seriously inadequate.

The auxiliary spillway was not constructed to its design dimensions and will not pass its design discharge.

No stability problems were evident for the embankment at the time of the visual inspection, but a potential hazard to stability exists due to erosion that might occur when there is flow in the auxiliary spillway.

The following studies and remedial measures are recommended to be undertaken by the Owner, in approximate order of priority, immediately:

(1) Perform a study to determine a means of completing the auxiliary spillway so that it will pass, as a minimum, its design discharge. As part of the study, the Owner should assess the need for protective measures and/or realignments that might be required to prevent erosion of the dam by auxiliary spillway discharges. Take appropriate action as required.

(2) Repair areas of surface erosion on the downstream slope of the embankment.

(3) Remove brush from the embankment.

All investigations, studies, designs, and supervision of construction should be performed by a professional engineer experienced in the design and construction of dams.

In addition, the Owner should institute the following operational and maintenance procedures:

(1) Develop a detailed emergency operation and warning system for Maple Lake Dam.

(2) During periods of unusually heavy rains, provide round-the-clock surveillance of Maple Lake Dam.

(3) When warnings of a storm of major proportions are given by the National Weather Service, the Owner should activate his emergency operation and warning system.

(4) Institute an inspection program such that the dam is inspected frequently. As presently required by the Commonwealth, the inspection program should include a formal annual inspection by a professional engineer experienced in the design and construction of dams. Utilize the inspection results to determine if remedial measures are necessary.

(5) Expand the existing maintenance program so that all features of the dam are properly maintained.

Submitted by:

GANNETT FLEMING CORDDRY
AND CARPENTER, INC.

FREDERICK FUTCHKO
Project Manager, Dam Section

Date: 21 March 1980

Approved by:

DEPARTMENT OF THE ARMY
BALTIMORE DISTRICT, CORPS OF ENGINEERS

JAMES W. PECK
Colonel, Corps of Engineers
District Engineer

Date: 10 APR 1980

MAPLE LAKE DAM

Overview

DELAWARE RIVER BASIN

STOFFLE-DENMARK CREEK, PIKE COUNTY

PENNSYLVANIA

MAPLE LAKE DAM

NDI ID No. PA-00766
DER ID No. 52-170

PINE RIDGE COMMUNITY ASSOCIATION

PHASE I INSPECTION REPORT

NATIONAL DAM INSPECTION PROGRAM

FEBRUARY 1980

SECTION 1

PROJECT INFORMATION

1.1 General.

a. Authority. The Dam Inspection Act, Public law 92-367, authorized the Secretary of the Army, through the Corps of Engineers, to initiate a program of 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. Maple Lake Dam is a homogeneous, earthfill embankment. It is 35 feet high at its maximum section and 685 feet long. A cutoff trench, 10 feet wide and about 6 feet deep, is located just upstream from the axis of the dam. A rock toe drain is located at the downstream toe of the dam. The embankment is on an earthen foundation.

The main spillway is located at the maximum section of the dam. It consists of a reinforced concrete riser structure near the upstream toe of the dam, a 24-inch diameter conduit, and a concrete outlet structure at the downstream toe of the dam. The riser structure has two weirs, each 4 feet long, located 5.4 feet below the top of the dam. The conduit through the embankment is a corrugated metal pipe encased in reinforced concrete.

The auxiliary spillway is an excavated, trapezoidal channel at the left abutment of the dam. The outlet channel parallels the toe of the dam along the abutment.

The outlet works is located at the main spillway riser. A 12-inch diameter cast-iron pipe, encased in reinforced concrete, extends from the upstream toe of the dam to the riser structure. A sluice gate for controlling flow through the 12-inch pipe is located on the inside face of the riser. A gate operating mechanism is located atop the riser structure.

The various features of the dam are shown on the Photographs in Appendix C and on the Plates in Appendix E. A description of the geology is included in Appendix F.

b. Location. Maple Lake Dam is located on Stoffle-Denmark Creek in Lehman Township, Pike County, Pennsylvania, approximately 3 miles north of Bushkill. Maple Lake Dam is shown on USGS Quadrangle, Lake Maskenozha, Pennsylvania - New Jersey, at latitude N 41° 08' 20" and longitude W 74° 59' 10". A location map is shown on Plate E-1.

c. Size Classification. Small (35 feet high, 128 acre-feet).

d. Hazard Classification. High hazard. Downstream conditions indicate that a high hazard classification is warranted for Maple Lake Dam (Paragraphs 3.1e and 5.1c (4)).

e. Ownership. Pine Ridge Community Association, Adam Skarzenski, Board Member, R.D. 1 Box 224, Bushkill, Pennsylvania 18324.

f. Purpose of Dam. Recreation.

g. Design and Construction History. Pine Ridge, Inc. constructed a dam at the site in 1968. The dam was an earthfill structure about 30 feet high. The dam failed on the night of August 13, 1969 and caused significant property damage. Investigations by the Commonwealth indicated that the cause of failure was piping (internal erosion) in the vicinity of the outlet conduit. The investigations cited generally poor construction as a contributing cause.

Edward C. Hess Associates, Consulting Engineers and Surveyors, of Stroudsburg prepared plans for a new dam at the same site in 1971. Soil and foundation investigations were performed by Northeastern Engineering Company, Inc. of Clarks Summit. Both Northeastern Engineering Company and D'Appolonia-Moody-Hess, Geo-Environmental Services, of Pittsburgh worked on the design of the embankment. Construction work began in 1971 and was completed in 1972 under the supervision of C. L. Dennis of Hess Associates. The original embankment was entirely removed and a new one was constructed.

h. Normal Operational Procedure. The pool is maintained at the main spillway crest level with excess inflow discharging through the conduit. The sluice gate at the outlet works is normally closed. Spillway discharge flows downstream to the confluence with the Delaware River.

1.3 Pertinent Data.

a. Drainage Area. (square miles) 0.34 (See Section 5)

b. Discharge at Damsite. (cfs)

Maximum known flood at damsite	Unknown.
Outlet works at maximum pool elevation	20
Spillway capacity at maximum pool elevation	
Main spillway	57
Auxiliary spillway	
Design conditions	375
Existing conditions	325
Combined capacity	
Design conditions	432
Existing conditions	382

c. Elevation. (feet above msl.)

Top of dam	
Design conditions	1004.0
Existing conditions	1004.4
Maximum pool	
Design conditions	1004.0
Existing conditions	1004.4
Normal pool (main spillway crest)	999.0
Upstream invert riser	972.5
Downstream invert outlet conduit	972.0
Streambed at toe of dam	969.7

d. Reservoir Length. (miles)

Normal pool	0.13
Maximum pool	0.23

e. Storage. (acre-feet)

Normal pool	68
Maximum pool	128

f. Reservoir Surface. (acres)

Normal pool	7
Maximum pool	16

g. Dam.

Type	Homogeneous earthfill.
Length (feet)	685
Height (feet)	35
Topwidth (feet)	17
Sides Slopes	
Upstream	1V on 2.5H
Downstream	1V on 2.5H
Zoning	None.
Cutoff	Cutoff trench.
Grout Curtain	None.

h. Diversion and Regulating Tunnel. — None.

i. Spillway (Main and Auxiliary).

Type	
Main	Drop inlet riser and conduit.
Auxiliary	Trapezoidal channel.
Length of Crest (feet)	
Main	Two weirs at 4.0 each.
Auxiliary	
Design	25
Existing	18
Crest Elevation	
Main	999.0
Auxiliary	
Design	1002.0
Existing	1001.3

i. Spillway (Main and Auxiliary) (cont'd.)

Upstream Channel	
Main	Reservoir.
Auxiliary	Reservoir.
Downstream Channel	
Main	Original stream channel.
Auxiliary	Excavated trapezoidal channel.

j. Regulating Outlets.

Type.	One 12-inch dia. cast-iron pipe.
Length (feet)	36
Closure	Sluice gate at main spillway riser.
Access	By boat.

SECTION 2

ENGINEERING DATA

2.1 Design.

a. Data Available. Design data available for review included the following: approved design drawings and specifications; a soils investigation report prepared by Northeastern Engineering Company, Inc.; a letter report prepared by D'Appolonia-Moody-Hess, Geo-Environmental Services, concerning the embankment design; and the permit application report prepared by the Commonwealth.

b. Design Features. The project is described in Paragraph 1.2a. The various features of the dam are shown on the Photographs in Appendix C and Plates E-2 and E-3 in Appendix E. The embankment is shown on Photographs A and B. The main spillway is shown on Photographs C and D. The auxiliary spillway is shown on Photographs E and F.

c. Design Considerations. Hydraulic and structural design considerations are covered in Sections 5 and 6, respectively.

2.2 Construction.

a. Data Available. The only construction data available was a dam completion report submitted to the Commonwealth by the engineer who supervised construction. The engineer certified that the dam was constructed in accordance with the approved plans and specifications. Telephone conversations with the engineer indicate that no unusual problems were encountered during construction.

b. Construction Considerations. The available data indicate that the construction of the dam was satisfactory.

2.3 Operation. There are no formal records of operation. Conversations with the Owner indicate that all features have performed satisfactorily since the dam was completed in 1972.

2.4 Evaluation.

a. Availability. Engineering data were provided by the Bureau of Dams and Waterway Management, Department of Environmental Resources, Commonwealth of Pennsylvania (PennDER), and by the Design Engineer, E. C. Hess Associates. The Owner made available his Caretaker and a Board Member for information during the visual inspection. He also researched his files for information at the request of the inspection team.

b. Adequacy. The type and amount of available design data and other engineering data are sufficient, and the assessment is based on the combination of available data, visual inspection, performance history, hydrologic assumptions, and hydraulic assumptions.

c. Validity. There is no reason to question the validity of the available data.

SECTION 3

VISUAL INSPECTION

3.1 Findings.

a. General. The overall appearance of the dam is good. Deficiencies were observed as noted below. A sketch of the dam with the locations of deficiencies is presented on Exhibit B-1 in Appendix B. Survey information acquired for this Report is summarized in Appendix B. On the day of the inspection, the pool was 0.1 foot above the main spillway crest.

b. Embankment. Most of the upstream slope was submerged on the day of the inspection. The exposed portion of the slope is protected by riprap and vegetation (Photograph A). No areas of erosion were observed.

The downstream slope is covered with grass except near the toe of the slope, where the rock toe drain was constructed. Some surface erosion of the toe drain material has occurred (Photograph B). No seepage or wet areas were observed. A minor amount of brush is growing at the left end of the embankment at its junction with the auxiliary spillway.

The survey performed for this inspection shows that the entire top of the dam is slightly above its design elevation. The measured topwidth and side slopes of the embankment conform to the design values.

c. Appurtenant Structures. No deficiencies were apparent for the main spillway. Both the riser structure and the outlet structure are in good condition (Photographs C and D). The 24-inch diameter main spillway conduit could not be inspected due to the flow of water through it. The outlet works conduit, a 12-inch diameter cast-iron pipe located upstream from the main spillway riser structure, was submerged and could not be inspected. The Owner stated that the sluice gate for the 12-inch conduit was operated recently and was in good working condition.

The auxiliary spillway is a trapezoidal channel at the left abutment (Photograph E). The outlet channel parallels the toe of the dam along the abutment at a distance of 6 to 10 feet from it (Photograph F). The side slopes of the auxiliary spillway and its outlet channel are protected by vegetation. It appeared that most portions of the bottom of the auxiliary spillway outlet channel are exposed bedrock. The survey performed for this inspection indicates that the auxiliary spillway was not constructed to its design template. The actual bottom width is 18 feet instead of 25 feet, which is the design width listed in the permit application report. However, the crest is lower than its design elevation. The existing auxiliary spillway section is shown on the survey data in Appendix B.

d. Reservoir Area. The slopes surrounding the reservoir are relatively mild. The watershed has some minor residential development within it, but the watershed is almost entirely wooded.

e. Downstream Channel. The confluence of Stoffle-Denmark Creek with the Delaware River is about 2.5 miles downstream from the dam. Between the dam and the confluence, there are at least two dwellings, one commercial structure, and one cottage that could be flooded if a failure of Maple Lake Dam were to occur. The downstream area is shown on Exhibit D-1 in Appendix D.

SECTION 4

OPERATIONAL PROCEDURES

4.1 Procedure. The reservoir is maintained at the main spillway crest level with excess inflow discharging through the main spillway conduit and into the downstream channel. The outlet works is used to drawdown the pool level for shoreline maintenance.

4.2 Maintenance of Dam. Grass on the embankment is cut annually. Informal inspections of the dam are made by the Owner about every two weeks.

4.3 Maintenance of Operating Facilities. The sluice gate on the outlet works is occasionally opened by the Owner to check its operational adequacy. The Owner stated that it was last opened during the summer prior to the inspection.

4.4 Warning Systems in Effect. There is no emergency operation and warning system. The Owner stated that the condition of the dam is checked during periods of heavy rain.

4.5 Evaluation of Operational Adequacy. The maintenance program is generally satisfactory, but a few deficiencies exist and require attention. Formal inspections are necessary to detect hazardous conditions at the dam. An emergency operation and warning system is necessary to reduce the risk of dam failure should adverse conditions develop and to prevent loss of life should the dam fail.

SECTION 5

HYDROLOGY AND HYDRAULICS

5.1 Evaluation of Features.

a. Design Data. The available data indicate that the design crest elevations of the main spillway and the auxiliary spillway were established to provide sufficient storage capacity to contain the runoff from a 100-year rainfall. The auxiliary spillway was designed to discharge 375 cfs, which was the Commonwealth's requirement for a 0.25 square mile drainage area. Data obtained for this Report indicate that there are a number of differences between the design elevations and dimensions and the existing conditions. The differences are shown on the survey data at the end of Appendix B. The spillway capacity used in this Report, 382 cfs, is the combined capacity of the main and auxiliary spillways for the existing conditions.

A drainage area of 0.25 square mile was used in the design of the dam. For this Report, the drainage area was checked using the 7.5-minute USGS Quadrangle. It was found that the available mapping is not sufficiently detailed to provide accurate resolution of the drainage area. The drainage area is not well-defined because a swamp exists at the headwaters. Because of the large contour interval of 20 feet of the USGS mapping, it is uncertain whether runoff into the swampy area would drain into the Maple Lake watershed or into the adjacent watershed. The value used for design, 0.25 square mile, is an acceptable estimate. However, other acceptable estimates determined from the same mapping are as great as 0.34 square mile. The procedures used in the analysis to evaluate the spillway adequacy are described in Appendix D.

b. Experience Data. No records of maximum pool levels are available. The Owner stated that there has been no flow over the auxiliary spillway since the dam was completed in 1972.

The existing dam is on the same site as a previous dam. The original dam was earthfill and about 30 feet high. It was constructed in 1968 and failed by piping in 1969. The breach that developed during failure was about 20 feet wide. The time required to develop the breach is unknown. A newspaper account indicates that the failure caused substantial property damage and caused evacuation of two dwellings. Neither dwelling was flooded, but water levels were within 0.5 foot of the first floor level of one dwelling.

c. Visual Observations.

(1) General. The visual inspection of Maple Lake Dam, which is described in Section 3, resulted in a number of observations relevant to hydrology and hydraulics. These observations are evaluated herein for the various features.

(2) Embankment. The survey performed during this inspection indicates that the entire top of the embankment is above its design elevation. The existing top of dam elevations were used for the hydraulic analyses.

(3) Appurtenant Structures. The actual dimensions and grades of the auxiliary spillway differ from the design values. The actual values were used for the hydraulic analyses.

(4) Downstream Conditions. No conditions were observed downstream from the dam that would reduce the hydraulic capacity of the spillway. Experience data, described in Paragraph 5.1b., and visual observations indicate that failure of Maple Lake Dam could cause flooding of at least two dwellings located along Stoffle-Denmark Creek. The downstream conditions indicate that a high hazard classification is warranted for Maple Lake Dam.

d. Overtopping Potential.

(1) Spillway Design Flood. According to the criteria established by the Office of the Chief of Engineers (OCE), the Spillway Design Flood (SDF) for the size (Small) and hazard potential (High) of Maple Lake Dam is between one-half of the Probable Maximum Flood (PMF) and the PMF. Because of the downstream conditions and the height of the dam, the PMF is selected as the SDF for Maple Lake Dam. The

watershed was modeled with the HEC-1DB computer program. A description of the model is included in Appendix D. As discussed in Paragraph 5.1a., the available mapping is not adequate to accurately define the drainage area. The two possible extremes for the size of the drainage area are 0.25 square mile and 0.34 square mile. An analysis was performed for each of the extreme values. The assessment of the dam is based on existing conditions, and the effects of future development are not considered.

(2) Summary of Results. Pertinent results are tabulated at the end of Appendix D. The analyses reveal that for a 0.25 square mile drainage area, which is the design value, Maple Lake Dam can pass about 62 percent of the PMF before overtopping of the dam occurs. For a 0.34 square mile drainage area, Maple Lake Dam can pass about 48 percent of the PMF before overtopping of the dam occurs. In each case, the dam is rated using the existing lines and grades of its features.

(3) Spillway Adequacy. The criteria used to rate the spillway adequacy of a dam are described in Appendix D. The analyses indicate that the spillway can pass an approximate minimum of 48 percent of the PMF without overtopping of the dam. The analyses also indicate that an occurrence of the 1/2 PMF would cause a maximum depth of overtopping of 0.12 foot for a duration of 1.25 hours. It is judged that this depth and duration of overtopping would not cause failure of the dam. Since an occurrence of the 1/2 PMF would not cause failure of the dam, the spillway capacity is rated as inadequate, but not seriously inadequate.

SECTION 6

STRUCTURAL STABILITY

6.1 Evaluation of Structural Stability.

a. Visual Observations.

(1) General. The visual inspection of Maple Lake Dam, which is described in Section 3, resulted in a number of observations relevant to structural stability. These observations are evaluated herein for the various features.

(2) Embankment. The surface erosion near the toe of the dam was not a serious problem at the time of the inspection, but continued erosion is likely. Similarly, the growth of brush at the left end of the embankment is only a minor problem at present, but the root systems can eventually cause damage to the embankment.

During the visual inspection it was observed that the outlet channel of the auxiliary spillway is steep and that neither the end of the embankment adjacent to the auxiliary spillway nor the side slopes of the outlet channel are protected against erosion. A substantial portion of the bottom of the outlet channel is bedrock and would not be susceptible to erosion, but the end of the embankment and the channel side slopes consist of erodible soil materials. High velocities in the auxiliary spillway might cause lateral erosion. Erosion could occur either at the end of the dam or along its downstream toe. Erosion at either location would be a significant hazard to the dam.

b. Design and Construction Data. Stability analyses were performed during the design of the embankment. Soil investigations, soil testing, and preliminary design of alternate embankment sections were performed by Northeastern Engineering Company, Inc. of Clarks Summit, Pennsylvania. Their findings, which included recommended embankment sections and factors of safety for stability, were presented in a report to E. C. Hess Associates. The findings were later reviewed by D'Appolonia-Moody-Hess, Geo-Environmental Services, of Pittsburgh, Pennsylvania. D'Appolonia Moody-Hess prepared a letter report to E. C. Hess Associates and recommended a revised embankment section. The revised section was adopted and is shown on Plate E-2 in Appendix E. The stability analyses performed for the adopted section indicate factors of safety of 1.65 for a steady seepage condition and 1.3 for a rapid drawdown condition. During construction, the embankment that had previously been constructed and that had failed was completely removed. The soil materials were stockpiled and re-used for the new construction. Surveys performed for this inspection indicate that the embankment slopes were constructed in accordance with the design drawings. The design and construction data indicate that Maple Lake Dam has adequate factors of safety for stability.

c. Operating Records. There are no formal records of operation. The embankment dam that failed in 1969 was completely removed prior to construction of the existing dam, and, as such, its failure is not relevant to the existing dam. According to available data, no stability problems have occurred over the operational history of the dam.

d. Post-construction Changes. There have been no post-construction changes to the dam.

e. Seismic Stability. Maple Lake Dam is located in Seismic Zone 1. Normally it can be considered that if a dam in this zone has adequate factors of safety under static loading conditions, it can be assumed safe for any expected earthquake loading. Since the available stability analyses for the embankment indicate that the dam has adequate factors of safety for static loading conditions, it is assumed that the seismic stability is also adequate.

SECTION 7

ASSESSMENT, RECOMMENDATIONS, AND PROPOSED REMEDIAL MEASURES

7.1 Dam Assessment.

a. Safety.

(1) Based on available records, visual inspection, calculations, and past operational performance, Maple Lake Dam is judged to be in good condition. Based on existing conditions, the main and auxiliary spillways will pass an approximate minimum of 48 percent of the PMF before overtopping of the dam occurs. The PMF is the SDF for Maple Lake Dam. The SDF is based on the criteria and the downstream conditions. It is judged that the dam could withstand the depth and duration of overtopping that would occur for the 1/2 PMF. Since the dam cannot pass its SDF but would not fail by overtopping during the 1/2 PMF, the spillway capacity is rated as inadequate, but not seriously inadequate.

(2) The auxiliary spillway was not constructed to its design dimensions and will not pass its design discharge.

(3) No stability problems were evident for the embankment at the time of the visual inspection, but a potential hazard to stability exists due to erosion that might occur when there is flow in the auxiliary spillway.

(4) A summary of the features and observed deficiencies is listed below:

Feature and Location	Observed Deficiency
Embankment:	Surface erosion at downstream toe; brush.
Auxiliary Spillway:	Not constructed to design dimensions.

b. Adequacy of Information. The information available is such that a preliminary assessment of the condition of the dam can be inferred from the combination of visual inspection, past performance, and computations performed prior to and as part of this study.

c. Urgency. The recommendations in Paragraph 7.2 should be implemented immediately.

d. Necessity for Further Investigations. In order to accomplish some of the remedial measures outlined in Paragraph 7.2, further investigations by the Owner will be required.

7.2 Recommendations and Remedial Measures.

a. The following studies and remedial measures are recommended to be undertaken by the Owner, in approximate order of priority, immediately:

(1) Perform a study to determine a means of completing the auxiliary spillway so that it will pass, as a minimum, its design discharge. As part of the study, the Owner should assess the need for protective measures and/or realignments that might be required to prevent erosion of the dam by auxiliary spillway discharges. Take appropriate action as required.

(2) Repair areas of surface erosion on the downstream slope of the embankment.

(3) Remove brush from the embankment.

All investigations, studies, designs, and supervision of construction should be performed by a professional engineer experienced in the design and construction of dams.

b. In addition, the Owner should institute the following operational and maintenance procedures:

(1) Develop a detailed emergency operation and warning system for Maple Lake Dam.

(2) During periods of unusually heavy rains, provide round-the-clock surveillance of Maple Lake Dam.

(3) When warnings of a storm of major proportions are given by the National Weather Service, the Owner should activate his emergency operation and warning system.

(4) Institute an inspection program such that the dam is inspected frequently. As presently required by the Commonwealth, the inspection program should include a formal annual inspection by a professional engineer experienced in the design and construction of dams. Utilize the inspection results to determine if remedial measures are necessary.

(5) Expand the existing maintenance program so that all features of the dam are properly maintained.

APPENDIX A

CHECKLIST - ENGINEERING DATA

CHECKLIST

ENGINEERING DATA

DESIGN, CONSTRUCTION, AND OPERATION
PHASE I

NAME OF DAM: Maple Lake Dam

NDI ID NO.: PA-00766 DER ID NO.: 52-170

ITEM	REMARKS
AS-BUILT DRAWINGS	Design drawings only. See Plates E-2 and E-3 in Appendix E.
REGIONAL VICINITY MAP	See Plate E-1 in Appendix E.
CONSTRUCTION HISTORY	Original dam at site failed Aug. 13, 1969. Dam entirely removed and new dam constructed 1971. No modifications since completion of construction.
TYPICAL SECTIONS OF DAM	See Plate E-2 in Appendix E.
OUTLETS: Plan Details Constraints Discharge Ratings	No discharge ratings. Details shown on Plate E-3 in Appendix E.

ENGINEERING DATA

ITEM	REMARKS
RAINFALL/RESERVOIR RECORDS	None.
DESIGN REPORTS	"Soils Investigation Report" by Northeastern Engineering Co. Inc; Letter report by D'Appolonia - Moody - Hess Geo-environmental Services; Permit application report by Commonwealth.
GEOLOGY REPORTS	Included in "Soils Investigation Report" by Northeastern Engineering Co., Inc.
DESIGN COMPUTATIONS: Hydrology and Hydraulics Dam Stability Seepage Studies	No H & H comps. Permit application report indicates riser set to store 100-year flood and emergency spillway capacity is 375 cfs (Curve C). Stability and seepage computations available.
MATERIALS INVESTIGATIONS: Boring Records Laboratory Field	See "Soils Investigation Report"
POSTCONSTRUCTION SURVEYS OF DAM	None.

ENGINEERING DATA

ITEM	REMARKS
BORROW SOURCES	Utilized material from original dam.
MONITORING SYSTEMS	None.
MODIFICATIONS	None.
HIGH POOL RECORDS	None.
POSTCONSTRUCTION ENGINEERING STUDIES AND REPORTS	None.
PRIOR ACCIDENTS OR FAILURE OF DAM: Description Reports	See construction history.

ENGINEERING DATA

ITEM	REMARKS
MAINTENANCE AND OPERATION RECORDS	None.
SPILLWAY: Plan Sections Details	See survey data at end of Appendix B.
OPERATING EQUIPMENT: Plans Details	See Plate E-3 in Appendix E.
PREVIOUS INSPECTIONS Dates Deficiencies	None.

APPENDIX B

CHECKLIST - VISUAL INSPECTION

CHECKLIST

VISUAL INSPECTION

PHASE I

Name of Dam: Maple Lake Dam County: Pike State: Pennsylvania

NDI ID No.: PA-00776 DER ID No.: 52-170

Type of Dam: Homogeneous earthfill Hazard Category: High

Date(s) Inspection: 24 October 1979 Weather: Clear Temperature: 55°F

Pool Elevation at Time of Inspection: 999.1 msl/Tailwater at Time of Inspection: 969.8 msl

Inspection Personnel:

A.H. Whitman (GFCC) C. Litts (Caretaker for Pine Ridge Community Assoc)

D.R. Ebersole (GFCC) A. Skarzenski (Member - Board of Directors)

J. Boswell (PennDER)

D.B. Wilson (GFCC) Recorder

EMBANKMENT

Sheet 1 of 2

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SURFACE CRACKS	None.	
UNUSUAL MOVEMENT OR CRACKING AT OR BEYOND THE TOE	None.	
SLOUGHING OR EROSION: Embankment Slopes Abutment Slopes	Slight surface erosion of toe drain material left of outlet works.	Areas should be filled and seeded.
CREST ALIGNMENT: Vertical Horizontal	See survey data at end of Appendix B.	
RIPRAP FAILURES	No erosion on upstream slope. Protection is vegetation and riprap.	

EMBANKMENT

Sheet 2 of 2

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
JUNCTION OF EMBANKMENT WITH: Abutment Spillway Other Features	Slight amount of brush at junction of embankment and emergency spillway.	
ANY NOTICEABLE SEEPAGE	None.	
STAFF GAGE AND RECORDER	None.	
DRAINS	Toe drain - no discharge observed.	

UNGATED SPILLWAY (EMERGENCY SPILLWAY)

Sheet 1 of 1

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONCRETE WEIR	No weir - trapezoidal section excavated into earth at left abutment.	No riprap ; possible erosion hazard.
APPROACH CHANNEL	No obstructions.	
DISCHARGE CHANNEL	Trapezoidal channel excavated into earth - follows toe of dam at 6'-10' from toe.	No riprap ; possible erosion hazard. Very slight amount of exposed bedrock.
BRIDGE AND PIERS	None.	

OUTLET WORKS (MAIN SPILLWAY)

Sheet 1 of 1

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
[redacted] OUTLET CONDUIT	24-inch Dia. CMP encased in concrete. Slight flow during inspection.	
INTAKE STRUCTURE (SERVICE SPILLWAY)	Concrete riser with trashracks. Good condition	Access by boat
OUTLET STRUCTURE	No deficiencies.	
OUTLET CHANNEL	No deficiencies.	
EMERGENCY GATE	Located at riser.	Did not open during inspection. Owner stated it was operated during summer and in good condition.

INSTRUMENTATION

Sheet 1 of 1

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

RESERVOIR AND WATERSHED

Sheet 1 of 1

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SLOPES	No evidence of stability problems.	
SEDIMENTATION	None reported.	
WATERSHED DESCRIPTION	Entirely wooded; minor residential development.	

DOWNSTREAM CHANNEL

Sheet 1 of 1

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONDITION: Obstructions Debris Other	None.	
SLOPES	Relatively mild.	
APPROXIMATE NUMBER OF HOMES AND POPULATION	2 Dwellings, 1 Commercial Structure, and 1 Cottage would be affected by failure of dam.	Failure of previous dam at site indicates high hazard classification is warranted.

GANNETT FLEMING CORDDRY
AND CARPENTER, INC.
HARRISBURG, PA.

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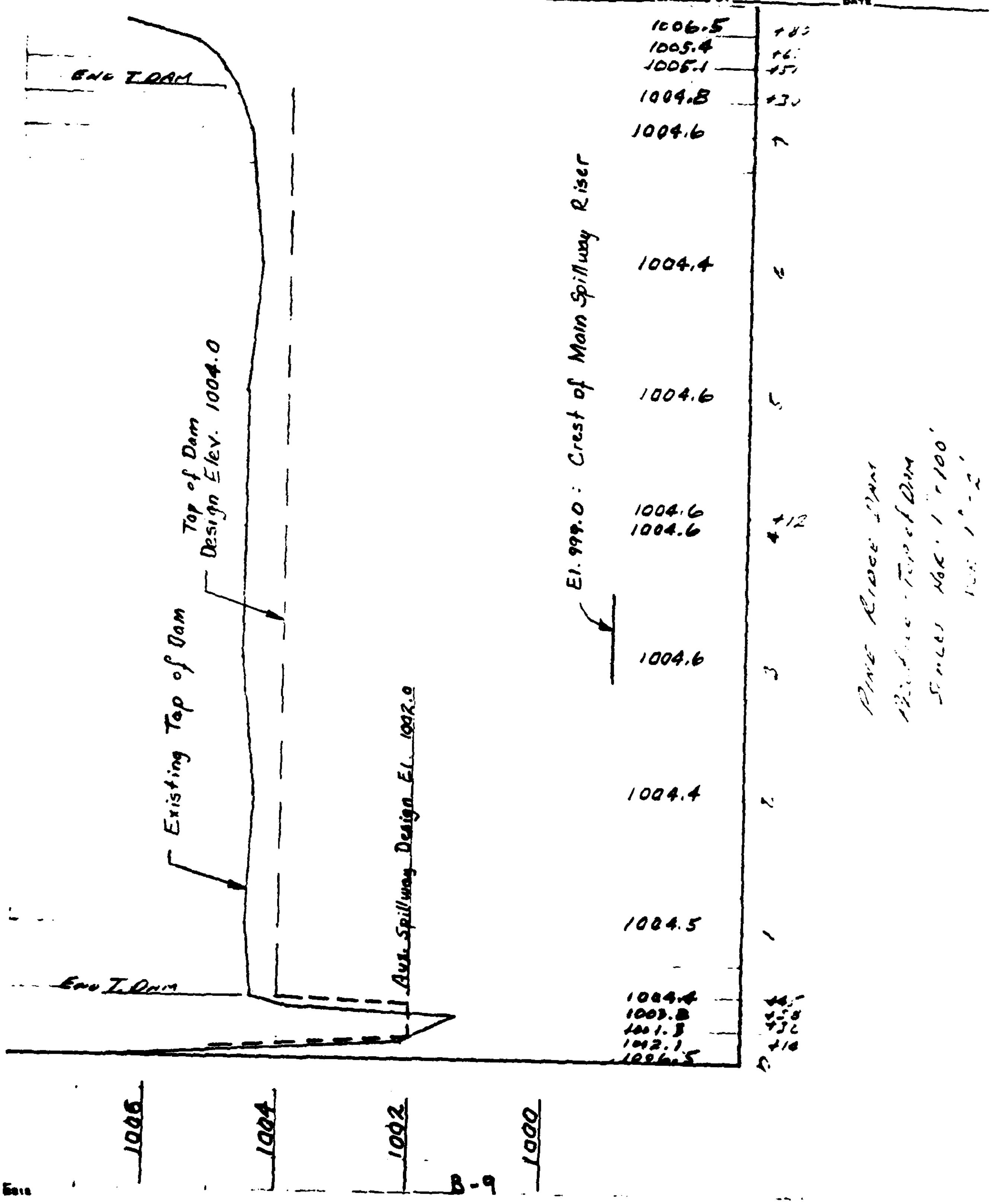
FOR ______
COMPUTED BY ______ DATE ______ CHECKED BY ______ DATE ______



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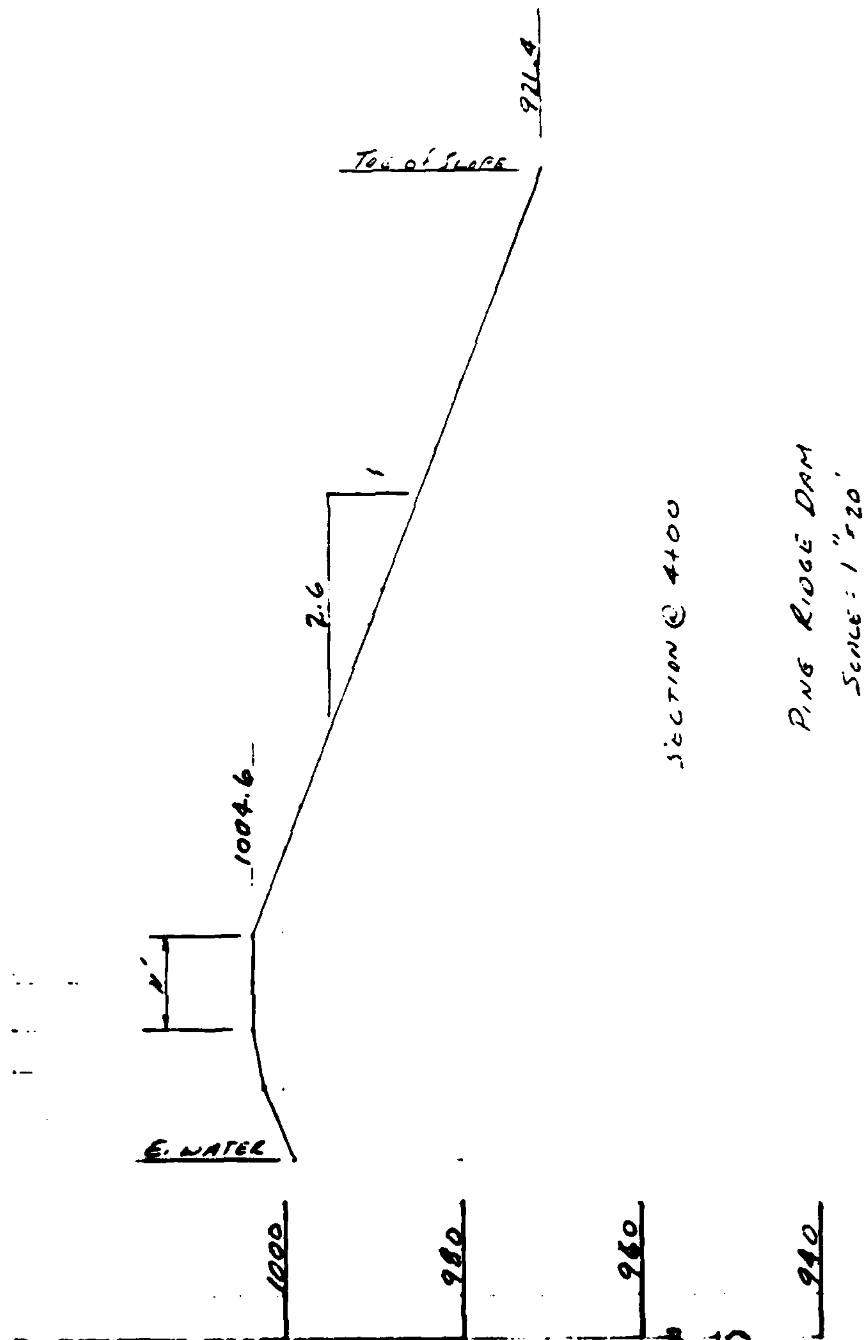

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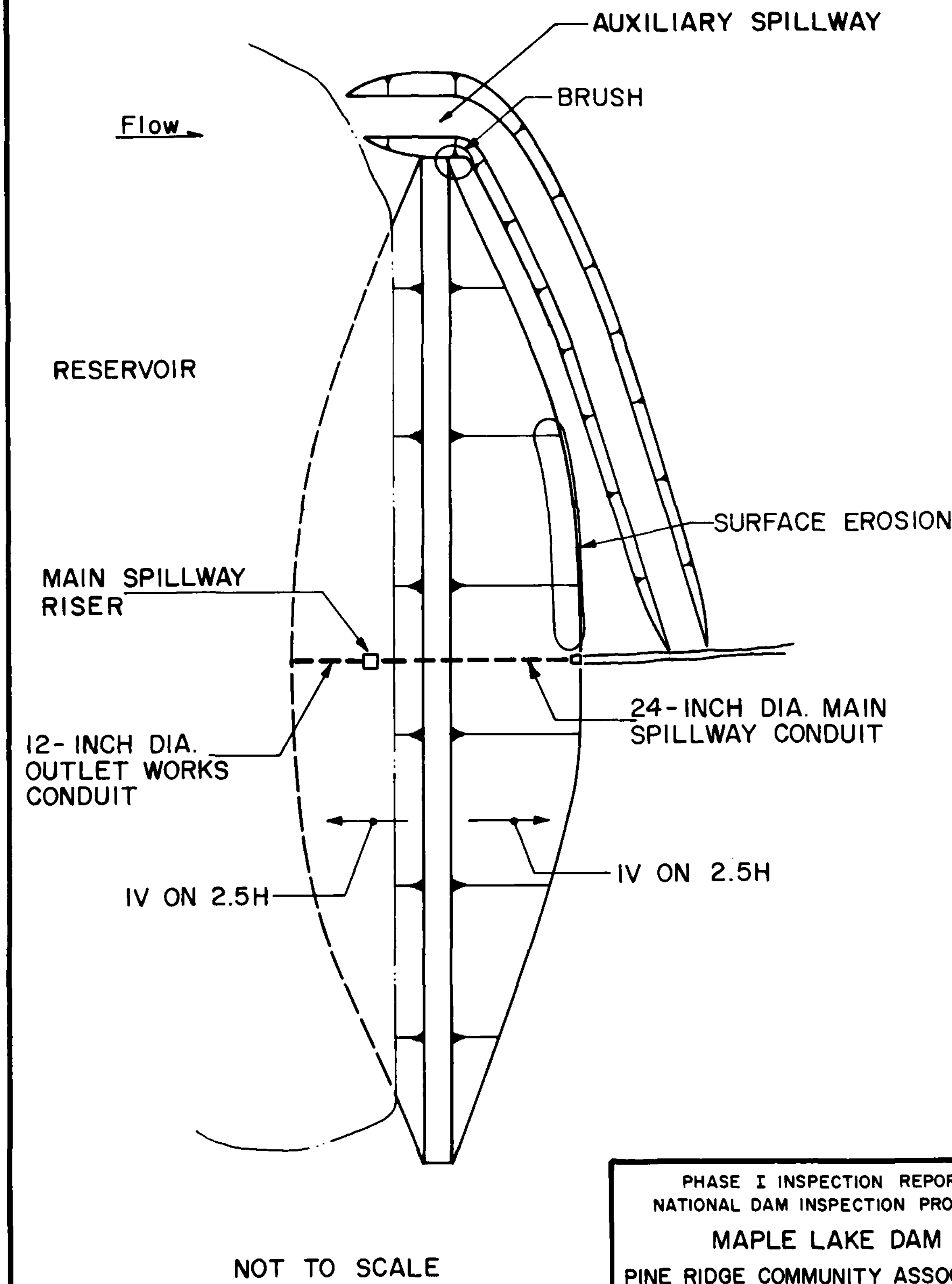


PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

MAPLE LAKE DAM

PINE RIDGE COMMUNITY ASSOCIATION

RESULTS OF VISUAL INSPECTION

FEBRUARY 1980 EXHIBIT B-1

APPENDIX C

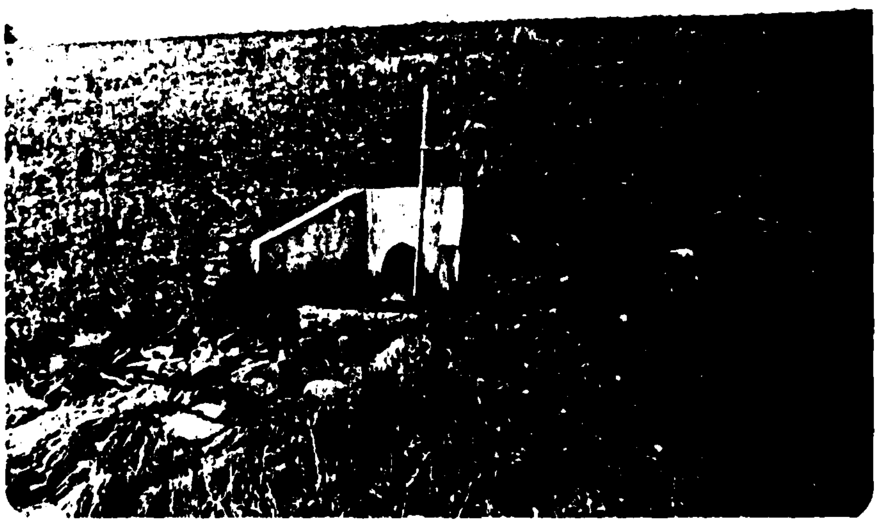
PHOTOGRAPHS

MAPLE LAKE DAM

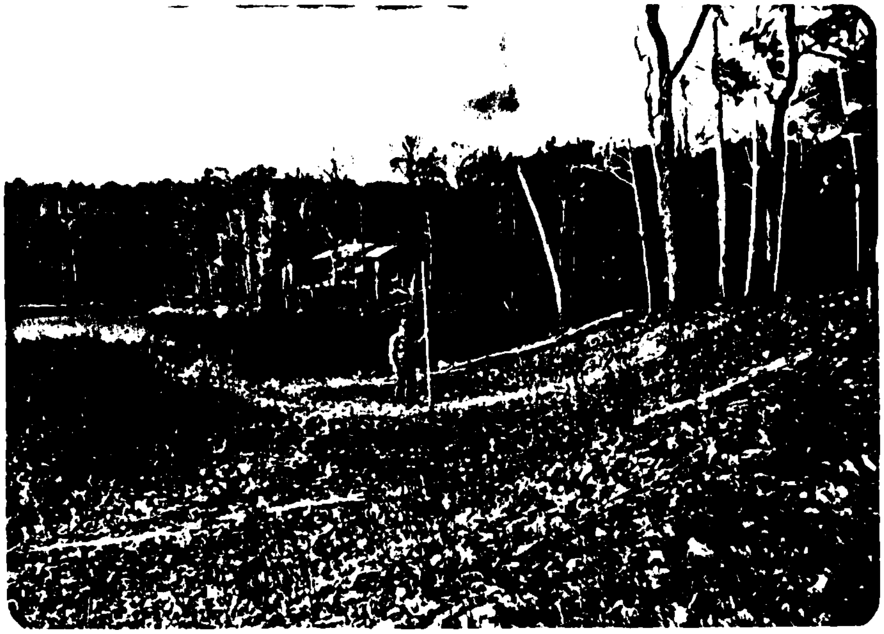
A. Upstream Slope.

B. Downstream Slope.

C. Main Spillway Riser Structure.

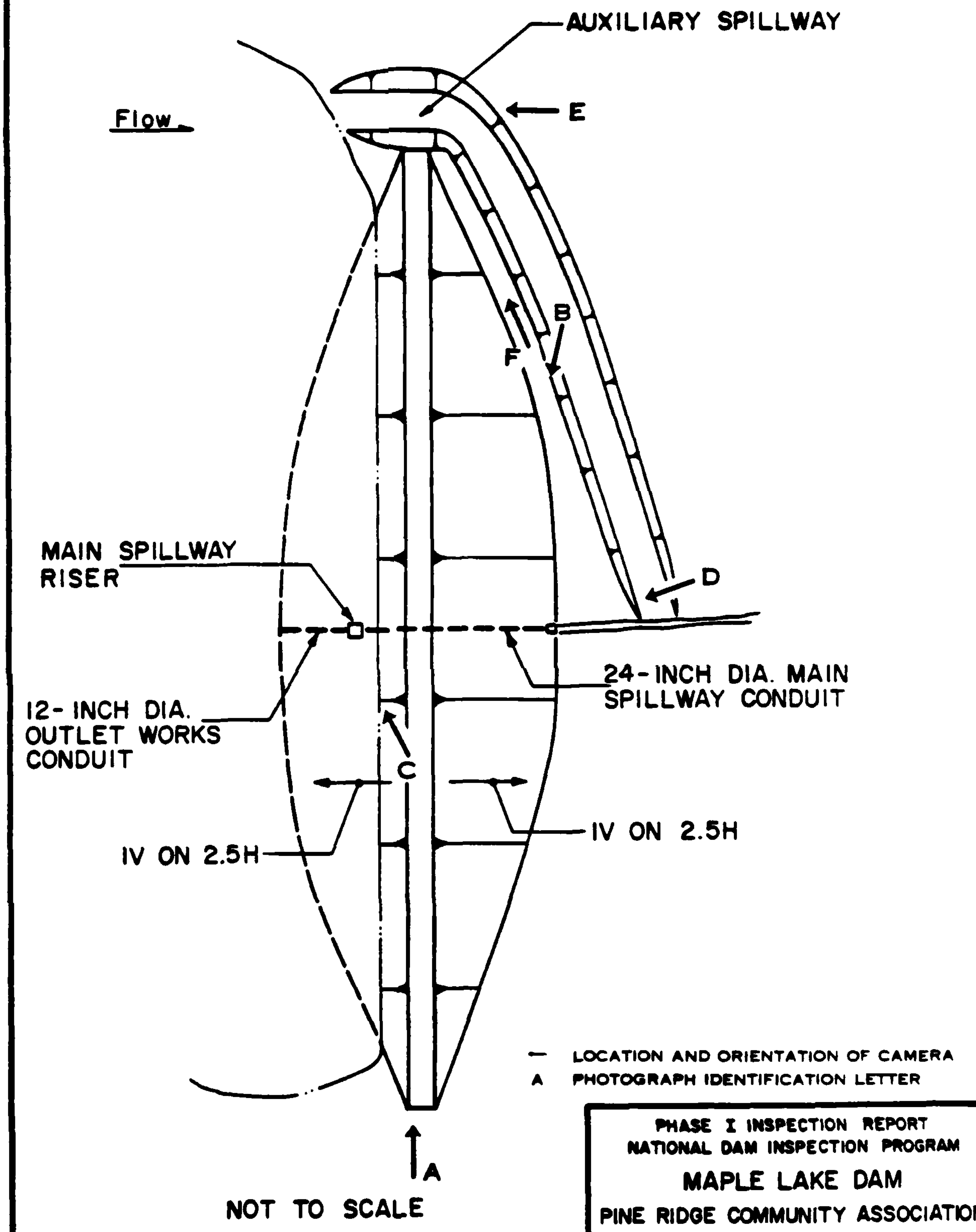


D. Main Spillway Outlet Conduit.



E. Auxiliary Spillway.

F. Auxiliary Spillway Outlet Channel.



PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

MAPLE LAKE DAM

PINE RIDGE COMMUNITY ASSOCIATION

GUIDE TO LOCATION OF PHOTOGRAPHS

FEBRUARY 1980 EXHIBIT C-1

APPENDIX D

HYDROLOGY AND HYDRAULICS

APPENDIX D

HYDROLOGY AND HYDRAULICS

Spillway Capacity Rating:

In the recommended Guidelines for Safety Inspection of Dams, the Department of the Army, Office of the Chief of Engineers (OCE), established criteria for rating the capacity of spillways. The recommended Spillway Design Flood (SDF) for the size (small, intermediate, or large) and hazard potential (low, significant, or high) classification of a dam is selected in accordance with the criteria. The SDF for those dams in the high hazard category varies between one-half of the Probable Maximum Flood (PMF) and the PMF. If the dam and spillway are not capable of passing the SDF without overtopping failure, the spillway capacity is rated as inadequate. If the dam and spillway are capable of passing one-half of the PMF without overtopping failure, or if the dam is not in the high hazard category, the spillway capacity is not rated as seriously inadequate. A spillway capacity is rated as seriously inadequate if all of the following conditions exist:

(a) There is a high hazard to loss of life from large flows downstream of the dam.

(b) Dam failure resulting from overtopping would significantly increase the hazard to loss of life downstream from the dam from that which would exist just before overtopping failure.

(c) The dam and spillway are not capable of passing one-half of the PMF without overtopping failure.

Description of Model:

If the Owner has not developed a PMF for the dam, the watershed is modeled with the HEC-1DB computer program, which was developed by the U.S. Army Corps of Engineers. The HEC-1DB computer program calculates a PMF runoff hydrograph (and percentages thereof) and routes the flows through both reservoirs and stream sections. In addition, it has the capability to simulate an overtopping dam failure. By modifying the rainfall criteria, it is also possible to model the 100-year flood with the program.

APPENDIX D

Delaware River Basin

Name of Stream: Stoffle - Denmark Creek

Name of Dam: Maple Lake Dam

NDI ID No.: PA-00766

DER ID No.: 52-170

Latitude: N 41° 08' 20" Longitude: W 74° 59' 10"

Top of Dam Elevation: 1004.4

Streambed Elevation: 969.7 Height of Dam: 35 ft

Reservoir Storage at Top of Dam Elevation: 128 acre-ft

Size Category: Small

Hazard Category: High (see Section 5)

Spillway Design Flood: Varies from 1/2 PMF to PMF; Select PMF based on height and downstream conditions.

UPSTREAM DAMS

Name	Distance from Dam (miles)	Height (ft)	Storage at top of Dam Elevation (acre-ft)	Remarks
	None.			

DOWNSTREAM DAMS

Name	Distance from Dam (miles)	Height (ft)	Storage at top of Dam Elevation (acre-ft)	Remarks
	None.			

DESCRIPTION OF ANALYSIS PROCEDURE

THE H & H ANALYSIS FOR MAPLE LAKE DAM IS COMPLICATED BY TWO FACTORS:

1. GEOMETRY OF FEATURES DIFFERS FROM DESIGN:

(a) TOP OF DAM IS 0.4 FOOT HIGHER THAN THE DESIGN TOP OF DAM ELEVATION.

(b) AUXILIARY SPILLWAY CREST IS 0.7 FOOT LOWER THAN ITS DESIGN ELEVATION, BUT THE CREST LENGTH IS 7 FEET LESS THAN THE DESIGN LENGTH.

2. WATERSHED CANNOT BE ACCURATELY DEFINED BY EXISTING MAPPING. THE CONTOUR INTERVAL AND THE TOPOGRAPHY ARE SUCH THAT ACCEPTABLE ESTIMATES OF THE DRAINAGE AREA RANGE FROM 0.25 SQ. MI. TO 0.34 SQ. MI. ALTHOUGH THIS IS ONLY A 60 ACRE DIFFERENCE, IT AMOUNTS TO A 36 PERCENT VARIATION FOR THE SMALL WATERSHED.

THE PROCEDURES ADOPTED FOR ANALYSIS AND THE REASONS THEREFORE ARE AS FOLLOWS:

1. BASE HYDRAULIC ANALYSIS ONLY ON EXISTING CONDITIONS (i.e. ACTUAL GEOMETRIC CONDITIONS). AN ANALYSIS OF DESIGN CONDITIONS IS WARRANTED ONLY WHEN IT APPEARS THAT RESTORING THE FEATURES TO DESIGN CONDITIONS WOULD BE A REASONABLE ALTERNATIVE (i.e. FILLING A LOW AREA). BECAUSE OF THE NATURE OF THE VARIATIONS FROM DESIGN FOR MAPLE LAKE DAM, A "DESIGN CASE" IS NOT WARRANTED. FURTHERMORE, THE UNCERTAINTY FOR THE DRAINAGE AREA WOULD STILL EXIST.

2. PERFORM HYDROLOGIC ANALYSES FOR BOTH EXTREME VALUES FOR THE DRAINAGE AREA. FOR THIS REPORT, RATE THE SPILLWAY ADEQUACY USING THE LARGER VALUE OF 0.34 SQ. MI.

Delaware River Basin

Name of Stream: Stoffle - Denmark Creek

Name of Dam: Maple Lake Dam

DETERMINATION OF PMF RAINFALL & UNIT HYDROGRAPH

UNIT HYDROGRAPH DATA:

Sub-area	Drainage Area (square miles)	Cp (1)	Ct (2)	L miles (3)	L_{ca} miles (4)	L' miles (5)	Tp hours (6)	Map Area (7)	Plate (8)
A-1	0.25	0.45	1.23	0.64	0.25	—	0.7	1	A
Total	0.25								

(See Sketch on Sheet D-6)

(1) & (2): Snyder Unit Hydrograph coefficients supplied by Baltimore District, Corps of Engineers on maps and plates referenced in (7) & (8)

The following are measured from the outlet of the subarea:

(3): Length of main watercourse extended to divide

(4): Length of main watercourse to the centroid

The following is measured from the upstream end of the reservoir at normal pool:

(5): Length of main watercourse extended to divide

(6): $Tp = C_t \times (L \times L_{ca})^{0.3}$, except where the centroid of the subarea is located in the reservoir. Then $Tp = C_t \times (L')^{0.6}$

Initial flow is assumed at 1.5 cfs/sq. mile

Computer Data: QRCSN = -0.05 (5% of peak flow)
RTIOR = 2.0

RAINFALL DATA:

PMF Rainfall Index= 22.1 in., 24 hr., 200 sq. mile

	Hydromet. 40 (Susquehanna Basin)	Hydromet. 33 (Other Basins)
Zone:	N/A	1
Geographic Adjustment Factor:	N/A	1.0
Revised Index Rainfall:	N/A	22.1

RAINFALL DISTRIBUTION (percent)

Time	Percent
6 hours	111
12 hours	123
24 hours	133
48 hours	142
72 hours	—
96 hours	—

Delaware River Basin

Name of Stream: Steffle - Denmark Creek

Name of Dam: Maple Lake Dam

DETERMINATION OF PMF RAINFALL & UNIT HYDROGRAPH

UNIT HYDROGRAPH DATA:

Sub-area	Drainage Area (square miles)	Cp (1)	Ct (2)	L miles (3)	L_{ca} miles (4)	L' miles (5)	Tp hours (6)	Map Area (7)	Plate (8)
A-1	0.34	0.45	1.23	0.80	0.34	—	0.8	1	A
Total	0.34								

(See Sketch on Sheet D-6)

(1) & (2): Snyder Unit Hydrograph coefficients supplied by Baltimore District, Corps of Engineers on maps and plates referenced in (7) & (8)

The following are measured from the outlet of the subarea:

(3): Length of main watercourse extended to divide

(4): Length of main watercourse to the centroid

The following is measured from the upstream end of the reservoir at normal pool:

(5): Length of main watercourse extended to divide

(6): $Tp=C_t \times (L \times L_{ca})^{0.3}$, except where the centroid of the subarea is located in the reservoir. Then $Tp=C_t \times (L')^{0.6}$

Initial flow is assumed at 1.5 cfs/sq. mile

Computer Data: QRCSN = -0.05 (5% of peak flow)
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PMF Rainfall Index= 22.1 in., 24 hr., 200 sq. mile

	Hydromet. 40 (Susquehanna Basin)	Hydromet. 33 (Other Basins)
Zone:	N/A	1
Geographic Adjustment Factor:	N/A	1.0
Revised Index Rainfall:	N/A	22.1

RAINFALL DISTRIBUTION (percent)

Time	Percent
6 hours	111
12 hours	123
24 hours	133
48 hours	142
72 hours	-
96 hours	-

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FOR ______
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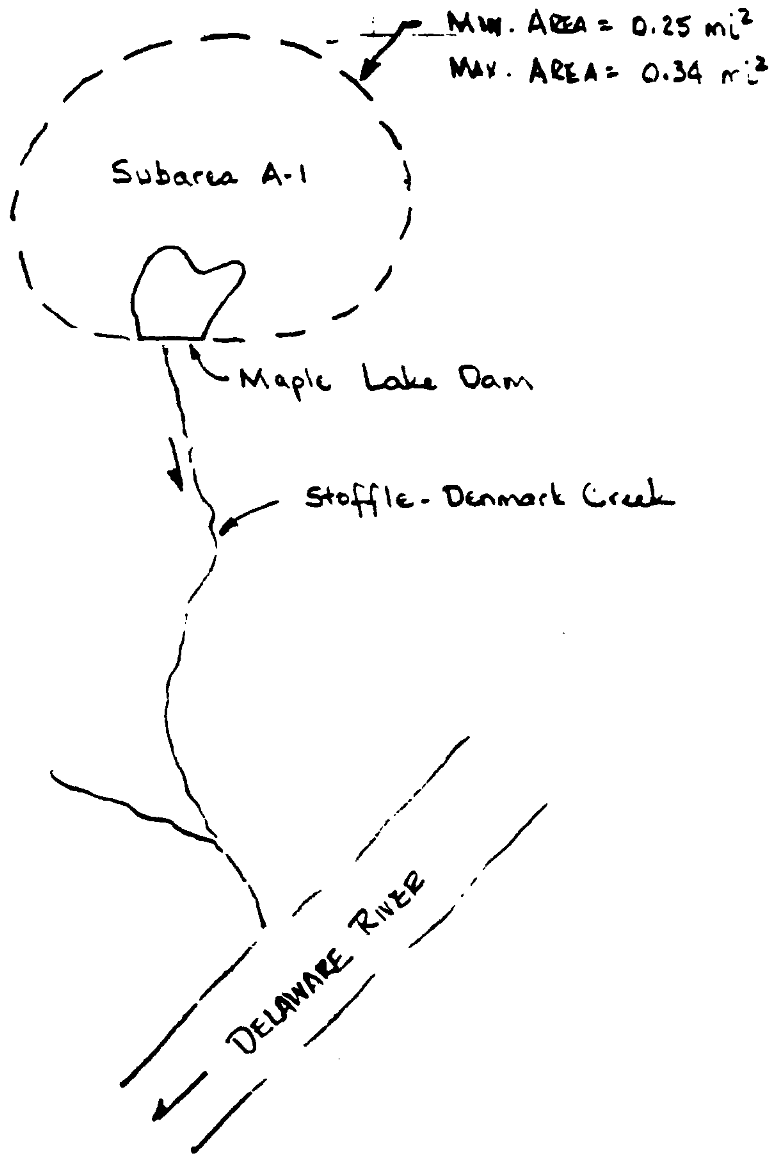

MAPLE LAKE DAM
SKETCH OF SYSTEM

NOT TO SCALE

6819

Data for Dam at Outlet of Subarea A-1

Name of Dam: Maple Lake Dam

SPILLWAY DATA:

	Existing Conditions	Design Conditions
Top of Dam Elevation	1004.4	1004.0
Spillway Crest Elevation	999.0	999.0
Spillway Head Available (ft)	5.4	5.0
Type Spillway	Riser structure and conduit	
"C" Value - Spillway	N/A	N/A
Crest Length - Spillway (ft)	N/A	N/A
Spillway Peak Discharge (cfs)	57	57
Auxiliary Spillway Crest Elev.	1001.3	1002.0
Auxiliary Spill. Head Avail. (ft)	3.1	2.0
Type Auxiliary Spillway	Trapezoidal earthen channel	
"C" Value - Auxiliary Spill. (ft)	N/A	N/A
Crest Length - Auxil. Spill. (ft)	18	25
Auxiliary Spillway Peak Discharge (cfs)	325	375
Combined Spillway Discharge (cfs)	382	432

Spillway Rating Curve: See Sheets D-8 through D-10.

Elevation	Q Spillway (cfs)	Q Auxiliary Spillway (cfs)	Combined (cfs)
999.0	0	0	0
1000.0	25	0	25
1000.5	46	0	46
1001.3	54	0	54
1002.0	55	23	78
1003.0	56	76	132
1004.4	57	325	382
1005.0	58	460	518
1006.0	59	693	752

OUTLET WORKS RATING:	Outlet 1	Outlet 2	Outlet 3
Invert of Outlet	972.5		
Invert of Inlet	976.0		
Type	CIP		
Diameter (ft) = D	1		
Length (ft) = L	36		
Area (sq. ft) = A	0.79		
N	0.014		
K Entrance	0.5		
K Exit	1.0		
K Friction $=29.1N^2L/R^{4/3}$	1.3		
Sum of K	2.8		
$(1/K)^{0.5} = C$	0.6		
Maximum Head (ft) = HM	27.9		
$Q = CA\sqrt{2g(HM)}$ (cfs)	20		
Q Combined (cfs)	20		

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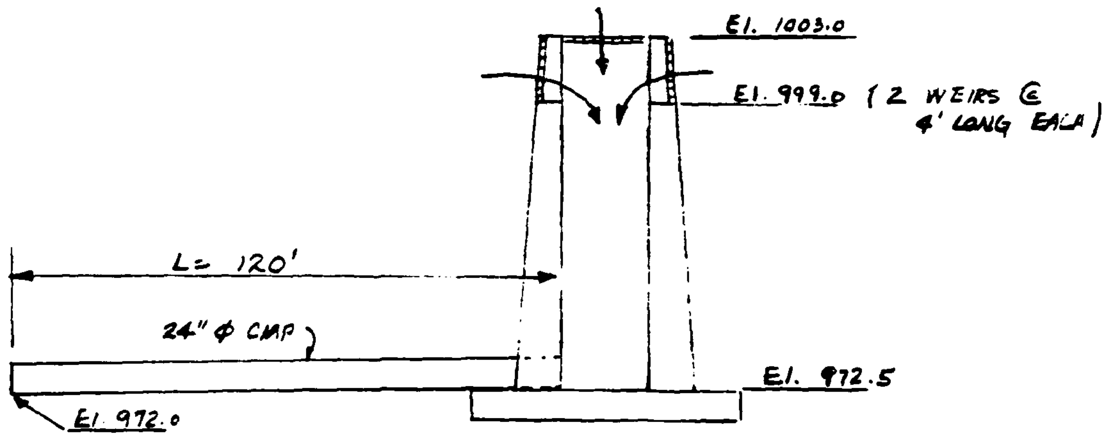
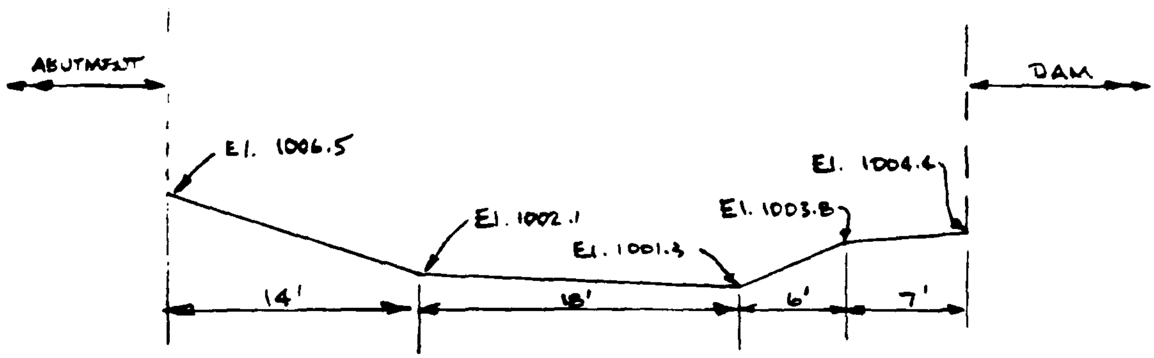
SUBJECT HYDROLOGY AND HYDRAULICS FILE NO.
MAPLE LAKE DAM SHEET NO. OF SHEETS
FOR
COMPUTED BY DATE CHECKED BY DATE

SPILLWAY RATING CURVE

Max. Pool El. 1004.4



MAIN SPILLWAY
NOT TO SCALE



AUXILIARY SPILLWAY
SECTION @ CREST

NOTE: CRITICAL DEPTH CONTROL AT
EMERGENCY SPILLWAY CREST

8013

MAIN SPILLWAY

FOR CONTROL AT TOP OF STRUCTURE USE:

$$Q_W = CLH^{3/2} = (3.1)(4+4)(H^{3/2}) = 24.8\ H^{3/2}$$

FOR CONTROL BY CONDUIT USE:

$$Q_C = CA\sqrt{2gH}$$

$$C = (1/K)^{0.5} \qquad K = K_{entrance} + K_{exit} + 29.1\,n^2 L / R^{4/3}$$

$$K = 0.5 + 1.0 + (29.1)(.024)^2(120)/(.50)^{4/3}$$

$$C = 0.4 \qquad K = 6.56$$

$$Q_C = (0.4)(3.14)(64.4\,H)^{1/2} = 10.1\sqrt{H}$$

POOL EL.	H_{WEIR}	Q_W	$H_{CONDUIT}$	Q_C	Q
999.0	0 ft	0 cfs	0 ft	0 cfs	0 cfs
1000.0	1.0	25	27.0	52	25
1000.5	1.5	46	27.5	53	46
1001.3	2.3	87	28.3	54	54
1004.4	—	—	31.4	57	57
1010.0	—	—	37.0	61	61

AUXILIARY SPILLWAY

y_c	A	T	Q*	V	$V^2/2g$	Pool El**
0	0	0	0	0	0	1001.3
1	12	21	51	4.25	0.3	1002.6
2	35.9	26.6	236	6.57	0.7	1004.0
2.5	49.9	29.4	369	7.39	0.8	1004.6
3.0	66.5	36.8	506	7.61	0.9	1005.2

$$*\ Q = \left(\frac{g A^3}{T}\right)^{1/2}$$

$$**\ \text{Pool El.} = y_c + V^2/2g + 1001.3$$

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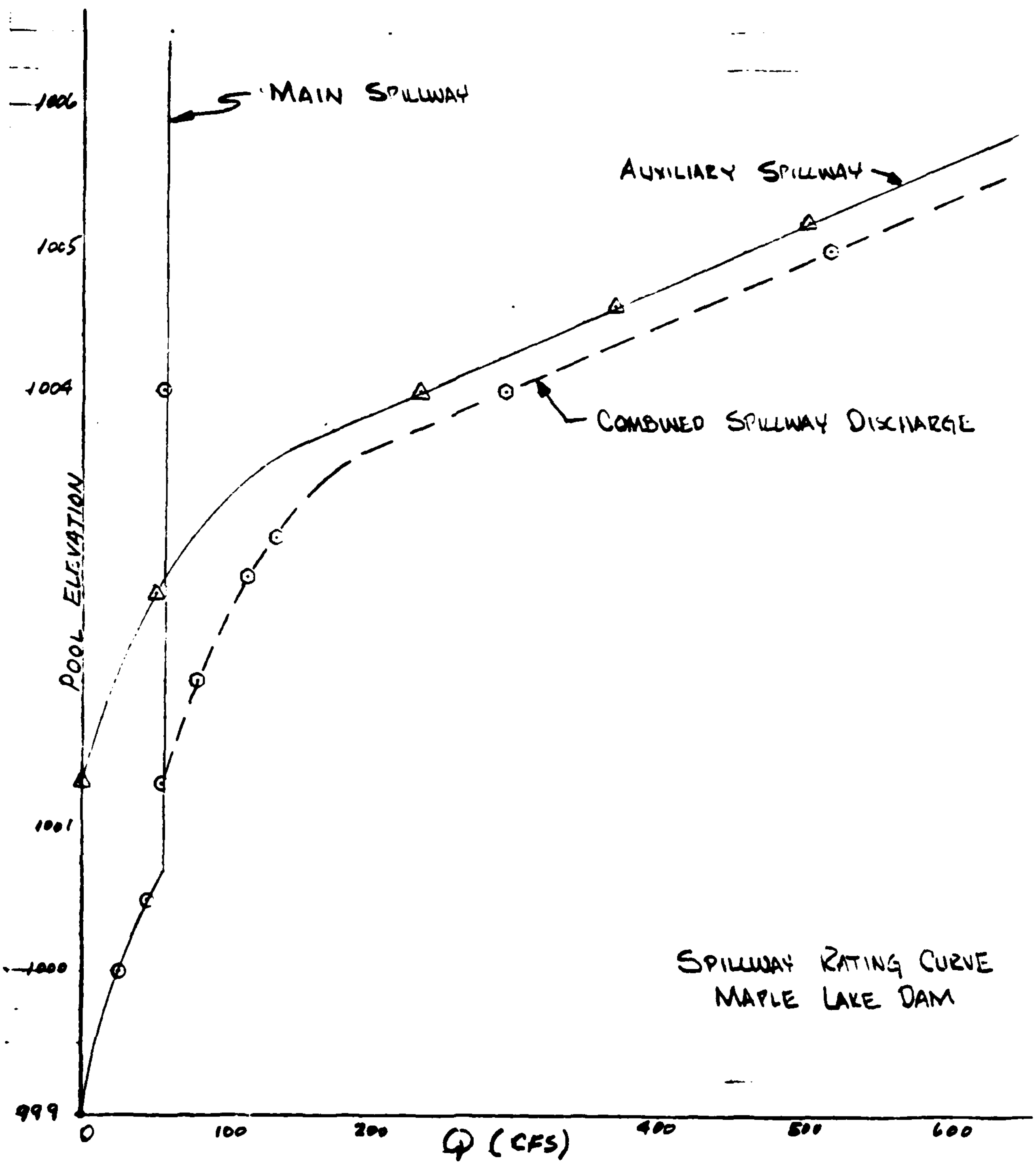
HARRISBURG, PA.

SUBJECT HYDROLOGY AND HYDRAULICS
MAPLE LAKE DAM
FILE NO. ____ SHEET NO. ____ OF ____ SHEETS
FOR ____
COMPUTED BY ____ DATE ____ CHECKED BY ____ DATE ____



6813

Data for Dam at Outlet of Subarea A-1 (See sketch on Sheet D-6)

Name of Dam: Maple Lake Dam

STORAGE DATA:

Elevation		Area (acres)		Storage million gals	Storage acre-ft		Remarks
969.9	=ELEVO	0		0	0		Surface Area at
999.0	=ELEV1	7	=A1	22	68	=S1*	ELEV 1 from
1004.4		16		42	138		design drawings.
1010.0		29		82	252		ELEVO estimated
							from survey data

* $S_1 = \frac{(ELEV1 - ELEVO) A_1}{3}$

** Planimetered contour at least 5 feet above top of dam

Reservoir Area at Normal Pool is 4 percent of subarea watershed.

BREACH DATA:

See Appendix B for sections and existing profile of the dam.

Soil Type from Visual Inspection: Silty sand

Maximum Permissible Velocity (Plate 28, EM 1110-2-1601) 2 fps (from $Q = CLH^{3/2} = V \cdot A$ and depth $= (2/3) \times H$) & $A = L \cdot$depth

HMAX = $(4/9\ V^2/C^2)$ = 0.2 ft., C = 3.1 Top of Dam El.= 1004.4

HMAX + Top of Dam El. = 1004.6 = FAILEL
(Above is elevation at which failure would start)

Dam Breach Data:

BRWID = 85 ft (width of bottom of breach)
Z = 1V on 1H (side slopes of breach)
ELBM = 970.0 (bottom of breach elevation, minimum of zero storage elevation)
WSEL = 999.0 (normal pool elevation)
T FAIL= 12 mins = 0.2 hrs (time for breach to develop)

Selected Computer Output

```
**********************************
FLOOD HYDROGRAPH PACKAGE (HEC-1)
DAM SAFETY VERSION      JULY 1978
  LAST MODIFICATION  17 JAN 80
**********************************
       1          A1                    NATIONAL DAM INSPECTION PROGRAM
       2          A2                        STOFFLE-DENMARK CREEK
       3          A3                           MAPLE LAKE DAM
       4          B     300       0      15       0       0       0       0       0      -4       0
       5          B1      5
       6          J       1       7       1
       7          J1      1      .7      .6      .5      .4      .3      .2
       8          K       0       1                                       1
       9          K1       RUNOFF INTO MAPLE LAKE
      10          M       1       1     .25             .25                             1
      11          P            22.1     111     123     133     142
      12          T                                                       1     .05             .04
      13          W      .7     .45
      14          X    -1.5    -.05     2.0
      15          K       1       1                                       1
      16          K1       ROUTE THROUGH MAPLE LAKE DAM
      17          Y                               1
      18          Y1      1                                            -999      -1
      19          Y4    999    1000  1000.5  1001.3    1002    1003  1004.4    1005    1006
      20          Y5      0      25      46      54      78     132     382     518     752
      21          $A      0       7      16      29
      22          $E  969.9     999  1004.4    1010
      23          $$    999
      24          $D1004.4
      25          $L      1     285     450     695     710     720     735
      26          $V1004.4 1004.5  1004.6  1004.8  1005.1  1005.4  1006.5
      27          K      99
```

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
				1.00	.70	.60	.50	.40	.30	.20
HYDROGRAPH AT	1	.25	1	870.	609.	522.	435.	348.	261.	174.
	(	.65)	(	24.64)(	17.25)(	14.79)(	12.32)(	9.86)(	7.39)(	4.93)(
ROUTED TO	1	.25	1	871.	493.	371.	298.	219.	129.	77.
	(	.65)	(	24.66)(	13.96)(	10.51)(	8.44)(	6.21)(	3.65)(	2.17)(

SUMMARY OF DAM SAFETY ANALYSIS

MAPLE LAKE DAM (0.25 mi² D.A.)

PLAN 1 ....

	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
ELEVATION	999.00	999.00	1004.40
STORAGE	68.	68.	129.
OUTFLOW	0.	0.	382.

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	1004.87	.47	136.	871.	3.00	40.50	0.00
.70	1004.61	.21	132.	493.	1.50	41.00	0.00
.60	1004.34	0.00	127.	371.	0.00	41.50	0.00
.50	1003.93	0.00	121.	298.	0.00	41.50	0.00
.40	1003.49	0.00	115.	219.	0.00	41.75	0.00
.30	1002.96	0.00	107.	129.	0.00	42.25	0.00
.20	1001.96	0.00	95.	77.	0.00	42.50	0.00

```
**********************************
FLOOD HYDROGRAPH PACKAGE (HEC-1)
DAM SAFETY VERSION      JULY 1978
  LAST MODIFICATION  17 JAN 80
**********************************

A1                       NATIONAL DAM INSPECTION PROGRAM
A2                            STOFFLE-DENMARK CREEK
A3                              MAPLE LAKE DAM
B     300        0       15        0        0        0        0        0       -4        0
B1      5
J       1        7        1
J1      1       .7       .6       .5       .4       .3       .2
K       0        1                                            1
K1        RUNOFF INTO MAPLE LAKE
M       1        1      .34               .36                                   1
P             22.1      111      123      133      142
T                                                             1      .05                .03
W      .8      .45
X    -1.5     -.05      2.0
K       1        1                                            1
K1        ROUTE THROUGH MAPLE LAKE DAM
Y                                  1
Y1      1                                                  -999       -1
Y4    999     1000   1000.5   1001.3     1002     1003   1004.4     1005     1006
Y5      0       25       46       54       78      132      382      518      752
$A      0        7       16       29
$E  969.9      999   1004.4     1010
$S    999
$D1006.4
$L      1      285      450      695      710      720      735
$V1006.4   1006.5   1006.6   1006.8   1005.1   1005.4   1006.5
K      99
```

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)

OPERATION	STATION	AREA	PLAN	RATIO 1 1.00	RATIO 2 .70	RATIO 3 .60	RATIO 4 .50	RATIO 5 .40	RATIO 6 .30	RATIO 7 .20
				RATIOS APPLIED TO FLOWS						
HYDROGRAPH AT	1	.34	1	1103.	772.	662.	551.	441.	331.	221.
	(	.88)	(	31.22)(	21.86)(	18.73)(	15.61)(	12.49)(	9.37)(	6.24)(
ROUTED TO	1	.34	1	1095.	749.	595.	425.	317.	217.	112.
	(	.88)	(	31.00)(	21.22)(	16.86)(	12.04)(	8.97)(	6.14)(	3.17)(

SUMMARY OF DAM SAFETY ANALYSIS

MAPLE LAKE DAM (D.A. = 0.34 mi^2)

PLAN 1 ....

	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
ELEVATION	999.00	999.00	1004.40
STORAGE	68.	68.	123.
OUTFLOW	0.	0.	382.

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	1004.97	.57	138.	1095.	4.00	40.50	0.00
.70	1004.90	.40	135.	749.	3.00	40.75	0.00
.60	1004.70	.30	133.	595.	2.25	41.00	0.00
.50	1004.52	.12	130.	425.	1.25	41.50	0.00
.40	1004.03	0.00	123.	317.	0.00	41.75	0.00
.30	1003.47	0.00	116.	217.	0.00	42.00	0.00
.20	1002.63	0.00	103.	112.	0.00	42.50	0.00

Maple Lake Dam
Summary of Pertinent Results

PMF Rainfall = 25.11 inches

Multi-ratio Analysis (0.25 mi^2 Drainage Area)

Maple Lake Dam	PMF	1/2 PMF
Runoff (inches)	22.8	11.4
Inflow (cfs)	870	435
Outflow (cfs)	870	298
Depth of Overtopping (ft)	0.47	0.00
Duration of Overtopping (hr)	3.00	0.00

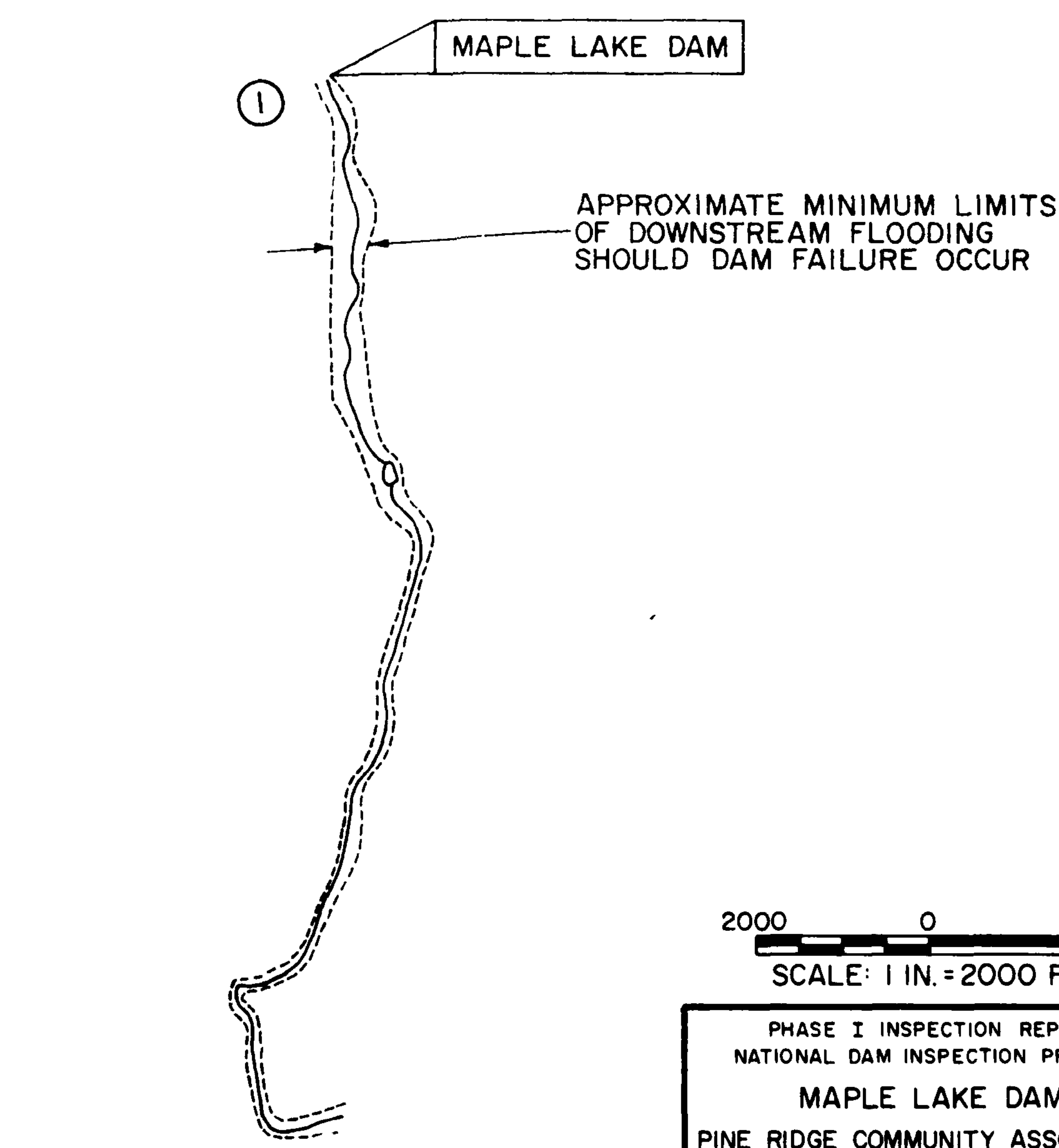
Multi-ratio Analysis (0.34 mi^2 Drainage Area)

Maple Lake Dam	PMF	1/2 PMF
Runoff (inches)	22.8	11.4
Inflow (cfs)	1,103	551
Outflow (cfs)	1,095	425
Depth of Overtopping (ft)	0.57	0.12
Duration of Overtopping (hr)	4.00	1.25

NOTE: SDF FOR MAPLE LAKE DAM = PMF

NOTES:

1. LIMITS OF DOWNSTREAM FLOODING ARE ESTIMATES BASED ON VISUAL OBSERVATIONS. THIS MAP SHOULD NOT BE USED IN CONNECTION WITH THE EMERGENCY OPERATION AND WARNING PLAN.
2. CIRCLED NUMBERS INDICATE STATIONS USED IN COMPUTER ANALYSIS.



2000 0 2000

SCALE: 1 IN. = 2000 FT.

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

MAPLE LAKE DAM

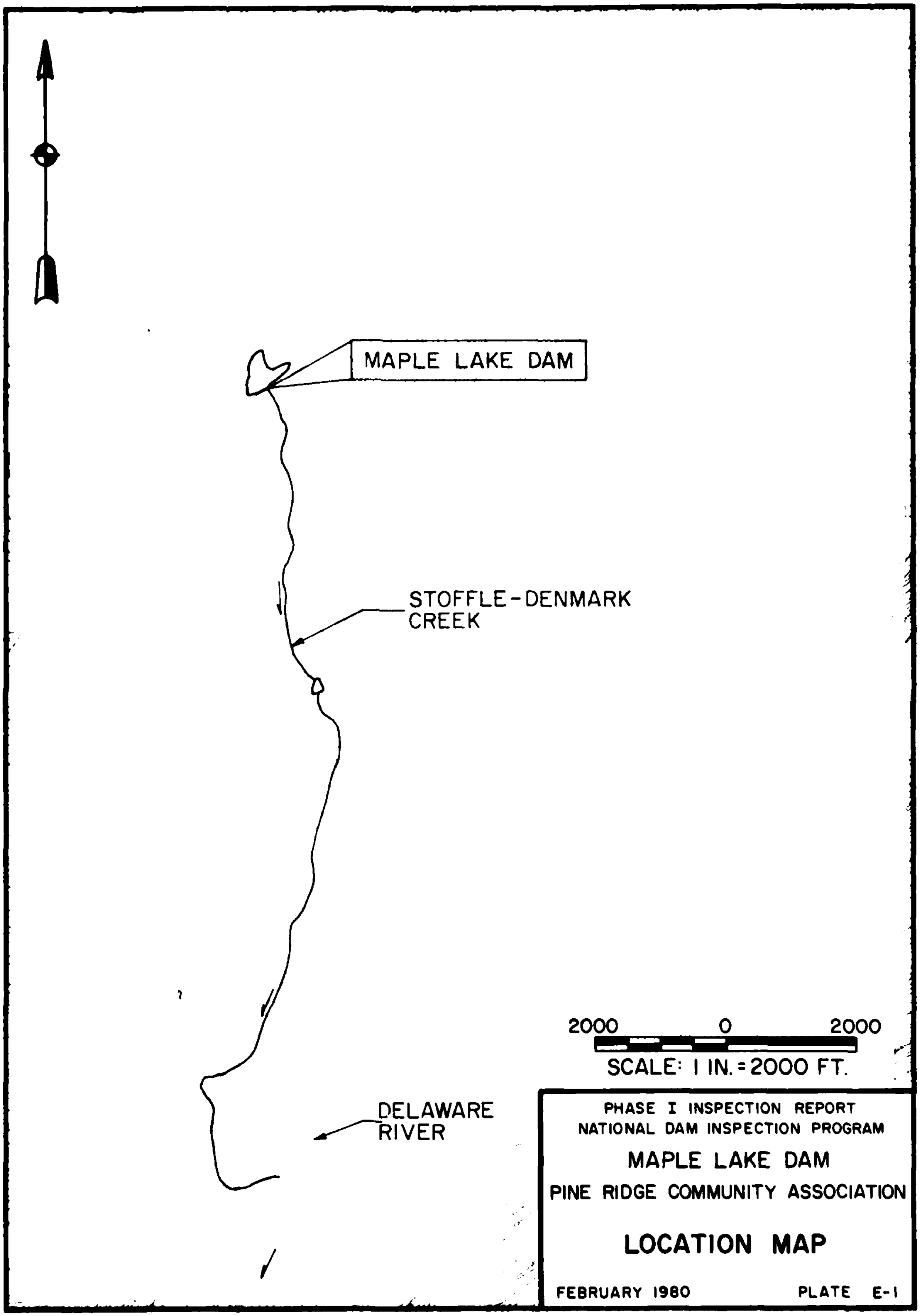
PINE RIDGE COMMUNITY ASSOCIATION

DOWNSTREAM DEVELOPMENT PLAN

FEBRUARY 1980 EXHIBIT D-1

APPENDIX E

PLATES



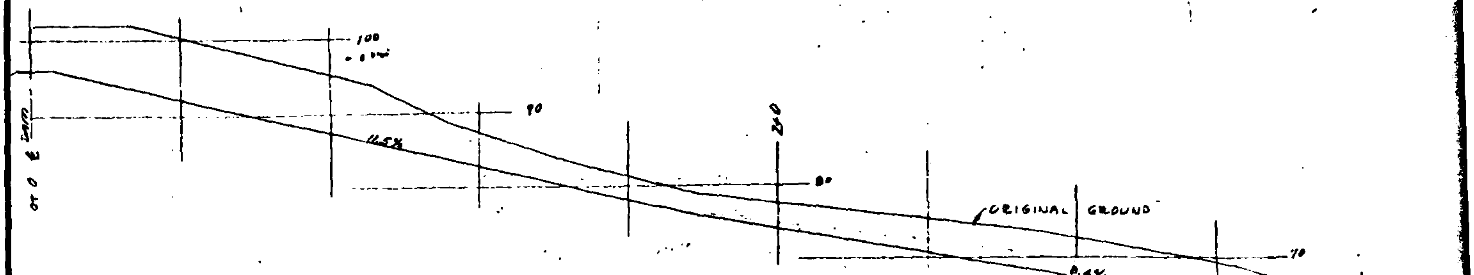
PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

MAPLE LAKE DAM

PINE RIDGE COMMUNITY ASSOCIATION

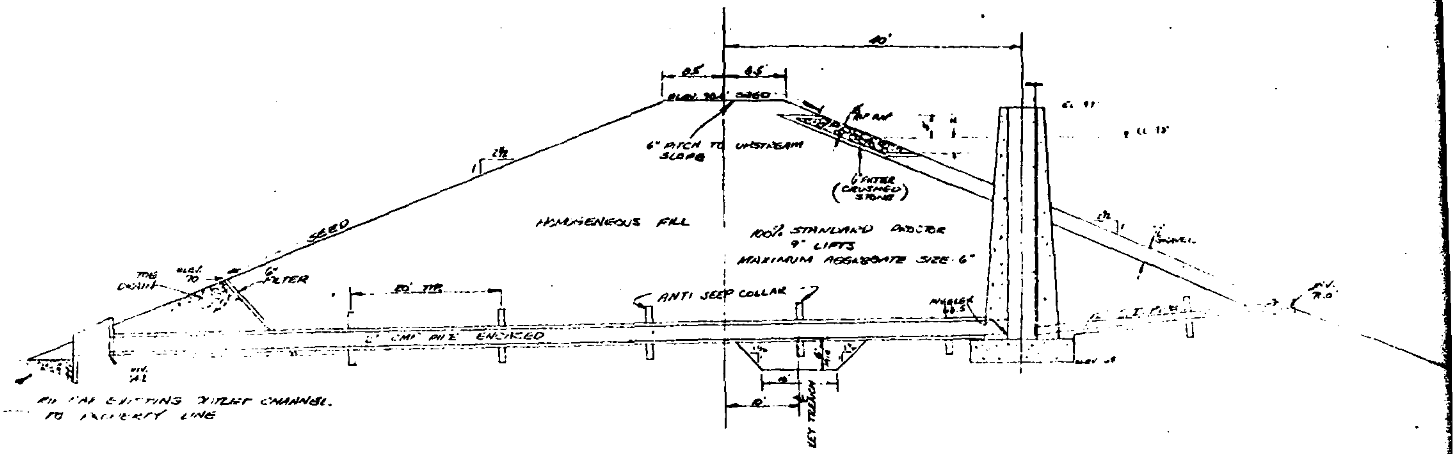
LOCATION MAP

FEBRUARY 1980 PLATE E-1



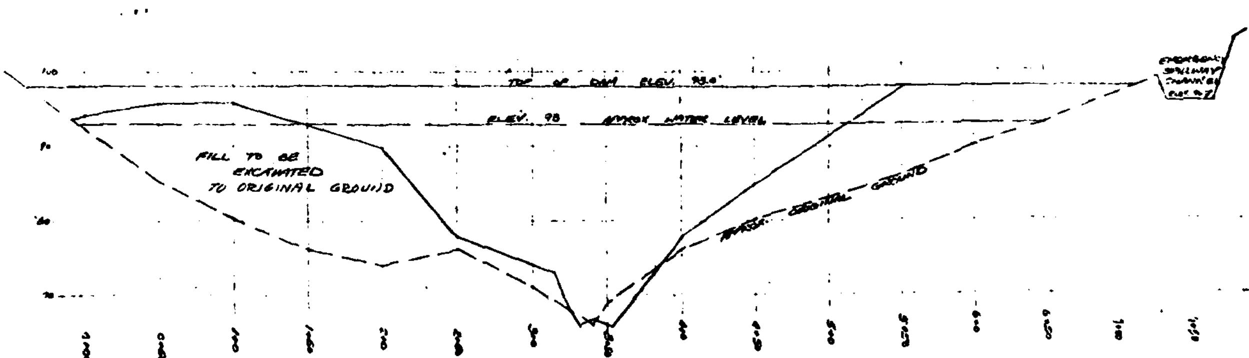
PROFILE - EMERGENCY SPILLWAY CHANNEL

SCALE HORIZ - 1" = 20'
VERT - 1" = 10'



MAXIMUM CROSS SECTION

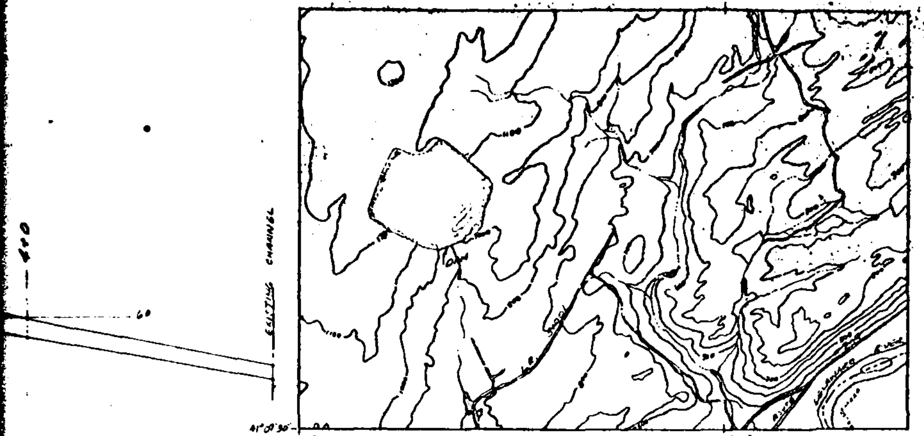
SCALE 1" = 10'



CENTERLINE PROFILE OF DAM

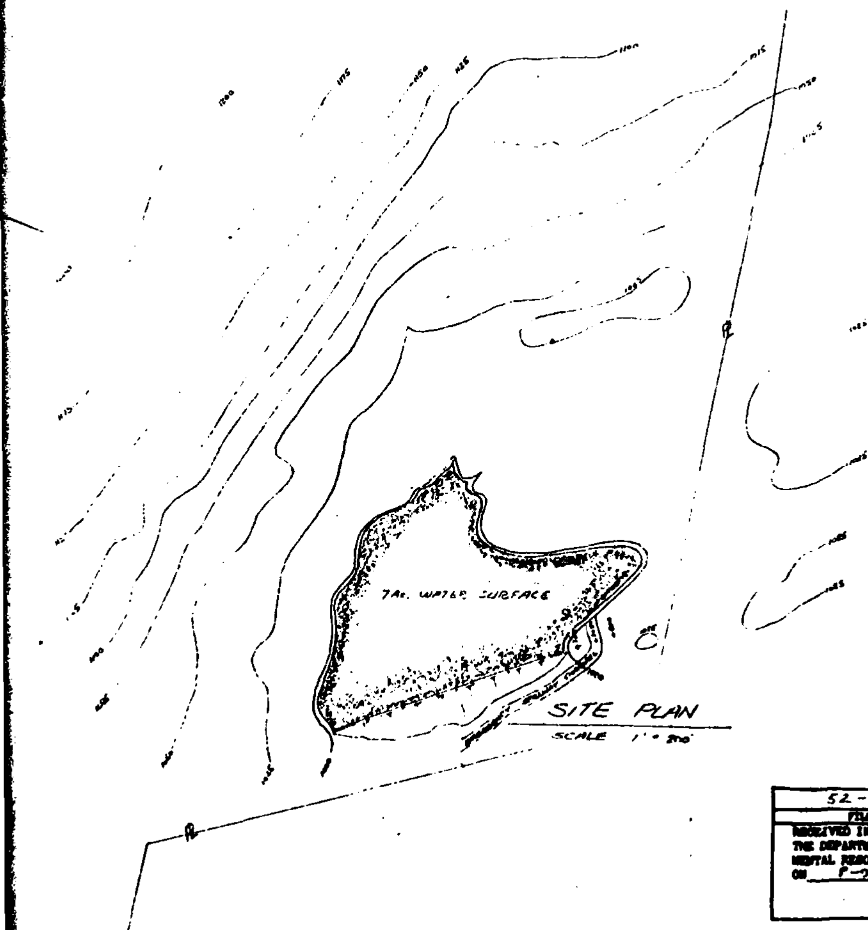
SCALE HORIZ - 1" = 50'
VERT - 1" = 10'

NOTE - CONSTRUCTION EL



LOCATION PLAN

PORTION OF U.S.G.S LAKE MASKENOZHA, PA.
QUADRANGLE 7.5 MINUTE SERIES
SCALE 1" - 2000'



SITE PLAN

SCALE 1" = 200'

52-170
8/9/71

PROPOSED DAM FOR SHEET 1 OF 2

PINE RIDGE DEVELOPMENT

LEHMAN TOWNSHIP PIKE COUNTY, PA.
JUNE 11, 1971 SCALES AS SHOWN
EDWARD C. HESS ASSOCIATES, INC. — STROUDSBURG, PENNA.

USGS EL 1000

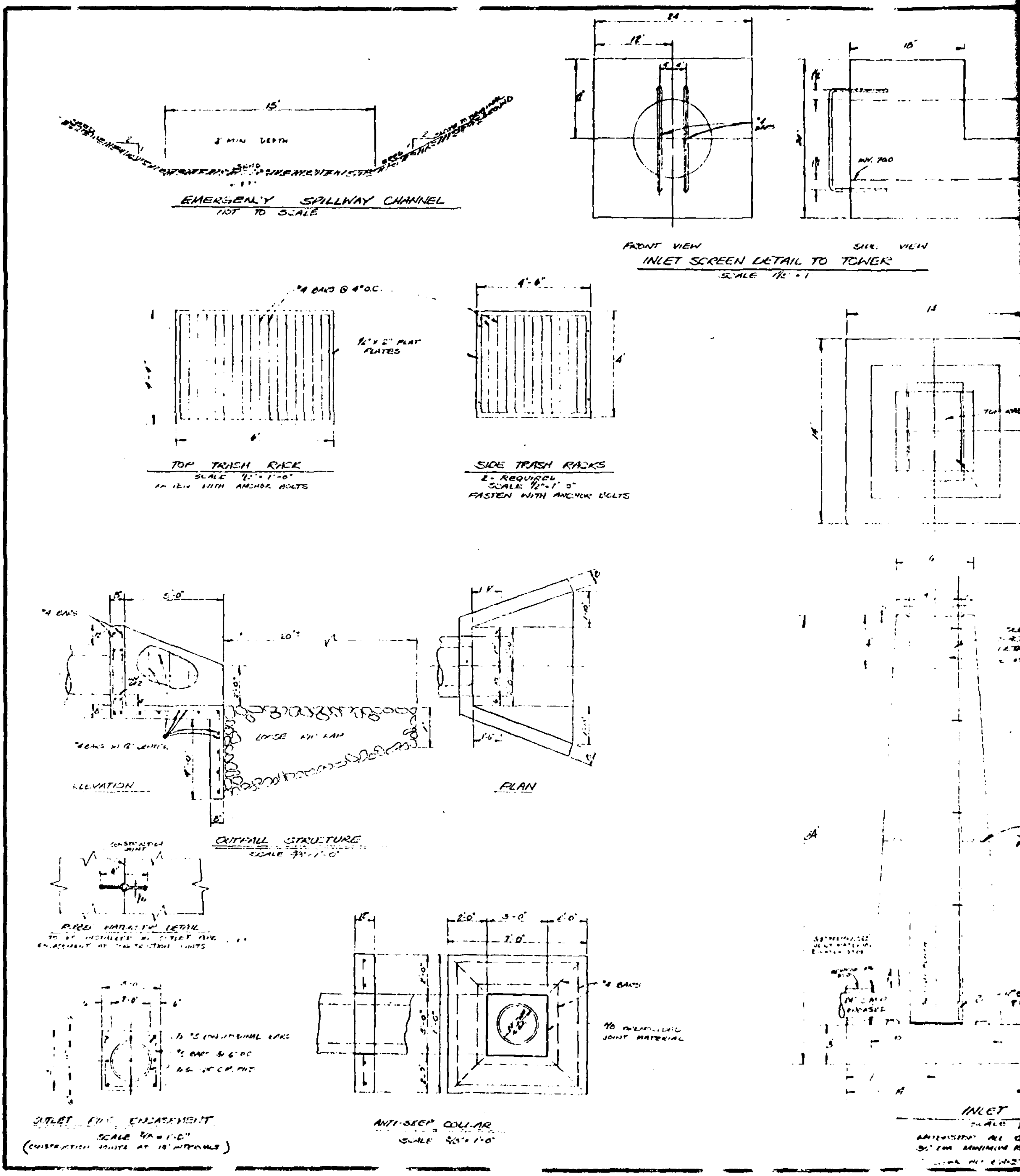
PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

MAPLE LAKE DAM

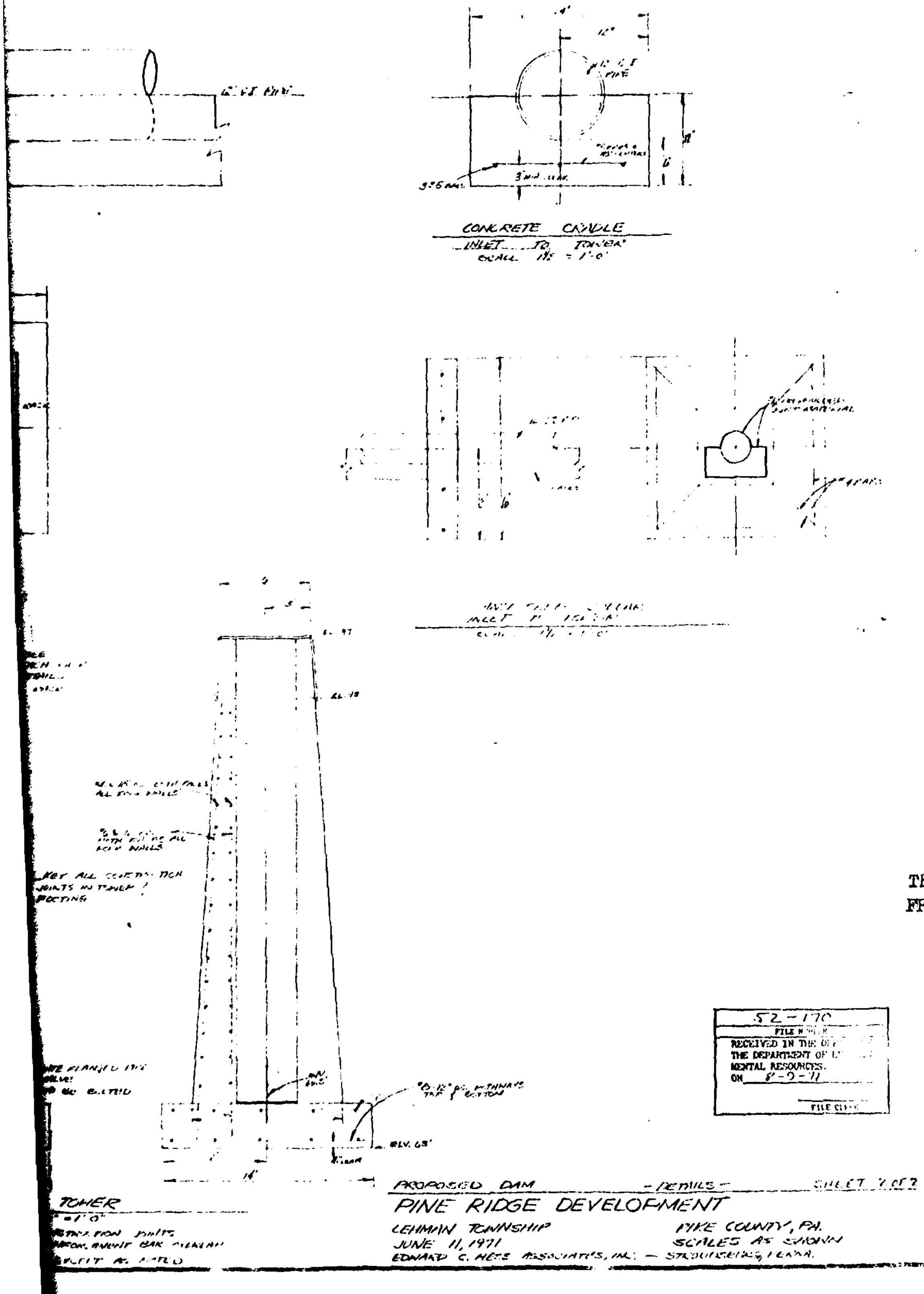
PINE RIDGE COMMUNITY ASSOCIATION

PLAN PROFILE AND SECTION

FEBRUARY 1980 PLATE E-2



15'
3' MIN DEPTH
EMERGENCY SPILLWAY CHANNEL
NOT TO SCALE
24
18
FRONT VIEW
SIDE VIEW
INLET SCREEN DETAIL TO TOWER
#4 BARS @ 4" O.C.
1/2" x 2" FLAT PLATES
6'
TOP TRASH RACK
4'-6"
4'
SIDE TRASH RACKS
2 REQUIRED
FASTEN WITH ANCHOR BOLTS
#4 BARS
5'-0"
LOOSE RIP RAP
ELEVATION
PLAN
OUTFALL STRUCTURE
2'-0"
3'-0"
7'-0"
#4 BARS
1/2 PREMOLDED JOINT MATERIAL
ANTI-SEEP COLLAR
OUTLET PIPE ENCASEMENT
INLET



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NATIONAL DAM INSPECTION PROGRAM

MAPLE LAKE DAM

PINE RIDGE COMMUNITY ASSOCIATIO

OUTLET WORKS

FEBRUARY 1980

PLATE E-3

2

APPENDIX F

GEOLOGY

MAPLE LAKE DAM

APPENDIX F

GEOLOGY

Maple Lake Dam is located in Pike County within the Appalachian Plateau Province. The most pronounced topographic feature in the area is Camelback Mountain, which is a part of the Pocono Plateau Escarpment. The escarpment is well-defined southwestward from Camelback Mountain, but is more irregular between Camelback Mountain and Mt. Pocono, which lies to the north. Streams east of the escarpment drain directly to the Delaware River, while those to the west drain to the Lehigh River.

The Pocono Plateau Section lies west of the escarpment. This area is relatively flat, with local relief seldom exceeding 100 feet. The topography has been greatly influenced by continental glaciation. Many features were created by deposition of glacial materials. The entire plateau lacks well-developed drainage.

East of the escarpment is the Glaciated Low Plateaus Section of the province. This area is characterized by pre-glacial erosional topography with locally-thick glacial deposits. Local relief is generally 100 to 300 feet.

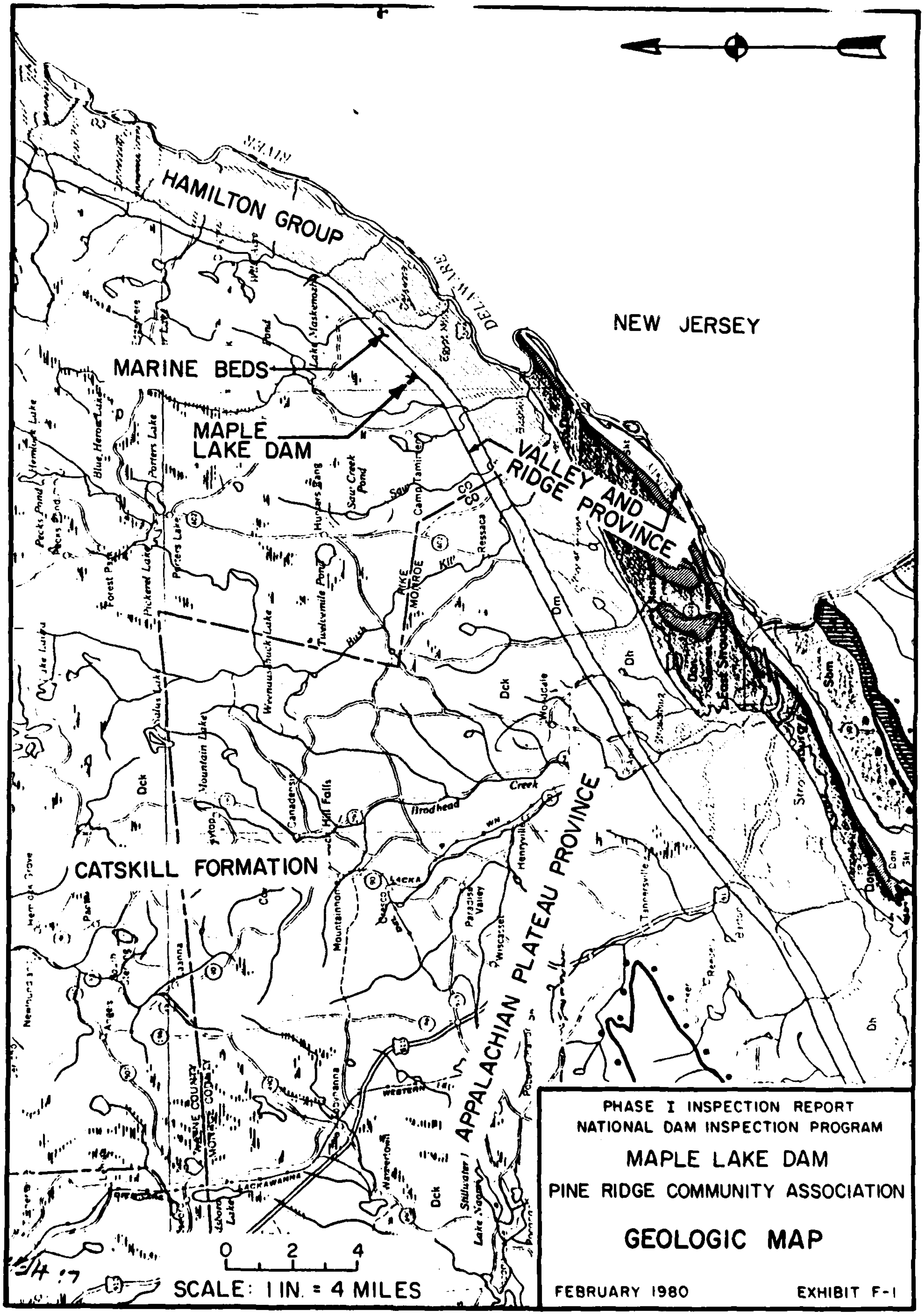
Bedrock units of the sections described above are the lithified sediments of offshore marine, marginal marine, deltaic and fluvial environments associated with the Devonian Period. These units include siltstones of the Mahantango Formation, siltstones and shales of the Trimmers Rock, and seven mapped members of the Catskill Formation. These members include sandstones, siltstones, and shales of the Towamensing Member; sandstone, siltstone and shale of the Walcksville Member; sandstones, siltstones and shale of the Beaverdam Run Member; sandstone and shale in the Long Run Member; sandstones and conglomerates in the Packerton Member; sandstones and some conglomerates in the Poplar Gap Member; and sandstones and conglomerates in the Duncannon Member.

Maple Lake Dam is underlain by the Walcksville Member of the Catskill Formation. The Walcksville Member is a cyclic sequence of sandstones and shales with some interbedded siltstones. Sandstones in this member are predominantly medium-to thick-bedded, well-sorted quartz grains in a clay matrix with a silica cement. Within the sandstone there are a few interbedded shale chip conglomerates. Shales occur primarily as non-fissile to sub-fissile thin beds, with some grading into siltstone. All lithologies in this member exhibit low porosity except where fractured by cleavage and jointing.

Sandstones and siltstones associated with the Walcksville Member are reported to maintain steep cut slopes. However, the shales weather rapidly when exposed. Slopes cut parallel to bedding strike may result in block slides on interbedded shales. The sandstones are good foundations for heavy structures.

Bedrock in the area is almost entirely overlain by glacial till of Late Wisconsin Age. This till is an unsorted mixture of clay, silt, sand, and gravel. It is moderately cohesive, and is derived locally from the sandstones of the Catskill Formation.

The records of foundation investigation for Maple Lake Dam indicate that bedrock at the site was overlain with 0 to 6.5 feet of the glacial till. The bedrock exposed at the site was reported to be a medium-hard sandstone with nearly horizontal bedding. The bedrock was reported to be fractured near the surface. The cutoff trench was designed to be constructed to a depth of one foot into sound rock to minimize seepage.



PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

MAPLE LAKE DAM

PINE RIDGE COMMUNITY ASSOCIATION

GEOLOGIC MAP

FEBRUARY 1980 EXHIBIT F-1