

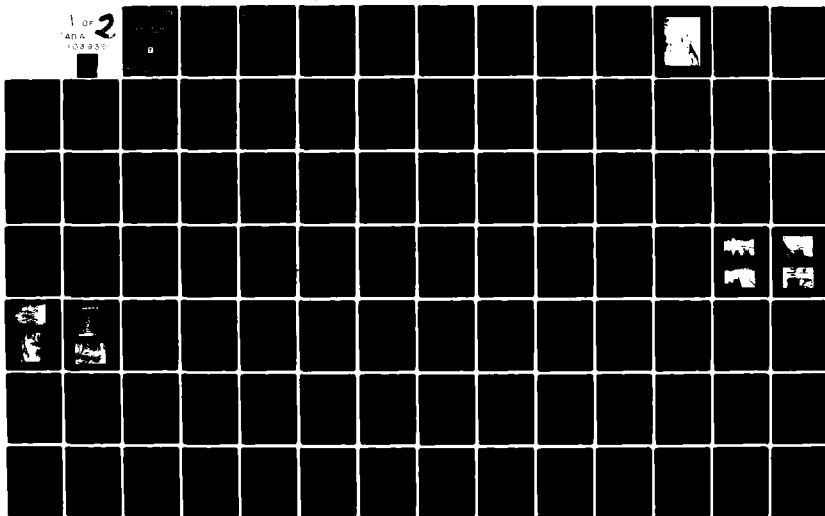
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NEW JERSEY DEPT OF ENVIRONMENTAL PROTECTION TRENTON --ETC F/G 13/13
NATIONAL DAM SAFETY PROGRAM, MAPLE LAKE DAM (NJ 00776), PASSAIC--ETC(U)
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PASSAIC RIVER BASIN
GOFFLE BROOK, BERGEN COUNTY.
NEW JERSEY

MAPLE LAKE DAM NJ 00776

PHASE 1 INSPECTION REPORT NATIONAL DAM SAFETY PROGRAM



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DEPARTMENT OF THE ARMY

Philadelphia District
Corps of Engineers
Philadelphia, Pennsylvania

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20. ABSTRACT (Continue on reverse side if necessary and identify by block number) This report cites results of a technical investigation as to the dam's adequacy. The inspection and evaluation of the dam is as prescribed by the National Dam Inspection Act, Public Law 92-367. The technical investigation includes visual inspection, review of available design and construction records, and preliminary structural and hydraulic and hydrologic calculations, as applicable. An assessment of the dam's general condition is included in the report.		

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DEPARTMENT OF THE ARMY
PHILADELPHIA DISTRICT CORPS OF ENGINEERS
CUSTOM HOUSE - 2 D & CHESTNUT STREETS
PHILADELPHIA, PENNSYLVANIA 19106

Honorable Brendan T. Byrne
Governor of New Jersey
Trenton, New Jersey 08621

31 AUG 1981

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Dear Governor Byrne:

Inclosed is the Phase I Inspection Report for Maple Lake Dam in Bergen County, New Jersey which has been prepared under authorization of the Dam Inspection Act, Public Law 92-367. A brief assessment of the dam's condition is given in the front of the report.

Based on visual inspection, available records, calculations and past operational performance, Maple Lake Dam, a high hazard potential structure, is judged to be in poor overall condition. The dam's spillway is considered inadequate because a flow equivalent to 21 percent of the Spillway Design Flood - SDF - would cause the dam to be overtopped. (The SDF, in this instance, is one half of the Probable Maximum Flood.) The decision to consider the spillway "inadequate" instead of "seriously inadequate" is based on the determination that dam failure resulting from overtopping would not significantly increase the hazard to loss of life downstream from the dam from that which would exist just before overtopping failure. To ensure adequacy of the structure, the following actions, as a minimum are recommended:

a. The spillway's adequacy should be determined by a qualified professional consultant engaged by the owner using more sophisticated methods, procedures, and studies within six months from the date of approval of this report. Within three months of the consultant's findings, remedial measures to ensure spillway adequacy should be initiated.

b. Within 30 days from the date of approval of this report the owner should engage a qualified professional consultant to design and oversee procedures for the removal of trees, vines, and brush from the upstream and downstream slopes and for a distance of 25 feet from the downstream toe of the dam or limits of property, whichever is less.

c. Within six months from the date of approval of this report the owner should engage a qualified professional consultant to perform the following:

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(1) Design and oversee repairs for the eroded areas on the downstream slope adjacent to the spillway, along the toe, and at the footpaths near the steel grating stairway.

(2) Design necessary remedial measures to prevent erosion of the toe by water flowing in the discharge channel downstream from the spillway.

(3) Design or specify repairs for the erosion of the upstream slope of the dam and design and specify erosion protection for the upstream slope of the dam.

(4) Investigate the cause of the wet, soft area 20 feet downstream from the toe of the dam near the left bank of the spillway channel.

(5) Design or specify reconstruction of the spillway and abutment walls.

(6) Design or specify repairs to the low level outlet.

(7) Design and oversee repairs to the cracked concrete core walls and upstream concrete walls.

d. Within three months from the date of approval of this report, the following remedial actions should be initiated:

(1) Start a program of checking the condition of the dam periodically and monitoring the wet area downstream from the toe of the downstream slope.

(2) Clear trees and brush from the discharge channel and from a zone 25 feet on either side of the discharge channel or to the property line, whichever is the lesser distance, from the spillway stilling basin to the next pond downstream.

(3) Control trespassing the dam.

(4) Start a program for maintaining the embankment free of weeds, brush, vines, and trees.

e. Within six months from the date of approval of this report the following remedial actions should be initiated:

(1) Backfill animal burrows with properly selected materials.

(2) Repair steel stairs on downstream face of dam.

f. The owner should develop written operating procedures and a periodic maintenance plan to ensure the safety of the dam, within one year from the date of approval of this report.

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Honorable Brendan T. Byrne

g. An emergency action plan and warning system should be developed which outlines actions to be taken by the owner to minimize the downstream effects of an emergency at the dam within six months from the date of approval of this report.

A copy of the report is being furnished to Mr. Dirk C. Hofman, New Jersey Department of Environmental Protection, the designated State Office contact for this program. Within five days of the date of this letter, a copy will also be sent to Congresswoman Roukema of the Seventh District. Under the provision of the Freedom of Information Act, the inspection report will be subject to release by this office, upon request, five days after the date of this letter.

Additional copies of this report may be obtained from the National Technical Information Services (NTIS), Springfield, Virginia 22161 at a reasonable cost. Please allow four to six weeks from the date of this letter for NTIS to have copies of the report available.

An important aspect of the Dam Inspection Program will be the implementation of the recommendations made as a result of the inspection. We accordingly request that we be advised of proposed actions taken by the State to implement our recommendations.

Sincerely,



ROGER L. BALDWIN
Lieutenant Colonel, Corps of Engineers
Commander and District Engineer

Incl
As stated

Copies furnished:

Mr. Dirk C. Hofman, P.E., Deputy Director
Division of Water Resources
N.J. Dept. of Environmental Protection
P.O. Box CN029
Trenton, NJ 08625

Mr. John O'Dowd, Acting Chief
Bureau of Flood Plain Regulation
Division of Water Resources
N.J. Dept. of Environmental Protection
P.O. Box CN029
Trenton, NJ 08625

MAPLE LAKE DAM (NJ00776)

CORPS OF ENGINEERS ASSESSMENT OF GENERAL CONDITIONS

This dam was inspected on 23 April 1981, by Anderson-Nichols and Co. Inc., under contract to the State of New Jersey. The State, under agreement with the U.S. Army Engineer District, Philadelphia, had this inspection performed in accordance with the National Dam Inspection Act, Public Law 92-367.

Maple Lake Dam, a high hazard potential structure, is judged to be in poor overall condition. The dam's spillway is considered inadequate because a flow equivalent to 21 percent of the Spillway Design Flood - SDF - would cause the dam to be overtopped.. (The SDF, in this instance, is one half of the Probable Maximum Flood.) The decision to consider the spillway "inadequate" instead of "seriously inadequate" is based on the determination that dam failure resulting from overtopping would not significantly increase the hazard to loss of life downstream from the dam from that which would exist just before overtopping failure. To ensure adequacy of the structure, the following actions, as a minimum are recommended:

a. The spillway's adequacy should be determined by a qualified professional consultant engaged by the owner using more sophisticated methods, procedures, and studies within six months from the date of approval of this report. Within three months of the consultant's findings, remedial measures to ensure spillway adequacy should be initiated.

b. Within 30 days from the date of approval of this report the owner should engage a qualified professional consultant to design and oversee procedures for the removal of trees, vines, and brush from the upstream and downstream slopes and for a distance of 25 feet from the downstream toe of the dam or limits of property, whichever is less.

c. Within six months from the date of approval of this report the owner should engage a qualified professional consultant to perform the following:

(1) Design and oversee repairs for the eroded areas on the downstream slope adjacent to the spillway, along the toe, and at the footpaths near the steel grating stairway.

(2) Design necessary remedial measures to prevent erosion of the toe by water flowing in the discharge channel downstream from the spillway.

(3) Design or specify repairs for the erosion of the upstream slope of the dam and design and specify erosion protection for the upstream slope of the dam.

(4) Investigate the cause of the wet, soft area 20 feet downstream from the toe of the dam near the left bank of the spillway channel.

(5) Design or specify reconstruction of the spillway and abutment walls.

(6) Design or specify repairs to the low level outlet.

(7) Design and oversee repairs to the cracked concrete core walls and upstream concrete walls.

d. Within three months from the date of approval of this report, the following remedial actions should be initiated:

(1) Start a program of checking the condition of the dam periodically and monitoring the wet area downstream from the toe of the downstream slope.

(2) Clear trees and brush from the discharge channel and from a zone 25 feet on either side of the discharge channel or to the property line, whichever is the lesser distance, from the spillway stilling basin to the next pond downstream.

(3) Control trespassing the dam.

(4) Start a program for maintaining the embankment free of weeds, brush, vines, and trees.

e. Within six months from the date of approval of this report the following remedial actions should be initiated:

(1) Backfill animal burrows with properly selected materials.

(2) Repair steel stairs on downstream face of dam.

f. The owner should develop written operating procedures and a periodic maintenance plan to ensure the safety of the dam, within one year from the date of approval of this report.

g. An emergency action plan and warning system should be developed which outlines actions to be taken by the owner to minimize the downstream effects of an emergency at the dam within six months from the date of approval of this report.

APPROVED:



ROGER L. BALDWIN
Lieutenant Colonel, Corps of Engineers
Commander and District Engineer

DATE:

31 Aug 31

PHASE I INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM

Name of Dam:	Maple Lake
Identification No.:	Fed ID No. NJ00776
State Located:	New Jersey
County Located:	Bergen
Stream:	Goffle Brook
River Basin:	Passaic
Date of Inspection:	April 23, 1981

ASSESSMENT OF GENERAL CONDITIONS

Maple Lake Dam is an earthfill and concrete dam, possibly 80 years old but extensively rebuilt in 1947, that is in poor overall condition. It is small in size and should retain its high hazard classification. Trees, brush and vines are growing on the dam's earthen slopes making visual inspection difficult. Erosion has occurred on the upstream slope between the core wall and reservoir level. Erosion gullies varying in width up to 3 feet and ranging from 4 to 8 inches deep have developed at many locations on the downstream slope. Some animal burrows were found on the downstream slope. Several transverse hairline cracks were found in the concrete apron and 2-foot thick core-wall on the right side of the dam. Four transverse cracks, one badly spalled and eroded, were noted on the left side core-wall. Spalling and cracking of the spillway abutments was noted, and a major vertical crack about 2 inches deep was observed in the downstream face of the concrete spillway. The low-level pipe has several large boulders covering its outlet. The valve box for the pipe is submerged and does not appear to have been operated for a long time. Debris and boulders have accumulated in the stilling basin and discharge channel. The downstream channel has trees growing on the eroded banks. Another very low dam about 200 feet downstream ponds water up to the stilling basin intermittently. Only one area about 20 feet downstream of the toe to the left of the spillway channel was found to be wet and soft. The spillway will pass about 20 percent of the one-half Probable Maximum Flood and is considered inadequate.

We recommend that the owner retain the services of a professional engineer, qualified in the design and inspection of dams, to accomplish the following immediately: Design and oversee procedures for the removal of trees, vines, and brush from the upstream and downstream slopes and for a distance of 25 feet from the downstream toe of the dam or limits of property whichever is less; soon: design and oversee repairs for the eroded areas on the downstream slope adjacent to the spillways along the toe, and at the footpaths near the steel grating stair; design necessary remedial measures to prevent erosion of the toe by water flowing in the discharge channel downstream from the spillway; design or specify repairs for the erosion of the upstream slope of the dam and design and specify erosion protection for the upstream slope of the dam; investigate the cause of the

wet, soft area 20 feet downstream from the toe of the dam near the left bank of the spillway channel; design or specify reconstruction of the spillway and abutment walls; design or specify repairs to the low-level outlet; and design and oversee repairs to the cracked concrete corewalls and upstream concrete walls. In the near future: Perform a more detailed hydrologic/hydraulic evaluation of the inadequacy of the spillway and design and implement necessary remedial measures; and backfill animal burrows.

We also recommend that, as part of operating and maintenance procedures, the owner should accomplish the following in the time periods specified: Starting very soon: Begin a program of checking the condition of the dam periodically and monitoring the wet area downstream from the toe of the downstream slope; clear trees and brush from the discharge channel and from a zone 25 feet on either side of the discharge channel or to the property line, whichever is the lesser distance, from the spillway stilling basin to the next pond downstream; control trespassing on dam; and start a program for maintaining the embankment free of weeds, brush, vines, and trees. Starting soon: Develop an emergency action plan which outlines actions taken by the owner to minimize downstream effects of an emergency at the dam; and repair steel stairs on downstream face of dam. In the near future: Develop written operating procedures and a periodic maintenance plan to ensure the safety of the dam.

ANDERSON-NICHOLS & COMPANY, INC.



Warren A. Guinan, P.E.
Project Manager
New Jersey 16848



OVERVIEW PHOTO

CAPITOL HILL

February 17, 1961

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. 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 continued care and inspection can there be any chance that unsafe conditions be detected.

Phase I inspections are not intended to provide detailed hydrologic and hydraulic analyses. In accordance with the established Guidelines, the Spillway Test Flood is based on the estimated "Probable Maximum Flood" for the region (greatest reasonable possible storm runoff), or fractions thereof. The test 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.

CONTENTS

PHASE I INSPECTION REPORT MAPLE LAKE DAM SAFETY REPORT

MAPLE LAKE DAM FED ID NO. NJ00776

SECTION		<u>Page</u>
SECTION 1	PROJECT INFORMATION	
	1.1 <u>General</u>	1
	1.2 <u>Project Description</u>	1
	1.3 <u>Pertinent Data</u>	3
SECTION 2	ENGINEERING DATA	
	2.1 <u>Design</u>	6
	2.2 <u>Construction</u>	6
	2.3 <u>Operation</u>	6
	2.4 <u>Evaluation</u>	6
SECTION 3	VISUAL INSPECTION	7
SECTION 4	OPERATIONAL PROCEDURES	
	4.1 <u>Procedures</u>	9
	4.2 <u>Maintenance of Dam</u>	9
	4.3 <u>Maintenance of Operating Facilities</u>	9
	4.4 <u>Warning System</u>	9
	4.5 <u>Evaluation of Operational Adequacy</u>	9
SECTION 5	HYDRAULIC/HYDROLOGIC	10
SECTION 6	STRUCTURAL STABILITY	12
SECTION 7	ASSESSMENT, RECOMMENDATIONS/REMEDIAL MEASURES	
	7.1 <u>Assessment</u>	14
	7.2 <u>Recommendations/Remedial Measures</u>	14
FIGURES	1. Essential Project Features	
	2. Regional Vicinity Map	
APPENDICES	1. Engineering and Experience Data	
	2. Check List Visual Inspection	
	3. Photographs	
	4. Hydrologic Computations	
	5. HEC1 Output	
	6. References	

PHASE I INSPECTION REPORT
NATIONAL DAM SAFETY INSPECTION PROGRAM
MAPLE LAKE DAM
FED ID NO. #NJ00776

SECTION 1
PROJECT INFORMATION

1.1 General

a. Authority. Authority to perform the Phase I Safety Inspection of Maple Lake Dam was received from the State of New Jersey, Department of Environmental Protection, Division of Water Resources by letter dated 12 December 1980 under Basic Contract No. FPM-39 and Contract No. A01093 dated 10 October 1979. This Authority was given pursuant to the National Dam Inspection Act, Public Law 92-367 and by agreement between the State and the U.S. Army Engineers District, Philadelphia. The inspection discussed herein was performed by Anderson-Nichols & Company, Inc.

b. Purpose: The purpose of the Phase I Investigation is to develop an assessment of the general conditions with respect to the safety of Maple Lake Dam and appurtenances. Conclusions are based upon available data and visual inspection. The results of this study were used to determine any need for emergency measures and to conclude if additional studies, investigations, and analyses are necessary and warranted.

1.2 Project Description

a. Description of Dam and Appurtenances. Maple Lake Dam is an earth fill and concrete dam, with a hydraulic height of 13.9 feet, a structural height of 14.5 feet and a length of 290 feet. The dam has a concrete core wall that is visible the entire length of the dam. The dam crest is grass-covered and has an average width of 15 feet. On the right side of the dam, approximately 12.5 feet from the upstream face lies the center line of either a 3-foot wide concrete sidewalk or another concrete core wall which extends approximately 37 feet. The upstream side of the dam crest has, on both sides of the spillway, concrete platforms used for recreation. Beyond the concrete platforms on both the right and left of the upstream side are earthen embankments. The upstream face of the dam is vertical concrete. The downstream face is a 2H:1V sloped, earthen embankment. The concrete spillway is 48 feet long, located approximately 91 feet from the road on the right

overbank. The spillway crest is flat, 2.4 feet wide, with the upstream face vertical and the downstream face sloped 2H:3V. The stilling basin at the toe of the spillway is approximately 38 feet long, 20 feet wide, and has a 2-foot end wall with a 3-foot wide overflow weir. The low-level outlet, probably a 12-inch pipe, leads from a valve box at the left upstream end of the spillway, through the dam, and along the left end of the stilling basin. The pipe is encased in concrete downstream of the spillway.

b. Location. Maple Lake Dam is located on Goffle Brook in Wycoff Township, Bergen County, New Jersey. The dam is at 40° 59.9' north latitude 74° 09.6' west longitude on the Paterson Quadrangle. A location map has been included as Figure 2. It may be reached by driving on Newton Road northward from U.S. Route 202 to the railroad station in Wortendyke; the dam is about 100 yards west of the station just south of the railroad track.

c. Size Classification. Maple Lake Dam is classified as being small in size on the basis of storage at the dam crest of 57.5 acre-feet, which is less than 1000 acre-feet but more than 50 acre-feet, and on the basis of its structural height of 14.5 feet, which is less than 40 feet, in accordance with criteria given in the Recommended Guidelines for Safety Inspection of Dams.

d. Hazard Classification. Visual inspection of the area below Maple Lake Dam revealed a single house just upstream of Newton Road, approximately 1300 feet downstream of the dam. Analyses indicated that up to 1.5 feet of water could flood the first floor of the house. The house is of frame construction and would probably be destroyed, thus endangering the lives of the six occupants. Newton Road, at the same elevation as the first floor of the house, would also suffer some property damage from the 1.5 feet of water. For these reasons the dam is given a High Hazard classification.

e. Ownership. The dam is owned by the Canterbury Development Corporation. The corporate officers may be reached by writing to Mr. Morris Sarna, 2375 Hudson Terrace, Fort Lee, New Jersey 07024.

f. Purpose. Maple Lake Dam was rebuilt for recreational use. Its original purpose is not known.

g. Design and Construction History. Plan #419, dated March 27, 1947 of "Existing Conditions After Repairs and New Construction," done by Frank D. Livermore, Engineer, are on file at the New Jersey Department of Environmental Protection, Prospect Street, Trenton, New Jersey 08625.

h. Normal Operational Procedure. No operational procedures were found for the dam.

i. Site Geology. No site specific geologic information (such as borings) was available at the time the dam was inspected. Information derived from the Geologic Map of New Jersey (Kummel and Johnson, 1912) and the Glacial Drift of New Jersey (Salisbury, Kummel, Peet and Whitson, 1902) indicates soils within the immediate site consist of stratified drift which may be comprised of sand and gravel plains, deltas, eskers, kames, and terraces.

No bedrock outcrops were observed during the dam inspection. The previously mentioned geologic map indicates that bedrock in this area consists of soft red shale and sandstone of Triassic age.

1.3 Pertinent Data

a. Drainage Area

2.21 square miles

b. Discharge at Damsite (cfs)

Maximum flood at damsite - unknown.

Total ungated spillway capacity at maximum pool (top of dam) elevation - 771

c. Elevation (ft. above NGVD)

Top of dam - 287.9

Maximum pool test flood surcharge - 289.3

Recreation pool (at time of inspection) - 285

Spillway crest - 285

Streambed at centerline of principal spillway - 274

Maximum tailwater (estimated) - 278

d. Reservoir (Length in feet)

Maximum pool - 800 (estimated)

Spillway crest - 700

e. Storage (acre-feet)

Spillway crest - 38.4

Top of dam - 57.5

Test flood - 75

f. Reservoir Surface (acres)

Top of dam - 9.6

Spillway crest - 6.4

g. Dam

Type - earthfill and concrete

Length - 290 feet

Height - 13.9 feet (hydraulic)

- 14.5 feet (structural)

Top width - 15 feet

Side slopes - upstream vertical, downstream 2H:1V

Zoning - unknown

Impervious core - concrete

Cutoff - unknown

Grout curtain - unknown

h. Spillway

Type - Broad crested, concrete

Length of weir - 48 feet

Crest elevation - 285 feet NGVD

Low level outlet - 12 inch pipe (estimated size)

U/S channel - Maple Lake

D/S channel - Goffle Brook

i. Regulating Outlets

Type - 1 foot x 2.5 foot concrete box encasing a
12-inch pipe

Length - 40 feet (estimated)

Access - valve box at upstream left end of spillway

SECTION 2 ENGINEERING DATA

2.1 Design

No hydraulic, hydrologic, or other design engineering data were disclosed. The design plans dated 1947 on file at NJDEP were in basic agreement with what was observed in the field. The dam plans from NJDEP did not show the low level outlet that was observed.

2.2 Construction

No recorded data concerning construction of the Maple Lake Dam were disclosed. The plans on file with NJDEP are plans detailing improvements made in 1947.

2.3 Operation

No data pertaining to the operation of the dam were found.

2.4 Evaluation

a. Availability. A search of the New Jersey Department of Environmental Protection files, and contact with community officials revealed a limited amount of information. All disclosed information with a copy of the plans was retrieved.

b. Adequacy. The plans, supplemented by visual inspection, are deemed adequate to complete this inspection.

SECTION 3 VISUAL INSPECTION

3.1 Findings

a. Dam. Trees are growing on the crest and upstream slope of the dam to the left of the spillway, on the downstream slope, and in the area at the downstream toe of the dam. The extensive vegetation on the downstream slope made it difficult to investigate the slopes thoroughly during the site visit.

The crest of the dam to the right of the spillway is comprised of a concrete apron, a 2-foot wide concrete core wall and zone of sandy soil which is partially covered with grass and vines. A 3-foot wide concrete wall was uncovered to the right of the spillway at the downstream edge of the crest which may be the top surface of another core wall. Several clusters of trees were growing near the waterline to the left of the upstream concrete apron on the left side of the dam. Erosion had occurred on the upstream slope between the core wall and reservoir level.

Erosion gullies varying in width up to 3 feet and 4 to 8 inches deep have developed at many locations on the downstream slope. Several paths are located near the steel grating stairway on the left side of the dam.

Several transverse hairline cracks were observed in the concrete apron and 2-foot thick core wall on right side. Four transverse cracks, one badly spalled and eroded, were visible on the concrete core wall, left of the spillway.

Large boulders up to 2 to 3 feet in diameter were incorporated into the lower half of slope to the right of the spillway wingwall. The boulders were partially obscured by the extensive vine growth on the slope. The area along the downstream toe exhibited no evidence of being wet and soft except for one area approximately 20 feet downstream from the toe near the left side of the spillway channel. A zone of erosion approximately 20 feet wide has occurred along the toe of the dam to the left of the spillway channel. Many boulders have been placed adjacent to the toe along this zone.

Some animal burrows and numerous small erosion gullies were observed on the downstream slope.

Another zone of small boulders was observed adjacent to the downstream toe in the vicinity of the left abutment.

b. Appurtenant Structures.

1. Ungated Spillway. The 48-foot wide concrete spillway near the center of the dam is badly spalled and eroded. One major vertical crack, up to 2 inches wide and approximately 2 inches deep, was observed on the downstream face. However, this crack shows no evidence of seepage. Both abutment walls to the spillway are badly eroded and undermined, where the abutments are in contact with the water. The right concrete spillway abutment wall has a vertical crack in the vicinity of the downstream edge of the crest, which is indicative of settlement or differential movement.
2. Gated Outlet. The downstream end of the low level outlet is badly spalled and covered with debris. The submerged valve chamber is visible on the upstream face but the valve size and condition could not be determined at the time of inspection; the operating hand wheel was missing. (Valve estimated to be 12 inches).

The entrance to the ungated spillway was generally clear of obstructions. Debris and boulders were observed on the floor of the discharge channel, both adjacent to the spillway in the stilling basin and downstream in the adjacent pond. Several boulders have been displaced from the masonry stone walls at the ends of the concrete spillway wingwalls along both sides of the spillway.

c. Reservoir Area. The watershed above the lake is gently to moderately sloping and wooded. A public beach exists along a portion of the left side of the reservoir. Slopes on the shore of the lake appear stable. No evidence of significant sedimentation was observed.

d. Downstream Channel. Erosion has occurred on the right and left banks of the channel immediately downstream of the channel for a distance of 50 to 100 feet. Trees are growing on the banks of the channel downstream of the spillway. Another low dam is located downstream which is ponding water adjacent to the stilling basin.

SECTION 4 OPERATIONAL PROCEDURES

4.1 Procedures

No formal operating procedures were disclosed.

4.2 Maintenance of Dam

No formal maintenance procedures for the dam were found, but from its condition, it is apparent that maintenance is needed to prevent serious deterioration of the structure.

4.3 Maintenance of Operating Facility

No formal maintenance procedures for the operating facilities were disclosed. From the condition of the gate valve stem, it appeared that little maintenance had been done.

4.4 Warning System

No description of any warning system was disclosed.

4.5 Evaluation of Operational Adequacy

Because of the lack of operation and maintenance procedures, the remedial measures described in Section 7.2 should be implemented as prescribed.

SECTION 5
HYDROLOGIC/HYDRAULIC

5.1 Evaluation of Features

a. Design Data. Because no hydrologic or hydraulic data were revealed an evaluation could not be performed.

b. Experience Data. No experience data were found.

c. Visual Observation. The visual inspection revealed that the concrete spillway has a major vertical crack up to 2 inches deep in the downstream face. The spillway abutment walls are eroded and spalled. Some of the stone masonry in the wing walls has fallen. The stilling basin has an accumulation of large stones and debris in it. The valve box for the low-level outlet is of the submerged type on the upstream left end of the spillway. Only the valve stem was observable in the valve box. The pipe and valve are estimated to be 12-inch. The pipe is encased in concrete that measures about 2.5 feet wide by 1 foot deep and the outlet end was essentially blocked by large stones so that the actual size of the pipe could not be determined. The valve stem did not appear to have been operated recently.

d. Maple Lake Overtopping Potential. The hydraulic/hydrologic evaluation for the dam is based on a selected Spillway Design Flood (SDF) equal to one-half the Probable Maximum Flood (PMF) in accordance with the range of test floods given in the evaluation guidelines, for dams classified as high hazard and small in size. The PMF was determined by application of a 24-hour Probable Maximum Storm of 22 inches to the SCS dimensionless unit hydrograph. Hydrologic computations are given in Appendix 4. The routed half-PMF peak discharge for the subject drainage area is 3501 cfs.

The minimum elevation of the dam allows 2.9 feet of depth above the spillway, before overtopping occurs. Under this head the total spillway capacity is 711 cfs, which is less than the selected SDF (approximately 20 percent).

Flood routing calculations indicate that Maple Lake Dam will be overtopped for 6.3 hours to a maximum depth of 2.1 feet under half-PMF conditions. It is estimated that the spillway can pass about 20 percent of the half-PMF without overtopping the dam; thus, the spillway is considered inadequate.

Because of the poor condition of the dam and the High Hazard classification based on visual inspection, a breach analysis was performed to assess the increase in downstream hazard under dam failure conditions. The results of the breach analysis, for the one-half PMF test flood contained in Appendix 5, show that the downstream hazard is not worsened under dam failure conditions.

Under one-quarter PMF conditions, failure of the dam increases the flood stage by 2.2 feet at the damage center. However, it is unlikely that the dam would fail from a one-quarter PMF discharge, which creates 4.3 hours of overtopping to a maximum depth of 0.6 foot.

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SECTION 6 STRUCTURAL STABILITY

6.1 Evaluation of Structural Stability. The presence of a dense growth of trees, brush and vines on the downstream slope, and grass, vines and coarse weed at the downstream edge of the crest makes it impossible to make an adequate visual inspection of the embankment.

Trees growing on the upstream and downstream slopes of the embankment and in the area immediately downstream of the toe may blow over and pull out their roots or they may die with the result that their roots rot. In either case, serious seepage and erosion problems could result.

Erosion immediately adjacent to the right and left spillway wingwalls, if not controlled, could contribute to stability problems in the spillway structure and contribute to a possible breach of the embankment.

The vertical crack in the right spillway abutment wall is evidence of movement. If the movement continues, a spillway and embankment stability problem could result.

The erosion paths and gullies, bare of vegetation from the crest to the downstream toe of the embankment, are susceptible to erosion and consequent damage, owing to runoff of rainfall.

Flow of water in the discharge channel could erode the toe of embankment on the left side of the dam and result in a stability problem of the downstream slope.

The soft, wet area approximately 20 feet downstream of the toe to the left of the spillway channel may be the result of seepage under the dam which, if not properly controlled, could lead to failure of the dam by piping.

Based on the visual inspection alone, it is not possible to determine the character of the dam and spillway foundations or the interior of the cross section of the embankment or the shape of the upstream side of the dam. Therefore, it is not possible to evaluate the factor of safety of the dam and spillway against slope failure, sliding or overturning.

6.2 Design and Construction Data. No design or construction data pertinent to the structural stability of the dam are available.

6.3 Operating Records. No operating records pertinent to the structural stability of the dam were available.

6.4 Post-Construction Changes. "Existing Conditions after Repairs and New Construction", Plan #419, dated March 27, 1947 were done by Frank D. Livermore and are on file at the New Jersey Department of Environmental Protection, Prospect Street, Trenton, New Jersey 08625.

6.5 Seismic Stability. This dam is in Seismic Zone 1. According to the Recommended Guidelines, dams located in Seismic Zone 1 "may be assumed to present no hazard from earthquake provided static stability conditions are satisfactory and conventional safety margins exist." Although no signs of unstable slopes were observed, adequate inspection was impossible because of the dense growth on the downstream crest and the downstream slopes of the dam. Because no data are available concerning the engineering properties of the embankment, foundation materials, or for the condition at the base of the corewall, it is impossible to make an engineering evaluation of the stability of the slopes or the factor of safety under static conditions.

SECTION 7
ASSESSMENT, RECOMMENDATIONS/REMEDIAL MEASURES

7.1 Dam Assessment

- a. Condition. Maple Lake Dam is estimated to be perhaps 80 years old and in poor overall condition.
- b. Adequacy of Information. The information available is such that the assessment of the dam must be based primarily on the results of the visual inspection.
- c. Urgency. The recommendations made in 7.2.a and 7.2.b should be implemented by the owner as prescribed.
- d. Necessity for Additional Data/Evaluation. The information available from the visual inspection is adequate to identify the potential problems which are listed in 7.2.a. These problems require the attention of a professional engineer who will have to make additional engineering studies to design or specify remedial measures to rectify the problems. If left unattended, the problems could lead to failure of the dam.

7.2 Recommendations/Remedial Measures

- a. Recommendations. The owner should retain a professional engineer qualified in the design and construction of dams to accomplish the following in the time periods specified:

Immediately:

Design and oversee procedures for the removal of trees, vines, and brush from the upstream and downstream slopes and for a distance of 25 feet from the downstream toe of the dam or limits of property, whichever is less.

Starting Soon:

1. Design and oversee repairs for the eroded areas on the downstream slope adjacent to the spillway, along the toe, and at the footpaths near the steel grating stairway.
2. Design necessary remedial measures to prevent erosion of the toe by water flowing in the discharge channel downstream from the spillway.
3. Design or specify repairs for the erosion of the upstream slope of the dam and design and specify erosion protection for the upstream slope of the dam.

4. Investigate the cause of the wet, soft area 20 feet downstream from the toe of the dam near the left bank of the spillway channel.
5. Design or specify reconstruction of the spillway and abutment walls.
6. Design or specify repairs to the low level outlet.
7. Design and oversee repairs to the cracked concrete core walls and upstream concrete walls.

In the near Future:

1. Perform a more detailed hydrologic/hydraulic evaluation of the inadequacy of the spillway and design and implement necessary increased capacity.
2. Backfill animal burrows with properly selected materials.

b. Operating and Maintenance Procedures. The owner should accomplish the following very soon.

1. Start a program of checking the condition of the dam periodically and monitoring the wet area downstream from the toe of the downstream slope.
2. Clear trees and brush from the discharge channel and from a zone 25 feet on either side of the discharge channel or to the property line, whichever is the lesser distance, from the spillway stilling basin to the next pond downstream.
3. Control trespassing on dam.
4. Start a program for maintaining the embankment free of weeds, brush, vines, and trees.

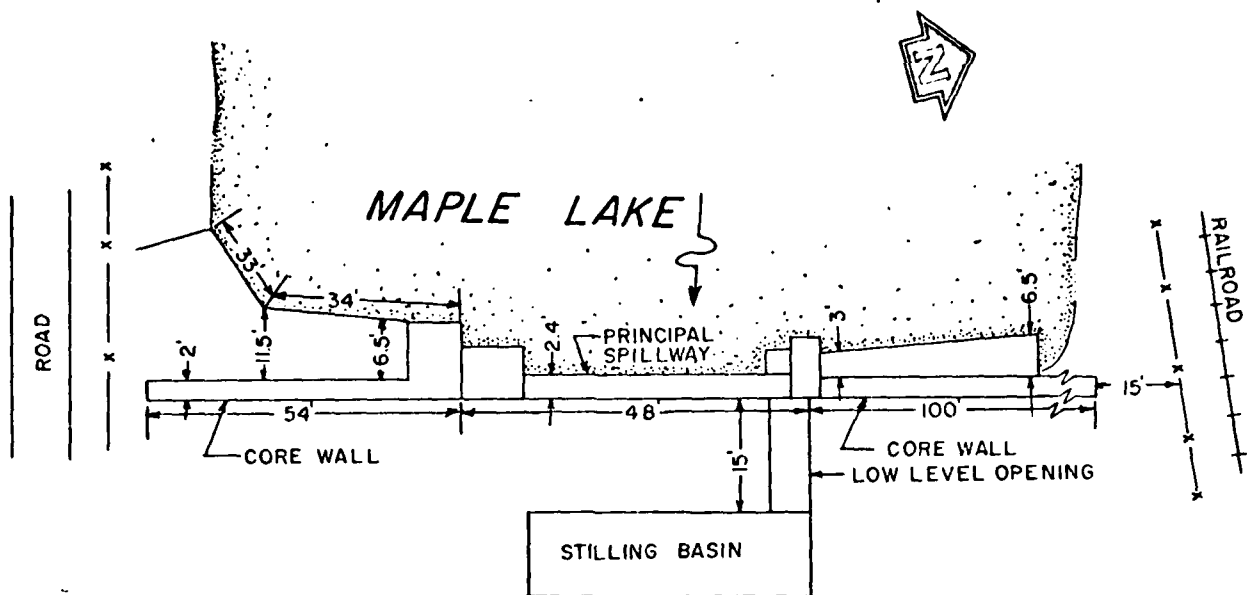
Starting Soon:

Develop an emergency action plan which outlines actions taken by the owner to minimize downstream effects of an emergency at the dam.

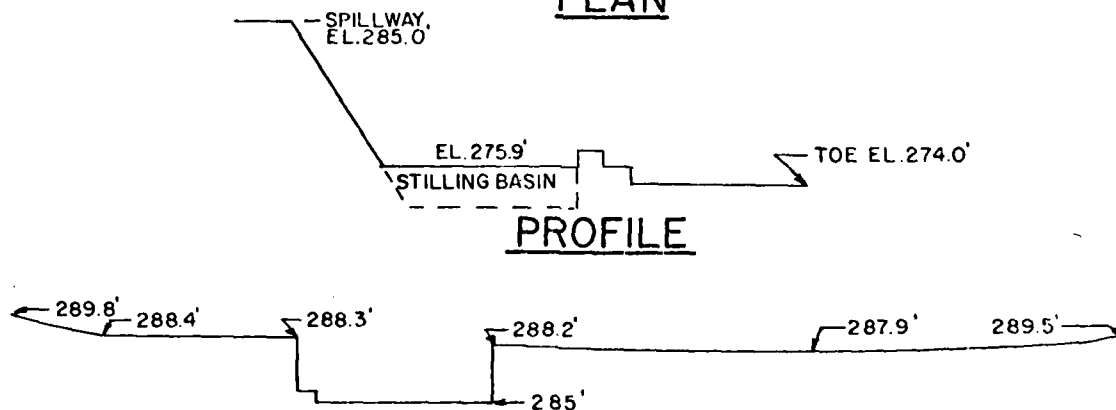
5. Repair steel stairs on downstream face of dam.

In the near Future:

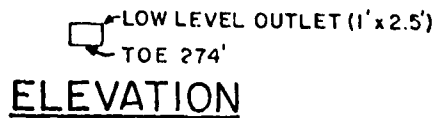
Develop written operating procedures and a periodic maintenance plan to ensure the safety of the dam.



PLAN



PROFILE



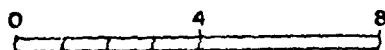
ELEVATION

Anderson-Nichols & Co., Inc.		U.S. ARMY ENGINEER DIST PHILADELPHIA	
BOSTON		CORPS OF ENGINEERS	
MASSACHUSETTS		PHILADELPHIA, PA	
NATIONAL PROGRAM OF INSPECTION OF NON-FED. DAMS			
MAPLE LAKE DAM			
GOFFLE BROOK		NEW JERSEY	
		SCALE NOT TO SCALE	
		DATE: JUNE 1981	

FIGURE -1



SCALE IN MILES



MAP BASED ON STATE OF NEW JERSEY
OFFICIAL MAP & GUIDE.

Anderson-Nichols & Co., Inc.

BOSTON

MASSACHUSETTS

U.S. ARMY ENGINEER DIST. PHILADELPHIA
CORPS OF ENGINEERS
PHILADELPHIA, PA.

NATIONAL PROGRAM OF INSPECTION OF NON-FED. DAMS

MAPLE LAKE DAM LOCATION MAP

GOFFLE BROOK

NEW JERSEY

SCALE: 1" = 4 Miles Approx.

DATE: JUNE 1941

FIGURE - 1

APPENDIX 1
ENGINEERING AND
EXPERIENCE DATA
MAPLE LAKE DAM

April 5, 1957

Mr. Garfield E. Avejarde
Maple Lake Club
Box Maple Drive
Brynckoff, New Jersey
Re: Sewer Relocation Eas. App

Dear Mr. Avejarde:

This is in reply to your recent letter relative to your proposal to relocate Coffie Brook, near the point where it enters Maple Lake, near Bortenslyke, in Bergen County.

Kindly forward a map or sketch of your property and indicate thereon the extent and location of the proposed relocation. Upon receipt of this information, you will be advised further.

Very truly yours,


George S. Ranklin
Chief Engineer and
Acting Director

SGS:mms



DRAINING PERMIT

Effective Date--March 18, 1957

TO WHOM IT MAY CONCERN:

Pursuant to the provisions of Section 2315-29,
Revised Statutes, permission is hereby granted to

E. G. AVOLARDO
804 Maple Drive
Wyckoff, New Jersey

to drain the waters of Maple Lake, for the purpose of cleaning
and making necessary repairs, under the supervision of Warden
Garret Westerveld, provided measures are taken to prevent the
destruction of the fish.

This permit expires April 18, 1957.

Director

JVM
cc. Westerveld
Water Policy
Fisheries Lab.

March 4, 1929

Mr. E. O. Avogadro
204 Maple Drive
Wyckoff, New Jersey

Re: Dam Application No. 433

Dear Sir:

This Division has been advised that you are contemplating repairs to the Maple Lake Dam across Goffle Brook, near Wertenzyke, in Bergen County. This dam was repaired about ten years ago by the former owners, Mr. & Mrs. John M. Bell.

Enclosed for your information is a copy of our booklet entitled, "Information for Applicants for Construction, Alteration or Repair of Dams". This booklet contains excerpts from the Statutes as well as the Rules and Regulations of this Division relative to the construction, reconstruction or repair of dams. Kindly advise the nature of repairs which you contemplate in order that a determination can be made as to the necessity for your obtaining a permit from this Division for such repairs.

Very truly yours,

Herman C. Wittwer
Assistant Chief Engineer

HCW:pm
Enc.

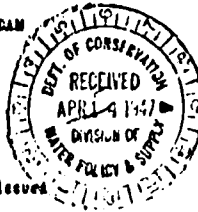
DAM APPLICATION NO. 119.....

NCW

N. J. DEPARTMENT OF CONSERVATION
DIVISION OF WATER POLICY & SUPPLY

ACCEPTANCE OF PERMIT FOR CONSTRUCTION OR REPAIR OF DAM

Division of Water Policy & Supply
Trenton, N. J.



Gentlemen:

We hereby acknowledge receipt of your permit issued
..... April 7, 1947..... in response to our application for
permit for the construction (or repair) of.....
across.....
at (near).....
Name of Stream

We hereby accept and agree to abide by and fulfill
the terms and conditions therein imposed in carrying out the
construction work therein authorized.

.....
Name of Applicant

.....
Address

..... April 11, 1947.....
Box 343

Dam Application No. 119
(21-57)

State of New Jersey
State Water Policy Commission
REPORT ON DAM APPLICATION

To the State Water Policy Commission,
State of New Jersey.

Gentlemen:

The application of John P. Sell, P. O. Box 313, Kortendyke, N. J.

Filed August 7, 1945 for approval of plans and for a permit to repair a dam
(plans filed Jan. 7, 1947)
known as Apple Lake near Kortendyke on Goffle Brook

tributary to Passaic River in Bergen County, New Jersey.

has been examined by Norman C. Mitter, Hydraulic Engineer.

PRINCIPAL FEATURES

Location 23.10.4.1.5	Site Inspected 4/27/45 - A.R.S. 5/13/46 - N.C.S.
Purpose of dam Semi-public swimming pool	Length of dam 355 feet
Drainage area 2.3 sq. mi.	Elevation of flow line 85.0 (U.S. Coast & Geodetic Datum)
Area of Lake 5.02 acres	Capacity of lake 3.5 Mill. gal.
Type of dam earth fill with concrete core wall	Top width 6 feet
Upstream slope Vertical concrete wall	Downstream slope 1 1/2:1 approx.
Foundation material Unknown	Max. height 13 feet
Type of spillway Concrete wall, C = 3.5	Length of spillway 1.5 feet
Max. head on spillway 5.3 feet dam awash	
Spillway capacity 47 sec. ft. @ 111	sec. ft. per sq. mi. dam awash
Estimated maximum flood flow 1.05	sec. ft. per sq. mi. mean Kortn & Central
Outlets other than spillway Concrete culvert 25" x 36" high	
Drawings filed by Frank D. Livermore - N. J. License 591	

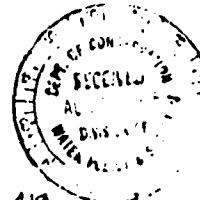
It has been found that the site for the dam is suitable and the plans adequate to ensure the construction of a structure which will not be a menace to life or property. It is therefore recommended that the plans be approved and that a permit be issued, subject, however, to the following terms and conditions:—

1. That this permit does not give any property rights, either in real estate or material, nor any exclusive privileges; neither does it authorize any injury to private property nor invasion of private rights, nor any infringement of Federal, State or local laws or regulations, nor does it waive the obtaining of Federal assent, when necessary.

Form 10-10-10

Form 10-10-10

STATE OF NEW JERSEY
DEPARTMENT OF CONSERVATION
Division of Water Policy and Supply
28 WEST STATE STREET
TRENTON 2, NEW JERSEY



TRENTON, NEW JERSEY

DAM APPLICATION No. 419

APPLICATION FOR PERMIT FOR CONSTRUCTION
OR REPAIR OF DAM

John M. Sell - New Jersey

May 6 - 1945

To the New Jersey State Water Policy Commission,
Gentlemen:—

In compliance with the provisions of Title 58, Chapter 4, Revised Statutes
(*John M. Sell* *owner* *of* *the* *dam* *known* *as* *the* *Appleton* *dam* *on* *the* *Appleton* *river* *in* *the* *County* *of* *Passaic* *in* *the* *State* *of* *New* *Jersey*)
hereby makes application for the approval of drawings and for the issuance of a permit to
construct (repair) *the* *dam* *known* *as* *the* *Appleton* *dam* *on* *the* *Appleton* *river* *in* *the* *County* *of* *Passaic* *in* *the* *State* *of* *New* *Jersey*
at a point *600* *feet* *from* *the* *mouth* *of* *the* *Appleton* *river* *in* *the* *County* *of* *Passaic* *in* *the* *State* *of* *New* *Jersey*
for the purpose of *improving* *the* *dam* *and* *as* *an* *underdrain* *for* *the* *dam*
in accordance with the following information and with the complete specifications and
drawings filed with this application and made part hereof, as follows:

Area of water shed *28* square miles
Maximum depth of lake *6 1/2* feet
Area of water surface *0* acres
Capacity of spillway at *400* *feet* *head*, *100* cubic feet per second
The character of the foundation material is *granite & bluish*

As determined by *John M. Sell*

APPENDIX 2

CHECK LIST

VISUAL INSPECTION

MAPLE LAKE DAM

Check List
Visual Inspection
Phase I

Name Dam Maple Lake County Bergen State NJ (00776) Coordinators NJDEP
 Date(s) Inspection 2/17/81 4/23/81 Weather' Rain Rain Temperature 50 ° 55 °
 Pool Elevation at Time of Inspection 285 NGVD Tailwater at Time of Inspection 276.3 NGVD

Inspection Personnel:

<u>Guinan</u>	<u>Murdock</u>
<u>Stone</u>	
<u>Gilman</u>	

Gilman/Stone Recorder

The owner was not present during inspection.

CONCRETE/MASONRY DAMS

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SURFACE CRACKS CONCRETE SURFACES	Right side - several transverse hairline cracks thru apron and 2 ft wall. Surface of concrete is eroded to expose coarse aggregate. 3 ft d/s concrete wall visible in few places. Some cracking and spalling on right end. Left side - u/s concrete wall has 4 transverse cracks, with one badly spalled and eroded. Surface laitance eroded from all concrete.	Repair cracking
STRUCTURAL CRACKING	Several transverse hairline cracks.	Repair cracking
VERTICAL AND HORIZONTAL ALIGNMENT	No indication of movement.	
MONOLITH JOINTS	Not visible.	
CONSTRUCTION JOINTS	Steel stairs on d/s right side - Steel treads, stringers and railing badly corroded.	

UNGATED SPILLWAY

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONCRETE WEIR	Concrete abutments are badly spalled, cracked and eroded. Poor condition. Top of weir is spalled and eroded exposing 6-in cable. D/s face is surface eroded with a vertical crack near center that is eroded to a depth of 2 inches ±.	Major reconstruction required.
APPROACH CHANNEL	Maple Lake	
DISCHARGE CHANNEL	Concrete wall at d/s of stilling basin is surface eroded 3/4 inch exposing coarse aggregate - Rock debris.	
BRIDGE AND PIERS OVER SPILLWAY	Not applicable.	

OUTLET WORKS

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CRACKING AND SPALLING OF CONCRETE SURFACES IN OUTLET CONDUIT	Valve of unknown diameter, some spalling. Concrete on the u/s and d/s of the intake and discharge conduit is badly spalled and eroded.	Repair concrete
INTAKE STRUCTURE	Concrete is spalled and chamber is filled with debris. Valve stem visible under water.	Repair concrete
OUTLET PIPE	1 ft x 2 1/2 ft. End covered with debris.	Clear
OUTLET CHANNEL	Rocky and filled with debris.	Clear
EMERGENCY GATE	Not visible.	

EMBANKMENT

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SURFACE CRACKS	Spalled and cracked corewall on right (south) side.	Repair concrete
UNUSUAL MOVEMENT OR CRACKING AT OR BEYOND THE TOE	None	
SLOUGHING OR EROSION OF EMBANKMENT AND ABUTMENT SLOPES	Erosion gullies of widths up to 3 feet, 4 to 8 inches deep have developed on the d/s slope.	Repair erosion and provide adequate erosion protection.
VERTICAL AND HORIZONTAL ALIGNMENT OF THE CREST	Not applicable	
RIPRAP FAILURES	Not applicable	

EMBANKMENT

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
RAILINGS	None	
JUNCTION OF EMBANKMENT AND ABUTMENT, SPILLWAY AND DAM	Erosion adjacent to both right and left spillway wingwalls. Cracks in right training wall of spillway.	Repair erosion and provide adequate erosion protection, repair cracks.
ANY NOTICEABLE SEEPAGE	None	
STAFF GAGE AND RECORDER	None	
DRAINS	None	

DOWNSTREAM CHANNEL

VISUAL EXAMINATION OF

OBSERVATIONS

REMARKS OR RECOMMENDATIONS

CONDITION
(CESTRUCTIONS,
DEBRIS, ETC.)

Some debris, dam 200 feet d/s.
No pond behind it.

SLOPES

Steep on right, mild low slope on
left.

APPROXIMATE NO. OF HOMES AND POPULATION

1 house - estimate 6 persons.

RESERVOIR

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SLOPES	Appear stable	
SEDIMENTATION		No evidence of significant sedimentation was observed.

CHECK LIST
ENGINEERING DATA
DESIGN, CONSTRUCTION, OPERATION

ITEM	REMARKS
------	---------

PLAN OF DAM	Plan #419 "Existing conditions after repairs and new construction" filed March 27, 1947 are on file at the New Jersey Department of Environmental Protection, Prospect Street, Trenton, New Jersey 08625
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REGIONAL VICINITY MAP	Prepared for this report
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CONSTRUCTION HISTORY	None found
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TYPICAL SECTIONS OF DAM	Existing spillway, new concrete cap and new concrete addition. See "PLAN OF DAM" above.
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HYDROLOGIC/HYDRAULIC DATA	None found
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OUTLETS - PLAN	None found
- DETAILS	None found
- CONSTRAINTS	None found
- DISCHARGE RATINGS	None found

RAINFALL/RESERVOIR RECORDS	None found
----------------------------	------------

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

ITEM	REMARKS
DESIGN REPORTS	None found
GEOLOGY REPORTS	None found
DESIGN COMPUTATIONS HYDROLOGY & HYDRAULICS DAM STABILITY SEEPAGE STUDIES	None found
MATERIALS INVESTIGATIONS BORING RECORDS LABORATORY FIELD	None found

POST-CONSTRUCTION SURVEYS OF DAM See "PLAN OF DAM" on previous page

BORROW SOURCES Unknown

ITEMS	REMARKS
SPILLWAY PLAN	See "PLAN OF DAM"
SECTIONS	None
DETAILS	None
OPERATING EQUIPMENT PLANS & DETAILS	None

CHECK LIST
HYDROLOGIC AND HYDRAULIC DATA
ENGINEERING DATA

DRAINAGE AREA CHARACTERISTICS: 2.21 square miles, woods, small urban area

ELEVATION TOP NORMAL POOL (STORAGE CAPACITY): 285' NGVD (38.4 acre-feet)

ELEVATION TOP FLOOD CONTROL POOL (STORAGE CAPACITY) Not applicable

ELEVATION MAXIMUM TESTFLOOD POOL: 289.3' NGVD

ELEVATION TOP DAM: 287.9' NGVD

SPILLWAY CREST: Uncontrolled concrete

a. Elevation 285' NGVD

b. Type Broad crested

c. Width 2.4 feet

d. Length 48 feet

e. Location Spillover Center of dam

f. Number and Type of Gates None

OUTLET WORKS: Low level outlet

a. Type Estimated 12-inch pipe contained in a
1 foot x 2.5 foot concrete box

b. Location Next to spilling basin on downstream side

HYDROMETEOROLOGICAL GAGES: None

MAXIMUM NON-DAMAGING DISCHARGE: 711 cfs

APPENDIX 3

PHOTOGRAPHS

MAPLE LAKE DAM



April 23, 1981

View of upstream face of dam at right abutment;
dam appears to have a 2-ft wide corewall.



April 23, 1981

View along corewall toward left abutment.



April 23, 1981

View erosion along left side of spillway channel.



April 23, 1981

View of downstream channel where it joins adjacent pond below bridge



April 23, 1961

View of low-level outlet hidden behind stones. Concrete casing of low-level pipe is clearly visible, extending d/s from face of spillway.



April 23, 1961

View of contact between spillway and training wall on left (north side).



April 23, 1951

Close-up view of crack and spalling in spillway d/s face.



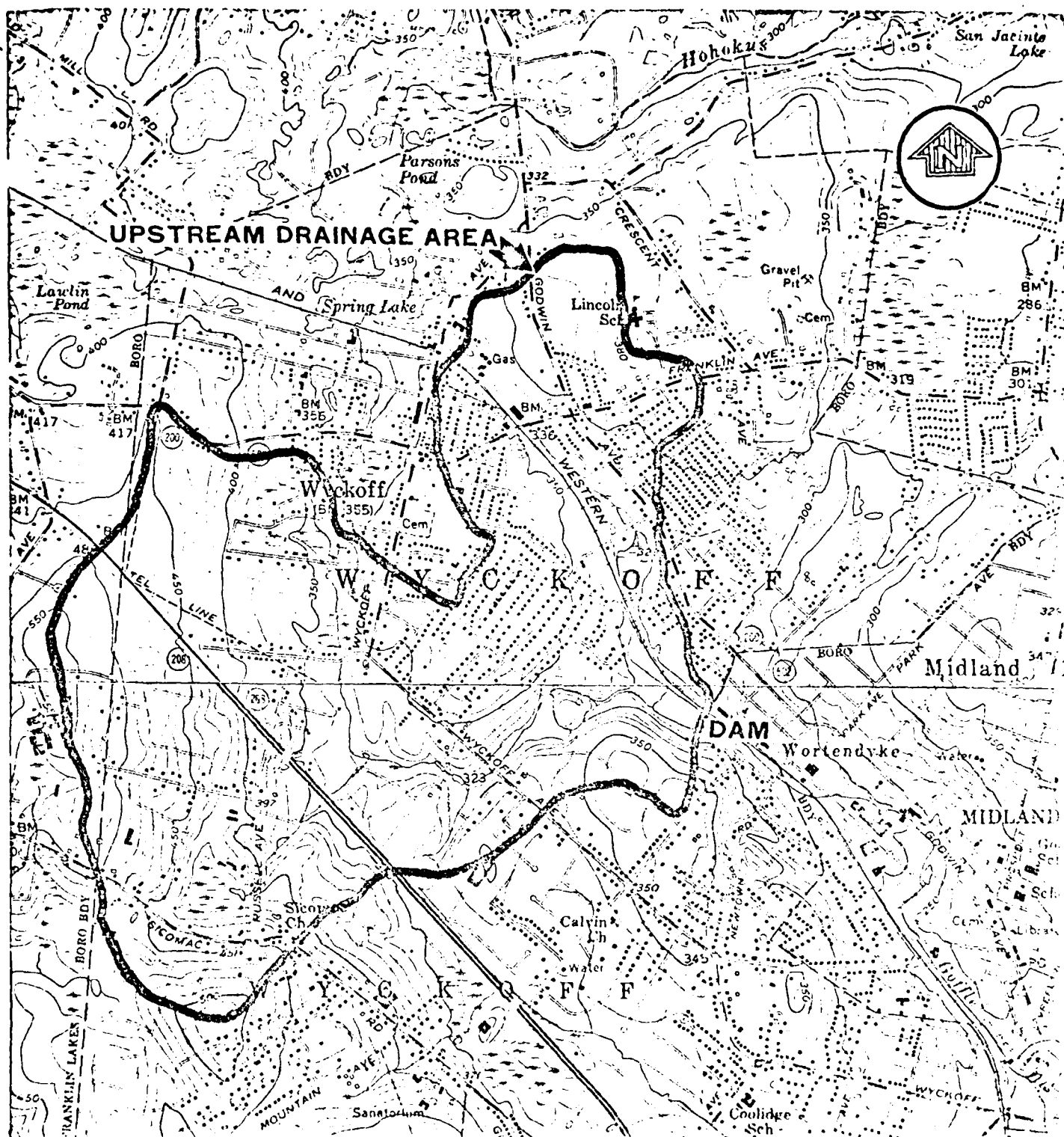
April 23, 1951

View of extensive root growth downstream of right side of dam.

APPENDIX 4

HYDROLOGIC COMPUTATIONS

MAPLE LAKE DAM



**NATIONAL PROGRAM OF INSPECTION OF
NON-FED. DAMS**

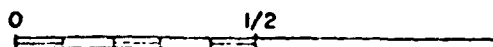
MAPLE LAKE DAM
WYCKOFF TOWNSHIP, NEW JERSEY
REGIONAL VICINITY MAP

DEPARTMENT OF THE ARMY
PHILADELPHIA DISTRICT, CORPS OF ENGINEERS
PHILADELPHIA, PENNSYLVANIA

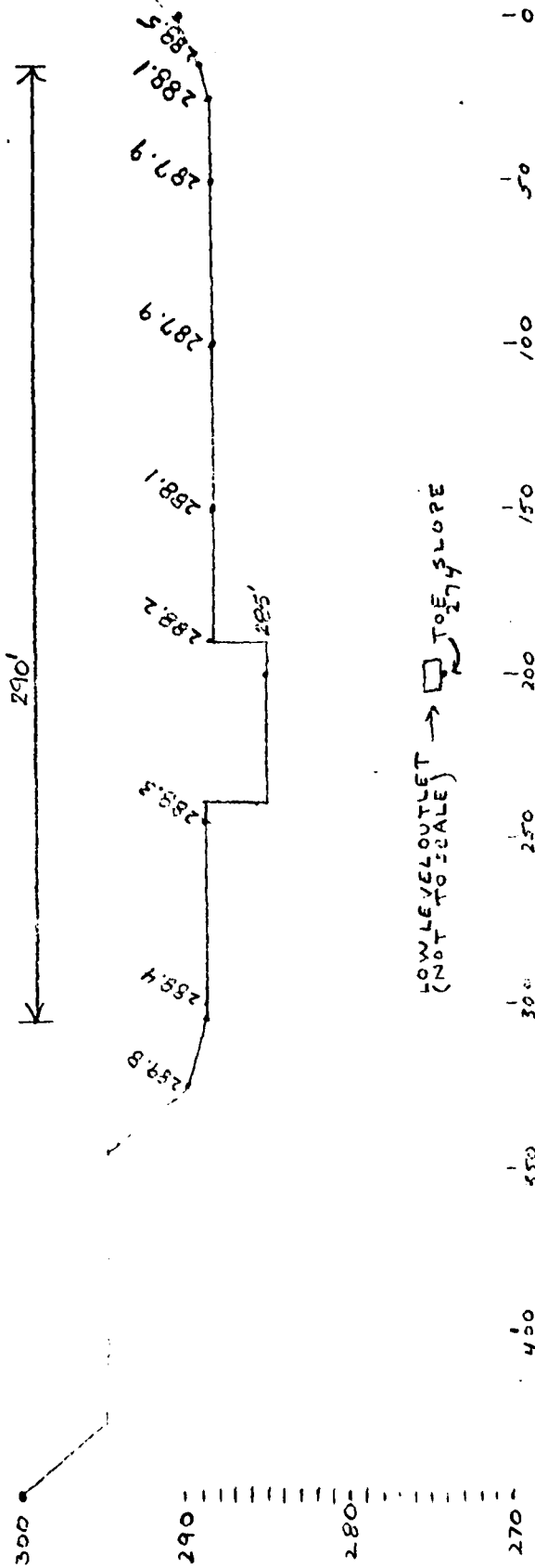
Anderson-Nichols & Company, Inc.

BOSTON, MA.

SCALE IN MILES



MAP BASED ON U.S.G.S. 7.5 MINUTE QUADRANGLE
SHEETS. RAMSEY, N.J., N.Y. 1955, AND PATERSON,
N.J., 1955, REVISED 1970.



ANDERSON-NICHOLS

VERNON	BOSTON	CONCORD
SM	MAPLE LAKE	D/S FACE
DATE 5/11/71	SCALE:	JOB NO.
		SHEET NO. 1 OF 14

JOB NO. 3671-08

QUARES 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30
1/4 IN. SCALE

DEVELOPMENT OF RATING CURVE

$$Q = CLH^{3/2}$$

1) SPILLWAY CURVE

C = 3.0 BREADTH = 2.4 ft

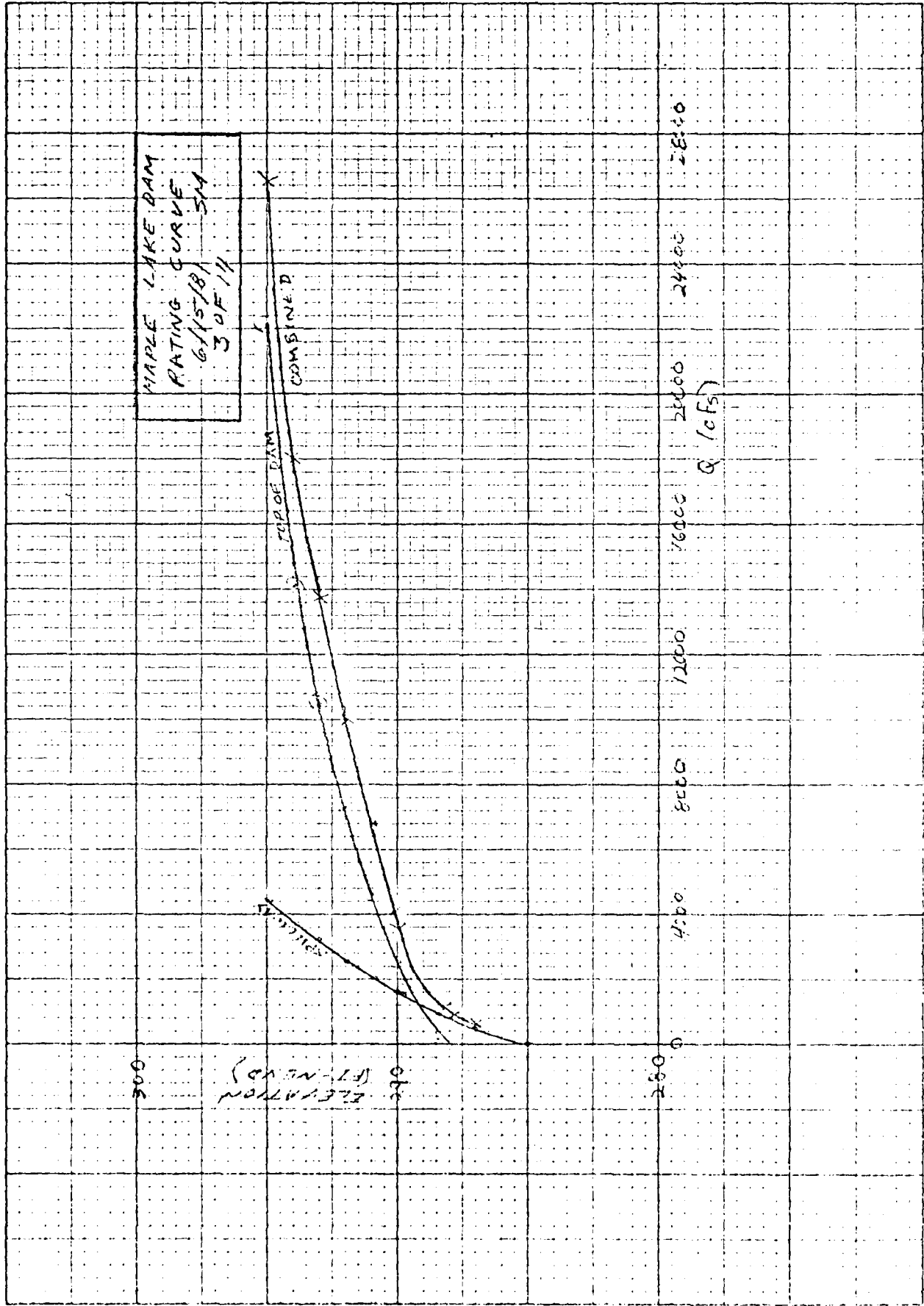
WEIR LENGTH = 48 ft

2) TOP OF DAM

C = 2.6 BREADTH = 15 ft

WEIR LENGTH = 242 ft (w/o spillway)

	ELEVATION (FT. NGVD)	SPILLWAY		TOP OF DAM		COMBINED Q (CFS)
		HEAD (FT)	CFS	HEAD (FT)	Q (CFS)	
18 SPILLWAY	285	0	0			
19	287.0	2.0	407			407
20 TOP DAM	287.1	2.9	711			711
21	289.1	3.1	786	0.2	138	919
22	292.4	3.4	903	0.5	290	1190
23	294.8	4.8	1514	1.9	310	1825
24	296.0	5.0	1610	2.1	327	1937
25	2910	6.0	2110	3.1	334	2440
26	2920	7.0	2667	4.1	3425	3093
27	2930	8.0	3258	5.1	3525	3814
28	2940	9.0	3888	6.1	361	4521
29	2950	10.0	4554	7.1	4505	5273



JOB NO. 3671-08SQUARES
1/4 IN. SCALE

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30

TIME OF CONCENTRATIONMETHOD #1 TEXAS HIGHWAY METHODOVERLAND FLOW

REACH LENGTH = 4000 ft

SLOPE = $\frac{560-350}{4000} = 0.053 = 5.3\%$

FROM TABLE "WOODLANDS"

AVG. VELOCITY $V = 2.0$ fps

4000 ft $\div$ 2.0 fps = 2000 sec = 33.3 min

CHANNEL FLOW

REACH LENGTH = 8800 ft

SLOPE = $\frac{350-256}{8800} = .0073 = .73\%$

FROM TABLE, AVG VELOCITY $V = 2.0$ fps

8800 ft $\div$ 2.0 fps = 4400 sec = 73.3 min

$T_C = 33.3 \text{ min} + 73.3 \text{ min} = 106.6 \text{ min} = \underline{1.8 \text{ hrs}}$

METHOD #2 SOIL AND WATER CONSERVATION

$L = 0.6 T_C$ $L = \frac{1.48 (S+1)^{1.67}}{9000 V^{1.5}}$ $S = \frac{10.22}{3.1} = 3.3$

TAKE $CN = 70$ FOR WOODS $S = \frac{10.22}{70} = 10 = 43$

$L = 4000 + 8800 = 12800 \text{ ft}$ $V = \frac{560-256}{(12800)} = .0212$

$L = \frac{(12800)^{0.8} (4.3+1)^{1.67}}{9000 (2.1)^{1.5}} = 2.40 \text{ hrs}$

$T_C = \frac{2.40}{.6} = \underline{4.0 \text{ hrs}}$

JOB NO. 3671-08

SQUARES
1/4 IN. SCALE

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30

1

2

METHOD #3 SCS TR #55

3

4

OVERLAND FLOW

5

6

LENGTH = 4000 ft

7

HEAD = 210 ft

8

SLOPE = .053 = 5.3 %

9

10

FROM FIGURE AVG VEL. = .67 fps

11

 $T_c = \frac{4000 \text{ ft}}{3600 (.67) \text{ fps}} = \underline{1.7 \text{ hrs}}$

12

13

14

CHANNEL FLOW

15

16

LENGTH = 8800 ft

17

HEAD = 54 ft

18

SLOPE = .0073 = .73 %

19

n = .04

20

21

 $V = \frac{1.49}{n} R^{2/3} S^{1/2}$

(Assume a 5' x 2' rectangular channel to collect runoff)

22

23

24

 $R = \frac{\text{Area}}{\text{wetted perimeter}} = \frac{10}{2.236} = 4.47 \text{ ft}$

25

26

 $V = \frac{1.49}{.04} (4.47)^{2/3} (.0073)^{1/2} = 3.41 \text{ fps}$

27

28

 $T_c = \frac{8800 \text{ ft}}{3.41 \text{ fps}} = 2580.6 \text{ sec} = .72 \text{ hr}$

29

30

31

Total $T_c = 1.7 \text{ hrs} + .72 \text{ hrs} = \underline{2.4 \text{ hrs}}$

32

33

34

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JOB NO. 3671-08SQUARES 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30
1/4 IN. SCALEMETHOD #4 KIRBY METHODOVERLAND FLOW

$$T_c = 0.83 \left(\frac{N_1}{\sqrt{S}} \right)^{0.467}$$

$$N = .6$$

$$S = .053$$

$$l = 4000$$

$$T_c = 0.83 \left(\frac{(.6)(4000)}{\sqrt{.053}} \right)^{0.467}$$

$$= 62.4 \text{ min} = 1.04 \text{ hrs.}$$

CHANNEL FLOW

USE MANNING AS IN METHOD #5

$$V = 3.41 \text{ fps}$$

$$T_c = \frac{86400 \text{ ft}}{3.41 \text{ fps}} = 2580.6 \text{ sec} = .72 \text{ hr}$$

$$\text{TOTAL } T_c = 1.04 \text{ hrs} + .72 \text{ hrs} = \underline{\underline{1.8 \text{ hrs}}}$$

AVERAGE T_c FROM 4 METHODS :

$$\frac{1.8 \text{ hrs} + 4.0 \text{ hrs} + 2.4 \text{ hrs} + 1.8 \text{ hrs}}{4} = 2.5 \text{ hrs}$$

$$T_{c \text{ ave}} = 2.5 \text{ hrs.}$$

$$T_L = .6 T_c$$

$$T_L = \underline{\underline{1.5 \text{ hrs}}}$$

JOB NO. 3671-08SQUARES 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29
1/4 IN. SCALESTAGE - STORAGE DETERMINATIONSTAKE DEPTH OF LAKE TO BE 6 FT

ELEVATION FT	SURFACE AREA ACRES	AVG S-A ACRES	INCREMENTAL STORAGE AC-FT	CUMULATIVE STORAGE AC-FT
285	6.4	6.4	38.4	38.4
290	12.8	9.6	48	86.4
300	38.4	25.6	256	342.4

INPUT FOR HEC I (FROM CURVE)STAGESTORAGE

274.0

0

285.0

38.4

287.9

57.5

288.3

63.0

289.8

85.0

290.0

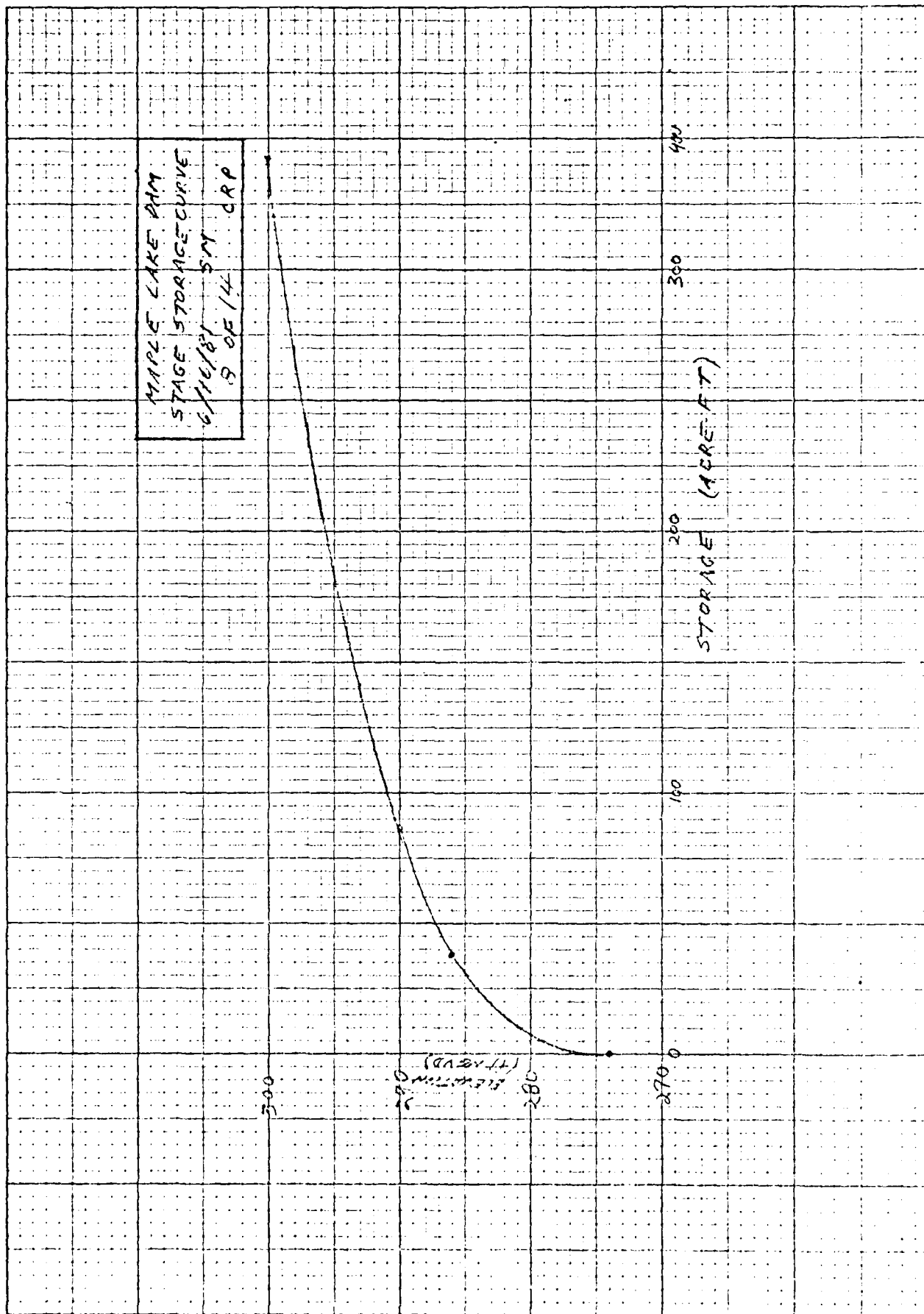
86.4

295.0

185.0

300.0

342.4



JOB NO. 3671-08SQUARES 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30
4 IN. SCALE

DETERMINATION OF Q FOR
LOW LEVEL OUTLET

D = DIAMETER = 12 INCHES (ASSUMED)

n = 0.013 (K & P 6-15)

A_p = AREA OF PIPE CIRCULAR = .79 ft^2

L_p = 40 ft (ESTIMATED)

K_f = FRICTION LOSS THROUGH PIPE

$$K_f = \frac{1487 n^2}{D^{4/3}} = \frac{5087 (0.013)^2}{(12)^{4/3}} = .051$$

K_L = ENTRANCE LOSS TO PIPE = 0.8 (K & P 6-15)

C_p = COEFFICIENT OF DISCHARGE

$$C_p \cdot A_p \sqrt{\frac{2g}{1 + K_L + K_f}} = .79 \sqrt{\frac{64}{1 + .8 + .051}} = 5.1$$

$$C = \frac{3.12}{5.1} = 0.57$$

JOB NO. 3671-08SQUARES 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29
1/4 IN. SCALEDRAWDOWN BY LOW LEVEL OUTLETASSUME: 1) NO SIGNIFICANT INFLOW

2) ONE 12 INCH PIPE

3) $Q_p = C_p H^{1/2} = 3.6 H^{1/2}$ 4) $\text{ACRE-FT/DAY} = 1.9835 \times Q_{\text{AVG}}$ 5) $\text{DAYS} = \Delta \text{STORAGE} / \text{DAY}$

ELEV	STORAGE (ACRE-FT)	ΔS	H^* FT	Q_p CFS	ALL Q CFS	$\frac{\text{ACRE-FT}}{\text{DAY}}$	DAYS
285	38.4		10.5	11.7			
		30.9			10.0	19.8	1.6
280	7.5		5.5	8.4			
		6.5			5.5	10.9	1.0
275	1.0		.5	2.5			
		1			1.3	2.6	0.4
274	0		0	0			

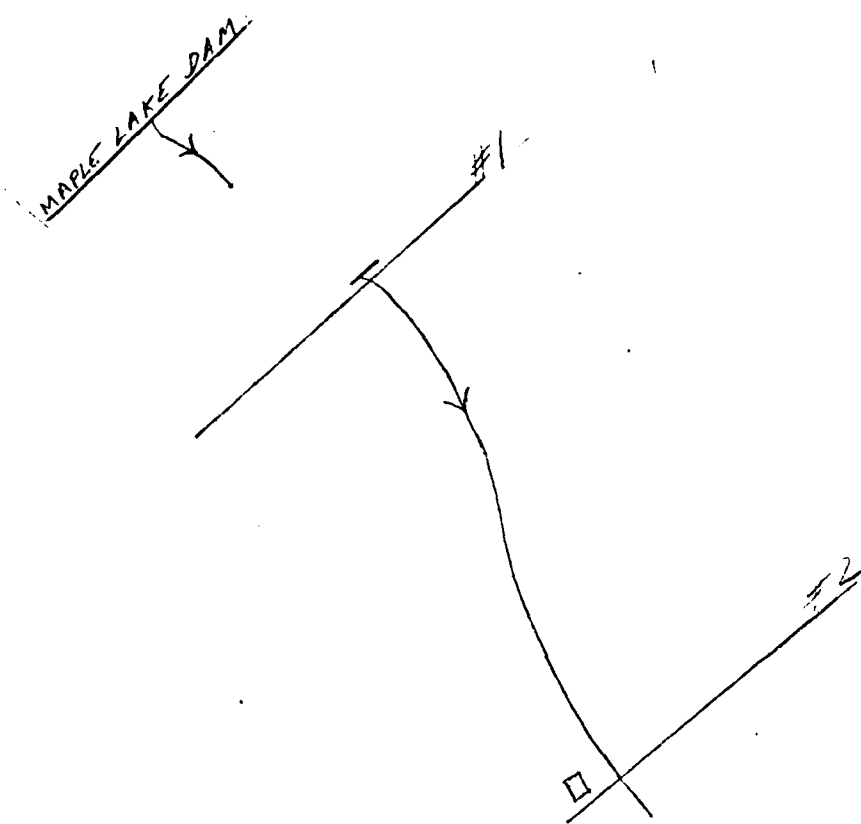
* from mid-point of pipe (274.5' ELEV)

TOTAL = 2.6 DAY

JOB NO.

JARES 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30
 IN. SCALE

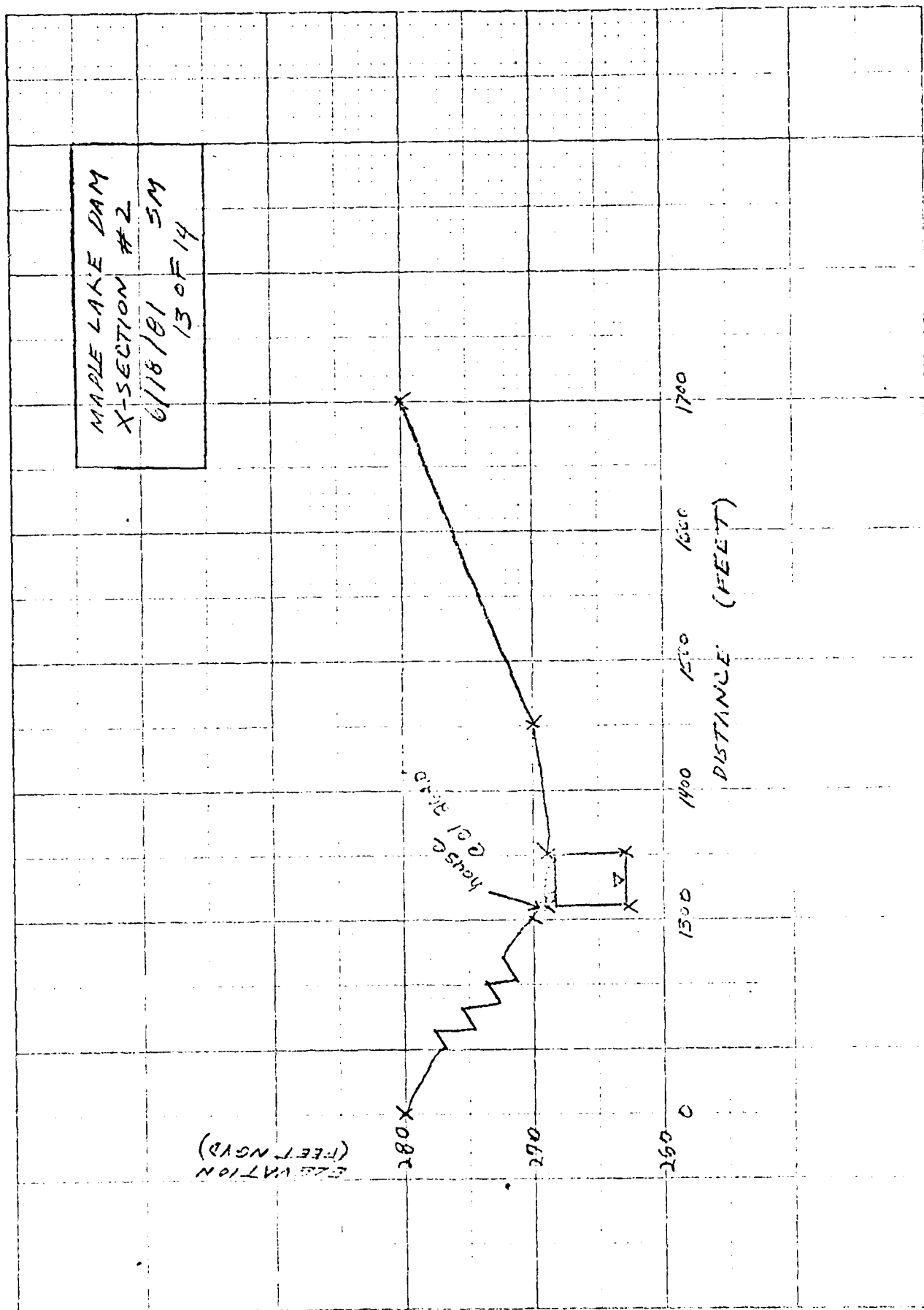
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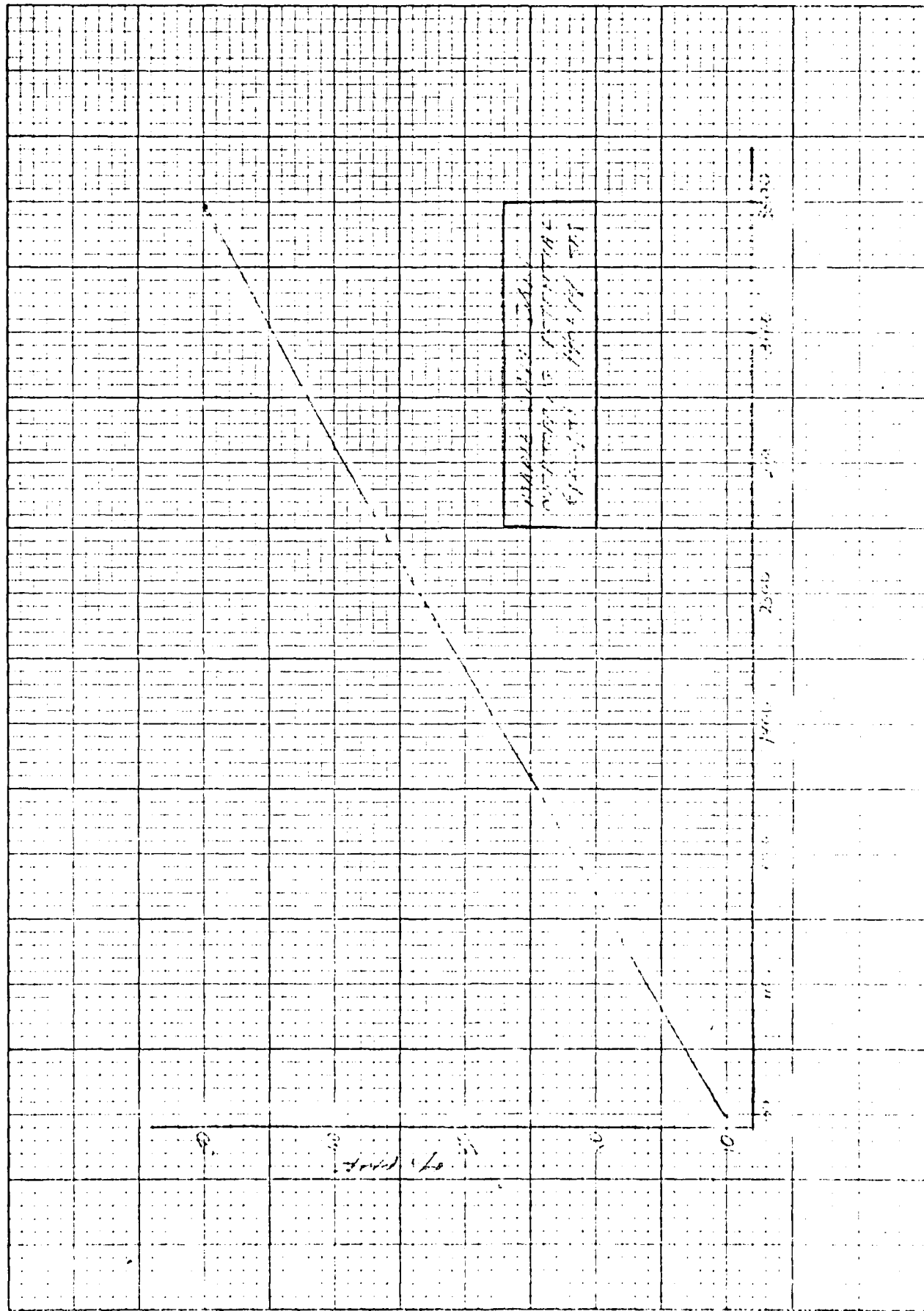


CROSS SECTION
 LOCATIONS
 FOR D/S
 HAZARD ANALYSIS

MAPLE LAKE DAM
X-SECTION & SMALL
DIM 300' D/S OF
MAPLE LAKE DAM
C/18/81 120' F14 SM







APPENDIX 5

HEC-1 OUTPUT

MAPLE LAKE DAM

三

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*****
*****
***** FLOID HYDROGRAPH PACKAGE (HEC-1) *****
***** F E B R U A R Y 1 9 8 1 *****
*****
*****
***** R U N   D A T E 0 7 / 3 0 / 8 1   T I M E 1 4 . 1 8 . 5 2 *****
*****
*****
```

U.S. ARMY COLLEGE OF ENGINEERS
THE HYDROLOGIC ENGINEERING CENTER
609 SECOND STREET
DAVIS, CALIFORNIA 95616
(916) 440-3285 TKN (FIS) 44F-3285

 * U.S. ARMY CORP. OF ENGINEERS
 * THE HYDROLOGIC ENGINEERING CENTER
 * 600 SOUTH BRIDGES
 * DAVIS, CALIFORNIA 95616
 * (916) 440-3285 PR (FIS) 440-3285
 * *****

 * FLOOD HYDROGRAPH PACKAGE (HLC-1)
 * FEBRUARY 1981
 *
 * RUN DATE 07/30/81 TIME 14.18.52
 * *****

MAPLE LAKE DAM OVERTOPPING & BREACH ANALYSIS #K930MERVILLE A-NECO INC#
 NEW JERSEY DAM NO. 776 BERGEN COUNTY TOWNSHIP (IF WYCOFF
 0.1-0.25-0.5 MULTIPLES OF PMF FROM 24-HOUR PMF

5 10 OUTPUT CONTROL VARIABLES 2 PRINT CONTROL
 IPRT 10 PLOT CONTROL
 IPLOT 10 PLOT SCALE
 LSCALE 0 HYDROGRAPH PLOT SCALE
 YES YES PRINT DIAGNOSTIC MESSAGES
 17 HYDROGRAPH TIME DATA 5 MINUTES IN COMPUTATION INTERVAL
 1 DATE 1 0000 STARTING DATE
 2 300 NUMBER OF HYDROGRAPH ORDINATES
 2 0055 ENDING DATE
 2 0055 ENDING TIME
 COMPUTATION INTERVAL 0.08 HOURS
 TOTAL TIME BASE 24.92 HOURS

ENGLISH UNITS
 DRAINAGE AREA SQUARE MILES
 PRECIPITATION DEPTH FEET
 LENGTH ELEVATION FEET
 FLOW RATE CUBIC FEET PER SECOND
 STORAGE VOLUME ACRES-Feet
 SURFACE AREA ACRES
 TEMPERATURE DEGREES FAHRENHEIT

JP MULTI-PLAN OPTION 2 NUMBER OF PLANS

JR MULTI-RATIO OPTION 0.50
 RATIOS OF RUNOFF 0.10 0.25 0.50

8 KK *****
 * A1 *
 * *****
 SCS UNIT GRAPH COMPUTATION -EXPONENTIAL LOSS RATE

SURBASIN RUNOFF DATA

10 BA SUBBASIN CHARACTERISTICS 2.20 SUBBASIN AREA

11 BF BASE FLOW CHARACTERISTICS
 START TO 6.60 INITIAL FLOW
 RECESS 6.60 BEGIN BASE FLOW RECESS
 RECESS 1.00000 RECESS RECESS RECESS

PRECIPITATION DATA

12 PM PROBABLE MAXIMUM STORM INDEX PRECIPITATION
 PMF 22.00 TRANSPOSITION COEFFICIENT
 TR30 0.80 TRANSPOSITION AREA
 TR50 2.20 USE S&D DISTRIBUTION

DA	MON	HRMN	ORD	RAIN	LDSS	EXCESS	COMP 3	**	**	**	DA	MON	HRMN	ORD	RAIN	LDSS	EXCESS	COMP 3	**	**	**
1	1	0000	12	0	0	0	7				1	1	0000	12	0	0	0	7			
2	1	0005	23	0	0	0	7				2	1	0005	13	0	0	0	7			
3	1	0010	34	0	0	0	7				3	1	0010	45	0	0	0	7			
4	1	0015	45	0	0	0	7				4	1	0015	56	0	0	0	7			
5	1	0020	56	0	0	0	7				5	1	0020	67	0	0	0	7			
6	1	0025	67	0	0	0	7				6	1	0025	78	0	0	0	7			
7	1	0030	78	0	0	0	7				7	1	0030	89	0	0	0	7			
8	1	0035	89	0	0	0	7				8	1	0035	90	0	0	0	7			
9	1	0040	90	0	0	0	7				9	1	0040	91	0	0	0	7			
10	1	0045	91	0	0	0	7				10	1	0045	92	0	0	0	7			
11	1	0050	92	0	0	0	7				11	1	0050	93	0	0	0	7			
12	1	0055	93	0	0	0	7				12	1	0055	94	0	0	0	7			
13	1	0100	94	0	0	0	7				13	1	0100	95	0	0	0	7			
14	1	0105	95	0	0	0	7				14	1	0105	96	0	0	0	7			
15	1	0110	96	0	0	0	7				15	1	0110	97	0	0	0	7			
16	1	0115	97	0	0	0	7				16	1	0115	98	0	0	0	7			
17	1	0120	98	0	0	0	7				17	1	0120	99	0	0	0	7			
18	1	0125	99	0	0	0	7				18	1	0125	00	0	0	0	7			
19	1	0130	00	0	0	0	7				19	1	0130	01	0	0	0	7			
20	1	0135	01	0	0	0	7				20	1	0135	02	0	0	0	7			
21	1	0140	02	0	0	0	7				21	1	0140	03	0	0	0	7			
22	1	0145	03	0	0	0	7				22	1	0145	04	0	0	0	7			
23	1	0150	04	0	0	0	7				23	1	0150	05	0	0	0	7			
24	1	0155	05	0	0	0	7				24	1	0155	06	0	0	0	7			
25	1	0200	06	0	0	0	7				25	1	0200	07	0	0	0	7			
26	1	0205	07	0	0	0	7				26	1	0205	08	0	0	0	7			
27	1	0210	08	0	0	0	7				27	1	0210	09	0	0	0	7			
28	1	0215	09	0	0	0	7				28	1	0215	10	0	0	0	7			
29	1	0220	10	0	0	0	7				29	1	0220	11	0	0	0	7			
30	1	0																			

HYDROGRAPH AT STATION A1 PLAN 1. RATIO = 0.50

DA	MEAN	HEMN	QKD	FLW	DA	MON	HEMN	QKD	FLW	DA	MON	HEMN	QKD	FLW
1	0000	0000	1234	3	1	1	145	6	176	1	1	145	6	176
2	0005	0005	1235	3	2	1	150	6	190	2	1	150	6	208
3	0010	0010	1236	3	3	1	155	6	230	3	1	155	6	237
4	0015	0015	1237	3	4	1	160	6	247	4	1	160	6	289
5	0020	0020	1238	3	5	1	165	6	289	5	1	165	6	325
6	0025	0025	1239	3	6	1	170	6	365	6	1	170	6	408
7	0030	0030	1240	3	7	1	175	6	455	7	1	175	6	553
8	0035	0035	1241	3	8	1	180	6	503	8	1	180	6	605
9	0040	0040	1242	3	9	1	185	6	554	9	1	185	6	709
10	0045	0045	1243	3	10	1	190	6	605	10	1	190	6	813
11	0050	0050	1244	3	11	1	195	6	657	11	1	195	6	915
12	0055	0055	1245	3	12	1	200	6	709	12	1	200	6	1013
13	0100	0100	1246	3	13	1	205	6	762	13	1	205	6	1106
14	0105	0105	1247	3	14	1	210	6	813	14	1	210	6	1149
15	0110	0110	1248	3	15	1	215	6	865	15	1	215	6	1190
16	0115	0115	1249	3	16	1	220	6	915	16	1	220	6	1230
17	0120	0120	1250	3	17	1	225	6	965	17	1	225	6	1269
18	0125	0125	1251	3	18	1	230	6	1013	18	1	230	6	1307
19	0130	0130	1252	3	19	1	235	6	1060	19	1	235	6	1345
20	0135	0135	1253	3	20	1	240	6	1106	20	1	240	6	1383
21	0140	0140	1254	3	21	1	245	6	1149	21	1	245	6	1420
22	0145	0145	1255	3	22	1	250	6	1190	22	1	250	6	1457
23	0150	0150	1256	3	23	1	255	6	1230	23	1	255	6	1494
24	0155	0155	1257	3	24	1	260	6	1269	24	1	260	6	1530
25	0200	0200	1258	3	25	1	265	6	1307	25	1	265	6	1566
26	0205	0205	1259	3	26	1	270	6	1345	26	1	270	6	1600
27	0210	0210	1260	3	27	1	275	6	1383	27	1	275	6	1634
28	0215	0215	1261	3	28	1	280	6	1395	28	1	280	6	1667
29	0220	0220	1262	3	29	1	285	6	1420	29	1	285	6	1699
30	0225	0225	1263	3	30	1	290	6	1457	30	1	290	6	1730
31	0230	0230	1264	3	31	1	295	6	1494	31	1	295	6	1760
32	0235	0235	1265	3	32	1	300	6	1530	32	1	300	6	1789
33	0240	0240	1266	3	33	1	305	6	1566	33	1	305	6	1817
34	0245	0245	1267	3	34	1	310	6	1600	34	1	310	6	1845
35	0250	0250	1268	3	35	1	315	6	1634	35	1	315	6	1872
36	0255	0255	1269	3	36	1	320	6	1667	36	1	320	6	1900
37	0300	0300	1270	3	37	1	325	6	1699	37	1	325	6	1927
38	0305	0305	1271	3	38	1	330	6	1730	38	1	330	6	1954
39	0310	0310	1272	3	39	1	335	6	1760	39	1	335	6	1980
40	0315	0315	1273	3	40	1	340	6	1789	40	1	340	6	2006
41	0320	0320	1274	3	41	1	345	6	1817	41	1	345	6	2032
42	0325	0325	1275	3	42	1	350	6	1845	42	1	350	6	2057
43	0330	0330	1276	3	43	1	355	6	1872	43	1	355	6	2082
44	0335	0335	1277	3	44	1	360	6	1900	44	1	360	6	2107
45	0340	0340	1278	3	45	1	365	6	1927	45	1	365	6	2132
46	0345	0345	1279	3	46	1	370	6	1954	46	1	370	6	2157
47	0350	0350	1280	3	47	1	375	6	1980	47	1	375	6	2182
48	0355	0355	1281	3	48	1	380	6	2006	48	1	380	6	2207
49	0400	0400	1282	3	49	1	385	6	2032	49	1	385	6	2232
50	0405	0405	1283	3	50	1	390	6	2057	50	1	390	6	2257
51	0410	0410	1284	3	51	1	395	6	2082	51	1	395	6	2282
52	0415	0415	1285	3	52	1	400	6	2107	52	1	400	6	2307
53	0420	0420	1286	3	53	1	405	6	2132	53	1	405	6	2332
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55	0430	0430	1288	3	55	1	415	6	2182	55	1	415	6	2382
56	0435	0435	1289	3	56	1	420	6	2207	56	1	420	6	2407
57	0440	0440	1290	3	57	1	425	6	2232	57	1	425	6	2432
58	0445	0445	1291	3	58	1	430	6	2257	58	1	430	6	2457
59	0450	0450	1292	3	59	1	435	6	2282	59	1	435	6	2482
60	0455	0455	1293	3	60	1	440	6	2307	60	1	440	6	2507
61	0500	0500	1294	3	61	1	445	6	2332	61	1	445	6	2532
62	0505	0505	1295	3	62	1	450	6	2357	62	1	450	6	2557
63	0510	0510	1296	3	63	1	455	6	2382	63	1	455	6	2582
64	0515	0515	1297	3	64	1	460	6	2407	64	1	460	6	2607
65	0520	0520	1298	3	65	1	465	6	2432	65	1	465	6	2632
66	0525	0525	1299	3	66	1	470	6	2457	66	1	470	6	2657
67	0530	0530	1300	3	67	1	475	6	2482	67	1	475	6	2682
68	0535	0535	1301	3	68	1	480	6	2507	68	1	480	6	2707
69	0540	0540	1302	3	69	1	485	6	2532	69	1	485	6	2732
70	0545	0545	1303	3	70	1	490	6	2557	70	1	490	6	2757
71	0550	0550	1304	3	71	1	495	6	2582	71	1	495	6	2782
72	0555	0555	1305	3	72	1	500	6	2607	72	1	500	6	2807
73	0600	0600	1306	3	73	1	505	6	2632	73	1	505	6	2832
74	0605	0605	1307	3	74	1	510	6	2657	74	1	510	6	2857
75	0610	0610	1308	3	75	1	515	6	2682	75	1	515	6	2882
76	0615	0615	1309	3	76	1	520	6	2707	76	1	520	6	2907
77	0620	0620	1310	3	77	1	525	6	2732	77	1	525	6	2932
78	0625	0625	1311	3	78	1	530	6	2757	78	1	530	6	2957
79	0630	0630	1312	3	79	1	535	6	2782	79	1	535	6	2982
80	0635	0635	1313	3	80	1	540	6	2807	80	1	540	6	3007
81	0640	0640	1314	3	81	1	545	6	2832	81	1	545	6	3032
82	0645	0645	1315	3	82	1	550	6	2857	82	1	550	6	3057
83	0650	0650	1316	3	83	1	555	6	2882	83	1	555	6	3082
84	0655	0655	1317	3	84	1	560	6	2907	84	1	560	6	3107
85	0700	0700	1318	3	85	1	565	6	2932	85	1	565	6	3132
86	0705	0705	1319	3	86	1	570	6	2957	86	1	570	6	3157
87	0710	0710	1320	3	87	1	575	6	2982	87	1	575	6	3182
88	0715	0715	1321	3	88	1	580	6	3007	88	1	580	6	3207
89	0720	0720	1322	3	89	1	585	6	3032	89	1	585	6	3232
90	0725	0725	1323	3	90	1	590	6	3057	90	1	590	6	3257
91	0730	0730	1324	3	91	1	595	6	3082	91	1	595	6	3282
92	0735	0735	1325	3	92	1	600	6	3107	92	1	600	6	3307
93	0740	0740	1326	3	93	1	605	6	3132	93	1	605	6	3332
94	0745	0745	1327	3	94	1	610	6	3157	94	1	610	6	3357
95	0750	0750	1328	3	95	1	615	6	3182	95	1	615	6	3382
96	0755	0755	1329	3	96	1	620	6	3207	96	1	620	6	3407
97	0800	0800	1330	3	97	1	625	6	3232	97	1	625	6	3432
98	0805	0805	1331	3	98	1	630	6	3257	98	1	630	6	3457
99	0810	0810	1332	3	99	1	635	6	3282	99	1	635	6	3482
100	0815	0815	1333	3	100	1	640	6	3307	100	1	640	6	3507
101	0820	0820	1334	3	101	1	645	6	3332	101	1	645	6	3532
102	0825	0825	1335	3	102	1	650	6	3357	102	1	650	6	3557
103	0830	0830	1336	3	103	1	655	6	3382	103	1	655	6	3582
104	0835	0835	1337	3	104	1	660	6	3407	104	1	660	6	3607
105	0840	0840	1338	3	105									

PEAK FLOW
(CFS)
3505.

TIME
(HR)
17.00

(CFS)
(INCHES)
(AC-FT)

6-HR
2092.
8.532
1039.

MAXIMUM AVERAGE FLOW
24-HR 72-HR
617. 594.
10.431 10.433
1224. 1224.

24.92-HR
594.
10.433
1224.

CUMULATIVE AREA = 2.20 SQ MI

PLAN 2 INPUT DATA FOR STATION A1 ARE SAME AS FOR PLAN 1

ROUTE INFLOW HYDROGRAPH THROUGH MAPLE LAKE

HYDROGRAPH ROUTING DATA

STORAGE ROUTING
HYSTP
RSVRIC

NUMBER OF SUBREACHES
TYPE OF INITIAL CONDITION
INITIAL CONDITION
WORKING R AND D COEFFICIENT

15 SV	STORAGE	0.0	38.4	57.5	63.0	85.0	86.4	185.0	342.4
16 SE	ELEVATION	274.00	285.00	287.90	288.30	289.80	290.00	295.00	300.00
19 SO	DISCHARGE	0.	0.	407.	711.	1170.	3625.	10060.	26713.
20 SE	ELEVATION	274.00	285.00	287.00	287.90	288.40	289.80	292.00	295.00
21 SS	SPILLWAY	285.00	SPILLWAY CREST ELEVATION						
	SPILLWAY	48.00	SPILLWAY WIDTH						
	SPILLWAY	3.00	WEIR COEFFICIENT						
	SPILLWAY	1.50	EXPONENT OF HEAD						

TOP OF DAM
TOPEL
DAMWID
DAMWID
COEF
EXP

BREACH DATA
FLUM
HEAD
TIME
TFAIL
FAILE

STORAGE	0.0	38.40	51.57	57.50	64.66	85.00	125.84	165.00
OUTFLOW	0.0	0.0	407.00	711.00	1170.00	3625.00	10060.00	26713.00

HYDROGRAPH AT STATION A2
PLAN 1. RATIO = 0.50

DA	MON	HR	MIN	ORD	OUTFLOW	STORAGE	STAGE	DA	MON	HR	MIN	ORD	OUTFLOW	STORAGE	STAGE
1	1	1	1	1	29.0	39.3	2.0	1	1	1	1	1	29.0	39.3	2.0
1	1	1	1	1	35.0	39.5	2.5	1	1	1	1	1	35.0	39.5	2.5
1	1	1	1	1	39.0	39.7	3.0	1	1	1	1	1	39.0	39.7	3.0
1	1	1	1	1	43.0	39.9	3.5	1	1	1	1	1	43.0	39.9	3.5
1	1	1	1	1	47.0	40.1	4.0	1	1	1	1	1	47.0	40.1	4.0
1	1	1	1	1	51.0	40.2	4.5	1	1	1	1	1	51.0	40.2	4.5
1	1	1	1	1	55.0	40.4	5.0	1	1	1	1	1	55.0	40.4	5.0
1	1	1	1	1	61.0	40.5	5.5	1	1	1	1	1	61.0	40.5	5.5
1	1	1	1	1	66.0	40.7	6.0	1	1	1	1	1	66.0	40.7	6.0
1	1	1	1	1	71.0	40.8	6.5	1	1	1	1	1	71.0	40.8	6.5
1	1	1	1	1	75.0	41.1	7.0	1	1	1	1	1	75.0	41.1	7.0
1	1	1	1	1	80.0	41.3	7.5	1	1	1	1	1	80.0	41.3	7.5
1	1	1	1	1	84.0	41.4	8.0	1	1	1	1	1	84.0	41.4	8.0
1	1	1	1	1	89.0	41.5	8.5	1	1	1	1	1	89.0	41.5	8.5
1	1	1	1	1	93.0	41.6	9.0	1	1	1	1	1	93.0	41.6	9.0
1	1	1	1	1	97.0	41.7	9.5	1	1	1	1	1	97.0	41.7	9.5
1	1	1	1	1	101.0	41.8	10.0	1	1	1	1	1	101.0	41.8	10.0
1	1	1	1	1	104.0	41.9	10.5	1	1	1	1	1	104.0	41.9	10.5
1	1	1	1	1	108.0	42.0	11.0	1	1	1	1	1	108.0	42.0	11.0
1	1	1	1	1	111.0	42.1	11.5	1	1	1	1	1	111.0	42.1	11.5
1	1	1	1	1	114.0	42.2	12.0	1	1	1	1	1	114.0	42.2	12.0
1	1	1	1	1	117.0	42.3	12.5	1	1	1	1	1	117.0	42.3	12.5
1	1	1	1	1	120.0	42.4	13.0	1	1	1	1	1	120.0	42.4	13.0
1	1	1	1	1	123.0	42.5	13.5	1	1	1	1	1	123.0	42.5	13.5
1	1	1	1	1	126.0	42.6	14.0	1	1	1	1	1	126.0	42.6	14.0
1	1	1	1	1	129.0	42.7	14.5	1	1	1	1	1	129.0	42.7	14.5
1	1	1	1	1	132.0	42.8	15.0	1	1	1	1	1	132.0	42.8	15.0
1	1	1	1	1	135.0	42.9	15.5	1	1	1	1	1	135.0	42.9	15.5
1	1	1	1	1	138.0	43.0	16.0	1	1	1	1	1	138.0	43.0	16.0
1	1	1	1	1	141.0	43.1	16.5	1	1	1	1	1	141.0	43.1	16.5
1	1	1	1	1	144.0	43.2	17.0	1	1	1	1	1	144.0	43.2	17.0
1	1	1	1	1	147.0	43.3	17.5	1	1	1	1	1	147.0	43.3	17.5
1	1	1	1	1	149.0	43.4	18.0	1	1	1	1	1	149.0	43.4	18.0
1	1	1	1	1	151.0	43.5	18.5	1	1	1	1	1	151.0	43.5	18.5
1	1	1	1	1	153.0	43.6	19.0	1	1	1	1	1	153.0	43.6	19.0
1	1	1	1	1	155.0	43.7	19.5	1	1	1	1	1	155.0	43.7	19.5
1	1	1	1	1	157.0	43.8	20.0	1	1	1	1	1	157.0	43.8	20.0
1	1	1	1	1	159.0	43.9	20.5	1	1	1	1	1	159.0	43.9	20.5
1	1	1	1	1	161.0	44.0	21.0	1	1	1	1	1	161.0	44.0	21.0
1	1	1	1	1	163.0	44.1	21.5	1	1	1	1	1	163.0	44.1	21.5
1	1	1	1	1	165.0	44.2	22.0	1	1	1	1	1	165.0	44.2	22.0
1	1	1	1	1	167.0	44.3	22.5	1	1	1	1	1	167.0	44.3	22.5
1	1	1	1	1	169.0	44.4	23.0	1	1	1	1	1	169.0	44.4	23.0
1	1	1	1	1	171.0	44.5	23.5	1	1	1	1	1	171.0	44.5	23.5
1	1	1	1	1	173.0	44.6	24.0	1	1	1	1	1	173.0	44.6	24.0
1	1	1	1	1	175.0	44.7	24.5	1	1	1	1	1	175.0	44.7	24.5
1	1	1	1	1	177.0	44.8	25.0	1	1	1	1	1	177.0	44.8	25.0
1	1	1	1	1	179.0	44.9	25.5	1	1	1	1	1	179.0	44.9	25.5
1	1	1	1	1	181.0	45.0	26.0	1	1	1	1	1	181.0	45.0	26.0
1	1	1	1	1	183.0	45.1	26.5	1	1	1	1	1	183.0	45.1	26.5
1	1	1	1	1	185.0	45.2	27.0	1	1	1	1	1	185.0	45.2	27.0
1	1	1	1	1	187.0	45.3	27.5	1	1	1	1	1	187.0	45.3	27.5
1	1	1	1	1	189.0	45.4	28.0	1	1	1	1	1	189.0	45.4	28.0
1	1	1	1	1	191.0	45.5	28.5	1	1	1	1	1	191.0	45.5	28.5
1	1	1	1	1	193.0	45.6	29.0	1	1	1	1	1	193.0	45.6	29.0
1	1	1	1	1	195.0	45.7	29.5	1	1	1	1	1	195.0	45.7	29.5
1	1	1	1	1	197.0	45.8	30.0	1	1	1	1	1	197.0	45.8	30.0
1	1	1	1	1	199.0	45.9	30.5	1	1	1	1	1	199.0	45.9	30.5
1	1	1	1	1	201.0	46.0	31.0	1	1	1	1	1	201.0	46.0	31.0
1	1	1	1	1	203.0	46.1	31.5	1	1	1	1	1	203.0	46.1	31.5
1	1	1	1	1	205.0	46.2	32.0	1	1	1	1	1	205.0	46.2	32.0
1	1	1	1	1	207.0	46.3	32.5	1	1	1	1	1	207.0	46.3	32.5
1	1	1	1	1	209.0	46.4	33.0	1	1	1	1	1	209.0	46.4	33.0
1	1	1	1	1	211.0	46.5	33.5	1	1	1	1	1	211.0	46.5	33.5
1	1	1	1	1	213.0	46.6	34.0	1	1	1	1	1	213.0	46.6	34.0
1	1	1	1	1	215.0	46.7	34.5	1	1	1	1	1	215.0	46.7	34.5
1	1	1	1	1	217.0	46.8	35.0	1	1	1	1	1	217.0	46.8	35.0
1	1	1	1	1	219.0	46.9	35.5	1	1	1	1	1	219.0	46.9	35.5
1	1	1	1	1	221.0	47.0	36.0	1	1	1	1	1	221.0	47.0	36.0
1	1	1	1	1	223.0	47.1	36.5	1	1	1	1	1	223.0	47.1	36.5
1	1	1	1	1	225.0	47.2	37.0	1	1	1	1	1	225.0	47.2	37.0
1	1	1	1	1	227.0	47.3	37.5	1	1	1	1	1	227.0	47.3	37.5
1	1	1	1	1	229.0	47.4	38.0	1	1	1	1	1	229.0	47.4	38.0
1	1	1	1	1	231.0	47.5	38.5	1	1	1	1	1	231.0	47.5	38.5
1	1	1	1	1	233.0	47.6	39.0	1	1	1	1	1	233.0	47.6	39.0
1	1	1	1	1	235.0	47.7	39.5	1	1	1	1	1	235.0	47.7	39.5
1	1	1	1	1	237.0	47.8	40.0	1	1	1	1	1	237.0	47.8	40.0
1	1	1	1	1	239.0	47.9	40.5	1	1	1	1	1	239.0	47.9	40.5
1	1	1	1	1	241.0	48.0	41.0	1	1	1	1	1	241.0	48.0	41.0
1	1	1	1	1	243.0	48.1	41.5	1	1	1	1	1	243.0	48.1	41.5
1	1	1	1	1	245.0	48.2	42.0	1	1	1	1	1	245.0	48.2	42.0
1	1	1	1	1	247.0	48.3	42.5	1	1	1	1	1	247.0	48.3	42.5
1	1	1	1	1	249.0	48.4	43.0	1	1	1	1	1	249.0	48.4	43.0
1	1	1	1	1	251.0	48.5	43.5	1	1	1	1	1	251.0	48.5	43.5
1	1	1	1	1	253.0	48.6	44.0	1	1	1	1	1	253.0	48.6	44.0
1	1	1	1	1	255.0	48.7	44.5	1	1	1	1	1	255.0	48.7	44.5
1	1	1	1	1	257.0	48.8	45.0	1	1	1	1	1	257.0	48.8	45.0
1	1	1	1	1	259.0	48.9	45.5	1	1	1	1	1	259.0	48.9	45.5
1	1	1	1	1	261.0	49.0	46.0	1	1	1	1	1	261.0	49.0	46.0
1	1	1	1	1	263.0	49.1	46.5	1	1	1	1	1	263.0	49.1	46.5
1	1	1	1	1	265.0	49.2	47.0	1	1	1	1	1	265.0	49.2	47.0
1	1	1	1	1	267.0	49.3	47.5	1	1	1	1	1	267.0	49.3	47.5
1	1	1	1	1	269.0	49.4	48.0	1	1	1	1	1	269.0	49.4	48.0
1	1	1	1	1	271.0	49.5	48.5	1	1	1	1	1	271.0	49.5	48.5
1	1	1	1	1	273.0	49.6	49.0	1	1	1	1	1	273.0	49.6	49.0
1	1	1	1	1	275.0	49.7	49.5	1	1	1	1	1	275.0	49.7	49.5
1	1	1	1	1	277.0	49.8	50.0	1	1	1	1	1	277.0	49.8	50.0
1	1	1	1	1	279.0	49.9	50.5	1	1	1	1	1	279.0	49.9	50.5
1	1	1	1	1	281.0	50.0	51.0	1	1	1	1	1	281.0	50.0	51.0
1	1	1	1	1	283.0	50.1	51.5	1	1	1	1	1	283.0	50.1	51.5
1	1	1	1	1	285.0	50.2	52.0	1	1	1	1	1	285.0	50.2	52.0
1	1	1	1												

*** ** PLAN 2 FOR STATION A2 *** ** ** ** **

HYDROGRAPH ROUTING DATA

16 MS	STORAGE ROUTING N STPS 177 PSVRIC X	STOR 38.40 C.O	NUMBER OF SURFACHES TYPE OF INITIAL CONDITION INITIAL CONDITION WORKING R AND D COEFFICIENT	ROUTE INFLW HYDROGRAPH THROUGH	MAPLE LAKE
17 SW	STORAGE	0.0	38.4 57.5 63.0	85.0	185.0
18 SE	ELEVATION	274.00	295.00 287.90 288.30	289.80	295.00
19 SQ	DISCHARGE	0.	0. 407. 711.	1170.	3625.
20 SE	ELEVATION	274.00	285.00 287.00 287.90	288.40	292.00
21 SS	SPILLWAY GREL SPWID CROW EXPD	285.00 49.00 3.00 1.50	SPILLWAY GREST ELEVATION SLOPE WEIR COEFFICIENT EXPONENT OF HEAD	289.80	295.00

22 ST	TOP OF DAM DAMPID CROW EXPD	287.90 242.00 2.50 1.50	ELEVATION AT TOP OF DAM DAM WIDTH WEIR COEFFICIENT EXPONENT OF HEAD	289.80	295.00
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25 SB	BREACH DATA ELWD BRWD TEAL FAILED	274.00 32.00 1.00 0.10 287.90	ELEVATION AT BOTTOM OF BREACH WIDTH OF BREACH BOTTOM BREACH SIDE SLOPE TIME FOR BREACH TO DEVELOP W.S. ELEVATION TO TRIGGER FAILURE	289.80	295.00
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STORAGE	0.0	51.57	57.50	84.96	125.84	185.00
OUTFLOW	0.0	407.00	711.00	1170.00	10060.00	26713.00

HYDROGRAPH AT STATION 0.50 A7 PLAN 2.

CA MCN	HRMN	ORD	OUTFLW	STDRGE	STAGE	UA	MON	HRMN	ORD	OUTFLW	STDRGE	STAGE
0000	0000	1	0	38.4	265.0	1	1600	201	3218	311	2.8	242.9
0005	0005	2	1	38.4	265.0	1	1605	203	3319	311	2.8	243.1
0010	0010	3	1	38.4	265.0	1	1610	205	3420	311	2.8	243.3
0015	0015	4	1	38.4	265.0	1	1615	207	3521	311	2.8	243.5
0020	0020	5	1	38.4	265.0	1	1620	209	3622	311	2.8	243.7
0025	0025	6	1	38.4	265.0	1	1625	211	3723	311	2.8	243.9
0030	0030	7	1	38.4	265.0	1	1630	213	3824	311	2.8	244.1
0035	0035	8	1	38.4	265.0	1	1635	215	3925	311	2.8	244.3
0040	0040	9	1	38.4	265.0	1	1640	217	4026	311	2.8	244.5
0045	0045	10	1	38.4	265.0	1	1645	219	4127	311	2.8	244.7
0050	0050	11	1	38.4	265.0	1	1650	221	4228	311	2.8	244.9
0055	0055	12	1	38.4	265.0	1	1655	223	4329	311	2.8	245.1
0100	0100	13	1	38.4	265.0	1	1660	225	4430	311	2.8	245.3
0105	0105	14	1	38.4	265.0	1	1665	227	4531	311	2.8	245.5
0110	0110	15	1	38.4	265.0	1	1670	229	4632	311	2.8	245.7
0115	0115	16	1	38.4	265.0	1	1675	231	4733	311	2.8	245.9
0120	0120	17	1	38.4	265.0	1	1680	233	4834	311	2.8	246.1
0125	0125	18	1	38.4	265.0	1	1685	235	4935	311	2.8	246.3
0130	0130	19	1	38.4	265.0	1	1690	237	5036	311	2.8	246.5
0135	0135	20	1	38.4	265.0	1	1695	239	5137	311	2.8	246.7
0140	0140	21	1	38.4	265.0	1	1700	241	5238	311	2.8	246.9
0145	0145	22	1	38.4	265.0	1	1705	243	5339	311	2.8	247.1
0150	0150	23	1	38.4	265.0	1	1710	245	5440	311	2.8	247.3
0155	0155	24	1	38.4	265.0	1	1715	247	5541	311	2.8	247.5
0200	0200	25	1	38.4	265.0	1	1720	249	5642	311	2.8	247.7
0205	0205	26	1	38.4	265.0	1	1725	251	5743	311	2.8	247.9
0210	0210	27	1	38.4	265.0	1	1730	253	5844	311	2.8	248.1
0215	0215	28	1	38.4	265.0	1	1735	255	5945	311	2.8	248.3
0220	0220	29	1	38.4	265.0	1	1740	257	6046	311	2.8	248.5
0225	0225	30	1	38.4	265.0	1	1745	259	6147	311	2.8	248.7
0230	0230	31	1	38.4	265.0	1	1750	261	6248	311	2.8	248.9
0235	0235	32	1	38.4	265.0	1	1755	263	6349	311	2.8	249.1
0240	0240	33	1	38.4	265.0	1	1760	265	6450	311	2.8	249.3
0245	0245	34	1	38.4	265.0	1	1765	267	6551	311	2.8	249.5
0250	0250	35	1	38.4	265.0	1	1770	269	6652	311	2.8	249.7
0255	0255	36	1	38.4	265.0	1	1775	271	6753	311	2.8	249.9
0300	0300	37	1	38.4	265.0	1	1780	273	6854	311	2.8	250.1
0305	0305	38	1	38.4	265.0	1	1785	275	6955	311	2.8	250.3
0310	0310	39	1	38.4	265.0	1	1790	277	7056	311	2.8	250.5
0315	0315	40	1	38.4	265.0	1	1795	279	7157	311	2.8	250.7
0320	0320	41	1	38.4	265.0	1	1800	281	7258	311	2.8	250.9
0325	0325	42	1	38.4	265.0	1	1805	283	7359	311	2.8	251.1
0330	0330	43	1	38.4	265.0	1	1810	285	7460	311	2.8	251.3
0335	0335	44	1	38.4	265.0	1	1815	287	7561	311	2.8	251.5
0340	0340	45	1	38.4	265.0	1	1820	289	7662	311	2.8	251.7
0345	0345	46	1	38.4	265.0	1	1825	291	7763	311	2.8	251.9
0350	0350	47	1	38.4	265.0	1	1830	293	7864	311	2.8	252.1
0355	0355	48	1	38.4	265.0	1	1835	295	7965	311	2.8	252.3
0400	0400	49	1	38.4	265.0	1	1840	297	8066	311	2.8	252.5
0405	0405	50	1	38.4	265.0	1	1845	299	8167	311	2.8	252.7
0410	0410	51	1	38.4	265.0	1	1850	301	8268	311	2.8	252.9
0415	0415	52	1	38.4	265.0	1	1855	303	8369	311	2.8	253.1
0420	0420	53	1	38.4	265.0	1	1860	305	8470	311	2.8	253.3
0425	0425	54	1	38.4	265.0	1	1865	307	8571	311	2.8	253.5
0430	0430	55	1	38.4	265.0	1	1870	309	8672	311	2.8	253.7
0435	0435	56	1	38.4	265.0	1	1875	311	8773	311	2.8	253.9
0440	0440	57	1	38.4	265.0	1	1880	313	8874	311	2.8	254.1
0445	0445	58	1	38.4	265.0	1	1885	315	8975	311	2.8	254.3
0450	0450	59	1	38.4	265.0	1	1890	317	9076	311	2.8	254.5
0455	0455	60	1	38.4	265.0	1	1895	319	9177	311	2.8	254.7
0500	0500	61	1	38.4	265.0	1	1900	321	9278	311	2.8	254.9
0505	0505	62	1	38.4	265.0	1	1905	323	9379	311	2.8	255.1
0510	0510	63	1	38.4	265.0	1	1910	325	9480	311	2.8	255.3
0515	0515	64	1	38.4	265.0	1	1915	327	9581	311	2.8	255.5
0520	0520	65	1	38.4	265.0	1	1920	329	9682	311	2.8	255.7
0525	0525	66	1	38.4	265.0	1	1925	331	9783	311	2.8	255.9
0530	0530	67	1	38.4	265.0	1	1930	333	9884	311	2.8	256.1
0535	0535	68	1	38.4	265.0	1	1935	335	9985	311	2.8	256.3
0540	0540	69	1	38.4	265.0	1	1940	337	10086	311	2.8	256.5
0545	0545	70	1	38.4	265.0	1	1945	339	10187	311	2.8	256.7
0550	0550	71	1	38.4	265.0	1	1950	341	10288	311	2.8	256.9
0555	0555	72	1	38.4	265.0	1	1955	343	10389	311	2.8	257.1
0600	0600	73	1	38.4	265.0	1	1960	345	10490	311	2.8	257.3
0605	0605	74	1	38.4	265.0	1	1965	347	10591	311	2.8	257.5
0610	0610	75	1	38.4	265.0	1	1970	349	10692	311	2.8	257.7
0615	0615	76	1	38.4	265.0	1	1975	351	10793	311	2.8	257.9
0620	0620	77	1	38.4	265.0	1	1980	353	10894	311	2.8	258.1
0625	0625	78	1	38.4	265.0	1	1985	355	10995	311	2.8	258.3
0630	0630	79	1	38.4	265.0	1	1990	357	11096	311	2.8	258.5
0635	0635	80	1	38.4	265.0	1	1995	359	11197	311	2.8	258.7
0640	0640	81	1	38.4	265.0	1	2000	361	11298	311	2.8	258.9
0645	0645	82	1	38.4	265.0	1	2005	363	11399	311	2.8	259.1
0650	0650	83	1	38.4	265.0	1	2010	365	11500	311	2.8	259.3
0655	0655	84	1	38.4	265.0	1	2015	367	11601	311	2.8	259.5
0700	0700	85	1	38.4	265.0	1	2020	369	11702	311	2.8	259.7
0705	0705	86	1	38.4	265.0	1	2025	371	11803	311	2.8	259.9
0710	0710	87	1	38.4	265.0	1	2030	373	11904	311	2.8	260.1
0715	0715	88	1	38.4	265.0	1	2035	375	12005	311	2.8	260.3
0720	0720	89	1	38.4	265.0	1	2040	377	12106	311	2.8	260.5
0725	0725	90	1	38.4	265.0	1	2045	379	12207	311	2.8	260.7
0730	0730	91	1	38.4	265.0	1	2050	381	12308	311	2.8	260.9
0735	0735	92	1	38.4	265.0	1	2055	383	12409	311	2.8	261.1
0740	0740	93	1	38.4	265.0	1	2060	385	12510	311	2.8	261.3
0745	0745	94	1	38.4	265.0	1	2065	387	12611	311	2.8	261.5
0750	0750	95	1	38.4	265.0	1	2070	389	12712	311	2.8	261.7
0755	0755	96	1	38.4	265.0	1	2075	391	12813	311	2.8	261.9
0800	0800	97	1	38.4	265.0	1	2080	393	12914	311	2.8	262.1
0805	0805	98	1	38.4	265.0	1	2085	395	13015	311	2.8	262.3
0810	0810	99	1	38.4	265.0	1	2090	397	13116	311	2.8	262.5
0815	0815	100	1	38.4	265.0	1	2095	399	13217	311	2.8	262.7

1	0755	96	18.	39.0	265.1	1	1615	196	2473.	26.7	281.6	2	0035	296	59.	274.7
1	0800	97	20.	39.0	285.1	1	1620	197	2631.	27.7	281.9	2	0040	297	59.	274.6
1	0805	98	21.	39.1	285.1	1	1625	198	2751.	28.7	282.2	2	0045	298	50.	274.6
1	0810	99	24.	39.2	265.1	1	1630	199	2949.	29.6	282.5	2	0050	299	50.	274.6
1	0815	100	26.	39.2	265.1	1	1635	200	3093.	30.5	282.7	2	0055	300	49.	274.6

PEAK OUTFLOW IS 5563. AT TIME 14.02 HOURS

PEAK FLOW (CFS) 4139.	TIME (HR) 14.00	MAXIMUM AVERAGE FLOW 24-HR 634.	24.92-HR 611.
(INCHES) (AC-FT)	6-HR 2179. 9.209 1061.	72-HR 611. 10.727 1259.	
PEAK STORAGE (AC-FT) 56.	TIME (HR) 13.94	MAXIMUM AVERAGE STORAGE 24-HR 31.	24.92-HR 30.
PEAK STAGE (FEET) 267.91	TIME (HR) 13.94	MAXIMUM AVERAGE STAGE 24-HR 282.63	24.92-HR 282.34
CUMULATIVE AREA = 2.20 SQ MI			

CHANNEL ROUTING-MOD PULS-AT SMALL DAM

26 KK *****
43

27 NO OUTPUT CONTROL VARIABLES
PRINT CONTROL
PLOT CONTROL
HYDROGRAPH PLOT SCALE

HYDROGRAPH ROUTING DATA

28 AS STORAGE ROUTING
STEPS
ITYP
RSVRIC
X

29 RC NORMAL DEPTH CHANNEL ROUTING
ANL
ANCH
ANR
RLNTH
SEL
ELMAX

30 ELEVATION
DISTANCE

LEFT OVERRANK
290.00
0.0

CROSS-SECTION DATA
275.00
245.00
280.00

RIGHT OVERRANK
275.00
330.00
280.00
400.00
418.00

STORAGE 0.0 0.27 0.63 1.08 1.63 2.27 2.91 3.66 4.46 5.34
 OUTFLOW 0.0 165.18 574.78 1253.40 2365.47 3825.00 5606.55 7722.48 10174.50 12956.50
 ELEVATION 16110.69 19665.90 23634.62 28032.43 32674.40 38176.47 43954.45 50223.82 57000.07 64298.45
 272.09 272.95 273.89 274.84 275.78 276.71 277.68 278.63 279.58 280.53
 281.49 282.42 283.37 284.31 285.26 286.21 287.16 288.10 289.05 290.03

*** WARNING *** MODIFIED PULS ROUTING WILL BE NUMERICALLY UNSTABLE FOR OUTFLOWS BETWEEN 0. TO 64298.
 USE SHORTER TIME INTERVAL OR LONGER REACH LENGTH

HYDROGRAPH AT STATION A3
 FOR PLAN 1. RATIO = 0.10

PEAK FLOW (CFS) 1749.0
 (INCHES) 1.754
 (AC-FT) 208.0
 TIME (HR) 6.0
 MAXIMUM AVERAGE FLOW 24-HR 119.0
 72-HR 208.1
 24.92-HR 244.0

PEAK STORAGE (AC-FT) 1.0
 TIME (HR) 6.0
 MAXIMUM AVERAGE STORAGE 24-HR 0.0
 72-HR 0.0
 24.92-HR 0.0

PEAK STAGE (FEET) 274.64
 TIME (HR) 6.0
 MAXIMUM AVERAGE STAGE 24-HR 0.0
 72-HR 0.0
 24.92-HR 0.0

CUMULATIVE AREA = 2.20 SQ MI

HYDROGRAPH AT STATION A3
 FOR PLAN 1. RATIO = 0.25

PEAK FLOW (CFS) 1749.0
 (INCHES) 1.754
 (AC-FT) 208.0
 TIME (HR) 6.0
 MAXIMUM AVERAGE FLOW 24-HR 119.0
 72-HR 208.1
 24.92-HR 244.0

PEAK STORAGE (AC-FT) 1.0
 TIME (HR) 6.0
 MAXIMUM AVERAGE STORAGE 24-HR 0.0
 72-HR 0.0
 24.92-HR 0.0

PEAK STAGE (FEET) 274.64
 TIME (HR) 6.0
 MAXIMUM AVERAGE STAGE 24-HR 0.0
 72-HR 0.0
 24.92-HR 0.0

CUMULATIVE AREA = 2.20 SQ MI

HYDROGRAPH AT STATION A3
 FOR PLAN 1. RATIO = 0.50

PEAK FLOW (CFS) 3500.0
 (INCHES) 3.508
 (AC-FT) 416.0
 TIME (HR) 6.0
 MAXIMUM AVERAGE FLOW 24-HR 236.5
 72-HR 439.5
 24.92-HR 593.0

PEAK STORAGE (AC-FT) 1.0
 TIME (HR) 6.0
 MAXIMUM AVERAGE STORAGE 24-HR 0.0
 72-HR 0.0
 24.92-HR 0.0

PEAK STAGE (FEET) 274.64
 TIME (HR) 6.0
 MAXIMUM AVERAGE STAGE 24-HR 0.0
 72-HR 0.0
 24.92-HR 0.0

CUMULATIVE AREA = 2.20 SQ MI


```

*** ** HYDROGRAPH AT STATION A3
FOR PLAN 2, RATIO = 0.50
*** **
PEAK FLOW (CFS) 3716.
TIME (HR) 14.00
(CFS) 2179.
(INCHES) 9.208
(AC-FT) 1080.
MAXIMUM AVERAGE FLOW
24-HR 634.
72-HR 611.
24.92-HR 611.
MAXIMUM AVERAGE STORAGE
24-HR 0.
72-HR 0.
24.92-HR 0.
PEAK STORAGE (AC-FT) 2.
TIME (HR) 14.00
PEAK STAGE (EFF) 276.67
TIME (HR) 14.00
MAXIMUM AVERAGE STAGE
24-HR 275.28
72-HR 273.23
24.92-HR 273.23
CUMULATIVE AREA = 2.20 SQ MI

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*** ** CHANNEL ROUTING-MOD PULS-AT HOUSE AND NEWTON ROAD BRIDGE
*** **
*****
* 32 KK *
* 44 *
* *****

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*** ** HYDROGRAPH ROUTING DATA
*** **
STORAGE ROUTING
TYPE NTYPE
RSVRIC X
STOR -1.00
NUMBER OF SURREACHES
TYPE OF INITIAL CONDITION
U.O WORKING R AND O COEFFICIENT
U.O
NORMAL DEPTH CHANNEL ROUTING
ANL 0.000
ANCH 0.040
AHR 0.000
KLNTH 1100.
SEL 0.0080
ELMAX 0.0
LEFT OVERBANK N-VALUE
MAIN CHANNEL N-VALUE
RIGHT OVERBANK N-VALUE
REACH LENGTH
ENERGY SLOPE
MAX. ELEV. FOR STORAGE/OUTFLOW CALCULATION

```

```

*** ** CROSS-SECTION DATA
*** **
LEFT OVERBANK 260.00
ELEVATION 270.00
DISTANCE 0.0
1300.00
269.00
1310.00
263.00
1350.00
1700.00
RIGHT OVERBANK 270.00
ELEVATION 280.00
DISTANCE 1450.00
1700.00
COMPUTED STORAGE-OUTFLOW CURVE
STORAGE 0.0 0.90 1.81 2.71 3.61 4.52 5.42 6.42 9.10 14.60
23.23 35.00 49.90 67.93 89.09 113.38 140.81 171.37 205.06 241.82
OUTFLOW 0.0 107.50 331.87 635.04 999.63 1616.40 1871.32 2382.23 3069.00 4210.69
5941.01 8455.46 11910.64 16950.53 22209.74 29315.60 37889.49 48047.66 59902.64 73562.94
ELEVATION 263.00 263.59 264.79 265.68 269.58 267.47 268.37 269.26 270.16 271.05
271.55 272.84 273.73 274.63 275.52 276.42 277.31 278.21 279.10 280.00

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PLAN	2	INPUT DATA FOR STATION	A4 ARE SAME AS FOR PLAN 1			
PLAN 2	INPUT DATA FOR STATION	CUMULATIVE AREA =	2.20	50	MI	
FEAR FLOW (CFS) 3697.	TIME (HR) 17.17	(CFS) (INCHES) (AC-FT)	6-HR 2092. 8.439 1037.	MAXIMUM AVERAGE FLOW 24-HR 616. 10.416 1221.	MAXIMUM AVERAGE STORAGE 72-HR 2. 2.	24.92-HR 593. 10.411 1222.
FEAR STORAGE (AC-FT) 11.	TIME (HR) 17.17		6-HR 6.			24.92-HR 2.
FEAR STAGE (FEET) 270.46	TIME (HR) 17.17		6-HR 268.53			24.92-HR 264.65

HYDROGRAPH AT STATION
PLAN 2. 0.53 A4

CA MON	HRHH	GRO	OUTFLOW	STORAGE	STAGE	DA MON	HRHH	GRO	OUTFLOW	STORAGE	STAGE
0000	1	3	0.00	0.00	26.3	1	0320	101	25.0	0.00	26.3
0005	2	3	0.00	0.00	26.3	1	0425	102	29.0	0.00	26.3
0010	3	4	0.00	0.00	26.3	1	0430	103	31.0	0.00	26.3
0015	4	5	0.00	0.00	26.3	1	0435	104	34.0	0.00	26.3
0020	5	6	0.00	0.00	26.3	1	0440	105	36.0	0.00	26.3
0025	6	7	0.00	0.00	26.3	1	0445	106	42.0	0.00	26.3
0030	7	8	0.00	0.00	26.3	1	0450	107	46.0	0.00	26.3
0035	8	9	0.00	0.00	26.3	1	0455	108	50.0	0.00	26.3
0040	9	10	0.00	0.00	26.3	1	0500	109	54.0	0.00	26.3
0045	10	11	0.00	0.00	26.3	1	0505	110	59.0	0.00	26.3
0050	11	12	0.00	0.00	26.3	1	0510	111	64.0	0.00	26.3
0055	12	13	0.00	0.00	26.3	1	0515	112	69.0	0.00	26.3
0100	13	14	0.00	0.00	26.3	1	0520	113	74.0	0.00	26.3
0105	14	15	0.00	0.00	26.3	1	0525	114	79.0	0.00	26.3
0110	15	16	0.00	0.00	26.3	1	0530	115	82.0	0.00	26.3
0115	16	17	0.00	0.00	26.3	1	0535	116	87.0	0.00	26.3
0120	17	18	0.00	0.00	26.3	1	0540	117	91.0	0.00	26.3
0125	18	19	0.00	0.00	26.3	1	0545	118	95.0	0.00	26.3
0130	19	20	0.00	0.00	26.3	1	0550	119	103.0	0.00	26.3
0135	20	21	0.00	0.00	26.3	1	0555	120	110.0	0.00	26.3
0140	21	22	0.00	0.00	26.3	1	1000	121	111.0	0.00	26.3
0145	22	23	0.00	0.00	26.3	1	1005	122	111.0	0.00	26.3
0150	23	24	0.00	0.00	26.3	1	1010	123	111.0	0.00	26.3

1	0730	91	13.	0.1	263.1	1	1550	191	1834.	5.5	268.3	*	2	0010	291	22.	0.5	263.5
1	0735	92	14.	0.1	263.1	1	1555	192	1925.	5.7	268.5	*	2	0015	292	23.	0.5	263.5
1	0740	93	14.	0.1	263.1	1	1600	193	2029.	5.7	268.6	*	2	0020	293	24.	0.5	263.5
1	0745	94	16.	0.1	263.1	1	1605	194	2146.	6.0	268.7	*	2	0025	294	25.	0.5	263.5
1	0750	95	16.	0.1	263.1	1	1610	195	2270.	6.2	268.8	*	2	0030	295	26.	0.5	263.5
1	0755	96	17.	0.1	263.1	1	1615	197	2411.	6.5	268.9	*	2	0035	296	27.	0.5	263.5
1	0800	97	18.	0.1	263.1	1	1620	197	2533.	6.5	269.0	*	2	0040	297	28.	0.5	263.5
1	0805	98	21.	0.2	263.2	1	1625	198	2653.	7.6	269.1	*	2	0045	298	29.	0.4	263.4
1	0810	99	21.	0.2	263.2	1	1630	199	2853.	8.2	269.2	*	2	0050	299	30.	0.4	263.4
1	0815	100	23.	0.2	263.2	1	1635	200	3005.	8.8	270.0	*	2	0055	300	50.	0.4	263.4

PEAK FLOW
 (CFS)
 3492.
 TIME
 (HR)
 17.17
 (INCHES)
 2177.
 6-HR
 9.202
 10721
 1258.
 MAXIMUM AVERAGE FLOW
 24-HR
 611.
 10722
 1258.
 24.92-HR
 611.
 10722
 1258.
 PEAK STAGE
 (AC-FT)
 11.
 TIME
 (HR)
 17.17
 MAXIMUM AVERAGE STORAGE
 24-HR
 2.
 24.92-HR
 2.
 PEAK STAGE
 (FEET)
 270.46
 TIME
 (HR)
 17.17
 MAXIMUM AVERAGE STAGE
 24-HR
 264.95
 72-HR
 264.88
 24.92-HR
 264.88
 CUMULATIVE AREA = 2.20 SQ MI

PEAK FLOW AND STAGE (LONG-OF-PERIOD) SUMMARY FOR MULTIPLE PLAN-RATIO ECONOMIC COMPUTATIONS
 FLOWS IN CUBIC FEET PER SECOND, AREA IN SQUARE FEET
 TIME TO PEAK IN HOURS

OPERATION	STATION	AREA	PLAN	RATIOS APPLIED TO FLOWS		
				RATIO 1	RATIO 2	RATIO 3
HYDROGRAPH AT	A1	2.20	1	0.10	0.25	0.50
				701.	1752.	3505.
				17.00	17.00	17.00
				17.00	17.00	17.00
ROUTED TO	A2	2.20	1	686.	1750.	3501.
				17.25	17.08	17.08
				686.	4070.	4139.
				17.25	15.33	14.00
ROUTED TO	A3	2.20	** PEAK STAGES IN FEET **			
			1	287.83	288.54	289.20
			1	17.25	17.08	17.08
			2	287.83	287.90	287.91
			2	17.25	15.26	13.94
			1	686.	1749.	3500.
			1	17.33	17.08	17.08
			2	686.	3851.	3716.
			2	17.33	15.33	14.00
			** PEAK STAGES IN FEET **			
			1	274.04	275.26	276.53
			1	17.25	17.08	17.08
ROUTED TO	A4	2.20	1	686.	1749.	3497.
				17.33	17.17	17.17
				686.	3320.	3492.
				17.33	15.42	17.17
			** PEAK STAGES IN FEET **			
			1	265.91	268.13	270.48
			1	17.33	17.17	17.17
			2	265.81	270.34	270.48
			2	17.33	15.42	17.17

SUMMARY OF DAM OVERTOPPING/BREACH ANALYSIS FOR STATION A2

PLAN 1

RATIO OF PHF	MAXIMUM RESERVOIR ELEV M.S.ELEV	MAXIMUM DEPTH OVER DAM	INITIAL VALUE 285.00 38. 0.	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
0.10	287.83	0.0	285.00	57.	686.	0.0	17.25	0.0
0.25	288.54	0.64	38.	97.	1750.	4.25	17.08	0.0
0.50	289.20	1.30	0.	76.	3501.	6.33	17.08	0.0

ELEVATION
STORAGE
OUTFLOW

TOP OF DAM
287.90
58.
711.

PLAN 2

RATIO OF PHF	MAXIMUM RESERVOIR ELEV M.S.ELEV	MAXIMUM DEPTH OVER DAM	INITIAL VALUE 285.00 38. 0.	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
0.10	287.83	0.0	285.00	57.	686.	0.0	17.25	0.0
0.25	287.90	0.00	38.	58.	5469.	0.11	15.35	15.25
0.50	287.91	0.01	0.	58.	5563.	0.03	14.02	13.92

ELEVATION
STORAGE
OUTFLOW

TOP OF DAM
287.90
58.
711.

*** NORMAL END OF JOB ***

AD-A103 935

NEW JERSEY DEPT OF ENVIRONMENTAL PROTECTION TRENTON --ETC F/6 13/13
NATIONAL DAM SAFETY PROGRAM, MAPLE LAKE DAM (NJ 00776), PASSAIC--ETC(U)
JUL 81 W GUINAN

DACW61-79-C-0011

DAEN/NAP-53842/NJ00776-81/ NL

UNCLASSIFIED

2 OF 2

AD-A
103 935



END
DATE
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10-81
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APPENDIX 6

REFERENCES

MAPLE LAKE DAM

APPENDIX 6
REFERENCES

MAPLE LAKE DAM

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