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NATIONAL DAM INSPECTION PROGRAM. LAKE QUINN DAM (NDI ID NUMBER --ETC(U)
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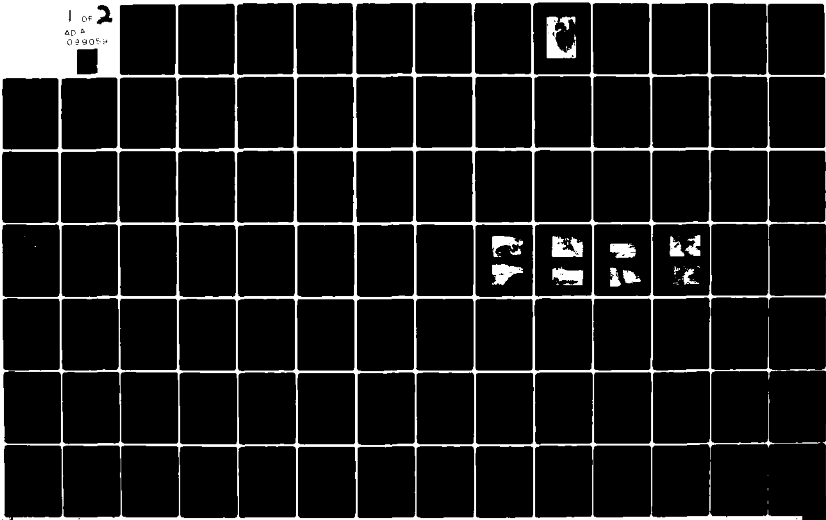

·LAWARE RIVER BASIN

TRIBUTARY TO MIDDLE CREEK, WAYNE COUNTY

PENNSYLVANIA

LAKE QUINN DAM

NDI ID NO. PA-00145
DER ID NO. 64-43

MR. DAVID BEYNON, SR.

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

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

DELAWARE RIVER BASIN

TRIBUTARY OF MIDDLE CREEK, WAYNE COUNTY

PENNSYLVANIA

(1) National Dam Inspection Program.

LAKE QUINN DAM

(NDI ID Number PA-00145
DER ID Number 64-43)

~~MR. DAVID BEYNON, SR.~~

Delaware River Basin Tributary of Middle Creek Wayne County Pennsylvania.

PHASE I INSPECTION REPORT.

NATIONAL DAM INSPECTION PROGRAM

(12) 100

Prepared by

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

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PREFACE

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

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

It is important to note that the condition of a dam depends on numerous and constantly changing internal and external conditions, and is evolutionary in nature. It would be incorrect to assume that the present condition of the dam will continue to represent the condition of the dam at some point in the future. Only through frequent inspections can unsafe conditions be detected and only through continued care and maintenance can these conditions be prevented or corrected.

Phase I inspections are not intended to provide detailed hydrologic and hydraulic analyses. In accordance with the established guidelines, the spillway design flood is based on the estimated "Probable Maximum Flood" for the region (greatest reasonably possible storm runoff), or fractions thereof. The spillway design flood provides a measure of relative spillway capacity and serves as an aid in determining the need for more detailed hydrologic and hydraulic studies, considering the size of the dam, its general condition, and the downstream damage potential.

NDI ID No. PA-00145, DER ID No. 64-43

PHASE I INSPECTION REPORT

NATIONAL DAM INSPECTION PROGRAM

CONTENTS

APPENDICES

PHASE I INSPECTION REPORT

NATIONAL DAM INSPECTION PROGRAM

BRIEF ASSESSMENT OF GENERAL CONDITION

AND

RECOMMENDED ACTION

Name of Dam:	Lake Quinn Dam NDI ID No. PA-00145 DER ID No. 64-43
Size:	Small (12.2 Feet high; 305 acre-feet)
Hazard Classification:	High
Owner:	Mr. David Beynon, Sr. Rd 2, Lake Quinn Box 125 Waymart, PA 18472
State Located:	Pennsylvania
County Located:	Wayne
Stream:	Tributary of Middle Creek
Date of Inspection:	4 November 1980

The visual inspection and review of available design and construction information indicate that Lake Quinn Dam is in fair condition. Deficiencies noted during the inspection included the lack of functional drawdown facilities and minor seepage through the masonry near the right abutment.

Based on the size and hazard classification of the dam, the recommended Spillway Design Flood (SDF) varies between 1/2 the Probable Maximum Flood (PMF) and the PMF. The 1/2 PMF has been selected as the SDF due to the size of the dam and reservoir, and the downstream conditions. The hydrologic and hydraulic computations indicate that the combination of reservoir storage and spillway discharge capacity will pass only 3 percent of the PMF without overtopping the dam. Overtopping the dam could cause failure, which would lead to a significant increase in downstream loss of life and property damage. Therefore, the spillway for Lake Quinn Dam is considered to be seriously inadequate, and the dam is judged to be unsafe, non-emergency.

It is recommended that the owner immediately:

(1) Retain a qualified professional engineer to perform a detailed hydrologic and hydraulic study to further assess the discharge capacity of the spillway and develop remedial measures found necessary to provide adequate spillway capacity. This study should also include development of an adequate drawdown facility for the dam having positive upstream closure capability.

(2) Seal the existing sluiceway, unless rehabilitation is undertaken.

(3) Monitor, the seepage near the right abutment and take appropriate remedial action should the condition begin to worsen significantly.

(4) Remove trees and brush from the abutments, and the cable and wire from the upstream face.

(5) Develop formal surveillance and downstream emergency warning system for use during periods of heavy or prolonged precipitation.

(6) Prepare an operation and maintenance manual or plan for use as a guide in the operation of the dam during normal and emergency conditions.

(7) Develop a schedule of regular inspections by a qualified engineer.

Approved by:

DEPARTMENT OF THE ARMY
Baltimore District, Corps of Engineers

James W. Peck

DATE: 9 APR 81

JAMES W. PECK
Colonel, Corps of Engineers
District Engineer

LAKE QUINN DAM

OVERVIEW

PHASE I INSPECTION REPORT

NATIONAL DAM INSPECTION PROGRAM

LAKE QUINN DAM

NDI ID NO. PA 00145

DER ID NO. 64-43

SECTION 1 - PROJECT INFORMATION

1.1 General

A. Authority

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

B. Purpose

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

1.2 DESCRIPTION OF PROJECT

A. Description of Dam and Appurtenances

Note: The U.S.G.S. Quadrangle Sheet (Waymart, Pa.) indicates a reservoir elevation ot 1352, which is used in this report as existing spillway crest elevation.

Lake Quinn Dam is an earthfill and dry stone masonry structure with an overflow spillway section and concrete cap. The overall dam length is approximately 150 feet and the low point of the dam's crest is 12.2 feet above the downstream toe. The spillway is an uncontrolled broad-crested weir having a length of 66 feet. There are no functional outlet facilities for the dam. The present spillway crest is 1 foot below top of dam.

Available records indicate that the dam was lengthened and reinforced by placing random fill on the upstream face at the masonry dam, sometime after 1946. A sluiceway (currently inoperable) was also constructed in the old millrace at that time. All normal inflow is discharged through the uncontrolled spillway at the present time.

B. Location: South Canaan Township, Wayne County
U.S.G.S. Quadrangle - Waymart, Pa.
Latitude 41° 30.5′, Longitude 75° 25.6′
Ref. Appendix E, Plates I & II

C. Size Classification: Small: Height - 12.2 feet

Storage - 305 Acre-feet

D. Hazard Classification: High (Refer to Section 3.1.E)

E. Ownership: Mr. David Beynon, Sr.

RD2 Lake Quinn

Box 125

Waymart, PA 18472

F. Purpose: Recreation

G. Design and Construction History. No information on the original design and construction of the dam is known to exist. Sketches are available showing proposed work to be done in the late 1940's; however, it is not known specifically when this work was actually accomplished. Visual examination of the existing structure and available photographs indicate that, with some dimensional changes, the work proposed in 1946 was done sometime prior to 1965.

H. Normal Operating Procedure. The reservoir is normally maintained at the crest level of the uncontrolled spillway. Inflow occurring when the lake is at or above the spillway crest is discharged thru the uncontrolled spillway.

1.3 Pertinent Data:

A. Drainage Area (square miles)

From files:	4.7
Computed for this report:	9.7
Use:	9.7

B. Discharge at Damsite (cubic feet per second)

Maximum known flood	Unknown
Spillway at maximum pool (El. 1353.0)	200

C. Elevations (feet above mean sea level)

Note: Reservoir elevation of 1352.0 shown on Waymart, Pa. U.S.G.S. quad is used as spillway crest elevation.

Top of dam (low point)	1353.0
Top of dam (design)	Unknown
Spillway crest (current)	1352.0
Spillway crest (design)	Unknown
Streambed at toe	1340.8

D. <u>Reservoir Length (miles)</u>

Spillway crest (El. 1352.0)	1.6
Maximum pool (El. 1353.0)	1.7

E. <u>Storage (acre-feet)</u>

Spillway crest (El. 1352.0)	190
Maximum pool (El. 1353.0)	305

F. <u>Reservoir Surface (acres)</u>

Spillway crest (El. 1352.0)	104
Maximum pool (El. 1353.0)	125

G. <u>Dam</u>

Note: Refer to plates in Appendix B for plan and section

Type: Dry stone masonry w/earthfill upstream; concrete cap on crest.

Crest Length: 150 feet (incl. spillway)

Height: 12.2 feet (field measured; low pt. to d/s toe)

Crest Width: 18.5′ left of the spillway

7.4′ between spillway and right abutment

Side Slopes:

Upstream: Vertical, upper 1.5′ of left end and flat below this depth

1V:8H at spillway

Downstream: Vertical

Zoning: Dry stone masonry w/earthfill upstream

Cutoff: None reported; placed on bedrock

Grouting: None reported.

H. Outlet Works: None

I. Spillway:

Type: Uncontrolled, rectangular concrete with broad crest

Length: 66 feet

Location: Middle of dam

Low Flow Notch: None

Approach Channel: Reservoir

Downstream Channel: Bedrock bottom

SECTION 2

ENGINEERING DATA

2.1 Design

The available data for Lake Quinn Dam consist of files provided by the Pennsylvania Department of Environmental Resources (PennDER). Information available includes state inspection reports, various related correspondence, and three rough sketches dated April 1946 showing proposed improvements to the dam. No other plans or design details are known to exist.

2.2 Construction

No information is available on the original construction of the dam. Records indicate that the repairs planned in 1946 were eventually accomplished, although the specific date is unknown. This work included strengthening the masonry section by placing random earthfill on the upstream side and extending the dam to its present length. A battered masonry downstream face was also to have been added, but was apparently never constructed. PennDER inspection reports indicate that a clay blanket was placed on the upstream face in the early 1970's to stop leakage thru the dam.

2.3 Operation

No formal records of operation or maintenance exist. The owner lives near the left abutment of the dam and checks the dam regularly to determine if maintenance is necessary. The owner stated that, to his knowledge, the greatest spillway flows occurred during the 1955 and 1972 storm events, with each causing a flow depth of approximately 2.5 feet over the dam and spillway. The most recent PennDER inspection report (4 October 1972) indicated that the dam was in satisfactory condition at that time.

2.4 Evaluation

a. Availability

All available written information and data was contained in the permit files provided by PennDER.

b. Adequacy

The available data, including that collected during the recent detailed visual inspection, are considered to be adequate to make a reasonable assessment of the dam.

SECTION 3

VISUAL INSPECTION

3.1 Findings

A. General

The overall appearance of the dam is fair. The concrete cap on the dam and spillway is spalling and there are no facilities with which to draw down the lake. On the day of inspection, the pool was at its normal level with 0.1 feet of water flowing over the spillway (overflow section).

The visual inspection checklist and sketches of the general plan, profile, and section of the dam, as surveyed during the inspection, are presented in Appendix A. The survey datum is the reservoir elevation obtained from the U.S.G.S. Waymart, PA, quadrangle map. The owner, Mr. David Beynon Sr., was present during the inspection.

Photographs taken on the day of inspection are reproduced in Appendix C.

B. Stone Masonry and Embankment

Although there are some surface cracks and spalling of the 6"-10" thick concrete cap, no evidence of structural distress exists. The crest alignment, both horizontal and vertical, is good with no indications of movement. The downstream face of the dry-laid stone is in fair condition with only a few stones missing. However, the old sluiceway has apparently been loosely filled with stone and timber and could be probed to a depth greater than 6 feet. The first 30 feet of the dam from the left abutment is battered at 3V:1H with stone. The dam foundation is bedrock which is visible immediately downstream of the toe for the right two-thirds of the dam. This rock is thick bedded and in good condition.

The upstream earth embankment to the left of the spillway has a horizontal grass covered crest 8.6 feet wide. The upper 1.5 feet of the upstream face is a vertical wall of dry laid stone 2.5 feet wide. The portion of the upstream earth embankment adjacent to the spillway and right abutment is at the same elevation as spillway crest and slopes away from the stone masonry at 1V:8H. Weeds are growing along the upstream side of crest and 4 to 8 inch diameter trees are growing at the embankment and abutment junctions. Two cables and one strand of barbed wire with a maximum height of three feet are supported on iron posts along the upstream limit of the crest.

Clear seepage is flowing at approximately 2 gpm from the downstream face about four feet below the crest and four feet to the right of the spillway. A pile of recently cut brush and small tree limbs obscures this area of the downstream face. Immediately downstream of the toe at the left end of the dam is an area of standing water. It is apparent from the type of vegetation that this area is usually wet. Inspection reports beginning in 1938 note that some seepage was observed at the right abutment and at the hillside on the left abutment. The area downstream of the toe of the overflow section is submerged by tailwater.

C. Appurtenant Structures

The spillway consists of a concrete capped overflow section of the dam 66 feet long, 7.4 feet wide and 1 foot deep. The concrete cap is 10 inches thick and has some spalling and surface erosion but no apparent structural defects. The approach channel is the reservoir with the bottom sloping at 1V:8H. Obstructions to flow are limited to the weeds and cables mentioned above. The downstream channel of the spillway consists of the vertical drop from the crest to the bedrock toe and a clear channel on bedrock for the full width of the spillway for the first 100 feet before narrowing to 10 feet wide. The channel immediately enters a shallow pond. The abandoned 2.5 foot high by 2.0 foot wide sluiceway in the left end of the dam is filled loosely with stones on the downstream side and is reportedly blocked on the upstream end by the stone masonry and earth embankment. No functional facility exists for drawing down the lake.

D. Reservoir Area:

About 25 per cent of the shoreline of the reservoir has residential development. The reservoir banks and the watershed are about 50% wooded and have flat to moderate slopes. The banks appear stable and major siltation is not expected.

E. Downstream Channel:

The downstream channel is tree lined with a flat slope. The first obstruction downstream is a road crossing about 1,500 feet downstream of the dam. Approximately 4,000 feet from the dam another road crosses and one house is adjacent to the stream. Three more minor roads are crossed before reaching the Town of Varden 3.0 miles downstream of the dam. Four homes are located within the floodplain at this point. The proximity of these homes to the stream creates a high hazard to loss of life if the dam fails.

F. Evaluation

The visual inspection of Lake Quinn indicates that the dam and spillway are in fair condition. Maintenance is required to remove existing trees and brush from the embankment and abutments. Adequate drawdown facilities should be provided.

SECTION 4

OPERATIONAL PROCEDURES

4.1 Normal Operating Procedure

The facility is essentially self-regulating. Excess inflow passes through the emergency spillway located in the center of the dam. Inflows in excess of the emergency spillway capacity will overtop the concrete capped dry stone masonry embankment. No formal operations manual exists.

4.2 Maintenance of Dam

The condition of the dam as observed by the inspection team was fair. Basic maintenance such as keeping the spillway clear, and repairing minor flood damage is performed by the owner. No formal maintenance manual exists.

4.3 Maintenance of Operating Facilities

See Section 4.2 above

4.4 Warning System

No formal warning system exists.

4.5 Evaluation

Routine maintenance of the facility should include removal of trees and brush. No means currently exist to lower the elevation of the lake if required for any repair to part of the structure. Formal manuals of maintenance and operation are also recommended to ensure that all needed maintenance is identified and performed regularly. In addition, a formal warning system for the protection of downstream inhabitants should be developed. Included in the plan should be provisions for around-the-clock surveillance of the facility during periods of unusually heavy precipitation.

SECTION 5

HYDROLOGIC/HYDRAULIC EVALUATION

5.1 Design Data

No formal design reports, calculations or miscellaneous design data are known to exist for the facility. However, in 1917 calculations were determined for the "equalizing effect" of Lake Quinn on a proposed change to a downstream structure. Data developed in that report was filed in Harrisburg, PA, April 19, 1917.

5.2 Experience Data

Records of reservoir levels and/or spillway discharges are not available. Discussion with the owner indicated that the dam had been overtopped by up to 2.5 feet during two previous flood events in October 1955 and June 1972. Other overtoppings are not known and are considered to be less significant than these events. No other records of past performance are known to exist.

5.3 Visual Observations

On the date of the inspection, no conditions were observed that would prevent the facility from operating within the capability of the structure.

5.4 Method of Analysis

The facility has been analyzed in accordance with procedures and guidelines established by the U.S. Army, Corps of Engineers, Baltimore District for Phase I hydrologic and hydraulic evaluations. This analysis has been performed using a modified version of the HEC-1 program developed by the U.S. Army Corps of Engineers, Hydrologic Engineering Center Davis, California. Capabilities of the program are briefly outlined in the preface contained in Appendix D.

5.5 Summary of Analysis

a. Spillway Design Flood (SDF). In accordance with the procedures and guidelines contained in the National Guidelines for Safety Inspection of Dams for Phase I Investigations, the SDF for Lake Quinn ranges between one-half the Probable Maximum Flood (PMF) and the full PMF. This classification is based on the relative size of the dam (small), and the potential hazard of dam failure to downstream development (High). Due to the small storage (approximately 300 ac-ft) and small dam height (12.2 feet) the SDF selected was the one-half PMF.

b. Results of the Analysis. Lake Quinn was evaluated under near normal operating conditions. The starting lake elevation was set at spillway crest, elevation 1352. The emergency spillway consists of a 1 foot deep notch, 66 feet in length, in the center portion of the dam. Flood hydrographs were developed and the following results were obtained:

Spillway Capacity at Top of Dam	200 CFS
Peak PMF Inflow	16,440 CFS

The overtopping analysis (using HEC-1DB) indicated that the discharge/storage capacity of Lake Quinn can only accommodate 3% of the PMF. Under one-half PMF conditions, the dam is overtopped 30 hours to a maximum depth of 5.7 feet. Since the SDF for this dam is the one-half PMF, it can be concluded that Lake Quinn has a high potential for overtopping, and thus, for breaching under floods of less than SDF magnitude.

Included in this study was the effect of two upstream structures, Robinson Pond and Bronson Pond. These structures have been investigated in the Dam Safety Inspection program and have the following Pennsylvania DER numbers.

Robinson Pond	70-64-136
Bronson Pond	70-64-42

Flood routings for their subareas were used in this study as shown in Appendix D of this report.

The effect of Telshaw Pond, also located upstream, was considered to be insignificant for the purposes of this analysis.

To determine if the spillway is seriously inadequate, these conditions must be met:

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

(ii) The spillway is not capable of passing one-half PMF without overtopping the dam and causing failure.

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

Since Lake Quinn meets the first two conditions, a breach analysis was performed to determine whether the third condition is met.

The modified HEC-1 computer program was used for the breaching analysis. The computer program requires that the failure elevation be given to the model so that failure may commence. It was assumed that the dam could withstand up to 1.5 feet of overtopping for short durations. Therefore, the water surface elevation selected to cause failure would be elevation 1354.5.

Four breach models were analyzed under conditions that would approximate 1.5 feet of overtopping. The flood selected to cause breaching was 10% of the PMF. Of the four plans, Plan 1 was a non-breach analysis used to provide a means of direct comparison between failure and non-failure conditions at downstream locations for the same flood event. Failure times in the three remaining plans ranged were 0.33 hour (Plan 2), 1.00 hour (Plan 3), and 2.00 hours (Plan 4). Downstream damage elevations and locations are shown in Appendix D and E of this report. Page D-12 of Appendix D, provides peak outflows and changes in stage at the downstream damage centers and their relationships between the four plans. As indicated in the table, failure conditions significantly increase the hazard to loss of life when compared to non-failure conditions. Breach geometry and location are also discussed in Appendix D.

5.6 Spillway Adequacy

Under existing conditions Lake Quinn can accommodate only 3% of the PMF. Should an event in excess of this occur, the dam would be overtopped and could possibly fail. Since the failure of this dam could lead to an increased hazard to loss of life or property damage at existing downstream residences, this spillway is considered seriously inadequate.

SECTION 6

STRUCTURAL STABILITY

6.1 Evaluation of Structural Stability

a. Visual Observations

1. Embankment. Visual observations of the Lake Quinn Dam indicate that the dam is in fair condition. The dam is a dry laid stone structure with an overflow spillway section and a random earth embankment upstream. The stone structure is 7.4 feet wide, has a 10-inch thick concrete cap, and has a vertical downstream face, except on the downstream left end. Additional stone for a length of 30 feet has been added to the downstream face of the dam at the left abutment. It is battered at a slope of 1H:3V. The upstream earth embankment to the left of the spillway has a horizontal crest 8.6 feet wide and a vertical upstream dry laid stone face approximately 1.5 feet high by 2.5 feet wide. The embankment crest upstream of the spillway and right abutment is at spillway elevation and slope away from the stone structure at an 8H:1V slope. Clear seepage estimated at 2 gpm was observed at the right abutment contact. At the left downstream toe, stagnant water was observed; it appeared from the vegetation that this area is usually wet. Inspection reports as early as 1938 mentioned that seepage was observed at the right abutment and from the hillside at the left abutment.

The base of the dam and right abutment are founded on bedrock of siltstone and shale. The left downstream abutment may have undergone some minor settlement or movement in the rock structure as evidenced by a crack in a patch of mortar. Brush has been dumped on the left downstream abutment and weeds are growing on it which prohibit a thorough inspection of this area.

2. Appurtenant Structures. The spillway is an overflow section of the dam, 66 feet long, 12 inches deep, and 7.4 feet wide. It is capped by a 10-inch thick concrete slab. Upstream of the spillway the earth embankment slopes away at 8H to 1V. An abandoned sluiceway 2.5 feet high by 2 feet wide was observed to exit near the left abutment. The sluiceway should be filled and grouted to prevent a possible collapse as the timbers in it are rotten.

b. Design and Construction Data

1. Embankment. There are no known design or construction data for this dam. The dam originally consisted of a vertical faced dry laid stone structure and had no upstream embankment. Timber planks were used on the upstream face for an impervious barrier. A few pictures dated from 1915 to the 1930's show that large capstones were placed on the crest of the dam and timber planking was placed on the spillway crest. Profile, cross section and plan view sketches of the dam are available for the changes proposed in 1946, some of which have been made. These sketches indicated that stone would be placed against the downstream dam face at a slope of 2H:3V; the crest would be capped with 6 inches of concrete; and an upstream embankment would be added with a 12 foot horizontal crest and an upstream slope of 2 1/3H:3V.

2. Appurtenant Structures. No design or construction data are known to exist other than the rough sketches mentioned above.

c. Operating Records. There are no records of operation.

d. Post-Construction Changes. Dam length was increased sometime between 1946 and 1965. An upstream earth embankment was added, and additional stone was laid at the left abutment. An upstream clay blanket was also added in the early 70's.

e. Seismic Stability The dam is located in Seismic Zone 1. Based on visual observations, the static stability of the dam is considered to be adequate. The seismic stability of the dam is therefore considered to be adequate.

SECTION 7

ASSESSMENT AND RECOMMENDATIONS

7.1 DAM ASSESSMENT

A. Safety

The visual inspection and review of available design and construction information indicate that Lake Quinn Dam is in fair condition. Deficiencies noted during the inspection included the lack of functional drawdown facilities and minor seepage through the masonry near the right abutment.

The hydrologic and hydraulic computations indicate that the combination of reservoir storage and spillway discharge capacity will pass only 3 percent of the PMF without overtopping the dam. Therefore, in accordance with criteria outlined and evaluated in Section 5.5b, the spillway for Lake Quinn Dam is considered to be seriously inadequate, and the dam is judged to be unsafe, non-emergency.

B. Adequacy of Information

The available information contained in PennDER files, in conjunction with data collected during the visual inspection, are considered to be adequate for making a reasonable assessment of this dam.

C. Urgency

The recommendations presented below should be implemented immediately.

D. Necessity for Additional Studies

The results of this inspection indicate a need for additional studies to further assess the adequacy of the spillway and develop necessary plans for providing adequate spillway capacity.

7.2 RECOMMENDATIONS

It is recommended that the owner immediately:

A. Retain a qualified professional engineer to perform a detailed hydrologic and hydraulic study to further assess the discharge capacity of the spillway and develop remedial measures found necessary to provide adequate spillway capacity. This study should also include development of an adequate drawdown facility for the dam having positive upstream closure capability.

B. The existing sluiceway should be sealed, unless rehabilitation is undertaken.

C. The seepage, near the right abutment should be monitored and appropriate remedial action taken should the condition begin to worsen significantly.

D. Remove trees and brush from the abutments, and the cable and wire from the upstream face of the dam.

E. A formal surveillance and downstream emergency warning system should be developed for use during periods of heavy or prolonged precipitation.

F. An operation and maintenance manual or plan should be prepared for use as a guide in the operation of the dam during normal and emergency conditions.

G. A schedule of regular inspections by a qualified engineer should be developed.

APPENDIX A

CHECKLIST - VISUAL INSPECTION

Check List
Visual Inspection
Phase 1

Name Dam Lake Quinn Dam   County Wayne   State Pennsylvania

Date(s) Inspection 4 Nov 80   Weather Cloudy   Temperature 50^{o}

Pool Elevation at Time of Inspection 1352.1 M.S.L.   Tailwater at Time at Inspection 1341.2 M.S.L.

Inspection Personnel:

J. Bianco (C.O.E.)   E. Hecker (C.O.E.)   David Beynon, Sr., Owner

B. Cortright (C.O.E.

J. Evans (C.O.E.)

B. Cortright Recorder

STONE MASONRY AND EMBANKMENT

VISUAL EXAMINATION OF	OBSERVATIONS
CREST ALIGNMENT:	
1. Horizontal	1. Horizontal - Good
2. Vertical	2. Vertical - Good except for slight settlement at downstream side of left abutment
SURFACE CRACKS:	
Concrete	Concrete cap is cracked and spalling in several locations
Embankment	D/S slope of earthfill was submerged. Crest good. No cracks observed.
STRUCTURAL CRACKING	None
JUNCTION OF EMBANKMENT WITH:	
Abutments	Slight settlement of downstream side of left abutment; otherwise good.
Spillway	
UNUSUAL MOVEMENT OR CRACKING AT OR BEYOND THE TOE	None.
SLOUGHING OR EROSION OF EMBANKMENT AND ABUTMENT SLOPES	None.

FOUNDATION	Bedrock; exposed at toe of spillway and right end and in downstream channel.
RIPRAP	No riprap.
ANY NOTICEABLE SEEPAGE	Approximately 2 gpm of clear water is flowing from d/s face; about 4 feet right of spillway and 4 feet below crest. A wet area exists about 7 feet d/s of toe and 30 feet from the left abutment. Flow over spillway and tailwater obscured a portion of d/s face and toe.
STAFF GAGE & RECORDER	None.
INSTRUMENTATION	None.
MISCELLANEOUS	Trees at the right and left abutments. Weeds along u/s face. 2 cables & 1 strand barbed wire stretched across u/s face; supported on iron posts 1' & 3' above crest. The old sluiceway (2' x 2.5' high) is loosely filled with stones and timber; probed more than 6 feet from d/s face; no seepage.

SPILLWAY

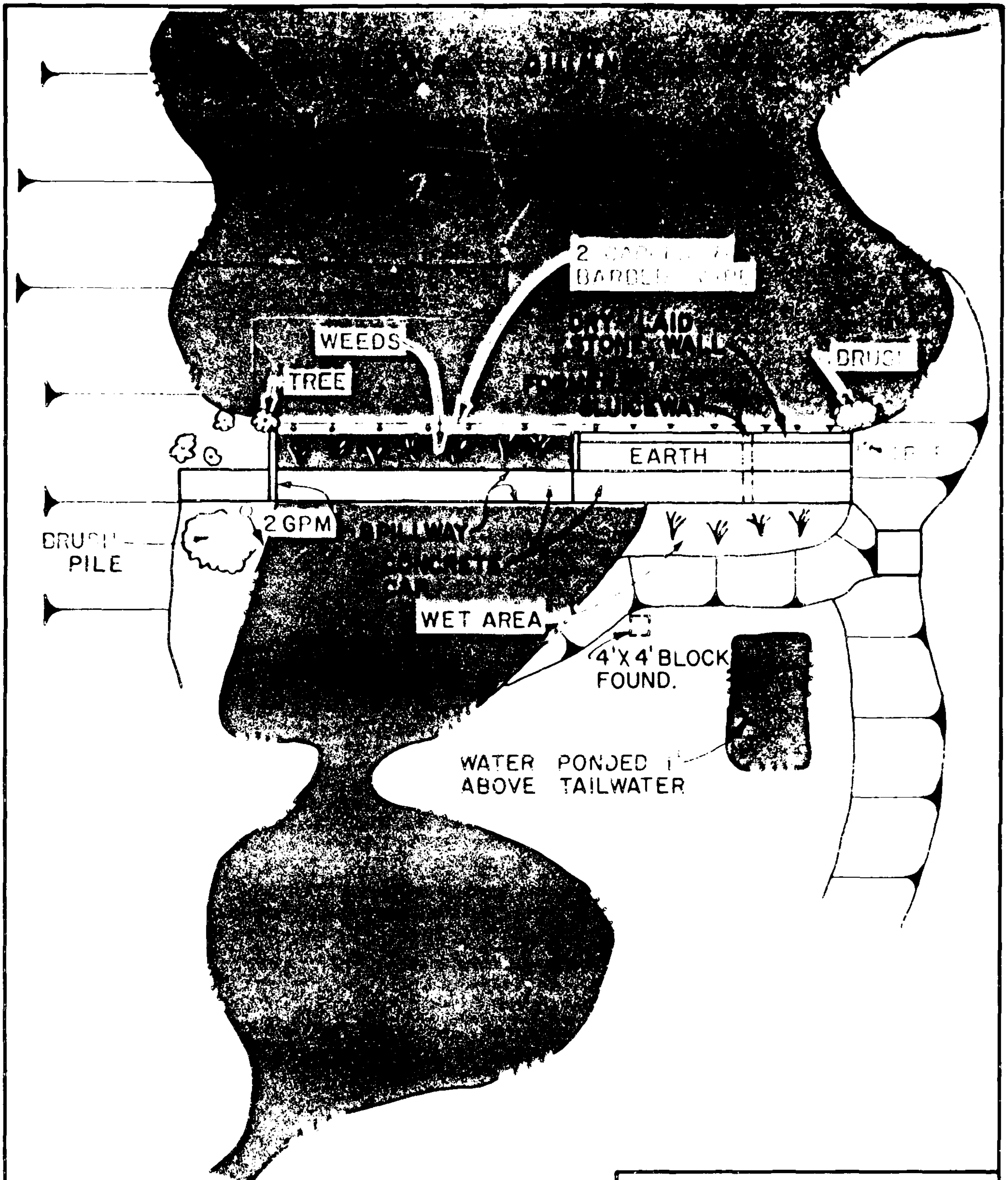
[illegible]	OBSERVATIONS
[illegible]	[illegible] notch in top of dam. Some surface cracking and spalling. [illegible] rolled.
[illegible]	[illegible] sides and 1 strand barbed wire on iron posts along u/s edge, [illegible] feet high. One-third of u/s area is full of grass and weeds - [illegible] feet high.
[illegible]	[illegible] until narrowing to 10 feet wide [illegible] feet d/s of [illegible] along sides at narrowest point. Then widens to [illegible]' wide pool.

RESERVOIR

VISUAL EXAMINATION OF	OBSERVATIONS
SLOPES	Flat to moderate; no potential for massive slide
SEDIMENTATION	None observed.

DOWNSTREAM CHANNEL

VISUAL EXAMINATION OF	OBSERVATIONS
CONDITION: Obstructions Debris Other	Several road crossings before reaching the town of Varden.
SLOPES: Channel Sides	 Flat Flat to 1V on 2H
APPROXIMATE NUMBER OF HOMES	One house - 4,000 feet downstream. Four homes in Varden 3.0 miles downstream.



LEGEND

2 GPM INDICATES LOCATION AND QUANTITY OF SEEPAGE

NOT TO SCALE

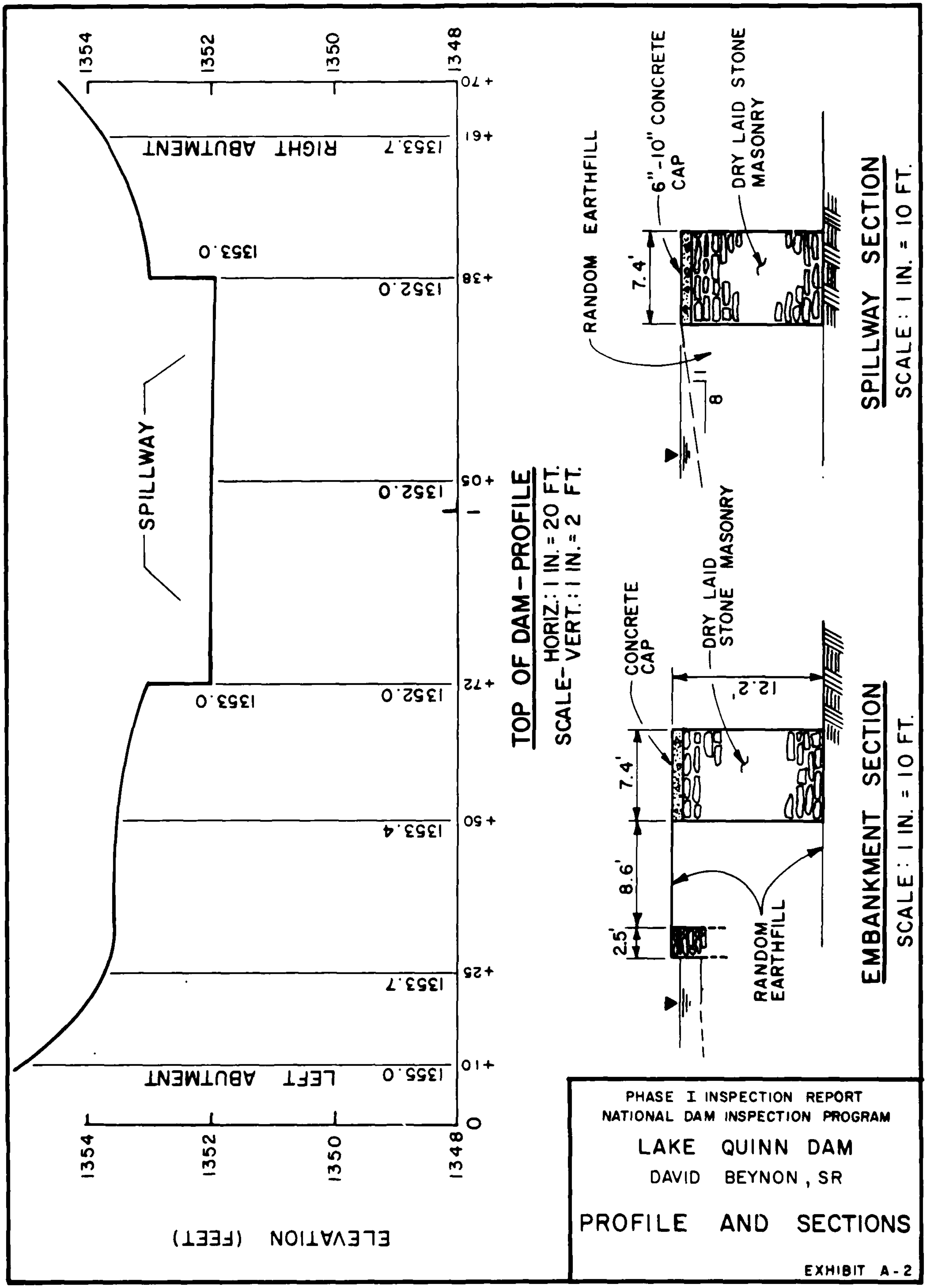
PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

LAKE QUINN DAM

DAVID BEYNON, SR

FIELD SKETCH

EXHIBIT A-1



PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

LAKE QUINN DAM

DAVID BEYNON, SR

PROFILE AND SECTIONS

EXHIBIT A-2

APPENDIX B

CHECKLIST - ENGINEERING DATA

CHECK LIST
ENGINEERING DATA
DESIGN, CONSTRUCTION, OPERATION
PHASE I

NAME OF DAM Lake Quinn Dam

NDI ID # PA 00145

DER ID # 64-43

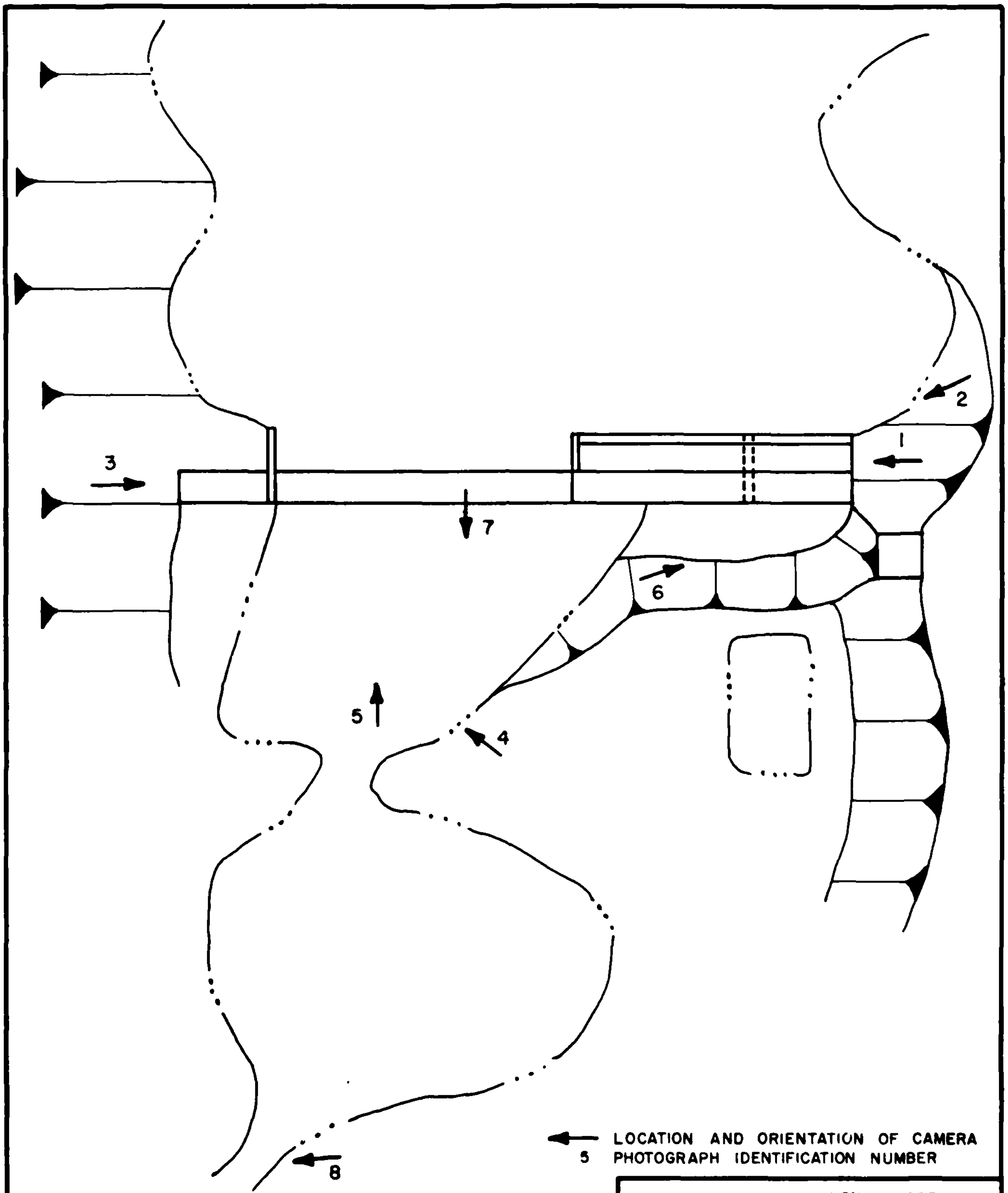
ITEM	REMARKS
As-Built Drawings	None.
Regional Vicinity Map	U.S.G.S. Waymart Quadrangle - 7 $^1/_2$ minute Quad Sheet. See Appendix E, Plate E-Z.
Construction History	Original Embankment completed prior to 1917. Modifications have been made since that time.
Typical Sections of Dam	None.
Outlets - Plan Details Constraints Discharge Ratings	None.
Rainfall/Reservoir Records	None.
Design Reports	None.
Geology Reports	None.

ITEM	REMARKS
Design Computations Hydrology & Hydraulics Dam Stability Seepage Studies	In 1917 a report was filed to the state for a proposed change at a downstream structure, W.W. Kiser's Dam (File No. 64-46) 2.75 miles downstream of Lake Quinn Dam. This report included in its study the equalizing potential of Lake Quinn Dam on this downstream structure.
Materials Investigations Boring Records Laboratory Field	None.
Post-Construction Surveys of Dam	None.
Monitoring Systems	None.
Modifications	Dam lengthened and reinforced by placing random fill on upstream face, sluiceway constructed in old Millrace sometime after 1946 and before 1965.
High Pool Records	In 1955 and 1972 flows reached a depth of overtopping the embankment up to 2.5 feet.
Post-Construction Engineering Studies and Reports	Sometime between 1946 and 1965 modifications above were accomplished. A clay blanket was placed on the upstream face in early 1970's to stop leakage through the dam.
Prior Accidents or Failure of Dam Description Reports	None reported.

ITEM	REMARKS
Maintenance Operation Records	None.
Spillway Plan Sections Details	Sketch in Appendix A.
Operating Equipment Plans & Details	None.
Specifications	None.
Miscellaneous	None.
Previous Inspections	1965 (PennDER) latest, others in 1952, 1948, 1938, 1935, 1932, 1930, 1928, 1924 by State Personnel.

APPENDIX C

PHOTOGRAPHS



NOT TO SCALE

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

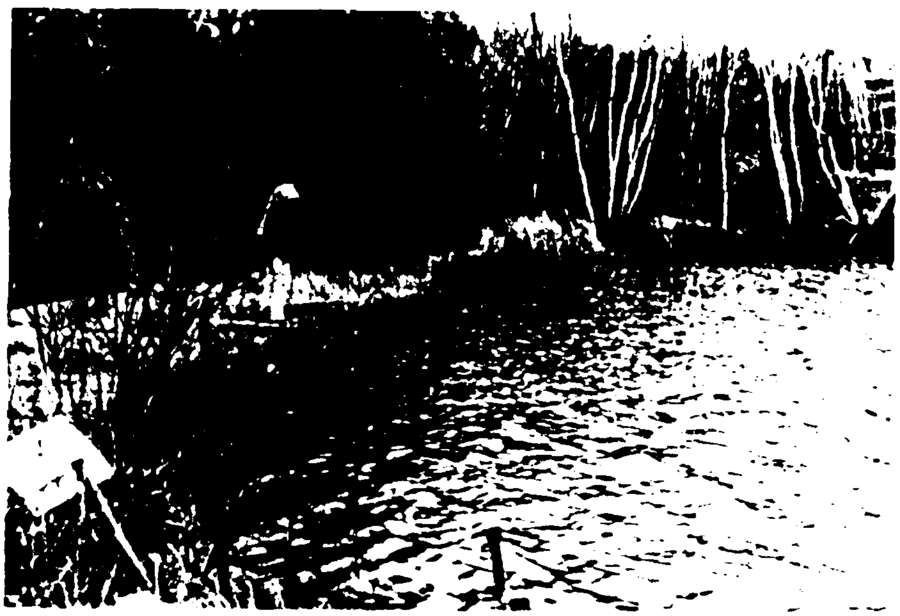
LAKE QUINN DAM

DAVID BEYNON, SR

PHOTOGRAPH LOCATION PLAN

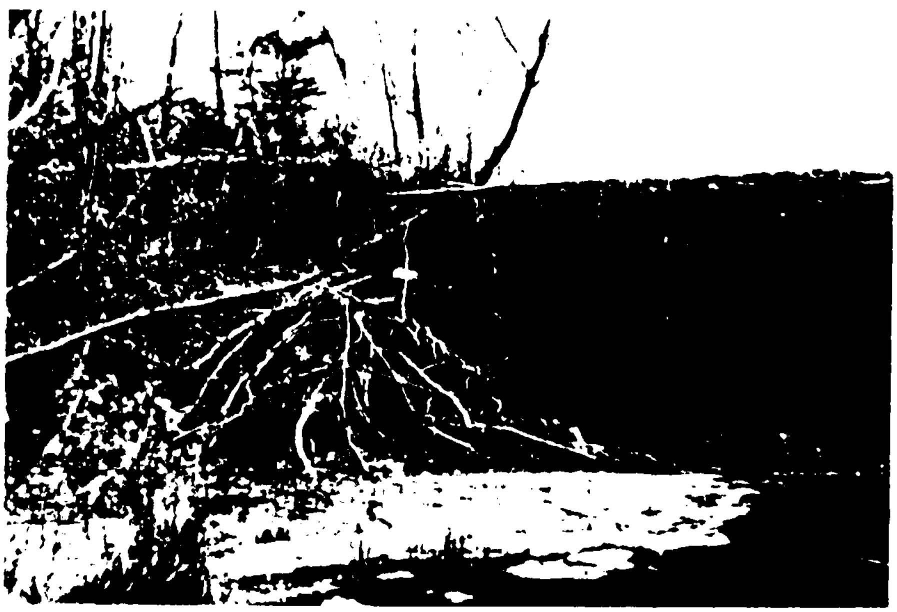
EXHIBIT C-1

1. Overview of Dam.

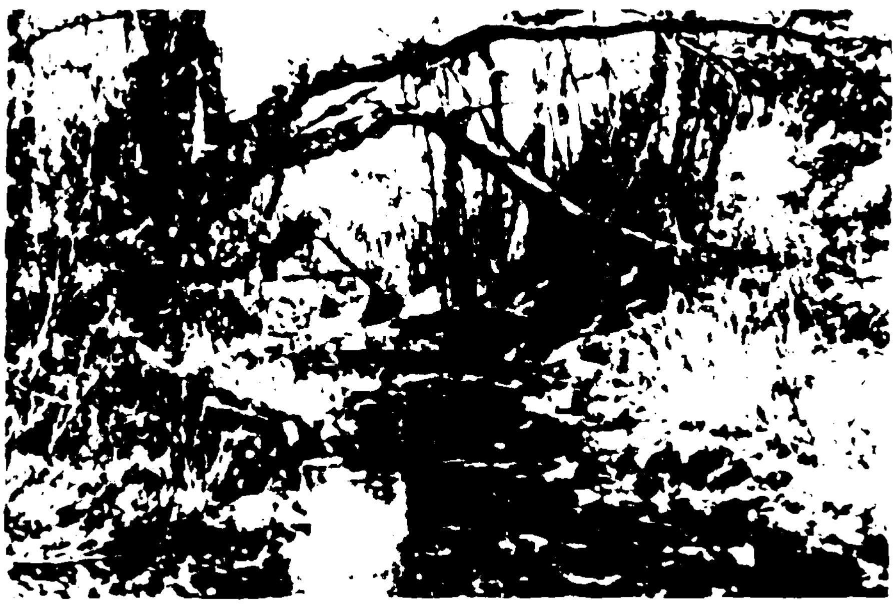


2. Upstream face and right abutment.

3. Crest and left abutment.



4. Downstream face adjacent to right abutment.



APPENDIX D

HYDROLOGY AND HYDRAULICS

PREFACE

The modified HEC-1 program is capable of performing two basic types of hydrologic analyses: 1) the evaluation of the overtopping potential of the dam; and 2) the estimation of the downstream hydrologic-hydraulic consequences resulting from assumed structural failures of the dam. Briefly, the computational procedures typically used in the dam overtopping analysis are as follows:

a. Development of an inflow hydrograph(s) to the reservoir.

b. Routing of the inflow hydrograph(s) through the reservoir to determine if the event(s) analyzed would overtop the dam.

c. Routing of the outflow hydrograph(s) from the reservoir to desired downstream locations. The results provide the peak discharge(s), time(s) of the peak discharge(s), and the maximum stage(s) of each routed hydrograph at the downstream end of each reach.

The evaluation of the hydrologic-hydraulic consequence resulting from an assumed structural failure (breach) of the dam is typically performed as shown below.

a. Development of an inflow hydrograph(s) to the reservoir.

b. Routing of the inflow hydrograph(s) through the reservoir.

c. Development of a failure hydrograph(s) based on specified breach criteria and normal reservoir outflow.

d. Routing of the failure hydrograph(s) to desired downstream locations. The results provide estimates of the peak discharge(s), time(s) to peak and maximum water surface elevations of failure hydrographs for each location.

HYDROLOGY & HYDRAULIC ANALYSIS
DATA BASE

NAME OF DAM: LAKE QUINN DAM

PROBABLE MAXIMUM PRECIPITATION (PMP) = 21.5 INCHES/24 HOURS (1)

DELAWARE RIVER BASIN

STATION	1	2	3
STATION DESCRIPTION	ROBINSON POND DAM	BRONSON POND DAM	LAKE QUINN DAM
DRAINAGE AREA (SQUARE MILES)	0.50	2.38	6.86
CUMULATIVE DRAINAGE AREA (SQUARE MILES)	0.50	2.38	9.74
ADJUSTMENT OF PMF FOR DRAINAGE AREA LOCATION (%) (1)	Zone 1	ZONE 1	ZONE 1
6 Hours	111	111	111
12 Hours	123	123	123
24 Hours	133	133	133
48 Hours	142	142	142
72 Hours	–	–	–
SNYDER HYDROGRAPH PARAMETERS			
Zone (2)	1	1	1
C_p (3)	0.45	0.45	0.45
C_t (3)	1.23	1.23	1.23
L (MILES) (4)	1.04	2.72	4.55
L_{ca} (MILES (4)	0.52	1.33	1.89
$tp = C_t (L \cdot L_{ca})^{0.3}$ (HOURS)	1.02	1.85	2.35
SPILLWAY DATA		ROCK FILL DAM	
CREST LENGTH (FEET)	12	N/A	66
FREEBOARD (FEET)	1.2	N/A	1.0

(1) HYDROMETEOROLOGICAL REPORT - 33, U. S. Army Corps of Engineers, 1955.

(2) Hydrologic zone defined by Corps of Engineers, Baltimore District, For Determination of Snyder Coefficients (C_p and C_t).

(3) Snyder Coefficients

(4) L = Length of longest watercourse from dam to basin divide.
L_{ca} = Length of longest watercourse from dam to point opposite basin centroid.

BALTIMORE DISTRICT, CORPS OF ENGINEERS PAGE ______

SUBJECT DAM SAFETY INSPECTION

COMPUTATIONS LAKE QUINN SHEET 1 OF 13 SHEETS

COMPUTED BY APB CHECKED BY ______ DATE 6-12-80

DAM CLASSIFICATION

SIZE OF DAM - SMALL
HAZARD - HIGH
REQUIRED SDF - 1/2 PMF TO FULL PMF

DAM STATISTICS

HEIGHT OF DAM — 12.2 FT.
STORAGE AT NORMAL POOL — 190 AC-FT (FROM PENNDER FILES)
STORAGE AT TOP OF DAM — 305 AC-FT
DRAINAGE AREA ABOVE DAMSITE — 9.74 $mi.^2$ (TOTAL)

ELEVATIONS *

TOP OF DAM (LOW POINT) - 1353.0
NORMAL POOL - 1352.0
SPILLWAY CREST - 1352.0
STREAMBED AT CENTERLINE OF DAM - 1340.8

HYDROGRAPH PARAMETERS

RIVER BASIN - DELAWARE
ZONE - 1
SNYDERS COEFFICIENTS -
C_p - 0.45
C_t - 1.23

MEASURED PARAMETERS - DETERMINED FROM U.S.G.S. WAYMART, PA. QUAD SHEET

FOR ENTIRE WATERSHED? (ASSUMING TOTAL WATERSHED AREA IS INFLOW)

L = LENGTH OF THE LONGEST WATERCOURSE : L_T = 5.38 mi
L_{CA} - LENGTH OF THE LONGEST WATERCOURSE TO CENTROID OF THE BASIN : L_{CA} = 2.08 mi

* ELEVATIONS ARE REFERENCED TO USGS QUAD SHEET WAYMART, PA. GIVING LAKE ELEVATION AT 1352 ASSUMED TO BE AT SPILLWAY CREST.

BALTIMORE DISTRICT, CORPS OF ENGINEERS PAGE ______

SUBJECT: DAM SAFETY INSPECTION

COMPUTATIONS: LAKE QUINN SHEET [illegible] OF 13 SHEETS

COMPUTED BY: [illegible] CHECKED BY: ______ DATE: [illegible]-12-80

NOTE: 3 STRUCTURES ARE UPSTREAM OF LAKE QUINN. ROBINSON POND AND BRONSON POND ARE LARGE ENOUGH TO INCLUDE STORAGE EFFECTS. THE THIRD STRUCTURE, TELSHAW POND HAS A VERY SMALL HEIGHT (LESS THAN 6 FEET) AND STORAGE (LESS THAN 100 AC-FT). THEREFORE ROBINSON AND BRONSON POND WILL BE INCLUDED UPSTREAM OF LAKE QUINN, BUT TELSHAW POND WILL BE IGNORED.

MEASURED PARAMETERS FOR UNCONTROLLED AREA ABOVE LAKE QUINN

$L = 4.55\ mi$

$L_{CA} = 1.89\ mi$

TOTAL DRAINAGE AREA IS $9.74\ mi^2$

UNCONTROLLED DRAINAGE AREA ABOVE LAKE QUINN = $6.86\ mi^2$

t_p = SNYDERS BASIN LAG TIME TO PEAK IN HOURS

FOR UNCONT AREA:

$$t_p = C_t (L\,L_{CA})^{0.3}$$

$$= 1.23\,(4.55(1.89))^{0.3}$$

$$= 2.35\ hours$$

REservoir CAPACITY

- SURFACE AREA AT NORMAL POOL (ELEV. 1352) – [illegible] ACRES *
- SURFACE AREA AT ELEVATION 1360 = [illegible] ACRES

ASSUME CONICAL METHOD APPLIES TO FIND LOW POINT IN POOL, BELOW NORMAL POOL.

VOLUME AT NORMAL POOL = 110 AC-FT.
(FROM PENNDER FILES)

* VALUES PLANIMETERED OFF WAYMART & LAKE ARIEL, PA. QUAD. SHEETS. WAYMART [illegible] 1969 LAKE ARIEL 1966 SERIES.

NADB FORM 252, 28 MAR 74

BALTIMORE DISTRICT, CORPS OF ENGINEERS — PAGE ______

SUBJECT: DAM SAFETY INSPECTION

COMPUTATIONS: [illegible]

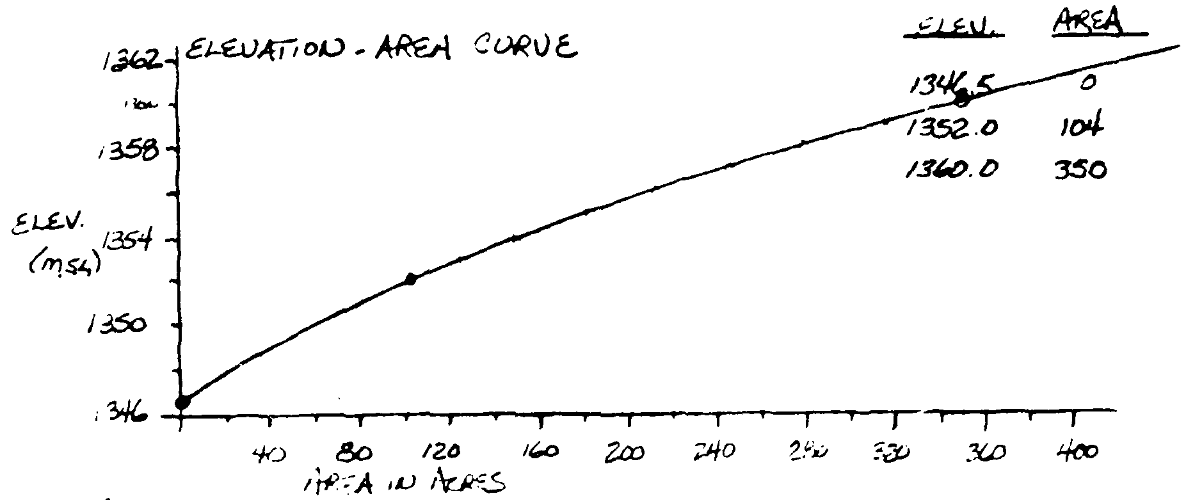
SHEET 2 OF [illegible] SHEETS

COMPUTED BY: JPB — CHECKED BY: ______ — DATE: 2-1[illegible]-80

FROM CONICAL METHOD: $V = \frac{1}{3}Ah$ $A = \pi r^2 = 104$ ACRES

$$\therefore h = \frac{3V}{A} = \frac{3(190 \text{ AC-FT})}{104 \text{ AC}} = 5.5 \text{ ft.}$$

∴ ELEVATION WHERE V=0, 1352-5.5 = 1346.5



ELEVATION - STORAGE TABLE

ELEVATION (MSL)	AREA (AC)	Δh (ft)	$\Delta V = \Delta h \left(\frac{A_1 + A_2}{2}\right)$ (AC-FT)	CUMULATIVE VOLUME (AC-FT)
1346.5 (*)	0		190 (conical method)	0
1352.0	104	1.0	115	190
1353.0 (TOD)	125	1.0	138	≈ 305
1354.0	150	1.0	166	≈ 445
1355.0	182	1.0	198	≈ 610
1356.0	213	1.0	229	≈ 810
1357.0	245	1.0	263	≈ 1040
1358.0	280	1.0	298	≈ 1300
1359.0	315	1.0	332	≈ 1600
1360.0	350			≈ 1930

[illegible] ASSUME THE AVERAGE END AREA METHOD [illegible] TO ELEVATIONS ABOVE SPILLWAY CREST 1352.0.

(*) NOTE - ELEVATION 1346.5 IS ABOVE THE INVERT OF THE DAM (EL. 1340.8)

NAB FORM 232, 28 MAR 74

PMP CALCULATIONS:

- APPROXIMATE RAINFALL INDEX = 21.5 INCHES (CORRESPONDING TO A DURATION OF 24 HOURS AND A DRAINAGE AREA OF 200 mi²) - ALL SEASON ENVELOPE

- DEPTH-AREA DURATION ZONE 1 : FROM HYDROMET # 33
- ASSUME VALUES CORRESPONDING TO 10 mi² AREA MAY BE APPLIED TO THIS 9.74 mi² BASIN

DURATION (HRS)	PERCENT OF INDEX RAINFALL
6	111
12	123
24	133
48	142

NOTE: HOP BROOK FACTOR IS INTERNALLY COMPUTED BY THE HEC1DB PROGRAM. FOR A DRAINAGE AREA LESS THAN 10 SQUARE MILES THE ADJUSTMENT [illegible] THE ADJUSTMENT IS FOR BASIN SHAPE AND FOR THE [illegible] OF A SEVERE STORM CENTERING OVER A SMALL [illegible].

SDF: BASED ON THE SMALL HEIGHT OF DAM ([illegible] feet) AND THE SMALL STORAGE AT LOW TOP OF DAM (~305 AC FT), THE SDF SELECTED FOR A HIGH HAZARD AND SMALL SIZE IS ½ PMF.

∴ USE SDF = ½ PMF

EMERGENCY SPILLWAY CAPACITY:

NOTE: SPILLWAY IS IN CENTER OF EMBANKMENT.
SEE FIELD SKETCH IN APPENDIX A EXHIBIT A-1

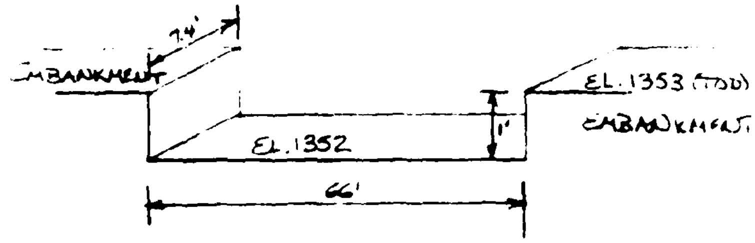
WIDTH OF SPILLWAY IS [illegible] ft - HORIZONTAL [illegible]

BALTIMORE DISTRICT, CORPS OF ENGINEERS PAGE ______

SUBJECT: DAM SAFETY INSPECTION

COMPUTATIONS: LAKE QUINN SHEET __ OF 12 SHEETS

COMPUTED BY: MB CHECKED BY: ______ DATE: ______



NOTE: SPILLWAY IS 66 FT IN LENGTH AND 1 FT DEEP.

∴ BROAD CRESTED WEIR.

$Q = CLH^{3/2}$ where L: length of weir 66'
H: height over weir MAX 1' before OVER EMBANKMENT
C: WEIR COEFFICIENT = 2.85

SPILLWAY RATING CURVE:

POOL ELEVATION (MSL)	H (ft)	Q (CFS)	ROUNDED Q (CFS)
1352	0	0	0
1353	1	187	190
1354	2	532	530
1355	3	977	980
1356	4	1504	1500
1357	5	2102	2100
1358	6	2763	2760
1359	7	3483	3480
1360	8	4255	4260

(CONTINUED)

POOL ELEV. (MSL)	H (FT)	Q (CFS)	ROUNDED Q (CFS)
1370	18	14365	14360

EMBANKMENT RATING CURVE:

THE ANALYSIS ASSUMES THAT THE EMBANKMENT BEHAVES AS A BROAD CRESTED WEIR IF OVERTOPPING OCCURS. THE DISCHARGE CAN BE ESTIMATED BY:

$$Q = CL_1H_w^{3/2}$$

where: Q = DISCHARGE OVER EMBANKMENT, IN CFS
L_1 = LENGTH OF EMBANKMENT, FT
H_w = WEIGHTED HEAD IN FEET, AVERAGE FLOW AREA WEIGHTED ABOVE LOW POINT OF DAM
C = COEFFICIENT OF DISCHARGE

BALT FORM 232, 28 MAR 74

BALTIMORE DISTRICT, CORPS OF ENGINEERS

PAGE

SUBJECT: DAM SAFETY INSPECTION

COMPUTATIONS: LAKE QUINN — SHEET 6 OF 13 SHEETS

COMPUTED BY: JPB — CHECKED BY: — DATE: 12-17-80

LENGTH OF EMBANKMENT INUNDATED VS. RESERVOIR ELEVATION :

RESERVOIR ELEVATION (MSL)	EMBANKMENT LENGTH (ft)
1352.0	0
1353.0	0
1354.0	80
1355.0	100
1356.0	110
1357.0	115
1358.0 *	120
1359.0 *	120
1360.0 *	120

* 120 FT - MAXIMUM LENGTH OF EMBANKMENT PLUS SOME ABUTMENT LENGTH   C = 2.85

EMBANKMENT RATING TABLE

RESERVOIR ELEVATION (MSL)	L_1 (ft)	L_2 (ft)	INCREMENTAL HEAD H_i (ft)	① INCREMENTAL FLOW AREA A_i (ft²)	TOTAL FLOW AREA (ft²) A_T	② WEIGHTED HEAD, H_W (ft)	③ Q (CFS)
1352.0	0	–	–	–	–	–	0
1353.0	0	0	1.0	0	0	0	0
1354.0	80	0	1.0	40	40	0.50	80
1355.0	100	80	1.0	90	130	1.30	421
1356.0	110	100	1.0	105	235	2.14	981
1357.0	115	110	1.0	112.5	347.50	3.02	1720
1358.0	120	115	1.0	117.5	465.0	3.88	2613
1359.0	120	120	1.0	120	585.0	4.88	3686
1360.0	120	120	1.0	120	705.0	5.88	4316
1370.0	120	120	10.0	1200	1905.0	15.88	21640

① $A_i = H_i[(L_1 + L_2)/2]$

② $H_W = A_T / L_1$

③ $Q = C L_1 H_W^{3/2}$

NADB FORM 232, 28 MAR 74

BALTIMORE DISTRICT, CORPS OF ENGINEERS — PAGE ______

SUBJECT: DAM SAFETY INSPECTION

COMPUTATIONS: LAKE CRUIKAN — SHEET 7 OF 13 SHEETS

COMPUTED BY: [illegible] — CHECKED BY: ______ — DATE: 12-?-80

TOTAL FACILITY RATING CURVE

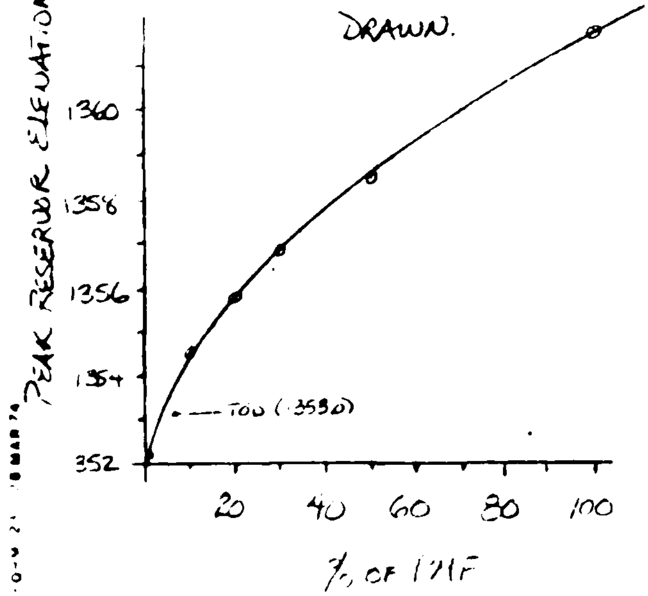
$Q_{TOTAL} = Q_{SPL} + Q_{EMB}$

RESERVOIR ELEV. (FT)	Q SPILLWAY (CFS)	Q EMBANKMENT (CFS)	Q TOTAL (CFS)
1352.0	0	0	0
1353.0	190	0	190
1354.0	530	80	610
1355.0	980	420	1400
1356.0	1500	980	2480
1357.0	2100	1720	3820
1358.0	2760	2610	5370
1359.0	3480	3690	7170
1360.0	4260	4810	9040
1370.0	14360	21640	36000

VALUES TO BE INPUT ON Y4 & Y5 CARDS.

RESULTS OF THE OVERTOPPING ANALYSIS

FROM THE OVERTOPPING ANALYSIS THE FOLLOWING CURVE CAN BE DRAWN.



LOW POINT OF DAM IS 1353.0

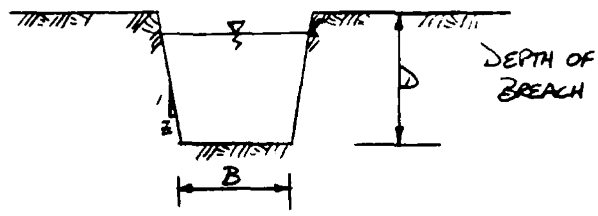
POINTS PLOTTED FROM PAGE 21/21 OF THE OVERTOPPING ANALYSIS OF THIS APPENDIX.

∴ THE DAM AND SPILLWAY CAN ACCOMMODATE A FLOOD UP TO 3% PMF PRIOR TO OVERTOPPING THE EMBANKMENT.

SINCE THIS DAM IS A HIGH HAZARD, AND IT IS FELT THAT THE 50% PMF WOULD CAUSE FAILURE A BREACH ANALYSIS IS REQUIRED. THE BREACH ANALYSIS WOULD EXAMINE THE SIGNIFICANCE OF FAILURE AND NON-FAILURE CONDITIONS FOR ~ 10% PMF.

BREACH ANALYSIS:

TYPICAL BREACH SECTION



PAST HISTORICAL EVENTS HAVE BEEN KNOWN TO OVERTOP THE EMBANKMENT BY AS MUCH AS 2.5 FEET. THIS OCCURED DURING THE OCT. 1955 & June 1972 EVENTS. SINCE THE EMBANKMENT IS CONCRE CAPPED AND HAS A RUBLE STONE DOWNSTREAM FACE, IT WAS FELT THAT A 1½ FOOT OF OVERTOPPING FOR A SHORT DURATION COULD BE WITHSTOOD. THEREFORE, FOR THE BREACHING ANALYSIS, 10% OF THE PMF WOULD BE APPROPRIATE FOR THIS ANALYSIS.

HEC1DB INPUT PARAMETERS FOR BREACH ANALYSIS

FOUR PLANS WILL BE USED FOR A DIRECT COMPARISON OF Failure VS. NON-FAILURE CONDITIONS PARAMETERS ARE AS FOLLOWS.

PLAN NUMBER	BREACH BOTTOM WIDTH (FT)	FULL BREACH DEPTH (FT)	SIDE SLOPES	TOTAL BREACH TIME (HR)
1	—	—	non failure	—
2	66	9	0.5H:1V	0.33
3	66	9	0.5H:1V	1.00
4	66	9	0.5H:1V	2.00

HEC1-DB OUTPUT

RESULTS OF DAM BREACH ANALYSIS

AS NOTED FROM PAGE D-11, PLAN 1 IS FOR NON-FAILURE CONDITIONS.

PLAN NUMBER	MAXIMUM OUTFLOW OVER DAM AND/OR THRU BREACH (CFS)	DOWNSTREAM DAMAGE CENTER #1		DOWNSTREAM DAMAGE CENTER #2	
		STAGE (MSL)	FLOW (CFS)	STAGE (MSL)	FLOW (CFS)
1	1100	1323.4	1100	1234.1	1090
2	7800	1331.6	7610	1239.9	5860
3	6800	1330.4	6180	1239.4	5220
4	5560	1329.6	5280	1238.9	4600

DOWNSTREAM DAMAGE CENTER #1 - DAMAGE ELEV. AT 1332.0
DOWNSTREAM DAMAGE CENTER #2 - DAMAGE ELEV. AT 1238.0

FROM THE TABLE ABOVE, IT CAN BE SEEN THAT AT THE LOWER DOWNSTREAM DAMAGE CENTER #2, FAILURE SIGNIFICANTLY INCREASES DOWNSTREAM HAZARD POTENTIAL.

NAB FORM 232, 28 MAR 74

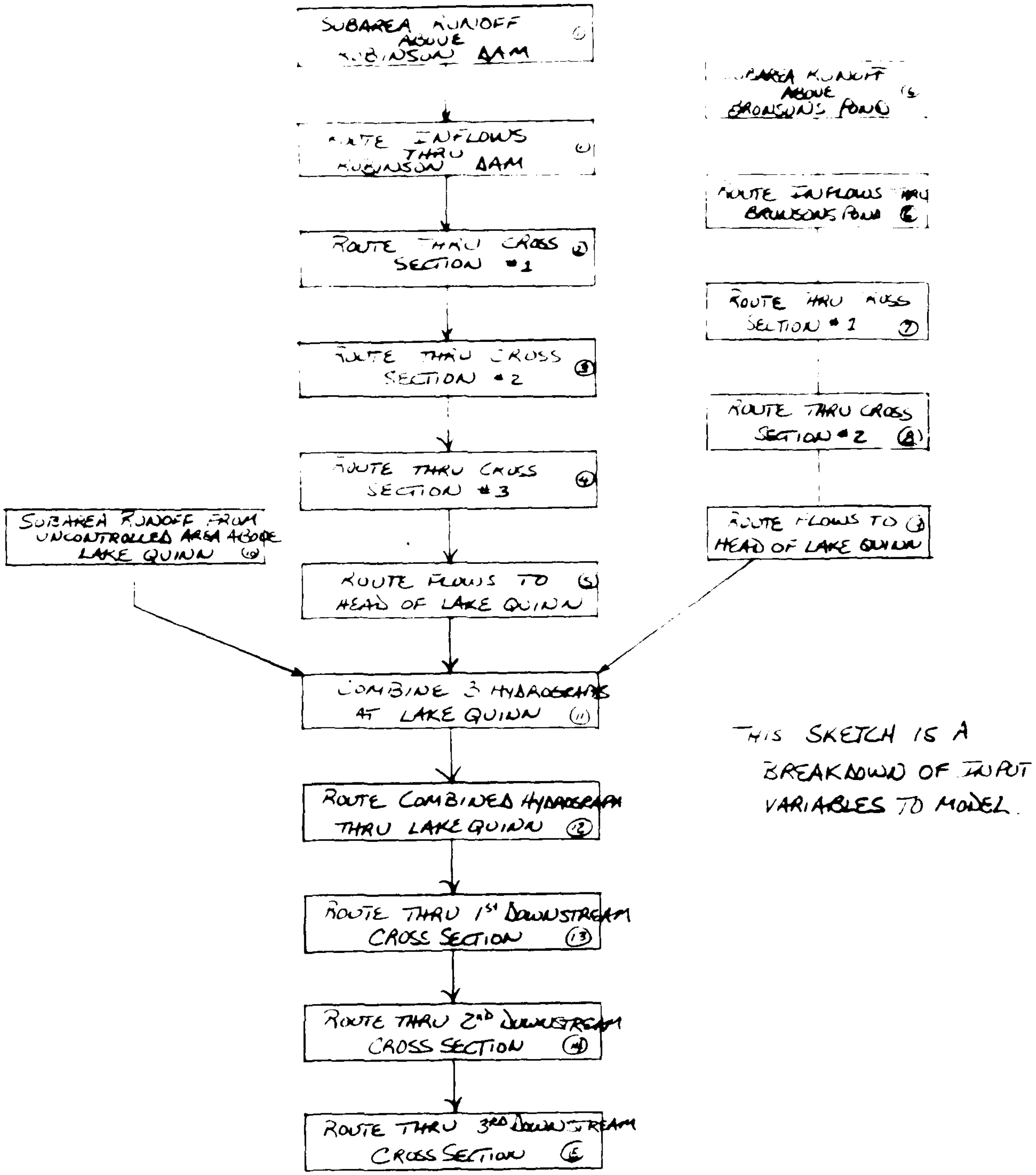
CORPS OF ENGINEERS PAGE

[illegible] ANALYSIS

COMPUTATIONS [illegible] QUINN SHEET 3

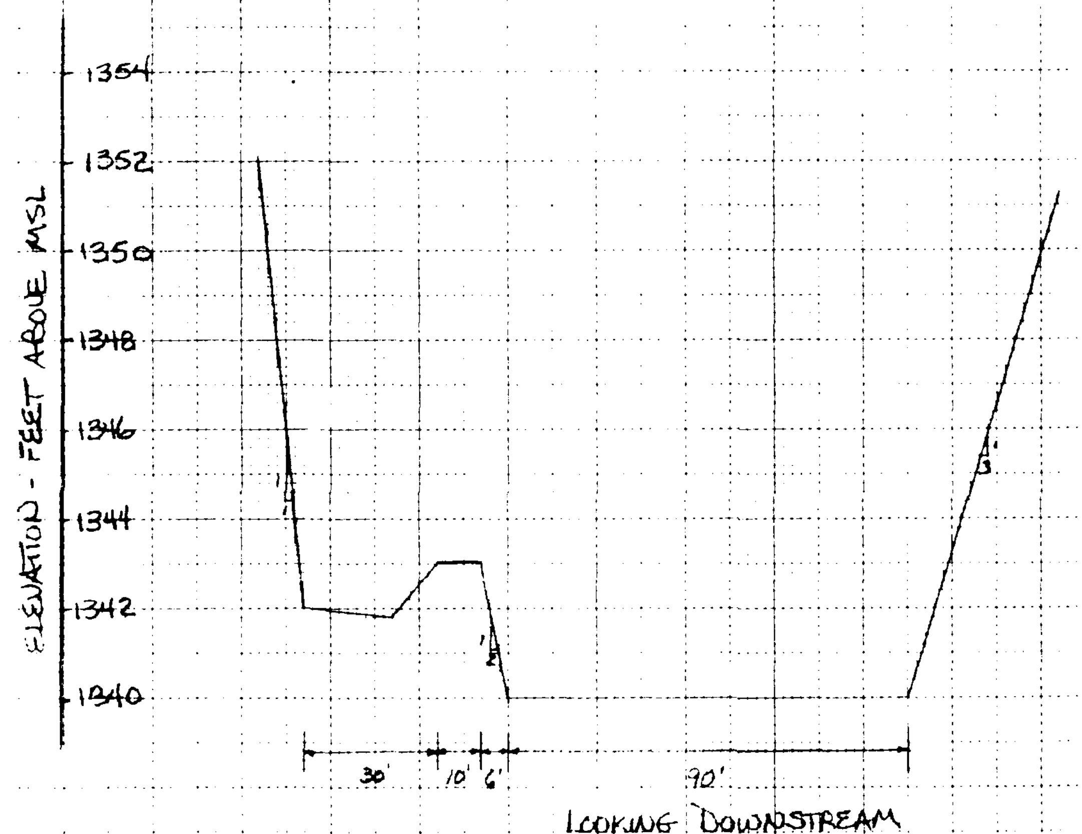
COMPUTED BY MC CHECKED BY DATE [illegible]

COMPUTER MODEL FLOW CHART



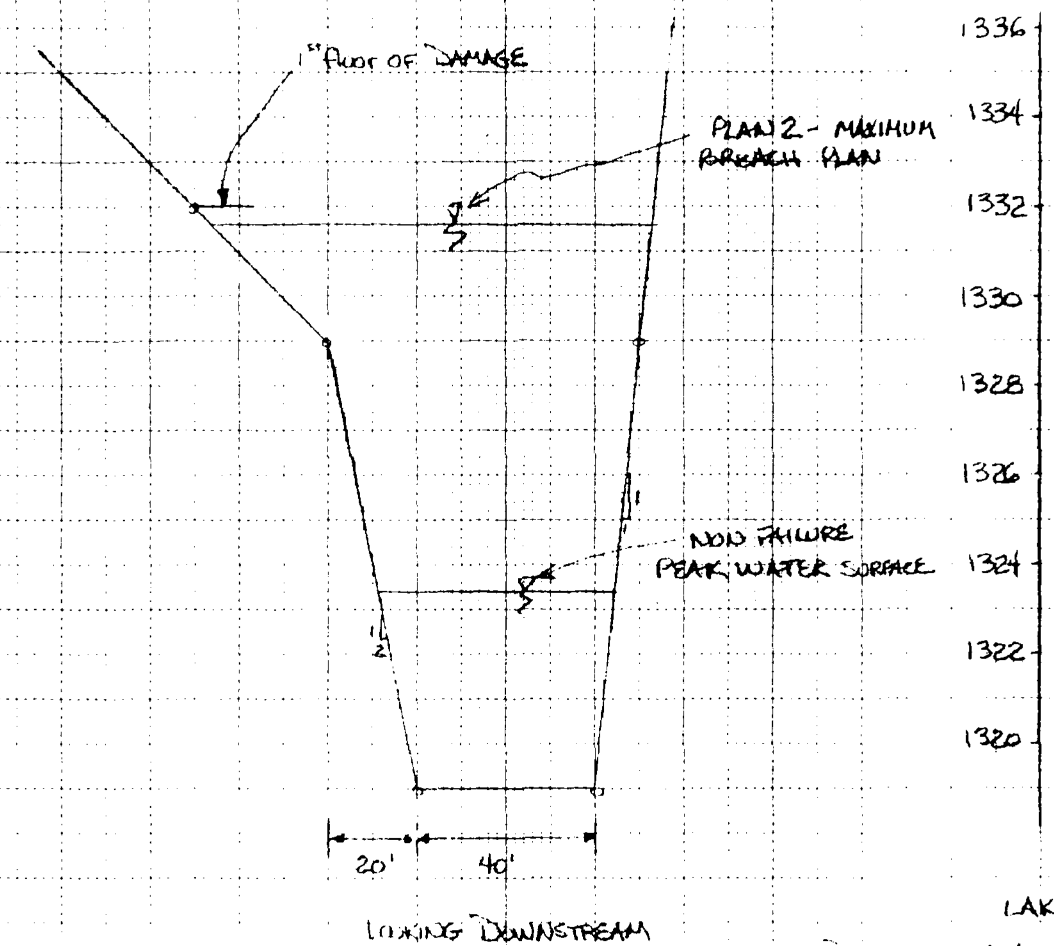
NUMBERS REFER TO COMPUTER VALUES IN INPUT PROGRAM

SCALE 1" VERT = 4'
1" HORZ = [illegible]



NOTE: ~500 ft. DOWNSTREAM OF DAM 1st 1,40 [illegible] are ~ 5ft above TOD at LAKE QUINN

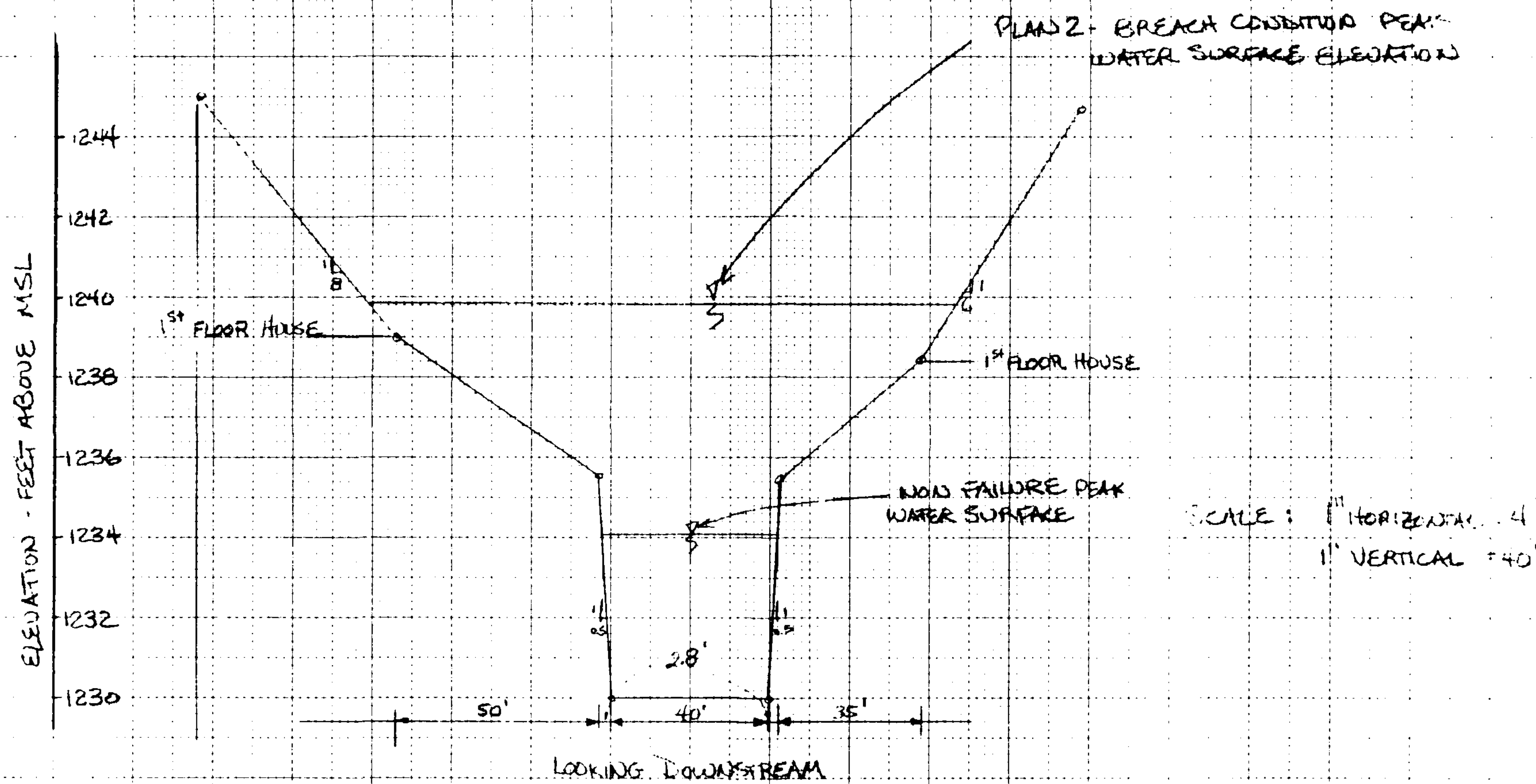
LAKE QUINN
CROSS SECTION APPROXIMATELY [illegible] DOWNSTREAM OF DAM



SCALE: 1" VERT = 4'
1" HORZ = 40'

LAKE QUINN
DOWNSTREAM X-SECTION APPROXIMATELY
4000 FT. DOWNSTREAM OF DAM
DAMAGE CENTER #1

NOTE: THIS DAMAGE CENTER IS 200 ft. DOWNSTREAM OF 20 ft. high by 30 ft wide highway CULVERT



NOTE: THIS DAMAGE CENTER IS IMMEDIATELY DOWNSTREAM OF TWO DAMS:
~200' DOWNSTREAM OF DER # 10-64-45 (SHAFFER POWER DAM)
~500' DOWNSTREAM OF DER # 10-64-47 (MILL POND DAM)

LAKE QUINN
DOWNSTREAM X-SECTION APPROXIMATELY
4,500' DOWNSTREAM OF DAM
THIS X-SECTION IS IN VARDEN, PA.
DAMAGE CENTER # 2

```
1******************************
FLOOD HYDROGRAPH PACKAGE (HEC-1)
DAM SAFETY VERSION      JULY 1978
 LAST MODIFICATION  01 APR 80
*******************************
A1       LAKE QUINN DAM   DER NO. 90-64-43
A2     DAM SAFTEY INSPECTION PROGRAM       12-9-80
A3      OVERTOPPING ANALYSIS     +++  PRELIMINARY    +++
B     144      0      20       0       0       0       0       0      -3       0
B1      5      0       0       0       0       0       0       0       0       0
J       1      6       1
J1   0.01   0.10    0.20    0.30    0.50    1.00
K       0      1       0       0       0       0       1       0       0       0
K1     RUNOFF FROM DRAINAGE AREA ABOVE ROBINSON DAM
M       1      1    0.50       0    9.74       0       0       0       1       0
P       0   21.5     111     123     133     142
T       0      0       0       0       0       0     1.0    0.05       0       0
W    1.02   0.45
X    -1.5  -0.05       2
K       1      1       0       0       0       0       1       0       0       0
K1     ROUTING %PMF'S THRU ROBINSON DAM AND SPILLWAY
Y       0      0       0       1       1       0       0       0       0       0
Y1      1      0       0       0       0       0   -1643      -1       0       0
Y41643.0 1643.5  1644.2  1644.5  1645.0  1646.0  1650.0  1655.0
Y5      0   12.0    45.0    90.0   390.0  1570.0 12030.0 37000.0
$S      0    150     190     410     660     960
$E1627.7 1643.0  1644.2  1650.0  1655.0  1660.0
$$1643.0
$D1644.2
K       1      2       0       0       0       0       1       0       0       0
K1      DOWNSTREAM X-SECTION 230 FEET FROM DAM  (ROBINSON)
Y       0      0       0       1       1
Y1      1      0       0       0       0       0       0
Y6   0.07   0.05    0.07    1622    1638     230  0.0090       0       0       0
Y7    100   1638     142    1630     162    1625     175    1622     190    1622
Y7    197   1625     207    1630     225    1638
K       1      3       0       0       0       0       1       0       0       0
K1        ROUTE THRU THE    2ND DOWNSTREAM CROSS SECTION  (ROBINSON)
Y       0      0       0       1       1
Y1      1      0       0       0       0       0       0
Y6   0.07   0.05    0.07    1620    1638     270  0.0090       0       0       0
Y7    100   1638     140  1627.8     180    1627     192    1620     202    1620
Y7    210   1627     277  1633.6     323    1638
K       1      4       0       0       0       0       1       0       0       0
K1         ROUTE FLOW THRU  3RD DOWNSTREAM  CROSS SECTION (ROBINSON)
Y       0      0       0       1       1
Y1      1      0       0       0       0       0       0
Y6   0.07   0.05    0.07    1400    1414    8200   0.027       0       0       0
Y7    100   1414     120    1406     170    1403     175    1400     178    1400
Y7    185   1405     246    1406     270    1414
K       1      5       0       0       0       0       1
K1           ROUTE FLOWS TO HEAD OF LAKE QUINN  (FROM ROBINSON)
Y       0      0       0       1       1
Y1      1      0       0       0       0       0       0
Y6   0.07   0.05    0.07    1352    1380    4400  0.0109
Y7    100   1380     500    1360     700    1353     705    1352     905    1352
Y7    910   1353    1200    1360    1400    1380
K       0      6       0       0       0       0       1       0       0       0
K1     RUNOFF FROM DRAINAGE AREA ABOVE BRONSONS POND
M       1      1    2.38       0    9.74       0       0       0       1       0
P       0   21.5     111     123     133     142
T       0      0       0       0       0       0     1.0    0.05       0       0
W    1.85   0.45
X    -1.5  -0.05       2
K       1      6       0       0       0       0       1       0       0       0
K1     ROUTING %PMF'S THRU BRONSONS POND
Y       0      0       0       1       1       0       0       0       0       0
Y1      1      0       0       0       0       0   -1403      -1       0       0
Y41403.1 1403.2  1403.6  1404.0  1405.0  1410.0  1415.0  1420.0
Y5      0    0.5    23.0    95.0   520.0  5310.0 13300.0 23500.0
$S      0    380     385     500     890    1490    2320
$F1382.0 1403.0  1403.1  1405.0  1410.0  1415.0  1420.0
$$1403.0
$D1403.1
```

LAKE QUINN
OVERTOPPING ANALYSIS
page 1/12

```
K       1       7       0       0       0       0       1
K1      ROUTE FLOWS THRU  1ST DOWNSTREAM CROSS SECTION (BRONSON)
Y       0       0       0       1       1
Y1      1       0       0       0       0       0       0
Y6   0.07    0.05    0.07    1393    1411     200   0.008
Y7    100    1411     125    1405     136    1397     140    1393     180    1393
Y7    186    1397     190    1402     230    1411
K       1       8       0       0       0       0       1
K1      ROUTE FLOWS THRU  2ND DOWNSTRAEM CROSS SECTION  (BRONSON)
Y       0       0       0       1       1
Y1      1       0       0       0       0       0       0
Y6   0.07    0.05    0.07    1368    1400    3100   0.008
Y7    100    1400     200    1380     250    1373     255    1368     285    1368
Y7    290    1372     350    1380     500    1400
K       1       9       0       0       0       0       1
K1    ROUTE FLOWS TO HEAD OF LAKE QUINN  (FROM BRONSON)
Y       0       0       0       1       1
Y1      1       0       0       0       0       0       0
Y6   0.07    0.05    0.07    1357    1375    1000   0.011
Y7    100    1375     106    1369     240    1362     280    1357     320    1357
Y7    323    1359     340    1369     356    1375
K       0      10       0       0       0       0       1       0       0       0
K1     RUNOFF FROM  UNCONTROLLED DRAINAGE AREA ABOVE LAKE QUINN
M       1       1    6.86       0    9.74       0       0       0       1       0
P       0    21.5     111     123     133     142
T       0       0       0       0       0       0     1.0    0.05       0       0
W    2.35    0.45
X    -1.5   -0.05       2
K       3      11       0       0       0       0       1
K1      COMBINE 3 HYDROGRAPHS AT LAKE QUINN   ROUTE COMBINED HYD. THRU LAKE
K       1      12       0       0       0       0       1       0       0       0
K1     ROUTING %PMF'S THRU     LAKE QUINN
Y       0       0       0       1       1       0       0       0       0       0
Y1      1       0       0       0       0       0   -1352      -1       0       0
Y41352.0  1353.0  1354.0  1355.0  1356.0  1357.0  1358.0  1359.0  1360.0  1370.0
Y5      0     190     610    1400    2480    3820    5370    7170    9040   36000
$S      0     190     305     445     610     810    1040    1300    1600    1930
$E1346.5    1352    1353    1354    1355    1356    1357    1358    1359    1360
$$1352.0
$D1353.0
K      99
```

1 PREVIEW OF SEQUENCE OF STREAM NETWORK CALCULATIONS

```
RUNOFF HYDROGRAPH AT          1
ROUTE HYDROGRAPH TO           1
ROUTE HYDROGRAPH TO           2
ROUTE HYDROGRAPH TO           3
ROUTE HYDROGRAPH TO           4
ROUTE HYDROGRAPH TO           5
RUNOFF HYDROGRAPH AT          6
ROUTE HYDROGRAPH TO           6
ROUTE HYDROGRAPH TO           7
ROUTE HYDROGRAPH TO           8
ROUTE HYDROGRAPH TO           9
RUNOFF HYDROGRAPH AT         10
COMBINE  3 HYDROGRAPHS AT    11
ROUTE HYDROGRAPH TO          12
END OF NETWORK
```

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1********************************
FLOOD HYDROGRAPH PACKAGE (HEC-1)
DAM SAFETY VERSION      JULY 1978
  LAST MODIFICATION  01 APR 80
*********************************

RUN  DATE* 81/03/04.
     TIME* 04.28.54.
```

LAKE QUINN

OVERTOPPING ANALYSIS
page 2/12

LAKE QUINN DAM DER NO. 90-64-43
DAM SAFTEY INSPECTION PROGRAM 12-9-80
OVERTOPPING ANALYSIS *** PRELIMINARY ***

JOB SPECIFICATION

NQ	NHR	NMIN	IDAY	IHR	IMIN	METRC	IPLT	IPRT	NSTAN
144	0	20	0	0	0	0	0	-3	0

JOPER	NWT	LROPT	TRACE
5	0	0	0

MULTI-PLAN ANALYSES TO BE PERFORMED
NPLAN= 1 NRTIO= 6 LRTIO= 1
RTIOS= .01 .10 .20 .30 .50 1.00

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SUB-AREA RUNOFF COMPUTATION

RUNOFF FROM DRAINAGE AREA ABOVE ROBINSON DAM

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

HYDROGRAPH DATA

IHYDG	IUHG	TAREA	SNAP	TRSDA	TRSPC	RATIO	ISNOW	ISAME	LOCAL
1	1	.50	0.00	9.74	0.00	0.000	0	1	0

PRECIP DATA

SPFE	PMS	R6	R12	R24	R48	R72	R96
0.00	21.50	111.00	123.00	133.00	142.00	0.00	0.00

TRSPC COMPUTED BY THE PROGRAM IS .800

LOSS DATA

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

UNIT HYDROGRAPH DATA
TP= 1.02 CP= .45 NTA= 0

RECESSION DATA
STRTQ= -1.50 QRCSN= -.05 RTIOR= 2.00
APPROXIMATE CLARK COEFFICIENTS FROM GIVEN SNYDER CP AND TP ARE TC= 3.33 AND R= 4.76 INTERVALS

UNIT HYDROGRAPH 27 END-OF-PERIOD ORDINATES, LAG= 1.03 HOURS, CP= .45 VOL= 1.00

21.	76.	128.	137.	115.	93.	75.	61.	49.	40.
32.	26.	21.	17.	14.	11.	9.	7.	6.	5.
4.	3.	3.	2.	2.	1.	1.			

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HYDROGRAPH ROUTING

ROUTING %PMF'S THRU ROBINSON DAM AND SPILLWAY

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

ROUTING DATA

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

NSTPS	NSTDL	LAG	AMSKK	X	TSK	STORA	ISPRAT
1	0	0	0.000	0.000	0.000	-1643.	-1

STAGE	1643.00	1643.50	1644.20	1644.50	1645.00	1646.00	1650.00	1655.00
FLOW	0.00	12.00	45.00	90.00	390.00	1570.00	12030.00	37000.00

CAPACITY=	0.	150.	190.	410.	660.	960.
ELEVATION=	1628.	1643.	1644.	1650.	1655.	1660.

CREL	SPWID	COQW	EXPW	ELEVL	COOL	CAREA	EXPL
1643.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

LAKE QUINN
OVERTOPPING ANALYSIS
page 3/12

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HYDROGRAPH ROUTING

DOWNSTREAM X-SECTION 230 FEET FROM DAM (ROBINSON)

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

ROUTING DATA

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

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

NORMAL DEPTH CHANNEL ROUTING

QN(1)	QN(2)	QN(3)	ELNVT	ELMAX	RLNTH	SEL
.0700	.0500	.0700	1622.0	1638.0	230.	.00900

CROSS SECTION COORDINATES--STA,ELEV,STA,ELEV--ETC
100.00 1638.00 142.00 1630.00 162.00 1625.00 175.00 1622.00 190.00 1622.00
197.00 1625.00 207.00 1630.00 225.00 1638.00

STORAGE	0.00	.08	.18	.31	.47	.64	.84	1.06	1.31	1.57
	1.86	2.18	2.53	2.90	3.30	3.73	4.19	4.67	5.19	5.73
OUTFLOW	0.00	33.99	116.74	248.65	451.16	736.24	1085.63	1501.21	1985.00	2539.10
	3162.58	3860.47	4640.03	5504.64	6457.67	7502.42	8642.14	9880.03	11219.25	12662.89
STAGE	1622.00	1622.84	1623.68	1624.53	1625.37	1626.21	1627.05	1627.89	1628.74	1629.58
	1630.42	1631.26	1632.11	1632.95	1633.79	1634.63	1635.47	1636.32	1637.16	1638.00
FLOW	0.00	33.99	116.74	248.65	451.16	736.24	1085.63	1501.21	1985.00	2539.10
FLOW	0.00	33.99	116.74	248.65	451.16	736.24	1085.63	1501.21	1985.00	2539.10
	3162.58	3860.47	4640.03	5504.64	6457.67	7502.42	8642.14	9880.03	11219.25	12662.89

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HYDROGRAPH ROUTING

ROUTE THRU THE 2ND DOWNSTREAM CROSS SECTION (ROBINSON)

	ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
	3	1	0	0	0	0	1	0	0

ROUTING DATA

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

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

NORMAL DEPTH CHANNEL ROUTING

QN(1)	QN(2)	QN(3)	ELNVT	ELMAX	RLNTH	SEL
.0700	.0500	.0700	1620.0	1638.0	270.	.00900

LAKE QUINN

OVERTOPPING ANALYSIS

page 4/12

CROSS SECTION COORDINATES--STA,ELEV,STA,ELEV--ETC
100.00 1638.00 140.00 1627.80 180.00 1627.00 192.00 1620.00 202.00 1620.00
210.00 1627.00 277.00 1633.60 323.00 1638.00

STORAGE	0.00	.07	.15	.25	.36	.49	.64	.80	1.04	1.51
	2.07	2.70	3.42	4.21	5.08	6.03	7.06	8.17	9.36	10.62
OUTFLOW	0.00	26.37	87.08	179.47	304.94	465.64	663.98	902.42	1232.01	1730.43
	2389.97	3207.67	4189.78	5344.29	6679.83	8203.65	9926.18	11857.69	14007.32	16384.04
STAGE	1620.00	1620.95	1621.89	1622.84	1623.79	1624.74	1625.68	1626.63	1627.58	1628.53
	1629.47	1630.42	1631.37	1632.32	1633.26	1634.21	1635.16	1636.11	1637.05	1638.00
FLOW	0.00	26.37	87.08	179.47	304.94	465.64	663.98	902.42	1232.01	1730.43
	2389.97	3207.67	4189.78	5344.29	6679.83	8203.65	9926.18	11857.69	14007.32	16384.04

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HYDROGRAPH ROUTING

ROUTE FLOW THRU 3RD DOWNSTREAM CROSS SECTION (ROBINSON)

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
4	1	0	0	0	0	1	0	0

ROUTING DATA

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

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

NORMAL DEPTH CHANNEL ROUTING

QN(1)	QN(2)	QN(3)	ELNVT	ELMAX	RLNTH	SEL
.0700	.0500	.0700	1400.0	1414.0	8200.	.02700

CROSS SECTION COORDINATES--STA,ELEV,STA,ELEV--ETC
100.00 1414.00 120.00 1406.00 170.00 1403.00 175.00 1400.00 178.00 1400.00
185.00 1405.00 246.00 1406.00 270.00 1414.00

STORAGE	0.00	.57	1.46	2.66	4.17	6.66	10.99	17.31	29.68	47.28
	65.52	84.33	103.69	123.62	144.10	165.16	186.77	208.94	231.68	254.98
OUTFLOW	0.00	9.81	35.97	81.21	148.82	257.39	424.36	676.95	1096.65	1828.20
	2301.85	3982.01	5355.41	6913.70	8651.27	10564.28	12650.10	14906.96	17333.74	19929.80
STAGE	1400.00	1400.74	1401.47	1402.21	1402.95	1403.68	1404.42	1405.16	1405.89	1406.63
	1407.37	1408.11	1408.84	1409.58	1410.32	1411.05	1411.79	1412.53	1413.26	1414.00
FLOW	0.00	9.81	35.97	81.21	148.82	257.39	424.36	676.95	1096.65	1828.20
	2301.85	3982.01	5355.41	6913.70	8651.27	10564.28	12650.10	14906.96	17333.74	19929.80

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HYDROGRAPH ROUTING

ROUTE FLOWS TO HEAD OF LAKE QUINN (FROM ROBINSON)

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
5	1	0	0	0	0	1	0	0

ROUTING DATA

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

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

NORMAL DEPTH CHANNEL ROUTING

QN(1)	QN(2)	QN(3)	ELNVT	ELMAX	RLNTH	SEL
.0700	.0500	.0700	1352.0	1380.0	4400.	.01090

LAKE QUINN
OVERTOPPING ANALYSIS
page 5/12

CROSS SECTION COORDINATES--STA,ELEV,STA,ELEV--ETC
100.00 1380.00 500.00 1360.00 700.00 1353.00 705.00 1352.00 905.00 1352.00
910.00 1353.00 1200.00 1360.00 1400.00 1380.00

STORAGE	0.00	31.55	75.42	134.65	209.24	299.18	403.04	514.29	632.12	756.54
	887.53	1025.11	1169.26	1320.00	1477.32	1641.22	1811.70	1988.76	2172.40	2362.63
OUTFLOW	0.00	1219.40	4192.66	9007.88	15858.67	24945.63	36846.88	51453.36	68427.94	87767.64
	109486.03	133607.09	160161.79	189185.89	220718.61	254801.63	291478.46	330793.92	372793.84	417524.75
STAGE	1352.00	1353.47	1354.95	1356.42	1357.89	1359.37	1360.84	1362.32	1363.79	1365.26
	1366.74	1368.21	1369.68	1371.16	1372.63	1374.11	1375.58	1377.05	1378.53	1380.00
FLOW	0.00	1219.40	4192.66	9007.88	15858.67	24945.63	36846.88	51453.36	68427.94	87767.64
	109486.03	133607.09	160161.79	189185.89	220718.61	254801.63	291478.46	330793.92	372793.84	417524.75

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SUB-AREA RUNOFF COMPUTATION

RUNOFF FROM DRAINAGE AREA ABOVE BRONSONS POND

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
6	0	0	0	0	0	1	0	0

HYDROGRAPH DATA

IHYDG	IUHG	TAREA	SNAP	TRSDA	TRSPC	RATIO	ISNOW	ISAME	LOCAL
1	1	2.38	0.00	9.74	0.00	0.000	0	1	0

PRECIP DATA

SPFE	PMS	R6	R12	R24	R48	R72	R96
0.00	21.50	111.00	123.00	133.00	142.00	0.00	0.00

TRSPC COMPUTED BY THE PROGRAM IS .800

LOSS DATA

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

UNIT HYDROGRAPH DATA

TP= 1.85 CP= .45 NTA= 0

RECESSION DATA

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

APPROXIMATE CLARK COEFFICIENTS FROM GIVEN SNYDER CP AND TP ARE TC= 5.85 AND R= 8.91 INTERVALS

UNIT HYDROGRAPH 51 END-OF-PERIOD ORDINATES, LAG= 1.86 HOURS, CP= .45 VOL= 1.00

24.	91.	184.	278.	347.	372.	352.	314.	281.	251.
224.	200.	179.	160.	143.	128.	114.	102.	91.	82.
73.	65.	58.	52.	47.	42.	37.	33.	30.	27.
24.	21.	19.	17.	15.	14.	12.	11.	10.	9.
8.	7.	6.	6.	5.	4.	4.	4.	3.	3.
3.									

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HYDROGRAPH ROUTING

ROUTING %PMF'S THRU BRONSONS POND

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
6	1	0	0	0	0	1	0	0

ROUTING DATA

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

NSTPS	NSTDL	LAG	AMSKK	X	TSK	STORA	ISPRAT
1	0	0	0.000	0.000	0.000	-1403.	-1

STAGE	1403.10	1403.20	1403.60	1404.00	1405.00	1410.00	1415.00	1420.00
FLOW	0.00	.50	23.00	95.00	520.00	5310.00	13300.00	23500.00

CAPACITY=	0.	380.	385.	500.	890.	1490.	2320.
ELEVATION=	1382.	1403.	1403.	1405.	1410.	1415.	1420.

CREL	SPWID	COQW	EXPW	ELEVL	COOL	CAREA	EXPL
1403.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

DAM DATA

TOPEL	COQD	EXPD	DAMWID
1403.1	0.0	0.0	0.

LAKE QUINN

OVERTOPPING ANALYSIS

PMF 6/12

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HYDROGRAPH ROUTING

ROUTE FLOWS THRU 1ST DOWNSTREAM CROSS SECTION (BRONSON)

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
7	1	0	0	0	0	1	0	0

ROUTING DATA

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

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

NORMAL DEPTH CHANNEL ROUTING

QN(1)	QN(2)	QN(3)	ELNVT	ELMAX	RLNTH	SEL
.0700	.0500	.0700	1393.0	1411.0	200.	.00800

CROSS SECTION COORDINATES--STA,ELEV,STA,ELEV--ETC
100.00 1411.00 125.00 1405.00 136.00 1397.00 140.00 1393.00 180.00 1393.00
186.00 1397.00 190.00 1402.00 230.00 1411.00

STORAGE	0.00	.18	.37	.57	.78	1.00	1.23	1.47	1.71	1.97
	2.23	2.52	2.84	3.17	3.54	3.95	4.39	4.87	5.38	5.92
OUTFLOW	0.00	97.40	309.72	610.77	991.07	1481.42	2062.78	2723.72	3462.41	4277.45
	5165.41	6134.72	7191.79	8333.24	9565.29	10908.94	12368.85	13950.25	15658.52	17499.99
STAGE	1393.00	1393.95	1394.89	1395.84	1396.79	1397.74	1398.68	1399.63	1400.58	1401.53
	1402.47	1403.42	1404.37	1405.32	1406.26	1407.21	1408.16	1409.11	1410.05	1411.00
FLOW	0.00	97.40	309.72	610.77	991.07	1481.42	2062.78	2723.72	3462.41	4277.45
	5165.41	6134.72	7191.79	8333.24	9565.29	10908.94	12368.85	13950.25	15658.52	17499.99

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

HYDROGRAPH ROUTING

ROUTE FLOWS THRU 2ND DOWNSTRAEM CROSS SECTION (BRONSON)

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
8	1	0	0	0	0	1	0	0

ROUTING DATA

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

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

NORMAL DEPTH CHANNEL ROUTING

QN(1)	QN(2)	QN(3)	ELNVT	ELMAX	RLNTH	SEL
.0700	.0500	.0700	1368.0	1400.0	3100.	.00800

LAKE QUINN

OVERTOPPING ANALYSIS

page 11/12

CROSS SECTION COORDINATES--STA,ELEV,STA,ELEV--ETC
100.00 1400.00 200.00 1380.00 250.00 1373.00 255.00 1368.00 285.00 1368.00
290.00 1372.00 350.00 1380.00 500.00 1400.00

STORAGE	0.00	3.82	8.10	13.08	20.34	30.56	43.74	59.87	78.79	100.24
	124.21	150.71	179.72	211.27	245.33	281.92	321.03	362.67	406.82	453.51
OUTFLOW	0.00	190.22	607.59	1237.68	2179.92	3481.38	5215.69	7446.81	10258.71	13661.16
	17688.99	22381.18	27775.99	33910.87	40822.46	48546.65	57118.60	66572.79	76943.05	88262.64
STAGE	1368.00	1369.68	1371.37	1373.05	1374.74	1376.42	1378.11	1379.79	1381.47	1383.16
	1384.84	1386.53	1388.21	1389.89	1391.58	1393.26	1394.95	1396.63	1398.32	1400.00
FLOW	0.00	190.22	607.59	1237.68	2179.92	3481.38	5215.69	7446.81	10258.71	13661.16
	17688.99	22381.18	27775.99	33910.87	40822.46	48546.65	57118.60	66572.79	76943.05	88262.64

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HYDROGRAPH ROUTING

ROUTE FLOWS TO HEAD OF LAKE QUINN (FROM BRONSON)

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
9	1	0	0	0	0	1	0	0

ROUTING DATA

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

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

NORMAL DEPTH CHANNEL ROUTING

QN(1)	QN(2)	QN(3)	ELNVT	ELMAX	RLNTH	SEL
.0700	.0500	.0700	1357.0	1375.0	1000.	.01100

CROSS SECTION COORDINATES--STA,ELEV,STA,ELEV--ETC
100.00 1375.00 106.00 1369.00 240.00 1362.00 280.00 1357.00 320.00 1357.00
323.00 1359.00 340.00 1369.00 356.00 1375.00

STORAGE	0.00	.97	2.13	3.49	5.05	6.81	8.83	11.27	14.15	17.45
	21.17	25.33	29.92	34.92	40.07	45.30	50.60	55.98	61.44	66.97
OUTFLOW	0.00	119.63	393.95	820.53	1396.78	2128.59	3132.45	4381.98	5864.00	7599.11
	9605.97	11902.10	14504.26	17490.76	20926.56	24673.53	28720.66	33059.28	37682.40	42584.24
STAGE	1357.00	1357.95	1358.89	1359.84	1360.79	1361.74	1362.68	1363.63	1364.58	1365.53
	1366.47	1367.42	1368.37	1369.32	1370.26	1371.21	1372.16	1373.11	1374.05	1375.00
FLOW	0.00	119.63	393.95	820.53	1396.78	2128.59	3132.45	4381.98	5864.00	7599.11
	9605.97	11902.10	14504.26	17490.76	20926.56	24673.53	28720.66	33059.28	37682.40	42584.24

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

SUB-AREA RUNOFF COMPUTATION

RUNOFF FROM UNCONTROLLED DRAINAGE AREA ABOVE LAKE QUINN

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
10	0	0	0	0	0	1	0	0

HYDROGRAPH DATA

IHYDG	IUHG	TAREA	SNAP	TRSDA	TRSPC	RATIO	ISNOW	ISAME	LOCAL
1	1	6.86	0.00	9.74	0.00	0.000	0	1	0

PRECIP DATA

SPFE	PMS	R6	R12	R24	R48	R72	R96
0.00	21.50	111.00	123.00	133.00	142.00	0.00	0.00

TRSPC COMPUTED BY THE PROGRAM IS .800

LOSS DATA

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

UNIT HYDROGRAPH DATA
TP= 2.35 CP= .45 NTA= 0

RECESSION DATA
STRTQ= -1.50 QRCSN= -.05 RTIOR= 2.00
APPROXIMATE CLARK COEFFICIENTS FROM GIVEN SNYDER CP AND TP ARE TC= 7.53 AND R=11.00 INTERVALS

UNIT HYDROGRAPH 63 END-OF-PERIOD ORDINATES, LAG= 2.36 HOURS, CP= .45 VOL= 1.00

40.	148.	301.	478.	649.	780.	854.	856.	797.	729.
664.	607.	554.	506.	462.	422.	385.	351.	321.	293.
268.	244.	222.	204.	186.	170.	155.	142.	129.	118.
108.	98.	90.	82.	75.	68.	62.	57.	52.	49.
43.	40.	36.	33.	30.	28.	25.	23.	21.	19.
17.	16.	15.	13.	12.	11.	10.	9.	8.	9.
7.	6.	6.							

LAKE QUINN
OVERTOPPING ANALYSIS
PAGE 8/12

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COMBINE HYDROGRAPHS

COMBINE 3 HYDROGRAPHS AT LAKE QUINN   ROUTE COMBINED HYD. THRU LAKE

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
11	3	0	0	0	0	1	0	0

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HYDROGRAPH ROUTING

ROUTING %PMF'S THRU   LAKE QUINN

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
12	1	0	0	0	0	1	0	0

ROUTING DATA

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

NSTPS	NSTDL	LAG	AMSKK	X	TSK	STORA	ISPRAT
1	0	0	0.000	0.000	0.000	-1352.	-1

STAGE	1352.00	1353.00	1354.00	1355.00	1356.00	1357.00	1358.00	1359.00	1360.00	1370.00
FLOW	0.00	190.00	610.00	1400.00	2480.00	3820.00	5370.00	7170.00	9040.00	36000.00

CAPACITY=	0.	190.	305.	445.	610.	810.	1040.	1300.	1600.	1930.
ELEVATION=	1347.	1352.	1353.	1354.	1355.	1356.	1357.	1358.	1359.	1360.

CREL	SPWID	COQW	EXPW	ELEVL	COOL	CAREA	EXPL
1352.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

DAM [illegible]

TOPEL	COQD	[illegible]D	DAMWID
1353.0	0	[illegible]	0.

STATION 12, PLAN 1, RATIO 1

LAKE QUINN
[illegible]VERTOPPING ANALYSIS
page 9/12

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PEAK FLOW AND STORAGE (END OF PERIOD) SUMMARY FOR MULTIPLE PLAN-RATIO ECONOMIC COMPUTATIONS
FLOWS IN CUBIC FEET PER SECOND (CUBIC METERS PER SECOND)
AREA IN SQUARE MILES (SQUARE KILOMETERS)

OPERATION	STATION	AREA	PLAN	RATIOS APPLIED TO FLOWS RATIO 1 .01	RATIO 2 .10	RATIO 3 .20	RATIO 4 .30	RATIO 5 .50	RATIO 6 1.00
HYDROGRAPH AT	1	.50	1	14.	138.	276.	414.	690.	1380.
	(	1.29)	(	.39)(	3.91)(	7.81)(	11.72)(	19.54)(	39.07)(
ROUTED TO	1	.50	1	3.	42.	188.	332.	638.	1303.
	(	1.29)	(	.08)(	1.20)(	5.32)(	9.41)(	18.06)(	36.88)(
ROUTED TO	2	.50	1	3.	42.	188.	333.	638.	1302.
	(	1.29)	(	.08)(	1.20)(	5.34)(	9.43)(	18.08)(	36.86)(
ROUTED TO	3	.50	1	3.	42.	188.	333.	639.	1301.
	(	1.29)	(	.08)(	1.20)(	5.33)(	9.44)(	18.09)(	36.83)(
ROUTED TO	4	.50	1	3.	42.	185.	326.	617.	1267.
	(	1.29)	(	.08)(	1.19)(	5.23)(	9.23)(	17.48)(	35.87)(
ROUTED TO	5	.50	1	3.	42.	180.	320.	603.	1241.
	(	1.29)	(	.08)(	1.19)(	5.11)(	9.07)(	17.09)(	35.14)(
HYDROGRAPH AT	6	2.38	1	44.	442.	884.	1326.	2210.	4420.
	(	6.16)	(	1.25)(	12.51)(	25.03)(	37.54)(	62.57)(	125.15)(
ROUTED TO	6	2.38	1	11.	358.	781.	1198.	2008.	4019.
	(	6.16)	(	.32)(	10.13)(	22.12)(	33.92)(	56.85)(	113.79)(
ROUTED TO	7	2.38	1	11.	358.	780.	1198.	2008.	4018.
	(	6.16)	(	.32)(	10.13)(	22.09)(	33.92)(	56.87)(	113.78)(
ROUTED TO	8	2.38	1	11.	358.	781.	1196.	2007.	4017.
	(	6.16)	(	.32)(	10.13)(	22.10)(	33.88)(	56.82)(	113.75)(
ROUTED TO	9	2.38	1	11.	358.	781.	1196.	2006.	4017.
	(	6.16)	(	.32)(	10.13)(	22.12)(	33.87)(	56.81)(	113.74)(
HYDROGRAPH AT	10	6.86	1	114.	1137.	2273.	3410.	5683.	11366.
	(	17.77)	(	3.22)(	32.19)(	64.37)(	96.56)(	160.93)(	321.85)(
3 COMBINED	11	9.74	1	119.	1485.	3162.	4872.	8206.	16439.
	(	25.23)	(	3.37)(	42.04)(	89.54)(	137.96)(	232.36)(	465.49)(
ROUTED TO	12	9.74	1	63.	1094.	2484.	3903.	6669.	14064.
	(	25.23)	(	1.79)(	30.98)(	70.33)(	110.53)(	188.86)(	398.24)(

AKE QUINN
VERTOPPING ANALYSIS
page 10/12

SUMMARY OF DAM SAFETY ANALYSIS

PLAN 1 ....

	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
ELEVATION	1643.00	1643.00	1644.20
STORAGE	150.	150.	190.
OUTFLOW	0.	0.	45.

RATIO OF PMF	MAXIMUM RESERVOIR W.S.ELEV	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
.01	1643.12	0.00	154.	3.	0.00	44.67	0.00
.10	1644.14	0.00	188.	42.	0.00	44.00	0.00
.20	1644.66	.46	208.	188.	7.67	42.33	0.00
.30	1644.90	.70	217.	332.	8.67	41.67	0.00
.50	1645.21	1.01	228.	638.	9.67	41.00	0.00
1.00	1645.77	1.57	250.	1303.	11.33	41.00	0.00

ROBINSON POND DAM

PLAN 1 STATION 2

RATIO	MAXIMUM FLOW,CFS	MAXIMUM STAGE,FT	TIME HOURS
.01	3.	1622.1	44.67
.10	42.	1622.9	44.00
.20	188.	1624.1	42.33
.30	333.	1624.9	41.67
.50	638.	1625.9	41.00
1.00	1302.	1627.5	41.00

PLAN 1 STATION 3

RATIO	MAXIMUM FLOW,CFS	MAXIMUM STAGE,FT	TIME HOURS
.01	3.	1620.1	44.67
.10	42.	1621.2	44.00
.20	188.	1622.9	42.33
.30	333.	1624.0	41.67
.50	639.	1625.6	41.00
1.00	1301.	1627.7	41.00

PLAN 1 STATION 4

RATIO	MAXIMUM FLOW,CFS	MAXIMUM STAGE,FT	TIME HOURS
.01	3.	1400.2	45.33
.10	42.	1401.6	44.33
.20	185.	1403.2	42.67
.30	326.	1404.0	42.00
.50	617.	1405.0	41.67
1.00	1267.	1406.1	41.33

PLAN 1 STATION 5

RATIO	MAXIMUM FLOW,CFS	MAXIMUM STAGE,FT	TIME HOURS
.01	3.	1352.0	46.00
.10	42.	1352.1	44.67
.20	180.	1352.2	43.00
.30	320.	1352.4	42.67
.50	603.	1352.7	42.00
1.00	1241.	1353.5	41.67

SUMMARY OF DAM SAFETY ANALYSIS

LAKE QUINN
OVERTOPPING ANALYSIS
page 11/12

PLAN 1 ....

	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
ELEVATION	1403.00	1403.00	1403.10
STORAGE	380.	380.	385.
OUTFLOW	0.	0.	0.

EFONSON POND DAM

RATIO OF PMF	MAXIMUM RESERVOIR W.S.ELEV	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
.01	1403.39	.29	403.	11.	12.00	47.33	0.00
.10	1404.62	1.52	477.	358.	31.33	43.33	0.00
.20	1405.27	2.17	521.	781.	32.33	42.67	0.00
.30	1405.71	2.61	555.	1198.	32.67	42.67	0.00
.50	1406.55	3.45	621.	2008.	33.00	42.67	0.00
1.00	1408.65	5.55	785.	4019.	33.33	42.67	0.00

PLAN 1 STATION 7

RATIO	MAXIMUM FLOW,CFS	MAXIMUM STAGE,FT	TIME HOURS
.01	11.	1393.1	47.33
.10	358.	1395.0	43.33
.20	780.	1396.3	42.67
.30	1198.	1397.2	42.67
.50	2008.	1398.6	42.67
1.00	4018.	1401.2	42.67

PLAN 1 STATION 8

RATIO	MAXIMUM FLOW,CFS	MAXIMUM STAGE,FT	TIME HOURS
.01	11.	1368.1	47.67
.10	358.	1370.4	43.33
.20	781.	1371.8	43.00
.30	1196.	1372.9	42.67
.50	2007.	1374.4	42.67
1.00	4017.	1376.9	42.67

PLAN 1 STATION 9

RATIO	MAXIMUM FLOW,CFS	MAXIMUM STAGE,FT	TIME HOURS
.01	11.	1357.1	47.67
.10	358.	1358.8	43.33
.20	781.	1359.8	43.00
.30	1196.	1360.5	42.67
.50	2006.	1361.6	42.67
1.00	4017.	1363.4	42.67

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SUMMARY OF DAM SAFETY ANALYSIS

PLAN 1 ....

	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
ELEVATION	1352.00	1352.00	1353.00
STORAGE	190.	190.	305.
OUTFLOW	0.	0.	190.

LAKE QUINN DAM

RATIO OF PMF	MAXIMUM RESERVOIR W.S.ELEV	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
.01	1352.33	0.00	228.	63.	0.00	46.33	0.00
.10	1354.61	1.61	546.	1094.	8.67	44.67	0.00
.20	1356.00	3.00	811.	2484.	12.67	44.33	0.00
.30	1357.05	4.05	1054.	3903.	23.33	44.00	0.00
.50	1358.72	5.72	1517.	6669.	30.00	44.00	0.00
1.00	1361.86	8.86	2545.	14064.	31.33	43.67	0.00

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FLOOD HYDROGRAPH PACKAGE (HEC-1)
DAM SAFETY VERSION JULY 1978
LAST MODIFICATION 01 APR 80
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LAKE QUINN
OVERTOPPING ANALYSIS
page 12/12

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1*******************************
FLOOD HYDROGRAPH PACKAGE (HEC-1)
DAM SAFETY VERSION      JULY 1978
  LAST MODIFICATION  01 APR 80
*******************************
              A1      LAKE QUINN DAM   DER NO. 90-64-43
              A2    DAM SAFTEY INSPECTION PROGRAM      12-19-80
              A3     BREACHING ANALYSIS     ***  PRELIMINARY   ***
              B     144       0      20       0       0       0       0       0      -3       0
              B1      5       0       0       0       0       0       0       0       0       0
              J       4       1       1
              J1   0.10
              K       0       1       0       0       0       0       1       0       0       0
              K1    RUNOFF FROM DRAINAGE AREA ABOVE ROBINSON DAM
              M       1       1    0.50       0    9.74       0       0       0       1       0
              P       0    21.5     111     123     133     142
              T       0       0       0       0       0       0     1.0    0.05       0       0
              W    1.02    0.45
              X    -1.5   -0.05       2
              K       1       1       0       0       0       0       1       0       0       0
              K1    ROUTING %PMF'S THRU ROBINSON DAM AND SPILLWAY
              Y       0       0       0       1       1       0       0       0       0       0
              Y1      1       0       0       0       0       0   -1643      -1       0       0
              Y41643.0  1643.5  1644.2  1644.5  1645.0  1646.0  1650.0  1655.0
              Y5      0    12.0    45.0    90.0   390.0  1570.0 12030.0 37000.0
              $S      0     150     190     410     660     960
              $E1627.7  1643.0  1644.2  1650.0  1655.0  1660.0
              $$1643.0
              $D1644.2
              K       1       2       0       0       0       0       1       0       0       0
              K1     DOWNSTREAM X-SECTION 230 FEET FROM DAM  (ROBINSON)
              Y       0       0       0       1       1
              Y1      1       0       0       0       0       0       0
              Y6   0.07    0.05    0.07    1622    1638     230  0.0090       0       0       0
              Y7    100    1638     142    1630     162    1625     175    1622     190    1622
              Y7    197    1625     207    1630     225    1638
              K       1       3       0       0       0       0       1       0       0       0
              K1      ROUTE THRU THE    2ND DOWNSTREAM CROSS SECTION  (ROBINSON)
              Y       0       0       0       1       1
              Y1      1       0       0       0       0       0       0
              Y6   0.07    0.05    0.07    1620    1638     270  0.0090       0       0       0
              Y7    100    1638     140  1627.8     180    1627     192    1620     202    1620
              Y7    210    1627     277  1633.6     323    1638
              K       1       4       0       0       0       0       1       0       0       0
              K1       ROUTE FLOW THRU  3RD DOWNSTREAM  CROSS SECTION (ROBINSON)
              Y       0       0       0       1       1
              Y1      1       0       0       0       0       0       0
              Y6   0.07    0.05    0.07    1400    1414    8200   0.027       0       0       0
              Y7    100    1414     120    1406     170    1403     175    1400     178    1400
              Y7    185    1405     246    1406     270    1414
              K       1       5       0       0       0       0       1
              K1         ROUTE FLOWS TO HEAD OF LAKE QUINN  (FROM ROBINSON)
              Y       0       0       0       1       1
              Y1      1       0       0       0       0       0       0
              Y6   0.07    0.05    0.07    1352    1380    4400  0.0109
1             Y7    100    1380     500    1360     700    1353     705    1352     905    1352
              Y7    910    1353    1200    1360    1400    1380
              K       0       6       0       0       0       0       1       0       0       0
              K1    RUNOFF FROM DRAINAGE AREA ABOVE BRONSONS POND
              M       1       1    2.38       0    9.74       0       0       0       1       0
              P       0    21.5     111     123     133     142
              T       0       0       0       0       0       0     1.0    0.05       0       0
              W    1.85    0.45
              X    -1.5   -0.05       2
              K       1       6       0       0       0       0       1       0       0       0
              K1    ROUTING %PMF'S THRU BRONSONS POND
              Y       0       0       0       1       1       0       0       0       0       0
              Y1      1       0       0       0       0       0   -1403      -1       0       0
              Y41403.1  1403.2  1403.6  1404.0  1405.0  1410.0  1415.0  1420.0
              Y5      0     0.5    23.0    95.0   520.0  5210.0 13300.0 23500.0
              $S      0     330     385     500     890    1490    2220
              $E1392.0  1403.0  1403.1  1405.0  1410.0  1415.0  1420.0
              $$14
              $D14
```

LAKE QUINN

BREACH ANALYSIS

Page 1/10

```
K       1       7       0       0       0       0       1
K1     ROUTE FLOWS THRU  1ST DOWNSTREAM CROSS SECTION (BRONSON)
Y       0       0       0       1       1
Y1      1       0       0       0       0       0       0
Y6   0.07    0.05    0.07    1393    1411     200   0.008
Y7    100    1411     125    1405     136    1397     140    1393     180    1393
Y7    186    1397     190    1402     230    1411
K       1       8       0       0       0       0       1
K1     ROUTE FLOWS THRU  2ND DOWNSTRAEM CROSS SECTION  (BRONSON)
Y       0       0       0       1       1
Y1      1       0       0       0       0       0       0
Y6   0.07    0.05    0.07    1368    1400    3100   0.008
Y7    100    1400     200    1380     250    1373     255    1368     285    1368
Y7    290    1372     350    1380     500    1400
K       1       9       0       0       0       0       1
K1   ROUTE FLOWS TO HEAD OF LAKE QUINN  (FROM BRONSON)
Y       0       0       0       1       1
Y1      1       0       0       0       0       0       0
Y6   0.07    0.05    0.07    1357    1375    1000   0.011
Y7    100    1375     106    1369     240    1362     280    1357     320    1357
Y7    323    1359     340    1369     356    1375
K       0      10       0       0       0       0       1       0       0       0
K1    RUNOFF FROM  UNCONTROLLED DRAINAGE AREA ABOVE LAKE QUINN
M       1       1    6.86       0    9.74       0       0       0       1       0
P       0    21.5     111     123     133     142
T       0       0       0       0       0       0     1.0    0.05       0       0
W    2.35    0.45
X    -1.5   -0.05       2
K       3      11       0       0       0       0       1
K1     COMBINE 3 HYDROGRAPHS AT LAKE QUINN   ROUTE COMBINED HYD. THRU LAKE
K       1      12       0       0       0       0       1       0       0       0
K1    ROUTING %PMF'S THRU     LAKE QUINN
Y       0       0       0       1       1       0       0       0       0       0
Y1      1       0       0       0       0       0   -1352      -1       0       0
Y41352.0  1353.0  1354.0  1355.0  1356.0  1357.0  1358.0  1359.0  1360.0  1370.0
Y5      0     190     610    1400    2480    2820    5370    7170    9040   36000
$S      0     190     305     445     610     810    1040    1300    1600    1930
$E1343.9    1352    1353    1354    1355    1356    1357    1358    1359    1360
$$1352.0
$D1353.0
$B     66     0.5    1344    0.33    1353    1400
$B     66     0.5    1344    0.33    1353  1354.5
$B     66     0.5    1344    1.00    1353  1354.5
$B     66     0.5    1344    2.00    1353  1354.5
K       1      13       0       0       0       0       1
K1     ROUTE FLOWS THRU  1ST DOWNSTREAM CROSS SECTION  (QUINN)
Y       0       0       0       1       1
Y1      1       0       0       0       0       0       0
Y6   0.07    0.05    0.07    1340    1358     100    0.01
Y7    100    1358     115    1344     157    1343     163    1340     253    1340
Y7    265    1344     286    1351     308    1358
K       1      14       0       0       0       0       1
K1     ROUTE FLOWS THRU  2ND DOWNSTREAM CROSS SECTION  (QUINN)
Y       0       0       0       1       1
Y1      1       0       0       0       0       0       0
Y6   0.07    0.05    0.07    1319    1339    3900  0.0054
Y7    100    1339     168    1332     193    1329     218    1319     258    1319
Y7    268    1329     278    1338     282    1339
K       1      15       0       0       0       0       1
K1    ROUTE FLOWS THRU  3RD  CROSS SECTION    (QUINN)
Y       0       0       0       1       1
Y1      1       0       0       0       0       0       0
Y6   0.07    0.05    0.07    1230    1245   10500  0.0085
Y7    100    1245     150    1239     202    1236     205    1230     245    1230
Y7    248    1235     282  1238.4     325    1245
K      99
```

PREVIEW OF SEQUENCE OF STREAM NETWORK CALCULATIONS

LAKE QUINN
BREACH ANALYSIS
page 2/10

```
RUNOFF HYDROGRAPH AT            1
ROUTE HYDROGRAPH TO             1
ROUTE HYDROGRAPH TO             2
ROUTE HYDROGRAPH TO             3
ROUTE HYDROGRAPH TO             4
ROUTE HYDROGRAPH TO             5
RUNOFF HYDROGRAPH AT            6
ROUTE HYDROGRAPH TO             6
ROUTE HYDROGRAPH TO             7
ROUTE HYDROGRAPH TO             8
ROUTE HYDROGRAPH TO             9
RUNOFF HYDROGRAPH AT           10
COMBINE  3 HYDROGRAPHS AT      11
ROUTE HYDROGRAPH TO            12
ROUTE HYDROGRAPH TO            13
ROUTE HYDROGRAPH TO            14
ROUTE HYDROGRAPH TO            15
END OF NETWORK
```

```
1*******************************
FLOOD HYDROGRAPH PACKAGE (HEC-1)
DAM SAFETY VERSION     JULY 1978
 LAST MODIFICATION  01 APR 80
********************************

RUN  DATE* 81/03/04.
     TIME* 04.30.54.
```

LAKE QUINN DAM   DER NO. 90-64-43
DAM SAFTEY INSPECTION PROGRAM   12-19-80
BREACHING ANALYSIS   *** PRELIMINARY ***

JOB SPECIFICATION

NO	NHR	NMIN	IDAY	IHR	IMIN	METRC	IPLT	IPRT	NSTAN
144	0	20	0	0	0	0	0	-3	0
			JOPER	NWT	LROPT	TRACE			
			5	0	0	0			

MULTI-PLAN ANALYSES TO BE PERFORMED
NPLAN= 4 NRTIO= 1 LRTIO= 1
RTIOS=   .10

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

DAM BREACH DATA

DAM BREACH DATA

BRWID	Z	ELBM	TFAIL	WSEL	FAILEL
66.	.50	1344.00	.33	1353.00	1400.00

DAM BREACH DATA

DAM BREACH DATA

BRWID	Z	ELBM	TFAIL	WSEL	FAILEL
66.	.50	1344.00	.33	1353.00	1354.50

STATION   12, PLAN 2, RATIO 1

DAM BREACH DATA

BRWID	Z	ELBM	TFAIL	WSEL	FAILEL
66.	.50	1344.00	1.00	1353.00	1354.50

STATION   12, PLAN 3, RATIO 1

DAM BREACH DATA

BRWID	Z	ELBM	TFAIL	WSEL	FAILEL
66.	.50	1344.00	2.00	1353.00	1354.50

STATION   12, PLAN 4, RATIO 1

LAKE QUINN
BREACH ANALYSIS
page 3/10

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

HYDROGRAPH ROUTING

ROUTE FLOWS THRU 1ST DOWNSTREAM CROSS SECTION (QUINN)

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
13	1	0	0	0	0	1	0	0

ALL PLANS HAVE SAME
ROUTING DATA

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

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

NORMAL DEPTH CHANNEL ROUTING

QN(1)	QN(2)	QN(3)	ELNVT	ELMAX	RLNTH	SEL
.0700	.0500	.0700	1340.0	1358.0	100.	.01000

CROSS SECTION COORDINATES--STA,ELEV,STA,ELEV--ETC
100.00 1358.00 115.00 1344.00 157.00 1343.00 163.00 1340.00 253.00 1340.00
265.00 1344.00 286.00 1351.00 308.00 1358.00

STORAGE	0.00	.20	.41	.63	.89	1.22	1.56	1.90	2.26	2.62
	2.99	3.37	3.76	4.15	4.56	4.97	5.39	5.82	6.26	6.71
OUTFLOW	0.00	246.67	788.86	1562.97	2581.64	3942.97	5603.00	7523.76	9691.65	12097.29
	14733.78	17595.86	20678.93	23979.86	27497.20	31229.08	35174.10	39331.19	43699.55	48278.65
STAGE	1340.00	1340.95	1341.89	1342.84	1343.79	1344.74	1345.68	1346.63	1347.58	1348.53
	1349.47	1350.42	1351.37	1352.32	1353.26	1354.21	1355.16	1356.11	1357.05	1358.00
FLOW	0.00	246.67	788.86	1562.97	2581.64	3942.97	5603.00	7523.76	9691.65	12097.29
	14733.78	17595.86	20678.93	23979.86	27497.20	31229.08	35174.10	39331.19	43699.55	48278.65

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

HYDROGRAPH ROUTING

ROUTE FLOWS THRU 2ND DOWNSTREAM CROSS SECTION (QUINN)

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
14	1	0	0	0	0	1	0	0

ALL PLANS HAVE SAME
ROUTING DATA

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

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

NORMAL DEPTH CHANNEL ROUTING

QN(1)	QN(2)	QN(3)	ELNVT	ELMAX	RLNTH	SEL
.0700	.0500	.0700	1319.0	1339.0	3900.	.00540

LAKE QUINN

BREACH ANALYSIS

page 4/10

CROSS SECTION COORDINATES--STA,ELEV,STA,ELEV--ETC
100.00 1339.00 168.00 1332.00 193.00 1329.00 218.00 1319.00 258.00 1319.00
268.00 1329.00 278.00 1338.00 282.00 1339.00

STORAGE	0.00	3.94	8.22	12.87	17.86	23.19	28.87	34.90	41.27	47.99
	55.13	63.14	72.08	81.99	92.96	105.01	118.13	132.33	147.59	164.07
OUTFLOW	0.00	96.05	307.92	612.59	1003.21	1477.28	2034.23	2674.55	3399.34	4210.12
	5193.03	6366.33	7661.17	9085.35	10650.38	12366.52	14242.22	16285.50	18504.02	20891.99
STAGE	1319.00	1320.05	1321.11	1322.16	1323.21	1324.26	1325.32	1326.37	1327.42	1328.47
	1329.53	1330.58	1331.63	1332.68	1333.74	1334.79	1335.84	1336.89	1337.95	1339.00
FLOW	0.00	96.05	307.92	612.59	1003.21	1477.28	2034.23	2674.55	3399.34	4210.12
	5193.03	6366.33	7661.17	9085.35	10650.38	12366.52	14242.22	16285.50	18504.02	20891.99

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HYDROGRAPH ROUTING

ROUTE FLOWS THRU 3RD CROSS SECTION (QUINN)

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
15	1	0	0	0	0	1	0	0

ALL PLANS HAVE SAME
ROUTING DATA

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

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

NORMAL DEPTH CHANNEL ROUTING

QN(1)	QN(2)	QN(3)	ELNVT	ELMAX	RLNTH	SEL
.0700	.0500	.0700	1230.0	1245.0	10500.	.00850

CROSS SECTION COORDINATES--STA,ELEV,STA,ELEV--ETC
100.00 1245.00 150.00 1239.00 202.00 1236.00 205.00 1230.00 245.00 1230.00
248.00 1235.00 282.00 1238.40 325.00 1245.00

STORAGE	0.00	7.69	15.55	23.58	31.77	40.13	48.65	57.65	68.35	82.70
	101.16	123.69	149.67	177.99	208.54	241.31	276.32	313.56	353.04	394.74
OUTFLOW	0.00	73.27	230.22	448.28	717.92	1033.32	1390.45	1800.49	2277.55	2844.98
	3514.16	4306.98	5249.17	6334.72	7559.33	8927.16	10442.82	12111.15	13937.07	15925.54
STAGE	1230.00	1230.79	1231.58	1232.37	1233.16	1233.95	1234.74	1235.53	1236.32	1237.11
	1237.89	1238.68	1239.47	1240.26	1241.05	1241.84	1242.63	1243.42	1244.21	1245.00
FLOW	0.00	73.27	230.22	448.28	717.92	1033.32	1390.45	1800.49	2277.55	2844.98
	3514.16	4306.98	5249.17	6334.72	7559.33	8927.16	10442.82	12111.15	13937.07	15925.54

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

1

PEAK FLOW AND STORAGE (END OF PERIOD) SUMMARY FOR MULTIPLE PLAN-RATIO ECONOMIC COMPUTATIONS
FLOWS IN CUBIC FEET PER SECOND (CUBIC METERS PER SECOND)
AREA IN SQUARE MILES (SQUARE KILOMETERS)

RATIOS APPLIED TO FLOWS

OPERATION	STATION	AREA	PLAN	RATIO 1 .10
HYDROGRAPH AT	1	.50	1	138.
	(	1.29)	(	3.91)(
			2	138.
			(	3.91)(
			3	138.
			(	3.91)(
			4	138.
			(	3.91)(
ROUTED TO	1	.50	1	42.
	(	1.29)	(	1.20)(
			2	42.
			(	1.20)(
			3	42.
			(	1.20)(
			4	42.
			(	1.20)(

LAKE QUINN
BREACH ANALYSIS
Page 5/10

ROUTED TO	2	.50 (1.29)	1	42. (1.20)(
			2	42. (1.20)(
			3	42. (1.20)(
			4	42. (1.20)(
ROUTED TO	3	.50 (1.29)	1	42. (1.20)(
			2	42. (1.20)(
			3	42. (1.20)(
			4	42. (1.20)(
ROUTED TO	4	.50 (1.29)	1	42. (1.19)(
			2	42. (1.19)(
			3	42. (1.19)(
			4	42. (1.19)(
ROUTED TO	5	.50 (1.29)	1	42. (1.19)(
			2	42. (1.19)(
			3	42. (1.19)(
			4	42. (1.19)(
HYDROGRAPH AT	6	2.38 (6.16)	1	442. (12.51)(
			2	442. (12.51)(
			3	442. (12.51)(
			4	442. (12.51)(
ROUTED TO	6	2.38 (6.16)	1	358. (10.13)(
			2	358. (10.13)(
			3	358. (10.13)(
			4	358. (10.13)(
ROUTED TO	7	2.38 (6.16)	1	358. (10.13)(
			2	358. (10.13)(
			3	358. (10.13)(
			4	358. (10.13)(
ROUTED TO	8	2.38 (6.16)	1	358. (10.13)(
			2	358. (10.13)(
			3	358. (10.13)(
			4	358. (10.13)(
ROUTED TO	9	2.38 (6.16)	1	358. (10.13)(
			2	358. (10.13)(
			3	358. (10.13)(
			4	358. (10.13)(
HYDROGRAPH AT	10	6.86 (17.77)	1	1137. (32.19)(
			2	1137. (32.19)(
			3	1137. (32.19)(
			4	1137. (32.19)(
3 COMBINED	11	9.74 (25.23)	1	1485. (42.04)(
			2	1485. (42.04)(
			3	1485. (42.04)(
			4	1485. (42.04)(
ROUTED TO	12	9.74 (25.23)	1	1094. (30.99)(
			2	7794. (220.71)(
			3	6793. (192.35)(
			4	5559. (157.42)(
ROUTED TO	13	9.74 (25.23)	1	1095. (31.00)(
			2	7690. (217.75)(
			3	6770. (191.71)(
			4	5553. (157.23)(
ROUTED TO	14	9.74 (25.23)	1	1095. (30.99)(
			2	7606. (215.38)(
			3	6173. (174.80)(
			4	5277. (149.44)(
ROUTED TO	15	9.74 (25.23)	1	1090. (30.88)(
			2	5860. (165.94)(
			3	5216. (147.71)(
			4	4604. (130.37)(

LAKE QUINN

BREACH ANALYSIS

page 6/10

SUMMARY OF DAM SAFETY ANALYSIS

PLAN 1 ....

	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
ELEVATION	1643.00	1643.00	1644.20
STORAGE	150.	150.	190.
OUTFLOW	0.	0.	45.

RATIO OF PMF	MAXIMUM RESERVOIR W.S.ELEV	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
.10	1644.14	0.00	188.	42.	0.00	44.00	0.00

PLAN 2 ....

	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
ELEVATION	1643.00	1643.00	1644.20
STORAGE	150.	150.	190.
OUTFLOW	0.	0.	45.

RATIO OF PMF	MAXIMUM RESERVOIR W.S.ELEV	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
.10	1644.14	0.00	188.	42.	0.00	44.00	0.00

PLAN 3 ....

	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
ELEVATION	1643.00	1643.00	1644.20
STORAGE	150.	150.	190.
OUTFLOW	0.	0.	45.

RATIO OF PMF	MAXIMUM RESERVOIR W.S.ELEV	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
.10	1644.14	0.00	188.	42.	0.00	44.00	0.00

PLAN 4 ....

	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
ELEVATION	1643.00	1643.00	1644.20
STORAGE	150.	150.	190.
OUTFLOW	0.	0.	45.

RATIO OF PMF	MAXIMUM RESERVOIR W.S.ELEV	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
.10	1644.14	0.00	188.	42.	0.00	44.00	0.00

Robinson Pond Dam

PLAN 1 STATION 2

RATIO	MAXIMUM FLOW,CFS	MAXIMUM STAGE,FT	TIME HOURS
.10	42.	1622.9	44.00

PLAN 1 STATION 3

RATIO	MAXIMUM FLOW,CFS	MAXIMUM STAGE,FT	TIME HOURS
.10	42.	1621.2	44.00

PLAN 2 STATION 2

RATIO	MAXIMUM FLOW,CFS	MAXIMUM STAGE,FT	TIME HOURS
.10	42.	1622.9	44.00

PLAN 2 STATION 3

RATIO	MAXIMUM FLOW,CFS	MAXIMUM STAGE,FT	TIME HOURS
.10	42.	1621.2	44.00

PLAN 3 STATION 2

RATIO	MAXIMUM FLOW,CFS	MAXIMUM STAGE,FT	TIME HOURS
.10	42.	1622.9	44.00

PLAN 3 STATION 3

RATIO	MAXIMUM FLOW,CFS	MAXIMUM STAGE,FT	TIME HOURS
.10	42.	1621.2	44.00

PLAN 4 STATION 2

RATIO	MAXIMUM FLOW,CFS	MAXIMUM STAGE,FT	TIME HOURS
.10	42.	1622.9	44.00

D35

PLAN 4 STATION 3

RATIO	MAXIMUM FLOW,CFS	MAXIMUM STAGE,FT	TIME HOURS
.10	42.	1621.2	44.00

LAKE QUINN
BREACH ANALYSIS
page 7/10

PLAN 1 STATION 4

RATIO	MAXIMUM FLOW,CFS	MAXIMUM STAGE,FT	TIME HOURS
.10	42.	1401.6	44.33

PLAN 1 STATION 5

RATIO	MAXIMUM FLOW,CFS	MAXIMUM STAGE,FT	TIME HOURS
.10	42.	1352.1	44.67

PLAN 2 STATION 4

RATIO	MAXIMUM FLOW,CFS	MAXIMUM STAGE,FT	TIME HOURS
.10	42.	1401.6	44.33

PLAN 2 STATION 5

RATIO	MAXIMUM FLOW,CFS	MAXIMUM STAGE,FT	TIME HOURS
.10	42.	1352.1	44.67

PLAN 3 STATION 4

RATIO	MAXIMUM FLOW,CFS	MAXIMUM STAGE,FT	TIME HOURS
.10	42.	1401.6	44.33

PLAN 3 STATION 5

RATIO	MAXIMUM FLOW,CFS	MAXIMUM STAGE,FT	TIME HOURS
.10	42.	1352.1	44.67

PLAN 4 STATION 4

RATIO	MAXIMUM FLOW,CFS	MAXIMUM STAGE,FT	TIME HOURS
.10	42.	1401.6	44.33

PLAN 4 STATION 5

RATIO	MAXIMUM FLOW,CFS	MAXIMUM STAGE,FT	TIME HOURS
.10	42.	1352.1	44.67

SUMMARY OF DAM SAFETY ANALYSIS

PLAN 1 ....

	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
ELEVATION	1403.00	1403.00	1403.10
STORAGE	380.	380.	385.
OUTFLOW	0.	0.	0.

RATIO OF PMF	MAXIMUM RESERVOIR W.S.ELEV	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
.10	1404.62	1.52	477.	358.	31.33	43.33	0.00

PLAN 2 ....

	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
ELEVATION	1403.00	1403.00	1403.10
STORAGE	380.	380.	385.
OUTFLOW	0.	0.	0.

RATIO OF PMF	MAXIMUM RESERVOIR W.S.ELEV	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
.10	1404.62	1.52	477.	358.	31.33	43.33	0.00

[illegible] POND DAM

PLAN 3 ....

	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
ELEVATION	1403.00	1403.00	1403.10
STORAGE	380.	380.	385.
OUTFLOW	0.	0.	0.

RATIO OF PMF	MAXIMUM RESERVOIR W.S.ELEV	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
.10	1404.62	1.52	477.	358.	31.33	43.33	0.00

PLAN 4 ....

LAKE QUINN
BREACH ANALYSIS
PAGE 3/10

	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
ELEVATION	1403.00	1403.00	1403.10
STORAGE	380.	380.	385.
OUTFLOW	0.	0.	0.

RATIO OF PMF	MAXIMUM RESERVOIR W.S.ELEV	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
.10	1404.62	1.52	477.	358.	31.33	43.33	0.00

PLAN 1 STATION 7

RATIO	MAXIMUM FLOW,CFS	MAXIMUM STAGE,FT	TIME HOURS
.10	358.	1395.0	43.33

PLAN 2 STATION 7

RATIO	MAXIMUM FLOW,CFS	MAXIMUM STAGE,FT	TIME HOURS
.10	358.	1395.0	43.33

PLAN 3 STATION 7

RATIO	MAXIMUM FLOW,CFS	MAXIMUM STAGE,FT	TIME HOURS
.10	358.	1395.0	43.33

PLAN 4 STATION 7

RATIO	MAXIMUM FLOW,CFS	MAXIMUM STAGE,FT	TIME HOURS
.10	358.	1395.0	43.33

PLAN 1 STATION 8

RATIO	MAXIMUM FLOW,CFS	MAXIMUM STAGE,FT	TIME HOURS
.10	358.	1370.4	43.33

PLAN 2 STATION 8

RATIO	MAXIMUM FLOW,CFS	MAXIMUM STAGE,FT	TIME HOURS
.10	358.	1370.4	43.33

PLAN 3 STATION 8

RATIO	MAXIMUM FLOW,CFS	MAXIMUM STAGE,FT	TIME HOURS
.10	358.	1370.4	43.33

PLAN 4 STATION 8

RATIO	MAXIMUM FLOW,CFS	MAXIMUM STAGE,FT	TIME HOURS
.10	358.	1370.4	43.33

PLAN 1 STATION 9

RATIO	MAXIMUM FLOW,CFS	MAXIMUM STAGE,FT	TIME HOURS
.10	358.	1358.8	43.33

PLAN 2 STATION 9

RATIO	MAXIMUM FLOW,CFS	MAXIMUM STAGE,FT	TIME HOURS
.10	358.	1358.8	43.33

PLAN 3 STATION 9

RATIO	MAXIMUM FLOW,CFS	MAXIMUM STAGE,FT	TIME HOURS
.10	358.	1358.8	43.33

PLAN 4 STATION 9

RATIO	MAXIMUM FLOW,CFS	MAXIMUM STAGE,FT	TIME HOURS
.10	358.	1358.8	43.33

SUMMARY OF DAM SAFETY ANALYSIS

PLAN 1 ....

	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
ELEVATION	1353.00	1352.00	1353.00
STORAGE	305.	190.	305.
OUTFLOW	190.	0.	190.

RATIO OF PMF	MAXIMUM RESERVOIR W.S.ELEV	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
.10	1354.61	1.61	546.	1094.	9.00	44.67	0.00

PLAN 2 ....

	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
ELEVATION	1353.00	1352.00	1353.00
STORAGE	305.	190.	305.
OUTFLOW	190.	0.	190.

RATIO OF PMF	MAXIMUM RESERVOIR W.S.ELEV	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
.10	1354.53	1.53	533.	7794.	5.33	44.00	43.67

Lake Quinn Dam

Lake Quinn
Breach Analysis
Page 9/10

PLAN 3 ....

	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
ELEVATION	1353.00	1352.00	1353.00
STORAGE	305.	190.	305.
OUTFLOW	190.	0.	190.

RATIO OF PMF	MAXIMUM RESERVOIR W.S.ELEV	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
.10	1354.54	1.54	535.	6793.	5.67	44.67	43.67

PLAN 4 ....

	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
ELEVATION	1353.00	1352.00	1353.00
STORAGE	305.	190.	305.
OUTFLOW	190.	0.	190.

RATIO OF PMF	MAXIMUM RESERVOIR W.S.ELEV	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
.10	1354.56	1.56	537.	5553.	6.54	45.67	43.67

LAKE QUINN DAM

PLAN 1 STATION 13

RATIO	MAXIMUM FLOW,CFS	MAXIMUM STAGE,FT	TIME HOURS
.10	1095.	1342.3	44.67

PLAN 2 STATION 13

RATIO	MAXIMUM FLOW,CFS	MAXIMUM STAGE,FT	TIME HOURS
.10	7690.	1346.7	44.00

PLAN 3 STATION 13

RATIO	MAXIMUM FLOW,CFS	MAXIMUM STAGE,FT	TIME HOURS
.10	6770.	1346.3	44.67

PLAN 4 STATION 13

RATIO	MAXIMUM FLOW,CFS	MAXIMUM STAGE,FT	TIME HOURS
.10	5553.	1345.7	45.67

PLAN 1 STATION 14

RATIO	MAXIMUM FLOW,CFS	MAXIMUM STAGE,FT	TIME HOURS
.10	1095.	1323.4	45.00

PLAN 2 STATION 14

RATIO	MAXIMUM FLOW,CFS	MAXIMUM STAGE,FT	TIME HOURS
.10	7606.	1331.6	44.33

PLAN 3 STATION 14

RATIO	MAXIMUM FLOW,CFS	MAXIMUM STAGE,FT	TIME HOURS
.10	6173.	1330.4	45.00

PLAN 4 STATION 14

RATIO	MAXIMUM FLOW,CFS	MAXIMUM STAGE,FT	TIME HOURS
.10	5277.	1329.6	45.67

PLAN 1 STATION 15

RATIO	MAXIMUM FLOW,CFS	MAXIMUM STAGE,FT	TIME HOURS
.10	1090.	1234.1	45.[illegible]

PLAN 2 STATION 15

RATIO	MAXIMUM FLOW,CFS	MAXIMUM STAGE,FT	TIME HOURS
.10	5860.	1239.9	44.67

PLAN 3 STATION 15

RATIO	MAXIMUM FLOW,CFS	MAXIMUM STAGE,FT	TIME HOURS
.10	5216.	1239.4	45.00

PLAN 4 STATION 15

RATIO	MAXIMUM FLOW,CFS	MAXIMUM STAGE,FT	TIME HOURS
.10	4604.	1238.9	46.00

STATION 14 = DOWNSTREAM DAMAGE CENTER #1. DAMAGE AT ELEV. 13[illegible]

STATION 15 = DOWNSTREAM DAMAGE CENTER #2 DAMAGE AT ELEV. 1238.0

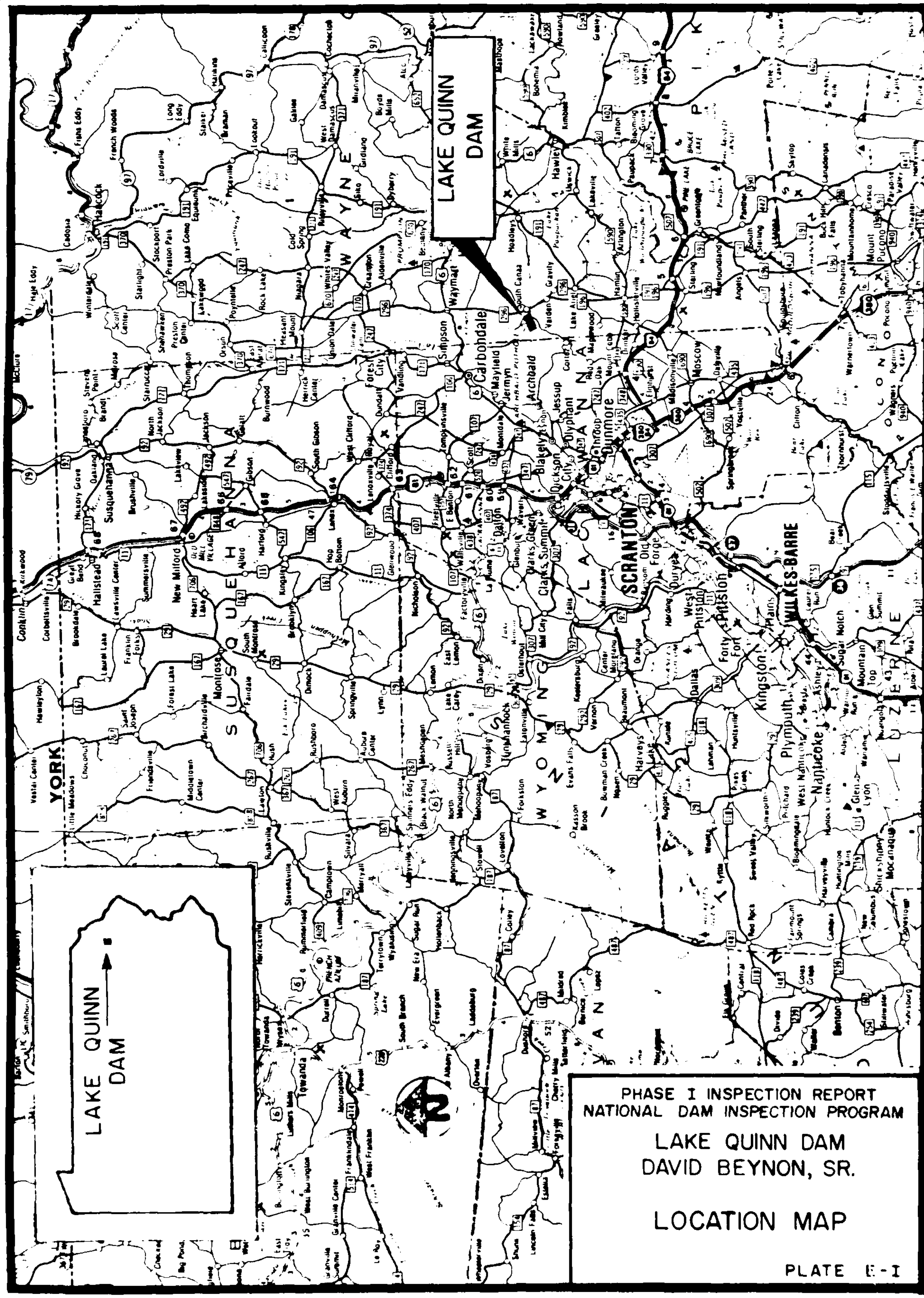
recall: PLAN 1: NON FAILURE. ALL OTHER PLANS ARE BREACH CONDITIONS

****
FLOOD HYDROGRAPH PACKAGE (HEC-1)
DAM SAFETY VERSION JULY 1978
LAST MODIFICATION 01 APR 80
****

LAKE QUINN
BREACH ANALYSIS
Page 10/10

APPENDIX E

PLATES

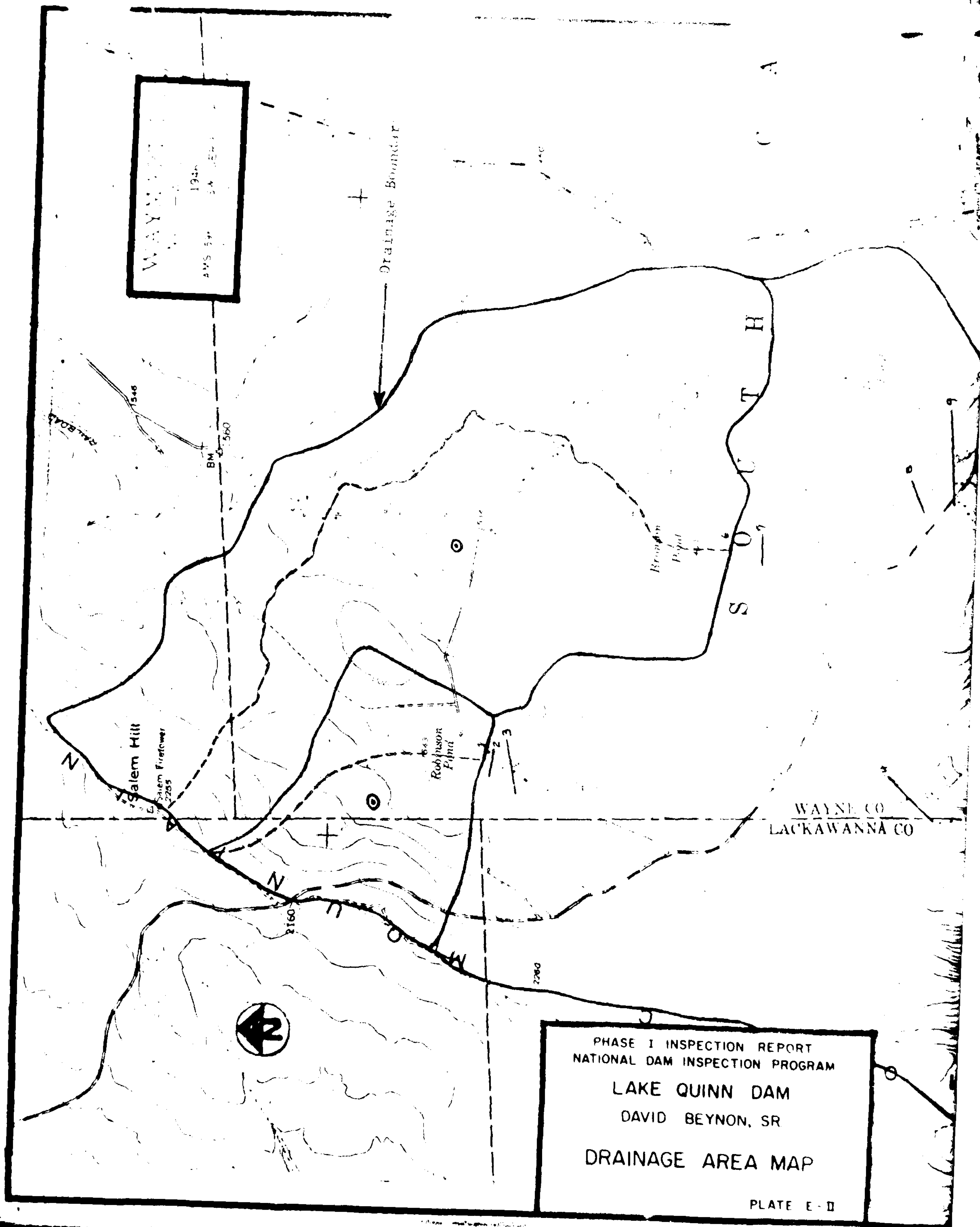


PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

LAKE QUINN DAM
DAVID BEYNON, SR.

LOCATION MAP

PLATE E-I



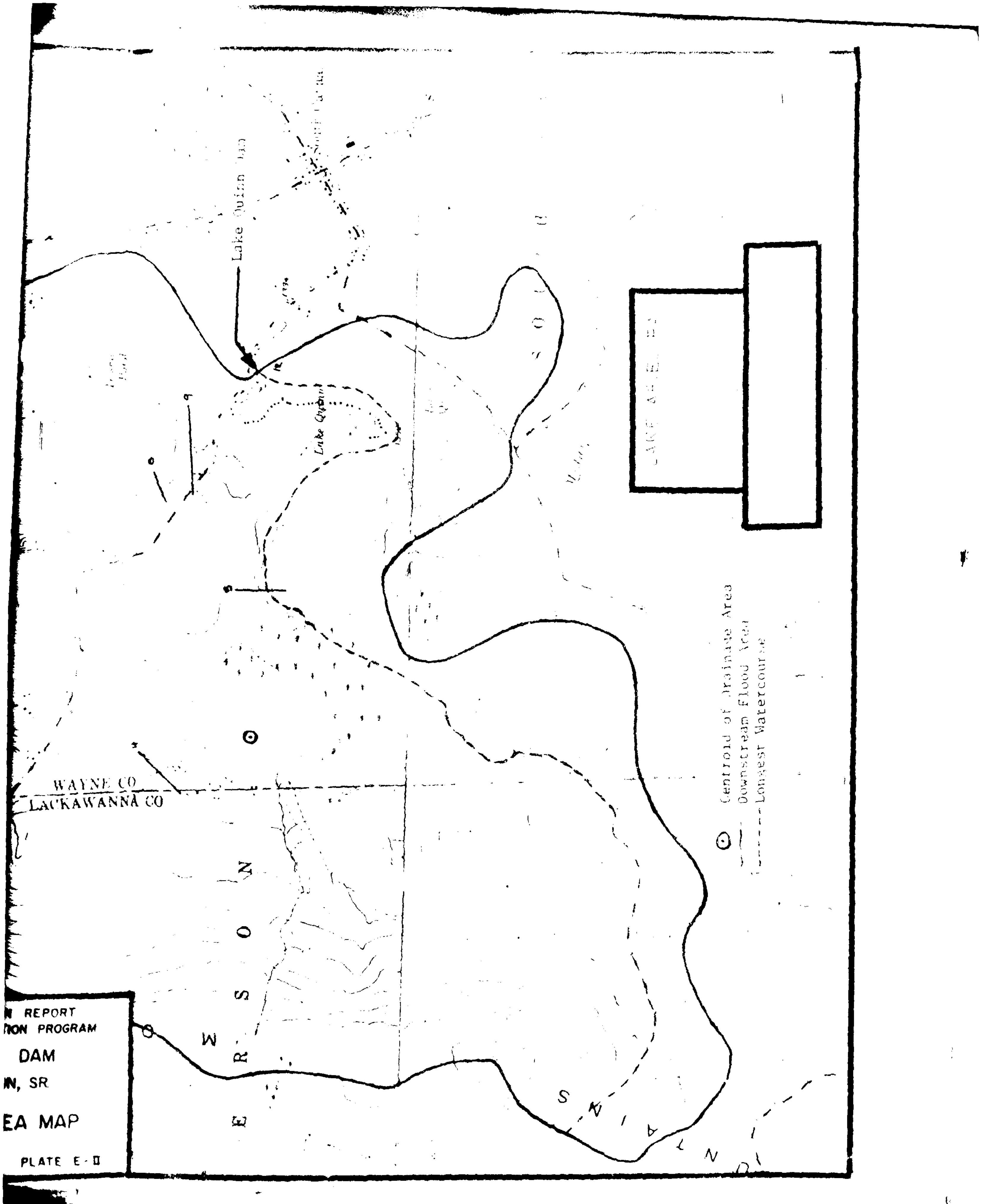
PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

LAKE QUINN DAM

DAVID BEYNON, SR

DRAINAGE AREA MAP

PLATE E-II



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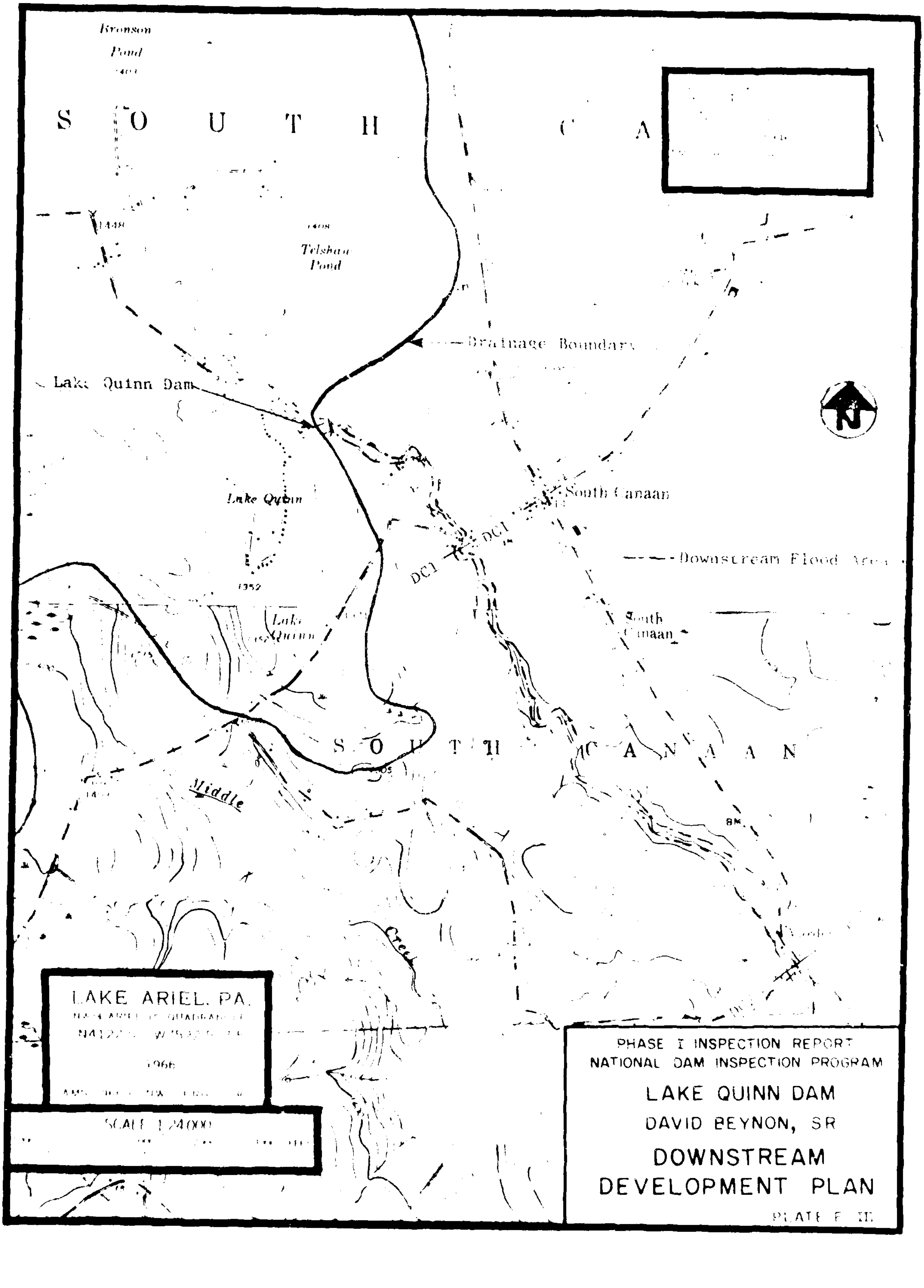
DAM

N, SR

EA MAP

PLATE E-II


Bronson Pond
SOUTH CANAAN
Telshaw Pond
Drainage Boundary
Lake Quinn Dam
Lake Quinn
South Canaan
DC1
Downstream Flood Area
South Canaan
Lake Quinn
SOUTH CANAAN
Middle Creek
LAKE ARIEL, PA.
1966
SCALE 1:24000
PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM
LAKE QUINN DAM
DAVID BEYNON, SR
DOWNSTREAM
DEVELOPMENT PLAN

AD-A099 059 CORPS OF ENGINEERS BALTIMORE MD BALTIMORE DISTRICT F/G 13/13
NATIONAL DAM INSPECTION PROGRAM. LAKE QUINN DAM (NDI ID NUMBER --ETC(U)
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APPENDIX F

GEOLOGY

LAKE QUINN DAM

GENERAL GEOLOGY

Bedrock at Lake Quinn is the Poplar Gap member of the Catskill Formation. It is medium-gray and light-olive-gray, fine- to coarse-grained sandstone and conglomerate with interbedded pale-red and grayish-red siltstone and shale. The rock is well bedded with sandstone and conglomerate thickly to very thickly bedded; shale and siltstone beds are medium to thick. The right abutment and base of the dam are of shale and sandstone of medium thickness. Joints and cleavage are well developed in thick-bedded rocks and are widely spaced; cleavage fractures are closely spaced. Fractures are open in surface exposures. Rock exposures are resistant to weathering. Fragments of sandstone and conglomerate are blocky and slabby, siltstone and shale fragments are platy, chippy and hackly.

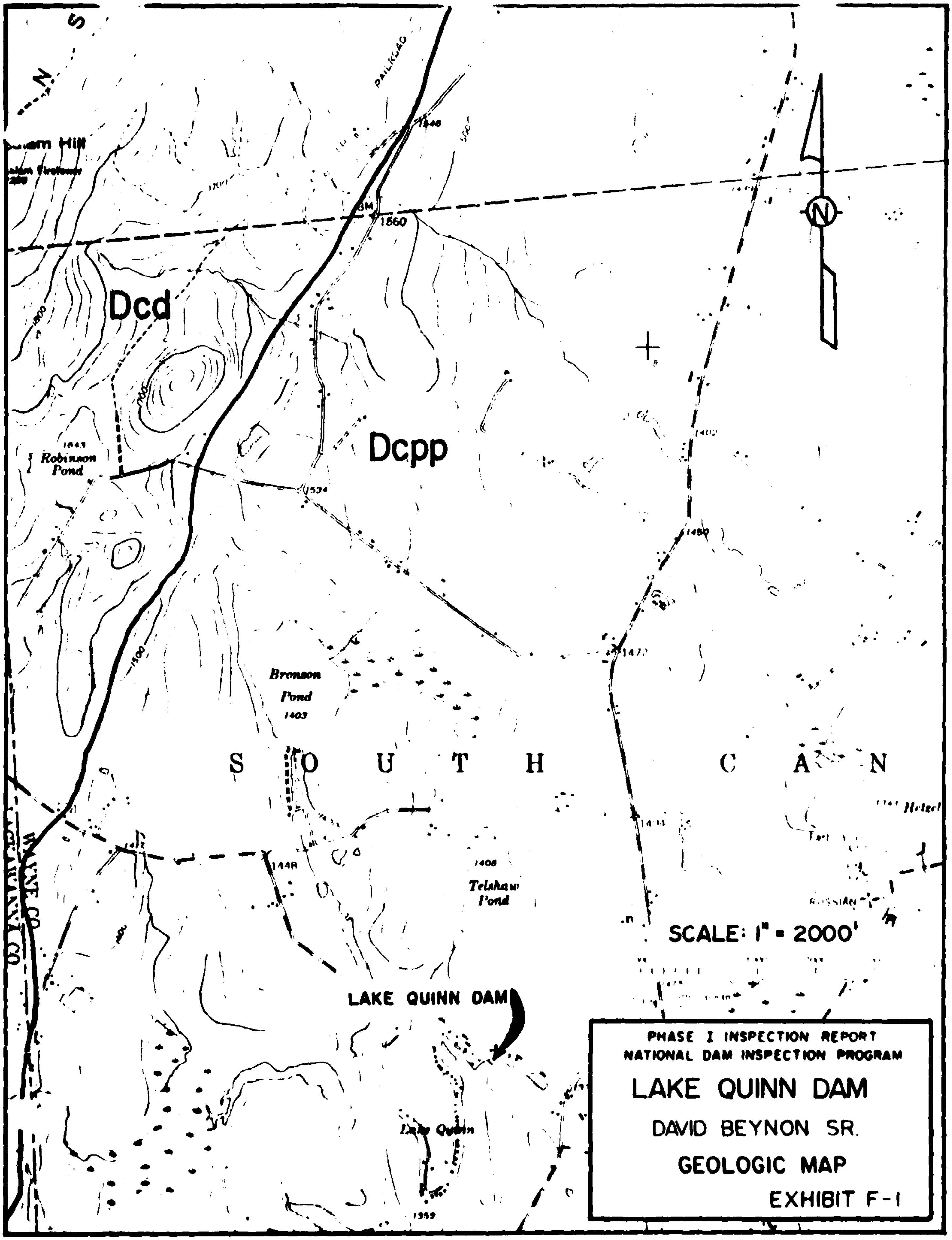
Unconsolidated material overlying the bedrock surface may be thick. Water well drill records show 48 feet of glacial till in a domestic well near Lake Quinn. The unconsolidated material is sand and gravel with minor amounts of clay.

LEGEND

(Bedrock)

Dcd CATSKILL FORMATION, DUNCANNON MEMBER - Grayish-red sandstone, siltstone, and claystone in fining - upward cycles; conglomerate occurs at the base of some cycles.

Dcpp CATSKILL FORMATION, PACKERTON MBR. THROUGH POPLAR GAP MBR - Fine to medium-grained sandstones, well-indurated to quartzitic; sandstones grade upward into grayish-red siltstone and shales.



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NATIONAL DAM INSPECTION PROGRAM

LAKE QUINN DAM

DAVID BEYNON SR.

GEOLOGIC MAP

EXHIBIT F-1