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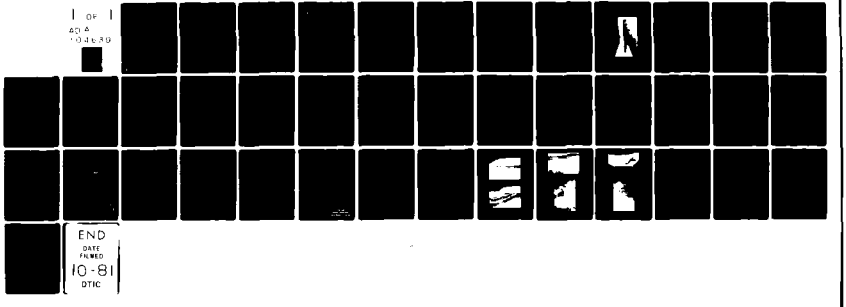

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MISSISSIPPI - KASKASKIA - ST. LOUIS BASIN

DALTON LAKE DAM
STE. GENEVIEVE COUNTY, MISSOURI
MO 31038

PHASE 1 INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM

PREPARED BY: U. S. ARMY ENGINEER DISTRICT, ST. LOUIS

FOR: STATE OF MISSOURI

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DECEMBER 1978

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1. REPORT NUMBER	2. GOVT ACCESSION NO. AD-A104639	3. RECIPIENT'S CATALOG NUMBER
4. TITLE (and Subtitle) Phase I Dam Inspection Report National Dam Safety Program Dalton Lake Dam (MO 31038) Ste. Genevieve County, Missouri	5. TYPE OF REPORT & PERIOD COVERED Final Report 6. PERFORMING ORG. REPORT NUMBER
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Dam Safety, Lake, Dam Inspection, Private Dams

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

This report was prepared under the National Program of Inspection of Non-Federal Dams. This report assesses the general condition of the dam with respect to safety, based on available data and on visual inspection, to determine if the dam poses hazards to human life or property.

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DEPARTMENT OF THE ARMY
ST. LOUIS DISTRICT, CORPS OF ENGINEERS
210 NORTH 12TH STREET
ST. LOUIS, MISSOURI 63101

REPLY REFER TO

SUBJECT: Dalton Lake Dam Phase I Inspection Report

This report presents the results of a field inspection and an evaluation of the Dalton Lake Dam.

It was prepared under the National Program of Inspection of Non-Federal Dams.

This dam has been classified as unsafe, non-emergency by the St. Louis District as a result of the application of the following criteria:

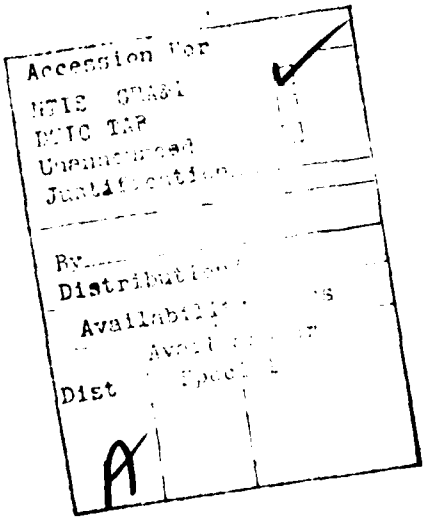
1) Spillway will not pass 50 percent of the Probable Maximum Flood.
2) Overtopping could result in dam failure.
3) Dam failure significantly increases the hazard to loss of life downstream.

SUBMITTED BY: SIGNED
Chief, Engineering Division

19 DEC 1978
Date

APPROVED BY: SIGNED
Colonel, CE, District Engineer

20 DEC 1978
Date



DALTON LAKE DAM
STE. GENEVIEVE COUNTY, MISSOURI

MISSOURI INVENTORY NO. 31038

PHASE I INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM

Dalton Lake Dam (Inventory Number MO-31038)
Mississippi-Kaskaskia-St. Louis Basin
Ste. Genevieve County, Missouri. Phase I
Inspection Report.

PREPARED BY:

HORNER & SHIFRIN, INC.
5200 OAKLAND AVENUE
ST. LOUIS, MISSOURI 63110

FOR:

U.S. ARMY ENGINEER DISTRICT, ST. LOUIS
CORPS OF ENGINEERS

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HS-7848-10

PHASE I REPORT

NATIONAL DAM SAFETY PROGRAM

Name of Dam:	Dalton Lake Dam
State Located:	Missouri
County Located:	Ste. Genevieve
Stream:	Tributary Coldwater Creek
Date of Inspection:	9 August 1978

The Dalton Lake Dam was visually inspected by engineering personnel of the office of Horner & Shifrin, Inc., Consulting Engineers, St. Louis, Missouri. The purpose of the inspection was to assess the general condition of the dam with respect to safety and, based upon this inspection and available data, determine if the dam poses a hazard to human life or property.

The following summarizes the findings of the visual inspection and the results of certain hydrologic/hydraulic investigations performed under the direction of the inspection team. The following deficiencies were noticed during the inspection and are considered to have an adverse effect on the overall safety and future operation of these dams.

1. Numerous small trees and brush exist on the upstream and downstream slopes of the dam. The tree roots may, in time, provide a pathway for lake seepage. Seepage was noticed at the left abutment near the toe of slope.

2. Considerable erosion of the subgrade at the outlet end of a 22-inch diameter pipe through the dam has occurred and a water filled pool has been created at this point. Although no flow was being discharged from the pipe, water was observed flowing from the downstream end of the pool. The possibility exists that continued erosion may back-cut the downstream slope of the dam, resulting in settlement of the slope and/or instability at the embankment. Seepage beneath the dam or along the alignment of the pipe can develop into a piping condition.

3. The surface of the excavated earth spillway was without some form of cover to protect it from erosion by lake outflow. Erosion of the spillway may affect the operation of the lake.

4. Grass is grown on the upstream slope of the dam to protect the slope from erosion by wave action. A grass covered slope is not considered adequate to protect the slope against erosion from wave action. Erosion of the bank will reduce the cross section of the dam and could result in instability and/or overtopping of the dam.

5. At the time of the inspection, it could not be determined if the 4-inch drawdown pipe, reported to pass beneath the dam, could be isolated if necessary in order to prevent loss of foundation soils, should collapse of the pipe beneath the dam occur. Voids resulting from loss of materials into the broken pipe will provide a passageway for seepage that may develop into a piping condition and subsequent failure of the dam.

The conditions described above are not considered to be serious at this time.

The crest of the dam was found to be approximately 2 feet lower near the left abutment than in the area adjacent to the spillway. (The low point of the dam is approximately 2 feet higher than the spillway crest.) As a result, the capacity of the spillway to discharge lake outflow without overtopping the dam is reduced.

Based on the criteria set forth in the recommended guidelines (see text) the minimum spillway design flood for this dam, which is classified as small in size and of high hazard potential, is considered to be one-half Probable Maximum Flood (1/2 PMF). Considering the relatively small volume of water impounded, the fact that only one house close to the dam may be seriously endangered, and that the area where more houses and inhabitants would be affected is located near the end of the designated possible flood zone, it is

our opinion that the spillway design should be limited to 1/2 PMF. Inspection of the downstream flood zone revealed that the house located near the dam is at an elevation that inhabitants must be concerned during any heavy rainfall and would be aware of the possibility of a dam failure and therefore would most likely be on guard for such an event. PMF is the flood that may be expected from the most severe combination of critical meteorologic and hydrologic conditions that are reasonably possible in the region. Results of a hydrologic/hydraulic analysis indicate that the existing spillway is inadequate to pass the lake outflow resulting from a storm of 1/2 PMF magnitude or the outflow from the 1 percent chance (100-year frequency) flood. The existing spillway is capable of passing lake outflow corresponding to about 7 percent of the PMF. The length of the downstream damage zone, should failure of the dam occur, is estimated to be five miles. There are two to three houses, a large swimming and camping area, and one semi-improved road within the possible damage zone.

A review of available data did not disclose that seepage and stability analyses of the dam were performed. This is considered a deficiency and should be rectified.

It is recommended that the Owner take the necessary action in the near future to correct or control the deficiencies and safety defects reported herein.

Albert B. Becker, Jr.
P.E. Missouri E-9168

OVERVIEW OF LAKE AND DAM

PHASE I INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM
DALTON LAKE DAM - ID NO. 31038

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APPENDIX

PHASE I INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM

DALTON LAKE DAM - ID NO. 31038

SECTION 1 - PROJECT INFORMATION

1.1 GENERAL

a. Authority. National Dam Inspection Act, Public Law 92-367, dated 8 August 1972.

b. Purpose of Inspection. The purpose of this visual inspection was to make an assessment of the general condition of the dam with respect to safety and, based upon available data and this inspection, determine if the dam poses a hazard to human life or property.

c. Evaluation Criteria. This evaluation was performed in accordance with the "Phase I" investigation procedures as prescribed in "Recommended Guidelines for Safety Inspection of Dams," Appendix D to "Report of the Chief of Engineers on the National Program of Dams," dated May 1975.

1.2 DESCRIPTION OF PROJECT

a. Description of Dam and Appurtenences. The Dalton Lake Dam is an earthfill type embankment rising approximately 33 feet above the original stream bed. The dam has a crest width of 14 feet with embankment slopes of 1v on 3h upstream and 1v on 2.5h downstream. Normal lake level is governed by the upstream invert elevation of a 22-inch diameter steel pipe trickle tube located near the center of the dam. The trickle tube is provided to protect vegetation in the spillway against saturation from spring flow or low flow conditions which may exist for several days after a storm. The outlet end of the trickle tube is an open ended pipe that discharges flow into a pool created by erosion of the ground at this point. An excavated earth spillway,

consisting of a 20 foot wide U-shaped section, is located adjacent to the right (looking downstream) abutment. The spillway lacks some form of ground cover to protect is from erosion by lake outflow. The control elevation of the crest of the spillway is approximately 2.5 feet higher than the overflow elevation of the trickle tube. The spillway outlet channel joins the original stream approximately 150 feet below the dam.

At normal pool, the lake surface occupies approximately 11 acres. The Owner indicated that a 4-inch diameter pipe is used for dewatering the lake, however this pipe could not be located during the inspection.

b. Location. The dam and lake are located on an unnamed tributary of Coldwater creek, approximately 3 miles northeast of Womack, Missouri, in Ste. Genevieve County, as shown on the Regional Vicinity Map, Plate 1. The dam is located in Section 33, Township 35 North, Range 8 East, approximately 2 miles northeast of the intersection of State Route T and Coldwater Creek Road.

c. Size Classification. The size classification, based on the height of the dam and storage capacity, is categorized as small. (Per Table 1, Recommended Guidelines for Safety Inspection of Dams.)

d. Hazard Classification. The Dalton Lake Dam, according to the St. Louis District, Corps of Engineers, has a high hazard potential. This means that if the dam fails there may be loss of life, extensive agricultural damage or damage to homes, industrial or commercial facilities, important public utilities, main highways, or railroads. The estimated flood damage zone, should failure of the dam occur, extends five miles downstream of the dam, as determined by the St. Louis District. There are two to three houses, a large swimming and camping area, and one semi-improved road within the possible damage zone.

e. Ownership. The property occupied by the lake and dam is owned by Baumeyer Enterprises, Inc., 81 Market Street, Ste. Genevieve, Missouri, 63620, of which Mr. Vern Bauman is president.

f. Purpose of Dam. The dam impounds water for the purpose of recreation.

g. Design and Construction History. The dam was constructed in 1974 by the Bauman Contracting Co., a grading contractor. The present address of the Bauman Contracting Co. is also 81 Market Street, Ste. Genevieve, Missouri, 63670.

h. Normal Operational Procedure. The lake level is unregulated.

1.3 PERTINENT DATA

a. Drainage Areas. The area tributary to the lake is virtually undeveloped and in a natural state covered with timber. The watershed above the dam amounts to approximately 530 acres. The watershed area is outlined on Plate 1.

b. Discharge at Damsite.

(1) Estimated known maximum flood at damsite ... 200 cfs[1]

(2) Trickle tube capacity ... 30 cfs

(3) Trickle tube and earth spillway capacity ... 200 cfs

c. Elevation (ft. above MSL). All elevations are based on the estimated elevation (772) of the original stream channel at the dam as determined from the 1959 Womack, Missouri, Quadrangle Map, 7.5 minute series. The invert of the inlet end of the 22-inch diameter steel pipe trickle tube was used as a benchmark with an elevation of 800.5.

(1) Top of dam ... 804.9 (min.)

(2) Normal pool (trickle tube overflow) ... 800.5

(3) Spillway control section ... 803.0

(4) Streambed at centerline of dam ... 772±

(5) Maximum tailwater ... Unknown

(1) Discharge value over spillway computed for water surface at elevation 805.0 based upon high lake level indicated by the Owner.

d. Reservoir.

(1) Length at normal pool (elevation 800.5) ... 1,600 ft.

(2) Length at maximum pool (elevation 804.9) ... 1,900 ft.

e. Storage.

(1) Normal pool ... 115 ac. ft.

(2) Top of dam (incremental) ... 50 ac. ft.

f. Reservoir Surface.

(1) Top of dam ... 14 acres

(2) Normal pool ... 11 acres

g. Dam.

(1) Type ... Earthfill, clay core (per Owner)

(2) Length ... 560 ft.

(3) Height ... 33 ft.

(4) Top width ... 14 ft.

(5) Side slopes

a. Upstream ... 1v on 3h

b. Downstream ... 1v on 2.5h

(6) Cutoff ... Core trench (per Owner)

(7) Slope protection

a. Upstream ... Grass

b. Downstream ... Grass

h. Spillway.

(1) Type ... Trickle tube, 22-inch diameter steel pipe

(2) Type ... Excavated earth, "U" section, 20 foot bottom width

i. Outlet for Lake Drawdown. Owner indicated 4-inch diameter pipe, unable to locate during inspection.

SECTION 2 - ENGINEERING DATA

2.1 DESIGN

No engineering data relating to the design of the dam are known to exist.

2.2 CONSTRUCTION

No formal records were kept during construction of the dam. Mr. Vern Bauman, builder of the dam and owner of the property, reported a trench was excavated approximately 12 feet wide to bedrock along the alignment of the dam. The trench was backfilled with clay and the embankment constructed. The backfill was compacted with the earth moving equipment used to haul the fill. Material used to backfill the trench and to construct the earthfill dam was obtained from the area to be occupied by the lake.

The Owner also reported that, shortly after the dam was constructed, ice pressure at the inlet end of the trickle tube heaved the pipe, creating an opening through the dam under the pipe. Subsequently, the pipe and a portion of the dam about the pipe were washed out causing the level of the lake to drop approximatley 9 feet below normal pool elevation. Mr. Chester Fancher with the Soil Conservation Service (SCS) in Ste. Genevieve was requested to make recommendations concerning the repair of the dam and tube. Mr. Fancher recommended that a minimum of two anti-seep collars be installed on the tube. The Owner reported that the pipe was reinstalled and three collars were constructed about the pipe. The dam was also repaired and the lake allowed to refill.

2.3 OPERATION

The lake level is governed by a 22-inch diameter steel pipe trickle tube which would discharge flow resulting from low runoff. Higher flows would be

discharged through both the trickle tube and earth spillway. It was reported by the Owner that the earth spillway had water flowing approximately 2 feet deep in the spring of 1977. According to the Owner, the spillway channel sustained some erosion damage as a result of this flow. The eroded areas have been recently repaired with earth fill.

2.4 EVALUATION

a. Availability. Engineering data for assessing the design of the earthfill dam and spillway were unavailable.

b. Adequacy. No data available. Seepage and stability analyses comparable to the requirements of the "Recommended Guidelines for Safety Inspection of Dams" were not available, which is considered a deficiency. These seepage and stability analyses should be performed for appropriate loading conditions and made a matter of record.

SECTION 3 - VISUAL INSPECTION

3.1 FINDINGS

a. General. A visual inspection of the dam and spillway was made by Horner & Shifrin engineering personnel on 9 August 1978. Also inspected at this time were the area downstream of the dam, various downstream road crossings, and homes between the dam and Saline Creek. Photographs of the dam and spillways taken at the time of the inspection are included on Pages A-1 through A-3 of the Appendix.

b. Dam. The visible portions of the upstream and downstream slopes (see Photos 1 and 2) of the dam appeared to be in satisfactory condition with the exception of some minor erosion of the downstream slope of the dam. Numerous small trees and brush exist on the upstream and downstream slopes. The elevation of the top of the dam was determined by survey to vary approximately 2 feet between the highest point near the center of the dam and the lowest point near the left abutment. The spillway, located at the right embankment, was determined by survey to be approximately 2 feet lower than the low point of the dam.

c. Trickle Tube Spillway. A 22-inch diameter steel pipe trickle tube, located near the center of the dam, is protected from clogging by a steel rod type (see Photo 3) trash rack. The upstream overflow elevation of the trickle tube is approximately 2.5 feet lower than the control section of the spillway. A large hole (see Photo 4), approximately 7.5 feet deep, has been eroded in the subgrade at the outlet end of the trickle tube. Erosion of this area has partially back-cut the downstream slope in the vicinity of the pipe. At the time of the inspection, the lake level was approximately 1.5 feet below normal pool.

Flow, estimated to be approximately 1-2 gpm, was noticed discharging from the pool at the end of the trickle tube. The pool contained water to a depth

of approximately 4.5 feet. Some seepage, estimated to be approximately 0.5 gpm, was also noticed flowing from the embankment near the toe of slope at the left abutment. It could not be determined if the flow at the downstream end of the trickle tube was due to seepage beneath the dam or to seepage through the embankment along the line of the tube.

d. Earth Spillway. The spillway section is an excavated earth section that contains a considerable quantity of gravel which appears to exist naturally in the soil. The entire spillway channel is unprotected (see Photo 5) and some erosion of the bottom was noticed. A profile of the spillway channel through the control section is shown on Plate 2.

e. Downstream Channel. The downstream channel is unimproved and not easily discernible (see Photo 6). A heavy growth of weeds and trees was evident in the channel in the vicinity of the dam.

3.2 EVALUATION

The deficiencies observed during the inspection, with the exception of the erosion of the subgrade at the trickle tube outlet, the lack of cover to protect the earth spillway, and the low areas in the dam are not considered of major consequence to warrant immediate remedial action. The brush and trees should be removed, taking care to preserve the existing turf cover.

SECTION 4 - OPERATIONAL PROCEDURES

4.1 PROCEDURES

The trickle tube and earth spillway are uncontrolled. The water surface level is governed by rainfall runoff, evaporation, seepage, and the capacities of the uncontrolled outlets.

4.2 MAINTENANCE OF DAM AND SPILLWAY

Based on the vegetation and small trees on the slopes of the dam, it is apparent that these areas receive little attention. According to the Owner, the grass on the dam crest and slopes is mowed approximately once per year. There is no established maintenance program for either the dam or spillway.

4.3 MAINTENANCE OF OUTLET OPERATING FACILITIES

No outlet operating facilities exist at this dam.

4.4 DESCRIPTION OF ANY WARNING SYSTEMS IN EFFECT

The inspection did not reveal the existence of a dam warning system.

4.5 EVALUATION

Lack of proper maintenance is considered detrimental to the safety of the dam. It is recommended that maintenance of the dam and spillway be undertaken on a regular basis.

SECTION 5 - HYDRAULIC/HYDROLOGIC

5.1 EVALUATION OF FEATURES

a. Design Data. Design data were not available.

b. Experience Data. The drainage area and lake surface area were measured using the USGS Womack, Missouri, Quadrangle Map. The proportions and dimensions of the spillway and dam were determined from surveys made during the inspection.

c. Visual Observations.

(1) A 22-inch diameter steel pipe trickle tube is located at approximately the center of the dam.

(2) The crest of the excavated auxiliary spillway section is in good condition; however, erosion protection is non-existent.

(3) The Owner reported that a 4-inch diameter pipe was installed to dewater the lake; however, neither the pipe nor the control valve could be located at the time of the inspection.

(4) The spillway and outlet channel are located at the right abutment. Spillway releases, within the limited capacity of the spillway section, will not endanger the integrity of the dam.

(5) The top of the dam is approximately 2 feet lower near the left abutment than the top of the dam at the spillway.

d. Overtopping Potential. The spillway section is too small to pass the probable maximum flood, the 1/2 probable maximum flood, or the 1 percent chance (100-year frequency) flood without overtopping the dam. The results of a dam overtopping analysis are as follows:

Ratio of PMF	Q - Peak Outflow (cfs)	Max. Lake Water Surface Elevation	Maximum Depth of Flow Over Dam (Elev. 804.9)	Duration of Overtopping of Dam (Hours)
0.07	200	804.9	0.0	0.0
0.5	3,800	807.4	2.5	8.7
1.0	7,730	808.4	3.5	12.8
100-Year Flood	2,120	806.8	1.9	2.7

The flow safely passing the spillways just prior to overtopping amounts to about 200 cfs, which is equivalent to about 7 percent of the probable maximum flood and considerably less than the 1 percent chance (100-year frequency) flood.

Procedures and data for determining the probable maximum flood, the 100-year frequency flood, and the discharge rating curve for flow over the spillway and the dam crest are presented on Pages B-1 and B-2 of the Appendix. A listing of the HEC-1 (Dam Safety Version) input data is shown on Page B-3 and a copy of the computer output "Summary of Dam Safety Analysis" is presented on Page B-4 of the Appendix.

SECTION 6 - STRUCTURAL STABILITY

6.1 EVALUATION OF STRUCTURAL STABILITY

a. Visual Observations. Visual observations which adversely affect the structural stability of the dam are discussed in Section 3, paragraph 3.1b.

b. Design and Construction Data. No design or construction data relating to the structural stability of the dam are known to exist.

c. Operating Records. No appurtenant structures or facilities requiring operation exist at this dam. According to the Owner, no records have been kept of lake level, spillway discharge, dam settlement, or seepage.

d. Post Construction Changes. According to the Owner, three anti-seep collars were installed about the 22-inch diameter steel pipe trickle tube after the tube washed out. The dam was repaired and the lake refilled.

e. Seismic Stability. Since the dam is located within a Zone II seismic probability area, an earthquake of the magnitude predicted is not expected to produce a hazardous condition to the dam, provided that static stability conditions are satisfactory and conventional safety margins exist.

SECTION 7 - ASSESSMENT/REMEDIAL MEASURES

7.1 DAM ASSESSMENT

a. Safety. A hydraulic analysis indicated the trickle tube and excavated earth spillway to be capable of passing lake outflow of about 200 cfs without the level of the lake exceeding the low point in the top of the dam. A hydrologic analysis of the runoff from the lake watershed area, as discussed in Section 5, paragraph 5.1d, indicated that for a storm runoff of one-half probable maximum flood magnitude, the lake outflow would be on the order of 3,800 cfs, and that for the 1 percent chance (100-year freqeuncy) flood, the lake outflow would be about 2,120 cfs.

The large hole which has been eroded in the subgrade at the outlet end of the trickle tube is considered to have an adverse effect on the safety of the dam. Continued erosion at the outlet end of the trickle tube could cause settlement of the downstream slope and/or instability of the dam.

No stability and seepage analyses of the dam are known to exist.

b. Adequacy of Information. Due to the lack of engineering and construction data, the assessments reported herein were based on external conditions as determined during the visual inspection. Those recommendations with regard to the hydrology of the lake and the capacity of the spillway were based on a hydrologic/hydraulic study as indicated in Section 5. Seepage and stability analyses comparable to the requirements of the "Recommended Guidelines for Safety Inspection of Dams" were not available, which is considered a deficiency.

c. Urgency. The safety defects noted in paragraph 7.1a regarding the limited capacity of the spillway section should be investigated without delay since failure of the dam may result from overtopping. The quantity of seepage

flow observed in the downstream channel near the dam toe of slope is not considered to be significant. However, it is recommended that this flow be monitored in the future in order to determine if the flow is increasing with time and if soil is being transported with the seepage. The remaining items concerning the safety of the dam and the remedial measures recommended in paragraph 7.2 should be accomplished in the near future.

d. Necessity for Phase II. Based on the results of the Phase I inspection, a Phase II investigation is not recommended.

e. Seismic Stability. Since the dam is located within a Zone II seismic probability area, an earthquake of the magnitude predicted is not expected to produce a hazardous condition to the dam, provided that static stability conditions are satisfactory and conventional safety margins exist.

7.2 *REMEDIAL MEASURES*

a. Recommendations. The following actions are recommended:

(1) Based upon criteria set forth in the recommended guidelines, alterations to the design of the dam should be made in order to pass lake outflow resulting from a storm of one-half probable maximum flood magnitude.

(2) It is recommended that the low area on the top of dam located near the left abutment be raised such that it will not limit the spillway capacity. Since it is possible that the low area is a result of settlement due to consolidation of the embankment and foundations soils, and since it is not known if all or nearly all of the settlement that is probable has taken place (the dam is about 4 years old), it is recommended that future settlement of the dam be monitored in order to determine overtopping potential and conditions affecting the operation of the spillway.

(3) The eroded area at the outlet end of the trickle tube should be restored. Improvements to the subgrade should be made at the trickle tube outlet to prevent erosion of this area in the future and possible back-cutting of the embankment.

(4) Obtain the necessary soil data and perform stability and seepage analyses in order to determine the structural stability of the dam for all operational conditions. Seepage and stability analyses should be performed by a professional engineer experienced in the design and construction of dams.

b. Operations & Maintenance (O & M) Procedures. The following O & M procedures are recommended:

(1) Remove the trees and brush from the upstream and downstream slopes of the dam. Tree roots can provide a passageway for seepage that may lead to a piping condition and potential failure. The ground surface and existing turf cover should be restored if destroyed or missing. Maintain the turf cover on the slope at a height that will not hinder inspection of the slope.

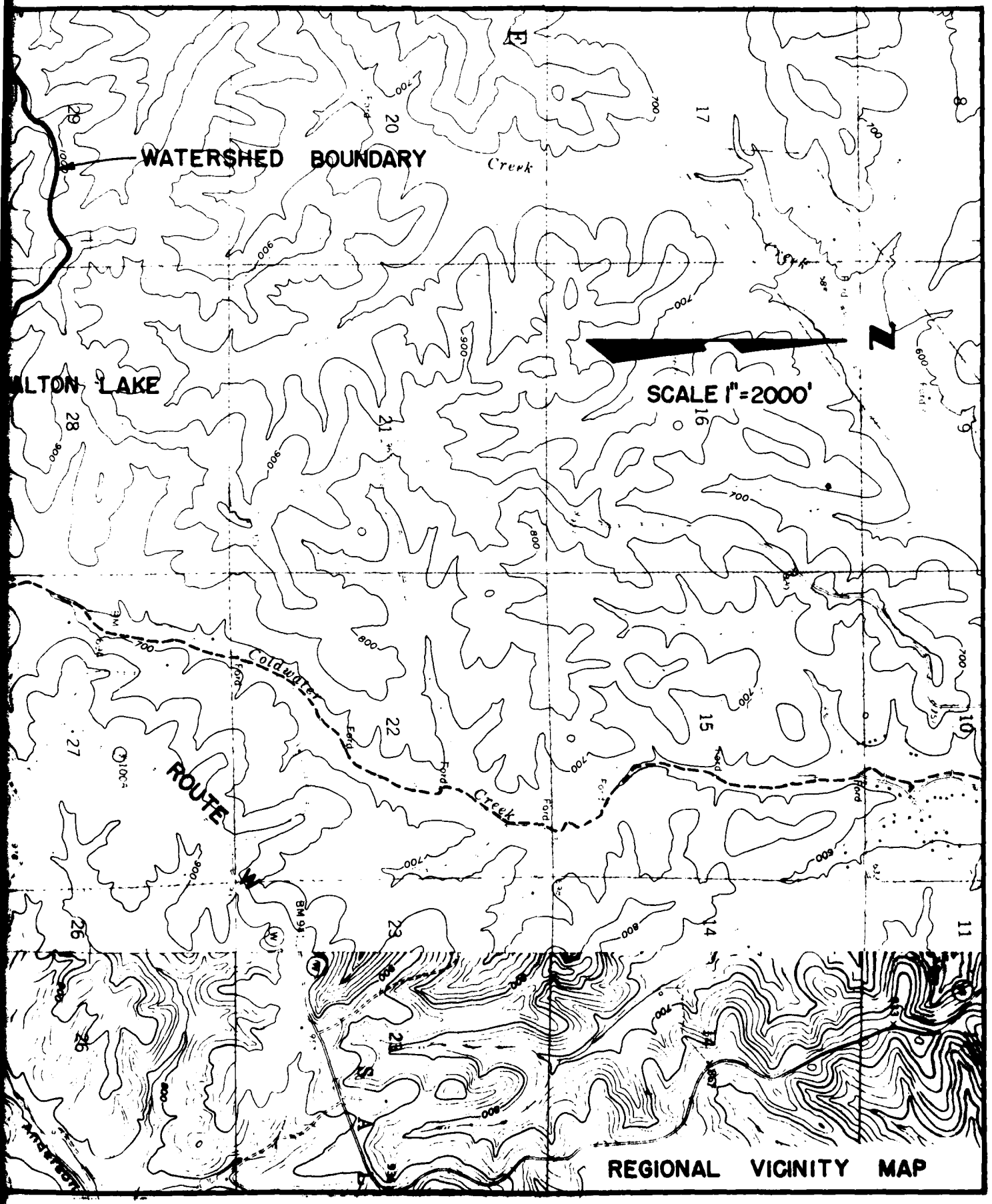
(2) Provide some form of protection for the spillway outlet channel and spillway crest to prevent the types of erosion which presently occur.

(3) Provide some form of slope protection for the upstream face of the dam in order to prevent erosion by wave action.

(4) The control valve and outlet end of the 4-inch diameter drawdown pipe should be located and permanently marked. The valve should be tested for proper operation. Inspection of the condition of the pipe and valve should be made when they are located.

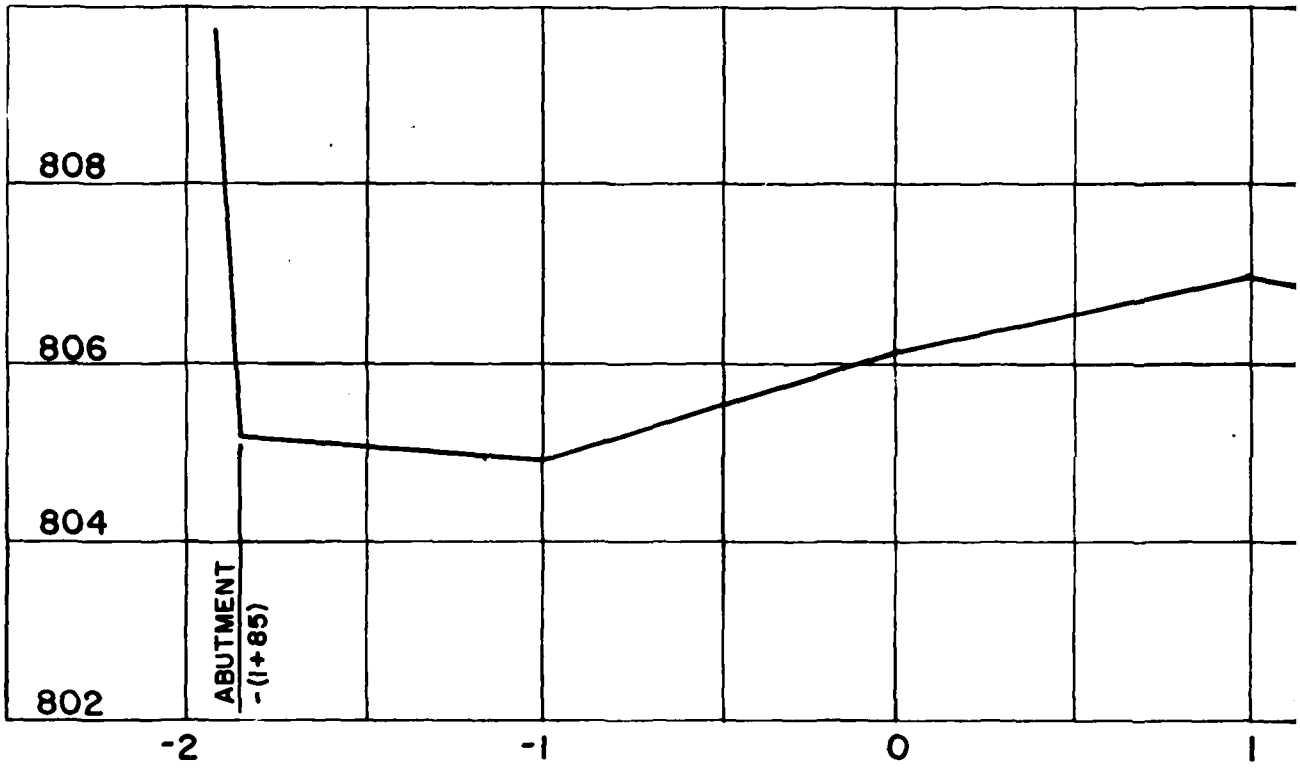
(5) A detailed inspection of the dam should be instituted on a regular basis by an engineer experienced in the design and construction of dams. It is also recommended, for future reference, that records be kept of all inspections made and remedial measures taken.

ROUTE
STATE
DAM
DALTON LA
STE GENEVIEVE CO
ST FRANCOIS CO
STATE
Whitewater
Anderson
Hollow
Whitewater Lookout Tower
19 MI TO PERRYVILLE
BM
STE.
GENEVIEVE
COUNTY
LOCATION MAP

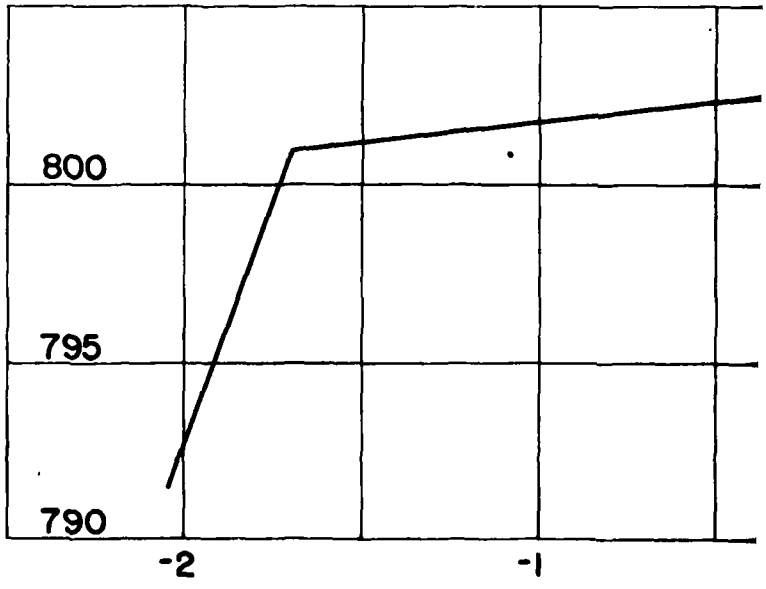

WATERSHED BOUNDARY
SCALE 1"=2000'
N
ROUTE
Coldwater Creek
Ford Creek
REGIONAL VICINITY MAP

12

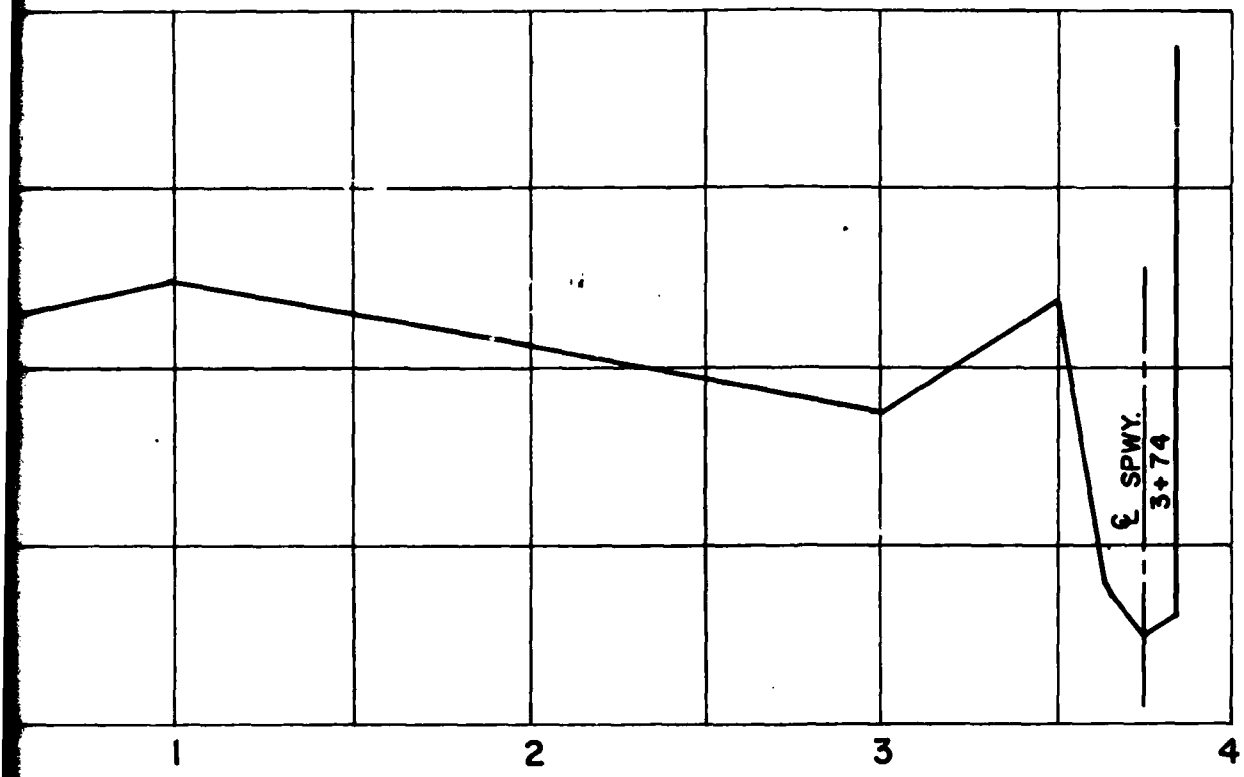
PLATE 1



PROFILE DAM CR
SCALES: 1"=2'V., 1"=

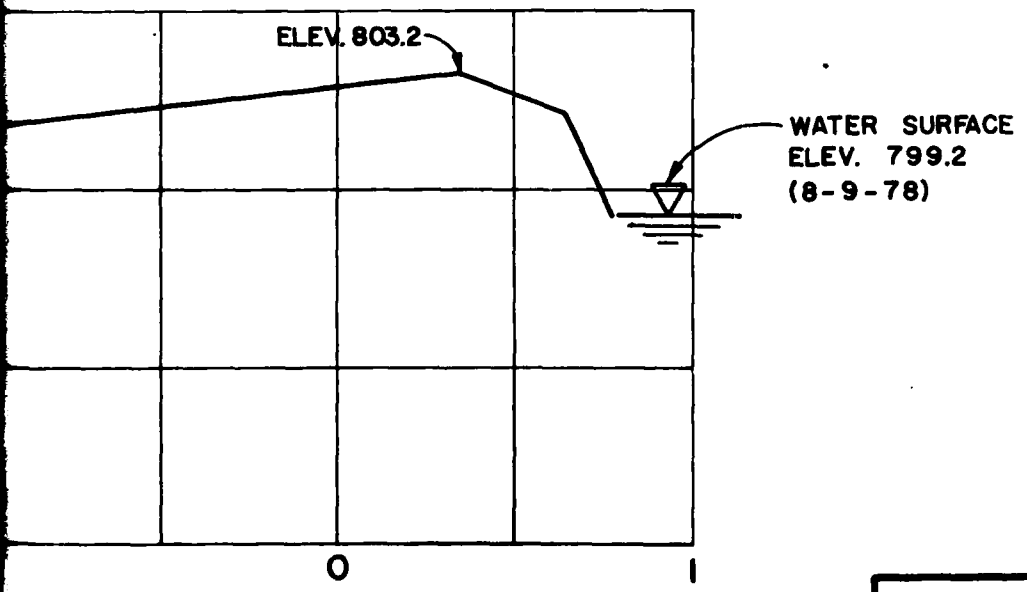


PROFILE SPILLWAY
SCALES: 1"=5'V., 1"=50'H.



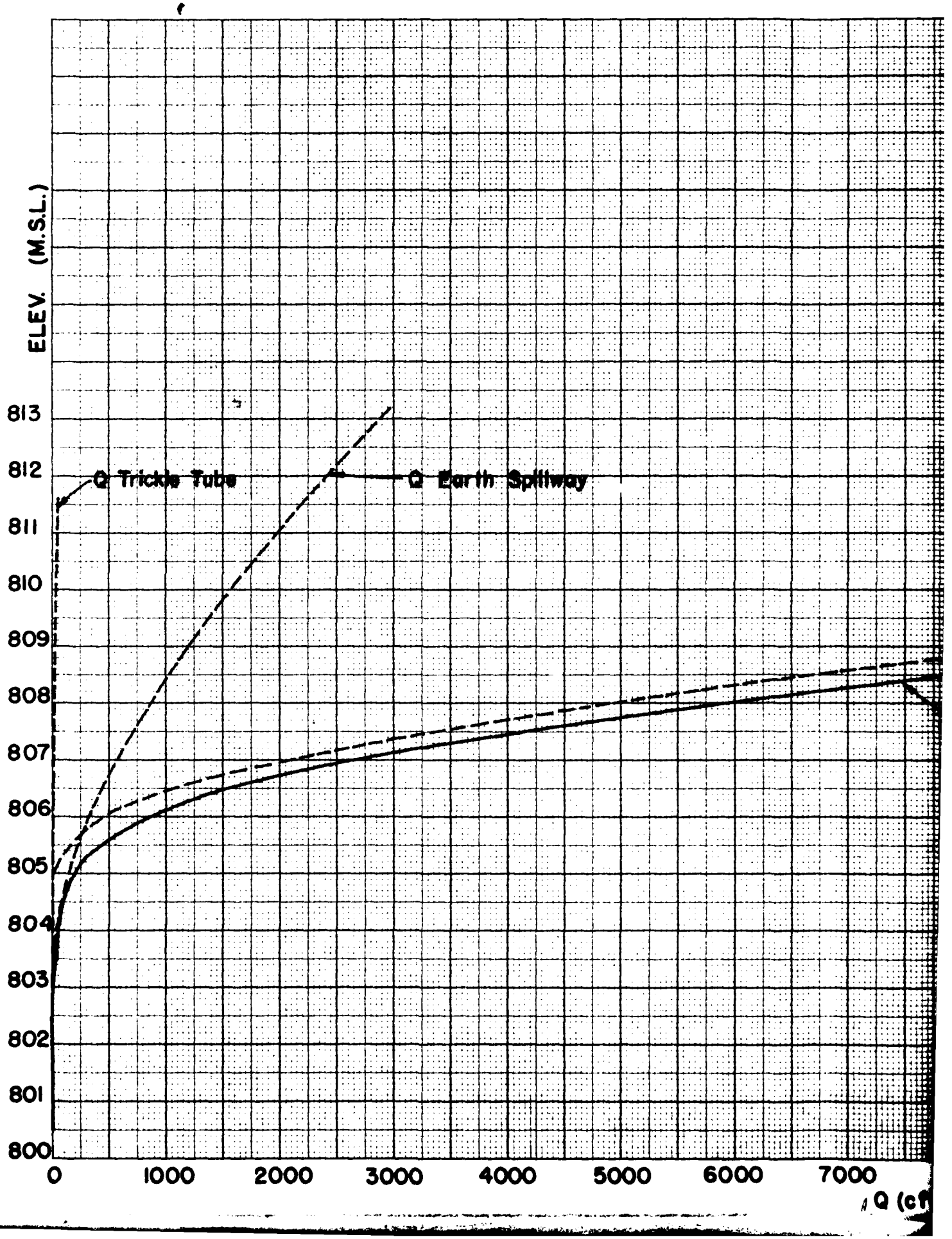
LE DAM CREST
ES: 1"=2'V., 1"=50'H.

NOTE: STA. 0+00 OPPOSITE TRICKLE TUBE INLET.

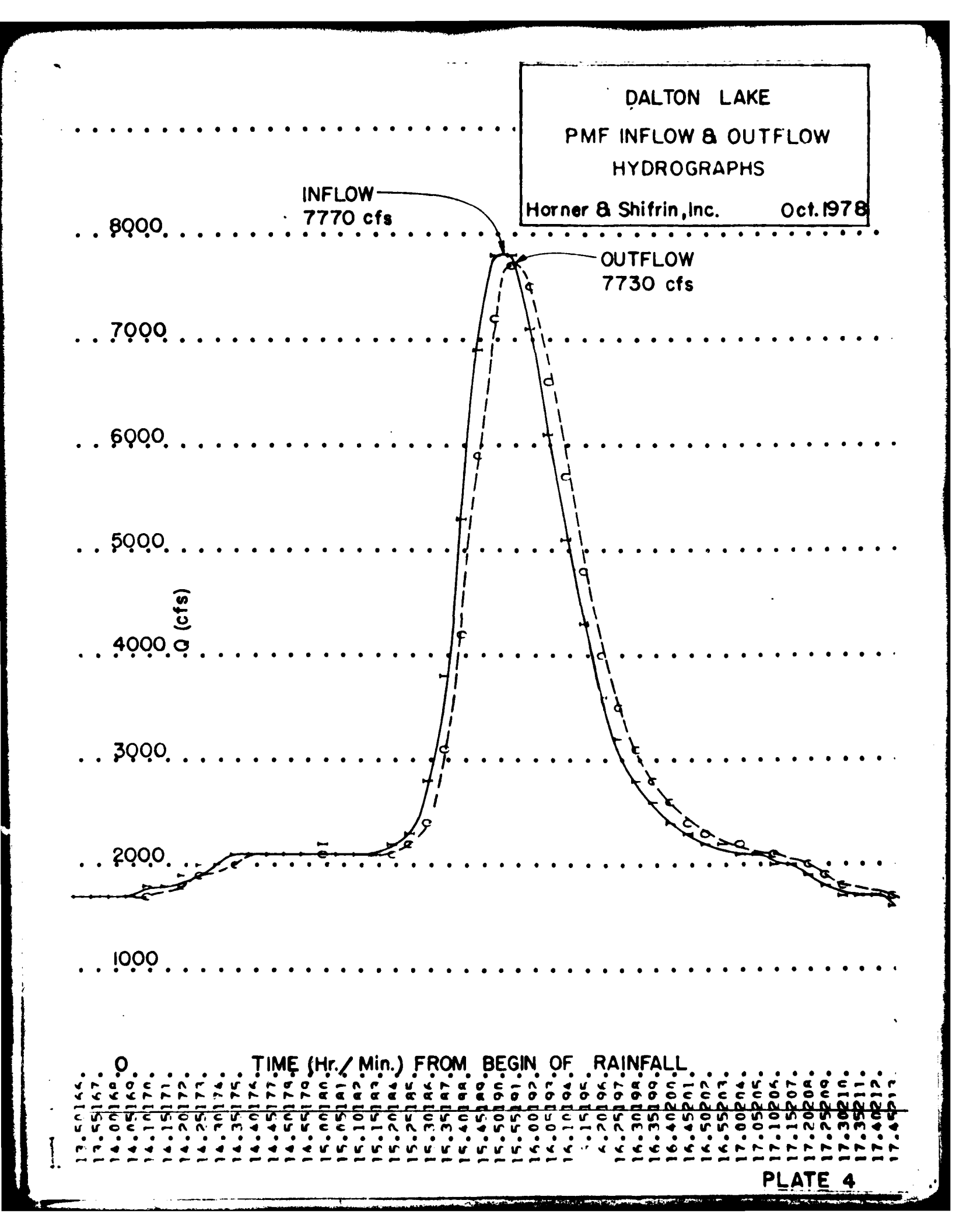


SPILLWAY ℄
=5'V., 1"=50'H.

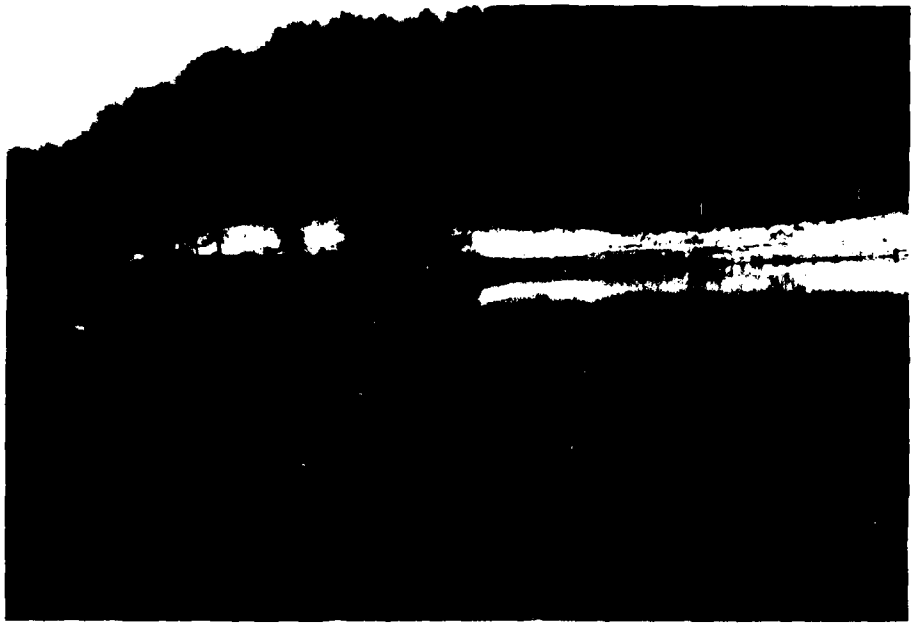
DALTON LAKE
DAM & SPILLWAY PROFILES
Horner & Shifrin, Inc. Oct. 1978


ELEV. (M.S.L.)
813
812
811
810
809
808
807
806
805
804
803
802
801
800
Q Trickle Tube
Q Earth Spillway
0
1000
2000
3000
4000
5000
6000
7000
Q (cf

Q Earth Spillway + Q Dam


DALTON LAKE
PMF INFLOW & OUTFLOW
HYDROGRAPHS
Horner & Shifrin, Inc. Oct. 1978
INFLOW
7770 cfs
OUTFLOW
7730 cfs
8000
7000
6000
5000
4000
3000
2000
1000
Q (cfs)
0
TIME (Hr./Min.) FROM BEGIN OF RAINFALL
PLATE 4

APPENDIX



NO. 1: UPSTREAM SLOPE

NO. 2: DOWNSTREAM SLOPE

NO. 3: TRICKLE TUBE INLET

NO. 4: TRICKLE TUBE OUTLET

NO. 5: SPILLWAY CHANNEL

NO. 6: DOWNSTREAM CHANNEL

HYDROLOGIC COMPUTATIONS

1. The HEC-1 Dam Safety Version (July 1978) program was used to develop inflow and outflow hydrographs and dam overtopping analyses, with hydrologic inputs as follows:

a. Probable maximum precipitation (200 sq. mile, 24-hour value equals 26.6 inches) from Hydrometeorological Report No. 33. One hundred year frequency (point source precipitation, 24-hour value equals 7.23 inches) from U.S. Weather Bureau Technical Paper No. 40.

b. Drainage area = 0.83 square miles
= 530 acres

c. SCS parameters
Lag time = 0.33 hours
Soil type CN = 91

2. Discharges through the 21-inch I.D. steel pipe trickle tube were computed as:

$Q = cA(2gh)^{0.5}$ where c = 0.75, A = pipe area, and h is the head on the pipe.

3. The spillway section consists of a broad-crested, approximately rectangular shaped earth section for which conventional weir formulas do not apply.

Spillway release rates were determined as follows:

(1) Spillway crest section properties (area, a, and top width, t) were computed for various depths, d.

(2) It was assumed that flow leaving the spillway crest would occur at critical depth. Flow at critical depth (Q_c) was computed as $Q_c = (\frac{a^3}{t} g)^{0.5}$ for the various depth, d.

Corresponding velocities (v_c) and velocity heads (H_{vc}) were determined using conventional formulas.

(3) Static lake levels corresponding to the various Q_c values passing over the spillway were computed as critical depths plus critical velocity head ($d_c + H_{vc}$), and the relationship between lake level and spillway discharge was thus obtained. The procedure neglects the minor insignificant friction losses across the length of the spillway.

4. The profile of the dam crest is irregular and flow over the dam crest cannot be determined by conventional weir formulas. Flow quantities overtopping the dam crest were computed as described in the preceding paragraph and corresponding flow over the dam, spillway, and through the trickle tube for given elevations were added to obtain the combined outflow rating curve for the dam, spillway, and trickle tube. This rating curve is shown on Plate 3. The inflow and outflow hydrographs for the PMF are shown on Plate 4.

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**********
FLOOD HYDROGRAPH PACKAGE (HEC-1)
DAM SAFETY VERSION      JULY 1978
  LAST MODIFICATION  3 AUG 78
**********
    1                 A1       ANALYSIS OF DAM OVERTOPPING USING RATIOS OF PMF
    2                 A2       HYDROLOGIC-HYDRAULIC ANALYSIS OF SAFETY OF COLD WATER CREEK DAM
    3                 A3       RATIOS OF PMF ROUTED THROUGH RESERVOIR
    4                 B     288        0        5       -0       -0       -0       -0       -0       -0       -0
    5                 B1      5
    6                 J       1        3        1
    7                 J1   0.07     0.50     1.00
    8                 K       0  INFLOW                                    3        1
    9                 K1       INFLOW HYDROGRAPH
   10                 M       1        2     0.83                         1.0                                1
   11                 P       0     26.6      102      120      130
   12                 T                                                              -1       -91
   13                 W2              0.33
   14                 X    -1.0     -.10      2.0
   15                 K       1      DAM                                    2        3        1
   16                 K1       RESERVOIR ROUTING BY MODIFIED PULS
   17                 Y                                          1        1
   18                 Y1                                                        109       -1
   19                 Y4  800.5    801.5    802.5    803.7    804.4      805    805.5      806    806.5      807
   20                 Y4  807.5      808      809      810
   21                 Y5      0       15       20       52      114      190      420      810     1500     2630
   22                 Y5   4090     5910    10040    15100
   23                 $A      0       11     25.7       50
   24                 $F  770.8    800.5      820      840
   25                 $$  800.5
   26                 $D  804.9
   27                 K      99
```

SUMMARY OF DAM SAFETY ANALYSIS

PLAN 1 .....

	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
ELEVATION	800.51	800.50	804.90
STORAGE	109.	109.	163.
OUTFLOW	0.	0.	177.

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
.07	805.02	.12	165.	198.	1.00	16.50	0.00
.50	807.40	2.50	200.	3795.	8.67	15.92	0.00
1.00	808.44	3.54	216.	7734.	12.83	15.92	0.00