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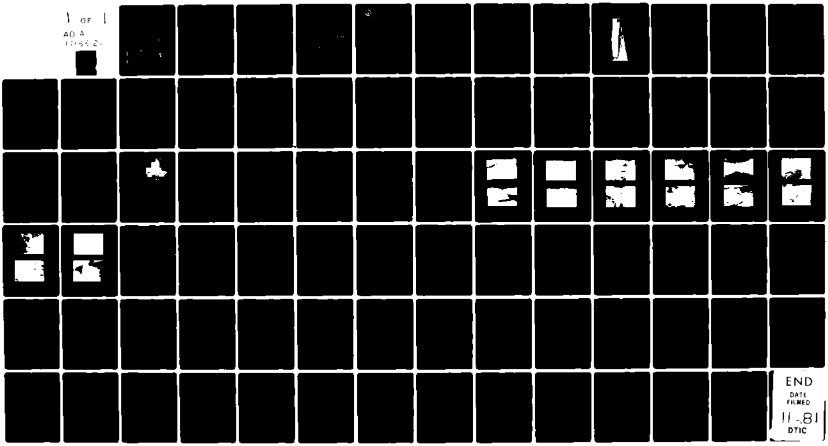

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LIONS LAKE DAM

JOHNSON COUNTY, MISSOURI

MO 20037

PHASE 1 INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM

United States Army
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St. Louis District

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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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MISSOURI-KANSAS CITY BASIN

LIONS LAKE DAM

JOHNSON COUNTY, MISSOURI

MO 20037

PHASE 1 INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM

Lions Lake Dam (MO 20037), Missouri - Kansas City Basin, Johnson County, Missouri. Phase I Inspection Report.

United States Army Corps of Engineers
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9 Final rept.,

DACW43-80-C-0074

10 Paul R. /Zaman Edwin R. /Burton
Harry L. /Callahan

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

FOR: STATE OF MISSOURI

11 MAY 1980

DEPARTMENT OF THE ARMY
ST. LOUIS DISTRICT, CORPS OF ENGINEERS
210 TUCKER BOULEVARD, NORTH
ST. LOUIS, MISSOURI 63101

REPLY TO
ATTENTION OF

LMSED-PD

SUBJECT: Lions Lake Dam, MO. I.D. No. 20037
Phase I Inspection Report

This report presents the results of field inspection and evaluation of the Lions 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:

a. Spillway will not pass 50 percent of the Probable Maximum Flood without overtopping the dam.

b. Overtopping of the dam could result in failure of the dam.

c. Dam failure significantly increases the hazard to loss of life downstream.

SUBMITTED BY: SIGNED — 19 SEP 1980
Chief, Engineering Division — Date

APPROVED BY : SIGNED — 22 SEP 1980
Colonel, CE, District Engineer — Date

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LIONS LAKE DAM

JOHNSON COUNTY, MISSOURI

MISSOURI INVENTORY NO. 20037

PHASE I INSPECTION REPORT

NATIONAL DAM SAFETY PROGRAM

PREPARED BY:

BLACK & VEATCH
CONSULTING ENGINEERS
KANSAS CITY, MISSOURI

UNDER DIRECTION OF

ST. LOUIS DISTRICT CORPS OF ENGINEERS

FOR

GOVERNOR OF MISSOURI

MAY 1980

PHASE I REPORT

NATIONAL DAM SAFETY PROGRAM

Name of Dam	Lions Lake Dam
State Located	Missouri
County Located	Johnson County
Stream	Tributary to East Fork Post Oak Creek
Date of Inspection	15 May 1980

Lions Lake Dam was inspected by a team of engineers from Black & Veatch, Consulting Engineers for the St. Louis District, Corps of Engineers. The purpose of the inspection was to make an assessment of the general condition of the dam with respect to safety, based upon available data and visual inspection, in order to determine if the dam poses hazards to human life or property.

The guidelines used in the assessment were furnished by the Department of the Army, Office of the Chief of Engineers and developed with the help of several Federal and state agencies, professional engineering organizations, and private engineers. Based on these guidelines, this dam is classified as a small size dam with a high downstream hazard potential. According to the St. Louis District, Corps of Engineers, failure would threaten lives and property. The estimated damage zone extends approximately one mile downstream of the dam. Within the estimated damage zone are one home, one barn, and a trailer court. Contents of the estimated downsteam damage zone were verified by the inspection team.

Our inspection and evaluation indicates the spillways do not meet the criteria set forth in the guidelines for a dam having the above size and hazard potential. The spillways will not pass the probable maximum flood without overtopping but will pass 13 percent of the probable maximum flood, and will pass the one percent chance flood (100-year flood). The spillway design flood recommended by the guidelines is 50 to 100 percent of the probable maximum flood. Considering the reservoirs in the upstream watershed and the hazard zone, the spillway design flood should be the probable maximum flood. The probable maximum flood is defined as the flood discharge which may be expected from the most severe combination of critical meteorologic and hydrologic conditions which are reasonably possible in the region.

Based on visual observations, this dam appears to be in good condition. Deficiencies visually observed by the inspection team were a quagmire and possible seepage area below the dam to the left of the lower lagoon, erosion of the drainage ditches at the left abutment, erosion on the upstream slope, erosion of embankment material at the primary spillway pipe outlet, deterioration of a retaining wall at the downstream toe of dam, and a few animal burrows on the upstream side of the embankment. Seepage and stability analyses required by the guidelines were not available.

There were no observed deficiencies or conditions existing at the time of the inspection which indicated an immediate safety hazard. Future corrective action and regular maintenance will be required to correct or control the described deficiencies. In addition, detailed seepage and stability analyses of the existing dam, as required by the guidelines, should be performed. A detailed report discussing each of these deficiencies is attached.

Paul R. Zaman, PE
Illinois 62-29261

Edwin R. Burton, PE
Missouri E-10137

Harry L. Callahan, Partner
Black & Veatch

OVERVIEW OF DAM

PHASE I INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM
LIONS LAKE DAM

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SECTION 1 - PROJECT INFORMATION

1.1 GENERAL

a. Authority. The National Dam Inspection Act, Public Law 92-367, authorized the Secretary of the Army, through the Corps of Engineers, to initiate a program of safety inspection of dams throughout the United States. Pursuant to the above, the District Engineer of the St. Louis District, Corps of Engineers, directed that a safety inspection of the Lions Lake Dam be made.

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

c. Evaluation Criteria. Criteria used to evaluate the dam were furnished by the Department of the Army, Office of the Chief of Engineers, in "Recommended Guidelines for Safety Inspection of Dams." These guidelines were developed with the help of several Federal agencies and many state agencies, professional engineering organizations, and private engineers.

1.2 DESCRIPTION OF PROJECT

a. Description of Dam and Appurtenances.

(1) The dam is an earth structure located in the valley of a tributary to East Fork Post Oak Creek at (Plate 1). The watershed area is hilly consisting of forested area, a residential area, and Pertle Springs dam Mo.I.D. No. 20044 and several small dams upstream. The dam is approximately 500 feet long along the crest and 22 feet high. The dam crest is 24 feet wide and has an asphalt road passing over the dam. Immediately below the embankment is a small lagoon formed by a dike around its perimeter.

(2) The primary spillway from the lake is an uncontrolled 36-inch steel pipe with a 48-inch diameter drop inlet installed in the embankment. The drop inlet has a 12-inch valved low level inlet. Flow through the pipe discharges into a plunge pool then through an open channel to the natural stream below. The emergency spillway consists of a concrete section of the road surface constructed in a low area of the embankment. Discharge through the emergency spillway overflows through a grass-lined channel between the road at the right abutment and the lagoon below the dam.

(3) Pertinent physical data are given in paragraph 1.3.

b. Location. The dam is located in South Central Johnson County, Missouri, as indicated on Plate 1. The lake formed by the dam is shown on the United States Geological Survey 7.5 minute series quadrangle map for Centerview, Missouri in Section 26 of T46N, R26W.

c. Size Classification. Criteria for determining the size classification of dams and impoundments are presented in the guidelines referenced in paragraph 1.1c above. Based on these criteria, the dam and impoundment are in the small size category.

d. Hazard Classification. The hazard classification assigned by the Corps of Engineers for this dam is as follows: The Lions Lake Dam has a high hazard potential, meaning that the dam is located where failure may cause loss of life, and serious damage to homes, agricultural, industrial and commercial facilities, and to important public utilities, main highways, or railroads. For the Lions Lake Dam the estimated flood damage zone extends approximately one mile downstream of the dam. Within the estimated damage zone are one residence, one barn, and a trailer court. Contents of the estimated downstream damage zone were verified by the inspection team.

e. Ownership. The dam is owned by the City of Warrensburg, 510 E. North St., Warrensburg, Missouri, Telephone 816-747-5291.

f. Purpose of Dam. The dam forms a 16-acre lake used for recreation in the city park.

g. Design and Construction History. Details of the design and construction of this dam are unknown. However, it was learned from the city that the dam was originally constructed by a water company to supply water to Warrensburg. The facilities were later purchased by the city. The water pumping station located near the dam is no longer in service.

h. Normal Operating Procedure. Normal rainfall, runoff, transpiration, evaporation, and overflow through the uncontrolled outlet pipe all combine to maintain a relatively stable water surface elevation.

1.3 PERTINENT DATA

a. Drainage Area - 426 acres

b. Discharge at Damsite.

(1) Normal discharge at the damsite is through an uncontrolled 36-inch outlet pipe and 48-inch drop inlet.

(2) Estimated experienced maximum flood at damsite - Unknown.

(3) Estimated ungated spillway capacity at maximum pool elevation 1,500 cfs (Probable Maximum Flood Pool El.763.1).

c. Elevation (Feet above m.s.l.).

(1) Top of dam - 760.2 (see Plate 3)

(2) Emergency spillway crest - 758.1±

(3) Primary spillway pipe invert - 746.0

(4) Primary spillway drop inlet crest - 755.0

(5) Streambed at toe of dam - 738.0 ±

(6) Maximum tailwater - Unknown.

d. Reservoir.

(1) Length of maximum pool - 1,300 feet ± (Probable maximum flood pool level)

(2) Length of normal pool - 800 feet ± (Primary spillway drop inlet crest)

e. Storage (Acre-feet).

(1) Top of dam - 160

(2) Emergency spillway crest - 112

(3) Primary spillway drop inlet crest - 54

(4) Design surcharge - Not available.

f. Reservoir Surface (Acres).

(1) Top of dam - 25.4

(2) Emergency spillway crest - 21.3

(3) Primary spillway drop inlet crest - 16.1

g. Dam.

(1) Type - Earth embankment

(2) Length - 465 feet ±

(3) Height - 22 feet ±

(4) Top width - 24 feet

(5) Side slopes - upstream face 1.0 V on 2.4 H, downstream face between 1.0 V on 2.8 H and 1.0 V and 9.5 H (see Plate 4).

(6) Zoning - Unknown.

(7) Impervious core - Unknown.

(8) Cutoff - Unknown.

(9) Grout curtain - None.

h. Diversion and Regulating Tunnel - None.

i. Primary Spillway.

(1) Type - 36-inch steel pipe with a 48-inch drop inlet.

(2) Drop inlet crest elevation - 755.0 feet m.s.l.

(3) Pipe invert elevation - 746.0

(4) Outlet invert elevation 742.2 feet m.s.l.

(5) Gates - None.

(6) Upstream channel - Not applicable.

(7) Downstream channel - Open channel to streambed.

j. Emergency Spillway.

(1) Type - Concrete and asphalt open channel.

(2) Width of channel - 103 feet.

(3) Emergency spillway crest - 758.1.

(4) Gates - None.

(5) Upstream channel - Not applicable.

(6) Downstream channel - Grass lined open channel to the natural stream channel below.

k. Regulating Outlets - None.

SECTION 2 - ENGINEERING DATA

2.1 DESIGN

Design drawings were unavailable.

2.2 CONSTRUCTION

Construction records were unavailable.

2.3 OPERATION

No records of operation or of past floods were available.

2.4 GEOLOGY

The site of the dam and reservoir is located in a deeply dissected valley between two ridges. The dam impounds a small intermittent tributary of the East Fork of Post Oak Creek.

The soils of the dam and reservoir area consist of the Bolivar and Blackoar soil series. The Bolivar Series consists of moderately deep, well-drained soils formed in residuum from sandstone on unplands. The depth to rock is 20-40 inches. For engineering purposes the soils are classified as low plastic silt (ML), silty sand (SM) clayey sand (SC) or low plastic clays (CL). The Blackoar Series consists of deep, poorly drained soils on nearly level areas in the flood plain. The depth to bedrock is greater than 60 inches. For engineering purposes the soil is classified as a low plastic silt (ML) or a low plastic clay (CL).

The bedrock in the vicinity of the dam and reservoir consists of Warrensburg sandstone of the Pleasanton Group. The Warrensburg sandstone is a channel sandstone that is massive, medium grained, micaceous and crossbedded.

2.5 EVALUATION

a. Availability. No engineering data were available.

b. Adequacy. 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 (including earthquake loads) and made a matter of record.

c. Validity. The validity of the design, construction, and operation could not be determined due to the lack of engineering data.

SECTION 3 - VISUAL INSPECTION

3.1 FINDINGS

a. General. A visual inspection of Lions Lake Dam was made on 15 May, 1980. The inspection team included professional engineers with experience in dam design and construction, hydrology, hydraulic engineering, and geotechnical engineering. The inspection team consisted of Edwin R. Burton, team leader; Robert Pinker, geologist; Gary Van Riessen, geotechnical engineer; John Ruhl, hydrologist/hydraulic engineer; and Russell Burnham, structural engineer. Specific observations are discussed below. No observations were made of the condition of the upstream face of the dam below the pool elevation at the time of the inspection.

b. Dam. The inspection team observed the following conditions at the dam. There was no riprap on the upstream face of the dam. Some minor erosion had occurred at the waterline. A ditch excavated in the left abutment on the upstream side of the dam allowed runoff from the area south of the dam to drain into the lake. Another ditch excavated in the left abutment downstream at the dam allowed hillside runoff to divert around the dam. Both of these ditches show signs of erosion. Some erosion was also observed at the outlet end of the primary spillway pipe. Part of a retaining wall supporting a small portion of the right side of the embankment at the downstream toe had failed and the remaining part of the wall was leaning. The downstream face of the dam is grass-covered. A quagmire is located near the embankment toe to the left of the primary spillway discharge channel. Several small animal burrows exist in the upstream face of the dam. No cracking, sliding, sloughing, settlement, or sinkholes were observed. There are no toe drains or relief wells. No evidence was found to indicate the embankment had ever been overtopped.

c. Appurtenant Structures. The primary spillway consists of a 48-inch drop inlet to a 36-inch steel pipe running through the embankment. A 12-inch low level inlet was located at the bottom of the drop inlet. The inside of the drop inlet and several feet of the outlet end of the spillway pipe were observable. The drop inlet pipe appeared in good condition. There was no trash screen at the inlet; however, there was an antivortex plate across the center of the inlet. The outlet end of the primary spillway pipe has been distorted where the crown is bent. Otherwise, it appeared to be in good condition. A 4-inch riser pipe with a locked cap was attached to the drop inlet pipe. It is suspected that this pipe provides for operation of a valve to the low level inlet of the drop inlet. The emergency spillway is located near the right end of the embankment and consists of a concrete section of the roadway pavement across a low area of the embankment crest. A concrete paved strip of the spillway approach on the upstream face of the dam serves as a boat ramp. Overflow of the spillway crest flows through a grass lined open channel downstream of the crest.

The lagoon immediately below the dam is contained by a dike along the south and west sides. A concrete retaining wall along a part of the east end of the lagoon separates the lagoon and dam embankment. No inlet to or outlet from the lagoon was observed; however, the lagoon was full of water. The only surface drainage that can get into the lagoon would be runoff from the embankment from approximately the middle of the dam to the emergency spillway. A small area of nonflowing seepage was observed near the toe of the lagoon dike beside the channel downstream from the primary spillway. Standing water and uncut grass was observed at the toe of the left half of the dam. This is referred to as the quagmire area in the remainder of this text. This quagmire could have resulted from seepage or possibly from poor drainage of left abutment runoff or primary spillway channel overflows.

d. Geology. The soil in the area of the dam and reservoir is formed in alluvium and in residuum from sandstone bedrock. The soils formed in alluvium are classified by the USDA/SCS as the Blackoar Series and consists of sandy silt (ML). The soils formed in residuum from sandstone are classified by the USDA/SCS as the Bolivar Series and consist of silty or clayey soil sand (SM or SC).

Rock outcrops composed of sandstone were observed in the left abutment. The unit was massive and crossbedded and badly weather. No outcrops were observed on the right abutment.

Samples of the embankment were taken near the upstream crest at the center of the dam using an Oakfield sampler. The material sampled consisted of sandy clay of low plasticity which was classified for engineering purposes as CL. The samples were classified in accordance with ASTM D 2488-69. Based on these samples, it is anticipated the embankment consists of sandy clay of low plasticity.

The left abutment of the dam is sandstone bedrock. The right abutment of the dam is anticipated to consist of sandy clay overlying sandstone bedrock. The foundation of the dam is anticipated to be sandy or clayey silt overlying sandstone bedrock.

e. Reservoir Area. No slides of the reservoir banks were observed. No appreciable reservoir sedimentation was observed.

f. Downstream Channel. The channel downstream of the spillway outlet pipe is an open channel to the original streambed.

3.2 EVALUATION

The various deficiencies observed at the time of the inspection are not believed to represent an immediate safety hazard. They do, however, warrant monitoring and control. The erosion in the left abutment may cause local distress and weakening of the embankment. The absence of riprap slope protection on the upstream embankment face can make this area vulnerable to erosion due to wave action. Animal burrows in the upstream face allow water to enter the embankment material and may erode to cause serious deterioration of embankment material. The erosion at the outlet end of the primary spillway pipe may cause distress within the pipe, which could eventually lead to loss of the functional capability of the pipe. The retaining wall failure does not appear to be causing distress within the embankment. However, erosion or localized sloughing could occur in this area, which could directly affect the stability of the embankment. The quagmire area should be drained then monitored to determine if it was caused by seepage.

SECTION 4 - OPERATIONAL PROCEDURES

4.1 PROCEDURES

The pool is primarily controlled by rainfall, runoff, evaporation, transpiration, and the capacity of the uncontrolled primary spillway.

4.2 MAINTENANCE OF DAM

The existing maintenance program includes removal of woody vegetation as it appears on the slopes of the dam. The slopes of the dam are mowed periodically. The asphalt road on the crest appears to be well maintained.

4.3 MAINTENANCE OF OPERATING FACILITIES

The 12-inch valved pipe may serve to draw down the reservoir, however the valvestem was locked and the valve unobservable, thus no evaluation of their maintenance could be made.

4.4 DESCRIPTION OF ANY WARNING SYSTEM IN EFFECT

There is no existing warning system or preplanned scheme for alerting downstream residents for this dam.

4.5 EVALUATION

The area of possible seepage should be monitored periodically and, if flows increase significantly or if seepage flows become muddy, a qualified engineer should be consulted. The program of cutting and maintaining the grass cover on the embankment appears to be doing a good job of controlling erosion and should be continued. The valve on the low level inlet to the drop inlet should be operated and inspected periodically.

SECTION 5 - HYDRAULIC/HYDROLOGIC

5.1 EVALUATION OF FEATURES

a. Design Data. Design data pertaining to hydrology and hydraulics was unavailable.

b. Experience Data. The drainage area and lake surface area are developed from USGS Warrensburg West, Warrensburg East, Centerview, and Cornelia Quadrangle Maps. The dam layout is from a survey made during the inspection.

c. Visual Observations.

(1) The primary spillway appears to be in good condition. The lake level at the time of the inspection was slightly above the inlet level and there was flow through the pipe. Only the inlet and outlet ends were observable. The spillway pipe discharges with a free outfall into an open channel. Some erosion was observed at the outlet end of the spillway pipe. There were no obstructions to flow in the downstream channel.

(2) The emergency spillway channel is in good condition with no evidence of erosion at the time of the inspection. A boring taken downstream of the crest and road showed the discharge channel to consist of cinders and clay over sandy silty clay.

(3) Spillway discharges do not endanger the integrity of the dam.

d. Overtopping Potential. Hydraulic routing of storms included routing through significant upstream structures. The hydrologic and hydraulic analyses are outlined in Appendix A. The spillways will not pass the probable maximum flood without overtopping the dam. The probable maximum flood is defined as the flood discharge that may be expected from the most severe combination of critical meteorologic and hydrologic conditions that are reasonably possible in the region. The spillways will pass 13 percent of the probable maximum flood without overtopping the dam and will pass the one percent chance flood estimated to have a peak outflow of 760 cfs developed by a 48-hour rainfall. According to the recommended guidelines from the Department of the Army, Office of the Chief of Engineers, a high hazard dam of small size should pass 50 to 100 percent of the probable maximum flood. Considering the reservoirs in the upstream watershed, and the downstream hazard, the appropriate spillway design flood should be the probable maximum flood. The portion of the estimated peak discharge of the probable maximum flood overtopping the dam would be 5,900 cfs of the total discharge from the reservoir of 7,400 cfs. The estimated duration of overtopping is

8.7 hours with a maximum height of 2.9 feet. The embankment could be jeopardized by overtopping for this period of time. The portion of the estimated peak discharge of 50 percent of the probable maximum flood overtopping the dam would be 2,900 cfs of the total discharge from the reservoir of 4,000 cfs. The estimated duration of overtopping is 6.2 hours with a maximum height of 2.0 feet.

According to the St. Louis District, Corps of Engineers, the effect from rupture of the dam could extend approximately one mile downstream of the dam. One home, one barn, and a trailer court could be severely damaged and lives could be lost should failure of the dam occur. Contents of the estimated downstream damage zone were verified by the inspection team.

SECTION 6 - STRUCTURAL STABILITY

6.1 EVALUATION OF STRUCTURAL STABILITY

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

b. Design and Construction Data. No design data relating to the structural stability of the dam were found. 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. Operating Records. No operational records exist.

d. Postconstruction Changes. The dam was originally constructed to create a water supply lake. It was constructed with two sedimentation lagoons located below the dam and a pumping station located north of these lagoons. The two lagoons and pumping station are shown on Plate 2 which was taken from a USGS map dated 1954. According to Mr. David Curtis of the City of Warrensburg, the water supply facilities have been abandoned and are no longer in service. It was observed by the inspection team that the left sedimentation lagoon no longer existed and that no evidence of a dike around the lagoon was observed. The area where this lagoon appears on Plate 2 is now a quagmire. The outlet from Lions Lake is shown on the USGS map at the far left. The observed location of the Lions Lake primary spillway is at the center of the dam. The primary spillway discharge channel is located between the quagmire and right sedimentation lagoon. No connections between the quagmire, lagoon, Lions Lake, or pumping station were observed. It is unknown when these changes were made.

e. Seismic Stability. The dam is located in Seismic Zone 1 which is a zone of minor seismic risk. A properly designed and constructed earth dam using sound engineering principles and conservatism should pose no serious stability problems during earthquakes in this zone. The seismic stability of an earth dam is dependent upon a number of factors: embankment and foundation material classifications and shear strengths; abutment materials, conditions, and strengths; embankment zoning; and embankment geometry.

Adequate descriptions of embankment design parameters, foundation and abutment conditions, or static stability analyses to assess the seismic stability of this embankment were not available and therefore no inferences will be made regarding the seismic stability. An assessment of the seismic stability should be included as part of the stability analysis required by the guidelines.

SECTION 7 - ASSESSMENT/REMEDIAL MEASURES

7.1 DAM ASSESSMENT

a. Safety. Several conditions observed during the visual inspection by the inspection team should be monitored and/or controlled. These are erosion of the upstream face of the embankment at normal lake level, possible seepage into the quagmire and lagoon below the dam, erosion of the drainage ditches at the left abutment, erosion of embankment material at the primary spillway pipe outlet, and animal burrows in the embankment. 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.

b. Adequacy of Information. Due to the lack of engineering design data, the conclusions in this report were based only on performance history and visual conditions. The inspection team considers that these data are sufficient to support the conclusions herein. 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. A program should be developed as soon as possible to monitor at regular intervals the deficiencies described in this report. The remedial measures recommended in paragraph 7.2 should be accomplished in the near future. The item recommended in paragraph 7.2a should be pursued on a high priority basis.

d. Necessity for Phase II. The Phase I investigation does not raise any serious questions relating to the safety of the dam nor does it identify any serious dangers which would require a Phase II investigation. However, the additional analyses noted in paragraph 2.5b are necessary for compliance with the guidelines.

e. Seismic Stability. This dam is located in Seismic Zone 1. Adequate description of embankment design parameters, foundation and abutment conditions, or static stability analyses to assess the seismic stability of this embankment was not available and therefore no inferences will be made regarding the seismic stability. An assessment of the seismic stability should be included as part of the recommended stability analysis.

7.2 REMEDIAL MEASURES

a. Alternatives. The emergency spillway size and/or height of the dam would need to be increased or the lake level would need to be lowered to increase available flood storage in order to pass the spillway design flood. The emergency spillway should be protected to prevent erosion.

b. Operation and Maintenance Procedures. The following operation and maintenance procedures are recommended and should be implemented under the direction of a professional engineer experienced in the design, construction, and maintenance of earth dams.

(1) Riprap should be placed on the upstream face of the dam at the normal lake level and near the primary spillway pipe outlet to prevent erosion of the embankment material.

(2) The quagmire area noted during the visual inspection should be drained and closely monitored and documented to determine if seepage is occurring in this area. The water level in the lagoon should be monitored and any significant changes should be evaluated.

(3) The animal burrows in the embankment should be repaired since they can lead to piping. Control measures should be implemented to discourage increased animal activity in the area. The embankment slope should be monitored during this repair.

(4) The area of the retaining wall failure should be monitored. Should displacement worsen, corrective repairs should be made.

(5) Erosion of the drainage ditches at the left abutment should be controlled.

(6) Seepage and stability analysis should be performed.

(7) A detailed inspection of the dam should be made periodically. More frequent inspections may be required if additional deficiencies are observed or the severity of the reported deficiencies increase.

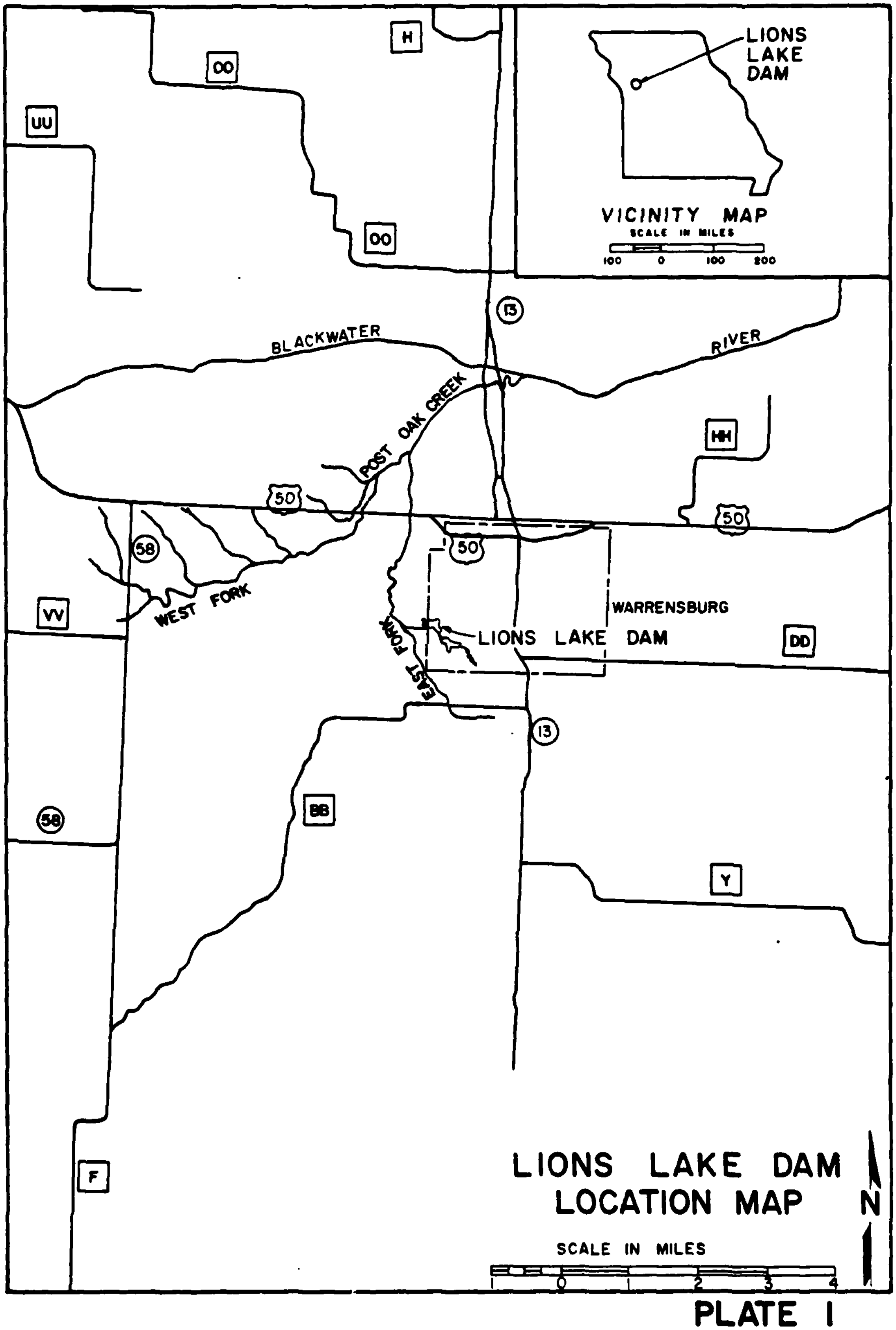

LIONS
LAKE
DAM
VICINITY MAP
SCALE IN MILES
100 0 100 200
H
OO
UU
OO
13
BLACKWATER
RIVER
POST OAK CREEK
HH
50
50
50
58
WEST FORK
VV
EAST FORK
WARRENSBURG
LIONS LAKE DAM
DD
13
BB
58
Y
F
LIONS LAKE DAM
LOCATION MAP
N
SCALE IN MILES
0 2 3 4

PLATE I

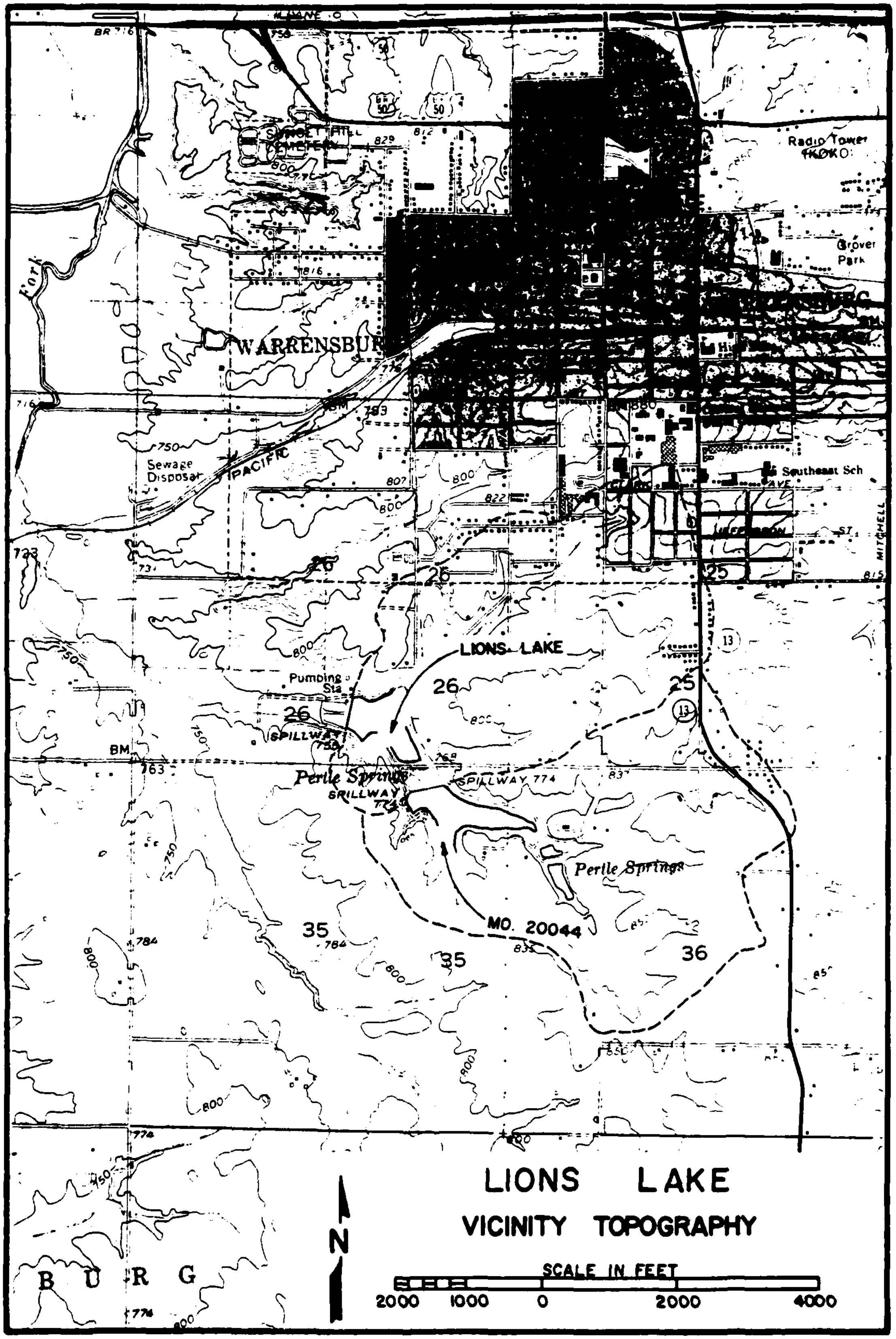
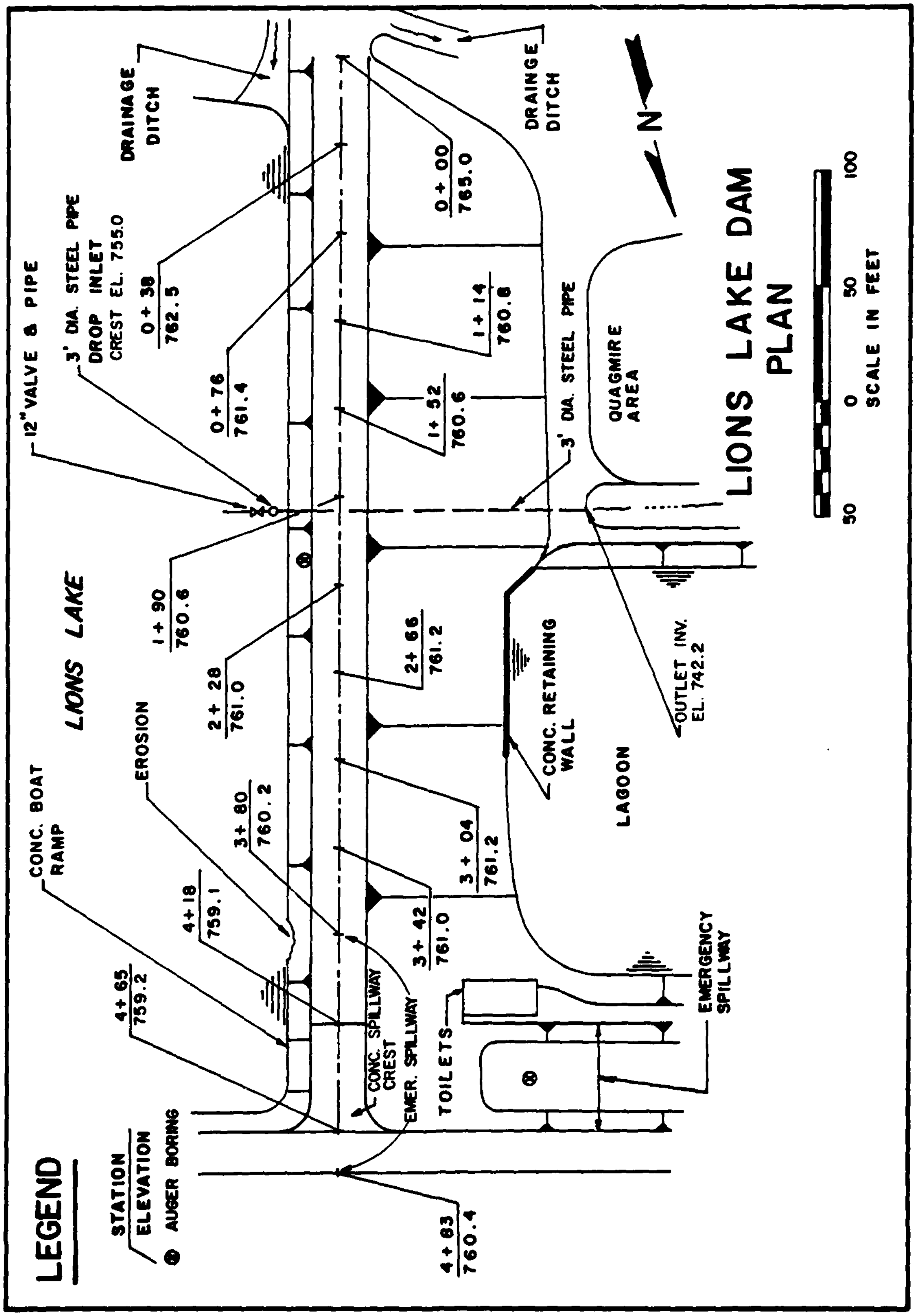
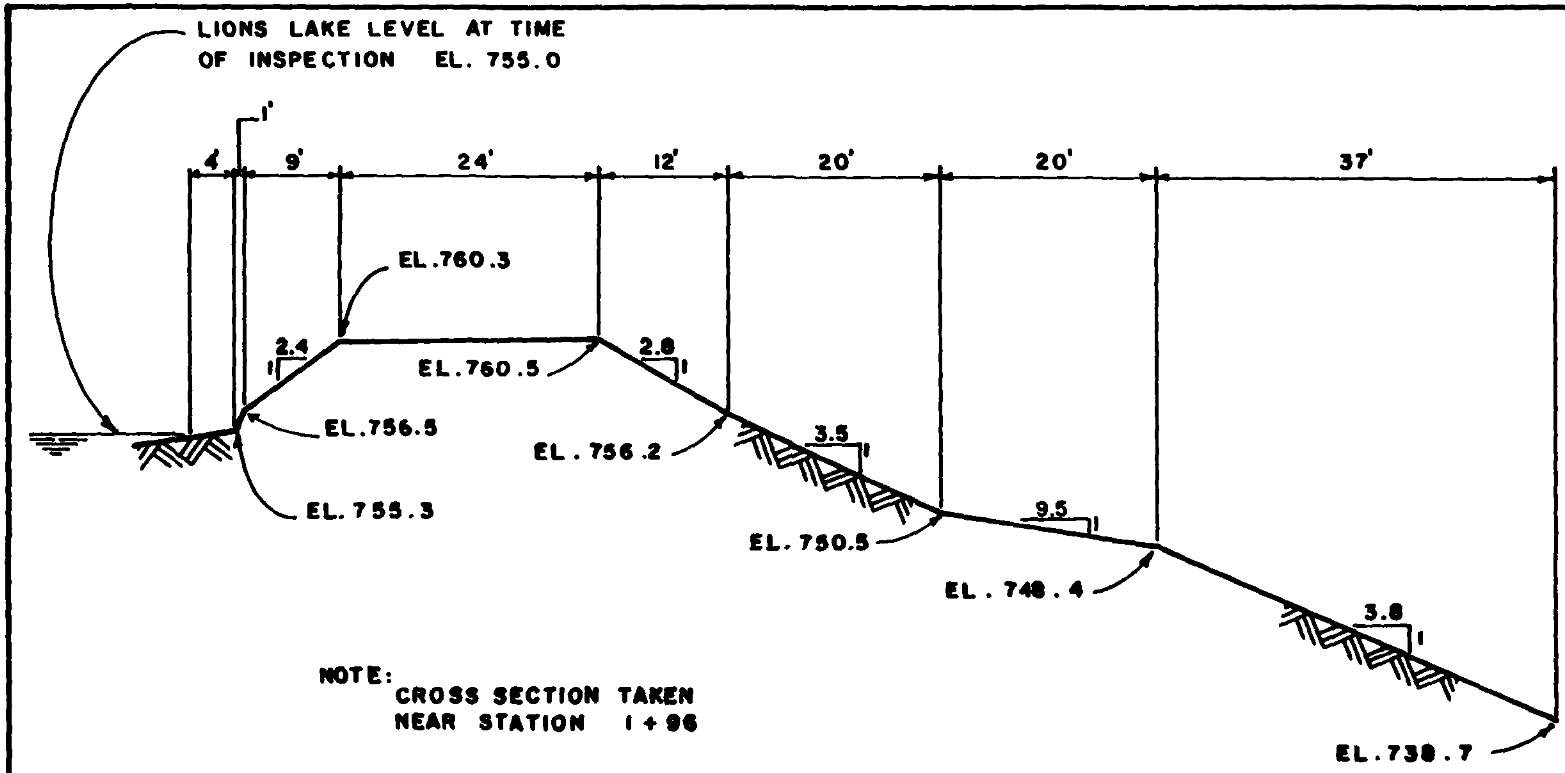

WARRENSBURG
Sewage Disposal
PACIFIC
Radio Tower
Grover Park
Southeast Sch
JEFFERSON
MITCHELL
LIONS LAKE
Pumping Sta
SPILLWAY
Perlle Springs
SPILLWAY 774
Perlle Springs
MO. 20044
LIONS LAKE
VICINITY TOPOGRAPHY
N
SCALE IN FEET
2000 1000 0 2000 4000
B U R G

PLATE 2



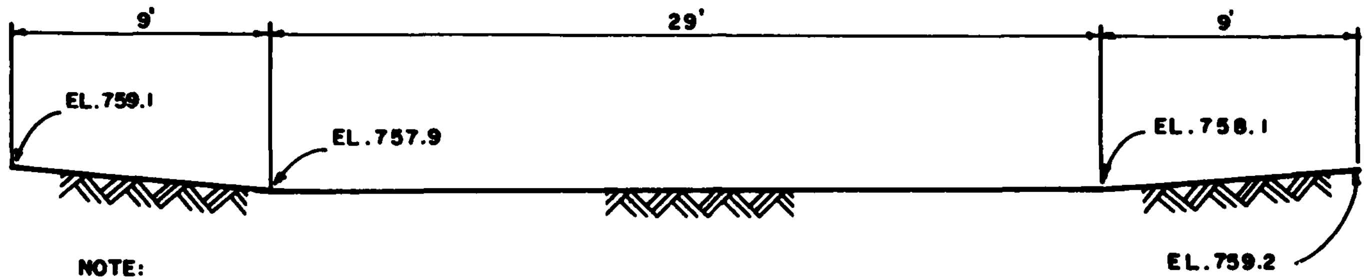
LIONS LAKE DAM
PLAN
LEGEND
STATION
ELEVATION
⊗ AUGER BORING
N
0 50 100
50
SCALE IN FEET
LIONS LAKE
LAGOON
QUAGMIRE AREA
DRAINAGE DITCH
DRAINGE DITCH
12" VALVE & PIPE
3' DIA. STEEL PIPE DROP INLET CREST EL. 755.0
3' DIA. STEEL PIPE
OUTLET INV. EL. 742.2
CONC. RETAINING WALL
EROSION
CONC. BOAT RAMP
CONC. SPILLWAY CREST
EMER. SPILLWAY
EMERGENCY SPILLWAY
TOILETS
0+00 / 765.0
0+38 / 762.5
0+76 / 761.4
1+14 / 760.8
1+52 / 760.6
1+90 / 760.6
2+28 / 761.0
2+66 / 761.2
3+04 / 761.2
3+42 / 761.0
3+80 / 760.2
4+18 / 759.1
4+65 / 759.2
4+83 / 760.4

PLATE 3

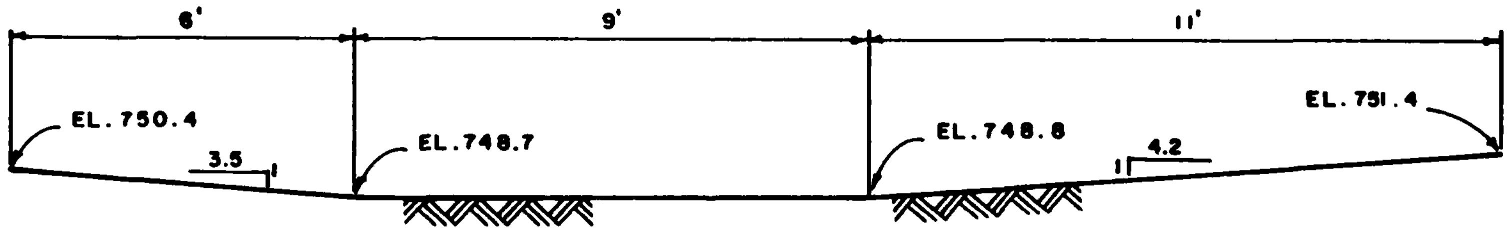


LIONS LAKE
DAM CROSS SECTION

PLATE 4



NOTE:
CROSS SECTION TAKEN
AT THE EMBANKMENT CENTERLINE
LOOKING DOWNSTREAM



NOTE:
CROSS SECTION TAKEN
317 FEET DOWNSTREAM OF
THE EMBANKMENT CENTERLINE
LOOKING DOWNSTREAM

LIONS LAKE DAM
EMERGENCY SPILLWAY CROSS SECTIONS

PLATE 5

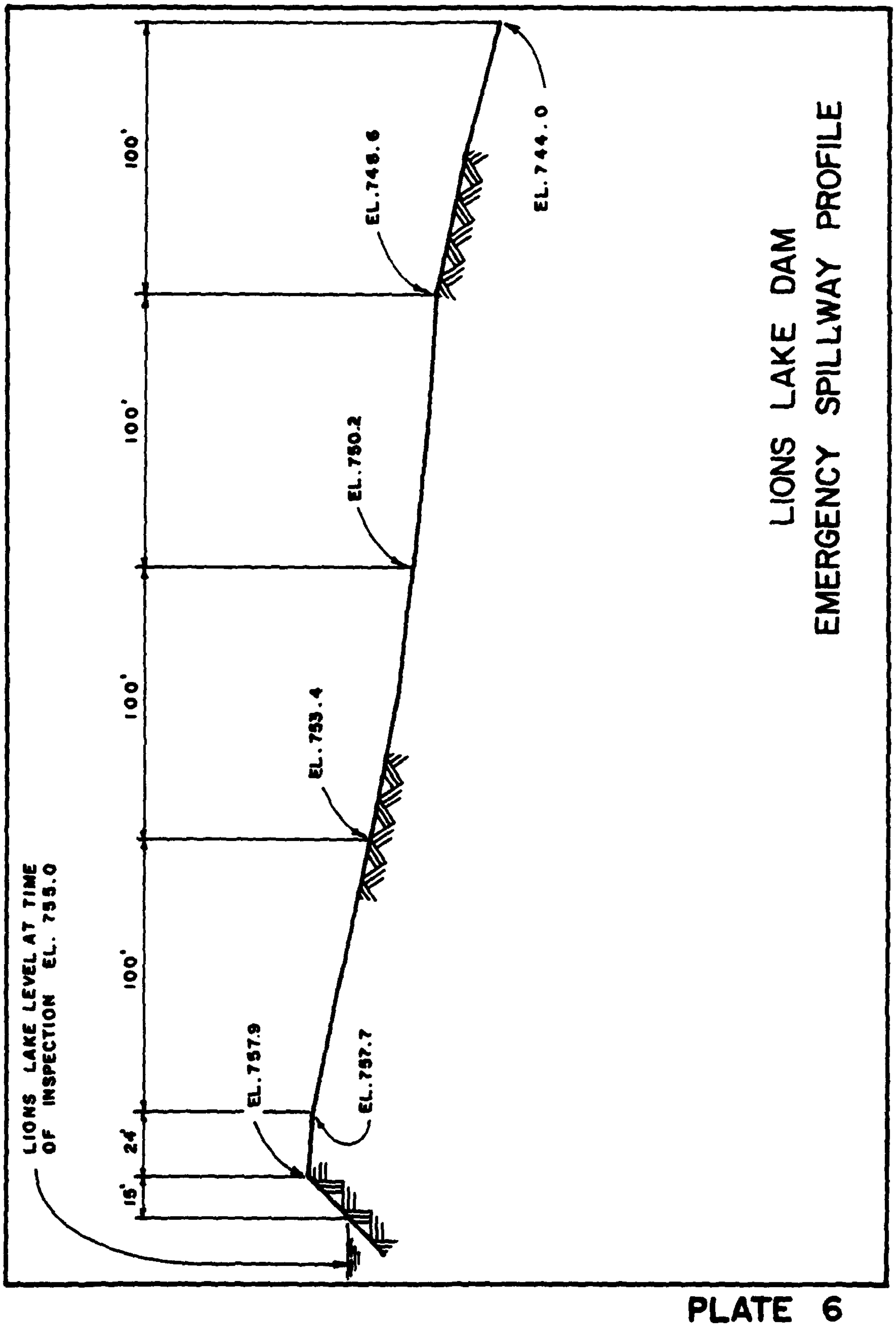

LIONS LAKE LEVEL AT TIME OF INSPECTION EL. 755.0
15'
24'
100'
100'
100'
100'
EL.757.9
EL.757.7
EL.753.4
EL.750.2
EL.745.6
EL.744.0
LIONS LAKE DAM
EMERGENCY SPILLWAY PROFILE

PLATE 6

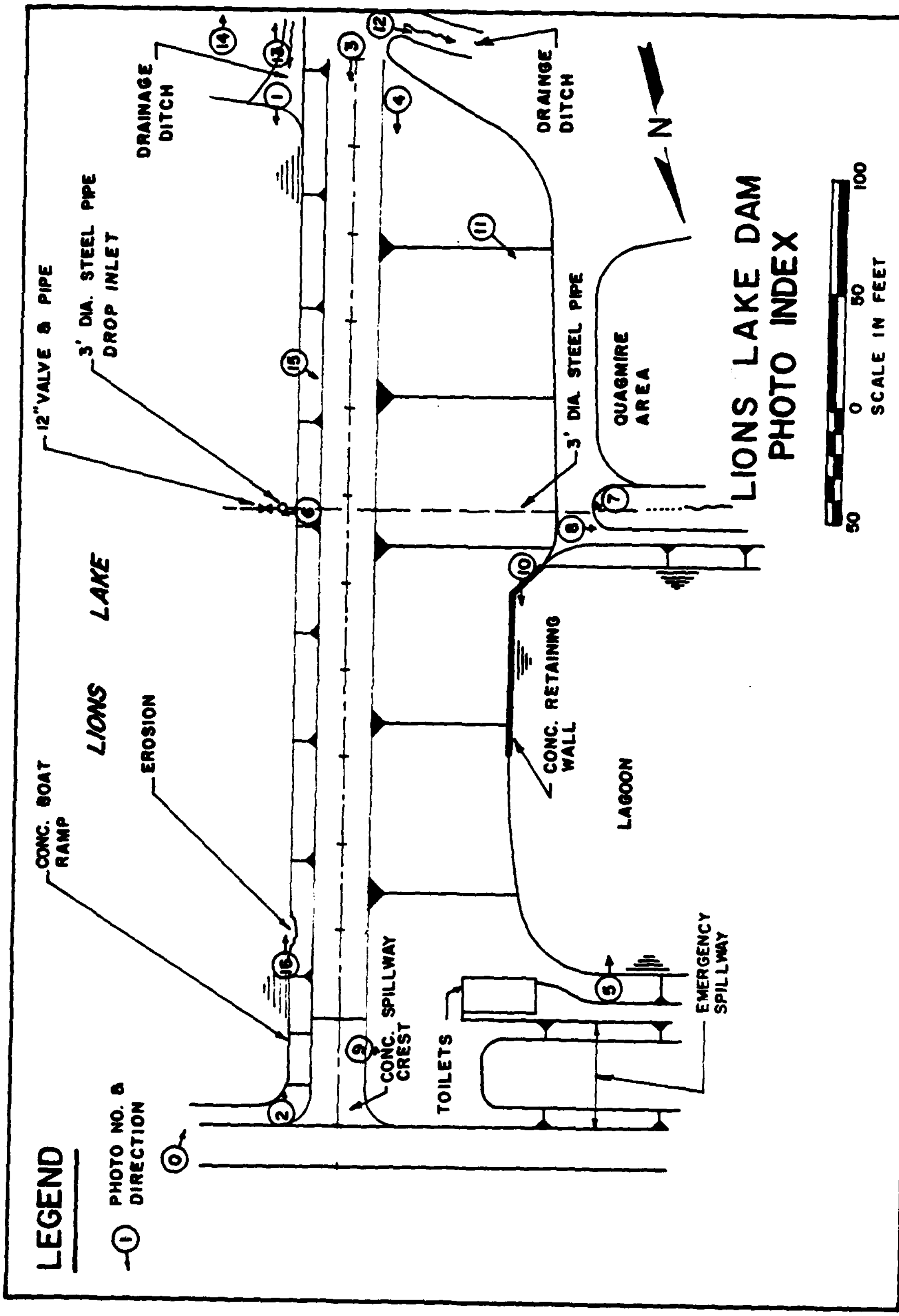

LIONS LAKE DAM
PHOTO INDEX
LEGEND
PHOTO NO. & DIRECTION
N
SCALE IN FEET
50 0 50 100
LIONS LAKE
LAGOON
QUAGMIRE AREA
DRAINAGE DITCH
DRAINGE DITCH
12"VALVE & PIPE
3' DIA. STEEL PIPE DROP INLET
3' DIA. STEEL PIPE
CONC. RETAINING WALL
EROSION
CONC. BOAT RAMP
CONC. CREST
SPILLWAY
TOILETS
EMERGENCY SPILLWAY

PLATE 7

PHOTO 1: UPSTREAM FACE OF DAM LOOKING NORTH

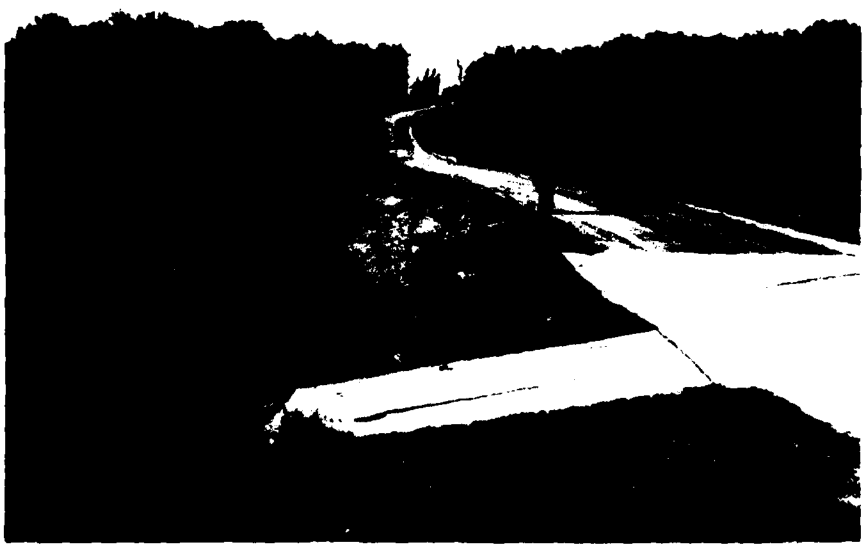


PHOTO 2: UPSTREAM FACE OF DAM LOOKING SOUTH

PHOTO 3: CREST OF DAM

PHOTO 4: DOWNSTREAM SLOPE OF DAM LOOKING NORTH

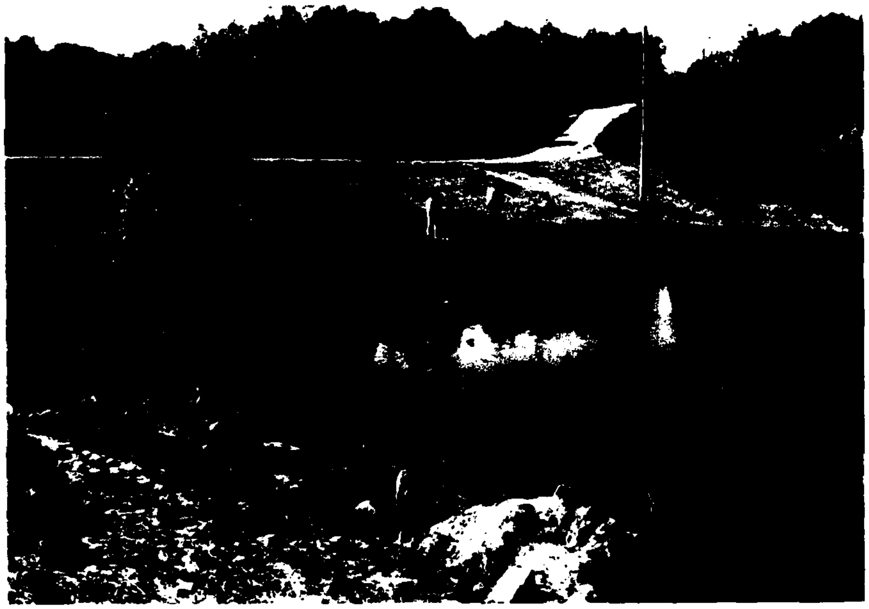


PHOTO 5: DOWNSTREAM SLOPE OF DAM LOOKING SOUTH

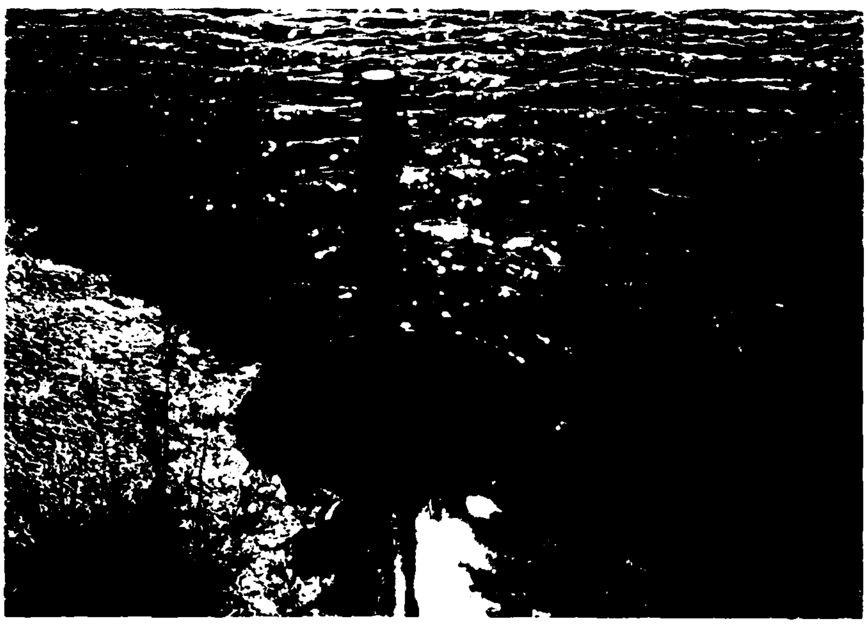


PHOTO 6: PRIMARY SPILLWAY DROP INLET

PHOTO 7: PRIMARY SPILLWAY OUTLET

PHOTO 8: PLUNGE POOL BELOW PRIMARY SPILLWAY

PHOTO 9: EMERGENCY SPILLWAY CHANNEL

PHOTO 10: CONCRETE RETAINING WALL AT TOE OF DAM

PHOTO 11: QUAGMIRE AT TOE OF DAM

PHOTO 12: DRAINAGE DITCH FROM LEFT ABUTMENT UPSTREAM FACE

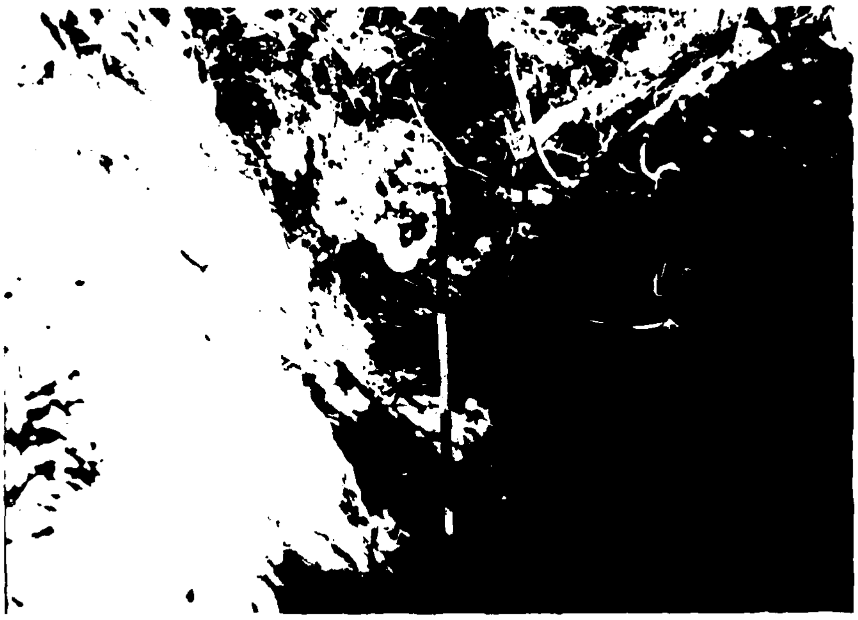


PHOTO 13: DRAINAGE DITCH FROM LEFT ABUTMENT DOWNSTREAM FACE

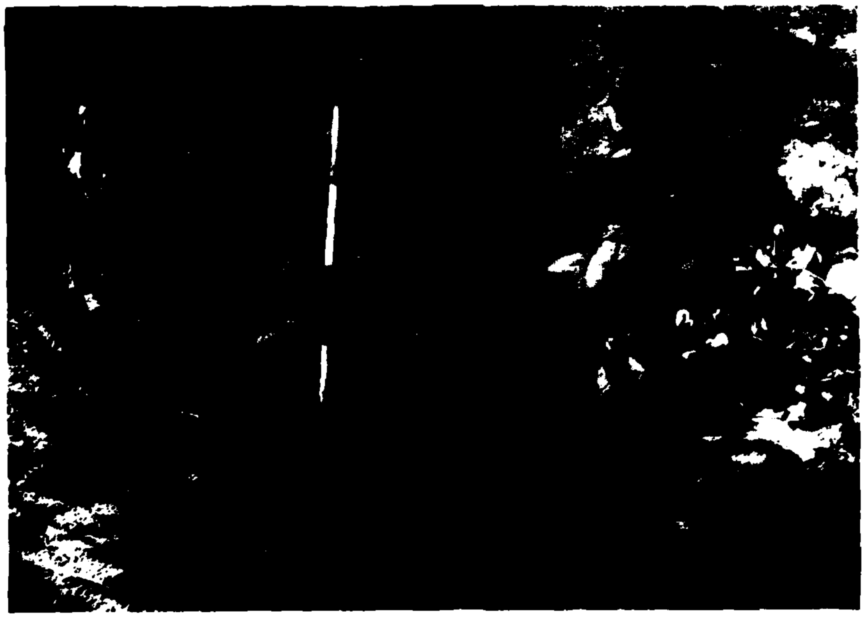


PHOTO 14: SANDSTONE FORMATION LEFT ABUTMENT ON UPSTREAM SIDE OF DAM

PHOTO 15: ANIMAL BURROW ON UPSTREAM FACE, MEASURED APPROXIMATELY FIVE FEET DEEP

PHOTO 16: EROSION AREA ON UPSTREAM FACE AT WATERLINE

APPENDIX A

HYDROLOGIC AND HYDRAULIC ANALYSES

HYDROLOGIC AND HYDRAULIC ANALYSES

To determine the overtopping potential of Lions Lake Dam , flood routings were performed by applying the Probable Maximum Precipitation (PMP) to synthetic unit hydrographs to develop inflow hydrographs for Lions Lake and its upstream reservoirs. The inflow hydrographs were then routed through the reservoirs and spillways. The overtopping analyses were determined using the computer program HEC-1 (Dam Safety Version) (1).

The PMP was determined from regional charts prepared by the National Weather Service in "Hydrometeorological Report No. 33" (HMR-33). Reduction factors were not applied. The rainfall distribution for the 48-hour PMP storm was determined according to the procedures outlined in HMR-33 and EM 1110-2-1411. The Kansas City, Missouri rainfall distribution (12 min. interval - 48 hours duration), as provided by the St. Louis District, Corp of Engineers, was used when the one percent chance probability flood was routed through the reservoirs and spillways.

The synthetic unit hydrographs for the watershed were developed by the computer program using the Soil Converation Service (SCS) method. The parameters for the unit hydrographs are shown in Table 1.

The SCS curve number (CN) method was used in computing the infiltration losses for rainfall-runoff relationships. The CN values used, and the result from the computer output, are shown in Table 2.

Although many impoundments exist in the watershed for Lions Lake, it was determined from visual inspection that only two impoundments upstream of Lions Lake would be included in the hydrologic and hydraulic analyses. Storms were routed through Pertle Springs Lake (immediately upstream of Lions Lake) and the second lake upstream of Pertle Springs Lake (see Plate 2) which shall be referenced as "Upstream Lake" through the remainder of this appendix.

Routing through the reservoirs was performed using the Modified Puls Method. The initial reservoir pool elevations for the routing of each storm were determined to be equivalent to the primary spillway crest elevations in accordance with antecedent storm conditions preceding the one percent probability and probable maximum storms outlined by the U.S. Army Corps of Engineers, St. Louis District (5). The hydraulic capacity of the spillways and the storage capacity of the reservoirs were defined by the elevation, surface area, storage, and discharge relationships shown in Table 3.

The rating curves for the spillways are shown in Table 4. The flow over the crest of each of the dams the Lions Lake and emergency spillway was determined using the non-level dam crest option ($L and $V cards) of the HEC-1 program.

The program assumes critical flow over a broad-crested weir. The flow through the primary spillways was determined from the orifice flow equation and weir flow equation. The flow over the Pertle Springs Lake emergency spillway was determined from the weir equation.

Where routings through upstream reservoirs resulted in overtopping of those structures, breach analyses were performed using HEC-1. The breaching parameters are noted in Table 5.

The result of the routing and breach analyses indicates that 13 percent of the PMF will not overtop the Lions Lake dam.

A summary of the routing analysis for different ratios of the PMF is shown in Table 6.

The computer input data and a summary of the output data are presented at the back of this appendix.

TABLE 1

SYNTHETIC UNIT HYDROGRAPH

Parameters:	Upstream Lake	Pertle Springs Lake	Lions Lake
Drainage Area (A)	179 acres	275 acres	426 acres
Hydraulic Length of Watercourse (ℓ)	3,900 feet	4,460 feet	4,550 feet
Hydrologic Soil Cover Complex Number (CN')	81 (AMC III) 64 (AMC II)	80 63	82 66
Average Watershed Land Slope (Y)	2.7%	2.6%	2.7%
Lag Time (L_g)	0.56 hours (AMC III) 0.90 hours (AMC II)	0.65 hours 1.04 hours	0.61 hours 0.96 hours
Time of concentration (T_c)	0.93 hours (AMC III) 1.50 hours (AMC II)	1.08 hours 1.73 hours	1.02 hours 1.60 hours
Duration (D)	7 minutes (AMC III) 12 minutes (AMC II) (use 10 minutes in all cases)	9 minutes 14 minutes	8 minutes 13 minutes

TABLE 1
(Continued)

Time (Min)*	Upstream Lake AMC II	Upstream Lake AMC III	Discharge (cfs)* Pertle Springs Lake AMC II	Pertle Springs Lake AMC III	Lions Lake AMC II	Lions Lake AMC III
0	0	0	0	0	0	0
10	11	32	12	35	22	63
20	33	106	35	112	66	204
30	67	190	71	224	135	392
40	108	210	120	280	223	463
50	132	182	160	274	286	432
60	137	129	182	229	307	343
70	129	80	184	162	302	222
80	112	53	173	107	270	148
90	89	35	154	75	229	102
100	64	23	129	52	174	68
110	48	15	98	36	129	47
120	37	10	75	25	99	31
130	28	6	58	17	78	21
140	21	4	47	12	60	14
150	16	3	37	8	46	10
160	12	2	29	6	36	7
170	9	1	23	4	28	5
180	7	1	18	3	21	3

*From HEC-1 computer output

FORMULAS USED:

$$L_g = \frac{\ell^{0.8} \times (S + 1)^{0.7}}{1,900 \times Y^{0.5}} \qquad (4)$$

$$S = \frac{1,000}{CN'} - 10$$

$$T_c = L_g/0.6$$

$$D = 0.133\ T_c$$

TABLE 2

RAINFALL-RUNOFF VALUES

Selected Storm Event	Storm Duration (Hours)	Rainfall (Inches)	Runoff (Inches)	Loss (Inches)
PMP				
Upstream Lake	48	34.58	31.92	2.66
Pertle Springs Lake	48	34.58	31.75	2.83
Lions Lake	48	34.58	32.08	2.50
1% Probability				
Upstream Lake	48	5.93	2.21	3.72
Pertle Springs Lake	48	5.93	2.13	3.80
Lions Lake	48	5.93	2.39	3.54

Additional Data:

1) The soil associations in this watershed are Bolivar, Barco, Deepwater, Macksburg, Sampsel, and Weller (3).
   92 percent of total drainage area in hydrologic soil group B.
   8 percent of total drainage area in hydrologic soil group C.
   40 percent of the land use was urban.
   40 percent of the land use was grassland.
   20 percent of the land use was timberland (2 and 4).
2) SCS Runoff Curve CN (AMC III) for ratios of the PMF:
   81 - Upstream Lake
   80 - Pertle Springs Lake
   82 - Lions Lake
3) SCS Runoff Curve CN (AMC II) for the one percent probability flood:
   64 - Upstream Lake
   63 - Pertle Springs Lake
   66 - Lions Lake

TABLE 3

ELEVATION, SURFACE AREA, STORAGE, AND DISCHARGE RELATIONSHIPS

Elevation (feet-MSL)	Lake Surface Area (acres)	Lake Storage (acre-ft)	Spillway Discharge (cfs)
Upstream Lake			
*785.0	1.0	2	0
***789.2	1.7	9	11
Pertle Springs Lake			
*774.0	16.1	75	0
**774.4	17.2	82	14
***777.6	25.8	149	924
Lions Lake			
*755.0	16.1	54	0
**758.1	21.3	112	113
***760.2	25.4	160	617

*Primary spillway crest elevation
**Emergency spillway crest elevation
***Top of dam elevation

The relationships in Table 3 were developed from the Centerview, Missouri and Cornelia, Missouri 7.5 minute quadrangle maps and the field measurements.

TABLE 4

SPILLWAY RATING CURVE

Reservoir Elevation (ft-msl)	Primary Spillway Discharge (cfs)	Emergency Spillway Discharge (cfs)	Total Spillway Discharges (cfs)
Upstream Lake			
785.0	0	-	0
786.0	10	-	10
787.0	10	-	10
788.0	10	-	10
789.0	11	-	11
**789.2	11	-	11
790.0	11	-	11
791.0	12	-	12
Pertle Springs Lake			
774.0	0	-	0
*774.4	14	0	14
775.0	340	19	53
776.0	97	94	191
777.0	142	206	348
**777.6	169	300	469
778.0	191	363	554
779.0	211	524	735
Lions Lake			
755.0	0	0	0
756.0	44	0	44
757.0	85	0	85
758.0	107	2	110
*758.1	109	4	113
759.0	124	99	223
760.0	140	377	518
**760.2	149	468	617
761.0	185	929	1114
762.0	192	1279	1461
763.0	196	1656	1852
764.0	200	2069	2269

*Emergency Spillway Crest Elevation
**Top of Dam Elevation

METHOD USED:

Upstream Lake

Primary spillway releases were determined by nomographs for corrugated metal pipe culverts with outlet control (7).

Pertle Springs Lake

Primary spillway release rates were based on the discharge calculated for flow through the pipe and drop inlet using the orifice equation:

$$Q = Ca[2gH]^{1/2}$$

where:

C = 0.77 = coefficient of discharge for pipe or
C = 0.57 = coefficient of discharge for drop inlet
a = 7.07 sq. ft. = net area of orifice for pipe or
a = 19.6 sq. ft. = net area of orifice for drop inlet
g = 32.2 ft/sec^2 = gravitational acceleration
H = difference between the energy gradient elevation upstream and the downstream tailwater elevation for pipe or
H = height of water surface above the crest of the drop inlet (6).

Emergency spillway release rates were computed using the weir equation:

$$Q = CLH^{3/2}$$
L = 16 feet
H = head in feet
C = coefficient of discharge and varies between 2.61 and 3.32.

Lions Lake

Primary spillway release rates were based on the discharge calculated for flow through the drop inlet and pipe using the orifice equation and the weir equation for a sharp crest circular weir. The minimum discharge of the two equations at a given water surface elevation was used for the spillway rating curve.

Orifice equation:

$$Q = Ca[2gH]^{1/2}$$

where:

$C = 0.7$ = coefficient of discharge
$a = 7.07$ sq. ft^2. = net area of orifice
$g = 32.2\ ft/sec^2$ = gravitational acceleration
H = difference between the energy gradient elevation upstream and the downstream tailwater elevation (6).

Circular weir equation:

$$Q = C_o(2\Pi R_s)(H_o)^{3/2}$$

where:

C_o = coefficient of discharge that varies between 1.0 and 3.5 with H_o.
H_o = effective head
R_s = radius of sharp crested weir = 2.0 feet

Emergency spillway releases were computed using the equations for flow over non-level crests:

$$d_c = 2/3\ (H_m + 1/4\ \Delta Y)$$

$$A = 1/2\ T\ (2d_c - \Delta Y)$$

$$Q = (A^3 g/T)^{0.5}$$

where:

d_c = critical depth (feet)
H_m = available specific energy which is taken to be the height of the water surface in the reservoir above the bottom of the section (feet)
ΔY = change in elevation across the section (feet)
A = flow area (sq. ft.)
T = top width (feet)
Q = flow (cfs)
$g = 32.2\ ft/sec^2$ = acceleration due to gravity.

TABLE 5

BREACHING PARAMETERS

	Upstream Lake	Pertle Springs Lake
Bottom Width of Breach (BRWID)	10 feet	10 feet
Side Slope of Breach (z) (In feet horizontal to 1.0 feet vertical)	0.5	0.5
Elevation of Breach Bottom at Maximum Size of Breach (ELBM)	782.0 ft. m.s.l.	764.0 ft. m.s.l
Time for Breach to Develop to Maximum Size (TFAIL)	1.0 hour	1.0 hour
Elevation of Water Surface Which Will Cause Dam to Fail (FAILEL)	789.2 ft. m.s.l.	777.6 ft. m.s.l.

TABLE 6

RESULTS OF FLOOD ROUTINGS

Ratio of PMF	Peak Inflow (CFS)	Peak Lake Elevation (ft.-MSL)	Total Storage (AC.-FT.)	Peak Outflow (CFS)	Depth (ft.) Over Top of Dam
-	0	*775.0	54	0	-
0.13	795	760.1	156	545	0
0.50	4,119	762.2	212	4,045	2.0
1.00	7,570	763.1	239	7,401	2.9

* Primary spillway drop inlet crest elevation.

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(4) U.S. Department of Agriculture, Soil Conservation Service, National Engineering Handbook, Section 4, Hydrology, August 1972.

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(6) Horace W. King and Ernest F. Brater, Handbook of Hydraulics, Sixth Edition, McGraw Hill Book Company, 1976.

(7) U.S. Department of Commerce, Bureau of Public Roads, Hydraulic Engineering Circular No. 5, Hydraulic Charts for the Selection of Highway Culverts, December, 1965.

(8) U.S. Department of the Interior, Bureau of Reclamation, Design of Small Dams, 1974, Washington, D.C.

(9) U.S. Department of Agriculture, Soil Conservation Service, Soil Survey Interpretations and Field Maps, 1980.

(10) Mary H. McCracken, Missouri Division of Geological Survey, Geologic Map of Missouri, 1961.

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FLOOD HYDROGRAPH PACKAGE (HEC-1)
DAM SAFETY VERSION       JULY 1978
  LAST MODIFICATION  06 FEB 80
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A1MISSOURI DAM INSPECTION PROGRAM
A2ST LOUIS DISTRICT US ARMY CORPS OF ENGINEERS
A3LIONS,PERTLE SPRINGS LAKE DAMS -- PMF
B    288       0      10       0       0       0       0       0       0       0
B1     5
J      1       7       1
J1   .10     .12     .13     .14     .15     .50      1.
K      0       1                               3       1
K1   UPSTREAM DAM (48 HR. PROBABLE MAXIMUM RUNOFF)
M      1       2     .28                       1
P          24.70     101     120     130     140
T                                                     -1     -81
W2             .56
X                      1
K      1       2                                       1
K1   ROUTING THROUGH UPSTREAM DAM
Y                              1       1
Y1     1                                           -785.      -1
Y4  785.    786.    787.    788.    789.    790.    791.
Y5    0.    10.0    10.0    10.0    11.0    11.0    12.0
SA0.0   1.0     3.0    11.1    21.2    44.3
SE780.  785.    790.    800.    810.    820.
SS789.2 0       0       1.5
SD789.2 2.6     1.5     264.
SB10.    .5    782.      1.    785.   789.2
K      0       3                               3       1
K1   PERTLE SPRINGS DAM (48 HR. PROBABLE MAXIMUM RUNOFF)
M      1       2     .43                       1
P          24.70     101     120     130     140
T                                                     -1     -80
W2             .65
X                      1
K      2       4                                       1
K1   COMBINE HYDROGRAPHS-TOTAL FLOW PERTLE SPRINGS (48 HR. PMF)
K      1       5                                       1
K1   ROUTING THROUGH PERTLE SPRINGS LAKE
Y                              1       1
Y1     1                                           -774.      -1
Y4  774.    775.    776.    777.    778.    779.    780.    781.    782.
Y5    0.    53.0    191.    348.    532.    715.    915.   1125.   1341.
SA0.    16.13   32.25   38.32   66.43   77.57   96.8
SE760.  774.    780.    790.    800.    810.    820.
SS774.
SD777.6
SL11.    31.    144.    194.    349.    514.    551.    569.
SV776.  776.5   777.    777.4   777.8   778.    779.    779.5
SB10.    .5    764.      1.    774.   777.6
K      0       6                               3       1
K1   LIONS LAKE DAM (48 HR. PROBABLE MAXIMUM RUNOFF)
M      1       2    .666                       1
```

```
SB10.   .5      764.    1.      774.    777.6
K       0       6                               3       1
K1      LIONS LAKE DAM (48 HR. PROBABLE MAXIMUM RUNOFF)
W       1       2       .666                    1
```

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B L A C K   &   V E A T C H                                              PROJECT 9166.     DATE 27 AUG 80    PAGE     3
==========================================================================================================================
FLOOD HYDROGRAPH PACKAGE - HEC-1                                         PROGRAM H21/02-OU  TIME  18:16:26    CASE PMF

P               24.70   101     120     130     140
T                                                       -1      -82
W2              .61
K                                1
K       2       7                                       1
K1      COMBINE HYDROGRAPHS-TOTAL FLOW LIONS (48 HR. PMF)
K       1       8                                       1
K1      ROUTING THROUGH LIONS LAKE
Y                                       1       1
Y1      1                                       -755.           -1
Y4  755.    756.    757.    758.    759.    760.    761.    762.    763.    764.
Y5      0.      44.     85.3    107.7   123.7   140.5   184.7   191.7   195.8   199.8
SA0.    16.13   24.69   43.74   65.51   95.75   131.02
SE745.  755.    760.    770.    780.    790.    800.
SS755.
SD760.2
SL0.0   29.     44.     117.    225.    336.    469.    536.    572.    594.
SV757.9 758.1   759.1   760.4   760.6   760.8   761.2   761.7   762.5   763.3
K       99
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B L A C K   &   V E A T C H                                                     PROJECT 9166.      DATE 27 AUG 80   PAGE    5
*****************************************************************************************************************************
FLOOD HYDROGRAPH PACKAGE - HEC-1                                                PROGRAM H21/02-OU  TIME  18:16:26   CASE PMF

*************************************
FLOOD HYDROGRAPH PACKAGE (HEC-1)
DAM SAFETY VERSION      JULY 1978
  LAST MODIFICATION  06 FEB 80
*************************************
                              MISSOURI DAM INSPECTION PROGRAM
                              ST LOUIS DISTRICT US ARMY CORPS OF ENGINEERS
                              LIONS,PERLE SPRINGS LAKE DAMS -- PMF

                                                    JOB SPECIFICATION
                              NQ      NHR     NMIN     IDAY      IHR     IMIN    METRC     IPLT     IPRT    NSTAN
                             288        0       10        0        0        0        0        0        0        0
                                                      JOPER      NWT    LROPT    TRACE
                                                          5        0        0        0

                                             MULTI-PLAN ANALYSES TO BE PERFORMED
                                                NPLAN= 1 NRTIO= 7 LRTIO= 1
                               RTIOS=     .10     .12     .13     .14     .15     .50    1.00

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

                                                 SUB-AREA RUNOFF COMPUTATION

                              UPSTREAM DAM (48 HR, PROBABLE MAXIMUM RUNOFF)

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

                                                     HYDROGRAPH DATA
                              IHYDG    IUHG   TAREA    SNAP   TRSDA   TRSPC   RATIO   ISNOW   ISAME   LOCAL
                                  1       2     .28     .00     .28    1.00    .000       0       0       0

                                                       PRECIP DATA
                                          SPFE     PMS      R6     R12     R24     R48     R72     R96
                                           .00   24.70  101.00  120.00  130.00  140.00     .00     .00

                                                        LOSS DATA
                         LROPT   STRKR   DLTKR   RTIOL   ERAIN   STRKS   RTIOK   STRTL   CNSTL   ALSMX   RTIMP
                             0     .00     .00    1.00     .00     .00    1.00   -1.00  -81.00     .00     .00

                             CURVE NO = -81.00  WETNESS =  -1.00  EFFECT CN =  81.00

                                                  UNIT HYDROGRAPH DATA
                                               TC=   .00     LAG=   .56

                                                     RECESSION DATA
                                         STRTQ=    -.00   QRCSN=    .00    RTIOR= 1.00

                            UNIT HYDROGRAPH 19 END OF PERIOD ORDINATES, TC=     .00 HOURS, LAG=    .56  VOL= 1.00
                              32.      106.      196.      210.      182.      129.       80.       53.       35.       23.
                              15.       10.        6.        4.        3.        2.        1.        1.        0.

                         0                                      END-OF-PERIOD FLOW
```

UNIT HYDROGRAPH 19 END OF PERIOD ORDINATES, TC= .00 HOURS, LAG= .56 VOL= 1.00

32.	106.	190.	210.	182.	129.	80.	53.	35.	23.
15.	10.	6.	4.	3.	2.	1.	1.	0.	

END-OF-PERIOD-FLOW

MO.DA	HR.MN	PERIOD	RAIN	EXCS	LOSS	COMP Q	MO.DA	HR.MN	PERIOD	RAIN	EXCS	LOSS	COMP Q
1.01	.10	1	.00	.00	.00	0.	1.02	.10	145	.03	.02	.01	3.
1.01	.20	2	.00	.00	.00	0.	1.02	.20	146	.03	.02	.01	5.
1.01	.30	3	.00	.00	.00	0.	1.02	.30	147	.03	.02	.01	6.
1.01	.40	4	.00	.00	.00	0.	1.02	.40	148	.03	.02	.01	12.
1.01	.50	5	.00	.00	.00	0.	1.02	.50	149	.03	.02	.01	15.
1.01	1.00	6	.00	.00	.00	0.	1.02	1.00	150	.03	.02	.01	17.
1.01	1.10	7	.00	.00	.00	0.	1.02	1.10	151	.03	.02	.01	19.
1.01	1.20	8	.00	.00	.00	0.	1.02	1.20	152	.03	.02	.01	20.
1.01	1.30	9	.00	.00	.00	0.	1.02	1.30	153	.03	.02	.01	20.
1.01	1.40	10	.00	.00	.00	0.	1.02	1.40	154	.03	.02	.01	21.
1.01	1.50	11	.00	.00	.00	0.	1.02	1.50	155	.03	.02	.01	21.
1.01	2.00	12	.00	.00	.00	0.	1.02	2.00	156	.03	.02	.01	22.
1.01	2.10	13	.00	.00	.00	0.	1.02	2.10	157	.03	.02	.01	22.
1.01	2.20	14	.00	.00	.00	0.	1.02	2.20	158	.03	.02	.01	22.
1.01	2.30	15	.00	.00	.00	0.	1.02	2.30	159	.03	.02	.01	22.
1.01	2.40	16	.00	.00	.00	0.	1.02	2.40	160	.03	.02	.01	22.
1.01	2.50	17	.00	.00	.00	0.	1.02	2.50	161	.03	.02	.01	22.
1.01	3.00	18	.00	.00	.00	0.	1.02	3.00	162	.03	.02	.01	22.
1.01	3.10	19	.00	.00	.00	0.	1.02	3.10	163	.03	.02	.01	22.
1.01	3.20	20	.00	.00	.00	0.	1.02	3.20	164	.03	.02	.01	23.
1.01	3.30	21	.00	.00	.00	0.	1.02	3.30	165	.03	.02	.01	23.
1.01	3.40	22	.00	.00	.00	0.	1.02	3.40	166	.03	.02	.01	23.
1.01	3.50	23	.00	.00	.00	0.	1.02	3.50	167	.03	.02	.01	23.
1.01	4.00	24	.00	.00	.00	0.	1.02	4.00	168	.03	.02	.01	23.
1.01	4.10	25	.00	.00	.00	0.	1.02	4.10	169	.03	.02	.01	23.
1.01	4.20	26	.00	.00	.00	0.	1.02	4.20	170	.03	.02	.01	23.
1.01	4.30	27	.00	.00	.00	0.	1.02	4.30	171	.03	.02	.01	23.
1.01	4.40	28	.00	.00	.00	0.	1.02	4.40	172	.03	.02	.01	23.
1.01	4.50	29	.00	.00	.00	0.	1.02	4.50	173	.03	.02	.01	23.
1.01	5.00	30	.00	.00	.00	0.	1.02	5.00	174	.03	.02	.01	23.
1.01	5.10	31	.00	.00	.00	0.	1.02	5.10	175	.03	.02	.01	23.
1.01	5.20	32	.00	.00	.00	0.	1.02	5.20	176	.03	.02	.01	23.
1.01	5.30	33	.00	.00	.00	0.	1.02	5.30	177	.03	.02	.01	24.
1.01	5.40	34	.00	.00	.00	0.	1.02	5.40	178	.03	.02	.01	24.
1.01	5.50	35	.00	.00	.00	0.	1.02	5.50	179	.03	.02	.01	24.
1.01	6.00	36	.00	.00	.00	0.	1.02	6.00	180	.03	.02	.01	24.
1.01	6.10	37	.01	.00	.01	0.	1.02	6.10	181	.13	.11	.02	26.
1.01	6.20	38	.01	.00	.01	0.	1.02	6.20	182	.13	.11	.02	35.
1.01	6.30	39	.01	.00	.01	0.	1.02	6.30	183	.13	.11	.02	52.
1.01	6.40	40	.01	.00	.01	0.	1.02	6.40	184	.13	.11	.02	69.
1.01	6.50	41	.01	.00	.01	0.	1.02	6.50	185	.13	.11	.02	85.
1.01	7.00	42	.01	.00	.01	0.	1.02	7.00	186	.13	.11	.02	97.
1.01	7.10	43	.01	.00	.01	0.	1.02	7.10	187	.13	.11	.02	104.
1.01	7.20	44	.01	.00	.01	0.	1.02	7.20	188	.13	.11	.02	110.
1.01	7.30	45	.01	.00	.01	0.	1.02	7.30	189	.13	.11	.02	114.
1.01	7.40	46	.01	.00	.01	0.	1.02	7.40	190	.13	.11	.02	116.
1.01	7.50	47	.01	.00	.01	0.	1.02	7.50	191	.13	.11	.02	119.
1.01	8.00	48	.01	.00	.01	0.	1.02	8.00	192	.13	.12	.02	120.
1.01	8.10	49	.01	.00	.01	0.	1.02	8.10	193	.13	.12	.01	121.
1.01	8.20	50	.01	.00	.01	0.	1.02	8.20	194	.13	.12	.01	123.
1.01	8.30	51	.01	.00	.01	0.	1.02	8.30	195	.13	.12	.01	123.
1.01	8.40	52	.01	.00	.01	0.	1.02	8.40	196	.13	.12	.01	124.
1.01	8.50	53	.01	.00	.01	0.	1.02	8.50	197	.13	.12	.01	125.
1.01	9.00	54	.01	.00	.01	0.	1.02	9.00	198	.13	.12	.01	126.

1.01	8.20	50	.01	.00	.01	0.	1.02	8.20	194	.13	.12	.01	123.
1.01	8.30	51	.01	.00	.01	0.	1.02	8.30	195	.13	.12	.01	123.
1.01	8.40	52	.01	.00	.01	0.	1.02	8.40	196	.13	.12	.01	124.
[illegible]	8.50	53	.01	.00	.01	0.	1.02	8.50	197	.13	.12	.01	125.
1.01	9.00	54	.01	.00	.01	0.	1.02	9.00	198	.13	.12	.01	126.

B L A C K & V E A T C H PROJECT 9166. DATE 27 AUG 80 PAGE 7

FLOOD HYDROGRAPH PACKAGE – HEC-1 PROGRAM H21/02-CU TIME 18:16:26 CASE PMF

1.01	9.10	55	.01	.00	.01	0.	1.02	9.10	199	.13	.12	.01	126.
1.01	9.20	56	.01	.00	.01	0.	1.02	9.20	200	.13	.12	.01	127.
1.01	9.30	57	.01	.00	.01	0.	1.02	9.30	201	.13	.12	.01	127.
1.01	9.40	58	.01	.00	.01	0.	1.02	9.40	202	.13	.12	.01	128.
1.01	9.50	59	.01	.00	.01	0.	1.02	9.50	203	.13	.12	.01	128.
1.01	10.00	60	.01	.00	.01	0.	1.02	10.00	204	.13	.12	.01	129.
1.01	10.10	61	.01	.00	.01	0.	1.02	10.10	205	.13	.12	.01	129.
1.01	10.20	62	.01	.00	.01	0.	1.02	10.20	206	.13	.12	.01	129.
1.01	10.30	63	.01	.00	.01	0.	1.02	10.30	207	.13	.12	.01	130.
1.01	10.40	64	.01	.00	.01	0.	1.02	10.40	208	.13	.12	.01	130.
1.01	10.50	65	.01	.00	.01	0.	1.02	10.50	209	.13	.12	.01	131.
1.01	11.00	66	.01	.00	.01	0.	1.02	11.00	210	.13	.12	.01	131.
1.01	11.10	67	.01	.00	.01	0.	1.02	11.10	211	.13	.12	.01	131.
1.01	11.20	68	.01	.00	.01	0.	1.02	11.20	212	.13	.12	.01	131.
1.01	11.30	69	.01	.00	.01	0.	1.02	11.30	213	.13	.12	.01	132.
1.01	11.40	70	.01	.00	.01	0.	1.02	11.40	214	.13	.12	.01	132.
1.01	11.50	71	.01	.00	.01	0.	1.02	11.50	215	.13	.12	.01	132.
1.01	12.00	72	.01	.00	.01	0.	1.02	12.00	216	.13	.12	.01	133.
1.01	12.10	73	.03	.00	.03	0.	1.02	12.10	217	.42	.39	.02	141.
1.01	12.20	74	.03	.00	.03	0.	1.02	12.20	218	.42	.40	.02	170.
1.01	12.30	75	.03	.00	.03	0.	1.02	12.30	219	.42	.40	.02	222.
1.01	12.40	76	.03	.00	.03	0.	1.02	12.40	220	.42	.40	.02	280.
1.01	12.50	77	.03	.00	.03	1.	1.02	12.50	221	.42	.40	.02	330.
1.01	13.00	78	.03	.00	.03	1.	1.02	13.00	222	.42	.40	.02	366.
1.01	13.10	79	.04	.01	.03	2.	1.02	13.10	223	.50	.48	.02	391.
1.01	13.20	80	.04	.01	.03	3.	1.02	13.20	224	.50	.48	.02	416.
1.01	13.30	81	.04	.01	.03	4.	1.02	13.30	225	.50	.48	.01	442.
1.01	13.40	82	.04	.01	.03	5.	1.02	13.40	226	.50	.49	.01	466.
1.01	13.50	83	.04	.01	.03	6.	1.02	13.50	227	.50	.49	.01	486.
1.01	14.00	84	.04	.01	.03	7.	1.02	14.00	228	.50	.49	.01	500.
1.01	14.10	85	.05	.01	.03	8.	1.02	14.10	229	.62	.61	.01	513.
1.01	14.20	86	.05	.01	.03	9.	1.02	14.20	230	.62	.61	.01	533.
1.01	14.30	87	.05	.02	.03	11.	1.02	14.30	231	.62	.61	.01	561.
1.01	14.40	88	.05	.02	.03	12.	1.02	14.40	232	.62	.61	.01	590.
1.01	14.50	89	.05	.02	.03	14.	1.02	14.50	233	.62	.61	.01	614.
1.01	15.00	90	.05	.02	.03	15.	1.02	15.00	234	.62	.61	.01	632.
1.01	15.10	91	.04	.02	.03	16.	1.02	15.10	235	.57	.56	.01	641.
1.01	15.20	92	.07	.03	.04	18.	1.02	15.20	236	.95	.94	.01	655.
1.01	15.30	93	.13	.06	.07	21.	1.02	15.30	237	1.71	1.69	.02	714.
1.01	15.40	94	.33	.17	.15	31.	1.02	15.40	238	4.27	4.23	.04	939.
1.01	15.50	95	.09	.06	.04	48.	1.02	15.50	239	1.23	1.22	.01	1326.
1.01	16.00	96	.06	.04	.02	65.	1.02	16.00	240	.76	.75	.01	1696.
1.01	16.10	97	.04	.03	.02	71.	1.02	16.10	241	.58	.59	.00	1783.
1.01	16.20	98	.04	.03	.02	67.	1.02	16.20	242	.58	.58	.00	1631.
1.01	16.30	99	.04	.03	.02	57.	1.02	16.30	243	.58	.58	.00	1361.
1.01	16.40	100	.04	.03	.02	49.	1.02	16.40	244	.58	.58	.00	1108.
1.01	16.50	101	.04	.03	.02	42.	1.02	16.50	245	.58	.58	.00	944.
1.01	17.00	102	.04	.03	.02	38.	1.02	17.00	246	.58	.58	.00	835.
1.01	17.10	103	.04	.02	.01	36.	1.02	17.10	247	.46	.45	.00	759.
1.01	17.20	104	.04	.02	.01	34.	1.02	17.20	248	.46	.46	.00	699.
1.01	17.30	105	.04	.02	.01	32.	1.02	17.30	249	.46	.46	.00	645.
1.01	17.40	106	.04	.02	.01	30.	1.02	17.40	250	.46	.46	.00	599.
1.01	17.50	107	.04	.02	.01	28.	1.02	17.50	251	.46	.46	.00	563.
1.01	18.00	108	.04	.02	.01	28.	1.02	18.00	252	.46	.46	.00	539.
1.01	18.10	109	.00	.00	.00	26.	1.02	18.10	253	.04	.04	.00	510.
1.01	18.20	110	.00	.00	.00	24.	1.02	18.20	254	.04	.04	.00	456.

1.01	17.40	106	.04	.02	.01	30.	1.02	17.40	250	.46	.46	.00	599.
1.01	17.50	107	.04	.02	.01	28.	1.02	17.50	251	.46	.46	.00	563.
1.0	18.00	108	.04	.02	.01	28.	1.02	18.00	252	.46	.46	.00	539.
1.	18.10	109	.06	.00	.00	26.	1.02	18.10	253	.04	.04	.00	510.
1.0	18.20	110	.00	.00	.00	24.	1.02	18.20	254	.04	.04	.00	456.

1.01	18.30	111	.00	.00	.00	19.	1.02	18.30	255	.04	.04	.00	369.
1.01	18.40	112	.00	.00	.00	15.	1.02	18.40	256	.04	.04	.00	277.
1.01	18.50	113	.00	.00	.00	10.	1.02	18.50	257	.04	.04	.00	199.
1.01	19.00	114	.00	.00	.00	9.	1.02	19.00	258	.04	.04	.00	144.
1.01	19.10	115	.00	.00	.00	6.	1.02	19.10	259	.04	.04	.00	110.
1.01	19.20	116	.00	.00	.00	5.	1.02	19.20	260	.04	.04	.00	87.
1.01	19.30	117	.00	.00	.00	4.	1.02	19.30	261	.04	.04	.00	72.
1.01	19.40	118	.00	.00	.00	3.	1.02	19.40	262	.04	.04	.00	62.
1.01	19.50	119	.00	.00	.00	3.	1.02	19.50	263	.04	.04	.00	56.
1.01	20.00	120	.00	.00	.00	3.	1.02	20.00	264	.04	.04	.00	52.
1.01	20.10	121	.00	.00	.00	3.	1.02	20.10	265	.04	.04	.00	49.
1.01	20.20	122	.00	.00	.00	3.	1.02	20.20	266	.04	.04	.00	47.
1.01	20.30	123	.00	.00	.00	3.	1.02	20.30	267	.04	.04	.00	46.
1.01	20.40	124	.00	.00	.00	2.	1.02	20.40	268	.04	.04	.00	45.
1.01	20.50	125	.00	.00	.00	2.	1.02	20.50	269	.04	.04	.00	45.
1.01	21.00	126	.00	.00	.00	2.	1.02	21.00	270	.04	.04	.00	44.
1.01	21.10	127	.00	.00	.00	2.	1.02	21.10	271	.04	.04	.00	44.
1.01	21.20	128	.00	.00	.00	2.	1.02	21.20	272	.04	.04	.00	44.
1.01	21.30	129	.00	.00	.00	2.	1.02	21.30	273	.04	.04	.00	44.
1.01	21.40	130	.00	.00	.00	2.	1.02	21.40	274	.04	.04	.00	44.
1.01	21.50	131	.00	.00	.00	2.	1.02	21.50	275	.04	.04	.00	44.
1.01	22.00	132	.00	.00	.00	2.	1.02	22.00	276	.04	.04	.00	44.
1.01	22.10	133	.00	.00	.00	2.	1.02	22.10	277	.04	.04	.00	44.
1.01	22.20	134	.00	.00	.00	2.	1.02	22.20	278	.04	.04	.00	44.
1.01	22.30	135	.00	.00	.00	2.	1.02	22.30	279	.04	.04	.00	44.
1.01	22.40	136	.00	.00	.00	2.	1.02	22.40	280	.04	.04	.00	44.
1.01	22.50	137	.00	.00	.00	2.	1.02	22.50	281	.04	.04	.00	44.
1.01	23.00	138	.00	.00	.00	2.	1.02	23.00	282	.04	.04	.00	44.
1.01	23.10	139	.00	.00	.00	2.	1.02	23.10	283	.04	.04	.00	44.
1.01	23.20	140	.00	.00	.00	2.	1.02	23.20	284	.04	.04	.00	44.
1.01	23.30	141	.00	.00	.00	2.	1.02	23.30	285	.04	.04	.00	44.
1.01	23.40	142	.00	.00	.00	2.	1.02	23.40	286	.04	.04	.00	44.
1.01	23.50	143	.00	.00	.00	2.	1.02	23.50	287	.04	.04	.00	44.
1.02	.00	144	.00	.00	.00	2.	1.03	.00	288	.04	.04	.00	44.

SUM 34.58 31.92 2.66 34393.
(878.)(811.)(68.)(973.90)

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	1783.	719.	232.	119.	34385.
CMS	50.	20.	7.	3.	974.
INCHES		23.89	30.82	31.73	31.73
MM		606.89	782.85	805.99	805.99
AC-FT		357.	460.	474.	474.
THOUS CU M		440.	567.	584.	584.

HYDROGRAPH AT STA 1 FOR PLAN 1, RTIO 1

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	178.	72.	23.	17.	3438.
CMS	5.	2.	1.	0.	97.
INCHES		2.39	3.08	3.17	3.17
MM		60.59	78.26	80.60	80.60
AC-FT		36.	46.	47.	47.

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                         HYDROGRAPH AT STA    1 FOR PLAN 1, RTIO 6

                           PEAK    6-HOUR   24-HOUR   72-HOUR   TOTAL VOLUME
                   CFS      891.     360.      116.       60.        17192.
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                   CMS       25.      10.        3.        2.          487.
                INCHES              11.95     15.41     15.87         15.87
                    MM             303.45    391.42    402.99        402.99
                 AC-FT               178.      230.      237.          237.
            THOUS CU M               220.      284.      292.          292.

                         HYDROGRAPH AT STA    1 FOR PLAN 1, RTIO 7

                           PEAK    6-HOUR   24-HOUR   72-HOUR   TOTAL VOLUME
                   CFS     1753.     719.      232.      119.        34365.
                   CMS       50.      20.        7.        3.          974.
                INCHES              23.59     30.82     31.73         31.73
                    MM             636.89    782.85    805.99        805.99
                 AC-FT               357.      460.      474.          474.
            THOUS CU M               440.      567.      584.          584.


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

                                  HYDROGRAPH ROUTING

          ROUTING THROUGH UPSTREAM DAM

                    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    .000     .00       1       1       0       0               0

                    NSTPS   NSTDL     LAG   AMSKK       X     TSK    STORA  ISPRAT
                        1       0       0    .000    .000    .000    -785.      -1

    STAGE     785.00     786.00     787.00     788.00     789.00     790.00     791.00

     FLOW        .00      10.00      10.00      10.00      11.00      11.00      12.00

 SURFACE AREA=      0.        1.        3.       11.       21.       44.

   CAPACITY=      0.        2.       11.       77.      236.      557.

  ELEVATION=    780.      785.      790.      800.      810.      820.

                    CREL   SPWID   COQW   EXPW   ELEVL   COQL   CAREA   EXPL
                   739.2      .0     .0    1.5      .0     .0      .0     .0

                                        DAM DATA
                               TOPEL    COQD    EXPD   DAMWID
                               789.2     2.6     1.5     264.

                                     DAM BREACH DATA
                     BRWID      Z     ELBM    TFAIL    WSEL   FAILEL
```

CMS	25.	10.	3.	2.	487.
INCHES		11.95	15.41	15.87	15.87
MM		303.45	391.42	402.99	402.99
AC-FT		178.	230.	237.	237.
THOUS CU M		220.	264.	292.	292.

HYDROGRAPH AT STA 1 FOR PLAN 1, RTIO 7

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	1783.	719.	232.	119.	34365.
CMS	50.	20.	7.	3.	974.
INCHES		23.59	30.82	31.73	31.73
MM		634.89	782.85	805.99	805.99
AC-FT		357.	460.	474.	474.
THOUS CU M		440.	567.	584.	584.

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

HYDROGRAPH ROUTING

ROUTING THROUGH UPSTREAM DAM

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	.003	.00	1	1	0	0	0

NSTPS	NSTDL	LAG	AMSKK	X	TSK	STORA	ISPRAT
1	0	0	.000	.000	.000	-785.	-1

STAGE	785.00	786.00	787.00	788.00	789.00	790.00	791.00
FLOW	.00	10.00	10.00	10.00	11.00	11.00	12.00

SURFACE AREA=	0.	1.	3.	11.	21.	44.
CAPACITY=	0.	2.	11.	77.	236.	557.
ELEVATION=	780.	785.	790.	800.	810.	820.

CREL	SPWID	COQW	EXPW	ELEVL	COOL	CAREA	EXPL
739.2	.0	.0	1.5	.0	.0	.0	.0

DAM DATA

TOPEL	COQD	EXPD	DAMWID
789.2	2.6	1.5	264.

DAM BREACH DATA

BRWID	Z	ELBM	TFAIL	WSEL	FAILEL
10.	.50	752.00	1.00	785.00	789.20

STATION 2, PLAN 1, RATIO 1

BEGIN DAM FAILURE AT 38.50 HOURS

OVN

SUB-AREA RUNOFF COMPUTATION

PERTLE SPRINGS DAM (48 HR. PROBABLE MAXIMUM RUNOFF)

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

HYDROGRAPH DATA

IHYDG	IUHG	TAREA	SNAP	TRSDA	TRSPC	RATIO	ISNOW	ISAME	LOCAL
1	2	.43	.00	.43	1.00	.000	0	0	0

PRECIP DATA

SPFE	PMS	R6	R12	R24	R48	R72	R96
.00	24.70	101.00	120.00	130.00	140.00	.00	.00

LOSS DATA

LROPT	STRKR	DLTKR	RTIOL	ERAIN	STRKS	RTIOK	STRTL	CNSTL	ALSMX	RTIMP
0	.00	.00	1.00	.00	.00	1.00	-1.00	-80.00	.00	.00

CURVE NO = -80.00 WETNESS = -1.00 EFFECT CN = 80.00

UNIT HYDROGRAPH DATA
TC= .00 LAG= .65

RECESSION DATA
STRTQ= .00 QRCSN= .00 RTIOR= 1.00

UNIT HYDROGRAPH 21 END OF PERIOD ORDINATES, TC= .00 HOURS, LAG= .65 VOL= 1.00

35.	112.	224.	283.	274.	229.	162.	107.	75.	52.
36.	25.	17.	12.	8.	6.	4.	3.	2.	1.
1.									

0

END-OF-PERIOD FLOW

MO.DA	HR.MN	PERIOD	RAIN	EXCS	LOSS	COMP Q	MO.DA	HR.MN	PERIOD	RAIN	EXCS	LOSS	COMP Q
1.01	.10	1	.00	.00	.00	0.	1.02	.10	145	.03	.02	.01	4.
1.01	.20	2	.00	.00	.00	0.	1.02	.20	146	.03	.02	.01	6.
1.01	.30	3	.00	.00	.00	0.	1.02	.30	147	.03	.02	.01	10.
1.01	.40	4	.00	.00	.00	0.	1.02	.40	148	.03	.02	.01	15.
1.01	.50	5	.00	.00	.00	0.	1.02	.50	149	.03	.02	.01	19.
1.01	1.00	6	.00	.00	.00	0.	1.02	1.00	150	.03	.02	.01	23.
1.01	1.10	7	.00	.00	.00	0.	1.02	1.10	151	.03	.02	.01	26.
1.01	1.20	8	.00	.00	.00	0.	1.02	1.20	152	.03	.02	.01	28.
1.01	1.30	9	.00	.00	.00	0.	1.02	1.30	153	.03	.02	.01	29.
1.01	1.40	10	.00	.00	.00	0.	1.02	1.40	154	.03	.02	.01	30.
1.01	1.50	11	.00	.00	.00	0.	1.02	1.50	155	.03	.02	.01	31.
1.01	2.00	12	.00	.00	.00	0.	1.02	2.00	156	.03	.02	.01	32.
1.01	2.10	13	.00	.00	.00	0.	1.02	2.10	157	.03	.02	.01	32.
1.01	2.20	14	.00	.00	.00	0.	1.02	2.20	158	.03	.02	.01	32.
1.01	2.30	15	.00	.00	.00	0.	1.02	2.30	159	.03	.02	.01	33.

1.01	1.50	11	.00	.00	.00	0.	1.02	1.50	155	.03	.02	.01	31.
1.01	2.00	12	.00	.00	.00	0.	1.02	2.00	156	.03	.02	.01	32.
1.01	2.10	13	.00	.00	.00	0.	1.02	2.10	157	.03	.02	.01	32.
1.01	2.20	14	.00	.00	.00	0.	1.02	2.20	158	.03	.02	.01	32.
1.01	2.30	15	.00	.00	.00	0.	1.02	2.30	159	.03	.02	.01	33.

1.01	2.40	16	.00	.00	.00	0.	1.02	2.40	160	.03	.02	.01	33.
1.01	2.50	17	.00	.00	.00	0.	1.02	2.50	161	.03	.02	.01	33.
1.01	3.00	18	.00	.00	.00	0.	1.02	3.00	162	.03	.02	.01	33.
1.01	3.10	19	.00	.00	.00	0.	1.02	3.10	163	.03	.02	.01	33.
1.01	3.20	20	.00	.00	.00	0.	1.02	3.20	164	.03	.02	.01	34.
1.01	3.30	21	.00	.00	.00	0.	1.02	3.30	165	.03	.02	.01	34.
1.01	3.40	22	.00	.00	.00	0.	1.02	3.40	166	.03	.02	.01	34.
1.01	3.50	23	.00	.00	.00	0.	1.02	3.50	167	.03	.02	.01	34.
1.01	4.00	24	.00	.00	.00	0.	1.02	4.00	168	.03	.02	.01	34.
1.01	4.10	25	.00	.00	.00	0.	1.02	4.10	169	.03	.02	.01	34.
1.01	4.20	26	.00	.00	.00	0.	1.02	4.20	170	.03	.02	.01	34.
1.01	4.30	27	.00	.00	.00	0.	1.02	4.30	171	.03	.02	.01	35.
1.01	4.40	28	.00	.00	.00	0.	1.02	4.40	172	.03	.02	.01	35.
1.01	4.50	29	.00	.00	.00	0.	1.02	4.50	173	.03	.02	.01	35.
1.01	5.00	30	.00	.00	.00	0.	1.02	5.00	174	.03	.02	.01	35.
1.01	5.10	31	.00	.00	.00	0.	1.02	5.10	175	.03	.02	.01	35.
1.01	5.20	32	.00	.00	.00	0.	1.02	5.20	176	.03	.02	.01	35.
1.01	5.30	33	.00	.00	.00	0.	1.02	5.30	177	.03	.02	.01	35.
1.01	5.40	34	.00	.00	.00	0.	1.02	5.40	178	.03	.02	.01	35.
1.01	5.50	35	.00	.00	.00	0.	1.02	5.50	179	.03	.02	.01	35.
1.01	6.00	36	.00	.00	.00	0.	1.02	6.00	180	.03	.02	.01	36.
1.01	6.10	37	.01	.00	.01	0.	1.02	6.10	181	.13	.10	.03	39.
1.01	6.20	38	.01	.00	.01	0.	1.02	6.20	182	.13	.10	.03	48.
1.01	6.30	39	.01	.00	.01	0.	1.02	6.30	183	.13	.11	.02	67.
1.01	6.40	40	.01	.00	.01	0.	1.02	6.40	184	.13	.11	.02	90.
1.01	6.50	41	.01	.00	.01	0.	1.02	6.50	185	.13	.11	.02	113.
1.01	7.00	42	.01	.00	.01	0.	1.02	7.00	186	.13	.11	.02	133.
1.01	7.10	43	.01	.00	.01	0.	1.02	7.10	187	.13	.11	.02	148.
1.01	7.20	44	.01	.00	.01	0.	1.02	7.20	188	.13	.11	.02	158.
1.01	7.30	45	.01	.00	.01	0.	1.02	7.30	189	.13	.11	.02	165.
1.01	7.40	46	.01	.00	.01	0.	1.02	7.40	190	.13	.11	.02	171.
1.01	7.50	47	.01	.00	.01	0.	1.02	7.50	191	.13	.11	.02	175.
1.01	8.00	48	.01	.00	.01	0.	1.02	8.00	192	.13	.11	.02	179.
1.01	8.10	49	.01	.00	.01	0.	1.02	8.10	193	.13	.11	.02	181.
1.01	8.20	50	.01	.00	.01	0.	1.02	8.20	194	.13	.11	.02	184.
1.01	8.30	51	.01	.00	.01	0.	1.02	8.30	195	.13	.12	.02	185.
1.01	8.40	52	.01	.00	.01	0.	1.02	8.40	196	.13	.12	.01	187.
1.01	8.50	53	.01	.00	.01	0.	1.02	8.50	197	.13	.12	.01	188.
1.01	9.00	54	.01	.00	.01	0.	1.02	9.00	198	.13	.12	.01	190.
1.01	9.10	55	.01	.00	.01	0.	1.02	9.10	199	.13	.12	.01	191.
1.01	9.20	56	.01	.00	.01	0.	1.02	9.20	200	.13	.12	.01	192.
1.01	9.30	57	.01	.00	.01	0.	1.02	9.30	201	.13	.12	.01	193.
1.01	9.40	58	.01	.00	.01	0.	1.02	9.40	202	.13	.12	.01	194.
1.01	9.50	59	.01	.00	.01	0.	1.02	9.50	203	.13	.12	.01	194.
1.01	10.00	60	.01	.00	.01	0.	1.02	10.00	204	.13	.12	.01	195.
1.01	10.10	61	.01	.00	.01	0.	1.02	10.10	205	.13	.12	.01	196.
1.01	10.20	62	.01	.00	.01	0.	1.02	10.20	206	.13	.12	.01	196.
1.01	10.30	63	.01	.00	.01	0.	1.02	10.30	207	.13	.12	.01	197.
1.01	10.40	64	.01	.00	.01	0.	1.02	10.40	208	.13	.12	.01	198.
1.01	10.50	65	.01	.00	.01	0.	1.02	10.50	209	.13	.12	.01	198.
1.01	11.00	66	.01	.00	.01	0.	1.02	11.00	210	.13	.12	.01	199.
1.01	11.10	67	.01	.00	.01	0.	1.02	11.10	211	.13	.12	.01	199.
1.01	11.20	68	.01	.00	.01	0.	1.02	11.20	212	.13	.12	.01	200.
1.01	11.30	69	.01	.00	.01	0.	1.02	11.30	213	.13	.12	.01	200.
1.01	11.40	70	.01	.00	.01	0.	1.02	11.40	214	.13	.12	.01	201.
1.01	11.50	71	.01	.00	.01	0.	1.02	11.50	215	.13	.12	.01	201.

[illegible]	[illegible]	[illegible]	.01	.00	.01	0.	1.02	11.10	211	.13	.12	.01	199.
1.01	11.20	68	.01	.00	.01	0.	1.02	11.20	212	.13	.12	.01	200.
1.01	11.30	69	.01	.00	.01	0.	1.02	11.30	213	.13	.12	.01	200.
1.01	11.40	70	.01	.00	.01	0.	1.02	11.40	214	.13	.12	.01	201.
1.01	11.50	71	.01	.00	.01	0.	1.02	11.50	215	.13	.12	.01	201.

1.01	12.00	72	.01	.00	.01	0.	1.02	12.00	216	.13	.12	.01	202.
1.01	12.10	73	.03	.00	.03	0.	1.02	12.10	217	.42	.39	.02	212.
1.01	12.20	74	.03	.00	.03	0.	1.02	12.20	218	.42	.39	.02	242.
1.01	12.30	75	.03	.00	.03	0.	1.02	12.30	219	.42	.40	.02	303.
1.01	12.40	76	.03	.00	.03	0.	1.02	12.40	220	.42	.40	.02	379.
1.01	12.50	77	.03	.00	.03	0.	1.02	12.50	221	.42	.40	.02	454.
1.01	13.00	78	.03	.00	.03	1.	1.02	13.00	222	.42	.40	.02	518.
1.01	13.10	79	.04	.00	.03	1.	1.02	13.10	223	.50	.48	.02	566.
1.01	13.20	80	.04	.01	.03	2.	1.02	13.20	224	.50	.48	.02	606.
1.01	13.30	81	.04	.01	.03	3.	1.02	13.30	225	.50	.48	.02	646.
1.01	13.40	82	.04	.01	.03	5.	1.02	13.40	226	.50	.48	.02	684.
1.01	13.50	83	.04	.01	.03	6.	1.02	13.50	227	.50	.48	.01	718.
1.01	14.00	84	.04	.01	.03	8.	1.02	14.00	228	.50	.49	.01	745.
1.01	14.10	85	.05	.01	.04	9.	1.02	14.10	229	.62	.61	.02	768.
1.01	14.20	86	.05	.01	.03	11.	1.02	14.20	230	.62	.61	.01	796.
1.01	14.30	87	.05	.01	.03	13.	1.02	14.30	231	.62	.61	.01	833.
1.01	14.40	88	.05	.02	.03	15.	1.02	14.40	232	.62	.61	.01	874.
1.01	14.50	89	.05	.02	.03	17.	1.02	14.50	233	.62	.61	.01	913.
1.01	15.00	90	.05	.02	.03	20.	1.02	15.00	234	.62	.61	.01	946.
1.01	15.10	91	.04	.02	.03	22.	1.02	15.10	235	.57	.56	.01	967.
1.01	15.20	92	.07	.03	.04	24.	1.02	15.20	236	.95	.93	.01	990.
1.01	15.30	93	.13	.06	.07	27.	1.02	15.30	237	1.71	1.68	.02	1057.
1.01	15.40	94	.33	.17	.16	38.	1.02	15.40	238	4.27	4.22	.04	1308.
1.01	15.50	95	.09	.05	.04	57.	1.02	15.50	239	1.23	1.22	.01	1751.
1.01	16.00	96	.06	.03	.02	60.	1.02	16.00	240	.76	.75	.01	2269.
1.01	16.10	97	.04	.03	.02	93.	1.02	16.10	241	.58	.58	.00	2536.
1.01	16.20	98	.04	.03	.02	95.	1.02	16.20	242	.58	.58	.00	2493.
1.01	16.30	99	.04	.03	.02	85.	1.02	16.30	243	.58	.58	.00	2240.
1.01	16.40	100	.04	.03	.02	76.	1.02	16.40	244	.58	.58	.00	1892.
1.01	16.50	101	.04	.03	.02	67.	1.02	16.50	245	.58	.58	.00	1599.
1.01	17.00	102	.04	.03	.02	60.	1.02	17.00	246	.58	.58	.00	1402.
1.01	17.10	103	.04	.02	.01	55.	1.02	17.10	247	.46	.45	.00	1265.
1.01	17.20	104	.04	.02	.01	52.	1.02	17.20	248	.46	.45	.00	1156.
1.01	17.30	105	.04	.02	.01	49.	1.02	17.30	249	.46	.45	.00	1063.
1.01	17.40	106	.04	.02	.01	46.	1.02	17.40	250	.46	.45	.00	982.
1.01	17.50	107	.04	.02	.01	44.	1.02	17.50	251	.46	.45	.00	917.
1.01	18.00	108	.04	.02	.01	42.	1.02	18.00	252	.46	.46	.00	867.
1.01	18.10	109	.00	.00	.00	40.	1.02	18.10	253	.04	.04	.00	818.
1.01	18.20	110	.00	.00	.00	37.	1.02	18.20	254	.04	.04	.00	749.
1.01	18.30	111	.00	.00	.00	32.	1.02	18.30	255	.04	.04	.00	640.
1.01	18.40	112	.00	.00	.00	26.	1.02	18.40	256	.04	.04	.00	513.
1.01	18.50	113	.00	.00	.00	20.	1.02	18.50	257	.04	.04	.00	391.
1.01	19.00	114	.00	.00	.00	15.	1.02	19.00	258	.04	.04	.00	289.
1.01	19.10	115	.00	.00	.00	11.	1.02	19.10	259	.04	.04	.00	217.
1.01	19.20	116	.00	.00	.00	9.	1.02	19.20	260	.04	.04	.00	171.
1.01	19.30	117	.00	.00	.00	7.	1.02	19.30	261	.04	.04	.00	139.
1.01	19.40	118	.00	.00	.00	6.	1.02	19.40	262	.04	.04	.00	117.
1.01	19.50	119	.00	.00	.00	5.	1.02	19.50	263	.04	.04	.00	101.
1.01	20.00	120	.00	.00	.00	5.	1.02	20.00	264	.04	.04	.00	91.
1.01	20.10	121	.00	.00	.00	4.	1.02	20.10	265	.04	.04	.00	83.
1.01	20.20	122	.00	.00	.00	4.	1.02	20.20	266	.04	.04	.00	78.
1.01	20.30	123	.00	.00	.00	4.	1.02	20.30	267	.04	.04	.00	75.
1.01	20.40	124	.00	.00	.00	4.	1.02	20.40	268	.04	.04	.00	73.
1.01	20.50	125	.00	.00	.00	4.	1.02	20.50	269	.04	.04	.00	71.
1.01	21.00	126	.00	.00	.00	4.	1.02	21.00	270	.04	.04	.00	70.
1.01	21.10	127	.00	.00	.00	4.	1.02	21.10	271	.04	.04	.00	69.

1.01	20.30	123	.00	.00	.00	4.	1.02	20.30	267	.04	.04	.00	75.
1.01	20.40	124	.00	.00	.00	4.	1.02	20.40	268	.04	.04	.00	73.
1.01	20.50	125	.00	.00	.00	4.	1.02	20.50	269	.04	.04	.00	71.
[illegible]	21.00	126	.00	.00	.00	4.	1.02	21.00	270	.04	.04	.00	70.
[illegible]	21.10	127	.00	.00	.00	4.	1.02	21.10	271	.04	.04	.00	69.

1.01	21.20	128	.00	.00	.00	4.	1.02	21.20	272	.04	.04	.00	68.
1.01	21.30	129	.00	.00	.00	4.	1.02	21.30	273	.04	.04	.00	68.
1.01	21.40	130	.00	.00	.00	4.	1.02	21.40	274	.04	.04	.00	68.
1.01	21.50	131	.00	.00	.00	4.	1.02	21.50	275	.04	.04	.00	68.
1.01	22.00	132	.00	.00	.00	4.	1.02	22.00	276	.04	.04	.00	68.
1.01	22.10	133	.00	.00	.00	4.	1.02	22.10	277	.04	.04	.00	68.
1.01	22.20	134	.00	.00	.00	4.	1.02	22.20	278	.04	.04	.00	68.
1.01	22.30	135	.00	.00	.00	4.	1.02	22.30	279	.04	.04	.00	68.
1.01	22.40	136	.00	.00	.00	4.	1.02	22.40	280	.04	.04	.00	68.
1.01	22.50	137	.00	.00	.00	4.	1.02	22.50	281	.04	.04	.00	68.
1.01	23.00	138	.00	.00	.00	4.	1.02	23.00	282	.04	.04	.00	68.
1.01	23.10	139	.00	.00	.00	4.	1.02	23.10	283	.04	.04	.00	68.
1.01	23.20	140	.00	.00	.00	4.	1.02	23.20	284	.04	.04	.00	68.
1.01	23.30	141	.00	.00	.00	4.	1.02	23.30	285	.04	.04	.00	68.
1.01	23.40	142	.00	.00	.00	4.	1.02	23.40	286	.04	.04	.00	68.
1.01	23.50	143	.00	.00	.00	4.	1.02	23.50	287	.04	.04	.00	68.
1.02	.00	144	.00	.00	.00	4.	1.03	.00	288	.04	.04	.00	68.
									SUM	34.58	31.75	2.83	52522.
										(878.)	(806.)	(72.)	(1487.26)

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	2536.	1097.	355.	182.	52483.
CMS	72.	31.	10.	5.	1486.
INCHES		23.74	30.68	31.54	31.54
MM		603.03	779.31	801.07	801.07
AC-FT		544.	703.	723.	723.
THOUS CU M		671.	867.	892.	892.

HYDROGRAPH AT STA 3 FOR PLAN 1, RTIO 1

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	254.	110.	35.	18.	5246.
CMS	7.	3.	1.	1.	149.
INCHES		2.37	3.07	3.15	3.15
MM		60.30	77.93	80.11	80.11
AC-FT		54.	70.	72.	72.
THOUS CU M		67.	87.	89.	89.

HYDROGRAPH AT STA 3 FOR PLAN 1, RTIO 2

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	304.	132.	43.	22.	6298.
CMS	9.	4.	1.	1.	178.
INCHES		2.85	3.68	3.78	3.78
MM		72.36	93.52	96.13	96.13
AC-FT		65.	84.	87.	87.
THOUS CU M		81.	104.	107.	107.

HYDROGRAPH AT STA 3 FOR PLAN 1, RTIO 3

```
   53.     56.     56.     53.     56.     59.     59.     59.     59.     59.
   63.     79.    109.    150.    189.    223.    247.    264.    276.    285.
  292.    297.    302.    305.    308.    311.    313.    315.    317.    318.
  320.    321.    322.    323.    325.    326.    327.    328.    329.    329.
  330.    331.    332.    333.    333.    334.    348.    395.    491.    620.
  747.    852.    933.   1000.   1065.   1128.   1185.   1230.   1269.   1312.
 1370.   1436.   1503.   1556.   1590.   1632.   1728.   2082.   2987.   3901.
 4325.   4162.   3659.   3050.   2577.   2267.   2052.   1902.   1760.   1629.
 1519.   1435.   1356.   1246.   1076.    867.    655.    477.    355.    275.
  221.    185.    161.    145.    134.    127.    122.    119.    116.    115.
  113.    113.    113.    113.    113.    113.    113.    113.    113.    113.
  113.    113.    113.    113.    113.    113.    113.    113.

                        PEAK   6-HOUR  24-HOUR  72-HOUR  TOTAL VOLUME
               CFS     4325.    1815.     586.     302.        86951.
               CMS      122.      51.      17.       9.         2462.
            INCHES              23.78    30.73    31.65         31.65
                MM             604.12   780.45   803.78        803.78
             AC-FT                900.    1163.    1198.         1198.
         THOUS CU M              1110.    1434.    1477.         1477.


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

                               HYDROGRAPH ROUTING

                  ROUTING THROUGH PERTLE SPRINGS LAKE

            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    .000    .00       1       1      0      0              0

            NSTPS   NSTDL    LAG   AMSKK      X     TSK   STORA  ISPRAT
                1       0      0    .000   .000    .000   -774.     -1

  STAGE     774.00   775.00   776.00   777.00   778.00   779.00   780.00   781.00   782.00

  FLOW         .00    53.00   191.00   348.00   532.00   715.00   915.00  1125.00  1341.00

  SURFACE AREA=     0.     16.     32.     38.     66.     78.     97.

     CAPACITY=      0.     75.    218.    570.   1087.   1807.   2677.

    ELEVATION=    760.    774.    780.    790.    800.    810.    820.

                CREL   SPWID   COQW   EXPW   ELEVL   COQL   CAREA   EXPL
```

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B L A C K   &   V E A T C H                              PROJECT 9166.    DATE 27 AUG 80   PAGE   71
*****************************************************************************************************
FLOOD HYDROGRAPH PACKAGE - HEC-1                         PROGRAM H21/02-OU  TIME  18:16:26  CASE PMF

                 774.0      .0      .0      .0      .0      .0      .0      .0

                                     DAM DATA
                              TOPEL    COQD    EXPD   DAMWID
                              777.6      .0      .0       0.

   CREST LENGTH      11.      31.     144.     194.     349.     514.     551.     569.
   AT OR BELOW
   ELEVATION      776.0    776.5    777.0    777.6    777.8    778.0    779.0    779.5

                                  DAM BREACH DATA
                      BRWID       Z    ELBM   TFAIL   WSEL   FAILEL
```

GVN

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

SUB-AREA RUNOFF COMPUTATION

LIONS LAKE DAM (48 HR. PROBABLE MAXIMUM RUNOFF)

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
6	0	0	0	0	3	1	0	0

HYDROGRAPH DATA

IHYDG	IUHG	TAREA	SNAP	TRSDA	TRSPC	RATIO	ISNOW	ISAME	LOCAL
1	2	.67	.00	.67	1.00	.000	0	0	0

PRECIP DATA

SPFE	PMS	R6	R12	R24	R48	R72	R96
.00	24.70	101.00	120.00	130.00	140.00	.00	.00

LOSS DATA

LROPT	STRKR	DLTKR	RTIOL	ERAIN	STRKS	RTIOK	STRTL	CNSTL	ALSMX	RTIMP
0	.00	.00	1.00	.00	.03	1.00	-1.00	-82.00	.00	.00

CURVE NO = -82.00   WETNESS = -1.00   EFFECT CN = 82.00

UNIT HYDROGRAPH DATA
TC= .00   LAG= .61

RECESSION DATA
STRTQ= .00   QRCSN= .00   RTIOR= 1.00

UNIT HYDROGRAPH 20 END OF PERIOD ORDINATES, TC= .00 HOURS, LAG= .61 VOL= 1.00

63.	204.	392.	463.	432.	343.	222.	148.	102.	68.
47.	31.	21.	14.	10.	7.	5.	3.	2.	1.

0

END-OF-PERIOD FLOW

MO.DA	HR.MN	PERIOD	RAIN	EXCS	LOSS	COMP Q	MO.DA	HR.MN	PERIOD	RAIN	EXCS	LOSS	COMP Q
1.01	.10	1	.00	.00	.00	0.	1.02	.10	145	.03	.02	.01	7.
1.01	.20	2	.00	.00	.00	0.	1.02	.20	146	.03	.02	.01	11.
1.01	.30	3	.00	.00	.00	0.	1.02	.30	147	.03	.02	.01	18.
1.01	.40	4	.00	.00	.00	0.	1.02	.40	148	.03	.02	.01	26.
1.01	.50	5	.00	.00	.00	0.	1.02	.50	149	.03	.02	.01	34.
1.01	1.00	6	.00	.00	.00	0.	1.02	1.00	150	.03	.02	.01	40.
1.01	1.10	7	.00	.00	.00	0.	1.02	1.10	151	.03	.02	.01	44.
1.01	1.20	8	.00	.00	.00	0.	1.02	1.20	152	.03	.02	.01	47.
1.01	1.30	9	.00	.00	.00	0.	1.02	1.30	153	.03	.02	.01	49.
1.01	1.40	10	.00	.00	.00	0.	1.02	1.40	154	.03	.02	.01	50.
1.01	1.50	11	.00	.00	.00	0.	1.02	1.50	155	.03	.02	.01	51.
1.01	2.00	12	.00	.00	.00	0.	1.02	2.00	156	.03	.02	.01	52.
1.01	2.10	13	.00	.00	.00	0.	1.02	2.10	157	.03	.02	.01	53.
1.01	2.20	14	.00	.00	.00	0.	1.02	2.20	158	.03	.02	.01	53.
1.01	2.30	15	.00	.00	.00	0.	1.02	2.30	159	.03	.02	.01	54.
1.01	2.40	16	.00	.00	.00	0.	1.02	2.40	160	.03	.02	.01	54.

1.01	2.00	12	.00	.00	.00	0.	1.02	2.00	156	.03	.02	.01	52.
1.01	2.10	13	.00	.00	.00	0.	1.02	2.10	157	.03	.02	.01	53.
01	2.20	14	.00	.00	.00	0.	1.02	2.20	158	.03	.02	.01	53.
1	2.30	15	.00	.00	.00	0.	1.02	2.30	159	.03	.02	.01	54.
.01	2.40	16	.00	.00	.00	0.	1.02	2.40	160	.03	.02	.01	54.

1.01	2.50	17	.00	.00	.00	0.	1.02	2.50	161	.03	.02	.01	54.
1.01	3.00	18	.00	.00	.00	0.	1.02	3.00	162	.03	.02	.01	54.
1.01	3.10	19	.00	.00	.00	0.	1.02	3.10	163	.03	.02	.01	55.
1.01	3.20	20	.00	.00	.00	0.	1.02	3.20	164	.03	.02	.01	55.
1.01	3.30	21	.00	.00	.00	0.	1.02	3.30	165	.03	.02	.01	55.
1.01	3.40	22	.00	.00	.00	0.	1.02	3.40	166	.03	.02	.01	55.
1.01	3.50	23	.00	.00	.00	0.	1.02	3.50	167	.03	.02	.01	55.
1.01	4.00	24	.00	.00	.00	0.	1.02	4.00	168	.03	.02	.01	56.
1.01	4.10	25	.00	.00	.00	0.	1.02	4.10	169	.03	.02	.01	56.
1.01	4.20	26	.00	.00	.00	0.	1.02	4.20	170	.03	.02	.01	56.
1.01	4.30	27	.00	.00	.00	0.	1.02	4.30	171	.03	.02	.01	56.
1.01	4.40	28	.00	.00	.00	0.	1.02	4.40	172	.03	.02	.01	56.
1.01	4.50	29	.00	.00	.00	0.	1.02	4.50	173	.03	.02	.01	56.
1.01	5.00	30	.00	.00	.00	0.	1.02	5.00	174	.03	.02	.01	57.
1.01	5.10	31	.00	.00	.00	0.	1.02	5.10	175	.03	.02	.01	57.
1.01	5.20	32	.00	.00	.00	0.	1.02	5.20	176	.03	.02	.01	57.
1.01	5.30	33	.00	.00	.00	0.	1.02	5.30	177	.03	.02	.01	57.
1.01	5.40	34	.00	.00	.00	0.	1.02	5.40	178	.03	.02	.00	57.
1.01	5.50	35	.00	.00	.00	0.	1.02	5.50	179	.03	.02	.00	57.
1.01	6.00	36	.00	.00	.00	0.	1.02	6.00	180	.03	.02	.00	58.
1.01	6.10	37	.01	.00	.01	0.	1.02	6.10	181	.13	.11	.02	63.
1.01	6.20	38	.01	.00	.01	0.	1.02	6.20	182	.13	.11	.02	81.
1.01	6.30	39	.01	.00	.01	0.	1.02	6.30	183	.13	.11	.02	114.
1.01	6.40	40	.01	.00	.01	0.	1.02	6.40	184	.13	.11	.02	155.
1.01	6.50	41	.01	.00	.01	0.	1.02	6.50	185	.13	.11	.02	193.
1.01	7.00	42	.01	.00	.01	0.	1.02	7.00	186	.13	.11	.02	223.
1.01	7.10	43	.01	.00	.01	0.	1.02	7.10	187	.13	.11	.02	244.
1.01	7.20	44	.01	.00	.01	0.	1.02	7.20	188	.13	.11	.02	259.
1.01	7.30	45	.01	.00	.01	0.	1.02	7.30	189	.13	.11	.02	269.
1.01	7.40	46	.01	.00	.01	0.	1.02	7.40	190	.13	.12	.02	277.
1.01	7.50	47	.01	.00	.01	0.	1.02	7.50	191	.13	.12	.01	283.
1.01	8.00	48	.01	.00	.01	0.	1.02	8.00	192	.13	.12	.01	287.
1.01	8.10	49	.01	.00	.01	0.	1.02	8.10	193	.13	.12	.01	291.
1.01	8.20	50	.01	.00	.01	0.	1.02	8.20	194	.13	.12	.01	294.
1.01	8.30	51	.01	.00	.01	0.	1.02	8.30	195	.13	.12	.01	296.
1.01	8.40	52	.01	.00	.01	0.	1.02	8.40	196	.13	.12	.01	298.
1.01	8.50	53	.01	.00	.01	0.	1.02	8.50	197	.13	.12	.01	300.
1.01	9.00	54	.01	.00	.01	0.	1.02	9.00	198	.13	.12	.01	302.
1.01	9.10	55	.01	.00	.01	0.	1.02	9.10	199	.13	.12	.01	303.
1.01	9.20	56	.01	.00	.01	0.	1.02	9.20	200	.13	.12	.01	304.
1.01	9.30	57	.01	.00	.01	0.	1.02	9.30	201	.13	.12	.01	305.
1.01	9.40	58	.01	.00	.01	0.	1.02	9.40	202	.13	.12	.01	307.
1.01	9.50	59	.01	.00	.01	0.	1.02	9.50	203	.13	.12	.01	308.
1.01	10.00	60	.01	.00	.01	0.	1.02	10.00	204	.13	.12	.01	309.
1.01	10.10	61	.01	.00	.01	0.	1.02	10.10	205	.13	.12	.01	309.
1.01	10.20	62	.01	.00	.01	0.	1.02	10.20	206	.13	.12	.01	310.
1.01	10.30	63	.01	.00	.01	0.	1.02	10.30	207	.13	.12	.01	311.
1.01	10.40	64	.01	.00	.01	0.	1.02	10.40	208	.13	.12	.01	312.
1.01	10.50	65	.01	.00	.01	0.	1.02	10.50	209	.13	.12	.01	313.
1.01	11.00	66	.01	.00	.01	0.	1.02	11.00	210	.13	.12	.01	313.
1.01	11.10	67	.01	.00	.01	0.	1.02	11.10	211	.13	.12	.01	314.
1.01	11.20	68	.01	.00	.01	0.	1.02	11.20	212	.13	.12	.01	315.
1.01	11.30	69	.01	.00	.01	0.	1.02	11.30	213	.13	.12	.01	315.
1.01	11.40	70	.01	.00	.01	0.	1.02	11.40	214	.13	.12	.01	316.
1.01	11.50	71	.01	.00	.01	0.	1.02	11.50	215	.13	.12	.01	317.
1.01	12.00	72	.01	.00	.01	0.	1.02	12.00	216	.13	.12	.01	317.

1.01	11.20	68	.01	.00	.01	0.	1.02	11.20	212	.13	.12	.01	315.
1.01	11.30	69	.01	.00	.01	0.	1.02	11.30	213	.13	.12	.01	315.
1.01	11.40	70	.01	.00	.01	0.	1.02	11.40	214	.13	.12	.01	316.
1.01	11.50	71	.01	.00	.01	0.	1.02	11.50	215	.13	.12	.01	317.
1.01	12.00	72	.01	.00	.01	0.	1.02	12.00	216	.13	.12	.01	317.

1.01	12.10	73	.03	.00	.03	0.	1.02	12.10	217	.42	.40	.02	335.
1.01	12.20	74	.03	.00	.03	0.	1.02	12.20	218	.42	.40	.02	391.
1.01	12.30	75	.03	.00	.03	1.	1.02	12.30	219	.42	.40	.02	498.
1.01	12.40	76	.03	.00	.03	1.	1.02	12.40	220	.42	.40	.02	626.
1.01	12.50	77	.03	.00	.03	2.	1.02	12.50	221	.42	.40	.01	745.
1.01	13.00	78	.03	.00	.03	4.	1.02	13.00	222	.42	.40	.01	841.
1.01	13.10	79	.04	.01	.03	6.	1.02	13.10	223	.50	.48	.02	908.
1.01	13.20	80	.04	.01	.03	8.	1.02	13.20	224	.50	.49	.01	968.
1.01	13.30	81	.04	.01	.03	10.	1.02	13.30	225	.50	.49	.01	1030.
1.01	13.40	82	.04	.01	.03	13.	1.02	13.40	226	.50	.49	.01	1088.
1.01	13.50	83	.04	.01	.03	15.	1.02	13.50	227	.50	.49	.01	1138.
1.01	14.00	84	.04	.01	.03	18.	1.02	14.00	228	.50	.49	.01	1177.
1.01	14.10	85	.05	.01	.03	20.	1.02	14.10	229	.62	.61	.01	1211.
1.01	14.20	86	.05	.02	.03	23.	1.02	14.20	230	.62	.61	.01	1254.
1.01	14.30	87	.05	.02	.03	27.	1.02	14.30	231	.62	.61	.01	1315.
1.01	14.40	88	.05	.02	.03	31.	1.02	14.40	232	.62	.61	.01	1381.
1.01	14.50	89	.05	.02	.03	35.	1.02	14.50	233	.62	.61	.01	1441.
1.01	15.00	90	.05	.02	.03	38.	1.02	15.00	234	.62	.62	.01	1468.
1.01	15.10	91	.04	.02	.02	41.	1.02	15.10	235	.57	.56	.01	1516.
1.01	15.20	92	.07	.03	.04	45.	1.02	15.20	236	.95	.94	.01	1550.
1.01	15.30	93	.13	.06	.07	52.	1.02	15.30	237	1.71	1.69	.02	1668.
1.01	15.40	94	.33	.18	.14	73.	1.02	15.40	238	4.27	4.23	.03	2115.
1.01	15.50	95	.09	.06	.04	102.	1.02	15.50	239	1.23	1.22	.01	2895.
1.01	16.00	96	.05	.04	.02	140.	1.02	16.00	240	.76	.75	.00	3744.
1.01	16.10	97	.04	.03	.02	167.	1.02	16.10	241	.58	.58	.00	4020.
1.01	16.20	98	.04	.03	.02	165.	1.02	16.20	242	.58	.58	.00	3900.
1.01	16.30	99	.04	.03	.02	149.	1.02	16.30	243	.58	.55	.00	3406.
1.01	16.40	100	.04	.03	.02	126.	1.02	16.40	244	.58	.58	.00	2802.
1.01	16.50	101	.04	.03	.01	109.	1.02	16.50	245	.58	.58	.00	2375.
1.01	17.00	102	.04	.03	.01	99.	1.02	17.00	246	.58	.58	.00	2094.
1.01	17.10	103	.04	.02	.01	91.	1.02	17.10	247	.46	.46	.00	1889.
1.01	17.20	104	.04	.02	.01	86.	1.02	17.20	248	.46	.46	.00	1735.
1.01	17.30	105	.04	.02	.01	80.	1.02	17.30	249	.46	.46	.00	1597.
1.01	17.40	106	.04	.02	.01	76.	1.02	17.40	250	.46	.46	.00	1479.
1.01	17.50	107	.04	.02	.01	72.	1.02	17.50	251	.46	.46	.00	1385.
1.01	18.00	108	.04	.03	.01	69.	1.02	18.00	252	.46	.46	.00	1315.
1.01	18.10	109	.00	.00	.00	66.	1.02	18.10	253	.04	.04	.00	1243.
1.01	18.20	110	.00	.00	.00	60.	1.02	18.20	254	.04	.04	.00	1129.
1.01	18.30	111	.00	.00	.00	51.	1.02	18.30	255	.04	.04	.00	945.
1.01	18.40	112	.00	.00	.00	40.	1.02	18.40	256	.04	.04	.00	737.
1.01	18.50	113	.00	.00	.00	30.	1.02	18.50	257	.04	.04	.00	547.
1.01	19.00	114	.00	.00	.00	22.	1.02	19.00	258	.04	.04	.00	397.
1.01	19.10	115	.00	.00	.00	16.	1.02	19.10	259	.04	.04	.00	301.
1.01	19.20	116	.00	.00	.00	13.	1.02	19.20	260	.04	.04	.00	238.
1.01	19.30	117	.00	.00	.00	11.	1.02	19.30	261	.04	.04	.00	194.
1.01	19.40	118	.00	.00	.00	9.	1.02	19.40	262	.04	.04	.00	165.
1.01	19.50	119	.00	.00	.00	8.	1.02	19.50	263	.04	.04	.00	145.
1.01	20.00	120	.00	.00	.00	7.	1.02	20.00	264	.04	.04	.00	132.
1.01	20.10	121	.00	.00	.00	7.	1.02	20.10	265	.04	.04	.00	123.
1.01	20.20	122	.00	.00	.00	6.	1.02	20.20	266	.04	.04	.00	117.
1.01	20.30	123	.00	.00	.00	5.	1.02	20.30	267	.04	.04	.00	113.
1.01	20.40	124	.00	.00	.00	6.	1.02	20.40	268	.04	.04	.00	110.
1.01	20.50	125	.00	.00	.00	6.	1.02	20.50	269	.04	.04	.00	108.
1.01	21.00	126	.00	.00	.00	6.	1.02	21.00	270	.04	.04	.00	107.
1.01	21.10	127	.00	.00	.00	6.	1.02	21.10	271	.04	.04	.00	106.
1.01	21.20	128	.00	.00	.00	6.	1.02	21.20	272	.04	.04	.00	106.

1.01	20.40	124	.00	.00	.00	6.	1.02	20.40	268	.04	.04	.00	110.
1.01	20.50	125	.00	.00	.00	6.	1.02	20.50	269	.04	.04	.00	108.
[illegible] 01	21.00	126	.00	.00	.00	6.	1.02	21.00	270	.04	.04	.00	107.
[illegible] 1	21.10	127	.00	.00	.00	6.	1.02	21.10	271	.04	.04	.00	106.
[illegible] 1	21.20	128	.00	.00	.00	6.	1.02	21.20	272	.04	.04	.00	106.

1.01	21.30	129	.00	.00	.00	6.	1.02	21.30	273	.04	.04	.00	106.
1.01	21.40	130	.00	.00	.00	6.	1.02	21.40	274	.04	.04	.00	106.
1.01	21.50	131	.00	.00	.00	6.	1.02	21.50	275	.04	.04	.00	106.
1.01	22.00	132	.00	.00	.00	6.	1.02	22.00	276	.04	.04	.00	106.
1.01	22.10	133	.00	.00	.00	6.	1.02	22.10	277	.04	.04	.00	106.
1.01	22.20	134	.00	.00	.00	5.	1.02	22.20	278	.04	.04	.00	106.
1.01	22.30	135	.00	.00	.00	6.	1.02	22.30	279	.04	.04	.00	106.
1.01	22.40	136	.00	.00	.00	5.	1.02	22.40	280	.04	.04	.00	106.
1.01	22.50	137	.00	.00	.00	6.	1.02	22.50	281	.04	.04	.00	106.
1.01	23.00	138	.00	.00	.00	6.	1.02	23.00	282	.04	.04	.00	106.
1.01	23.10	139	.00	.00	.00	6.	1.02	23.10	283	.04	.04	.00	106.
1.01	23.20	140	.00	.00	.00	6.	1.02	23.20	284	.04	.04	.00	106.
1.01	23.30	141	.00	.00	.00	5.	1.02	23.30	285	.04	.04	.00	106.
1.01	23.40	142	.00	.00	.00	6.	1.02	23.40	286	.04	.04	.00	106.
1.01	23.50	143	.00	.00	.00	6.	1.02	23.50	287	.04	.04	.00	106.
1.02	.00	144	.00	.00	.00	6.	1.03	.00	288	.04	.04	.00	106.
									SUM	34.58	32.08	2.50	82219.
										(878.)	(815.)	(64.)	(2328.18)

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	4080.	1709.	553.	285.	82164.
CMS	116.	48.	16.	8.	2327.
INCHES		23.87	30.91	31.88	31.88
MM		606.37	785.20	809.71	809.71
AC-FT		849.	1097.	1132.	1132.
THOUS CU M		1045.	1354.	1396.	1396.

HYDROGRAPH AT STA 6 FOR PLAN 1, RTIO 1

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	408.	171.	55.	29.	8216.
CMS	12.	5.	2.	1.	233.
INCHES		2.39	3.09	3.19	3.19
MM		60.64	78.52	80.97	80.97
AC-FT		85.	110.	113.	113.
THOUS CU M		105.	135.	140.	140.

HYDROGRAPH AT STA 6 FOR PLAN 1, RTIO 2

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	490.	205.	66.	34.	9860.
CMS	14.	6.	2.	1.	279.
INCHES		2.86	3.71	3.83	3.83
MM		72.76	94.22	97.17	97.17
AC-FT		102.	132.	136.	136.
THOUS CU M		125.	162.	168.	168.

HYDROGRAPH AT STA 6 FOR PLAN 1, RTIO 3

3207.	3403.	1584.	1751.	1911.	2050.	2203.	2391.	2631.	2961.
3341.	3456.	3651.	3528.	3440.	3396.	3472.	3944.	4902.	6114.
7097.	7570.	7237.	6324.	5523.	4915.	4451.	4118.	3838.	3583.
3357.	3162.	2974.	2757.	2473.	2143.	1824.	1536.	1296.	1091.
917.	771.	650.	551.	472.	409.	360.	323.	294.	273.
257.	246.	238.	233.	228.	225.	223.	222.	221.	220.
220.	219.	219.	219.	219.	219.	219.	218.		

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	7570.	3665.	1178.	605.	174141.
CMS	214.	104.	33.	17.	4931.
INCHES		24.78	31.86	32.70	32.70
MM		629.29	809.19	830.63	830.63
AC-FT		1817.	2337.	2399.	2399.
THOUS CU M		2242.	2882.	2959.	2959.

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HYDROGRAPH ROUTING

ROUTING THROUGH LIONS LAKE

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	.000	.00	1	1	0	0	0

NSTPS	NSTDL	LAG	AMSKK	X	TSK	STORA	ISPRAT
1	0	0	.000	.000	.000	-755.	-1

STAGE	755.00	756.00	757.00	758.00	759.00	760.00	761.00	762.00	763.00	764.00
FLOW	.00	44.00	85.30	107.70	123.70	140.50	184.70	191.70	195.80	199.80

SURFACE AREA=	0.	16.	25.	44.	66.	96.	131.
CAPACITY=	0.	54.	155.	493.	1035.	1837.	2966.
ELEVATION=	745.	755.	760.	770.	780.	790.	800.

CREL	SPWID	COQW	EXPW	ELEVL	COQL	CAREA	EXPL
755.0	.0	.0	.0	.0	.0	.0	.0

B L A C K & V E A T C H PROJECT 9166. DATE 27 AUG 80 PAGE 106

FLOOD HYDROGRAPH PACKAGE - HEC-1 PROGRAM H21/02-OU - TIME- 18:16:26 CASE PMF

DAM DATA

TOPEL	COQD	EXPD	DAMWID
760.2	.0	.0	0.

CREST LENGTH	0.	29.	44.	117.	225.	336.	469.	536.	572.	594.
AT OR BELOW ELEVATION	757.9	758.1	759.1	760.4	760.6	760.8	761.2	761.7	762.5	763.3

STATION 8, PLAN 1, RATIO 1

END-OF-PERIOD HYDROGRAPH ORDINATES

DUN

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SUB-AREA RUNOFF COMPUTATION

LIONS LAKE DAM (48 HR. PROBABLE MAXIMUM RUNOFF)

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
6	0	0	0	0	3	1	0	0

HYDROGRAPH DATA

IHYDG	IUHG	TAREA	SNAP	TRSDA	TRSPC	RATIO	ISNOW	ISAME	LOCAL
1	2	.67	.00	.67	1.00	.000	0	0	0

PRECIP DATA

SPFE	PMS	R6	R12	R24	R48	R72	R96
.00	24.70	101.00	120.00	130.00	140.00	.00	.00

LOSS DATA

LROPT	STRKR	DLTKR	RTIOL	ERAIN	STRKS	RTIOK	STRTL	CNSTL	ALSMX	RTIMP
0	.00	.00	1.00	.00	.00	1.00	-1.00	-82.00	.00	.00

CURVE NO = -82.00 WETNESS = -1.00 EFFECT CN = 82.00

UNIT HYDROGRAPH DATA
TC= .00 LAG= .61

RECESSION DATA
STRTQ= .00 QRCSN= .00 RTIOR= 1.00

UNIT HYDROGRAPH 20 END OF PERIOD ORDINATES, TC= .00 HOURS, LAG= .61 VOL= 1.00

63.	204.	392.	463.	432.	343.	222.	148.	102.	68.
47.	31.	21.	14.	10.	7.	5.	3.	2.	1.

0

END-OF-PERIOD FLOW

MO.DA	HR.MN	PERIOD	RAIN	EXCS	LOSS	COMP Q	MO.DA	HR.MN	PERIOD	RAIN	EXCS	LOSS	COMP Q
1.01	.10	1	.00	.00	.00	0.	1.02	.10	145	.03	.02	.01	7.
1.01	.20	2	.00	.00	.00	0.	1.02	.20	146	.03	.02	.01	11.
1.01	.30	3	.00	.00	.00	0.	1.02	.30	147	.03	.02	.01	18.
1.01	.40	4	.00	.00	.00	0.	1.02	.40	148	.03	.02	.01	26.
1.01	.50	5	.00	.00	.00	0.	1.02	.50	149	.03	.02	.01	34.
1.01	1.00	6	.00	.00	.00	0.	1.02	1.00	150	.03	.02	.01	40.
1.01	1.10	7	.00	.00	.00	0.	1.02	1.10	151	.03	.02	.01	44.
1.01	1.20	8	.00	.00	.00	0.	1.02	1.20	152	.03	.02	.01	47.
1.01	1.30	9	.00	.00	.00	0.	1.02	1.30	153	.03	.02	.01	49.
1.01	1.40	10	.00	.00	.00	0.	1.02	1.40	154	.03	.02	.01	50.
1.01	1.50	11	.00	.00	.00	0.	1.02	1.50	155	.03	.02	.01	51.
1.01	2.00	12	.00	.00	.00	0.	1.02	2.00	156	.03	.02	.01	52.
1.01	2.10	13	.00	.00	.00	0.	1.02	2.10	157	.03	.02	.01	53.
1.01	2.20	14	.00	.00	.00	0.	1.02	2.20	158	.03	.02	.01	53.
1.01	2.30	15	.00	.00	.00	0.	1.02	2.30	159	.03	.02	.01	54.
1.01	2.40	16	.00	.00	.00	0.	1.02	2.40	160	.03	.02	.01	54.

1.01	2.00	12	.00	.00	.00	0.	1.02	2.00	155	.03	.02	.01	52.
1.01	2.10	13	.00	.00	.00	0.	1.02	2.10	157	.03	.02	.01	53.
1.01	2.20	14	.00	.00	.00	0.	1.02	2.20	158	.03	.02	.01	53.
1.01	2.30	15	.00	.00	.00	0.	1.02	2.30	159	.03	.02	.01	54.
1.	2.40	16	.00	.00	.00	0.	1.02	2.40	160	.03	.02	.01	54.

1.01	2.50	17	.00	.00	.00	0.	1.02	2.50	161	.03	.02	.01	54.
1.01	3.00	18	.00	.00	.00	0.	1.02	3.00	162	.03	.02	.01	54.
1.01	3.10	19	.00	.00	.00	0.	1.02	3.10	163	.03	.02	.01	55.
1.01	3.20	20	.00	.00	.00	0.	1.02	3.20	164	.03	.02	.01	55.
1.01	3.30	21	.00	.00	.00	0.	1.02	3.30	165	.03	.02	.01	55.
1.01	3.40	22	.00	.00	.00	0.	1.02	3.40	166	.03	.02	.01	55.
1.01	3.50	23	.00	.00	.00	0.	1.02	3.50	167	.03	.02	.01	55.
1.01	4.00	24	.00	.00	.00	0.	1.02	4.00	168	.03	.02	.01	56.
1.01	4.10	25	.00	.00	.00	0.	1.02	4.10	169	.03	.02	.01	56.
1.01	4.20	26	.00	.00	.00	0.	1.02	4.20	170	.03	.02	.01	56.
1.01	4.30	27	.00	.00	.00	0.	1.02	4.30	171	.03	.02	.01	56.
1.01	4.40	28	.00	.00	.00	0.	1.02	4.40	172	.03	.02	.01	56.
1.01	4.50	29	.00	.00	.00	0.	1.02	4.50	173	.03	.02	.01	56.
1.01	5.00	30	.00	.00	.00	0.	1.02	5.00	174	.03	.02	.01	57.
1.01	5.10	31	.00	.00	.00	0.	1.02	5.10	175	.03	.02	.01	57.
1.01	5.20	32	.00	.00	.00	0.	1.02	5.20	176	.03	.02	.01	57.
1.01	5.30	33	.00	.00	.00	0.	1.02	5.30	177	.03	.02	.01	57.
1.01	5.40	34	.00	.00	.00	0.	1.02	5.40	178	.03	.02	.00	57.
1.01	5.50	35	.00	.00	.00	0.	1.02	5.50	179	.03	.02	.00	57.
1.01	6.00	36	.00	.00	.00	0.	1.02	6.00	180	.03	.02	.00	56.
1.01	6.10	37	.01	.00	.01	0.	1.02	6.10	181	.13	.11	.02	63.
1.01	6.20	38	.01	.00	.01	0.	1.02	6.20	182	.13	.11	.02	81.
1.01	6.30	39	.01	.00	.01	0.	1.02	6.30	183	.13	.11	.02	114.
1.01	6.40	40	.01	.00	.01	0.	1.02	6.40	184	.13	.11	.02	155.
1.01	6.50	41	.01	.00	.01	0.	1.02	6.50	185	.13	.11	.02	193.
1.01	7.00	42	.01	.00	.01	0.	1.02	7.00	186	.13	.11	.02	223.
1.01	7.10	43	.01	.00	.01	0.	1.02	7.10	187	.13	.11	.02	244.
1.01	7.20	44	.01	.00	.01	0.	1.02	7.20	188	.13	.11	.02	259.
1.01	7.30	45	.01	.00	.01	0.	1.02	7.30	189	.13	.11	.02	269.
1.01	7.40	46	.01	.00	.01	0.	1.02	7.40	190	.13	.12	.02	277.
1.01	7.50	47	.01	.00	.01	0.	1.02	7.50	191	.13	.12	.01	283.
1.01	8.00	48	.01	.00	.01	0.	1.02	8.00	192	.13	.12	.01	287.
1.01	8.10	49	.01	.00	.01	0.	1.02	8.10	193	.13	.12	.01	291.
1.01	8.20	50	.01	.00	.01	0.	1.02	8.20	194	.13	.12	.01	294.
1.01	8.30	51	.01	.00	.01	0.	1.02	8.30	195	.13	.12	.01	296.
1.01	8.40	52	.01	.00	.01	0.	1.02	8.40	196	.13	.12	.01	298.
1.01	8.50	53	.01	.00	.01	0.	1.02	8.50	197	.13	.12	.01	300.
1.01	9.00	54	.01	.00	.01	0.	1.02	9.00	198	.13	.12	.01	302.
1.01	9.10	55	.01	.00	.01	0.	1.02	9.10	199	.13	.12	.01	303.
1.01	9.20	56	.01	.00	.01	0.	1.02	9.20	200	.13	.12	.01	304.
1.01	9.30	57	.01	.00	.01	0.	1.02	9.30	201	.13	.12	.01	305.
1.01	9.40	58	.01	.00	.01	0.	1.02	9.40	202	.13	.12	.01	307.
1.01	9.50	59	.01	.00	.01	0.	1.02	9.50	203	.13	.12	.01	308.
1.01	10.00	60	.01	.00	.01	0.	1.02	10.00	204	.13	.12	.01	309.
1.01	10.10	61	.01	.00	.01	0.	1.02	10.10	205	.13	.12	.01	309.
1.01	10.20	62	.01	.00	.01	0.	1.02	10.20	206	.13	.12	.01	310.
1.01	10.30	63	.01	.00	.01	0.	1.02	10.30	207	.13	.12	.01	311.
1.01	10.40	64	.01	.00	.01	0.	1.02	10.40	208	.13	.12	.01	312.
1.01	10.50	65	.01	.00	.01	0.	1.02	10.50	209	.13	.12	.01	313.
1.01	11.00	66	.01	.00	.01	0.	1.02	11.00	210	.13	.12	.01	313.
1.01	11.10	67	.01	.00	.01	0.	1.02	11.10	211	.13	.12	.01	314.
1.01	11.20	68	.01	.00	.01	0.	1.02	11.20	212	.13	.12	.01	315.
1.01	11.30	69	.01	.00	.01	0.	1.02	11.30	213	.13	.12	.01	315.
1.01	11.40	70	.01	.00	.01	0.	1.02	11.40	214	.13	.12	.01	316.
1.01	11.50	71	.01	.00	.01	0.	1.02	11.50	215	.13	.12	.01	317.
1.01	12.00	72	.01	.00	.01	0.	1.02	12.00	216	.13	.12	.01	317.

1.01	11.20	68	.01	.00	.01	0.	1.02	11.20	212	.13	.12	.01	315.
1.01	11.30	69	.01	.00	.01	0.	1.02	11.30	213	.13	.12	.01	315.
1.01	11.40	70	.01	.00	.01	0.	1.02	11.40	214	.13	.12	.01	3[illegible]
1.01	11.50	71	.01	.00	.01	0.	1.02	11.50	215	.13	.12	.01	3[illegible]
1.01	12.00	72	.01	.00	.01	0.	1.02	12.00	216	.13	.12	.01	317.

1.01	12.10	73	.03	.00	.03	0.	1.02	12.10	217	.42	.40	.02	335.
1.01	12.20	74	.03	.00	.03	0.	1.02	12.20	218	.42	.40	.02	391.
1.01	12.30	75	.03	.00	.03	1.	1.02	12.30	219	.42	.40	.02	498.
1.01	12.40	76	.03	.00	.03	1.	1.02	12.40	220	.42	.40	.02	626.
1.01	12.50	77	.03	.00	.03	2.	1.02	12.50	221	.42	.40	.01	745.
1.01	13.00	78	.03	.00	.03	4.	1.02	13.00	222	.42	.40	.01	841.
1.01	13.10	79	.04	.01	.03	6.	1.02	13.10	223	.50	.48	.02	908.
1.01	13.20	80	.04	.01	.03	8.	1.02	13.20	224	.50	.49	.01	968.
1.01	13.30	81	.04	.01	.03	10.	1.02	13.30	225	.50	.49	.01	1030.
1.01	13.40	82	.04	.01	.03	13.	1.02	13.40	226	.50	.49	.01	1086.
1.01	13.50	83	.04	.01	.03	15.	1.02	13.50	227	.50	.49	.01	1138.
1.01	14.00	84	.04	.01	.03	18.	1.02	14.00	228	.50	.49	.01	1177.
1.01	14.10	85	.05	.01	.03	20.	1.02	14.10	229	.62	.61	.01	1211.
1.01	14.20	86	.05	.02	.03	23.	1.02	14.20	230	.62	.61	.01	1254.
1.01	14.30	87	.05	.02	.03	27.	1.02	14.30	231	.62	.61	.01	1315.
1.01	14.40	88	.05	.02	.03	31.	1.02	14.40	232	.62	.61	.01	1381.
1.01	14.50	89	.05	.02	.03	35.	1.02	14.50	233	.62	.61	.01	1441.
1.01	15.00	90	.05	.02	.03	38.	1.02	15.00	234	.62	.62	.01	1468.
1.01	15.10	91	.04	.02	.02	41.	1.02	15.10	235	.57	.56	.01	1516.
1.01	15.20	92	.07	.03	.04	45.	1.02	15.20	236	.95	.94	.01	1550.
1.01	15.30	93	.13	.06	.07	52.	1.02	15.30	237	1.71	1.69	.02	1668.
1.01	15.40	94	.33	.18	.14	73.	1.02	15.40	238	4.27	4.23	.03	2115.
1.01	15.50	95	.09	.06	.04	109.	1.02	15.50	239	1.23	1.22	.01	2895.
1.01	16.00	96	.06	.04	.02	149.	1.02	16.00	240	.76	.75	.00	3744.
1.01	16.10	97	.04	.03	.02	169.	1.02	16.10	241	.58	.58	.00	4080.
1.01	16.20	98	.04	.03	.02	166.	1.02	16.20	242	.58	.58	.00	3960.
1.01	16.30	99	.04	.03	.02	149.	1.02	16.30	243	.58	.58	.00	3406.
1.01	16.40	100	.04	.03	.02	126.	1.02	16.40	244	.58	.58	.00	2802.
1.01	16.50	101	.04	.03	.01	109.	1.02	16.50	245	.58	.58	.00	2375.
1.01	17.00	102	.04	.03	.01	99.	1.02	17.00	246	.58	.58	.00	2094.
1.01	17.10	103	.04	.02	.01	91.	1.02	17.10	247	.46	.46	.00	1889.
1.01	17.20	104	.04	.02	.01	86.	1.02	17.20	248	.46	.46	.00	1735.
1.01	17.30	105	.04	.02	.01	89.	1.02	17.30	249	.46	.46	.00	1597.
1.01	17.40	106	.04	.02	.01	76.	1.02	17.40	250	.46	.46	.00	1479.
1.01	17.50	107	.04	.02	.01	72.	1.02	17.50	251	.46	.46	.00	1385.
1.01	18.00	108	.04	.03	.01	69.	1.02	18.00	252	.46	.46	.00	1315.
1.01	18.10	109	.00	.00	.00	66.	1.02	18.10	253	.04	.04	.00	1243.
1.01	18.20	110	.00	.00	.00	60.	1.02	18.20	254	.04	.04	.00	1129.
1.01	18.30	111	.00	.00	.00	51.	1.02	18.30	255	.04	.04	.00	945.
1.01	18.40	112	.00	.00	.00	40.	1.02	18.40	256	.04	.04	.00	737.
1.01	18.50	113	.00	.00	.00	30.	1.02	18.50	257	.04	.04	.00	547.
1.01	19.00	114	.00	.00	.00	22.	1.02	19.00	258	.04	.04	.00	397.
1.01	19.10	115	.00	.00	.00	16.	1.02	19.10	259	.04	.04	.00	301.
1.01	19.20	116	.00	.00	.00	13.	1.02	19.20	260	.04	.04	.00	238.
1.01	19.30	117	.00	.00	.00	11.	1.02	19.30	261	.04	.04	.00	194.
1.01	19.40	118	.00	.00	.00	9.	1.02	19.40	262	.04	.04	.00	165.
1.01	19.50	119	.00	.00	.00	8.	1.02	19.50	263	.04	.04	.00	145.
1.01	20.00	120	.00	.00	.00	7.	1.02	20.00	264	.04	.04	.00	132.
1.01	20.10	121	.00	.00	.00	7.	1.02	20.10	265	.04	.04	.00	123.
1.01	20.20	122	.00	.00	.00	6.	1.02	20.20	266	.04	.04	.00	117.
1.01	20.30	123	.00	.00	.00	6.	1.02	20.30	267	.04	.04	.00	113.
1.01	20.40	124	.00	.00	.00	6.	1.02	20.40	268	.04	.04	.00	110.
1.01	20.50	125	.00	.00	.00	6.	1.02	20.50	269	.04	.04	.00	108.
1.01	21.00	126	.00	.00	.00	6.	1.02	21.00	270	.04	.04	.00	107.
1.01	21.10	127	.00	.00	.00	6.	1.02	21.10	271	.04	.04	.00	106.
1.01	21.20	128	.00	.00	.00	6.	1.02	21.20	272	.04	.04	.00	106.

1.01	20.40	124	.00	.00	.00	6.	1.02	20.40	268	.04	.04	.00	110.
1.01	20.50	125	.00	.00	.00	6.	1.02	20.50	269	.04	.04	.00	108.
1.01	21.00	126	.00	.00	.00	6.	1.02	21.00	270	.04	.04	.00	107.
1.01	21.10	127	.00	.00	.00	6.	1.02	21.10	271	.04	.04	.00	10[illegible]
1.01	21.20	128	.00	.00	.00	6.	1.02	21.20	272	.04	.04	.00	106.

1.01	21.30	129	.00	.00	.00	6.	1.02	21.30	273	.04	.04	.00	106.
1.01	21.40	130	.00	.00	.00	6.	1.02	21.40	274	.04	.04	.00	106.
1.01	21.50	131	.00	.00	.00	6.	1.02	21.50	275	.04	.04	.00	106.
1.01	22.00	132	.00	.00	.00	6.	1.02	22.00	276	.04	.04	.00	106.
1.01	22.10	133	.00	.00	.00	6.	1.02	22.10	277	.04	.04	.00	106.
1.01	22.20	134	.00	.00	.00	5.	1.02	22.20	278	.04	.04	.00	106.
1.01	22.30	135	.00	.00	.00	6.	1.02	22.30	279	.04	.04	.00	106.
1.01	22.40	136	.00	.00	.00	6.	1.02	22.40	280	.04	.04	.00	106.
1.01	22.50	137	.00	.00	.00	6.	1.02	22.50	281	.04	.04	.00	106.
1.01	23.00	138	.00	.00	.00	6.	1.02	23.00	282	.04	.04	.00	106.
1.01	23.10	139	.00	.00	.00	6.	1.02	23.10	283	.04	.04	.00	106.
1.01	23.20	140	.00	.00	.00	6.	1.02	23.20	284	.04	.04	.00	106.
1.01	23.30	141	.00	.00	.00	5.	1.02	23.30	285	.04	.04	.00	106.
1.01	23.40	142	.00	.00	.00	6.	1.02	23.40	286	.04	.04	.00	106.
1.01	23.50	143	.00	.00	.00	6.	1.02	23.50	287	.04	.04	.00	106.
1.02	.00	144	.00	.00	.00	6.	1.03	.00	288	.04	.04	.00	106.

SUM 34.58 32.08 2.50 82219.
(878.)(815.)(64.)(2328.18)

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	4080.	1709.	553.	285.	82164.
CMS	116.	48.	16.	8.	2327.
INCHES		23.87	30.91	31.88	31.88
MM		606.37	785.20	809.71	809.71
AC-FT		849.	1097.	1132.	1132.
THOUS CU M		1045.	1354.	1396.	1396.

HYDROGRAPH AT STA 6 FOR PLAN 1, RTIO 1

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	408.	171.	55.	29.	8216.
CMS	12.	5.	2.	1.	233.
INCHES		2.39	3.09	3.19	3.19
MM		60.64	78.52	80.97	80.97
AC-FT		85.	110.	113.	113.
THOUS CU M		105.	135.	140.	140.

HYDROGRAPH AT STA 6 FOR PLAN 1, RTIO 2

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	490.	205.	66.	34.	9860.
CMS	14.	6.	2.	1.	279.
INCHES		2.86	3.71	3.83	3.83
MM		72.76	94.22	97.17	97.17
AC-FT		102.	132.	136.	136.
THOUS CU M		125.	162.	168.	168.

HYDROGRAPH AT STA 6 FOR PLAN 1, RTIO 3

[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	509.	522.	534.	545.	556.
565.	[illegible]	582.	589.	598.	602.	606.	613.	617.	622.
620.	629.	632.	635.	638.	641.	661.	725.	851.	1019.
1207.	1403.	1584.	1751.	1911.	2059.	2203.	2391.	2631.	2941.
3341.	3656.	3651.	3526.	3640.	3396.	3472.	3944.	4902.	6114.
7097.	7570.	7237.	6324.	5523.	4915.	4451.	4116.	5636.	5583.
3357.	3162.	2974.	2757.	2473.	2143.	1824.	1536.	1296.	1091.
917.	771.	650.	551.	472.	409.	360.	323.	294.	273.
257.	245.	236.	235.	228.	225.	225.	222.	221.	220.
220.	[illegible]	219.	219.	219.	219.	219.	218.		

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	7570.	3665.	1178.	605.	174141.
CMS	214.	104.	33.	17.	4931.
INCHES		24.78	31.26	32.70	32.70
MM		629.29	809.19	830.63	830.63
AC-FT		1817.	2337.	2399.	2399.
THOUS CU M		2242.	2862.	2959.	2959.

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HYDROGRAPH ROUTING

ROUTING THROUGH LIONS LAKE

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	.000	.00	1	1	0	0		0

NSTPS	NSTDL	LAG	AMSKK	X	TSK	STORA	ISPRAT
1	0	0	.000	.000	.000	-755.	-1

STAGE	755.00	756.00	757.00	758.00	759.00	760.00	761.00	762.00	763.00	764.00
FLOW	.00	44.00	85.30	107.70	123.70	140.50	184.70	191.70	195.80	199.80

SURFACE AREA=	0.	16.	25.	44.	66.	96.	131.
CAPACITY=	0.	54.	155.	493.	1035.	1837.	2966.
ELEVATION=	745.	755.	760.	770.	780.	790.	800.

CREL	SPWID	COQW	EXPW	ELEVL	COQL	CAREA	EXPL
755.0	.0	.0	.0	.0	.0	.0	.0

DAM DATA

TOPEL	COQD	EXPD	DAMWID
760.2	.0	.0	0.

CREST LENGTH AT OR BELOW ELEVATION	0.	29.	44.	117.	225.	336.	469.	536.	572.	594.
	757.9	758.3	759.1	760.4	760.6	760.8	761.2	761.7	762.5	763.3

STATION 8, PLAN 1, RATIO 1

END-OF-PERIOD HYDROGRAPH ORDINATES

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

OPERATION	STATION	AREA	PLAN	RATIO 1 .10	RATIO 2 .12	RATIO 3 .13	RATIO 4 .14	RATIO 5 .15	RATIO 6 .50	RATIO 7 1.00
				RATIOS APPLIED TO FLOWS						
HYDROGRAPH AT	1	.28	1	178.	214.	232.	250.	267.	891.	1783.
	(	.73)	(	5.05)(	6.06)(	6.56)(	7.07)(	7.57)(	25.24)(	50.48)(
ROUTED TO	2	.28	1	255.	262.	265.	264.	267.	859.	1789.
	(	.73)	(	7.23)(	7.43)(	7.50)(	7.48)(	7.57)(	24.33)(	50.67)(
HYDROGRAPH AT	3	.43	1	254.	304.	330.	355.	380.	1268.	2536.
	(	1.11)	(	7.16)(	8.62)(	9.33)(	10.05)(	10.77)(	35.90)(	71.80)(
2 COMBINED	4	.71	1	422.	507.	549.	591.	633.	2106.	4325.
	(	1.84)	(	11.95)(	14.35)(	15.55)(	16.74)(	17.93)(	59.63)(	122.46)(
ROUTED TO	5	.71	1	255.	314.	350.	386.	428.	2676.	3831.
	(	1.84)	(	7.22)(	8.90)(	9.91)(	10.94)(	12.11)(	75.77)(	108.48)(
HYDROGRAPH AT	6	.67	1	408.	490.	530.	571.	612.	2040.	4080.
	(	1.72)	(	11.55)(	13.86)(	15.02)(	16.17)(	17.33)(	57.77)(	115.53)(
2 COMBINED	7	1.38	1	605.	729.	795.	860.	931.	4119.	7570.
	(	3.56)	(	17.13)(	20.66)(	22.52)(	24.34)(	26.37)(	116.65)(	214.36)(
ROUTED TO	8	1.38	1	342.	472.	545.	622.	702.	4045.	7401.
	(	3.56)	(	9.68)(	13.36)(	15.43)(	17.60)(	19.87)(	114.53)(	209.57)(

SUMMARY OF DAM SAFETY ANALYSIS

PLAN 1 ....

	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
ELEVATION	765.00	789.20	769.20
STORAGE	2.	9.	9.
OUTFLOW	0.	11.	11.

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	769.34	.14	9.	256.	.58	39.35	38.50
.12	769.35	.15	9.	264.	.60	38.87	38.00
.13	769.37	.17	9.	267.	.60	38.71	37.83
.14	769.35	.15	9.	266.	.60	38.37	37.50
.15	769.36	.16	9.	269.	.60	38.21	37.33
.50	769.38	.18	9.	859.	.62	40.33	32.33
1.00	790.31	1.11	12.	1789.	1.98	40.17	17.67

SUMMARY OF DAM SAFETY ANALYSIS

PLAN 1 ....

	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
ELEVATION	774.00	774.00	777.60
STORAGE	75.	75.	149.
OUTFLOW	0.	0.	924.

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	776.34	.00	120.	255.	.00	40.83	.00
.12	776.60	.00	125.	314.	.00	40.83	.00
.13	776.72	.00	128.	350.	.00	40.83	.00
.14	776.82	.00	130.	396.	.00	40.83	.00
.15	776.92	.00	132.	429.	.00	40.83	.00
.50	778.18	.58	164.	2576.	1.02	40.83	39.83
1.00	778.03	.43	160.	3031.	1.31	40.50	37.67

SUMMARY OF DAM SAFETY ANALYSIS

PLAN 1 ....

	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
ELEVATION	755.00	755.00	760.20
STORAGE	54.	54.	160.
OUTFLOW	0.	0.	617.

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	759.50	.00	143.	342.	.00	42.00	.00
.12	759.88	.00	152.	472.	.00	41.50	.00
.13	760.05	.06	156.	545.	.00	41.33	.00
.14	760.21	.01	160.	622.	.33	41.17	.00
.15	760.36	.16	164.	702.	1.33	41.17	.00
.50	762.15	1.95	212.	4045.	6.17	40.50	.00
1.00	763.07	2.87	239.	7401.	8.67	40.50	.00