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NATIONAL DAM SAFETY PROGRAM. B & K LAKE NUMBER 1 DAM (MO 30506)--ETC(U)
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LEVEL II

B & K LAKE NO. 1 DAM
WARREN COUNTY, MISSOURI
MO 30506

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PHASE I INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM



United States Army
Corps of Engineers
...Serving the Army
...Serving the Nation

St. Louis District

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

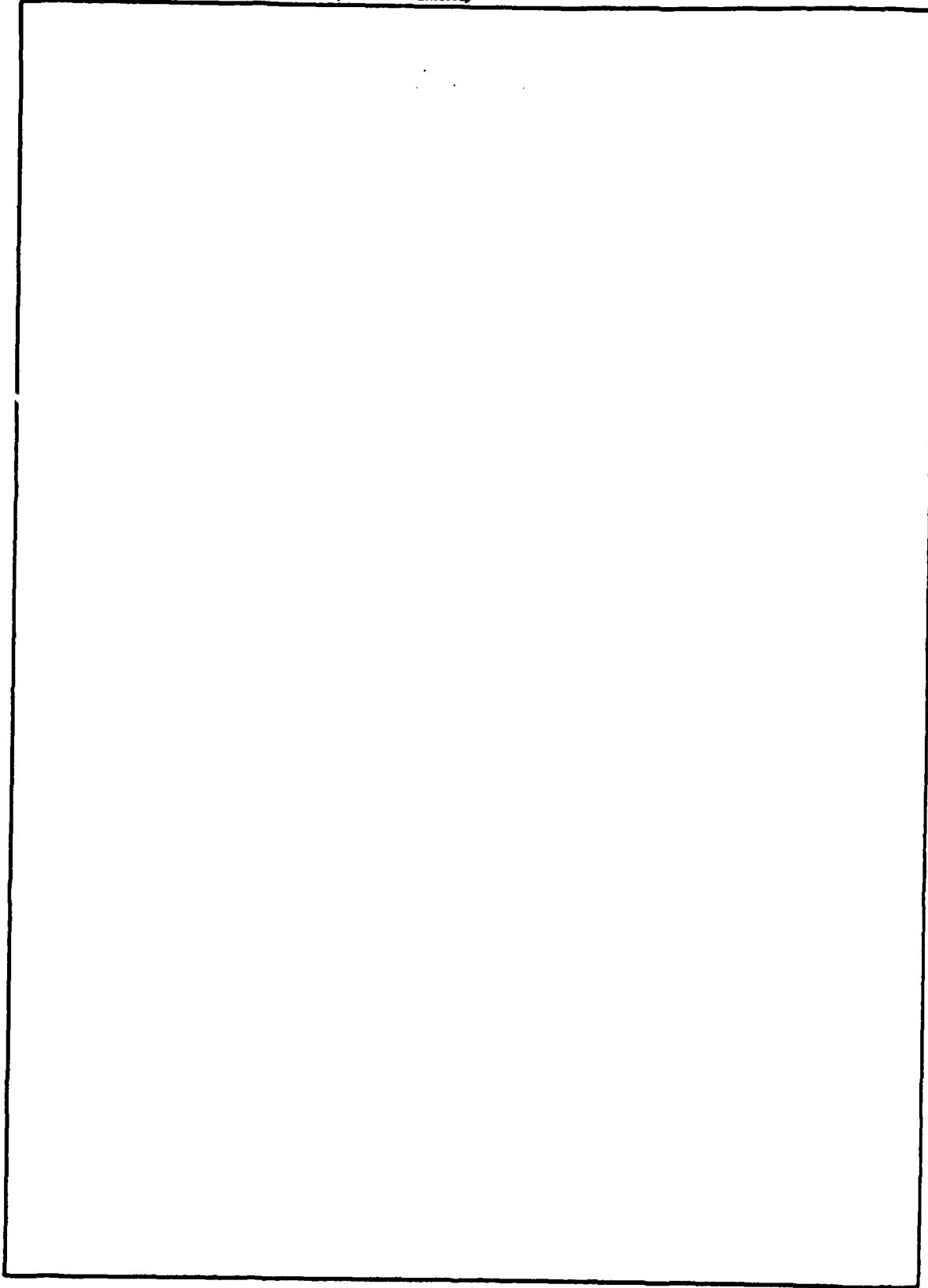
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SEPTEMBER, 1979

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

IN REPLY REFER TO

SUBJECT: B & K Lake No. 1 Dam (Mo. 30506) Phase I Inspection Report

This report presents the results of field inspection and evaluation of the B & K Lake No. 1 Dam (Mo. 30506).

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

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

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

SUBMITTED BY:

SIGNED

Chief, Engineering Division

25 SEP 1979

Date

APPROVED BY:

SIGNED

Colonel, CE, District Engineer

25 SEP 1979

Date

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B & K LAKE NO. 1 DAM
WARREN COUNTY, MISSOURI

MISSOURI INVENTORY NO. 30506

PHASE I INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM

PREPARED BY
CONSOER, TOWNSEND AND ASSOCIATES LTD.
ST. LOUIS, MISSOURI
AND
ENGINEERING CONSULTANTS, INC.
ENGLEWOOD, COLORADO
A JOINT VENTURE

UNDER DIRECTION OF
ST. LOUIS DISTRICT, CORPS OF ENGINEERS
FOR
GOVERNOR OF MISSOURI

SEPTEMBER 1979

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PHASE I INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM

Name of Dam: B & K Lake No. 1 Dam, Missouri Inv. No. 30506
State Located: Missouri
County Located: Warren
Stream: An Unnamed Tributary of Lost Creek
Date of Inspection: May 19, 1979

Assessment of General Condition

B & K Lake No. 1 Dam was inspected using the "Recommended Guidelines for Safety Inspection of Dams". These guidelines were developed by the Chief of Engineers, U.S. Army, Washington, D.C., with the help of Federal and State agencies, professional engineering organizations, and private engineers. The resulting guidelines are considered to represent a consensus of the engineering profession.

→ Based on the criteria in the guidelines, the dam is in the high hazard potential classification, which means that loss of life and appreciable property loss could occur in the event of failure of the dam. Within the estimated five mile damage zone downstream of the dam are seven houses, six buildings, and one road crossing which may be subjected to flooding, with possible damage and/or destruction, and possible loss of life. B & K Lake No. 1 Dam is in the small size classification since it is less than 40 feet high and impounds less than 1,000 acre-feet of water.

Our inspection and evaluation indicates that the spillway of B & K Lake No. 1 Dam does not meet the criteria set forth in the guidelines for a dam having the above size and hazard potential. B & K Lake No. 1 Dam being a small size dam with a high hazard potential, is required by the guidelines to pass from one-half of the Probable Maximum Flood to the Probable Maximum Flood without overtopping. Since there is high hazard potential downstream of the dam, the appropriate spillway design flood for this dam is the Probable Maximum Flood. It was determined that the reservoir/spillway system can accommodate 17 percent of the Probable Maximum Flood without overtopping the dam. Our evaluation also indicates that the reservoir/spillway system can accommodate the 100-year 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 meteorological and hydrologic conditions that are reasonably possible in the region. The 100-year flood is defined as a flood having one percent chance of being equalled or exceeded during any given year.

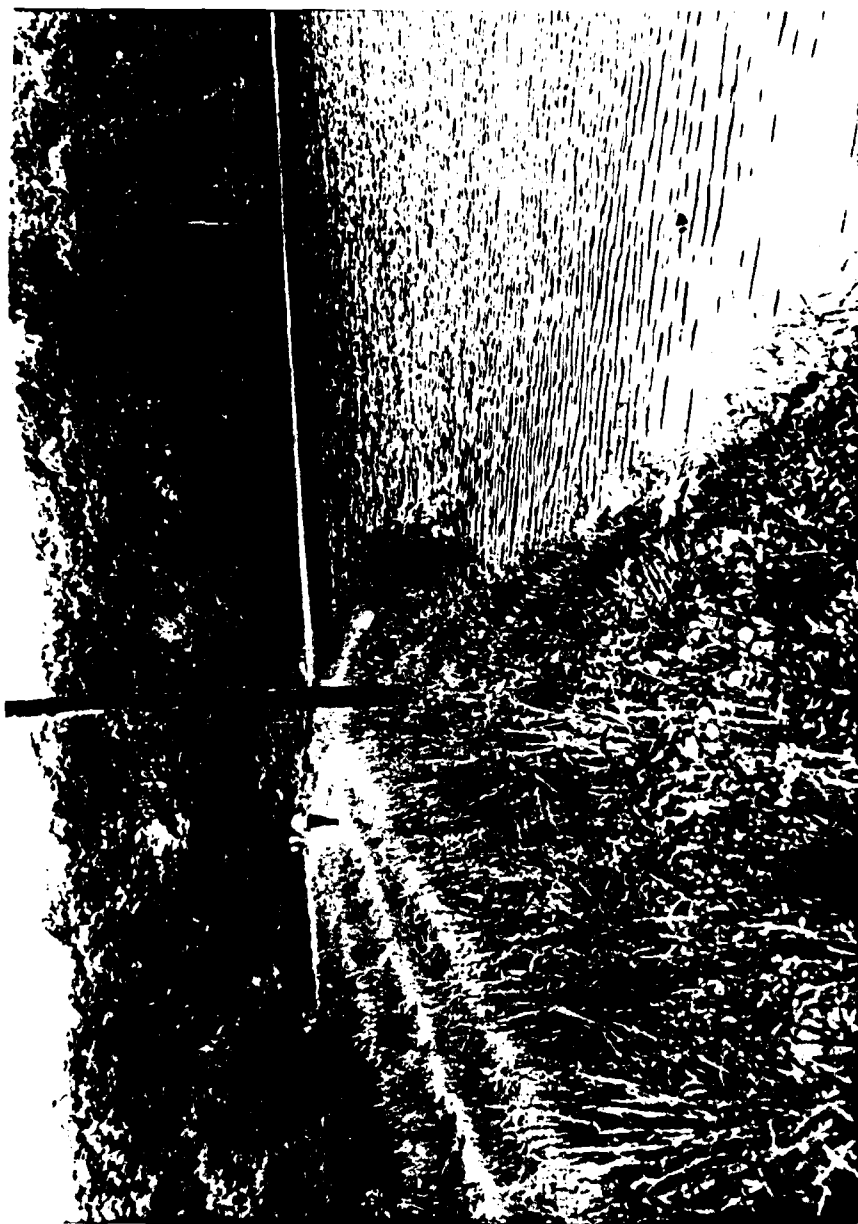
Other deficiencies noted by the inspection team were: the seepage on the downstream slope at the right abutment contact; sloughing and erosion on the upstream embankment slope; trees and brush in the spillway channel; a need for periodic inspection by a qualified engineer and a lack of maintenance schedule. The lack of stability and seepage analyses on record is also a deficiency that should be corrected.

It is recommended that the owner take action to correct
or control the deficiencies described above.

Walter G. Shifrin

Walter G. Shifrin, P.E.





Overview of B & K Lake No. 1 Dam

PHASE I INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM

B & K LAKE NO. 1 DAM, MISSOURI INV. NO. 30506

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PHASE I INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM

B & K Lake No. 1 Dam, Missouri Inv. No. 30506

SECTION 1: PROJECT INFORMATION

1.1 General

a. Authority

The Dam Inspection Act, Public Law 92-367 of August, 1972, authorizes the Secretary of the Army, through the Corps of Engineers, to initiate a national program of dam inspections. Inspection for B & K Lake No. 1 Dam was carried out under Contract DACW 43-79-C-0075 to the Department of the Army, St. Louis District, Corps of Engineers, by the engineering firms of Consoer, Townsend & Associates Ltd., and Engineering Consultants, Inc. (A Joint Venture), of St. Louis, Missouri.

b. Purpose of Inspection

The visual inspection of B & K Lake No. 1 Dam was made on May 19, 1979. The purpose of the inspection was to make a general assessment as to the structural integrity and operational adequacy of the dam embankment and its appurtenant structures.

c. Scope of Report

This report summarizes available pertinent data relating to the project; presents a summary of visual observations made during the field inspection; presents an assessment of hydrologic and hydraulic conditions at the site; presents an assessment as to the structural adequacy of the various project features; and assesses the general condition of the dam with respect to safety.

Subsurface investigations, laboratory testing, and detailed analyses were not within the scope of this study. The conclusions drawn herein, therefore, are based on the presence of, or absence of, obvious signs of distress. No warranty as to the absolute safety of the project features is implied by the conclusions presented in this report.

It should be noted that reference in this report to left or right abutments is as viewed looking downstream. Where left abutment or left side of the dam is used in this report, this also refers to east abutment or side, and right to the west abutment or side.

d. 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", Appendix D. 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 the Project

a. Description of Dam and Appurtenances

It should be noted that design drawings are not available for the dam or appurtenant structures. The following description is based on visual observations and information taken from Fenneman, N.M., "Physiographic of Eastern United States", 1946.

The dam is a compacted earthfill structure. The crest width is 14 feet, and the crest length is 475 feet. The crest elevation varies from 833.25 to 833.58 feet above MSL, and the maximum height of the embankment was measured as 28.0 feet.

The downstream slope of the embankment was measured to be 1V to 2H. It was not possible to accurately measure the upstream slope because of high reservoir level.

No riprap was placed on the upstream face. The entire exposed embankment has a grass cover.

There is a dam named as B & K Lake No. 2 Dam upstream of B & K Lake No. 1 Dam. The inventory number of the dam is Mo. 11002. The upstream dam has been taken into consideration in the hydrologic and hydraulic evaluation of B & K Lake No. 1 Dam.

The damsite is situated on the border between the Dissected Till Plain Section of Central Lowlands Physiographic Province which extends to the north and the Ozark Plateau Province to the south. Although the area in which the dam and reservoir are located was glaciated during Pleistocene time,

the till and loess which characterize the uplands of the Till Plains have been largely removed by erosion since the end of the Pleistocene. The area is characterized by wooded hills which have gentle to steep slopes.

The bedrock geology of the area, as shown on the Geologic Map of Missouri (1979), typically consists of gently northeastwardly dipping (ca. 30 - 50 feet/mile) sediments of Paleozoic age. North of Warren County these beds are often capped by young (Pleistocene) deposits of glacial drift and wind blown loess. In the southern areas of the county the bedrocks are generally covered by residual soil, colluvium, or alluvium. The rocks underlying the area are predominately carbonates (limestones and dolomites) although beds of sandstone and shale are not infrequent.

The bedrock of Warren County contains some minor folding. The largest known geologic structure in the area is a gentle anticline centered about 2 1/2 miles northwesterly of the town of Warrenton. This structure trends nearly north-south and is about 2 1/2 miles long. It is not known if this fold affects the attitude of the beds beneath the site.

The Soil Conservation Service reports (Soil Survey of Montgomery and Warren Counties, Missouri, 1978) that the soils in the bottom land at the damsite are clayey silt (ML) and cherty, clayey gravel (GC). The upslope soils consist largely of silty clay (CL-ML) and clay (CL).

The spillway for B & K Lake No. 1 Dam is an open channel depression located just beyond the right abutment of the dam. Approximately 50 feet downstream of the upstream edge of the spillway, which has a 12 inch high wire mesh trashscreen, a concrete weir has been constructed. This weir

is a 10 inch thick concrete wall with a total length of 54 feet. The weir is trapezoidal in shape, with a 16 foot bottom width, a side slope of 1V to 10.4H on the right bank and 1V to 20H on the left bank. Five 12-inch diameter corrugated metal pipes are constructed through the concrete weir, placed on 4 foot centers. The outside pipes have a total length of 6 feet, while the three inside pipes have a length of 4 feet. The elevation difference between the crest of the embankment and the crest of the concrete weir is 1 foot, 3 inches. The difference between the crest of the weir and the invert of the outside corrugated metal pipes is 1 foot, 4 inches, while the inside corrugated metal pipes are 8 inches lower than the outside pipes.

Discharges through the spillway pipe and over the weir flow through a channel adjacent to the right abutment contact to the downstream toe of the dam. The channel is an earth channel with rock riprap recently placed at the bottom and sides of the channel.

There is no low level drain pipe or outlet works for this dam.

b. Location

The dam is located at the headwaters of a small intermittent stream which is tributary to Lost Creek. The stream flows to the south about a quarter mile before entering Lost Creek.

Lost Creek flows southward from the confluence for about 2 miles and then southwesterly for about 11 miles where it flows into the Missouri River near the village of Gore just upstream of Mile 90. The upper reaches of Lost Creek are intermittent but, about 3 miles below the dam it becomes perennial.

The major access to the damsite from Warrenton, Missouri is west on the Interstate Highway No. 70 frontage road approximately 3 miles to a gravel road heading south, thence south on this road 1/4 mile to a private road to the east. The damsite is located at the end of the private road, approximately 1,000 feet from the beginning of the road. The dam and reservoir are shown in the Warrenton Quadrangle Sheet (7.5 minute series) in Section 24, Township 47 North, Range 3 West.

c. Size Classification

According to the "Recommended Guidelines for Safety Inspection of Dams", by the U.S. Department of the Army, Office of the Chief Engineer, the dam is classified in the dam size category as being "Small" since its storage is less than 1,000 acre-feet. The dam is also classified as "Small" in dam height category because its height is less than 40 feet. The overall size classification is, accordingly, "Small" in size.

d. Hazard Classification

The dam has been classified as having "High" hazard potential in the National Inventory of Dams, on the basis that in the event of failure of the dam or its appurtenances, excessive damage could occur to downstream property, together with the possibility of the loss of life. Our findings concur with the classification. Within the estimated five mile damage zone downstream of the dam are seven houses, six buildings, and one road crossing.

e. Ownership

The dam and lake are owned by B & K Construction Company. The mailing address is B & K Construction Company, c/o Ken Davis Sr., 4140 Cypress Road, St. Ann, Missouri, 63114.

f. Purpose of Dam

The purpose of the dam is to impound water for recreational use as a private lake.

g. Design and Construction History

B & K Lake No. 1 Dam was originally built in 1945 (est.) by Gene Rugh of Wright City, Missouri. Efforts to contact the original builder were futile and it is very doubtful if any formal design was done at the time of original construction.

The dam was rebuilt in 1977 by the present owner, Mr. Ken Davis of B & K Construction Company. Mr. Davis was his own engineer for the reconstruction and according to him, a 20 foot wide key trench was placed at the downstream toe. Also the crest width was increased from 6 feet to 14 feet. The owner informed the inspection team that the material for the reconstruction was taken from an area several hundred feet north of the left abutment.

h. Normal Operational Procedures

There are no specific operational procedures for the dam. The lake is used for recreational purposes and the water level below the spillway crest is controlled by rainfall, runoff and evaporation.

1.3 Pertinent Data *

a. Drainage Area (square miles):	0.25
b. Discharge at Damsite	
Estimated experienced maximum flood (cfs):	NA
Estimated ungated spillway capacity at maximum pool elevation (cfs):	125
c. Elevation (Feet above MSL)	
Top of dam:	833.25
Spillway crest:	
Service Spillway	830.0
Emergency Spillway	832.0
Normal Pool	830.0
Maximum Pool (PMF):	834.88
d. Reservoir	
Length of maximum pool:	1400 feet
e. Storage (Acre-Feet)	
Top of dam:	108
Spillway crest:	
Service Spillway	72
Emergency Spillway	92
Normal Pool:	72
Maximum Pool(PMF):	138

* Maximum pool referred to in this section indicates pool at top of dam elevation unless otherwise specified.

f. Reservoir Surface (Acres)

Top of dam:	13.2
Spillway crest:	
Service Spillway	9
Emergency Spillway	11.4
Normal Pool:	9.0
Maximum Pool(PMF):	15.5

g. Dam

Type:	Rolled Earthfill
Length:	475 feet
Structural Height:	28.0 feet
Hydraulic Height:	28.0 feet
Top width:	14.0 feet
Side slopes:	
Downstream	1V to 2H
Upstream	Unknown
Zoning:	Unknown
Impervious core:	Unknown

Cutoff:	Unknown
---------	---------

Grout curtain:	Unknown
----------------	---------

h. Diversion and Regulating Tunnel None

i. Spillway

Type:	
Service Spillway	5 - 1' diameter CMP, Uncontrolled
Emergency Spillway	Trapezoidal Concrete Weir, Uncontrolled
Length of weir:	

Service Spillway	5 - 1' diameter CMP
Emergency Spillway	16 feet
Crest Elevation (feet above MSL):	
Service Spillway	830 for 3 pipes and 830.67 for 2 pipes
Emergency Spillway	832

j. Regulating Outlets

None

SECTION 2 : ENGINEERING DATA

2.1 Design

Design drawings are not available for the dam for either the original construction or the modifications done in 1977.

2.2 Construction

No records or construction data is available for B & K Lake No. 1 Dam.

2.3 Operation

No operational data is available for the lake and dam because there is no specific operational procedure for this dam.

2.4 Evaluation

a. Availability

No design drawings, design computations, construction data, or operation data is available.

In addition, no pertinent data was available for review of hydrology, spillway capacity, flood routing through the reservoir, slope stability, seepage analysis, or foundation conditions.

b. Adequacy

The lack of engineering data did not allow for a definitive review and evaluation. Therefore, the adequacy of this dam could not be assessed from the standpoint of reviewing and evaluating design, operation and construction data, but is based primarily on visual inspection, past performance history, and sound engineering judgment.

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

No valid engineering data is available.

SECTION 3: VISUAL INSPECTION

3.1 Findings

a. General

A visual inspection of the B & K Lake No. 1 Dam was made on May 19, 1979. The following persons were present during the inspection:

<u>Name</u>	<u>Affiliation</u>	<u>Disciplines</u>
Dr. M. A. Samad	Engineering Consultants, Inc.	Project Engineer, Hydraulics and Hydrology
Jon Diebel	Engineering Consultants, Inc.	Structural and Mechanical
Peter Strauss	Engineering Consultants, Inc.	Soils
Peter Howard	Engineering Consultants, Inc.	Geology
Kevin Blume	Consoer, Townsend & Assoc., Ltd.	Civil and Structural

Specific observations are discussed below.

b. Dam

The crest and downstream slope of the dam has a heavy grass cover which appears to be adequately protecting the embankment materials against surface erosion. The upstream slope has no riprap protection and has consequently undergone erosion from wave action. Scarps ranging from 1-3 feet high have been cut into the upper part of the upstream face. No trees or bushes were observed on the dam slopes.

The dam, as seen from materials in the scarps, appears to be composed of residual soils with gravel.

Some seepage in the form of standing water was seen next to a large tree adjacent to the downstream toe near the left abutment. Damp conditions were noted next to the spillway channel in a row of trees and bushes about 20 feet downstream of the downstream toe of dam near the right abutment. Standing water was seen at about the same level in the spillway channel. Boggy conditions were also seen about 300 feet downstream of the toe of the embankment at the central part of the dam.

No signs of instability were seen on the embankment or in the foundation at any location.

The present owner reported that the original dam leaked in the right abutment-spillway area. He reported that in 1977 he cleared trees from the downstream face and placed 9000 cubic yards of clay against the downstream slope to stop seepage. A core trench about 20 feet wide and 14 feet high was constructed at the downstream toe of the embankment and

the crest width increased to 14 feet during the embankment construction.

There are no rock outcrops at the damsite. According to the Geologic Map of Missouri (1979) the covered bedrock is Burlington Limestone (Osagean Series, Mississippian). The Burlington is predominately cherty, crinoidal limestone.

The Soil Conservation Service reports (Soil Survey of Montgomery and Warren Counties, Missouri, 1978) that the soils in the bottom land at the site are clayey silt (ML) and cherty, clayey gravel (GC). The upslope soils consist largely of silty clay (CL-ML) and clay (CL).

It is not known if the dam rests on bedrock or not. If it does, the Burlington will form an adequate foundation provided it was blanketed with sufficient impervious material to prevent the possible development of solution channels along possible joints or joint intersections in the limestone.

The type of material used in the embankment fill is not known.

c. Appurtenant Structures

(1) Spillway

The spillway approach channel to the concrete weir is covered by a thin grass cover. The center of the channel is a small erosion gully. The concrete in the weir structure is old and deteriorated, but appears to be structurally sound. The corrugated metal pipes through the concrete weir are in satisfactory condition.

Upstream and downstream of the weir trees and large brush are growing in the channel. This vegetation will inhibit flows through the spillway channel. The spillway channel downstream of the weir has recently had rock riprap placed in the bottom of the channel from a point approximately 30 feet downstream of the weir to and beyond the toe of the embankment. The sides of the channel exhibit sloughing and erosion due to flows through the spillway channel.

The spillway channel is separated from the embankment by a small ridge of natural ground. This ridge is heavily vegetated with trees and brush, but substantial erosion is occurring on the bank of this channel.

(2) Outlet Works

There is no low level drain or outlet works at the damsite.

d. Reservoir Area

The water surface elevation was approximately 830 feet above MSL at the time of inspection.

The reservoir rim is gently sloping with trees and woods near the shore. No evidence of instability was observed.

e. Downstream Channel

The downstream channel is well defined with some vegetative and tree growth. The channel joins Lost Creek about 1/4 mile downstream from the dam. No major obstacles were found in the channel which would significantly reduce the

hydraulic efficiency of the channel. Some erosion could be observed in a few areas.

3.2 Evaluation

The following items were observed which could affect the safety of the dam, or which will require maintenance within a reasonable period of time.

1. Wave erosion on the upstream embankment slope.
2. Seepage observed downstream of the toe of the embankment at the left and right abutment of the dam.
3. Trees and large brush growing in several areas of the spillway discharge channel.
4. Erosion on the banks of the spillway discharge channel, particularly on the left bank adjacent to the dam embankment.

SECTION 4: OPERATIONAL PROCEDURES

4.1 Procedures

B & K Lake No. 1 Dam is used solely for recreational purposes. No provisions were made for drawing down the reservoir or regulating the water level. No formal operational procedures are in effect for this dam.

4.2 Maintenance of Dam

The dam is maintained by the owner Mr. Ken Davis and his caretaker, Mr. Bob Curtis who lives on the property. The dam seems to be maintained satisfactorily. the downstream and upstream slopes, along with the crest, seem to be kept free of saplings and bushes. Periodically the grasses are mowed on the dam. At the time of inspection it was apparent that the spillway channel had been recently lined with rocks ranging in size from 2 inches to 24 inches in diameter.

The approach channel to the spillway is somewhat blocked with trees and bushes. There is also a close-meshed trash rack at the entrance to the approach channel which is partially clogged with debris. These areas should receive attention within a reasonable period of time.

4.3 Maintenance of Operating Facilities

There are no operating facilities at the damsite which require maintenance. No water level records are kept for the lake.

4.4 Description of Any Warning System in Effect

The inspection team is not aware of any warning system in effect.

4.5 Evaluation

The operation and maintenance for B & K Lake No. 1 Dam, with the exception of the spillway approach channel, seems to be satisfactory. Also the upstream slope at the water level is showing signs of erosion.

No operation is required for the lake and dam, however, the items suggested for maintenance should receive attention within a reasonable length of time.

SECTION 5: HYDRAULIC/HYDROLOGIC

5.1 Evaluation of Features

a. Design

The watershed area of B & K Lake No. 1 Dam upstream from the dam axis consists of approximately 157 acres. There is a dam named as B & K Lake No. 2 Dam (Mo. 11002) upstream of B & K Lake No. 1 Dam. The watershed area between the upstream dam and B & K Lake No. 1 Dam investigated in this report is about 132 acres. Most of the watershed area is wooded and covered with grass. Land gradients in the watershed average roughly 4 percent. B & K Lake Dam No. 1 is located on an unnamed tributary of Lost Creek. The reservoir is about 1/4 mile upstream from the confluence of the unnamed tributary and Lost Creek. At its longest arm the watershed is approximately 0.6 mile long. A drainage map showing the watershed area is presented as Plate 1 in Appendix B.

Evaluation of the hydraulic and hydrologic features of B & K Lake No. 1 Dam was based on criteria set forth in the Corps of Engineers' "Recommended Guidelines for Safety Inspection of Dams", and additional guidance provided by the St. Louis District of the Corps of Engineers. The Probable Maximum Flood (PMF) was calculated from the Probable Maximum Precipitation (PMP) using the methods outlined in the U.S. Weather Bureau Publication, Hydrometeorological Report No. 33. The probable maximum storm duration was set at 24 hours, and storm rainfall distribution was based on criteria given in EM 1110-2-1411 (Standard Project Storm). The SCS method was used

for deriving the unit hydrographs, utilizing the Corps of Engineers' computer program HEC-1 (Dam Safety Version). Two unit hydrographs were derived. One unit hydrograph was for the drainage above the B & K Lake No. 2 Dam; another unit hydrograph was for drainage area between B & K Lake No. 2 Dam and B & K Lake No. 1 Dam. The parameters of the unit hydrographs are presented in Appendix B. The SCS method was used for determining loss rate. The hydrologic soil group of the watershed was determined by use of published soil maps. The hydrologic soil group of the watershed and the SCS curve number are also presented in Appendix B. The curve number, the unit hydrograph parameters, and the PMP rainfall were directly input to the HEC-1 (Dam Safety Version) computer program to obtain the PMF hydrograph. The computed peak discharges of the PMF and one-half of the PMF at the B & K Lake No. 2 Dam reservoir are 647 cfs and 324 cfs respectively. The peak discharges of the PMF and one-half of the PMF between B & K Lake No. 2 Dam and B & K Lake No. 1 Dam are 2,376 and 1,368 cfs respectively.

Both the PMF and one-half of the PMF inflow hydrographs at the B & K Lake No. 2 Dam were routed through B & K Lake No. 2 Dam reservoir by the Modified Puls Method, also utilizing the HEC-1 (Dam Safety Version) computer program. The peak outflow discharges for the PMF and one-half of the PMF at B & K Lake No. 2 Dam are 520 cfs and 193 cfs, respectively. Both the PMF and one-half of the PMF when routed through the reservoir resulted in overtopping of B & K Lake No. 2 Dam. The outflow hydrographs at B & K Lake No. 2 Dam were combined with the PMF and one-half of the PMF hydrographs for B & K Lake No. 1 Dam. The combined hydrographs for both the PMF and one-half of the PMF, were then routed through B & K Lake No. 1 Dam reservoir. The peak outflow discharges for the PMF and one-half of the PMF at B & K Lake No. 1 Dam are

2,626 cfs and 1,217 cfs respectively. Both the PMF and one-half of the PMF, when routed through the reservoir resulted in overtopping of the B & K Lake No. 1 Dam.

The stage-outflow relations for the spillways were prepared from field notes, and sketches, prepared during the field inspection. The reservoir stage-capacity data were based on the U.S.G.S. Warrenton Quadrangle topographic map (7.5 minute series). The spillway and overtop rating curves and the reservoir capacity curves for B & K Lake No. 1 & No. 2 Dams are presented as Plates 2 through 5 in Appendix B.

From the standpoint of dam safety, the hydrologic design of a dam aims at avoiding overtopping. Overtopping is especially dangerous for an earth dam because the downrush of waters over the crest can erode the dam embankment and release all the stored water into the downstream floodplain. The safe hydrologic design of a dam requires a spillway crest height that can handle a very large and exceedingly rare flood without overtopping.

The Corps of Engineers designs its dams to safely pass the Probable Maximum Flood that is estimated could be generated from the upstream watershed. This is the generally accepted criterion for major dams throughout the world, and is the standard for dam safety where overtopping would pose any threat to human life. According to the Corps criteria, the hydrologic requirement for safety for this dam is the capability to pass from one-half of the Probable Maximum Flood to the Probable Maximum Flood without overtopping.

b. Experience Data

It is believed that no records of reservoir stage or spillway discharge are maintained for this site.

c. Visual Observations

Observations made of the spillway during the visual inspection are discussed in Section 3.1c(1) and evaluated in Section 3.2.

d. Overtopping Potential

As indicated in Section 5.1-a, both the Probable Maximum Flood and one-half of the Probable Maximum Flood, when routed through the reservoir, resulted in overtopping of the dam. The peak outflow discharges for the PMF and one-half of the PMF at B & K Lake No. 1 Dam are 2,626 cfs and 1,217 cfs respectively. The PMF overtopped the dam crest by 1.63 feet and one-half of the PMF overtopped the dam crest by 0.91 feet. The total duration of embankment overflow is 6.67 hours during the PMF, and 4.83 hours during one-half of the PMF. The spillways for B & K Lake No. 1 Dam are capable of passing a flood equal to approximately 17 percent of the PMF just before overtopping the dam.

The computed one percent chance flood using 100-year 24 hour rainfall data was routed through the reservoir. The routing results indicate that the spillway/reservoir system will accommodate the 100-year flood without overtopping the dam.

The failure of the dam could cause extensive damage to the property downstream of the dam and possible loss of life. Within the estimated five mile damage zone downstream of the dam are seven houses, six buildings and one road crossing.

SECTION 6: STRUCTURAL STABILITY

6.1 Evaluation of Structural Stability

a. Visual Observations

There were no signs of settlement or distress observed on the embankment or foundation during the visual inspection. The upstream slope of the embankment is exhibiting sloughing and erosion due to wave action. The condition does not appear to be serious at this time, but the condition should be watched and the slope stabilized as required.

Seepage observed during the inspection is not believed to be serious enough to indicate an unsafe condition at this time. However, the seepage should be monitored and any changes in quantity, location or color should be reported and investigated. The recommended seepage and stability study should address this seepage in detail.

The spillway discharge channel should be cleared of all trees and large brush, and future growth should be prevented. The structural condition of the spillway weir is satisfactory. The discharge channel, however, is undergoing substantial erosion on the earthen banks of the channel. The erosion on the left bank is especially hazardous for the structural integrity of the embankment. The discharge channel is separated from the embankment by a thin wall of material, and continued erosion of the bank will eventually cause the bank to fail, allowing discharges to flow along the abutment contact of the dam. The owner has recently added some riprap

to the channel, but more riprap is required to adequately stabilize the bank of the channel.

b. Design and Construction Data

No design or construction data relating to the structural stability of the dam or appurtenant structures were found.

c. Operating Records

No operating records are available relating to the stability of the dam or appurtenant structures. Water levels in the reservoir have not been recorded, however, the reservoir was almost full on the day of inspection, and is assumed to be close to full at all time.

d. Post Construction Changes

The construction in 1977 of a core trench and the addition of material to the downstream embankment slope is a post construction change. This work probably increased the structural stability at the time it was done if the work was performed properly.

e. Seismic Stability

According to the Seismic Zone Map of Contiguous States, Form TM 5-809-10/NAVFAC P.355/AFM 88-3 Chapter 13; April 1973 the portion of Missouri in which B & K Lake No. 1 Dam is located is in Seismic Zone 2. This means there is only moderate damage probability. A detailed seismic analysis is not felt to be necessary for this embankment under present conditions.

SECTION 7: ASSESSMENT/REMEDIAL MEASURES

7.1 Dam Assessment

The assessment of the general condition of the dam is based upon available data and visual inspections. Detailed investigations, testing, and detailed computational evaluations are beyond the scope of a Phase I investigation; however, the investigation is intended to identify any need for such studies.

It should be realized that the reported condition of the dam is based on observations of field conditions at the time of inspection along with data available to the inspection team.

It is also important to note that the condition of a dam depends on numerous and constantly changing internal and external conditions, and is evolutionary in nature. It would be incorrect to assume that the present condition of the dam will continue to represent the condition of the dam at some point in the future. Only through continued care and inspection can there be any chance that an unsafe condition could be detected.

a. Safety

The spillway capacity of B & K Lake No. 1 Dam was found to be "Seriously Indadequate". The spillway/reservoir system will accommodate only 17 percent of the PMF before overtopping the dam. The dam is overtopped by more than 1 1/2 feet during the PMF. The duration of overflow is over 6 hours. Overtopping could result in dam failure. If the body of the dam is made up of silty soils the probability of failure of the dam due to overtopping will increase.

The seepage observed below the downstream toe near the left and right abutments and in the spillway channel is not felt to indicate an unsafe condition at present. This seepage should be monitored for changes indicating a potential hazard. The recommended study should determine the cause and effect of the seepage.

The sloughing and erosion on the upstream embankment slope does not appear to be affecting the safety of the dam at this time, but the condition should be monitored and repairs made as required.

The spillway discharge channel is in need of remedial measures. The trees and brush in the spillway channel should be cleared, and future growth prevented. The vegetation in the channel will substantially reduce the hydraulic efficiency of the spillway.

Additional riprap will be required to stabilize the banks of the spillway channel. This should be accomplished in the near future to prevent further erosion of the banks of the channel.

b. Adequacy of Information

Prior information concerning the dam and appurtenant structures is not available. The information presented in this report is based upon visual inspection and simple field measurements.

c. Urgency

The remedial measures recommended in Paragraph 7.2 should be accomplished in the near future. The items recommended in Paragraph 7.2a should be pursued on a high priority basis.

d. Necessity for Phase II Inspection

Based on results of the Phase I inspection, and if the remedial measures recommended in Paragraph 7.2 are undertaken as soon as possible, a Phase II inspection is not felt to be necessary.

7.2 Remedial Measures

a. Alternatives:

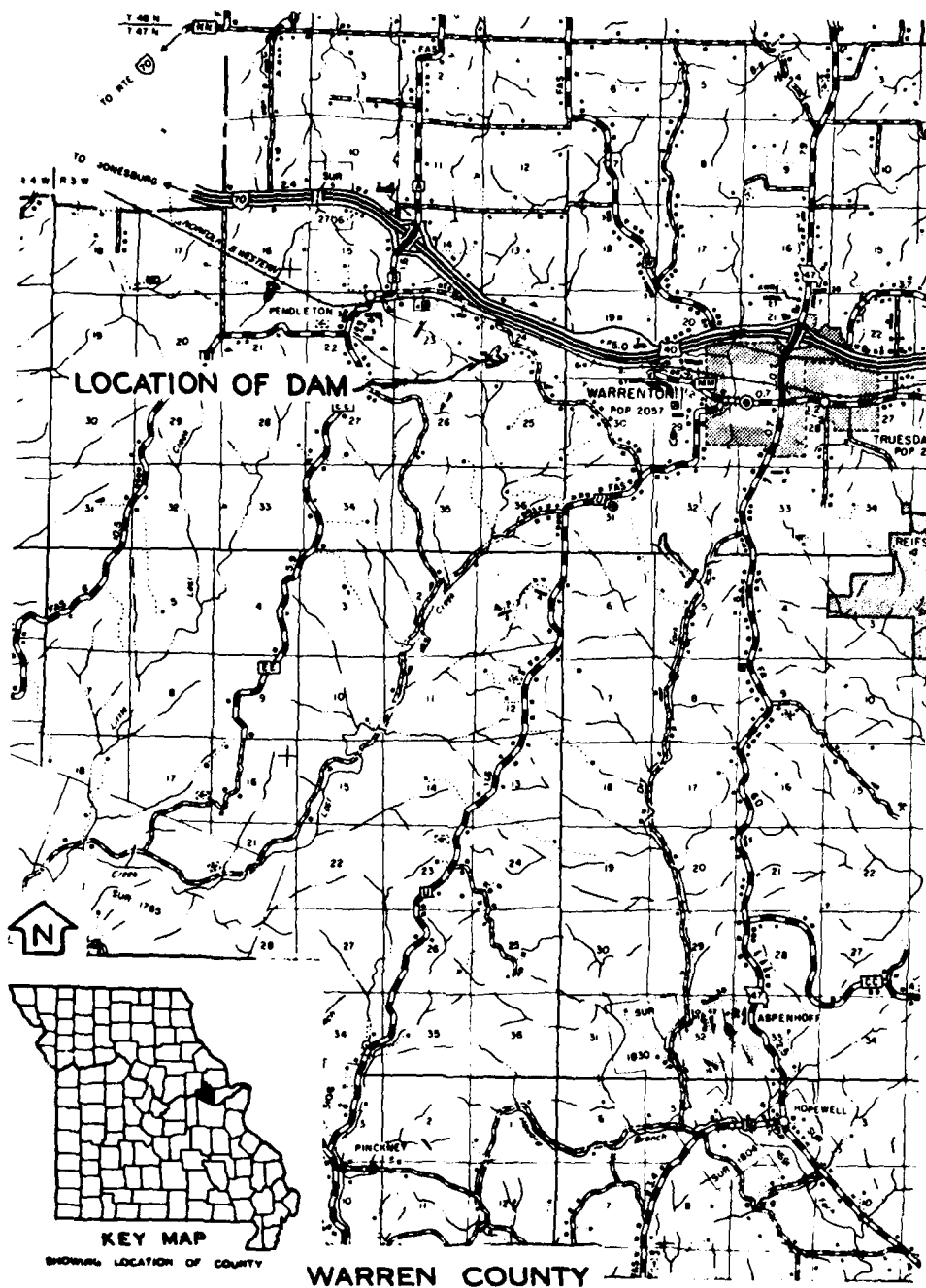
Spillway capacity and/or height of dam should be increased to accommodate the PMF without overtopping the dam.

b. O & M Procedures:

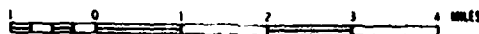
1. Seepage and stability analyses should be performed by a professional engineer experienced in the design and construction of dams. This study should concentrate on the area exhibiting seepage on the downstream slope at the right abutment contact.
2. Monitor the condition of the upstream embankment slope, and make repairs to the slope as required.

3. Stabilize the banks of the spillway discharge channel to prevent future erosion and sloughing.
4. Clear the trees and large brush from the spillway discharge channel, and prevent future growth. This work should be done under the supervision of an engineer experienced in the design and construction of earth dams.
5. The owner should initiate the following programs.
 - (a) Periodic inspection of the dam by a professional engineer experienced in the design and construction of earthen dams.
 - (b) Set up a maintenance schedule and log all visits to the dam for operation, repairs and maintenance.

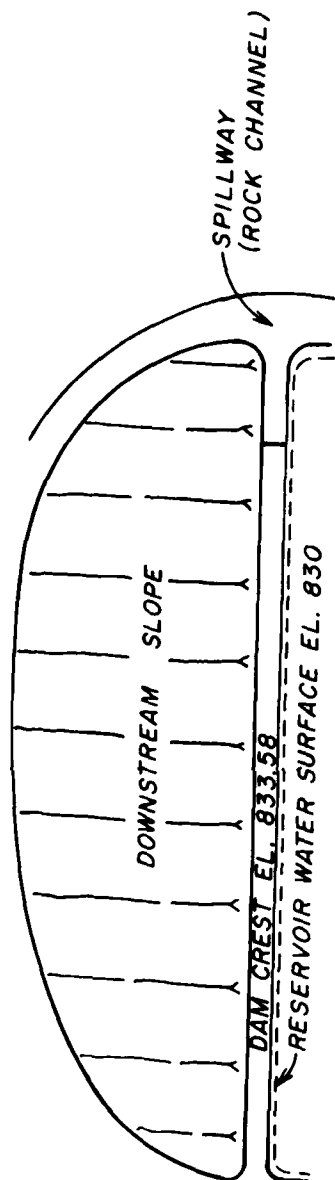
PLATES



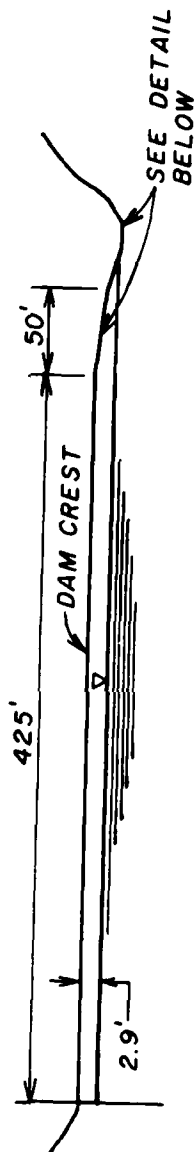
SCALE



LOCATION MAP - B & K LAKE NO. 1 DAM

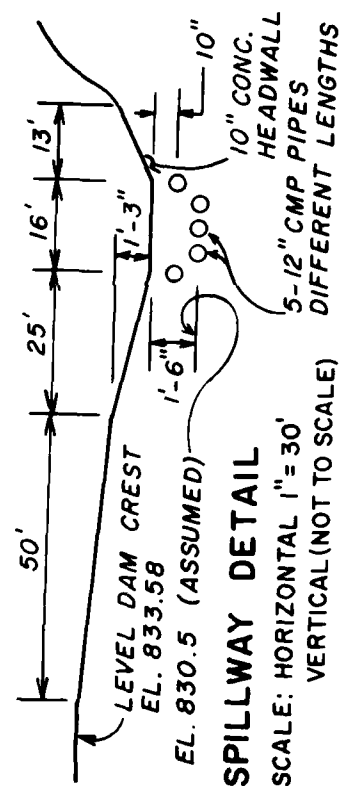


PLAN

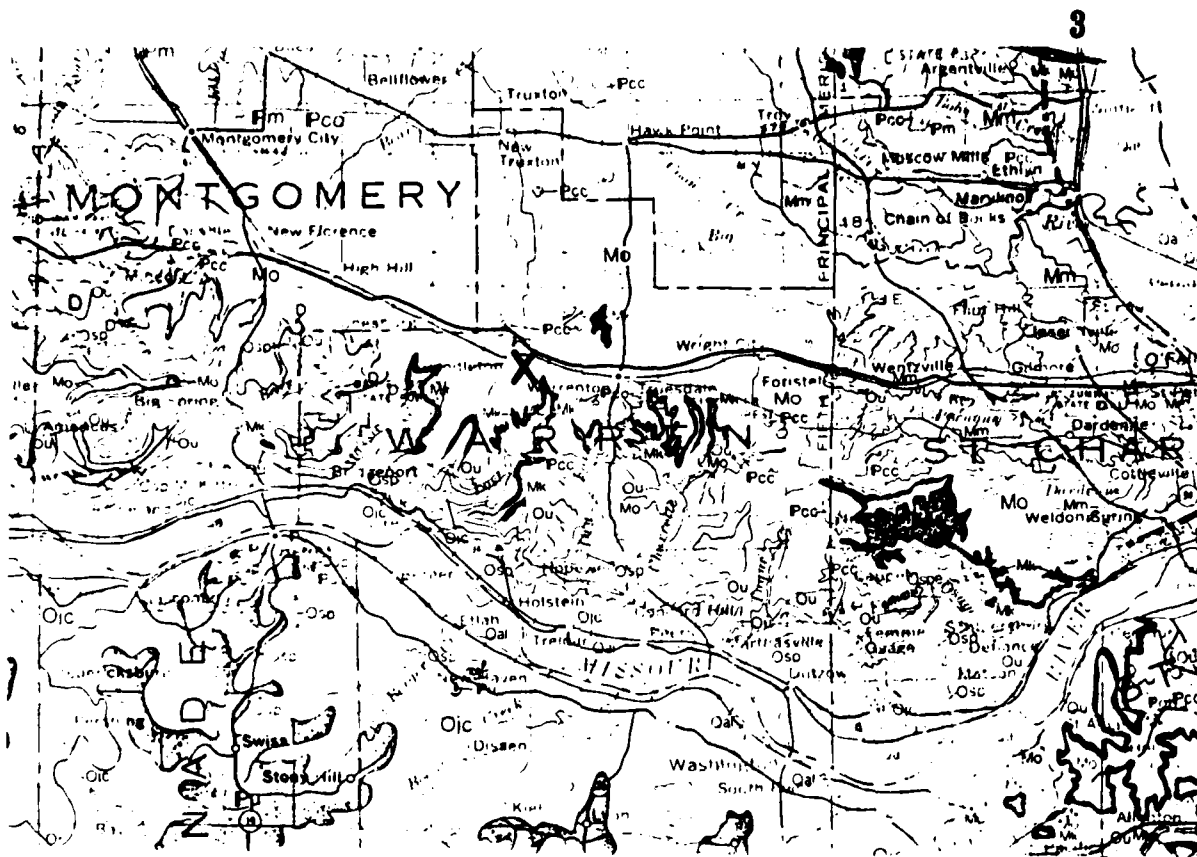


ELEVATION

SCALE
1" = 100' (HORIZONTAL)
VERTICAL (NOT TO SCALE)



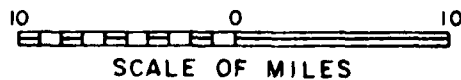
B & K LAKE NO. 1 DAM (MO. 30506)
PLAN AND ELEVATION



<u>QUATERNARY</u>	{ Qal - ALLUVIUM	
<u>PENNSYLVANIAN</u>	{ Pm - MARMATON GROUP	
	{ Pcc - CHEROKEE GROUP	
	{ Mm - ST. LOUIS LIMESTONE <u>ORDOVICIAN</u>	
		SALEM FORMATION
		WARSAW FORMATION
<u>MISSISSIPPIAN</u>	{ Mo - BURLINGTON-KEOKUK FORMATION	
	{ Mk - CHOTEAU GROUP	
		Ou- NOIX LIMESTONE
		MAQUOKETA SHALE
		CAPE LIMESTONE
		KIMMSWICK FORMATION
		DECORAH FORMATION
		PLATTIN FORMATION
		JOACHIM DOLOMITE
		Osp-ST. PETER SANDSTONE
		Ojc-COTTER-POWELL FORMATION
		JEFFERSON CITY DOLOMITE

X LOCATION OF DAM MO. 30506

REFERENCE:
GEOLOGIC MAP OF MISSOURI,
MISSOURI GEOLOGIC SURVEY,
1979.

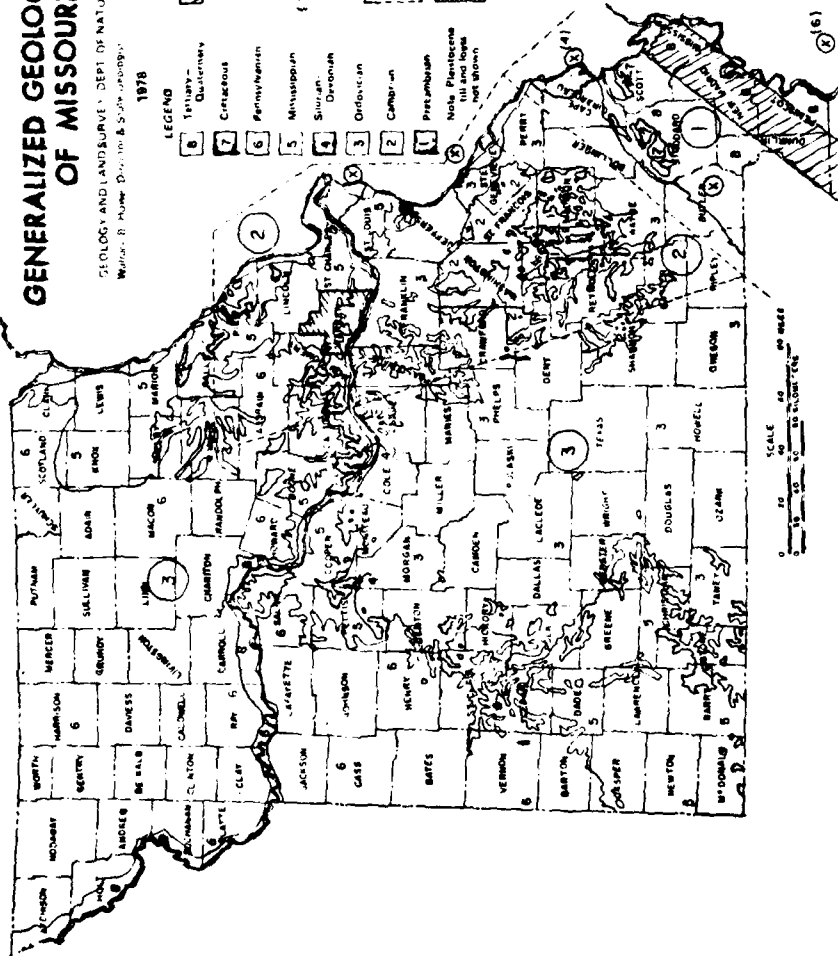


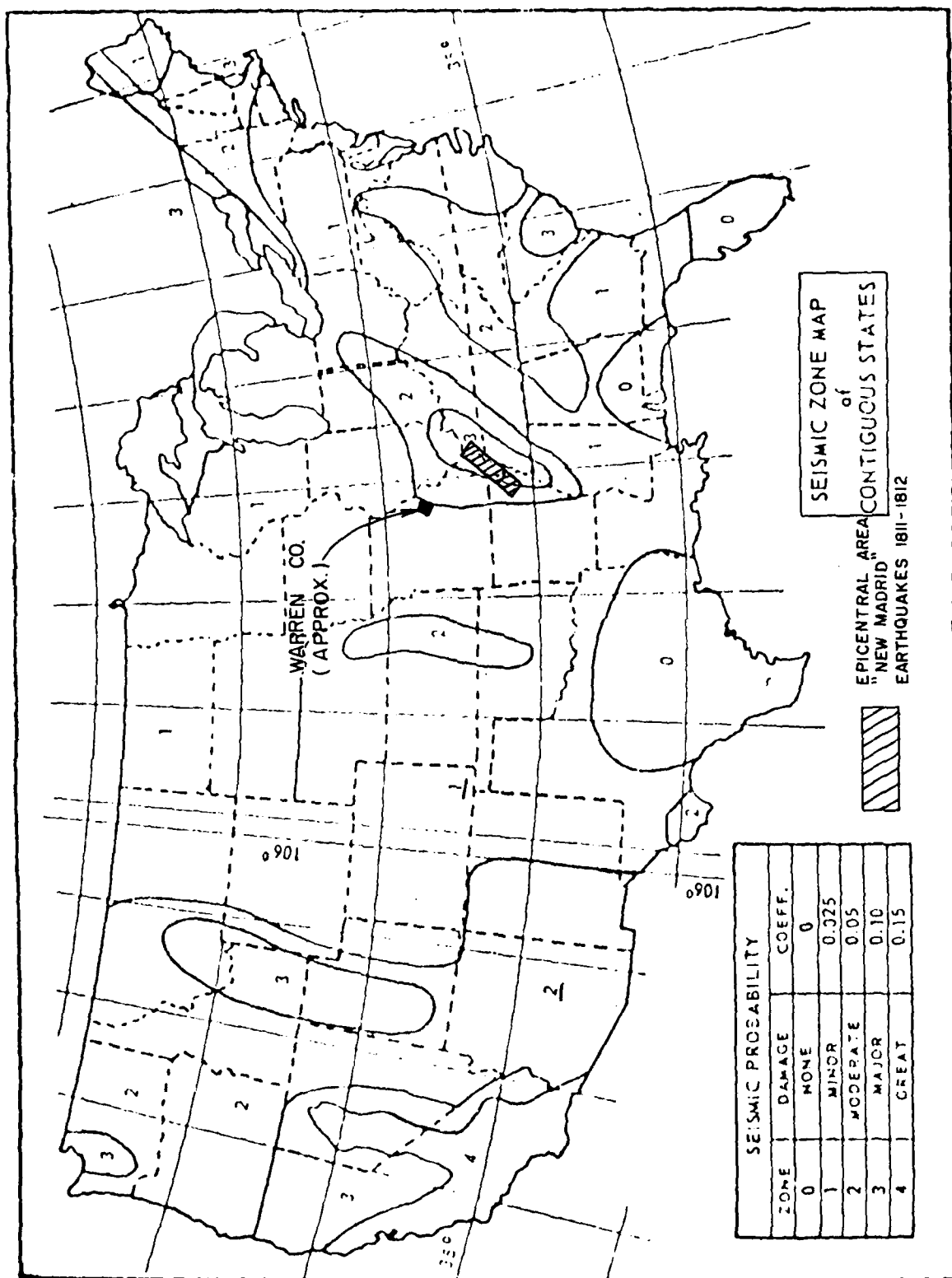
GEOLOGIC MAP OF WARREN COUNTY AND ADJACENT AREA

GENERALIZED GEOLOGIC MAP OF MISSOURI

GEOLOGY AND LAND SURVEY, DEPT. OF NATURAL RESOURCES
Warren B. Hume, Director & State Geologist
1978

- LEGEND**
- Capital Area, New Madrid Earthquakes 1811-1812
 - Other Selected Epicenters $\geq$ MM VI Since 1843
 - Other Selected Epicenters $\geq$ MM V 1850 - 1970 (Number of Events)
 - Seismic Region (After N.A.T.I.)
 - Border of Warren County





APPENDIX A

PHOTOGRAPHS TAKEN DURING INSPECTION

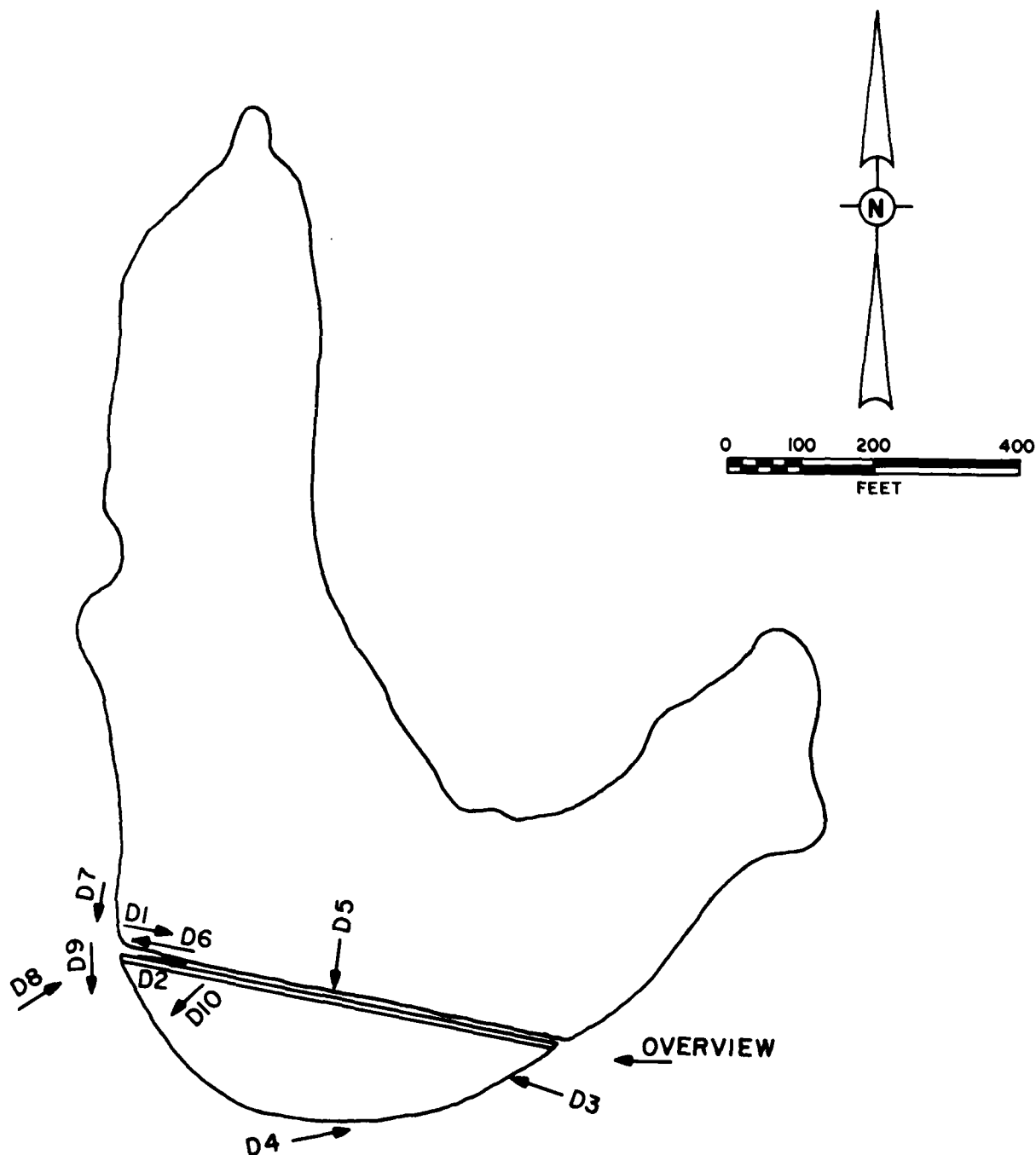


PHOTO INDEX
FOR
B & K LAKE NO. 1 DAM

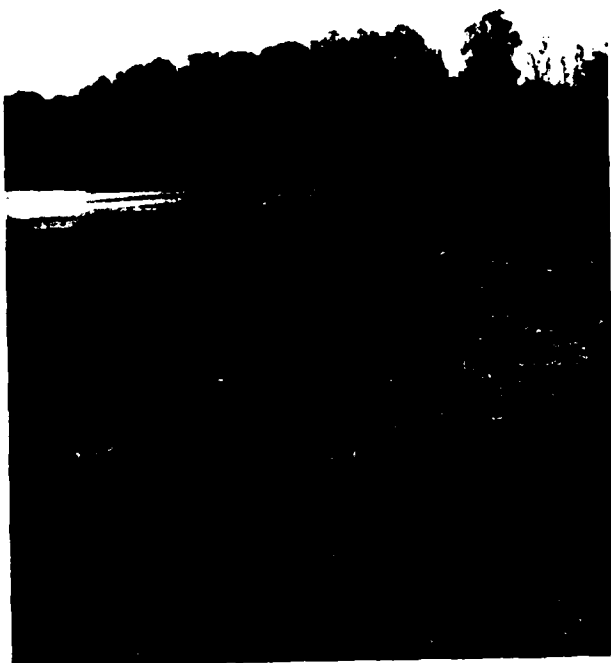
B & K Lake No.1 Dam

- D1 - Upstream embankment slope
- D2 - Crest of embankment slope
- D3 - Downstream embankment slope
- D4 - Downstream embankment slope
- D5 - View downstream of embankment
- D6 - Spillway approach
- D7 - Concrete weir in spillway channel
- D8 - Pipes through concrete weir
- D9 - Spillway discharge channel
- D10- View downstream of embankment



D1

D2

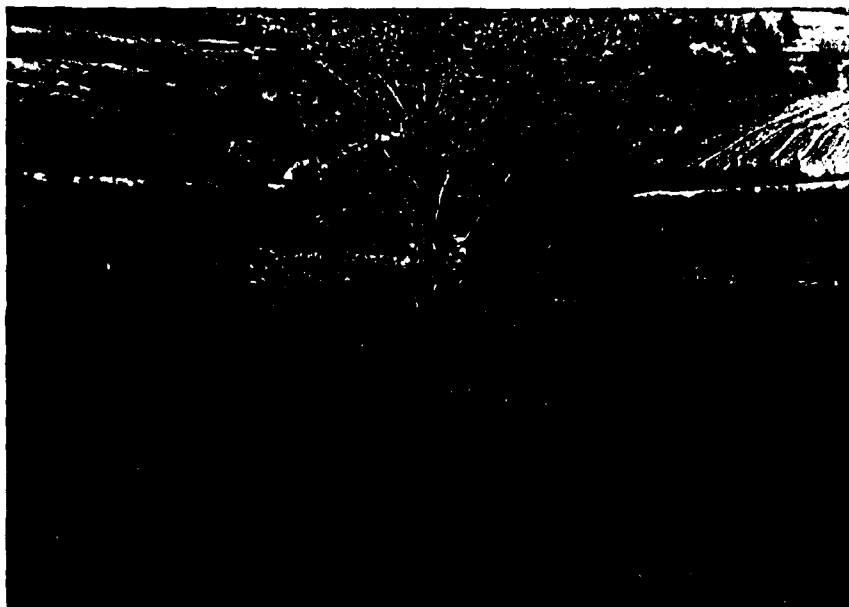




D3



D4



D5



D6



D7



D8



D9

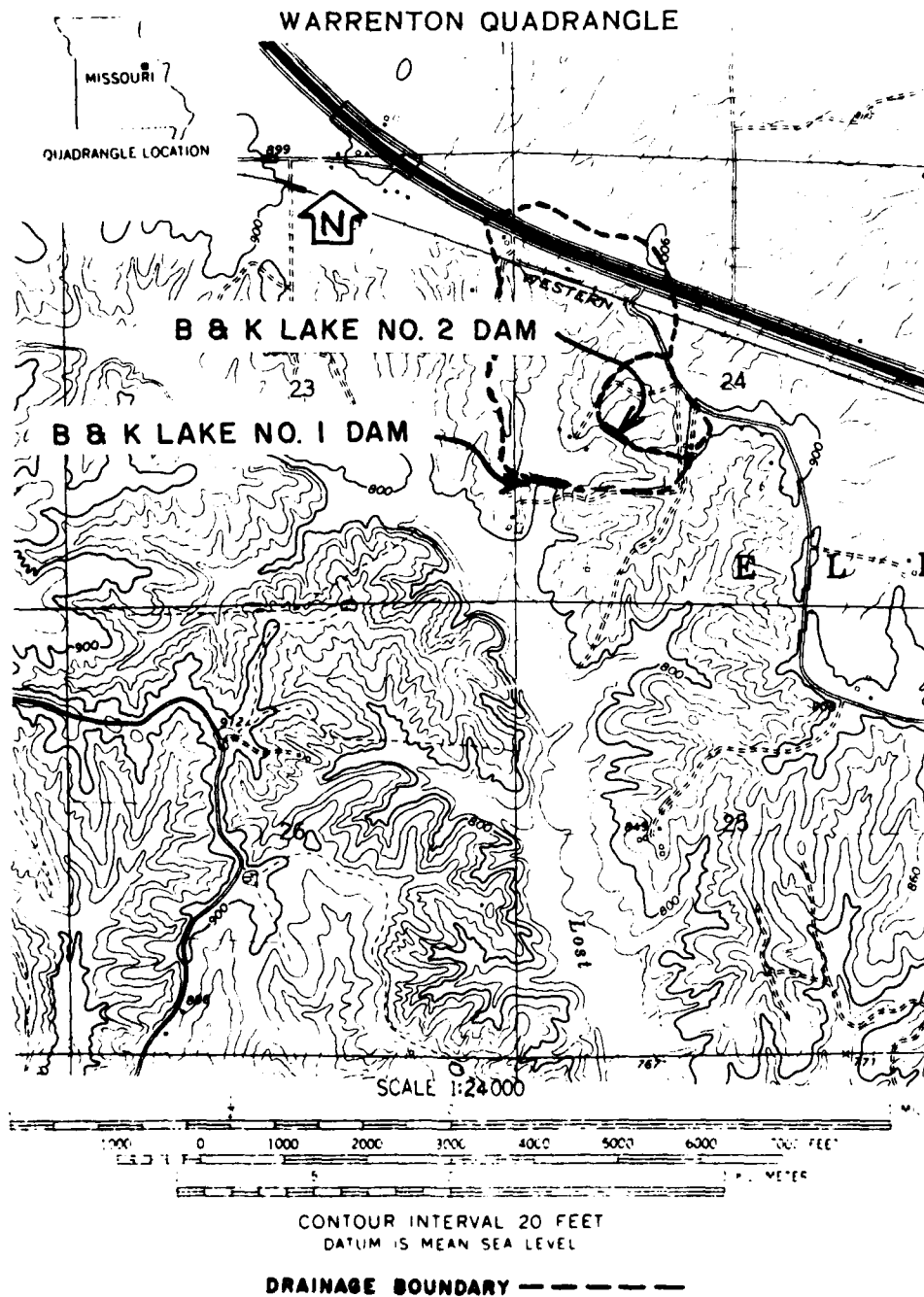


D10

APPENDIX B

HYDROLOGIC COMPUTATIONS

PLATE I, APPENDIX B



B & K LAKE NO. 1 DAM (MO. 30506)
DRAINAGE BASIN

Dam Safety Inspection - Missouri

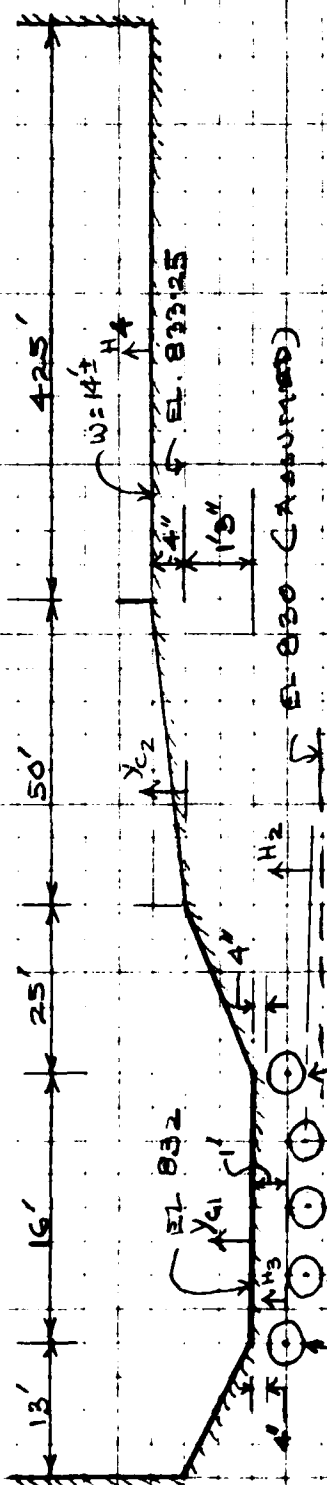
SHEET NO. 1 OF 1

B&K LAKE No 4. Dam

JOB NO. 1246

3 PILLWAY AND OVERTOP

BY JSW DATE 9-4-76

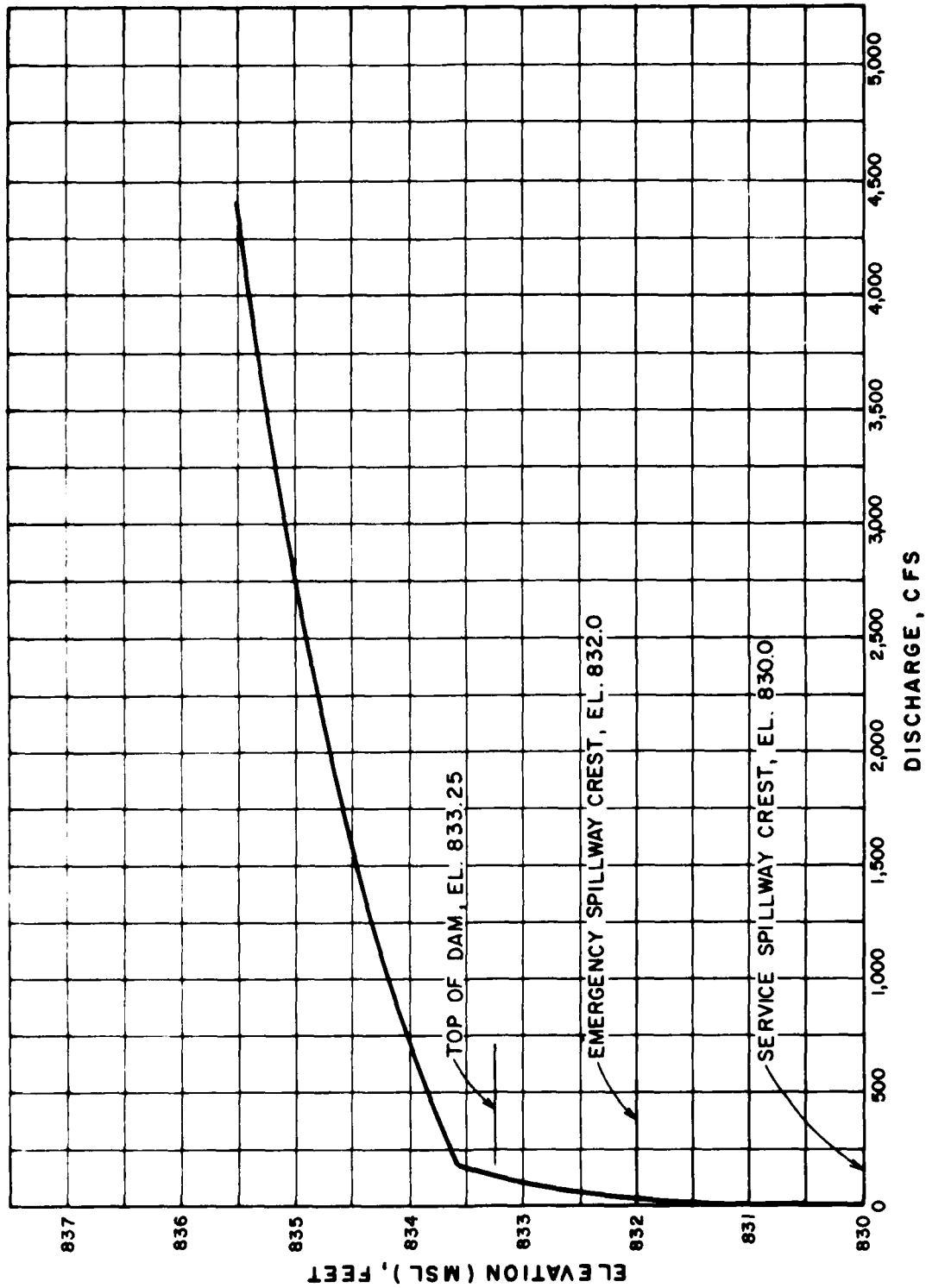

$$A^2 \pi^2 = 0.785 \text{ ft}^2$$

2-1cmφL=61

3-1 CMP

γ_{E1}	P_{E1}	T_{E1}	λ_{E1} $\frac{1}{\sin \theta_{E1}}$	λ_{E1}^2 $\frac{1}{\sin^2 \theta_{E1}}$	Q_{E1} $= \frac{P_{E1} \lambda_{E1}}{2}$	US E_{E1} 8332.4 $\lambda_{E1} + \frac{1}{\lambda_{E1}}$	H_{E1}	Q_{E1}^2 $0.25 \sqrt{3} H_{E1}$	M_{E1}	Q_{E1}^2 $\frac{0.048 \pi}{\sqrt{3} H_{E1}}$	γ_{E1}^2 $\frac{3}{2} (US)$ $(\lambda_{E1} - 8332.5)$	H_{E1}	T_{E1}	γ_{E1} $= \frac{5.67}{\sqrt{\frac{H_{E1}}{T_{E1}}}}$	Q_{E1} $= \frac{P_{E1} \lambda_{E1}}{2}$	C_{E1}	L_{E1}	Q_{E1} 0.102 193194
0						8333	1.5	16.3	1	8.57							24.8	
0.5	11.8	316.2	3.49	0.19	41.3	8332.69	2.19	19.6	1.69	11.14								71.9
1.0	31.2	46.4	4.65	0.24	145	8333.34	2.84	22.3	2.24	13.1	0.06	0.27	9.0	0.18	0.26			180.7
1.25	43.8	57.0	5.10	0.40	224	8333.65	3.16	23.5	3.66	13.9	0.27	5.4	40.0	2.08	11.2	0.07	2.60	293
2.00	84.2	54.0	7.08	0.70	576.8	8347.8	4.28	27.9	3.78	16.6	1.02	46.7	50	5.24	23.7	1.60	2.64	3349
2.80	111.3	54.0	8.14	1.03	906	8355.53	5.03	29.7	4.83	18.2	1.52	67.7	60	6.60	44.7	1.95	2.63	4348

PLATE 2, APPENDIX-B



B & K LAKE NO. 1 DAM (MO. 30506)
SPILLWAY AND OVERTOP RATING CURVE

DAM SAFETY INSPECTION - MISSOURI

SHEET NO. 1 OF

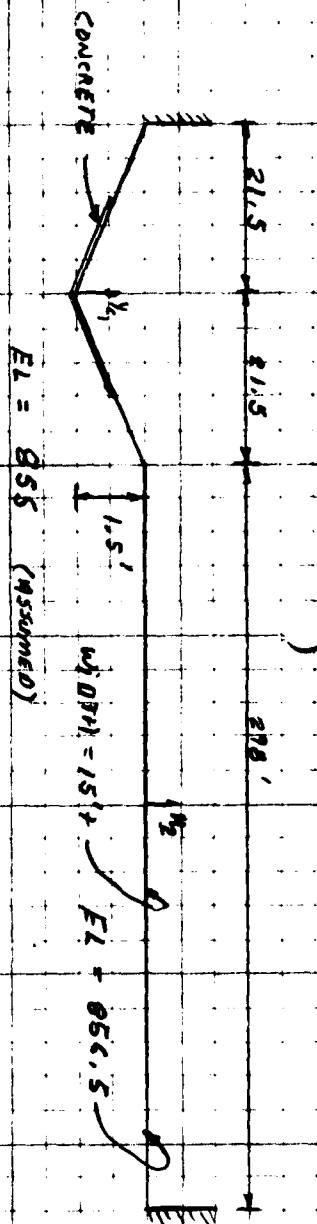
B&K Lake No. 2 Dam, Upstream of B&K Lake No. 2 Dam

JOB NO. 1240-001-1

EMERGENCY SPILLWAY AND OVERTOP RATING CURVE BY KLG

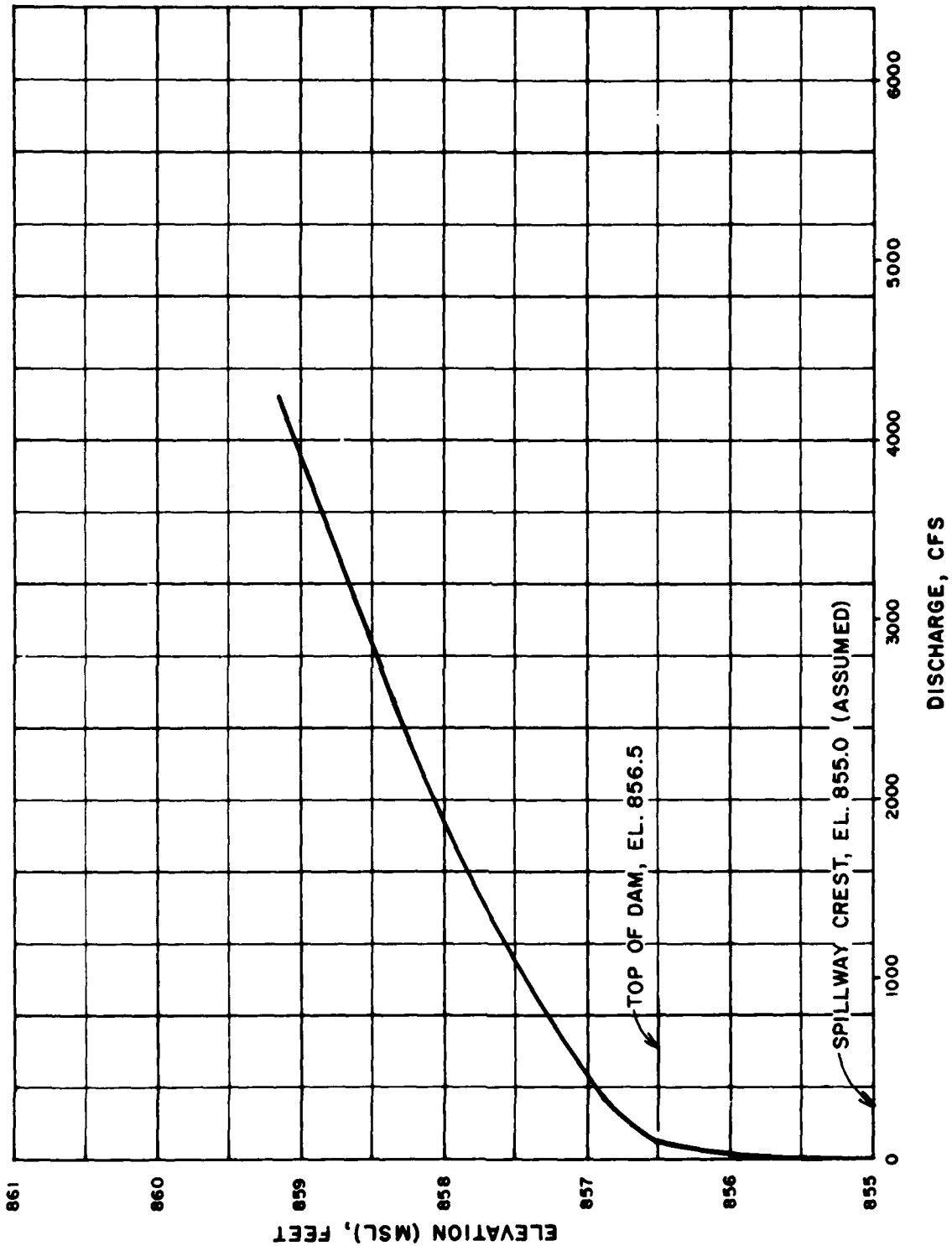
DATE 5.21.77

CRITICAL DEPTH ASSUMED IN SPILLWAY SECTION.



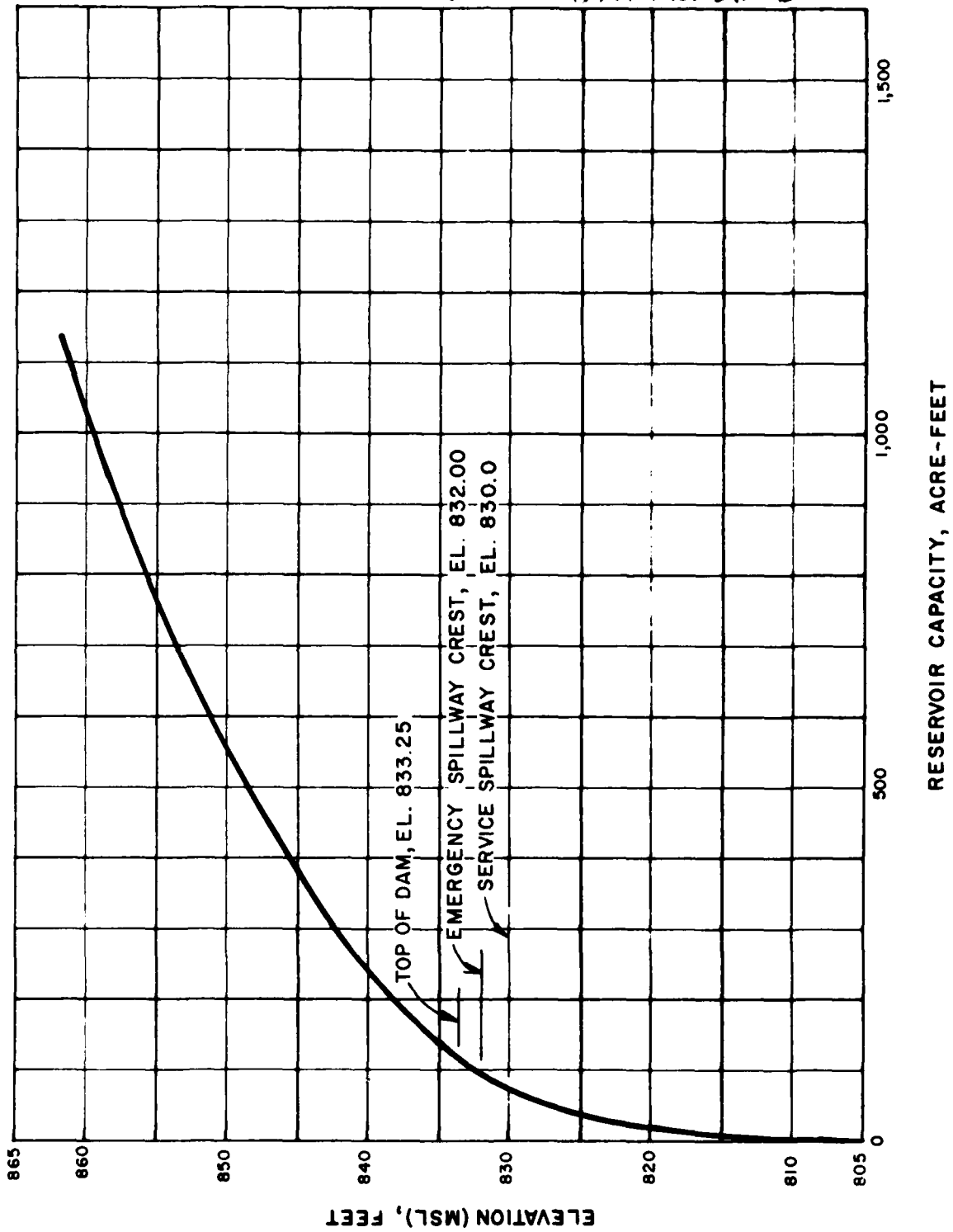
Y_1 (FEET)	A_1 (FEET ²)	T_1 (FEET)	$V_1 = \sqrt{\frac{A_1}{Q_1}}$ $5.47 \sqrt{\frac{A_1}{Q_1}}$	$\frac{V_1^2}{2g}$	$Q_1 = \frac{A_1 V_1}{C_1}$ (CFS)	$\frac{1}{5} W.D.S.$ $= 855 + \frac{V_1^2}{2g} + Y_1$	H_2	C_2	L_2	$Q_2 = \frac{A_2 V_2}{C_2}$ $C_2 L_2 \frac{H_2}{2}$	$Q = Q_1 + Q_2$
0	0	0	0	0	0	855	-	-	-	-	0
.5	3.58	14.33	2.84	0.12	10.17	855.62	-	-	-	-	10.17
1	14.33	28.67	4.01	0.25	52.46	856.25	-	-	-	-	57.46
1.5	32.25	43.0	4.91	0.37	158.35	856.87	.37	2.70	298	181.09	339.44
2.0	53.75	43.0	6.34	0.62	340.78	857.62	1.12	2.64	298	932.5	1273.28
2.5	75.25	43.0	7.50	0.87	544.38	858.57	1.87	2.63	298	2004.1	2568.55
3.0	96.75	43.0	8.51	1.12	823.34	859.12	2.62	2.63	298	3333.7	4147.06
3.5	118.25	43.0	9.40	1.37	1111.5	859.87	3.37	2.63	298	4848.6	5960.16
4.0	139.75	43.0	10.22	1.62	1428.25	860.62	4.12	2.63	298	6554.2	7982.42

PLATE-3, APPENDIX-B



B & K LAKE NO. 2 DAM
SPILLWAY & OVERTOP RATING CURVE

PLATE-4, APPENDIX-B



B & K LAKE NO. 1 DAM (MO. 30506)
RESERVOIR CAPACITY CURVE

ENGINEERING CONSULTANTS, INC.

Dam Safety Inspection - Missouri
B&K Lake No. 2 Dam Upstream of B&K Lake No. 1
RESERVOIR AREA CAPACITY

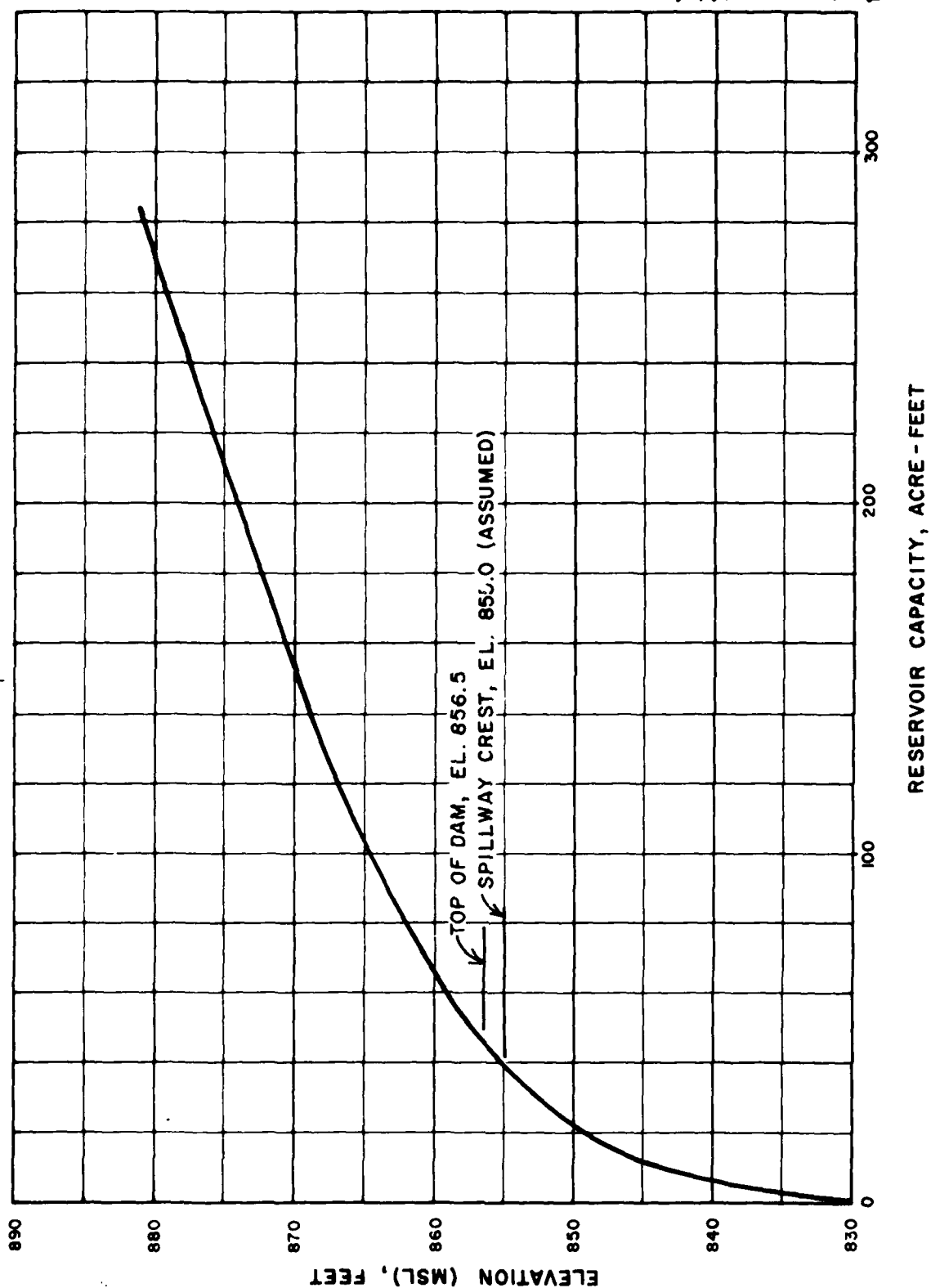
SHEET NO. 1 OF

JOB NO. 1240

BY M.P.H. DATE 6-1-79

B&K Lake No. 2 DamRESERVOIR AREA CAPACITY

Elev. M.S.L. (Ft.)	Reservoir Surface Area (Acres)	Incremental Volume (Ac.-ft.)	Total Volume (Ac.-ft.)	Remarks
830	0	0	0	Est. streambed Elev. at Dam.
855	4.7	39.2	39.2	W.S. as shown on U.S.G.S map (Elev. Assumed)
856.5	5.1	7.3	46.5	Top of Dam.
860	6.1	19.6	66.1	Area as measured on U.S.G.S. map.
880	13.4	190.3	266.4	Area as measured on U.S.G.S. map.



B & K LAKE NO. 2 DAM
RESERVOIR CAPACITY CURVE

DAM SAFETY INSPECTION / MISSOURI

SHEET NO. 4 OF

DAM # MO 30506

JOB NO. 1240-001

PROBABLE MAXIMUM PRECIPITATION

BY MAB DATE 5/22/77

DAM NO MO 30506

DETERMINATION OF PMP

1. Determine drainage area of the basin

$$D.A. = 157 \text{ Ac} = 0.25 \text{ sq. mi}$$

2. Determine PMP Index Rainfall

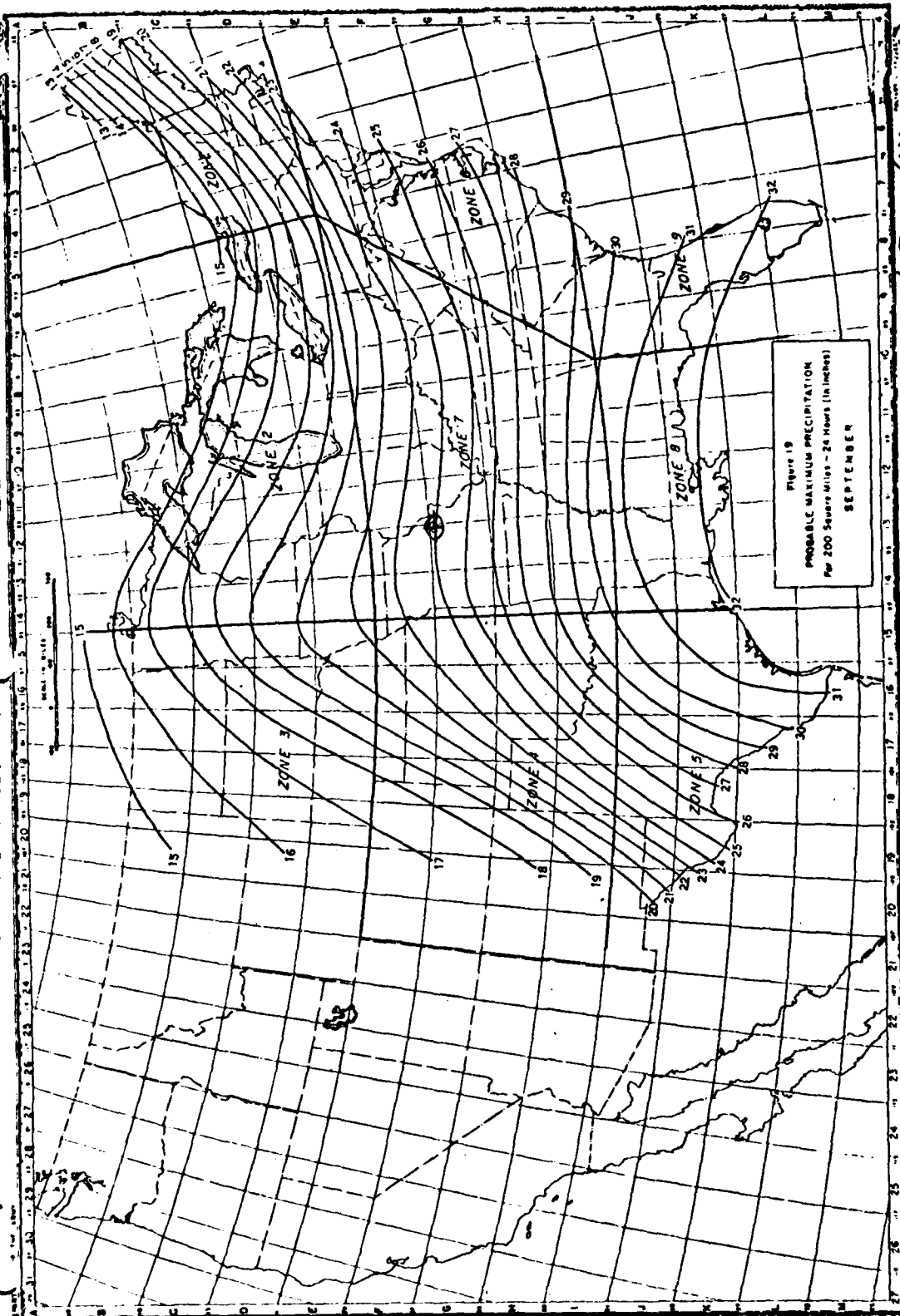
Location of centroid of basin.

$$\text{Long.} = 91^{\circ}12'57", \text{ Lat.} = 38^{\circ}40'59" \Rightarrow \text{PMP} = 24" \quad (\text{From HMR \#33, Fig 1})$$

3. Determine basin rainfall in terms of percentage of PMP Index Rainfall for various durations:

Location: Long. = $91^{\circ}12'57"$, Lat. = $38^{\circ}40'59"$ $\Rightarrow$ Zone 7

Duration (Hrs.)	Percent of Index Rainfall (%)	Total Rainfall (inches)	Rainfall Increment (inches)	Duration of Increment (Hrs.)
6	100	24	24	6
12	120	28.8	4.8	6
24	130	31.2	2.4	12



B&K Lake No. 1 Dam (MO. 30506)
 LOCATION OF CENTROID OF WATERSHED
 LAT. = 38° 40' 59", LONG. = 91° 12' 57"

PMP FOR 200 SQ. MI. - 24 HRS
 DURATION = 24"

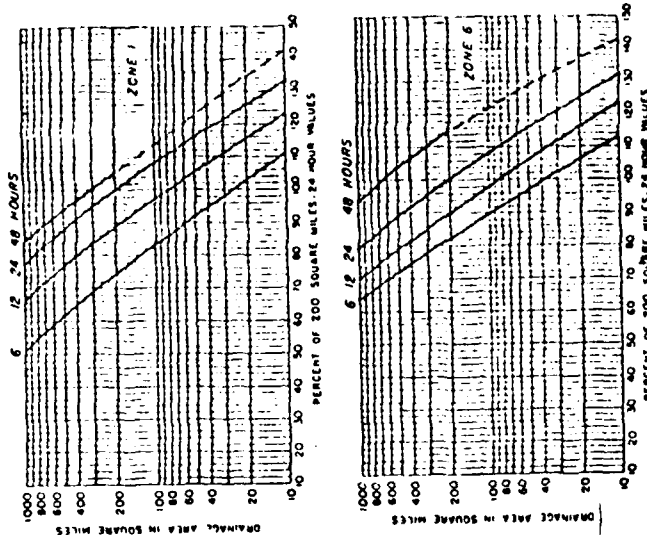
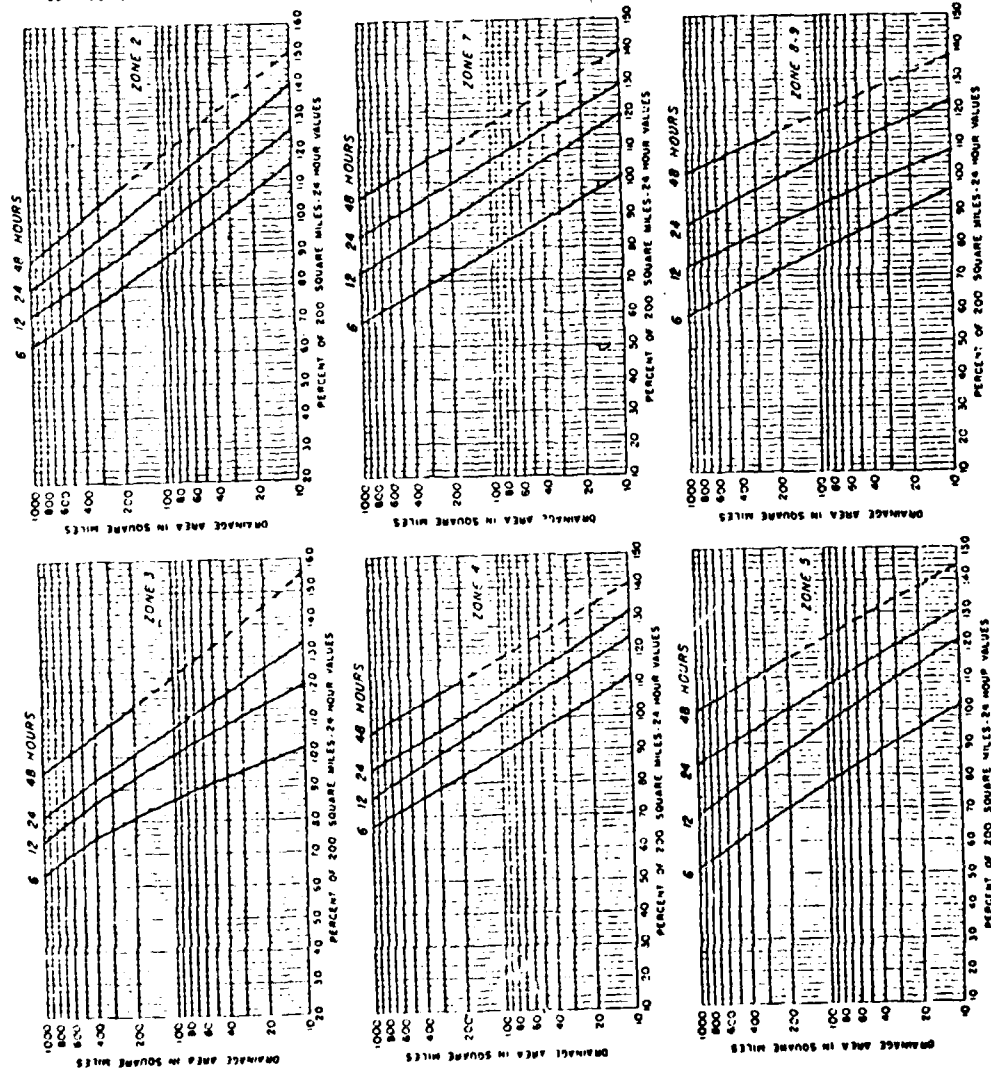


FIGURE 2
SEASONAL VARIATION
DEPTH-AREA-DURATION RELATIONSHIPS
Percentage to be applied to 200 square miles
24 hour probable maximum precipitation values
for: THE-ALL SEASON ENVELOPE



DAM SAFETY INSPECTION / MISSOURI

SHEET NO. 1 OF

B&K Lake No. 1 Dam (MO. 30506)

JOB NO. 1240-001

UNIT HYDROGRAPH PARAMETERS

BY MAB DATE 6-4-75

1. Drainage Area = 132 acres = 0.21 Sq. mi.
2. Length of stream = $(1.00 \times 2000' / 5280) = 0.38 \text{ miles}$
3. Elevation of drainage divide along the longest stream, $H_1 = 900'$
4. Reservoir elevation at spillway crest, $H_2 = 830'$
5. Difference in elevation, $\Delta H = 900 - 830 = 70'$
6. Time of concentration

a) By Kimpich formula:

$$T_c = \left(\frac{11.9 \times L^3}{\Delta H} \right)^{0.385} = \left(\frac{11.9 \times 0.38^3}{70} \right)^{0.385}$$

$$= 0.17 \text{ hr.}$$

b) By velocity estimate:

$$\text{Avg. Slope} = \frac{\Delta H}{L} = \frac{70}{2000} = 3.5\%$$

$$\Rightarrow \text{Avg. Velocity} = 3 \text{ ft/sec}$$

$$T_c = \frac{2000}{3 \times 60 \times 60} = 0.19 \text{ hr.}$$

$$\text{Use } T_c = 0.18 \text{ hr}$$

7. Lag time, $L_t = 0.6 \times 0.18 = 0.11 \text{ hr.}$
8. Unit duration, $D \leq \frac{L_t}{3} = 0.04 < 0.083$
- Use $D = 0.083 \text{ hr.}$

$$9. \text{ Time to peak, } T_p = \frac{D}{2} + L_t = \frac{0.083}{2} + 0.11 = 0.15 \text{ hr.}$$

$$10. Q_p = \frac{484A}{T_p} = \frac{484 \times 0.21}{0.15} = 678 \text{ cfs.}$$

DAM SAFETY INSPECTION / MISSOURI

SHEET NO. 1 OF

B&K Lake No. 2 Dam U/s of B&K Lake No. 1 Dam

JOB NO. 1240-001

UNIT HYDROGRAPH PARAMETERS

BY MAS DATE 6-178

1. Drainage Area = 25 acres = 0.089 sq. mi.
2. Length of stream = $(0.35 \times 2000 / 5280 \text{ ft/mi}) = 0.13 \text{ miles}$
3. Elevation at drainage divide along the longest stream, $H_1 = 905'$
4. Reservoir elevation at spillway crest $H_2 = 855'$
5. Difference in elevation, $\Delta H = 905 - 855 = 50'$
6. Average slope of stream = $\frac{\Delta H}{L} = \frac{50}{700} = 7.14\%$
7. Time of concentration

a) By Kirpich formula:

$$T_c = \left(\frac{11.9 \times L^3}{\Delta H} \right)^{0.385} = \left(\frac{11.9 \times 13^3}{50} \right)^{0.385}$$

$$= 0.06 \text{ hour}$$

b) By velocity estimate:

$$\text{Avg slope} = 7.14\% \Rightarrow \text{Avg. velocity} \approx 3.8 \text{ ft/sec}$$

$$T_c = \frac{700}{5 \times 3600} = 0.04 \text{ hr.}$$

Use $T_c = 0.083 \text{ hr}$ to meet the Corps criteria of Minimum $D = 5 \text{ minutes}$

$$8. \text{Lag time, } L_t = 0.6 \times 0.083 = 0.05 \text{ hr.}$$

9. Unit duration: Use Minimum $D = 5 \text{ minutes}$ to meet the Corps criteria

$$10. \text{Time to peak, } T_p = \frac{D}{2} + L_t = \frac{0.083}{2} + 0.05 = 0.092 \text{ hr.}$$

$$11. Q_p = \frac{484A}{T_p} = \frac{484 \times 0.039}{0.092} = 205 \text{ cfs}$$

DAM SAFETY INSPECTION / MISSOURI

SHEET NO. 1 OF

B&K LAKE NO. 1 DAM (MO. 30506)

JOB NO. 1240-001

DETERMINATION OF SOIL GROUP & CURVE NUMBER BY MAS DATE 6-1-79

MISSOURI DAM # MO. 30506DETERMINATION OF HYDROLOGIC SOIL GROUP & SCS CURVE NUMBER

1. The soils in the watershed consist of C&D group soils. The 'C' group soil seems to be predominant.

Assume soil group 'C' for the entire watershed.

2. Most of the watershed is wooded and covered with grass. Assume 'Fair' condition for infiltration purpose.
thus

CN = 73 for soil group 'C' & AMC-II

⇒ CN = 87 for AMC-III.

DAM SAFETY INSPECTION / MISSOURI

SHEET NO. 1 OF

B&K Lake No. 2 Dam U/S of B&K Lake No. 1 Dam JOB NO. 1240-001

DETERMINATION OF SOIL GROUP & CURVE NUMBER BY MAS DATE 6-1-79

B&K LAKE NO. 2 DAM UPSTREAM OF B&K LAKE NO. 1 DAMDETERMINATION OF HYDROLOGIC SOIL GROUP & SCS CURVE NUMBER

1. The soils in the watershed consist of C & D group soils but D group soil is predominant

Assume 'D' group soil for this watershed.

2. Most of the watershed area is wooded and covered with grass. Assume 'Fair' condition for infiltration.

Thus $CN = 79$ for soil group D & AMC-II

$\Rightarrow CN = 91$ for AMC-III.

HEC1DB INPUT DATA

DPM SAFETY INSPECTION - MISSOURI
 H AND K LAKE **NOI DAM** 3050A3
 DPMF AND 50 PERCENT DPMF DETERMINATION AND ROUTING

COM SATELV 1981 - "MISSIONS"

4 AND K LAKE NO. 1 DAM 3050A)
PMF AND 50 PERCENT PMF DETERMINATION AND ROUTING

INPUT PRECIPITATION INDEX, RATIOS AND UNIT HYDROGRAPH, PARAMETERS

ν	ν	ν
1	1	1.0
0.030	0.030	0.030

Year	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050	2051	2052	2053	2054	2055	2056	2057	2058	2059	2060	2061	2062	2063	2064	2065	2066	2067	2068	2069	2070	2071	2072	2073	2074	2075	2076	2077	2078	2079	2080	2081	2082	2083	2084	2085	2086	2087	2088	2089	2090	2091	2092	2093	2094	2095	2096	2097	2098	2099	2100
1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050	2051	2052	2053	2054	2055	2056	2057	2058	2059	2060	2061	2062	2063	2064	2065	2066	2067	2068	2069	2070	2071	2072	2073	2074	2075	2076	2077	2078	2079	2080	2081	2082	2083	2084	2085	2086	2087	2088	2089	2090	2091	2092	2093	2094	2095	2096	2097	2098	2099	2100	

500

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41 WHITE HYDROGRAPH THROUGH UPSTREAM CAN TO 3 C. K. LAKE NO. 1 DAM, 30506 1
1 0/51

100

11	1	855.00	856.25	856.50	856.75	857.00	-855.00	859.17	859.47	859.52
Y435	0	855.00	856.25	856.50	856.75	857.00	859.17	859.47	859.52	859.52
Y435	9	855.00	856.25	856.50	856.75	857.00	859.17	859.47	859.52	859.52

[illegible]

17 8565
18 8550
19 8550

3350
INPUT INDEX PRECIPITATION, RAINFALL, AND SSC UNIT HYDROGRAPH PARAMETERS

1	2	0.21	1.0
24.0	100	135	120

0.11
0.11

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95 96 97 98 99

K 1 3056 2
K 1 3056 2

COMBINE HYDROGRAPHS BEFORE ROUTING THROUGH R AND K LAKE NOS DAM (30506)

1 KI ROUTE COMBINED HYDROGRAPH THROUGH D AND K LAKE NO. 1 DAM 30536

Y4	830.0	832.00	832.69	833.25	833.34	833.65	834.78	835.52
Y1	1						830.0	831

V5	0	24.8	71.9	125	-180.7	293	23800	9445
S	0	72.	108.	1339.	1632.			

	850.	P40.	850.
SE 806..	830. 833.25		
	\$ 870.		

10833.25
K. 99

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	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100
1	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100

INFLOW PMF AND ONE-HALF PMF HYDROGRAPHS

C

REVIEW OF SEQUENCE OF STAFF VEHICLE CALCULATIONS

ROUTE HYDROGRAPH AT 0751
ROUTE HYDROGRAPH TO 0751
ROUTE HYDROGRAPH AT 0806
ROUTE HYDROGRAPH AT 0806
ROUTE HYDROGRAPH TO 0806
END OF REVIEW

.....
 1000 BY GRAPH PACKAGE (REC-1)
 DAM SAFETY SECTION JULY 1978
 LIST OF IDENTIFICATION 16 FEB 79

NUM DAT: 780627/00
 TIME: 1 07:16

DAM SAFETY INSPECTION - HYDROGRAPH
 NO DATA LANE NO DATA
 P/F INF A PERCENT AND DETERMINATION AND ROUTING

NO TIME IDAY INR INR METG ILLY IPRY HSTAR
 100 0 0 0 0 0 0 0 0 0
 JOPER VNT LOSSY TRACF
 0 0 0 0 0 0 0 0 0 0

MULTI-POLY ANALYSIS TO BE PERFORMED
 PLANE 1 UNIT 1 LAG 1

RATIOS= 1.00 1.00

.....
 SUB-AREA ROUTING COMPUTATION
 INPUT PRECIPITATION INCR, RATIOS AND UNIT HYDROGRAPH PARAMETERS

ISTAG ICUP IFCN ITAP JPLT JPRT INAME ISTAGE ITAUD
 0/51 0 0 0 0 0 0 0 0 0
 INVG IUNG TAREA SNAP TRSDA TRSPC A RATIO ISNOJ ISAME A LOCAL
 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00

HYDROGRAPH DATA
 TRSDA TRSPC A RATIO ISNOJ ISAME A LOCAL
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LOSS DATA
 ERATY STRKS PRIOK STRTL CNSTL ALSHY RTIMP
 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00

UNIT HYDROGRAPH DATA
 TCE 0.00 LAGS 0.05

PRECEDENCE DATA
 STRKE 0.00 ORSEN 0.00

INCREMENT 100 LARG--(ING IS GT LAG2)

UNIT HYDROGRAPH 5 END OF PERIOD ORDINATES, TCE= 0.00 HOURS

239.	77.	183		1.
INCHES	FEET	RATE	LOSS	IMP-OF-BERARD FLD. COMP Q
1.00	1	3.00	.01	0.
1.01	1	3.06	.01	0.
1.02	1	3.12	.01	0.
1.03	1	3.18	.01	0.
1.04	1	3.24	.01	0.
1.05	1	3.30	.01	0.
1.06	1	3.36	.01	0.
1.07	1	3.42	.01	0.
1.08	1	3.48	.01	0.
1.09	1	3.54	.01	0.
1.10	1	3.60	.01	0.
1.11	1	3.66	.01	0.
1.12	1	3.72	.01	0.
1.13	1	3.78	.01	0.
1.14	1	3.84	.01	0.
1.15	1	3.90	.01	0.
1.16	1	3.96	.01	0.
1.17	1	4.02	.01	0.
1.18	1	4.08	.01	0.
1.19	1	4.14	.01	0.
1.20	1	4.20	.01	0.
1.21	1	4.26	.01	0.
1.22	1	4.32	.01	0.
1.23	1	4.38	.01	0.
1.24	1	4.44	.01	0.
1.25	1	4.50	.01	0.
1.26	1	4.56	.01	0.
1.27	1	4.62	.01	0.
1.28	1	4.68	.01	0.
1.29	1	4.74	.01	0.
1.30	1	4.80	.01	0.
1.31	1	4.86	.01	0.
1.32	1	4.92	.01	0.
1.33	1	4.98	.01	0.
1.34	1	5.04	.01	0.
1.35	1	5.10	.01	0.
1.36	1	5.16	.01	0.
1.37	1	5.22	.01	0.
1.38	1	5.28	.01	0.
1.39	1	5.34	.01	0.
1.40	1	5.40	.01	0.
1.41	1	5.46	.01	0.
1.42	1	5.52	.01	0.
1.43	1	5.58	.01	0.
1.44	1	5.64	.01	0.
1.45	1	5.70	.01	0.
1.46	1	5.76	.01	0.
1.47	1	5.82	.01	0.
1.48	1	5.88	.01	0.
1.49	1	5.94	.01	0.
1.50	1	6.00	.01	0.
1.51	1	6.06	.01	0.
1.52	1	6.12	.01	0.
1.53	1	6.18	.01	0.
1.54	1	6.24	.01	0.
1.55	1	6.30	.01	0.
1.56	1	6.36	.01	0.
1.57	1	6.42	.01	0.
1.58	1	6.48	.01	0.
1.59	1	6.54	.01	0.
1.60	1	6.60	.01	0.
1.61	1	6.66	.01	0.
1.62	1	6.72	.01	0.
1.63	1	6.78	.01	0.
1.64	1	6.84	.01	0.
1.65	1	6.90	.01	0.
1.66	1	6.96	.01	0.
1.67	1	7.02	.01	0.
1.68	1	7.08	.01	0.
1.69	1	7.14	.01	0.
1.70	1	7.20	.01	0.
1.71	1	7.26	.01	0.
1.72	1	7.32	.01	0.
1.73	1	7.38	.01	0.
1.74	1	7.44	.01	0.
1.75	1	7.50	.01	0.
1.76	1	7.56	.01	0.
1.77	1	7.62	.01	0.
1.78	1	7.68	.01	0.
1.79	1	7.74	.01	0.
1.80	1	7.80	.01	0.
1.81	1	7.86	.01	0.
1.82	1	7.92	.01	0.
1.83	1	7.98	.01	0.
1.84	1	8.04	.01	0.
1.85	1	8.10	.01	0.
1.86	1	8.16	.01	0.
1.87	1	8.22	.01	0.
1.88	1	8.28	.01	0.
1.89	1	8.34	.01	0.
1.90	1	8.40	.01	0.
1.91	1	8.46	.01	0.
1.92	1	8.52	.01	0.
1.93	1	8.58	.01	0.
1.94	1	8.64	.01	0.

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SUMMARY OF PIF AND ONE-HALF PIF FLOOD ROUTING

SUMMARY OF DAM SAFETY ANALYSIS

RATIO OF PPE	MAXIMUM STORAGE OUTFLOW	MAXIMUM STORAGE OVER DAM	MAXIMUM STORAGE OUTFLOW	MAXIMUM STORAGE OUTFLOW	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
1.03	87.42	452	474	1204	15.57	0.00
0.50	236.34	414	474	1931	15.57	0.00

INITIAL VACUE
52.00
52.00
0.00

TOP OF DAM
-56.4
-56.4
-56.4

F/G 13/13

SEP 79 W G SHIFRIN

DACW43-79-C-0075

NL

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2006

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SUMMARY OF DAM SAFETY ANALYSIS

RATIO OF PPE	MAXIMUM RESERVOIR WATER ELEV.	MAXIMUM STOCK WATER ELEV.	MAXIMUM DURATION OF FAILURE	TIME OF FAILURE	TIME OF FAILURE
1.00	874.55	1.51	1.47	15.75	0.00
1.25	874.55	1.51	1.47	15.75	0.00
1.50	874.55	1.51	1.47	15.75	0.00
1.75	874.55	1.51	1.47	15.75	0.00
2.00	874.55	1.51	1.47	15.75	0.00
2.25	874.55	1.51	1.47	15.75	0.00
2.50	874.55	1.51	1.47	15.75	0.00
2.75	874.55	1.51	1.47	15.75	0.00
3.00	874.55	1.51	1.47	15.75	0.00
3.25	874.55	1.51	1.47	15.75	0.00
3.50	874.55	1.51	1.47	15.75	0.00
3.75	874.55	1.51	1.47	15.75	0.00
4.00	874.55	1.51	1.47	15.75	0.00
4.25	874.55	1.51	1.47	15.75	0.00
4.50	874.55	1.51	1.47	15.75	0.00
4.75	874.55	1.51	1.47	15.75	0.00
5.00	874.55	1.51	1.47	15.75	0.00
5.25	874.55	1.51	1.47	15.75	0.00
5.50	874.55	1.51	1.47	15.75	0.00
5.75	874.55	1.51	1.47	15.75	0.00
6.00	874.55	1.51	1.47	15.75	0.00
6.25	874.55	1.51	1.47	15.75	0.00
6.50	874.55	1.51	1.47	15.75	0.00
6.75	874.55	1.51	1.47	15.75	0.00
7.00	874.55	1.51	1.47	15.75	0.00
7.25	874.55	1.51	1.47	15.75	0.00
7.50	874.55	1.51	1.47	15.75	0.00
7.75	874.55	1.51	1.47	15.75	0.00
8.00	874.55	1.51	1.47	15.75	0.00
8.25	874.55	1.51	1.47	15.75	0.00
8.50	874.55	1.51	1.47	15.75	0.00
8.75	874.55	1.51	1.47	15.75	0.00
9.00	874.55	1.51	1.47	15.75	0.00
9.25	874.55	1.51	1.47	15.75	0.00
9.50	874.55	1.51	1.47	15.75	0.00
9.75	874.55	1.51	1.47	15.75	0.00
10.00	874.55	1.51	1.47	15.75	0.00

RATIO OF PPE	MAXIMUM RESERVOIR WATER ELEV.	MAXIMUM STOCK WATER ELEV.	MAXIMUM DURATION OF FAILURE	TIME OF FAILURE	TIME OF FAILURE
1.00	874.55	1.51	1.47	15.75	0.00
1.25	874.55	1.51	1.47	15.75	0.00
1.50	874.55	1.51	1.47	15.75	0.00
1.75	874.55	1.51	1.47	15.75	0.00
2.00	874.55	1.51	1.47	15.75	0.00
2.25	874.55	1.51	1.47	15.75	0.00
2.50	874.55	1.51	1.47	15.75	0.00
2.75	874.55	1.51	1.47	15.75	0.00
3.00	874.55	1.51	1.47	15.75	0.00
3.25	874.55	1.51	1.47	15.75	0.00
3.50	874.55	1.51	1.47	15.75	0.00
3.75	874.55	1.51	1.47	15.75	0.00
4.00	874.55	1.51	1.47	15.75	0.00
4.25	874.55	1.51	1.47	15.75	0.00
4.50	874.55	1.51	1.47	15.75	0.00
4.75	874.55	1.51	1.47	15.75	0.00
5.00	874.55	1.51	1.47	15.75	0.00
5.25	874.55	1.51	1.47	15.75	0.00
5.50	874.55	1.51	1.47	15.75	0.00
5.75	874.55	1.51	1.47	15.75	0.00
6.00	874.55	1.51	1.47	15.75	0.00
6.25	874.55	1.51	1.47	15.75	0.00
6.50	874.55	1.51	1.47	15.75	0.00
6.75	874.55	1.51	1.47	15.75	0.00
7.00	874.55	1.51	1.47	15.75	0.00
7.25	874.55	1.51	1.47	15.75	0.00
7.50	874.55	1.51	1.47	15.75	0.00
7.75	874.55	1.51	1.47	15.75	0.00
8.00	874.55	1.51	1.47	15.75	0.00
8.25	874.55	1.51	1.47	15.75	0.00
8.50	874.55	1.51	1.47	15.75	0.00
8.75	874.55	1.51	1.47	15.75	0.00
9.00	874.55	1.51	1.47	15.75	0.00
9.25	874.55	1.51	1.47	15.75	0.00
9.50	874.55	1.51	1.47	15.75	0.00
9.75	874.55	1.51	1.47	15.75	0.00
10.00	874.55	1.51	1.47	15.75	0.00

PERCENT OF PMF FLOOD ROUTING
EQUAL TO SPILLWAY CAPACITY

PREVIEW OF SEQUENCE OF STREAM NETWORK CALCULATIONS

RHOFF IN PROGRAM AT 0751
DATE INITIALIZATION TO 0751
RHOFF IN PROGRAM AT 0751
COMPT 0751 AVERAGING AT 1004
END OF PREVIEW

.....
 5000 HAN GRAPH PAPER (DEC-1)
 2400 CITY VISION JULY 1970
 LAST MODIFICATION 25 FEB 74

DATE: 07/9/74
 TIME: 14.06.49.

DATA SAFETY INCIDENT: MICROFILM
 1. ALL SLIDES NOT DAMAGED
 PERCENT OF DME DETERMINATION AND ROUTING

NO	WBS	MPIN	LCY	IMP	UP	WTRC	LT	PORT	WSTAY
100	2	15	0	0	0	0	0	0	0

MULTI-PHASE ANALYSIS: 1. DEFORMED
 NO. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1.

..... 01 016 017 018 019 020 021 022 023

CU-AREA PHASE COMPUTATION

INPUT PRECIPITATION INDIC. 0.0100 AND UNIT HYDROGRAPH PARAMETERS

UNIT	ICOD	TECH	ITYPE	UOLT	UNIT	ITYPE	ITYPE	ITYPE
0.01	0	1	0	0	0	1	0	0

INVO	LONG	AREA	SHAP	INSD	TRSPC	UNIT	IS	IS	LOCAL
2	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

DATE	PMS	RA	PRECIP DATA	RA	RA
1.00	24.00	100.00	120.00	150.00	0.00

LOSS DATA

LRGT	STPR	DLTP	RTOL	FRAT	STRT	STRT	ALSN	PTIM
0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

..... 01 016 017 018 019 020 021 022 023

UNIT HYDROGRAPH DATA
 TC= 0.00 LAGE 0.05

REGRESSION DATA
 TC= 0.00 LAGE 0.05

END-OF-PERIOD FILM
 NO. 0000 WBS. 0000 PERIOD 0000 EXCS 0000 LOSS 0000

1

755.10

0000

• 027



1

I-27.

2

10

11

10

25

1

SUMMARY A RUNOFF COMPUTATION

INPUT INDEX, PRECIPITATION, RAINFALL, AND SOCS INPUT HYDROLOGICAL PARAMETER.

[illegible]

TIME	DATE	TIME	DATE	TIME	DATE	TIME	DATE
1	01	02	03	04	05	06	07

SPFC	2	PRCLIP DATA	PRG
0.00	10.00	120.00	0.00
		K12	0.00
		5.4	0.00

[illegible]

60.74 = NO LOSS 60.1 = SENSITIVE - 0.64m = CR LOSS

NYT HVCNCGAPL 237A
TC= 0.00 LGS= .11

YR 1 = 0.00
ACCESSION PAY = 0.00
KID = 1.00

[illegible]

31.20 20.46 1.672 479640
(792.0)(7990)(44.1)(1356.04)

.....
CENTINE HYDROGRAPH
.....

COMBINE HYDROGRAPHS BEFORE ROUTING THROUGH B AND K LAKES DAY '60.1 (30505)

ISTAQ	ICOMP	IECON	ITADE	JPLY	JPRY	IVAME	ISTAGE	JAUTZ
00506	2	0	0	0	0	1	0	0

[illegible]

ROUTE COMBINED HYDROGRAPH THROUGH R AND W LAKE 74° NS.1 (3.506)

STAGE	ICOMP	IFL	ITAGE	JOLT	ISAMP	ISTAGE	IAUT
3085	1	0	0	0	1	0	
ROUTING DATA							
1-PS	1	1	1	1	1	1	
2-PS	1	1	1	1	1	1	
3-PS	1	1	1	1	1	1	
4-PS	1	1	1	1	1	1	
5-PS	1	1	1	1	1	1	
6-PS	1	1	1	1	1	1	
7-PS	1	1	1	1	1	1	
8-PS	1	1	1	1	1	1	
9-PS	1	1	1	1	1	1	
10-PS	1	1	1	1	1	1	
11-PS	1	1	1	1	1	1	
12-PS	1	1	1	1	1	1	
13-PS	1	1	1	1	1	1	
14-PS	1	1	1	1	1	1	
15-PS	1	1	1	1	1	1	
16-PS	1	1	1	1	1	1	
17-PS	1	1	1	1	1	1	
18-PS	1	1	1	1	1	1	
19-PS	1	1	1	1	1	1	
20-PS	1	1	1	1	1	1	
21-PS	1	1	1	1	1	1	
22-PS	1	1	1	1	1	1	
23-PS	1	1	1	1	1	1	
24-PS	1	1	1	1	1	1	
25-PS	1	1	1	1	1	1	
26-PS	1	1	1	1	1	1	
27-PS	1	1	1	1	1	1	
28-PS	1	1	1	1	1	1	
29-PS	1	1	1	1	1	1	
30-PS	1	1	1	1	1	1	
31-PS	1	1	1	1	1	1	
32-PS	1	1	1	1	1	1	
33-PS	1	1	1	1	1	1	
34-PS	1	1	1	1	1	1	
35-PS	1	1	1	1	1	1	
36-PS	1	1	1	1	1	1	
37-PS	1	1	1	1	1	1	
38-PS	1	1	1	1	1	1	
39-PS	1	1	1	1	1	1	
40-PS	1	1	1	1	1	1	
41-PS	1	1	1	1	1	1	
42-PS	1	1	1	1	1	1	
43-PS	1	1	1	1	1	1	
44-PS	1	1	1	1	1	1	
45-PS	1	1	1	1	1	1	
46-PS	1	1	1	1	1	1	
47-PS	1	1	1	1	1	1	
48-PS	1	1	1	1	1	1	
49-PS	1	1	1	1	1	1	
50-PS	1	1	1	1	1	1	
51-PS	1	1	1	1	1	1	
52-PS	1	1	1	1	1	1	
53-PS	1	1	1	1	1	1	
54-PS	1	1	1	1	1	1	
55-PS	1	1	1	1	1	1	
56-PS	1	1	1	1	1	1	
57-PS	1	1	1	1	1	1	
58-PS	1	1	1	1	1	1	
59-PS	1	1	1	1	1	1	
60-PS	1	1	1	1	1	1	
61-PS	1	1	1	1	1	1	
62-PS	1	1	1	1	1	1	
63-PS	1	1	1	1	1	1	
64-PS	1	1	1	1	1	1	
65-PS	1	1	1	1	1	1	
66-PS	1	1	1	1	1	1	
67-PS	1	1	1	1	1	1	
68-PS	1	1	1	1	1	1	
69-PS	1	1	1	1	1	1	
70-PS	1	1	1	1	1	1	
71-PS	1	1	1	1	1	1	
72-PS	1	1	1	1	1	1	
73-PS	1	1	1	1	1	1	
74-PS	1	1	1	1	1	1	
75-PS	1	1	1	1	1	1	
76-PS	1	1	1	1	1	1	
77-PS	1	1	1	1	1	1	
78-PS	1	1	1	1	1	1	
79-PS	1	1	1	1	1	1	
80-PS	1	1	1	1	1	1	
81-PS	1	1	1	1	1	1	
82-PS	1	1	1	1	1	1	
83-PS	1	1	1	1	1	1	
84-PS	1	1	1	1	1	1	
85-PS	1	1	1	1	1	1	
86-PS	1	1	1	1	1	1	
87-PS	1	1	1	1	1	1	
88-PS	1	1	1	1	1	1	
89-PS	1	1	1	1	1	1	
90-PS	1	1	1	1	1	1	
91-PS	1	1	1	1	1	1	
92-PS	1	1	1	1	1	1	
93-PS	1	1	1	1	1	1	
94-PS	1	1	1	1	1	1	
95-PS	1	1	1	1	1	1	
96-PS	1	1	1	1	1	1	
97-PS	1	1	1	1	1	1	
98-PS	1	1	1	1	1	1	
99-PS	1	1	1	1	1	1	
100-PS	1	1	1	1	1	1	

PEAK OUTFLOW IS 80% AT TIME 16.47 HOURS
 PEAK OUTFLOW IS 80% AT TIME 16.25 HOURS
 PEAK OUTFLOW IS 11% AT TIME 16.00 HOURS
 PEAK OUTFLOW IS 130% AT TIME 16.17 HOURS
 PEAK OUTFLOW IS 16% AT TIME 16.00 HOURS
 PEAK OUTFLOW IS 192% AT TIME 16.00 HOURS
 PEAK OUTFLOW IS 213% AT TIME 16.00 HOURS
 PEAK OUTFLOW IS 234% AT TIME 16.00 HOURS
 PEAK OUTFLOW IS 16.959% AT TIME 16.00 HOURS

TOTAL COLD FLOW 0.0
 TOTAL COLD FLOW 0.0
 TOTAL COLD FLOW 0.0

FILE FLOW AND STORAGE (USE OF PERIPHERAL STORAGE FOR MULTIPLE PLAYERS IN TURN TAKING SECOND (CONSTANT) FILED AREA IN SEPARATE WILSON AND WILSON)

COMPARISON OF DAM SAFETY ANALYSIS

PLAN 1

RATIO OF PPE	ELEVATION STATION OUTFLOW	INITIAL VALU STRESS	OUTLET CREST STRESS	TOP OF DAM STRESS	MAX OUTFLOW STRESS	TIME OF FAILURE HOURS	TIME OF FAILURE HOURS
.15	955.00	0.00	43	0.00	15.00	0.00	0.00
.17	955.00	0.00	43	0.00	15.00	0.00	0.00
.18	955.00	0.00	43	0.00	15.00	0.00	0.00
.19	955.00	0.00	43	0.00	15.00	0.00	0.00
.20	955.00	0.00	43	0.00	15.00	0.00	0.00
.21	955.00	0.00	43	0.00	15.00	0.00	0.00
.22	955.00	0.00	43	0.00	15.00	0.00	0.00
.23	955.00	0.00	43	0.00	15.00	0.00	0.00

SUMMARY OF DAM SAFETY ANALYSIS

RATIO OF PUE	ELEVATION OF WATER SURFACE IN RESERVOIR	INITIAL VALUE OF 75% 0%	SETBACK OF 53% 72% 5%	TOP OF DAM HEIGHT 155' 155' 125'	MAXIMUM DEPTH OF OVERFLOW	MAXIMUM STRESS IN FOOT-PSI	MAXIMUM OUTFLOW IN CFS	DURATION OF OVERFLOW IN HOURS	TIME OF MAX OUTFLOW IN HOURS	TIME OF FAILURE IN HOURS
1.0	432.00	0.00	105	155	0.00	105	0.00	0.00	15.67	0.00
1.1	432.17	0.00	105	155	0.00	105	0.00	0.00	15.67	0.00
1.2	432.34	0.00	105	155	0.00	105	0.00	0.00	15.67	0.00
1.3	432.51	0.00	105	155	0.00	105	0.00	0.00	15.67	0.00
1.4	432.68	0.00	105	155	0.00	105	0.00	0.00	15.67	0.00
1.5	432.85	0.00	105	155	0.00	105	0.00	0.00	15.67	0.00
1.6	433.02	0.00	105	155	0.00	105	0.00	0.00	15.67	0.00
1.7	433.19	0.00	105	155	0.00	105	0.00	0.00	15.67	0.00
1.8	433.36	0.00	105	155	0.00	105	0.00	0.00	15.67	0.00
1.9	433.53	0.00	105	155	0.00	105	0.00	0.00	15.67	0.00
2.0	433.70	0.00	105	155	0.00	105	0.00	0.00	15.67	0.00
2.1	433.87	0.00	105	155	0.00	105	0.00	0.00	15.67	0.00
2.2	434.04	0.00	105	155	0.00	105	0.00	0.00	15.67	0.00
2.3	434.21	0.00	105	155	0.00	105	0.00	0.00	15.67	0.00
2.4	434.38	0.00	105	155	0.00	105	0.00	0.00	15.67	0.00
2.5	434.55	0.00	105	155	0.00	105	0.00	0.00	15.67	0.00

DATE
FILMED
- 8