

HOSKINS-WESTERN-SONDERGGER INC LINCOLN NE F/0 13/13
NATIONAL DAM SAFETY PROGRAM, BAUMBARTNER DAM (MO 10883), MISSOURI--ETC(U)
JUN 79 R S DECKER, & JANISON, M MCWEEKIN DACW43-79-C-0046

F/G 13/13
SSOU--ETC(U)
-0046
NL

$$\frac{dC}{dt} = \frac{dC}{dC_0} \frac{dC_0}{dt}$$

END
DATE
11 FEB 68
11 8
DTIC

MISSOURI - KANSAS CITY BASIN

AD A105540

LEVEL II

BAUMGARTNER DAM

CALLAWAY COUNTY, MISSOURI

MO. 10883

DTIC
ELECTE
OCT 15 1981
S D E

PHASE 1 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

FOR: STATE OF MISSOURI

This document has been approved
for public release and its
distribution is unlimited.

JUNE, 1979

81 10 15

ENC FILE COPY

UNCLASSIFIED

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

REPORT DOCUMENTATION PAGE		READ INSTRUCTIONS BEFORE COMPLETING FORM
1. REPORT NUMBER	2. GOVT ACCESSION NO. AD-A105540	3. RECIPIENT'S CATALOG NUMBER
4. TITLE (and Subtitle) Phase I Dam Inspection Report National Dam Safety Program Baumgartner Dam (MO 10883) Callaway County, Missouri		5. TYPE OF REPORT & PERIOD COVERED Final Report
7. AUTHOR(s) Hoskins-Western-Sonderegger, Inc.		6. PERFORMING ORG. REPORT NUMBER
9. PERFORMING ORGANIZATION NAME AND ADDRESS U.S. Army Engineer District, St. Louis Dam Inventory and Inspection Section, LMSED-PD 210 Tucker Blvd., North, St. Louis, Mo. 63101		8. CONTRACT OR GRANT NUMBER(s) DACW43-79-C-0046
11. CONTROLLING OFFICE NAME AND ADDRESS U.S. Army Engineer District, St. Louis Dam Inventory and Inspection Section, LMSED-PD 210 Tucker Blvd., North, St. Louis, Mo. 63101		10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS
14. MONITORING AGENCY NAME & ADDRESS (if different from Controlling Office)		12. REPORT DATE June 1979
		13. NUMBER OF PAGES Approximately 60
		15. SECURITY CLASS. (of this report) UNCLASSIFIED
		15a. DECLASSIFICATION/DOWNGRADING SCHEDULE
16. DISTRIBUTION STATEMENT (of this Report) Approved for release; distribution unlimited.		
17. DISTRIBUTION STATEMENT (of the abstract entered in Block 20, if different from Report)		
18. SUPPLEMENTARY NOTES		
19. KEY WORDS (Continue on reverse side if necessary and identify by block number) Dam Safety, Lake, Dam Inspection, Private Dams		
20. ABSTRACT (Continue on reverse side if necessary and identify by block number) This report was prepared under the National Program of Inspection of Non-Federal Dams. This report assesses the general condition of the dam with respect to safety, based on available data and on visual inspection, to determine if the dam poses hazards to human life or property.		

DD FORM 1 JAN 73 1473

EDITION OF 1 NOV 65 IS OBSOLETE

UNCLASSIFIED

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

INSTRUCTIONS FOR PREPARATION OF REPORT DOCUMENTATION PAGE

RESPONSIBILITY. The controlling DoD office will be responsible for completion of the Report Documentation Page, DD Form 1473, in all technical reports prepared by or for DoD organizations.

CLASSIFICATION. Since this Report Documentation Page, DD Form 1473, is used in preparing announcements, bibliographies, and data banks, it should be unclassified if possible. If a classification is required, identify the classified items on the page by the appropriate symbol.

COMPLETION GUIDE

General. Make Blocks 1, 4, 5, 6, 7, 11, 13, 15, and 16 agree with the corresponding information on the report cover. Leave Blocks 2 and 3 blank.

Block 1. Report Number. Enter the unique alphanumeric report number shown on the cover.

Block 2. Government Accession No. Leave Blank. This space is for use by the Defense Documentation Center.

Block 3. Recipient's Catalog Number. Leave blank. This space is for the use of the report recipient to assist in future retrieval of the document.

Block 4. Title and Subtitle. Enter the title in all capital letters exactly as it appears on the publication. Titles should be unclassified whenever possible. Write out the English equivalent for Greek letters and mathematical symbols in the title (see "Abstracting Scientific and Technical Reports of Defense-sponsored RDT/E," AD-667 000). If the report has a subtitle, this subtitle should follow the main title, be separated by a comma or semicolon if appropriate, and be initially capitalized. If a publication has a title in a foreign language, translate the title into English and follow the English translation with the title in the original language. Make every effort to simplify the title before publication.

Block 5. Type of Report and Period Covered. Indicate here whether report is interim, final, etc., and, if applicable, inclusive dates of period covered, such as the life of a contract covered in a final contractor report.

Block 6. Performing Organization Report Number. Only numbers other than the official report number shown in Block 1, such as series numbers for in-house reports or a contractor/grantee number assigned by him, will be placed in this space. If no such numbers are used, leave this space blank.

Block 7. Author(s). Include corresponding information from the report cover. Give the name(s) of the author(s) in conventional order (for example, John R. Doe or, if author prefers, J. Robert Doe). In addition, list the affiliation of an author if it differs from that of the performing organization.

Block 8. Contract or Grant Number(s). For a contractor or grantee report, enter the complete contract or grant number(s) under which the work reported was accomplished. Leave blank in in-house reports.

Block 9. Performing Organization Name and Address. For in-house reports enter the name and address, including office symbol, of the performing activity. For contractor or grantee reports enter the name and address of the contractor or grantee who prepared the report and identify the appropriate corporate division, school, laboratory, etc., of the author. List city, state, and ZIP Code.

Block 10. Program Element, Project, Task Area, and Work Unit Numbers. Enter here the number code from the applicable Department of Defense form, such as the DD Form 1498, "Research and Technology Work Unit Summary" or the DD Form 1634, "Research and Development Planning Summary," which identifies the program element, project, task area, and work unit or equivalent under which the work was authorized.

Block 11. Controlling Office Name and Address. Enter the full, official name and address, including office symbol, of the controlling office. (Equates to funding/sponsoring agency. For definition see DoD Directive 5200.20, "Distribution Statements on Technical Documents.")

Block 12. Report Date. Enter here the day, month, and year or month and year as shown on the cover.

Block 13. Number of Pages. Enter the total number of pages.

Block 14. Monitoring Agency Name and Address (if different from Controlling Office). For use when the controlling or funding office does not directly administer a project, contract, or grant, but delegates the administrative responsibility to another organization.

Blocks 15 & 15a. Security Classification of the Report: Declassification/Downgrading Schedule of the Report. Enter in 15 the highest classification of the report. If appropriate, enter in 15a the declassification/downgrading schedule of the report, using the abbreviations for declassification/downgrading schedules listed in paragraph 4-207 of DoD 5200.1-R.

Block 16. Distribution Statement of the Report. Insert here the applicable distribution statement of the report from DoD Directive 5200.20, "Distribution Statements on Technical Documents."

Block 17. Distribution Statement (of the abstract entered in Block 20, if different from the distribution statement of the report). Insert here the applicable distribution statement of the abstract from DoD Directive 5200.20, "Distribution Statements on Technical Documents."

Block 18. Supplementary Notes. Enter information not included elsewhere but useful, such as: Prepared in cooperation with . . . Translation of (or by) . . . Presented at conference of . . . To be published in . . .

Block 19. Key Words. Select terms or short phrases that identify the principal subjects covered in the report, and are sufficiently specific and precise to be used as index entries for cataloging, conforming to standard terminology. The DoD "Thesaurus of Engineering and Scientific Terms" (TEST), AD-672 000, can be helpful.

Block 20: Abstract. The abstract should be a brief (not to exceed 200 words) factual summary of the most significant information contained in the report. If possible, the abstract of a classified report should be unclassified and the abstract to an unclassified report should consist of publicly-releasable information. If the report contains a significant bibliography or literature survey, mention it here. For information on preparing abstracts see "Abstracting Scientific and Technical Reports of Defense-Sponsored RDT&E," AD-667 000.

BAUMGARTNER DAM
CALLAWAY COUNTY, MISSOURI
MISSOURI INVENTORY NO. 10883

Accession For	
NTIS GRA&I	☒
DTIC TAB	☐
Unannounced	☐
Justification	
By	
Distribution/	
Availability Codes	
Dist	Avail and/or Special
A	

PHASE I INSPECTION REPORT

NATIONAL DAM SAFETY PROGRAM.

Baumgartner Dam (MO 10883),
Missouri - Kansas City Basin,
Callaway County, Missouri. Phase I
Inspection Report.

PREPARED BY
HOSKINS-WESTERN-SONDEREGGER, INC.
CONSULTING ENGINEERS
LINCOLN, NEBRASKA

UNDER DIRECTION OF
ST. LOUIS DISTRICT, CORPS OF ENGINEERS

FOR

GOVERNOR OF MISSOURI

JUN 1979

15 DACW43-79-C-0046

10 Rey S. /Decker Gordon G. /Jamison
Michael/McMeekin Harold P. /Hoskins

9 Final rept.,

341131

ATC



REPLY TO
ATTENTION OF

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

SUBJECT: Baumgartner Dam Phase I Inspection Report

This report presents the results of field inspection and evaluation of the Baumgartner Dam. It was prepared under the National Program of Inspection of Non-Federal Dams.

SUBMITTED BY: SIGNED 24 MAR 1980
Chief, Engineering Division Date

APPROVED BY: SIGNED 24 MAR 1980
Colonel, CE, District Engineer Date

PHASE I INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM

TABLE OF CONTENTS

<u>PARAGRAPH NO.</u>	<u>TITLE</u>	<u>PAGE NO.</u>
	Assessment Summary	
	Overview Photograph	
SECTION 1 - PROJECT INFORMATION		
1.1	General	1
1.2	Description of Project	1
1.3	Pertinent Data	2
SECTION 2 - ENGINEERING DATA		
2.1	Design	5
2.2	Construction	5
2.3	Operation	5
2.4	Evaluation	5
SECTION 3 - VISUAL INSPECTION		
3.1	Findings	6
3.2	Evaluation	8
SECTION 4 - OPERATIONAL PROCEDURES		
4.1	Procedures	9
4.2	Maintenance of Dam	9
4.3	Maintenance of Operating Facilities	9
4.4	Description of Any Warning System in Effect	9
4.5	Evaluation	9
SECTION 5 - HYDRAULIC/HYDROLOGIC		
5.1	Evaluation of Features	10
SECTION 6 - STRUCTURAL STABILITY		
6.1	Evaluation of Structural Stability	12
SECTION 7 - ASSESSMENT/REMEDIAL MEASURES		
7.1	Dam Assessment	13
7.2	Remedial Measures	13

APPENDIX A - MAPS

Plate A-1	Vicinity Topography
Plate A-2	Location Map

APPENDIX B - PHOTOGRAPHS

Plate B-1	Photo Index	
Plate B-2	Photo No. 2	Overview Taken From Right Abutment
	Photo No. 3	Crest Taken From Right End
Plate B-3	Photo No. 4	Upstream Slope Taken From Right End
	Photo No. 5	Downstream Slope From Right End. Farm Pond at Extreme Right
Plate B-4	Photo No. 6	Downstream Toe. Note Erosion Caused By Farm Pond.
	Photo No. 7	Seepage in Left Abutment Trough
Plate B-5	Photo No. 8	Downstream Slope Taken From Left Abutment
	Photo No. 9	Crest of Dam Taken From Left End
Plate B-6	Photo No. 10	View Upstream in Spillway
	Photo No. 11	View Downstream in Spillway
Plate B-7	Photo No. 12	Exit Channel of Spillway Showing Head Cutting
	Photo No. 13	View of Head Cut
Plate B-8	Photo No. 14	Large Rodent Hole at Sta. 7+00
	Photo No. 15	View Downstream From Sta. 7+00 Showing Farm Ponds
Plate B-9	Photo No. 16	View Upstream From Sta. 4+50
	Photo No. 17	View Downstream From Sta. 4+50

APPENDIX C - PROJECT PLATES

Plate C-1	Phase I - Plan and Centerline Profile of Dam
Plate C-2	Phase I - Section of Dam and Profile of Spillway
Plate C-3	Phase I - Section of Spillway

APPENDIX D - HYDRAULIC AND HYDROLOGIC DATA

Plates D-1 & D-2	Hydrologic Computations
Plate D-3	Spillway Rating Curve
Plate D-4	PMF Ratios - Peak Flows
Plate D-5 to D-20	Computer Input and Output for 1/2 PMF

PHASE I INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM
ASSESSMENT SUMMARY

Name of Dam	Baumgartner Dam
State Located	Missouri
County Located	Callaway County
Stream	Tributary to Owl Creek
Date of Inspection	June 1, 1979

Baumgartner Dam was inspected by an interdisciplinary team of engineers from Hoskins-Western-Sonderregger, Inc. 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. Failure would threaten life and property. The estimated damage zone extends approximately three miles downstream of the dam. Within the damage zone are a church, two dwellings and a Highway F bridge.

Our inspection and evaluation indicates that the spillway does meet the criteria set forth in the recommended guidelines for a small dam having a high hazard potential. Considering the small volume of water impounded and the large floodplain downstream of the dam, one-half of the Probable Maximum Flood is the appropriate spillway design flood. The spillway will pass the 100-year flood (flood having a one percent chance of being exceeded in any year) without overtopping the dam. The spillway will pass 50% of the Probable Maximum Flood without overtopping the dam. The Probable Maximum Flood (PMF) is defined as the flood that may be expected from the most severe combination of critical meteorologic and hydrologic conditions that are reasonably possible in the region.

No design data were available for this dam. 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 analyses should be obtained in the future.

Other deficiencies observed during the inspection are some slumping of the upstream slope and the crest; a rodent hole in the crest; heavy tree growth on the downstream slope; erosion of the downstream toe; seepage in the left abutment trough; and severe erosion of the spillway outlet.

Maintenance of the downstream slope and the spillway outlet is very deficient. Preventative maintenance items related to the tree growth, rodent holes and erosion of the spillway and toe of the dam need to be initiated by the owner as described in more detail in the body of the report.

Rey S. Decker
Rey S. Decker
E-3703

Gordon G. Jamison
Gordon Jamison

Michael McMeekin
Michael McMeekin
E-4776

H. P. Hoskins
Harold P. Hoskins
Chairman of Board
Hoskins-Western-Sonderegger, Inc.
E-8696



PHOTO NO. 1 - OVERVIEW

PHASE I INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM
BAUMGARTNER DAM - MO 10883
CALLAWAY COUNTY, MISSOURI

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 St. Louis District, Corps of Engineers, District Engineer directed that a safety inspection of Brady 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", Appendix D to "Report of the Chief of Engineers on the National Program of Inspection of Dams," dated May, 1975, and published by the Department of the Army, Office of the Chief of Engineers.

1.2 DESCRIPTION OF PROJECT

- a. Description of Dam and Appurtenances.
 - (1) The dam is an earth fill located in the Central Mississippi Valley wooded slope physiographic area of Central Missouri. Topography of the area is gently rolling with moderately deep loess covering the uplands. Two excavated ponds divided by a narrow strip of land are located immediately downstream from the dam.
 - (2) The uncontrolled spillway consists of a vegetated earth channel cut through the left abutment. The spillway discharges into the adjoining downstream pond.

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

- b. Location. The dam is located in the west central part of Callaway County, Missouri, as shown on Plate A-2. The dam is shown on Plate A-1 in the NW¼ of Section 36, T48N, R11W. The lake formed behind the dam is shown in the NW¼ of Section 36, T48N, R11W.
- 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, this dam and impoundment is in the small size category.
- d. Hazard Classification. Guidelines for determining hazard classification are presented in the same guidelines as referenced in paragraph 1.1c above. Based on referenced guidelines, this dam is in the High Hazard Classification. The estimated damage zone extends approximately three miles downstream of the dam. Within the damage zone are a church, two dwellings and a Highway F bridge.
- e. Ownership. The dam is owned by J.C. Baumgartner, Route 5, Fulton, Missouri 65251.
- f. Purpose of Dam. The purpose of the dam is for erosion control (gully head cutting) and recreation.
- g. Design and Construction History. No information was available on the design or construction of this dam. The size of the trees on the downstream slope would indicate that it was probably built in the early 1960's.
- h. Normal Operating Procedure. There are no operating procedures for this dam. The spillway is uncontrolled.

1.3 PERTINENT DATA

- a. Drainage Area. 61.3 acres (.096 square miles).
- b. Discharge at Damsite.
 - (1) All discharges at the damsite are through an uncontrolled earthen spillway.
 - (2) Estimated maximum flood at damsite - unknown.

- (3) The earthen spillway capacity varies from 0 c.f.s. at its crest elevation 830.0 feet to 330± c.f.s. at elevation 832.8 feet (minimum top of dam).

c. Elevations (feet above M.S.L.).

- (1) Top of Dam - 832.8± (low point)
- (2) Spillway crest - 830.0±
- (3) Streambed at centerline - 803.7±
- (4) Maximum tailwater - unknown

d. Reservoir. Length (feet) of maximum pool - 1100±.

e. Storage (Acre-feet).

- (1) Top of dam - 75±
- (2) Spillway crest - 42±

f. Reservoir Surface (Acres).

- (1) Top of dam - 10±
- (2) Spillway crest - 7±

g. Dam.

- (1) Type - Earth fill
- (2) Length - 750 feet ±
- (3) Height - 29 feet ± (maximum)
- (4) Top width - 16 feet ± (crown down centerline)
- (5) Side slopes.
 - (a) Downstream - 3.2 H on 1V ± (measured)
 - (b) Upstream - 4.3 H on 1V (measured exposure)
- (6) Zoning - unknown
- (7) Impervious core - unknown
- (8) Cutoff - unknown
- (9) Grout curtain - unknown
- (10) Wave protection - none

h. Diversion Channel and Regulating Tunnel. None.

i. Spillway.

- (1) Principal (and only)
 - (a) Type - uncontrolled, vegetated earth channel cut through the left abutment with a 30 foot± bottom width at the centerline of the dam.

- (b) Control section - the control section is downstream about 75 feet from the centerline of the dam where the cross section is restricted to a 10 foot± bottom width. The channel slopes down at approximately 1% from the crest to the control section.
- (c) Crest elevation - 830 ft.± at inlet, 829.2 ft.± at control section.
- (d) Upstream Channel. The channel is well vegetated and open.
- (e) Downstream Channel - the exit channel drops off abruptly into an eroded gulley about 100 feet downstream from the centerline of the dam.

j. Regulating Outlets. None

SECTION 2 - ENGINEERING DATA

2.1 DESIGN

No design data were available for this dam.

2.2 CONSTRUCTION

No construction data were available.

2.3 OPERATION

No data were available on spillway operation.

2.4 EVALUATION

- a. Availability. No data were available.
- b. Adequacy. The field surveys and visual observation presented herein are considered adequate to support the conclusion of this report. 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. Not applicable.

SECTION 3 - VISUAL INSPECTION

3.1 FINDINGS

a. General. A visual inspection of the Baumgartner Dam was made on June 1, 1979. Engineers from Hoskins-Western-Sonderregger, Inc., Lincoln, Nebraska, making the inspection were: R.S. Decker, Geotechnical; Gordon Jamison, Hydrology and Mike McMeekin, Civil Engineer. The owner of the dam was not present during the inspection.

b. Dam.

- (1) Geology and Soils (Abutment and Embankment).
Soils on the site consist of CL loess on the uplands with residual soils derived from glacial till or from limestone and/or shale on the valley slopes. Material exposed in the lower portion of the right abutment was reddish-brown CH soil which appeared to be residuum from limestone. Material exposed in the left abutment spillway cut is brown CL-CH soil, very blocky with gray silty intrusions overlying what appeared to be a silty or clay silt shale formation. (See Photos 12 and 13.)
- (2) Upstream Slope. The upstream slope is well vegetated with grasses and reeds. No significant erosion was noted on the face. Some slumping of the upstream slope was observed between stations 5+00 and 5+50. No other deformations or cracks were observed on the upstream slope.
- (3) Crest. The crest is well vegetated with adapted grasses. A rodent hole about 9 inches in diameter was observed at about station 7+00. The profile along the crest is remarkably uniform. The top of the dam is higher (crowned) along the centerline with slight slopes both up and down from the crown. Borings on the crest show about 1 foot of gray limey CL-ML with yellow to reddish brown CL-CH material from 1 foot to 2.5 feet. The crest has slumped upstream between stations 5+00 and 5+50 and downstream between stations 4+50 and 4+75. No other deformations or cracks were noted.

- (4) Downstream slope. The downstream slope is almost entirely covered with oak, sycamore and cottonwood trees up to 8 inches in diameter. The toe of the dam is eroded with rills and gullies caused by wave wash from the pond which encroaches on the toe of the dam. Seepage was observed in the left abutment trough downstream from about station 6+75. The seepy spot is about 20 feet wide and about 5 feet above the level of the pond adjoining the toe of the dam. Free water but no flow was observed in the seep area. All effluent was clear. No other indications of seepage were noted. No cracks, rodent holes or abnormal deformations were noted on the downstream slope.
- (5) Miscellaneous. The vegetative cover and the materials in the dam would indicate that the structure could withstand overtopping without serious damage.

c. Appurtenant Structures.

- (1) The spillway consists of an uncontrolled, well vegetated channel cut into the left abutment. Measurements indicate that the channel slopes downstream from the inlet elevation. Spillway discharge is controlled by a contraction in the cross section some 100 feet downstream from the inlet. The spillway exits into a deeply eroded gulley about 125 feet downstream from the inlet. The gulley is eroded into a silty shale formation. No significant erosion was noted in the spillway channel except in the outlet gulley which is severely eroded.
- (2) Drawdown Facilities. There are no drawdown facilities for this dam.

- d. Reservoir Area. No significant erosion or wave wash was observed around the shoreline of the reservoir.
- e. Downstream Channel. There is no channel downstream from the dam. The excavated pond at the downstream toe of the dam receives the discharges from this structure.

3.2 EVALUATION

This dam does not appear to have an immediate serious potential of failure. The effect of seepage in the left abutment trough is not known but it does not appear to be critical. Tree growth on the downstream slope could ultimately lead to potential of failure. Progression of the gulley headcut at the spillway outlet could lead to breaching of the dam; however, there is a sizable mass of fairly erosion resistant material between the present headcut and the reservoir. Wave wash of the downstream toe caused by the adjoining pond could damage the structure if left uncontrolled.

SECTION 4 - OPERATIONAL PROCEDURES

4.1 PROCEDURES

There are no controlled outlet works for this dam. The pool level is controlled by rainfall, infiltration, evaporation, and the capacity of the uncontrolled spillway.

4.2 MAINTENANCE OF DAM

Maintenance of the downstream section of the dam and of the spillway outlet is very deficient.

4.3 MAINTENANCE OF OPERATING FACILITIES

No operating facilities exist at this dam.

4.4 DESCRIPTION OF ANY WARNING SYSTEM IN EFFECT

There is no warning system in effect for this dam.

4.5 EVALUATION

There does not appear to be any serious potential of failure of this structure.

SECTION 5 - HYDRAULIC/HYDROLOGIC

5.1 EVALUATION OF FEATURES

- a. Design Data. No design data were found for this dam.
- b. Experience. There are no available records of reservoir operation.
- c. Visual Observations. The dam has only one spillway which is an uncontrolled earthen spillway located on the left abutment. The water surface was observed to be at the elevation of the crest of the spillway. The spillway is well vegetated with grasses and has a few trees growing in it. The spillway has eroded forming a gully beginning approximately 125 feet downstream of the dam. A control section is formed downstream because the grade becomes very steep. The spillway becomes narrower at the control section forming a restriction.
- d. Overtopping Potential. The spillway is too small to pass the probable maximum flood without overtopping. The spillway will pass the 100-year flood and 50% of the probable maximum flood without overtopping of the dam. The dam could withstand overtopping without serious damage.

The results of the routings through the dam are tabulated below.

<u>Frequency</u>	<u>Peak Inflow Discharge c.f.s.</u>	<u>Peak Outflow Discharge c.f.s.</u>	<u>Maximum Pool Elevation</u>	<u>Freeboard Top of Dam Min. Elev. 832.8</u>	<u>Duration of Dam Overtopping Hr.</u>
100 yr.	280	90	831.2	+1.6	0
1/2 PMF	550	270	832.5	+0.3	0
PMF	1,100	980	833.4	-0.6	1±

The drainage area and reservoir surface area of the watershed were determined from the U.S.G.S. Millersburg NE, Missouri, 7½ minute topographic quadrangle map. The hydraulic computations for the spillway and dam overtopping discharge ratings were based on data collected during the field inspection. Hydrologic and hydraulic computations are described in Appendix D.

According to the recommended guidelines from the Department of the Army, Office of the Chief of Engineers, this dam is classified as having a high hazard rating and a small size. Therefore, the 1/2 PMF to the PMF is the test for the adequacy of the dam and its spillway.

The estimated damage zone is described in Paragraph 1.2d in this report.

SECTION 6 - STRUCTURAL STABILITY

6.1 EVALUATION OF STRUCTURAL STABILITY

- a. Visual Observation. The dam appears to be structurally stable. The flat slopes and the materials in the dam would provide adequate safety against shear failures for a dam of this height. The deficiencies in maintenance (trees on the downstream slope) could ultimately impair the integrity of the structure.
- b. Design and Construction Data. No design or construction data were available. Seepage and stability analyses comparable to the requirements of the "Recommended Guidelines for Safety Inspection of Dams" were not available, which is considered a deficiency.
- c. Operating Records. There are no controlled operating facilities for this dam.
- d. Post Construction Changes. The inspection team is not aware of any post construction changes for this structure.
- e. Seismic Stability. This dam is located in Seismic Zone 1. An earthquake of the magnitude predicted in this area is not expected to cause structural failure of this dam.

SECTION 7 - ASSESSMENT/REMEDIAL MEASURES

7.1 DAM ASSESSMENT

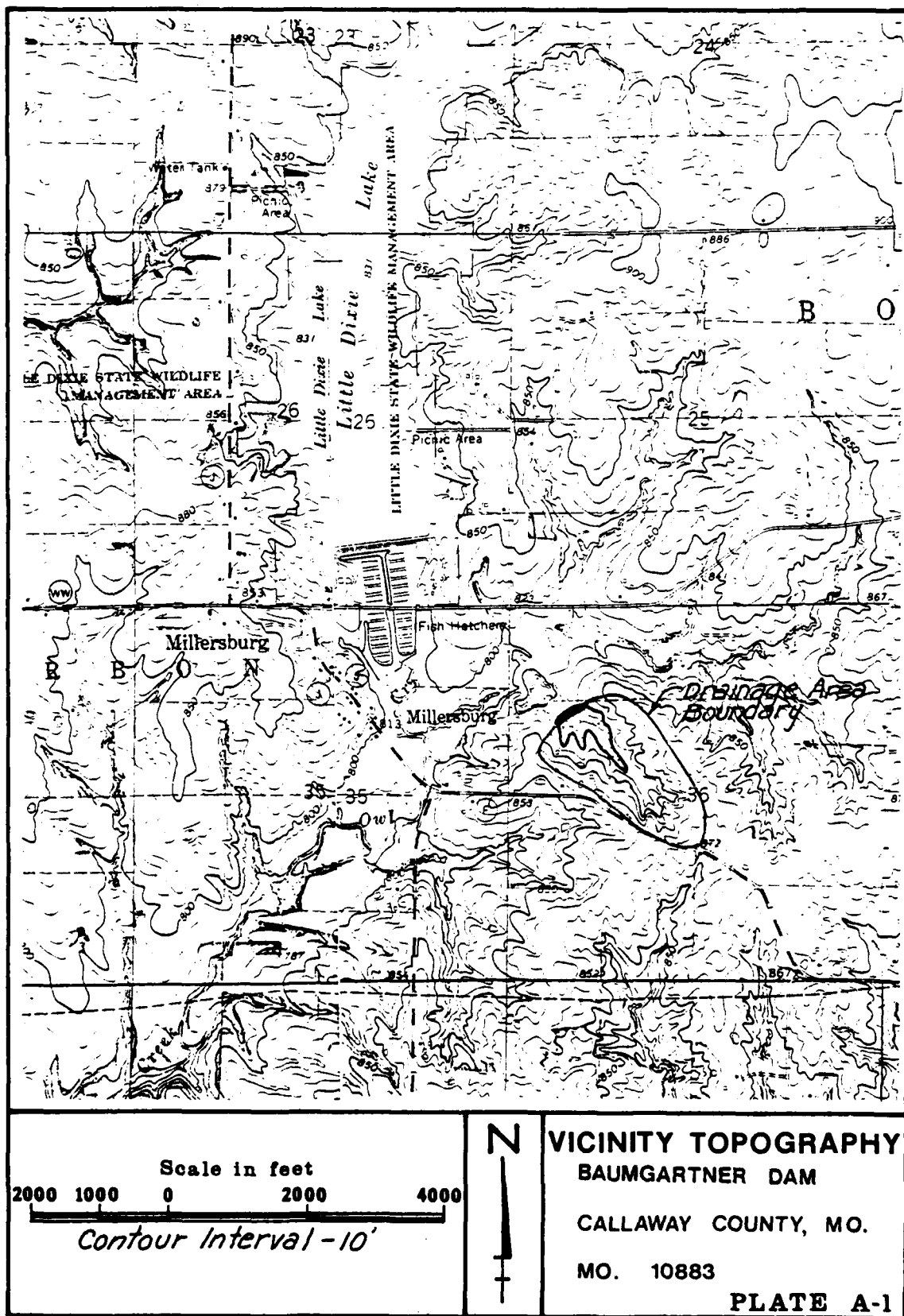
- a. Safety. There does not appear to be a serious potential of failure of this structure. Analyses presented in Section 5 indicate that the spillway will pass one half of the Probable Maximum Flood without overtopping. The adverse effects of abutment seepage are not known, but would not appear to be serious. Deficiencies in maintenance, trees on the downstream slope and erosion of the spillway exit should be corrected and/or controlled.
- b. Adequacy of Information. Due to the lack of engineering data, the conclusions in this report are based upon performance history and visual observations. Seepage and stability analyses comparable to the requirements of the guidelines were not available which is considered a deficiency.
- c. Urgency. There does not appear to be an immediate urgency to accomplish the remedial measures recommended in paragraph 7.2.
- d. Necessity for Phase II. Phase II investigation is not considered necessary.
- e. Seismic Stability. This dam is located in Seismic Zone 1. An earthquake of this magnitude is not expected to be hazardous to this dam.

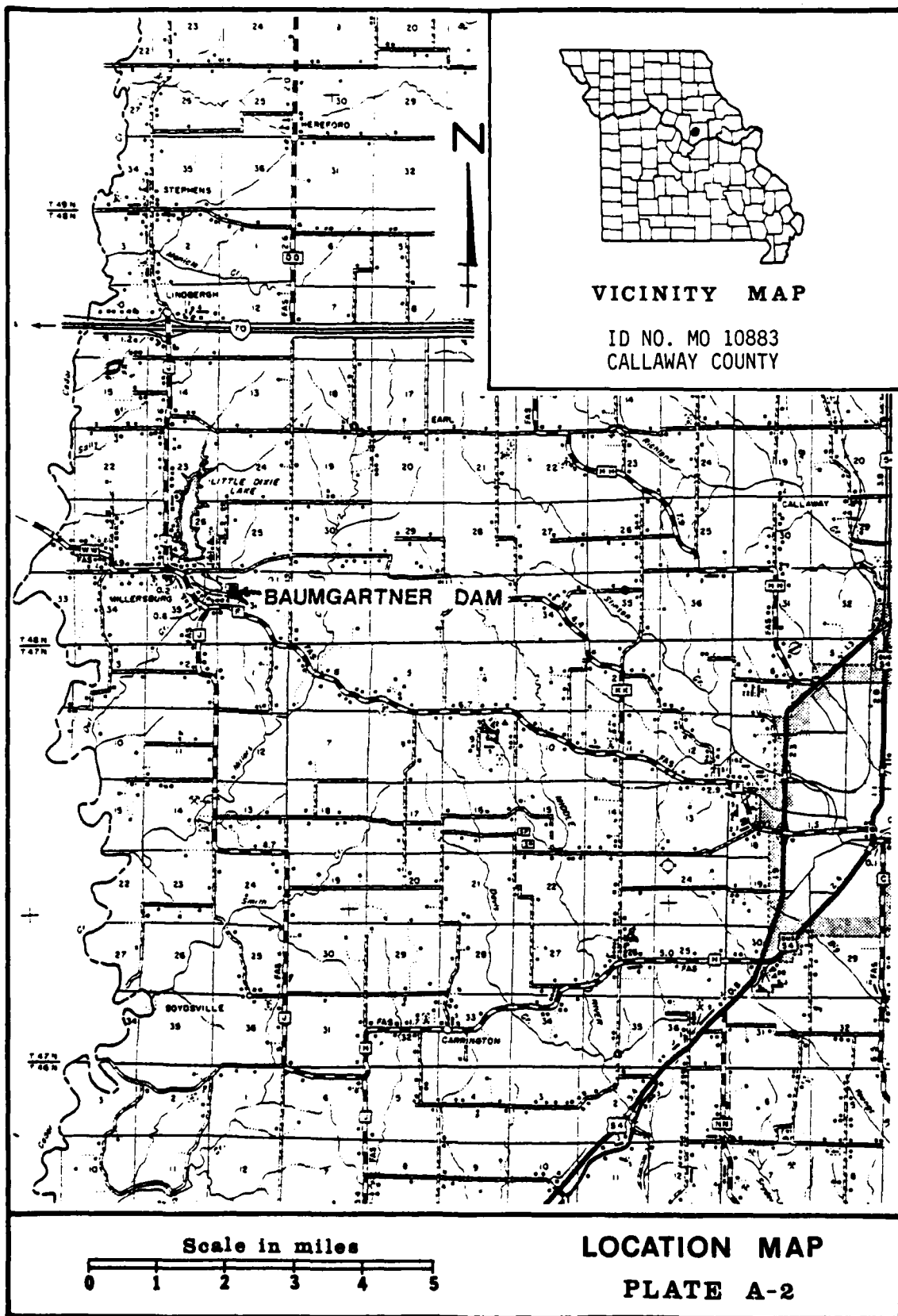
7.2 REMEDIAL MEASURES

- a. Alternatives. The services of an engineer experienced in the design of dams should be obtained to provide seepage and stability analyses of the present dam, and to design protective measures, if required.
- b. O & M Procedures.
 - (1) The tree growth should be removed from the downstream slope and measures taken to prevent their recurrence.
 - (2) Measures should be taken to control the erosion and headcutting in the spillway exit channel.

- (3) The rodent hole observed on the crest and any other observed should be repaired.
- (4) A program of regular inspection and maintenance should be initiated with particular concern for tree growth on the dam, rodent activity, excessive erosion in the spillway and along the toe of the dam, and any changes in seepage pattern or volume.

APPENDIX A
MAPS





APPENDIX B
PHOTOGRAPHS

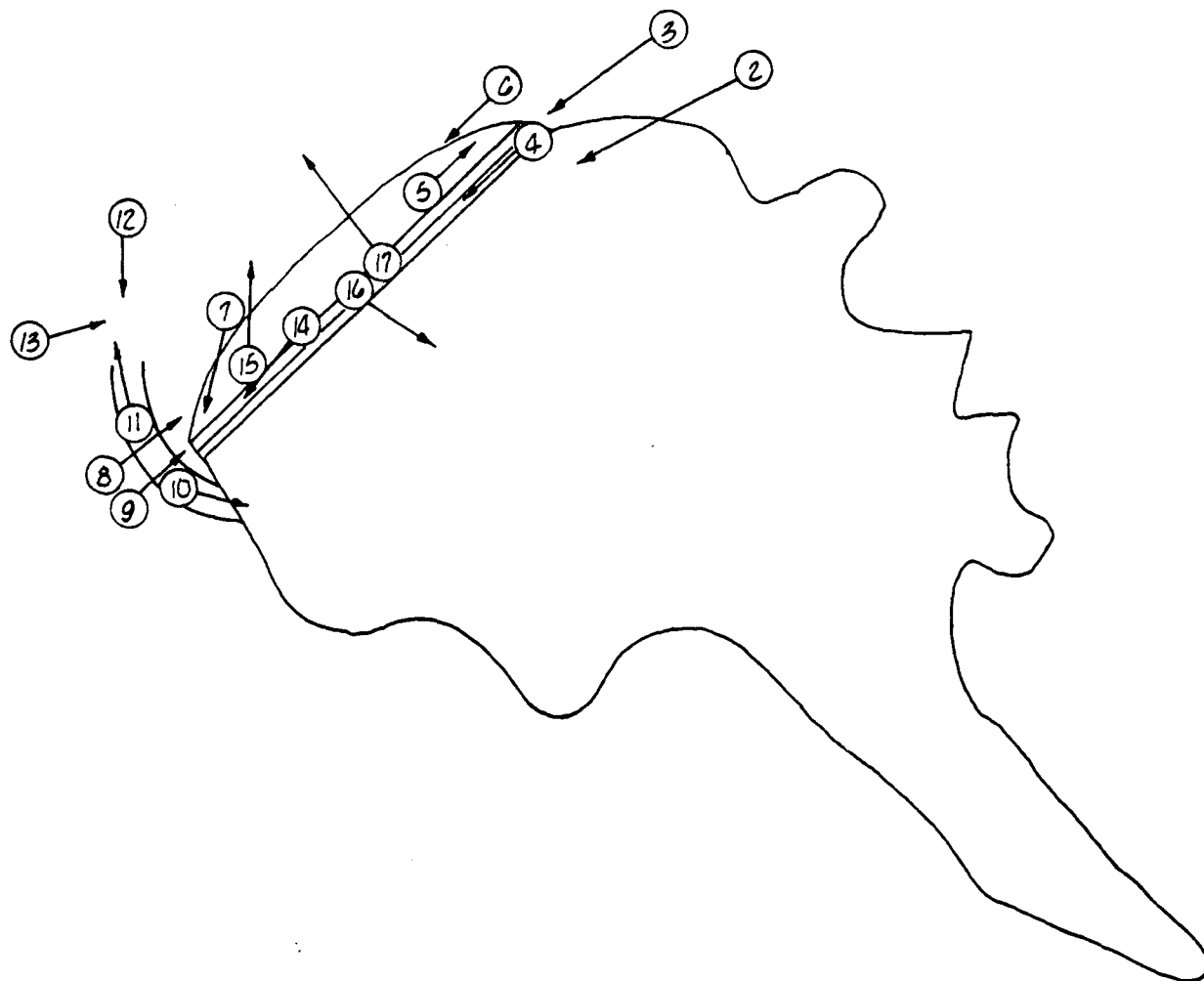


PHOTO INDEX
BAUMGARTNER DAM
CALLAWAY COUNTY, MISSOURI
MO. 10883

PLATE B-1



PHOTO NO. 2 - OVERVIEW TAKEN FROM RIGHT ABUTMENT



PHOTO NO. 3 - CREST TAKEN FROM RIGHT END



PHOTO NO. 4 - UPSTREAM SLOPE TAKEN FROM RIGHT END



PHOTO NO. 5 - DOWNSTREAM SLOPE FROM RIGHT END. FARM POND
AT EXTREME RIGHT



PHOTO NO. 6 - DOWNSTREAM TOE. NOTE EROSION CAUSED
BY FARM POND.



PHOTO NO. 7 - SEEPAGE IN LEFT ABUTMENT TROUGH



PHOTO NO. 8 - DOWNSTREAM SLOPE TAKEN FROM LEFT ABUTMENT.



PHOTO NO. 9 - CREST OF DAM TAKEN FROM LEFT END.



PHOTO NO. 10 - VIEW UPSTREAM IN SPILLWAY

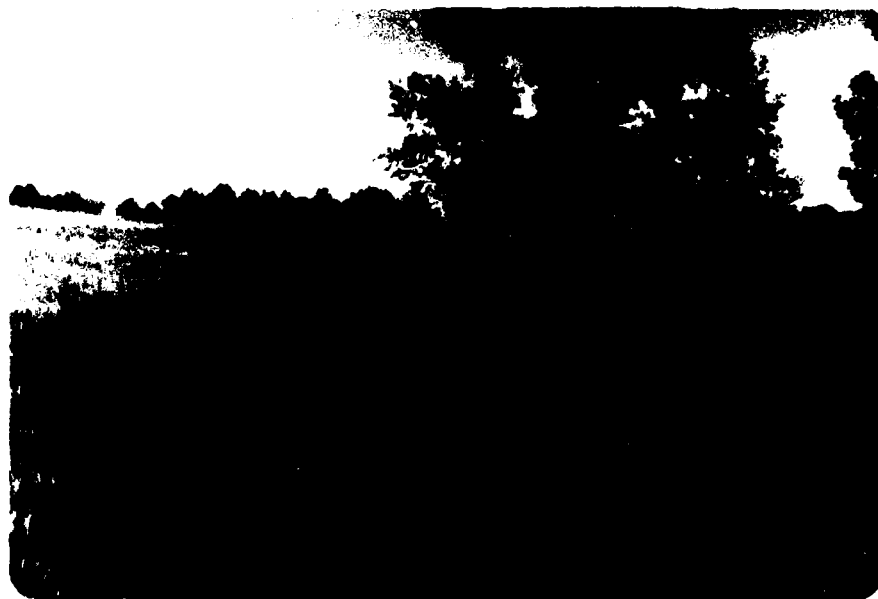


PHOTO NO. 11 - VIEW DOWNSTREAM IN SPILLWAY



PHOTO NO. 12 - EXIT CHANNEL
OF SPILLWAY SHOWING
HEAD CUTTING.



PHOTO NO. 13 - VIEW OF HEAD CUT.

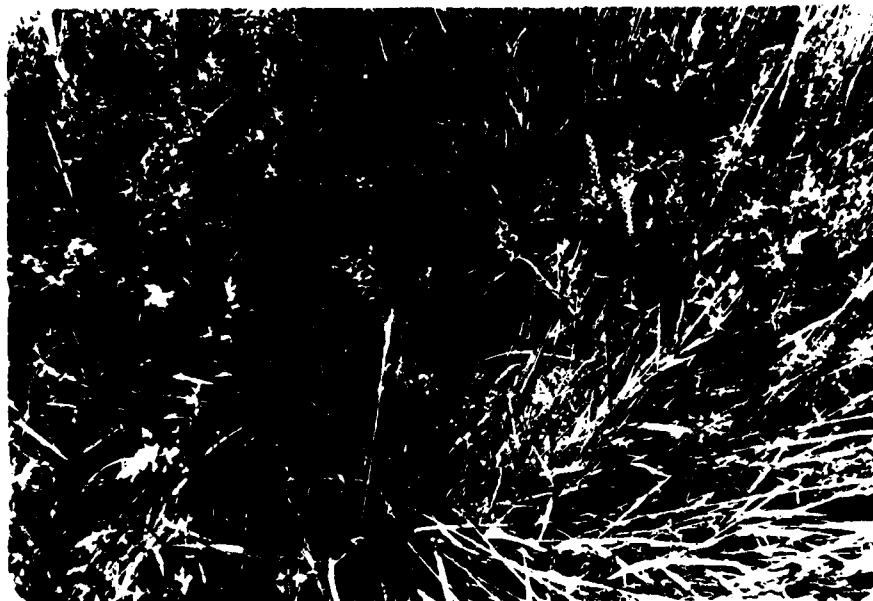


PHOTO NO. 14 - LARGE RODENT HOLE AT STA. 7+00.



PHOTO NO. 15 - VIEW DOWNSTREAM FROM STA. 7+00 SHOWING FARM PONDS.

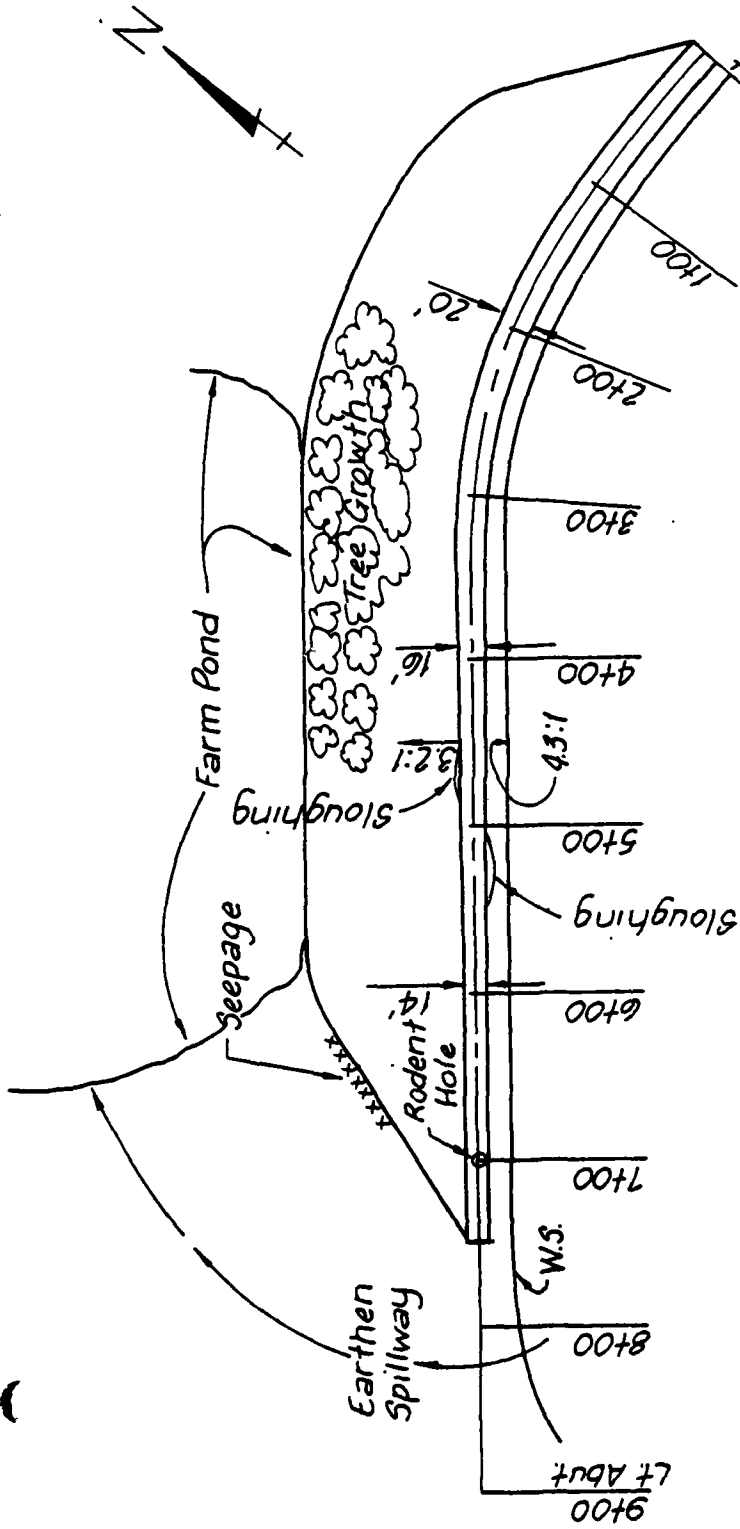


PHOTO NO. 16 - VIEW UPSTREAM FROM STA. 4+50.

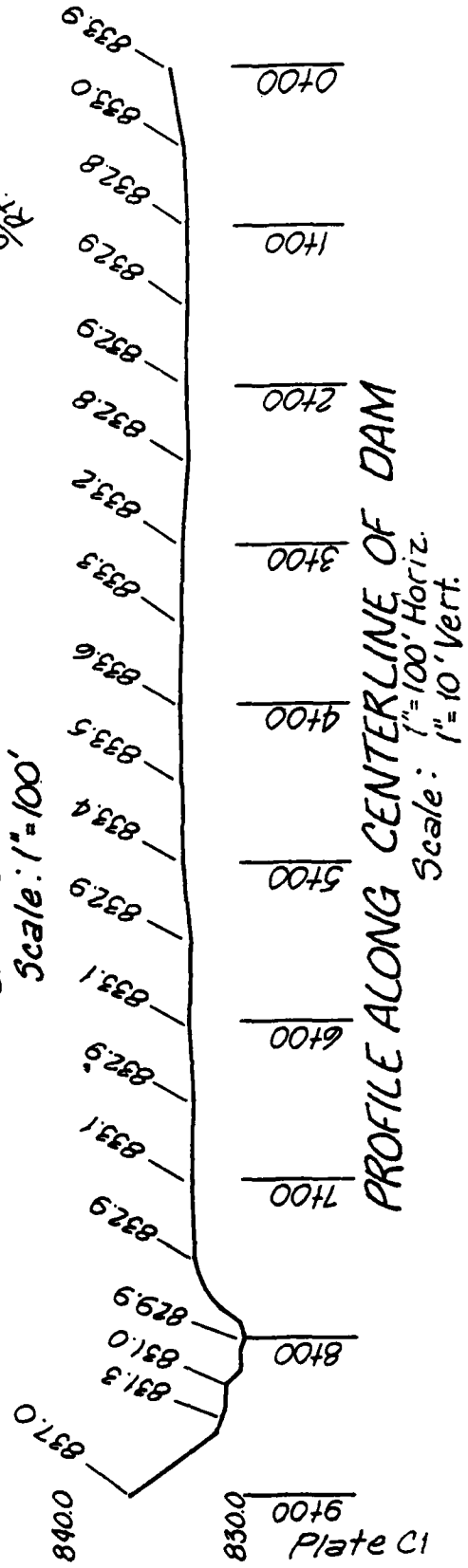


PHOTO NO. 17 - VIEW DOWNSTREAM FROM STA. 4+50.

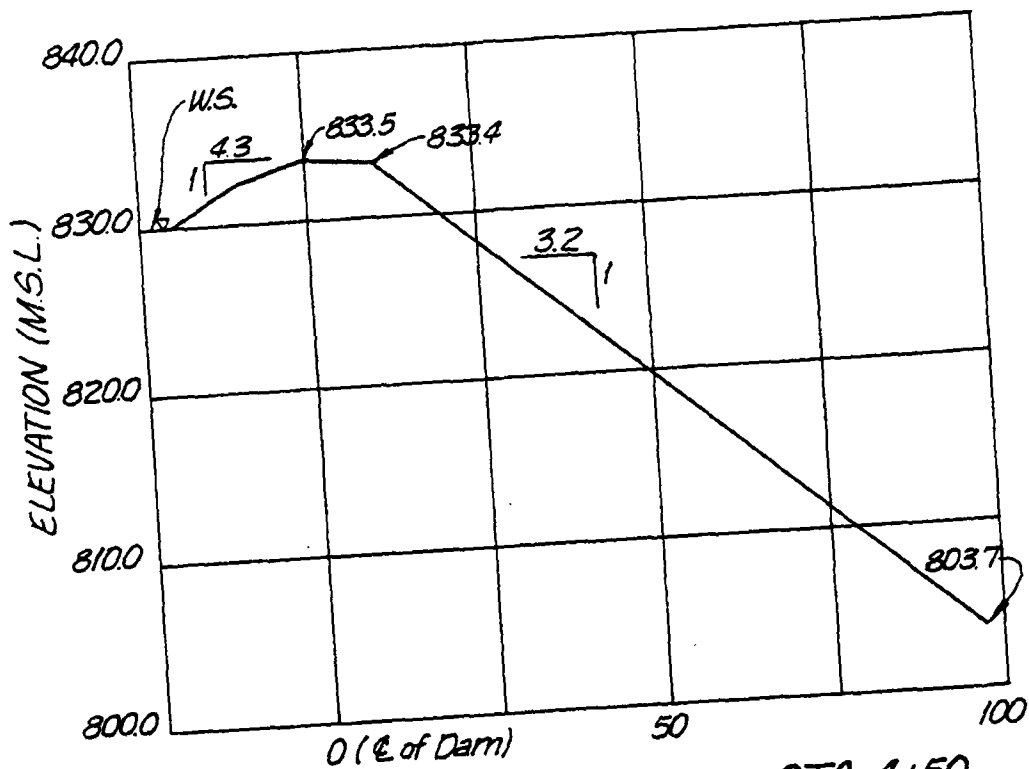
APPENDIX C
PROJECT PLATES



PLAN OF DAM
Scale: 1"=100'

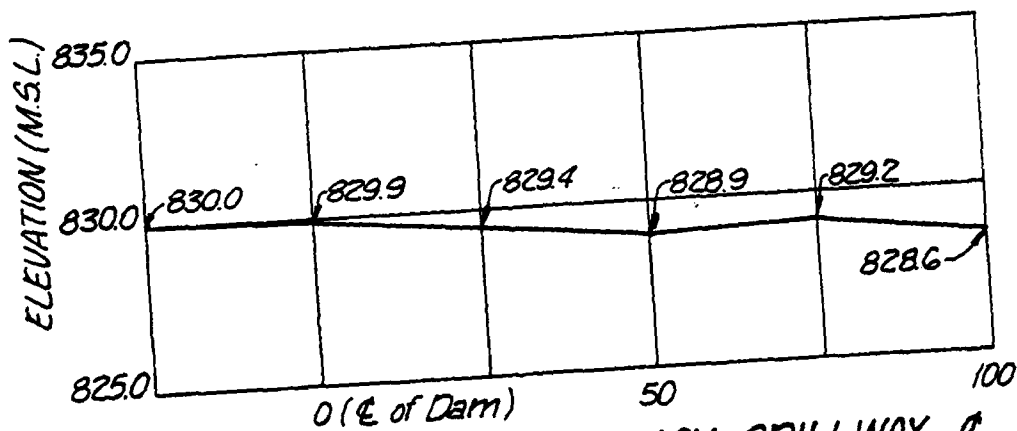


PROFILE ALONG CENTERLINE OF DAM



DAM SECTION @ STA. 4+50

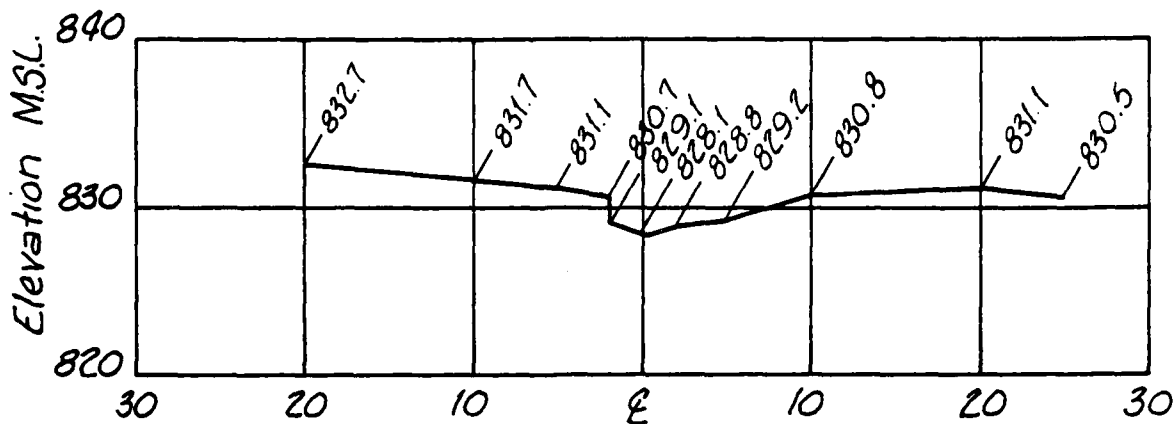
Scale: 1" = 25' Horiz.
1" = 10' Vert.



PROFILE OF EMERGENCY SPILLWAY

Scale: 1" = 25' Horiz.
1" = 5' Vert.

Plate C2



CROSS-SECTION OF EMERGENCY SPILLWAY
125 FEET DOWNSTREAM OF DAM E
Scale: 1"=10' Horiz.
1"=10' Vert.

APPENDIX D
HYDRAULIC AND HYDROLOGIC DATA

HYDROLOGIC COMPUTATIONS

1. The SCS dimensionless unit hydrograph and the systemized computer program HEC-1 (Dam Safety Version), July 1978, prepared by the Hydrologic Engineering Center, U.S. Corps of Engineers, Davis, California, were used to develop the inflow hydrographs.

a. Twenty-four hour, 100-year rainfall for the dam location was taken from the data for the rainfall station at Moberly, Missouri, as supplied by the St. Louis District, Corps of Engineers per their letter dated 6 March 1979. The twenty-four hour probable maximum precipitation was taken from the curves of Hydrometeorological Report No. 33 and current Corps of Engineers and St. Louis policy and guidance for hydraulics and hydrology.

b. Drainage area = 0.096 square miles (61.3 acres).

c. Time of concentration of runoff equals 16 minutes. Due to the small size of the watershed, Soil Conservation Service methods from Chapter 15 of NEH 4 were used to determine the time of concentration.

d. The antecedent storm conditions for the probable maximum precipitation were heavy rainfall and low temperatures which occurred on the previous 5 days (SCS AMC III). The antecedent storm conditions for the 100-year precipitation were an average of the conditions which have preceded the occurrence of the maximum annual flood on numerous watersheds (SCS AMC II). The initial pool elevation was assumed at the spillway crest.

e. The total twenty-four hour storm duration losses for the 100-year storm were 2.54 inches. The total losses for the PMF storm were 1.30 inches. These losses are based on SCS runoff curve No. 90 and No. 78 for antecedent moisture conditions, SCS AMC III and AMC II respectively. The watershed is composed of primarily SCS soil group C & D (Lindley, Keswick, Hattan) and consists mostly of grassland and woodland.

f. Average soil loss rate = 0.05 inch per hour for the P.M.F.

2. The discharge rating for the spillway was developed using the Corps of Engineers Water Surface Profile HEC-2 computer program.

The discharge rating for flow over the dam crest was developed using the HEC-1 (Dam Safety Version) program.

3. Floods were routed through the reservoir using the HEC-1 (Dam Safety Version) program. The input, output, and plotted hydrographs are included in this Appendix.

DIETZEN CORPORATION
MADE IN U.S.A.

NO. 340R-10 DIETZEN GRAPH PAPER
10 X 10 PER INCH

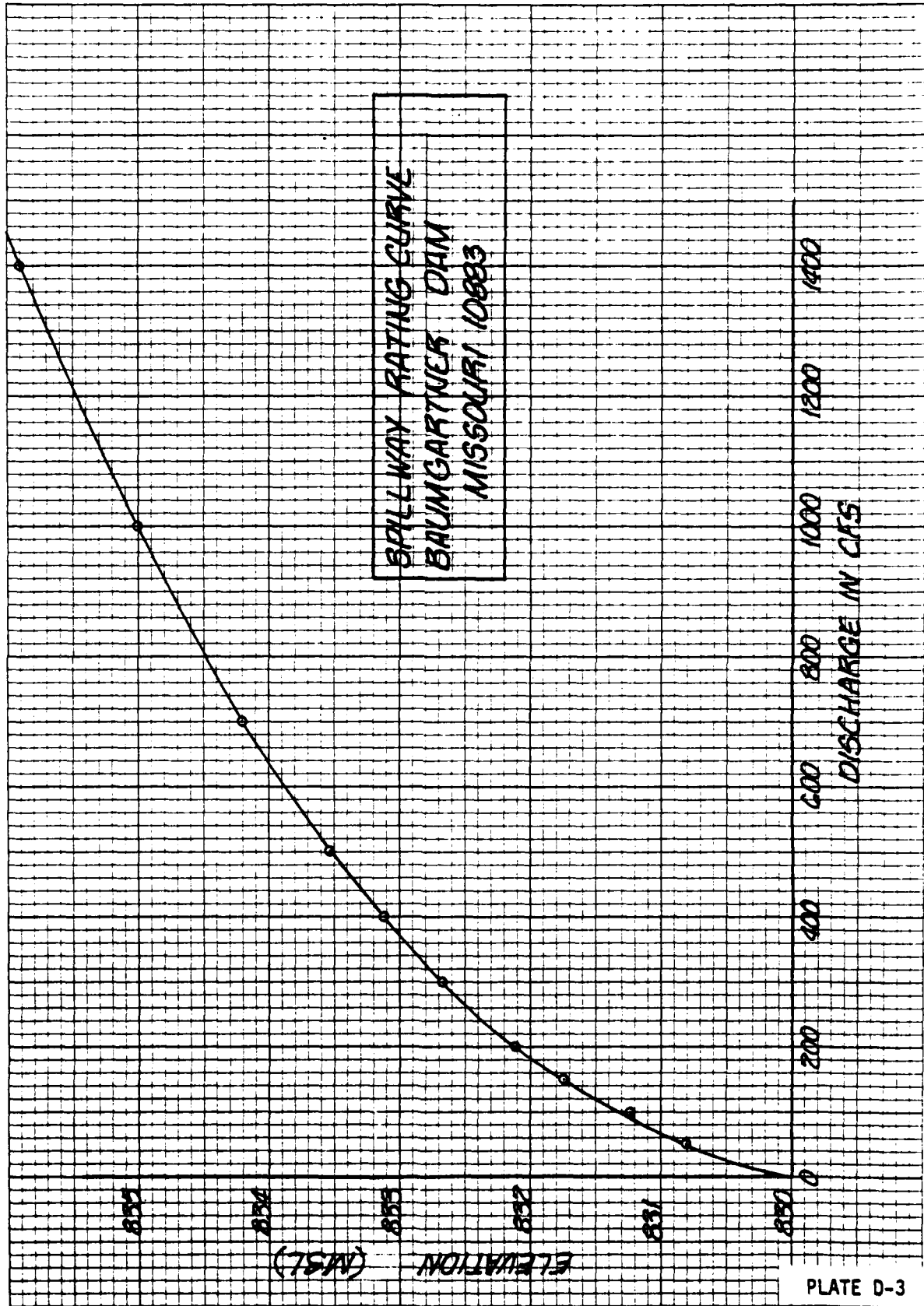
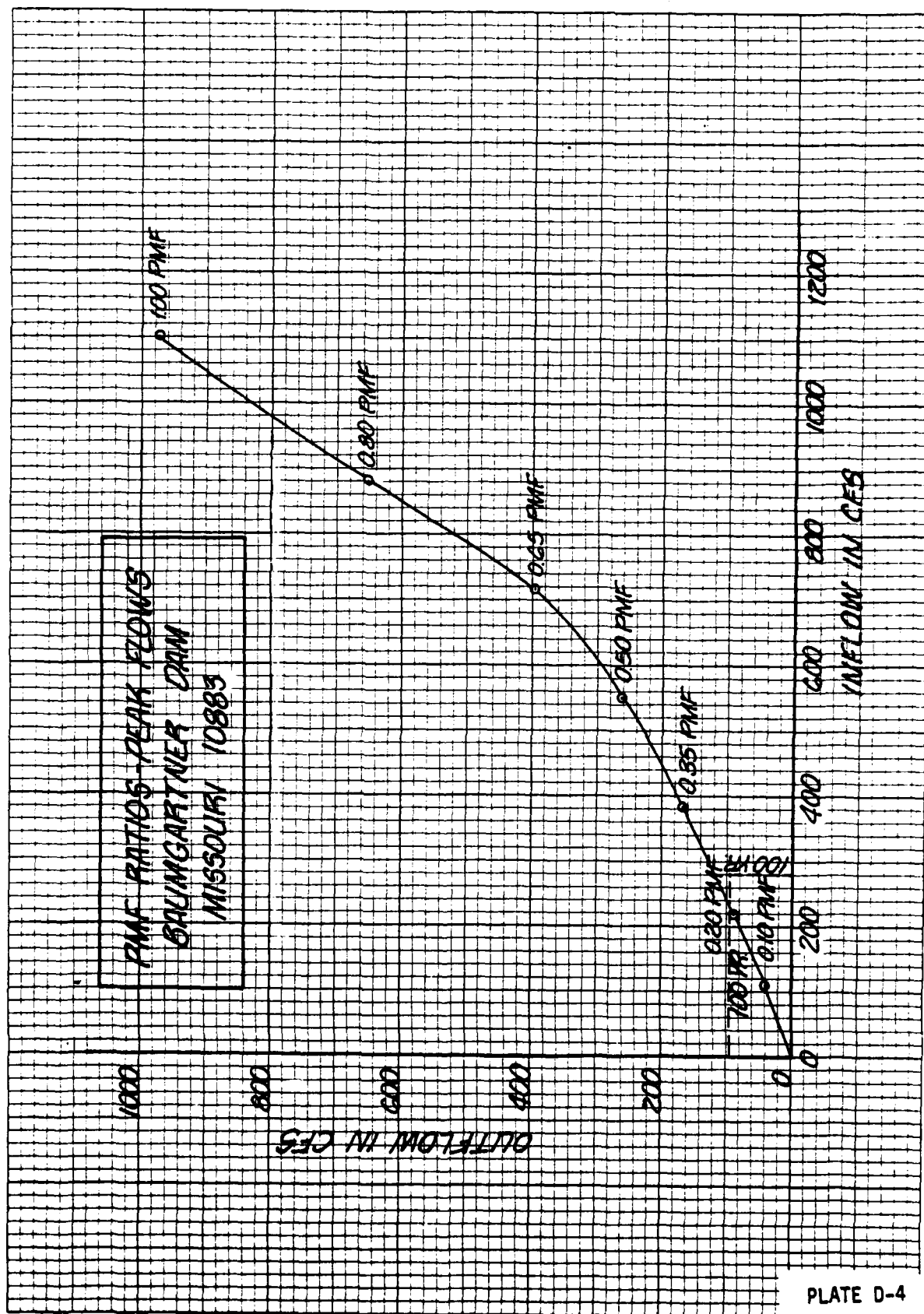


PLATE D-3



 FLOOD HYDROGRAPH PACKAGE (HEC-1)
 DAM SAFETY VERSION JULY 1978
 LAST MODIFICATION 24 FEB 79

RUN DATE= 79/02/23.
 TIME= 17.02.10.

MISSOURI DAM INSPECTION 793101
 BAUMGARTNER DAM 10883
 RATIOS OF PMF 0.10 0.20 0.35 0.50 0.65 0.80 1.00

JOB SPECIFICATION									
NO	MHR	MMIN	IDAY	IHR	IMIN	METRC	IPLT	IPRT	INSTAN
288	0	5	0	0	0	0	0	3	0
	JOPER	MWT	LBOPT	IRACE					
	5	0	0	0					

MULTI-PLAN ANALYSES TO BE PERFORMED
 NPLAN= 1 NRTIO= 7 LRTIO= 1
 RTIOS= .10 .20 .35 .50 .65 .80 1.00

***** SUB-AREA RUNOFF COMPUTATION *****
 CALCULATION OF INFLOW HYDROGRAPH TO BAUMGARTNER DAM

HYDROGRAPH DATA									
INHYG	IUNG	TAREA	SNAP	TRSDA	TRSPC	RATIO	ISNDW	ISAME	LOCAL
1	2	.10	0.00	.10	1.00	0.000	0	1	0
PRECIP DATA									
	SPEE	PHS	RA	R12	R24	R48	R72	R96	
	0.00	24.80	102.00	121.00	130.00	0.00	0.00	0.00	

LOSS DATA
 LROPT STRKA DLTKR RTIOL ERAIN STRKS RTIOK STRYL CNSTL ALSMK RTIMP
 0 0.00 0.00 1.00 0.00 0.00 1.00 -1.00 -90.00 0.00 0.00
 CURVE NO = -90.00 NETNESS = -1.00 EFFECT CN = 90.00

UNIT HYDROGRAPH DATA
 TC= 0.00 LAG= .17

RECESSION DATA
 SIRTQ= 0.00 ORCSN= -.01 RTIOR= 1.00

UNIT HYDROGRAPH 12 END OF PERIOD ORIGINATES IC= 0.00 HOURS LAG= .17 VOL= 1.00
 67. 202. 130. 65. 35. 18. 10. 5. 3.

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	0.05	1	-01	0.00	-01	0.	1.01	12.05	145	-21	-20	-01	57.
1.01	1.10	2	-01	0.00	-01	0.	1.01	12.10	146	-21	-21	-01	57.
1.01	1.15	3	-01	0.00	-01	0.	1.01	12.15	147	-21	-21	-01	114.
1.01	1.20	4	-01	0.00	-01	0.	1.01	12.20	148	-21	-21	-00	133.
1.01	1.25	5	-01	0.00	-01	0.	1.01	12.25	149	-21	-21	-00	152.
1.01	1.30	6	-01	0.00	-01	0.	1.01	12.30	150	-21	-21	-00	148.
1.01	1.35	7	-01	0.00	-01	0.	1.01	12.35	151	-21	-21	-00	150.
1.01	1.40	8	-01	0.00	-01	0.	1.01	12.40	152	-21	-21	-00	152.
1.01	1.45	9	-01	0.00	-01	0.	1.01	12.45	153	-21	-21	-00	153.
1.01	1.50	10	-01	0.00	-01	0.	1.01	12.50	154	-21	-21	-00	153.
1.01	1.55	11	-01	0.00	-01	0.	1.01	12.55	155	-21	-21	-00	154.
1.01	1.00	12	-01	0.00	-01	0.	1.01	13.00	156	-21	-21	-00	154.
1.01	1.05	13	-01	0.00	-01	0.	1.01	13.05	157	-25	-25	-00	157.
1.01	1.10	14	-01	0.00	-01	0.	1.01	13.10	158	-25	-25	-00	162.
1.01	1.15	15	-01	0.00	-01	0.	1.01	13.15	159	-25	-25	-00	174.
1.01	1.20	16	-01	0.00	-01	0.	1.01	13.20	160	-25	-25	-00	180.
1.01	1.25	17	-01	0.00	-01	0.	1.01	13.25	161	-25	-25	-00	182.
1.01	1.30	18	-01	0.00	-01	0.	1.01	13.30	162	-25	-25	-00	184.
1.01	1.35	19	-01	0.00	-01	0.	1.01	13.35	163	-25	-25	-00	185.
1.01	1.40	20	-01	0.00	-01	0.	1.01	13.40	164	-25	-25	-00	185.
1.01	1.45	21	-01	0.00	-01	0.	1.01	13.45	165	-25	-25	-00	186.
1.01	1.50	22	-01	0.00	-01	0.	1.01	13.50	166	-25	-25	-00	186.
1.01	1.55	23	-01	0.00	-01	0.	1.01	13.55	167	-25	-25	-00	186.
1.01	2.00	24	-01	0.00	-01	1.	1.01	14.00	168	-25	-25	-00	186.
1.01	2.05	25	-01	0.00	-01	1.	1.01	14.05	169	-32	-31	-00	190.
1.01	2.10	26	-01	0.00	-01	1.	1.01	14.10	170	-32	-31	-00	203.
1.01	2.15	27	-01	0.00	-01	1.	1.01	14.15	171	-32	-31	-00	216.
1.01	2.20	28	-01	0.00	-01	1.	1.01	14.20	172	-32	-31	-00	224.
1.01	2.25	29	-01	0.00	-01	1.	1.01	14.25	173	-32	-31	-00	229.
1.01	2.30	30	-01	0.00	-01	2.	1.01	14.30	174	-32	-31	-00	231.
1.01	2.35	31	-01	0.00	-01	2.	1.01	14.35	175	-32	-31	-00	232.
1.01	2.40	32	-01	0.00	-01	2.	1.01	14.40	176	-32	-31	-00	233.
1.01	2.45	33	-01	0.00	-01	2.	1.01	14.45	177	-32	-31	-00	233.
1.01	2.50	34	-01	0.00	-01	2.	1.01	14.50	178	-32	-31	-00	233.
1.01	2.55	35	-01	0.00	-01	2.	1.01	14.55	179	-32	-31	-00	234.
1.01	3.00	36	-01	0.00	-01	2.	1.01	15.00	180	-32	-31	-00	234.
1.01	3.05	37	-01	0.00	-01	3.	1.01	15.05	181	-19	-19	-00	235.
1.01	3.10	38	-01	0.00	-01	3.	1.01	15.10	182	-38	-38	-00	235.
1.01	3.15	39	-01	0.00	-01	3.	1.01	15.15	183	-38	-38	-00	226.
1.01	3.20	40	-01	0.00	-01	3.	1.01	15.20	184	-58	-57	-00	263.
1.01	3.25	41	-01	0.00	-01	3.	1.01	15.25	185	-67	-67	-00	325.
1.01	3.30	42	-01	0.00	-01	3.	1.01	15.30	186	1.63	1.63	-01	456.
1.01	3.35	43	-01	0.00	-01	3.	1.01	15.35	187	2.69	2.68	-01	768.
1.01	3.40	44	-01	0.00	-01	3.	1.01	15.40	188	1.06	1.05	-00	1098.
1.01	3.45	45	-01	0.00	-01	4.	1.01	15.45	189	-67	-67	-00	1102.
1.01	3.50	46	-01	0.00	-01	4.	1.01	15.50	190	-58	-58	-00	887.
1.01	3.55	47	-01	0.00	-01	4.	1.01	15.55	191	-38	-38	-00	670.
1.01	4.00	48	-01	0.00	-01	4.	1.01	16.00	192	-38	-38	-00	513.
1.01	4.05	49	-01	0.00	-01	4.	1.01	16.05	193	-30	-29	-00	403.
1.01	4.10	50	-01	0.00	-01	4.	1.01	16.10	194	-30	-29	-00	326.
1.01	4.15	51	-01	0.00	-01	4.	1.01	16.15	195	-30	-29	-00	277.
1.01	4.20	52	-01	0.00	-01	4.	1.01	16.20	196	-30	-29	-00	249.
1.01	4.25	53	-01	0.00	-01	4.	1.01	16.25	197	-30	-29	-00	232.
1.01	4.30	54	-01	0.00	-01	4.	1.01	16.30	198	-30	-29	-00	226.
1.01	4.35	55	-01	0.00	-01	4.	1.01	16.35	199	-30	-29	-00	222.
1.01	4.40	56	-01	0.00	-01	4.	1.01	16.40	200	-30	-29	-00	220.
1.01	4.45	57	-01	0.00	-01	5.	1.01	16.45	201	-30	-29	-00	219.
1.01	4.50	58	-01	0.00	-01	5.	1.01	16.50	202	-30	-29	-00	219.
1.01	4.55	59	-01	0.00	-01	5.	1.01	16.55	203	-30	-29	-00	219.
1.01	5.00	60	-01	0.00	-01	5.	1.01	17.00	204	-30	-29	-00	219.

PLATE D-7

1.01	5.05	61	-01	-01	-01	5.	1.01	17.05	205	-23	-23	-00	215.
1.01	5.10	62	-01	-01	-01	5.	1.01	17.10	206	-23	-23	-00	202.
1.01	5.15	63	-01	-01	-01	5.	1.01	17.15	207	-23	-23	-00	189.
1.01	5.20	64	-01	-01	-01	5.	1.01	17.20	208	-23	-23	-00	181.
1.01	5.25	65	-01	-01	-01	5.	1.01	17.25	209	-23	-23	-00	177.
1.01	5.30	66	-01	-01	-01	5.	1.01	17.30	210	-23	-23	-00	174.
1.01	5.35	67	-01	-01	-01	5.	1.01	17.35	211	-23	-23	-00	173.
1.01	5.40	68	-01	-01	-01	5.	1.01	17.40	212	-23	-23	-00	173.
1.01	5.45	69	-01	-01	-01	5.	1.01	17.45	213	-23	-23	-00	172.
1.01	5.50	70	-01	-01	-01	5.	1.01	17.50	214	-23	-23	-00	172.
1.01	5.55	71	-01	-01	-01	5.	1.01	17.55	215	-23	-23	-00	172.
1.01	6.00	72	-01	-01	-01	5.	1.01	18.00	216	-23	-23	-00	172.
1.01	6.05	73	-07	-04	-02	8.	1.01	18.05	217	-02	-02	-00	158.
1.01	6.10	74	-07	-04	-02	15.	1.01	18.10	218	-02	-02	-00	115.
1.01	6.15	75	-07	-04	-02	22.	1.01	18.15	219	-02	-02	-00	71.
1.01	6.20	76	-07	-05	-02	27.	1.01	18.20	220	-02	-02	-00	43.
1.01	6.25	77	-07	-05	-02	30.	1.01	18.25	221	-02	-02	-00	29.
1.01	6.30	78	-07	-05	-02	32.	1.01	18.30	222	-02	-02	-00	22.
1.01	6.35	79	-07	-05	-02	34.	1.01	18.35	223	-02	-02	-00	18.
1.01	6.40	80	-07	-05	-02	35.	1.01	18.40	224	-02	-02	-00	16.
1.01	6.45	81	-07	-05	-01	36.	1.01	18.45	225	-02	-02	-00	15.
1.01	6.50	82	-07	-05	-01	37.	1.01	18.50	226	-02	-02	-00	14.
1.01	6.55	83	-07	-05	-01	37.	1.01	18.55	227	-02	-02	-00	14.
1.01	7.00	84	-07	-05	-01	38.	1.01	19.00	228	-02	-02	-00	14.
1.01	7.05	85	-07	-05	-01	39.	1.01	19.05	229	-02	-02	-00	14.
1.01	7.10	86	-07	-05	-01	39.	1.01	19.10	230	-02	-02	-00	14.
1.01	7.15	87	-07	-05	-01	40.	1.01	19.15	231	-02	-02	-00	14.
1.01	7.20	88	-07	-06	-01	40.	1.01	19.20	232	-02	-02	-00	14.
1.01	7.25	89	-07	-06	-01	40.	1.01	19.25	233	-02	-02	-00	14.
1.01	7.30	90	-07	-06	-01	41.	1.01	19.30	234	-02	-02	-00	14.
1.01	7.35	91	-07	-06	-01	41.	1.01	19.35	235	-02	-02	-00	14.
1.01	7.40	92	-07	-06	-01	41.	1.01	19.40	236	-02	-02	-00	14.
1.01	7.45	93	-07	-06	-01	42.	1.01	19.45	237	-02	-02	-00	14.
1.01	7.50	94	-07	-06	-01	42.	1.01	19.50	238	-02	-02	-00	14.
1.01	7.55	95	-07	-06	-01	42.	1.01	19.55	239	-02	-02	-00	14.
1.01	8.00	96	-07	-06	-01	43.	1.01	20.00	240	-02	-02	-00	14.
1.01	8.05	97	-07	-06	-01	43.	1.01	20.05	241	-02	-02	-00	14.
1.01	8.10	98	-07	-06	-01	43.	1.01	20.10	242	-02	-02	-00	14.
1.01	8.15	99	-07	-06	-01	43.	1.01	20.15	243	-02	-02	-00	14.
1.01	8.20	100	-07	-06	-01	44.	1.01	20.20	244	-02	-02	-00	14.
1.01	8.25	101	-07	-06	-01	44.	1.01	20.25	245	-02	-02	-00	14.
1.01	8.30	102	-07	-06	-01	44.	1.01	20.30	246	-02	-02	-00	14.
1.01	8.35	103	-07	-06	-01	44.	1.01	20.35	247	-02	-02	-00	14.
1.01	8.40	104	-07	-06	-01	44.	1.01	20.40	248	-02	-02	-00	14.
1.01	8.45	105	-07	-06	-01	44.	1.01	20.45	249	-02	-02	-00	14.
1.01	8.50	106	-07	-06	-01	45.	1.01	20.50	250	-02	-02	-00	14.
1.01	8.55	107	-07	-06	-00	45.	1.01	20.55	251	-02	-02	-00	14.
1.01	9.00	108	-07	-06	-00	45.	1.01	21.00	252	-02	-02	-00	14.
1.01	9.05	109	-07	-06	-00	45.	1.01	21.05	253	-02	-02	-00	14.
1.01	9.10	110	-07	-06	-00	45.	1.01	21.10	254	-02	-02	-00	14.
1.01	9.15	111	-07	-06	-00	45.	1.01	21.15	255	-02	-02	-00	14.
1.01	9.20	112	-07	-06	-00	45.	1.01	21.20	256	-02	-02	-00	14.
1.01	9.25	113	-07	-06	-00	45.	1.01	21.25	257	-02	-02	-00	14.
1.01	9.30	114	-07	-06	-00	45.	1.01	21.30	258	-02	-02	-00	14.
1.01	9.35	115	-07	-06	-00	46.	1.01	21.35	259	-02	-02	-00	14.
1.01	9.40	116	-07	-06	-00	46.	1.01	21.40	260	-02	-02	-00	14.
1.01	9.45	117	-07	-06	-00	46.	1.01	21.45	261	-02	-02	-00	14.
1.01	9.50	118	-07	-06	-00	46.	1.01	21.50	262	-02	-02	-00	14.
1.01	9.55	119	-07	-06	-00	46.	1.01	21.55	263	-02	-02	-00	14.
1.01	10.00	120	-07	-06	-00	46.	1.01	22.00	264	-02	-02	-00	14.
1.01	10.05	121	-07	-06	-00	46.	1.01	22.05	265	-02	-02	-00	14.
1.01	10.10	122	-07	-06	-00	46.	1.01	22.10	266	-02	-02	-00	14.

1.01	10.15	123	.07	.06	.00	46.	1.01	22.15	267	.02	.02	.00	14.
1.01	10.20	124	.07	.06	.00	46.	1.01	22.20	268	.02	.02	.00	14.
1.01	10.25	125	.07	.06	.00	46.	1.01	22.25	269	.02	.02	.00	14.
1.01	10.30	126	.07	.06	.00	46.	1.01	22.30	270	.02	.02	.00	14.
1.01	10.35	127	.07	.06	.00	46.	1.01	22.35	271	.02	.02	.00	14.
1.01	10.40	128	.07	.06	.00	46.	1.01	22.40	272	.02	.02	.00	14.
1.01	10.45	129	.07	.06	.00	47.	1.01	22.45	273	.02	.02	.00	14.
1.01	10.50	130	.07	.06	.00	47.	1.01	22.50	274	.02	.02	.00	14.
1.01	10.55	131	.07	.06	.00	47.	1.01	22.55	275	.02	.02	.00	14.
1.01	11.00	132	.07	.06	.00	47.	1.01	23.00	276	.02	.02	.00	14.
1.01	11.05	133	.07	.06	.00	47.	1.01	23.05	277	.02	.02	.00	14.
1.01	11.10	134	.07	.06	.00	47.	1.01	23.10	278	.02	.02	.00	14.
1.01	11.15	135	.07	.06	.00	47.	1.01	23.15	279	.02	.02	.00	14.
1.01	11.20	136	.07	.06	.00	47.	1.01	23.20	280	.02	.02	.00	14.
1.01	11.25	137	.07	.06	.00	47.	1.01	23.25	281	.02	.02	.00	14.
1.01	11.30	138	.07	.06	.00	47.	1.01	23.30	282	.02	.02	.00	14.
1.01	11.35	139	.07	.06	.00	47.	1.01	23.35	283	.02	.02	.00	14.
1.01	11.40	140	.07	.06	.00	47.	1.01	23.40	284	.02	.02	.00	14.
1.01	11.45	141	.07	.06	.00	47.	1.01	23.45	285	.02	.02	.00	14.
1.01	11.50	142	.07	.06	.00	47.	1.01	23.50	286	.02	.02	.00	14.
1.01	11.55	143	.07	.06	.00	47.	1.01	23.55	287	.02	.02	.00	14.
1.01	12.00	144	.07	.06	.00	47.	1.02	0.00	288	.02	.02	.00	14.
SUM 32.24 30.94 1.30 22971-										650.571			
1.819.11 786.11 33.11													
PEAK 1.02 257.													
6-HOUR 24-HOUR 72-HOUR TOTAL VOLUME													
CES 31. 80. 80. 2. 650.													
CMS 7. 2. 2. 30.89													
INCHES 24.92 30.89 30.89 785.66													
MM 632.82 785.66 785.66 158.													
AC-FT 120. 158. 158. 195.													
THOUS CU YD 157. 195. 195. 195.													

00VN*

HYDROGRAPH AT STA000001 FOR PLAN 1, RTIO 1

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	110.	24.	8.	8.	2295.
CMS	3.	1.	0.	0.	65.
INCHES		2.49	3.09	3.09	3.09
MM		63.29	78.47	78.47	78.47
AC-FI		13.	16.	16.	16.
THOUS CU M		16.	19.	19.	19.

HYDROGRAPH AT STA000001 FOR PLAN 1, RTIO 2

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	220.	51.	16.	16.	4591.
CMS	6.	1.	0.	0.	130.
INCHES		4.98	6.18	6.18	6.18
MM		126.57	156.93	156.93	156.93
AC-FI		26.	32.	32.	32.
THOUS CU M		31.	39.	39.	39.

HYDROGRAPH AT STA000001 FOR PLAN 1, RTIO 3

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	386.	90.	28.	28.	8034.
CMS	11.	3.	1.	1.	227.
INCHES		8.72	10.81	10.81	10.81
MM		221.50	274.63	274.63	274.63
AC-FI		55.	55.	55.	55.
THOUS CU M		55.	68.	68.	68.

HYDROGRAPH AT STA000001 FOR PLAN 1, RTIO 4

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	551.	129.	40.	40.	11477.
CMS	16.	4.	1.	1.	323.
INCHES		12.46	15.45	15.45	15.45
MM		316.43	392.33	392.33	392.33
AC-FI		44.	79.	79.	79.
THOUS CU M		79.	97.	97.	97.

HYDROGRAPH AT STA000001 FOR PLAN 1, RTIO 5

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	716.	167.	52.	52.	14920.
CMS	20.	5.	1.	1.	422.
INCHES		16.20	20.08	20.08	20.08
MM		411.35	510.03	510.03	510.03
AC-FI		83.	103.	103.	103.
THOUS CU M		102.	127.	127.	127.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL
CFE	981.	206.	64.	66.	18363.
CMS	25.	6.	2.	2.	520.
INCHES		19.93	24.71	24.71	24.71
MM		506.28	627.73	627.73	627.73
AC-FY		102.	126.	126.	126.
THOUS CU M		126.	156.	156.	156.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL
	1102.	57.	80.	80.	22954.
CES	31.	7.	2.	2.	650.
CMS					30.89
INCMES		24.92	30.89	30.89	786.66
HR		632.85	786.66	786.66	158.
AC-FI		128.	158.	158.	195.
THOUS CU M		157.	195.	195.	

RESERVOIR ROUTING OF HYDROGRAPH AT BAUMGARTNER DAM

ISTAQ	ICOMP	IECON	ITYPE	JPLT	JPRI	INAME	ISTAGE	IAUTO
000002	1	0	0	2	0	1	0	0

ROUTING DATA		ROUTING DATA		ROUTING DATA			
QLOSS	CLOSS	AVG	IRIS	ISAME	IOPT	IPMP	LSTR
0.0	0.000	0.00	1	1	0	0	0

INSTPS	NSTD	LAG	AMSK	X	TSK	STOR	ISPRAT
1	0	0	0.000	0.000	0.000	-830.	-1

STAGE	830.00	830.81	831.76	832.12	832.68	833.13	833.53	834.19	835.00	835.89
FLOW	0.00	50.00	150.00	200.00	300.00	400.00	500.00	700.00	1000.00	1400.00

SURFACE AREA = 0. 2. 7. 17.

CAPACITY=	0.	3.	42.	150.
-----------	----	----	-----	------

ELEVATION=	815.	820.	830.	840.

CREL SPVID COOW

CREL	SPMD	COQM	EXPM	ELEV	COOL	CAREA	EXPL
830.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

TOPEL	COQD	EXPD	DAMWID
832.8	3.0	1.5	0.

CREST LENGTH AT OR BELOW ELEVATION	10.	190.	420.	650.	750.
	832.6	832.9	833.0	833.5	834.0
					836.0

STATION 000002, PLAN 1, RATIO 4 (0.50 RIF)

END-OF-PERIOD HYDROGRAPH ORDINATES

PLATE D-12

QDVF*

STATION000002

INFLOW(I), OUTFLOW(O) AND OBSERVED FLOW(*)										
0.	100.	200.	300.	400.	500.	600.	0.	0.	0.	0.
.05 11	.	.	.	.	.	.	.	.	.	.
.10 21	.	.	.	.	.	.	.	.	.	.
.15 31	.	.	.	.	.	.	.	.	.	.
.20 41	.	.	.	.	.	.	.	.	.	.
.25 51	.	.	.	.	.	.	.	.	.	.
.30 61	.	.	.	.	.	.	.	.	.	.
.35 71	.	.	.	.	.	.	.	.	.	.
.40 81	.	.	.	.	.	.	.	.	.	.
.45 91	.	.	.	.	.	.	.	.	.	.
.50 101	.	.	.	.	.	.	.	.	.	.
.55 111	.	.	.	.	.	.	.	.	.	.
1.00 121	.	.	.	.	.	.	.	.	.	.
1.05 131	.	.	.	.	.	.	.	.	.	.
1.10 141	.	.	.	.	.	.	.	.	.	.
1.15 151	.	.	.	.	.	.	.	.	.	.
1.20 161	.	.	.	.	.	.	.	.	.	.
1.25 171	.	.	.	.	.	.	.	.	.	.
1.30 181	.	.	.	.	.	.	.	.	.	.
1.35 191	.	.	.	.	.	.	.	.	.	.
1.40 201	.	.	.	.	.	.	.	.	.	.
1.45 211	.	.	.	.	.	.	.	.	.	.
1.50 221	.	.	.	.	.	.	.	.	.	.
1.55 231	.	.	.	.	.	.	.	.	.	.
2.00 241	.	.	.	.	.	.	.	.	.	.
2.05 251	.	.	.	.	.	.	.	.	.	.
2.10 261	.	.	.	.	.	.	.	.	.	.
2.15 271	.	.	.	.	.	.	.	.	.	.
2.20 281	.	.	.	.	.	.	.	.	.	.
2.25 291	.	.	.	.	.	.	.	.	.	.
2.30 301	.	.	.	.	.	.	.	.	.	.
2.35 311	.	.	.	.	.	.	.	.	.	.
2.40 321	.	.	.	.	.	.	.	.	.	.
2.45 331	.	.	.	.	.	.	.	.	.	.
2.50 341	.	.	.	.	.	.	.	.	.	.
2.55 351	.	.	.	.	.	.	.	.	.	.
3.00 361	.	.	.	.	.	.	.	.	.	.
3.05 371	.	.	.	.	.	.	.	.	.	.
3.10 381	.	.	.	.	.	.	.	.	.	.
3.15 391	.	.	.	.	.	.	.	.	.	.
3.20 401	.	.	.	.	.	.	.	.	.	.
3.25 411	.	.	.	.	.	.	.	.	.	.
3.30 421	.	.	.	.	.	.	.	.	.	.
3.35 431	.	.	.	.	.	.	.	.	.	.
3.40 441	.	.	.	.	.	.	.	.	.	.
3.45 451	.	.	.	.	.	.	.	.	.	.
3.50 461	.	.	.	.	.	.	.	.	.	.
3.55 471	.	.	.	.	.	.	.	.	.	.
4.00 481	.	.	.	.	.	.	.	.	.	.
4.05 491	.	.	.	.	.	.	.	.	.	.
4.10 501	.	.	.	.	.	.	.	.	.	.
4.15 511	.	.	.	.	.	.	.	.	.	.
4.20 521	.	.	.	.	.	.	.	.	.	.
4.25 531	.	.	.	.	.	.	.	.	.	.
4.30 541	.	.	.	.	.	.	.	.	.	.
4.35 551	.	.	.	.	.	.	.	.	.	.
4.40 561	.	.	.	.	.	.	.	.	.	.

20.15203.10
20.20204.10
20.25205.10
20.30206.10
20.35207.10
20.40208.10
20.45209.10
20.50210.10
20.55211.10
21.00212.10
21.05213.10
21.10214.10
21.15215.10
21.20216.10
21.25217.10
21.30218.10
21.35219.10
21.40220.10
21.45221.10
21.50222.10
21.55223.10
22.00224.10
22.05225.10
22.10226.10
22.15227.10
22.20228.10
22.25229.10
22.30230.10
22.35231.10
22.40232.10
22.45233.10
22.50234.10
22.55235.10
23.00236.10
23.05237.10
23.10238.10
23.15239.10
23.20240.10
23.25241.10
23.30242.10
23.35243.10
23.40244.10
23.45245.10
23.50246.10
23.55247.10
0.00248.10

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	RATIO	2	RATIO	3	RATIO	4	RATIO	5	RATIO	6	RATIO	7
					.10	.20	.30	.40	.50	.60	.70	.80	.90	1.00			
HYDROGRAPH AT	000001	.10	1	110.	220.	330.	440.	550.	660.	770.	880.	990.	1100.	1210.	1320.	1430.	1540.
		.25	1	3.12	6.24	9.36	12.48	15.60	18.72	21.84	24.96	28.08	31.20	34.32	37.44	40.56	43.68
ROUTED TO	000002	.10	1	40.	91.	172.	266.	395.	551.	716.	881.	1046.	1211.	1376.	1541.	1706.	1871.
		.25	1	1.12	2.59	4.86	7.54	11.10	15.61	21.11	26.62	32.13	37.64	43.15	48.66	54.17	59.68

PLAN 1

• 2000 •

END

DATE
FILMED

11-81

DTIC