REPORT DOCUMENTATION PAGE		READ INSTRUCTIONS BEFORE COMPLETING FORM
1. REPORT NUMBER	2. GOVT ACCESSION NO. AD-A106 046	3. RECIPIENT'S CATALOG NUMBER
4. TITLE (and Subtitle) Phase I Dam Inspection Report National Dam Safety Program Tripoli Valley Dam (MO 30345) Phelps County, Missouri		5. TYPE OF REPORT & PERIOD COVERED Final Report
		6. PERFORMING ORG. REPORT NUMBER
7. AUTHOR(s) Corps of Engineers, St. Louis District		8. CONTRACT OR GRANT NUMBER(s) N/A
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		10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS
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		12. REPORT DATE November 1978
		13. NUMBER OF PAGES Approximately 35
14. MONITORI National Dam Safety Program. Tripoli Valley Dam (MO 30345), Mississippi-Kaskaskia-St. Louis Basin, Phelps County, Missouri. Phase I Inspection Report.		15. SECURITY CLASS. (of this report) UNCLASSIFIED
		15a. DECLASSIFICATION/DOWNGRADING SCHEDULE

16. DISTRIBU

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.

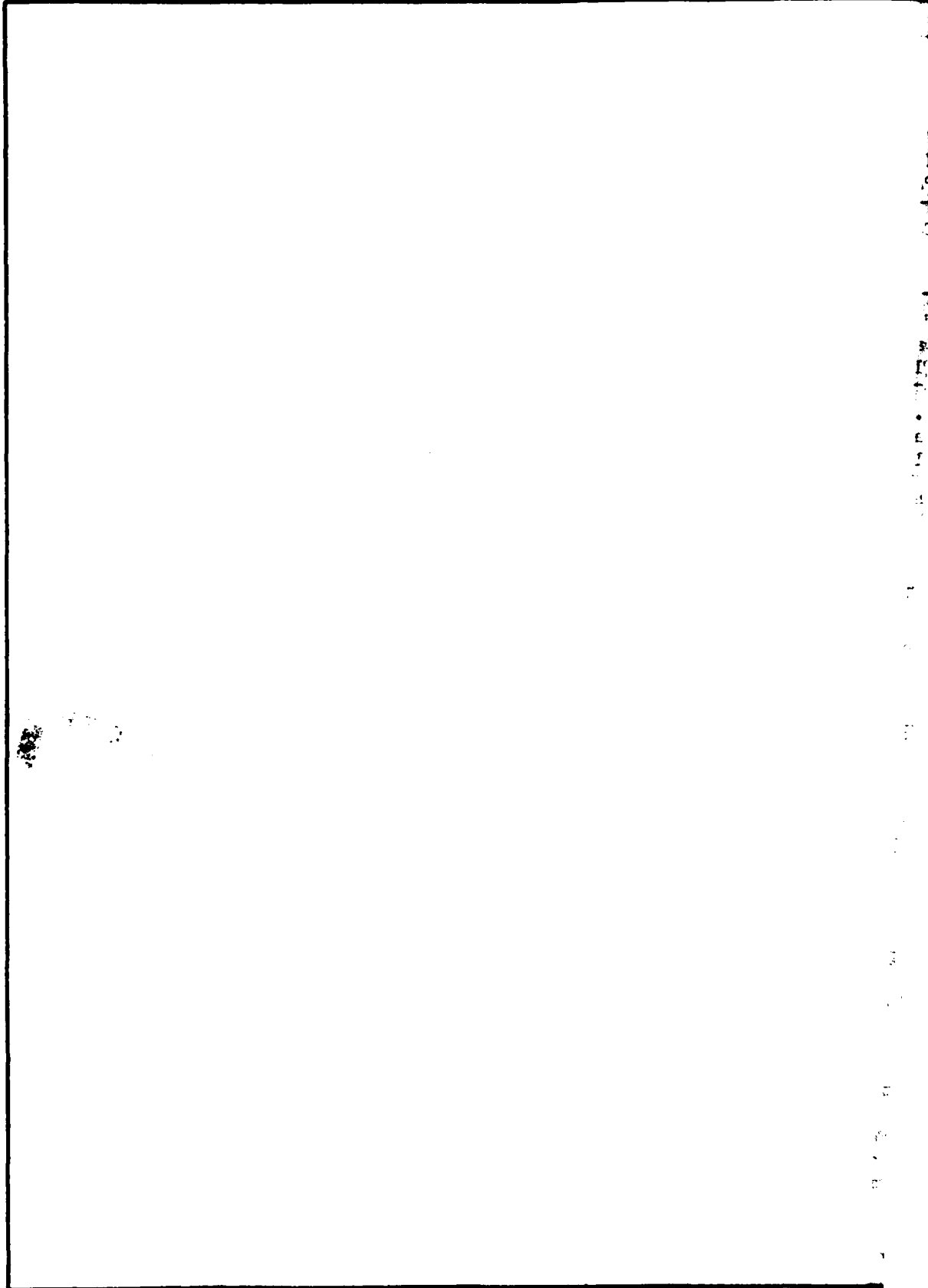DD FORM 1473 EDITION OF 1 NOV 65 IS OBSOLETE

TRIPOLI VALLEY DAM
PHELPS COUNTY, MISSOURI

MISSOURI INVENTORY NO. 30435

PHASE I INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM

PREPARED BY: ST. LOUIS DISTRICT CORPS OF ENGINEERS
FOR: GOVERNOR OF MISSOURI

PHASE I REPORT

NATIONAL DAM SAFETY PROGRAM

Name of Dam   Tripoli
State Located   Missouri
County Located   Phelps County
Stream   Tributary to Asher Hollow
Date of Inspection   6 September 1978

   Tripoli Valley Dam was inspected by an interdisciplinary team
of engineers from the St. Louis District, U. S. Army Corps of
Engineers. The purpose of the inspection was to make an assessment
of the general condition of the dam with respect to safety, based
upon available data and visual inspection, in order to determine if
the dam poses hazards to human life or property. The inspection and
assessment were made using the "Recommended Guidelines for Safety
Inspection of Dams," developed by the Chief of Engineers, U. S.
Army, Washington, D. C., 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 the life and property of approximately 2 families
downstream of the dam and cause appreciable damage to two homes, one
farm building, one county road, one state road and one recreational
area, all within a three-mile damage reach of the dam.

   For its size and hazard category, this dam is required by the
guidelines to pass from one-half the Probable Maximum Flood (PMF) to
PMF. The PMF is defined as the flood discharge that may be expected
from the most severe combination of critical meteorologic and
hydrologic conditions that are reasonably possible in the region.
This dam was evaluated using the one-half PMF because of the
possible loss of human life downstream of the dam. It was found
that the spillway is only capable of passing 10 percent of the PMF
without overtopping the dam. Since the spillway is not capable of
passing a minimum of one-half of the PMF without overtopping the dam
and perhaps causing failure, the spillway is considered seriously
inadequate and the dam is accordingly considered unsafe.

   Other deficiencies visually observed by the inspection team
were trees on embankment, obstruction of spillway, minor erosion of
the upstream face of dam, and lack of erosion protection on the

upstream face of dam. Seepage and stability analyses comparable to the requirements of the guidelines are not on record; this is also a deficiency which should be rectified.

It is recommended that action be taken to implement the remedial measures listed herein in the near future. Any corrective works performed in relation to increasing the spillway size and/or dam height and stability and seepage investigations of the embankment should be made in accordance with analyses and design performed by an engineer experienced in the design of dams. These conclusions were reached by the undersigned inspection team members.

MICHAEL J. KLOSTERMAN
Geologist
St. Louis District
Corps of Engineers

DAVID W. CARTER
Hydraulic Engineer
St. Louis District
Corps of Engineers

Accession For

NTIS GRA&I ✓
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Unannounced ☐
Justification

By
Distribution/
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Avail and/or
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A

ANDREW HEYDINGER
Soils Engineer
St. Louis District
Corps of Engineers

CHIEN (NANCY) HSIEH
Hydraulic Engineer
St. Louis District
Corps of Engineers

SUBMITTED BY: _____   17 Nov 78
                Chief, Engineering Division   Date

APPROVED BY: _____   20 Nov 1978
                Colonel, CE, District Engineer   Date

PHASE I INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM
TRIPOLI VALLEY DAM - ID NO. 30435

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PHASE I INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM
TRIPOLI VALLEY DAM ID NO. 30435

SECTION 1 - PROJECT INFORMATION

1.1 GENERAL

    a. <u>Authority</u>. 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 the Tripoli Valley Dam be made.

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

1.2 DESCRIPTION OF PROJECT

    a. <u>Description of Dam and Appurtenances</u>.

    (1) The dam is an earth structure built in a narrow valley. The topography adjacent to the valley is rolling to steep. The earth embankment is composed of gravelly clay. Topography in the vicinity of the dam is shown on PLATE 1.

    (2) Appurtenant structures consist of an ungated spillway and a valve controlled, 6-inch diameter, discharge pipe through the dam.

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

    b. <u>Location</u>. The dam is located in the eastern portion of Phelps County, Missouri, in the SE 1/4 of the SE 1/4 of T37N, R6W of the Maramec Spring, Missouri Quadrangle Sheet.

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.** Criteria for determining hazard classification are presented in the same report as referenced in paragraph 1.2c above. Based on referenced criteria, this dam is in the High Hazard Classification.

e. **Ownership.** This dam is owned by Clara Sooter, 3945 Bayless, St. Louis, Missouri 63125.

f. **Purpose of Dam.** The dam forms a 6-acre recreational lake.

g. **Design and Construction History.** The Tripoli Valley Dam was built in 1965 by the Smith Brothers Construction Company. No plans were drawn up for construction of the dam.

h. **Normal Operating Procedure.** Operating procedures at the dam consist of releases through the discharge pipe whenever the pool appears to be too high to the owner.

1.3 PERTINENT DATA

a. **Combined Drainage and Lake Area** - 269 acres.

b. **Discharge at Damsite.**

(1) Estimated ungated spillway capacity at maximum pool elevation - 270 cfs.

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

c. **Elevation (Based on an assumed datum of 800 feet msl).**

(1) Top of dam (minimum elevation of earth embankment) - 898.0.

(2) Spillway crest - 895.1.

(3) There is no low head outlet.

(4) Maximum tailwater - Unknown.

(5) Streambed at centerline of dam - estimated 873 feet.

d. **Reservoir Length of Maximum Pool** - 1000 feet.

e. **Storage (Acre-feet) at Top of Dam Estimated.** 68.

2

f. <u>Reservoir Surface (Acres)</u>.

(1) Top of dam - 8.

(2) Spillway crest - 6.

g. <u>Dam</u>.

(1) Type - earth.

(2) Length - 435 feet.

(3) Height - 26 feet.

(4) Top width - 29 feet.

(5) Side Slopes -

(a) Downstream - 1.5H on 1V (varies)

(b) Upstream - 1H on 1V (varies)

(6) Zoning - unknown.

(7) Impervious Core - unknown.

(8) Cutoff - unknown.

(9) Grout curtain - unknown.

h. <u>Diversion and Regulating Tunnel</u>. None.

i. <u>Spillway</u>.

(1) Type - Ungated

(2) Length of weir - 65 feet.

(j) <u>Regulating Outlets</u> - 6-inch diameter discharge pipe

SECTION 2 - ENGINEERING DATA

2.1 DESIGN

No design data were available on this dam.

2.2 CONSTRUCTION

The dam was built in 1965 by the Smith Brother Construction
Co. No additional construction data are available.

2.3 OPERATION

The maximum reservoir loading on the dam is not known. All
releases are through an uncontrolled spillway and a discharge pipe.

2.4 EVALUATION

a. Availability. No design data was available.

b. Adequacy. Seepage and stability analyses comparable to
the requirements of the "Recommend Guidelines for Safety Inspection
of Dam" were not available, which is considered a deficiency. These
seepage and stability analyses should be performed for the
appropriate loading conditions and made a matter of record.

c. Validity. No valid engineering design data or
construction data were available.

SECTION 3 - VISUAL INSPECTION

3.1 FINDINGS

a. <u>General</u>. The owner did not accompany the inspection team. There is no other lake in the watershed that would affect Tripoli Lake.

b. <u>Project Geology</u>.

(1) Tripoli Valley is a tributary to a losing (or dry) stream in Asher Hollow which is itself a tributary to the Meramec River. The area is approximately 2-1/2 miles south of Meramec Springs and has the land form features and subsurface hydrologic characteristics typical of karst terrain.

(2) The Tripoli Valley dam and watershed are underlain by Gasconade Dolomite. The damsite itself is founded on residuum and bedrock of the upper Gasconade and, although the divides forming the limits of the watershed may have some Roubidoux residuum, they are composed primarily of Gasconade residuum. The bedrock in the spillway described as "tan to light brown, moderately hard, sedimentary carbonate rock" (paragraph 3.1.b(1)) is an outcrop of Gasconade Dolomite.

(3) Inspection of the watershed area indicated several areas of seeps and springs but, since it had recently rained, it was not possible to determine if they were perennial or intermittent. The small stream leading into the reservoir appears to flow continuously and there is no reason to question that some of the springs are perennial (paragraph 3.1.b(2)).

(4) The "large area with standing water" (paragraph 3.1.c(5)) located on the downstream face near the toe on the east side of the dam appears to be occurring as seepage through the right abutment. The bedrock has been extensively weathered, there is a very irregular and uneven bedrock surface, and it seems very likely that this seepage is occurring through residuum and weathered dolomite underlying the abutment.

(5) Adverse conditions prevented a close inspection of the left abutment. However, no outcrops of particular geologic significance were noted from a safe distance and, since no seepage was reported in the preliminary report, a close inspection was not considered critical.

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c. <u>Dam</u>.

(1) No detrimental settlement, cracking, or sinkholes were observed in or near the earth embankments. An embankment cross section at the maximum height section for the dam is shown on PLATE 2. No animal burrows were noted at the dam.

(2) There are some small trees on the dam, mostly on the downstream slope, which include willow trees near the toe where the moist conditions were noted, oak trees up the slope from the willows, and fruit trees. The root systems of the trees constitute a potential seepage hazard. In addition to the trees, there is some heavy vegetation which increases the likelihood of animal burrows which could also create potential seepage hazards.

(3) Based on surface observations, the dam is composed of gravelly clay.

(4) There is no riprap on the dam embankment.

(5) A large area with standing water was observed on the downstream face near the toe on the east side of the dam. The standing water, willow trees and heavy vegetation indicates that there is either a spring in the abutment or there is a steady seepage condition.

(6) There is some erosion on the upstream face of the dam which is caused by surface washing of soil loosened by livestock on the dam.

c. <u>Appurtenant Structures</u>.

(1) Appurtenant structures at Tripoli Dam consist of a spillway and a 6-inch diameter iron pipe with a downstream valve.

(2) The spillway at Tripoli Lake is approximately 65 feet wide and is earth with some grass cover. Downstream of the dam rock outcrops occur in the spillway. The spillway eventually flows into a channel that flows along a "stair step" rock outcrop. A few trees at the entrance of the spillway were observed.

d. <u>Reservoir Area</u>. No pertinent problems were noted in the reservoir area.

e. <u>Downstream Channel</u>. The downstream channel flows down a rock outcrop, across a gravel road and into a pasture. It has some trees, logs and debris in it.

6

3.2 EVALUATION

Trees and thick vegetation on the embankment and insufficient erosion protection on the upstream face of the dam and spillway are deficiencies which should be corrected. Soft, spongy ground conditions could lead to instability of the embankment if uncorrected. The need for possible seepage control measures should be based upon analysis of the stability and seepage conditions by a professional engineer experienced in the design and construction of dams.

SECTION 4 - OPERATIONAL PROCEDURES

4.1 PROCEDURES

Operational procedures consist of opening the valve downstream of the embankment to allow water to flow from the reservoir. This lowers the reservoir and reduces the time of flow over the spillway and the fish losses associated with flow over the spillway.

4.2 MAINTENANCE OF DAM

Little maintenance is apparent as evidenced by the vegetative cover and the small trees on the embankment and spillway. There reportedly was a large leak in the west side of the dam which was corrected.

4.3 MAINTENANCE OF OPERATING FACILITIES

None mentioned.

4.4 DESCRIPTION OF ANY WARNING SYSTEM IN EFFECT

No warning system is known to exist.

4.5 EVALUATION

Additional maintenance in the form of clearing and mowing the embankment is recommended.

SECTION 5 - HYDRAULIC/HYDROLOGIC

5.1 EVALUATION OF FEATURES

a. <u>Design Data</u>. No design data were available for Tripoli Valley Dam.

b. <u>Experience Data</u>. The drainage area and lake surface area were developed from USGS Maramec Spring, Missouri, Quadrangle Map. The spillway and outlet data were surveyed during the inspection.

c. <u>Visual Observations</u>.

(1) A valve controlled, 6-inch diameter, steel pipe through the dam has been used to regulate releases. The pipe can be used for drawdown of the lake. (See photograph 9).

(2) A earth spillway with some grass cover located at the right side of the dam consists of a channel with a parallel guide levee at left and continuing downstream through a narrow rocky channel to a road right downstream of the dam. (See PLATES 5 and 4 and photographs 5 through 8). The grass on the spillway and channel is not in good condition and rocks show through some of the bare areas at channel.

(3) A few trees at the entrance of the spillway were observed.

d. <u>Overtopping Potential</u>. Tripoli Valley Dam can be overtopped by any flood greater than 10 percent of the Probable Maximum Flood (PMF). The Probable Maximum Flood is defined as the flood discharge that may be expected from the most severe combination of critical meteorologic and hydrologic conditions that are reasonably possible in the region. Tripoli Valley Dam can be overtopped by a 1 percent chance flood. A 1 percent chance flood is a flood with a 1 percent chance of being exceeded in any given year. The guidelines require that a dam of this hazard potential (high) and size pass at least 50 percent of the PMF without overtopping the dam. The maximum discharge over the dam for 50 percent of the PMF is 2200 cfs. The maximum depth of flow over the low point of the earth embankment by 50 percent of the PMF is 2.0 feet. The duration of overtopping is 5.3 hours.

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SECTION 6 - STRUCTURAL STABILITY

6.1 EVALUATION OF STRUCTURAL STABILITY

    a.   <u>Visual Observations</u>. Visual observations of the dam and spillway are discussed and evaluated in Sections 3 and 5. The dam has no other appurtenant structures.

    b.   <u>Design and Construction Data</u>. None available. Seepage and stability analyses comparable to the requirements of the "Recommended Guidelines for Safety Inspection of Dams" were not available, which is considered a deficiency. These seepage and stability analyses should be performed for appropriate loading conditions and made matter of record.

    c.   <u>Operating Records</u>. No operating records were available.

    d.   <u>Post Construction Changes</u>. According to the owner's father, a large leak on the right side of the dam was repaired.

    e.   <u>Seismic Stability</u>. Tripoli Lake is located in Seismic Zone 1, for which the recommended guidelines for inspection assign a "moderate" damage probability. The relatively low height and the type of material of which the dam was constructed minimize the likelihood of failure due to earthquake shock.

SECTION 7 - ASSESSMENT/REMEDIAL MEASURES

7.1 DAM ASSESSMENT

a. __Safety__. Several items are deficient which should be corrected. No erosion protection exists on the upstream slope of the dam. Cattle on the upstream slope and on the embankment loosens the earth and causes surface erosion. The upstream face of the embankment is not sufficiently protected against erosion. The left side of the spillway, which effectively is a protection dike for the area downstream of the embankment, is not sufficiently protected against erosion. Trees and heavy vegetation on the embankment provide a potential seepage hazard and animal habitat. The spillway is not adequately protected against erosion. The capacity of the spillway is insufficient to pass one-half of the PMF to PMF without overtopping the dam.

b. __Adequacy of Information__. The statements and recommendations in this report are based on visual observations and verbal discussions. Seepage and stability analyses are not on record as prescribed in the recommended guidelines. This is considered a deficiency which should be corrected.

c. __Urgency__. We recommend the remedial measures listed in Section 7.2 be accomplished in the near future. The item recommended in Paragraph 7.2d should be pursued on a high-priority basis.

d. __Necessity for Phase II__. No Phase II inspection is recommended.

7.2 REMEDIAL MEASURES

The following remedial measures are recommended:

a. Remove trees and cut heavy vegetation on the embankment.

b. Fill any animal burrows found during clearing.

c. Establish and maintain a grass cover on the embankment.

d. The spillway size and/or height of the dam should be increased to pass a minimum of one-half of the Probable Maximum Flood without overtopping the dam.

f. A stability and seepage analysis of the dam should be performed by a professional engineer experienced in the design and

construction of dams. These analyses should provide a design of seepage control works and other remedial measures related to embankment stability and erosion protection.

g.   A detailed inspection of the dam and spillway should be made every two to five years by a professional engineer experienced in the design and construction of dams.

APPENDIX

HYDROLOGIC COMPUTATIONS

HYDROLOGIC AND HYDRAULIC ANALYSIS METHODOLOGY

1. The hydrologic analysis used in development of the overtopping potential is based on applying a hypothetical storm to a unit hydrograph to obtain the inflow hydrograph for a reservoir routing. The Probable Maximum Precipitation for those dams in the high hazard potential category is derived and determined from regional charts prepared by the National Weather Service in "Hydrometeorological Report No. 33." Reduction factors have not been applied. A 24-hour storm duration is assumed with the 24-hour rainfall depths distributed over 6-hour periods in accordance with procedures outlined in EM 1110-2-1411 (SPF Determination). The maximum 6-hour rainfall period is then distributed to hourly increments by the same criteria. Within-the-hour distribution is based upon NOAA Technical Memorandum NWS HYDRO-35. The non-peak 6-hour rainfall periods are distributed uniformly. All distributed values are arranged in a critical sequence by the SPF criteria. The final inflow hydrograph is produced by deduction of infiltration losses appropriate to the soil, land use, and antecedent moisture conditions.

2. The reservoir routing is accomplished by using Modified Puls routing techniques wherein the flood hydrograph is routed through lake storage. Hydraulic capacities of the outlet works, spillway, and crest of dam are used as outlet controls in the routing. Storage in the pool area is defined by an elevation-storage capacity curve. The hydraulic capacity of the outlet works, spillway, and top of dam are defined by elevation-discharge curves.

3. Dam overtopping analysis has been conducted by hydrologic methods for this dam and lake. This computation determines the percentage of the PMF hydrograph that the reservoir can contain without the dam being overtopped. An output summary in the hydrologic appendix displays this information as well as other characteristics of the simulated dam overtopping.

4. The above analysis has been accomplished for this report using the systemized computer program HEC-1 (Dam Safety Version), July 1978, prepared by the Hydrologic Engineering Center, U.S. Army Corps of Engineers, Davis, California. The numeric parameters estimated for this site are listed on the attached computer printout. Definitions of these variables are contained in the "User's Manual" for the computer program.

5. The rating curve for Tripoli Valley Lake Dam was computed by using HEC-2 backwater program to get a rating curve for the spillway. Flow over the dam was computed by using the broad-crested weir equation for sections of the dam of equal crest elevation. A "C" valve of 3.0 was used for the weir equation.

****
FLOOD HYDROGRAPH PACKAGE (HEC-1)
DAM SAFETY VERSION   JULY 1978
LAST MODIFICATION 29 AUG 78
****

		DAM TRIPULI PROBABLE	INSPECTION VALLEY MAXIMUM	DAY FLOOD			DAY		
1	A	288	5	0	0	0	0	-3	0
2	A	2	1	0	.25	.30	.50	1.0	
3	B	.01	.10	.15		TRIPULI	DAM		
4	B1	9			FOR	1			
5	J1	.05	.10			1.0			
6	K1	1	RUNOFF						
7	K1	2	.420	0	0				
8	P	20	100	120	130		-89	0	.03
9	H2	0	0	0	0	-1			
10	X	.19	3.0						
11	K1	-1	0	0	0	0	TRIPULI	DAM	
12	K1	1	RESERVOIR	1	1	1			
13	Y	0	0	0	0	1.0	-1		
14	Y4	1	897	898	899	900	901	902	903	904
15	Y5	50	120	270	920	2214	4166	6535	9251	12268
16	ZA	6	8	6.3						
17	ZL	8/1	898	905						
18	ZZ	896.1								
19	ZZ	898.0								
20	K	99								

PREVIEW OF SEQUENCE OF STREAM NETWORK CALCULATIONS

LABOUR HYDROGRAPH AT   1
ROUTE HYDROGRAPH TO   2
END OF NETWORK

INSPECTION
VALLEY
PROBABLE   MAXIMUM

JOB SPECIFICATION

NO	NMN	NPLN	IDAY	JFK	IFR	IFR	IPLT	PRPC	IPLT	IPRT	DSTAN
2nd	0	0	0	0	0	0	0	0	0	-0	0

JOFFE   NPT   LROPT   TRACE
5   0   0   0

MULTI-PLAN ANALYSES TO BE PERFORMED
DRLAR= 1 NRTIO= 9 LRTIO=-1

PRIOS= .01   .05   .10   .15   .20   .25   .30   .50   1.00

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

SUB-AREA RUNOFF COMPUTATION

RUNOFF
SUBAREA   ISTAQ   ICOMP   IECOR   TRAPE   JPLT   TRIPOLT   JPLT   INANE   ISTAGE   IAUTO
1   0   0   0   0   0   0   0   0   0

HYDROGRAPH DATA
INHYD   TAREA   SBAP   TSBDA   TSEPC   RATIO   R4P   R72   R96
1   2   .42   .42   1.00   0.000   0.00 0.00 0.00

PRECIP DATA
SPFI   PMS   R6   R12   R24   R48
0.00   26.00 100.00 120.00 130.00

LOSS DATA
LROPT   STRFE   DLTKR   ETIOL   ERAIN   STRLS   RTIOR   STRTL   CHSTL   ALSHX   FTIMP
0   0.00   0.00   1.00   0.00   0.00   1.00   -1.00   -89.00 0.00   .03

CURVE NO = -89.00 UTTRESS = -1.00 EFFECT CN = 89.00

UNIT HYDROGRAPH DATA
TC= 0.00 LAG= .19

RECESSION DATA
STRTQ= -10.00 QRCSP= -.10 RTIOR= 3.00

UNIT HYDROGRAPH 13 END OF PERIOD ORDINATES, TC= 0.00 HOURS, LAG= .19 VOL= 1.00
228.   755.   666.   341.   194.   108.   60.   33.
10.   6.   3.   1.

END-OF-PERIOD FLOW

NO.DA	HR.MN	PERIOD	RAIN	EXCS	LOSS	CORP Q	PO.DA	HR.MN	PERIOD	RATE	EXCS	LOSS	CORP Q
1.01	.05	1	.01	.00	.01	4.	1.01	12.05	145	.22	.21	.01	260.
1.01	.10	2	.01	.00	.01	4.	1.01	12.10	146	.22	.21	.01	363.
1.01	.15	3	.01	.00	.01	4.	1.01	12.15	147	.22	.21	.01	486.
1.01	.20	4	.01	.00	.01	4.	1.01	12.20	148	.22	.21	.01	577.
1.01	.25	5	.01	.00	.01	3.	1.01	12.25	149	.22	.21	.00	626.
1.01	.30	6	.01	.00	.01	3.	1.01	12.30	150	.22	.21	.00	654.
1.01	.35	7	.01	.00	.01	3.	1.01	12.35	151	.22	.21	.00	670.
1.01	.40	8	.01	.00	.01	3.	1.01	12.40	152	.22	.21	.00	679.
1.01	.45	9	.01	.00	.01	3.	1.01	12.45	153	.22	.21	.00	685.
1.01	.50	10	.01	.00	.01	3.	1.01	12.50	154	.22	.21	.00	688.
1.01	.55	11	.01	.00	.01	3.	1.01	12.55	155	.22	.21	.00	690.
1.01	1.00	12	.01	.00	.01	3.	1.01	13.00	156	.26	.26	.00	691.
1.01	1.05	13	.01	.00	.01	2.	1.01	13.05	157	.26	.26	.00	702.
1.01	1.10	14	.01	.00	.01	2.	1.01	13.10	158	.26	.26	.00	734.
1.01	1.15	15	.01	.00	.01	2.	1.01	13.15	159	.26	.26	.00	774.
1.01	1.20	16	.01	.00	.01	2.	1.01	13.20	160	.26	.26	.00	800.
1.01	1.25	17	.01	.00	.01	2.	1.01	13.25	161	.26	.26	.00	812.
1.01	1.30	18	.01	.00	.01	2.	1.01	13.30	162	.26	.26	.00	824.
1.01	1.35	19	.01	.00	.01	3.	1.01	13.35	163	.26	.26	.00	829.
1.01	1.40	20	.01	.00	.01	4.	1.01	13.40	164	.26	.26	.00	832.
1.01	1.45	21	.01	.00	.01	5.	1.01	13.45	165	.26	.26	.00	834.
1.01	1.50	22	.01	.00	.01	6.	1.01	13.50	166	.26	.26	.00	835.
1.01	1.55	23	.01	.00	.01	7.	1.01	13.55	167	.26	.26	.00	836.
1.01	2.00	24	.01	.00	.01	8.	1.01	14.00	168	.26	.26	.00	837.
1.01	2.05	25	.01	.00	.01	9.	1.01	14.05	169	.33	.32	.00	852.
1.01	2.10	26	.01	.00	.01	10.	1.01	14.10	170	.33	.32	.00	899.
1.01	2.15	27	.01	.00	.01	10.	1.01	14.15	171	.33	.32	.00	926.
1.01	2.20	28	.01	.00	.01	11.	1.01	14.20	172	.33	.32	.00	998.
1.01	2.25	29	.01	.00	.01	12.	1.01	14.25	173	.33	.32	.00	1020.
1.01	2.30	30	.01	.00	.01	13.	1.01	14.30	174	.33	.32	.00	1033.
1.01	2.35	31	.01	.00	.01	13.	1.01	14.35	175	.33	.32	.00	1040.
1.01	2.40	32	.01	.00	.01	14.	1.01	14.40	176	.33	.32	.00	1044.
1.01	2.45	33	.01	.00	.01	15.	1.01	14.45	177	.33	.32	.00	1047.
1.01	2.50	34	.01	.00	.01	15.	1.01	14.50	178	.33	.32	.00	1048.
1.01	2.55	35	.01	.00	.01	16.	1.01	14.55	179	.33	.32	.00	1049.
1.01	3.00	36	.01	.00	.01	16.	1.01	15.00	180	.33	.32	.00	1050.
1.01	3.05	37	.01	.01	.01	17.	1.01	15.05	181	.20	.20	.00	1022.
1.01	3.10	38	.01	.01	.01	17.	1.01	15.10	182	.40	.39	.00	974.
1.01	3.15	39	.01	.01	.01	18.	1.01	15.15	183	.40	.35	.00	1008.
1.01	3.20	40	.01	.01	.01	18.	1.01	15.20	184	.59	.59	.00	1142.
1.01	3.25	41	.01	.01	.01	19.	1.01	15.25	185	.69	.69	.00	1393.
1.01	3.30	42	.01	.01	.01	19.	1.01	15.30	186	1.68	1.67	.01	1504.
1.01	3.35	43	.01	.01	.01	20.	1.01	15.35	187	2.77	2.76	.01	3112.
1.01	3.40	44	.01	.01	.01	20.	1.01	15.40	188	1.09	1.09	.00	4524.
1.01	3.45	45	.01	.01	.01	21.	1.01	15.45	189	.69	.69	.00	4861.
1.01	3.50	46	.01	.01	.01	21.	1.01	15.50	190	.59	.59	.00	4161.
1.01	3.55	47	.01	.01	.01	21.	1.01	15.55	191	.49	.50	.00	3225.
1.01	4.00	48	.01	.01	.01	22.	1.01	16.00	192	.40	.36	.00	2409.
1.01	4.05	49	.01	.01	.01	22.	1.01	16.05	193	.30	.30	.00	1567.
1.01	4.10	50	.01	.01	.01	23.	1.01	16.10	194	.3	.30	.00	1584.
1.01	4.15	51	.01	.01	.01	23.	1.01	16.15	195	.30	.30	.06	1332.
1.01	4.20	52	.01	.01	.01	23.	1.01	16.20	196	.30	.30	.00	1176.
1.01	4.25	53	.01	.01	.01	23.	1.01	16.25	197	.30	.30	.00	1091.
1.01	4.30	54	.01	.01	.01	24.	1.01	16.30	198	.30	.30	.00	1044.

1014.	.00	.30	.30	199	16.35	1.01	24.	.01	.01	.01	4.35	1.01
997.	.00	.30	.30	200	16.40	1.01	24.	.01	.01	.01	4.40	1.01
990.	.00	.30	.30	201	16.45	1.01	25.	.01	.01	.01	4.45	1.01
987.	.00	.30	.30	202	16.50	1.01	25.	.01	.01	.01	4.50	1.01
985.	.00	.30	.30	203	16.55	1.01	25.	.01	.01	.01	4.55	1.01
985.	.00	.24	.24	204	17.00	1.01	26.	.01	.01	.01	5.00	1.01
970.	.00	.24	.24	205	17.05	1.01	26.	.01	.01	.01	5.05	1.01
922.	.00	.24	.24	206	17.10	1.01	27.	.01	.01	.01	5.10	1.01
806.	.00	.24	.24	207	17.15	1.01	27.	.01	.01	.01	5.15	1.01
824.	.00	.24	.24	208	17.20	1.01	27.	.01	.01	.01	5.20	1.01
802.	.00	.24	.24	209	17.25	1.01	28.	.01	.01	.01	5.25	1.01
789.	.00	.24	.24	210	17.30	1.01	28.	.01	.01	.01	5.30	1.01
762.	.00	.24	.24	211	17.35	1.01	28.	.01	.01	.01	5.35	1.01
778.	.00	.24	.24	212	17.40	1.01	28.	.01	.01	.01	5.40	1.01
776.	.00	.24	.24	213	17.45	1.01	27.	.01	.01	.01	5.45	1.01
775.	.00	.24	.24	214	17.50	1.01	27.	.01	.01	.01	5.50	1.01
774.	.00	.24	.24	215	17.55	1.01	28.	.01	.01	.01	5.55	1.01
774.	.00	.24	.24	216	18.00	1.01	29.	.01	.01	.01	6.00	1.01
724.	.00	.02	.02	217	18.05	1.01	29.	.03	.05	.07	6.05	1.01
565.	.00	.02	.02	218	18.10	1.01	34.	.02	.05	.07	6.10	1.01
457.	.00	.02	.02	219	18.15	1.01	67.	.02	.05	.07	6.15	1.01
409.	.00	.02	.02	220	18.20	1.01	101.	.02	.05	.07	6.20	1.01
367.	.00	.02	.02	221	18.25	1.03	129.	.02	.05	.07	6.25	1.01
320.	.00	.02	.02	222	18.30	1.01	145.	.02	.05	.07	6.30	1.01
294.	.00	.02	.02	223	18.35	1.01	156.	.02	.06	.07	6.35	1.01
264.	.00	.02	.02	224	18.40	1.01	164.	.02	.06	.07	6.40	1.01
236.	.00	.02	.02	225	18.45	1.01	170.	.02	.06	.07	6.45	1.01
212.	.00	.02	.02	226	18.50	1.01	175.	.01	.06	.07	6.50	1.01
190.	.00	.02	.02	227	18.55	1.01	183.	.01	.06	.07	6.55	1.01
170.	.00	.02	.02	228	19.00	1.01	186.	.01	.06	.07	7.00	1.01
152.	.00	.02	.02	229	19.05	1.01	188.	.01	.06	.07	7.05	1.01
136.	.00	.02	.02	230	19.10	1.01	191.	.01	.06	.07	7.10	1.01
122.	.00	.02	.02	231	19.15	1.01	193.	.01	.06	.07	7.15	1.01
110.	.00	.02	.02	232	19.20	1.01	195.	.01	.06	.07	7.20	1.01
98.	.00	.02	.02	233	19.25	1.01	197.	.01	.06	.07	7.25	1.01
85.	.00	.02	.02	234	19.30	1.01	198.	.01	.06	.07	7.30	1.01
75.	.00	.02	.02	235	19.35	1.01	200.	.01	.06	.07	7.35	1.01
71.	.00	.02	.02	236	19.40	1.01	202.	.01	.06	.07	7.40	1.01
70.	.00	.02	.02	237	19.45	1.01	203.	.01	.06	.07	7.45	1.01
70.	.00	.02	.02	238	19.50	1.01	204.	.01	.06	.07	7.50	1.01
70.	.00	.02	.02	239	19.55	1.01	204.	.01	.06	.07	7.55	1.01
70.	.00	.02	.02	240	20.00	1.01	207.	.01	.07	.07	8.00	1.01
70.	.00	.02	.02	241	20.05	1.01	207.	.01	.07	.07	8.05	1.01
70.	.00	.02	.02	242	20.10	1.01	209.	.01	.07	.07	8.10	1.01
70.	.00	.02	.02	243	20.15	1.01	210.	.01	.07	.07	8.15	1.01
70.	.00	.02	.02	244	20.20	1.01	211.	.01	.07	.07	8.20	1.01
70.	.00	.02	.02	245	20.25	1.01	212.	.01	.07	.07	8.25	1.01
70.	.00	.02	.02	246	20.30	1.01	213.	.01	.07	.07	8.30	1.01
70.	.00	.02	.02	247	20.35	1.01	214.	.01	.07	.07	8.35	1.01
70.	.00	.02	.02	248	20.40	1.01	215.	.01	.07	.07	8.40	1.01
70.	.00	.02	.02	249	20.45	1.01	216.	.01	.07	.07	8.45	1.01
70.	.00	.02	.02	250	20.50	1.01	216.	.00	.07	.07	8.50	1.01
70.	.00	.02	.02	251	20.55	1.01	217.	.00	.07	.07	8.55	1.01
70.	.00	.02	.02	252	21.00	1.01	217.	.00	.07	.07	9.00	1.01
70.	.00	.02	.02	253	21.05	1.01	217.	.00	.07	.07	9.05	1.01
70.	.00	.02	.02	254	21.10	1.01	218.	.00	.07	.07	9.10	1.01
70.	.00	.02	.02	255	21.15	1.01	218.	.00	.07	.07	9.15	1.01

				RATIOS APPLIED TO FLOWS							
OPERATION	STATION	AREA	PLAN	RATIO 1 .01	RATIO 2 .05	RATIO 3 .10	RATIO 4 .15	RATIO 5 .20	RATIO 6 .25	RATIO 7 .30	RATIO 8 .50	RATIO 9 1.00
HYDROGRAPH AT	1	.42 (1.09)	1 (	49. 1.38)(	243. 6.88)(	486. 13.76)(	729. 20.65)(	972. 27.53)(	1215. 34.41)(	1458. 41.29)(	2430. 68.82)(	4861. 137.64)
ROUTED TO	2	.42 (1.09)	1 (	18. .50)(	93. 2.64)(	235. 6.67)(	522. 14.78)(	764. 21.64)(	1037. 29.37)(	1303. 36.89)(	2229. 63.11)(	4642. 131.44)

SUMMARY OF DAM SAFETY ANALYSIS

TRIPOLI VALLEY DAM

PLAN 1 ....

	INITIAL VALUE 895.10 48. 0.	SPILLWAY CREST 895.10 48. 0.	TOP OF DAM 898.60 68. 270.
ELEVATION STORAGE OUTFLOW			

RATIO OF PMF	MAXIMUM RESERVOIR W.S.ELEV	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
.01	895.35	0.00	50.	18.	0.00	16.17	0.00
.05	896.62	0.00	58.	93.	0.00	16.08	0.00
.10	897.77	0.00	67.	235.	0.00	16.00	0.00
.15	898.39	.39	72.	522.	.58	15.92	0.00
.20	898.76	.76	75.	764.	.83	15.83	0.00
.25	899.09	1.69	77.	1037.	1.25	15.83	0.00
.30	899.30	1.30	79.	1303.	2.67	15.83	0.00
.50	900.01	2.01	85.	2229.	5.33	15.83	0.00
1.00	901.20	3.20	94.	4642.	6.50	15.75	0.00

!*******************************
FLOOD HYDROGRAPH PACKAGE (HEC-1)
DAM SAFETY VERSION   JULY 1978
LAST MODIFICATION 29 AUG 78
****

COI.
E>

VICINITY MAP

SCALE IN MILES

100   0   100   200

MISSOURI

LAKE LOCATION

Maramec Cem

Recreation Area

Old Iron Furnace

Maramec Spring

MERAMEC

Gravel Pit

Mound Ridge Camp

Cem

PHELPS CO.

CRAWFORD CO.

Hollow

SCALE IN FEET

2000   1000   0   2000

500   0

SCALE IN METERS
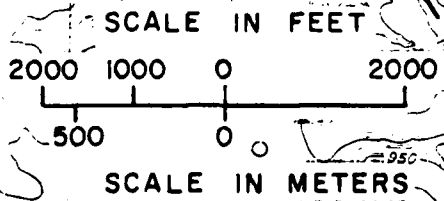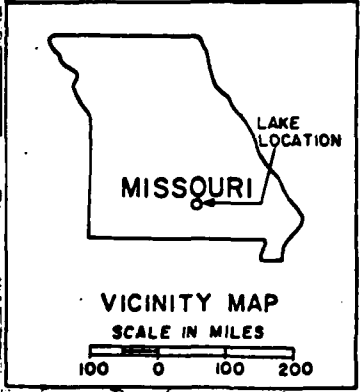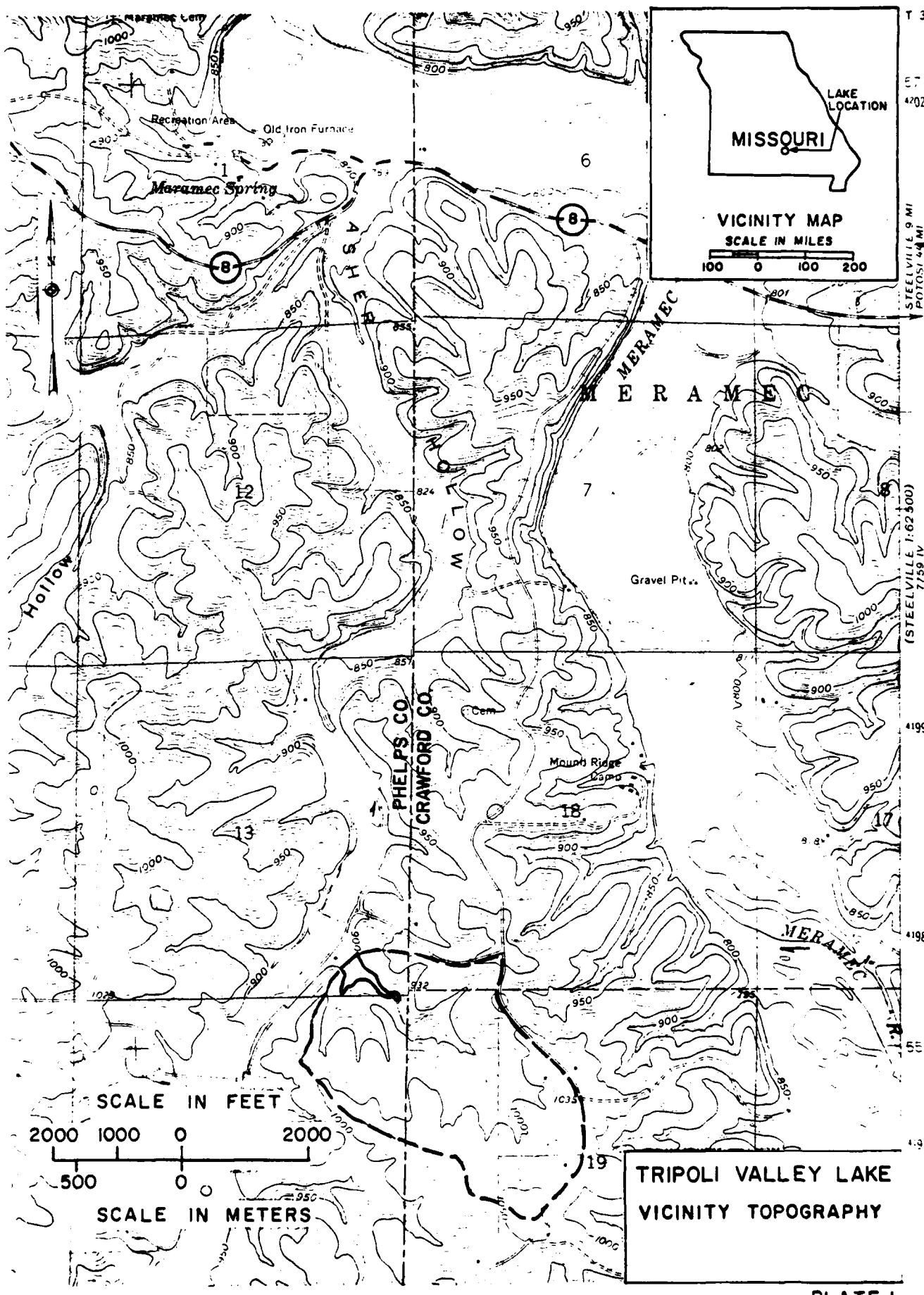
TRIPOLI VALLEY LAKE

VICINITY TOPOGRAPHY
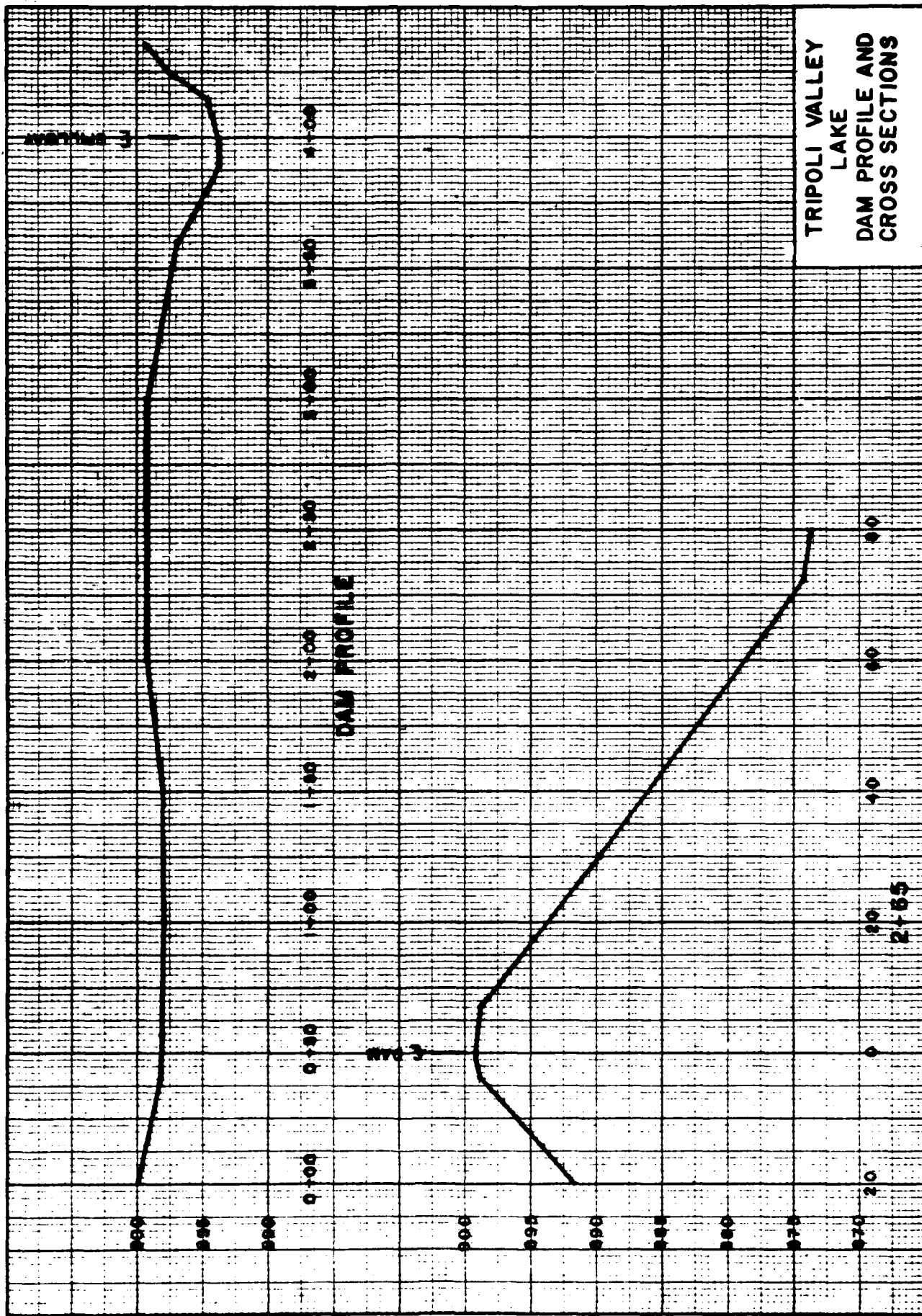
TRIPOLI VALLEY
LAKE
DAM PROFILE AND
CROSS SECTIONS

PLATE 2

TRIPOLI VALLEY
LAKE
PLAN

PLATE 3

SCALE IN FEET

WATER SURFACE ELEV. 891.7

TRIPOLI VALLEY LAKE
SALEM, MISSOURI AREA
SPILLWAY PROFILE AND
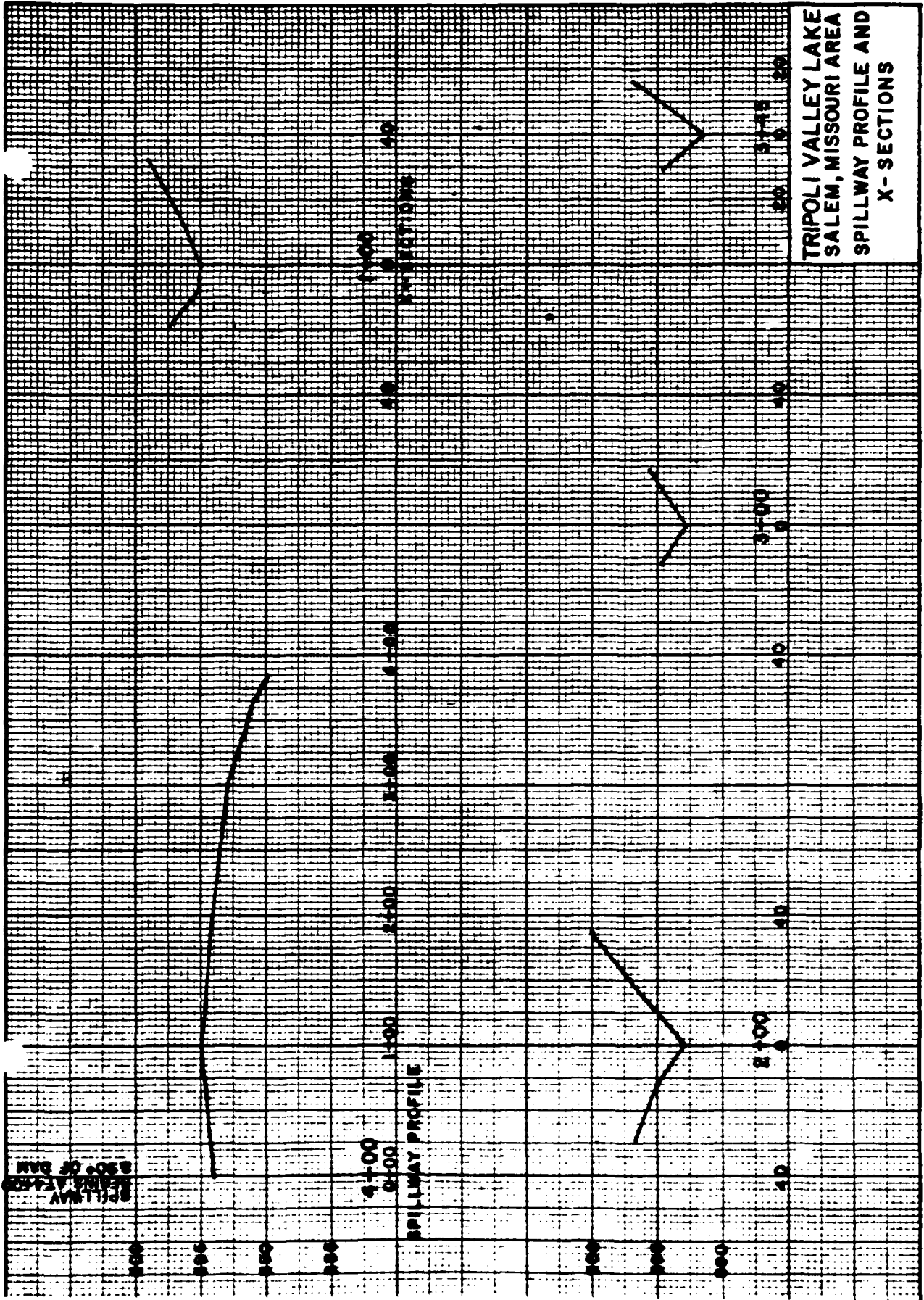X- SECTIONS

PLATE 4
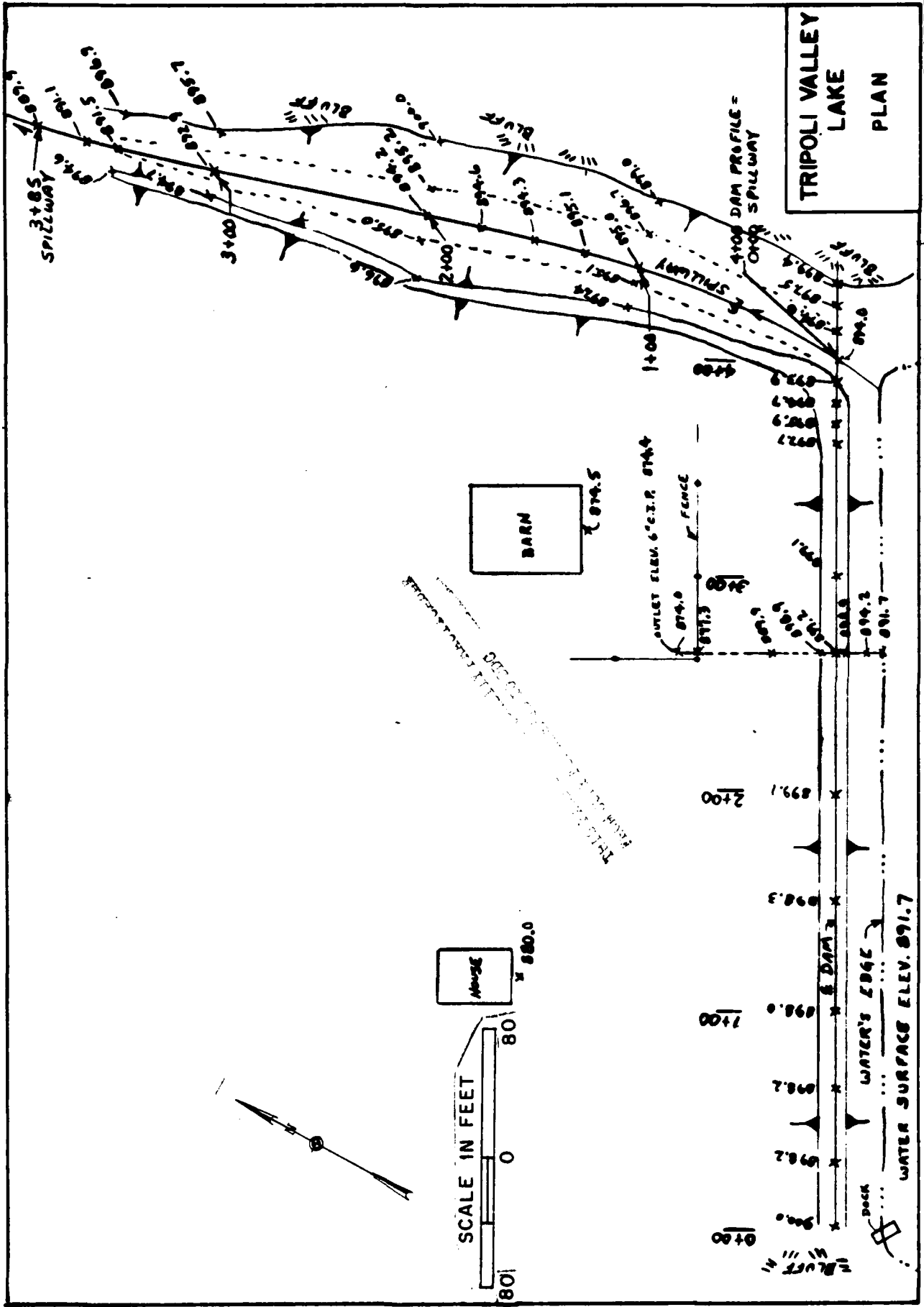
PHOTO 1   Downstream View

PHOTO 2   Looking Upstream from
           Spillway

PHOTO 3   Looking Along Crest of Dam

PHOTO 4   Upstream From Face of Dam

PHOTO 5   Spillway

PHOTO 6   Looking Downstream From
Spillway

PHOTO 7   Looking Towards Lake From
           Spillway

PHOTO 8   Spillway at Road Crossing

PHOTO 9   Discharge Valve

PHOTO 10   Marshy Area Near
Downstream Toe of Dam