AD-A106 295 ANDERSON ENGINEERING INC SPRINGFIELD MO F/G 13/13
NATIONAL DAM SAFETY PROGRAM. VAN METER DAM (MO 10658), MISSOURI--ETC(U)
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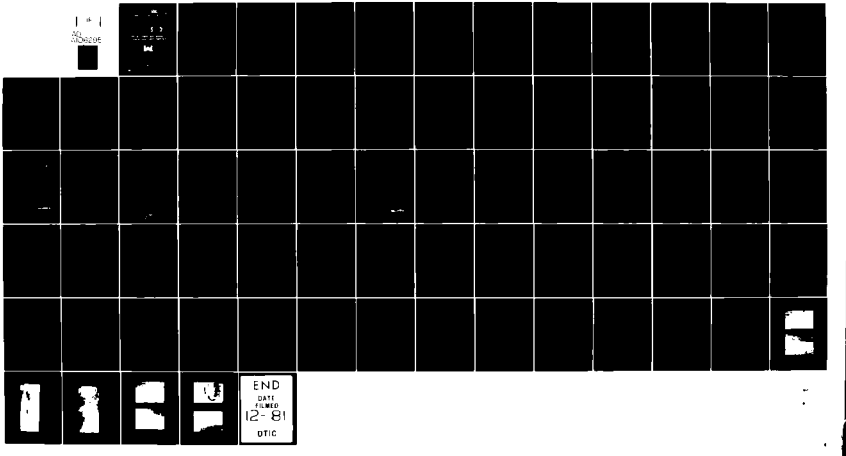

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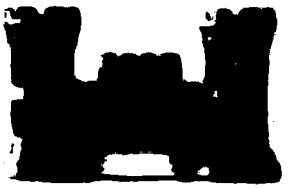
MISSOURI - KANSAS CITY BASIN

AD A106295

VAN METER DAM
SALINE COUNTY, MISSOURI
MO 10658

PHASE I INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM



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

FOR: STATE OF MISSOURI

DECEMBER 1978

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REPORT DOCUMENTATION PAGE

READ INSTRUCTIONS

AD-A106 295

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Block 17. [illegible] distribution statement of the report [illegible] Statements on Technical Documents [illegible]

Block 18. [illegible] Prepared in cooperation with [illegible]

Block 19. [illegible] the report and are [illegible] The DoD "Thesaurus [illegible]

Block 20. [illegible] the most significant information [illegible] the abstract [illegible] unclassified [illegible] bibliography or literature survey, mention [illegible] Abstracting [illegible] Reports of Defense-Sponsored RDT&E," [illegible]

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

IN REPLY REFER TO

SUBJECT: Van Meter Dam (Mo. 10658), Phase I Inspection Report

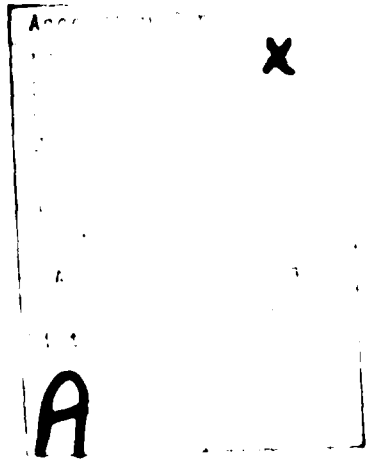
This report presents the results of field inspection and evaluation of Van Meter Dam (Mo. 10658).

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

The St. Louis District has classified this dam as unsafe because of heavy tree growth on the downstream face, excessive seepage under the dam, and a highly erodible spillway.

SUBMITTED BY: SIGNED
Chief, Engineering Division — 15 MAY 1979
Date

APPROVED BY:
Colonel, CE, District Engineer — 16 MAY
Date



VAN METER DAM

SALINE COUNTY, MISSOURI

MISSOURI INVENTORY NO. 10658

PHASE I INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM

Prepared by

[illegible]

for

[illegible]

APPENDICES

	Sheet
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Vicinity Map (Woodward-Clyde-Sherard)	1
Plan & Typical Sections (W-C-S)	2
Emergency Spillway (W-C-S)	3
Primary Spillway (Russell & Axon)	4
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State Geologist Letter	5
Boring Plan W-C-S Design Report	6
Soil Profile W-C-S Design Report	7
Summary Lab Soil Test Data (W-C-S)	8
Stability Analysis (W-C-S)	9
Site and Foundation Conditions (W-C-S)	10-12
Engineering Analysis (W-C-S)	12-15
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Hydrograph (W-C-S)	17
Geologic Report (Missouri Geological Survey	18-19
[illegible]	
[illegible] Study [illegible] EMI	1-6
[illegible]	
[illegible] [illegible] Lake and watershed	1-5

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 be made of Van Meter Dam in Saline County, Missouri.

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 a 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, "Recommended Guidelines for Safety Inspection of Dams". The guidelines were developed with the help of various federal agencies and consulting engineering organizations.

C. Size Classification:

With an embankment height of [illegible] and a storage capacity of approximately 5[illegible] acre-ft, the dam is in the intermediate size category.

D. Hazard Classification:

The St. Louis District, [illegible] dam as a high hazard [illegible] zone extends [illegible] damage zone are [illegible] [illegible] [illegible]

3.1 EVALUATION:

a. Design and experience data:

Based on storage information in the design report by Woodward Lyon Sherard (hydraulic information from the report included as Sheets 1 & 2 in Appendix C), a field check of spillway dimensions and embankment elevations (field information was used where discrepancies existed between the original Design Plans and the field survey), and a check of the drainage area from the U.S.G.S. quad sheet, a hydrologic analysis using U.S. Army Corps of Engineers guidelines was performed and appears in Appendix C, Sheets 1 to 6.

b. Visual observations:

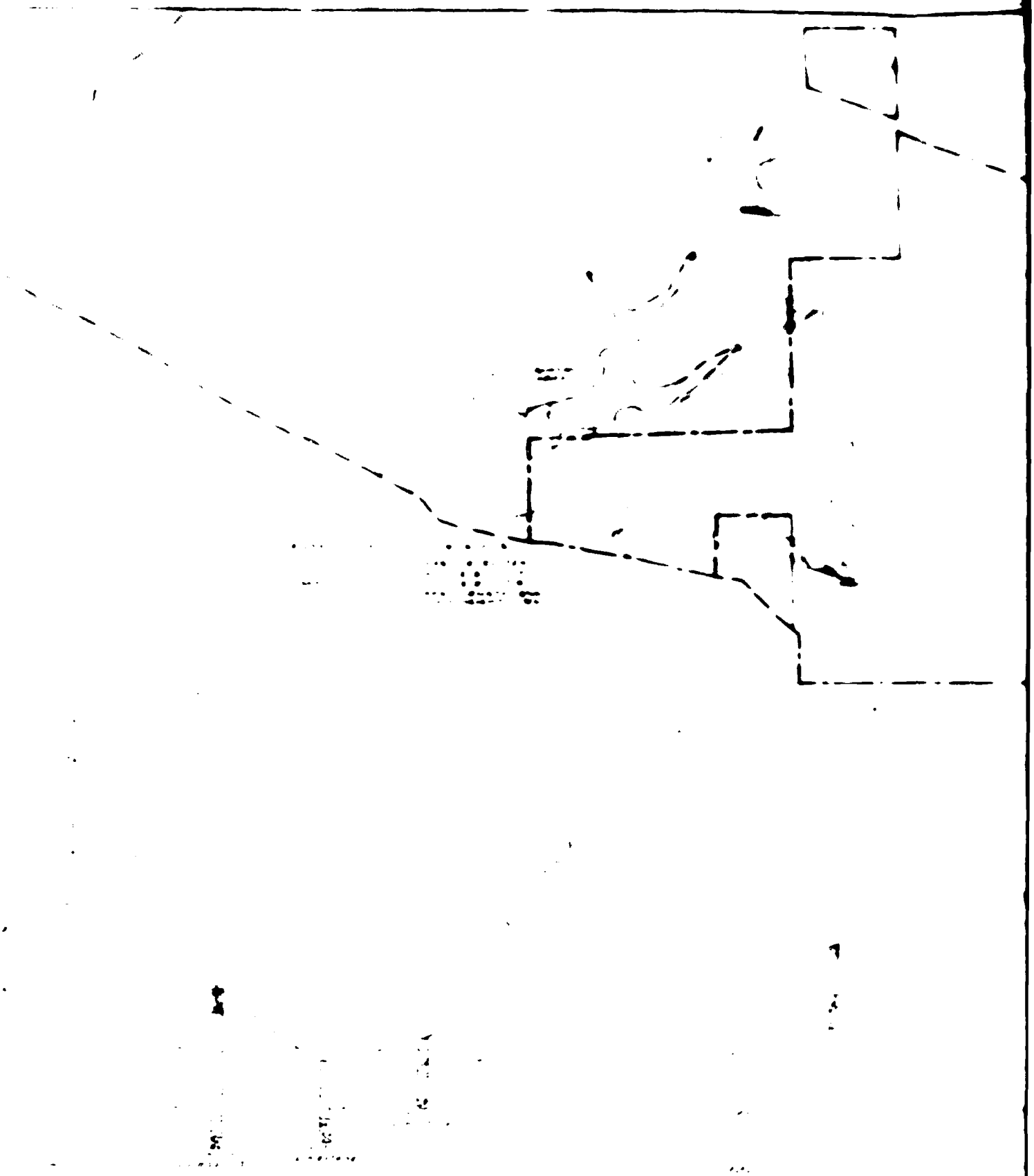
The inflow structure and outlet pipe for the primary spillway appear to be in good condition; the outlet area should be cleared, the earth emergency spillway is in good condition; the outlet channel of the emergency spillway should be cleared, the emergency spillway has apparently never come into service.

No facilities are available to draw down the pool. The primary spillway is located near the east abutment, and the emergency spillway is located on the east abutment. Spill any failure would not be expected to endanger the integrity of the dam.

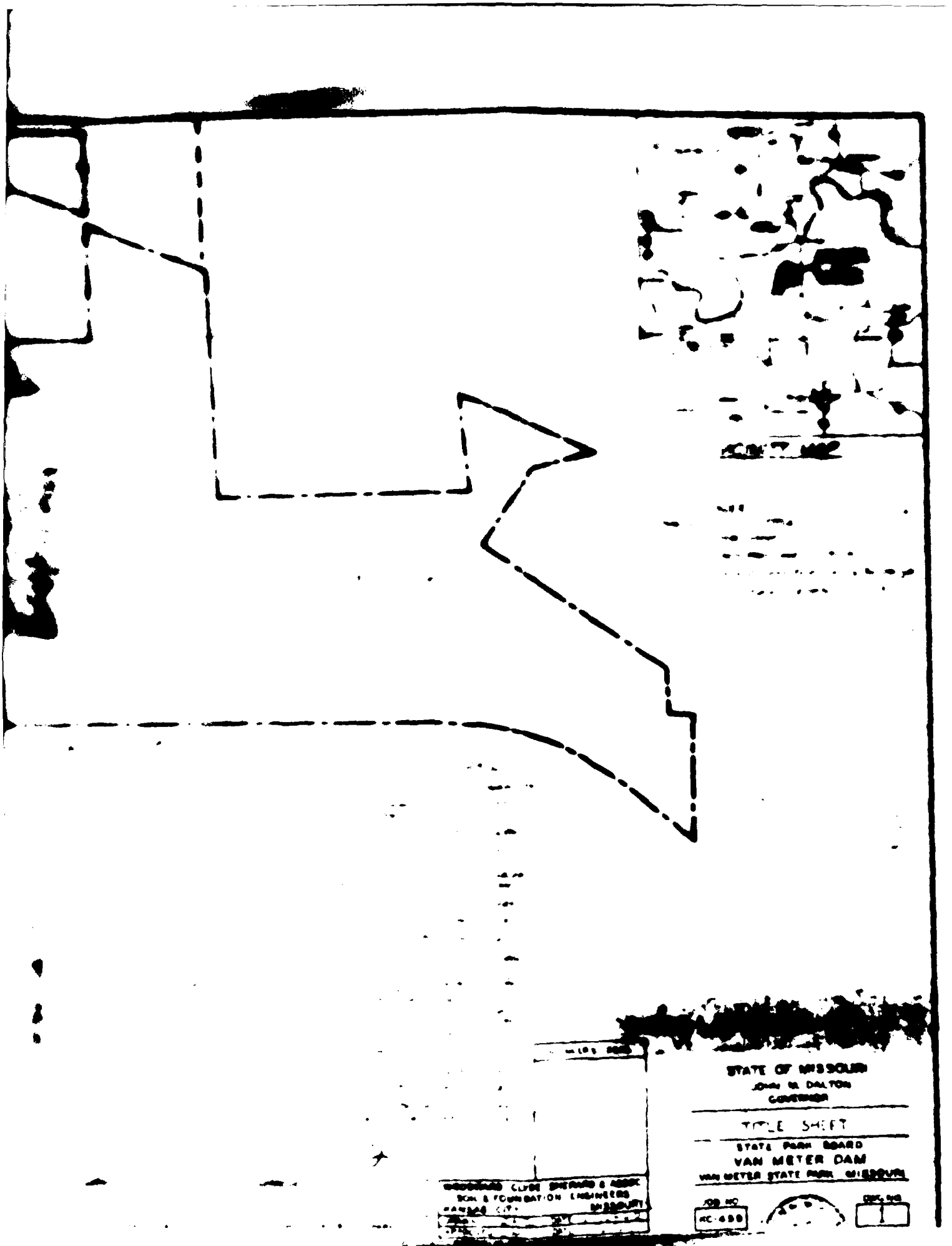
c. Overtopping potential:

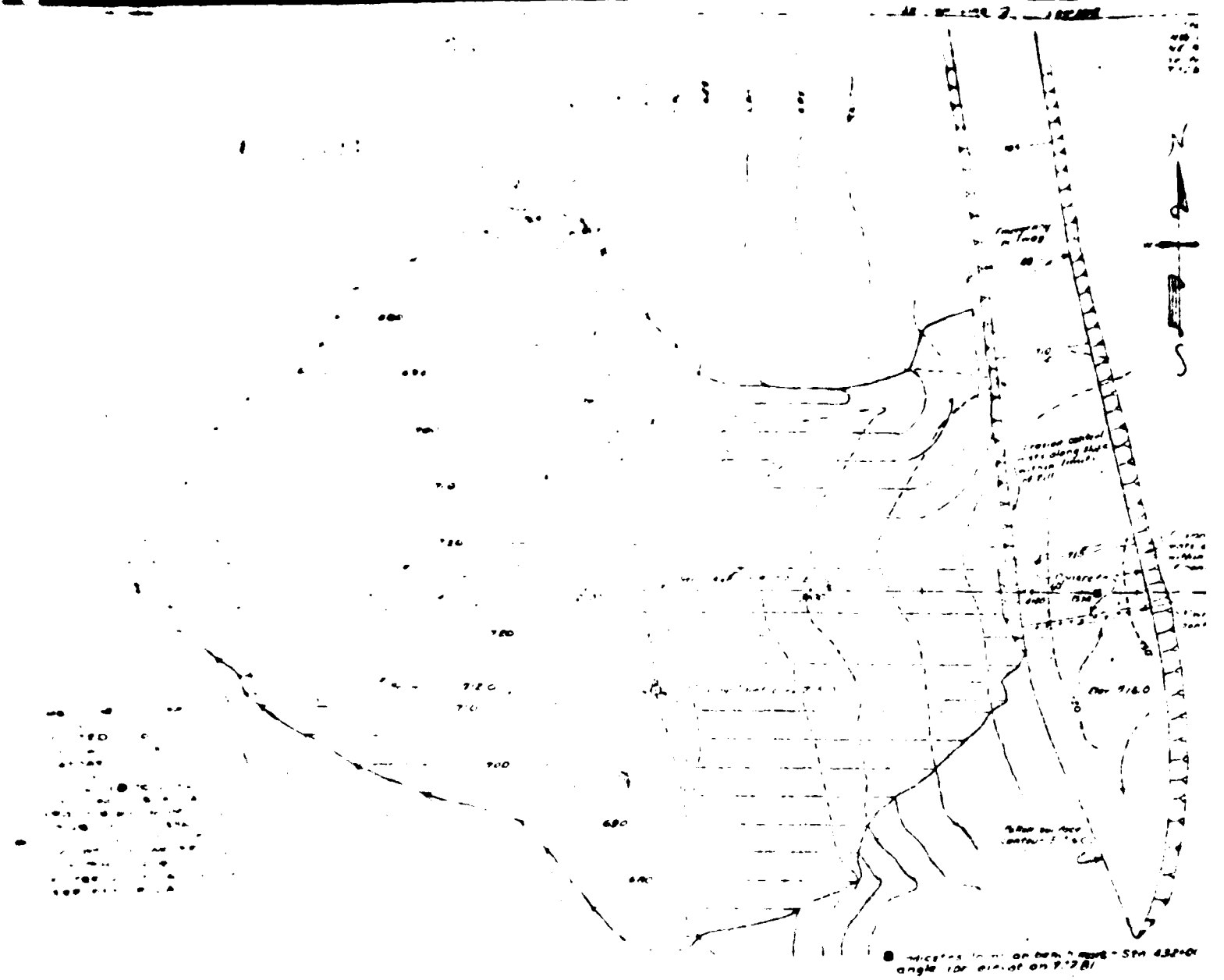
Based on the hydrologic and hydraulic analyses presented in Appendix C, the combined primary and emergency spillways will pass 68 percent of the Probable Maximum Flood. The Probable Maximum Flood is defined as the flood discharge that may be expected from the most severe combination of critical meteorologic and hydrologic conditions that are reasonably possible in the region. As recommended guidelines from the Department of the Army, Corps of Engineers, require that this structure intermediate size with high downstream hazard potential, pass 100 percent of the PMF, without overtopping.

The routing of the PMF through the spillways and dam indicates that the dam will be overtopped 1.41 feet at elevation 5.11. The duration of the overtopping will be .67 hour, and the maximum outflow will be 565 c.f.s. The spillways system will be able to pass the 100 year frequency flood without overtopping.

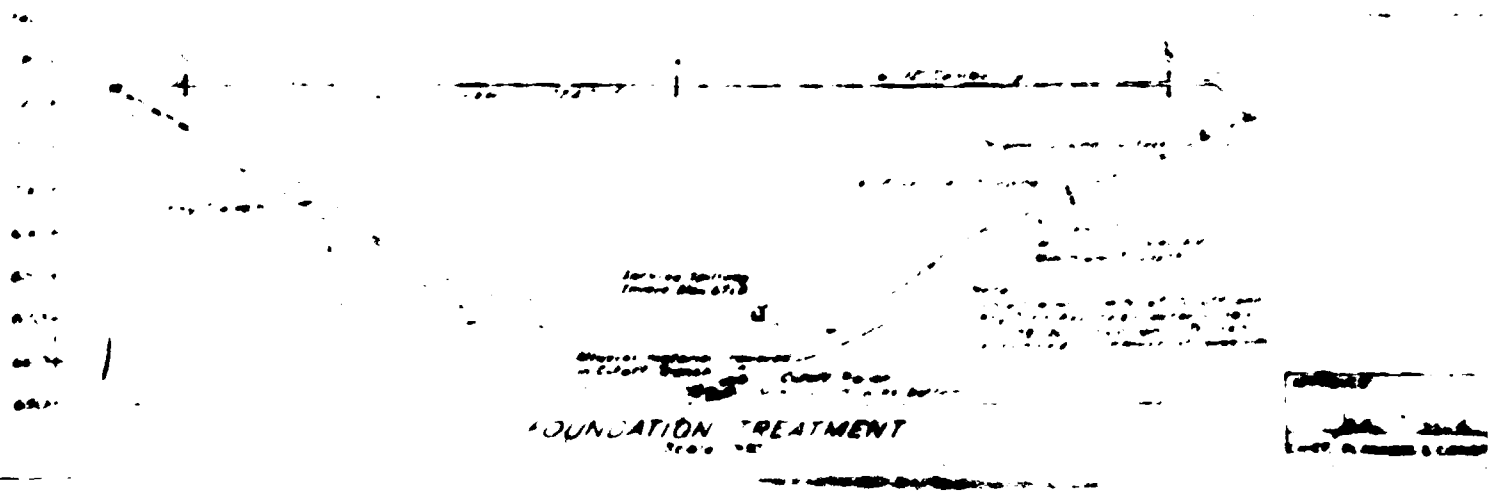


SUBSURFACE INFORMATION

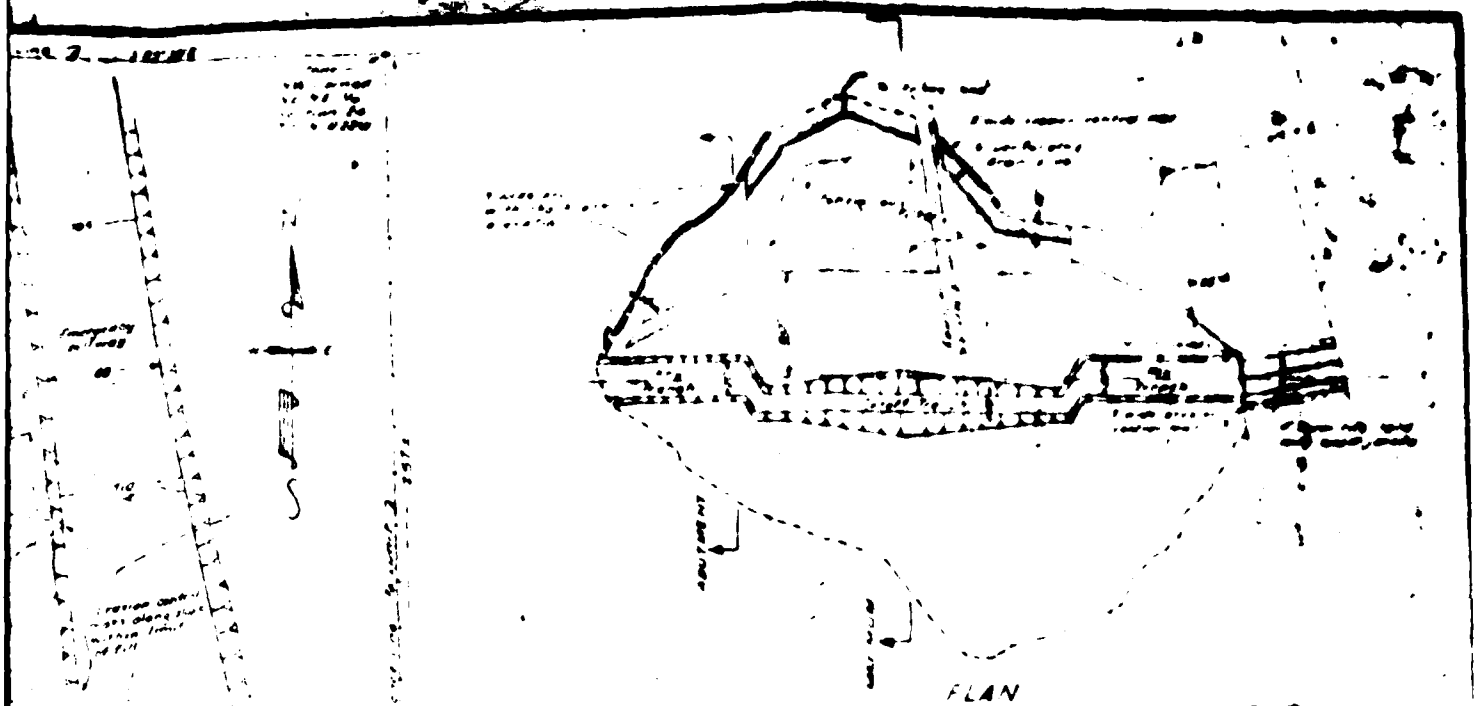

STATE OF MISSOURI
JOHN M. DALTON
GOVERNOR
TITLE SHEET
STATE PARK BOARD
VAN METER DAM
VAN METER STATE PARK MISSOURI



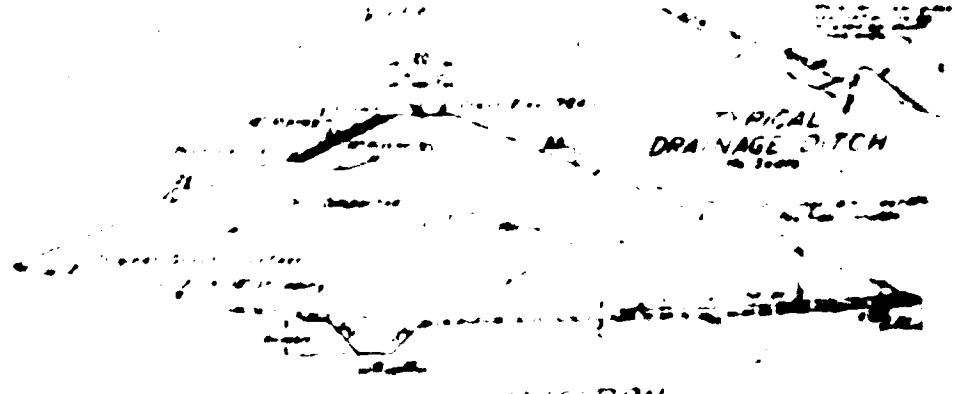
GENERAL PLAN



FOUNDATION TREATMENT

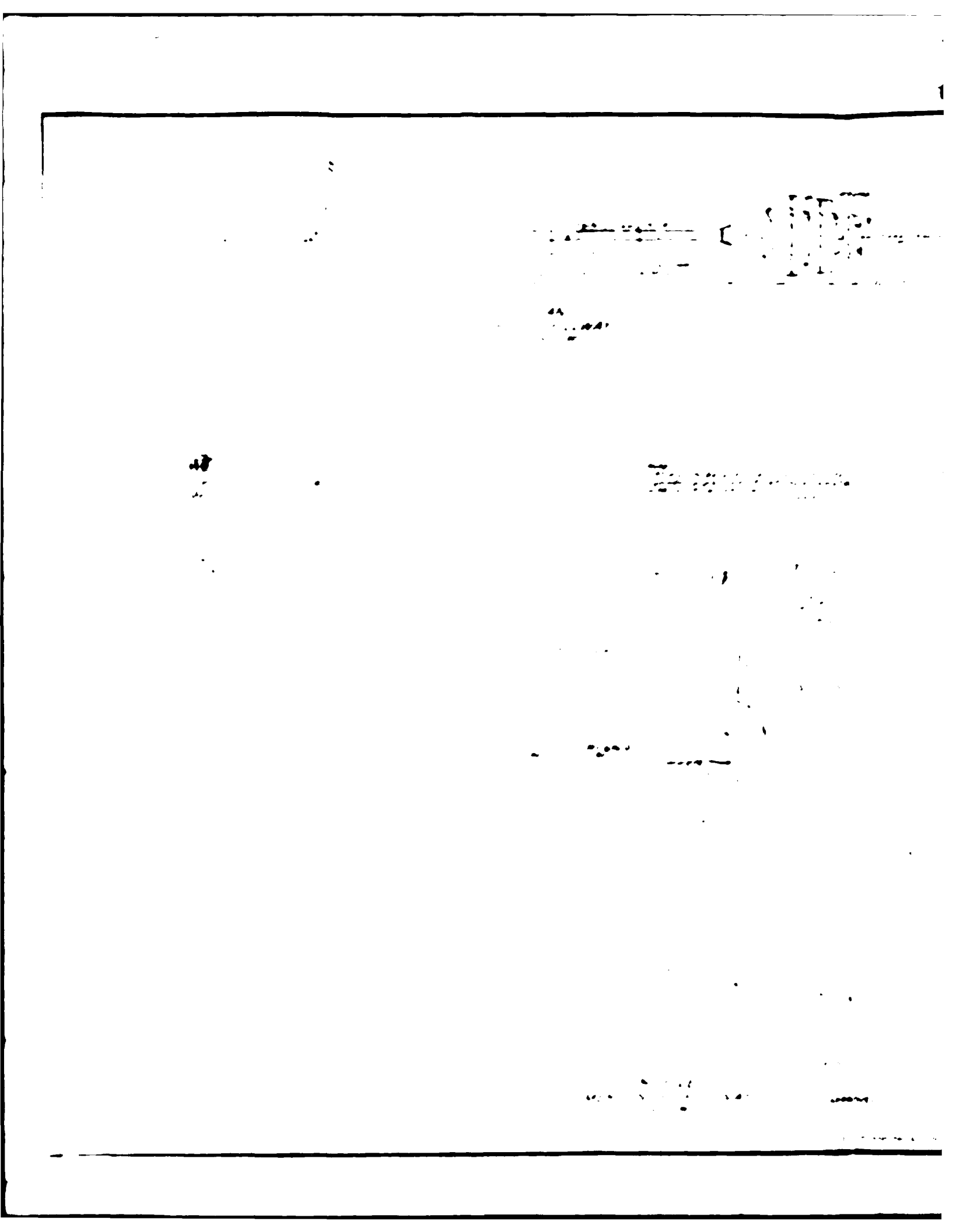


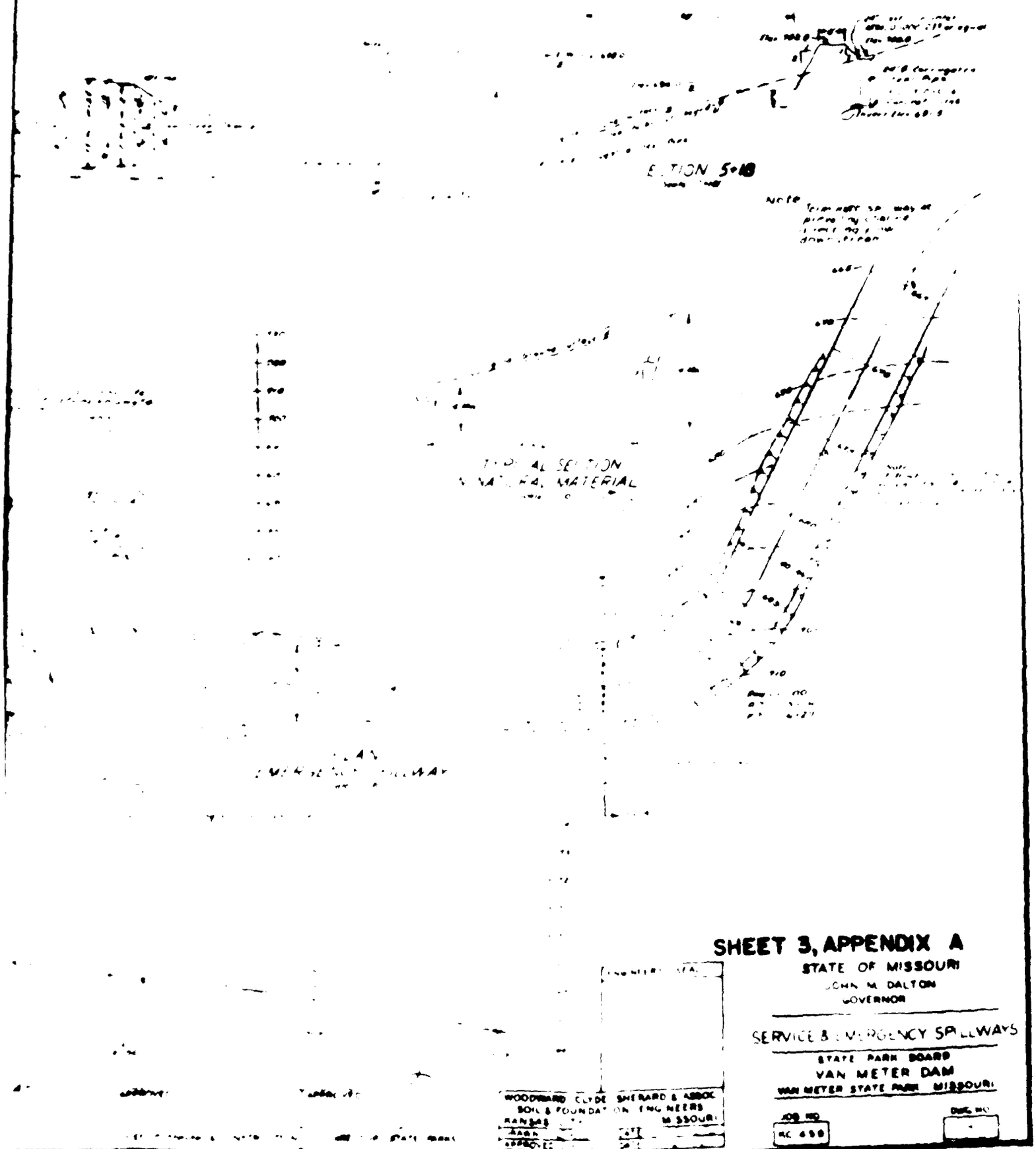
PLAN
FOUNDATION TREATMENT & DRAINAGE CONTROL



TYPICAL
DRAINAGE DITCH

TYPICAL MAXIMUM SECTION





SHEET 3, APPENDIX A

STATE OF MISSOURI

JOHN M. DALTON

GOVERNOR

SERVICE & EMERGENCY SPILLWAYS

STATE PARK BOARD

VAN METER DAM

VAN METER STATE PARK MISSOURI

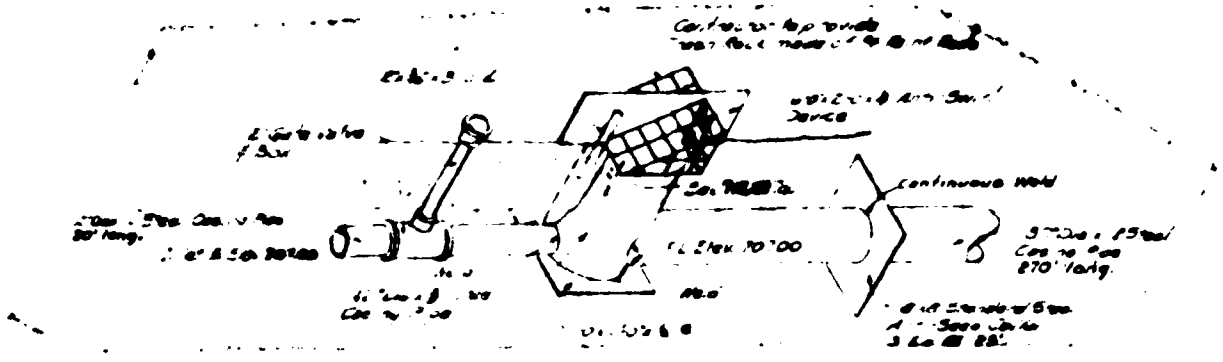
WOODWARD CLYDE SHERARD & ASSOC.

SOIL & FOUNDATION ENGINEERS

KANSAS CITY MISSOURI

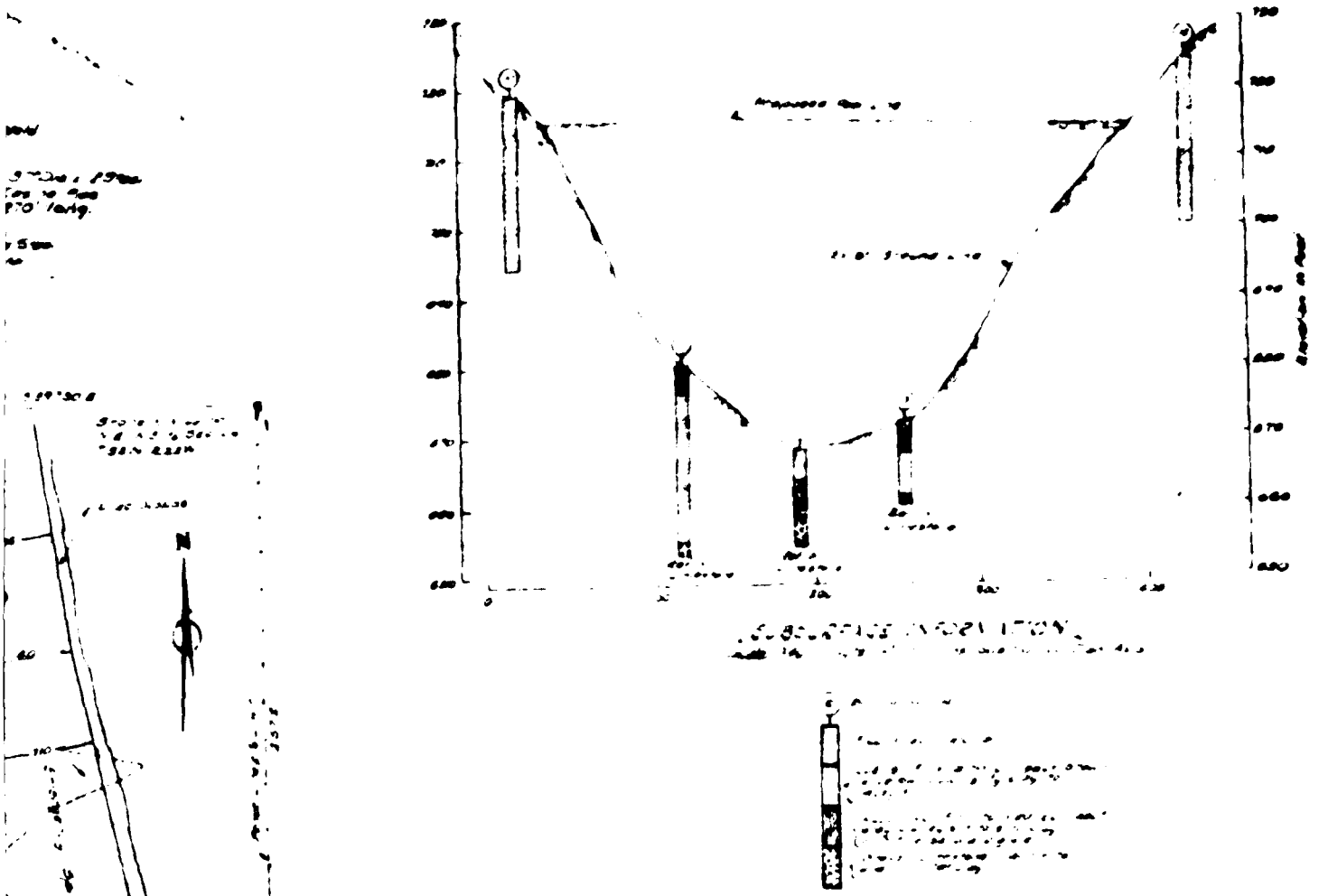
JOB NO. KC 498

DWG. NO. -



DETAIL OF DRAIN INLET
& OVERFLOW INTAKE
NOT TO SCALE

GENERAL PLAN



STATE OF MISSOURI
WARREN E. HEARNES GOVERNOR

VAN METER STATE PARK
DAM REHABILITATION

APPENDIX B

CONSERVATION COMMISSION

MEMORANDUM

Date June 22, 1960

FROM: Vernon D. Doughty

TO: Floyd C. Larsen

SUBJECT: Soundings of Lakesite at Van Meter State Park

The general soil type is Marshall silt loam, a loessial or wind deposited soil. The following percentages are taken from the Missouri State Highway Soils Manual: Sand - 5 to 7; Silt - 71 to 69; Clay - 23 to 29; Retained in No. 200 screen - 0.4 to 0.2.

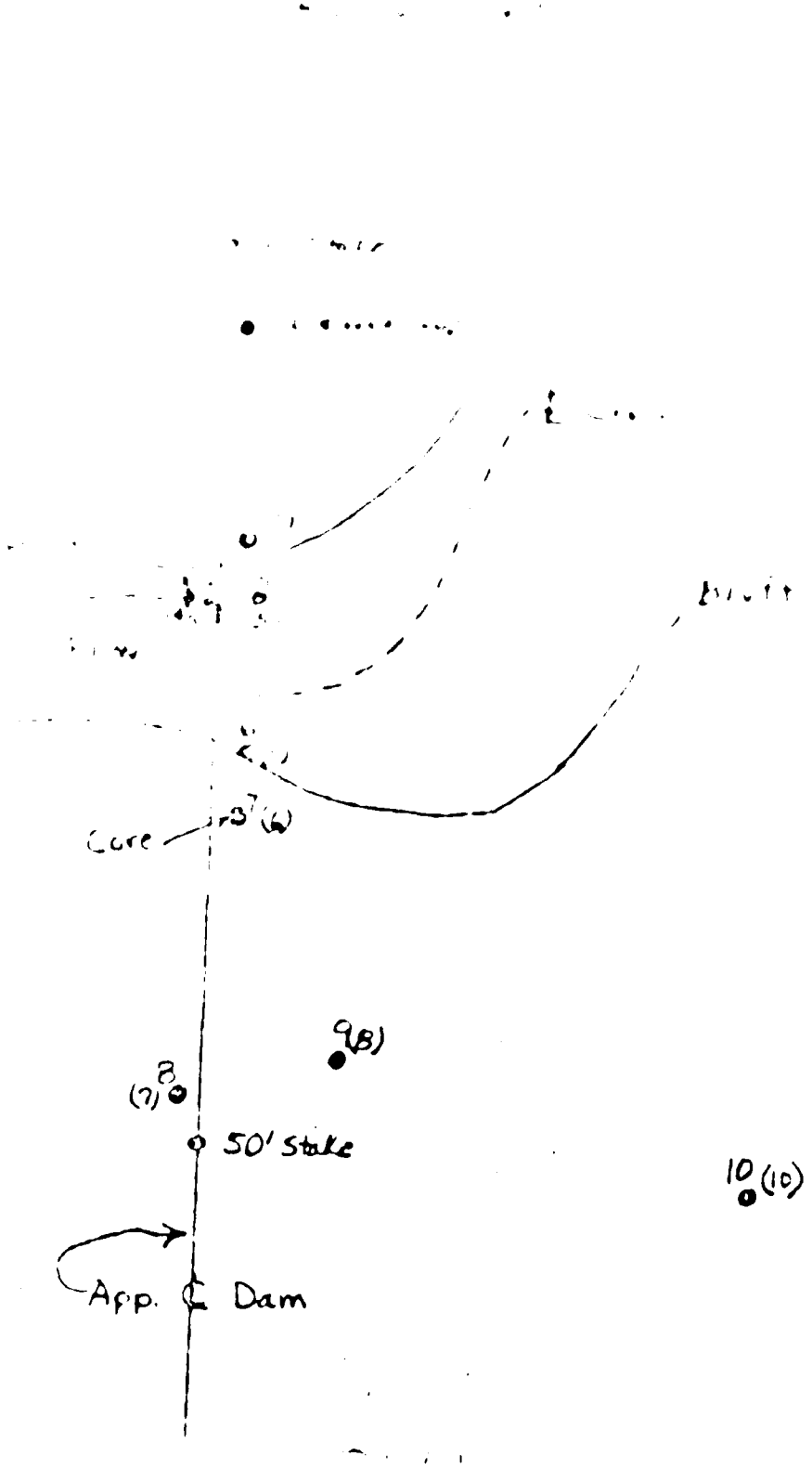
Hole No.		Location	Depth	Remarks
1	(2)	In roadway between top of bluff and 50' water-line stake.	0'-17.5'	Brown silt loam - soft velvety texture and will not ribbon.
2	(1)	By big stump on top of north bluff	0'-23'	Brown silt loam.
			23'-29'	Brownish gray silt loam.
			29'-31'	Brown silt loam and broken rock.
			31'	Rock.
3	(4)	Centerline of creek at bottom of north bluff. About 1.5' of ramp fill over rock and gravel creek bottom.	6'-12'	Brown gravelly silt loam mixed with large broken rock.
			12'	Rock.

(Creek channel has cut about 2 feet into a formation of silt loam mixed with large broken rock.)

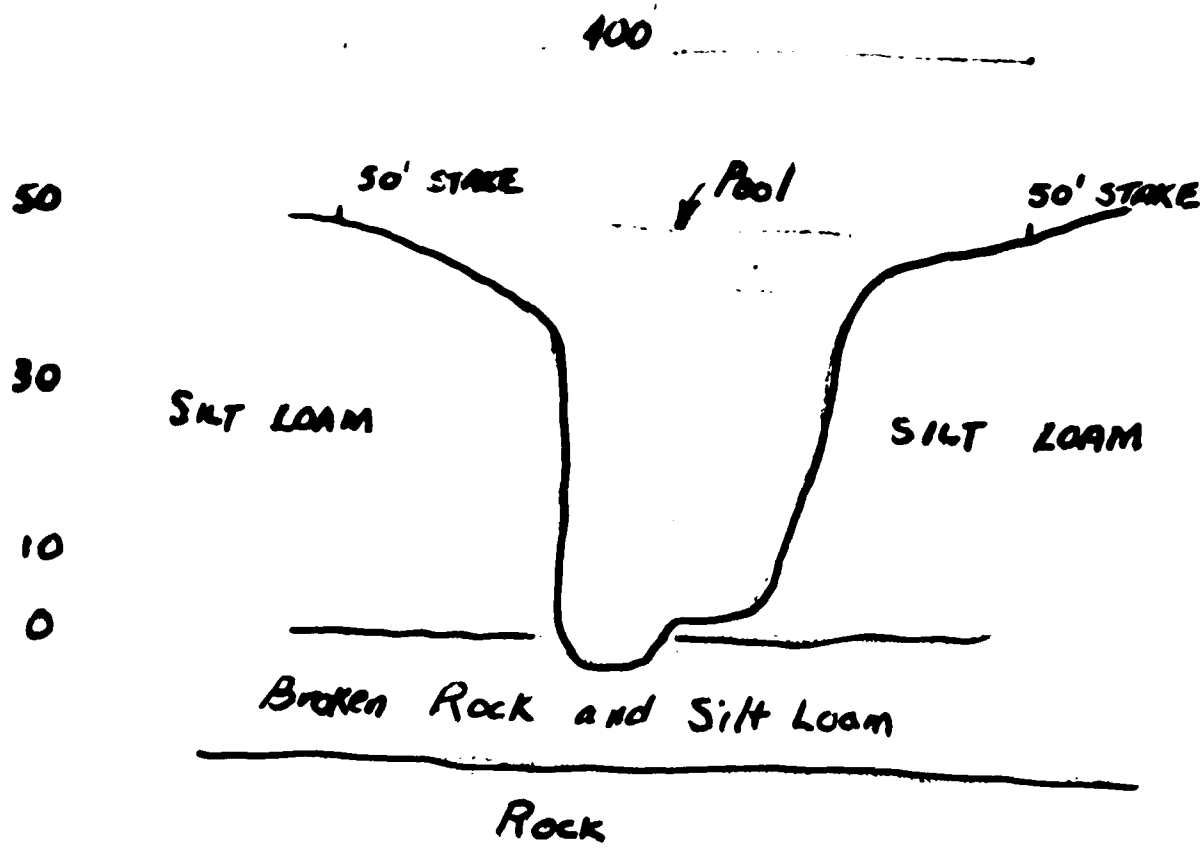
4	(11)	In creek bottom about 4' upstream from No. 3 and about 1' of ramp fill over creek bottom.	0'- 6'	Brown gravelly silt loam and broken rock.
			6'- 7'	Brown gravelly sandy clay loam (pocket).
			7'- 8'	(Split Spoon Sample) Brown sandy loam, containing specks of iron deposit.
			8'-12.5'	Brown gravelly sandy silt loam and broken rock.
			12.5'	Rock.
5	(5)	Middle of bottom about 1.5' below natural ground.	6'- 8'	Brown silt loam with considerable clay content and mixed with broken rock.

SHEET 1, APPENDIX B

Auger No.	Location	Depth	Description
6	(5) Bottom of south bluff.	0'- 4'	Brown silt loam
		4'-10'	Same, mixed with gravel [illegible] rock.
		10'-14'	Brown silt loam, some [illegible] pieces of sandstone
		14'-15'	Soft then hard rock
7	(6) Top of south bluff.	0'-22'	Brown silt loam.
		22'-27'	Same with slightly more [illegible]
		27'-39'	Brown silt loam
		39'-41.5	Brown silt loam with [illegible]
		41.5'	Rock.
8	(7) By 30' waterline stake at south end.	0'- 8'	Brown silt loam.
		8'- 9'	(Sample) Very dry brown silt loam, floury texture.
9	(8) About 30' east of No. 8.	0'-11'	Brown silt loam.
		11'-17.5'	Dry brown silt loam.
10	(10) Along 50' traverse line on south side, possible waterline borrow.	0'- 8'	Brown silt loam
		8'- 9'	Dry brown silt loam.



SHEET 3, APPENDIX B



Approx profile Between 50' stakes (Possible Dam Location)

July 21, 1960

Mr. Joseph Jaeger
Director of Parks
Missouri State Park Board
P. O. Box 176--1206 Jefferson Building
Jefferson City, Missouri

Dear Mr. Jaeger:

On July 18 I had the pleasure of inspecting the proposed reservoir at Van Meter State Park in conjunction with Mr. Coates, Mr. Grogger, and Mr. Culpepper. A careful inspection of the abandoned limestone quarry near the park and geologic conditions in the reservoir area reveal nothing of an unsatisfactory nature geologically as related to the proposed reservoir. There is no evidence of marked solution, sink holes, or other natural underground drainage which might cause excess leaking of the reservoir. Bedrock is exposed in the stream valley in the reservoir area and it appears that an excessive amount of trenching will not be needed to place the dam on reasonably solid rock.

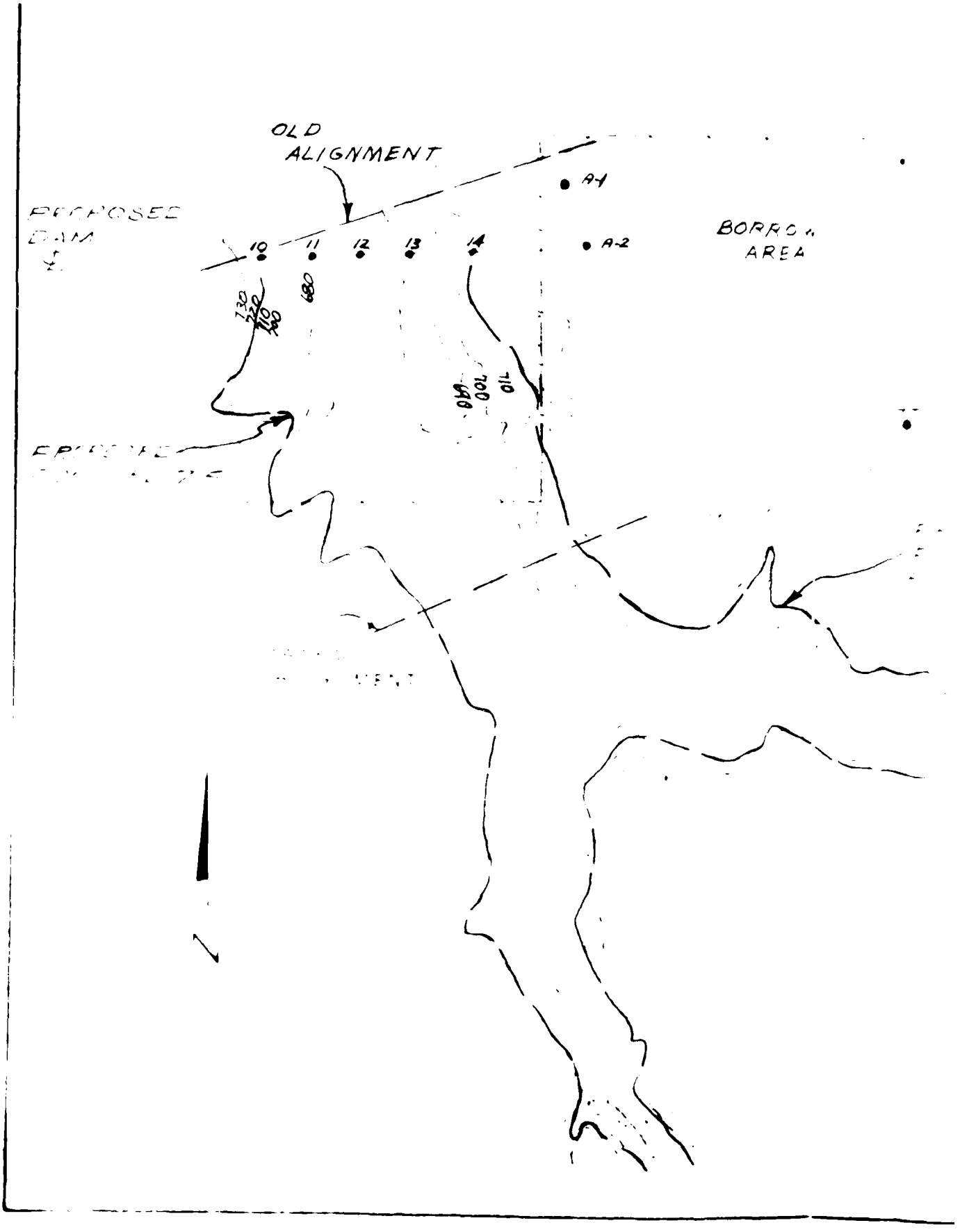
Throughout much of the reservoir area, bedrock is concealed with the exception of in the stream bed and the major visable material is loess, which is predominantly silt in the lower part and contains a higher clay fraction in the upper part. The major problem appears to be one of finding sufficient material for construction of the dam in view of the very low clay content of the lower part of the loess. I concur with Mr. Grogger in suggesting that additional borings be made to make certain that sufficient plastic material is available for construction of the dam. And I believe all of us agree that leakage does not appear to be a major problem.

As you undoubtedly realize, one cannot make a 100% guarantee on any reservoir site, but this one is, in my opinion, a satisfactory one if sufficient material can be found.

With personal regards,

Thomas J. Beveridge
State Geologist

SHEET 5, APPENDIX E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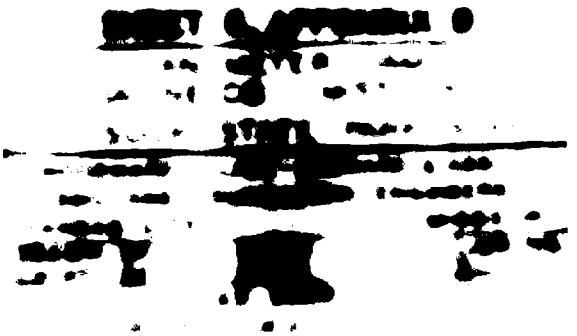

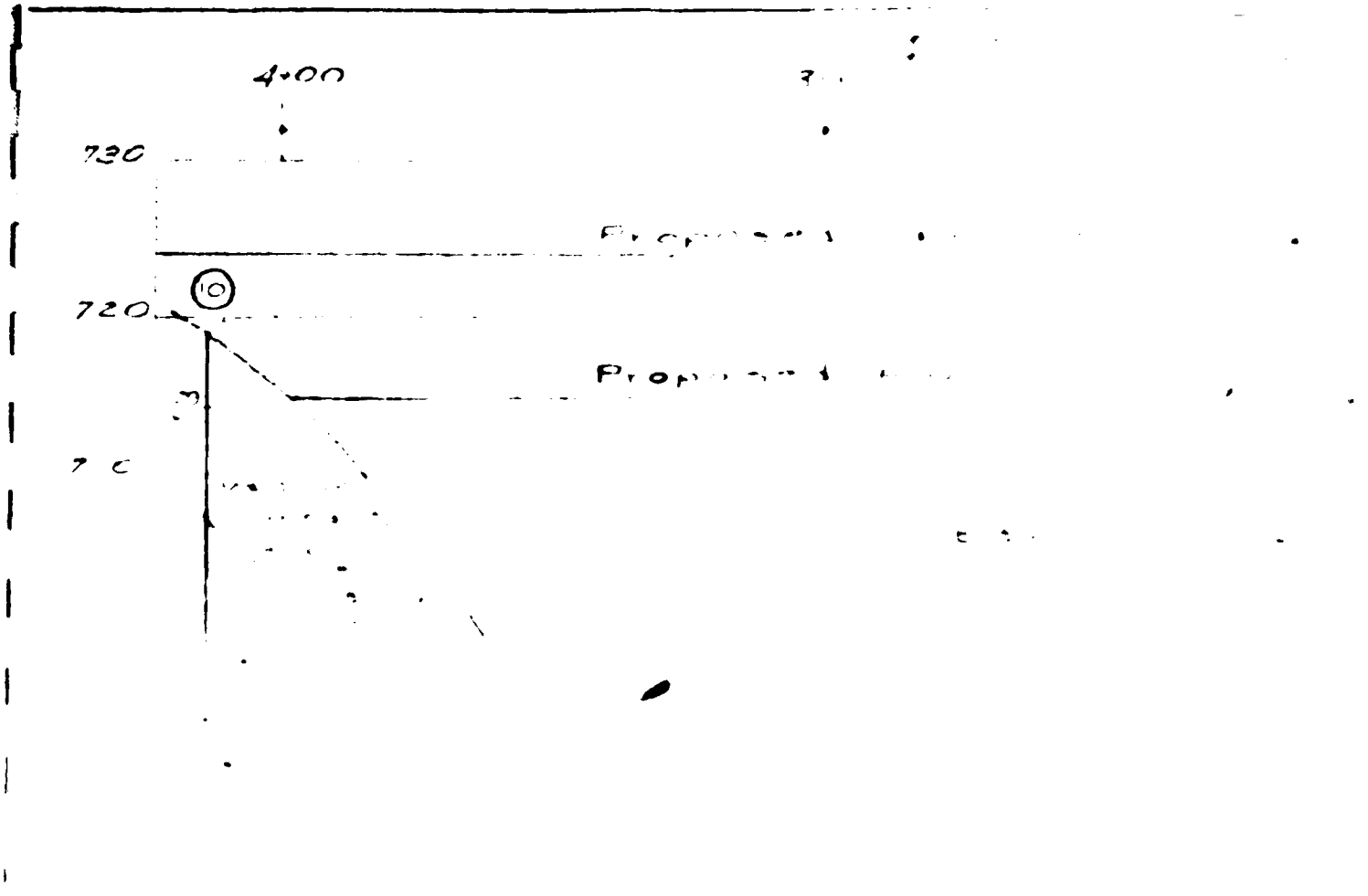
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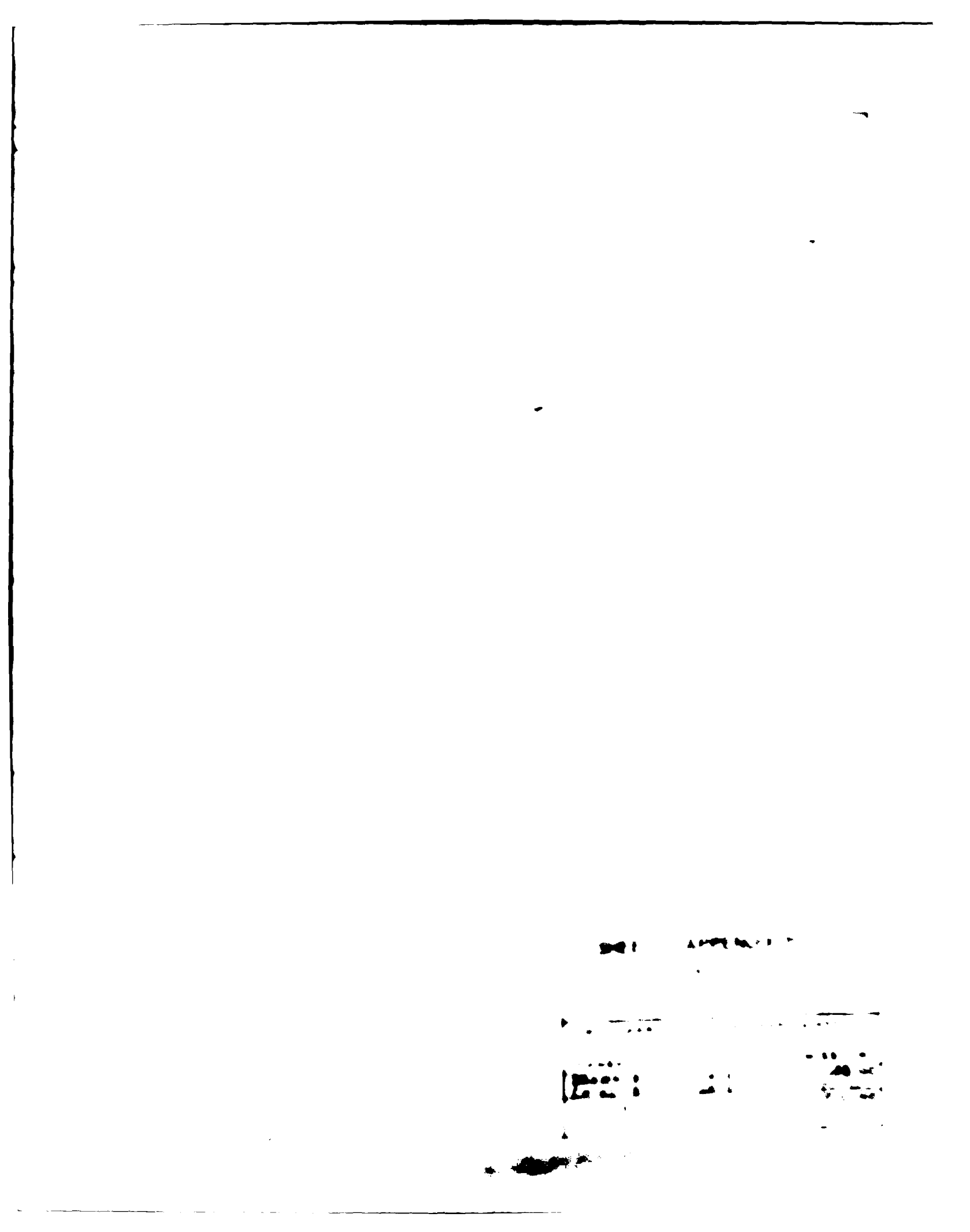
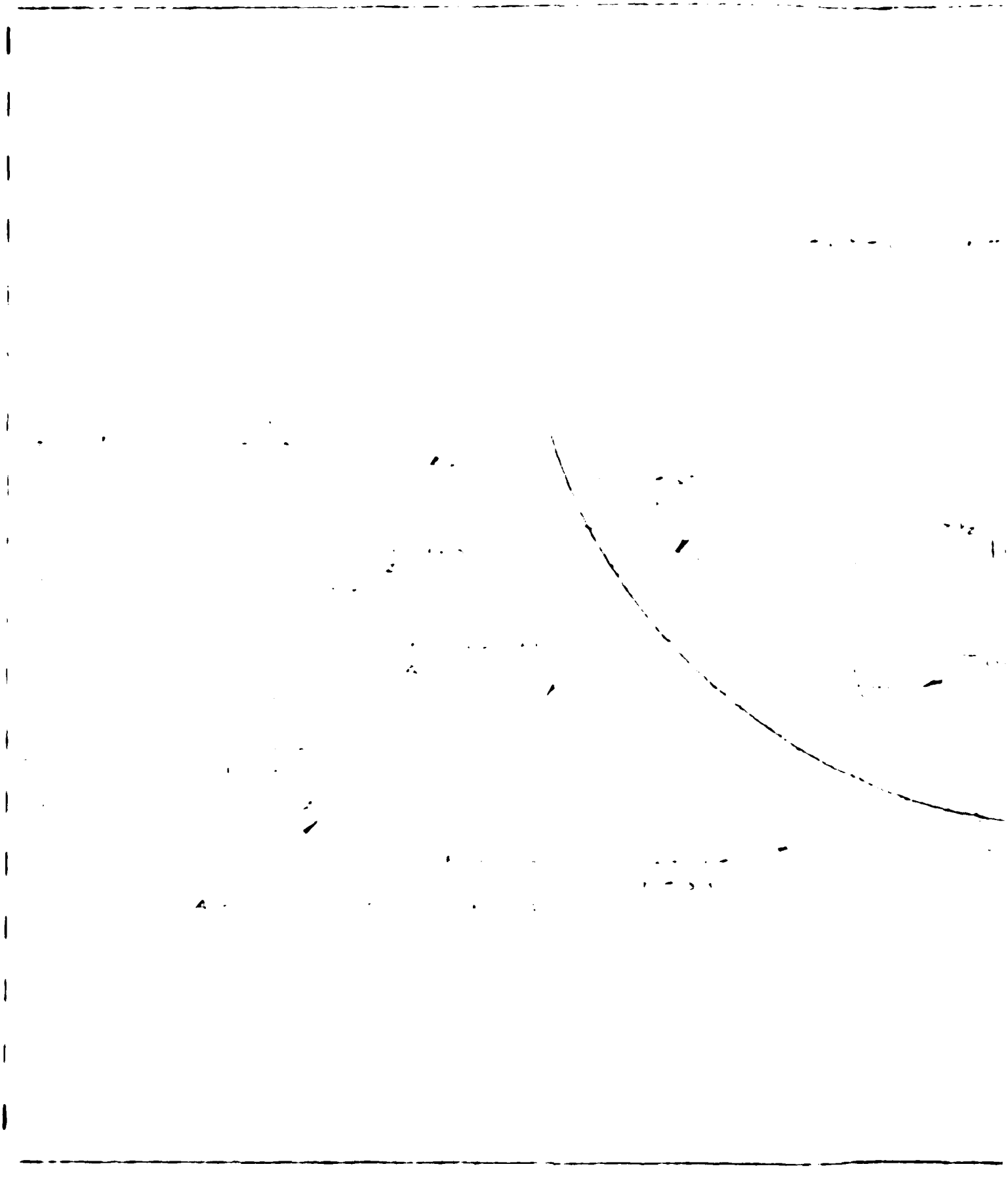


SHEET 8, APPENDIX B



RESULTS

Method	Factor of Safety
[illegible]	155
[illegible]	57
[illegible]	120
[illegible]	45

[illegible] Circle

Circular Failure Surface

SHEET 9, APPENDIX B

VA[illegible]METER DAM
SALINE COUNTY, MISSOURI
MISSOURI STATE PARK BOARD

WOODWARD-CLYDE-SHERARD & ASSOC
SOIL AND FOUNDATION ENGINEERS
KANSAS CITY MISSOURI

DRAWN BY CM DATE [illegible] JOB NO [illegible]
CH'KD. BY DATE

STABILITY ANALYSIS — FIG NO 11

Results of all the tests performed are presented on the Summary Table, and on Figures 3 through 11. It is noted that Figures 3, 4 and 5, present the results of grain-size determinations from data obtained by others and are presented for correlation purposes and as an indication of the areal characteristics of the major constituent material.

SITE AND FOUNDATION CONDITIONS

The proposed dam and lake site is typical of valleys eroded in loessial deposits immediately adjacent to the Missouri River. Side slopes in the valley proper are very steep, approaching the vertical, and gulley and sheet erosion in adjoining areas are evident. The site is presently covered by timber of various sizes. Ground cover is generally fairly dense. For purposes of hydrologic analyses, the site may be described as rolling, timber-covered area with general slopes averaging from 4 to 8 percent. With a water line at the proposed elevation of 715, the lake area is estimated at 15.4 acres, or approximately 1 14 of the total watershed estimated at 212 acres (.33 square miles). The total volume of the lake with storage to elevation 715, is 315 acre-feet. Surcharge storage to elevation 720 provides an additional 77 acre-feet. The embankment required to complete storage to this elevation will be 305 feet in length at water line, with a maximum height from water line (permanent pool level) to the existing stream bed of approximately 51 feet.

Field and laboratory data indicate the loessial origin of the overburden soil deposits and their considerable thickness at the treatment areas. The upper portions of the loess are medium-compact with densities between 85 to 91 pounds per cubic foot. In these depths the natural water contents, although the soils are not fully saturated, are in the vicinity of the plastic limit of the material and are considerably higher than those associated with very loose, loessial deposits. A significant change with depth is indicated, however, and the lower portions of the loess are considerably looser. It is believed that the variation in unit weight has occurred because of saturation following run-off

sample indicates a medium-range magnitude. It is pertinent to note that sedimentation has undoubtedly sorted materials sufficiently so that permeability in the horizontal direction is greater than the vertical value obtained in the laboratory. This was confirmed by rough field observations.

The loess and alluvium are underlain by limestone bedrock. It is apparent that the bedrock slopes, at the dam centerline, from south to north, falling approximately 15 feet between Borings 13 and 11. The bedrock is overlain by a 1- to 2-foot layer of limestone fragments embedded in a matrix of fine-grained soils.

[illegible] ANALYSIS

General - Analysis of the earth embankment and appurtenant structures has been completed in accordance with accepted procedures. The reference used to check minimum standards and to provide methods of analysis is the manual, Design of Small Dams, published by the Bureau of Reclamation in 1960. This book presents procedures and many examples of designs used effectively by the bureau in the course of its design of numerous small, water retaining structures. Where deemed desirable, methods or approach, not documented in the above reference, were utilized; this is particularly true in regards to the hydrologic estimates. Basic data for design computations is presented in "Rainfall Frequency Atlas of the United States", Weather Bureau, U. S. Department of Commerce, May, 1961.

Hydrographic Analysis - Storm runoff and peak-quantity estimates are computed in accordance with unit hydrograph methods. A unit-hydrograph was constructed assuming a design storm of 26 inches for a 6-hour duration, as recommended by the Bureau of Reclamation's compilation of data. For this stringent condition, a peak flow of approximately 3,500 cubic feet per second is indicated, with a maximum period of rainfall of 12 inches per hour. The U. S. Weather Bureau has recorded such a rainfall intensity in the area, actually 42 miles away from the dam site, but indicates that this was an extremely unusual storm and that [illegible] three times higher than the 3 inches per hour rate of the most

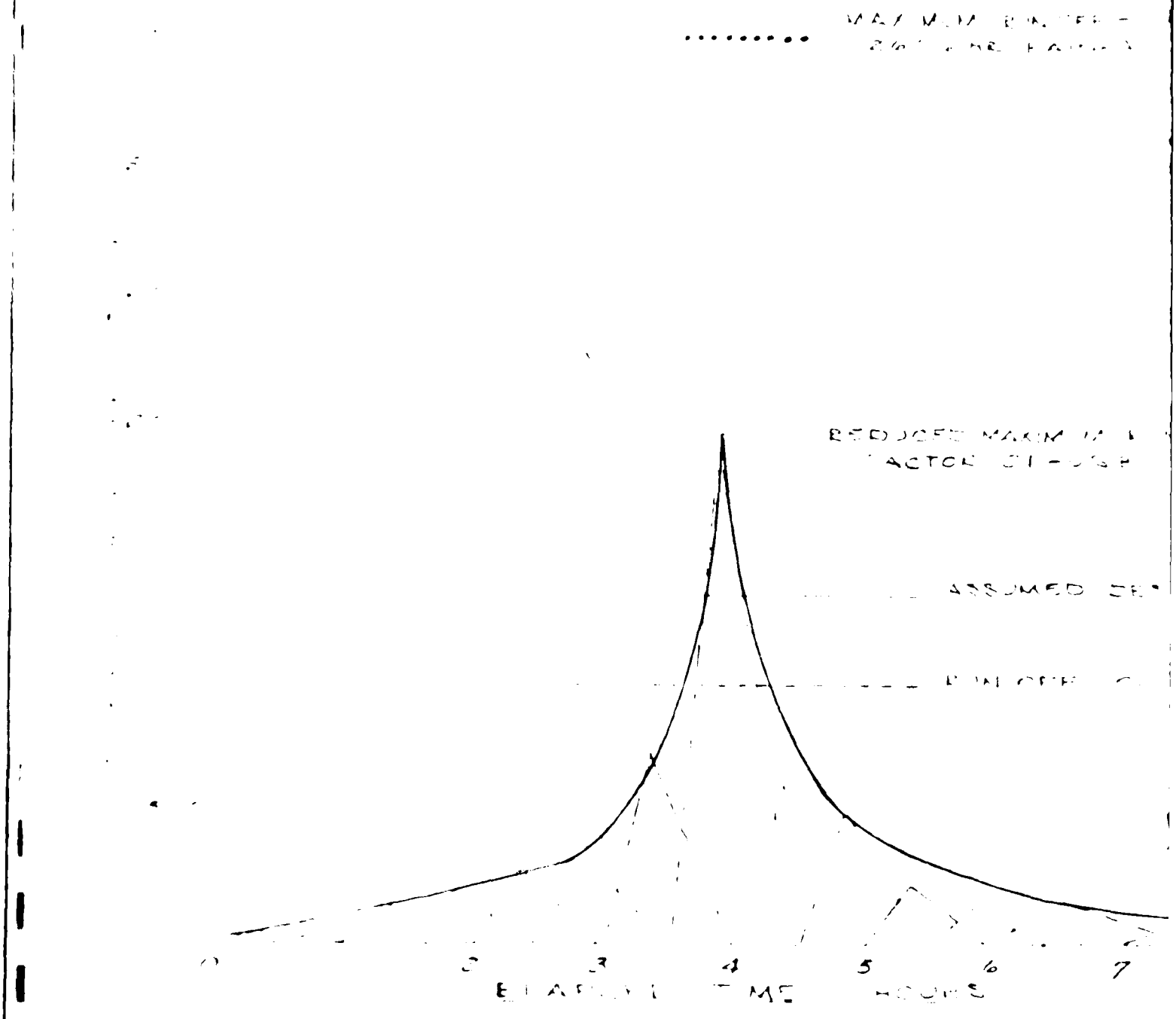
frequency shown in the Atlas. This consideration, together with rough spillway requirements for a 3,500 second-foot peak, made revision to less conservative design requirements most desirable. This is in accordance with accepted practice for situations where damage, because of overtopping and possible dam failure, is not catastrophic.

In view of the design situation presented, a reduced design storm was approximated by several methods. It is important to note that the time of concentration for the relatively small area involved is slightly less than 10 minutes and, consequently, disregarding changes in antecedent ground conditions, a peak rate will occur for maximum intensity storm duration greater than the concentration period. Results of the various analyses, made utilizing the various procedures [illegible] attached Table 2.

On the basis of these results, [illegible] provide sufficient capacity to accommodate a 3,500 second-foot peak flow. It should be noted that [illegible] meter area indicates that [illegible] an interval of about one hour [illegible] level by approximately 1 foot [illegible] proximations, the peak outflow [illegible] proximately 1,900 second-feet [illegible] proximately 40 percent of the maximum flood, [illegible] conditions are present and [illegible] comparisons presented [illegible] high capacity [illegible] year frequency [illegible] procedure is provided [illegible]

[illegible] ment slopes were [illegible] zontally to 1 vertical [illegible] [illegible] area [illegible] vest, [illegible] are [illegible]

from maximum stage has not been considered. Consequently, the downstream slope, at steady seepage, is the critical design condition. The stability of the embankment was checked by methods of analysis presented by Bishop (see "Stability Coefficients for Earth Slopes" A.S. Bishop and Morgenstern Geotechnique and the critical [illegible] proposed for [illegible]

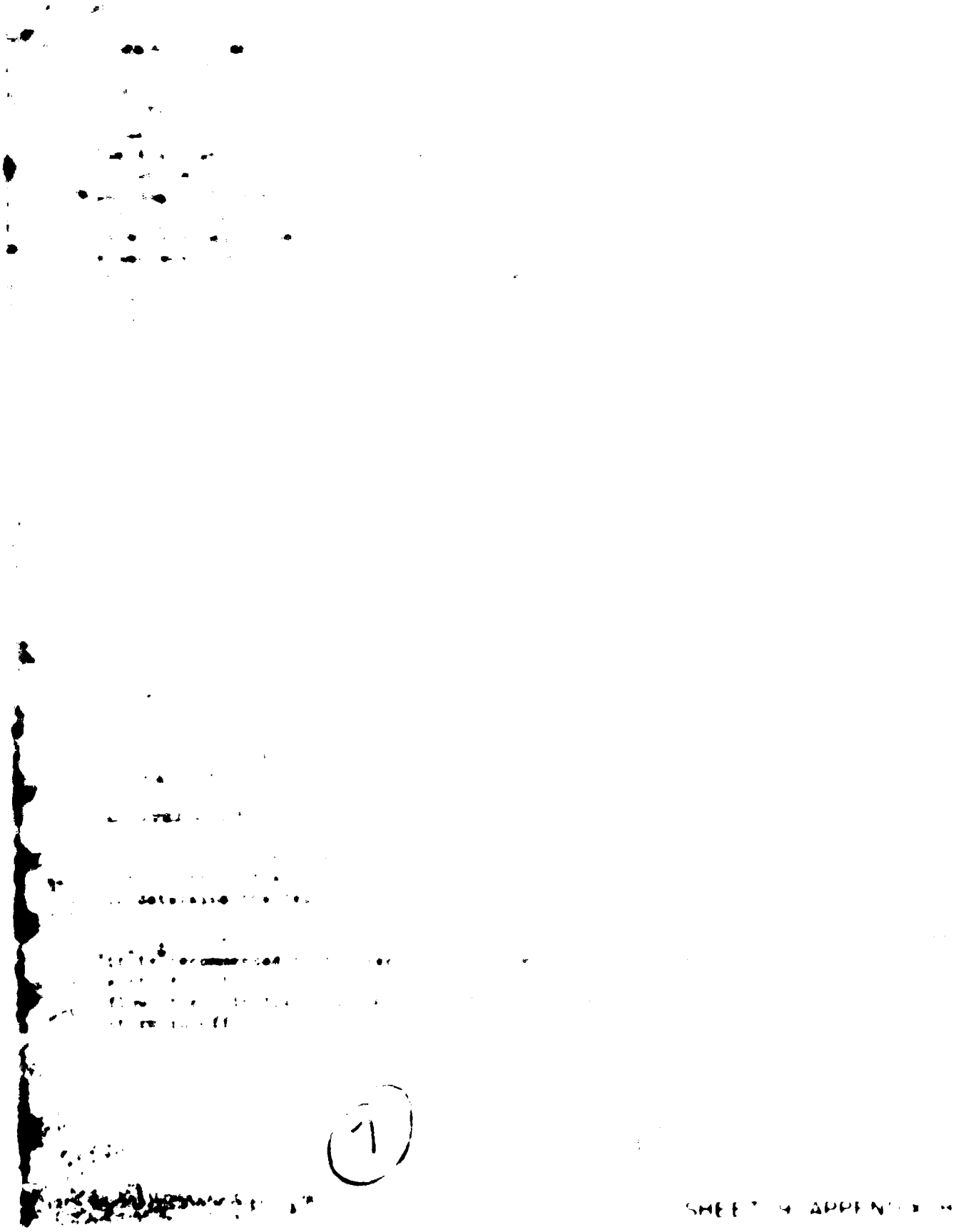

3
4
5
6
7

SHEET 17, APPENDIX B

VA METER DAM
SALINE COUNTY, MISSOURI
MISSOURI STATE PARK BOARD

WOODWARD - CLYDE - SHERARD & ASSOC
SOIL AND FOUNDATION ENGINEERS
KANSAS CITY MISSOURI

DRAWN BY CMC DATE 12-22-81 CH'KD BY DATE	JOB NO K-45
UNIT HYDROGRAPHS	FIG NO 12




DRAINAGE
AREA

Appendix C

AN METEO

FLOW AND STAGE

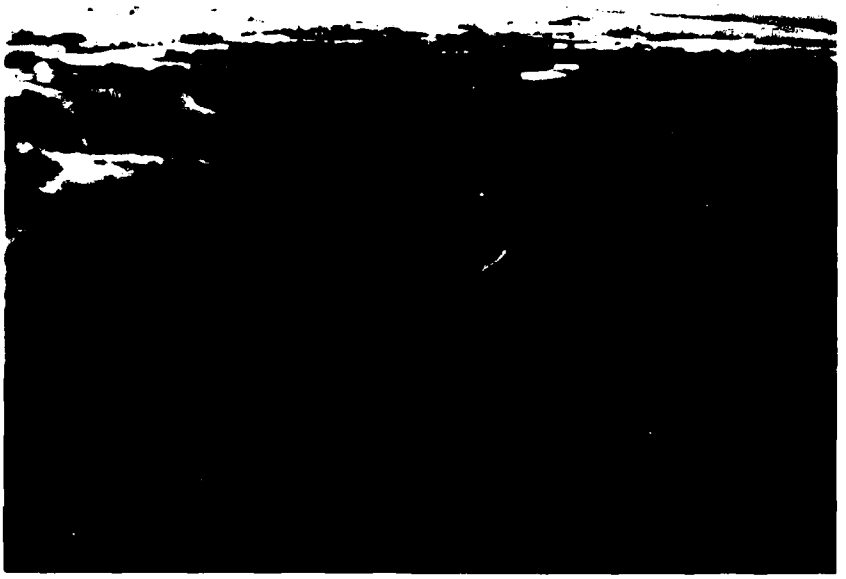
OPERATION STATION AREA

HYDROGRAPH AT 1 0.33
0.85

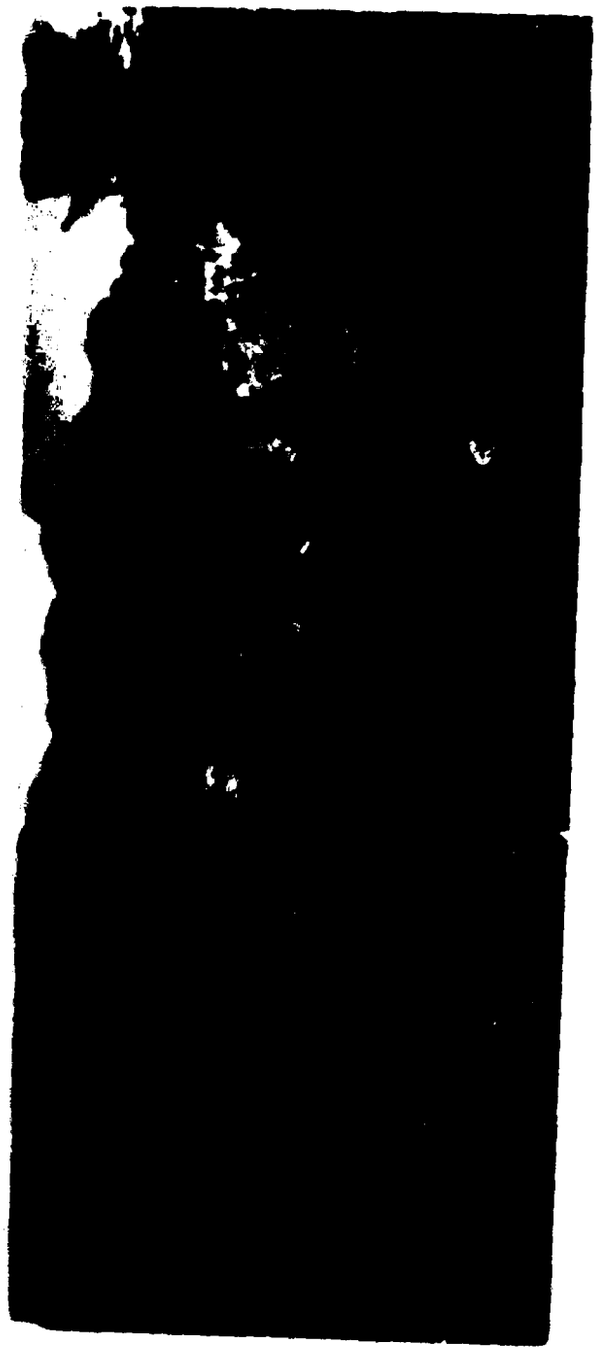
STATE
0.55

ELEV
STORM
OUTFLOW

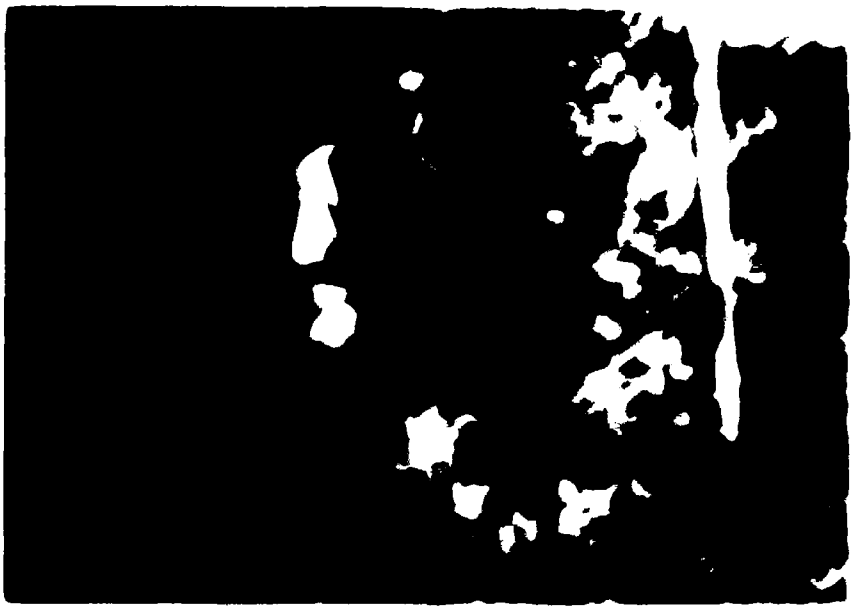
RATIO OF PMF	MAXIMUM RESERVOIR W S ELEV	MAXIMUM DEPTH		MAXIMUM
0.20	723.42			
0.30	724.xx			
0.40	725.47			
0.50	726.34	0.00	54.	685
0.60	727.04	0.00	5.	985
0.70	727.61	0.11	5.4	1311
0.80	728.96	0.46	5.x	1462
1.00	729.44	0.94	5.x	2066



Aerial Views of Lake and Dam



Downstream Face of Dam



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