

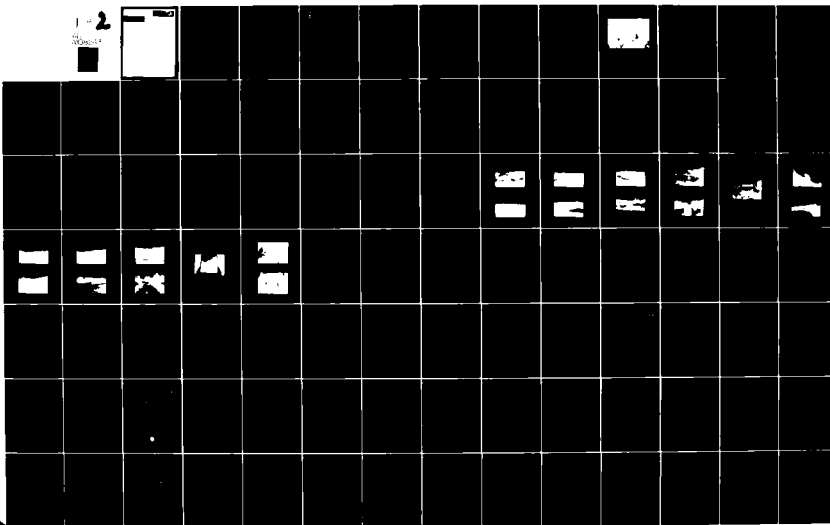
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NATIONAL PROGRAM OF INSPECTION OF NON-FEDERAL DAMS, TENNESSEE. --ETC(U)
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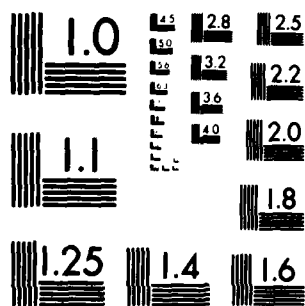
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20. ABSTRACT (Continue on reverse side if necessary and identify by block number) The dam is a linear earthen structure 450' long and 47.5 high with a crest width of 18'. The upstream and downstream slopes are 3.2H:1V and 3.0H:1V respectively. The surface area of the lake is 5.4 acres at normal pool and 15.5 acres at the top of the dam. On the day of the inspection the reservoir was about 2/3 full for the first filling since construction. At the left abutment is an uncontrolled earth and rock saddle spillway with a base width of 72'. The principal spillway consists of a 2.5' x 7.5' reinforced concrete riser feeding a 30" steel cylinder concrete pipe. The drawdown is a 74" formed		

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opening at the upstream toe of the riser regulated by a manually operated 24" sliding headgate. The embankment is uniform and well grassed with no signs of cracking, sliding, or differential settlement observed on the embankment or in the area immediately downstream. There are no trees or other deleterious vegetative growth. The dam is in the intermediate size and high hazard potential category. On the basis of these classifications, the structure is required to pass the full probable maximum flood (PMF) of 28.2" of rain falling in 6 hours. Analysis reveals that the spillway is capable of passing the flood without causing the dam to overtop. Since the dam has no significant defects or inadequacies, it is considered to be "not deficient". Operation and maintenance procedures should be continued as usual.

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DEPARTMENT OF THE ARMY
NASHVILLE DISTRICT, CORPS OF ENGINEERS
P. O. BOX 1070
NASHVILLE, TENNESSEE 37202

IN REPLY REFER TO

9 JUN 1981

ORND-G

Honorable Lamar Alexander
Governor of Tennessee
Nashville, TN 37219

Dear Governor Alexander:

Furnished herewith is the Phase I Investigation Report on Red Boiling Springs Dam No. 1 near Red Boiling Springs, Tennessee. The report was prepared under the authority and provisions of PL 92-367, the National Dam Inspection Act, dated 8 August 1972.

The report presents details of the field inspection, background information, technical analyses, findings, and recommendations for improving the condition of the dam.

Based upon the inspection and subsequent evaluation, this dam is classified as not deficient having no apparent deficiencies relative to its safety. The dam, classified as high hazard, has sufficient spillway capacity to pass the full probable maximum flood.

Public release of the report and initiation of public statements fall within your prerogative. However, under provisions of the Freedom of Information Act, the Corps of Engineers is required to respond fully to inquiries on information contained in the report and to make it accessible for review on request.

Your assistance in keeping me informed of any further developments will be appreciated.

Sincerely,

LEE W. TUCKER
Colonel, Corps of Engineers
Commander

1 Incl
As Stated

CF:
Mr. Robert A. Hunt, Director
Division of Water Resources
4721 Trousdale Drive
Nashville, TN 37220

PHASE I REPORT
NATIONAL DAM SAFETY PROGRAM
TENNESSEE

Name of Dam Red Boiling Springs Dam No. 1
County Macon
Stream .. Tributary of Salt Lick Creek at Witcher Hollow
Date of Inspection January 8, 1981

This investigation and evaluation was prepared by the
Tennessee Department of Conservation, Division of Water
Resources.

PREPARED BY:



William Culbert, Jr.
Water Resources Engineer

APPROVED BY:



Edmond O'Neill
Chief Engineer
Safe Dams Section

APPROVED BY:



Robert A. Hunt, P.E.
Director, Division of
Water Resources
Tennessee Department of
Conservation

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PREFACE

This report is prepared under guidance contained in the Department of the Army, Office of the Chief of Engineers, Recommended Guidelines for Safety Inspection of Dams, for a Phase I investigation. The purpose of the Phase I investigation is to identify expeditiously those dams which may pose hazards to human life or property. The assessment of the general condition of the dam is based upon available data and visual inspections. Detailed investigation and analyses involving topographic mapping, subsurface investigations, testing, and detailed computational evaluations are beyond the scope of a Phase I investigation; however, the investigation is intended to identify any need for such studies.

In the review of this report, it should be realized that the reported condition of the dam is based on observations of field conditions at the time of inspection along with data available to the inspection team. Additional data or data furnished containing incorrect information could alter the findings of this report. In cases where the reservoir was lowered or drained prior to inspection, such action, while improving the stability and safety of the dam, removes the normal load on the structures and may obscure certain conditions which might be detectable if inspected under the normal operating environment of the structure.

The analyses and recommendations included in this report are related to the hazard classification of the structure at the time of the report. Changes in conditions downstream of the dam may change the hazard classification of the structure. A change in hazard classification may in turn change the design flood on which the hydraulic and hydrologic analyses are based and may have a significant impact on the assessment of the safety of the structure.

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



Red Boiling Springs Dam No. 1

Macon County

April 2, 1981

PHASE I INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM
TENNESSEE

Name of Dam Red Boiling Springs Dam # 1
County Macon
Stream Tributary of Salt Lick Creek
 at Witcher Hollow
Date of Inspection January 8, 1981

ABSTRACT

The dam is a linear earthen structure 450' long and 47.5' high with a crest width of 18'. The upstream and downstream slopes are 3.2H:1V and 3.0H:1V respectively. The surface area of the lake is 5.4 acres at normal pool and 15.5 acres at the top of the dam. On the day of the inspection the reservoir was about 2/3 full for the first filling since construction.

At the left abutment is an uncontrolled earth and rock saddle spillway with a base width of 72'. The principal spillway consists of a 2.5' x 7.5' reinforced concrete riser feeding a 30" steel cylinder concrete pipe. The drawdown is a 24" formed opening at the upstream toe of the riser regulated by a manually operated 24" sliding headgate.

The embankment is uniform and well grassed with no signs of cracking, sliding, or differential settlement observed on the embankment or in the area immediately downstream. There are no trees or other deleterious vegetative growth.

The dam is in the intermediate size and high hazard potential category. On the basis of these classifications, the structure is required to pass the full probable maximum flood (PMF) of 28.2" of rain falling in 6 hours. Analysis reveals that the spillway is capable of passing the flood without causing the dam to overtop.

Since the dam has no significant defects or inadequacies, it is considered to be "not deficient". Operation and maintenance procedures should be continued as usual.

PHASE I INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM
RED BOILING SPRINGS DAM NO. 1
MACON COUNTY, TENNESSEE

SECTION 1 - GENERAL

- 1.1 Authority - The Phase I inspection of this dam was carried out under the authority of Tennessee Code Annotated, Section 70-2501 to 70-2530, "The Safe Dams Act of 1973", and in cooperation with the U. S. Army Corps of Engineers under the authority of Public Law 92-367, "The National Dam Inspection Act".
- 1.2 Purpose and Scope - The purpose of a Phase I investigation is to develop an engineering assessment of the general condition of a dam with respect to safety and stability. This is accomplished by conducting a visual inspection, reviewing any available design and construction data, and performing appropriate hydraulic, hydrologic, and other analyses. A comprehensive description of the Phase I investigation program is given in Recommended Guidelines for Safety Inspection of Dams, by the Department of the Army, Chief of Engineers, Washington, D. C. 20314.
- 1.3 Past Inspections - Personnel from the Tennessee Department of Conservation, Division of Water Resources, surveyed the dam and conducted a cursory inspection of the site on December 30, 1980. The dam is inspected at least annually by SCS to provide maintenance recommendations for the Watershed District Board.
- 1.4 Details of Inspection - The Phase I inspection was conducted on January 8, 1981. The weather was partly cloudy and 25°F. There were scattered patches of snow on the ground but the embankment was relatively clear. The reservoir was approximately 7' below normal pool elevation 871.5' msl.
- 1.5 Inspection Team Members - The inspection was conducted by the following State personnel:

Edmond O'Neill
William Culbert, Jr.

Robert Ramsey

The team was accompanied by Albert Dunn (Corps of Engineers) and Paul Goforth, Project Engineer (SCS).

SECTION 2 - PROJECT DESCRIPTION

- 2.1 Location - Red Boiling Springs Dam # 1 is located in Macon County, Tennessee, 1.6 miles east of Red Boiling Springs in Witcher Hollow on an unnamed tributary of Salt Lick Creek. The site is shown on the 7.5 minute Red Boiling Springs U. S. Geological Survey map 320 SE at latitude 36°31'52" N and longitude 85°49'20" W. Location maps are provided in Appendix B of this report.
- 2.2 History of Project - The project was sponsored by the City of Red Boiling Springs and the Macon and Clay County Soil Conservation Districts as a flood control dam. It was completed on October 12, 1979, by Pat Eatherly Construction firm of Carthage, Tennessee. Design was by the Soil Conservation Service under Public Law 566, the Watershed Protection and Flood Prevention Act. The site is owned by the city of Red Boiling Springs and the city is also responsible for all protection, maintenance, and operating procedures.
- 2.3 Size and Hazard Classification - Based on a structural height of 47.5 feet and a maximum storage capacity of 241 acre-feet, the dam is considered to be of intermediate size. According to the OCE guidelines, the structure falls into the high hazard potential category because several homes lie downstream of the dam in the probable flood path.
- 2.4 Description of Dam and Appurtenances
- 2.4.1 Embankment - The embankment is 450' long and 47.5' high with a crest width of 18'. The upstream and downstream slopes are 3.2H:1V and 3.0H:1V respectively. The crest of the dam is straight with variations in elevation from 891.0' to 893.1' msl.
- The embankment is underlain with cherty limestone of Fort Payne formations. Beneath this is Chattanooga shale and finally Ordovician age limestone.
- According to District Conservationist Paul Goforth, a cutoff trench was excavated to impervious Chattanooga Shale. The design plans specify depths of

excavation between 820' and 830' msl for approximately 170' along the centerline of the dam. The trench was designed to have a base width of 10' and side slopes of 1:1.

According to Mr. Goforth, grouting was performed along the centerline of the dam. Additional grouting was done parallel to the centerline at intervals of 12', 50', and 100' both upstream and downstream of the centerline. At the upstream right of the emergency spillway critical section, a large cavern was grouted.

The general contractor, Pat Eather, of Carthage, confirmed that the rockfill toe was built to specifications; approximately 25' thick and 90' long beginning 14' upstream of the impact basin.

2.4.2 Service Spillway - The principal spillway consists of a reinforced concrete riser 28' tall with inside dimensions of 2.5' x 7.5' and a 30" AWWA C-301 steel cylinder concrete pressure pipe 304' long. The culvert lies on a 1.6% grade and discharges into an impact basin with baffle slab and end sill. Water discharges from the basin into a riprapped channel extending 40' downstream before tying into the natural channel. The culvert design includes eight 11½' x 7 ¾' anti-seep collars. The spillway is located almost perpendicular to the dam, left of mid-section. It maintains normal pool elevation at 871.5 msl (see photo nos. 7, 8, 9, and 10).

2.4.3 Emergency Spillway - The emergency spillway is an uncontrolled earth and rock saddle type channel located at the left abutment. Its crest is protected by a narrow concrete grout cap extending most of the channel width (see photo nos. 1 and 12). The spillway is trapezoidal with a base width of 72'. The entrance and exit channels are sloped 2.6% and 2.9% respectively. The channel centerline is a regular curve perpendicular to the dam at its critical section (see photo nos. 1 and 12).

2.4.4 Drawdown Facilities - The reservoir is drained by means of a 24" formed concrete inlet pipe at the upstream base of the riser. It is controlled by a 24" gate valve manually operated from the top of the riser.

- 2.5 Downstream Channel - The natural channel lies on a slope of approximately 1.5% and has a top width of 22' at the outlet structure. Several feet downstream of the riprapped section, the channel has a 3' base width, a 20' top width, and side slopes of approximately 2H:1V. Approximately 100' further downstream, the natural channel becomes narrower with steeper slopes. It is relatively free of undesirable vegetation and other obstructions (see photo nos. 16 and 17).
- 2.6 Reservoir and Drainage Area - At normal pool elevation 871.5, the reservoir impounds 54 acre-feet of water in a 5.4 acre lake. At the top of the dam (elevation 891.0) the storage capacity increases to 241 acre-feet with a pool area of 15.5 acres. The average ground slope for the drainage area is approximately 11%. Major soil types in the watershed include Mountview, Frankstown, and Bodine. The land usage of the area consists of row crop farming, grassed pastureland, woodlands, and some houses (Appendix F).

SECTION 3 - FINDINGS

3.1 Visual Inspection

3.1.1 Embankment - The crest and embankment slopes are regular and well defined. They support a thick uniform grass cover over most of the dam surface. The embankment is virtually free of trees and any other deleterious vegetation or debris.

Erosion is minor. The downstream right abutment tie-in has channeled runoff water creating a shallow gully from crest to toe. Some localized rilling appears sporadically along the slope, but no significant loss of cover accompanies the condition. Seepage is nonexistent.

No cracking, sliding, or differential settlement, was observed on the embankment or in the area immediately downstream.

3.1.2 Service Spillway - The principal spillway appears to be in excellent condition. The riser shows no signs of weathering or cracking. Similarly, the pipe outfall is free of any noticeable weathering. The baffle wall, apron, and end sill of the impact basin are all intact and in good condition. No significant erosion of the underlying and adjacent fill material was observed. There was a nominal flow emanating from the outlet, presumably the result of leakage around the headgate.

3.1.3 Emergency Spillway - The emergency spillway channel is uniform and well defined. It is well grassed and free of any undesirable vegetation or debris. There are sporadic outcroppings of smooth flat rock along the base of the spillway, particularly near the critical section.

3.1.4 Drawdown Facilities - The drawdown drain condition cannot be ascertained since the reservoir contains water. A deep water release duct surrounds most of the drawdown control rod, so only a small portion of the mechanism is visible. It is assumed to be operable.

3.1.5 Downstream Channel - The downstream channel is relatively clear and free from obstruction. It

lies on a moderate 1.2 - 1.5% slope and has gently sloping sides. There is only scant vegetative cover, but no significant erosion was observed. Apparently only nominal flow has been carried by the channel in recent years (see photo nos. 16 & 17).

- 3.2 Review of Data - The data available for review consists of the SCS work plan for the watershed and a set of design drawings. An excerpt from the work plan section on physical data reads as follows:

The Red Boiling Springs Watershed lies in the Highland Rim area of Tennessee. The topography of the watershed is steep to rolling with variable ridge elevations on either side. Elevations around the rim of the watershed area range from about 900 to 1,035 feet above sea level. Salt Lick Creek confluences with Long Hungry Creek at elevation 708 msl.

The climate is excellent all year with an average annual temperature of 56 degrees that range from an average low of 34 in January to an average high of 80 in July. Normal annual precipitation is about 58 inches. Rains are heaviest in the late winter or early spring and the driest season is mid-fall. There are about 125 days throughout the year with measurable precipitation. Clear skies prevail on about 145 days during the year. The relative humidity averages about 70 percent. Nights are cool during the hot summer season.

The watershed is on the Northern Highland Rim physiographic province of Tennessee. The area consists of narrow "V"-shaped valleys with steep hills and ridges. The ridgetops are remnants of the Highland Rim peneplain and are supported by residual chert of the Fort Payne Formation. This formation is predominantly a cherty limestone but contains layers of calcareous siltstone and shale. Green calcareous shale interbedded with crinoidal limestone is present locally near the base of the Fort Payne.

Stream valleys have cut down through the Fort Payne along most of Salt Lick Creek and its major tributaries exposing the underlying Chattanooga shale. This formation is a black, carbonaceous shale

containing frequent nodules of pyrite. The shale is about 20 feet thick and is underlain by Ordovician limestones.

- 3.3 Static and Seismic Stability - The actual margin of safety for static stability cannot be determined since the engineering data required for an analytical stability analysis are not available without extensive embankment and foundation exploration. Consequently, the assessment of embankment stability must be based on visual evidence and engineering judgment. On this basis, the stability of the embankment appears to be good.

The dam is in Seismic Zone 1. No seismic stability analysis is required for the Phase I investigation, provided static conditions are satisfied and conventional safety margins exist.

- 3.4 Hydraulic and Hydrologic Analysis - According to OCE guidelines, the design flood for a dam in the intermediate size and high hazard categories is the PMF. Hydraulic analysis of the emergency spillway under the influence of this design storm and an antecedent moisture condition (AMC) II indicates that the dam will not be overtopped and will in fact maintain 1.9' of freeboard at maximum water surface.

3.5 Conclusions and Recommendations

3.5.1 Conclusions

3.5.1.1 Visual inspection of the dam reveals no indications of structural instability.

The dam appears to be well constructed, however, since it was completed only recently, it may not have had time to develop any major problems.

3.5.1.2 Hydraulic and hydrologic analysis indicates that the spillway is adequate to pass the Probable Maximum Flood as required by OCE guidelines for dams of intermediate size and high hazard potential.

3.5.1.3 The dam is located in Seismic Zone 1, indicating that the risk of damage from seismic activity is minor.

3.5.1.4 The dam has apparently been well maintained since construction, with no woody vegetation or debris present on the embankment or in the emergency spillway.

3.5.1.5 The dam is considered to have a deficiency classification of "not deficient".

3.5.2 Recommendations - Continue a regular program of inspection, protection, operation, and maintenance.

An emergency action plan should be developed, including a warning system to alert downstream residents, in the event a serious condition develops with the project and also when the emergency spillway is expected to be used.

SECTION 4 REVIEW BOARD FINDINGS

The Interagency Review Board for the National Program of Inspection of Non-Federal Dams met in Nashville on 10 April 1981 to examine the technical data contained in the Phase I investigation report for Red Boiling Springs Dam No. 1. The Review Board considered the information and recommended that (1) an emergency action plan be developed, including a warning system to alert downstream residents when the emergency spillway is in use, in the event that a serious condition develops with the project, and (2) the condition classification in Section 3.5.1.5; be changed from "satisfactory" to "not deficient." They agreed with other report conclusions and recommendations. A copy of the letter report presented by the Review Board is included in Appendix G.

APPENDIX A
DATA SUMMARY

APPENDIX A
DATA SUMMARY

A.1 Dam

A.1.1 Type - The dam is a linear earthen structure with a saddle type earth and rock emergency spillway at the left abutment and a reinforced concrete principal spillway with a steel cylinder concrete pressure pipe culvert.

A.1.2 Dimensions and Elevations - Elevations are expressed in feet above mean sea level (msl) and are referenced to the top grating of the principal spillway impact basin. The elevation of this slab as given on the design plan is 851.0.

- a. Crest length - 450'
- b. Crest width - 18'
- c. Height - 47.5' (measured from low point in crest to downstream principal spillway invert)
- d. Crest elevation 891.0
- e. Normal pool elevation - 871.5 (from plans)
- f. Emergency spillway crest elevation - 882.4 (effective)
- g. Upstream embankment slope - 3.2H:1V
- h. Downstream embankment slope - 3.0H:1V
- i. Size classification - Intermediate

A.1.3 Embankment Zoning - The embankment design indicates that it is comprised of 8 zones including a rock toe (2 zones), an impervious core (2 zones), and peripheral sections (4 zones). Most of the earthen fill material has a high percentage of rock.

A.1.4 Cutoffs and Grout Curtains - The dam has a compacted clay cutoff trench that extends into impervious Chattanooga Shale. The axis of the dam was grouted with cement and chemical grout after the foundation excavation (see 2.4.1 - Embankment).

A.1.5 Instruemntation - None

A.1.6 Operation and Maintenance - The city of Red Boiling Springs will be responsible for adequately protecting, operating, and maintaining the dam. The city will arrange with the landowners and operators for minor maintenance jobs to be done as part of regular farm operations. The major maintenance jobs will be accomplished by the city of Red Boiling Springs since this may require skilled labor or machinery normally not found on a farm.

A.2 Reservoir and Drainage Area

A.2.1 Reservoir

a. At Normal Pool

- 1) Elevation - 871.5
- 2) Surface area - 5.4 acres
- 3) Storage - 54 acre-feet
- 4) Length - 1280'

b. At Top of Dam

- 1) Elevation - 891.0
- 2) Storage - 241 acre-feet

A.2.2 Drainage Area

a. Size - 398 acres (0.622 mi²)

b. Soils - Mountview, Frankstown, Bodine

c. Average slope - 11%

d. Land use - Row crops, grassed pasture, woodland, some houses

e. Runoff from PMP

- 1) AMC II - 24.7"
- 2) AMC III - 26.8"

f. Runoff from 100 year storm

- 1) AMC II - 2.4"
- 2) AMC III - 3.6"

A.3 Outlet Structures

A.3.1 Service Spillway & Drawdown Facilities

- a. Type - Single stage reinforced concrete riser with AWWA C-301 steel cylinder concrete pressure pipe and 24" formed concrete drain pipe regulated by manually operated 24" sliding headgate
- b. Pipe length - 304 feet
- c. Gradient - 1.6%

A.3.2 Emergency Spillway

- a. Type - Saddle type curvilinear earth and rock channel
- b. Crest elevation - 882.4 (effective)
- c. Size - 72' base width
- d. Side slopes - 3.1H:1V and 1.7H:1V

A.4 Historical Data

- A.4.1 Construction date - Completed October 12, 1979
- A.4.2 Engineer - Soil Conservation Service
- A.4.3 Builder - Pat Eatherly (Carthage, Tennessee)
- A.4.4 Owner - City of Red Boiling Springs
- A.4.5 Previous Inspection - None
- A.4.6 Seismic Zone - 1

A.5 Downstream Hazard Data

- A.5.1 Downstream Hazard Potential Classification
 - a. Corps of Engineers - High
 - b. State of Tennessee - 1

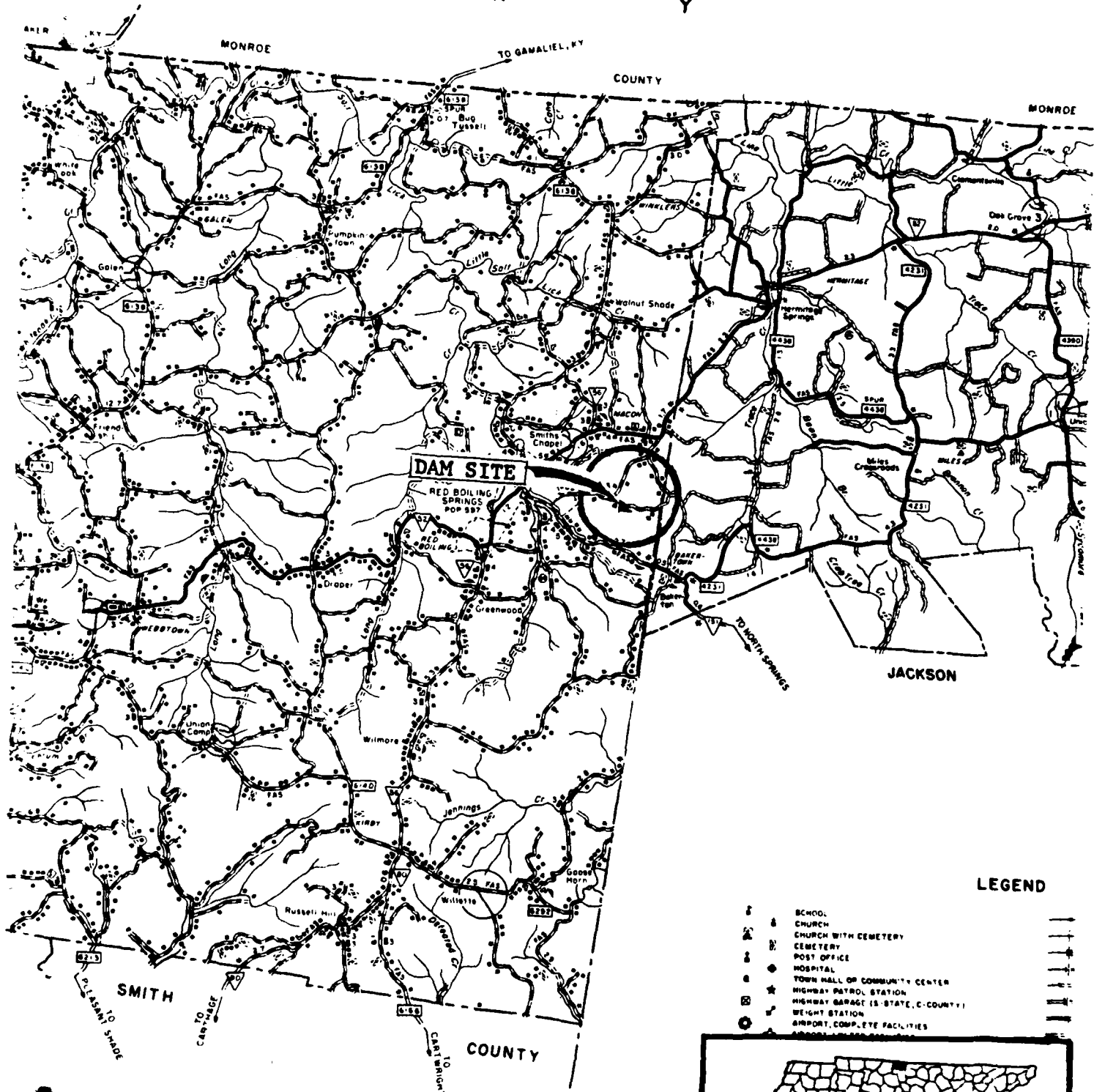
A.5.2 Persons in Probable Flood Path - as many as 150

A.5.3 Downstream Property - 15 to 20 family dwellings within hollow would be damaged; downstream of confluence with Spring Creek (1.1 miles downstream of dam) as many as 25 more homes may be affected. Several local roads and 1 state route downstream.

A.5.4 Warning Systems - None

APPENDIX B
SKETCHES AND LOCATION MAPS

U
C
K
Y

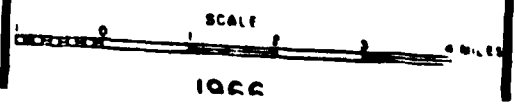


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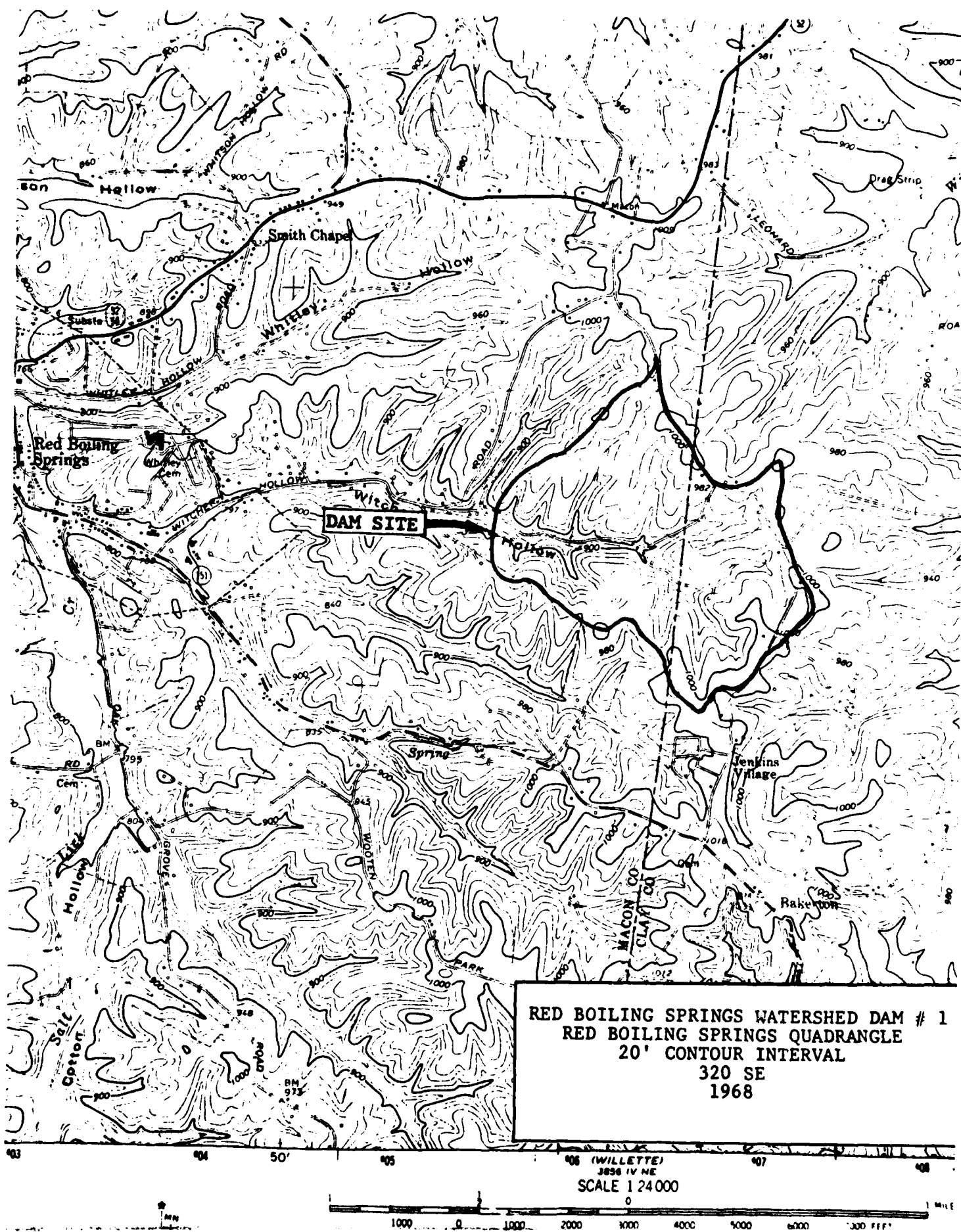
- SCHOOL
- CHURCH
- CHURCH WITH CEMETERY
- CEMETERY
- POST OFFICE
- HOSPITAL
- TOWN HALL OR COMMUNITY CENTER
- HIGHWAY PATROL STATION
- HIGHWAY GARAGE (S-STATE, C-COUNTY)
- WEIGHT STATION
- AIRPORT, CAMP, EYE FACILITIES
- AIRPORT, CAMP, EYE FACILITIES

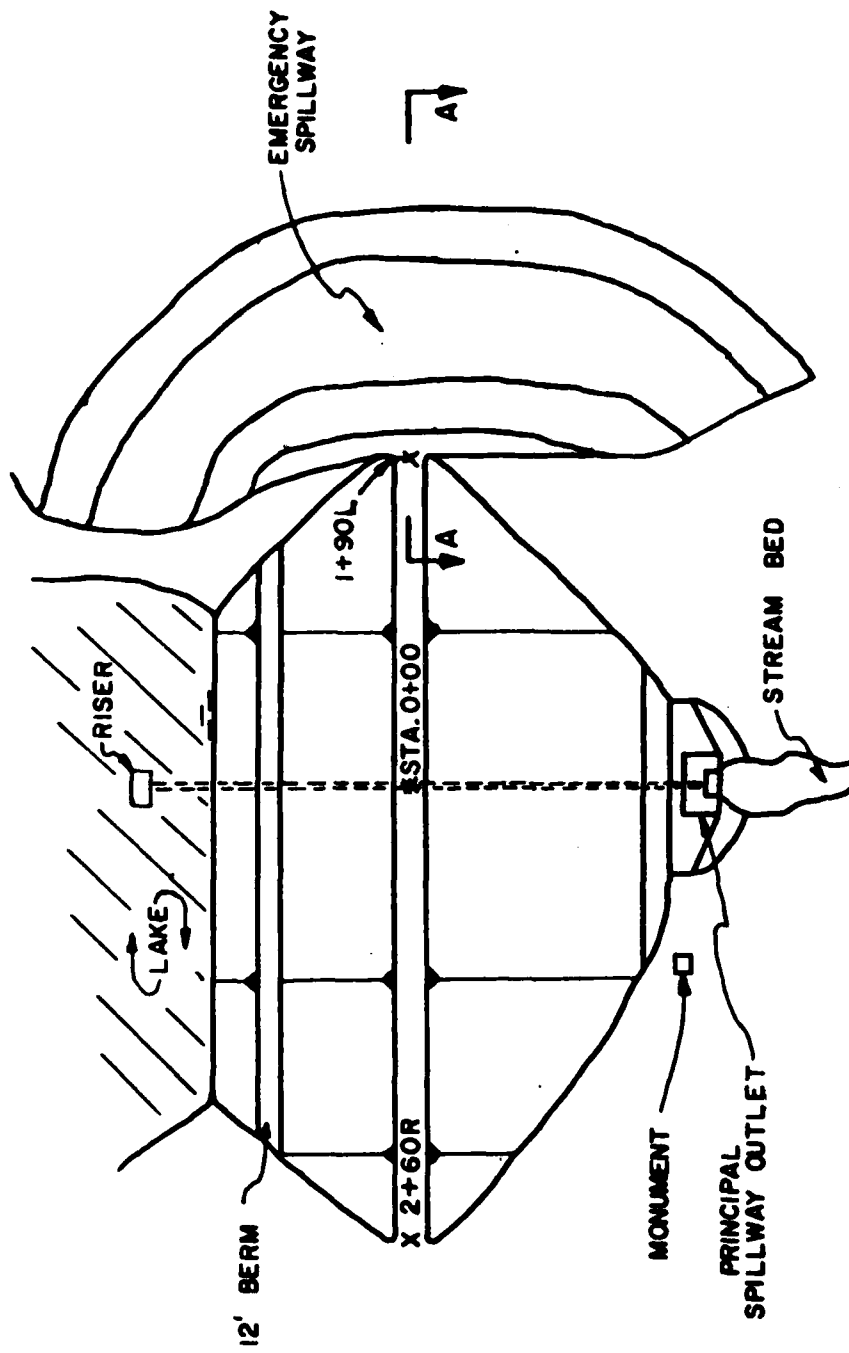


GENERAL HIGHWAY MAP
MACON COUNTY
TENNESSEE



1966

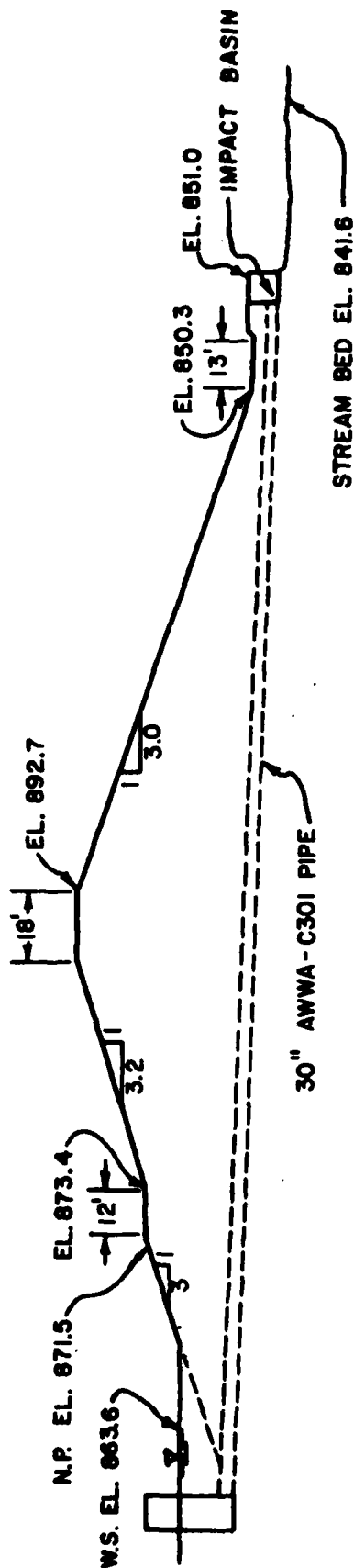




GENERAL PLAN
SCALE: 1"=100'

RED BOILING SPRINGS
DAM NO. 1

DRAWN BY: M.J.F.
DATE: 12 JAN. 61
SHEET: 1 OF 3



MAXIMUM SECTION STA. 0+00
SCALE: 1"=40'

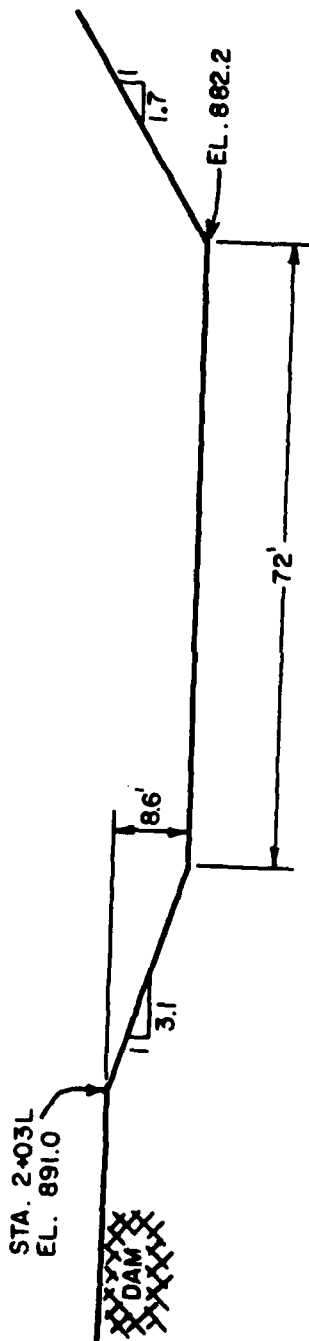
NOTE: ALL ELEVS. REFERENCED
TO TOP OF PRIN. SPILL.
OUTLET GRADING, ELEV.
851.0' MSL AS GIVEN
ON DESIGN DRAWINGS.

RED BOILING SPRINGS
DAM NO. 1

DRAWN BY: G.A.D.

DATE: 12 JAN. 81

SHEET: 2 OF 5

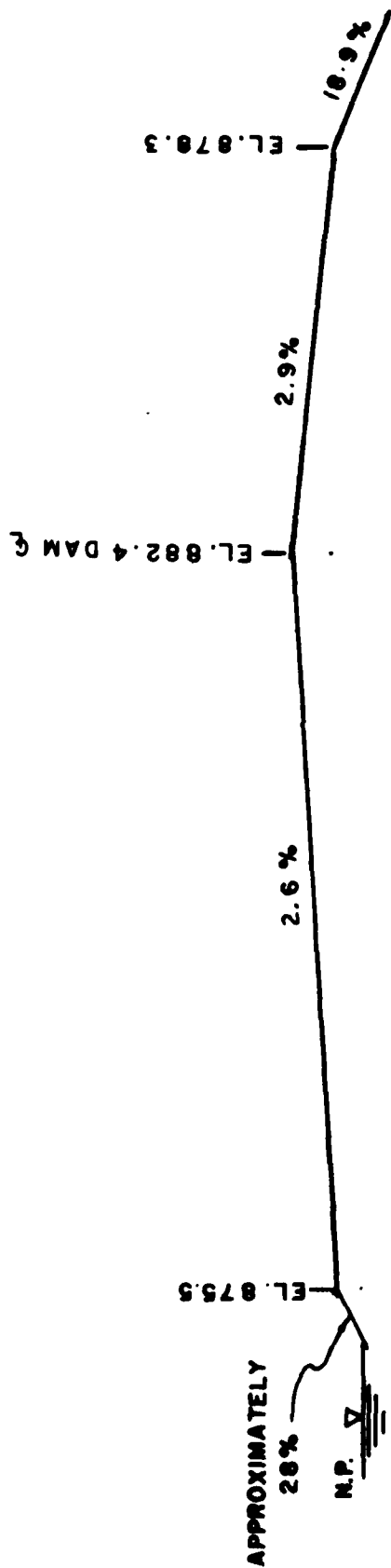


EMERGENCY SPILLWAY CONTROL SECTION A-A
SCALE: 1" = 20'

NOTE: EFFECTIVE SPILLWAY CREST EL. = 882.4

RED BOILING SPRINGS
DAM NO. 1

DRAWN BY: G.A.D.
DATE: 12 JAN. 81
SHEET: 3 OF 5



EMERGENCY SPILLWAY PROFILE

HORZ SCALE 1"= 60'

VERT SCALE 1"= 30'

RED BOILING SPRING
DAM NO. 1

DRAWN BY: W H C
DATE: 12 JAN. 81
SHEET: 5 OF 5

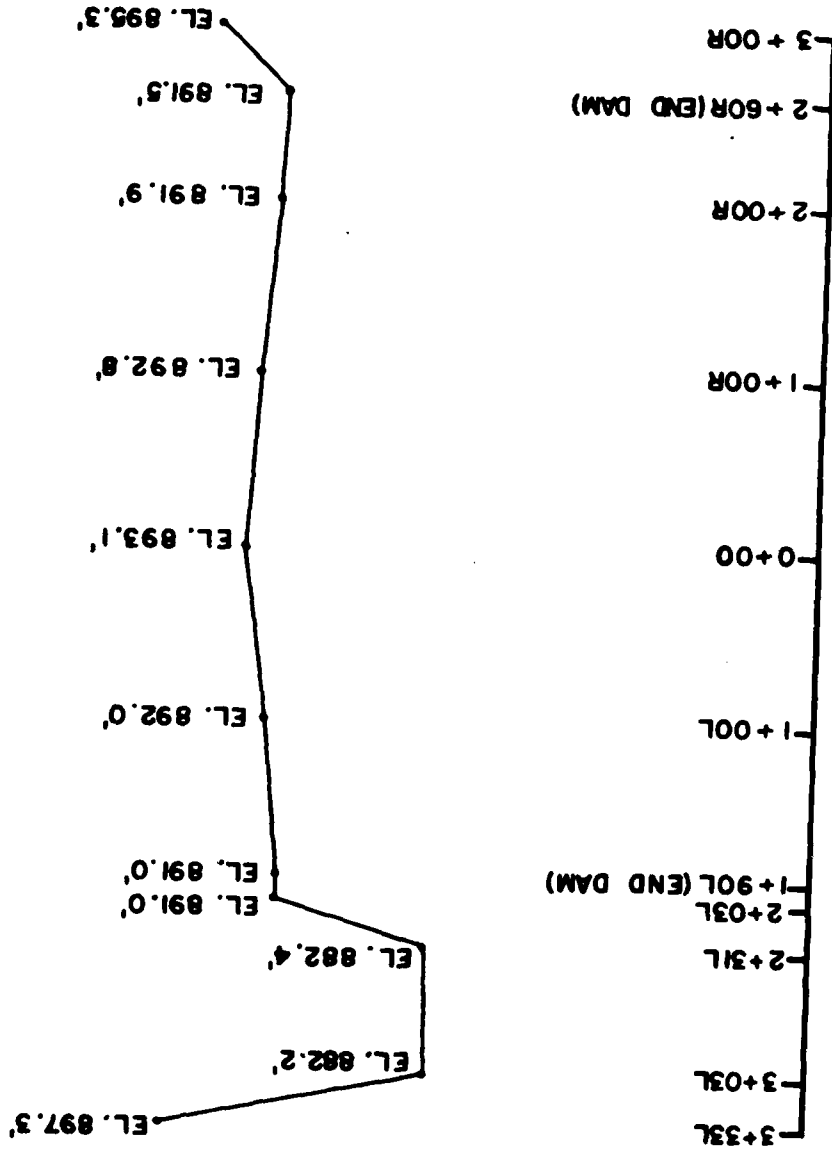
RED BOILING SPRING DAM NO. 1

DRAWN BY: M.J.F.
DATE: 12 JAN. 8
SHEET: 5 OF 5

DAM & PROFILE

H. SCALE: 1" = 100'

V. SCALE: 1" = 10'



APPENDIX C
PHOTOGRAPHIC RECORD

Photo Log

- Photo No. 1 - Overview from berm above emergency spillway.
- Photo No. 2 - Dam crest from right side.
- Photo No. 3 - Upstream face from right.
- Photo No. 4 - Upstream face from left.
- Photo No. 5 - Reservoir.
- Photo No. 6 - Dam crest and spillway entrance channel.
- Photo No. 7 - Riser.
- Photo No. 8 - Riser showing low water release duct.
- Photo No. 9 - Impact basin.
- Photo No. 10 - Principal spillway outlet inside impact basin.
- Photo No. 11 - Embankment drain outlet pipe showing some minor fines deposition.
- Photo No. 12 - Emergency spillway crest showing grout cap, looking downstream.
- Photo No. 13 - Minor erosion along right downstream abutment.
- Photo No. 14 - View from end of emergency spillway exit channel.
- Photo No. 15 - Home downstream of dam.
- Photo No. 16 - Looking downstream from crest at mid-section.
- Photo No. 17 - View of natural channel just downstream of dam.
- Photo No. 18 - Monument plaque.
- Photo Nos. 19 & 20 - Aerial shots.

NOTE: All photographs containing snow were taken on the date of the inspection. Aerial shots were taken on April 21, 1981. All others were taken as part of the pre-inspection reconnaissance, December 30, 1980.



PHOTO NO. 1



PHOTO NO. 2



PHOTO NO.3.



PHOTO NO.4.



PHOTO NO.5



PHOTO NO.6



PHOTO NO.7



PHOTO NO.8

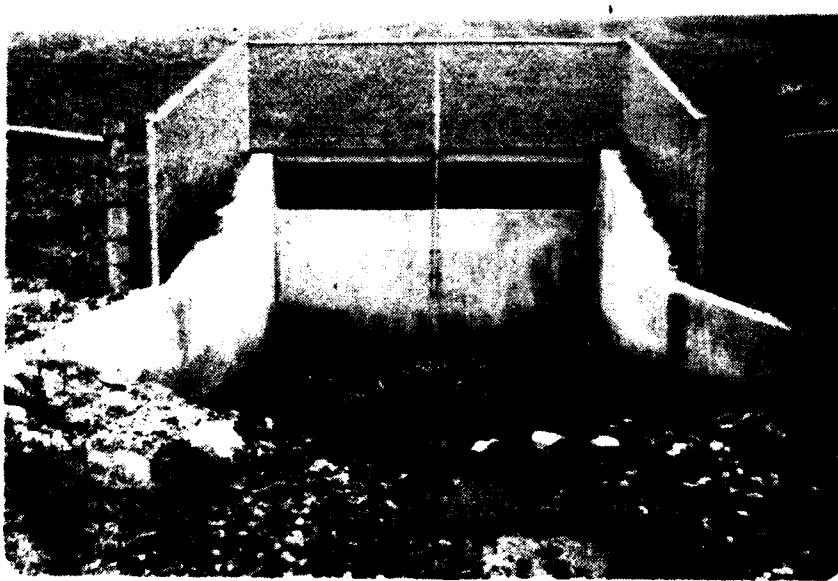


PHOTO NO. 9



PHOTO NO. 10



PHOTO NO. 11



PHOTO NO.12



PHOTO NO.13



PHOTO NO.14



PHOTO NO.15



PHOTO NO. 16

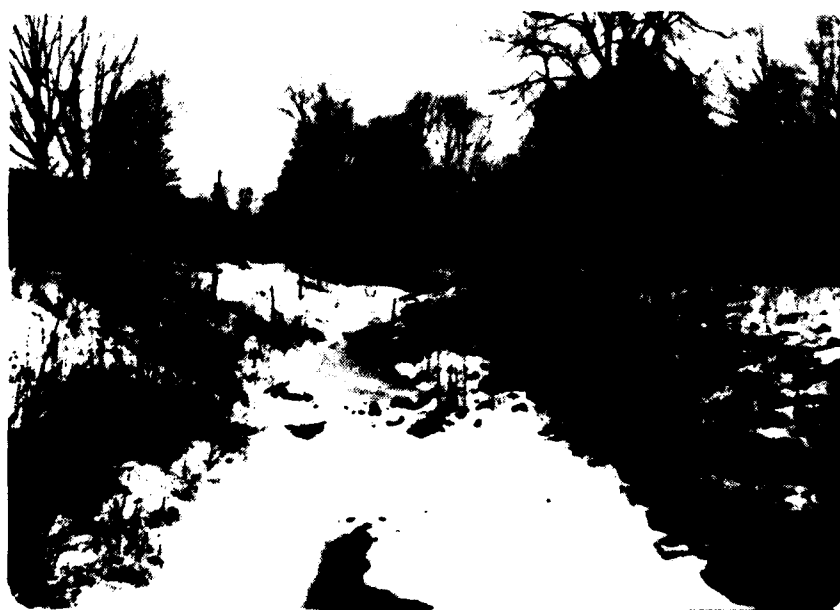


PHOTO NO. 17

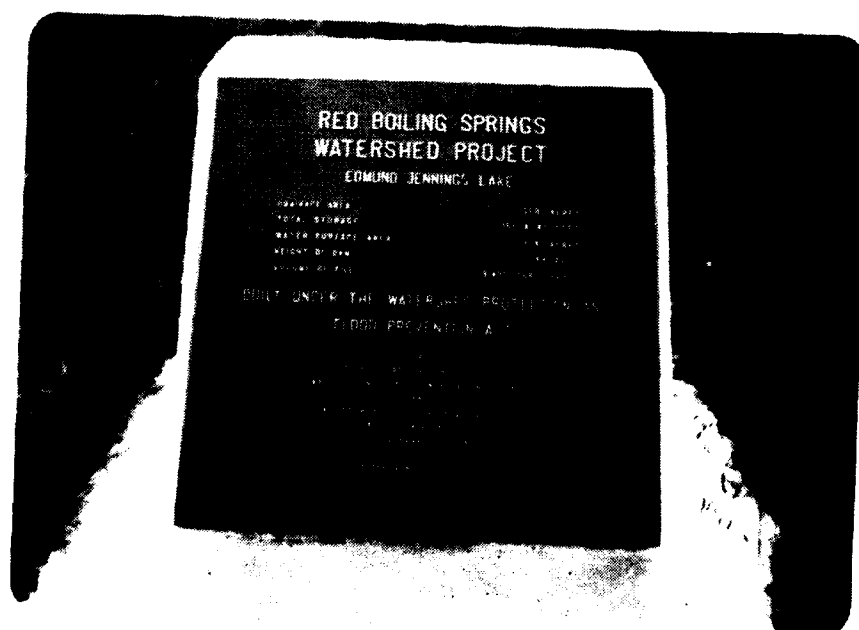


PHOTO NO. 18



PHOTO NO .19



PHOTO NO .20

APPENDIX D
TECHNICAL CRITIQUE -
CHECKLISTS FOR VISUAL INSPECTION,
ENGINEERING DATA, SOIL TESTS

Check List
Visual Inspection of Earth Dams
Department of Conservation
Division of Water Resources

Name of Dam Red Boiling Springs Dam No. 1

County Macon Date of Inspection January 8, 1981

ID # - State 56-7004 Federal TN 11104

Type of Dam Earth

Hazard Category-Federal High State 1

Weather Cloudy, cold, scattered snow on ground Temperature 25° F

Pool at Time of Inspection Approx. 25' (distance from crest)

Tailwater at Time of Inspection few tenths (distance from stream bed)

Design/As Built Drawings Available: Yes X No

Location: SCS - Nashville

Copy Obtained: Yes X No

Reviewed: Yes X No

Construction History Available: Yes X No

Location: SCS + Nashville, Watershed District Board

Copy Obtained: Yes No

Reviewed: Yes No

Other Records and Reports Available: Yes No X

Location:

Copy Obtained: Yes No

Reviewed: Yes No

Prior Incidents or Failures: Yes No X

Inspection Personnel and Affiliation:

Ed O'Neill - TDWR Al Dunn - Corps of Engineers

Bob Ramsey - TDWR Paul Goforth - SCS District Conservationist
(Cookeville)

Bill Culbert - TDWR

I. Embankment

A. Crest

Description (1st inspection) 6" gravel cover on
crest. Some snow cover . No differential settlement.

1. Longitudinal Alignment Linear

2. Longitudinal Surface Cracks None

3. Transverse Surface Cracks None

4. General Condition of Surface Good.

5. Miscellaneous _____

B. Upstream Slope

1. Undesirable Growth or Debris None

2. Sloughing, Subsidence, or Depressions None

3. Slope Protection Thick grass cover of fescue and
crown vetch with winter wheat intersperced. 12 foot
wave berm at normal pool.

a. Condition of Riprap N/A

b. Durability of Individual Stones N/A

c. Adequacy of Slope Protection Against Waves
and Runoff Adequate

d. Gradation of Slope Protection - Localized Areas
of Fine Material N/A

4. Surface Cracks None

C. Downstream Slope

1. Undesirable Growth or Debris None

2. Sloughing, Subsidence, or Depressions; Abnormal
Bulges or Non-Uniformity None
3. Surface Cracks on Face of Slope None
4. Surface Cracks or Evidence of Heaving at
Embankment Toe None
5. Wet or Saturated Areas or Other Evidence of Seepage
on Face of Slope; Evidence of "Piping" or "Boils"
None
6. Drainage System Rockfill drainage system at toe.
7. Fill Contact with Outlet Structure Good. No
erosion. Drains around endwall and stilling basin
have a small flow and have deposited a thin layer of
finer in the basin.
8. Condition of Grass Slope Protection Excellent.

D. Abutments

1. Erosion of Contact of Embankment with Abutment from
Surface Water Runoff, Upstream or Downstream _____
Small gully at right downstream slope from surface
runoff. Not serious. _____
2. Springs or Indications of Seepage Along Contact of
Embankment with the Abutments _____ None _____

3. Springs or Indications of Seepage in Areas a Short
Distance Downstream of Embankment - Abutment Tie-in
None _____

II. Area Downstream of Embankment, Including Channel

A. Localized Subsidence, Depressions, Sinkholes, Etc. _____

None

B. Evidence of "Piping", "Boils", or "Seepage" _____

None

C. Unusual Presence of Lush Growth, such as Swamp

Grass, etc. None

D. Unusual Muddy Water in Downstream Channel _____

None

E. Sloughing or Erosion Slight erosion of downstream

channel.

F. Surface Cracks or Evidence of Heaving Beyond

Embankment Toe None

G. Stability of Channel Sideslopes Fair

H. Condition of Channel Slope Protection No significant

protection.

I. Adequacy of Slope Protection Against Waves, Currents,
and Surface Runoff Fair

J. Miscellaneous

K. Condition of Relief Wells, Drains, and Other
Appurtenances N/A

L. Unusual Increase or Decrease in Discharge from
Relief Wells N/A

II. Instrumentation

A. Monumentation/Surveys Monument with plaque near
toe of dam.

B. Observation Wells N/A

C. Weirs N/A

D. Piezometers N/A

E. Other _____

IV. Spillways

A. Service Spillway (Service/Emergency Combination Yes ☐ No ☒)

1. Intake Structure Condition Riser appears to be in good condition with no noteworthy weathering.
2. Outlet Structure Condition Good condition. No erosion around impact basin.
3. Pipe Condition Pipe outlet appears in excellent condition.
4. Evidence of Leakage or Piping Some flow through pipe. May be leaking past gate.
5. General Remarks Deep water intake on upstream side of riser.

B. Emergency Spillway

1. General Condition Excellent. Uniform and well defined with thick grass cover on side slopes. Base is mostly rock with grass covered patches of earth.
2. Entrance Channel Good condition. no obstructions. A cave was grouted in this area.
3. Control Section Excellent condition. Concrete grout cap along most of section at dam centerline.

3. Exit Channel Good grass cover on slopes with rock
base.
4. Vegetative/Woody Cover Grassed side slopes.
5. Other Observations Orientation of emergency spill-
way is such that discharge may affect house immediately
downstream.

7. Emergency Drawdown Facilities (if part of service spillway
so state) Part of service spillway located at bottom of
riser. 24" slide gate covering 24" opening.

Are Facilities Operable: Yes X No

Were Facilities Operated During Inspection: Yes No X

Date Facilities Were Last Used Gate closed in 1980 to fill

lake. (Reservoir was approximately 6' below normal
pool at time of inspection.)

VI. Reservoir

A. Slopes 10%

B. Sedimentation Low

C. Turbidity Low

VII. Drainage Area

Description (for hydrologic analysis) _____

Grassed pasture, row crops, and woods.

A. Changes in Land Use None expected.

III. Downstream Area (Stream)

A. Condition (obstructions, debris, etc.) _____

None

B. Slopes 1.5% channel

C. Approximate No. Homes, Population, and Distance D/S

Numerous houses downstream of dam. One house

immediately downstream. Two hotels.

D. Other Hazards State highway and several county roads.

X. Miscellaneous

Incidents/Failures Dam was slightly overtopped during
construction with little damage. Dam has three grout curtains
near centerline, 12½ feet apart, plus upstream and downstream
grout curtain.

Observed Geology of Area Fort Payne Formation. Most of dam
is comprised of gravelly soil.

X. Conclusions

Dam is in excellent condition.

XI. Recommendations

Continue a regular program of protection and maintenance.

Regional Engineer

Chief Engineer

OHIO RIVER DIVISION, NASHVILLE DISTRICT SOIL TEST DATA SUMMARY

PROJECT Red Boiling Springs No. 1 HOLE _____ ELEV. TOP _____ SHEET 1 OF 1 SHEETS

[illegible]

APPENDIX E
DESIGN DRAWINGS

DAM NO. 1

RED BOILING SPRINGS WATERSHED MACON AND CLAY COUNTIES, TENNESSEE

U.S. DEPARTMENT OF AGRICULTURE

SOIL CONSERVATION SERVICE

COOPERATING WITH

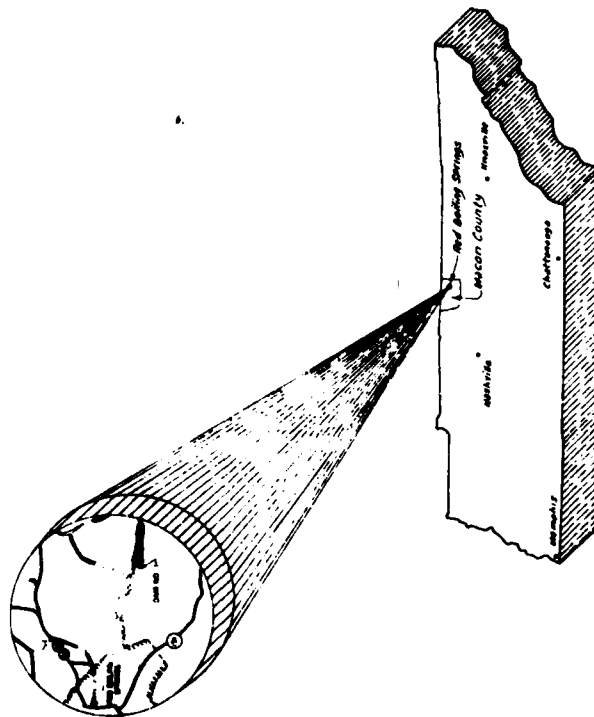
CITY OF RED BOILING SPRINGS

MACON COUNTY SOIL CONSERVATION DISTRICT

CLAY COUNTY SOIL CONSERVATION DISTRICT

AND

U. S. DEPARTMENT OF AGRICULTURE, FOREST SERVICE



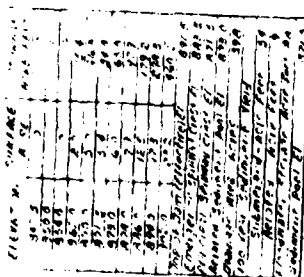
INDEX TO DRAWINGS

- 1 Section map
- 2 Site location map
- 3 Site location map
- 4 Shoreline Shaping & Grading
- 5-6 Principal Shillings
- 7 Ditch and Race Fill Details
- 8 New Ditch
- 9-10 New Ditch
- 11-12 New Ditch
- 13-14 New Ditch
- 15-16 New Ditch
- 17-18 New Ditch
- 19-20 New Ditch
- 21 Filter Details - Impact Basin
- 22 Impact Basin Cover & Fence Details
- 23 Typical Section - Embankment
- 24 Typical Section - Foundation
- 25 Foundation Treatment Details
- 26 Legend of Bearings
- 27 Typical Section - Grouting Chamber
- 28 New - Grouting Chamber
- 29 New - Grouting Chamber
- 30 New - Grouting Chamber
- 31 New - Grouting Chamber
- 32 New - Grouting Chamber
- 33 New - Grouting Chamber
- 34 New - Grouting Chamber
- 35 New - Grouting Chamber
- 36 New - Grouting Chamber
- 37 New - Grouting Chamber
- 38 New - Grouting Chamber
- 39 New - Grouting Chamber
- 40 New - Grouting Chamber
- 41 New - Grouting Chamber
- 42 New - Grouting Chamber
- 43 New - Grouting Chamber
- 44 New - Grouting Chamber
- 45 New - Grouting Chamber
- 46 New - Grouting Chamber
- 47 New - Grouting Chamber
- 48 New - Grouting Chamber
- 49 New - Grouting Chamber
- 50 New - Grouting Chamber
- 51 Structure Monument

CONSTRUCTION - APPROVED
By: [Signature]
Date: [Date]
Checked by: [Signature]
Date: [Date]
Approved by: [Signature]
Date: [Date]

7/1 TN-2038-1

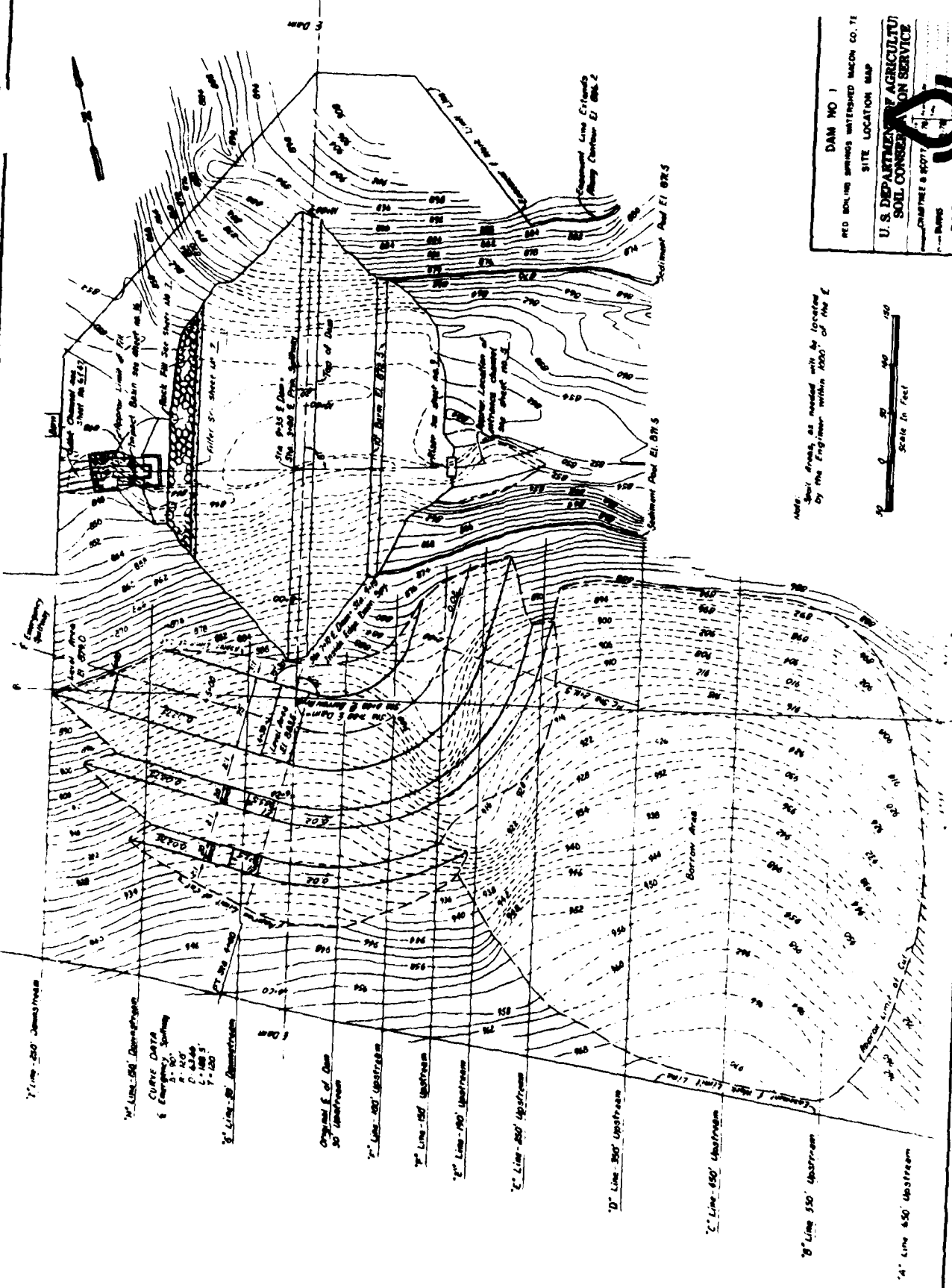
1. How many of the data will be close to zero for a sign test above median?
2. How many of the data will be rejected as not normal?
3. This test will be done prior to conducting



DAM NO 1
RED BOILING SPRINGS WATERSHED MACON CO. TENN

RESERVING AREA MAP
U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

TN-2035-1



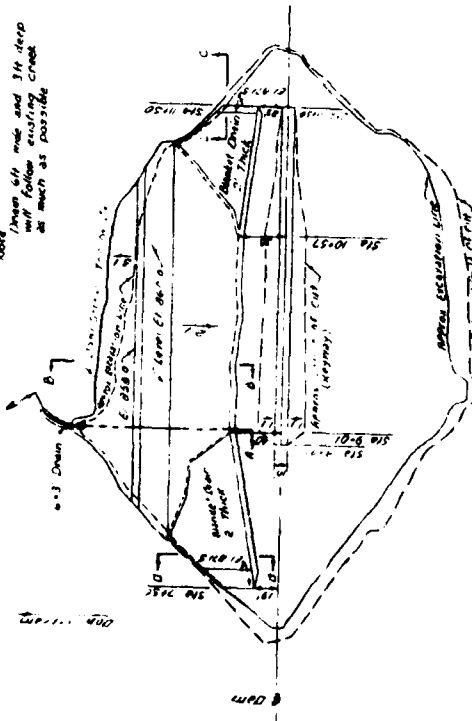
DAM NO 1
RED BOLLING SPRINGS WATERSHED MACON CO. GE
SITE LOCATION MAP
U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
CHARLES E. SCOTT
BUREAU
MADE BY
M.F.C.
TN-2035

Note: Areas as needed will be located by the Engineer within 500' of the E

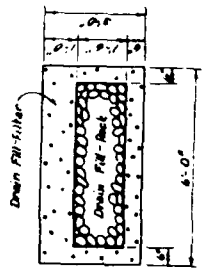


MAIN FILL		EXIST. EXCAVATION	
1	2	3	4
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2	0.5	0.5	0.5
3	0.5	0.5	0.5
4	0.5	0.5	0.5
5	0.5	0.5	0.5
6	0.5	0.5	0.5
7	0.5	0.5	0.5
8	0.5	0.5	0.5
9	0.5	0.5	0.5
10	0.5	0.5	0.5
11	0.5	0.5	0.5
12	0.5	0.5	0.5
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42	0.5	0.5	0.5
43	0.5	0.5	0.5
44	0.5	0.5	0.5
45	0.5	0.5	0.5
46	0.5	0.5	0.5
47	0.5	0.5	0.5
48	0.5	0.5	0.5
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63	0.5	0.5	0.5
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67	0.5	0.5	0.5
68	0.5	0.5	0.5
69	0.5	0.5	0.5
70	0.5	0.5	0.5
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90	0.5	0.5	0.5
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92	0.5	0.5	0.5
93	0.5	0.5	0.5
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95	0.5	0.5	0.5
96	0.5	0.5	0.5
97	0.5	0.5	0.5
98	0.5	0.5	0.5
99	0.5	0.5	0.5
100	0.5	0.5	0.5

Note: When 6th and 9th deep will follow existing creek as much as possible.

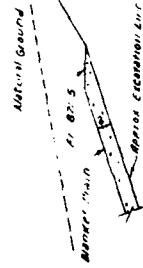


SECTION D-D

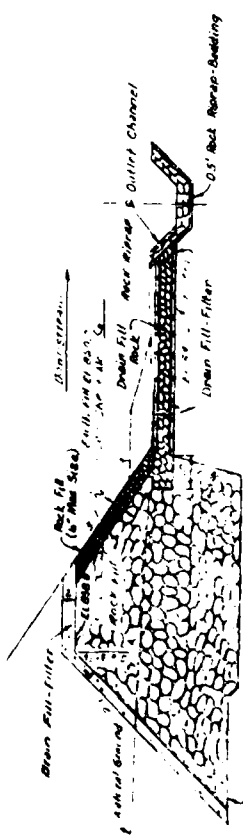


SECTION - 6-13' DRAIN

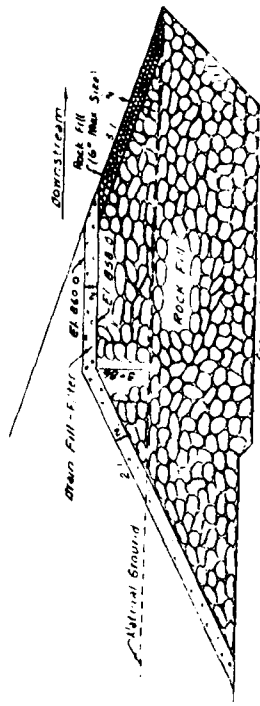
Note: Drain is to extend 10' into Rock Fill area. The Drain Fill-Filler will be omitted for this portion.



SECTION - C-C



SECTION - A-A



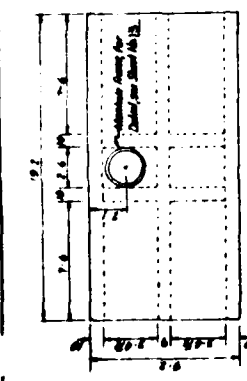
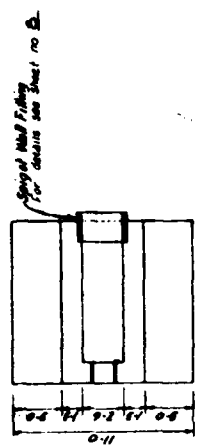
SECTION - B-B

DAM NO. 1
RED BOLLING SPRINGS WATERSHED MACON CO. TENN.
DRAIN AND ROCK FILL DETAILS

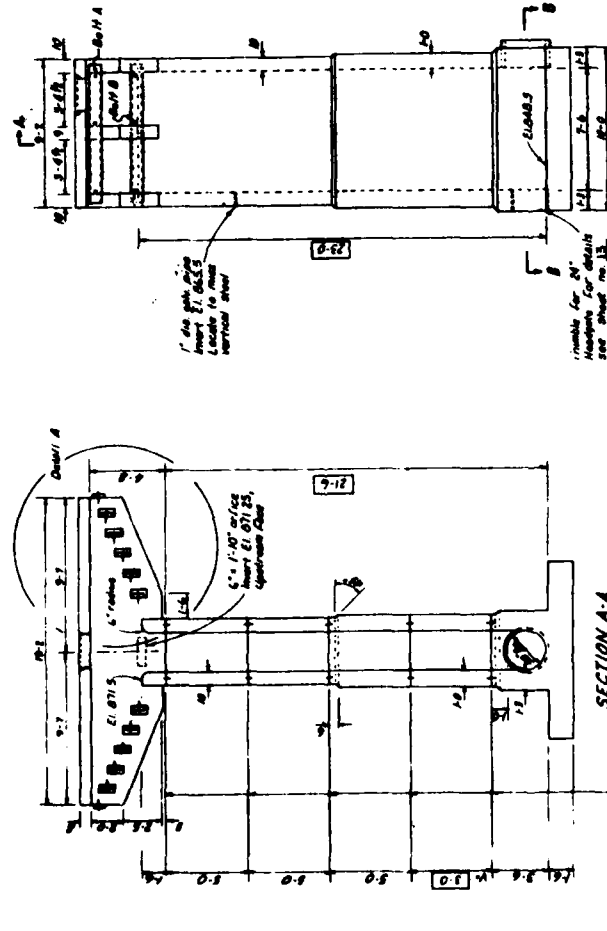
U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

CHARLES B. SCOTT
D. M. SULLIVAN
J. M. SULLIVAN

TN-2035-1



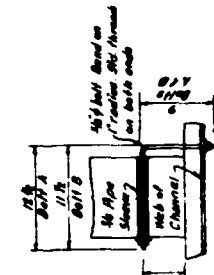
TOP PLAN



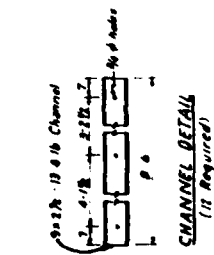
SECTION A-A

Please Construction
Details for details
See sheet no. 13

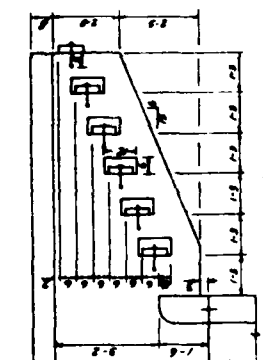
SIDE ELEVATION



BOLT DETAIL
(Bolt A - 3/4" Dia)
(Bolt B - 1/2" Dia)



CHANNEL DETAIL
(If Required)



DETAILS

- NOTES: Dimensions are out to out of bar
1. Bar sizes are 3/8" and 1/2" diameter
 2. The 3/8" bar is used for all other details
 3. The 1/2" bar is used for all other details
 4. For all support details see sheet no. 13
 5. For hinge details see sheet no. 13
 6. For deep meter base device detail
 7. Channel detail see sheet no. 13
 8. All iron cast channels, bolts and nuts shall be galvanized all nuts shall be hexagonal

MARK	SIZE	QUANTITY	LENGTH	TYPE	Ø	C	Ø	C	Ø	C
1	1/2"	1	10'-6"	1						
2	1/2"	1	10'-6"	1						
3	1/2"	1	10'-6"	1						
4	1/2"	1	10'-6"	1						
5	1/2"	1	10'-6"	1						
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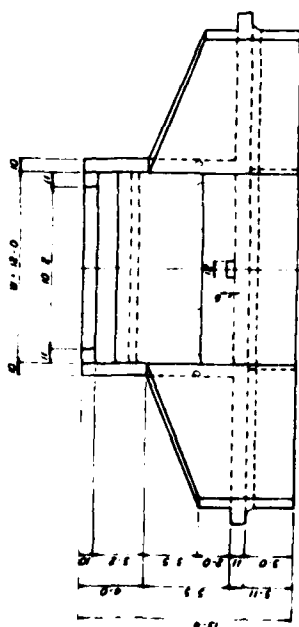
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DAM NO 1
 RED BOLLING SPRINGS WATERBED MASON CO. TENN
 RISER DETAILS
 U.S. DEPARTMENT OF AGRICULTURE
 SOIL CONSERVATION SERVICE
 CHARTER NO 3007 4-7-70
 SANDERS
 3-7-70
 6-7-70
 TN-2035-1

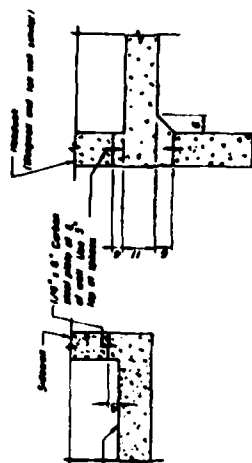


Not to Scale

DAM NO 1					TN-2035-H
RED BOILING SPRINGS WATERFISHED MACON CO, TENN.					
BEEP WATER RELEASE DEVICE					
U S DEPARTMENT OF AGRICULTURE					
SOIL CONSERVATION SERVICE					
CHASTREE B SCOTT 4 76					
SULLIVAN 5 76					
FREEMAN 7 76					
77 E C					



DOWNSTREAM ELEVATION



CONSTRUCTION JOINT DETAILS

Wale
Chamber of Commerce about 3%.

QUANTITIES	
Resin (Copoly ester)	16.00 kg (1)
Reinforced Concrete	Co HC
Reinforcing Steel	400
6" Polypropylene mesh	1.00 (1)
Asphalt concrete (gravel, sand)	50
Drum steel mesh	50
Drum steel mesh	50
Drum steel mesh	50
Drum steel mesh	50
1.10% Material	4.2 Co V
2. 6" Carbon steel mesh, structural grade	700

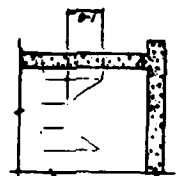
DAM NO :

RED BONE WING SPRINGS WATER-SIDE MACON, CO., TENN

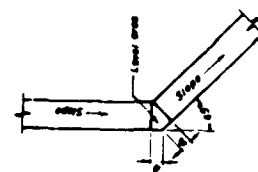
U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

9-10-64

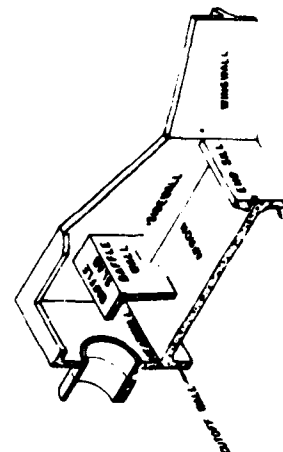
4-16



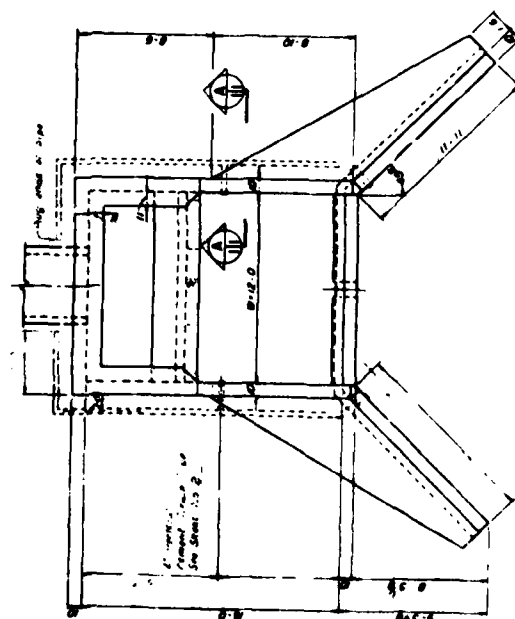
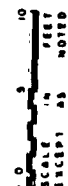
SECTION 101



PLAN - JUNCTION
SAFE WALL AND
WING WALL
NOT TO SCALE



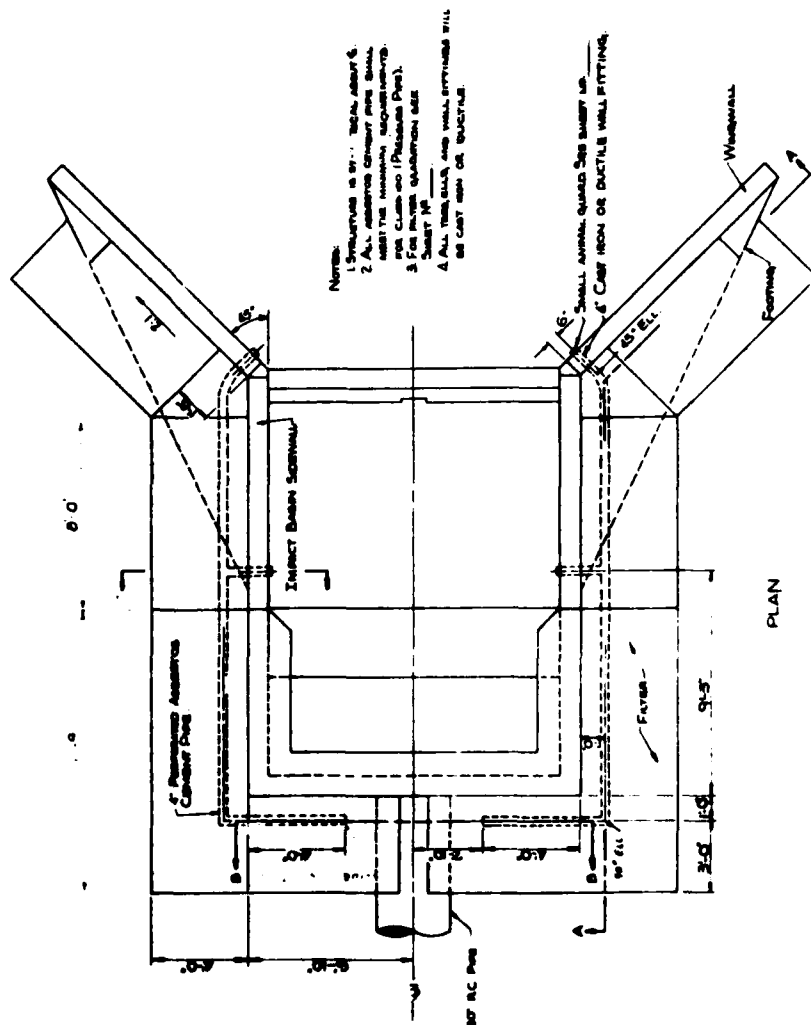
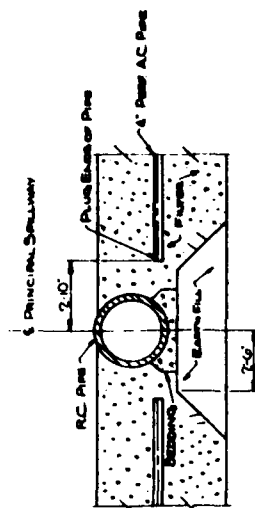
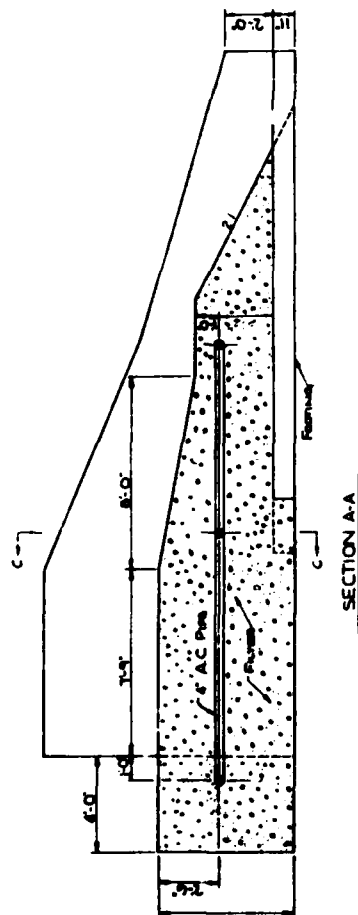
ISOMERISM VIEW



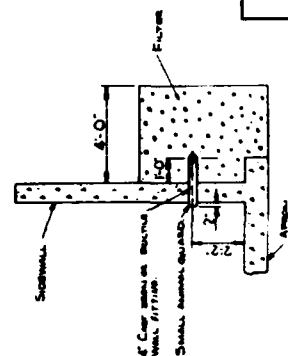
PLAN

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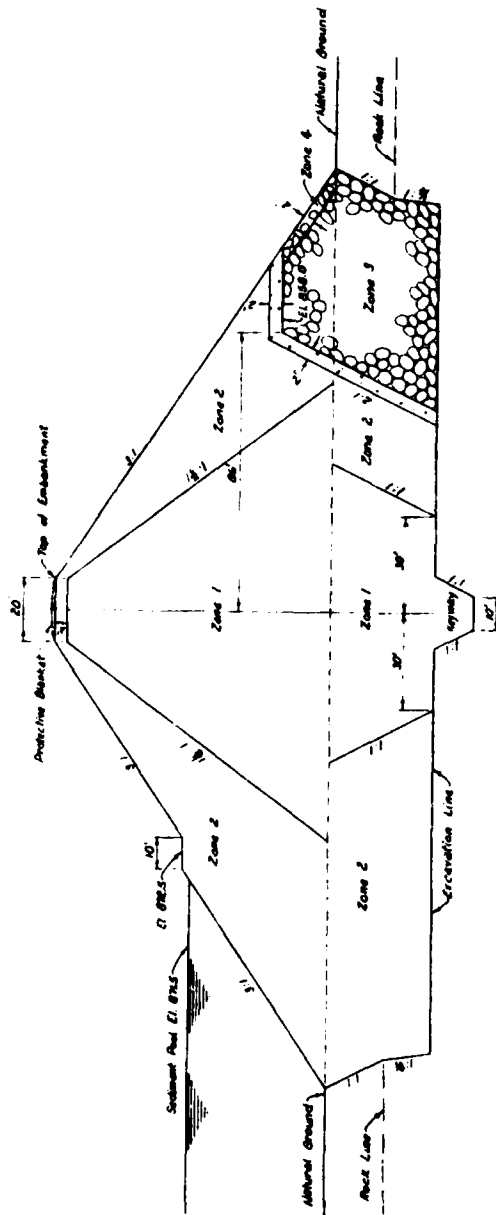
1 AM: MONDE



- Notes:
1. Structure is to be built about 6' high.
 2. All concrete shall be rubble concrete with 1/2 inch nominal size aggregate and 4000 psi (28 day) strength.
 3. For more information see Sheet 10.
 4. All materials and workmanship will be cast in place or better.



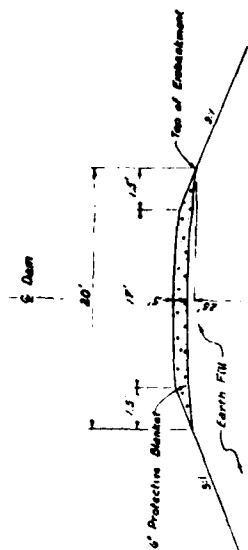
DAM NO. 1	
U.S. DEPARTMENT OF AGRICULTURE SOIL CONSERVATION SERVICE	
N. 7035-1	



TYPICAL SECTION - EMBANKMENT

EMBANKMENT ZONE		REQUIRED USE OF EXCAVATION MATERIAL		LAB TEST		CONSTRUCTION REQUIREMENTS		LAB	
Zone No.	Description	Location	From To	Standard	Min. Dry Density	Min. Dry Density	Min. Dry Density	Comp. %	Class. / Remarks
1	Inside and Core	Barrow (Emergency) Sp.	3	91.0	27	91.1	27	12.5	CH
2	Outside Sections	Barrow (Emergency) Sp.	3	89.5	28	87.7	28	12.5	GM
2	Outside Sections	Barrow (Emergency) Sp.	3	92.0	27.5	90.2	27.5	12.5	GM
2	Outside Sections	Foundation	2	93.5	19	90.9	19	12.5	GC
2	Outside Sections	Foundation	7	97.5	16.5	102.7	16.5	12.5	GC
3	Damstream Toe	Foundation (Emergency) Sp.	7	15	Method	Method	Method	Method	Rock

Notes:
 1. The engineer will direct a selective placement of all fill materials in consideration of the permitted uses shown in the table above.
 2. Zones shown are for guidance in placement only and have no fixed limits. They are variable to the extent that materials are suitable to construct the zones as recommended in the table above.



DETAILS OF PROTECTIVE BLANKET
 (From Approval Sta 7+39 To Approval Sta 12+01)

DAM NO 1
 RED SOILS SPURIOUS WATERED MAJOR CL. TERM
 TYPICAL SECTIONS - EMBANKMENT
 U.S. DEPARTMENT OF AGRICULTURE
 SOIL CONSERVATION SERVICE
 CHARTERED & SOIL
 ENGINEERS
 19 C C
 TN-2035-1

Adjoining Ground

Rock Line

Feathers

Top of Arch of 1st 150' Span No. 28'

Spine of Dam

Crack

Estimation Line

Limits of Dam's Foundation Transferred

Crack

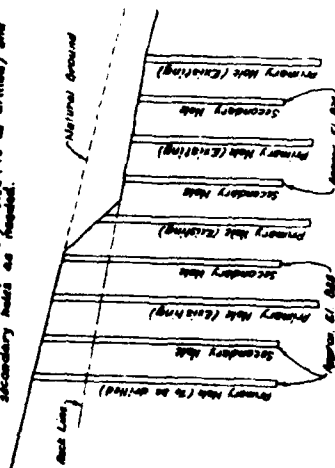
Feathers

Crack

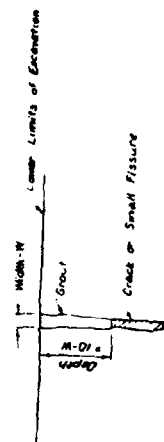
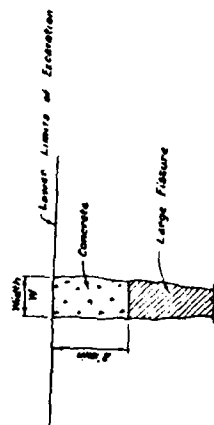
Rock Line

TYPICAL SECTION-DENTAL FOUNDATION TREATMENT

1. Foundation Excavation will be completed prior to grouting primary holes.
2. The engineer will determine the final location and depth of primary holes (to be drilled) and secondary holes as needed.



TYPICAL SCOUT MILE PLACEMENT



DETAILS OF DENTAL FOUNDATION TREATMENT

DAM NO 1
RED BOLLING SPRINGS WATERSHED MACON CO, TENN
FOUNDATION TREATMENT DETAILS

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

CHARTER & SCOTT

Cheng

Spokane, Wash.

W.F. 1
TN-2035-1

Abel To Seal

[illegible]

	Designated Change
	Designated Numbered Plate Area
	Designated Chart or Area
	Designated County or County Filled or Partially Filled with 1979-1981 City Population Statistics

Centering of Dam	1-17
Survey Area	100-199
Emergency Spillway	100-199
Concrete Apron/ Spillway	100-199
Valley Section between Piers & Dam	100-199
Spillway Section Dam/Stream from S Dam	100-199
Spillway Section Dam/Stream from S Dam	100-199
Spillway Section Dam/Stream from S Dam	100-199

1. All soil classifications are field classifications.
2. Unified Soil Classification System used.
3. Soil investigation report is available for review by requesting agency at the office issuing the authorization.

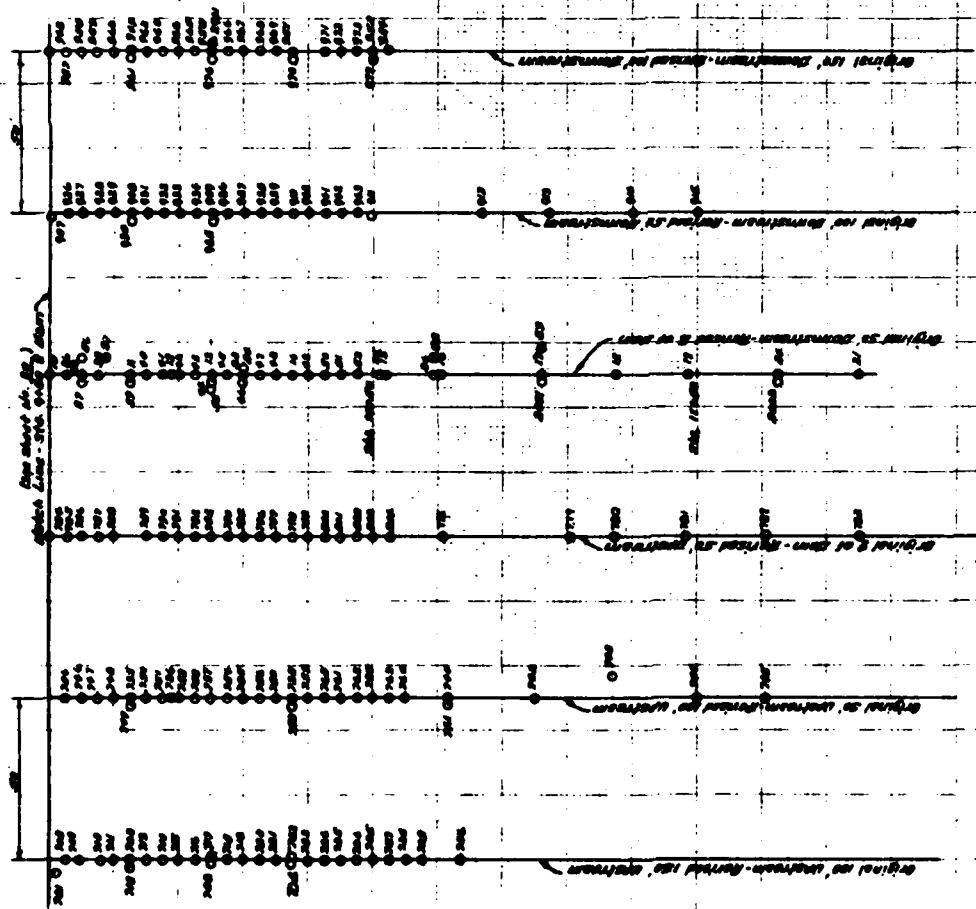
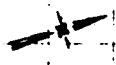
2nd State + 2d. (Profession)

DAM NO. 1
RED BOILING SPRINGS WVS MACOM CO TENN
LEGEND OF BORNHES

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

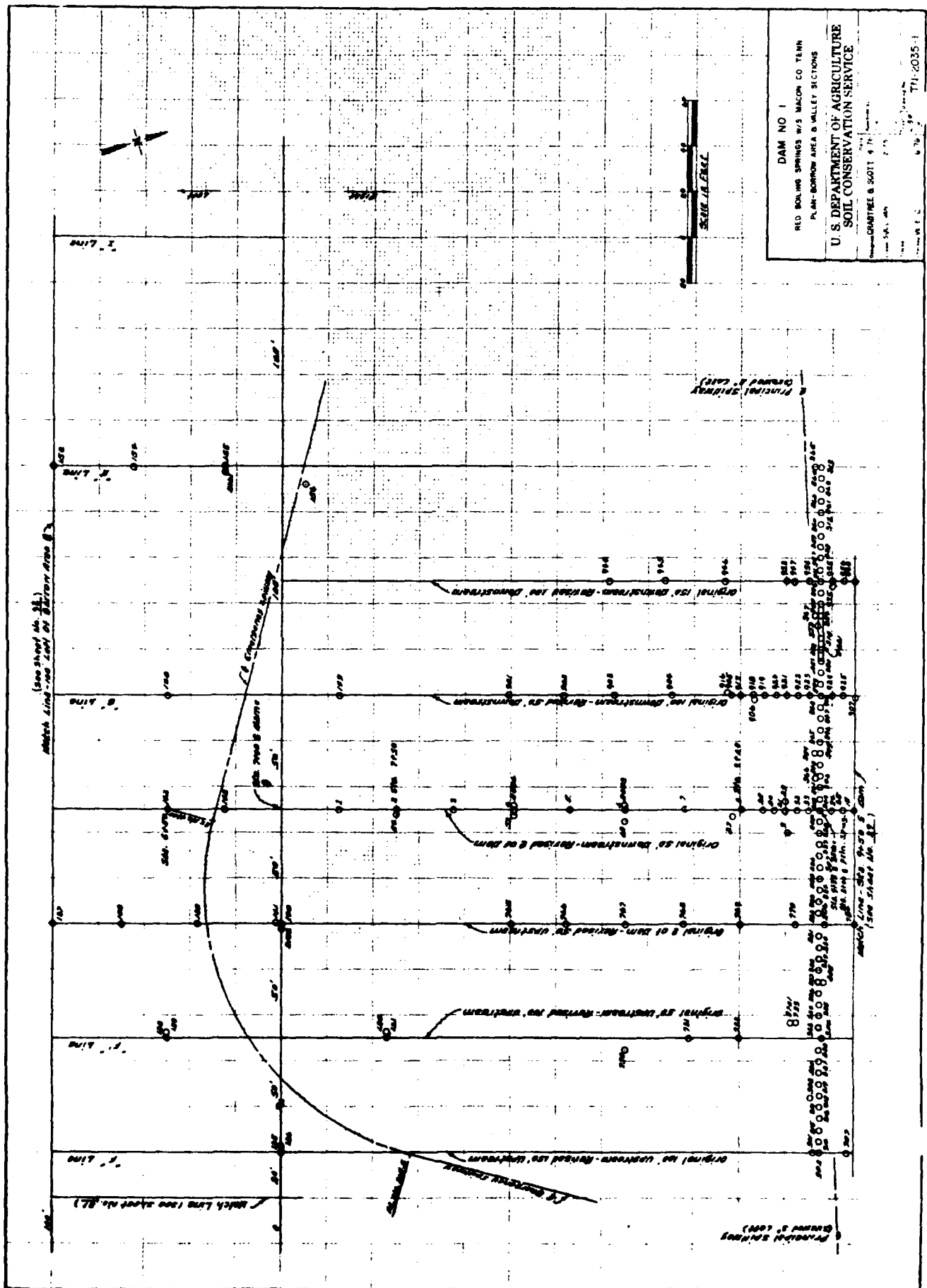
0014
CHRISTINE B SCOTT 4-76
- BIRTH 2 73
Approved by
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- 28
- 26
TN-2039-1

IN-2035-1

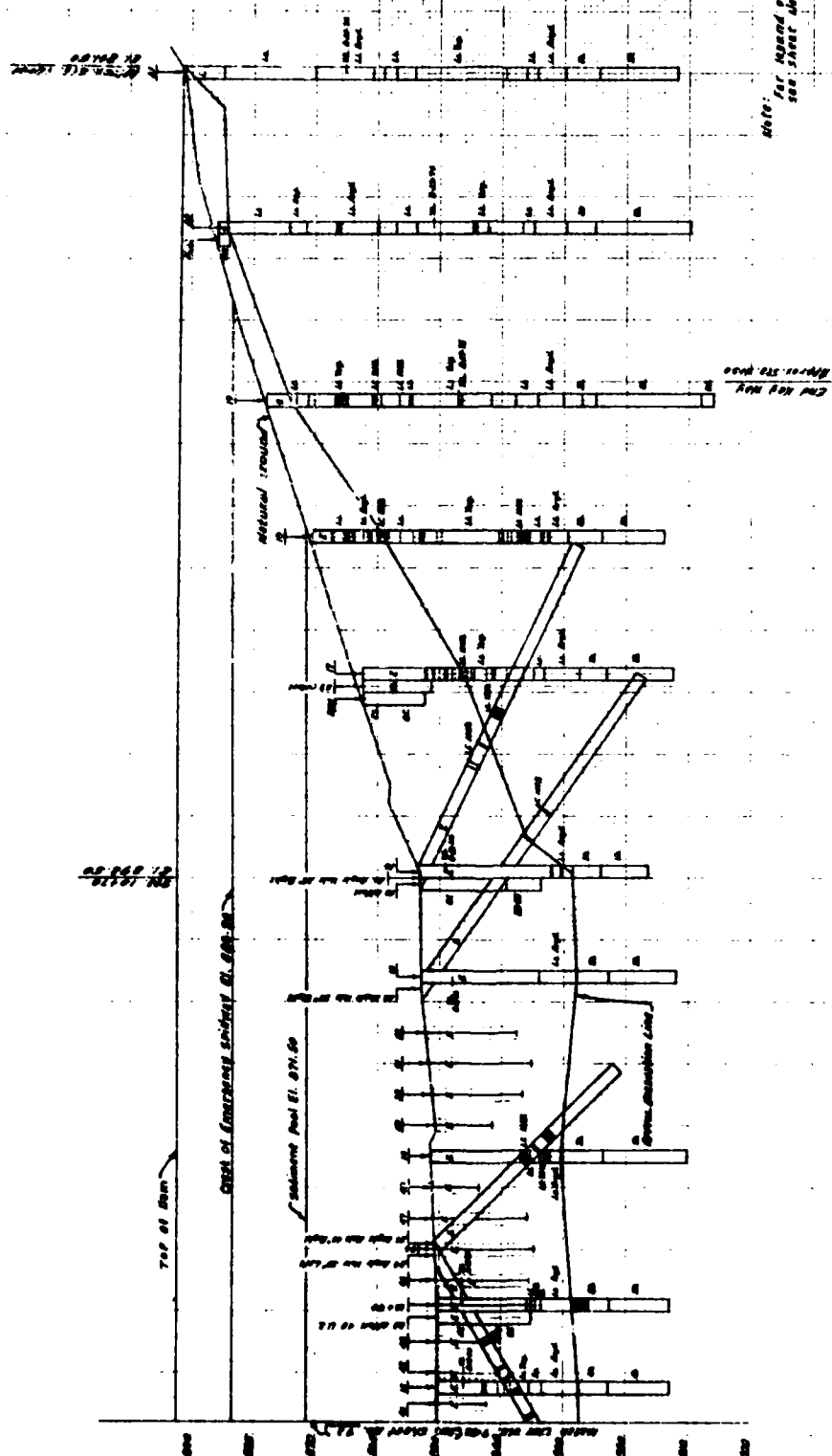


Scale 1/2 inch = 1 foot

DAM NO. 1	
RED BOLLING SPRINGS NVA, MACON CO. TENN.	
PLAN - BORROW AREA & WILLEY SECTIONS	
U. S. DEPARTMENT OF AGRICULTURE	
SOIL CONSERVATION SERVICE	
Engineer	CHARLES E. SCOTT
Drawn	W. E. C.
Check	W. E. C.
Date	6-7-36
Sheet	1 of 1
TN-2035-1	

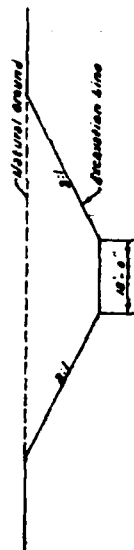


DAM NO. 1
 FIELD BORROW SPRINGS W/S MACOM CO TENN
 PLANT-BORROW AREA & VALLEY SECTIONS
 U. S. DEPARTMENT OF AGRICULTURE
 SOIL CONSERVATION SERVICE
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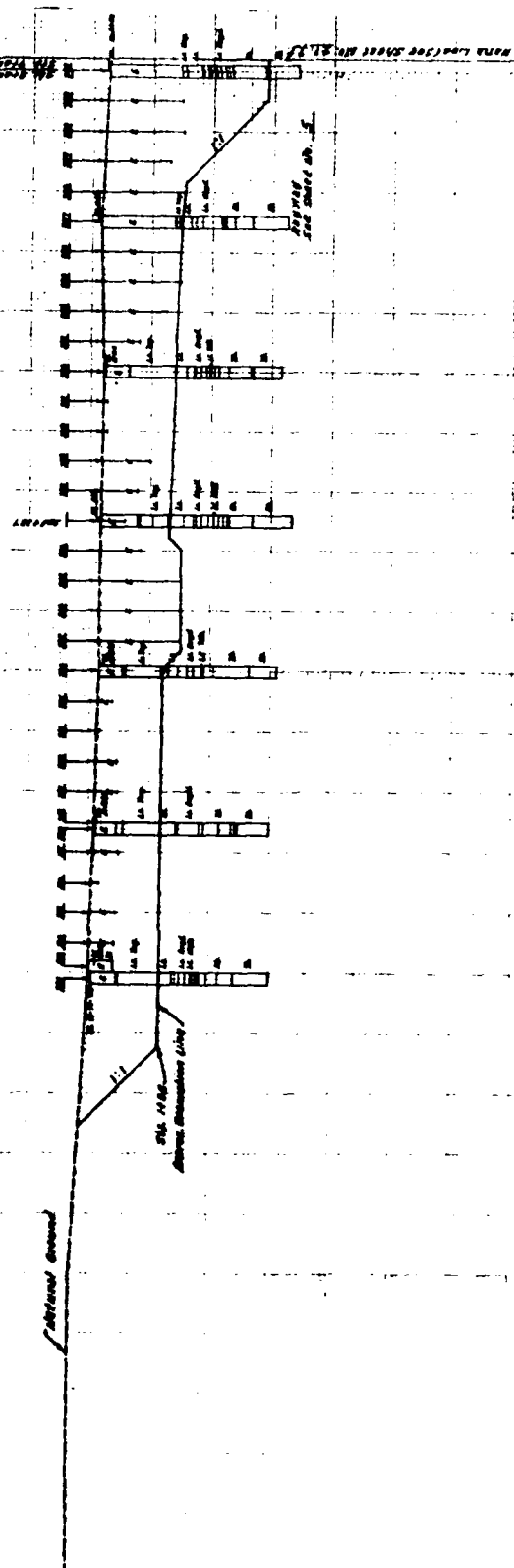
DAM NO. 1
 REC. BOLDING SPRINGS W/S. MACON CO. TENN.
 ORIGINAL VALLEY SECTION 80' DOWNSTREAM
 REVISED PROFILE E. OF DAM
 U. S. DEPARTMENT OF AGRICULTURE
 SOIL CONSERVATION SERVICE
 Prepared by CHARTER & SCOTT 4/70
 Drawn by J. H. H. 4/70
 Scale 1" = 20' HORIZ. 1" = 10' VERT.
 Sheet 1 of 1

PROFILE - E. DAM



TYPICAL SECTION - PRINCIPAL SAILWAY

Notes: are drilled 90° to E of dam.
personal surveying is accurate 3" vert.



Note: For Report of Barings
See Sheet No. 13

PROFILE 8. PRINCIPAL SPILLWAY

DAM NO 1
NEED BOILING SPRINGS W/5 WAGON CO TENN
PROFILE & PRINCIPAL SPILLWAY

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

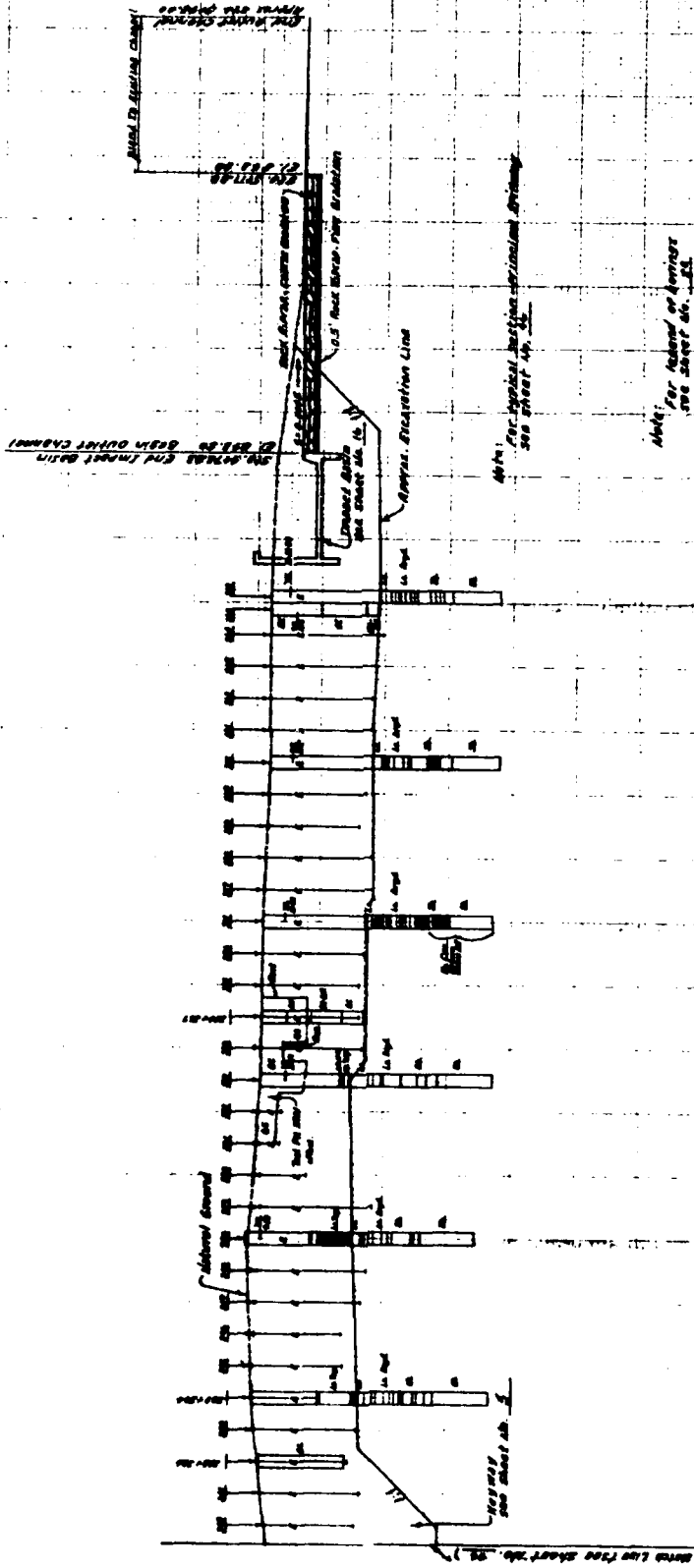
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FN-2035-1

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DAM NO 1 RED BOLLING SPRINGS WYSON CO TEXAS PROFILE & MINERAL SPILLWAY		
U. S. DEPARTMENT OF AGRICULTURE SOIL CONSERVATION SERVICE		
Drawn - CHARTREZ & SCOTT 4-76	Revised by	
Sheet R-108	Scale	
	Project Name	TN-2035-1
Date	6-7-76	
Checked by C		

PROFILE & PRINCIPAL SPILLWAYS

RED BOILING SPRINGS WATERSHED PROJECT EDMUND JENNINGS LAKE

DRAINAGE AREA 398 ACRES
 TOTAL STORAGE 151 ACRE FEET
 WATER SURFACE AREA 5.4 ACRES
 HEIGHT OF DAM 4.4 FEET
 VOLUME OF FILL 108,400 CUBIC YARDS

BUILT UNDER THE WATERSHED PROTECTION AND
FLOOD PREVENTION ACT

by
CITY OF RED BOILING SPRINGS
MACON COUNTY SOIL CONSERVATION DISTRICT
and
CLAY COUNTY SOIL CONSERVATION DISTRICT

with the assistance of
SOIL CONSERVATION SERVICE
of the
U. S. DEPARTMENT OF AGRICULTURE
197 *

BRONZE PLAQUE

24" x 24"

* Note:

1. The plaque shall be made of bronze and shall be the property of the U.S. Department of Agriculture. The contractor shall be responsible for the cost of the plaque and its installation. The contractor shall be responsible for the cost of the plaque and its installation. The contractor shall be responsible for the cost of the plaque and its installation.

DAM NO. 1

RED BOILING SPRINGS WATERSHED MACON CO., TENN.

STRUCTURE MONUMENT

U.S. DEPARTMENT OF AGRICULTURE

SOIL CONSERVATION SERVICE

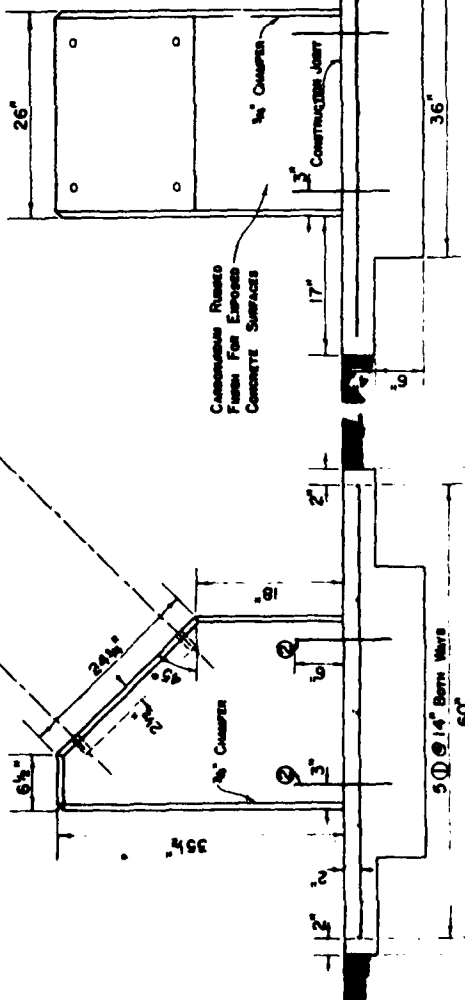
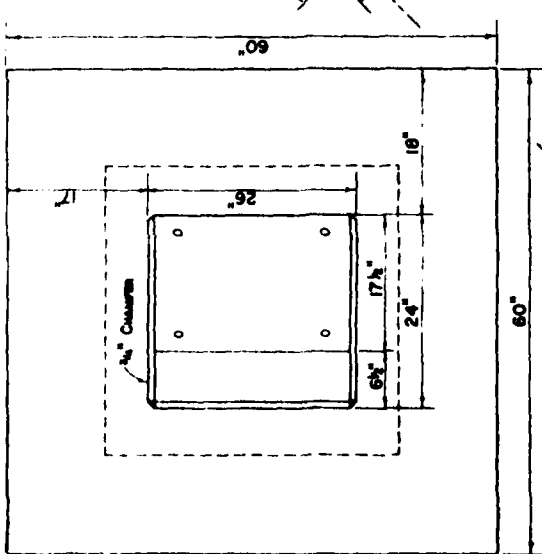
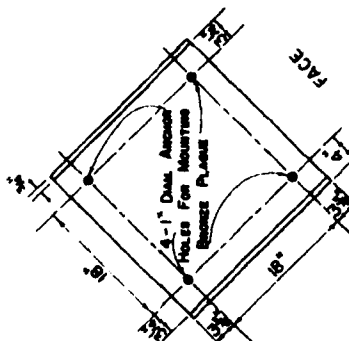
APPROVED BY: SCOTT A. HARRIS

DATE: 4/16/77

TN-2035-1

Dam No.	Qty.	Length	Total Length	Size	Type
1	10	4'-8"	46'-8"	3	Str.
2	4	1'-0"	4'-0"	4	Str.

TOTAL SIZE NO. 3 STEEL = 46'-8" x 17'-13" Lbs.
 TOTAL SIZE NO. 4 STEEL = 4'-0" x 2'-67" Lbs.
 VOLUME OF CONCRETE = 0.86 Cu Yds.



NOTE: LOCATION OF THE MONUMENT ON THE SITE WILL BE DETERMINED BY THE ENGINEER.

FRONT ELEVATION

LEFT ELEVATION

CONCRETE MONUMENT

APPENDIX F
HYDRAULIC AND HYDROLOGIC DATA

HYDROLOGIC AND HYDRAULIC ANALYSIS

According to OCE guidelines, Red Boiling Springs Dam #1 must be able to safely pass the Probable Maximum Flood (PMF). Six-hour rainfall depths for the Probable Maximum Precipitation (PMP) and the 100-year rainfall were obtained from the U. S. Weather Service's Technical Paper 40. Flood routings were performed using the HEC-1-CB computer program. The program used the dimensionless hydrograph technique described in Section 4 of the Soil Conservation Service National Engineering Handbook and the Modified Puls method of reservoir routing.

The peak outflow from the PMF (AMC II) is 4634 cfs. This flood does not overtop the dam.

RED BOILING SPRINGS DAM #1

Rainfall-Runoff Data:

Antecedent Moisture Condition II

Storm Event	PMP	0.56 PMP	100 yr.
Duration of Storm	6 hr.	6 hr.	6 hr.
Precipitation Depth	28.2"	15.7"	4.8"
Runoff Depth	24.7"	12.4"	2.4"
Peak Inflow to Reservoir	5044 cfs	2522 cfs	504 cfs
Maximum Flood Elevation	889.1	886.6	877.9

Antecedent Moisture Condition III

Storm Event	PMP	0.52 PMP	100 yr.
Duration of Storm	6 hr.	6 hr.	6 hr.
Precipitation Depth	28.2"	14.8"	4.8"
Runoff Depth	26.8"	13.4"	3.6"
Peak Inflow to Reservoir	6328 cfs	3164 cfs	823 cfs
Maximum Flood Elevation	890.0	887.2	880.6

SUMMARY OF ROUTINGS

EVENT	ANTECEDENT MOISTURE CONDITION	
	II	III
PMF	Passed with 1.9' of freeboard	Passed with 1.0' of freeboard
$\frac{1}{4}$ PMF	Passed with 4.4' of freeboard	Passed with 3.8' of freeboard
100 - YEAR	Passed with 13.1' of freeboard	Passed with 10.4' of freeboard

RED BOILING SPRING WATERSHED DAM #1

SCS NUMBER DETERMINATION:

LAND USE	% OF D.A.	CN (SOIL GP. B: MCINTVIEW, FRANKSTOWN, BOONIE)
IDLE	28	70
ST. PASTURE	21	86
WOODED.	12	60
GRASSED PASTURE	21	70
MISC	16	82
WATER	2	100

$$CN = 0.28(70) + 0.21(86) + 0.12(60) + 0.21(70) + 0.16(82) + 0.02(100)$$

$$= 74.7$$

USE SCS VALUE OF 76 (AMC II)

89 (AMC III)

* NOTE - LAND USE DISTRIBUTION IS THAT OF THE SCS.

LAG TIME DETERMINATION:

USING THE MORE CONSERVATIVE SCS CN METHOD

$$L = \frac{L^{0.8} (S+1)^{0.7}}{1900 Y^{0.5}}$$

L = LONGEST WATERCOURSE OF D.A.

$$S = \frac{1000}{CN} - 10$$

Y = AVER. BASIN SLOPE

$$L = \frac{1000^{0.8} (3.16 + 1)^{0.7}}{1900 (11)^{0.5}}$$

$$= 0.45 \text{ hrs. (AMC II)}$$

$$= 0.9 \text{ hrs. (AMC III)}$$

RED BOILING SPGS WATERSHED DAM #1

SPILLWAY RATING CURVE DETERMINATION:

USING THE FOLLOWING EXPRESSION FOR FLOW AT CRITICAL DEPTH:

$$\frac{Q^2}{g} = \frac{a^3}{T}$$

WHERE Q = EMER. SPIL. FLOW

Q_p = PRIN. SPIL. FLOW

T = TOP WIDTH OF SPIL. @ WATER SURFACE

a = CROSS-SECTIONAL FLOW AREA

$\frac{V^2}{2g}$ = VEL. HD. OF EMER. SPIL. FLOW

TR. EL. (MSL)	a (ft ²)		T (ft)	Q (cfs)	Q_p (cfs)	$V^2/2g$ (ft)	LR. EL. (MSL)	TOT Q (cfs)
	Δa	COMP.						
882.4	0	0	0	0	122	0	882.4	122
883.4	74.4	74.4	76.8	415	124	0.48	883.9	519
884.4	79.2	153.6	81.6	1195	125	0.94	885.3	1320
885.5	94.0	237.6	86.4	2235	127	1.38	886.9	2362
886.4	88.8	326.4	91.2	3502	129	1.79	888.2	3631
887.4	93.6	420.0	96.0	4982	131	2.19	889.6	5113
888.4	98.4	518.4	100.8	6668	133	2.57	891.0	6901
889.4	103.2	621.6	105.6	8553	134	2.94	892.3	8647
890.4	108.0	729.6	110.4	10,637	136	3.30	893.7	10,777
891.4	113.0	842.6	113.3	13,032	137	3.72	895.1	13,109
892.4	113.3	955.9	113.3	15,747	139	4.22	896.6	15,846

PRIN. SPIL. CALCULATIONS:

WEIR FLOW - $Q = CLH^{3/2}$ WHERE C = DISCHARGE COEFF.

L = WEIR LENGTH

$= 2(2.5' \times 7.5') = 20'$

PIPE FLOW - $Q = a \sqrt{\frac{2gH}{1+K_e+K_b+K_{rL}}} = 4.91 \sqrt{\frac{2(32.2)H}{1+0.5+0+0.0066(20)}}$

K_e = ENTRANCE LOSS COEF. 0.5

K_b = BEND COEF = 0

K_r = PIPE ROUGHNESS COEF.

$= \frac{508.7n^2}{d^{4/3}} = \frac{508.7(0.011)^2}{30^{4/3}} = 0.0066$

H	LR. EL.	Q	Q _p	V ² /2g
0	871.5	0	0	0
1	872.5	103	124	0.48
2	873.5	108	125	0.94
3	874.5	120	129	1.79

H	LR. EL.	Q	Q _p	V ² /2g
0	871.5	0	0	0
4	872.5	103	124	0.48
26.5	875.0	108	125	0.94
33	881.5	120	129	1.79

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HYDROGRAPH AT STA		1 FOR PLAN 1, RYIO 2	
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4.	4.	3.	3.
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END-OF-PERIOD HYDROGRAPH ORDINATES

OUTFLOW

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PEAK JUTFLOW IS 113. AT TIME 18.20 HOURS

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NATIONAL PROGRAM OF INSPECTION OF NON-FEDERAL DAMS, TENNESSEE. --ETC(U)
JUN 81 W H CULBERT DACW62-81-C-0056

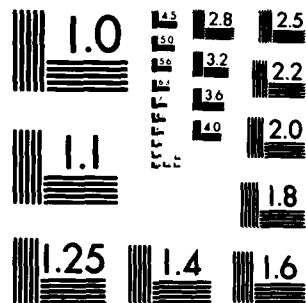
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NATIONAL BUREAU OF STANDARDS-1963-A₁

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885.2	886.1	885.9	885.0	885.7	885.5	885.4	885.3	885.3	885.2
885.2	885.1	885.0	884.8	884.6	884.4	884.1	883.9	883.7	883.4
883.2	882.9	882.7	882.5	882.4	882.2	882.1	882.0	881.9	881.6
881.7	881.6	881.5	881.5	881.4	881.3	881.3	881.2	881.1	881.0
881.0	880.9	880.8	880.7	880.7	880.6	880.5	880.4	880.3	880.2
880.2	880.1	880.0	879.9	879.8	879.7	879.6	879.6	879.5	879.4
879.1	879.2	879.1	879.0	879.0	878.9	878.8	878.7	878.6	878.5

PEAK OUTFLOW IS 4034. AT TIME 16.10 HOURS

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	4034.	1502.	401.	401.	96252.
CMS	131.	43.	11.	11.	2726.
INCHES		22.47	23.99	23.99	23.99
MM		570.75	609.39	609.39	609.39
AC-FT		745.	795.	795.	795.
THOUS CU M		919.	991.	991.	991.

.....

SUMMARY OF DAM SAFETY ANALYSIS

PLAN 1

RATIO OF PME	MAXIMUM RESERVOIR STORAGE ACFT	MAXIMUM STORAGE ACFT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS	ELEVATION STORAGE OUTFLOW	INITIAL VALUE 871.50 54. 0.	SPILLWAY CREST 871.50 54. 0.	TOP OF DAM 891.00 241. 8966.
.10	877.94	97.	113.	0.00	16.20	0.00				
.50	886.59	167.	2175.	0.00	16.20	0.00				
1.00	889.13	218.	8334.	0.00	16.10	0.00				

 FLOOD HYDROGRAPH PACKAGE (WEC-1)
 DAM SAFETY VERSION JULY 1978
 LAST MODIFICATION 01 APR 80

RED BOILING SPRINGS WATERSHED DAM #1									
MACON COUNTY									
AHC III									
1	A1								
2	A2								
3	A3								
4	B	100							
5	B1	5							
6	J	1							
7	J1	0.13	3	1					
8	K		1						
9	K1								
10	K	1	2	0.032	0.032	1			
11	P		28.2	100	101				
12	T								
13	A3		0.20						
14	K	10	100	2					
15	K	1							
16	V			1	1				
17	V1	1							
18	V4	071.5	072.5	075.0	081.5	083.9	086.9	-071.5	
19	V5	0	04	108	130	530	2362	009.6	092.3
20	SE	0	54	63	97.9	179.2	241	5113	0607
21	SE	040.5	071.5	073	076	086	091	278.3	460.2
22	SE	071.5						094	902
23	SD	091.0	3.1	1.5	450				
24	K	09							

SUMMARY OF DAM SAFETY ANALYSIS

PLAN 1									
ELEVATION		INITIAL VALUE		SPILLWAY CREST		TOP OF DAM			
STORAGE		871.50		871.50		891.00			
OUTFLOW		0.		0.		241.			
		0.		0.		6966.			
RATIO OF DMP	MAXIMUM RESERVOIR W-B-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		
.13	880.60	0.00	124.	119.	0.00	18.20	0.00		
.50	887.18	0.00	194.	2653.	0.00	16.00	0.00		
1.00	889.98	0.00	220.	5023.	0.00	10.00	0.00		

APPENDIX G
CORRESPONDENCE



TENNESSEE DEPARTMENT OF CONSERVATION
DIVISION OF WATER RESOURCES
4721 TROUSDALE DRIVE, NASHVILLE 37220
615/741-8800

Certified

December 1, 1980

The Honorable Willis Knight
Mayor of Red Boiling Springs
P.O. Box 190
Red Boiling Springs, TN 37150

Dear Dam Owner:

As provided by the State Safe Dams Act, Tennessee Code Annotated, Sections 70-2501 to 70-2530, non-federal dams in Tennessee must be inspected and certified for safety by our agency. According to our records, you are identified as the owner of Red Boiling Spgs Dam, located in Macon County, Tennessee. Enclosed for your information and review is a copy of our inventory record on the structure along with a copy of the Act and adopted rules and regulations.

Tentative plans are to schedule a safety inspection of your dam within the next few months. A staff engineer will very shortly be in further communication with you to discuss the pending inspection and your responsibilities under the Safe Dams Act. Your immediate attention, however, is called to the matter of maintaining the earthen dam with a good grass cover and clear of all brush, undergrowth and tree growth. If these conditions do not presently exist, please make plans to remove the brush, undergrowth and all trees less than two inches in diameter as soon as possible. Larger trees may have to be removed at a later date but must be done so under the direction of an experienced engineer.

Please let me, or our Chief Engineer, Mr. Ed O'Neill, know of any assistance we might be.

Very truly yours,

A handwritten signature in dark ink, appearing to read "Robert A. Hunt", is written over the typed name.

Robert A. Hunt, P.E.
Director, Division of Water Resources

RAH:lt

Enclosures



DEPARTMENT OF THE ARMY
NASHVILLE DISTRICT, CORPS OF ENGINEERS
P. O. BOX 1070
NASHVILLE, TENNESSEE 37202

IN REPLY REFER TO

ORNED-G

NON-FEDERAL DAM INSPECTION REVIEW BOARD
PO BOX 1070
NASHVILLE, TENNESSEE 37202

District Engineer, Nashville District
US Army, Corps of Engineers
PO Box 1070
Nashville, TN 37202

1. The Interagency Review Board, appointed by the District Engineer on 8 October 1980, presents the following recommendations after meeting on 10 April 1981 to consider the Phase I investigation report on Red Boiling Springs Dam No. 1 inspected by the Tennessee Department of Conservation.
2. An emergency action plan should be developed, including a warning system to alert downstream residents when the emergency spillway is in use, in the event a serious condition develops with the project.
3. Section 3.5.1.5 should be changed to read 'The dam is considered to have a condition classification of "not deficient."'
4. The board is in agreement with report conclusions and recommendations following minor revisions.

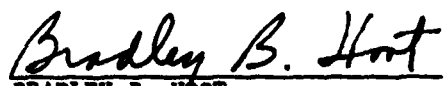

FRANK B. COUCH
Chief, Geotechnical Branch
Chairman


WILEY B. SCOTT
Assistant Design Engineer
Soil Conservation Service


EDMOND B. O'NEILL
Alternate, Division of Water
Resources
State of Tennessee


H. F. PHILLIPS
Chief, Hydraulics Section
Alternate, Hydrology & Hydraulics Branch


EDWARD B. BOYD
Hydrologic Technician
Alternate, US Geological Survey


BRADLEY B. HOOT
Chief, Structural Section
Alternate, Design Branch

END

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