

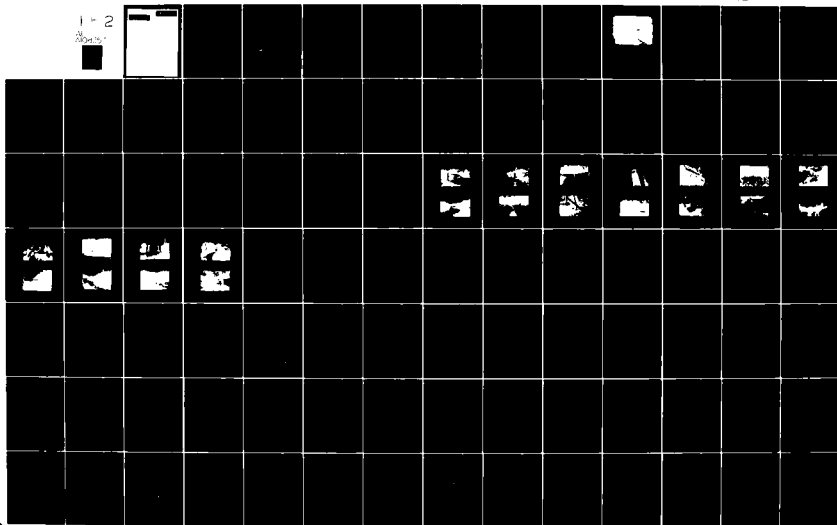
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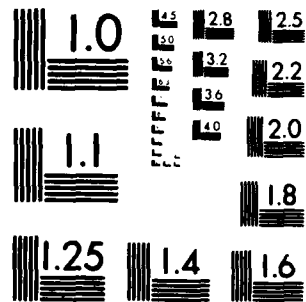
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REPORT DOCUMENTATION PAGE		READ INSTRUCTIONS BEFORE COMPLETING FORM
1. REPORT NUMBER	2. GOVT ACCESSION NO. AD-A108257	3. RECIPIENT'S CATALOG NUMBER
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7. AUTHOR(s)		6. PERFORMING ORG. REPORT NUMBER
9. PERFORMING ORGANIZATION NAME AND ADDRESS Tennessee Department of Conservation Division of Water Resources 4721 Trousdale Dr., Nashville, TN. 37220		8. CONTRACT OR GRANT NUMBER(s) DACW-62-81-C-0056
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20. ABSTRACT (Continue on reverse side if necessary and identify by block number) The dam is a linear earthen structure 163 feet long and 26.4 feet high with a crest width of 11 feet. The upstream and downstream slopes are both 1.4H:1V. The surface area of the lake is 3.7 acres at normal pool and 5.8 acres at the top of the dam. The 104 acre drainage area of the reservoir is predominantly woodland and meadow with an average ground slope of approximately 14%. The crest and upstream slope of the dam are uniform and clear of undesirable vegetation with no significant sloughing or other erosion. The downstream slope is wavy and generally nonuniform, having the appearance of dumped fill		

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material. Tree growth exists over the entire surface. Most of the trees are less than 4" in diameter, but several are as large as 8" to 1'. The service and emergency spillways are open saddle types located at opposite ends of the dam. The service spillway is a concrete channel 15 feet wide with a rectangular cross-section. It discharges through a highly eroded earthen channel at the right side of the dam. The emergency spillway is an earthen channel with a parabolic cross-section 40 feet wide at the effective dam crest with 0.7 feet of available head. Reportedly, water seeps slowly through fissures in the natural ground into a 0.4 acre lake 200 feet right of Lever. This dam was built for the purpose of maintaining pressure on the seeps and thereby maintaining the pool level of the larger lake. OCE guidelines recommend that small, high hazard dams such as Lever pass the one-half Probable Maximum Flood (1/2 PMF) to the full PMF. Analysis reveals that the dam will be overtopped by 0.6 feet for 0.6 hours under the 1/2 PMF. The reservoir contains the 100 year frequency storm maintaining 3 feet of freeboard. The dam is given a condition classification of "unsafe - nonemergency" because of its spillway limitations and because the steepness of its downstream slope constitutes a stability concern. It is recommended that a qualified engineer be retained to study the embankment stability and the hydraulic limitations of the spillway and make recommendations for their correction.

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IN REPLY REFER TO

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

21 JUL 1981

Honorable Lamar Alexander
Governor of Tennessee
Nashville, TN 37219

Dear Governor Alexander:

Furnished herewith is the Phase I Investigation Report on Lever Lake Dam located near Brush Creek, 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.

Lever Lake Dam is classified as unsafe-nonemergency, because of questionable slope stability and inadequate spillway capacity in passing the design flood.

The recommendation concerning project modifications to allow safe passage of the design flood and others contained in this report should be undertaken in the near future.

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,

Kenneth W. Oakley, LTC, DEPUTY COMMANDER
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 Lever Lake
(Camp Marymount)
County Williamson
Stream Harrison Branch
(Trib. Brush Creek)
Date of Inspection January 29, 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 B. O'Neill
Chief Engineer
Safe Dams Section

Approved By:

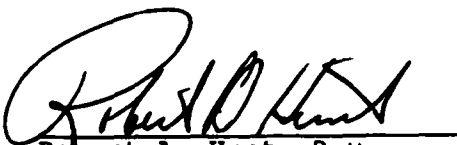

Robert A. Hunt, P.E.
Director, Division of
Water Resources
Tennessee Department
of Conservation

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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.



Lever Lake Dam
Williamson County
April 2, 1981

PHASE I INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM
TENNESSEE

Name of Dam Lever Lake (Camp Marymount)
County Williamson
Stream Harrison Branch (Tributary of Brush Creek)
Date of Inspection January 29, 1981

ABSTRACT

The dam is a linear earthen structure 163 feet long and 26.4 feet high with a crest width of 11 feet. The upstream and downstream slopes are both 1.4H:1V. The surface area of the lake is 3.7 acres at normal pool and 5.8 acres at the top of the dam. The 104 acre drainage area of the reservoir is predominantly woodland and meadow with an average ground slope of approximately 14%.

The crest and upstream slope of the dam are uniform and clear of undesirable vegetation with no significant sloughing or other erosion. The downstream slope is wavy and generally nonuniform, having the appearance of dumped fill material. Tree growth exists over the entire surface. Most of the trees are less than 4" in diameter, but several are as large as 8" to 1'.

The service and emergency spillways are open saddle types located at opposite ends of the dam. The service spillway is a concrete channel 15 feet wide with a rectangular cross-section. It discharges through a highly eroded earthen channel at the right side of the dam. The emergency spillway is an earthen channel with a parabolic cross-section 40 feet wide at the effective dam crest with 0.7 feet of available head.

Reportedly, water seeps slowly through fissures in the natural ground into a 0.4 acre lake 200 feet right of Lever. This dam was built for the purpose of maintaining pressure on the seeps and thereby maintaining the pool level of the larger lake.

OCE guidelines recommend that small, high hazard dams such as Lever pass the one-half Probable Maximum Flood ($\frac{1}{2}$ PMF) to the full PMF. Analysis reveals that the dam will be overtopped by 0.6 feet for 0.6 hours under the $\frac{1}{2}$ PMF. The reservoir contains the 100-year frequency storm maintaining 3 feet of freeboard.

The dam is given a condition classification of "unsafe - nonemergency" because of its spillway limitations and because the steepness of its downstream slope constitutes a stability concern. It is recommended that a qualified engineer be retained to study the embankment stability and the hydraulic limitations of the spillway and make recommendations for their correction.

PHASE I INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM
LEVER LAKE DAM
WILLIAMSON 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 - Lever Lake was surveyed by State personnel on January 18, 1980, and again on November 19, 1980.
- 1.4 Details of Inspection - The Phase I inspection of Lever Lake was conducted on January 29, 1981. The temperature was 50° F under partly cloudy skies. The reservoir was drained to approximately 12' below the crest of the dam.
- 1.5 Inspection Team Members - The field inspection was conducted by the following State personnel:

Edmond O'Neill, Chief Engineer
Robert Ramsey, Regional Engineer
William Culbert, Jr., Water Resources Engineer

SECTION 2 - PROJECT DESCRIPTION

- 2.1 Location - The dam is located on Harrison Creek 2,200 feet north of State Highway 100 and 2,700 feet east of the Brush Creek community in Williamson County, Tennessee. The site is shown on the Kingston Springs U. S. Geological Survey map (305 SE) at latitude 36°00'19" N and longitude 87°04'13" W (see location maps in Appendix B).
- 2.2 History of Project - 150 acres of property in the Fairview area, including the lake, were purchased by the Catholic Diocese of Nashville in May of 1946 from Mr. George Lever. There are no known records of construction or engineering for the dam. Reports from various individuals involved with the lake indicate that the embankment was constructed in the early 1930's with the use of mules and pushcarts. (See 3.1.6, Other Features)
- 2.3 Size and Hazard Classification - Based on a height of 26.4 feet and a maximum storage capacity of 51 acre-feet, the dam is given a size classification of "small". A federal hazard potential classification of "high" was determined for the site because a sudden failure of the structure could result in destruction of at least two summer cabins 700 and 1,000 feet downstream, resulting in possible loss of life. Two other cabins might also be damaged.
- 2.4 Description of Dam and Appurtenances
- 2.4.1 Embankment - The dam is a linear earthen structure presumably constructed using residual clay derived from the in-situ weathering of the underlying bedrock. The embankment is 163 feet long and 26.4 feet high with a crest width of 11 feet. The upstream and downstream slopes are both 1.4H:1V. The crest elevation varies from 734.9 to 735.3.

Review of geologic maps indicates that the area is predominantly Fort Payne and Chattanooga Formations of siltstone with some shale. Outcroppings of high chert Warsaw Limestone are also present.

- 2.4.2 Service Spillway - The service spillway consists of a rectangular concrete channel approximately 15 feet wide located on the right abutment of the dam. The spillway crest elevation is 731.0. A wooden bridge crossing the spillway along the dam centerline restricts the available head to 3.5 feet. The concrete base of the spillway extends several feet downstream of the control section before discharging into a highly eroded clay channel.
- 2.4.3 Emergency Spillway - The emergency spillway is an uncontrolled earthen saddle type channel located on the left abutment of the dam. It has a parabolic cross-section with a top width of approximately 40 feet and 0.7 feet of available head. (Crest elevation 734.2' MSL) The entrance and exit channels are sloped on the average of 16% and 4% respectively (see sketch in Appendix B). The exit channel extends approximately 100 feet downstream of the critical section with no wing wall to divert flow away from the left abutment tie-in.
- 2.4.4 Drawdown Facilities - A 4 inch and a 6 inch siphon are used to draw down the lake. The 4 inch iron pipe has a gate valve at the downstream toe. The upstream and horizontal sections of the 6 inch siphon are iron with the downstream sections being polyvinyl chloride (PVC). This siphon is capped at the outlet. An abandoned 1 foot square concrete culvert drawdown apparently extends through the dam near mid-section. It was apparently operated by a valve at the upstream end. A valve stem mounted on a timber pile can be seen on the upstream slope well below normal pool level.
- 2.5 Downstream Channel - The downstream channel lies on approximately a 2% slope. The conflux of the spillway flow and the seepage occurs approximately 50 feet downstream of the dam. The channel then passes through a few trees and a construction area for a drain pipe 300 feet downstream. About 450 feet downstream, the channel develops its full definition as it traverses an open recreational field. Encountering the right valley wall at this point, it turns back to the left and continues downstream in a straight path. Two cabins are built along this segment of the channel 700 and 1,000 feet downstream of the dam. (See photo nos. 17, 18, and 19)

- 2.6 Reservoir and Drainage Area - At normal pool, elevation 731.2, the lake has a surface area of 3.7 acres and a total storage capacity of 34 acre-feet. A 5.8 acre lake with a storage of 51 acre-feet is impounded when the water level reaches the top of the dam, elevation 734.9. The drainage area for the reservoir is 104 acres with an average slope of 14%. It is predominantly wooded and meadowland with some low density residential at the southern end. The major soil types in the area are Baxter and Greendale.

SECTION 3 - FINDINGS

3.1 Visual Inspection

- 3.1.1 Embankment - The crest of the embankment is used as a provisional road. It exhibits no signs of significant structural defects or noteworthy erosion. The upstream slope is uniform and clear of undesirable vegetation. The downstream slope is nonuniform, having the appearance of dumped fill material. Presumably, this is a result of the construction mode and not necessarily indicative of the quality of the workmanship.

Downstream of the dam two areas of seepage were observed. One flows from the abandoned concrete drawdown and the adjacent area to the right, beneath the rock retention wall. The other area of seepage is a 10' X 15' wet area left of the abandoned drain. The combined seepage flow is approximately 4 gpm. An appendage of the embankment extending 20 or 30 feet downstream near the mid-section separates the two areas. According to the camp caretaker, the condition has existed for at least 20 years. (See photo nos. 10, 11, and 12)

A small slide has occurred at the downstream toe of the dam immediately right of the concrete drawdown. The seepage downstream of this area could possibly be related to the slide, but the concavity is dry and appears to be stabilized.

Dozens of various size trees grow over the surface of the downstream slope. Most are less than 4 inches in diameter, but several are as large as 8 inches to 1 foot.

- 3.1.2 Service Spillway - The service spillway is in good condition with no appreciable cracking or spalling. The concrete base terminates in an earth and rock channel several feet downstream. The most extensive erosion of the spillway occurs at this transition, but the concrete base is deep enough to have prevented any undermining. The base and side slopes of the channel continue

to be highly eroded downstream, but they appear to have stabilized.

3.1.3 Emergency Spillway - The emergency spillway is in good condition and does not appear to have carried flow in recent years. The channel does not have a right sidewall and any flow would impinge on the left abutment tie-in.

3.1.4 Drawdown Facilities - The siphon pipes appear to be operable, but the mode of operation of the 4 inch pipe is of questionable reliability. Since there is apparently no intrinsic mechanism to fill the pipe, any leak of the gate valve would render it inoperable. It would presumably have to be pumped full, via the gate valve. The 6 inch siphon is filled through a capped opening at the top of the horizontal section when the downstream outlet is plugged.

The concrete culvert drawdown leaks approximately 2 gpm. Whether the flow is from a leak at the inlet or from infiltration through the culvert could not be ascertained. (See photo nos. 6 and 7)

3.1.5 Downstream Channel - No excessive erosion was observed along the banks of the channel. Much of the side slopes are rock with sparse vegetative cover in the area immediately downstream of the dam. In the area of the drain pipe construction, the channel widens significantly and the banks become more heavily vegetated. As the channel emerges into the recreational field the banks retain most of their cover even though the surrounding area is bare. 450 feet downstream of the dam the channel becomes fully developed and more closely assumes the appearance of the surrounding terrain with gradual side slopes covered by scrub and intermitant large trees. (See photo nos. 16 and 17)

3.1.6 Other Features - A small dam was found 200 feet to the right of Lever Lake Dam. It is 120 feet long, 16.6 feet high, and impounds a 0.4 acre lake. (See photo nos. 20, 21, and 22) The dam is reportedly used to maintain the pool of Lever Lake by preventing seepage through the rock strata at the right side of the basin of the larger lake.

The lake was included in the property purchase by the Diocese in 1946. Sometime between 1946 and 1950, the small dam was washed away by heavy rains. It was redesigned by E. W. Cooper and Sons Engineering firm of Nashville. The reconstruction was performed by Hagon Construction Company in late 1950.

Correspondence between Mr. Cooper and Father Ryan High School (see Appendix F) indicates that safety recommendations for Lever Dam were made. Mr. Cooper suggested that the embankment be cleared of trees, that the emergency spillway be enlarged to a 50 foot base width, and that 9 feet of freeboard be maintained.

- 3.2 Review of Data - Although correspondence between the engineer of the small adjacent lake (E. W. Cooper and Sons) and the Diocese makes some reference to the operation and spillway limitation of Lever, no significant data concerning design or construction is available.
- 3.3 Static and Seismic Stability Assessment - The project is located in Seismic Zone 1 and according to OCE guidelines, should not be expected to be threatened by seismic effects provided static conditions are satisfied. The actual margin of safety for static stability cannot be determined because the engineering data required for an analytical stability analysis are not available. However, an assessment of the embankment stability based on visual evidence and engineering judgment would indicate that the stability of the structure is questionable due to unusually steep embankment slopes.
- 3.4 Hydraulic and Hydrologic Analysis - According to OCE guidelines, the design flood for a small size dam in a high hazard area is the one-half Probable Maximum Flood ($\frac{1}{2}$ PMF) to the full PMF. Hydraulic analysis indicates that outflow resulting from the PMF will overtop the dam by a maximum depth of 1.5 feet for a duration of 2.2 hours. The $\frac{1}{2}$ PMF will overtop the dam by a maximum depth of 0.6 feet for a duration of 0.6 hours.

3.5 Conclusions and Recommendations

3.5.1 Conclusions - The stability of the dam is questionable due to the steepness of the downstream slope.

The condition of the concrete drawdown could not be determined, but from the appearance of the outlet, its condition seems questionable.

Hydraulic analysis shows the spillway will not safely pass the $\frac{1}{2}$ PMF as required by OCE guidelines for dams of small size and high hazard potential.

The project is situated in Seismic Zone 1, indicating that risk of damage from seismic activity is only minor.

The dam is given a condition classification of "unsafe - nonemergency" because of its seriously inadequate spillway and questionable stability.

3.5.2 Recommendations - The owner should:

- a. Engage the services of a qualified engineer to:
 1. Recommend project modifications to allow safe passage of the $\frac{1}{2}$ PMF.
 2. Conduct necessary stability studies to ascertain that conventional safety margins for the embankment are satisfied.
 3. Develop a plan for the removal of trees.
 4. Investigate the seepage, including the abandoned concrete drain, and recommend necessary corrective measures.
- b. Establish a regular program of inspection and maintenance.
- c. An emergency action plan should be established to alert downstream campers in the event a serious problem develops with the dam.

SECTION 4 REVIEW BOARD FINDINGS

The Interagency Review Board for the National Program of Inspection of Non-Federal Dams met in Nashville on 21 May 1981 to examine the technical data contained in the Phase I investigation report on Lever Lake Dam. The Review Board considered the information and recommended that the spillway be described as one with a seriously inadequate spillway capacity. 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

- A.1 Dam
- A.1.1 Type - Earthfill
- A.1.2 Dimensions and Elevations
 - a. Crest length - 163 feet
 - b. Crest width - 11 feet
 - c. Height - 26.4 feet
 - d. Crest elevation (low point) - 734.9
 - e. Upstream slope above water line - 1.4H:1V
 - f. Downstream slope - 1.4H:1V
 - g. Size classification - Small
- A.1.3 Zones, Cutoffs, Grout Curtains - Unknown
- A.1.4 Instrumentation - None
- A.2 Reservoir and Drainage Area
- A.2.1 Reservoir
 - a. Normal pool
 - 1) Elevation - 731.2
 - 2) Surface area - 3.7 acres
 - 3) Capacity - 34 acre-feet
 - 4) Length 1300 feet
 - b. Maximum pool (top of dam)
 - 1) Elevation - 734.9
 - 2) Surface area - 5.8 acres
 - 3) Capacity - 51 acre-feet

A.2.2 Drainage Area

- a. Size - 104 acres
- b. Average slope - 14 percent
- c. Soils - Baxter, Greendale
- d. Land use - Forest, meadow, residential
- e. Runoff (AMC II)
 - 1. PMF - 22.8 inches
 - 2. $\frac{1}{2}$ PMF - 11.4 inches
 - 3. 100-year flood - 1.3 inches

A.3 Outlet Structures

A.3.1 Service Spillway

- a. Type - Rectangular concrete open channel
- b. Crest elevation - 734.2
- c. Channel width at maximum section - 15 feet
- d. Maximum discharge capacity - 315 cfs (elev. 734.0)

A.3.2 Emergency Spillway

- a. Type - Earthen saddle with approximately parabolic cross-section.
- b. Size - 0.7 feet of available head, 40 foot top width.
- c. Maximum discharge capacity - 20 cfs (elev. 734.9)

A.3.3 Drawdown Facilities

- a. Type - 4" iron siphon; 6" iron and PVC siphon; filling pipe (presumably pumped full from gate valve)
 - 6" siphon; filled through cap on top
 - 1' square concrete culvert; abandoned

3

A.4 Historical Data

A.4.1 Construction Date - Approximately 1930; smaller dam was rebuilt in 1950

A.4.2 Designer - Unknown

A.4.3 Builder - Unknown

A.4.4 Owner - Catholic Diocese of Nashville
2400 21st Avenue South
Nashville, TN 37212

A.4.5 Previous Inspections - January 18, 1980, Tennessee Division of Water Resources

A.4.6 Seismic Zone - 1

A.5 Downstream Hazard Data

A.5.1 Downstream Hazard Potential Classification

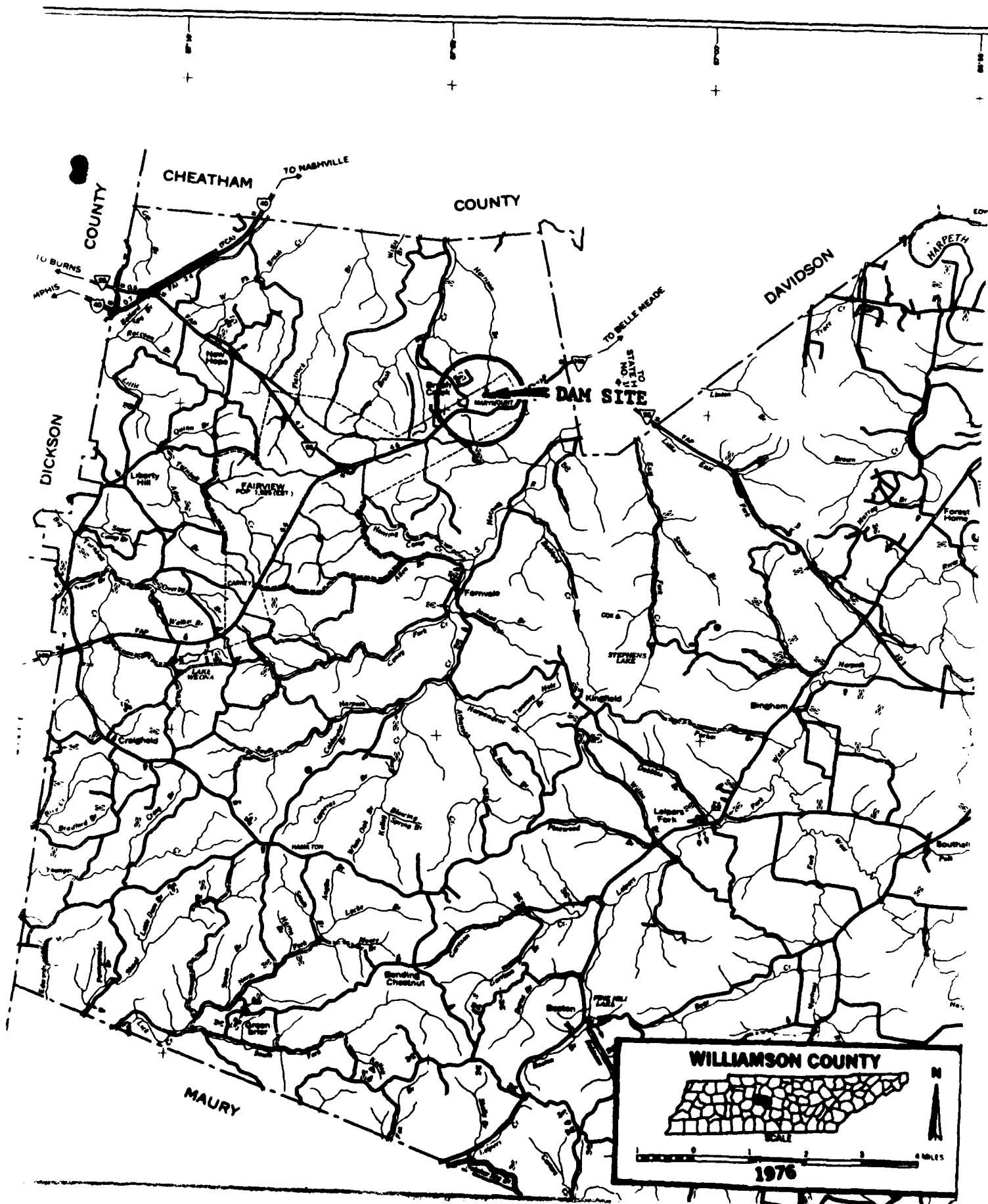
- a. Corps of Engineers - High
- b. State of Tennessee - 1

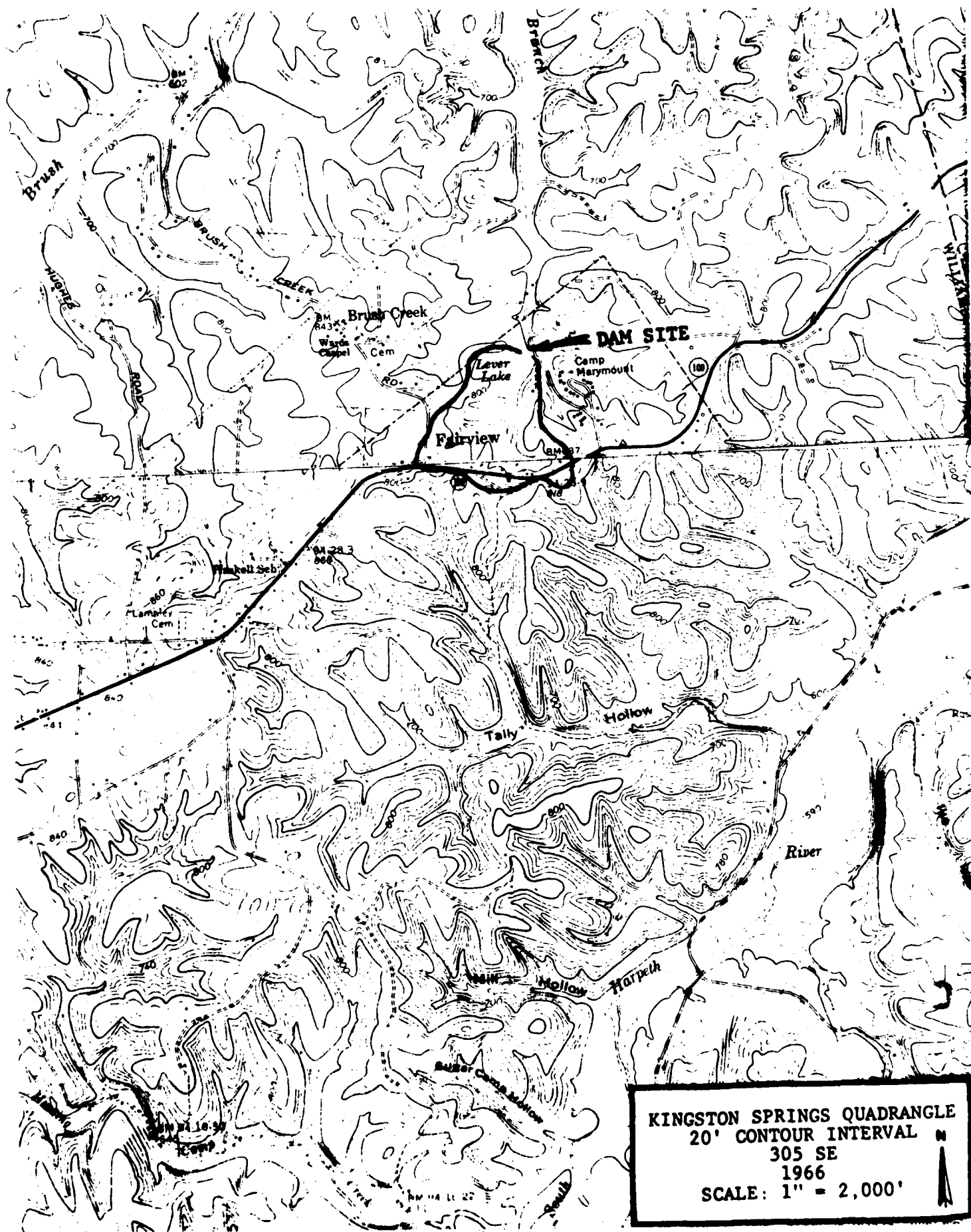
A.5.2 Persons in Probable Flood Path - Maximum of 16
(occupied only during summer months)

A.5.3 Downstream Property - Narrow flat land in hollow, owned by the Diocese and occupied by cabins several hundred feet downstream of dam. Nothing further downstream for miles.

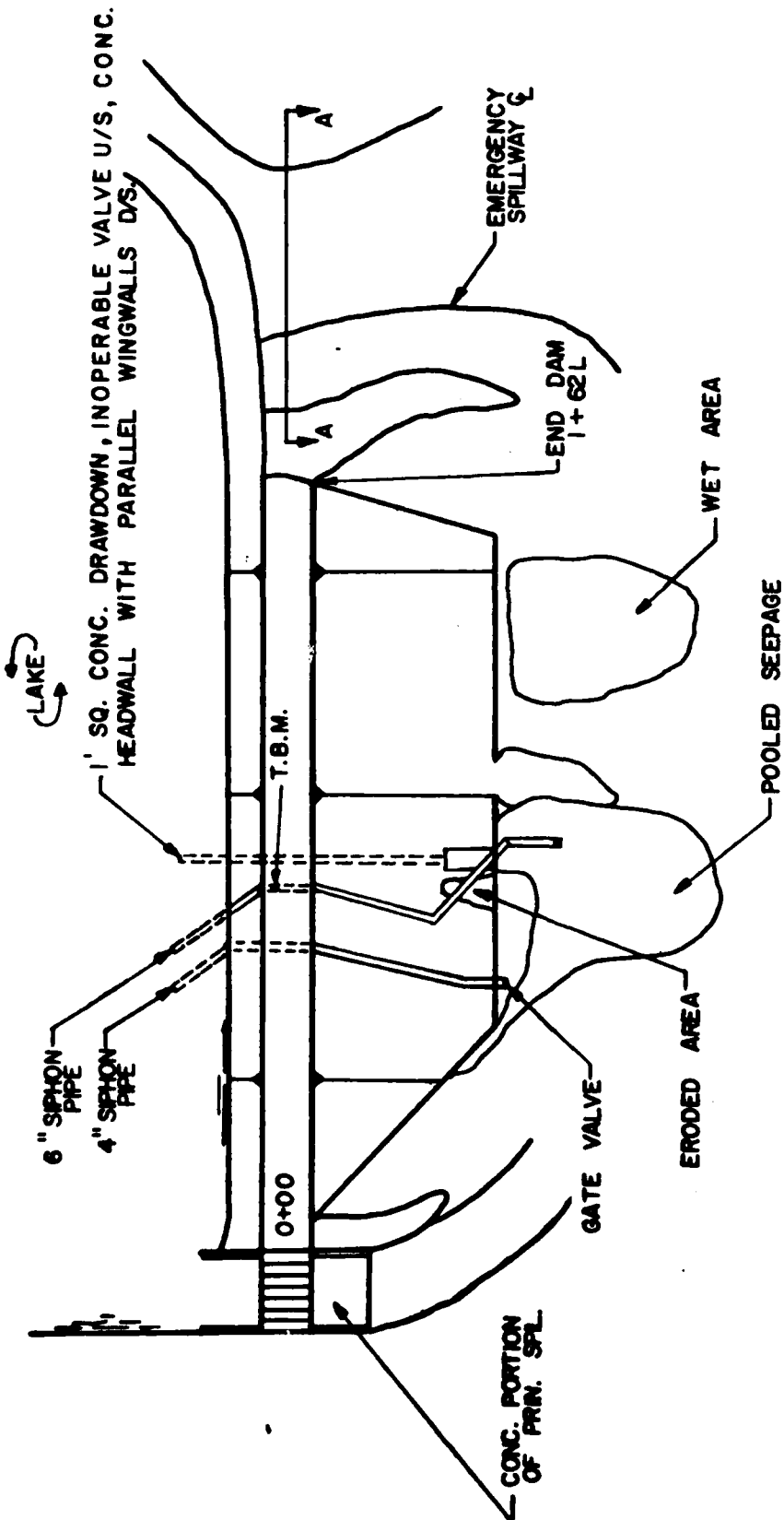
A.5.4 Warning Systems - None

APPENDIX B
SKETCHES AND LOCATION MAPS





KINGSTON SPRINGS QUADRANGLE
20' CONTOUR INTERVAL
305 SE
1966
SCALE: 1" = 2,000'



NOTE: ALL ELEVS. ARE REFERENCED TO TOP OF 6" SIPHON CAP. APPROX. EL. 735.7' MSL.

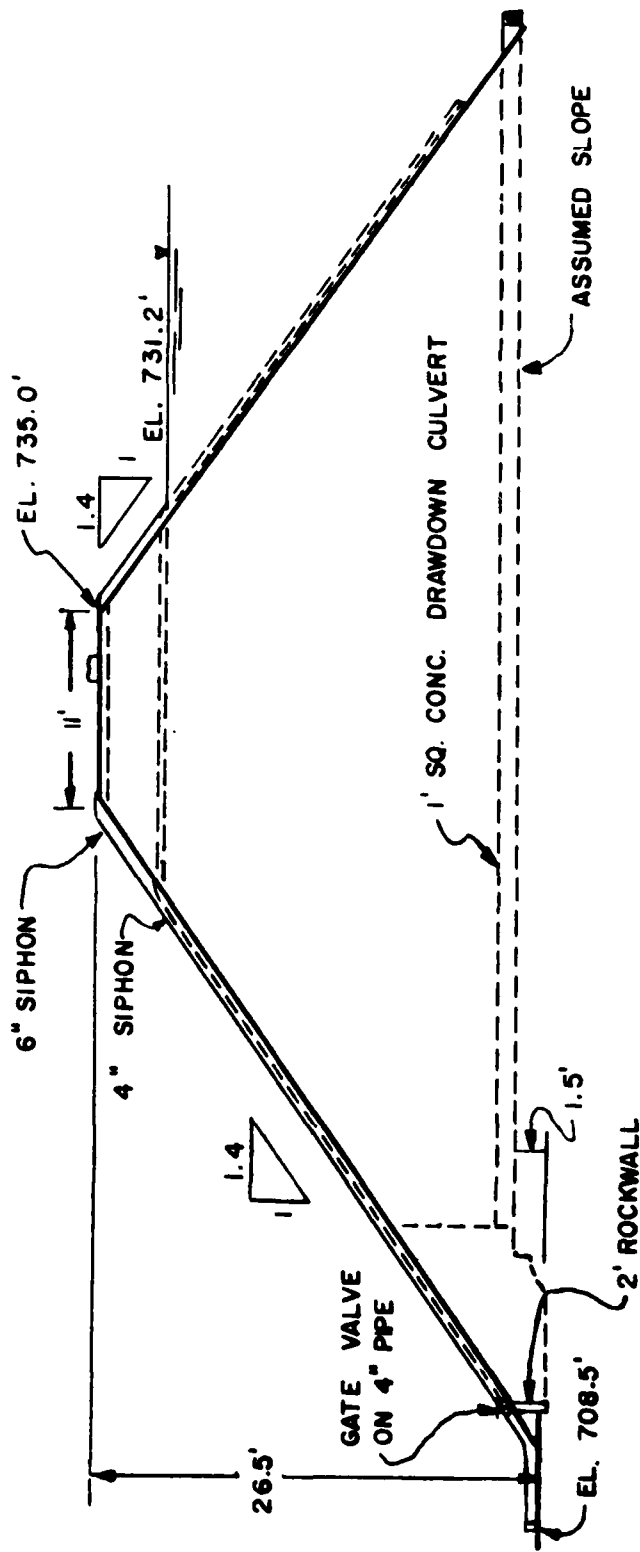
GENERAL PLAN
N. Y. S.

LEVER LAKE

DRAWN BY: M.J.F.

DATE: 3 DEC. 80

SHEET: 1 OF 5



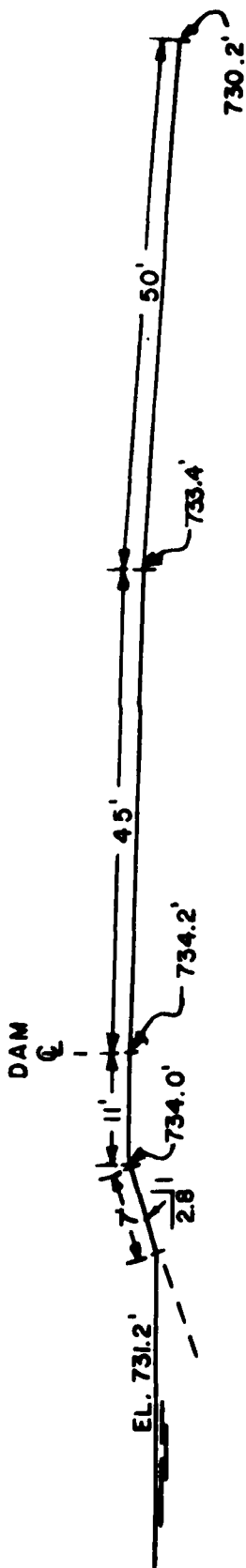
CROSS - SECTION
SCALE: 1"=10'

LEVER LAKE

DRAWN BY: M.J.F.

DATE: 1 DEC. 80

SHEET: 2 OF 5



EMERGENCY SPILLWAY PROFILE

SCALE: 1" = 15'



SECTION A-A EMERGENCY SPILLWAY CROSS-SECT.

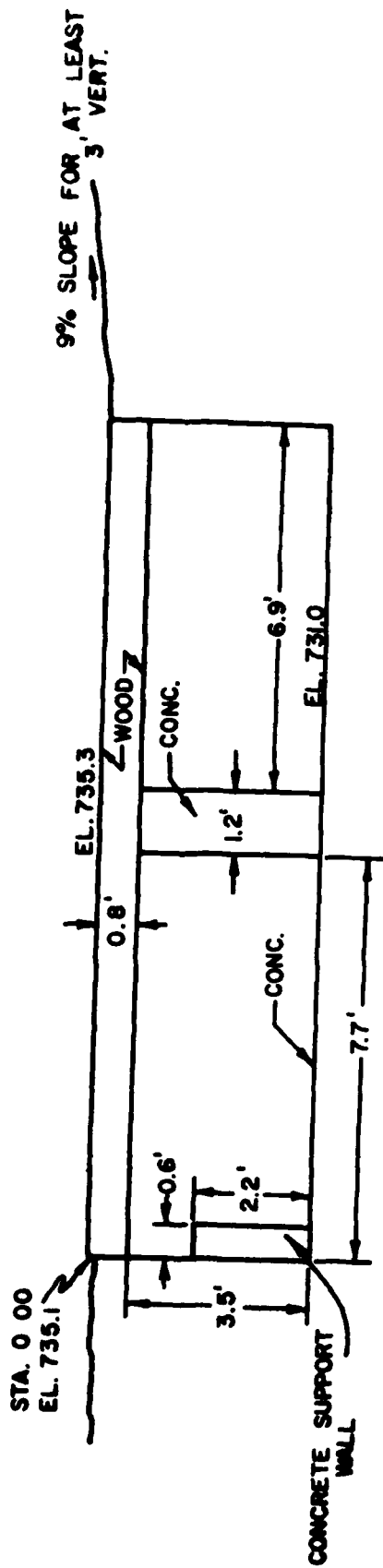
SCALE: 1" = 10'

LEVER LAKE

DRAWN BY: M.J.F.

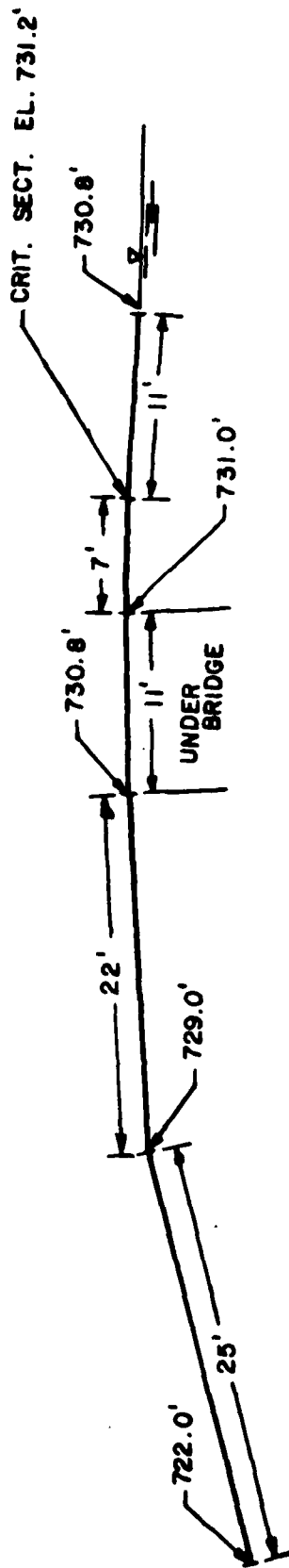
DATE: 1 DEC. 80

SHEET: 3 OF 5



SERVICE SPILLWAY CROSS-SECT.

SCALE: 1" = 3'



SERVICE SPILLWAY PROFILE

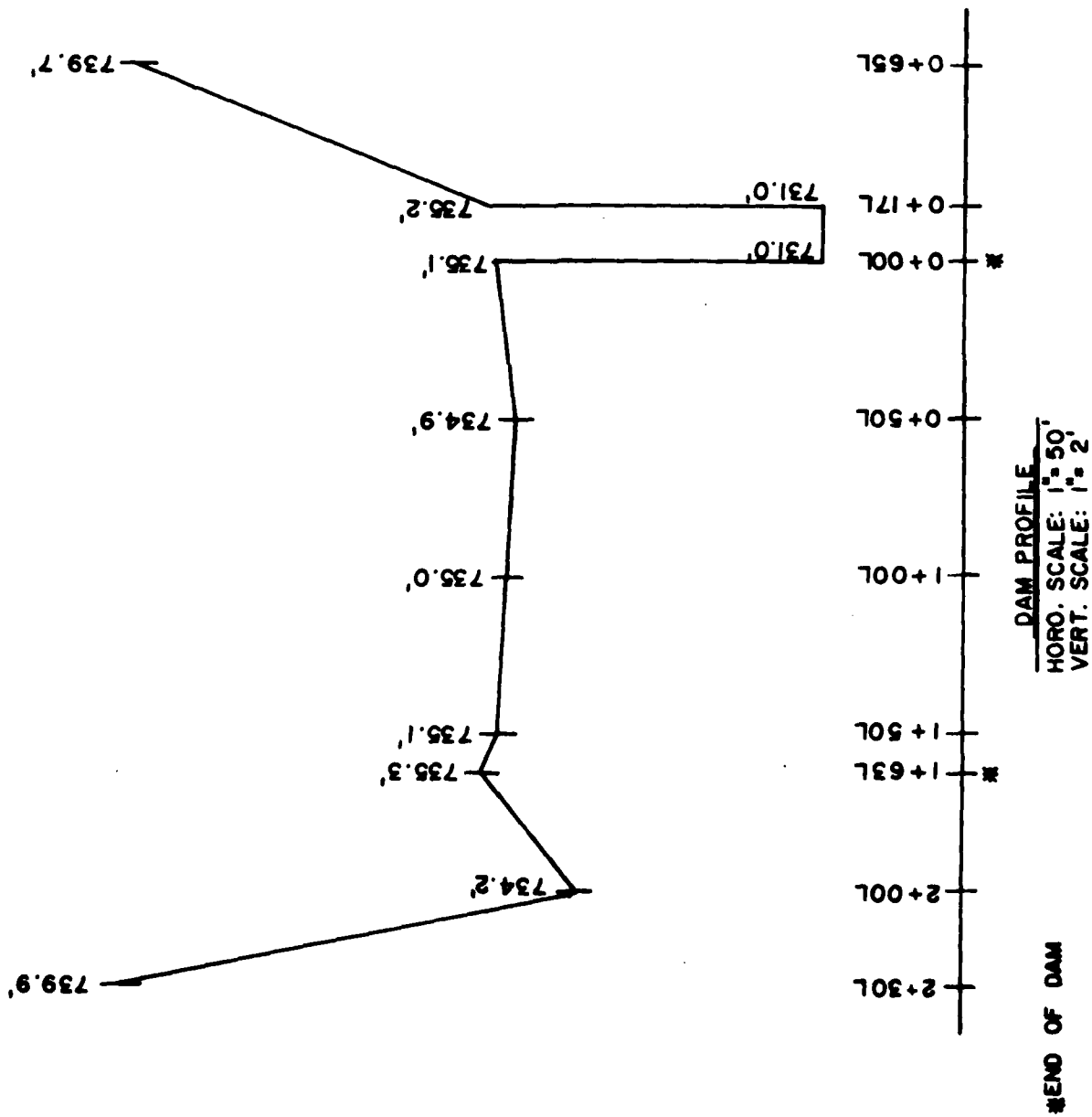
SCALE: 1" = 10'

LEVER LAKE

DRAWN BY: M.J.F.

DATE: 2 DEC. 80

SHEET: 4 OF 5



—740.0'
 —739.0'
 —738.0'
 —737.0'
 —736.0'
 —735.0'
 —734.0'
 —733.0'
 —732.0'
 —731.0'

LEVER LAKE

DRAWN BY: M.J.F.
 DATE: 2 DEC. 80
 SHEET: 5 OF 5

APPENDIX C
PHOTOGRAPHIC RECORD

PHOTO LOG

- Photo No. 1 - Lake and dam.
- Photo No. 2 - Reservoir from middle of dam.
- Photo No. 3 - Principal spillway from lake side.
- Photo No. 4 - Emergency spillway from upstream dam crest.
- Photo No. 5 - Upstream slope of dam showing 4" and 6" siphons and drain stem of abandoned concrete drawdown in background.
- Photo No. 6 - 6" PVC siphon pipe and outlet for abandoned drawdown. Center pipe is apparently scrap.
- Photo No. 7 - Close-up of drawdown outlet.
- Photo No. 8 - Downstream slope of dam.
- Photo No. 9 - Localized slide at toe just right of concrete drawdown outlet.
- Photo No. 10 - Seepage at downstream right toe from right abutment tie-in.
- Photo No. 11 - Closer view of iron stained seepage at center downstream toe.
- Photo No. 12 - Wet area at downstream left toe.
- Photo No. 13 - Confluence of concrete drawdown leakage and seepage from right toe.
- Photo No. 14 - Principal spillway exit channel.
- Photo No. 15 - Downstream of Photo No. 14.
- Photo No. 16 - Channel 50-100' downstream of dam showing open shelter in background.
- Photo No. 17 - 450' downstream showing fully developed channel.
- Photo No. 18 - 400' downstream showing channel and cabins 700'-1000' downstream.
- Photo No. 19 - Same cabin pictured at far right of Photo No. 18.
- Photo No. 20 - Small lake to the right of Lever.
- Photo No. 21 - Crest of small dam.
- Photo No. 22 - Downstream of small dam showing seepage.
- Note: See next page for dates photographs were taken.

Photographs taken during January 18, 1980 survey:

1, 7, 8, 10, 14, 15

Photographs taken during preinspection reconnaissance November 19, 1980:

20, 21, 22

Photographs taken during subsequent visit prior to inspection April 3, 1981:

19

Photographs taken during inspection January 29, 1981:

2, 3, 4, 5, 6, 9, 11, 12, 13, 16, 17, 18

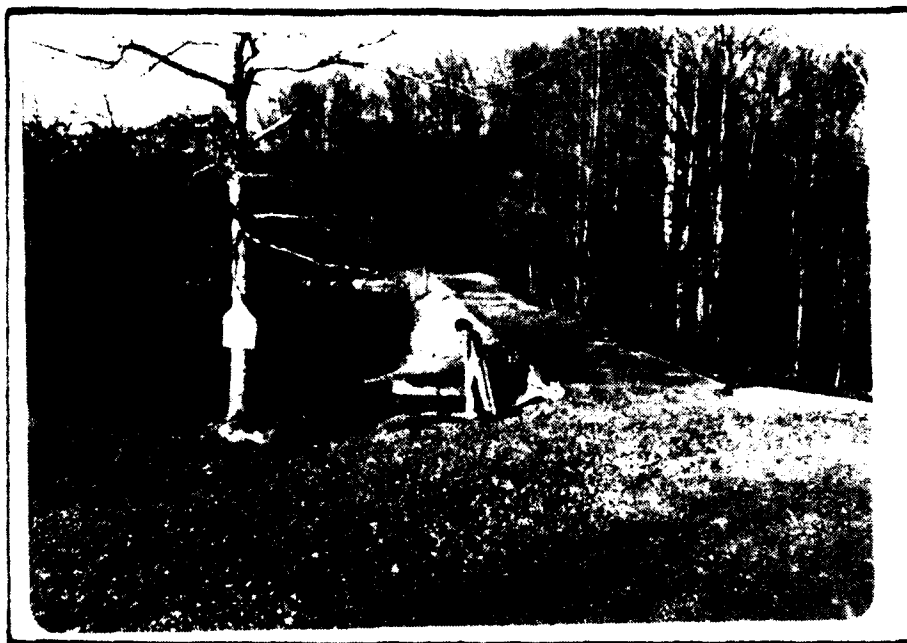


PHOTO NO. 1



PHOTO NO. 2

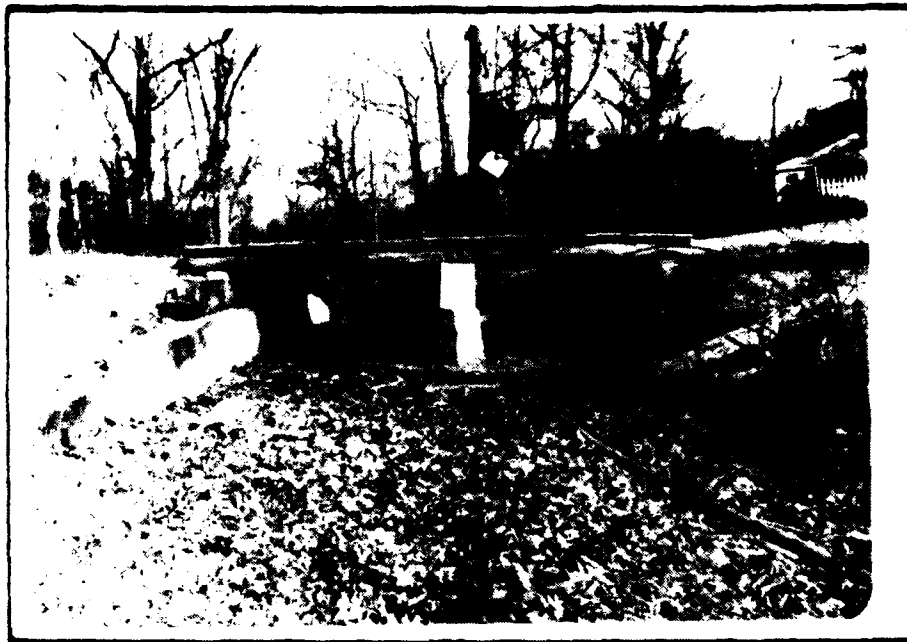


PHOTO NO. 3



PHOTO NO. 4



PHOTO NO. 5



PHOTO NO. 6



PHOTO NO. 7

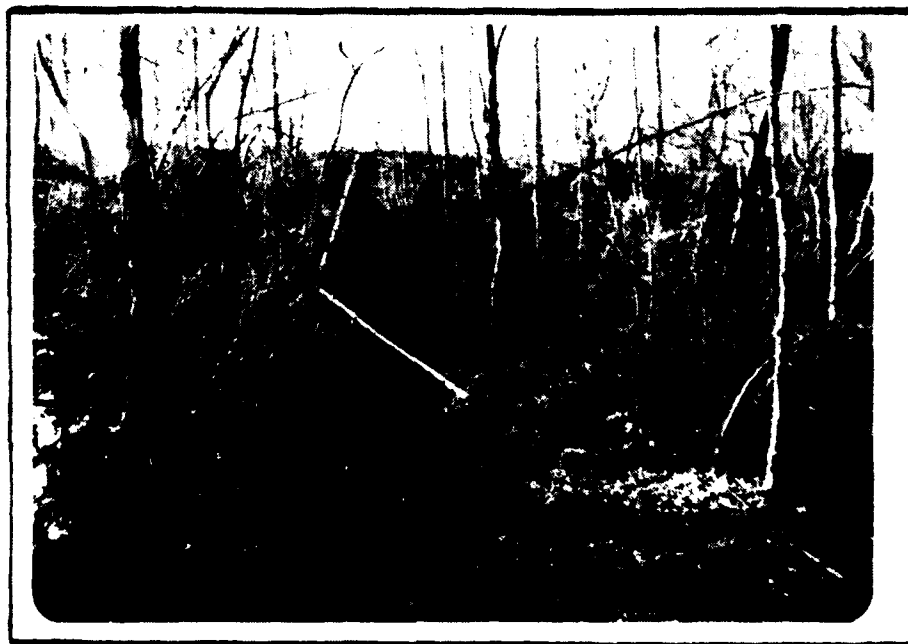


PHOTO NO. 8



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

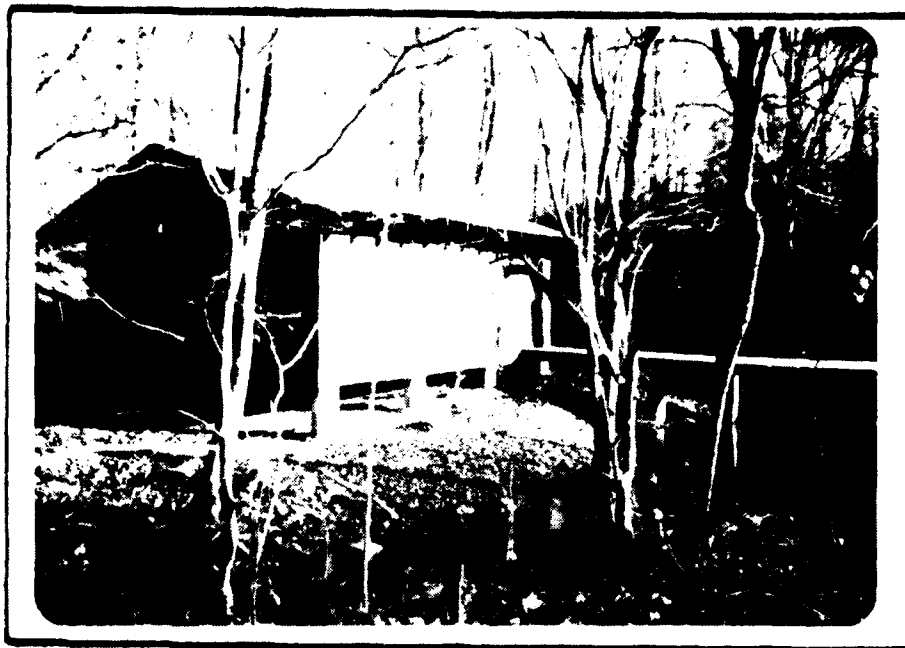


PHOTO NO .19



PHOTO NO .20



PHOTO NO. 21



PHOTO NO. 22

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 Lever Lake Dam

County Williamson Date of Inspection 1/29/81

ID # - State 94-7008 Federal TN 18708

Type of Dam Earth

Hazard Category-Federal High State 1

Weather Clear to partly cloudy Temperature 50° F

Pool at Time of Inspection Approx. 12' (distance from crest)

Tailwater at Time of Inspection Few tenths from seepage and leakage (distance from stream bed)

Design/As Built Drawings Available: Yes No X
(Sketch of small adjacent dam only)

Location: St. Henry's Catholic Church, Highway 70, Nashville

Copy Obtained: Yes X No

Reviewed: Yes No

Construction History Available: Yes No X

Location:

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 (See IX, Miscellaneous)

Inspection Personnel and Affiliation:

Ed O'Neill - TDWR

Robert Ramsey - TDWR

William Culbert - TDWR

I. Embankment

A. Crest

Description (1st inspection) Flat, uniform.

Serves as access road. Little erosion. Surface
high in chert.

1. Longitudinal Alignment Straight

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 Few 1" diameter
woody bushes.

2. Sloughing, Subsidence, or Depressions _____

Minor sloughing at normal pool.

3. Slope Protection Grass only.

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 Several dozen trees
scattered over surface. Approximately one dozen
8"-1' diameter. Most others less than 4".

2. Sloughing, Subsidence, or Depressions; Abnormal
Bulges or Non-Uniformity Irregular slope. Non-uniform.
Has appearance of being dumped. Minor slide near
center toe just right of drawdown outlet.
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 None observed
7. Fill Contact with Outlet Structure Good
8. Condition of Grass Slope Protection Moss and leaf
cover. No significant amount of grass.

D. Abutments

1. Erosion of Contact of Embankment with Abutment from Surface Water Runoff, Upstream or Downstream _____

None _____

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 _____

Miscellaneous

There is a seepage path through the natural ground from the right side of the reservoir to the 0.4 acre lake 700 feet right of Lever. The engineer that designed the small dam believed the channel to be in the area of the wading pool approximately 70 feet upstream of the principal spillway (see aerial photo).

According to the caretaker, Mr. Randall Cunningham, when the water level of Lever is fluctuated, the small lake lags by a day or two in reestablishing its surface. Although the seepage path is obviously capable of delivering a large flow rate, it apparently takes place through a large surface area with a significant amount of resistance for any single flow pathway. This is suspected because a site visit on April 3, 1981 to obtain more information about the principal spillway, we found that the small lake surface was 0.9 feet below that of Lever, several weeks after Lever had been refilled. Apparently there is enough resistance that the flow rate practically ceases under low head.

II. Area Downstream of Embankment, Including Channel

- A. Localized Subsidence, Depressions, Sinkholes, Etc.** _____
_____ None observed _____

- B. Evidence of "Piping", "Boils", or "Seepage"** _____
_____ Seepage from under retention wall right of _____
_____ concrete drawdown and wet area 15' X 10' at _____
_____ left toe.. Total seepage flow approximately 2 gpm. _____
- C. Unusual Presence of Lush Growth, such as Swamp**
Grass, etc. None _____

- D. Unusual Muddy Water in Downstream Channel** _____
_____ None _____

- E. Sloughing or Erosion** Nothing significant _____

- F. Surface Cracks or Evidence of Heaving Beyond**
Embankment Toe None _____

- G. Stability of Channel Sideslopes** Shallow natural _____
_____ channel. Poor definition until 300' downstream _____
_____ of dam. _____
- H. Condition of Channel Slope Protection** Natural cover only. _____

I. Adequacy of Slope Protection Against Waves, Currents,
and Surface Runoff N/A

J. Miscellaneous Stone wall at toe, 18" tall. Extends
approximately 30' both sides of drawdown. Presumably
for erosion protection.

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

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

III. Instrumentation

A. Monumentation/Surveys N/A

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 X)

1. Intake Structure Condition Good Reasonably clear
and uniform. Some minor debris.
2. Outlet Structure Condition Concrete portion is in
good condition. Earth and rock portion further down-
stream is highly eroded, but erosion appears to have
occured gradually and represents no imminent problem.
3. Pipe Condition _____
N/A
4. Evidence of Leakage or Piping _____
N/A
5. General Remarks Open rectangular concrete channel.

B. Emergency Spillway

1. General Condition Reasonably clear and uniform. Wooden rail along entrance.
2. Entrance Channel No appreciable channel. No significant obstruction except reeds and wooden rail.
3. Control Section Good. Clear and uniform.

3. Exit Channel Clear and uniform. No end wall on
dam side.
4. Vegetative/Woody Cover
Grass only. Adequate.
5. Other Observations Exit channel will discharge flow
along left abutment and toe of dam. Right wing wall
should be constructed.

V. Emergency Drawdown Facilities (if part of service spillway

so state) The old bottom drain through the embankment is abandoned.

The valve stem can be seen on the U/S slope. It leaks by approximately 2 gpm. It appears to have been formed in place. 4 bolts on headwall indicate that a valve may have once been present. The lake is now drained with a 4" and a 6" siphon.

Are Facilities Operable: Yes X No Siphons are operable

Were Facilities Operated During Inspection: Yes No

Date Facilities Were Last Used Within last few months. Used yearly around December.

Information obtained from caretaker (Randall Cunningham), Mrs. Franz (Chancellory Secretary of Diocese), and Camp Director (Father Chris Michaelson).

The Catholic Diocese of Nashville acquired the lake and a total of 150 acres of property in the Fairview area on May 22, 1946 from Mrs. George Lever. 3 acres were sold back to Mr. Lever in July of that year. No design plans or other records of construction or engineering were ever transferred. Presumably no engineering work was done, judging from the steepness and the "dumped" appearance of the downstream slope.

Mr. Randall Cunningham has been caretaker of the lake and property for 23 years. Each year he draws the lake down in early winter to kill the moss and to clean the basin. He installed the 4" diameter siphon pipe on the dam a few years after he began working there.

The small embankment to the right of the main dam was reconstructed in late 1950 after being washed away some time after the Diocese acquired the property. The dam is used to maintain the water level of Lever since seepage through the natural ground would drain the lake in periods of low inflow.

Of the cluster of buildings several hundred feet downstream of the dam, only 4 are cabins. These are occupied 9 weeks out of the year (June to September) by an average of 8 persons per cabin.

Water has not flowed over the emergency spillway channel in the 23 years that Mr. Cunningham has been there (In fact, he says the water has never overtopped the wading pool fence, approximately 8" above normal pool). The caretaker that maintained the camp previously does not live in the area any longer and could not be reached for comment.

VI. Reservoir

- A. Slopes Approximately 14% average.

- B. Sedimentation Lake was 12' below crest. No significant
sedimentation was observed.

- C. Turbidity Low

VII. Drainage Area

- Description (for hydrologic analysis) _____
Predominantly woodland and meadow.

- A. Changes in Land Use None

VIII. Downstream Area (Stream)

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

Considerable tree growth and poorly defined
channel for 300' downstream.

B. Slopes _____ Approximately 2% channel

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

4 camp cabins that are occupied 9 weeks out of
the year. 2 are along streambed 700' and 1000'
downstream of dam. Recreational area 500' - 1000'
downstream.

D. Other Hazards _____

IX. Miscellaneous

Incidents/Failures The small dam to the right of Lever
was washed away presumably in the late 1940's. The diocese
had it rebuilt in September of 1950 to prevent seepage from the
main lake from emptying the reservoir.

Observed Geology of Area _____

High chert limestone of Fort Payne Formation.

X. Conclusions

The steepness of the downstream slope in conjunction with the
extensive growth of large trees warrants concern about the
stability of the structure.

XI. Recommendations

- 1) The seepage should be monitored by the caretaker to note
any increase in flow.
- 2) Remove all trees on the embankment.

William H. Calhoun, Jr.
Regional Engineer

Chief Engineer

OHIO RIVER DIVISION, NASHVILLE DISTRICT

SOIL TEST DATA SUMMARY

PROJECT LEVER LAKE DAM HOLE 1 ELEV. TOP _____ SHEET 1 OF 1 SHEETS

[illegible]

APPENDIX E
HYDRAULIC AND HYDROLOGIC DATA

HYDRAULIC AND HYDROLOGIC ANALYSIS

According to OCE guidelines, Lever Lake Dam must be able to safely pass a minimum of the one-half Probable Maximum Flood ($\frac{1}{2}$ PMF). Six hour rainfall depths for the Probable Maximum Precipitation 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-DB computer program. The program uses 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 $\frac{1}{2}$ PMF (AMC II) is 1595 cfs. This flood overtops the dam by 0.6' for 0.6 hours.

Lever Lake Dam

Basin Characteristics:

A. Watershed Size	104 acres
B. Average Channel Slope	Approximately 2%
C. Average Land Slope	14%
D. Hydrologic Soil Group	B
E. Time of Concentration	0.4 hours (AMC II) 0.25 hours (AMC III)
F. SCS Curve Number	63 (AMC II) 80 (AMC III)

Reservoir Characteristics:

A. Normal Pool Elevation	731.2
B. Dam Crest Elevation	734.9
C. Normal Pool Area	3.7 acres
D. Normal Pool Length	670 feet
E. Normal Pool Storage	34 acre-feet
F. Surcharge Storage Volume (Normal Pool to Dam Crest)	17 acre-feet
G. Surface Area at Dam Crest	5.8 acres

Emergency Spillway:

A. Type	Parabolic T=40' Hd=0.7'
B. Crest Elevation	734.2
C. Maximum Discharge at Dam Crest	20 cfs (335 cfs combined service/emergency spillway flow at elev. 734.9; 379 cfs at elev. 735.3)

Lever Lake Dam

Rainfall-Runoff Data:

AMC II

Storm Event	PMP	0.58 PMP	100 year
Duration of Storm	6 hours	6 hours	6 hours
Precipitation Depth	28.8"	16.8"	5.0"
Runoff Depth	22.8"	11.4"	1.5"
Peak Inflow to Reservoir	1707 cfs	854 cfs	113 cfs
Maximum Flood Elevation	736.4	735.5	732.0

AMC III

Storm Event	PMP	0.54 PMP	100 year
Duration of Storm	6 hours	6 hours	6 hours
Precipitation Depth	28.8"	15.7"	5.0"
Runoff Depth	26.0"	13.0"	2.8"
Peak Inflow to Reservoir	2215 cfs	1109 cfs	239 cfs
Maximum Flood Elevation	736.7	735.7	732.6

SUMMARY OF ROUTINGS

EVENT	ANTECEDENT MOISTURE CONDITION	
	II	III
PMF	Overtopped for 2.2 hours by 1.48 feet	Overtopped for 2.9 hrs by 1.77 feet
½ PMF	Overtopped for 0.6 hrs by 0.58 feet	Overtopped for 0.6 hrs by 0.82 feet
100 - YEAR	Passed. 2.95 feet of freeboard	Passed. 2.32 feet of freeboard

* Additional spillway capacity required to pass ½ PMF

318 cfs (AMC II)

LEVER LK., WILLIAMSON Co.

CN AND LAG TIME DETERMINATION

CN :

<u>SOIL TYPE</u>	<u>% D.A.</u>	
BAXTER	25	B
GREENDALE	75	B

<u>LD. USE</u>	<u>% D.A.</u>	<u>CN (SOIL Gr. B)</u>
WOOD	56	60
MEADOW	32	58
PAVED AREAS + LOW DENSITY POP.	8	78
LAKE	4	100

$$\begin{aligned}
 CN &= 60(0.56) + 58(0.32) + 78(0.08) + 100(0.04) \\
 &= \textcircled{63} \text{ (AMC II)} \\
 &= 80 \text{ (AMC III)}
 \end{aligned}$$

LAG TIME :

$$\text{SCS CN METHOD: } L = \frac{L^{0.8} (S+1)^{0.7}}{1900 Y^{0.5}}$$

$$= \frac{2000^{0.8} (5.9+1)^{0.7}}{1900 (14)^{0.5}}$$

$$= \textcircled{0.24} \text{ hrs. (AMC II)}$$

$$= 0.15 \text{ hrs. (AMC III)}$$

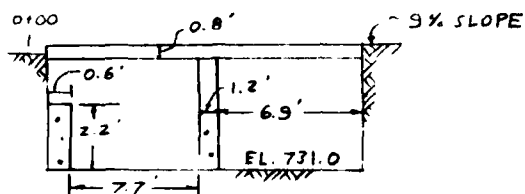
L = LENGTH OF LONGEST
WATER COURSE

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

Y = AVER. BASIN Gd. SLOPE

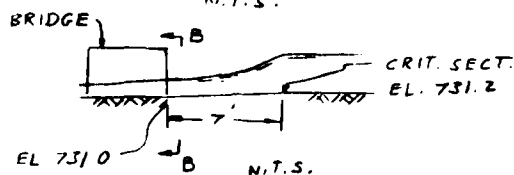
RATING CURVE CALCULATIONS:

PRIN. SPILLWAY

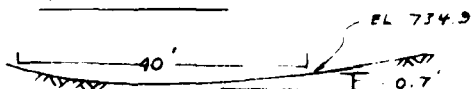


SECT B-B

N.T.S.



EMER. SPIL.



$$\frac{Q^2}{g} = \frac{A^3}{T} \quad (\text{Kj's hdbk. - FOR } Q \text{ \& CRIT. DEPTH IN IRREGULAR CHANNEL})$$

A = CROSS-SECT. FLOW AREA

T = TOP WIDTH OF CHANNEL

PRIN. SPIL.

ASSUMPTION: NOMINAL Δ IN W.S. PROFILE FROM CRIT. SECT. TO BRIDGE SECT. I.E. CRIT DEPTH @ CRIT. SECT. ≈ DEPTH UNDER BRIDGE FOR GIVEN FLOW.

$$Q = B \sqrt{g} D_c^{5/2} \quad (\text{Q IN RECT CHANNEL-Kj's. Hdbk.})$$

$$= 14 \sqrt{g} 2.2^{5/2}$$

$$= 259 \text{ cfs}$$

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

$$\frac{Q^2}{g} = \frac{49.8^3}{14.6}$$

$$Q = 521 \text{ cfs}$$

PRIN. SPIL.

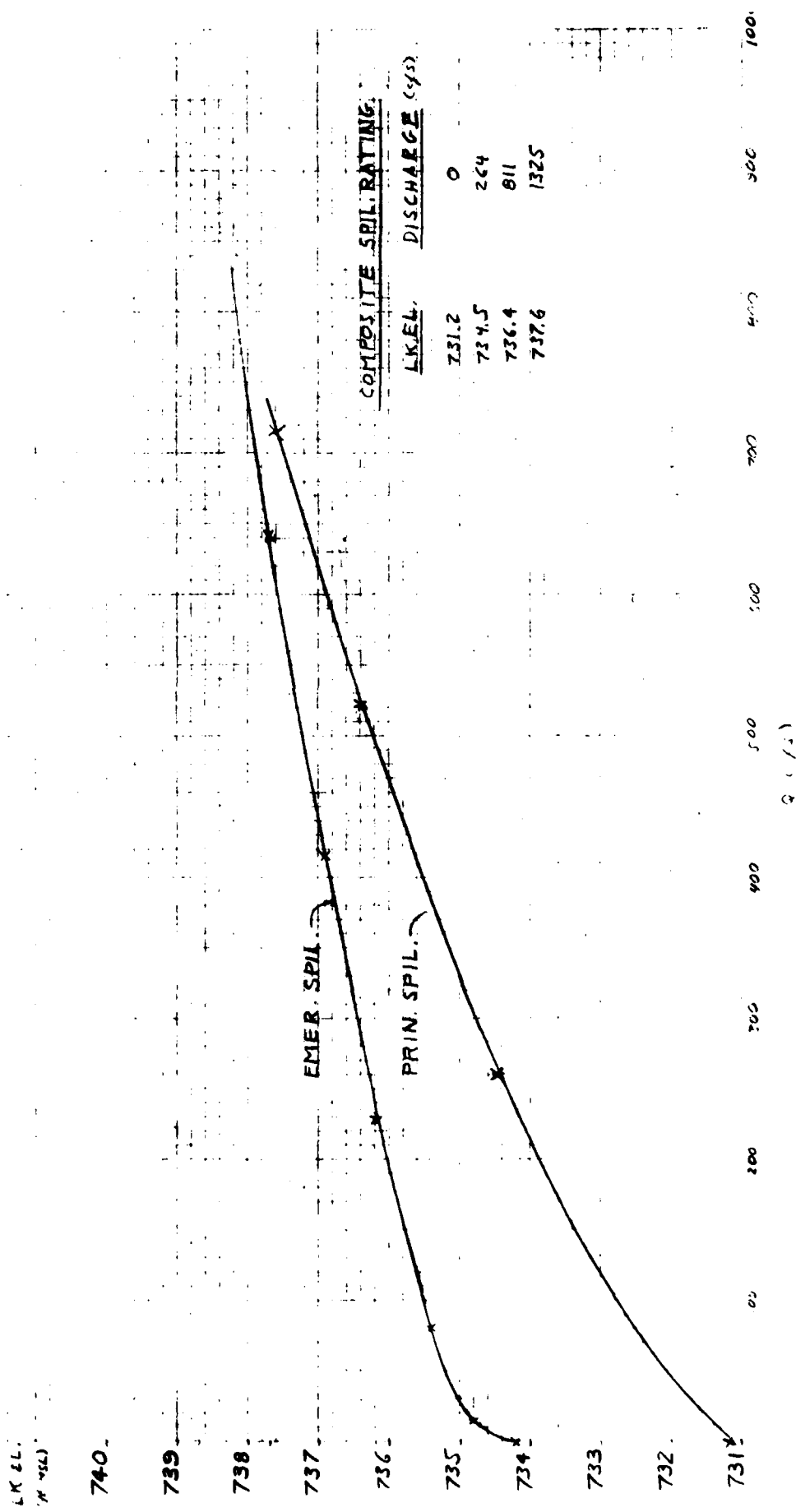
WTR. EL. UNDER BRIDGE (MSL)	Q (cfs)	AREA (ft ²)	$\frac{V^2}{2g}$ (ft)	LK. EL. (MSL)
731.0	0	0	0	731.2
732.2	259	30.8	1.1	734.5
734.5	521	49.8	1.7	736.4

EMER. SPIL.

WTR SURFACE @ CRIT. SECT. (MSL)	DEPTH @ CRIT. SECT. (ft)	T (ft)	A (ft ²)	Q (cfs)	$\frac{V^2}{2g}$ (ft)	LK. EL. (MSL)
734.2	0	0	0	0	0	734.2
734.7	0.5	20	5	14	0.12	734.8
735.2	1.0	40*	20	80	0.25	735.4
735.7	1.5	40	40	227	0.50	736.2
736.2	2.0	40	60	417	0.75	736.9
736.7	2.5	40	80	642	1.00	737.7
737.2	3.0	40	100	897	1.25	738.4
737.7	3.5	40	120	1179	1.50	739.2

* AS DAM OVERTOPPED, SPIL IS CONFINED TO MAINTAIN 40' WIDTH.

SPILLWAY RATING CURVES FOR
LEVER LAKE, WILLIAMSON CO.
LAKE ELEV. (MSL) VS. DISCHARGE (CFS)



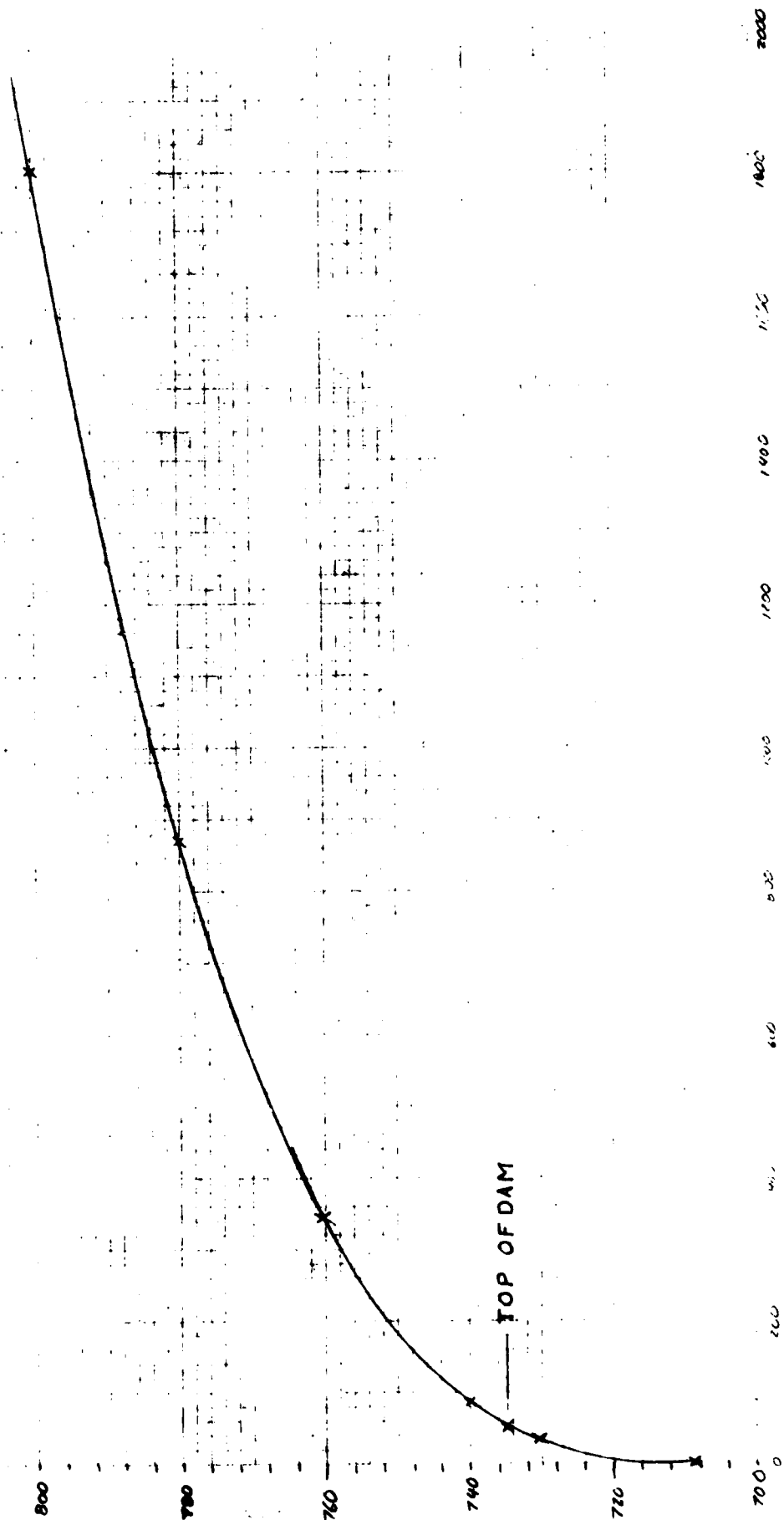
COMPOSITE SPILL RATING

LAKE ELEV. DISCHARGE (CFS)

EMER. SPIL.

PRIN. SPIL.

STAGE STORAGE CURVE FOR
LEVER LAKE, WILLIAMSON CO.
ELEV. (MSL) VS. RESERVOIR
STORAGE (A. Ft.)



LEVER LAKE DAM
WILLIAMSON COUNTY
AMC II

HYDROGRAPH COMPUTATIONS

-731.2 -1

806 802

1.5 163
140 163
735.1 735.3

PEAK OUTPUT IS 1505. AT TIME 15.00 HOURS

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CPS	1595.	397.	107.	107.	25581.
CMS	45.	11.	3.	3.	724.
INCHPS		22.78	24.48	24.48	24.48
MM		578.66	621.85	621.85	621.85
AC-FT		197.	211.	211.	211.
THOUS CU M		243.	261.	261.	261.

PEAK FLOW AND STORAGE (END OF PERIOD) SUMMARY FOR MULTIPLE PLAN-RATIO ECONOMIC COMPUTATIONS
 FLOWS IN CUBIC FEET PER SECOND (CUBIC METERS PER SECOND)
 AREA IN SQUARE MILES (SQUARE KILOMETERS)

OPERATION	STATION	AREA	PLAN	RATIOS APPLIED TO FLOWS		
				RATIO 1	RATIO 2	RATIO 3
				.07	.50	1.00

HYDROGRAPH AT	1	.16	1	111	454	1707
	(	.42)	(	3.19)	(24.17)	(40.34)
ROUTED TO		.16	1	60	402	1595
	(	.42)	(	1.69)	(19.74)	(45.16)

PLAN I

[illegible]

PLAN 1

INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
731.20	731.20	734.90
34.	34.	51.
0.	0.	379.

MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
0.00	40.	111.	0.00	15.00	0.00
0.82	56.	906.	.60	15.80	0.00
1.77	62.	1991.	2.90	15.80	0.00

**RATIO
OF
ONE**

**MAXIMUM
RESERVOIR**

```

FLOOD HYDROGRAPH PACKAGE (HEC-1)
DAW SAFETY VERSION      JULY 1978
LAST MODIFICATION @1 APR 80

```

FLOOD HYDROGRAPH PACKAGE (HEC-1)

DATA SAFETY VERSION JULY 1978

LAST MODIFICATION 01 APR 80

XXXXXXXXXXXXXXXXXXXX

58

NET LEVER

REVISE, LEVER
01 28

11,28
ILLEGAL EDIT COMMAND

AP, 27

TOP OF FILE)

LEVER LAKE
HILLIAMS

APC III

9
1001

15-5-3

10-108-105

SECRET

HYDROGRAPH

[illegible]

10:00 8.82

2 0.15

100 100 2

10

—

731.2	734.5	736.4	737.6
-------	-------	-------	-------

5	0	264	811	1325
5	34	61	94	344

5	34	51	84	344
5	731.2	734.9	740	760

8 731.2

Case No.	Age	Sex	Occupation	Duration of Illness	Site of Lesion	Microscopic Findings	Diagnosis
10734.9	3.1	Male	Farmer	1.5	Brain	...	...
10735.0	3.1	Male	Farmer	1.5	Brain	...	...
10735.1	3.1	Male	Farmer	1.5	Brain	...	...
10735.2	3.1	Male	Farmer	1.5	Brain	...	...
10735.3	3.1	Male	Farmer	1.5	Brain	...	...
10735.4	3.1	Male	Farmer	1.5	Brain	...	...
10735.5	3.1	Male	Farmer	1.5	Brain	...	...
10735.6	3.1	Male	Farmer	1.5	Brain	...	...
10735.7	3.1	Male	Farmer	1.5	Brain	...	...
10735.8	3.1	Male	Farmer	1.5	Brain	...	...
10735.9	3.1	Male	Farmer	1.5	Brain	...	...
10736.0	3.1	Male	Farmer	1.5	Brain	...	...
10736.1	3.1	Male	Farmer	1.5	Brain	...	...
10736.2	3.1	Male	Farmer	1.5	Brain	...	...
10736.3	3.1	Male	Farmer	1.5	Brain	...	...
10736.4	3.1	Male	Farmer	1.5	Brain	...	...
10736.5	3.1	Male	Farmer	1.5	Brain	...	...
10736.6	3.1	Male	Farmer	1.5	Brain	...	...
10736.7	3.1	Male	Farmer	1.5	Brain	...	...
10736.8	3.1	Male	Farmer	1.5	Brain	...	...
10736.9	3.1	Male	Farmer	1.5	Brain	...	...
10737.0	3.1	Male	Farmer	1.5	Brain	...	...
10737.1	3.1	Male	Farmer	1.5	Brain	...	...
10737.2	3.1	Male	Farmer	1.5	Brain	...	...
10737.3	3.1	Male	Farmer	1.5	Brain	...	...
10737.4	3.1	Male	Farmer	1.5	Brain	...	...
10737.5	3.1	Male	Farmer	1.5	Brain	...	...
10737.6	3.1	Male	Farmer	1.5	Brain	...	...
10737.7	3.1	Male	Farmer	1.5	Brain	...	...
10737.8	3.1	Male	Farmer	1.5	Brain	...	...
10737.9	3.1	Male	Farmer	1.5	Brain	...	...
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10738.1	3.1	Male	Farmer	1.5	Brain	...	...
10738.2	3.1	Male	Farmer	1.5	Brain	...	...
10738.3	3.1	Male	Farmer	1.5	Brain	...	...
10738.4	3.1	Male	Farmer	1.5	Brain	...	...
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10738.7	3.1	Male	Farmer	1.5	Brain	...	...
10738.8	3.1	Male	Farmer	1.5	Brain	...	...
10738.9	3.1	Male	Farmer	1.5	Brain	...	...
10739.0	3.1	Male	Farmer	1.5	Brain	...	...
10739.1	3.1	Male	Farmer	1.5	Brain	...	...
10739.2	3.1	Male	Farmer	1.5	Brain	...	...
10739.3	3.1	Male	Farmer	1.5	Brain	...	...
10739.4	3.1	Male	Farmer	1.5	Brain	...	...
10739.5	3.1	Male	Farmer	1.5	Brain	...	...
10739.6	3.1	Male	Farmer	1.5	Brain	...	...
10739.7	3.1	Male	Farmer	1.5	Brain	...	...
10739.8	3.1	Male	Farmer	1.5	Brain	...	...
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10740.2	3.1	Male	Farmer	1.5	Brain	...	...
10740.3	3.1	Male	Farmer	1.5	Brain	...	...
10740.4	3.1	Male	Farmer	1.5			

1	0	70	140	163
1	734.9	735.0	735.1	735.3

68

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1

APPENDIX F
CORRESPONDENCE

E. W. Cooper

James L. Cooper

Joe B. Cooper

E. W. COOPER & SONS

ENGINEERS

LAKES, DAMS, WATER SUPPLY, CONSERVATION

MACHINERY, PLANT EQUIPMENT & LAYOUT

PIT, QUARRY & FOREST PRODUCTS

PHOSPHATE, STONE, MINERALS

NASHVILLE, TENN. 8/15/49/

Father F.W. Eisman
Father Ryan High School
2300 Elliston Place
Nashville Tenn.

IS BEST QUALITY MATERIAL
AVAILABLE TO US

Dear Sir:

Please find enclosed bid of Hagen Construction Company to restore washed out dam near Linton--Mr Hagen is our most experienced dam contractor, having built some 50 or more large and small earth dams in Middle Tennessee --only last week Mr Hagen finished a third dam on his own farm in Giles County near Milky Way Farms -----some nearby examples of his work are Lake Wartrace at Springfield, Lake Ridgetop, Lake Tullahoma and Lake Bedford (where all the Big Fish Records are held) and Willow Lake at Fountain Head 10 miles north of Gallatin .

You might ,also, want for B Dam 3 feet of Baffle Boards (with flow trench in spillway center) to permit you to raise ,lower or fluctuate lake level and those control misquito breeding around lakes perimeter . Or you may want a draw down and drain pipe thro the bottom of the dam . For this we have recently designed a new type which is quite inexpensive ,yet meets the requirements --in principle this new type is concrete pipe thro low part of dam with a T joint on Lake end --from T joint lead another concrete pipe to within 3 ft of normal Lake surface and cap this pipe -----~~\$\$\$1000~~ comes a time when you want to drain the lake you simply pull it down 3 feet with baffle boards and this uncovers the capped ,upper end, of the concrete pipe --pull out the plug and start taking up one joint at a time or in short lower lake one joint ,then another etc until you reach the T --No valves ; no danger of a pipe of water under pressure ;no leakage ;the draw down pipe is DRY until you want to draw the lake down --To fill Lake up simply put the pipe back ,joint by joint from T (many lakes have been drained by boys or low characters wanting to get the fish) but a lake with our new type of draw down is proof against such pranks --they simply do not know there is a draw down -its upper end is under 3 ft of water and you can shovel dirt over the lower end etc .

We can give you the 3 feet of fluctuation baffles and the simple "draw or draw down" pipe for comparatively small addition -all sums ----all of our Engineering services charges are included in Contractor Hagen's bids .

It appears to writer that you Lake A is leaking considerably into Lake B and the level of A is dropping rather rapidly --if you build Dam B with leak blocker French this should hold level of A as most of the leakage from A appears to come into B --Will be pleased to hear from you on this Lake any time you want to restore same

E. W. Cooper
Phone 6-2808

E. W. Cooper

James L. Cooper

Joe B. Cooper

E. W. COOPER & SONS
ENGINEERS
LAKES, DAMS, WATER SUPPLY, CONSERVATION
MACHINERY, PLANT EQUIPMENT & LAYOUT
PIT, QUARRY & FOREST PRODUCTS
PHOSPHATE, STONE, MINERALS
NASHVILLE, TENN. 8/15/49/

Father F.W.Eiseman
Father Ryan High School
2300 Elliston Place
Nashville Tenn

Dear Sir:

After inspecting the SITE of washed out Dam B (near Highway 100, Linton Section) in company with Engineer E.W.Cooper on 8/13/49/ we propose to rebuild and restore the said DamB subject to following stipulations and specifications.

Exhibit ~~E~~^C-A TYPICAL CROSS SECTION of dam-B and Exhibit-K a SITUATION SKETCH, hereto attached, together with their printed data and specification, are, hereby, made a part of this proposal.

Before Construction starts the two END OF DAM HUBS (large round stakes) will be, securely, driven into the natural ground, so that the TOPS of said two hubs will be at the finished elevation of the TOP OF DAM and the horizontal distance between two said hubs will be the LENGTH OF DAM-----the top width of dam will be 12 feet wide and the finished slopes on either side will be 2 to 1 and, as shown on Exhibit C the leak blocking puddle trench will be excavated, all along the dam, to ~~W~~ either rock or to an impervious strata and the said trench then back-filled with a good quality of impervious or leak blocking material.

I propose to do all of the above contract work for a LUMP SUM of Seven Hundred Dollars (\$700.00) payable when the, herein described work is finished and I agree to start work on the project within-----days from date of your acceptance and to complete this contract within days from date of starting

Hagen Construction Company

By-----
H.R.Hagen
Lewisburgh Tenn

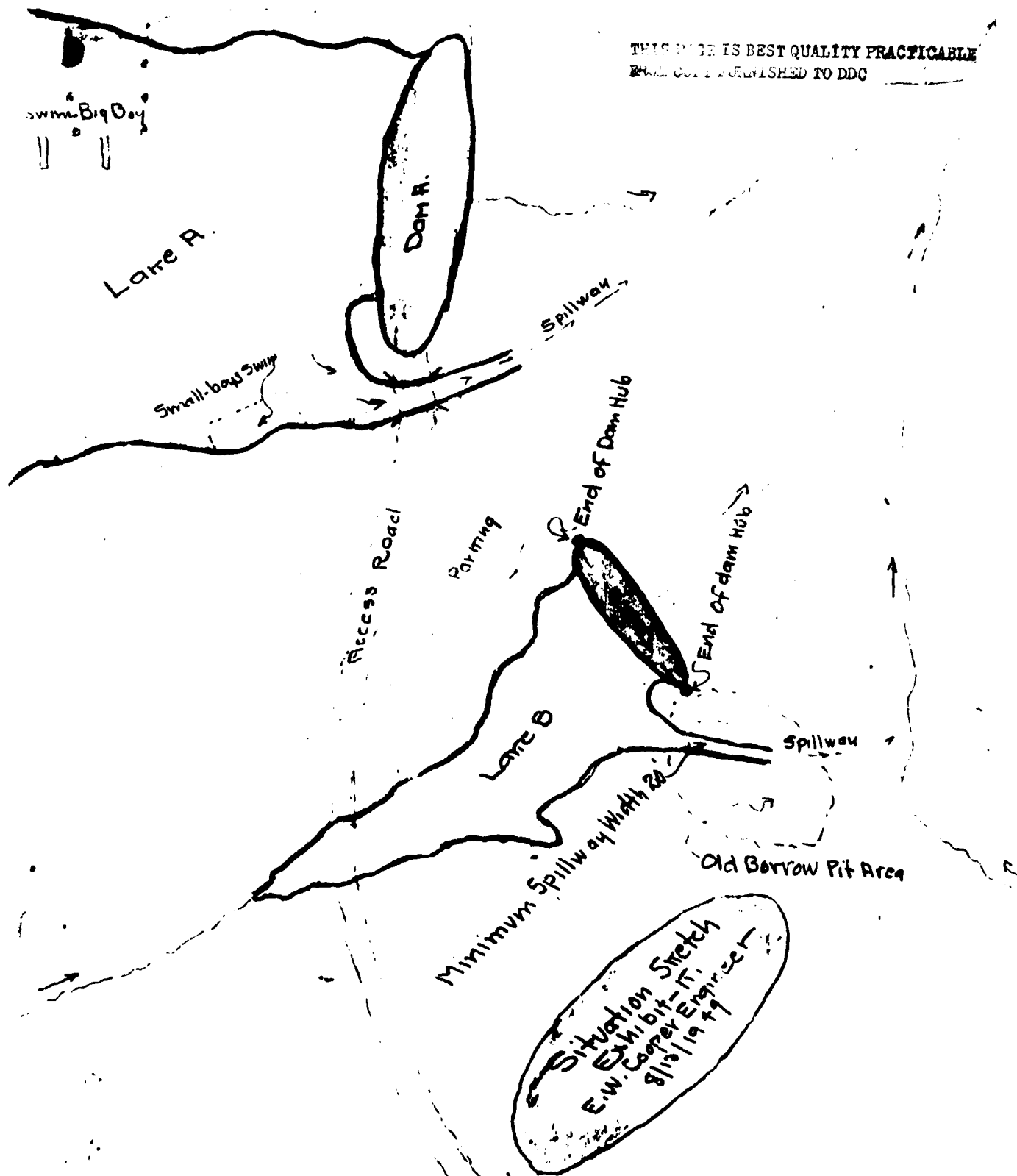
Accepted

Surveyed, planned and
approved for construction.

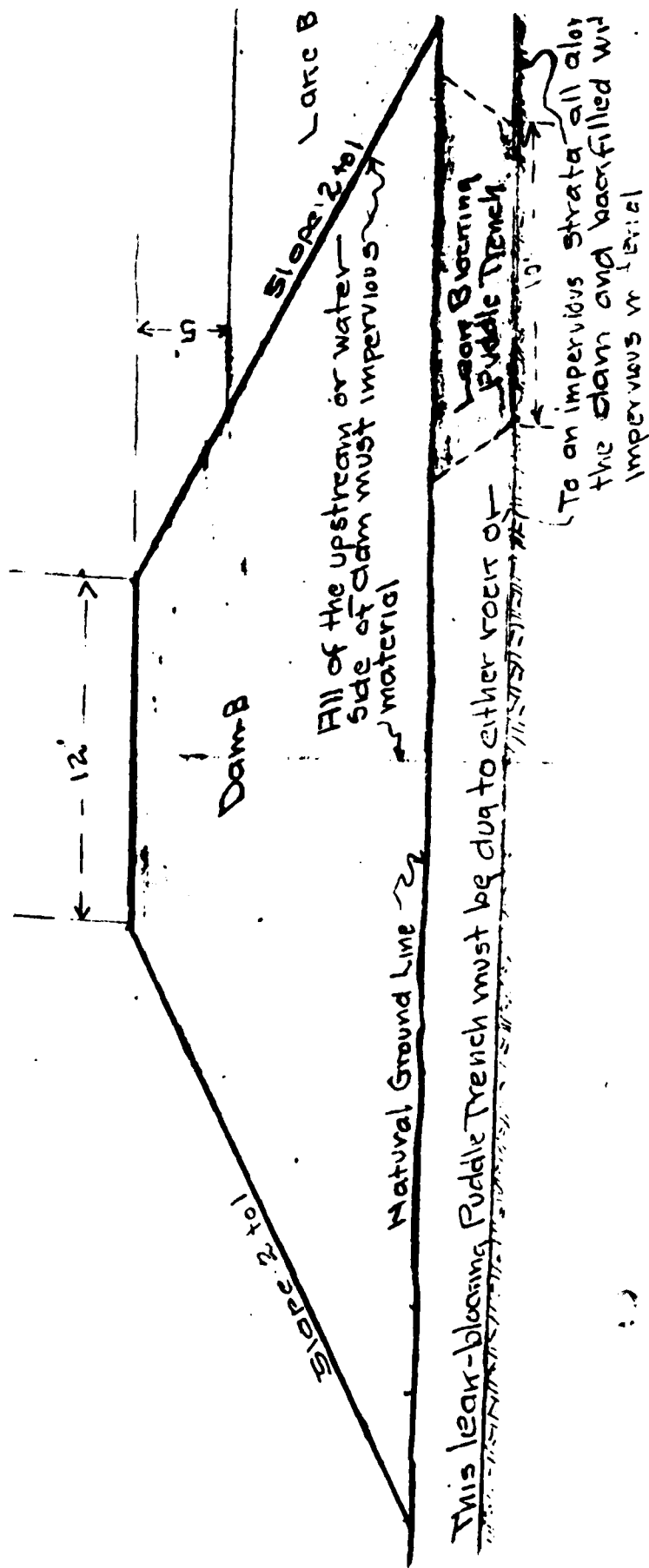
E.W. Cooper

E.W.Cooper Engineer.

THIS PAGE IS BEST QUALITY PRACTICABLE
REPRODUCED FROM ORIGINAL FURNISHED TO DDC



Typical Cross-Section
 Exhibit C
 E.W. Cooper Engineer
 8/13/99



E. W. Cooper

James L. Cooper

Joe B. Cooper

E. W. COOPER & SONS
ENGINEERS
LAKES, DAMS, WATER SUPPLY, CONSERVATION
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PIT, QUARRY & FOREST PRODUCTS
PHOSPHATE, STONE, MINERALS

NASHVILLE, TENN. August/19/1950/

Father Lynch
Father Ryan High School
2300 Elliston Place
Nashville Tenn
Gentlemen:

After ,again, inspecting the SITE of washed out,dam B,
at Camp Marymount (Highway 100,Linton Section) with Engineer
E.W.Cooper TODAY we propose to rebuild and restore the said
dam B subject to the following specifications and stipulations.

Exhibit "Father Ryan(a Situation Sketch)and Exhibit
"Marymount"(a Typical Cross-Section),together with all their
printed data and specification are ,hereby ,made a part of
this proposal.

Before construction starts the two END OF DAM HUBS
(see exhibit #Father Ryan") will be ,securely ,driven into the
natural ground so that the top of the said hubs will be at
the finished elevation (104') of the top of the dam and the
horizontal distance between the two hubs will be the LENGTH
of the said dam B---The top width of the dam will be 12 feet
wide on top at elevation 104' ----as shown on Exhibit "Marymount"
a LEAK BLOCKING TRENCH will be dug ,all along the dam ,from
water line to water line , down to either Rock or to an
impervious strata and the said leak block trench will then be
backfilled with a good quality of impervious or leak blocking
dirt .

We propose to o all of the ,herin, described contract
work for a LUMP SUM of Seven Hundred Dollars (\$700.00) payable
when the contract work is finished and I further agree to
start work on the projet within 10 days from the date of your
acceptance of this propasal and to complete the contract work
within 30 days

Yours Truly

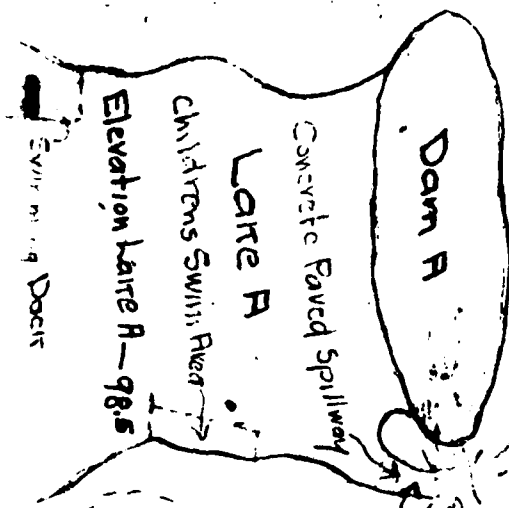
Hagen Construction Company
H.R.Hagen

By

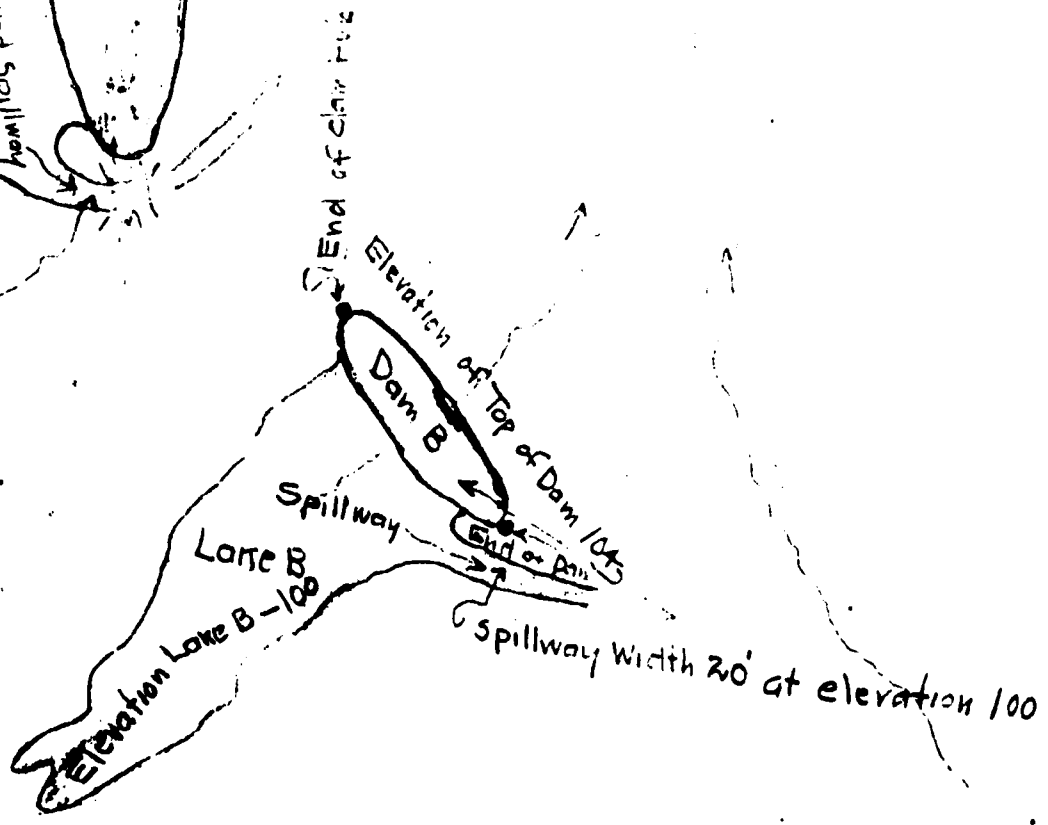
E.W. Cooper
E.W.Cooper

Engineer for Hagen Construction Co.

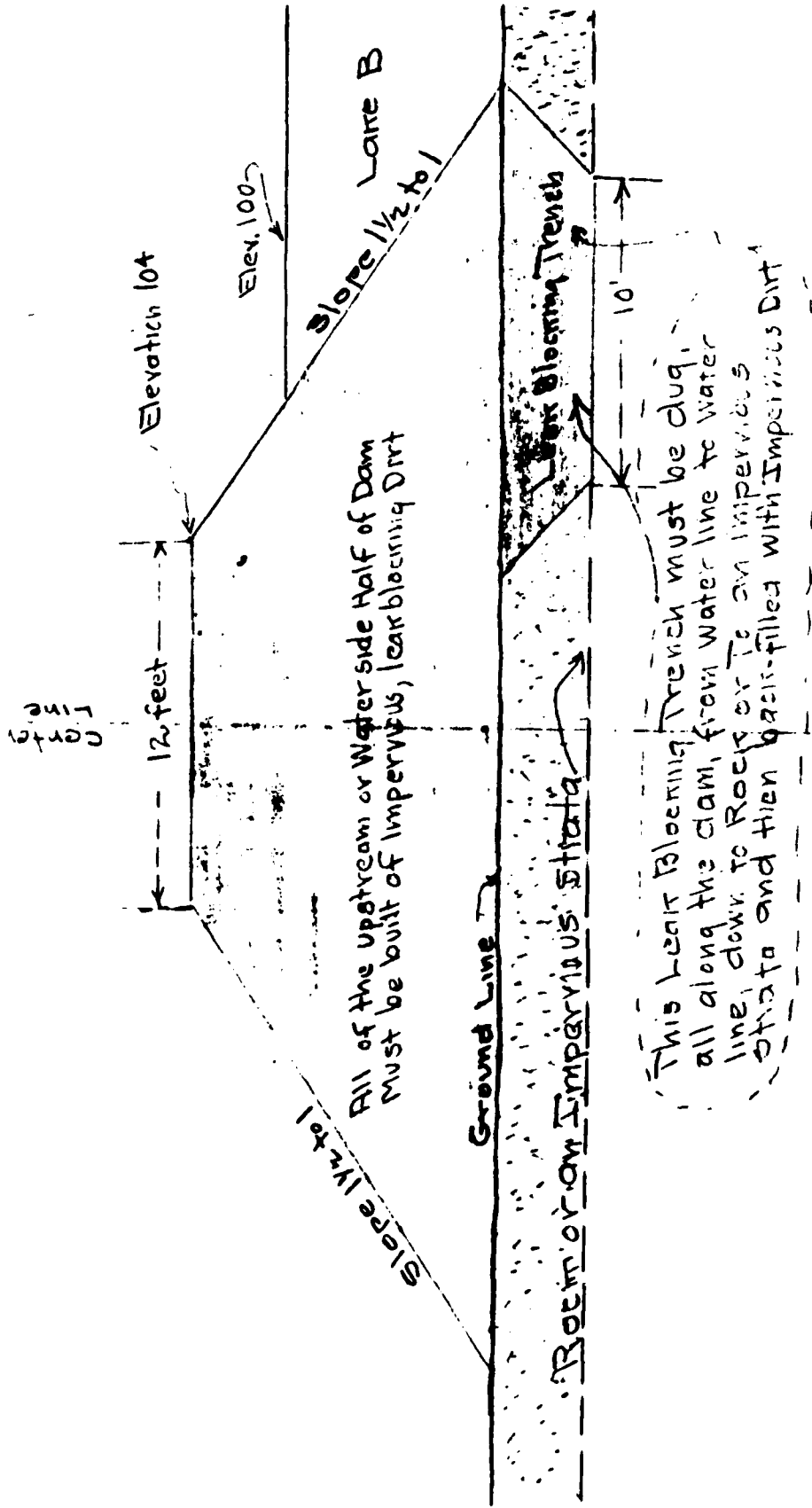
Copy to
Mr H.R.Hagen
Lewisburgh Tenn.



Note - The elevation of Lake A is 98.5 feet. The elevation of the concrete spillway of Lake A is 100 feet. The elevation of the floor of the spillway of Lake A is 98.5 feet. The elevation of the concrete spillway of Lake A is 100 feet. The elevation of the floor of the spillway of Lake A is 98.5 feet.



Situation Sketch
Exhibit - Father Ryan
E.W. Cooper Engineer
8/19/50



Typical Cross-Section
 Exhibit
 "Marquette"
 E.W. Coffey, Engineer
 8/19/50

E. W. Cooper

James L. Cooper

Joe B. Cooper

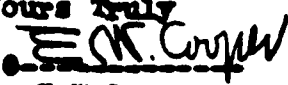
E. W. COOPER & SONS
ENGINEERS
LAKES, DAMS, WATER SUPPLY, CONSERVATION
MACHINERY, PLANT EQUIPMENT & LAYOUT
PIT, QUARRY & FOREST PRODUCTS
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NASHVILLE, TENN/ 9/21/50

Mr H.R.Hagen
Prof Zambo (Lewisburgh phone 518-j)
Lewisburgh Tenn
Dear Mr Hagen:

Referring to your contract to restore the Father Ryan Camp Marymount dam ,dated 8/19/50 ---Father Lynch phoned me on Sat. Sept 9th to advise you to go ahead on this dam and I immediately phoned you to this effect ---Last night Father Lynch phoned me and advised that you had not yet started work down there and I put in a long distance call for you about 9 P.M. last night --Lewisburgh operator advised that you were out and that 518-j reported you would return about 11 P.M. last night and they would have you answer my call ----Up to 7 A.M. this morning ,however, you have not phoned me .

The contract accepted on 9/9/50 provided 10 days time to start work--so ,you see ,the full 10 days has elapsed . On receipt of this letter please call Father Lynch (Athletic Director of our local Father Ryan School at 2300 Elliston Place -phone 7-0420)and advise him WHEN you will start work on the above project

Awaiting your advice

Yours Truly

E.W.Cooper
Elm Hill Road
Phone 6-2808

Copy to
Father Ryan School
attention Father Lynch
2300 Elliston Place
Nashville Tenn

E. W. Cooper

James L. Cooper

Joe B. Cooper

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NASHVILLE, TENN. 1/26/51/

Father Lynch
Father Ryan School
2300 Elliston Place
Nashville Tenn
Dear Father Lynch:

Referring to your phone call tonight ,to writer, relative to the LAKES at Camp Marymount,,I understand your report to be appm. as follows.-----The Small lake recently rose so that it ran through its spillway for a short time but soon dropped to a level of about ONE FOOT below the bottom of said small lakes bottom of spillway ---the larger lake is just now beginning to trickle through its concrete lined spillway under the "overpass" bridge.

The above report "checks" or confirms ,the writers theory hypothesis that the many CRAWFISH BORINGS observed at the childrens SWIM POOL sector of the large lakes perimeter have caused water from the large lake to leak through the "backbone" or ridge between the two said lakes ---this leakage has undoubtedly ~~followed~~ followed the hundreds of crawfish borings in the grey clay stratas somewhat below the pool level at the childrens swim pool---of course it is quite possible that the offending crawfish did follow NATURAL DRAIN CHANNELS In the rock and dirt of this backbone sector --in short ,my hypothesis ,is that the crawfish ~~did~~ merely opened up ,kept open and enlarged said drain channels and that these small drain channels became "main street" for the crawfish tribes -----WITH THESE ~~channels~~ CRAWFISH channels a "fait accompli"at the time we built the dam for the small lake you will recall that the CONTRACT (at your request) stipulated that the level of small lake be placed 1 1/2 feet higher than level of the large lake ---this was so constructed but as I pointed out ,at the time of the restoration of said small lakes dam; it was obvious that these CRAWFISH LEAKS THROUGH the backbone or ridge would ALSO permit water from small lake to leak back INTO large lake ---in short the two lake levels would tend to equalize and REGARDLESS OF the levels we set (of course the levels of the two spillway bottoms coincide with the two lake levels (a third or emergency spillway on one end of the large lake is set somewhat higher than the one lined with concrete under the overpass)

So ,when the recent winter rains put enough water into the smaller lake then this lake rose to its planned level and then dropped (as you report) about one foot----I assume that this observed drop in the ~~small lake~~ small lake was due to the LEAKAGE of the small lake water into the large lake THROUGH THE SAME , above noted , CRAWFISH BORINGS -----and it would be ,logical, to assume (based on your report)that the spillway of small lake will run ,ONLY, when MORE water comes into small lake than the CRAWFISH CHANNELS can drain back thro the ridge and into large lake etc --pleased to note your report that the ALONG PIPE LEAKS in large lake seem to have ceased -- E.W. COOPER

Copied to
Contractor H. H. Hagen
of Prof. Lamb
Newburgh Tenn

E. W. COOPER & SONS -
ENGINEERS

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NASHVILLE, TENN. 4/18/51/ 51/
4/18/51/

Father Lynch
Father Eiseman
Father Ryan School
2300 Elliston Place
Nashville Tenn.
Gentlemen:

As requested by Father Lynch the writer made the trip to Camp Marymount this afternoon and made an inspection of the LARGE and the SMALL lake.

I estimate the total seepage below the Hagen dam (small lake) to be 6000 gallons in 24 hours. If the springs and all the inbound water to the lakes were (~~in some miracle~~) (by some miracle) to ENTIRELY CEASE inbound flow about 12 years would elapse before a 6000 gals in 24 hours would drain the two lakes ---or another way of stating it would be to say that a loss of 6000 gals per day would lower the lakes ONE FOOT in TWO YEARS --and that sure would be a long dry spell ----The ~~30~~ seepage through this Hagen dam is far less than would be expected and is of NO CONSEQUENCE, whatsoever, in the matter of conserving your water level for the SWIMMING PERIOD from June 1st to Sept 1st.

Just as the writer figured (see my letter 1/26/51/ for the details) the two lakes are undoubtedly connected by the underground enlargement of natural drain channels, by crawfish, working thro the backbone between the two lakes ---this simply means that the two lakes are permanently connected and are for all Engineering calculations ONE LAKE --the reason the small lake rises towards its spillway floor after a rain and then falls back $1\frac{1}{2}$ feet is simply because the small lake ~~drain~~ drains back into the large one as pointed out in my 1/26/51/ letter.

I estimate (today) the total LEAKAGE through the CONCRETE CULVERT in the old or large dam to be 10000 gallons per day of 24 hrs. If, by some miracle, all inbound water from spring and drainage were to CEASE it would require about 250 days for this leak to drain the lakes.

I estimate ~~that~~ (today) that the seepage and leakage in the northern end of the large lake dam to be about 15000 gallons in 24 hrs and this rate of leakage (were the miracle to happen as to stoppage of all inbound water) would drain the lakes in 5 years.

The total Flow through spillway today is about 70000 gals per 24 hours --adding the Concrete Culvert leakage of 10000 gals and the 15000 gallons of seepage on north end of old dam it appears that the total flow (today) is about 815000 gals per 24 hrs.

Estimating your total EVAPORATION losses from June 1st to Sept 1st as about 12 inches ---Estimate your SAVING of water from leakage from large lake to small lake (with dam on small lake washed out but now fully restored and without leakage) for the period from June 1st to Sept 1st as 10 million gallons.

You have no data on the total number of acres that do drain into your lakes --to get this would require a survey or at least a day long "cruise" in the hills and valleys around the lakes ---Your SWIMMING PAVILION has been built (for some time) at a level of about 2'-6" above the level of the floor of the spillway--Your kids wading pool has been built with concrete bottom and you do not want to deepen the water there ---Your top of dam is used as a walkway and you do not want to change that ---Your Spillway from large lake, runs, right along a road and you do

E. W. Cooper

James L. Cooper

Joe B. Cooper

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NASHVILLE, TENN.

not want to disturb that road and lead the outfalling water AWAY from the dam -----As pointed out today all those trees in the dam should have been cut down long ago and burned --Cut down and burn trees to a point say 150 feet below large dam ---Burn the cut down trees now blocking the HIGH LEVEL spillway OUTFALL on the north end (do it now BEFORE the big rains come) ---This High Level spillway of Contractor Hagen may prove a BLESSING some wild, rainy, night when the floods come.

As often pointed out, your large dam does not have ENOUGH free-board (vertical distance from normal lake level to top) ---you should have here a minimum of 9 feet BUT THIS WOULD UPSET your present walkways etc etc

You could easily BUILD UP say two feet of water by the use of Baffle Boards (as I pointed out today) but this would put the water too deep for the kids you point out ---the building up would give you SURPLUS WATER for the period from June 1st to Sept 1st --surplus to leak, evaporate etc and STILL leave the large lake level (and the small one too ---they are connected thro the backbone) at NORMAL.

Summing up ~~the~~ it seems to the writer that, in spite of the lack of data or ~~experience~~ any records of flows, drainage areas etc (see above) that you would have the writer cast in the role of a superman to say that the LAKE LEVEL SHALL STAY AS OF TODAY ----While I appreciate the fact that you would like to have some guarantee on such matters you must realize that it is impossible for anyone to ~~#~~ even predict with so much missing data and so many mistakes that stand out so glaringly in the design (if there ever was a design) of the ORIGINAL LARGE DAM (not to mention the small dam which also washed out) -----So the best I can do is (as above) to point out some of the facts and you will have to make the decisions as to what you CAN NOW DO to INSURE yourselves and the boys and girls that today's lake level will be there in the hot months of July and August.

Of course the writer trusts and hopes that the boys and girls will not be disappointed when the hot swimming days roll around ---An Engineer must work and make decisions based on data, records of run in and of evaporation, of springs flow and many other factors BUT he can still hope for the best and in this case may I cast aside science (for the moment) and express my hope that providence will cause the clear, cool, waters of your lakes to stand still or maintain their levels during the coming heated season and that the youths may disport themselves and have the healthy recreation so needful to their proper ~~development~~ development

Yours very truly

E. W. Cooper

E. W. Cooper Engr.
Yard-Office Phone 6-2808

Copy to -Contractor H. R. Hagen
Lewisburgh Tenn

I enclose 1943-44 - Wood Control matter

E. W. Cooper

James L. Cooper

Joe B. Cooper

**E. W. COOPER & SONS
ENGINEERS**

LAKES, DAMS, WATER SUPPLY, CONSERVATION
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NASHVILLE, TENN.

4/19/51/

Father F.J. Lynch
Father F.W. Wiseman
Father Ryan School
2500 Elliston Place
Nashville Tenn.
Gentlemen:

Taking into account the various "angles" and the previous mistakes in layout and design; together with your desire to come as NEAR AS POSSIBLE to INSURE that the boys and girls will have the many benefits of the swims in the cool, clear waters of the Camp Marymount lakes in the season from June 1st to Sept 1st I suggest that you take the following ACTION on the said project.

With the spillway BAFFLES of ship lap boards cause the Lake to impound say 25 MORE vertical depth of water, to raise the present lake level to a HIGH LAKE LEVEL a pm 6 inches lower than the 1001 floor of the "big boys" SWIM DAVELION or platform-----To compensate the "safe" depths you desire for the "kids" wading and beginners area in the edge of the lake near the spillway act on a choice of these alternate plans (1) Simply move the kids place to tie on to the concrete paving, which now forms the floor of the spillway --extend this paving up to coincide with the high level lake --to make said upward extension use either concrete or sectional, skidded, wooden sections to butt to a junction with present, concrete, forming the spillway floor (in winter simply pull these skidded and weighted wood sections out of the edge of the lake to a "winter position" well above floods (so there will be no chance of said sections floating into the rush of spillway discharge water -----)(2) Leave the kids place as now and simply extend the floored area uphill enough to compensate for the higher lake level --For this aided floor area use either concrete paving or use skidded and weight wood SECTIONS to BUTT against the present Concrete floor paving and in the winter pull these wooden sections (with a truck and a rope) well above flood stage of high water etc .

Of the above 2 plans ~~the combination of the~~ I would prefer the one of placing the "kids place" at the mouth or throat of the spillway for a number of reasons (a) The kids would be getting the benefit of the cleanest of the lake water and would be playing in RUNNING WATER or gently flowing water as it went to the outfall down the spillway channel (2) The wooden bridge over the spillway would be convenient as a seating platform for attendants or guards for the supervision of the childrens water sports and would enable a life guard to keep an eye on the entire field of the kids activities in the water ---and there would be far less likelihood of a child getting out beyond the rope barrier-----In either case the rope barrier should be a floating one with floating bouys (see those in Centennial Swim Pool --love the barrier outwardly as the water drops (if it does drop)

Be sure and keep in mind that your CUSTODIAN MUST be on the alert to move the spillway baffles in case of MAXIMUM FLOODS -The Lake is not properly designed to avoid a washout -it does not have enough free board nor enough TURN of spillway.

Have E.W. Cooper Ex

Copy mailed to Contractor H.R. Bayen of Lewisburgh Tenn

E. W. Cooper

James L. Cooper

Joe B. Cooper

E. W. COOPER & SONS
ENGINEERS
LAKES, DAMS, WATER SUPPLY, CONSERVATION
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PHOSPHATE, STONE, MINERALS
NASHVILLE, TENN. 4/20/51/

Father F.W. Eiseman
Father T.J. Lynch
Father Ryan School
2300 Elliston Place
Nashville Tenn.
Gentlemen:

Supplementing my letter of 4/19/51/ suggestion ACTION FOR YOU on the Marymount Lake project note the following additional or supplementing suggestions.

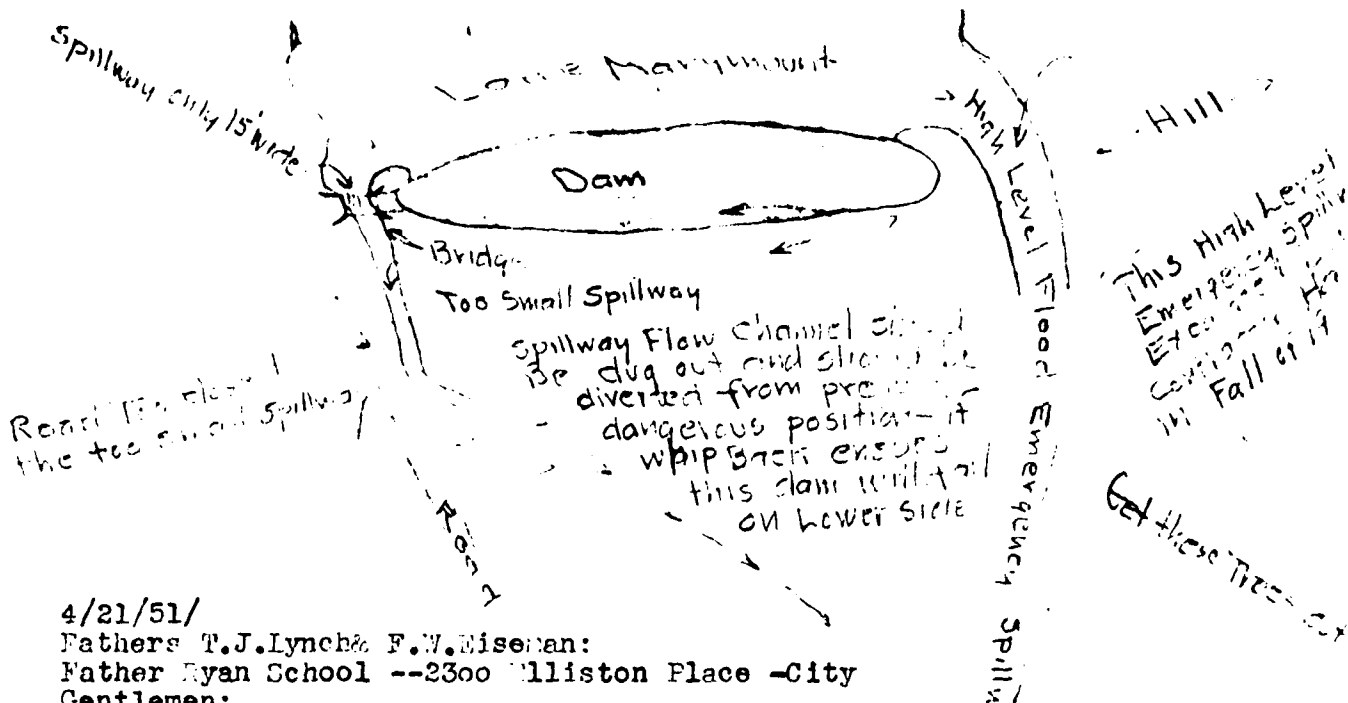
Put the BAFFLE BOARDS in NOW (it can be done in ONE DAY by one carpenter and the help of students)and raise the NORMAL LAKE LEVEL (as of 4/18/51/) a vertical distance of $2\frac{1}{2}$ feet .This will CREATE in the lake a SURPLUS WATER SUPPLY of about 7 million gallons of water (keep in mind that on 4/18/your lake was WASTING more than half a million gallons of water per day through its spillway discharge) ---At the wastage rate of 4/18/ and on the basis of NO RAINS the placing of these baffle boards would CREATE the surplus SEVEN MILLION GALLONS of water in about 15 days .

Let us estimate that from now until your June loth opening date there may be a total of say 20 days with NO INFLOW TO THE LAKE and with no outflow from the spillway ----Taking into account the WATER LOSS (based on 4/18/ leakages noted in two areas of your big dam) these said leakages and evaporation might reduce the 7 million surplus ~~##~~ gallons of water by $2\frac{1}{2}$ million gallons -----But you would come to the SWIM SEASON of June loth with the remaining $4\frac{1}{2}$ million surplus gallons or another way of putting it would be to say that you would come to June loth with more than ONE FOOT surplus above the water level of 4/18/

Assume ,now, that on June loth you were STILL UNDECIDED and STILL HAD TAKEN NO ACTION on the matter of WHAT TO DO about the kids Swim Place -----in this ovent you would still reach June loth with an EXTRA FOOT of water behind the baffles (and having spent NOTHING except a days work with a carpenter and some of the students) and at this point you could CALL A MEETING of YOUR BOARD OF DIRECTORS (include all Vice Presidents)and you could drive them to the Lake and show them that extra foot of water and ask the Board (and the V.Ps) to stand on the bridge and make the DECISIONas to whether or NOT the boards were to be pulled out to drop the normal lake level to its 4/18/51/ level so that the KIDS would have the same levels for thedr small activities and water sports .

The above procedure is not necessarily the best procedure when considered on a stractly scientific basis but it does come near to meeting the SITUATION that seems to face you in charge i.e.the fervent desire of the HIGH BRASS to NOT SPEND ANY MORE MONEY and to STILL HAVE AN ASSURANCE THAT ,PROVIDENCE ,will cause the waters to keep to a level as was established by a very poorly designed Project (if designed at all) --Keep in mind that as long as the spillway is running THERE IS NO NET LOSS OF WATER . I remain

Yours very truly *E.W. Cooper* ENC



4/21/51/

Fathers T.J. Lynch & F.W. Wiseman:

Father Ryan School --2300 Williston Place --City
Gentlemen:

Still supplementing my suggestions of 4/18---4/19/and 4/20/
please refer to this sketch ---I urge you to enlarge the WIDTH of the
HIGH LEVEL FLOOD EMERGENCY SPILLWAY by the old ,time honored use of the
PICK AND SHOVEL wielded by the brawn of the "student body " ---You could
sell the boys on the idea by pointing out how it would harden their
muscles and make them fit for the athletic contests that lie ahead --
perhaps a reference to the hardened condition of General of the Armies
Douglas McArthur ,as he now returns in the "twilight of Life",singing
the old British Army marching song (Old soldiers never die ; they only
fade away) would increase the # esprit de corps and make the teen age
boys see the glamour in the use of the pick and the shovel on the said
spillway BEFORE they are privileged to use the swimming and diving
facilities on same side of the lake -----Be that as it
may ,I am sure that you can "sell " the boys on the idea and the
high level spillway should be WIDENED to at least 50 feet bottom width
and let every point on that 50 foot bottom width (as it crosses the
axis of the dam) be at an ELEVATION of 6 inches below the floor
of the ~~Swimming~~ Swimming Platforms -----Try to get this spillway
enlargement under way NOW and be ready for the chance of a SPRING FLOOD

Yours very truly

E.W. Cooper

E.W. Cooper Engineer.

P.S. I might suggest ,also, that PICK AND SHOVEL WORK on spillway
enlargement might be a good method of punishment for infractions
of the School discipline -----However ,in these latter days of ~~the~~
Socialism of the Fair and New Deals ,it may well be that each of
you would have no RIGHT to punish or hit an insubordinate youth
---except ,of course ,in SELF DEFENSE .

am

AD-A108 257

TENNESSEE STATE DEPT OF CONSERVATION NASHVILLE DIV 0--ETC F/6 13/13
NATIONAL PROGRAM OF INSPECTION OF NON-FEDERAL DAMS, TENNESSEE. --ETC(11)
JUL 81 W CULBERT DACW62-81-C-0056

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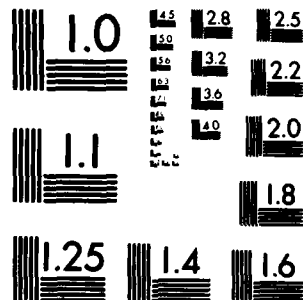
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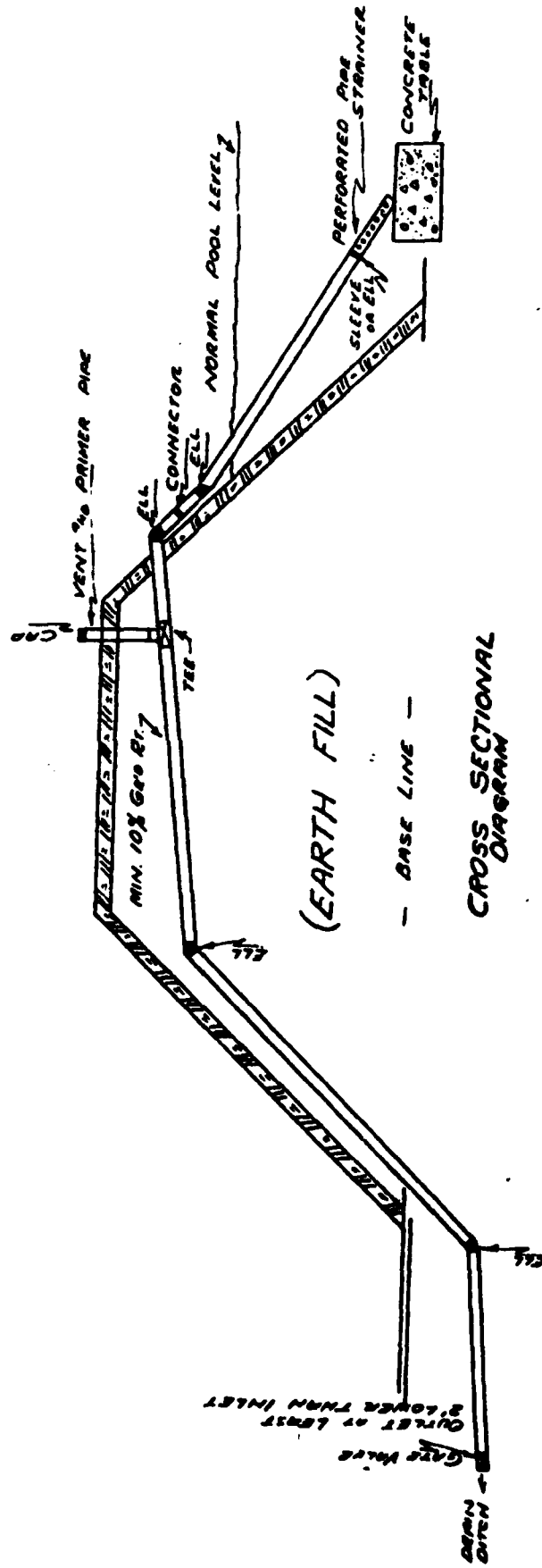


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MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS-1963-A

SUGGESTED SYPHON DRAIN FOR NEW AND EXISTING LAKES



NOTE - IF DRAINAGE FACILITIES ARE NOT AVAILABLE. DISCHARGE MAY BE ABOVE GROUND ELEVATION WHERE PIPE IS LAID BELOW GROUND LEVEL PROTECTION AGAINST FREEZING IS PROVIDED

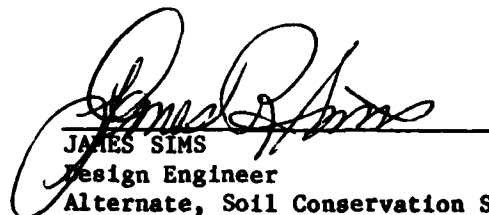
NON-FEDERAL DAM INSPECTION REVIEW BOARD
PO BOX 1070
NASHVILLE, TENNESSEE 37202

ORNED-G

Commander
US Army Engineer District, Nashville
PO Box 1070
Nashville, TN 37202

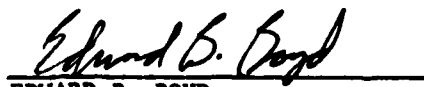
1. The Interagency Review Board, appointed by the District Engineer on 8 October 1980, presents the following recommendations after meeting on 21 May 1981 to consider the Phase I investigation report on Lever Lake inspected by the Tennessee Department of Conservation.
2. The spillway should be classified as one with a "seriously inadequate spillway capacity."
3. The board is in agreement with report conclusions and recommendations following minor revisions.


FRANK B. COUCH
Chief, Geotechnical Branch
Chairman


JAMES SIMS
Design Engineer
Alternate, Soil Conservation Service


ROBERT A. HUNT
Director, Div 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


L. E. LOCKETT
Structural Engineer
Alternate, Design Branch



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

2 JUN 1981

IN REPLY REFER TO

ORND-G

Honorable Lamar Alexander
Governor of Tennessee
Nashville, TN 37219

Dear Governor Alexander:

Please be informed of the results of an inspection, under authority of Public Law 92-367, conducted on Lever Lake Dam in Williamson County, Tennessee. An inspection team, composed of personnel from your Division of Water Resources, observed conditions which indicate a high potential for failure of the embankment dam due to seriously inadequate spillway capacity and other serious deficiencies.

Lever Lake is classified as a high hazard potential, small size dam and, as such, should be able to regulate a one-half probable maximum flood ($1/2$ PMF) to conform to inspection program guidelines. A hydraulic analysis of the project's spillway showed the dam would be substantially overtopped by a one-half probable maximum flood. A visible inspection indicated that the stability of the embankment is questionable due to the steepness of the slope, undesirable growth on the downstream slope, and seepage at the toe of the dam.

Based on the results of the visual inspection and due to the seriously inadequate spillway capacity, the dam is considered unsafe. While I do not view this as an emergency at this time, I recommend you initiate prompt action by the State to cause the owner to correct the deficiencies as soon as practical to minimize the risk to the summer cabins located downstream.

A report of the technical investigation will be furnished your office upon completion.

Sincerely,

LEE W. TUCKER
Colonel, Corps of Engineers
Commander

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

END

DATE
FILMED

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