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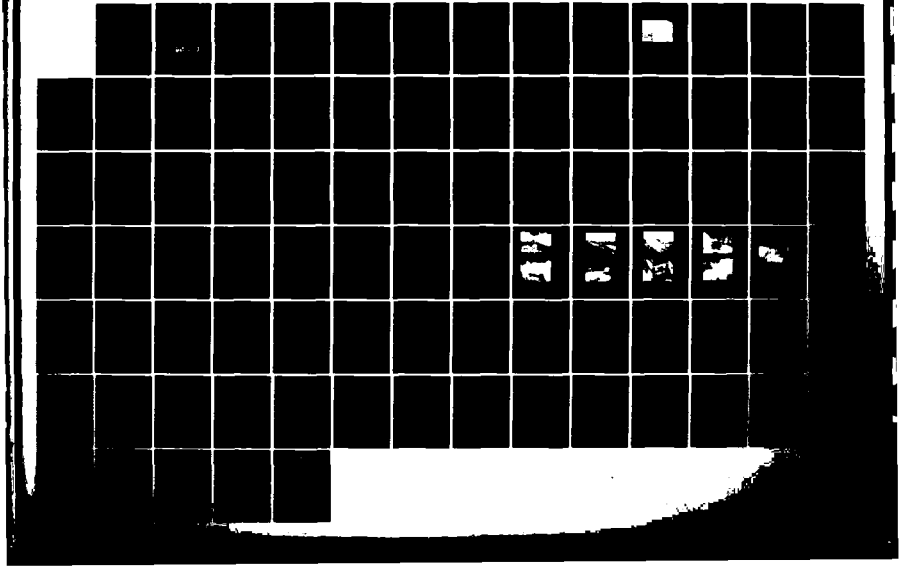

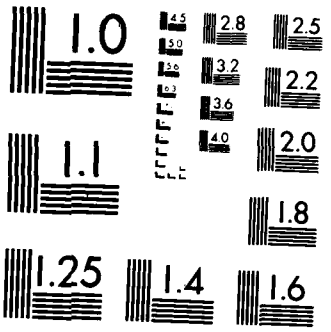

CONNECTICUT RIVER BASIN
MONROE, NEW HAMPSHIRE

TYLER TREE FARM DAM
NH 00325

STATE NO 162.04

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION, CORPS OF ENGINEERS
WALTHAM, MASS. 02154

JUNE 1979

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18. SUPPLEMENTARY NOTES

Cover program reads: Phase I Inspection Report, National Dam Inspection Program; however, the official title of the program is: National Program for Inspection of Non-Federal Dams; use cover date for date of report.

19. KEY WORDS (Continue on reverse side if necessary and identify by block number)

DAMS, INSPECTION, DAM SAFETY,

Connecticut River Basin
Monroe, New Hampshire
Roaring Brook

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

THe dam has a hydraulic height of 25 ft. and is 254 ft. long. It is an earthen dam with a 60 inch diameter drop inlet principal spillway. THe dam is in good condition. Existing conditions which may cause more serious problems if left uncorrected. It is small in size with a significant hazard potential. A major breach at normal pool or emergency spillway crest could result in the loss of 3 to 4 lives and appreciable property damage.

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DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION, CORPS OF ENGINEERS
424 TRAPELO ROAD
WALTHAM, MASSACHUSETTS 02154

REPLY TO
ATTENTION OF:

NEDED

OCT 2 1979

Honorable Hugh J. Gallen
Governor of the State of New Hampshire
State House
Concord, New Hampshire 03301

Dear Governor Gallen:

I am forwarding to you a copy of the Tyler Tree Farm Dam Phase I Inspection Report, which was prepared under the National Program for Inspection of Non-Federal Dams. This report is presented for your use and is based upon a visual inspection, a review of the past performance and a brief hydrological study of the dam. A brief assessment is included at the beginning of the report. I have approved the report and support the findings and recommendations described in Section 7 and ask that you keep me informed of the actions taken to implement them. This follow-up action is a vitally important part of this program.

A copy of this report has been forwarded to the Water Resources Board, the cooperating agency for the State of New Hampshire. In addition, a copy of the report has also been furnished the owner, Mr. George R. tyler, Monroe, New Hampshire 03771.

Copies of this report will be made available to the public, upon request, by this office under the Freedom of Information Act. In the case of this report the release date will be thirty days from the date of this letter.

I wish to take this opportunity to thank you and the Water Resources Board for your cooperation in carrying out this program.

Sincerely,

MAX B. SCHEIDER
Colonel, Corps of Engineers
Division Engineer

Incl
As stated

NATIONAL DAM INSPECTION PROGRAM
PHASE I INSPECTION REPORT

Identification No.: NH00325
Name of Dam: Tyler Tree Farm Dam
Town: Monroe
County and State: Grafton County, New Hampshire
Stream: Roaring Brook
Date of Inspection: May 7, 1979

BRIEF ASSESSMENT

Tyler Tree Farm Dam has a hydraulic height of 25 feet, is 12 feet wide, and is 254 feet long. It is an earthen dam with a 60-inch diameter drop-inlet principal spillway. It has an emergency spillway with earth bottom and sides which is located between the east end of the dam and the east abutment. It has a 24" diameter low-level outlet for lowering pool elevation. The dam spans a reach of Roaring Brook, and is located in northwestern New Hampshire. Maximum storage capacity is about 109 acre-feet. Tyler Tree Farm Dam is used for recreational purposes including: sport fishing, boating and wildlife observation. The pond ranges from 900 feet to 1200 feet in length with a surface area of about 5 acres.

The dam is in good condition. Minor concerns are: existing conditions which may cause more serious problems if left uncorrected. These include: erosion of banks at the downstream discharge channel, the destruction of vegetation on the crest of the dam which is due to vehicular traffic, use of upstream face of the dam for beaching boats, growth of saplings on upstream face of the dam, and sloughing of east abutment.

Based on small size and significant hazard classifications in accordance with Corps guidelines, the test flood is ½ Probable Maximum Flood (PMF). A test flood outflow of 3,500 cfs (1,207 csm) would rise to 1.3 feet below top of dam. The total project capacity at top of dam is 5,235 cfs which is 150 percent of the test flood discharge.

A major breach at normal pool or emergency spillway crest could result in the loss of 3 to 4 lives and appreciable property damage. A potentially greater loss of life could result, if the grange hall, located downstream of the dam, were occupied and a breach were to occur at the crest of the emergency spillway.

The owners: George R., Esther S., and Robert G. Tyler, should implement the results of the recommendations and remedial measures given in Sections 7.2 and 7.3 within two years after receipt of this Phase I Inspection Report.

Warren A. Guinan
Project Manager
N.H. P.E. 2339

This Phase I Inspection Report on Tyler Tree Farm Dam has been reviewed by the undersigned Review Board members. In our opinion, the reported findings, conclusions, and recommendations are consistent with the Recommended Guidelines for Safety Inspection of Dams, and with good engineering judgment and practice, and is hereby submitted for approval.

Joseph W. Finegan

JOSEPH W. FINEGAN, JR., MEMBER
Water Control Branch
Engineering Division

Joseph A. McElroy

JOSEPH A. MCELROY, MEMBER
Foundation & Materials Branch
Engineering Division

Carney M. Terzian

CARNEY M. TERZIAN, CHAIRMAN
Chief, Structural Section
Design Branch
Engineering Division

APPROVAL RECOMMENDED:

Joe B. Fryar

JOE B. FRYAR
Chief, Engineering Division

PREFACE

This report is prepared under guidance contained in the Recommended Guidelines for Safety Inspection of Dams, for Phase I Investigations. Copies of these guidelines may be obtained from the Office of Chief of Engineers, Washington, D.C. 20314. The purpose of a 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 reviewing 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. 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 structure and may obscure certain conditions which might otherwise be detectable if inspected under the normal operating environment 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 condition of the dam will continue to represent the condition of the dam at some point in the future. Only through continued care and inspection can there be any chance that unsafe conditions be detected.

Phase I inspections are not intended to provide detailed hydrologic and hydraulic analyses. In accordance with the established Guidelines, the Spillway Test flood is based on the estimated "Probable Maximum Flood" for the region (greatest reasonably possible storm runoff), or fractions thereof. Because of the magnitude and rarity of such a storm event, a finding that a spillway will not pass the test flood should not be interpreted as necessarily posing a highly inadequate condition. The test flood provides a measure of relative spillway capacity and serves as an aide in determining the need for more detailed hydrologic and hydraulic studies, considering the size of the dam, its general condition and the downstream damage potential.

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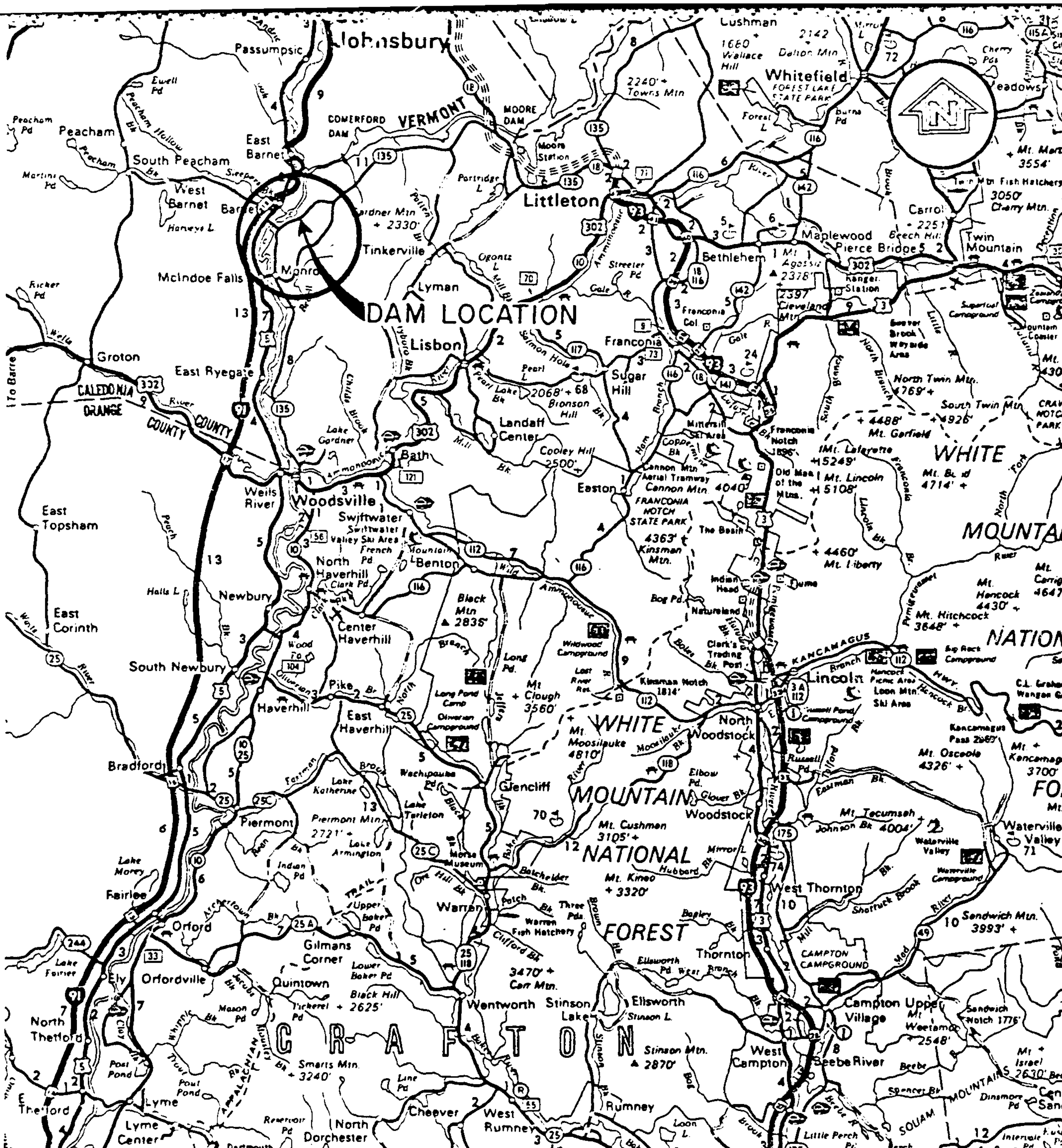
Figure 1 - Overview of Tyler Tree Farm Dam.



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Anderson-Nichols & Co., Inc. CONCORD NEW HAMPSHIRE	U.S. ARMY ENGINEER DIV. NEW ENGLAND CORPS OF ENGINEERS WALTHAM, MASS.

NATIONAL PROGRAM OF INSPECTION OF NON-FED. DAMS

TYLER TREE FARM DAM LOCATION MAP

ROARING BROOK NEW HAMPSHIRE

SCALE: SEE BAR SCALE

DATE: JUNE, 1979

SCALE IN MILES

0 5 10

MAP BASED ON STATE OF NEW HAMPSHIRE OFFICIAL HIGHWAY MAP.

NATIONAL DAM INSPECTION PROGRAM
PHASE I INSPECTION REPORT
TYLER TREE FARM DAM

SECTION 1
PROJECT INFORMATION

1.1 General

a. Authority. Public Law 92-367, August 8, 1972, authorized the Secretary of the Army, through the Corps of Engineers, to initiate a National Program of Dam Inspection throughout the United States. The New England Division of the Corps of Engineers has been assigned the responsibility of supervising the inspection of dams within the New England Region. Anderson-Nichols & Company, Inc. has been retained by the New England Division to inspect and report on selected dams in the State of New Hampshire. Authorization and notice to proceed were issued to Anderson-Nichols under a letter of March 22, 1979 from John P. Chandler, Colonel, Corps of Engineers. Contract No. DACW33-79-C-0050 has been assigned by the Corps of Engineers for this work.

b. Purpose

(1) To perform technical inspection and evaluation of non-Federal dams to identify conditions which threaten the public safety and thus permit correction in a timely manner by non-Federal interests.

(2) To encourage and prepare the States to initiate quickly effective dam safety programs for non-Federal dams.

(3) To update, verify and complete the National Inventory of Dams.

1.2 Description of Project

a. Location. Tyler Tree Farm Dam is located in the Town of Monroe, New Hampshire and spans Roaring Brook. After discharging through the dam, Roaring Brook flows southwesterly for a distance of approximately 1.2 miles before becoming confluent with the Connecticut River. Roaring Brook is a minor tributary in the Connecticut River Basin. Tyler Tree Farm Dam is shown on the U.S.G.S. Quadrangle, St. Johnsbury, Vt-NH, with coordinates at N 44° 17' 43", W 72° 01' 34", Grafton County, New Hampshire. (See Location Map page vii.)

b. Description of Dam and Appurtenances. Tyler Tree Farm Dam is an earthen dam about 254 feet in length and about 25 feet in height. The dam consists of: a 200-foot long earthen dam embankment; a 54-foot wide grassed covered earthen emergency spillway which is located between the east end of the dam and the east abutment; a 60-inch diameter drop-inlet principal spillway, and a

24-inch low-level drain pipe extends into the pond behind the dam. This latter pipe is connected through a tee to the 48-inch principal spillway discharge pipe. The 24-inch line is apparently plugged at the inlet end with a vitrified clay plug with eye arrangement for quick removal with power equipment (tractor or truck). A trash rack with screening attached to its exterior face encircles the top of the drop-inlet spillway. An anti-vortex device spans across the 60-inch drop-inlet spillway. Design plans indicate that two 6-inch diameter perforated bituminous coated corrugated metal pipes are located near the downstream toe of the dam to serve as toe drains for the dam. These two pipes drain in the vicinity of 48-inch diameter principal spillway discharge pipe.

c. Size Classification. Small (hydraulic height - 25 feet; storage - 109 acre-feet) based on hydraulic height and storage (based on height $\geq$ 25 to $<$ 40 feet and storage $\geq$ 50 to $<$ 1,000 acre-feet) as given in Recommended Guidelines for Safety Inspection of Dams.

d. Hazard Classification. Significant Hazard. A major breach could probably result in the loss of 3 or 4 lives and appreciable property damage. (See Section 5.1 f.)

e. Ownership. The Tyler Tree Farm Dam was originally constructed by the Tyler Family of Esther S., George R. and Robert G. Tyler. The ownership has remained unchanged throughout the years. The Tylers presently own, maintain, and operate the dam.

f. Operator. The current owner and operator of the Tyler Tree Farm Dam is the Tyler Family; Esther S., George R. and Robert G. Tyler, of Monroe, New Hampshire 03771. Phone: (603) 638-2524.

g. Purpose of Dam. The dam was constructed for the purpose of creating a recreational pond to be used for sport fishing, boating, and for wildlife observation. The pond is presently being utilized for these recreational activities.

h. Design and Construction History. Tyler Tree Farm Dam was constructed in 1969. The Soil Conservation Service (SCS), Woodsville, New Hampshire Field Office, designed and assisted the owner in the construction of the dam.

i. Normal Operating Procedures. No written operating procedures were disclosed for the Tyler Tree Farm Dam. During the inspection one of the owners of the dam, George Tyler, stated that during periods of high water the dam is periodically inspected for trash build-up and any debris removed. The owner also indicated that the 24-inch diameter low-level outlet, which originates in the reservoir pool, has never been used (i.e. he has not tested the flow control mechanism, a vitrified clay plug).

1.3 Pertinent Data

a. Drainage Area. The drainage area consists of 2.9 square miles (1,856 acres) of primarily mountainous terrain. No storage areas are present in the upstream drainage area.

b. Discharge at Damsite.

(1) According to the owner, the maximum known stage at the damsite occurred in July, 1973 when flow of approximately one foot in depth was observed in the emergency spillway. Using the rating curve calculated for the dam the project discharge was estimated to have been 670 cfs.

(2) Low-level outlet capacity @ principal spillway elevation - 53 cfs @ 681.3' MSL

(3) Drop-inlet spillway capacity @ test flood elevation - 275 cfs @ 693.4' MSL

(4) Emergency spillway discharge @ test flood elevation - 3,220 cfs @ 693.4' MSL

(5) Total project discharge @ test flood elevation - 3,500 cfs @ 693.4' MSL

(6) Drop-inlet spillway capacity @ top of dam - 285 cfs @ 694.7' MSL

(7) Emergency spillway capacity @ top of dam - 4,950 cfs @ 694.7' MSL

(8) Total spillway capacity @ top of dam - 5,235 cfs @ 694.7' MSL

c. Elevation (feet above MSL)

(1) Streambed @ centerline of dam - 670 (at downstream toe; assumed elevation using U.S.G.S. quadrangle as a reference. All elevations referenced from this datum.)

(2) Maximum tailwater - unknown

(3) Upstream invert low-level outlet - 671.9

(4) Recreation pool - 681.3 (principal spillway)

(5) Full flood control pool - not applicable

(6) Drop-inlet spillway crest - 681.3
Emergency spillway crest - 688.8

(7) Design surcharge (Original Design) - unknown

(8) Top of dam - 694.7

(9) Test flood pool - 693.4

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(9) Test flood pool - 693.4

d. Reservoir (feet)

(1) Length of maximum pool - 1200 (approximate)

(2) Length of pool at principal spillway crest - 900 (approximate)

(3) Length of pool at emergency spillway crest - 1100 (approximate)

(4) Length of flood control pool - not applicable

e. Storage (acre-feet)

(1) Recreation pool - 16 (approximate)

(2) Flood control pool - not applicable

(3) Principal spillway crest pool - 16 (approximate)

(4) Emergency spillway crest pool - 62 (approximate)

(5) Top of dam -109 (approximate)

(6) Test flood pool - 62 (approximate)

f. Reservoir Surface (acres)

(1) Recreation pool - 5 (approximate)

(2) Flood control pool - not applicable

(3) Principal spillway crest - 5 (approximate)

(4) Emergency spillway crest - 7 (approximate)

(5) Test flood pool - 7 (approximate)

(6) Top of dam - 9 (approximate)

g. Dam

(1) Type - earthen embankment on unconsolidated glacial deposits with drop-inlet spillway (principal) and grassed emergency spillway.

(2) Length - 254' (includes 54-foot wide emergency spillway)

(3) Height - 25' (hydraulic height)

(4) Topwidth - 12'

(5) Side slopes - 2.5H:1V on upstream face and 3H:1V on downstream.

(6) Zoning - none indicated on SCS design plans.

(7) Impervious Core - unknown

(8) Cut-off - core trench excavated to impervious material along centerline.

(9) Grout Curtain - none

(10) Toe drain - two 6" perforated bituminous coated metal pipes.

h. Diversion and Regulating Tunnel - not applicable

i. Spillway

(1) Type - A vertical 60-inch bituminous coated corrugated metal drop-inlet riser which discharges into a 48-inch horizontal bituminous coated corrugated metal conduit.

(2) Size - 60" diameter drop-inlet riser, 84" diameter horizontal conduit

(3) Crest Elevation - 681.3' MSL

(4) Gates - none

(5) Low-level - 24" diameter bituminous coated corrugated metal pipe which originates in pool bottom and discharges into the 48" diameter conduit.

(6) U/S Channel - The approach channel to the dam consists of Roaring Brook about 130 feet in width. The banks are lined with trees of moderate size and some brush.

(7) D/S Channel - The channel immediately downstream is about 15 feet in width. The channel bottom is a mixture of sand, gravel, and boulders. Trees and some brush cover the valley sides. Approximately one mile downstream of the dam is located one inhabited structure and a grange meeting hall.

j. Emergency Spillway

(1) Type - A grass covered earthen channel. It is nearly trapezoidal in shape with 2H:1V side slopes.

(2) Width - 54'

(3) Crest Elevation - 688.8' MSL

(4) Length - 250' (approximate)

(5) U/S Channel - The approach channel originates at the east bank of the reservoir and is grass covered.

(6) D/S Channel - The downstream channel is not well defined. It joins the downstream channel of the prinicpal spillway about 100 feet downstream of the principal spillway outlet.

SECTION 2
ENGINEERING DATA

2.1 Design

Tyler Tree Farm Dam was designed by the U.S. Department of Agriculture, Soil Conservation Service (SCS) in July 1968. Design data were obtained at the SCS Woodsville Field office. The data consisted of:

(1) Plan of dam, spillway, emergency spillway, toe drains, and pool

(2) Sketches of typical sections of dam embankment and emergency spillway

(3) Profiles along top of dam and emergency spillway

(4) Detailed listing of quantities of construction materials. (See Appendix B.)

2.2 Construction

The design plans were revised in 1969 to reflect as-built conditions. Revisions were made directly to the file design data located in the SCS Woodsville Field office. (See Appendix B.)

2.3 Operation

No engineering operational data were disclosed.

2.4 Evaluation

a. Availability. SCS engineering plans and sketches were available for Tyler Tree Farm Dam and on file at the SCS Woodsville Field office. A search of the SCS files revealed only limited amount of hydraulic and hydrologic calculations.

b. Adequacy. Based on field inspection the SCS plans and sketches were determined adequate. Because of the limited amount of detailed hydrologic and hydraulic data, the final assessments and recommendations are based on the SCS plans and sketches in conjunction with visual inspection and hydrologic and hydraulic calculations.

c. Validity. The visual inspection disclosed that the present conditions are consistent with the SCS as-built plans and sketches.

SECTION 3
VISUAL INSPECTION

3.1 Findings

a. General. Tyler Tree Farm Dam is a low dam which impounds a reservoir of small size. The watershed above the reservoir is primarily rolling and partially wooded. The stream gradient below the dam is steep.

b. Dam. Tyler Tree Farm Dam is an earthen embankment about 25 feet high, 254 feet long, and 12 feet wide at the crest. (See Appendix C - Figure 2.) At the time of the inspection, water was discharging through the drop-inlet spillway. The reservoir level was 14.5 feet below the crest of the dam and 7.3 feet below the crest of the emergency spillway.

The crest of the dam is covered with grass and appears to have been mowed regularly. Vehicles are driven on the crest of the dam and there is no vegetation in the two vehicle tracks. (See Appendix C - Figure 2.)

The upstream slope of the dam has a slope of 2.5H:1V. It is covered with grass which appears to have been mowed regularly. (See Appendix C - Figure 3.) Near the east end of the dam there are a few saplings, less than one-half inch in diameter, on the upstream face. Two boats were beached on the upstream face.

The downstream slope of the dam has a slope of 3H:1V. It is covered with grass which appears to have been mowed regularly. (See Appendix C - Figure 4.) Riprap has been placed at the downstream toe near the outlet of the principal spillway discharge pipe. (See Appendix C - Figure 5.) No seepage or wet areas were observed near the downstream toe or on the downstream face of the dam. One corrugated pipe, a toe drain, exits from the toe of the embankment near the spillway outlet. No water was discharging from this pipe at the time of the inspection.

c. Appurtenant Structures. An emergency spillway, with earth bottom and sides is located between the east end of the dam and the east abutment. (See Appendix C - Figure 6.) (According to the owner and SCS drawing of July 1968, the soil excavated from the emergency spillway was used to construct the dam.) The west bank of the spillway is covered with grass which appears to have been mowed regularly. There are some wet areas in the bottom of the spillway (above reservoir level) and these appear to be the result of groundwater discharge from the high ground in the east abutment. The east bank of the spillway

is a cut slope and constitutes the east abutment. There is little vegetation on this slope. A few small pine trees have been planted on the upper part of the slope. Much of the slope is soft and wet, which is apparently due to groundwater discharge from the high ground above the slope. The bottom and east bank of the emergency spillway appear to be glacial till.

The principal spillway (outlet works) consists of a 60-inch diameter bituminous coated corrugated metal pipe (BCCMP) vertical riser spillway approximately 10' long which discharges into a 48-inch diameter BCCMP horizontal conduit into the downstream channel. An 8' square by 4' high trashrack constructed with treated timber encircles the intake structure and is supported by 6" treated wood posts. (See Appendix C - Figure 7.) A 4' high x 2" thick anti-vortex device spans the 60" riser in a north-south direction and is supported vertically by the the wood posts and horizontally by the trashrack. A screen with ½" square openings has been installed at and above the water level on the exterior face of the trashrack. The screen was apparently installed to keep larger stocked fish from exiting the reservoir through this spillway.

A partially enclosed wooden platform structure with a pitched asphalt shingled roof has been constructed above the trashrack using the 6" treated wood posts as supports. The walkway access to the platform consists of wood planks and spans to the north dam embankment.

The wooden structure above the spillway does not serve a function in operating the dam, but appears to serve as a sport-fishing access and storage for boat oars and canoe paddles.

d. Reservoir Area. The watershed above the reservoir is rolling and partially wooded. No camps or other structures were noted on the shoreline of the reservoir. No visible evidence was noted of significant sedimentation in the reservoir. (See Appendix C - Figure 8.)

e. Downstream Channel. The channel downstream of the spillway outlet has a sand-gravel-and-boulders bottom. The sides of the channel are eroding, particularly near the outlet of the principal spillway discharge pipe. Several logs and fallen trees were observed in and across the channel. (See Appendix C - Figure 9.)

The channel downstream of the emergency spillway is not well defined. It is filled with standing trees and brush, and cut trees and brush have been dumped just beyond the downstream end of the emergency spillway. The channel downstream of the emergency spillway joins the channel downstream of the regular spillway about 100 feet downstream of the dam.

Approximately one mile downstream from Tyler Tree Farm Dam, Roaring Brook passes through a box culvert under highway (secondary) 135. (See Appendix C - Figure 10.)

Two structures, a farmhouse and Grange meeting house are located near the box culvert and may pose a hazard under flood flow conditions. The sill of the house is approximately 7.6 feet above the channel and the meeting house is approximately 11.6 feet above the channel.

3.2 Evaluation

Based on the results of the visual inspection, Tyler Tree Farm Dam appears to be in good condition.

The dam and emergency spillway appear to be well-constructed and well-maintained. Boats are beached on the upstream face of the dam and vehicle traffic has destroyed some of the vegetation on the crest of the dam. Both of these activities could lead to future erosion of the dam embankment.

Serious erosion of the banks of the natural channel immediately downstream of the principal spillway outlet is occurring and could affect the seepage pattern and stability of the downstream toe of the dam.

Several logs and fallen trees were noted in the channel downstream of the spillway. They could cause temporary damming of water discharged from the spillway.

The channel downstream of the emergency spillway is filled with standing trees and brush and piles of cut brush and logs, which could retard the discharge of flood flows through the emergency spillway.

A few saplings are growing on the east end of the upstream face of the dam and could pose a long-term problem if allowed to grow into trees.

The groundwater, discharging from the east abutment slope may cause some surface sloughing, which if left uncorrected could decrease the effectiveness of the spillway.

SECTION 4
OPERATIONAL PROCEDURES

4.1 Procedures

No written operational procedures were disclosed for Tyler Tree Farm Dam. The owners reported that during periods of high water the debris accumulated around the trash rack is periodically removed. A low-level outlet is available to drain the pond below spillway crest elevation, but has never been used.

4.2 Maintenance of the Dam

Esther S., George R., and Robert G. Tyler are responsible for maintenance of Tyler Tree Farm Dam.

4.3 Maintenance of Operating Facilities

No formal maintenance program was disclosed. The owners reported that the low-level outlet mechanism has never been used.

4.4 Description of Any Warning System in Effect

No written warning system was disclosed for Tyler Tree Farm Dam.

4.5 Evaluation

Minor maintenance is good; however, the debris in the discharge channels,erosion around the end of the 48-inch discharge pipe, lack of cover on the east abutment slope, and vehicle trespass on the dam crest require attention.

The low-level outlet intake plug which is located along the pond bottom should be located and inspected. Any sedimentation around the plug should be removed and the plug should be checked to ensure that it is still operational.

SECTION 5
HYDROLOGIC/HYDRAULIC

5.1 Evaluation of Features

a. General. Tyler Tree Farm Dam is low earthen dam which impounds a reservoir of small size. The total length of the dam is 254 feet which includes 54 feet of grass covered earthen emergency spillway. The top of dam is 13.4 feet above the principal spillway crest. The reservoir pool extends about 900 feet upstream.

A drawdown estimate was calculated assuming no inflow and that the 24" diameter BCCMP low-level outlet was open and flowing full. An analysis of the drawdown capacity under falling head conditions determined that it would take one day to drain the pond to the level of the low-level outlet. The 24" diameter BCCMP low-level outlet allows the pond behind the dam to be drained in a resonable time period.

b. Design Data. Limited hydrologic and hydraulic design data for Tyler Tree Farm Dam were disclosed. SCS design details give a pipe spillway capacity of 196 cfs and an emergency spillway capacity of 1000 cfs. These figures reflect design capacities and are not representative of as-built conditions. Detailed calculations were not disclosed. A drainage area of 2.9 square miles was also given.

c. Experience Data. The owners of the dam indicated that a maximum flow of about one foot in depth occurred in the emergency spillway in July, 1973 (estimated to be 670 cfs).

d. Visual Observation. No visual evidence of damage to the structure as the result of flood flow was disclosed at the time of the visual inspection.

e. Test Flood Analysis. Tyler Tree Farm Dam is classified as being small in size, having a hydraulic height of 25 feet and a top of dam storage of about 109 acre-feet. Using the Recommended Guidelines for Safety Inspection of Dams, the test flood was determined to be ½ the Probable Maximum Flood (PMF). The test flood inflow from the 2.9 square mile, mountainous drainage area is 3500 cfs (1207 csm). Using a simple inflow-outflow averaging technique, it was determined that surcharge storage would be insignificant in reducing the test flood discharge. (See storage routing calculations on page D-2.) During the test flood outflow of 3500 cfs (1207 csm), the reservoir will rise to 1.3 feet below top of dam. The total project capacity at top of dam is 5,235 cfs which is 150 percent of the test flood discharge.

f. Dam Failure Analysis. The impact of failure of the dam at normal flow (principal spillway crest) conditions and at crest of emergency spillway were assessed using the Guidance for Estimating Downstream Dam Failure Hydrographs issued by the Corps of Engineers. Owing to the large capacity of the dam project, it was assumed that assessing the impact of dam failure at top of dam would be unreasonable and therefore, the dam failure analysis at emergency spillway crest and normal flow conditions were assessed. The analysis covered the reach extending from the dam to State Route 135, a distance of about one mile downstream. It was determined that a breach at emergency spillway crest would create the greater downstream hazard. A breach at emergency spillway crest would increase the stage about 9.4 feet above the antecedent stage of about 3.9 feet at State Route 135. The total stage increase of about 13.3 feet would cause appreciable property damage to State Route 135, the Grange meeting house, and an inhabited structure resulting in the probable loss of 3 to 4 lives. A potential for greater loss of life exists if the Grange meeting hall is occupied at time of dam failure. A breach at normal pool would increase the antecedent stage of 0.5 feet by 10.1 feet. The total increase in stage of 10.6 feet would result in appreciable property damage to State Highway 135 and to one inhabited structure resulting in the loss of 3 to 4 lives. No other inhabited structures are located in the reach between State Route 135 and the confluence with the Connecticut River, a distance of approximately 500 feet downstream of State Route 135.

As a result of the analysis described above, the Tyler Tree Farm Dam was classified as Significant Hazard.

SECTION 6
STRUCTURAL STABILITY

6.1 Evaluation of Structural Stability

a. Visual Observations. The dam appears to be generally well-constructed and well-maintained. The visual examination indicated the following evidence of potential problems:

(1) Erosion of the banks of the discharge channel immediately downstream of the spillway outlet at the downstream toe of the dam.

(2) Vehicular tracks where vegetation has been destroyed on the crest of the dam.

(3) Use of the upstream face of the dam for beaching boats.

(4) Saplings growing near the east end of the upstream face of the dam.

(5) Possible future sloughing of east abutment side slopes above the emergency spillway channel.

In addition, there are logs and fallen trees across the channel downstream from the spillway outlet, and logs, cut brush, and standing trees and brush in the channel downstream of the emergency spillway.

b. Design and Construction Data. Tyler Tree Farm Dam was designed by the U.S. Soil Conservation Service in 1968. The available drawings do not show any zoning of the cross section of the embankment, and do not indicate the type of borrow to be used for constructing the embankment. They do show that a core trench was to be excavated "to impervious material" along the centerline of the dam. Mr. George Tyler stated that the embankment was constructed from material excavated to form the emergency spillway.

c. Operating Records. Water to a depth of approximately one foot discharged through the emergency spillway in July, 1973 according to the owner.

d. Post-Construction Changes. No record of post-construction changes were disclosed; the owner states that none have been made.

e. Seismic Stability. This dam is located in Seismic Zone 2 and in accordance with the Phase I guidelines does not warrant seismic analysis.

SECTION 7
ASSESSMENT, RECOMMENDATIONS, AND REMEDIAL MEASURES

7.1 Dam Assessment

a. Condition. The visual inspection indicates that the Tyler Tree Farm Dam is in good condition. It appears to be well-constructed and well-maintained. Principal problems that could affect the dam's integrity if left uncorrected are:

(1) Erosion of the banks of the discharge channel immediately downstream of the spillway outlet at the downstream toe of the dam.

(2) Vehicular tracks where vegetation has been destroyed on the crest of the dam.

(3) Use of the upstream face of the dam for beaching boats.

(4) Saplings growing near the east end of the upstream face of the dam.

(5) Possible future surface sloughing of east abutment side slope.

In addition, are the presence of logs and fallen trees across the channel downstream from the spillway outlet and logs, cut brush, and standing trees and brush in the channel downstream from the emergency spillway.

b. Adequacy of Information. The information available is such that the assessment of this dam must be based on the results of the visual inspection and information obtained from the SCS design data. The visual inspection in conjunction with available information is adequate to identify the problems noted in 7.1 a. and to assess the general condition of the dam.

c. Urgency. The recommendations and remedial measures made in 7.2 and 7.3 should be implemented by the owner within two years after receipt of this Phase I report.

d. Need for Additional Investigation. There is no need for additional investigation for the purpose of making the Phase I assessment of the condition of this dam.

7.2 Recommendations

The owner should engage a Registered Professional Engineer to investigate, design and construct remedial measures for the erosion of the banks of the channel immediately downstream of the spillway outlet at the downstream toe of the dam.

7.3 Remedial Measures

a. Operating and Maintenance Procedures. The owner should:

(1) Re-establish vegetation in the wheel tracks on the crest of the dam.

(2) Cut the saplings on the east end of the upstream face of the dam.

(3) Discontinue beaching boats on the upstream face of the dam.

(4) Remove trees and brush from the channels downstream of the principal and emergency spillways for a distance of 25 feet on either side of the channel to the point of confluence of the two channels or to limits of owner's property whichever is less.

(5) Repair any sloughing that may occur on the east abutment side slope and remove any sloughed material from spillway bottom and establish vegetative ground cover on this slope.

(6) Determine the operational integrity of the low-level outlet mechanism.

(7) Inspect the dam and appurtenant structures once a month.

(8) Engage a Registered Professional Engineer to make a comprehensive technical inspection of the dam once every two years.

(9) Establish a surveillance program for use during and immediately after periods of heavy rainfall, and also a warning program to follow in case of emergency conditions.

7.4 Alternatives

No alternatives are recommended.

APPENDIX A

VISUAL INSPECTION CHECKLIST

VISUAL INSPECTION CHECKLIST
PARTY ORGANIZATION

PROJECT Tyler Tree Farm Dam, N.H. DATE May 7, 1979

TIME 3:45 P.M.

WEATHER Sunny, warm

W.S. ELEV. U.S. 681.5 DN.S. 670.5

PARTY:

1. Warren Guinan
2. Stephen Gilman
3. Robert Ojendyk
4. John Regan
5. Gerry Blanchette
6. Pattu Kesavan
7. Ronald Hirschfeld
8.
9.
10.

	PROJECT FEATURE	INSPECTED BY	REMARKS
1.	Hydrology/Hydraulics	W. Guinan/J. Regan	
2.	Structural Stability	S. Gilman/G. Blanchette	
3.	Soils & Geology	R. Hirschfeld	
4.			
5.			
6.			
7.			
8.			
9.			
10.			

PERIODIC INSPECTION CHECKLIST

PROJECT Tyler Tree Farm Dam, N.H. DATE May 7, 1979

PROJECT FEATURE Dam Embankment NAME _____

DISCIPLINE _____ NAME _____

AREA EVALUATED	CONDITION
DAM EMBANKMENT	
Crest Elevation	694.7'MSL
Current Pool Elevation	681.5'MSL
Maximum Impoundment to Date	689.8'MSL
Surface Cracks	None apparent
Pavement Condition	Not paved
Movement or Settlement of Crest	None apparent
Lateral Movement	None apparent
Vertical Alignment	Good
Horizontal Alignment	Good
Condition at Abutment and at Concrete Structures	Good
Indications of Movement of Structural Items on Slopes	None apparent
Trespassing on Slopes	Boats pulled up on upstream slope
Sloughing or Erosion of Slopes or Abutments	None apparent
Rock Slope Protection - Riprap Failures	No riprap except around downstream end of outlet pipe; grassy slopes.
Unusual Movement or Cracking at or Near Toe	None apparent
Unusual Embankment or Downstream Seepage	None apparent
Piping or Boils	None apparent
Foundation Drainage Features	One drain pipe exits near downstream end of outlet pipe. No water discharging from drain.
Toe Drains	See above.
Instrumentation System	None apparent
Vegetation	Grass on slopes and crest. Small brush (less than ½"in diameter) growing on part of upstream slope.

PERIODIC INSPECTION CHECKLIST

PROJECT Tyler Tree Farm Dam, N.H. DATE May 7, 1979

PROJECT FEATURE Principal Spillway NAME

DISCIPLINE NAME

AREA EVALUATED	CONDITION
OUTLET WORKS - INTAKE CHANNEL AND INTAKE STRUCTURE	
a. Approach Channel	Roaring Brook
Slope Conditions	Good
Bottom Conditions	Not visible beneath water surface
Rock Slides or Falls	None
Log Boom	Not applicable
Debris	Some branches around intake
Condition of Concrete Lining	Not applicable
Drains or Weep Holes	None
b. Intake Structure	BCCMP drop-inlet intake structure
Condition of Concrete	Good
Stop Logs and Slots	None Treated timber trashrack supported by 6" wooden posts with screening on exterior face, encircles intake.

PERIODIC INSPECTION CHECKLIST

PROJECT Tyler Tree Farm Dam, N.H. DATE May 7, 1979

PROJECT FEATURE Principal Spillway NAME

DISCIPLINE NAME

AREA EVALUATED	CONDITION
OUTLET WORKS - OUTLET STRUCTURE AND OUTLET CHANNEL - PRINCIPAL SPILLWAY	
General Condition of Concrete	Not applicable
Rust or Staining	None
Spalling	Not applicable
Erosion or Cavitation	Not applicable
Visible Reinforcing	Not applicable
Any Seepage or Efflorescence	Not applicable
Condition at Joints	Not applicable
Drain holes	None
Channel	
Loose Rock or Trees Overhanging Channel	Trees overhanging channel about 50 feet downstream of toe and beyond
Condition of Discharge Channel	Fair; trees and brush in channel.

PERIODIC INSPECTION CHECKLIST

PROJECT Tyler Tree Farm Dam, N.H. DATE May 7, 1979

PROJECT FEATURE Emergency Spillway NAME

DISCIPLINE NAME

AREA EVALUATED	CONDITION
OUTLET WORKS - EMERGENCY SPILLWAY, APPROACH AND DISCHARGE CHANNELS	
a. Approach Channel	
General Condition	Good
Loose Rock Overhanging Channel	None
Trees Overhanging Channel	None
Floor of Approach Channel	Grassed glacial till
b. Emergency Spillway	Grassed; small trees (less than ½" in diameter) on east bark
General Condition of Concrete	Some sloughing on east bank; west bank in good condition
Rust or Staining	Not applicable
Spalling	Not applicable
Any Visible Reinforcing	Not applicable
Any Seepage or Effloresceence	Not applicable
Drain Holes	None
c. Discharge Channel	
General Condition	Fair
Loose Rock Overhanging Channel	None
Trees Overhanging Channel	None to end of excavated channel; trees in channel farther downstream
Floor of Channel	Glacial till
Other Obstructions	Logs, brush and stumps in channel downstream of excavated section of emergency spillway

PROJECT Tyler Tree Farm Dam, N.H. DATE May 7, 1979

PROJECT FEATURE Reservoir NAME J. Regan

AREA EVALUATED	REMARKS
Stability of Shoreline	Good
Sedimentation	Little
Changes in Watershed Runoff Potential	None apparent
Upstream Hazards	None
Downstream Hazards	Highway bridge (Route 135), one house on north bank, one grange meeting house on south side
Alert Facilities	None
Hydrometeorological Gages	None
Operational & Maintenance Regulations	None posted.

State of New Hampshire

WATER RESOURCES BOARD

37 Pleasant St.
CONCORD 03301

February 10, 1976

Tyler Tree Farm
Monroe, N.H.

Att'n: Ms. Esther S. and
Messrs. George R. & Robert G. Tyler

Under the provisions of RSA-Chapter 482, Sections 8 through 15, the New Hampshire Water Resources Board is authorized to inspect all dams in the state which by reason of their physical condition, height, and location may be a menace to the public safety.

The dam structure (Dam # 162.04) located on your property in Monroe , N.H. was inspected on 8/15/74 and as a result of this inspection no discrepancies were found at the time of the inspection which would require any corrective measures.

This letter is provided for your information only. If you have any questions, please feel free to call or write.

Sincerely,

George McGee Sr

George M. McGee, Sr.
Chairman

GMM/SCB:L

cc:

Board of Selectmen
Monroe

N. H. WATER RESOURCES BOARD
Concord, N. H. 03301

DAM SAFETY INSPECTION REPORT FORM

Town: Monroe Dam Number: 162.04

Inspected by: SOB Date: 15 Aug 1974

Local name of dam or water body: _____

Owner: Tyler Tree Farm Address: _____

Owner (was)/was not interviewed during inspection.

Drainage Area: _____ sq. mi. Stream: _____

Pond Area: 4 Acre, Storage _____ Ac-Ft. Max. Head _____ Ft.

Foundation: Type _____, Seepage present at toe - Yes/(No), _____

Spillway: Type Pipe, Freeboard over perm. crest: _____,

Width 4' Dia, Flashboard height _____,

Max. Capacity _____ c.f.s.

Embankment: Type Earth, Cover Grass Width 20'±,

Upstream slope 3 to 1; Downstream slope 3 to 1

Abutments: Type _____, Condition: Good, Fair, Poor

Gates or Pond Drain: Size _____ Capacity _____ Type _____

Lifting apparatus _____ Operational condition _____

Changes since construction or last inspection: _____

Downstream development: _____

This dam would/(would not) be a menace if it failed.

Suggested reinspection date: _____

Remarks: _____

AUG 21 1968

NEW HAMPSHIRE
WATER RESOURCES BOARD

THE STATE OF NEW HAMPSHIRE

County of Grafton ss. August 18 19 68

STATEMENT OF INTENT TO CONSTRUCT OR

RECONSTRUCT A DAM AT a point southeast of farm buildings about 300 yards, on an unnamed brook.

TO THE WATER RESOURCES BOARD:

In compliance with the provisions of RSA 482:3.

We, I, The Tyler Tree Farm: George R., Esther S., Robert G., Tyler
(Here state name of person or persons, partnership, association, corporation, etc.)

hereby state our intent to the Water Resources Board to construct, ~~to reconstruct, to make repairs to, a dam along, or~~ (cross out portion not applicable) across: an unnamed brook on the farm.

(Here state name of stream or body of water)

At a point approximately four-fifths mile from mouth of stream at Connecticut River.
(Here give location, by distance from mouth of stream, county or municipal boundary)

in the town (~~x~~) of Monroe.

in accordance with PRELIMINARY PLANS, and SPECIFICATIONS FILED WITH THIS STATEMENT AND MADE A PART HEREOF.

We, I, understand that more detailed plans and specifications may be requested by the Board in conformance with RSA 482:4 and that, if such plans are requested, construction will not commence until such plans have been filed with and approved by the Board.

Construction has not been started.

The purpose of the proposed construction is part of a development
(Here briefly state use to
for recreational purposes and improvement of wildlife habitat (duck
which stored water is to be put)
marsh at upper end of pond.). Pond will be stocked with trout (salve-
linus fontinalis).

The construction will consist of an earth dam, 24 feet high, with
(Here give brief description of
appropriate spillway, drainage and seepage tubes, gradd spillway,
work contemplated including height of dam)
and fourteen feet of freeboard.

All land to be flowed ~~is not~~ is owned by applicant.

George R. Fuller

Esther S. Fuller

Robert G. Fuller

Address Monroe, N.H.

Note: This statement together with plans, specifications and information and data filed in connection herewith will remain on file in the office of the Water Resources Board. This statement is to be filed in duplicate.

FARM POND PLAN

Cooperator: GEORGE TYLER

Location: MONROE, NEW HAMPSHIRE

DESIGN DETAILS

Drainage Area: 1,860 Acres

Design Runoff: FREEBOARD - 1,355 CFS EMERGENCY SPILLWAY 515 CFS

Pond Area: 4.0 Acres

Reservoir Capacity: 55.0 ACRES - FT. TO E.S. CREST PERM. POOL 10.5 Acres - FT

Reservoir Capacity: 3,420,000 Gallons

Pipe Spillway Capacity: 25 YR. - 6 HR. STORM THROUGH PIPE 196 CFS

Vegetated Spillway Capacity: EMERGENCY SPILLWAY DESIGN STORM V_c=5.4FT/SEC. 250 CFS
FREEBOARD DESIGN STORM V_c=8.5FT/SEC. 1,000

ST. JOHNSBURY, VERMONT-NEW HAMPSHIRE Quadrangle U.S.G.S.

Latitude 44° 17' 43" (UP 3.1") Longitude 72° 1' 35" (LEFT 1.3")

MATERIALS

Item	Quantity	Unit		
CONCRETE	3.0	C.Y.		
FILL	9,427	C.Y.		
EXCAVATION (TOTAL)	13,267	C.Y.		
60"Ø B.C.C.M.P. RISER	10	FT.		
48"Ø B.C.C.M.P. (STUB WELDED TO RISER)	2	FT.		
24"Ø B.C.C.M.P. (STUB WELDED TO RISER)	2	FT.		
48"Ø B.C.C.M.P. (10 GAGE)	118	FT.		
48"Ø B.C.C.M.P. CONNECTING BANDS	6	EA.	(WATERTIGHT)	
24"Ø B.C.C.M.P.	18	FT.		
24"Ø B.C.C.M.P. CONNECTING BANDS	1	EA.	(WATERTIGHT)	
B.C.C.M. ANTI-SEEP COLLAR 8'x12'	3	EA.		
TRASH RACK AND ANTI-VORTEX DEVICE	1	EA.	SEE SHEETS 3 & 4	
6"Ø PERFORATED B.C.C.M.P.	128	FT.		

Approved

Area Conservationist

Engineer

Date Date 8-7-68 Date

REFERENCE B-5

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
ASSISTING
SOIL CONSERVATION DISTRICT

DRAWING NUMBER

SHEET 1 OF 5

DATE 7-25-68

STATE N. H. PROJECT GEORGE TYLER

BY D. K. DATE 12/2/57 CHECKED BY DATE JOB NO

SUBJECT MATERIAL FOR TRASH RACK & ANTI-VORTEX DEVICE SHEET 5 OF 5

6" MIN. DIA. POST CEDAR OR PRESSURE TREATED (10 REQ'D)

4 - 12'-9" LONG
4 - 8'-3" LONG
2 - 10'-6" LONG

ALL MATERIAL IN TRASH RACK AND ANTI-VORTEX DEVICE TO BE CREOSOTE TREATED

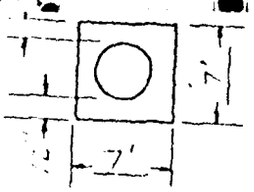
ANTI-VORTEX DEVICE TO BE MADE OF 2" STOCK 12'-6" LONG MATERIAL CAN BE OF VARIOUS WIDTHS THE TOTAL SPACING 4'-0"

2"x4" MATERIAL REQ'D

10 @ 2'-3 1/4"
12 @ 3'-10 11/16"
2 @ 3'-0"
2 @ 4'-0"

5" LONG 1/2" ϕ GALV. BOLTS (16 REQ'D)
9" LONG 1/2" ϕ " " (18 REQ'D)

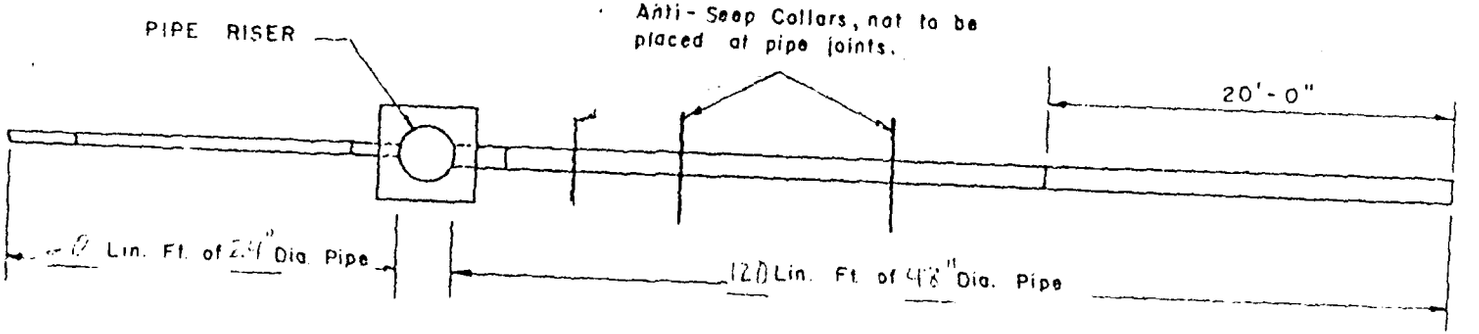
20d SPIKES (48 REQ'D)



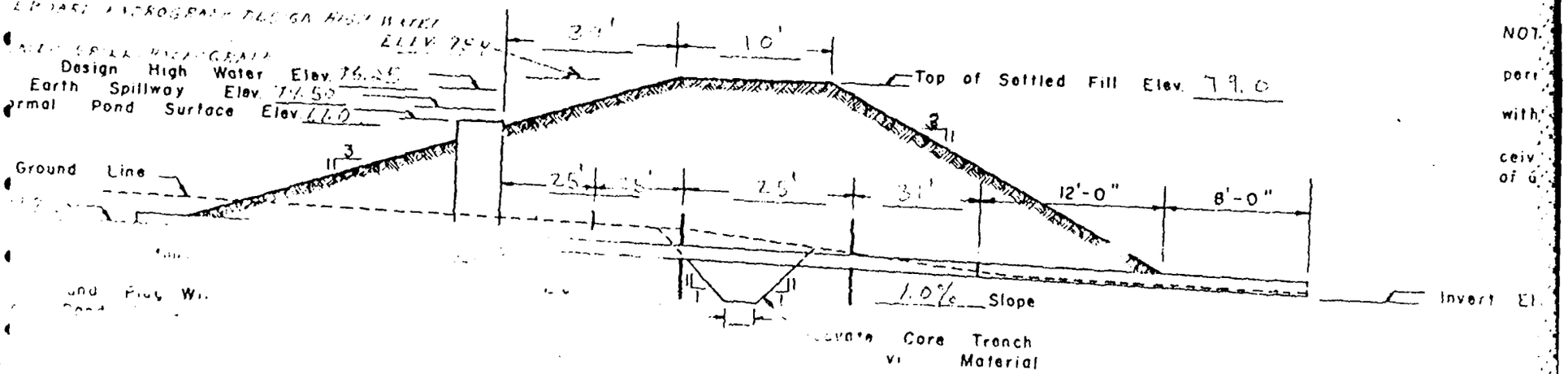
half of collar and
edge on lower half.

NOTE:
Use watertight coupling bands at pipe joints.

Anti-Seep Collars, not to be placed at pipe joints.



B-8



NOT
per
with
ceiv
of

Biological Management Associates

...e and Weed Control
...h Fish Eradication
...ate Pond Surveys
...anagement Plans

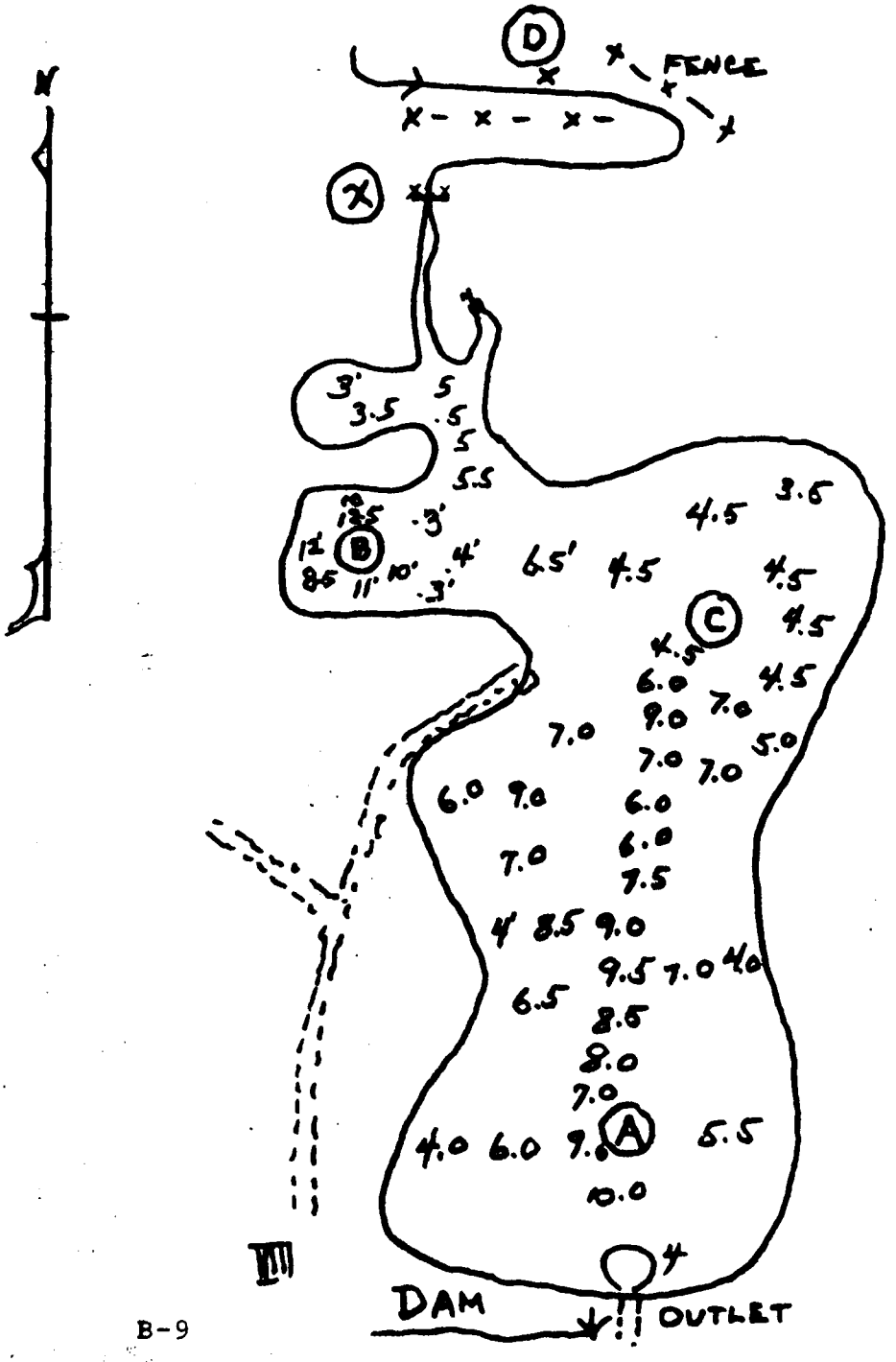
Robert B. Knowlton
P.O. Box 329
Concord, N. H.
Tel. 783-4318

BIOLOGICAL SURVEY AND RECOMMENDATIONS

for

George Tyler Pond.
Monroe, N.H. 03771

August 22, 1970



escription:

yler Pond is a private and artificial body of water. Approximately 4.6 acres in rea (as determined by S.C.S. survey). It is located on the property of George yler in the town of Monroe, Grafton County, N.H. It has a maximum depth of 12.5 eet, an average of 6.6 as determined by 52 depth soundings, and a volume of 30.4 cre feet.

he pond was created by an earthen dam and has a corregated culvert or stand pipe or an overflow pipe together with an emergency overflow at the top of the dam, the ond can be drained if necessary. The pond was developed on the recommendations of he U.S. Soil Conservation service.

oth surface drainage and springs feed the pond. The surface drainage, of considerble area is also supplimented by springs. At the time of the survey there was a mall flow of 62° farenheit water in the brook which forms the inlet.

hysical Condition:

he pond is almost entirely shoal area (10 feet or less in depth). The shoreline is ooded. The water is light brown in color with a transparency of two (2) feet.

quatic vegetation is scant at the time of the survey. It consists of both an Algae Pond scum) and water weed, a floating Potamogeton sp., but neither are a problem at his time.

Chemical Condition:

Two chemical stations were established, one at Station(A) in the main pond near the dam at the south end, where the water depth was found to be 10 feet. Another at Station (B), in the northern section of the pond where, prior to creating the main pond, there was a small farm pond. This station was established at a point where the maximum depth was 12.5 feet. The reason for checking both sections was that at (B) there was a greater depth, but this available depth and water could be eliminated from use by fish life due to a barrier which was flooded when the new and larger pond was created.

Air temperature at the time of survey, about noon, was 76° F., the weather was cloudy. The water temperature varied from 76.0° F. at the surface at Station (A) to 60.8° F. at 8 feet. At Station (B) water temperatures varied from 77.0° F. at the surface to 57° F. at the 10 foot level.

The pH (acidity) was similar, varying from 7.5 at the surface to 7.0 at 10 feet at Station (B) ~~at the 10 foot level~~ and 6.5 at the eight foot level at station (A). This difference in pH or acidity is due to decomposition of flooded organic matter. The average pH of most state waters is 6.4 indicating that the Tyler Pond water is slightly more alkaline than most N.H. waters. The water also has a hardness of over 100 ppm., which is common in the Connecticut River drainage area.

The oxygen content was satisfactory at the surface and the five foot levels at both stations (A) and (B). At the six, eight and ten foot levels at stations (A) and (B) however, the levels of oxygen had dropped to a point below the minimum requirements for trout. Brook trout require minimum oxygen levels of 3.0 ppm for good growth, coupled with favorable water temperatures of about 65° F.

Carbon Dioxide content extended beyond the recommended requirements for trout. They varied from 10.0 ppm at the surface at station (A) to 85.0 ppm at the ten foot level at station (B). Trout will normally stand about 40 ppm CO2, but do not usually thrive in concentrations exceeding this level. Water temperatures were taken at station (D) at the inlet and in flowing water and found to be satisfactory for trout, (62° F.)

Tabulation of chemical condition August 22, 1970

Sta.	Depth	Temp.°F	pH	O2 ppm	CO2 ppm	Hardness ppm
(A)	0'	76° F	7.5	10.0	10.0	119.0
	5'	69.8	6.5	3.5	85+ high	--
	6'	69.8	6.5	0.2	85 high	--
	8'	60.8	6.5	0.0	85 high	—
(B)	10'	57-60.0	7.0	0.0	85.0	—
	5'	71.6	7.5	8.0	15.0	—
	0'	77.0	7.5	10.0	10.0	—
(C)	6'	69.8	—	6.0	—	—
(D) Inlet	0'	62.0	—	—	—	—
(X) "	0'	63.0	—	--	—	—

Biological Conditions:

The inlet area of the pond presently is supporting a population of brook and rainbow trout. Aquatic insects such as dragon fly larvae and water boatmen or backswimmers were observed. Both are of value as a natural trout food. Plankton, both phyto (plant life) and Zoo (animal life) were common, a partial cause of the low transparency.

Discussion:

Tyler Pond was found to be quite productive in plant and animal life. At the time of the survey however, it must be considered as marginal trout waters as a result of findings of relatively high temperatures and low oxygen levels. There is a very thin layer of pond water that can be considered suitable for trout at the time of survey on August 22, 1970. This is probably due to the extremely warm temperatures experienced this year as well as the shortage of water. Trout require cool, well oxygenated waters for continuous growth and survival. Temperatures should be in the 60-65° F levels with ample oxygen of 5 to 8 ppm.

Conditions similar to those considered favorable to trout were scarce in Tyler Pond. Brook water temperatures and flow however, were favorable for maintaining a substantial population for a limited period. Trout should not be fed when temperatures exceed 70° F. They will not utilize the feed which results in decomposition and rise in carbon dioxide and drop in oxygen levels.

The pond water is hard with relative high pH levels, indicating the waters are quite productive and should support a good population provided oxygen can be supplied.

Many trout were seen to be congregated at station (X) in the brook where the first beaver dam exists. It was quite obvious if the low dam was removed, the trout would ascend further upstream.

Water temperature and oxygen content are the two limiting factors found to be critical

Tyler Pond, particularly for the mid-summer months period. Consequently, if the ...n can be raised and the temperatures maintained at the 60.0° to 70.0° F level, ...pond's productivity will be greatly increased.

...low oxygen level in the pond area is apparently due to decomposition of organic ...er left on the bottom when the stream was flooded. It is noted that a former ...l pond existed at Station (B) prior to the development of the present pond. ...s section of the pond is actually cut off by an embankment between the old pond ... the former stream bed at pond site (B). It is believed that if the main pond ...ld be lowered, and at least a part of the former dike be removed in order that ...etter circulation of the cool water at station (B) be realized.

...was noted that a small low beaver dam at point (X) on the inlet prohibits the up...eam migration of trout at the present time. This is favorable since it keeps the ...t population within the limit of property ownership. It was also noted that the ...ent water level backs up to this point (X) which means that a flash flood or ...ver would temporarily raise the water level and could result in spawning fish to ...beyond this temporary barrier.

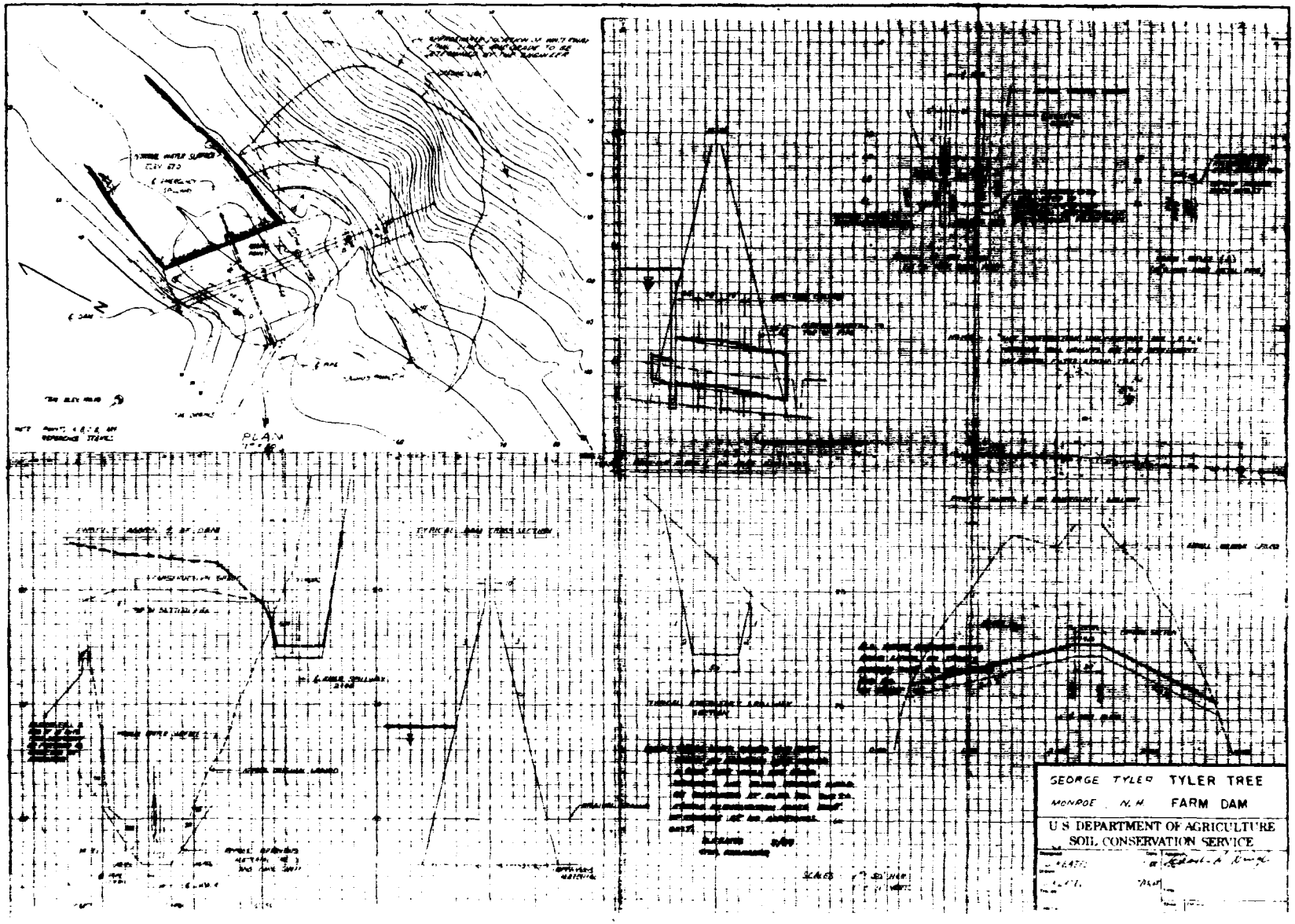
...mmendations:

Since it was found that existing oxygen levels are low and carbon dioxide is ... as a result of decomposition of flooded organic matter, it is believed, and ...mended that draining of the water close to it's lowest level would be an ef...ive measure to insure restoration of more favorable chemical conditions to the ...sting water quality. Allow the pond to refill immediately after draining.

While water level is low, would be the most opportune time to excavate the ex...ing submerged barrier at the old pond site (B) and allow mixing of these cooler ...ers with the water in the pond proper.

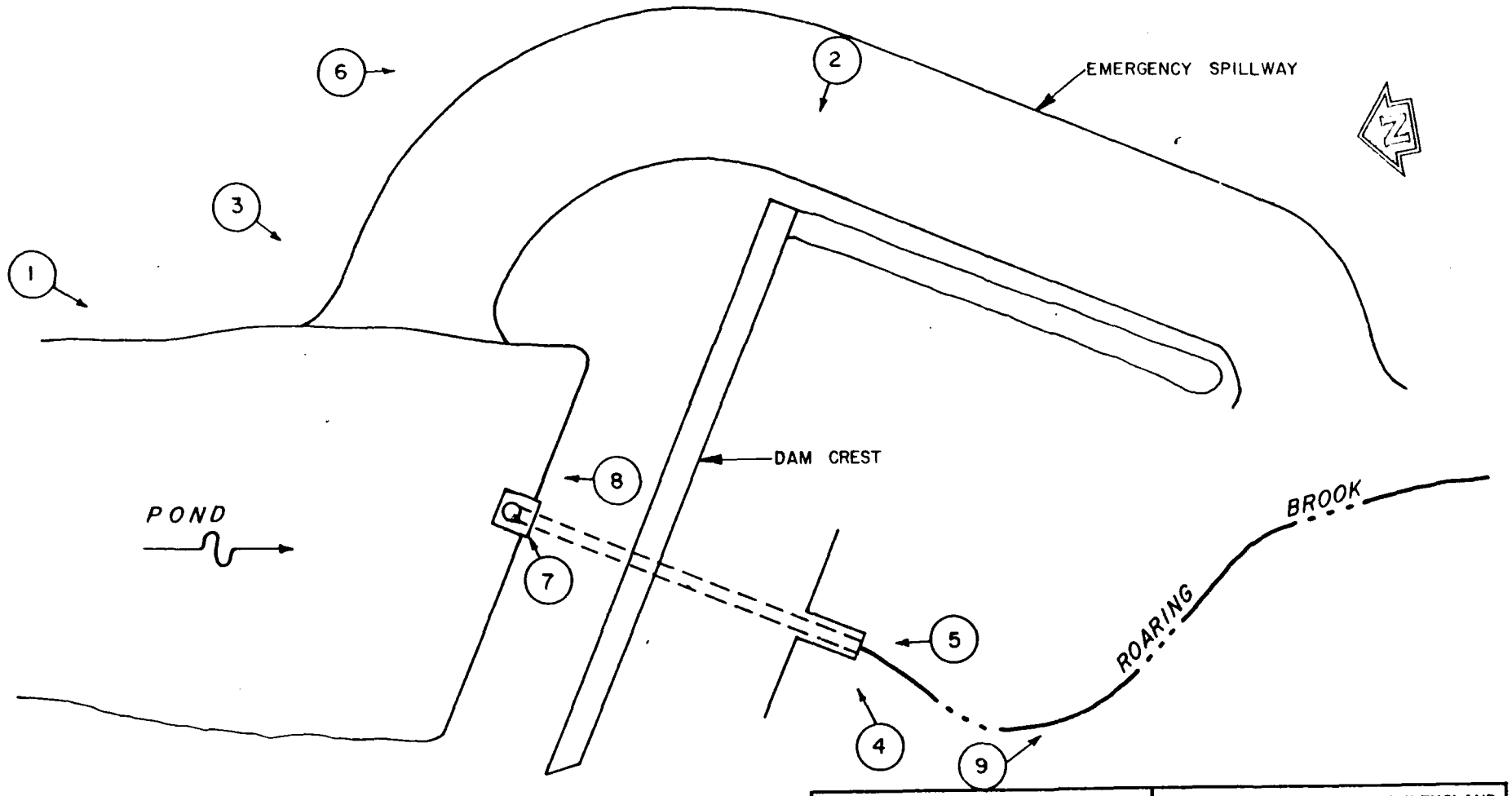
Maintain a water level six (6) inches below the present level. This might be ...e by cutting the stand pipe (overflow) one foot. A one foot coupling could be ...d to the stand pipe but have the top six inches below the present level. This ...ld insure a way of lowering the level another 6 inches if it should become neces...y in the future. I would leave the beaver dam so that it could continue to act ... barrier for fall spawning fish.

Stock at least 1,000 sexed crayfish as soon as convenient. This will supplie... the natural food supply and insure quality fish. Crayfish also are helpful in ...taining good quality of water since they feed on both carrion and vegetable ...er. They have been known to act as a biological control of weed growth.


PLAN
GEORGE TYLER TYLER TREE
MONROE N. H. FARM DAM
U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

APPENDIX C

PHOTOGRAPHS



Anderson-Nichols & Co., Inc. CONCORD NEW HAMPSHIRE	U.S. ARMY ENGINEER DIV. NEW ENGLAND CORPS OF ENGINEERS WALTHAM, MASS.

NATIONAL PROGRAM OF INSPECTION OF NON-FED. DAMS

TYLER TREE FARM DAM
PHOTO INDEX

ROARING BROOK NEW HAMPSHIRE

			SCALE: NOT TO SCALE
			DATE: JUNE, 1979

Figure 2 - Looking west across crest of dam. Note vehicular tracks.

Figure 3 - Looking south at upstream slope of dam.

Figure 4 - Looking east across downstream slope of dam.

Figure 5 - View of 48" diameter discharge pipe. Note placed riprap at outlet.

Figure 6 - Looking at approach channel of emergency spillway located at east end of dam.

Figure 7 - View of the drop-inlet principal spillway.

Figure 8 - Looking upstream into the reservoir.

Figure 9 - View of the downstream channel of principal spillway.

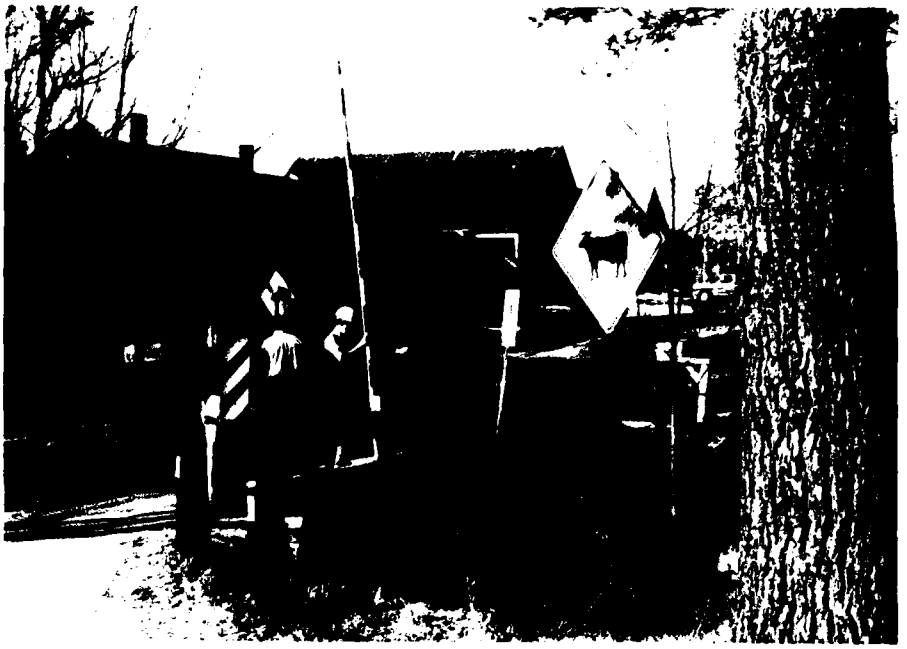
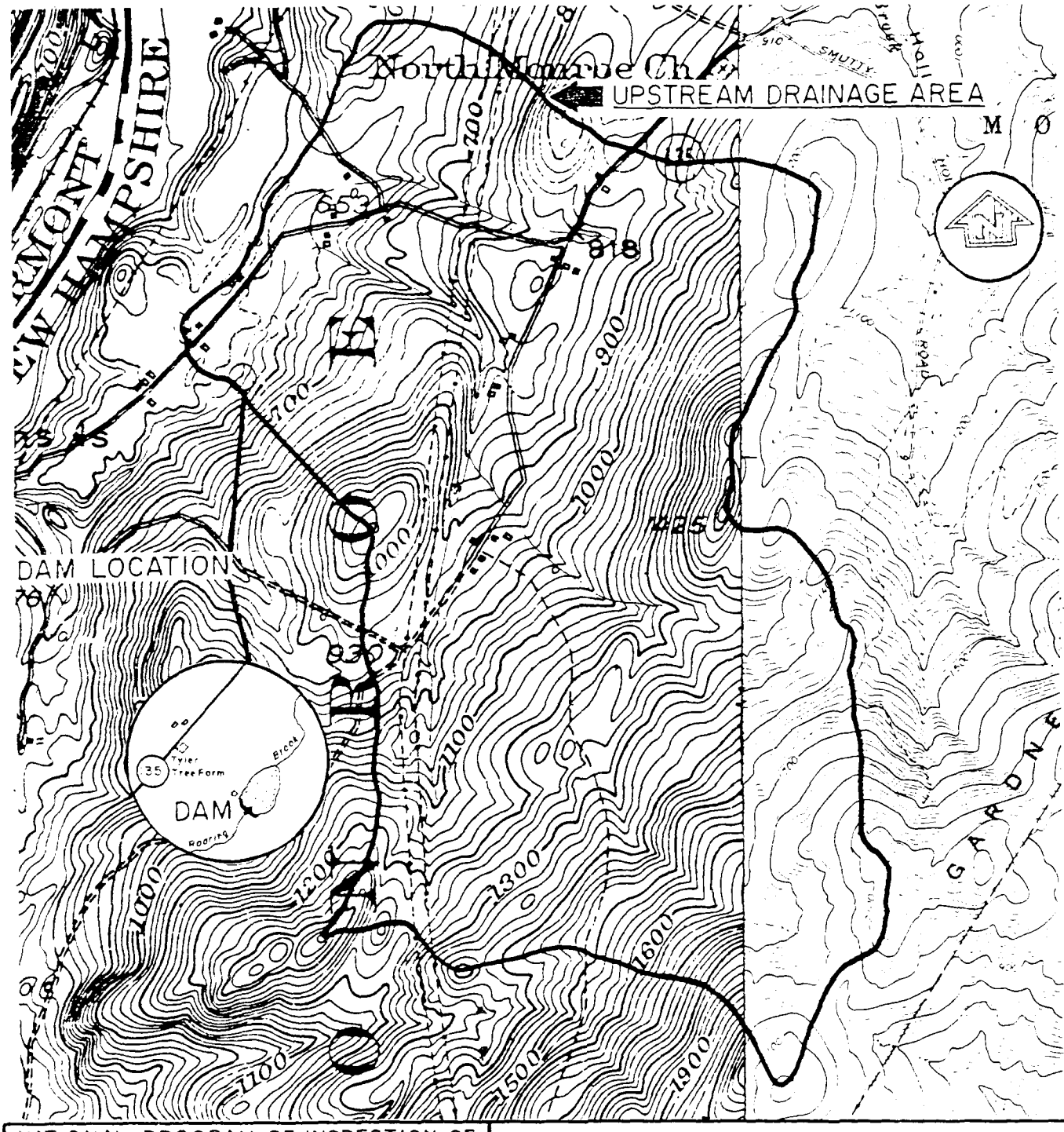


Figure 10 - Looking at State Route 135 located about one mile downstream of the dam.

APPENDIX D

HYDROLOGIC AND HYDRAULIC COMPUTATIONS



NATIONAL PROGRAM OF INSPECTION OF NON-FED. DAMS

TYLER TREE FARM DAM
MONROE, NEW HAMPSHIRE

REGIONAL VICINITY MAP

DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION, CORPS OF ENGINEERS
WALTHAM, MASSACHUSETTS

ANDERSON-CHOLS & CO., INC. CONCORD, NH

SCALE IN MILES

0 1/2

MAP BASED ON U.S.G.S. 7.5 MINUTE QUADRANGLE SHEET. LOWER WATERFORD, N.H., VT. 1967. AND U.S.G.S. 15 MINUTE QUADRANGLE SHEET. St JOHNSBURY, VT., N.H. 1949.

Tyler Tree Farm Dam - Test Flood Analysis

DA = 2.90 mi^2
Size Classification = small
Hazard Classification = significant
Test Flood = ½ PMF

Calculate PMF using "Preliminary Guidance For Estimating Maximum Probable Discharges in Phase I Dam Safety Investigations, March 1978.

Watershed Slope = 300 ft/mi ∴ the "Mountainous" Curve was used. CSM = 2410 $\frac{ft^3}{sec\text{-}mi^2}$

PMF = 2410 $\frac{ft^3}{mi^2\text{-}sec}$ x 2.90 mi^2 = 6989 cfs

½ PMF (Test Flood) = 3495 cfs, say 3500 cfs

Using rating curve developed for principal spillway & emergency spillway (Attachment "C") and making the following assumptions:

1) Low-level outlet (2' diameter BCCMP) was closed
2) Spillway Crest = 681.3' MSL
3) Normal Storage = 16.5 ac-ft

Test Flood Q = 3500 cfs ⇒ elev. 693.4

5-31-79
TMR

STORAGE R[illegible] [illegible] 26 Jul 79

Test [illegible] = ½ PMF = 3500 cfs, stage = 693.4

Normal storage = 16 ac-ft, stage = [illegible]
surface area = 5 acres

Q_{P1} = 3500 cfs, storage ≐ 98 ac-ft, stage = 693.4

98 - 16 = 82 ac-ft

$82 \text{ ac-ft} \cdot \frac{1}{2.9 \text{ mi}^2} \cdot \frac{1 \text{ mi}^2}{640 \text{ ac}} \cdot \frac{12 \text{ in}}{\text{ft}} = 0.53''$ runoff = STOR 1

$Q_{P2} = Q_{P1}\left(1 - \frac{\text{STOR 1}}{9.5}\right) = 3500\left(1 - \frac{0.53}{9.5}\right) \doteq 3300$ cfs

@ 3300 cfs, storage = 96 ac-ft, stage = 693.2

96 - 16 = 80 ac-ft

$80 \text{ ac-ft} \cdot \frac{1}{2.9 \text{ mi}^2} \cdot \frac{1 \text{ mi}^2}{640 \text{ ac}} \cdot \frac{12 \text{ in}}{\text{ft}} = 0.52''$ runoff = STOR 2

Average of (STOR 1 & STOR 2) = 0.53'' or 0.0441 ft runoff

$0.0441 \text{ ft} \cdot \frac{2.9 \text{ mi}^2}{1} \cdot \frac{640 \text{ ac}}{\text{mi}^2} = 81.8$ ac-ft

81.8 + 16 = 97.8 ac-ft

@ storage = 97.8 ac-ft, stage = 693.4, Q_{P3} = 3500 cfs

Then flood discharge = 3500 cfs, stage = [illegible] MSL

Top of dam = 694.7 [illegible] dam will not be overtopped [illegible]

[illegible] insignificant [illegible]

[illegible]

Tyler Tree Farm Dam

Breach Analysis

To determine downstream hazard classification, failure of the dam will be considered at two different reservoir pool elevations: i.e. 1) normal pool elevation 2) maximum pool elevation before flow occurs in emergency spillway, (NOTE: The capacity of the emergency spillway is so large that it is unrealistic to assume maximum pool at the top of dam embankment elevation)

I. Breach @ normal pool elevation (elev = 681.3)

$$Q_1 = \frac{8}{27} W_b \sqrt{g} Y_o^{3/2}$$

W_b = width breach, .4 dam width = (200).4 = 80'

$\sqrt{g} = \sqrt{32.2 \frac{ft}{sec^2}} = 5.67$

Y_o = 681.3 - 670 = ____ (pool elev - stream bed)

$Q_1 = \frac{8}{27} (80)(5.67)(11.3)^{3/2} = 5105$ cfs

Q_2 = Discharge over spillway

Q_3 = at normal pool elevation there is no antecedent flow

Q_3 = 0 ⟶ stage = 0' assume antecedent stage = 0.5'

$Q_p = 5105$ cfs ⟶ stage = 10.6'

(using rating curve for typical d/s reservoir - see attachment "A"

Assumed no reservoir storage

∴ Increase in stage = 10.1 feet

Assuming no reach storage and allowing the breach discharge to pass thru the Route 135 crossing a stage of 11.5' may be expected. (see Attachment "B") This would overtop Route 135 by approximately 2.5 Feet and inundating an [illegible] structure on the north side of Roaring Brook.

II. Breach with pool @ emergency spillway crest (elev. = 688.8)

$$Q_1 = \frac{8}{27} W_b \sqrt{g}\ Y_0^{3/2}$$

$$= 8/27\ (80)(\sqrt{32.2})\ (18.8)^{3/2} = 10{,}965 \text{ cfs}$$

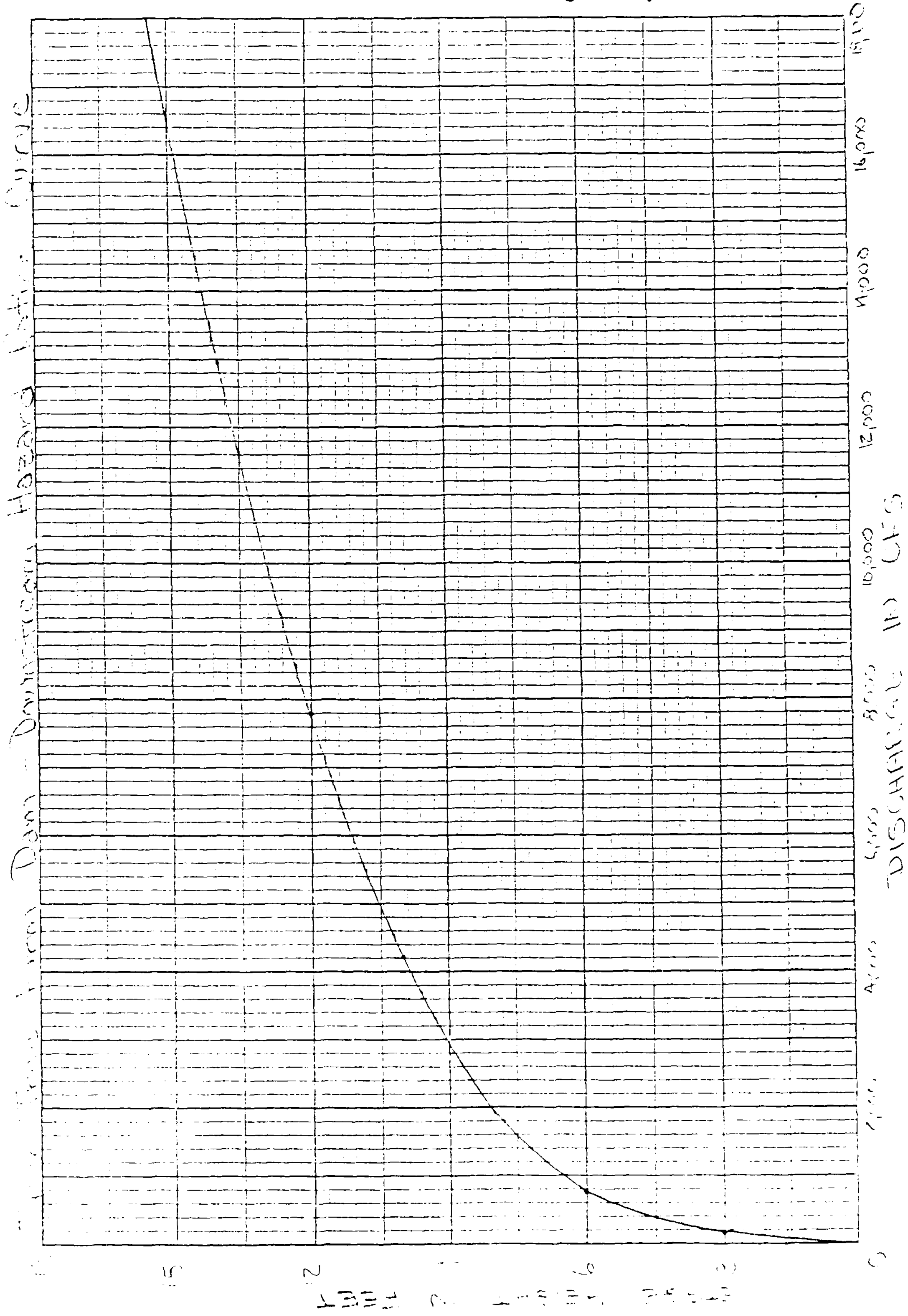
Antecedent Discharge = 230 cfs
Stage = 3.9 Ft

Assuming no reach storage then stage @ typical d/s x-section breach discharge stage - 13.3 ft. (see Attachment "A")

∴ Increase in stage due to breach = 13.3 - 3.9
= 9.4 ft

Allowing the breach discharge of 10965 cfs to pass [illegible] route 135 crossing [illegible] no reach storage [illegible] a stage of 13.7 ft. This would overtop Rte 135 by approximately 4.8 ft [illegible] would inundate a [illegible] structure [illegible] Brook [illegible] [illegible] hill on the south [illegible]

Attachment 'A'
Page 1 of 4



Attachment A' 20-4

Tyler Tree Farm Dam

Rating Curve @ typical d/s x-section

Refer to attached x-section for x-section geometry:

Using Manning's Equation determine head vs. discharge rating curve.

$$Q = \frac{1.49}{n} A R^{\frac{2}{3}} S^{\frac{1}{2}}$$

$n = .05$ (composite n-value for x-section)

$S = .016$

A, R - varies with head

Trial #1 Assume $H = 6'$

$$A = \tfrac{1}{2}(10+16)4 + (2)(16) + \tfrac{1}{2}(16)(2) + \tfrac{1}{2}(21)(2) = 121 \text{ ft}^2$$

$$P = 10 + 5 + 5 + \sqrt{2^2+16^2} + \sqrt{2^2+21^2} = 57.2 \text{ ft}$$

$$R = \frac{A}{P} = 2.1$$

$$Q = \frac{1.49}{.05}(121)(2.1)^{\frac{2}{3}}(.016)^{\frac{1}{2}} = 750 \text{ cfs}$$

Trial #2 Assume $H = 8'$

$$A = 52 + (4)(16) + \tfrac{1}{2}(4)(4) + \tfrac{1}{2}(29)(4) = 256 \text{ ft}^2$$

$$P = 20 + \sqrt{4^2+4^2} + \sqrt{4^2+29^2} = 90.5 \text{ ft}$$

$$R = 256/90.5 = 2.83$$

$$\frac{1.49}{n} S^{\frac{1}{2}} = \text{constant} = 3.77$$

$$Q = K R^{\frac{2}{3}} = (3.77)(256)(2.83)^{\frac{2}{3}} = 1392 \text{ cfs}$$

Trial #3 Assume H = 10'

$A = 52 + (6)(16) + \frac{1}{2}(6)(47) + \frac{1}{2}(6)(60) = 469$ ft²
$P = 20 + \sqrt{47^2+6^2} + \sqrt{60^2+6^2} = 127.7$ ft
$R = 469/127.7 = 3.67$

$Q = (3.77)(469)(3.67)^{2/3} = 4207$ cfs

Trial #4 Assume H = 12'

$A = 52 + (8)(16) + \frac{1}{2}(8)(62) + \frac{1}{2}(8)(80) = 748$
$P = 20 + \sqrt{62^2+8^2} + \sqrt{80^2+8^2} = 162.9$
$R = 748/162.9 = 4.59$

$Q = (3.77)(748)(4.59)^{2/3} = 7788$ cfs

Trial #5 Assume H = 14'

$A = 52 + (10)(16) + \frac{1}{2}(10)(100) + \frac{1}{2}(10)(77) = 1097$
$P = 20 + \sqrt{10^2+100^2} + \sqrt{10^2+77^2} = 198.1$
$R = 1097/198.1 = 5.54$

$Q = (3.77)(1097)(5.54)^{2/3} = 12,950$ cfs

Trial #6 Assume H = 16'

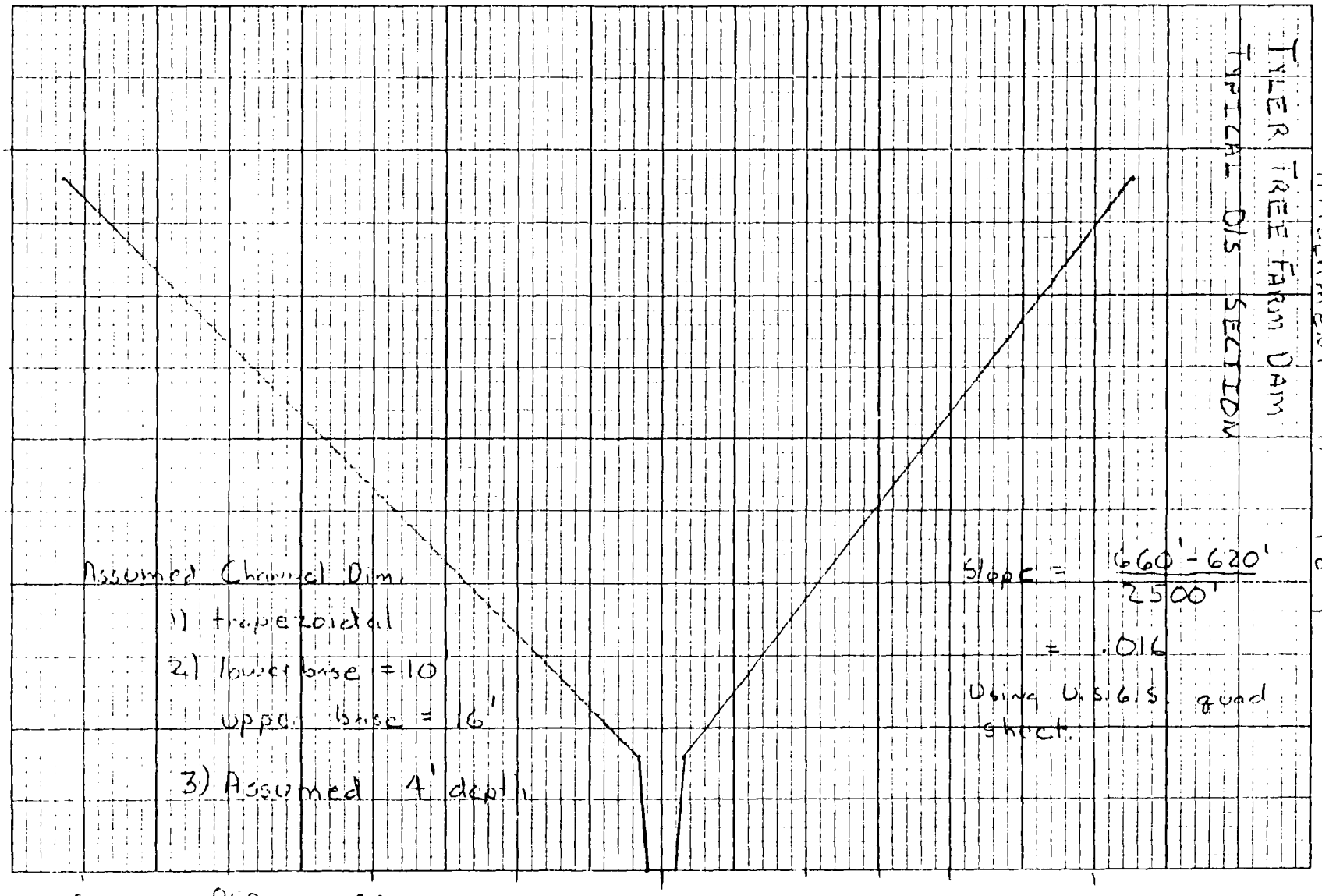
$A = 52 + (12)(16) + \frac{1}{2}(120)(12) + \frac{1}{2}(12)(92) = 1516$
$P = 20 + \sqrt{12^2+120^2} + \sqrt{12^2+92^2} = 233.4$
$R = 1516/233.4 = 6.50$

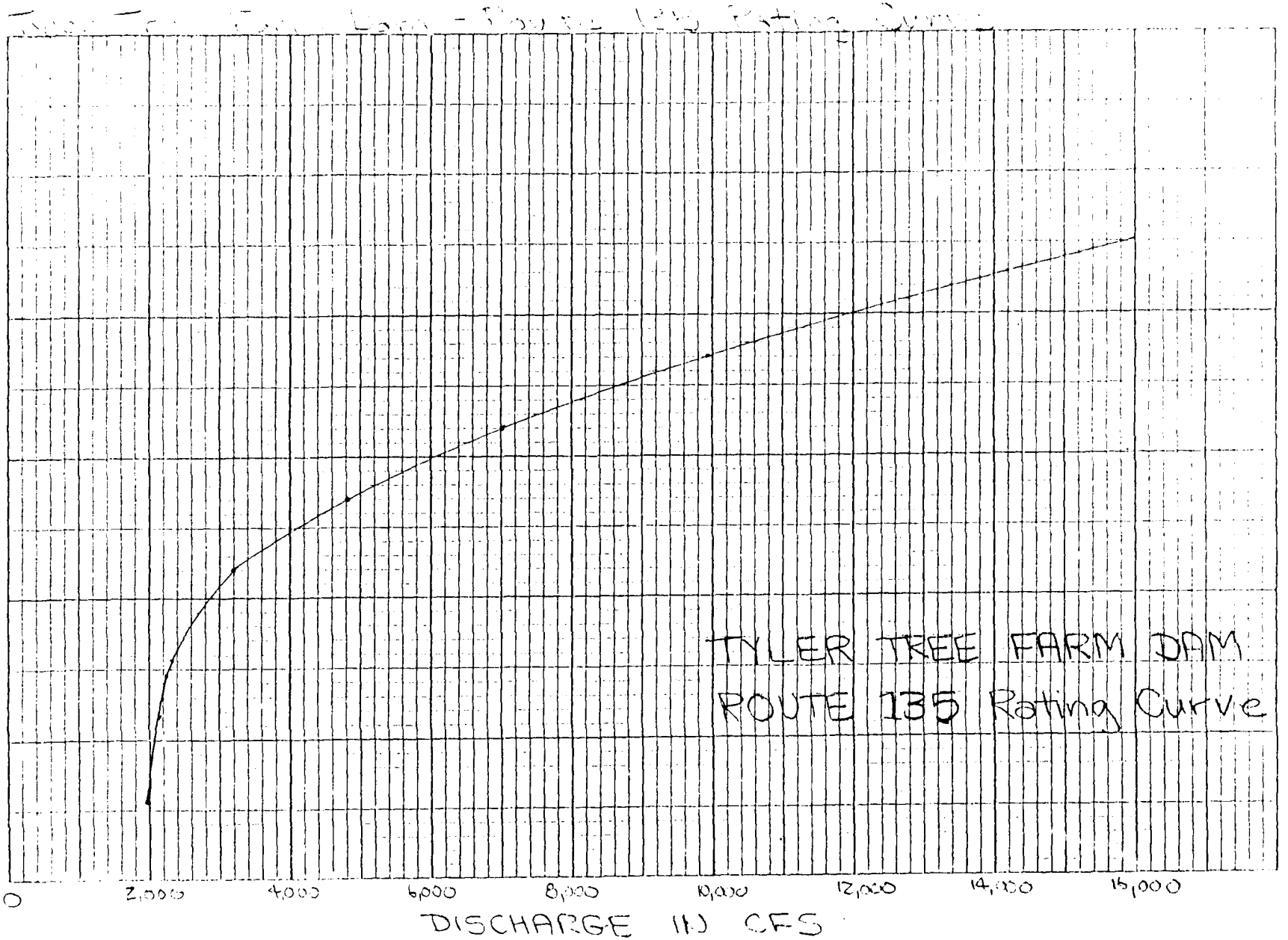
$Q = (3.77)(1516)(6.50)^{2/3} = 19,906$ cfs

Trial #7 Assume H = 3'

$A = 33$ ft²
$P = 5 + 2\sqrt{3^2+6^2} = 18.4$
$R = 1.79$

$Q = \frac{1.49}{.05}(33)(1.79)^{\frac{2}{3}}(.016)^{\frac{1}{2}} = 184$ cfs


TYLER TREE FARM DAM
TYPICAL D/S SECTION
Attachment D-9
Stage in feet
25
20
15
10
5
0
800
850
900
950
1000
1050
1100
1150
Station (Assume C of brook is Sta. 1000)
Assumed Channel Dim.
1) trapezoidal
2) lower base = 10'
upper base = 16'
3) Assumed 4' depth
Slope = (660' - 620') / 2500'
= .016
Using U.S.G.S. quad sheet
JMR 5-31-79



Attachment 6
Page 1 of 5

Attachment D

Develop Rating Curve @ Route 135 over Roaring Brook

Assumptions:

1) Breach Qs from Tyler Tree Farm Dam will occur @ upper range of rating curve and it was assumed that all breach Qs will at least cause pressure @ Route 135 rating. Therefore the low limit of rating curve is at the point of pressure flow.

Rating Curve consist of:

1) Pressure Flow

$$Q = CA(2gH)^{1/2}$$

$$C = \left(\frac{1}{K_T}\right)^{1/2}$$

$$K_T = K_e + K_f$$

K_e = entrance & exit losses = 1.10 (estimated)

$$K_f = \frac{29.1\, n^2 L}{R^{4/3}}$$

$L = 23'$ $n = .03$ (conc. w/ earth bottom)

$R = A/P$ (Flowing Full)

$A = 14.9' \times 7.1' = 105.8\ Ft^2$

$P = 2(14.9) + 2(7.1) = 44\ Ft$

$R = 2.40$

$R^{4/3} = 3.22$

$$K_f = \frac{29.1(.03)^2(23)}{3.22}$$

$$K_f = .19$$

$$K_T = 1.10 + .19 = 1.29$$

$$C = \left(\frac{1}{K_T}\right)^{1/2} = .88$$

Attachment B

Trial #1 H = 7.1 (Pressure Flow Begins)

$Q = C A (2g H)^{1/2}$

$= (.88)(105.8)(2 \cdot 32.2 \cdot 7.1)^{1/2}$

$= 1990 \text{ cfs}$

Trial #2 H = 8.3 low pt in road

$Q = (.88)(105.8)(2 \cdot 32.2 \cdot 8.3)^{1/2}$

$= 2153 \text{ cfs}$

Trial #3 H = 8.9

$Q_T = Q_{weir} + Q_{pressure}$

$Q_{weir} = C L h^{3/2}$

where C = 2.6 (assumed)

L = length of weir

h = avg head over weir

$Q_w = 2.6(67)(.3)^{3/2} = 29 \text{ cfs}$

$Q_p = (.88)(105.8)(2 \cdot 32.2 \cdot 8.9)^{1/2} = 2229$

$Q_T = 29 + 2229 = 2258 \text{ cfs}$

Trial #4 H = 9.1

$Q_w = (2.6)(113)(.4)^{3/2} = 74$

$Q_p = (.88)(105.8)(64.4 \cdot 9.1)^{1/2} = 2254$

$Q_T = 74 + 2254 = 2328$

Trial #5 H = 10.4

$Q_w = (2.6)(233)(1.2)^{3/2} = 796$

$Q_p = (.88)(105.8)(64.4 \cdot 10.4)^{1/2} = 2410$

$Q_T = 796 + 2410 = 3206 \text{ cfs}$

Trial #6 H = 11.4

$Q_w = 2.6(288)(2.1)^{1.5} = 2279$

$Q_p = (.88)(105.8)(64.4 \cdot 11.4)^{\frac{1}{2}} = 2523$

$Q_T = 2279 + 2523 = 4802$ cfs

Trial #7 H = 12.4

$Q_w = 2.6(325)(3.0)^{1.5} = 4391$

$Q_p = (.88)(105.8)(64.4 \cdot 12.4)^{\frac{1}{2}} = 2631$

$Q_T = 4391 + 2631 = 7022$ cfs

Trial #8 H = 13.4

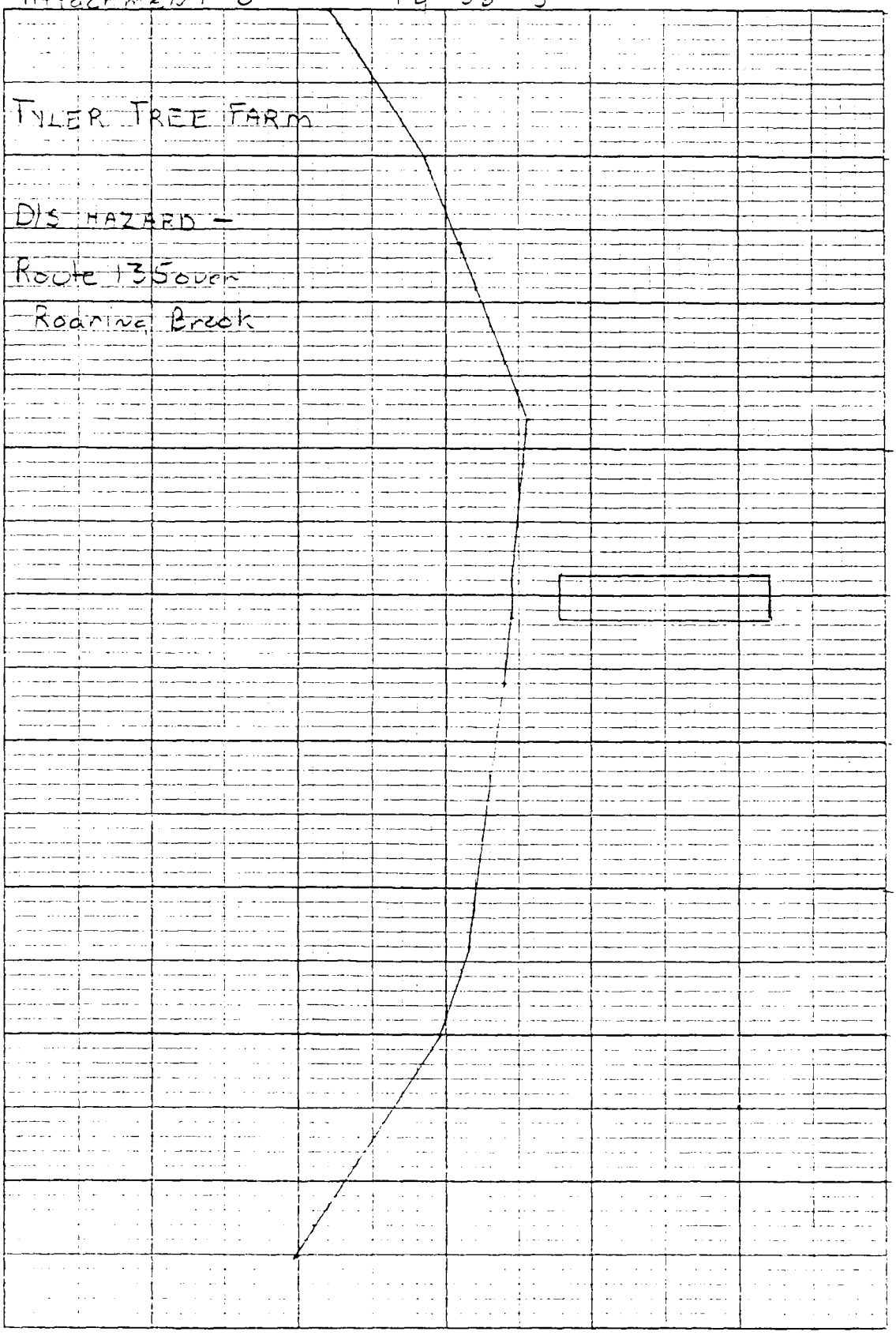
$Q_w = 2.6(346)(4.0)^{1.5} = 7197$

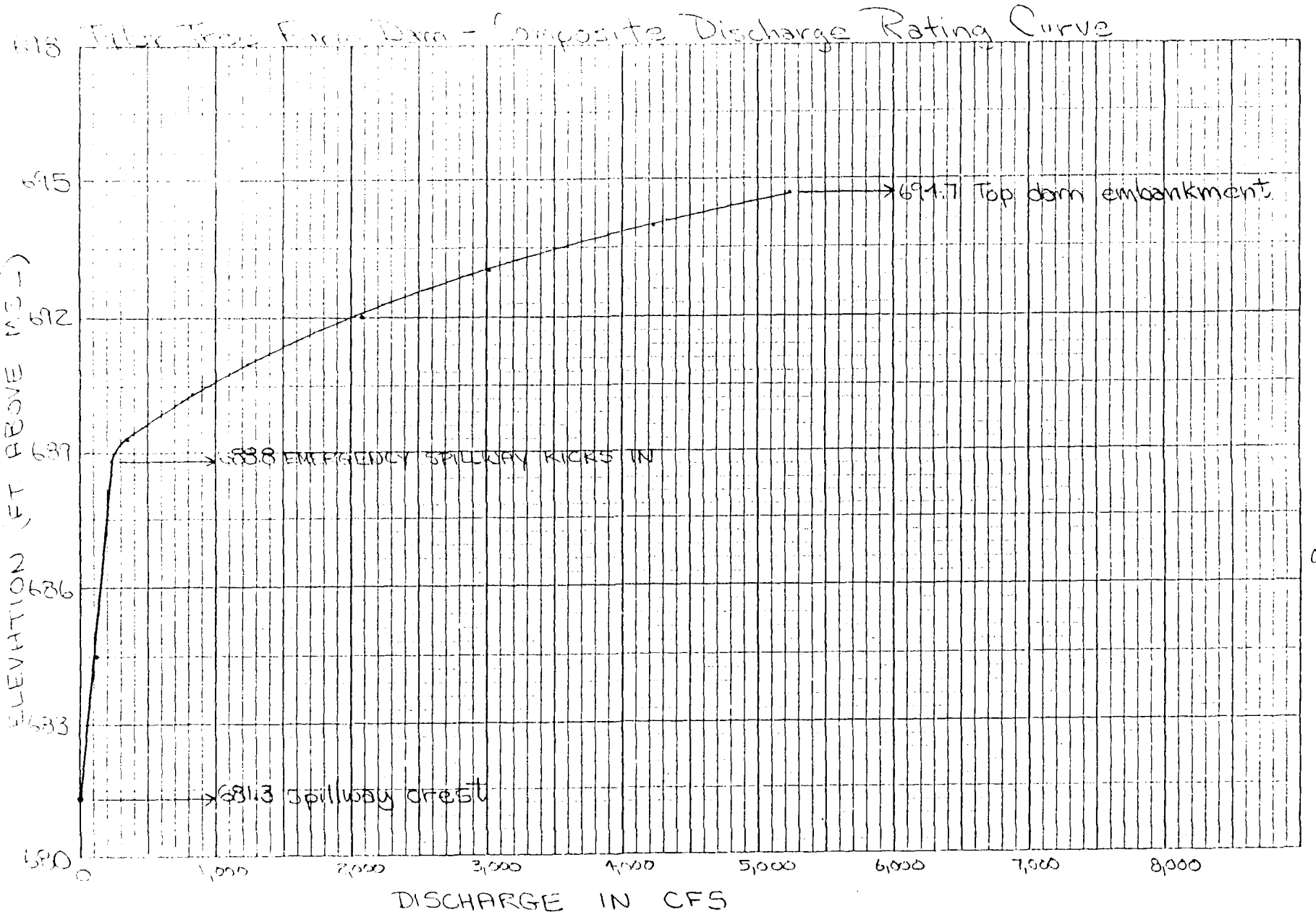
$Q_p = (.88)(105.8)(64.4 \cdot 13.4)^{\frac{1}{2}} = 2735$

$Q_T = 7197 + 2735 = 9,932$ cfs

Attachment "B"

Pg 50 = 5





D-15

Attachment C
Page 1 of 3

Tyler Tree Farm Dam

Elevation - Discharge Rating Curve = Combination of Glory-hole Spillway & Emergency Spillway Rating Curve

NOTE: Use Emergency Spillway Rating Curve based on critical depth The rating curve calculated using Manning's Equations gave elevations for super-critical flow. It is assumed that at the control section of the emergency spillway there will be a transition from sub-critical depths to critical depths to super-critical depths and therefore critical depth will occur at the control section.

Trial # 1

Elev = 688.8

Q_p = 230 cfs

Q_{EM} = 0 cfs

Q_T = 230 cfs

Q_p = discharge of principal spillway

Q_{EM} = discharge of emergency spillway

$Q_T = Q_{EM} + Q_p$

Trial #2 Elev = 689.3

Q_p = 235 cfs

Q_{EM} = 109 cfs

Q_T = 344 cfs

Trial #3 Elev = 690.3

Q_p = 245 cfs

Q_{EM} = 590 cfs

Q_T = 835 cfs

Trial #4 Elev = 691.0

Q_p = 250 cfs

Q_{EM} = 990 cfs

Q_T = 1240 cfs

Trial #5 Elev. = 692 C
Q_p = 265 c.f.s
Q_{Em} = 1820 c.f.s
Q_T = 2085 c.f.s

Trial #6 Elev. = 693.0
Q_p = 272 c.f.s
Q_{Em} = 2740 c.f.s
Q_T = 3012 c.f.s

Trial #7 Elev = 694.0
Q_p = 278 c.f.s
Q_{Em} = 3960 c.f.s
Q_T = 4238 c.f.s

Trial #8 Elev = 6947 (top of dam)
Q_p = 285 c.f.s
Q_{Em} = 4950 c.f.s
Q_T = 5235 c.f.s

Principal Spillway Rating Curve → See Attach "D"

Emergency Spillway Rating Curve → See Attach "E"

Tyler Tree Farm Dam

Elevation Discharge Curve for Principal Spillway

Principal spillway consists of 5' diameter cmp drop inlet which connects to 4' diameter cmp conduit. Rating curve is a component curve. It is comprised of weir flow over intake pipe and orifice flow thru the conduit. The highest elev. for given discharge was used to derive the final rating curve.

Weir Flow over drop inlet structure

$Q = CLH^{3/2}$

L = circumference of 5' intake pipe

L = 15.7'

C = 3.3 (sharp-crested weir) from King and Brater

Trial #1

Elev. = 681.3

H = 0'

Q = 0 cfs

Trial #2

Elev. = 681.8

H = 0.5'

$Q = 3.3(15.7)(.5)^{3/2} = 18.3$ cfs

Trial #3

Elev. = 683.0

H = 1.7

$Q = 3.3(15.7)(1.7)^{3/2} = 115$ cfs

Trial #4

Elev. = 685.0

H = 3.7'

$Q = 3.3(15.7)(3.7)^{3/2} = 369$ cfs

Trial # 5

Elev. = 687.0

H = 5.7'

$Q = 3.3(15.7)(5.7)^{3/2} = 705$ cfs

Trial #6

Elev = 687.8

H = 6.5'

$Q = 3.3(15.7)(6.5)^{3/2} = 859$ cfs

Trial #7

Elev = 689.0

H = 7.7

$Q = 3.3(15.7)(7.7)^{3/2} = 1107$ cfs

Trials used to develop rating curve assuming the 4' cmp conduit

Use Hydraulic Charts for the Selection of Highway Culverts - HEC-5

Assumptions:

Due to the steep gradient of the downstream channel the effect of tailwater was assumed to be negligible Therefore inlet control was assumed to govern.

Assuming inlet control Chart 5 was used to develop rating curve data for 4' cmp conduit

HW = head to centerline of inlet of 4' cmp conduit (elev 687.3)

Attachment "D" 3 of 6

Trial #1

Elev = 681.3 D = 4'
HW = 8.0'
HW/D = 2.0
Q = 147 cfs

Trial #2

Elev. = 683.3
HW = 10.0
HW/D = 2.5
Q = 170 cfs

Trial #3

Elev. = 685.3
HW = 12.0
HW/D = 3.0
Q = 200 cfs

Trial #4

Elev. = 687.8
HW = 14.5
HW/D = 3.6
Q = 220 cfs

Trial #5

Elev = 690.0
HW = 16.7
HW/D = 4.2
Q = 240 cfs

Trial #6

Elev. = 691.0
HW = 17.7
HW/D = 4.4
Q = 250 cfs

Trial #7

Elev. = 691.5
HW = 18.2
HW/D = 4.55
Q = 260 cfs

Trial #8

Elev. = 692.5
HW = 19.2
HW/D = 4.8
Q = 270 cfs

Trial #9

Elev. = 693.5
HW = 20.2
HW/D = 5.05
Q = 275 cfs

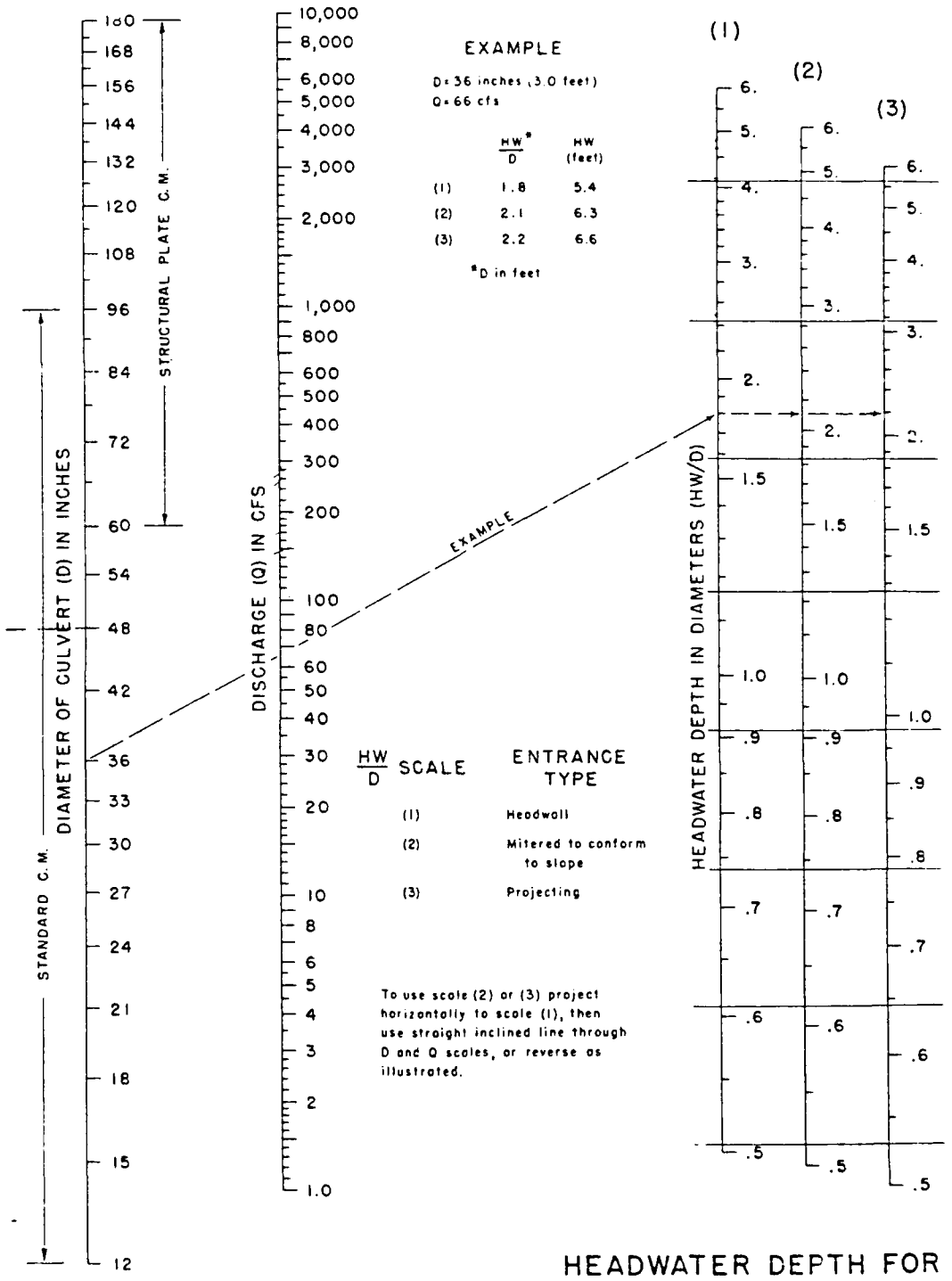
Trial #10

Elev = 694.5
HW = 21.2
HW/D = 5.3
Q = 280 cfs

Attachment D 30 6

HEC-5 Charts

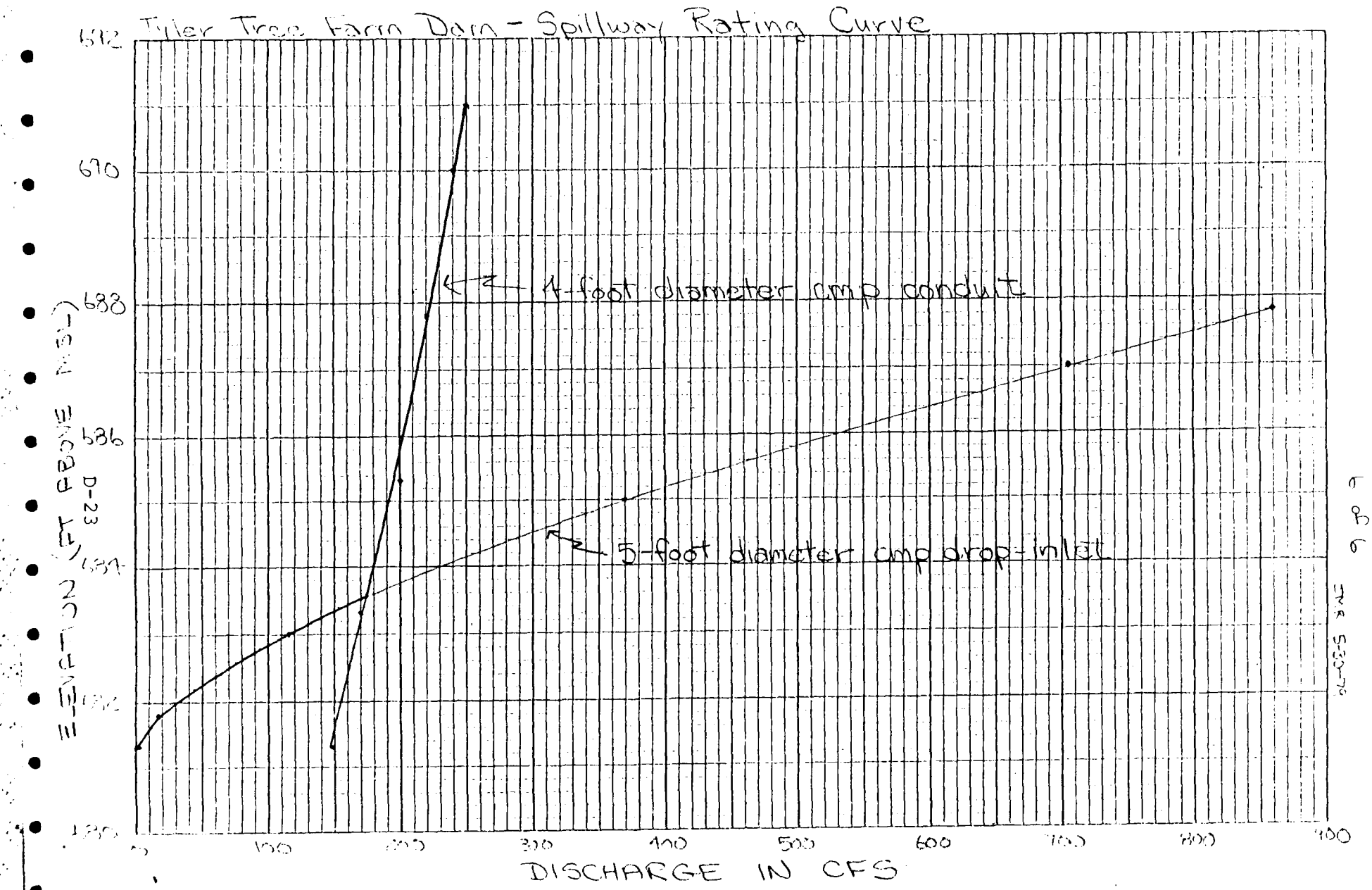
CHART 5



BUREAU OF PUBLIC ROADS JAN. 1963

HEADWATER DEPTH FOR C. M. PIPE CULVERTS WITH INLET CONTROL

D-22



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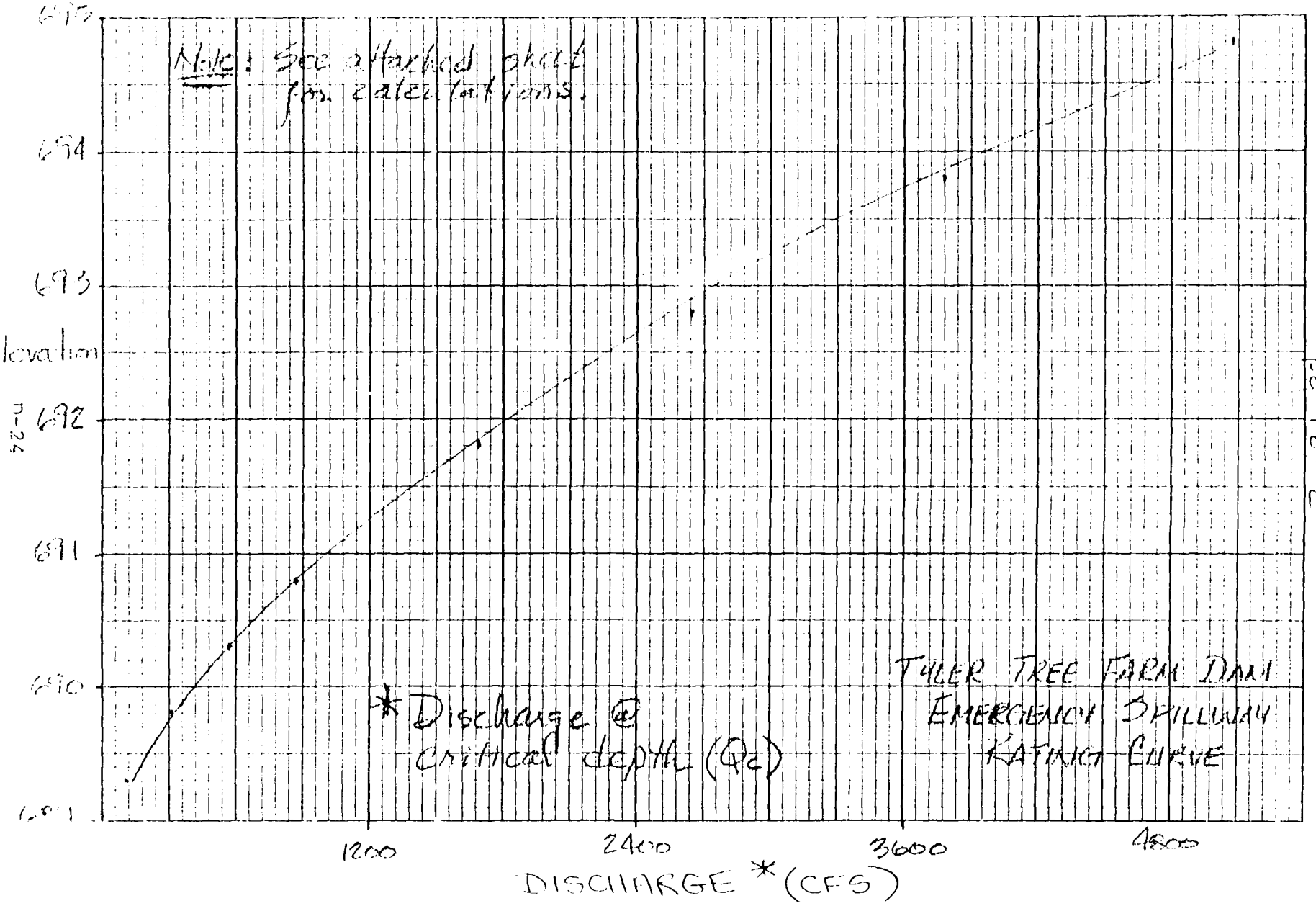
Attachment D
6 of 6

TR# 53078



Attachment II

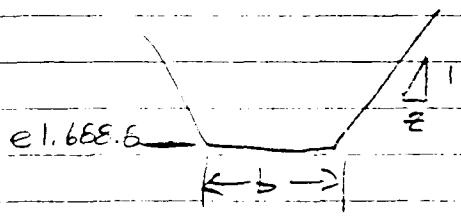
pg 1 of 2

D-24

Attachment "E" 2 of 2

Trial No.	Critical Depth (d_c) (ft.)	Elev.	Q_c (cfs)
1	0.5	689.3	109
2	1.0	689.8	312
3	1.5	690.3	572
4	2.0	690.8	883
5	3.0	691.8	1687
6	4.0	692.8	2649
7	5.0	693.8	3776
8	6.0	694.8	5063

where $Q_c = d_c^{3/2} \sqrt{\frac{9(b+z d_c)^3}{b+2z d_c}}$



Ref. See Engineering Handbook for Hydraulics, Soil Conservation Service, U.S. Dept. of Agriculture; STD. DWG. ES-24.

Storage - Elevation Info. Pg 1 of 2

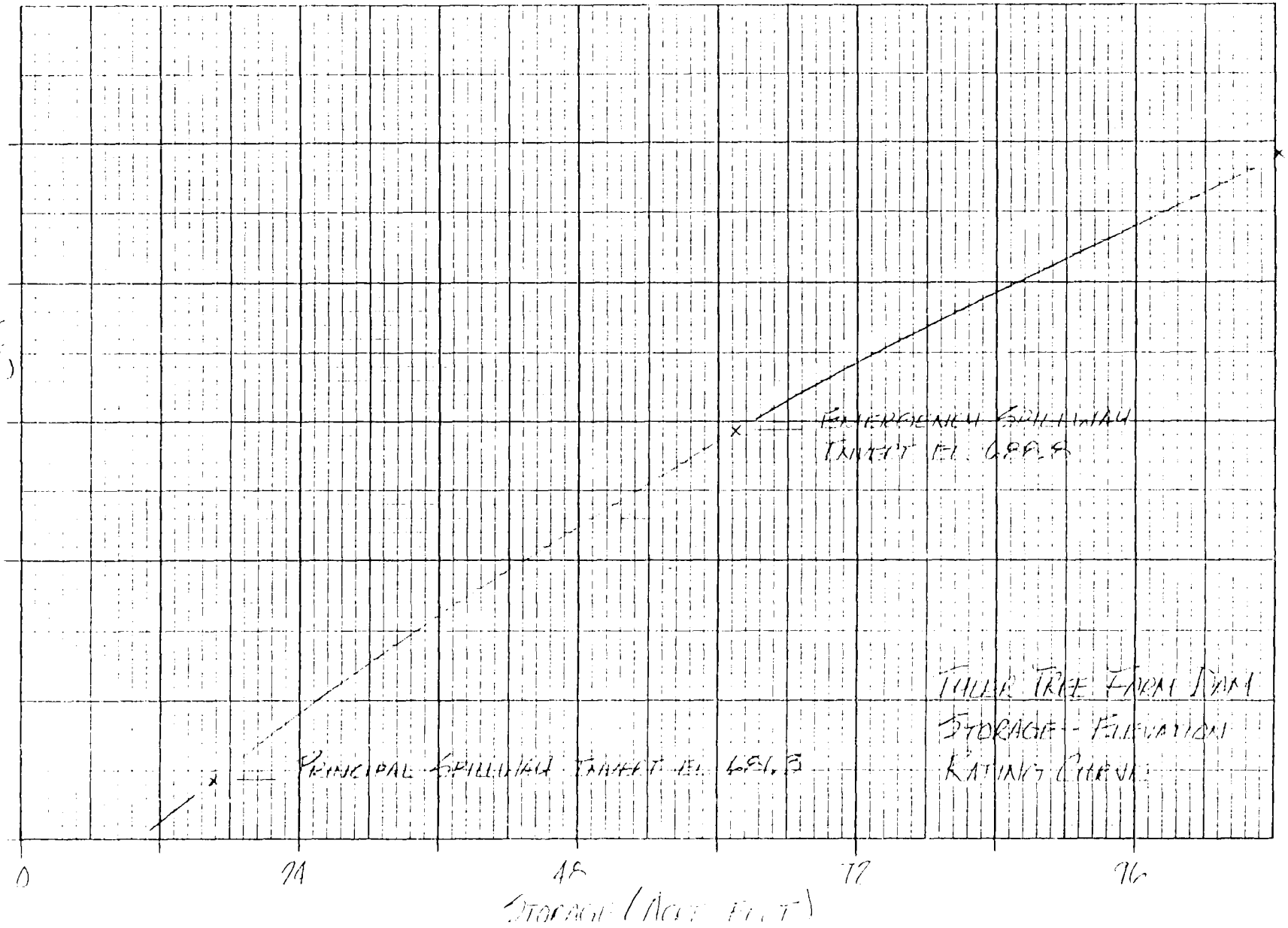
ECE Design Flows

ORIGINAL DESIGN
- Normal Pool Elev. (670 - 680.3) : 10.3 acre-ft
- Pool @ emergency spillway crest (674.5-687.8) 55 acre-ft

Note: The as-built elevations of the normal pool and emergency spillway crest were 1' higher than originally designed.

- Storage-elevation relation was generated for Tyler Tree Farm Dam using the "Function of a Pyramid" equation to approximate a conical volume.

A storage-elevation curve is shown on p. D-27.


695
694
689
686
0
24
48
72
96
PRINCIPAL SPILLWAY CREST EL. 689.5
EMERGENCY SPILLWAY CREST EL. 694.5
TOP OF DAM EL. 704
STORAGE - ELEVATION CURVE

D-27

Tree Farm Dam

Principal outlet capacity - 24" BCCMP

Invert elev. = 671.9

area = $\pi R^2 = \pi (1)^2 = 3.14$ ft^2

perimeter = $2\pi R = 2\pi (1) = 6.28$ ft

R = 0.5

Calculate capacity @ spillway elevation = 681.3

Using orifice equation

$Q = CA(2 \cdot g \cdot H)^{\frac{1}{2}}$

H = 681.3 - 671.9 = 9.4

C = .68

↖ using King & Brater "Handbook of Hydraulics" (Table 4-11)

$Q = (.68)(3.14)(2 \cdot 32.2 \cdot 9.4)^{\frac{1}{2}}$

$Q = 53$ cfs

Tyler Tree Farm Dam - Drawdown Capacity 1 of 2

Calculation of the time required to drain pond using 24" diameter RCCMP low-level outlet

see D. C. Noonan's memo, "Drawdown Capacity with Falling Head", as a guide

Assumptions:

1) Inflow Q during drawdown duration

2) Surface Area vs head can be expressed as linear relationship (using Storage-Elevation Curve and extending lower range of curve)

$$\Delta S.A. = K h$$

3) Out-flow Q can be calculated using orifice equation

$$Q_o = C A_o \sqrt{2gh}$$

C = .68 from King & Brater Handbook of Hydraulics (Table 4-11)

Equation Used: obtained from D. C. N. memo

$$t = \frac{K}{C A_o \sqrt{2g}} \left[-\frac{2}{3} h^{3/2} \right]_{h_2}^{h_1}$$

derived from integral

h_1 = [illegible] normal pool = 81.3 - 67.9 = 9.4'

h_2 = 0 D-29 [illegible]

Drawdown Capacity (cont.) 2 of 2

Given:

1) 24" low-level pipe, 20' in length (C = .68)
   Invert = 671.9 (h = 0)

2) Normal pool elevation = 681.3
   (h = 9.4)

3) Surface area
   @ normal pool = 5 acres   h = 9.4
   @ top of dam (elev. 694.7) = 9 acres   = 22.8

4) Orifice Coef. = .68 (King & Brater - "Handbook of Hydraulics")

Looking at Surface Area - Head points, a linear relationship may be defined.

$$\Delta S.A. = \frac{9\ ac - 5\ ac}{22.8' - 9.4'} = 0.30 \frac{ac}{ft}$$

$$K = \Delta S.A. = 0.30 \frac{ac}{ft} \left(\frac{43{,}560\ ft^2}{1\ ac} \right) = 13{,}068 \frac{ft^2}{ft}$$

∴ for unit change in head, 13,068 ft^2 change in surface area will occur.

Substitute into the equation $t = \frac{K}{C A_p \sqrt{2g}} \left[-\frac{2}{3} h^{3/2} \right]_{h_1}^{h_2}$

$$t = \frac{13{,}068}{(.68)(1)^2(\pi)\sqrt{2g}} \left[-\frac{2}{3}(0)^{3/2} - \left(-\frac{2}{3}(9.4)^{3/2} \right) \right]$$

$= (762)\ [19.2]$ secs.

$=$ [illegible] secs. $\times \frac{1\ hr}{3600\ sec} \times \frac{1\ day}{24\ hr} =$ [illegible]

APPENDIX E

INFORMATION AS CONTAINED IN THE NATIONAL INVENTORY OF DAMS

INVENTORY OF DAMS IN THE UNITED STATES

STATE	IDENTITY NUMBER	DIVISION	STATE	COUNTY	CONGR DIST	STATE	COUNTY	CONGR DIST	NAME	LATITUDE (NORTH)	LONGITUDE (WEST)	REPORT DATE DAY MO YR
NH	424	NED	NH	[illegible]	02				TYLER TREE FARM DAM	4417.9	7201.6	04JUN79

POPULAR NAME	NAME OF IMPOUNDMENT
	ROARING BROOK

REGION	BASIN	RIVER OR STREAM	NEAREST DOWNSTREAM CITY-TOWN-VILLAGE	DIST FROM DAM (MI.)	POPULATION
01	08	ROARING BROOK	MONROE	1	385

TYPE OF DAM	YEAR COMPLETED	PURPOSES	STRUCTURAL HEIGHT (FT.)	HYDRAULIC HEIGHT (FT.)	IMPOUNDING CAPACITIES MAXIMUM (ACRE-FT.)	IMPOUNDING CAPACITIES NORMAL (ACRE-FT.)	DIST	OWN	FED R	PRV/FED	SCS A	VER/DATE
PGRE	1969	R	30	29	97	16	NED	N	N	N	B	04JUN79

REMARKS

D/S HAS	SPILLWAY CREST LENGTH	SPILLWAY TYPE	SPILLWAY WIDTH (FT.)	MAXIMUM DISCHARGE (FT.)	VOLUME OF DAM (CY)	POWER CAPACITY INSTALLED (MW)	POWER CAPACITY PROPOSED (MW)	NO	NAVIGATION LOCKS LENGTH (FT.)	WIDTH (FT.)	LENGTH (FT.)	WIDTH (FT.)	LENGTH (FT.)	WIDTH (FT.)	LENGTH (FT.)	WIDTH (FT.)
2	254	U	54	5235	9427											

OWNER	ENGINEERING BY	CONSTRUCTION BY
[illegible] TYLER	USDA SCS	OWNER

REGULATORY AGENCY DESIGN	CONSTRUCTION	OPERATION	MAINTENANCE
NH WATER RES BD	NH WATER RES BD	NH WATER RES BD	NH WATER RES BD

INSPECTION BY	INSPECTION DATE DAY MO YR	AUTHORITY FOR INSPECTION
ANDERSON-NICHOLS + COMPANY INC	07MAY79	PL 92-367

REMARKS
33-EMER SPLWY-PLUS 5FT DIA DROPINLET 34-EARTHFILL 9CY CONC

END

FILMED

8-85

DTIC