THAMES RIVER BASIN
STAFFORD, CONNECTICUT

RIVERSIDE POND DAM
CT. 00336

PHASE 1 INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

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

OCTOBER, 1980

UNCLASSIFIED

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

407 141

REPORT DOCUMENTATION PAGE

READ INSTRUCTIONS BEFORE COMPLETING FORM

1. REPORT NUMBER	2. GOVT ACCESSION NO.	3. RECIPIENT'S CATALOG NUMBER
CT 00336	ADA144079	

4. TITLE (and Subtitle)
Riverside Pond Dam

NATIONAL PROGRAM FOR INSPECTION OF NON-FEDERAL DAMS

5. TYPE OF REPORT & PERIOD COVERED
INSPECTION REPORT

6. PERFORMING ORG. REPORT NUMBER

7. AUTHOR(s)
U.S. ARMY CORPS OF ENGINEERS
NEW ENGLAND DIVISION

8. CONTRACT OR GRANT NUMBER(s)

9. PERFORMING ORGANIZATION NAME AND ADDRESS

10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS

11. CONTROLLING OFFICE NAME AND ADDRESS
DEPT. OF THE ARMY, CORPS OF ENGINEERS
NEW ENGLAND DIVISION, NEDED
424 TRAPELO ROAD, WALTHAM, MA. 02254

12. REPORT DATE
October 1980

13. NUMBER OF PAGES
55

14. MONITORING AGENCY NAME & ADDRESS(if different from Controlling Office)

15. SECURITY CLASS. (of this report)
UNCLASSIFIED

15a. DECLASSIFICATION/DOWNGRADING SCHEDULE

16. DISTRIBUTION STATEMENT (of this Report)

APPROVAL FOR PUBLIC RELEASE: DISTRIBUTION UNLIMITED

17. DISTRIBUTION STATEMENT (of the abstract entered in Block 20, if different from Report)

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,

Thames River Basin
Stafford, Connecticut

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)
The dam at Riverside Pond is a stone-faced earth embankment dam and is used to supply process water to the adjacent factory located just downstream of the dam. The dam has a height of 21 feet and is approximately 180 feet in length (including the spillway). Based on the visual inspection at the site, the dam is considered to be in POOR condition. The dam is classified as SMALL in size and a HIGH hazard structure.

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DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION, CORPS OF ENGINEERS
424 TRAPELO ROAD
WALTHAM, MASSACHUSETTS 02254

REPLY TO
ATTENTION OF:

NEDED

MAR 0 6 1981

Honorable William A. O'Neill
Governor of the State of Connecticut
State Capitol
Hartford, Connecticut 06115

Dear Governor O'Neill:

Inclosed is a copy of the Riverside Pond Dam (CT-00336) 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 Department of Environmental Protection, the cooperating agency for the State of Connecticut. In addition, a copy of the report has also been furnished the owner, North American Printed Circuit Company, Division of Tyco Labs., Old Monson Road, Stafford, CT 06075.

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 Department of Environmental Protection for your cooperation in carrying out this program.

Sincerely,

C. E. EDGAR, III
Colonel, Corps of Engineers
Division Engineer

Incl
As stated

RIVERSIDE POND DAM

CT 00336

THAMES RIVER BASIN

STAFFORD, CONNECTICUT

PHASE 1 INSPECTION REPORT

NATIONAL DAM INSPECTION PROGRAM

NATIONAL DAM INSPECTION PROGRAM

PHASE 1 - INSPECTION REPORT

IDENTIFICATION NO.:	CT 00336
NAME OF DAM:	Riverside Pond Dam
COUNTY AND STATE:	Tolland County, Connecticut
STREAM:	Furnace Brook
DATE OF INSPECTION:	8 April, 1980

BRIEF ASSESSMENT

The dam at Riverside Pond is a stone-faced earth embankment dam and is used to supply process water to the adjacent factory located just downstream of the dam. The dam has a height of 21 feet and is approximately 180 feet in length (including the spillway). A single span two lane bridge spans the spillway crest. The spillway is a stone masonry/concrete cap, uncontrolled broad crested weir, 64 feet in length. There are two outlet works, one located to the right of the spillway and the other at the left of the spillway. The right outlet works is a gated underground sluiceway that supplies process water to the adjacent mill. Flows at this outlet pass through the mill and discharge through the side wall of the building foundation and return to Furnace Brook. The left outlet works is also gated and is a 42 inch diameter riveted steel plate pipe through the left dam embankment.

Based on the visual inspection at the site, the dam is considered to be in POOR condition. Deficiencies observed include: cracks and voids in the upstream masonry face, vegetation growing in the upstream and downstream masonry walls, cracks and bulging of the downstream face of the dam, leakage through the left intake gates and deterioration of the outlet pipe, and seepage along the downstream face.

The dam is classified as SMALL in size and a HIGH hazard structure in accordance with recommended guidelines established by the Corps of Engineers. Based on the size and hazard classification, the test flood adopted for the Riverside Pond Dam is equal to one-half the Probable Maximum Flood (½ PMF) which is estimated to be 500 CSM or 6700 CFS from the 13.4 square miles drainage basin. This test flood has a routed outflow discharge equal to 6300 CFS and would overtop the dam by about 1.8 feet therefore, the spillway capacity is considered inadequate. Assuming the pool elevation at the top of the dam, the spillway can pass a flow of 4,345 CFS, which represents only 69 percent of the test flood outflow.

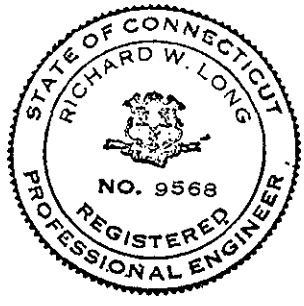
It is recommended that the Owner engage the services of a qualified registered engineer experienced in the design of dams to accomplish the following: Conduct further study of the hydraulic and hydrologic aspects of the drainage basin to provide alternate means of reducing the overtopping potential at the dam, analyze the stability of the left dam embankment, investigate the seepage through the left dam embankment and determine its effect on the structural stability of the dam and repair the leakage of the left outlet works gate and the poor condition of the left outlet conduit.

The above recommendations and other remedial measures as described in Section 7 should be implemented by the owner within one year after receipt of this Phase 1 inspection report.

CE MAGUIRE, INC.

By: Richard W. Long

Richard W. Long, P.E.
Vice President



This Phase I Inspection Report on Riverside Pond 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.

ARAMAST MAHTESIAN, MEMBER
Geotechnical Engineering Branch
Engineering Division

CARNEY M. TERZIAN, MEMBER
Design Branch
Engineering Division

RICHARD DIBUONO, CHAIRMAN
Water Control Branch
Engineering Division

APPROVAL RECOMMENDED:

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 1 Investigations. Copies of these guidelines may be obtained from the Office of Chief of Engineers, Washington, DC 20314. The purpose of a Phase 1 Investigation is to identify expeditiously those dams which may pose hazards to human life or to 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 1 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 condition 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 1 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 reasonable 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 aid 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.

The Phase I Investigation does not include an assessment of the need for fences, gates, no-trespassing signs, repairs to existing fences and railings and other items which may be needed to minimize trespass and provide greater security for the facility and safety to the public. An evaluation of the project for compliance with OSHA rules and regulations is also excluded.

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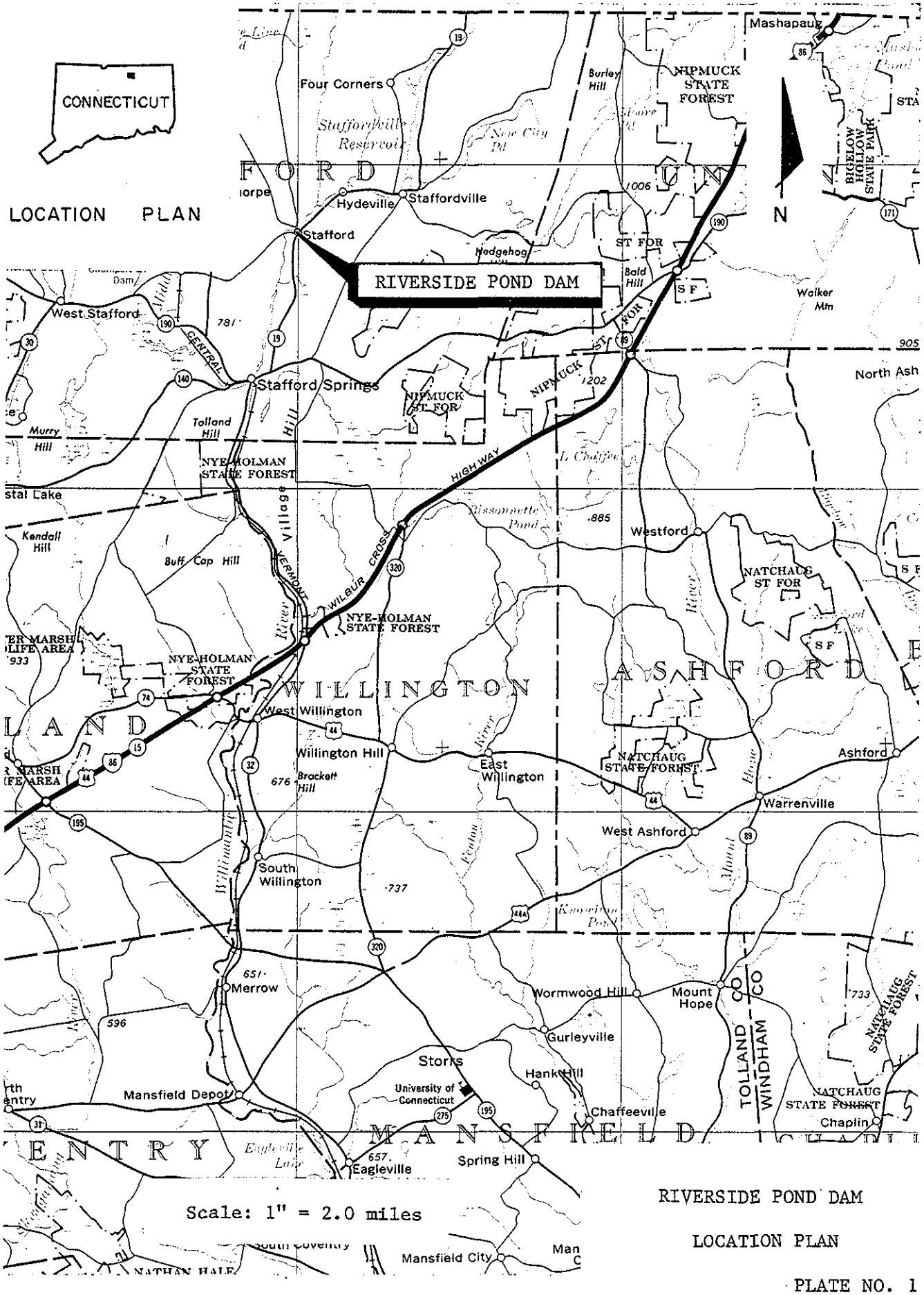
OVERVIEW PHOTO - Riverside Pond Dam



RIVERSIDE POND DAM

LOCATION PLAN

PLATE NO. 1

NATIONAL DAM INSPECTION PROGRAM

PHASE 1 - INSPECTION REPORT

NAME OF DAM: RIVERSIDE POND 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. CE Maguire, Inc. has been retained by the New England Division to inspect and report on selected dams in the State of Connecticut. Authorization and notice to proceed was issued to CE Maguire, Inc. under a letter from Max B. Scheider, Colonel, Corps of Engineers. Contract No. DACW33-80-C-0013 has been assigned by the Corps of Engineers for this work.

b. Purpose of Inspection.

1. 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. Encourage and assist 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 the Project

a. Location. Riverside Pond is located in the Town of Stafford, Tolland County, Connecticut; approximately 200 feet north of the intersection of Orcuttville Road, Patton Road and Route 19. Coordinates of the dam are approximately 41°59.0'N Latitude and 72°17.4' W Longtitude. The dam impounds water from Furnace Brook which drains a 13.4 square mile watershed of rolling terrain. The dam is located about 8,000 feet north of the Glenville Pond Dam and approximately 2 miles south of the Staffordville Reservoir Dam. The axis of the dam is oriented in a north-south alignment with the pond to the east of the dam. Furnace Brook joins the Williamantic River below the dam near the junction of the Middle River, approximately 1300 feet downstream.

b. Description of Dam and Appurtenances. The dam at Riverside Pond is approximately 180 feet in length (including the overflow spillway), and is an earth embankment stone faced structure. The concrete overflow, uncontrolled weir spillway is approximately 64 feet in length and is located about 44 feet from the right abutment of the dam. The maximum height of the dam is 21 feet. There are two outlet work structures for the dam. The gated outlet works to the right of the spillway supplies process water to the factory which is located approximately 150 feet from the dam along the right side of the spillway discharge channel (Furnace Brook). The inlet and conduit were not measured during the field inspection. The gated outlet works to the left of the spillway consists of a manually operated sluice gate and a 42 inch diameter riveted steel pipe conduit. Discharges through the left outlet works conduit and the uncontrolled spillway discharge directly into Furnace Brook. Discharges from the right spillway outlet pass below the factory and discharge through the basement foundation wall into Furnace Brook approximately 300 feet downstream of the toe of dam. A single span, two lane highway bridge spans the spillway of the dam with the low cord of the bridge approximately 4.2 feet above the crest of the dam. The abutments of the bridge have been incorporated into the spillway abutments at each end of the spillway.

c. Size Classification. The dam at Riverside Pond has an impoundment capacity at the top of the dam (elev. 585.0 NGVD) equal to 200 Ac-Ft and a height of 21.0 feet. In accordance with guidelines established by the Corps of Engineers, this dam is classified as a SMALL size structure based on its height and impoundment capacity.

d. Hazard Classification. The dam is classified as a HIGH hazard potential structure because its failure could result in loss of more than a few lives, and inundation of 1-3 dwellings and 1-3 commercial facilities. Failure flows will cause flooding and potential damage to Orcuttville and Monson Roads and could cause temporary disruption of utility service for those utilities located with the rights of way of those respective roadways. Water depth due to the dam failure discharge of 10,000 CFS is estimated to be approximately 10.0 feet. Depths of flows downstream of the dam before and after the dam failure are 6.0 and 10.0 feet for respective discharges of 4,345 and 10,000 CFS. The failure will cause flooding conditions downstream and high velocities of flow which will carry trees, vegetation and other debris that will increase the damage potential. The increased depth in flow in the impacted areas causing damage due to failure of the dam will be approximately 4.0 feet and may cause 1-2 feet depth of water in dwellings and commercial properties.

e. Ownership. Riverside Pond Dam is owned by The North American Printed Circuit Company, Division of Tyco Labs, Old Monson Road, Stafford, Connecticut 06075.

f. Operator. Operation personnel are under the direction of:

Mr. Jerry LaMorte
North American Printed Circuit Company
Division of Tyco Labs
Old Manson Road
Stafford, CT 06075

Note: During excessive rain and highwater conditions the Stafford Department of Public Works, under the direction of Mr. D. Campenelli, regulates the water level of Riverside Pond by opening the outlet works structure located to the left of the spillway.

g. Purpose of the Dam. The impoundment at Riverside Pond Dam is presently used for process water at the adjacent factory. Reportedly, future plans include the installation of a hydro-generating turbine.

h. Design and Construction History. There are no design or construction drawings or information available for the dam at Riverside Pond. The dam was constructed about 1880.

i. Normal Operational Procedures. There are no operating procedures for this facility. An indeterminate amount of process water is withdrawn by North American Printed Circuit Company through their sluiceway whose intake structure is located at the right of the spillway. During excessive periods of rainfall and highwater levels, the water level at the pond is lowered by the Department of Public Works (Town of Stafford). Normally all flows are discharged over the uncontrolled spillway.

1.3 Pertinent Data

a. Drainage Area. The Riverside Pond drainage basin located in the communities of Monson and Wales, Massachusetts and Stafford, Connecticut is oval in shape with a length of approximately 5.4 miles and a average width of 2.8 miles and has a total area of 13.4 square miles. (See Appendix D for the Basin Map). Approximately 10% of the watershed (1.34 square miles) is swampy or natural storage. The topography is generally rolling with elevations ranging from a high of 1315 feet at Burley Hill to 577.0 feet at the spillway crest. Basin slopes being 0.007 to 0.015 feet per feet are generally flat to moderate. Staffordille Reservoir is located upstream of Riverside Pond and its large storage capacity will substantially reduce the peak inflow at this project.

b. Discharge at Damsite. There is no discharge data available for the dam at Riverside Pond. Listed below are calculated discharge data for spillway and outlet works:

1. Outlet Works

Conduit Size	42 inch diameter riveted steel plate pipe invert elevation 564.0 (left of Spillway) 6' x 6' intake gate and 6' diameter penstock (right of spillway)
i. Discharge Capacity For 6' x 6' = 555 CFS For 42" Ø = 115 CFS	670 CFS (combined) @ spillway crest Elevation 577.0 feet
ii. Discharge Capacity For 6' x 6' = 753 CFS For 42" Ø = 177 CFS	930 CFS (combined) @ top of dam Elevation 585.0 feet
iii. Discharge Capacity For 6' x 6' = 854 CFS For 42" Ø = 206 CFS	1060 CFS (combined) at Test Flood Elevation 590.0
2. Maximum known flood at damsite	5,000 CFS (estimated 1955)
3. Ungated spillway capacity at top of dam	4,345 CFS
4. Ungated spillway capacity at test flood elevation	5,475 (assumed no overtopping)
5. Gated spillway capacity at normal pool elevation	N/A
6. Gated spillway capacity at test flood elevation	N/A
7. Total spillway capacity at test flood elevation	5,475 (assumed no overtopping)
8. Total project discharge at top of dam	5,275 CFS
9. Total project discharge at test flood elevation	7,360 CFS

c. Elevations (ft. above NGVD)

1.	Streambed at toe of dam	564.0
2.	Bottom of cutoff	Unknown
3.	Maximum tailwater	Unknown
4.	Normal pool	577.0
5.	Full flood control pool	N/A
6.	Spillway crest	577.0
7.	Design surcharge (Original Design)	Unknown
8.	Top of dam	585.0
9.	Test flood level	586.8

d. Reservoir Lengths (in feet)

1.	Normal pool	1,200
2.	Flood control pool	N/A
3.	Spillway crest pool	1,200
4.	Top of dam	1,200
5.	Test flood pool	1,200

e. Storage (acre-feet)

1.	Normal pool	120
2.	Flood control pool	N/A
3.	Spillway crest pool	120
4.	Top of dam	200
5.	Test flood pool	250

f. Reservoir Surface Area (acres)

1.	Normal pool	10
2.	Flood-control pool	N/A
3.	Spillway crest	10

4.	Test flood pool	10
5.	Top of dam	10
g.	Dam	
1.	Type	Earth filled dry stone masonry faced
2.	Length	180 feet
3.	Height	21 feet
4	Top Width	25 feet
5.	Side Slopes	Vertical stone masonry
6.	Zoning	Unknown
7.	Impervious Core	Unknown
8.	Cutoff	Unknown
9.	Grout curtain	Unknown
10.	Other	Unknown
h.	Diversion and Regulating Tunnel	N/A
i.	Spillway	
1.	Type	Free overflow broad crested vertical fall (underbridge) weir
2.	Length of weir	64 feet
3.	Crest elevation	577.0 (USGS QUAD)
4.	Gates	None
5.	U/S Channel	Natural Streambed
6.	D/S Channel	Natural Streambed
7.	General	

j. Regulating Outlets

Refer to paragraph 1.2b "Description of Dam and Appurtenances Page 1-2 for description of outlet works.

1.	Invert	Left 564.0	Right Unknown
2.	Size	42 inch	Covered sluiceway/6-feet diameter penstock
3.	Description	riveted steel plate pipe	Unknown/steel penstock
4.	Control Mechanisms	Manually operated sluice gate on upstream side of dam	3/8 inch aluminum plate which is placed over the intake opening on upstream side of dam
5.	Other		

SECTION 2

ENGINEERING DATA

2.1 Design. No design data is available for this dam.

2.2 Construction Data. No records of construction or repairs exist.

2.3 Operation Date. No record of operation for this facility has been maintained.

2.4 Evaluation of Data

a. Availability. No information available.

b. Adequacy. The lack of in-depth engineering data did not allow a definitive review. Therefore, the adequacy of this dam could not be assessed from the standpoint of reviewing design and construction data, but is based primarily on the visual inspection, the dam's past performance and sound engineering judgement.

c. Validity. The validity of the limited information available must be verified.

SECTION 3

VISUAL INSPECTION

3.1 Findings

a. General. The Phase 1 Inspection of the dam at Riverside Pond Dam was performed on 8 April, 1980 by representatives of CE Maquire, Inc. and Geotechnical Engineers, Inc. A visual checklist and photographic record of that inspection is included in Appendix A and C, respectively, of this report.

Based on the visual inspection, the dam at Riverside Pond and its appurtenances are judged to be in POOR condition.

b. Dam. The dam is a stone-faced earth embankment structure approximately 180 feet long, 21 feet high, and with a crest width of about 25 feet. No construction drawings are available, nor are details of the design and subsequent repairs known.

1. Crest - The crest of the dam is broad and well defined between upstream and downstream vertical stone masonry faces (see Photos C-1 and C-2). Old Monson Road crosses the crest of the dam and is supported by a single span dual lane highway bridge over the spillway (see Overview Photo). Pavement on the crest appears to be in good condition, except for some minor erosion at the edge of the pavement at the left abutment. A steel guard rail along both sides of the roadway and bridge prevents vehicles from leaving the roadway.

2. Upstream Face - The lower portion of the upstream face is stone mansonry construction and the upper portion consists of a recently constructed concrete wall which forms the base for the roadway (See Photo C-2). The stone masonry face of the wall is very uneven with many bulges and voids resulting from displaced stones in the wall. Some voids and erosion between the stones in the wall extend as far as 4 feet into the face of the dam with the area on the left upstream face being the most severely effected. Grass and small brush were observed to grow from between the stones in the upstream face.

   Extensive erosion caused by uncontrolled runoff from the roadway was observed on the upstream slope of the left abutment.

3. Downstream Face. The downstream face of the dam consists of a stone masonry wall parallel with the spillway crest left of the spillway and perpendicular to the spillway right of the spillway crest. (See photos C-3 and C-4).

The top of the stone wall located to the right of the spillway slopes gently downward from the right, along the edge of the downstream spillway discharge channel and forms the foundation wall of the adjacent factory building. The area behind the wall is grass covered and quite uneven. The adjacent factory building shows evidence of differential settlement. The stone wall at the right of the spillway appeared to be in fair condition with no visible evidence of instability or seepage.

The downstream face of the wall located at the left of the spillway is uneven and bulged outward in the area surrounding the outlet conduit. A series of horizontal and vertical cracks surround this portion of the wall and it appears to have moved outward in the downstream direction. A vertical crack extending from the foot of the wall to the crest was observed 6 to 8 feet left of the spillway. Grass, brush and small trees were observed growing from between the stones in the downstream face at many locations (See Photos C-10, C-11 and C-12).

Seepage was observed flowing from several cracks and voids in the downstream face in the area between the spillway and outlet conduit and extends vertically from the toe of the dam to within 11 feet of the crest. Larger amounts of water were flowing from beneath the invert of the outlet pipe (see Photos C-11 and C-12). All seepage observed was clear and free of sediment. The elevation of the bed of the reservoir at the upstream side of the dam is 2 feet above the elevation of the uppermost seepage observed at the downstream face.

Extensive erosion of the right abutment was observed. Trees up to 9 inches in diameter are growing on the left abutment and a small amount of seepage was observed at the base of the trees.

c. Apurtenant Structures

1. Spillway - The natural stream channel, forming the approach channel to the straight drop spillway, was submerged and could not be inspected. The training walls of the spillway are capped by the bridge abutments and were covered by the bridge superstructure and could not be inspected closely. The concrete on the left training wall appeared to be in good condition above the water level. Spalling of concrete on the upstream end of the right training wall was observed above the water level.

The downstream face of the spillway could not be inspected because of the flows, however, those visible portions appeared to be of stone masonry construction (see Photos C-3 and C-4).

2. Left Outlet - The intake structure for the left outlet is located on the upstream face of the dam left of the spillway (See Photo C-1). Most of the intake structure was submerged. The steel and wood portion of the gates above the water level appeared to be in good condition. The outlet left of the spillway consists of a 42-in.-diameter steel pipe passing through the dam and emerging through the downstream face of the dam. The pipe is rusted and has many holes at the invert that allow water that leaks through the upstream gate to emerge from the pipe and flow through the dam beneath the pipe invert (See Photo C-11). Large riprap was observed on the left abutment beneath the outlet pipe (see Photo C-6). The outlet works are not presently in operable condition.

3. Right Outlet - The gated intake structure for the right outlet is located to the right of the spillway (See photo C-2). At the time of the inspection, considerable debris had accumulated at the intake gates. Additional information pertaining to the type and operational characteristics of the gate could not be verified or obtained at the site. Spalling of concrete was observed on the training walls of the intake structure, and the left training wall appeared to be tilted slightly inward.

   The right sluiceway is a covered conduit to the downstream factory from the dam on the right abutment. This conduit passes through the building and discharges at the base of the building into the downstream channel (See photo C-7). The sluiceway and outlet could not be inspected.

   Reportedly, American Printed Circuit Company is planning to install hydro-generating equipment within the sluiceway of the right outlet works in the near future.

d. Reservoir Area. No specific detrimental features in the reservoir area were observed during the visual inspection. The slope of the shoreline are flat and well covered with grass and vegetation to preclude sloughing of shoreline materials.

e. Downstream Channel. The discharge channel consists of the natural streambed of Furnace Brook which, just below the dam has a downstream with a bedrock floor. Sandstone strata outcropping at the base of the spillway dips 70° W and strikes 15° N at a 20° angle with the axis of the spillway crest. Many trees grow on small islands that obstruct flow in the downstream channel, and trees overhang the channel (See Photo C-9) on the left bank. The right bank of the channel downstream of the dam is a stone masonry wall, which is the foundation wall of the factory building and a small factory waste water treatment plant.

3.2 Evaluation

Based on visual observations, the dam appears to be in POOR condition. The following features could adversely affect the future performance of the dam:

1. Cracks and voids on the upstream walls can result in migration of soil through the openings.

2. Vegetation growing in the upstream and downstream walls can displace stones and otherwise damage the faces of the walls.

3. Cracks and bulging of the downstream face of the dam left of the spillway indicate possible instability.

4. Leakage through the left intake gates and deterioration of the outlet pipe allow seepage to flow within the dam, which can cause erosion of the embankment material and jeopardize the stability of the downstream wall.

5. Seepage exiting through the downstream face left of the spillway can accelerate erosion of the embankment material.

6. Evaluate the outlet structures for their type, size and operational characteristics.

7. Seepage at the location of a 9" tree and erosion at the right abutment and upstream slope of the left abutment.

SECTION 4

OPERATIONAL AND MAINTENANCE PROCEDURES

4.1 Operational Procedures

a. General. A limited amount of water is presently used as process water by the American Printed Circuit Company located on the right side of the spillway discharge channel. Future plans of the company include the installation of hydro-generating equipment. Water is withdrawn from the sluiceway located to the right of the spillway and flows through the factory and discharges back to the river downstream. During adverse or threatening weather conditions the level of the pond is lowered by the Stafford Department of Public Works. The outlet works to the left of the spillway can be used for this procedure.

b. Description of Any Warning System in Effect. There is no warning system in effect for Riverside Pond Dam.

4.2 Maintenance Procedures

a. General. There is no scheduled maintenance program for the dam. It appears that little regular maintenance has occurred at the dam. Trees and vegetation are growing on the slopes and abutments. Seepage is emerging at numerous locations and erosion of the left embankment indicates a lack of maintenance. No documented maintenance has occurred except for the replacement of the bridge which spans the spillway.

b. Operating Facilities. There is no documentation, however, based in visual inspection, the outlet works gate at the left of the spillway seems to have been rehabilitated. No other specific maintenance has been documented or is apparent. The right outlet works gate appears to be in poor condition and the chain link trash rack is clogged with debris. The outlet conduit of the left outlet works is rusted and has many holes in the invert. Lack of maintenance is apparent. Both of the outlet works are inoperable.

4.3 Evaluation. There is no regularly scheduled maintenance for this dam. As described above, there are numerous maintenance deficiencies. A systematic inspection and rehabilitation program should be developed and implemented. The gates should be periodically operated and cleared of all debris to insure proper performance. The condition of the spillway should be determined based on an inspection during a no-flow condition.

An emergency action plan should be developed and implemented that will provide for inspection and monitoring of the facility by a representative of the Owner and a course of action determined that should be followed during critical situations. The plan should include as a minimum: the authorities to be contacted; the locations of emergency materials, equipment or manpower to prevent or minimize failure. Dewatering procedures should be listed.

SECTION 5

EVALUATION OF HYDRAULIC/HYDROLOGIC FEATURES

5.1 General. The dam at Riverside Pond was probably constructed around 1880 as a source of power for the adjacent factory complex. The dam is located on Furnace Brook in the Thames River Basin, Connecticut. The watershed for the reservoir is equal to 13.4 square miles with approximately 10% of this basin natural or manmade storages.

The dam has a spillway length of 64.0 feet and a surcharge height of 8.0 feet. The total length of the dam is 180 feet. The reservoir has a storage capacity at the spillway crest of 120 Ac-Ft. and can accommodate 0.17 inches of runoff from the watershed. Each foot of depth in the reservoir above the spillway level can accommodate 10 Ac-Ft. of water equivalent to 0.01 inches of runoff.

It will require about 10 minutes to lower the reservoir level one foot assuming a surface area of 10 acres. For the 120 Ac-Ft. of available storage below the spillway crest, it is estimated that 4 hours will be needed to drain this reservoir.

5.2 Design Data. No specific design data is available for this watershed or structure. In lieu of existing design information, U.S.G.S. topographic maps (scale 1" = 2,000 ft.) were utilized to develop hydrologic parameters such as: drainage area, reservoir surface areas, basin slopes, time of concentration and other runoff characteristics. Elevation/storage relationships for the reservoir were approximated. Surcharge storage was computed assuming the surface area remained constant above the spillway crest. Some of the pertinent hydraulic data was obtained and/or confirmed by actual field measurements at the time of the visual inspection. Test flood inflows and outflows and dam failure flows were determined in accordance with the Corps of Engineers guidelines. Final values used in this report are quite approximate and are no substitute for actual detail analysis.

5.3 Experience Data. No historical data for recorded discharge or water surface elevation is available for this dam.

5.4 Test Flood Analysis: Recommended guidelines for the Safety Inspection of Dams by the Corps of Engineers were used for selection of the Test Flood. This dam is classified under those guidelines as a HIGH hazard and SMALL in size. Guidelines indicate that a storm event equal to one-half the PMF to the full PMF be used as a range of test floods for such a classification. The watershed has a total drainage area equal to 13.4 sq. miles of which 1.34 sq. miles (10%) is swampy or covered by natural storages. This drainage area is sparsely populated, mostly wooded, with basin slopes averaging 0.007 feet per feet which are considered flat to moderate.

A test flood equal to one-half the PMF was calculated to be 500 CSM, equal to 6,700 CFS and was adopted for this analysis. One-half the PMF was justified on the basis that the size of the dam places it on the low side of the size classification. The routed outflow discharge for the test flood inflow was 6,300 CFS with outlets closed. The spillway and outlet rating curves are illustrated in Appendix D. Flood routing was performed assuming a full reservoir at the spillway crest and also a uniform dam crest elevation of 585.0.

The analysis indicates that the spillway capacity is hydraulically inadequate to pass the test flood outflow and this outflow would overtop the dam by approximately 1.8 ft. assuming the overflow length of dam to be 180 feet. The overtopping may exceed by an additional one-half foot, a small local depression on the dam crest. The inflow and routed outflow discharge values for this test flood are 6.700 CFS and 6,300 CFS, respectively. The maximum outflow capacity of the spillway, in a still reservoir, without overtopping of the dam is 4,345 CFS which is 69% of the test flood overflow discharge. At the spillway crest elevation of 577 feet, the total capacity of the outlet structures is 721 CFS. The roadway located above the spillway does obstruct free flow beyond the low chord elevation of 581.0 feet. Consequently, there are free flow conditions over the spillway from elevation 577.0-581.0 feet; surface conditions from 581.0-585.0 feet (top of road); and again free overflow conditions from 585.0-590.0 feet (Test Flood elevation). These outflow characteristics are reflected in the spillway rating curve computations in Appendix D.

5.5 Dam Failure Analysis. For this analysis a full depth-partial width (35.0 feet) breach was assumed to have occurred in this dam. The adopted breach width of 35.0 feet was based on visual inspection of downstream topographic features. Use of the entire spillway length as the breach width will be unrealistic and contrary to site conditions. The calculated dam failure discharge of 10,000 CFS assumes the reservoir is full (at the top of dam Elevation 585.0 feet) just prior to failure, and will produce an approximate water surface level of 574 feet immediately downstream from the dam. This will raise the water surface approximately 4.0 feet over the depth just prior to failure when the discharge is 4345 CFS. Depths of flows downstream from the dam before and after the dam failure are 6.0 and 10.0 feet for respective discharges of 4,345 and 10,000 CFS. No damage except some minor flooding conditions are anticipated beyond 6,000 feet. The total failure discharge of 10,000 CFS could result in loss of more than a few lives and inundation of 1-3 dwellings and 1-3 commercial properties. The depth of flooding due to the failure discharge at these inundated structures will range from 1-4 feet. Flooding and potential damage may also occur to Monson and Orcuttville roads and cause temporary disruption to utility services located within the rights of way of those roadways. The prime impact area has been estimated, if the dam were to fail, and has been delineated on the Drainage Basin Map in Appendix D. Discharge from the outlet structures is excluded from the failure

discharge computations assuming them to be inoperable and/or insignificant. As a result of the failure analysis the dam has been classified as a HIGH hazard structure.

RIVERSIDE POND DAM

Inflow, Outflow and Surcharge Data

OD	24-HOUR TOTAL RAINFALL IN INCHES	24-HOUR* RUNOFF IN INCHES	MAXIMUM INFLOW IN CFS	MAXIMUM** OUTFLOW IN CFS	SURCHARGE HEIGHT IN FEET	SURCHARGE STORAGE ELEVATION
MF	11.9	9.5	6700	6300	9.8	586.8
; PMF	21.4	19.0	13400	13300	13.0	590.0

filtration assumed as 0.1"/hour
ake assumed initially full at spillway crest elevation 577.0
p of dam = 585.0)

ES:

1. "Test Flood" computation based on COE guidelines.

2. The maximum capacity of the spillway without overtopping the top of the dam (elevation 585.0) is equal to 4,345 CFS.

3. All discharges indicated are dependent upon the continued integrity of upstream storage reservoirs.

4. Surcharge storage is assumed to overtop the dam when exceeding the spillway capacity.

5. Test flood = One-Half PMF = 500 CSM = 6700 CFS (D.A. = 13.4 sq. mi.).

SECTION 6

EVALUATION OF STRUCTURAL STABILITY

6.1 Visual Observations

The visual observations disclosed evidence of possible structural instability of the downstream wall of the dam left of the spillway.

6.2 Design and Construction Data

No design or construction drawings or records for the embankment or spillway are available.

6.3 Post-Construction Changes

No records of post-construction changes are available, although it appears that the elevation of the crest may have been raised after original construction of the upstream and downstream stone walls during construction of the road bridge.

6.4 Seismic Stability

The dam is located in Seismic Zone 1, and in accordance with the recommended Phase 1 guidelines does not warrant seismic stability analysis.

SECTION 7

ASSESSMENT, RECOMMENDATIONS & REMEDIAL MEASURES

7.1 Assessment

a. Condition. Based on the visual inspection, the dam appears to be in POOR condition. There are several features that could adversely affect the condition of the dam in the future:

1. Cracks and voids on the face of the upstream walls.

2. Vegetation growing from cracks in the face of the upstream and downstream walls.

3. Cracking and bulging of the downstream face of the dam left of the spillway.

4. Leakage through the invert of the left outlet pipe within the dam.

5. Seepage emerging from the downstream face of the dam left of the spillway.

6. Extensive erosion caused by uncontrolled runoff on the upstream slope at the left abutment.

b. Adequacy of Information. The available information is such that the assessment of the condition of the dam must be based on visual observation.

c. Urgency. The recommendations and remedial measures described below should be implemented by the Owner within one year after receipt of the Phase 1 report.

7.2 Recommendations

The following items should be undertaken by a qualified registered engineer, and any recommendations developed from analysis should be implemented by the Owner:

1. Analyze the stability of the dam. To obtain realistic soil parameters to be used in the analysis, conduct a limited subsurface investigation. To define the physical dimensions of the structure a site topographic survey is also needed.

2. Repair the left outlet pipe to make it operable.

3. Investigate the source of seepage observed to exit through the downstream face at the left of the spillway.

4. Periodically inspect the downstream face of the dam to monitor the extent of seepage and examine the downstream wall for additional movement or cracking.

5. Inspect the downstream face of the spillway when there is no flow over the spillway.

6. Perform detailed hydrologic and hydraulic studies to further assess the need for and means to increase the project discharge capacity.

7. Repair the upstream face of the dam by sealing cracks in the stone wall and preventing the growth of vegetation on the wall. Also prevent erosion on the upstream slope of the left and right abutments.

8. Seepage at 9" tree should be investigated.

7.3 Remedial Measures

a. Operation and Maintenance Procedures

1. Remove vegetation growing in the upstream and downstream face of the dam.

2. Repair all cracks and voids in the upstream face of the dam.

3. Institute a program of annual technical inspection by a qualified registered engineer.

4. Develop and implement a regular maintenance program.

5. Develop an "Emergency Action Plan" that will include an effective preplanned downstream warning system, locations of emergency equipment, materials and manpower, authorities to contact and potential areas that require evacuation.

7.4 Alternatives

There are no practical alternatives to the recommendations discussed above.

APPENDIX A

INSPECTION CHECKLIST

VISUAL INSPECTION CHECKLIST
PARTY ORGANIZATION

PROJECT Riverside Pond Dam DATE April 8, 1980

TIME 12:45 P.M.

WEATHER Cloudy

W.S.ELEV. 577.5 U.S. 565.0 D.S.

PARTY:

1. A. Reed, CEM-Civil
2. L. Topp, CEM-Civil
3. E. Dessert, CEM-Civil
4. R. Brown, CEM-Civil
5. S. Khanna, CEM-Hydrology & Hydraulics
6. G. Castro, GEI-Geotechnical
7. R. Stetkar, GEI-Geotechnical
8.
9.
10.

	PROJECT FEATURE	INSPECTED BY	REMARKS
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			

PERIODIC INSPECTION CHECKLIST

PROJECT Riverside Pond Dam DATE April 8, 1980

INSPECTOR _____ DISCIPLINE _____

INSPECTOR _____ DISCIPLINE _____

AREA EVALUATED	CONDITION
DAM	Upstream and downstream stone masonry walls with earth fill.
Crest Elevation	577.0 (USGS Quad Sheet)
Current Pool Elevation	577.5
Maximum Impoundment to Date	Unknown
Surface Cracks	Apparent crack in downstream wall near low level outlet, right of spillway.
Movement or Settlement of Crest	None observed. Road and bridge over crest of dam.
Lateral Movement	Too irregular to judge.
Vertical Alignment	Too irregular to judge.
Horizontal Alignment	Too irregular to judge.
Condition at Abutment and at Concrete Structures	Some apparent erosion on left abutment downstream of dam possibly due to previous overtopping. Some local erosion from road runoff onto upstream left abutment.
Sloughing or Erosion of Slopes or Abutments	None except for that noted above.
Unusual Movement or Cracking at or Near Toe	None observed.
Unusual Embankment or Downstream Seepage	Seepage through downstream wall 10 ft. left of spillway, exiting in an area extending from the toe of the dam to within 11 ft. of crest. Seepage from beneath low level outlet pipe extending out of downstream wall.
Piping or Boils	Not observable.

PERIODIC INSPECTION CHECKLIST

PROJECT Riverside Pond Dam DATE April 8, 1980

INSPECTOR _____ DISCIPLINE _____

INSPECTOR _____ DISCIPLINE _____

AREA EVALUATED	CONDITION
DAM (Cont.)	
Foundation Drainage Features	None known.
Toe Drains	None known.
Instrumentation System	None known.
Vegetation	Small trees and brush growing out from upstream and downstream walls.

PERIODIC INSPECTION CHECKLIST

PROJECT Riverside Pond Dam DATE April 8, 1980

INSPECTOR _____ DISCIPLINE _____

INSPECTOR _____ DISCIPLINE _____

AREA EVALUATED	CONDITION
OUTLET WORKS - INTAKE CHANNEL AND INTAKE STRUCTURE	
Approach channel	No approach channel.
Drains or Weep Holes	None

PERIODIC INSPECTION CHECKLIST

PROJECT Riverside Pond Dam DATE April 8, 1980

INSPECTOR _____ DISCIPLINE _____

INSPECTOR _____ DISCIPLINE _____

AREA EVALUATED	CONDITION
OUTLET WORKS - CONDUIT	Left outlet works conduit is 42 inch diameter riveted steel pipe, rusted with many holes. Unable to inspect or measure right outlet works due to high water level. Left outlet works conduit is severely rusted.

PERIODIC INSPECTION CHECKLIST

PROJECT Riverside Pond Dam DATE April 8, 1980

INSPECTOR _____ DISCIPLINE _____

INSPECTOR _____ DISCIPLINE _____

AREA EVALUATED	CONDITION
OUTLET WORKS - OUTLET STRUCTURE AND OUTLET CHANNEL	Right outlet channel into adjacent factory building covered and not observable. Left outlet works discharges through embankment and directly into Furnace Brook.

PERIODIC INSPECTION CHECKLIST

PROJECT Riverside Pond Dam DATE April 8, 1980

INSPECTOR _____ DISCIPLINE _____

INSPECTOR _____ DISCIPLINE _____

AREA EVALUATED	CONDITION
OUTLET WORKS - SPILLWAY WEIR, APPROACH AND DISCHARGE CHANNELS	Highway bridge spans crest of dam concrete bridge abutments placed inside old stone masonry spillway abutments.
a. Approach Channel	No approach channel; natural stream bed Furnace Brook.
b. Weir and Training Walls	Weir and downstream face were not observable. 5 ft. of water flowing over weir during inspection of dam. Stone masonry training walls upstream and downstream.
Drain Holes	None; dry stone masonry walls.
c. Discharge Channel	
General Condition	Natural stream bed, good condition.
Loose Rock Overhanging Channel	None
Trees Overhanging Channel	None
Floor of Channel	Bedrock
Other Obstructions	Some trees growing in channel.
Other Comments	Stone masonry retaining wall on right side of channel in generally good condition except for some larger voids approximately 100 ft. downstream of dam under upstream edge of adjacent factory building.

APPENDIX B

ENGINEERING DATA

APPENDIX B-1

Correspondence pertaining to the history, maintenance, and modifications to the Riverside Pond Dam as well as copies of past inspection reports are located at:

State of Connecticut
Department of Environmental Protection
State Office Building
165 Capitol Avenue
Hartford, Connecticut 06115
Attention: Mr. Victor J. Galgowski,
Dam Safety Engineer

APPENDIX B-2

SELECTED COPIES OF PAST INSPECTION REPORTS

1/6 10

CT-336

STATE BOARD FOR THE SUPERVISION OF DAMS
INVENTORY DATA

ME OF DAM OR POND 99 Riverside Pond

DE NO. N240 FU2.6

CATION OF STRUCTURE:

Town [illegible]

Name of Stream [illegible]

U.S.G.S. Quad. [illegible] Long. 72-17.4 Lat. 41-59.0

NER:

Address North American Printed Circuit

Telephone ~~[illegible]~~ Div. Syco Labs, Inc. VE2-2751
~~Old Monson Road~~
12/78 Stafford, CT 06075
684-2703

nd Used For: Rec ?

mensions of Pond: Width _____ Length _____, Area 7 acres+

pth of Water below Spillway Level (Downstream) 17'

tal Length of Dam 220' Length of Spillway 68'

ight of Abutments above Spillway 6'

pe of Spillway Construction [illegible]

pe of Dike Construction [illegible]

wnstream Conditions [illegible]

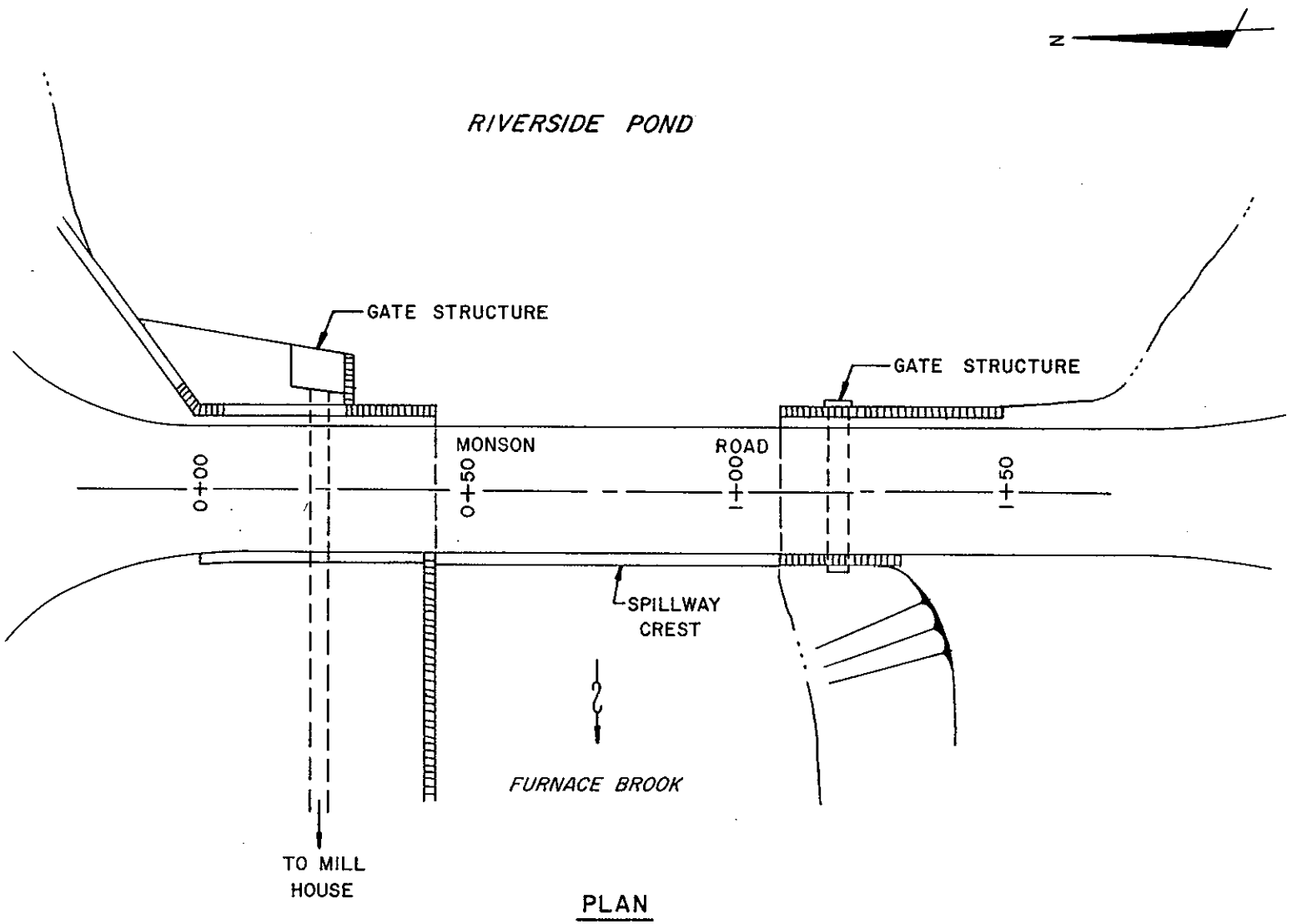
mmary of File Data _____

emarks [illegible]

1900?

APPENDIX B-3

PLANS, SECTIONS AND DETAILS



PLAN

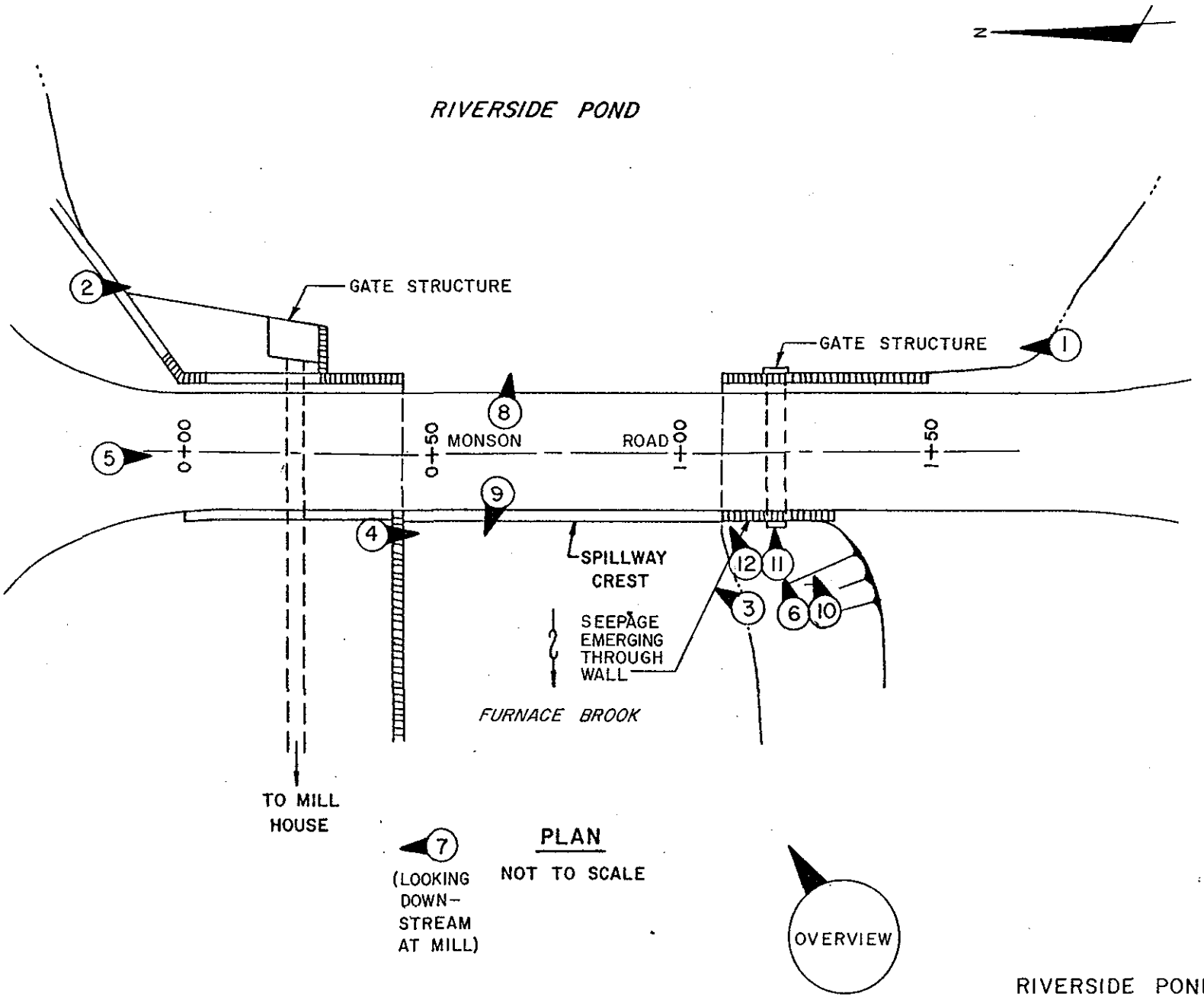
NOT TO SCALE

PLATE B-1

RIVERSIDE POND DAM
GENERAL PLAN

APPENDIX C

PHOTOGRAPHS



RIVERSIDE POND DAM
PHOTO INDEX

PHOTO C-1 Upstream face of dam from left abutment.

PHOTO C-2 Upstream face of dam from right abutment.

PHOTO C-3 Crest and downstream face of dam from left abutment.

PHOTO C-4 Crest and downstream face from right abutment.

PHOTO C-5 Bridge over crest of dam from right dam abutment.

PHOTO C-6 Left outlet works conduit at downstream face of dam.

PHOTO C-7 Left outlet works sluiceway, located

PHOTO C-8 Overview of Riverside Pond from crest of dam.

PHOTO C-9 Spillway discharge channel from crest of dam.

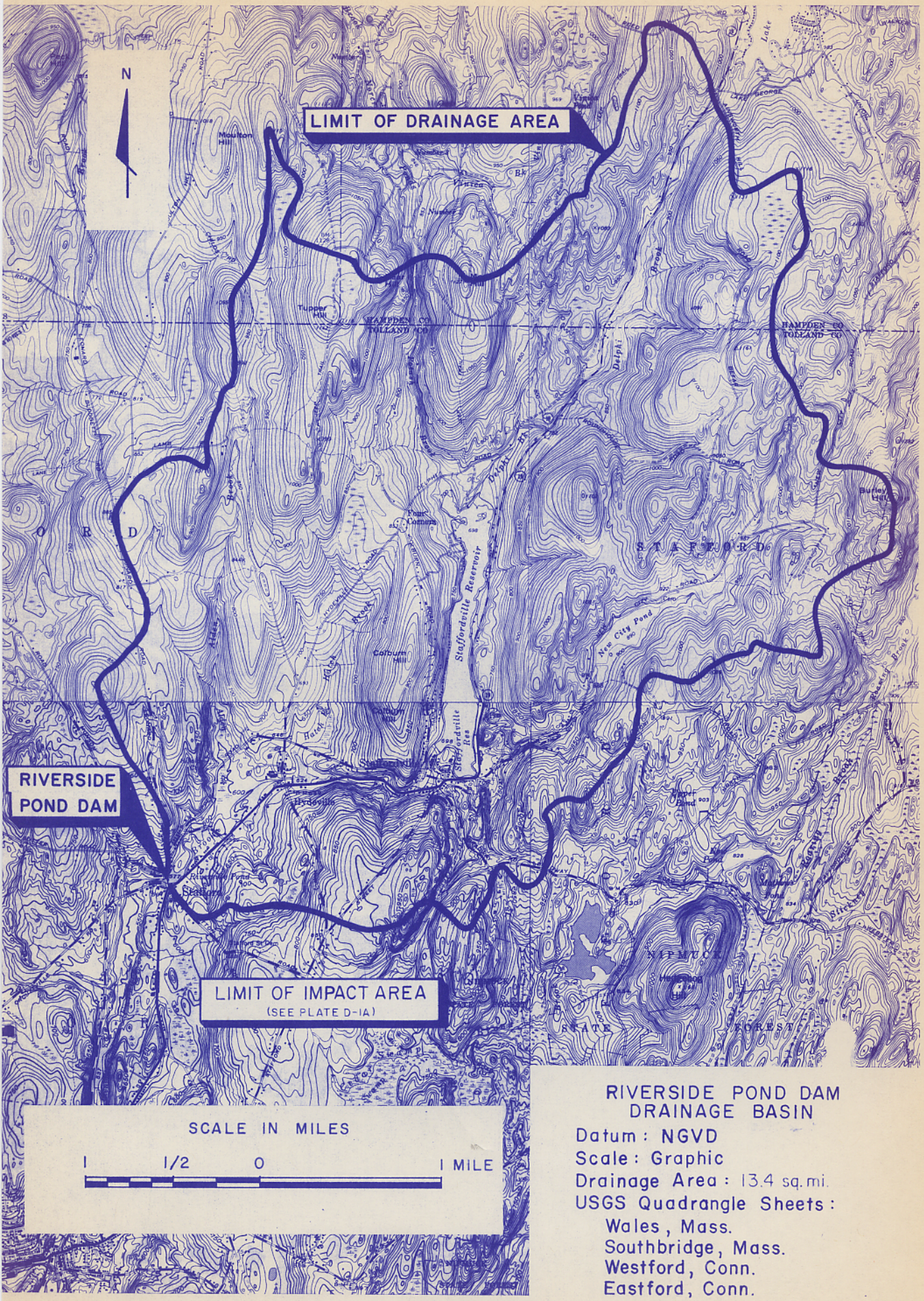
PHOTO C-10 Trees growing on downstream slope of left dam embankment near left outlet works discharge pipe.

PHOTO C-11 Seepage emerging from beneath invert of left outlet works discharge pipe.

PHOTO C-12 Seepage at downstream face of dam at left spillway abutment.

APPENDIX D

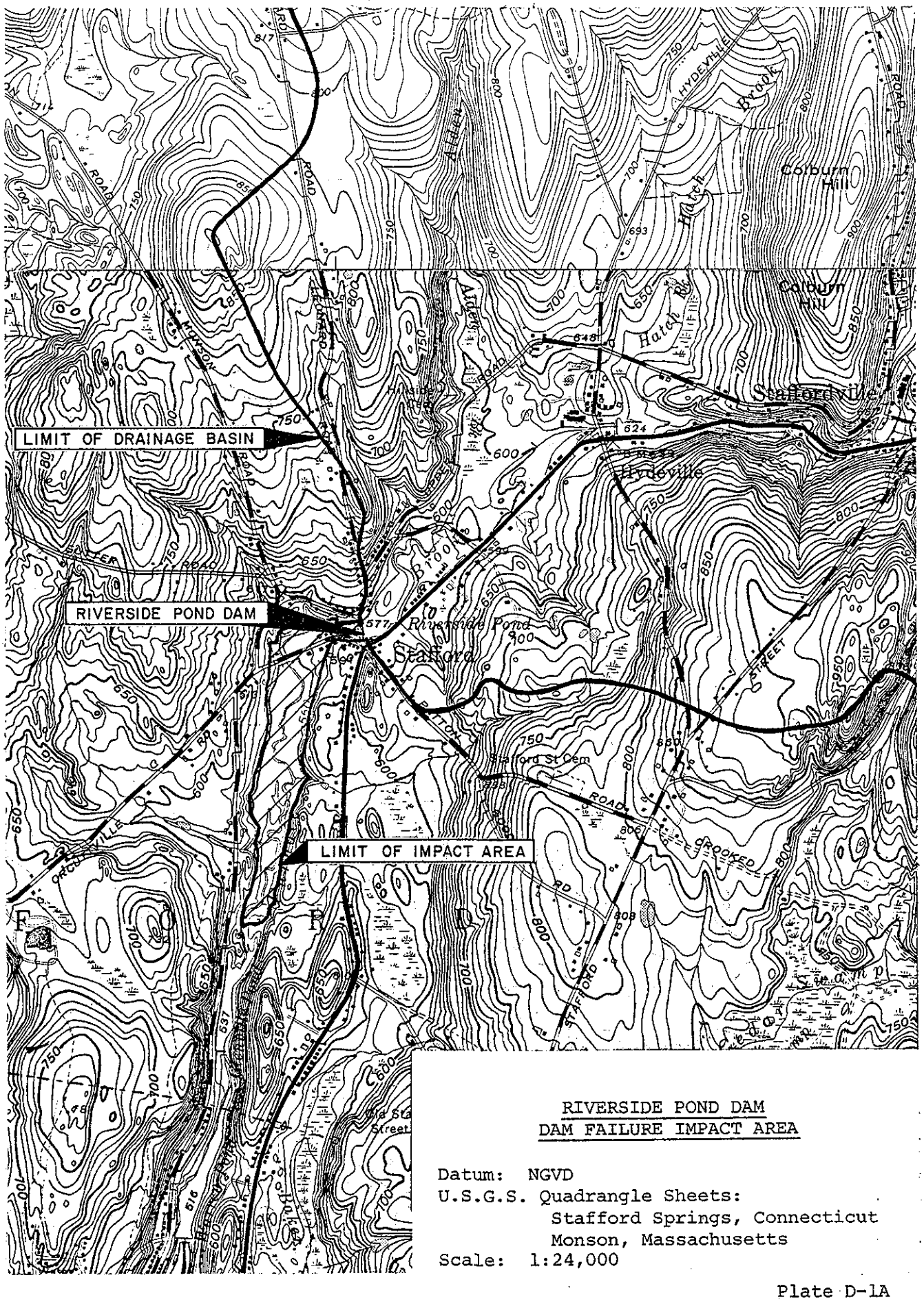
HYDROLOGIC AND HYDRAULIC COMPUTATIONS



RIVERSIDE POND DAM
DRAINAGE BASIN

Datum : NGVD
Scale : Graphic
Drainage Area : 13.4 sq. mi.
USGS Quadrangle Sheets :
Wales, Mass.
Southbridge, Mass.
Westford, Conn.
Eastford, Conn.

PLATE D-1



RIVERSIDE POND DAM
DAM FAILURE IMPACT AREA

Datum: NGVD
U.S.G.S. Quadrangle Sheets:
Stafford Springs, Connecticut
Monson, Massachusetts
Scale: 1:24,000

Plate D-1A

. Size Classification Riverside Pond Dam

eight of dam = 21.0 ft.; hence Small

torage capacity at top of dam (elev. 585.0) = 200 AC-FT.; hence Small

dopted size classification SMALL

. Hazard Potential

This dam is located in a predominantly suburban area under a bridge and near the junction of various roads. Failure may result in the loss of more than a few lives, and inundation of 1-3 dwellings and 1-3 commercial properties. Flooding and extensive damage may also occur at Orcutt ville Road and Monson Road, as well as disruption of traffic and utilities located within the flowpaths and along these roadways. Failure will cause flood conditions downstream, and high velocities of flow carrying debris will increase the damage potential due to scouring and undermining.

. Adopted Classifications

HAZARD	SIZE	TEST FLOOD RANGE
HIGH	SMALL	Half PMF to Full PMF

Adopted Test Flood = ONE HALF PMF = 500 CSM

= 6700 CFS

. Overtopping Potential

Drainage Area = 13.4 sq. miles

Spillway crest elevation = 577.0 NGVD

Top of Dam Elevation = 585.0 NGVD

Maximum spillway discharge
Capacity without overtopping of dam = 4345 CFS
"test flood" inflow discharge = 6700 CFS
"test flood" outflow discharge = 6300 CFS
% of "test flood" overflow carried
by spillway without overtopping = 69 %
"test flood" outflow discharge portion
which overflows over the dam = 1955 CFS
% of test flood which overflows over the dam = 31 %

Estimating Maximum Probable Discharges - Inflow and Outflow Values Date of Inspection: April 8, 1980

Name of Dam Riverside Pond Dam ; Location of Dam Furnace Brook ; Town Stafford, CT

Watershed Characterization Rolling terrain; moderate slopes; swampy areas; 1.34 sq. miles of drainage area is swampy or occupied by storage reservoirs

Adopted "test" flood = ONE HALF PMF = 500 CSM = 6700 CFS; Re = Effective Rainfall = 19.0 inches

D.A. = Drainage Area (Gross) = 13.4 Square Miles; Basin Slope = 0.007 hence; Flat to moderate

S.A. = Surface Area of Reservoir = 0.016 Square Miles; Time of Concentration about 50 minutes

Shape and Type of Spillway = Free vertical broad crested weir

B = Width of Spillway = 64.0 feet; C = Coefficient of Discharge = (3.09-Friction) = 3.0

up to elevation 581.0 and then operates as a culvert until it overflows the road at elevation 585.0

Maximum Capacity of Spillway Without Overtopping the road = 4345 CFS = 69 % of test flood outflow

Top of Dam Elevation = 585.0 ; Spillway Crest Elevation = 577.0

Overflow portion of Length of Dam = 180 ft. ; C = Coefficient of discharge for Dam = 3.0

Name of Dam	Test Flood Q_p		Inflow Characteristics		Outflow Characteristics First Approximation			Outflow Characteristics Second Approximation			Outflow Characteristics Third Approximation (Adopted)		
	CSM	CFS	h_0 in feet	S_0 in in.	Q_{p1} CFS	h_1 in ft.	S_1 in in.	S_2 in in.	h_2 in ft.	Q_{p2} CFS	S_3 in in.	h_3 in ft.	Q_{p3} CFS
1	2	3	4	5	6	7	8	9	10	11	12	13	14
Riverside Pond Dam	PMF = 1000	13400	13.3	0.20	–	–	–	–	–	–	0.186	13.0	13300
	½ PMF = 500	6700	10.0	0.15	–	SEE	PLATE	D-14	–	–	0.140	9.8	6300

Q_p = Discharge; h= Surcharge height; S = Storage in inches

NOTE: Outflow discharge values are computed as per COE guidelines.

ME OF DAM: RIVERSIDE POND DAM

ESTIMATING EFFECT OF SURCHARGE STORAGE ON "TEST FLOOD"

This routing of floods through the reservoir was carried out according to the guidelines established by the Corps of Engineers in Phase 1 Inspection for Dam Safety Investigations issued in March, 1978.

Formulas used are as follows:

i. For no overtopping: $Q = C_1 B_1 h_1^{3/2}$ = SPILLWAY DISCHARGE
For overtopping: $Q = C_1 B_1 h_1^{3/2} + C_d A\sqrt{2g}\sqrt{h - hf}$ = SPILLWAY DISCHARGE
$C_2 B_2 h_2^{3/2}$ = Dam overflow discharge

where C_1 = coefficient of discharge for spillway; B_1 = length of spillway
C_2 = coefficient of discharge for dam; B_2 = length of dam
h_1 = head over spillway crest (feet); h_2 = head over dam (feet)
F.B. = distance between spillway crest and top of dam
$C_d = 0.84$; $A = 64 \times 4 = 256$ Sq.ft.; $h = (W.S.E. - 577)$

ii. Surcharge storage in inches = $S = 12\ (h_1 + h_2)\ \frac{S.A.}{D.A.} = 0.0143h$
where S.A. = surface area =
D.A. = drainage area in sq. miles

iii. $Q_{outflow} = Q_{inflow}\ (1 - \frac{S}{Re})$; where Re = effective rainfall = 9.5"

iv. Length of dam = 116 ft. ; Top of Dam elev. = 585.0 ; c for dam = 3.0
Length of spillway = 64 ft. ; Spillway crest el. 577.0 ; c for spillway = 3.0

Q = Spillway Discharge + $46 \times 3h_2^{1.5}$ where h_2 is head over top of dam

S = Storage in inches = $12h\frac{S.A}{D.A} = 0.0143h$ where h is head over spillway crest

v. Q_{inflow} = 6700 C.F.S. [300 CFS IS DIVERTED THROUGH LOCAL DEPRESSIONS ∴ Q_{inflow} = 6400 CFS.]

in CFS	Elevation	Total Head over crest $h_1 + h_2 = h$	Storage in inches = S	Remarks
6352	582.0	5.0	0.0716	
6332	584.0	7.0	0.100	
6313	586.0	9.0	0.129	
6290	588.0	11.0	0.158	
6275	590.0	13.0	0.186	
6255	592.0	15.0	0.215	
6300	586.8	9.8	0.139 = 0.14	

"Rule of Thumb Guidance for Estimating
Downstream Dam Failure Discharge"

BASIC DATA

Name of dam Riverside Pond Dam Name of town Stafford, CT

Drainage area = 13.4 sq. mi., Top of dam 585.0 NGVD

Spillway type = Free overflow vertical fall broad crest under a bridge Crest of spillway 577.0 NGVD

Surface area at crest elevation = 10 Acres = 0.016 sq.mi.

Reservoir bottom near dam = 564.0 NGVD

Assumed side slopes of embankments 2:1

Depth of reservoir at dam site 21.0 = Y_o = 21.0 ft.

Mid-height elevation of dam = 574.5 NGVD

Length of dam at crest = 180 ft.

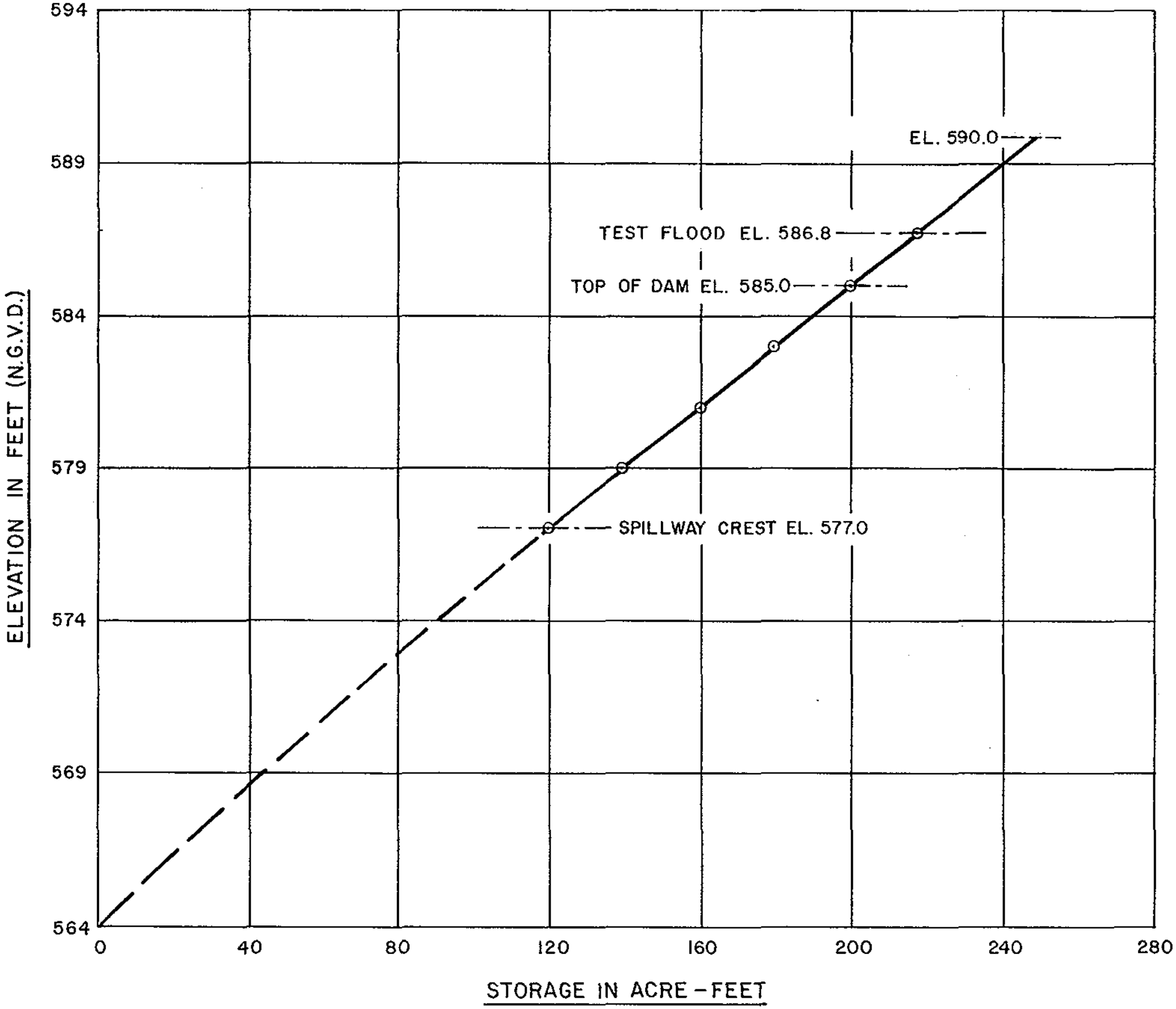
Length of dam at mid-height = 140 ft.

25% of dam length at mid-height = W_b = 35 ft.

Width of channel immediately downstream = B = 35 ft.; Shape of breach = rectangular

Elevation (NGVD)	Estimated Surcharge Storage in Ac-Ft	
577.0	120	Spillway Crest Elevation
579.0	140	
581.0	160	
583.0	180	
585.0	200	Top of Dam or Bridge Elevation
586.8	215	Test Flood Elevation
587.0	220	
590.0	250	

STORAGE-ELEVATION CURVE
RIVERSIDE POND DAM



RIVERSIDE POND DAM

DAM FAILURE ANALYSIS

A. Failure Analysis Discharge $= \frac{8}{27} W_B \sqrt{9}\, y_o^{1.5}$ C.F.S.

$= 1.68\, W_B\, y_o^{1.5}$

$= 5658$ C.F.S.

B. Maximum Spillway

Discharge with W.S.E.

At top of Dam @ 585.0 4345 C.F.S.

C. Total Dam Failure Discharge 10000 C.F.S.

D. Reservoir - Storage Data:

Volume of storage at spillway crest = 120 AC-ft. @ Elev. 577

Surcharge storage at top of dam = 80 AC-ft. @ Elev. 585.00

Storage Total = 200 AC-ft. @ Elev. 585.00

E. Flood Discharge Channel

i. Maximum depth of flow just D/S of Dam = $\frac{4}{9} y_o$ = 9.3 feet

tes:

1. Failure of dam is assumed to be instantaneous. When pool reaches top of dam, and is a full-depth partial width rectangular shape failure with a width of failure = W = 35 feet and depth of failure y_o = _____ 21.0 feet.

2. Steady, uniform flow phenomenon is assumed for determination of failure profile and is based on Manning's formulae.

3. Failure profile for impacted area determination is determined at three typical cross sections in the downstream channel. Reduction in discharge due to available storage has been taken into account.

Reach 1

Length = 6000 feet; Station 0 to Station 60+00; n = 0.05

Bed slope = $S_o \simeq S_f$ = .0045; Bed width = b = 80 feet ±

Bed width is scaled from U.S.G.S. map; scale 1" = 2,000 feet

As bed width is large and 1" = 2,000 feet and 10-foot contour interval scale maps are being used for various channel parameters, it is appropriate to assume that d = R = Hyd Radius = depth, hense Manning's formulae is transformed:

$$Q = A \frac{1.49}{n} R^{2/3} \sqrt{S} = bd \frac{1.49}{n} d^{2/3} \sqrt{S}$$

$$Q = b \frac{1.49}{n} \sqrt{S}\, d^{5/3} = Kd^{5/3} = 216 d^{5/3}$$

:e Discharge Relationship for Reach 1

:h = d 'eet	Stage of Elevation	Discharge in CFS = Q	Velocity in ft./sec.	Storage Volume in AC-ft. = V
0	550	0	0	0
2	552	685	4.28	22
4	554	2175	6.80	44
6	556	4274	8.90	66
8	558	6902	10.78	88
10	560	10000	12.50	110
12	562	13563	14.13	132

Water surface profiles resulting from maximum spillway discharge and also from dam failure discharge are shown on Plate D-11 for comparison purposes. This figure also shows the rise in water depth due to failure of dam.

Also, Discharge -- Depth and Storage-depth curves are shown on Plate D-12 for downstream channel.

Notes: 1. Storage volume in AC-ft = $\frac{\text{(Length of Reach) (Bed Width) (Depth)}}{43{,}560}$

2. Failure discharge being large will mostly be overbank flow on existing channel.

For Q_1 = 10000CFS; depth = 10.0 ft. V_1 = 110 AC-ft.

Trial $Q_2 = Q_1 \left(1 - \frac{V_1}{\text{Storage}}\right) = Q_1 \left(1 - \frac{110}{200}\right)$ = 4500 CFS

$\therefore V_2$ = 70 AC-ft.

Avg $V = \frac{V_1 + V_2}{2}$ = 90 AC-ft.

$\therefore Q_2 = Q_1 \left(1 - \frac{V \text{ Avg.}}{\text{Storage}}\right)$ = 5500 CFS; y_2 = 7.0 ft.

Depth at center of flood as adopted = 8.5 feet

Additional dam failure analysis beyond Reach 1 has not been undertaken because the depth of flow of 8.5 feet at the middle of Reach 1 will not cause any hazardous conditions further downstream. The failure discharge and depth will continually decrease beyond Reach 1, However almost total impacted area due to failure of dam is shown on Plate D-11. No significant damages in life and/or property are anticipated beyond Reach 1 because no houses, roads or establishments are located below the anticipated depths beyond Reach 1 of 6000 feet.

SUMMARIZED AND ADOPTED VALUES

FOR

DAM FAILURE ANALYSIS

Name of Dam RIVERSIDE POND DAM

. Dam Failure Discharge _____ = 5658 cfs.

i. Maximum Spillway Discharge _____ = 4345 cfs.

. Total Dam Failure Discharge _____ = 10,000 cfs.

Normal (Manning Depth) for 10,000 = 10.0 feet

. Normal (Manning Depth) for 4345 = 6.0 feet

i. Increase in depth due to failure of dam = 4.0 feet

ii. W.S.E. prior to failure = Ground Elevation + 6.0

. W.S.E. after failure = Ground Elevation + 10.0

te: The adopted depth of flow values are assumed to be accurate representations of damages in the impacted areas. Professional judgement is used in these final adopted values.

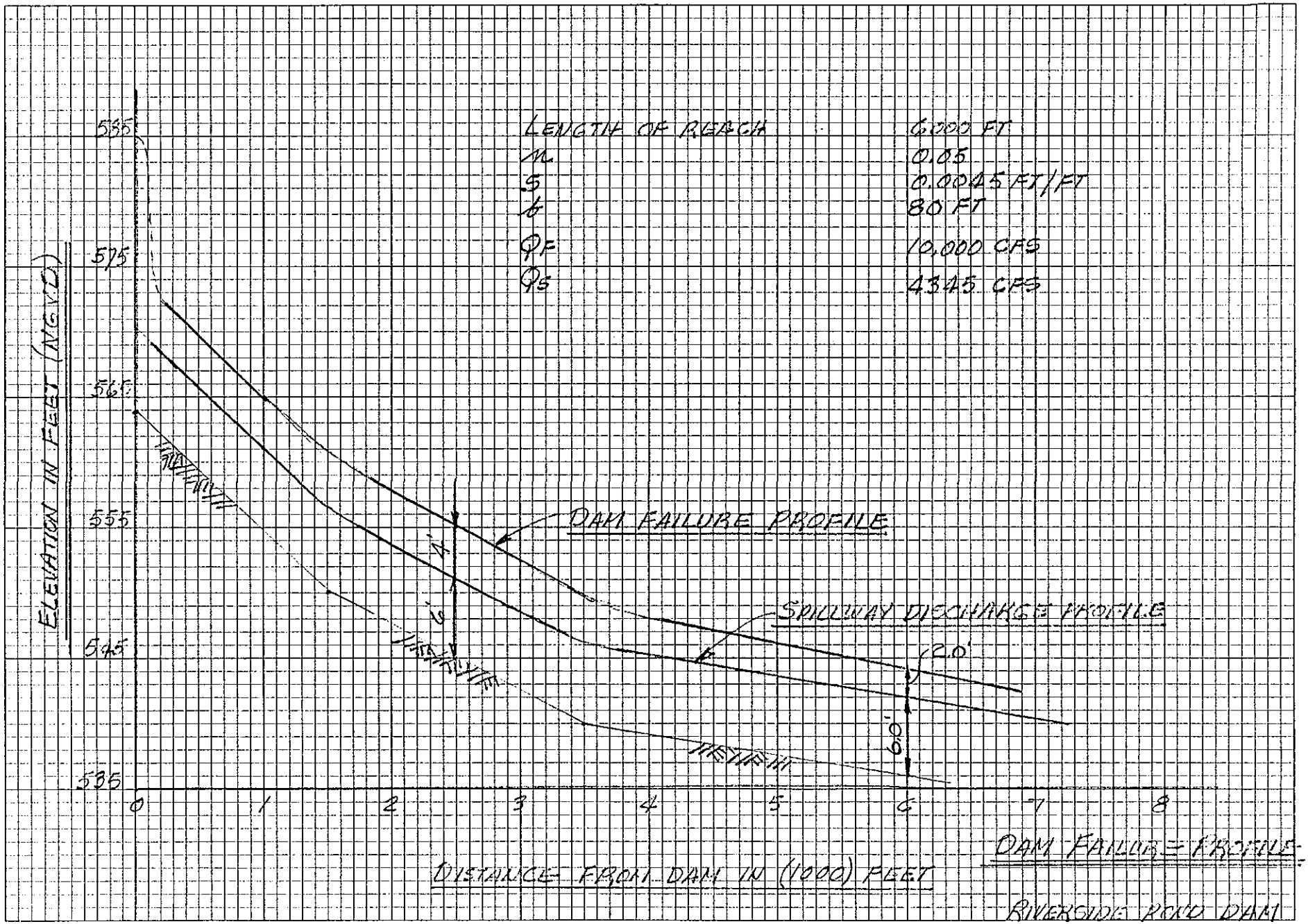

LENGTH OF REACH 6,000 FT
n 0.05
S 0.0045 FT/FT
b 80 FT
QF 10,000 CFS
Qs 4345 CFS
DAM FAILURE PROFILE
SPILLWAY DISCHARGE PROFILE
20.0'
9.6'
14.4'
INITIAL WSEL
INITIAL WSEL
NEW WSEL
ELEVATION IN FEET (NGVD)
555
575
565
555
545
535
0
1
2
3
4
5
6
7
8
DISTANCE FROM DAM IN (1000) FEET
DAM FAILURE PROFILE
RIVERSIDE ROAD DAM

PLATE D-11

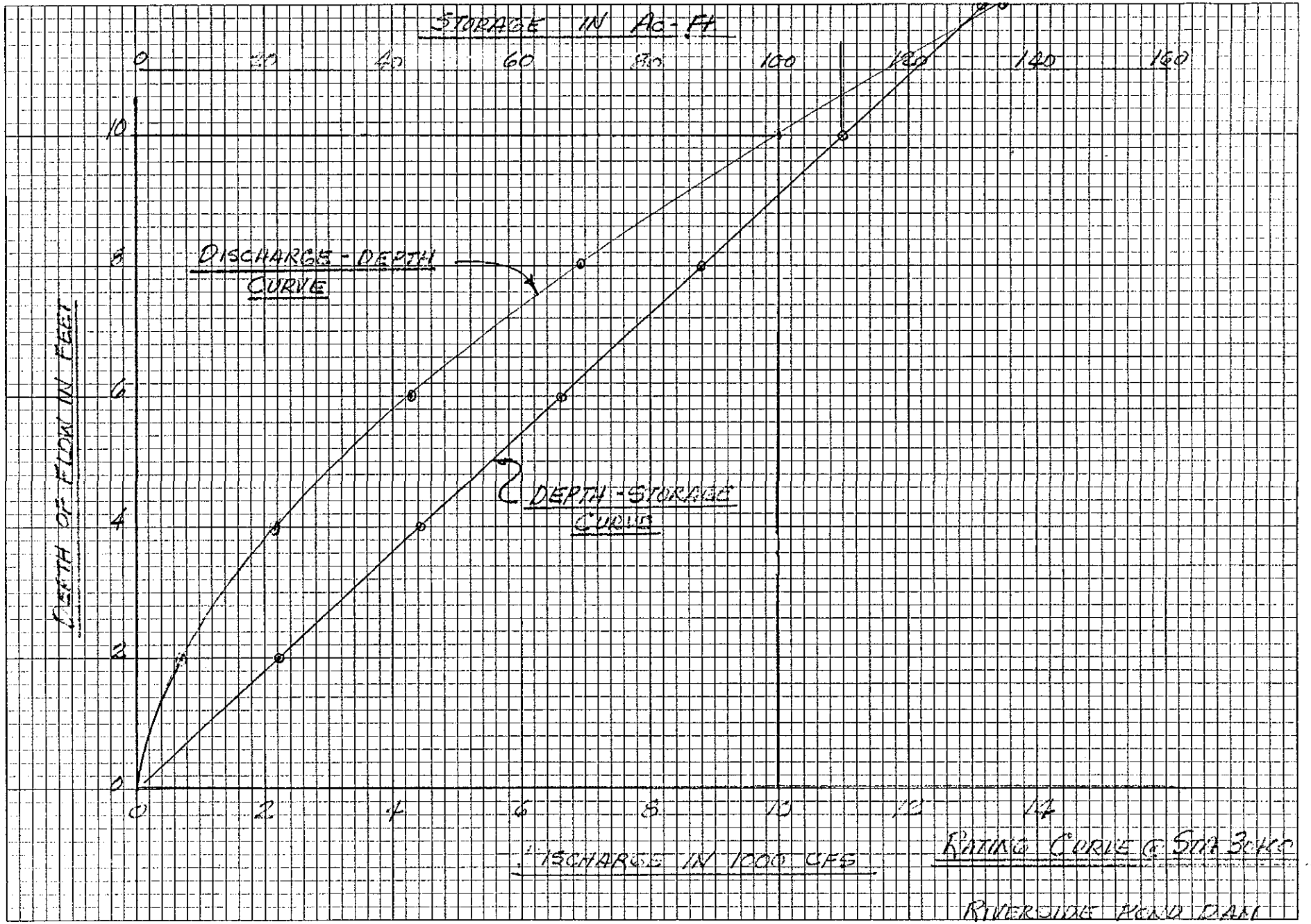

STORAGE IN AC-FT
0
20
40
60
80
100
120
140
160
10
8
6
4
2
0
DEPTH OF FLOW IN FEET
DISCHARGE - DEPTH CURVE
DEPTH - STORAGE CURVE
0
2
4
6
8
10
12
14
DISCHARGE IN 1000 CFS
RATING CURVE @ SHAFTHOUSE
RIVERSIDE PENN DAM

PLATE D-12

RIVERSIDE POND DAM

COMPUTATIONS FOR SPILLWAY RATING CURVE AND OUTLET RATING CURVE COMPUTATIONS

Spillway width = 64.0 feet; Spillway crest elevation = 577.0 NGVD

Length of dam = 180 (including spillway) feet; Top of dam elevation = 585.0 NGVD (TOP OF ROADWAY)

C = 3.0 up to elev. 581.0 and above 585.0; acts as a culvert between elev. 581.0 and 585.0 Elev. above 581.0 spillway portion is an orifice flow

i) SPILLWAY RATING CURVE COMPUTATIONS

Elevation (ft.) NGVD	Spillway Discharge (CFS)	Remarks
577.0	0	Spillway Crest Elevation
578.0	192	
579.0	543	
580.0	998	
581.0	1536	Bottom of Bridge Girder Elev.
583.0	2840	
585.0	4345	Top of Dam & Road Elevation
586.0	5532	
586.8	6300	Test Flood Elevation
587.0	7055	
589.0	10765	
590.0	12891	

ii) OUTLET RATING CURVE COMPUTATIONS

There are two outlets
1.) 6'x6' leading to 6' diameter penstock located on left side
2.) 42" riveted steel pipe on right side

Elevation (ft.) NGVD	Discharge (CFS) 6'x6'	42" Pipe	Total	Remarks
(estimate) 564.0	0	0	0	Invert of 6'x6' outlet
568.0	127	0	127	
569.8	205	0	205	Invert of 42" dia. pipe
572.0	382	32	414	
577.0	555	112	667	Spillway Crest Elevation
581.0	661	148	809	
585.0	753	176	929	Top of Dam and Road Elev.
586.8	789	187	976	Test Flood Elevation
590.0	854	206	1060	

Size of outlet = 1.) 6'x6' (estimated); 2.) 42" dia. pipe; Area of outlet = 1.) 36 sq. Ft. 2.) 9.62 sq. ft.

Invert of outlet = 1.) 564.0 (estimated) 2.) 569.80; Center line of outlet = 1.) 567.0 2.) 571.55

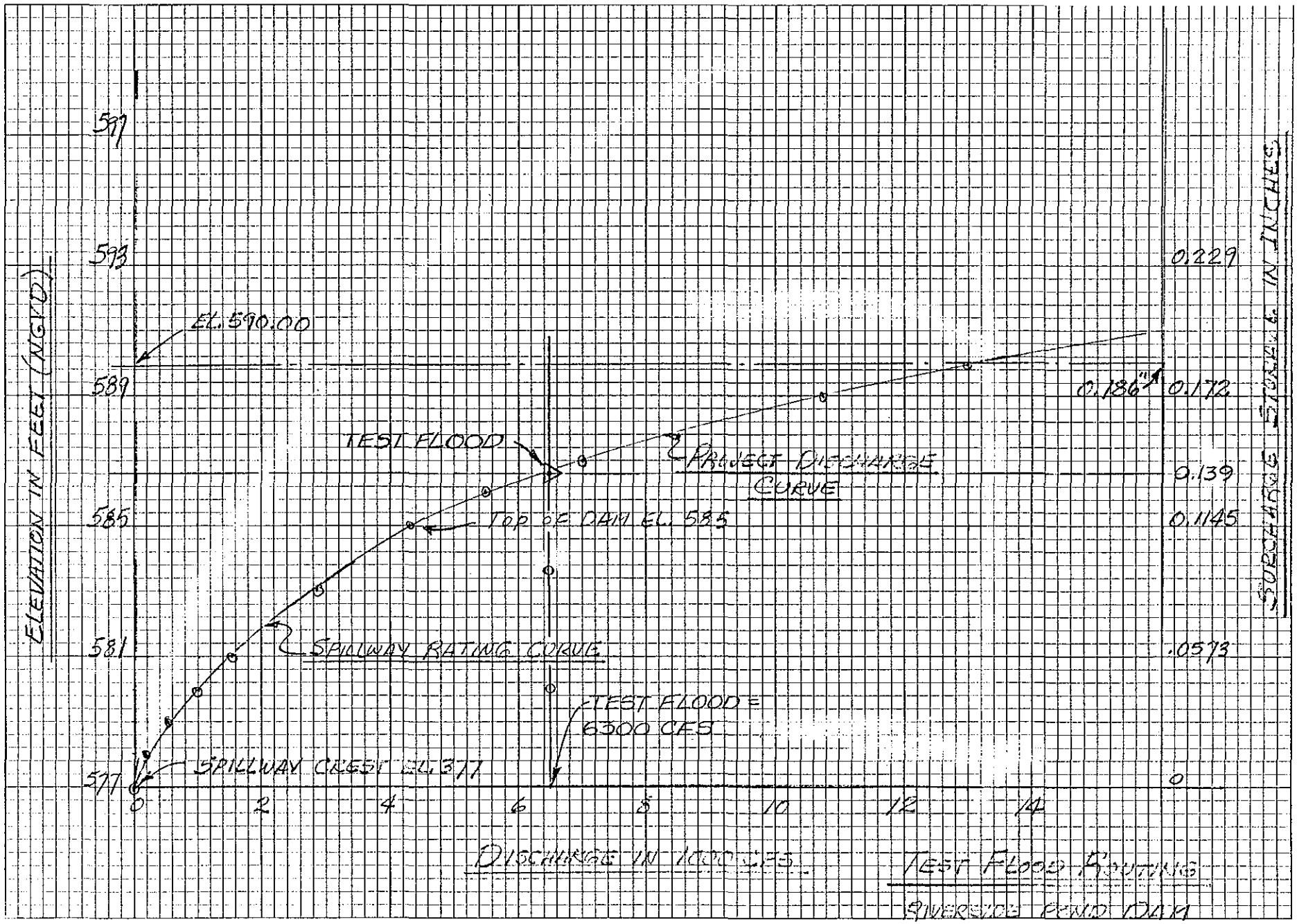
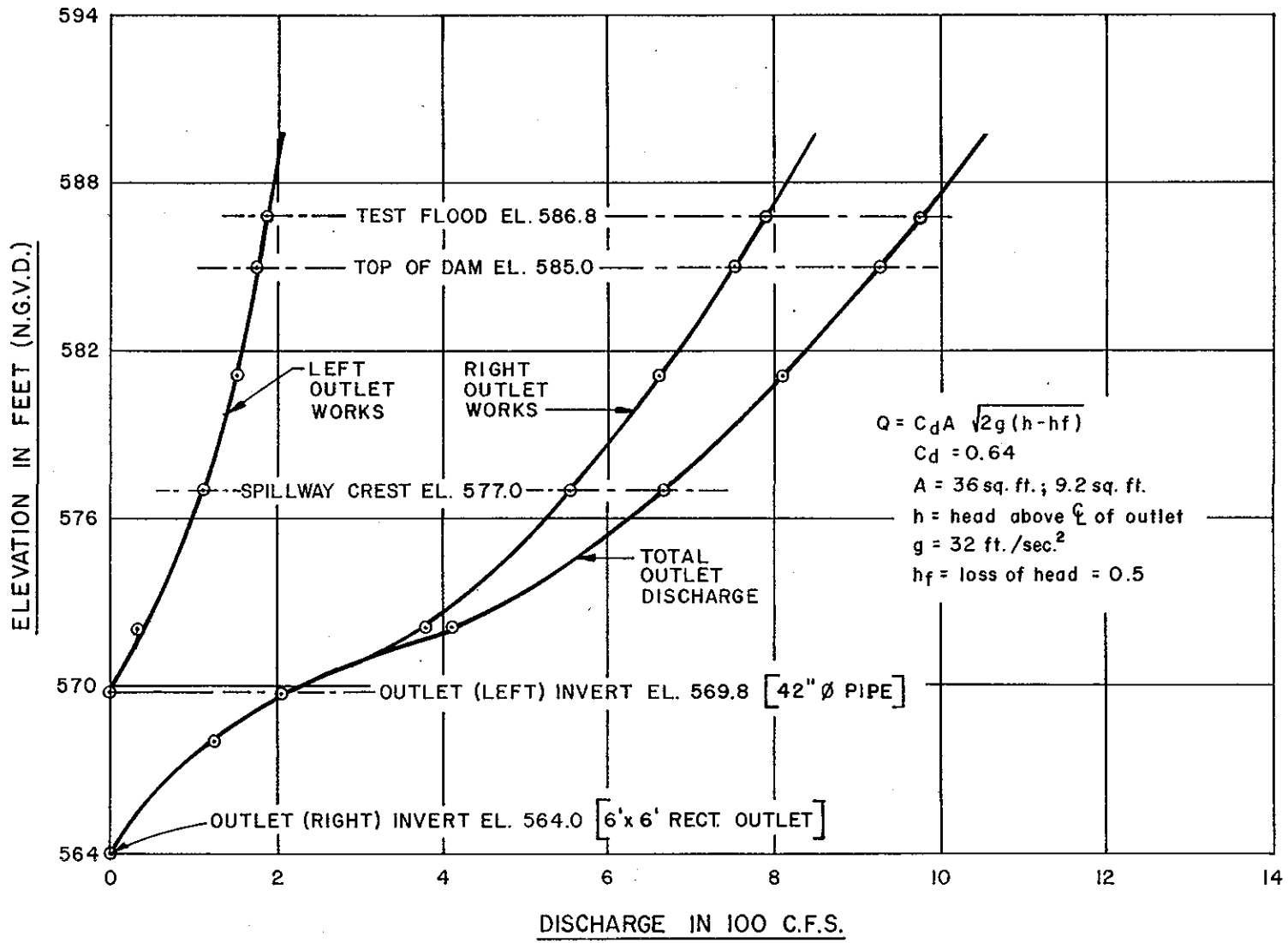

ELEVATION IN FEET (NGVD)
597
593
589
585
581
577
0
2
4
6
8
10
12
14
DISCHARGE IN 1000 CFS
EL. 590.00
TEST FLOOD
PROJECT DISCHARGE CURVE
TOP OF DAM EL. 585
SPILLWAY RATING CURVE
TEST FLOOD = 6300 CFS
SPILLWAY CREST EL. 577
0.186"
0.229
0.172
0.139
0.1145
.0573
0
STORAGE IN INCHES
TEST FLOOD STORAGE
RIVERSIDE POND DAM

PLATE D-14



OUTLET RATING CURVE
RIVERSIDE POND DAM

PLATE D-15

APPENDIX E

INFORMATION AS CONTAINED IN THE NATIONAL INVENTORY OF DAMS

INVENTORY OF DAMS IN THE UNITED STATES

(1) STATE	(2) IDENTITY NUMBER	(3) DIVISION	(4) STATE	(5) COUNTY	(6) CONGR DIST.	(7) STATE	(8) COUNTY	(9) CONGR DIST.	(9) NAME	(10) LATITUDE (NORTH)	(11) LONGITUDE (WEST)	(12) REPORT DATE DAY	MO	YR
CT	336	NED	CT	013	02				RIVERSIDE POND DAM	4159.0	7217.4	00	JUL	80

(13) POPULAR NAME	(14) NAME OF IMPOUNDMENT
	RIVERSIDE POND

(15) REGION	(16) BASIN	(17) RIVER OR STREAM	(18) NEAREST DOWNSTREAM CITY–TOWN–VILLAGE	(19) DIST FROM DAM (MI.)	(20) POPULATION
01	10	FURNACE BROOK	STAFFORD	10	1500

(21) TYPE OF DAM	(22) YEAR COMPLETED	(23) PURPOSES	(24) STRUCTURAL HEIGHT (FT.)	(25) HYDRAULIC HEIGHT (FT.)	(26) IMPOUNDING CAPACITIES MAXIMUM (ACRE–FT.)	(27) NORMAL (ACRE–FT.)
REPG	1880	S	21	13	200	120

DIST	OWN	FED R	PRV/FED	SCS A	VER/DATE
NED	N	N	N	N	

(28) REMARKS

(29) D/S HAS	(30) SPILLWAY CREST LENGTH	(31) TYPE	(32) WIDTH (FT.)	(33) MAXIMUM DISCHARGE (FT.)	(34) VOLUME OF DAM (CY)	(35) POWER CAPACITY INSTALLED (MW)	(36) PROPOSED (MW)	(37) NAVIGATION LOCKS NO.	(38) LENGTH (FT.)	(39) WIDTH (FT.)	(40) LENGTH (FT.)	(41) WIDTH (FT.)	(42) LENGTH (FT.)	(43) WIDTH (FT.)	(44) LENGTH (FT.)	(45) WIDTH (FT.)
1	180	U	64	4345												

(46) OWNER	(47) ENGINEERING BY	(48) CONSTRUCTION BY
NO. AMERICAN PRINTED CIR.	UNKNOWN	UNKNOWN

(49) REGULATORY AGENCY DESIGN	(50) CONSTRUCTION	(51) OPERATION	(52) MAINTENANCE
NONE	NONE	NONE	NONE

(53) INSPECTION BY	(54) INSPECTION DATE DAY | MO | YR	(55) AUTHORITY FOR INSPECTION
C E MAGUIRE INC	08APR80	PL 92-367

(56) REMARKS