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NATIONAL PROGRAM FOR INSPECTION OF NON-FEDERAL DAMS
COLCHESTER POND DAM (U) CORPS OF ENGINEERS WALTHAM
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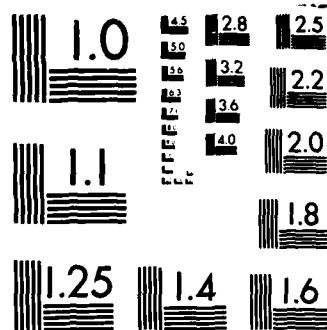
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AD-A157 517

RICHELIEU RIVER BASIN
COLCHESTER, VERMONT

**COLCHESTER POND DAM
VT 00056**

**PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM**



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

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20. ABSTRACT (Continue on reverse side if necessary and identify by block number) The dam is a reinforced concrete gravity structure about 40 ft. long and 25 ft. high. The dam is considered to be in good condition. No evidence of structural instability was observed, but a slight steep was noted at the ledge contact of the right abutment, which, if allowed to persist, could eventually become great enough to erode the adjacent concrete. It is intermediate in size with a sig- nificant hazard potential.		

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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 06 1981

Honorable Richard A. Snelling
Governor of the State of Vermont
State Capitol
Montpelier, Vermont 05602

Dear Governor Snelling:

Inclosed is a copy of the Colchester Pond Dam (VT-00056) 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 Water Resources, the cooperating agency for the State of Vermont. In addition, a copy of the report has also been furnished the owner, Colchester Fire District #3, Colchester, Vermont 05446.

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 Water Resources for your cooperation in carrying out this program.

Sincerely,

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

Incl
As stated

COLCHESTER POND DAM
VT 00056

RICHELIEU RIVER BASIN
COLCHESTER, VERMONT

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM



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BRIEF ASSESSMENT
PHASE I INSPECTION REPORT
NATIONAL PROGRAM OF INSPECTION OF DAMS

Identification Number:	VT 00056
Name of Dam:	COLCHESTER POND DAM
Town:	COLCHESTER
County and State:	CHITTENDEN COUNTY, VERMONT
Stream:	POND BROOK
Date of Inspection:	MAY 6, 1980

The dam, constructed in 1965, is a reinforced concrete gravity structure approximately 40 feet long and 25 feet in height. The upstream face is vertical; the downstream face is sloped at 3 horizontal to 4 vertical. The dam includes a 30 foot ogee crested spillway, of which about 9 feet is rendered ineffective by an adjacent upstream bridge abutment. The reinforced concrete outlet structure at the right abutment contains a valved 6 inch diameter low level drain, two gated 12 inch inlet ports at higher elevations, and a 12 inch valved outlet which originally fed the water system. All gates and valves are reported to be operable.

The dam impounds Colchester Pond and the discharge, Pond Brook, flows in a northwesterly direction approximately 4.2 miles to its mouth at Lake Champlain. Originally constructed as a water supply facility, the structure is now used to maintain the level of Colchester Pond. The pond is 5500 feet in length with a surface area of 182 acres. Normal storage capacity is about 2350 acre-ft.

Based on the visual inspection and the review of available data regarding this facility, the dam is considered to be in GOOD condition. No evidence of structural instability was observed, but a slight seep was noted at the ledge contact of the right abutment, which, if allowed to persist, could eventually become great enough to erode the adjacent concrete.

In accordance with the Corps of Engineers Guidelines and the size (INTERMEDIATE) and hazard (SIGNIFICANT) classification of this dam, the Test Flood selected was equivalent to one-half the Probable Maximum Flood (PMF). Peak inflow to Colchester Pond is 2000 cfs; routed peak outflow from the dam is 550 cfs with the water elevation 1.25 feet below the top of dam. The spillway capacity is 850 cfs or about 155 percent of the routed Test Flood outflow from the dam.

It is recommended that the owner engage a qualified registered engineer to access the necessity and means to stop the seepage at the right abutment. This and remedial measures which are discussed in Section 7 should be instituted within two years of the owner's receipt of this report except as otherwise noted.



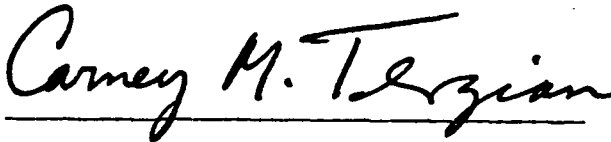
Stephen D. Murray, P.E.
Project Manager
James W. Sewall Company



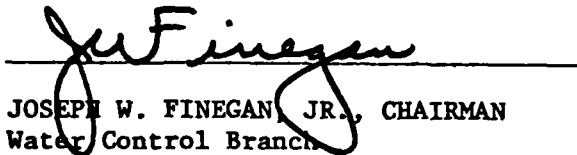
This Phase I Inspection Report on Colchester Pond Dam (VT-00056) has been reviewed by the undersigned Review Board members. In our opinion, the reported findings, conclusions, and recommendations are consistent with the Recommended Guidelines for Safety Inspection of Dams, and with good engineering judgement and practice, and is hereby submitted for approval.



ARAMAST MAHTESIAN, MEMBER
Geotechnical Engineering Branch
Engineering Division

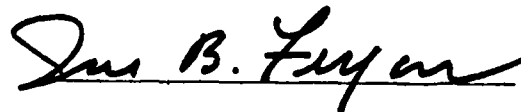


CARNEY M. TERZIAN, MEMBER
Design Branch
Engineering Division



JOSEPH W. FINEGAN, JR., 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 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.

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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.5 DAM FAILURE ANALYSIS

Utilizing the April, 1978, "Rule of Thumb Guidance for Estimating Downstream Dam Failure Hydrographs", the peak failure outflow with the pool initially at the top of the dam (el. 388.0 NGVD) would be approximately 2800 cfs. Storage downstream of the dam would not significantly attenuate the peak failure discharge until flow reached the relatively flat area downstream of U.S. Route 2/7 some 2.5 miles from the dam.

The prefailure flood would produce a substantial pool upstream of the 35 foot Central Vermont Railroad embankment located 2000 feet downstream of the dam, and would overtop two town roads 1 and 2 miles from the dam. The failure flood would overtop the railroad embankment by 0.7 feet causing damage to the track and the fill, resulting in possible derailment with consequent damage to rolling stock and hazard to passengers and crew. Further downstream, the failure flood would overtop the two town roads, assumed washed out by the prefailure flood, by about 2.4 feet and likely cause some damage to U.S. Route 2/7 about 2.5 miles from the dam. There would be substantial agricultural flooding along the entire course of Pond Brook. Damage to the railroad creates the potential for loss of not more than a few lives. Thus Colchester Pond Dam has been classified as a "Significant Hazard" dam.

SECTION 5: EVALUATION OF HYDRAULIC/HYDROLOGIC FEATURES

5.1 GENERAL

The project is basically a low surcharge storage-high spillage gravity dam, originally constructed for public water supply.

The tributary watershed consists of 1.85 square miles of relatively undeveloped terrain, approximately 70% wooded and containing no significant storage other than Colchester Pond. Colchester Pond has a surface area of 182 acres constituting about 15% of the total drainage area. NGVD elevations within the watershed range from 380 feet to over 700 feet. Average watershed slope is about 9.5%, which in the absence of significant storage would be considered mountainous. Because of the relatively large pond area, however, the watershed is considered rolling for hydrologic purposes.

Adjacent to and upstream of the dam, a roadway bridge crosses the approach channel with its bottom steel about 8.6 feet above the spillway crest and its abutments contacting the upstream dam face.

Hydraulics computations indicate that the dam would control the outflow at elevations below the bridge steel; at higher elevations the bridge and adjacent roadway would act as a weir controlling outflow to Pond Brook. The spillway would accommodate 100% of the routed Test Flood outflow from the dam with an average surcharge above the spillway crest of 3.75 feet. With surcharge to the top of dam, the spillway would accommodate 155% of the routed Test Flood outflow from the dam.

5.2 DESIGN DATA

No design data are known to exist for this project.

5.3 EXPERIENCE DATA

No information on serious problem situations arising at this dam was found and it does not appear that the water level has ever reached sufficient elevation to overtop the dam or create a hazard to any dam component.

5.4 TEST FLOOD ANALYSIS

The Test Flood for this significant hazard, intermediate size dam ranges from one-half of the Probable Maximum Flood (PMF) to the Probable Maximum Flood. One-half of the PMF was selected as the Test Flood since Colchester Pond Dam is at the lower end of the intermediate size classification and poses a relatively low risk to populated areas.

Peak inflow to Colchester Pond is 2000 cfs and was determined using the "Rolling" guide curve of the "Preliminary Guidance for Estimating Maximum Probable Discharge", dated March, 1978. Peak outflow is 550 cfs with the water elevation 1.25 feet below the top of dam and the initial reservoir level assumed at the crest of the spillway (el. 383.0 NGVD). Based upon hydraulics computations, the maximum spillway capacity is 850 cfs, or approximately 155% of the routed Test Flood outflow.

SECTION 4: OPERATIONAL AND MAINTENANCE PROCEDURES

4.1 OPERATIONAL PROCEDURES

a. General - This dam is no longer used for water supply and no operating procedure, as such, is known to exist.

b. Warning System - No warning system is known to exist.

4.2 MAINTENANCE PROCEDURES

a. General - The dam receives no regular maintenance and is not visited frequently.

b. Operating Facilities - No formal plan for the maintenance of operating facilities is known to exist. The gate stands and operating handwheels appear in good condition and show no sign of misuse.

4.3 EVALUATION

The operation and maintenance procedures at this dam are inadequate to ensure that all problems encountered can be remedied within a reasonable period of time. The owner should establish a written operation and maintenance procedure as well as a downstream warning system to follow in the event of an emergency at the dam.

e. Downstream Channel - The channel directly below the dam is heavily wooded with steep sides and bottom as shown in Photo 10. Pond Brook flows through the wooded area from the center to the upper right of Photo 9. A 35 foot high Central Vermont Railroad embankment 2000 feet downstream, beneath which the brook passes, is also visible in this photo. The 5 foot culvert under the embankment is shown in Photo 11.

Further downstream, the brook passes under two Town roads 1 and 2 miles from the dam, and the channel banks remain primarily wooded. The upstream Town road crossing is shown in Photo 12. About 2.5 miles downstream from the dam, the brook passes under U.S. Route 2/7, receiving flow from three tributaries from there to its mouth at Lake Champlain, about 4.2 miles downstream of the dam.

3.2 EVALUATION

On the basis of the visual examination the dam is considered to be in good condition.

The minor leakage on the downstream face at the right abutment, if uncorrected, could develop into a future erosion problem.

The handrail around the operating platform, if allowed to deteriorate, could create a safety hazard to operating personnel.

The heavily wooded condition of the downstream channel reduces the hydraulic efficiency of the channel and could result in downstream blockages and consequent damage during flood flows.

SECTION 3: VISUAL INSPECTION

3.1 FINDINGS

a. General - The visual inspection of the dam was conducted on May 6, 1980. At that time, the water level of the reservoir was about 1 inch above the spillway. The weather was sunny and mild. The general condition of the dam is good.

b. Dam - The dam is a reinforced concrete gravity structure with an operating platform at the right abutment 5 feet above the crest. The operating platform is shown in Photo 1. All visible concrete components of the dam appear in good condition.

There is a minor amount of clear leakage coming from the downstream contact of the right abutment with the ledge as shown in Photo 2.

A roadway bridge, visible in Photos 3 and 4 and in the Overview Photo, exists directly upstream from the dam with its concrete abutments immediately adjacent to the dam.

c. Appurtenant Structures

Spillway

As shown in Photo 4, the major portion of the dam consists of the 30 foot long spillway section with the 10 foot long gate structure to the right of the spillway. The spillway has an ogee crest and a downstream slope of 3 horizontal to 4 vertical. Very minor erosion of the downstream face has made the construction joints visible as shown in Photos 5 and 6. The left abutment of the upstream roadway bridge obstructs flow to a portion of the spillway as shown in Photo 7.

Outlet Structure

A 6 inch low level drain shown in Photo 8, exits at the bottom of the dam about a foot above the stream channel. This outlet is sufficiently low to relieve hydrostatic pressure from the dam and to facilitate dam repair, and is piped through the outlet structure. The outlet structure is equipped with two 12 inch intakes, the lowest being 1 foot above the 6 inch pipe. These serve the valved 12 inch outlet which formerly supplied the water system, and which, it is presumed, could be used as an auxiliary pond drain. The gate and valve mechanisms, so far as are visible, appear in good condition and are reported operable. The handrail around the operating platform of the outlet structure is in good condition with some minor rusting as shown in Photo 1.

d. Reservoir Area - The area surrounding the reservoir is essentially rural with a mixture of woods and open fields as shown in Photo 9. There are no indications of instability along the banks of the reservoir in the vicinity of the dam.

SECTION 2: ENGINEERING DATA

2.1 DESIGN

a. Available Data - The available data consists of sheets 1 and 2 of original contract drawings by Whitman and Howard, Inc., Engineers, dated March, 1960.

b. Design Features - The drawings, computations and inspection reports indicate the design features stated in Section 1.

c. Design Data - Design data consists of information on the two contract drawings by Whitman and Howard as listed in "Available Data".

2.2 CONSTRUCTION

a. Available Data - Information as contained in any plans, drawings, or specifications previously listed in "Design Data" or Appendix B.

b. Construction Considerations - Some variations were noted in the dam as built compared to the original contract drawings. The original plans provided for the gate structure to be near the center of the dam and to be served by a steel service bridge from the left abutment. This gate structure was moved to the right abutment to take advantage of a ledge projection and to eliminate the service bridge. The crest of the spillway was raised to elevation 383.0 rather than elevation 380.0 shown on the original contract drawings.

2.3 OPERATION

Pond level readings are not taken on any regular schedule. This dam and reservoir are not currently being used for water supply and no formal operating procedures are known to exist.

2.4 EVALUATION

a. Availability - Existing data was provided by the State of Vermont Agency of Environmental Conservation, and Colchester Fire District No. 3 (the owner).

b. Adequacy - Detailed hydrologic/hydraulic data were not available. Design data and field measurements were utilized in conjunction with New England Division - Army Corps of Engineers "Preliminary Guidance for Estimating Maximum Probable Discharges" to perform the computations of outflow capacity.

The detailed engineering data required to perform an in-depth stability analysis of the dam was not available. The final assessment of the dam, therefore, must be based primarily on visual inspection, performance history, and spillway capacity computations.

c. Validity - A comparison of records, data, and visual observations reveals no significant discrepancies, other than those noted above between design and as-built dimensions.

j. Regulating Outlets

- | | |
|-----------------------|---|
| 1. Invert: | 366.75 |
| 2. Size: | 6 inch diameter |
| 3. Description: | Cast iron waste pipe
discharging to downstream
channel |
| 4. Control mechanism: | Gate operated by hand-
wheel at control structure |
| 5. Other: | 12 inch increasing to
16 inch gated cast iron
water supply pipe dis-
charging to chlorination
station - not currently in
use |

- | | | |
|---------------|--|---|
| 4. | Test flood pool: | 182 ± acres |
| 5. | Top of dam: | 182 acres |
| g. <u>Dam</u> | | |
| 1. | Type: | concrete gravity |
| 2. | Length: | 40 ± ft |
| 3. | Height: | 25 ± ft |
| 4. | Top Width: | 2.5 ± ft |
| 5. | Side Slopes: | 3H to 4V D/S
Vertical U/S |
| 6. | Zoning: | N/A |
| 7. | Impervious core: | N/A |
| 8. | Cutoff: | N/A |
| 9. | Grout curtain: | N/A |
| 10. | Other: | N/A |
| h. | <u>Diversion and Regulating Tunnel</u> | N/A |
| i. | <u>Spillway</u> | |
| 1. | Type: | concrete ogee |
| 2. | Length of weir: | 30 ± ft |
| 3. | Crest elevation: | 383.0 |
| 4. | Gates: | N/A |
| 5. | Upstream channel: | 31 ft span between
bridge abutments |
| 6. | Downstream channel: | original streambed |
| 7. | General: | 9 feet of spillway
ineffective - located
behind bridge abutment |

c. Elevation (Feet, NGVD)

1. Streambed at toe of dam:	363 $\pm$
2. Bottom of cutoff:	N/A
3. Maximum tailwater:	366.8 $\pm$
4. Recreation pool:	N/A
5. Full flood control pool:	N/A
6. Spillway crest (ungated):	383.0
7. Design surcharge:	N/A
8. Top of dam:	388.0
9. Test flood surcharge:	386.75

d. Reservoir

1. Length of normal pool:	5500 ft
2. Length of flood control pool:	N/A
3. Length of spillway crest pool:	5500 ft
4. Length of pool at top of dam:	5500 ft
5. Length of test flood pool:	5500 ft

e. Storage

1. Normal pool:	2350 acre-ft
2. Flood control pool:	N/A
3. Spillway crest pool:	2350 acre-ft
4. Top of dam:	3260 acre-ft
5. Test flood pool:	3030 acre-ft

f. Reservoir Surface

1. Normal pool:	182 acres
2. Flood control pool:	N/A
3. Spillway crest:	182 acres

i. Normal Operational Procedures - All gates in the outlet structure are normally tightly closed and locked and all four hand-wheels are reported operable. There are no regular operational procedures other than occasional checking.

1.3 PERTINENT DATA

a. Drainage Area - 1.82 square miles of moderately steep, relatively undeveloped terrain which is about 30% open and 70% wooded.

b. Discharge at Dam Site - Discharge is over the spillway and through two gated cast iron outlet pipes. One is a 6 inch low level drain and the other a 12 inch water supply conduit which increases to 16 inches just downstream of the dam. Elevations are in feet referenced to NGVD datum.

1. Outlet works (conduits) capacity at top of dam el. 388.0:	
One 6" cast iron pipe @ invert el. 366.75	2+ cfs
One 12" increasing to 16" cast iron pipe @ invert el. 367.0	N/A
2. Maximum known flood at damsite:	N/A
3. Ungated spillway capacity at top of dam el. 388.0:	850+ cfs
4. Ungated spillway capacity at test flood el. 386.75:	550+ cfs
5. Gated spillway capacity at normal pool el. 383.0:	N/A
6. Gated spillway capacity at test flood el. 386.75:	N/A
7. Total spillway capacity at test flood el. 386.75:	550+ cfs
8. Total project discharge at top of dam el. 388.0:	852+ cfs
9. Total project discharge at test flood el. 386.75:	552+ cfs

6 inch diameter valved low level drain with a center line elevation of 367.5. All three inlets are equipped with trashracks and screens. As the dam is no longer used for water supply, the 12" diameter valved outlet which originally fed the water system remains permanently closed. Access to the handwheel gate controls is via the right embankment.

Elevations are in feet referenced to NGVD datum.

No instrumentation exists at this dam.

c. Size Classification - INTERMEDIATE - The dam impounds approximately 3260 acre-feet with the pond level at the top of the dam, which at elevation 388 is 25 feet above the streambed. According to the Recommended Guidelines, the dam is classified as intermediate in size since its impoundment is between 1,000 and 50,000 acre-feet.

d. Hazard Classification - SIGNIFICANT - If the dam were to be breached, there is potential for considerable downstream damage and loss of no more than a few lives. The Central Vermont Railroad tracks cross Pond Brook on a 35 foot high embankment about 2000 feet downstream of the dam. This embankment would be overtopped by about 0.7 feet resulting in damage to the track and a possible serious derailment. Considerable flooding of agricultural land, both upstream and downstream of the railroad embankment, would ensue. Two town roads, 1 and 2 miles downstream of the dam, presumably washed out by the pre-failure flow because of the relatively small bridges under them, would receive further damage from the approximate 5 foot submergence resulting from the breach. U.S. Route 7, about 2.5 miles downstream of the dam, would likely receive relatively minor damage.

e. Ownership - Colchester Fire District #3
Colchester, Vermont 05446
(802) 658-6616

The dam was built for its present owner.

f. Operator - Clifford Morrie
1 Wintergreen Drive
Colchester, Vermont 03446
Home (802) 879-0969
Office (802) 655-0813

g. Purpose of Dam - The dam was originally constructed for water supply and was used as such for 12 years. The area is now served by the Champlain Water District. As there is no public access to the pond, except at the dam site, recreational use is minimal. Except for maintenance of pond level for local aesthetic purposes, the dam now serves no function.

h. Design and Construction History - The following information is believed to be accurate based upon available plans and correspondence and conversations with persons familiar with the history of the dam. The dam was designed in 1960 by Whitman and Howard Engineers, Inc. for Fire District No. 3, Colchester, Vermont. A public hearing as required by the state was held on May 19, 1960 and a Hearing Order was issued on July 15, 1960, allowing the project to proceed to construction. The dam was completed in 1965.

PHASE I INSPECTION REPORT

COLCHESTER 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. James W. Sewall Company has been retained by the New England Division to inspect and report on selected dams in the State of Vermont. Authorization and notice to proceed were issued to James W. Sewall Company under a letter of April 2, 1980 from William E. Hodgson, Jr., Colonel, Corps of Engineers. Contract No. DACW 33-80-C-0051 has been assigned by the Corps of Engineers for this work.

b. Purpose of Inspection Program - The purposes of the program are to:

1. Perform technical inspection and evaluation of non-federal dams to identify conditions requiring correction in a timely manner by non-federal interests.
2. Encourage and prepare the States to quickly initiate effective dam inspection programs for non-federal dams.
3. To update, verify and complete the National Inventory of Dams.

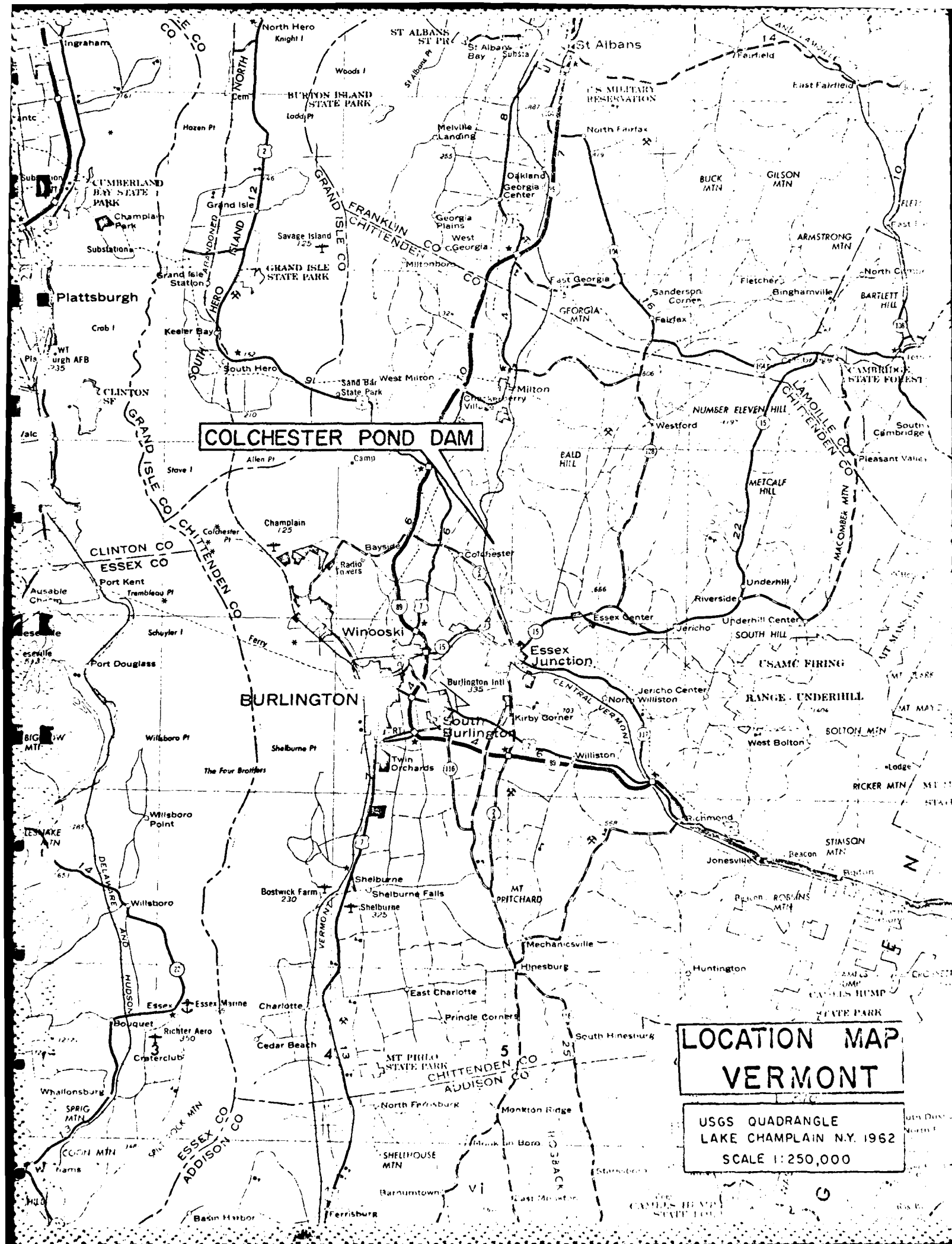
1.2 DESCRIPTION OF PROJECT

a. Location - The dam is located on the headwaters of Pond Brook about 4.2 miles upstream from Lake Champlain in a rural area of the Town of Colchester, County of Chittenden, State of Vermont. The dam is shown on the Colchester, VT. USGS Quadrangle Map having coordinates latitude N 44°-32.9' and longitude W 73°-07.5'. The dam is also known as Pond Brook Reservoir Dam.

b. Description of Dam and Appurtenances - The dam, completed in 1965, is a concrete gravity structure built on exposed bedrock, having a total length of 40 feet. This includes a 30 foot long spillway section on the left of the dam and a 10 foot long gate structure on the right.

The ogee crest spillway has a top elevation of approximately 383 and a downstream slope of 3 horizontal to 4 vertical. Immediately upstream of the dam is a roadway bridge with a 31 foot span. The left bridge abutment blocks any direct flow to the leftmost 9 feet of the spillway section.

The gate structure has a top elevation of approximately 388, a maximum of 25 feet in height above the streambed. The structure has two gated inlet ports, 12 inches in diameter with center line elevations of 370 and 377. There is a



COLCHESTER POND DAM

LOCATION MAP
VERMONT

USGS QUADRANGLE
LAKE CHAMPLAIN N.Y. 1962
SCALE 1:250,000



OVERVIEW PHOTO

U.S. ARMY ENGINEER DIV. NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASSACHUSETTS

JAMES W. SEWALL COMPANY
CONSULTANTS
OLD TOWN, MAINE

NATIONAL PROGRAM OF
INSPECTION OF
NON-FED. DAMS

Colchester Pond Dam - VT 00056

Colchester, Vermont

May 6, 1980

SECTION 6: EVALUATION OF STRUCTURAL STABILITY

6.1 VISUAL OBSERVATIONS

Visual inspection did not disclose any immediate stability problems. The minor seepage observed at the contact of the concrete dam and bedrock on the right abutment does not indicate immediate stability problems.

6.2 DESIGN AND CONSTRUCTION DATA

No original design and construction data are available for this dam.

6.3 POST CONSTRUCTION CHANGES

There is no record of post construction changes.

6.4 SEISMIC STABILITY

The dam is located in Seismic Zone 2, and in accordance with the recommended Phase 1 guidelines does not warrant seismic investigation.

SECTION 7: ASSESSMENT, RECOMMENDATIONS AND REMEDIAL MEASURES

7.1 DAM ASSESSMENT

- a. Condition - Based upon the visual inspection, the dam is judged to be in good condition.
- b. Adequacy of Information - Due to the lack of design and construction data for this dam, the assessment of safety is based on the visual inspection.
- c. Urgency - Except as noted, the remedial measures and recommendations presented below should be implemented by the owner within two years after receipt of this Phase I Inspection Report.

7.2 RECOMMENDATIONS

The owner should engage a qualified registered engineer to assess the necessity and means to stop the seepage at the right abutment.

The owner should implement all recommendations by the engineer.

7.3 REMEDIAL MEASURES

- a. A program of biennial technical inspection, with repairs as necessary, should be instituted by the owner.
- b. A formal downstream warning system to be implemented in the event of an emergency at the dam should be developed by the owner within one year of the receipt of this report by the owner.
- c. A formal program of operation and maintenance procedures should be instituted and fully documented to provide accurate records for future reference.
- d. The owner should arrange for the removal of trees from the downstream channel within 50 feet of the dam toe.
- e. The handrail around the operating platform should be painted and maintained.

7.4 ALTERNATIVES

Removal of this dam may be a practical alternative to the above recommendations.

APPENDIX A
VISUAL CHECK LIST WITH COMMENTS

VISUAL INSPECTION CHECKLIST
PARTY ORGANIZATION

PROJECT Colchagua, Poma Dam

DATE May 6, 1980

TIME 11:19 AM

WEATHER Fair, mild

W.S. ELEV. _____ U.S. _____ DN.S. _____

PARTY:

- | | | |
|------------------------------|---------------|-----------|
| 1. <u>Stephen J. Mitty</u> | <u>S.D.M.</u> | 6. _____ |
| 2. <u>William J. Johnson</u> | <u>R.L.H.</u> | 7. _____ |
| 3. <u>James A. Henry</u> | <u>C.A.H.</u> | 8. _____ |
| 4. <u>Donald P. LaGotta</u> | <u>D.P.L.</u> | 9. _____ |
| 5. _____ | | 10. _____ |

PROJECT FEATURE	INSPECTED BY	REMARKS
1. <u>Dam</u>	<u>SDM, R.L.H., C.A.H., D.P.L.</u>	
2. <u>Gate Structure</u>	<u>SDM, R.L.H., C.A.H.</u>	
3. <u>Outlet Conduit</u>	<u>SDM, R.L.H., C.A.H.</u>	
4. <u>Outlet Channel</u>	<u>SDM, R.L.H., C.A.H., D.P.L.</u>	
5. <u>Spillway Weir, Escalade Road</u>	<u>SDM, R.L.H., C.A.H., D.P.L.</u>	
6. _____		
7. _____		
8. _____		
9. _____		
10. _____		

PROJECT Salmon River Dam
 PROJECT FEATURE Concrete Dam
 DISCIPLINE Hydrology, Geology, Co. Geotechnical Engineering

DATE Nov. 6, 1963
 NAME S.D.M. R. L. H.
 NAME S.F.M. D. H.

AREA EVALUATED	CONDITION
<u>DAM EMBANKMENT</u>	<i>The dam is a concrete structure founded on solid rock. It is situated at both abutments and along the downstream toe.</i>
Crest Elevation <u>323.0 NGVD</u>	
Current Pool Elevation <u>323.0</u>	
Maximum Impoundment to Date	
Surface Cracks	<i>There are a few minor surface cracks.</i>
Pavement Condition	<i>Good</i>
Movement or Settlement of Crest	<i>None observed</i>
Lateral Movement	<i>None observed</i>
Vertical Alignment	<i>Good</i>
Horizontal Alignment	<i>Good</i>
Condition at Abutment and at Concrete Structures	<i>There is a small amount of seepage at the intersection of the downstream face and the right abutment on the right.</i>
Indications of Movement of Structural Items on Slopes	<i>None observed</i>
Trespassing on Slopes	<i>No</i>
Sloughing or Erosion of Slopes or Abutments	<i>N.A.</i>
Rock Slope Protection - Riprap Failures	<i>N.A.</i>
Unusual Movement or Cracking at or Near Toe	<i>None observed</i>
Unusual Embankment or Downstream Seepage	<i>No</i>
Piping or Boils	<i>N.A.</i>
Foundation Drainage Features	<i>None</i>
Toe Drains	<i>None</i>
Instrumentation System	<i>None</i>
Vegetation	<i>Not observed</i>

PERIODIC INSPECTION CHECKLIST

PROJECT 2nd Street Flood DamDATE May 5, 1965

PROJECT FEATURE _____

NAME James H. SmithDISCIPLINE Sanitary Engineer, Inc.NAME Mr. J. H. Smith

AREA EVALUATED

CONDITION

DIKE EMBANKMENT

Crest Elevation

Current Pool Elevation

Maximum Impoundment to Date

Surface Cracks

Pavement Condition

Movement or Settlement of Crest

Lateral Movement

Vertical Alignment

Horizontal Alignment

Condition at Abutment and at Concrete Structures

Indications of Movement of Structural Items on Slopes

Trespassing on Slopes

Sloughing or Erosion of Slopes or Abutments

Rock Slope Protection - Riprap Failures

Unusual Movement or Cracking at or Near Toes

Unusual Embankment or Downstream Seepage

Piping or Boils

Foundation Drainage Features

Toe Drains

Instrumentation System

Vegetation

There is no dike on this project.

DATE 10/15/2009

NAME James E. Smith

NAME John J. Hall

A-4

PROJECT Colonosar Feed DamDATE 1/10/81PROJECT FEATURE Gate StructureNAME W.D.M. AllenDISCIPLINE Water Resources EngineeringNAME C.F.H. D.P.L.

AREA EVALUATED

CONDITION

OUTLET WORKS - CONTROL TOWER

a. Concrete and Structural

General Condition

Good

Condition of Joints

Good

Spalling

None

Visible Reinforcing

None

Rusting or Staining of Concrete

Minor rust stains

Any Seepage or Efflorescence

None, see Sheet A-2

Joint Alignment

N.A.

Unusual Seepage or Leaks in Gate Chamber

No

Cracks

None

Rusting or Corrosion of Steel

Minor rust on railing

b. Mechanical and Electrical

Air Vents

N.A.

Float Wells

N.A.

Crane Hoist

N.A.

Elevator

N.A.

Hydraulic System

N.A.

Service Gates

Good

Emergency Gates

Good

Lightning Protection System

N.A.

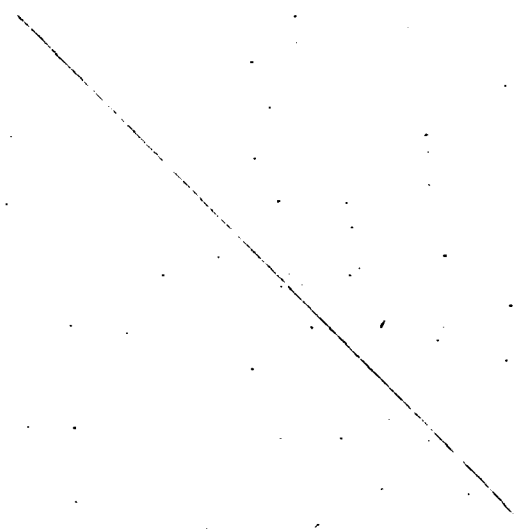
Emergency Power System

N.A.

Wiring and Lighting System

N.A.

PROJECT Concrete Pumping DATE 10/10/1991
 PROJECT FEATURE Outlet for water NAME John J. ...
 DISCIPLINE Structural Engineering NAME C.H. ... D.H. ...

AREA EVALUATED	CONDITION
<u>OUTLET WORKS - TRANSITION AND CONDUIT</u> General Condition of Concrete Rust or Staining on Concrete Spalling Erosion or Cavitation Cracking Alignment of Monoliths Alignment of Joints Numbering of Monoliths	 There is a 6 inch waste pipe from the downstream face of the wall and a 12 inch discharge pipe for water supply which is not being used.

PROJECT 2nd Street Bridge DATE May 8, 1960
 PROJECT FEATURE Outlet Structure NAME John J. ...
 DISCIPLINE Sanitary Engineering NAME John J. ...
Geotechnical Engineers Inc.

AREA EVALUATED	CONDITION
<u>OUTLET WORKS - OUTLET STRUCTURE AND OUTLET CHANNEL</u> General Condition of Concrete Rust or Staining Spalling Erosion or Cavitation Visible Reinforcing Any Seepage or Efflorescence Condition at Joints Drain holes Channel Loose Rock or Trees Overhanging Channel Condition of Discharge Channel	<i>See photo of structure</i> <i>Channel is original, irregular</i> <i>Channel walls are very steep and have many overhanging trees</i> <i>General condition is poor.</i>

PERIODIC INSPECTION CHECKLIST

PROJECT Colebrook Dam

DATE May 6, 1970

PROJECT FEATURE Spillway

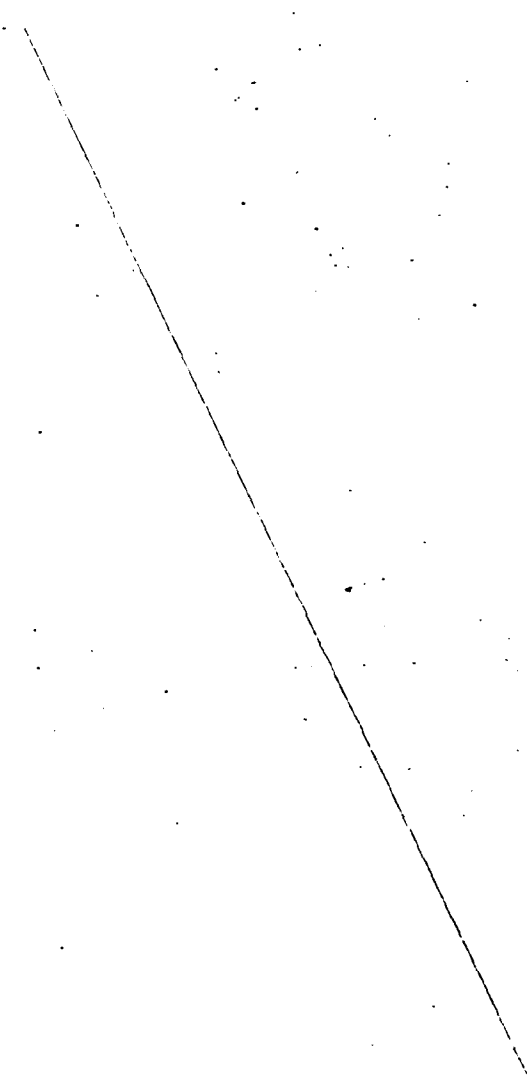
NAME James H. Jones

DISCIPLINE James H. Jones & Co.
Civil Engineers Inc.

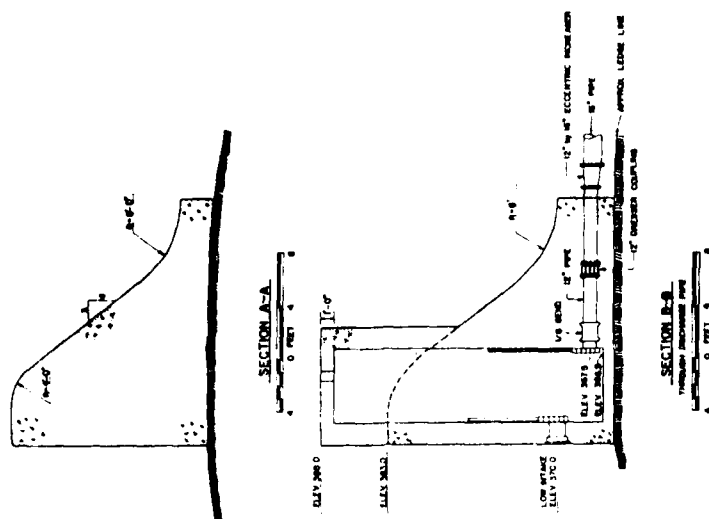
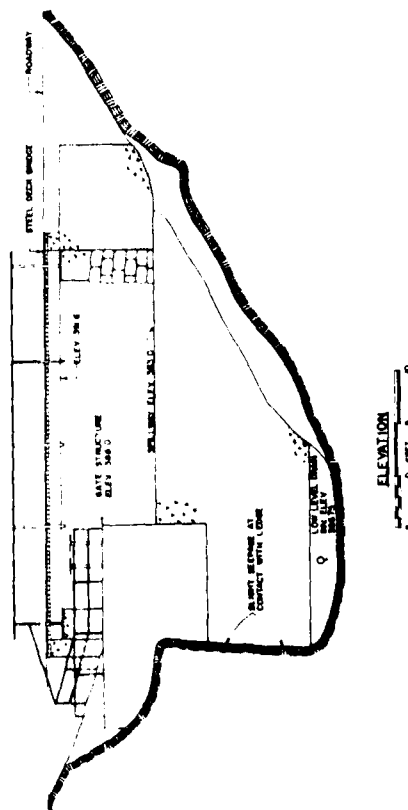
NAME J.H. Jones

AREA EVALUATED	CONDITION
<u>OUTLET WORKS - SPILLWAY WEIR, APPROACH AND DISCHARGE CHANNELS</u>	
a. Approach Channel	<i>Beneath Reservoir</i>
General Condition	
Loose Rock Overhanging Channel	
Trees Overhanging Channel	
Floor of Approach Channel	
b. Weir and Training Walls	
General Condition of Concrete	<i>Good</i>
Rust or Staining	<i>Minor rust stains</i>
Spalling	<i>None visible</i>
Any Visible Reinforcing	<i>No</i>
Any Seepage or Efflorescence	<i>None visible</i>
Drain Holes	
c. Discharge Channel	<i>see Outlet channel</i>
General Condition	
Loose Rock Overhanging Channel	
Trees Overhanging Channel	
Floor of Channel	
Other Obstructions	

OBJECT Colchester Town Drain DATE May 6, 1992
 OBJECT FEATURE _____ NAME John M. Wilson
 DISCIPLINE Drainage Engineering NAME John M. Wilson
Geometric Engineers Inc.

AREA EVALUATED	CONDITION
<u>OUTLET WORKS - SERVICE BRIDGE</u> 1. Super Structure Bearings Anchor Bolts Bridge Seat Longitudinal Members Underside of Deck Secondary Bracing Deck Drainage System Railings Expansion Joints Paint 2. Abutment & Piers General Condition of Concrete Alignment of Abutment Approach to Bridge Condition of Seat & Backwall	<i>There is no further work to be done.</i> 

APPENDIX B
ENGINEERING DATA



NOTE: THE PLAN COMPILED FROM EXISTING PLANS FOR DAM CONSTRUCTION IN 1963 BY WHITMAN AND HOWARD, INC. ENGINEERS, AND MODIFIED AS OBSERVED IN THE FIELD.

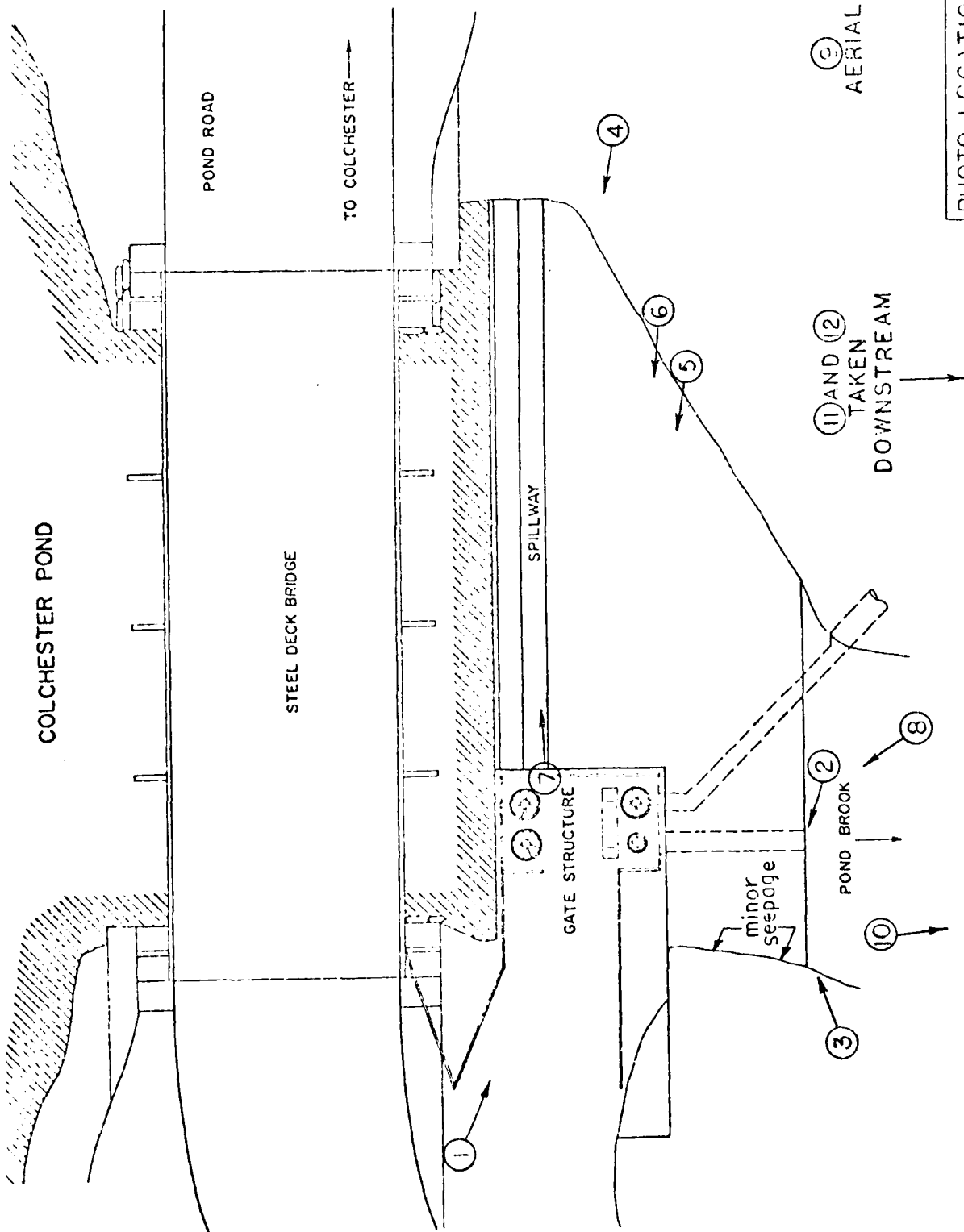
U.S. ARMY ENGINEER DIV. NEW ENGLAND
CORPS OF ENGINEERS
WILTHAM, MASSACHUSETTS

UNITED STATES OF AMERICA
DEPARTMENT OF JUSTICE
FEDERAL BUREAU OF INVESTIGATION
WASHINGTON, D. C. 20535

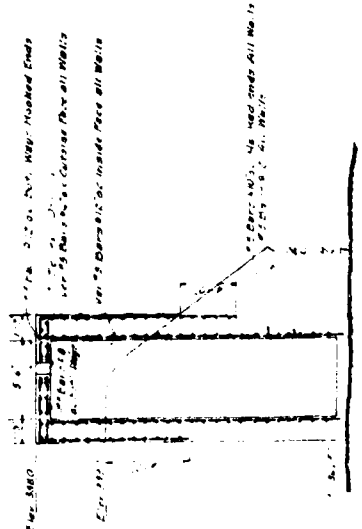
COLCHESTER POND DAM
COLCHESTER, VT P-1

13

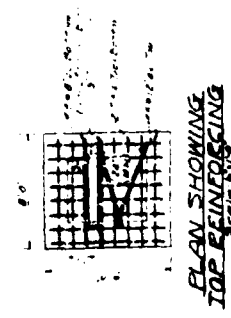
PHOTO LOCATION PLAN
COLCHESTER POND DAM



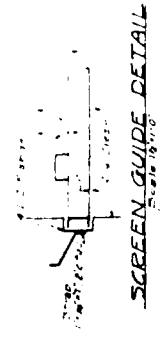
APPENDIX C
DETAIL PHOTOGRAPHS



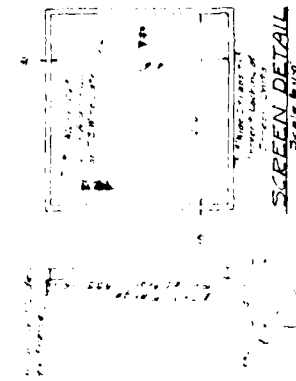
**SECTION THRU GATE STRUCTURE
SHOWING REINFORCING**
Scale 1/4" = 1'-0"



**PLAN SHOWING
TOP REINFORCING**
Scale 1/4" = 1'-0"

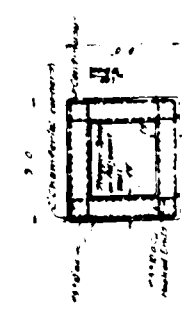


SCREEN GUIDE DETAIL
Scale 1/4" = 1'-0"



SCREEN DETAIL
Scale 1/4" = 1'-0"

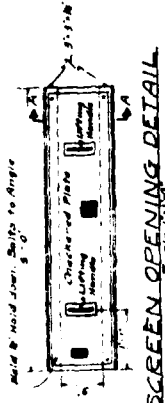
NOT TO SCALE



**PLAN SHOWING ARRANGEMENT
OF HORIZONTAL STEEL**

**STEEL DETAILS OF DAM
POND BROOK RESERVOIR
FIRE DISTRICT NO. 3
COLCHESTER, VT**
WHITMAN & HOWARD, INC.
ENGINEERS
100 STATE ST. BOSTON, MASS. 02109

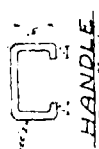
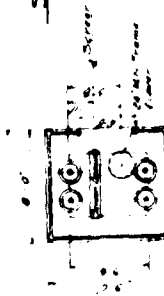
DETAIL OF LADDER RUNG
Scale 1/4" = 1'-0"



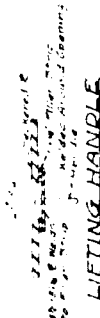
SCREEN OPENING DETAIL
Scale 1/4" = 1'-0"



SECTION AA
Scale 1/4" = 1'-0"

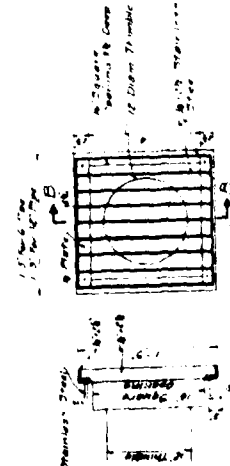


HANDLE
Scale 1/4" = 1'-0"

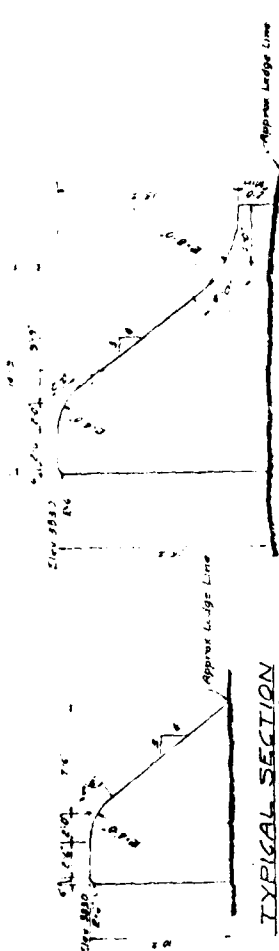


LIFTING HANDLE
Scale 1/4" = 1'-0"

GATE STRUCTURE
Scale 1/4" = 1'-0"

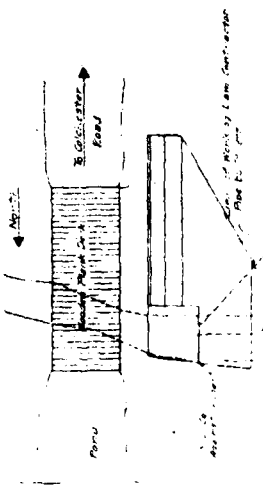


SECTION BB
BACK DETAIL
Scale 1/4" = 1'-0"



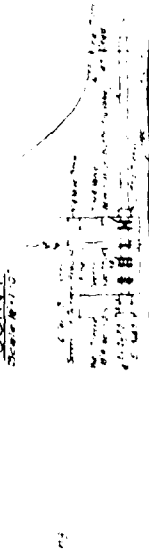
TYPICAL SECTION
STA 2+20 TO 2+30
Scale 1/4" = 1'-0"

TYPICAL SECTION STA 2+00 TO 2+20
Scale 1/4" = 1'-0"



PLAN OF DAM
Scale 1/4" = 1'-0"

DETAIL OF CONSTRUCTION
JOINT
Scale 1/4" = 1'-0"



SECTION THRU WASTE PIPE
Scale 1/4" = 1'-0"

EXHIBIT
NO. 10
DATE 10-1-58

DETAILS OF DAM
POND BROOK RESERVOIR
FIRE DISTRICT NO. 3
COLCHESTER, VT.
WHITMAN & HOWARD, INC.
ENGINEERS
100 STATE STREET
BOSTON, MASS.

NOT TO SCALE

ELEVATION
Scale 1/4" = 1'-0"

The concrete in the dam shall have a minimum compressive strength of 2,000 pounds per square inch, and in the gate structure of 3,000 pounds.

The maximum slump shall be 2-1/2 inches.

Test cylinders will be tested for compressive strength in accordance with ASTM- C 39.

All concrete shall be deposited by means of a concrete bucket. Use of chutes will not be permitted.

The maximum height of any pour shall be 5 feet. A delay of five days in pouring adjacent monoliths.

One vertical construction joint will be required as shown on the drawings. The Contractor is to drill holes for grouting as directed by the Engineers. Grout pipes to extend one foot into ledge and through forms so grouting may be done after lower sections of dam have been poured.

ALL INFORMATION CONTAINED
HEREIN IS UNCLASSIFIED
DATE 11-11-01 BY 1043
1043

1. Reservoir Clearing

The reservoir site shall be cleared of all trees, brush and bushes to within 6-inches of the ground. These materials, along with all slash, are to be disposed of by burning.

The proposed flow line of the reservoir is elevation 320.0. The limit of clearing shall be elevation 331.0 with a minimum distance of 10 feet horizontally from the flow line.

2. Stripping

All overburden at the dam site including loose or partially loose or seamy ledge that can be removed with bars, picks, paving breakers, etc. shall be removed and the solid ledge thoroughly cleaned with compressed air and water. The ledge foundation shall be approved by the Engineers a minimum of 12 hours before commencement of concrete operations.

3. Miscellaneous Metals

Footbridge eliminated in revised plans

~~The footbridge beams shall be standard 6-inch wide-flange beams.~~

The floor shall be type M 1"x 3/16" galvanized bars - subway grating.

The pipe rail fence shall be 2-inch standard genuine wrought iron.

The ladder rungs shall be stainless steel.

The intake racks shall be of stainless steel.

The fine screen shall be either stainless steel or aluminum.

4. Sluice Gates

The sluice gates shall be cast iron, bronze mounted Rodney Hunt or equal. The floor stands shall have Timken bearings. The stems shall be steel with threaded sections of bronze.

5. Concrete

The cement shall be a Portland cement, meeting all the requirements of the latest revision ASTM-C 150 and shall be Type II.

Air entraining agent shall be used. The maximum percent of air entraining shall be 3 percent by volume.

SPECIFICATION FOR
CONSTRUCTING STORAGE RESERVOIR AND DAM
FIRE DISTRICT NO. 3
COLCHESTER, VERMONT

WHITMAN & HOWARD, INC.
ENGINEERS
89 Broad Street
Boston, Mass.

MARCH, 1960

WHITMAN & HOWARD, INC.

EST. 1869 • INC. 1924

ENGINEERS

CHANNING HOWARD (1867-1952)

PAUL F. HOWARD
EDWIN M. HOWARD
C. ROGER FLANSON
C. R. WICKERSON
I. M. PITTENGER REIGN

89 Broad Street, Room 514 • Boston 10, Massachusetts

HAncock 6-1633

March 17, 1960

Mr. Reinhold W. Thieme
Commission of Water Resources
Water Conservation Board
Montpelier, Vermont

Dear Mr. Thieme:

We are enclosing two sets of plans and specifications for the proposed dam for Colchester Fire District No. 3. The District is sending you the application and copy of letter to the Selectmen.

Yours very truly,

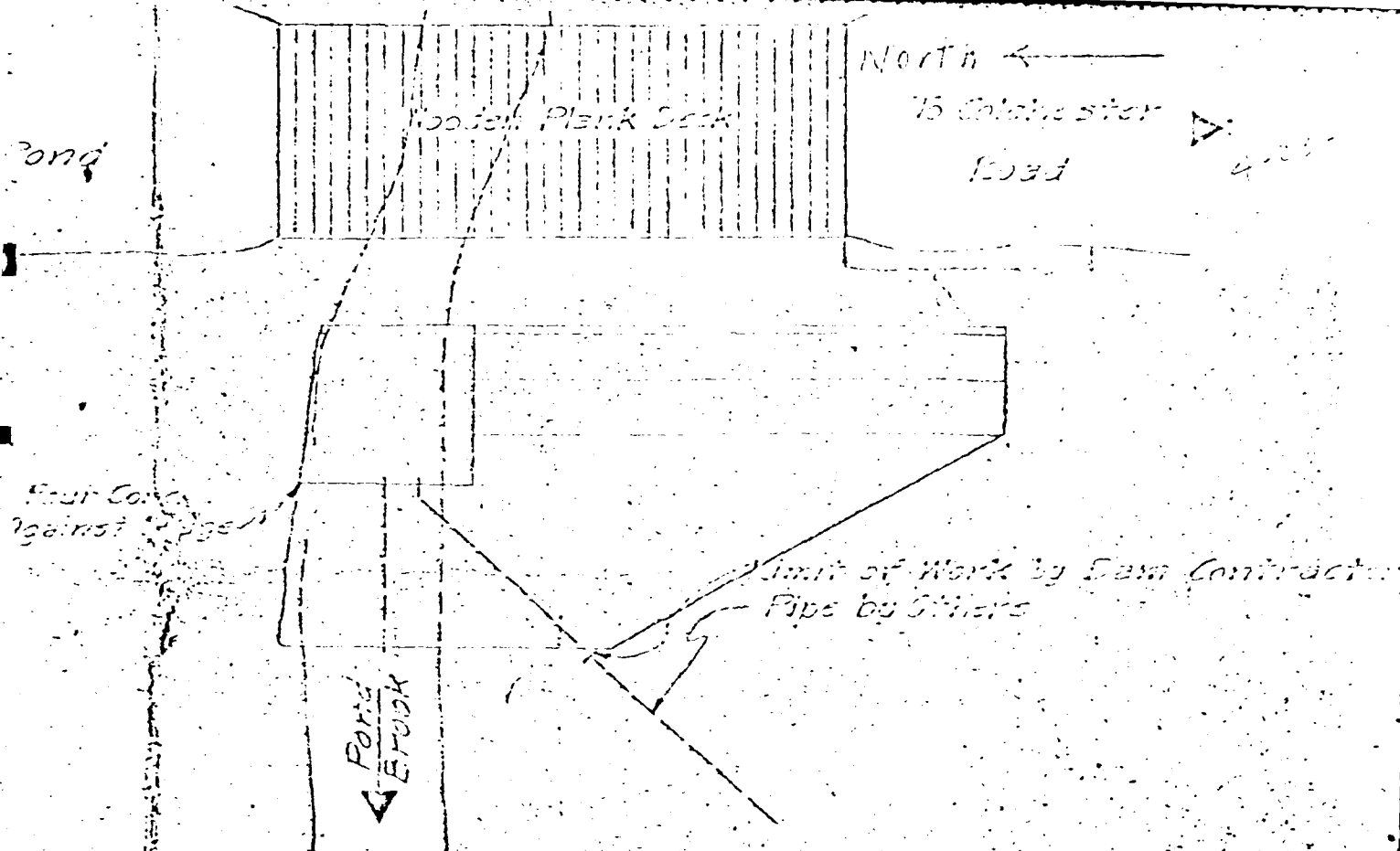
WHITMAN & HOWARD, INC.

By Nancy L. Lash

c/c Mr. A. Grant Kennedy, Chairman
Prudential Committee
Fire District No. 3
Colchester, Vermont

ROUTING		
NAME	DATE	
Mr. T. J. Mc	3-18	
SEC	3-18	
FLANN	3-22	

Our 92nd Year of Continuous Service



PLAN OF DAM

Scale: 1"=10'-0"

Sta 2+25

Exist. Bridge; El. 39.50

El. 39.75

Railroad

El. 38.80

Remain. Footing

El. 38.30

Exposed Ledge

Const. Joint

Ground

Ledge

Exposed Ledge

2+23 2+25

2+20 2+28

2+41

2+50

2+62

ELEVATION

Scale: 1"=10'-0"

WHITMAN & HOWARD, INC.

EST. 1869 INC. 1924

ENGINEERS

CHANNING HOWARD (1867-1958)

PAUL F. HOWARD
EDWIN M. HOWARD
C. ROGER PEARSON
C. R. WICKLSON
L. M. PITENDREIGH

89 Broad Street, Room 514 Boston 10, Massachusetts

HAncock 6-1633

April 28, 1960

Mr. Reinhold W. Thieme
Commissioner of Water Resources
Water Conservation Board
Montpelier, Vermont

Dear Mr. Thieme:

April 29, 1960

We are enclosing two sets of revised Plans for the proposed Dam for Fire District No. 3, Colchester, Vermont.

1. Detailed surveys since the snow has melted indicate the ledge to be higher and the crest of the Dam has been raised to 383.0. No change was made in the typical section of the Dam. The higher elevation also will eliminate some low areas in the Reservoir.

2. The Intake Structure was moved to the North end of the Dam to take advantage of a ledge projection and thus eliminate a foot-bridge and pier.

Yours very truly,

WHITMAN & HOWARD, INC.

By Roger E. Shaker

c/c Mr. Daniel Healey
Colchester, Vermont

ROUTING		
TO	BY	DATE
Mr. Thieme	J. C.	4-29
Mr. Healey	D. M.	5-2
- SENT BY TO -		



State of Vermont

AGENCY OF ENVIRONMENTAL CONSERVATION

MARTIN L. JOHNSON, Secretary

Montpelier, Vermont 05602

DEPARTMENT OF WATER RESOURCES

August 29, 1974

Department of Fish and Game
Department of Forests and Parks
Department of Water Resources
Environmental Board
Division of Environmental Protection
Division of Recreation
Division of Planning
Natural Resources Conservation Council

COLCHESTER POND TOWN OF COLCHESTER CHITTENDEN COUNTY

Colchester Pond is located in the Eastern corner of the town. Access to the pond area is by town highways 15, 17, and 23, the latter of which is also called Lost Nation Road and leads to the East shore of the pond and the lands the Wheelocks have offered the state.

The original pond surface area was 97 acres. In 1965 a dam was built on Pond Brook about 2000 feet downstream of the natural outlet of the pond. This dam raised the pond level approximately 17 feet to elevation 383 and increased the surface area to 182 acres. The date of the Water Resources Board order of permission was 7/15/60.

The Pond has a maximum length of 5500 feet, a maximum width of 2000 feet, a mean width of 1400 feet, and a shoreline length of 14,500 feet.

The watershed area is 1.8 square miles and the drainage area to surface area ratio is 6.3. The area is about 70% forests.

The dam is a concrete structure, 42 feet long, 17 feet high with an Ogee crest spillway 34 feet in length. The dam was constructed on exposed ledge formations and from a site visit on 8/27/74 it appears to be very good condition.

The pond and 25 feet back from the shoreline is owned by Colchester Fire District #3. The surrounding acreage is owned by seven individuals, with Wheelocks owning about one third of this.

The pond is no longer used as a water supply as the area is now served by the Champlain Water District. Public access is not provided, however, according to Mrs. Wheelock, there is some unauthorized recreational use of the pond.

Colchester pond is a Class "A" water.

LRF/st
Enclosure

VERMONT DEPARTMENT OF WATER RESOURCES

INFORMATION SHEET

Name of Dam Colchester Pond Town Colchester
 Owner Colchester Fire District #3 Name of Stream Pond Brook
 Address Colchester, Vt. 05446 Classification II

U.S.G.S. Coordinates: Lat. 44°-32'-55" Long. 73°-7'-31"

U.S.G.S. Maps Fort Ethan Allen Aerial Photos VT-61-H 20-221 to 222

U.S.G.S. Elev. @ Spillway _____

Total Length of Dam 40 42 ft Crest Width of Emergency 38 ft
 Spillway

Width of Top 2 1/2 ft Maximum Height 15 ft 23' TOP GATE STRUCTURE
17' EASE OF SPILLWAY

Spillway Capacity: Principal _____ Emergency _____

Pond Area 180 ± A ON NW 1/4 Drainage Area 1.8 Sq. Mi.

Pond Volume: Normal Water Level 2000 AF Design High Water Level _____

Maximum Water Depth: Normal Water Level 15 ft Dam Design High Water Level _____
 Level

Storage Before Emergency Spillway is Used None

Use of Reservoir Water Supply

Description of Dam: Concrete gravity with 6" ^{galv.} drain pipe.

Description of Spillway(s): Ogee weir

Designed by Whitman & Howard Year Built 1965

Hearing Date May 12, 1960 Order Date July 15, 1960

Additional Remarks:

SUMMARY OF DATA AND CORRESPONDENCE

<u>DATE</u>	<u>TO</u>	<u>FROM</u>	<u>SUBJECT</u>	<u>PAGE</u>
-	File	-	Vermont Dept. of Water Resources Information Sheet	B-4
8-29-74	-	Dept. of Water Resources	Description of Pond and Dam	B-5
4-28-60	R.W. Thieme	Whitman & Howard	Transmittal letter - revised plans	B-6
3-17-60	R.W. Thieme	Whitman & Howard	Transmittal letter - revised plans and specs	B-8
3-60	-	Whitman & Howard	Specifications	B-9
3-60	-	Whitman & Howard	Design Plans - Reduced in size	B-12

COLCHESTER POND DAM

EXISTING PLANS

On file with Vermont Department of Water Resources:

1. Details of Dam - Pond Brook Reservoir
Fire District No. 3 - Colchester, Vermont
Whitman and Howard, Inc., Engineers - Boston, Mass.
March, 1960 - Sheets 1 and 2
Marked - "Revised, see sheets of April 29, 1960
2. Proposed Water System
Fire District No. 3 - Colchester, Vermont
Scale 1" = 2000' - November, 1959
Whitman and Howard, Inc., Engineers - Boston, Mass.

On file with Fire District No. 3:

3. Details of Dam - Pond Brook Reservoir
Fire District No. 3 - Colchester, Vermont
Whitman and Howard, Inc., Engineers - Boston, Mass.
March, 1960 - revised sheets 1 and 2



(1) Operating Platform



(2) Seepage at Right Abutment

U.S. ARMY ENGINEER DIV, NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASSACHUSETTS

JAMES W. SEWALL COMPANY
CONSULTANTS
OLD TOWN, MAINE

NATIONAL PROGRAM OF
INSPECTION OF
NON-FED. DAMS

Colchester Pond Dam
VT 00056

Colchester, Vermont
May 6, 1980

C-2



(3) Bridge Abutment Directly
Upstream of Left Abutment



(4) Spillway Crest and Gate Structure, With
Roadway Bridge Abutments at Right

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NATIONAL PROGRAM OF
INSPECTION OF
NON-FED. DAMS

Colchester Pond Dam
VT 00056

Colchester, Vermont
May 6, 1980

C-3



(5) Downstream Face of Concrete
Ogee Spillway



(6) Spillway and Gate Structure

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INSPECTION OF
NON-FED. DAMS

Colchester Pond Dam
VT 00056
Colchester, Vermont
May 6, 1980

C-4



(7) Spillway Crest with Bridge
Abutment in Left Background



(8) 6" Low Level Drain at Left
of Spillway Base

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NATIONAL PROGRAM OF
INSPECTION OF
NON-FED. DAMS

Colchester Pond Dam
VT 00056

Colchester, Vermont
May 6, 1980

C-5



(9) Overview of Reservoir and Downstream Area



(10) Downstream Channel Immediately Below Dam

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NATIONAL PROGRAM OF
INSPECTION OF
NON-FED. DAMS

Colchester Pond Dam

VT 00056

Colchester, Vermont

May 6, 1980

C-6



(11) Culvert Under Central Vermont
Railroad Embankment



(12) Culvert Under Town Road, One Mile Downstream of Dam

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OLD TOWN, MAINE

NATIONAL PROGRAM OF
INSPECTION OF
NON-FED. DAMS

Colchester Pond Dam

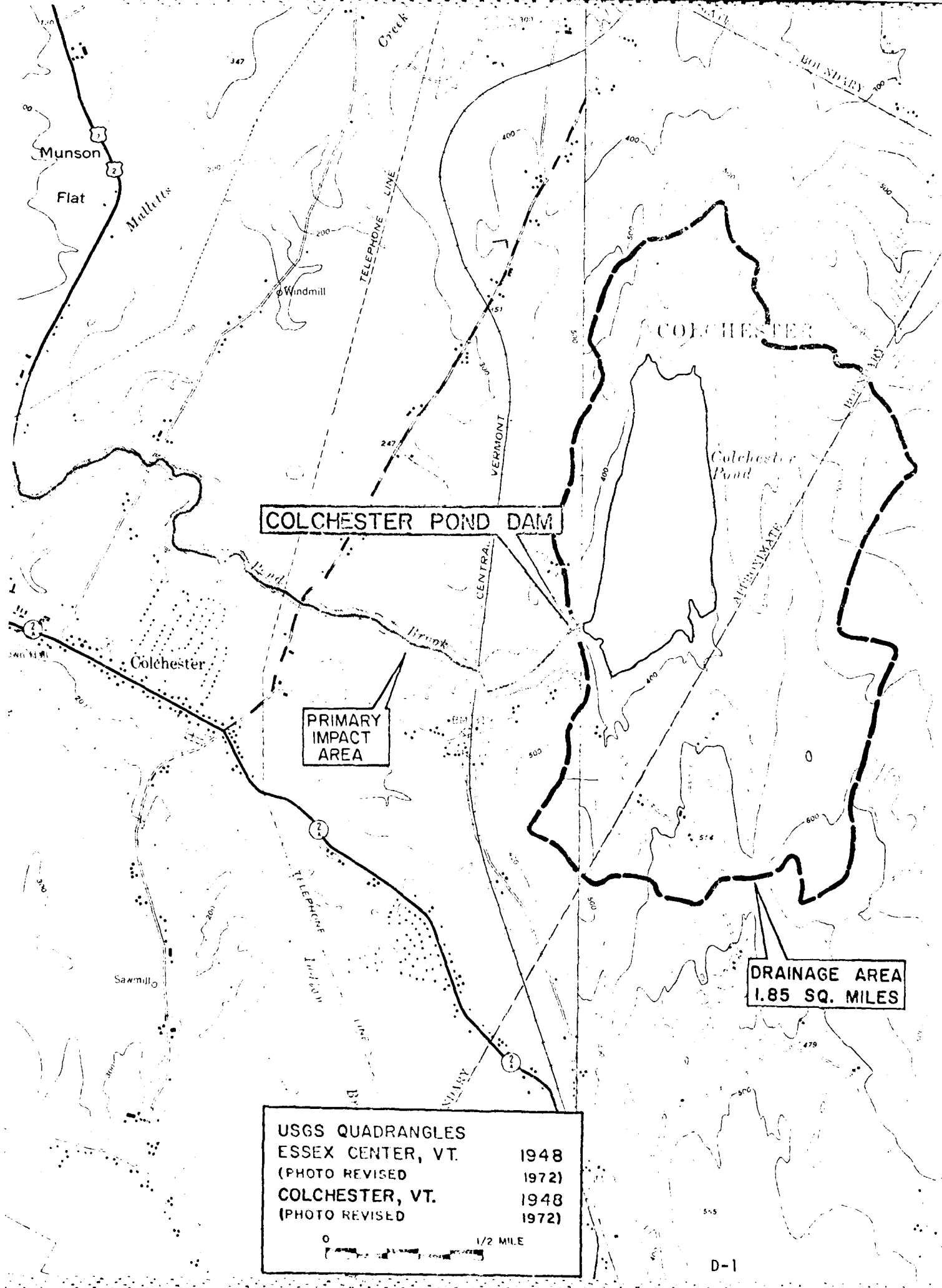
VT 00056

Colchester, Vermont

May 6, 1980

C-7

APPENDIX D
HYDRAULIC/HYDROLOGIC COMPUTATIONS



USGS QUADRANGLES
ESSEX CENTER, VT. 1948
(PHOTO REVISED 1972)
COLCHESTER, VT. 1948
(PHOTO REVISED 1972)

0 1/2 MILE

Subject _____

Computation _____ Job No. 9402-05 H

Computed by _____ Checked by SDI Date 7-15-00

Hydrologic / Hydraulic Inspection

I) Performance at Test Flood Conditions

1) Design Probable Flood

a) Watershed classified as "Rolling"

b) Watershed Area

U.S. Geological Survey Water Resources Info. 7-1-00
1.85 sq. miles (calculated average of 4 trials) USGS
Sheet Essex Centre, VT 1:50,000 scale

c) From NED-ACE Preliminary Guidance for Estimating
Max. Probable Discharge - Guide Curve for PMF
Peak Flow =

$$PMF = 2150 \text{ cfs / sq. mile}$$

d) Peak Inflow

$$PMF = 1.85 \text{ sq. miles} \times 2150 \text{ cfs / sq. mile} = 4000 \text{ cfs}$$

$$\text{Similarly, } 1/2 \text{ PMF} = 2000 \text{ cfs}$$

2) Test Flood

Classification of Test According to NED-ACE
B. Minimum Test Conditions

1) Size of Structure (1) 5'4" x 6'6" x 10'0"

$$\text{Height} = 2.5' \text{ (10'0" - 7'5")}$$

* See Classification of Structure

Subject Inspection of 1927 Flood Dam

Computation Calculated Pond Calculated 14

Job No. _____

Computed by MEB

Checked by SPM

Date 2-27-80

Stage - Storage Curve - Calibrated 1927

1. Depth of Water Reservoir Dam, 1927

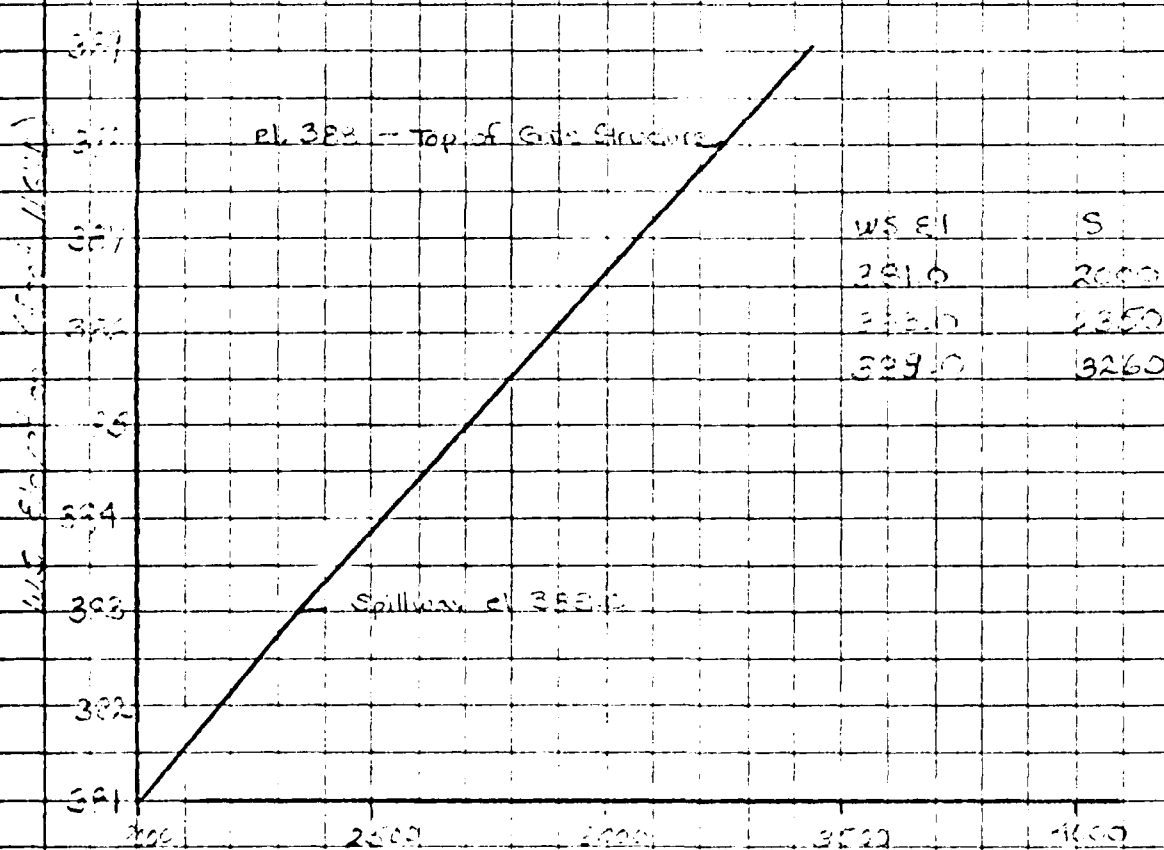
- surface area = 182 acres

USGS Sta. 1824000 - surface area = 182 acres - 1927

Assumed 175 acre below spillway - 1825, 1825 area el. 383

2. Top of Water Reservoir Dam, 1927

Assumed 151' storage = 2010 acre-ft el. 381



Storage Curve 1927

Subject Design of dam for ...

Computation ... Job No. ...

Computed by ... Checked by ... Date ...

a) Classification of Dam ...

(1) Failure ...

Peak Inflow ... covers ...
to the ... failure ...
2000 ... This is a ...
... railway. Failure ...
... from 3-4 feet and ...
to a ... and a ...

(2) Classification

... Intermediate

... Significant

b) PMF ≈ 4000 ... Test Flood

3) Design of ...

(1) Peak Inflow Test Flood @ $1/2$ PMF ≈ 2000 cfs

(2) Outflow Rating Curve

Spillway ...

21' Control ...

... 21' ...

... 21' ...

... 21' ...

... 21' ...

... 21' ...

... 21' ...

... 21' ...

... 21' ...

... 21' ...

... 21' ...

... 21' ...

... 21' ...

... 21' ...

... 21' ...

... 21' ...

... 21' ...

... 21' ...

... 21' ...

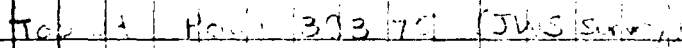
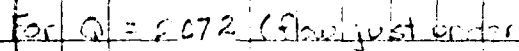
... 21' ...

... 21' ...

Computed by MEC Checked by SDH Date 7-21-80

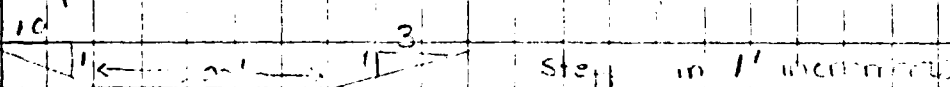
Pressure: Flow rate: 100 ml/min

$A = 215.67 \text{ ft}^2$ $PCD = 391.97 \text{ (3.5' from)}$



$2.13' \approx 2.15'$ - Assumed no change in
flow due to presence of
road bridge

Top of River elev 292.75 $Q = 4113^3$ $C = 7.5$



H	G	W	ht
1.0	522	374.75	
2.0	1522	395.75	
3.0	2522	296.75	

7. Letter from [redacted] to [redacted] on page 3

ect _____

utation _____ Job No. _____

uted by _____ Checked by SDH Date 1-11

c) Spilling Capacity at Top of Dam

$$H = 51.0' \quad Q_{sp} = 5200 \text{ cfs} \quad (40\% Q_p + 1/2 PMP)$$

d) Surge Height at Top of Dam

$$Q_p = 1/2 PMP = 2000 \text{ cfs} \quad H = 8.3'$$

1) Effect of Surge Height on Minimum Freeboard Distance

a) Lake Bed Elevation = 182 ft *

* At Dept. of Interior Design Area 1911
3rd Creek USGS 1:25000 $H = 175 \text{ ft}$ (low water)

b) Assume Normal Pool Level at Spillway Crest (elev. 225 ft)

c) Watershed Area $A_{ws} = 1.85 \text{ mi}^2$ (see p. 1)

d) Discharge (Q_p) at Various Surge Height Elevations

$$H = 51' \quad V = 182 \text{ ft} \times 51' = 9282 \text{ ft}^2$$

$$S = 9282 / (1.49 \times 59.2) = 21.23$$

$$H = 21' \quad V = 182 \text{ ft} \times 21' = 3822 \text{ ft}^2$$

$$S = 3822 / (1.49 \times 59.2) = 8.69$$

Fit. App. Storage Storage Guideline
(19) max. freeboard in Q. in design

$$Q_{sp} = Q_p (1 + 9.14 S) \text{ for } Q_p \geq 1/2 PMP$$

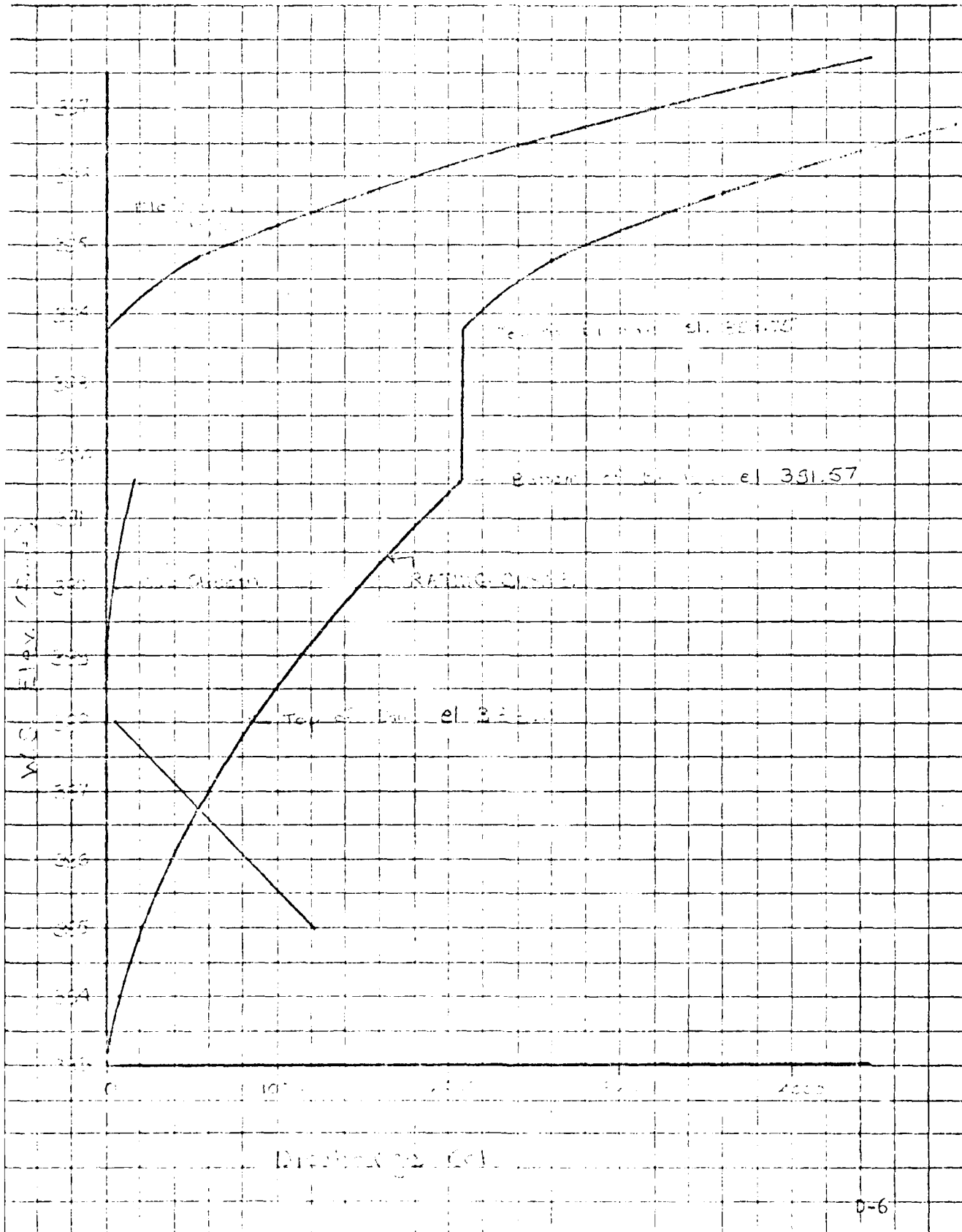
$$H = 51' \quad Q_{sp} = 5200$$

$$H = 21' \quad Q_{sp} = 1215 \text{ cfs}$$

at Top of Dam

tation 1-15-10 Col. 1-10 Job No. 250-000 H

ted by D.P. Checked by D.W. Date 7-21-20



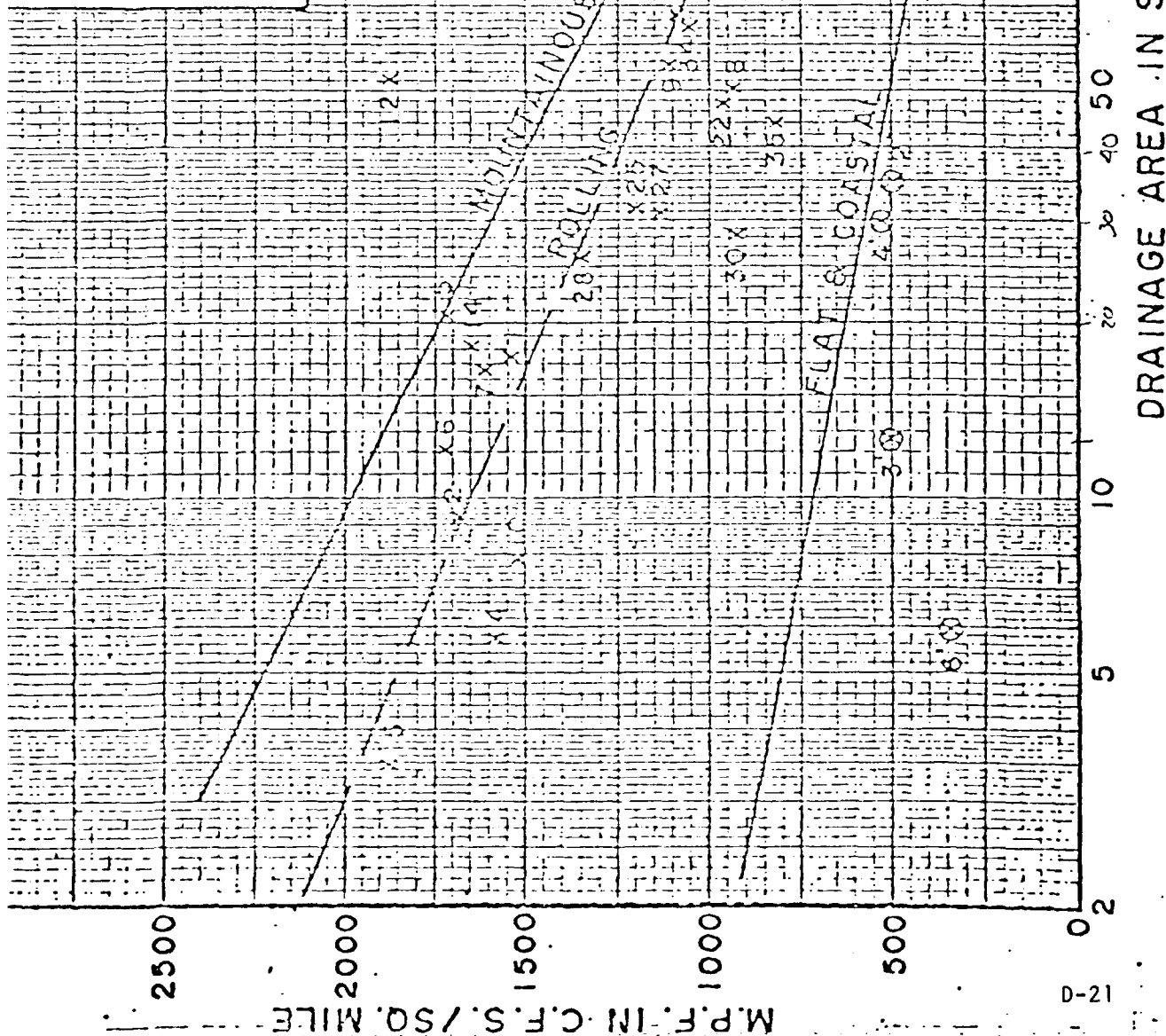
MAXIMUM PROBABLE FLOOD

PEAK FLOW RATES

x5 - NED DAM IDENTIFICATION

⊗ 7' - TWICE SPF AT INDICATED SITES

DEC. 1977



MAXIMUM PROBABLE FLOWS
BASED ON TWICE THE
STANDARD PROJECT FLOOD
(Flat and Coastal Areas)

<u>River</u>	<u>SPF</u> (cfs)	<u>D.A.</u> (sq. mi.)	<u>MPF</u> (cfs/sq. mi.)
1. Pawtuxet River	19,000	200	190
2. Mill River (R.I.)	8,500	34	500
3. Peters River (R.I.)	3,200	13	490
4. Kettle Brook	8,000	30	530
5. Sudbury River.	11,700	86	270
6. Indian Brook (Hopk.)	1,000	5.9	340
7. Charles River.	6,000	184	65
8. Blackstone River.	43,000	416	200
9. Quinebaug River	55,000	331	330

MAXIMUM PROBABLE FLOOD INFLOWS
NED RESERVOIRS

<u>Project</u>	<u>Q</u> (cfs)	<u>D.A.</u> (sq. mi.)	<u>MPF</u> cfs/sq. mi.
1. Hall Meadow Brook	26,600	17.2	1,546
2. East Branch	15,500	9.25	1,675
3. Thomaston	158,000	97.2	1,625
4. Northfield Brook	9,000	5.7	1,580
5. Black Rock	35,000	20.4	1,715
6. Hancock Brook	20,700	12.0	1,725
7. Hop Brook	26,400	16.4	1,610
8. Tully	47,000	50.0	940
9. Barre Falls	61,000	55.0	1,109
10. Conant Brook	11,900	7.8	1,525
11. Knightville	160,000	162.0	987
12. Littleville	98,000	52.3	1,870
13. Colebrook River	165,000	118.0	1,400
14. Mad River	30,000	18.2	1,650
15. Sucker Brook	6,500	3.43	1,895
16. Union Village	110,000	126.0	873
17. North Hartland	199,000	220.0	904
18. North Springfield	157,000	158.0	994
19. Ball Mountain	190,000	172.0	1,105
20. Townshend	228,000	106.0(278 total)	820
21. Surry Mountain	63,000	100.0	630
22. Otter Brook	45,000	47.0	957
23. Birch Hill	88,500	175.0	505
24. East Brimfield	73,900	67.5	1,095
25. Westville	38,400	99.5(32 net)	1,200
26. West Thompson	85,000	173.5(74 net)	1,150
27. Hodges Village	35,600	31.1	1,145
28. Buffumville	36,500	26.5	1,377
29. Mansfield Hollow	125,000	159.0	786
30. West Hill	26,000	28.0	928
31. Franklin Falls	210,000	1000.0	210
32. Blackwater	66,500	128.0	520
33. Hopkinton	135,000	426.0	316
34. Everett	68,000	64.0	1,062
35. MacDowell	36,300	44.0	825

PRELIMINARY GUIDANCE
FOR ESTIMATING
MAXIMUM PROBABLE DISCHARGES
IN
PHASE I DAM SAFETY
INVESTIGATIONS

New England Division
Corps of Engineers

March 1978

Subject Inspection of New Federal Dam in New England

Computation Colchester Pond Colchester Vt Job No. 953-05 H

Computed by meb Checked by SM Date 7-22-80

Summary

a) Peak Failure Outflow = 2800 cfs

b) Raise in stage just D/S from dam = 3.5'

c) Approximate stage before failure $\pm$ 6000 ft D/S of Dam
 $Y_s = 5.25'$

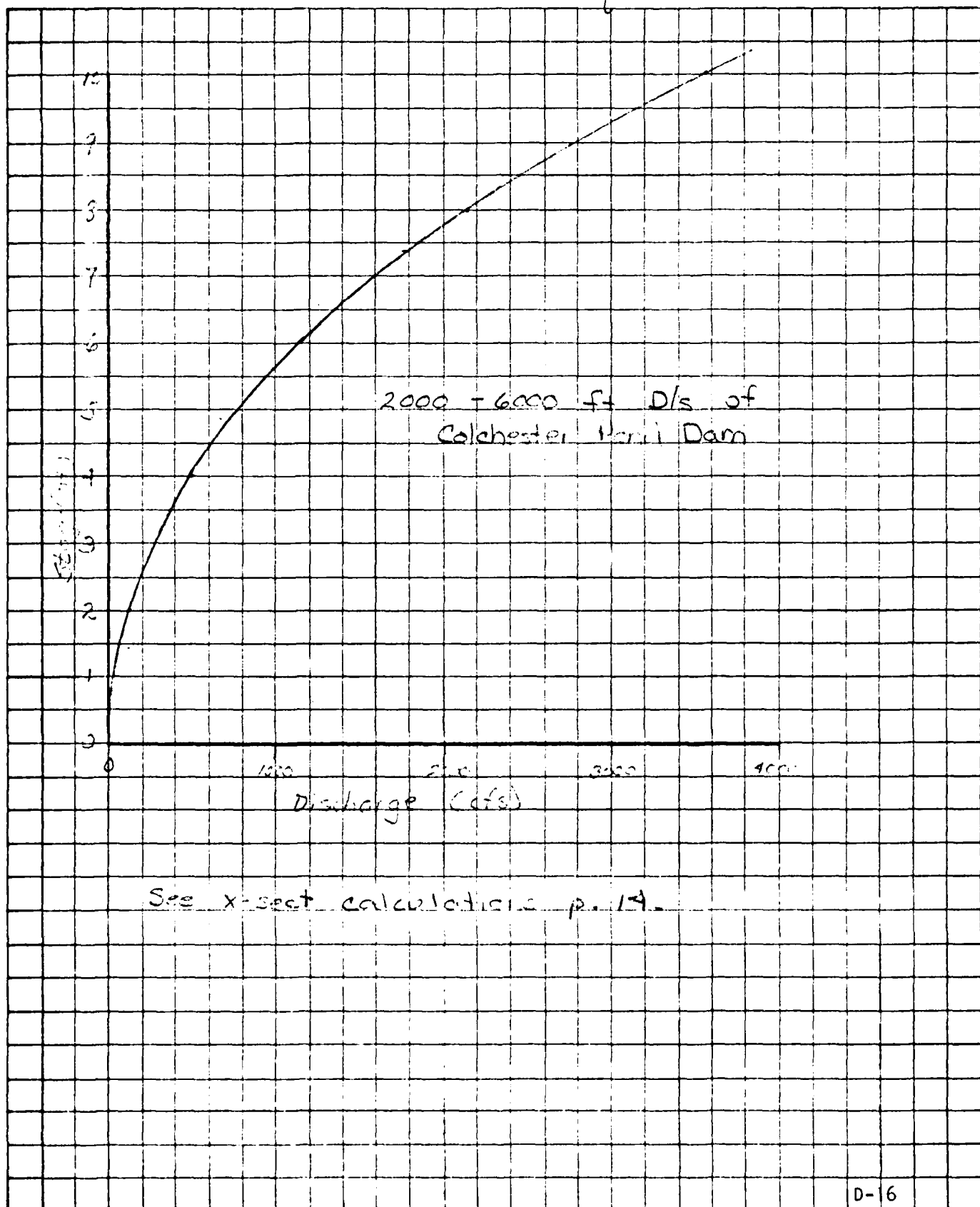
d) Approximate stage after failure $\pm$ 6000 ft D/S of Dam
 $Y_p = 9.0'$

e) Raise in stage $\pm$ 6000 ft D/S of Dam
 $\Delta Y = 9.0 - 5.25 = 3.75'$

Subject Inspection of ...

Computation ... Part ... Job No. 912-000

Computed by D.P.F. Checked by S.M. Date 7-22-00



Subject Inspection of non-ferrous lines in New England

Computation Colchester Pond Colchester VT Job No. 953-05H

Computed by NFE Checked by SDM Date 8-27-90

d) Raise in Stage 2000 - 6000 ft Dis of Dam

Approx X-section:

$$Q = AV \quad V = 1.486 R^{2/3} S^{1/2}$$

$$S \approx .01 \text{ (from USGS)} \quad n \approx .045$$

H	A	P	R	V	Q
2	30	20.7	1.44	4.22	126
4	60	31.59	2.02	6.13	491
6	150	42.37	3.04	7.67	1150
8	240	53.19	4.51	9.50	2164
10	350	63.98	5.19	11.5	3552

See curve p. 15

Stage for $Q_s = 850$ cfs $H = 5.25'$

Stage for $Q_p = 2800$ cfs $H = 9'$

Raise in stage = $3.75'$

No appreciable change in this river reach
— stage routing assumed unnecessary.

Subject Inspector of pre-failure dam

Computation Calden Pond, Calden, VT Job No. 953-05H

Computed by MEF Checked by SEM Date 8-27-80

$$\text{Pre-failure Volume} = \frac{(44.84 + 265.45)}{2} \times 1500 = 457.8 \text{ ac-ft}$$

$$\text{Failure Volume} = \frac{(111.69 + 275.50)}{2} \times 1500 = 476.3 \text{ ac-ft}$$

$$\text{Volume in Reach} = 476.3 - 457.8 = 18.5 \text{ ac-ft}$$

$$\begin{aligned} Q_p(\text{trial}) &= Q_p (1 - \frac{V}{V_p}) \\ &= 2800 (1 - \frac{18.5}{3260}) \\ &= 2784 \text{ cfs} \approx 2800 \text{ cfs} \end{aligned}$$

∴ Storage behind railroad bend does not attenuate peak flow significantly

c) Raise in stage at Road Crossing Approx. 1 mile
Dis. from Dam

48" ACCINF, ±30' long, 5' below road surface

$$H = h_f + h_{ent} + h_{exit} \quad Q = AV$$

$$h_{ent} = \frac{.5 V^2}{2g} \quad h_{exit} = \frac{1.0 V^2}{2g} \quad h_f = \frac{f L V^2}{D 2g} \quad f = 0.073 \quad L = 30 \quad D = 4$$

$$H = 5' \quad Q = 159 \text{ cfs before overtopping road}$$

∴ Assume roadway overtopped and taken out prior to dam failure

Continuing further downstream there are no habitable structures lower than 40 feet above the streambed and this is residential structures would be endangered by dam failure U.S. Route 7 crosses Pond Brook approximately 13,000 ft downstream of the dam but would not suffer any major damage from the failure.

Subject Inspection of non-federal dams

Computation Calcheater Pond

Job No. 953-05 H

Computed by MEB

Checked by SDM

Date 3-25-11

Assuming that the railroad crossing remains stable, it would dam up the stream up to 1500 feet upstream of the railroad bed, that is to say, 500 feet downstream of the dam. The first 500 feet of the downstream channel would be like the cross-section pictured on page 9. Computations indicate that there is no significant storage in this first downstream section so the storage computations shown here will start with the section 500 - 2000 feet downstream of the dam.

Reach 500 - 2000 ft DLS of Dam

Railroad crossing at DLS end of reach

Reservoir storage at time of failure = 3260 Ac-ft

Volume in stream reach available for storage

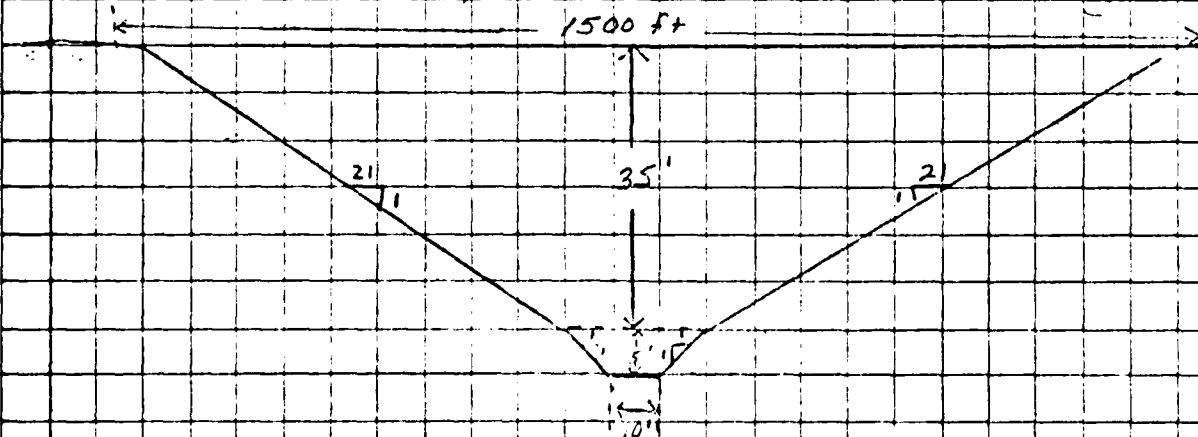
= Failure volume - Pre-failure volume

Failure Volume = $\frac{\text{Upstream } \chi\text{-sect} + \text{Downstream } \chi\text{-sect}}{2} \times L$

L = Length of Reach.

Pre-failure Volume similarly computed

Downstream χ -sect (at Railroad Crossing)



Subject Inspection of non-federal dams in New England

Computation Calchester Pond Calchester Vt Job No. 953-05 H

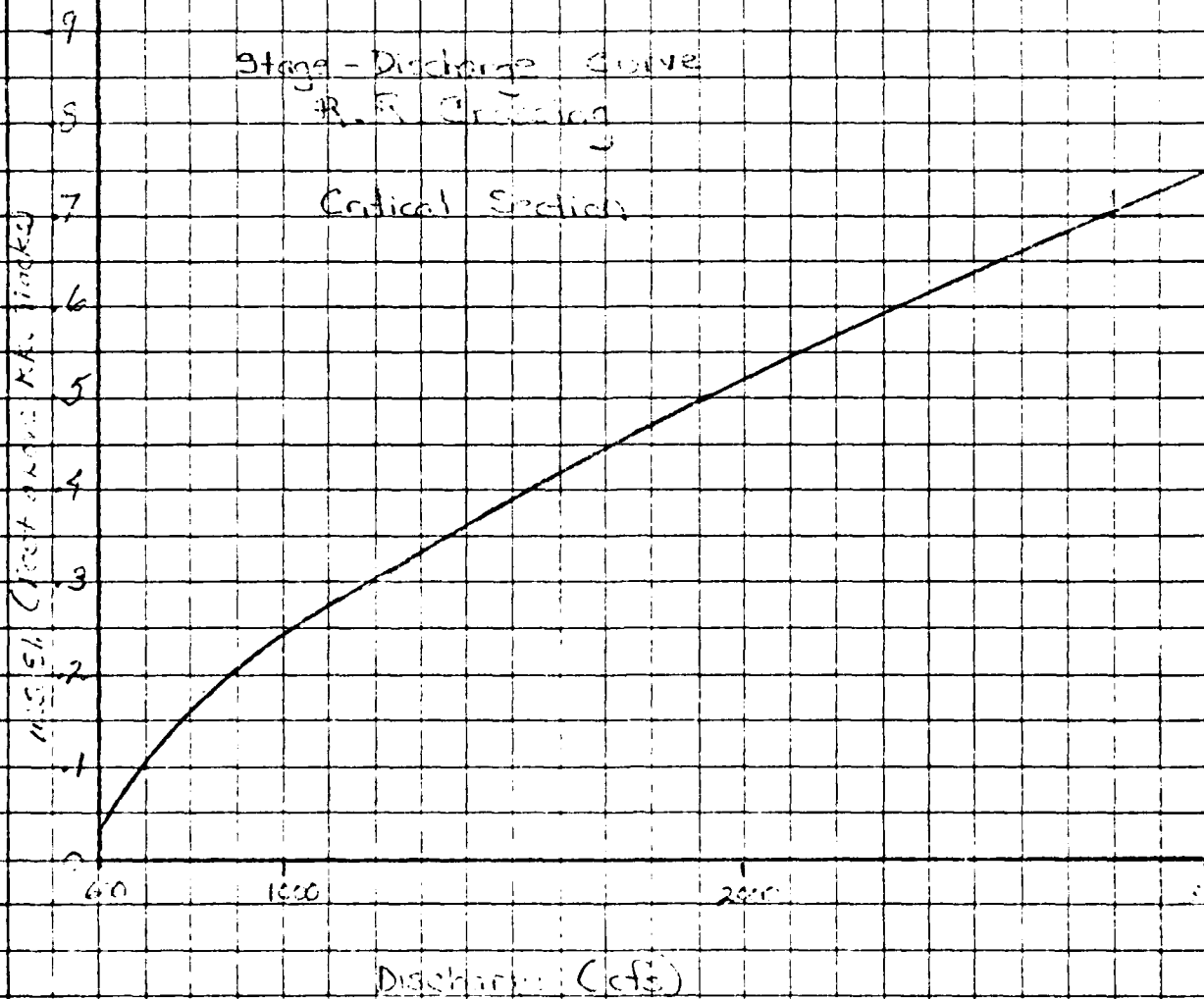
Computed by MEB Checked by SDH Date 3-27-50

Railroad crossing approx 2000 feet downstream cont.

Flow over Railroad Tracks

$$Q = CAH^{3/2} \quad C \approx 2.5 \quad L \approx 1100' \text{ (from top of dam)}$$

H	Q
.1	119
.3	616
.5	1324
.7	2176
.9	3072



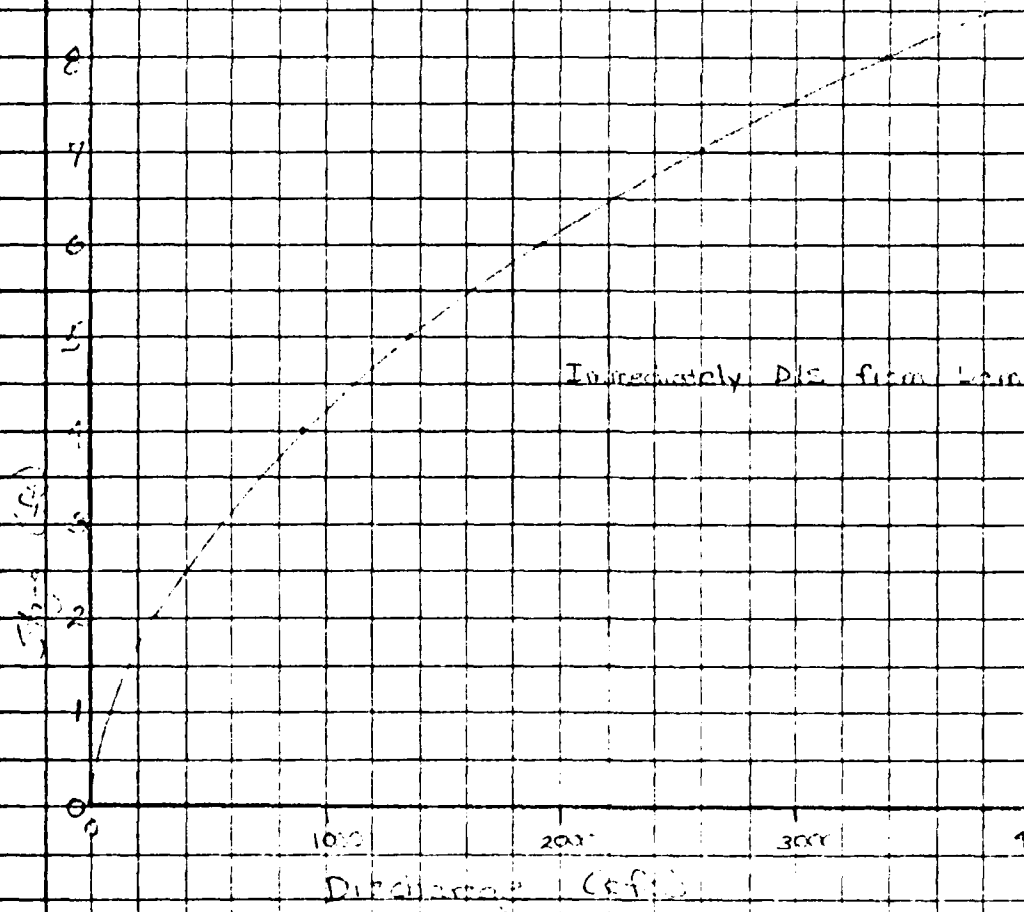
Subject Inspection of non-federal dam

Computation Colchester Pond Colchester Vt Job No. 953-05 H

Computed by mee Checked by SDY Date 7-22-80

Immediately Downstream from Dam

H	A	P	R	V	Q
1	9	10.83	.83	9.09	81
2	20	13.66	1.45	13.19	264
4	48	19.31	2.43	18.37	901
5	65	22.19	2.94	20.99	1363
6	84	24.97	3.36	22.97	1930
7	105	27.51	3.78	24.30	2605
8	126	29.83	4.18	25.55	3341



Subject Inspection of non-failure dam

Computation Calchester Pond Calchester Vt Job No. 953-65 H

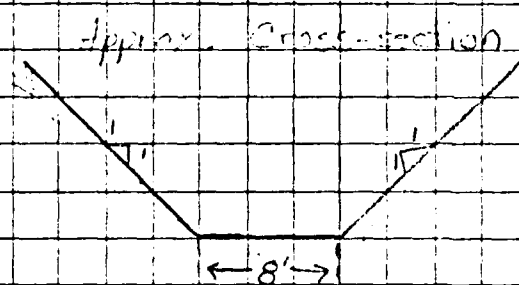
Computed by WSE Checked by SDH Date 8-25-92

1) Peak Failure Outflow

Peak Failure Outflow = Breach Outflow + Remaining Spillway Discharge
= 2354 + 403
= 2757 cfs say 2500 cfs +

2) Peak Flood and Stage - Downstream River Reaches

a) Immediately Downstream from the dam



$$V = \frac{1.486}{n} R^{4/3} S^{1/2}$$

$$n = .045 \quad S = .042$$

(from 1-25)

Pre-failure Flow = 850 cfs

H = 3.2' (see curve on following page)

Failure Flow = 2870 cfs

H = 7.3'

Raise in stage = 7.3 - 3.2 = 3.5 feet

b) Railroad crossing approx. 2000 ft downstream

60" AGCOP, 25' long, 35' below track

$$H = h_f + h_{entr} = h_{exit}$$

$$Q = AV$$

$$h_{entr} = \frac{1.5 V^2}{2g}$$

$$h_{exit} = \frac{1.0 V^2}{2g}$$

$$h_f = \frac{1.49 V^2}{D^{4/3}}$$

$$f = .065$$

$$H = 3.5' \quad Q = 420 \text{ cfs}$$

$$n = .5$$

Assume channel geometry through railroad bridge

Curve curve p. 10

Subject Investigation of Failure of Dam

Computation Caldwater Pond, Calais, Me. Job No. 952-0511

Computed by MEB Checked by SMH Date 8-25-61

II Downstream Failure Hazard

1) Peak Failure Outflow (Assume Spillways to top of dam)

a) Breach Outflow

i) Breach Width w_b

Mid-Height Elev = 375.5' NGVD (382 - 25/2 = 375.5)

Approx. Mid-Height Length = 28' (From D+H Draw)

Breach Width (see U.S. Army Corps of Engineers Dam Failure Guidelines) $w_b = C_b \times 28' = 11.2$ feet

ii) Height h_b

Height at time of failure = 25'

iii) Breach Outflow

$$Q_b = \frac{1}{17} w_b \sqrt{g} h_b^{3/2} \quad w_b = 11.2$$

$$h_b = 25$$

$$Q_b = 2351 \text{ cfs}$$

b) Remaining Spillway Discharge

Assume breach within spillway section

21' - 11' = 10' (Assume)

$$Q = C L H^{3/2} \quad C = 10 \quad L = 10$$

10	10	10
5	10	10

Remaining Spillway Discharge = 1000

Subject Inspection of ~~new~~ Pond

Computation Colchester Pond, Colchester, VT Job No. 953-05 H

Computed by MSP Checked by SDH Date 2-27-80

e) Peak Outflow (Q_{p3})

Using NED-ACE Guidelines "Standard Standard
Routing Alternate Method"

$$Q_{p3} = 550 \text{ cfs } @ 3.75' \text{ for } Q_p = 1/2 \text{ PMF}$$

f) Spillway Capacity to Outfall

Spillway capacity to Top of Low Dam 350 cfs
 $Q_s = 155\%$ of the outflow at $1/2$ PMF

Summary

a) Peak Inflow

$$\text{Test Flood} = 1/2 \text{ PMF} = 2000 \text{ cfs}$$

b) Peak Outflow

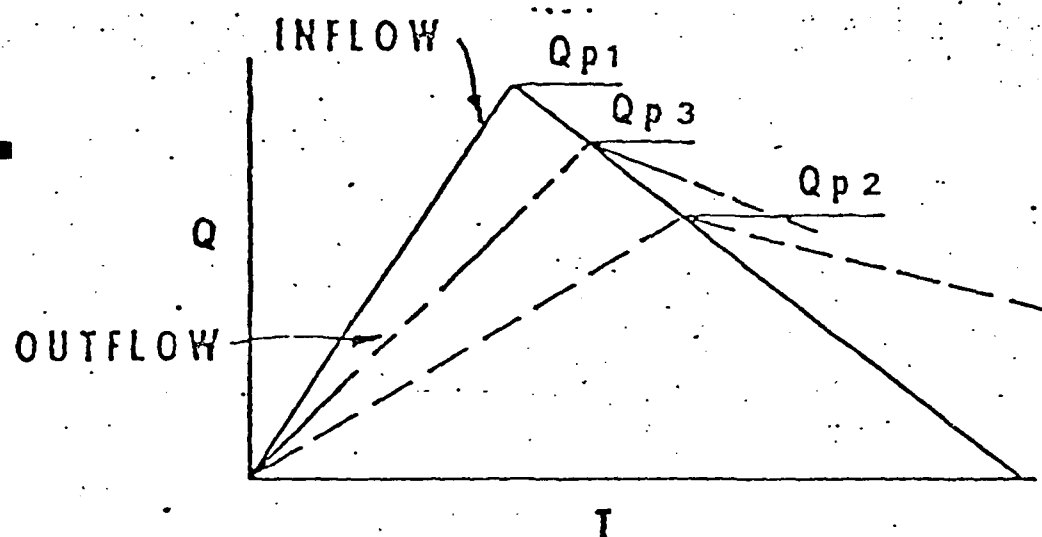
$$Q_{p3} = 550 \text{ cfs } @ 1/2 \text{ PMF}$$

c) Spillway Peak Capacity

$$Q_s = 350 \text{ cfs or } 155\% \text{ of } Q_{p3}$$

Therefore, at Test Flood = $1/2$ PMF, the
spillway handles the entire flow utilizing
155% of its capacity with a storage surcharge
above the spillway crest of 3.75 ft.

ESTIMATING EFFECT OF SURCHARGE STORAGE ON MAXIMUM PROBABLE DISCHARGES



STEP 1: Determine Peak Inflow (Q_{p1}) from Guide Curves.

STEP 2: a. Determine Surcharge Height To Pass " Q_{p1} ".

b. Determine Volume of Surcharge ($STOR_1$) In Inches of Runoff.

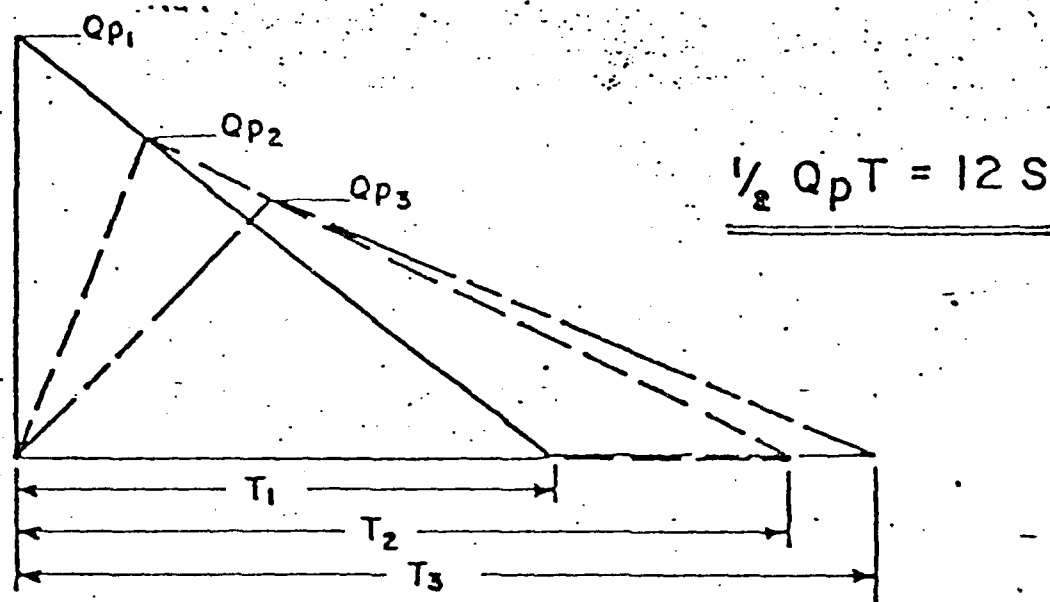
c. Maximum Probable Flood Runoff In New England equals Approx. 19", Therefore:

$$Q_{p2} = Q_{p1} \times \left(1 - \frac{STOR_1}{19}\right)$$

STEP 3: a. Determine Surcharge Height and " $STOR_2$ " To Pass " Q_{p2} "

b. Average " $STOR_1$ " and " $STOR_2$ " and Determine Average Surcharge and Resulting Peak Outflow " Q_{p3} ".

"RULE OF THUMB" GUIDANCE FOR ESTIMATING DOWNSTREAM DAM FAILURE HYDROGRAPHS



STEP 1: DETERMINE OR ESTIMATE RESERVOIR STORAGE (S) IN AC-FT AT TIME OF FAILURE.

STEP 2: DETERMINE PEAK FAILURE OUTFLOW (Q_{p1}).

$$Q_{p1} = \frac{8}{27} W_b \sqrt{g} Y_0^{3/2}$$

W_b = BREACH WIDTH - SUGGEST VALUE NOT GREATER THAN 40% OF DAM LENGTH ACROSS RIVER AT MID HEIGHT.

Y_0 = TOTAL HEIGHT FROM RIVER BED TO POOL LEVEL AT FAILURE.

STEP 3: USING USGS TOPO OR OTHER DATA, DEVELOP REPRESENTATIVE STAGE-DISCHARGE RATING FOR SELECTED DOWNSTREAM RIVER REACH.

STEP 4: ESTIMATE REACH OUTFLOW (Q_{p2}) USING FOLLOWING ITERATION.

A. APPLY Q_{p1} TO STAGE RATING, DETERMINE STAGE AND ACCOMPANYING VOLUME (V_1) IN REACH IN AC-FT. (NOTE: IF V_1 EXCEEDS 1/2 OF S, SELECT SHORTER REACH.)

B. DETERMINE TRIAL Q_{p2} :

$$Q_{p2} (\text{TRIAL}) = Q_{p1} \left(1 - \frac{V_1}{S}\right)$$

C. COMPUTE V_2 USING Q_{p2} (TRIAL).

D. AVERAGE V_1 AND V_2 AND COMPUTE Q_{p2} :

$$Q_{p2} = Q_{p1} \left(1 - \frac{V_{\text{avg}}}{S}\right)$$

STEP 5: FOR SUCCEEDING REACHES REPEAT STEPS 3 AND 4.

APRIL 1978

APPENDIX E

INFORMATION AS CONTAINED IN

THE NATIONAL INVENTORY OF DAMS

INVENTORY OF DAMS IN THE UNITED STATES

STATE	COUNTY	TOWNSHIP	SECTION	CONCRETE	STATE	COUNTY	TOWNSHIP	SECTION	CONCRETE
VT	NEEDHAM	01	01	01	VT	NEEDHAM	01	01	01
NAME				COLCHESTER POND					
LATITUDE (NORTH)				7307.5				REPORT DATE	
LONGITUDE (WEST)				150CT80				DAY MO YR	

POPULAR NAME		NAME OF IMPROVEMENT	
COLCHESTER POND		COLCHESTER POND	
NEAREST DOWNSTREAM CITY - TOWN - VILLAGE	COLCHESTER		
DIST FROM DAM (MI.)	1		
POPULATION			

TYPE OF DAM	YEAR COMPLETED	PURPOSES	STRUCTURAL HEIGHT (FT.)	HYDRAULIC HEIGHT (FT.)	IMPOUNDING CAPACITY (ACRE-FT.)	NEAREST DOWNSTREAM CITY - TOWN - VILLAGE	DIST FROM DAM (MI.)	POPULATION
01 01	1965	R	25	20	3260	COLCHESTER	1	

REMARKS									
ES-3RIG CONSTR FOR WATER SUPPLY									
SPILLWAY	MAXIMUM DISCHARGE (CFS)	VOLUME OF DAM (CV)	POWER CAPACITY (KW)	INSTALLED PROPOSED (KW)	NAVIGATION LOCKS	LENGTH (FT.)	WIDTH (FT.)	DEPTH (FT.)	TYPE OF FILL
02 01	30	850							

OWNER	ENGINEERING BY	CONSTRUCTION BY
COLCHESTER FIRE DIST #3	WHITMAN + HOWARD	

DESIGN		REGULATORY AGENCY	
CONSTRUCTION	OPERATION	MAINTENANCE	
WATER RESOURCES 80	WATER RESOURCES 80	WATER RESOURCES 80	WATER RESOURCES 80

INSPECTION BY	INSPECTION DATE	AUTHORITY FOR INSPECTION
J W SEWELL CO FOR CORPS OF ENGRS	06MAY80	CONTRACT NO. DACW 33-80-C-0051

REMARKS	

DIST OWN FED R PRV/FED SCS A VER/DATE
NEED N N N 150CT80

END

FILMED

9-85

DTIC