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NATIONAL PROGRAM FOR INSPECTION OF NON-FEDERAL DAMS
RICHVILLE DAM (VT 00074) RICHELIEU RIVER BASIN SHOREHAM
(U) CORPS OF ENGINEERS WALTHAM MA NEW ENGLAND DIV

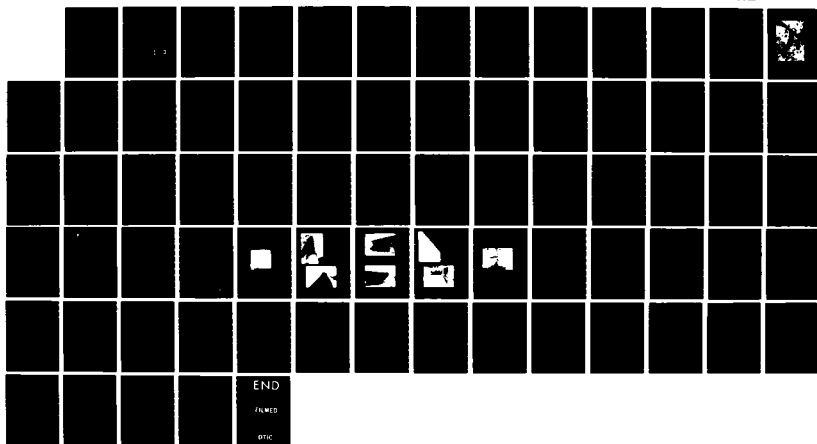
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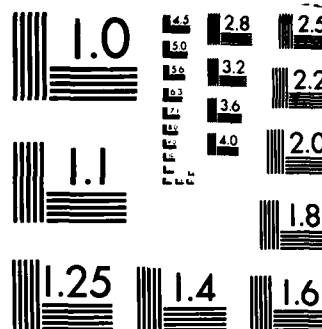
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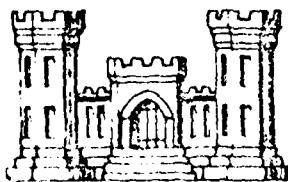
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AD-A157 518

**RICHELIEU RIVER BASIN
SHOREHAM**

**RICHVILLE DAM
VT 00074**

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



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JUL 19 1985
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**DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION, CORPS OF ENGINEERS
WALTHAM, MASS. 02154**

SEPTEMBER 1978

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20. ABSTRACT (Continue on reverse side if necessary and identify by block number) The dam is a concrete gravity dam with an overall length of 116 ft. and a height of 15 ft. It is small in size with a low hazard potential. The dam is in good condition. There are a few items which need maintenance and repair..		

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

REPLY TO
ATTENTION OF:

NEDED

APR 12 1979

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

Dear Governor Snelling:

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

A copy of this report has been forwarded to the 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, State of Vermont, Department of Fish and Game, Montpelier, Vermont 05602
ATTN: Mr. Edward F. Kehoe, Commissioner.

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 yours,


JOHN P. CHANDLER
Colonel, Corps of Engineers
Division Engineer

Incl
As stated

RICHVILLE DAM

VT00074

SHOREHAM, VERMONT

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

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NATIONAL DAM INSPECTION PROGRAM
PHASE I INSPECTION REPORT

Identification No.: VT00074
Name of Dam: Richville Dam
Town: Shoreham
County and State: Addison County, Vermont
Stream: Lemon Fair River
Date of Inspection: August 2, 1978

BRIEF ASSESSMENT

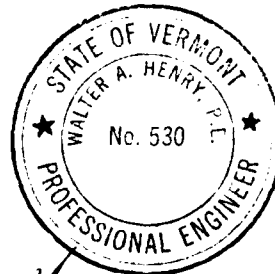
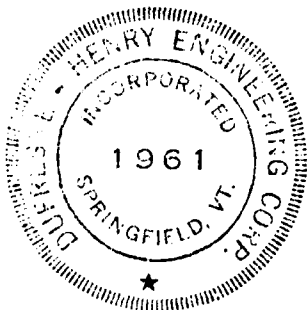
This dam is a concrete gravity dam with an overall length of 116 feet, a spillway width of 92 feet and a structural height of 15 feet. The dam was constructed, and is maintained for recreational purposes by the Vermont Department of Fish and Game.

The dam is classified as small and has a low hazard potential in the event of a dam failure. The dam is designed to overtop without damage to the structure. It is constructed on ledge and set in a deep walled gorge.

Due to the small size classification and low hazard potential the 100-year flood is used as the test flood. Under this condition, the dam would have a surcharge of 4.1 feet. This is not a hazardous situation as the dam is designed to be overtopped. The dam has a total drainage area of 28 square miles with a normal impoundment surface area of 156 acres.

The dam is in good condition. The following items require minor maintenance and repair:

1. The log boom which is rotted,
2. The gate mechanism which is severely rusted,
3. The flume which is partially blocked by a build-up of silt and debris.



Walter A. Henry

This Phase I Inspection Report on Richville 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.

Charles G. Tiersch

CHARLES G. TIERSCH, Chairman
Chief, Foundation and Materials Branch
Engineering Division

Fred J. Ravens, Jr.

FRED J. RAVENS, Jr., Member
Chief, Design Branch
Engineering Division

Saul Cooper

SAUL COOPER, Member
Chief, Water Control Branch
Engineering Division

APPROVAL RECOMMENDED:

Joe B. Fryar

JOE B. FRYAR
Chief, Engineering Division

PREFACE

This report is prepared under guidance contained in the Recommended Guidelines for Safety Inspection of Dams, for Phase I Investigations. Copies of these guidelines may be obtained from the Office of Chief of Engineers, Washington, D.C. 20314. The purpose of a Phase I Investigation is to identify expeditiously those dams which may pose hazards to human life or property. The assessment of the general condition of the dam is based upon available data and visual inspections. Detailed investigation, and analyses involving topographic mapping, subsurface investigations, testing, and detailed computational evaluations are beyond the scope of a Phase I investigation; however, the investigation is intended to identify any need for such studies.

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

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

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

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APPENDIX E

Information as Contained in the National Inventory of Dams



RICHVILLE DAM
SHOREHAM, VERMONT

3. The following maintenance items require attention:

- (a) The log boom should be replaced.
- (b) The outlet gate should be kept in operable condition.
- (c) The wooden stairs leading to the dam should be repaired.

SECTION 7: ASSESSMENT, RECOMMENDATIONS/
REMEDIAL MEASURES

7.1 Dam Assessment

a. Condition

The visual inspection and available records of the dam indicate that the dam is in good condition. There are no items requiring remedial action other than minor maintenance items noted in 7.3.

b. Adequacy of Information

The information available is insufficient to evaluate the safety of the dam other than by visual inspection.

c. Urgency

The operating and maintenance measures noted in Section 7.3 should take place within 2 years of the receipt of this Phase I Inspection Report.

d. Necessity for Additional Investigations

There were no findings in the Phase I inspection that require further investigations.

7.2 Recommendations

None, other than those noted in Section 7.3.

7.3 Remedial Measures

a. Alternatives

Not applicable.

b. Operating and Maintenance Procedures

1. A regular maintenance schedule should be implemented. This schedule would include periodic operation of gates, removal of debris and a general inspection of the dam.
2. A technical inspection should be performed every two years.

SECTION 6: STRUCTURAL STABILITY

6.1 Evaluation of Structural Stability

a. Visual Observations

The visual inspection did not disclose any findings which could indicate instability of the foundation of the structure.

b. Design and Construction Data

The available design and construction data is insufficient to formally evaluate the stability of the dam.

c. Operating Records

None of the available records indicate that foundation stability problems have developed since the dam was constructed in 1954.

d. Post-Construction Changes

Data during the construction period or thereafter is not available.

e. Seismic Stability

The dam is in Seismic Zone 2 and in accordance with recommended Phase I guidelines does not warrant seismic analysis.

SECTION 5: HYDRAULIC/HYDROLOGIC

5.1 Evaluation of Features

a. Design Data

No design data for the structures at Richville was available.

b. Experience Data

There are no records of flood events at the dam site.

c. Visual Observations

The dam has been designed to overtop without damage to the structure and is set in a steep walled gorge. Outlet structures appear adequate.

d. Overtopping Potential

Preliminary computations of the overtopping potential indicate that during a 100-year flood (test flood) the spillway would have a 4.1 foot surcharge. The overtopping potential can therefore be considered as high. This is not a hazard as the dam is designed to be overtopped.

The calculations of the spillway capacity are based on the conservative estimates that the stop logs are in place, the drawdown conduit closed and flow over a broad-crested weir. Consequently the actual flood level will be somewhat lower.

Analysis of the flood wave generated by a dam burst was based on engineering judgment. Assuming a flood wave two-thirds the height of the dam, a wave 10 feet high would be produced. No structures downstream would be adversely affected.

SECTION 4: OPERATIONAL PROCEDURES

4.1 Procedures

There are no operational procedures known.

4.2 Maintenance of Dam

Maintenance of the dam is not known. Based on the condition of the facility at the time of inspection, little maintenance is provided.

4.3 Maintenance of Operating Facilities

Maintenance of the operating facilities is not known. From the condition of the log boom, gate, and silt and debris in front of the flume, maintenance has not been provided.

4.4 Description of Any Warning System in Effect

There is no warning system associated with this facility.

4.5 Evaluation

Maintenance and operational procedures are minimal.

condition. The channel bottom is the natural stream bed (see Photo #8). There is no evidence of slope instability or of substantial obstruction to flow in the channel.

A log boom is not operational, and a portion of it lies along the right abutment. The outlet conduit is made to be operated from the spillway and thus is inaccessible during spillway discharge. The wooden stairs leading to the dam from the left are rotting and present a hazard to maintenance and inspection personnel.

d. Reservoir Area

The reservoir area consists of 156 acres at normal pool level. The surface area of the pond will increase with increased water surface elevation; however, without more detailed mapping it is not possible to determine the change.

e. Downstream Channel

The downstream channel is in fair to good condition. Directly below the dam a large pile of boulders is located within the stream and helps to dissipate the energy of the flow as it passes the dam. The overbanks are heavily vegetated with trees and brush, but the channel was free of obstructions.

Downstream of the dam a number of homes exist along the banks of the Lemon Fair River; however, these homes are located high on the banks and probably not in danger of flooding.

3.2 Evaluation

The visual inspection indicated that the dam is in good condition.

The inaccessibility of outlet conduit could on many dams pose a substantial problem; however, this is not the case for the dam at Richville. The dam has been designed to overtop and is in fact predominantly a weir.

SECTION 3: VISUAL INSPECTION

3.1 Findings

a. General

In general the Richville Dam is in good condition. The concrete is in good repair and there is no significant cracking or spalling or uneven settlement.

b. Dam

The dam is a concrete gravity dam. The water elevation was 1 foot 8 inches below the spillway crest. All exposed concrete was in very good condition with no efflorescence or spalling observed. No seeps were observed at the construction joints of the dam. Inspection for possible seeps at the base of the dam was not possible due to the existence of a pool of water about 6 feet deep. No seeps were observed along the contact of the dam and right abutment. A few wet areas were observed at rock joints about 2 feet downstream on the right abutment. Discharge from the flume outlet prevented detection of seeps along the left abutment.

Bedrock is exposed at the right and left abutments from the crest of the dam axis to about 50 feet downstream of the dam. The bedrock is basically a massively bedded, very hard blue-gray calcitic dolostone probably from the Whitehall Formation. Where exposed, the bedrock is moderagely jointed, although no systematic joint pattern is apparent. Because dolostone is relatively soluble, minor-solution features in the form of small pits up to one inch deep were observed at a bedrock exposure about 20 feet above the dam at the right abutment (see Photos #4 and #5).

The abutments downstream of the dam appear stable with no significant sloughing, erosion, or rock slides.

A field sketch shows the rock outcrops visited in the area of the dam (see Figure 1).

Floating logs and pieces of wood were observed at the intake area of the flume outlet. Small trees, less than 4 inches in trunk diameter, exist near the intake area.

c. Appurtenant Structures

The discharge channel immediately downstream of the dam has exposed bedrock at both left and right banks and is in good

SECTION 2: ENGINEERING DATA

2.1 Design

There are design plans which were prepared in 1954 by the design firm of Haley and Ward Consulting Engineers. There are no design computations or hydrological computations available.

2.2 Construction

There are no daily construction documents available for review. Based on the visual inspection of the dam and a review of the plans, it appears that the construction was completed substantially in accordance with the plans.

2.3 Operation

There are no known operational or maintenance procedures associated with this dam.

2.4 Evaluation

a. Availability

The plans for Richville Dam are stored at the Vermont Department of Fish and Game, Commissioner's Office, Montpelier, Vermont.

Computations pertaining to the design and hydraulic aspects of the facility are unavailable.

b. Adequacy

Sufficient engineering data are available for a Phase I inspection.

c. Validity

The available engineering data are considered valid on the basis of the visual inspection.

(6) Zoning

Not applicable.

(7) Impervious Core

Not applicable.

(8) Cutoff

Concrete to ledge.

(9) Grout Curtain

None known.

(10) Other

No other aspects known.

i. Spillway

The spillway consists of an ogee weir 92 feet in length. The crest of the weir is 2 feet wide and located at an elevation of 253 feet above sea level. The upstream face has a vertical wall and a 1:1 slope and a downstream radius of 5 feet. The overall height of the structure is 15 feet.

The downstream channel condition is fair to good. Directly below the dam a large pile of boulders is located in the channel. The overbanks are heavily overgrown, but no major obstructions to flow were found in the channel (see Photo #8).

j. Regulating Structures

The primary regulating structure is a gated 5' x 5' spillway on the easterly side of the dam. The pool level can be controlled by the addition or removal of stop logs. The primary purpose of this structure is to insure flow downstream of the dam during dry periods (see Photo #7). The upstream invert of the structure is located at elevation 249. The top stop log is at elevation 253.

The other regulating structure is a gated 24" conduit located in the center of the spillway. The conduit is controlled by means of a screw operated sluice gate. As the stem of the gate is located in the center of the spillway, it could not be operated during high flows. The upstream invert of the conduit is at elevation 241 (see Photo #2).

c. Elevation Data

Elevation (feet
above MSL)

Top of Dam (Maximum)	260.0
Test Flood (100-Year)	257.1
Top of Dam (Minimum)	254.0
Spillway Crest	253.0
Normal Pool	253.0
Low Flow Flume-Upstream Crest With Stop Logs	253.0
Low Flow Flume-Upstream Crest Without Stop Logs	249.0
Upstream Invert of 24" Drawdown Conduit	241.0
Streambed at Centerline of Dam	238.6

d. Reservoir Data

Feet

Length of Test Flood Pool	18480+
Length of Normal Pool	18480

e. Storage Data

Acre-Feet

Test Flood (100-Year)	1316+
Top of Dam (Minimum)	848+
Normal Pool	692

f. Reservoir Surface Area

Acres

Test Flood (100-Year)	156+
Top of Dam (Minimum)	156+
Normal Pool	156

g. Dam

(1) Type

The dam is a concrete gravity facility.

(2) Length

The overall length is 116 feet; the weir length is 92 feet.

(3) Height

The maximum height is 15 feet.

(4) Top Width

Level section at top of weir is 2 feet.

(5) Side Slope

Upstream - Vertical Concrete Face
Downstream - 1H:1.5V Concrete Spillway

1.3 Pertinent Data

a. Drainage Area

The total drainage area above the Richville Dam is 28 sq. miles.¹

The drainage area is located in the south central portion of a physiographic region of Vermont known as the Champlain Lowlands. The Champlain Lowland represents a northern extension of the Great Valley Province of the Appalachian Mountain system.

The geology of the area may best be described as a broad, north-south trending structural trough of early marine deposits, overlying sandstone and quartz and more recently, a series of shales. During the mountain-building period known as the Taconic Orogeny the Champlain Thrust Fault uplifted the Paleozoic carbonates and quartzites to overlie the younger shales. A branch of this fault known as the Orwell Fault passes through the drainage basin.

The predominant soils in the drainage area belong to the Vergennes-Covington association. These are poorly-drained, clayey soils formed in water-deposited minerals. Also present are soils belonging to Farmington-Nellis and Nassau-Dutchess associations. These are shallow soils that have formed in glacial tills. All soils belong to the hydrologic group D.

The major waterways within the drainage basin are: the Lemon Fair River, the Little Lemon Fair River and Sawmill Brook.

b. Discharge at Dam Site

(1) Outlet Works

Two structures have been designed into the dam for the purpose of regulating the pond level. The primary regulating outlet is a 5' x 5' flume regulated by a series of stop logs. In addition to this, a gated 24" conduit is located in the center of the dam. The primary function of these outlets appears to be for the regulation of low flow. During high water conditions the conduit could not be operated, and it is also possible that the stop logs may be inaccessible.

(2) Maximum Known Flood at Dam Site

There was no record available of major flooding at the dam site.

(3) Spillway Capacity

The capacity of the spillway at elevation 254 (the point at which the easterly abutment will be overtopped) is 260 cfs.

¹Planimetered from Bridport, Vt.; Sudbury, Vt.; Orwell, Vt; Vt-N.Y.; and Cornwall, Vt. 7.5 minute quad sheets.

The dam was constructed on ledge and the stream channel is ledge to a height well above the dam.

c. Size Classification

Richville Dam impounds 156 acres. The dam has a maximum storage potential of 848 acre-feet and a height of 15 feet. The Army Corps of Engineers recommends that dams with a storage potential of greater than 50 acre-feet but less than 1000 acre-feet and a height of greater than 25 feet but less than 40 feet be classified as small. In the case of this dam the storage volume governs. The dam is classified as small.

d. Hazard Classification

The potential for hazard in the event of the failure of this dam is low. The homes near the affected area, in the event of a dam break, are above the flood wave or are well removed from the area of inundation.

e. Ownership

The Richville Dam is owned by the Vermont Department of Fish and Game, Montpelier, Vermont.

f. Operator

Richville Dam has no one individual responsible for the day to day operation of the facility.

g. Purpose of Dam

The impoundment is used for recreational purposes. Such recreation is primarily fishing, boating and hunting.

h. Design and Construction History

The dam was designed and constructed in 1954. Design engineer was Haley and Ward Consulting Engineers, Boston, Massachusetts. The Contractor was the C.W. Miller Company. Construction records are not available but a review of plans and a visual inspection indicate that the dam was built in accordance with the plans.

i. Normal Operational Procedures

Normal operational procedures are not known.

The gate was not operated at the time of inspection. The outlet at the left abutment which has stop boards had a considerable build-up of silt and debris in front of it.

NATIONAL DAM INSPECTION PROGRAM
PHASE I INSPECTION REPORT
RICHVILLE 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. Dufresne-Henry Engineering Corporation 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 Dufresne-Henry Engineering Corporation under a letter of May 26, 1978 from Ralph T. Garver, Colonel, Corps of Engineers. Contract No. DACW33-78-C-0341 has been assigned by the Corps of Engineers for this work.

b. Purpose

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 prepare the states to initiate quickly effective dam safety programs for non-Federal dams.
3. To update, verify and complete the National Inventory of dams.

1.2 Description of Project

a. Location

The Richville Dam is located on the Lemon Fair River, approximately 14 miles upstream from where it converges with Otter Creek, in the Richelieu River Basin. The dam is located in the town of Shoreham, Addison County, which lies in the west central section of Vermont.

b. Description of Dam and Appurtenances

The Richville Dam is a concrete gravity facility with an overall length of 116 feet and a maximum height of 15 feet.

The ogee spillway has a weir length of 92 feet with a crest elevation of 253 MSL with training walls at 260 MSL.



MAP SOURCE

U.S. GEOLOGICAL SURVEY
ORWELL QUADRANGLE
VERMONT - NEW YORK
7.5 MIN. SERIES
1:24000 1967

CLIENT NO	22-0561	DUFRESNE-HENRY ENGINEERING CORP. LOCATION MAP RICHVILLE DAM	VERMONT	A	6013
PROJ. ENG	MRP				
DRAWN BY	RB				
DATE	9-6-78				
		SHOREHAM			

APPENDIX A

VISUAL INSPECTION CHECK LIST

VISUAL INSPECTION CHECK LIST
PARTY ORGANIZATIONPROJECT RICHVILLE DAMDATE August 2, 1978TIME 10:00WEATHER Cloudy, overcast

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

PARTY:

1. <u>W. A. Henry</u>	<u>D-H</u>	6. _____
2. <u>M. R. Peloso</u>	<u>D-H</u>	7. _____
3. <u>G. Castro</u>	<u>GEI</u>	8. _____
4. _____		9. _____
5. _____		10. _____

PROJECT FEATURE

INSPECTED BY

REMARKS

1. _____		
2. _____		
3. _____		
4. _____		
5. _____		
6. _____		
7. _____		
8. _____		
9. _____		
10. _____		

PERIODIC INSPECTION CHECK LIST

2 of 9

PROJECT RICHVILLE DAMDATE August 2, 1978PROJECT FEATURE Concrete Gravity Dam

NAME _____

DISCIPLINE _____

NAME _____

AREA EVALUATED	CONDITION
<u>DAM EMBANKMENT</u>	
Crest Elevation	253.00
Current Pool Elevation	251.30
Maximum Impoundment to Date	Unknown.
Surface Cracks	None observed.
Pavement Condition	Not applicable.
Movement or Settlement of Crest	None observed.
Lateral Movement	None observed.
Vertical Alignment	Good.
Horizontal Alignment	Good.
Condition at Abutment and at Concrete Structures	Good.
Indications of Movement of Structural Items on Slopes	N/A
Trespassing on Slopes	No detrimental effects.
Sloughing or Erosion of Slopes or Abutments	N/A
Rock Slope Protection - Riprap Failures	N/A
Unusual Movement or Cracking at or near Toes	N/A
Unusual Embankment or Downstream Seepage	N/A
Piping or Boils	None observed
Foundation Drainage Features	None known to exist.
Toe Drains	None known to exist.
Instrumentation System	
Differential Settlement	None observable.
Condition of Structure Foundation	Good.

PERIODIC INSPECTION CHECK LIST

3 of 9

PROJECT RICHVILLE DAMDATE August 2, 1978

PROJECT FEATURE _____

NAME _____

DISCIPLINE _____

NAME _____

AREA EVALUATED	CONDITION
<u>DIKE EMBANKMENT</u>	No Dikes.
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	

PERIODIC INSPECTION CHECK LIST

4 of 9

PROJECT RICHVILLE DAM

DATE August 2, 1978

PROJECT FEATURE _____

NAME _____

DISCIPLINE _____

NAME _____

AREA EVALUATED	CONDITION
<u>OUTLET WORKS - INTAKE CHANNEL AND INTAKE STRUCTURE</u>	At flume with stop boards.
a. Approach Channel	
Slope Conditions	Cluttered with debris, mostly logs and brush.
Bottom Conditions	6" silt on upstream face of wood stop boards (28" high, 4 boards).
Rock Slides or Falls	
Log Boom	Log boom has deteriorated and is on the shoreline of the dam.
Debris	Debris has accumulated and submerged at upstream face.
Condition of Concrete Lining	None.
Drains or Weep Holes	None.
b. Intake Structure	
Condition of Concrete	Good.
Stop Logs and Slots	Condition is good; logs appear adequate.

PERIODIC INSPECTION CHECK LIST

5 of 9

PROJECT RICHVILLE DAMDATE August 2, 1978

PROJECT FEATURE _____

NAME _____

DISCIPLINE _____

NAME _____

AREA EVALUATED	CONDITION
<u>OUTLET WORKS - CONTROL TOWER</u>	
a. Concrete and Structural	There is a gate approximately 24" in diameter located at center of dam.
General Condition	Unable to operate.
Condition of Joints	
Spalling	None.
Visible Reinforcing	None.
Rusting or Staining of Concrete	None.
Any Seepage or Efflorescence	None.
Joint Alignment	Good.
Unusual Seepage or Leaks in Gate Chamber	None.
Cracks	None
Rusting or Corrosion of Steel	Yes - on conduit and gate mechanism.
b. Mechanical and Electrical	
Air Vents	
Float Wells	
Crane Hoist	None
Elevator	
Hydraulic System	
Service Gates	
Emergency Gates	
Lightning Protection System	
Emergency Power System	
Wiring and Lighting System	

PERIODIC INSPECTION CHECK LIST

6 of 9

PROJECT RICHVILLE DAM

DATE August 2, 1978

PROJECT FEATURE _____

NAME _____

DISCIPLINE _____

NAME _____

AREA EVALUATED	CONDITION
<u>OUTLET WORKS - TRANSITION</u> <u>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	None at site.

PERIODIC INSPECTION CHECK LIST

7 of 9

PROJECT RICHVILLE DAMDATE August 2, 1978

PROJECT FEATURE _____

NAME _____

DISCIPLINE _____

NAME _____

AREA EVALUATED	CONDITION
<u>OUTLET WORKS - OUTLET STRUCTURE AND OUTLET CHANNEL</u>	
General Condition of Concrete	Good.
Rust or Staining	None.
Spalling	None.
Erosion or Cavitation	None.
Visible Reinforcing	None.
Any Seepage or Efflorescence	None.
Condition at Joints	None.
Drain Holes	None
Channel	
Loose Rock or Trees Overhanging Channel	Trees overhanging stream channel.
Condition of Discharge Channel	Fair to good.

PERIODIC INSPECTION CHECK LIST

8 of 9

PROJECT RICHVILLE DAMDATE August 2, 1978

PROJECT FEATURE _____

NAME _____

DISCIPLINE _____

NAME _____

AREA EVALUATED	CONDITION
<u>OUTLET WORKS - SPILLWAY WEIR,</u> <u>APPROACH AND DISCHARGE CHANNELS</u>	
a. Approach Channel	
General Condition	Good.
Loose Rock Overhanging Channel	None observed.
Trees Overhanging Channel	Small trees less than 4 inches in diameter.
Floor of Approach Channel	Unobservable.
b. Weir and Training Walls	
General Condition of Concrete	Good.
Rust or Staining	None.
Spalling	None.
Any Visible Reinforcing	None.
Any Seepage or Efflorescence	None.
Drain Holes	None.
c. Discharge Channel	
General Condition	Good.
Loose Rock Overhanging Channel	None observed.
Trees Overhanging Channel	Small trees less than 4 inches in diameter.
Floor of Channel	Concrete.
Other obstructions	None observed.

PERIODIC INSPECTION CHECK LIST

9 of 9

PROJECT RICHVILLE DAM

DATE August 2, 1978

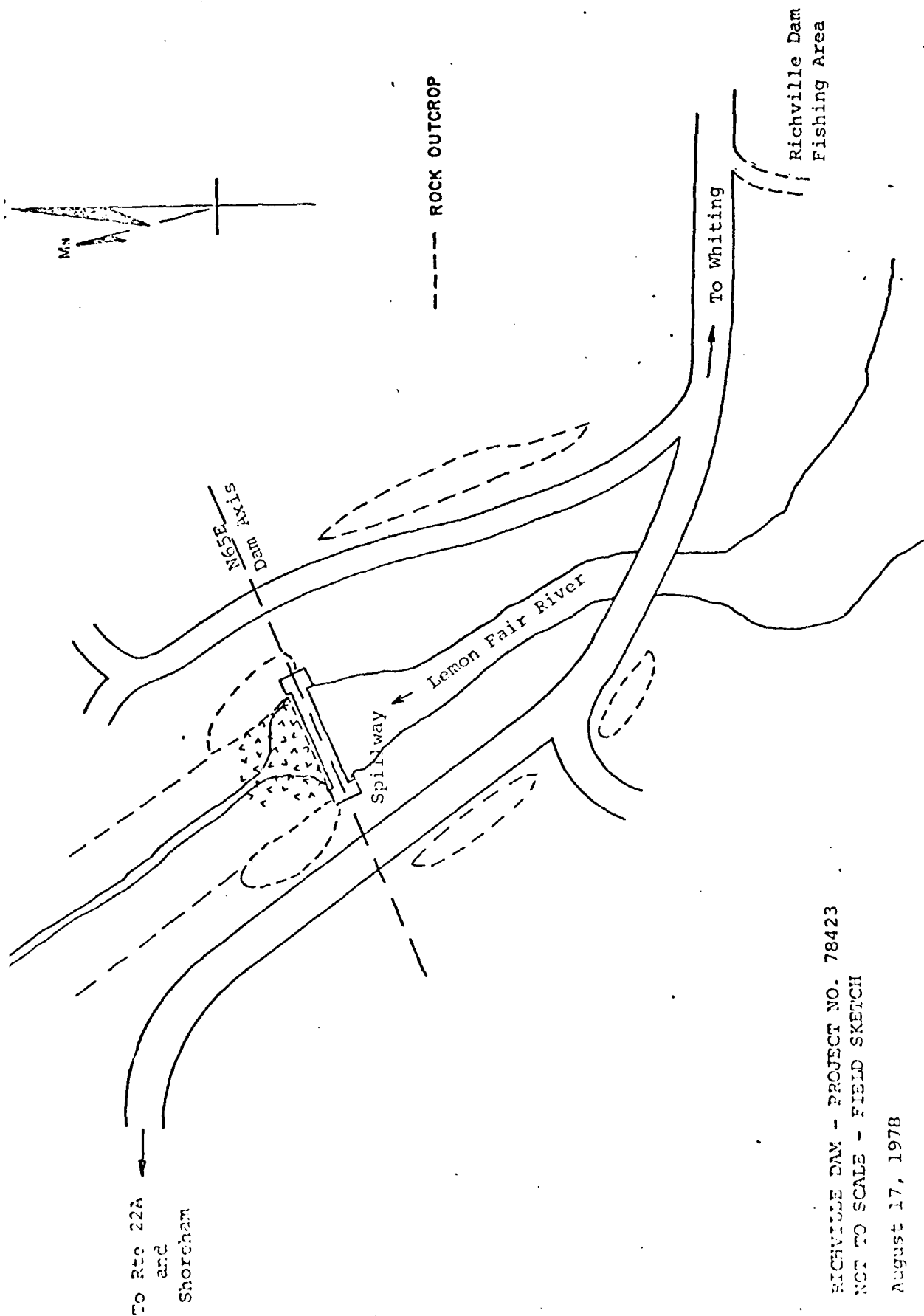
PROJECT FEATURE _____

NAME _____

DISCIPLINE _____

NAME _____

AREA EVALUATED	CONDITION
<u>OUTLET WORKS - SERVICE BRIDGE</u>	No service bridge.
a. Super Structure	Wood steps down to the dam from highway are in total disrepair. Steps are missing, broken and rotted; hand rails are also gone. Use of stairs is dangerous. Should be repaired.
Bearings	
Anchor Bolts	
Bridge Seat	
Longitudinal Members	
Under Side of Deck	
Secondary Bracing	
Deck	
Drainage System	
Railings	
Expansion Joints	
Paint	
b. Abutment & Piers	
General Condition of Concrete	
Alignment of Abutment	
Approach to Bridge	
Condition of Seat & Backwall	



RICHVILLE DAM - PROJECT NO. 78423

NOT TO SCALE - FIELD SKETCH

August 17, 1978

APPENDIX B

PROJECT RECORDS AND PLANS

MENTAL
SERVATION
MONTPELIER

AGENCY MEMORANDUM
SUBJECT

Richville Dam - Shoreham

rd F. Kehoe, Commissioner, Department of Fish & Game

ld H. Spies, Dam Construction Engineer,
rtment of Water Resources

ember 27, 1972

On November 16, 1972, the writer inspected the subject structure.
The dam is a concrete ogee weir with a flume containing stop planks for
water level control.

This dam appears to be in excellent condition. No cracking was
detected and it wasn't possible to determine if any leakage existed. The
boom has broken loose on the west side and should be repaired.

Robert Collins, Maintenance Supervisor
Richard Sears, Land Negotiator

ROUTING		
GENERAL		
TO	DATE	
DHS JEC	12/5 12/2	
SUBMITTED TO		
FILE	✓	

FINDINGS OF FACT

Hearing on application of the Fish and Game Service for authorization by the State Water Conservation Board to construct the subject dam for the purpose of storing in excess of 500,000 cubic feet of water for use in the development of a water fowl refuge and fish habitat on Lemon Fair River was heard by the Board at the Richville School House, February 27, 1954.

Plans and specifications for the proposed dam as prepared by Healy & Ward, Engineers, of Boston, were presented and made a part of the record.

The record also shows the following pertinent facts with relation to this project from testimony of George W. Davis and Roger Seamans of the Fish & Game Service:

- (1) The dam would be located on the Lemon Fair River at Richville.
- (2) The Fish & Game Service has title or flowage rights to all land to be flowed.
- (3) The dam would be used to impound water the year round.
- (4) The reservoir formed by the dam is to be used for water fowl refuge - to improve fishing on the Lemon Fair River.

The testimony presented showed that the public good would be served as follows:

- (1) The watershed would benefit because of the improved scenic and recreational value to the area by virtue of this impoundment.
- (2) The improved fishing brought about by the reservoir and the improved hunting to result from the operation of certain portions as a waterfowl refuge.
- (3) The town revenues would continue on all properties purchased by the Fish and Game Service.
- (4) All areas to be flowed are clear or will be cleared of timber and tree growth.

DUFRESNE-HENRY ENGINEERING CORPORATION

Blavin _____ SUBJECT Storage VS. Elevation SHEET NO. 1 OF 2
 18 _____ Richville Dam (Lemon Fair River) JOB NO. 22-0561

tion is that surface area stage constant with increase in elevation.
 lack of greater detail mapping.

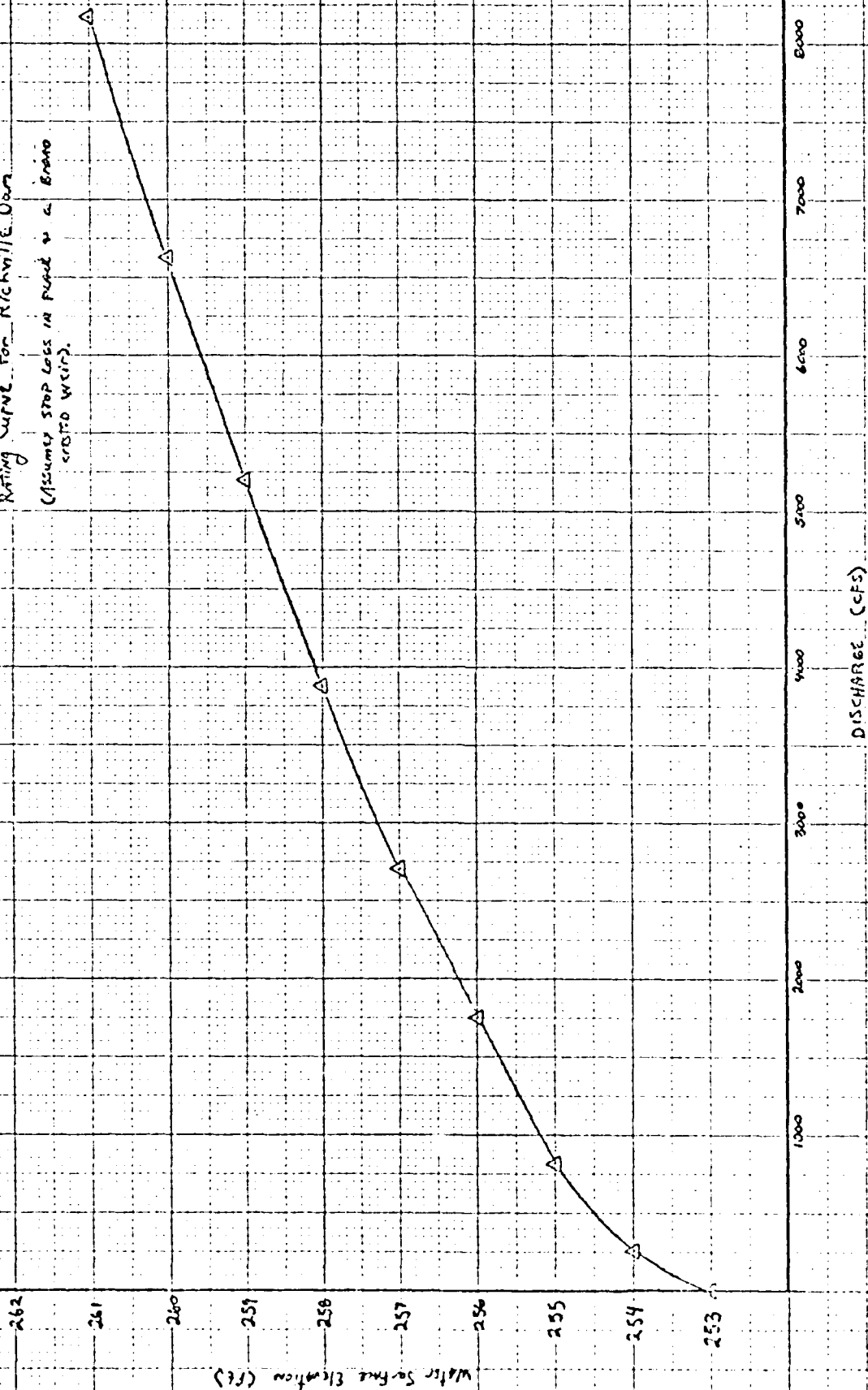
ce Elevation (ft)	Surface Area (Acre)	Storage (Acre/ft)
253	156	692
254	156+	848+
255	156+	1004+
256	156+	1160+
257	156+	1316+
258	156+	1472+
259	156+	1028+
260	156+	1784+
261	156+	1940+
262	156+	2096+
263	156+	2252+

is realized that this is only an approximation of the storage area, but
 out more available information it is the best available. Storage will
 underestimated by this analysis so that actual water surface elevations
 luced by flooding would be somewhat lower. However, for the purposes of
 s investigation, the estimate is sufficient.

SHEET 2 of 2

Rating Curve for Richville Dam

(Assumes stop loss in pond & a broad crest weir)



DUFRESNE-HENRY ENGINEERING CORPORATION

J. Slavin SUBJECT Discharge Over the Dam SHEET NO. 1 OF 2
2/3/78 Richville Dam JOB NO. 22-0561

Over Dam

umption is that all stop logs are in place and gate structure is
ed. Flow is further considered to take place over a broad-crested

This assumption under rates the capacity of the dam, but not
ificantly.)

$$Q = CLH^{3/2}$$

$$Q = CAH_{AVE}^{1/2}$$

face Elevation Above MSL.)	Weir Length (L) (Feet)	Area (A) (Sq. Feet)	Average Head (H) (Feet)	C	Discharge (Q) (CFS)
253	92	0	0	2.66	0
254	97	97	1	2.85	275
255	106	203	1.9	3.32	930
256	106	309	2.9	3.32	1750
257	116	425	3.7	3.32	2700
258	116	541	4.7	3.32	3880
259	116	657	5.7	3.32	5190
260	116	773	6.7	3.32	6620
261	116	889	7.7	3.32	8170
262	116	1005	8.7	3.32	9820

DUFRESNE-HENRY ENGINEERING CORPORATION

J. Slavin

SUBJECT 100-Year Discharge on Lemon

SHEET NO. 1 OF 1

-22-78

Fair River

JOB NO. 22-0561-

methodology used to determine a peak discharge for the Lemon Fair
is to use a drainage area reduction to the 0.75 power from the USGS
Otter Creek in Center Rutland, Vermont.

$$Q_{OC} = 19880 \text{ cfs} *$$

(Otter Creek at C. Rutland gage) - 307 sq. mi.

$$Q = Q_{OC} \left(\frac{DA_{(LF)}}{DA_{(OC)}} \right)^{0.75}$$

$$F(100) = 19880 \left(\frac{28 \text{ sq. mi.}}{307 \text{ sq. mi.}} \right)^{0.75}$$

$$F(100) = 3300 \text{ cfs}$$

$$F(500) = 29060 \left(\frac{28 \text{ mi.}^2}{307 \text{ mi.}^2} \right)^{0.75}$$

$$F(500) = 4825 \text{ cfs}$$

SCHARGES FOR THE LEMON FAIR RIVER

$$= 28 \text{ sq. mi.}$$

$$= 3300 \text{ cfs}$$

$$= 4825 \text{ cfs}$$

The 100-year flood was selected and input into the HEC-1 program as a
multiplier of the PMF.

Computed for Town of Rutland FIS, computations attached in Appendix

APPENDIX D

HYDRAULIC COMPUTATIONS



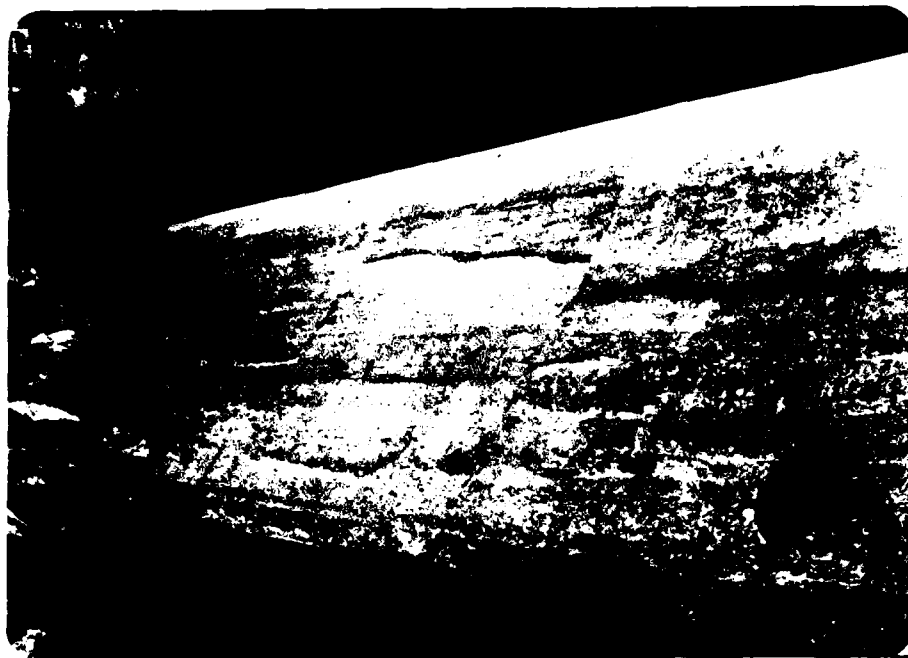
#8 VIEW OF DOWNSTREAM CHANNEL FROM DAM.



#6 GATE OPERATING STEM
IN SEVERELY RUSTED
CONDITION.



#7 DOWNSTREAM VIEW OF FLUME SHOWING STOP BOARDS.



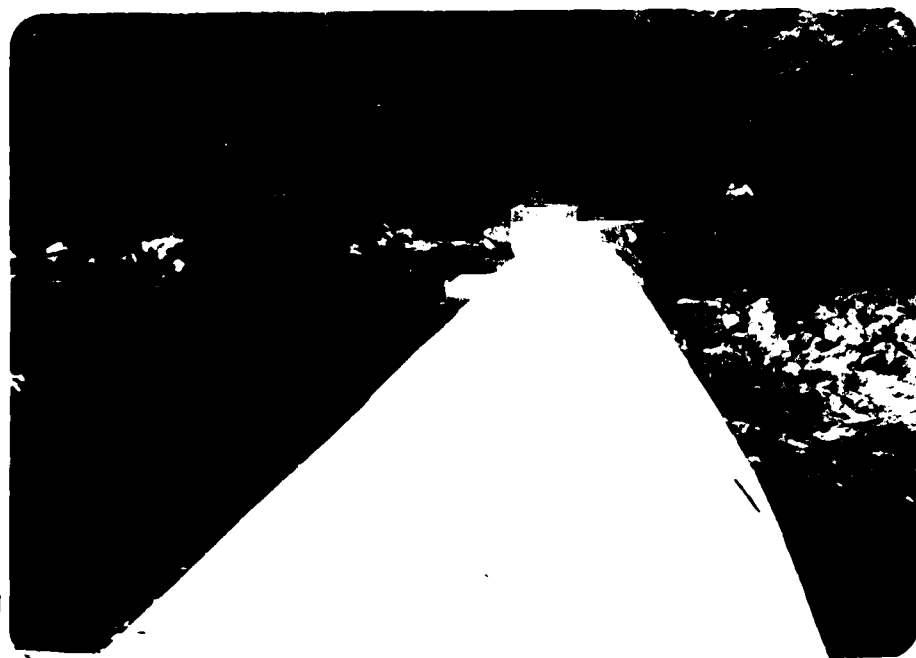
#4 VIEW OF DOWNSTREAM FACE OF DAM AND RIGHT ABUTMENT.



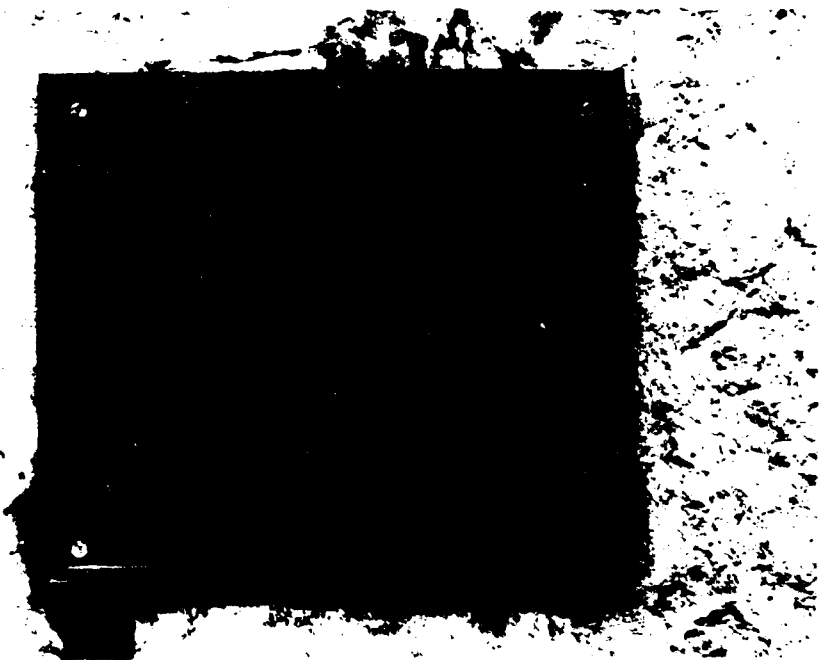
#5 VIEW OF DOWNSTREAM FACE OF DAM, LEFT ABUTMENT AND FLUME.



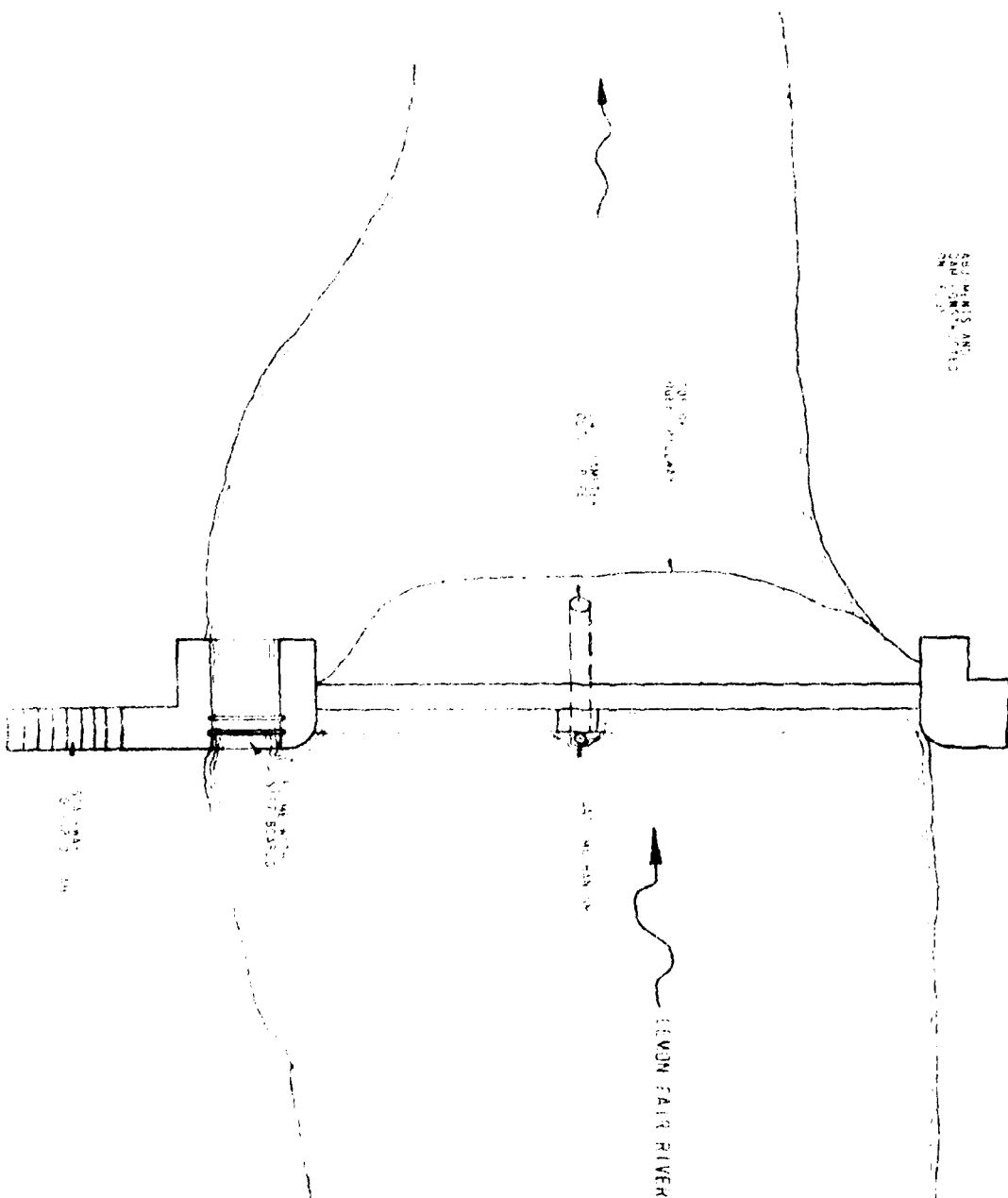
#2 VIEW OF DAM FROM
LEFT ABUTMENT.



#3 VIEW OF DAM FROM RIGHT ABUTMENT.



#1 MARKER GIVING CREDITS FOR CONSTRUCTION OF THE RICHVILLE DAM.

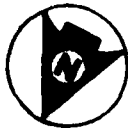


NATIONAL ENGINEERING CORP.		1001 BAY STREET, NEW ORLEANS, LA 70112	
NATIONAL PROGRAM OF INSPECTION & MAINT. DATA		RICHARD E. RAY	
SKELETON PLAN			

APPENDIX C

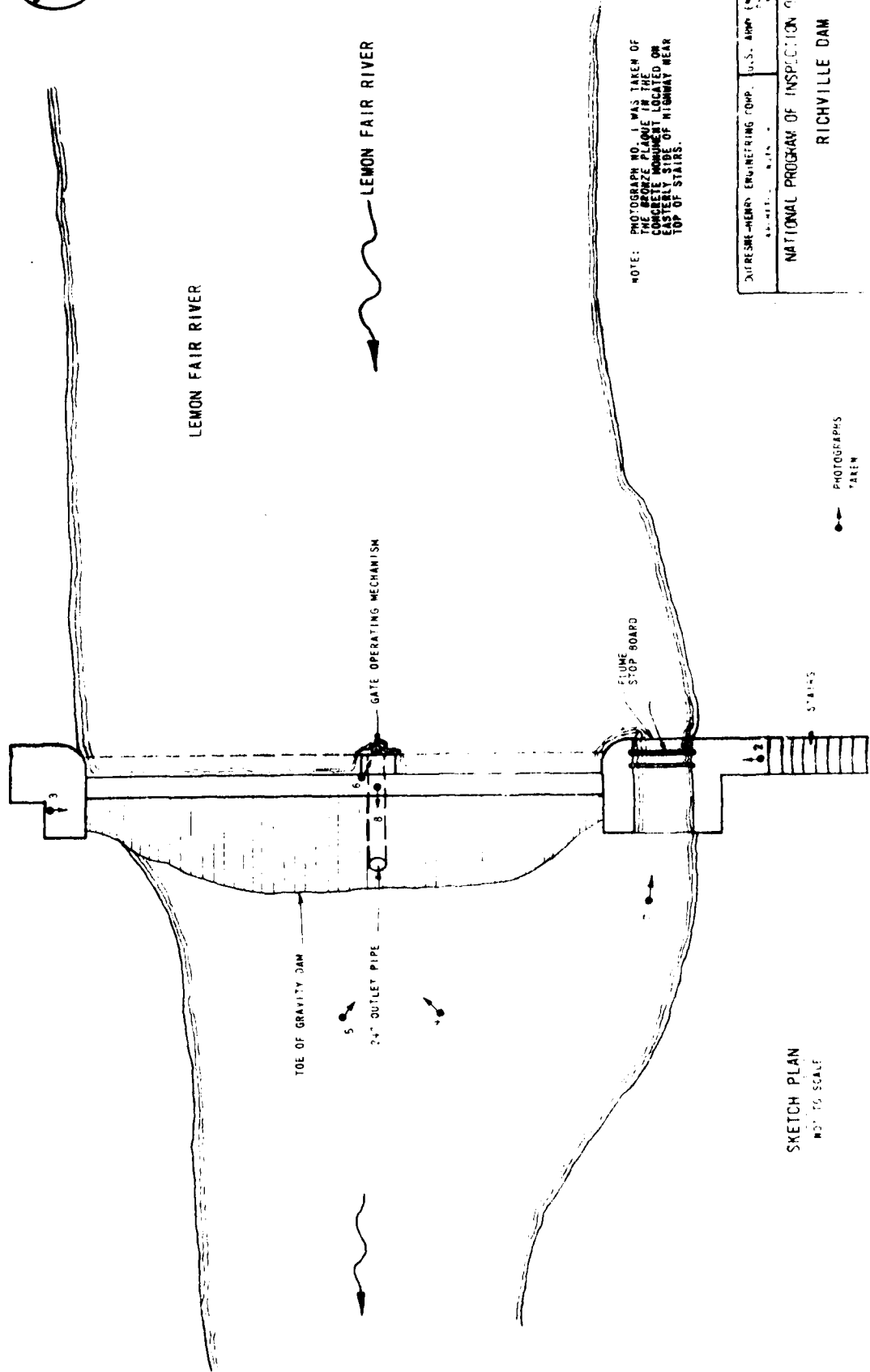
PHOTOGRAPHS

1. Marker giving credits for construction of the Richville Dam.
2. View of dam from left abutment.
3. View of dam from right abutment.
4. View of downstream face of dam and right abutment.
5. View of downstream face of dam, left abutment and flume.
6. Gate operating stem in severely rusted condition.
7. Downstream view of flume showing stop boards.
8. View of downstream channel from dam.



LEMON FAIR RIVER

LEMON FAIR RIVER



NOTE: PHOTOGRAPH NO. 1 WAS TAKEN OF
THE BRONZE PLAQUE IN THE
CUTTING ROOMS LOCATED ON
THE EAST SIDE OF HIGHWAY NEAR
TOP OF STAIRS.

DAVIS-HERRING ENGINEERING CO., U.S. ARMY ENGINEER OFFICE, NEW ORLEANS,
LOUISIANA

NATIONAL PROGRAM OF INSPECTION OF NON-FED DAMS

RICHVILLE DAM

PHOTOGRAPHS
TAKEN

SKETCH PLAN
NOT TO SCALE

15001-100

15001-100

=====

The Acting Commissioner of Water Resources stated that the plans had been reviewed and that they were satisfactory.

ORDER OF PERMISSION

Subsequent to the hearing and prior to authorization of the project, the Water Conservation Board came to an agreement with George W. Davis, Director, State Fish & Game Service, that at dry periods of the year when there was low flow or no flow below the dam, the department would pass 4 cubic feet/sec from the impoundment to the stream below to provide for the needs of riparian owners downstream.

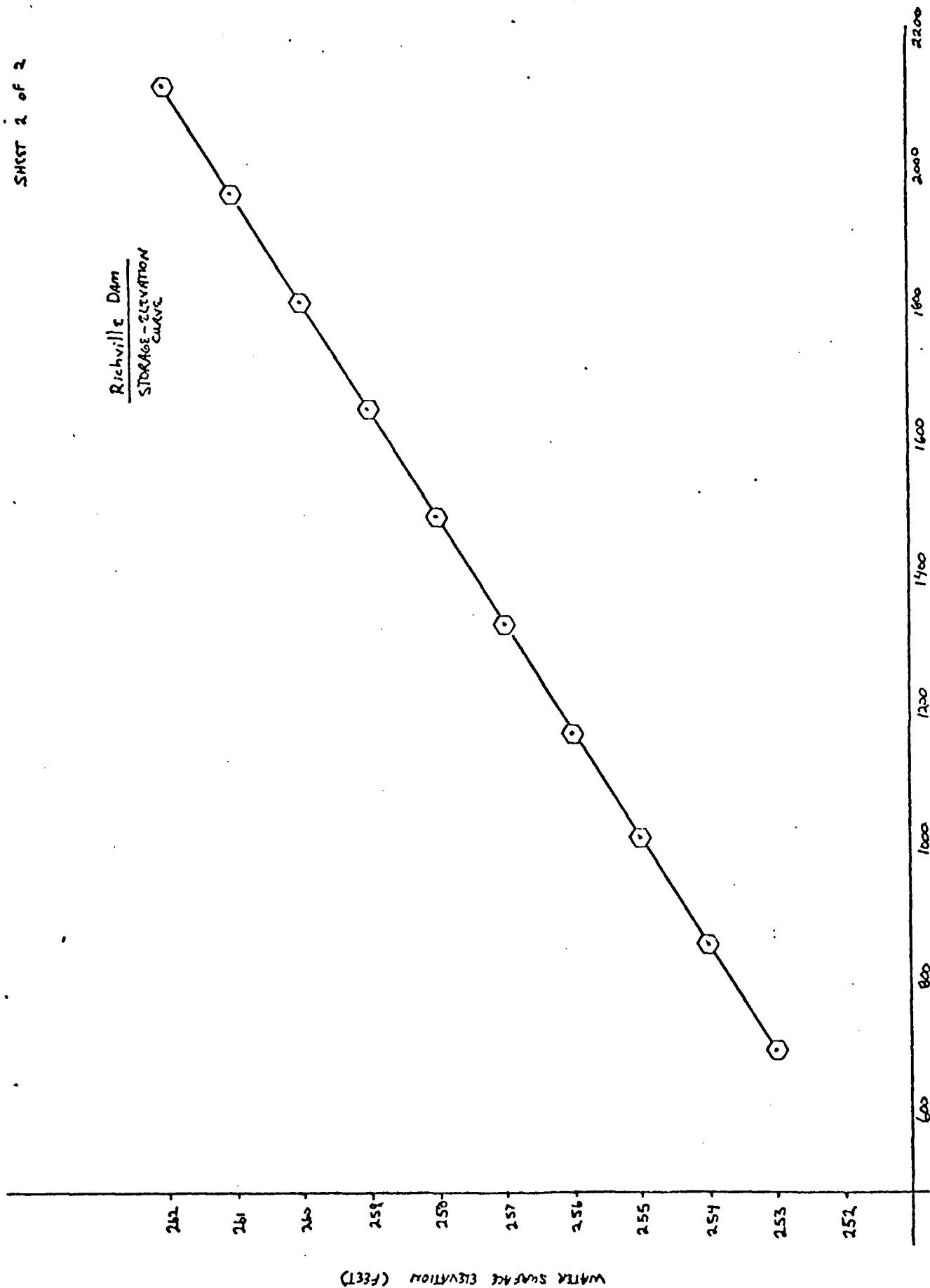
The Board voted to issue its authorization for the project.

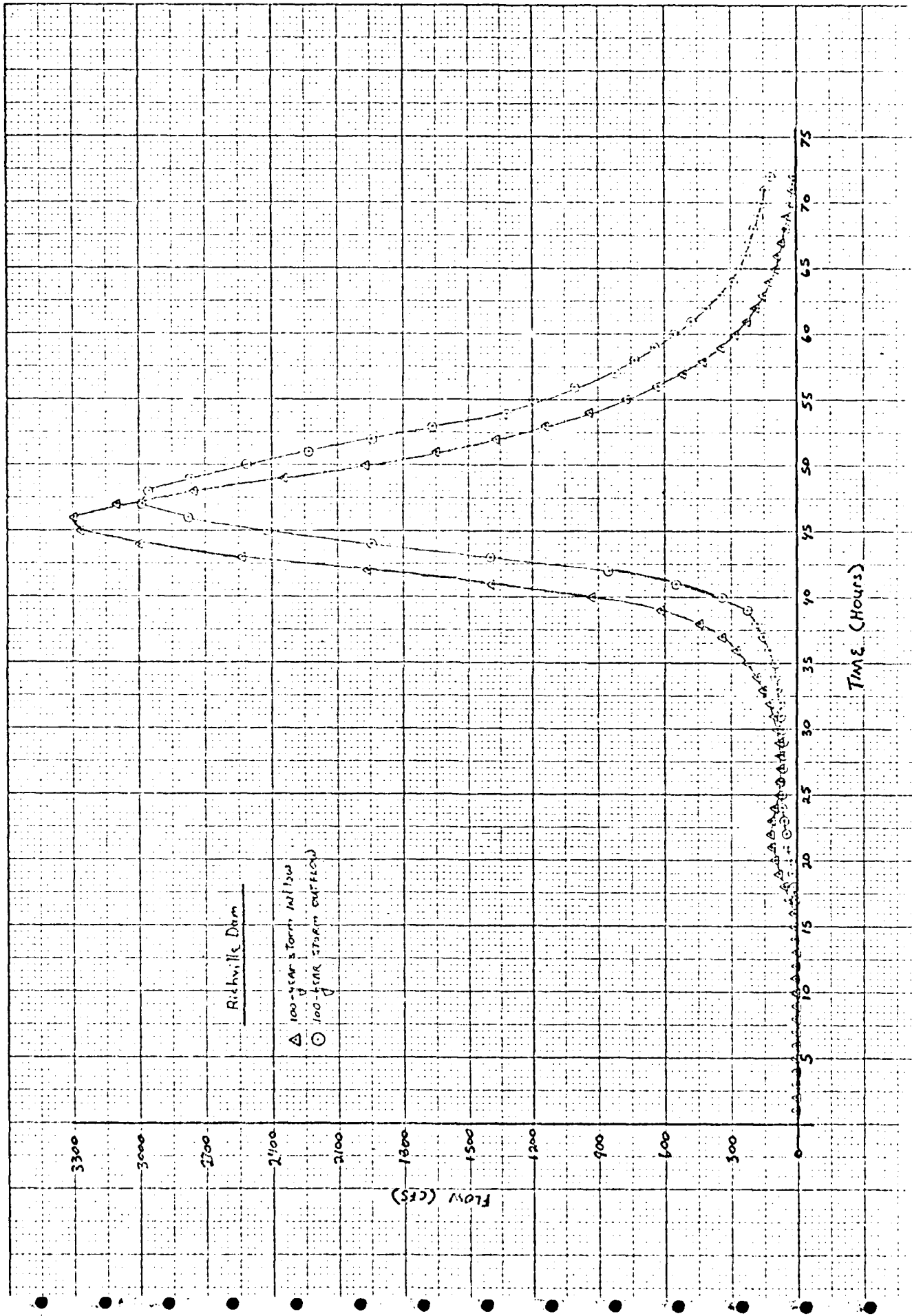
Done at Montpelier, Vermont, this 25th day of March 1954.

Benjamin W. Fisher Chairman
Thomas W. Lunn

Vermont State Water Conservation Board

Richville Dam
STORAGE-ELEVATION
CURVE





MEC-1 VERSION DATED JAN 1973
UPDATED AUG 74
CHANGE NC- 01

SPILLWAY DESIGN FLOOD

RICHVILLE DAM
PHASE 1 DAM SAFETY INVESTIGATION

JOB SPECIFICATION

NQ MHR NMN ICAY IHR IMN METRC IPLT IPRT NSTAN
72 1 0 1 0 0 0 2 0 0
JOPER NWT
3 0

SUB-AREA RUNOFF COMPUTATION

PROBABLE MAXIMUM 24 - HOUR PRECIPITATIO

ISTAQ ICONP IECON ITAPE JPLT JPRT INAME
1 0 0 0 0 1

HYDROGRAPH DATA
IHYOG IUNG TAREA SNAP TRSDA TRSPC RATIO ISNCW ISAME LOCAL
1 1 28.00 0.0 28.00 0.93 0.116 0 0 0

PRECIP DATA
SPFE PMS R6 R12 R24 R72 R96
0.0 17.00 99.00 111.00 123.00 130.00 0.0 0.0

LOSS DATA
STRKR DLTKR RTIOL ERAIN STRKS RTIOK STRTL CNSTL ALSNX RTIMP
0.0 0.0 1.00 0.0 0.0 1.00 0.20 0.05 0.0 0.0

UNIT HYDROGRAPH DATA
TP# 6.40 CP#0.68 NTA# 0

RECESSION DATA

STRATQ# 50.00 GRCSN# 50.00 RTIOL# 1.00
APPROXIMATE CLARK COEFFICIENTS FROM GIVEN SNYDER CP AND TP ARE TC# 7.63 AND R# 4.89 INTERVALS

UNIT HYDROGRAPH 31 END-OF-PERIOD ORDINATES, LAG# 6.35 HOURS, CP# 0.68 VOL# 1.00
112. 409. 805. 1235. 1617. 1860. 1938. 1813. 1533. 1249.
1017. 829. 550. 448. 365. 297. 242. 197. 161.
121. 87. 71. 58. 47. 38. 31. 25. 21.
17.

END-OF-PERIOD FLOW

TIME	RAIN	EXCS	COMP Q
1 1 0	0.01	0.00	50.
1 2 0	0.01	0.03	50.
1 3 0	0.01	0.03	50.
1 4 0	0.01	0.00	50.
1 5 0	0.01	0.03	50.
1 6 0	0.01	0.00	50.
1 7 0	0.02	0.00	50.
1 8 0	0.02	0.00	50.
1 9 0	0.02	0.00	50.
1 10 0	0.02	0.00	50.
1 11 0	0.02	0.00	50.

12	0.02	0.00	50
13	0.02	0.00	52
14	0.11	0.06	64
15	0.13	0.08	97
16	0.34	0.29	184
17	0.12	0.07	343
18	0.10	0.05	546
19	0.01	0.00	761
20	0.01	0.00	945
21	0.01	0.00	1059
22	0.01	0.00	1067
23	0.01	0.00	1024
24	0.01	0.00	898
25	0.01	0.00	764
26	0.13	0.08	640
27	0.13	0.08	622
28	0.13	0.08	629
29	0.13	0.08	632
30	0.13	0.08	766
31	0.32	0.27	889
32	0.32	0.27	1067
33	0.32	0.27	1305
34	0.32	0.27	1605
35	0.32	0.27	1973
36	1.57	1.52	2919
37	1.68	1.83	3840
38	2.35	2.30	5341
39	5.95	5.90	7989
40	2.19	2.14	12032
41	1.72	1.67	16922
42	0.19	0.14	21883
43	0.19	0.14	25919
44	0.19	0.14	25213
45	0.19	0.14	28516
46	0.19	0.14	26848
47	0.19	0.14	23706
48	0.00	0.00	20308
49	0.00	0.00	17047
50	0.00	0.00	14238
51	0.00	0.00	11869
52	0.00	0.00	9854
53	0.00	0.00	8136
54	0.00	0.00	6678
55	0.00	0.00	5450
56	0.00	0.00	4452
57	0.00	0.00	3636
58	0.00	0.00	2970
59	0.00	0.00	2428
60	0.00	0.00	1986
61	0.00	0.00	1623
62	0.00	0.00	1324
63	0.00	0.00	1088
64	0.00	0.00	892
65	0.00	0.00	732
66	0.00	0.00	602
67	0.00	0.00	479
68	0.00	0.00	374
69	0.00	0.00	283
70	0.00	0.00	158
71	0.00	0.00	109
SUM	20.63	18.87	341945
PEAK	28516	25861	72-HOUR
CFS			4749
			TOTAL VOLUME
			341945

INFLUENCE OF OUTFLOW ZONE AND OBSERVED FLOW ZONE

[illegible]

[illegible]

— — — — —

6

[illegible]

INFLOW, OUTFLOW AND OBSERVED FLOWS*

	400.	800.	1200.	1600.	2000.	2400.	2800.	3200.	3600.	0.
1 01										
1 12										
1 23										
1 34										
1 45										
1 56										
1 67										
1 78										
1 89										
1 90										
1 101										
1 112										
1 123										
1 134										
1 145										
1 156										
1 167										
1 178										
1 189										
1 190										
1 201										
1 212										
1 223										
1 234										
2 05										
2 16										
2 27										
2 38										
2 49										
2 50										
2 61										
2 72										
2 83										
2 94										
2 105										
2 116										
2 127										
2 138										
2 149										
2 150										
2 161										
2 172										
2 183										
2 194										
2 205										
2 216										
2 227										
2 238										
3 09										
3 10										
3 21										
3 32										
3 43										
3 54										
3 65										
3 76										
3 87										
3 98										
3 109										

3	3	3	3	3	3
18	19	20	21	22	23
0	0	0	0	0	0
10	10	10	10	10	10
1	1	1	1	1	1

[illegible]

3 3 0	1257	1510	1940
3 4 0	1161	1257	1667
3 5 0	1146	1041	1419
3 6 0	1104	857	1197
3 7 0	1067	702	1001
3 8 0	1034	573	432
3 9 0	1006	463	734
3 10 0	980	302	643
3 11 0	955	312	558
3 12 0	921	255	479
3 13 0	903	209	410
3 14 0	890	171	348
3 15 0	872	140	284
3 16 0	857	114	254
3 17 0	844	94	233
3 18 0	832	77	213
3 19 0	820	63	194
3 20 0	808	49	175
3 21 0	797	38	157
3 22 0	786	26	140
3 23 0	776	15	124
4 0 0	767		

38758

SUM

TOTAL VOLUME
38758
2.15
3205

72-HOUR
538
2.15
3205

24-HOUR
1457
1.94
2891

6-HOUR
2736
0.91
1357

PEAK
2984

CFS
INCHES
AC-FT

3 21 0-1 0
3 22 0-1 0
3 23 0-1 0
4 0 01 0

62

RUNOFF SUMMARY, AVERAGE FLOW

HYDROGRAPH AT		PEAK	6-HOUR	24-HOUR	72-HOUR	AREA
ROUTED TO		3299.	2992.	1501.	549.	28.00
		2984.	2736.	1457.	538.	28.00



APPENDIX E

Information as Contained in the National Inventory of Dams

FORM 10-1

INVENTORY OF DAMS IN THE UNITED STATES

(1) STATE	(2) DIVISION	(3) COUNTY	(4) DIST.	(5) CONGR. DIST.	(6) NAME	(7) LATITUDE (NORTH)	(8) LONGITUDE (WEST)	(9) REPORT DATE DAY MO YR
VT	70	NED			RICHVILLE DAM	4352.5	7316.5	19SEP78

(10) POPULAR NAME	(11) NAME OF IMPOUNDMENT
	RICHVILLE POND

(12) RECD. DAM	(13) RIVER OR STREAM	(14) NEAREST DOWNSTREAM CITY - TOWN - VILLAGE	(15) DIST. FROM DAM (MI.)	(16) POPULATION
02 01	LEMON FAIR RIVER	SHOREHAM CENTER	0	50

(17) TYPE OF DAM	(18) YEAR COMPLETED	(19) PURPOSES	(20) SURFACE HEIGHT (FT.)	(21) HYDRAULIC HEIGHT (FT.)	(22) IMPOUNDING CAPACITIES (ACRE-FT.)	(23) LATERAL CAPACITY (ACRE-FT.)
CIPG	1954	R	15	15	1316	692

REMARKS	
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(24) D/S HAS CONTROL	(25) SPILLWAY TYPE	(26) MAXIMUM DISCHARGE (CFS)	(27) VOLUME OF DAM (CU YD)	(28) POWER CAPACITY (KW)	(29) INSTALLED PROPOSED (KW)	(30) NO. OF LOCKS	(31) LENGTH (FT.)	(32) WIDTH (FT.)	(33) LENGTH WITH WIDTH (FT.)
3	116 U	92	260						

(34) OWNER	(35) ENGINEERING BY	(36) CONSTRUCTION BY
STATE OF VERMONT	HALEY AND WARD	C W MILLER CONSTRUCTION

(37) REGULATORY AGENCY	
(38) DESIGN	(39) OPERATION
DEPT OF WATER RES	DEPT OF FISH+GAME

(40) INSPECTION BY	(41) INSPECTION DATE DAY MO YR	(42) AUTHORITY FOR INSPECTION
DUFRESNE-HEARY ENG CORP	18AUG78	PL-92-367

REMARKS	
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END

FILMED

9-85

DTIC