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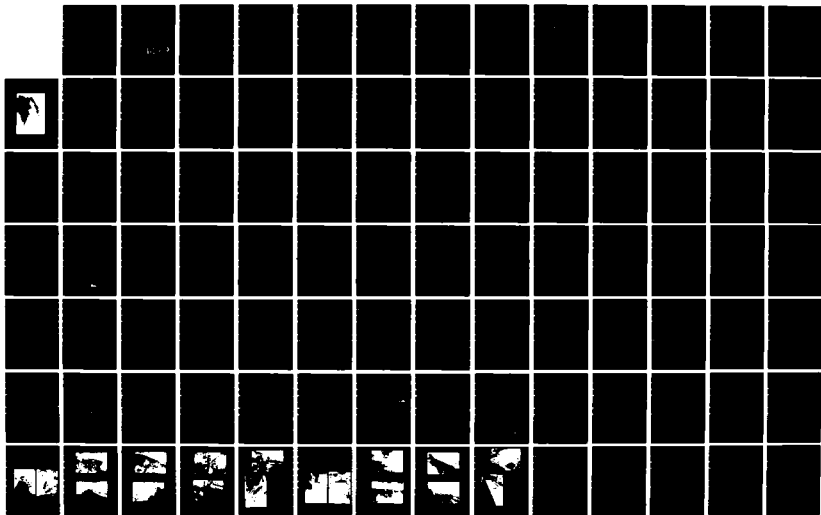
NATIONAL PROGRAM FOR INSPECTION OF NON-FEDERAL DAMS
BLODGETT DAM (VT 0011) (U) CORPS OF ENGINEERS WALTHAM
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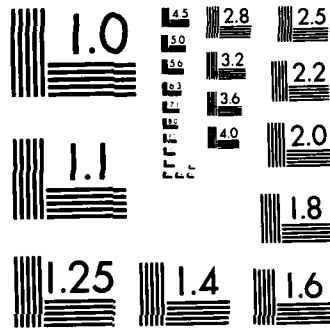
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AD-A157 558

CONNECTICUT RIVER BASIN
BRADFORD, VERMONT

BLODGETT DAM
VT 00117

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 zoned earthfill embankment about 29 ft. high and 714 ft. long. The dam is considered to be in fair condition. The dam is small in size with a significant hazard potential. There are a few recommendations and remedial measures which should be undertaken by the owner.			

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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 Blodgett Dam (VT-00117) 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, Mr. Putnam W. Blodgett, Bradford, Vermont 05033.

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

BLODGETT DAM

VT 00117

CONNECTICUT RIVER BASIN

BRADFORD, VERMONT

PHASE I INSPECTION REPORT

NATIONAL DAM INSPECTION PROGRAM

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GRA&I	<input checked="" type="checkbox"/>
DTIC TAB	<input checked="" type="checkbox"/>
Unannounced	<input type="checkbox"/>
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BRIEF ASSESSMENT
PHASE I INSPECTION REPORT
NATIONAL PROGRAM OF INSPECTION OF DAMS.

Identification Number: VT 00117
Name of Dam: BLODGETT DAM
Town: BRADFORD
County and State: ORANGE COUNTY, VERMONT
Stream: ROARING BROOK
Date of Inspection: AUGUST 5, 1980

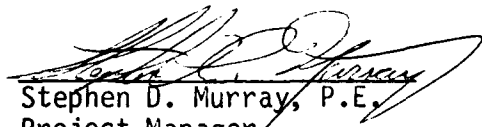
The dam, constructed in 1965, is a zoned earthfill embankment approximately 29 feet high and 714 feet long, including an 80 foot long overflow spillway founded in bedrock located to the left of the dam. The spillway contains a concrete crest wall, 15 feet of which is lower than the remaining 65 feet and constitutes the primary spillway. The right side of the downstream spillway channel is an earthen training wall protected by riprap. The upstream slope of the main dam is inclined at 3 horizontal to 1 vertical; the downstream slope is inclined at 2½ horizontal to 1 vertical and is equipped with a drainage system. The manually operated, gated low level outlet, located about 180 feet from the right abutment, is an 18 inch diameter corrugated metal pipe. The gate is reported to be operable.

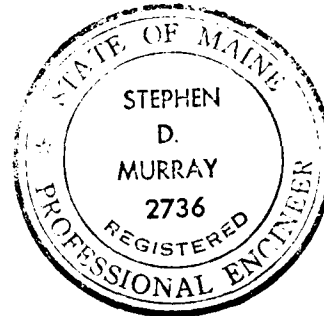
The dam impounds a recreational pool in the lower watershed of Roaring Brook, and the discharge flows in an easterly direction approximately 3700 feet to its confluence with the Connecticut River. The impoundment is 1100 feet in length with a surface area of 14 acres. Normal storage capacity is 100 acre-feet.

Based upon the visual inspection and the review of available data regarding this facility, the dam is considered to be in FAIR condition. The considerable evidence of seepage noted downstream of the dam is not considered evidence of structural instability but should be monitored for changes in quality or quantity.

In accordance with the Corps of Engineers Guidelines and the size (SMALL) and hazard (SIGNIFICANT) of the dam, the Test Flood selected for use in the analysis was equivalent to the 100 year recurrence flood. Peak inflow to the impoundment is 1600 cfs; routed peak outflow from the dam 1470 cfs with the water elevation 4.2 feet over the spillway crest, or 6.8 feet below the top of the dam. The spillway capacity is 8950 cfs or 609% of the routed Test Flood outflow.

It is recommended that the owner retain a qualified registered engineer to design a seepage collection system that would permit measurement of the seepage observed at the downstream toe of the embankment, and to oversee removal of trees and root systems from the embankment and channel areas. This and remedial measures which are discussed in Section 7 should be instituted within one year of the owner's receipt of this report.

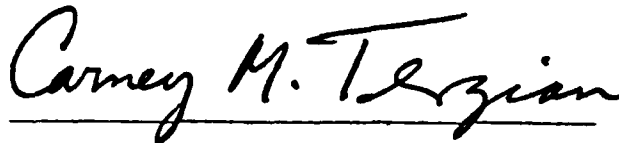

Stephen D. Murray, P.E.
Project Manager
James W. Sewall Company



This Phase I Inspection Report on Blodgett Dam (VT-00117) 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

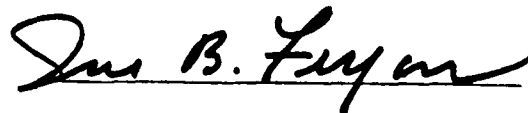


CARNEY M. TERZIAN, MEMBER
Design Branch
Engineering Division



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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SECTION 5: EVALUATION OF HYDRAULIC/HYDROLOGIC FEATURES

5.1 GENERAL

The project is basically a low surcharge storage-high spillage earth embankment, constructed to impound water for recreational use only.

The tributary watershed consists of 3.70 square miles of relatively undeveloped terrain containing no significant storage other than the Blodgett Dam impoundment which, with a surface area of 14 acres, constitutes less than 1% of the total drainage area. With NGVD elevations ranging from about 650 feet to over 1,200 feet and an average slope of about 5%, the watershed topography is considered borderline between rolling and mountainous.

Blodgett Dam is a zoned earthfill structure equipped with a rock lined overflow spillway. The spillway will pass approximately 265% of the routed Test Flood outflow with the pool at the dam crest.

5.2 DESIGN DATA

Detailed SCS hydrologic/hydraulic design data were available and were utilized as applicable.

5.3 EXPERIENCE DATA

The maximum known flood at the dam site occurred June 30, 1973. Maximum water depth in the spillway was about 3 feet, or seven feet below the dam crest. This flow caused some minor erosion in the lower end of the downstream spillway channel.

5.4 TEST FLOOD ANALYSIS

The "Recommended Guidelines for Safety Inspection of Dams" presents a test flood range for significant hazard small size dams of the 100 year frequency to one-half the Probable Maximum Flood (PMF). Selection of the test flood to be utilized in the analysis of a particular dam is dependent upon the proximity of the dam to the upper or lower limits of its size category and upon the perceived risk of future failure. Due primarily to the former consideration, the test flood selected is equivalent to the 100 year frequency flood. The magnitude of this flood was estimated utilizing Weather Bureau projections of the ratio of the 100 year frequency precipitation to the probable maximum precipitation as presented in U.S. Department of Commerce T.P. #40 and applying that ratio to the PMF. The tributary watershed consists of 3.70 square miles of moderately steep, essentially undeveloped terrain about 20% open and 80% wooded. Using a point midway between the curves for "rolling" and "mountainous" watersheds contained in the "Preliminary Guidance for Estimating Maximum Probable Discharge", dated March, 1978, peak inflow to Blodgett Dam impoundment is 1600 cfs. Routed Test Flood outflow, with the pool initially at normal level (el. 644 NGVD) is 1470 cfs with the spillway overtopped 4.2 feet, or 6.8 feet below top of dam. Based upon hydraulics computations, the capacity of the spillway is 8950 cfs, which is approximately 609% of the routed Test Flood outflow at the top of the dam.

SECTION 4: OPERATIONAL AND MAINTENANCE PROCEDURES

4.1 OPERATIONAL PROCEDURES

- a. General - No formal operating procedure exists.
- b. Warning System - No warning system exists.

4.2 MAINTENANCE PROCEDURES

a. General - The dam receives no regular maintenance. The crushed stone camp road crossing the spillway channel usually requires repair following the spring runoff.

b. Operating Facilities - The low level outlet gate is reported in good condition. No plan for the periodic maintenance of operating facilities is known to exist.

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 warning system to follow in the event of an emergency at the dam.

3.2 EVALUATION

On the basis of the results of the visual inspection, Blodgett Pond Dam is judged to be in fair condition.

If the small trees on the upstream and downstream slopes are allowed to continue to grow, the resulting root systems could create seepage paths which could lead to internal erosion of the dam.

The outlet channel contains dense brush and fallen trees which could restrict the flow of water discharged from the outlet pipes.

The seepage areas observed beneath the outlet pipe are most likely not due to seepage through the embankment but a spring in the abutment. Seepage at the foundation drain is most likely exiting the toe drain shown in the drawings. The bedrock beneath the dam, as observed just downstream of the embankment, is horizontally jointed, and the joints are the most probable cause of the seepage viewed below the dam.

The eroded concrete spillway crest could incur further damage if not repaired.

c. Appurtenant Structures

Spillways

The primary and secondary spillways both occupy the same location at the left end of the dam. The primary spillway is established by a 15 foot by 1 foot notch formed in the concrete sill which forms the spillway crest. This concrete crest is eroded near its centerline as shown in Photo 1. Bedrock is exposed to the left of the spillway crest, also shown in Photo 1.

Outlet Structure

An 18" diameter low level outlet pipe passes through the dam and exits at the downstream toe of the dam at the contact with the right abutment as seen in Photo 6. The low level outlet is controlled by a slide gate housed in a steel well assembly on the upstream dam face as shown in Photo 12. The low level outlet appears in good condition and is reported operable.

d. Reservoir Area - There are no indications of instability along the banks of the reservoir in the vicinity of the dam.

e. Downstream Channel - There are two downstream channels, one downstream from the spillway and the other downstream from the pond drain and foundation drain outlets. The two downstream channels are referred to as the spillway channel and the outlet channel, respectively, in the following sections. The two channels join about 500 feet downstream of the dam.

The outlet channel contains dense brush and fallen trees, as shown in Photo 13. Trees were observed overhanging the channel.

The spillway channel is shown in Photo 14. The floor of the channel is covered with pieces of blasted bedrock and boulders and tall grass. A crushed-stone covered roadway crosses the channel about 250 feet downstream from the spillway crest. As shown in Photo 15 downstream from the roadway the floor of the spillway channel is covered with pieces of blasted bedrock, as shown in Photo 16. Erosion of the side of the spillway channel downstream from the roadway crossing is shown in Photo 17.

Further downstream, the natural brook channel is steep and the banks are wooded with heavy softwood growth. About 500 feet from the dam, the channel banks have been partially cleared of underbrush and there is a boys camp with the lowest structure about 15 feet above the brook channel. The next 2900 feet of brook channel between the boys camp and U.S. Route 5 is steep with undeveloped and wooded banks except in the vicinity of the road where there are four buildings, the lowest of which is about 19 feet above the stream. About 50 feet downstream of the highway bridge is a Boston and Maine railroad Bridge. As shown in Photo 18, this bridge backwall has a marker denoting the height of the November 4, 1927 flood.

SECTION 3 - VISUAL INSPECTION

3.1 FINDINGS

a. General - At the time of inspection on August 5, 1980, the water level in the pond, impounded by the dam, was equal to the crest of the primary spillway with flow over the eroded center as shown in Photo 1. The weather was hot and humid. The general condition of this dam is fair.

b. Dam - The dam is an earth embankment with approximately 2.5H:1V downstream and 3H:1V upstream slopes. The dam consists of two sections separated by a knob of natural ground which is located between about Sta 5+00 and Sta 6+10. (The referenced station numbers were obtained from SCS Drawing No. 3 - "Blodgett Pond, Plan of Damsite," dated June, 1965.) The right section of the dam extends from about Sta 1+00 to Sta 5+00 and the left section is located between about Sta 6+10 and Sta 7+00. The top of the knob of natural ground has been removed down to the elevation of the dam crest.

An operating primary-secondary spillway is located to the left of the dam. A 10" thick, 25' long sill extension shown in Photo 2 forms the right abutment of the spillway with the left section of the dam. On the upstream slope of the right section of the dam is a gate structure which contains the controls for the pond drain. A 6 inch diameter outlet pipe from the foundation drainage system exits at the downstream toe of the right section of the dam about 10 feet left of the pond drain. The upstream slope of the dam is covered with tall grass, brush and some small trees as shown in Photo 3. No riprap was observed on the upstream slope above the waterline. Minor erosion has occurred on the upstream slope at the reservoir elevation as shown in Photo 3.

The crest of the dam is generally about 15 feet wide and has an unpaved roadway as shown in Photo 4. The crest is wider, on the downstream side, at the location of the natural knob. As shown in Photo 5, the downstream slope is covered with tall grass and brush and scattered small pine trees. Water was observed seeping from beneath the 18 inch diameter outlet pipe which exits at the downstream toe of the dam adjacent to the right abutment, seen in Photo 6. Clear seepage was observed downstream of the 6 inch diameter outlet pipe from the foundation drainage system as shown in Photo 7; a rust-colored pool of water, shown in Photo 8, was observed downstream from this seepage area. The SCS drawings for the Blodgett Dam indicate that a rock fill toe drain and blanket drain are located in the downstream toe of the dam at the location of the two seepage areas. The rock toe could not be discerned in the field.

Rust-colored seepage areas were also observed in the natural ground downstream of the downstream toe of the right section of the dam between the location of the 6 inch diameter outlet pipe and the natural knob as shown in Photo 9. The seepage areas are located about 125 feet downstream from the centerline of the crest of the dam. Photo 10, taken approximately 10 feet up the slope from the seepage area shown in Photo 9, shows seepage exiting the original ground at the base of a 10 inch diameter Birch. Another 10 feet up the slope, near the toe of the dam, evidence of animal burrows was noted as shown in Photo 11.

b. Adequacy - Detailed SCS hydrologic/hydraulic design data were available and with 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.

SECTION 2: ENGINEERING DATA

2.1 DESIGN

a. Available Data - Available data consists of six sheets by the Soil Conservation Service; Sheet 3 of 10 "Plan of Dam Site" June, 1965; Sheets 4 and 5 of 10 "Profiles" June, 1965, Sheet 6 of 10 "Drainage Details" June, 1965; Sheet 7 of 10 "Structural Details" June, 1965 and an unnumbered sheet "Construction Revision - Spillway" August, 1965. Also available was sheet 30 of a series of topographic maps prepared in 1957 at a scale of 1"=200' with a 5 foot contour interval.

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 drawings as listed in "Available Data" and nine pages of design computations by the Soil Conservation Service prepared during late 1964 and early 1965.

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 - Minor variations were noted in the dam as built compared to the design drawings. Sheet 3 indicates that a knoll or knob of natural ground would have projected above the crest of the dam for about 100 feet on the left center of the dam. The projection was removed and the typical dam cross section applies full length.

The concrete capped control section in the spillway was moved about 100 feet upstream in the spillway as shown in the Construction Revision plan of August, 1965.

The access road for the Challenge Wilderness Camp goes along the crest of the dam, turns right along the top of the training wall, runs down the side of the wall and across the spillway channel and continues on down to the camping area in the ravine below the dam.

2.3 OPERATION

Pond level readings are not taken on any regular schedule. No formal operation procedures are known to exist. The pond has been drained twice since 1965 in an attempt to eliminate trash fish which were competing with trout.

2.4 EVALUATION

a. Availability - Existing data was provided by the State of Vermont Agency of Environmental Conservation.

- | | | |
|-----|--|---|
| 4. | Top Width: | 14 ft |
| 5. | Side Slopes: | 3H to IV Upstream
2½H to IV Downstream |
| 6. | Zoning: | 2 Zones & drain |
| 7. | Impervious Core: | to el. 645± |
| 8. | Cutoff: | Trench |
| 9. | Grout Curtain: | N/A |
| 10. | Other: | N/A |
| h. | <u>Diversion and Regulating Tunnel</u> | N/A |
| i. | <u>Spillway</u> | |
| 1. | Type: | Overflow |
| 2. | Length of weir: | 15 ft primary
65 ft secondary |
| 3. | Crest el. | primary 644±
secondary 645± |
| 4. | Gates: | N/A |
| 5. | Upstream channel: | N/A |
| 6. | Downstream channel: | Rocklined channel |
| 7. | General: | N/A |
| j. | <u>Regulating Outlets</u> | |
| 1. | Invert: | 630.75± |
| 2. | Size: | 18 inch diameter |
| 3. | Description: | Corrugated Metal
Pipe pond drain |
| 4. | Control mechanism: | Slide gate |
| 5. | Other: | N/A |

5.	Full flood control pool:	N/A
6.	Spillway crest (Ungated):	644 ₊
7.	Design surcharge (original design):	651.2 ₊
8.	Top of dam:	655 ₊
9.	Test flood surcharge:	648.2 ₊
d.	<u>Reservoir</u>	
1.	Length of normal pool:	1100 ₊ ft
2.	Length of flood control pool:	N/A
3.	Length of spillway crest pool:	1100 ₊ ft
4.	Length of pool at top of dam:	1100 ₊ ft
5.	Length of test flood pool:	1100 ₊ ft
e.	<u>Storage</u>	
1.	Normal pool:	100 acre-ft
2.	Flood control pool:	N/A
3.	Spillway crest pool:	100 acre-ft
4.	Top of dam:	300 acre-ft
5.	Test flood pool:	160 acre-ft
f.	<u>Reservoir Surface</u>	
1.	Normal pool:	14 acres
2.	Flood control pool:	N/A
3.	Spillway crest:	14 acres
4.	Test flood pool:	17 acres
5.	Top of dam:	21 acres
g.	<u>Dam</u>	
1.	Type:	Zoned earthfill
2.	Length:	714 ₊ ft
3.	Height:	29 ₊ ft

i. Normal Operational Procedures - The gated low level outlet is reported operable and remains closed under normal operating conditions. There are no regular operational procedures other than occasional checking.

1.3 PERTINENT DATA

a. Drainage Area - 3.70 square miles of moderately steep, relatively undeveloped terrain which is 20% open and 80% wooded.

b. Discharge at Dam Site - Discharge is from over the primary and secondary spillways. Elevations are in feet referenced to NGVD datum.

1. Outlet Works (conduits):

18" low level pond drain w/water at
dam crest el. 655 (normally closed) 60 cfs

2. Maximum known flood at dam site:

June 30, 1973. Magnitude esti-
mated from data provided by owner: 750± cfs

3. Ungated spillway capacity at
top of dam el. 655 : 8950 cfs

4. Ungated spillway capacity at
test flood el. 648.2: 1470 cfs

5. Gated spillway capacity at
normal pool el. 644 : N/A

6. Gated spillway capacity at test
flood el. 648.2: N/A

7. Total spillway capacity at
test flood el. 648.2: 1470 cfs

8. Total project discharge at
top of dam el. 655 : 9010 cfs

9. Total project discharge at
test flood el. 648.2: 1530 cfs

c. Elevation (Feet, NGVD)

1. Streambed at toe of dam: 626±

2. Bottom of cutoff: Unknown

3. Maximum tailwater: 633±

4. Recreation pool: 644±

The remainder of the crest wall is 1 foot higher. The spillway outflow channel is founded in bedrock with the left side a cut section, and the right side an earthen training wall. Both are protected with riprap.

To the immediate right of the spillway, a 100 foot section of natural earth, supplemented by cutoff trenches and a drainage system, is incorporated into and forms the left abutment of the main dam.

A gated 18 inch pond drain, with upstream invert at approximately 630.75, penetrates the main embankment at its approximate center.

Elevations are in feet referenced to NGVD datum.

No instrumentation exists at this dam.

c. Size Classification - SMALL - The dam impounds 300 acre-feet of water with the water at the top of the dam, which at elevation 655 is approximately 29 feet above the streambed elevation. Since the storage is between 50 and 1000 acre-feet and the height is between 25 and 40 feet, the dam is in the small category on the basis of both parameters and is thus classified as small in size according to the Recommended Guidelines.

d. Hazard Classification - SIGNIFICANT - If the dam were to be breached, there is potential for considerable downstream damage and the loss of a few lives. Approximately 500 feet downstream from the dam is a boys summer camp with lean-to type buildings about 15 feet above the streambed. The rapid 5 foot rise in stage from 7 to 12 feet would likely not damage the structures but could, under certain circumstances, catch personnel at lower elevations. Further downstream, about 3400 feet from the dam, U.S. Route 5 crosses about 16 feet above the streambed. The sudden 10 foot rise in stage here from 9 feet to 19 feet would inundate and probably destroy this bridge. About 3550 feet downstream from the dam the failure wave would overtop the Boston and Maine Railroad bridge by approximately 2 feet and damage or destroy it.

e. Ownership - Mr. Putnam W. Blodgett
Challenge Wilderness Camp
Bradford, Vermont 05033
(802) 649-1363

f. Operator - As above.

g. Purpose of Dam - Recreation.

h. Design and Construction History - The following information is believed to be accurate based upon plans and correspondence available and from conversations with the dam owner. The dam was designed in 1965 by the U.S. Department of Agriculture, Soil Conservation Service, and constructed by the owner during that same year. Except for some minor erosion repairs on the spillway outlet channel, there have been no post-construction changes.

PHASE I INSPECTION REPORT

BLODGETT 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.

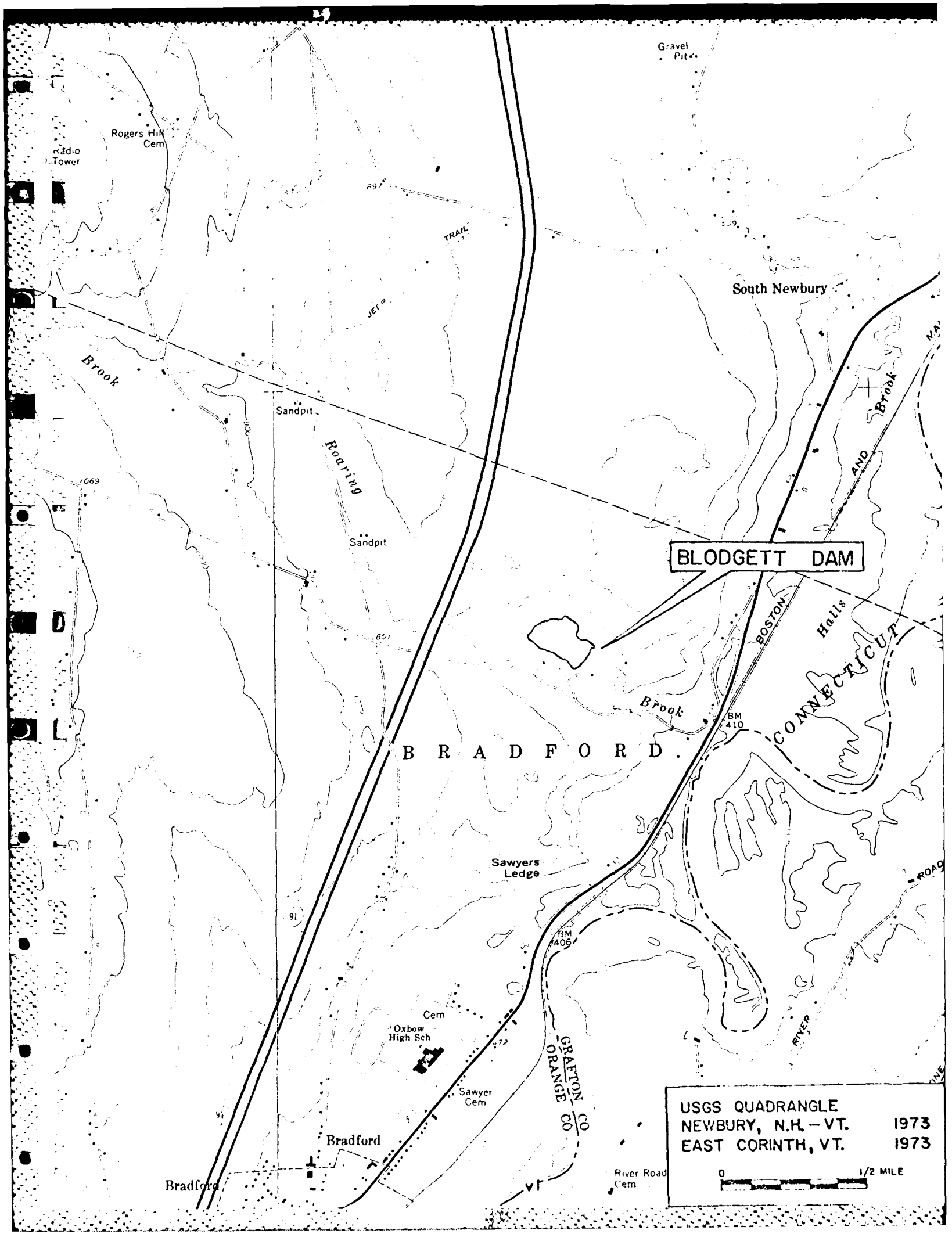
1.2 DESCRIPTION OF PROJECT

a. Location - The dam is located on the course of Roaring Brook about 3,700 feet upstream of its confluence with the Connecticut River, in the Town of Bradford, County of Orange, State of Vermont. The dam is shown on the Newbury, N.H.-Vt. 7.5 minute Quadrangle Map having coordinates N44° 01.7' and longitude W 72° 06.1'.

b. Description of Dam and Appurtenances - The dam, initially constructed in 1965, consists of a zoned earthfill embankment having a total length of approximately 714 feet, including an overflow spillway founded in bedrock, located to the left of the dam.

The embankment has a top elevation of approximately 655, is 29 feet in height above the streambed and is 14 feet wide at the crest. The upstream slope is inclined at 3 horizontal to 1 vertical; the downstream slope is inclined at 2½ horizontal to 1 vertical and is equipped with a drainage system.

The primary spillway has a crest elevation of about 644 and is 15 feet long formed in the 80 foot long concrete crest wall of the rock spillway section.



Gravel Pit

Rogers Hill Cem

Radio Tower

South Newbury

TRAIL

R97

JEF 2

Brook

Sandpit

Roaring

Sandpit

1069

851

BLODGETT DAM

B R A D F O R D

Brook

BM 410

CONNECTICUT

Sawyers Ledge

Oxbow High Sch

Cem

Sawyer Cem

GRAFTON CO
ORANGE CO

BM 406

Bradford

Bradford

USGS QUADRANGLE
NEWBURY, N.H. - VT. 1973
EAST CORINTH, VT. 1973

River Road Cem

0 1/2 MILE



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

Blodgett Dam - VT 00117

Bradford, Vermont

August 5, 1980

5.5 DAM FAILURE ANALYSIS

Utilizing the April, 1978, "Rule of Thumb Guidance for Estimating Downstream Dam Failure Hydrographs", the peak failure outflow would be 33,600 cfs with the pool initially at the top of the dam (655± NGVD). A breach of the dam would result in a rise of 5 feet in the water level of the stream at the initial impact area, a boys camp 500 feet downstream from the dam. This 5 foot rise in flood stage corresponds to an increase in flow of 24,650 cfs and an increase in the water level from a depth of 7 feet just before the breach, to a depth of 12 feet just after the breach. The rapid 5 foot increase in the water level would not likely damage the structures, the lowest of which is about 15 feet above the brook channel, but could potentially catch personnel unaware at lower elevations in the camping area. Further downstream, about 3400 feet from the dam, U. S. Route 5 crosses about 16 feet above the stream bed. The sudden 10 foot rise in stage here from 9 feet to 19 feet would inundate and probably destroy this bridge. About 3550 feet downstream from the dam the failure wave would overtop the Boston and Maine Railroad bridge by approximately 2 feet and damage or destroy it. Because of the potential for loss of a few lives in the initial impact area and the considerable downstream damage which would ensue from a breach, Blodgett Dam is classified as a "Significant Hazard" dam.

SECTION 6: EVALUATION OF STRUCTURAL STABILITY

6.1 VISUAL OBSERVATION

The visual inspection did not disclose any immediate stability problems. However, if the small trees on the upstream and downstream slopes continue to grow, the resulting root masses could lead to internal erosion of the dam. The dense brush and fallen trees in the outlet channel could restrict the flow of water discharged from the outlet pipes. The seepage areas observed at the downstream toe of the dam should be monitored. The concrete spillway crest could incur further damage if not repaired.

Erosion observed on the side of the downstream spillway channel is judged too remote from the dam to be of structural consequence.

6.2 DESIGN AND CONSTRUCTION DATA

The available data on the existing plans for the dam are inadequate for analyzing the stability of the 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 I 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 fair condition.
- b. Adequacy of Information - Due to the lack of adequate design and construction data for this dam, the assessment of safety is based solely on the visual inspection.
- c. Urgency - The remedial measures and recommendations presented below should be implemented by the owner within 1 year after receipt of this Phase I Inspection Report.

7.2 RECOMMENDATIONS

The owner should retain a qualified registered engineer to design a seepage collection system that would permit measurement of the seepage observed at the downstream toe of the embankment and to supervise removal of trees and root systems as noted below and the backfilling of areas thus excavated with suitable material.

7.3 REMEDIAL MEASURES

- a. The tall grass and brush growing on the dam slopes should be mowed and subsequent new growth cut regularly. The trees and bushes growing on the slopes and to a distance of 25 feet downstream should be removed and later new growth cut every two years.
- b. The brush and fallen trees in the outlet channel should be removed. Trees overhanging the channel should also be removed.
- c. The eroded concrete spillway crest should be repaired.
- d. A formal annual inspection program by qualified engineers, with repairs as necessary, should be established by the owner.
- e. A formal downstream warning system, to be implemented in the event of flood flow or imminent dam failure conditions, should be developed by the owner.
- f. A formal program of operating and maintenance procedures, including exercising of the drain valve, should be instituted and fully documented to provide accurate records for future reference.

7.4 ALTERNATIVES

This study has identified no practical alternative to the above recommendations.

APPENDIX A
VISUAL CHECK LIST WITH COMMENTS

VISUAL INSPECTION CHECKLIST
PARTY ORGANIZATION

PROJECT St. Lawrence River Dam

DATE Aug. 5, 1970

TIME 9:30 AM

WEATHER Partly Cloudy

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

PARTY:

- | | |
|-------------------------------------|-----------|
| 1. <u>Don Emery S.A.H.</u> | 6. _____ |
| 2. <u>W. L. - oncom R.H.</u> | 7. _____ |
| 3. <u>James H. - onel C.A.H.</u> | 8. _____ |
| 4. <u>Walter R. - oncom D.P.L.</u> | 9. _____ |
| 5. <u>Stephen L. Watters S.A.H.</u> | 10. _____ |

PROJECT FEATURE

INSPECTED BY

REMARKS

- | | |
|-----------------------------------|---|
| 1. <u>Dam Encasement</u> | <u>D.P.L. S.L.A. S.D.M. R.L.H. C.A.H.</u> |
| 2. <u>Outlet Channel</u> | <u>D.P.L. S.L.A. S.D.M. R.L.H. C.A.H.</u> |
| 3. <u>Spillway, 1st Discharge</u> | <u>D.P.L. S.L.A. S.D.M. R.L.H. C.A.H.</u> |
| 4. _____ | _____ |
| 5. _____ | _____ |
| 6. _____ | _____ |
| 7. _____ | _____ |
| 8. _____ | _____ |
| 9. _____ | _____ |
| 10. _____ | _____ |

PROJECT Albion Dam DATE 10/1/77
 PROJECT FEATURE Dam Embankment NAME W. A. ...
 DISCIPLINE Structural Engineering NAME W. A. ...
 Geotechnical Engineering

AREA EVALUATED	CONDITION
<p><u>DAM EMBANKMENT</u></p> <p>Crest Elevation</p> <p>Current Pool Elevation</p> <p>Maximum Impoundment to Date</p> <p>Surface Cracks</p> <p>Pavement Condition</p> <p>Movement or Settlement of Crest</p> <p>Lateral Movement</p> <p>Vertical Alignment</p> <p>Horizontal Alignment</p> <p>Condition at Abutment and at Concrete Structures</p> <p>Indications of Movement of Structural Items on Slopes</p> <p>Trespassing on Slopes</p> <p>Sloughing or Erosion of Slopes or Abutments</p> <p>Rock Slope Protection - Riprap Failures</p> <p>Unusual Movement or Cracking at or Near Toe</p> <p>Unusual Embankment or Downstream Seepage</p> <p>Piping or Boils</p> <p>Foundation Drainage Features</p> <p>Toe Drains</p> <p>Instrumentation System</p> <p>Vegetation</p>	<p>655 NGVD</p> <p>644 NGVD</p> <p>N.A.</p> <p>None observed</p> <p>No pavement on crest</p> <p>None observed</p> <p>None observed</p> <p>No misalignment observed</p> <p>No misalignment observed</p> <p>Some seepage observed along junction of downstream slope and right abutment.</p> <p>None observed</p> <p>Crest is unobstructed roadway used for vehicular traffic.</p> <p>Minor erosion on upstream slope at present water level.</p> <p>No riprap observed on upstream slope</p> <p>None observed</p> <p>Seepage noticed from below 18 in. outlet pipe and from within ground downstream of downstream toe.</p> <p>None observed</p> <p>Outlet pipe from downstream toe was observed</p> <p>None observed</p> <p>None observed to upstream toe</p> <p>None observed on upstream slope.</p>

PERIODIC INSPECTION CHECKLIST

PROJECT _____

DATE _____

PROJECT FEATURE _____

NAME _____

DISCIPLINE _____

NAME _____

Engineering Inc.

AREA EVALUATED	CONDITION
<p><u>DIKE EMBANKMENT</u></p> <p>Crest Elevation</p> <p>Current Pool Elevation</p> <p>Maximum Impoundment to Date</p> <p>Surface Cracks</p> <p>Pavement Condition</p> <p>Movement or Settlement of Crest</p> <p>Lateral Movement</p> <p>Vertical Alignment</p> <p>Horizontal Alignment</p> <p>Condition at Abutment and at Concrete Structures</p> <p>Indications of Movement of Structural Items on Slopes</p> <p>Trespassing on Slopes</p> <p>Sloughing or Erosion of Slopes or Abutments</p> <p>Rock Slope Protection - Riprap Failures</p> <p>Unusual Movement or Cracking at or Near Toes</p> <p>Unusual Embankment or Downstream Seepage</p> <p>Piping or Boils</p> <p>Foundation Drainage Features</p> <p>Toe Drains</p> <p>Instrumentation System</p> <p>Vegetation</p>	<p><i>There is no dike on this project</i></p>

PERIODIC INSPECTION CHECKLIST

PROJECT Bladon - P. 1, 2, 3

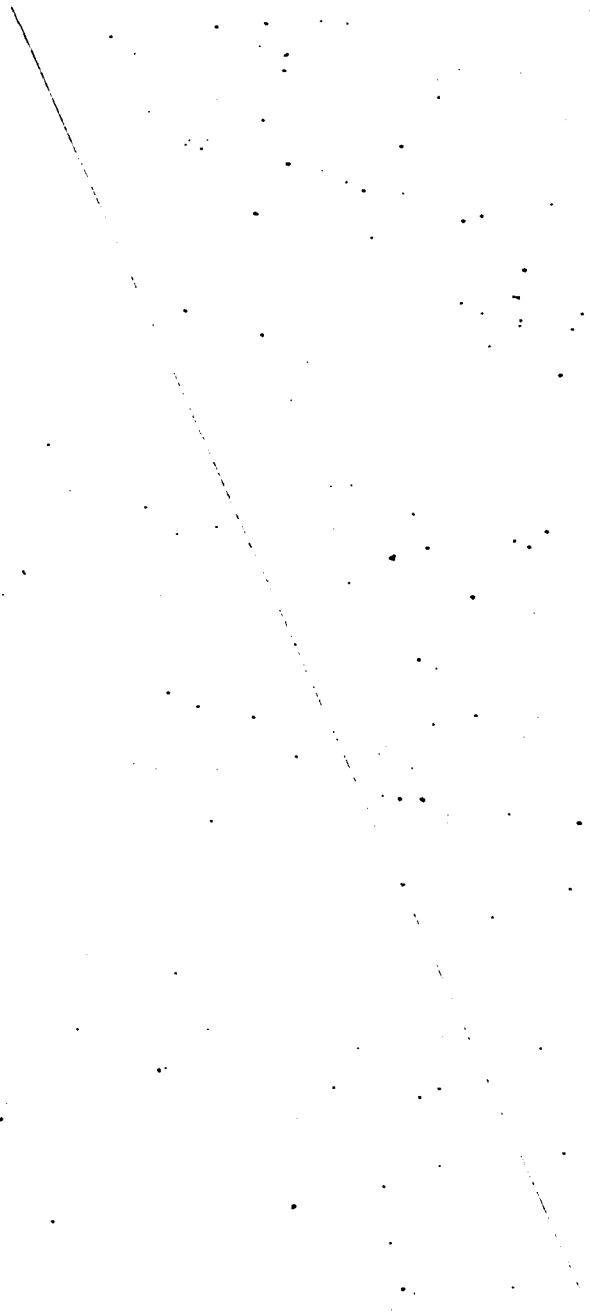
DATE 11/1/80

PROJECT FEATURE _____

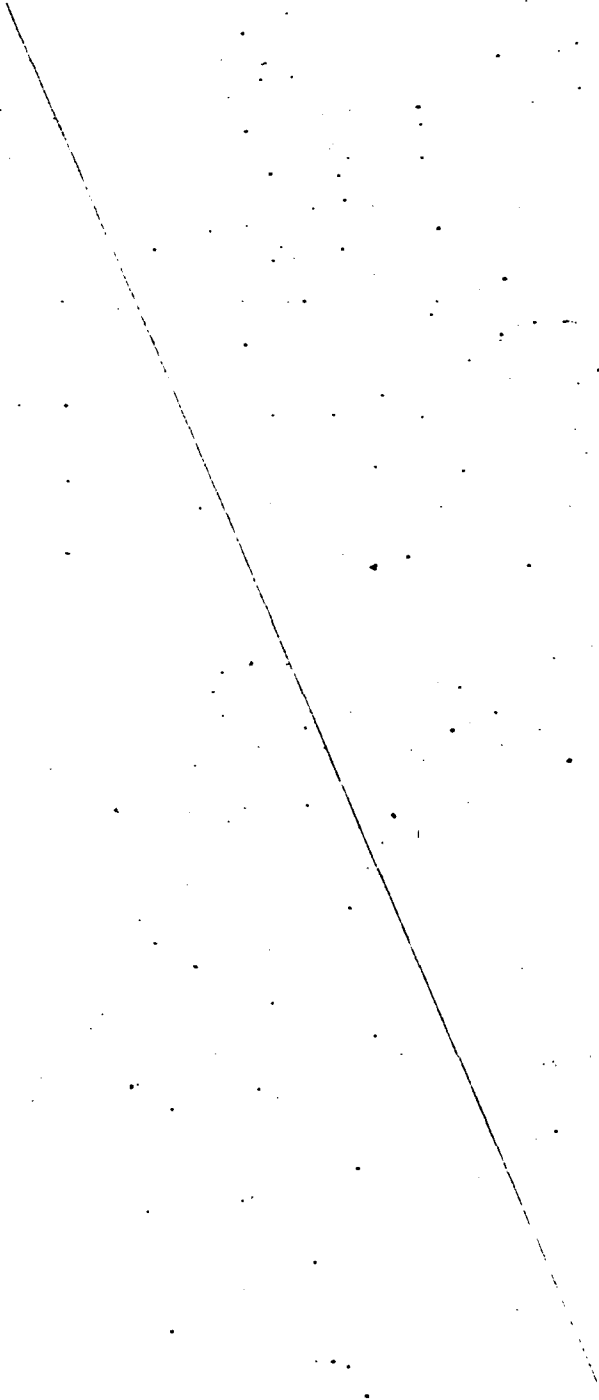
NAME _____

DISCIPLINE Electrical

NAME _____

AREA EVALUATED	CONDITION
<p><u>OUTLET WORKS - CONTROL TOWER</u></p> <p>a. Concrete and Structural</p> <p> General Condition</p> <p> Condition of Joints</p> <p> Spalling</p> <p> Visible Reinforcing</p> <p> Rusting or Staining of Concrete</p> <p> Any Seepage or Efflorescence</p> <p> Joint Alignment</p> <p> Unusual Seepage or Leaks in Gate Chamber</p> <p> Cracks</p> <p> Rusting or Corrosion of Steel</p> <p>b. Mechanical and Electrical</p> <p> Air Vents</p> <p> Float Wells</p> <p> Crane Hoist</p> <p> Elevator</p> <p> Hydraulic System</p> <p> Service Gates</p> <p> Emergency Gates</p> <p> Lightning Protection System</p> <p> Emergency Power System</p> <p> Wiring and Lighting System</p>	<p><i>There is no control tower</i></p> 

PROJECT _____ DATE _____
 PROJECT FEATURE _____ NAME _____
 DISCIPLINE _____ NAME _____
Geotechnical Engineering *10/10/20*

AREA EVALUATED	CONDITION
<p><u>OUTLET WORKS - TRANSITION AND CONDUIT</u></p> <p>General Condition of Concrete</p> <p>Rust or Staining on Concrete</p> <p>Spalling</p> <p>Erosion or Cavitation</p> <p>Cracking</p> <p>Alignment of Monoliths</p> <p>Alignment of Joints</p> <p>Numbering of Monoliths</p>	

PROJECT _____

DATE 5/15/2017

PROJECT FEATURE _____

NAME _____

DISCIPLINE _____

NAME _____

AREA EVALUATED	CONDITION
<p><u>OUTLET WORKS - OUTLET STRUCTURE AND OUTLET CHANNEL</u></p> <p>General Condition of Concrete</p> <p>Rust or Staining</p> <p>Spalling</p> <p>Erosion or Cavitation</p> <p>Visible Reinforcing</p> <p>Any Seepage or Efflorescence</p> <p>Condition at Joints</p> <p>Drain holes</p> <p>Channel</p> <p>Loose Rock or Trees Overhanging Channel</p> <p>Condition of Discharge Channel</p>	<p style="text-align: center;">/</p> <p><i>None observed</i></p> <p><i>Some trees overhanging channel</i></p> <p><i>Brush growing in channel, cobble and boulders in channel.</i></p>

PERIODIC INSPECTION CHECKLIST

PROJECT Spillway Weir

DATE August 17, 1950

PROJECT FEATURE Spillway Weir

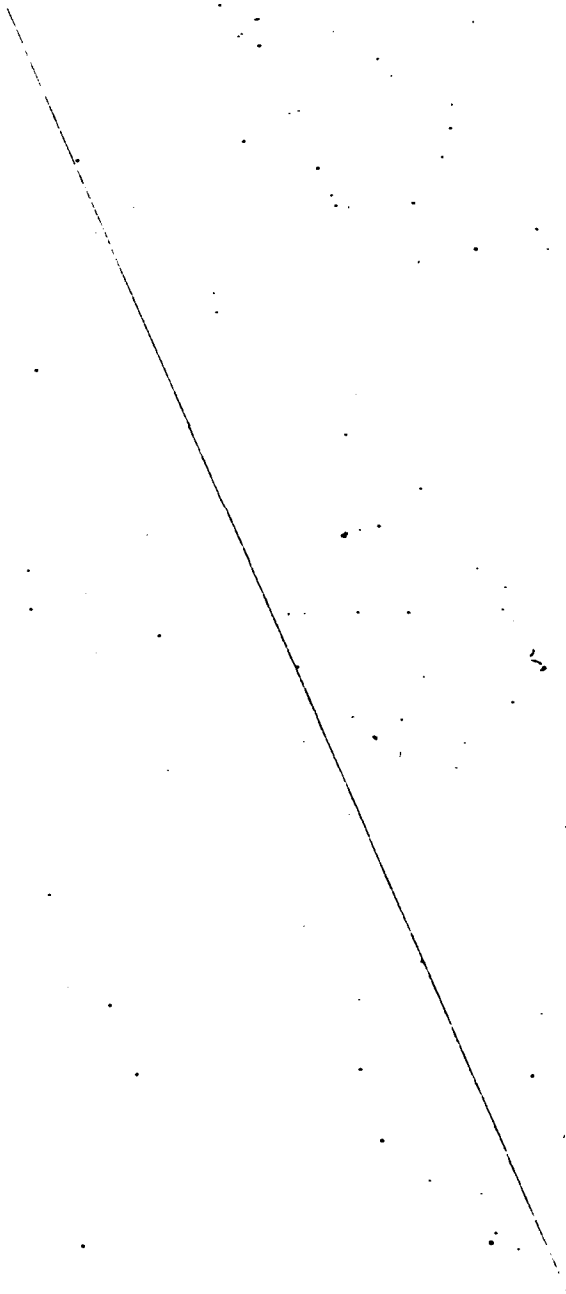
NAME W. W. ...

DISCIPLINE Engineering

NAME ...

AREA EVALUATED	CONDITION
<p><u>OUTLET WORKS - SPILLWAY WEIR, APPROACH AND DISCHARGE CHANNELS</u></p> <p>a. Approach Channel</p> <p> General Condition</p> <p> Loose Rock Overhanging Channel</p> <p> Trees Overhanging Channel</p> <p> Floor of Approach Channel</p> <p>b. Weir and Training Walls</p> <p> General Condition of Concrete</p> <p> Rust or Staining</p> <p> Spalling</p> <p> Any Visible Reinforcing</p> <p> Any Seepage or Efflorescence</p> <p> Drain Holes</p> <p>c. Discharge Channel</p> <p> General Condition</p> <p> Loose Rock Overhanging Channel</p> <p> Trees Overhanging Channel</p> <p> Floor of Channel</p> <p> Other Obstructions</p>	<p>Good</p> <p>None observed</p> <p>None observed</p> <p>Goodie covered</p> <p>The spillway crest is formed by a concrete cap on existing ledge.</p> <p>This concrete is eroded near its centerline</p> <p>No</p> <p>None observed</p> <p>None observed</p> <p>Good</p> <p>None observed</p> <p>Some trees overhanging channel.</p> <p>Covered with goodies and pieces of blasted rock.</p> <p>Crushed stone covered roadway crosses spillway channel about 250' downstream of spillway crest.</p>

PROJECT _____ DATE _____
 PROJECT FEATURE _____ NAME _____
 DISCIPLINE _____ NAME _____
 Section 101.00 - 101.00 D. P. S. L. 101.00

AREA EVALUATED	CONDITION
<p><u>OUTLET WORKS - SERVICE BRIDGE</u></p> <p>a. Super Structure</p> <ul style="list-style-type: none"> Bearings Anchor Bolts Bridge Seat Longitudinal Members Underside of Deck Secondary Bracing Deck Drainage System Railings Expansion Joints Paint <p>b. Abutment & Piers</p> <ul style="list-style-type: none"> General Condition of Concrete Alignment of Abutment Approach to Bridge Condition of Seat & Backwall 	<p><i>There is no service bridge</i></p> 

APPENDIX B
ENGINEERING DATA

VI. General Comments

Dam is in overall good condition but shows lack of maintenance. Drainage system and seepage should be further investigated.

Report By A. Peter Berrucant Date 10-23-79
A. Peter Berrucant, PE
Dam Safety Engineer

Attachments:

- ① Photos when developed
- ② Copy of SCS plans (1965) showing general area of seepage.
Note: The writer did not have this plan with him during the inspection so notations are approximate.

Copy to Dick Gallo SCS 10/25/79 a.m.

2. Other Gates, Drains, Appurtenances Access pipe 51"x34"
vertical riser on ups wt had covered on. Did not inspect

~~condition~~ Possibly some ^{infiltration} leakage into pond drain
because of rust color water sediments(?)

3. Remarks _____

IV. Operation and Maintenance

Apparently no brush has been cut since last inspected
(10/4/76).

V. Inspection Summary

A. Information Obtained

- 1. Photographs
- 2. Dimensions _____
- 3. Other _____

B. Additional Information Needed

Investigate French drain & seepage.

C. Overall Condition of Dam

Good but needs maintenance.

10. Stop Logs, Flash Boards None

11. Remarks OK. but vegetation may become a problem if left too long.

B. Emergency Spillway

Type see "A" above

Controlled or Uncontrolled _____

1. Approach Channel _____

2. Transition _____

3. Control Section _____

4. Discharge Channel _____

5. Remarks _____

C. Drawdown Facilities, Gates, Drains, Appurtenances, Etc.

1. Drawdown Facility 18" pond drain

Condition Outlet, only, visible. Seepage (rust colored) exiting end of pipe. Some sediments (?) - rust colored. Flowing water (5-10 gpm) exiting from stone fill under pipe from general area of blanket drain.

10. Alignment OK

11. Remarks Good condition

III. Condition of Outlet Works

A. Principal Spillway and Emergency Spillway (Combined)

Type Earth, rock cut, concrete control section, training
dike right side

Controlled or Uncontrolled uncontrolled

1. Approach Channel clear

2. Transition clear

3. Control Section clear

4. Discharge Channel Tall grass + brush, ^{& pine trees} along right side
clear of debris.

5. Intake Structure N/A

6. Conduit N/A

7. Outlet Structure N/A

8. Trash Racks N/A

9. Anti-vortex Devices N/A

14. Alignment OK
15. Movement none apparent
16. Remarks Embankment stable but brush growing up. Apparently drainage system (trough drain) is plugged and seepage is being forced out at along toe of old ground near old track bed.

C. Crest

1. Vegetative Cover grass cover - OK except in wheel tracks
2. Erosion none significant
3. Evidence of Overtopping none
4. Settlement, Cracks none observed
5. Animal Burrows none observed
6. Debris none
7. Use of crest (road, trail, etc.) Crest provides vehicular access - no grass in wheel tracks
8. Structural OK
9. Abutments OK

B. Downstream Face or Slope and Toe

1. Vegetative Cover grass cover being taken over by brush.
A few small pines.
2. Erosion none observed
3. Slumps, Slides, Cracks none observed
4. Animal Burrows a few ~ rat size
5. Slope Protection vegetated
6. Debris none
7. Seepage significant, all along toe of slope (old ground) between
stations 370 → 570. Seepage has pooled in low area and standing in
old track bed. No active seepage on embankment but "wet type" vegetation
observed 1/3-1/2 way up slope in same area.
8. Piping Possible along active toe (old ground) and possibly some
near toe of embankment near pond drain and toe drain.
9. Boils None apparent.
10. Toe Drains 6" C.G.M.P. to left of 18" pond drain was dry but
seepage existing below and around it.
11. Scour none
12. Structural slope is firm, appears stable
13. Abutments right contact damp

II. Condition of Main Structure

Type of Construction Zoned E/F

A. Upstream Face or Slope

1. Vegetative Cover Grass cover being taken over by brush and small (3-8') evergreens (mostly white pine)
2. Erosion none observed
3. Slumps, Slides, Cracks none observed
4. Animal Burrows none observed
5. Slope Protection vegetated
6. Debris none
7. Structural stable
8. Abutments OK
9. Alignment OK
10. Movement none apparent
11. Remarks Good condition except for brush & trees.

State of Vermont
Agency of Environmental Conservation
Department of Water Resources
Montpelier, VT 05602

DAM INSPECTION REPORT

Name BLODGETT DWR No. 24-2
Town Bradford NDS No. VT00 117
Owner Putnam W. Blodgett Inspection Date 10-22-79
Address Bradford, Ut. 05033 Last Inspected 10-4-76
Telephone _____ Hazard Class 3 check (scs 2')
Size Category III

PERSONS PRESENT AT INSPECTION (Name and Organization):

Inspecting Party A. P. Barranco, Jr. - Dept. of Water Resources

Others _____

I. General Conditions at Time of Inspection

Weather Clear, hot (80°+) Ground Conditions Dry

Water Surface Elevation -0.05' Datum low flow section (conc.)

Accessibility fully accessible

Reservoir Area clear

Remarks Stopped at Blodgett house and spoke with Mr. Blodgett's mother. Got permission to inspect dam.

GENERAL		
TO	NOTED	DATE
DJM	Ljm	11/24/76
DHS	QHS	11-24-76
ASR		

MANAGEMENT & ENGINEERING DIVISION

802/828-2393

November 23, 1976

Mr. Putnam W. Blodgett
Bradford, VT 05033

Subject: Blodgett Dam - Bradford

Dear Mr. Blodgett:

Thank you for allowing engineers of this Division to make a visual inspection of your dam, and for visiting our office on October 18 concerning their findings.

As you are aware, no signs of stress or deterioration were found during the inspection. There was no seepage noted except at the toe drains. Overall, the embankment seemed to be in stable condition and structurally sound. The spillway was also found to be in good condition and apparently functioning well.

It was noted though, some maintenance is needed. This is generally limited to brush and tree cutting on the dam and mowing the grass cover. Similar work is needed in the spillway area. We generally encourage this activity to maintain the protective plant cover. Mowing prevents the growth of woody plants and helps develop a cover and root system more resistant to runoff.

If we may be of further assistance, or should you have additional questions, please feel free to contact Donald H. Spies, Dam Construction Engineer, at this office.

Sincerely yours,

Andre J. Rouleau
Assistant Director

DJM/vl



VERMONT DEPARTMENT OF WATER RESOURCES
INFORMATION SHEET

Name of Dam Blodgett Town Bradford
Owner Putnam Blodgett Name of Stream Rearing Brook
Address Bradford Vermont Classification III ?
05033

U.S.G.S. Coordinates: Lat. 44° 01' 40" Long. 72° - 6' 5"

U.S.G.S. Map Woodsville N.H. Aerial Photos VT-62-H 43-103 to 109

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

Total Length of Dam 585 ft Crest Width of Emergency 5.7 ft
Spillway

Width of Top 14 ft. Maximum Height 29.4 ft

Spillway Capacity: Principal 523 cfs * Emergency 4165 cfs @ DHW
19.0 AF @ DHW

Pond Area 14.4 AF @ NULL Drainage Area 4.85 sq. mi.

Pond Volume: Normal Water Level 28.6 AF Design High Water Level 218.5 AF

Maximum Water Depth: Normal Water Level 17 ft. Design High Water 24.2 ft.
Level

Storage Before Emergency Spillway is Used 14.4 AF

Use of Reservoir Recreation

Description of Dam: Zoned earth fill with 3 on 1 upstream slope and 2 1/2 on 1 downstream slope.

Description of Spillway(s): P.S. - 1 ft notch 15 ft wide in C.S. C.S. - Concrete weir with 1/2 ft notch and channel. 11 ft 101

Designed by SCS Year Built 1965

Hearing Date June 25, 1965 Order Date August 24, 1965

Additional Remarks: 1/2 depth of water in C.S. 285 cfs
2.85 10-27

SUMMARY OF DATA AND CORRESPONDENCE

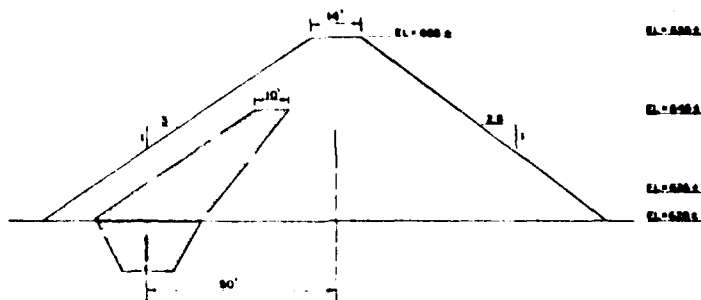
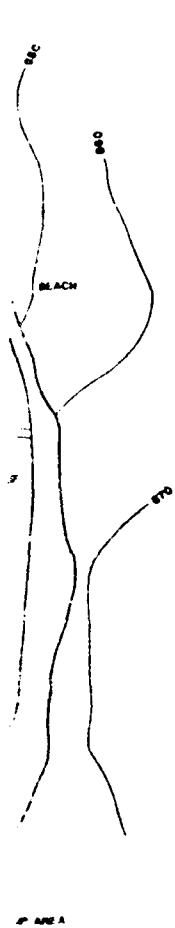
<u>DATE</u>	<u>TO</u>	<u>FROM</u>	<u>SUBJECT</u>	<u>PAGE</u>
-	-	-	Vermont Dept. of Water Resources Information Sheet	B-4
10-23-76	Putman Blodgett	Andre J. Rouleau	Inspection Results	B-5
10-4-76	File	A.P. Barranco Dam Safety Eng.	Inspection Report	B-6
1-4-74	Putman Blodgett	John Cerutti	Draining of Pond	B-14
12-26-73	John Cerutti	Putman Blodgett	Draining of Pond	B-15
12-18-75	Putman	John Cerutti	Draining of Pond	B-16
11-4-65	File	Donald Webster	Completion of Dam	B-17
8-17-65	John Cerutti	Kenneth Wilson	Spillway Revision	B-18
'64-'65	File	S.C.S.	Design Sheets	B-19
6 to 8-65	-	S.C.S.	Design plans - reduced to 1/2 size	B-28
1957	-	-	Topographic sheet - Reduced to 1/2 size	B-34

BLODGETT DAM

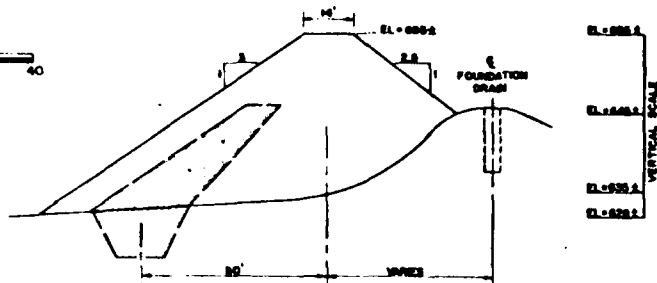
EXISTING PLANS

On file with the Vermont Department of Water Resources:

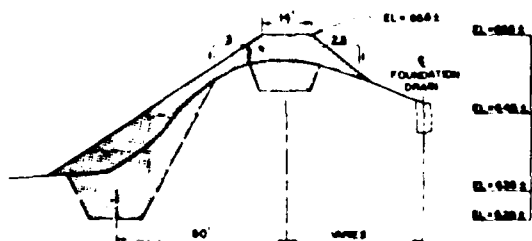
1. U. S. Department of Agriculture
Soil Conservation Service
Blodgett Pond
Bradford, Vermont
Sheet 3 of 10 - Plan of Dam Site, June, 1965
Sheet 4 of 10 - Profiles, June, 1965
Sheet 5 of 10 - Profiles, June, 1965
Sheet 6 of 10 - Drainage Details, June, 1965
Sheet 7 of 10 - Structural Details, June, 1965
Unnumbered Sheet Construction Revision - Spillway August, 1965
2. Vermont Department of Highways
Sheet 30 of a series of topographic maps prepared in 1957 at a
scale of 1"=200' with a 5 foot contour interval. This covers the
site of Blodgett Dam.



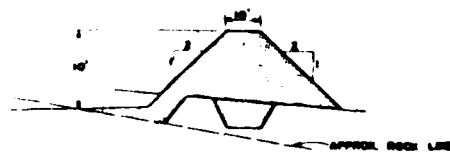
SECTION A-A
20 0 FEET 20 40



SECTION B-B
20 0 FEET 20 40



SECTION C-C
20 0 FEET 20 40



TYPICAL SECTION OF TRAINING WALL
20 0 FEET 20 40

 FINE GRAINED SILTY CLAY MATERIAL

NOTE THIS PLAN COMPILED FROM EXISTING PLANS FOR DAM CONSTRUCTION IN 1965, AS SHOWN BY U.S.D.A. SOIL CONSERVATION SERVICE IN MAY, 1965, AND MODIFIED AS OBSERVED IN THE FIELD.

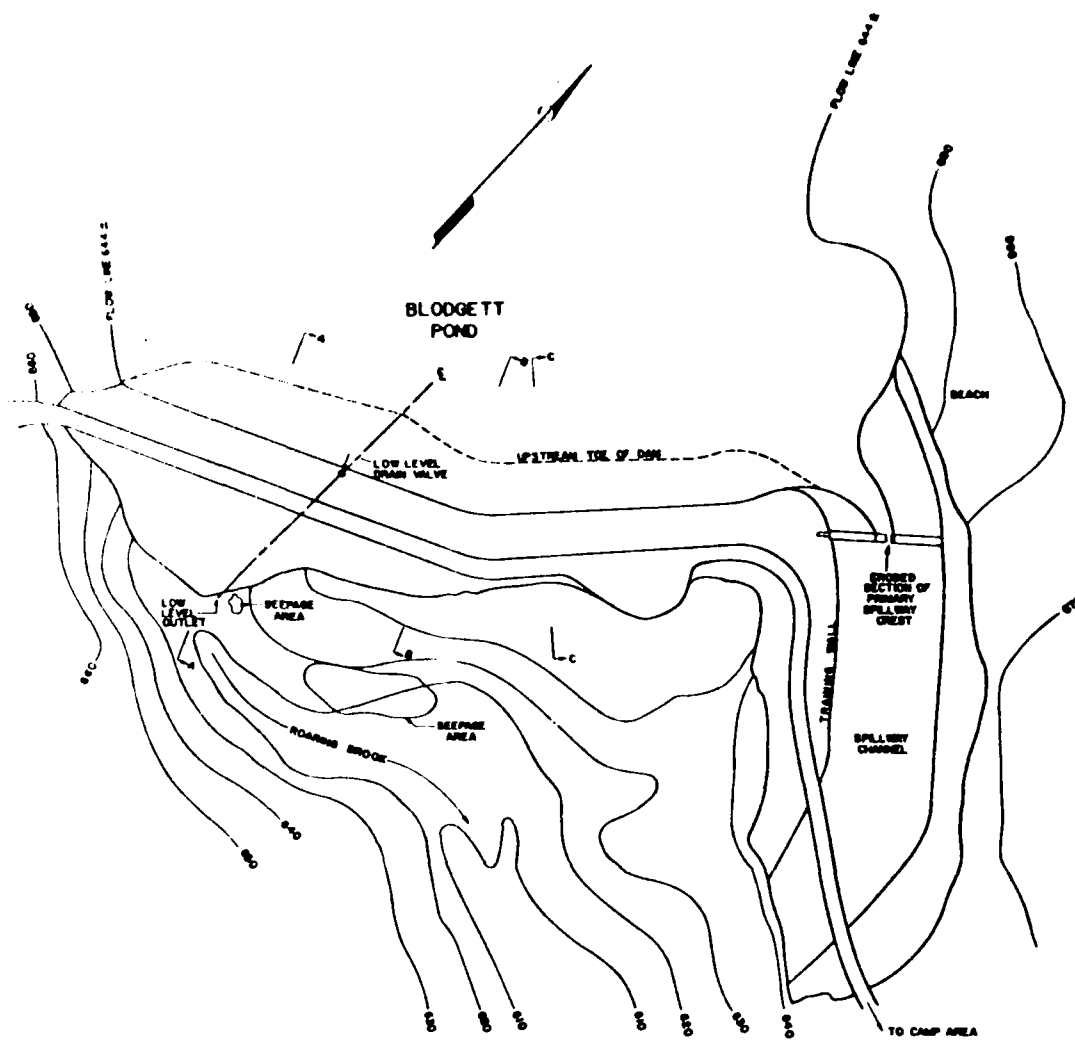
10 FT. CONTOURS (NGVD) ARE FROM PRE-CONSTRUCTION SURVEY INFORMATION AND ARE APPROXIMATE.

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

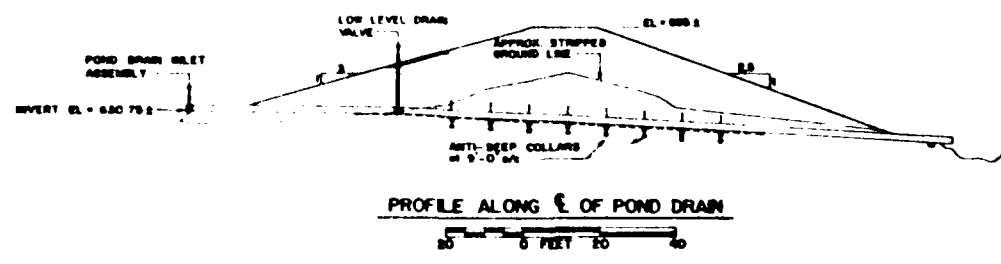
JAMES W. SEWALL COMPANY
CONSULTING ENGINEERS
87 State Street
Boston, Massachusetts
Tel. 877-8700

NATIONAL PROGRAM OF INSPECTION OF NON-FEDERAL DAMS
BLODGETT DAM
BRADFORD, VT

NO.	REVISION	DATE	BY	CHECKED	APPROVED	SHEET	OF



PLAN
 60 0 FEET 60 120



PROFILE ALONG C-C OF POND DRAIN
 80 0 FEET 40

11/2

FILE COPY

TO	DATE
DEC	1/7/74
ARR	
DND	
FILE	

MANAGEMENT & ENGINEERING DIVISION
January 4, 1974

Mr. Putnam W. Blodgett
Bradford
Vermont 05033

Dear Mr. Blodgett:

We appreciate your prompt reply to our letter of December 18, 1973, relative to the draining and de-silting of your pond.

We recognize that if the work was carried out as noted, sediment transportation down Roaring Brook was minimized. However, on the basis of the present information, it is our opinion the work was a de-silting operation. In your future operation and maintenance of the dam, we would caution you to refrain from performing this type of work without notifying and seeking approval of the Board as noted in the Order.

We will plan to have our dam construction engineer review your project along with his routine inspections this year.

Very truly yours,

John E. Cerutti, Director
Management & Engineering Division

JEC/DJM/jcd
cc: C. Bothwell, Water Resources Board

Putnam W. Blodgett

CHALLENGE WILDERNESS CAMP / BRADFORD, VERMONT 05033

December 26, 1973

TO	NOTED	DATE
SEC -		
AJR	AK	1/3/74
DJM	aspy	1/4/74
DHS	DHS	1-3-74

Mr. John E. Cerutti, Director
 Management & Engineering Division
 Agency of Environmental Conservation
 Montpelier, Vermont 05602

Dear Mr. Cerutti:

SPEND TO

This is in reply to your letter of December 18 inquiring about the draining and 'de-siltation' of my pond.

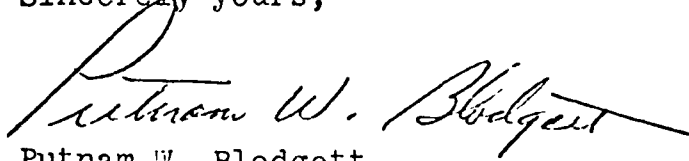
The pond was drained for two reasons: 1) to try to reclaim the pond from the trash fish that were destroying the trout, and 2) to remove part of the delta that had built up at the inlet due to the natural inflow, the construction of I-91 upstream, and this year's June 30 flood.

The SCS dozer pushed the material up on the bank above waterlevel.

As this work took place after the pond had been drained and was out of the streambed and as the pond drain is above the pond bottom no sediment went down Roaring Brook.

Therefore, I did not consider that any 'de-siltation' would or did take place.

Sincerely yours,


 Putnam W. Blodgett

FILE COPY

ROUTING		
GENERAL		
TO	NOTED	DATE
DHS	DHS	12-18-73
DGM	DGM	12/18/73
OR		12/15
JEC		
SUSPEND TO		
FILE		

MANAGEMENT & ENGINEERING DIVISION

December 18, 1973

Mr. Putnam W. Blodgett
Bradford
Vermont 05033

Dear Mr. Blodgett:

We have been informed you recently drained and de-silted your pond on Roaring Brook in Bradford. We wish to remind you Condition No. 10 of the Order Approving and Authorizing the Construction of a Dam issued August 24, 1965, reads, "There shall be no de-silting, so-called, with respect to the operation and maintenance of said dam except upon the prior written approval of the Board and on such terms and conditions as it shall specify."

We therefore request you please provide an explanation of how and why this occurred.

Sincerely yours,

John E. Cerutti, Director
Management & Engineering Division

JEC/DHS/lmp

cc: Cathy Bothwell, Water Resources Board

OFFICE MEMORANDUM

DATE November 4, 1965

TO: For the Record

FROM: Donald W. Webster

SUBJECT: Blodgett Dam, Bradford

On November 3, 1965, the writer and John E. Cerutti inspected the dam at the Blodgett family camping area on Roaring Brook in the Town of Bradford. The impoundment section on the dam is complete and water has been impounded in the dam to within four feet of design normal water level. The spillway crest (concrete) has been completed, and with the exception of shaping up the spillway outlet channel downstream of the crest, which the contractor was doing on this date, the dam is substantially completed in accordance with plans and specifications on file in this office.

ROUTING		
GENERAL		
TO	NOTED	DATE
DWW	DWW	11-5
JEC	JEC	11-5
RWT	JEC	11-5
SUBMITTED TO		
FILE		

UNITED STATES DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

19 Church Street
Burlington, Vermont
August 17, 1965

Mr. John E. Cerutti, Hydraulic Engineer
Department of Water Resources
State Office Building
Montpelier, Vermont

Dear John:

Enclosed you will find plans for proposed spillway revision on the Blodgett RC&D dam.

In the event any part of this does not meet with your approval we would appreciate being advised at your earliest convenience.

The requirements of your department for the compaction of the earth fill in the upper part of the dam have been met. Spillway rock excavation is about complete and I expect concrete work will be started soon.

Very truly yours,



Kenneth P. Wilson
State Conservation Engineer

cc: P. Blodgett
J. Bryant

Enclosure

ROUTING		
GENERAL		
TO	NOTED	DATE
JEC	jec	8-23
SUSPEND TO		
FILE		

GEOLOGY REPORT
 White River RC&D Project
 Blodgett Pond,
 Bradford, Vermont

Prepared by:

John H. Bryant, Design Engineer
 Louis Dondero, Soil Scientist

Date: 12-21-64

A. General

Dates of Exploration: 8/7/64, 9/3/64 - Louis Dondero
 John H. Bryant

Location: Town of Bradford, Orange County, Vermont

Structure Class: "b"

Equipment Used: Massey-Ferguson MF 185 Backhoe

Site Data:

Drainage Area: 4.85 sq. miles, 3100 acres
 Maximum Pool Depth: 22 feet
 Purpose: Recreation
 Maximum Height of Dam: 32.5 feet
 Top Length of Dam: 345 feet
 Emergency Spillway: Vegetated
 Principal Spillway: Concrete Weir
 Volume of Fill: 16,000 cubic yards

Methods of Exploration:

Backhoe, Hand Auger, Seismic

B. Surface Geology and Physiography

Connecticut River Valley modified by glacio fluvial and glacial lacustrine deposits to an elevation of 600± feet. At elevations above 600± feet the area is mainly glacial till and outcrops of bedrock. The bedrock occurs at lesser elevations in streambeds and deep erosion cuts.

REFERENCE	U. S. DEPARTMENT OF AGRICULTURE SOIL CONSERVATION SERVICE ASSISTING SOIL AND WATER CONSERVATION DISTRICT	DRAWING NUMBER SHEET _____ OF _____ DATE _____
-----------	---	--

STATE	PROJECT	JOB NO.	
VERMONT	BUDGET FUND		
BY	DATE	CHECKED BY	DATE
J.H.	1-10-65	F.M.W.	2-23-65
SUBJECT			SHEET OF
CRITERIA & STRUCTURE CLASSIFICATION			

DESIGN CRITERIA

CLASS 'B' STRUCTURE - S.C.S. E.M. 27

(SCS) PRINCIPAL SPILLWAY STORM - 6 HR - 50YR (MC II)

(SCS) FREQUENCY OF OPERATION OF EMERGENCY SPILLWAY - 2%

(SCS) EMERGENCY SPILLWAY STORM - 1.25 X MIN. E.W.P. REC
(MC II)

(SCS) FREEBOARD - 1.25 X MIN. E.W.P. REC.
(MC II)

(VT W.R. DEPT) ANTI-SEEP COLLARS - 125% INCREASE FROM TOE TO DRAIN

STRUCTURE CLASSIFICATION COMPUTATIONS

HEIGHT 30.9'

STORAGE 290.5 A.F.

POP. DAMAGE CENTER 0

FLOOD PLAIN WIDTH 150'

DISTANCE TO DAMAGE CENTER 0.35 MI

$H_{1/2} = 8.405$

$K_s = 7.3$ $K_p = 1$ $K_w = 7.6$ $K_d = 0.55$

$K = \frac{K_s + K_p + K_w}{K_d} = \frac{7.3 + 7.6 + 1}{0.55} = \frac{15}{0.55} = 27.3$

This recreation dam is located in the Township of Bradford, Vermont.

A summary of pertinent design information is given on sheet 2 of this report.

Criteria and procedures used in this design are given in the following Soil Conservation Service publications:

National Engineering Memorandum No. 27, Limiting Criteria for the Design of Earth Dams

National Engineering Memorandum No. 42, Reinforced Concrete Pipe Drop Inlet Barrels

National Engineering Memorandum No. 50, Drop Inlet Spillway Standards

National Engineering Handbook No. 4A, Hydrology

National Engineering Handbook No. 5, Hydraulics

National Engineering Handbook No. 8, Geology

Engineering Division Technical Release No. 2, Earth Spillways

The results of hydrologic and hydraulic computations are given on sheet 3 of this report.

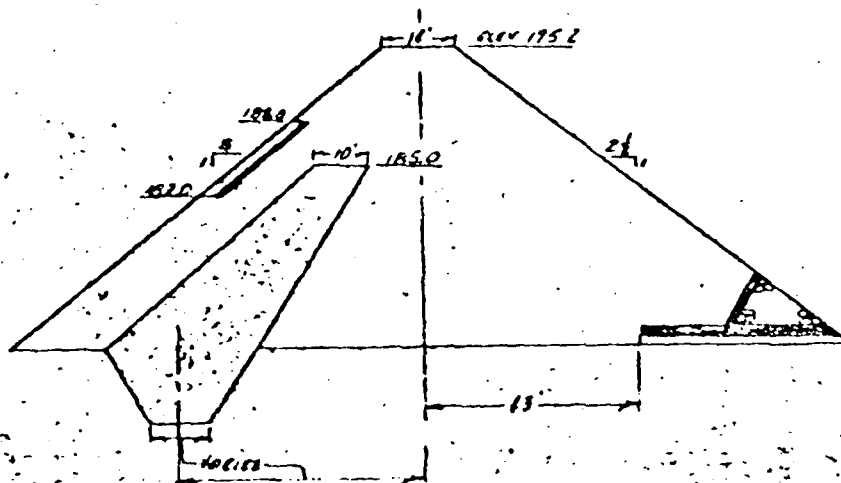
This structure consists of a compacted earth fill with a cutoff extending down into the foundation. A drainage system is installed to control seepage through the embankment and foundation.

The principal spillway is a weir section located in the emergency spillway.

The emergency spillway is designed as a rock cut in the left abutment.

DESIGN REPORT SUMMARY

- I. Watershed data
- A. Structure class (b)
 - B. Drainage area 3,100 Ac.
 - C. Time of concentration - T_c 1.77 Hrs.
 - D. Hydrologic curve number - C_n
 - 1. Moisture condition II 64
 - 2. Moisture condition III 82
- II. Principal spillway
- A. Weir size 1 x 15 Ft.
 - B. Pond drain size 18 In.
- III. Emergency spillway
- A. Width 80 Ft.
 - B. Side slopes 1-1/2 and 2:1
 - C. Exit slope 0.0167 Ft/Ft.
 - D. Maximum velocity at control section (D.H.W.) 11.1 Ft/Sec.
- IV. Earth fill
- A. Height 32 Ft.
 - B. Volume 22,000 C. Y.
 - C. Compaction Class A



TYPICAL SECTION OF DAM

U. S. DEPARTMENT OF AGRICULTURE - SOIL CONSERVATION SERVICE

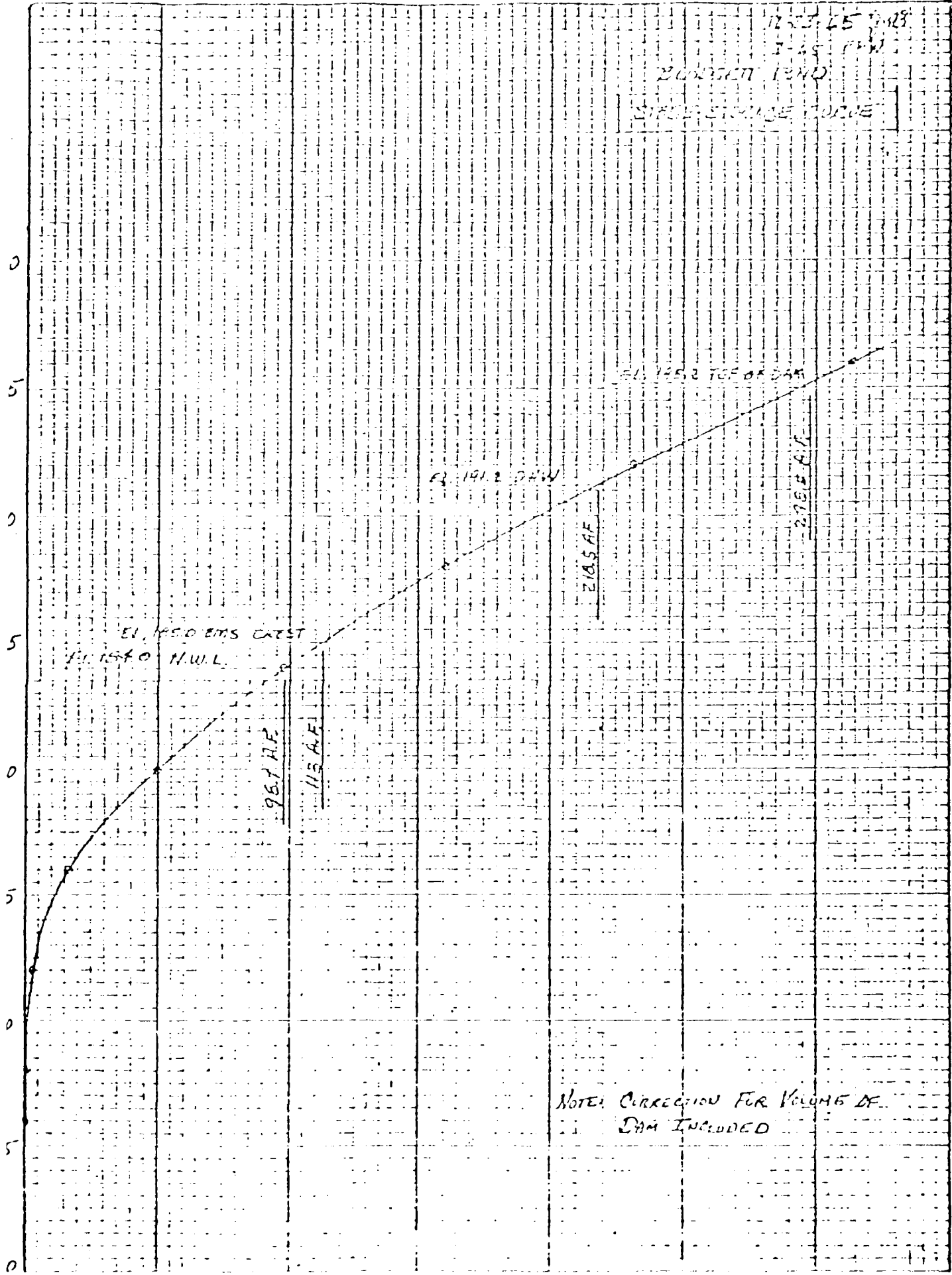
Element of Structure	Determining Factor	Elevation	Surface Area Acres	Storage		Inflow		Peak Outflow c.f.s.
				Acres-Feet	Inches*	Volume Inches*	Rate c.f.s.	
Crest of principal spillway		184.0	14.4	98.7	0.38			
Crest of emergency spillway	50-year frequency storm, 6 hour rainfall moisture condition III	185.0	15.0	113.0	0.44	1.94		
Design high water	1.25X minimum 6 hour precipitation - ES-1020 sheet 2 of 5, moisture condition II	191.2	19.0	218.5	0.85	3.67		
Top of dam	1.25X minimum 6 hour precipitation - ES-1020 sheet 3 of 5 moisture condition II	195.2	21.2	298.5	1.16	8.05		

*Inches of runoff from controlled area of 3100 acres

12-25-48
7-25 PM

BURTON POND

STILL STORAGE CURVE

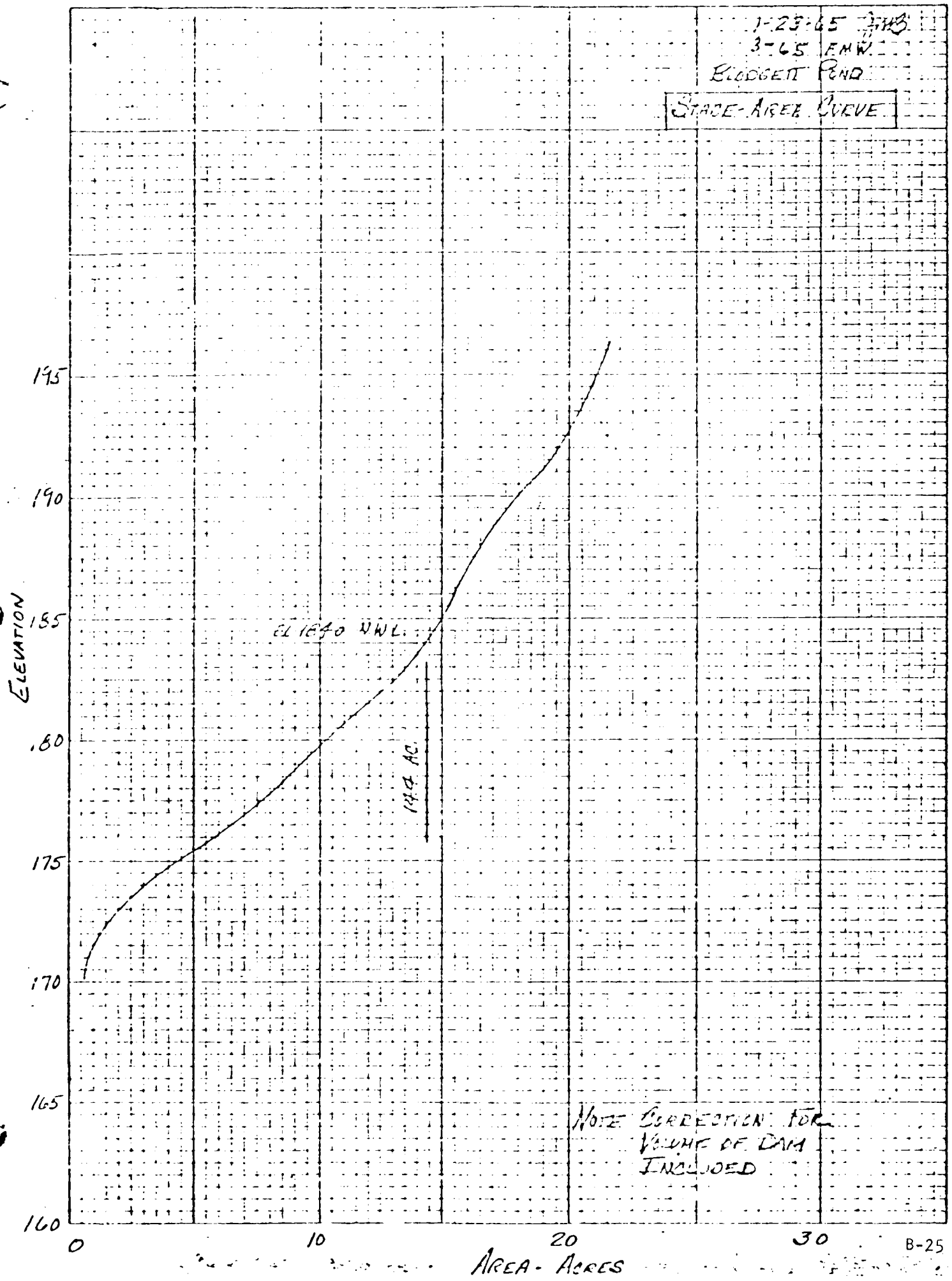


NOTE: CORRECTION FOR VOLUME OF DAM INCLUDED

STORAGE - AKIC FEET

1-23-65 JMB
3-65 FMW
BUDGET POND

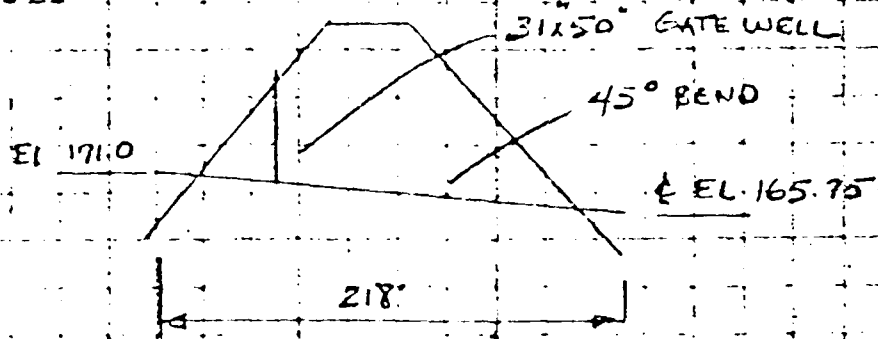
STAGE-AREA CURVE



NOTE CORRECTION FOR
VOLUME OF DATA
INCLUDED

STATE VERMONT PROJECT BUDGET POND
 BY JMB DATE 3-24-65 CHECKED BY DATE JOB NO.
 SUBJECT CONSTRUCTION AND POND DRAIN CAPACITY SHEET 4-11 OF

$f = 0.025$



K_0 (ENTRANCE) = 0.78

K_2 (ENLARGEMENT) = 1

K_{45} (BEND)

$K_{45} = \left[1 - \left(\frac{90-45}{90} \right)^2 \right] K_{90}$

$R \& S$ $R/d = \frac{R}{1.5} = 3.34$ $K_{90} = 0.35$ NEH 5 FR 5.5-5

$K_{45} = [1 - 0.25] 0.33 = 0.25$

K_p (PIPE FRICTION) = 0.06743

$$C_p = \sqrt{\frac{2.3}{1 + K_2 + K_{45} + K_p L + K_0}}$$

$$= \sqrt{\frac{64.4}{1 + 1 + 0.25 + 0.0674 \times 21.8 + 0.78}}$$

$$= \sqrt{\frac{64.4}{12.73}} = 1.90$$

$Q = 1.48 H^{1.48} = 1.90 \times 1.77^{1.48} = 3.36 \text{ ft}^3/\text{sec}$

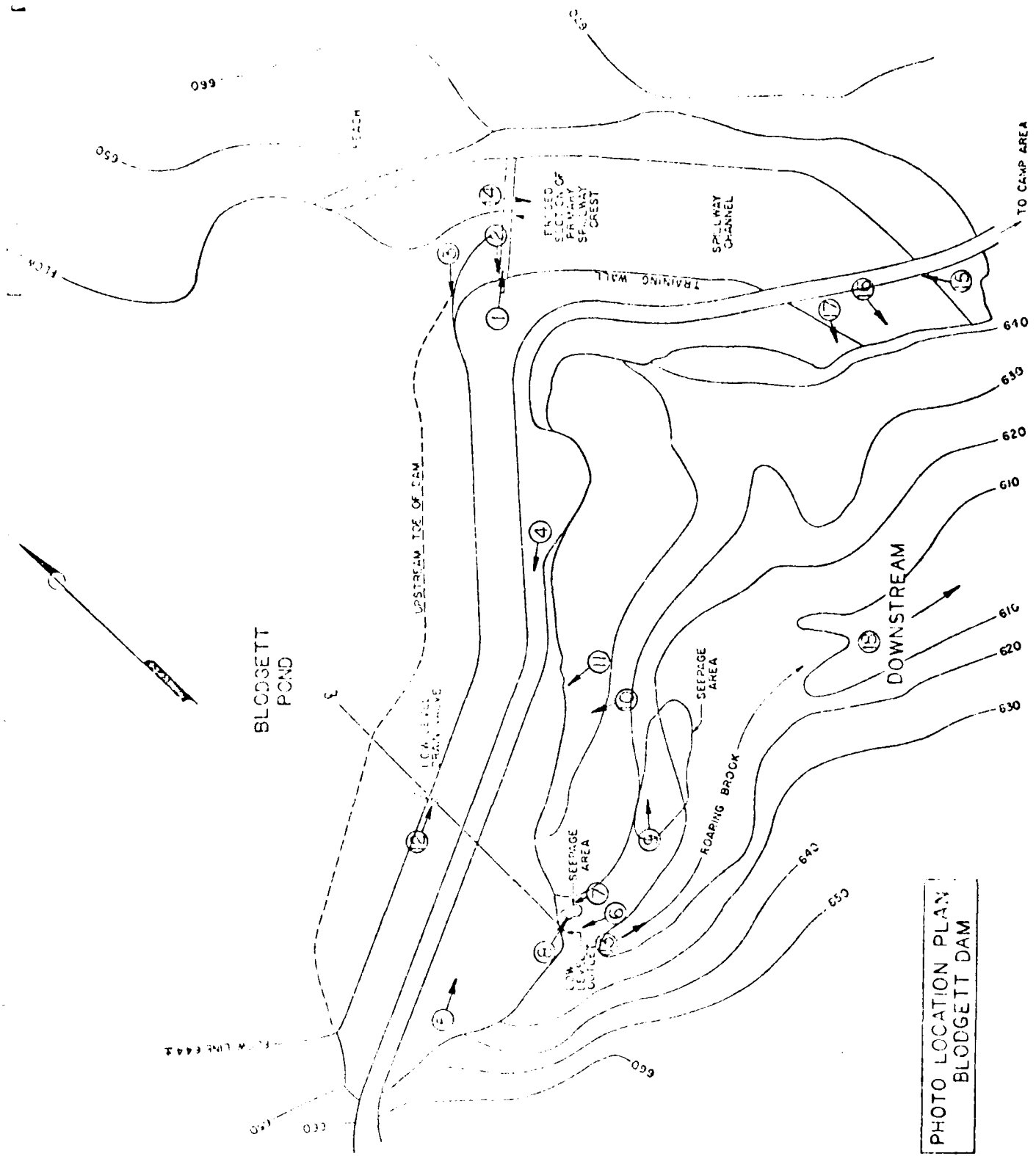
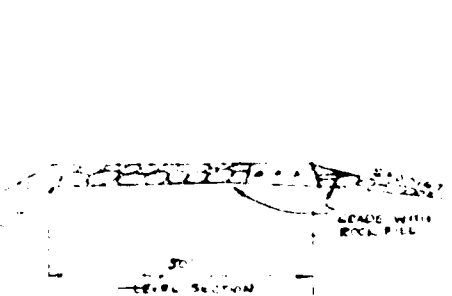
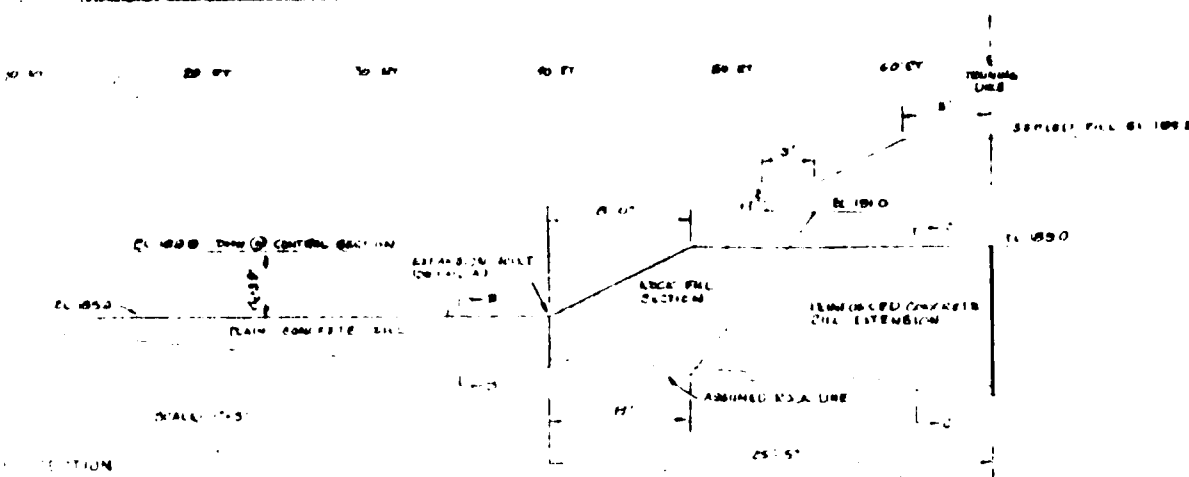
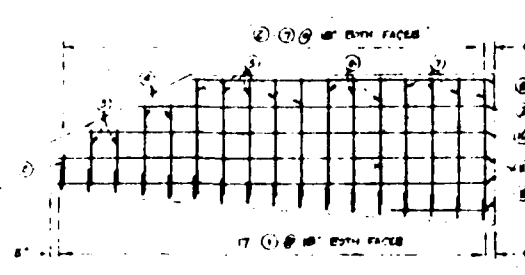


PHOTO LOCATION PLAN
BLODGETT DAM

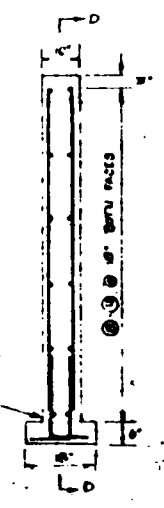
APPENDIX C
DETAIL PHOTOGRAPHS



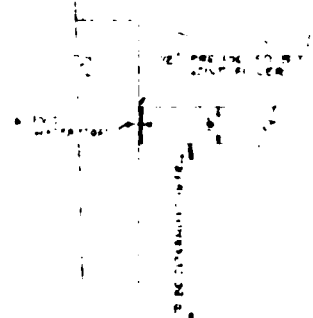
SECTION A-A



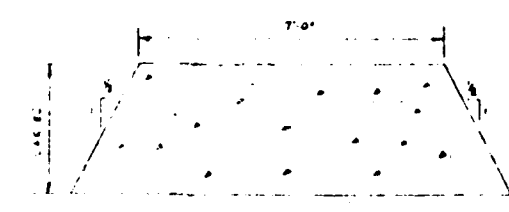
SECTION D-D



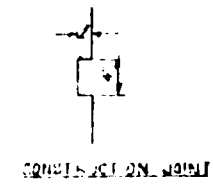
SECTION C-C



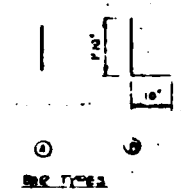
DETAIL A



CONCRETE SILL



CONSTRUCTION JOINT



REINFORCING

NO.	SIZE	LENGTH	TYPE	TOTAL
1	4	2.5'	D	80.00
2	4	1.9'	A	3.50
3	4	3.3'	A	8.00
4	4	5.0'	A	20.00
5	4	6.7'	A	47.50
6	4	7.5'	A	41.50
7	4	7.9'	A	62.00
8	4	7.9'	A	34.00
9	4	7.9'	A	40.00
10	4	7.9'	A	74.00
11	4	7.9'	A	33.00
12	4	5.9'	A	11.00

STEEL QUANTITY
 24 BARS 51'-0" UNIT 2542 LBS

CONCRETE QUANTITY
 SILL 180 CY
 SILL EXTENSION 61 CY
 TOTAL 241 CY

B-33

NOT TO SCALE

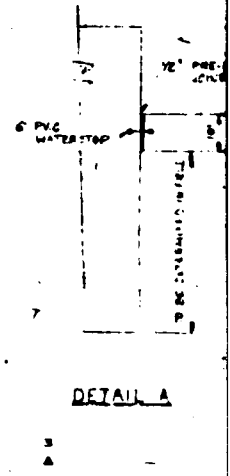
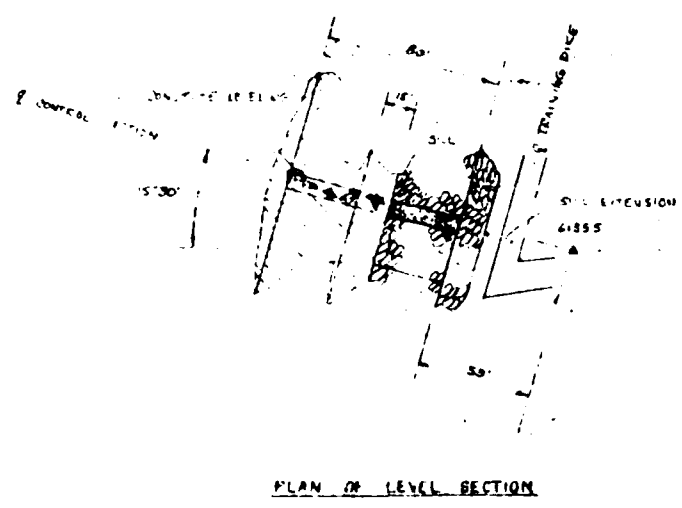
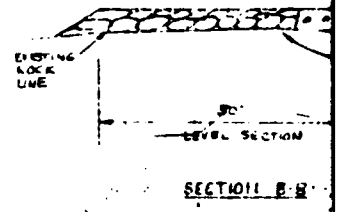
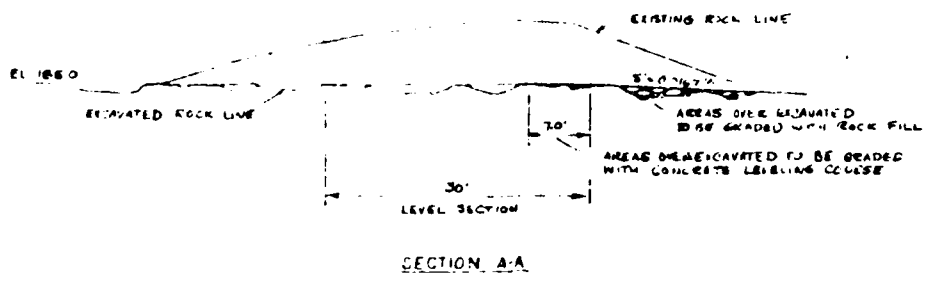
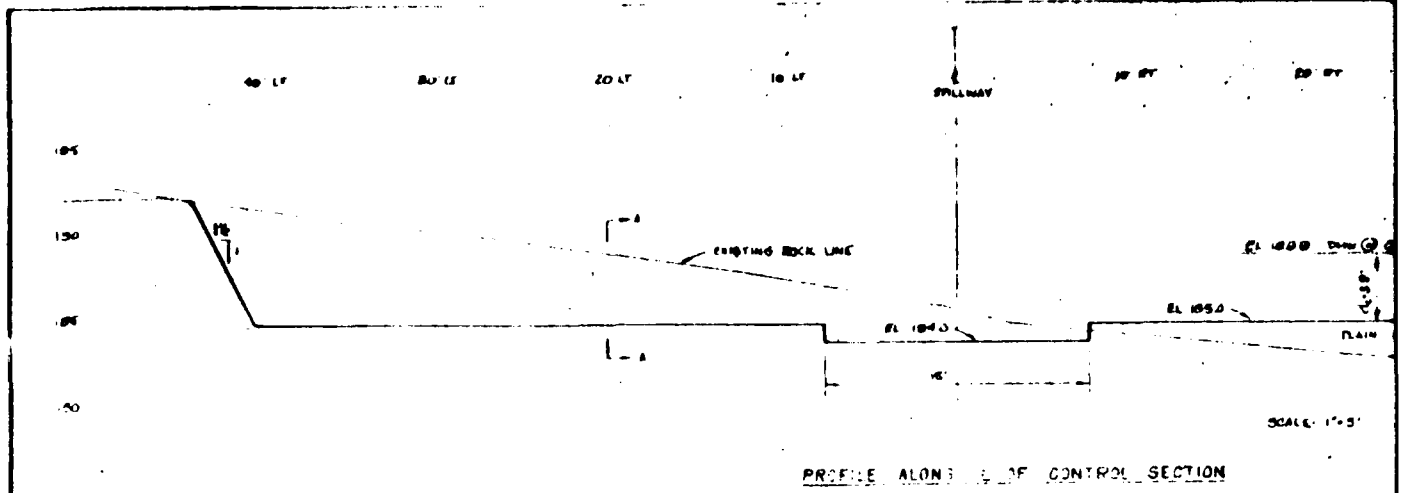
Vf Water Resources
 John C. Grant

BLODGETT POND
 WHITE RIVER FLOOD PROJECT
 BRADFORD, VERMONT
 CONSTRUCTION REVISION-SPILLWAY

U. S. DEPARTMENT OF AGRICULTURE
 SOIL CONSERVATION SERVICE

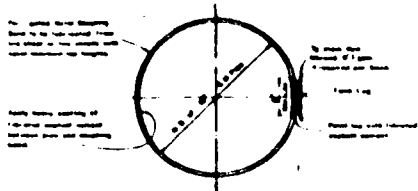
Project: _____ Date: _____
 Drawn: P. Carlson _____
 Checked: _____
 Approved: _____

20/2



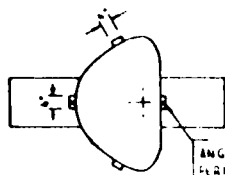
K-33

10/2



DETAILS OF WATER-TIGHT COUPLING BAND

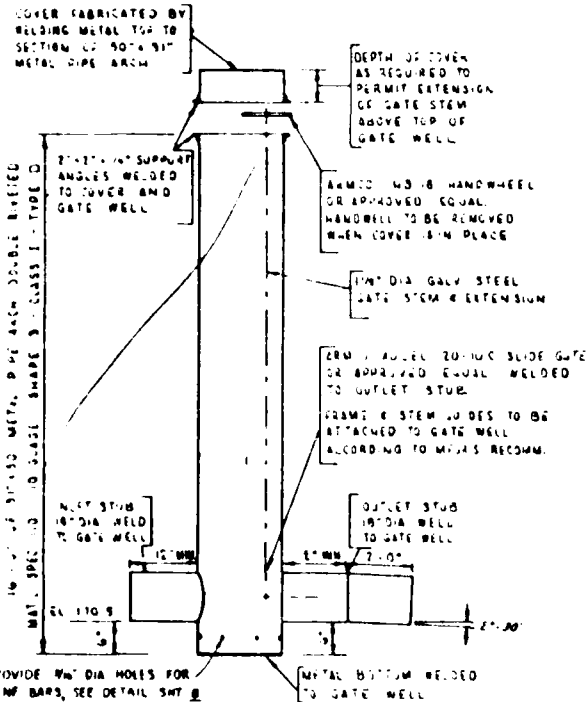
NOTE:
STANDARD 2-PIECE WATER-TIGHT COUPLING BAND
MAY BE SUBSTITUTED FOR ABOVE



ANGLES SLICED TO
PERMIT PULLING NO
COVER TO GATE WELL

PLAN VIEW

COVER FABRICATED BY
WELDING METAL TOP TO
SECTION OF 90° x 90°
METAL PIPE ARCH



PROVIDE 1/2" DIA HOLES FOR
REINFORCING BARS, SEE DETAIL SHT 2

NOTE:
ENTIRE ASSEMBLY TO BE SHOP FABRICATED

DETAILS OF SLIDE GATE WELL ASSEMBLY

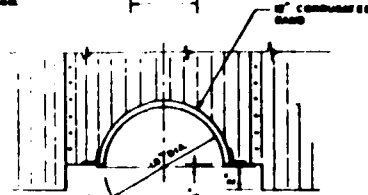
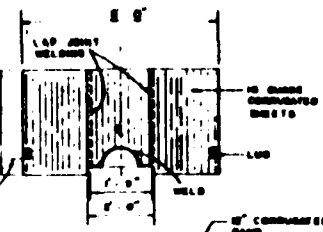
NOT TO SCALE

HAND-DRIVEN ROCK
TO PROVIDE TENSION
FOR GATE WELLS FOR
POND DRAIN PIPE

APPROX SOUND ROCK
ON ROCK SUPPORT
SCALE

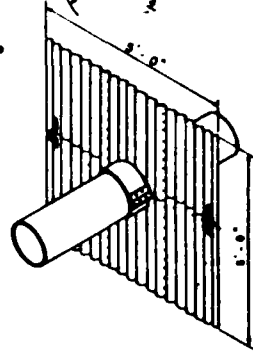
NOT TO SCALE

1/2" FROM EDGE ON UPPER HALF
OF DIAPHRAGM & 1" FROM EDGE
ON LOWER HALF OF DIAPHRAGM



NOTES

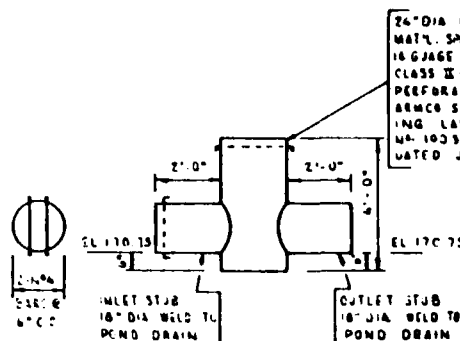
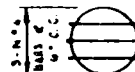
WELLS MATCH PUNCHED IN SHOP
TO PERMIT FIELD BOLTING
GALVANIZED BOLTS TO BE FURNISHED
WITH DIAPHRAGM
LAP BETWEEN TWO SECTIONS TO
RECEIVE EXTRA BITUMINOUS
COATING AT TIME OF ASSEMBLY
DIAPHRAGM TO BE FULLY
BITUMINOUS COATED



DETAILS OF ANTI-SEEP COLLAR

NOT TO SCALE

7 REQ'D

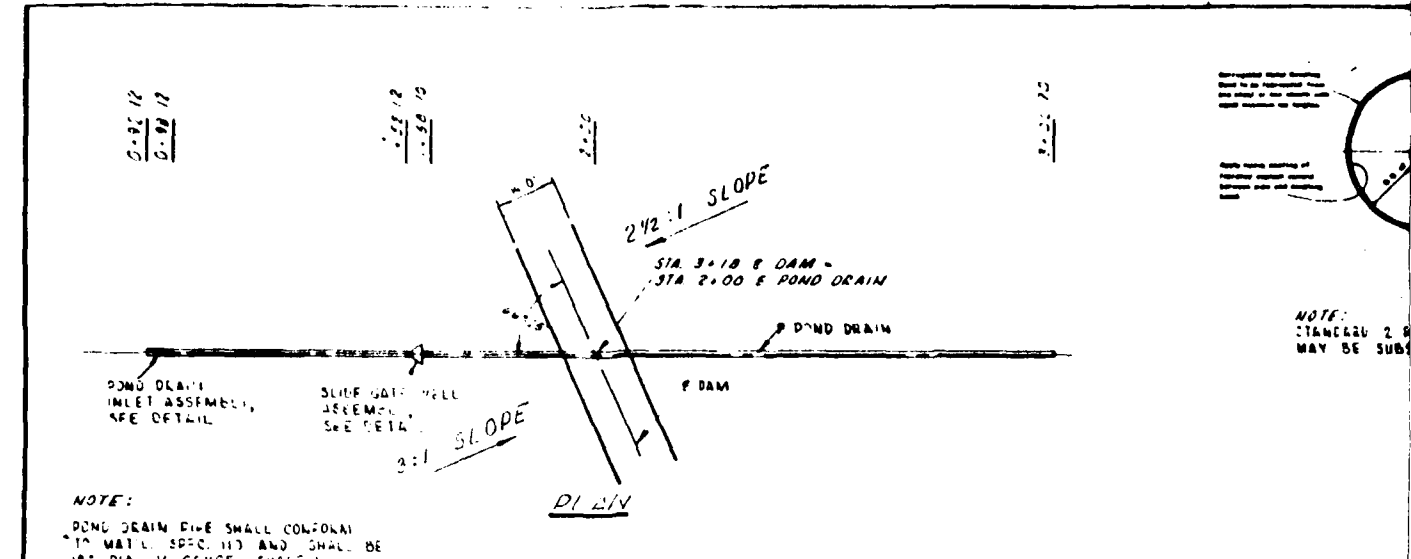


DETAILS OF POND DRAIN INLET ASSEMBLY
NOT TO SCALE

BLODGETT POND
WHITE RIVER R.C. AND D. PROJECT
BRADFORD, VERMONT
STRUCTURAL DETAILS
U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

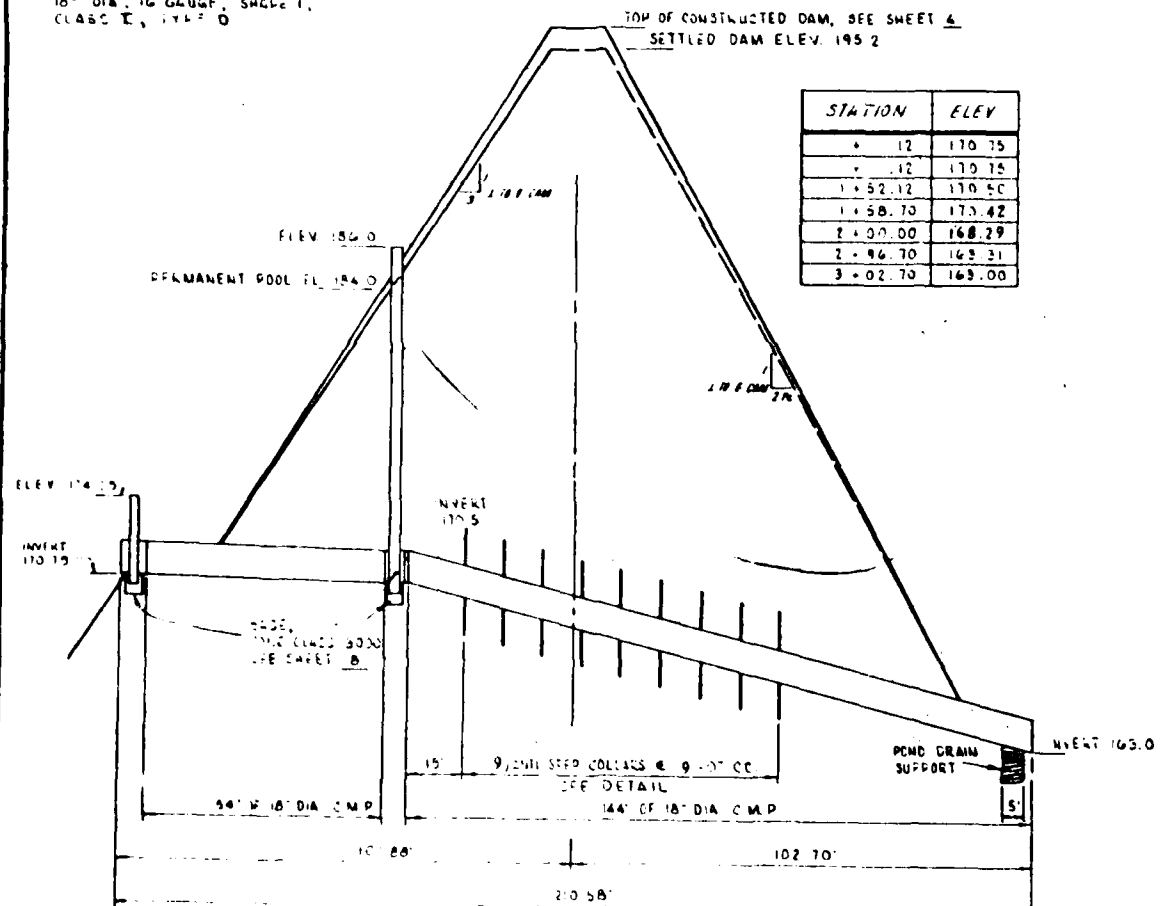
Designed by J. H. BRYANT MAY '65	Checked by A. W. ZIMMO MAY '65	Approved by M. T. BROWNING, JR. MAY '65
Drawn by M. T. BROWNING, JR.	Scale 1" = 1'-0"	Sheet VT-

safe



NOTE:
POND DRAIN PIPE SHALL CONFORM TO MAT'L SPEC. 117 AND SHALL BE 18" DIA. 16 GAUGE, SLOPE 1, CLASS E, TYPE D

NOTE:
STANCG22 2 8
MAY BE SUB

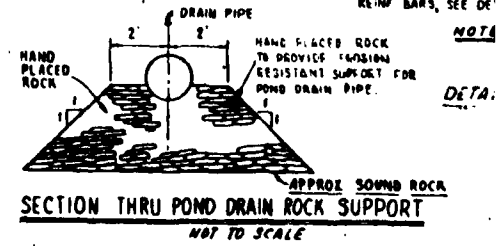


STATION	ELEV	
+	12	170.75
+	12	170.75
1+	52.12	170.50
1+	58.70	173.42
2+	00.00	168.29
2+	46.70	163.31
3+	02.70	163.00

COVER FABRIC
HOLDING METAL
SECTION OF 50
METAL PIPE AN

PROFILE OF POND DRAIN
NOT TO SCALE

LOCATION	ITEM	SIZE	LENGTH	QUANTITY
	C.M.P.	18" DIA.	192	
	SLIDE GATE WELL ASSEMBLY			1
	POND DRAIN INLET ASS'Y			1
	ANTI-SIFTER COLLARS, C.M.	8" x 8"		9
	WATER-TIGHT COUPLING BANDS			12



SECTION THRU POND DRAIN ROCK SUPPORT
NOT TO SCALE

COVER FABRIC
HOLDING METAL
SECTION OF 50
METAL PIPE AN

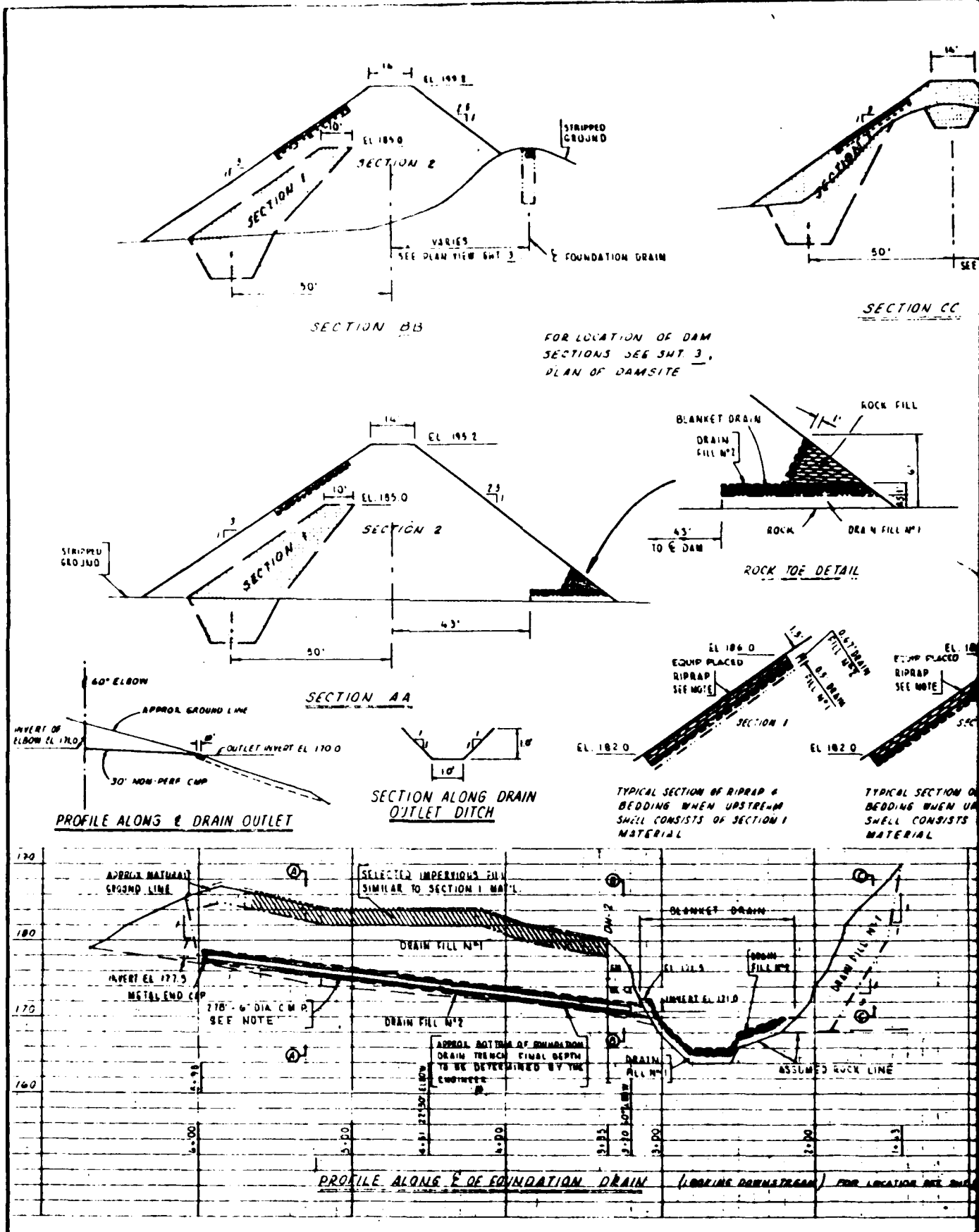
16'-0" OF 3" x 10" METAL PIPE ARCH DOUBLE RIVETED
MAT'L SPEC 110 - 10 GAUGE - SHAPE B - CLASS I - TYPE D
2'-2 1/2" ANGLE IRON TO COVER GATE WE

PROVIDE 1/4" DIA H REINB BARS, SEE DE

NOTE
DETAIL

A. 32

10/2



B-31

10/32

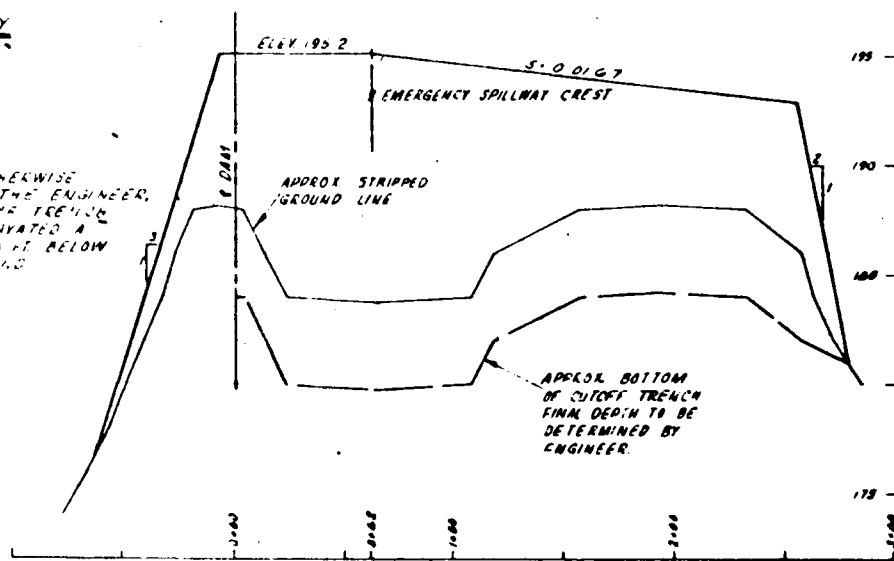
THE LOWER SPURT SECTION WILL BE EXCAVATED AS NEARLY TO GRADE AS THE SKILLFUL OPERATION OF A STRIPPING AND/OR A ROCK RIPPER ATTACHMENT WILL PERMIT. SATISFACTORY EVIDENCE OF THE INTENT OF THIS MEANS SHALL BE DETERMINED BY THE ENGINEER. THE SECTION FROM STA 2+90 TO 3+20 (1+200A) SHALL BE EXCAVED SO THAT ALL POINTS ARE AT LEAST 18" TO 24" THROUGHOUT THE LOWER SPURT WIDTH. SHALL BE 18" TO 24" THROUGHOUT THE 15' SECTION SAID AS THE PRINCIPAL SPURT. AFTER COMPLETION OF ROUGH EXCAVATION TO THE 30' HIGH SECTION DESCRIBED ABOVE, THE ENTIRE SECTION SHALL BE THOROUGHLY FLUSHED WITH WATER TO REMOVE ALL SOIL & LOOSE ROCK PARTICLES. ALL CRACKS & CREVICES SHALL BE CLEANED OUT AS SET FORTH IN SPECIFICATION NOS 4 AND 5. THE CONTROL SECTIONS OF THE LOWER & PRINCIPAL SPURTS WILL BE SHAPED SYMMETRICALLY WITH CLASS 3000 CONCRETE AS DIRECTED BY THE ENG. TO FORM A UNIFORM CREST SECTION. HIGH SLUMP CONCRETE WILL BE

USED TO FILL CRACKS AND CREVICES WHILE LOW SLUMP UNDERPAID CONCRETE WILL BE USED TO SHAPE THE CREST SECTION. PAYMENT WILL BE MADE AT THE CONTRACT UNIT PRICE PER CUBIC YARD AS MEASURED AT THE FINISH PLANT.

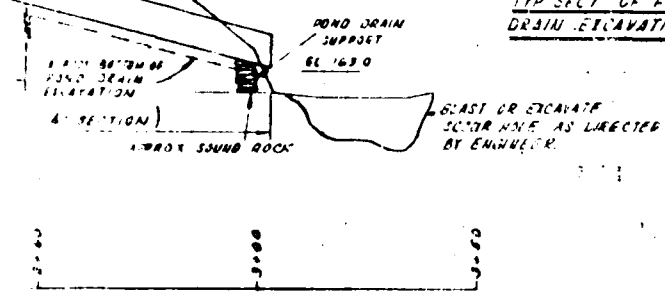
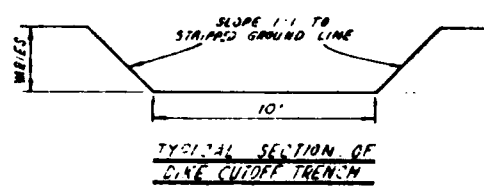
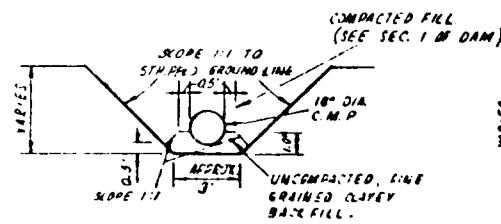
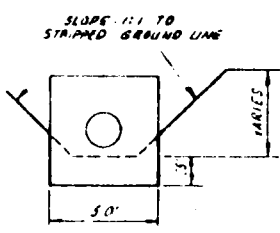
BOTTOM OF LOWER SPURT
SLOPE = 0.1167

LOW DAM AND EMERGENCY SPILLWAY

NOTE: UNLESS OTHERWISE DIRECTED BY THE ENGINEER, THE DIKE OUTSIDE TRENCH SHALL BE EXCAVATED A MINIMUM OF 4 FT BELOW NATURAL GRAUND.



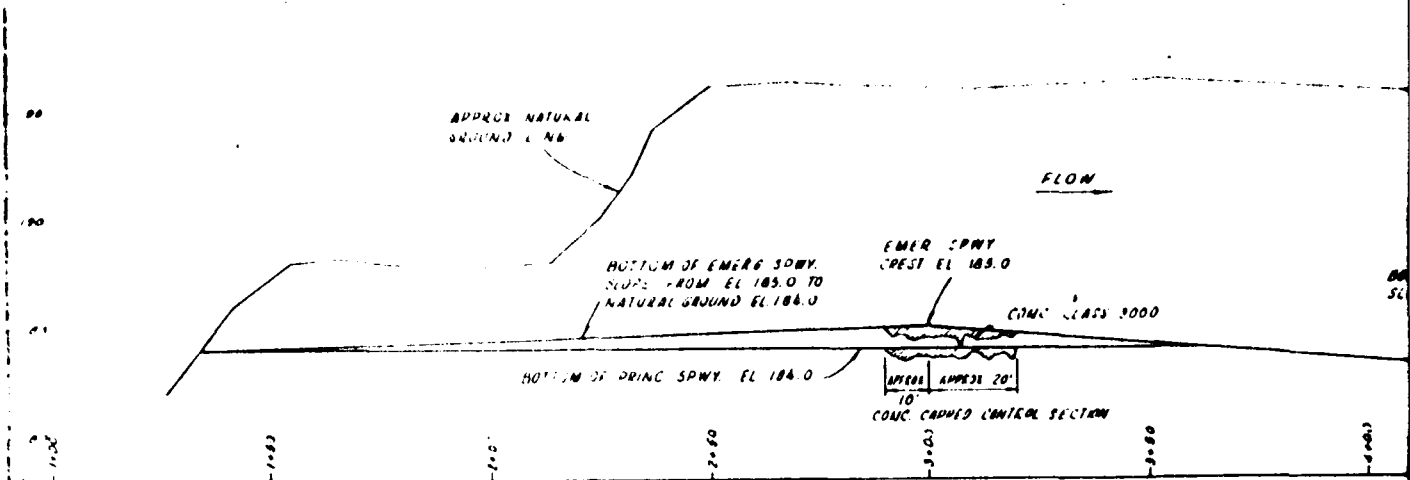
PROFILE ALONG E OF DIKE



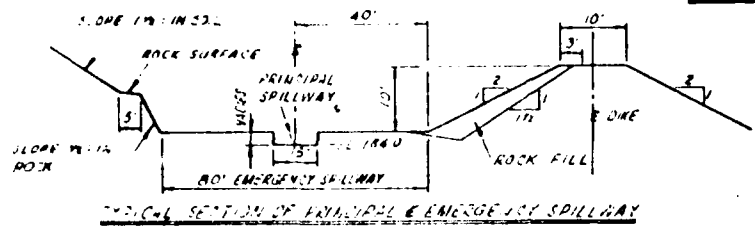
NOT TO SCALE
B-30

BLODGETT POND			
WHITE RIVER R.C. AND D. PROJECT			
BRADFORD, VERMONT			
PROFILES			
U. S. DEPARTMENT OF AGRICULTURE			
SOIL CONSERVATION SERVICE			
J. H. BRYANT	Mar '65	Scale	Sheet
Designed by	A. W. ZURLO	May '65	Page
Drawn by	H. I. BARNHART & ASSOC.	Checked by	W. A. HANCOCK
Project	White River R.C. and D. Project	Scale	Sheet
Drawn	W. A. HANCOCK	Checked	W. A. HANCOCK
			VT-

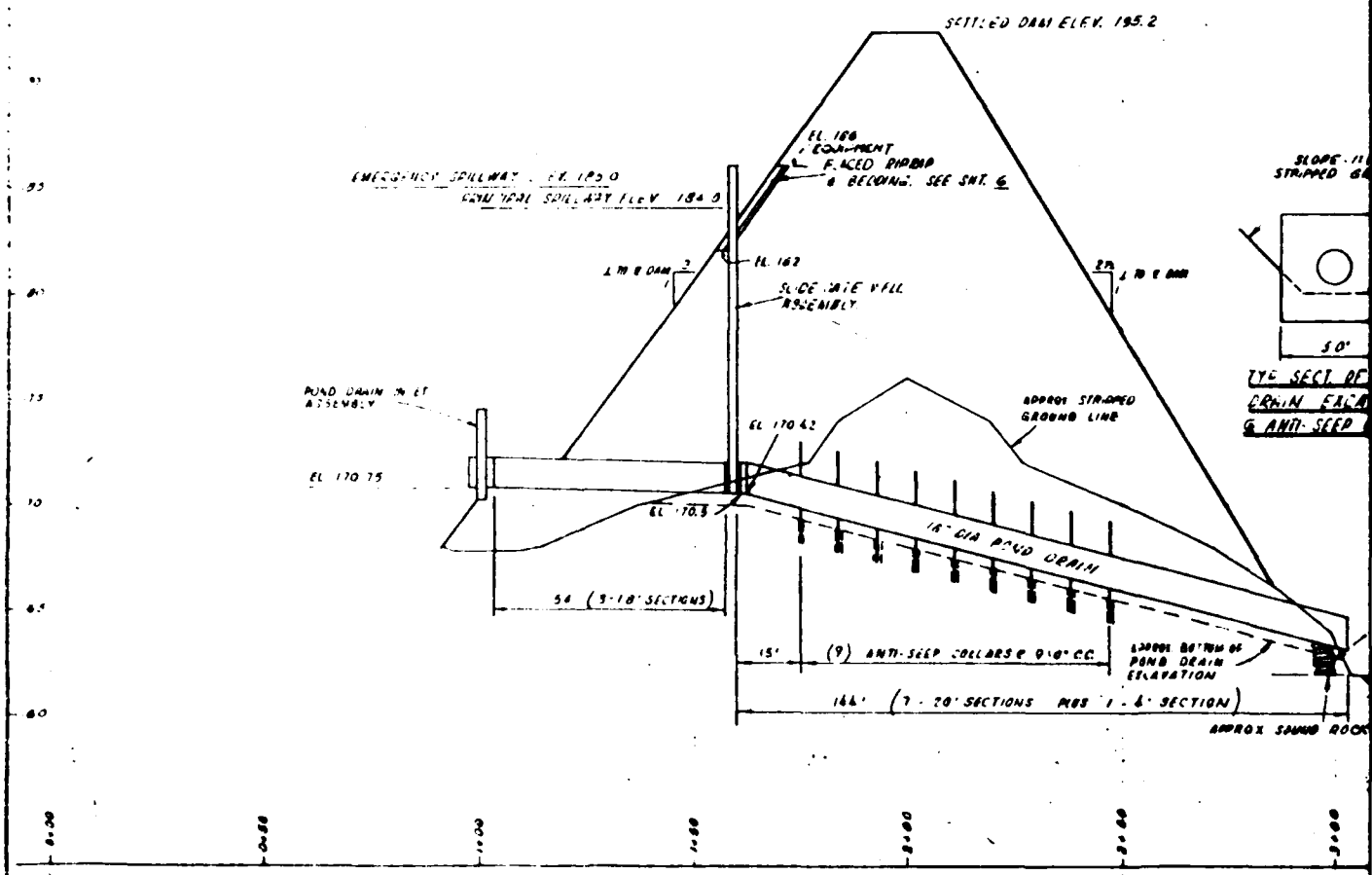
2 of 2



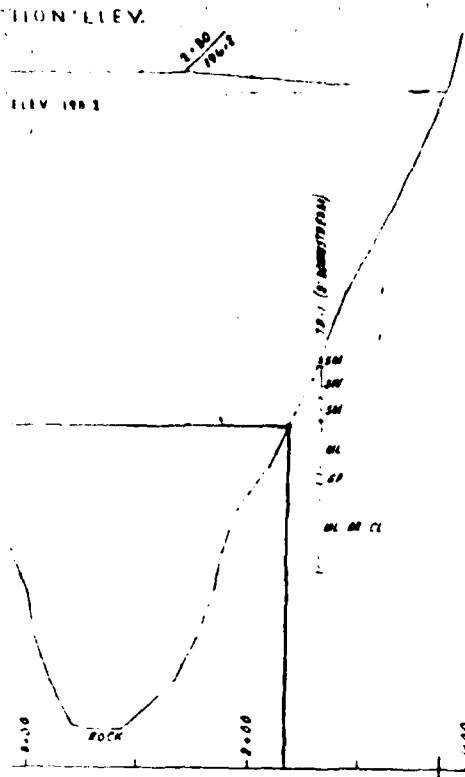
PROFILE ALONG E OF PRINCIPAL AND EMERGENCY



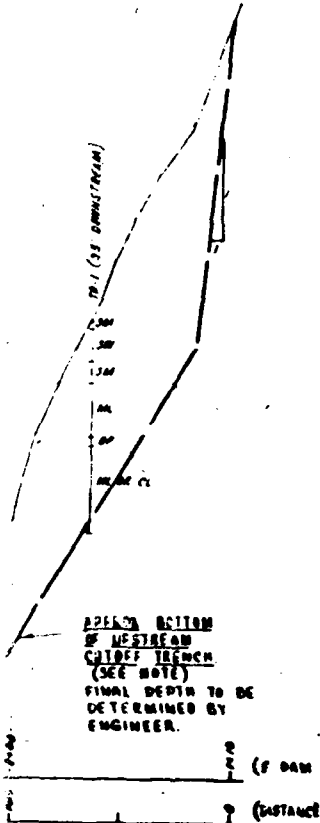
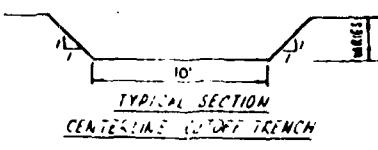
TYPICAL SECTION OF PRINCIPAL & EMERGENCY SPILLWAY



PROFILE ALONG E OF POND DRAIN

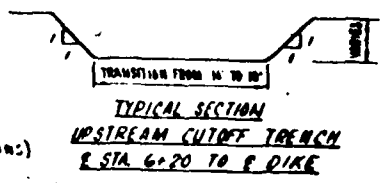
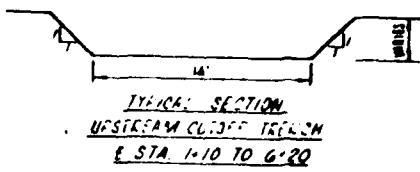


NOTE:
UNLESS OTHERWISE DIRECTED BY THE ENGINEER, THE R CUTOFF SHALL EXTEND BELOW FROST PENETRATION DEPTH OR BELOW SILTY SAND (SM) MATERIAL, REPRESENTED BY GULLY HOLE 1 & 2 FROM 0 TO 5 FT. WHICHEVER IS GREATER.



NOTE:
UNLESS OTHERWISE DIRECTED BY THE ENGINEER, THE DAM CUTOFF TRENCH SHALL BE EXCAVATED A MINIMUM OF 10 FT. BELOW NATURAL GROUND WHERE ROCK IS ENCOUNTERED THE TRENCH SHALL EXTEND ONLY TO THE SURFACE OF SOUND, HARD ROCK OR INTO WEATHERED ROCK TO A MINIMUM DEPTH OF 5 FT.

NOTE:
FOR DESCRIPTION OF LOGS SEE SHEETS 9 & 10



DEPTH BOTTOM OF UPSTREAM CUTOFF TRENCH (SEE NOTE)
FINAL DEPTH TO BE DETERMINED BY ENGINEER.

(R DAM STATIONS)
(DISTANCE ALONG TRENCH)

SEE SHEET 3 - PLAN OF DAMS/TS

NOT TO SCALE

BLODGETT POND	
WHITE RIVER RC AND D PROJECT BRADFORD, VERMONT	
PROFILES	
U. S. DEPARTMENT OF AGRICULTURE SOIL CONSERVATION SERVICE	
Designed by J. H. FLETCHER	Checked by J. H. FLETCHER
Drawn by B. BRIDGEMAN	Scale 1" = 10'
Date 10-10-58	Sheet 8-29
Project White River	Location VT

8-29

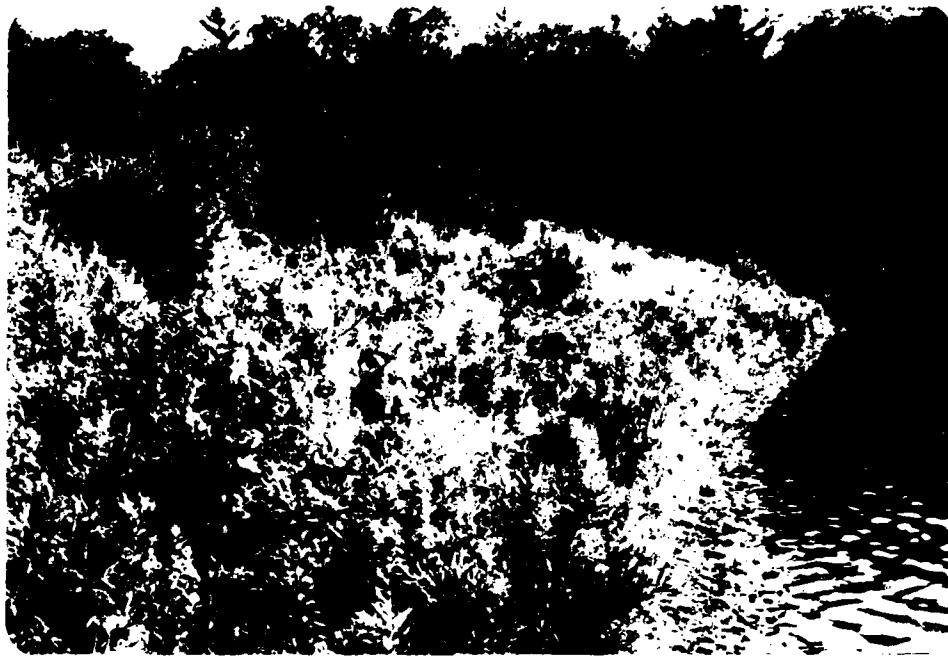


(1) Primary/Secondary Spillway Crest Wall, Showing Eroded Section. Bedrock in Background is Left Abutment of Dam.



(2) Reinforced Concrete Sill Extension at Right End of Spillway

U.S. ARMY ENGINEER DIV, NEW ENGLAND CORPS OF ENGINEERS WALTHAM, MASSACHUSETTS	NATIONAL PROGRAM OF INSPECTION OF NON-FED. DAMS	Blodgett Dam VT 00117 Bradford, Vermont April 22, 1980
JAMES W. SEWALL COMPANY CONSULTANTS OLD TOWN, MAINE		C-2



(3) Upstream Slope of Dam From Spillway Channel Entrance.



(4) Crest of Dam, Looking Toward 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

Blodgett Dam

VT 00117

Bradford, Vermont

April 22, 1980

C-3



(5) Downstream Slope, from Point Near Right Abutment.



(6) Low Level Outlet at Toe of Dam.

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

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CONSULTANTS
OLD TOWN, MAINE

NATIONAL PROGRAM OF
INSPECTION OF
NON-FED. DAMS

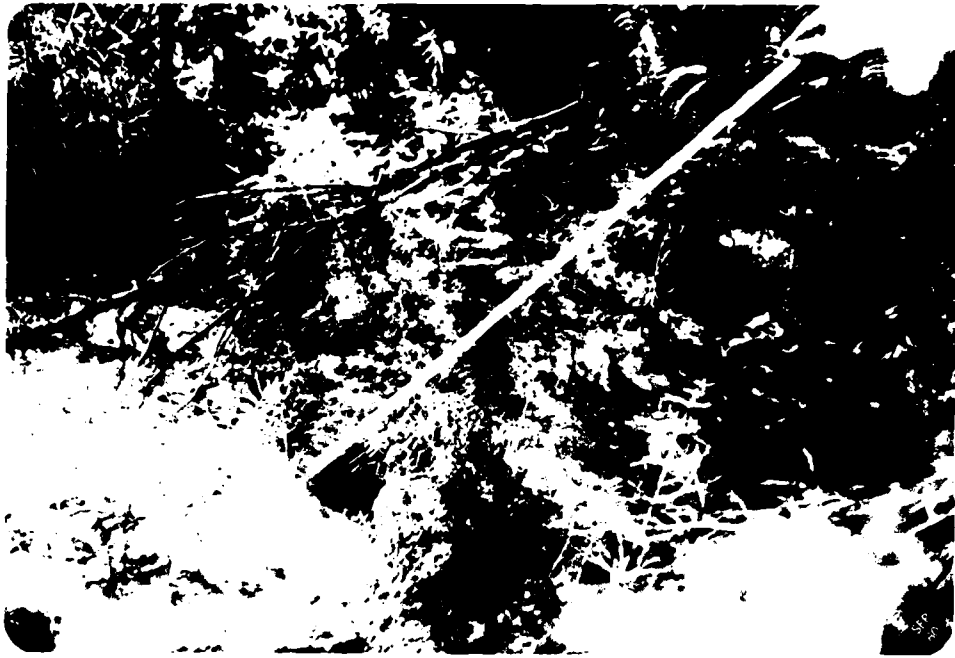
Blodgett Dam

VT00117

Bradford, Vermont

April 22, 1980

C-4



(7) Seepage Immediately Downstream of Drainage Outlet Pipe.



(8) Pool Downstream of Seepage in Photo (7).

U.S. ARMY ENGINEER DIV, NEW ENGLAND
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OLD TOWN, MAINE

NATIONAL PROGRAM OF
INSPECTION OF
NON-FED. DAMS

Blodgett Dam
VT 00117
Bradford, Vermont
April 22, 1980



(9) Partial View of Extensive Area of Seepage in Original Ground Below Toe of Dam.



(10) Seepage Exiting Original Ground at Base of Tree.

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OLD TOWN, MAINE

NATIONAL PROGRAM OF
INSPECTION OF
NON-FED. DAMS

Blodgett Dam

VT 00117

Bradford, Vermont

April 22, 1980

C-6



(11) Animal Burrow Near Toe of Dam.



(12) Low Level Outlet Gate Housing.

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

Blodgett Dam

VT 00117

Bradford, Vermont

April 22, 1980

C-7



(13) Low Level Outlet Channel.



(14) Spillway Channel, From Primary/Secondary Spillway Crest.

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WALTHAM, MASSACHUSETTS

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OLD TOWN, MAINE

NATIONAL PROGRAM OF
INSPECTION OF
NON-FED. DAMS

Blodgett Dam

VT 00117

Bradford, Vermont

April 22, 1980

C-8



(15) Roadway Across Spillway Channel.



(16) Spillway Channel Downstream of Road Crossing.

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OLD TOWN, MAINE

NATIONAL PROGRAM OF
INSPECTION OF
NON-FED. DAMS

Blodgett Dam

VT 00117

Bradford, Vermont

April 22, 1980

C-9



(17) Erosion of Right Side of Spillway Channel.



(18) November 4, 1927 Flood Level Marker (Disk) on Backwall of B & M Railroad Bridge Crossing Roaring Brook.

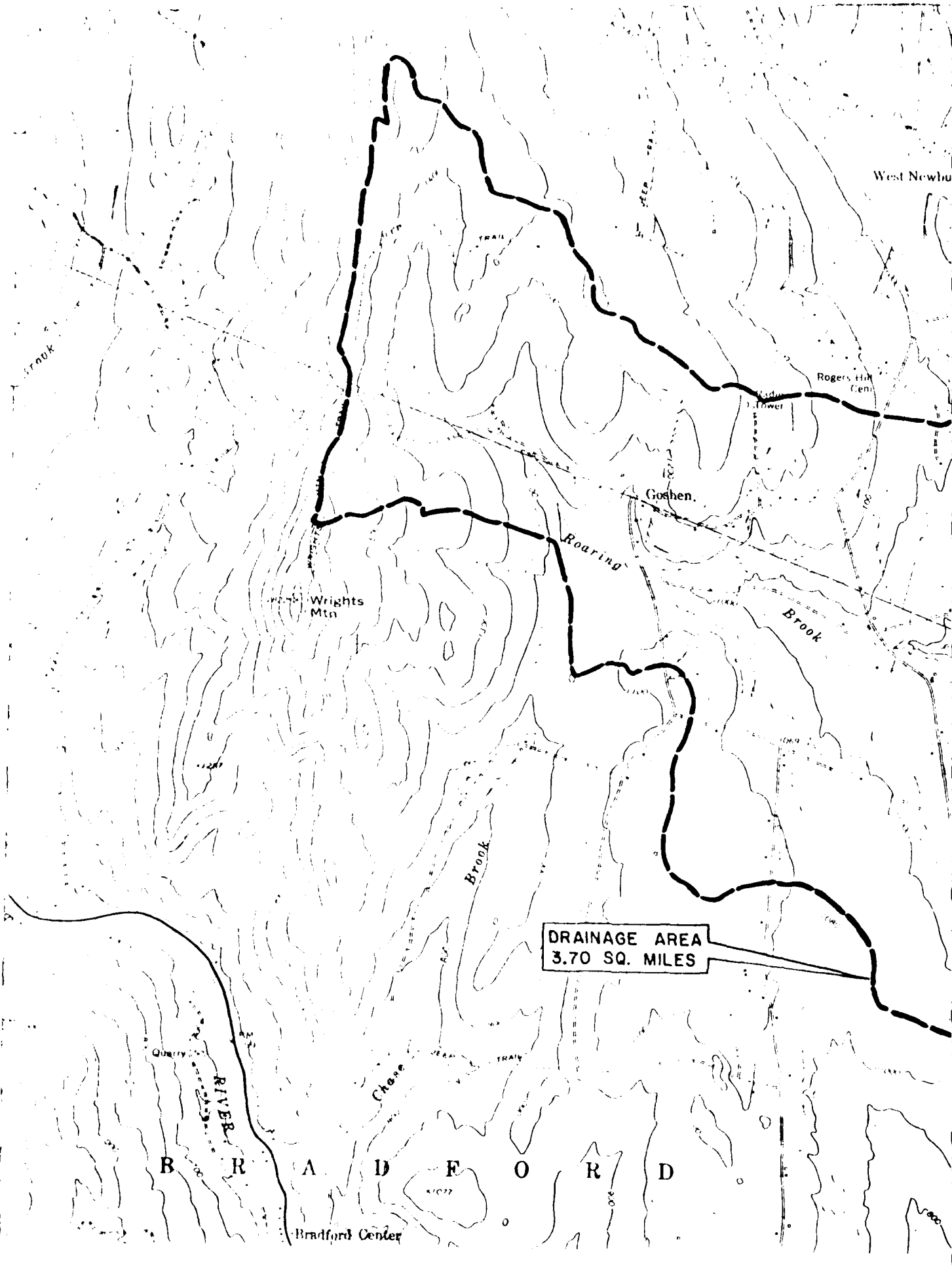
U.S. ARMY ENGINEER DIV. NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASSACHUSETTS

JAMES W. SEWALL COMPANY
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OLD TOWN, MAINE

NATIONAL PROGRAM OF
INSPECTION OF
NON-FED. DAMS

Blodgett Dam
VT 00117
Bradford, Vermont
April 22, 1980

APPENDIX D
HYDRAULIC/HYDROLOGIC COMPUTATIONS



**DRAINAGE AREA
3.70 SQ. MILES**

B R A D F O R D

Bradford Center

West Newbu

Rogers Hill
Cent.

Goshen

Wrights
Mtn

Quarry

Chase

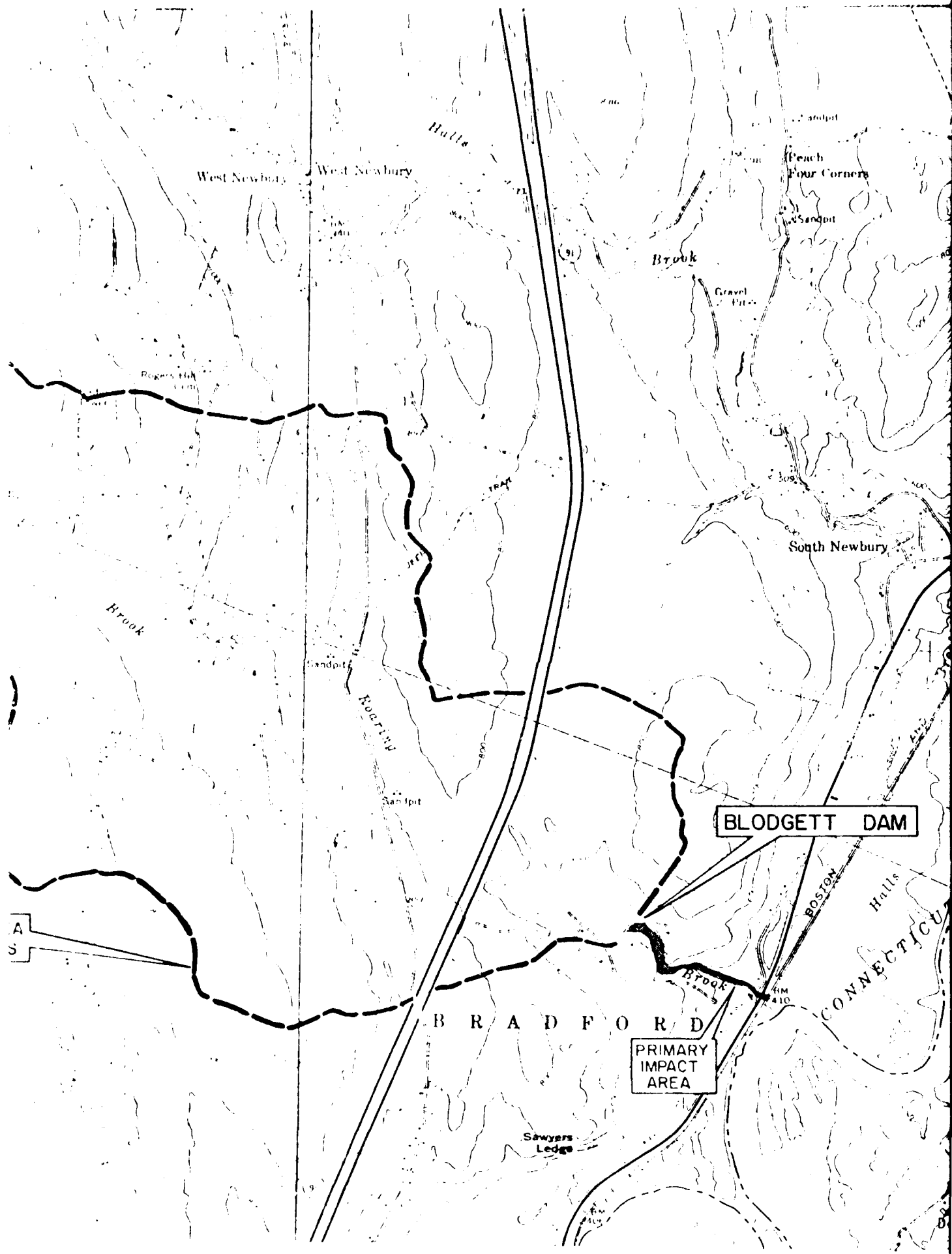
Brook

Roaring

Brook

11077

1000



BLODGETT DAM

B R A D F O R D

PRIMARY IMPACT AREA

A
S

CONNECTICUT

West Newbury

Four Corners

South Newbury

Brook

Brook

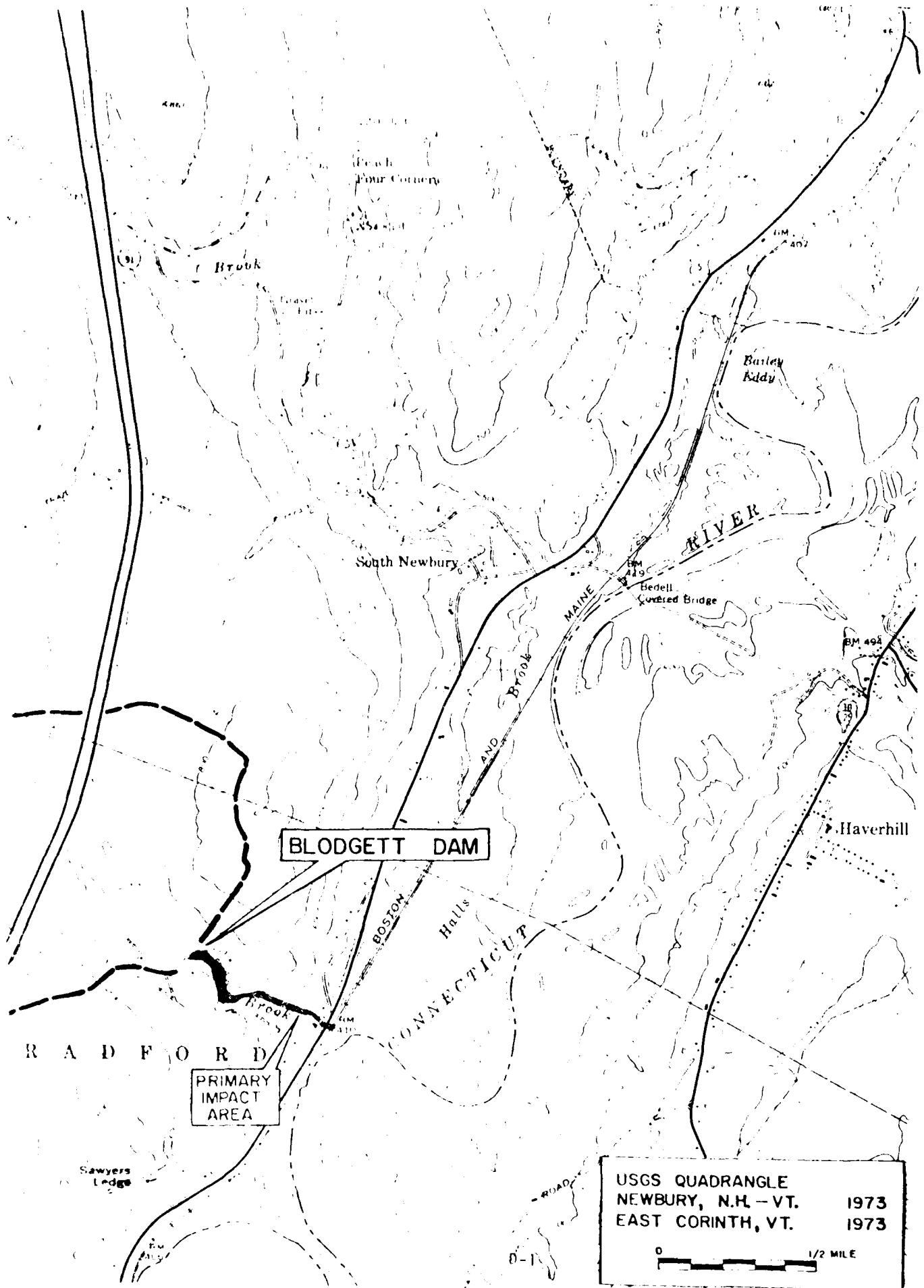
Rogers Hill

Sawyers Ledge

Brook

BOSTON

Halls



BLODGETT DAM

**PRIMARY
IMPACT
AREA**

USGS QUADRANGLE
NEWBURY, N.H. - VT. 1973
EAST CORINTH, VT. 1973

0 1/2 MILE

Subject Hydrology / Hydrology Report

Computation 1-1-50 Job No. 952-11

Computed by W.H.F. Checked by D.C./RW Date 1-2-50

Hydrology / Hydrology Report

I. Proposed Project - Flood Control

A. Maximum Probable Flood

a) Watershed: Clinton Hill Brook, 1.5 sq. miles
Average slope = 1/4 of 1% (1/4" drop per 100')

b) Watershed Area:

3.10 sq. mi. J.E. plan, 1940

3.85 sq. mi. Conservation Service

c) Peak NEELAGE: Peak Flood Condition for Maximum
Flow: 15 cfs (1940) (1940) (1940)

PMF: Peak Flow Point

PMF = 2240 cfs (1940) (1940)

PMF = 1940 cfs (1940) (1940)

d) Peak Flood:

100% peak flow as shown on NEELAGE inflow
rates for 1940 (1940) (1940)

Q₁₀₀ = 3.1 (1940) (1940) (1940)

Q₁₀₀ = 1940 (1940) (1940)

AD-A157 558

NATIONAL PROGRAM FOR INSPECTION OF NON-FEDERAL DAMS
BLODGETT DAM (VT 0011) (U) CORPS OF ENGINEERS WALTHAM
MA NEW ENGLAND DIV OCT 80

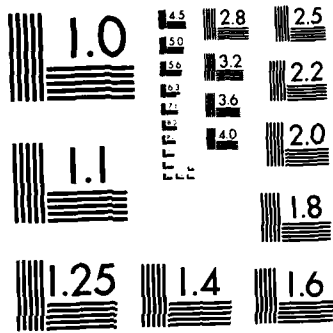
2/2

UNCLASSIFIED

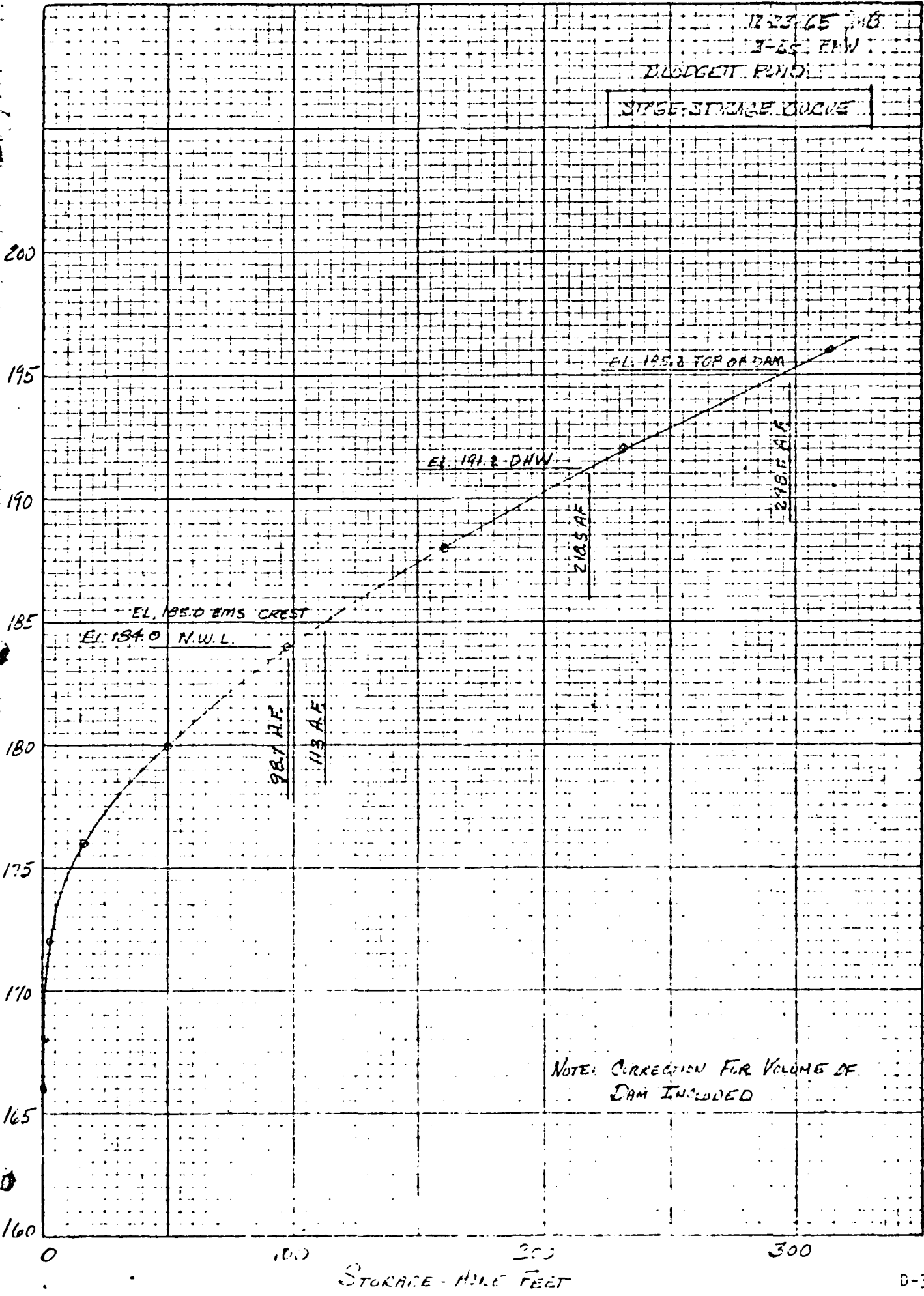
F/G 13/13

NL

END
FORMED
etc



MICROCOPY RESOLUTION TEST CHART
NBS-1963-A



Subject Inspection of water-filling dam

Computation Bledgett Dam

Job No. 953-05 L

Computed by NBF

Checked by SDM/BW

Date 8-28-20

i) SIZE cont.

Storage cont.

Note that elevations used on the stage-storage curve are from the SCS Conservation Service records. Approximate equation is $SCS + 960 = NGVD$.

Height = 29.9 feet - 1/4 Dept of Water Resources Information Sheet

ii) Hazard Potential

U.S. Dept of Commerce Housing Dept. approx 3466 feet W of the dam and the location of Maine R.P. crosses approximately 150 feet W of the dam. Both these structures would be overtopped causing severe damage. Due to the fact that a few trees could be lost at log camp south of dam.

iii) Classification

SIZE : SMALL

HAZARD : SIGNIFICANT

iv) Test Flood = 100 year flood @ 1/5 PMF = 1600 cfs
(used "Ratio of Probable Maximum 6-Hour Precipitation for 10 Year AEP to 100-year 6-Hour PMF"
given in the Dept of Comm. Tech. Rep. #10, p. 58.

Subject Improvement of non-flooded ditches

Computation Highway Drain Job No. 950-152

Computed by MSR Checked by SDM/BW Date 8-28-50

3) Spillways at East Trestle

a) Peak Inflow

Peak Flood = 1,600 cfs @ 100 yr. flood

b) Outflow Rating Curve

Primary Spillway el. 649 MSLVD L=15' width=7'
 $Q = C H^{3/2}$ $C = 2.85$

H	MSL	Q
1	645.0	43
2	646.0	121
3	648.0	342
6	650.0	623
8	652.0	467
10	654.0	1352
11.2	655.0	1600

* A 3 foot long section of this spillway had been severely damaged; no correction was made for this in the flow calculations.

Emergency Spillway el. 645 MSLVD L=65' width=7'
 $Q = C H^{3/2}$ $C = 2.3$

H	Q	MSL	H	Q	MSL
1	135	646.0	7	3431	642.0
3	945	648.0	9	6723	644.0
5	2071	650.0	10.2	6723	645.0

Right Side of Emergency Spillway

$Q = C H^{3/2}$ $C = 2.4$
 $Q = C H^{3/2}$ $C = 2.9$

1	5	645.0	2	207	645.0
3	15	646.0	3	423	646.0
5	141	648.0	5	1100	648.0
	407				

Subject Inspection of ...

Computation ... Job No. ...

Computed by ... Checked by SDM / RW Date ...

18" corrugated pipe - use Manning's n = 0.120, available head = 2.0', $Q = 200$
 $Q = 60$ cfs

Left Side of Emergency Spillway

Side Slope = 1.5 H to 1 V

$Q = CLH^{2.2}$ $C = 2.5$ stepping in 1 ft vertical increments

H (ft)	Q	WSFL	H (ft)	Q	WSFL
1	4	646.0	7	230	652.0
3	39	648.0	9	415	654.0
5	106	651.0	10.2	561	655.2

The outflow rating curve is plotted on page 6

a) Spillway Capacity to Top of Dam

$Q_s = 8950$ cfs WSFL = 655.2

$Q_s = 559$ % of the Test Max $Q_p = 1600$ cfs

b) Surge Height to Pass Q_p

$Q_p @ 100yr flood = 1600$ cfs

(see curve p. 6)

$H = 648.3 - 644.0 = 4.3'$

1) Effect of Surcharge on Max Probable Discharge

a) Pond Area - varies with surcharge (see curve p. 7)

Curve from Unit Hydrograph P. 3 + D. 11
Draw Pond 1, 1964, USGS 500,
or for use of H. 1 of Pond Area

b) Normal Pool Level at ...

644.0 MSL

3.7 ft (see p. 4)

Subject Inspection of non-federal dams

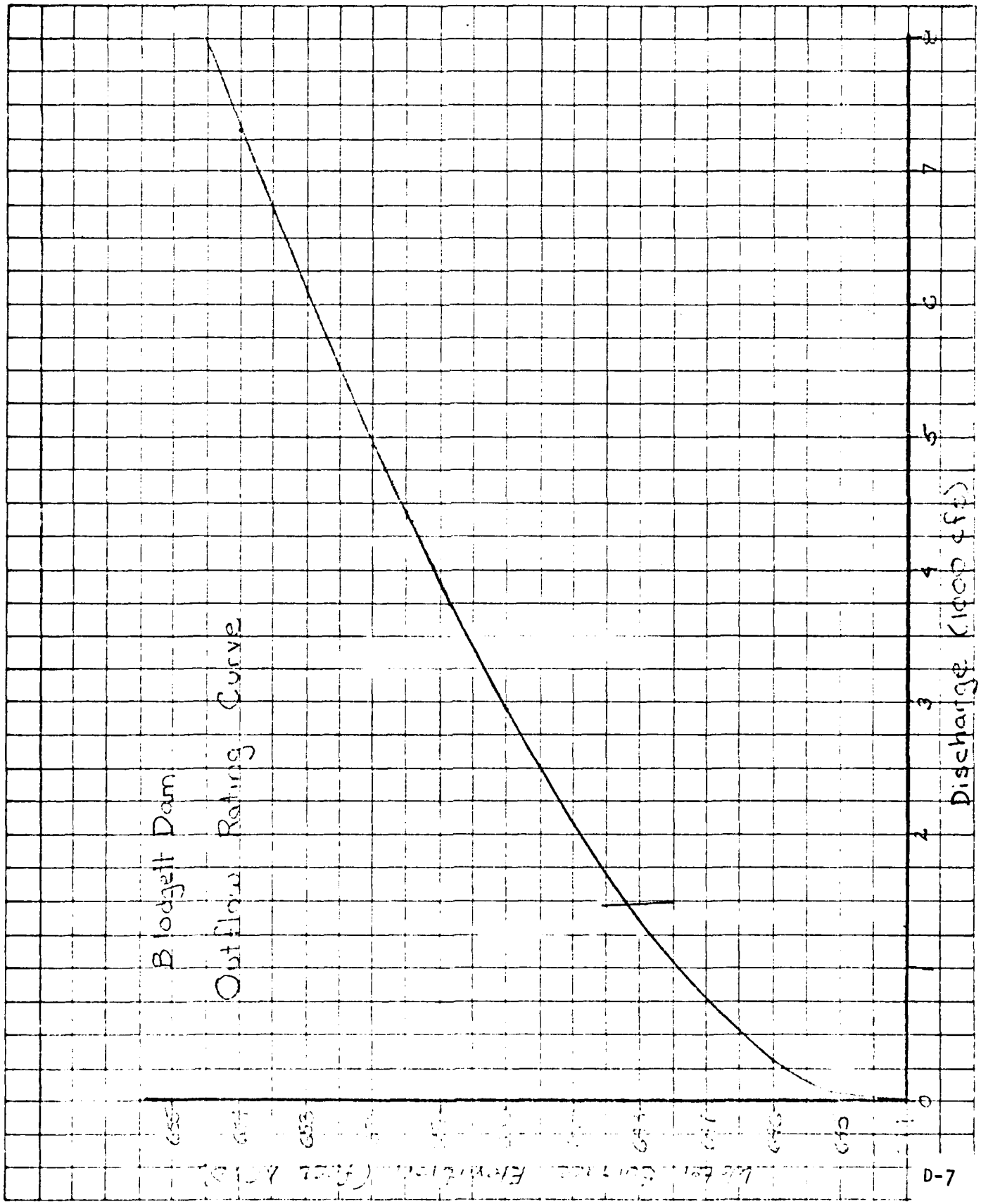
Computation Blodgett Dam

Job No. 253-051

Computed by MFB

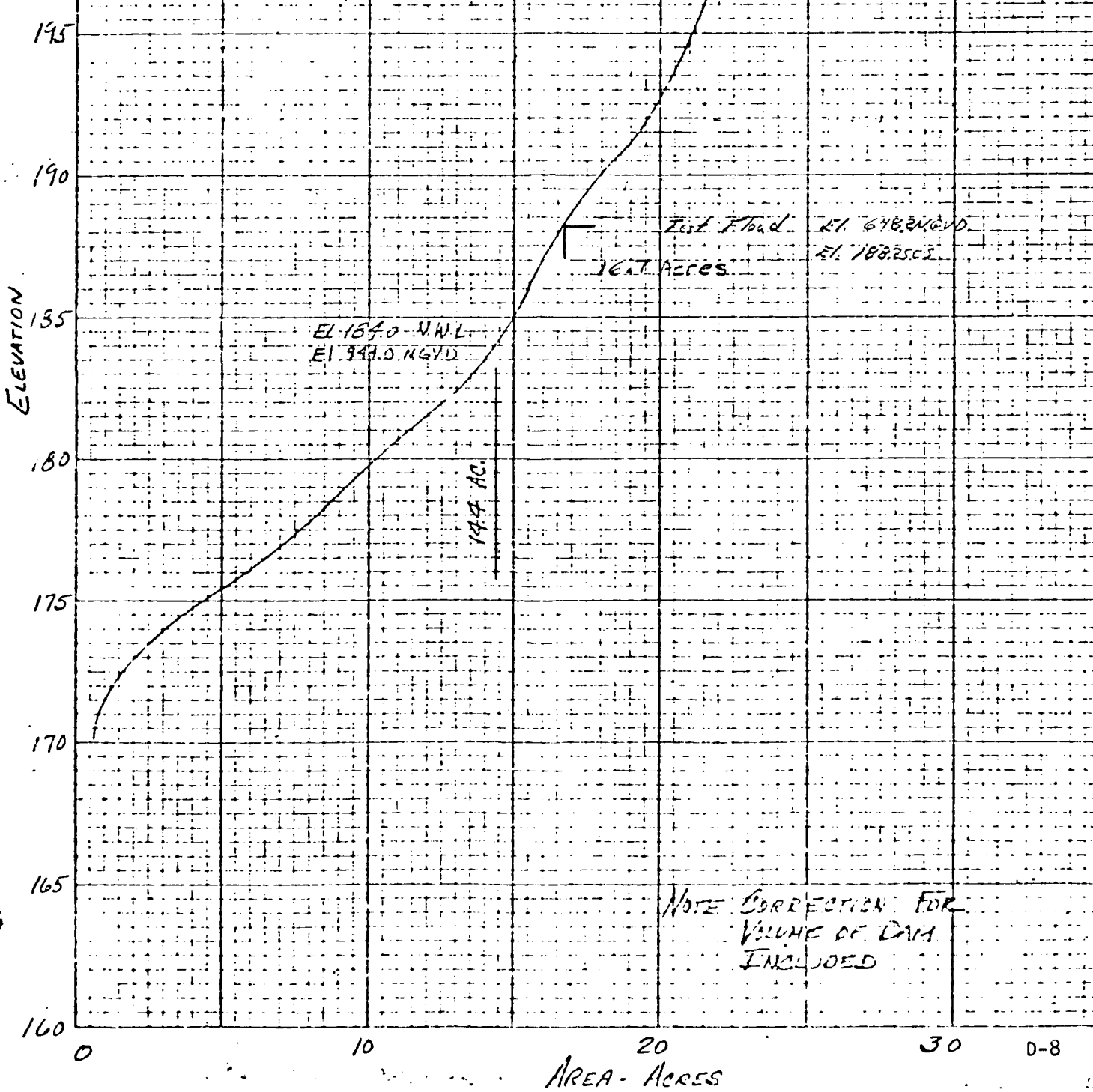
Checked by SDM/BW

Date 8-29-80



1-23-65 JMS
3-65 F.M.V.
KLOGGETT POND

STAGE-AREA CURVE



NOTE CORRECTION FOR
VOLUME OF DAM
INCLUDED

SCALE 1/4" = 10' HORIZONTAL
1" = 5' VERTICAL

ELEVATION

AREA - ACRES

Subject Inspection of ...

Computation Bl-ty ...

Job No. 92-101

Computed by WSP

Checked by CDL/BW

Date 7-1-50

d) Discharge (Q_{10}) at Various Surge Levels

$H = 3.5'$
 $V = 152 - 98.7 = 53.3 \text{ Ac-ft (Cur. pg. 2)}$
 $S = \frac{53.3}{3.7 \times 10^3} = 0.27''$

$H = 4.5'$
 $V = 171.0 - 98.7 = 72.3 \text{ Ac-ft}$
 $S = \frac{72.3}{3.1 \times 10^3} = 0.37''$

From Approximate Storage from the Guidelines
 (10' in. ...
 100% flood $Q_{10} = Q_{10} (3.8)$

$H = 3.5$ $Q_{10} = 1600 (1 - \frac{.27}{3.8}) = 1480 \text{ cfs}$

$H = 4.5$ $Q_{10} = 1600 (1 - \frac{.37}{3.8}) = 1440 \text{ cfs}$

e) Peak Outflow (Q_p)

Using HEC-10 Guidelines "Secondary Storage"
 Peak $Q_p = 1470 \text{ cfs}$
 $H = 4.2$

f) Spillage Capacity to ...

Spillage Capacity to ... $Q = 9.2$
 109 cfs

Subject _____

Computation _____ Job No. _____

Computed by _____ Checked by SAM/BW Date 9-4-83

5) Summary

a) Peak Inflow

$$Q_p = 1600 \text{ cfs} = \text{Test Flood @ 100 yr flood}$$

b) Peak Outflow

$$Q_o = 1470 \text{ cfs}$$

c) Spillway Max Capacity

$$Q = 2950 \text{ cfs or } 60\% \text{ of } Q_p$$

At Test Flood = 100 yr flood, the spillway
handles the entire flow utilizing $\pm 16\%$ of its capacity
with an average surcharge above the spillway
crest of 4.2 feet and 6.8 feet below the top
of the dam.

Subject Design of non-federal dam

Computation Project Part

Job No. 753-151

Computed by H. S.

Checked by S. H.

Date 7-7-83

II Downstream Failure Hazard

a) Peak Failure Outflow

i) Breach Outflow

Mid-Height Elev. = 610.5 NGVD

Approx. Mid-Height Length = 230' (From SCS Manual)

Breach Width: (CSU NED-AGE Dam Failure Guidelines)

$$W_b = 0.4 \times 230 = 92 \text{ Feet}$$

Height at time of failure: $h_b = 29.4 \text{ feet}$

$$\text{Breach Outflow} = Q_b = \frac{9}{27} W_b \sqrt{h_b} \quad \begin{matrix} W_b = 92 \\ h_b = 29.4 \\ g = 32.2 \end{matrix}$$

$$Q_b = 24,650 \text{ cfs}$$

b) Remaining Spillway Discharge

Since the breach is assumed to occur in
a narrow spillway section, the remaining
spillway discharge is assumed to be equal to
the design spillway capacity.

$$Q_s = 39,000 \text{ cfs}$$

$$Q_{\text{Total}} = Q_b + Q_s = 24,650 + 39,000 = 63,650 \text{ cfs}$$

$$Q_{\text{Total}} = 63,650 \text{ cfs}$$

Subject _____

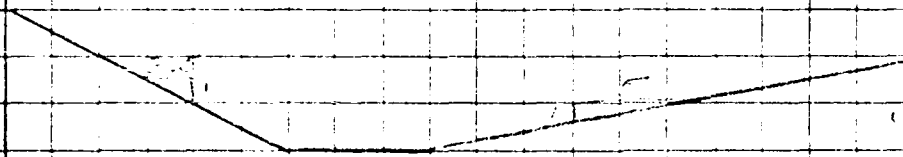
Computation _____ Job No. _____

Computed by _____ Checked by _____ Date _____

1) Peak Discharge of 100 Year Flood = 1000 cfs

in Section 1000' long of 1000' Reach = 1000

Approximate Velocity: $V = 1.48 R^{.63} S^{.48}$ $Q = AV$ $S = .03$



Highway's Center Line
C.I. = 5 feet

$n = .10$ $S = .03$ $n = .10$ $n = .10$

Channel Section

1	A	P	R	V	Q
2	47	125	145	14.3	672
4	112	300	155	20.1	1611
6	192	527	160	23.0	4254
7	232	687	162	23.4	5453
8	272	857	163	23.7	6457
9	312	1027	164	24.0	7457
10	352	1200	165	24.3	8457
11	392	1375	166	24.6	9457

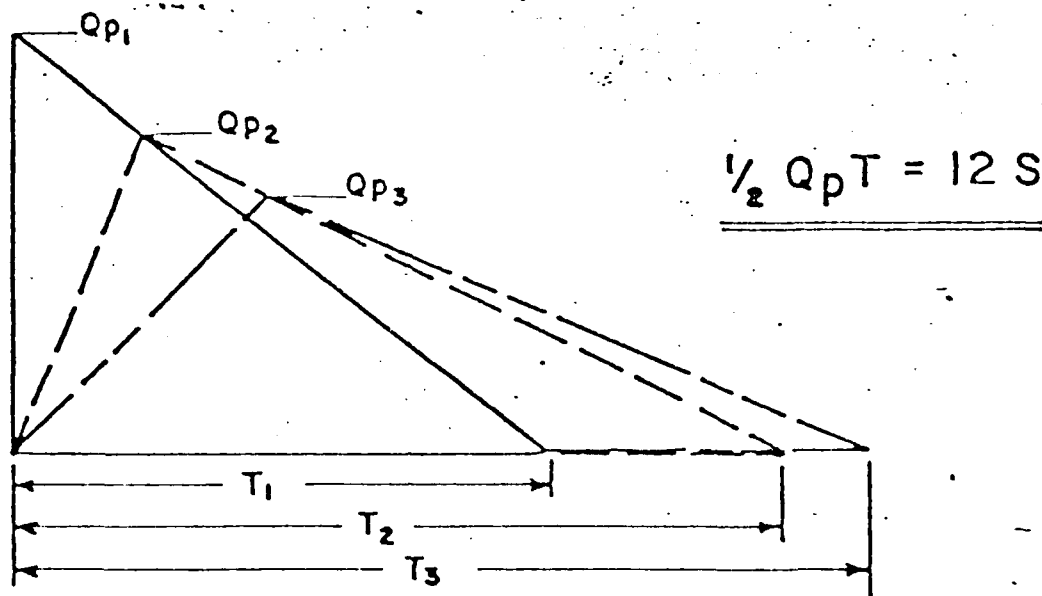
Section 1000'

1	A	P	R	V	Q
2	112	300	155	20.1	1611
4	192	527	160	23.0	4254
6	272	857	162	23.4	5453
8	352	1200	163	23.7	6457
10	432	1550	164	24.0	7457
12	512	1900	165	24.3	8457
14	592	2250	166	24.6	9457

NOT AVAILABLE AT THIS TIME

APPENDIX E
INFORMATION AS CONTAINED IN
THE NATIONAL INVENTORY OF DAMS

"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}).

$$Q_{p1} = \frac{8}{27} W_b \sqrt{9} Y_0^{3/2}$$

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).

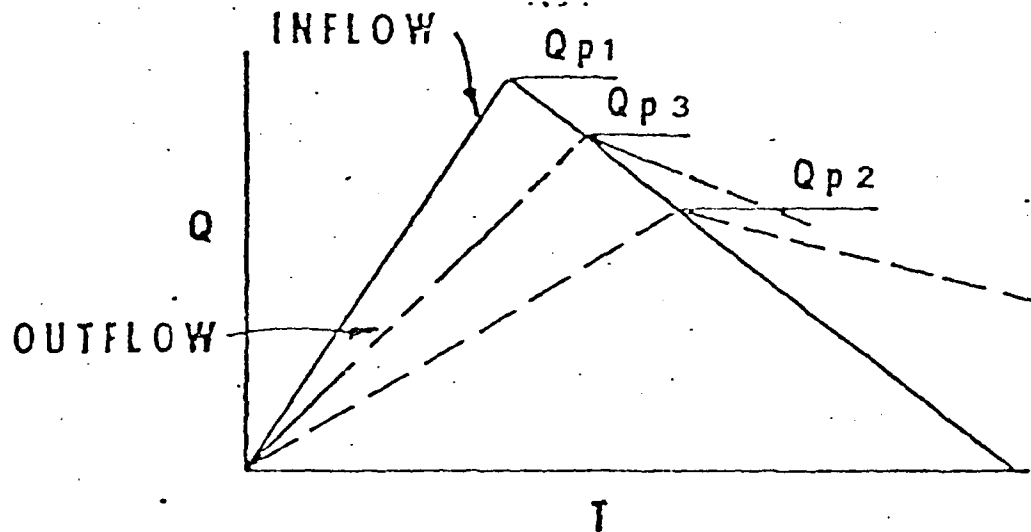
D. AVERAGE V_1 AND V_2 AND COMPUTE Q_{p2} .

$$Q_{p2} = Q_{p1} \left(1 - \frac{V_1 + V_2}{2S}\right)$$

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

APRIL 1978

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} ".

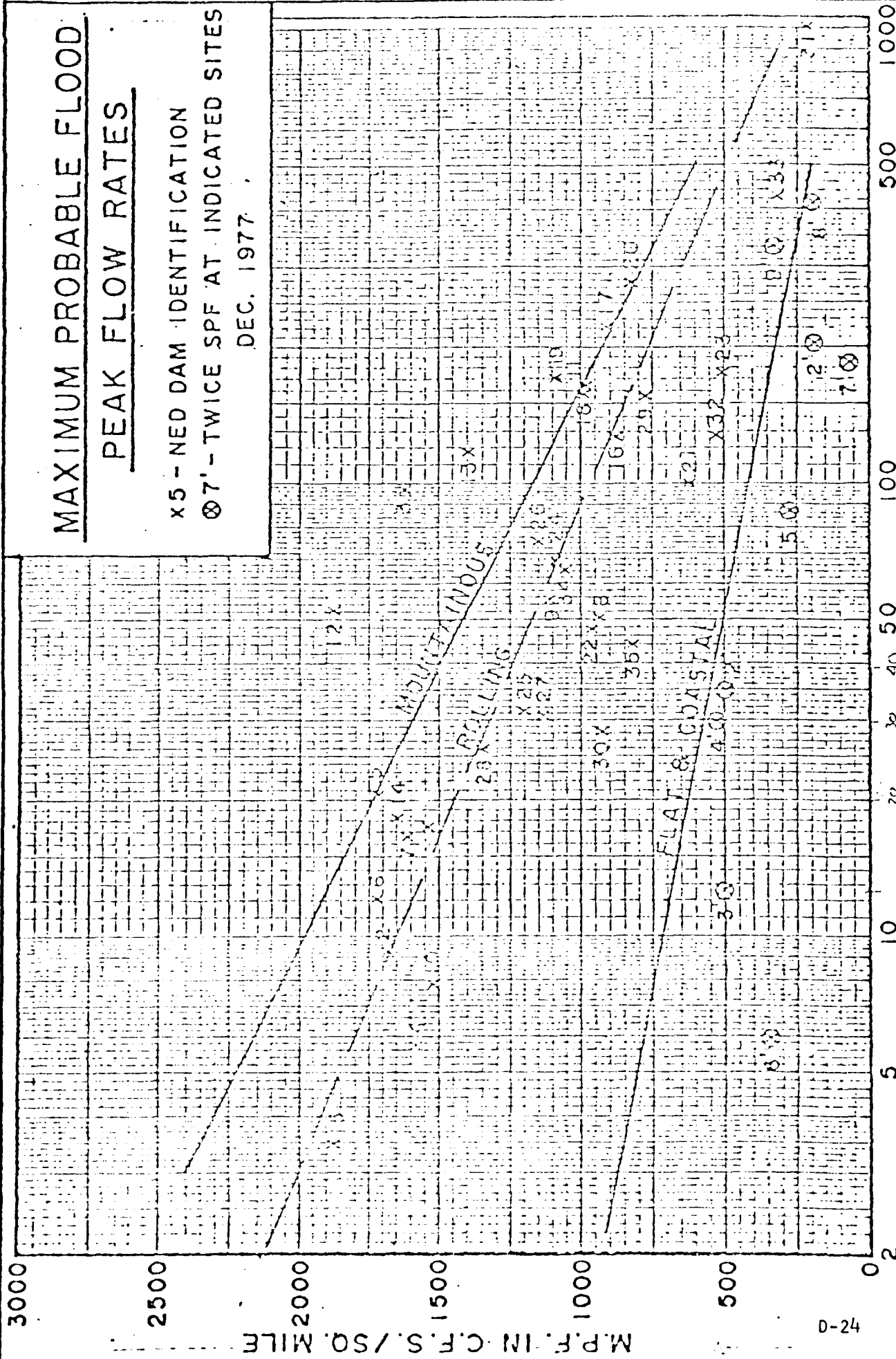
b. Determine Volume of Surcharge ($STOR_1$) In Inches of Runoff.

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} ".



**MAXIMUM PROBABLE FLOOD
PEAK FLOW RATES**

X5 - NED DAM IDENTIFICATION
 ⊗ 7' - TWICE SPF AT INDICATED SITES
 DEC. 1977

M.P.F. IN C.F.S./SQ. MILE
 DRAINAGE AREA IN SQ. MILES
 42-0

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
IN 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 Improvement of non-flooded

Computation Blodgett Co. Job No. 123-123

Computed by L.S. Checked by SM Date 9-15-57

Summary

a) Peak Failure Outflow $Q_p \approx 3,500 \text{ cfs}$

b) Rise in Stage = 5.0 ft D/S of dam @ 1000 cfs
Pre-failure stage = 6.75 feet
Failure stage = 11.75 feet
Rise in stage = 11.75 - 6.75 = 5.0 feet

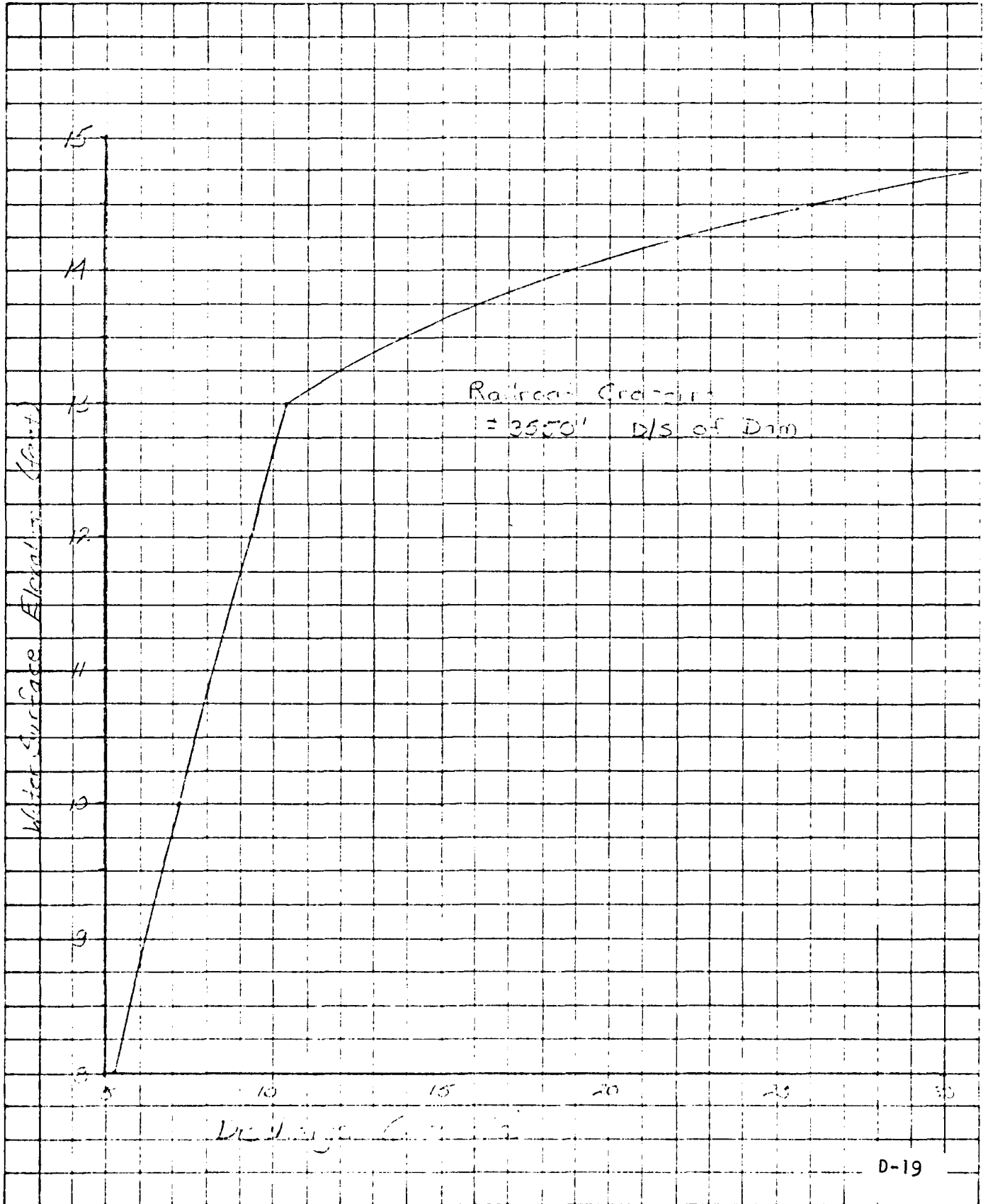
c) Rise in Stage = 8.0 ft @ 5000 cfs
Pre-failure stage = 3.9 feet
Failure stage = 11.9 feet
Rise in stage = 11.9 - 3.9 = 8.0 feet
U.S. Army will be developed
by 3.3 feet of water to the structure

d) Rise in Stage @ 10000 cfs
Pre-failure stage = 11.75 feet
Failure stage = 14.7 feet
Rise in stage = 14.7 - 11.75 = 2.95 feet
Rise in stage = 11.75 feet
with 10000 cfs of water to the structure

Subject _____

Computation _____ Job No. 252-1-11

Computed by _____ Checked by SDM Date 9-15-20



Subject Improvement of Railroad Crossing at _____

Computation _____ Job No. 10-1-1917

Computed by _____ Checked by _____ Date 7-7-17

a) Section at Railroad Crossing: _____

Width $N = 43.5$ $R^2 = 38.4$ $\theta = 17^\circ$ $\sin \theta = .292$

H	A	P	T	Y	Z
2	10	37	175	9.46	527
4	12	41	228	15.08	1852
6	14	44	281	17.28	3421
8	16	47	334	17.77	5211
10	18	50	387	18.25	7137
12	20	53	440	18.72	9217
13	20	53	440	18.72	9217

Flow over the center of tracks: _____

$Q = CLH^{3/2}$ $C = 2.4$ $L = 750' + 400' = 1150'$

H	Q
1	8375 cfs
1.5	13125 cfs
2	17875 cfs

Subject Flowage at failure

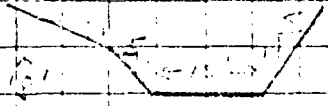
Computation Flowage at failure Job No. 7-22-1911

Computed by W.S. Checked by SMY Date 9-12-11

Resistance at failure flow through weirs 1120 cfs

$$Q_p = 33000 \left(\frac{19.3 - 8.9}{2.75} \right)^2 = 20287 \text{ cfs say } 30000 \text{ cfs}$$

Downstream (1120 cfs) of station 12 X-section shown:



$$V_1 = 11.25 - 8.9 = 2.35 \text{ feet}$$

$$Q_p \text{ (down)} = 33000 \left(\frac{19.3 - 8.9}{2.75} \right)^2 = 20287 \text{ cfs}$$

$$V_2 = 11.25 - 8.9 = 2.35 \text{ feet}$$

$$Q_p = 33000 \left(\frac{19.3 - 8.9}{2.75} \right)^2 = 20287 \text{ cfs}$$

Failure stage at Route 5 crossing free curve

$$Q_p = 29500 \text{ cfs } H = 19.3 \text{ feet}$$

$$\text{Rise in stage} = 19.3 - 8.9 = 10.4 \text{ feet}$$

Failure flow will overflow roadway by 5.3 feet.

③ Rise in stage at Railroad crossing approximately 10.4 feet

Pre-failure stage at R.R. crossing

$$Q_p = 5950 \text{ cfs } H = 11.75 \text{ feet}$$

Failure stage at R.R. crossing

$$Q_p = 25000 \text{ cfs } H = 19.70 \text{ feet}$$

$$\text{Rise in stage} = 19.7 - 11.75 = 7.95 \text{ feet}$$

Subject Design of Sewer Pipe

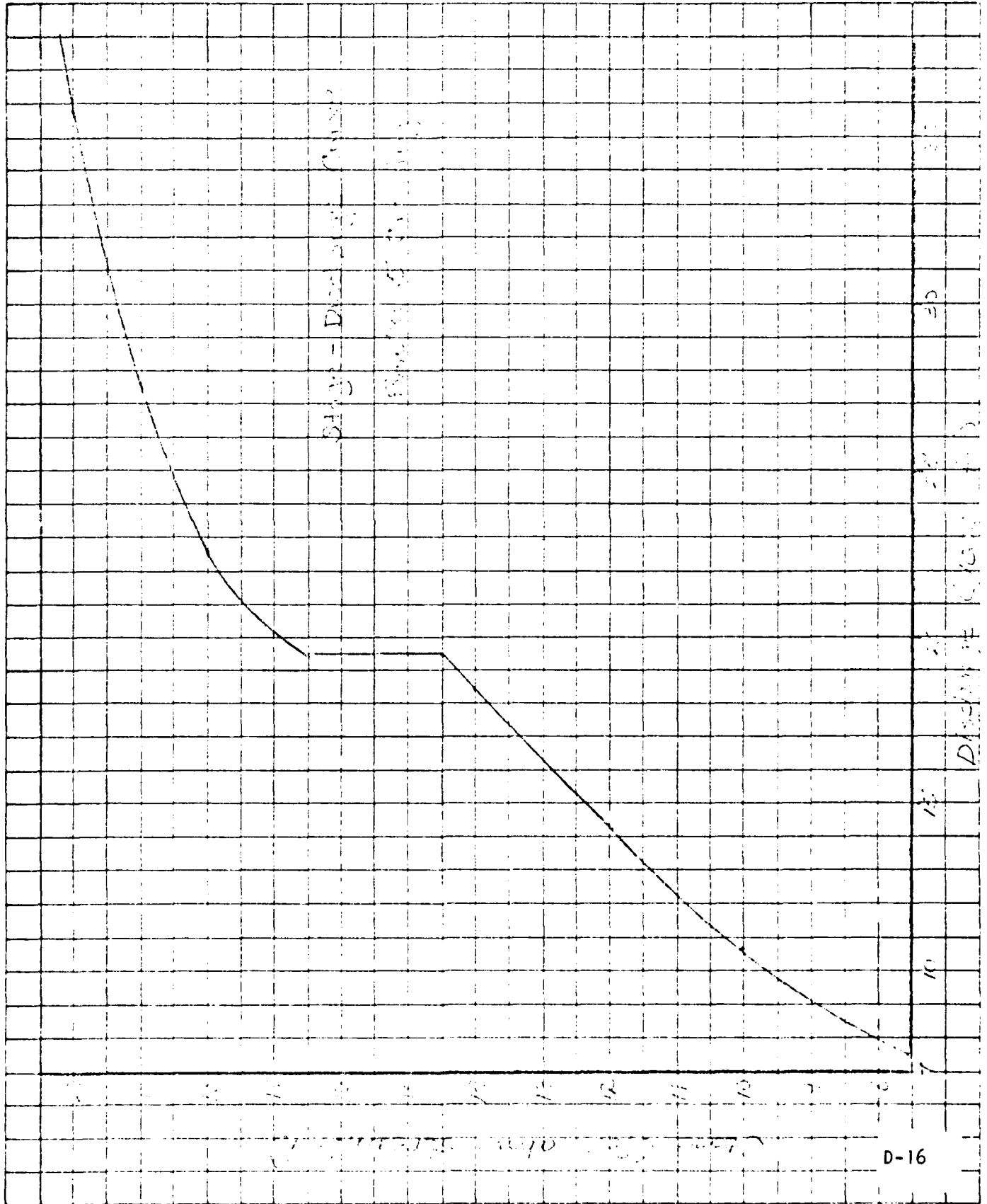
Computation for 1000 ft

Job No. 12-1-10

Computed by J. W. S.

Checked by S. D. M.

Date 7-1-10



Subject Trigonometry of an irregular polygon

Computation Blockoff Dam Job No. 100-1000

Computed by M.F.B. Checked by W.C. Date 11-1-19

Blockoff Dam

H	A	B	C	D	E
2	27	100	100	100	100
4	54	141.4	141.4	141.4	141.4
6	81	173.2	173.2	173.2	173.2
8	108	200	200	200	200
10	135	223.6	223.6	223.6	223.6
12	162	242.4	242.4	242.4	242.4
14	189	257.1	257.1	257.1	257.1
16	216	268.1	268.1	268.1	268.1

Area of polygon = 10000 sq. ft. (approx.)

Over the 4 sides: $\sum L^2 = 20000$ $\sum L^4 = 2.5 \times 10^6$

L	L ²	L ⁴	Notes
1	1	1	Side of dam
2	4	16	Side of dam
3	9	81	Side of dam
4	16	256	Side of dam

2. The area of the triangle at Route 5 Crossing is 10000 sq. ft.

Section of Federal Highway at 1/2 mi. from
 Boundary line and dam. (See sketch)
 Volume of first water table is 100000 cu. ft.
 Volume of second water table is 100000 cu. ft.
 Volume of third water table is 100000 cu. ft.
 Volume of fourth water table is 100000 cu. ft.
 Volume of fifth water table is 100000 cu. ft.

END

FILMED

9-85

DTIC