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PIONEER DAM ME 00110.. (U) CORPS OF ENGINEERS WALTHAM MA
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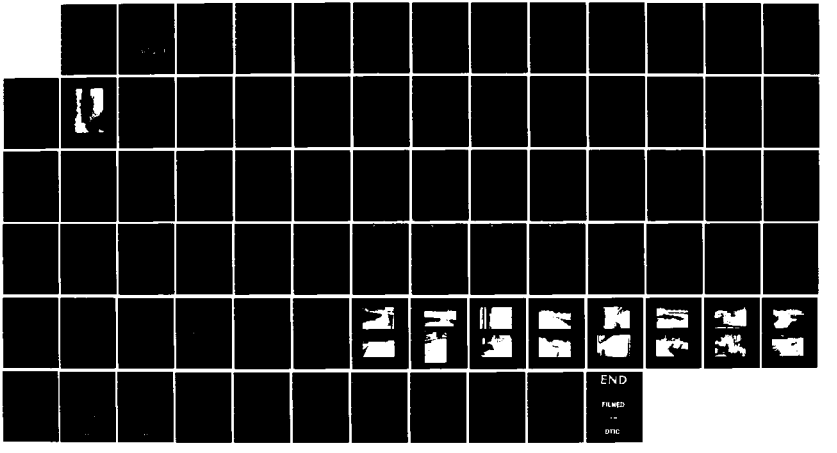

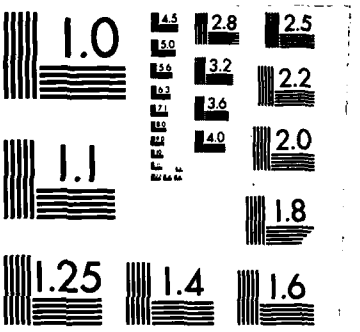

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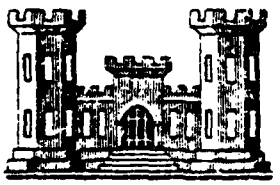
KENNEBEC RIVER BASIN

PITTSFIELD, MAINE

PIONEER DAM

ME 00110

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM



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

APRIL 1981

UNCLASSIFIED

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

REPORT DOCUMENTATION PAGE		READ INSTRUCTIONS BEFORE COMPLETING FORM
1. REPORT NUMBER ME 00110	2. GOVT ACCESSION NO. A155793	3. RECIPIENT'S CATALOG NUMBER
4. TITLE (and Subtitle) Pioneer Dam NATIONAL PROGRAM FOR INSPECTION OF NON-FEDERAL DAMS		5. TYPE OF REPORT & PERIOD COVERED INSPECTION REPORT 6. PERFORMING ORG. REPORT NUMBER
7. AUTHOR(s) U.S. ARMY CORPS OF ENGINEERS NEW ENGLAND DIVISION		8. CONTRACT OR GRANT NUMBER(s)
9. PERFORMING ORGANIZATION NAME AND ADDRESS		10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS
11. CONTROLLING OFFICE NAME AND ADDRESS DEPT. OF THE ARMY, CORPS OF ENGINEERS NEW ENGLAND DIVISION, NEDED 424 TRAPELO ROAD, WALTHAM, MA. 02254		12. REPORT DATE April 1981 13. NUMBER OF PAGES 65
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16. DISTRIBUTION STATEMENT (of this Report)

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18. SUPPLEMENTARY NOTES

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

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

DAMS, INSPECTION, DAM SAFETY,

Kennebec River Basin
Pittsfield Maine
Sebasticook River

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

The dam consists of an abput 165 ft. long spillway and a 390 ft. long composite dam. In the event that hte dam were to fail it could cause the possible loss of more than a few lives. The dam is in fair condition. There were no conditions noted which would warrent urgent remedial action. It is small in size with a hazard potential of high.

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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-E

AUG 3 1 1981

Honorable Joseph E. Brennan
Governor of the State of Maine
State Capitol
Augusta, ME 04330

Dear Governor Brennan:

Inclosed is a copy of the Pioneer Dam (ME-00110) Phase I Inspection Report, prepared under the National Program for Inspection of Non-Federal Dams. The report is based upon a visual inspection, a review of past performance, and a preliminary hydrological analysis.

The preliminary hydrologic analysis indicated that the spillway capacity would likely be exceeded by floods greater than 37 percent of the Probable Maximum Flood (PMF). Our screening criteria specifies that a dam classified as high hazard with a spillway capacity insufficient to discharge fifty percent of the PMF be judged as having a seriously inadequate spillway. As a result, this dam is assessed as unsafe, non-emergency until more detailed studies prove otherwise or corrective measures are completed.

The term "unsafe" applied to a dam because of an inadequate spillway does not indicate the same degree of emergency as that term would if applied because of structural deficiency. It does indicate, however, that a severe storm may cause overtopping and possible failure of the dam, with significant damage and potential loss of life downstream.

We recommend that within twelve months from the date of this report the owner of the dam engage the services of a qualified registered engineer to determine further the potential of overtopping the dam and the need for and the means to increase project discharge capacity. Based on this determination, appropriate remedial mitigating measures should be designed and completed within 24 months of this date of notification. In the interim a detailed emergency operation plan and warning system should be promptly developed and round-the-clock surveillance should be provided during periods of unusually heavy precipitation or high project discharge.

AUG 3 1 1981

NEDED-E
Honorable Joseph E. Brennan

I approve the report and support the findings and recommendations described in Section 7, with qualifications as noted above. I request that you keep me informed of the actions taken to implement these recommendations since this follow-up is an important part of the program.

Copies of this report have been forwarded to the Department of Agriculture and to the owner, Town of Pittsfield. Copies will be available to the public in thirty days.

I wish to thank you and the Department of Agriculture for your cooperation in this program.

Sincerely,

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

KENNEBEC RIVER BASIN
PITTSFIELD, MAINE

PIONEER DAM
ME 00110

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION, CORPS OF ENGINEERS

APRIL 1981

NATIONAL DAM INSPECTION PROGRAM
PHASE I INVESTIGATION REPORT

Identification No.:	ME 00110
Name of Dam:	Pioneer
Town:	Pittsfield
County and State:	Somerset, Maine
Stream:	Sebasticook River
Date of Site Visit:	6 November 1980

BRIEF ASSESSMENT

Pioneer Dam consists of an approximately 165-ft. long spillway and a 390-ft. long composite dam. The outlet works, two 6-ft. wide wooden gates, is incorporated with the left end of the spillway. The crest length of the dam is about 580 ft. The height of the dam is 21 ft. and the storage, at top of dam, is approximately 380 acre-ft. The dam previously provided water for the power and processing needs of two mill complexes located adjacent to the dam. Presently, the dam forms a small recreational pond.

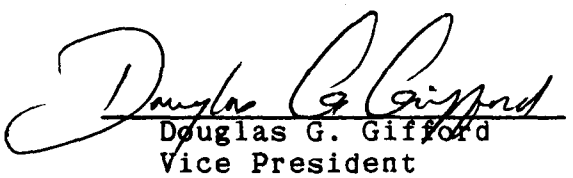
Due to the possible loss of more than a few lives, in the event the dam were to fail, Pioneer Dam has been determined to have a "high" hazard potential classification in accordance with Corps of Engineers guidelines.

The dam is in fair condition, based on a visual examination of the structure. Although some deficiencies were noted, there was no evidence of settlement, lateral movement or other signs of structural failure, or other conditions which would warrant urgent remedial action.

Based on the "small" size and "high" hazard potential classifications in accordance with Corps of Engineers guidelines, the adopted test flood for this dam is 1/2 of the Probable Maximum Flood (1/2 PMF). Hydraulic analyses indicate that the test flood of 15,000 cfs would overtop the dam by about 1 ft. with the outlet works gates closed. With the water level at the top of dam, the ungated spillway capacity is approximately 11,000 cfs which is 73 percent of the test flood.

The Town of Pittsfield should engage a registered professional engineer qualified in the design and construction of dams to determine the nature and effect of the seepage along the left reach of the dam, the function of the opening through the bottom of the spillway weir, and perform a detailed hydrologic and hydraulic analysis to assess further the need for and means to increase the project discharge capacity and the ability of the dam to withstand overtopping, as outlined in Section 7.2. Any necessary modifications resulting from the investigations, and remedial measures, including reparing the outlet works to operational condition, repointing cracked and spalled masonry, removing brush along the dam and removing the cable suspended across the spillway, as outline in Section 7.3, should be implemented by the Owner within one year after receipt of this report. The Owner should also prepare a formal operations and maintenance manual for the dam and establish an emergency preparedness plan and downstream warning system.

HALEY & ALDRICH, INC.
by:



Douglas G. Gifford
Vice President

This Phase I Inspection Report on Pioneer Dam (ME-00110) 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, DC 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 will be detected.

Phase I Investigations are not intended to provide detailed hydrologic and hydraulic analyses. In accordance with the established Guidelines, the test flood is based on the estimated "probable maximum flood" for the region (greatest reasonably possible storm run-off), or a fraction thereof. Because of the magnitude and rarity of such a storm event, a finding that a spillway will not pass the test flood should not be interpreted as necessarily posing a highly inadequate condition. The test flood provides a measure of relative spillway capacity and serves as an aid in determining the need for more detailed hydrologic and hydraulic studies, considering the size of the dam, its general condition and the downstream damage potential. Consideration of downstream flooding other than in the event of a dam failure is beyond the scope of this investigation.

The Phase I Investigation does <u>not</u> 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 of the dam was satisfactory, but, there was evidence of seepage through the concrete along the downstream face. The quantity of flow could not be estimated due to thick local vegetation and the areal extent of the condition. Staining and efflorescence of the masonry indicate the condition as being long-term, Photo No. 6. The rate of flow appeared constant and the water was clear. Although no portion of the masonry was failed, severe spalling and pronounced cracking of the concrete and loose joints in the granite block construction were apparent.

c. Appurtenant Structures. The concrete training wall upstream of the spillway at the left abutment appeared sound with no major deficiencies.

The outlet works, Photo No. 16, was in fair condition, however, only one of the two gates was operable. Both gate lift mechanisms were in the down, or closed, position. The interior of gate chamber was not completely accessible at the time of the site investigation. Turbulent flow observed within the chamber indicated leakage past the gates.

The abandoned powerhouse associated with the outlet works at the left side of the dam was gutted and deteriorated with several holes in the concrete substructure, Photo No. 14. The leakage past the outlet works gates was emanating through these holes in the powerhouse, Photo No. 15.

The abandoned powerhouse located along the dam was also in a deteriorated condition with leakage flowing through holes in its concrete substructure to the 36-in. diameter culvert. The concrete of the powerhouse was generally in poor condition, Photo No. 5. With the exception of the leakage, the physical condition of the structure should have no significant effect on the dam.

d. Reservoir Area. The impounded portion of the Sebasticook River, Mill Pond, extends upstream of the dam approximately 0.44 miles. Main Street has two bridge crossings across the pond and Sebasticook Street has a twin CMP culvert at its crossing of the pond. There is significant development along the banks of Mill Pond with the sill elevations of some structures about 5 to 6 ft. above the crest of the spillway.

SECTION 3 - VISUAL EXAMINATION

3.1 Findings

a. General. The Phase I visual examination of Pioneer Dam was conducted on 6 November 1980. The upstream water surface elevation was about 1.0 ft. above the spillway crest that day.

In general, the project was found to be in fair condition. Several deficiencies which require correction were noted.

A visual inspection check list is included in Appendix A and selected photographs of the project are given in Appendix C. A "Site Plan Sketch", page C-1, shows the direction of view for each photograph.

b. Dam. Flow over spillway of Pioneer Dam precluded its close examination, Photo No. 1. The alignment of the visual portions of the spillway did not indicate major lateral movement or unusual settlement, Photo No. 10. There was a steel cable suspended across the upstream side of the spillway weir which would create an obstruction to flow should a large log or tree become snagged. The concrete training walls at either end of the spillway were spalled and cracked, Photo Nos. 13 and 15, but they did not appear to be unstable.

The right end of the composite dam was in fair condition overall, Photo No. 2. The earthfill on the downstream side showed no signs of sloughing or major erosion, Photo No. 3. Alignment of the masonry crest was good, but, spalling and deterioration of the concrete was evident. Thick brush and weeds were growing over the fill on the upstream side.

The granite block and concrete portion of the dam located immediately to the right of the spillway was in fair to poor condition, Photo No. 8. Alignment of this

SECTION 2 - ENGINEERING DATA

2.1 Design Data

No design data for the original dam were located and none are believed to exist.

2.2 Construction Data

No as-built data or records of the construction of the dam, or reconstruction of the spillway, were located and none are believed to exist.

2.3 Operation Data

No operational data, other than a prior inspection and flood analysis report on the facility, were located.

2.4 Evaluation of Data

a. Availability. A list of the engineering data available for use in preparing this report is included on page B-1. Selected documents from the listing are also included in Appendix B.

b. Adequacy. There was a lack of engineering data available to aid in the evaluation of Pioneer Dam. This Phase I assessment was therefore based primarily on visual examination, preliminary hydraulic and hydrologic computations, consideration of past performance and application of engineering judgement.

c. Validity. The information contained in the engineering data may generally be considered valid. However, some of the State of Maine registration data appears to be in error (see page B-2) and has been revised as shown on the Corps of Engineers inventory sheets in Appendix E.

j. Regulating Outlet

1. Invert	El. 193.5
2. Size	6-ft. by 6-ft.
3. Description	Two wooden gates located to the left of the spillway
4. Control mechanism	Manually operated with operator stand located above at platform El. 209.3
5. Other	Pictures of the spillway weir located during the inspection indicate the presence of a reservoir drain or sluiceway through the bottom of the weir. No method of operating this drain or sluiceway was located during the investigation

g. Dam

1. Type	Gravity, masonry on bedrock. Spillway at left; composite dam at right
2. Crest length	580 ft. approximately
3. Structural height	21.0 ft.
4. Crest width	2-ft. sq. concrete cap
5. Side slopes	Approx. 2H to 1V U/S and 4H to 1V D/S at right reach of dam
6. Zoning	Unknown
7. Impervious core	Composite masonry core wall
8. Cutoff	Masonry bears on bedrock
9. Grout curtain	Unknown
10. Other	No known internal drainage system, 36-in. diameter culvert located D/S for local surface runoff and seepage and/or leakage

h. Diversion and Regulating Tunnel Not applicable

i. Spillway

1. Type	Broad crested concrete weir
2. Length of weir	165 ft. (est.)
3. Crest elevation	201.0
4. Gates or flashboards	None
5. U/S channel	Sebasticook River (Mill Pond) - upstream pool spanned by two bridges
6. D/S channel	Sebasticook River - new protective berm at right bank

c. Elevation (ft. above NGVD)

1. Streambed at centerline of dam	187.0
2. Maximum tailwater	Unknown
3. Upstream portal invert diversion tunnel	Not applicable
4. Normal pool	201.0
5. Full flood control pool	Not applicable
6. Spillway crest	201.0
7. Design surcharge-original design	Unknown
8. Top of dam	208.0
9. Test flood surcharge	209.0

d. Length of Reservoir (mi. estimated)

1. Normal pool	0.44
2. Flood control pool	Not applicable
3. Spillway crest pool	0.44
4. Top of dam	0.66
5. Test flood pool	0.70

e. Storage (acre-ft.)

1. Normal pool	116
2. Flood control pool	Not applicable
3. Spillway crest pool	116
4. Top of dam	380
5. Test flood pool	420

f. Reservoir Surface (acres)

1. Normal pool	35
2. Flood control pool	Not applicable
3. Spillway crest pool	35
4. Top of dam	40
5. Test flood pool	41

established the spillway crest at elevation 200.97 NGVD. This report adopted a spillway crest elevation of 201.0.

a. Drainage Area. The 290.7 sq. mi. drainage area tributary to the dam site consists of sparsely developed rolling terrain which is primarily drained by the Sebasticook River. In addition to numerous small ponds, the upstream watershed contains Douglas and Indian Ponds and Great Moose Lake which have a combined surface area of about 9 sq. mi. Additionally, a large marsh area is located in the Town of Cambridge having a surface area of about 5 sq. mi. upstream of Route 152.

b. Discharge at Dam Site.

1. Outlet Works.....	1,370 cfs with upstream pool at top of dam El. 208
2. Maximum known flood at dam site.....	Unknown
3. Ungated spillway capacity at top of dam.....	11,000 cfs at El. 208.0
4. Ungated spillway capacity at test flood pool elevation.....	13,810 cfs at El. 209.0
5. Gated spillway capacity at normal pool elevation..	Not applicable
6. Gated spillway capacity at test flood pool elevation.....	Not applicable
7. Total spillway capacity at test flood pool elevation.....	13,810 cfs at El. 209.0
8. Total project discharge at test flood pool elevation.....	15,000 cfs at El. 209.0

All correspondence should be addressed to the attention of the Town Manager.

f. Operator. Mr. Richard A. Nadeau, Public Works Director, has been responsible for the operation, maintenance and safety of the dam since 1978. He can be reached at the address and phone number given above.

g. Purpose of Dam. The dam previously provided water for the power and processing needs of two mill complexes, located at either side of the Sebasticook River. These capabilities are no longer utilized. The mill complex at the left bank is used as a warehouse, the other has been razed and built over. Pioneer Dam is presently used by the Town of Pittsfield to maintain the water level of Mill Pond for aesthetic and recreational purposes.

h. Design and Construction History. There are no design or construction records available to document when, how and by whom the original dam was built. It was reported that the dam site was occupied by a timber dam in 1806 and subsequently by a granite masonry dam in 1868. The spillway was apparently rebuilt about 20 years ago, but, no records of this work could be found.

i. Normal Operational Procedures. There is no formal written procedure for the operation of Pioneer Dam. The existing outlet works, located at the left side of the spillway, incorporates two 6-ft. wide wooden gates, one of which is inoperable. While there are provisions for flashboards along the spillway crest and projecting iron pipe pins are in place along the top of the dike, flashboards are reportedly not installed on the dam.

1.3 Pertinent Data

A field survey performed for the Owner by Kleinschmidt and Dutting, Consulting Engineers, in the summer of 1980

A filled sluiceway is located about 10 ft. from the right dam abutment. The dam between the abandoned powerhouse and the right abutment is earth filled on the downstream side (approximately 4 horizontal to 1 vertical) and upstream side (approximately 2 horizontal to 1 vertical) up to within 1 to 2 ft. of the concrete cap. Granite blocks were placed as rip rap on the upstream side making the slope on that side somewhat irregular.

A second filled sluiceway is located about midway between the right end of the spillway and the abandoned powerhouse. This reach of the dam is not filled on the downstream side, the distance between the crest and downstream ground surface varying from about 9 ft., adjacent to the abandoned powerhouse, to about 5 ft. 6 in., adjacent to the spillway. On the upstream side of this section of the dam there is a light cover of vegetation, grass and weeds, over outcropping bedrock. Bedrock outcrops are visible at several locations along the alignment of the dam.

c. Size Classification. The storage to the top of Pioneer Dam is estimated to be 380 acre-ft., and the corresponding hydraulic height of the dam is approximately 21 ft. Storage of less than 1,000 acre-ft. and a height of less than 40 ft. classifies this dam in the "small" size category according to guidelines established by the Corps of Engineers.

d. Hazard Classification. Dam failure analysis computations in Appendix D, which are based on "Guidance for Estimating Downstream Dam Failure Hydrographs", demonstrate why Pioneer Dam has been classified as having a "high" hazard potential classification. Failure of any portion of the dam located immediately to the right of the spillway would result in a flood wave of 5 to 9 ft. impacting directly on the Edwards Company mill complex, with the possible loss of more than a few lives.

e. Ownership. The name, address and phone number of the current owner are:

Town of Pittsfield
P.O. Box R
Pittsfield, ME 04967
Phone (207) 487-3136

1.2 Description of Project

a. Location. Pioneer Dam, also called Lower Dam, is located along the southeastern side of Mill Pond within the downtown area of Pittsfield, Maine, Somerset County, as shown on the Location Map, page vii. The latitude and longitude of the dam site are N44°44.2' and W69°22.9', respectively. Flow is conveyed from the dam by the Sebasticook River approximately 22 mi. to the Kennebec River.

b. Description of Dam and Appurtenances. Pioneer Dam consists of an approximately 165-ft. long spillway, located at the left and an approximately 390-ft. long composite dam constructed with a multi-sectioned alignment, located to the right. An outlet works, in the form of two 6-ft. wide wooden gates, is incorporated with the left end of the spillway. Previously, the outlet works functioned as the intake for a now deteriorated and abandoned powerhouse. The overall crest length of Pioneer Dam is approximately 580 ft. The hydraulic height of the structure, measured at the right side of the spillway, is 21 ft. The top of dam is El. 208 at its low point located 25 ft. right of the right spillway training wall.

The spillway has a broad crested weir with provisions for flashboard pins (see Appendix C). The exact cross-section of the spillway is not known, but, a low level drain or sluiceway is located near the middle of the spillway. There are no known means for the operation of this low level drain.

Constructed primarily of stone blocks, the dam is founded on bedrock and topped with a 2-ft. by 2-ft. concrete cap. These blocks are widest at the base and are stepped inward on the upstream face; where visible, the downstream face of the blocks was vertical. Cast into the concrete cap are steel pins for mounting flashboards. The pins project 1 ft. above the crest of the dam.

A second abandoned powerhouse is located about 210 ft. from the right end of the spillway, and forms the primary turning point in the dam alignment. This abandoned powerhouse is constructed of reinforced concrete and has two 7-ft. 9-in. wooden intake gates. A debris rack is located over the intake gates and gate lift mechanisms are mounted at the top of the structure. A 36-in. diameter culvert is located at the downstream side of the structure to drain local surface runoff in addition to leakage or seepage flow.

PHASE I INVESTIGATION REPORT
NATIONAL DAM INSPECTION PROGRAM

PIONEER DAM
ME 00110

SECTION 1 - PROJECT INFORMATION

1.1 General

a. Authority. Public Law 92-367, 8 August 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.

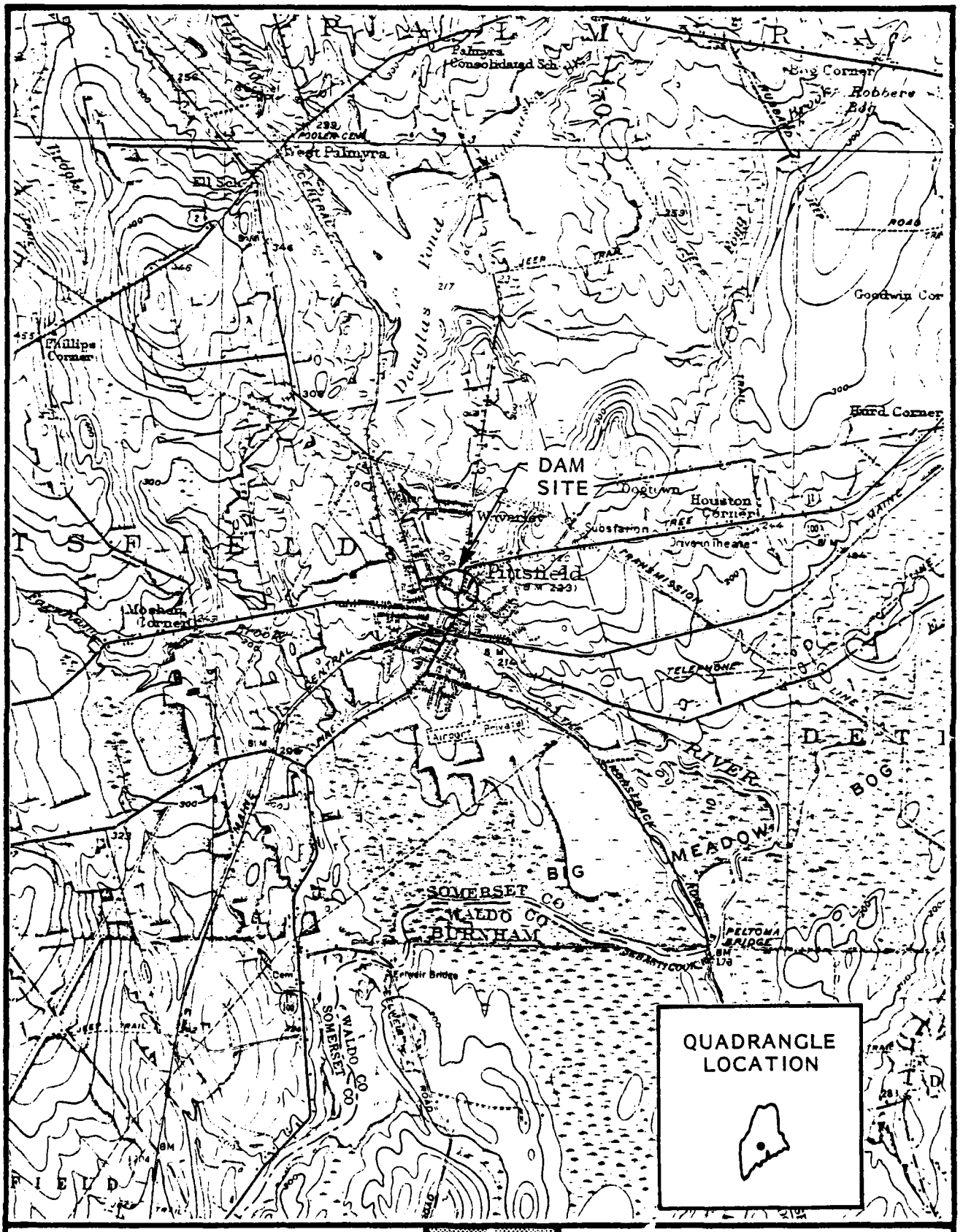
Haley & Aldrich, Inc. has been retained by the New England Division to inspect and report on selected dams in the States of New Hampshire and Maine. Authorization and notice to proceed were issued to Haley & Aldrich, Inc. under a letter dated 31 October 1979 from Colonel William E. Hodgson, Jr., Corps of Engineers. Contract No. DACW33-80-C0009 has been assigned by the Corps of Engineers for this work. Camp, Dresser & McKee, Inc. was retained as consultant to Haley & Aldrich, Inc. on the structural, mechanical/ electrical and hydraulic/hydrologic aspects of the Investigation.

b. Purpose of Inspection. The primary purposes of the National Dam Inspection Program are to:

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

2. Encourage and prepare the states to intiate effective dam safety programs for non-Federal dams.

3. Update, verify and complete the National Inventory of Dams.



DAM: Pioneer

IDENTIFICATION NO. ME 00110

FILE NO. 4454 A48

LOCATION MAP

U.S.G.S. QUADRANGLE

PITTSFIELD, ME

APPROX. SCALE: 1" = 1 MILE

1. Overview of Pioneer Dam from left abutment, downstream

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e. Downstream Channel. The Sebasticook River downstream of the dam flows through a developed section of Pittsfield before entering a large marsh area referred to as the Big Meadow Bog. The Edwards Company mill complex is located immediately downstream of the dam on the right bank.

3.2 Evaluation

The spillway structure of Pioneer Dam appears to be performing satisfactorily at the present time. The masonry portions of the dam are in fair condition. However, seepage observed at the downstream face of the dam, and leakage at the abandoned powerhouse located to the right of the spillway, warrant further investigation and monitoring. An investigation of the function of the low level drain through the bottom of the spillway should also be performed.

Based on the visual examination conducted on 6 November 1980, Pioneer Dam is considered to be in fair condition. The remedial measures outlined in Section 7.3 should be implemented to correct the noted deficiencies in the outlet works, masonry portions of the dam and the growth of brush and weeds along the downstream toe of the dam. In addition the cable suspended across the upstream side of the spillway should be removed unless it serves as a safety barrier.

SECTION 4 - OPERATIONAL AND MAINTENANCE PROCEDURES

4.1 Operational Procedures

a. General. In general, there are no formal procedures to provide routine maintenance and satisfactory operation of the dam.

b. Description of Any Warning System in Effect. There is no warning system or emergency preparedness plan in effect for this structure.

4.2 Maintenance Procedures

a. General. There are no established formal procedures or manuals for inspection and maintenance of the dam. Remedial measures pertaining to the dam and outlet works are performed on an as needed basis as determined by the Owner.

b. Operating Facilities. There is no formal plan to maintain or regulate the outlet works and controls nor for the installation and removal of flashboards on the spillway or dam. The operability of one of the two outlet works gates was demonstrated during the site visit. The remaining gate was reportedly inoperable. Although there is evidence of a reservoir drain, or sluiceway, through the spillway weir, nothing is apparently known about its method of operation.

4.3 Evaluation

The Owner should prepare an operations and maintenance manual for the dam. The manual should delineate the routine operational procedures and maintenance work to be done on the dam to provide satisfactory operation and minimize deterioration of the facility. For example, an annual observation and maintenance program should be established to examine the dam, control vegetation growth and maintain slopes, walls and channels. A formal procedure should be established to operate the outlet works periodically.

Since failure of the dam could cause loss of life and property damage downstream, the owner should also prepare and implement a formal emergency preparedness plan and warning system.

SECTION 5 - EVALUATION OF HYDRAULIC/HYDROLOGIC FEATURES

5.1 General

Pioneer Dam is a run-of-the-river dam located on the Sebasticook River in the Town of Pittsfield, Maine. The overall length of the dam is approximately 580 ft. which includes a 165-ft. long broad crested concrete spillway. The top of the dam is at El. 208.0 and the spillway crest is at El. 201.0. The outlet works consist of two manually operated 6-ft. wide wooden gates located at the spillway left abutment. The 290.7 sq. mi. drainage area is drained by several tributaries and incorporates three major bodies of water which have a combined surface area of about 9 sq. mi.

5.2 Design Data

There is no hydraulic/hydrologic design data available for the original dam. In a recent report prepared by Kleinschmidt & Dutting, Consulting Engineers (see Appendix B), it was determined that the 100-year flow for the Sebasticook River would be about 9,000 cfs at the dam site and that this discharge would not overtop the dam.

5.3 Experience Data

No records of historical floods at the dam site were located.

5.4 Test Flood Analysis

Based on the Corps of Engineers Guidelines, the recommended test flood range for the size "small" and hazard potential "high" is the 1/2 PMF to full PMF (Probable Maximum Flood). The 1/2 PMF was adopted as the test flood for this facility because the project is at the low end of the "small" classification range. In order to account for the available storage in the upstream watershed, the test flood was estimated by considering preliminary analysis by

the Corps of Engineers for a flood protection study of the Sebasticook River upstream of Pioneer Dam in the Town of Hartland. The drainage area at this location is about 235 sq. mi. and is downstream of Great Moose Lake. The estimated Standard Project Flood (SPF) is reported to be 8,000 cfs at that location. Assuming a peak PMF inflow rate of 250 csm for the intervening 55 sq. mi. drainage area, the resulting test flood at the dam site would be about 15,000 cfs.

The spillway capacity with Mill Pond at top of dam (El. 208.0) is estimated to be 11,000 cfs or about 73 percent of the test flood. If the outlet works gates were open, the combined discharge at top of dam would be approximately 12,400 cfs or about 83 percent of the test flood. The test flood would overtop the dam by about 0.7 ft. if the outlet works gates were open or by about 1.0 ft. if the gates were closed. Consequently, Pioneer Dam is considered hydraulically unable to pass the test flood under existing operating conditions.

5.5 Dam Failure Analysis

Based on the Corps of Engineers Guidelines for estimating dam failure hydrographs, and assuming that a failure would occur along a 20-ft. long section of the dam located immediately to the right of the spillway, the peak failure outflow is estimated to be about 900 cfs. This peak failure outflow would be in addition to the 11,000 cfs spillway discharge which is not expected to cause any significant flooding immediately downstream of the portion of dam which is assumed to fail. However, a flood wave of 5 to 9 ft. would flow approximately 160 ft. across the parking area located between the toe of dam and the Edwards Company mill complex and impact directly on the building.

The potential loss of life resulting from the dam failure could be more than a few and the dam is accordingly classified in the "high" hazard category.

SECTION 6 - STRUCTURAL STABILITY

6.1 Visual Observations

There was no visual evidence of major settlement or lateral movement of the composite dam. Seepage through the concrete, observed downstream of the dam, between the spillway and former powerhouse does warrant attention. However, the present magnitude of seepage is not considered sufficient to question the structural stability of the dam.

The spillway was obscured by flowing water during the site inspection preventing a detailed examination. Since there was no evidence of major settlement or lateral movement, no reason was found to question the structural stability of the spillway.

6.2 Design and Construction Data

No design plans or construction data were located for the dam. A sketch of the facility showing a plan view of the dam is included in the report prepared by Kleinschmidt & Dutting, Consulting Engineers, dated September 1980, (see Appendix B). In addition, work sheets showing four typical cross-sections for stability analyses were supplied by Kleinschmidt & Dutting. The location of the cross-sections and the results of associated stability analyses are given in their report to the Town of Pittsfield.

Also located were municipal tax atlases for the years 1901, 1914 and 1924, and a plan developed for the Edwards Company building dated 1956 showing details of previous powerhouse, tailrace and flume locations. Based on the conditions observed during the site examination, combined with the Kleinschmidt & Dutting stability information, the dam is expected to have an adequate factor of safety relative to stability under normally anticipated static loadings.

6.3 Post Construction Changes

There have been no known significant modifications to the Pioneer Dam since its construction in about 1868.

6.4 Seismic Stability

Pioneer Dam is located in a Seismic Zone 1 and in accordance with Corps of Engineers' guidelines does not warrant seismic analysis at this time.

SECTION 7 - ASSESSMENT, RECOMMENDATIONS AND REMEDIAL MEASURES

7.1 Dam Assessment

a. Condition. The visual examination of Pioneer Dam revealed that the facility was in fair condition. There were no signs of impending structural failure or other conditions which would warrant urgent remedial action. Deficiencies were noted which require attention including the deterioration of the masonry portions, spillway training walls and abandoned powerhouses, and seepage along the left reach of the dam.

Based on the results of computations included in Appendix D and described in Section 5, the spillway is not capable of passing the adopted test flood, which for this structure is 1/2 PMF. The test flood of 15,000 cfs would overtop the dam by about 1 ft. With the water level at the top of dam, the spillway capacity is about 11,000 cfs, which is 73 percent of the test flood flow.

b. Adequacy of Information. This evaluation of the dam is based primarily on visual examination, preliminary hydraulic and hydrologic computations, consideration of past performance and application of engineering judgement. Generally, the information available or obtained was adequate for the purpose of a Phase I assessment. However, it is recommended that additional information regarding the seepage along the left reach of the dam and the need for additional spillway capacity be obtained as outlined in Section 7.2.

c. Urgency. The recommendations for additional investigations and remedial measure outlined in Sections 7.2 and 7.3, respectively, should be undertaken by the Owner and completed within one year after receipt of this report.

7.2 Recommendations

It is recommended that the Owner engage a registered professional engineer qualified in the design and construction of dams to undertake the following investigations:

1. Perform an investigation to determine the nature and effect of the seepage along the left reach of the dam and around the abandoned powerhouse located to the right of the spillway.

2. Perform an investigation to determine the function of the low level drain through the bottom of the spillway weir and its method of operation.

3. Perform a detailed hydrologic and hydraulic analysis to assess further the need for and means to increase the project discharge capacity and the ability of the dam to withstand overtopping.

The Owner should then implement corrective measures on the basis of these engineering evaluations.

7.3 Remedial Measusres

Although the dam is generally in fair condition, it is considered important that the following items be accomplished:

a. Operation and Maintenance Procedures. The following should be undertaken by the Owner:

1. Make repairs as necessary to halt leakage through the outlet works and restore both outlet works gates to operational condition.

2. Repoint the cracked and spalled areas of masonry and, where present, remove the growth of brush and weeds from the masonry and grout any resulting voids.

3. Remove the growth of brush and weeds along the downstream toe of the dam between the spillway and abandoned powerhouse.

4. Remove the cable suspended across the upstream side of the spillway. If the purpose of the cable is related to public safety and the recreational use of Mill Pond, then it should not be removed unless a replacement provision for safety is found.

5. Prepare an operations and maintenance manual for the dam. The manual should include provisions for annual technical inspection of the dam and for round-the-clock surveillance of the dam during periods of heavy precipitation and high project discharge. The procedures should delineate the routine operational procedures and maintenance work to be done on the dam to ensure safe, satisfactory operation and to minimize deterioration of the facility.

   The next technical inspection should preferably be scheduled during a period of low flow to allow a more detailed inspection of the spillway.

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

7.4 Alternatives

There are no practical alternatives to the above recommendations.

APPENDIX A - INSPECTION CHECK LIST

VISUAL INSPECTION PARTY ORGANIZATION
NATIONAL DAM INSPECTION PROGRAM

Dam: Pioneer Dam

Date: 6 November 1980

Time: 09:30 - 13:45

Weather: Clear - temperature in 30's

Water Surface Elevation Upstream: 202.0 (NGVD) (Approximately 1.0 ft. above spillway crest)

Stream Flow: Approximately 500 cfs

Inspection Party:

Douglas G. Gifford	-	Soils/Geology
Charles R. Nickerson Haley & Aldrich, Inc.		
Francis E. Luttazi	-	Structural/Mechanical
Joseph E. Downing Camp, Dresser & McKee, Inc.	-	Hydraulic/Hydrologic

Present During Inspection:

Richard Nadeau - Pittsfield, ME, Department of Public Works
Thomas Kitchen - Edwards Co. representative

VISUAL INSPECTION CHECK LIST
NATIONAL DAM INSPECTION PROGRAM

DAM: Pioneer Dam DATE: 6 Nov 80

AREA EVALUATED	CONDITION
DIKE	
Crest Elevation	208.0
Current Pool Elevation	202.0
Maximum Impoundment to Date	Unknown
Surface Cracks	None observed
Pavement Condition	Not applicable
Movement or Settlement of Crest	None observed, crest is masonry core wall with concrete cap. Flashboard pins cast into concrete cap
Lateral Movement	None observed
Vertical Alignment	Fair, constructed in two principal sections, each section slightly irregular
Horizontal Alignment	Fair, slightly irregular
Condition at Abutment and at Concrete Structures	Fair, concrete shows much efflorescence and spalling
Indications of Movement of Structural Items on Slopes	No structural items on slopes
Trespassing on Slopes	Unrestricted but no vandalism noted
Animal Burrows in Embankment	None observed
Vegetation on Embankment	Earth portions of downstream side of dike covered with mowed grass, several trees located around abandoned generating structure. Weeds growing from joints in masonry wall
Sloughing or Erosion of Slopes or Abutments	None observed
Rock Slope Protection - Riprap Failures	At upstream side, right end of dike, in fair condition, no failures observed
Unusual Movements or Cracking at or near Toes	None observed
Unusual Embankment or Downstream Seepage	Seepage through concrete at several locations (see page C-1), water clear
Piping or Boils	None observed
Foundation Drainage Features	None known to exist
Toe Drains	None known to exist
Instrumentation Systems	None

VISUAL INSPECTION CHECK LIST
NATIONAL DAM INSPECTION PROGRAM

DAM: Pioneer Dam DATE: 6 Nov 80

AREA EVALUATED	CONDITION
OUTLET WORKS - INTAKE CHANNEL AND INTAKE STRUCTURE	Remains of an intake structure front on Mill Pond at right retaining wall. The intake facilities have been abandoned. See Outlet Works - Control Tower.
OUTLET WORKS - CONTROL TOWER	
a. Concrete and Structural	
General Condition	Poor
Condition of Joints	Fair
Spalling	Excessive at numerous locations
Visible Reinforcing	Several locations at holes in floor slab of powerhouse, at eroded areas of gate chamber beneath powerhouse and at stairs and landing of powerhouse
Rust or Staining of Concrete	At locations of visible reinforcing
Any Seepage or Efflorescence	At base of U/S wall of gate chamber. Pool of water in powerhouse chamber as evidence of seepage condition at intake gates
Cracks	Pattern cracking observed throughout structure
Rusting or Corrosion of Steel	Rusting of visible reinforcing, gate mechanism and bar rack at intake gates observed
b. Mechanical and Electrical	
Air Vents	None noted
Float Wells	None noted
Crane Hoist	None noted
Elevator	None noted
Hydraulic System	None noted
Service Gates	Two sets of timber intake gates with steel bar rack at gate chamber inlets. Timber superstructure of gate mechanisms in poor condition. Gate mechanisms were not operable at time of inspection
Emergency Gates	None noted

VISUAL INSPECTION CHECK LIST
NATIONAL DAM INSPECTION PROGRAM

DAM: Pioneer Dam DATE: 6 Nov 80

AREA EVALUATED	CONDITION
Lightning Protection System	None noted
Emergency Power System	None noted
Wiring and Lighting System in Gate Chamber	None noted
UTLET WORKS - OUTLET STRUCURE AND OUTLET CHANNEL	NOTE: Water level at Mill Pond controlled by two timber gates at left abutment of spillway. The gates front on Mill Pond and apparently were originally intakes for a power facility since abandoned. The right gate was operated at the time of the inspection. The left gate was inoperable.
General Condition of Concrete	Poor
Rust or Staining	At downstream end of structure at intersection of right side and downstream wall
Spalling	At right side of abandoned power facility and top slab of gate chamber
Erosion or Cavitation	Major portion of right wall or structure has been breeched and remaining portions of wall are severely eroded
Visible Reinforcing	At right wall noted above
Any Seepage or Efflorescence	At three major locations on right side. Magnitude of seepage flow through right side indicates that although stop log gates are in closed position, major leaks exist in one or both gate(s). Gates were unobservable
Condition of Discharge Channel	None noted
UTLET WORKS - SPILLWAY WEIR, PPROACH AND DISCHARGE CHANNELS	
. Approach Channel	
General Condition	Good
Loose Rock Overhanging Channel	None noted

02 or at least two feet above the floor elevation of the plant.

The effect of the culvert and bridges on Main Street and ebasticook Street and their impact on flood levels upstream were lso investigated. In this analysis, the hydraulic characteristics, arrying capacity and velocities during the 100 year flood for each f the structures were determined. Inputting the 100 year flood ischarge into the calculations, it was determined that a 0.5 foot ise in water surface elevation would result during this event. 'rom the analysis we estimated the 100 year flood elevation in the ıill pond to be approximately 208 and approximately 208.5 in the ırea of North Main Street and Sebasticook Street.

An analysis was then conducted to determine the structural ;tability of the retaining wall during the 100 year flood event. 'ield inspection indicated six locations where the retaining wall :hanged significantly either in dimension and/or type of construction (see attachment). Cross-section data was then taken at these .ocations and the stability analysis performed for the retaining ;all. In the analysis the following assumptions were applied:

1. Normal pond level at top of wall equal to the 100 year flood (elev. 208).
2. No tailwater was considered on downstream side.
3. 100% uplift was used in the stability analysis. Unless extensive geotechnical tests are made to prove otherwise, the 100% uplift assumption is used. With this assumption the uplift force is taken at 100% of the depth of water at the upstream face decreasing to 0 at the toe of the

while the drainage area at the gage equals 579 square miles. Applying the pro-ration factor the 100 year flood flow at Pioneer Dam was 8,070 cfs. Averaging the two values, a 100 year flood discharge of 9,000 cfs was determined. Inputting this discharge into the weir flow equation:

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

where Q = discharge in cfs

L = length of weir in feet

H = head in feet

C = coefficient

it was determined that during a 100 year flood event, water level of Mill Pond would be at approximately 208 MSL and equal to the crest of the retaining wall.

Analysis of the flood level downstream of Pioneer Dam was also conducted at two locations; the first being approximately 200 feet downstream of the dam and the other at the sewer line crossing in back of Edwards Company (see attachment). The downstream restriction at the old bridge abutment appeared to be the control for the water surface elevation at these high flood flows. Applying Manning's equation with the known 100 year flood discharge, the flood stage was determined to be 202 feet MSL at this location. This restriction will influence water surface elevations upstream, however, the flood level should not overtop the protective berms recently installed downstream of the dam. It is our recommendation that the protective berm be continued around Edwards Company past the location of the sewer line crossing and should be built to an elevation above

FLOOD ANALYSIS OF PIONEER DAM

Pittsfield, Maine

The primary goal of this study was to establish the 100 year flood level and to investigate the stability of the retaining wall at Pioneer Dam during the 100 year flood flow. The 100 year flood flow was determined by two methods to check for accuracy. The first method made use of the U.S.G.S. regression analysis where drainage area, percent of storage and slope parameters of the drainage basin are analyzed to determine the flood flow (Q_{100}). With this method Q_{100} is expressed as:

$$Q_{100} = 50.9A^{0.907} S^{0.358} S_t^{-0.282}$$

where A = drainage area = 290.7 sq miles

S = slope in feet/mile = 7.48 feet/mile

S_t = storage index plus 1% = 8.02%

Using this method the 100 year flood discharge at Pioneer Dam was found to be approximately 9970 cfs.

The second method was done by a log Pearson Type III analysis of the annual peak flows at the U.S.G.S. gage in Burnham and then applying a pro-ration factor based on the difference in drainage areas between the gage site and Pioneer Dam. This pro-ration is a non-linear function in the form:

$$Q_{100} = Q_{100\ gage} \left(\frac{\text{Area of Site}}{\text{Area of Gage}}\right)^{0.8}$$

The Q_{100} at the gage using the log Pearson analysis was equal to 14,000 cfs. The drainage area at Pioneer Dam is 290.7 square miles,

Kleinschmidt & Dutting
Consulting Civil Engineers

73 MAIN STREET
PITTSFIELD, MAINE 04967
Phone: 207-487-3328

September 15, 1980

Mr. Richard M. Plante
Town Manager
Pittsfield, Maine 04907

RE: Pioneer Dam Flood Analysis

Dear Mr. Plante:

In accordance with the terms of our proposal dated April 30, 1980 and your acceptance dated June 19, 1980, we have completed our study of the flood potential and structural stability of the Pittsfield Pioneer Dam.

Based on our study we have concluded that the 100 year flood elevation upstream of the dam is approximately the top of the existing granite and concrete retaining wall. No significant increase in the elevation of the wall is required to protect the existing and proposed facilities of the Edwards Company. Our preliminary stability analysis of the wall indicates that the wall is stable at this flood elevation but probably would not stand much more. As you are aware, the wall leaks badly and has signs of deterioration in some areas. We recommend that the Town of Pittsfield undertake a program to make repairs to these areas and coat the upstream face of the wall to stop the leakage and retard further deterioration of the structure. Also the old powerhouse foundation should be closed off and covered or removed. Our estimate for this work in 1982 dollars is $69,000.

Enclosed is a detailed report of our analysis and conclusions. If you have any questions, please contact us at any time.

Sincerely,

KLEINSCHMIDT & DUTTING

By William B. Ball
William B. Ball
Project Engineer

WBB/jha
Enc

KLEINSCHMIDT & DUTTING
CONSULTING CIVIL ENGINEERS

Page No. _____

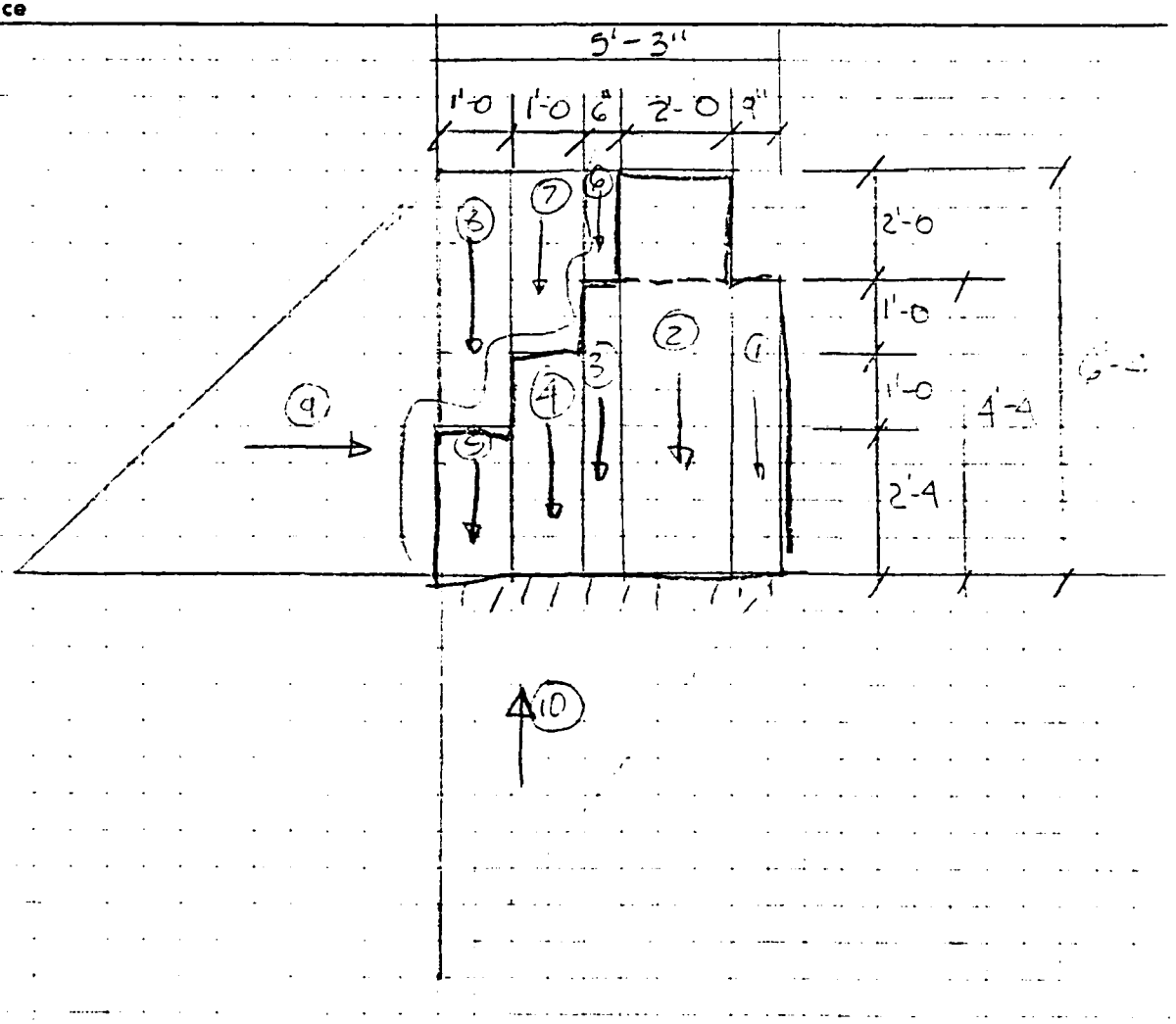
CALCULATION SHEET

Client PITTSFIELD Location PIONEER Job No. 1[illegible]

Subject STABILITY 55 Date 9/8/80 By FF

Checked _____ By _____

Reference



KLEINSCHMIDT & DUTTING
CONSULTING CIVIL ENGINEERS

Page No. _____

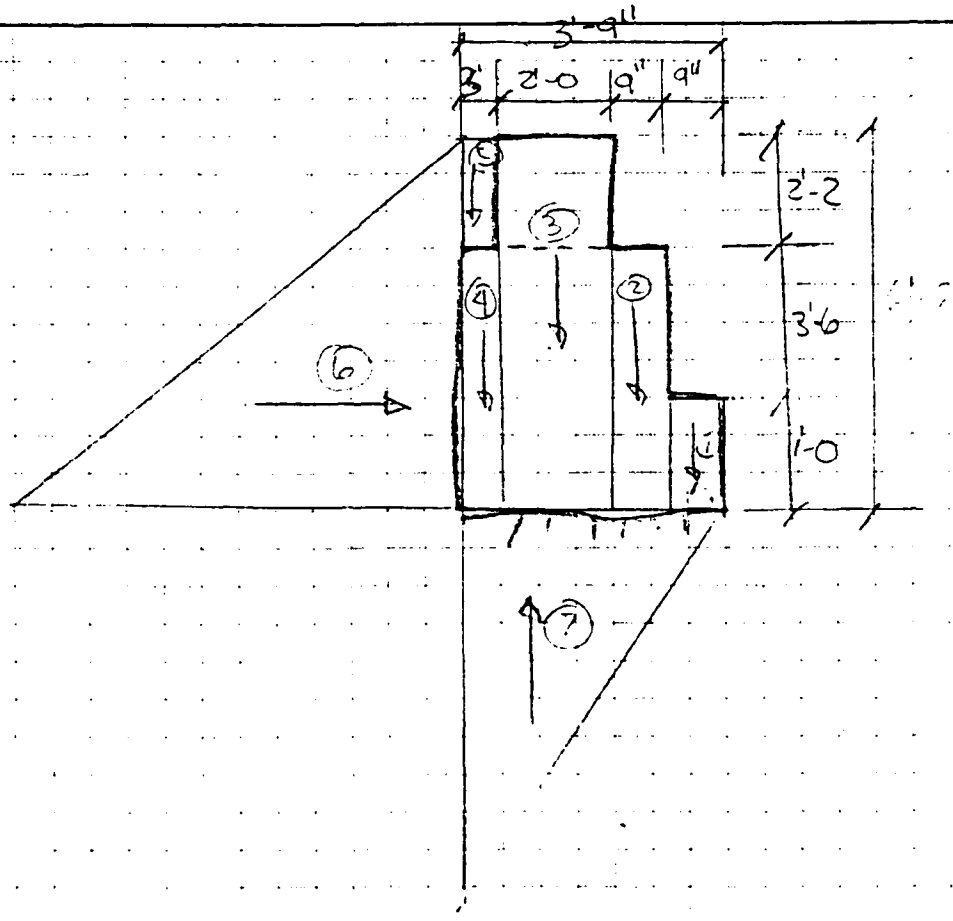
CALCULATION SHEET

Client PITTSFIELD Location PIONEER Job No. [illegible]

Subject STABILITY - 44 Date 5/13/80 By [illegible]

Checked _____ By _____

Reference



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CONSULTING CIVIL ENGINEERS

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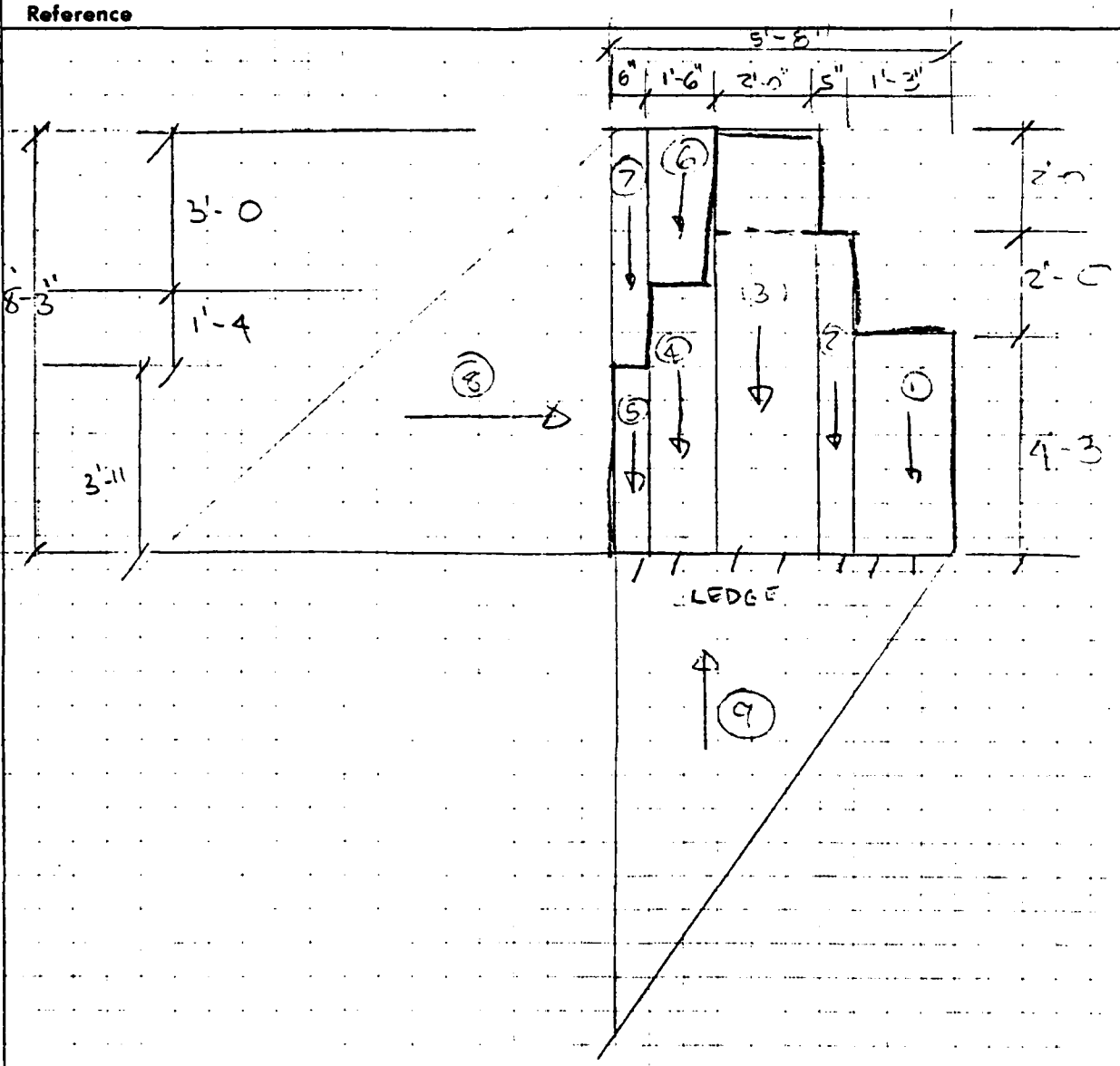
CALCULATION SHEET

Client PITTSFIELD Location DIKE-R Job No. 19-

Subject STABILITY 22 Date 3/13/80 By [illegible]

Checked _____ By _____

Reference



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Page No. _____

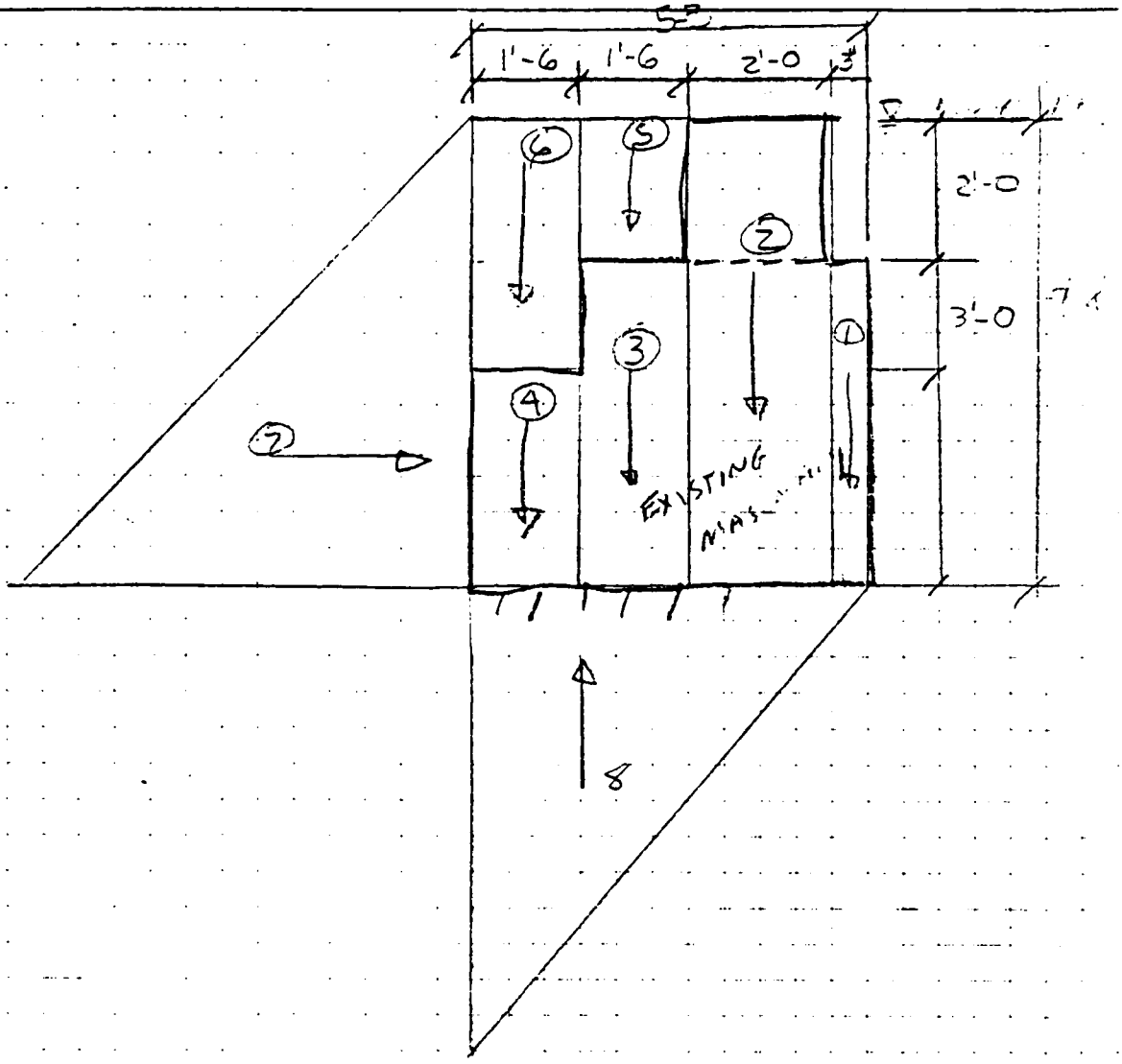
CALCULATION SHEET

Client PITTSFIELD Location PIONEER Job No. [illegible]

Subject STABILITY Z-Z Date 8/13/91 By [illegible]

Checked _____ By _____

Reference



REGISTRATION OF DAM

RENEWAL FORM

1980

NOV 1979

TO PITTSFIELD
PITTSFIELD, MAINE

Date Received JAN 15 1980

Fee Enclosed 10 00

For Office Use Only

Name: PIONEER DAM
Owner: TOWN OF PITTSFIELD
PO BOX R
PITTSFIELD MAINE 04967
0462

Send Renewal Fee of $10.00 to:

Soil & Water Conservation Comm.
State House Station 28
State Office Building
Augusta, Maine 04333

Make Check Payable to:

Treasurer, State of Maine

Tel. Number: 487 3136

Any change or additional information since previous registration:

PLEASE RETURN THIS FORM WITH YOUR CHECK

SWCC #15 93.00-15

B-3

APPLICATION FOR DAM REGISTRATION

Dam Registration Number 0462
Date Received SEP 2 1976
Fee Enclosed $10.00 Ck.
Quad Sheet Name
Quad Sheet Number

ocation:

ounty: Somerset

unicipality: Pittsfield

ame of Dam: Pioneer

ame of Impoundment: Sebasticook River

wnership:

ame of Owner: Town of Pittsfield

Name of Agent: (if different from Owner)

ddress of Owner: P. O. Box R
South Main St.
Pittsfield, ME 04967

Address:

Telephone Number: 487-5959

Telephone Number:

Description of Dam

ype: Concrete

Construction Material: Concrete; Earth filled embankment with masonry core wall.
(Concrete, wood, earth)

Year Originally built: about 1804.

Year last major repair: 20 years ago (?)

Height: 15'

Width: 200'

Spillway type: Gravity Masonry

Spillway Width: 10'

Impounding Capacity: 35 acres
(Acre-feet)

Drawdown available: No
(feet)

Fish Passage available?: No

Installed Electrical Generating Cap: No

Purposes for which stored water is used: To keep area attractive.

Most recent inspection by Qualified Engineer (Date): 8/9/71

Name and Address of Engineer: Kleinschmidt and Dutting
Main St., Pittsfield, ME 04967

Other Permits applicable:

SWCC #14

LIST OF AVAILABLE DATA
PIONEER DAM

Document	Contents	Location
Application for Dam Registration	State of Maine registration form for Pioneer Dam dated 2 September 1976	Maine Soil and Water Conservation Commission Department of Agriculture State of Maine State Office Building Augusta, Maine 04333
Registration of Dam, Renewal Form	State of Maine, registration renewal form for Pioneer Dam dated 15 January 1980	Maine Soil and Water Conservation Commission
Kleinschmidt & Dutting, Consulting Engineers Calculation Sheets	Four calculation sheets showing cross-sections of dam, dated 13 August 1980, location of cross-sections shown in report referenced below	Kleinschmidt & Dutting, Consulting Engineers 73 Main Street Pittsfield, Maine 04967
Pioneer Dam Flood Analysis	Report on Pioneer Dam conducted for Town of Pittsfield, Maine, dated 15 September 1980	Town of Pittsfield P.O. Box R Pittsfield, Maine 04967

APPENDIX B - ENGINEERING DATA

VISUAL INSPECTION CHECK LIST
NATIONAL DAM INSPECTION PROGRAM

DAM: Pioneer Dam DATE: 6 Nov 80

AREA EVALUATED	CONDITION
c. Discharge Channel	
General Condition	Good
Loose Rock Overhanging Channel	Right bank lined with stone rubble
Trees Overhanging Channel	None noted
Floor of Channel	Submerged

VISUAL INSPECTION CHECK LIST
NATIONAL DAM INSPECTION PROGRAM

DAM: Pioneer Dam DATE: 6 Nov 80

AREA EVALUATED	CONDITION
Trees Overhanging Channel	Left bank is tree lined
Floor of Approach Channel	Submerged
b. Weir and Training Walls	
General Condition of Concrete	Spillway weir was submerged at the time of inspection. Alignment of spillway structure appeared satisfactory. Right portion of dam is composite granite block and concrete retaining wall in fair condition with loose joints and several cracks noted. Left upstream concrete training wall in good condition with some spalled areas. No exceptions noted with alignment of retaining wall portion of dam and left upstream training wall
Rust or Staining	At downstream face of retaining wall adjacent to the left side of the abandoned powerhouse
Spalling	Right and left spillway abutments were badly spalled. Spalling observed the length of the concrete cap on the right retaining wall
Any Visible Reinforcing	None noted
Any Seepage or Efflorescence	At downstream face of retaining wall adjacent to the abandoned powerhouse. The downstream toe of this wall was observed to be wet over its length between the powerhouse and spillway weir
Drain Holes	None noted
Other Obstructions	A small diameter steel cable was observed spanning the spillway weir, its middle third suspended below water level. The cable is fastened to steel posts anchored at right and left spillway abutments

retaining wall. Further, with the amount of leakage at the toe of the dam, this appears to be a valid assumption.

4. Concrete and granite unit weight equals 140 lbs/ft^3.

Results of the analysis are summarized in Table 1.0.

Field inspection of the selected cross-section indicated that the retaining wall was constructed of masonry block placed in a step-formation with a 2 foot by 2 foot concrete cap. Actual configuration of the granite block was determined for sections 1-1 to 5-5 probing and minor excavation. Pond level was also lowered to further get an accurate determination of the structural configuration. Ledge outcroppings were plainly visible at the lower water level leading to the assumption that the granite blocks were tied to ledge. No indepth field analysis was done to determine the structural configuration from sections 1-1 to 6-6 due to the significant amount of backfill on the downstream side of the retaining wall.

With this data, and the assumptions indicated previously, the stability analysis was performed. As indicated in Table 1.0 by all positive numbers, the retaining wall proved to be stable for both overturning and sliding during the 100 year event. While the wall was stable structurally, it was in poor condition physically. Field inspection found the condition of portions of the concrete to be poor with spalling in many locations and several deep cracks. Further, the condition of the existing powerhouse poises a potential safety hazard. It was also noted that there was considerable leakage at numerous locations along the toe of the retaining wall and at

the existing powerhouse.

In light of its current condition, it is our recommendation that the following repairs be made to the retaining wall:

1. Excavate the upstream face to ledge.
2. Seal the upstream face with gunite to prevent further leakage.
3. Chip existing cap down to sound concrete and resurface.
4. Plug the intakes at the existing powerhouse.
5. Place a concrete cover over opening on top of existing powerhouse.
6. Plug structure remnant found near section 5-5.

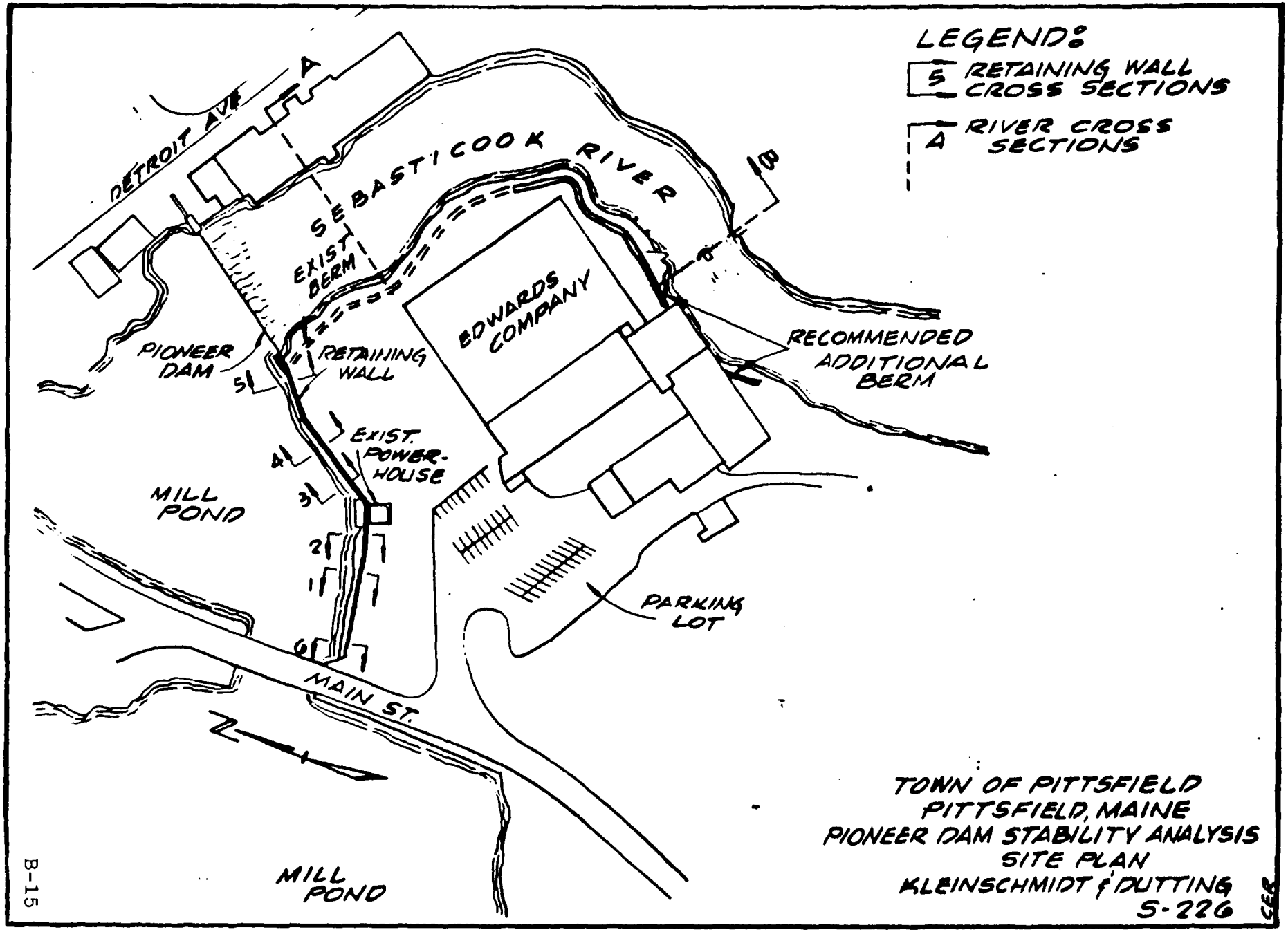
The cost estimate for the work indicated is as follows:

1. Excavation of upstream face	$7,500
2. Chip existing concrete and resurface front face and top with new gunite surface	28,000
3. Plug the intake structures	3,500
4. Concrete cover for opening in powerhouse	2,000
5. Plugging structure indicated in item 6	1,000
Subtotal	$42,000
Contingencies	8,000
Engineering Costs (Basic)	5,000
	55,000
Inflation allowance to 1982 @ 10%	11,000
AFDC @ 8½%	2,800
	$68,800*

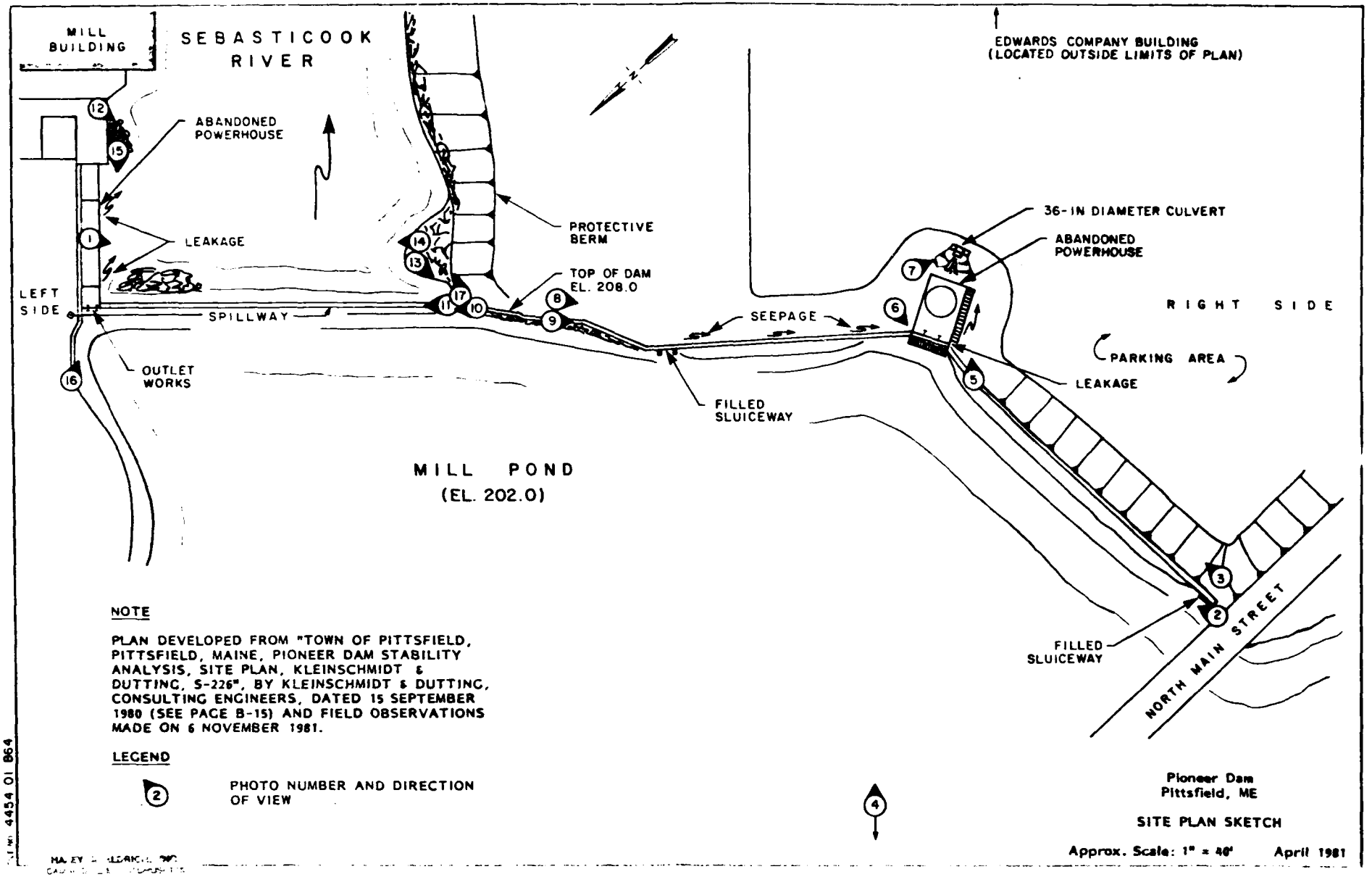
* Does not include land & right-of-way which may not be owned by the Town.

TABLE 1.0
PITTSFIELD PIONEER DAM
SUMMARY - STABILITY

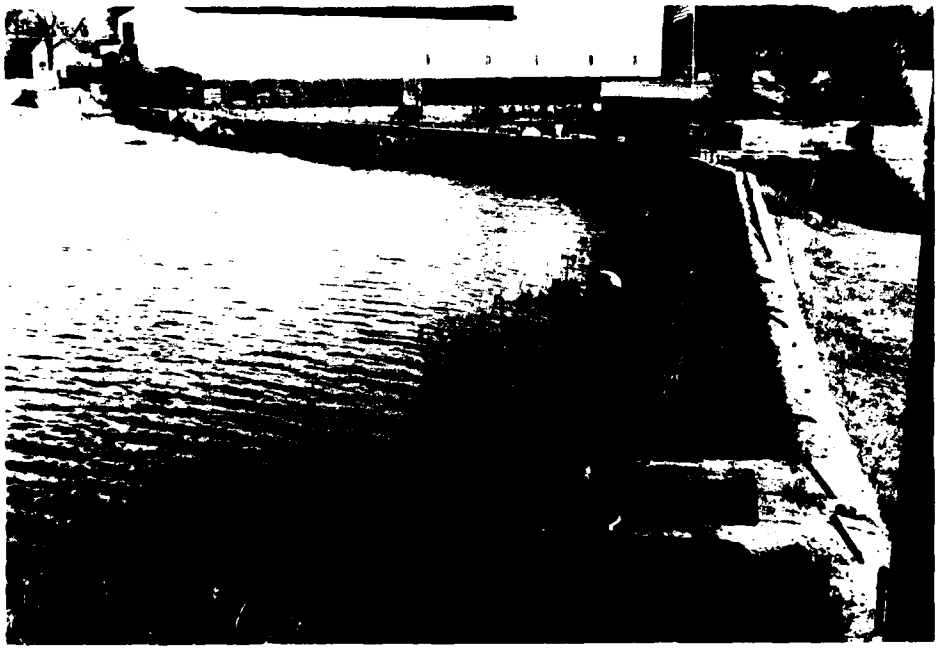
Existing Section	ΣH_{lbs}	ΣV_{lbs}	$\Sigma M_{ft\ lbs}$	$\frac{\Sigma H}{\Sigma V}$	$\frac{\Sigma M}{\Sigma V} = R$	$\frac{R}{(\% \text{ of Base})}$
1-1	728.9	1168.8	275.5	0.62	0.24	9.6
2-2	2717.9	4516.4	883.7	0.60	0.20	3.8
3-3	2123.5	3775.7	4259.9	0.56	1.13	19.9
4-4	1386.7	1855.5	899.6	0.75	0.48	12.8
5-5	1251.2	2786.8	3287.5	0.45	1.18	22.4
6-6	124.8	435.2	310.4	0.29	0.71	35.5


LEGEND:
5 RETAINING WALL CROSS SECTIONS
A RIVER CROSS SECTIONS
DETROIT AVE
A
SEBASTICOOK RIVER
B
EXIST BERM
EDWARDS COMPANY
PIONEER DAM
5
RETAINING WALL
RECOMMENDED ADDITIONAL BERM
EXIST. POWER-HOUSE
4
3
MILL POND
2
1
6
PARKING LOT
MAIN ST.
MILL POND
TOWN OF PITTSFIELD
PITTSFIELD, MAINE
PIONEER DAM STABILITY ANALYSIS
SITE PLAN
KLEINSCHMIDT & DUTTING
S-226
SER

APPENDIX C - PHOTOGRAPHS

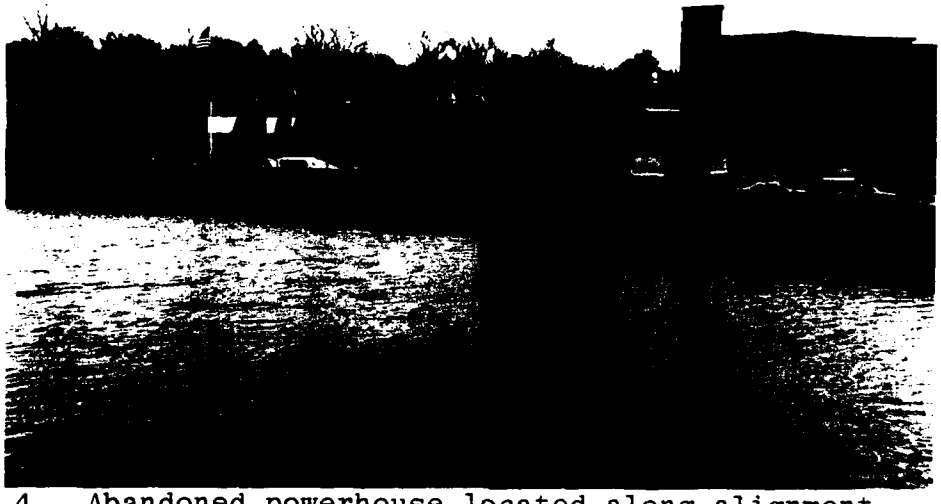

MILL BUILDING
SEBASTICOOK RIVER
EDWARDS COMPANY BUILDING (LOCATED OUTSIDE LIMITS OF PLAN)
ABANDONED POWERHOUSE
LEAKAGE
PROTECTIVE BERM
TOP OF DAM EL. 208.0
36-IN DIAMETER CULVERT
ABANDONED POWERHOUSE
LEFT SIDE
SPILLWAY
SEEPAGE
RIGHT SIDE
PARKING AREA
OUTLET WORKS
FILLED SLUICEWAY
LEAKAGE
MILL POND
(EL. 202.0)
FILLED SLUICEWAY
NORTH MAIN STREET
NOTE
PLAN DEVELOPED FROM "TOWN OF PITTSFIELD, PITTSFIELD, MAINE, PIONEER DAM STABILITY ANALYSIS, SITE PLAN, KLEINSCHMIDT & DUTTING, S-226", BY KLEINSCHMIDT & DUTTING, CONSULTING ENGINEERS, DATED 15 SEPTEMBER 1980 (SEE PAGE B-15) AND FIELD OBSERVATIONS MADE ON 6 NOVEMBER 1981.
LEGEND
PHOTO NUMBER AND DIRECTION OF VIEW
Pioneer Dam
Pittsfield, ME
SITE PLAN SKETCH
Approx. Scale: 1" = 40'
April 1981

4454 01 864



2. Alignment of right side of dam from right abutment, upstream

3. Earth fill at right side of dam, downstream



4. Abandoned powerhouse located along alignment of dam and flood impact area

5. Condition of concrete at abandoned powerhouse

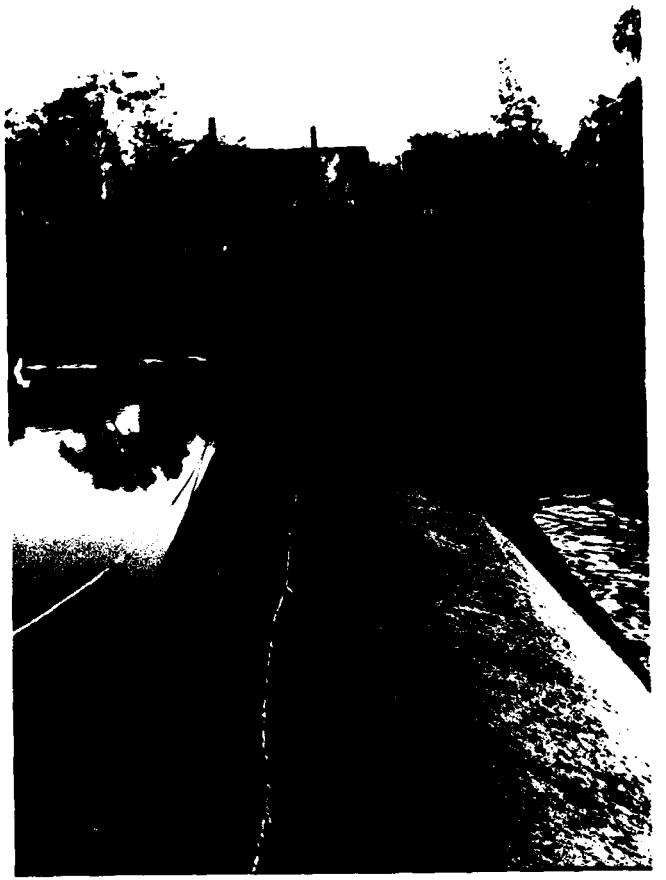
6. Location of seepage, left side of dam at powerhouse, downstream

7. Thirty-six-inch diameter culvert located downstream of powerhouse

8. Masonry at left side of dam, downstream

9. Masonry at left side of dam, downstream, August 1980

10. Alignment of spillway weir

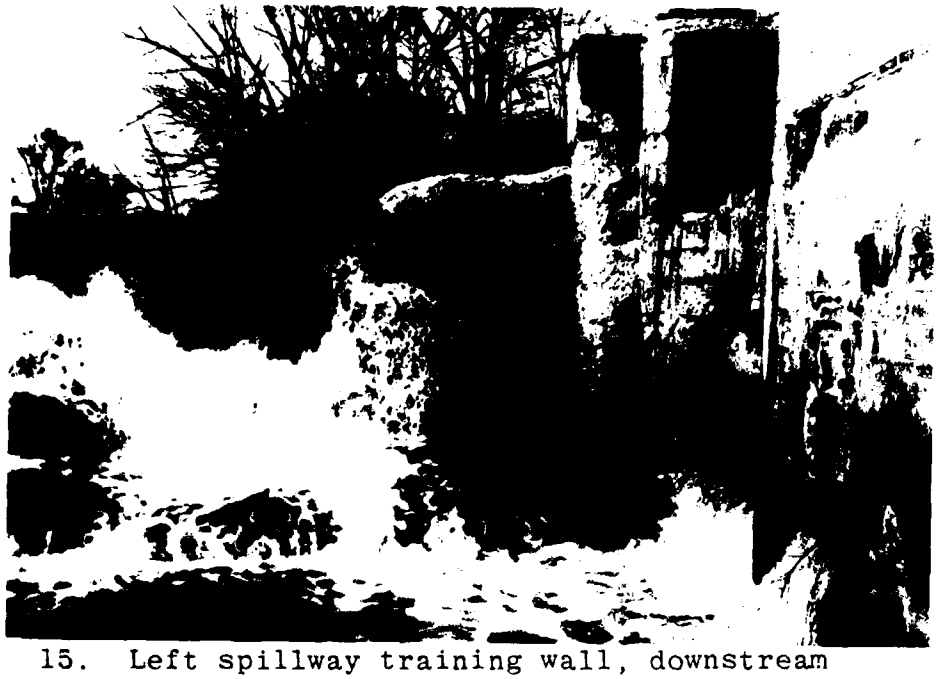


11. Alignment of spillway weir during period of low flow, August 1980

12. Right side of spillway, downstream

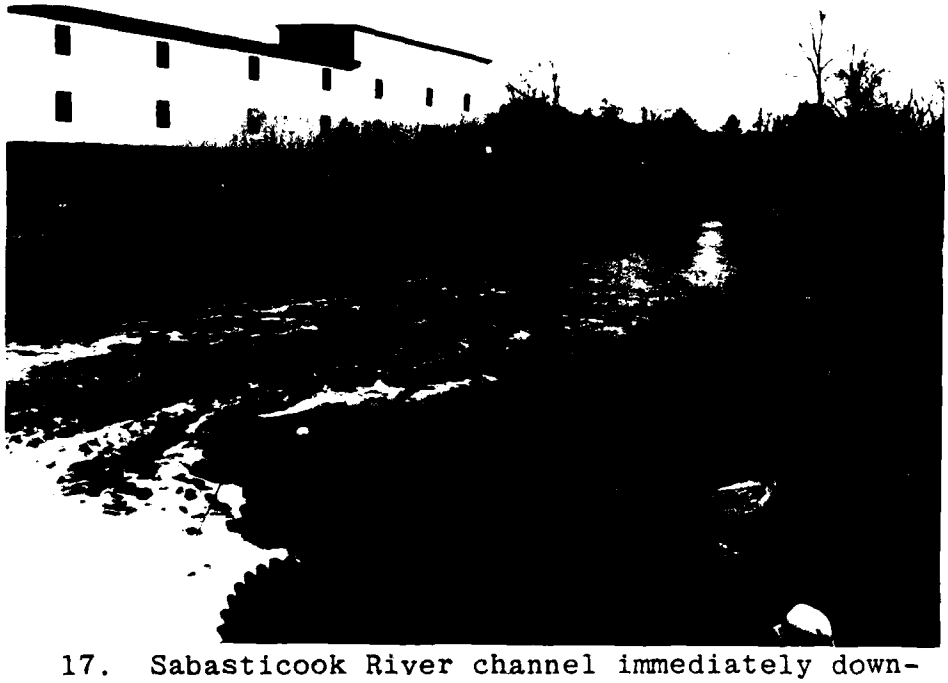
13. Right spillway training wall, downstream

14. Abandoned powerhouse at left end of spillway



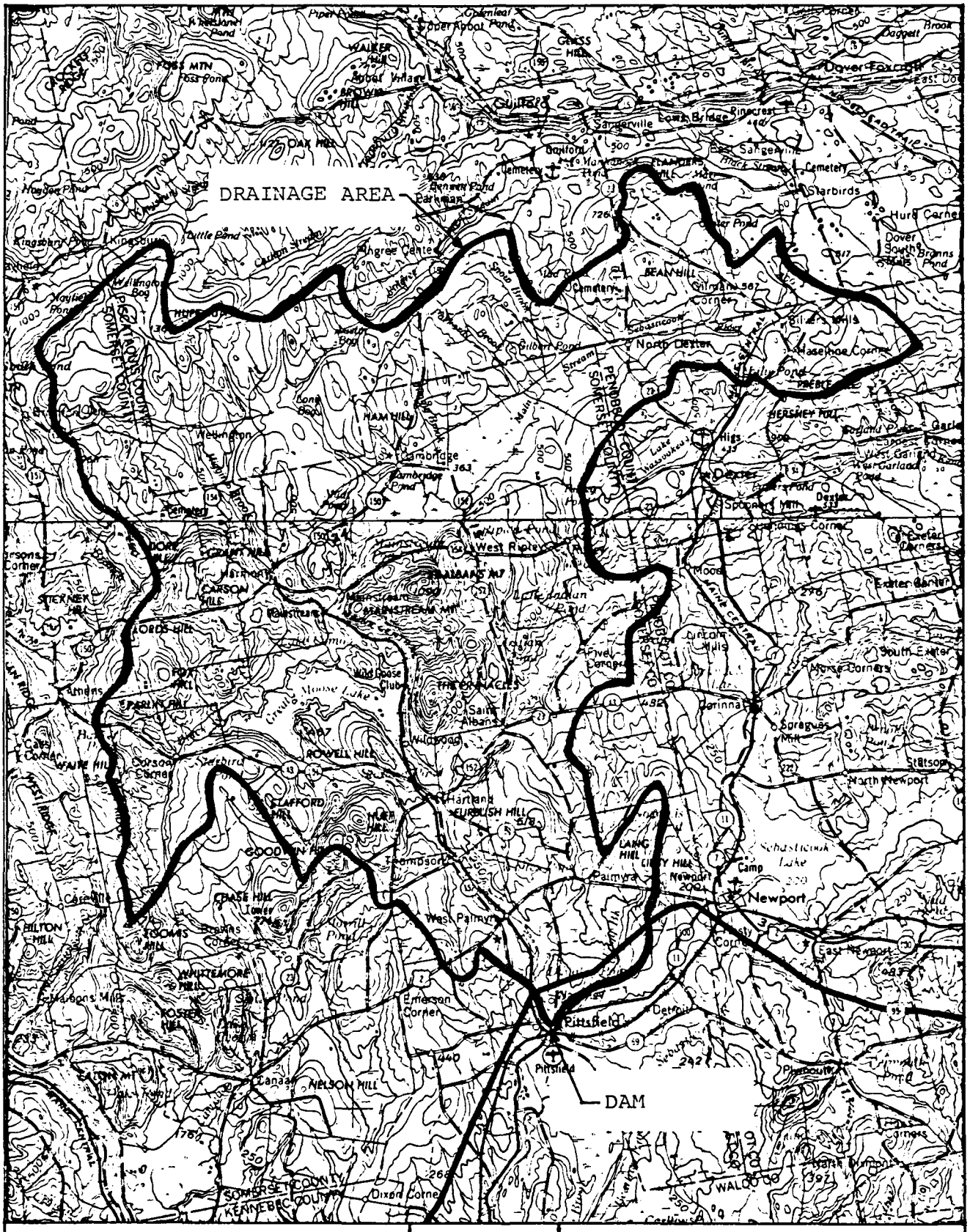
15. Left spillway training wall, downstream

16. Outlet works adjacent to left end of spillway, upstream



17. Sabasticook River channel immediately downstream of the spillway

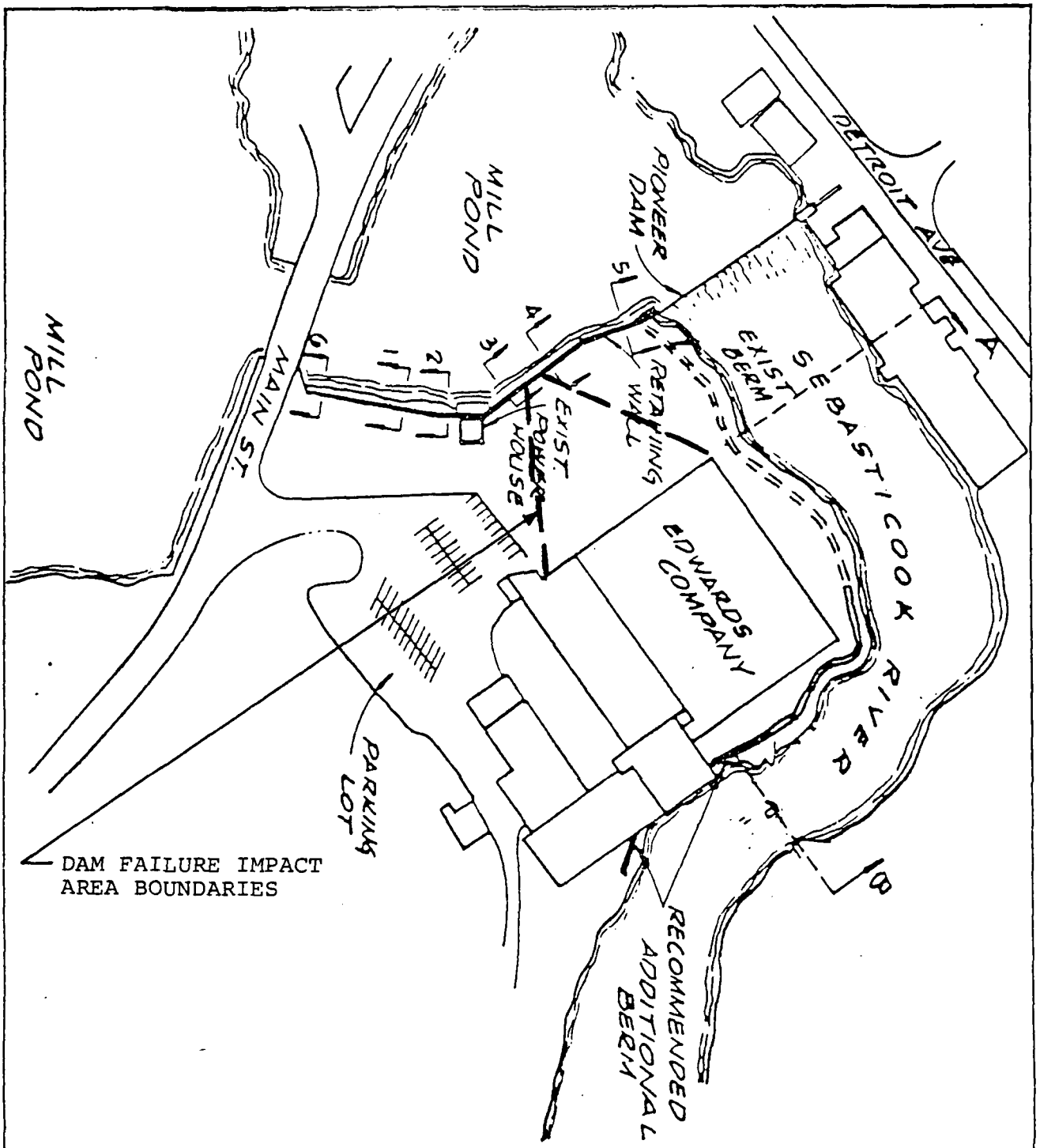
APPENDIX D - HYDRAULIC AND HYDROLOGIC COMPUTATIONS



LOWER PIONEER DAM
ME 00110

DRAINAGE AREA MAP

APPROX. SCALE: 1" = 4 miles



LOWER PIONEER DAM ME 00110		DAM FAILURE IMPACT AREA MAP APPROX. SCALE: 1" = 140'

ELEVATIONS (MSL datum established by Kleinschmidt & Dutting survey during Summer of 1980)

Spillway Crest Elev. 201.0
Top of Dam Elev. 208.0 (low point ~ 25' rt. of spillway rt. abutment)
Toe of Dam Elev. 187.0 (est. during Phase I Insp.)

FEATURES

Length of Dam: approx. 580 ft. (includes spillway)
Length of Spillway: approx. 165 ft.
Outlet Works at Spillway left abut.: two - 6' wide wooden gates; est. Inv. El. 193.5

SURFACE AREAS

Drainage Area = 290.7 sq. mi. (from Kleinschmidt & Dutting Rt.)
W.S. Area @ spillway crest (El. 201.0) ≃ 35 acres (est. from Quad)
W.S. Area @ top of dam (El. 208.0) ≃ 40 acres (est.)

STORAGE CAPACITIES

At spillway crest: 35 ac. x 10 ft. depth x 1/3 = 116 ac. ft.
At top of dam: 116 ac-ft. + $\frac{35+40}{2}$ x 7' depth = 380 ac-ft.

SIZE CLASSIFICATION

Hydraulic height = 208.0 - 187.0 = 21.0 ft.
Storage at top of dam = 380 ac-ft.
∴ Size is SMALL

HAZARD CLASSIFICATION

Failure of the dam would result in the potential loss of several lives at the Edwards Co. plant.
∴ Hazard Classification is HIGH

TEST FLOOD DETERMINATION

For a small size and High hazard, COE Guidelines give test flood range of 1/2 PMF to PMF (Probable Maximum Flood). Adopt 1/2 PMF for test flood.

The 290.7 sq. mi. drainage area is primarily drained by the Sebasticook River as well as numerous small streams and brooks including Indian Stream. In addition to numerous small ponds, the upstream watershed contains Douglas and Indian Ponds and Great Moose Lake which have a combined surface area of about 9 sq. miles. Additionally, a large marsh area is located in the town of Cambridge having a surface area of about 5 sq. miles U/S of Rte. 152.

The Corps of Eng'rs are presently investigating flooding in Hartland, Me. and have developed a preliminary SPF ($\simeq$ 1/2 PMF) of 8000 cfs for the outlet from Great Moose Lake at a D.A. of 235 sq. mi. The effective csm for the PMF would then be $8000 \text{ cfs} \times 2 / 235 \text{ mi}^2 = 68$ csm. Based on this, assume PMF for intervening 55 mi^2 D.A. to be 1/2 that of Flat/Coastal or 250 csm.

$\therefore$ 1/2 PMF = $55 \text{ mi}^2 \times 250 \text{ csm} \times 1/2 + 8{,}000 \simeq 7{,}000 + 8{,}000 = 15{,}000$ cfs

STAGE-DISCHARGE RELATIONSHIPS

Spillway: about 165 ft. long, broad crested, "C" varies with head

Dam: total length that could overflow $\simeq$ 390 ft. at Elev. 208.0

Outlet Works: two - 6 ft. wide wooden gates at Inv. El. 193.5

Spillway discharge: $Q(\text{cfs}) = CLH^{3/2}$ where "C" varies with H
L = 165 ft.
H = W.S. - 201.0

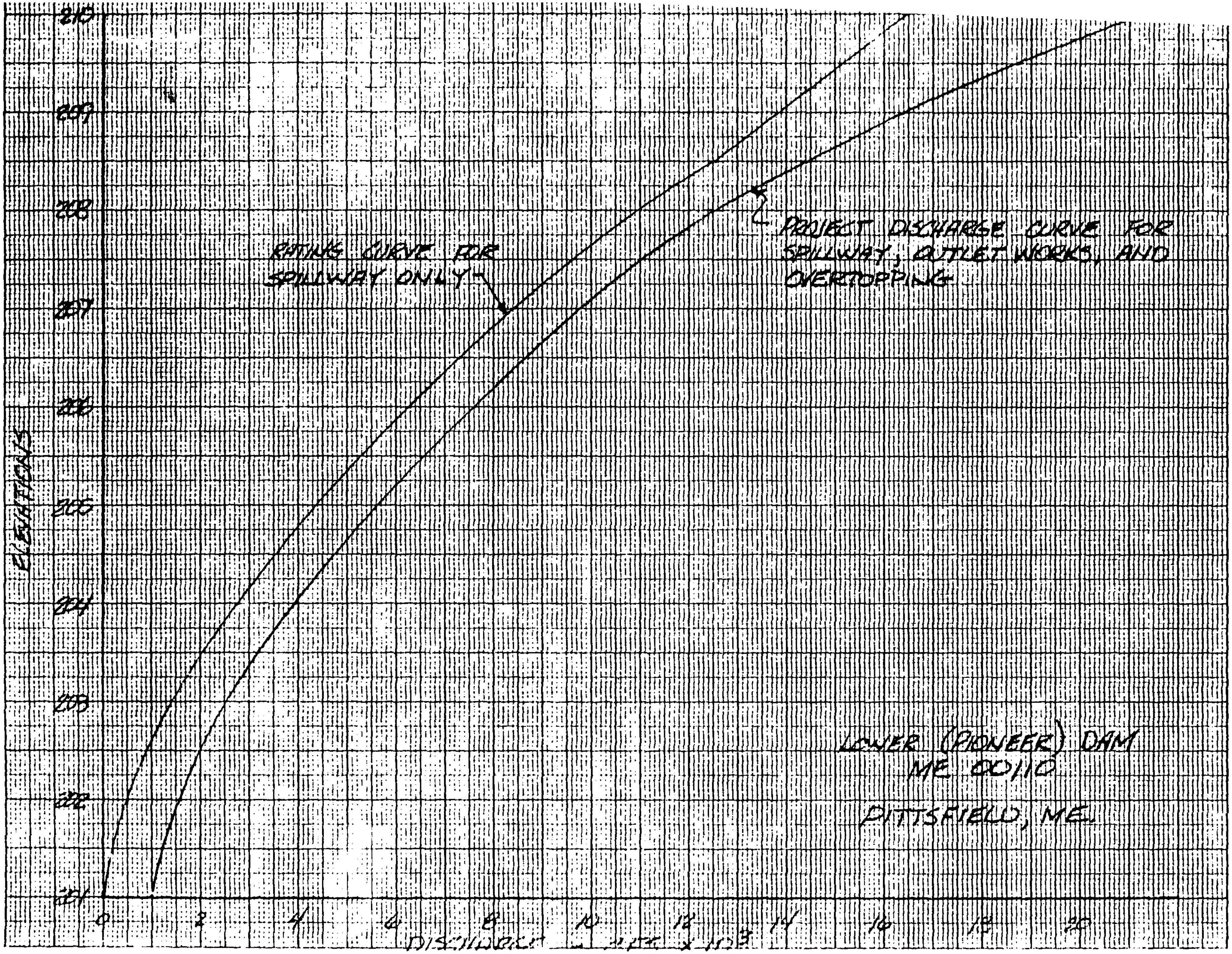
Discharge over top of dam: $Q(\text{cfs}) = CLH^{3/2}$ where "C" varies w/ H
L = 360 ft. (excludes intake struct.)
H = W.S. - 208.0

Outlet Works discharge: $Q(\text{cfs}) = CA(2gH)^{1/2}$ where C = 0.7
A = (6' x 6') x 2
H = W.S. - 1965

W.S. ELEV.	SPILLWAY		DAM OVERTOPPING		OUTLET WORKS (cfs)	TOTAL (cfs)
	"C"	Q (cfs)	"C"	Q (cfs)		
201.0	-	0	-	-	860	860
202.0	3.0	500	-	-	950	1,450
204.0	3.2	2,740	-	-	1,110	3,850
206.0	3.4	6,270	-	-	1,250	7,520
208.0	3.6	11,000	-	0	1,370	12,370
208.5	3.7	12,540	2.9	370	1,400	14,310
209.0	3.7	13,610	3.0	1,080	1,430	16,320
209.5	3.7	15,130	3.1	2,050	1,460	18,640
210.0	3.7	16,460	3.2	3,260	1,490	21,230

Note: Above stage-discharge relationships do not consider tailwater effects (if any) nor the upstream constrictions caused by the bridges.

Due to the insignificant size of Mill Pond and the approx method of determining the test flood, no routing will be performed and the outflow is assumed to equal the inflow of 15,000 cfs.


RATING CURVE FOR SPILLWAY ONLY
PROJECT DISCHARGE CURVE FOR SPILLWAY, OUTLET WORKS, AND OVERTOPPING
LOWER (PIONEER) DAM
ME 00110
PITTSFIELD, ME.
ELEVATIONS
201
202
203
204
205
206
207
208
209
210
0
2
4
6
8
10
12
14
16
18
20

DAM FAILURE ANALYSIS

A failure of any section of the 360 ft. long portion of the dam located to the right of the spillway will impact on the Edwards Co. plant which is located approx. 160 ft. d/s of the toe with a paved parking lot between the dam and the buildings.

The max. height of this portion of the dam is approx. 9 ft. above the parking lot near the abandoned Power House.

Assume length of failed section to be about twice the height of about 20 ft.

Then $Q_p = 8/27 \times 20 \times (32.2)^{1/2} (9)^{3/2} = 910$ cfs

This flood wave would flow across 160 ft. of parking lot and impact on the Edwards Co. building which has a floor elev. approx. 10 ft. below top of dam. The potential for loss of several lives would be great and the hazard is therefore HIGH

The above is assumed to be the worst condition. Failure of a portion of the spillway would result in the following discharge:

$Q_f = 8/27 \times (165 \times .4) \times (32.2)^{1/2} (21)^{3/2} = 10{,}700$ cfs

$Q_s' = 3.6 \times 165 \times (7)^{3/2} \times .6 = 6{,}600$ cfs

17,300 cfs

or approx. 7000 cfs greater than spillway discharge prior to failure.

APPENDIX E - INFORMATION AS CONTAINED IN THE NATIONAL INVENTORY OF DAMS

NOT AVAILABLE AT THIS TIME

END

FILMED

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