

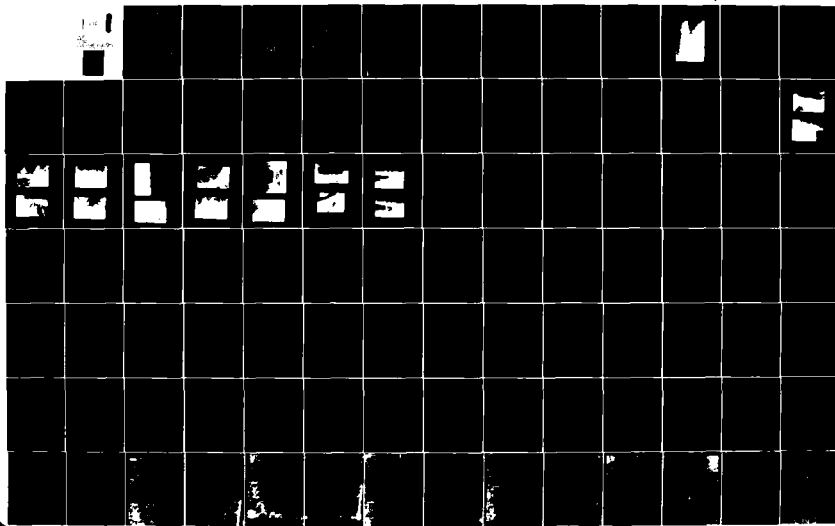
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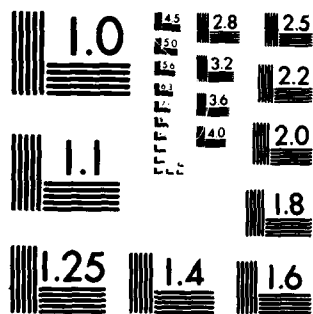
NEW YORK STATE DEPT OF ENVIRONMENTAL CONSERVATION ALBANY F/G 13/1
NATIONAL DAM SAFETY PROGRAM. WINDOVER DAM (I.D. NUMBER NY 150, --F
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19. KEY WORDS (Continue on reverse side if necessary and identify by block number) Dam Safety National Dam Safety Program Visual Inspection Hydrology, Structural Stability Windover Dam Warren County Baker Brook		
20. ABSTRACT (Continue on reverse side if necessary and identify by block number) This report provides information and analysis on the physical condition of the dam as of the report date. Information and analysis are based on visual inspection of the dam by the performing organization. The examination of documents and the visual inspection of Windover Dam did not reveal conditions which constitute an immediate hazard to human life or property. However, the dam has some deficiencies which require further investigation and remedial action.		

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Using the Corps of Engineers "screening criteria" for the initial review of spillway adequacy, it has been determined that the embankment would be overtopped for all storms in excess of 37% of the PMF (Probable Maximum Flood). The spillway is, therefore, adjudged as "seriously inadequate" and the dam is assessed as unsafe, non-emergency.

The classification of "unsafe" applied to a dam because of a "seriously inadequate" spillway is not meant to connote the same degree of emergency as would be associated with an "unsafe" classification applied for a structural deficiency. It does mean that there appears to be a serious deficiency in spillway capacity and if a severe storm were to occur, overtopping and failure of the dam could take place, significantly increasing the hazard to loss of life downstream of the dam.

It is, therefore recommended that within 3 months of notification to the owner, detailed hydrological hydraulic investigations of the structure should be undertaken to more accurately determine the site specific characteristics of the watershed and their affect upon the overtopping potential of the dam. The results of these investigations will determine the appropriate remedial measures which will be required to achieve a spillway capacity adequate to discharge the outflow from at least the 1/2 PMF. In the interim, a detailed emergency action plan must be developed and implemented during periods of unusually heavy precipitation. Also, around-the-clock surveillance of the structure must be provided during these periods.

The structural stability analysis indicates that the factors of safety are not acceptable, therefore, an investigation of the structural stability of the spillway portion of the dam is required. This investigation will determine the type and extent of remedial measures required.

In addition the dam has a number of problem areas, which if left uncorrected have the potential for the development of hazardous conditions and must be corrected within 1 year. These areas are:

1. Monitor the downstream slope of the right embankment at bi-weekly intervals to ascertain if movement is ongoing.
2. Monitor the seepage at the toe of the slope of the right embankment at bi-weekly intervals with the aid of weirs.
3. Repair the eroded upstream slope with riprap.
4. Backfill the depressions observed at the toe of the left embankment, and at the crest of the embankment adjacent to the spillway walls. Also repair the eroded areas adjacent to the downstream toe of the spillway buttresses with riprap.
5. Repair all cracked concrete and recaulk all joints.
6. Return the reservoir drain to operating condition.
7. Remove all tree and brush growth on the embankment surfaces and along the banks of the immediate downstream channel. Provide a program of periodic cutting and mowing of the embankment surfaces and downstream channel.

UPPER HUDSON RIVER BASIN

WINDOVER DAM

WARREN COUNTY NEW YORK
INVENTORY NO. N.Y. 150

PHASE I INSPECTION REPORT NATIONAL DAM SAFETY PROGRAM



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NEW YORK DISTRICT CORPS OF ENGINEERS

MARCH 1980

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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 frequent inspections can unsafe conditions be detected and only through continued care and maintenance can these conditions be prevented or corrected.

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.

6

PHASE I INSPECTION REPORT
 NATIONAL DAM SAFETY PROGRAM
 WINDOVER DAM (I.D. # NY 158) Number
 DEC 186-1322 UPPER HUDSON RIVER BASIN
 WARREN COUNTY, NEW YORK
 Phase I Inspection Report
 TABLE OF CONTENTS

	PAGE NO.
- ASSESSMENT	
- OVERVIEW PHOTOGRAPH	
1 PROJECT INFORMATION	1
1.1 GENERAL	
1.2 DESCRIPTION OF PROJECT	
1.3 PERTINENT DATA	2
2 ENGINEERING DATA	3
2.1 GEOLOGY	3
2.2 SUBSURFACE INVESTIGATION	3
2.3 DAM AND APPURTENANT STRUCTURES	3
2.4 CONSTRUCTION RECORDS	4
2.5 OPERATION RECORD	4
2.6 EVALUATION OF DATA	4
3 VISUAL INSPECTION	5
3.1 FINDINGS	5
3.2 EVALUATION OF OBSERVATIONS	6
4 OPERATION AND MAINTENANCE PROCEDURE	8
4.1 PROCEDURES	8
4.2 MAINTENANCE OF THE DAM	8
4.3 WARNING SYSTEM	8
4.4 EVALUATION	8

iii

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	<u>PAGE NO.</u>
5 HYDRAULIC/HYDROLOGIC	9
5.1 DRAINAGE AREA	9
5.2 ANALYSIS CRITERIA	9
5.3 SPILLWAY CAPACITY	9
5.4 RESERVOIR CAPACITY	9
5.5 FLOODS OF RECORD	9
5.6 OVERTOPPING POTENTIAL	9
5.7 EVALUATION	9
6 STRUCTURAL STABILITY	11
6.1 EVALUATION OF STRUCTURAL STABILITY	11
6.2 STRUCTURAL STABILITY ANALYSIS	11
7 ASSESSMENT/RECOMMENDATIONS	13
7.1 ASSESSMENT	13
7.2 RECOMMENDED MEASURES	14

APPENDIX

- A. PHOTOGRAPHS
- B. VISUAL INSPECTION CHECKLIST
- C. HYDROLOGIC/HYDRAULIC ENGINEERING DATA AND COMPUTATIONS
- D. REFERENCES
- E. STRUCTURAL STABILITY
- F. DRAWINGS

**Phase I Inspection Report
National Dam Safety Program**

Name of Dam: Windover I.D. No. NY 150
State Located: New York
County: Warren
Watershed: Upper Hudson River
Stream: Baker Brook (trib. of North Creek)
Dates of Inspection: November 29 and December 6, 1979

ASSESSMENT

The examination of documents and the visual inspection of Windover Dam did not reveal conditions which constitute an immediate hazard to human life or property. However, the dam has some deficiencies which require further investigation and remedial action.

Using the Corps of Engineers "screening criteria" for the initial review of spillway adequacy, it has been determined that the embankment would be overtopped for all storms in excess of 37% of the PMF (Probable Maximum Flood). The spillway is, therefore, adjudged as "seriously inadequate" and the dam is assessed as unsafe, non-emergency.

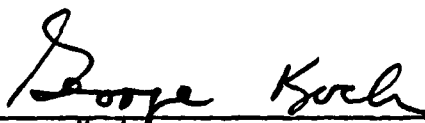
The classification of "unsafe" applied to a dam because of a "seriously inadequate" spillway is not meant to connote the same degree of emergency as would be associated with an "unsafe" classification applied for a structural deficiency. It does mean that there appears to be a serious deficiency in spillway capacity and if a severe storm were to occur, overtopping and failure of the dam could take place, significantly increasing the hazard to loss of life downstream of the dam.

It is, therefore recommended that within 3 months of notification to the owner, detailed hydrological hydraulic investigations of the structure should be undertaken to more accurately determine the site specific characteristics of the watershed and their affect upon the overtopping potential of the dam. The results of these investigations will determine the appropriate remedial measures which will be required to achieve a spillway capacity adequate to discharge the outflow from at least the 1/2 PMF. In the interim, a detailed emergency action plan must be developed and implemented during periods of unusually heavy precipitation. Also, around-the-clock surveillance of the structure must be provided during these periods.

The structural stability analysis indicates that the factors of safety are not acceptable, therefore, an investigation of the structural stability of the spillway portion of the dam is required. This investigation will determine the type and extent of remedial measures required.

In addition the dam has a number of problem areas, which if left uncorrected, have the potential for the development of hazardous conditions and must be corrected within 1 year. These areas are:

1. Monitor the downstream slope of the right embankment at bi-weekly intervals to ascertain if movement is ongoing.
2. Monitor the seepage at the toe of the slope of the right embankment at bi-weekly intervals with the aid of weirs.
3. Repair the eroded upstream slope with riprap.
4. Backfill the depressions observed at the toe of the left embankment, and at the crest of the embankment adjacent to the spillway walls. Also repair the eroded areas adjacent to the downstream toe of the spillway buttresses with riprap.
5. Repair all cracked concrete and recaulk all joints.
6. Return the reservoir drain to operating condition.
7. Remove all tree and brush growth on the embankment surfaces and along the banks of the immediate downstream channel. Provide a program of periodic cutting and mowing of the embankment surfaces and downstream channel.
8. Provide a program of periodic inspection and maintenance of the dam and appurtenances, including yearly operation and lubrication of the reservoir drain system. Document this information for future reference. The aforementioned emergency action plan should be maintained and updated periodically during the life of the structure.



George Koch
Chief, Dam Safety Section
New York State Department
of Environmental Conservation --
NY License No. 45937

Approved By:



Col. Clark H. Benn
New York District Engineer

Date:





Photo #1
Overview of Windover Dam

PHASE I INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM
WINDOVER DAM I.D. No. NY 150
DEC #186-1322 UPPER HUDSON RIVER BASIN
WARREN COUNTY, NEW YORK

SECTION 1: PROJECT INFORMATION

1.1 GENERAL

a. Authority

The Phase I inspection reported herein was authorized by the Department of the Army, New York District, Corps of Engineers, to fulfill the requirements of the National Dam Inspection Act, Public Law 92-367.

b. Purpose of Inspection

Evaluation of the existing conditions of the subject dam to identify deficiencies and hazardous conditions, determine if they constitute hazards to human life and property and recommend measures where necessary.

1.2 DESCRIPTION OF PROJECT

a. Description of Dam and Appurtenances

→ Windover dam consists of 2 earth embankments abutting a 140 feet long concrete capped masonry spillway, the maximum height of which is 15 feet. The left embankment is 75 feet long and the right embankment is 125 feet long. The crest width is 5 feet. The upstream slope is 1 vertical on 3 horizontal and the downstream slope is 1 on 2. A reservoir drain is located near the left end of the spillway. → [Handwritten mark]

b. Location

The dam is located on Baker Brook, a tributary North Creek and the Hudson River, approximately 0.5 miles west of the Village of Sodom, New York.

c. Size

The dam is 15 feet high and impounds approximately 500 acre-feet. The dam is classified as "small" in size.

d. Hazard Classification

The dam is classified as high hazard because of its location, about 0.5 miles above the Village of Sodom, New York.

e. Ownership

The dam is owned and operated by Messers Thomas, Stewart and H.B. Hudnut. Mr. H.B. Hudnut Jr. resides at 27 Horicon Avenue, Glens Falls, New York 12801. Tel: (518)793-6922.

f. Purpose of Dam

The dam is used for recreational purposes.

g. Design and Construction History

The dam was constructed about 1916 to form a trout pond and provide power for a small saw mill. Between 1927 and 1931, 4 feet of concrete was added to the height of the spillway to increase the lake size. The dam was reported to have failed in 1943 during a flash flood. No record of loss of life or property damage was reported. In 1948 the dam was extensively reconstructed by B.A. Burton, Contractor, Brant Lake, N.Y. under the direction of the owner W.H. Hudnut, Jr.

h. Normal Operating Procedures

All flows are discharged over the spillway. The reservoir drain system is not operational.

1.3 PERTINENT DATA

a. Drainage Area (sq. mi.)

8.0

b. Elevations (ft. USGS Datum)

Top of Dam

1514.0

Spillway Crest

1510.0

Invert of Reservoir Drain

N/A

c. Reservoir (acres; acre ft.)

Surface Area @ Top of Dam

105. Acres

Surface Area @ Spillway Crest

99.6 Acres

Storage @ Top of Dam

855. Acre Ft.

Storage @ Spillway Crest

505. Acre Ft.

d. Dam

Type: Homogeneous earth with concrete core wall.

Length (ft):

200.

Upstream Slope:

1:3

Downstream Slope:

1:2

Crest Width (ft):

5.0

e. Spillway

Type: Ungated, masonry and stone crest with a concrete cap.

Weir length (ft):

140.0

Spillway Capacity @ Top of Dam (cfs):

4032.0

f. Reservoir Drain: original sluice was plugged with concrete; presently there is a reported metal pipe in place of the sluice but is bolted closed therefore inoperable in case of emergency draw-down.

SECTION 2: ENGINEERING DATA

2.1 GEOLOGY

Windover Dam is located in the "Adirondack Highlands" physiographic province of New York State. The highest mountains in the State occur in this province, with an average relief of 2,000 feet. North, west, and south of the High Peaks region (east-central part of the province) elevations decrease gradually; east to the Champlain lowland, the slope is more abrupt. The Adirondacks are transected by long, northeast-southwest lineaments, representing shear zones or major faults. The lineaments frequently control drainage and the shape of land forms. Many lakes follow geological contacts, or are confined to valleys along weak metasedimentary rocks. Because glacial deposits have clogged the normal radial drainage, lower areas are dotted with lakes, ponds, and swamps.

The landforms present are largely bedrock-controlled. The High Peaks are underlain solely by anorthosite. The remainder of the Central Highlands is composed of granite and syenitic gneisses which are not as erosion resistant as the High Peaks. Metasedimentary rocks, the least resistant type of rocks, are more local in distribution and occur in valleys. The "Landforms and Bedrock Geology of New York State" map prepared by the University of the State of New York indicates that the bedrock in the vicinity of the dam is Metasedimentary and Metavolcanic rocks (marble, calc-silicate rocks, quartzite and various para gneisses) of Precambrian origin (prior to 570 million years ago). Their sedimentary precursors limestones, impure limestones, quartz sandstones, and shales respectively originally were deposited as horizontal beds in a shallow sea.

2.2 SUBSURFACE INVESTIGATION

- No subsurface investigation could be located for the dam. However, the "General Soil Map of New York State" prepared by the Cornell University Agriculture Experiment Station indicates that the surficial soils in the vicinity of the dam are Becket, Berkshire and Potsdam soils of glacial till origin.

These soils are formed on mostly thick glacial till from the aforementioned bedrock types (see 2.1 Geology). The soils are stony and bouldery silty sands. Overall drainage is good, but due to the lack of clay type particles soil erosion is common. Permeability is moderate to rapid.

2.3 DAM AND APPURTENANT STRUCTURES

The dam was constructed about 1916 and consisted of a masonry and concrete structure approximately 10 feet in height. A moulded concrete sluice served as a reservoir drain near the left end of the spillway. An additional sluice at the extreme left end of the spillway served as an intake for a 2 feet square penstock, which supplied a small sawmill. This mill was located immediately below the dam at the left abutment. Ice damage during the spring of 1918 necessitated repairs to the dam. Between 1927 and 1931, 4 feet of concrete was added to the spillway. Subsequent to a failure of the dam (right masonry portion) during a storm in 1943, the structure was rebuilt (1948) incorporating earth embankments in the construction. These embankments were placed on the upstream and downstream sides of the remaining

portions of the masonry sections of the dam.

2.4 CONSTRUCTION RECORDS

The limited construction and reconstruction information which is available is included in Appendix F, Drawings.

2.5 OPERATION RECORD

No operation information is available.

2.6 EVALUATION OF DATA

Some of the data presented in this report has been made available by Dr. Herbert B. Hudnut, Jr. This information has been invaluable in preparation of this report and appears adequate and reliable for Phase I Inspection purposes.

SECTION 3: VISUAL INSPECTION

3.1 FINDINGS

a. General

Visual inspection of Windover Dam and the surrounding watershed was conducted on November 29 and December 6, 1979. The weather was partly cloudy and the temperature ranged in the thirties. The reservoir level at the time of the inspections was approximately 1510.25 or 0.25 feet above the spillway crest.

b. Embankment

The earth embankment shows certain signs of distress which require monitoring to determine the severity of the problem area. The upstream slope is eroded from wave action above spillway crest elevation. (See Photos #6, 7, & 10) Trees on the upstream slope were evident, and one of these, near the right spillway buttress, was undermined and bowed (See Photos #1, 3 & 10) indicating movement of the root system during its life. On the downstream slope of the right embankment near the spillway numerous mature trees were bowed (See Photo #11), also indicating some past movement of the slope. No evidence could be discovered which would indicate that any current movement is in progress. This area was reported to have experienced a failure during a 1943 storm. The area was rebuilt in 1948 and no further problems were reported.

The downstream slope of the left embankment appears to be steeper than that of the right embankment, which may be the cause of an erosion area beginning at the crest of the dam and extending toward the toe of slope. (See Photo #8) Removal of trees and seeding of the area should eliminate this problem. At the toe of the dam several depressions were observed near the roots of a tree. (See Photo #9) No active movement or seepage could be discerned. Since this area was in the vicinity of the foundation for the old sawmill the depressions could be related to settlement around its foundation.

The crest of the embankments appears to be in good condition. Some distortion of the embankment crest near the spillway buttresses was noted. During discussions with the owner, it was learned that the owner had excavated in this area, attempting to locate the core wall. The core wall was discovered in the right embankment, but not in the left.

c. Seepage

Seepage was observed emanating from an area near the toe of the right embankment beneath a pile of brush. The flow, estimated to be 2 to 3 gallons per minute, had a rusty appearance. However, no migration of fines could be discerned. (See Photo #12)

d. Spillway

The spillway is a concrete capped masonry structure located between the two earth embankments. (See Photos #1 thru 5) The spillway is generally in good condition with only some minor evidence of concrete cracking. The left spillway buttress, on the upstream side, was tipped toward the spillway approximately 1/4 inch. No evidence of current movement was apparent.

e. Reservoir Drain

The reservoir drain, located near the left side of the spillway, was reconstructed in 1948. This drain has not been operated for many years. A detailed inspection of the drain could not be conducted due to the spillway discharge.

f. Downstream Channel

The downstream channel immediately below the dam is bouldery and overgrown with trees. (See Photo #13) Some erosion of the original grade below the spillway buttresses was observed. This erosion is believed to be due to the flow restrictive nature of the boulders and vegetation.

g. Reservoir

There are no visible signs of instability or sedimentation problems in the reservoir area.

3.2 EVALUATION OF OBSERVATIONS

Significant conditions were observed which require investigation to determine if remedial action is required to insure the stability of the dam and appurtenances. The following is a summary of the problem areas encountered, in order of importance, with the appropriate recommended action:

1. The bowing of trees on the right embankment near the spillway indicate that movement of the slope has occurred. This area should be monitored at bi-weekly intervals with the aid of survey equipment to ascertain if ongoing movement is occurring.
2. The seepage observed at the toe of the right embankment, should be monitored at bi-weekly intervals with the aid of weirs. If the flow rate increases significantly or migration of fines occurs, immediate remedial measures will be required to control this seepage.
3. The upstream slope at the normal reservoir level is eroded due to wave action. This area should be ripraped to prevent further erosion.
4. The depressions observed at the toe of the left embankment should be backfilled.
5. The concrete elements of the spillway are cracked and the joints are not caulked. Repair all deteriorated areas during low flow periods and recaulk all joints.
6. The areas of the earth embankments adjacent to the spillway buttresses are depressed. Backfill these areas so that the crest is flush with the top of the buttresses.
7. The reservoir drain is not operational. Restore this system to operating condition.
8. The areas below the spillway buttresses (downstream side) are eroding due to spillway discharges. Repair these areas with riprap.

9. Considerable vegetation was observed growing on the embankments and in the downstream channel. Remove this vegetation and provide a program of periodic cutting and mowing of the embankment surfaces and the downstream channel.

SECTION 4: OPERATION AND MAINTENANCE PROCEDURE

4.1 PROCEDURES

The normal water surface is approximated by the spillway crest, Elevation 1510±.

4.2 MAINTENANCE OF THE DAM

The dam is maintained by the owners, the Hudnut family. Maintenance of the dam is not considered satisfactory as evidenced by the erosion of the upstream face, extensive tree growth, inoperative reservoir drain and deterioration of concrete elements of the spillway.

4.3 WARNING SYSTEM

There is no warning system in effect or in preparation.

4.4 EVALUATION

The dam and appurtenances have not been maintained in satisfactory condition as noted in "Section 3: Visual Inspection."

SECTION 5: HYDRAULIC/HYDROLOGIC

5.1 DRAINAGE AREA

Windover Lake Dam is located on the Baker Brook approximately 1/2 mile west of Sodom, Warren County, New York. The total drainage at the dam is 8.01 square miles. The topography is moderately steep with two well defined drainage paths.

5.2 ANALYSIS CRITERIA

The analysis of the spillway capacity of the dam and storage of the reservoir was performed using the Corps of Engineers HEC-1 computer program, incorporating the "Snyder Synthetic Unit Hydrograph" method, and the "Modified Puls" flood routing procedure. The floods selected for analysis were the PMF and 1/2 PMF in accordance with the recommended guidelines of the Corps of Engineers.

5.3 SPILLWAY CAPACITY

The Windover Lake spillway is an ungated, concrete capped weir, 5 feet in width, 140 feet long. The structure was rebuilt in 1948 after it had breached in June 1943.

The spillway has a capacity of 3700 cfs at top of dam which is 37% of the computed PMF, which is 9920 cfs. The dam is overtopped by approximately 2.3 feet during the PMF event.

5.4 RESERVOIR CAPACITY

Capacity to normal elevation is 505 acre-feet. Surge storage to top of dam is an additional 350 acre-feet, creating a total storage capacity of 855 acre feet to top of dam. The surge storage between the spillway crest and top of dam is equivalent to .82 inches of runoff.

5.5 FLOODS OF RECORD

There have been no recorded events since the dam was rebuilt in 1948. However, shortly before the dam was inspected on November 29, 1979 there was a major storm event in the eastern Adirondack region where it was estimated that the spillway was flowing approximately 2 feet deep or 1190 cfs.

5.6 OVERTOPPING POTENTIAL

The PMF analysis indicates the dam will be overtopped by 2.3 feet during the PMF, and 0.51 feet during the 1/2 PMF. During either of these magnitude of floods it is felt that the bridges on Chatiemac Road and the low lying homes along Peaceful Valley Road would be inundated.

5.7 EVALUATION

The spillway is inadequate to pass 1/2 the PMF of 4817 cfs. The previous breaching caused no loss to life or property but some development downstream has taken place increasing the potential danger.

The spillway, therefore, is adjudged as "seriously inadequate", and the dam is assessed as unsafe, non-emergency.

SECTION 6: STRUCTURAL STABILITY

6.1 EVALUATION OF STRUCTURAL STABILITY

a. Visual Observation

Signs of distress were observed in connection with the right earth embankment. The bowed trees near the right spillway buttress indicate that movement of the slope has occurred in the past. Careful inspection of the slope did not reveal any condition which would indicate that this movement is current or ongoing.

b. Design and Construction Data

No information could be located regarding the structural stability of the structure.

c. Operating Records

No operating problems were reported which would affect the stability of the dam.

d. Post Construction Changes

The dam was repaired in 1918 when ice damaged the structure. Between 1927 and 31, 4 feet of concrete was placed to increase the lake size. In 1948 the dam was reconstructed due to a failure of the structure during a storm in 1943.

6.2 STRUCTURAL STABILITY ANALYSIS

A structural stability analysis was conducted for the spillway portion of the dam. The results of the analysis are as follows:

<u>Case</u>	<u>Description of Loading Conditions</u>
-------------	--

- | | |
|---|--|
| 1 | Normal Operating Conditions, reservoir at El. 1510 full uplift, no tailwater |
| 2 | Same as Case I, 7.5 kips/L.F. ice load |
| 3 | Water at 1/2 PMF level (El. 1514.4), uplift as in Case I, tailwater = 2 feet |
| 4 | Water at PMF level (El. 1516.3), uplift as in Case I tailwater = 3 feet |
| 5 | Normal Operating Conditions as in Case I with Seismic forces of 0.1 (Seismic Zone 3) |

<u>Case</u>	<u>Factor of Safety Overturning</u>	<u>Location of Resultant from Toe</u>	<u>Factor of Safety Sliding</u>
1	2.00	3.5	2.2
2	0.79	-1.8	1.1
3	1.13	0.8	1.0
4	0.94	-0.5	0.8
5	1.59	2.6	1.5

Location of Middle 1/3 is 3.67 to 7.33 feet from the toe.

These results indicate that the spillway portion analyzed does not meet the factors of safety recommended by the Corps of Engineers for any condition. (Resultant must fall within the middle 1/3 and factor of safety for sliding = 3.0.)

Since the structure has withstood ice loading conditions and normal loading conditions without damage, the analysis (which includes available information) may not indicate the true configuration of the structure and the proper loading conditions. Therefore, it is recommended that an in-depth analysis of the structure be conducted, prior to initiation of any remedial actions.

Further information on Structural Stability is included in Appendix E.

SECTION 7: ASSESSMENT/RECOMMENDATIONS

7.1 ASSESSMENT

a. Safety

The Phase I Inspection of Windover Dam revealed that the spillway is "seriously inadequate", based upon the Corps of Engineers "screening criteria", and outflows from any storm in excess of 37% of the PMF will overtop the dam. This overtopping could cause breaching of the dam and the resulting flood-wave would significantly increase the hazard to downstream residents. For these reasons, the dam has been assessed as unsafe, non-emergency.

In addition, the dam has a number of problem areas which if left uncorrected, have the potential for the development of hazardous conditions. These areas are:

1. The unacceptable factors of safety for all loading conditions concerning the structural stability of the spillway portion of the dam.
2. The bowed trees on the downstream slope of the right embankment indicate that movement of the slope has occurred.
3. Seepage encountered at the toe of the right embankment below the bowed tree area may be associated with the movement of the slope.

b. Adequacy of Information

The information reviewed is considered adequate for Phase I Inspection purposes.

c. Need for Additional Investigations

Since the spillway is considered to be "seriously inadequate", additional hydrologic/hydraulic investigations are required to more accurately determine the site specific characteristics of the watershed. After the in-depth hydrologic/hydraulic investigations have been completed, remedial measures must be initiated to provide spillway capacity sufficient to discharge the outflow from the 1/2 PMF event. In addition, an investigation of the structural stability of the spillway portion of the dam is required.

d. Urgency

The additional hydrologic/hydraulic investigations and the stability investigation which are required must be initiated within 3 months from the date of notification. Within 1 year of notification, remedial measures as a result of these investigations must be initiated, with completion of these measures during the following year. In the interim, develop an emergency action plan for the notification of downstream residents and proper governmental authorities in the event of overtopping and provide round-the-clock surveillance of the dam during periods of extreme run-off. The other problem areas listed below must be corrected within 1 year from notification.

7.2 RECOMMENDED MEASURES

1. The results of the aforementioned investigations will determine the appropriate remedial actions required.
2. Monitor the downstream slope of the right embankment at bi-weekly intervals with the aid of survey equipment to ascertain if movement is occurring.
3. Monitor the seepage at the toe of the downstream slope of the right embankment at bi-weekly intervals with the aid of weirs. If flow rates increase significantly or migration of fines occurs, immediate remedial measures will be required to control this seepage.
4. Repair the eroded upstream slope with riprap to prevent further deterioration from wave action.
5. Backfill the depressions observed at the toe of the left embankment and at the crest of both embankments adjacent to the spillway.
6. Repair all concrete areas which are cracked and recaulk all joints.
7. Return the reservoir drain to operating conditions.
8. Repair the eroded areas at the downstream toe of the spillway buttresses.
9. Remove all vegetative growth from the embankment surfaces and along the banks of the immediate downstream channel. Provide a program of periodic cutting and mowing of the embankment surfaces.
10. Provide a program of periodic inspection and maintenance of the dam and appurtenances, including yearly operation and lubrication of the reservoir drain system. Document this information for future reference. The emergency action plan described in section 7.1d should be maintained and updated periodically during the life of the structure.

APPENDIX A

PHOTOGRAPHS



Photo #2
Spillway - Downstream Face



Photo #3
Spillway - Crest



Photo #4
Downstream Channel
Note Debris



Photo #5
Right Abutment of Spillway
Note Debris



Photo #6
Left Embankment
(pointing to high water mark)



Photo #7
Erosion of Left Embankment
Upstream Face

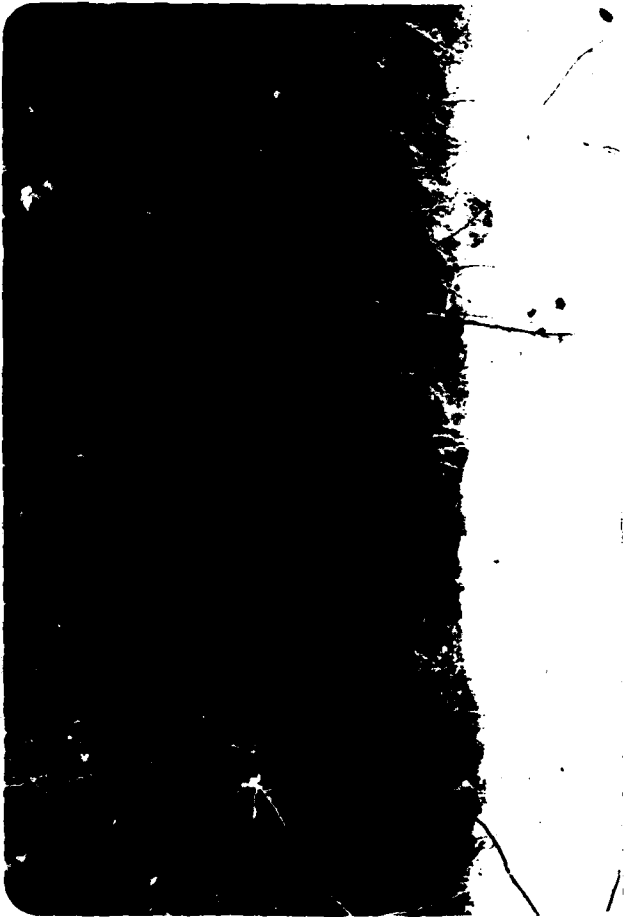


Photo #8
Left Embankment
Erosion of Downstream Face

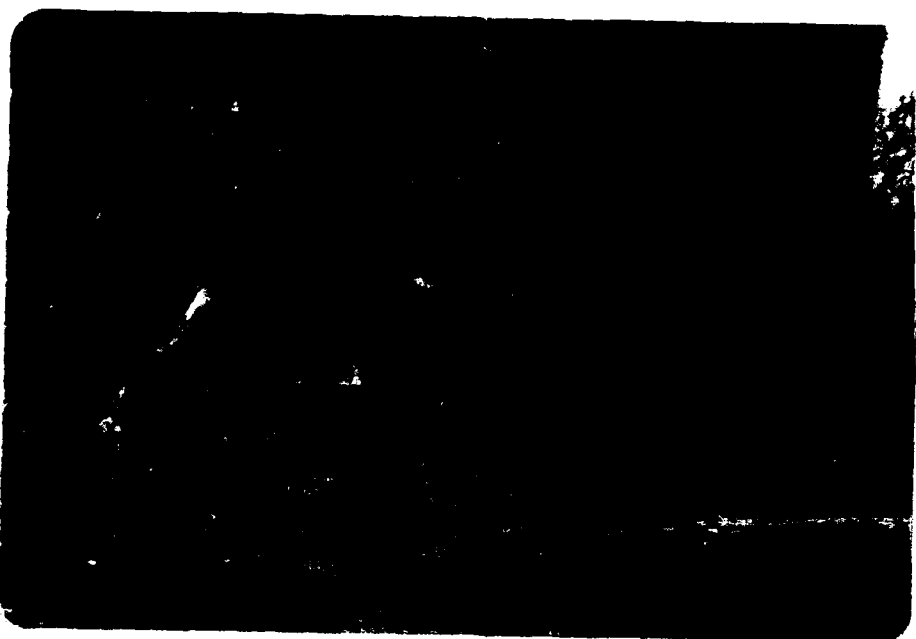


Photo #9
Depression at toe of
Left Embankment

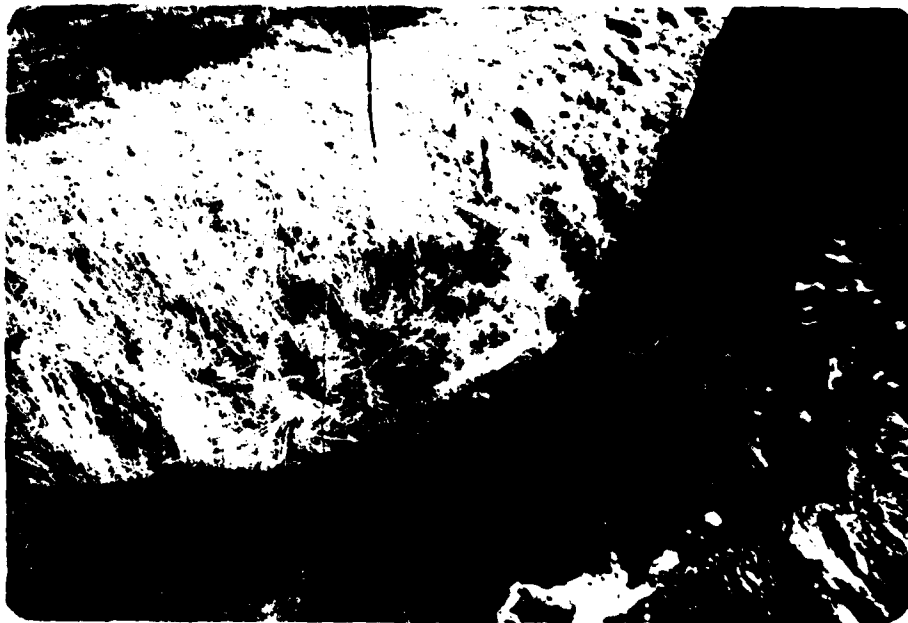


Photo #10
Right Embankment
Erosion of Upstream Face



Photo #11
Downstream Face Right Embankment
Note Bowed Trees

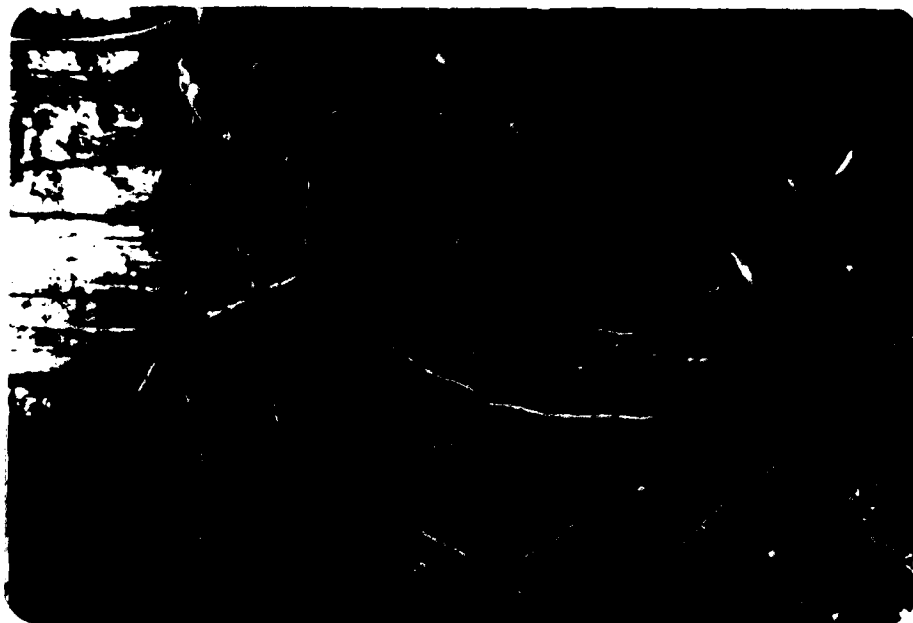


Photo #12
Seepage at toe of Right Embankment
Note rusty color



Photo #13
Downstream Channel



Old Photo Dated 1920
Downstream Face of Spillway
(Old Mill at Right)



Spillway Downstream Face
Dated August 20, 1970



Old Photos Dated 1946
Upstream Face
Note Breach at right end of spillway



APPENDIX B

VISUAL INSPECTION CHECKLIST

VISUAL INSPECTION CHECKLIST

1) Basic Data

a. General

Name of Dam Windover (Formerly Ross Lake)
Fed. I.D. # 150 DEC Dam No. 186-1322
River Basin Upper Hudson
Location: Town Johnsburg County Warren
Stream Name Baker Brook
Tributary of North Creek & Upper Hudson
Latitude (N) 43° 36.1' Longitude (W) 74° 00.2'
Type of Dam 2 Earth embankment's abutting a concrete capped masonry spillway
Hazard Category "C" - High
Date(s) of Inspection 11/29/79 & 12/6/79
Weather Conditions Partly Cloudy Temp = 30's
Reservoir Level at Time of Inspection 0.25 feet above spillway crest

b. Inspection Personnel J. C. Vetch R. P. McCarty

c. Persons Contacted (Including Address & Phone No.)

Herbert B. Hudnot Jr. 27 Harrison Ave
Glens Falls, NY 12801
(518) 793-6922 home / office 793-6610

d. History:

Date Constructed 1916 Date(s) Reconstructed 1918 (March) Ice Damage
1927-31 Earth dam by 4'
Designer Unknown Failure in 1943 required major reconstruction completed in 1948
Constructed By original owner Ellsworth Ross
Owner Thomas, Stewart and Herbert Hudnot

2) Embankment

a. Characteristics

- (1) Embankment Material silty sand, bouldery
- (2) Cutoff Type unknown possibly old masonry dam
- (3) Impervious Core concrete core approx 1 foot thick
- (4) Internal Drainage System none
- (5) Miscellaneous

b. Crest

- (1) Vertical Alignment appears good except where adjacent to spillway buttresses / corner has excavated to locate core wall.
- (2) Horizontal Alignment appears good
- (3) Surface Cracks none evident
- (4) Miscellaneous

c. Upstream Slope

- (1) Slope (Estimate) (V:H) 1 : 3
- (2) Undesirable Growth or Debris, Animal Burrows numerous trees near water line
- (3) Sloughing, Subsidence or Depressions trees have bowed shape indicating movement of root system possible undercutting from wave action wave action has created a step in the slope near normal water level

(4) Slope Protection plans indicate that riprap
was called for - none evident however

(5) Surface Cracks or Movement at Toe unobservable

d. Downstream Slope

(1) Slope (Estimate - V:H) 1:2

(2) Undesirable Growth or Debris, Animal Burrows trees and brush
some cutting of brush was piled near right spillway buttress

(3) Sloughing, Subsidence or Depressions erosion near crest on left emb
depressions at toe of left emb. (possibly due to old mill) evidence
of tree houses on right emb. in vicinity of debris - no indication
of current movement or cracks.

(4) Surface Cracks or Movement at Toe none evident - trees bowed on right emb slope

(5) Seepage 2-3 gpm emanating from right embankment toe
area (beneath pile of brush) area surrounding flow
has a rusty appearance (no migration of fines)

(6) External Drainage System (Ditches, Trenches; Blanket) none

(7) Condition Around Outlet Structure see spillway
Some erosion of grade behind spillway retaining walls

(8) Seepage Beyond Toe none evident

e. Abutments - Embankment Contact

earth abutments appear to be in good
condition

(1) Erosion at Contact none evident

(2) Seepage Along Contact none evident

3) Drainage System

a. Description of System none

b. Condition of System

c. Discharge from Drainage System

4) Instrumentation (Monumentation/Surveys, Observation Wells, Weirs, Piezometers, Etc.)

none

5) Reservoir

- a. Slopes appear stable
- b. Sedimentation no problems reported
- c. Unusual Conditions Which Affect Dam

6) Area Downstream of Dam

- a. Downstream Hazard (No. of Homes, Highways, etc.) Village of Sechin $\approx$ 1/2 mile below dam
- b. Seepage, Unusual Growth seepage - none evident
numerous trees & brush - should be removed
- c. Evidence of Movement Beyond Toe of Dam none evident
- d. Condition of Downstream Channel boulders & trees in channel

7) Spillway(s) (Including Discharge Conveyance Channel)

- a. General concrete capped masonry spillway 140' wide
- b. Condition of Service Spillway Some minor cracking of the
spillway crest and buttresses was observed.
The left buttress upstream wall appears to have moved $\approx$ 1/2" toward
spillway - monitor & resseal joint - Patch up all cracks &
resseal all joints.

c. Condition of Auxiliary Spillway _____

None

d. Condition of Discharge Conveyance Channel _____

boulders & trees in downstream channel

8) Reservoir Drain/Outlet

Type: Pipe _____ Conduit ☒ Other _____

Material: Concrete ☒ Metal _____ Other _____

Size: _____ Length _____

Invert Elevations: Entrance _____ Exit _____

Physical Condition (Describe): _____ Unobservable ☒

Material: _____

Joints: _____ Alignment _____

Structural Integrity: _____

Hydraulic Capability: _____

Means of Control: Gate _____ Valve _____ Uncontrolled _____

Operation: Operable _____ Inoperable ☒ Other _____

Present Condition (Describe): Design has not been

specified for many years

9) Structural

a. Concrete Surfaces

generally good condition

b. Structural Cracking

some minor cracking of spillway
crest & buttresses

c. Movement - Horizontal & Vertical Alignment (Settlement)

no significant movement evident

d. Junctions with Abutments or Embankments

appears good

e. Drains - Foundation, Joint, Face

none

f. Water Passages, Conduits, Sluices

reservoir drain unobservable

g. Seepage or Leakage

more than concrete abutments
where observed - spillway flow obscured
detailed inspection

- h. Joints - Construction, etc. joints require recasting
- i. Foundation unobservable
- j. Abutments relatively good condition
- k. Control Gates none
- l. Approach & Outlet Channels approach unobservable
outlet is natural boundary channel
- m. Energy Dissipators (Plunge Pool, etc.) boulders in downstream channel
- n. Intake Structures none
- o. Stability appears adequate
- p. Miscellaneous

10) Appurtenant Structures (Power House, Lock, Gatehouse, Other)

a. Description and Condition _____

None

APPENDIX C

HYDROLOGIC / HYDRAULIC

ENGINEERING DATA AND COMPUTATIONS

CHECK LIST FOR DAMS
HYDROLOGIC AND HYDRAULIC
ENGINEERING DATA

1

AREA-CAPACITY DATA:

	<u>Elevation</u> (ft.)	<u>Surface Area</u> (acres)	<u>Storage Capacity</u> (acre-ft.)
1) Top of Dam	<u>154.0</u>	<u>105</u>	<u>855</u>
2) Design High Water (Max. Design Pool)	<u>-</u>	<u>-</u>	<u>-</u>
3) Auxiliary Spillway Crest	<u>-</u>	<u>-</u>	<u>-</u>
4) Pool Level with Flashboards	<u>-</u>	<u>-</u>	<u>-</u>
5) Service Spillway Crest	<u>1510.0</u>	<u>100</u>	<u>505</u>

DISCHARGES

	<u>Volume</u> (cfs)
1) Average Daily	<u>10 cfs.</u>
2) Spillway @ Maximum High Water	<u>3696 cfs</u>
3) Spillway @ Design High Water	<u>-</u>
4) Spillway @ Auxiliary Spillway Crest Elevation	<u>-</u>
5) Low Level Outlet	<u>N/A</u>
6) Total (of all facilities) @ Maximum High Water	<u>3696 cfs.</u>
7) Maximum Known Flood	<u>-</u>
8) At Time of Inspection	<u>60 cfs</u>

CREST:

ELEVATION: 1510.0Type: Concrete capped (broad crested weir)Width: 5.0' Length: 140.0'

Spillover _____

Location

Southeastern corner of Windover Lake
centered on dam (over original streambed)

SPILLWAY:

SERVICE

AUXILIARY

1510.0

Elevation _____

br. crested weir

Type _____

5.0' w140.0' l

Width _____

Type of Control✓

Uncontrolled _____

Controlled: _____

Type _____

(Flashboards; gate)

Number _____

Size/Length _____

Invert Material _____

Anticipated Length
of operating service _____

Chute Length _____

Height Between Spillway Crest
& Approach Channel Invert
(Weir Flow) _____

HYDROMETEROLOGICAL GAGES:

Type : none

Location:

Records:

Date -

Max. Reading -

FLOOD WATER CONTROL SYSTEM:

Warning System: none

Method of Controlled Releases (mechanisms):

original sluice plugged

DRAINAGE AREA: 8.01 mi.²

DRAINAGE BASIN RUNOFF CHARACTERISTICS:

Land Use - Type: RURAL, WOODED.
Terrain - Relief: moderate to steep slopes (Hirondak Region)
Surface - Soil: SILTY SAND
Runoff Potential (existing or planned extensive alterations to existing
(surface or subsurface conditions)

Potential Sedimentation problem areas (natural or man-made; present or future)

NONE CHANGES to CONTINUAL SEDIMENTATION

Potential Backwater problem areas for levels at maximum storage capacity
including surcharge storage:

NONE

Dikes - Floodwalls (overflow & non-overflow) - Low reaches along the
Reservoir perimeter:

Location: NONE

Elevation: _____

Reservoir:

Length @ Maximum Pool .7 (Miles)

Length of Shoreline (@ Spillway Crest) 1.5 (Miles)

PREVIEW OF SEQUENCE OF STREAM NETWORK CALCULATIONS
RUNOFF HYDROGRAPH AT 1
ROUTE HYDROGRAPH TO 1
END OF NETWORK

```

*****
FLOOD HYDROGRAPH PACKAGE (HEC-1)
DAM SAFETY VERSION    JULY 1978
LAST MODIFICATION    26 FEB 79
MODIFIED FOR MONEYWELL APR 79
*****

*****
NEW YORK STATE
DEPT OF ENVIRONMENTAL CONSERVATION
FLOOD PROTECTION BUREAU
*****

```

```

RUN DATE 03/06/80
WINDOVER LAKE DAM
PHASE I
PHF

```

```

NO      NHR      NMIN      IDAY      IHR      IMIN      METRC      IPLT      IPRT      NSTAN
200      0      15      0      0      0      0      0      0      0
JOPER      5      0      0      0      0      0      0      0

```

```

MULTI-PLAN ANALYSES TO BE PERFORMED
NPLAN= 1 NRTIO= 2 LRTIO= 1
RTIOS= 0.50 1.00

```

```

*****
*****
*****
*****
*****

```

SUB-AREA RUNOFF COMPUTATION

```

INFLOW FROM BASIN
ISTAQ      1      ICOMP      0      IECON      0      ITAPE      0      JPLT      2      JPRT      0      INAME      1      ISTAGE      0      IAUTO      0

```

```

1HYDQ      1      IUNG      1      TAREA      8.01      SNAP      0.      TRSDA      8.01      TRSPC      0.      RATID      0.      ISNOW      0      ISAME      0      LOCAL      0

```

```

PRECIP DATA
SPFE      PMS      R6      R12      R24      R48      R72      R96
0.      17.60      111.00      123.00      133.00      142.00      0.      0.
TRSPC COMPUTED BY THE PROGRAM IS 0.800

```

```

LOSS DATA
LROPT      0      STKR      0      OLTR      0      RTIOL      1.00      ERAIN      0.      STKS      0.      RTICK      1.00      STRTL      1.00      CNSTL      0.10      ALSHX      0.      RTIMP      0.

```

```

UNIT HYDROGRAPH DATA
TP= 4.30 CP=0.63 NTAB= 0

```

```

APPROXIMATE CLARK COEFFICIENTS FROM GIVEN SNYDER CP AND TP ARE TC=18.07 AND R=16.05 INTERVALS

```

UNIT HYDROGRAPH 96 END-OF-PERIOD ORDINATES, LAG= 4.34 TOLAP, CP= 0.63 VBL= 1.00									
11.	41.	83.	134.	190.	251.	312.	371.	430.	489.
583.	638.	685.	721.	749.	767.	775.	772.	753.	716.
673.	632.	594.	558.	524.	493.	463.	435.	409.	384.
361.	339.	318.	299.	281.	264.	248.	233.	219.	206.
193.	182.	171.	160.	151.	142.	133.	125.	117.	110.
104.	97.	92.	86.	81.	76.	71.	67.	63.	59.
56.	52.	49.	46.	43.	41.	38.	36.	34.	32.

NO. DA	HR. MN	PERIOD	RAIN	EXCS	LOSS	END-OF-PERIOD FLUM COMP Q	HR. MN	PERIOD	RAIN	EXCS	LOSS	END-OF-PERIOD FLUM COMP Q	HR. MN	PERIOD	RAIN	EXCS	LCSS	COMP C
1.01	0.15	1	0.00	0.	0.00	16.	1.02	101	0.02	0.	0.02	101	1.15	101	0.02	0.	0.02	30.
1.01	0.30	2	0.00	0.	0.00	16.	1.02	102	0.02	0.	0.02	102	1.30	102	0.02	0.	0.02	30.
1.01	0.45	3	0.00	0.	0.00	16.	1.02	103	0.02	0.	0.02	103	1.45	103	0.02	0.	0.02	29.
1.01	1.00	4	0.00	0.	0.00	16.	1.02	104	0.02	0.	0.02	104	2.00	104	0.02	0.	0.02	28.
1.01	1.15	5	0.00	0.	0.00	16.	1.02	105	0.02	0.	0.02	105	2.15	105	0.02	0.	0.02	27.
1.01	1.30	6	0.00	0.	0.00	16.	1.02	106	0.02	0.	0.02	106	2.30	106	0.02	0.	0.02	27.
1.01	1.45	7	0.00	0.	0.00	16.	1.02	107	0.02	0.	0.02	107	2.45	107	0.02	0.	0.02	26.
1.01	2.00	8	0.00	0.	0.00	16.	1.02	108	0.02	0.	0.02	108	3.00	108	0.02	0.	0.02	25.
1.01	2.15	9	0.00	0.	0.00	16.	1.02	109	0.02	0.	0.02	109	3.15	109	0.02	0.	0.02	25.
1.01	2.30	10	0.00	0.	0.00	16.	1.02	110	0.02	0.	0.02	110	3.30	110	0.02	0.	0.02	24.
1.01	2.45	11	0.00	0.	0.00	16.	1.02	111	0.02	0.	0.02	111	3.45	111	0.02	0.	0.02	24.
1.01	3.00	12	0.00	0.	0.00	16.	1.02	112	0.02	0.	0.02	112	4.00	112	0.02	0.	0.02	23.
1.01	3.15	13	0.00	0.	0.00	16.	1.02	113	0.02	0.	0.02	113	4.15	113	0.02	0.	0.02	23.
1.01	3.30	14	0.00	0.	0.00	16.	1.02	114	0.02	0.	0.02	114	4.30	114	0.02	0.	0.02	22.
1.01	3.45	15	0.00	0.	0.00	16.	1.02	115	0.02	0.	0.02	115	4.45	115	0.02	0.	0.02	22.
1.01	4.00	16	0.00	0.	0.00	16.	1.02	116	0.02	0.	0.02	116	5.00	116	0.02	0.	0.02	22.
1.01	4.15	17	0.00	0.	0.00	16.	1.02	117	0.02	0.	0.02	117	5.15	117	0.02	0.	0.02	21.
1.01	4.30	18	0.00	0.	0.00	16.	1.02	118	0.02	0.	0.02	118	5.30	118	0.02	0.	0.02	21.
1.01	4.45	19	0.00	0.	0.00	16.	1.02	119	0.02	0.	0.02	119	5.45	119	0.02	0.	0.02	21.
1.01	5.00	20	0.00	0.	0.00	16.	1.02	120	0.02	0.	0.02	120	6.00	120	0.02	0.	0.02	20.
1.01	5.15	21	0.00	0.	0.00	16.	1.02	121	0.07	0.05	0.03	121	6.15	121	0.07	0.05	0.03	21.
1.01	5.30	22	0.00	0.	0.00	16.	1.02	122	0.07	0.05	0.03	122	6.30	122	0.07	0.05	0.03	22.
1.01	5.45	23	0.00	0.	0.00	16.	1.02	123	0.07	0.05	0.03	123	6.45	123	0.07	0.05	0.03	26.
1.01	6.00	24	0.00	0.	0.00	16.	1.02	124	0.07	0.05	0.03	124	7.00	124	0.07	0.05	0.03	32.
1.01	6.15	25	0.00	0.	0.00	16.	1.02	125	0.07	0.05	0.03	125	7.15	125	0.07	0.05	0.03	40.
1.01	6.30	26	0.00	0.	0.00	16.	1.02	126	0.07	0.05	0.03	126	7.30	126	0.07	0.05	0.03	51.
1.01	6.45	27	0.00	0.	0.00	16.	1.02	127	0.07	0.05	0.03	127	7.45	127	0.07	0.05	0.03	65.
1.01	7.00	28	0.00	0.	0.00	16.	1.02	128	0.07	0.05	0.03	128	8.00	128	0.07	0.05	0.03	83.
1.01	7.15	29	0.00	0.	0.00	16.	1.02	129	0.07	0.05	0.03	129	8.15	129	0.07	0.05	0.03	103.
1.01	7.30	30	0.00	0.	0.00	16.	1.02	130	0.07	0.05	0.03	130	8.30	130	0.07	0.05	0.03	126.
1.01	7.45	31	0.00	0.	0.00	16.	1.02	131	0.07	0.05	0.03	131	8.45	131	0.07	0.05	0.03	153.
1.01	8.00	32	0.00	0.	0.00	16.	1.02	132	0.07	0.05	0.03	132	9.00	132	0.07	0.05	0.03	181.
1.01	8.15	33	0.00	0.	0.00	16.	1.02	133	0.07	0.05	0.03	133	9.15	133	0.07	0.05	0.03	212.
1.01	8.30	34	0.00	0.	0.00	16.	1.02	134	0.07	0.05	0.03	134	9.30	134	0.07	0.05	0.03	245.
1.01	8.45	35	0.00	0.	0.00	16.	1.02	135	0.07	0.05	0.03	135	9.45	135	0.07	0.05	0.03	279.
1.01	9.00	36	0.00	0.	0.00	16.	1.02	136	0.07	0.05	0.03	136	10.00	136	0.07	0.05	0.03	314.
1.01	9.15	37	0.00	0.	0.00	16.	1.02	137	0.07	0.05	0.03	137	10.15	137	0.07	0.05	0.03	349.
1.01	9.30	38	0.00	0.	0.00	16.	1.02	138	0.07	0.05	0.03	138	10.30	138	0.07	0.05	0.03	384.
1.01	9.45	39	0.00	0.	0.00	16.	1.02	139	0.07	0.05	0.03	139	10.45	139	0.07	0.05	0.03	418.
1.01	10.00	40	0.00	0.	0.00	16.	1.02	140	0.07	0.05	0.03	140	11.00	140	0.07	0.05	0.03	450.
1.01	10.15	41	0.00	0.	0.00	16.	1.02	141	0.07	0.05	0.03	141	11.15	141	0.07	0.05	0.03	481.
1.01	10.30	42	0.00	0.	0.00	16.	1.02	142	0.07	0.05	0.03	142	11.30	142	0.07	0.05	0.03	509.
1.01	10.45	43	0.00	0.	0.00	16.	1.02	143	0.07	0.05	0.03	143	11.45	143	0.07	0.05	0.03	536.
1.01	11.00	44	0.00	0.	0.00	16.	1.02	144	0.07	0.05	0.03	144	12.00	144	0.07	0.05	0.03	561.
1.01	11.15	45	0.00	0.	0.00	16.	1.02	145	0.39	0.37	0.02	145	12.15	145	0.39	0.37	0.02	589.
1.01	11.30	46	0.00	0.	0.00	16.	1.02	146	0.39	0.37	0.02	146	12.30	146	0.39	0.37	0.02	624.
1.01	11.45	47	0.00	0.	0.00	16.	1.02	147	0.39	0.37	0.02	147	12.45	147	0.39	0.37	0.02	672.
1.01	12.00	48	0.00	0.	0.00	16.	1.02	148	0.39	0.37	0.02	148	13.00	148	0.39	0.37	0.02	734.
1.01	12.15	49	0.03	0.	0.03	16.	1.02	149	0.47	0.44	0.02	149	13.15	149	0.47	0.44	0.02	815.
1.01	12.30	50	0.03	0.	0.03	16.	1.02	150	0.47	0.44	0.02	150	13.30	150	0.47	0.44	0.02	916.
1.01	12.45	51	0.03	0.	0.03	16.	1.02	151	0.47	0.44	0.02	151	13.45	151	0.47	0.44	0.02	1039.
1.01	13.00	52	0.03	0.	0.03	16.	1.02	152	0.47	0.44	0.02	152	14.00	152	0.47	0.44	0.02	1187.
1.01	13.15	53	0.03	0.	0.03	16.	1.02	153	0.59	0.56	0.02	153	14.15	153	0.59	0.56	0.02	1362.
1.01	13.30	54	0.03	0.	0.03	16.	1.02	154	0.59	0.56	0.02	154	14.30	154	0.59	0.56	0.02	1566.
1.01	13.45	55	0.03	0.	0.03	16.	1.02	155	0.59	0.56	0.02	155	14.45	155	0.59	0.56	0.02	1800.
1.01	14.00	56	0.04	0.	0.04	16.	1.02	156	0.59	0.57	0.02	156	15.00	156	0.59	0.57	0.02	2062.
1.01	14.15	57	0.04	0.	0.04	16.	1.02	157	0.59	0.57	0.02	157	15.15	157	0.59	0.57	0.02	2350.
1.01	14.30	58	0.04	0.	0.04	16.	1.02	158	1.19	1.16	0.03	158	15.30	158	1.19	1.16	0.03	2668.
1.01	14.45	59	0.04	0.	0.04	16.	1.02	159	3.33	3.30	0.03	159	15.45	159	3.33	3.30	0.03	3048.
1.01	15.00	60	0.04	0.	0.04	16.	1.02	160	0.83	0.81	0.02	160	16.00	160	0.83	0.81	0.02	3509.

1.01	15.45	63	0.23	0.	0.23	16.	1.02	16.45	163	0.55	0.52	0.02	5158.
1.01	16.00	64	0.06	0.	0.06	16.	1.02	17.00	164	0.55	0.52	0.02	5743.
1.01	16.15	65	0.04	0.	0.04	16.	1.02	17.15	165	0.43	0.40	0.02	6328.
1.01	16.30	66	0.03	0.01	0.03	16.	1.02	17.30	166	0.43	0.40	0.02	6907.
1.01	16.45	67	0.04	0.01	0.03	16.	1.02	17.45	167	0.43	0.40	0.02	7473.
1.01	17.00	68	0.03	0.01	0.03	17.	1.02	18.00	168	0.43	0.40	0.02	8017.
1.01	17.15	69	0.03	0.00	0.03	18.	1.02	18.15	169	0.04	0.01	0.03	8517.
1.01	17.30	70	0.03	0.00	0.03	20.	1.02	18.30	170	0.04	0.01	0.03	8949.
1.01	17.45	71	0.03	0.00	0.03	22.	1.02	18.45	171	0.04	0.01	0.03	9306.
1.01	18.00	72	0.03	0.00	0.03	24.	1.02	19.00	172	0.04	0.01	0.03	9584.
1.01	18.15	73	0.00	0.	0.00	27.	1.02	19.15	173	0.04	0.01	0.03	9780.
1.01	18.30	74	0.00	0.	0.00	30.	1.02	19.30	174	0.04	0.01	0.03	9852.
1.01	18.45	75	0.00	0.	0.00	33.	1.02	19.45	175	0.04	0.01	0.03	9920.
1.01	19.00	76	0.00	0.	0.00	36.	1.02	20.00	176	0.04	0.01	0.03	9857.
1.01	19.15	77	0.00	0.	0.00	39.	1.02	20.15	177	0.04	0.01	0.03	9652.
1.01	19.30	78	0.00	0.	0.00	42.	1.02	20.30	178	0.04	0.01	0.03	9427.
1.01	19.45	79	0.00	0.	0.00	44.	1.02	20.45	179	0.04	0.01	0.03	9103.
1.01	20.00	80	0.00	0.	0.00	47.	1.02	21.00	180	0.04	0.01	0.03	8753.
1.01	20.15	81	0.00	0.	0.00	48.	1.02	21.15	181	0.04	0.01	0.03	8384.
1.01	20.30	82	0.00	0.	0.00	50.	1.02	21.30	182	0.04	0.01	0.03	8001.
1.01	20.45	83	0.00	0.	0.00	51.	1.02	21.45	183	0.04	0.01	0.03	7610.
1.01	21.00	84	0.00	0.	0.00	51.	1.02	22.00	184	0.04	0.01	0.03	7217.
1.01	21.15	85	0.00	0.	0.00	51.	1.02	22.15	185	0.04	0.01	0.03	6826.
1.01	21.30	86	0.00	0.	0.00	50.	1.02	22.30	186	0.04	0.01	0.03	6442.
1.01	21.45	87	0.00	0.	0.00	49.	1.02	22.45	187	0.04	0.01	0.03	6069.
1.01	22.00	88	0.00	0.	0.00	48.	1.02	23.00	188	0.04	0.01	0.03	5716.
1.01	22.15	89	0.00	0.	0.00	46.	1.02	23.15	189	0.04	0.01	0.03	5385.
1.01	22.30	90	0.00	0.	0.00	45.	1.02	23.30	190	0.04	0.01	0.03	5073.
1.01	22.45	91	0.00	0.	0.00	43.	1.02	23.45	191	0.04	0.01	0.03	4780.
1.01	23.00	92	0.00	0.	0.00	41.	1.03	0.	192	0.04	0.01	0.03	4505.
1.01	23.15	93	0.00	0.	0.00	40.	1.03	0.15	193	0.	0.	0.	4246.
1.01	23.30	94	0.00	0.	0.00	38.	1.03	0.30	194	0.	0.	0.	4003.
1.01	23.45	95	0.00	0.	0.00	37.	1.03	0.45	195	0.	0.	0.	3774.
1.02	0.	96	0.00	0.	0.00	36.	1.03	1.00	196	0.	0.	0.	3598.
1.02	0.15	97	0.02	0.	0.02	34.	1.03	1.15	197	0.	0.	0.	3354.
1.02	0.30	98	0.02	0.	0.02	33.	1.03	1.30	198	0.	0.	0.	3163.
1.02	0.45	99	0.02	0.	0.02	32.	1.03	1.45	199	0.	0.	0.	2981.
1.02	1.00	100	0.02	0.	0.02	31.	1.03	2.00	200	0.	0.	0.	2810.

SUM 19.99 16.41 3.58 258309.
(508.) (417.) (91.) (8447.17)

TOTAL VOLUME			
PEAK	6-HOUR	24-HOUR	72-HOUR
9920.	8241.	3067.	1485.
281.	233.	87.	42.
	9.57	14.25	14.37
CFS	243.09	361.94	364.92
CMS	4086.	6084.	6134.
INCHES	5041.	7505.	7567.
MM			
AC-FT			
THOUS CU M			

STATION 1

INFLOW(I), OUTFLOW(O) AND OBSERVED FLOW(*)

[illegible]

14.15 371
14.30 581
14.45 591
15.00 601
15.15 611
15.30 621
15.45 631
16.00 641
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17.45 711
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23.15189.
23.30190.
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[illegible][illegible]

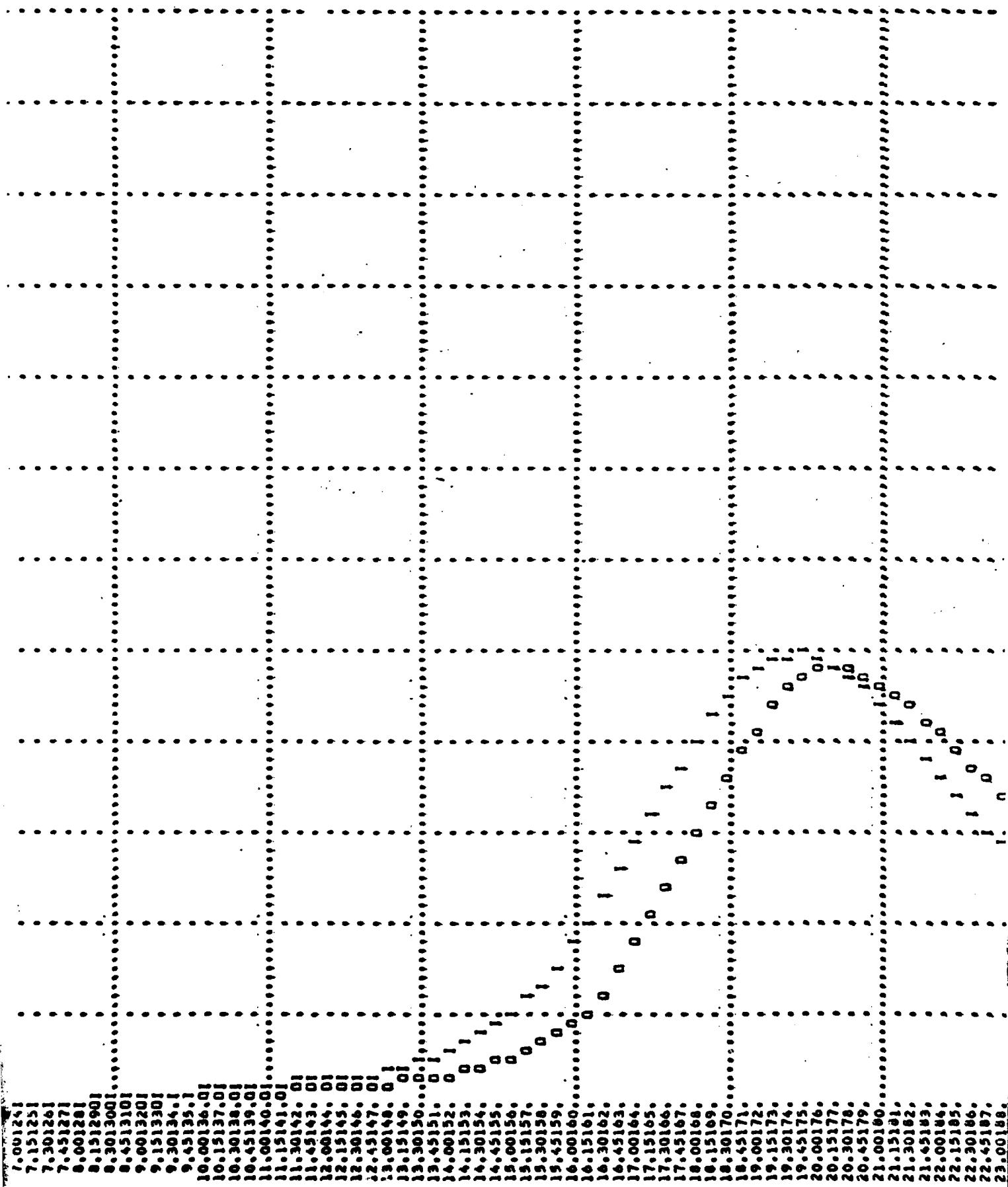
PEAK OUTFLOW IS		4817, AT TIME		44.25 HOURS	
	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	4817,	4007,	1427,	690,	138093.
CMS	136,	113,	40,	20,	3910.
INCHES		4.65	6.63	6.68	6.68
MM		118.21	168.38	169.73	169.73
AC-FT		1987,	2830,	2853,	2853.
THOUS CU M		2451,	3491,	3519,	3519.

STATION 1

	INFLOW(I),	OUTFLOW(O)	AND OBSERVED FLOW(*)
1000,	2000,	3000,	4000,
			5000,
			0,

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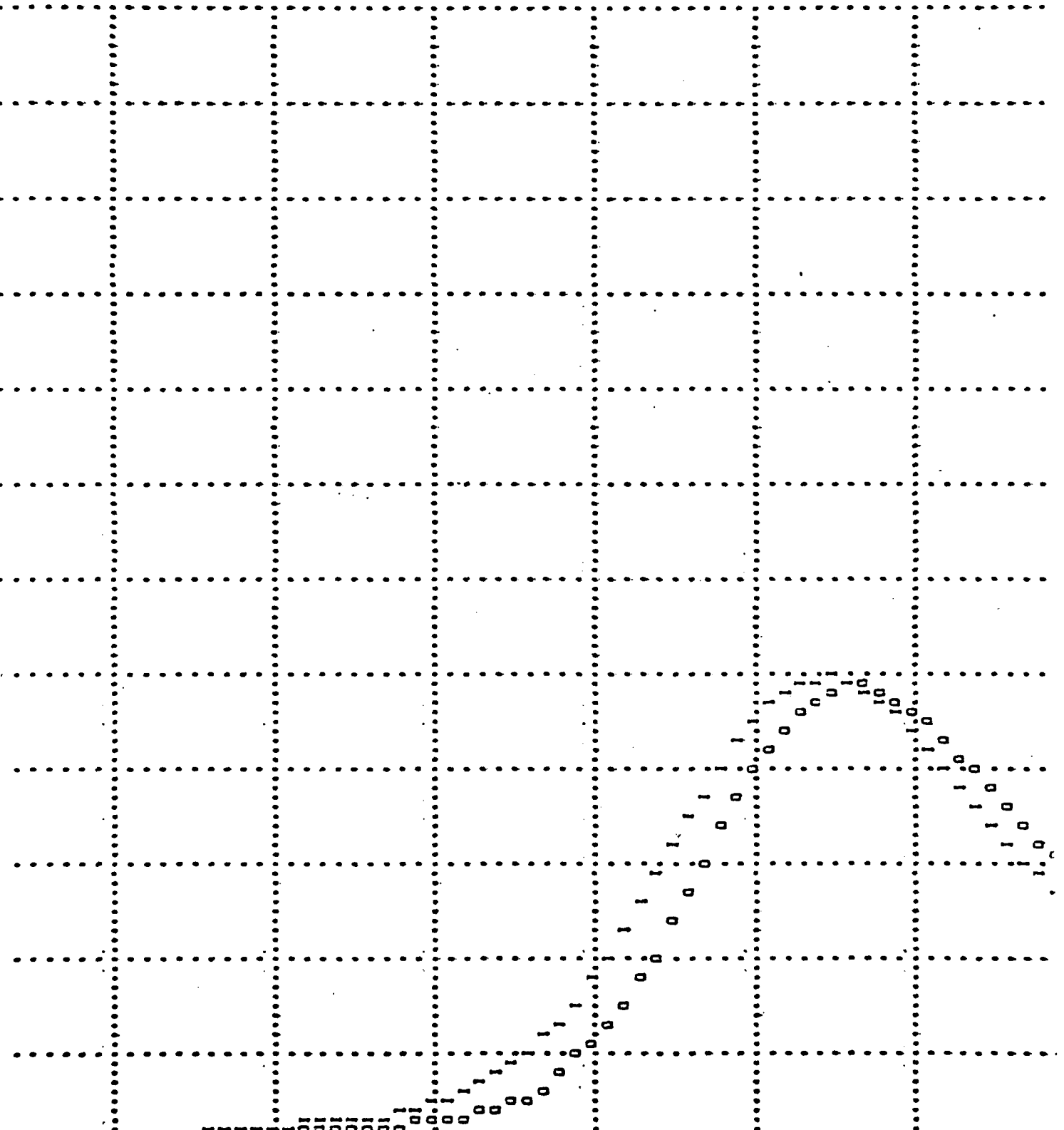
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596.	617.	631.	647.
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1076.	1063.	1049.	1036.
931.	917.	905.	892.
			880.
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			737.
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			425.
			413.
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PEAK FLOW AND STORAGE (END OF PERIOD) SUMMARY FORMULTIPLE PLAN-RATIO ECONOMIC COMPUTATIONS
 FLOWS IN CUBIC FEET PER SECOND (CUBIC METERS PER SECOND)
 AREA IN SQUARE MILES (SQUARE KILOMETERS)

RATIOS APPLIED TO FLOWS

OPERATION	STATION	AREA	PLAN	RATIO 1	RATIO 2
				0.50	1.00
HYDROGRAPH AT	1	8.01	1	4960.	9920.
	(	0.00)	(	140.45)(	280.90)(
ROUTED TO	1	8.01	1	4817.	9776.
	(	0.00)	(	136.41)(	276.83)(

SUMMARY OF DAM SAFETY ANALYSIS

PLAN 1

RATIO OF PMF	MAXIMUM RESERVOIR W.S. ELEV	ELEVATION STORAGE OUTFLOW	INITIAL VALUE 1510.00 505. 0.	SPILLWAY CREST 1510.00 505. 0.	TOP OF DAM 1514.00 855. 3696.	DURATION OVER TOP HOURS	MAXIMUM OUTFLOW CFS	MAXIMUM STORAGE AC-FT	MAXIMUM DEPTH OVER DAM	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
0.50	1514.51					4.00	4817.	915.	0.51	44.25	0.
1.00	1516.27					8.75	9776.	1118.	2.27	44.00	0.

APPENDIX D

REFERENCES

APPENDIX D

REFERENCES

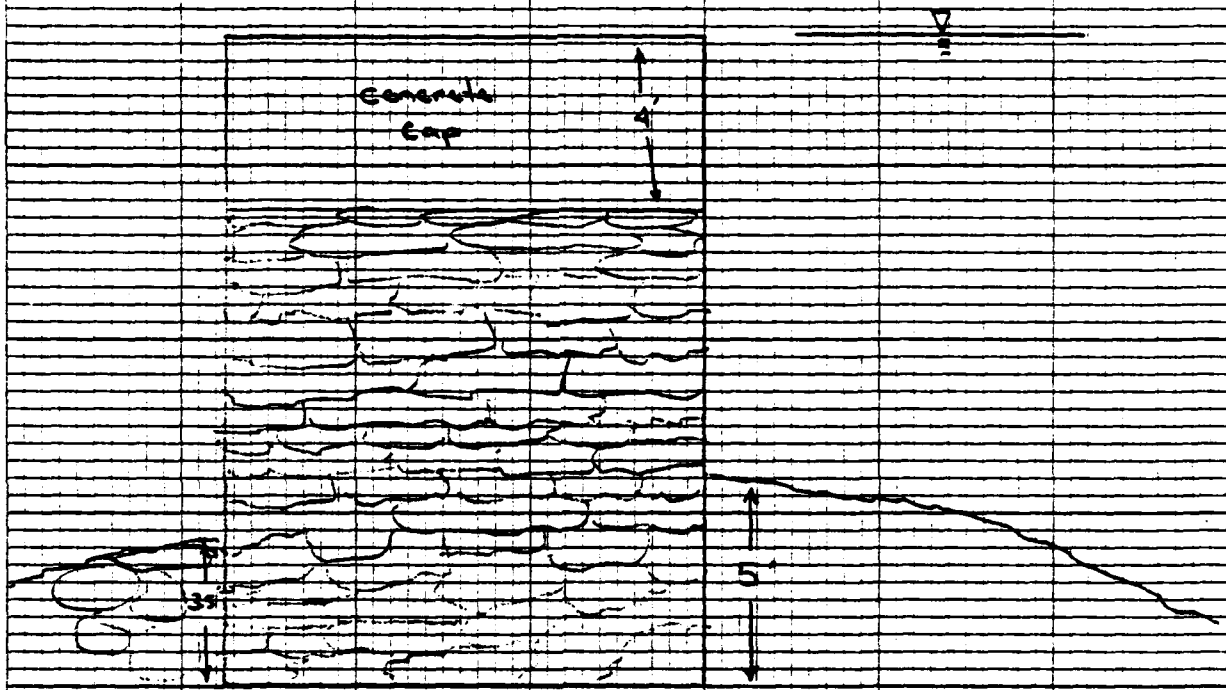
- 1) U.S. Department of Commerce, Technical Paper No. 40, Rainfall Frequency Atlas of the United States, May 1961.
- 2) Soil Conservation Service, National Engineering Handbook, Section 4, Hydrology, August 1972 (U.S. Department of Agriculture).
- 3) H.W. King and E.F. Brater, Handbook of Hydraulics, 5th edition, McGraw-Hill, 1963.
- 4) T.W. Lambe and R.V. Whitman, Soil Mechanics, John Wiley and Sons, 1965.
- 5) W.D. Thornbury, Principles of Geomorphology, John Wiley and Sons, 1969.
- 6) University of the State of New York, Geology of New York, Education Leaflet 20, Reprinted 1973.
- 7) Cornell University Agriculture Experiment Station (compiled by M.G. Cline and R.L. Marshall), General Soil Map of New York State and Soils of New York Landscapes, Information Bulletin 119, 1977.

APPENDIX E

STABILITY ANALYSIS

WINDOVER DAM

Stability Analysis Spillway Section



Scale 1" = 4'

46 0700

K.E.
10 X 10 TO THE INCH • 7 X 10 INCHES
NEUPPEL & EBBEN CO.
MADE IN U.S.A.

Area of Dam Spillway Section

$$11 \times 15 = 165 \text{ ft}^2 \quad \text{moment arm} = 5.5'$$

$$\text{Seismic Zone 3} \quad \alpha = .10$$

$$\text{Active Soil Pressure} = 5' \text{ height}$$

$$\text{Passive Soil Pressure} = 3.5' \text{ height}$$

$$\text{Assume Ice Loading} = 7.5 \text{ kips / L.F. at top of Spillway}$$

$$\frac{1}{2} \text{ PMF} = 4.4 \text{ ft. over top of spillway}$$

$$\text{PMF} = 6.3 \text{ ft. over top of spillway}$$

Case I	Normal Conditions
Case II	Ice Loading
Case III	$\frac{1}{2}$ PMF
Case IV	PMF
Case V	Seismic Loading

INPUT FOR STABILITY ANALYSIS PROGRAM

<u>Input Location</u>	<u>Input Parameter Description</u>
0	Unit Weight of Dam (K/ft. ³)
1	Area of Segment #1 (ft. ²)
2	Location of Center of Gravity from toe (ft.) Segment #1
3	Area of Segment #2 (ft. ²)
4	Location of CG from toe, Seg. #2 (ft.)
5	Area of Segment #3 (ft. ²)
6	Location of CG from toe, Sg. #3 (ft.)
7	Total Base Width of Dam (ft.)
8	Height of Dam (ft.)
9	Ice Loading (K/L.F.)
10	Coefficient of Sliding
11	Unit Weight of Soil (K/ft. ³)
12	Coefficient of Active Soil Pressure - Ka
13	Coefficient of Passive Soil Pressure - Kp
14	Height of Water over Top of Dam (ft.)
15	Height of Soil for Active Pressure (ft.)
16	Height of Soil for Passive Pressure (ft.)
17	Height of Water in Tailrace Channel (ft.)
18	Unit Weight of Water (K/ft. ³)
19	Area of Segment #4 (ft. ²)
20	Location of CG from toe, Seg. #4 (ft.)
46	Height of Ice Load or Active Water
49	Location of Foundation Drains from Heel (ft.)
50	Seismic Coefficient (α)

Stability Analysis
Input Parameters

Input Location	Case I	Case II	Case III	Case IV	Case V
00	.16				
01	165				
02	5.5				
03	0				
04	0				
05	0				
06	0				
07	11				
08	15				
09	0	7.5	0	0	0
10	.7				
11	.08				
12	.3				
13	3				
14	0	0	4.4	6.3	0
15	5				
16	35				
17	0	0	2	3	0
18	.0624				
19	0				
20	0				
46	15	5	19.4	21.3	15
50	0	0	0	0	.10

WINDOVER DAM
STABILITY ANALYSIS
SPILLWAY SECTION

Case I Normal Loading

- (a) 2.002876541
- (b) 3.461462451
- (c) 2.233114754

Case IV PMF

- (a) .9373806748
- (b) -.4862449561
- (c) .7815711612

Case II Ice Loading

- (a) .7904945871
- (b) -1.832156973
- (c) 1.102995951

Case V Seismic Loading

- (a) 1.587532282
- (b) 2.558441558
- (c) 1.522323774

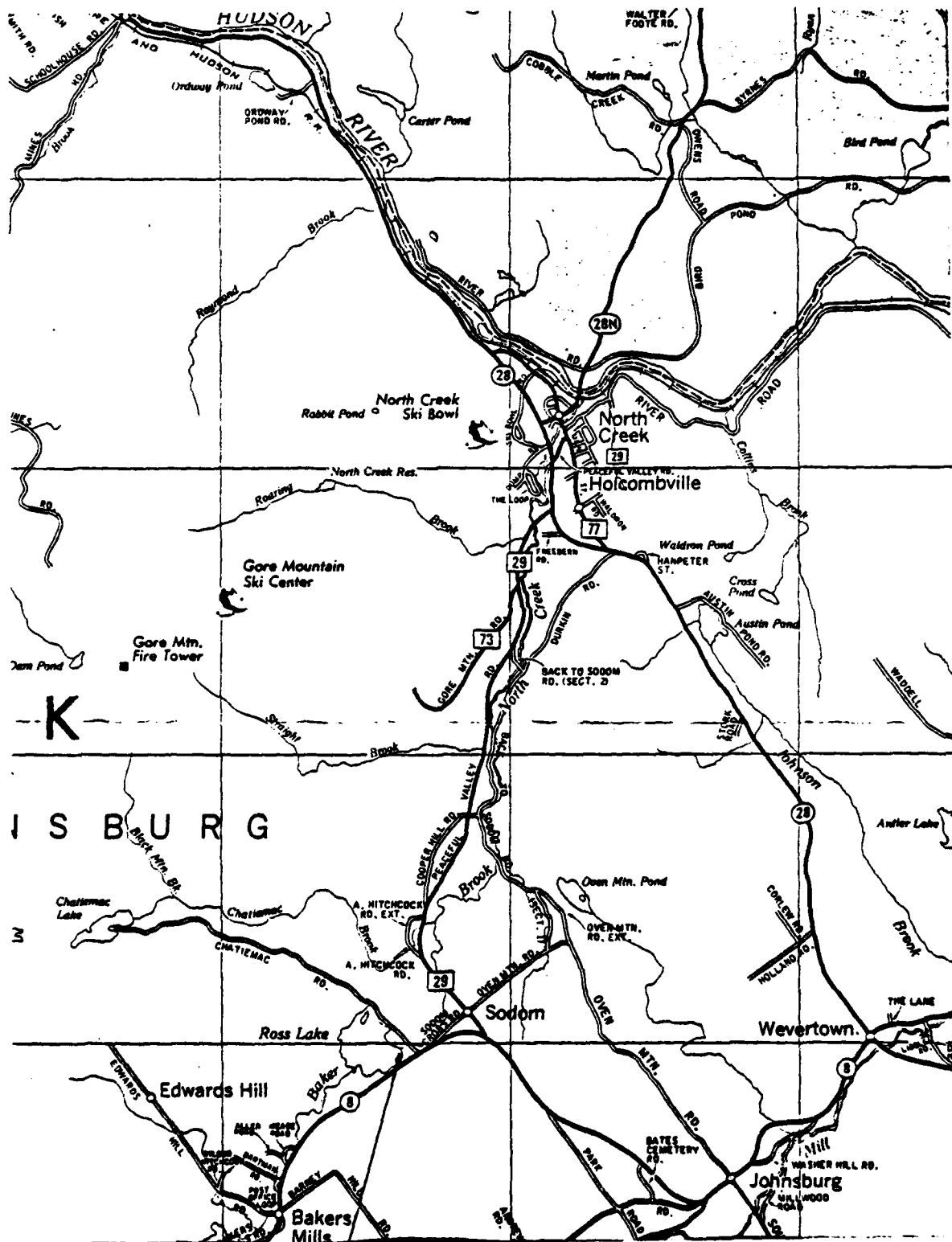
Case III 1/2 PMF

- (a) 1.127555209
- (b) .8085949352
- (c) .9894738093

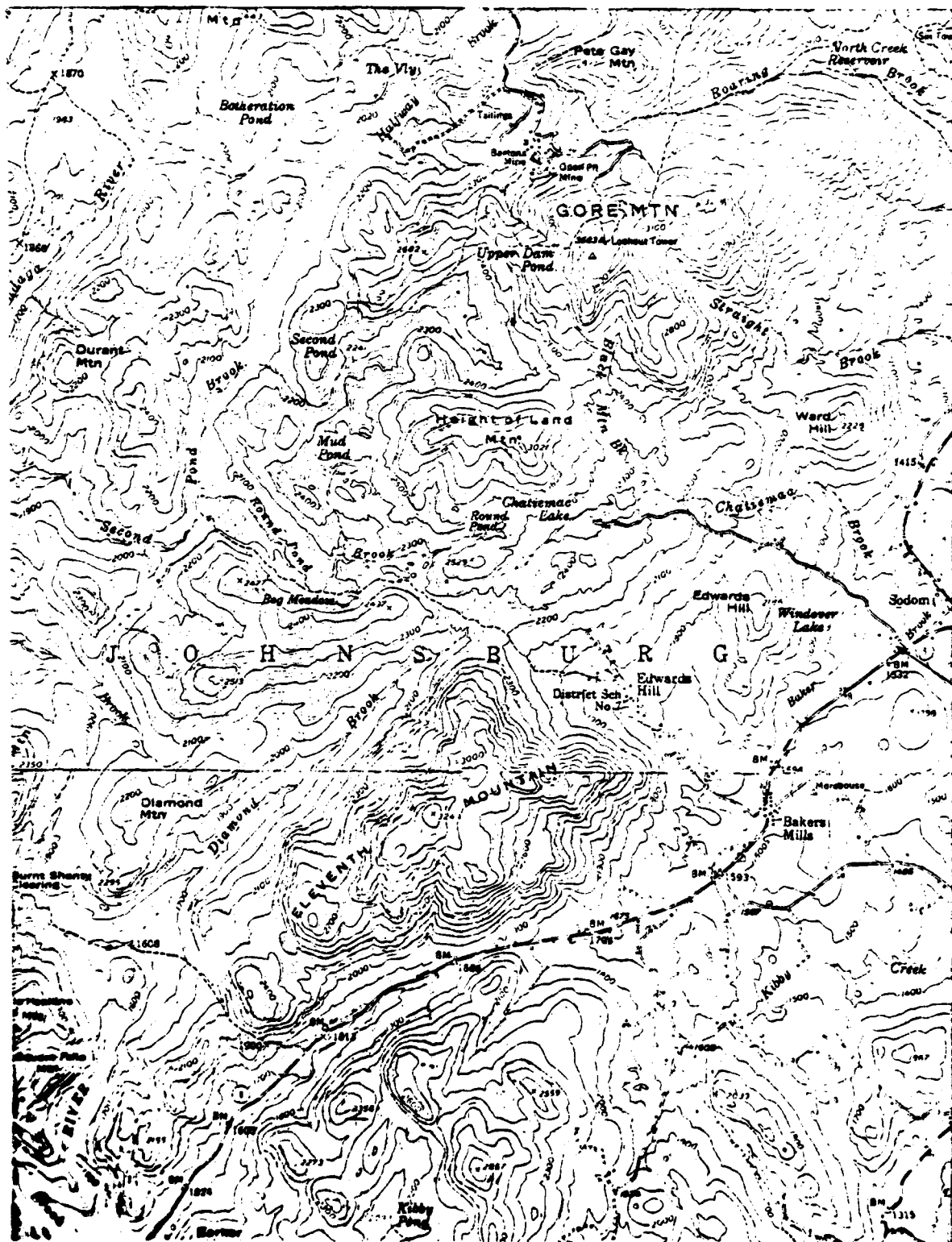
NOTE: (a) is the factor of safety for overturning;
(b) is the location of the resultant from the toe;
(c) is the factor of safety of safety for sliding.

APPENDIX F

DRAWINGS



VICINITY MAP



TOPOGRAPHIC MAP

WINDOVER DAM
LIST OF DRAWINGS

Plan & Sections
Existing Conditions (1948)

Sheet I of III

Plan - Proposed Construction

Sheet II of III

Sections of Earth Embankment - Proposed

Sheet III of III

Plans Dated September 10, 1948

Old Ross Dam

Bakers Mills N.Y.

Dr. 3

2140 2160 2180 2200 2220 2240 2260 2280 2300 2320 2340 2360 2380 2400 2420 2440 2460 2480 2500 2520 2540 2560 2580 2600 2620 2640 2660 2680 2700 2720 2740 2760 2780 2800 2820 2840 2860 2880 2900 2920 2940 2960 2980 3000 3020 3040 3060 3080 3100 3120 3140 3160 3180 3200 3220 3240 3260 3280 3300 3320 3340 3360 3380 3400 3420 3440 3460 3480 3500 3520 3540 3560 3580 3600 3620 3640 3660 3680 3700 3720 3740 3760 3780 3800 3820 3840 3860 3880 3900 3920 3940 3960 3980 4000 4020 4040 4060 4080 4100 4120 4140 4160 4180 4200 4220 4240 4260 4280 4300 4320 4340 4360 4380 4400 4420 4440 4460 4480 4500 4520 4540 4560 4580 4600 4620 4640 4660 4680 4700 4720 4740 4760 4780 4800 4820 4840 4860 4880 4900 4920 4940 4960 4980 5000 5020 5040 5060 5080 5100 5120 5140 5160 5180 5200 5220 5240 5260 5280 5300 5320 5340 5360 5380 5400 5420 5440 5460 5480 5500 5520 5540 5560 5580 5600 5620 5640 5660 5680 5700 5720 5740 5760 5780 5800 5820 5840 5860 5880 5900 5920 5940 5960 5980 6000 6020 6040 6060 6080 6100 6120 6140 6160 6180 6200 6220 6240 6260 6280 6300 6320 6340 6360 6380 6400 6420 6440 6460 6480 6500 6520 6540 6560 6580 6600 6620 6640 6660 6680 6700 6720 6740 6760 6780 6800 6820 6840 6860 6880 6900 6920 6940 6960 6980 7000 7020 7040 7060 7080 7100 7120 7140 7160 7180 7200 7220 7240 7260 7280 7300 7320 7340 7360 7380 7400 7420 7440 7460 7480 7500 7520 7540 7560 7580 7600 7620 7640 7660 7680 7700 7720 7740 7760 7780 7800 7820 7840 7860 7880 7900 7920 7940 7960 7980 8000 8020 8040 8060 8080 8100 8120 8140 8160 8180 8200 8220 8240 8260 8280 8300 8320 8340 8360 8380 8400 8420 8440 8460 8480 8500 8520 8540 8560 8580 8600 8620 8640 8660 8680 8700 8720 8740 8760 8780 8800 8820 8840 8860 8880 8900 8920 8940 8960 8980 9000 9020 9040 9060 9080 9100 9120 9140 9160 9180 9200 9220 9240 9260 9280 9300 9320 9340 9360 9380 9400 9420 9440 9460 9480 9500 9520 9540 9560 9580 9600 9620 9640 9660 9680 9700 9720 9740 9760 9780 9800 9820 9840 9860 9880 9900 9920 9940 9960 9980 10000

Dr. 3

Submittal, Owner

9/10/48

B

A

Section A-A
Scale 1/4" = 1' 0"

12.00 0+50 0+40 0+20 0+00

A

Section B-B

B

A

Bottom



2+00 2+20 2+40 2+60 2+80 2+100 2+120 2+140 2+160 2+180 2+200

old Spillway

See 1"

Owner

9/10/48

B

A

Section A-A
Scale 1" = 10'

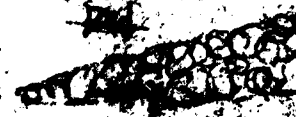
0+00 0+20 0+40 0+60 0+80

B

A

Section B-B
Scale 1" = 10'

Butter Stream



1

2

Old Mass. D...

...

Dr. H. B. ...

B. A. B. ...

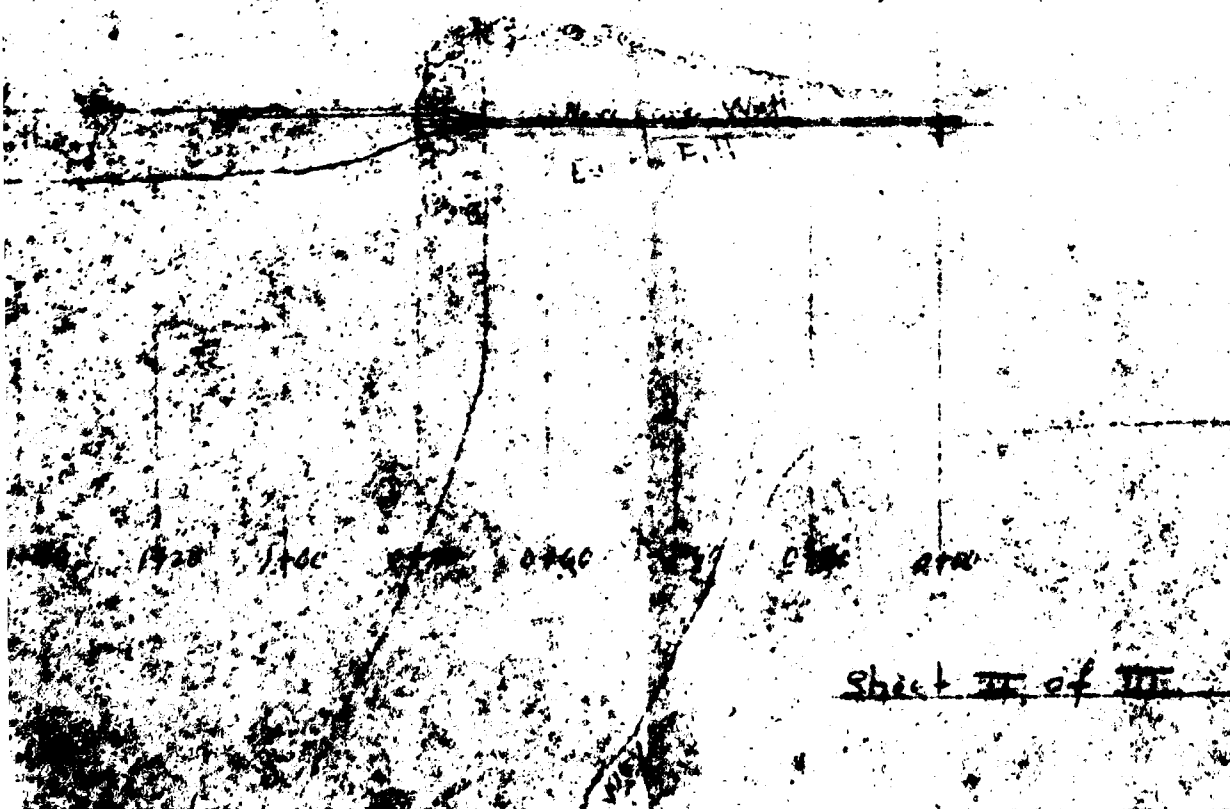
...

old + New ...

1720

Dr. H. J. C. C. C.

Brant Lake, N.Y. Cont- to



OT: Mass Data

5. 10. 11.

Dr

BA. B. B. B.

Earth Fill

Earth Fill

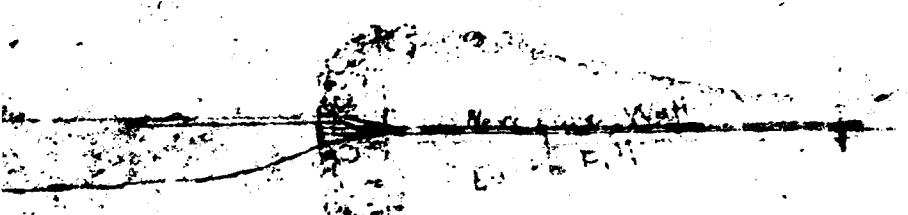
Earth Fill

old + New Spillway

2100 2000 2100 2100 2100 1400 1400 1400

Midway, Oregon

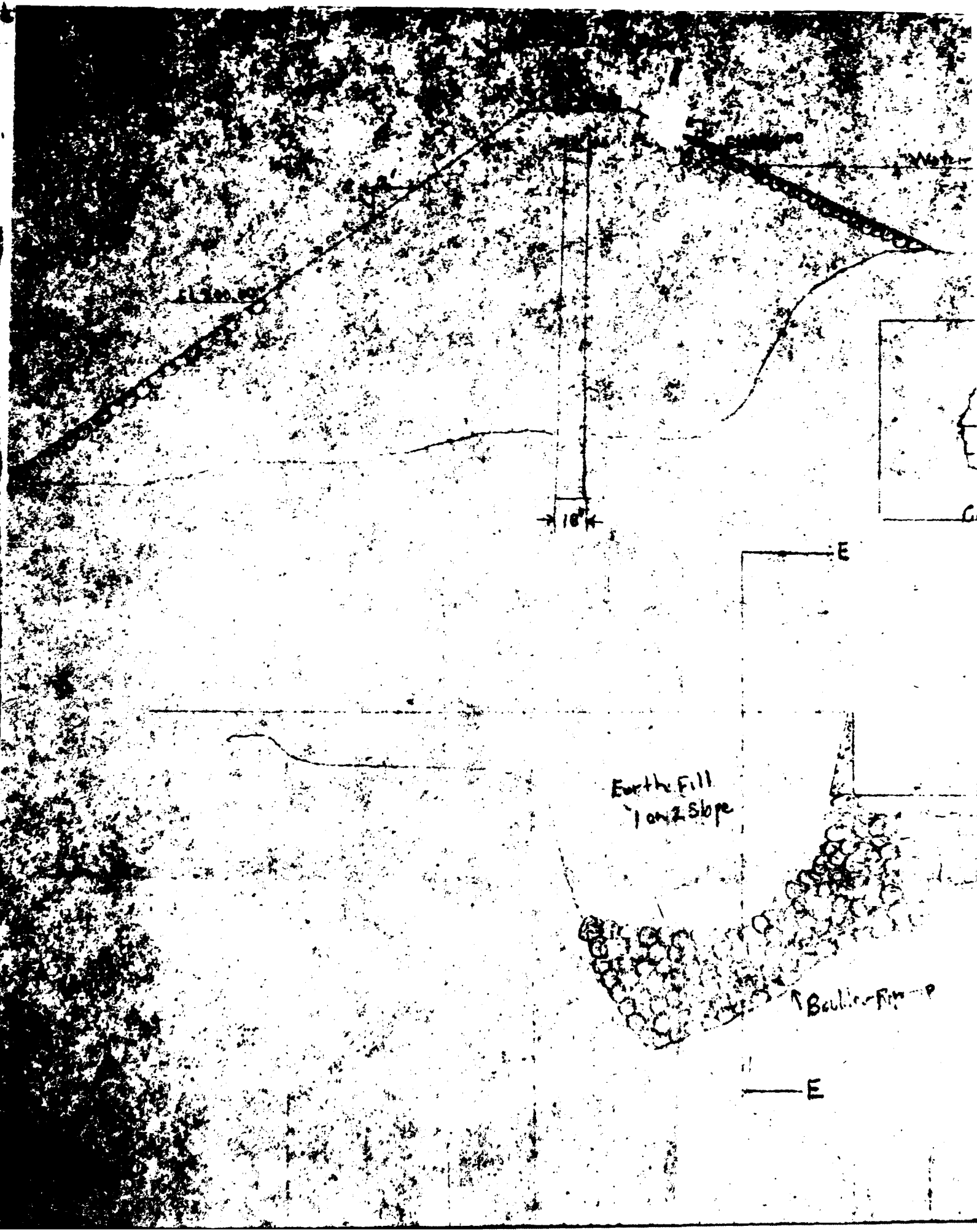
Brant Line, N.Y. (cont.)



1720 1700 0700 0760 0740 0720 0700

Sheet II of III

4



10'

E

Earth Fill
1 on 2 Slope

Boulder Fill

E



Dam wall Section Showing Reinforcing



Dam Elevation 212.00

Earth Fill 10.00

Spillway El. 208.00

Boulder M. top

18'

E

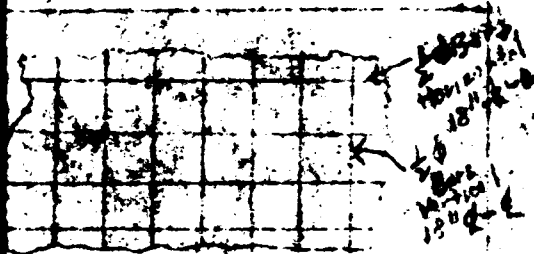
Earth Fill
1 on 2 Slope

Backfill

E

Down street
Scale Horizontal

3



Core Wall Section Showing Reinforcing

Dam Elevation 212.00

Earth Full 10 ft. Slope

Spillway El. 208.00

Boulder P. Trip

Pond
Pump

Sheet III of III

Scale
Horizontal 1" = 4'

Proposed Reconstruction
Old Ross Dam, Baker's Mills, Pa.
Dr. Hadnot, Owner
B. A. Barton, Contractor

4
END