

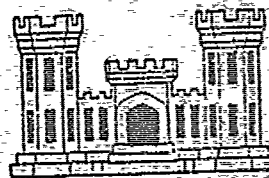
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LAKE FREDERICK DAM
ORANGE COUNTY, NEW YORK
INVENTORY NO. 769

PHASE I INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM



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REPORT DOCUMENTATION PAGE		READ INSTRUCTIONS BEFORE COMPLETING FORM
1. REPORT NUMBER	2. GOVT ACCESSION NO.	3. RECIPIENT'S CATALOG NUMBER
	AD-A086 226	
4. TITLE (and Subtitle) Phase I Inspection Report Lake Frederick Dam Orange County New York Inventory No. NY 769		5. TYPE OF REPORT & PERIOD COVERED Phase I Inspection Report National Dam Safety Program
		6. PERFORMING ORG. REPORT NUMBER
7. AUTHOR(s) (10) Eugene O'Brien, P.E.		8. CONTRACT OR GRANT NUMBER(s) (15) DACW-51-79-C-0001 (2)
9. PERFORMING ORGANIZATION NAME AND ADDRESS Tippetts - Abbott - McCarthy - Stratton 655 Third Avenue New York, NY 10017		10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS (11) 11 Mar 80
11. CONTROLLING OFFICE NAME AND ADDRESS New York State Department of Environmental Con- servation/ 50 Wolf Road Albany, New York 12230		12. REPORT DATE 11 March 1980
		13. NUMBER OF PAGES
14. MONITORING AGENCY NAME & ADDRESS (if different from Controlling Office) Department of the Army 25 Federal Plaza/ New York District, CofE New York, New York 10007		15. SECURITY CLASS. (of this report) UNCLASSIFIED
		15a. DECLASSIFICATION/DOWNGRADING SCHEDULE
16. DISTRIBUTION STATEMENT (of this report) Approved for public release; Distribution unlimited. (12) 672		
17. DISTRIBUTION STATEMENT (of the abstract entered in Block 20, if different from Report) (6) National Dam Safety Program, Lake Frederick Dam (Inventory Number NY 769), Tributary Woodbury Creek, Orange County, New York. Phase I Inspection Report.		
18. SUPPLEMENTARY NOTES		
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 Lake Frederick Dam Orange County Central Valley West Point		
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. Examination of the available documents and visual inspection of the Lake Frederick Dam and appurtenant structures did not reveal any conditions which are considered to be unsafe. 5/0/80		

Using the Corps of Engineers screening criteria for initial review of spillway adequacy, it has been determined that the dam would be overtopped for all storms exceeding approximately 16.5 percent of the Probable Maximum Flood (PMF), and 55 percent of the Standard Project Flood (SPF). Under the SPF the dam will be overtopped by approximately 0.1 feet, an amount which will not adversely affect the safety of the dam. Therefore, although the spillway capacity is inadequate to pass the SPF, the project can safely pass the SPF.

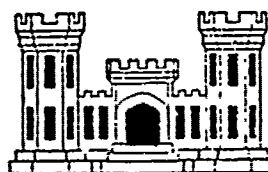
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→ No remedial measures are required to assure the safety of the dam at the present time; however, certain measures are recommended regarding:

- Slope protection
- Removal of vegetation from the dam
- Preparation of an O & M manual and establishment of periodic inspections
- Monitoring of wet zone downstream of the toe of the dam

**LAKE FREDERICK DAM
ORANGE COUNTY, NEW YORK
INVENTORY NO. 769**

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



Prepared by: TIPPETTS-ABBETT-McCARTHY-STRATTON

NEW YORK DISTRICT CORPS OF ENGINEERS

DECEMBER 1978

HUDSON RIVER BASIN
LAKE FREDERICK DAM
INVENTORY NO. 769
PHASE I INSPECTION REPORT

CONTENTS

Accession For	NTIS GMA&I	DDC TAB	Unannounced	Justification
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	Page No.
- ASSESSMENT	-
- OVERVIEW PHOTOGRAPH	-
1 PROJECT INFORMATION	1
1.1 GENERAL	1
a. Authority	1
b. Purpose of Inspection	1
1.2 DESCRIPTION OF THE PROJECT	1
a. Description of Dam and Appurtenances	1
b. Location	2
c. Size Classification	2
d. Hazard Classification	2
e. Ownership	2
f. Use of Dam	2
g. Design and Construction History	2
h. Normal Operating Procedures	2
1.3 PERTINENT DATA	3
a. Drainage Area	3
b. Discharge at Dam Site	3
c. Elevation	3
d. Reservoir	3
e. Storage	3
f. Dam	3
g. Spillway	3
h. Regulating Gates	3
2 ENGINEERING DATA	4
2.1 DESIGN	4
2.2 CONSTRUCTION RECORDS	4
2.3 OPERATION RECORDS	4
2.4 EVALUATION OF DATA	4

		<u>Page No.</u>
3	VISUAL OBSERVATIONS	5
3.1	FINDINGS	5
a.	General	5
b.	Embankment	5
c.	Appurtenant Structures	5
d.	Abutments	6
e.	Downstream Channel	6
f.	Reservoir Area	6
3.2	EVALUATION OF OBSERVATIONS	6
4	OPERATIONAL AND MAINTENANCE PROCEDURES	7
4.1	PROCEDURES	7
4.2	MAINTENANCE OF THE DAM	7
4.3	MAINTENANCE OF OPERATING FACILITIES	7
4.4	WARNING SYSTEMS IN EFFECT	7
4.5	EVALUATION	7
5	HYDRAULIC/HYDROLOGIC	8
5.1	DRAINAGE BASIN CHARACTERISTICS	8
5.2	SPILLWAY CAPACITY	8
5.3	RESERVOIR CAPACITY	8
5.4	FLOODS OF RECORD	8
5.5	OVERTOPPING POTENTIAL	8
5.6	EVALUATION OF THE ANALYSIS	9
6	STRUCTURAL STABILITY	10
6.1	EVALUATION OF STRUCTURAL STABILITY	10
a.	Visual Observation	10
b.	Design and Construction Data	10
c.	Operating Records	10
d.	Post Construction Changes	10
e.	Seismic Stability	10
7	ASSESSMENT/RECOMMENDATIONS	11
7.1	DAM ASSESSMENT	11
a.	Safety	11
b.	Adequacy of Information	11

		<u>Page No.</u>
c.	Necessity for Additional Investigations	11
7.2	REMEDIAL MEASURES	11

APPENDICES

- A. DRAWINGS
- B. PHOTOGRAPHS
- C. ENGINEERING DATA CHECKLIST
- D. VISUAL INSPECTION CHECKLIST
- E. HYDROLOGIC DATA AND COMPUTATIONS
- F. OTHER DATA

PHASE I REPORT
NATIONAL DAM SAFETY PROGRAM

Name of Dam: LAKE FREDERICK DAM (I.D. NO. 769)
State Located: NEW YORK
County Located: ORANGE
Stream: TRIBUTARY - WOODBURY CREEK
Date of Inspection: 5 DECEMBER 1978

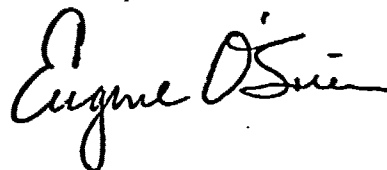
ASSESSMENT

Examination of the available documents and visual inspection of the Lake Frederick Dam and appurtenant structures did not reveal any conditions which are considered to be unsafe.

Using the Corps of Engineers screening criteria for initial review of spillway adequacy, it has been determined that the dam would be overtopped for all storms exceeding approximately 16.5 percent of the Probable Maximum Flood (PMF), and 55 percent of the Standard Project Flood (SPF). Under the SPF the dam will be overtopped by approximately 0.1 feet, an amount which will not adversely affect the safety of the dam. Therefore, although the spillway capacity is inadequate to pass the SPF, the project can safely pass the SPF.

No remedial measures are required to assure the safety of the dam at the present time; however, certain measures are recommended regarding:

- Slope protection
- Removal of vegetation from the dam
- Preparation of an O & M manual and establishment of periodic inspections
- Monitoring of wet zone downstream of the toe of the dam



Eugene O'Brien, P.E.
New York No. 29823


Approved By: Col. Clark H. Benn
New York District Engineer

Date:

11 March 80



1. GENERAL OVERVIEW OF DAM.

PHASE I INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM
LAKE FREDERICK DAM, INVENTORY NO. 769
HUDSON RIVER BASIN
ORANGE 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 by Contract No. DACW 51-78-C-0024, Modification No. P 00002, in fulfillment of the request by the Commandant, United States Military Academy, in accordance with criteria specified in the National Dam Inspection Act, Public Law 92-367, 8 August 1976.

b. Purpose of Inspection

The purpose of this inspection and report is to investigate and evaluate the existing conditions of subject dam in order to: identify deficiencies and hazardous conditions; determine if they constitute hazardous to human life or property; and notify the Commandment of the United States Military Academy of these results along with recommendations for remedial measures where necessary.

1.2 DESCRIPTION OF THE PROJECT

a. Description of Dam and Appurtenances

Lake Frederick Dam is an earth and rockfill embankment with a maximum height of about 35 feet. The crest, about 15 feet wide, is gently curved and 590 feet long. The grass covered upstream slope is about 1(V) on 4(H). The downstream slope, which is not grass covered, is about 1(V) on 1.5(H).

A concrete covered stone spillway is located about 50 feet from the left end of the embankment. The spillway crest, which is spanned by a steel and concrete slab bridge, is approximately 14 feet long and 3 feet wide, with a 10-inch high sill. The sill is 12 inches below the bottom of the bridge. The downstream face of the spillway is stepped. Flanking the spillway on the right is a concrete training wall about 50 feet long and 4 feet high; on the left the spillway is flanked by a stone wall about 20 feet long and 4 feet high.

A 36 inch square concrete low level outlet conduit is located at the base of the dam about 230 feet to the right of the spillway. The conduit runs underground and outfalls about 75 feet downstream from the toe of the dam; the location of the intake and controls are unknown.

The spillway discharges into a natural channel which runs about 4000 feet downstream to join Woodbury Brook which flows into Moodna Creek, a tributary of the Hudson River.

b. Location

The dam is located near the western boundary of the United States Military Academy Reservation, about 1 mile north of the town of Central Valley.

c. Size Classification

The dam is less than 40 feet high and has a reservoir less than 1000 acre-feet and is therefore classified as a "small" dam.

d. Hazard Classification

The dam is in the "high" hazard potential category because of the large numbers of homes located a short distance downstream from the dam.

e. Ownership

Lake Frederick Dam is owned by the United States Military Academy. The day-to-day operation and maintenance of the operating facilities is managed by the Water Plants Section of the Utilities Division. The maintenance of the embankment is managed by the Buildings and Structures Section of the Buildings and Grounds Division. Both Divisions are directly responsible to the Directorate of Facilities Engineering, United States Military Academy.

f. Use of Dam

The impoundment provided by the dam is used for recreational purposes.

g. Design and Construction History

Original design and construction records are not available. The year the dam was constructed is unknown. The Academy acquired the dam from a private owner in about 1944.

h. Normal Operating Procedures

There are no operating procedures for the dam.

1.3

PERTINENT DATA

a.	<u>Drainage Area</u> , square miles	0.19
b.	<u>Discharge at Damsite</u> , cfs	
	Maximum flood at site	Unknown
	Maximum regulating gate	Inoperable
	Ungated spillway, top of dam (El 714.5)	135
c.	<u>Elevation</u> (feet above MSL)	
	Top of dam	714.5
	Crest of spillway	712.0
	Streambed at centerline of dam	679.5
d.	<u>Reservoir</u>	
	Length of pool, mi (El 712.0)	0.3
	Surface area, acres (El 712.0)	18.1
	Length of shoreline, mi (El 712.0)	0.8
e.	<u>Storage</u> , acre-feet	
	Crest of spillway, (El 712.0)	25.6
	Top of dam, (El 714.5)	316 (est)
f.	<u>Dam</u>	
	Type	Earth
	Length, feet	590±
	Height, feet	35±
	Side Slopes	U/S 1V on 4H D/S 1V on 1.5H
	Impervious core	Unknown
	Grouting	Unknown
g.	<u>Spillway</u>	
	Type	Broad-crested
	Length, feet	14±
	Crest elevation	712.0
	Upstream channel	None
	Downstream channel	Natural

h. Regulating Gates

The low level outlet conduit does not have any visible means by which flows may be regulated. There are no records available regarding this structure.

SECTION 2 - ENGINEERING DATA

2.1 DESIGN

Design data and specific memoranda are not available for evaluation of the original design of the dam. There are no records available of any design changes to the dam.

2.2 CONSTRUCTION RECORDS

There are no construction records available for the project.

2.3 OPERATION RECORDS

No records of reservoir elevation or rainfall are kept and since there are no regulating outlets there are no operating records.

2.4 EVALUATION OF DATA

Information was made readily available by personnel of the Water Plants Section of the Utilities Division and the Civil Section of the Engineering Plans and Services Division; Directorate of Facilities Engineering, United States Military Academy.

The information obtained from available data, the personal interviews and the visual inspection are considered adequate for this Phase I inspection and evaluation.

SECTION 3 - VISUAL OBSERVATIONS

3.1 FINDINGS

a. General

A visual inspection of Lake Frederick Dam was made on December 5, 1978. The weather was sunny, temperature between 45° and 55°F. The last rainfall occurred during the previous day. At the time of the inspection the lake level was about 10 inches below the crest of the spillway.

b. Embankment

The embankment appears to be in generally good condition. The horizontal and vertical alignments of the crest are generally good except for some rutting and 6 inch deep depressions. This condition appears to have been caused by vehicular traffic which has also removed a substantial quantity of the grass surface. The remainder of the grass appears to have been cut this year. A single animal burrow was found on the crest.

The upstream slope is in generally fair condition. Along the entire length of the slope, about one foot below the crest of the dam and at what appears to be the normal water level, erosion has created about a one foot high vertical step. At several locations this erosion has begun to erode the crest edge. In addition there are trees, saplings, bushes and tall grass growing on the slope.

The downstream slope is in generally good condition with only minimal evidence of sloughing and some small erosion gullies near the crest. The slope, which for the most part is gravelly, is covered with trees, saplings, bushes and substantial debris; however, there is little to no ground cover. Evidence of seepage was noted at the toe of the dam about 100 feet to the right of the spillway. The seepage has created a wet area about 15 feet by 30 feet. The total seepage from this area is estimated at about 3 to 5 gpm. The flow from the area follows a drainage channel along the toe of the dam and apparently has been caused by runoff.

c. Appurtenant Structures

The spillway appears to be in generally fair condition. The concrete surface is cracked and spalled at several locations and there are some underlying stones missing. The sill has been broken off from the left side of the spillway leaving an irregular surface about 5.5 feet long. This condition, in effect creates a two level sill with a 6 inch difference. The downstream stepped chute is in generally good condition with little spalling of the concrete surface and only a few underlying stones missing.

The spillway walls are in generally fair condition. The concrete walls are cracked at several places, and spalled and deeply eroded at the contact with the chute steps.

The concrete of the right downstream training wall is in generally good condition with only slight spalling and some erosion at its base. The left stone training wall is in good condition.

The condition along the full length of the low level outlet conduit could not be ascertained, however, it can be seen that the last 10 feet has collapsed. No water was observed coming from the conduit.

d. Abutments

There were no signs of seepage or other unusual conditions at the abutments. On the left abutment approach to the spillway the slope is ripped.

e. Downstream Channel

For several hundred feet downstream of the dam the spillway channel contains many trees. At the end of the concrete training wall a large collection of debris including several fallen trees has blocked the channel. At and on the steps of the spillway there is substantial debris.

f. Reservoir Area

In the vicinity of the dam there is no evidence of sloughing, potentially unstable slopes or other unusual conditions which could adversely affect the dam.

3.2 EVALUATION OF OBSERVATIONS

Visual observations made during the course of the investigation revealed several deficiencies which at present do not adversely affect the adequacy of the dam. However, these deficiencies do require attention and should be corrected before further deterioration leads to a hazardous condition. Recommended measures to improve these conditions are given in Section 7.

SECTION 4 - OPERATIONAL AND MAINTENANCE PROCEDURES

4.1 PROCEDURES

There are no operational procedures for the dam.

4.2 MAINTENANCE OF THE DAM

There is no operation and maintenance manual for the project. There is no formally established inspection program by operating or maintenance personnel. The existence of the low level outlet conduit was unknown and no record of its purpose, the location of its intake or controls is unknown or available.

The embankment dam is maintained only occasionally; maintenance reportedly includes only yearly mowing of the vegetated portion of the crest.

4.3 MAINTENANCE OF OPERATING FACILITIES

There are no operating facilities.

4.4 WARNING SYSTEMS IN EFFECT

There is no warning system in effect or in preparation.

4.5 EVALUATION

The maintenance of the Lake Frederick Dam is considered less than adequate in the following areas:

1. No formal operation and maintenance manuals for the project.
2. The control of vegetation growing on the embankment and the removal of debris.
3. Control of erosion to upstream slope.
4. Maintenance of spillway and training walls.

SECTION 5 - HYDRAULIC/HYDROLOGIC

5.1 DRAINAGE BASIN CHARACTERISTICS

The total area contributing to Lake Frederick is 119.5 acres (0.19 sq. mi.), with a lake surface area (El 712) of 18.1 acres (15% basin area). The drainage basin is square shaped with steep (17%) wooded slopes located on the western side of Backcap Mountain, United States Military Academy Reservation, Orange County, New York. It is essentially undeveloped with no defined stream channels and no apparent storage.

5.2 SPILLWAY CAPACITY

Discharge from Lake Frederick is possible through a spillway, about 14.0 feet long with a crest width of 3.0 feet. The computed capacity at El 713.0, equivalent to the bottom of the bridge which spans the spillway, is 49.4 cfs. If taken at the top of the bridge, El 714.5, the spillway acts as a box culvert and creates a pressure head of 1.5 feet, with a computed discharge of 135 cfs. The low level outlet is inoperable.

5.3 RESERVOIR CAPACITY

The maximum capacity of Lake Frederick is reported as 50 acre-feet^{1/}, however, the computed surcharge storage between the spillway crest (El 712) and the top of the dam, El 714.5, is 44 acre-feet. In addition, the lake with a surface area of about 18.1 acres, and maximum dam height of about 35 feet, has an estimated reservoir capacity of about 316 acre-feet which is greater than reported in the National Program of Inspection of Dam^{1/}.

5.4 FLOODS OF RECORD

There are no records available of floods or maximum lake elevations.

5.5 OVERTOPPING POTENTIAL

The Probable Maximum Flood (PMF) and the Standard Project Flood (SPF) were estimated and compared with the total project discharge capacity. Because there are no data available for the PMF for an area of 119.5 acres it was necessary to synthesize a flood hydrograph for the contributing area. The Probable Maximum 6-hour point rainfall for the West Point area was taken from Weather

See References at end of this Section.

Bureau sources^{2/} and its distribution is based on data in a publication of the World Meteorological Organization.^{3/} A unit hydrograph was developed, using the Synder method and the values of the coefficients C_t and C_p of 0.5 and 730 respectively. The coefficients selected were developed for small basins with similar steepness by the Corps of Engineers, Honolulu District in April 1970^{4/}. Assuming a loss rate of 0.2 inches per hour, the excess Probable Maximum Rainfall is 18.31 inches. The inflow hydrographs derived by applying the excess rainfall to the unit hydrograph resulted in inflow peaks of 910 cfs and 455 cfs for the PMF and SPF respectively.

The potential of the Lake overtopping the dam was investigated on the basis of the available surcharge storage and spillway discharge capacity to meet a potential emergency inflow.

5.6 EVALUATION OF THE ANALYSIS

The floods, routed through the lake, using a computerized technique resulted in the following:

Flood	Maximum Elevation (MSL)	Depth Over Dam (Ft)	Maximum Discharge (cfs)	Surface Area (Acre)	Surcharge Storage (Acre-feet)
PMF	715.04	0.54	814.13	19.6	54.
SPF	714.59	0.09	245.08	19.3	45.7

Using the Corps of Engineers screening criteria, the maximum spillway capacity, without overtopping the dam, is equal to 16.5 percent of the PMF and 55 percent of the SPF. Under the SPF discharge the dam would be overtopped by 0.1 feet.

REFERENCES

- ^{1/} "National Program of Inspection of Dams" Department of the Army, Office of the Chief Engineers, Washington, D.C. 20314, May 1975.
- ^{2/} "Rainfall Frequency Atlas of the United States" USWB TP No. 40.
- ^{3/} Manual for Estimation of Probable Maximum Precipitation, World Meteorological Organization, No. 332, 1977.
- ^{4/} "Report on Survey for Flood Control and Allied Purposes - Kaneohe - Kailua Area, Oahu, Hawaii (with Appendices), U.S. Army Engineers District, Honolulu, April 1970.

SECTION 6 - STRUCTURAL STABILITY

6.1 EVALUATION OF STRUCTURAL STABILITY

a. Visual Observation

Visual observations did not indicate any serious structural problems with the embankment or spillway. The deficiencies described in Section 3 require attention and measures to improve these deficiencies are given in Section 7.

b. Design and Construction Data

No design computations or other data pertaining to the structural stability of the dam have been located.

On the basis of the performance experience, the visual inspection, as well as engineering judgment, the dam and spillway appear to be structurally adequate at the present time.

c. Operating Records

There are no operating records available.

d. Post Construction Changes

The year the dam was constructed is unknown. There are no records of any construction changes to the dam.

e. Seismic Stability

The dam is located in Seismic Zone No. 1 and in accordance with recommended Phase I guidelines does not warrant seismic analyses.

SECTION 7 - ASSESSMENT/RECOMMENDATIONS

7.1 DAM ASSESSMENT

a. Safety

Examination of the available documents and visual inspection of the Lake Frederick Dam and appurtenant structures did not reveal any conditions which are considered to be unsafe.

Using the Corps of Engineers screening criteria for initial review of spillway adequacy, it has been determined that the dam would be overtopped for all storms exceeding approximately 16.5 percent of the Probable Maximum Flood (PMF), and 55 percent of the Standard Project Flood (SPF). Under the SPF the dam will be overtopped by approximately 0.1 feet, an amount which will not adversely affect the safety of the dam. The project discharge capacity is therefore adequate in accordance with the Corps of Engineers adopted general principle that structures be designed for the maximum flood characteristic of the region, which is, in practice, the Standard Project Flood.

b. Adequacy of Information

The information and data available were adequate for performance of this investigation.

The information and data available with regards to operation and maintenance of the project is considered less than adequate in the following areas:

- 1) Record drawings of the project
- 2) Records of modifications
- 3) Operation and maintenance manuals
- 4) Records of inspections

c. Necessity for Additional Investigations

Additional investigations to assess the adequacy of the dam and appurtenant structures do not appear necessary.

7.2 REMEDIAL MEASURES

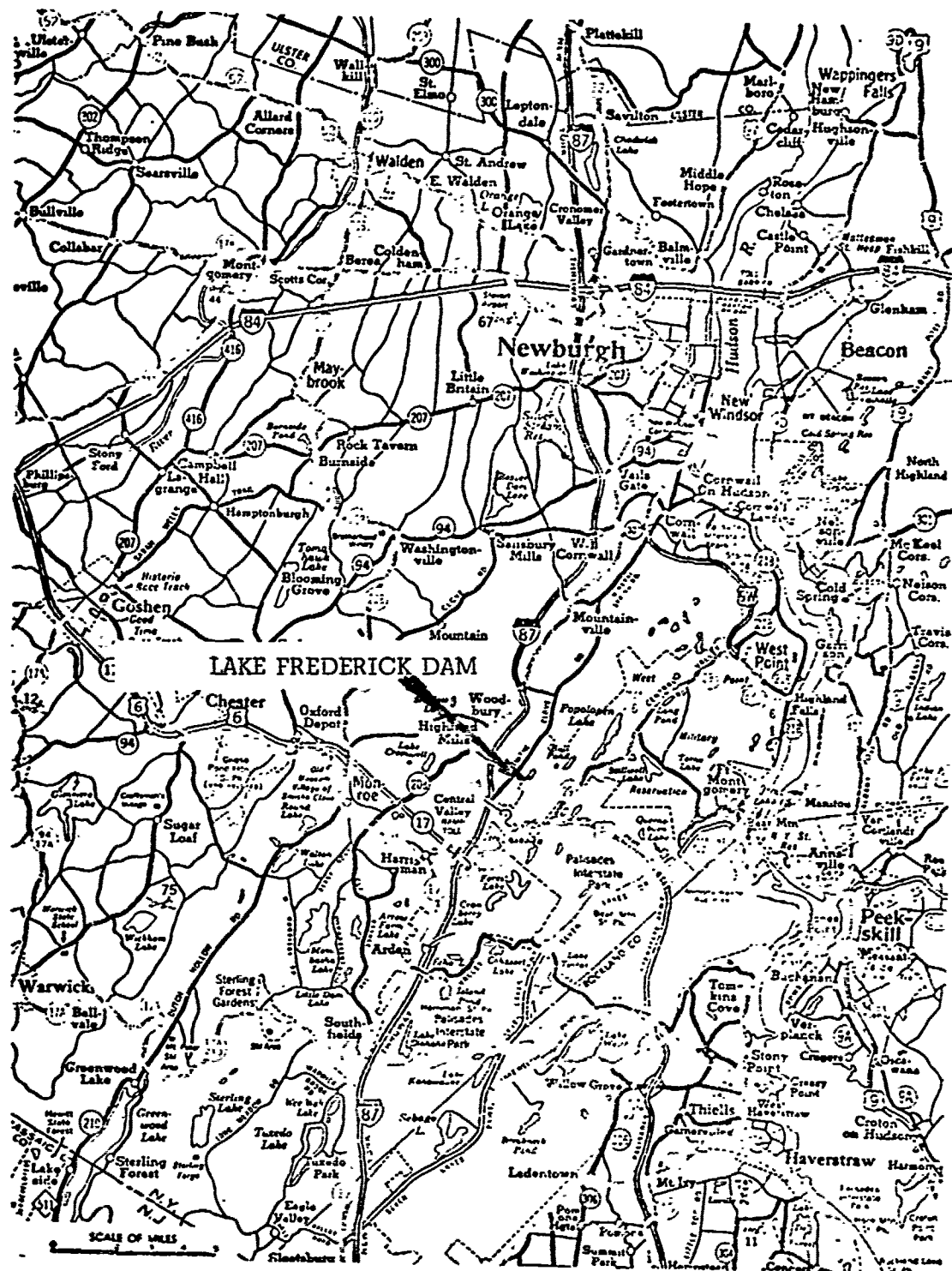
No remedial measures are required to assure the safety of the dam at the present time; however, certain measures are recommended as follows:

- 1) Repair the erosion to the upstream slope and provide slope protection to prevent the reoccurrence of this condition.

- 2) Repair the concrete and loose stone along the training walls and spillway chute, adding new pointing where necessary.
- 3) Remove the debris and trees from the spillway channel.
- 4) Remove heavy brush, shrubs and saplings and debris from all locations on the embankment. On the downstream slope larger conifers, but not deciduous hardwoods, should be removed. The remaining trees should be inventoried and their condition monitored. If a tree dies, the area around the tree should be monitored for seepage.
- 5) Prepare an operation and maintenance manual and establish a program of periodic inspections for the project features.
- 6) Establish a systematic program of observation and monitoring of changes in the pattern and quantity of seepage.
- 7) Refill the ruts, depressions and reseed the crest. Take measures to prevent the reoccurrence of this condition.
- 8) Steps should be taken to determine the location of the low level intake and the existence of any operating controls. If they can be located, consideration should be given to making the low level outlet system operable.

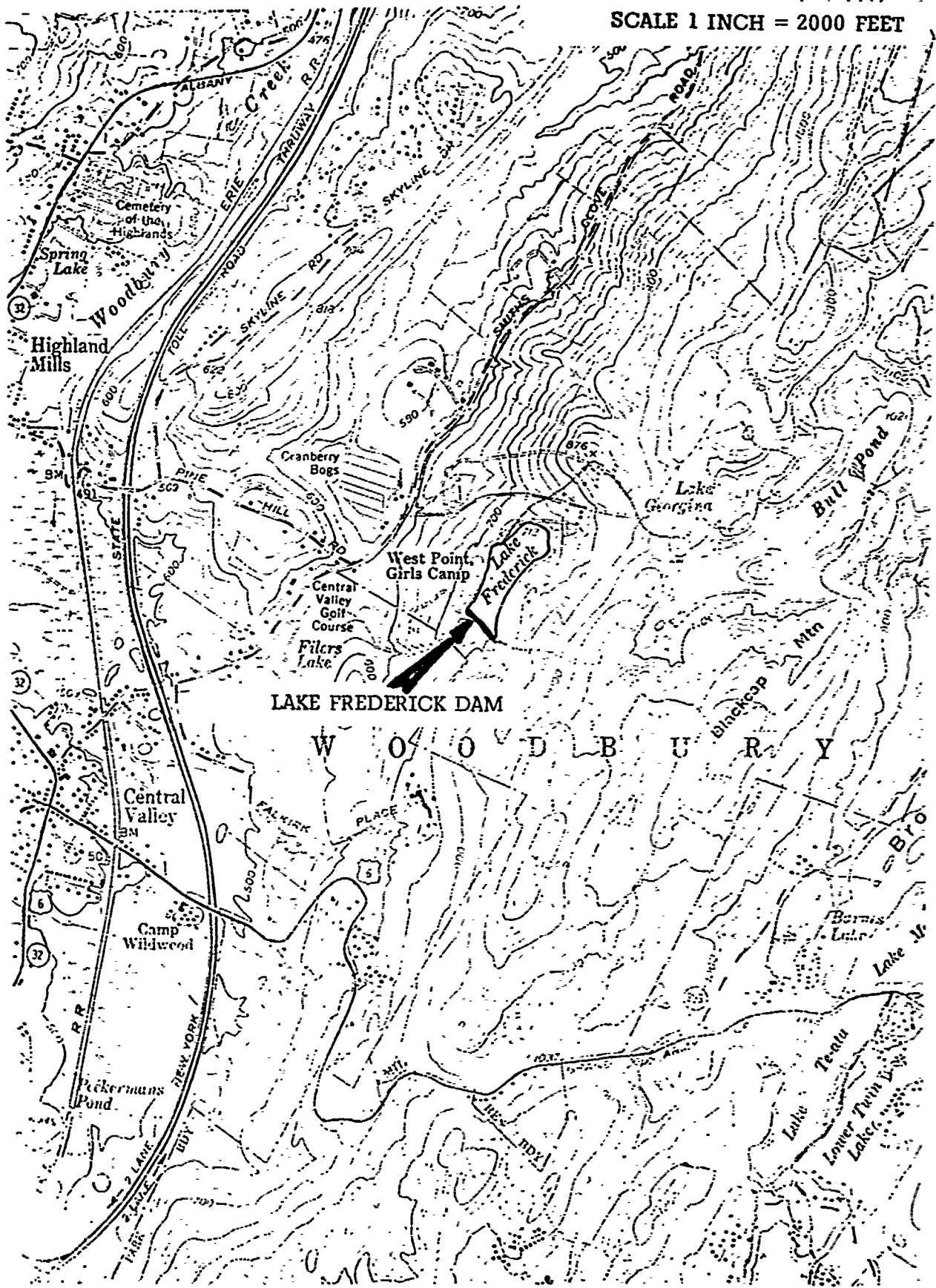
DRAWINGS

APPENDIX A

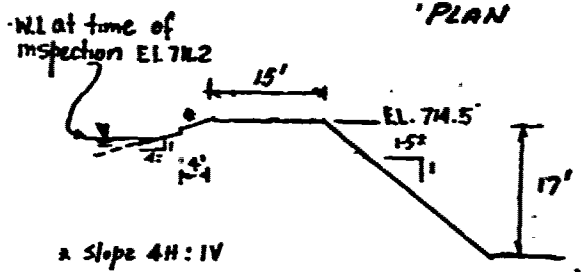
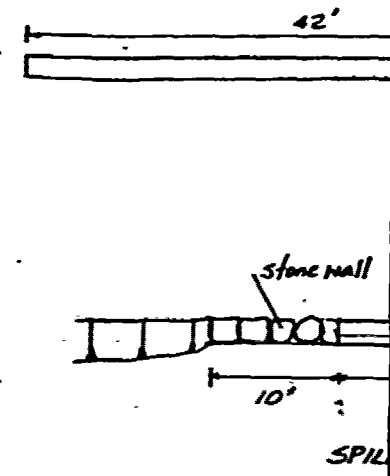
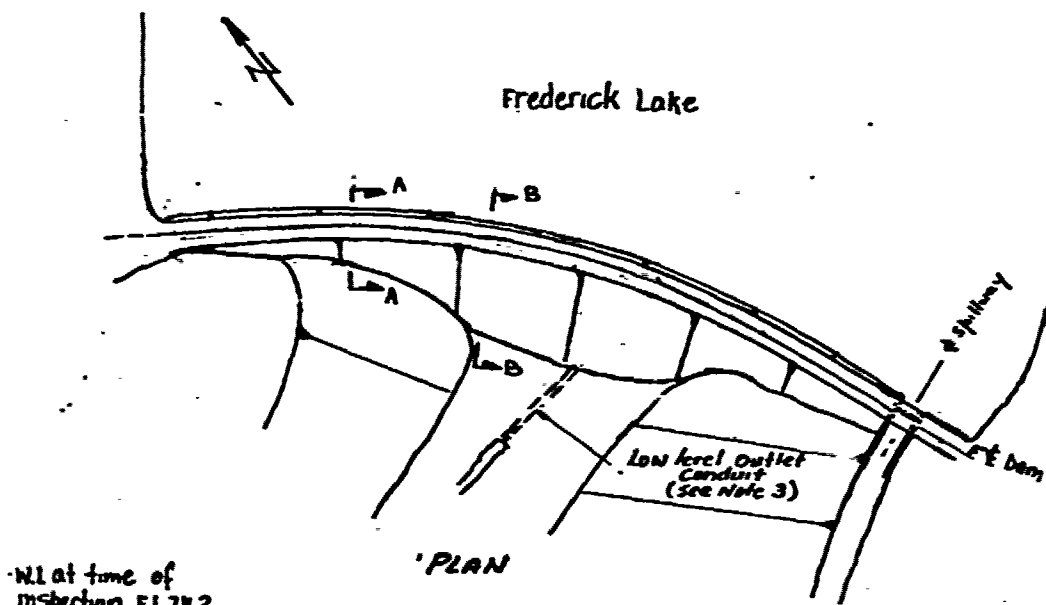


VICINITY MAP
LAKE FREDERICK DAM

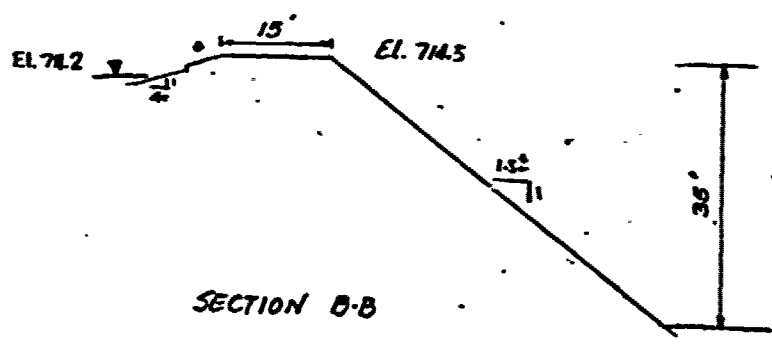
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TOPOGRAPHIC MAP
LAKE FREDERICK DAM AND RESERVOIR



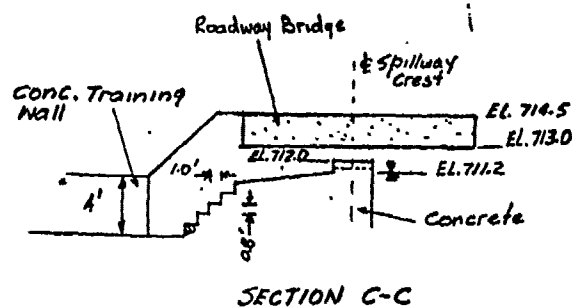
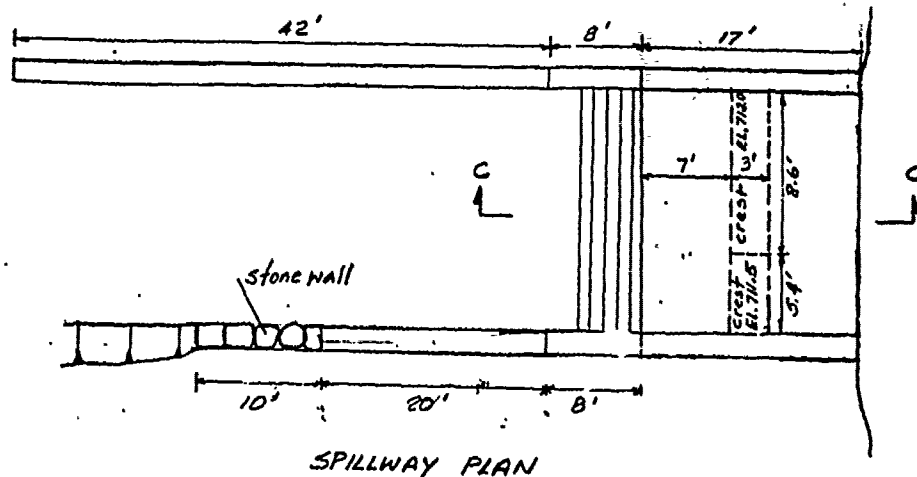
SECTION A-A



SECTION B-B

- Notes:
1. Drawing has made during
 2. All elevations
 3. upstream

PHASE I DAM IN



Notes:

1. Drawing based on rough field measurements made during visual inspection.
- 2 All elevations referred to M.S.L.
- 3 upstream extent and Controls are unknown.

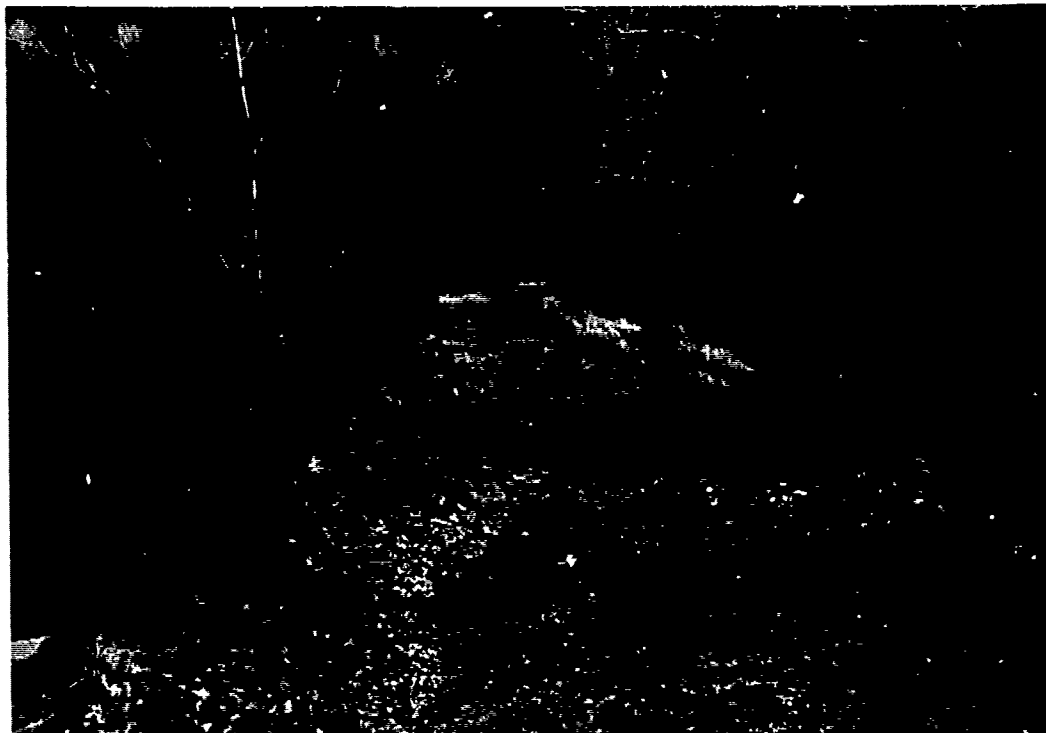
SCALE: Not To Scale

PHASE I DAM INSPECTION		TIPPETTS-ABBETT-McCARTHY-STRATTON ENGINEERS AND ARCHITECTS NEW YORK	
LAKE FREDERICK DAM PLANS AND SECTIONS		BY:	DATE: Dec 78
		DWG:	

2

PHOTOGRAPHS

APPENDIX B



2. VIEW OF CREST.



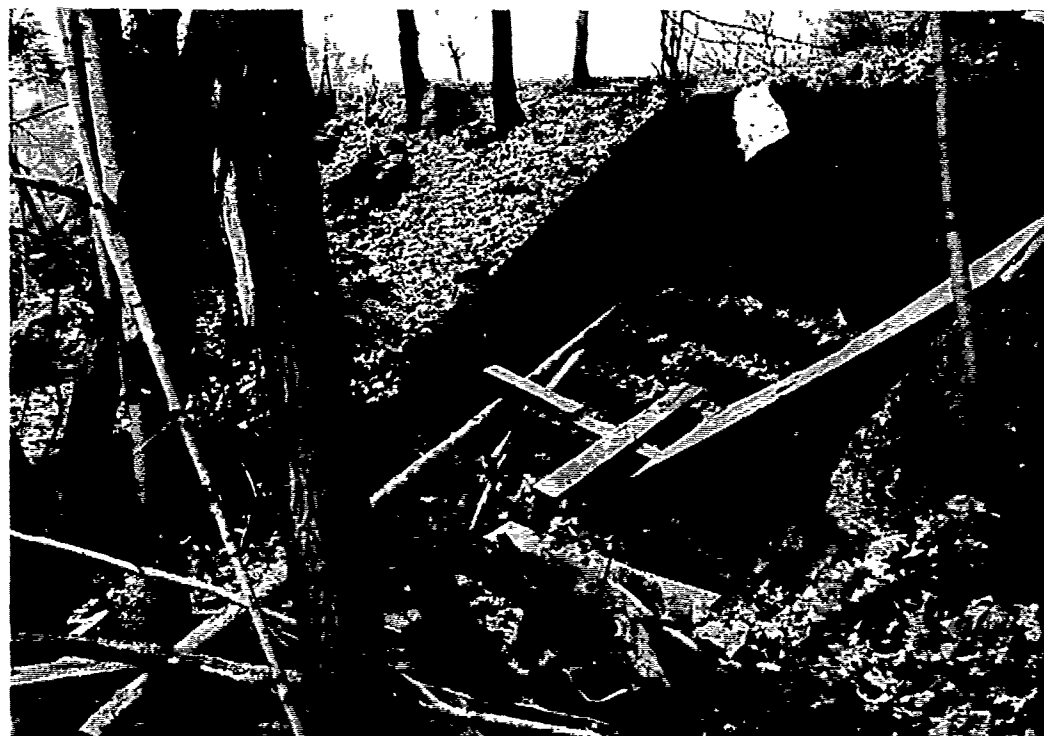
3. VIEW OF UPSTREAM SLOPE OF DAM, NOTE VEGETATION



4. VIEW OF DOWNSTREAM SLOPE OF DAM. NOTE EXTENSIVE TREE GROWTH.



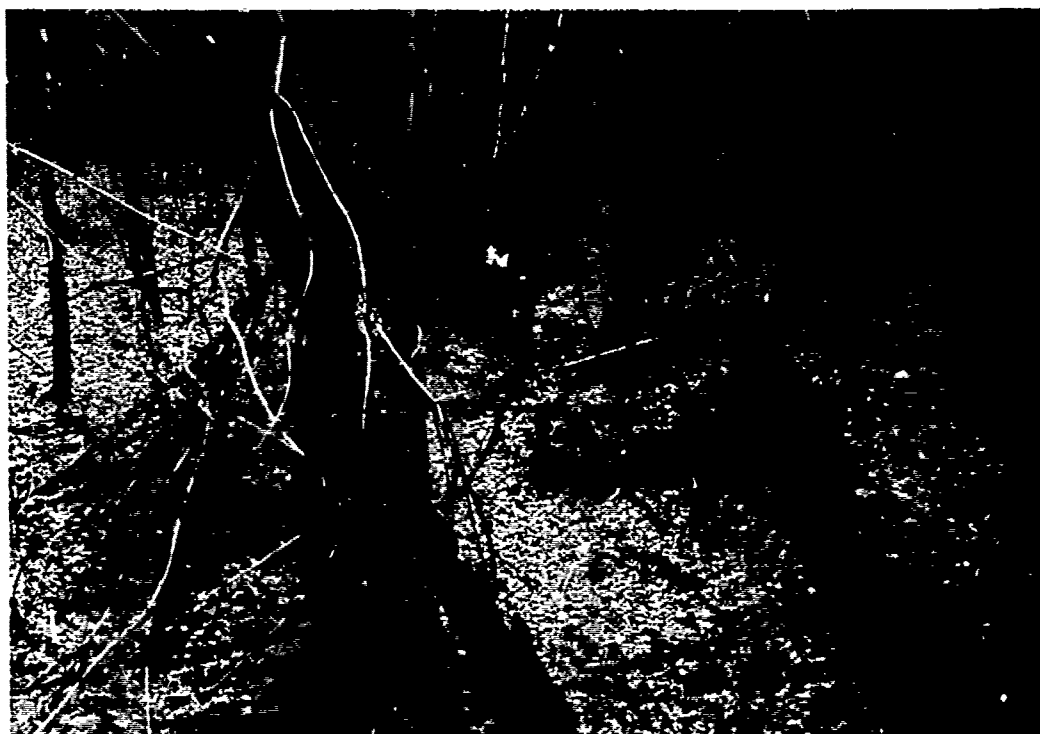
5. VIEW OF BROKEN SPILLWAY CREST LOCATED UNDER BRIDGE.



6. VIEW OF DOWNSTREAM FACE OF SPILLWAY. NOTE EXTENSIVE DEBRIS.



7. VIEW OF SPILLWAY CHANNEL LOOKING UPSTREAM. NOTE HEAVY TREE GROWTH AND EXTENSIVE DEBRIS.



8. VIEW OF SPILLWAY CHANNEL LOOKING DOWNSTREAM.
NOTE TREES AND DEBRIS.



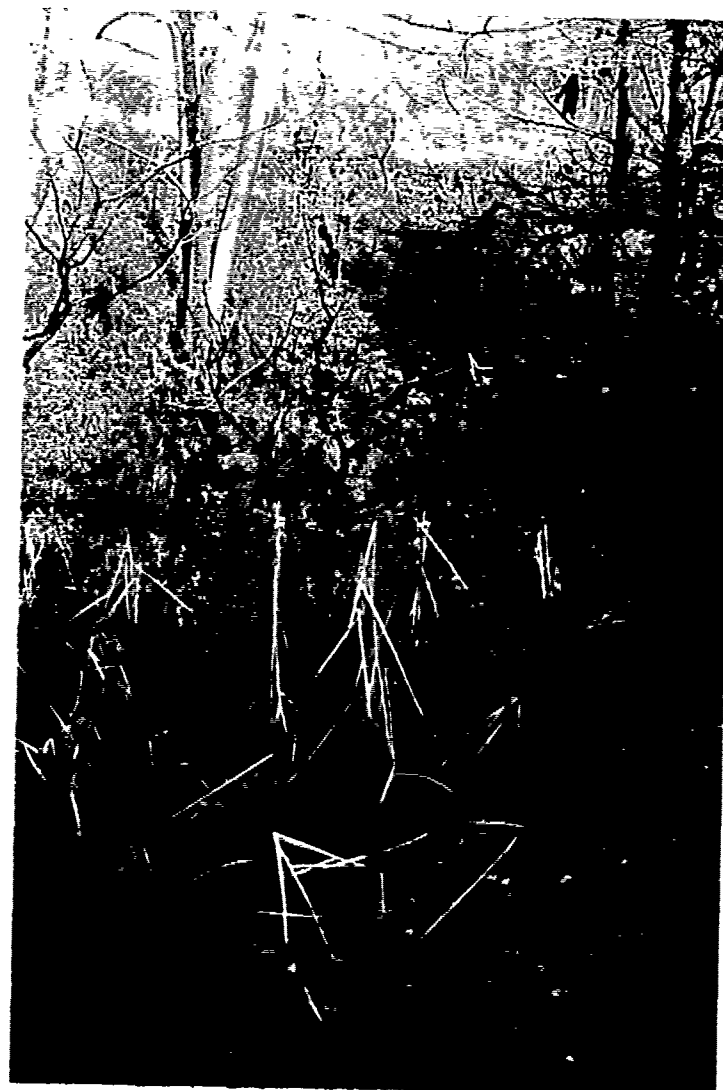
9. VIEW OF COLLAPSED OUTFALL OF LOW LEVEL OUTLET
CONDUIT.



10. VIEW OF RUTS AND DEPRESSIONS ON DAM CREST. NOTE NON-SODDED AREAS.



11. VIEW OF EROSION ON UPSTREAM SLOPE. NOTE LACK OF SLOPE PROTECTION.



12. VIEW OF SEEPAGE AREA AT DOWNSTREAM TOE.
NOTE CHANNEL IN FOREGROUND.

ENGINEERING DATA CHECKLIST

APPENDIX C

CHECKLIST
ENGINEERING DATA
DESIGN, CONSTRUCTION, OPERATION
PHASE I

NAME OF DAM LAKE FREDERICK DAM

ID # 769

ITEM

REMARKS

AS-BUILT DRAWINGS None available

REGIONAL VICINITY MAP USGS maps: Popolopen Lake, N.Y.

CONSTRUCTION HISTORY None available.

TYPICAL SECTIONS OF DAM None available from the owner;

A sketch showing Plan and Section was prepared during
the course of inspection. See drawings.

OUTLETS-PLAN None available

-DETAILS None available

-CONSTRAINTS None available

-DISCHARGE RATINGS None available

RAINFALL/RESERVOIR RECORDS

None available

ITEM	REMARKS
DESIGN REPORTS	None available
GEOLOGY REPORTS	None available
DESIGN COMPUTATIONS	None available
HYDROLOGY & HYDRAULICS	None available
DAM STABILITY	None available
SEEPAGE STUDIES	None available
MATERIALS INVESTIGATIONS	None available
BORING RECORDS	None available
LABORATORY	None available
FIELD	None available
POST-CONSTRUCTION SURVEYS OF DAM	None available
BORROW SOURCES	No data available

ITEM	REMARKS
------	---------

MONITORING SYSTEMS	None available
--------------------	----------------

MODIFICATIONS	None recorded
---------------	---------------

HIGH POOL RECORDS	None available
-------------------	----------------

POST CONSTRUCTION ENGINEERING STUDIES AND REPORTS	None available
---	----------------

PRIOR ACCIDENTS OR FAILURE OF DAM DESCRIPTION REPORTS	None reported or related
---	--------------------------

MAINTENANCE OPERATION RECORDS	No formal program or schedule available; however embankment is maintained occasionally. None None available
-------------------------------	---

ITEM**REMARKS****SPILLWAY PLAN****SECTIONS****DETAILS**

None available from owner. However a sketch was prepared showing the spillway section. See drawings in this report.

OPERATING EQUIPMENT

No data available.

PLANS & DETAILS

VISUAL INSPECTION CHECKLIST

APPENDIX D

VISUAL INSPECTION CHECKLIST

1. Basic Data

a. General

Name of Dam LAKE FREDERICK DAM Hazard Category High

County Orange ID# 769

Stream Name - Tributary of Woodbury Creek

Location Orange County, Nearest Town (P.O.) Central Valley

Longitude - Latitude - Other Directions -

About 1.0 mile north of the town of Central Valley

Date of Insp. 5, Dec 1978 Weather Sunny Temperature 45°-55°F

b. Inspection Personnel Hannay S. Feldman Sr. Geotechnical Engr
Jyotindra H. Patel Geotechnical Engr.

c. Persons Contacted John O'Connell Civil Engr. - USMA
Jim Mc Donald Water Plant Foreman - USMA
Kenneth G. Tomann Civil Engr. - USMA
R. Hunyan Civil Engr. - USMA

d. History: Date Constructed Unknown
Present Owner United States Military Academy
Designed by Unknown
Constructed by Unknown
Recent History -

2. Technical Data

Type of Dam Earth & Rockfill Drainage Area 119.5 Acres

Height 35 ± Ft Length 590 ± Ft.

Upstream Slope 1V on 4H Downstream Slope 1V on 1.5H

Crest Width 15 ± Ft Freeboard ^{over} at Spillway Crest 2.5 ± Ft.

Low Level Control: (Type and Size) Control unknown

Valve Condition Unknown

Emergency Spillway Type (Material) Concrete ^{covering stone} Width 14 feet

Side Slopes —

Height (Crest to Top) 2.5 ± from crest to Tip of Dam

Exit Slope See sketch in this report

Exit Length See sketch in this report

Ponded Surface Area 18.1 Acres

Capacity (Normal Level) 25.6 Acre Feet
_{crest of spillway}

Capacity Emergency Spillway Level — Acre Feet

3. Embankment

Length is 590 feet - gently curved.

a. Crest about 15 feet wide

(1) Vertical Alignment Uniform except some rutting and
6 inch deep depressions

(2) Horizontal Alignment Curved and generally good

(3) Longitudinal Surface Cracks None

(4) Transverse Surface Cracks None

(5) General Condition of Surface Good

(6) Miscellaneous There are several non-sodded
areas; remainder of grass appears to have
been cut; A single animal burrow was found.

b. Upstream Slope 1V on 4H and Grassed

(1) Undesirable Growth or Debris Trees, Saplings, bushes and tall grass growing.

(2) Sloughing, Subsidence, or Depressions None however one foot below the crest of the dam at about normal water line entire slope shows signs of erosion.

(3) Slope Protection None

(a) Condition of Riprap —

(b) Durability of Individual Stones —

(c) Adequacy of Slope Protection Against Waves and Runoff —

(d) Gradation of Slope Protection - Localized Areas of Fine Material —

(4) Surface Cracks None visible.

c. Downstream Slope 1V on 1.5H

(1) Undesirable Growth or Debris trees, saplings, bushes, substantial debris, fallen trees but very little ground cover.

- (2) Sloughing, Subsidence, or Depressions; Abnormal Bulges or Non-Uniformity

Minimal sloughing.

- (3) Surface Cracks on Face of Slope None visible

- (4) Surface Cracks or Evidence of Heaving at Embankment Toe

None

- (5) Wet of Saturated Areas or Other Evidence of Seepage on Face of Slope; Evidence of "Piping" or "Boils"

At 100 feet right of spillway a wet area about 15 ft by 30 feet is created by seepage. The estimated seepage is about 3 to 5 gpm.

- (6) Fill Contact with Outlet Structure Contacts at spillway and low level outlet generally good.

- (7) Condition of Grass Slope Protection No grass at downstream slope

d. Abutments

- (1) Erosion of Contact of Embankment with Abutment from Surface Water Runoff, Upstream or Downstream

None observed.

- (2) Springs or Indications of Seepage Along Contact of Embankment with the Abutments

None observed.

- (3) Springs or Indications of Seepage in Areas a Short Distance
Downstream of Embankment - Abutment Tie-in

None

- e. Area Downstream of Embankment, Including Tailrace Channel

The spillway and lowlevel out channel joins
tributary of Woodbury Creek.

- (1) Localized Subsidence, Depressions, Sinkholes, Etc. Could
not be determined because of heavy debris
in both channels

- (2) Evidence of "Piping" or "Boils" See comment
above

- (3) Unusual Presence of Lush Growth, such as Swamp Grass, etc.
See comment above.

- (4) Unusual Muddy Water in Downstream Channel Both channels
were dry

- (5) Sloughing or Erosion None observed

- (6) Surface Cracks or Evidence of Heaving Beyond Embankment, Toe
None

(7) Stability of Tailrace Channel Sideslopes Spillway channel Concrete walls, stone wall and natural slopes
stable, low level out channel slopes are stable

(8) Condition of Tailrace Channel Riprap No riprap at both channels

(9) Adequacy of Slope Protection Against Waves, Currents and Surface Runoff

(10) Miscellaneous

f. Drainage System None

(1) Condition of Relief Wells, Drains and Appurtenances

(2) Unusual Increase or Decrease in Discharge from Relief Wells

4. Instrumentation

No instrumentation

(1) Monumentation/Surveys None

(2) Observation Wells None

(3) Weirs None

(4) Piezometers None

(Other) _____

5. Reservoir

a. Slopes appears to be stable

b. Sedimentation _____

6. Spillways

There is one spillway

a. Principal Spillway: Inlet Condition _____

Pipe Condition _____

General Remarks (include information such as recently repaired,
potential for debris accumulation, special items of note, etc.)

b. ~~Emergency~~ Spillway: General Condition _____

Fair

Tree Growth _____

None

Erosion _____

None observed

Other Observations _____

The concrete caping

is cracked and spalled at several locations and some

underlying stones are missing. At downstream face there

is substantial debris.

7. Structural (if required) See Attached Appendix

8. Downstream Channel

consists of concrete training walls on both sides
with left side

a. Condition (obstructions, debris, etc.) Several hundred
feet downstream channel contains many trees
At the end of the concrete training wall large collection
of debris including several fallen trees has blocked
the channel

b. Slopes of channel are stable

c. Approximate No. Homes and Population About 20 to 25
homes.

d. General

Henry S. Feldman
TEAM CAPTAIN

STRUCTURAL INSPECTION CHECKLIST

PHASE I DAM INSPECTION

Main dam is earth and
rock fill. Spillway
is concrete cover.

1. Concrete Surfaces is in fair condition. Concrete
is cracked and spalled at several locations.
2. Structural Cracking See above
3. Movement - Horizontal and Vertical Alignment None observed
4. Junctions with Abutments or Embankments —
5. Drains - Foundation, Joint, Face —
6. Water Passages, Conduits, Sluices —
7. Seepage or Leakage —
8. Monolith Joints - Construction Joints —
9. Foundation —

10. Abutments _____

11. Control Gates _____

12. Approach and Outlet Channels _____

13. Stilling Basin _____

14. Intake Structure _____

15. Settlement _____

16. Stability
a. Overturning } *Calculation not required for Phase I*
b. Sliding }
c. Seismic _____
17. Instrumentation *No Instrumentation*
a. Alignment _____
b. uplift _____
c. Seismic _____
18. Miscellaneous _____

HYDROLOGIC DATA & COMPUTATIONS

APPENDIX E

TAMS

Job No. 1487-19

Project Safety Inspection Lake Frederick

Subject _____

Sheet 1 of _____

Date Nov 17, 1978

By DLC

Ch'k. by _____

Basin Area 119.5 acres

LAKE Area 18.1 acres

PROBABLE MAXIMUM 6 HOUR point RAINFALL for

WEST POINT 24.4 inches

Reduction of 20% = 19.52 inches (EC 1110-2-27)

Assume rainfall loss rate of 0.2 inches per hour

Total Excess rainfall on land area = 18.32 inches

TAMS

Job No. 1487-19

Sheet 2 of

Project LAKE FREDERICK SAFETY INSPECTION

Date DEC 15, 1978

Subject

By RH

Ch'k. by

$$L_{ca} = 400 \text{ ft.} = 0.076 \text{ mi.} \quad DA = 0.19 \text{ sq. mi.} = 119.5 \text{ acres}$$

$$L = 2000 \text{ ft.} = 0.379 \text{ m.} \quad S = 0.17\%$$

$$T_p = C_T (L L_{ca})^{0.3} \quad \text{Assume:}$$

$$= 0.5 (0.0288)^{0.3} \quad C_T = 0.5$$

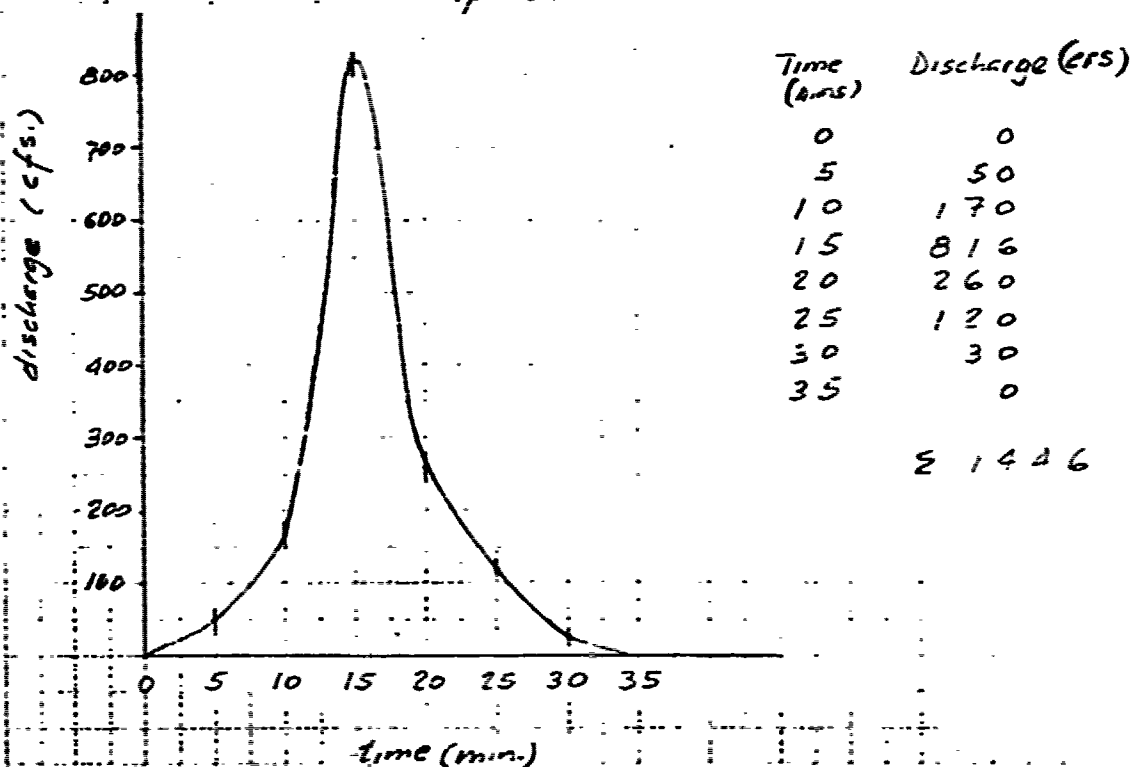
$$T_p = 0.17 \text{ hrs} = 10 \text{ min.}$$

$$640 C_p = 730.$$

$$q_p = \frac{730}{0.17} = 4294.1 \text{ cfs/square}$$

$$Q_p = 4294.1 \times 0.19 = 816 \text{ cfs.}$$

$$T_p = 15 \text{ min.}$$



IAMS

Job No. 1487-19

Project INSPECTION LAKE FREDERICK.

Subject _____

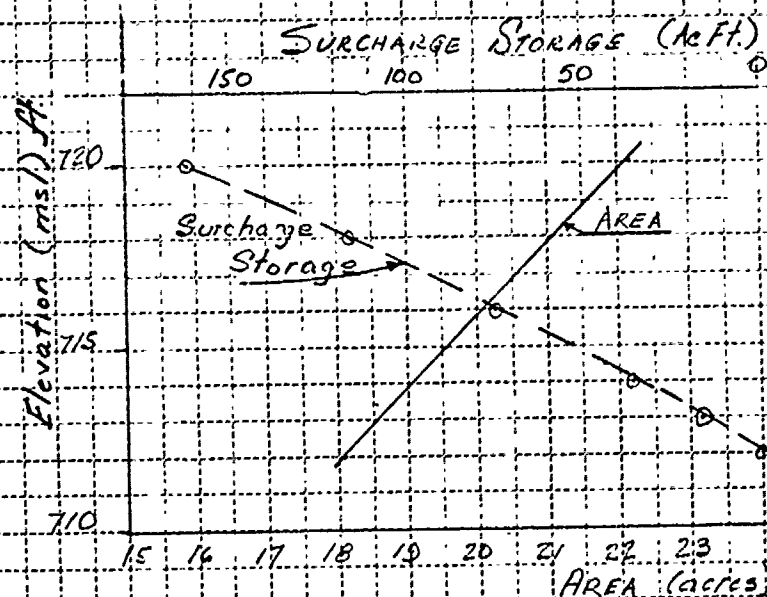
Sheet 3 of _____

Date Nov 17, 1978

By D.L.C.

Ch'k. by _____

Elev ft.	AREA (acres)	MEAN AREA	Δ VOLUME	Surcharge Storage (ac.ft.)
712	18.1	18.35	18.35	0
713	18.6	18.85	18.85	18.35
714	19.1			37.2
		19.66	39.32	
716	20.2	20.7	41.4	76.4
718	21.2	21.7	43.4	117.8
720	22.2			161.2



TAMIS

Job No. 1487-19

Project LAKE FREDERICK

Subject _____

Sheet 4 of _____

Date DEC 15 1971

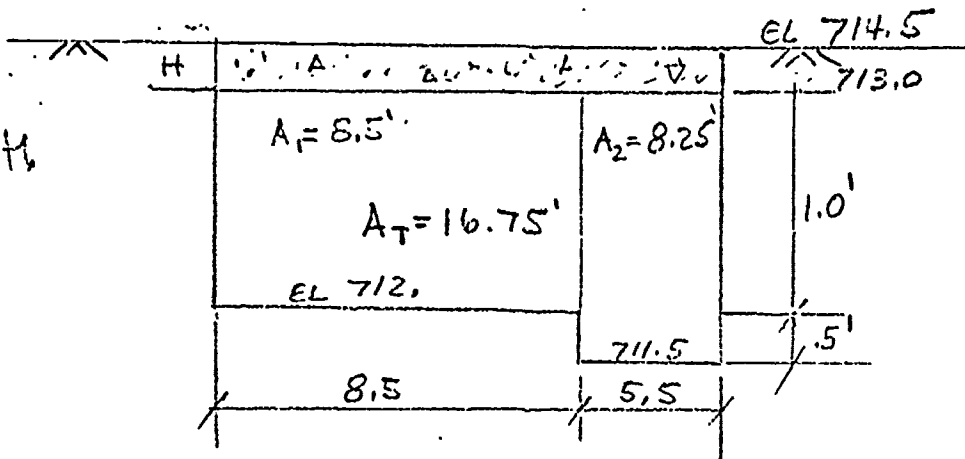
By FS.

Ch'k. by _____

X = Average depth

X (14) = 16.77'

X = 1.2



Length = 17.0'

AT EL. 714.5

$H_{CRITICAL} \geq (1.5)d$ flows full hydraulically long

$H^* \geq (1.5)(1.2) = 1.79$ hydraulically long

Pressure flow

$$Q = A \sqrt{\frac{2gH}{K}} = 16.75 \sqrt{\frac{64.4(1.5)}{K}}$$

$K = \frac{1}{C^2}$ Bureau of Public Roads $C = 0.8 = 1.5$

$$Q = 16.75 \sqrt{\frac{64.4(1.5)}{1.5}} = 135 \text{ cfs.}$$

AT EL 715

$$Q = 16.75 \sqrt{\frac{64.4(2)}{1.5}} = 155.21$$

AT EL 716

$$Q = 190$$

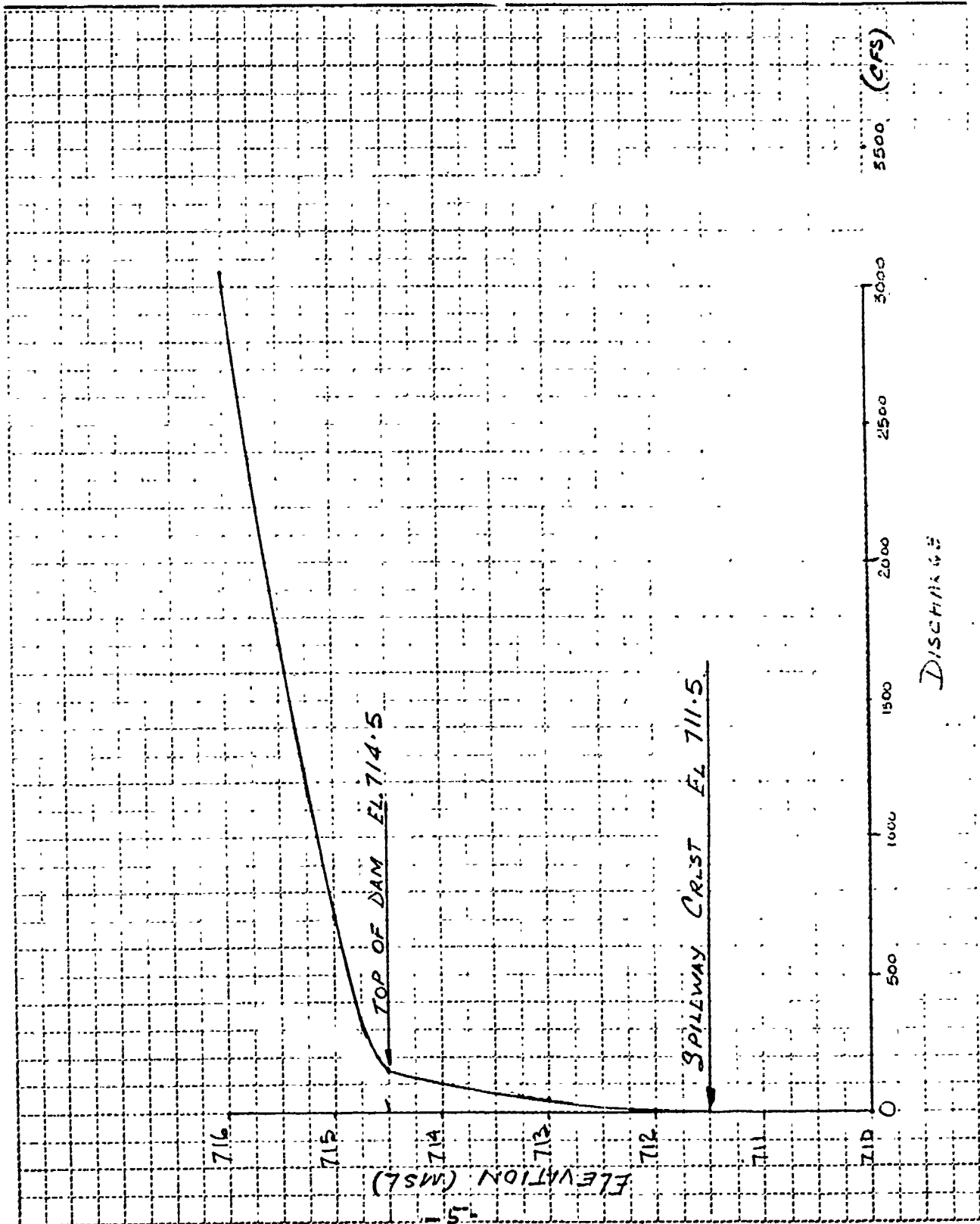
AT 718

$$Q = 245$$

TAMS

Job No. 1487-19
 Project LAKE FREDERICK
 Subject _____

Sheet 5 of _____
 Date DEC 19, 76
 By D.L.C
 Ch'k. by _____



AVIS

Job No. 1487-19

Project LAKE FREDERICK SAFETY INSPECTIONS

Subject

Sheet 6 of

Date DEC 15

By DLC

Ch'k. by _____

E	Q _{SP}	Q _D	Z Q	SURCHARGE STORAGE
711.5	0	0	0	0
712.	5.1	0	5.1	0
713	49.4	0	49.4	18.4
714.5	135.	0	135.	44.0
715	155	561	716	53.
716	190	2860	3050	76.4
718	245	10160	10405	117.8

-6-

LAKE FREDERICK BEST POINT NY
 TAMS SANETY INSPECTION
 RESERVOIR ROUTING JOB NO 7487-19

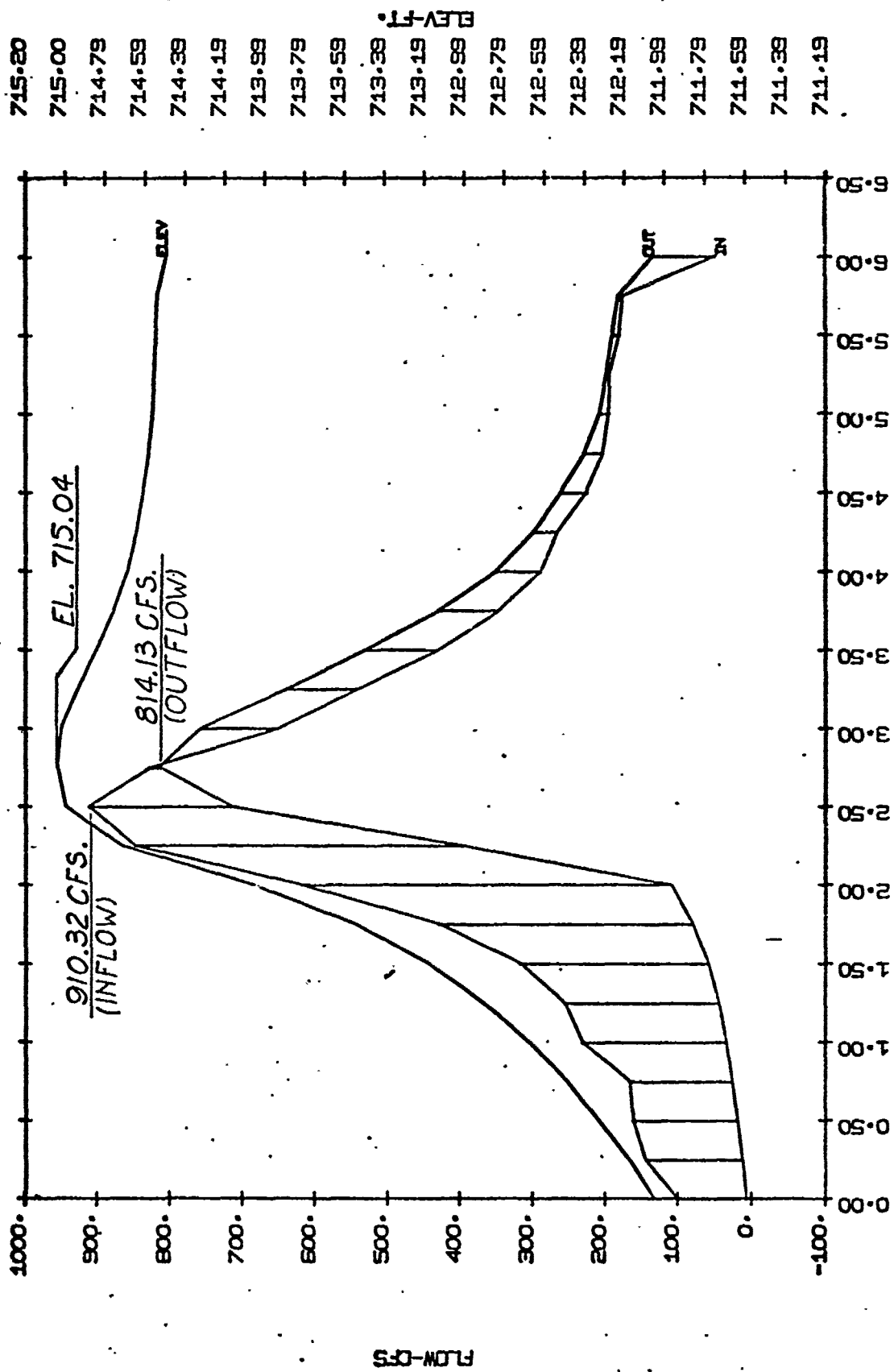
PROPOSED MAXIMUM FLOOD

INPUT PARAMETERS

STARTING ELEV (FT.)	TIME INTERVAL (HOURS)	STARTING TIME (HOURS)	ENDING TIME (HOURS)	PRINT INTERVAL (HOURS)	GALE OPTION	PLOT OPTION	STORAGE COEF.	OUTFLOW COEF.	INFLOW COEF.	TIME COEF.	BREAK TIME
711.50	0.25	0.00	6.33	1	NO	YES	1.000	1.000	1.000	1.000	0.000

RESERVOIR ELEV. (FT.)	RESERVOIR STORAGE (ACFT)	RESERVOIR OUTFLOW (CCS)
711.50	0.0000	0.00
712.00	0.0000	5.10
713.00	18.4000	49.40
714.50	44.0000	135.00
715.00	53.0000	716.00
716.00	76.4000	3050.00
718.00	118.0000	10405.00

TIME (HRS)	INFLOW (CFS)	OUTFLOW (CFS)	STORAGE (ACFT)	ELEVATION (FT)
0.00	0.00		0.0000	711.50
0.25	100.64	7.31	0.9282	712.05
0.50	144.43	12.92	3.2503	712.17
0.75	162.05	19.73	6.0786	712.33
1.00	166.73	26.75	8.9944	712.48
1.25	231.07	35.10	12.4642	712.67
1.50	256.10	45.22	16.6653	712.90
1.75	316.83	59.79	21.5097	713.18
2.00	429.00	80.70	27.7608	713.54
2.25	620.14	110.33	36.6222	714.06
2.50	849.01	393.97	48.0115	714.72
2.75	910.32	715.28	52.9889	714.99
3.00	826.81	814.13	53.9838	715.04
3.25	651.02	758.17	53.4228	715.01
3.50	541.92	639.38	51.8131	714.93
3.75	429.63	530.64	50.1288	714.84
4.00	346.57	429.74	48.5657	714.75
4.25	289.02	350.50	47.3382	714.68
4.50	265.75	298.74	46.5365	714.64
4.75	227.24	241.76	45.9636	714.60
5.00	203.59	228.95	45.4534	714.58
5.25	196.06	208.34	45.1361	714.56
5.50	194.25	199.01	44.9915	714.55
5.75	181.57	191.15	44.8698	714.54
6.00	176.52	182.58	44.7371	714.54
6.25	59.62	134.63	43.8953	714.49
MAX. VALUES				
	910.32	814.13		715.04
MIN. VALUES				
	0.00	0.00		711.50



LAKE FREDERICK WEST POINT NY
TAMS SAFETY INSPECTION
RESERVOIR ROUTING JOB NO 1487-19

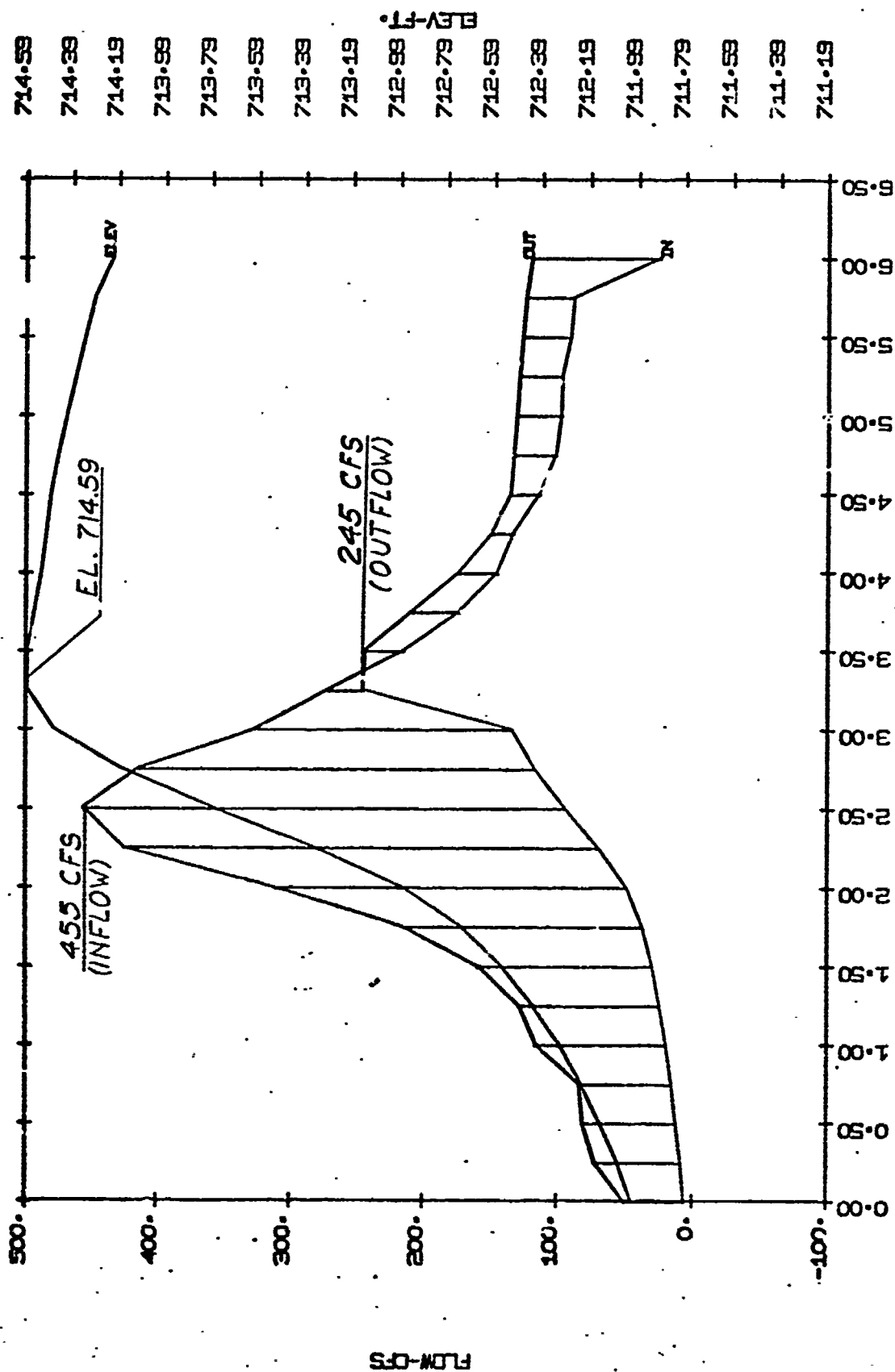
STANDARD PROJECT FLOOD

INPUT PARAMETERS

STARTING ELEV (FT.)	TIME INTERVAL (HOURS)	STARTING TIME (HOURS)	ENDING TIME (HOURS)	PRINT INTERVAL (HOURS)	GATE OPTION	PLOT OPTION	STORAGE COEF.	OUTFLOW COEF.	INFLOW COEF.	TIME COEF.	BREAK TIME
711.50	0.25	0.00	6.33	1	NO	YES	1.000	1.000	0.500	1.000	0.000

RESERVOIR ELEV. (FT.)	RESERVOIR STORAGE (ACFT)	RESERVOIR OUTFLOW (CES)
711.50	0.0000	0.00
712.00	0.0000	5.10
713.00	18.4000	49.40
714.50	44.0000	135.00
715.00	52.0000	716.00
716.00	76.4500	3050.00
718.00	116.0000	10405.00

TIME (HRS.)	INFLOW (CFS)	OUTFLOW (CFS)	STORAGE (ACFT.)	ELEVATION (FT.)
0.00	0.00		0.0000	711.50
0.25	50.32	6.11	0.4210	712.02
0.50	72.21	8.79	1.5328	712.09
0.75	81.02	12.08	2.9000	712.15
1.00	83.36	15.48	4.2133	712.23
1.25	112.53	19.55	6.0057	712.32
1.50	128.05	24.52	8.0664	712.43
1.75	159.41	30.28	10.4592	712.56
2.00	214.50	37.86	13.6071	712.73
2.25	310.07	48.75	18.1306	712.98
2.50	424.50	59.77	24.4939	713.35
2.75	455.16	94.47	31.8816	713.79
3.00	413.40	117.16	38.6653	714.18
3.25	325.51	134.00	43.7031	714.48
3.50	270.96	245.08	45.7053	714.59
3.75	214.21	243.53	45.6812	714.59
4.00	173.28	208.50	45.1386	714.56
4.25	144.51	173.39	44.5927	714.53
4.50	132.87	146.83	44.2142	714.51
4.75	113.62	134.61	43.8847	714.49
5.00	101.79	132.81	43.3476	714.46
5.25	98.03	130.62	42.6908	714.42
5.50	97.12	128.41	42.0311	714.38
5.75	90.78	126.11	41.3432	714.34
6.00	88.26	123.67	40.6127	714.30
6.25	24.24	119.19	39.2728	714.22
MAX. VALUES				
	455.16	245.08		714.59
MIN. VALUES				
	0.00	0.00		711.50



LAKE FREDERICK - SPF

TIME-HRS

OTHER DATA

APPENDIX F

INSTALLATION NAME: United States Military Reservation

NAME OF DAM/DIKE: Lake Frederick Dam ←

C. REAL PROPERTY INVENTORY NUMBER: 1823

D. YEAR CONSTRUCTION COMPLETED: Acquired 1944
Year construction unknown

E. PURPOSE OF STRUCTURE: Storage, recreation

F. TYPE OF DAM/DIKE: Earth, dam, concrete spillway

G. PRIMARY CONSTRUCTION MATERIAL: Concrete - *Earth*

H. HEIGHT OF DAM/DIKE STRUCTURE, HYDRAULIC: 20 feet

I. LENGTH OF DAM/DIKE STRUCTURE, HYDRAULIC: 125 feet

J. IMPOUNDING CAPACITY MAXIMUM, NORMAL: Normal (at spillway) 137 A/T
Max = same (no flashboards)

K. OWNER OF STRUCTURE: USMA

L. DESIGNER: Unknown

M. CONSTRUCTION ORGANIZATION: Unknown

N. MAINTAINED BY: USMA

O. INSPECTION FREQUENCY: Annually

P. DATE LAST INSPECTED: April 1976

Q. ACTIVITY INSPECTING STRUCTURE: IFS - USMA

1. SIZE CLASSIFICATION:

a. CATEGORY: Small

b. CAPACITY: 137 AC Ft.

c. HEIGHT: 20 feet

2. HAZARD POTENTIAL CLASSIFICATION:

a. CATEGORY: Significant

b. LOSS OF LIFE: Few

c. ECONOMIC LOSS: Appreciable

City or county in which dam is located . . .

Name of dam LAKE FREDERICK

a. Popular name of dam if other than above . . .

b. Name of reservoir if other than that of dam . . .

3. Year of completion . . .

If under construction give estimated completion thus: C/1976 . . . (NOT C-1976-10-10)

If proposed mark thus: P . . .

4. Location: (a) River or stream . . .

(b) Nearest city downstream . . .

(c) Latitude and longitude . . . 74-05-50
41-20-17

5. Type of dam (Earth, Rockfill, Gravity, Buttress Arch, Multi-Arch) . . .

6. Height above lowest point in foundation . . . feet

7. Hydraulic height (Maximum water surface to upstream base of dam) . . . feet

8. Volume content of dam . . . cu. yd.

a. Maximum capacity of reservoir . . . acre-feet

b. Normal capacity of reservoir . . . acre-feet

9. Axial length of dam at top . . . feet

10. Elevation at top of dam . . . feet

11. Purposes (Irrigation, hydroelectric, flood control, navigation, water supply, recreation) . . .

12. Type of spillway (Uncontrolled or controlled)

a. Elevation of crest . . . feet

b. Width of spillway . . . feet

c. Maximum design discharge . . . cfs

13. Crest . . .

14. Engineering by . . .

15. Construction by . . .

16. Construction of . . .

17. Construction of . . .

18. Construction of . . .

19. Remarks: