AD-A091 274 NEW YORK STATE DEPT OF ENVIRONMENTAL CONSERVATION ALBANY F/G 13/13
NATIONAL DAM SAFETY PROGRAM. HELDERBERG LAKE DAM (INVENTORY NUM--ETC(U)
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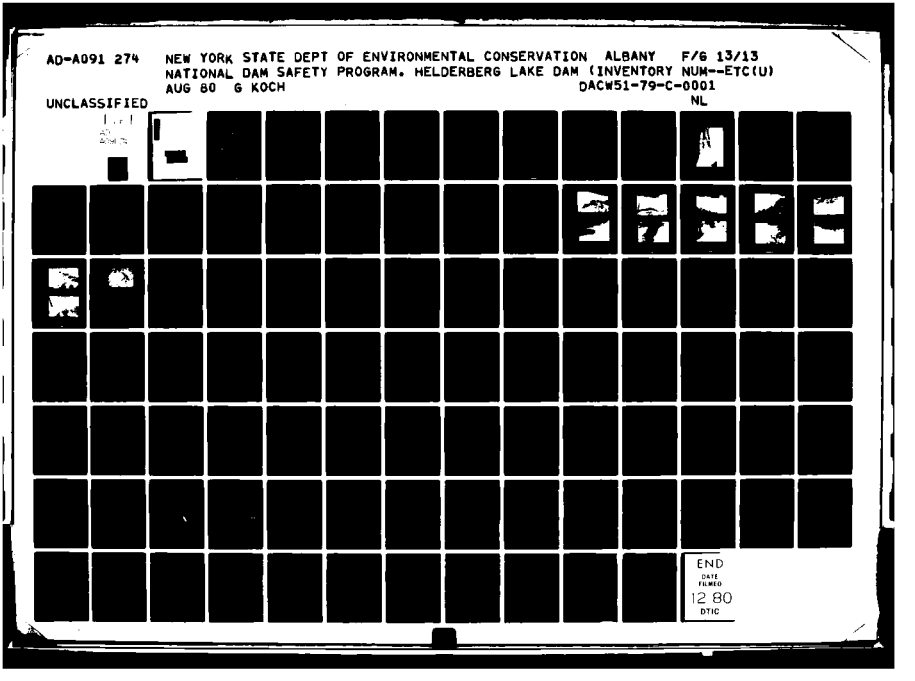

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Visual Inspection
Hydrology, Structural Stability

Helderberg Lake Dam
Albany County
Onesquethaw Creek

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 visual inspection of Helderberg Lake Dam and appurtenant structures did not reveal conditions which constitute a hazard to human life or property. The discharge capacity of the spillway is inadequate for all storms in excess of 50% of the PMF (Probable Maximum Flood). During the

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1/2 PMF event the water surface will approximate the top of dam elevation and the outflow will be 2100 cfs.

The following problem areas were observed which require remedial action within 1 year of notification to the owner:

1. Monitor and repair as required the erosion on the downstream slope of the dam adjacent to the spillway and the downstream channel.

2. Monitor at biweekly intervals with the aid of weirs the seepage observed at the outlet of the reservoir drain and the left downstream end of the spillway.

3. Repair the concrete surfaces of the spillway and periodically monitor the tilt of the spillway walls.

4. Restore the deteriorated masonry wall and the inspection reservoir drain.

5. Remove the vegetative growth on the embankment. Provide a program of periodic cutting and mowing of the embankment surfaces.

6. 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. Also develop an emergency action plan.

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.

PHASE I INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM
HELDERBERG LAKE DAM I.D. NO. 276
DEC # 190D-1294 LOWER HUDSON RIVER BASIN
ALBANY COUNTY

TABLE OF CONTENTS

PHASE I INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM

Name of Dam:	Helderberg Lake Dam(I.D. No. NY 276)
State Located:	New York
County Located:	Albany
Stream:	Onesquethaw Creek
Dates of Inspection:	November 27, 1979, January 25, 1980

ASSESSMENT

The examination of documents and visual inspection of Helderberg Lake Dam and appurtenant structures did not reveal conditions which constitute a hazard to human life or property. The discharge capacity of the spillway is inadequate for all storms in excess of 50% of the PMF (Probable Maximum Flood). During the 1/2 PMF event the water surface will approximate the top of dam elevation and the outflow will be 2100 cfs.

The following problem areas were observed which require remedial action within 1 year of notification to the owner:

1. Monitor and repair as required the erosion on the downstream slope of the dam adjacent to the spillway and the downstream channel.

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4. Restore the deteriorated masonry wall and the inspection reservoir drain.

5. Remove the vegetative growth on the embankment. Provide a program of periodic cutting and mowing of the embankment surfaces.

6. 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. Also develop an emergency action plan.

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

Approved By:

Col.W. M. Smith Jr.
New York District Engineer

Date: 15 AUG 1980

Photo #1
Overview of Helderberg Lake Dam

PHASE I INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM
Helderberg Lake Dam I.D. No. 276
DEC #190D-1294 Lower Hudson River Basin
Albany County, New York

SECTION 1: PROJECT INFORMATION

1.1 GENERAL

a. Authority

The Phase 1 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 remedial measures where necessary.

1.2 DESCRIPTION OF PROJECT

Helderberg Lake Dam consists of a 285 foot long earth embankment with concrete cutoff wall and a 55 foot wide concrete, channel spillway. The maximum height above the original stream bed is approximately 35 feet. Both the upstream and downstream slopes of the earth embankment are 1 vertical to 2 horizontal, and the crest width is 12 feet. The dam was reconstructed in 1944 after a failure of the original structure in 1938. The spillway crest was increased in length from 35 feet to 55 feet and lowered 2 feet. The original cutoff wall which is founded on bedrock was lengthened and increased in height by 2.25 feet. A 20" drain pipe was installed and incorporated into the tunnel that was in the original dam. The pipe has a manual control through the crest of the dam. There is a masonry retaining wall around the outlet of the tunnel at the toe of the embankment.

b. Location

The dam is located on Onesquethaw Creek, a tributary to Coeymans Creek and Hudson River, approximately 3 miles west of Clarksville, New York.

c. Size

The dam is approximately 35 feet high and impounds 180 acre feet at normal water elevation. The dam is classified as "small" in size (less than 40 feet in height).

d. Hazard Classification

The dam is classified as high hazard due to its location, about 3 miles west of the Village of Clarksville. The failure of the original dam created significant flooding to the village.

e. Ownership

The dam is owned and operated by Helderberg Lake community Association, Inc., Rd #1 Box 150, East Berne, NY 12059, Mr. Edward Hopkins, President, tel. (518)872-0419.

f. Purpose of the Dam
The dam provides storage for recreational purposes.

g. Design and Construction History
The reconstruction of the original dam was designed by Leo Westfall, Altamont, New York in 1944 for Helderberg Lake Association. It is not known who constructed the dam. The original dam was constructed by the United Construction Company in 1926 for F.A. Becker and the downstream slope failed during a storm in September 1938. The upstream earth portion of the dam and the core wall, however, remained intact. The cause of the failure was attributed to overtopping (See Memorandum of July 26, 1944 in Appendix E).

h. Normal Operating Procedure
All water releases from Helderberg Lake pass over the spillway as the manual gate has not been in use for some time. There is no control of the channel spillway.

1.3 PERTINENT DATA

a. Drainage Area (sq. mi.)	2.33
b. Elevations (ft./USGS)	
Top of Dam	1359.
Spillway Crest	1354.
Reservoir Drain	1328.
c. Reservoir (acres)	
Surface Area @ Top of Dam	38.
Surface Area @ Spillway Crest	27.
d. Storage (acre-feet)	
Top of Dam	330.
Spillway Crest	172.

e. Dam
Type: Earth and rockfill embankment with a concrete core wall.

Length (ft.):	285.
Height (ft.):	35.
Upstream Slope	1:2
Downstream Slope	1:2

f. Spillway: Ungated, Reinforced
Type: Concrete Channel, creating a broad crested weir control

Length (ft.):	55.
Capacity (cfs):	2100

g. Reservoir Drain
Type: 20" cast iron pipe which runs into the original masonry tunnel through the dam.
Control: Manual valve on crest of dam.

Capacity (cfs)	30 cfs

SECTION 2: ENGINEERING DATA

2.1 GEOLOGY

The Helderberg Lake Dam is located in the glaciated portion of the Appalachian Uplands (northern extreme of the Appalachian Plateau) physiographic province of New York State. These uplands were formed by the dissection of the uplifted but flat lying sandstones, siltstones and shales of the Lower and Middle Devonian Period (395 to 365 million years ago). The plateau surface is represented by flat-topped divides with drainage generally southward. Drainage in the vicinity of the dam is generally eastward over the Helderberg Escarpment.

Glacial cover is generally thin, the deposits of which have resulted from glaciations during the Wisconsin glaciation, approximately 11,000 years ago.

The "Preliminary Brittle Structures Map of New York" developed by Ynguar W. Isachsen and William G. McKendree (dated 1977), does not indicate the presence of any faulting or other brittle deformations within the vicinity of the dam and impoundment.

2.2 SUBSURFACE INVESTIGATION

No subsurface investigation could be located for the dam. The "General Soil Map of New York State" prepared by Cornell University Agriculture Experiment Station indicates that the surficial soils are the Farmington series of glacial till origin. These soils are formed on thin glaciated till and ice-fractured bedrock from and over limestone, and are composed of stony silt, some sand and a trace of clay. The permeability is low and runoff is generally moderate. The depth to bedrock is normally about 2 feet. Bedrock was observed outcropping in the downstream channel and at both abutments of the dam.

2.3 DAM AND APPURTENANT STRUCTURES

The original dam was constructed by the United Construction Company, Albany New York, in 1926 for Mr. Fred A. Becker. The downstream slope below the core wall failed by overtopping during a storm in September 1938. The upstream portion of the dam and the core wall remained intact. A detailed account of an inspection after the failure is included in Appendix E.

The dam was reconstructed in 1944 to its present configuration. This design was prepared by Leo B. Westfall P.E. The contractor is unknown. All available plans and details have been included in Appendix E.

2.4 CONSTRUCTION RECORDS

The only construction records available are those found in the NYSDEC Dam Safety files concerning certain construction modifications and testing of the aggregate for use in the concrete of the structure.

2.5 OPERATION RECORD

No operation records are maintained for the dam.

2.6 EVALUATION OF DATA

The data presented in this report has been compiled from information obtained from Mr. Edward Hopkins, President of the Helderberg Lake Community Association Inc., Mrs. Yvonne Farmer, resident, and the NYS Department of Environmental Conservation files. This information appears adequate and reliable for Phase I Inspection purposes.

SECTION 3: VISUAL INSPECTION

3.1 FINDINGS

a. General

Visual inspection of Helderberg Lake Dam and the surrounding watershed was conducted on November 27, 1979 and January 25, 1980. The weather was clear and the temperature ranged in the thirties. The reservoir level at the times of the inspections was approximately 0.2 feet above spillway crest.

b. Embankment

The earth embankment shows no signs of major distress, some erosion is taking place near the left spillway abutment (See Photo #13) and along each side of the channel walls. Erosion on the downstream slope can be seen on Photo #10. Trees and low brush were growing on both sides of the downstream slope, there were also some trees on the crest of the dam. The concrete core wall which is exposed on the upstream side of the embankment and also acts as a wavebreak appears to be in good shape with little deterioration. (See Photo #3)

Erosion of the original grade on the left side of the spillway was evident and should be monitored periodically. (See Photo #6) The downstream slope on the right side of the spillway is very steep and should also be monitored for signs of erosion. (See Photos #8, 9 & 10)

c. Seepage

There was a notable flow eminating from the toe of the dam. (See Photo #12) The flow was clear and seemed to come primarily through the collapsed masonry outlet wall (See Photo #11); is assumed to be caused by a leaking valve on the drain pipe, flow is estimated to be 10 to 15 gpm. On both inspection visits to the dam the spillway was flowing, hampering close inspection around the spillway. It appeared to be in good condition although erosion along each side was taking place, apparently from surface runoff. A 2" drain pipe was located along the left spillway channel wall, no flow was emanating at the time of inspection. Seepage was evident on the left side of the spillway (downstream edge) emanating from a crack at the intersection of the spillway wall and the spillway slab. The flow estimated to be less than 10 gpm was clear with no indication of particle migration. It is recommended that further investigation look into seepage around and under the spillway during a period when the spillway is not operating. (See Photos #6 & 7)

d. Spillway

The uncontrolled spillway is located on the left side of the embankment and appears to be founded on shale and sandstone bedrock. The concrete is in generally good condition, although some movement and cracking of the spillway slab and walls was noted. Different movement of the spillway walls up to 1/2 inch was observed. This movement is believed to be related to backfill pressures, but is not considered a significant problem at this time. (See Photos #4 & 6)

e. Downstream Channel

The downstream channel is shale and sandstone bedrock. Which some surface erosion of the channel slopes was observed, due to the steep slope, significant erosion affecting the stability of the spillway is unlikely due to the integrity of the bedrock. (See Photo #5)

f. Reservoir

No sedimentation problems or instability was reported within the reservoir area.

g. Reservoir Drain

The reservoir drain, consisting of a 20" diameter intake pipe, a valve with a stem at the crest of the dam (See Photos #2 & 14), and a concrete and masonry outlet chamber, has not been operated since the 1940's. The outlet chamber is buried beneath backfill at the toe of the dam and the deteriorated masonry wall. (See Photos #9, 11 & 12)

3.2 EVALUATION OF OBSERVATIONS

The problem areas observed during the inspections and the recommended remedial actions are as follows:

1. Erosion was evident on the downstream slope of the dam adjacent to the spillway and on the slopes of the downstream channel. Monitor this erosion and repair as required.

2. Seepage was observed at the left downstream end of the spillway and below the reservoir drain. Monitor the seepage at bi-weekly intervals with the aid of weirs.

3. Cracking and movement of the spillway walls and slab was noted. Repair these surfaces and monitor the walls for signs of ongoing movement.

4. The reservoir drain is inoperative and the outlet is buried by backfill and the deteriorated masonry wall. Restore the wall and remove the backfill to expose this outlet. Ascertain the condition of the drain system and restore it to operating condition.

5. Remove all tree and brush growth from the embankment surfaces. Provide a program of periodic cutting and mowing of the embankment surfaces.

6. 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. Also develop an emergency action plan.

SECTION 4: OPERATION AND MAINTENANCE PROCEDURES

4.1 PROCEDURES

The normal water surface elevation is approximated by the crest of the spillway. Since the reservoir drain has not been operated for many years all flows are discharged over the spillway.

4.2 MAINTENANCE OF THE DAM

Maintenance of the dam is provided by the owner, Helderberg Lake Community Association, Inc. Maintenance is not considered satisfactory due to the inoperative reservoir drain, trees and brush on the dam, seepage at the left abutment of the spillway, erosion of portions of the downstream slope and deterioration of the spillway concrete.

4.3 WARNING SYSTEM

There is no warning system in effect as 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 CHARACTERISTICS

Helderberg Lake Dam is located on the Onesquethaw Creek approximately 3 miles west of Clarksville, through which the Onesquethaw runs. The total drainage area at Helderberg Dam is 2.33 square miles. The topography is generally of mild slopes interspersed with some swamps.

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 model. The unit hydrograph was defined by the "Snyder Synthetic Unit Hydrograph" and the "Modified Puls" routing procedure was incorporated. The Probable Maximum Precipitation (PMP) was 19.5 inches (24 hrs., 200 sq. mile) from Hydrometeorological Report #33. The floods selected for analysis were the PMF and the 1/2 PMF in accordance with the recommended guidelines of the Corps of Engineers.

5.3 SPILLWAY CAPACITY

The Helderberg Lake Dam spillway is an ungated concrete channel, forming an 18" wide weir, 55' long. The structure was rebuilt in 1944 after failure of the structure and embankment in September 1938. The spillway has a capacity of 2100 cfs at top of dam. Due to routing this has the capacity to pass the 1/2 PMF event. The 1/2 PMF is 2250 cfs and the full PMF is 4500 cfs into the lake. The dam is overtopped by 1.5 feet during the full PMF.

5.4 RESERVOIR CAPACITY

Capacity to normal water elevation is 172 acre feet. Surcharge storage to top of dam is an additional 158 acre feet, creating a total storage capacity of 330 acre feet to top of dam. The surcharge storage between the spillway crest and top of dam is equivalent to 1.27 inches of runoff.

5.5 FLOODS OF RECORD

There have been no recorded events since the dam was rebuilt in 1944.

5.6 OVERTOPPING POTENTIAL

The PMF analysis indicates the dam will be overtopped by 1.5 feet during the PMF and pass the 1/2 PMF. The reservoir has not enough storage to reduce the peak flow of a major storm event. Flooding would occur in Clarksville, but this would happen whether or not Helderberg Lake Dam was in existance due to the low in bank capacity of the stream and low lying areas of Clarksville.

5.7 EVALUATION

The spillway is inadequate to pass the PMF flow of 4500 cfs, but is adequate to pass 1/2 of the PMF.

SECTION 6: STRUCTURAL STABILITY

6.1 EVALUATION OF STRUCTURAL STABILITY

a. Visual Observations

No signs of major distress were observed in connection with the earth embankment or spillway. The original dam built in 1926 was overtopped in September 1938 due to an inadequate spillway. In 1944 the spillway was modified and the downstream slope of the earth embankment repaired to its present configuration. The present capacity of the spillway is adequate to discharge the 1/2 PMF event.

b. Design and Construction Data

No design or construction data could be located concerning the structural stability of the embankment section of the dam.

c. Post Construction Changes

The original dam built in 1926 by the United Construction Company, Albany N.Y. for Mr. F.A. Becker, was overtopped in September 1938. The original spillway constructed was substantially smaller than that approved by the "Inspection of Docks and Dams." Overtopping of the dam resulted in erosion of the downstream portion of the embankment below the core wall. The upstream embankment portion and the core wall remained intact. Repairs were initiated in 1944 to repair the embankment and modify the spillway to increase its capacity. (See Memorandum of July 26, 1944 in Appendix E).

SECTION 7: ASSESSMENT/RECOMMENDATIONS

7.1 ASSESSMENT

a. Safety

The Phase I Inspection of Helderberg Lake Dam did not reveal any conditions which constitute an immediate hazard to human life or property. The embankment portion of the dam is not considered unstable. The dam, however, has a number of problem areas which require remedial attention.

b. Adequacy of Information

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

c. Need for Additional Investigation

No additional investigations are required at this time.

d. Urgency

The areas requiring remedial action should be initiated within 3 months and completed within 1 year of notification to the owner.

7.2 RECOMMENDED MEASURES

1. Monitor the erosion on the downstream slope of the dam adjacent to the spillway and on the slopes of the downstream channel and repair as required.

2. Monitor the seepage observed at the left downstream end of the spillway and below the reservoir drain, at bi-weekly intervals with the aid of weirs. If quantities of seepage increase significantly, immediately notify the NYS DEC Dam Safety Section at (518)457-5557.

3. Repair the cracked and deteriorated portions of the spillway walls and slabs. Monitor these walls for signs of ongoing movement.

4. Restore the masonry wall and the reservoir drain to operating condition.

5. Remove all tree and brush growth from the embankment surfaces and provide a program of periodic cutting and mowing of these surfaces.

6. 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. Also develop an emergency action plan.

APPENDIX A

PHOTOGRAPHS

Photo #2
Crest of Embankment
(Concrete Core Wall at right)

Photo #3
Upstream Face

Photo #4
Spillway & left Abutment

Photo #5
Downstream Channel

Photo #6
Spillway
Note Crack in Wall

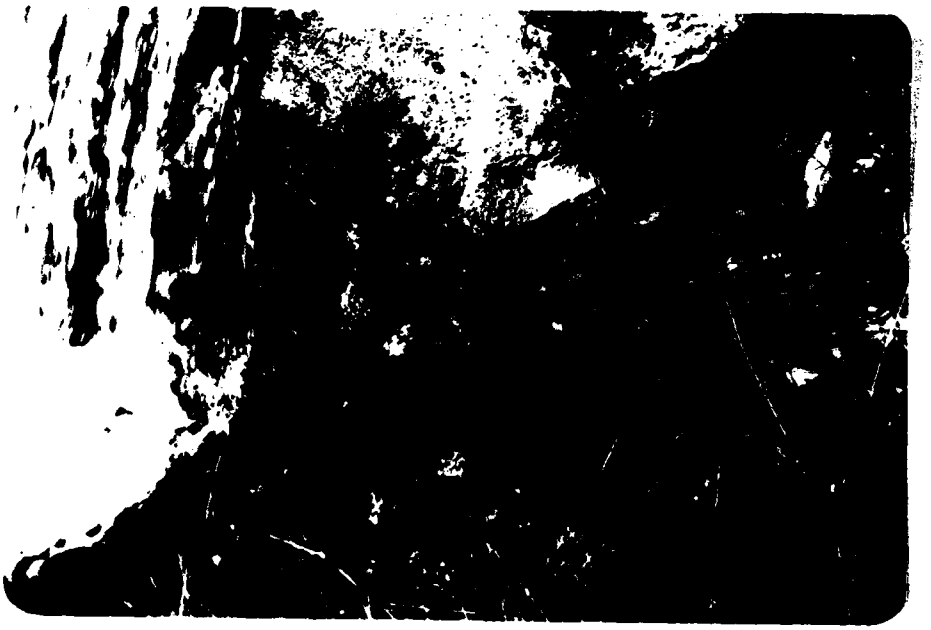

Photo #7
Seepage at Base of Spillway

Photo #8
Downstream Slope

Photo #9
Right Abutment

Photo #10
Downstream Slope
Viewed from toe

Photo #11
Masonry Wall at Toe

Photo #12
Toe of Masonry Wall
Note deterioration & seepage

Photo #13
Left Downstream Channel Bank
Note Erosion

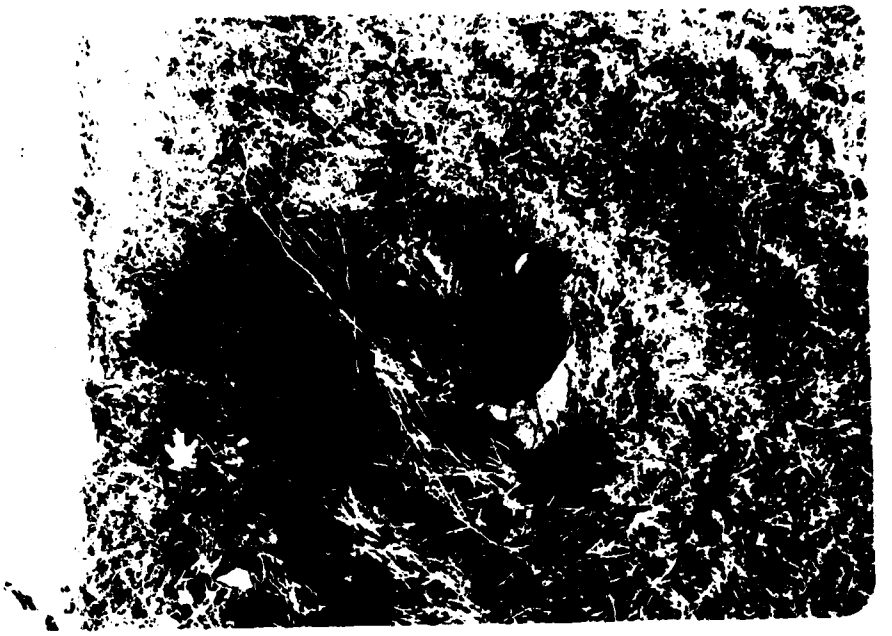

Photo #14
Value Extention at Crest
for Reservoir Drain

APPENDIX B

VISUAL INSPECTION CHECKLIST

VISUAL INSPECTION CHECKLIST

1) **Basic Data**

a. General

Name of Dam HELDERBERG LAKE DAM.

Fed. I.D. # [illegible] DEC Dam No. [illegible]

River Basin [illegible]

Location: Town BERNE County ALBANY

Stream Name ONESQUETHAW

Tributary of [illegible]

Latitude (N) 42° 35' Longitude (W) 74° 00'

Type of Dam [illegible]

Hazard Category C

Date(s) of Inspection Nov. 7, 1977 ; JAN. 25, 1979

Weather Conditions clear, cold

Reservoir Level at Time of Inspection 2" OVER SPILLWAY CREST

b. Inspection Personnel [illegible]

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

Mr Edward Hopkins, Pres.

Helderberg Lake Assoc

Clarksville NY 12059

(518) 872-0419

d. History:

Date Constructed 1926 Date(s) Reconstructed 1994

Designer [illegible]

Constructed By [illegible]

Owner [illegible]

2) Embankment

a. Characteristics

(1) Embankment Material Earth, Small portion rock fill

(2) Cutoff Type concrete to bedrock

(3) Impervious Core Concrete

(4) Internal Drainage System

(5) Miscellaneous

b. Crest

(1) Vertical Alignment good

(2) Horizontal Alignment good

(3) Surface Cracks none

(4) Miscellaneous top of crest - must be mowed

c. Upstream Slope

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

(2) Undesirable Growth or Debris, Animal Burrows None

(3) Sloughing, Subsidence or Depressions Some slight sloughing

(4) Slope Protection —

(5) Surface Cracks or Movement at Toe NONE

d. Downstream Slope

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

(2) Undesirable Growth or Debris, Animal Burrows MANY trees left embankment

(3) Sloughing, Subsidence or Depressions much erosion due to runoff - must be filled & protected, some rock fill displaced, outlet wall CAVED IN (SEE PHOTOS)

(4) Surface Cracks or Movement at Toe (outlet wall)

(5) Seepage through drain (ASSUMED) exiting from CAVED WALL

(6) External Drainage System (Ditches, Trenches; Blanket) —

(7) Condition Around Outlet Structure CAVED

(8) Seepage Beyond Toe NONE APPARENT

e. Abutments - Embankment Contact

good.

(1) Erosion at Contact SOME, MINOR

(2) Seepage Along Contact NONE APPARENT

3) Drainage System

a. Description of System NONE ON PLANS, ONLY PIPE ALONG SPILLWAY WALLS

b. Condition of System

c. Discharge from Drainage System None @ time of inspection

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

NONE

5) Reservoir

a. Slopes _____

b. Sedimentation [illegible]

c. Unusual Conditions Which Affect Dam _____

6) Area Downstream of Dam

a. Downstream Hazard (No. of Homes, Highways, etc.) SEVERAL HOMES in floodplain between dam & CLARKSVILLE 2nd. CONSTRUCTION.

b. Seepage, Unusual Growth NONE

c. Evidence of Movement Beyond Toe of Dam NONE

d. Condition of Downstream Channel _____

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

CONCRETE CHANNEL, BK. CR. WEIR

a. General _____

b. Condition of Service Spillway _____

c. Condition of Auxiliary Spillway NONE

d. Condition of Discharge Conveyance Channel _____

8) Reservoir Drain/Outlet

Type: Pipe ✓ Conduit _____ Other _____

Material: Concrete _____ Metal ✓ Other _____

Size: 30" Length 65'

Invert Elevations: Entrance 1328 Exit _____

Physical Condition (Describe): Unobservable ✓

Material: CAST IRON

Joints: _____ Alignment _____

Structural Integrity: _____

Hydraulic Capability: 30 cfs

Means of Control: Gate _____ Valve ✓ Uncontrolled _____

Operation: Operable _____ Inoperable ✓ Other _____

Present Condition (Describe): possibly operable if well to VALVE cleaned out, CAVED WALL probably would restrict flow

9) Structural

a. Concrete Surfaces good, SOME CRACKING EVIDENT ON SPILLWAY SURFACE & WALLS - RECOMMEND POINTING

b. Structural Cracking SEE ABOVE

c. Movement - Horizontal & Vertical Alignment (Settlement) SOME TILTING OF SPILLWAY WALLS, SOME SLIGHT IN SPILLWAY SURFACE CAUSING THE CRACKING

d. Junctions with Abutments or Embankments good, slight erosion

e. Drains - Foundation, Joint, Face ONLY EVIDENT ALONG SPILLWAY WALLS.

f. Water Passages, Conduits, Sluices

g. Seepage or Leakage NO SEEPAGE EVIDENT, SOME LEAKAGE believed to be through drain.

h. Joints - Construction, etc. _____

i. Foundation _____

j. Abutments _____

k. Control Gates NONE

l. Approach & Outlet Channels GOOD COND.

m. Energy Dissipators (Plunge Pool, etc.) NONE

n. Intake Structures NONE

o. Stability _____

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

AREA-CAPACITY DATA:

	Elevation (ft.)	Surface Area (acres)	Storage Capacity (acre-ft.)
1) Top of Dam	1359.	39	330
2) Design High Water (Max. Design Pool)	—	—	—
3) Auxiliary Spillway Crest	—	—	—
4) Pool Level with Flashboards	—	—	—
5) Service Spillway Crest	1354.	27.	172.

DISCHARGES

	Volume (cfs)
1) Average Daily	4.5
2) Spillway @ Maximum High Water	2090. (TOP OF DAM.)
3) Spillway @ Design High Water	—
4) Spillway @ Auxiliary Spillway Crest Elevation	—
5) Low Level Outlet	30.
6) Total (of all facilities) @ Maximum High Water	2070.
7) Maximum Known Flood	
8) At Time of Inspection	20 cfs.

CREST: ELEVATION: 1359.0

Type: EARTH, Rockfill Concrete core wall

Width: 12.' Length: 295'

Spillover NONE

Location —

SPILLWAY:

SERVICE		AUXILIARY
1359.	Elevation	—
Concrete channel	Type	—
55'	Width	—
	Type of Control	
295	Uncontrolled	—
	Controlled:	
—	Type (Flashboards; gate)	—
—	Number	—
—	Size/Length	—
	Invert Material	—
	Anticipated Length of operating service	—
70'	Chute Length	—
2'	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):

None.

DRAINAGE AREA: 2.33 Mi.²

DRAINAGE BASIN RUNOFF CHARACTERISTICS:

Land Use - Type: Agricultural / Rural Resid

Terrain - Relief: Mild.

Surface - Soil: thin glacial till & talus

Runoff Potential (existing or planned extensive alterations to existing (surface or subsurface conditions)

No planned alterations.

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

heavy sediment loading

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

low lying homes & cottages

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

Location: —

Elevation: —

Reservoir:

Length @ Maximum Pool .4 (Miles)

Length of Shoreline (@ Spillway Crest) 1 (Miles)

```
**********                                                    **********
FLOOD HYDROGRAPH PACKAGE (HEC-1)                              NEW YORK STATE
DAM SAFETY VERSION     JULY 1978                              DEPT OF ENVIRONMENTAL CONSERVATION
  LAST MODIFICATION  26 FEB 79                                FLOOD PROTECTION BUREAU
  MODIFIED FOR HONEYWELL APR 79
**********                                                    **********
```

```
    1              A1   HELDERBERG LAKE
    2              A2  PHASE I
    3              A3  PMF
    4              B    200       0      15       0       0       0       0       0       0       0
    5              B1     5

    6              J      1       2       1

    7              J1    .5       1

    8              K      0       1                       2               1

    9              K1   INFLOW FROM BASIN

   10              M      1       1    2.33

   11              P      0    19.5     111     123     133     142

   12              T                                                       1      .1

   13              W   2.50    .625

   14              X   -2.0    -.05       1

   15              K      1       1                       2               1

   16              K1   ROUTE THROUGH RESERVOIR

   17              Y                                  1       1

   18              Y1     1                                                -1354.0      -1

   19              Y4  1354    1355    1356    1357    1358    1359    1360

   20              Y5     0     150     470    1000    1500    2100    2680

   21              $S     0    12.5    52.5    83.7   123.1   171.9   229.1   294.3   368.7   451.4

   22              $S 541.6

   23              $E  1340    1344    1348    1350    1352    1354    1356    1358    1360    1362

   24              $E  1364

   25              $$  1354

   26              $D  1359       3     1.5     285

   27              K     99

   28              A

   29              A

   30              A
```

PREVIEW OF SEQUENCE OF STREAM NETWORK CALCULATIONS

RUNOFF HYDROGRAPH AT	1
ROUTE HYDROGRAPH TO	1

END OF NETWORK

```
**********                                          **********
FLOOD HYDROGRAPH PACKAGE (HEC-1)                    NEW YORK STATE
DAM SAFETY VERSION      JULY 1978                   DEPT OF ENVIRONMENTAL CONSERVATION
  LAST MODIFICATION  26 FEB 79                      FLOOD PROTECTION BUREAU
  MODIFIED FOR HONEYWELL APR 79
**********                                          **********

RUN  DATE 07/14/80
                    HELGENBERG LAKE
                    PHASE I
                    PMF

                                JOB SPECIFICATION
      NC      NHR     NMIN     IDAY      IHR     IMIN    METRC     IPLT     IPRT    NSTAN
     200        0       15        0        0        0        C        0        0        0
                          JOPER      NWT    LROPT    TRACE
                              5        0        0        C

                          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   ICOMP   IECON   ITAPE   JPLT    JPRT    INAME  ISTAGE   IAUTO
                         1       0       0       0       2       C       1       0       0

                              HYDROGRAPH DATA
        IHYDG     IUHG    TAREA     SNAP    TRSDA    TRSPC    FAILC    ISNOW    ISAME    LOCAL
            1        1     2.33       0.     2.33       0.       0.        0        0        0

                              PRECIP DATA
                    SPFE      PMS       R6      R12      R24      R48      R72      R96
                      0.    19.50   111.00   123.00   133.00   142.00       C.       0.
TRSPC COMPUTED BY THE PROGRAM IS 0.800

                              LOSS DATA
      LROPT    STRKR    DLTKR    RTIOL    ERAIN    STRKS    RTIOK    STRTL    CNSTL    ALSMX    RTIMP
          0       C.       0.     1.00       0.       0.     1.00     1.00     0.10       0.       0.

                          UNIT HYDROGRAPH DATA
                        TP=  2.50    CP=0.63    NTA=  C

                              RECESSION DATA
                    STRTQ=   -2.00    QRCSN=   -0.05    RTIOR= 1.00
APPROXIMATE CLARK COEFFICIENTS FROM GIVEN SNYDER CP AND TP ARE TC=11.13 AND R= 9.29 INTERVALS

          UNIT HYDROGRAPH 56 END-OF-PERIOD ORDINATES, LAG=  2.52 HOURS, CP= C.63  VOL= 1.00
      12.     44.     88.    140.    195.    253.    305.    345.    372.    384.
     381.    356.    320.    288.    258.    232.    208.    187.    168.    151.
     135.    122.    109.     98.     89.     79.     71.     64.     57.     51.
      46.     41.     37.     33.     30.     27.     24.     22.     19.     17.
      16.     14.     13.     11.     10.      9.      8.      7.      7.      6.
       5.      5.      4.      4.      3.      3.

0                                   END-OF-PERIOD FLOW
```

1.01	0.45	3	0.00	0.	[illegible]	5.	1.02	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	9.
1.01	1.00	4	0.00	0.	0.00	5.	1.02	2.00	104	0.03	0.00	0.03	9.
1.01	1.15	5	0.00	0.	0.00	5.	1.02	2.15	105	0.03	0.00	0.03	9.
1.01	1.30	6	0.00	0.	0.00	5.	1.02	2.30	106	0.03	0.00	0.03	9.
1.01	1.45	7	0.00	0.	0.00	5.	1.02	2.45	107	0.03	0.00	0.03	9.
1.01	2.00	8	0.00	0.	0.00	5.	1.02	3.00	108	0.03	0.00	0.03	9.
1.01	2.15	9	0.00	0.	0.00	5.	1.02	3.15	109	0.03	0.00	0.03	9.
1.01	2.30	10	0.00	0.	0.00	5.	1.02	3.30	110	0.03	0.00	0.03	10.
1.01	2.45	11	0.00	0.	0.00	5.	1.02	3.45	111	0.03	0.00	0.03	10.
1.01	3.00	12	0.00	0.	0.00	5.	1.02	4.00	112	0.03	0.00	0.03	10.
1.01	3.15	13	0.00	0.	0.00	5.	1.02	4.15	113	0.03	0.00	0.03	10.
1.01	3.30	14	0.00	0.	0.00	5.	1.02	4.30	114	0.03	0.00	0.03	10.
1.01	3.45	15	0.00	0.	0.00	5.	1.02	4.45	115	0.03	0.00	0.03	10.
1.01	4.00	16	0.00	0.	0.00	5.	1.02	5.00	116	0.03	0.00	0.03	10.
1.01	4.15	17	0.00	0.	0.00	5.	1.02	5.15	117	0.03	0.00	0.03	10.
1.01	4.30	18	0.00	0.	0.00	5.	1.02	5.30	118	0.03	0.00	0.03	10.
1.01	4.45	19	0.00	0.	0.00	5.	1.02	5.45	119	0.03	0.00	0.03	10.
1.01	5.00	20	0.00	0.	0.00	5.	1.02	6.00	120	0.03	0.00	0.03	10.
1.01	5.15	21	0.00	0.	0.00	5.	1.02	6.15	121	0.04	0.05	0.03	11.
1.01	5.30	22	0.00	0.	0.00	5.	1.02	6.30	122	0.09	0.05	0.03	13.
1.01	5.45	23	0.00	0.	0.00	5.	1.02	6.45	123	0.08	0.05	0.03	18.
1.01	6.00	24	0.00	0.	0.00	5.	1.02	7.00	124	0.08	0.05	0.03	25.
1.01	6.15	25	0.01	0.	0.01	5.	1.02	7.15	125	0.08	0.05	0.03	35.
1.01	6.30	26	0.01	0.	0.01	5.	1.02	7.30	126	0.08	0.05	0.03	48.
1.01	6.45	27	0.01	0.	0.01	5.	1.02	7.45	127	0.08	0.05	0.03	64.
1.01	7.00	28	0.01	0.	0.01	5.	1.02	8.00	128	0.08	0.05	0.03	82.
1.01	7.15	29	0.01	0.	0.01	5.	1.02	8.15	129	0.08	0.05	0.03	101.
1.01	7.30	30	0.01	0.	0.01	5.	1.02	8.30	130	0.08	0.05	0.03	121.
1.01	7.45	31	0.01	0.	0.01	5.	1.02	8.45	131	0.09	0.05	0.03	141.
1.01	8.00	32	0.01	0.	0.01	5.	1.02	9.00	132	0.08	0.05	0.03	160.
1.01	8.15	33	0.01	0.	0.01	5.	1.02	9.15	133	0.08	0.05	0.03	177.
1.01	8.30	34	0.01	0.	0.01	5.	1.02	9.30	134	0.08	0.05	0.03	192.
1.01	8.45	35	0.01	0.	0.01	5.	1.02	9.45	135	0.08	0.05	0.03	205.
1.01	9.00	36	0.01	0.	0.01	5.	1.02	10.00	136	0.08	0.05	0.03	217.
1.01	9.15	37	0.01	0.	0.01	5.	1.02	10.15	137	0.08	0.05	0.03	228.
1.01	9.30	38	0.01	0.	0.01	5.	1.02	10.30	138	0.08	0.05	0.03	238.
1.01	9.45	39	0.01	0.	0.01	5.	1.02	10.45	139	0.08	0.05	0.03	246.
1.01	10.00	40	0.01	0.	0.01	5.	1.02	11.00	140	0.08	0.05	0.03	254.
1.01	10.15	41	0.01	0.	0.01	5.	1.02	11.15	141	0.09	0.05	0.03	261.
1.01	10.30	42	0.01	0.	0.01	5.	1.02	11.30	142	0.08	0.05	0.03	268.
1.01	10.45	43	0.01	0.	0.01	5.	1.02	11.45	143	0.08	0.05	0.03	273.
1.01	11.00	44	0.01	0.	0.01	5.	1.02	12.00	144	0.09	0.05	0.03	278.
1.01	11.15	45	0.01	0.	0.01	5.	1.02	12.15	145	0.43	0.41	0.02	287.
1.01	11.30	46	0.01	0.	0.01	5.	1.02	12.30	146	0.43	0.41	0.02	307.
1.01	11.45	47	0.01	0.	0.01	5.	1.02	12.45	147	0.43	0.41	0.02	342.
1.01	12.00	48	0.01	0.	0.01	5.	1.02	13.00	148	0.43	0.41	0.02	394.
1.01	12.15	49	0.03	0.	0.03	5.	1.02	13.15	149	0.52	0.49	0.02	468.
1.01	12.30	50	0.03	0.	0.03	5.	1.02	13.30	150	0.52	0.49	0.02	564.
1.01	12.45	51	0.03	0.	0.03	5.	1.02	13.45	151	0.52	0.49	0.02	682.
1.01	13.00	52	0.03	0.	0.03	5.	1.02	14.00	152	0.52	0.49	0.02	819.
1.01	13.15	53	0.04	0.	0.04	5.	1.02	14.15	153	0.65	0.62	0.02	971.
1.01	13.30	54	0.04	0.	0.04	5.	1.02	14.30	154	0.65	0.62	0.02	1137.
1.01	13.45	55	0.04	0.	0.04	5.	1.02	14.45	155	0.65	0.62	0.02	1311.
1.01	14.00	56	0.04	0.	0.04	5.	1.02	15.00	156	0.65	0.62	0.02	1487.
1.01	14.15	57	0.04	0.	0.04	5.	1.02	15.15	157	0.66	0.63	0.02	1660.
1.01	14.30	58	0.04	0.	0.04	5.	1.02	15.30	158	1.32	1.29	0.03	1837.
1.01	14.45	59	0.04	0.	0.04	5.	1.02	15.45	159	3.68	3.66	0.03	2060.
1.01	15.00	60	0.04	0.	0.04	5.	1.02	16.00	160	0.92	0.90	0.02	2348.
1.01	15.15	61	0.04	0.	0.04	5.	1.02	16.15	161	0.61	0.58	0.02	2677.
1.01	15.30	62	0.09	0.	0.09	5.	1.02	16.30	162	0.61	0.58	0.02	3023.
1.01	15.45	63	0.25	0.	0.25	5.	1.02	16.45	163	0.61	0.58	0.02	3373.
1.01	16.00	64	0.06	0.03	0.03	5.	1.02	17.00	164	0.61	0.58	0.02	3713.
[illegible]													

1.01	17.15	69	0.03	0.01	[illegible]	[illegible]	1.02	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	4497.
1.01	17.30	70	0.03	0.01	0.03	25.	1.02	18.30	170	0.04	0.01	0.03		4392.
1.01	17.45	71	0.03	0.01	0.03	30.	1.02	18.45	171	0.04	0.01	0.03		4216.
1.01	18.00	72	0.03	0.01	0.03	35.	1.02	19.00	172	0.04	0.01	0.03		4017.
1.01	18.15	73	0.00	0.	0.00	39.	1.02	19.15	173	0.04	0.01	0.03		3800.
1.01	18.30	74	0.00	0.	0.00	43.	1.02	19.30	174	0.04	0.01	0.03		3564.
1.01	18.45	75	0.00	0.	0.00	45.	1.02	19.45	175	0.04	0.01	0.03		3313.
1.01	19.00	76	0.00	0.	0.00	46.	1.02	20.00	176	0.04	0.01	0.03		3055.
1.01	19.15	77	0.00	0.	0.00	45.	1.02	20.15	177	0.04	0.01	0.03		2797.
1.01	19.30	78	0.00	0.	0.00	44.	1.02	20.30	178	0.04	0.01	0.03		2542.
1.01	19.45	79	0.00	0.	0.00	42.	1.02	20.45	179	0.04	0.01	0.03		2298.
1.01	20.00	80	0.00	0.	0.00	39.	1.02	21.00	180	0.04	0.01	0.03		2072.
1.01	20.15	81	0.00	0.	0.00	36.	1.02	21.15	181	0.04	0.01	0.03		1870.
1.01	20.30	82	0.00	0.	0.00	33.	1.02	21.30	182	0.04	0.01	0.03		1688.
1.01	20.45	83	0.00	0.	0.00	31.	1.02	21.45	183	0.04	0.01	0.03		1524.
1.01	21.00	84	0.00	0.	0.00	28.	1.02	22.00	184	0.04	0.01	0.03		1378.
1.01	21.15	85	0.00	0.	0.00	26.	1.02	22.15	185	0.04	0.01	0.03		1246.
1.01	21.30	86	0.00	0.	0.00	23.	1.02	22.30	186	0.04	0.01	0.03		1128.
1.01	21.45	87	0.00	0.	0.00	21.	1.02	22.45	187	0.04	0.01	0.03		1021.
1.01	22.00	88	0.00	0.	0.00	20.	1.02	23.00	188	0.04	0.01	0.03		926.
1.01	22.15	89	0.00	0.	0.00	18.	1.02	23.15	189	0.04	0.01	0.03		840.
1.01	22.30	90	0.00	0.	0.00	17.	1.02	23.30	190	0.04	0.01	0.03		763.
1.01	22.45	91	0.00	0.	0.00	16.	1.02	23.45	191	0.04	0.01	0.03		694.
1.01	23.00	92	0.00	0.	0.00	14.	1.03	0.	192	0.04	0.01	0.03		632.
1.01	23.15	93	0.00	0.	0.00	13.	1.03	0.15	193	0.	0.	0.		577.
1.01	23.30	94	0.00	0.	0.00	13.	1.03	0.30	194	0.	0.	0.		526.
1.01	23.45	95	0.00	0.	0.00	12.	1.03	0.45	195	0.	0.	0.		480.
1.02	0.	96	0.00	0.	0.00	11.	1.03	1.00	196	0.	0.	0.		438.
1.02	0.15	97	0.03	0.00	0.03	10.	1.03	1.15	197	0.	0.	0.		399.
1.02	0.30	98	0.03	0.00	0.03	10.	1.03	1.30	198	0.	0.	0.		363.
1.02	0.45	99	0.03	0.00	0.03	9.	1.03	1.45	199	0.	0.	0.		329.
1.02	1.00	100	0.03	0.00	0.03	9.	1.03	2.00	200	0.	0.	0.		298.
									SUM	22.15	18.47	3.68		109336.
										(563.)	(469.)	(94.)		(3096.05)

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	4497.	3273.	1125.	546.	109164.
CMS	127.	93.	32.	15.	3091.
INCHES		13.07	17.96	18.16	18.16
MM		331.91	456.23	461.25	461.25
AC-FT		1623.	2231.	2255.	2255.
THOLS CU M		2002.	2752.	2782.	2782.

OVF

STATION 1

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

	0.	500.	1000.	1500.	2000.	2500.	3000.	3500.	4000.	4500.	C. PRECIP(L) AND	C. EXCESS(X)	0.
	0.	0.	0.	0.	0.	0.	0.	0.	4.	3.	2.	1.	0.
0.15	1I												L
0.30	2I												L
0.45	3I												L
1.00	4I												L
1.15	5I												L
1.30	6I												L
1.45	7I												L
2.00	8I												L
2.15	9I												L
2.30	10I												L
2.45	11I												L
3.00	12I												L
3.15	13I												L
3.30	14I												L
3.45	15I												L
4.00	16I												L
4.15	17I												L
4.30	18I												L
4.45	19I												L
5.00	20I												L
5.15	21I												L
5.30	22I												L
5.45	23I												L
6.00	24I												L
6.15	25I												L
6.30	26I												L
6.45	27I												L
7.00	28I												L
7.15	29I												L
7.30	30I												L
7.45	31I												L
8.00	32I												L
8.15	33I												L
8.30	34I												L
8.45	35I												L
9.00	36I												L
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9.30	38I												L
9.45	39I												L
10.00	40I												L
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10.30	42I												L
10.45	43I												L
11.00	44I												L
11.15	45I												L
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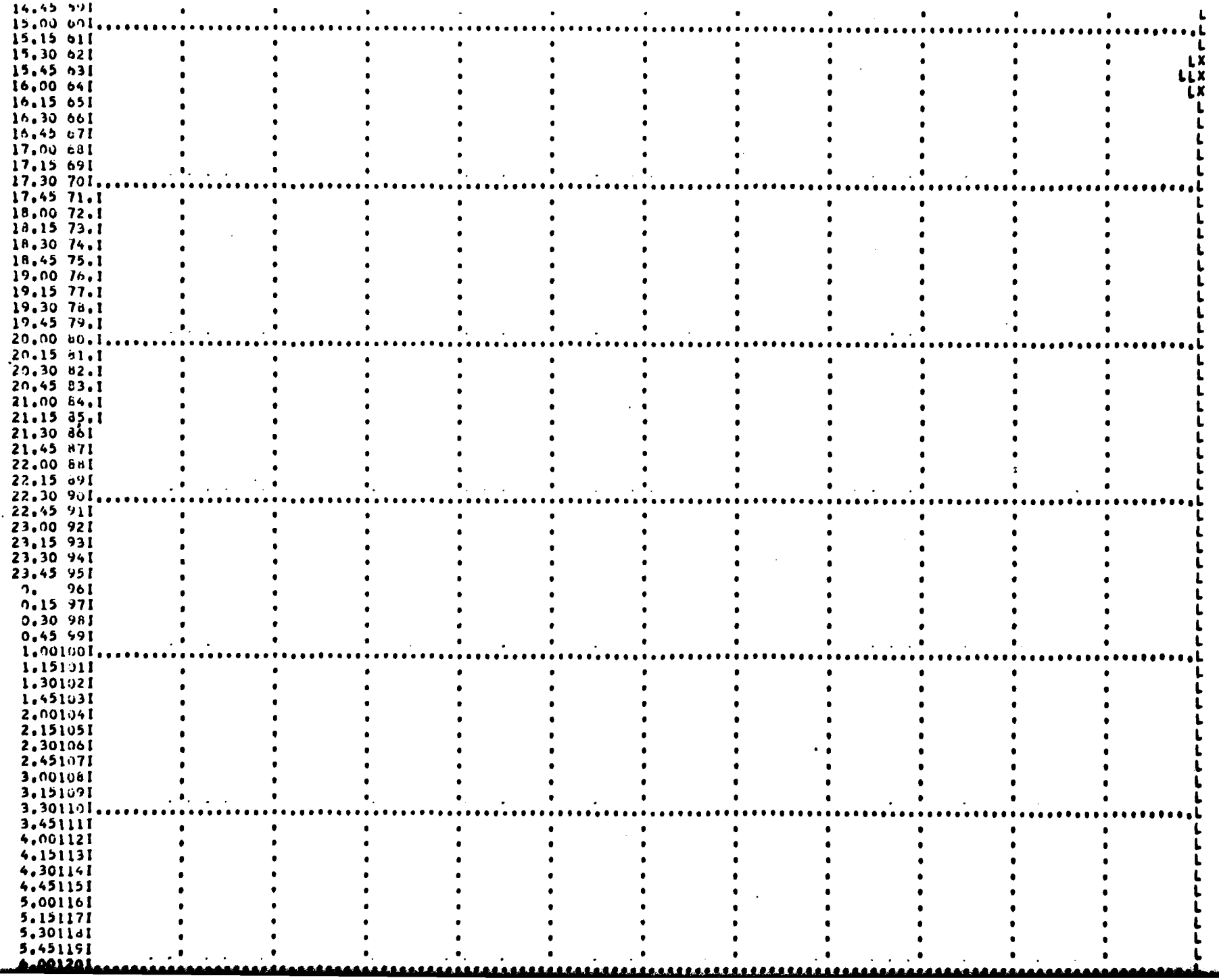
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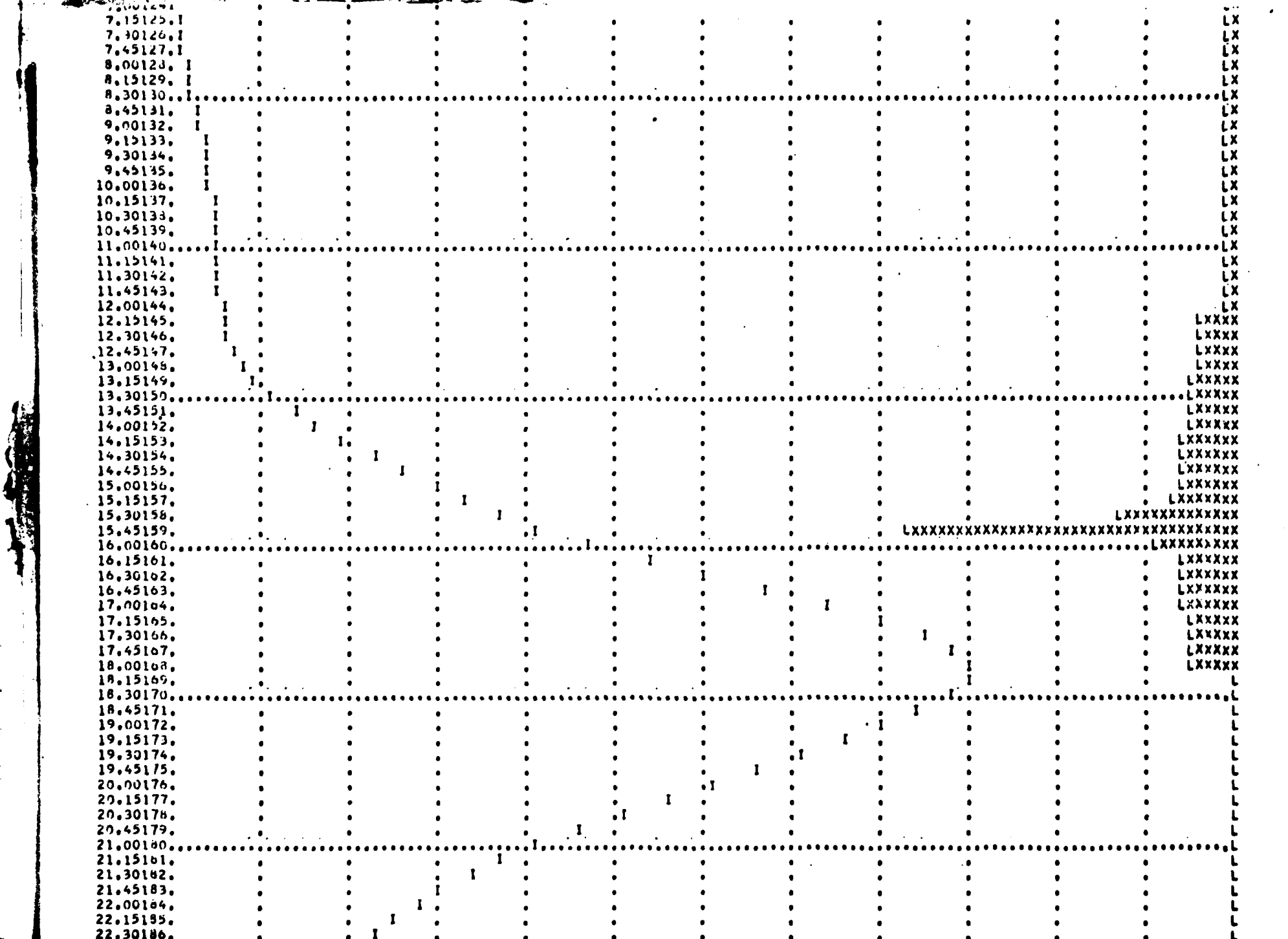

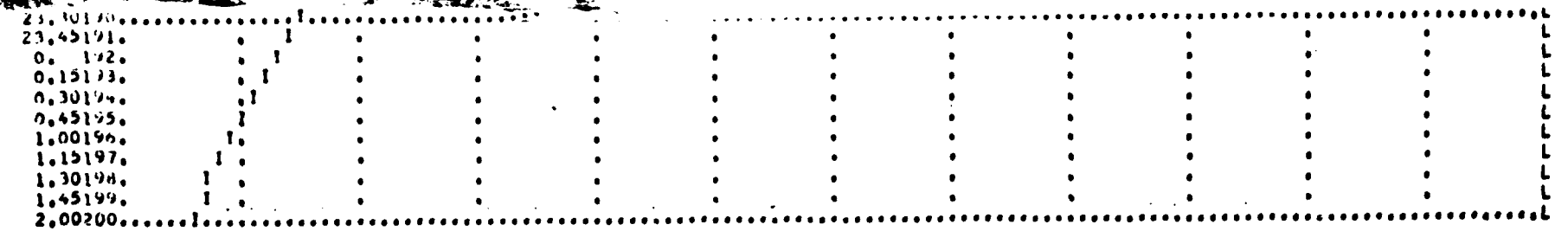
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DYN

HYDROGRAPH AT STA 1 FOR PLAN 1, RTIC 1

2.	2.	2.	2.	2.	2.	2.	2.	2.	2.
2.	2.	2.	2.	2.	2.	2.	2.	2.	2.
2.	2.	2.	2.	2.	2.	2.	2.	2.	2.
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2.	2.	2.	2.	2.	2.	2.	2.	2.	2.
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2.	2.	2.	2.	3.	4.	5.	7.	10.	12.
15.	17.	20.	21.	23.	23.	23.	22.	21.	19.
18.	17.	15.	14.	13.	12.	11.	10.	9.	8.
8.	7.	7.	6.	6.	6.	5.	5.	5.	5.
4.	4.	4.	4.	4.	4.	5.	5.	5.	5.
5.	5.	5.	5.	5.	5.	5.	5.	5.	5.
5.	7.	9.	12.	19.	24.	32.	41.	51.	61.
71.	80.	88.	96.	102.	109.	114.	119.	123.	127.
131.	134.	137.	139.	144.	153.	171.	197.	234.	282.
341.	409.	486.	568.	656.	744.	830.	919.	1030.	1174.
1339.	1512.	1687.	1856.	2006.	2123.	2204.	2249.	2249.	2196.
2108.	2009.	1900.	1782.	1657.	1528.	1398.	1271.	1149.	1036.
935.	844.	762.	689.	623.	564.	511.	463.	420.	382.
347.	316.	288.	263.	240.	219.	199.	181.	165.	149.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	2249.	1687.	562.	273.	54582.
CMS	64.	46.	16.	8.	1546.
INCHES		6.53	8.98	9.08	9.08
MM		165.96	228.11	230.63	230.63
AC-FT		812.	1115.	1128.	1128.
THOUS CU M		1001.	1376.	1391.	1391.

HYDROGRAPH AT STA 1 FOR PLAN 1, RTIC 2

5.	5.	5.	5.	5.	5.	5.	5.	5.	5.
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5.	5.	5.	5.	5.	5.	5.	5.	5.	5.
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5.	5.	5.	5.	5.	5.	5.	5.	5.	5.
5.	5.	5.	5.	5.	5.	5.	5.	5.	5.
5.	5.	5.	5.	6.	8.	11.	15.	19.	25.
30.	35.	39.	43.	45.	46.	45.	44.	42.	39.
36.	33.	31.	28.	26.	23.	21.	20.	18.	17.
16.	14.	13.	13.	12.	11.	10.	10.	9.	9.
9.	9.	9.	9.	9.	9.	9.	9.	9.	10.
10.	10.	10.	10.	10.	10.	10.	10.	10.	10.
11.	13.	18.	25.	35.	48.	64.	82.	101.	121.
141.	160.	177.	192.	205.	217.	228.	238.	246.	254.
261.	268.	273.	278.	287.	307.	342.	354.	468.	564.
682.	819.	971.	1137.	1311.	1487.	1660.	1827.	2060.	2348.
2677.	3023.	3373.	3713.	4012.	4246.	4409.	4457.	4497.	4392.
4216.	4017.	3800.	3564.	3313.	3055.	2797.	2542.	2298.	2072.
1870.	1688.	1524.	1378.	1246.	1128.	1021.	926.	840.	762.
694.	632.	577.	526.	480.	438.	399.	363.	329.	298.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	4497.	3273.	1125.	546.	109164.
CMS	127.	93.	32.	15.	3091.
INCHES		13.07	17.96	18.16	18.16
MM		331.91	456.23	461.25	461.25
AC-FT		1623.	2231.	2255.	2255.
THOUS CU M		2002.	2752.	2782.	2782.

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

HYDROGRAPH ROUTING

ROUTE THROUGH RESERVOIR

ISTAO	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
1	1	0	0	2	C	1	0	0

ROUTING DATA

QLOSS	CLOSS	AVG	IRES	ISAME	IOPT	IPMP	LSTR
0.	0.	0.	1	1	0	C	0

NSTPS	NSTOL	LAG	AMSKK	X	TSK	STORA	ISPRAT
1	0	0	0.	0.	C.	-1354.	-1

STAGE	1354.00	1355.00	1356.00	1357.00	1358.00	1359.00	1360.00
FLOW	0.	150.00	470.00	1000.00	1500.00	2100.00	2680.00
CAPACITY=	0.	13.	53.	84.	123.	172.	229.	294.	369.	451.	542.
ELEVATION=	1340.	1344.	1348.	1350.	1352.	1354.	1356.	1358.	1360.	1362.	1364.

CREL	SPWID	COOW	EXPW	ELEVL	COOL	CAREA	EXPL
1354.0	0.	0.	0.	0.	C.	0.	0.

DAM DATA

TOPEL	COOD	EXPD	DAMWIC
1359.0	3.0	1.5	285.

STATION 1, PLAN 1, RATIO 1

END-OF-PERIOD HYDROGRAPH ORDINATES

OUTFLOW

0.	0.	1.	1.	1.	1.	1.	1.	1.	2.
2.	2.	2.	2.	2.	2.	2.	2.	2.	2.
2.	2.	2.	2.	2.	2.	2.	2.	2.	2.
2.	2.	2.	2.	2.	2.	2.	2.	2.	2.
2.	2.	2.	2.	2.	2.	2.	2.	2.	2.
2.	2.	2.	2.	2.	2.	2.	2.	2.	2.
2.	2.	2.	2.	2.	2.	3.	3.	4.	4.
5.	6.	8.	9.	10.	12.	13.	14.	15.	15.
15.	16.	16.	16.	15.	15.	15.	14.	14.	13.
13.	12.	12.	11.	11.	10.	10.	9.	9.	8.
8.	8.	7.	7.	7.	6.	6.	6.	6.	6.
6.	6.	6.	5.	5.	5.	5.	5.	5.	5.
5.	5.	6.	6.	7.	8.	10.	13.	17.	21.
24.	30.	36.	42.	49.	54.	59.	65.	71.	77.
82.	87.	92.	97.	101.	106.	112.	119.	129.	142.
170.	212.	261.	316.	377.	444.	533.	631.	730.	837.
957.	1087.	1227.	1376.	1529.	1682.	1820.	1936.	2025.	2082.
2101.	2089.	2051.	1991.	1913.	1821.	1715.	1609.	1496.	1385.
1274.	1170.	1070.	974.	883.	800.	724.	656.	594.	539.
489.	451.	420.	390.	361.	334.	309.	284.	261.	239.

STORAGE

172.	172.	172.	172.	172.	172.	172.	172.	172.	172.
172.	172.	172.	172.	172.	172.	172.	172.	172.	172.
172.	172.	172.	172.	172.	172.	172.	172.	172.	172.
172.	172.	172.	172.	172.	172.	172.	172.	172.	172.

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         173.      173.      173.      173.      173.      173.      173.      173.      173.      173.
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         173.      173.      173.      173.      173.      174.      174.      174.      175.      176.
         177.      178.      179.      180.      181.      182.      183.      184.      185.      187.
         188.      189.      189.      190.      191.      192.      193.      195.      197.      199.
         202.      206.      210.      215.      221.      227.      233.      239.      245.      252.
         259.      267.      277.      285.      296.      306.      314.      321.      327.      330.
         332.      331.      328.      325.      320.      314.      308.      301.      294.      287.
         280.      273.      266.      260.      254.      249.      245.      241.      237.      233.
         230.      227.      225.      222.      219.      217.      215.      212.      210.      208.

                                                  STAGE
       1354.0    1354.0    1354.0    1354.0    1354.0    1354.0    1354.0    1354.0    1354.0    1354.0
       1354.0    1354.0    1354.0    1354.0    1354.0    1354.0    1354.0    1354.0    1354.0    1354.0
       1354.0    1354.0    1354.0    1354.0    1354.0    1354.0    1354.0    1354.0    1354.0    1354.0
       1354.0    1354.0    1354.0    1354.0    1354.0    1354.0    1354.0    1354.0    1354.0    1354.0
       1354.0    1354.0    1354.0    1354.0    1354.0    1354.0    1354.0    1354.0    1354.0    1354.0
       1354.0    1354.0    1354.0    1354.0    1354.0    1354.0    1354.0    1354.0    1354.0    1354.0
       1354.0    1354.0    1354.0    1354.0    1354.0    1354.0    1354.0    1354.0    1354.0    1354.0
       1354.0    1354.0    1354.1    1354.1    1354.1    1354.1    1354.1    1354.1    1354.1    1354.1
       1354.1    1354.1    1354.1    1354.1    1354.1    1354.1    1354.1    1354.1    1354.1    1354.1
       1354.1    1354.1    1354.1    1354.1    1354.1    1354.1    1354.1    1354.1    1354.1    1354.1
       1354.1    1354.1    1354.0    1354.0    1354.0    1354.0    1354.0    1354.0    1354.0    1354.0
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       1354.0    1354.0    1354.0    1354.0    1354.0    1354.1    1354.1    1354.1    1354.1    1354.1
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       1355.1    1355.2    1355.3    1355.5    1355.7    1355.9    1356.1    1356.3    1356.5    1356.7
       1356.9    1357.2    1357.5    1357.8    1358.0    1358.3    1358.5    1358.7    1358.9    1359.0
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       1357.6    1357.3    1357.1    1357.0    1356.8    1356.6    1356.5    1356.4    1356.2    1356.1
       1356.0    1355.9    1355.8    1355.8    1355.7    1355.6    1355.5    1355.4    1355.3    1355.3

PEAK OUTFLOW IS     2101. AT TIME  42.75 HOURS

                                 PEAK    6-HOUR    24-HOUR   72-HOUR   TOTAL VOLUME
                          CFS    2101.    1598.      545.      264.        52813.
                          CMS      59.      45.       15.        7.         1496.
                       INCHES              6.38      8.70      8.79          8.79
                           MM            162.05    220.90    223.15        223.15
                        AC-FT              792.     1080.     1091.         1091.
                   THOUS CU M              977.     1332.     1346.         1346.
```

OVF

STATION 1

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

	0.	400.	800.	1200.	1600.	2000.	2400.	C.	C.	C.	C.	C.	C.
0.15	1I												
0.30	2I												
0.45	3I												
1.00	4I												
1.15	5I												
1.30	6I												
1.45	7I												
2.00	8I												
2.15	9I												
2.30	10I												
2.45	11I												
3.00	12I												
3.15	13I												
3.30	14I												
3.45	15I												
4.00	16I												
4.15	17I												
4.30	18I												
4.45	19I												
5.00	20I												
5.15	21I												
5.30	22I												
5.45	23I												
6.00	24I												
6.15	25I												
6.30	26I												
6.45	27I												
7.00	28I												
7.15	29I												
7.30	30I												
7.45	31I												
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8.15	33I												
8.30	34I												
8.45	35I												
9.00	36I												
9.15	37I												
9.30	38I												
9.45	39I												
10.00	40I												
10.15	41I												
10.30	42I												
10.45	43I												
11.00	44I												
11.15	45I												
11.30	46I												
11.45	47I												
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12.15	49I												
12.30	50I												
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13.00	52I												
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13.30	54I												
13.45	55I												
14.00	56I												
14.15	57I												

15.00 60
15.15 61
15.30 62
15.45 63
16.00 64
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16.30 66
16.45 67
17.00 68
17.15 69
17.30 70
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18.00 72
18.15 73
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18.45 750
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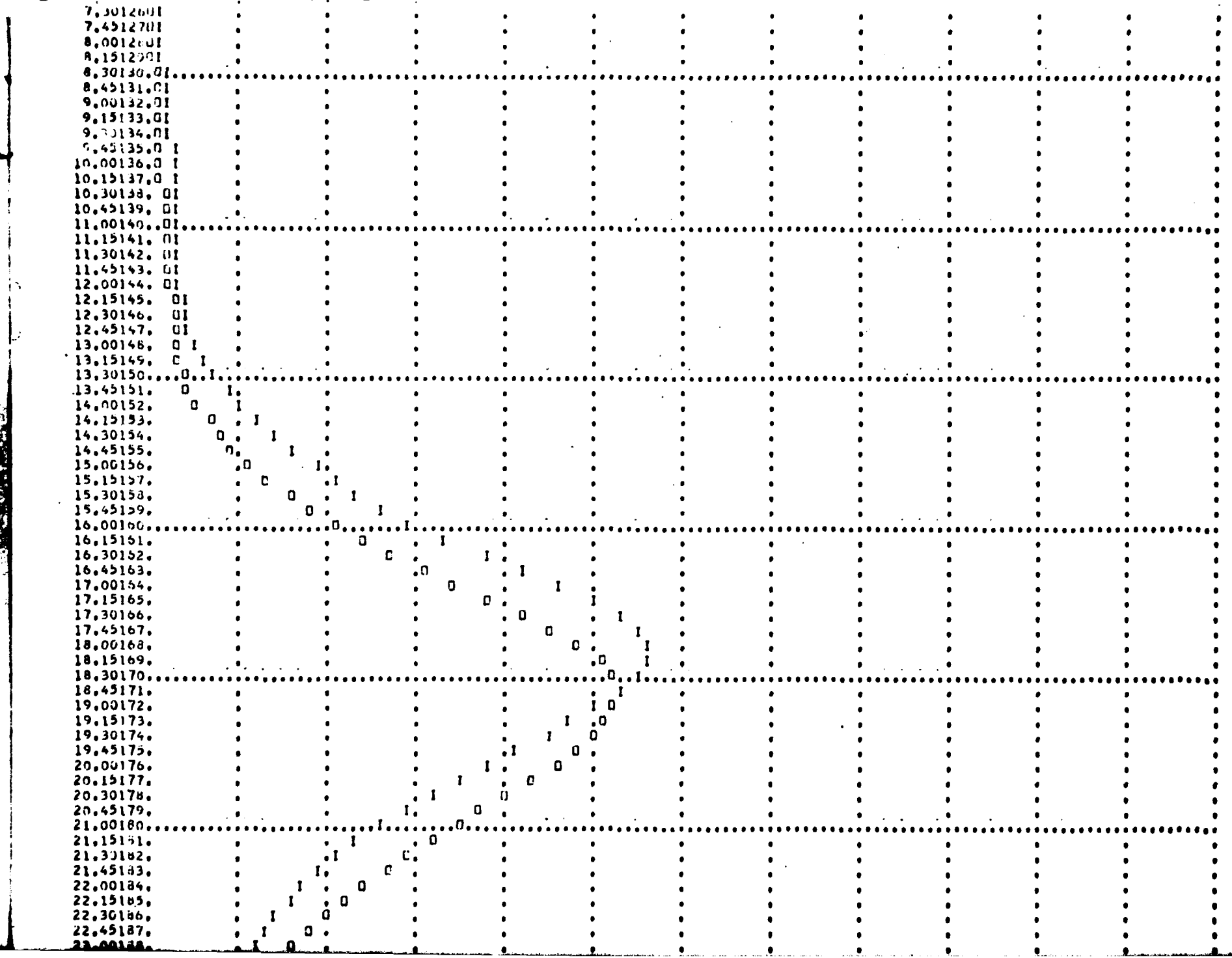
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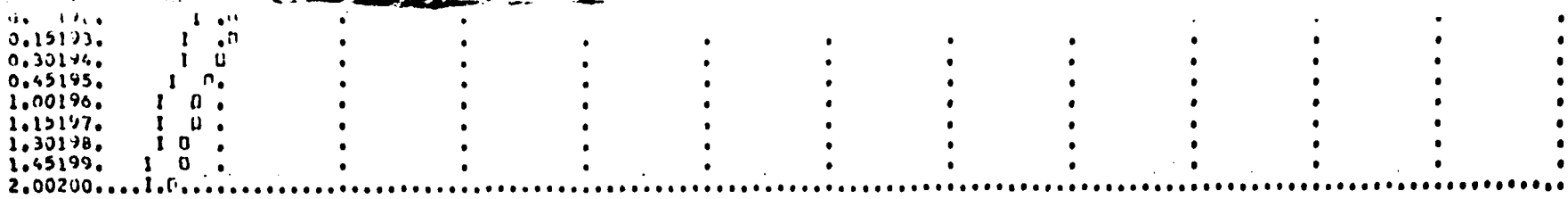
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```
*OVN*

                          STATION     1, PLAN 1, RATIO 2

                          END-OF-PERIOD HYDROGRAPH ORDINATES

                                   OUTFLOW
     0.       1.       1.       2.       2.       2.       2.       3.       3.       3.
     3.       3.       4.       4.       4.       4.       4.       4.       4.       4.
     4.       4.       4.       4.       4.       4.       4.       4.       4.       4.
     4.       5.       5.       5.       5.       5.       5.       5.       5.       5.
     5.       5.       5.       5.       5.       5.       5.       5.       5.       5.
     5.       5.       5.       5.       5.       5.       5.       5.       5.       5.
     5.       5.       5.       5.       5.       5.       5.       6.       7.       9.
    11.      13.      15.      18.      21.      23.      26.      27.      29.      30.
    31.      31.      31.      31.      31.      30.      29.      28.      27.      26.
    25.      24.      23.      22.      21.      20.      19.      18.      17.      17.
    16.      15.      14.      14.      13.      13.      12.      12.      12.      12.
    11.      11.      11.      11.      11.      11.      11.      11.      11.      11.
    11.      11.      11.      12.      14.      17.      21.      26.      33.      41.
    59.      61.      72.      83.      95.     107.     119.     131.     142.     156.
   177.     195.     211.     224.     236.     249.     264.     286.     316.     357.
   412.     487.     605.     734.     875.    1024.    1175.    1322.    1500.    1701.
  1933.    2234.    2752.    3248.    3654.    3965.    4209.    4376.    4460.    4449.
  4349.    4190.    4001.    3790.    3563.    3310.    3061.    2818.    2585.    2369.
  2180.    2046.    1920.    1766.    1651.    1518.    1396.    1280.    1172.    1071.
   976.     886.     805.     732.     665.     607.     552.     503.     461.     431.

                                   STORAGE
   172.     172.     172.     172.     172.     172.     172.     172.     172.     172.
   173.     173.     173.     173.     173.     173.     173.     173.     173.     173.
   173.     173.     173.     173.     173.     173.     173.     173.     173.     173.
   173.     173.     173.     173.     173.     173.     173.     173.     173.     173.
   173.     173.     173.     173.     173.     173.     173.     173.     173.     173.
   173.     173.     173.     173.     173.     173.     173.     173.     173.     173.
   173.     173.     173.     173.     173.     173.     173.     173.     173.     174.
   174.     174.     175.     175.     175.     176.     177.     177.     177.     178.
   178.     178.     178.     178.     179.     178.     177.     177.     177.     177.
   177.     177.     176.     176.     175.     176.     176.     175.     175.     175.
   175.     175.     175.     175.     174.     174.     174.     174.     174.     174.
   174.     174.     174.     174.     174.     174.     174.     174.     174.     174.
   174.     174.     174.     174.     175.     175.     176.     177.     178.     180.
   152.     183.     186.     188.     190.     192.     195.     197.     199.     201.
   203.     205.     206.     207.     208.     209.     211.     213.     215.     219.
   224.     230.     237.     245.     254.     263.     273.     283.     294.     307.
   321.     337.     352.     363.     371.     378.     383.     386.     388.     388.
   386.     382.     379.     374.     367.     364.     359.     353.     347.     341.
   335.     328.     320.     312.     304.     295.     288.     280.     273.     266.
   260.     255.     250.     245.     241.     237.     234.     231.     228.     226.

                                   STAGE
1354.0   1354.0   1354.0   1354.0   1354.0   1354.0   1354.0   1354.0   1354.0   1354.0
1354.0   1354.0   1354.0   1354.0   1354.0   1354.0   1354.0   1354.0   1354.0   1354.0
1354.0   1354.0   1354.0   1354.0   1354.0   1354.0   1354.0   1354.0   1354.0   1354.0
1354.0   1354.0   1354.0   1354.0   1354.0   1354.0   1354.0   1354.0   1354.0   1354.0
1354.0   1354.0   1354.0   1354.0   1354.0   1354.0   1354.0   1354.0   1354.0   1354.0
1354.0   1354.0   1354.0   1354.0   1354.0   1354.0   1354.0   1354.0   1354.0   1354.0
1354.0   1354.0   1354.0   1354.0   1354.0   1354.0   1354.0   1354.0   1354.0   1354.1
1354.1   1354.1   1354.1   1354.1   1354.1   1354.2   1354.2   1354.2   1354.2   1354.2
1354.2   1354.2   1354.2   1354.2   1354.2   1354.2   1354.2   1354.2   1354.2   1354.2
1354.2   1354.2   1354.2   1354.1   1354.1   1354.1   1354.1   1354.1   1354.1   1354.1
1354.1   1354.1   1354.1   1354.1   1354.1   1354.1   1354.1   1354.1   1354.1   1354.1
```

[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1355.1	1355.1	1355.2	1355.2	1355.3	1355.3	1355.4	1355.4	1355.5	1355.6
1355.8	1356.0	1356.3	1356.5	1356.8	1357.0	1357.3	1357.7	1358.0	1358.3
1358.7	1359.1	1359.5	1359.8	1360.1	1360.2	1360.3	1360.4	1360.5	1360.5
1360.4	1360.3	1360.2	1360.1	1360.0	1359.9	1359.7	1359.6	1359.4	1359.3
1359.1	1358.9	1358.7	1358.5	1358.3	1358.0	1357.8	1357.6	1357.3	1357.1
1357.0	1356.8	1356.6	1356.5	1356.4	1356.3	1356.2	1356.1	1356.0	1355.9

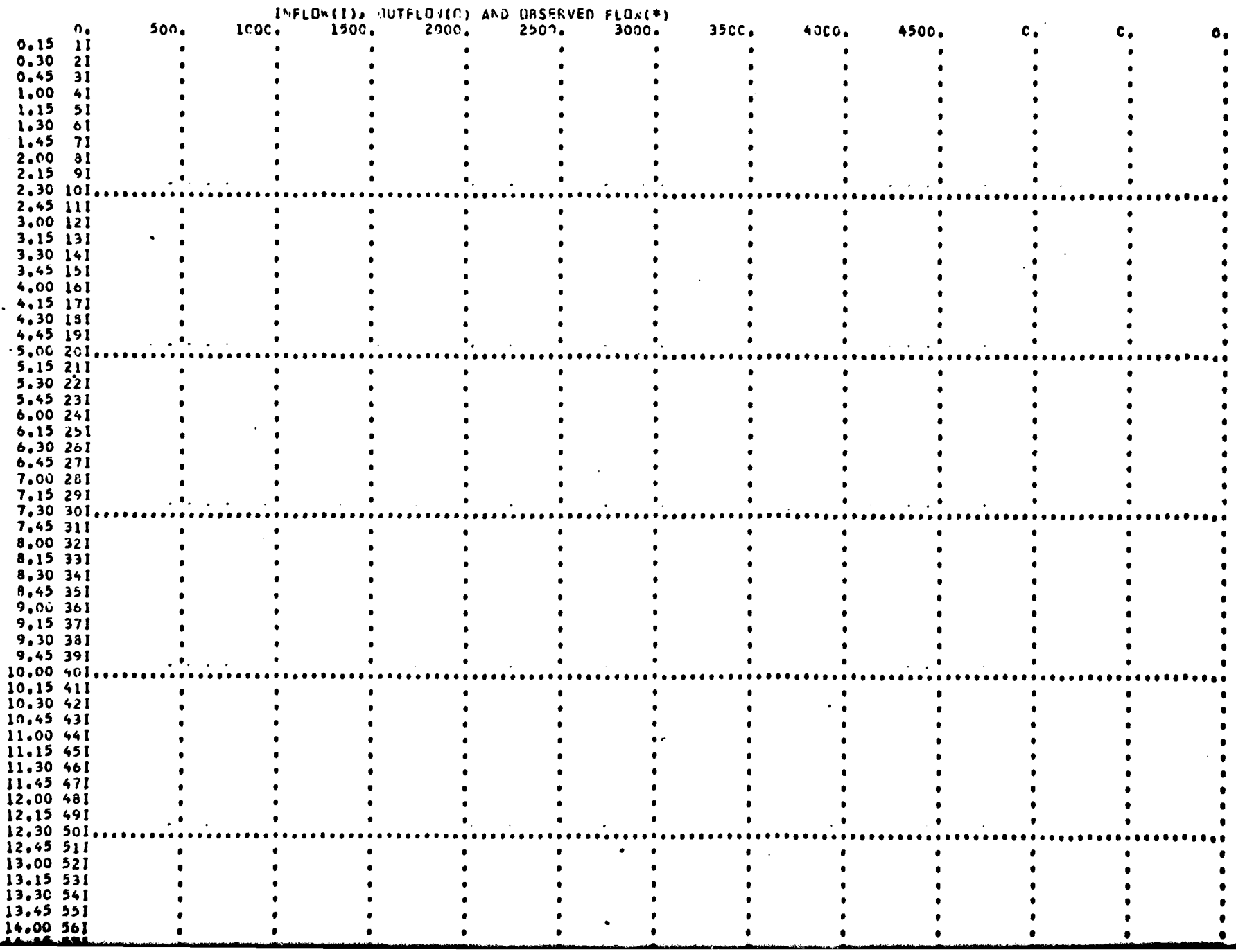
PEAK OUTFLOW IS 4460. AT TIME 42.25 HOURS

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	4460.	3217.	1099.	533.	106569.
CMS	126.	91.	31.	15.	3018.
INCHES		12.84	17.55	17.73	17.73
MM		326.22	445.79	450.29	450.29
AC-FT		1595.	2180.	2202.	2202.
THOUS CU M		1968.	2689.	2716.	2716.

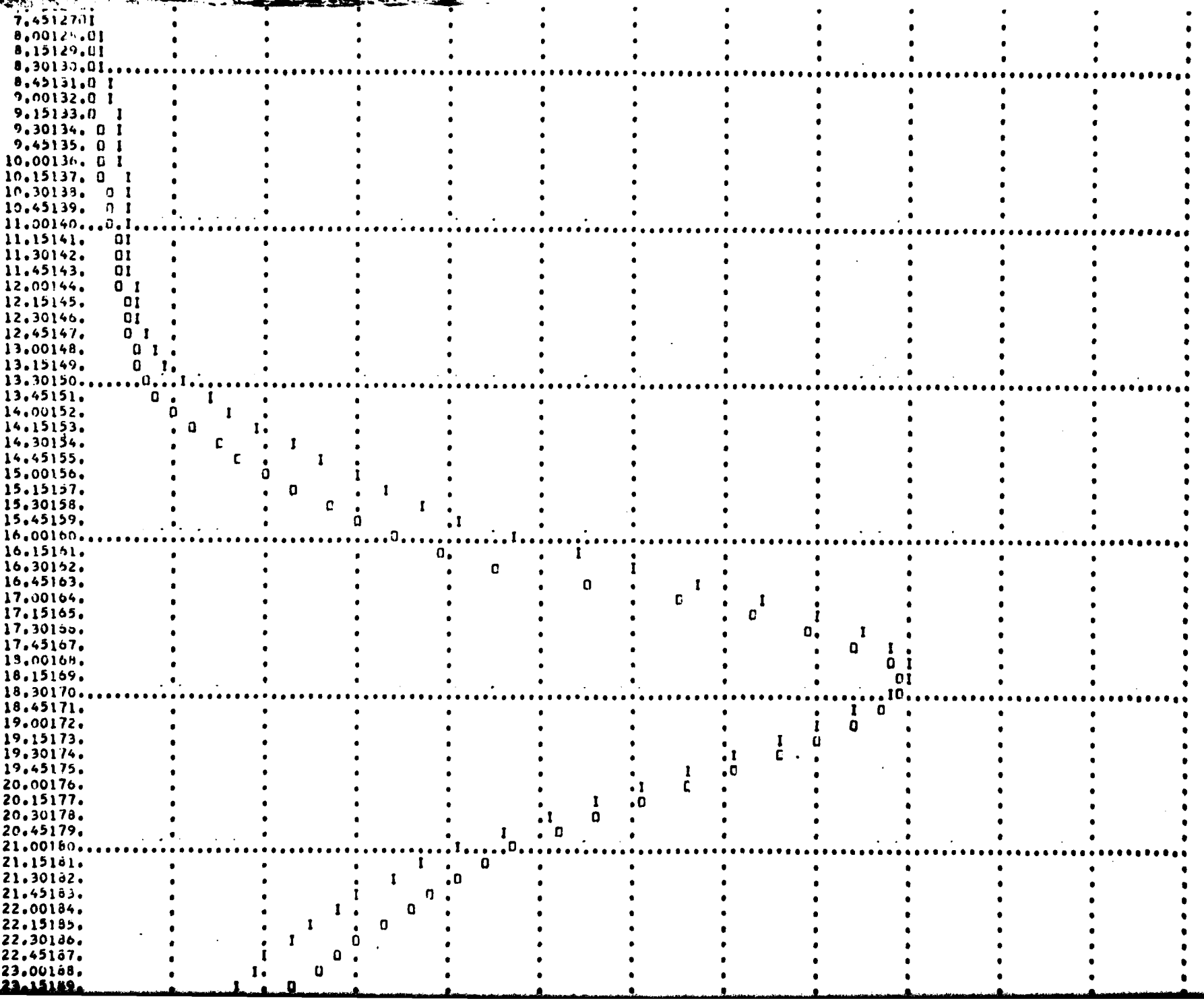
DVF

STATION 1

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



15.15 611
15.30 621
15.45 631
16.00 641
16.15 651
16.30 661
16.45 671
17.00 681
17.15 691
17.30 701
17.45 7101
18.00 7201
18.15 7301
18.30 7401
18.45 7501
19.00 7601
19.15 771.
19.30 781.
19.45 791.
20.00 801.
20.15 811.
20.30 821.
20.45 831.
21.00 841.
21.15 851.
21.30 8610
21.45 8710
22.00 8810
22.15 8910
22.30 9010
22.45 9110
23.00 921
23.15 931
23.30 941
23.45 951
0. 961
0.15 971
0.30 981
0.45 991
1.00100I
1.15101I
1.30102I
1.45103I
2.00104I
2.15105I
2.30106I
2.45107I
3.00108I
3.15109I
3.30110I
3.45111I
4.00112I
4.15113I
4.30114I
4.45115I
5.00116I
5.15117I
5.30118I
5.45119I
6.00120I
6.15121I
6.30122I


7.45127
8.00128
8.15129
8.30130
8.45131
9.00132
9.15133
9.30134
9.45135
10.00136
10.15137
10.30138
10.45139
11.00140
11.15141
11.30142
11.45143
12.00144
12.15145
12.30146
12.45147
13.00148
13.15149
13.30150
13.45151
14.00152
14.15153
14.30154
14.45155
15.00156
15.15157
15.30158
15.45159
16.00160
16.15161
16.30162
16.45163
17.00164
17.15165
17.30166
17.45167
18.00168
18.15169
18.30170
18.45171
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19.15173
19.30174
19.45175
20.00176
20.15177
20.30178
20.45179
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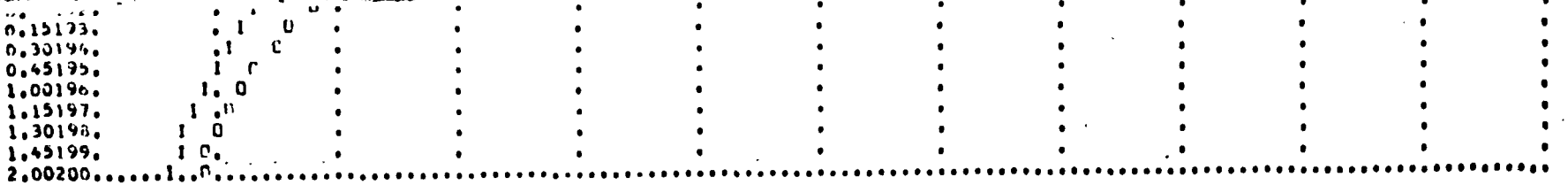
22.15185
22.30186
22.45187
23.00188
23.15189


0.15193.
0.30194.
0.45195.
1.00196.
1.15197.
1.30198.
1.45199.
2.00200.

PEAK FLOW AND STORAGE (END OF PERIOD) SUMMARY FOR MULTIPLE PLAN-RATIO ECONOMIC COMPUTATIONS
FLOWS IN CUBIC FEET PER SECOND (CUBIC METERS PER SECOND)
AREA IN SQUARE MILES (SQUARE KILOMETERS)

OPERATION	STATION	AREA	PLAN	RATIOS APPLIED TO FLOWS RATIO 1 0.50	 RATIO 2 1.00
HYDROGRAPH AT	1 (	2.33 0.00)	1 (	2249. 63.68)(	4497. 127.35)(
ROUTED TO	1 (	2.33 0.00)	1 (	2101. 59.50)(	4461. 126.29)(

SUMMARY OF DAM SAFETY ANALYSIS

PLAN 1 .....

	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
ELEVATION	1354.00	1354.00	1359.00
STORAGE	172.	172.	332.
OUTFLO	0.	0.	2100.

RATIO OF PMF	MAXIMUM RESERVOIR W.S.ELEV	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
0.50	1359.00	0.00	332.	2101.	0.25	42.75	0.
1.00	1360.46	1.46	388.	4460.	5.00	42.25	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.

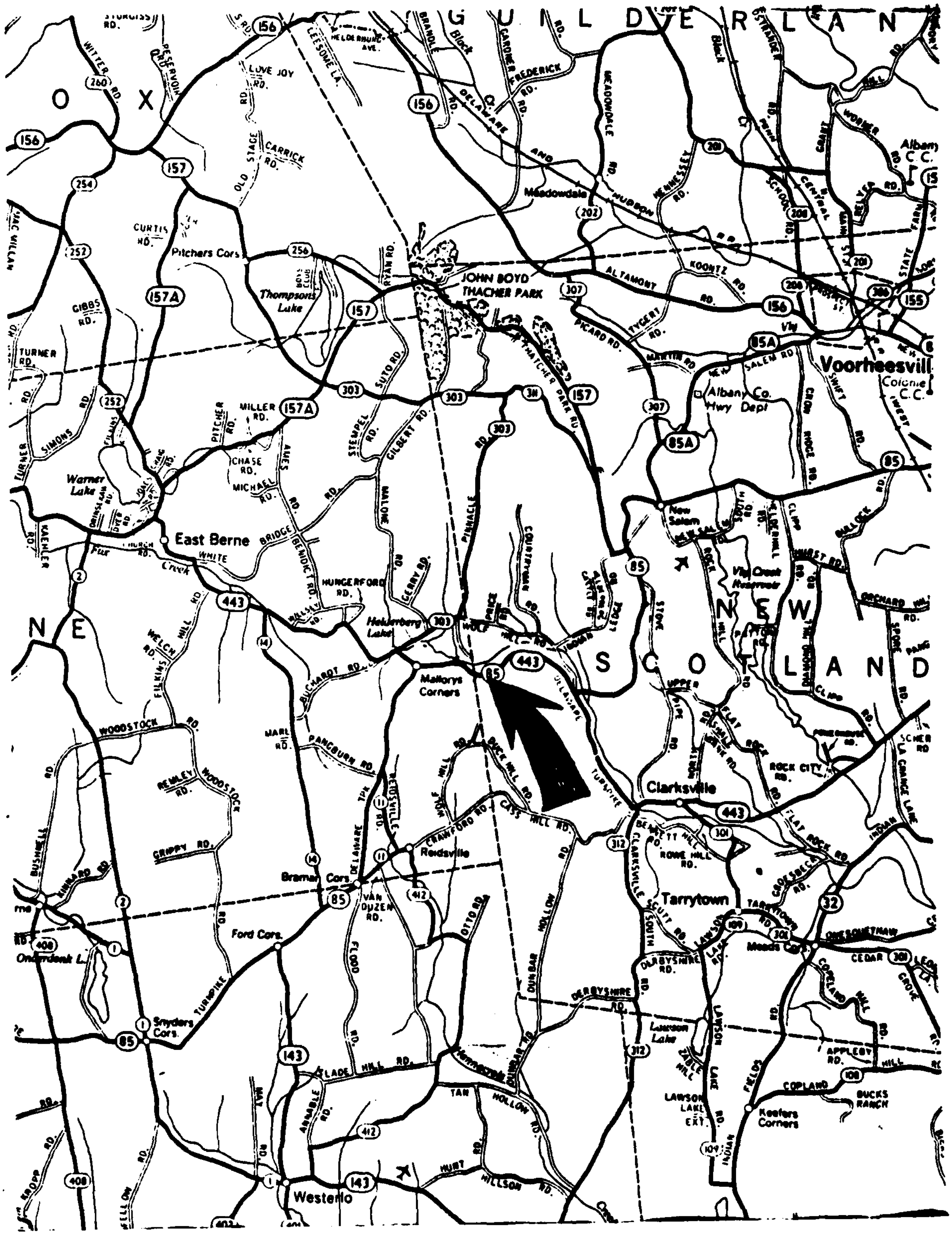
5) W.D. Thornbury, Principles of Geomorphology, John Wiley and Sons, 1969.

6) University of the State of New York, Geology of New York, Education Leaflet 20, Reprinted 1973.

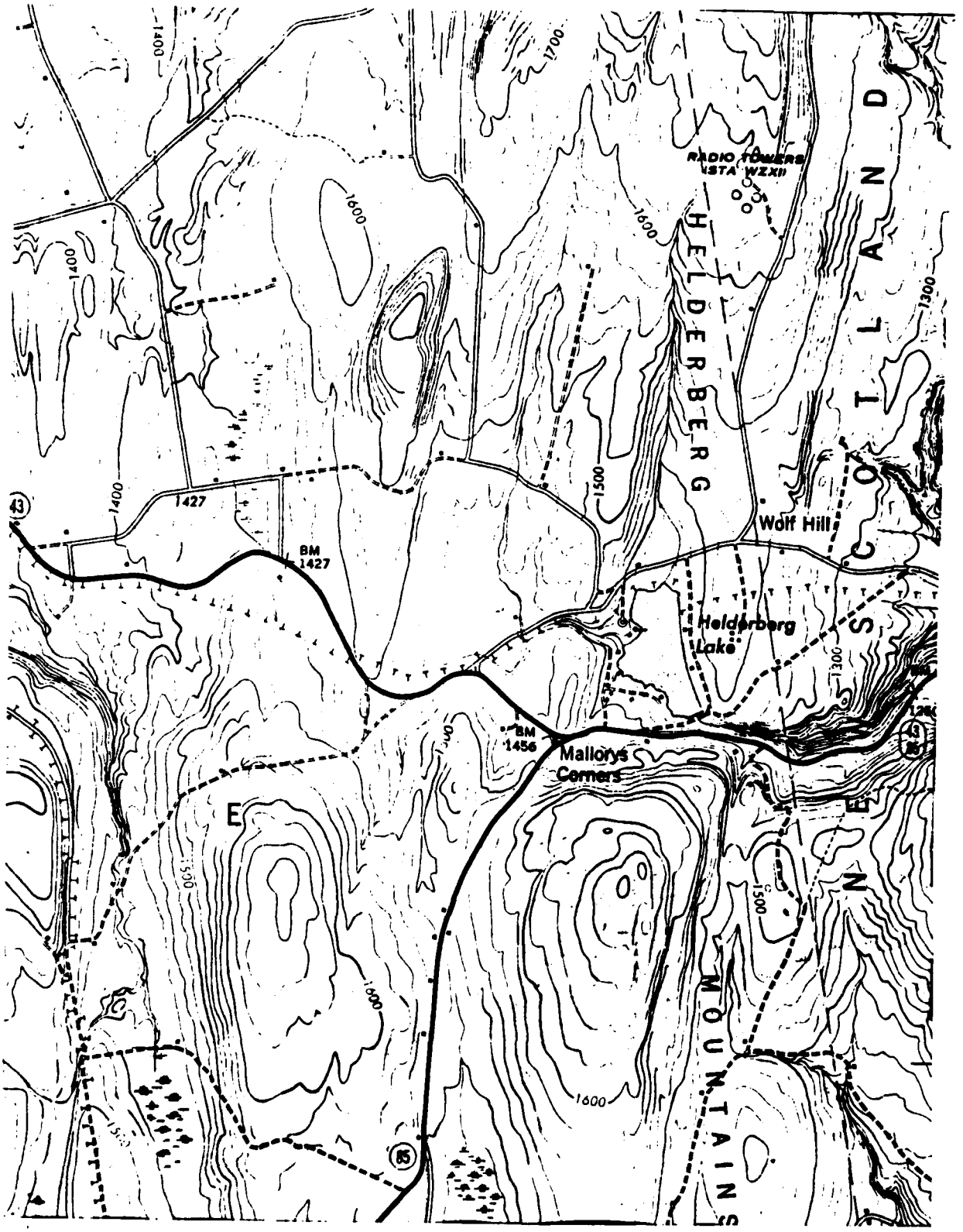
7) Cornell University Agriculture Experiment Station (compiled by M.G. Cline and R.L. Marshall), General Soil Map of New York State and Soils of New York Landscapes, Information Bulletin 119, 1977.

APPENDIX E

DRAWINGS



VICINITY MAP

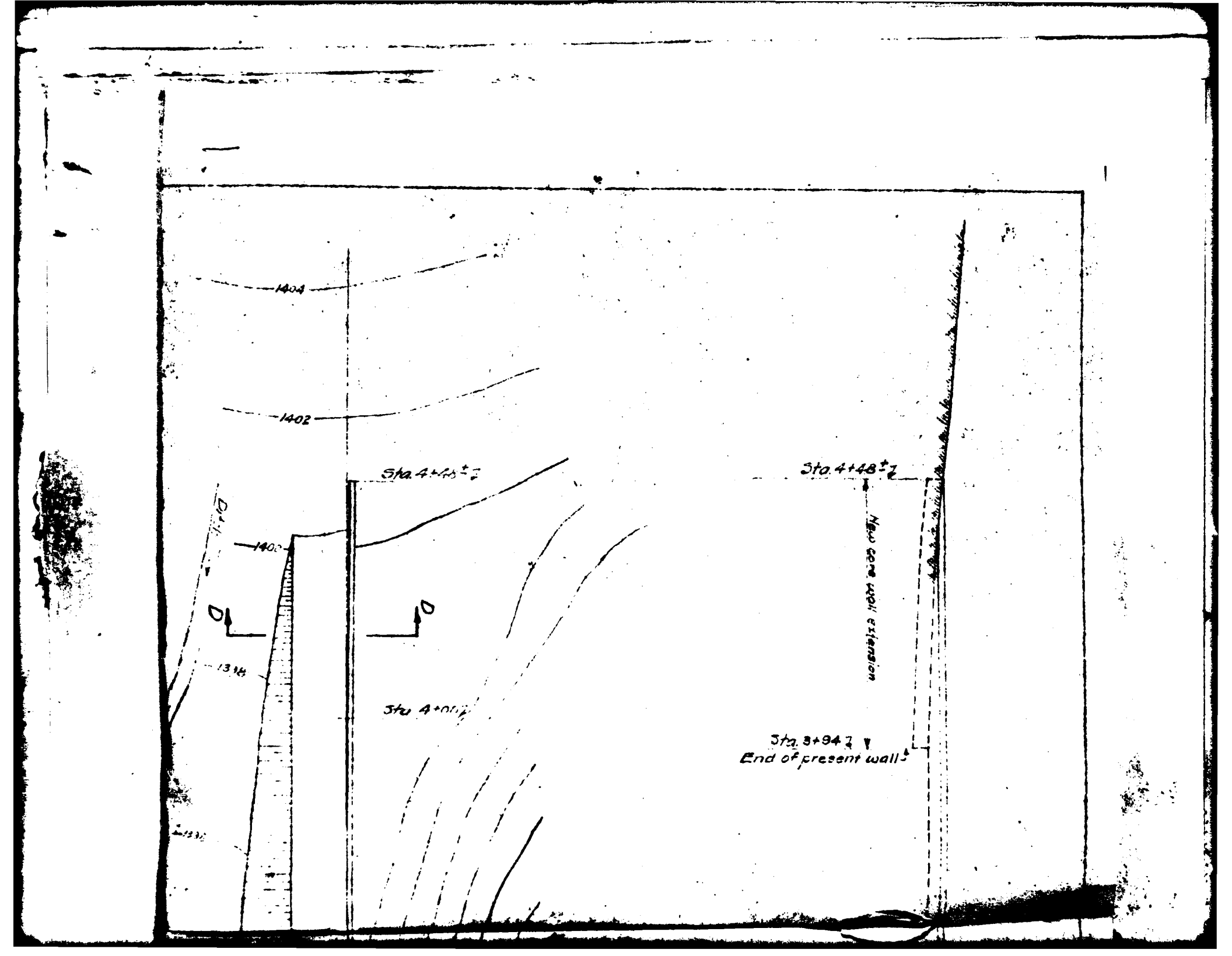


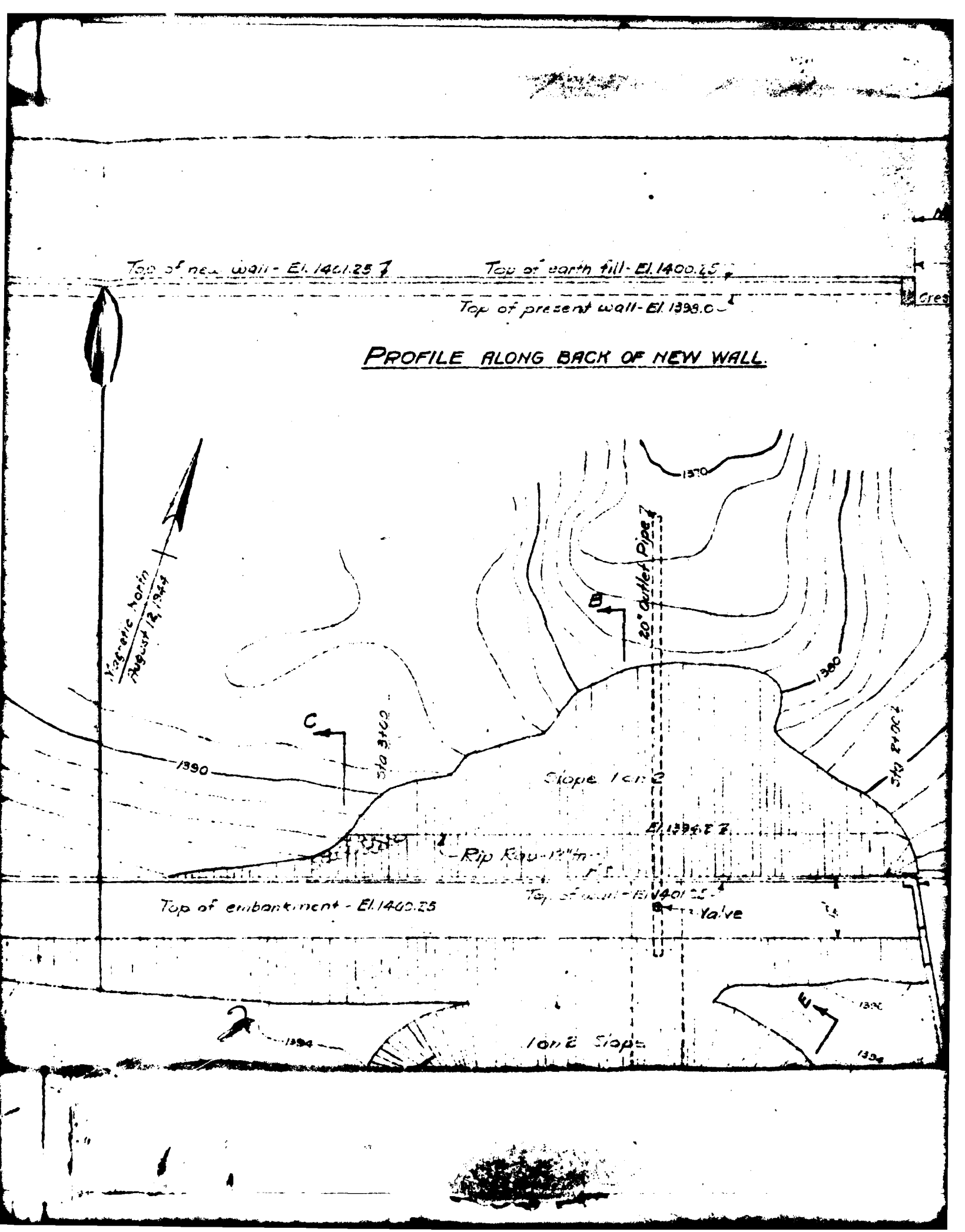
TOPOGRAPHIC MAP

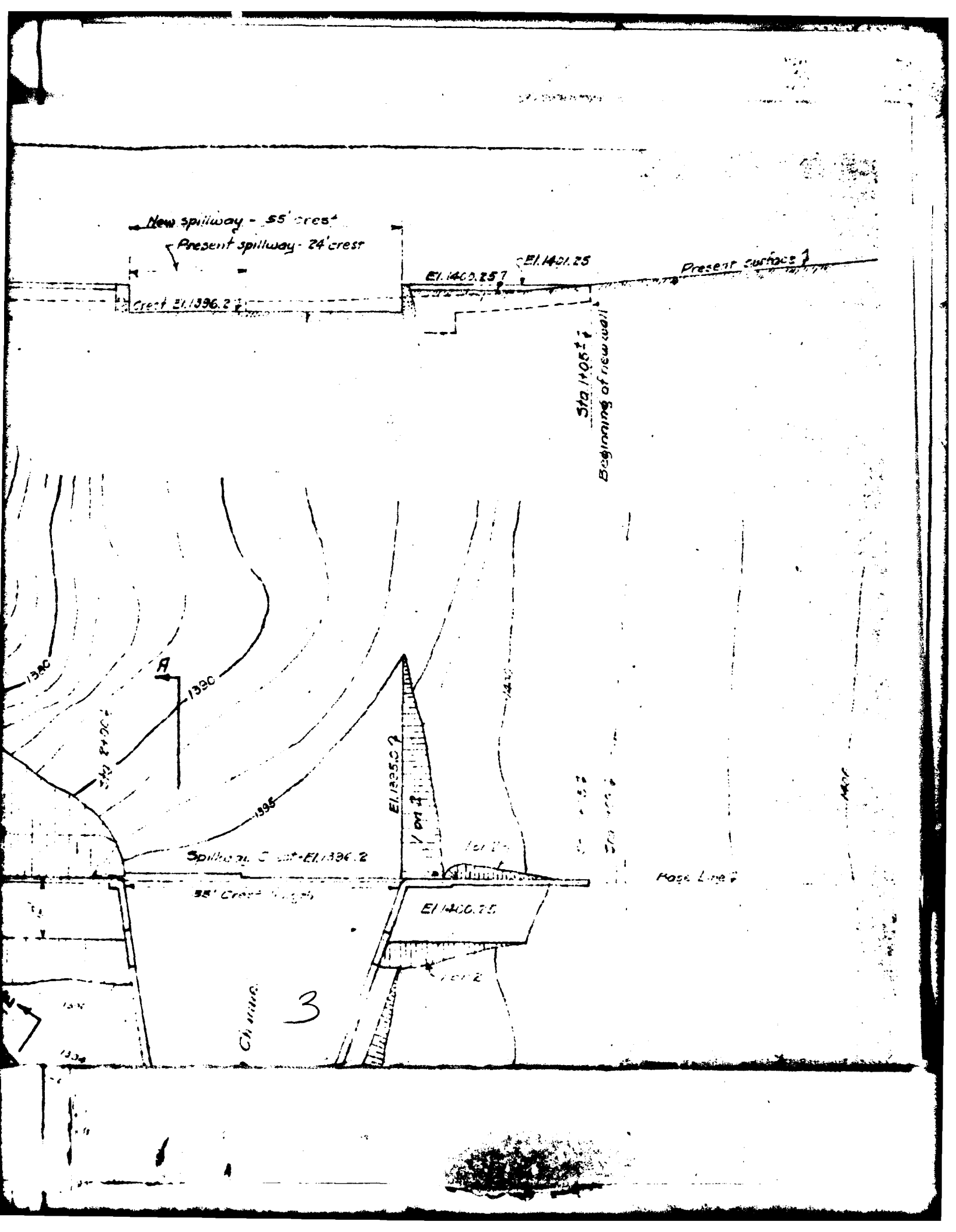
HELDERBERG LAKE DAM

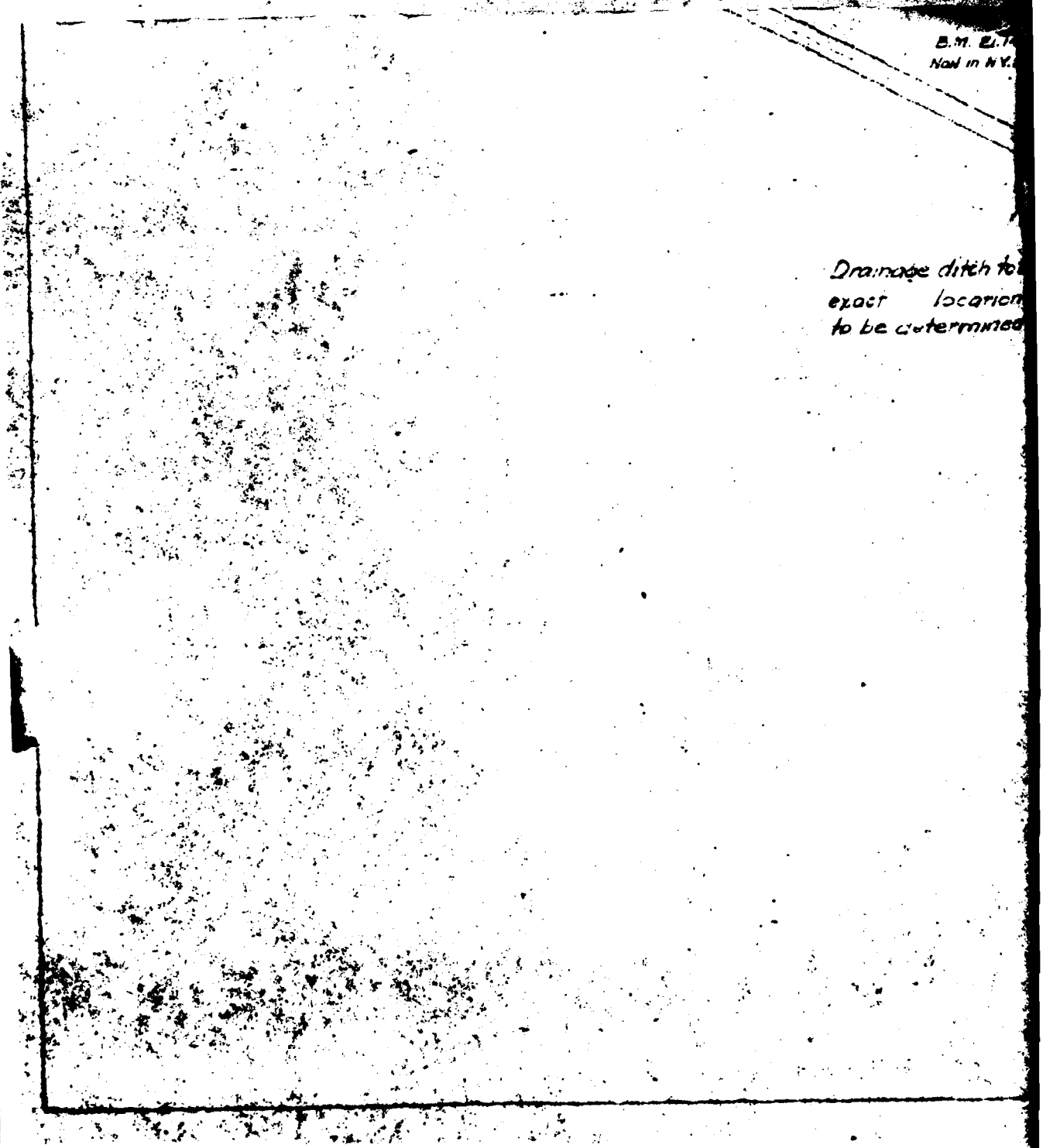
LIST OF DRAWINGS

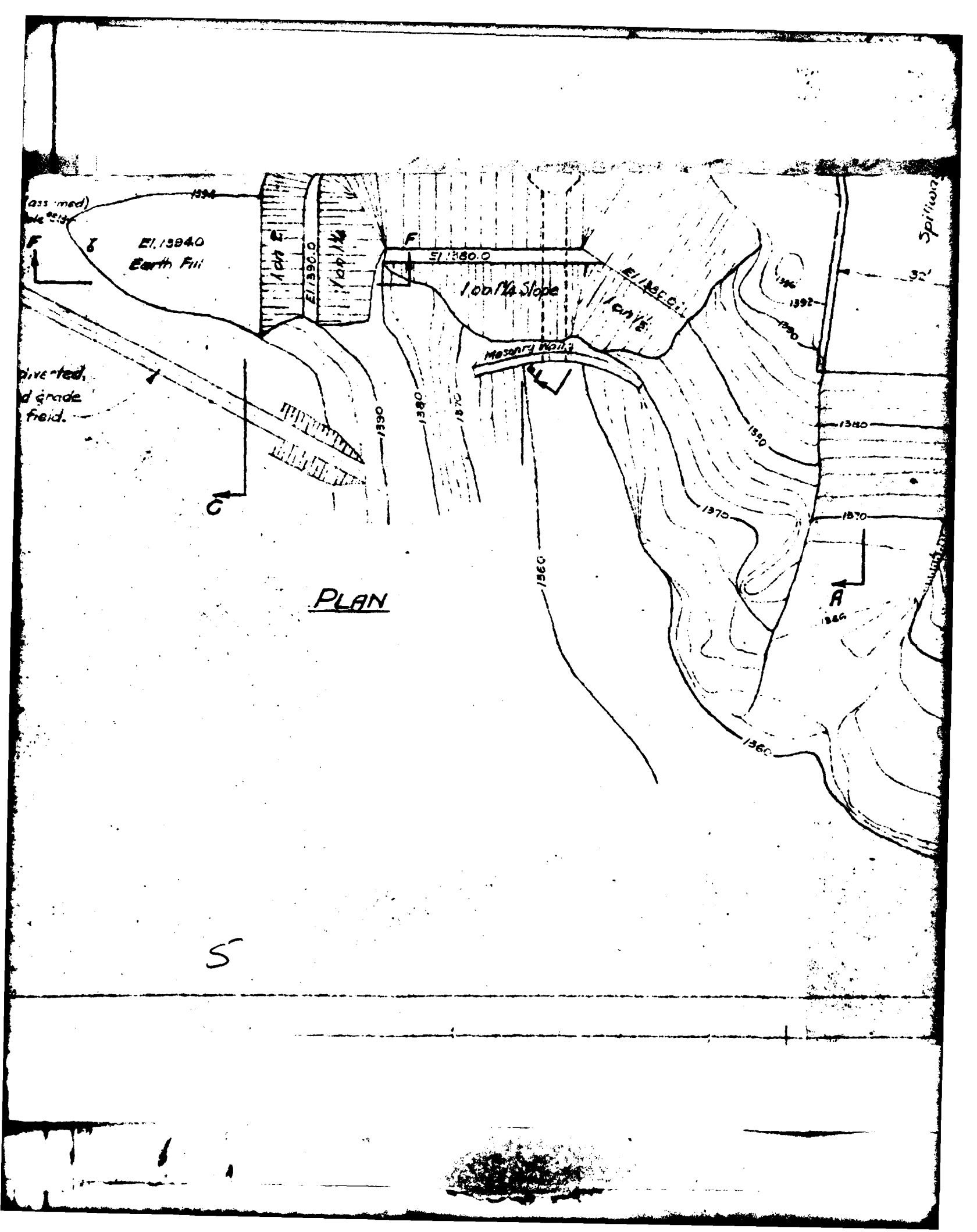
	Drawing #
Plan and Profile 9/44	1 of 3
Sections 9/44	2 of 3
Spillway Details 9/44	3 of 3
Detail Sheet	Aug. 11, 1926

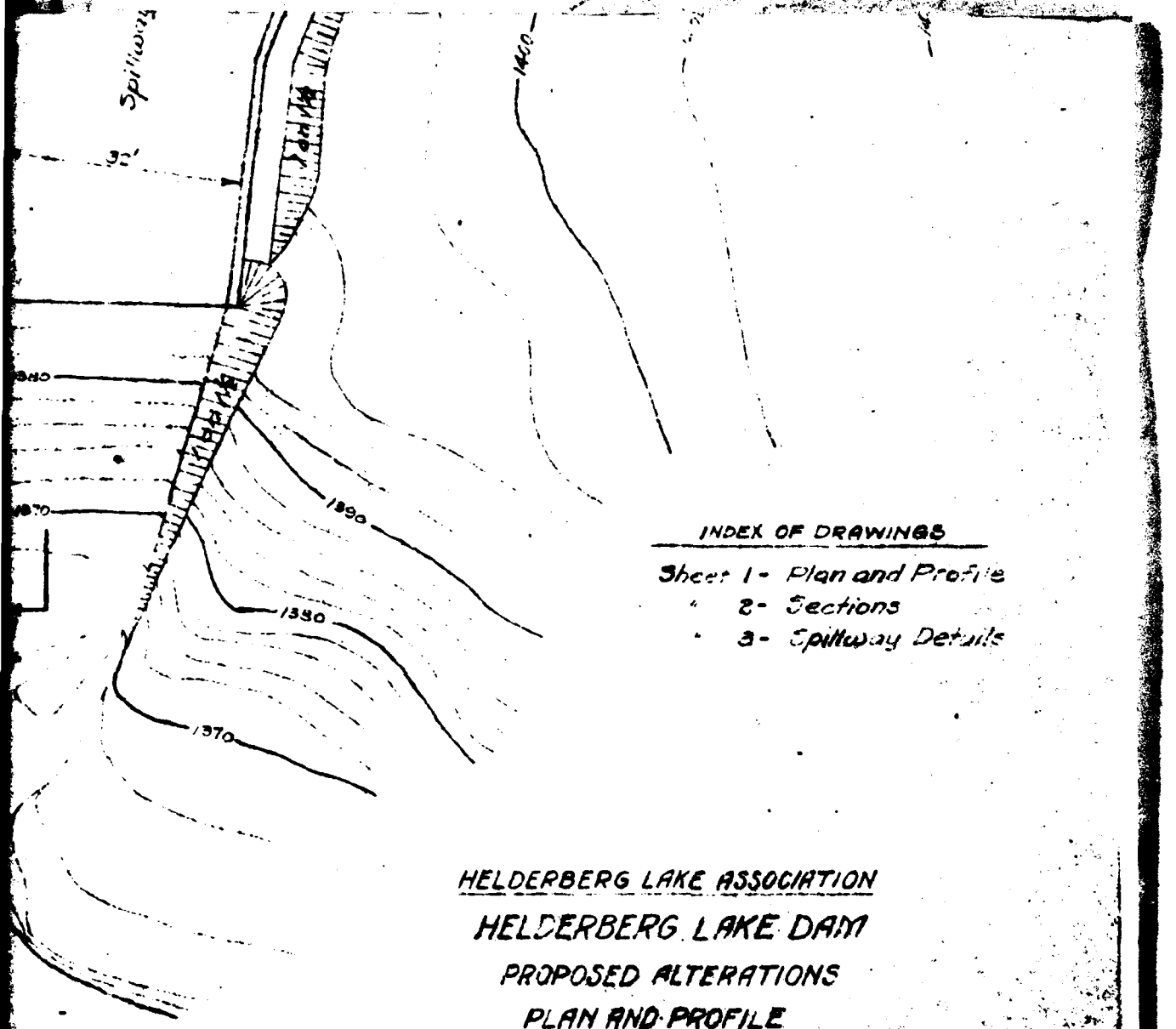

1404
1402
Sta. 4+48 ± ℄
Sta. 4+48 ± ℄
New conc. wall extension
Sta. 3+94 ℄
End of present wall
D
D


Top of new wall - El. 1401.25
Top of earth fill - El. 1400.45
Top of present wall - El. 1399.0
PROFILE ALONG BACK OF NEW WALL.
Magnetic North
August 14, 1944
1370
20" Cutler Pipe
B
1380
C
Sta 3+00
1390
Slope 1 on
Sta 2+00
El. 1394.2
Rip Rap - 12" m
Top of embankment - El. 1400.25
Top of wall - El. 1401.25
Valve
E
1394
1 on 2 Slope
1394


New spillway - 55' crest
Present spillway - 24' crest
Crest El. 1396.2
El. 1400.25
El. 1401.25
Present surface
Sta. 1+08
Beginning of new wall
1390
A
1390
1395
El. 1395.0
Spillway Crest-El. 1396.2
55' Crest
El. 1400.25
Base Line
Channel
3


B.M. El.
Nail in N.Y.
Drainage ditch to
exact location
to be determined


(ass med)
1394
F
El. 1384.0
Earth Fill
El. 1390.0
Top of
F
El. 1380.0
1 on 1½ Slope
1 on 1½
El. 1385.0
Masonry Wall
Spillway
1394
1392
1390
1380
1370
1360
diverted,
d grade
freid.
C
A
PLAN
5'



INDEX OF DRAWINGS

Sheet 1 - Plan and Profile
" 2 - Sections
" 3 - Spillway Details

HELDERBERG LAKE ASSOCIATION

HELDERBERG LAKE DAM

PROPOSED ALTERATIONS

PLAN AND PROFILE

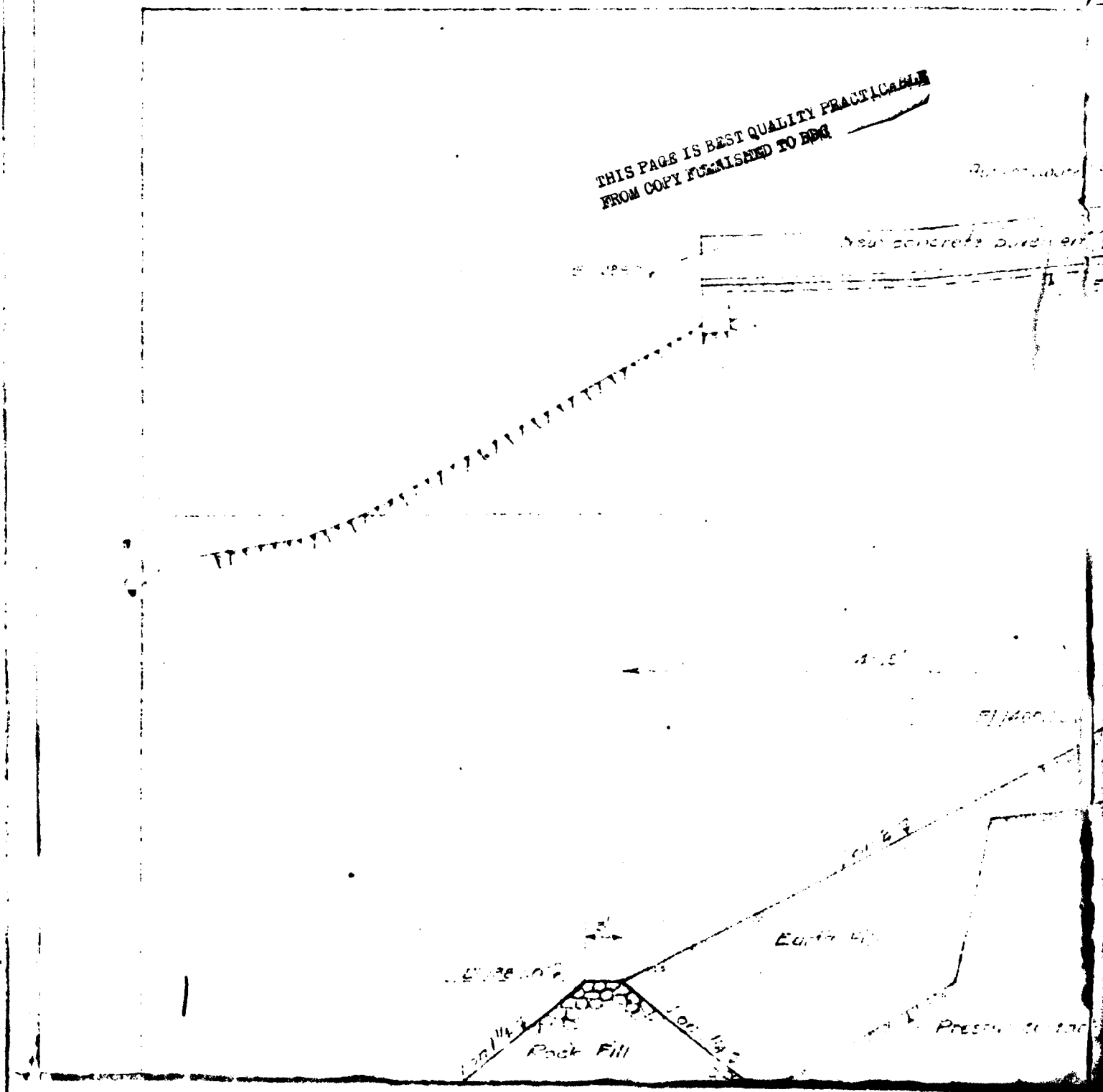
Scale 1" = 20'

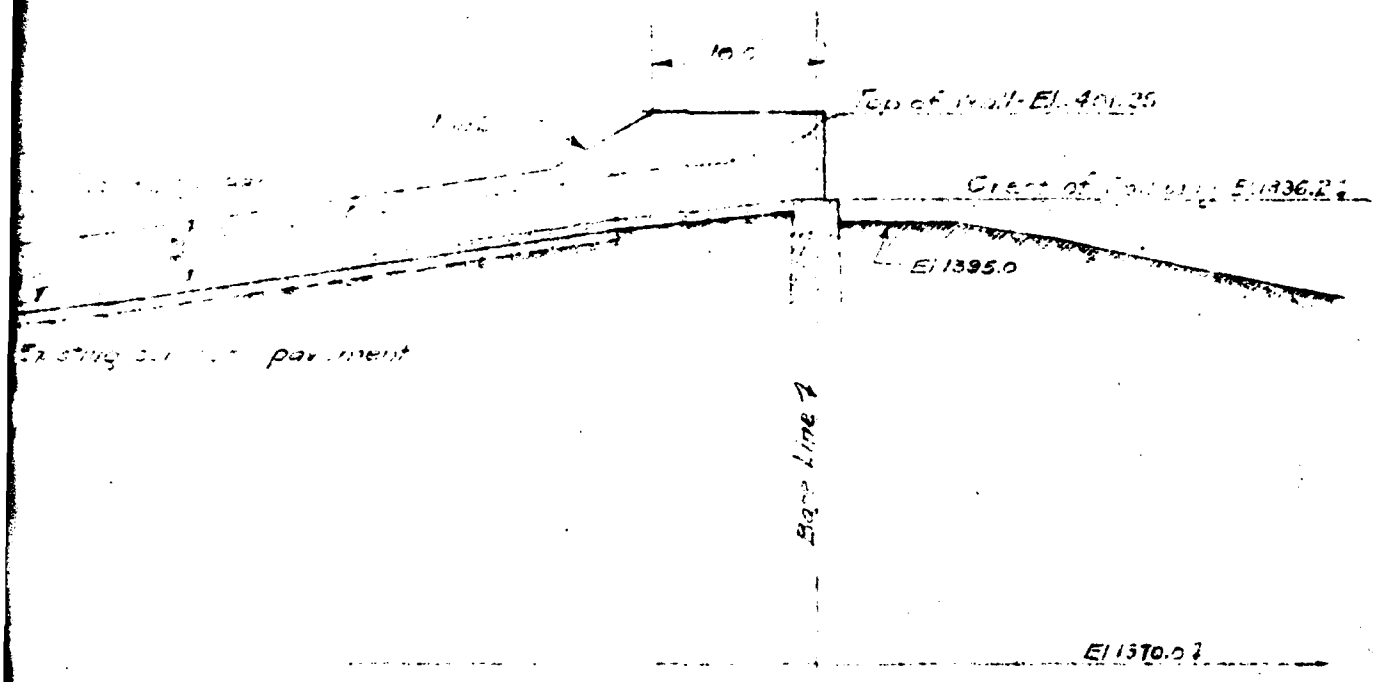
Engineer

P.E. License 10100

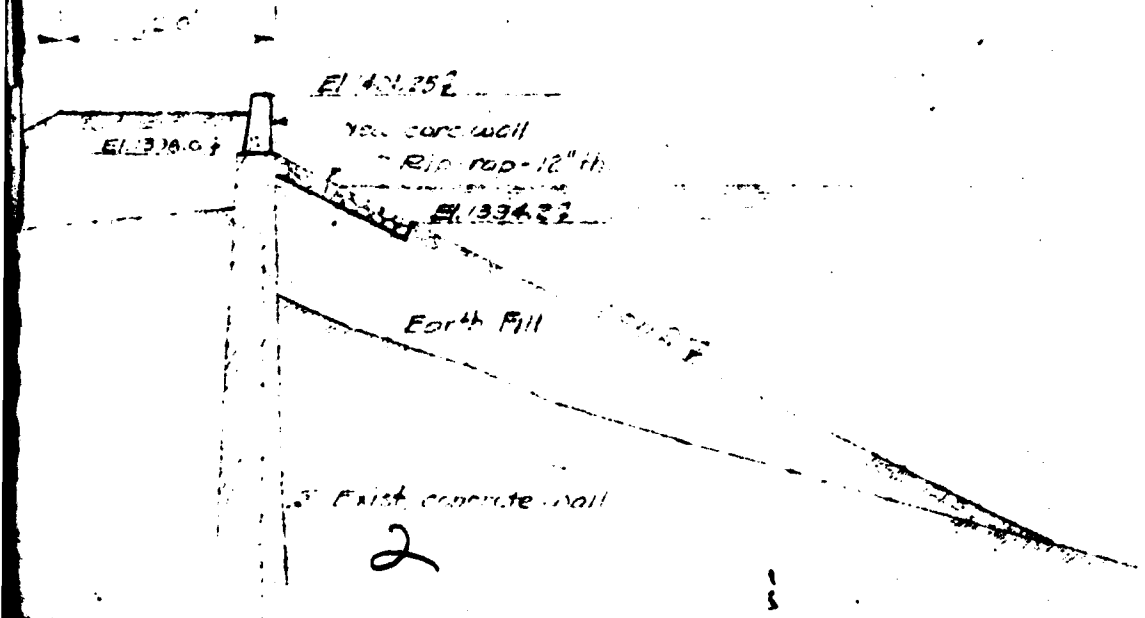
6

SHEET 1 OF 3

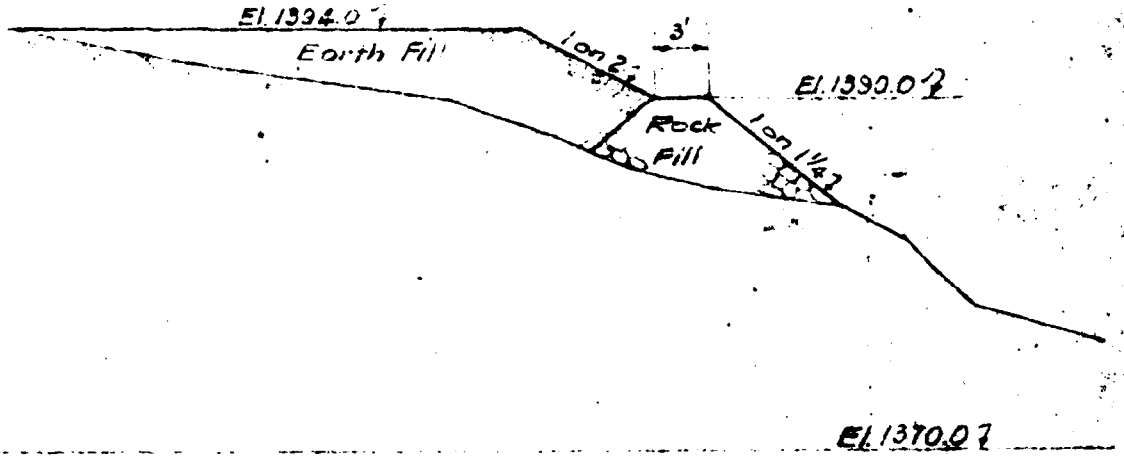



Top of wall-El. 401.35
El 1395.0
Edge Line 7
El 1370.0

SECTION A-A


El 401.35
El 1334.2
Earth Fill
Excavate
Eroded
be filled.

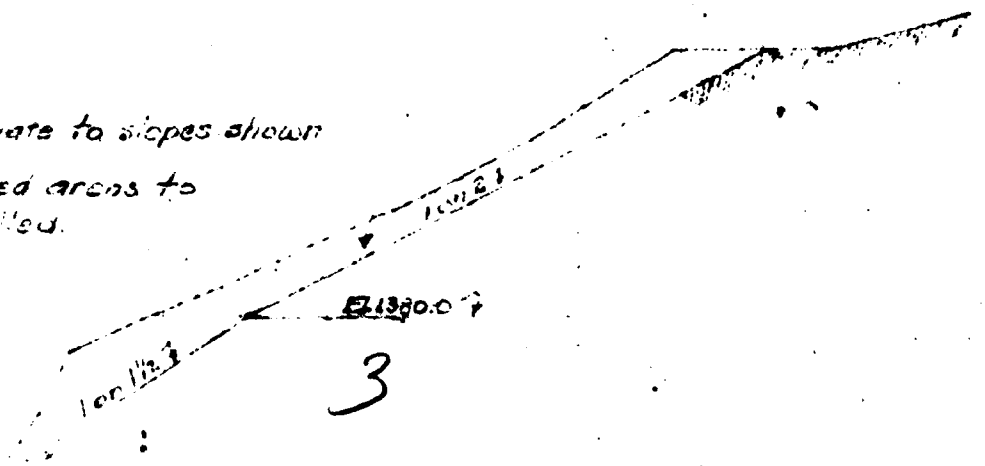
2



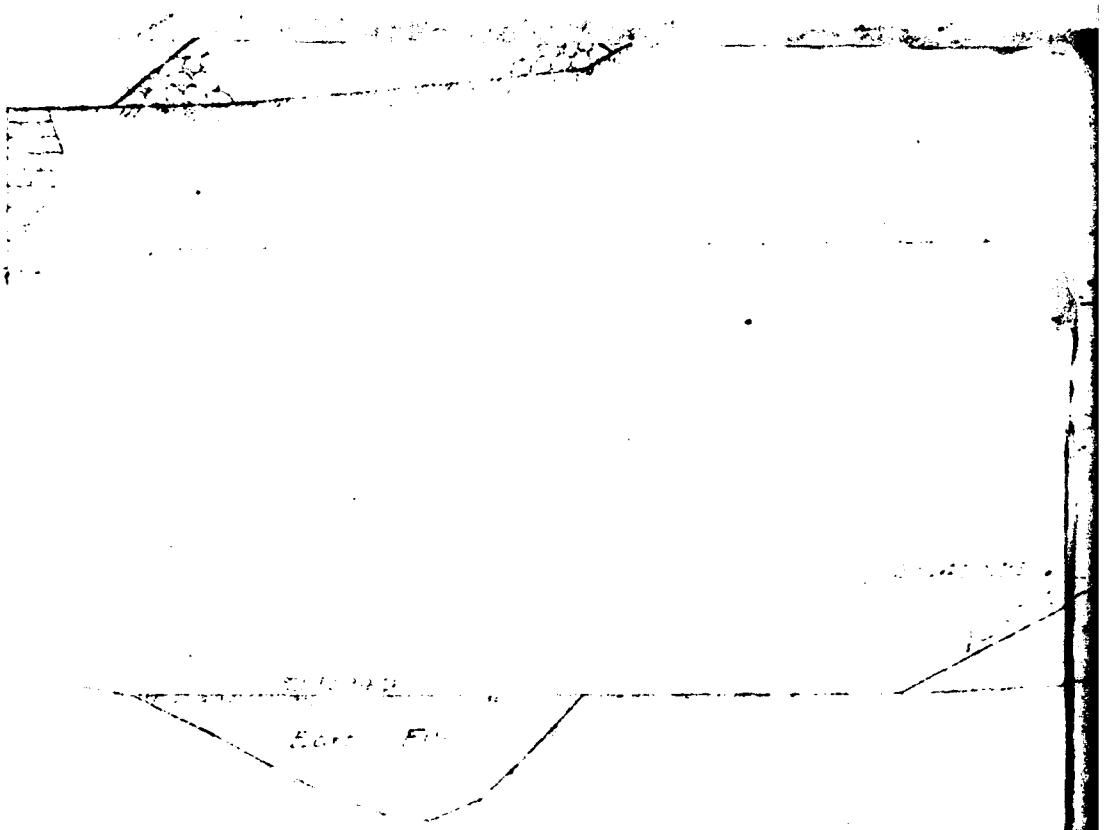
SECTION F-F

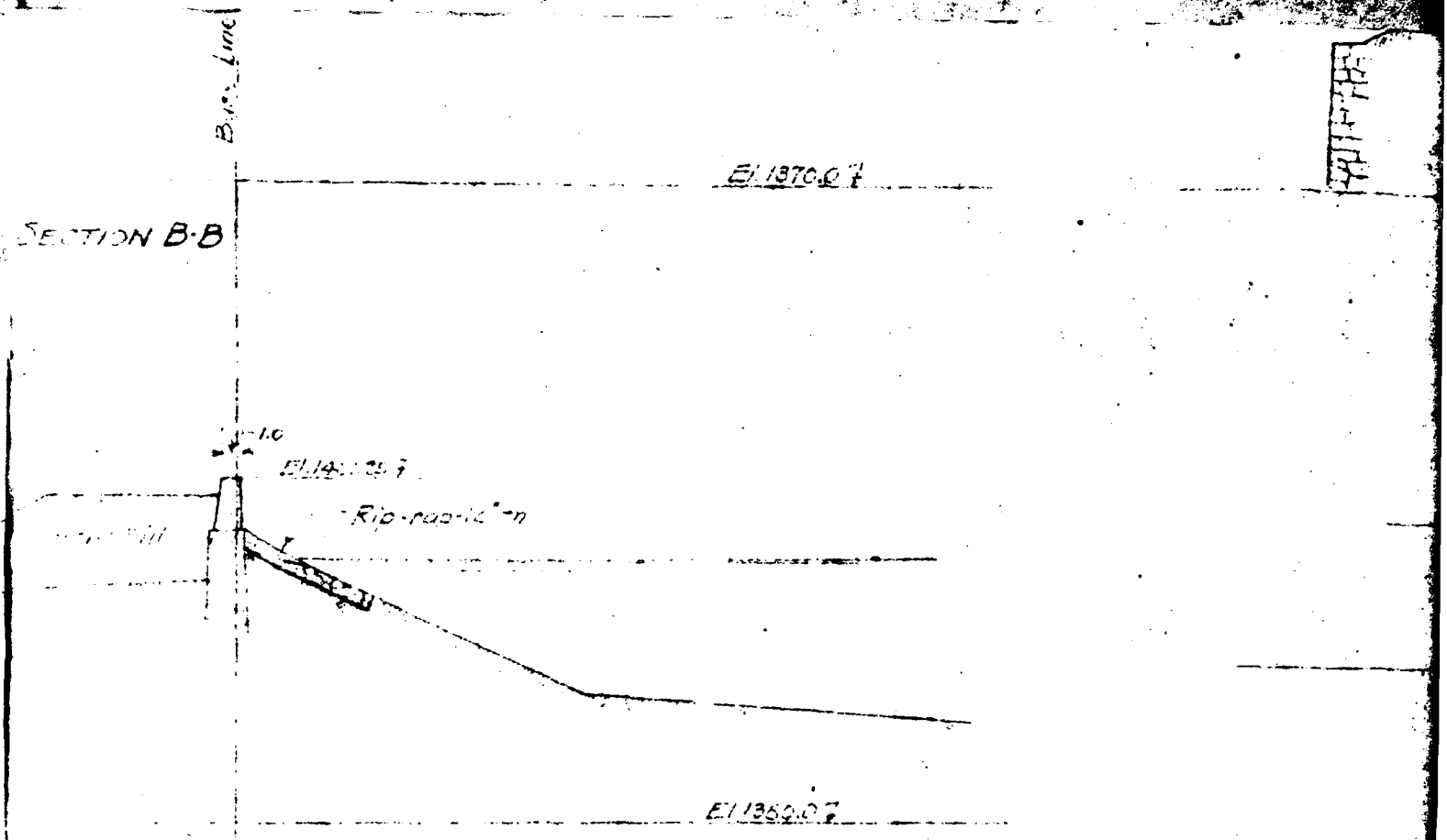
Excavate to slopes shown

Eroded areas to be filled.



3



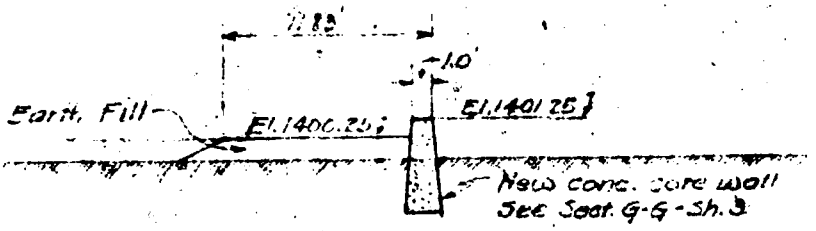


NOTE - For location of sections - See Sh #1
details of spillway - See Sh #3

5

El. 1360.0'

SECTION E-E



El. 1390.0'

SECTION D-D

HELDERBERG LAKE ASSOCIATION

HELDERBERG LAKE DAM

PROPOSED ALTERATIONS

SECTIONS

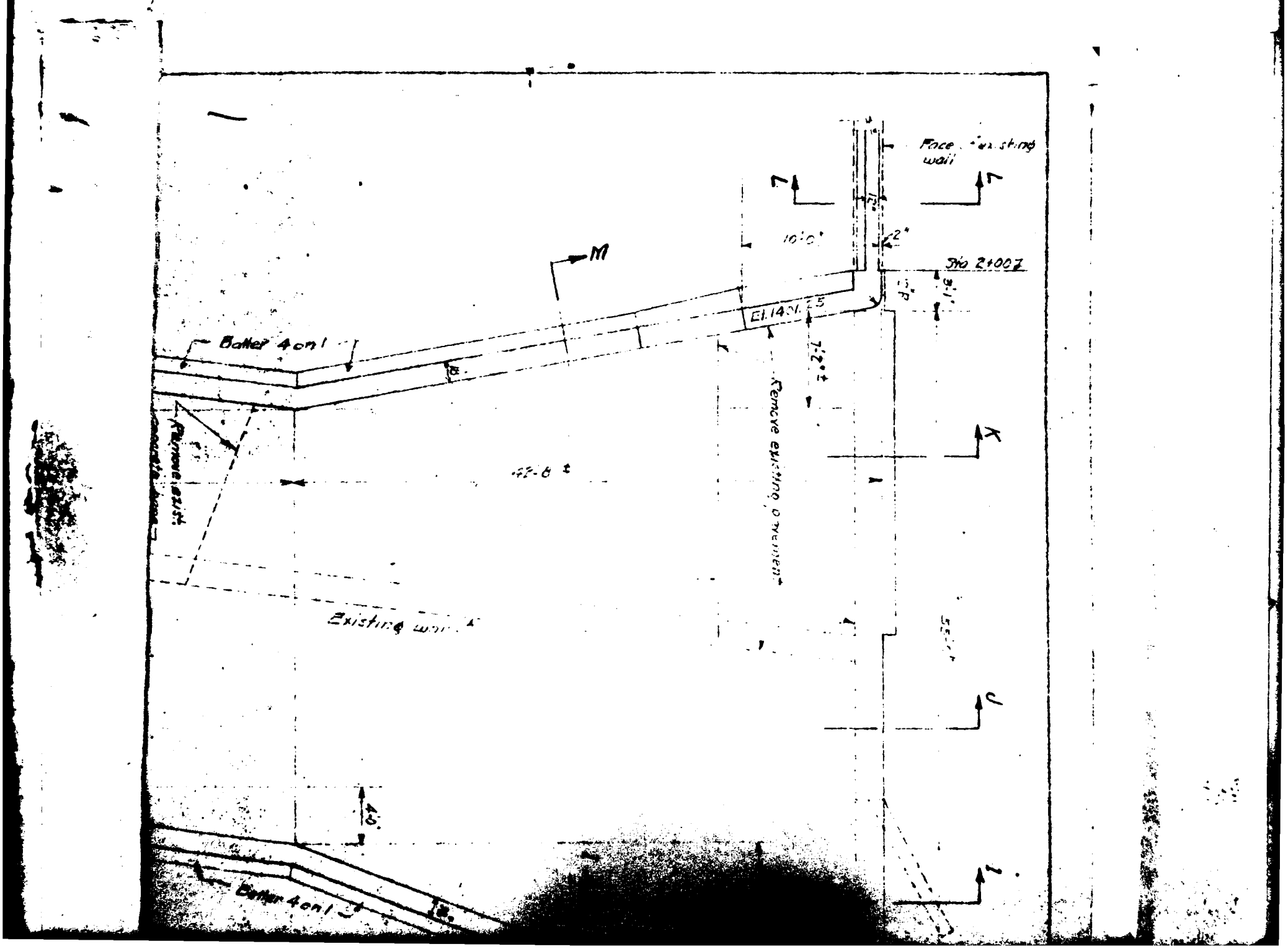
Scale 1" = 10'

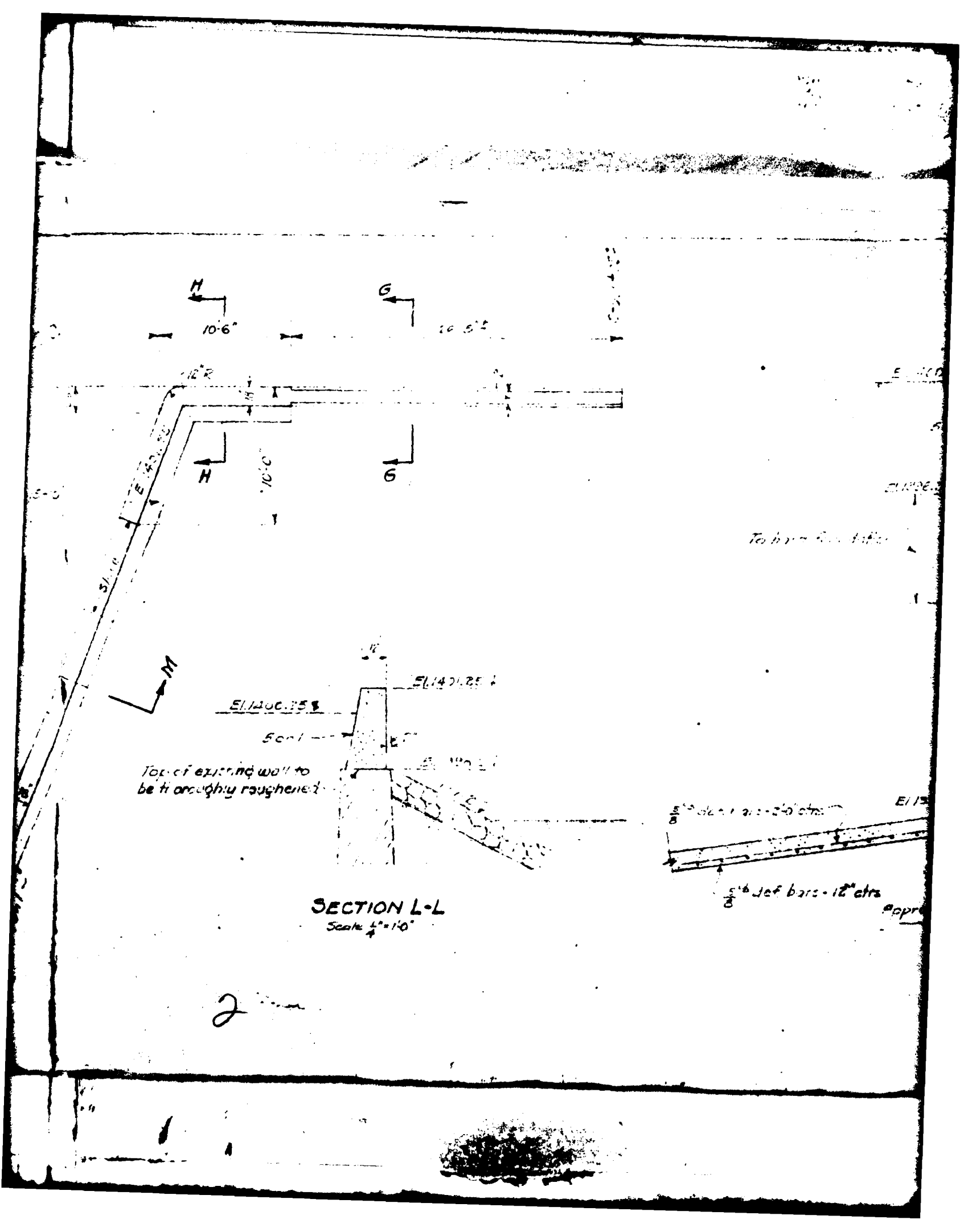
Engineer

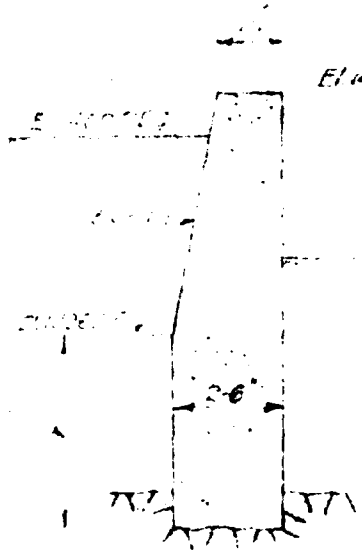
P.E. License # 10100

6.

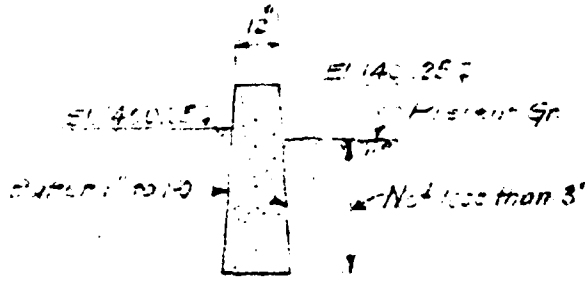
SHEET No. 5


Face existing wall
Sta 21007
El. 14.5
Batter 4 on 1
Remove exist.
Existing wall
Remove existing pavement
Batter 4 on 1
7'-2" ±
42'-8" ±
10'-0"
M
K
C
L
40'

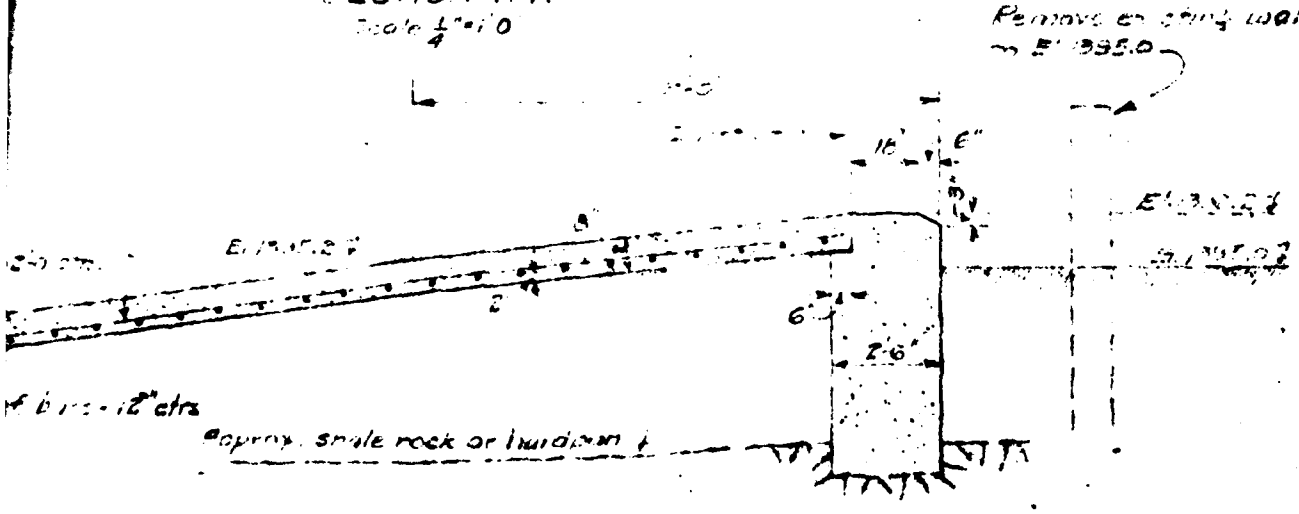

M
G
10'-6"
H
G
10'-0"
M
Top of existing wall to be thoroughly roughened
SECTION L-L
Scale 1/4"=1'-0"



SECTION H-H
Scale 1/4"=1'0

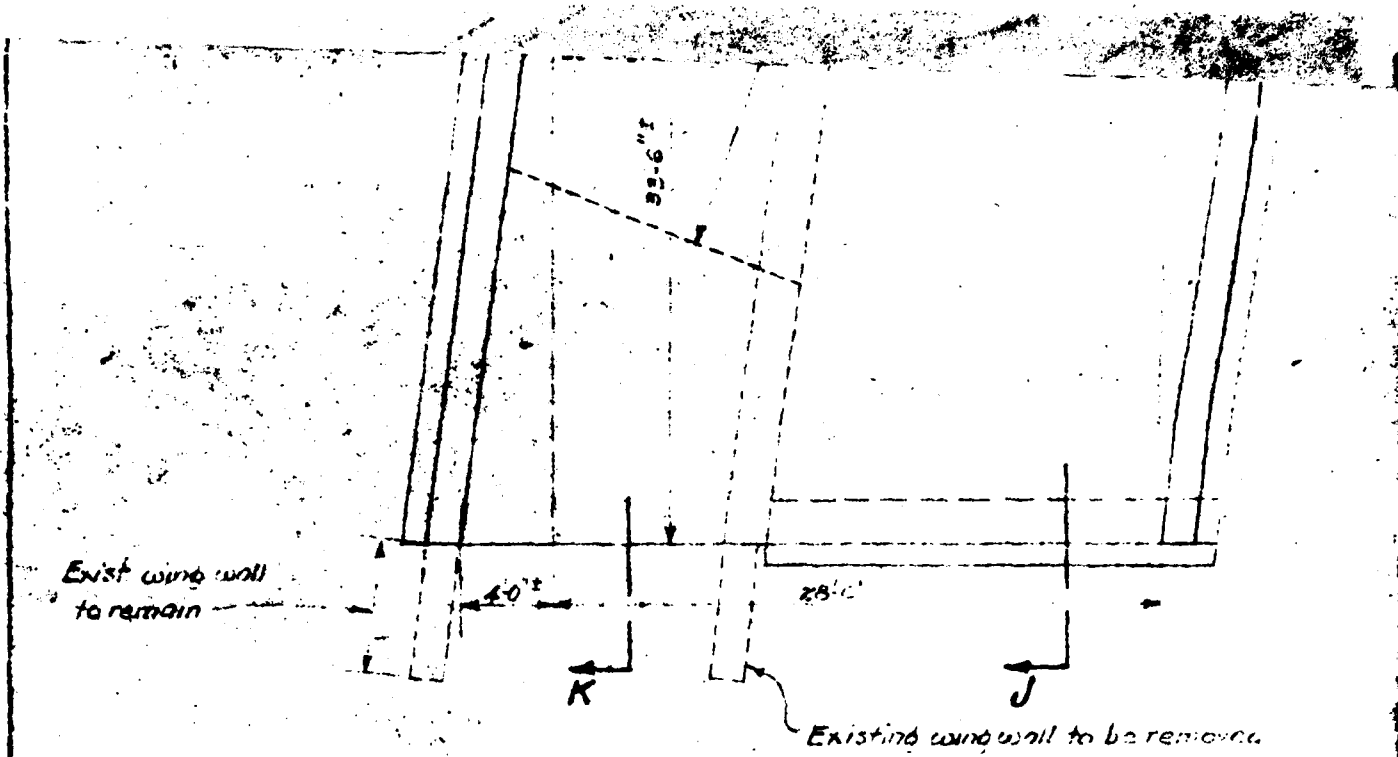


SECTION G-G
Scale 1/4"=1'0"

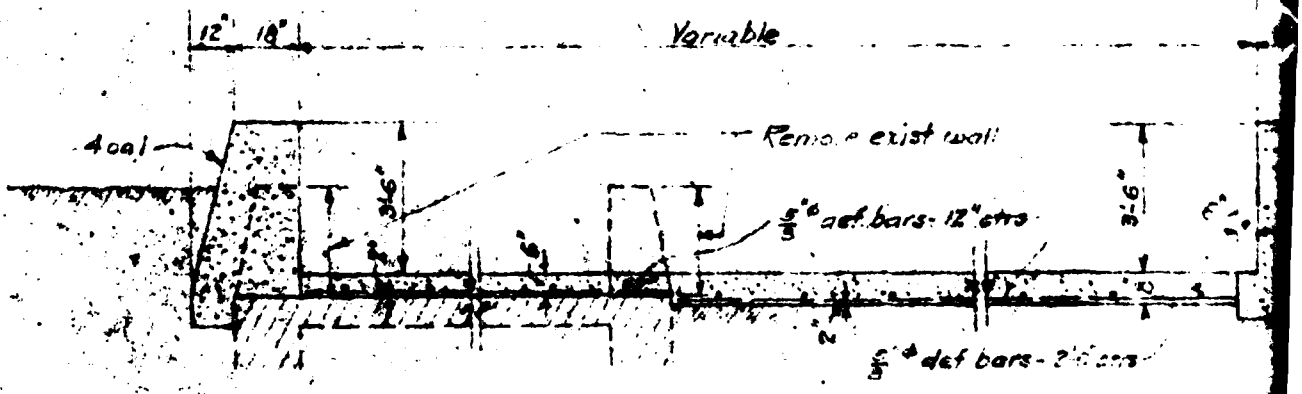


SECTION I-I
Scale 1/2"=1'0"

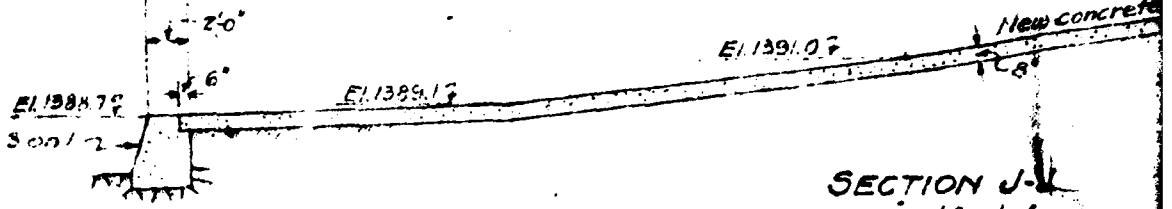
3



PLAN
Scale $\frac{1}{8}$"=1'-0"



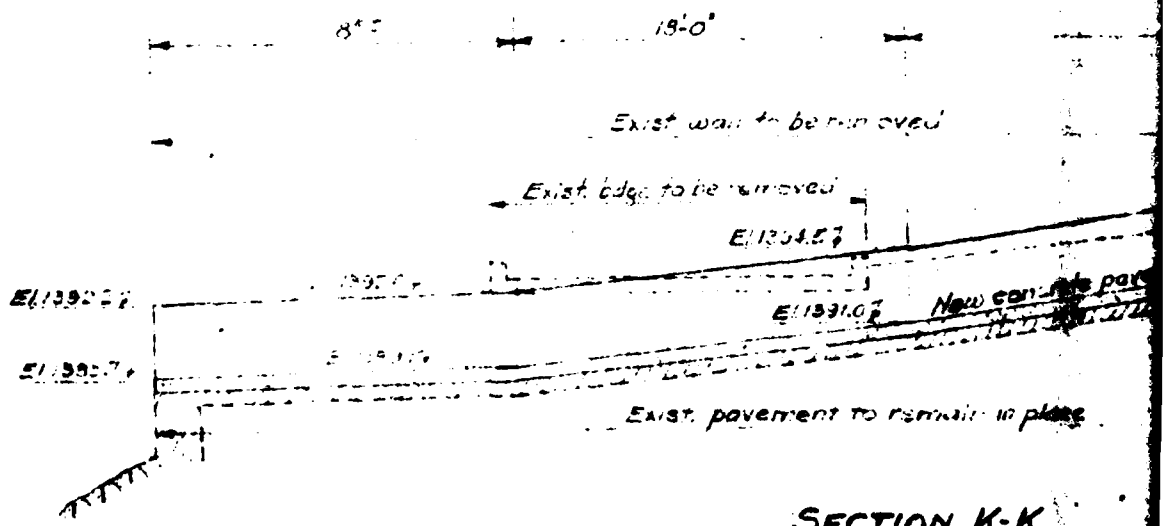
SECTION M-M
Scale $\frac{1}{4}$"=1'-0"



SECTION J-J

Scale $\frac{1}{8}$" = 1'-0"

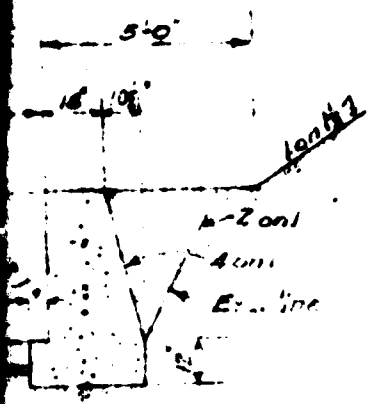
Reinforcement not shown.



SECTION K-K

Scale $\frac{1}{8}$" = 1'-0"

Reinforcement not shown.



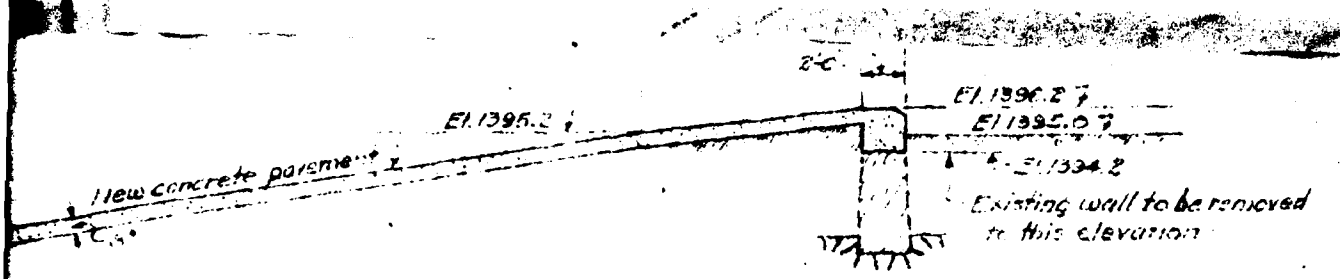
All masonry shown on this sheet to be Class 'B' concrete (1-2½-5 mix) except spillway pavement which shall be Class "A" concrete (1-2-4 mix). See specifications. Metal reinforcement to be deformed bars of minimum gross sectional area given. Vertical joints shall not be spaced more than 30 ft apart. Suitable resilient joints to be provided at all vertical joints.

All exposed edges of concrete shall be rolled 1" except as otherwise shown.

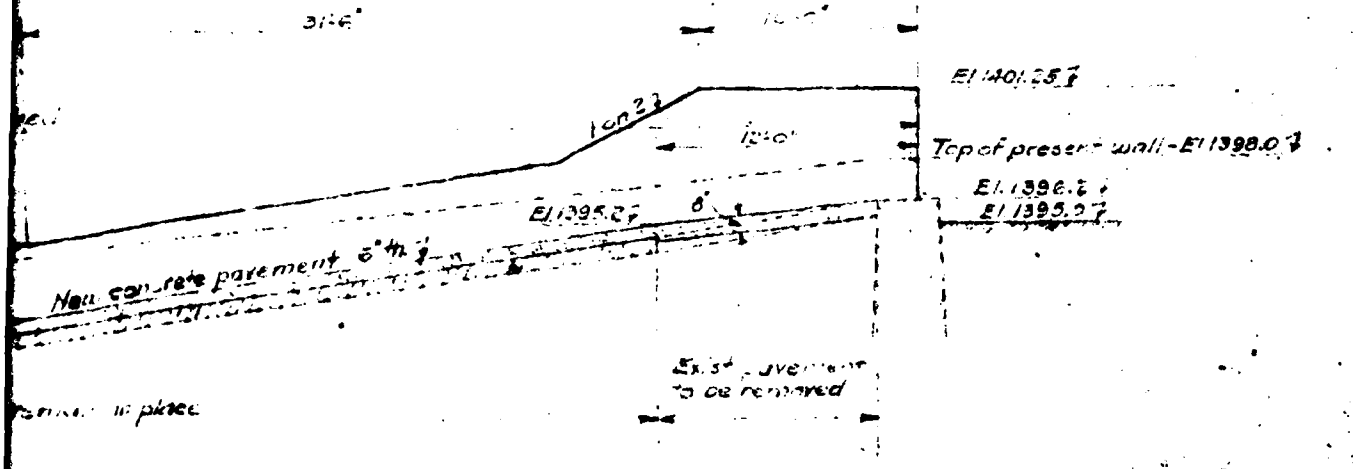
For plan and profile of dam, See Sheet #1

" sections of dam, See Sheet #2

5



TION J-J



ION K-K

HELDERBERG LAKE ASSOCIATION

HELDERBERG LAKE DAM

PROPOSED ALTERATIONS

SPILLWAY DETAILS

Scales as shown.

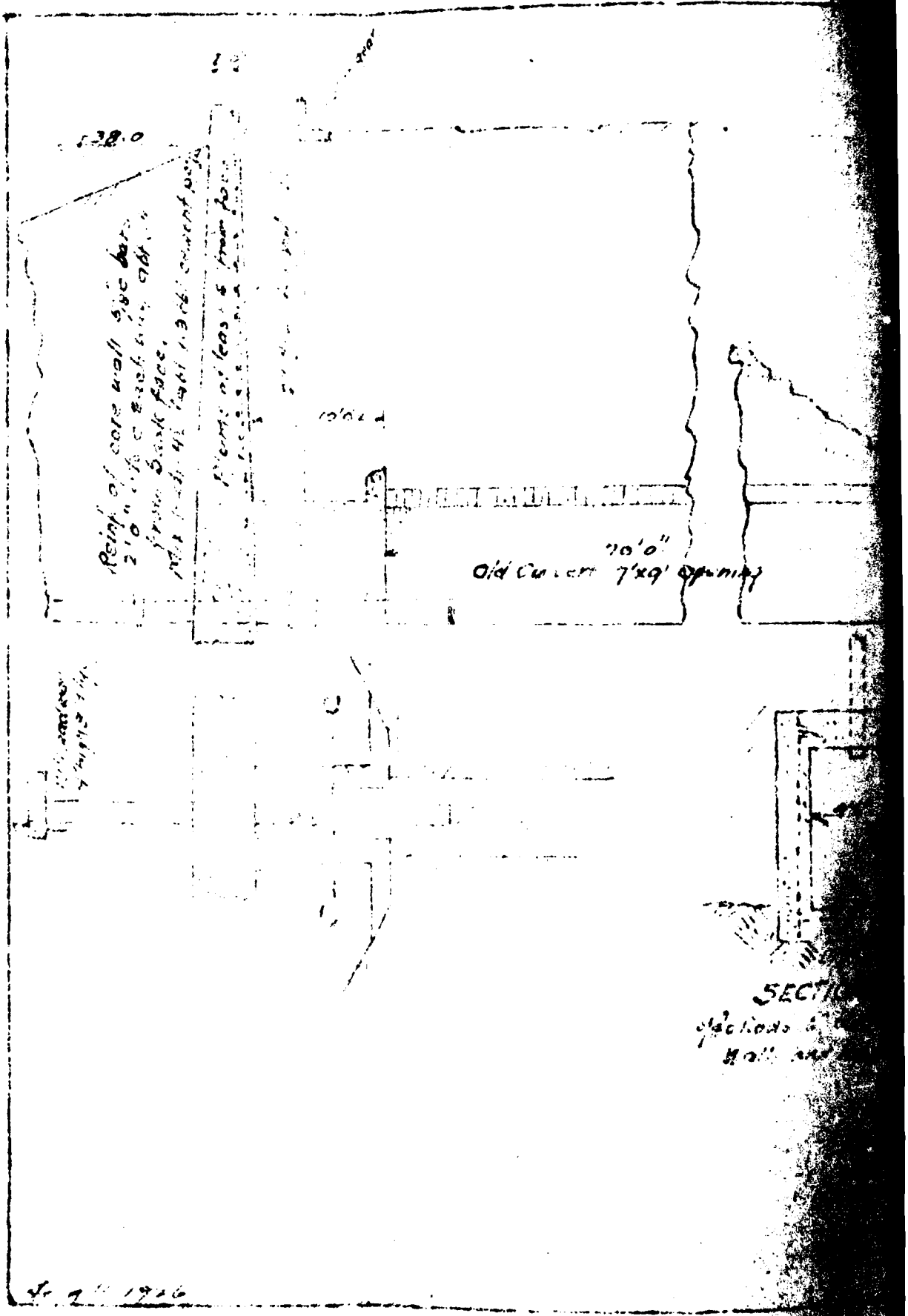
Engineer.

P.E. License #10100

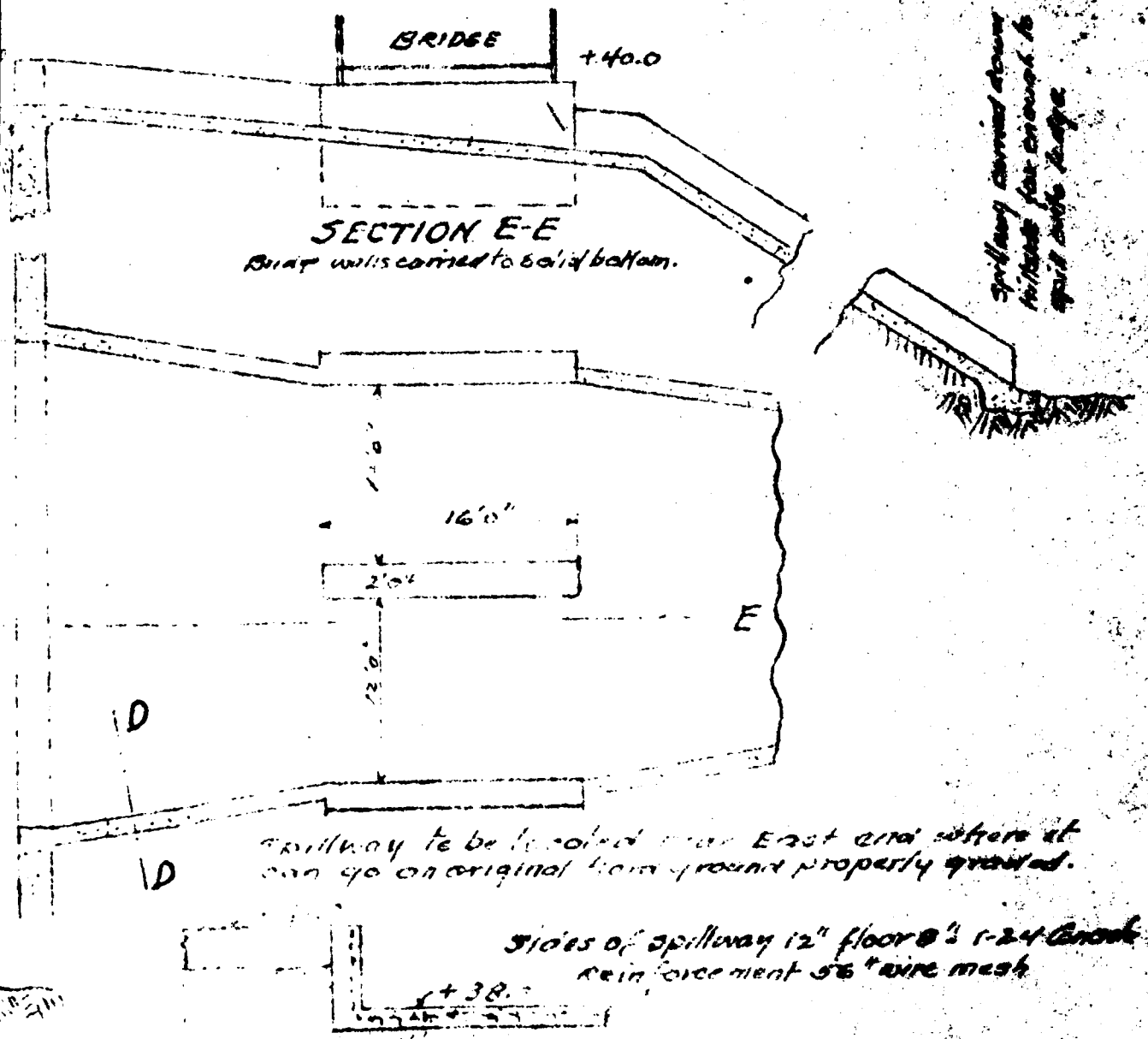
6

SHEET 3 OF 3

Sept 1964


20'0"
Old Culvert 7'x9' Opening
SECTI

2

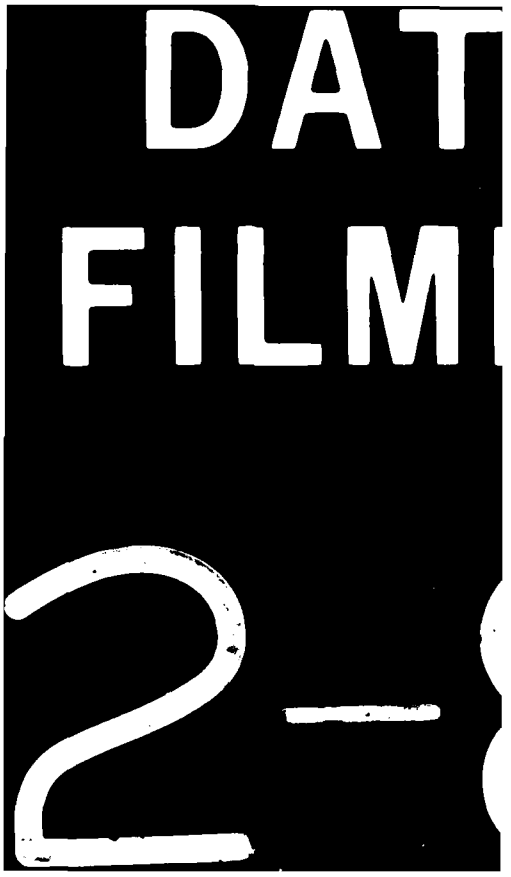


DAM AT BERNE N.Y.

FOR E. A. BECKER, BALTIMORE MD.

Detail Sheet

2


DAT
FILM
2-