

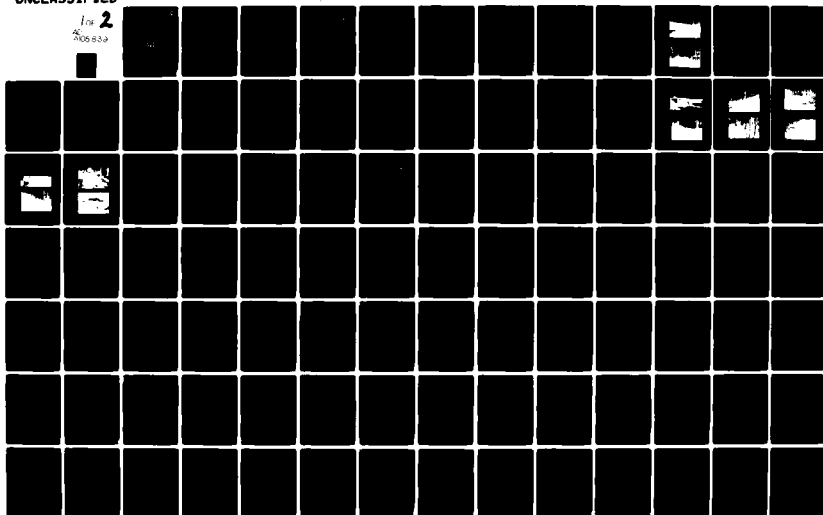
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NEW YORK STATE DEPT OF ENVIRONMENTAL CONSERVATION ALBANY F/G 13/13
NATIONAL DAM SAFETY PROGRAM. MARTIN DUNHAM RESERVOIR DAM (INVEN-ETC(U)
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LEVEL II

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LOWER HUDSON RIVER BASIN

MARTIN DUNHAM RESERVOIR DAM

RENSSELAER COUNTY, NEW YORK

AD A105839

INVENTORY NO. N.Y. 672

PHASE I INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM



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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 available documents and a visual inspection of this dam did not reveal conditions which constitute an immediate hazard to human life or property. However, the dam has some deficiencies which need to be evaluated and remedied.		

The most serious deficiency noted was a large wet area near the right abutment contact at the downstream toe of the main embankment. The ground in this area was very soft and there was minor sloughing of the embankment slope, as well. Two smaller wet areas were also observed. One of these was near the downstream toe at the left end of the main embankment and the other was beyond the toe of the spillway dike. Investigations into the causes and possible treatments of these wet areas should be commenced within 3 months of the date of notification of the owner. Remedial measures on these areas should be completed within 12 months.

The hydrologic/hydraulic analysis performed indicates that the spillway does not have sufficient capacity to discharge the peak outflow from one-half the Probable Maximum Flood (PMF). However, spillway discharges occurring during large storm events will cause water surface elevations in the downstream hazard area to rise to flood levels. A dam failure resulting from overtopping would not significantly increase the hazard to loss of life from that which would exist just prior to an overtopping failure. Therefore, the spillway is assessed as inadequate.

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PREFACE

This report is prepared under guidance contained in the Recommended Guidelines for Safety Inspection of Dams, for Phase I Investigations. Copies of these guidelines may be obtained from the Office of Chief of Engineers, Washington, D.C. 20314. The purpose of a Phase I Investigation is to identify expeditiously those dams which may pose hazards to human life or property. The assessment of the general condition of the dam is based upon available data and visual inspections. Detailed investigation, and analyses involving topographic mapping, subsurface investigations, testing, and detailed computational evaluations are beyond the scope of a Phase I Investigation; however, the investigation is intended to identify any need for such studies.

In reviewing this report, it should be realized that the reported condition of the dam is based on observations of field conditions at the time of inspection along with data available to the inspection team. In cases where the reservoir was lowered or drained prior to inspection, such action, while improving the stability and safety of the dam, removes the normal load on the structure and may obscure certain conditions which might otherwise be detectable if inspected under the normal operating environment of the structure.

It is important to note that the condition of a dam depends on numerous and constantly changing internal and external conditions, and is evolutionary in nature. It would be incorrect to assume that the present condition of the dam will continue to represent the condition of the dam at some point in the future. Only through frequent inspections can unsafe conditions be detected and only through continued care and maintenance can these conditions be prevented or corrected.

Phase I inspections are not intended to provide detailed hydrologic and hydraulic analyses. In accordance with the established Guidelines, the Spillway Test flood is based on the estimated "Probable Maximum Flood" for the region (greatest reasonably possible storm runoff), or fractions thereof. Because of the magnitude and rarity of such a storm event, a finding that a spillway will not pass the test flood should not be interpreted as necessarily posing a highly inadequate condition. The test flood provides a measure of relative spillway capacity and serves as an aide in determining the need for more detailed hydrologic and hydraulic studies, considering the size of the dam, its general condition and the downstream damage potential.

PHASE I INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM
MARTIN DUNHAM RESERVOIR DAM
I.D. No. NY 762
24C-1430
LOWER HUDSON RIVER BASIN
RENSSELAER COUNTY, NEW YORK

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PHASE I INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM

Name of Dam: Martin Dunham Reservoir Dam
(I.D. No. NY 672)

State Located: New York

County: Rensselaer

Watershed: Lower Hudson River Basin

Stream: Quacken Kill

Date of Inspection: November 13, 1980

ASSESSMENT

Examination of available documents and a visual inspection of this dam did not reveal conditions which constitute an immediate hazard to human life or property. However, the dam has some deficiencies which need to be evaluated and remedied.

The most serious deficiency noted was a large wet area near the right abutment contact at the downstream toe of the main embankment. The ground in this area was very soft and there was minor sloughing of the embankment slope, as well. Two smaller wet areas were also observed. One of these was near the downstream toe at the left end of the main embankment and the other was beyond the toe of the spillway dike. Investigations into the causes and possible treatments of these wet areas should be commenced within 3 months of the date of notification of the owner. Remedial measures on these areas should be completed within 12 months.

The hydrologic/hydraulic analysis performed indicates that the spillway does not have sufficient capacity to discharge the peak outflow from one-half the Probable Maximum Flood (PMF). However, spillway discharges occurring during large storm events will cause water surface elevations in the downstream hazard area to rise to flood levels. A dam failure resulting from overtopping would not significantly increase the hazard to loss of life from that which would exist just prior to an overtopping failure. Therefore, the spillway is assessed as inadequate.

A number of other deficiencies were noted on this structure. These deficiencies should be corrected within 12 months of the date of notification of the owner. Among the required actions are the following:

1. Cut brush and trees growing on both main embankment and spillway dike.
2. Repair cracks and spalling concrete at both ends of spillway section.
3. Replace backfill along left spillway wingwall.
4. Repair deteriorated concrete slabs forming the spillway apron;

5. Cut trees growing in channel immediately downstream of spillway;
6. Make valves at mid-point of the two 24 inch low level outlet pipes operational.
7. Develop an emergency action plan for the notification and evacuation of downstream residents.

George Koch

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Approved By:

W. M. Smith, Jr.
for Col. W. M. Smith, Jr. Deputy DE
New York District Engineer

Date:

4 MAY 1981



OVERVIEW - MAIN EMBANKMENT
MARTIN - DUNHAM RESERVOIR



OVERVIEW - SPILLWAY DIKE

PHASE I INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM
MARTIN DUNHAM RESERVOIR DAM
I.D. No. NY 672
24C-1430
LOWER HUDSON RIVER BASIN
RENSSELAER COUNTY, NEW YORK

SECTION 1: PROJECT INFORMATION

1.1 GENERAL

a. Authority

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

b. Purpose of Inspection

This inspection was conducted to evaluate the existing conditions of the dam, to identify deficiencies and hazardous conditions, to determine if these deficiencies constitute hazards to life and property, and to recommend remedial measures where required.

1.2 DESCRIPTION OF PROJECT

a. Description of Dam

The Martin Dunham Reservoir Dam is an earth dam consisting of a main embankment and a separate dike section. There is an Ambursen-type concrete spillway section near the north end of the dike. Two low level outlet conduits pass through the main embankment and there is one pipe through the dike section.

The main embankment is 660 feet long and a maximum of 84 feet high. The crest width is 20 feet. The upstream slope of the embankment is 1 vertical on 2.5 horizontal. The downstream slope is 1 vertical on 2 horizontal. There are two thin concrete core walls which extend the length of the embankment.

The dike is approximately 400 feet to the east of the main embankment. It is 555 feet long and a maximum of 22 feet high. The crest is 12 feet wide. Both the upstream and downstream slopes of this section are 1 vertical on 2.5 horizontal. There is a concrete core wall which extends within the entire embankment. The spillway divides this dike into two segments.

The spillway is a 100 foot long ungated concrete overflow weir. It is located across the original stream channel of Shaver Pond Brook. There are concrete slabs forming an apron at the downstream toe of the spillway section. These slabs and rip rap in the downstream channel provide erosion protection.

Two 24 inch diameter cast iron pipes pass through the main embankment. These pipes serve as low level outlets and can also act as reservoir drains. The pipes are each 275 feet long. Flow through these pipes is controlled by valves at the outlet end. These valves are housed in a concrete gate chamber at the downstream toe of the dam. There are also valves near the mid-point of these pipes. The control mechanism for these valves is located in a brick gate house situated on the crest of the dam.

Plans indicate that there are two anti-seepage cutoff walls on the upstream portion of these pipes. There is also a 20 foot high concrete riser at the upstream end of one of the pipes. However, since the crest of this riser is almost 50 feet below the normal water surface, it does not control flow through the pipe.

There is a 12 inch diameter cast iron pipe located in the dike section. This pipe may serve as a low level outlet. This pipe is 95 feet long and has two concrete cutoff walls to prevent seepage along the pipe. There is a valve located beneath the crest of the dike which controls flow in this pipe. The control mechanism for this valve is located in a manhole with access from the top of the dam.

b. Location

The Martin Dunham Reservoir Dam is located off Reservoir Road in the Town of Grafton. It is about 1/2 mile south of New York State Route 2 and 2 miles southwest of the Village of Grafton. The structure is located within the Grafton Lakes State Park.

c. Size Classification

The dam is a maximum of 84 feet high and has a storage capacity of 2322 acre feet. Therefore, the dam is in the intermediate size category as defined by the "Recommended Guidelines for Safety Inspection of Dams".

d. Hazard Classification

The dam is classified as "high" hazard due to the presence of a group of homes located adjacent to the stream bed in the hamlet of Quackenkil, about 3.5 miles downstream of the dam.

e. Ownership

The dam is owned by New York State Office of Parks and Recreation. It is located within the Saratoga-Capital District State Park Region, whose headquarters are in Saratoga. Those contacted concerning the inspection are as follows:

Mr. Jack Barkevich
Associate Park Engineer
Office of Parks and Recreation
Agency Building No. 1
Empire State Plaza
Albany, NY 12238
(518) 474-0482

Mr. Sam MacMillan
Park Engineer
Grafton Lakes State Park
Grafton, NY
(518) 279-1155

f. Purpose of Dam

The dam was constructed for the City of Troy, NY to create a water supply reservoir. New York State Office of Parks and Recreation took over control of this dam in about 1965. The reservoir is now used for recreational purposes.

g. Design and Construction History

This dam was constructed in 1912 for the City of Troy. Plans and construction specifications were prepared in 1911 under the direction of the Commissioner of Public Works for Troy. The dam was built by the Otis Construction Company, who took a sub-letting of the contract from the McDonough Construction Company of Troy.

h. Normal Operation Procedures

There are no regular operation procedures on this structure. A continuous discharge through the low level outlets is provided for fish habitation in the downstream channel.

1.3 PERTINENT DATA

a. Drainage Area (sq. mi.) 11.64

b. Discharge At Dam (cfs)

Concrete spillway - Water Surface at Top of Dam 4556

Low level outlet pipes:

2-24 inch pipes - water surface at spillway crest 132

12 inch pipe-water surface at spillway crest 7

c. Elevation (Plan Datum)

Top of Dam 107.0

Top of Dike 106.0

Spillway Crest 100.0

Inlet Invert of 12 inch low level outlet pipe 92.0

Inlet Invert of 2-24 inch low level outlet pipes 53.8

d. Reservoir (Surface Area) (acres)

Top of Dam 123.5

Spillway Crest 98.5

e. Storage Capacity (acre-feet)

Top of Dam 2322

Spillway Crest 1648

f. Dam

Type: Compacted earth embankment with two thin concrete core walls.

Embankment Length (ft) 660

Slopes (V:H) Upstream 1 on 2 1/2

Downstream 1 on 2

Crest Width (ft) 20

g. Dike

Type: Compacted earth embankment with concrete core wall

Embankment Length (ft) 400

Slopes (V:H) Upstream 1 on 2 1/2

Downstream 1 on 2 1/2

Crest Width (ft) 12

h. Spillway

Type: Ambursen-type concrete overflow weir inclined upstream slab and hollow interior

Length of Weir (ft) 100

i. Low Level Outlets

1) 2-24 Inch Pipes - Cast iron pipes through main embankment, 275 feet long; Valves controlling flow both at outlet end and at midpoint of pipes; May also act as reservoir drain.

2) 12 inch - Cast iron pipe through dike section 95 feet long; Valve beneath crest of dam near midpoint of pipe.

SECTION 2: ENGINEERING DATA

2.1 GEOTECHNICAL DATA

a. Geology

The Martin Dunham Reservoir Dam is located in the Taconic Section of the New England Uplands physiographic province of New York State. The bedrock in this province consists of limestones, sandstones and slates. They have been altered and broken by the folding and faulting which has characterized the geologic history of these areas. A review of the "Brittle Structures Map of the State of New York" indicated that there are no faults in the vicinity of this dam.

Surficial soils in the area are the results of glaciations during the Cenozoic Era, the last of which was the Wisconsin glaciation.

b. Subsurface investigation

A subsurface investigation program was performed for this structure during the original design. The results of ten drill holes progressed in the area of the main embankment are shown on the plans. These borings indicate that the foundation consists of thin deposits of sand and glacial till over bedrock. Bedrock varied in depth from 30 feet at the left end of the section to 5 feet at the right end.

2.2 DESIGN RECORDS

Plans and construction specifications were prepared in 1911 under the direction of the Commissioner of Public Works for the City of Troy. These were the only design records available.

2.3 CONSTRUCTION RECORDS

This dam was constructed in 1912 by the Otis Construction Company. There was some correspondence available concerning the construction. Conservation Commission representatives inspected the structure several times during construction. The most significant change in the original design was that the concrete spillway section was changed from a mass concrete structure to an Ambursen-type (hollow interior) structure.

2.4 OPERATION RECORDS

No operation records were available for this structure.

2.5 EVALUATION OF DATA

Information used for the preparation of this report was obtained from the Department of Environmental Conservation files and from the City of Troy's Department of Public Utilities files. The information available appeared to be reasonably accurate.

SECTION 3: VISUAL INSPECTION

3.1 FINDINGS

a. General

Visual inspection of the Martin Dunham Reservoir Dam was conducted on November 13, 1980. The weather was sunny with the temperature around 40 degrees. The water level at the time of the inspection was slightly above the crest of the spillway.

b. Main Embankment

Inspection of the main embankment was hampered by the trees and brush growing on the downstream face. There was also a dense cover of brush on the upstream face. The crest was grassed but somewhat irregular. There were several uprooted trees on the upper portion of the downstream slope.

Two wet areas were noted on the downstream slope. Both areas were near the downstream toe. One area was at the left end of the dam and was relatively minor in nature. The other wet area was along the right abutment contact. Seepage appeared about half way up the abutment and covered an extensive area which extended down to the base of the embankment. The ground in the area was very soft and some minor sloughing of the embankment slope was also noted.

c. Dike

The earth dike was also covered with brush and trees. Inspection of this dike was hampered by the vegetated growth. There was a wet area beyond the downstream toe near the point where the embankment takes a 90 degree bend. No concentrated seepage was noted in this area but the ground surface was soft and spongy. Another deficiency noted on this segment was an area adjacent to the left spillway wingwall where the backfill had been removed. This was probably due to scouring during high flows.

d. Spillway

The spillway was in satisfactory condition. Some concrete surface deterioration was noted on the spillway crest, but there were no large voids or cracks visible. Inspection of the underside of the concrete slab revealed that this concrete was in good condition. The buttresses supporting the crest concrete were also in good condition. There were several large cracks extending for the entire height of the right abutment wall. One area extended along the entire downstream inclined section. There was also extensive deterioration along the lower half of the upstream inclined section. The slabs which form an apron downstream from the spillway were in varying stages of deterioration. Some of the slabs were intact while others were almost completely removed.

e. Low Level Outlet Pipes

Only a limited inspection of the low level outlet pipes was possible due to the nature of these facilities. The two 24 inch pipes through the main embankment were used to provide normal flows in the downstream channel. The valves located near the midpoint of these pipes (beneath the crest of the dam) were open but inoperable. Flow through the pipes was controlled by valves at the outlet end. These valves were refurbished recently and the concrete valve chamber was reconstructed. These valves

were operational. One of the valves was partially opened at the time of the inspection. Controlling flow at the outlet end of the pipes is undesirable since it results in the conduit always being subjected to pressure. There was surficial rusting on the pipes and the flap covers which are at the end of each pipe.

The 12 inch pipe through the spillway dike did not appear to be operational. The valve controlling flow through this pipe was located in a manhole on the crest of the dike. It appeared that there had been no flow through this pipe for a long period of time.

f. Reservoir

There were no indications of soil instability in the reservoir area.

g. Downstream Channel

The channel downstream of the spillway was natural and rock filled. There were a number of trees growing in the channel immediately downstream of the spillway apron.

3.2 EVALUATION OF OBSERVATIONS

Visual observations revealed several deficiencies on this structure. The following items were noted:

1. A large wet area at the downstream toe of the main embankment along the right abutment contact.
2. A smaller wet area on the left end of the main embankment.
3. An area downstream of the spillway dike in which the ground was soft and spongy.
4. Brush and trees growing on both the main embankment and the spillway dike.
5. Several uprooted trees on the crest of the main embankment.
6. Removed backfill along the left spillway wingwall.
7. Cracks and spalling concrete on the wingwalls at both ends of the spillway.
8. Deterioration of the concrete on the slabs which form the spillway apron.
9. Trees growing in the channel immediately downstream of the spillway apron.
10. The valves near the middle of the two 24 inch low level outlet pipes being under pressure at all times.

SECTION 4: OPERATION AND MAINTENANCE PROCEDURES

4.1 PROCEDURES

There are no formal operating procedures for this dam. The low level outlet pipes remain partially opened to provide flows downstream for the fish population.

4.2 MAINTENANCE OF DAM

There is no established maintenance plan for this dam.

4.3 WARNING SYSTEM IN EFFECT

No apparent warning system for evacuation of downstream residents is present.

4.4 EVALUATION

The operation procedures on this structure are satisfactory. Increased maintenance efforts are required to correct the deficiencies noted in section 3.2.

SECTION 5: HYDROLOGIC/HYDRAULIC

5.1 DRAINAGE AREA CHARACTERISTICS

The delineation of the contributing watershed to this dam is indicated on the map titled "Drainage Area Map - Martin Dunham Reservoir" (Appendix C). The irregular but somewhat rectangular-shaped, east-west oriented watershed of some 11.64 square miles (7452 acres) is comprised of relatively undeveloped lands consisting of open fields, woodlands, and forests. The hamlet of Grafton located near the center of the watershed is the largest developed area. Slopes along the primary drainage paths are flat (less than 3.5%). However, the adjacent hillsides have moderate slopes (less than 8%); with those hills forming the watershed divide ranging from 200 feet to 500 feet in elevation above the reservoir. Numerous bodies of water within the watershed are Cranberry Pond, White Lily Pond, and Lake Elizabeth located within subbasin one, Shaver located in subbasin two, and Long Pond, Second Pond, and Mill Pond, all situated in the Grafton Lakes State Park, located in subbasin three. The above four ponds located in subbasins two and three also have dams regulating outlet stream discharges although these structures were not considered in the watershed analysis because of their small size. Also interspersed throughout the watershed are several sizable wetlands. The two major tributaries, Shaver Pond Brook and the Quacken Kill join within the reservoir. The outlet stream is known as the Quacken Kill.

5.2 ANALYSIS CRITERIA

No hydrologic/hydraulic information was available regarding the original design for this dam. Therefore, the analysis of the floodwater retarding capability of the dam was performed using the Corps of Engineers HEC-1 computer program, Dam Safety version. The computer program develops inflow hydrographs using the "Snyder Unit Hydrograph" method for each of the subbasins, combines them at selected stream locations, and then reservoir routs the resulting hydrograph using the "Modified Puls" flood routing procedure. The spillway design flood selected for analysis was the Probable Maximum Flood (PMF), in accordance with the Recommended Guidelines of the U.S. Army Corps of Engineers. The PMF event is that hypothetical storm event resulting from the most critical combination of rainfall, minimum soil retention, and direct runoff to a specific site that is considered reasonably possible for a particular watershed. Precipitation values used in the analysis were obtained from the Weather Bureau publication HRR 33.

5.3 SPILLWAY CAPACITY

The single, 100 foot long, ungated Ambursen spillway was analyzed for weir flow using a discharge coefficient, C , of 3.1. The computed discharge capacity of the spillway is 4556 cfs.

The flood analysis performed for this dam indicates that the spillway does not have sufficient capacity for discharging one-half the PMF. For this storm event, the peak inflow is 6878 cfs and the peak outflow is 6822 cfs. The PMF peak inflow and peak outflow are 13,755 cfs and 13,656 cfs respectively.

5.4 RESERVOIR CAPACITY

The normal water surface is at or near the spillway crest elevation of 100.0 (plan datum). Using the 1911 reservoir contour mapping for the project, the impounded capacity at this elevation is 1648 acre-feet. Surcharge storage capacity to the top-of-dam (elev. 106) adds 674 acre-feet which is equivalent to a direct runoff depth of 1.08 inches over the watershed. The total storage capacity is 2322 acre-feet.

5.5 FLOODS OF RECORD

The date of occurrence of the maximum flood at the dam site is not known.

5.6 OVERTOPPING POTENTIAL

Analyses using the PMF and one-half the PMF storm events indicates that the spillway does not have sufficient discharge capacity. The computed depths of overtopping for these two events are 1.81 feet and 0.66 feet respectively. All storm events exceeding 36% of the PMF will result in the dam being overtopped.

5.7 EVALUATION

Overtopping the earth embankment and dike is likely to cause dam failure. The spillway capacity is inadequate for the peak outflow from one-half the PMF.

Spillway discharges flow downstream in the relatively narrow and confining channel for some 3.5 miles to the settlement at Quacken Kill, and then an additional 2 miles to Cropseyville. Between Quacken Kill and Cropseyville, numerous residences as well as State Route 2 are located immediately adjacent the stream channel. For increased spillway discharges occurring during large storm events, downstream water surface elevations would rise to flood levels exceeding the top-of-streambank elevations. Therefore, a dam failure resulting from overtopping would not significantly increase the hazard to loss of life downstream from that which would exist just prior to an overtopping failure. The spillway is, therefore, assessed as inadequate.

SECTION 6: STRUCTURAL STABILITY

6. 1 EVALUATION OF STRUCTURAL STABILITY

a. Visual Observations

inspection

Visual inspection of the embankments was hampered by trees and brush growing on the slopes. No major settlement or sloughing of the embankment was noted. There were several wet areas observed at the downstream toe of the embankments. The most extensive of these was along the right abutment of the main embankment. The ground in this area was extremely soft and minor sloughing was noted at the toe of the embankment. The other wet areas were near the downstream toe at the left end of the main embankment and near the 90 degree bend in the spillway dike.

b. Data Review and Stability Evaluation

No design information concerning the stability of either the earth embankment sections or the concrete spillway section was available. The construction plans provided a cross section of the spillway. The design of the spillway section was changed during construction from a mass concrete section to an Ambursen - type (hollow interior) structure.

A stability analysis was performed for this report in accordance with the "Recommended Guidelines for Safety Inspection of Dams". Due to the sloping upstream face of the spillway section, it was assumed that an expanding ice sheet would deflect up on the structure. Therefore, no ice loading was considered in the analyses. For the purposes of the analyses, it was assumed that the combination of cutoff walls at both the upstream and downstream ends of the spillway and weep holes in the base were effective in reducing uplift pressures.

Appendix D

The results of the analyses performed (See Appendix D) are as follows:

<u>Case</u>	<u>Overturning Safety Factor</u>	<u>Resultant In Middle Third</u>	<u>Sliding Safety Factor</u>
a. Normal conditions; water surface at spillway crest	2.26	YES	1.80
b. Flood flows; water surface a top of spillway dike	1.18	NO	1.06
c. Normal conditions with seismic coefficient of 0.10	2.06	YES	1.44

The analyses performed indicate that under normal conditions the structure has an adequate safety factor against overturning. While the sliding safety factor for these conditions is below the recommended value, it is considered adequate as well. For extreme loading conditions, such as flood flows, the dam is marginally stable. However, as discussed in Section 5.7, spillway discharges under these flow conditions would cause flooding downstream even if the spillway did not fail. Therefore, no further stability investigations are required.

c. Seismic Stability

The structure is located in Seismic Zone 2. A Seismic stability analysis was performed assuming a seismic coefficient of 0.1. The results of this analysis (shown on page 10) indicate that the safety factors are adequate when seismic considerations are included.

SECTION 7: ASSESSMENT/RECOMMENDATIONS

7.1 ASSESSMENT

a. Safety

The Phase I inspection of the Martin Dunham Reservoir Dam revealed a large wet area near the downstream toe along the right abutment contact on the main embankment. The ground was very soft in this area and there was minor sloughing of the embankment slope. Two other smaller wet areas were also noted beyond the downstream of the embankment. Both the main embankment and the spillway dike were covered with trees and brush. Several uprooted trees were noted along the crest of the main embankment.

The spillway capacity is inadequate for the peak outflow from one-half the Probable Maximum Flood (PMF). However, since downstream flooding could be expected prior to an overtopping induced failure, the spillway capacity is not considered to be seriously inadequate.

b. Adequacy of Information

The information available for the preparation of this report was fairly complete and appeared to be reasonably accurate.

c. Need for Additional Investigations

Investigations into the causes of the wet areas downstream of the dam and into possible treatments for these wet areas are required. Priority should be given to devising a method of treatment for the large wet area at the right abutment contact.

d. Urgency

The investigations into the wet area should be commenced within 3 months of the date of notification of the owner. Remedial measures deemed appropriate as a result of the investigations should be completed within 12 months.

Other deficiencies outlined below should also be corrected within 12 months of the date of notification of the owner.

7.2 RECOMMENDED MEASURES

- a. A method of treatment of the wet areas at the downstream toe should be designed and implemented.
- b. Brush and trees growing on both the main embankment and on the spillway dike should be cut.
- c. Areas on the main embankment where trees have been uprooted should be regraded and seeded.
- d. Cracks and spalling concrete on wingwalls at both ends of the spillway should be repaired.
- e. Removed backfill along the left spillway wingwall should be replaced.
- f. Deteriorated concrete slabs forming the spillway apron should be repaired.
- g. Trees growing in the channel immediately downstream of the spillway apron should be cut.

APPENDIX A

PHOTOGRAPHS



MAIN EMBANKMENT - SEPTEMBER 1914



MAIN EMBANKMENT - NOVEMBER 1980



DOWNSTREAM SLOPE OF MAIN EMBANKMENT



UPROOTED TREE ON DOWNSTREAM SLOPE
(ONE OF SEVERAL)



SEEPAGE AREA @ TOE OF MAIN EMBANKMENT



SEEPAGE AREA (as above)



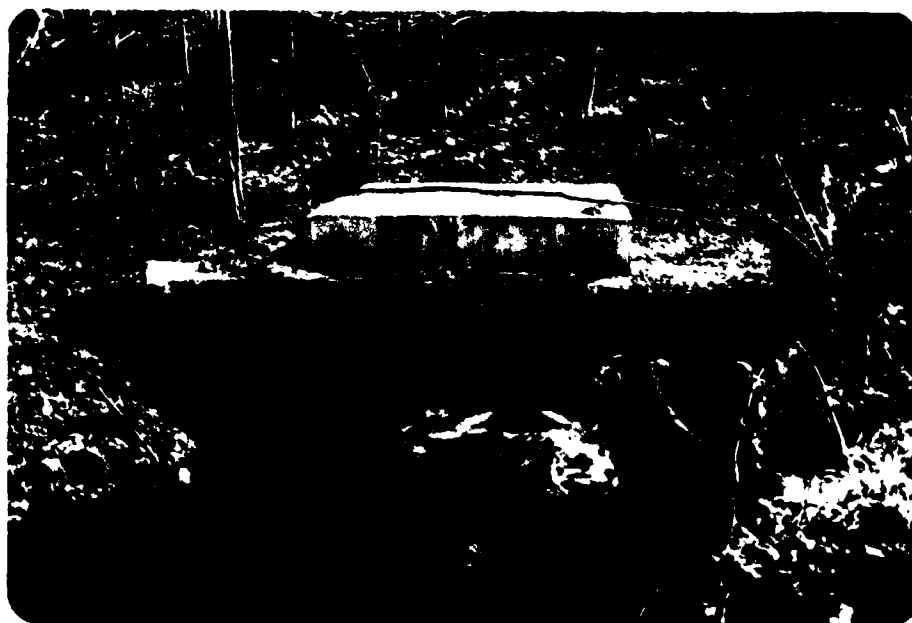
SPILLWAY @ MARTIN - DUNHAM RESERVOIR



CONCRETE DETERIORATION @ SPILLWAY LEFT WALL



SPILLWAY DIKE - OUTLET STRUCTURE FOR 12" PIPE



MAIN EMBANKMENT - OUTLET STRUCTURE FOR TWIN
24" PIPES (RESERVOIR DRAIN)

APPENDIX B
VISUAL INSPECTION CHECKLIST

VISUAL INSPECTION CHECKLIST1) Basic Data

a. General

Name of Dam MARTIN DUNHAM RESERVOIR DAMFed. I.D. # NY 672 DEC Dam No. 243C-1430River Basin LOWER HUDSONLocation: Town GRAFTON County RENSSELAERStream Name QUACKEN KILLTributary of BATTEN KILLLatitude (N) 42° 45.1' Longitude (W) 73° 29.1'Type of Dam EARTH WITH CONCRETE CORE WALLHazard Category HIGH HAZARDDate(s) of Inspection 11/13/80Weather Conditions SUNNY - 40°Reservoir Level at Time of Inspection SLIGHTLY ABOVE SPILLCRESTb. Inspection Personnel ROBIN WARRENDER, WALTER LYNICK

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

ED BLY - CAPITAL DISTRICT STATE PARK COMMISSIONGRAFTON LAKES STATE PARKGRAFTON, N.Y.518-279-1155

d. History:

Date Constructed 1912 Date(s) Reconstructed _____Designer CITY OF TROY DEPT. OF PUBLIC WORKSConstructed By OTIS CONSTRUCTION Co.Owner NY'S OFFICE OF PARKS & RECREATION

2) Embankment - MAIN EMBANKMENT SECTION

a. Characteristics

- (1) Embankment Material GLACIAL TILL
- (2) Cutoff Type NONE
- (3) Impervious Core CONCRETE CORE WALL
- (4) Internal Drainage System NONE
- (5) Miscellaneous _____

b. Crest

- (1) Vertical Alignment IRREGULAR WITH WHEEL PATHS OR GULLIES
- (2) Horizontal Alignment SATISFACTORY
- (3) Surface Cracks NONE
- (4) Miscellaneous NONE

c. Upstream Slope

- (1) Slope (Estimate) (V:H) 1 ON 2 1/2
- (2) Undesirable Growth or Debris, Animal Burrows BRUSH THROUGH RIPRAP ON FACE
- (3) Sloughing, Subsidence or Depressions NONE

(4) Slope Protection RIP RAP

(5) Surface Cracks or Movement at Toe UNOBSERVABLE

d. Downstream Slope

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

(2) Undesirable Growth or Debris, Animal Burrows LARGE TREES & BRUSH
ON ENTIRE FACE - SOME BLOWN DOWN TREES NEAR CREST

(3) Sloughing, Subsidence or Depressions NONE

(4) Surface Cracks or Movement at Toe SOME MINOR SLOUGHING
NEAR RIGHT ABUTMENT IN WET AREA

(5) Seepage LARGE WET AREA ALONG RIGHT ABUTMENT AT DOWNSTREAM
TOE - SMALLER WET AREA AT D.S. TOE OF
LEFT END OF DAM

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

(7) Condition Around Outlet Structure SATISFACTORY

(8) Seepage Beyond Toe NONE EXCEPT AS NOTED ABOVE

e. Abutments - Embankment Contact

BOTH EMBANKMENTS - SATISFACTORY EXCEPT FOR
SEEPAGE NOTED ABOVE

93-15-3(9/80)

MAIN EMBANKMENT SECTION

4

(1) Erosion at Contact NONE

(2) Seepage Along Contact - ALONG RIGHT ABUTMENT
WATER FLOWING FROM ABOUT 30' UP FROM THE TOE
SOIL VERY SOFT - SLOUGHING ON ~~THE~~ EMBANKMENT
SLOPE.

3) Drainage System

a. Description of System

NONE

b. Condition of System

c. Discharge from Drainage System

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

NONE

2) Embankment - DIKE SECTION

a. Characteristics

- (1) Embankment Material GLACIAL TILL
- (2) Cutoff Type CONCRETE CORE WALL TO ROCK
- (3) Impervious Core CONCRETE CORE WALL
- (4) Internal Drainage System NONE
- (5) Miscellaneous _____

b. Crest

- (1) Vertical Alignment SATISFACTORY
- (2) Horizontal Alignment SATISFACTORY
- (3) Surface Cracks NONE
- (4) Miscellaneous BRUSH & TREES GROWING ON CREST

c. Upstream Slope

- (1) Slope (Estimate) (V:H) 1 ON 2 1/2
- (2) Undesirable Growth or Debris, Animal Burrows TREES & BRUSH
- (3) Sloughing, Subsidence or Depressions NONE

DIKE SECTION

(4) Slope Protection RIPRAP

(5) Surface Cracks or Movement at Toe _____

d. Downstream Slope

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

(2) Undesirable Growth or Debris, Animal Burrows BRUSH & TREES

(3) Sloughing, Subsidence or Depressions NONE ON MOST OF DIKE
SOME MISSING BACKFILL 0'

(4) Surface Cracks or Movement at Toe NONE

(5) Seepage ONE WET AREA NOTED BEYOND TOE

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

NONE

(7) Condition Around Outlet Structure SATISFACTORY

(8) Seepage Beyond Toe WET AREA NOTED NEAR 90° BEND IN
SPILLWAY DIKE - GROUND SOMEWHAT SOFT

e. Abutments - Embankment Contact

SATISFACTORY - VERY FLAT CONTACTS

5) Reservoir

- a. Slopes SATISFACTORY
- b. Sedimentation NONE NOTED
- c. Unusual Conditions Which Affect Dam ~~NONE~~ LARGE AREA OF TREES
& BRUSH NEAR RIGHT $\frac{1}{3}$ OF SPILLWAY ENTRANCE WITHIN 50 ft.
FLOW RESTRICTION POSSIBLE

6) Area Downstream of Dam

- a. Downstream Hazard (No. of Homes, Highways, etc.) $\pm$ 3.5 MILES TO
HAMLET OF QUACKEN KILL AT ROUTE 2 BRIDGE CROSSING
- b. Seepage, Unusual Growth NONE - EXCEPT AS PREVIOUSLY NOTED
- c. Evidence of Movement Beyond Toe of Dam NO
- d. Condition of Downstream Channel NATURAL BOULDER STREW
CHANNEL. CONFINED, STEEP SIDES ALL THE WAY TO CROPSYVILLE

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

- LOW HEIGHT AMBURSEN TYPE CONCRETE SPILLWAY
- a. General CONCRETE ON UNDERSIDE OF SPILLWAY SECTION
& ON CONCRETE BUTRESSES IN GOOD CONDITION - CONCRETE
ON SPILLWAY CREST HAS SOME SURFACE DETERIORATION
DUE TO FLOWING WATER - NO LARGE CRACKS OR VOIDS
- b. ~~Condition of Service Spillway~~ VISIBLE
ABUTMENT WING WALLS - RT. ABUT. - SEVERAL LARGE
CRACKS EXTENDING ENTIRE HEIGHT OF WALL; MINOR SPALLING
LEFT ABUTMENT - LARGE AREA OF SPALLING & DETERIORATION
ALSO $\frac{1}{2}$ LENGTH OF ENTIRE UPSTREAM INCLINED
SECTION.

- b. Condition of Auxiliary Spillway NONE
- c. APRON - CONCRETE SLAB APRON EXTENDS 20' FROM
DOWNSTREAM TOE. SLABS IN VARIOUS STAGES OF
DETERIORATION - SOME INTACT SOME ALMOST ENTIRELY
GONE
- d. Condition of Discharge Conveyance Channel BOULDER STREWN CHANNEL
WITH LARGE TREES GROWING BEYOND END OF CONCRETE
SLAB APRON - SHOULD CLEAR AREA FOR AT LEAST
100' DOWNSTREAM OF DAM.
- 8) Low LEVEL
Reservoir Drain/Outlet - 2 PIPES IN MAIN EMBANKMENT SECTION
- Type: Pipe V (2) Conduit _____ Other _____
- Material: Concrete _____ Metal CAST IRON Other _____
- Size: 24 IN. DIA Length _____
- Invert Elevations: Entrance 53.8 Exit 49
- Physical Condition (Describe): _____ Unobservable V
- Material: _____
- Joints: _____ Alignment _____
- Structural Integrity: _____
- Hydraulic Capability: EACH HAS FLAP COVER AT OUTLET
REDUCING CAPACITY
- Means of Control: Gate V Valve _____ Uncontrolled _____
- Operation: Operable V Inoperable _____ Other _____
- Present Condition (Describe): GATES AT MID POINT OF PIPE
ARE OPEN BUT INOPERABLE - GATES AT OUTLET END
OPERABLE - CONDUIT ALWAYS UNDER PRESSURE - NEW GATE
HOUSE AT TOE IS LOCKED

c. ~~Condition of Auxiliary Spillway~~ _____

d. ~~Condition of Discharge Conveyance Channel~~ _____

8) Reservoir Drain/Outlet - PIPE THROUGH DIKE SECTION

Type: Pipe ✓ Conduit _____ Other _____

Material: Concrete ✗ Metal CAST IRON Other _____

Size: 12" DIA Length 80'

Invert Elevations: Entrance 92 Exit 91.5

Physical Condition (Describe): _____ Unobservable ✓

Material: _____

Joints: _____ Alignment _____

Structural Integrity: _____

Hydraulic Capability: FLAP GATE ON OUTLET

Means of Control: Gate ✓ Valve _____ Uncontrolled _____

Operation: Operable _____ Inoperable ✓ Other _____

Present Condition (Describe): DOES NOT APPEAR TO
HAVE BEEN OPERATED FOR A LONG TIME

SECTION 10 - APPURTENANT STRUCTURES } NOT COMPLETED
} NOT APPLICABLE
SECTION 10 - OPERATION PROCEDURES }
}
SECTION 9 - STRUCTURAL - DISCUSSED IN OTHER SECTIONS

APPENDIX C

HYDROLOGIC/HYDRAULIC
ENGINEERING DATA AND COMPUTATIONS

CHECK LIST FOR DAMS
HYDROLOGIC AND HYDRAULIC
ENGINEERING DATA

AREA-CAPACITY DATA:

	(PLAN) Elevation (ft.)	Surface Area (acres)	Storage Capacity (acre-ft.)
1) Top of Dam (DIKE)	106	123.5	2322
2) Design High Water (Max. Design Pool)	N/A		
3) Auxiliary Spillway Crest	N/A		
4) Pool Level with Flashboards	N/A		
5) Service Spillway Crest	100	98.5	1648

DISCHARGES

	(cfs)
1) Average Daily	N/A
2) Spillway @ Maximum High Water	4556
3) Spillway @ Design High Water	N/A
4) Spillway @ Auxiliary Spillway Crest Elevation	N/A
5) Low Level Outlet (2 - 24" ϕ PIPES) [W.S. @ EL. 100]	132 (MAX)
6) Total (of all facilities) @ Maximum High Water [INCL. 2-24" ϕ + 1-12" ϕ]	4695
7) Maximum Known Flood	N/A
8) At Time of Inspection	± 5

DIKE
CREST:

(PLAN)
ELEVATION: 106

Type: BROAD-CRESTED; EARTH w/ VEGETATIVE COVER
Width: 12' Length: MAIN EMB = 660' } 1110'
SPILLWAY DIKE = 450'
Spillover @ RIGHT END OF SPILLWAY DIKE - SERVICE SPILLWAY
Location _____

SPILLWAY:

SERVICE	(PLAN) Elevation	AUXILIARY
<u>100.0</u>	<u>_____</u>	<u>_____</u>
UNGATED WEIR (AMBURSEN w/ 3.4' (VERT. DNSTRM. FACE)	Type Width	<u>NONE</u>
Type of Control		
<u>✓</u>	Uncontrolled	<u>_____</u>
Controlled:		
<u>N/A</u>	Type (Flashboards; gate)	<u>_____</u>
<u>_____</u>	Number	<u>_____</u>
<u>100'</u>	<u>_____</u> /Length	<u>_____</u>
Invert Material <u>_____</u>		
Anticipated Length of operating service <u>_____</u>		
<u>N/A</u>	Chute Length	<u>_____</u>
<u>SLOPING UPSTREAM FACE</u>	Height Between Spillway Crest & Approach Channel Invert (Weir Flow) <u>_____</u>	

HYDROMETEROLOGICAL GAGES:

Type : NONE

Location: _____

Records:

Date - _____

Max. Reading - _____

FLOOD WATER CONTROL SYSTEM:

Warning System: NONE

Method of Controlled Releases (mechanisms):

MAIN EMB: 2 - 24" ϕ CAST IRON PIPES w/ GATE VALVES

SPILLWAY DIKE: 12" ϕ CAST IRON PIPE w/ VALVE

INLET INV.
ELEV.
53.8
92.0

DRAINAGE AREA: 11.64 SQ MI. (7452 ACRES)

DRAINAGE BASIN RUNOFF CHARACTERISTICS:

Land Use - Type: RELATIVELY UNDEVELOPED w/ OPEN FIELDS, WOODLANDS, FORESTS

Terrain - Relief: DRAINAGEWAYS - FLAT SLOPES

ADJACENT HILLSIDES - MODERATE SLOPES HILLTOPS @ 200'-500'

Surface - Soil: GLACIAL TILL ABOVE RESV.

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

NOT KNOWN; PORTION OF WATERSHED IS CONTROLLED - NYS
GRAFTON LAKES STATE PARK

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

N/A

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

NONE APPARENT

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

Location: NONE

Elevation: _____

Reservoir:

Length @ Maximum Pool ± 0.7 (Miles)

Length of Shoreline (@ Spillway Crest) ± 3.4 (Miles)

PROJECT GRID

JOB MARTIN - DUNHAM RESV. NY-672		SHEET NO. 1/		CHECKED BY		DATE	
SUBJECT DRAINAGE AREA				COMPUTED BY WCL		DATE 2/9/81	
USGS QUAD. (7.5 MIN)	SUBBASIN 1	SUBBASIN 2	SUBBASIN 3	TOTAL			
GRAFTON	28.22	14.68	26.95				
TABORTON	5.49	—	5.82				
	33.71	14.68	32.77	→ 81.16			
@ 1 SQ IN =	91.827 ACRES	3095	1348	3009	7452 ACRES ←		
50 MI =	4.83	2.11	4.70	11.64 SQ MI. ←			
IMPERVIOUS AREAS:				← TOTAL % IMPERV. = 4.7% BASIN			
CRANBERRY POND =	0.20 → 18.3 ACRES			#1 % IMPERVIOUS = 1.6%			
WHITE LILY POND =	0.20 → 18.3 ACRES	50.4 ACRES					
LAKE ELIZABETH =	0.15 → 13.8 ACRES			#2 % IMPERVIOUS = 2.0%			
SHAYER POND =		0.30 → 27.5 ACRES					
MILL POND =		0.19 → 17.4					
SECOND POND =		0.27 → 24.8		244.2 ACRES			
LONG POND =		1.17 → 107.4					
M-D RESV. =		1.03 → 94.6					
DEPTH - CONTOUR MAPS:							
M-D RESV. =	100 ACRES						
LONG POND =	122 ACRES	271.4 ACRES		#3 % IMPERVIOUS = 9.0%			
SECOND POND =	31.4 ACRES						
MILL POND =	18 ACRES						
SHAYER POND =	44 ACRES						

USE

PROJECT GRID

JOB MARTIN - DUNHAM RESV.		SHEET NO. 2/		CHECKED BY	DATE
SUBJECT WATERSHED PARAMETERS				COMPUTED BY WCL	DATE 2/10/81

SNYDER UNIT HYDROGRAPH:

LAG TIME : $t_p = C_t (L \times L_{CA})^{0.3}$

	SUBBASIN		
	1	2	3
$C_t =$	2.5	2.5	2.5
(MILES) $L =$	3.968	3.570	4.759
$L_{CA} =$	1.278	1.989	1.818
(HRS) $t_p =$	4.07	4.50	4.78

UNIT RAINFALL DURATION :

$t_r = \frac{t_p}{5.5}$

	1	2	3
(HRS) $t_r =$	0.74	0.82	0.87
ADJUSTED $t_r =$	1.0	1.0	1.0

ADJUSTED LAG TIME : $TP = t_p + 0.35(t_r - t_p)$

	1	2	3
$TP =$	4.14	4.54	4.81

PEAKING COEFFICIENT :

GAO CP = 362

CP = 0.57

REF: CORPS ENGINEERS
LOWER HUDSON RIVER BASIN STUDY
(WYNAUTSKILL SUBBASIN)

PROJECT GRID

JOB MARTIN - DUNHAM RESV.		SHEET NO. 3/		CHECKED BY	DATE
SUBJECT WATERSHED PARAMETERS				COMPUTED BY WCL	DATE 2/10/81
SOIL INFILTRATION (LOSS RATES):					
SOIL NAMES	SCS				
WORTH	C	} INITIAL LOSS = 1.0 IN/HR CONSTANT " = 0.1 IN/HR			
EMPEYVILLE	C				
WESTBURY	C				
DANNEMORA	D				
BASE FLOW:					
CORPS ENGINEERS					
REF: LOWER HUDSON RIVER BASIN STUDY } RTOR = 3: (WYNAUTSKILL SUBBASIN)					
		SUBBASIN			
		1	2	3	
DRAINAGE AREA (SQ MI.)		4.83	2.11	4.70	
DA ≈		5	2	5	(USE)
FROM GAGE DATA — CSM =		1	1	1	
INITIAL BASE FLOW		5	2	5	
QRCEN		15	6	15	
PMP RAINFALL - HRR #33:					
200 SQ MI / 24 HR INDEX RAINFALL = 19 IN/HR (ZONE 1)					
ADJUSTMENT FOR AREA / DURATION:					
(HRS) →		6	12	24	48
% OF INDEX →		109.5 (110)	121.5 (122)	130.5 (130)	140

PROJECT GRID

JOB MARTIN - DUNHAM RESV. NY-670	SHEET NO. 6/	CHECKED BY	DATE
SUBJECT		COMPUTED BY WCL	DATE 2/17/81

CALIBRATION :

PLANIMETERED AREA VS ACTUAL AREA

TRIANGULAR AREA NEAR DAM OUTLET

706.99' @ N 76°-00'-11"

1246.74' @ N 11°-39'-41"

1678.548'

CALCULATED :

3RD SIDE = 1678.548'

ACTUAL AREA = 397258.17 ft²

PLANIMETERED SAME TRIANGLE

MAP SCALE: 1" = 200'

(3 RUNS) AVE = 11.2933 IN³

AREA = 451732 ft²

CALIBRATION FACTOR :

$\frac{\text{ACTUAL}}{\text{PLANIMETERED}} = 0.8794$

PROJECT GRID

JOB MARTIN - DUNHAM RESV. NY-672		SHEET NO. 7/		CHECKED BY		DATE	
SUBJECT STAGE - SURFACE AREA CALCULATION				COMPUTED BY WCL		DATE 2/17/81	
ACTUAL AREA @ CONTOUR ELEVATION:							
SHEET NO.	55	60	65	70	75	80	
PLANIMETERED	---	1.25	5.88	24.38	33.05	46.90	
(SQ IN)							
ACTUAL	---	1.099	5.171	21.44	29.064	41.244	
ACRES	---	1.009	4.748	19.688	26.689	37.873	
	85	90	95	100	105	110	
PLANIMETERED	64.42	78.49	92.71	121.98	148.67	169.67	
(SQ IN)							
ACTUAL	56.651	69.024	81.529	107.269	130.74	149.208	
ACRES	52.021	63.383	74.866	98.502	120.055	137.013	
SUM(Σ):							
CALIBRATION FACTOR = $\frac{\text{ACTUAL}}{\text{PLANIM}} = 0.8794$							
PLAN(SCALE): 1" = 200' $\rightarrow$ 1 SQ IN = 40000 FT ²							
AREA: $\rightarrow$ = 0.91827 ACRES							
CONTOUR							
SURFACE AREA							
()							

PROJECT GRID

JOB		SHEET NO.			CHECKED BY	DATE
MARTIN - DUNHAM RESV.		8/				
SUBJECT				COMPUTED BY		DATE
STAGE - STORAGE DATA				WCL		2/17/81

REF: SMT 7/						
(PLAN)		AREA		CUM.		
ELEV.	AH	(ACRES)	AVOL.	VOL.		
	(FT)			(AC-FT)		
55		0		0		
	5		2.5			
60		1.01		2.5		
	5		14.4			
65		4.75		16.9		
	5		61.1			
70		19.69		78.0		
	5		115.9			
75		26.69		193.9		
	5		161.4			
80		37.87		355.3		
	5		224.7			
85		52.02		580.0		
	5		238.5			
90		63.38		868.5		
	5		345.6			
95		74.87		1214.1		
	5		433.4			
100		98.50		1647.5	← SPILLWAY CREST	
	5		546.4			
105		120.06		2193.9		
	1		128.5			
106			642.6	2322.4	← TOP DAM	
	5		514.1			
110		137.01		2836.5		
	4					

PROJECT GRID

JOB		SHEET NO.		CHECKED BY	DATE
MARTIN - DUNHAM RESV. NY-670		9/			
SUBJECT				COMPUTED BY	DATE
SPILLWAY DISCHARGES				WCL	2/17/81

WEIR FLOW : $Q = CLH^{3/2}$

$L = 100'$
 $C = 3.1$

$Q = 310 H^{3/2}$

TYPICAL SECTION
(EXTERIOR GEOMETRY)

(PLAN) ELEV.	H	(CFS) Q
100	—	—
101	1	310
102	2	877
103	3	1611
104	4	2480
105	5	3466
106	6	4556

← DIKE CREST

← TOP DAM

TOP OF DAM : ELEV: 106

WEIR FLOW → $Q = CLH^{3/2}$

(BROAD-CRESTED) $C = 2.63$ $L = 1110'$

EMBANKMENT @ SPILLWAY — $L = 450'$ MAIN EMBANKMENT — $L = 660'$

RT — $L = 102'$
LT — $L = 348'$

PROJECT GRID

JOB MARTIN - DUNHAM RESV. NY-672		SHEET NO. 10/		CHECKED BY		DATE	
SUBJECT DISCHARGE CAPACITY - TWIN 24" PIPES - EMBANKMENT FOR WATER SURFACE @ SPILLWAY CREST - ALL GATES FULLY OPEN (ELEV. 100)				COMPUTED BY WCL		DATE 2/18/81	
LEFT SIDE - PIPE #2		ITEM		PIPE #1 - RT SIDE			
24" Ø CAST IRON n=0.015		BOTH n=0.015		24" CAST IRON			
53.8		AREA = 3.142 ft ²		53.8			
EXTERNAL VERT. SLIDE GATE		CONTROLLED ENTR.		NO			
± 133'		PIPE		± 130'			
ONE		GATEHOUSE DOUBLE GATED VALVE w/ NON-RISING STEM (VERTICAL OPENING)		ONE			
± 129'		PIPE		± 132'			
ONE		VALVE WELL (VERTICAL OPNG) SLUICE GATES		ONE			
± 6'		PIPE		± 6'			
ONE		FLAP VALVE - EXIT		ONE			
48		OUTLET INVERT		48			
PIPE FLOW:							
$Z_1 + \frac{P_1}{\gamma} + \alpha \frac{V_1^2}{2g} = Z_2 + \frac{P_2}{\gamma} + \alpha \frac{V_2^2}{2g} + \sum h_L$				CAST IRON			
$P_1 = 0 \quad V_1 \approx 0 \quad P_2 = 0$				FOR n=0.015			
$Z_1 = 100 \quad Z_2 = 49 = (48 + 1)$				24" Ø f = 0.034			
$Z_1 - Z_2 = \sum h_L = \sum K \frac{V^2}{2g}$				$h_L = K \frac{V^2}{2g}$			
$(100 - 49) = \frac{V^2}{2g} + \left[0.5 + 2.21 + 0.19 + 2.24 + 0.19 + 0.1 + 1.0 \right] \frac{V^2}{2g}$				OR			
$51 = (1 + 6.43) \frac{V^2}{2g}$				$h_f = f \frac{L}{D} \frac{V^2}{2g}$			
$V = 21.02 \text{ fps}$				PIPE #1			
$A = 3.142 \text{ ft}^2$				$Q = 66 \text{ cfs} \leftarrow$			
				132 cfs ← TOTAL			

PROJECT GRID

JOB MARTIN - DUNHAM RESV. NY-672		SHEET NO. 11/		CHECKED BY	DATE
SUBJECT DISCHARGE CAPACITY - 12" PIPE - @ SPILLWAY		EMBANKMENT		COMPUTED BY WCL	DATE 2/18/81
FOR WATER SURFACE @ SPILLWAY CREST (ELEV. 100)		- ALL GATES FULLY OPEN			
ITEM					
12" Ø CAST IRON PIPE		n = 0.015		AREA = 0.7854 ft ²	
ENTRANCE SCREEN		SCREEN LOSS:			
INLET INVERT		92		$K_{sc} = 1.45 - 0.45 \left(\frac{d_n}{d_g} \right) - \left(\frac{d_n}{d_g} \right)^2$	
PIPE		± 35'		FOR $d_n = 0.5$	
VALVE		$K_{sc} = 1.45 - 0.225 - 0.25$			
PIPE		± 40'		$K_{sc} = 0.975$	
VALVE					
PIPE		± 6'			
FLAP VALVE - EXIT					
OUTLET INVERT		91.5			
PIPE FLOW:		CAST IRON			
		FOR n = 0.015			
$z_1 + \frac{P_1}{\gamma} + \alpha \frac{V_1^2}{2g} = z_2 + \frac{P_2}{\gamma} + \alpha \frac{V_2^2}{2g} + \sum h_L$		$12" \text{ Ø } f = 0.0425$			
$P_1 = 0 \quad V_1 \approx 0 \quad P_2 = 0$		$h_L = K \frac{V^2}{2g}$			
$z_1 = 100$		OR $h_f = f \frac{L}{D} \frac{V^2}{2g}$			
$z_2 = 92 = (91.5 + 0.5)$					
$z_1 - z_2 = \alpha \frac{V^2}{2g} + \sum K \frac{V^2}{2g}$					
$(100 - 92) = \frac{V^2}{2g} + \left[0.975 + 0.5 + 1.49 + 0.19 + 1.70 + 0.19 + 0.26 + 1.0 \right] \frac{V^2}{2g}$					
$8 = (1 + 6.305) \frac{V^2}{2g}$					
		$V = 8.398 \text{ fps}$		$Q = 6.6 \text{ cfs}$	
		$A = 0.7854 \text{ ft}^2$			

5959-6 OCT

LINE	AL	ACCTED	DELETED	EA	SPILLAGE	ELEV	LOG-PLAN	1916.9-0506
33	Y			1	1			
34	Y1	1				-100	-1	
35	Y4	100	102	103	104	105	106	
36	Y5	C	877	1611	2480	3466	4556	
37	55	C	355.3	580	868.5	1214.1	1647.5	2193.9 2322.4 2836.5
38	5E	55	80	85	90	95	100	105 106 110
39	5E	100						
40	50	106	1.5	1110				
41	N	99						
42	A							
43	A							
44	A							
45	A							
46	A							

PREVIEW OF SEQUENCE OF STREAM NETWORK CALCULATIONS

RUNOFF HYDROGRAPH AT BSN-1
RUNOFF HYDROGRAPH AT BSN-2
RUNOFF HYDROGRAPH AT BSN-3
COMBINE 3 HYDROGRAPHS AT DAM
ROUTE HYDROGRAPH TO DAM
END OF NETWORK

 NEW YORK STATE
 DEPT OF ENVIRONMENTAL CONSERVATION
 FLOOD PROTECTION BUREAU

 FLOOD HYDROGRAPH PACKAGE (HFC-1)
 DATA SAFETY VERSION JULY 1978
 LAST MODIFICATION 26 FEB 79
 MODIFIED FOR HONEYWELL APR 79

RUN DATE 02/20/81

NY-672 MARTIN - CUNHAM RESERVOIR
 DEC 243C-1430 LH -- QUACKENKILL
 RVS - CAPITAL DISTRICT PARK COMM.

LOWER HUDSON RIVER BASIN
 REMSELAE COUNTY
 SNYDER UP WITH SUBBASINS

JOB SPECIFICATION

RTICS= 0.35 0.36 0.37 0.38 0.39 0.40 0.50 1.00

SUB-AREA RUNOFF COMPUTATION

INFLOW HYDROGRAPH -- SUBBASIN 1
 ISTAQ ICOMP IECN ITAPE JPLT JPRT INAME ISTAGE IAUTO
 BSN-1 0 0 0 0 0 0 1 0 0

HYDROGRAPH DATA
 IHYDC IUNG TAREA SHAP TRSDA TRSPC RATIO ISNOW ISAME LOCAL
 1 1 4.83 0. 11.64 0. 0. 0 1 0

FRECIP DATA
 SPE FMS R6 R12 R24 R48 R72 R96
 0. 19.00 110.00 122.00 130.00 140.00 C. 0.

TRSPC COMPUTED BY THE PROGRAM IS 0.805

LOSS DATA
 LPOPT STRKS DLTKR RTICK STRKS RTICK STRTL CNSTL ALSMX RTIMP
 0 C. 0. 1.00 0. 0. 1.00 1.00 0.10 0. 0.02

UNIT HYDROGRAPH DATA
 TP= 4.14 CP=0.57 NTA= 0

REGRESSION DATA
 STATQ= 5.00 GRCSN= 15.00 RTICR= 3.00
 APPROXIMATE CLARK COEFFICIENTS FROM GIVEN SNYDER CP AND TP ARE TC= 4.81 AND R= 4.45 INTERVALS

UNIT HYDROGRAPH 27 END-OF-PERIOD ORIGINATES, LAG= 4.15 HOURS, CP= C.57 VOL= 1.00
 42. 153. 292. 420. 366. 292. 233. 186. 148.
 118. 94. 75. 60. 48. 38. 31. 24. 19. 15.
 12. 10. 8. 6. 5. 4. 3. 2. 1. 0.

END-OF-PERIOD FLOW
 MO.DA HR. PERIOD RAIN EXCS LOSS CCHP Q MU.DA HR. PERIOD RAIN EXCS LOSS COM.P C
 1.01 1.00 1 0.01 0.00 0.01 4. 1.03 3.00 51 0. 0. 0. 1570.
 1.01 2.00 2 0.01 0.00 0.01 4. 1.03 4.00 52 0. 0. 0. 1250.
 1.01 3.00 3 0.01 0.00 0.01 4. 1.03 5.00 53 0. 0. 0. 1000.
 1.01 4.00 4 0.01 0.00 0.01 3. 1.03 6.00 54 0. 0. 0. 800.

1.01	1.00	0.01	0.00	0.01	0.01	4.	1.03	5.00	55	0.	0.	0.	1.00.
1.01	4.00	0.01	0.00	0.01	0.01	3.	1.03	6.00	54	0.	0.	0.	600.
1.01	5.00	0.01	0.00	0.01	0.01	3.	1.03	7.00	55	0.	0.	0.	638.
1.01	6.00	0.01	0.00	0.01	0.01	3.	1.03	8.00	56	0.	0.	0.	509.
1.01	7.00	0.02	0.00	0.02	0.02	3.	1.03	9.00	57	0.	0.	0.	466.
1.01	8.00	0.02	0.00	0.02	0.02	2.	1.03	10.00	58	0.	0.	0.	324.
1.01	9.00	0.02	0.00	0.02	0.02	2.	1.03	11.00	59	0.	0.	0.	254.
1.01	10.00	0.02	0.00	0.02	0.02	2.	1.03	12.00	60	0.	0.	0.	203.
1.01	11.00	0.02	0.00	0.02	0.02	2.	1.03	13.00	61	0.	0.	0.	163.
1.01	12.00	0.02	0.00	0.02	0.02	2.	1.03	14.00	62	0.	0.	0.	130.
1.01	13.00	0.03	0.00	0.13	0.13	2.	1.03	15.00	63	0.	0.	0.	103.
1.01	14.00	0.16	0.00	0.15	0.15	2.	1.03	16.00	64	0.	0.	0.	76.
1.01	15.00	0.19	0.00	0.19	0.19	3.	1.03	17.00	65	0.	0.	0.	57.
1.01	16.00	0.49	0.13	0.37	0.37	9.	1.03	18.00	66	0.	0.	0.	40.
1.01	17.00	0.18	0.08	0.10	0.10	27.	1.03	19.00	67	0.	0.	0.	16.
1.01	18.00	0.14	0.04	0.10	0.10	55.	1.03	20.00	68	0.	0.	0.	14.
1.01	19.00	0.01	0.00	0.01	0.01	85.	1.03	21.00	69	0.	0.	0.	12.
1.01	20.00	0.01	0.00	0.01	0.01	102.	1.03	22.00	70	0.	0.	0.	11.
1.01	21.00	0.01	0.00	0.01	0.01	101.	1.03	23.00	71	0.	0.	0.	10.
1.01	22.00	0.01	0.00	0.01	0.01	88.	1.04	C.	72	0.	0.	0.	9.
1.01	23.00	0.01	0.00	0.01	0.01	71.	1.04	1.00	73	0.	0.	0.	8.
1.02	0.	0.01	0.00	0.01	0.01	57.	1.04	2.00	74	0.	0.	0.	7.
1.02	1.00	0.08	0.00	0.08	0.08	46.	1.04	3.00	75	0.	0.	0.	6.
1.02	2.00	0.08	0.00	0.08	0.08	37.	1.04	4.00	76	0.	0.	0.	5.
1.02	3.00	0.08	0.00	0.08	0.08	30.	1.04	5.00	77	0.	0.	0.	4.
1.02	4.00	0.08	0.00	0.08	0.08	25.	1.04	6.00	78	0.	0.	0.	3.
1.02	5.00	0.08	0.00	0.08	0.08	20.	1.04	7.00	79	0.	0.	0.	2.
1.02	6.00	0.08	0.00	0.08	0.08	17.	1.04	8.00	80	0.	0.	0.	1.
1.02	7.00	0.31	0.21	0.10	0.10	23.	1.04	9.00	81	0.	0.	0.	0.
1.02	8.00	0.31	0.21	0.10	0.10	53.	1.04	10.00	82	0.	0.	0.	0.
1.02	9.00	0.31	0.21	0.10	0.10	111.	1.04	11.00	83	0.	0.	0.	0.
1.02	10.00	0.31	0.21	0.10	0.10	192.	1.04	12.00	84	0.	0.	0.	0.
1.02	11.00	0.31	0.21	0.10	0.10	278.	1.04	13.00	85	0.	0.	0.	0.
1.02	12.00	0.31	0.21	0.10	0.10	352.	1.04	14.00	86	0.	0.	0.	0.
1.02	13.00	1.08	1.56	0.10	0.10	470.	1.04	15.00	87	0.	0.	0.	0.
1.02	14.00	2.02	1.92	0.10	0.10	742.	1.04	16.00	88	0.	0.	0.	0.
1.02	15.00	2.52	2.43	0.10	0.10	1255.	1.04	17.00	89	0.	0.	0.	0.
1.02	16.00	6.40	6.30	0.10	0.10	2172.	1.04	18.00	90	0.	0.	0.	0.
1.02	17.00	2.36	2.26	0.10	0.10	3479.	1.04	19.00	91	0.	0.	0.	0.
1.02	18.00	1.05	1.75	0.10	0.10	4835.	1.04	20.00	92	0.	0.	0.	0.
1.02	19.00	0.12	0.02	0.10	0.10	5757.	1.04	21.00	93	0.	0.	0.	0.
1.02	20.00	0.12	0.02	0.10	0.10	6021.	1.04	22.00	94	0.	0.	0.	0.
1.02	21.00	0.12	0.02	0.10	0.10	5526.	1.04	23.00	95	0.	0.	0.	0.
1.02	22.00	0.12	0.02	0.10	0.10	4670.	1.05	C.	96	0.	0.	0.	0.
1.02	23.00	0.12	0.02	0.10	0.10	3794.	1.05	1.00	97	0.	0.	0.	0.
1.03	0.	0.12	0.02	0.10	0.10	3042.	1.05	2.00	98	0.	0.	0.	0.
1.03	1.00	0.	0.	0.	0.	2441.	1.05	3.00	99	0.	0.	0.	0.
1.03	2.00	0.	0.	0.	0.	1959.	1.05	4.00	100	0.	0.	0.	0.

SLM 21.42 17.00 3.52 55709.
(544.)(455.)(89.)(1577.50)

PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
6021.	5081.	2222.	773.	55701.
170.	144.	63.	22.	1577.
	9.79	17.86	17.88	17.88
	248.55	434.80	453.74	454.14
	2519.	4407.	4593.	4603.
	3108.	5436.	5673.	5678.

HYDROGRAPH AT STA. BSN-1 FOR PLAN 1, RTID 1

THOUS CUM	AC-FT	MP	INCHES	CMS	CF5	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
2.	1.	1.	1.	1.	1.	6021.	5081.	2222.	773.	55701.
1.	1.	1.	1.	1.	1.	170.	144.	63.	22.	1577.
35.	31.	25.	20.	16.	13.		9.79	17.86	17.88	17.88
							248.55	434.80	453.74	454.14
							2519.	4407.	4593.	4603.
							3108.	5436.	5673.	5678.

CDS 6021. 5081. 713. 55701.
 CDS 173. 144. 22. 1577.
 INCHES 9.79 17.12 17.86 17.86
 HM 248.55 434.80 453.74 454.14
 AC-FT 2519. 4407. 4599. 4603.
 TPOLS CUM 3108. 5436. 5673. 5678.

SUB-AREA RUNOFF COMPUTATION

INFLOW HYDROGRAPH -- SUBBASIN 2
 ISTAQ ICOMP IFCCM IYAPE JPLT JPRT INAME ISTAGE IAUTO
 BSN-2 0 0 0 0 0 0 0 0 0

HYDROGRAPH DATA
 IYDC IYHG TAREA SNAP TRSDA TRSPC RATIO ISNOW ISAME LOCAL
 1 1 2.11 0. 11.64 0. 0. 0 1 0

PRECIP DATA
 SPFE PMS R6 R12 R24 R48 R72 R96
 0. 19.00 110.00 122.00 130.00 140.00 0. 0. 0.

TRSPC COMPUTED BY THE PROGRAM IS 0.605

LOSS DATA
 LROPT STRKR DLTKR RTIOL ERAIN STRKS RTIOK STIRL CNSTL ALSMX RTIMP
 0 0 0. 1.00 0. 0. 1.00 1.00 0.10 0. 0.02

UNIT HYDROGRAPH DATA
 TP= 4.54 CP=0.57 NTA= C

STRIQ= 2.00 RECESION DATA
 QPCSN= 6.00 RTICR= 3.00
 APPROXIMATE CLARK COEFFICIENTS FROM GIVEN SNYDER CP AND TP ARE TC= 5.05 AND R= 5.03 INTERVALS

UNIT HYDROGRAPH 30 END-OF-PERIOD ORDINATES, LAG= 4.55 FCURS, CP= 0.57 VOL= 1.00
 15. 56. 109. 152. 167. 155. 127. 104. 85. 70.
 57. 47. 36. 32. 26. 21. 17. 14. 12. 10.
 8. 6. 5. 4. 4. 3. 2. 2. 2. 1.

NO. DA	HP. MN	PERIOD	RAIN	EXCS	LOSS	END-OF-PERIOD FLOW	NO. DA	HP. MN	PERIOD	RAIN	EXCS	LESS	COMP C
0	1.01	1.00	0.01	0.00	0.01	2.	1.03	3.00	51	0.	0.	0.	779.
1.01	2.00	2	0.01	0.00	0.01	2.	1.03	4.00	52	0.	0.	0.	640.
1.01	3.00	3	0.01	0.00	0.01	1.	1.03	5.00	53	0.	0.	0.	524.
1.01	4.00	4	0.01	0.00	0.01	1.	1.03	6.00	54	0.	0.	0.	429.
1.01	5.00	5	0.01	0.00	0.01	1.	1.03	7.00	55	0.	0.	0.	352.
1.01	6.00	6	0.01	0.00	0.01	1.	1.03	8.00	56	0.	0.	0.	288.
1.01	7.00	7	0.02	0.00	0.02	1.	1.03	9.00	57	0.	0.	0.	236.
1.01	8.00	8	0.02	0.00	0.02	1.	1.03	10.00	58	0.	0.	0.	193.
1.01	9.00	9	0.02	0.00	0.02	1.	1.03	11.00	59	0.	0.	0.	158.
1.01	10.00	10	0.02	0.00	0.02	1.	1.03	12.00	60	0.	0.	0.	130.
1.01	11.00	11	0.02	0.00	0.02	1.	1.03	13.00	61	0.	0.	0.	106.
1.01	12.00	12	0.02	0.00	0.02	1.	1.03	14.00	62	0.	0.	0.	87.
1.01	13.00	13	0.13	0.00	0.13	1.	1.03	15.00	63	0.	0.	0.	71.
1.01	14.00	14	0.16	0.00	0.15	1.	1.03	16.00	64	0.	0.	0.	58.
1.01	15.00	15	0.19	0.00	0.19	1.	1.03	17.00	65	0.	0.	0.	47.
1.01	16.00	16	0.49	0.13	0.37	4.	1.03	18.00	66	0.	0.	0.	36.
1.01	17.00	17	0.13	0.08	0.10	10.	1.03	19.00	67	0.	0.	0.	30.
1.01	18.00	18	0.14	0.04	0.10	21.	1.03	20.00	68	0.	0.	0.	22.
1.01	19.00	19	0.01	0.00	0.01	33.	1.03	21.00	69	0.	0.	0.	16.
1.01	20.00	20	0.01	0.00	0.01	41.	1.03	22.00	70	0.	0.	0.	6.

430.	170.	170.	41.	15.	110.	193.	322.
312.	913.	934.	934.	814.	560.	461.	375.
42.	210.	172.	141.	115.	77.	63.	52.
20.	20.	23.	19.	15.	9.	6.	2.
1.	2.	2.	1.	1.	1.	1.	1.
0.	1.	1.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.

PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
984.	335.	135.	4.	270.
28.	34.	11.	7.15	7.15
	3.68	6.78	181.54	181.54
	93.50	172.22	804.	805.
	414.	783.	992.	992.
	211.	941.		

THOUS CU M

HYDROGRAPH AT STA BSN-2 FOR PLAN 1, RTIC 7

1.	1.	1.	1.	0.
0.	0.	1.	2.	11.
21.	13.	11.	9.	5.
5.	37.	54.	70.	145.
668.	1143.	1167.	850.	416.
390.	1230.	1017.	118.	474.
53.	215.	176.	15.	65.
3.	29.	23.	1.	3.
1.	2.	2.	1.	1.
1.	1.	1.	0.	0.
0.	0.	0.	0.	0.

PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
1230.	1044.	491.	165.	12170.
35.	30.	14.	5.	345.
	4.60	8.43	8.93	6.94
	116.88	215.28	226.53	227.13
	518.	953.	1005.	1006.
	638.	1176.	1235.	1241.

THOUS CU M

HYDROGRAPH AT STA BSN-2 FOR PLAN 1, RTIC 8

2.	1.	1.	1.	1.
1.	1.	1.	4.	10.
42.	32.	26.	14.	15.
22.	43.	74.	140.	187.
1337.	2298.	2459.	2034.	1701.
11.	524.	352.	288.	236.
106.	71.	47.	38.	30.
5.	4.	3.	3.	3.
2.	1.	1.	1.	1.
1.	0.	0.	0.	0.

PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
2459.	2098.	961.	338.	24340.
70.	59.	27.	10.	689.
	9.20	16.55	17.87	17.88
	233.76	430.55	454.27	454.27
	1035.	1907.	2010.	2012.
	1277.	2352.	2475.	2481.

THOUS CU M

SUB-AREA RUNOFF COMPUTATION

INFLW HYDROGRAPH -- SUBBASIN 3

SUB-AREA RUNOFF COMPUTATION

INFILTRATION HYDROGRAPH -- SUBBASIN 3
ISTAQ ICOMP IECOV ITAPE JPLT JPRT INAME ISTAGE IAUO
BSN-3 0 0 0 0 0 0 1 0 0

HYDROGRAPH DATA
INHYD IUNG TAREA SHAP TRSCA TRSPC RATIO ISNOW ISAME LOCAL
1 1 4.70 0. 11.64 0. 0. 0 0 1 0

PRECIP DATA
SPFE PMS R6 R12 R24 R48 R72 R96
0. 19.00 110.00 122.00 130.00 140.00 0. 0.
TRSPC COMPUTED BY THE PROGRAM IS 0.305

LOSS DATA
LROPT STRKR DLTR RTIOL ERAIN STRKS RTIOK STRIL CMSTL ALSHX RTIHP
0 C. 0. 1.00 0. 0. 1.00 1.00 0.10 0. 0.09

UNIT HYDROGRAPH DATA
TP= 4.81 CP=0.57 NTA= C

RECESSION DATA
STRTO= 5.00 QRCSEN= 15.00 RTICR= 3.00
APPROXIMATE CLAPK COEFFICIENTS FROM GIVEN SNYDER CP AND TP ARE TC= 5.43 AND R= 5.22 INTERVALS

UNIT HYDROGRAPH 31 END-OF-PERIOD ORDINATES, LAG= 4.86 HOURS, CP= C.57 VOL= 1.00
30. 108. 212. 306. 356. 345. 293. 242. 199. 165.
136. 112. 92. 76. 63. 52. 43. 35. 29. 24.
20. 16. 14. 11. 9. 8. 6. 5. 4. 4.
3.

MO. DA		HR. MIN		PERIOD		RAIN	EXCS	LOSS	END-OF-PERIOD FLOW		MO. DA	FR. MIN	PERIOD	RAIN	EXCS	LOSS	COMP Q
1.01	1.00	1	0.01	0.01	0.00	0.01	0.00	0.01	4.	1.03	3.00	51	0.	0.	0.	0.	1875.
1.01	2.00	2	0.01	0.01	0.00	0.01	0.00	0.01	4.	1.03	4.00	52	0.	0.	0.	0.	1552.
1.01	3.00	3	0.01	0.01	0.00	0.01	0.00	0.01	4.	1.03	5.00	53	0.	0.	0.	0.	1283.
1.01	4.00	4	0.01	0.01	0.00	0.01	0.00	0.01	4.	1.03	6.00	54	0.	0.	0.	0.	1059.
1.01	5.00	5	0.01	0.01	0.00	0.01	0.00	0.01	3.	1.03	7.00	55	0.	0.	0.	0.	874.
1.01	6.00	6	0.01	0.01	0.00	0.01	0.00	0.01	3.	1.03	8.00	56	0.	0.	0.	0.	721.
1.01	7.00	7	0.02	0.02	0.00	0.02	0.00	0.02	3.	1.03	9.00	57	0.	0.	0.	0.	555.
1.01	8.00	8	0.02	0.02	0.00	0.02	0.00	0.02	3.	1.03	10.00	58	0.	0.	0.	0.	491.
1.01	9.00	9	0.02	0.02	0.00	0.02	0.00	0.02	4.	1.03	11.00	59	0.	0.	0.	0.	405.
1.01	10.00	10	0.02	0.02	0.00	0.02	0.00	0.02	4.	1.03	12.00	60	0.	0.	0.	0.	334.
1.01	11.00	11	0.02	0.02	0.00	0.02	0.00	0.02	4.	1.03	13.00	61	0.	0.	0.	0.	276.
1.01	12.00	12	0.02	0.02	0.00	0.02	0.00	0.02	5.	1.03	14.00	62	0.	0.	0.	0.	227.
1.01	13.00	13	0.13	0.01	0.01	0.12	0.00	0.01	6.	1.03	15.00	63	0.	0.	0.	0.	187.
1.01	14.00	14	0.16	0.01	0.01	0.14	0.00	0.01	7.	1.03	16.00	64	0.	0.	0.	0.	154.
1.01	15.00	15	0.19	0.02	0.02	0.18	0.00	0.01	10.	1.03	17.00	65	0.	0.	0.	0.	126.
1.01	16.00	16	0.49	0.15	0.03	0.34	0.00	0.03	17.	1.03	18.00	66	0.	0.	0.	0.	104.
1.01	17.00	17	0.49	0.09	0.09	0.09	0.00	0.09	35.	1.03	19.00	67	0.	0.	0.	0.	85.
1.01	18.00	18	0.14	0.05	0.05	0.09	0.00	0.09	61.	1.03	20.00	68	0.	0.	0.	0.	66.
1.01	19.00	19	0.01	0.00	0.00	0.01	0.00	0.01	89.	1.03	21.00	69	0.	0.	0.	0.	50.
1.01	20.00	20	0.01	0.00	0.00	0.01	0.00	0.01	108.	1.03	22.00	70	0.	0.	0.	0.	36.
1.01	21.00	21	0.01	0.00	0.00	0.01	0.00	0.01	114.	1.03	23.00	71	0.	0.	0.	0.	19.
1.01	22.00	22	0.01	0.00	0.00	0.01	0.00	0.01	105.	1.04	C.	72	0.	0.	0.	0.	13.
1.01	23.00	23	0.01	0.00	0.00	0.01	0.00	0.01	91.	1.04	1.00	73	0.	0.	0.	0.	12.
1.02	0.	24	0.01	0.00	0.00	0.01	0.00	0.01	76.	1.04	2.00	74	0.	0.	0.	0.	11.
1.02	1.00	25	0.01	0.01	0.01	0.07	0.00	0.07	63.	1.04	3.00	75	0.	0.	0.	0.	10.
1.02	2.00	26	0.06	0.01	0.07	0.07	0.00	0.07	53.	1.04	4.00	76	0.	0.	0.	0.	9.

1.	1.	C.	0.	0.	0.	0.	0.	0.	0.
	PEAK								
	1846.								
	52.								
	CFS								
	CMS								
	1597.								
	45.								
	3.16								
	80.31								
	151.22								
	1492.								
	977.								
	AC-FT								
	1840.								
	T-DLS CU M								

HYDROGRAPH AT STA BSN-3 FOR PLAN 1, RTIO 2

1.	1.	C.	0.	0.	0.	0.	0.	0.	0.
	PEAK								
	1899.								
	54.								
	CFS								
	CMS								
	1597.								
	45.								
	3.16								
	80.31								
	151.22								
	1492.								
	977.								
	AC-FT								
	1840.								
	T-DLS CU M								

HYDROGRAPH AT STA BSN-3 FOR PLAN 1, RTIO 3

1.	1.	C.	0.	0.	0.	0.	0.	0.	0.
	PEAK								
	1952.								
	55.								
	CFS								
	CMS								
	1597.								
	45.								
	3.16								
	80.31								
	151.22								
	1492.								
	977.								
	AC-FT								
	1840.								
	T-DLS CU M								

HYDROGRAPH AT STA BSN-3 FOR PLAN 1, RTIO 4

1.	1.	C.	0.	0.	0.	0.	0.	0.	0.
	PEAK								
	1952.								
	55.								
	CFS								
	CMS								
	1597.								
	45.								
	3.16								
	80.31								
	151.22								
	1492.								
	977.								
	AC-FT								
	1840.								
	T-DLS CU M								

SLM OF 3 HYDROGRAPHS AT	DAM	PLAN 1	HTIC 2
4.	3.	3.	2.
3.	5.	26.	2.
92.	4.	11.	74.
03.	57.	39.	25.
48.	47.	384.	987.
26.	92.	288.	594.
2714.	155.	224.	2780.
310.	4644.	4693.	2274.
1241.	4932.	4079.	295.
1521.	1011.	546.	363.
136.	624.	445.	37.
160.	104.	65.	28.
10.	83.	47.	4.
11.	7.	6.	5.
3.	2.	2.	1.
3.	1.	1.	0.
1.	1.	1.	0.
4.	3.	3.	3.
3.	4.	5.	90.
92.	70.	47.	22.
26.	57.	39.	1642.
2714.	92.	288.	1860.
310.	155.	224.	241.
1241.	4644.	4693.	19.
1521.	4932.	4079.	4.
136.	1011.	546.	1.
160.	624.	445.	0.
10.	104.	65.	0.
11.	83.	47.	0.
3.	7.	6.	0.
3.	2.	2.	0.
1.	1.	1.	0.
4.	3.	3.	0.
3.	4.	5.	0.
92.	70.	47.	0.
26.	57.	39.	0.
2714.	92.	288.	0.
310.	155.	224.	0.
1241.	4644.	4693.	0.
1521.	4932.	4079.	0.
136.	1011.	546.	0.
160.	624.	445.	0.
10.	104.	65.	0.
11.	83.	47.	0.
3.	7.	6.	0.
3.	2.	2.	0.
1.	1.	1.	0.

[illegible][illegible]

[illegible]

W 03 570-13
14-75

ENDO-OF-FERIO HYDROGRAPH COINATES

[illegible][illegible][illegible]

4466. AT TIME 45.30 HOURS

	PEAK	G-ROCK	ZT-ROCK	12-RACK	16-RACK
CFS	4465.	3959.	1895.	674.	48607.
CHS	126.	112.	15.	53.	1376.
INCHES		3.16	6.34	6.47	6.47
MM		80.36	153.38	164.24	164.45
AC-FT	1963.	3747.	4012.	4945.	4017.
DMS CU M	2421.	2421.	4632.	4945.	4955.

END-OF-PERIOD HYDROGRAPH ORIGINATES

1.	2.	2.	2.	2.	2.
1.	2.	2.	2.	2.	2.
3.	3.	3.	7.	14.	24.
3.	62.	63.	57.	48.	44.
49.	58.				

ALL INFORMATION CONTAINED
HEREIN IS UNCLASSIFIED

END-QF-PERIOD HYDROGRAPH ORDINATES

OUTFLOW

STORAGE

STAGE

TOTAL

510-415-0171

END-OF-PERIOD HYDROGRAPH ORDINATES

Outline

PEAK JIFFLE IS

PEAK	CFS	CHS
5232.		
150.		

TRDLS CU M

STATION DAM, PLAN 1, RATIC 7

END-OF-PERIOD HYDROGRAPH ORDINATES

[illegible][illegible][illegible]

SI 1071100 4533

PEAK	CFS	CNS	INCHES	MM	AC-FT	TDLS	CUM
6822.							
193.							

TH-17LS CU H:

STATION
DAM, PLAN 1, RATIO B

1.03. 1.03. 75. 27. 1512.
 4.45 8.42 8.99
 113.00 213.86 228.12
 2760. 5224. 5579.
 3405. 6444. 6874. 6882.

T-OL5 CU M
 AC-FT
 MM
 CFS

STATION DAM, PLAN 1, RATIO 8

END-OF-PERIOD HYDROGRAPH ORIGINATES

OUTFLOW									
2.	3.	4.	5.	6.	7.	8.	9.	10.	11.
132.	156.	167.	167.	169.	169.	169.	169.	169.	169.
97.	100.	120.	120.	120.	120.	120.	120.	120.	120.
4439.	9646.	12449.	13656.	13656.	13656.	13656.	13656.	13656.	13656.
4697.	4256.	3647.	3059.	3059.	3059.	3059.	3059.	3059.	3059.
845.	721.	609.	508.	508.	508.	508.	508.	508.	508.
157.	130.	108.	90.	90.	90.	90.	90.	90.	90.
23.	24.	21.	18.	18.	18.	18.	18.	18.	18.
7.	6.	5.	4.	4.	4.	4.	4.	4.	4.

STORAGE

1649.	1650.	1650.	1650.	1650.	1650.	1650.	1650.	1650.	1650.
1649.	1650.	1650.	1650.	1650.	1650.	1650.	1650.	1650.	1650.
1650.	1650.	1650.	1650.	1650.	1650.	1650.	1650.	1650.	1650.
1650.	1650.	1650.	1650.	1650.	1650.	1650.	1650.	1650.	1650.
1650.	1650.	1650.	1650.	1650.	1650.	1650.	1650.	1650.	1650.
1650.	1650.	1650.	1650.	1650.	1650.	1650.	1650.	1650.	1650.
1650.	1650.	1650.	1650.	1650.	1650.	1650.	1650.	1650.	1650.
1650.	1650.	1650.	1650.	1650.	1650.	1650.	1650.	1650.	1650.
1650.	1650.	1650.	1650.	1650.	1650.	1650.	1650.	1650.	1650.
1650.	1650.	1650.	1650.	1650.	1650.	1650.	1650.	1650.	1650.

STAGE

100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

PEAK OUTFLOW IS 13656. AT TIME 44.00 HOURS

CFS 13656.
 CMS 387.
 INCHES
 MM
 AC-FT
 T-OL5 CU M

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

OPERATION	STATION	AREA	PLAN	RATIOS APPLIED TO FLOWS									
				RATIO 1	RATIO 2	RATIO 3	RATIO 4	RATIO 5	RATIO 6	RATIO 7	RATIO 8		
				0.35	0.36	0.37	0.38	0.39	0.40	0.50	1.00		
HYDROGRAPH AT	BSN-1	4.83 (13703.17)	1	2107. (59.67)	2167. (61.37)	2228. (63.08)	2288. (64.78)	2348. (66.49)	2408. (68.19)	3010. (85.24)	6021. (170.48)		
HYDROGRAPH AT	BSN-2	2.11 (13703.17)	1	951. (24.38)	885. (25.07)	910. (25.77)	935. (26.47)	959. (27.16)	984. (27.86)	1230. (34.82)	2459. (69.05)		
HYDROGRAPH AT	BSN-3	4.70 (13703.17)	1	1946. (52.28)	1897. (53.73)	1952. (55.27)	2005. (56.76)	2057. (58.26)	2110. (59.75)	2638. (74.65)	5275. (149.38)		
3 COMBINED	DAM	11.64 (13703.17)	1	4814. (136.33)	4952. (140.22)	5089. (144.12)	5227. (148.01)	5365. (151.51)	5502. (155.80)	6878. (194.75)	13755. (389.51)		
ROUTED TO	DAM	11.64 (13703.17)	1	4342. (122.94)	4466. (126.48)	4602. (130.30)	4805. (136.06)	5036. (142.62)	5282. (149.57)	6822. (193.17)	13656. (386.71)		

MARTIN - DUNHAM RESERVOIR
 NY-672

SUMMARY OF DAM SAFETY ANALYSIS

PLAN 1	ELEVATION STORAGE OUTFLOW	INITIAL VALUE 100.00 1648. 0.	SPILLWAY CREST 100.00 1648. 0.	TOP OF DAM 106.00 2322. 4556.	TIME OF FAILURE HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
RATIO CF PWF	MAXIMUM RESERVOIR W.S. ELEV.	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TCP HOURS		
0.35	107.80	0.	2297.	4342.	0.	45.00	0.
0.36	107.92	0.	2312.	4466.	0.	45.00	0.
0.37	108.03	0.03	2326.	4602.	1.00	45.00	0.
0.38	108.12	0.12	2338.	4805.	2.00	45.00	0.
0.39	108.20	0.20	2348.	5036.	2.00	45.00	0.
0.40	108.28	0.28	2358.	5282.	2.00	45.00	0.
0.50	108.66	0.66	2407.	6822.	5.00	44.00	0.
1.00	107.81	1.81	2555.	13656.	10.00	44.00	0.

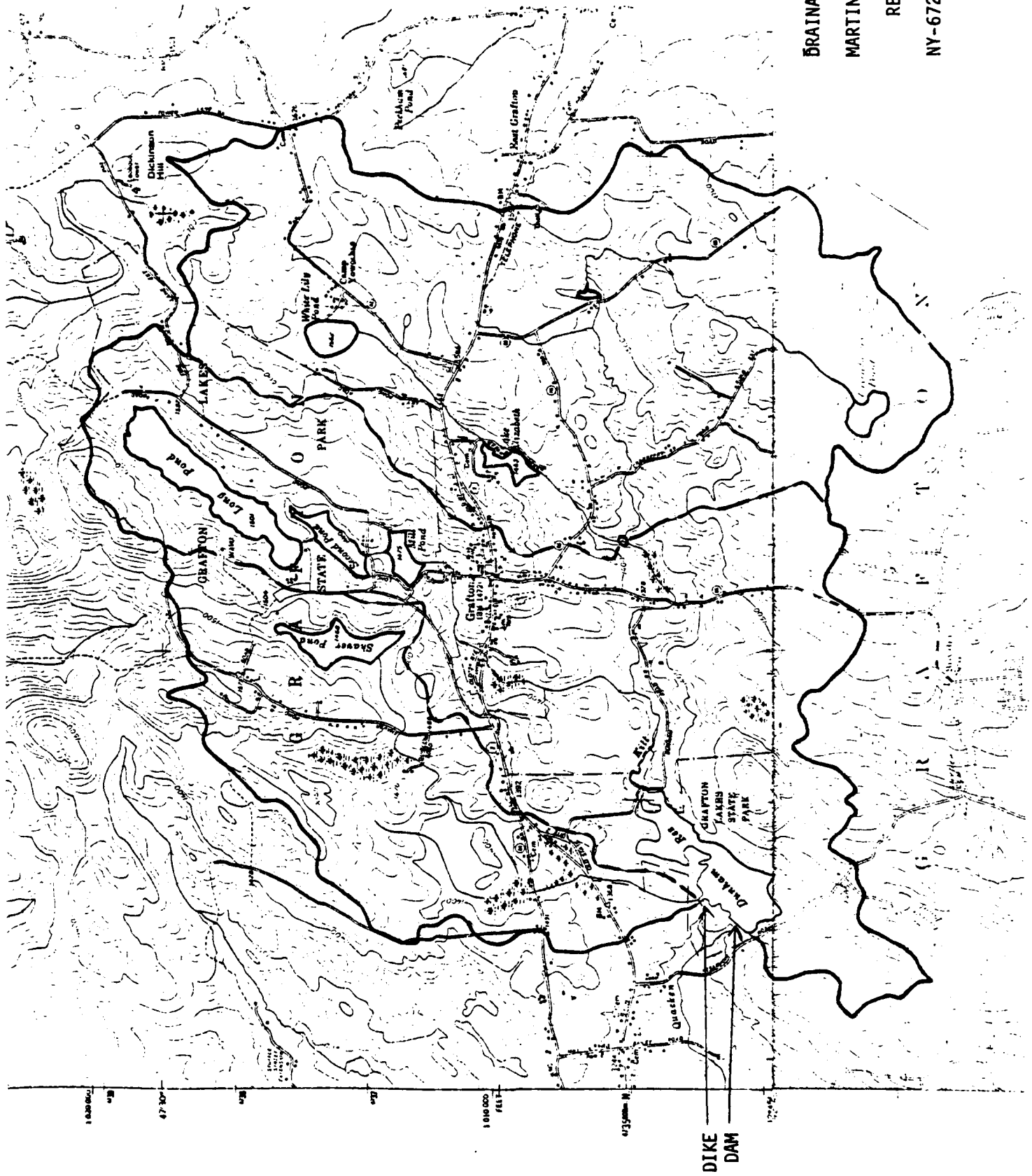
MARTIN - DUNHAM RESERVOIR
NY-673

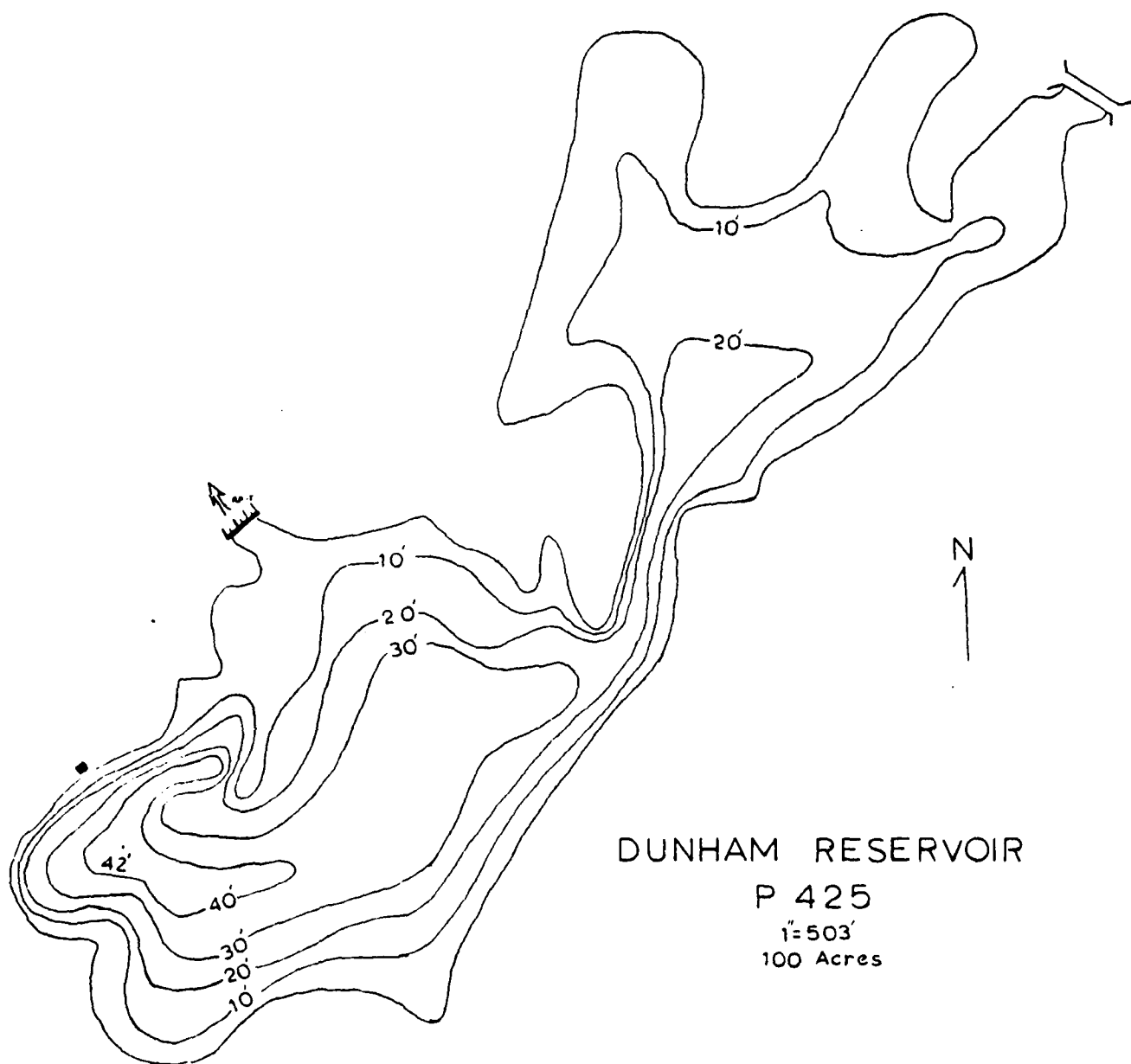
NY-672

MARTIN - DUNHAM

RESERVOIR

NY-672





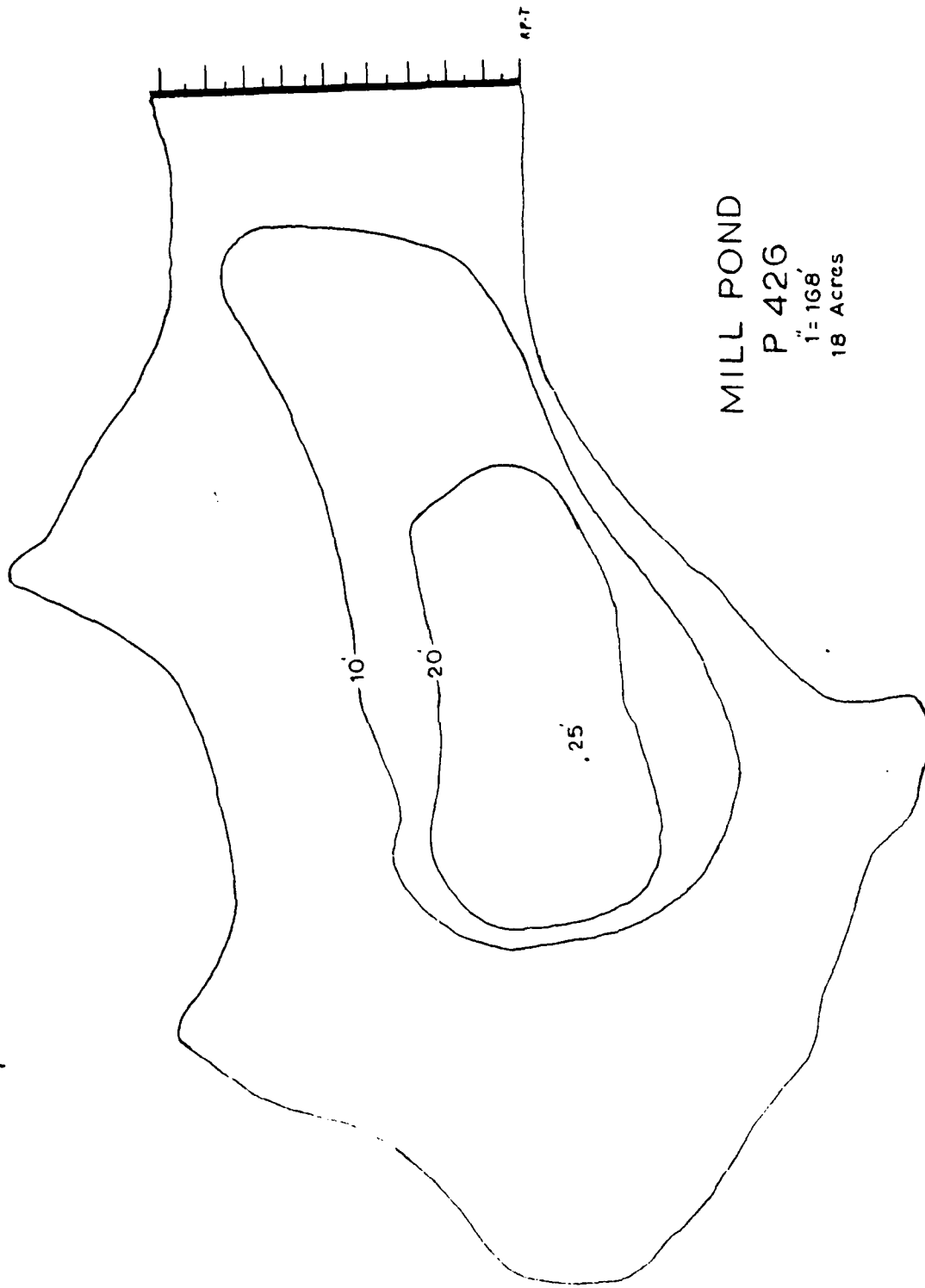
DUNHAM RESERVOIR

P 425

1"=503'
100 Acres

RENSSELAER COUNTY

N



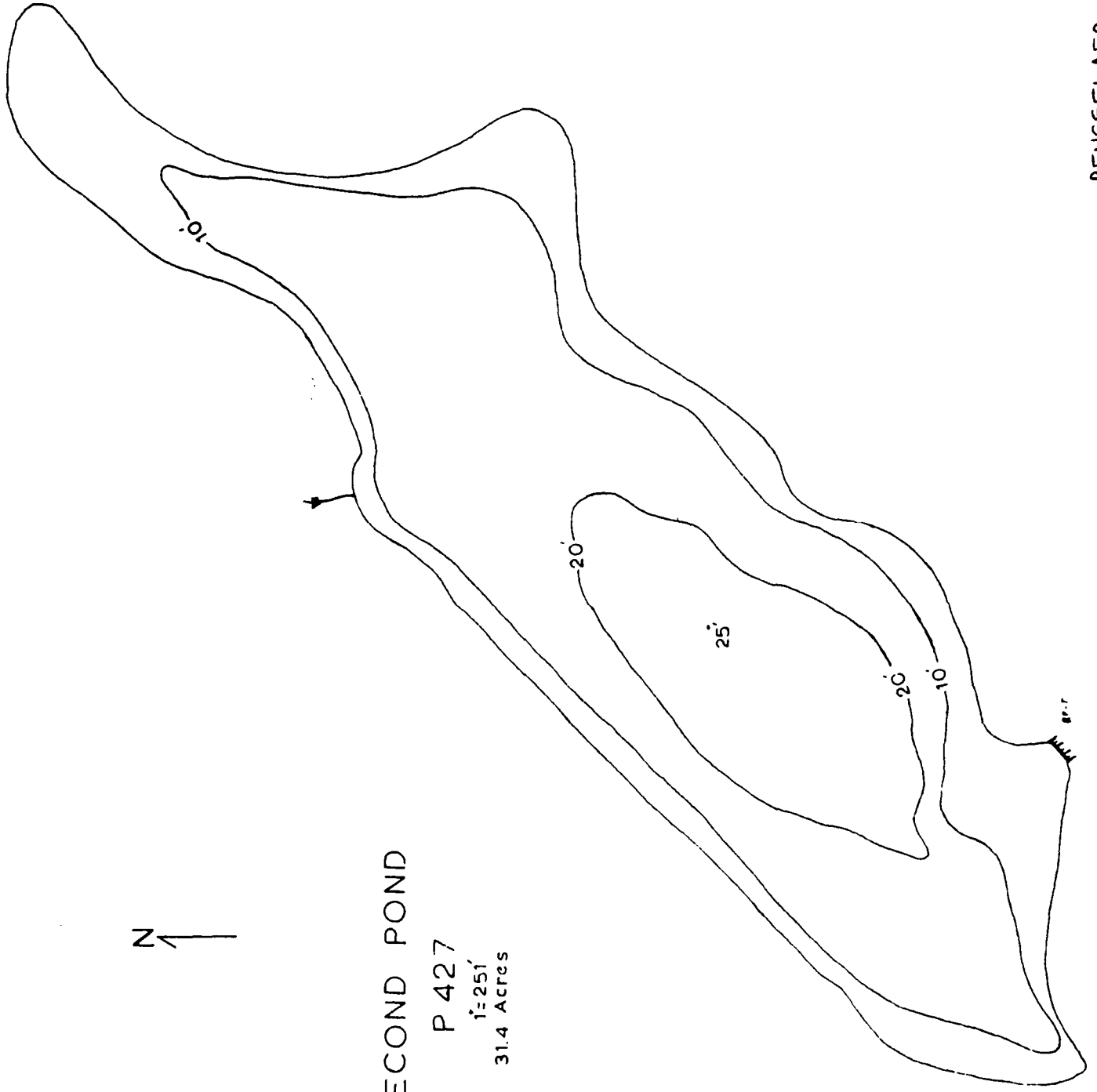
MILL POND

P 426

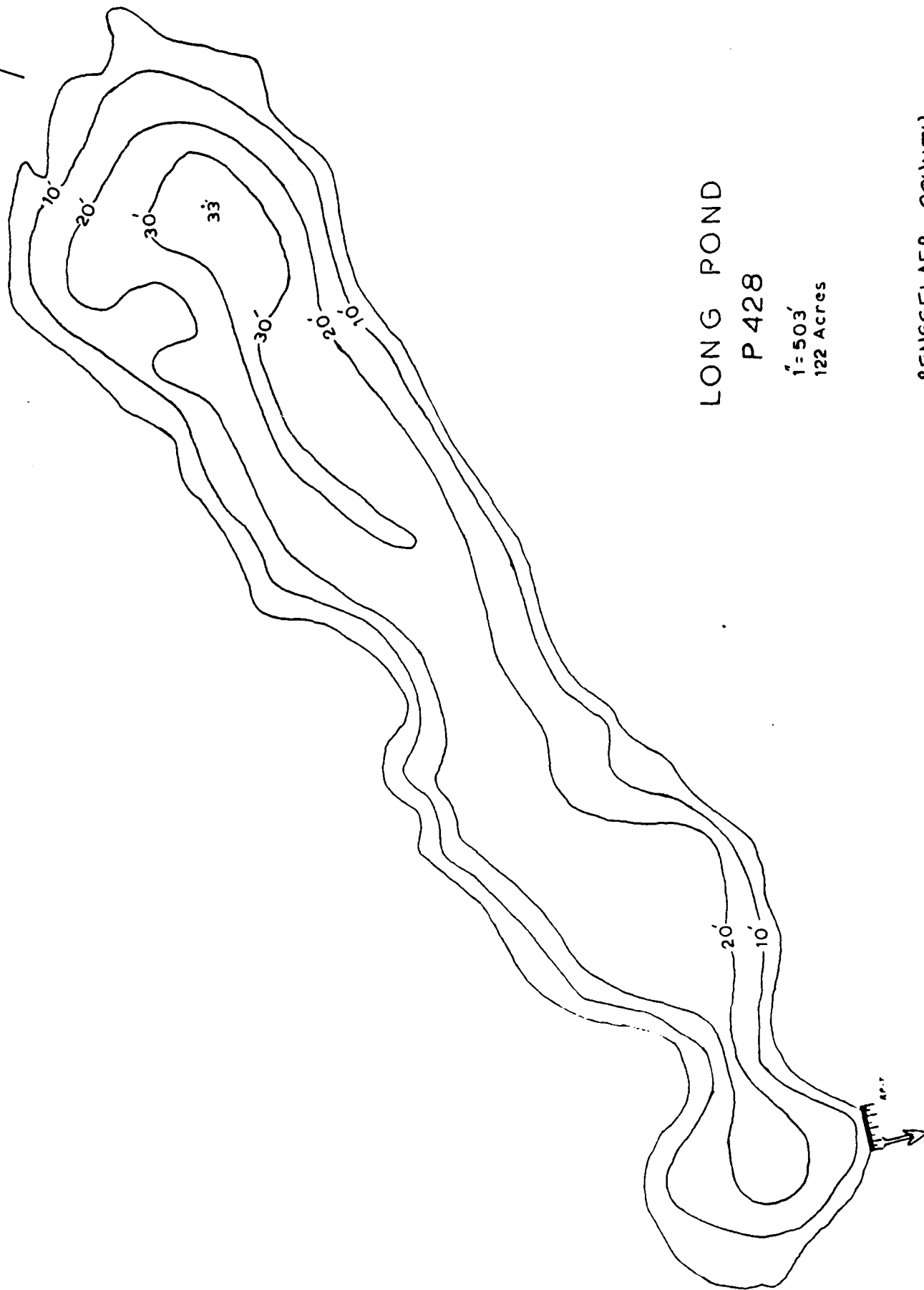
1" = 168'

18 Acres

RENSSELAER COUNTY



N

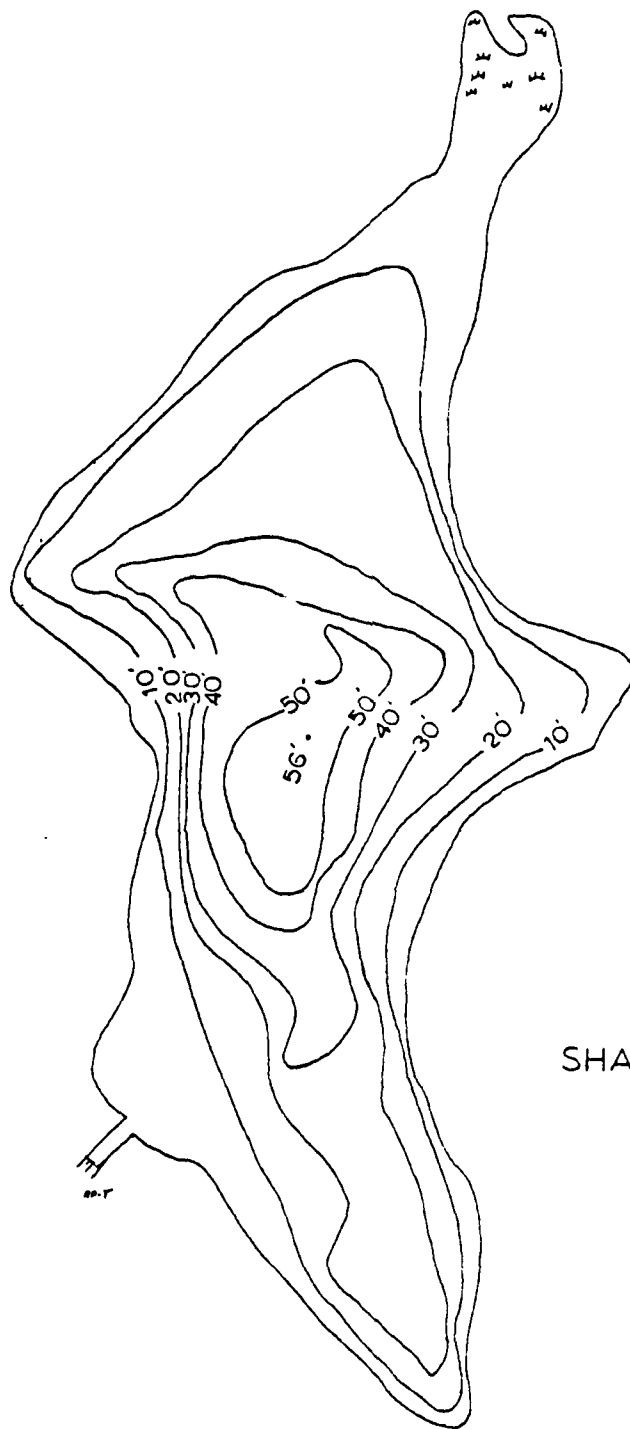


LONG POND

P 428

1" = 503'
122 Acres

RENSSELAER COUNTY



SHAVER POND

RENSSELAER COUNTY

HUDSON RIVER BASIN

113

98. Quacken Kill at Quacken Kill, N. Y.

Location--Lat 42°46'10", long 73°31'15", just downstream from lower highway bridge in village of Quacken Kill, Rensselaer County, 3 miles southeast of Haynersville, and 6 miles upstream from mouth.

Drainage area--17.3 sq mi (revised).

Gage--Staff gage and weir. Altitude of gage is 900 ft (from topographic map).

Remarks--Some regulation by ponds above station.

Cooperation--Records furnished by W. G. Raymond, consulting engineer, Department of Water Supply, Troy, N. Y.; records for January to December 1894 are revised and supercede those published in WSP 82.

Monthly and yearly mean discharge, in cubic feet per second												
Water year	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1893	-	-	-	-	-	-	-	-	-	-	-	-
1894	115.4	111.6	130.4	120.8	118.58	158.9	120.9	110.3	17.01	15.95	11.60	11.81
1895	118.26	128.4	125.7	116.8	119.1	120.7	120.9	116.25	-	-	-	-
The year												
	118.3											

* Only monthly figures revised; revised daily figures not published.

† Not previously published.

Monthly and yearly runoff, in inches												
Water year	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1893	-	-	-	-	-	-	-	-	-	-	-	-
1894	11.03	10.76	12.56	11.39	10.52	13.92	11.86	10.89	10.45	10.40	12.23	11.79
1895	11.55	11.35	11.71	11.12	11.1	11.38	11.5	11.4	-	-	11.44	11.51
The year												
	11.35											

* Revised.

† Not previously published.

Yearly discharge, in cubic feet per second									
Year	U.S.G.P. No.	Water year ending Sept. 30						Calendar year	
		Discharge	Date	Minimum day	Mean	Per square mile	Runoff in inches	Mean	Runoff in inches
1893	-	-	-	-	-	-	-	-	-
1894	-	-	-	-	10.56	118.3	11.35	11.79	11.35
1895	-	-	-	-	-	-	-	-	-

* Revised.

† Not previously published.

99. Poesten Kill near Troy, N. Y.

Location--Lat 42°44'00", long 73°38'00", on left bank 600 ft downstream from bridge on Troy-Eagle Mills road, a quarter of a mile downstream from Sweet Milk Creek, 1½ miles west of Eagle Mills, 3 miles east of Troy, Rensselaer County, and 5 miles upstream from mouth.

Drainage area--89 sq mi, approximately.

Gage--Water-stage recorder. Datum of gage is 321.46 ft above mean sea level (city of Troy, N. Y., datum). Prior to Sept. 22, 1938, at site 90 ft upstream at same datum.

Average discharge--27 years (1923-50), 137 cfs.

Extremes--1923-50: Maximum discharge, 11,900 cfs Sept. 22, 1938 (gage height, 12.1 ft. from floodmarks); minimum, 1.7 cfs Oct. 15, 1930.

Remarks--Practically entire low flow of Quacken Kill, a tributary above station, diverted for municipal supply. Average annual diversion about 5 cfs.

Monthly and yearly mean discharge, in cubic feet per second												
Water year	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1923	-	-	-	-	-	-	-	-	-	-	-	-
1924	95.6	306	321	259	28.4	122	528	157	35.3	12.6	12.1	75.4
1925	82.7	82.5	89.2	20.5	337	326	201	100	50	66.2	30.2	74.3
1926	104	257	74.8	88.5	111	263	496	91.9	58.2	12.0	68.2	12.6
1927	108	260	64.0	163	169	488	86.3	120	42.0	16.1	24.5	26.5
1928	162	626	351	203	207	179	324	184	269	167	183	121
1929	34.0	42.0	46.4	45.9	60.5	478	551	190	41.0	28.3	11.7	12.2
1930	9.69	22.4	43.0	129	147	258	127	91.5	112	19.5	7.10	7.26
1931	5.12	21.9	16.5	8.19	28.0	167	308	268	125	161	41.7	25.2
1932	16.8	26.0	119	252	123	84.8	481	80.0	29.9	28.5	26.0	15.3
1933	74.8	266	64.9	97.5	93.5	279	538	57.0	31.2	17.2	21.4	129
1934	120	93.8	1.6	192	34.2	540	475	145	134	29.1	12.5	25.6
1935	52.1	81.4	135	233	99.6	311	182	231	62.2	80.6	24.9	21.3
1936	12.6	116	108	163	59.3	737	242	115	23.3	7.30	26.3	18.0
1937	34.9	32.6	135	220	187	84.5	312	226	110	55.1	25.3	85.4
1938	110	145	127	230	184	218	108	111	52.8	262	117	638
1939	79.1	103	297	64.3	255	252	5.3	53.8	13.6	13.3	18.1	19.6
1940	37.4	149	71.1	41.7	29.7	250	771	190	82.2	1.3	46.4	118

Published as Quacken Kill Creek at Quacken Kill Village, January to December 1932.

HUDSON RIVER BASIN

Monthly and yearly mean discharge, in cubic feet per second, of Poesten Kill at Troy, N. Y.--Con.

Water year	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	The year
1941	41.9	200	199	89.0	118	75.5	208	29.5	17.7	7.43	9.48	38.7	85.7
1942	15.2	30.0	95.5	86.4	59.7	348	240	71.9	78.7	121	44.2	62.4	103
1943	130	288	188	139	194	288	279	323	90.5	29.5	70.8	16.6	167
1944	37.5	180	95.0	52.1	55.6	503	570	85.5	92.8	54.5	26.4	42.2	116
1945	77.9	105	117	120	145	445	245	560	262	288	44.1	96.4	195
1946	112	211	171	157	78.2	325	98.1	263	197	30.1	31.7	37.1	145
1947	134	51.5	46.5	215	159	259	245	278	140	67.1	66	16.4	147
1948	12.5	89.1	47.6	56.4	156	457	205	268	155	34.2	70.5	12.9	174
1949	15.1	89.2	517	594	168	201	142	116	17.8	11.8	9	6.1	125
1950	16.5	34.8	96.9	192	107	298	248	114	122	12.2	128	290	137

Monthly and yearly run off, in inches

Water year	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	The year
1925	-	-	-	-	-	-	-	-	-	-	-	-	-
1926	41.21	83.83	64.15	83.36	80.34	41.58	46.82	82.05	80.44	80.16	80.21	80.56	824.76
1927	1.07	1.03	1.16	.27	3.94	4.23	2.52	1.50	.63	.86	.39	.93	18.33
1928	1.35	3.25	.97	1.12	1.50	3.40	6.21	1.19	.73	.18	.88	.16	20.70
1929	1.39	3.25	.83	2.19	1.88	6.37	1.08	1.55	.53	.21	.51	.35	19.92
1930	2.10	7.84	4.55	2.62	2.51	2.37	4.06	2.58	3.38	2.17	2.37	1.52	37.82
1931	.44	.53	.60	.59	.71	6.19	6.90	2.46	.51	.57	.15	.15	19.60
1932	.13	.26	.59	1.67	1.72	3.35	1.59	1.19	1.40	.25	.69	.09	12.17
1933	.07	.27	.71	.11	.53	2.17	3.84	3.74	1.56	2.09	.54	.29	15.24
1934	.22	.33	1.54	3.27	1.49	1.00	6.22	1.04	.37	.37	.34	.17	16.26
1935	.97	5.34	.84	1.27	1.09	3.61	6.74	.74	.19	.13	.78	2.12	21.52
1936	1.58	1.17	1.64	2.49	.40	4.40	5.96	1.86	1.68	.53	.16	.30	21.95
1937	.42	1.02	1.75	5.02	1.17	4.02	2.28	5.00	.78	1.04	.32	.26	19.18
1938	.16	1.45	1.40	2.11	.72	9.55	3.34	1.49	.29	.09	.24	.35	20.87
1939	.45	1.16	1.75	2.85	1.72	1.29	3.92	2.93	1.38	.71	.37	.82	19.08
1940	1.43	1.80	1.58	2.97	2.18	2.82	2.26	1.44	.66	3.59	1.45	7.88	29.64
1941	1.02	1.29	3.85	.85	2.99	5.28	6.38	.70	.17	.11	.23	.25	21.44
1942	.48	1.86	.97	.54	.56	3.74	9.66	2.48	.78	1.41	.63	1.40	23.87
1943	.54	2.51	2.58	1.15	1.58	.98	2.61	.58	.22	.10	.13	.49	13.07
1944	.20	3.38	1.23	1.12	1.46	4.51	3.71	.93	.96	1.57	.40	.78	15.75
1945	1.68	3.60	2.43	1.80	2.30	3.75	3.00	4.19	1.15	.58	.99	.21	25.44
1946	.48	2.39	1.50	.42	.65	3.92	4.89	1.10	.16	.70	.54	.53	17.77
1947	1.01	1.32	1.52	1.55	1.69	5.76	3.07	4.66	3.29	3.73	.57	1.23	29.40
1948	1.48	2.54	2.21	2.23	.91	4.18	1.23	3.67	2.47	.39	.41	.46	22.26
1949	1.13	.45	.60	2.19	1.65	5.35	3.08	5.83	1.75	.97	.85	.21	21.62
1950	.16	1.12	.62	.45	1.70	5.32	2.54	3.45	1.95	.44	.76	.16	18.97
1951	.17	1.12	4.11	5.10	1.96	2.61	1.65	1.50	.41	.15	.10	.22	19.28
1952	.21	.43	1.26	1.25	3.86	1.10	1.51	1.51	.26	1.40	3.63	20.92	20.92

* Not previously published.

Yearly discharge, in cubic feet per second

Year	W.S.P. no.	Water year ending Sept. 30					Calendar year	
		Momentary maximum		Minimum day	Mean	Per square mile	Runoff in inches	Mean in inches
		Discharge	Date					
1924	581	2,940	Dec. 1, 1923	4.7	162	41.82	824.76	123
1925	601	3,280	Feb. 12, 1925	5.7	120	1.35	18.33	135
1926	621	1,810	Nov. 16, 1925	4.7	136	1.53	20.70	135
1927	641	1,950	Mar. 14, 1927	5.7	121	1.47	19.92	130
1928	661	7,030	Nov. 4, 1927	-	247	2.74	37.82	163
1929	681	2,210	Mar. 14, 1929	2.2	179	1.45	19.60	125
1930	698	1,990	June 10, 1930	2.1	80.7	.907	12.17	78.0
1931	711	1,670	July 10, 1931	1.9	99.9	1.12	15.24	110
1932	728	2,150	Apr. 12, 1932	3.4	106	1.19	16.26	106
1933	741	1,990	Nov. 19, 1932	3.5	141	1.58	21.52	136
1934	756	1,780	Mar. 3, 1934	4.6	144	1.60	21.95	135
1935	781	2,080	Jan. 9, 1935	6.8	125	1.40	19.18	124
1936	801	4,750	Mar. 12, 1936	3.4	126	1.53	20.87	139
1937	821	1,480	May 15, 1937	6.1	125	1.42	19.28	134
1938	851	11,920	Sept. 22, 1938	13	124	2.18	29.64	203
1939	871	5,320	Feb. 15, 1939	5.7	119	1.56	21.44	120
1940	891	4,520	Mar. 31, 1940	7.5	156	1.75	23.87	121
1941	921	1,200	Nov. 15, 1940	2.9	85.7	.953	13.07	60.6
1942	951	2,440	Mar. 17, 1942	9.9	103	1.26	15.75	142
1943	971	2,570	Dec. 31, 1942	9.1	167	1.88	25.44	143
1944	1001	1,820	Nov. 9, 1943	6.0	115	1.30	17.77	115
1945	1031	2,560	July 22, 1945	28	193	2.17	29.40	209
1946	1051	1,110	Mar. 7, 1946	10	145	1.63	20.86	123
1947	1081	2,120	Jan. 31, 1947	12	142	1.60	21.62	135
1948	1111	2,180	Mar. 16, 1948	9.6	124	1.39	18.97	147
1949	1141	10,100	Dec. 31, 1948	4.0	125	1.40	19.08	102
1950	1171	1,750	Sept. 1, 1950	9.7	127	1.54	20.90	-

* Not previously published.

MARTIN - DUNHAM RESV.
NY-672

64

HUDSON RIVER BASIN

3565. Poesten Kill near Troy, N. Y.

Location.--Lat 42°14'00", Long 73°36'00", on left bank 400 ft downstream from bridge on State Highway 2, a quarter of a mile downstream from Sweet Milk Creek, 1 1/2 miles west of Eagle Mills, 3 miles east of Troy, Rensselaer County, and 5 miles upstream from mouth.

Drainage area.--83 sq mi, approximately.

Records available.--July 1923 to September 1960.

Gage.--Water-stage recorder. Datum of gage is 321.46 ft above mean sea level (city of Troy, N. Y. datum). Prior to Sept. 22, 1938, at site 90 ft upstream at same datum.

Average discharge.--37 years (1923-60), 136 cfs.

Extremes.--1933-60: Maximum discharge, 11,900 cfs Sept. 22, 1938 (gage height, 12.1 ft. from floodmarks); minimum, 1.7 cfs Oct. 15, 1939.

Remarks.--Diversions from Quacken Kill, above station, for municipal supply returns to Poesten Kill below station, to Wynants Kill, and to Hudson River. Usable capacity of regulated ponds in Quacken Kill basin, 134,000,000 cu ft. Data prior to 1955 not available.

Monthly and yearly mean discharge, in cubic feet per second

Water year	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	The year
1951	53.7	171	233	176	203	325	311	68.5	40.2	111	85.5	67.7	159
1952	205	308	178	273	123	218	389	226	214	22.8	24.9	26.1	184
1953	17.8	10.1	116	223	181	389	438	384	39.5	13.8	15.2	13.8	154
1954	19.8	25.7	155	103	248	208	135	290	197	21.0	16.9	47.6	126
1955	41.5	194	224	84.4	157	306	290	55.5	41.8	12.4	32.5		121
1956	127	273	56.5	62.3	63.4	232	536	176	76.1	13.5	11.0	43.0	139
1957	29.6	124	109	97.2	63.4	145	198	127	55.6	23.2	13.9	18.0	90.4
1958	13.9	35.0	216	85.1	55.6	241	551	180	41.1	54.1	24.7	31.6	128
1959	85.9	178	95.1	81.3	63.8	191	339	107	30.8	15.5	15.6	12.9	100
1960	30.3	274	213	155	233	159	254	92.4	135	74.3	114	421	203

Monthly and yearly diversion, in cubic feet per second, from Quacken Kill

Water year	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	The year
1951	-	-	-	-	-	-	-	-	-	-	-	-	-
1952	-	-	-	-	-	-	-	-	-	-	-	-	-
1953	-	-	-	-	-	-	-	-	-	-	-	-	-
1954	-	-	-	-	-	-	-	-	-	-	-	-	-
1955	-	-	-	-	-	-	-	-	-	-	-	-	-
1956	-	-	-	-	-	-	-	-	-	-	-	-	-
1957	5.26	4.55	4.00	4.35	5.00	5.32	5.00	5.00	5.04	5.10	5.64	6.17	5.49
1958	4.18	7.13	7.71	7.41	5.49	5.78	5.95	6.11	6.34	7.19	6.29	5.70	6.47
1959	6.05	6.47	6.40	5.40	5.82	6.00	5.99	6.20	5.61	7.34	6.87	6.77	6.37
1959	6.13	5.93	5.74	5.82	5.40	5.99	5.83	6.11	7.86	6.00	6.16	7.14	6.41
1960	7.30	6.35	6.39	5.63	5.48	5.71	5.25	5.38	5.91	5.41	5.59	6.18	5.34

Yearly discharge, in cubic feet per second

Year	WSP	Water year ending Sept. 30						Calendar year	
		Momentary maximum		Minimum day	Mean	Per square mile	Runoff in inches	Mean	Runoff in inches
		Discharge	Date						
1950	-	-	-	-	-	-	-	-	-
1951	1232	2,820	Nov. 26, 1950	1.1	159	-	-	164	-
1952	1232	3,490	June 1, 1952	8.3	184	-	-	179	-
1953	1272	2,600	Apr. 27, 1953	6.3	154	-	-	158	-
1954	1332	1,720	June 16, 1954	6.3	126	-	-	148	-
1955	1392	2,000	Feb. 23, 1955	4.0	121	-	-	121	-
1956	1432	2,480	Mar. 7, 1956	4.5	132	-	-	129	-
1957	1502	1,630	Jan. 13, 1957	6.6	92.4	-	-	84.1	-
1958	1552	2,080	Dec. 21, 1957	7.0	126	-	-	132	-
1959	1622	2,480	Apr. 3, 1959	4.4	130	-	-	114	-
1960	1702	5,040	Sept. 22, 1960	9.1	203	-	-	-	-

Note.--Monthly and yearly figures of discharge per square mile and runoff in inches previously published in water-supply papers, may be in error because of diversion from Quacken Kill. Those figures are not published herein.

MARTIN - DUNHAM RESV.

NY-670

HUDSON RIVER BASIN

1-1545, Poesten Kill near Troy, N. Y.

Location.--Lat 42°44'00", Long 73°48'00", on left bank 600 ft downstream from bridge on State Highway 2, a quarter of a mile down from Sweet Milk Creek, 1 1/2 miles west of Eagle Mills, 3 miles east of Troy, Rensselaer County, and 7 miles upstream from mouth.

Drainage area.--83.4 sq mi.

Records available.--July 1921 to September 1968 (discontinued).

Gage.--water stage recorder. Datum of gage is 121.46 ft above mean sea level (city of Troy, N. Y., datum). Prior to Sept. 22, 1934, at site 90 ft upstream at same datum.

Average discharge.--45 years, 131 cfs.

Extremes.--Maximum discharge during year, 2,560 cfs Apr. 25 (gage height, 4.81 ft); minimum, 4.6 cfs Sept. 2 (gage height, 0.78 ft).

Notes.--Maximum discharge, 11,900 cfs Sept. 22, 1934 (gage height, 12.1 ft, 100 floodmarks); minimum, 0.6 cfs Sept. 24, 25, 1964 (gage height, 0.58 ft).

Remarks.--Records poor prior to Mar. 20 and fair thereafter. Diversion from Quacken Kill, a tributary above station, for municipal supply, returns to Poesten Kill below station, to Rhynants Kill, or to Hudson River east to capacity of regulated ponds in Quacken Kill basin, 134,000,000 cu ft.

DISCHARGE, IN CFS, WATER YEAR OCTOBER 1967 TO SEPTEMBER 1968

DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	10	140	154	56	250	30	302	154	67	151	10	5.8
2	10	120	115	56	350	31	302	131	59	160	13	5.2
3	10	150	154	54	500	32	214	134	54	114	13	5.5
4	11	194	291	60	400	32	140	190	71	89	11	5.8
5	10	250	250	50	300	33	205	160	54	73	97	5.2
6	97	170	250	54	240	33	190	137	47	54	97	5.8
7	97	134	214	57	210	33	160	110	59	44	10	7.6
8	97	114	255	50	190	34	145	95	54	47	93	9.7
9	97	105	240	47	150	35	137	87	57	51	97	9.3
10	27	102	210	44	130	40	114	102	51	50	97	9.3
11	149	102	190	42	110	54	107	91	205	54	93	17
12	91	105	772	40	94	64	94	120	117	35	82	50
13	61	157	1,240	34	84	50	89	160	115	23	70	37
14	47	147	875	34	72	52	80	124	80	18	70	23
15	47	120	567	34	65	54	75	102	80	17	63	19
16	53	100	365	34	60	110	71	89	137	15	64	16
17	54	91	270	37	52	350	64	114	147	14	84	14
18	27	94	207	37	46	1,000	59	120	143	13	93	12
19	54	124	160	37	41	1,200	54	143	157	54	74	12
20	40	117	145	37	37	1,150	50	214	430	65	74	11
21	40	93	124	37	33	1,090	47	230	260	52	90	11
22	54	91	144	37	32	931	47	143	160	25	80	11
23	54	163	157	37	31	1,140	42	140	103	30	97	10
24	53	240	123	34	30	1,373	103	151	95	18	93	10
25	40	318	96	40	30	632	1,800	110	47	21	82	11
26	400	346	74	41	29	450	827	91	214	30	73	13
27	310	335	64	46	29	364	463	76	367	16	70	13
28	250	265	62	50	29	324	335	66	330	14	67	12
29	210	206	60	56	24	291	245	67	273	13	64	11
30	140	157	54	90	-----	250	147	93	104	17	64	11
31	160	-----	56	220	-----	194	-----	73	-----	11	64	-----
TOTAL	4,572.5	4,872	2,942	1,611	5,444	11,565	6,744	5,892	4,354	1,304	2,641	3,992
MEAN	165	162	108	52.0	126	373	227	126	145	42.1	8.66	13.1
MAX	400	146	1,280	220	500	1,170	1,800	230	420	160	13	56
MIN	10	91	56	37	29	30	42	66	27	11	6.1	5.2
(%)	1.23	1.23	1.23	1.23	1.23	1.23	1.23	1.23	1.11	1.11	1.11	1.11
CAL YR 1967	TOTAL 55,136.2			MEAN 151	MAX 1,500	MIN 7.9	≠ 1.30					
WTR YR 1968	TOTAL 49,024.3			MEAN 134	MAX 1,800	MIN 5.2	≠ 1.25					

PEAK DISCHARGE (BASEL. 1,700 CFS)

* Diversion, in cubic feet per second, from Quacken Kill basin furnished by Troy water department.

DATE	TIME	GMT	DISCHARGE	DATE	TIME	GMT	DISCHARGE
3-24	0100	4.71	2,140	4-25	0310	4.81	2,560

APPENDIX D

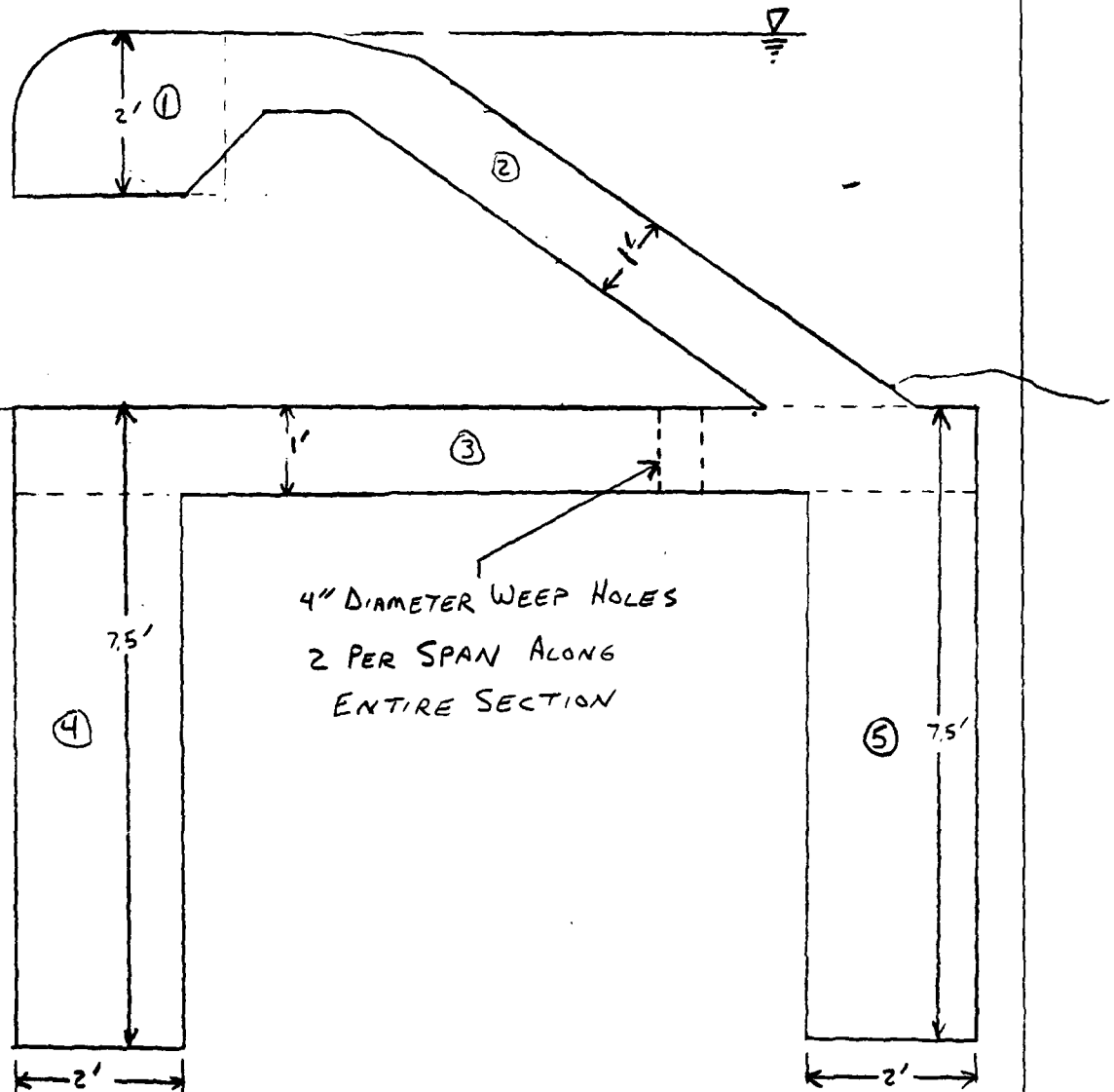
STABILITY COMPUTATIONS

MARTIN DUNHAM RESERVOIR DAM - SPILLWAY SECTION

DRAWING BASED ON FIELD MEASUREMENTS (11/13/81)

SCALE 1"=2'

ELEV. 100



ASSUMPTIONS MADE FOR STABILITY ANALYSIS

1. IGNORE EFFECTS OF 2' PIERS SPACED 10 FEET ON CENTER UNDER SPILLWAY CREST
2. ASSUME THAT CUTOFF WALLS ARE BOTH CONTINUOUS FOR THE LENGTH OF THE STRUCTURE
3. ASSUME CUTOFF WALLS AND WEEP HOLES EFFECTIVELY REDUCE UPLIFT PRESSURES

PROJECT GRID

JOB MARTIN DUNHAM RESERVOIR DAM		SHEET NO. 1	CHECKED BY	DATE
SUBJECT STRUCTURAL STABILITY COMPUTATIONS			COMPUTED BY RLW	DATE 3/16/81

AREAS INPUT INTO STABILITY ANALYSIS PROGRAM
(BASED ON AS-BUILT CROSS-SECTION)

SEGMENT	AREA	DISTANCE TO CENTROID
1	$(2.5)(2) = 5 \text{ ft}^2$	1.25 ft
2	$(7.5)(1) = 7.5 \text{ ft}^2$	5.75 ft
3	$(11.4)(1) = 11.4 \text{ ft}^2$	5.7 ft
4	$6.5(2) = 13 \text{ ft}^2$	1 ft
5	$6.5(2) = 13 \text{ ft}^2$	10.4 ft

CALCULATE SHEAR RESISTANCE OF THE SHEAR KEYS

1. COMPUTE SHEAR STRENGTH OF CONCRETE

ASSUME 2000 PSI CONCRETE

$\text{SHEAR STRENGTH} = 2\sqrt{f'_c} = 2\sqrt{2000} = 89.44 \text{ psi}$

2. CALCULATE RESISTANCE OF UPSTREAM & DOWNSTREAM KEY SEPARATELY

$\text{STRENGTH} = \frac{\text{AREA} \times \text{STRENGTH}}{1000 \text{ lb/ft}^2} = \frac{(89.44 \text{ lb/ft}^2)(288 \text{ ft}^2)}{1000 \text{ lb/ft}^2} = 25.7 \text{ k/ft ON EACH KEY}$

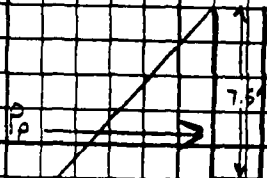
$\text{TOTAL SHEAR KEY RESISTANCE} = 2(25.7 \text{ k/ft}) = 51.4 \text{ k/ft}$

PROJECT GRID

JOB	MARTIN DONHAM RESERVOIR DAM	SHEET NO.	2	CHECKED BY		DATE	
SUBJECT	STRUCTURAL STABILITY COMPUTATIONS			COMPUTED BY	RLW	DATE	3/17/21

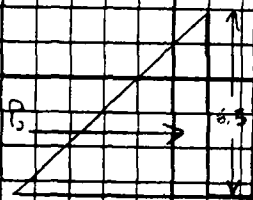
CALCULATE PASSIVE RESISTANCE OF CUTOFF WALLS

DOWNSTREAM WALL



$$P_p = \frac{1}{2} K_a \gamma_s H^2 = \frac{1}{2} (3.0) (.055) (7.5)^2 = 4.64 \text{ K/ft}$$

UPSTREAM WALL



$$P_p = \frac{1}{2} (3.0) (.055) (6.5)^2 = 3.48 \text{ K/ft}$$

TOTAL PASSIVE RESISTANCE = 8.12 K/ft

∴ TOTAL SHEAR RESISTANCE CAN'T
BE DEVELOPED - SOIL WOULD FAIL FIRST

STRUCTURAL STABILITY ANALYSIS

A structural stability analysis was performed for the spillway portion of this structure using a Texas Instrument's TI - 59 Programable Calculator.

The following conditions were analyzed:

1. Normal conditions with water surface at spillway crest.
2. Flood Flow conditions; water surface at crest of dike.
3. Seismic loading; normal conditions with a seismic load of 0.10.

STABILITY ANALYSIS PROGRAM - WORK SHEET

<u>INPUT ENTRY</u>		<u>ANALYSIS CONDITION</u>				
		1	2	3	4	5
Unit Weight of Dam (K/ft ³)	0	0.15	0.15	0.15		
Area of Segment No. 1 (ft ²)	1	5	5	5		
Distance from Center of Gravity of Segment No. 1 to Downstream Toe (ft)	2	1.25	1.25	1.25		
Area of Segment No. 2 (ft ²)	3	7.5	7.5	7.5		
Distance from Center of Gravity of Segment No. 2 to Downstream Toe (ft)	4	5.75	5.75	5.75		
Area of Segment No. 3 (ft ²)	5	11.4	11.4	11.4		
Distance from Center of Gravity of Segment No. 3 to Downstream Toe (ft)	6	5.7	5.7	5.7		
Base Width of Dam (Total) (ft) *	7	4	4	4		
* REDUCED TO ACCOUNT FOR CUTOFF						
Height of Dam (ft)	8	12	12	12		
Ice Loading (K/L ft.)	9					
Coefficient of Sliding	10	0.50	.50	.50		
Unit Weight of Soil (K/ft ³) (deduct 18)	11	0.055	.055	.055		
Active Soil Coefficient - Ka	12	0.33	0.33	0.33		
Passive Soil Coefficient - Kp	13	3.0	3.0	3.0		
Height of Water over Top of Dam or Spillway (ft)	14		6.0			
Height of Soil for Active Pressure (ft)	15	8	8	8		
Height of Soil for Passive Pressure (ft)	16	7.5	7.5	7.5		
Height of Water in Tailrace Channel (ft)	17	8	10			
Weight of Water (K/ft ³)	18	0.0624	.0624	.0624		
Area of Segment No. 4 (ft ²)	19	13	13	13		
Distance from Center of Gravity of Segment No. 4 to Downstream Toe (ft)	20	1	1	1		
Height of Ice Load or Active Water (ft) (does not include 14)	46	12	12	12		
Seismic Coefficient (g)	50			0.10		
	21	13	13			
	22	10.4	10.4			
<u>RESULTS OF ANALYSIS</u>						
Factor of Safety vs. Overturning		2.26	1.18	2.06		
Distance From Toe to Resultant		6.31	1.95	5.81		
Factor of Safety vs. Sliding		1.80	1.06	1.44		

APPENDIX E

REFERENCES

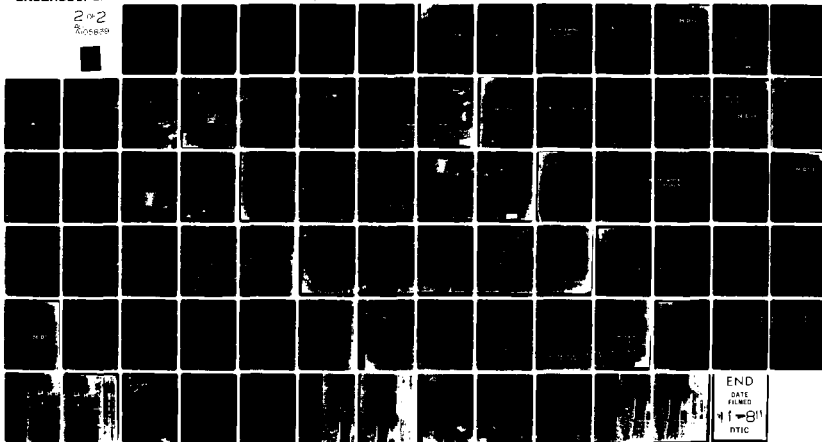
AD-A105 839

NEW YORK STATE DEPT OF ENVIRONMENTAL CONSERVATION ALBANY F/G 13/13
NATIONAL DAM SAFETY PROGRAM. MARTIN DUNHAM RESERVOIR DAM (INVEN--ETC(U)
MAY 81 G KOCH DACWS1-79-C-0001

NL

UNCLASSIFIED

2 of 2
700589



APPENDIX E

REFERENCES

APPENDIX

REFERENCES

- 1) M.G. Cline and R.L. Marshall, Soils of New York Landscapes - Information Bulletin 119, New York State College of Agriculture and Life Sciences, Cornell University, August 1977.
- 2) T.S. George, and R.S. Taylor, Lower Hudson River Basin Hydrologic Flood Routing Model, for the Department of the Army, New York District, Corps of Engineers, Water Resources Engineers Inc. January 1977.
- 3) H.W. King and E.F. Brater, Handbook of Hydraulics, 5th Edition, McGraw-Hill, 1963.
- 4) University of the State of New York, Geology of New York, Education Leaflet 20, Reprinted 1973.

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- 5) HEC-1 Flood Hydrograph Package - Dam Safety Version, September 1978.
- 6) Engineering Manual 1110-2-1405; Flood-Hydrograph Analyses and Computations, August 1959.

U.S. Department of Agriculture, Soil Conservation Service:

- 7) Generalized Soils Report - Capital District Region,
CDRPC - TR - 200 - 1, August 1974.
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1972.

U.S. Department of Commerce; Weather Bureau:

- 9) Hydrometeorological Report No. 33: Seasonal Variation of the
Probable Maximum Precipitation East of the 105th Meridian for
Areas from 10 to 1,000 Square Miles and Durations of 6,12,24, and
48 Hours, April 1956.
- 10) U.S. Department of Interior; BUREC; Design of Small Dams, 2nd
edition (rev. reprint), 1977.

U.S. Geological Survey; Compilation of Records of Surface Waters
of the United States, Part 1-B North Atlantic Slope Basins;

- 11) Water Supply Paper 1302 (Through September 1950), 1960
- 12) Water Supply Paper 1722 (October 1950 to September 1960), 1964

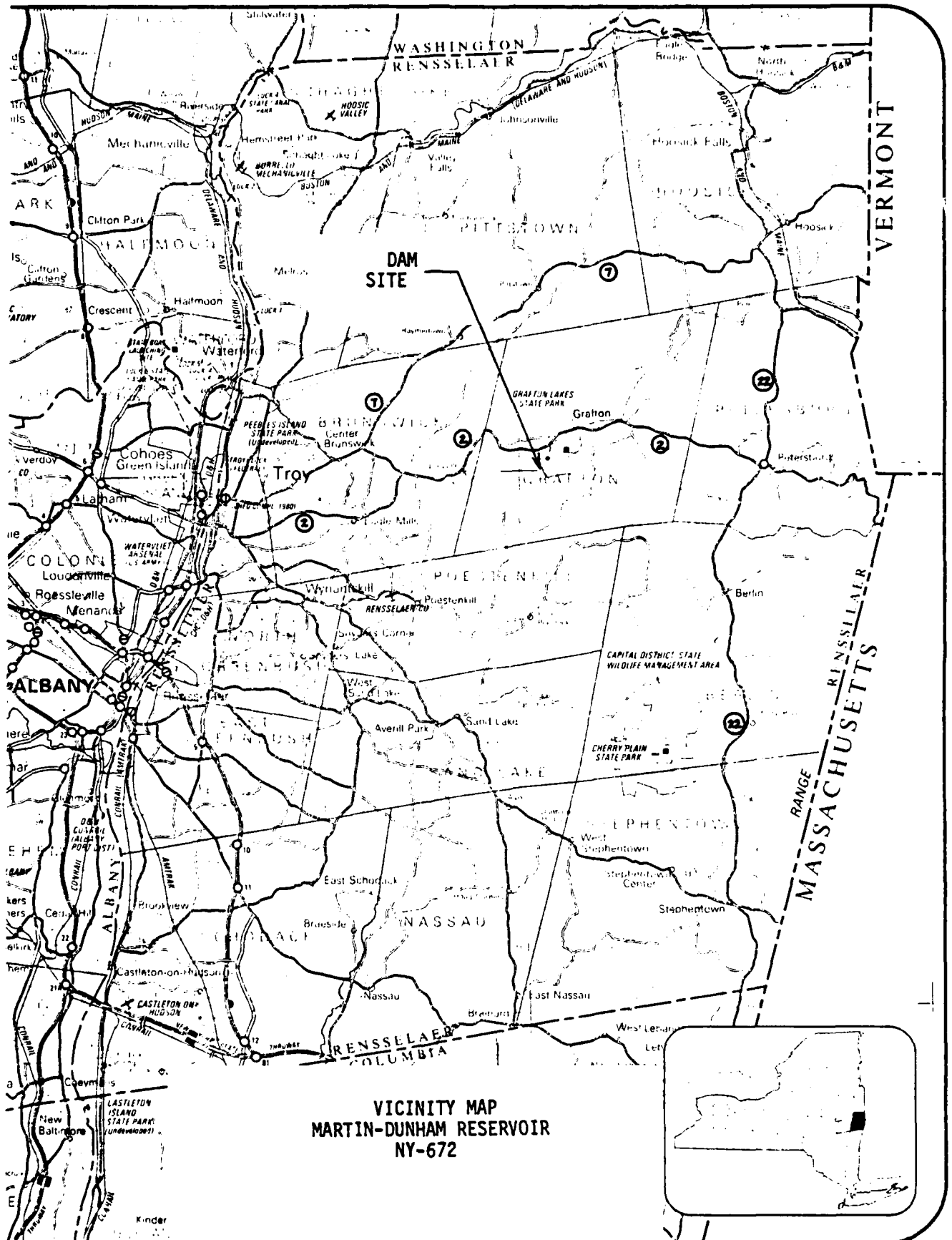
U.S. Geological Survey:

- 13) Water Resources Data for New York - 1968.

APPENDIX F

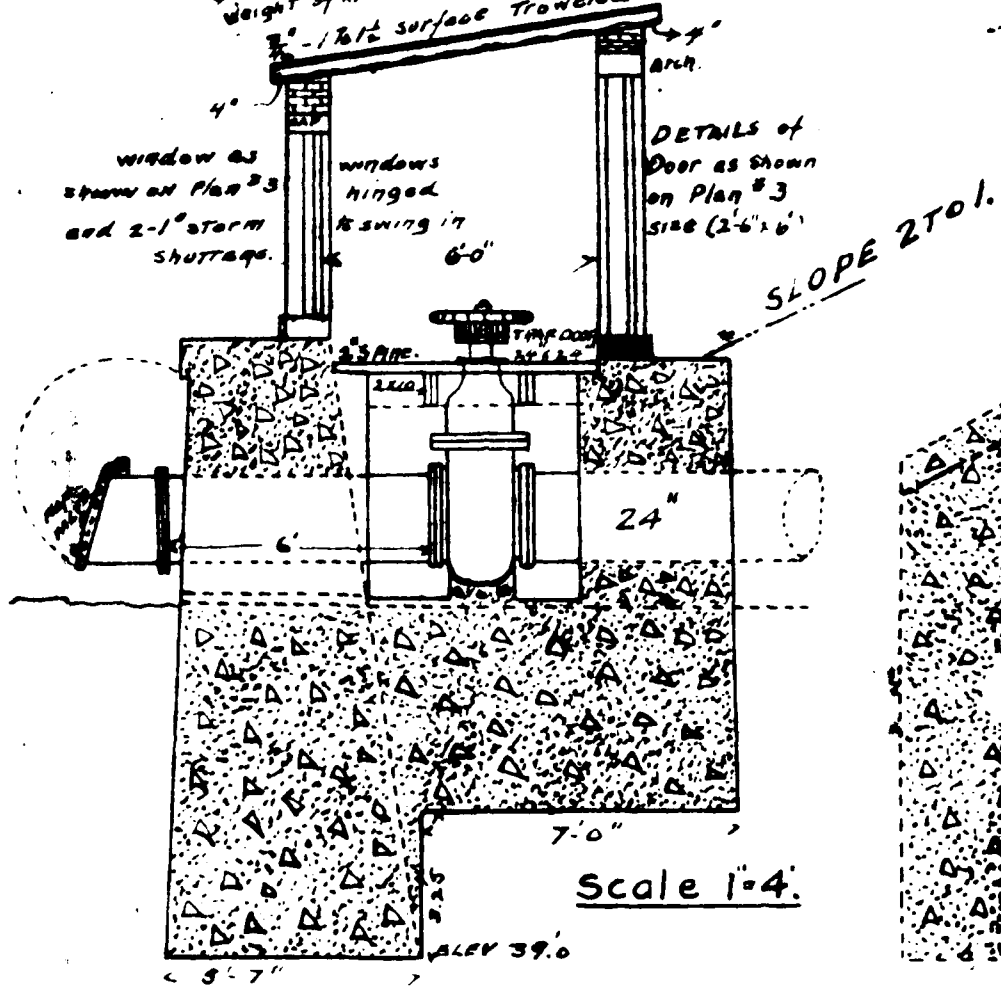
DRAWINGS

ALBANY, RENSSELAER and SCHENECTADY COUNTIES



VICINITY MAP
MARTIN-DUNHAM RESERVOIR
NY-672

6" CONCRETE ROOF REINFORCED WITH
 3" DIAMOND OR TRIANGULAR MESH REINFORCEMENT
 WEIGHT OF METAL 45# PER SQ. FT.
 1/2" - 1/4" SURFACE TROWEL SMOOTH.

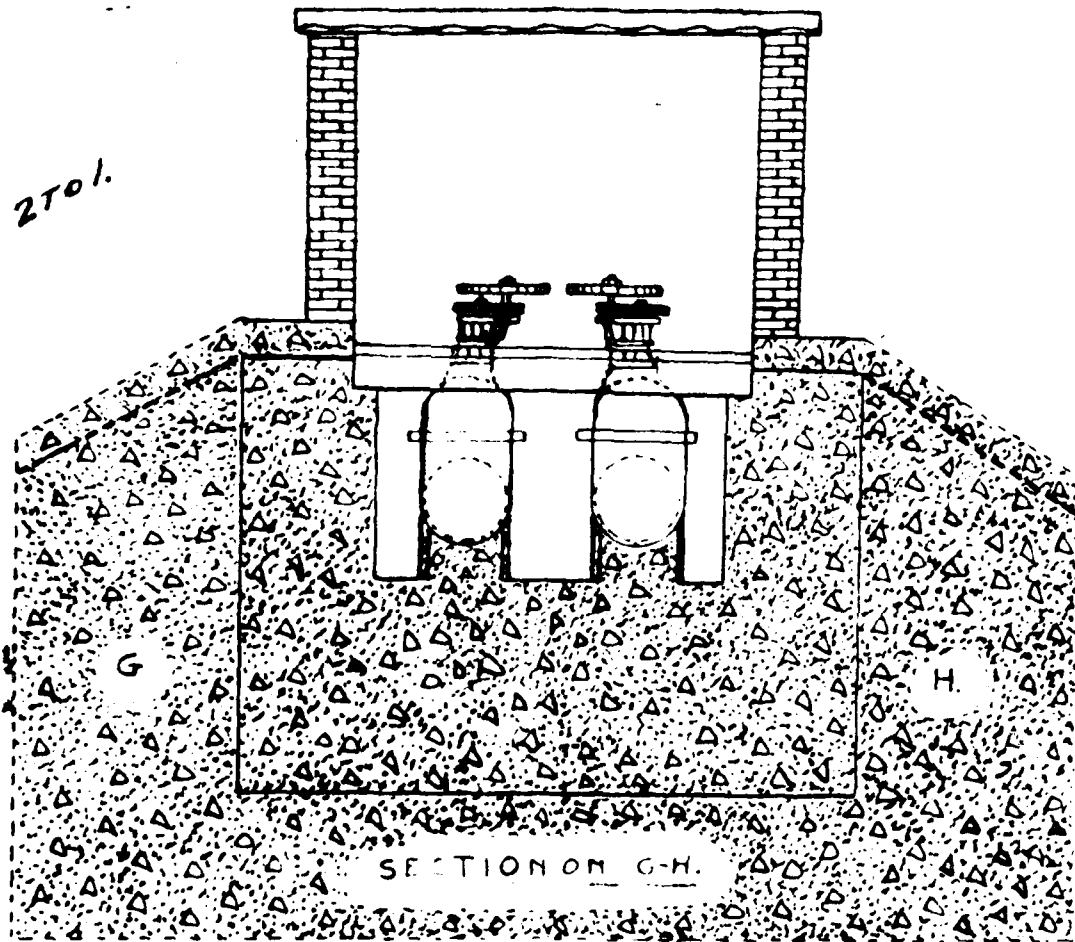


6



2

DPE 2 Tol.

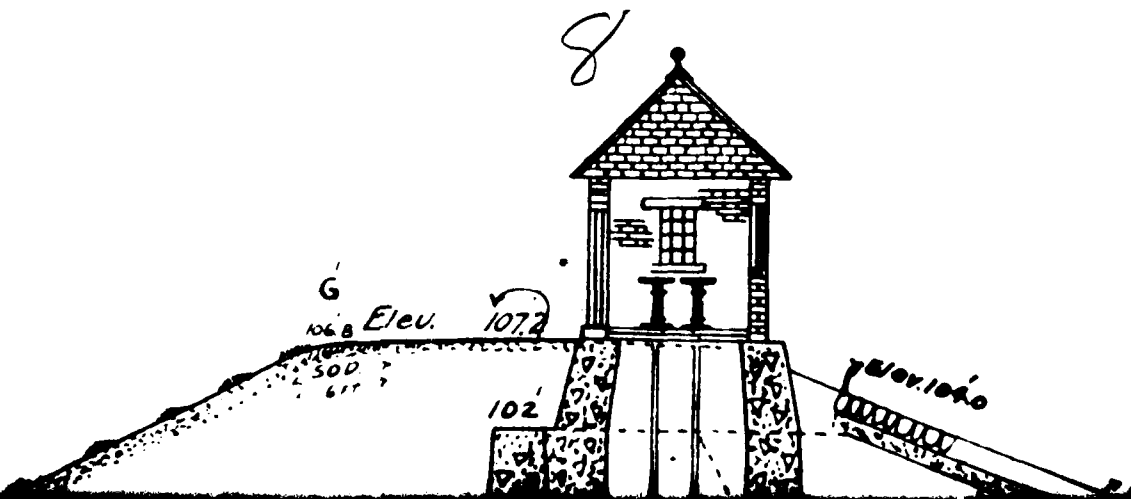


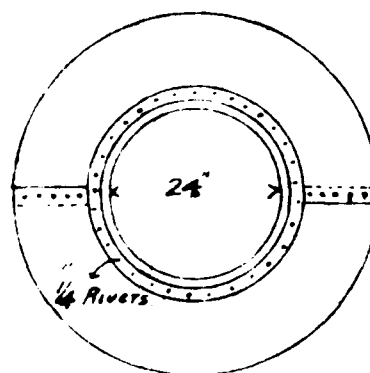
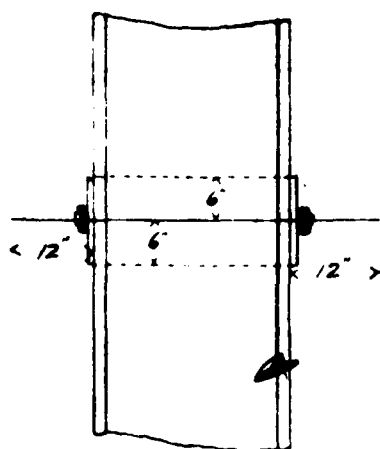
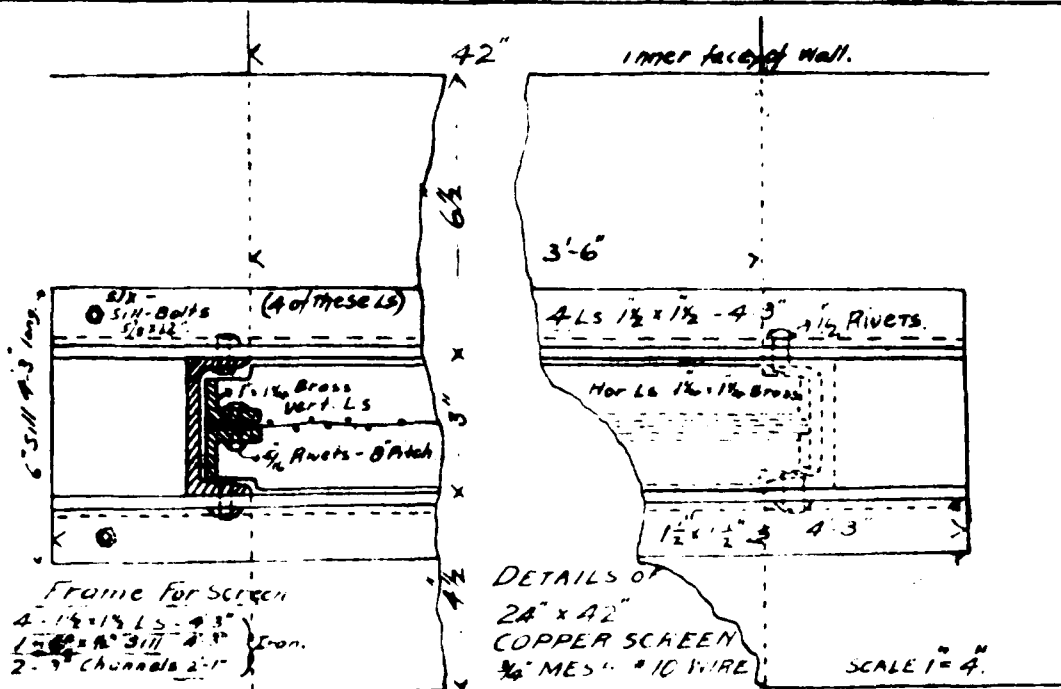
7

3

TROY WATER WORKS EXTENSION.

SECTION THRU-PIPE LINE.





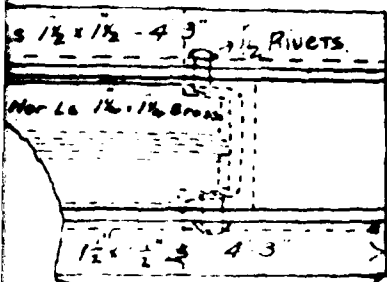
DETAIL OF COLLAR
 N°6 .203 IN
 FOR CUT OFF WALL.
 4 COLLARS REQUIRED

Elev 74'

Walls Reinforced
 1/4" Thread Steel
 Spaced 18" c/c.

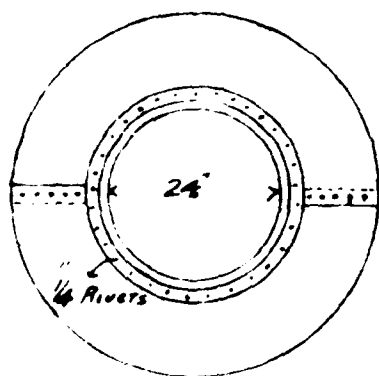
inner face of wall.

M-D.IV.



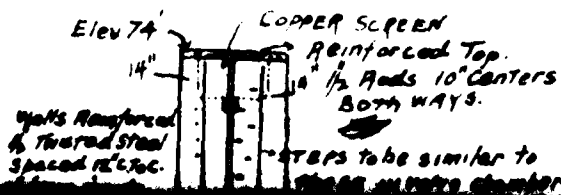
LS OF
#2
A SCREEN
3/4" #10 WIRE

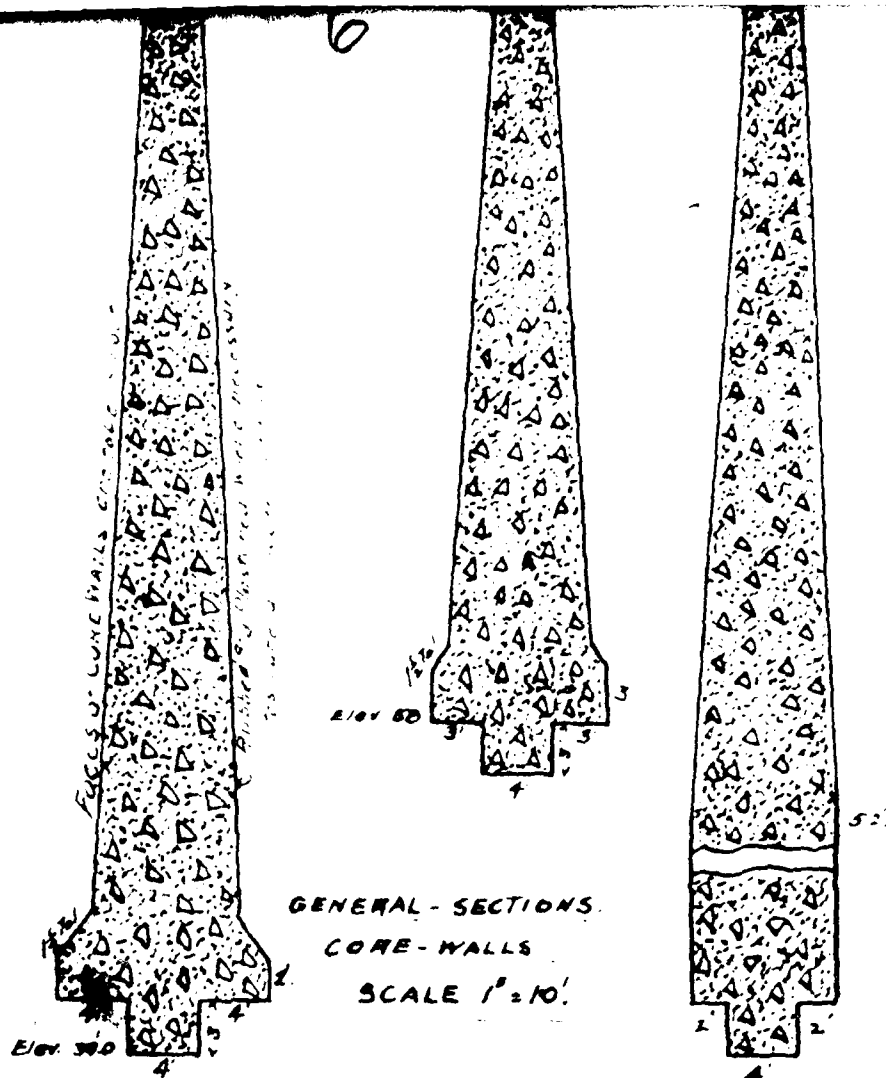
SCALE 1" = 4"



OF COLLAR
.203 IN
OFF WALL
REQUIRED

10

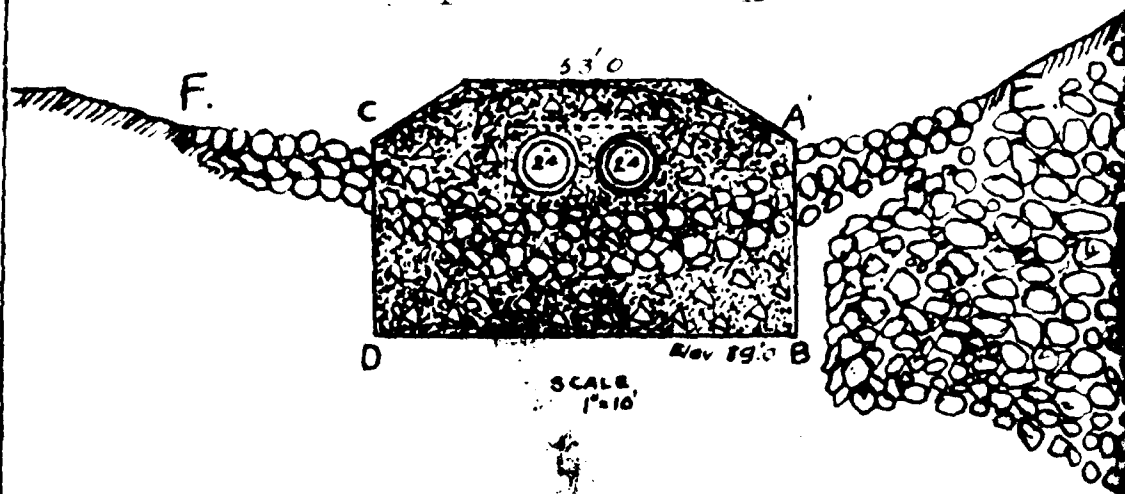




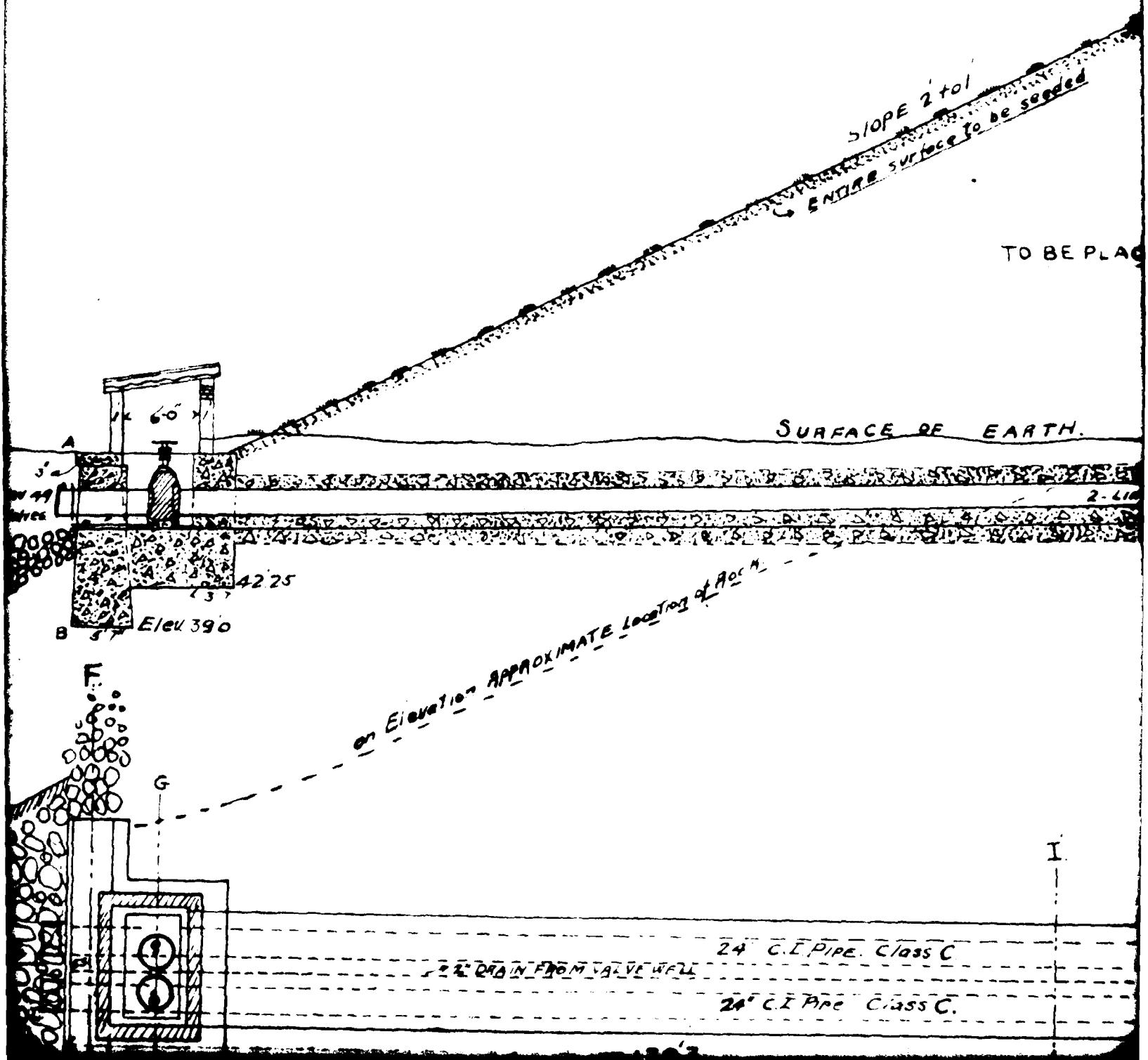
GENERAL - SECTIONS
CORE - WALLS
SCALE 1" = 10'

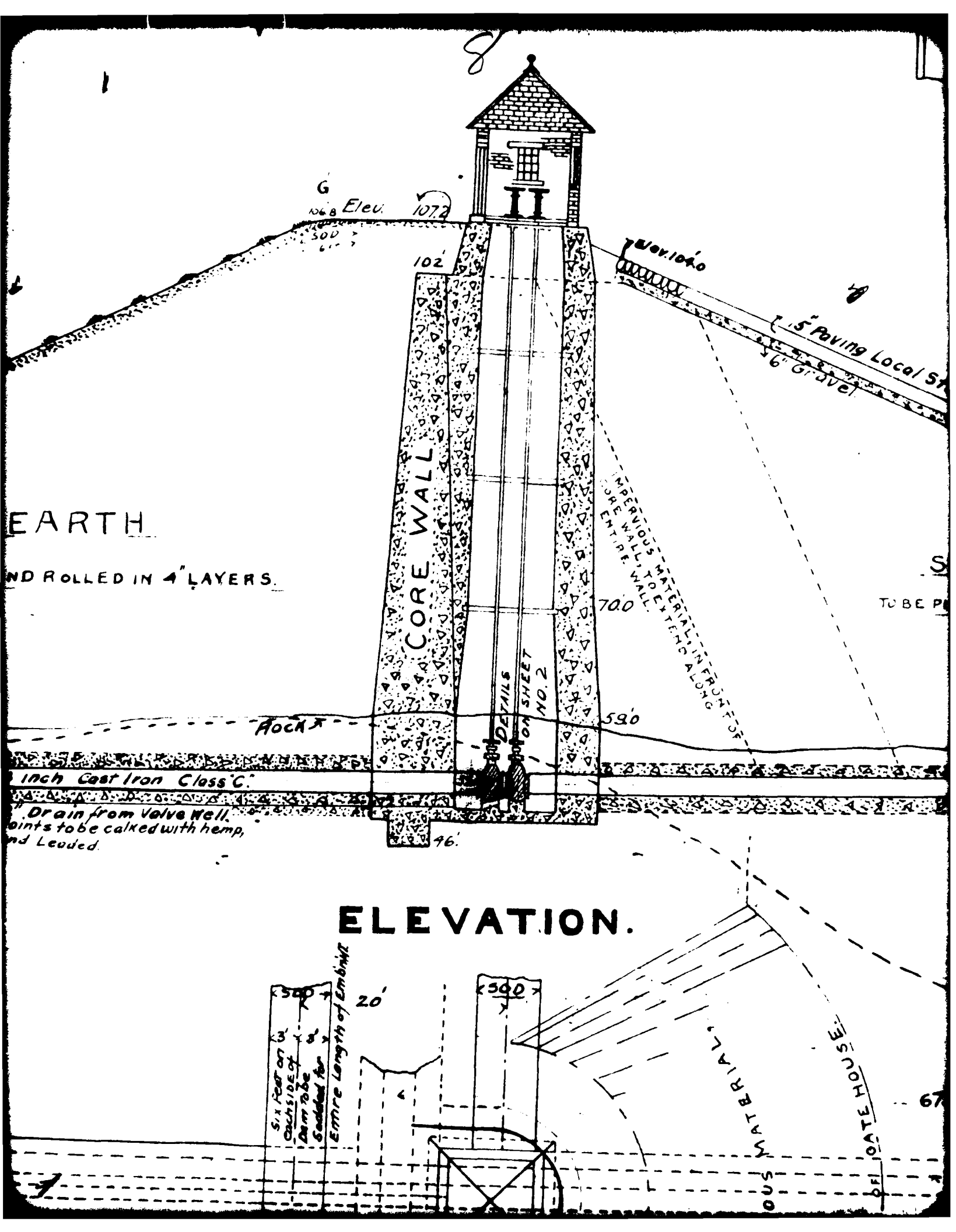
PRESENT CREEK BOTTOM.

SECTION ON E-F

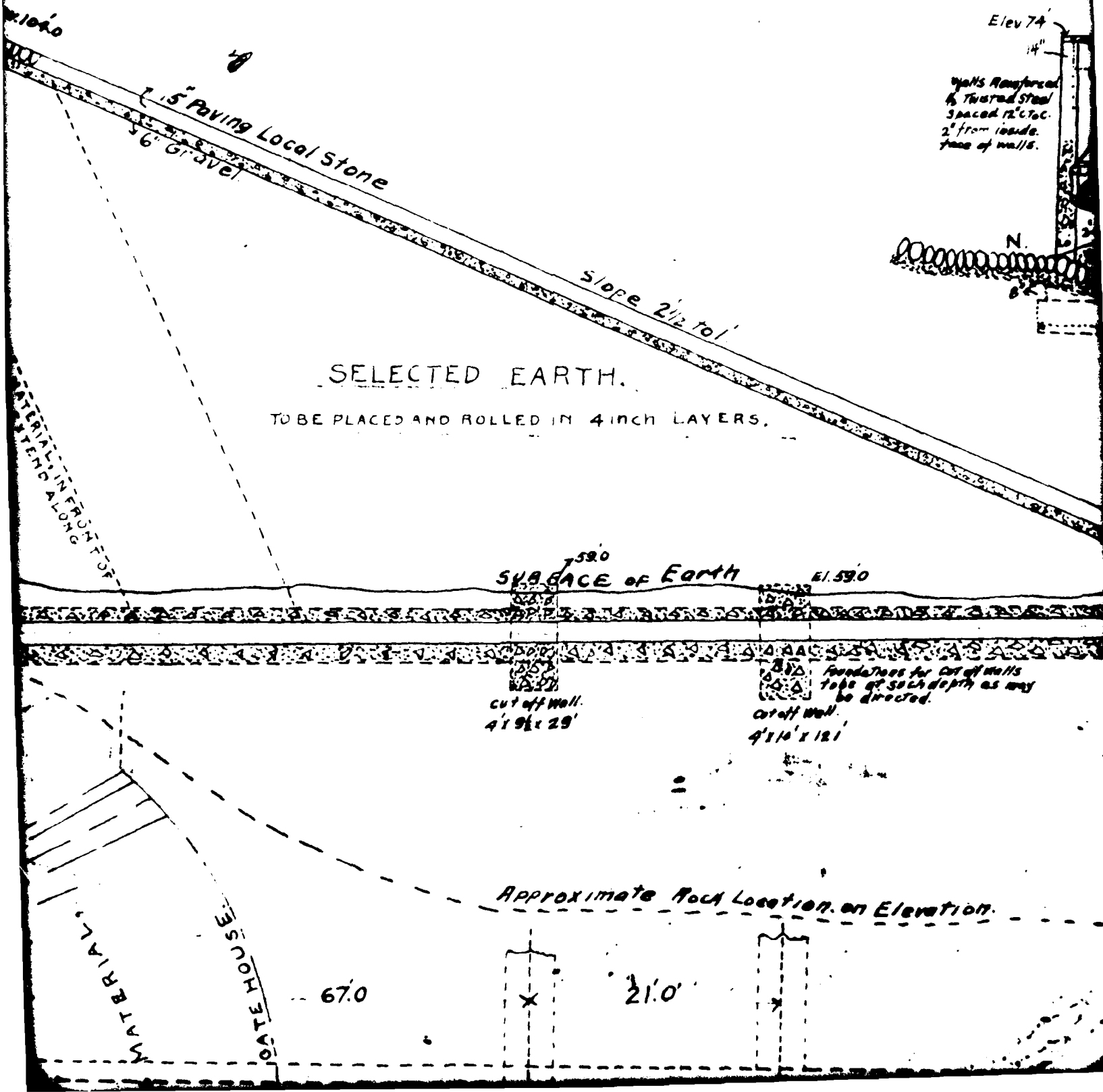


SCALE
1" = 10'





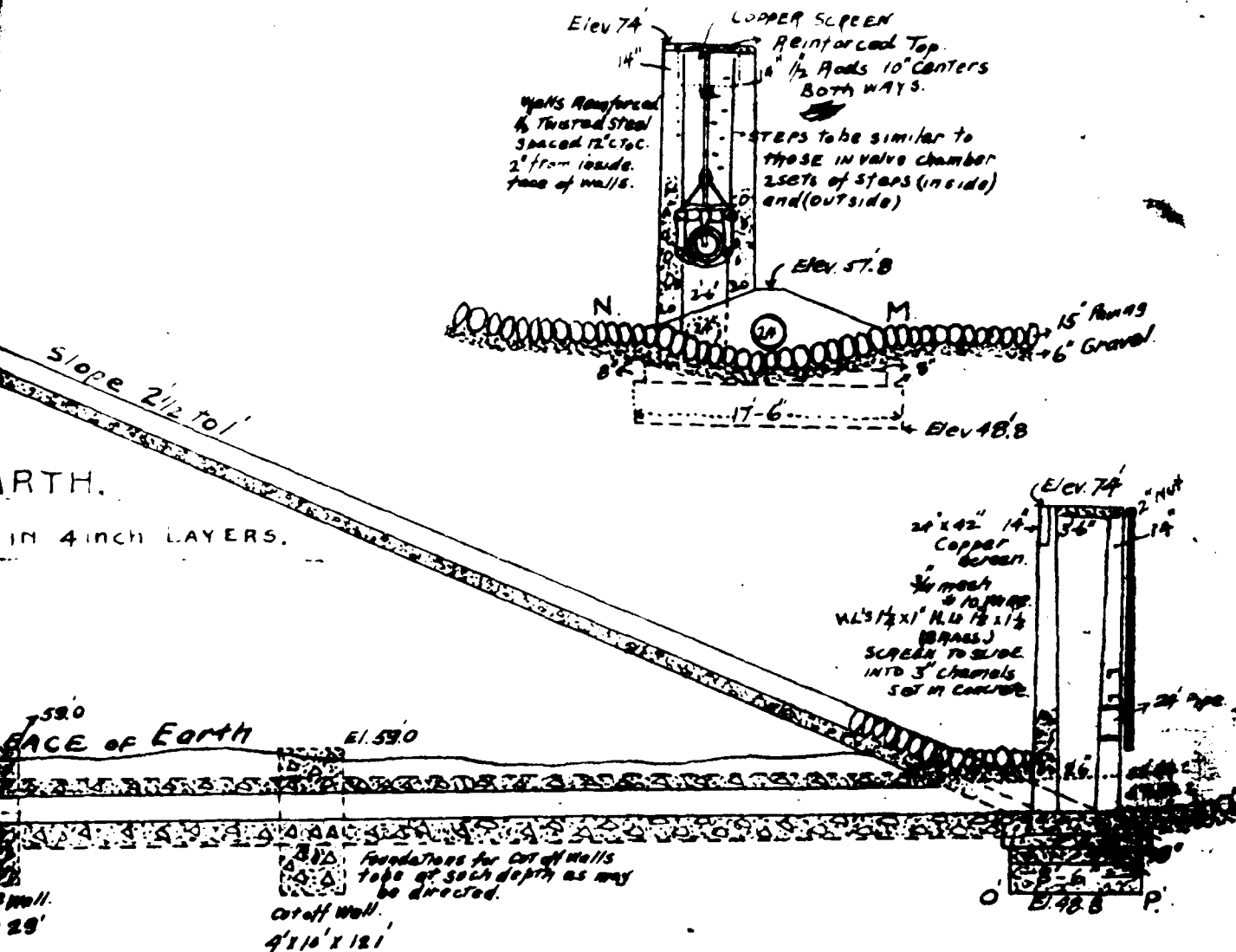
DETAIL OF COLLAR
 NO 6 .203 IN
 FOR CUT OFF WALL
 4 COLLARS REQUIRED



9

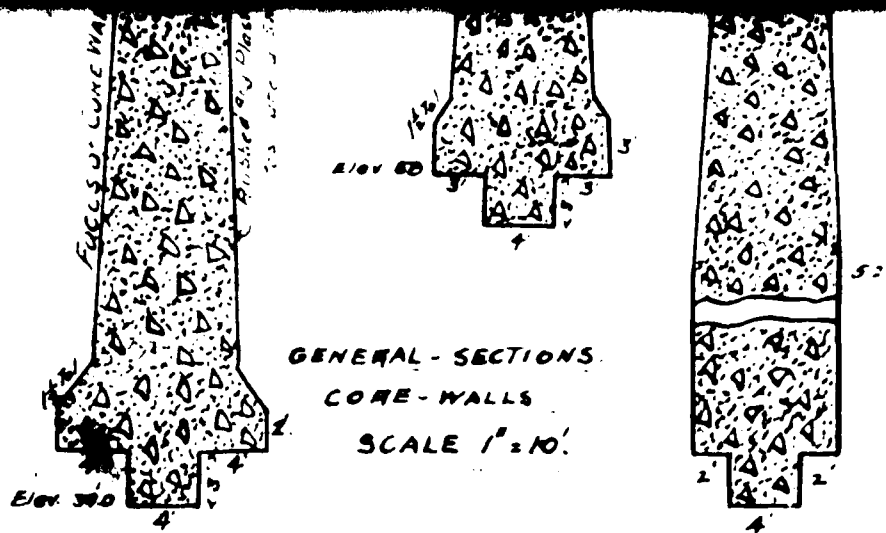
10

1/2" OF COLLAR
196.203 IN
CUT OFF WALL
LAYERS REQUIRED



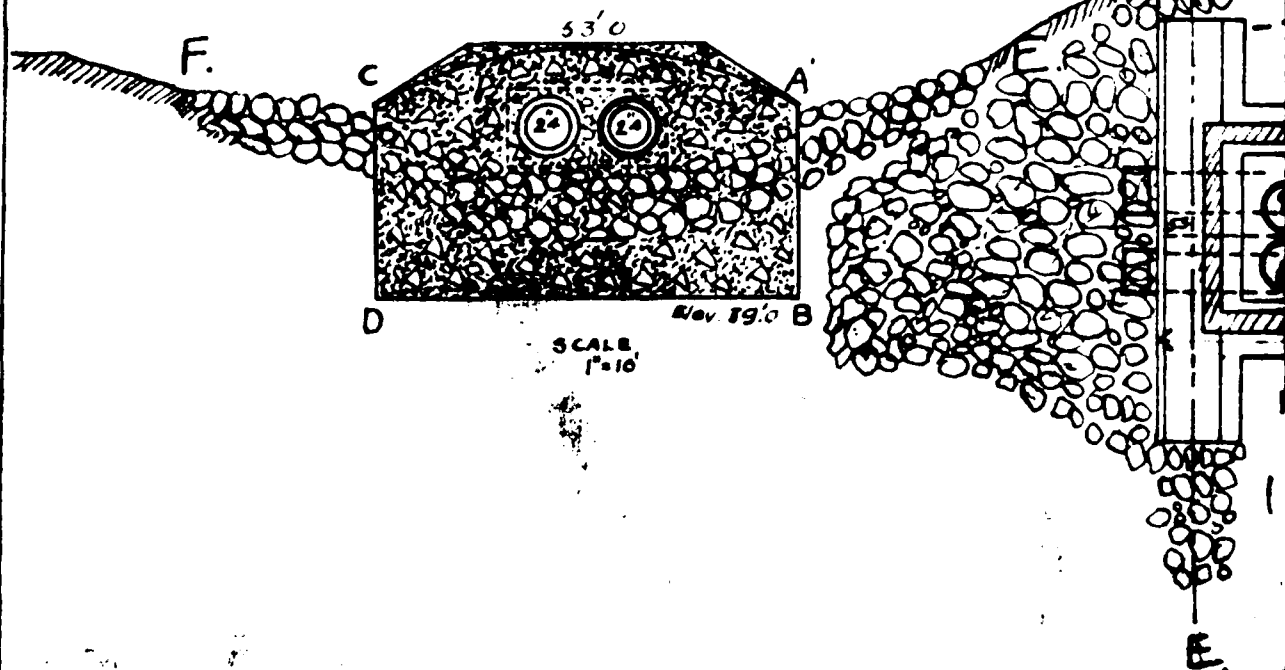
Approximate Rock Location on Elevation.

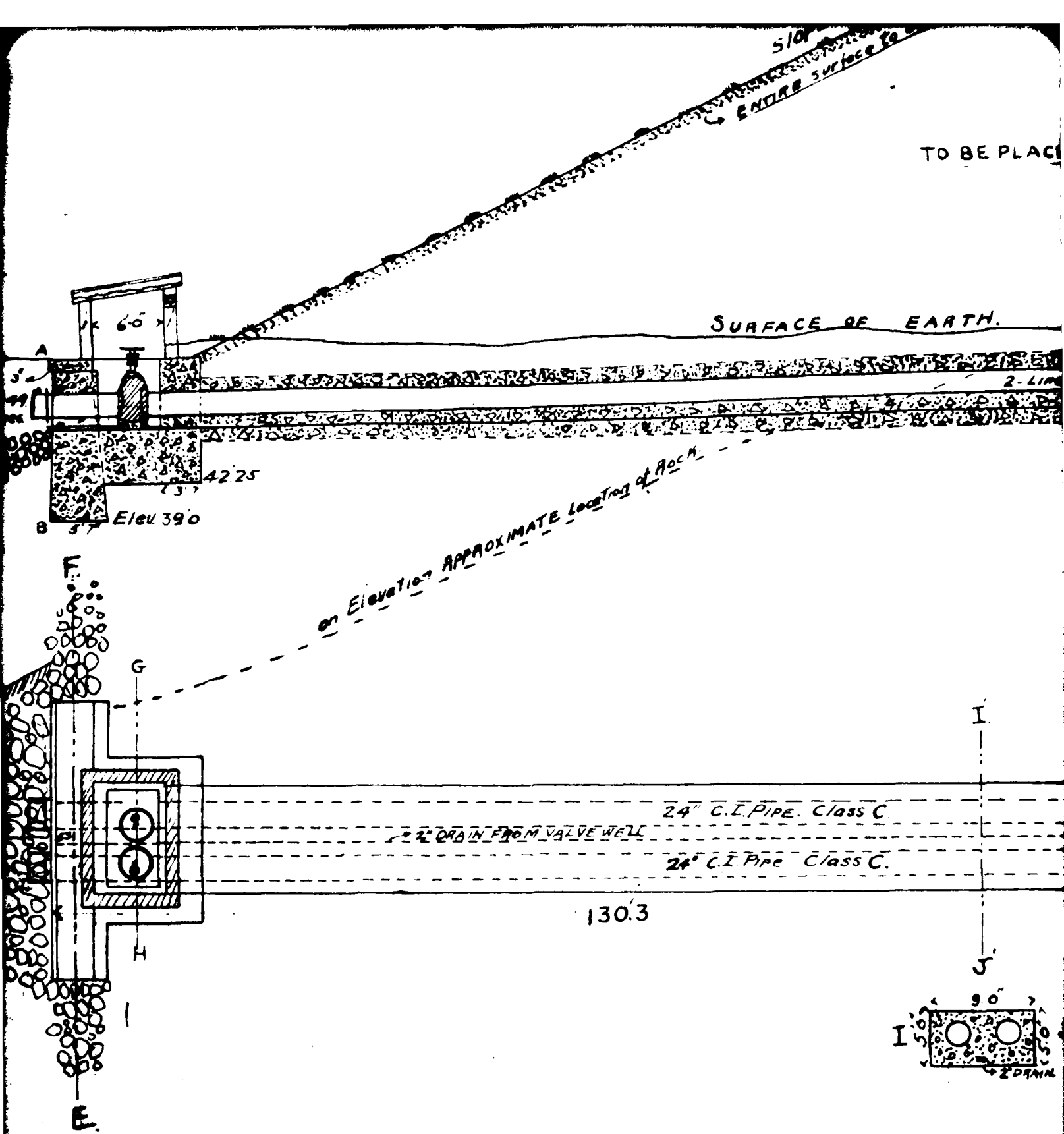
21.0'



PRESENT CREEK BOTTOM.

SECTION ON E-F.





✓

PLACED AND ROLLED IN 4 LAYERS.

CORE WA

TAILS
SHEET
NO. 2

1700

1596

ROCK

3-Lines. 24 inch Cast Iron Class 'C'.

2" Drain from Valve Well.
Joints to be calked with hemp,
and Leaded.

96

ATB RIAL,

THE CONE OF IMPERVIOUS

2 mi. of top of "Embankment"	Six feet on W Cachside of Dam to be Sealed for	50	10
---------------------------------	---	----	----

Entire Length of Embroid

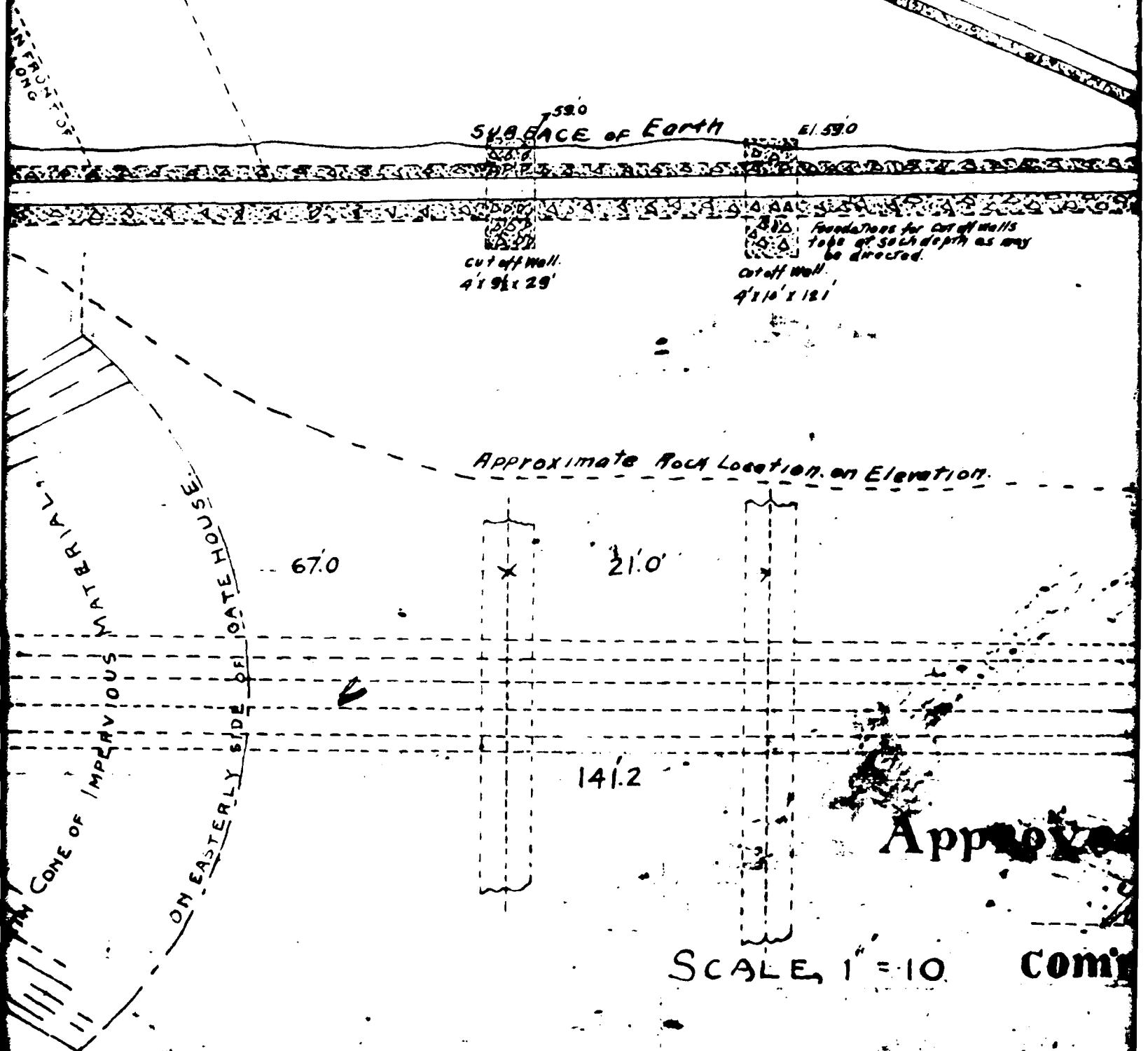
20

20

PLAN.

SELECTED EARTH.

TUBE PLACED AND ROLLED IN 4 INCH LAYERS.



DRAWN #9

4 INCH LAYERS.

590
CE of Earth E1.590

20' x 42" 14"
Copper
Screen.
2 1/2' mesh
4 10' x 10'
W.L. 1 1/2' x 1' H.L. 15' x 1 1/2'
(BAGS)
SCREEN TO SLIDE
INTO 3" channels
SET IN CONCRETE

Foundations for cut off walls
to be of such depth as may
be directed.

cut off wall.
4' x 10' x 12'

Approximate Rock Location, on Elevation.

21.0

141.2

Approved

Aug. 27. 1911

SCALE, 1" = 10.

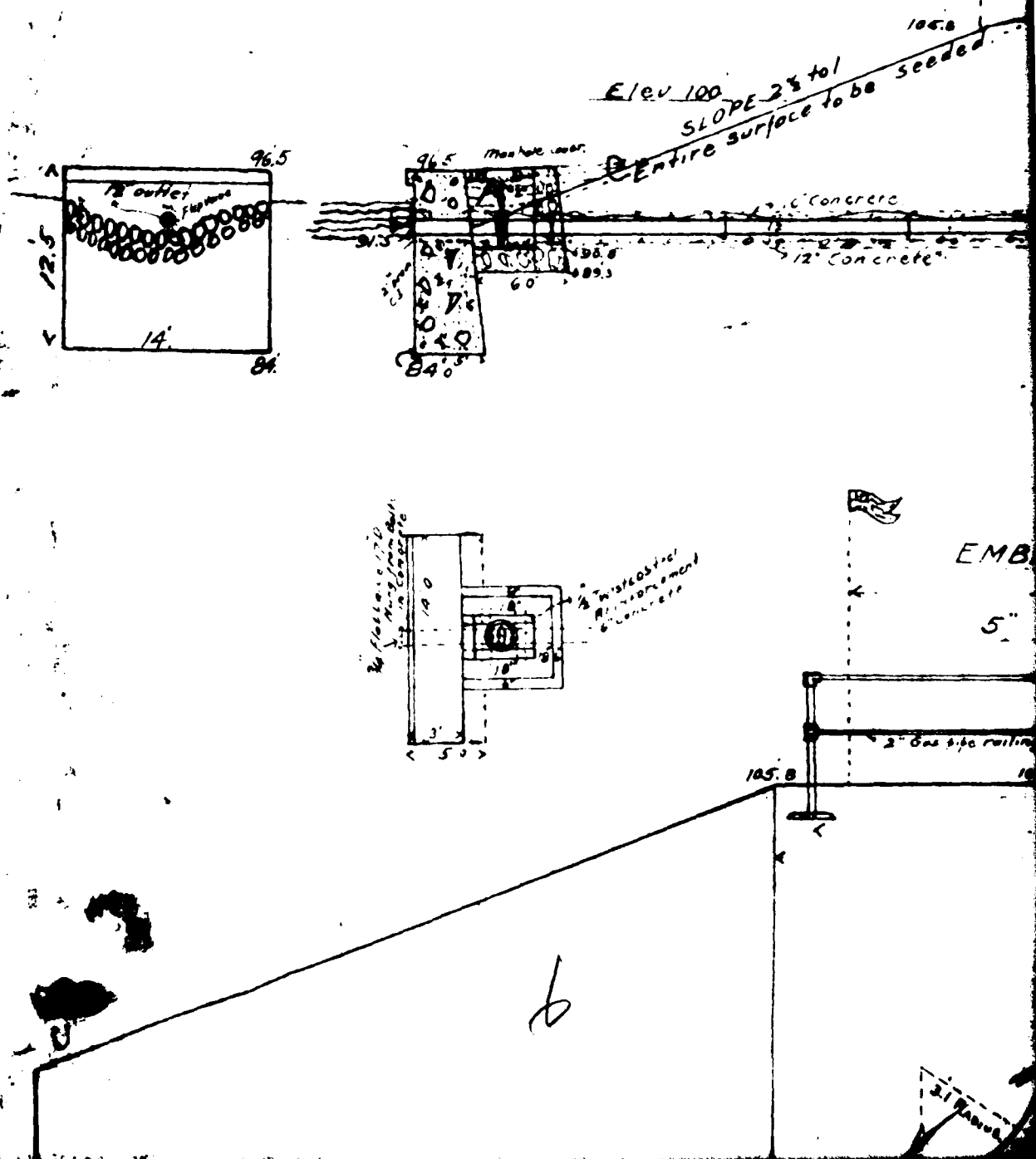
**Comr. of Public Works
Troy, N. Y.**

DRAWER # 9

29

14

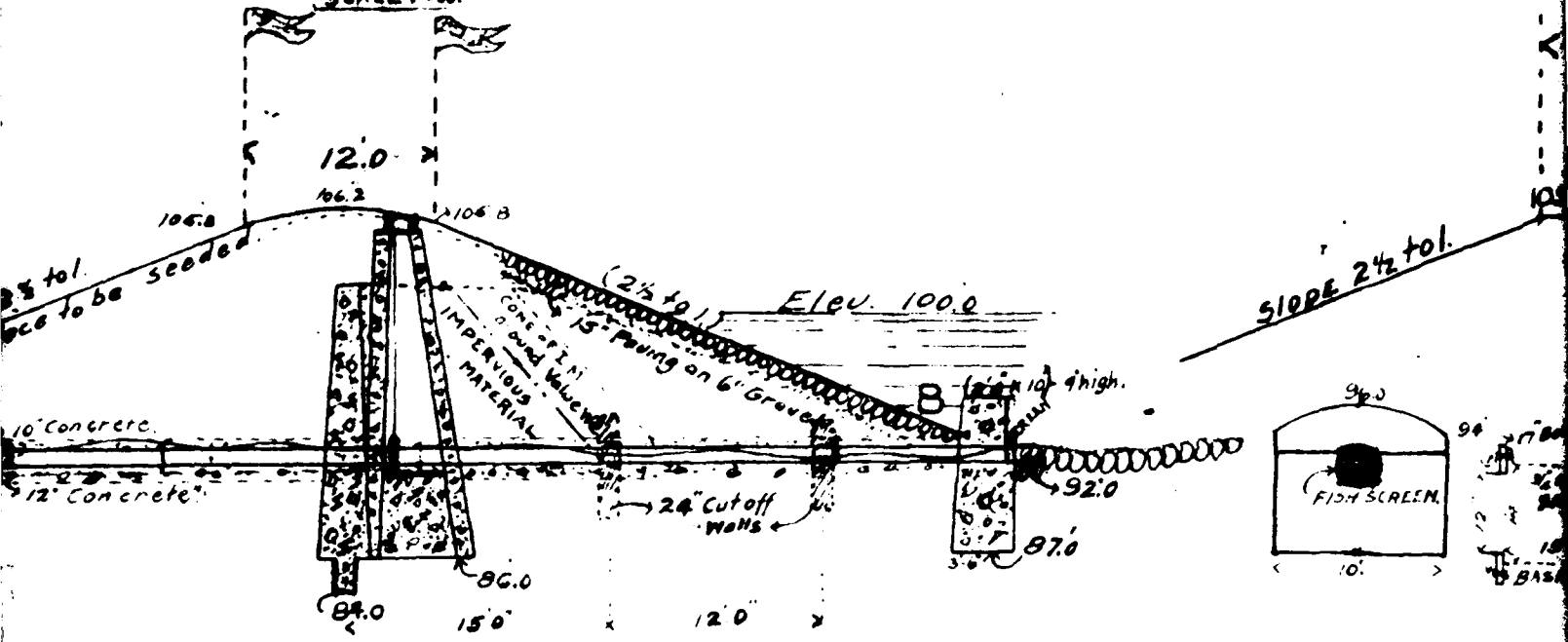
SECT



2

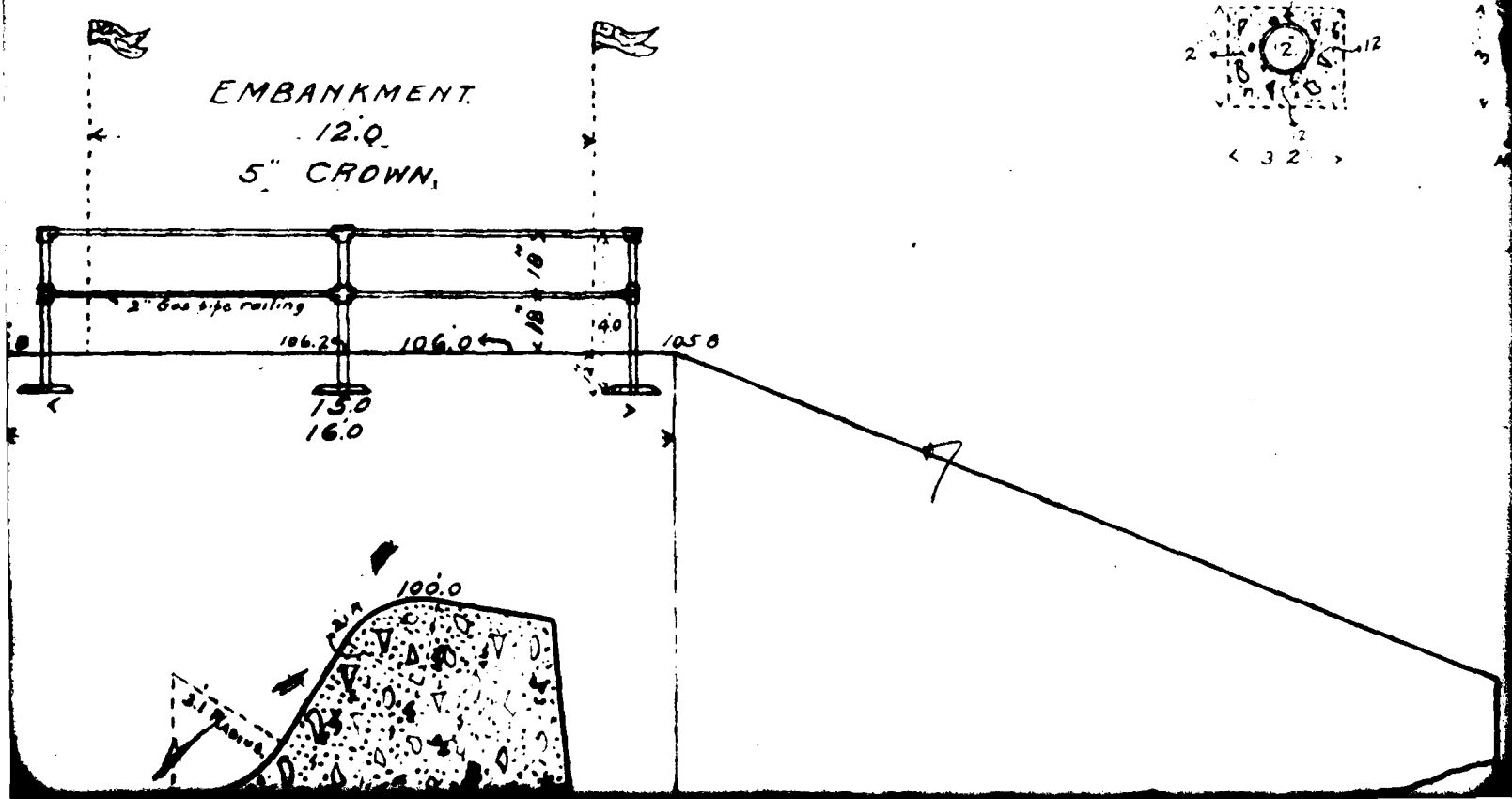
SECTION ON A-B.

SCALE 1"=20'

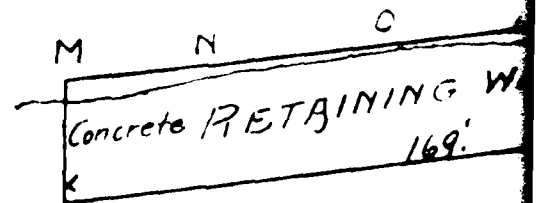


EMBANKMENT

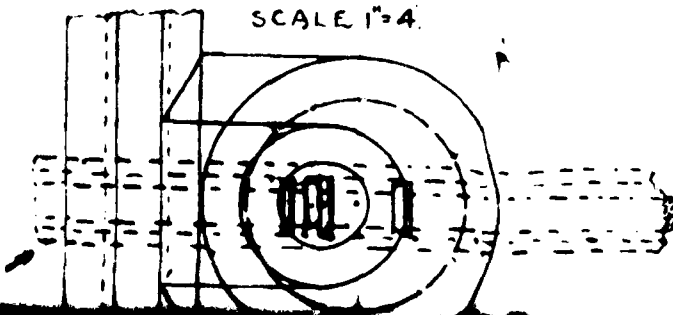
12.0'
5" CROWN



1



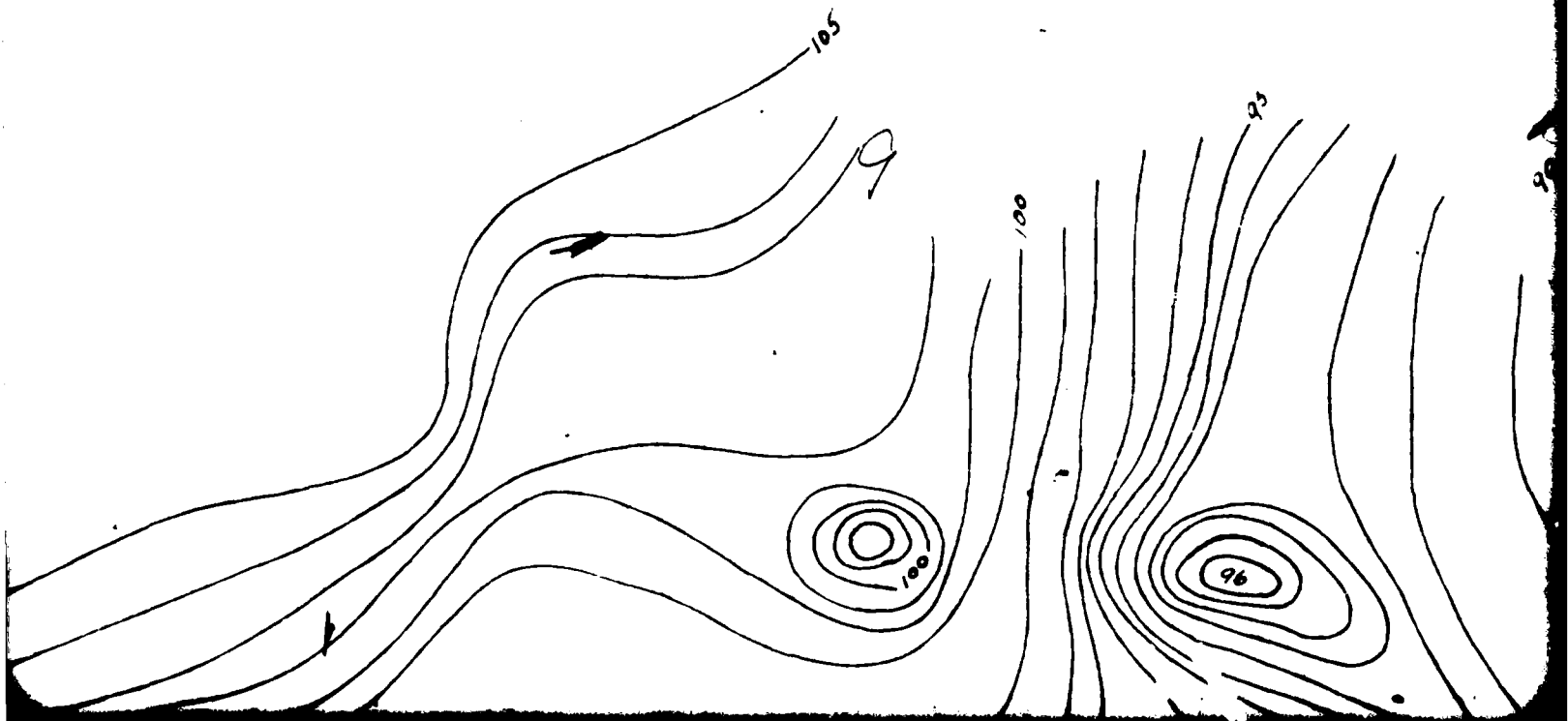
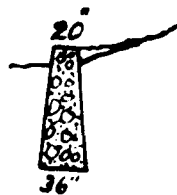
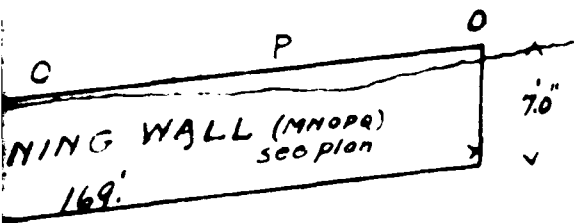
SCALE 1"=4'



TROY WATER

EXTENSION

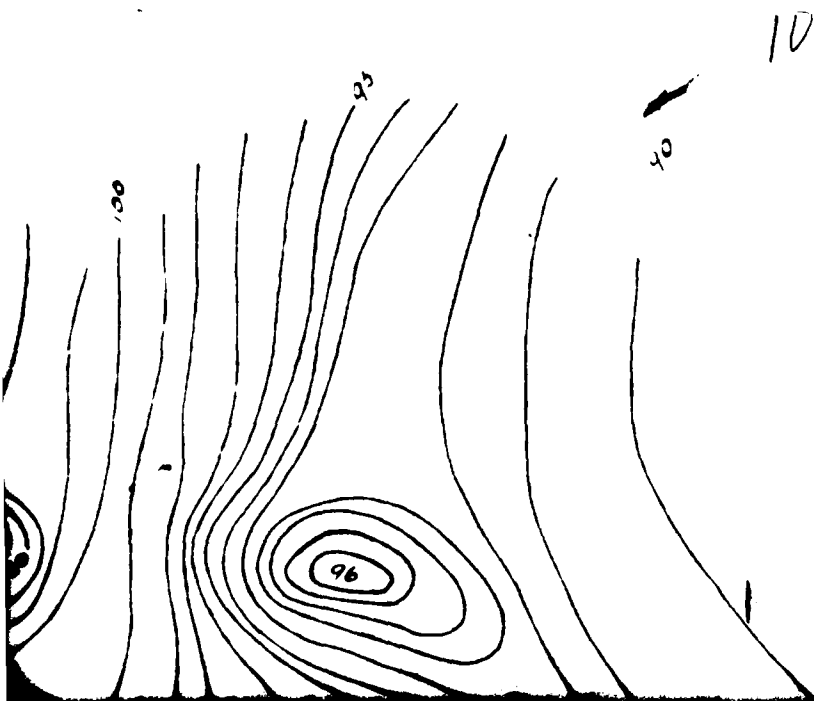
DETAILS OF S

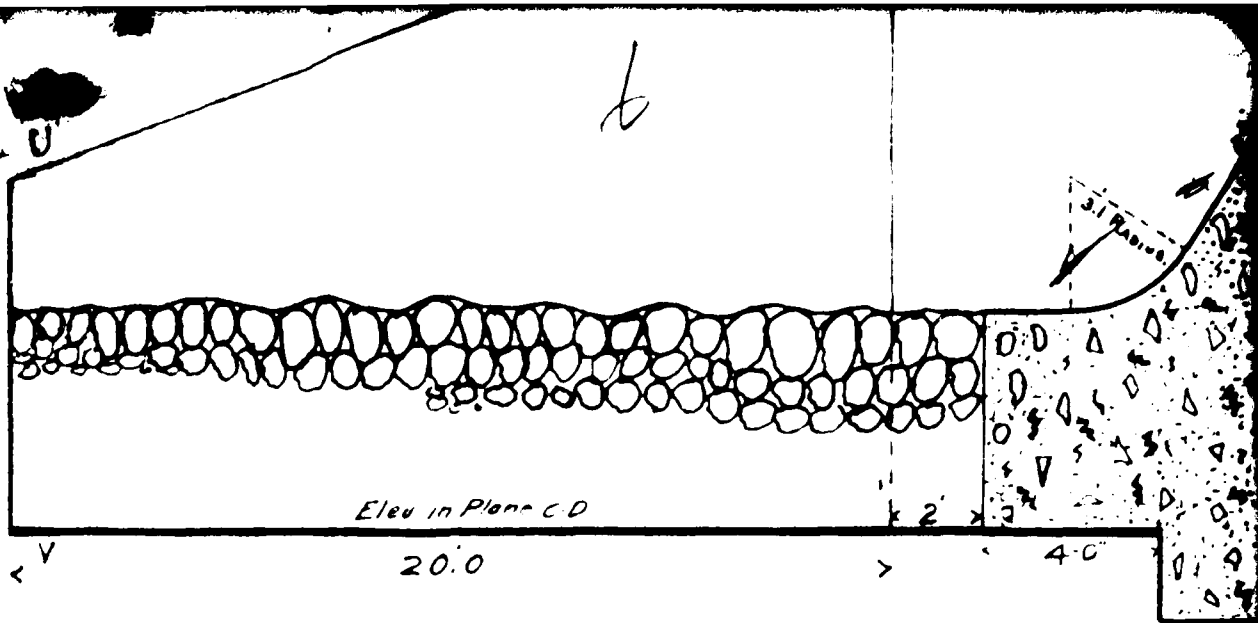


**TROY WATER WORKS
EXTENSION.**

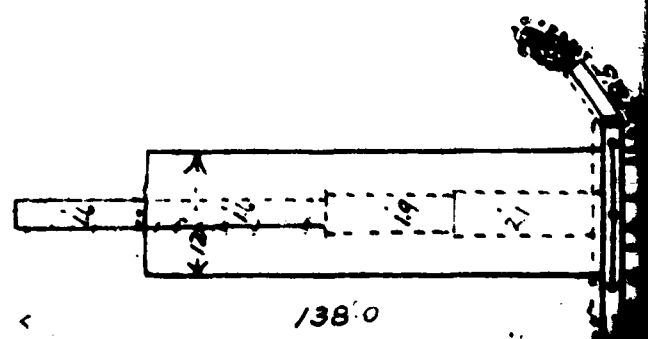
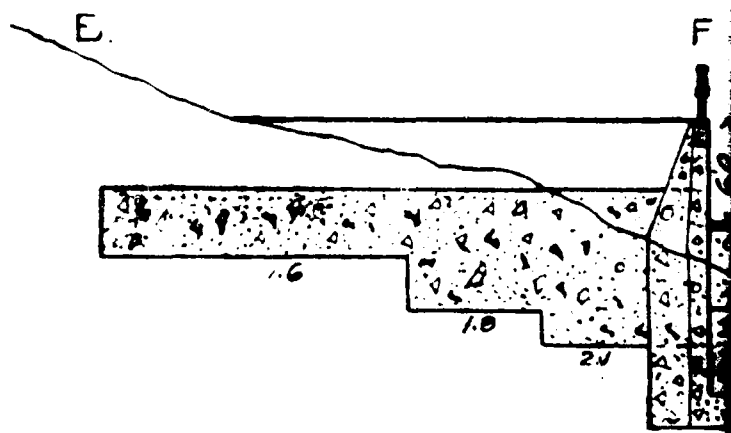
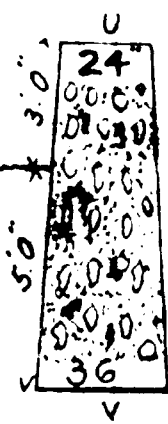
TAILS OF SPILL-WAY.

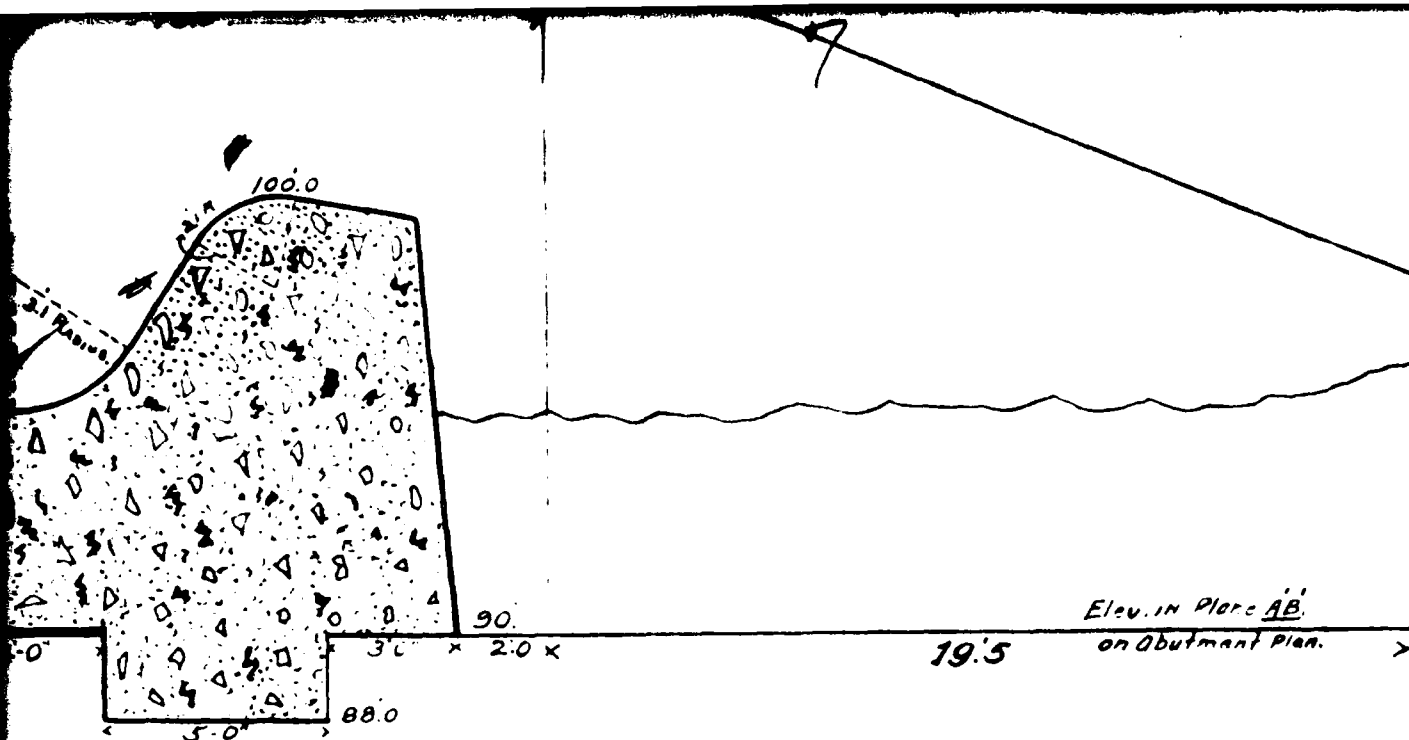
M-D. VI.



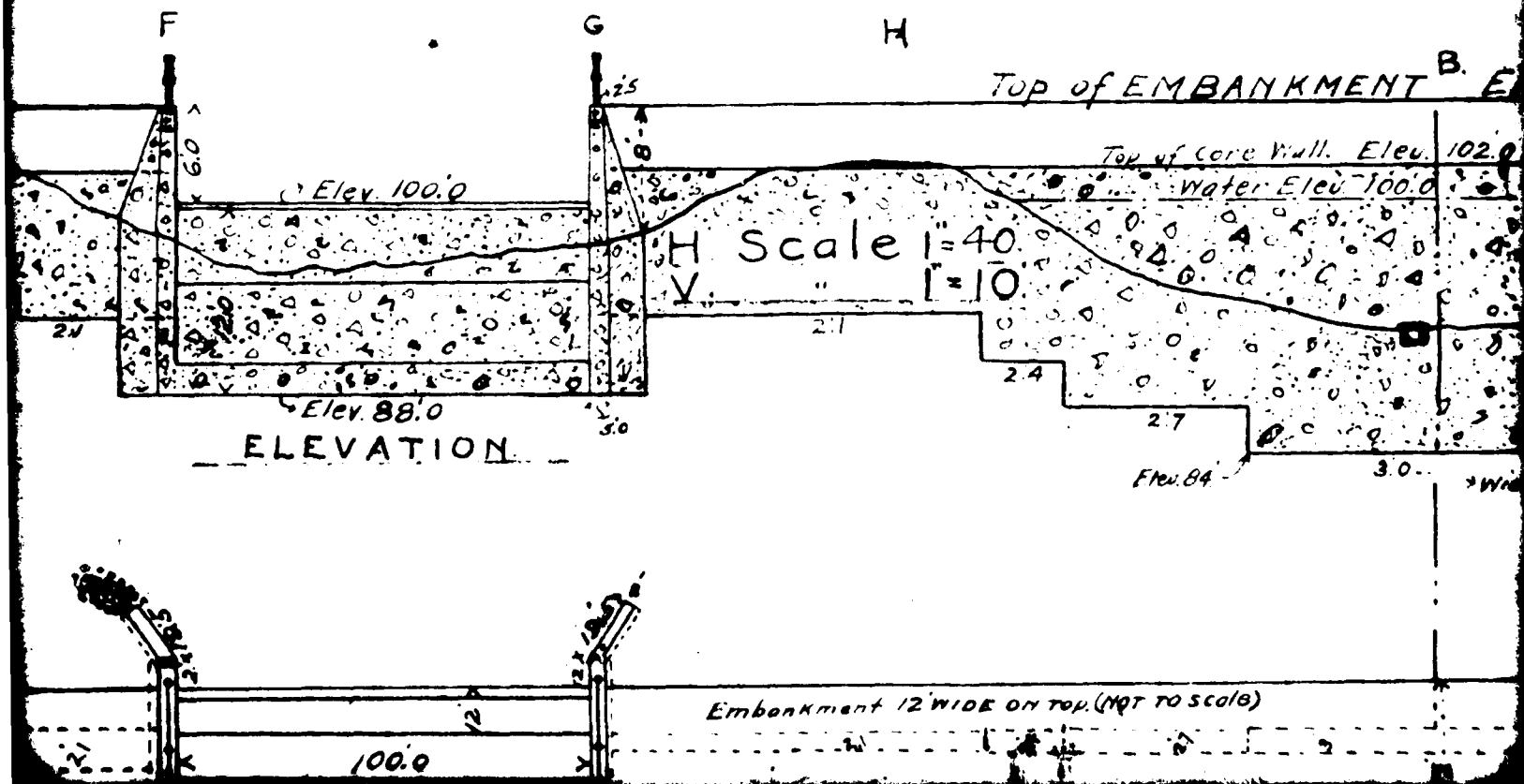


ELEVATION OF
SPILLWAY



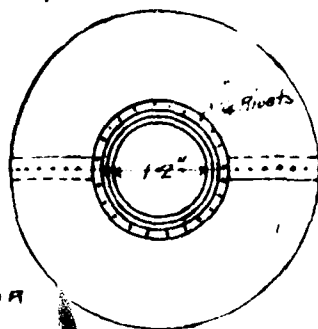
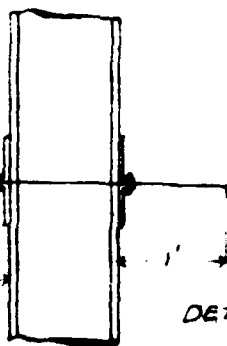
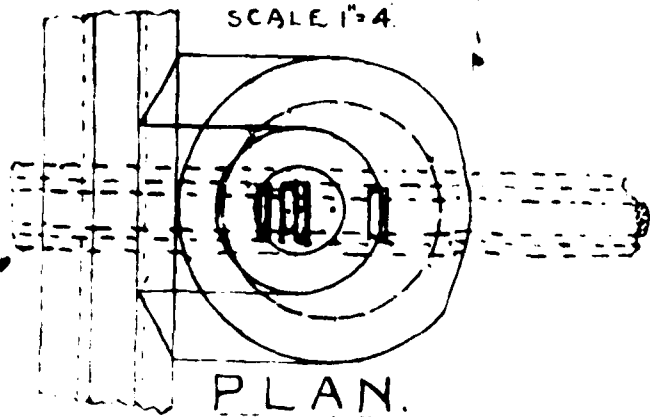


ION OF CONCRETE
PILLWAY $\frac{1}{4}$ WING WALLS.
scale, 1"=4'.



SECTION.

SCALE 1"=4.

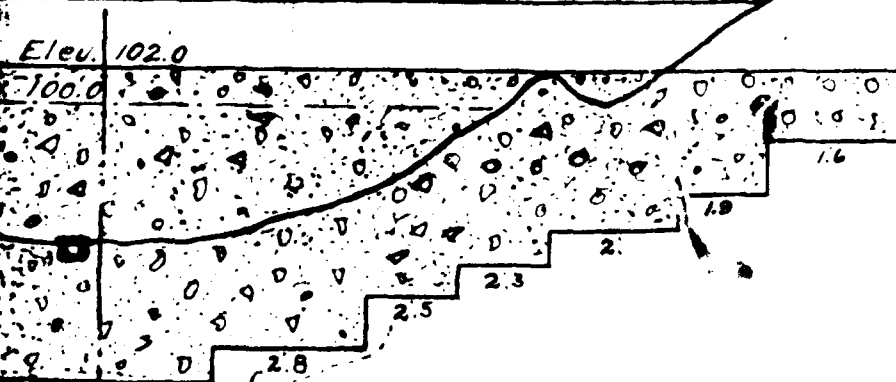


DETAILS OF COLLAR
NO. 6 308 IN
FOR CUT OFF WALL

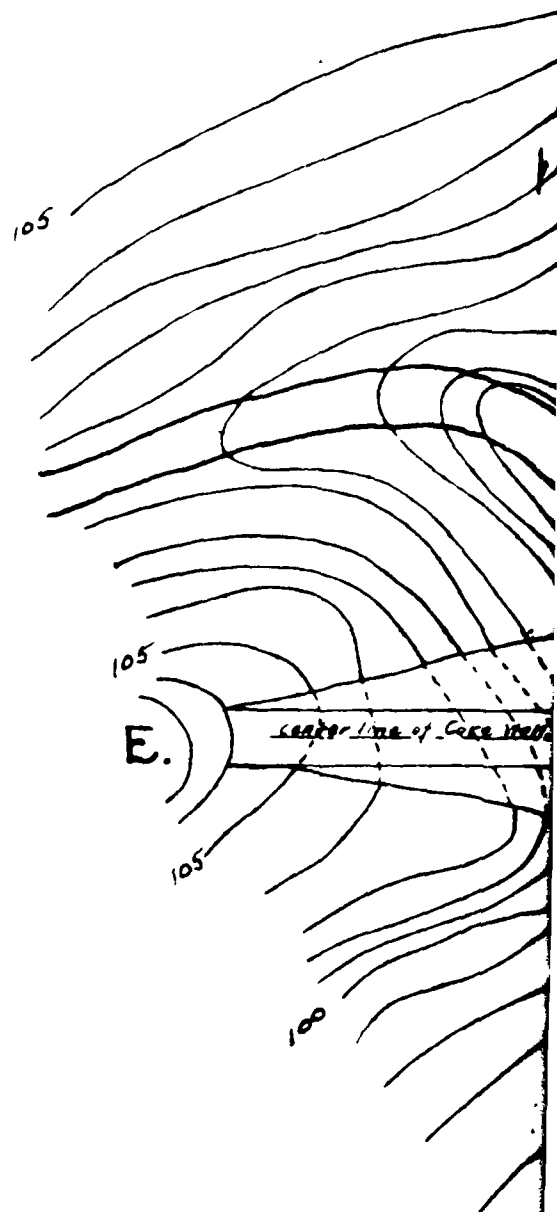
SCALE 1"=4.

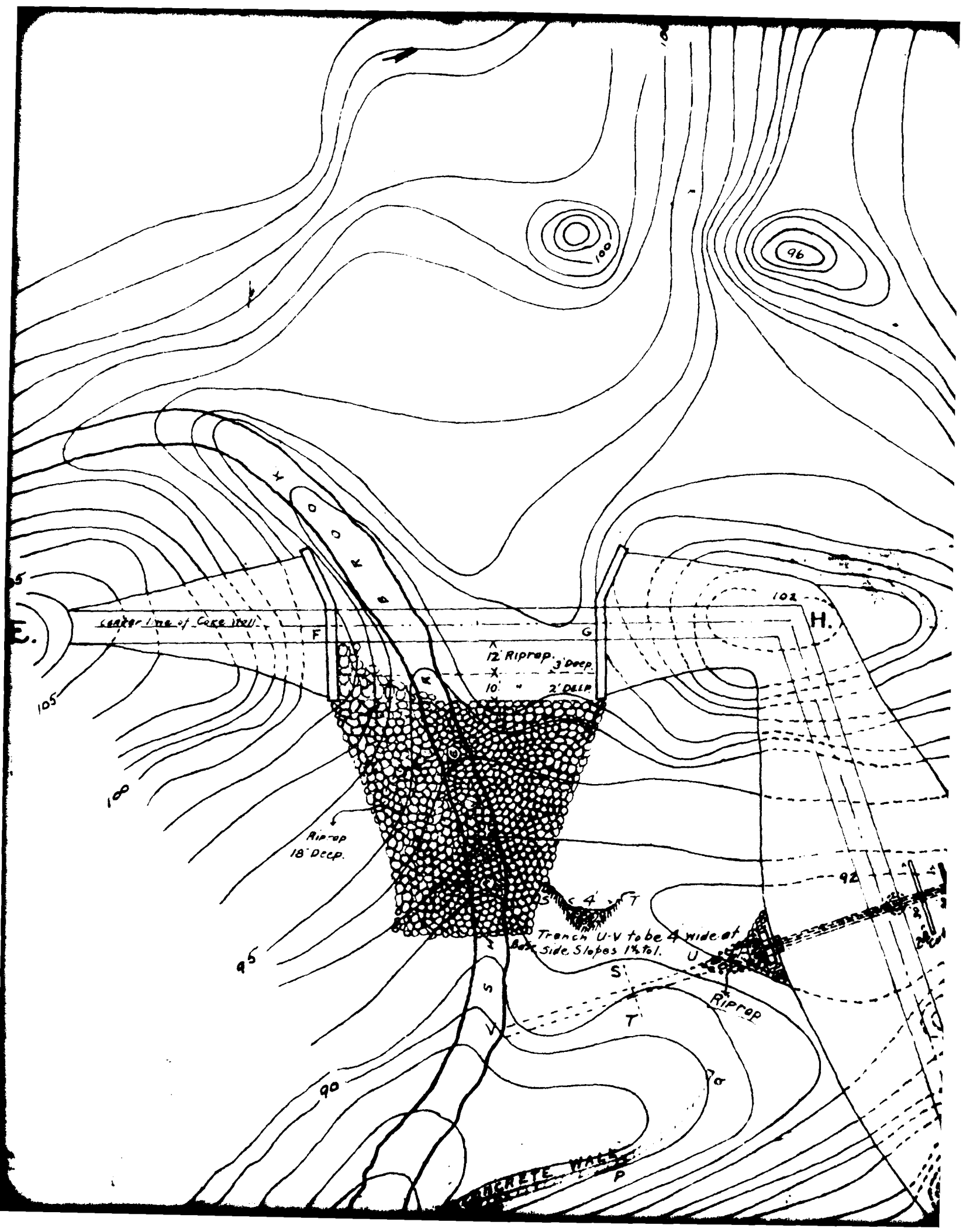
Two collars required.

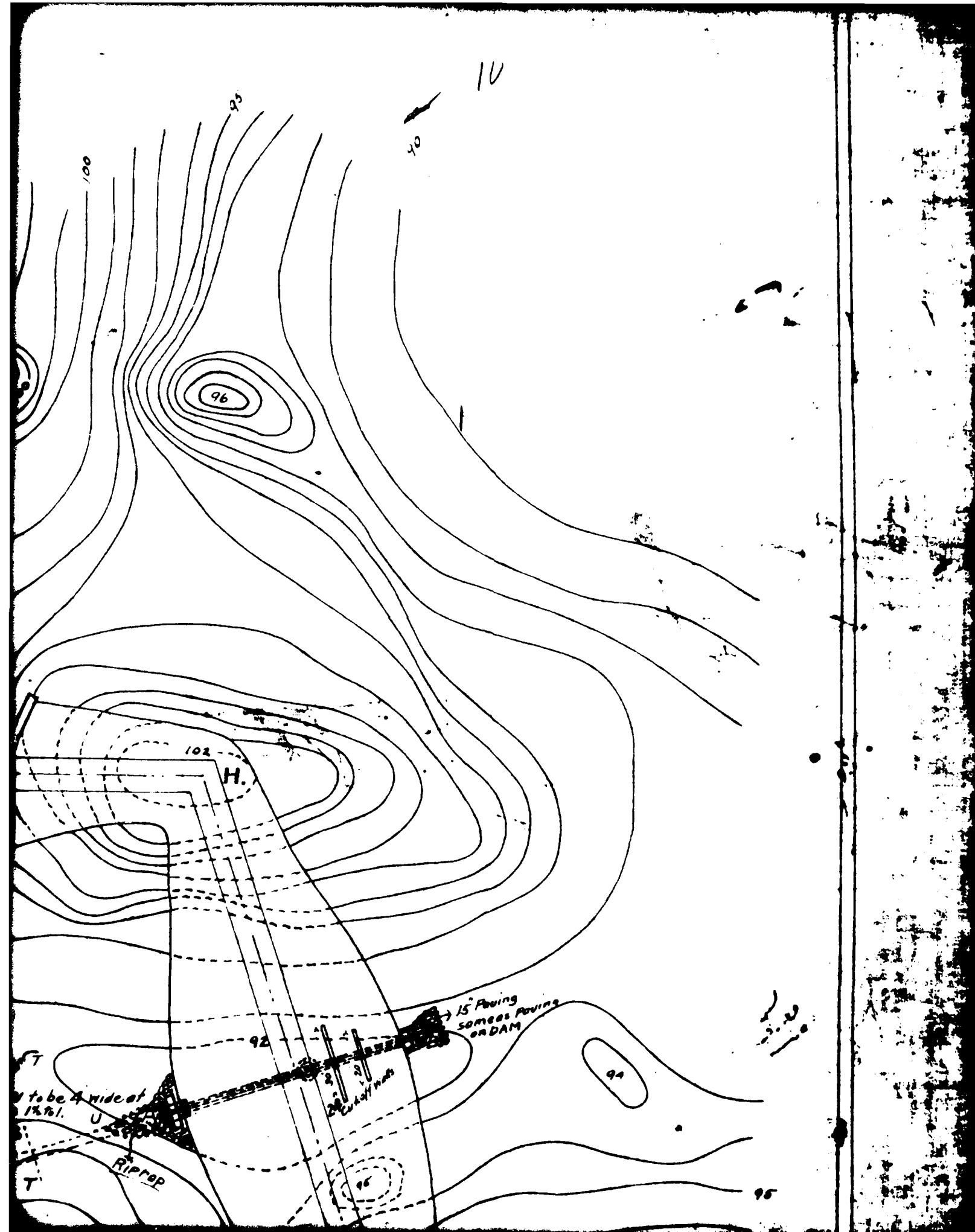
MENT B. Elev. 106.0



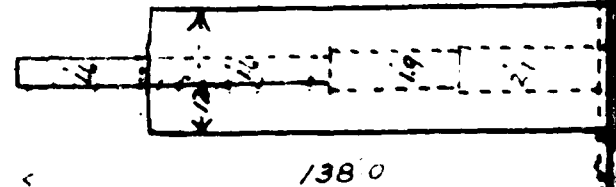
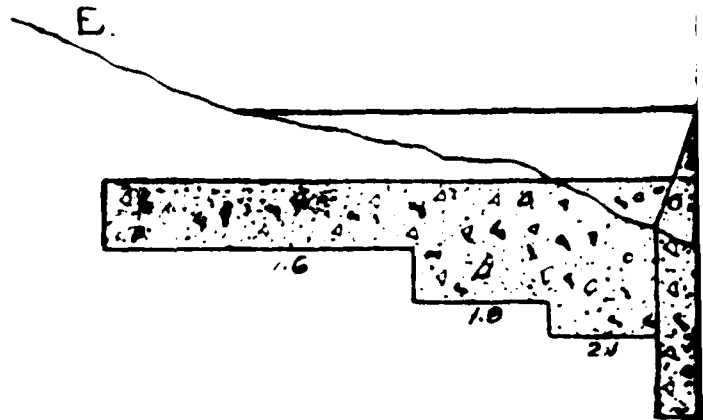
Width of Core Wall, at Base.



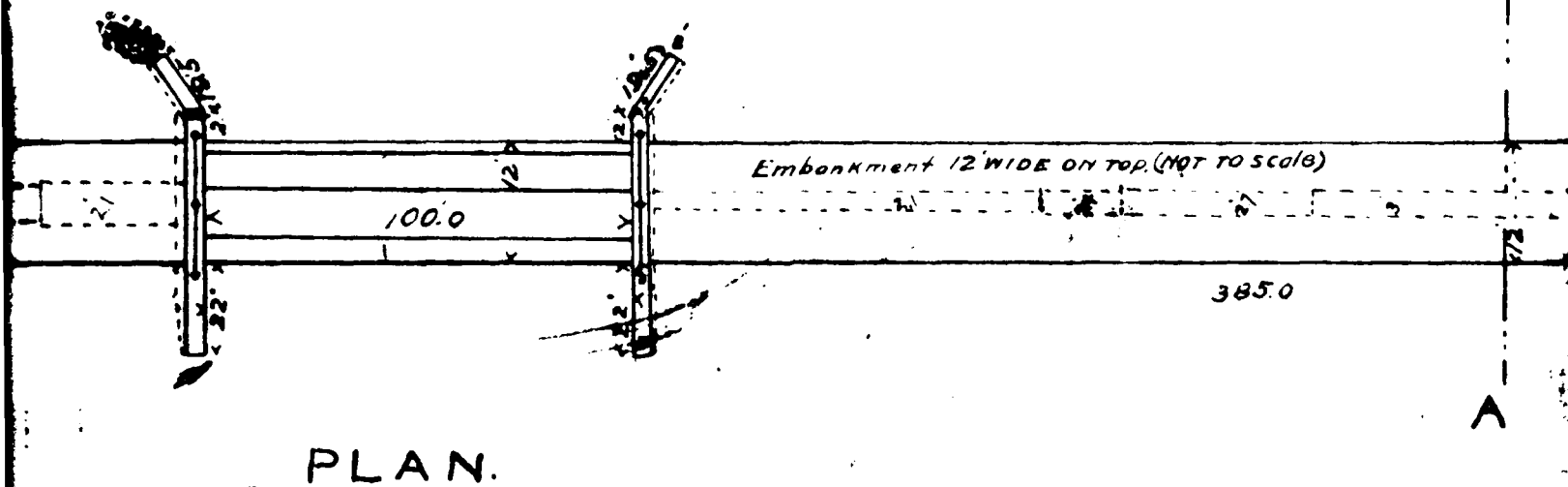
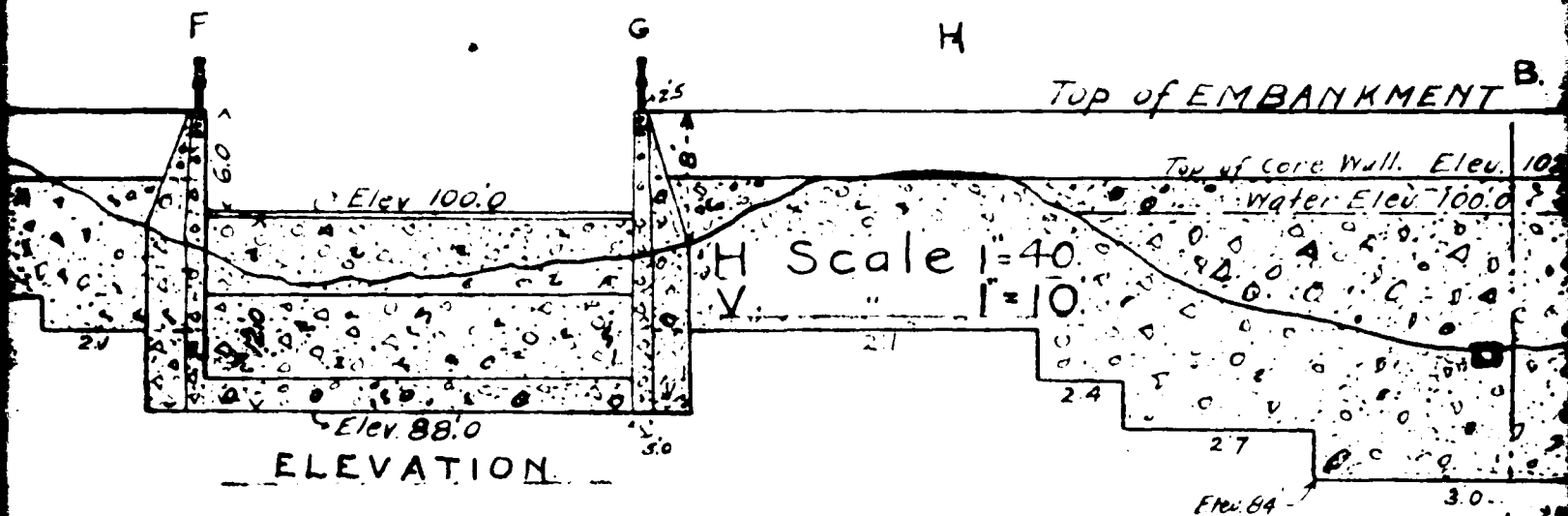




ELEVATION
SPILLW



ION OF CONCRETE SPILLWAY ^{NO} WING WALLS. scale, 1"=4'.

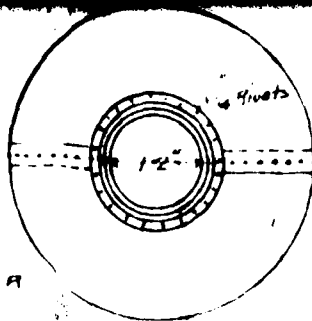
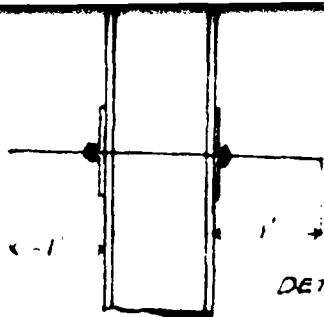


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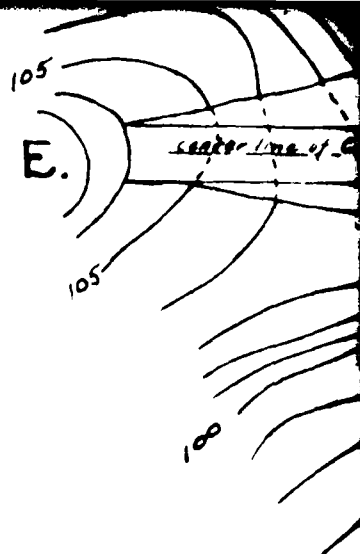
12



DETAILS OF COLLAR
NO. 6 203 IN
FOR CUT OFF WALL

SCALE 1" = 1'

Two Collars required.



MENT B. Elev. 106.0

Wall. Elev. 102.0

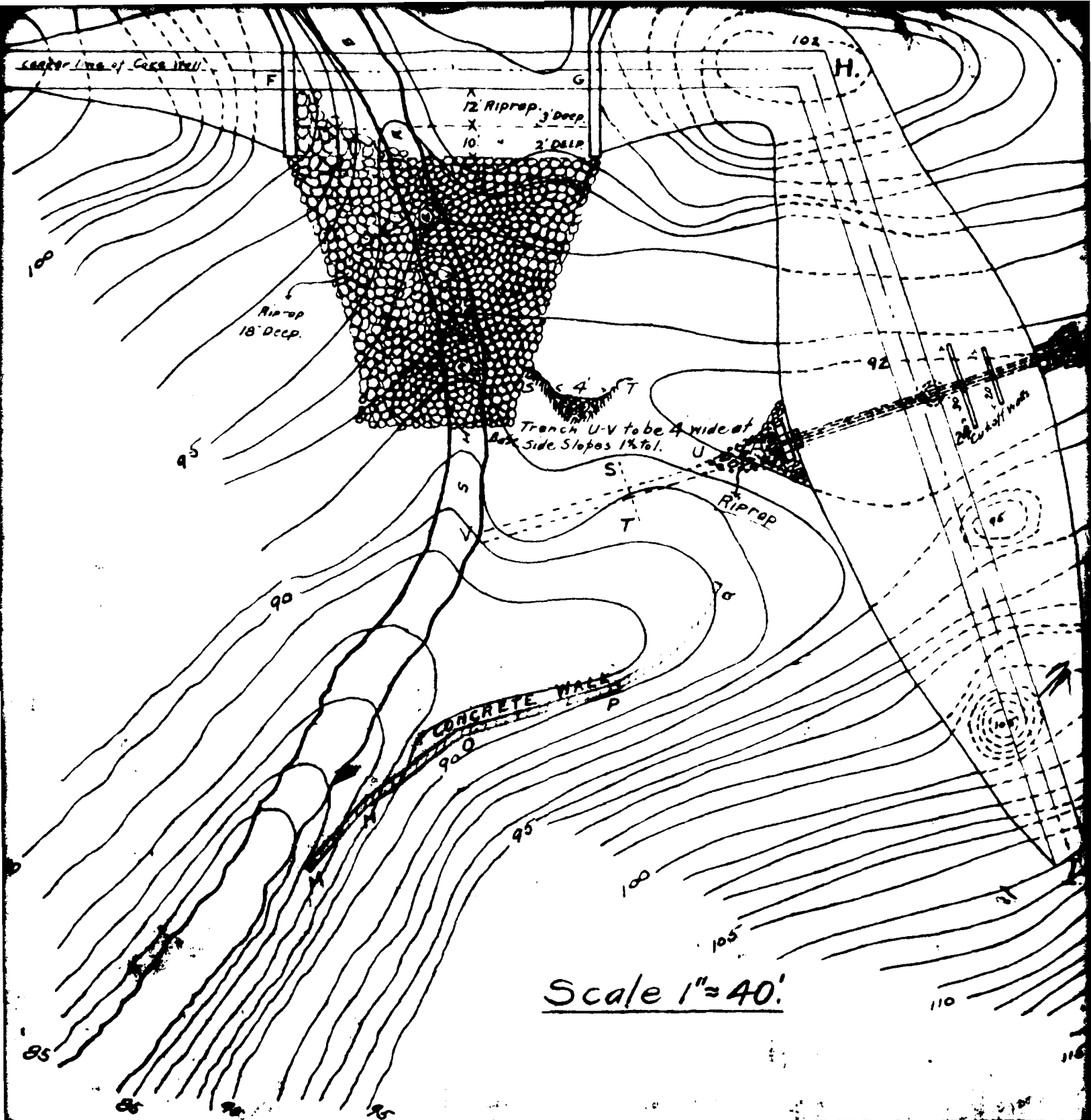
Elev. 100.0

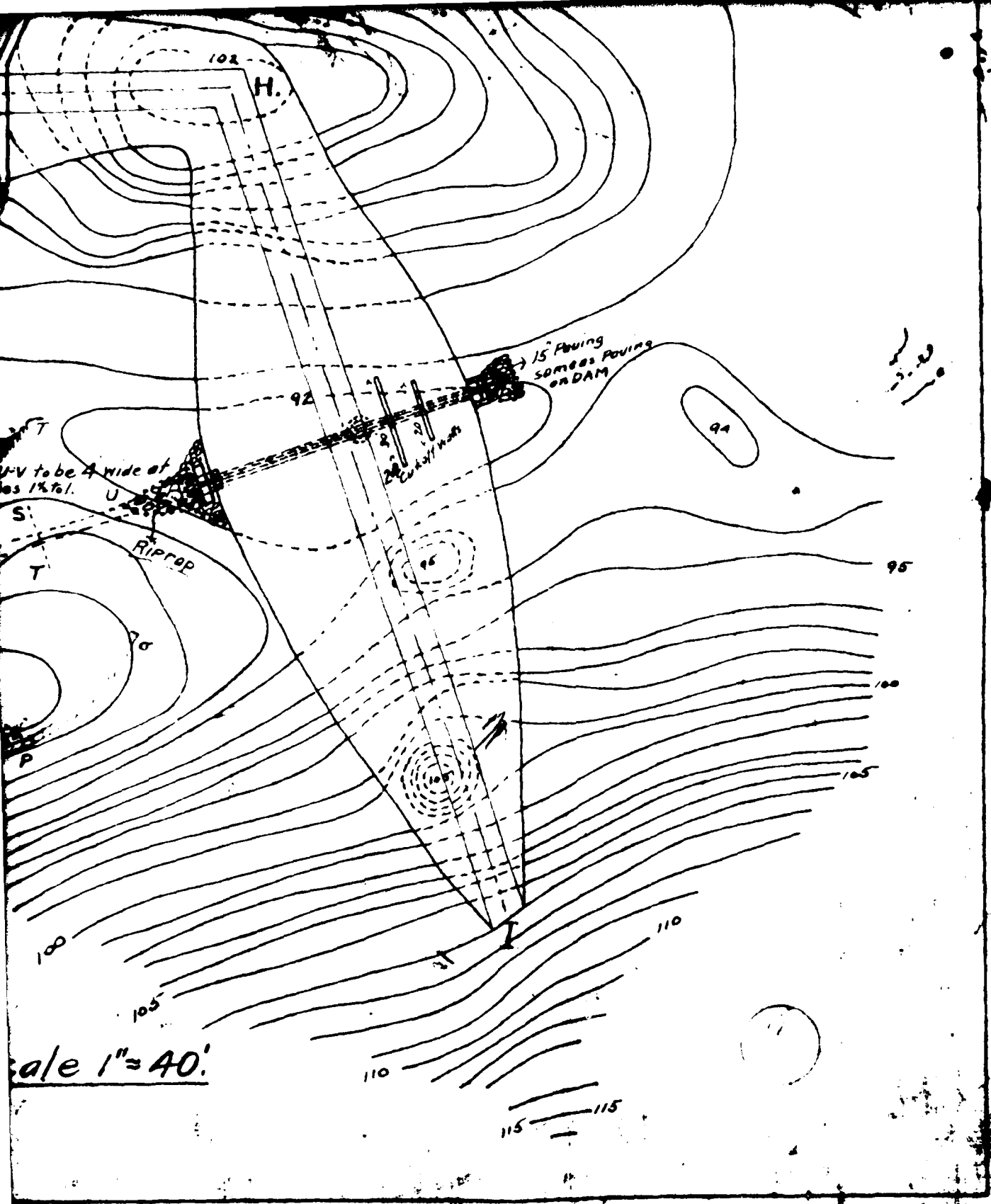


Width of Core Wall, at Base.

Approved, Feb. 27, 1911

W. H. Lindes
Com'r. of Public Works,
Troy, N. Y.



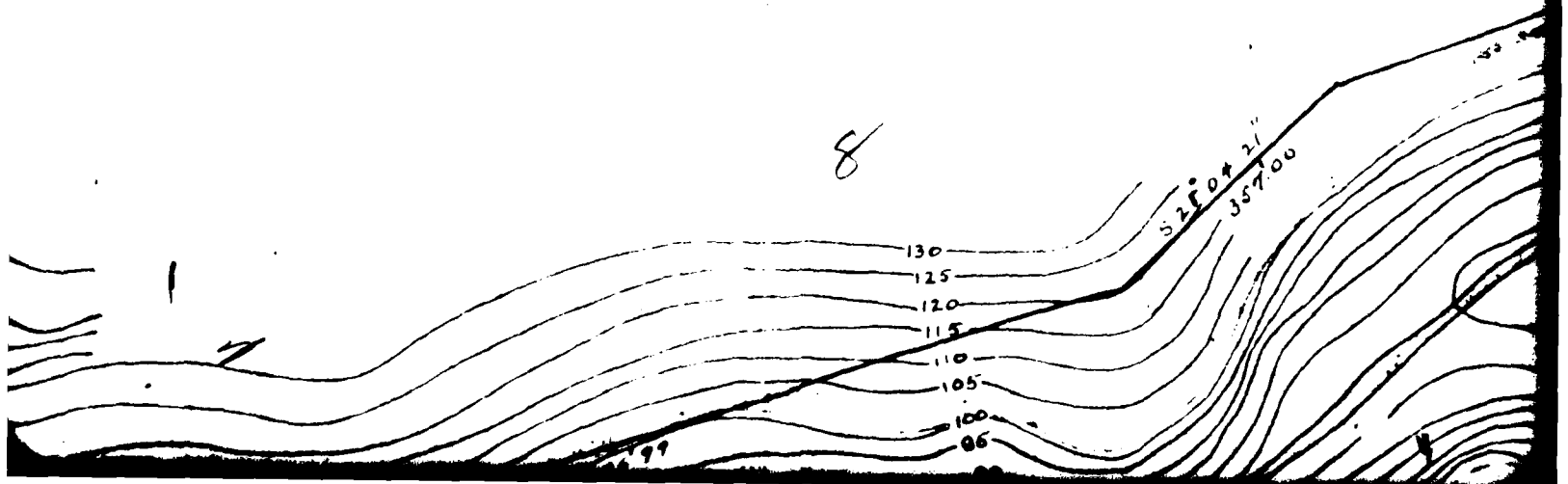


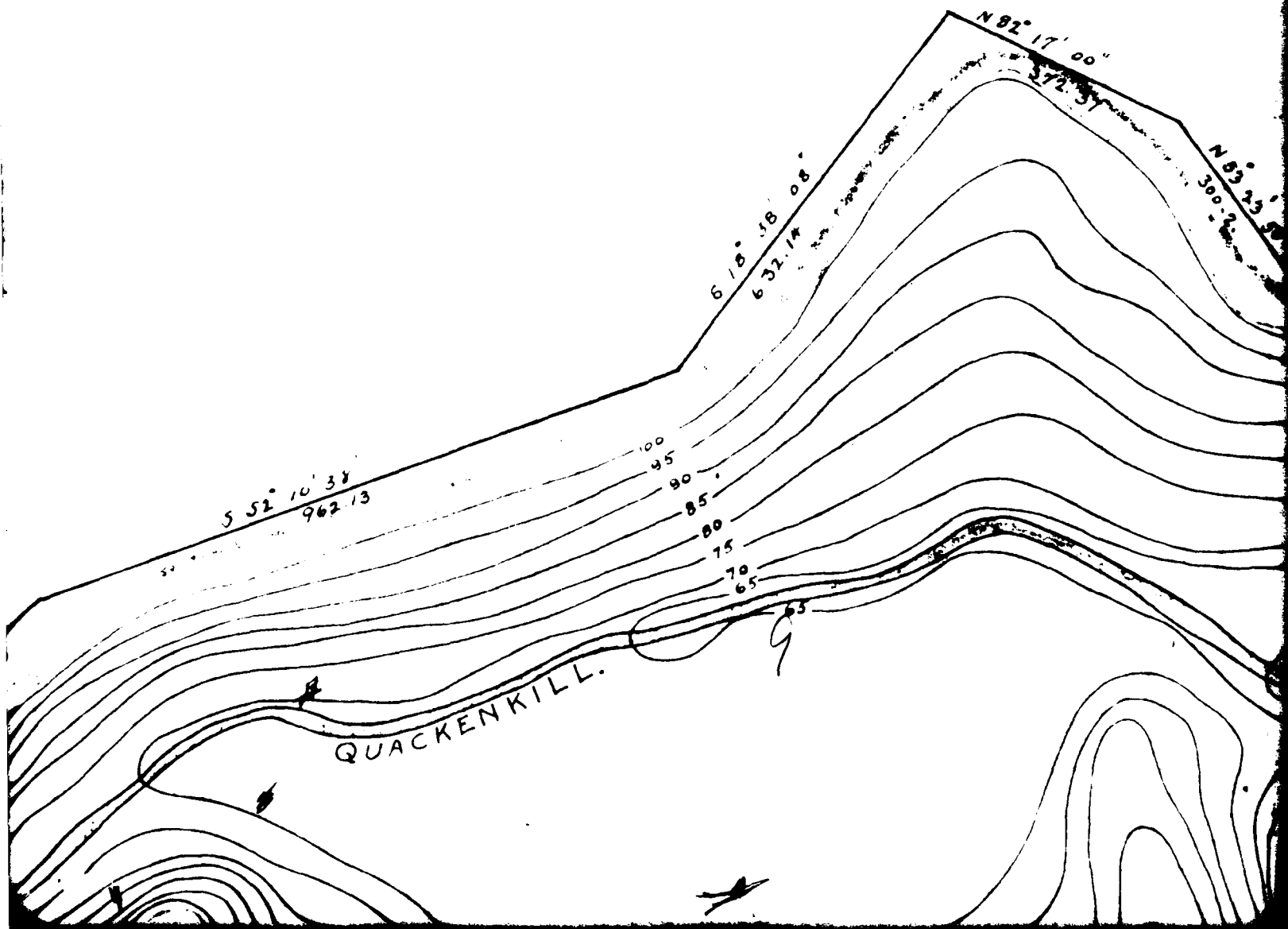


**TROY WATER WORKS
EXTENSION.**

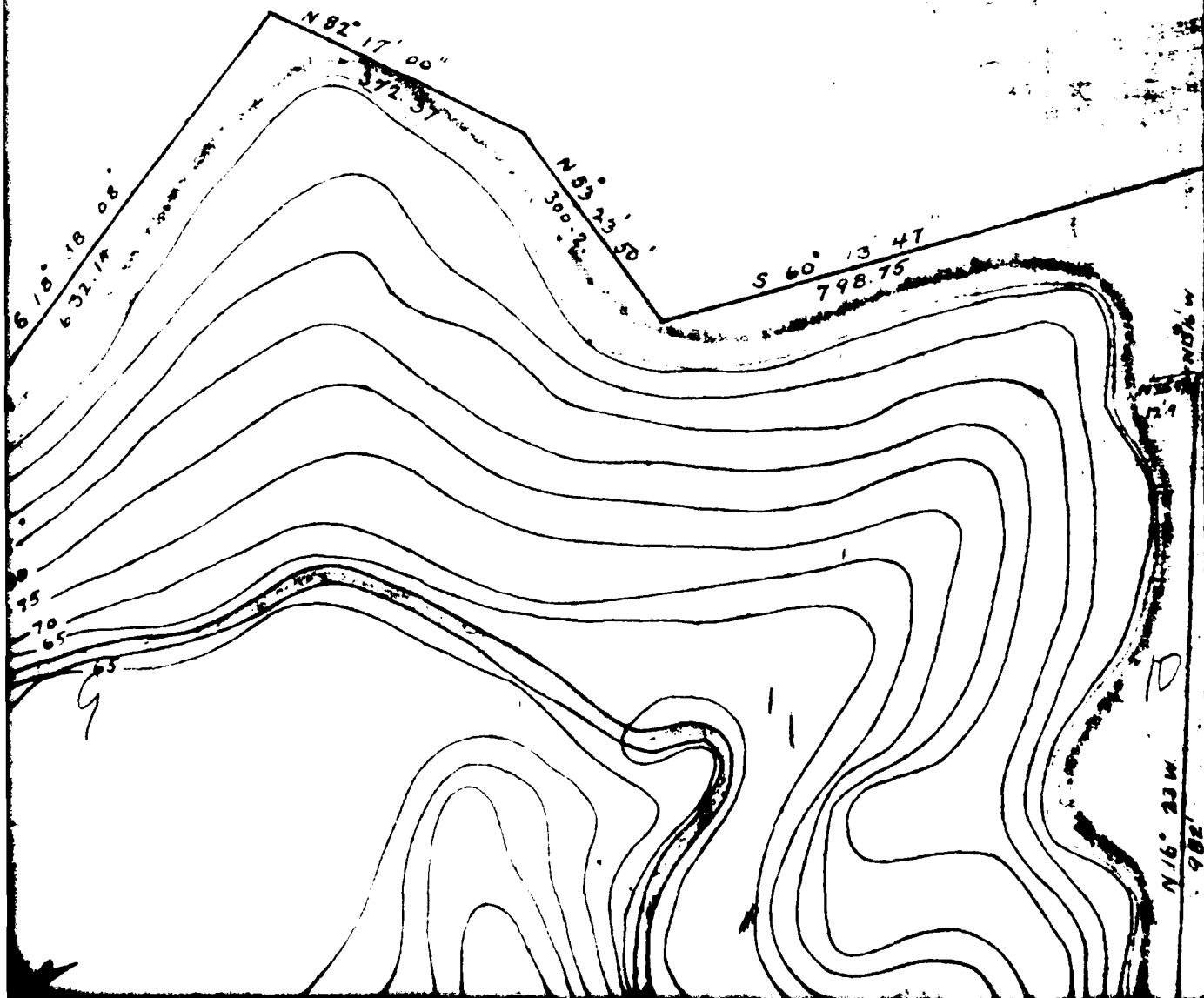
CONTOUR MAP OF
VOLINHAM-RE SERVOIR.

SCALE, 1" = 200

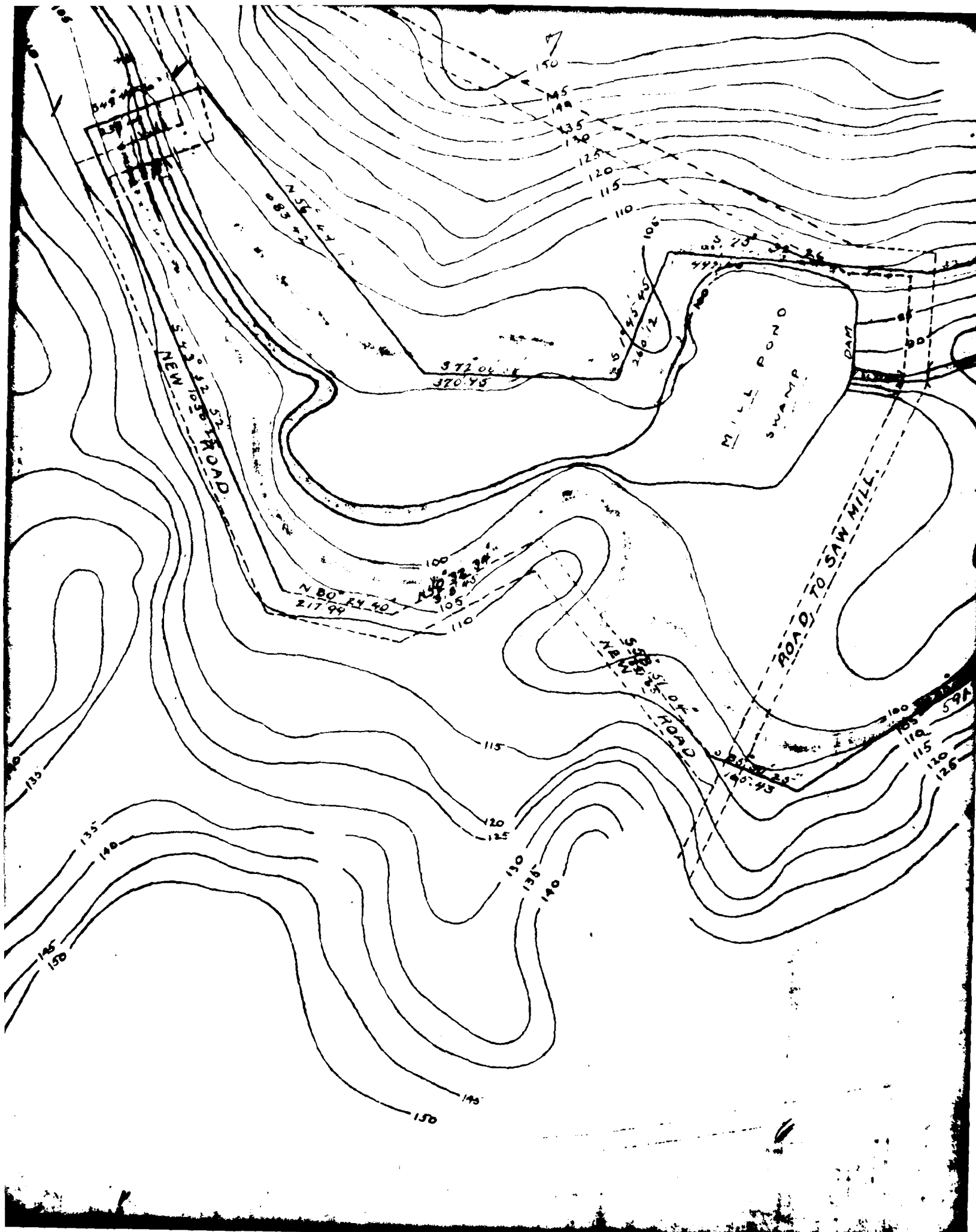


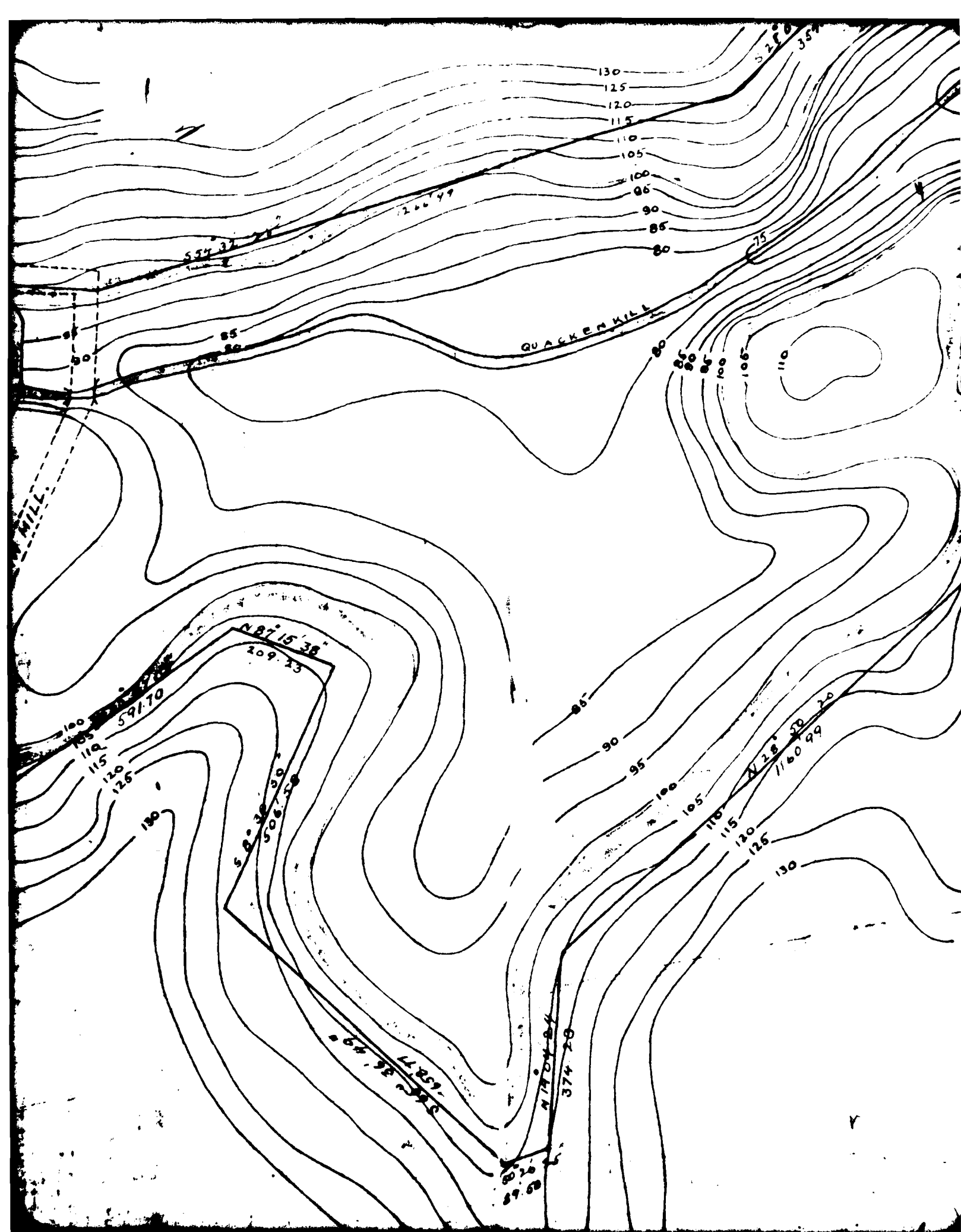


M-D.VII.









QUACKENKILL.

9

CREEK TO BE DIVERTED.

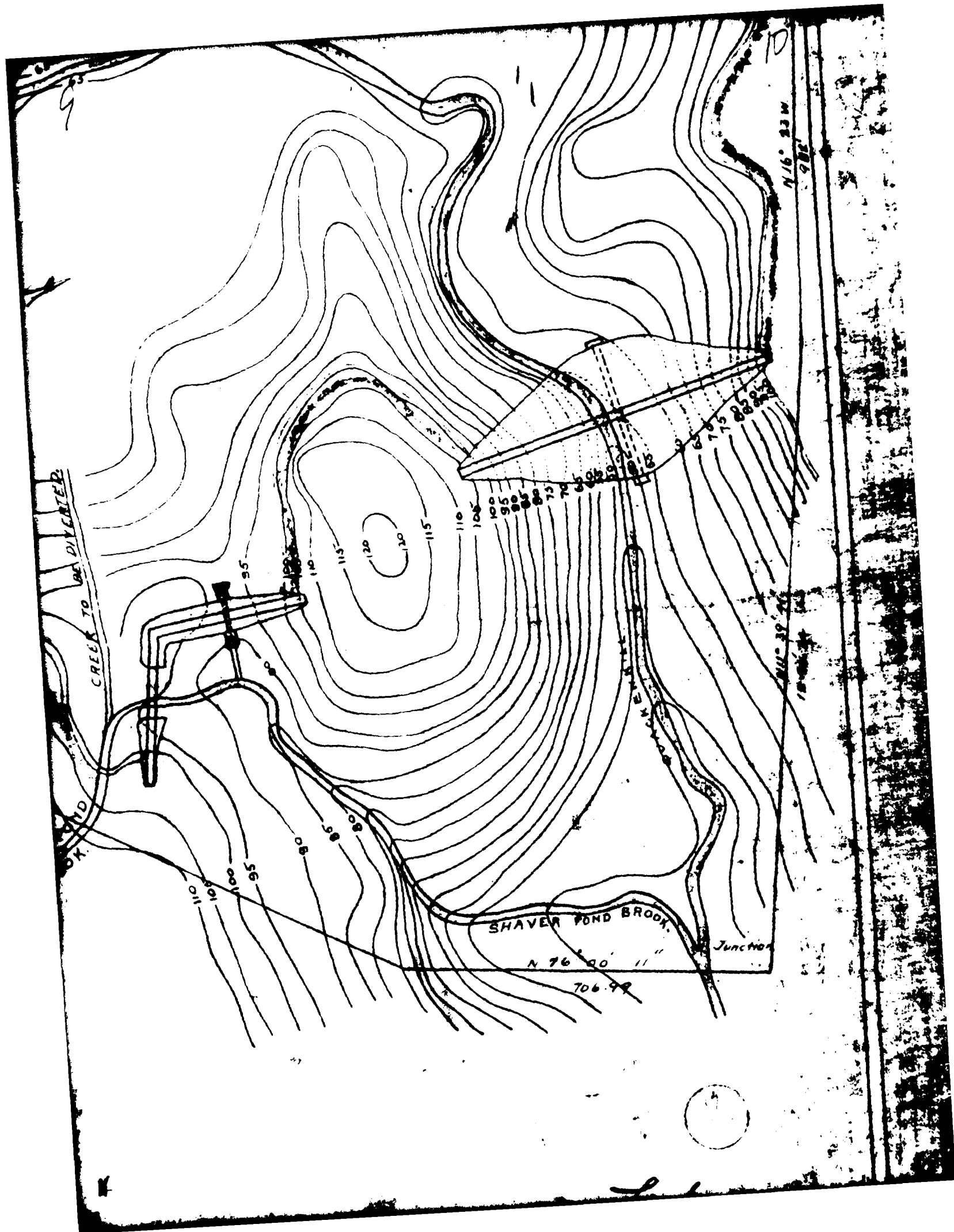
S 79° 38' 40"
1518.74

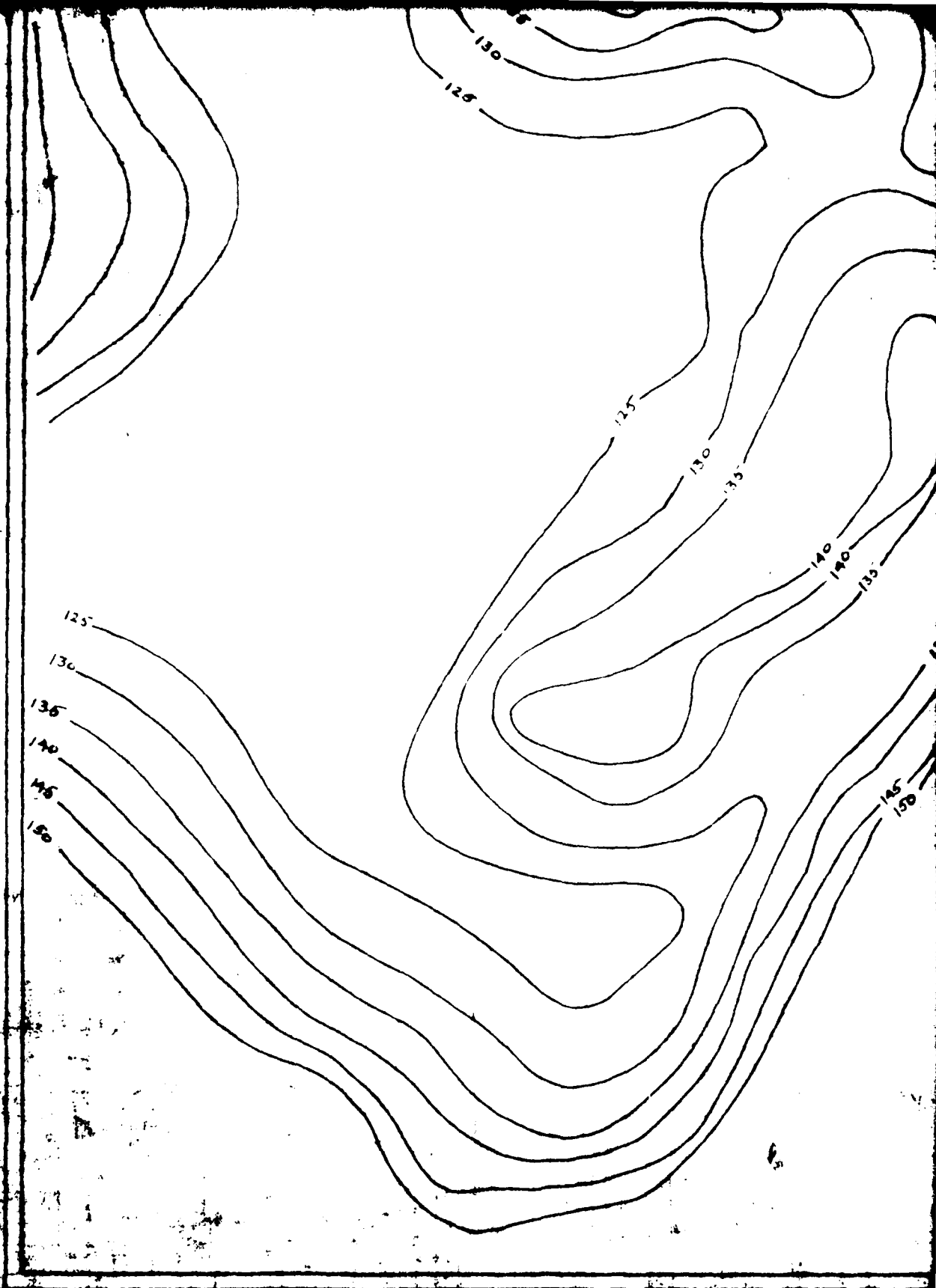
SHAVER POND
BROOK.

N.

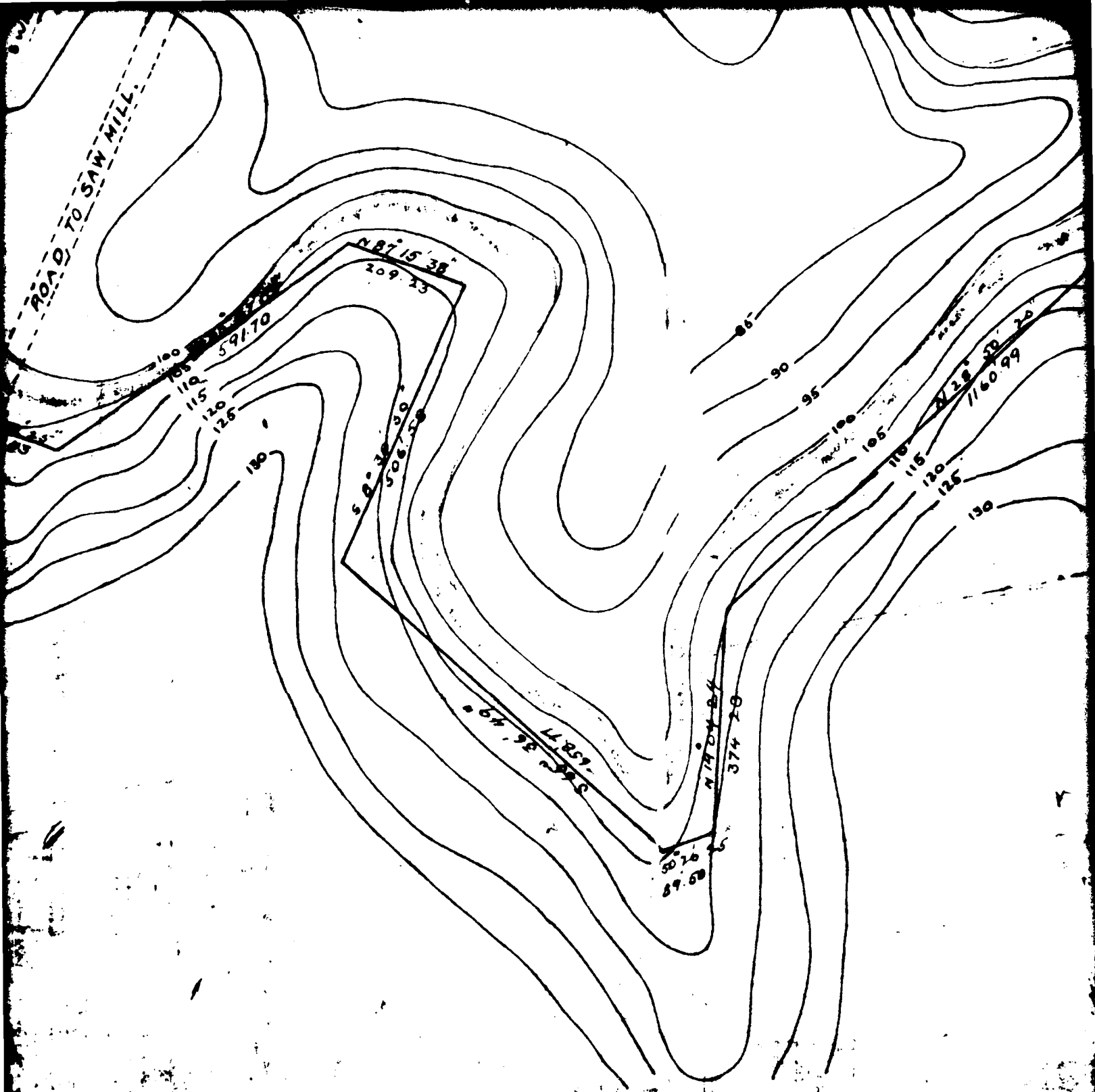
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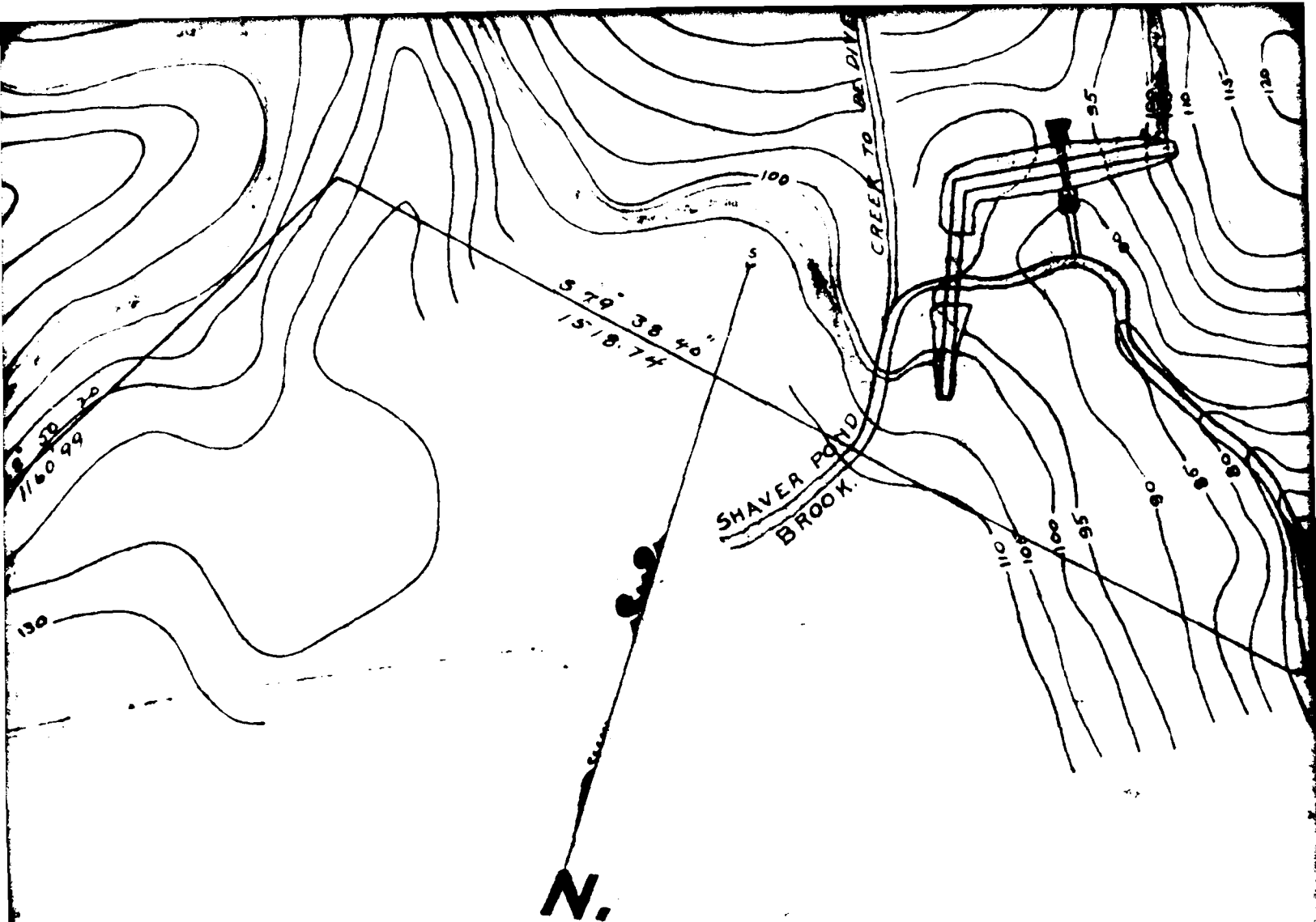
Approved





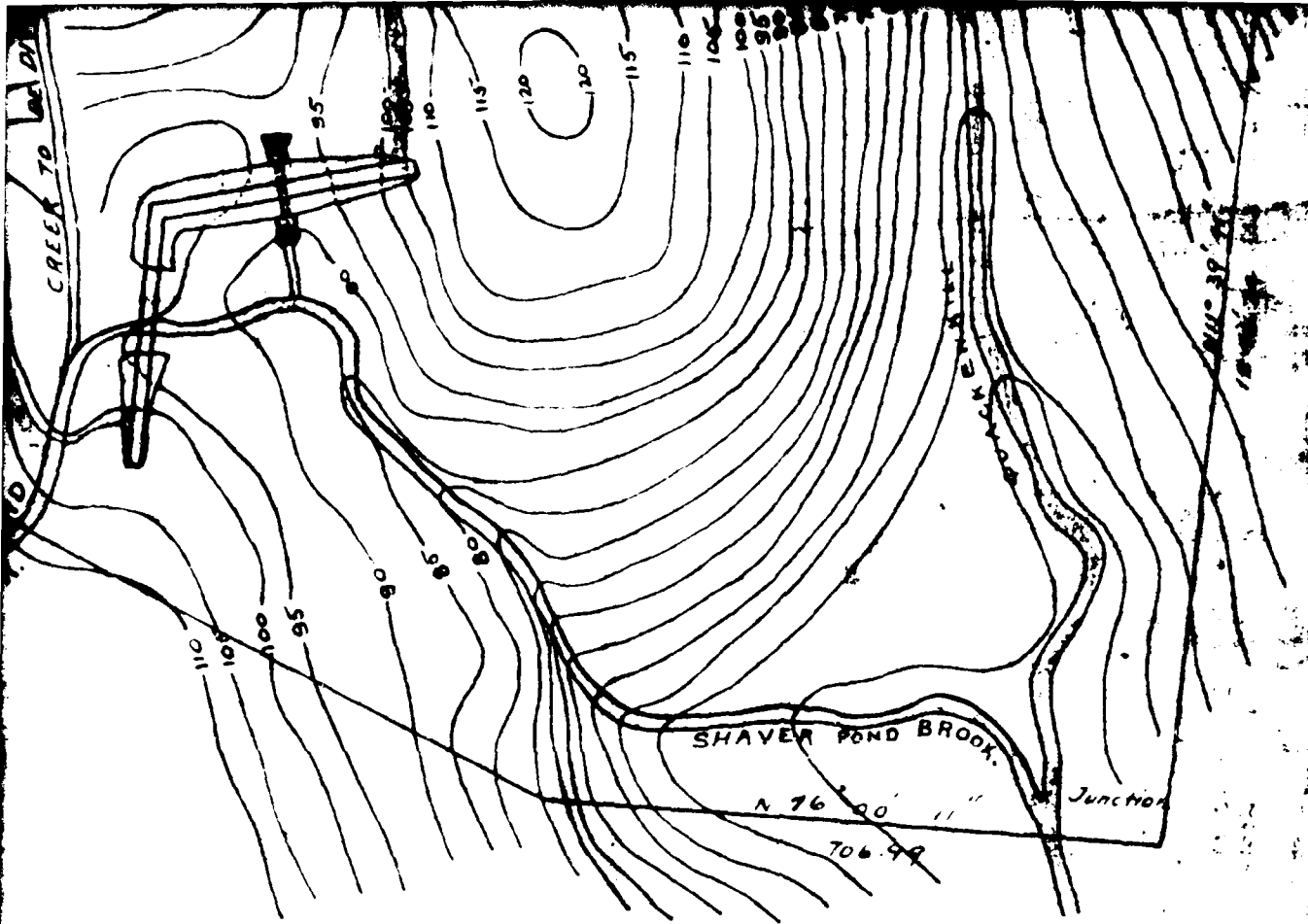




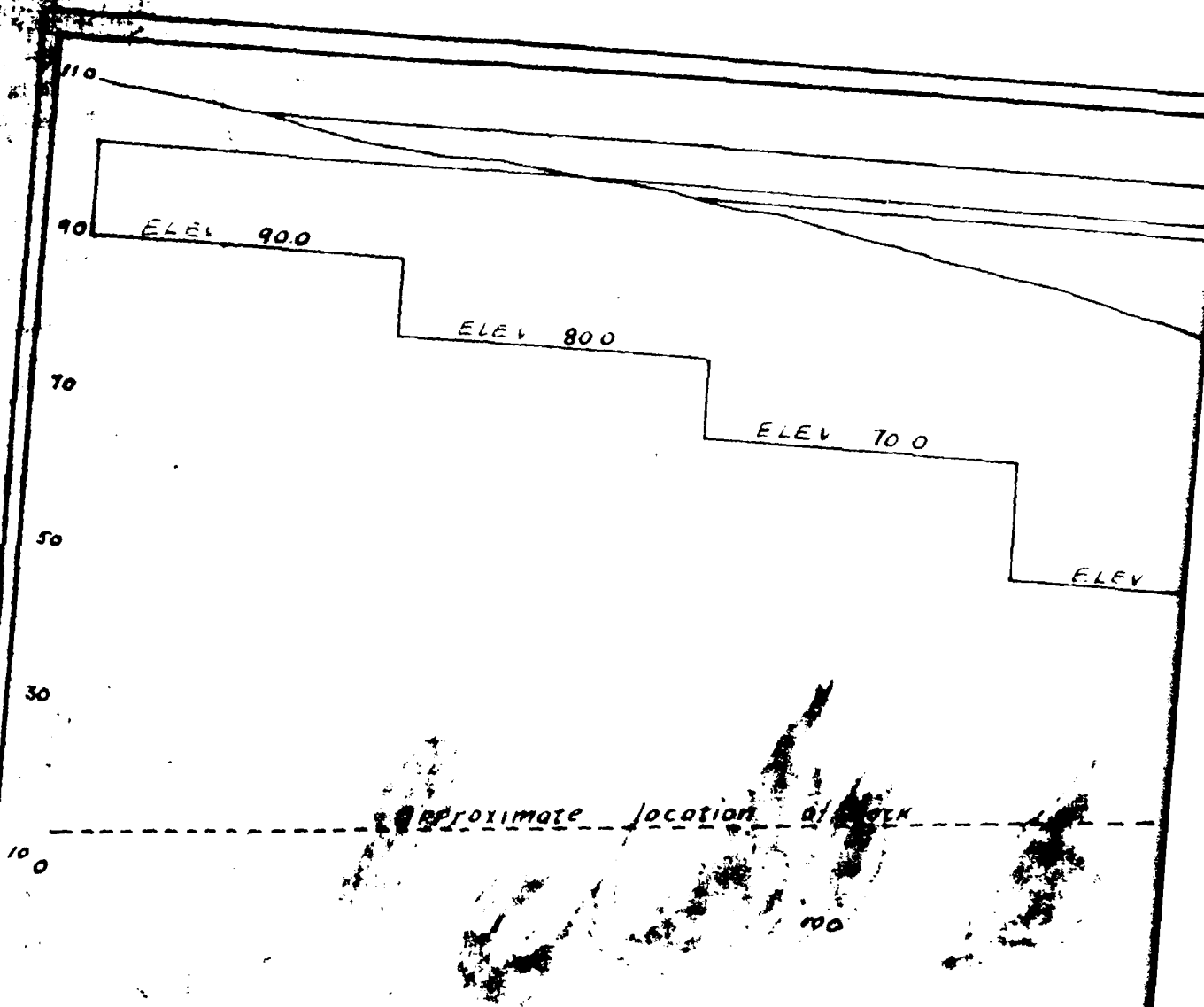


App

Com



Approved, Feb 27 1941
W. H. Shiers
Com'r. of Public Works,
Troy, N. Y.



TOP

Surface of Ground

ELEV 55.0

ELEV. 39.0

ELEV. 23.0

ELEV 25.0

ELEV 28.0

ELEV 26.0

Point
Hole #10
Hole #11
Hole #12
Hole #13
Hole #14
Hole #15
Hole #16
Hole #17
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Hole #100

Hole #4
Hole #5
Hole #6
Hole #7
Hole #8
Hole #9
Hole #10
Hole #11
Hole #12
Hole #13
Hole #14
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Hole #88
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Hole #90
Hole #91
Hole #92
Hole #93
Hole #94
Hole #95
Hole #96
Hole #97
Hole #98
Hole #99
Hole #100

200

4

W

W

10

5

0.5

80

75

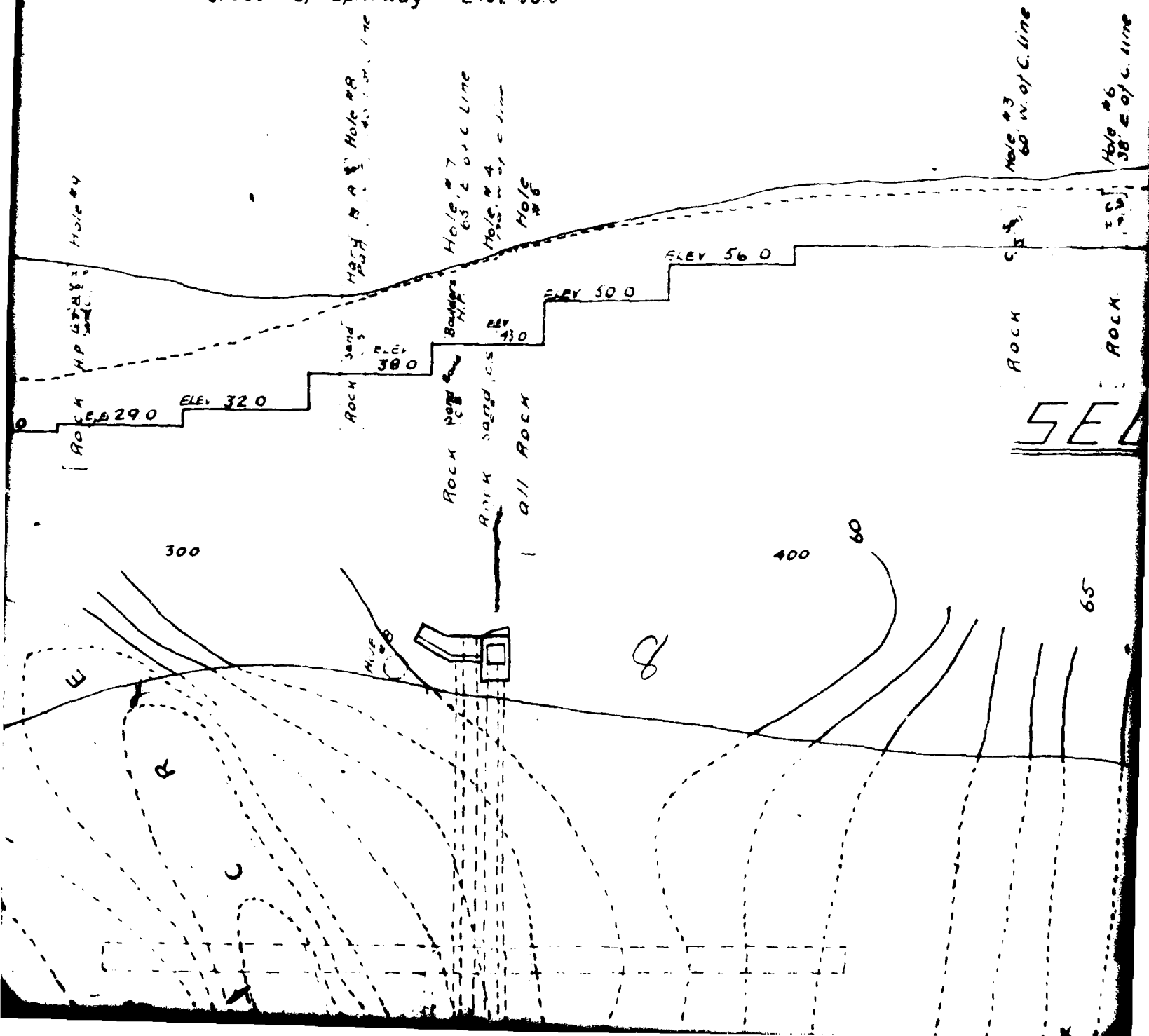
70

85

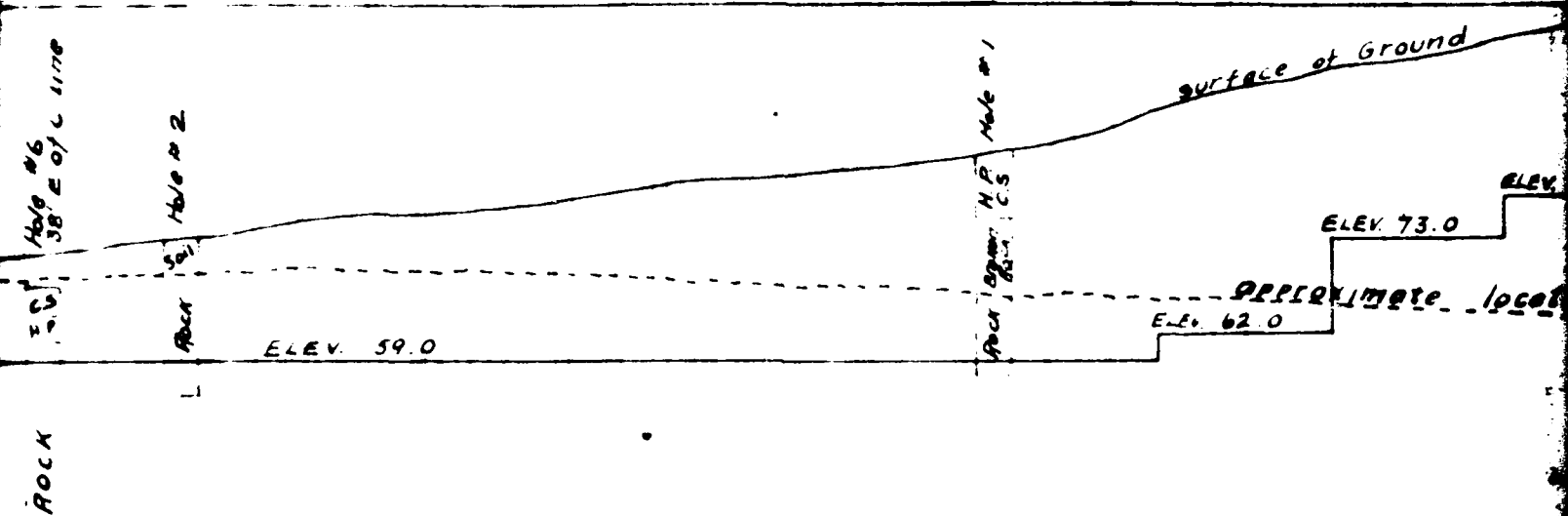
1

3

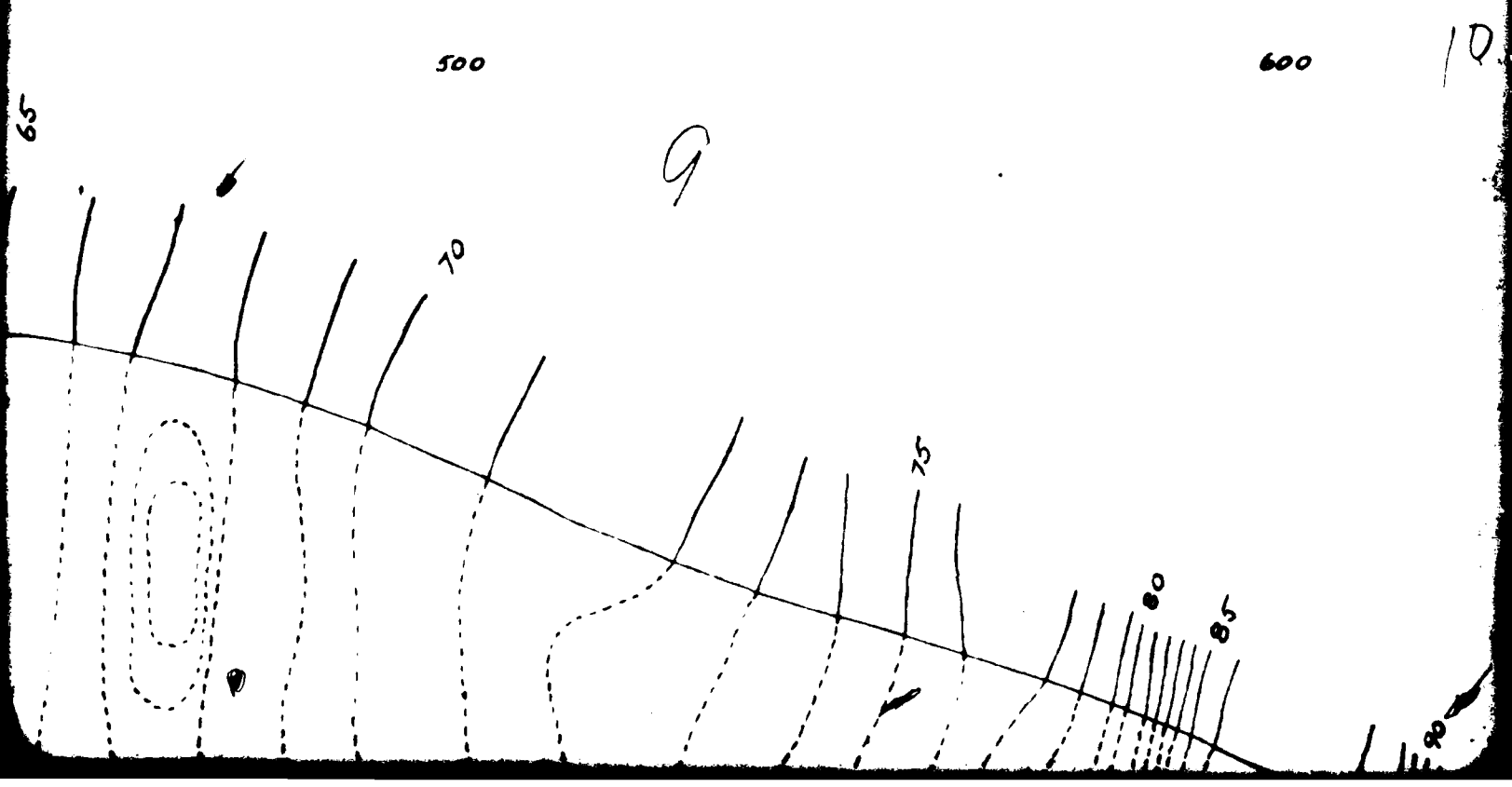
Top of Embankment Elev 107.0
Top of Core Wall Elev 102.0
Crest of Spillway Elev 100.0



4



SECTION ON CENTER LINE



Rock Layer N.P. Hole #1
C.S.

surface of Ground

ELEV. 73.0

ELEV. 78.0

ELEV. 83.0

ELEV. 88.0

ELEV. 93.0

APPROXIMATE location of Rock.
ELEV. 62.0

M-D.V.

ENTER LINE

600

10

4

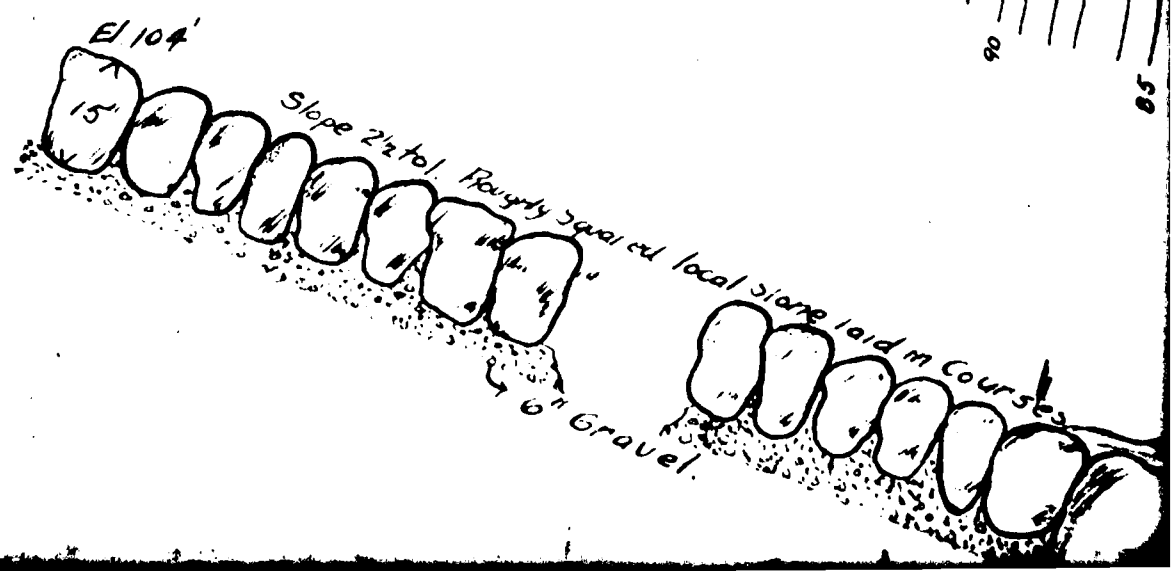
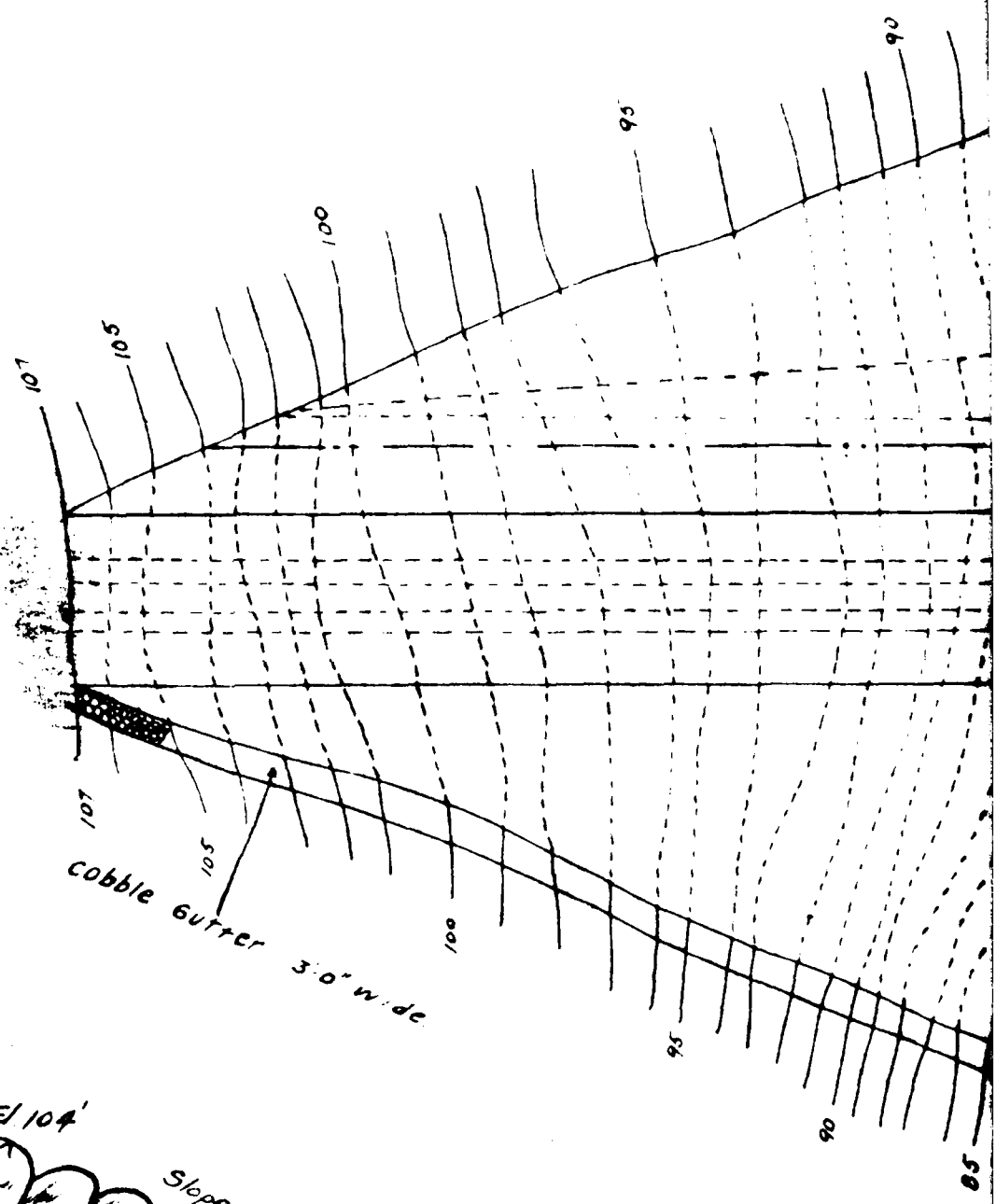
200

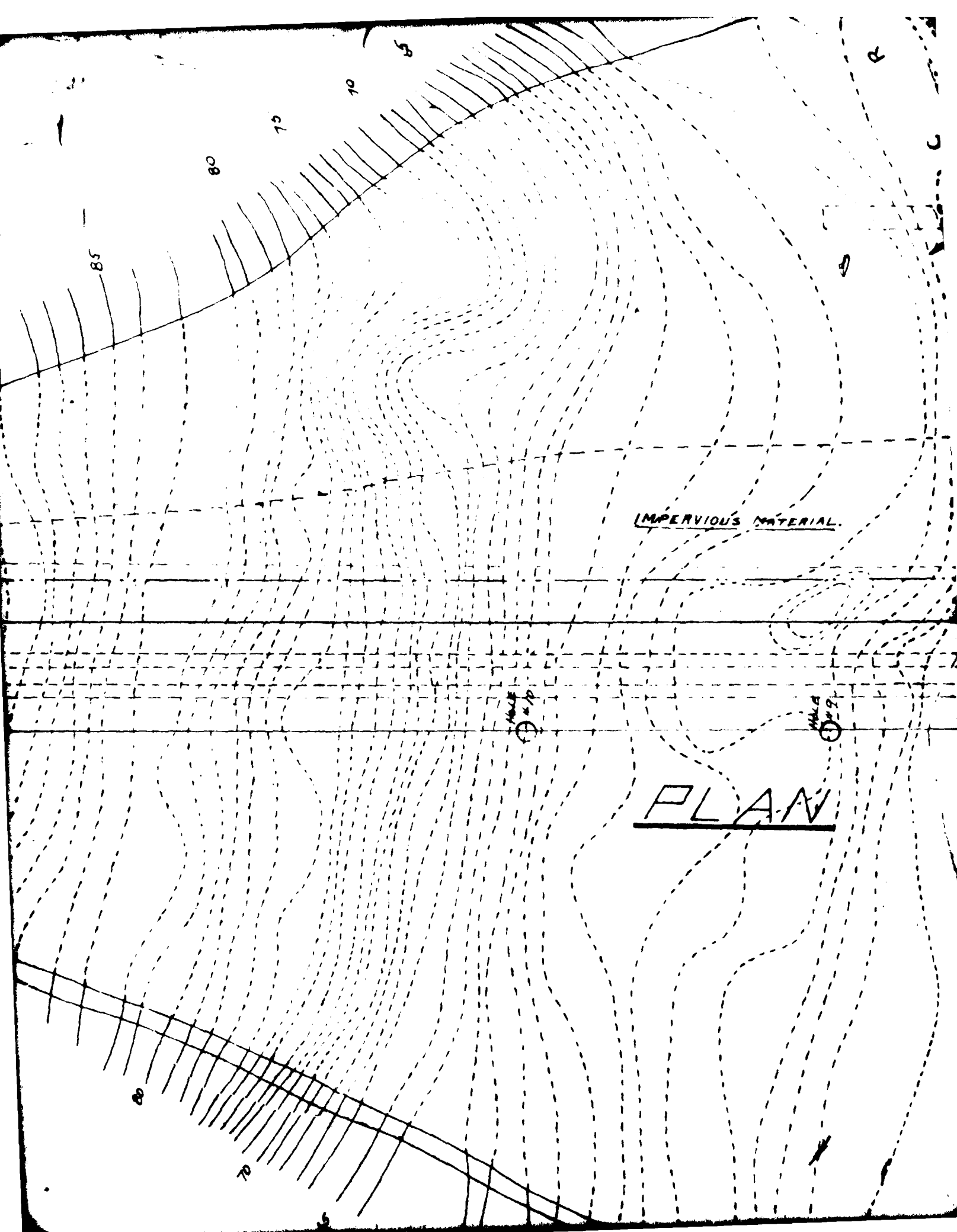
75

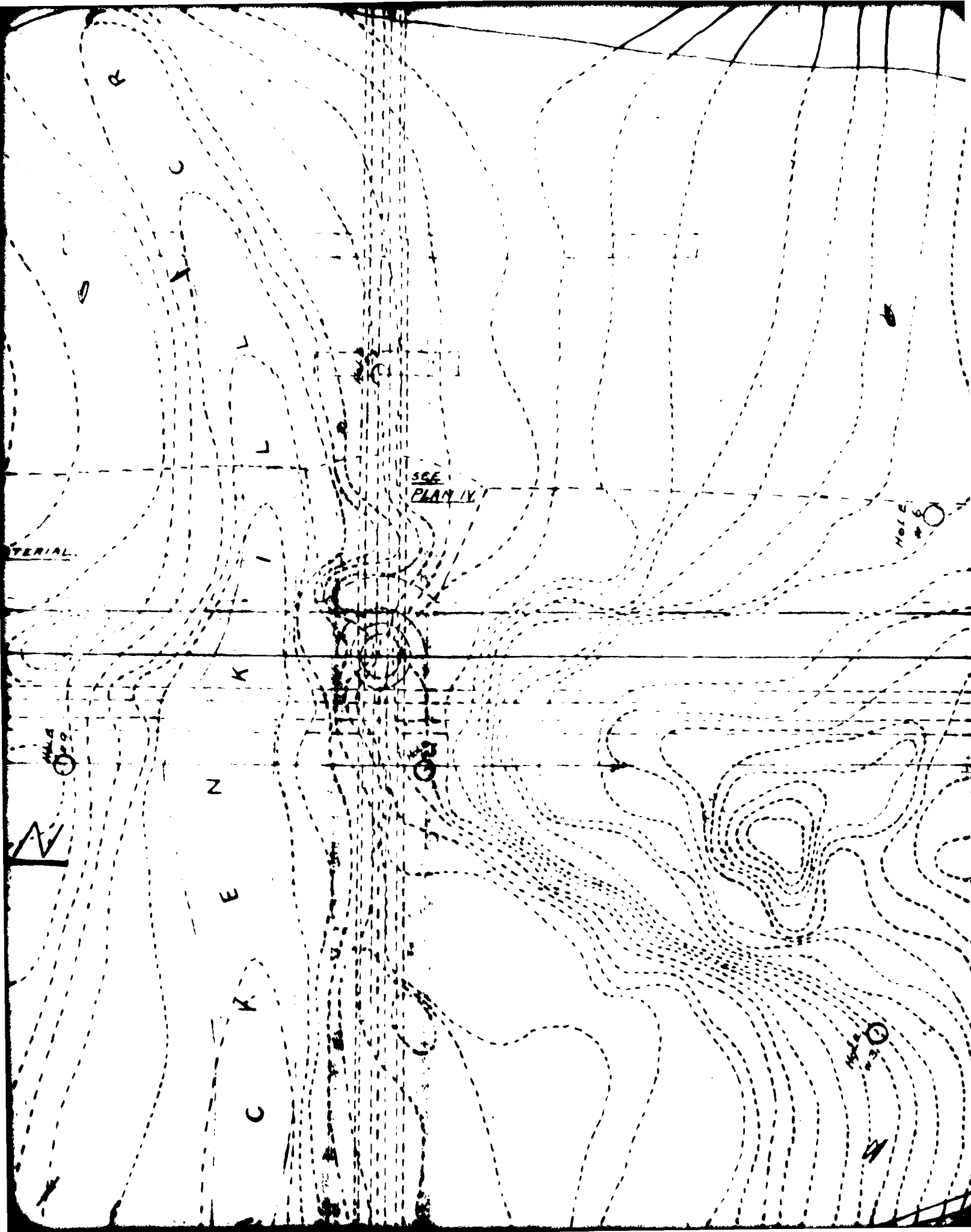
80

85

6







65

9

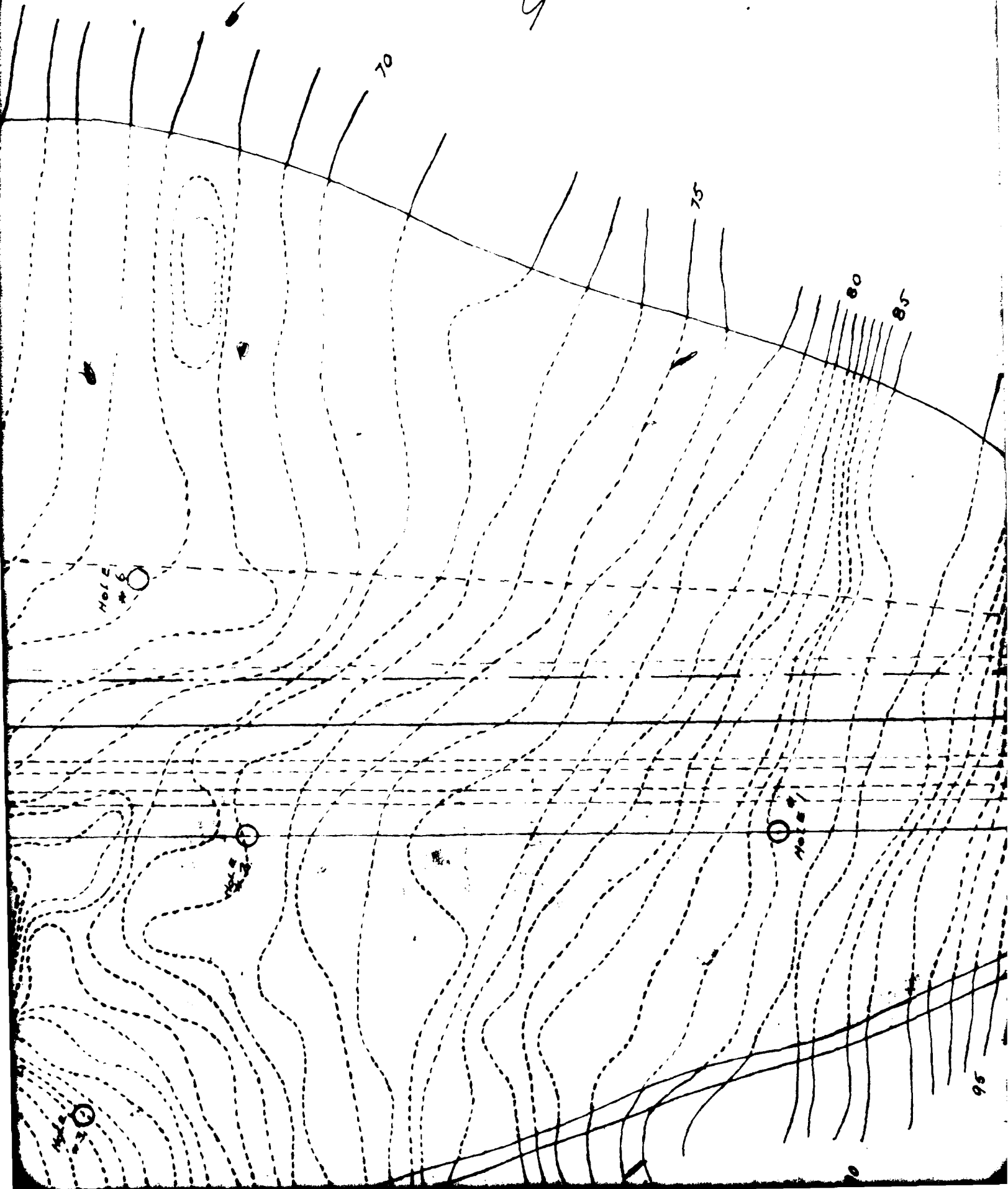
70

75

80

85

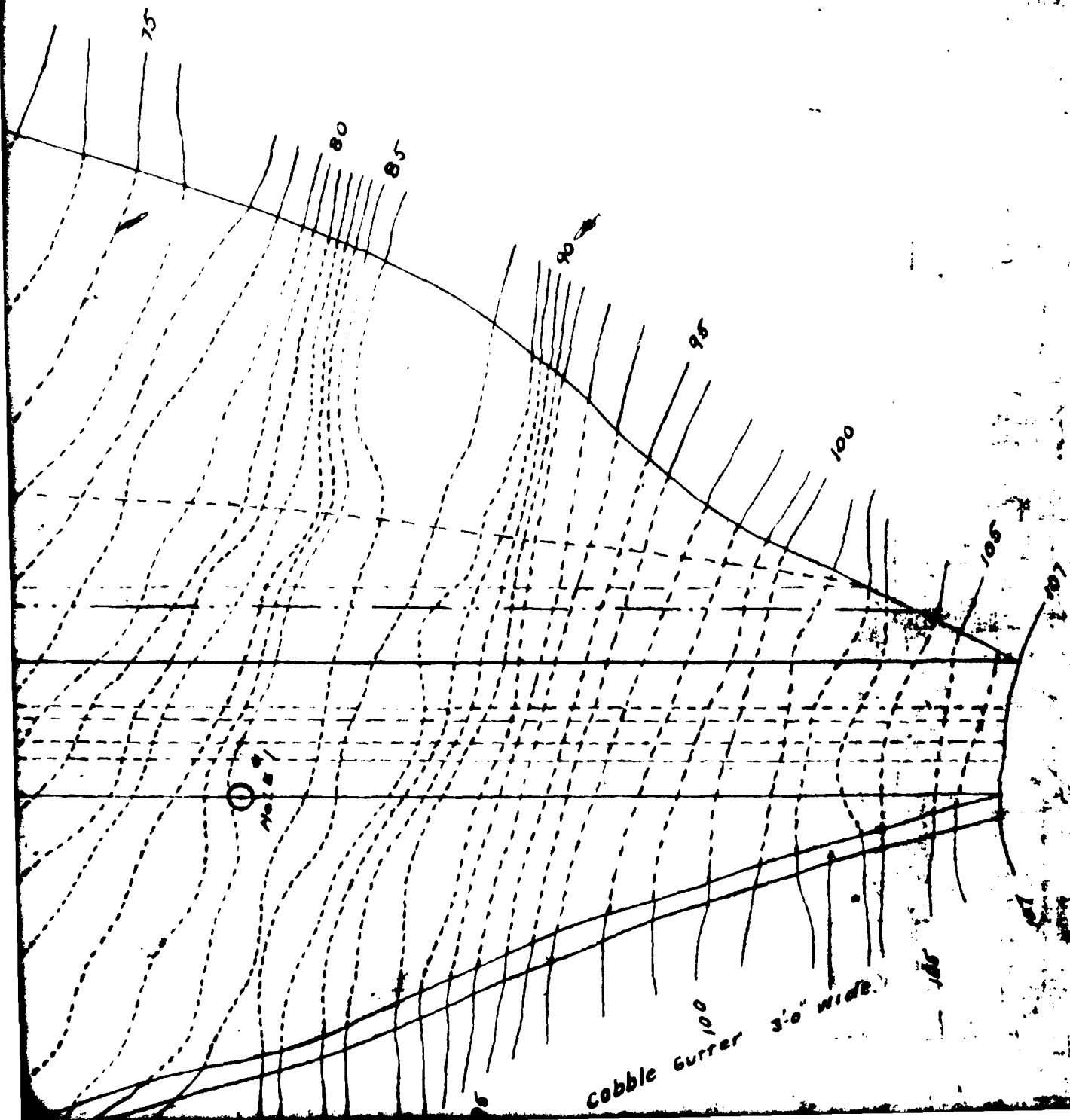
95

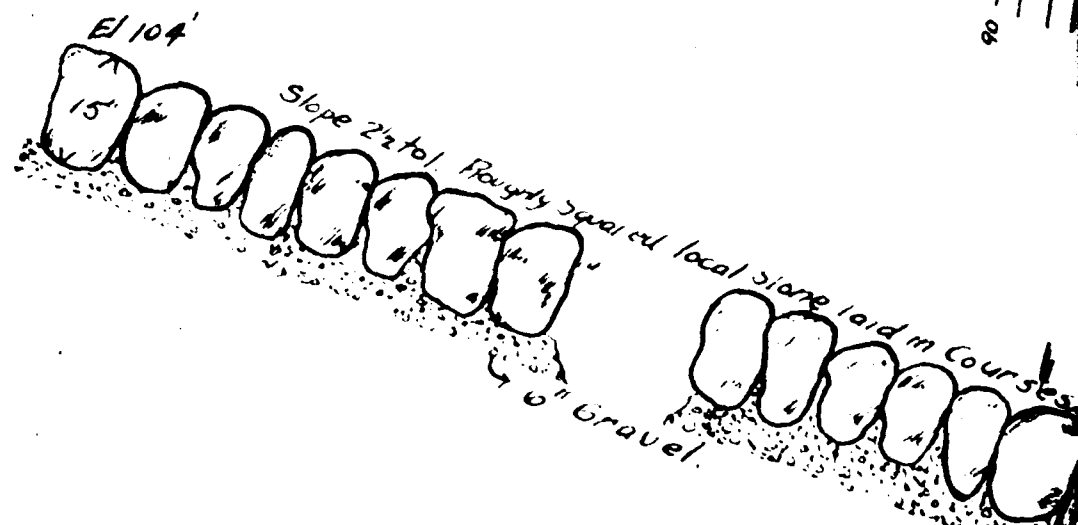
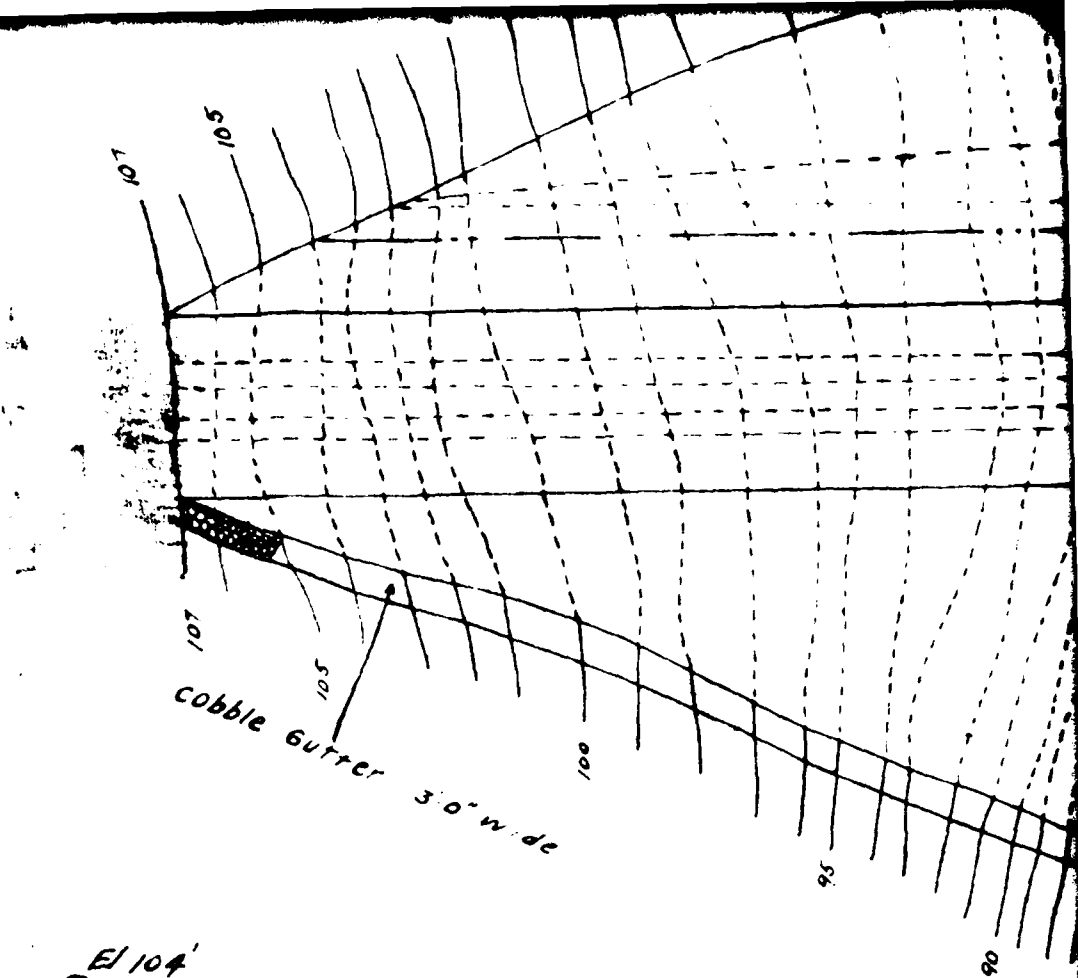


600

17

200



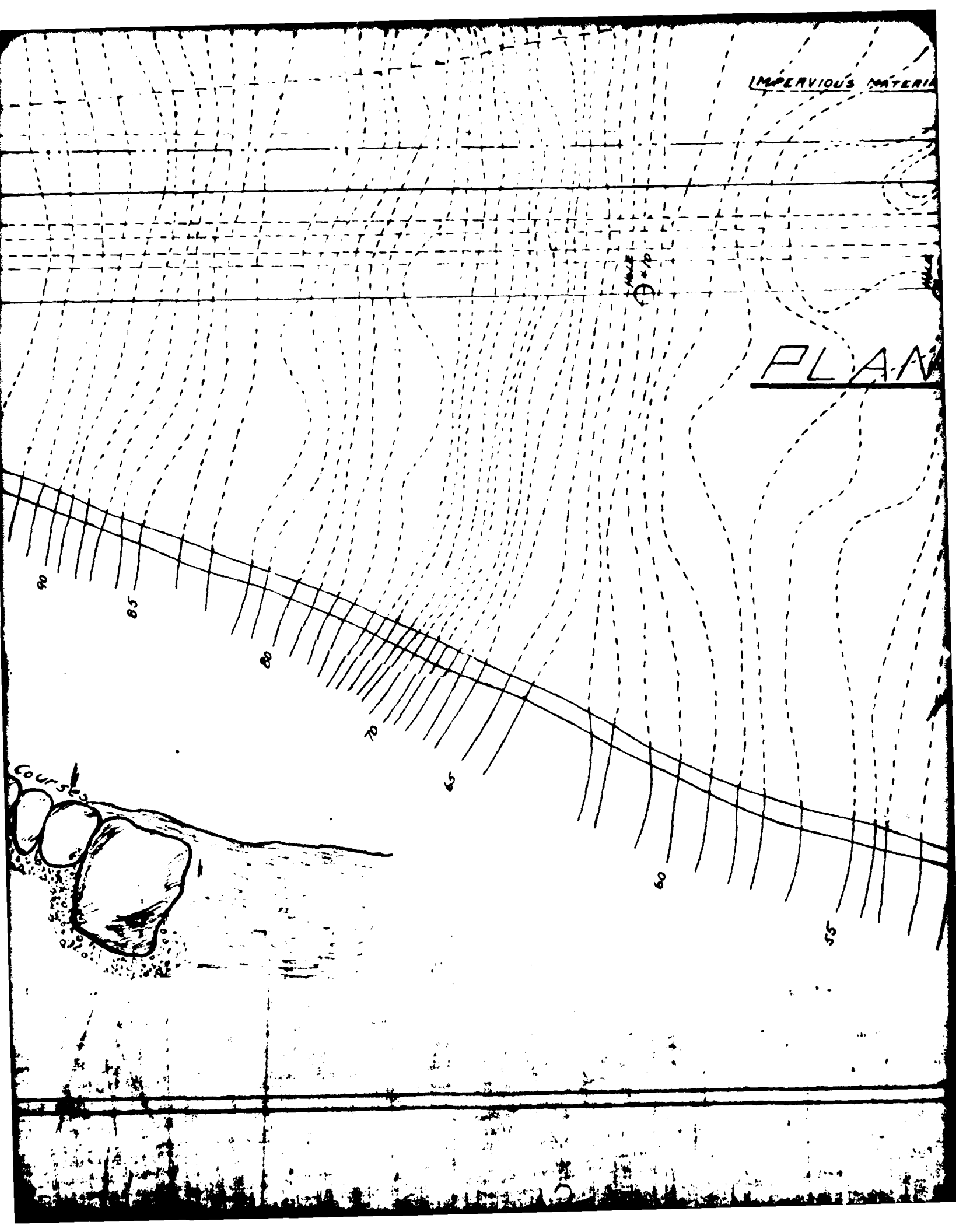


DETAILS OF SLOPE PAVING

SCALE 1" = 2'

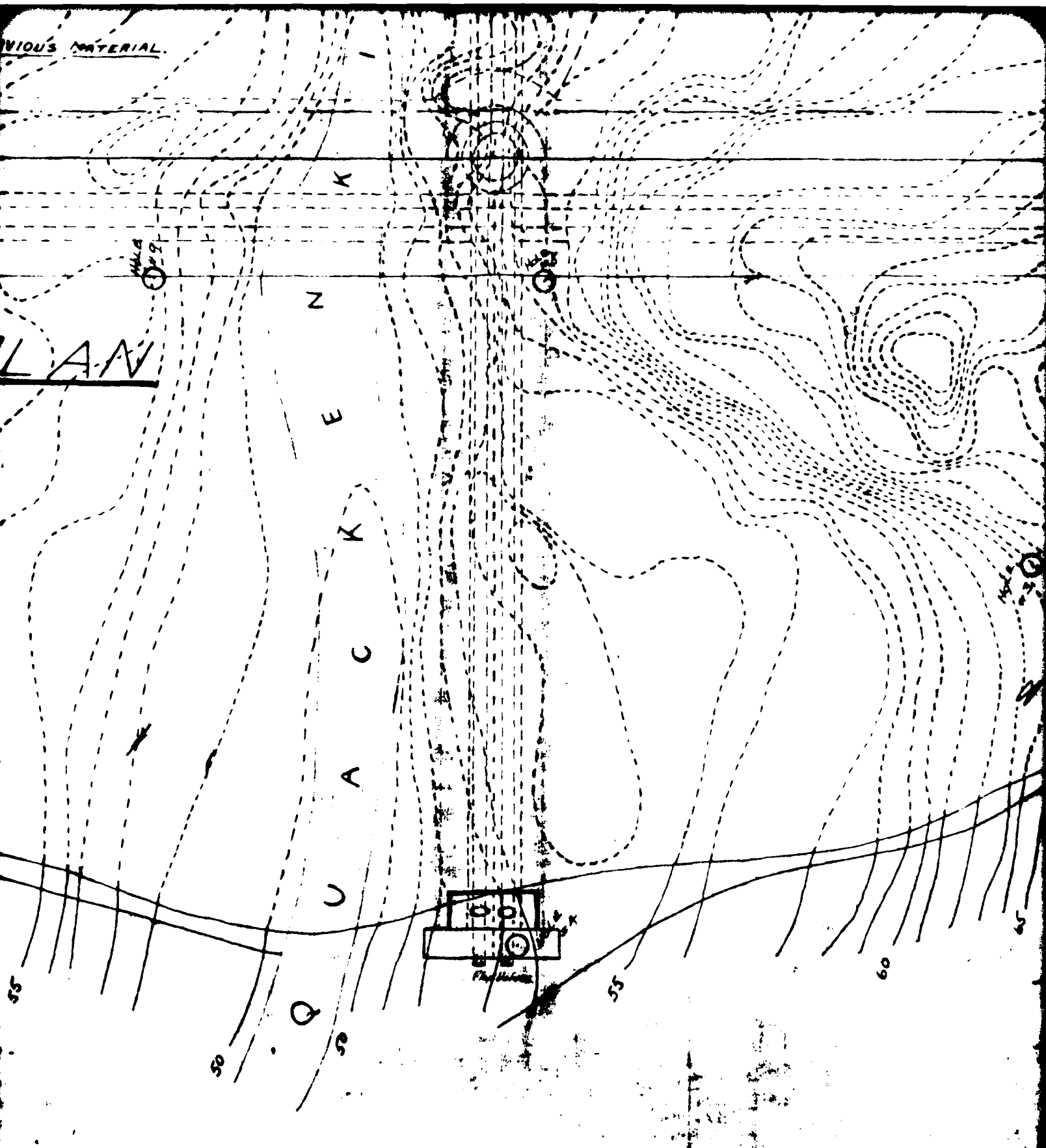
IMPERVIOUS MATERIAL

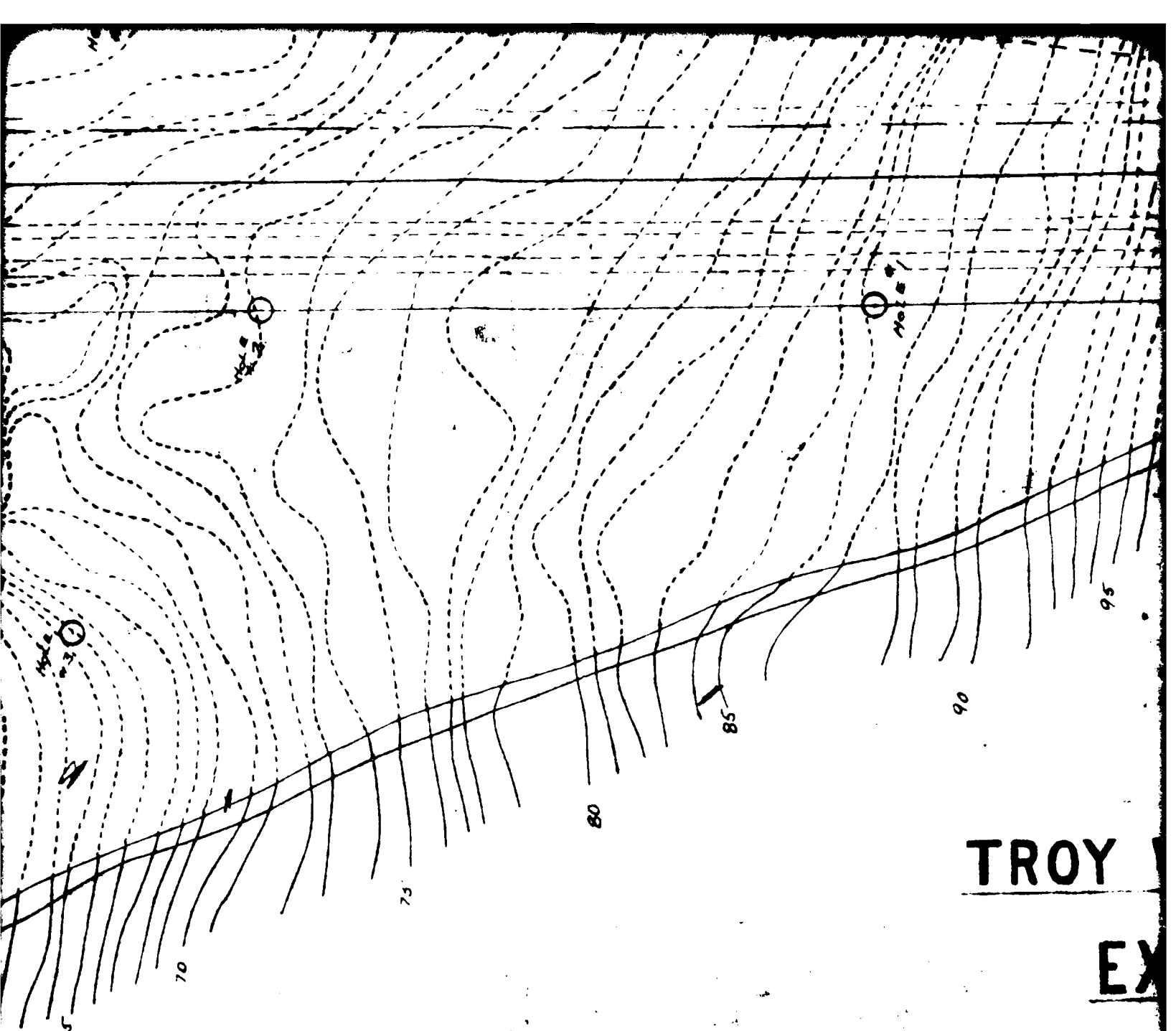
PLAN



VIOUS MATERIAL.

LAN





TROY

EX

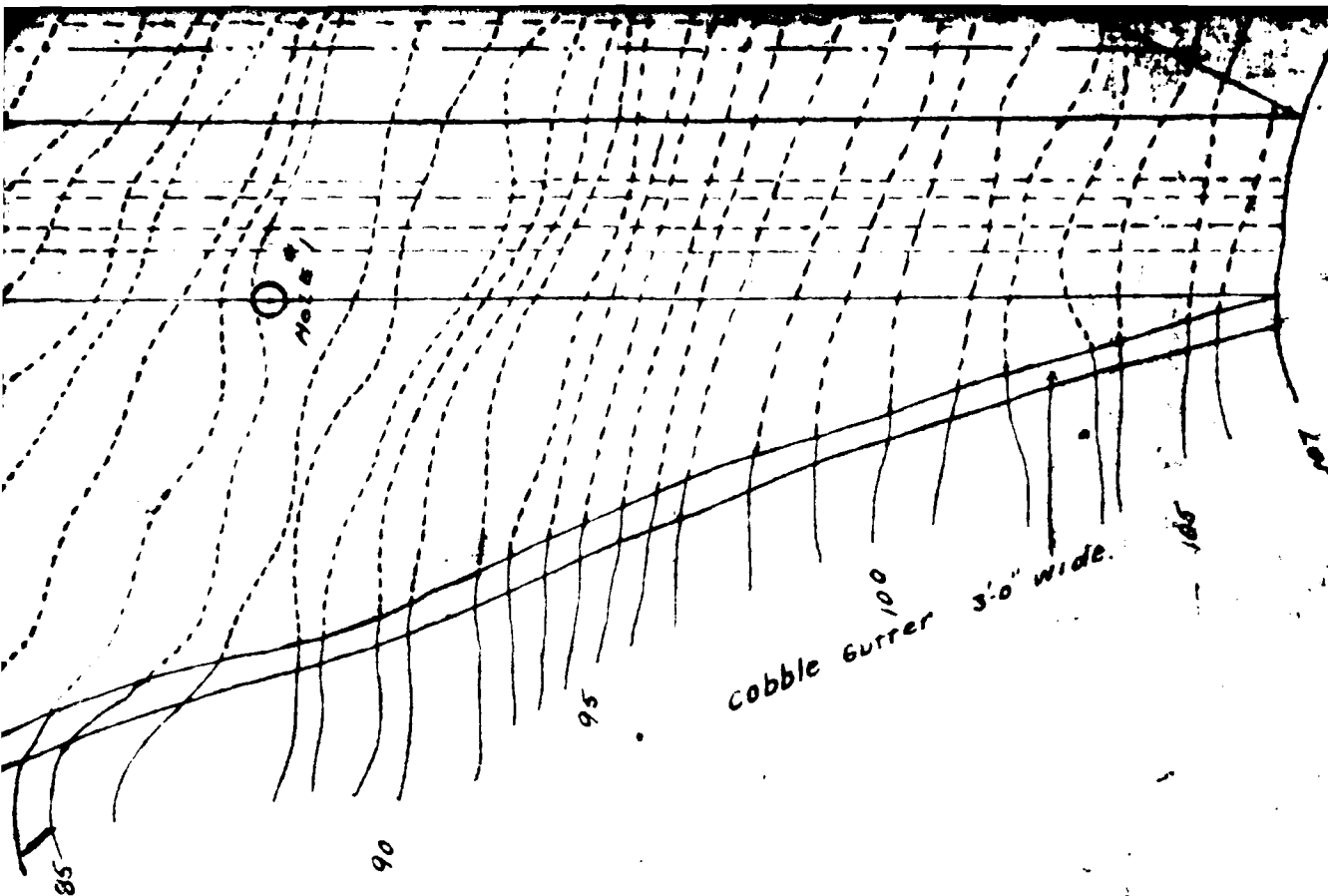
Approved, Feb. 27, 1911

W. H. Thomas

**Comr. of Public Works,
Troy, N. Y.**

DAM FOR

S



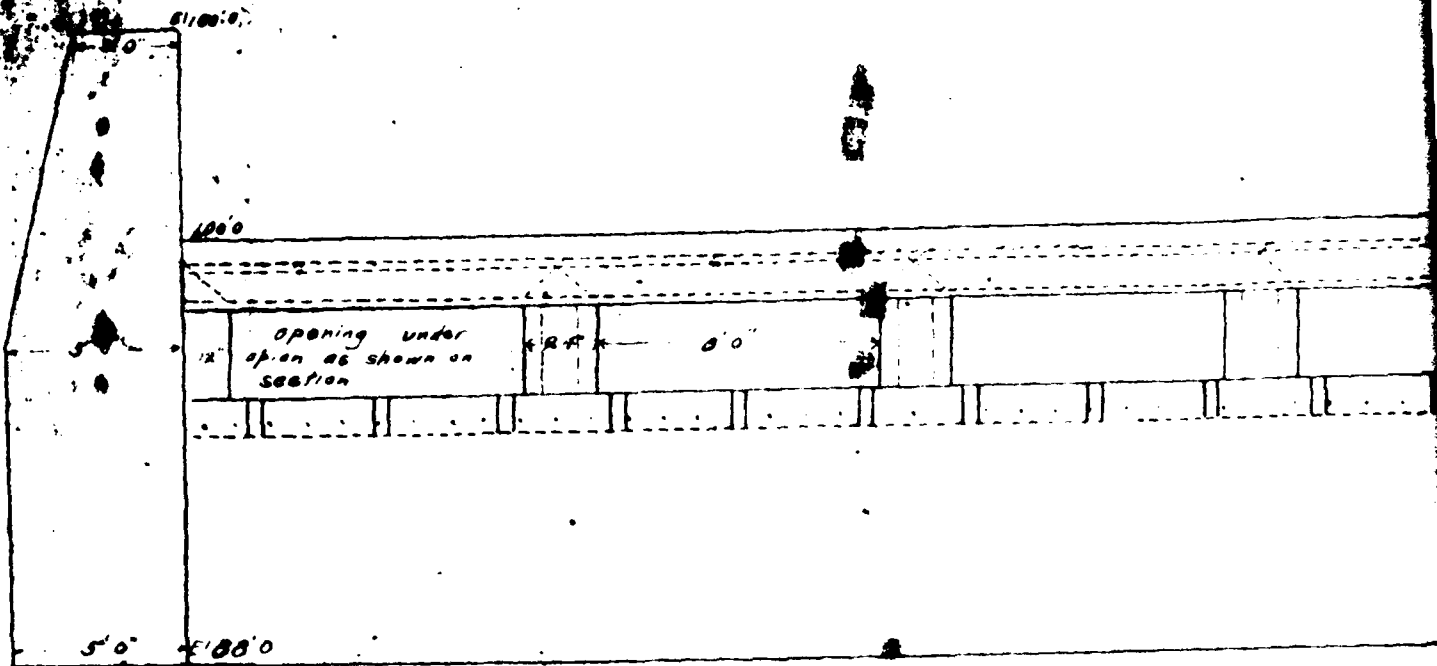
TROY WATER WORKS EXTENSION

PLAN OF

DAM FOR RESERVOIR

SCALE 1 INCH = 20 FT.

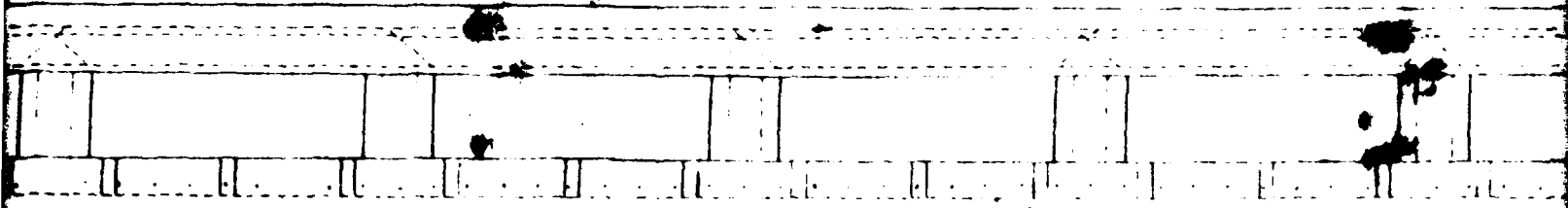
1911
Works,
N. Y.



2

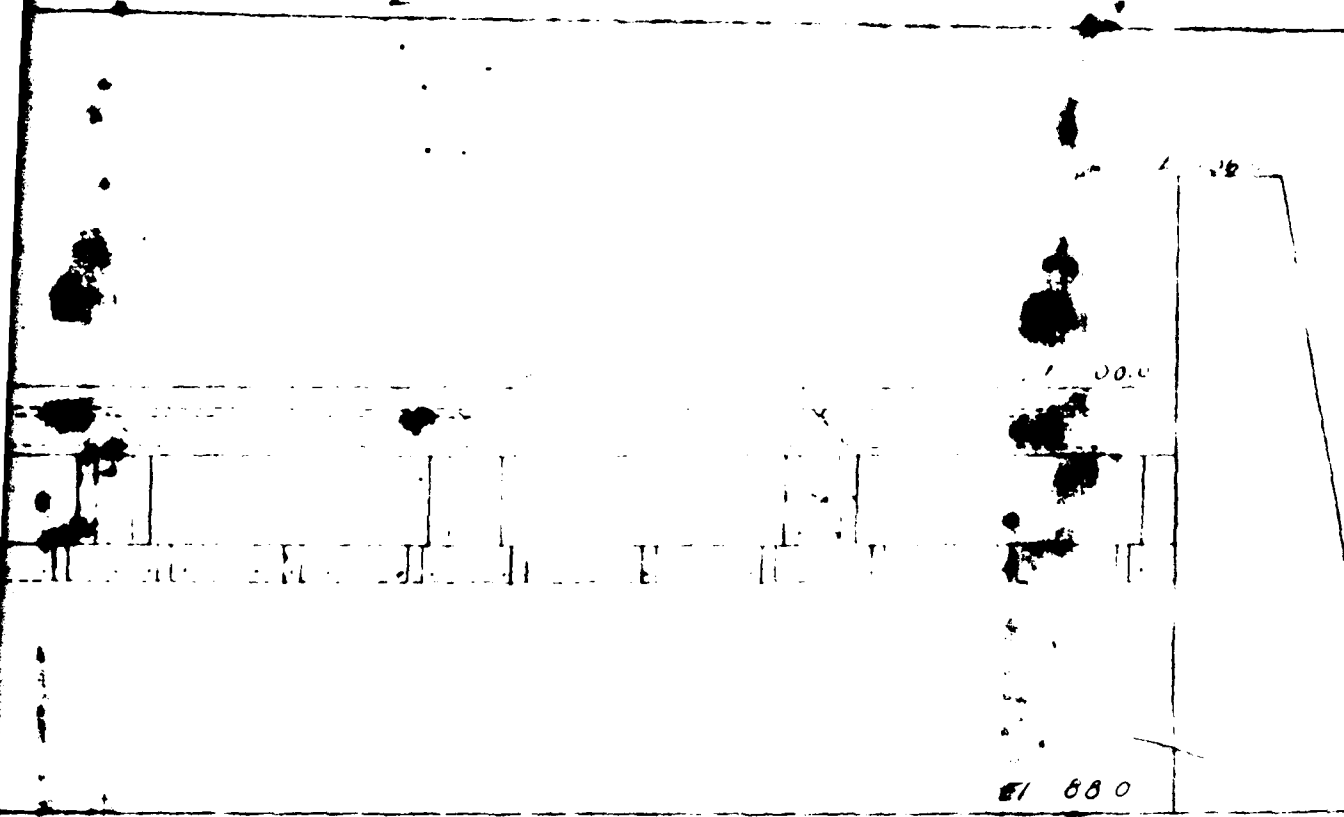
Elevation

Scale 1" = 5'

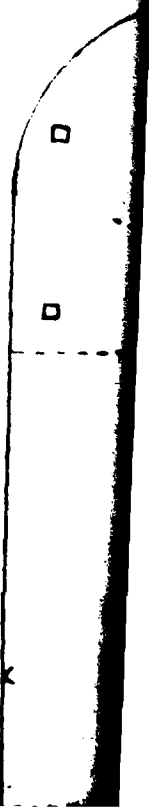


7

3



8



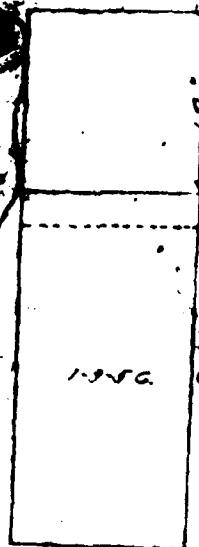
4

M.D. X

10.

9

12' No 11.



12

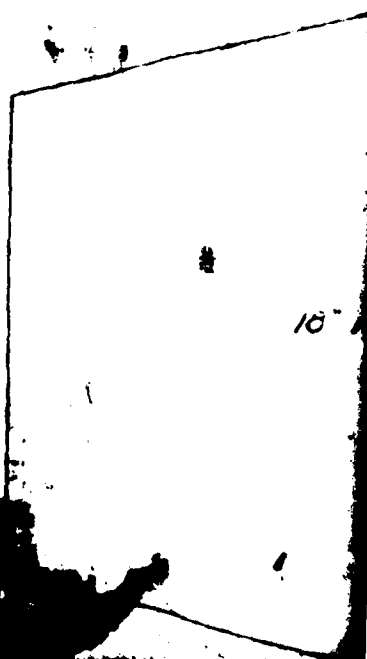
24

12

13-50

50

12



10

7

12

7-50

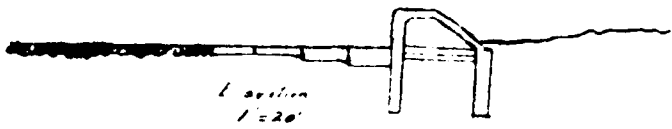
50"

12

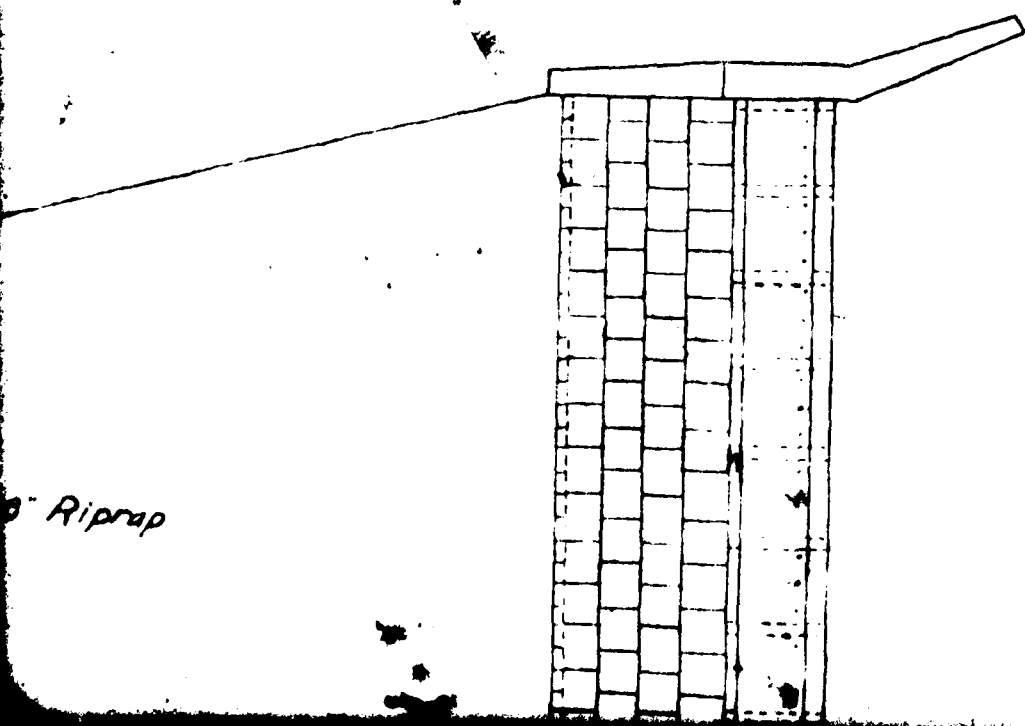
24

7-50

50



Location
1=20'



Riprap

8

1-2-46

24" Pier

24"
35"

35" Concrete

35"

50"

1-3-56

24"

1-2-4 C

24" Pier

12' Well.

CFI 955

Sub 1-2-4 C

15' CNG Length 10-0'

Shore Road

35'

1-3-5 C

Scale 1"

24"

83'0

9
1/2" Ruler
1/2" Vertical Scale

12 Wall

95.5

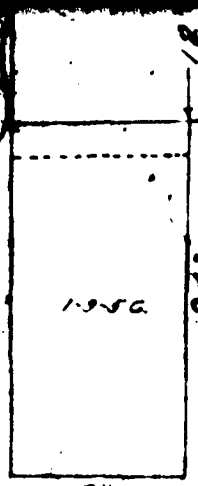
Sub 1-2-A C

1/2" 18 CPG Length 10-0

3" High 4" Deep 1/2" Thick
to each section

Scale 1/2"

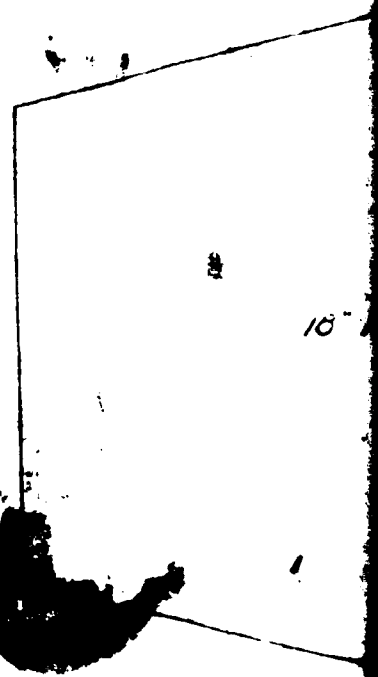
5
0



12

50°

12"

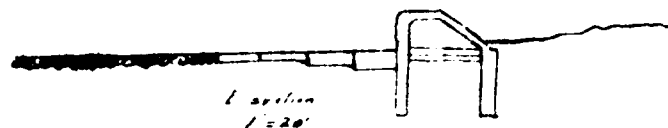


10"

5'0"

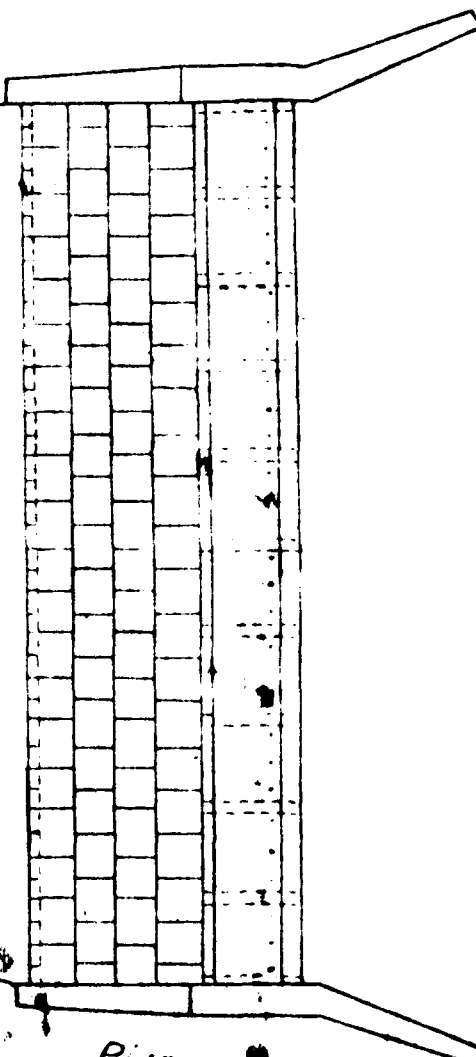
24'

5'0"



Location
1-20'

10" Riprap



Pier
1-20'

23.5 C

24
35

1.5 Concrete

50

50

12

Scale 1/1

24

890

Approved

Camr.

Scale 1/1

Approved

Com'r.

