CONNECTICUT WESTERN COASTAL AREA

WESTON , CONNECTICUT

SAMUEL P. SENIOR RESERVOIR DAM
CT 00108
and
POPPS MOUNTAIN DIKE
CT 00022

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

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

SEPTEMBER 1978

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Samuel P. Senior Reservoir Dam
Popps Mountain Dike

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

Samuel P. Senoir Dam is a linear concrete gravity structure, 990 ft. long, with a 300-ft. spillway located at the west end of the dam. The spillway is concaved looking downstream and consists of several steps on the downstream side. An earthen embankment section on the downstream side of the dam begins 61 ft. below the top of the dam and has slopes varying from 2:1 to 3:1. The dam is approx. 110 ft. long above the streambed. The dam is judged to be in good condition. The dike is judged to be in good condition. The overflow will be 2.7 ft. above the top of the dam.

DD FORM

SAMUEL P. SENIOR DAM

CT 00108

AND

POPPS MOUNTAIN DIKE

CT 00022

CONNECTICUT WESTERN COASTAL AREA

WESTON, CONNECTICUT

PHASE I INSPECTION REPORT

NATIONAL DAM INSPECTION PROGRAM

PHASE I REPORT

NATIONAL DAM SAFETY PROGRAM

Name of Dam: SAMUEL P. SENIOR DAM

Name of Dike: POPPS MOUNTAIN DIKE

State Located: Connecticut

County Located: Fairfield County

Stream: Saugatuck River

Date of Inspection: 26 JULY 1978

BRIEF ASSESSMENT

Samuel P. Senior Dam is a linear concrete gravity structure, 990 feet long, with a 300-foot spillway located at the west end of the dam. The spillway is concaved looking downstream and consists of several steps on the downstream side. An earthen embankment section on the downstream side of the dam begins 61 feet below the top of dam and has slopes varying from 2:1 to 3:1. The dam is approximately 110 feet above the streambed. Approximately 2,000 feet northeast of the dam, a concrete gravity dike 670 feet long is provided. The structural height of the dike is 36 feet.

Based on the visual inspection of the site, review of available information and past performance of the dam, the dam is judged to be in good condition. There are surface patches of spalled concrete; however, no structural cracks were observed, nor was any visible evidence of abnormal settlements, heaving, deflections or lateral movements noted. The downstream berm is generally in good condition with no sloughing or wet spots noted. Based on the visual inspection of the site, review of available information and past performance of the dike, the dike is also judged to be in good condition. There are surface patches of spalled concrete; however, no structural cracks were observed, nor was any visible evidence of abnormal settlements, heaving, deflections or lateral movements noted.

The maximum spillway capacity at top of dam is 35 percent of the peak discharge rate of the test flood. Therefore, the test flood cannot be passed by the spillway without overtopping the dam. The overflow will be 2.7 feet above the top of the dam.

It is recommended that spalling at joints along the downstream face of the dam be repaired by the owner. Arrangements should be made to exercise the 48-inch blowoff periodically to ensure continued

serviceability. The owner should cut the trees and brush for a distance of 25 feet downstream of the dam and dike, ensuring that the tree roots are removed and the resulting holes are replaced with proper backfill. Because of the location of the dam, upstream of a populated area, round-the-clock surveillance should be provided during periods of high precipitation. The owner should develop a formal warning system and an operational procedure to follow in the event of an emergency.

Recommendations and remedial measures described should be implemented by the owner within 2 years after receipt of this Phase I Inspection Report.

S. Giavara, P.E.
Principal

Registered, CT 7634

This Phase I Inspection Report on Samuel P. Senior Reservoir Dam has been reviewed by the undersigned Review Board members. In our opinion, the reported findings, conclusions, and recommendations are consistent with the Recommended Guidelines for Safety Inspection of Dams, and with good engineering judgment and practice, and is hereby submitted for approval.

Charles G. Tiersch

CHARLES G. TIERSCH, Chairman
Chief, Foundation and Materials Branch
Engineering Division

Fred J. Ravens Jr.

FRED J. RAVENS, Jr., Member
Chief, Design Branch
Engineering Division

Saul Cooper

SAUL COOPER, Member
Chief, Water Control Branch
Engineering Division

APPROVAL RECOMMENDED:

Joe B. Fryar

JOE B. FRYAR
Chief, Engineering Division

PREFACE

This report is prepared under guidance contained in the recommended Guidelines for Safety Inspection of Dams, for Phase I Investigations. Copies of these guidelines may be obtained from the Office of Chief of Engineers, Washington, 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 continued care and inspection can there be any chance that unsafe conditions be detected.

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 reaonably 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 aid in determining the need for more detailed hydrologic and hydraulic studies, considering the size of the dam, its general condition and the downstream damage potential.

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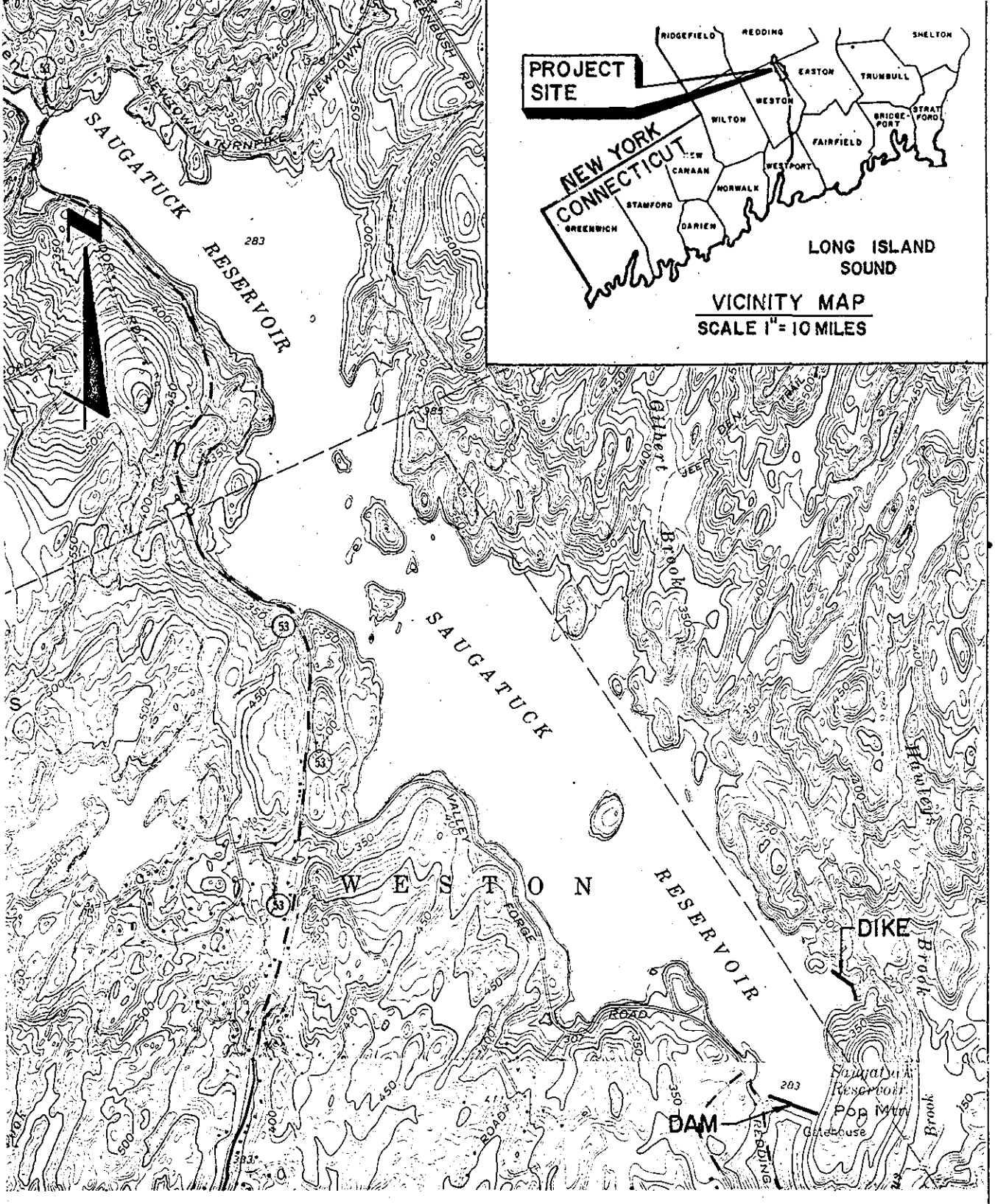


LOCATION MAP

SAUGATUCK RESERVOIR DAM AND POPPS MOUNTAIN DIKE

WESTON - EASTON , CONNECTICUT

SCALE IN FEET

2000 0 1000 2000

PHASE I INSPECTION REPORT
SAMUEL P. SENIOR DAM CT 00108

SECTION 1 - PROJECT INFORMATION

1.1 GENERAL:

a. Authority. Public Law 92-367, August 8, 1972, authorized the Secretary of the Army, through the Corps of Engineers, to initiate a national program of dam inspection through the United States. The New England Division of the Corps of Engineers has been assigned the responsibility of supervising the inspection of dams within the New England Region. Flaherty Giavara Associates, P.C. has been retained by the New England Division to inspect and report on selected dams in the State of Connecticut. Authorization and notice to proceed was issued to Flaherty Giavara Associates, P.C. under a letter of 25 April 1978 from Ralph T. Garver, Colonel, Corps of Engineers. Contract No. DACW33-78-0309 has been assigned by the Corps of Engineers for this work.

b. Purpose:

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

2) Encourage and assist the States to initiate quickly effective dam safety programs for non-federal dams.

3) To update, verify and complete the National Inventory of Dams.

1.2 DESCRIPTION OF PROJECT:

a. Description of Dam and Appurtenances. The Samuel P. Senior Dam, popularly known as the Saugatuck Reservoir Dam, is a linear concrete gravity structure, 990 feet long, with a 300-foot spillway located at the west end of the dam. The spillway is concaved looking downstream and consists of several steps on the downstream side whereupon the water is channeled into a 60-foot wide spillway channel until it discharges into the Saugatuck River some 400 feet downstream of the dam. An earthen embankment section on the downstream side of the dam begins at elevation 225, 61 feet below the top of dam, has a 16-foot wide top width and a 2:1 (horizontal) slope to elevation 200, then a 2-1/2:1 slope to elevation 190 and finally a 3:1 slope to elevation 182.

The top of the dam is about 11 feet wide, with a railing on both the upstream and downstream sides. The dam is approximately 110 feet above the streambed. An intake structure is located in the eastern portion of the dam, equipped with 6 48-inch influent sluice gates at various elevations. From the intake structure, a 36-inch pipe supplies water to the Bridgeport Hydraulic Company's facilities while a 48-inch lined tunnel can divert water to Hemlock Reservoir. Also, from the intake structure, a 48-inch blow off and 2 8-inch drains pass through the dam to a lower gate house and then terminate at a concrete endwall to discharge into the Saugatuck River. An additional 8-inch drain is provided between the lower gate house and this endwall. A linear concrete gravity dike 670 feet long north of the dam is also provided.

b. Location. The Samuel P. Senior Dam is located on the Saugatuck River, within the Connecticut Western Coastal Area in the Town of Weston. The dam is approximately 7 miles north of the Town of Westport. The concrete dike is about 2,000 feet north of the dam on the east side of reservoir in the Town of Easton.

c. Size Classification. The applicable guidelines indicate that for a large size classification the height of dam must be greater than or equal to 100 feet. The Samuel P. Senior Dam is 110 feet above the streambed. Therefore, the dam is classified as large. The applicable guidelines also indicate that for an intermediate category the storage (in acre-feet) for the impoundment must be greater than or equal to 1,000 and less than 50,000. The top of dike storage is 42,000 acre-feet and therefore the dike is classified as intermediate.

d. Hazard Classification. The dam is classified as having a high hazard potential. More than 100 houses are located in the area that could be affected by a dam failure flood wave. The same area would be affected by a dike failure flood wave.

e. Ownership. Samuel P. Senior Dam and Popps Mountain Dike are owned by the Bridgeport Hydraulic Company, having its headquarters in Bridgeport, Connecticut.

f. Purpose of Dam. The dam was constructed to form an impounding reservoir. The reservoir forms part of the water company's supply and distribution system, providing potable water to the residents of the Greater Bridgeport area. Draw-off water can also be diverted to Hemlock Reservoir as needed.

g. Design and Construction History. The dam and dike were built around 1941. They were designed by Clarence M. Blair, Inc. of New Haven, Connecticut. The Bridgeport Hydraulic Company constructed the dam and dike with its own forces.

h. Normal Operating Procedures. Water is withdrawn at various depths from the intake structure and then conveyed to the distribution system through a 36-inch supply pipe. When needed, water can also be withdrawn and diverted to Hemlock Reservoir through a lined tunnel. An 8" drain pipe in the intake structure is used to maintain a continuous flow in the Saugatuck River.

1.3 PERTINENT DATA:

a. Drainage Area -	34.6 sq. miles
b. Discharge at Dam Site -	
Maximum Known Flood	Unknown
Warm Water Outlet	Not Available
Div. Tunnel Low Pool Outlet	Not Available
Diversion Tunnel Outlet	Not Available
Gated Spillway	None
Ungated Spillway at Max. Pool	11,900 CFS @ 1 Ft. freeboard
Total Spillway Cap. at Max. Pool	15,600 CFS @ no freeboard
c. Elevation (above M.S.L.) -	
Top of Dam	286
Max. Design Pool	Not Available
Full Flood Control Pool	Not Available
Recreation Pool	Not Available
Spillway Crest Ungated	280
Upstream Portal Invert. Div. Tunnel	Not Available
Downstream Portal Invert. Div. Tunnel	Not Available
Streambed at Centerline of Dam	170±
Maximum Tailwater	Unknown
d. Reservoir -	
Length of Max. Pool	18,500 feet
Length of Recreation Pool	Not Applicable
Length of Flood Control Pool	Not Applicable
e. Storage -	
Recreation Pool	Not Applicable
Flood Control Pool	Not Applicable
Design Surcharge	Not Applicable
Top of Dam	42,000 Acre-Feet
f. Reservoir Surface (acres) -	
Top of Dam	Not Available
Max. Pool	Not Available
Flood Control Pool	Not Applicable
Recreation Pool	Not Applicable
Spillway Crest	868

g. Dam -

Type:	Linear concrete gravity
Length:	990 feet
Height:	130 feet
Top Width:	11 feet
Side Slopes:	Downstream: 1 vertical to 0.7 horizontal
	Upstream: 1 vertical to 0.05 horizontal
Impervious Core:	Not Applicable
Grout Curtain:	Unknown

h. Dike -

Type:	Linear concrete gravity
Length:	665 feet
Height:	36 feet
Top Width:	6'-8"
Side Slopes:	Downstream: 1 vertical to 0.65 horizontal
	Upstream: 1 vertical to 0.05 horizontal
Zoning:	Concrete
Impervious Core:	Not Applicable
Grout Curtain:	Unknown

h. Diversion and Regulating Tunnel -

Type:	Lined tunnel
Length:	1-1/2 miles
Diameter:	48 inch
Access:	Intake Structure
Regulation:	Sluice Gate

i. Spillway -

Type:	Ogee
Length of Weir:	295 feet
Crest Elevation:	280
Gates:	Ungated
Upstream Channel:	Reservoir
Downstream Channel:	Concrete
Spillway is founded on:	Bedrock

j. Regulating Outlets -

Gates:	None
Conduits:	36" diameter cast iron supply pipe
	48" diameter blow off pipe, cast iron

SECTION 2 - ENGINEERING DATA .

2.1 DESIGN:

The design of the dam and dike was made by Clarence M. Blair, Inc. of New Haven, Connecticut in 1939. Pertinent sections of the following information have been utilized in this report.

a. Bridgeport Hydraulic Co. Saugatuck Development-General Plan at Dam - 1939.

b. Bridgeport Hydraulic Co. Saugatuck Development - Contour Map of Dam Site - 1937.

c. Bridgeport Hydraulic Co. Saugatuck Development - Cross Sections of Dam and Spillway - 1937.

d. Bridgeport Hydraulic Co. Saugatuck Development - Plan of Gate House and Intakes - 1939.

e. Bridgeport Hydraulic Co. Saugatuck Dam Site - Results of Borings - March 15, 1920.

f. Bridgeport Hydraulic Co. - Core Drill Boring at Saugatuck River - undated.

g. Bridgeport Hydraulic Co. - Section proposed for Saugatuck Dam - 1937.

h. Bridgeport Hydraulic Co. Saugatuck Development - Plan of Dam at Notch - Popps Mountain - 1940.

The "As-Built" drawings for this project are on file at the State Library in Hartford, Connecticut. The basis of design for the project is unknown.

2.2 CONSTRUCTION:

Some construction records are available at the offices of the Bridgeport Hydraulic Company and in files maintained by the State Supervisor of Dam Maintenance in Hartford, Connecticut and a formal review of these records has been made. From the inspection report submitted by the Resident Engineer dated February 5, 1942, the following information was obtained:

> "In preparing the foundation, which was gneiss rock the overburden was first stripped and then the rock was excavated until a firm solid foundation was reached. The

depth of necessary excavation varied considerably over the length of the dam as shown by the profile. The greater part of the foundation sloped upward from the heel to the toe but where this condition did not exist the rock was drilled and blasted to present a very rough and uneven surface.

"Between the easterly end of the dam and the gate house, after excavation had been carried to an apparently sound foundation, twenty grout holes were drilled into which grout was forced under pressure. This work was done as an additional precaution to insure a sound foundation as more rock excavation had been necessary over this area to reach what seemed to be a good bottom."

"The aggregate for the concrete contained in the dam was obtained from a gravel deposit in the reservoir bottom, where a crushing, screening and washing plant was set up. The screened and washed material was hauled from this plant to the mixing plant in trucks. The sand used all passed a #4 square mesh and the stone was screened into three sizes, varying from 1/4" to 6". "

Two classes of concrete were mixed, one called Class A which was used on all exposed faces of the dam for a width of 5 to 7 feet and the other called Class B which was used on the interior of the dam. "Cylinders 6" x 12" were made each day from concrete taken from the forms [tested by the Pittsburg Testing Laboratory], which gave average strength of 2000# per square inch in 7 days and 4200# in twenty-eight days for Class A concrete and 1800# in seven days and 3700# in twenty-eight days for Class B concrete."

"The dam was built in sections forty feet long except at the ends where the lengths were 45 feet and 48 feet. The gate house section, 69 feet in length, was constructed in two equal halves. For water stops in the joints, keys 12" x 24" spaced 10 feet apart were set at the ends of each section. Concrete was deposited in forms 4'-2" high and each lift of this height was placed in three courses. Before concrete was placed on any rock surface or on any concrete already in place all dirt, laitance and other foreign matter was removed by thoroughly washing and cleaning the surface." Extraordinary attention was paid to this cleaning because it was considered most important. The spillway was constructed in the same general way as the dam.

"An earth embankment was placed against the downstream face of the dam to elevation 235. This was composed of material excavated from the dam foundation and from the spillway channel and consisted mostly of rock. Special care was taken to have coarse material against the dam itself in order to provide proper drainage."

The foundation for the Dike was prepared in the same manner as that of the dam and the concrete consisted of the same materials. Expansion joints with keys were provided at forty foot intervals and the concrete was placed in the forms in 1-1/2 yard batches after having been mixed at the same mixing plant utilized for the dam.

Construction of the dam was carried out by Bridgeport Hydraulic Company forces.

2.3 OPERATION:

No formal operation records are available.

2.4 EVALUATION:

a. Availability. Available data was reviewed by members of the inspection team and office personnel and found to be generally accurate and complete.

b. Adequacy. The data available is adequate for the purposes of a Phase I investigation.

c. Validity. There is no reason to question the validity of the available data.

SECTION 3 - VISUAL INSPECTION

3.1 FINDINGS:

a. General. The structure appears to be in good condition, except for surface patches of spalled concrete. No structural cracks were observed, nor was any visible evidence of abnormal settlements, heaving, deflections or lateral movements noted. The downstream berm is generally in good condition with no sloughing or wet spots noted. The berm appeared to be relatively shallow in the vicinity of the right and left abutments.

Overall the spillway appeared to be in good condition; a crack was noted at the crest of the spillway where it meets the training wall.

b. Dam.

1) Upstream Face - At or above the water line, slight spalling was evident. Generally the concrete was in good condition.

2) Downstream Face - There was evidence of wet spots, staining, efflorescence and joint spalling at nearly every construction joint. From Station 1+90 to Station 2+30 about 30 feet above the berm there was a horizontal line of efflorescence at a horizontal pour joint. In the panel between Station 3+45 to 3+85, about 10 feet up from the top of the berm, there are four drilled holes about 2 inches in diameter, depth undetermined, spaced 3 to 4 feet apart horizontally, which were dry but showed evidence of efflorescence (the purpose of these holes is unknown). There was quite a bit of spalling below the holes and some slight spalling above them. The joint at Station 3+85 was wet and stained from about the berm to a height of 35 feet. For about 20 feet from the top of berm, the joint was badly spalled and quite deteriorated.

3) Spillway - The concrete in the spillway and steps was found to be in generally good condition. A crack was noted at the crest of the spillway, where it meets the training wall. Some surface spalling of the concrete steps was observed.

4) Earth Embankment - The downstream embankment is generally in good condition with no sloughing or wet spots noted. The berm is 15 feet wide at the top of the slope and slopes toward the concrete dam. There is a depression at each joint of the dam. The depressions are filled with stone. The berm appeared to be relatively shallow in the vicinity of the right and left abutments.

Approximately 150 feet downstream of the toe of the downstream berm is an extensive area of dumped riprap adjacent to the blow-off outlet works. The riprap has been covered with a thin veneer of soil which has been eroded away in several locations.

Several large depressions, approximately 3' x 4', exist in the flat grassed area downstream from the earth berm approximately 125 feet in the vicinity of Station 3+0 and 3+50. The depressions vary in depth between 6" to 15". Another depression, 2' x 2' x 1' deep, was located approximately 50 feet down on the berm slope in the vicinity of Station 2+29. The origin of these depressions is not known.

No animal burrows were encountered on the slopes of the downstream embankment.

c. Appurtenant Structures.

1) Spillway Channel - The spillway channel is in good condition. Low concrete walls on the right and left side of the channel are also in good condition. Layered mica gneiss bedrock is exposed in the bottom of the spillway channel from the spillway weir to the large pool at the end of the left concrete training wall. A small amount of seepage was noted in the channel floor. A rock fall has occurred in the upper part of the channel from its east bank, however, it does not restrict flow. The blow-off discharge structure is in excellent condition.

2) Upper Gate House - This structure, located on upstream face of dam, was clean and neat. Gates are reportedly operated once a year, and were inspected by divers in 1977 with minor repair work required at stem guides. There are cracks in the brickwork in the northwest, west, and southwest walls. The cracks are wide enough to allow daylight through in some places. The building has 100 amp, 240 volt electrical service for lights and a deicer which is located adjacent to the spillway.

3) Lower Gate House - This structure, on the downstream side of the dam, is in good condition, but is subject to condensation and high humidity due to the cold water flowing in the pipes through the structure. It has 30 amp, 120 volt electrical service for lights, flow meters, and a furnace.

4) Concrete Gravity Dike (Popps Mountain) - Generally the dike is in good condition. Along the full length of the upstream face about 2 feet above the water line, scouring of the concrete has occurred.

At the top of the dike, at Station 1+80, there is a crack the full width of the dam and the lip or coping has deteriorated.

At Station 4+20 there is a crack adjacent to the joint for the full width, and at the upstream edge, the lip has spalled off.

At Station 4+63 at the top, a one foot wide strip several inches deep for the full width has deteriorated and spalled off, and the lip at the upstream face has also spalled off.

At Station 5+40, there is a crack adjacent to the joint the full width of the dike and on the downstream face, the lip has spalled off.

On the downstream face of the dike, at Station 1+80, from the top to about 4 feet down from the top there is a piece of concrete about one foot in width and several inches deep breaking away from the face.

Considerable tree growth and bushes exist in the filled area along the toe of the dike.

No evidence of seepage or wet areas were found along the toe of the dam from the right to left abutments. At approximately Station 1+25, a wet area exists approximately 100 feet east of the dam in a naturally occurring gully. There is a small amount of iron-stained seepage flowing north from this area. It is not evident whether the flow is from underneath the dam or naturally occurring drainage from the adjacent steep watershed area.

d. Reservoir Area. The reservoir perimeter has well vegetated banks at moderate to steep slopes. There was no evidence of slides or sloughing. No noticeable debris or obstructions were seen in the vicinity of the intake tower. The depth of sediment, and rate of accumulation in the reservoir, is unknown.

e. Downstream Channel. The open channel extending downstream from the junction of the 48" blow-off and spillway channels is in excellent condition. It has a bed of coarse gravel and cobbles, and there is no evidence of aggradation or recent degradation. The banks are partly lined with riprap, and are stable. Seepage was observed entering this channel between the spillway and blow-off channels. This clear water is apparently seeping from a bank of fill material overlying the original stream channel.

3.2 EVALUATION:

a. Dam. Visual observation revealed that the dam and attendant structures are structurally sound and that no immediate actions to remedy any serious problems should be taken. There was no visual indication of dam weakness.

b. Dike. Visual observations indicated that the dike was in good condition. Although spalling has occurred at several joints, this does not affect the stability of the dike.

SECTION 4 - OPERATIONAL PROCEDURES

4.1 PROCEDURES:

The dam 8" blow-off drain line is operated to maintain minimum flow of the Saugatuck River. The reservoir is used as a storage reservoir and is connected into the upper end of Hemlocks Reservoir through a tunnel about 1-1/2 miles long. Take off points from the reservoir are changed periodically.

4.2 MAINTENANCE OF DAM:

The dam, dike and associated structures are well maintained with a regular program of grass mowing and general maintenance in effect. Yearly routine inspections are carried out by Bridgeport Hydraulic Company staff. A consultant was hired to perform a cursory inspection of Bridgeport Hydraulic Company dams during November 1976.

4.3 MAINTENANCE OF OPERATING FACILITIES:

The operating valves were inspected recently; although the results of the inspection are not available, generally the valves/valve stems need some repair.

4.4 DESCRIPTION OF ANY WARNING SYSTEM IN EFFECT:

There was no warning system of any kind in effect at the time of the inspection.

4.5 EVALUATION:

The Samuel P. Senior Dam and dike, which are almost 40 years old, are well operated and maintained. Although not designed for rapid drawdown, it should be noted that, if the need should arise, drawdown could be effected by the following procedures:

a. Allowing for maximum discharge through the 48" blow-off and 8" drain line.

b. Allowing for maximum discharge through the 6' - 4" inside horseshoe shaped concrete tunnel to Hemlocks Reservoir.

The blow-off was not operated during the site inspection, therefore comments on the serviceability cannot be made. The valve should be tested on a periodic basis to insure that it could be operated if required.

SECTION 5 - HYDRAULICS/HYDROLOGY

5.1 EVALUATION OF FEATURES:

a. Design Data. There is no available information on the hydraulic design criteria for this dam and appurtenances. Under established criteria (OCE Guidelines) the recommended spillway design flood for size (large) and hazard potential (high) classification is the probable maximum flood (PMF). The PMF is the flood that may be expected from the most severe combination of critical meteorologic and hydrologic conditions that are reasonably possible in the region.

An estimate of the magnitude of the PMF at the site is based on an analysis of several sets of regional flood frequency data as presented in Appendix II.

As a conservative approach to the investigation, the more critical design PMF hydrograph was used throughout. The peak inflow rate of the PMF of 48,800 CFS was used as the test flood.

A stage-discharge relationship was calculated for the spillway and indicates the following flows, based upon a coefficient of 3.6 and an effective length of 295 feet.

Stage - Discharge Relationship

Stage	Head, Ft.	Discharge Rate, CFS
280	0	0
281	1	1,060
282	2	3,000
283	3	5,520
284	4	8,500
285	5	11,870
286	6	15,610

The maximum spillway capacity, with no freeboard, is equal to about 35 per cent of the peak discharge rate of the test flood. In order to determine the effect of the reservoir storage capacity, a hydrograph of the test flood was routed through the reservoir.

The hydrograph was formed by assuming the test flood had a duration of 24 hours, with the peak of 48,800 CFS occurring at 8 hours from the beginning of runoff. The rising and falling limbs of the hydrograph were assumed to be changing at a constant rate, forming a triangle. The routing operation indicated that the peak rate of discharge would be reduced to 46,000 CFS, resulting in a stage elevation of 288.7 feet.

b. Experience Data. During the flood of October 15 - 17, 1955, the dam was not overtopped. United States Geologic Survey information indicates that the flow of October 16, 1955 had a peak rate of 7,100 CFS, which is the maximum flood of record for the Saugatuck River.

c. Visual Observations. The on-site inspection of the dam provided the data for the hydraulic evaluation of the spillway.

d. Overtopping Potential. The elevation-discharge relations indicate that the test flood would not be passed by the spillway without overtopping the dam. The spillway capacity is about 35 per cent of the test flood, and the stage would be 2.7 feet above the top of the dam and dike.

SECTION 6 - STRUCTURAL STABILITY

6.1 EVALUATIONS OF STRUCTURAL STABILITY:

a. Visual Observations. No evidence was observed that would indicate structural instability of the dam and dike.

b. Design and Construction Data. The design and construction data available are not sufficient to formally evaluate the stability of the dam and dike.

c. Operating Records. There are no available records which indicate evidence of stability problems since the dam and dike were constructed in the early 1940's. As the Samuel P. Senior dam has been designed and constructed as a water supply dam and has been subjected to a full head of water a majority of the time since construction, its stability could be considered to be adequate based on past performance.

d. Post-Construction Changes. The bridge that provided access to the dam site, across the spillway section, has been removed.

e. Seismic Stability. This dam is in Seismic Zone 1 and, in accordance with recommended Phase I guidelines, does not warrant seismic analysis.

SECTION 7 - ASSESSMENT, RECOMMENDATIONS AND REMEDIAL MEASURES

7.1 DAM ASSESSMENT:

a. Condition. Based on the visual inspection, records available and past operational performance, the dam is judged to be in good condition.

The project will not pass the test flood without overtopping the dam, and therefore the spillway capacity is inadequate. The spillway capacity is judged seriously inadequate, as the project will not pass one-half the test flood without overtopping the dam.

b. Adequacy of Information. The information available is such that the assessment of the safety of the dam must be based primarily on the visual inspection and past operational performance of the structure.

c. Urgency. The recommendations and remedial measures should be implemented by the owner within 2 years after receipt of this report.

d. Need for Additional Investigation. Additional investigations to further assess the adequacy of the dam do not appear necessary. However, it appears that detailed investigations should be initiated by the owner to determine requirements for obtaining additional spillway capacity.

7.2 RECOMMENDATIONS:

It is recommended that the following measures be undertaken by the owner:

1) Spalling at joints along the downstream face should be repaired.

7.3 REMEDIAL MEASURES:

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

a. Alternatives. Not applicable.

b. Operation and Maintenance and Procedures.

1) Arrangements should be made to exercize the 48" blow-off periodically to ensure continued serviceability.

2) The owner should cut the trees and brush for a distance of 25 feet downstream of the dam and dike, ensuring that the tree roots are removed and the resulting holes are replaced with proper backfill.

3) Because of the location of the dam, upstream of a populated area, round the clock surveillance should be provided during periods of high precipitation.

4) The owner should develop a formal warning system. An operational procedure to follow in the event of an emergency should also be adopted.

5) The owner should provide continued periodic inspections at a two year frequency.

APPENDIX A

VISUAL INSPECTION - CHECK LIST

PERIODIC INSPECTION CHECK LIST

:T Samuel P. Senior Dam — DATE July 26, 1978

:TOR Anthony D. Rummo — DISCIPLINE Structural

:TOR Robert C. Smith — DISCIPLINE Project Manager

AREA EVALUATED	CONDITION
:TE DAM STRUCTURE	
:ral Condition Concrete ırfaces	The condition of concrete is good.
:ment or Settlement of 'est	No noticeable movement of dam crest or side slopes.
:ical Alignment	Good horizontal and vertical alignment.
.zontal Alignment	
:ition at Abutment and :her Structures	
ıctural Cracking	None
.ling	Slight surface spalling D/S face.
.ble Reinforcing	
:ing or Staining of ncrete	Slight staining of several joints.
:ition of Monolith/ nstruction Joints	Good
ns - Foundation, int, Faces	None observed.
Seepage or Efflorescence	Some efflorescence observed.
ıdation Damage, Undermining	None observed.
:r Passages	Spillway in good condition, minor spalling.
:ments	

PERIODIC INSPECTION CHECK LIST

Samuel P. Senior Dam — DATE July 26, 1978

OR Richard F. Murdock — DISCIPLINE Geotechnical

OR Robert C. Smith — DISCIPLINE Project Manager

AREA EVALUATED	CONDITION
EMBANKMENT	
. Elevation	286
ent Pool Elevation	279
ium Impoundment to Date	
ace Cracks	
ent Condition	
ent or Settlement of est	
al Movement	None
cal Alignment	Good
ontal Alignment	Good
ition at Abutment and at ncrete Structures	Good
cations of Movement of uctural Items on Slopes	None
passing on Slopes	
ghing or Erosion of opes or Abutments	Some minor surface erosion on west slope of dam.
Slope Protection - prap Failures	None
ual Movement or Cracking or near Toes	None
ual Embankment or Down-ream Seepage	None

PERIODIC INSPECTION CHECK LIST

Samuel P. Senior Dam — DATE July 26, 1978

OR Richard F. Murdock — DISCIPLINE Geotechnical

OR Robert C. Smith — DISCIPLINE Project Manager

AREA EVALUATED	CONDITION
MBANKMENT - (continued)	
g or Boils	None
ation Drainage Features	None
rains	None
umentation System	None

PERIODIC INSPECTION CHECK LIST

Popps Mountain Dike	DATE July 26, 1978
OR Richard F. Murdock	DISCIPLINE Geotechnical
OR Robert C. Smith	DISCIPLINE Project Manager

AREA EVALUATED	CONDITION
EMBANKMENT	
: Elevation	286
ent Pool Elevation	279
num Impoundment to Date	
ace Cracks	
nent Condition	
nent or Settlement of est	
cal Movement	
ical Alignment	
zontal Alignment	
ition at Abutment and at ncrete Structures	
cations of Movement of ructural Items on Slopes	None
passing on Slopes	
ghing or Erosion of opes or Abutments	None
Slope Protection - prap Failures	None
ual Movement or Cracking or near Toes	None
ual Embankment or Down-ream Seepage	Seepage observed at Station 1+0, approximately 100 ft. downstream of dam.

PERIODIC INSPECTION CHECK LIST

Popps Mountain Dike — DATE July 26, 1978

OR Richard F. Murdock — DISCIPLINE Geotechnical

OR Robert C. Smith — DISCIPLINE Project Manager

AREA EVALUATED	CONDITION
EMBANKMENT - (continued)	
g or Boils	None
ation Drainage Features	None
rains	None
umentation System	None

PERIODIC INSPECTION CHECK LIST

:T Popps Mountain Dike — **DATE** July 26, 1978

:TOR Anthony D. Rummo — **DISCIPLINE** Structural

:TOR Robert C. Smith — **DISCIPLINE** Project Manager

AREA EVALUATED	CONDITION
ETE DAM STRUCTURE	
eral Condition Concrete urfaces	The concrete in dike is in good condition.
ement or Settlement of rest	None observed.
tical Alignment	Good alignment.
izontal Alignment	
dition at Abutment and ther Structures	Excellent
uctural Cracking	None
lling	Some surface spalling observed at top of dike.
ible Reinforcing	
ting or Staining of oncrete	None
dition of Monolith/ onstruction Joints	Good
ins - Foundation, oint, Faces	
Seepage or Efflorescence	Very slight
ndation Damage, Undermining	None
er Passages	None
tments	

PERIODIC INSPECTION CHECK LIST

T Samuel P. Senior Dam DATE July 26, 1978

TOR James MacBroom DISCIPLINE Hydraulics/Hydrology

TOR _____ DISCIPLINE _____

AREA EVALUATED	CONDITION
WORKS - INTAKE CHANNEL AND KE STRUCTURE	
proach Channel	
Slope Conditions	
Bottom Conditions	
Rock Slides or Falls	
Log Boom	
Debris	
Condition of Concrete Lining	
Drains or Weep Holes	
take Structure	
Condition of Concrete	Good condition, slight spalling at water line.
Stop Logs and Slots	Good condition.

PERIODIC INSPECTION CHECK LIST

T Samuel P. Senior Dam **DATE** July 26, 1978

TOR James MacBroom **DISCIPLINE** Hydraulics/Hydrology

TOR _____ **DISCIPLINE** _____

AREA EVALUATED	CONDITION
' WORKS - CONTROL TOWER	
ncrete and Structural	
General Condition	
Condition of Joints	
Spalling	
Visible Reinforcing	
Rusting or Staining of Concrete	
Any Seepage or Efflorescence	
Joint Alignment	
Unusual Seepage or Leaks in Gate Chamber	
Cracks	
Rusting or Corrosion of Steel	
echanical and Electrical	
Air Vents	
Float Wells	
Crane Hoist	
Elevator	
Hydraulic System	

PERIODIC INSPECTION CHECK LIST

CT Samuel P. Senior Dam — DATE July 26, 1978

CTOR James MacBroom — DISCIPLINE Hydraulics/Hydrology

CTOR _____ — DISCIPLINE _____

AREA EVALUATED	CONDITION
T WORKS - CONTROL TOWER (continued)	
Service Gates	Good condition
Emergency Gates	Unknown
Lightning Protection System	Good condition
Emergency Power System	
Wiring and Lighting System In Gate Chamber	

PERIODIC INSPECTION CHECK LIST

CT Samuel P. Senior Dam, DATE July 26, 1978

CTOR Richard F. Murdock DISCIPLINE Geotechnical

CTOR James MacBroom DISCIPLINE Hydraulics/Hydrology

AREA EVALUATED	CONDITION
T WORKS - SPILLWAY WEIR, ROACH AND DISCHARGE CHANNELS	
pproach Channel	Underwater (Reservoir)
General Condition	
Loose Rock Overhanging Channel	
Trees Overhanging Channel	
Floor of Approach Channel	
eir and Training Walls	
General Condition of Concrete	Good condition
Rust or Staining	None
Spalling	
Any Visible Reinforcing	None
Any Seepage or Efflorescence	None
Drain Holes	Some drainage of drain holes.
ischarge Channel	
General Condition	
Loose Rock Overhanging Channel	
Trees Overhanging Channel	A few large healthy trees present.
Floor of Channel	Good - bedrock surfaces.
Other Obstructions	None

PERIODIC INSPECTION CHECK LIST

:T Samuel P. Senior Dam DATE July 26, 1978

:TOR James MacBroom DISCIPLINE Hydraulics/Hydrology

:TOR DISCIPLINE

AREA EVALUATED	CONDITION
: WORKS - OUTLET STRUCTURE OUTLET CHANNEL	
ɜral Condition of Concrete	
: or Staining	
ɬling	
ɜion or Cavitation	
ɬble Reinforcing	
Seepage or Efflorescence	
ɪition at Joints	
in Holes	
ɪnel	
ɔose Rock or Trees Over-hanging Channel	No trees or loose rock over-hanging channel.
ɔndition of Discharge Channel	The channel is in excellent condition.

APPENDIX B

ENGINEERING DATA

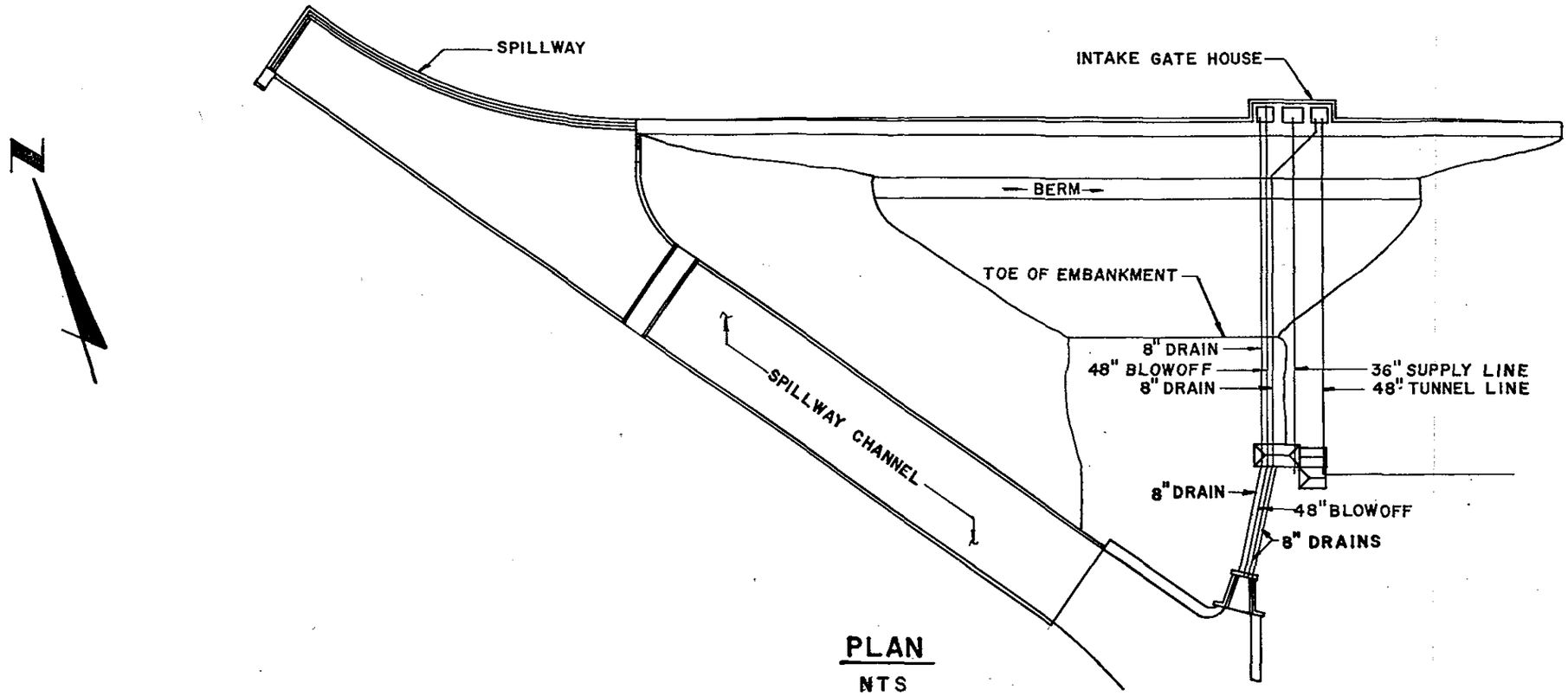
ENGINEERING DATA
DESIGN, CONSTRUCTION, OPERATION
PHASE I

I.D. NO. CT 00108

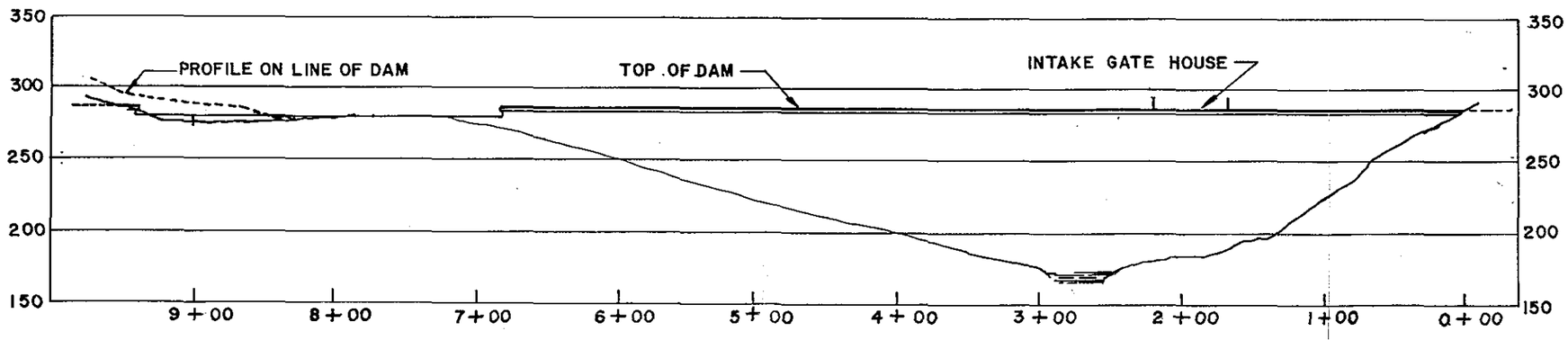
ITEM	REMARKS
AS-BUILT DRAWINGS	Conn. State Library - Hartford
REGIONAL VICINITY MAP	Available From U.S.G.S.
CONSTRUCTION HISTORY	Records State D.E.P. and Bridgeport Hydraulic Co.
TYPICAL SECTIONS OF DAM	Available From Plans
OUTLETS - Plan	From Plans
- Details	From Plans
- Constraints	Unknown
- Discharge Ratings	Unavailable
RAINFALL/RESERVOIR RECORDS	From Bridgeport Hydraulic Co.
DESIGN REPORTS	None
GEOLOGY REPORTS	None
DESIGN COMPUTATIONS	None
HYDROLOGY & HYDRAULICS	None
DAM STABILITY	Available From Plan
SEEPAGE STUDIES	None
MATERIALS INVESTIGATIONS	None
BORINGS RECORDS	From Plan
LABORATORY	None
FIELD	None

DESIGN, CONSTRUCTION, OPERATION I.D. NO. CT 00108
PHASE I

ITEM	REMARKS
POST-CONSTRUCTION SURVEYS OF DAM	None
BORROW SOURCES	Construction Records
MONITORING SYSTEMS	None
MODIFICATIONS	Unknown
HIGH POOL RECORDS	Approximate From Bridgeport Hydraulic Co. Records
POST-CONSTRUCTION ENGINEERING STUDIES AND REPORTS	None
PRIOR ACCIDENTS OR FAILURE OF DAM DESCRIPTION REPORTS	None
MAINTENANCE OPERATION RECORDS	Inspection Reports From Bridgeport Hydraulic Co.
SPILLWAY PLAN	
SECTIONS	Plans
DETAILS	Plans
OPERATING EQUIPMENT PLANS & DETAILS	Plans

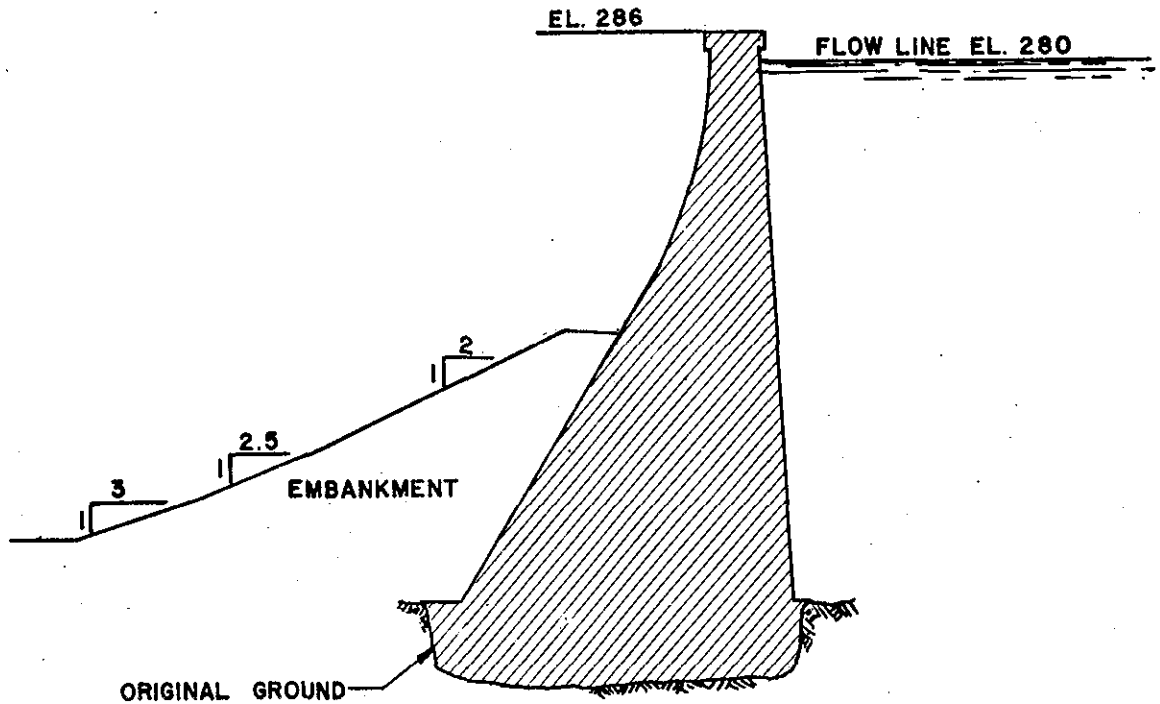


PLAN
NTS



DOWNSTREAM ELEVATION OF DAM
NTS

SAMUEL P. SENIOR DAM
SAUGATUCK RIVER



CROSS SECTION OF DAM

NTS

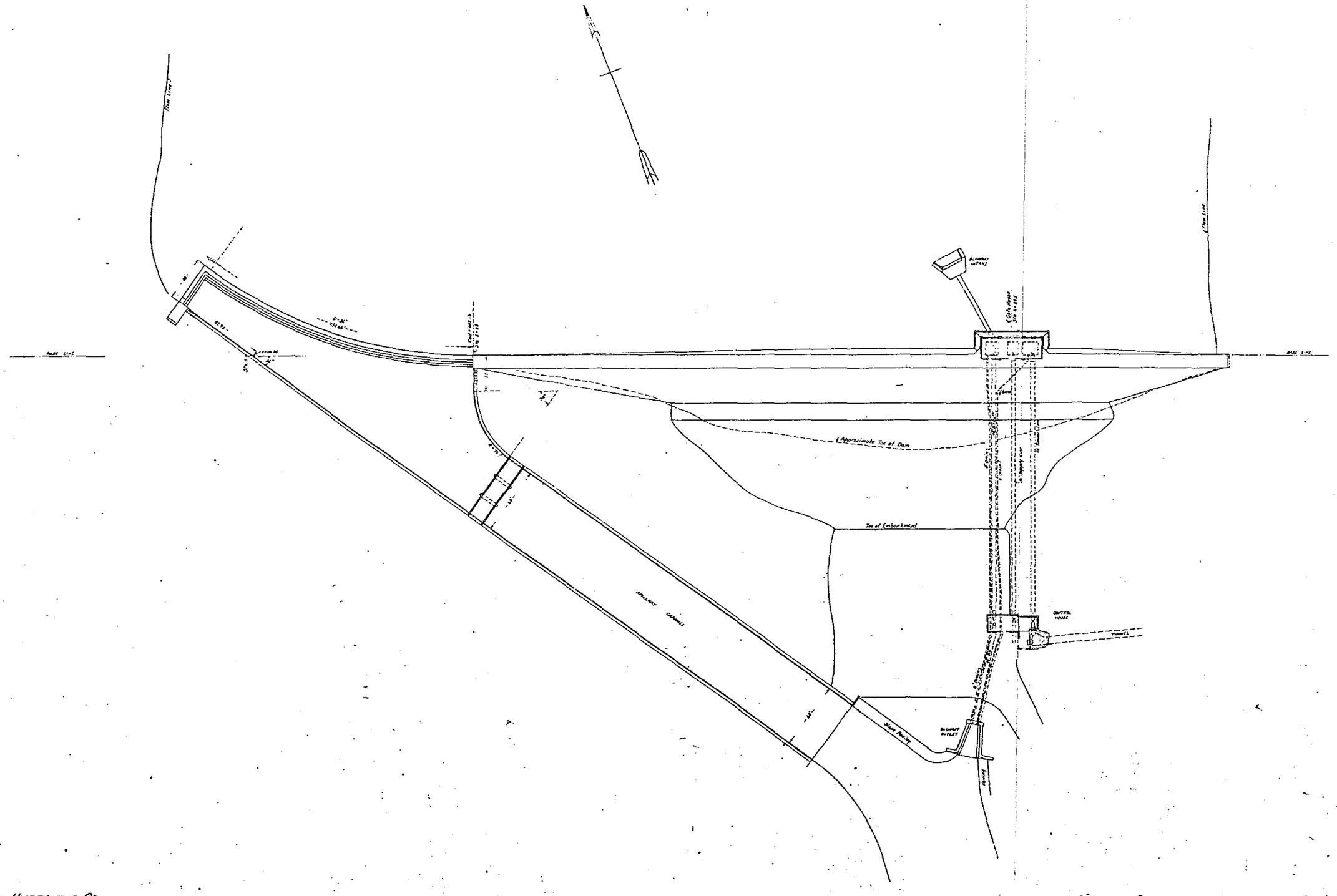
SAMUEL P. SENIOR DAM

SAUGATUCK RIVER

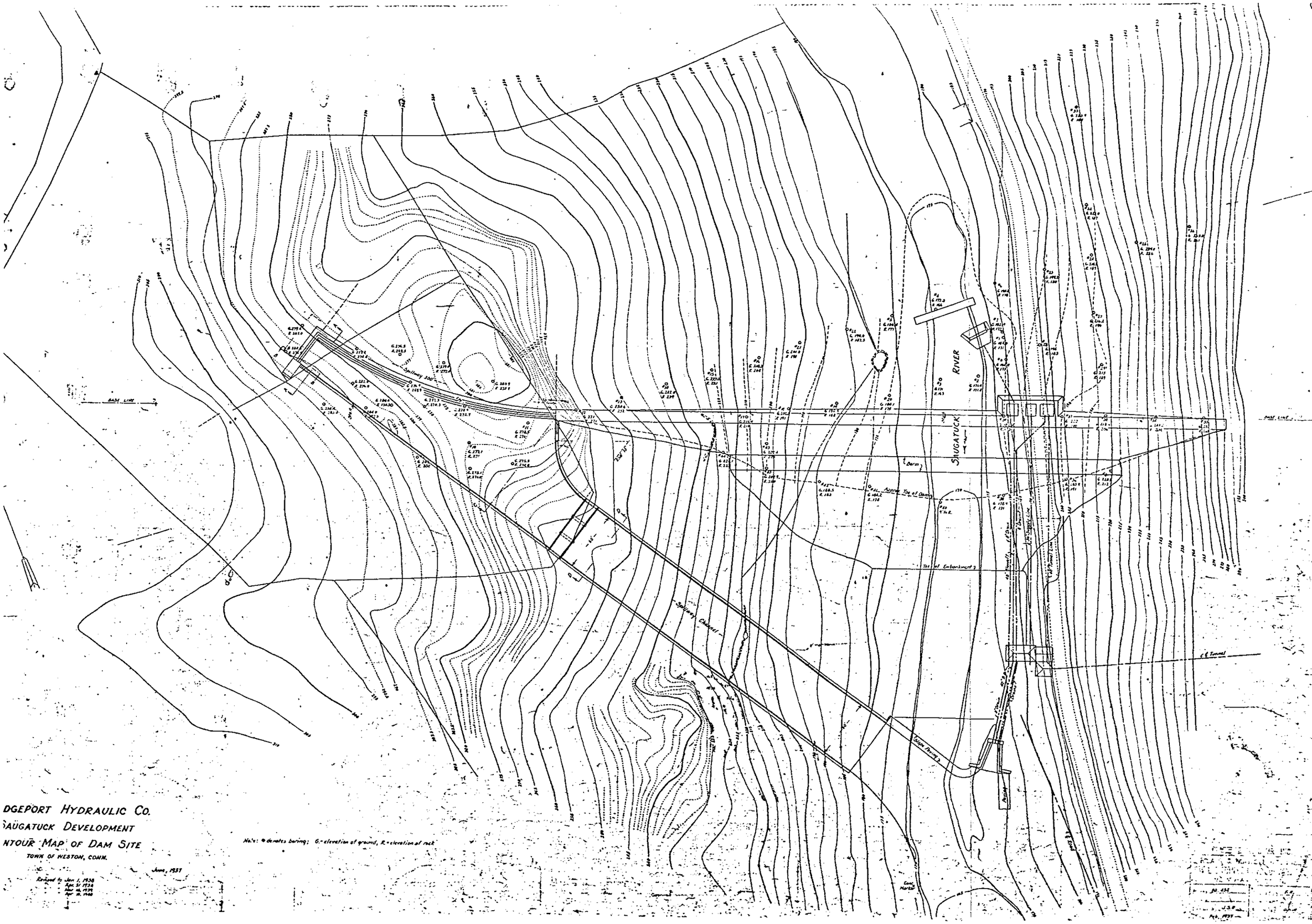
BRIDGEPORT HYDRAULIC CO.
SAUGATUCK, DEVELOPMENT
GENERAL PLAN AT DAM
TOWN OF WESTON, CONN.

March, 1931

Revised to Feb 1, 1932
Apr 16, 1932



CLARENCE M. BLAIR
ENGINEERS & SUPERINTENDENTS
NEW YORK



DGEPORT HYDRAULIC CO.

SAUGATUCK DEVELOPMENT

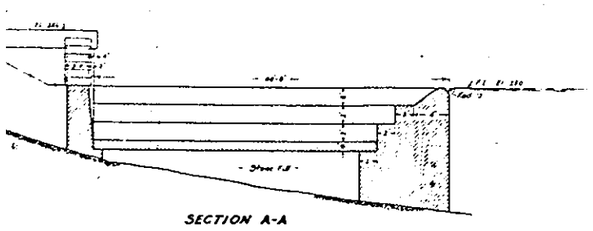
NTOUR MAP OF DAM SITE

TOWN OF WESTON, CONN.

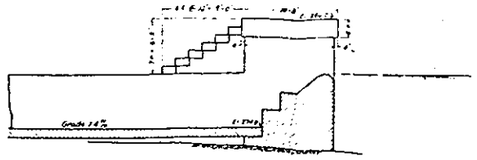
June, 1937

Revised to Jan. 1, 1938
Apr. 21, 1938
Apr. 28, 1939
Apr. 26, 1940

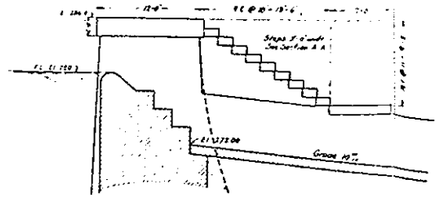
Note: ⊕ denotes boring; E.= elevation of ground, R.= elevation of rock



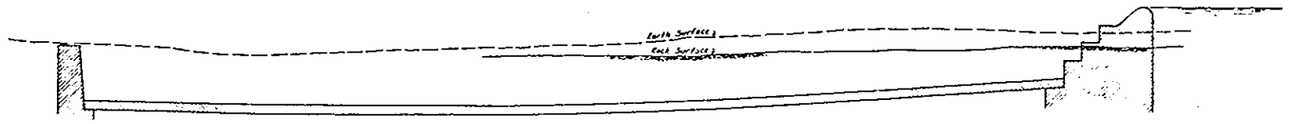
SECTION A-A



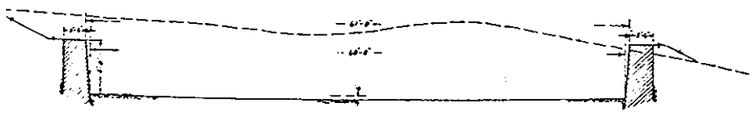
SECTION B-B



SECTION E-E



SECTION C-C

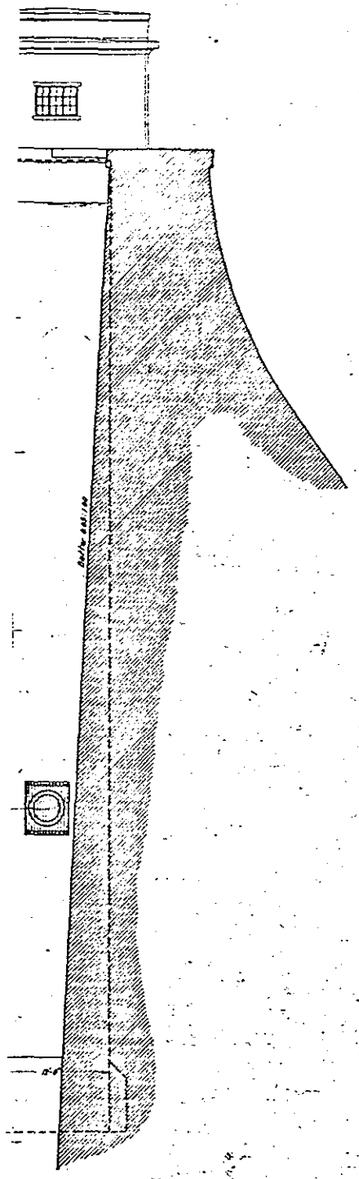


SECTION D-D

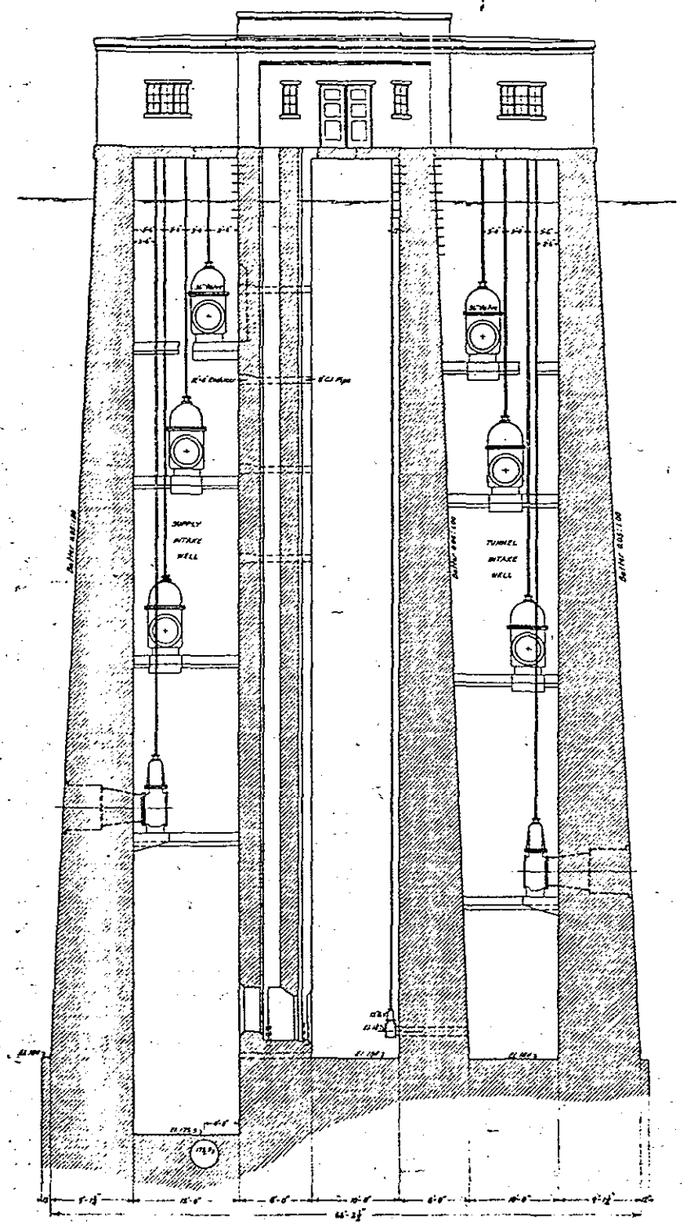
CROSS SECTION OF DAM

N.T. Inc.,
JAVEYORS.
ORK
by ER
ed by —
ed SHH

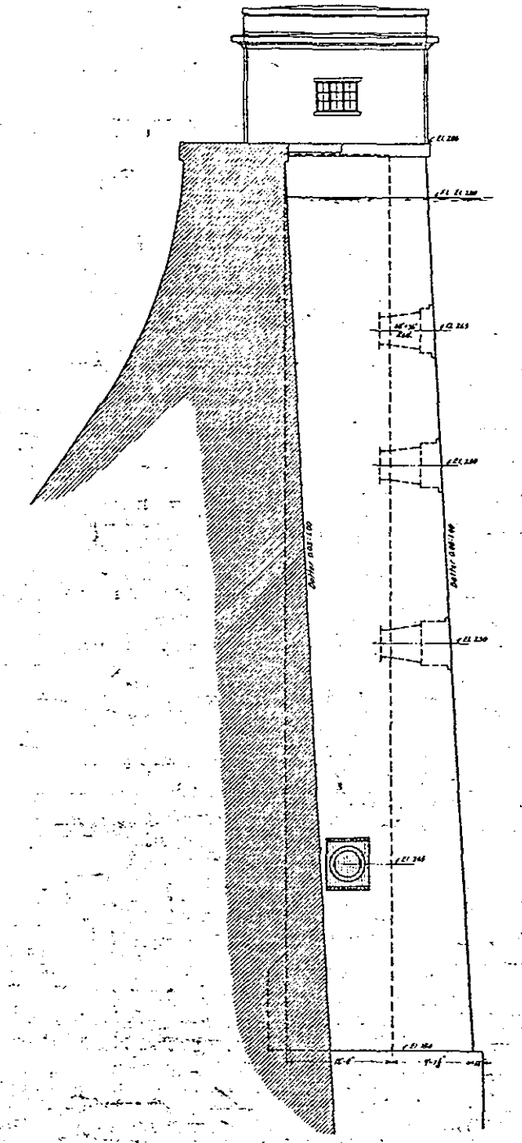
BRIDGEPORT HYDRAULIC CO.
SAUGATUCK DEVELOPMENT
CROSS SECTIONS OF DAM AND SPILLWAY
TOWN OF WESTON, CONN.
Scale 1"=1'
August, 1937
Revised to Nov 2, 1937
Nov 7, 1937



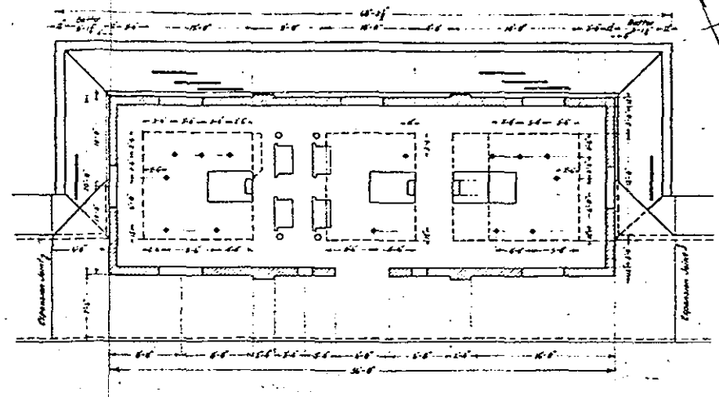
TION LOOKING EAST



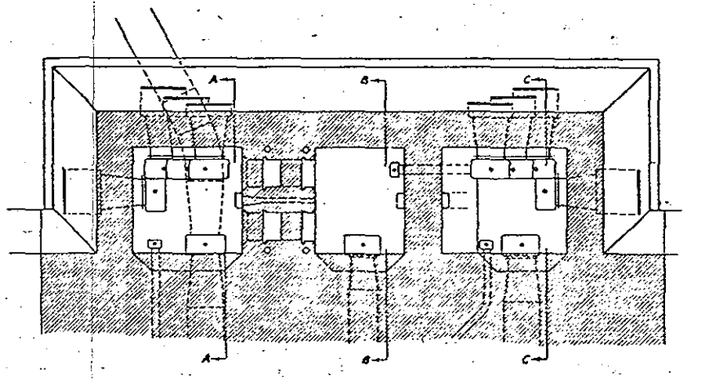
SECTIONAL ELEVATION LOOKING UPSTREAM



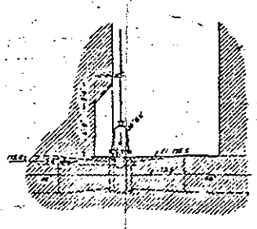
ELEVATION LOOKING WEST



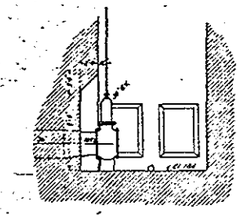
FLOOR PLAN



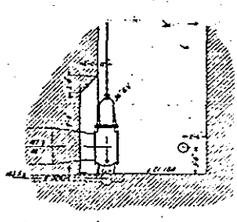
SECTIONAL PLAN SHOWING WELLS



SECTION A-A

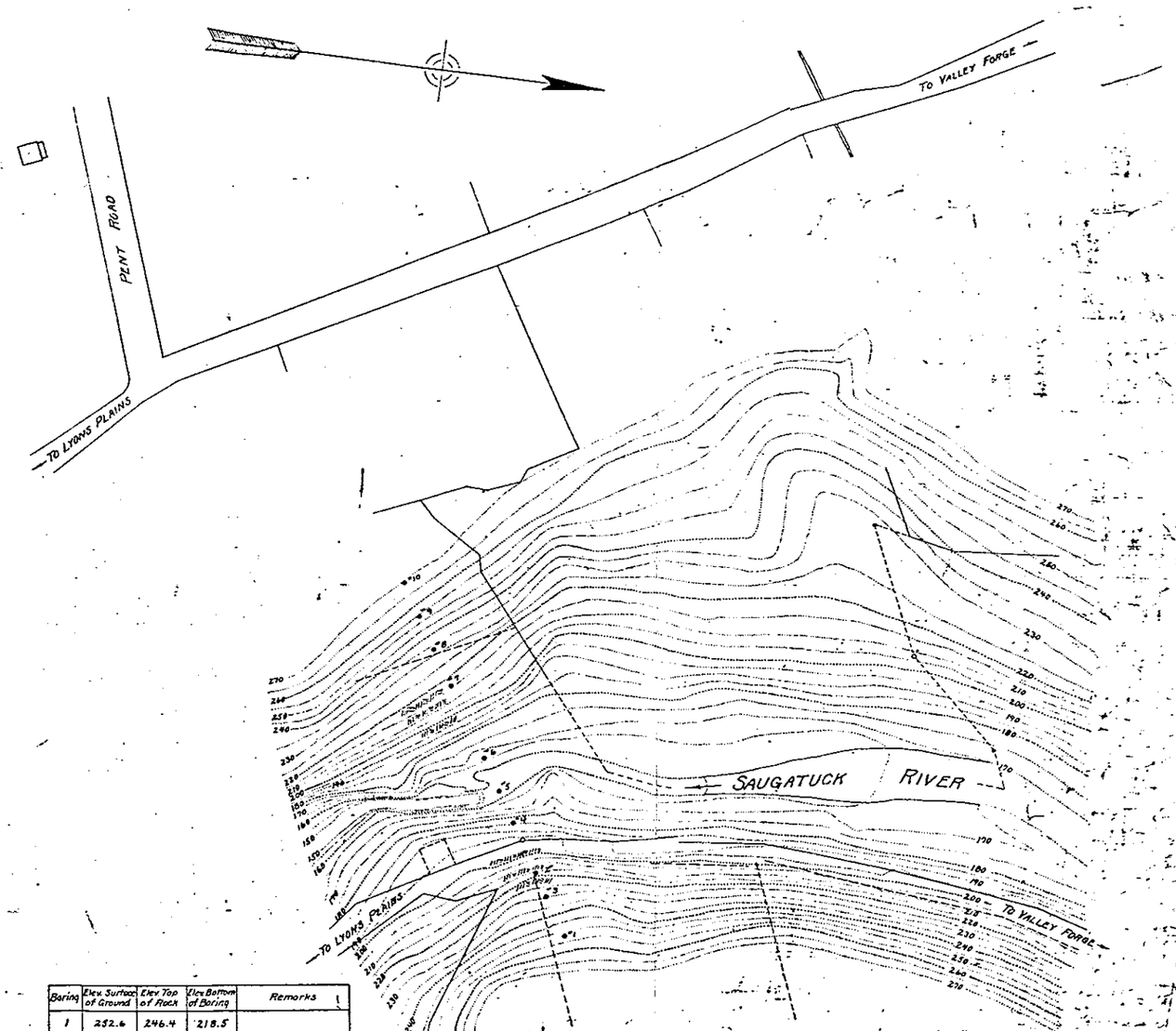


SECTION B-B



SECTION C-C

BRIDGEPORT HYDRAULIC CO.
SAUGATUCK DEVELOPMENT
PLAN OF GATE HOUSE AND INTAKES
TOWN OF WESTON, CONN.
Scale 1/4" = 1'
October, 1929
Revised to March 1, 1930



Boring	Elev. Surface of Ground	Elev Top of Rock	Elev Bottom of Boring	Remarks
1	252.6	246.4	218.5	
2	219.0	218.0	188.0	Lost water in seam El. 200, not regained
3	230.5	227.6	200.4	Lost water at Elev. 215 regained it at Elev. 214
4	188.0	177.0	147.0	
5	159.5	158.0	121.0	Soft rock from Elev. 158 to Elev. 148
6	163.0	160.4	130.4	
7	213.6	211.2	184.4	Seamy from Elev. 211 to Elev. 197
8	229.0	216.0	186.0	Lost water Elev. 212
9	251.6	238.5	208.5	Lost water Elev. 228
10	273.0	269.4	239.6	Lost water Elev. 260

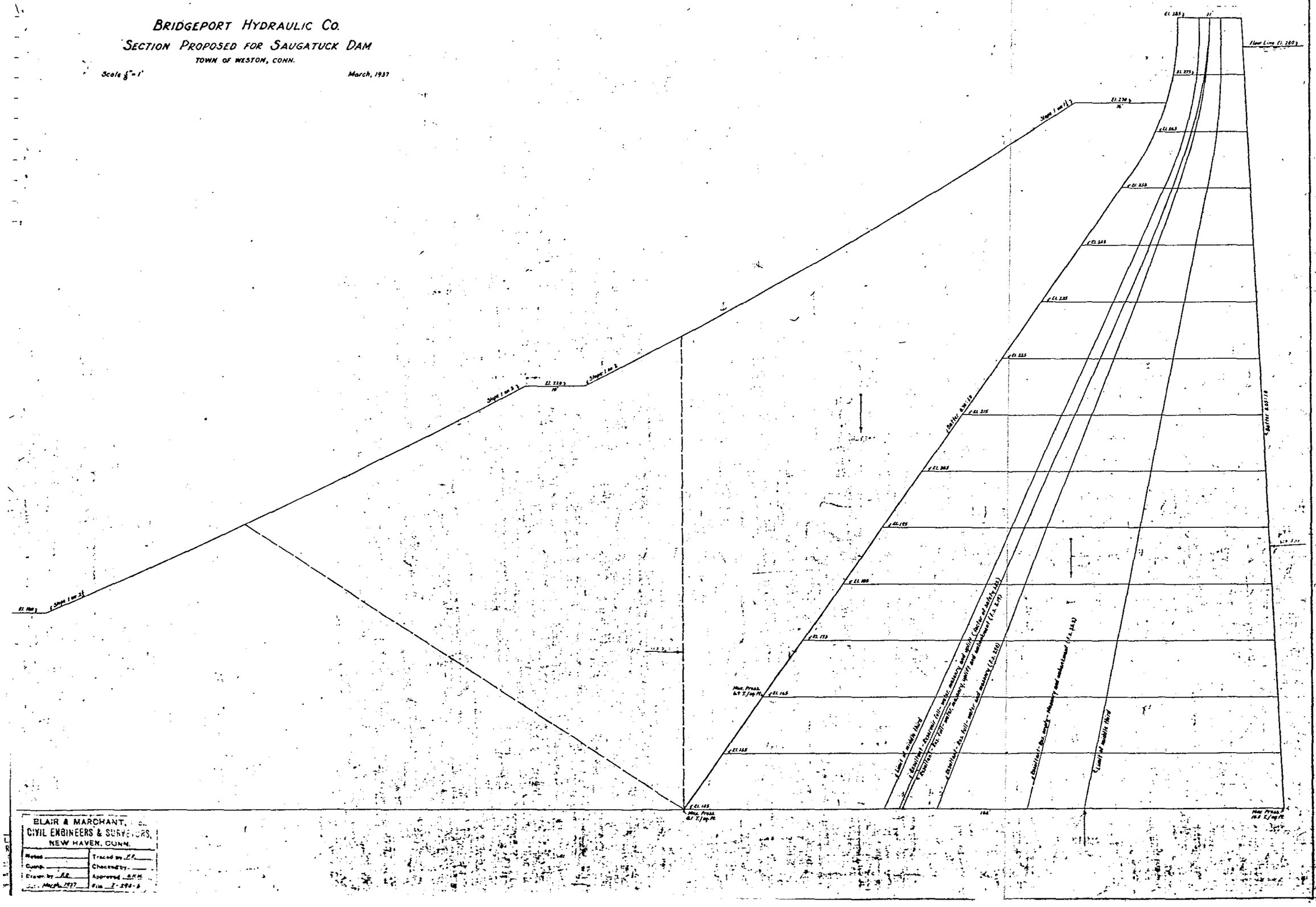
BRIDGEPORT HYDRAULIC CO.
SAUGATUCK DAM SITE
TOWN OF WESTON, CONN.
SCALE 1"=100' MARCH 15, 1920.

BRIDGEPORT HYDRAULIC CO.

SECTION PROPOSED FOR SAUGATUCK DAM

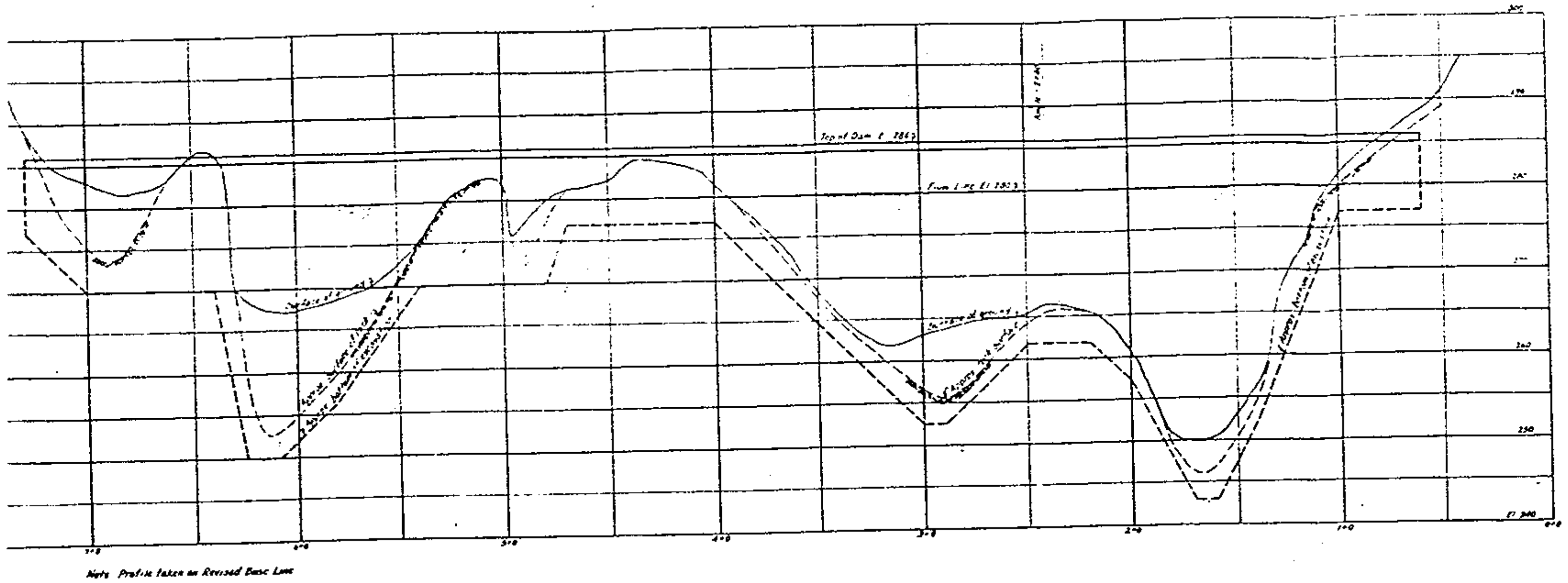
TOWN OF WESTON, CONN.

Scale $\frac{1}{8}$" = 1' March, 1937

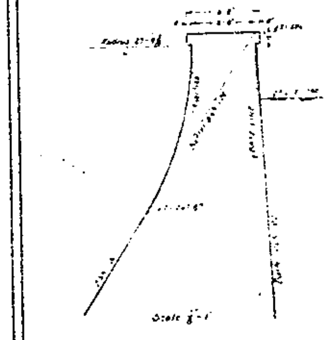


BLAIR & MARCHANT, Inc.
CIVIL ENGINEERS & SURVEYORS,
NEW HAVEN, CONN.

Horiz. ____	Traced by J.F.
Comp. ____	Checked by ____
Drawn by J.R.	Approved B.K.M.
March, 1937	File 1-296-6

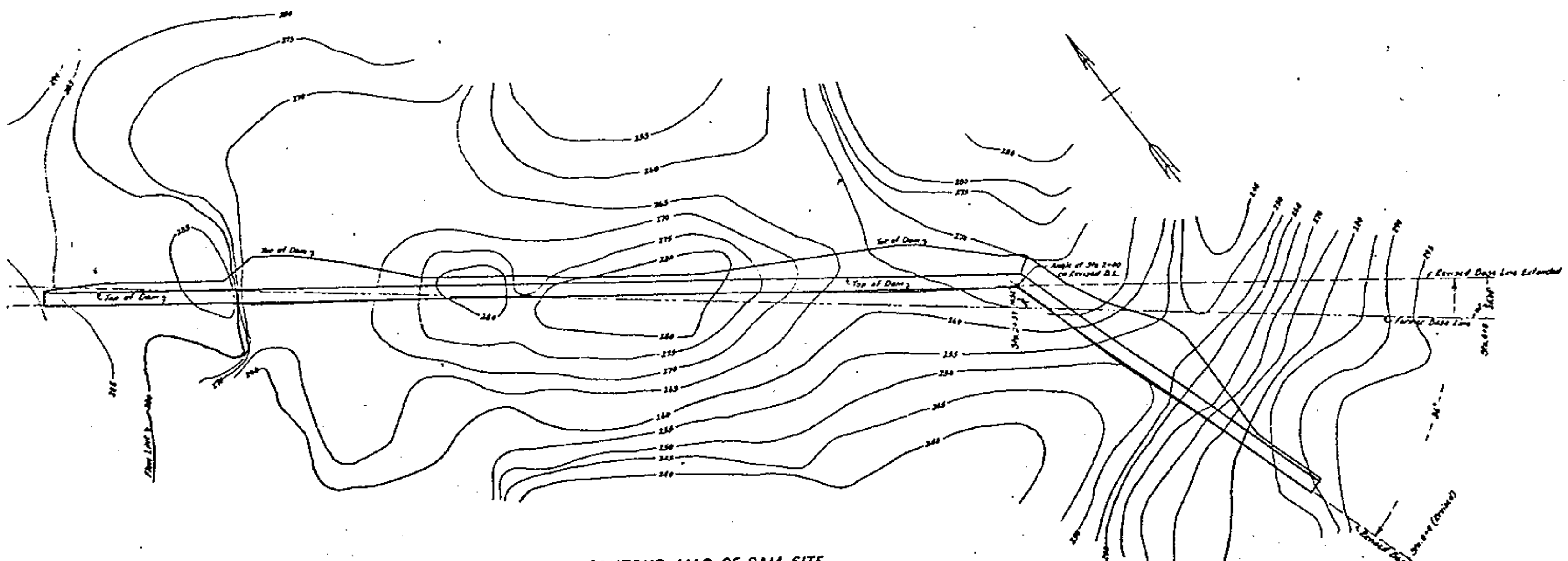


PROFILE OF DAM
Scales: Hor 1"=40'
Vert 1"=10'

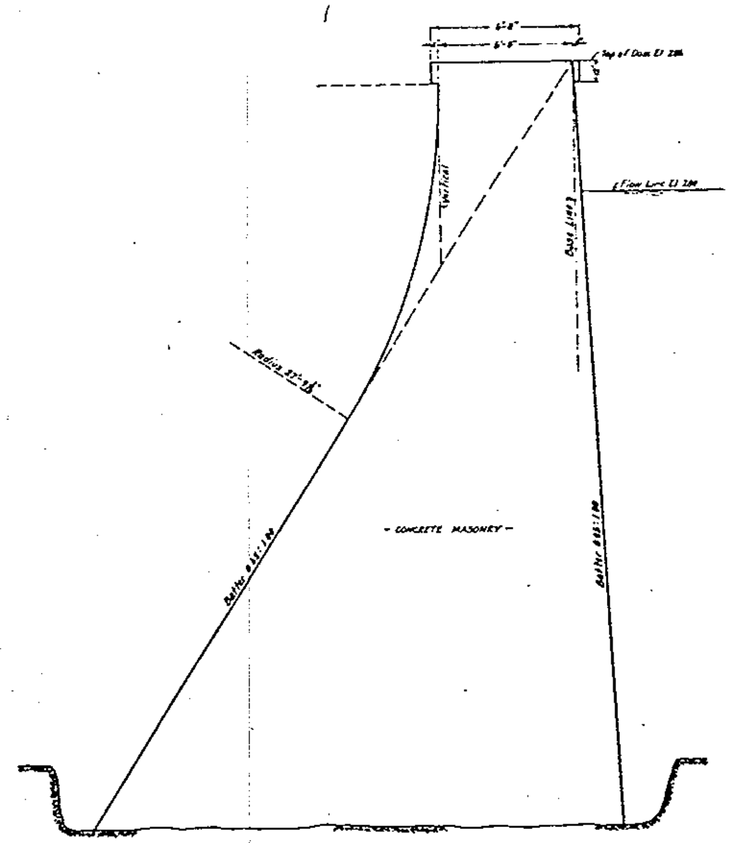


BRIDGEPORT HYDRAULIC CO.
DAM AT NOTCH
TABLE OF WIDTHS AND TOTAL VOLUMES
FOR SECTION OF DAM ONE FOOT LONG
TOWN OF WESTON, CONN
Jan., 1940

Distance below top	Elev	Offset base line to face	Offset base line to back	Bottom width of section	Volume cubic yards per lin ft
0	286	0.333	6.333	6.667	
[illegible]	285	[illegible]	[illegible]	[illegible]	[illegible]
2	284	[illegible]	6.42	[illegible]	[illegible]
3	283	[illegible]	[illegible]	[illegible]	[illegible]
4	282	[illegible]	6.16	6.36	[illegible]
[illegible]	[illegible]	[illegible]	6.29	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	6.45	[illegible]	[illegible]
[illegible]	[illegible]	0.35	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	275	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	274	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	12.60	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	13.30	[illegible]
20	266	1.00	[illegible]	14.00	[illegible]
21	265	1.05	13.65	14.70	7.204
22	264	1.10	14.30	15.40	7.561
23	263	1.15	14.95	16.10	8.144
24	262	1.20	15.60	16.80	8.754
25	261	1.25	16.25	17.50	9.359
26	260	1.30	[illegible]	[illegible]	[illegible]
27	259	1.35	[illegible]	[illegible]	[illegible]
28	258	1.40	[illegible]	[illegible]	[illegible]
29	[illegible]	1.45	[illegible]	[illegible]	[illegible]
30	256	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	255	1.55	[illegible]	[illegible]	[illegible]
32	254	[illegible]	[illegible]	[illegible]	[illegible]
33	253	[illegible]	[illegible]	[illegible]	[illegible]
34	252	[illegible]	[illegible]	[illegible]	[illegible]
35	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
42	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]



CONTOUR MAP OF DAM SITE
Scale 1"=40'



CROSS SECTION OF DAM
Scale 1/4"=1'

BRIDGEPORT HYDRAULIC CO.
SAUGATUCK DEVELOPMENT
PLAN OF DAM AT NOTCH – POPPS MOUNTAIN
TOWN OF WESTON, CONN.

Scales indicated

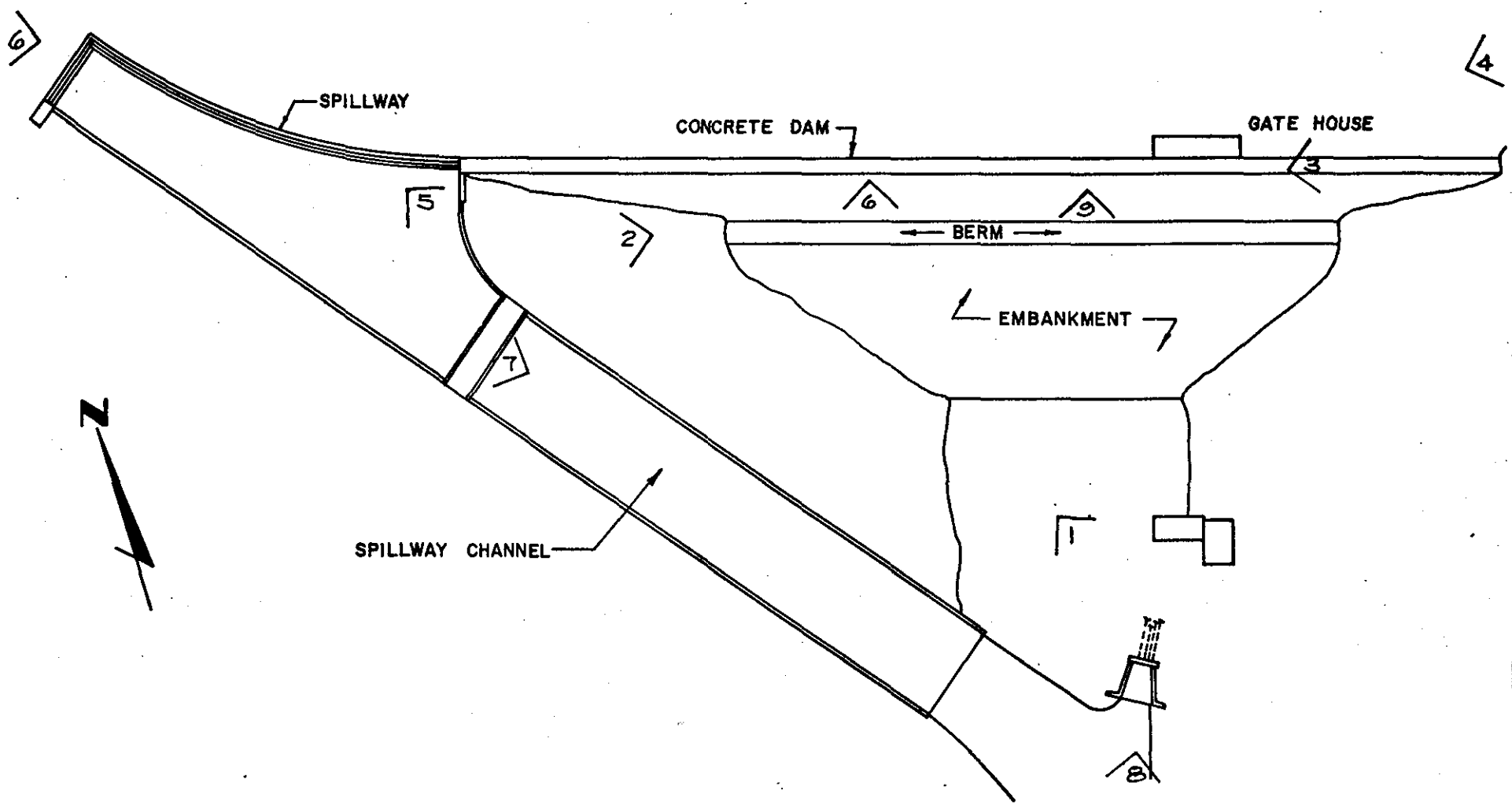
January, 1940

LAIR, Inc.
RVEYORS
CONN.

...by ECB–FR
...CMB

APPENDIX C

PHOTOGRAPHS



SAMUEL P. SENIOR DAM

LOCATION OF PHOTOGRAPHS

PHOTO #1: View of the western, downstream face of the dam.

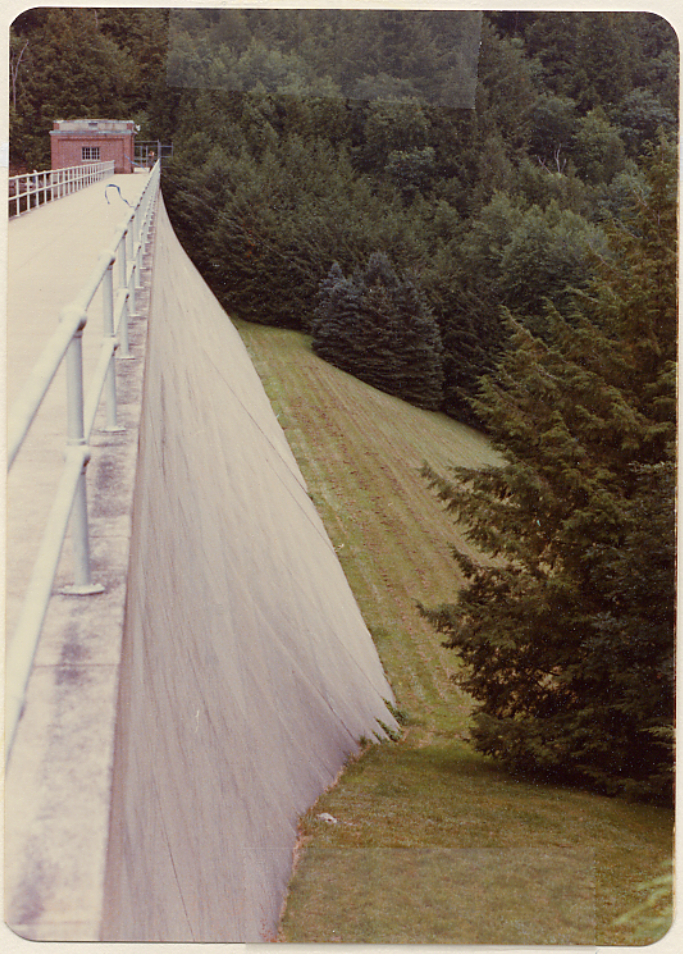


PHOTO #2: View along the face of the dam, looking east.

PHOTO #3: Looking west along the crest of the dam.

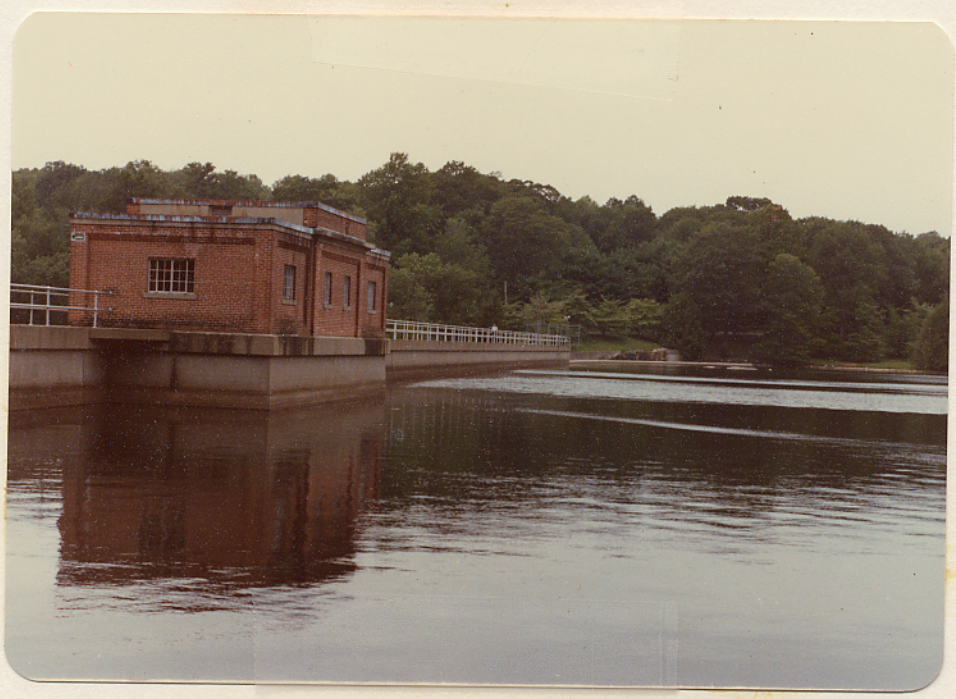


PHOTO #4: Upstream face of the dam and upper gate house.

PHOTO #5: View of the spillway, looking west.

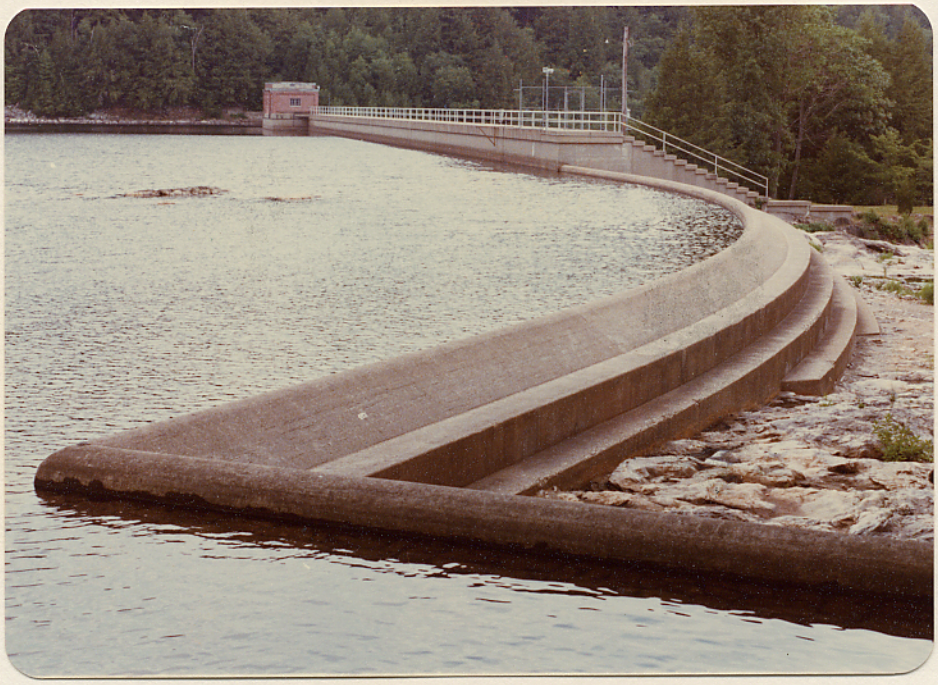


PHOTO #6: View of the spillway and dam, looking east from west abutment.

PHOTO #7: The spillway discharge channel, looking down at the natural river in the background.

PHOTO #8: Blow-off discharge point, showing the wingwalls and riprap.

PHOTO #9: Typical spalling at a construction joint.

PHOTO #10: Holes cored in concrete dam-purpose unknown.

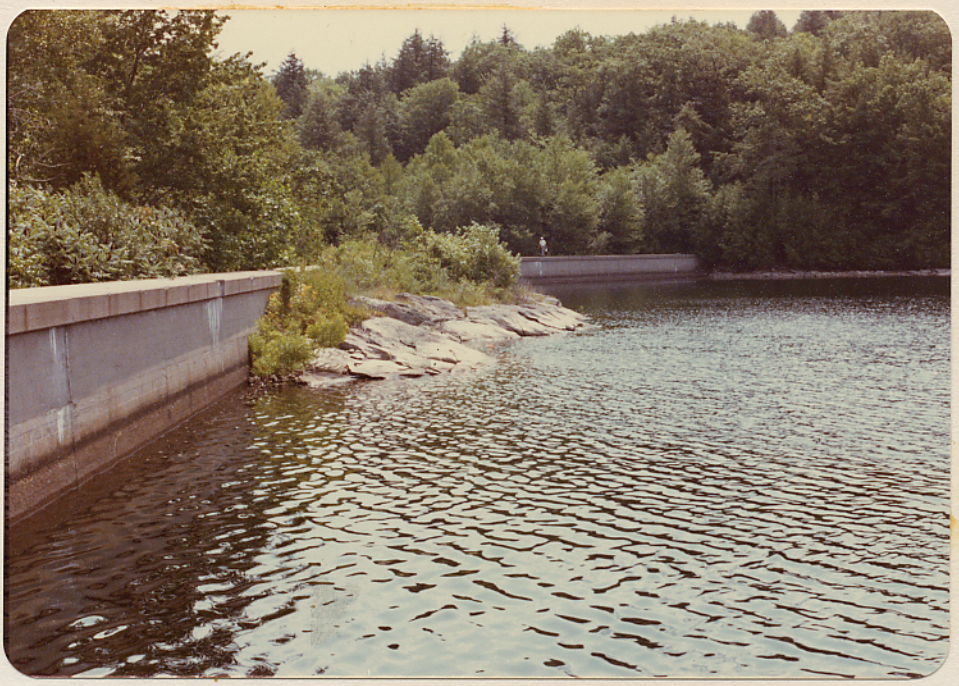


PHOTO #11: View looking south along the concrete dike.

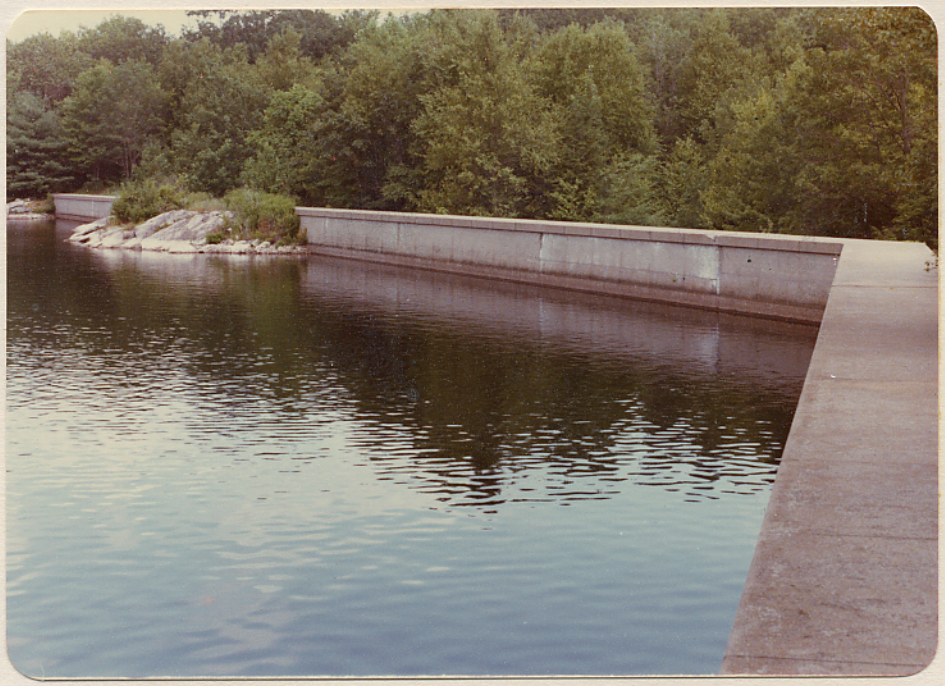
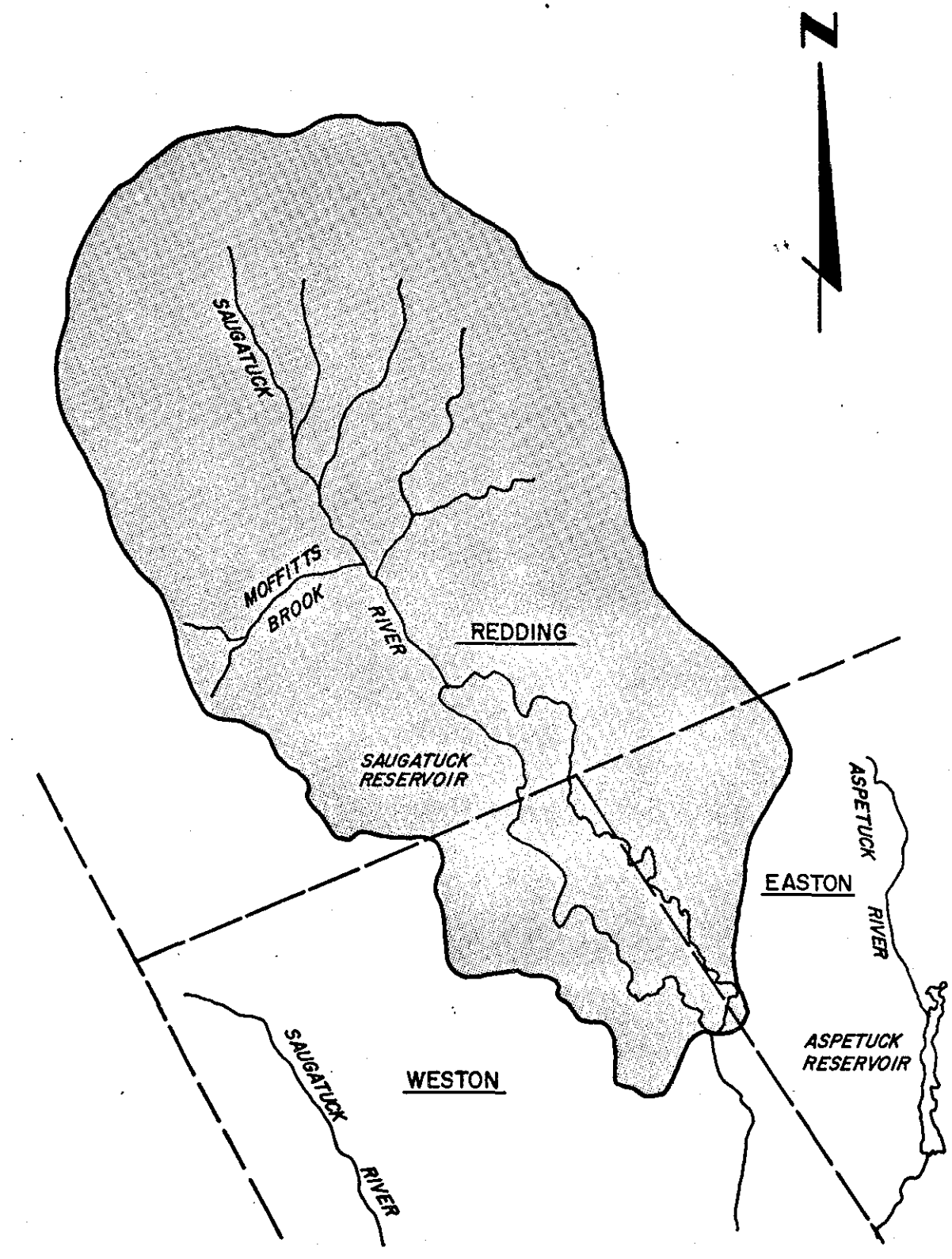


PHOTO #12: View looking north along the concrete dike.

PHOTO #13: Downstream face of the concrete dike.

APPENDIX D

HYDROLOGIC COMPUTATIONS



SCALE IN FEET

6000 0 3000 6000

DRAINAGE AREA MAP

SAMUEL P. SENIOR DAM

WESTON , CONNECTICUT

FLAHERTY-GIAVARA ASSOCIATES
ENVIRONMENTAL DESIGN CONSULTANTS
ONE COLUMBUS PLAZA, NEW HAVEN, CONN. 06510/203/789-1260

SHEET NO. 1 OF 3
BY JGM DATE 8/7/78
CHK'D. BY EJ DATE 8/23/78

P.M.F. PEAK FLOW ESTIMATE

DRAINAGE AREA IS 34.6 SQ. MILES

METHOD #1

REFER TO "PRELIMINARY GUIDANCE FOR ESTIMATING PMF DISCHARGES" by NEW ENGLAND DIVISION, CORPS OF ENGINEERS

UNIT FLOW = 1410 CFS /mi^2 (Rolling Curve)
PMF $\approx$ (34.6 SQ mi) $\times$ (1410 CFS/mi^2) = 48,786 CFS

METHOD #2

REFER TO "CONN WATER RESOURCE BULLETIN NO. 17, PART 4", BY U.S.G.S.

MEAN ANNUAL FLOOD = 1200 CFS
Q_{100} = 5 x MAF = 5 x 1200 CFS = 6000 CFS

PMF $\approx$ 5 x Q_{100} (APPROXIMATE)
PMF $\approx$ 5 x 6000 CFS = 30,000 CFS

METHOD #3

REFER TO FAIRFIELD, CT F.I.A. FLOOD INSURANCE STUDY, "FREQUENCY, DISCHARGE, DRAINAGE AREA CURVES"

Q_{100} = 7000 CFS
PMF $\approx$ 5 x Q_{100} (APPROXIMATE)
PMF $\approx$ 5 x 7000 CFS = 35,000 CFS

: USE 48,800 CFS FOR SPILLWAY TEST FLOOD

FLAHERTY-GIAVARA ASSOCIATES
ENVIRONMENTAL DESIGN CONSULTANTS
ONE COLUMBUS PLAZA, NEW HAVEN, CONN. 06510/203/789-1260

FORMATION OF INFLOW HYDROGRAPH

1) P.M.F. = 48,800 CFS

2) FORM A TRIANGULAR HYDROGRAPH WITH A 24 HOUR DURATION, PEAK @ 8 HOURS

TIME HOURS	UNIT FLOW RATE	FLOW RATE CFS
0	0.00	0
2	0.25	12,200
4	0.50	24,400
6	0.75	36,600
8	1.00	48,800
10	0.875	42,700
12	0.75	36,600
16	0.50	24,400
20	0.25	12,200
24	0.00	0

FLAHERTY-GIAVARA ASSOCIATES
ENVIRONMENTAL DESIGN CONSULTANTS
ONE COLUMBUS PLAZA, NEW HAVEN, CONN. 06510/203/789-1260

SPILLWAY CAPACITY

$$Q = C L H^{3/2}$$

$C \approx 3.6$
$L = 295$ FT (EFFECTIVE LENGTH)
$H = 6$ FT (EL. 286 - EL. 280)

$$Q_{MAX} = 3.6(295)(6)^{1.5} = 15,608 \text{ CFS}$$

$$\frac{\text{SPILLWAY CAPACITY}}{\text{TEST FLOOD}} = \frac{15,608}{48,800} = 32\ \%$$

SAUGATUCK DAM 78-36-10 FLOOD ROUTING JGM 9/19/78

INPUT DATA: UNSUBMERGED WEIR
SEGMENT 1 DISCHARGE COEFFICIENT = 3.6 LENGTH OF WEIR = 295 ELEVATION OF WEIR = 280
SEGMENT 2 DISCHARGE COEFFICIENT = 3 LENGTH OF WEIR = 1360 ELEVATION OF WEIR = 286
IE=280 IV= 0.0 E=280 A=868.00 E=290 A=868.00

HOUR	INFLOW	MASS INFLOW	WATER EL.	TAIL WATER	OUTFLOW	MASS OUTFLOW	STORAGE(R)	STORAGE(A)
0.00	0CFS	0.00AC-F	280.00FT	0.00FT	0CFS	0.00AC-F	0.00AC-F	0.00AC-F
2.00	12,200CFS	1,008.26AC-F	281.05FT	0.00FT	1,146CFS	94.76AC-F	913.50AC-F	913.50AC-F
4.00	24,400CFS	4,033.05AC-F	283.70FT	0.00FT	7,578CFS	815.82AC-F	3,217.23AC-F	3,217.23AC-F
6.00	36,600CFS	9,074.38AC-F	286.75FT	0.00FT	21,360CFS	3,207.46AC-F	5,866.91AC-F	5,866.91AC-F
8.00	48,800CFS	16,132.23AC-F	288.63FT	0.00FT	44,363CFS	8,639.17AC-F	7,493.05AC-F	7,493.05AC-F
10.00	42,700CFS	23,694.21AC-F	288.74FT	0.00FT	45,982CFS	16,105.73AC-F	7,588.47AC-F	7,588.47AC-F
12.00	36,600CFS	30,247.93AC-F	288.23FT	0.00FT	38,683CFS	23,102.88AC-F	7,145.05AC-F	7,145.05AC-F
16.00	24,400CFS	40,330.57AC-F	287.31FT	0.00FT	27,140CFS	33,982.88AC-F	6,347.69AC-F	6,347.69AC-F
20.00	12,200CFS	46,380.16AC-F	286.07FT	0.00FT	15,972CFS	41,109.07AC-F	5,271.08AC-F	5,271.08AC-F
24.00	0CFS	48,396.69AC-F	283.83FT	0.00FT	7,976CFS	45,067.64AC-F	3,329.05AC-F	3,329.05AC-F
30.00	0CFS	48,396.69AC-F	281.17FT	0.00FT	1,347CFS	47,379.41AC-F	1,017.27AC-F	1,017.27AC-F
36.00	0CFS	48,396.69AC-F	280.63FT	0.00FT	536CFS	47,846.40AC-F	550.29AC-F	550.29AC-F
48.00	0CFS	48,396.69AC-F	280.25FT	0.00FT	133CFS	48,178.56AC-F	218.12AC-F	218.12AC-F

crest of dam = 695 ft.
crest of dike = 665 ft.
total length = 1360 ft.

APPENDIX E

INFORMATION - NATIONAL INVENTORY OF DAMS

INVENTORY OF DAMS IN THE UNITED STATES

(1) STATE	(2) IDENTITY NUMBER	(3) DIVISION	(4) STATE	(5) COUNTY	(6) CONGR DIST.	(7) STATE	(8) COUNTY	(9) CONGR DIST.	(10) NAME	(11) LATITUDE (NORTH)	(12) LONGITUDE (WEST)	(13) REPORT DATE DAY | MO | YR
CT	108	NED	CT	001	05				SAMUEL P SENIOR DAM	4114.9	7321.0	08SEP78

(14) POPULAR NAME	(15) NAME OF IMPOUNDMENT
SAUGATUCK RESERVOIR DAM	SAUGATUCK RESERVOIR

(16) REGION	(17) BASIN	(18) RIVER OR STREAM	(19) NEAREST DOWNSTREAM CITY–TOWN–VILLAGE	(20) DIST FROM DAM (MI.)	(21) POPULATION
01	07	SAUGATUCK RIVER	WESTPORT	7	29500

(22) TYPE OF DAM	(23) YEAR COMPLETED	(24) PURPOSES	(25) STRUCTURAL HEIGHT (FT.)	(26) HYDRAULIC HEIGHT (FT.)	(27) IMPOUNDING CAPACITIES MAXIMUM (ACRE–FT.)	(28) IMPOUNDING CAPACITIES NORMAL (ACRE–FT.)	DIST	OWN	FED R	PRV/FED	SCS A	VER/DATE
CTPG	1941	S	130	128	42000	37600		N	N	N	N	23AUG78

(29) REMARKS

(30) D/S HAS	(31) SPILLWAY CREST LENGTH	(32) SPILLWAY TYPE	(33) SPILLWAY WIDTH (FT.)	(34) MAXIMUM DISCHARGE (FT.)	(35) VOLUME OF DAM (CY)	(36) POWER CAPACITY INSTALLED (MW)	(37) POWER CAPACITY PROPOSED (MW)	(38) NAVIGATION LOCKS NO.	(39) LENGTH (FT.)	(40) WIDTH (FT.)	(41) LENGTH (FT.)	(42) WIDTH (FT.)	(43) LENGTH (FT.)	(44) WIDTH (FT.)	(45) LENGTH (FT.)	(46) WIDTH (FT.)
1	990	U	300	15600												

(47) OWNER	(48) ENGINEERING BY	(49) CONSTRUCTION BY
BRIDGEPORT HYDRAULIC CO	CLARENCE M BLAIR INC	BRIDGEPORT HYDRAULIC CO

(50) REGULATORY AGENCY DESIGN	(51) CONSTRUCTION	(52) OPERATION	(53) MAINTENANCE
NONE	NONE	NONE	NONE

(54) INSPECTION BY	(55) INSPECTION DATE DAY | MO | YR	(56) AUTHORITY FOR INSPECTION
FLAHERTY-GIAVARA, ASSOC, PC	26JUL78	PL 92-367

(57) REMARKS