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NATIONAL DAM SAFETY PROGRAM. BOG BROOK DAM NUMBER 1 (NY-00068) --ETC(U)
SEP 78 J J WILLIAMS DACW51-78-C-0035

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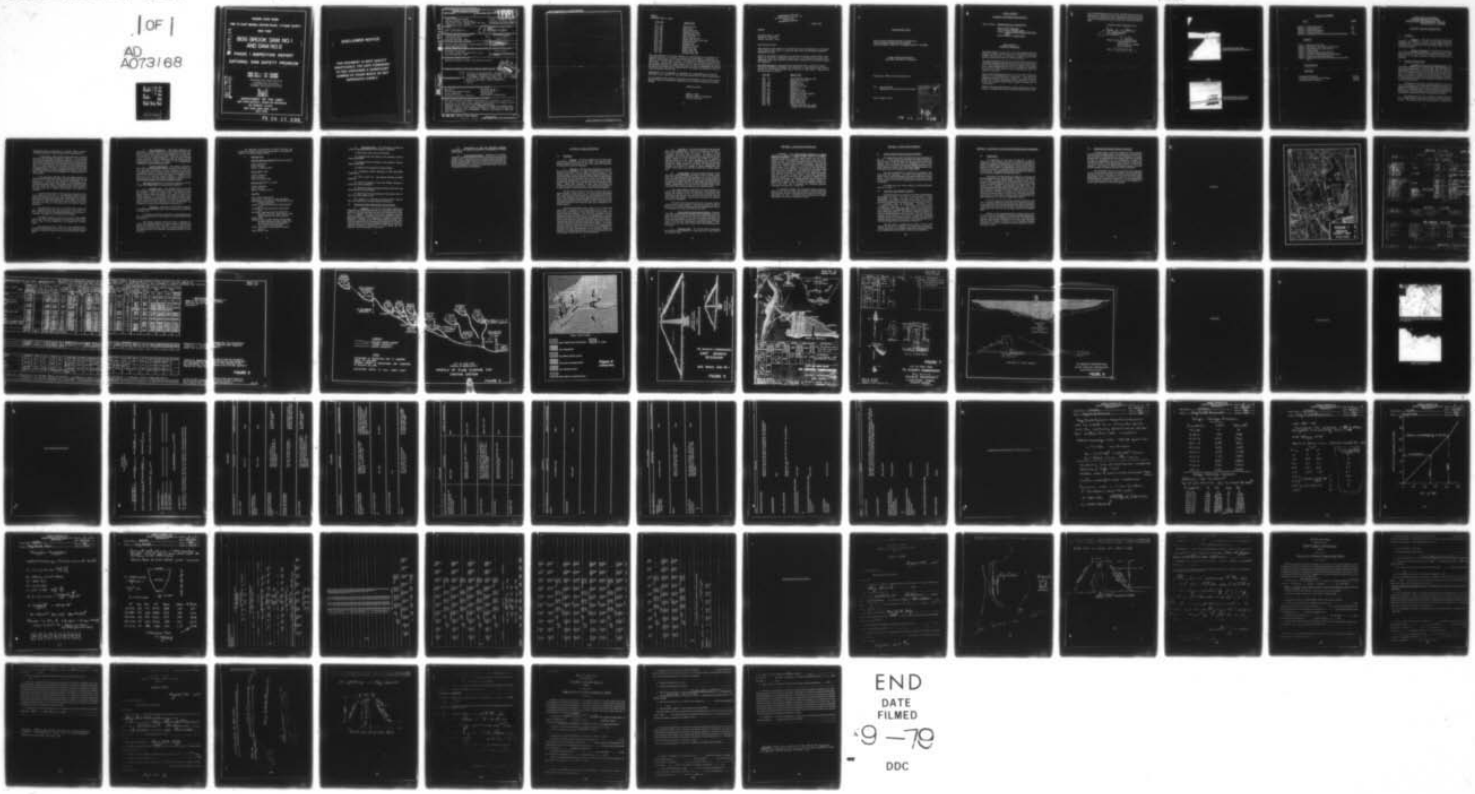

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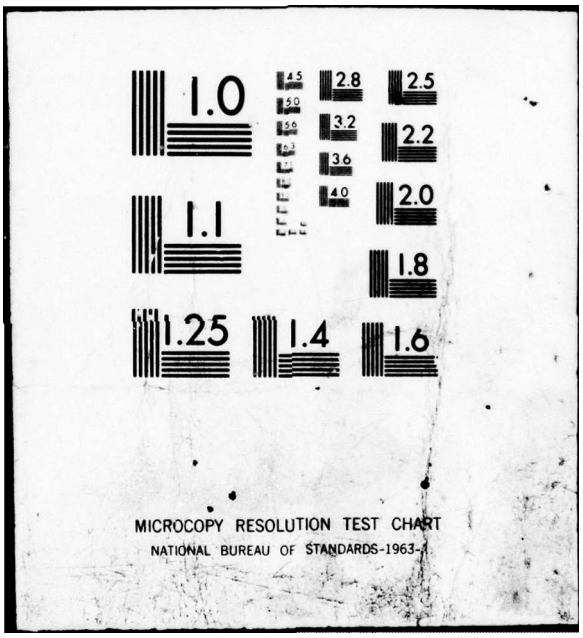
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HUDSON RIVER BASIN

TRIB. TO EAST BRANCH CROTON RIVER, PUTNAM COUNTY

NEW YORK

BOG BROOK DAM NO. 1 AND DAM NO. 2

PHASE I INSPECTION REPORT

NATIONAL DAM SAFETY PROGRAM

DAM NO. 1 - NY 00068
DAM NO. 2 - NY 00069

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CONTRACT NO. DACW 51-78-C-0035

DEPARTMENT OF THE ARMY
NEW YORK DISTRICT, CORPS OF ENGINEERS
26 FEDERAL PLAZA
NEW YORK, NEW YORK 10007

JULY 1978

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Bog Brook Dam No. 1 and Dam No. 2
Hudson River Basin, Putnam County, New York
Inventory No. N.Y. 68 & 69

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National Dam Safety Program. Bog Brook Dam Number 1 (NY-00068) and Dam Number 2 (NY-00069), Hudson River Basin, Tributary to East Branch Croton River, Putnam County, New York. Phase I Inspection Report.

19. KEY WORDS (Continue on reverse side if necessary and identify by block number)
Dam Safety
National Dam Safety Program
Visual Inspection
Hydrology, Structural Stability
Bog Brook Dam No. 1
Bog Brook Dam No. 2
Putnam County
East Branch of Croton River

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.
Bog Brook Dam No. 1 and No. 2 were inspected and judged to be unsafe, non-emergency. Dam No. 1 has significant seepage at junction of the north abutment and downstream face of embankment. Dam No. 2 has growth of trees and brush on embankment.

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NANEN-F
Honorable Hugh L. Carey

I.D. NO.	NAME OF DAM
N.Y. 49	Pocantico Dam
N.Y. 445	Attica Dam
N.Y. 658	Cork Center Dam
N.Y. 153	Jackson Creek Dam
N.Y. 172	Lake Algonquin Dam
N.Y. 318	Sixth Lake Dam
N.Y. 13	Butlet Storage Dam
N.Y. 90	Putnam Lake (Bog Brook Dam)
N.Y. 166	Pecks Lake Dam
N.Y. 674	Bradford Dam
N.Y. 75	Sturgeon Pool Dam
N.Y. 414	Skaneateles Dam
N.Y. 155	Indian Lake Dam
N.Y. 472	Newton Falls Dam
N.Y. 362	Buckhorn Lake Dam

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

Consequently, it is advisable to implement the recommendations previously furnished in the reports for the above-mentioned dams as soon as practicable.

It is requested that owners of these dams be furnished a copy of this letter and that copies be permanently appended to all reports previously furnished to you.

Sincerely yours,

CLARK H. BENN
Colonel, Corps of Engineers
District Engineer

DEPARTMENT OF THE ARMY
U. S. ARMY ENGINEER DISTRICT, NEW YORK
26 FEDERAL PLAZA
NEW YORK, NEW YORK 10007

2 OCT 1978

NANEN-F

Honorable Hugh L. Carey
Governor of New York
Albany, New York 12224

Dear Governor Carey:

The purpose of this letter is to inform you of a clarification of the guidelines used by this office in assessing dams under the National Program of Inspection of Dams.

Office of the Chief of Engineers has recently provided a clarification that dams with seriously inadequate spillways are to be assessed as unsafe, non-emergency, until more detailed studies prove otherwise or corrective measures are completed.

The following dams in your state have previously been assessed as having seriously inadequate spillways, with capability to pass safely only the percentage of the probable maximum flood as noted in each report. They are now to be assessed as unsafe:

I.D. NO.	NAME OF DAM
N.Y. 59	Lower Warwick Reservoir Dam
N.Y. 4	Salisbury Mills Dam
N.Y. 45	Amawalk Dam
N.Y. 418	Jamesville Dam
N.Y. 685	Colliersville Dam
N.Y. 6	Delta Dam
N.Y. 421	Oneida City Dam
N.Y. 39	Croton Falls Dam
N.Y. 509	Chadwick Dam (Plattenkill)
N.Y. 66	Boyds Corner Dam
N.Y. 397	Cranberry Lake Dam
N.Y. 708	Seneca Falls Dam
N.Y. 332	Lake Sebago Dam
N.Y. 338	Indian Brook Dam
N.Y. 33	Lower(S) Wiccopee Dam (Lower Hudson W.S. for Peekskill)

HUDSON RIVER BASIN

Name of Dams: Bog Brook Dam No. 1 and Dam No. 2
County and State: Putnam County, New York
Inventory Numbers: Dam No. 1 - NY 00068; Dam No. 2 - NY 00069

PHASE I INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM

Prepared by: O'Brien and Gere Engineers, Inc.

For: New York State
Department of Environmental Conservation

Date: August 17, 1978

PHASE I REPORT

NATIONAL DAM INSPECTION PROGRAM

Name of Dams: Bog Brook Dam No.1 and Dam No.2

State Located: New York
County Located: Putnam County
Stream: Tributary to East Branch of the Croton River
Date of Inspection: July 17, 1978

ASSESSMENT OF GENERAL CONDITIONS

Bog Brook Dams No. 1 and No. 2 are earth embankments with masonry corewalls. Neither structure is provided with a spillway; however, the reservoir is connected by a tunnel to East Branch Reservoir which is provided with a 500 foot spillway.

Two major depressions were observed along the crest of Dam No. 1; significant seepage and saturated ground were noted at the junction of the north abutment and the downstream slope of the embankment. These conditions should be further investigated to determine the source or cause, and how these conditions may affect the stability of Dam No. 1.

The trees and brush growing on Dam No. 2 may have a deleterious affect on the compacted earth embankment. Trees, brush and vegetation growing on Dam No. 2 should be cut near the ground surface and a further investigation made to determine the extent of the root systems before further remedial measures can be recommended.

Results of the hydrologic/hydraulic analysis indicate that the dams could be overtopped by all floods exceeding approximately 83 per

cent of the Probable Maximum Flood. The East Branch spillway is hydraulically inadequate to pass flood flows associated with the PMF; however, the spillway is not considered "seriously inadequate" as cited in Engineering Technical Letter No. 1110-2-234, May 10, 1978.

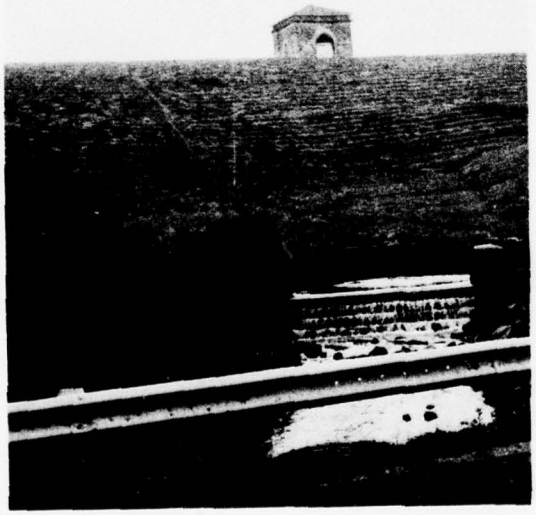
O'BRIEN & GERE ENGINEERS, INC.

John J. Williams, P.E.
Vice President

Approved by: Clark H. Benn
Clark H. Benn
Colonel, Corps of Engineers
District Engineer

Date: 18 September 78

UPSTREAM SLOPE AND
CENTER GATEHOUSE DAM NO. 1



DOWNSTREAM SLOPE AND
STILLING BASIN DAM NO. 1

TABLE OF CONTENTS

PHASE I INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM
NAME OF DAMS BOG BROOK NO. 1 ID# 00068
BOG BROOK NO. 2 ID# 00069

SECTION I - PROJECT INFORMATION

1.1 GENERAL

a. Authority - This report is authorized by the Dam Inspection Act, Public Law 92-367, and has been prepared in accordance with contract #1467.021 between O'Brien and Gere Engineers, Inc. and the New York State Department of Environmental Conservation.

b. Purpose of Inspection - The purpose of this inspection is to evaluate the structural and hydraulic conditions of Bog Brook Dam No. 1 and Dam No. 2 and appurtenant structures, and to determine if the dams constitute a hazard to human life or property.

1.2 PROJECT DESCRIPTION

a. Description of Dams and Appurtenances (From information supplied by the City of New York, Department of Environmental Protection) The Bog Brook dams are located in southeastern Putnam County about 1½ miles east of Brewster, New York. The impoundment area was formed by the construction of Dam No. 1, across a tributary to the East Branch of the Croton River, and Dam No. 2, which was constructed across a depression on the dividing line between the watershed of Bog Brook and that of another small stream.

According to the section drawings supplied by the New York City Department of Environmental Protection, both dams are rolled earth embankments with masonry corewalls extending into bedrock. The upstream slope of both structures is protected by stone riprap. Each embankment is provided with a downstream toe drainage ditch consisting of a trench backfilled with cobbles.

Bog Brook Dam No. 1 has a maximum height of about 47 feet, is approximately 1,340 feet long and has a top width of about 25 feet. The upstream slope is 2½ horizontal to 1 vertical; the

downstream slope is 2 horizontal to 1 vertical. Refer to Figure 5 for details concerning transverse sections of this embankment.

A rectangular, stone masonry outlet structure is situated near the crest and near the center of Dam No. 1. Flow into the structure is accomplished through four openings: one at the toe of the upstream slope, one at mid-height and two at operating pool level. The two lower inlets are controlled by sluice gates (each 3 feet by 5 feet) housed in the structure and are provided with stoplogs upstream of the gates. The upper two inlets are controlled by stoplogs placed in a slot immediately downstream of the sluice gates. Refer to Figure 6 of the appendix for a detailed section of this structure.

Two thirty-inch diameter cast iron pipes, housed in a horseshoe-shaped brick-lined culvert, convey the discharge through Dam No. 1. About 30 feet beyond the downstream toe of embankment, the conduits pass through a vault containing two horizontal stem gate valves. The pipes continue downstream about 200 feet where the discharge from each pipe exits through a fountain orifice into a common stilling basin. (See Figure 8 of Appendix).

A second stone masonry outlet structure is situated on the south abutment of Dam No. 1. This structure houses two gate valves and a butterfly valve which control discharge into a 10 foot diameter, brick-lined connecting tunnel. (See Figure 7 for details). The tunnel is 2,200 feet long and is used to maintain the same operating pool level in Bog Brook and East Branch (Sodom) Reservoirs.

Bog Brook Dam No. 2 has a maximum height of about 23 feet, is approximately 1,936 feet long and has a top width of 12 feet. Both the upstream and downstream slopes are 2 horizontal to 1 vertical. See Figure 5 for transverse section details.

Bog Brook Reservoir is part of the Croton Water Supply System; the Dams and Appurtenant Structures are owned by the City of New York and operated by the Department of Water Supply.

Bog Brook Dams No. 1 and No. 2 were designed by the Aqueduct Commissioners, City of New York and were constructed by David R. Paige & Company between February 1889 and August 1893.

b. Size Classification - Big Brook Reservoir was designed for a storage volume of 4.4 billion gallons (13,500 acre-feet) at the maximum operating pool elevation of 417 feet mean sea level (MSL). The maximum heights of Dam No. 1 and Dam No. 2 are 47 feet and 23 feet respectively. Since the normal storage volume is between 1,000 and 50,000 acre-feet, the dams are in the intermediate size category as defined by the Recommended Guidelines for Safety Inspection of Dams.

c. Hazard Classification - The Village of Brewster, New York is located within 1½ miles of Dam No. 1 and Dam No. 2. The topography downstream of both structures is such that overtopping or failure of either structure would direct flood waters towards the Village of Brewster resulting in the possible loss of many lives and extensive property damage. Therefore, both structures are in the high hazard category as defined by the Recommended Guidelines for Safety Inspection of Dams.

1.3 PERTINENT DATA (From information supplied by the City of New York, Department of Environmental Protection)

a) Drainage Area - The drainage area of the Bog Brook Reservoir is about 3.73 square miles and the surface area of the reservoir is about 0.64 square miles. Bog Brook and East Branch (Sodom) Reservoirs together form what is known as the "Double Reservoir 1". While these two basins have about equal storage capacities, the watershed of East Branch is about twenty times as large as Bog Brook Reservoir. Therefore, to equalize the supply received by each reservoir, the two impoundments are connected by a tunnel which is described in Section 1.2.a.

b. Discharges - Discharge from Bog Brook Reservoir is accomplished through operation of two sluice gates as described in Section 1.2.a.

A statutory conservation discharge of 5 million gallons per day must be maintained to the tributary to the East Branch of the Croton River.

East Branch (Sodom) Reservoir, which is operated in tandem with Bog Brook Reservoir, is provided with a 500 foot long spillway at Elevation 416.55 feet MSL. Since no spillway was constructed at the Bog Brook site, the discharge capacity of the East Branch spillway was apparently considered adequate for both reservoirs.

The maximum pool elevation of 419.15 feet MSL was recorded on October 16, 1955 and corresponds to a discharge of 6,240 cfs over the East Branch spillway.

c. Reservoir Data

Maximum Operating Pool (Reservoir at El. 416.55)

Length - 8,700 feet
Area - 399 acres
Volume - 13,500 acre-feet

Top of Dam (El. 425)

Length - 9,500 feet
Area - 405 acres
Volume 17,130 acre-feet

Maximum Pool (PMF - El. 425.5)

Length - 9,600 feet
Area - 408 acres
Volume - 17,460 acre-feet

d. Dam Data

Type - earth embankments
Top Elevation - 425 feet (Dam No.1 and No.2)
Original Ground Elevations - 378 feet (Dam No.1)
402 feet (Dam No.2)
Lengths - 1,340 feet (Dam No.1); 1,936 feet (Dam No.2)
Top Widths - 25 feet (Dam No.1); 12 feet (Dam No.2)
Side Slopes - upstream slope 2½:1 (Dam No.1)
upstream slope 2:1 (Dam No.1); downstream slope 2:1 (Dam No.1 and No.2)
Zoning - none
Impervious Core - rubble masonry: 10 feet wide at base narrowing to 4 feet at crest (Dam No. 1); 4 feet wide at base narrowing to 2.5 feet at crest (Dam No.2)
Cutoff - base width of core extends into sound bedrock
Grout Curtain - none

e. Engineering Data - The information available for review of Bog Brook Dam No. 1 and Dam No. 2 included:

1) Data Table - New York City Reservoirs

2) Excerpts from the "Report to the Aqueduct Commissioners, 1887-1895"

3) Excerpts from the "Report to the Aqueduct Commissioners, 1895-1907"

4) Profile of Flow Diagram for Croton System

5) Transverse Section Drawings of both Bog Brook Embankments

6) Plan of Dam No. 1 and Section Drawing of Outlet Gatehouse

7) Plan of Connecting Tunnel and Section Drawing of Connecting Tunnel Gatehouse

8) Elevation Drawing of Upstream Slope of Dam No.1 and Section Drawing of Outlet Works

9) Dam Report by the Conservation Commission, State of New York, dated August 6, 1915

10) "Report of a Structure Impounding Water", State of New York, Department of State Engineer and Surveyor

1.4 OPERATING AND MAINTENANCE PROCEDURES

a. Operation - Two 30 inch drain pipes, operable for drawdown and low flow augmentation, are controlled by gate valves located in the outlet gatehouse and valve vault downstream of Dam No. 1. In addition, two gate valves and an emergency butterfly valve for control of discharge through the connecting tunnel to East Branch Reservoir are available for drawdown of Bog Brook Reservoir. According to Mr. John Birrell, Section Engineer, New York City Department of Environmental Protection, the valves are exercised every six months; and adjusted periodically to maintain a minimum conservation discharge of 5 million gallons per day. Reservoir elevation readings are taken daily.

b. Maintenance of Dam and Operating Facilities - According to Mr. Birrell, maintenance is performed on a "most needed" basis.

c. Flood Warning System - According to Mr. Birrell, inspection crews are placed on round the clock duty during periods of high runoff. Reservoir levels are checked hourly, and high pool levels or unusual observations are reported to Mr. Birrell and the Deputy Chief Engineer. Mr. Birrell would contact local police and the Civil Defense for evacuation of downstream areas in the event of impending failure or overtopping.

SECTION 2 - VISUAL INSPECTION

2.1 FINDINGS

a. General - The field inspection of the Bog Brook embankments took place on July 17, 1978. The reservoir water surface elevation was about 415 feet MSL during the inspection. No underwater areas were inspected.

b. Dam No. 1 - The riprap on the upstream face of the dam is a poorly graded mix of large, flat boulders (1 to 5 feet in diameter) and small rocks (6 inches or less in diameter). The boulders appear to have been individually selected and placed to maximize contact between adjacent stones while the cobbles were used as filler for the remaining voids. There is no visible vertical or horizontal displacement of the boulders but some of the cobble backfill near the water line has apparently been removed by wave action. Brush piles composed of small trees and bushes are scattered across the upstream face. This vegetation had apparently been cut down to root level shortly before the field inspection.

The dam crest, as well as the uppermost four feet of the upstream slope, is grass covered. Two long, shallow depressions were noted in the embankment crest: one immediately in front of the center gatehouse and another approximately 150 feet to the north. Each depression grades parallel to the long axis of the dam and reaches a maximum depth of about 18 inches. According to the operating personnel, these features have been noticeable for a period of years.

The entire downstream face of Dam No. 1 is covered with grass which is reported to be mowed about twice a year. No indications of settlement or slope misalignment were noted on the slope during the inspection. The toe drain extending from the southeast abutment to the center of the embankment is partially obscured by grass and brush growing amongst the cobble backfill. Some ponded water was noted in the drain during the inspection. Seepage was observed where the downstream slope of the embankment intersects the north slope of the stream valley. The ground surface, for about 20 yards to either side of the intersection and extending from the valley crest to the toe of the embankment is generally very moist and saturated in a few locations. Wheel ruts about12 to 15 inches deep have been cut into the embankment and valley slopes in this area by the mowing equipment.

c. Dam No. 2 - The riprap protection on the upstream face of this embankment is similar to the riprap on Dam No. 1. The entire upstream slope and crest of the dam is heavily overgrown with small trees and brush. In addition to this vegetation, the downstream slope supports trees as tall as 50 feet. (Visual inspection of this structure was limited to walking a footpath along the dam crest, inspecting the upstream and downstream slopes at randomly selected locations and walking through the woods parallel to and below the downstream toe). Although no evidence of seepage or slope misalignments was evident, observations were severely limited due to dense vegetation.

d. Outlet Works - All of the original equipment inside the center outlet gatehouse, including the floor gratings, pulley hoists and supporting steel beams appear to be in fair condition. The sluice gate controlling the lowest inlet was completely opened at the time of inspection while the other gate was inoperable and scheduled for repairs. Both of the downstream stoplog slots were closed; spillage (about 30 gpm) into the southern outlet conduit was evident due to improper seating of the individual planks.

The tunnel gatehouse situated on the south abutment of Dam #1 also appears to be in fair condition. The butterfly valve located just upstream of the two sluice gates is inoperable, and according to the operator, the valve stem is rusted out with the valve in the open position. The two gate valves were not operated at the time of inspection.

The valve vault and tunnel housing for the outlet conduits appears to be in good condition. There was no evidence of flow in the tunnel at the time of inspection but some standing water (about 6 inches deep) was noted on the floor of the vault.

e. Stilling Basin and Downstream Channel - Extensive underwater plant growth was observed in the stilling pond and vines were seen growing between the rocks which form the walls of the basin. The cross-section of the stone lined channel downstream of the stilling basin appears uniform but is overgrown with weeds and brush. Flow from the stilling basin is conveyed through a 7 foot diameter culvert under a road located about 100 yards downstream of the dam.

f. Reservoir Area - The natural ground surrounding the reservoir has a moderate to steep slope and is well covered with trees and brush.

SECTION 3 - HYDROLOGY/HYDRAULICS

According to the Recommended Guidelines for Safety Inspection of Dams, the Spillway Design Flood is the Probable Maximum Flood (PMF). The PMF was calculated from the 12 hour Probable Maximum Precipitation (PMP), using a loss rate of 0.1 inches per hour. The flood hydrograph was constructed from the Snyder unit hydrograph using average coefficients. Flood routing through the "Double Reservoir 1" was performed assuming the gated outlets to be closed, and the crest of the East Branch spillway to be at 425 feet MSL. The peak inflow and outflow rates were calculated as 58,000 cfs and 55,500 cfs respectively. The peak outflow corresponds to a stage of 9 feet above the spillway crest (0.5 feet above the top of dam). Peak inflow and outflow rates for one-half of the PMF were calculated as 29,000 cfs and 25,500 cfs respectively. The spillway capacity was calculated to be approximately 43,000 cfs. Although the spillway capacity is insufficient to pass the PMF, it will safely discharge at least one-half of the PMF, and is therefore not considered seriously inadequate, as cited in ETL 1110-2-234.

A drawdown analysis was performed assuming discharge from the two 36 inch pipes, the connecting tunnel closed, the starting water surface at the spillway crest, and 2 cfs per square mile inflow (7.5 cfs). According to the calculations, complete drawdown of the reservoir would take 30 days.

SECTION 4 - STRUCTURAL STABILITY

4.1 VISUAL OBSERVATIONS AND DATA REVIEW

Two observations were made during the visual inspection of Dam No. 1 which suggest the existence of unstable conditions: The two long, narrow depressions in the dam crest indicate the possible loss of material from the embankment due to fines migration, and the saturated ground and seepage observed at the north abutment indicate that uncontrolled seepage path(s) have developed through the embankment or valley slopes.

The entire embankment of Dam No. 2 is overgrown with trees, brush and vegetation. The roots of the large trees on the slopes may be providing seepage paths which could lead to future piping. These trees could also be uprooted by high winds, which would result in the removal of a large volume of material from the embankment.

No design data was made available for either Bog Brook Dam No. 1 or No. 2.

4.2 GEOLOGY AND SEISMIC STABILITY

Bog Brook Reservoir is located in the New England Uplands physiographic province. The rocks in this province are either metamorphic or igneous, and the land forms show a close relationship to the relative durability of these rocks. Both of the Bog Brook embankments are founded upon metamorphic Precambrian hornblende gneiss and amphibolite. According to the discussion on Dam No. 1 in the "Report to the Aqueduct Commissioners, 1887-1895", the upper zone of this bedrock, was sic, "excavated to a considerable depth to avoid the percolation of water through its fissures." The apparent weathered condition of this rock necessitated excavations as deep as 50 feet below the original ground surface in an effort to encounter competent material on which to found the masonry corewall. Figure 8 of the Appendix shows a plot of the bottom of the corewall, the top of rock and the goundline along the center of Dam No. 1.

No fault zones or lineaments are known to exist in the vicinity of the dams or reservoir. The structures are located in Seismic Risk Zone 1 of the Seismic Zone Map of Contiguous States and it appears that static stability conditions are satisfactory.

SECTION 5 - ASSESSMENT, RECOMMENDATIONS/REMEDIAL MEASURES

5.1 ASSESSMENT

The depressions in the crest of Dam No. 1 may be indicative of fines migration through the embankment although no evidence of seepage or misalignments was noted on the downstream slopes immediately below the depressions. Surface erosion does not appear to be the cause of the depressions since the ground surface is uniform and there is no standing water or excessive moisture at the low points. The operating personnel stated that these features have remained unchanged for at least eight years.

According to Mr. Birrell, Section Engineer, the seepage and saturated ground at the north abutment of Dam No. 1 has existed for a number of years except during extended periods of dry weather. Fine-grained soil is not in evidence either in the seepage or as accumulated deposits on the dam and valley slopes. The "Report to the Aqueduct Commissioners, 1895-1907" states, sic "notwithstanding that precaution (extending the corewall into what was considered competent bedrock), a slight infiltration occurs, which has been collected in a system of drains and led finally through small pipes, where its volume can be constantly observed." The location of these pipes is unknown and it is possible that the observed seepage is a result of a clogged drain system.

The root systems of the trees and brush growing on Dam No. 2 may have a deleterious affect upon the compacted materials in the embankment and provide seepage paths which could lead to future piping and failure of the structure. In addition, high winds could uproot the trees and remove large portions of the embankment.

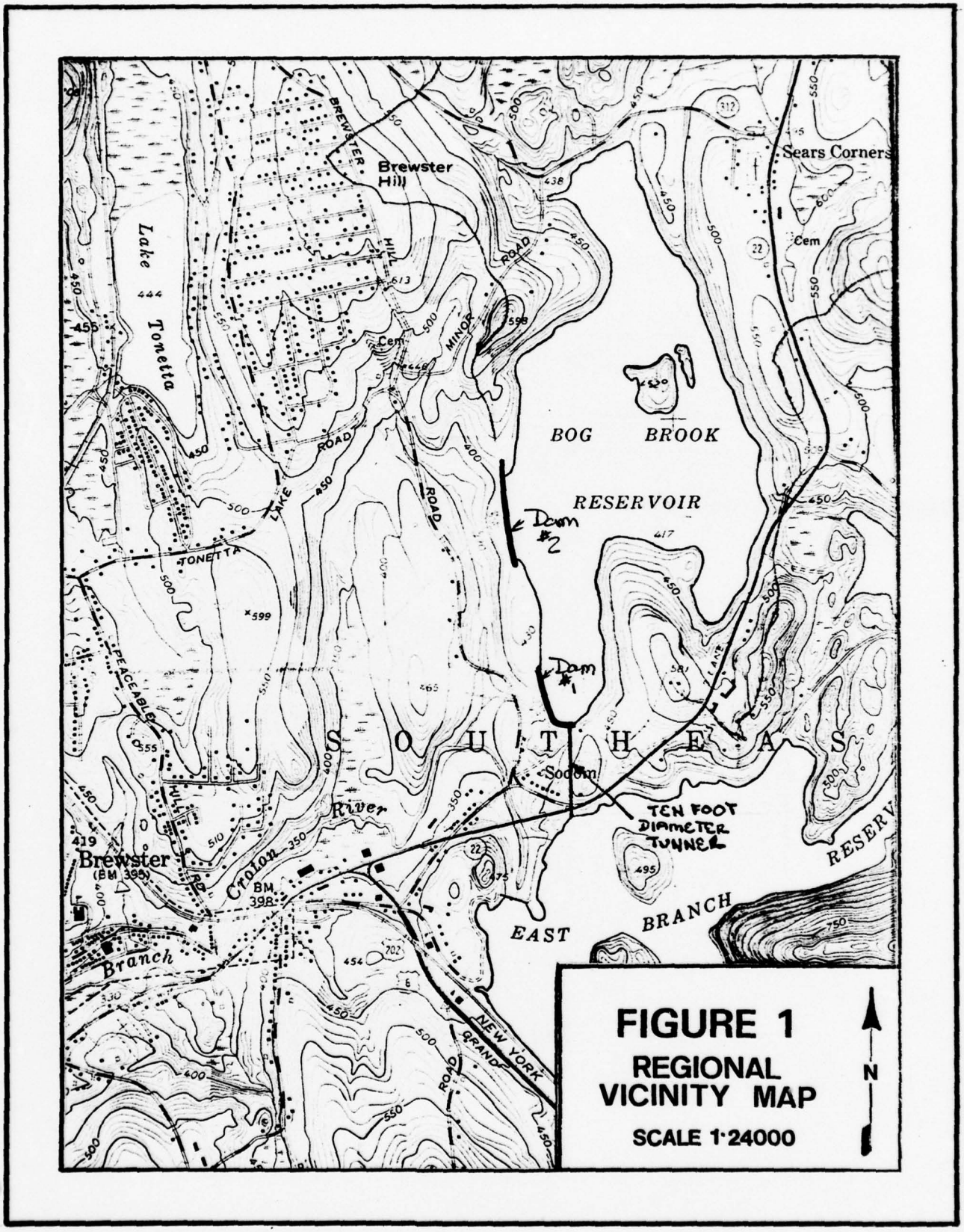
Results of the hydrologic/hydraulic analysis indicate that the dams could be overtopped by all floods exceeding approximately 83 per cent of the Probable Maximum Flood. The East Branch spillway is hydraulically inadequate to pass flood flows associated with the PMF; however, the spillway is not considered "seriously inadequate" as cited in Engineering Technical Letter No. 1110-2-234, May 10, 1978.

5.2 RECOMMENDATIONS/REMEDIAL MEASURES

A boring program should be initiated at several sections (including the depressed areas) of the embankment to include, but not be limited to, determination of the composition and in-situ properties of the embankment and foundation materials to establish if they are satisfactory for the embankment, corewall and foundation as designed and constructed; to assist in the determination of the cause of the seepage and to detect possible fines migration. The results of these investigations should be used to perform seepage and stability analyses for the embankment.

The inoperable valves in the connecting tunnel gatehouse and the outlet gatehouse should be repaired. The trees and brush growing on Dam No. 2 should be cut near the ground surface and an investigation made to determine the extent of the root systems before additional measures are undertaken. The toe drainage ditch for both structures should be cleared of debris and vegetation to insure proper collection of runoff and seepage.

FIGURES


Brewster Hill
Sears Corners
Lake Tonetta
BOG BROOK
RESERVOIR
Dam #2
Dam #1
SOUTHEAS
Sodom
TEN FOOT DIAMETER TUNNEL
EAST BRANCH
Brewster
(BM 395)
BM 398
Croton River
Branch
NEW YORK
GRAND
ROAD
LAKE ROAD
TONETTA
PEACEABLE
HILL
MINOR
Cem
FIGURE 1
REGIONAL VICINITY MAP
SCALE 1·24000
N

CROTON SYSTEM — DATA

Name of Reservoir	Location: Town	Location: County	Drainage Area: Sq Mi	Drainage Area: Includes Sq Miles of Lakes	Date Placed in Service	Kind
1 BOYDS CORNERS	KENT	PUTNAM	29.46	1	1873	MASONRY, EARTH &
2x BARRETTS POND			0.55	2	1873	EARTH
3x LAKE GLENIDA	CARMEL	"	0.60	3	1870	EARTH
4 WEST BRANCH (CARMEL)	"	"	42.87	1 to 4	1896	EARTH, MASONRY CO
5 WEST BRANCH	"	"				
6 MIDDLE BRANCH	SOUTHEAST	"	21.31	5	1878	EARTH, MASONRY CO
7 EGG BROOK	"	"	5.67	6	1892	" "
8 EAST BRANCH (BOGGAM)	"	"	20.20	6 & 7	1891	MASONRY, EARTH & M
9 CROTON FALLS (DIVERTING)	"	"	87.56	6 to 8	1911	EARTH, CONCRETE C
10x LAKE GILEAD	CARMEL	"	0.87	9	1870	EARTH
11 CROTON FALLS	"	"	160.64	1, 5, 6, 9, 10	1911	CYCLOPEAN MASONR
12x LAKE KIRK	"	"	7.84	11	1870	EARTH
13 AMAWALK	SOMERS	WESTCHESTER	19.13	10, 10.2	1897	EARTH, MASONRY CO
14 TITICUS	NORTH SALEM	"	29.53	13	1893	MASONRY, EARTH & M
15 CROSS RIVER	BEDFORD	"	29.80	14	1908	CYCLOPEAN MASON
16 MUSCOOT	SOMERS & BEDFORD	"	31.573	10 to 15	1905	MASONRY
17 NEW CROTON	CORTLAND	"	375.00	1 to 16	1905	MASONRY

x Control 3 Lakes — CROTON TOTALS

CATSKILL SYSTEM

1 ASHOKAN	OLIVE BRIDGE	ULSTER	257.00	1	1915	MASONRY
2 SCHOHARIE	GILBOA	GREENE	314.00	2	1926	MASONRY
CATSKILL TOTALS						

DELAWARE SYSTEM

1 NEVERSINK	NEVERSINK	SULLIVAN	93.0	1	1953	EARTH, CONCRETE
2 PEPACTON	COLCHESTER, ANDES & MIDDLETOWN	DELAWARE	372.0	2	1954	" "
3 CANNONSVILLE	DEPOSIT, TOMPKINS & WALTON	DELAWARE	450.0	3	1967	ROLLED
4 RONDOUT	WAWARSING, NEVERSINK	ULSTER, SULLIVAN	75 (EST.) 12.0	1 to 4	1951	CONCRETE
DELAWARE TOTALS						

KENSICO RESERVOIR

KENSICO	MT KISCO, NO CASTLE	WESTCHESTER	9.33		1915	MASONRY

PERTAINING TO N.Y. CITY RESERVOIRS

THE IMPOUNDING RESERVOIRS BELONG TO THE
OPERATING LEVEL & 568.0 BILL GAL. (AVAILAE

of Dam	Capacity (Bil. Gal.) Total Avail able (Above Sill or Outlet)	Vol. Dep. Ft. above Min Op Lev.	Area of Water Surface at Spillway Elev. Sq Mi.	Acres	Length of Shoreline Mi. 69	Elev. of Spillway M.S.L Sandy Hook Feet	Elev. of Ft. of Mar Dept. (Min Oper Level Feet	Elev. of Sill or Outlet Feet	Depth Spillway to Outlet Feet	
\35	1.696		0464	296 9	6 2	580.05		536.7	43.4	
	0.170		0.108	69.1	1.4	778.55		768.6	10.0	
	0.163		0.264	160.9	2 2	504.55		499.6	5.0	
RE & SPILLWAY	10.070		1.692	1082.8	15.6	503.2		455.6	47.0	
AUX. DRY DAM						514.55 Top		466.1		
ORE	4.005		0.669	428.2	6 82	371.55	UNKNOWN	310.5	61.1	
"	4.400		0 640	399.0	4.9	416.53		365.1	51.5	
NS	5.343		0.698	556.8	10.5	416.55		351.6	65.0	
CORE & SPILLWAY	0.888		0 240	153.6	4.2	309.53		275.8	33.0	
	0.380		0.191	122 2	2 1	496.53		480.6	16.0	
NRY	14.192		1.660	1082.4	18.0	309.4		214.6	95.0	
	0.565		0.158	101.1	3.1	582.55		564.6	18.0	
ORE	6.692		0 947	606.1	8.5	399.55		334.6	65.0	
NGS W MASONRY CORE	7.167		1.046	669.4	8.1	324.3		249.8	75.0	
NRY, CONCRETE FACES	10.308		1.202	769.2	12.9	329.55		226.6	103.0	
	4.914		1.822	1166.1	35.0	190 55		164.6	30.0	
	29.782		5.350	2259.2	38.0	195.55		159.6	36.0	
	94.637	86.6	15.591	9911.0	177.52					

	127.858	122.9	12 99	8315.2	40.2	[illegible]	UNKNOWN	328.88	5.73	4.
	19.583	17.6	1 79	1145.0	16.5	1130 0	"	1090.0	60.00	
	147.441	140.5	14 78	9460.2	56.5					

CORE	35 466	34 9	2.9	1470	16.5	1440.00	1319.03	1314.00	126.00	1.
"	143.701	140.2	8.9	5700	59 5	1250 00	1152.00	1143 00	137 00	6.
FILL	96726	95.7	7.5	4800	53 5	① 1150 00 ② 1150 00	1040.00	1035 00	① 115 00	1.
CORE	50 048	49 6	3.25	2080	17 0	840.00	723 00	720 00	120 00	2.
	325.941	320 4	21.93	14050	140.5	① LOW WEIR ② HIGH "				

SAFETY OR INTERMEDIATE STORAGE RES FOR ALL OF THE CATSKILL & DELAWARE SUPPLIES AL

	30 573	UNKNOWN	3 47	2218.3	30 0	357.00	UNKNOWN	295.32	61.63	UN

CROTON, CATSKILL & DELAWARE SYSTEMS TOTALLING 547.5 BIL. GAL. ABOVE MIN.
LE ABOVE SILL. AN ADDITIONAL 30.6 BILL GAL. IS STORED IN A SAFETY STORAGE RES. KENSICO

Dead Storage Million Gallons	Length of Spillway Feet	Max Depth Below Spillway Feet	Max Hgt of Main Dam Above Lowest Foundation Feet	Max Hgt of Main Dam Above Roadway Surface Feet	Width of Dam Feet Top	Width of Dam Feet Bott.	Length of Dam Feet Total	Length of Dam Feet Masonry Portion
	135 0		78 0	97.0	6 60	53 60	670 0	670 0
UNKNOWN	260 0	UNKNOWN	66.0	62.0	19.00	307.50	1794 5	260.0
	NO SPILLWAY		65.0	30.0	2[illegible]00	240.00	741 0	
	100 0		94.0		50.00	660.00	615.0	100.0
			[illegible] 68.8 [illegible] 38.8	[illegible] 53.8	22.88 12.00	238.58 173.58	[illegible] 1356.8	
	5000		96.0	78.0	12.00	53.00	1100.0	500.0
	1000.0		51.0	45.0	19.00	240.00	2190.0	1000.0
	700 0		179.0	119.0	29.00	116.00	1300.0	1100.0
	50.0			82.0	58.00	658.00	1270.0	50.0
	200 0		135.0	109.0	29 70	75.21	1319.0	[illegible]
	240.0		170.0	126 0	29.00	118 30	1060.0	670 0
	950 0		56.0		4.00	40.00	1150.0	1150.0
	1000.0		247.0	174.0	16.00	206.00	2125.0	2165.0

Most of the Croton carried by the New Aqueduct

1.137	950.0	[illegible]	252.0	210.0	26.33	200.00	4650 0	1000.0
	1324.0	150.0	182.0	155.0	15.00	158 00	2280.0	2000.0

Schoharie water is c
Tunnel to Ashokan
enter the Catskill Aq

1.600	600.0	175.00	345.0	195 0	60.00	1392 00	2620 0	NONE
1.000	000.0	180 00	304.0	204.0	60.00	1460.00	2450.0	"
092	D 240.0 D 560.0	[illegible] 6.00 [illegible] 5.00	196.0	179 0	45 00	1312 00	2000 0	"
367	600.0	175 00	375. 0	195.0	60.00	1392 00	2400.0	"

Neversink, Pepacton
are conveyed via th
& W. Delaware Tunn
Thence all Four su

ALSO SOME OF THE CROTON SUPPLY (SEE REMARKS).

KNOWN	50.0	155 50	307.0	168 0	28.00	235 00	1643 0	1643 0

Of the Croton Suppl
plus pumpage fr
Falls flows into K

REMARKS

Comp J.J.O
Drawn J.R.D.

Supply is
Croton

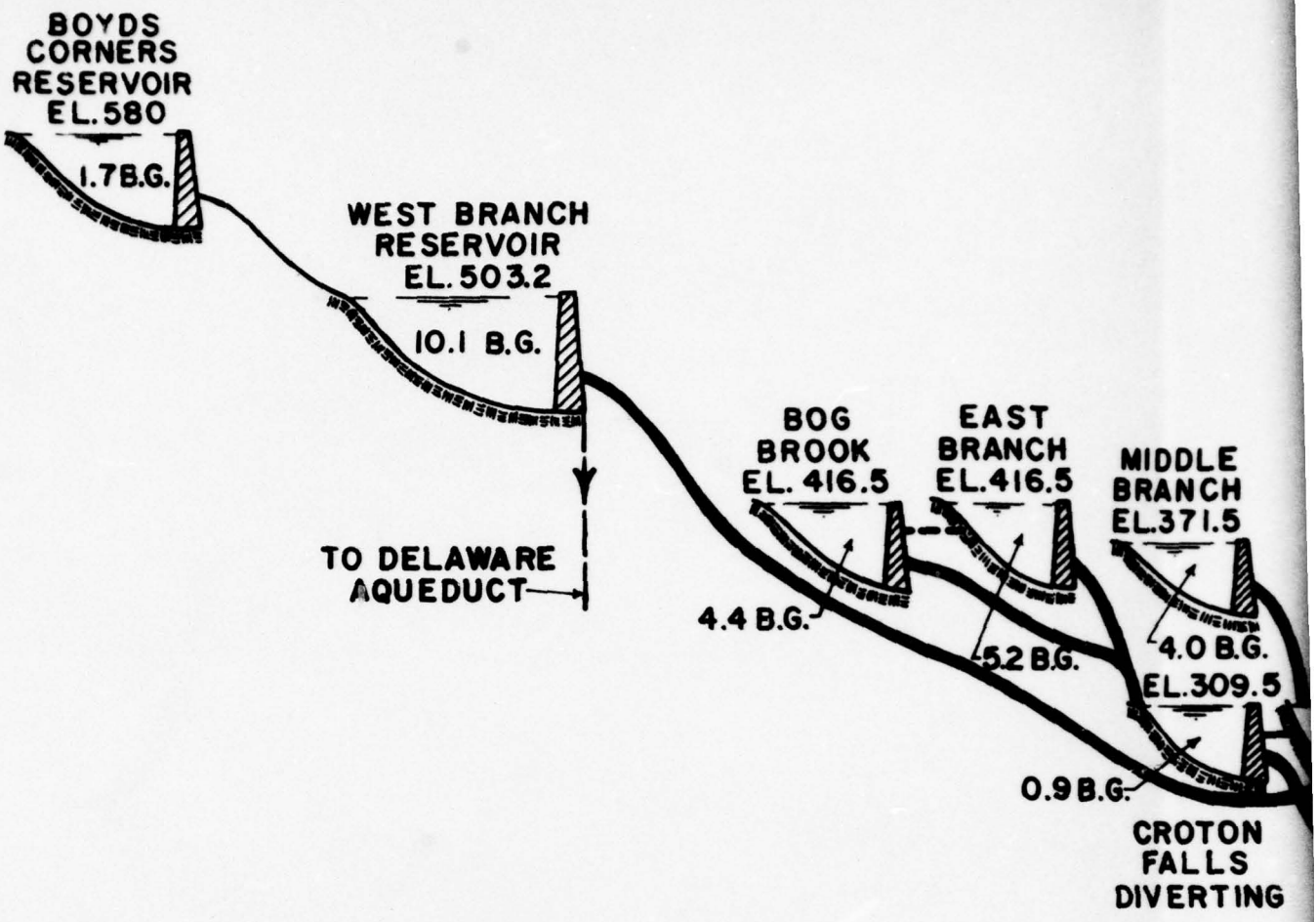
veyed by the Shandaken
s. Thence both supplies
duct.

& Cannonsville supplies
Neversink, East Delaware
s to the Rondout Res.
plies enter the Del. Aqueduct.

FIGURE 2

all of the West Branch
n Cross River & Croton
ico Reservoir.

Acc NS



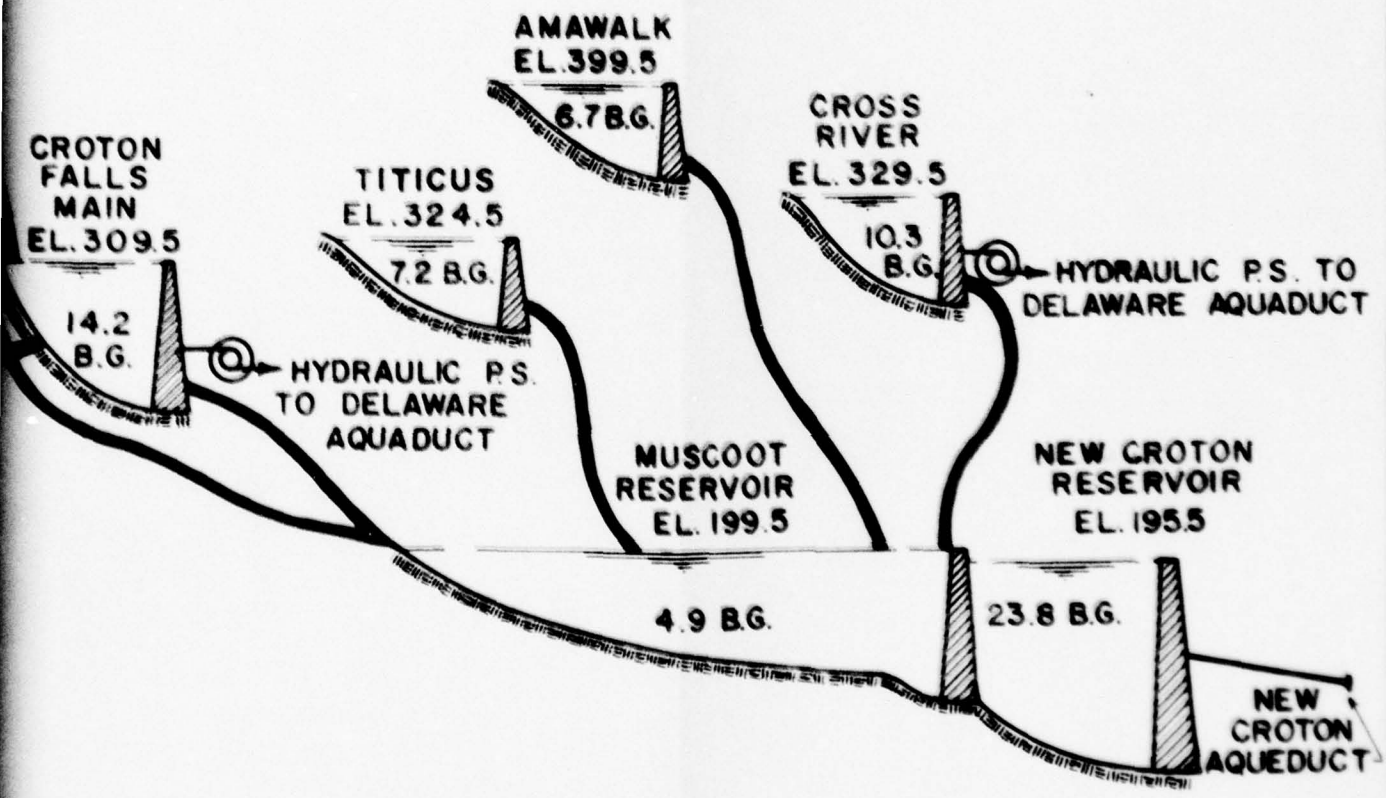
LEGEND

= NATURAL WATER COURSE.
= TUNNEL AQUEDUCT.
= GRADE AQUEDUCT.

NOTE

ELEVATIONS OF RESERVOIRS ARE AT MASONRY CREST OF SPILLWAY.
FIGURES SHOWN IN RESERVOIRS ARE CAPACITIES IN BILLION GALLONS.

ELEVATIONS REFER TO M.S.L. SANDY HOOK.

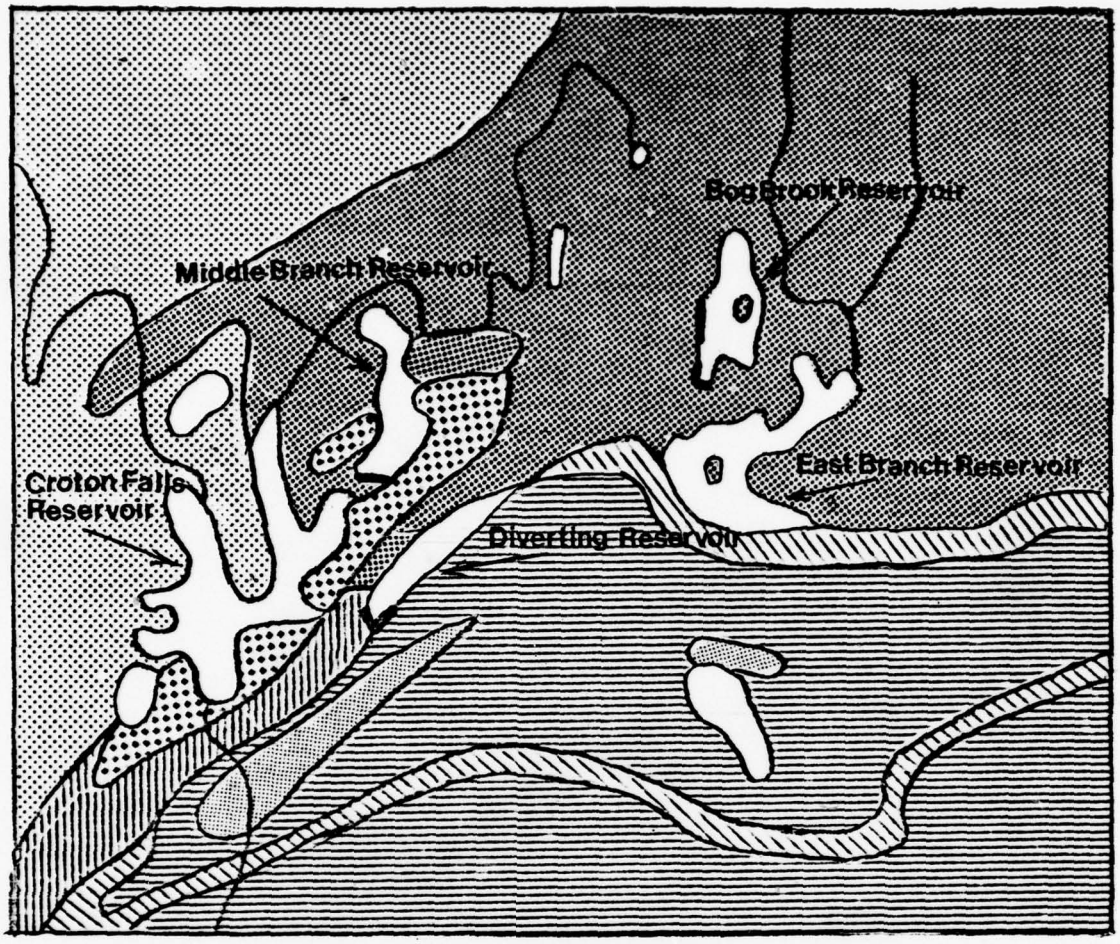


CITY OF NEW YORK
BUREAU OF WATER SUPPLY

PROFILE OF FLOW DIAGRAM FOR CROTON SYSTEM

FIGURE 3

2



Scale: 1 inch = 1.7 miles

bqpc - biotite, quartz, plagioclase

Xi - marble

Am - Amphibolite

bg - biotite, granitic gneiss

qtcs - quartz, feldspar, gneiss

Xm - schistose gneiss

Xgb - gabbro, hornblende, gneiss

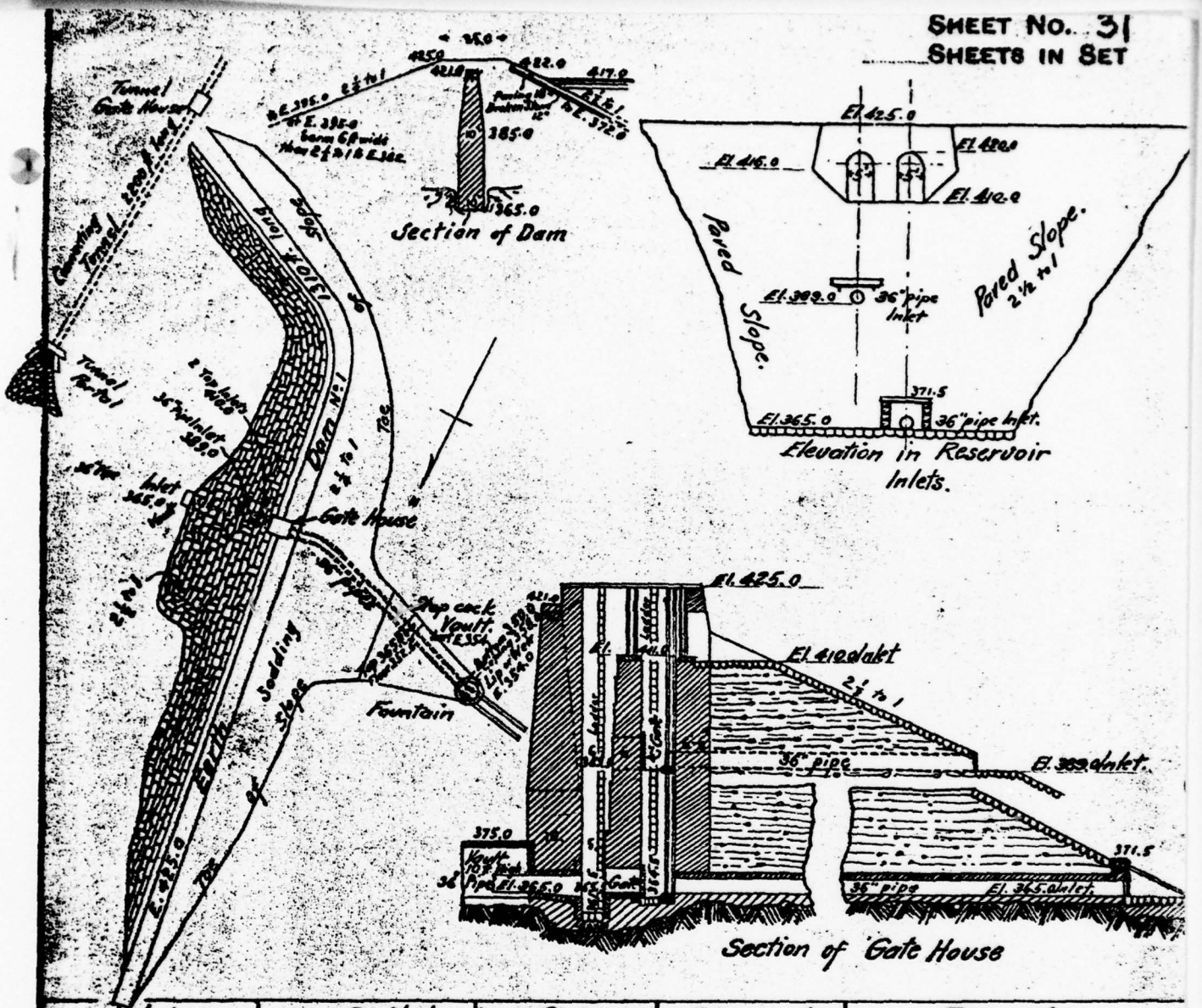
Figure 4
Geologic Map

THE AQUADUCT COMMISSIONERS

EAST BRANCH RESERVOIR

BOG BROOK DAM Nº 1

FIGURE 5



Inlets			Outlets			Gates			Stop-cocks			Remarks
Number	Shape and Dimension	Elevation of Invert	Number	Shape and Dimension	Elevation of Invert	Number	Size	Elevation of Invert	Number	Diam.	Elevation of Invert	
2	T 2'6" 3'6" 5'	410.	2	3' pipes	364	1	2'x5'	389.5				NOTE - These Elevations refer to Croton Datum which is 3.61 ft. below City Datum.
						1	2'x5'	365.5	2	36"	354.	No Spillway El. lip of Fountain 354. Earth Dam No. 2 is 1935 ft. long.
1	3' Pipes	389										
1	3'	365.										

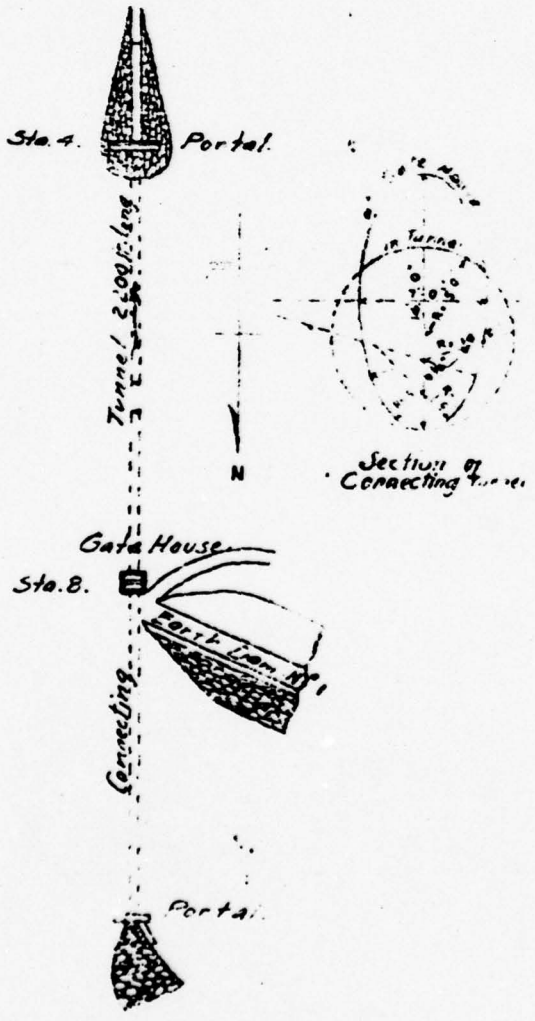
CITY OF NEW YORK
THE AQUEDUCT COMMISSIONERS
DOUBLE RESERVOIR "1"
BOG BROOK
EARTH DAM No 1.
ACCESSION No.

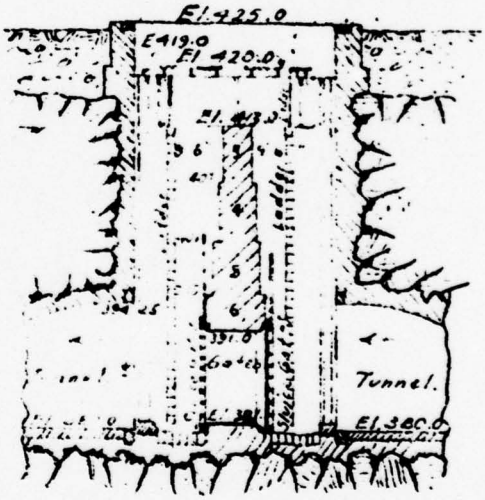
Drawn by A.S.F.
Traced by W.E.K.
Checked by W.E.K. & J.P.G.

FIGURE 6

SHEET NO. 30
SHEETS IN SET

Inlets.			Outlets		Gate	Blow cocks	Remarks.
Number	Shape and Dimension	Elevation of Invert	Number	Shape and Dimension	Elevation of Invert	Number	Elevation of Invert	
1	At Portal 10'	380	1	Same as Inlets	380			NOTE. These Elevations refer to Croton Datum which is 3.61 ft below City Datum.
1	At Gate House. 14' 7'	380.	1		380			





Section of Gate House.

FIGURE 7

CITY OF NEW YORK

THE AQUEDUCT COMMISSIONERS

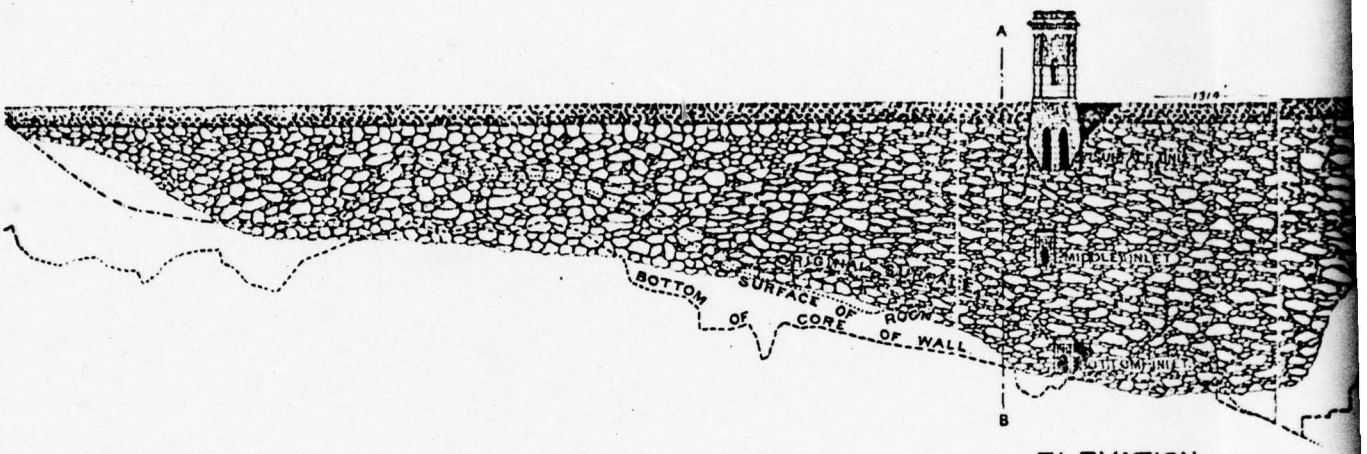
Bog Brook

DOUBLE RESERVOIR "I"

CONNECTING TUNNEL & GATE HOUSE

SECTION NO.

Drawn by A.S.F.
Traced by A.W.F.
Checked by A.W.F. & W.E.K. 8 [illegible] 9.

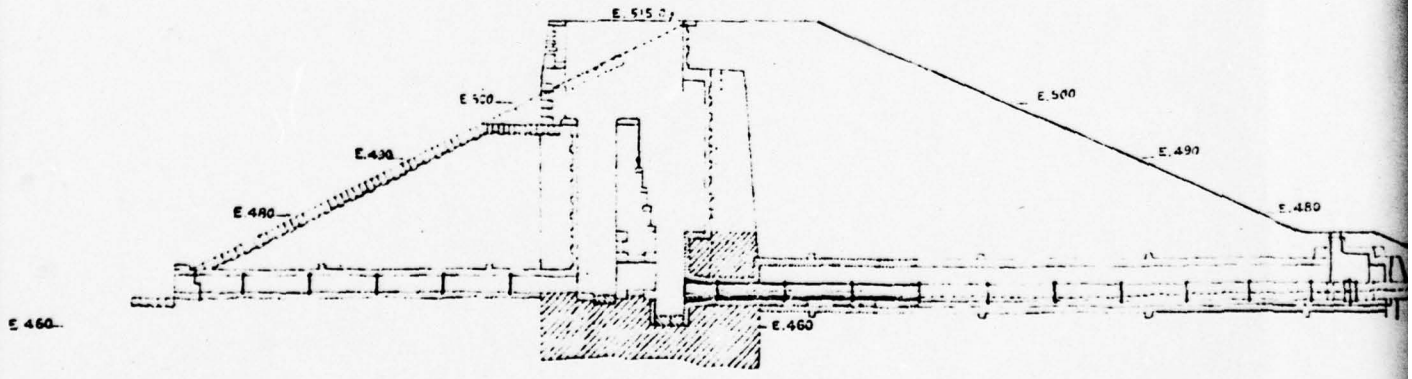


ELEVATION

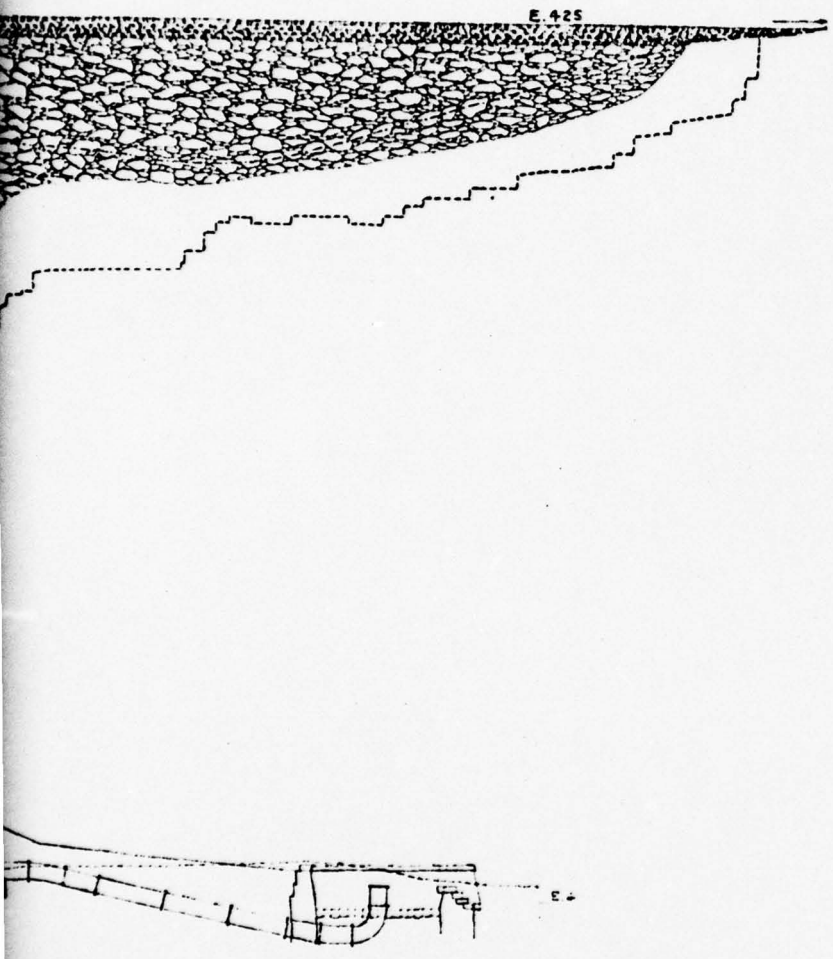
SCALES

VERTICAL

HORIZONTAL



SECTION AT GATE HOUSE



THE AQUEDUCT COMMISSIONERS

EAST BRANCH RESERVOIR

BOG BROOK DAM Nº 1

FIGURE 8

APPENDIX

PHOTOGRAPHS

SATURATED GROUND NEAR RIGHT ABUTMENT
OF DAM NO. 1

CREST OF DAM NO. 2

FIELD INSPECTION REPORT

Check List
Visual Inspection
Phase 1

Name Dam Bog Brook Dam No. 1 / Bog Brook Dam No. 2 County Putnam State New York Coordinators --------

Date(s) Inspection July 17, 1978 Weather Overcast Temperature 75°

Pool Elevation at Time of Inspection 417 M.S.L. Tailwater at Time of Inspection ---- M.S.L.

Inspection Personnel:

Mr. George Elias

Mr. David Campbell

Mr. Steve Snider

Mr. Steve Snider Recorder

Accompanied by:

Mr. John Birrell - Section Engineer, New York City Department of Environmental Protection
Mr. Edward Stoorza - Section Foreman, New York City Department of Environmental Protection

EMBANKMENT

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SURFACE CRACKS	None noted.	None.
UNUSUAL MOVEMENT OR CRACKING AT OR BEYOND THE TOE	None noted.	None.
SLOUGHING OR EROSION OF EMBANKMENT AND ABUTMENT SLOPES	None noted on Dam No. 1. Dense vegetation on Dam No. 2. obstructed visual detection of this condition.	All growth on Dam No. 2 should be removed.
VERTICAL AND HORIZONTAL ALINEMENT OF THE CREST	Two long, shallow depressions noted in the crest on Dam No. 1.	A study should be made to determine their cause and if they are increasing in size.
RIPRAP FAILURES	Some minor loss of cobble backfill noted at the waterline on Dam No. 1. Dense vegetation on Dam No. 2 obstructed visual detection of this condition.	All growth on Dam No. 2 should be removed.

EMBANKMENT

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
JUNCTION OF EMBANKMENT AND ABUTMENT, SPILLWAY AND DAM	Seepage noted at the north abutment of Dam No. 1. Ground surface was moist and saturated in some locations.	A study should be undertaken to determine the cause and source of seepage and it should be monitored continuously to detect turbidity or increased flow.
ANY NOTICEABLE SEEPAGE	See above.	See above.
STAFF GAGE AND RECORDER	N/A	
DRAINS	The two drains for both dams are partially filled with vegetation and debris.	The drains should be cleaned to insure proper collection of runoff and seepage.

OUTLET WORKS

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CRACKING AND SPALLING OF CONCRETE SURFACES IN OUTLET CONDUIT	None noted.	None.
INTAKE STRUCTURE	Emergency butterfly valve inoperable at time of inspection.	Repair valve.
OUTLET STRUCTURE	One of the gate valves was inoperable at time of inspection. Stop logs in downstream slot of middle inlet were not properly seated allowing about 30 gpm to pass into outlet conduit.	Repair gate valve.
OUTLET CHANNEL	Some grass and brush growing from stone walls of stilling pond.	None.
EMERGENCY GATE	See "Outlet Structure"	

RESERVOIR

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SLOPES	No problems noted.	None.
SEDIMENTATION	None noted.	None.

DOWNSTREAM CHANNEL

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONDITION (OBSTRUCTIONS, DEBRIS, ETC.)	No problems noted.	None.
SLOPES	Slopes of channel heavily overgrown with brush and some small trees.	None.
APPROXIMATE NO. OF HOMES AND POPULATION	The Village of Brewster, New York, is located within 1½ miles of both dams. The population is approximately 1,600 (800 homes).	None.

ITEM	REMARKS
MONITORING SYSTEMS	Personnel from the New York City Department of Environmental Protection operate and monitor operation of the reservoir.
MODIFICATIONS	None.
HIGH POOL RECORDS	Maximum pool of record was 419.15 feet MSL recorded on October 16, 1955.
POST CONSTRUCTION ENGINEERING STUDIES AND REPORTS	None noted.
PRIOR ACCIDENTS OR FAILURE OF DAM DESCRIPTION REPORTS	None noted.
MAINTENANCE OPERATION RECORDS	None available.

ITEM	REMARKS
DESIGN REPORTS	Two reports entitled "Report to the Aqueduct Commissioners, 1887-1895 and 1895-1907" contain brief discussions pertinent to the purpose, operation and construction of the Bog Brook Dams and appurtenances.
GEOLOGY REPORTS	None available.
DESIGN COMPUTATIONS HYDROLOGY & HYDRAULICS DAM STABILITY SEEPAGE STUDIES	None available.
MATERIALS INVESTIGATIONS BORING RECORDS LABORATORY FIELD	None available.
POST-CONSTRUCTION SURVEYS OF DAM	None available.
BORROW SOURCES.	Unknown.

HYDROLOGIC AND HYDRAULIC COMPUTATIONS

Bog Brook Reservoir & East Branch Reservoir are connected by a 10' diameter tunnel, and the spillway @ East Branch provides for outflow from both reservoirs.

Total drainage area = 80.28 square miles

$L = 19$ miles $\quad L_{CA} = 8$ miles

$t_p = C_t (L \times L_{CA})^{.3} = 2.0(19 \times 8)^{.3} = 9.0$ hrs

$t_R = t_p / 5.5 = 1.6$ hrs. use $t_R = 1.5$ hrs.

Spillway crest at East Branch = 416.55 ft MSL

Spillway length = 500'

Surface area of reservoirs @ normal pool = 956 acres

Surface area @ El. 420 = 1225 acres

Assume area a linear function of elevation above the crest.

$A = 78H + 956$ $\quad$ & Surcharge Storage $(S) = \int (78H + 956)$

$S = 39H^2 + 956H + C^0$

Stage - Storage Relation

Elevation	H (ft)	S (acre-ft)
416.55	0	0
418.0	1.45	1468
420.0	3.45	3762
421.0	4.45	5026
422.0	5.45	6369
423.0	6.45	7789
424.0	7.45	9287
425.0	8.45	10863
426.0	9.45	12516
427.0	10.45	14249

Stage - discharge relation

Spillway - $Q_S = 3.5 \times 500 \times H^{3/2}$

Top of dam @ El 425 $Q_{OT} = 3.1 \times 3300 \times (H - 8.45)^{3/2}$

Elevation	H	Q_S	Q_{OT}	Q_T
416.55	0	0	0	0
418.00	1.45	3056	0	3056
420.00	3.45	11214	0	11214
421.00	4.45	16428	0	16428
422.00	5.45	22266	0	22266
423.00	6.45	28667	0	28667
424.00	7.45	35585	0	35585
425.00	8.45	42986	0	42986
426.00	9.45	50837	10230	61067
427.00	10.45	59117	28935	88052

6HR. PMP = 24"

Reduction for "probable misfit" of storm isohyetals and drainage basin = 14%

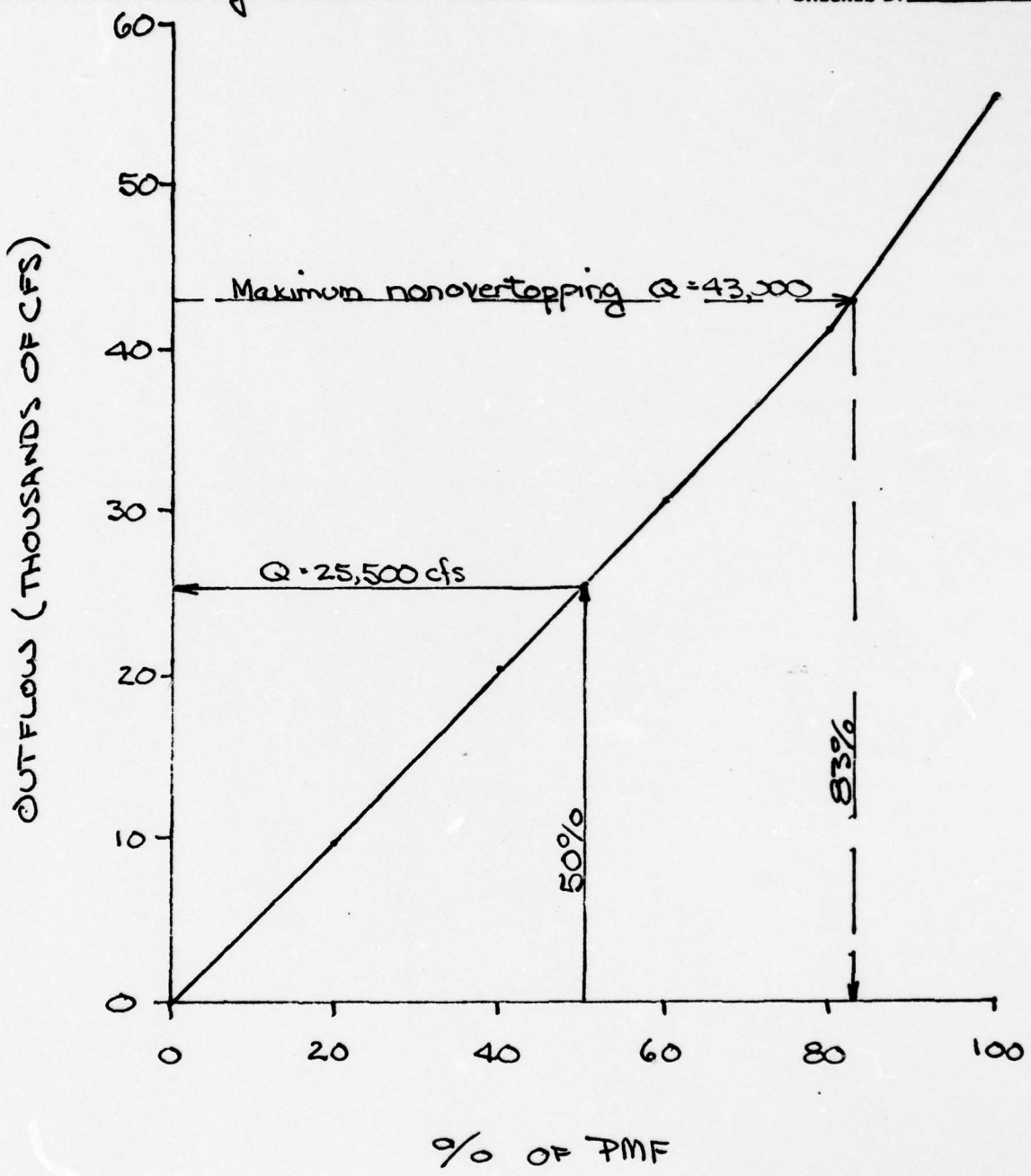
6HR $PMP_{REDUCED}$ = 20.64"

ZONE 1, 80 SQ. MILES 6HR PMP = 20.64" × .77 = 15.9

Time	Σ PMP	Δ	
0	0	0	
1.5	9.0	9.0	
3.0	12.1	3.1	
4.5	14.1	2.0	
6.0	15.9	1.8	
7.5			.7
9.0	12 HR PMP = 20.64 × .89 = 18.4		.7
10.5	12HR − 6HR = 2.5"		.6
12.0			.5

Third quartile arrangement

.5
.6
1.8
2.0
3.1
9.0
.7
.7


60
50
40
30
20
10
0
OUTFLOW (THOUSANDS OF CFS)
Maximum nonovertopping Q = 43,300
Q = 25,500 cfs
50%
83%
0
20
40
60
80
100
% OF PMF

Drawdown Computations

Outlet Discharge (tunnel assumed closed)

$$H = \left(1 + K_e + K_v + K_s + \frac{29 n^2 L}{r^{4/3}}\right)\frac{V^2}{2g}$$

K_e = entrance and exit losses

K_v = valve loss

K_s = sluice loss

$n = .025 \quad L = 450' \quad \& \quad \frac{V^2}{2g} = \frac{Q^2}{2gA^2}$

$$H = \left(1 + 1.5 + .5 + .25 + \frac{29(.015)^2 450}{.75^{4/3}}\right)\frac{Q^2}{2g(\pi 1.5^2)^2}$$

$$H = \frac{(2.56)Q^2}{3217.7} = .00235\,Q^2$$

$\therefore Q = 20.63 H^{.5}$ (per pipe) $\quad Q_T = 41.26 H^{.5}$

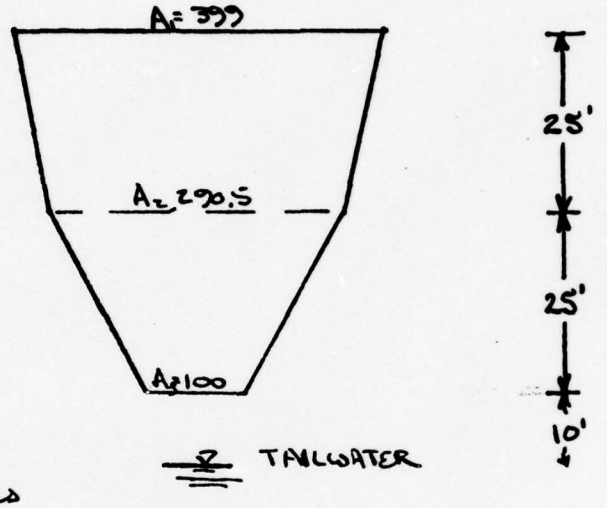
Assume an inflow of 2 c.f.s./sq. mi. × 3.67 sq. mi = 7.5 cfs

$\therefore Q_{NET} = 41.26 H^{.5} - 7.5$ Assume Tw = 356.6 (Lip of stilling basin weir 354.6)

H	55	45	35	25	15
Q	298	269	237	199	152

Normal pool volume = 13500 acre-feet
Depth normal pool to lower outlet invert = 50'
Surface area = 399.0 acres

Assume Area at lower outlet invert = 100 acres



$V = 13500$ acre-ft

$= \frac{399 + A_2}{2} \times 25 +$

$\frac{A_2 + 100}{2} \times 25$

$A_2 = 290.5$ acres

ΔH	H_{AVE}	A_{AVE}	ΔS	$Q_{NET AVE}$	ΔT (HRS)	ΣT (DAYS)
60→50	55	377	3770	298	153	6.4
50→40	45	334	3340	269	150	12.6
40→30	35	291	2910	237	149	18.8
30→20	25	252	2520	199	153	25.2
20→10	15	138	1380	152	110	29.8

DRAWDOWN TIME
≃ 30 days

```
*****************************
HEC-1 VERSION DATED JAN 1973
UPDATED AUG 74
CHANGE NO. 01
*****************************

                    NATIONAL DAM INSPECTION PROGRAM
                          BOG BROOK RESERVOIR
                              PMF HYDROGRAPH

                              JOB SPECIFICATION
      NQ    NHR   NMIN   IDAY    IHR   IMIN  METRC   IPLT   IPRT  NSTAN
      50      1     30      1      0      0      0      0      2      0
                          JOPER     NHT
                              5      0

                    MULTI-PLAN ANALYSES TO BE PERFORMED
                          NPLAN= 1 NRTIO= 5 LRTIO= 1
          RTIOS=    .20    .40    .60    .80   1.00

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

                          SUB-AREA RUNOFF COMPUTATION
          ISTAQ   ICOMP   IECON   ITAPE    JPLT    JPRT   INAME
              1       0       0       0       0       0       0

                              HYDROGRAPH DATA
    IHYDG    IJHG   TAREA    SNAP   TRSDA   TRSPC   RATIO   ISNOW   ISAME   LOCAL
        0       1   80.28    0.00    0.00    0.00   0.000       0       0       0

                              PRECIP DATA
                          NP   STORM     DAJ     DAK
                           8    0.00    0.00    0.00
                              PRECIP PATTERN
     .50     .60    1.80    2.00    3.10    9.00     .70     .70

                              LOSS DATA
    STRKR   DLTKR   RTIOL   ERAIN   STRKS   RTIOK   STRTL   CNSTL   ALSMX   RTIMP
     0.00    0.00    1.00    0.00    0.00    1.00    0.00     .10    0.00    0.00

                          UNIT HYDROGRAPH DATA
                      TP=  9.00    CP= .63    NTA=  0

                              RECESSION DATA
                      STRTQ=    0.00    QRCSN=    0.00    RTIOR= 1.00
APPROXIMATE CLARK COEFFICIENTS FROM GIVEN SNYDER CP AND TP ARE TC= 6.86 AND R= 5.37 INTERVALS

      UNIT HYDROGRAPH 33 END-OF-PERIOD ORDINATES, LAG=  8.97 HOURS, CP=  .63  VOL= 1.00
    232.     847.    1675.    2557.    3272.    3650.    3614.    3182.    2640.    2190.
   1817.    1507.    1250.    1037.     861.     714.     592.     491.     408.     339.
    281.     233.     193.     160.     133.     110.      91.      76.      63.      52.
     43.      36.      30.

                          END-OF-PERIOD FLOW
                        TIME   RAIN   EXCS   COMP Q
                    1   1 30    .50    .35      81.
                    1   2 60    .60    .45     401.
                    1   4 30   1.80   1.65    1350.
```

1	7	30	3.10	2.95	7310.
1	8	60	9.00	8.85	14615.
1	10	30	.70	.55	25602.
1	11	60	.70	.55	37772.
1	13	30	0.00	0.00	48736.
1	14	60	0.00	0.00	55943.
1	16	30	0.00	0.00	58031.
1	17	60	0.00	0.00	55024.
1	19	30	0.00	0.00	48113.
1	20	60	0.00	0.00	40339.
1	22	30	0.00	0.00	33565.
1	23	60	0.00	0.00	27845.
2	1	30	0.00	0.00	23100.
2	2	60	0.00	0.00	19163.
2	4	30	0.00	0.00	15897.
2	5	60	0.00	0.00	13188.
2	7	30	0.00	0.00	10941.
2	8	60	0.00	0.00	9076.
2	10	30	0.00	0.00	7530.
2	11	60	0.00	0.00	6246.
2	13	30	0.00	0.00	5182.
2	14	60	0.00	0.00	4299.
2	16	30	0.00	0.00	3566.
2	17	60	0.00	0.00	2958.
2	19	30	0.00	0.00	2454.
2	20	60	0.00	0.00	2036.
2	22	30	0.00	0.00	1689.
2	23	60	0.00	0.00	1401.
3	1	30	0.00	0.00	1162.
3	2	60	0.00	0.00	956.
3	4	30	0.00	0.00	782.
3	5	60	0.00	0.00	608.
3	7	30	0.00	0.00	458.
3	8	60	0.00	0.00	307.
3	10	30	0.00	0.00	36.
3	11	60	0.00	0.00	16.
3	13	30	0.00	0.00	0.
3	14	60	0.00	0.00	0.
3	16	30	0.00	0.00	0.
3	17	60	0.00	0.00	0.
3	19	30	0.00	0.00	0.
3	20	60	0.00	0.00	0.
3	22	30	0.00	0.00	0.
3	23	60	0.00	0.00	0.
4	1	30	0.00	0.00	0.
4	2	60	0.00	0.00	0.
		SUM	18.40	17.20	591252.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	59031.	54434.	32392.	12318.	591255.
INCHES		6.31	15.29	17.13	17.13
AC-FT		27606.	65473.	73334.	73334.

HYDROGRAPH AT STA 1 FOR PLAN 1, RTIO 1

16.	80.	270.	695.	1462.	2923.	5120.	7554.	9747.	11189.
11606.	11005.	9623.	9068.	6713.	5569.	4620.	3833.	3179.	2638.
2188.	1815.	1506.	1249.	1036.	860.	713.	592.	491.	407.
338.	280.	232.	191.	156.	122.	92.	61.	7.	3.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	11606.	10887.	6598.	2464.	118251.
					3.43

HYDROGRAPH AT STA 1 FOR PLAN 1, RTIO 2

32.	160.	540.	1390.	2924.	5846.	10241.	15109.	19495.	22377.
23216.	22010.	19295.	16135.	13426.	11138.	9240.	7665.	6359.	5275.
4376.	3631.	3012.	2499.	2073.	1720.	1426.	1183.	982.	814.
676.	560.	465.	382.	313.	243.	183.	123.	14.	7.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	23212.	21774.	13197.	4927.	236502.
INCHES		2.52	6.12	6.85	6.85
AC-FT		10802.	26189.	29334.	29334.

HYDROGRAPH AT STA 1 FOR PLAN 1, RTIO 3

49.	240.	810.	2085.	4386.	8769.	15361.	22663.	29242.	33566.
34819.	33014.	28868.	24203.	20139.	16707.	13860.	11498.	9538.	7913.
6564.	5446.	4518.	3748.	3109.	2579.	2140.	1775.	1473.	1222.
1013.	841.	697.	573.	469.	365.	275.	184.	22.	10.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	34819.	32660.	19795.	7391.	354753.
INCHES		3.78	9.18	10.28	10.28
AC-FT		16204.	39284.	44000.	44000.

HYDROGRAPH AT STA 1 FOR PLAN 1, RTIO 4

65.	321.	1080.	2780.	5848.	11692.	20481.	30218.	38989.	44755.
46425.	44019.	38491.	32270.	26852.	22276.	18480.	15331.	12718.	10551.
8753.	7261.	6024.	4997.	4146.	3439.	2853.	2367.	1963.	1629.
1351.	1121.	930.	765.	625.	486.	367.	246.	29.	13.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	46425.	43547.	26394.	9854.	473004.
INCHES		5.05	12.23	13.70	13.70
AC-FT		21605.	52378.	58667.	58667.

HYDROGRAPH AT STA 1 FOR PLAN 1, RTIO 5

81.	401.	1350.	3475.	7310.	14615.	25602.	37772.	48736.	55943.
58031.	55024.	48113.	40338.	33565.	27845.	23100.	19163.	15897.	13188.
10941.	9076.	7530.	6246.	5182.	4299.	3566.	2958.	2454.	2036.
1689.	1401.	1162.	956.	782.	608.	458.	307.	36.	16.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	58031.	54434.	32992.	12318.	591255.
INCHES		6.31	15.29	17.13	17.13
AC-FT		27006.	65473.	73334.	73334.

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

HYDROGRAPH ROUTING

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME
2	1	0	0	0	0	0

ROUTING DATA

QLOSS	CLOSS	AVG	IRES	ISAME
0.0	0.000	0.00	1	1

NSTPS	NSTOL	LAG	AMSKK	X	TSK	STORA
0	0	0	0.000	0.000	0.000	-1.

STORAGE=	0.	1459.	3762.	5026.	6369.	7799.	9287.	10863.	12516.	14249.
OUTFLOW=	0.	3056.	11214.	16428.	22266.	28667.	35585.	42986.	61067.	88052.

16.	24.	36.	52.	1000.	1000.	1000.	1000.	1000.	1000.
8389.	9443.	9757.	9428.	8692.	7770.	6804.	5873.	5018.	4256.
353.	3031.	2718.	2411.	2121.	1853.	1609.	1391.	1197.	1026.
87.	747.	659.	538.	466.	383.	319.	264.	211.	164.
127.	93.	76.	58.	45.	35.	27.	21.	16.	12.

STOR

8.	11.	23.	75.	176.	376.	732.	1261.	1888.	2689.
2968.	3264.	3352.	3260.	3053.	2794.	2522.	2260.	2020.	1805.
1618.	1456.	1305.	1158.	1019.	890.	773.	668.	575.	493.
421.	359.	305.	258.	218.	184.	153.	127.	102.	79.
61.	47.	36.	28.	22.	17.	13.	10.	8.	6.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	9757.	9330.	6164.	2463.	118272.
INCHES		1.08	2.86	3.43	3.43
AC-FT		4629.	12233.	14666.	14669.

STATION 2, PLAN 1, RTIO 2

32.	47.	116.	310.	732.	1567.	3048.	6520.	10415.	14598.
18000.	19957.	20242.	19159.	17300.	15221.	13172.	11250.	9715.	8307.
7050.	5949.	5000.	4189.	3501.	2971.	2651.	2344.	2055.	1791.
1552.	1338.	1150.	984.	838.	710.	597.	495.	398.	309.
239.	185.	142.	110.	85.	65.	50.	39.	30.	23.

STOR

16.	23.	56.	149.	352.	753.	1464.	2442.	3537.	4582.
5388.	5838.	5903.	5654.	5227.	4733.	4237.	3771.	3341.	2945.
2591.	2282.	2015.	1787.	1593.	1427.	1274.	1126.	987.	860.
745.	643.	552.	473.	403.	341.	287.	238.	191.	149.
115.	89.	68.	53.	41.	31.	24.	19.	14.	11.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	20242.	19339.	12616.	4927.	236550.
INCHES		2.24	5.85	6.85	6.85
AC-FT		9595.	25036.	29333.	29339.

STATION 2, PLAN 1, RTIO 3

49.	71.	174.	465.	1099.	2351.	5451.	10350.	16601.	22903.
27834.	30525.	30710.	28852.	25931.	22651.	19513.	16612.	14123.	11925.
10152.	9654.	7327.	6173.	5182.	4337.	3623.	3034.	2712.	2400.
2107.	1837.	1593.	1374.	1179.	1005.	848.	707.	569.	442.
342.	264.	204.	157.	121.	94.	72.	56.	43.	33.

STOR

23.	34.	84.	224.	528.	1129.	2141.	3519.	5066.	6510.
7604.	8191.	9231.	7829.	7182.	6455.	5736.	5068.	4467.	3934.
1463.	3042.	2669.	2345.	2066.	1828.	1627.	1457.	1303.	1153.
1012.	882.	765.	660.	566.	483.	408.	340.	273.	213.
165.	127.	98.	76.	58.	45.	35.	27.	21.	16.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	30710.	29480.	19041.	7391.	354830.
INCHES		3.42	8.83	10.28	10.28
AC-FT		14626.	37787.	44000.	44010.

STATION 2, PLAN 1, RTIO 4

65.	94.	233.	621.	1465.	3180.	7842.	14543.	22999.	31291.
37693.	41082.	41160.	38554.	34513.	30085.	25919.	21935.	18577.	15662.
13214.	11107.	9494.	8055.	6797.	5711.	4785.	3999.	3337.	2801.
2563.	2260.	1978.	1719.	1485.	1273.	1079.	903.	728.	566.
433.	338.	261.	201.	155.	120.	92.	71.	55.	42.

STOR

32.	44.	108.	308.	704.	1503.	2814.	4569.	6532.	8357.

4247.	3732.	3270.	2874.	2520.	2215.	1954.	1733.	1547.	1384.
1231.	1086.	950.	826.	713.	611.	518.	434.	350.	272.
211.	162.	125.	97.	75.	58.	44.	34.	26.	20.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	41160.	39620.	25482.	9854.	473113.
INCHES		4.59	11.81	13.70	13.71
AC-FT		19656.	50570.	58669.	58681.

STATION 2, PLAN 1, RTIO 5

81.	118.	291.	776.	1831.	4419.	10086.	18837.	29417.	39672.
51040.	55475.	52318.	45779.	40564.	36119.	31373.	26849.	22779.	19268.
16219.	13690.	11496.	9800.	8324.	7029.	5911.	4954.	4142.	3457.
2945.	2625.	2318.	2030.	1765.	1520.	1295.	1086.	877.	683.
529.	408.	315.	243.	187.	144.	111.	86.	66.	51.

STOR

39.	56.	140.	373.	880.	1851.	3445.	5580.	7951.	10157.
11599.	12005.	11716.	11118.	10347.	9401.	8375.	7386.	6483.	5679.
4975.	4362.	3830.	3364.	2949.	2585.	2271.	2002.	1773.	1581.
1415.	1261.	1114.	975.	848.	730.	622.	522.	421.	328.
254.	196.	151.	117.	90.	69.	54.	41.	32.	25.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	55475.	51153.	31931.	12318.	591397.
INCHES		5.93	14.80	17.13	17.13
AC-FT		25378.	63367.	73337.	73352.

PEAK FLOW SUMMARY FOR MULTIPLE PLAN-RATIO ECONOMIC COMPUTATIONS

OPERATION	STATION	PLAN	RATIOS APPLIED TO FLOWS .20	.40	.60	.80	1.00
HYDROGRAPH AT	1	1	11606.	23212.	34819.	46425.	58031.
		2	0.	0.	0.	0.	0.
ROUTED TO	2	1	9757.	20242.	30710.	41160.	55475.
		2	0.	0.	0.	0.	0.

PREVIOUS INSPECTION REPORT

Acc. 382

[illegible] filing out one of these forms is completely answerable for each dam in your district, return it at once to the [illegible]

STATE OF NEW YORK

CONSERVATION COMMISSION

ALBANY

DAM REPORT

August 5th, 1915

CONSERVATION COMMISSION,

DIVISION OF INLAND WATERS.

GENTLEMEN:

I have the honor to make the following report in relation to the structure known as the Bog Brook Dam.

This dam is situated upon the [illegible] (Give name of stream)

in the Town of South East, Putnam County,

about 1½ Miles (Give distance) from the Village (or city) of Brewster

The distance [illegible] (Give distance) stream from the dam, to the [illegible] (Give name of railroad, highway, stream or bridge)

is about [illegible] (Give distance)

The dam is now owned by New York City (Give name in full)

and was built in or about the year 1891, and was extensively repaired or reconstructed

during the year [illegible]

As it now stands, the spillway portion of this dam is built of [illegible] (Give kind of material used)

and the other portions are built of [illegible] (Give kind of material used)

As nearly as I can learn, the character of the foundation bed under the spillway portion

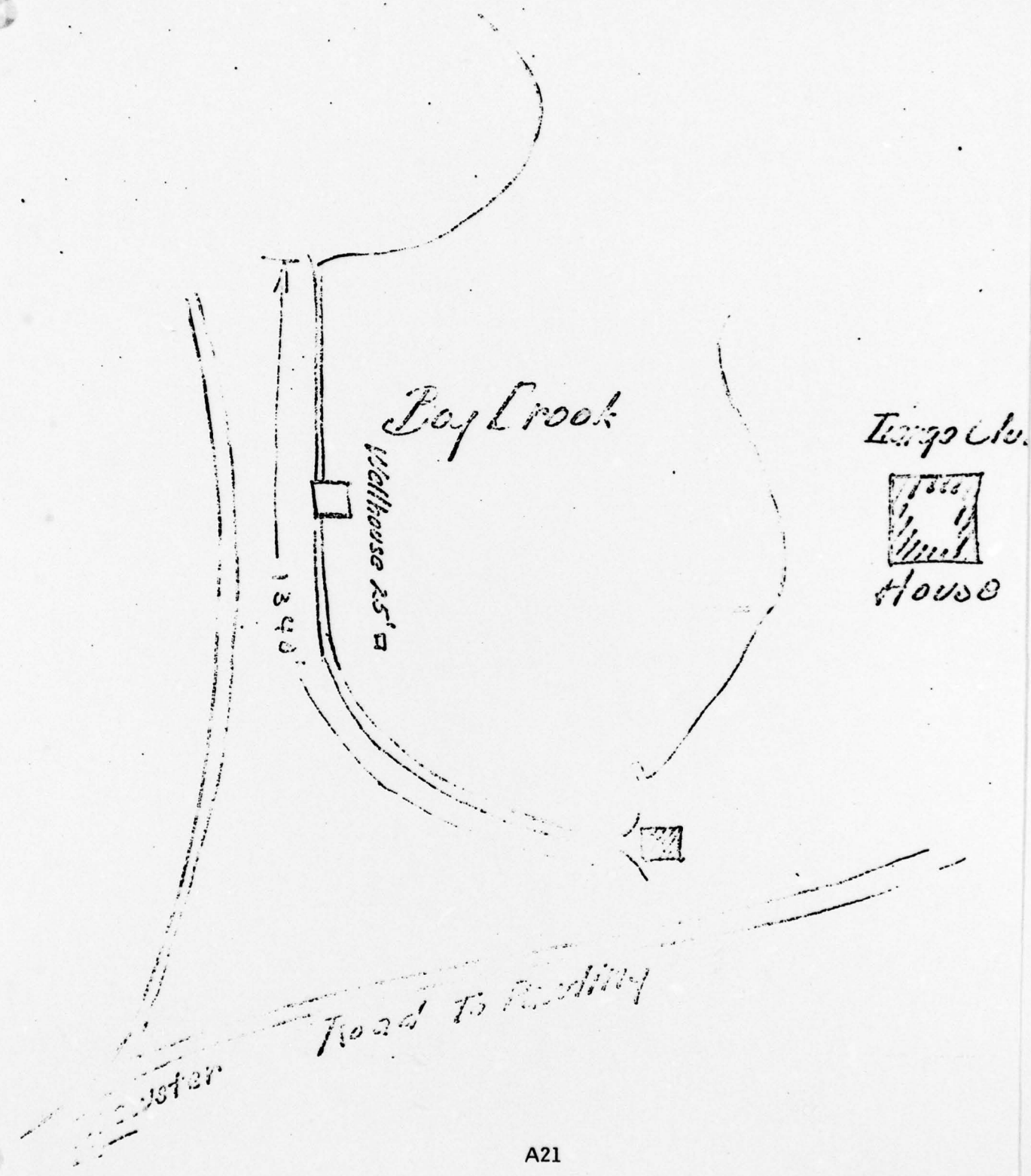
of the dam is [illegible] and under the remaining portions such

foundation bed is [illegible]

A20

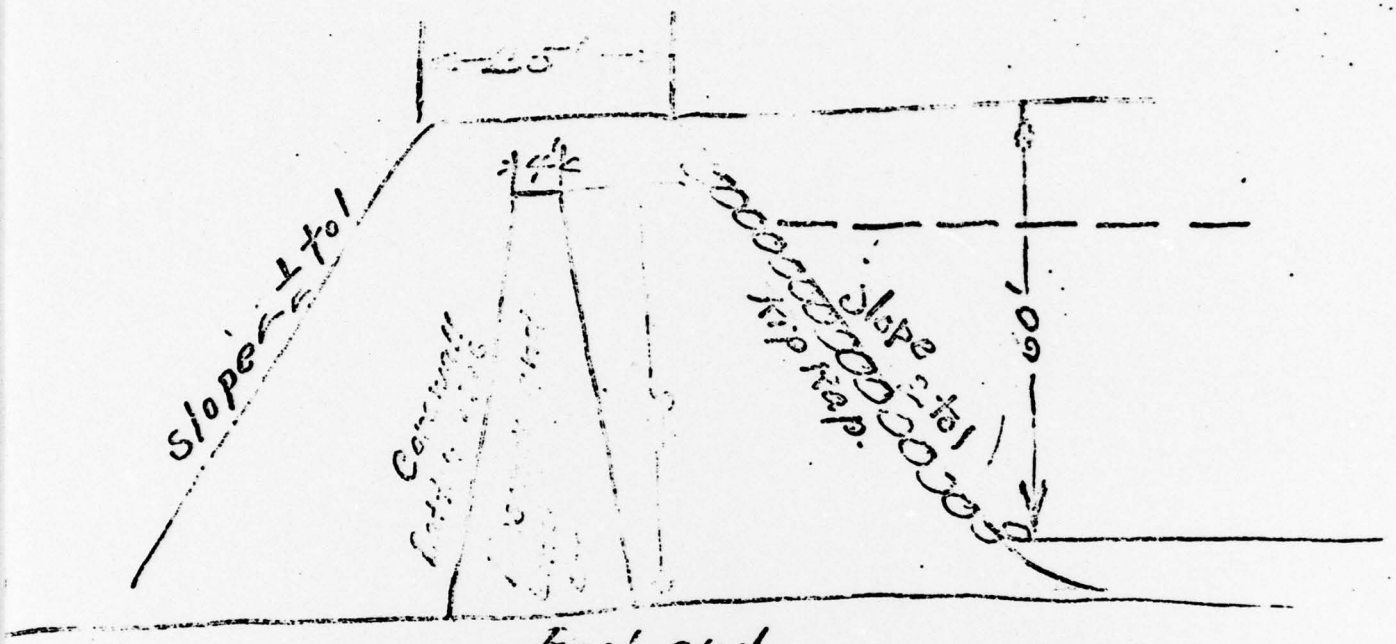
Wap 231 - 525 LH

(In the space below, make a third sketch showing the general plan of the dam, and its approximate position in relation to buildings and other conspicuous objects in the vicinity.)



In the space below, make one sketch showing the form and dimensions of a cross section through the spillway or waste-weir of this dam, and a second sketch showing the same information for a cross section through the other portion of the dam. Show particularly the character of the material in the stream bed, its thickness at the top, and thickness at the bottom, as nearly as you can learn.)

ONLY ONE SECTION NO SPILLWAY



The total length of this dam is 120 feet. The spillway or waste-way portion, is [illegible] feet long, and the crest of the spillway is about [illegible] feet below the top of the dam.

The number, size and location of discharge pipes, waste pipes or gates which may be used for drawing off the water from behind the dam, are as follows: Two 30" pipes near mill house as shown

At the time of this inspection the water level above the dam was 2.5 ft. [illegible] in. below the crest of the spillway.

(State briefly, in the space below, whether, in your judgment, this dam is in good condition, or bad condition, describing particularly any leaks or cracks which you may have observed.)

This dam seems to be in good condition and with a reasonable possibility of giving way. If the dam did fail the water would not be caused [illegible] to rise to any great height above [illegible] on account of the wide [illegible]

Reported by [illegible]

[illegible] P.O. Box [illegible] R.F.D. No. [illegible]

[illegible]

STATE OF NEW YORK

DEPARTMENT OF

State Engineer and Surveyor

ALBANY

Report of a Structure Impounding Water

To assist in carrying out the provisions of Section 22 of the Conservation Law, being Chapter LXV of the Consolidated Laws of New York State, relating to safeguarding life and property and the erection, reconstruction, or maintenance of structures for impounding water, owners of such structures are requested to fill out as completely as possible this report form for each such dam or reservoir owned within the State of New York for which no plans or reports relative thereto are on file in this Department, and to return this report form, together with prints or photographs explanatory thereof to this department.

1. The structure is on Bog Brook Dam, No. 1 Bog Brook flowing into East Branch of Croton Ri in the Town of Southeast County of Putnam and New York about a quarter of a mile S.E. from the Cross Roads in Sodom, Putnam Co., New York.
(Give exact distance and direction from a well-known bridge, dam, village main cross-roads or mouth of a stream)

2. Is any part of the structure built upon or does its pond flood any State lands? no

3. The name and address of the owner is the City of New York

4. The structure is used for impounding water for water supply

5. The material of the right bank, in the direction with the current, is .....; at the spillway crest elevation this material has a top slope of .....inches vertical to a foot horizontal on the center line of the structure, a vertical thickness at this elevation of .....feet, and the top surface extends for a vertical height of .....feet above the spillway crest.

6. The material of the left bank is .....; has a top slope of .....inches to a foot horizontal, a thickness of .....feet and a height of .....feet.

7. The natural material of the bed on which the structure rests is (clay, sand, gravel, boulders, granite, shale, slate, limestone, etc.) sand, gravel and hardpan.

8. State the character of the bed and the banks in respect to the hardness, perviousness, water bearing, effect of exposure to air and to water, uniformity, etc.....

9. If the bed is in layers, are the layers horizontal or inclined? ..... If inclined what is the direction of the horizontal outcropping relative to the axis of the main structure and the inclination and direction of the layers in a plane perpendicular to the horizontal outcropping? .....

10. What is the thickness of the layers? .....

11. Are there any porous seams or fissures? .....

12. The watershed at the above structure and draining into the pond formed thereby is by Bog Brook Dams Nos. 1 and 2 3.67 square miles.

13. The pond area at the spillway crest elevation is 399 acres and the pond impounds 586 mill cubic feet of water.

14. The maximum known flow of the stream at the structure was ..... cubic feet per second on .....
(Date)

15. Has the spillway capacity ever been exceeded by a high flow? no

Can any possible flood flow from the pond otherwise than through the wastes noted under 17 and 18 of this report? no If so, give the location, the length and the elevation relative to the spillway crest and the character and slopes of the ground of such possible wastes .....

16. State if any damage to life or to any buildings, roads or other property could be caused by any possible failure of the above structure. Describe the location, the character and the use of buildings below the structure which might be damaged by any failure of the structure; of roads adjacent to or crossing the stream below the structure, giving the lowest elevation of the roadway above the stream bed and giving the shape, the height and the width of stream openings; and of any embankments or steep slopes that any flood could pass over. Also indicate the character and use made of the ground below the structure. .....

No great damages or loss of life would be caused by the failure of the dam.

17. WASTES. The spillway of the above structure is ..... feet long in the clear; the waters are held at the right end by a ..... the top of which is ..... feet above the spillway crest, and has a top width of ..... feet; and at the left end by a ....., the top of which is ..... feet above the spillway crest, and has a top width of ..... feet.

18. There is also for flood discharge 2 pipes 36 inches inside diameter and the bottom is about 4 feet below the top of the dam and a (sluice, gate outlet) ..... feet wide in the clear by ..... feet high, and the bottom is ..... feet below the spillway crest.

19. Apron. Below the spillway there is no apron but a paved waste channel (Masonry) 12-18 in. feet thick. The downstream side of the apron has a thickness of ..... feet for a width of ..... feet.

20. Has the structure any weaknesses which are liable to cause its failure in high flows? ..... no .....

21. Sketches. On the back of this report make a sketch to scale for each different cross-section of the above structure at the greatest depth; giving the height and the depth from the surface of the foundation, the bottom width, the top width (for a concrete or masonry spillway at two feet below the crest), the elevation of the top in reference to the spillway crest, the length of the section, and the material of which the section is constructed; on the spillway section show a cross section of the apron, giving its width, thickness and material, and show the abutment or wash wall at the end of the spillway, giving its heights and thickness. Mark each section with a capital letter. Also sketch a plan; show the above sections by their top lines, giving the mark and the length of each; the openings by their horizontal dimensions; the abutments by their top width and top lengths from the upstream face of the spillway section; and outline the apron. Also sketch an elevation of each end of the structure with a cross section of the banks, giving the depth and width excavated into the banks.

22. Water Supply. The waters impounded by the above structure have (~~not~~) been used for a public water supply since 1891 by the City of New York.

Spillway. There is no spillway for this dam as the Bog Brook Reservoir is connected by a tunnel with the Sodom Reservoir, which has a spillway, 500 feet wide.

Acc. 3[illegible]

[illegible] filling out one of these forms, as completely as possible for each dam in your district, return it at once to the [illegible] Conservation Commission, Albany.

STATE OF NEW YORK

CONSERVATION COMMISSION

ALBANY

DAM REPORT

August 5th (Day), 1915

CONSERVATION COMMISSION,

DIVISION OF INLAND WATERS.

GENTLEMEN:

I have the honor to make the following report in relation to the structure known as the Bog Brook Auxilliary Dam.

This dam is situated upon the Bog Brook Reservoir (Give name of stream)

in the Town of South East, Putnam County,

about 1 3/4 miles (State distance) from the Village of Brewster.

The distance (State distance) stream from the dam, to the (Give name of nearest important stream or of a village),

is about (State distance).

The dam is now owned by New York City (Give name, or last known owner),

and was built in or about the year 1897, and was extensively repaired or reconstructed

during the year —.

As it now stands, the spillway portion of this dam is built of [illegible] (State whether of stone, concrete, timber, etc.)

and the other portions are built of [illegible] (State whether of stone, concrete, timber, etc.)

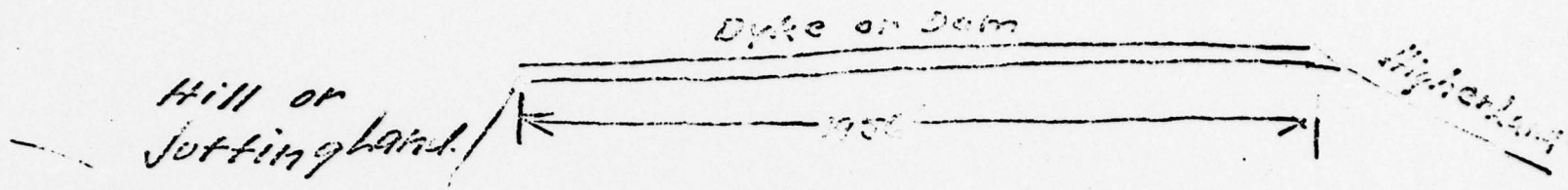
As nearly as I can learn, the character of the foundation bed under the spillway portion

of the dam is [illegible] and under the remaining portions such

foundation bed is [illegible].

Map 231 C A27

(In the space below, make a third sketch showing the general plan of the dam, and its approximate location with reference to other conspicuous objects in the vicinity.)

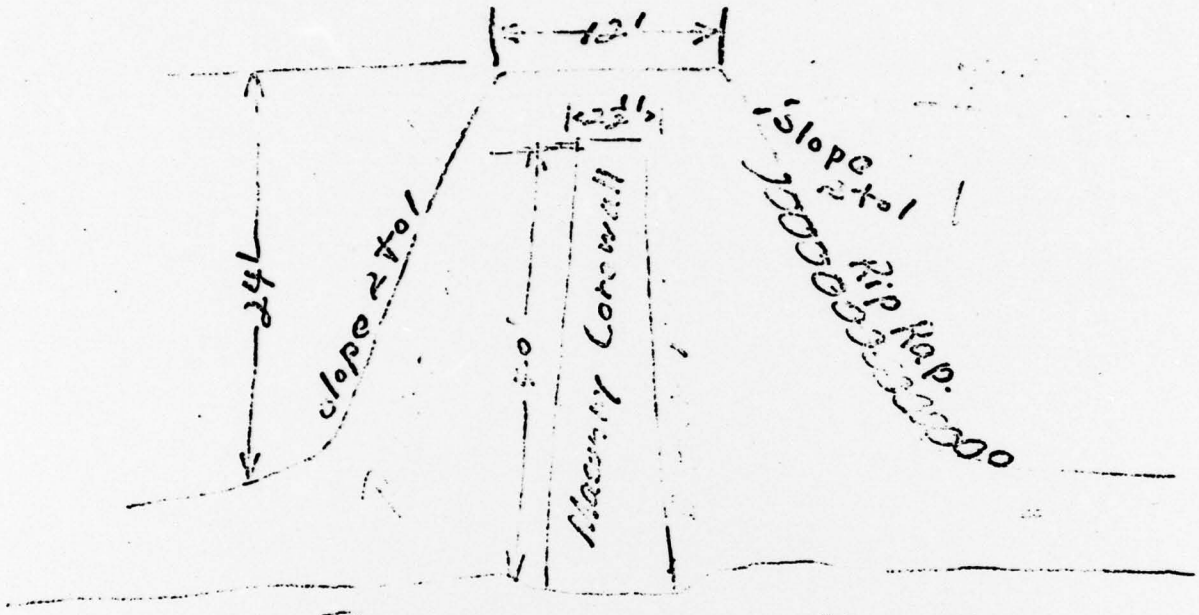


Dog Brook Reservoir.

A28

In the space below, make a cross sketch showing the form and dimensions of a cross section through the spillway or waste-weir of this dam, and a second sketch showing the same information for a cross section through the other portion of the dam. Show particularly the greatest thickness of the dam above the stream bed, its thickness at the top, and thickness at the bottom, as nearly as you can learn.)

No spillway - Only one dec.



Rock and Hard Pan Bed.

The length of the dam is [illegible] feet. The spillway or waste-

way, [illegible] feet long, and the crest of the spillway is

[illegible] feet below the top of the dam.

The number, [illegible] and location of discharge pipes, waste pipes or gates which may be used

for drawing off the water from behind the dam, are as follows:

Masonry outlets

At the time of this inspection the water level above the dam was [illegible] ft. [illegible] in.

below the crest of the spillway.

(State briefly, in the space below, whether, in your judgment, this dam is in good condition, or bad condition, describing particularly any defects or cracks which you may have observed.)

No flaws observed at present time in good condition with no indications of any necessary repairs except it is recommended that the outlet be cleaned of debris

Reported by [illegible]

(Name)

[illegible] (P. O. address of R. I. D. man)

STATE OF NEW YORK

DEPARTMENT OF

State Engineer and Surveyor

ALBANY

Report of a Structure Impounding Water

To assist in carrying out the provisions of Section 22 of the Conservation Law, being Chapter LXV of the Consolidated Laws of New York State, relating to safeguarding life and property and the erection, reconstruction, or maintenance of structures for impounding water, owners of such structures are requested to fill out as completely as possible this report form for each such dam or reservoir owned within the State of New York for which no plans or reports relative thereto are on file in this Department, and to return this report form, together with prints or photographs explanatory thereof to this department.

1. The structure is at expansion Bog Brook Dam No.2 at the foot of Bog Brook Reservoir in the Town of Southeast County of Putnam and New York about 1-1/10 miles north of Bog Brook Dam No. 1 center to center
(Give exact distance and direction from a well-known bridge, dam, village main cross-roads or mouth of a stream)

2. Is any part of the structure built upon or does its pond flood any State lands? no

3. The name and address of the owner is City of New York

4. The structure is used for impounding water for water supply

5. The material of the right bank, in the direction with the current, is .....; at the spillway crest elevation this material has a top slope of .....inches vertical to a foot horizontal on the center line of the structure, a vertical thickness at this elevation of .....feet, and the top surface extends for a vertical height of .....feet above the spillway crest.

6. The material of the left bank is .....; has a top slope of .....inches to a foot horizontal, a thickness of .....feet and a height of .....feet.

7. The natural material of the bed on which the structure rests is (clay, sand, gravel, boulders, granite, shale, slate, limestone, etc.) Rock, gray l and hardpan

8. State the character of the bed and the banks in respect to the hardness, perviousness, water bearing, effect of exposure to air and to water, uniformity, etc.....

9. If the bed is in layers, are the layers horizontal or inclined? ..... If inclined what is the direction of the horizontal outcropping relative to the axis of the main structure and the inclination and direction of the layers in a plane perpendicular to the horizontal outcropping? .....

.....

10. What is the thickness of the layers? .....

11. Are there any porous seams or fissures? .....

.....

12. The watershed at the above structure and draining into the pond formed/thereby is by Poe Creek Dam No. 1 3.67 square miles.

13. The pond area/at the spillway crest elevation is of the Poe Creek Reservoir 209 acres and the pond impounds 588 - 11 cubic feet of water.

14. The maximum known flow of the stream at the structure was ..... cubic feet per second on

..... (Date)

15. Has the spillway capacity ever been exceeded by a high flow? No.

Can any possible flood flow from the pond otherwise than through the wastes noted under 17 and 18 of this report? No. If so, give the location, the length and the elevation relative to the spillway crest and the character and slopes of the ground of such possible wastes .....

.....

.....

16. State if any damage to life or to any buildings, roads or other property could be caused by any possible failure of the above structure. Describe the location, the character and the use of buildings below the structure which might be damaged by any failure of the structure; of roads adjacent to or crossing the stream below the structure, giving the lowest elevation of the roadway above the stream bed and giving the shape, the height and the width of stream openings; and of any embankments or steep slopes that any flood could pass over. Also indicate the character and use made of the ground below the structure. .....

16. No great damages could be causedif the dam should fail.

.....

.....

.....

17. WASTES. The spillway of the above structure is ..... feet long in the clear; the waters are held at the right end by a ..... the top of which is ..... feet above the spillway crest, and has a top width of ..... feet; and at the left end by a ....., the top of which is ..... feet above the spillway crest, and has a top width of ..... feet.

18. There is no flood discharge a pipe ..... inches inside diameter and the bottom is ..... feet below the spillway crest; and a (sluice, gate outlet) ..... feet wide in the clear by ..... feet high, and the bottom is ..... feet below the spillway crest.

19. APRON. Below the spillway there is no apron [illegible] (Material) feet wide and ..... feet thick. The downstream side of the apron has a thickness of ..... feet for a width of ..... feet.

20. Has the structure any weaknesses which are liable to cause its failure in high flows? ..... No .....

21. SKETCHES. On the back of this report make a sketch to scale for each different cross-section of the above structure at the greatest depth; giving the height and the depth from the surface of the foundation, the bottom width, the top width (for a concrete or masonry spillway at two feet below the crest), the elevation of the top in reference to the spillway crest, the length of the section, and the material of which the section is constructed; on the spillway section show a cross section of the apron, giving its width, thickness and material, and show the abutment or wash wall at the end of the spillway, giving its heights and thickness. Mark each section with a capital letter. Also sketch a plan; show the above sections by their top lines, giving the mark and the length of each; the openings by their horizontal dimensions; the abutments by their top width and top lengths from the upstream face of the spillway section; and outline the apron. Also sketch an elevation of each end of the structure with a cross section of the banks, giving the depth and width excavated into the banks.

22. WATER SUPPLY. The waters impounded by the above structure have (not) been used for a public water supply since 1891 by the City of New York

Spillway. There is no spillway for this dam as the Bog Brook Reservoir is connected by a tunnel with the Sodom Reservoir which is provided with a spillway, 500 feet wide.