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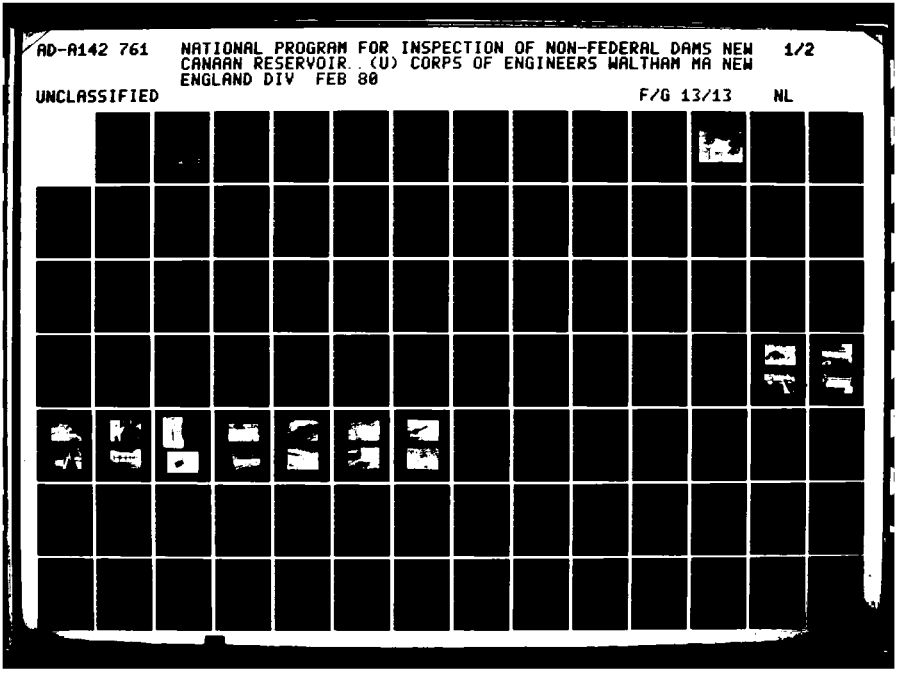

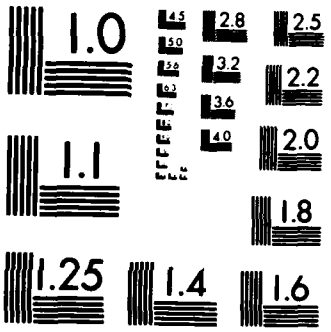

SOUTHWESTERN COASTAL BASIN

NEW CANAAN, CONNECTICUT

NEW CANAAN RESERVOIR DAM
CT 00055

PHASE 1 INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

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

FEBRUARY, 1980

UNCLASSIFIED

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

REPORT DOCUMENTATION PAGE	READ INSTRUCTIONS BEFORE COMPLETING FORM
1. REPORT NUMBER: CT 00055 — 2. GOVT ACCESSION NO.: AD-A142761	3. RECIPIENT'S CATALOG NUMBER
4. TITLE (and Subtitle): Southwestern Coastal Basin New Canaan, Conn., New Canaan Reservoir Dam NATIONAL PROGRAM FOR INSPECTION OF NON-FEDERAL DAMS	5. TYPE OF REPORT & PERIOD COVERED: INSPECTION REPORT 6. PERFORMING ORG. REPORT NUMBER
7. AUTHOR(s): U.S. ARMY CORPS OF ENGINEERS NEW ENGLAND DIVISION	8. CONTRACT OR GRANT NUMBER(s)
9. PERFORMING ORGANIZATION NAME AND ADDRESS	10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS
11. CONTROLLING OFFICE NAME AND ADDRESS: DEPT. OF THE ARMY, CORPS OF ENGINEERS NEW ENGLAND DIVISION, NEDED 424 TRAPELO ROAD, WALTHAM, MA. 02254	12. REPORT DATE: Feb. 1980 13. NUMBER OF PAGES: 75
14. MONITORING AGENCY NAME & ADDRESS(if different from Controlling Office)	15. SECURITY CLASS. (of this report): UNCLASSIFIED 15a. DECLASSIFICATION/DOWNGRADING SCHEDULE

16. DISTRIBUTION STATEMENT (of this Report)

APPROVAL FOR PUBLIC RELEASE: DISTRIBUTION UNLIMITED

17. DISTRIBUTION STATEMENT (of the abstract entered in Block 20, if different from Report)

18. SUPPLEMENTARY NOTES

Cover program reads: Phase I Inspection Report, National Dam Inspection Program; however, the official title of the program is: National Program for Inspection of Non-Federal Dams; use cover date for date of report.

19. KEY WORDS (Continue on reverse side if necessary and identify by block number)

DAMS, INSPECTION, DAM SAFETY,

Southwestern Coastal Basin
New Canaan, Conn.
New Canaan Reservoir Dam

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

The dam at New Canaan Reservoir is an earth embankment approx. 445 ft. long, 37 ft. high and ahving a top width of 21 ft. Built originally about 1898 with subsequent modification from 1929 to 1942, this dam impounds water used by New Canaan, Conn. The New Canaan Water Company presently owns and operates the dam including its water works facilities. This dam is classified as SMALL in size and a HIGH hazard potential structure in accordance with the recommended guidelines established by the Corps of Engineers.

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SOUTHWESTERN COASTAL BASIN

NEW CANAAN, CONNECTICUT

NEW CANAAN RESERVOIR DAM

CT 00055

PHASE I INSPECTION REPORT

NATIONAL DAM INSPECTION PROGRAM

NATIONAL DAM INSPECTION PROGRAM

PHASE I - INSPECTION REPORT

Identification No.:	CT 00055
Name of Dam:	New Canaan Reservoir Dam
Town:	New Canaan
County and State:	Fairfield, Connecticut
Stream:	Five Mile River
Date of Inspection:	November 14, 1979

BRIEF ASSESSMENT

The dam at New Canaan Reservoir is an earth embankment approximately 445 feet long, 37 feet high and having a top width of 21 feet. Built originally about 1898 with subsequent modification from 1929 to 1942, this dam impounds water used by New Canaan, Connecticut. The New Canaan Water Company presently owns and operates the dam including its water works facilities.

Based on the visual inspection and past operational performance, the dam is judged to be in FAIR condition. Seepage was noted on the downstream face. The emergency outlet works have not been operated in some time. The two service bridges were found to be in need of repair. Trees were recently cut on the downstream face and the slope is in an unvegetated state.

This dam is classified as SMALL in size and a HIGH hazard potential structure in accordance with the recommended guidelines established by the Corps of Engineers.

The test flood for this dam is the Probable Maximum Flood (PMF). The test flood has an outflow discharge equal to 1820 cfs and will overtop the dam by 1.1 feet in a stillwater condition. The maximum outflow capacity of the spillway under stillwater conditions is 240 cfs, which is approximately 13 percent of the test flood.

It is recommended that the following items be studied further: The location, condition, and operability of various outlet works; downstream seepage; the composition and adequacy of the dam embankment; the stumps from recently cut trees on the downstream face of the dam; and the deteriorated condition of the service bridge to the gate house.

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 by 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 reasonably possible storm runoff), or fractions thereof. Because of the magnitude and rarity of such a storm event, a finding that a spillway will not pass the test flood should not be interpreted as necessarily posing a highly inadequate condition. The test flood provides a measure of relative need for more detailed hydrologic and hydraulic studies, considering the size of the dam, its general condition and downstream damage potential.

The Phase I Investigation does not include an assessment of the need for fences, gates, no-trespassing signs, repairs to existing fences and railings and other items which may be needed to minimize trespass and provide greater security for the facility and safety to the public. An evaluation of the project for compliance with OSHA rules and regulations is also excluded.

Recommendations and remedial measures that should be implemented within one year of receipt of this Phase I Inspection Report are further described in Section 7.

JAMES P. PURCELL ASSOCIATES, INC.

Sudhir A. Shah, P.E.
Vice-President
Connecticut P.E. No. 8012

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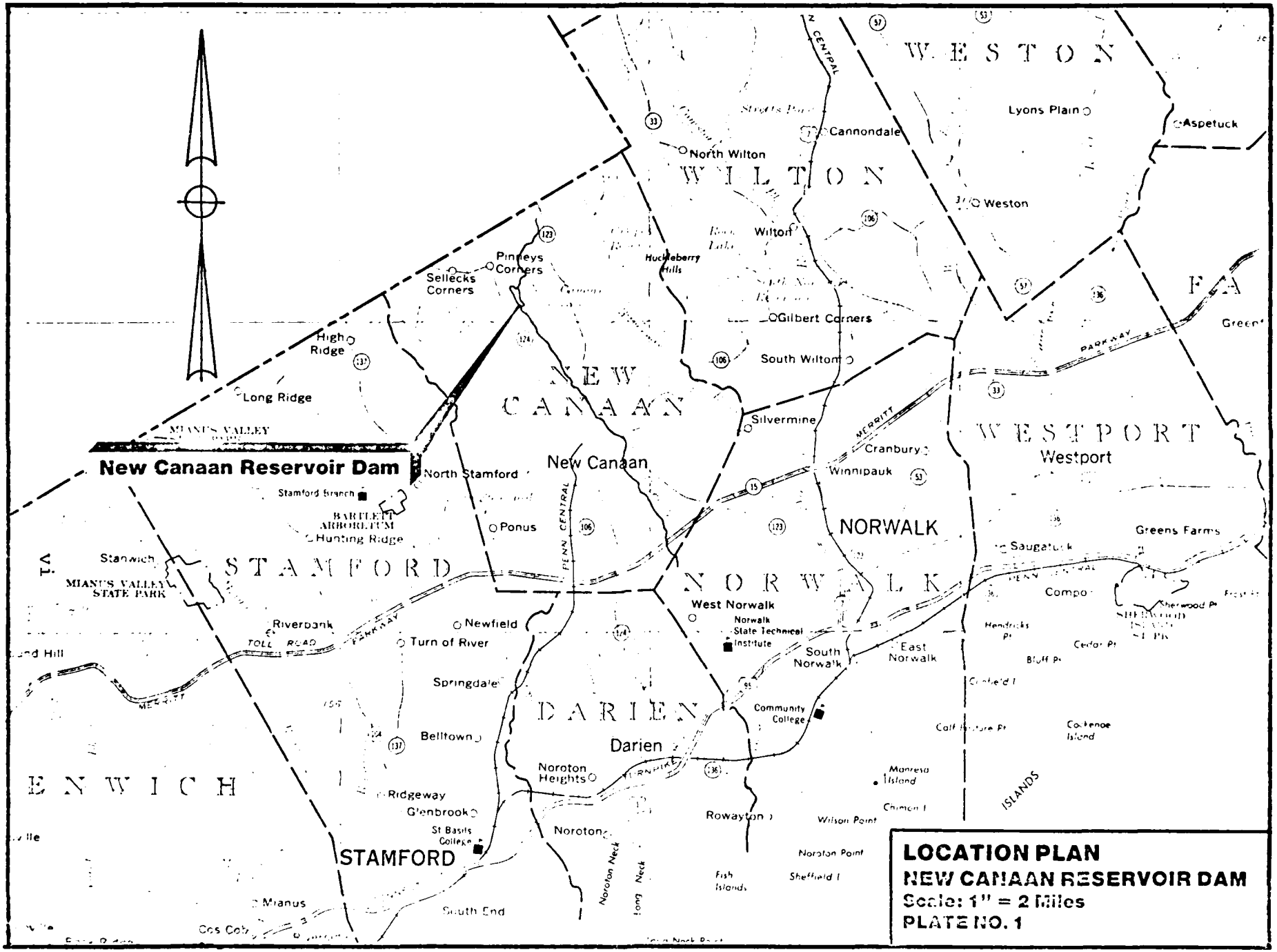

New Canaan Reservoir Dam
LOCATION PLAN
NEW CANAAN RESERVOIR DAM
Scale: 1" = 2 Miles
PLATE NO. 1
WESTON
WILTON
NEW CANAAN
WESTPORT
NORWALK
DARIEN
STAMFORD
ENWICH
Lyons Plain
Aspetuck
Cannondale
North Wilton
Weston
Wilton
Pinneys Corners
Sellecks Corners
Huckleberry Hills
Gilbert Corners
South Wilton
High Ridge
Long Ridge
Silvermine
Cranbury
Winnipauk
Westport
New Canaan
North Stamford
Stamford Branch
BARTLETT ARBORETUM
Hunting Ridge
Ponus
Greens Farms
Saugatuck
Stanwich
MIANUS VALLEY STATE PARK
Riverbank
TOLL ROAD
Newfield
Turn of River
West Norwalk
Norwalk State Technical Institute
South Norwalk
East Norwalk
Springdale
Belltown
Community College
Darien
Noroton Heights
Ridgeway
Glenbrook
St Basils College
Noroton
Rowayton
Monroe Island
Wilson Point
Noroton Point
Sheffield I
Fish Islands
Cockenoe Island
ISLANDS
Mianus
South End
Cos Cob
Noroton Neck
Long Neck
PENN CENTRAL
MERRITT PARKWAY
TURNPIKE

NATIONAL DAM INSPECTION PROGRAM

PHASE I - INSPECTION REPORT

NAME OF DAM: NEW CANAAN RESERVOIR

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 throughout 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. James P. Purcell Associates, Inc. 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 James P. Purcell Associates, Inc., under a letter from William E. Hodgson, Jr., Colonel, Corps of Engineers. Contract No. DACW33-80-C-0002 has been assigned by the Corps of Engineers for this work.

b. **Purpose of Inspection**

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 prepare 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 the Project

a. **Location:** New Canaan Reservoir Dam is located in Fairfield County, Connecticut, approximately 0.8 miles southeast of Pinneys Corners (See Plate No. 1). The dam impounds water from Five Mile River and is located approximately 9 miles upstream of Long Island Sound, and 1000 feet upstream of the village of New Canaan.

The impoundment is situated in a north/south direction with the dam at the southern end. The latitude is 41° -10'-36" and the longitude is 73° -30'-54". All elevations used in this report are based on the National Geodetic Vertical Datum (NGVD).

b. **Description of Dam and Appurtenances:** New Canaan Reservoir Dam is an earth embankment with a concrete and stone masonry core, approximately 445 feet long and having a maximum height of 37 feet. The emergency spillway is concrete and located at the west end of the dam and has a length of 25.5 feet with a crest elevation of 449.0 feet. The spillway has a 24 inch permanent timber flashboard with another 4 inch removable timber flashboard attached at the top. The top width of the dam is approximately 21 feet and is 4 feet above the top of the spillway. The downstream face of the dam is an earth embankment sloping at approximately 3H:1V. The concrete spillway outlet channel is 11 feet wide and 3.5 feet deep.

A gate house containing the outlet works is located in the reservoir 38 feet upstream of the dam. Water can be withdrawn from the reservoir into the gate house wet wells through three (3) 12 inch valves, located at depths of 6 ft., 12 ft., and 30 ft. below the top of the permanent flashboards and a sluice gate at a depth of 14 feet. There are also other inoperable sluices. A 16 inch blowoff valve is located at a depth of 33 feet to 35 feet. This valve and pipe are used to control the accumulation of silt at the bottom of the reservoir. Water can be discharged to the Five Mile River below the dam through the 16 inch cast iron pipe directly from the reservoir. A 12 inch diameter cast iron pipe carries flows by gravity from the wet well to the pumping station - filter house, located at the toe of the dam embankment.

c. **Size Classification:** The size classification of this dam is SMALL as per the criteria set forth in the Recommended Guidelines for Safety Inspection of Dams, by the Corps of Engineers. The impoundment storage at the top of the dam is 535 acre-feet (within the range 50 to 1000 acre-feet) and the maximum height of the dam is 37 feet (within the range of 25 to 40 feet). The size classification is based on both the height and storage criteria.

d. **Hazard Classification:** The hazard classification of this dam is HIGH as per the criteria set forth in the Recommended Guidelines for Safety Inspection of Dams, by the Corps of Engineers. The failure of the dam would result in more than a few losses of life and extensive damage to residential areas located downstream. Numerous homes will be inundated by 5 to 10 feet of water.

e. **Ownership:** New Canaan Reservoir Dam was constructed about 1898 and is presently owned and maintained by the New Canaan Water Company, New Canaan, Connecticut.

f. **Operator:** The operator and caretaker for the New Canaan Reservoir Dam is:

Mr. Nicholas Negria, General Manager
New Canaan Water Company
36 Grove Street
New Canaan, CT 06841
Tel: (203) 966-5676

g. **Purpose of Dam:** New Canaan Reservoir impounds water from Five Mile River and is used to supply water to the surrounding area through a water distribution system.

h. **Design and Construction History:** The facility was constructed about 1898. The dam consists of an earth embankment with a concrete and stone masonry core. In 1929 the dam was raised to its present level and a road was constructed across the top of the dam.

i. **Normal Operational Procedures:** Water is withdrawn by gravity from the impoundment on demand through a 12 inch diameter pipe flowing from the wet well in the gate house to the filter house, located at the toe of the dam embankment and then it is supplied to customers through a 12 inch water main utilizing the pumping facilities in the filter house. Water can also be by-passed to the Five Mile River below the dam through a 16 inch blowoff pipe directly from the reservoir.

1.3 Pertinent Data

a. **Drainage Area:** New Canaan Reservoir is located in Fairfield County, Connecticut. The drainage basin lies 2-1/2 miles northwest of New Canaan. The shape of the basin is generally rectangular with its length being 2.1 miles and width approximately 0.5 miles. Total drainage area to the dam is 0.84 square miles. (See Drainage Basin Map in Appendix D.) Topography is generally rolling to moderate terrain with elevations ranging from a high of 660.0 feet to a normal reservoir elevation of approximately 445.7 feet. Stream and basin slopes are moderate to flat, 1.0 percent to 0.7 percent, respectively. The normal reservoir surface area is 20.6 acres, which is approximately 4 percent of the watershed.

b. **Discharge at Dam Site:** There are no specific discharge records available for this dam. Listed below are calculated discharge values for the spillway and outlet works (16 inch blowoff).

1. Outlet works: A 16 inch blowoff pipe with an intake approximately at elevation 416.0 and a discharge capacity of 39 cfs at elevation 451.0.

2. Maximum known flood at dam site: Calculated to be 300 to 400 cfs in 1955 based on a reported water level 2 inches below the top of the dam. There were 12 to 18 inches of flashboards on the spillway at that time.

3. Spillway capacity at top of dam: 240 cfs at elevation 453.0. (550 cfs without flashboards.)

4. Spillway capacity at test flood elevation: 465 cfs at elevation 454.1.

5. Gated outlet capacity at normal pool elevation: 38 cfs at elevation 445.7.

6. Gated outlet capacity at test flood elevation: 41 cfs at elevation 454.1.

7. Gated outlet capacity at top of dam elevation: 41 cfs at elevation 453.0.

8. Total project discharge at top of dam: 281 cfs at elevation 453.0.

9. Total project discharge at test flood elevation: 506 cfs at elevation 454.1.

c. **Elevation** (Feet above NGVD):

1.	Streambed at toe of dam	416.0
2.	Bottom of cutoff	Unknown
3.	Maximum tailwater	N/A
4.	Recreation pool	N/A
5.	Full flood control pool	N/A
6.	Spillway crest (w/o flashboards)	449.0
	Spillway crest (w/flashboards)	451.0
7.	Design surcharge (original design)	Unknown
8.	Top of dam	453.0
9.	Test flood level	454.1

d. **Reservoir** (Length in Feet)

1.	Normal pool	2000
2.	Flood control pool	N/A
3.	Spillway crest pool	2000
4.	Top of dam	2000
5.	Test flood pool	2000

e. **Storage** (Acre-Feet)

1.	Normal pool	320

2.	Flood control pool	N/A
3.	Spillway crest pool (permanent flashboards)	463
4.	Top of dam	535
5.	Test flood pool	580

f. **Reservoir Surface** (Acres)

1.	Normal pool	20.6
2.	Flood control pool	N/A
3.	Spillway crest (w/o flashboards)	23
4.	Spillway crest (w/flashboards)	34
5.	Test flood pool	42
6.	Top of dam	38

g. **Dam**

1.	Type	Earth embankment
2.	Length	445 feet
3.	Height	37 feet
4.	Top width	21 feet
5.	Side slopes	Upstream - Vertical above water. Downstream - 3H:1V
6.	Zoning	Unknown
7.	Impervious core	Concrete & masonry
8.	Cutoff	Unknown

9.	Grout curtain	Unknown
10.	Other	- - -
h.	**Diversion and Regulating Tunnel**	N/A
i.	**Spillway**	
1.	Type	Overflow, ogee crested with timber flash-boards
2.	Length of weir	25.5 feet
3.	Crest elevation (w/o flashboards)	449.0
	Crest elevation (w/flashboards)	451.0
4.	Gates	None
5.	U/S Channel	Natural bed
6.	D/S Channel	Curved, rectangular concrete channel. Width is 11 ft., depth is 3.5 ft. & length is approx. 300 ft.
7.	General	- - -
j.	**Regulating Outlets**	

Refer to Paragraph 1.2b - "Description of Dam and Appurtenances" for description of Outlet Works.

1.	Inverts	Water Supply Intakes at Gate House El. 445 - West Side El. 439 - East Side El. 437 - North Side El. 421 - North Side Blowoff Intake, El. 416 Others - El. Unknown

2.	Size	Water Supply - 12 inch diameter Blowoff - 16 inch diameter
3.	Description	Cast Iron Pipes
4.	Control Mechanism	Hand Operated Gear mechanism within masonry gate house.

SECTION 2

ENGINEERING DATA

2.1 Design

There are no available records presenting design information for the construction of the New Canaan Reservoir Dam.

2.2 Construction

There are no available records of the construction or subsequent repairs to this dam.

2.3 Operation

No formal records of operation are maintained for this facility. Daily customer usage is the only information which is recorded.

2.4 Evaluation

a. **Availability:** The information concerning this dam was gathered only by field investigation and meetings with officials of the New Canaan Water Company.

b. **Adequacy:** The lack of indepth engineering did not allow a definitive review. Therefore, the adequacy of this dam could not be assessed from the standpoint of reviewing design and construction data, but is based primarily on the visual inspection, the dam's past performance, and sound engineering judgment.

c. **Validity:** The validity of the limited information available must be verified.

SECTION 3

VISUAL INSPECTION

3.1 Findings

a. **General:** The visual inspection was conducted on November 14, 1979 and a copy of the visual inspection check list is included in Appendix A of this report.

The following procedure was used:

1. Visual inspection of the face and top of the dam and spillway for cracks, leakage, etc.

2. Inspection of the outlet works, gate house, and other appurtenances as to their condition and operability.

3. Inspection of the spillway and discharge channel for cracks, leaks, serviceability.

4. Review of procedures that could be utilized in the event of an emergency situation.

5. A check of the downstream area for seepage, piping, boils or other indications of abnormal conditions. The downstream hazard potential in the event of a dam failure was investigated.

6. Photographs of the general area of the dam and specific items of note were taken and are included in Appendix C of this report.

Before the inspection, the available existing data and aerial photographs were studied and reviewed.

b. **Dam:**

1. **Crest:** In general, the top of the dam is level with no indication of misalignment or settlement although it has been recently regraded indicating possible past settlement. The top of the dam is earth with a low concrete wall on the upstream side (Photos C-1, C-2). A road traverses the entire length of the dam and is carried over the spillway on a steel bridge with a timber deck (Photo C-4). Minor rusting of the steel was noted and the wood deck is slightly deteriorated. Reportedly, this bridge is too narrow to provide access for chemical trucks to the filter house. The top has an average width of approximately 21 feet.

2. **Upstream Slope:** The upstream face of the dam is a vertical concrete wall above the water level and reportedly a sloping earth embankment with a riprap cover below. Cracking and spalling of the concrete was noted (Photos C-11 , C-12).

3. **Downstream Slope:** The downstream face is an earth embankment with a slope of approximately 3H:1V (Photos C-13, C-14). There is a rock outcrop in the center of the embankment at the toe. Evergreen trees which were planted on the embankment in the early 1940's had recently been cut; however, the stumps remain. Because of the recent removal of the trees, the slope is essentially unvegetated, resulting in the formation of minor gullies from storm runoff. A few trees remain along the edges of the dam primarily along the spillway discharge channel. Seepage was noted from one location at each edge of the embankment, both with steady clear flows of 5 to 10 GPM (Photo C-16). These have reportedly been in existence since at least 1932. Other wet spots on the embankment were noted, although they may have been due to a recent rainfall (Photo C-15).

   The filter house for the water supply system is located at the toe of the slope towards the right edge (Photo C-17). There is an underdrain system at the base of the slope, which was flowing at the time of inspection, although it is reportedly an area drain for the filter house area and not a toe drain for the dam.

c. **Appurtenant Structures**

1. **Spillway:** The spillway is a 25.5 foot long concrete ogee weir with 24 inches of permanent and 4 inches of temporary timber flashboards (Photo C-6). The spillway discharges into a 25.5 foot wide rectangular concrete channel which tapers to an 11 foot wide, 42 inch deep, rectangular concrete channel (Photo C-7) and extends down the right edge of the embankment to the Five Mile River below the dam. The water level on the day of the inspection was 3.3 feet below the spillway crest. No leaks or cracks were noted in the spillway, although the training walls are cracked and deteriorated (Photos C-5, C-6). There are two 10 inch drain pipes extending through the spillway, which are plugged with concrete on the upstream side (Photo C-5). The discharge channel floor is cracked at joints and the condition deteriorates toward the downstream end where the floor and walls are severly broken. The slope of the channel is quite steep in the upper and middle sections and becomes mild at the outfall to the stream.

2. **Low Level Outlets:** There is a 16 inch blowoff located through the center of the dam. The intake is located at the gate house, 33 - 35 feet below the top of the permanent flashboard level and is controlled by a valve stem in the gate house (Photo C-10). The 16 inch pipe extends to a sealed (bolted plate) outlet downstream of the dam. It reportedly requires

back pressure from the potable water system (12 inch supply main) via a 6 inch tap to the bolted plate to operate the blowoff valves. The outlet is suspected to be operational; however, the last time it was used is unknown (Photo C-18).

There is an 8 inch drain with a valve in the gate house. The location, use, and operability of this outlet is unknown.

3. **Water Supply Outlets:** A 12 inch pipe carries water from the gate house to the filter house and continues to the water distribution system. Various intakes at different elevations allow water into two wet wells in the gate house where the water is screened prior to entering the 12 inch main. An operational 12 inch valve on the west side of the house admits water 6 feet below the permanent flashboard level. An operational 12 inch valve on the east side of the house (Photo C-9) admits water 12 feet below the flashboard level. A sluice gate is located on the north side of the gate house which must be raised from outside the house from a boat, by attaching a cable to a block and tackle. A 12 inch low level valve is also located on the north side of the house, but is not used because sediments would be introduced into the water system. Two other sluice gates are located on the north side of the house. However, information concerning their operability is unknown.

   There is a 6 inch tap on the 12 inch main below the filter house, which can be utilized to create the back pressure on the 16 inch blowoff necessary for the operation of its valves.

   Reportedly, fire hydrants within the water distribution system could be opened to drain the reservoir, although this has not been done.

4. **Gate House:** The gate house is a concrete and brick structure located in the reservoir 38 feet upstream of the dam and is generally in good condition (Photo C-2). Access to the house is via a steel service bridge with a timber deck (Photo C-8). The steel portion appears sound; however, the deck is deteriorating and the wood railing is in poor condition.

d. **Reservoir Area:** The reservoir is formed by the flooding of a portion of the Five Mile River bed extending partially up two tributary stream beds. The western side of the reservoir has fairly gentle slopes, while the slopes on the eastern side are generally steeper. The eastern slope at the dam site is subject to erosion and 2 feet of fill was added to a lodging road at the east abutment in 1979. Sediments are entering the northwest corner of the lake, forming a delta on the western side of the reservoir. No geologic features were detected that could be expected to adversely affect the dam or its appurtenant structures.

   Trespassing on the dam is not permitted and the site is located off traveled ways.

e. **Downstream Channel:** The downstream channel is a fairly straight and natural bed with a rough vegetated bottom.

3.2 Evaluation

Based on the visual inspection, the New Canaan Reservoir Dam appears to be in fair condition and there are specific areas of concern that should be addressed.

The unvegetative state of and the remaining trees on the downstream face of the dam should not be allowed to persist.

The operability and condition of the 16 inch blowoff should be ascertained. The location, use and operability of the 8 inch drain should be ascertained. The two points of steady seepage on the downstream face should be monitored.

The timber decks and the railing of the service bridges and the spalling concrete surfaces of the wall along the upstream face of the dam, the spillway wingwalls and training walls should be rehabilitated.

The downstream face of the embankment should be monitored for leakage and piping due to the remaining stumps and a study made to determine methods to reduce this potential.

SECTION 4

OPERATIONAL AND MAINTENANCE PROCEDURES

4.1 Operational Procedures

The New Canaan Reservoir is a surface water supply storage facility for the New Canaan Water Company. Water flows by gravity from the gate house, located in the reservoir, to the filter house, located at the toe of the dam, through a 12 inch cast iron pipe. Water is then supplied to customers through a 12 inch water main utilizing the pumping facilities in the filter house. Reservoir discharges utilizing the spillway are only used in spring for snow-melt runoff or during emergency overflow situations. The 16 inch blowoff is not regularly operated.

4.2 Maintenance of the Dam

Evergreen trees, planted in the early 1940's, on the downstream face of the dam embankment were cut down in 1979. However, the stumps still remain in the embankment. The embankment slope is otherwise unvegetated. Larger trees upstream of the reservoir in the watershed were also cut down in 1979 to increase runoff to the reservoir.

4.3 Maintenance of the Operating Facilities

No regular maintenance of gate house valves was reported. Valves used regularly appear in good working condition. The gate house blowoff valve, used to discharge water from the bottom of the reservoir for the purpose of controlling the accumulation of silt, has not been operated for a long period of time. Thus, it is not known whether this valve is operable.

4.4 Description of Any Warning System in Effect

Emergency action and/or warning would be coordinated through the office of the New Canaan Water Company in New Canaan, Connecticut and through Mr. Nicholas Negria, General Manager of the Water Company. Mr. Negria resides in the house adjacent to the dam and in an emergency situation, would remove the top 4 inch flashboard, thus diverting overflow to the concrete outlet channel. No formal emergency or contingency plan is in effect to reduce or minimize downstream damage in emergency situations.

Monitoring of the approach of intense storm activity is normally through the U. S. Weather Service, or local weather forecasts.

4.5 Evaluation

The operational procedures for this water supply are a direct function of the demands placed on the overall system and, therefore, can not be regulated. However, the maintenance for both the dam and its appurtenance is apparently not on a "regular" basis and therefore, intermittent. It is important to maintain the water supply, and therefore, assure a consistent long-term performance of the facility. A regular monitoring, inspection and maintenance program should be developed and implemented.

SECTION 5

EVALUATION OF HYDRAULIC/HYDROLOGIC FEATURES

5.1 General

The New Canaan Reservoir Dam creates an impoundment with a total storage capacity of 405 ac.-ft. at elevation 449.0, the spillway crest elevation. Each foot of depth in the reservoir above the spillway crest can accommodate approximately 29 ac.-ft. The spillway is a concrete ogee weir 25.5 feet in length and 4.0 feet below the top of the dam. 24 inches of permanent and 4 inches of temporary timber flashboards are attached to the spillway. Stream and basin slopes are moderate to flat, 1.0 percent to 0.7 percent, respectively. The reservoir has a normal surface area of 20.6 acres which is approximately 4 percent of the watershed.

5.2 Design Data

1. No specific design data is available for this watershed or the structures of the New Canaan Reservoir Dam. In lieu of existing design information, USGS topographic maps (scale 1"=2000') were utilized to develop hydrologic parameters such as drainage area, basin length, time of concentration, and other runoff characteristics. Elevation-storage relations for the reservoir were approximated. Reservoir surface area and surcharge storage was computed using the USGS maps. Some of the pertinent hydraulic design data was obtained and/or confirmed by actual field measurements at the time of the visual inspection.

b. Outflow values (routing procedures) and dam overtopping analyses were computed in accordance with the guidelines developed by the Corps of Engineers. Judgment was used in calculating final values outlined in this report, which are quite approximate and should not be considered a substitute for actual detailed analysis.

5.3 Experience Data

Historical data for recorded discharges is not available for this dam. The maximum discharge to date occurred in 1955 and was calculated to be approximately 300 to 400 cfs corresponding to a reported water level of 2 inches below the top of the dam, and there were 12 to 18 inches of flashboards on the spillway at that time.

5.4 Test Flood Analysis

Recommended Guidelines for the Safety Inspection of Dams by the Corps of Engineers were used for the selection of the "Test Flood". This dam is classified as a HIGH hazard and SMALL size structure. Guidelines indicate that 1/2 to 1 times the Probable Maximum Flood (PMF) be used as the test flood for these classifications.

A test flood equal to the PMF was chosen because the height of the dam is on the high side of the "small" category, and the dam is upstream of a populated residential area. The watershed has a total area of .84 square miles. Snyder's lag was calculated to be 2.48 hours and a Snyder peaking coefficient of 0.625 was used. The 200 square mile - 24 hour Probable Maximum Precipitation (PMP) is 22 inches. The flood hydrograph package, HEC-1 computer program, developed by the Corps of Engineers was utilized to develop the inflow hydrograph, route the flood through the reservoir, and for the dam overtopping analysis. A test flood inflow equal to the PMF was calculated to be 1825 cfs. The inflow from 1/2 PMF was calculated to be 910 cfs. The outlet works were considered to be closed for this analysis.

The spillway capacity is hydraulically inadequate to pass the test flood (PMF) and overtopping of the dam will occur. The maximum outflow capacity of the spillway without overtopping the dam is 240 cfs, with the permanent flashboards. This corresponds to approximately 13 percent of the test flood and a storage above the permanent flashboard level of 72 ac.-ft. The maximum outflow discharge value for the test flood is 1820 cfs, corresponding to a depth of flow over the top of the dam of 1.1 feet and a storage above the spillway level of 117 ac.-ft. The outflow from 1/2 PMF was calculated to be 840 cfs. A spillway rating curve, low level outlet rating curve, and a reservoir surface area-capacity curve are included in Appendix D of this report.

At the permanent flashboard elevation of 451.0, the capacity of the 16 inch outlet structure is 39 cfs and approximately 2 cfs are withdrawn via the 12 inch supply main. It will require approximately 11 hours to lower the water level the first foot assuming a water surface area of 34 acres and use of the outlet works to regulate the water level for expected inflows. Storage for impending flood conditions cannot be provided quickly by use of the outlet works if the pool level is high.

5.5 Dam Failure Analysis

This dam is classified as a HIGH hazard structure. Failure discharge can cause damage due to high velocities, impact from debris, and flooding to residential homes along the downstream channel. Also, loss of this dam would impose hardships on the local community because of the loss of water supply.

Calculated dam failure discharge is 28887 cfs at a pool level equal to the top of the dam. At this elevation, the downstream discharge before failure will be the full spillway capacity of 240 cfs, corresponding to a depth of flow of 1 to 2 feet in the downstream channel. Failure will produce a water surface level approximately 10.5 feet immediately downstream from the dam. Residential homes along the downstream channel will be inundated by approximately 5 to 10 feet of water. The failure discharge will effect downstream areas for a distance of 14,500 feet from the dam. At this distance, the water surface level will be approximately 5.0 feet above normal observations as it enters Mill Pond. Beyond 14,500 feet, the effects of the failure discharge will be reduced as it enters Mill Pond. Water surface elevations due to the failure of the dam are listed in Appendix D. Probable consequences including the prime impact areas are also listed in Appendix D.

SECTION 6

EVALUATION OF STRUCTURAL STABILITY

6.1 Visual Observations

Visual observations of the earth embankment, overflow spillway, and outlet structure did not disclose any signs of major structural instabilities. However, slight seepage is surfacing somewhat below mid-height of the dam embankment near the east crotch (with the point of seepage emergence covered by recently felled trees), and at about the level of the toe in the west crotch. Because the geometry of the core in the dam is unknown, the flow path for the observed seepage cannot be estimated.

The vertical and horizontal alignments of the embankment appeared to have been maintained, and there was no evidence of cracks in the earth. There was recent filling (reportedly up to about 8 inches thick, placed in the summer of 1979) to level the top of the dam. At the same time, fill along the logging road was placed at the east abutment where, we were informed, erosion has been taking place as a result of wave action in the reservoir.

A small section of concrete in the upstream face (at the crest) was cracked, and appeared to have moved slightly upstream (possibly due to frost action). The floor of the spillway discharge channel is severely deteriorated.

Many full-size trees were established on the crest and the downstream slope of the embankment, and have only recently been felled. Therefore, some of the roots may have crossed the embankment transversely.

6.2 Design and Construction Data

There is insufficient design and construction data to permit a formal evaluation of stability.

6.3 Post-Construction Changes

No post-construction design data pertinent to the embankment or foundation is available.

The dam was raised to its present level in 1929-1930. However, no construction data is available.

Up to 8 inches of fill was placed in 1979 to level the top of the dam, indicating possible past settlement of the embankment.

6.4 Seismic Stability

This dam is in Seismic Zone 1 and, hence, does not require evaluation for seismic stability according to the USCE Recommended Guidelines.

SECTION 7

ASSESSMENT, RECOMMENDATIONS, AND REMEDIAL MEASURES

7.1 Dam Assessment

a. **Condition:** Based on the visual inspection, past performance and hydraulic/hydrologic evaluation, the New Canaan Reservoir Dam and appurtenances is judged to be generally in FAIR condition. Items of concern that should be addressed as a result of this inspection are listed in Sections 7.2 and 7.3.

b. **Adequacy of Information:** The absence of existing engineering data did not allow for definitive review. Therefore, the adequacy of the dam is based on visual inspection, past performance history, and engineering judgment.

c. **Urgency:** The recommendations and remedial measures described below should be implemented by the owner within one year after receipt of this Phase I Inspection Report.

7.2 Recommendations

It is recommended that the owner engage a qualified registered engineer to carry out the following actions:

a. The location, condition and operability of the 8 inch drain be ascertained.

b. A simpler procedure for operation of the 16 inch blowoff be designed.

c. Investigate the significance of the seepage observed on the downstream face of the dam embankment, and the composition and adequacy of the embankment; and develop any necessary remedial actions.

d. A detailed hydraulic/hydrologic investigation to determine the need and means of increasing the discharge capacity of the project.

e. The erosion protection provided where the upstream face of the dam meets the east abutment should be evaluated and augmented as needed.

f. A study be made to determine the adequacy of the spillway discharge channel in its present state and to make recommendations for repair and/or improvement.

g. An investigation be made to reduce the potential for piping or leakage due to the stumps on the downstream face.

7.3 Remedial Measures

a. Operational and Maintenance Procedures

1. Ground cover vegetation should be established on the downstream face as soon as possible.

2. The remaining trees on the edges of the embankment should be removed.

3. The seepage on the downstream slope should be monitored to note any change from the existing conditions.

4. The concrete wall on the upstream face of the dam, the spillway wing-walls, training walls, and discharge channel floor should be rehabilitated to their original condition.

5. The deck of the service bridge to the gate house should be rehabilitated.

6. Institute a program of annual periodic technical inspection.

7. Develop a formal flood warning and surveillance plan, including round-the-clock monitoring during heavy precipitation.

7.4 Alternatives

None.

APPENDIX A

INSPECTION CHECK LIST

INSPECTION CHECK LIST

PARTY ORGANIZATION

PROJECT New Canaan Reservoir Dam DATE November 14, 1979

TIME 8:30 - 11:00 a.m.

WEATHER Overcast

W.S. ELEV. _____ U.S. _____ DN.S.

PARTY:

1. R. Johnston, JPPA
2. R. Lyon, JPPA
3. G. Salzman, CWDD
4. J. Chastanet, CWDD
5. _____
6. N. Negria, New Canaan Water Co.
7. _____
8. _____
9. _____
10. _____

	PROJECT FEATURE	INSPECTED BY	REMARKS
1.	Hydraulics	R. Johnston	
2.	Structural	R. Lyon	
3.	Geotechnical	G. Salzman	
4.	Geotechnical	J. Chastanet	
5.			
6.			
7.			
8.			
9.			
10.			

INSPECTION CHECK LIST

PROJECT New Canaan Reservoir Dam DATE November 14, 1979

PROJECT FEATURE _____ NAME _____

DISCIPLINE _____ NAME _____

AREA EVALUATED	CONDITION
DAM EMBANKMENT	Upstream face conc. Downstream face earth.
Crest Elevation 453.0	Good - Road along crest.
Current Pool Elevation 445.7	7'-4" Below Crest
Maximum Impoundment to Date	2" Below Crest - 1955
Surface Cracks	Horizontal crack in conc. joint at water level. Other minor in conc.
Pavement Condition	Compacted earth road along crest. Asphalt approaches at abutments.
Movement or Settlement of Crest	None observed - Regraded in 1979 6"-8" of fill added.
Lateral Movement	None
Vertical Alignment	Good
Horizontal Alignment	Good
Condition at Abutment and at Concrete Structures	2' fill added to left abutment embankment in 1979. Subject to erosion.
Indications of Movement of Structural Items on Slopes	None observed.
Trespassing on Slopes	Not permitted.
Vegetation on Slopes	Evergreens on D.S. face cut 1979
Sloughing or Erosion of Slopes or Abutments	Minor due to unvegetated D.S. face due to recent cutting of trees.
Rock Slope Protection - Riprap Failures	Riprap on upstream slope underwater - not visible.
Unusual Movement or Cracking at or near Toes	None observed.
Unusual Embankment or Downstream Seepage	One point at each abutment 5 to 10 GPM.
Piping or Boils	None observed.
Foundation Drainage Features	None observed for dam.
Toe Drains	None observed.
Instrumentation System	Non-recording water level gage at spillway.

INSPECTION CHECK LIST

PROJECT New Canaan Reservoir Dam DATE November 14, 1979

PROJECT FEATURE _____ NAME _____

DISCIPLINE _____ NAME _____

AREA EVALUATED	CONDITION
OUTLET WORKS - INTAKE CHANNEL AND INTAKE STRUCTURE	
a. Approach Channel	Entire reservoir bed under water.
b. Intake Structure	All intakes from the gate house under water and not visible.
12 Inch Supply Main	Water can enter the gate house via the following intakes: 12 inch valves on east, west and north sides. Apparently operable. 12 inch sluice on north side. Must be opened from outside the house. Apparently operable. Other intakes on north side apparently inoperable. Valve in gate house on 12 inch supply main.
8 Inch Drain	Location of intake suspected to be on north side of house. Valve in house.
16 Inch Blowoff	Intake on north side of house. Valve in house.

INSPECTION CHECK LIST

PROJECT New Canaan Reservoir Dam DATE November 14, 1979

PROJECT FEATURE _____ NAME _____

DISCIPLINE _____ NAME _____

AREA EVALUATED	CONDITION
OUTLET WORKS - CONTROL TOWER	
a. Concrete and Structural	
General Condition	Good.
Condition of Joints	Minor deterioration.
Spalling	None observed.
Visible Reinforcing	None observed.
Rusting or Staining of Concrete	Minor.
Any Seepage or Efflorescence	None observed.
Joint Alignment	Good.
Unusual Seepage or Leaks in Gate Chamber	Minor into screen wells.
Cracks	None observed.
Rusting or Corrosion of Steel	None observed.
b. Mechanical and Electrical	
Air Vents	None observed.
Float Wells	N/A
Crane Hoist	N/A
Elevator	N/A
Hydraulic System	N/A
Service Gates	See intake structures
Emergency Gates	See intake structures
Lightning Protection System	None observed.
Emergency Power System	None observed.
Wiring and Lighting System in Gate Chamber	Operable.

INSPECTION CHECK LIST

PROJECT New Canaan Reservoir Dam DATE November 14, 1979

PROJECT FEATURE _____ NAME _____

DISCIPLINE _____ NAME _____

AREA EVALUATED	CONDITION
OUTLET WORKS - TRANSITION AND CONDUIT	
12 Inch Supply Main	Water from intakes goes through screens and through dam to filter house via 12 inch line. 12 inch service to water distribution system. Can be drained via 6 inch blow off.
8 Inch Drain	Unknown. Suspected to go through dam.
16 Inch Blow Off	16 inch line extends from gate house through second valve near filter house to outlet.

INSPECTION CHECK LIST

PROJECT New Canaan Reservoir Dam DATE November 14, 1979

PROJECT FEATURE _____ NAME _____

DISCIPLINE _____ NAME _____

AREA EVALUATED	CONDITION
OUTLET WORKS - OUTLET STRUCTURE AND OUTLET CHANNEL	
12 Inch Supply Main	12 inch supply main extends to water distribution system. 6 inch blow off extends from valve below filter house to discharge channel of the 16 inch blow off. The 6 inch line is connected to the sealed end of the 16 inch blow off. Pressure from the public water supply is required in the 16 inch line to operate the 16 inch valves.
8 Inch Drain	Unknown
16 Inch Blow Off	Outlet bolted shut but may be opened. Grassed and gravel outlet channel extends to stream.

INSPECTION CHECK LIST

PROJECT New Canaan Reservoir Dam DATE November 14, 1979

PROJECT FEATURE _____ NAME _____

DISCIPLINE _____ NAME _____

AREA EVALUATED	CONDITION
OUTLET WORKS - SPILLWAY WEIR, APPROACH AND DISCHARGE CHANNELS	
a. Approach Channel	Reservoir bed under water.
General Condition	
Loose Rock Overhanging Channel	
Trees Overhanging Channel	
Floor of Approach Channel	
b. Weir and Training Walls	24 inches permanent flash boards 4 inches temporary flash boards
General Condition of Concrete	Good
Rust or Staining	None observed.
Spalling	Minor cracking of wingwalls and training walls
Any Visible Reinforcing	None Observed
Any Seepage or Efflorescence	None Observed
Drain Holes	Two 10 inch pipes, plugged with concrete on upstream ends.
c. Discharge Channel	Rectangular conc. channel 11 feet wide by 42 inches deep.
General Condition	Fair at upstream end, poor at downstream end.
Loose Rock Overhanging Channel	None observed.
Trees Overhanging Channel	Yes
Floor of Channel	Major deterioration at downstream end.
Other Obstructions	Rocks and trees between channel outlet and stream.

INSPECTION CHECK LIST

PROJECT New Canaan Reservoir Dam DATE November 14, 1979

PROJECT FEATURE _____ NAME _____

DISCIPLINE _____ NAME _____

AREA EVALUATED	CONDITION
OUTLET WORKS - SERVICE BRIDGE	
a. To Gate House	
Girders	Steel - Good
Deck	Timber - Fair to poor
Railing	Timber - Poor
Abutments	Concrete - Good
b. Over Spillway	
Girders	Steel - Good
Pier	Steel - Good, minor rusting
Deck	Timber - Fair
Abutments	Concrete - Good, minor cracking
Approach	Asphalt - Good
Accessibility	Delivery trucks reportedly cannot navigate the bridge limiting access to dam and filter house.

APPENDIX B

ENGINEERING DATA

APPENDIX B-1

DESIGN, CONSTRUCTION AND MAINTENANCE RECORDS AND LOCATION

Mr. Victor J. Galgowski
Dam Safety Engineer
Water and Related Resources Unit
Department of Environmental Protection
State of Connecticut
State Office Building
Hartford, Connecticut 06115

New Canaan Water Company
36 Grove Street
New Canaan, Connecticut 06840

APPENDIX B-2

COPIES OF PAST INSPECTION REPORTS

No. NCA 12

WATER RESOURCES COMMISSION
SUPERVISION OF DAMS
INVENTORY DATA

Long. 73° 30.7' Lat 41° 10.6'

Inventoried By L.P.S

Date 13 APRIL 1965

Name of Dam or Pond NEW CANAAN RESERVOIR

Code No. FV 102

Nearest Street Location OENOKE RIDGE ROAD

Town NEW CANAAN

U.S.G.S. Quad. WOOD RIDGE

Name of Stream FIVE MILE RIVER

Owner NEW CANAAN WATER COMPANY

Address 39 SOUTH AVENUE
NEW CANAAN

Pond Used For WATER SUPPLY DA 0.835 sq mi

Dimensions of Pond: Width 400 FEET Length 2000 FEET Area 20 ACRES

Total Length of Dam 315 FEET Length of Spillway 25 FEET

Location of Spillway WEST END OF DAM

Height of Pond Above Stream Bed 35 FEET

Height of Embankment Above Spillway 2 FEET

Type of Spillway Construction CONCRETE WITH TWO FOOT FLASHBOARDS

Type of Dike Construction CONCRETE, EARTH DOWNSTREAM

Downstream Conditions WOODS, ROADS, HOUSES

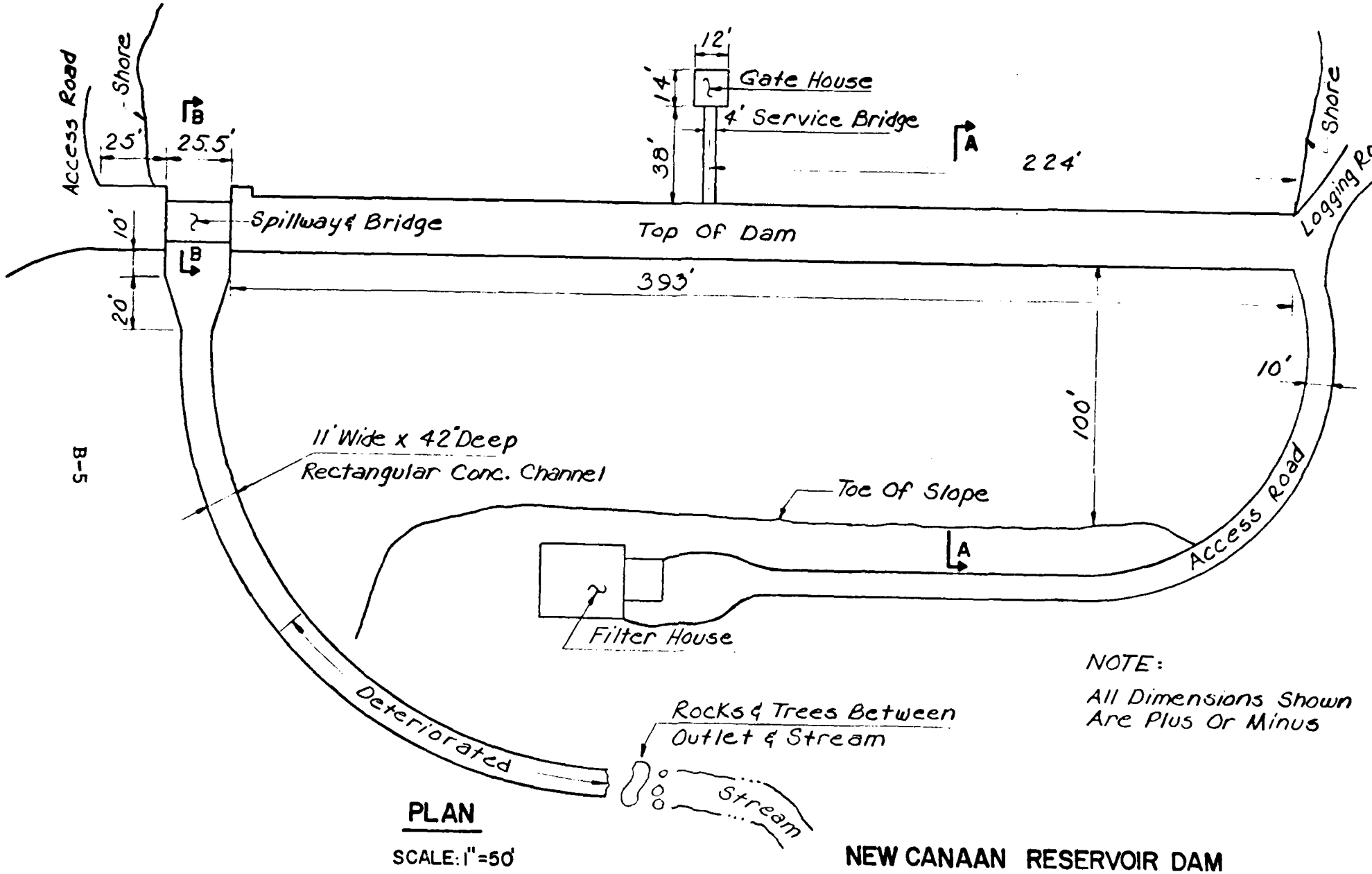
Summary of File Data

Remarks DAM BUILT IN 1928. TREES GROWING ON DOWNSTREAM FACE OF DAM

Would Failure Cause Damage? YES Class B

APPENDIX B-3

RECORD DRAWINGS AND SKETCHES



B-5

NOTE:

All Dimensions Shown Are Plus Or Minus

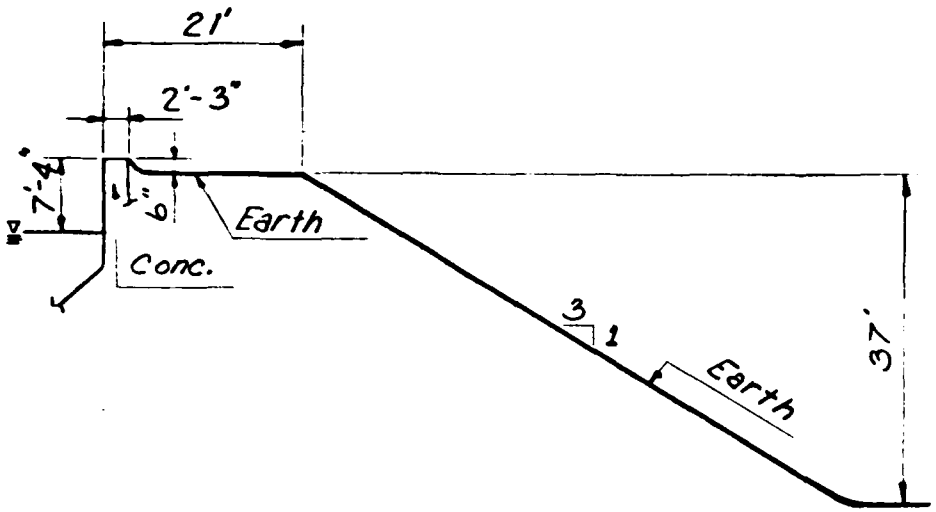
PLAN

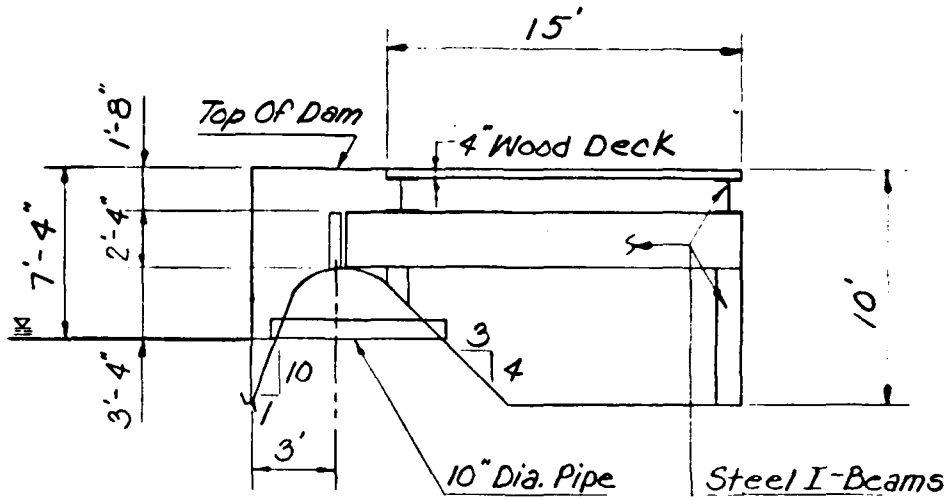
SCALE: 1"=50'

NEW CANAAN RESERVOIR DAM

JAMES P. PURCELL ASSOCIATES, INC.

ENGINEERS • ARCHITECTS • PLANNERS





B-6

SECTION A-A

NOT TO SCALE

SECTION B-B

SCALE : 1/8" = 1'

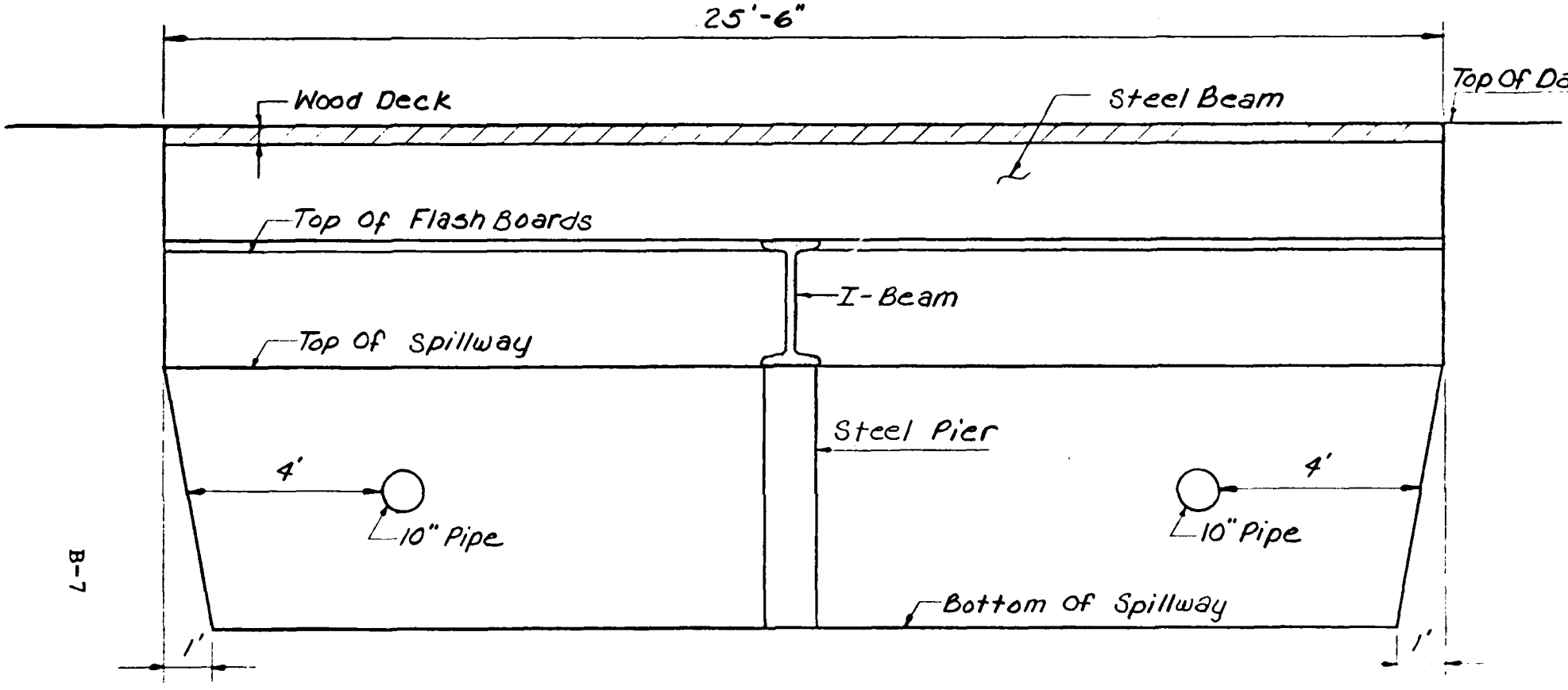
NOTE:

All Dimensions Shown Are Plus Or Minus

NEW CANAAN RESERVOIR DAM

JAMES P. PURCELL ASSOCIATES, INC.

ENGINEERS • ARCHITECTS • PLANNERS



B-7

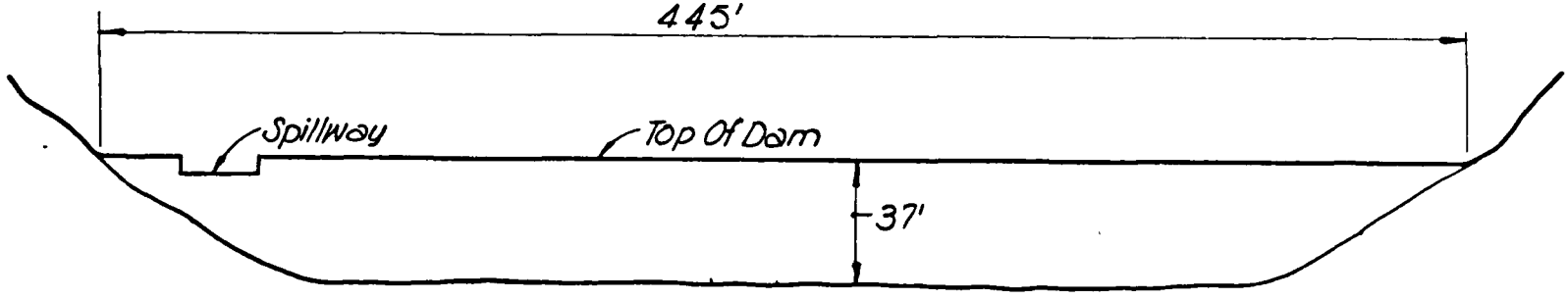
ELEVATION OF SPILLWAY LOOKING UPSTREAM

SCALE: 1" = 3'

NOTE:
All Dimensions Shown Are Plus Or Minus

NEW CANAAN RESERVOIR DAM

JAMES P. PURCELL ASSOCIATES, INC.
ENGINEERS • ARCHITECTS • PLANNERS



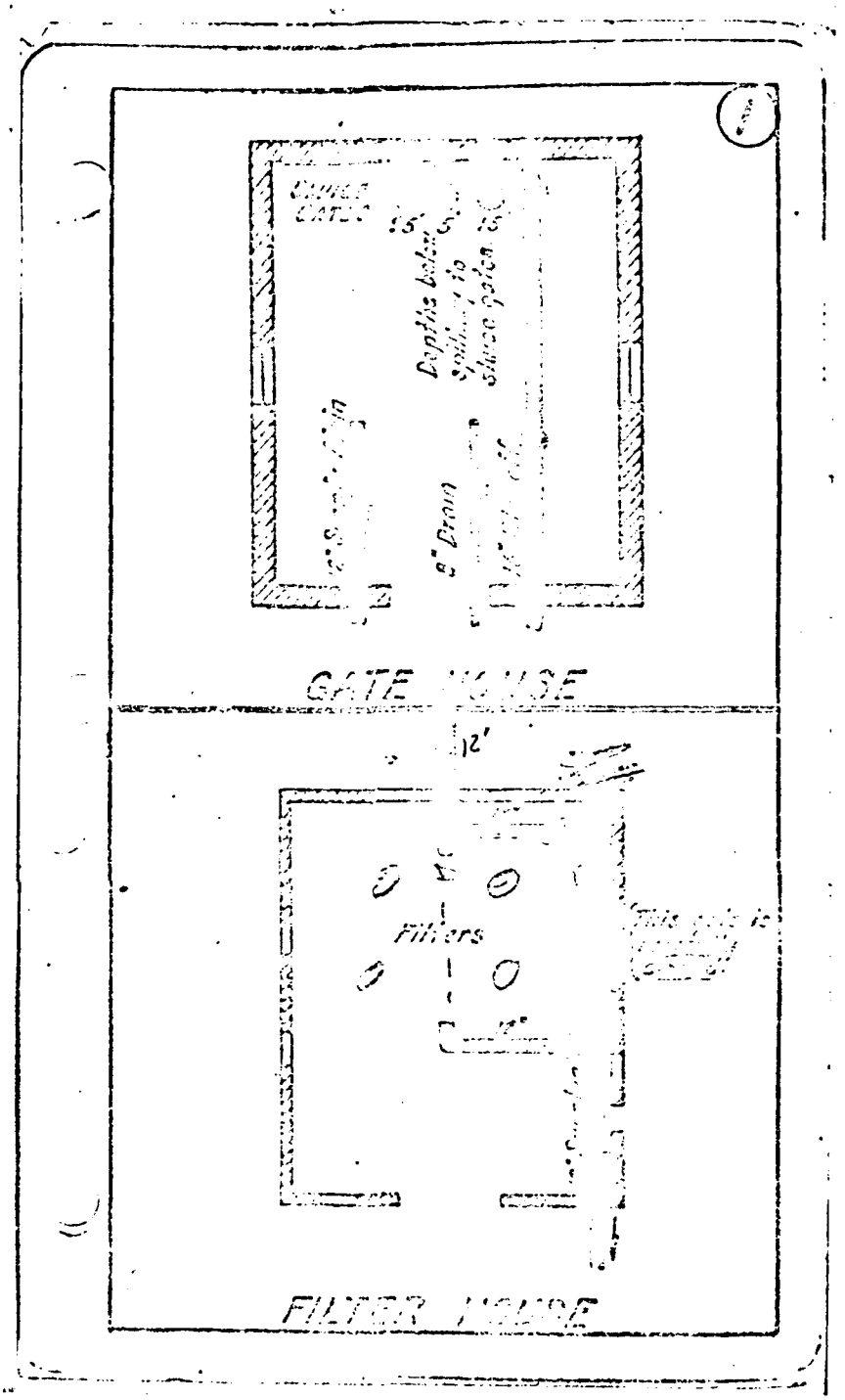
NOTE: All Dimensions Shown Are Plus Or Minus.

ELEVATION OF THE DAM LOOKING UPSTREAM

SCALE: 1" = 60'

NEW CANAAN RESERVOIR DAM

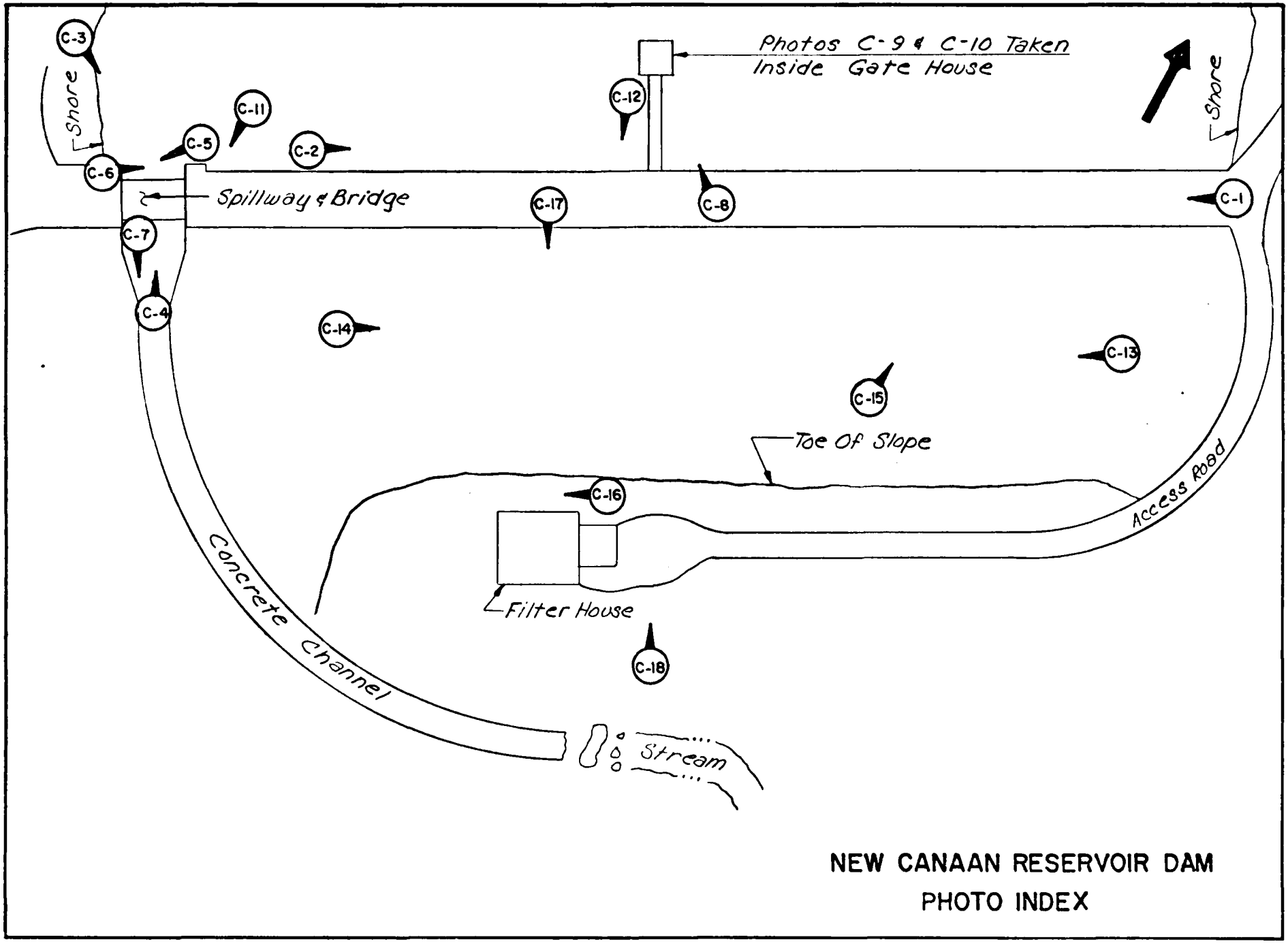
JAMES P. PURCELL ASSOCIATES, INC.
ENGINEERS • ARCHITECTS • PLANNERS



SKETCH OF GATE HOUSE
AND FILTFR HOUSE PIPING.
FROM NEW CANAAN WATER
COMPANY.

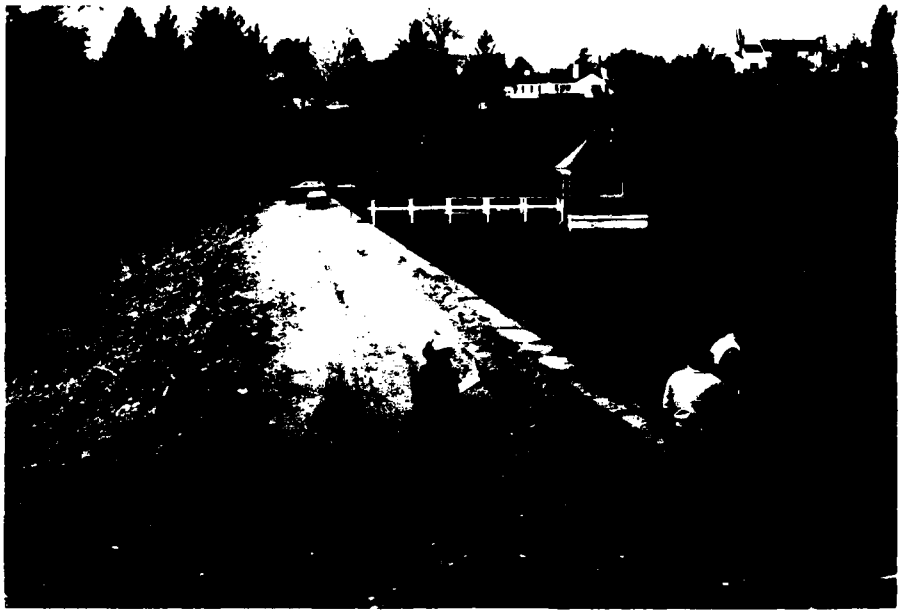
APPENDIX C

PHOTOGRAPHS

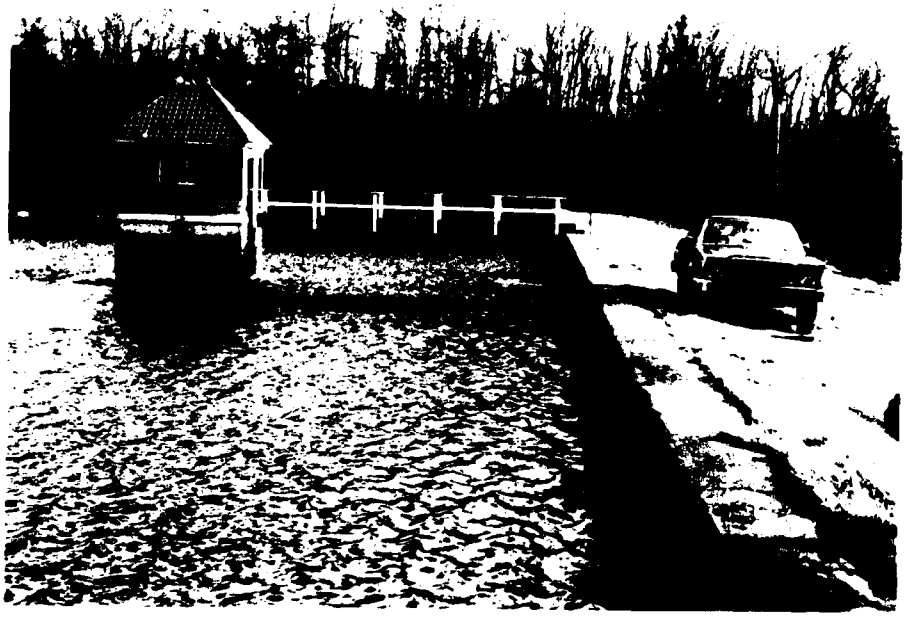


NEW CANAAN RESERVOIR DAM

PHOTO INDEX



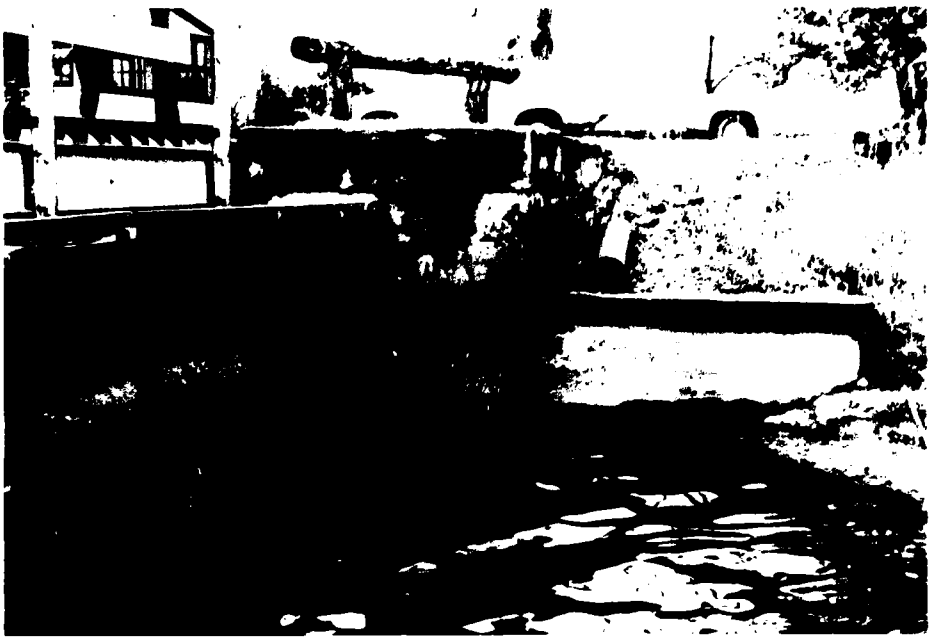
C-1 CREST OF DAM - LOOKING FROM EAST ABUTMENT



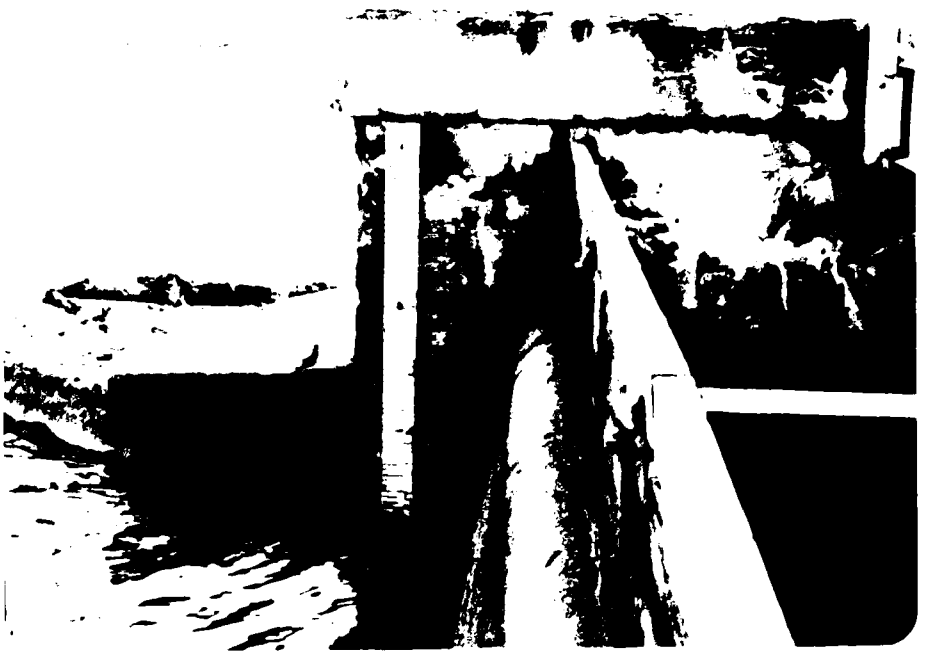
C-2 DAM CREST AND GATE HOUSE - LOOKING EAST

C-3 UPSTREAM FACE OF SPILLWAY

C-4 DOWNSTREAM FACE OF SPILLWAY - LOOKING FROM OUTLET CHANNEL



C-5 WEST ABUTMENT AND SPILLWAY

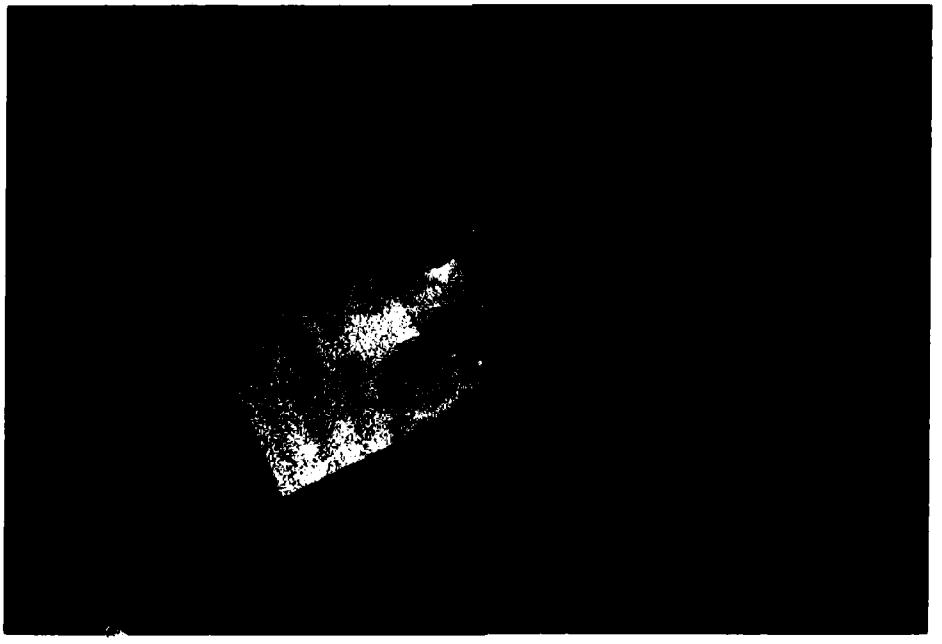


C-6 EAST WALL OF SPILLWAY SHOWING TRAINING WALL

C-7 SPILLWAY OUTLET CHANNEL

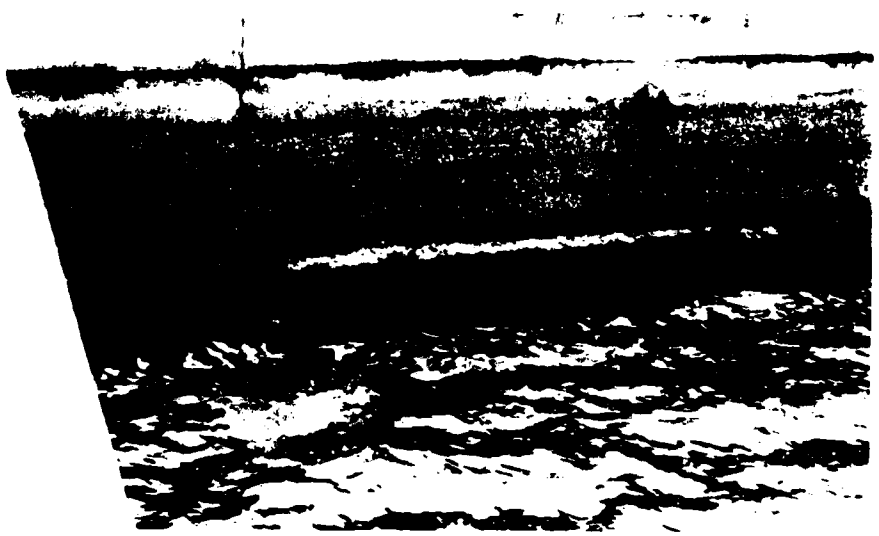
C-8 GATE HOUSE AND SERVICE BRIDGE

C-9 WATER SUPPLY INTAKE CONTROL - INTERIOR OF GATE HOUSE



C-10 16 INCH BLOW OFF VALVE STEM (IN HOLE) - INTERIOR OF GATE HOUSE

C-11 CRACK IN CONCRETE WALL ON UPSTREAM FACE OF DAM

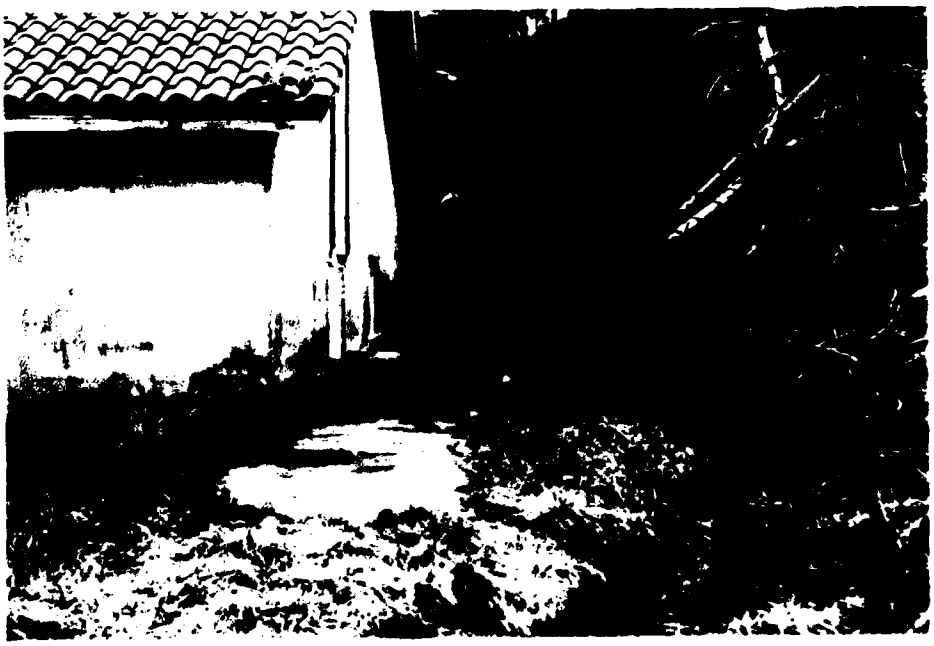


C-12 TYPICAL SPALLING CONCRETE ON UPSTREAM FACE OF DAM

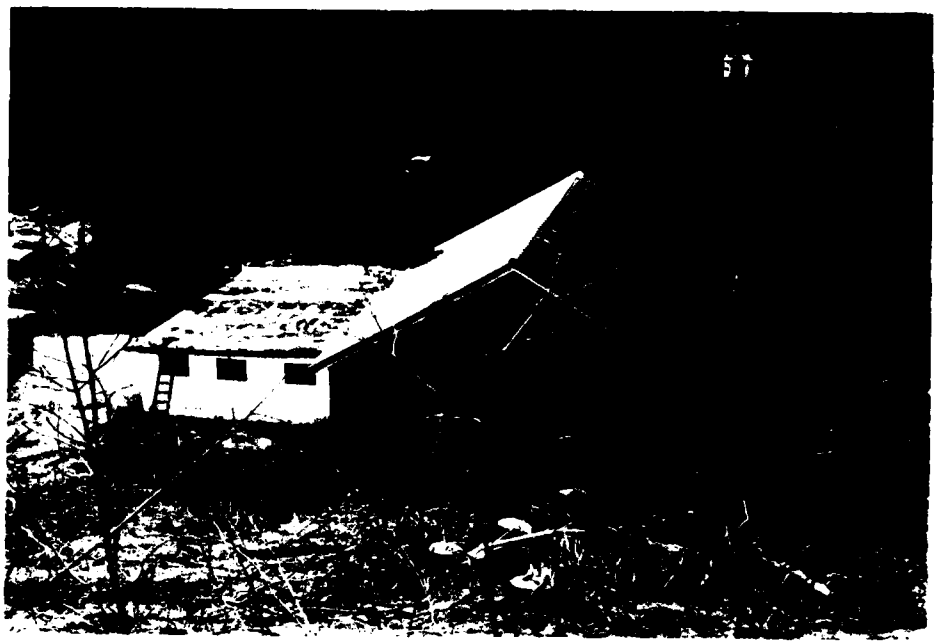
C-13 DOWNSTREAM FACE OF DAM - LOOKING WEST

C-14 DOWNSTREAM FACE OF DAM - LOOKING EAST

C-15 TYPICAL WET SPOT ON DOWNSTREAM FACE

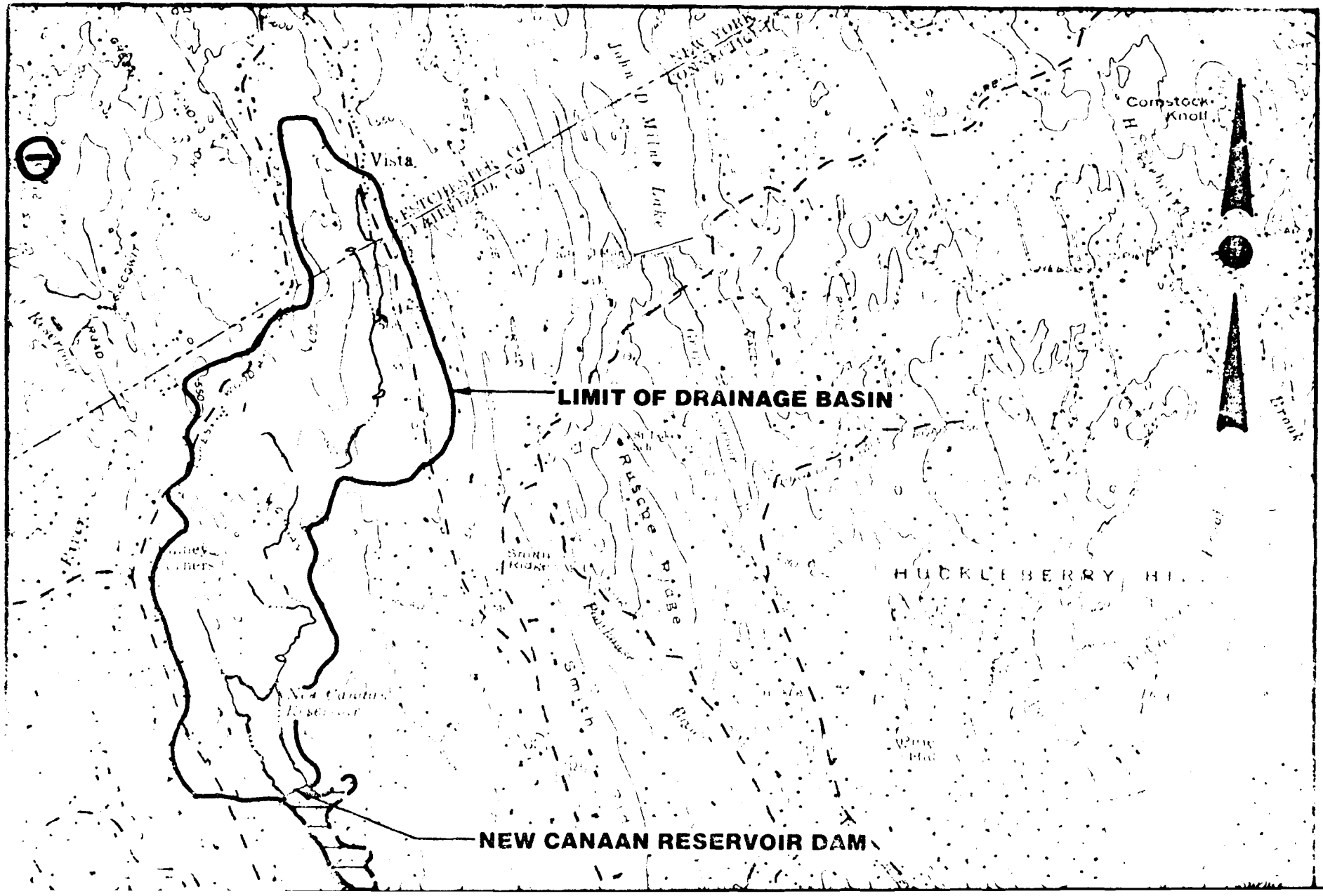


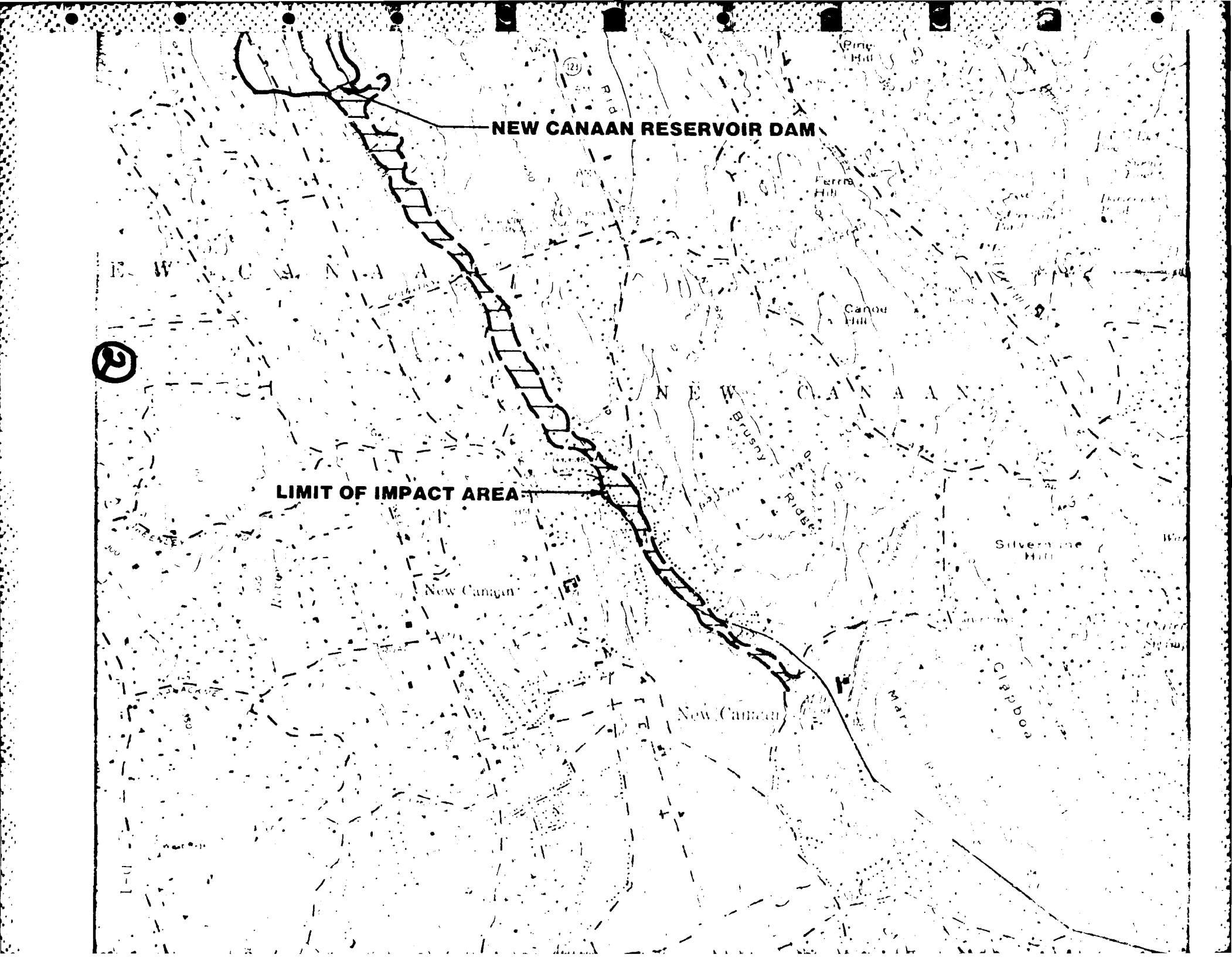
C-16 SEEPAGE POINT (UNDER TREE PILE) AND FLOW FROM SEEPAGE (LOWER RIGHT CORNER OF PHOTO)

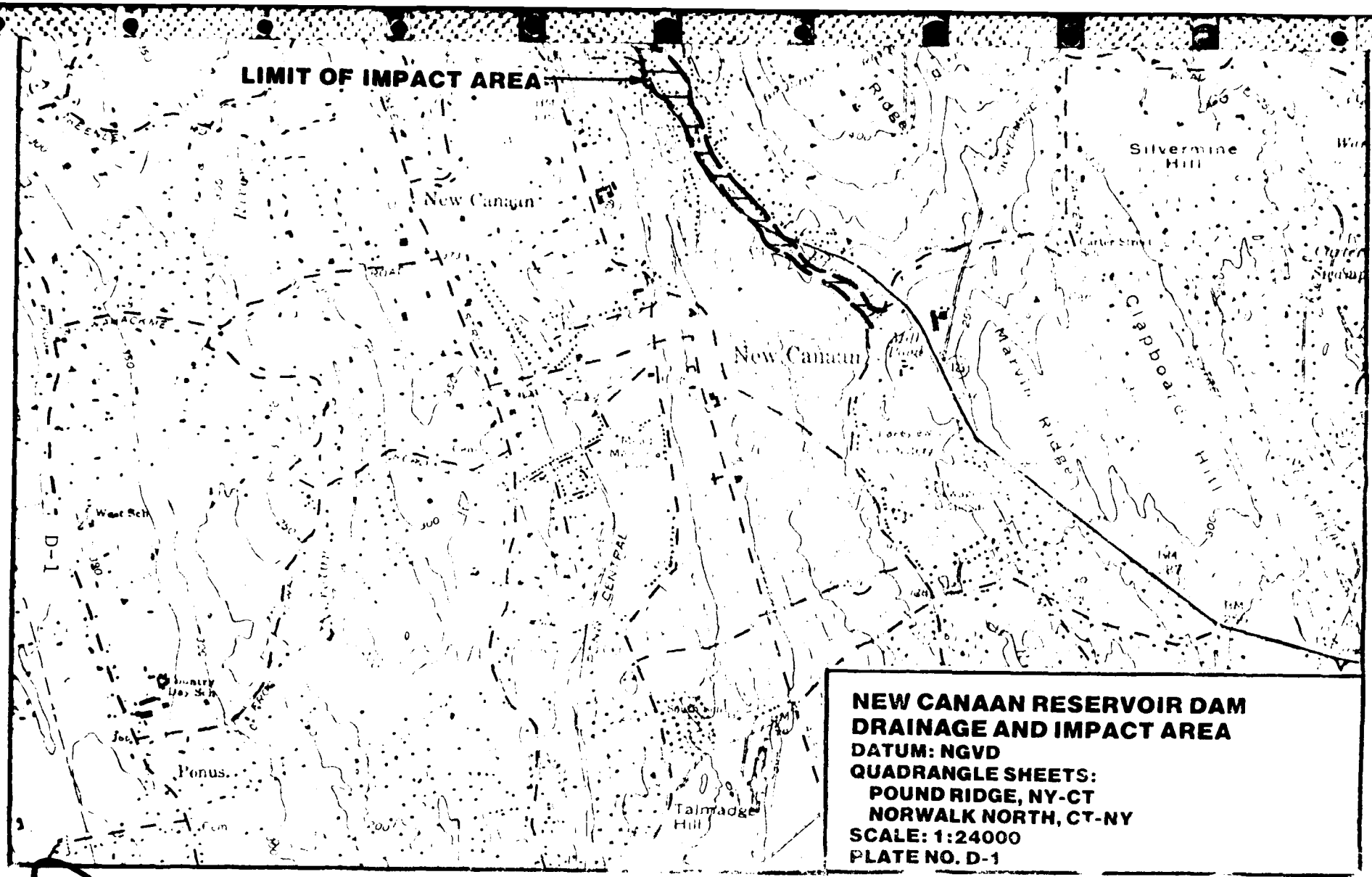


C-17 FILTER HOUSE - LOOKING FROM DAM CREST

C-18 SEALED OUTLET OF 16 INCH BLOWOFF SHOWING 6 INCH POTABLE WATER TAP


LIMIT OF DRAINAGE BASIN
NEW CANAAN RESERVOIR DAM
Vista
Comstock Knoll
HUCKLEBERRY HI
Ruscoe Ridge


NEW CANAAN RESERVOIR DAM
LIMIT OF IMPACT AREA
NEW CANAAN
Canon Hill
Brushy Ridge
New Canaan
New Canaan
Silvermine Hill
Clapboa
Ferris Hill
Pine Hill



NEW CANAAN RESERVOIR DAM
DRAINAGE AND IMPACT AREA
DATUM: NGVD
QUADRANGLE SHEETS:
POUND RIDGE, NY-CT
NORWALK NORTH, CT-NY
SCALE: 1:24000
PLATE NO. D-1

3 of 3

APPENDIX D

HYDROLOGIC AND HYDRAULIC COMPUTATIONS

HYDROLOGIC AND HYDRAULIC ANALYSIS
SUMMARY SHEET

Dam New Canaan Reservoir Dam

Test Flood PMF

INFLOW HYDROGRAPH DEVELOPMENT

Drainage Area .84 **sq. mi.**

Probable Maximum Precipation
24 hour - 200 square mile PMP 22 **inches**

Initial Railfall Loss 0 **Inch**
Uniform Railfall loss .1 **Inch**

Snyder's Lag 2.48 **hours**
Snyder's Peaking Coefficient .625

Test Flood Inflow 1825 **CFS**

PMF Inflow 1825 **CFS**

RESERVOIR ROUTING AND DAM OVERTOPPING

Test Flood Outflow 1820 **CFS**

Spillway Capacity at Top of Dam 240 **CFS**
13 **% of Test Flood**

Flow Over Spillway at Test Flood 465 **CFS**

Spillway Crest Elevation	451.0	**Feet**
Top of Dam Elevation	453.0	**Feet**
Test Flood Elevation	454.1	**Feet**

FINAL

```
**********
FLOOD HYDROGRAPH PACKAGE (HEC-1)
DAM SAFETY VERSION  JULY 1978
 LAST MODIFICATION  26 FEB 79
**********
     1     A1   DAM SAFETY ANALYSIS-JOB NO.79-905/05-ERJ
     2     A2   NEW CANAAN RESERVOIR DAM- NEW CANAAN-CT
     3     A3   12-03-79  1/2 PMF
     4     B    150       0         30        0         0         0         0         2         0         0
     5     B1   5
     6     I    1         2         1
     7     J1   .5        1.        0.        0.        0.        0.        0.        0.        0.
     8     K    0         1         0         0         0         0         1         0
     9     K1        COMPUTATION OF PMF-DEVELOPMENT OF INFLOW HYDROGRAPH
    10     M    1         1         .84       0         .84       0         0         0         1
    11     P    0         22        110       124       134       142
    12     T    0         0         0         0         0         0         0         .1
    13     E    2.48      .625
    14     X    1.4       .05       2.0
    15     K    1         1         0         0         0         0         1
    16     K1        ROUTING INFLOW HYDROGRAPH THRU LAKE-OVERTOPPING ANALYSIS
    17     Y    0         0         0         1         1
    18     Y1   1         9         0         0         0         0         -445.7
    19     SA   20.4      34.0      38.0      0
    20     SE   445.7     451.0     453       0
    21     SS   451.0     25.5      3.3       1.5
    22     SD   453.0     2.65      1.5       420
    23     K    99
```

SUMMARY OF SEQUENCE OF STREAM NETWORK CALCULATIONS

SUBBEE HYDROGRAPH AT	1
ROUTE HYDROGRAPH TO	1
END OF NETWORK	

****
FLOOD HYDROGRAPH PACKAGE (HEC-1)
DAM SAFETY VERSION JULY 1978
LAST MODIFICATION 26 FEB 79
****

RUN DATE= 12/06/79.
TIME= 07.44.04.

DAM SAFETY ANALYSIS-JOB NO.79-905/05-ERJ
SEE CANAAN RESERVOIR DAM-NEW CANAAN-CT
12-05-79

JOB SPECIFICATION

NO	NHR	NMIN	IDAY	IHR	IMIN	METRC	IPLT	IPRT	NSTAN
150	0	30	0	6	0	0	2	0	0
			JOPER	NUT	LROPT	TRACE			
			5	0	0	0			

MULTI-PLAN ANALYSES TO BE PERFORMED
NPLAN= 1 NRTIO= 2 LRTIO= 1
RTIOS= .50 1.00

****

SUB-AREA RUNOFF COMPUTATION

COMPUTATION OF PMF-DEVELOPMENT OF INFLOW HYDROGRAPH

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
1	0	0	0	0	0	1	0	0

HYDROGRAPH DATA

IHYDG	IUNG	TAREA	SNAP	TRSDA	TRSPC	RATIO	ISNOW	ISAME	LOCAL
1	1	.84	0.00	.84	0.00	0.000	0	1	0

PRECIP DATA

SPFE	PMS	R6	R12	R24	R48	R72	R96
0.00	22.00	110.00	124.00	134.00	142.00	0.00	0.00

TRSPC COMPUTED BY THE PROGRAM IS .800

LOSS DATA

LROPT	STRKR	DLTKR	RTIOL	ERAIN	STRKS	RTIOK	STRTL	CNSTL	ALSMX	RTIMP
0	0.00	0.00	1.00	0.00	0.00	1.00	0.00	.10	0.00	0.00

UNIT HYDROGRAPH DATA
TP= 2.48 CP= .63 NTA= 0

RECESSION DATA
STRTQ= 1.80 QRCSN= .05 RTIOR= 2.00
APPROXIMATE CLARK COEFFICIENTS FROM GIVEN SNYDER CP AND TP ARE TC= 5.70 AND R= 4.46 INTERVALS

UNIT HYDROGRAPH 27 END-OF-PERIOD ORDINATES, LAG= 2.45 HOURS, CP= .62 VOL= 1.00

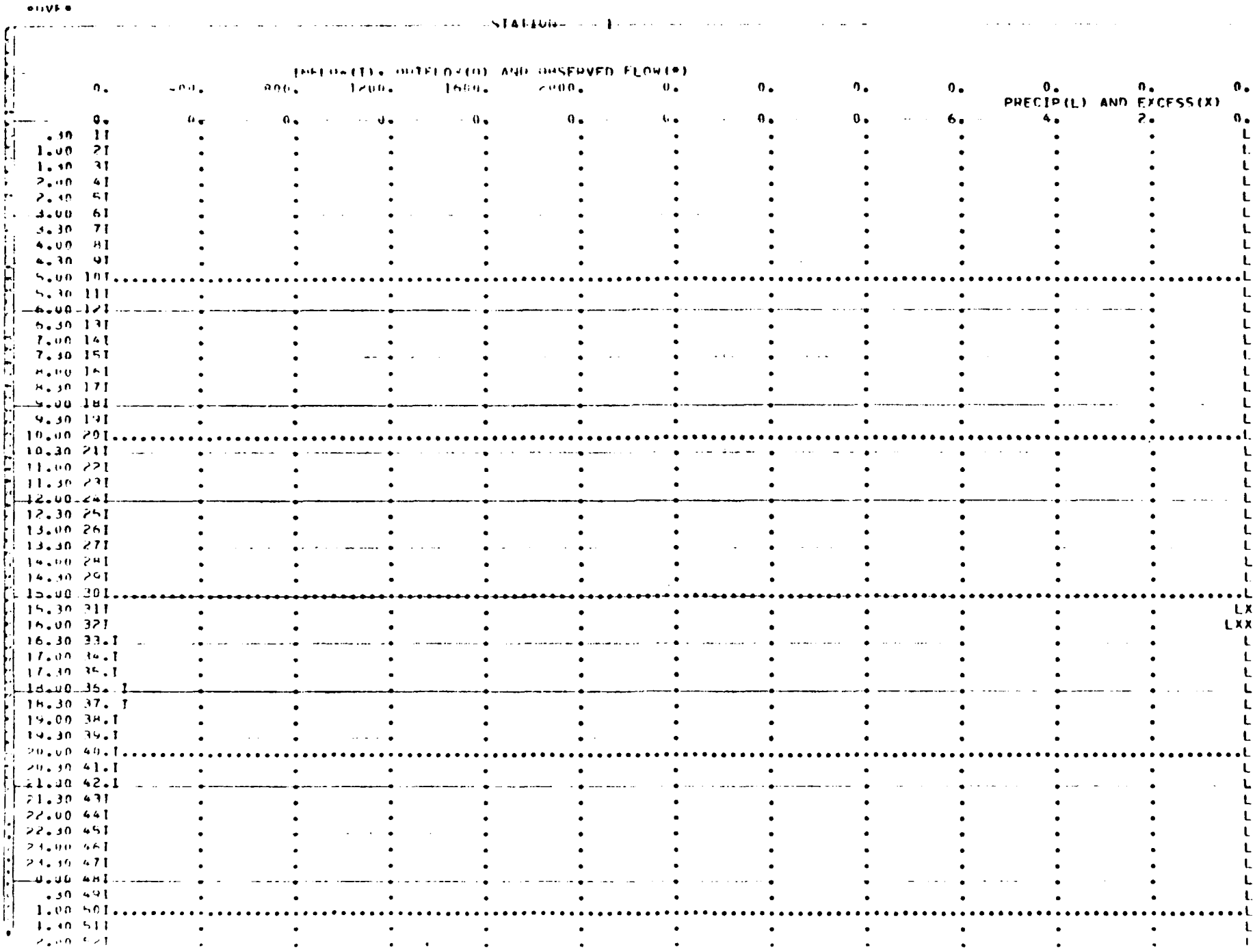
11.	41.	89.	136.	136.	134.	114.	91.	72.	58.
47.	37.	29.	22.	17.	13.	12.	10.	8.	6.

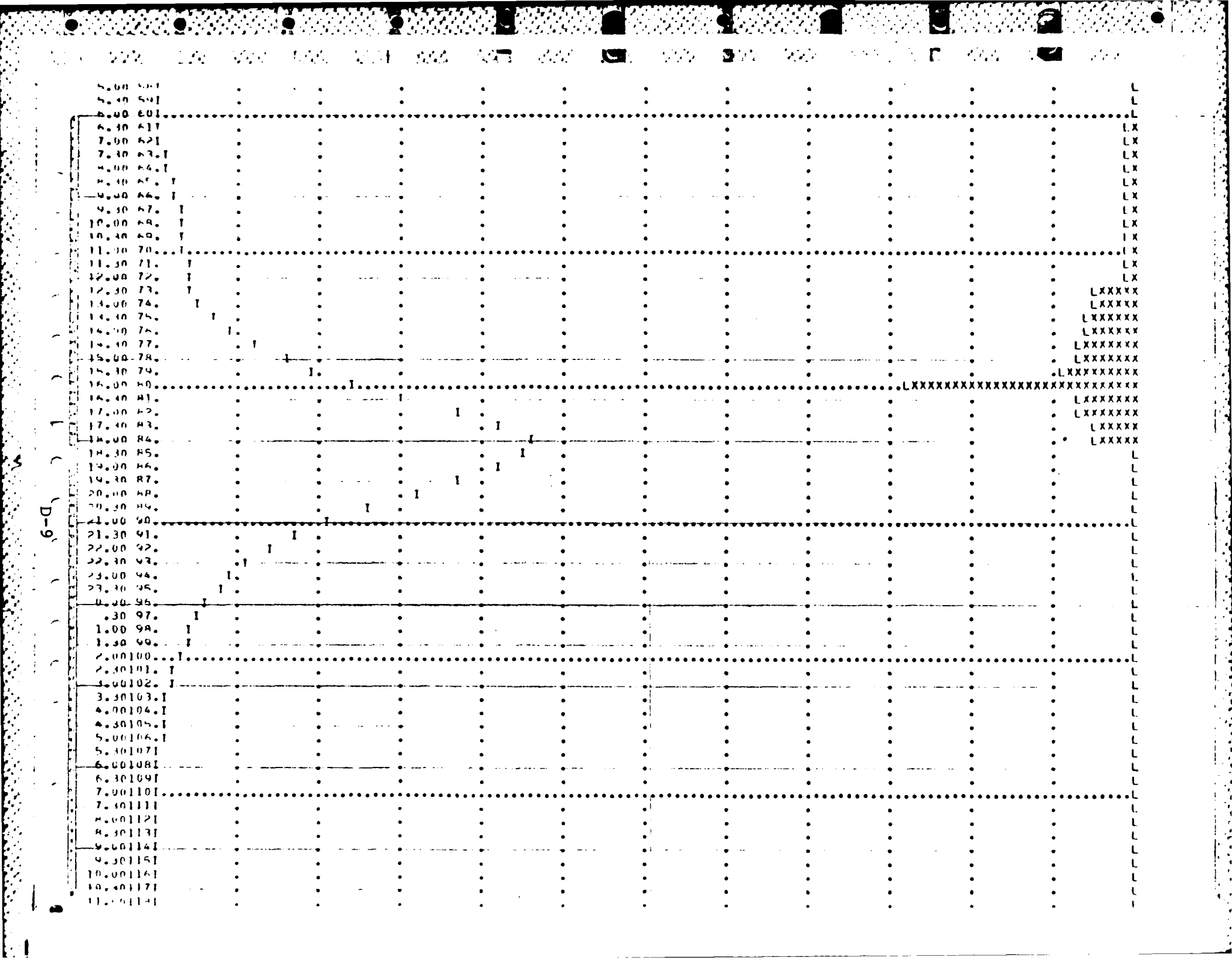
1.01	.00	1	.00	0.00	.00	2.	1.02	14.00	76	1.16	1.11	.05	360.
1.01	.30	2	.00	0.00	.00	2.	1.02	14.30	77	1.45	1.40	.05	484.
1.01	1.00	3	.00	0.00	.00	1.	1.02	15.00	78	1.45	1.40	.05	622.
1.01	1.30	4	.00	0.00	.00	1.	1.02	15.30	79	1.77	1.72	.05	764.
1.01	2.00	5	.00	0.00	.00	1.	1.02	16.00	80	5.59	5.54	.05	950.
1.01	2.30	6	.00	0.00	.00	1.	1.02	16.30	81	1.36	1.31	.05	1202.
1.01	3.00	7	.00	0.00	.00	1.	1.02	17.00	82	1.36	1.31	.05	1473.
1.01	3.30	8	.00	0.00	.00	1.	1.02	17.30	83	1.06	1.01	.05	1699.
1.01	4.00	9	.00	0.00	.00	1.	1.02	18.00	84	1.06	1.01	.05	1825.
1.01	4.30	10	.00	0.00	.00	1.	1.02	18.30	85	.09	.04	.05	1814.
1.01	5.00	11	.00	0.00	.00	1.	1.02	19.00	86	.09	.04	.05	1678.
1.01	5.30	12	.00	0.00	.00	1.	1.02	19.30	87	.09	.04	.05	1481.
1.01	6.00	13	.01	0.00	.01	1.	1.02	20.00	88	.09	.04	.05	1267.
1.01	6.30	14	.01	0.00	.01	1.	1.02	20.30	89	.09	.04	.05	1051.
1.01	7.00	15	.01	0.00	.01	1.	1.02	21.00	90	.09	.04	.05	853.
1.01	7.30	16	.01	0.00	.01	1.	1.02	21.30	91	.09	.04	.05	690.
1.01	8.00	17	.01	0.00	.01	1.	1.02	22.00	92	.09	.04	.05	559.
1.01	8.30	18	.01	0.00	.01	1.	1.02	22.30	93	.09	.04	.05	454.
1.01	9.00	19	.01	0.00	.01	0.	1.02	23.00	94	.09	.04	.05	371.
1.01	9.30	20	.01	0.00	.01	0.	1.02	23.30	95	.09	.04	.05	304.
1.01	10.00	21	.01	0.00	.01	0.	1.03	0.00	96	.09	.04	.05	251.
1.01	10.30	22	.01	0.00	.01	0.	1.03	.30	97	0.00	0.00	0.00	208.
1.01	11.00	23	.01	0.00	.01	0.	1.03	1.00	98	0.00	0.00	0.00	173.
1.01	11.30	24	.01	0.00	.01	0.	1.03	1.30	99	0.00	0.00	0.00	143.
1.01	12.00	25	.06	.01	.05	0.	1.03	2.00	100	0.00	0.00	0.00	116.
1.01	12.30	26	.06	.01	.05	1.	1.03	2.30	101	0.00	0.00	0.00	93.
1.01	13.00	27	.07	.02	.05	1.	1.03	3.00	102	0.00	0.00	0.00	73.
1.01	13.30	28	.07	.02	.05	3.	1.03	3.30	103	0.00	0.00	0.00	57.
1.01	14.00	29	.09	.04	.05	5.	1.03	4.00	104	0.00	0.00	0.00	44.
1.01	14.30	30	.09	.04	.05	8.	1.03	4.30	105	0.00	0.00	0.00	34.
1.01	15.00	31	.11	.06	.05	12.	1.03	5.00	106	0.00	0.00	0.00	25.
1.01	15.30	32	.13	.08	.05	20.	1.03	5.30	107	0.00	0.00	0.00	19.
1.01	16.00	33	.08	.03	.05	32.	1.03	6.00	108	0.00	0.00	0.00	10.
1.01	16.30	34	.08	.03	.05	46.	1.03	6.30	109	0.00	0.00	0.00	7.
1.01	17.00	35	.06	.01	.05	58.	1.03	7.00	110	0.00	0.00	0.00	5.
1.01	17.30	36	.06	.01	.05	64.	1.03	7.30	111	0.00	0.00	0.00	3.
1.01	18.00	37	.01	0.00	.01	62.	1.03	8.00	112	0.00	0.00	0.00	2.
1.01	18.30	38	.01	0.00	.01	55.	1.03	8.30	113	0.00	0.00	0.00	2.
1.01	19.00	39	.01	0.00	.01	46.	1.03	9.00	114	0.00	0.00	0.00	1.
1.01	19.30	40	.01	0.00	.01	38.	1.03	9.30	115	0.00	0.00	0.00	1.
1.01	20.00	41	.01	0.00	.01	31.	1.03	10.00	116	0.00	0.00	0.00	1.
1.01	20.30	42	.01	0.00	.01	25.	1.03	10.30	117	0.00	0.00	0.00	1.
1.01	21.00	43	.01	0.00	.01	20.	1.03	11.00	118	0.00	0.00	0.00	0.
1.01	21.30	44	.01	0.00	.01	16.	1.03	11.30	119	0.00	0.00	0.00	0.
1.01	22.00	45	.01	0.00	.01	13.	1.03	12.00	120	0.00	0.00	0.00	0.
1.01	22.30	46	.01	0.00	.01	10.	1.03	12.30	121	0.00	0.00	0.00	0.
1.01	23.00	47	.01	0.00	.01	8.	1.03	13.00	122	0.00	0.00	0.00	0.
1.01	23.30	48	.01	0.00	.01	6.	1.03	13.30	123	0.00	0.00	0.00	0.
1.02	0.00	49	.06	.01	.05	5.	1.03	14.00	124	0.00	0.00	0.00	0.
1.02	.30	50	.06	.01	.05	5.	1.03	14.30	125	0.00	0.00	0.00	0.
1.02	1.00	51	.06	.01	.05	4.	1.03	15.00	126	0.00	0.00	0.00	0.
1.02	1.30	52	.06	.01	.05	5.	1.03	15.30	127	0.00	0.00	0.00	0.
1.02	2.00	53	.06	.01	.05	5.	1.03	16.00	128	0.00	0.00	0.00	0.
1.02	2.30	54	.06	.01	.05	6.	1.03	16.30	129	0.00	0.00	0.00	0.
1.02	3.00	55	.06	.01	.05	7.	1.03	17.00	130	0.00	0.00	0.00	0.
1.02	3.30	56	.06	.01	.05	7.	1.03	17.30	131	0.00	0.00	0.00	0.
1.02	4.00	57	.06	.01	.05	8.	1.03	18.00	132	0.00	0.00	0.00	0.
1.02	4.30	58	.06	.01	.05	8.	1.03	18.30	133	0.00	0.00	0.00	0.
1.02	5.00	59	.06	.01	.05	8.	1.03	19.00	134	0.00	0.00	0.00	0.
1.02	5.30	60	.06	.01	.05	8.	1.03	19.30	135	0.00	0.00	0.00	0.
1.02	6.00	61	.06	.01	.05	10.	1.03	20.00	136	0.00	0.00	0.00	0.

1.02	9.30	67	.21	.16	.05	102.	1.03	23.00	142	0.00	0.00	0.00	0.
1.02	10.00	68	.21	.16	.05	115.	1.03	23.30	143	0.00	0.00	0.00	0.
1.02	10.30	69	.21	.16	.05	126.	1.04	0.00	144	0.00	0.00	0.00	0.
1.02	11.00	70	.21	.16	.05	135.	1.04	.30	145	0.00	0.00	0.00	0.
1.02	11.30	71	.21	.16	.05	141.	1.04	1.00	146	0.00	0.00	0.00	0.
1.02	12.00	72	.21	.16	.05	147.	1.04	1.30	147	0.00	0.00	0.00	0.
1.02	12.30	73	.27	.22	.05	160.	1.04	2.00	148	0.00	0.00	0.00	0.
1.02	13.00	74	.27	.22	.05	175.	1.04	2.30	149	0.00	0.00	0.00	0.
1.02	13.30	75	1.16	1.11	.05	261.	1.04	3.00	150	0.00	0.00	0.00	0.

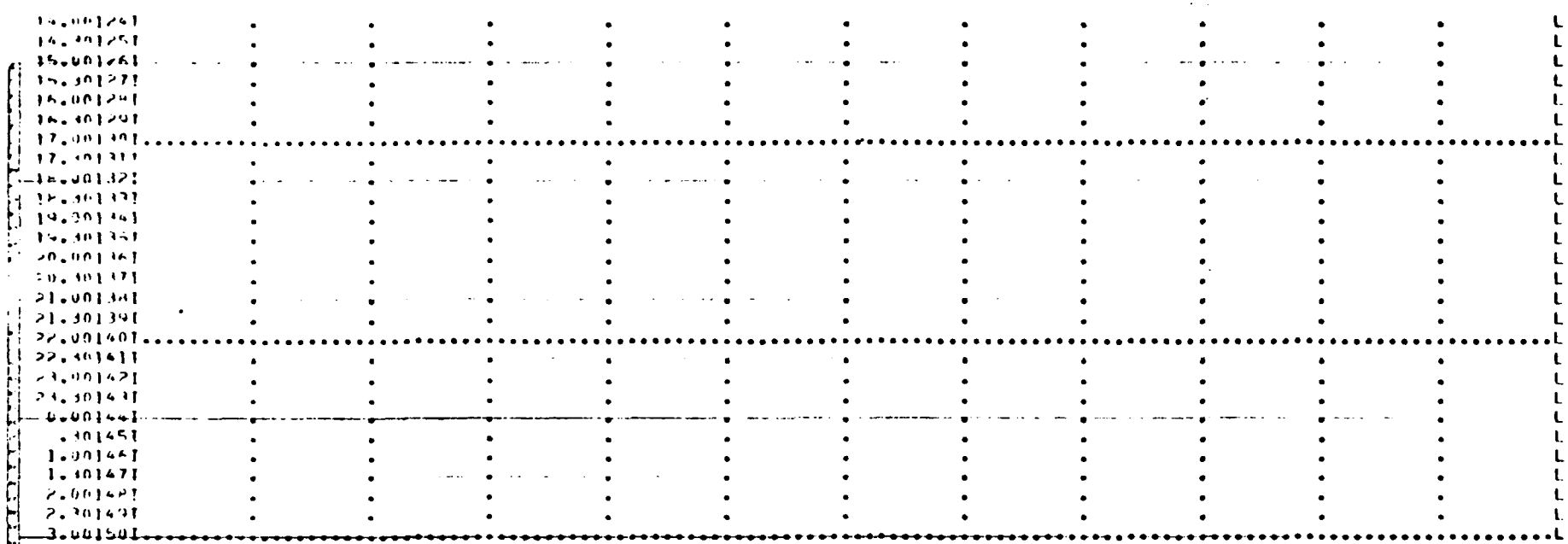
SUM	24.99	21.74	3.25	23474.
	(635.)	(552.)	(83.)	(664.71)

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	1425.	1335.	474.	163.	23474.
CMS	52.	38.	13.	5.	665.
INCHES		14.78	21.02	21.66	21.66
MM		375.46	533.79	550.23	550.23
AC-FT		662.	941.	970.	970.
THOUS CU M		816.	1161.	1196.	1196.


STATION- 1
INFLOW(I), OUTFLOW(O) AND OBSERVED FLOW(*)
0. 400. 800. 1200. 1600. 2000. 0. 0. 0. 0. 0. 0.
PRECIP(L) AND EXCESS(X)
0. 0. 0. 0. 0. 0. 0. 0. 0. 6. 4. 2. 0.
.30 11
1.00 21
1.30 31
2.00 41
2.30 51
3.00 61
3.30 71
4.00 81
4.30 91
5.00 101
5.30 111
6.00 121
6.30 131
7.00 141
7.30 151
8.00 161
8.30 171
9.00 181
9.30 191
10.00 201
10.30 211
11.00 221
11.30 231
12.00 241
12.30 251
13.00 261
13.30 271
14.00 281
14.30 291
15.00 301
15.30 311
16.00 321
16.30 331
17.00 341
17.30 351
18.00 361
18.30 371
19.00 381
19.30 391
20.00 401
20.30 411
21.00 421
21.30 431
22.00 441
22.30 451
23.00 461
23.30 471
0.00 481
.30 491
1.00 501
1.30 511
2.00 521



D-9



HYDROGRAPH AT STA 1 FOR PLAN 1, RTIO 1

1.	1.	1.	1.	1.	1.	1.	1.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	1.	1.	2.	4.
7.	10.	14.	21.	29.	37.	31.	28.	23.	19.
15.	12.	10.	8.	6.	5.	4.	3.	3.	2.
2.	2.	3.	4.	3.	4.	4.	4.	4.	4.
5.	9.	14.	23.	33.	43.	51.	59.	63.	67.
71.	73.	80.	97.	130.	180.	242.	311.	382.	475.
661.	736.	869.	912.	907.	834.	741.	633.	525.	427.
344.	279.	227.	185.	152.	126.	104.	86.	71.	58.
46.	37.	29.	22.	17.	13.	7.	5.	4.	2.
1.	1.	1.	1.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	912.	667.	237.	82.	11737.
CMS	26.	19.	7.	2.	332.
INCHES		7.39	10.51	10.83	10.83
MM		187.73	266.90	275.11	275.11
AC-FT		331.	471.	485.	485.
THOUS CU M		408.	580.	598.	598.

HYDROGRAPH AT STA 1 FOR PLAN 1, RTIO 2

2.	2.	1.	1.	1.	1.	1.	1.	1.	1.
1.	1.	1.	1.	1.	1.	1.	1.	0.	0.
0.	0.	0.	0.	0.	1.	1.	3.	5.	8.
12.	20.	32.	46.	58.	64.	62.	55.	46.	38.
31.	25.	20.	16.	13.	10.	8.	6.	5.	5.
4.	5.	5.	6.	7.	7.	8.	8.	8.	8.
10.	16.	28.	45.	66.	85.	102.	115.	126.	135.
141.	147.	160.	195.	261.	360.	484.	622.	764.	950.
1202.	1473.	1699.	1825.	1814.	1678.	1481.	1267.	1051.	853.
690.	559.	454.	371.	304.	251.	208.	173.	143.	116.
94.	73.	57.	44.	34.	25.	15.	10.	7.	5.
3.	2.	2.	1.	1.	1.	1.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	1825.	1335.	474.	163.	23474.
CMS	52.	38.	13.	5.	665.
INCHES		14.78	21.02	21.66	21.66
MM		375.45	533.79	550.23	550.23
AC-FT		662.	941.	970.	970.
THOUS CU M		816.	1161.	1196.	1196.

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

1	1	0	0	0	0	1	0	0

ROUTING DATA

WIDTH	CLOSS	AVG	IRES	ISAME	IOPT	IPMP	LSTR
0.0	0.000	0.00	1	1	0	0	0

NSTPS	NSTDL	LAG	AMSKK	X	TSK	STORA	ISPRAT
1	0	0	0.000	0.000	0.000	-446.	0

SURFACE AREA=	21.	34.	44.
CAPACITY=	0.	143.	215.
ELEVATION=	446.	451.	453.

CREL	SPRATO	COOW	EXPW	ELEVL	COOL	CAREA	EXPI
451.0	25.5	3.3	1.5	0.0	0.0	0.0	0.0

DAM DATA

TOPEL	COOD	EXPD	DAMWID
453.0	2.7	1.5	420.

STATION 1. PLAN 1. RATIO 1

END-OF-PERIOD HYDROGRAPH ORDINATES

OUTFLOW

0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	13.	103.	228.	655.	840.	797.	703.	602.	504.
417.	344.	291.	249.	230.	214.	197.	180.	163.	148.
134.	119.	106.	95.	85.	75.	67.	59.	53.	47.
42.	37.	34.	30.	27.	25.	22.	20.	19.	17.
16.	14.	13.	12.	11.	10.	10.	9.	8.	8.
7.	7.	6.	6.	6.	5.	5.	5.	4.	4.
4.	4.	4.	3.	3.	3.	3.	3.	3.	3.

STORAGE

0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	1.	1.	1.
1.	1.	2.	3.	4.	5.	6.	7.	8.	9.
10.	11.	11.	11.	12.	12.	12.	12.	12.	13.
13.	13.	13.	13.	13.	13.	13.	14.	14.	14.
14.	14.	15.	16.	17.	18.	20.	22.	25.	28.
30.	33.	37.	40.	45.	51.	60.	72.	86.	104.
126.	153.	184.	213.	232.	236.	236.	234.	231.	228.
225.	222.	219.	216.	213.	210.	206.	202.	199.	195.
191.	188.	184.	181.	178.	176.	173.	171.	169.	167.
165.	163.	162.	161.	159.	158.	157.	157.	156.	155.
154.	154.	153.	153.	152.	152.	151.	151.	151.	150.
150.	150.	149.	149.	149.	149.	148.	148.	148.	148.
148.	148.	147.	147.	147.	147.	147.	147.	147.	147.

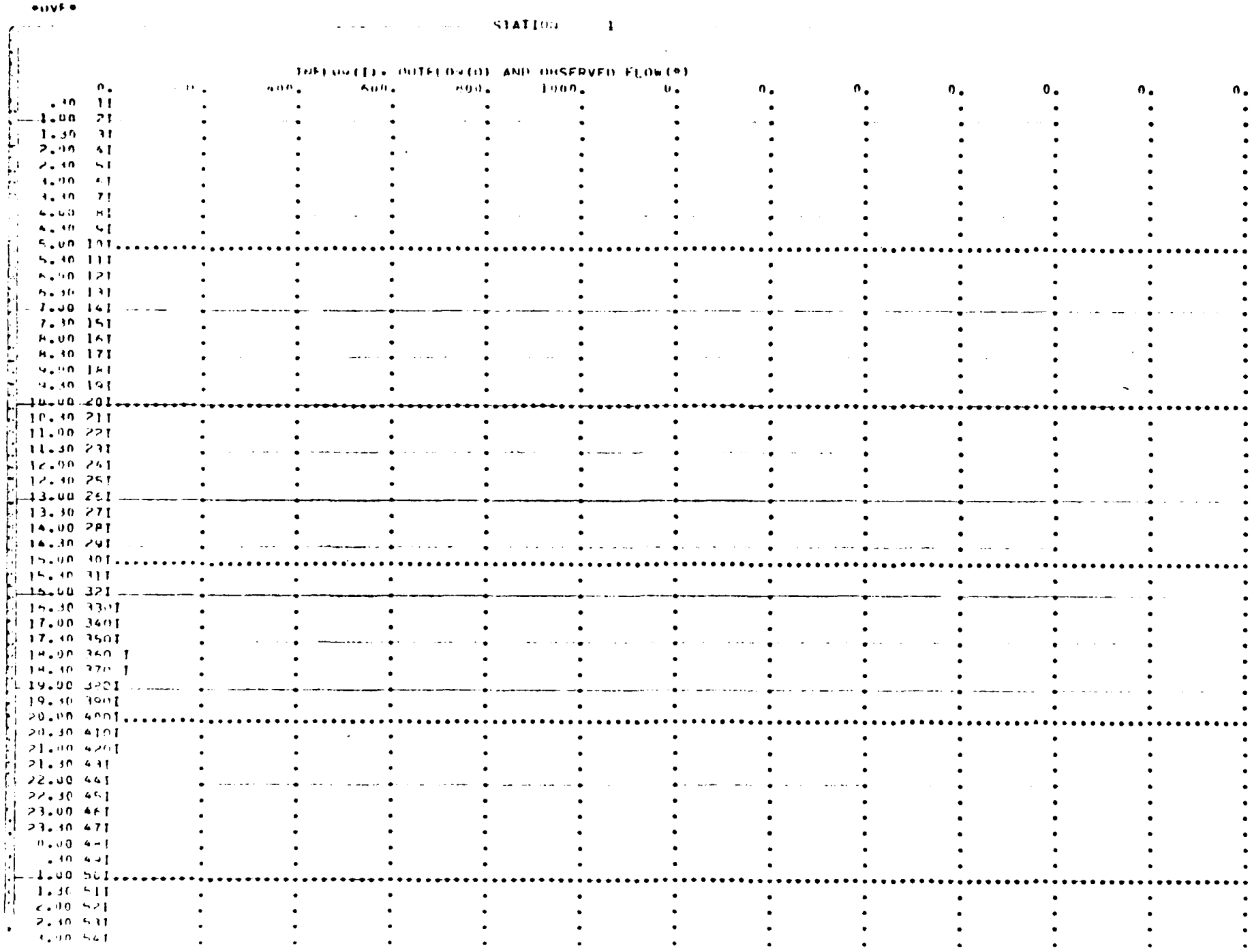
STAGE

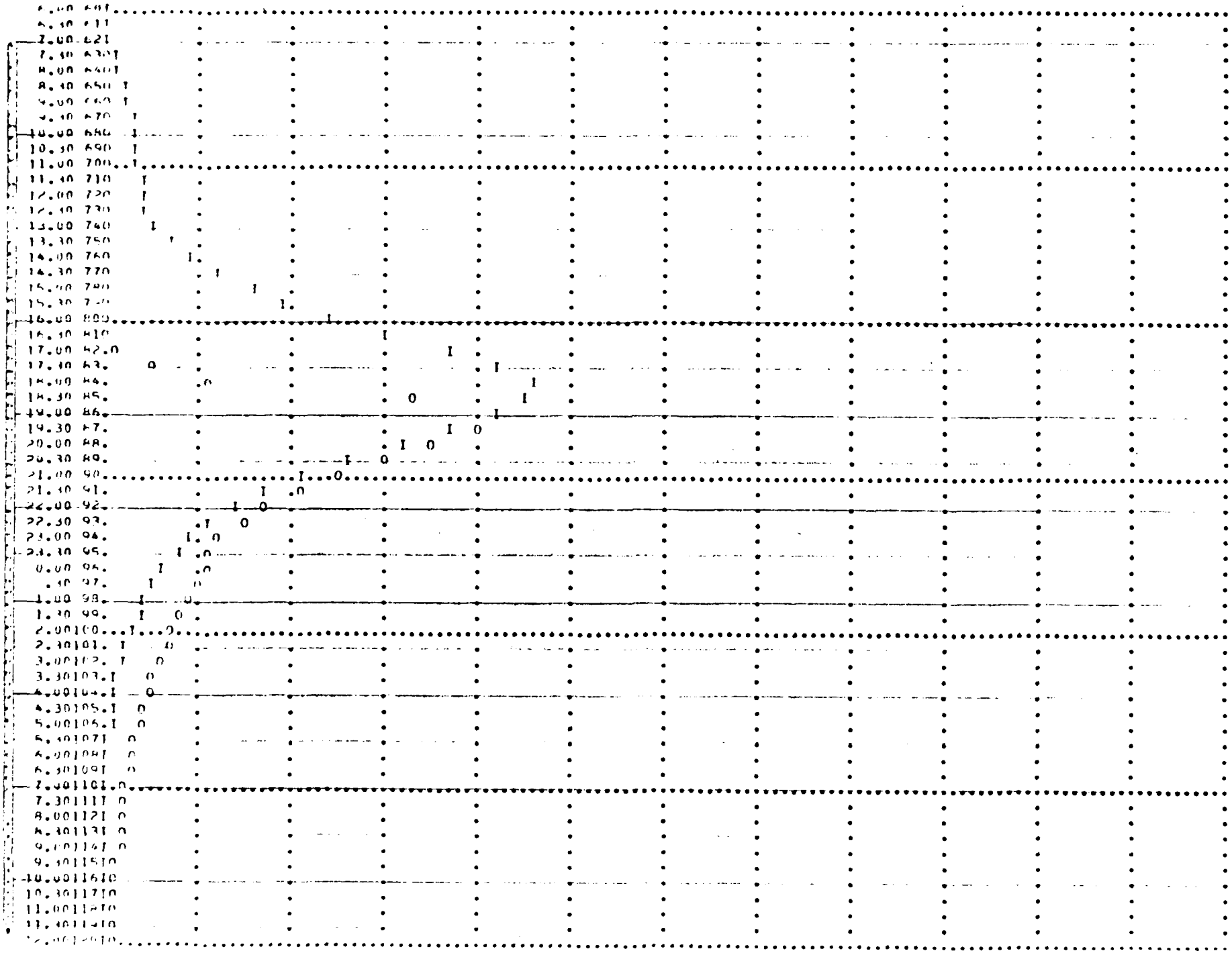
445.7	445.7	445.7	445.7	445.7	445.7	445.7	445.7	445.7	445.7

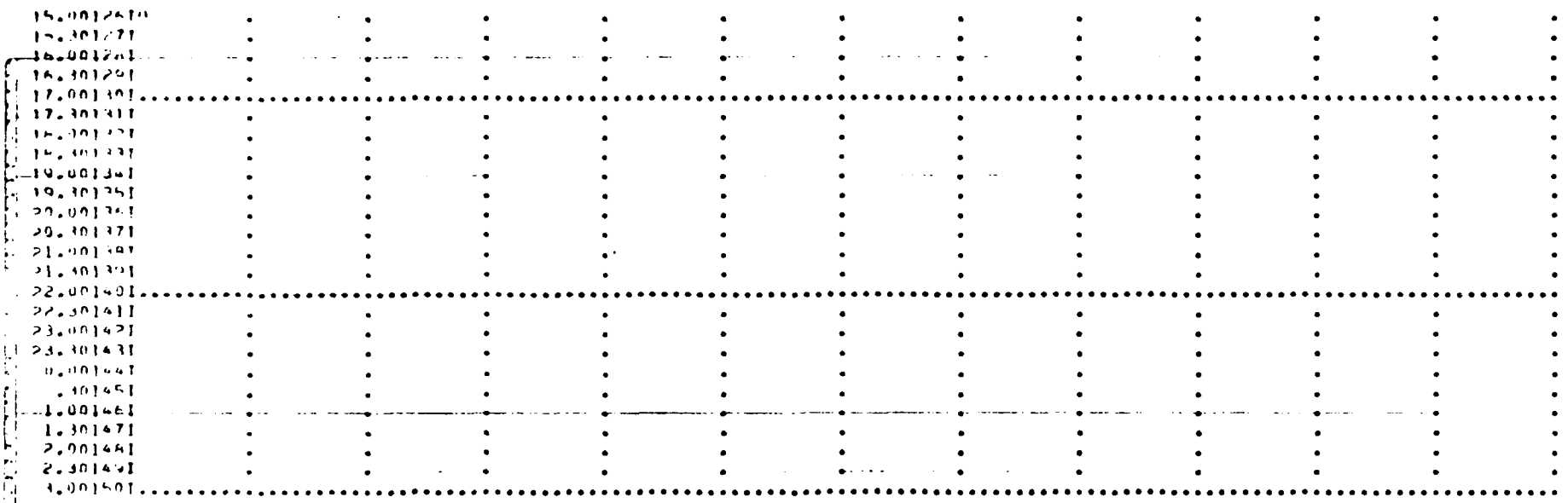
446.4	446.4	446.4	446.4	446.5	446.5	446.6	446.7	446.8	447.0
447.1	447.2	447.3	447.5	447.7	447.9	448.3	448.7	449.2	449.8
450.5	451.1	451.1	452.9	453.4	453.6	453.6	453.5	453.4	453.3
453.2	453.2	453.1	453.0	453.0	452.9	452.8	452.7	452.6	452.5
452.4	452.3	452.2	452.1	452.0	451.9	451.9	451.8	451.7	451.7
451.6	451.6	451.5	451.5	451.5	451.4	451.4	451.4	451.4	451.3
451.3	451.3	451.3	451.3	451.3	451.2	451.2	451.2	451.2	451.2
451.2	451.2	451.2	451.2	451.2	451.2	451.2	451.1	451.1	451.1
451.1	451.1	451.1	451.1	451.1	451.1	451.1	451.1	451.1	451.1

PEAK OUTFLOW IS 840. AT TIME 43.00 HOURS

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	840.	488.	169.	57.	8193.
CMS	24.	14.	5.	2.	232.
INCHES		5.40	7.47	7.56	7.56
MM		137.25	189.77	192.06	192.06
AC-FT		242.	335.	339.	339.
THOUS CU M		298.	413.	418.	418.


•DVF•
STATION 1
INFLOW(I), OUTFLOW(O) AND OBSERVED FLOW(*)
0. 200. 400. 600. 800. 1000. 0. 0. 0. 0. 0. 0. 0.
.30 11
1.00 21
1.30 31
2.00 41
2.30 51
3.00 61
3.30 71
4.00 81
4.30 91
5.00 101
5.30 111
6.00 121
6.30 131
7.00 141
7.30 151
8.00 161
8.30 171
9.00 181
9.30 191
10.00 201
10.30 211
11.00 221
11.30 231
12.00 241
12.30 251
13.00 261
13.30 271
14.00 281
14.30 291
15.00 301
15.30 311
16.00 321
16.30 331
17.00 341
17.30 351
18.00 361
18.30 371
19.00 381
19.30 391
20.00 401
20.30 411
21.00 421
21.30 431
22.00 441
22.30 451
23.00 461
23.30 471
0.00 481
.30 491
1.00 501
1.30 511
2.00 521
2.30 531
3.00 541





STATION 1, PLAN 1, RATIO 2

END-OF-PERIOD HYDROGRAPH ORDINATES

OUTFLOW

0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	59.	175.
417.	1248.	1575.	1761.	1819.	1746.	1580.	1379.	1169.	969.
795.	651.	536.	443.	370.	312.	267.	237.	223.	207.
190.	172.	155.	138.	123.	110.	97.	85.	75.	66.
58.	52.	46.	41.	37.	33.	30.	27.	24.	22.
20.	18.	17.	15.	14.	13.	12.	11.	10.	10.
9.	8.	8.	7.	7.	6.	6.	6.	5.	5.
5.	4.	4.	4.	4.	4.	3.	3.	3.	3.

STORAGE

0.	0.	0.	0.	0.	0.	0.	0.	0.	1.
1.	1.	1.	1.	1.	1.	1.	1.	1.	1.
1.	1.	1.	1.	1.	1.	1.	1.	1.	1.
2.	3.	4.	5.	7.	10.	12.	15.	17.	19.
20.	21.	22.	23.	24.	24.	24.	25.	25.	25.
25.	26.	26.	26.	26.	27.	27.	27.	27.	28.
28.	29.	30.	31.	33.	37.	40.	45.	50.	55.
61.	67.	73.	81.	90.	103.	120.	143.	171.	201.
230.	248.	255.	259.	260.	258.	255.	250.	246.	241.
236.	232.	229.	225.	223.	220.	218.	215.	212.	208.
205.	201.	196.	193.	189.	185.	182.	178.	176.	173.
170.	168.	166.	165.	163.	162.	160.	159.	158.	157.
156.	156.	155.	154.	154.	153.	153.	152.	152.	151.
151.	151.	150.	150.	150.	149.	149.	149.	149.	148.
148.	148.	148.	148.	148.	147.	147.	147.	147.	147.

STAGE

445.7	445.7	445.7	445.7	445.7	445.7	445.7	445.7	445.7	445.7
445.7	445.7	445.7	445.7	445.7	445.7	445.7	445.7	445.7	445.7
445.7	445.7	445.7	445.7	445.7	445.7	445.7	445.8	445.8	445.8
445.8	445.8	445.9	445.9	446.0	446.2	446.3	446.4	446.5	446.6
446.6	446.7	446.7	446.8	446.8	446.8	446.8	446.8	446.8	446.8
446.8	446.9	446.9	446.9	446.9	446.9	446.9	446.9	446.9	447.0
447.0	447.0	447.0	447.1	447.2	447.3	447.5	447.7	447.9	448.1
448.3	448.5	448.7	449.0	449.3	449.7	450.3	451.0	451.8	452.6
453.4	453.8	454.0	454.1	454.1	454.1	454.0	453.9	453.8	453.7
453.6	453.4	453.4	453.3	453.2	453.1	453.1	453.0	452.9	452.8
452.7	452.6	452.5	452.4	452.3	452.2	452.1	452.0	451.9	451.9
451.8	451.7	451.7	451.6	451.6	451.5	451.5	451.5	451.4	451.4
451.4	451.4	451.3	451.3	451.3	451.3	451.3	451.3	451.2	451.2
451.2	451.2	451.2	451.2	451.2	451.2	451.2	451.2	451.2	451.2
451.1	451.1	451.1	451.1	451.1	451.1	451.1	451.1	451.1	451.1

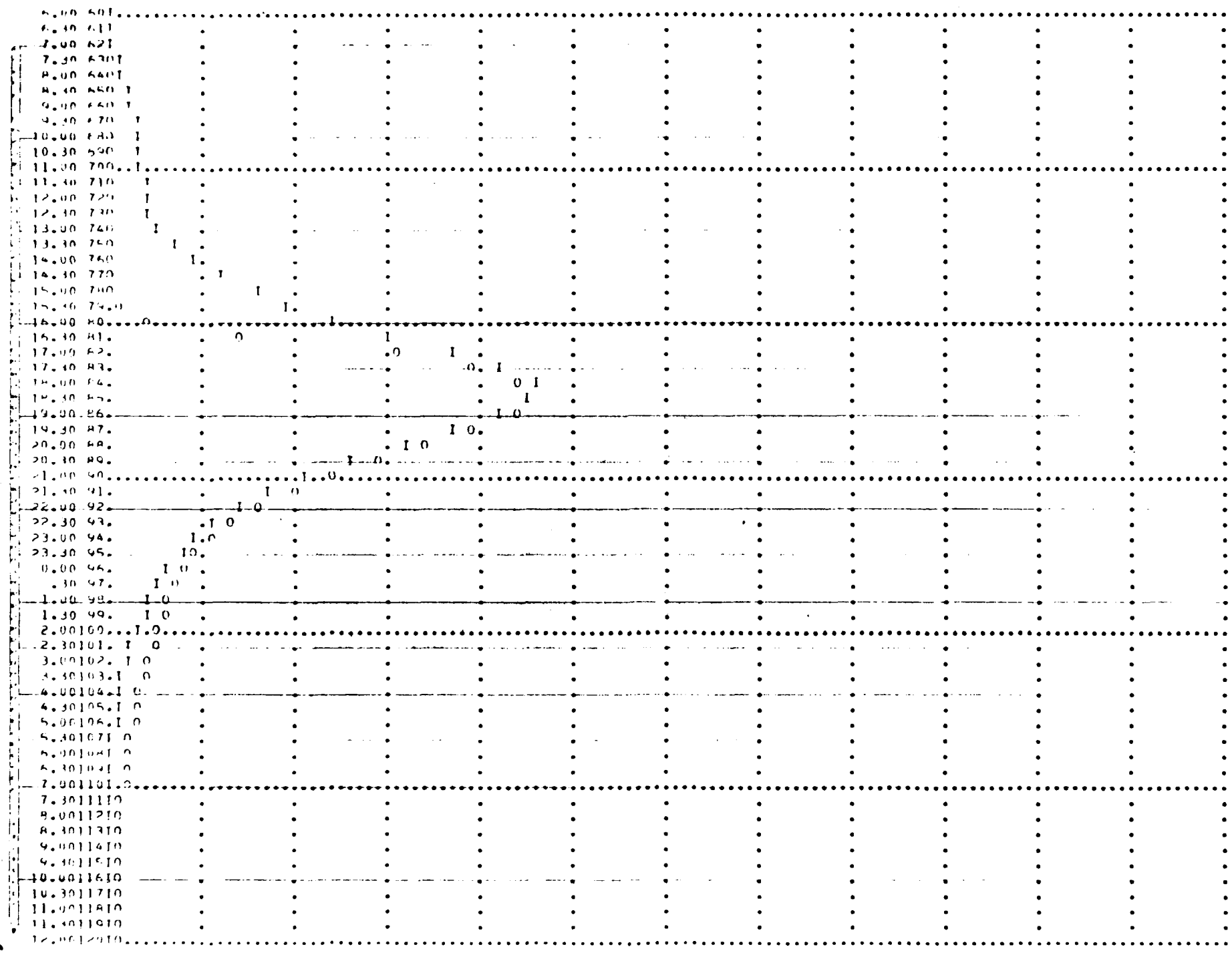
PEAK OUTFLOW IS 1819. AT TIME 42.50 HOURS

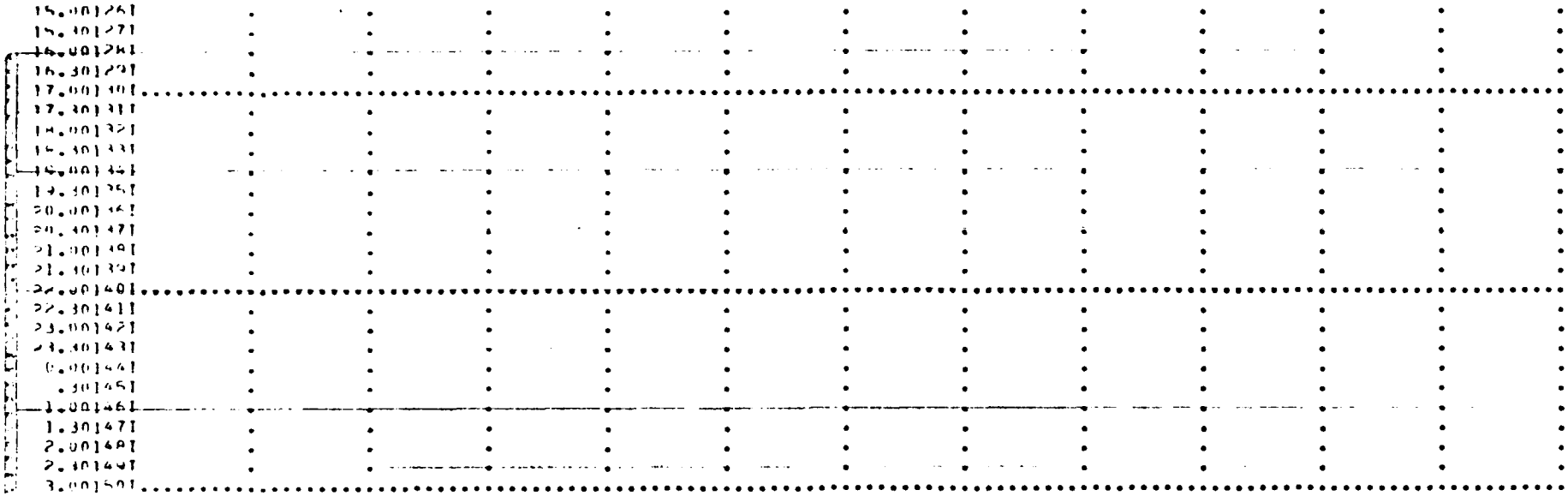
AC-FT	630.	817.	823.	823.
[illegible]	777.	1008.	1015.	1015.

STATION 1

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

	0.	400.	800.	1200.	1600.	2000.	0.	0.	0.	0.	0.	0.	0.
.30	11												
1.00	21												
1.30	31												
2.00	41												
2.30	51												
3.00	61												
3.30	71												
4.00	81												
4.30	91												
5.00	101												
5.30	111												
6.00	121												
6.30	131												
7.00	141												
7.30	151												
8.00	161												
8.30	171												
9.00	181												
9.30	191												
10.00	201												
10.30	211												
11.00	221												
11.30	231												
12.00	241												
12.30	251												
13.00	261												
13.30	271												
14.00	281												
14.30	291												
15.00	301												
15.30	311												
16.00	321												
16.30	331												
17.00	341												
17.30	351												
18.00	361												
18.30	371												
19.00	381												
19.30	391												
20.00	401												
20.30	411												
21.00	421												
21.30	431												
22.00	441												
22.30	451												
23.00	461												
23.30	471												
0.00	481												
.30	491												
1.00	501												
1.30	511												
2.00	521												
2.30	531												
3.00	541												





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

OPERATION	STATION	AREA	PLAN	RATIOS APPLIED TO FLOWS RATIO 1 .50	 RATIO 2 1.00
HYDROGRAPH AT	1	.84	1	912.	1825.
		(2.18)		(25.84)	(51.67)
ROUTED TO	1	.84	1	840.	1819.
		(2.18)		(23.79)	(51.52)

SUMMARY OF DAM SAFETY ANALYSIS

PLAN 1 .....

	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
ELEVATION	445.70	451.00	453.00
STORAGE	0.	143.	215.
OUTFLOW	0.	0.	238.

RATIO OF PMF	MAXIMUM RESERVOIR W.S.ELEV	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
.50	453.58	.58	238.	840.	5.00	43.00	0.00
1.00	454.14	1.14	260.	1819.	8.50	42.50	0.00

A. Size Classification

Height of dam = 37 ft.; hence small

Storage capacity at top of dam (elev. 453.0) = 532 AC-FT.; hence small

Adopted size classification small

B.i) Hazard Potential

This dam is located upstream of an urbanized area. Residential homes line the banks of Five Mile River. The dam impounds water which is used by the surrounding communities.

ii) Impact of Failure of Dam at Maximum Pool (Top of Dam)

It is estimated from the "rule of thumb" failure hydrograph, that the following adverse impacts are a possibility by the failure of this dam.

a) Loss of homes over 10;
b) Loss of buildings 3-5;
c) Loss of highways or roads Possibly 1 or 2;
d) Loss of bridges None;

The failure profile can affect a distance of 14,500 feet from the dam.

C. Hazard Potential Classifications

HAZARD	SIZE	TEST FLOOD RANGE
High	Small	1/2 PMF to PMF

Adopted Test Flood = PMF = 2170 CSM

= 1825 CFS

D. Overtopping Potential

Drainage Area 535 Acres = 0.84 sq. miles

Spillway crest elevation = 451.0 (w/flashboards) NGVD

Top of Dam Elevation = 453.0 NGVD

Maximum spillway discharge

Capacity without overtopping of dam = 240 CFS
"test flood" inflow discharge = 1825 CFS
"test flood" outflow discharge = 1820 CFS

NEW CANAAN RESERVOIR DAM

Dam Failure Analysis

1. Failure discharge with pool at top of dam (elev. 453.0) = 28,887 CFS
2. Depth of water in reservoir at time of failure = 37 ft.
3. Maximum depth of flow downstream of dam = @ Face 10.5 ft.
4. Water surface elevation just downstream) of dam at time of failure) = 422.5 NGVD

The failure discharge of 28,887 CFS will enter and flow downstream 14,500 feet until the brook enters Mill Pond. Valley storage in this 14,500 foot length of brook is substantial in reducing the discharge. Also due to roughness characteristics, obstructions and frictional losses, it is very likely that the unsteady dam failure flow will dissipate its wave and kinetic energy and thus convert to steady and uniform flow obeying Manning's formulae 14,500 feet downstream. The failure profile will have the following hydraulic characteristics:

DISTANCE FROM THE DAM	WATER SURFACE ELEVATION NGVD	REMARKS
0	453.0	Upstream of dam
0	426.5	Downstream of dam
1000'	396.5	
2000'	380.5	
4000'	357.0	@ Country Club Rd.
6000'	334.0	
9000'	297.5	
12000'	249.0	@ Route 123
14500'	200.0	@ Mill Pond

Beyond 14,500 feet, failure discharge will flow in the below given channel characteristics:

Q = 10,300 CFS; S = .008

n = 0.05 ; b = 200 ; d = 5.0

Side slopes = 1V or 2H.

"Rule of Thumb Guidance for Estimating Downstream Dam Failure Analysis"

DATA

Name of Dam New Canaan Reservoir Dam

Location South of Pinneys Corners

Drainage Area 0.84 sq. mi., Top of Dam 453.0 NGVD

Spillway Type OGEE/Flash Boards Crest of Spillway 449.0 NGVD

Surface Area @ Crest Elev. 23 Acres = 0.036 sq. mi.

Pool Bottom Near Dam = 416.0 NGVD

Assumed Side Slopes of Embankments = 2:1

Depth of Pool at Dam (Yo) = 37 Feet

Mid-Height Elev. 432.5 NGVD

Length of Dam at Crest = 445 Feet

Length of Dam at Mid-Height = 382 Feet

20% of Dam Length at Mid-Height = W_b = 76 Feet

Step 1

Storage (S) at time of failure 535 Ac-FT
(Equal to top of dam)

Step 2

Peak Failure Discharge

$Q_{pl} = 8/27\ W_b \sqrt{g}\ Yo^{3/2}$

$= 1.68\ W_b\ Yo^{3/2}$ = 28,887 cfs

Failure is assumed to coincide with pool elevation at top of dam.

Mill Pond is located 14,500 feet downstream of New Canaan Reservoir dam. There is a 217 foot drop into Mill pond which will cause the dissipation of wave and kinetic energy of the failure discharge. Approximately, the water surface elevations between New Canaan Reservoir dam and Mill pond will be as given on Dam Failure Analysis. The increase of depth in Mill pond due to failure of the dam is estimated to be 5.0 feet.

BY. ECB DATE 11/27/79 SUBJECT DAM INSPECTION SHEET NO. 1 OF
CHKD. BY ERJ DATE 11/15/80 STUDIES JOB NO. 79-905

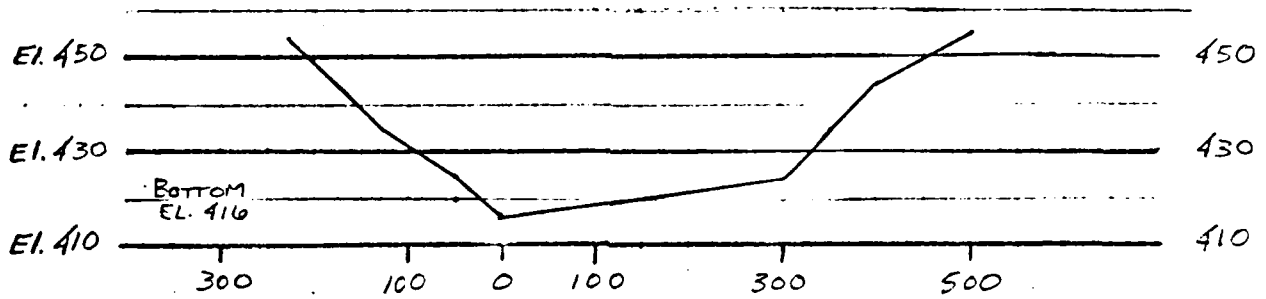
DOWNSTREAM W.S.EL. COMPUTATIONS

NAME OF DAM : NEW CANAAN RECREATION DAM

SECTION LOCATION : AT FACE DOWNSTREAM OF DAM

USING: $Q = 1.486/n \cdot AR^{2/3}S^{1/2}$

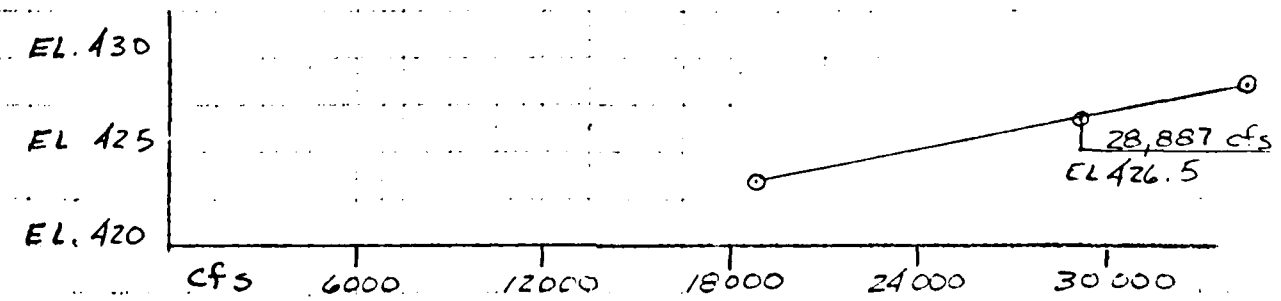
WHERE: n = 0.05 S = SLOPE = 0.05



CHANNEL SECTION

QP_1 = _____ cfs STORAGE (S) = _____ AC-FT

ELEV.	AREA	WP	R	$R^{2/3}$	$S^{1/2}$	$1.486/n$	Q	DEPTH
424	1225	350	3.5	2.31	.22	29.72	18 905	7'
429	1913	415	4.61	2.77	.22	29.72	34 646	12'
						29.72		



ASSUME FAILURE AT W.S. EL. EQUAL TO TOP OF DAM
EL. 455.67

STAGE DISCHARGE = 28,887 cfs ELEV = 426.5 OR AD = 10.5'
NEXT DOWNSTREAM SECTION 1000 ft.

PURCELL ASSOCIATES

BY EGS DATE 1/27/77 SUBJECT DAM INSPECTION SHEET NO 4 OF 8
CHKD BY ERJ DATE 1/15/80 STUDIES JOB NO 77-905

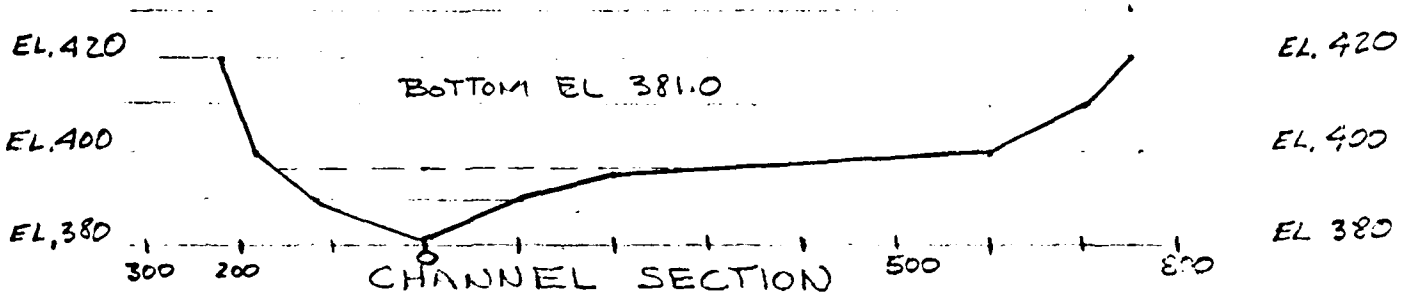
DOWNSTREAM W.S.EL. COMPUTATIONS

NAME OF DAM: NEW CANAAN RESERVOIR DAM

SECTION LOCATION: 1000' DOWNSTREAM OF DAM

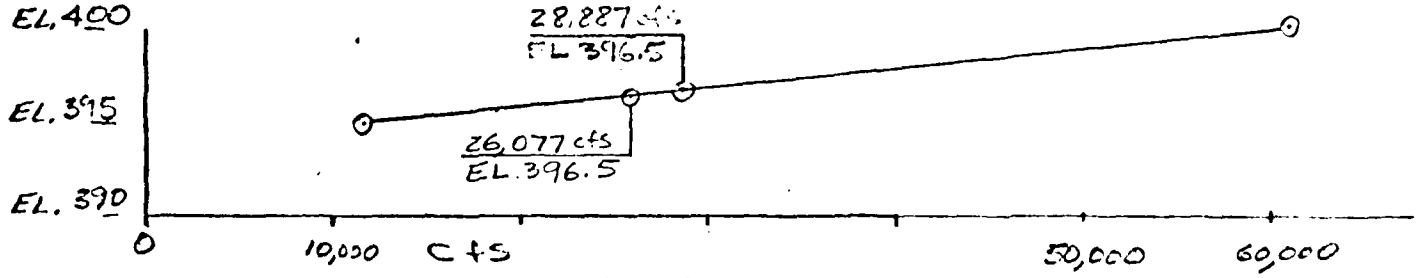
USING: $Q = 1.486/n \, A \, R^{2/3} \, S^{1/2}$

WHERE: n = 0.05 S = SLOPE = 0.0125 ft/ft



Q_{P_1} = 28,887 cfs STORAGE (S) 532 Ac-ft.

ELEV	AREA	W.P	R	$R^{2/3}$	$S^{1/2}$	1.486/n	Q cfs	DEPTH
390	990	220	4.5	2.73	0.11	29.72	8322	9
400	5240	781	6.71	3.56	0.11	29.72	33942	19
395	1415	350	4.04	2.54	0.11	29.72	11,740	14



$V_1 = \frac{10.5+11.5}{2} \times \left(\frac{380+440}{2} \times \frac{(9.41)}{1000 \div 43560}\right) 1/2 = 51.8$ Ac-ft

Q_{P_2} (TRAIL) = $Q_{P_1}(1 - V_1/S) = 26,077$ cfs

SINCE DEPTH DOES NOT CHANGE $V_1 = V_2$

Q_{P_2} (TRAIL) IS OK

STAGE DISCHARGE = 26,077 ELEV = 396.5 OR A D = 11.5

NEXT DOWNSTREAM SECTION 1000 ft.

BY FCB DATE 11/27/77 SUBJECT DAM INSPECTION SHEET NO 3 OF 6
CHKD. BY ERJ DATE 11/15/78 STORIES JOB NO 77-335

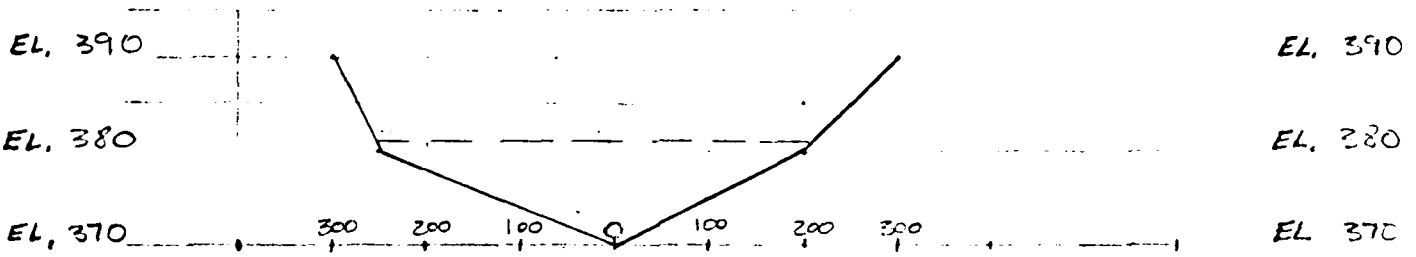
DOWNSTREAM W.S.EL. COMPUTATIONS

NAME OF DAM: NEW CANAAN RESERVOIR SDM

SECTION LOCATION: 2000' DOWNSTREAM OF DAM

USING: $Q = 1.486/n \, A \, R^{2/3} \, S^{1/2}$

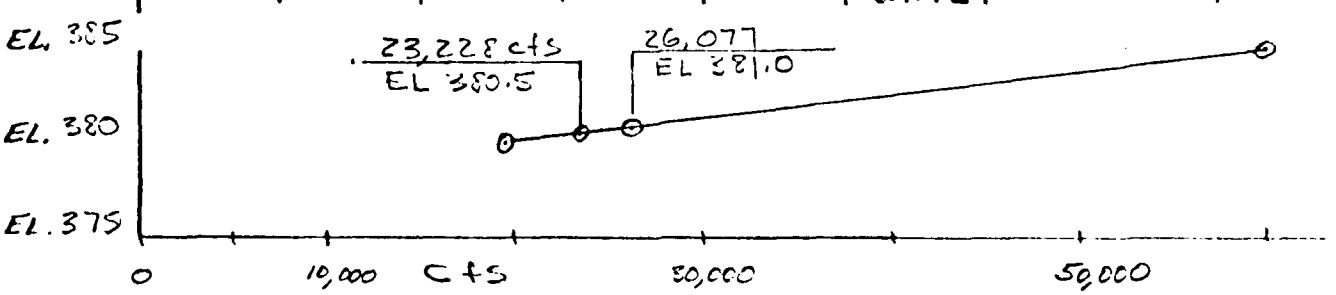
WHERE: n = 0.05 S = SLOPE = .011



CHANNEL SECTION

Q_{P_1} = 26,077 cfs STORAGE (S) 532 Ac-ft

ELEV	AREA	W.P.	R	$R^{2/3}$	$S^{1/2}$	1.486/n	Q cfs	DEPTH
380	2250	450	5.0	2.92	.10	29.72	19,553	10
385	4688	525	8.93	4.30	.10	29.72	59,973	15
						29.72		



$V_1 = \frac{11.5+11.0}{2} \times \left(\frac{440+460}{2} \times \frac{(10.33)}{1000} \div 43560\right) 1/2 = 58.1$ Ac-ft

Q_{P_2} (TRIAL) = $Q_{P_1}(1 - V/S)$ = 23,228 cfs

$V_2 = \frac{11.5+10.5}{2} \times 10.33 \times 1/2 = 56.8$ Ac-ft $V_{AVE} = 57.5$ Ac-ft

$Q_{P_2} = Q_{P_1}(1 - V_{AVE}/S)$ = 23,259 cfs

STAGE DISCHARGE = 23,259 cfs ELEV = 380.5 OR A D = 10.5

NEXT DOWNSTREAM SECTION 2000 ft.

BY FLB DATE 11/27/79 SUBJECT DAM INSPECTION SHEET NO 4 OF 7
CHKD. BY EEJ DATE 11/28/79 STORIES JOB NO 79-905

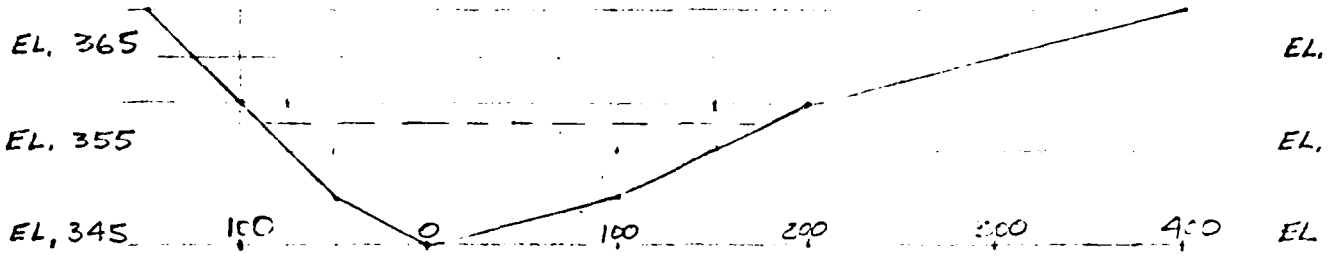
DOWNSTREAM W.S. EL. COMPUTATIONS

NAME OF DAM: [illegible]

SECTION LOCATION: 4000' DOWNSTREAM OF DAM
JUST BEFORE COUNTRY CLUB RD.

USING: $Q = 1.486/n \, A R^{2/3} S^{1/2}$

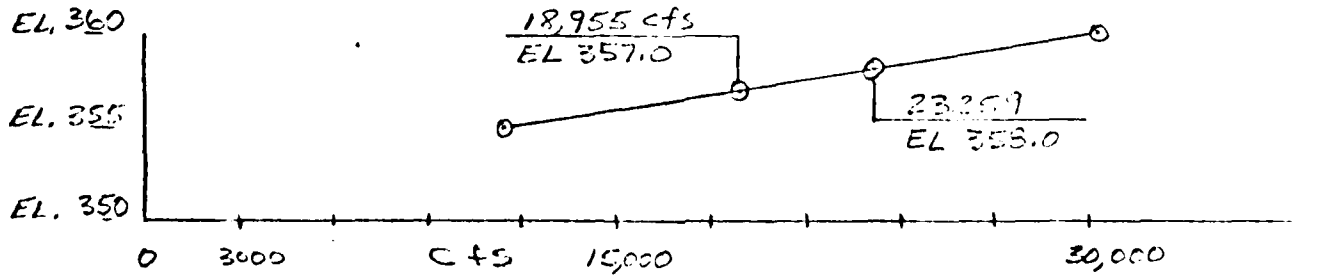
WHERE: n = 0.05 S = SLOPE = .005



CHANNEL SECTION

Q_{P_1} = 23,259 STORAGE (S) 532 Ac-FT

ELEV	AREA	W.P.	R	$R^{2/3}$	$S^{1/2}$	$1.486/n$	Q cfs	DEPTH
355	1313	225	5.84	3.24	.09	29.72	11,[illegible]	10
360	2651	300	8.84	4.27	.09	29.72	30,510	15'
						29.72		



$V_1 = \frac{10.5+13.0}{2} \times \left(\frac{460+270}{2} \times 2000 + 43500 \right) \times 1/2 = 98.5$ Ac-FT (16.76)

Q_{P_2} (TRIAL) $= Q_{P_1}(1 - V/S) = 18,955$ cfs

$V_2 = \frac{10.5+12.0}{2} \times 16.76 \times 1/2 = 94.3$ Ac-FT $V_{AVE} = 96.4$ Ac-FT

$Q_{P_2} = Q_{P_1}(1 - V_{AVE}/S) = 19,041$ cfs

STAGE DISCHARGE = 19,041 cfs ELEV = 357.0 OR A D = 12.0'

NEXT DOWNSTREAM SECTION 2000 ft.

PUMPELL ASSOCIATES

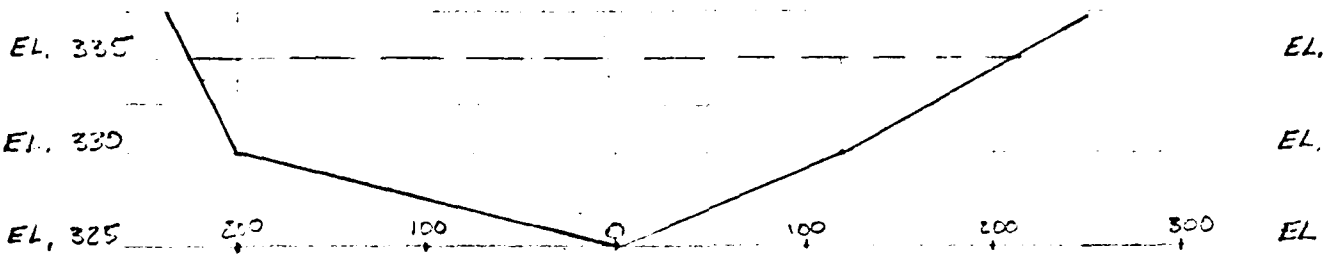
DOWNSTREAM W.S.EL. COMPUTATIONS

NAME OF DAM: NEW CANAAN RESERVOIR DAM

SECTION LOCATION: 6000' DOWNSTREAM OF DAM

USING: $Q = 1.486/n \, A \, R^{2/3} \, S^{1/2}$

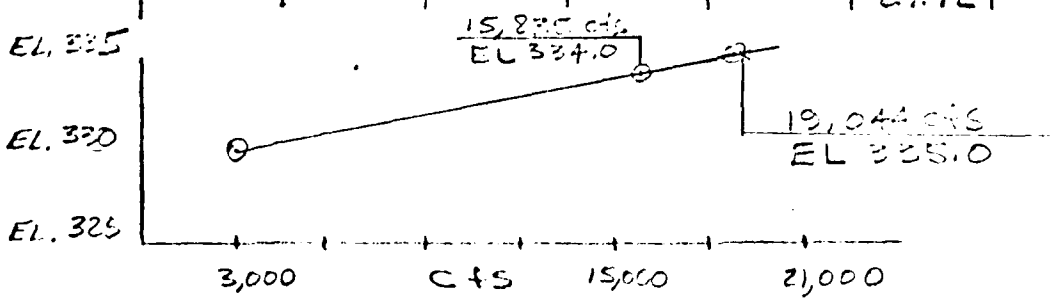
WHERE: n = 0.05 S = SLOPE = .005 ft/ft



CHANNEL SECTION

Q_{P_1} = 19,044 cfs STORAGE (S) 532 AC-FT

ELEV	AREA	W.P.	R	$R^{2/3}$	$S^{1/2}$	1.486/n	Q cfs	DEPTH
330	800	320	2.5	1.84	.07	29.72	3066	5
335	2688	435	6.18	3.37	.07	29.72	18,830	10
						29.72		



$V_1 = \frac{12.0+10.0}{2} \times \left(\frac{270+440}{2} \times 2000 + 43,560\right) 1/2 =$ 39.6 AC-FT

Q_{P_2} (TRIAL) $= Q_{P_1}(1 - V/S) =$ 15,825 cfs

$V_2 = \frac{12.0+9.0}{2} \times 16.3 \times 1/2 =$ 85.6 AC-FT VAVE = 87 AC-FT

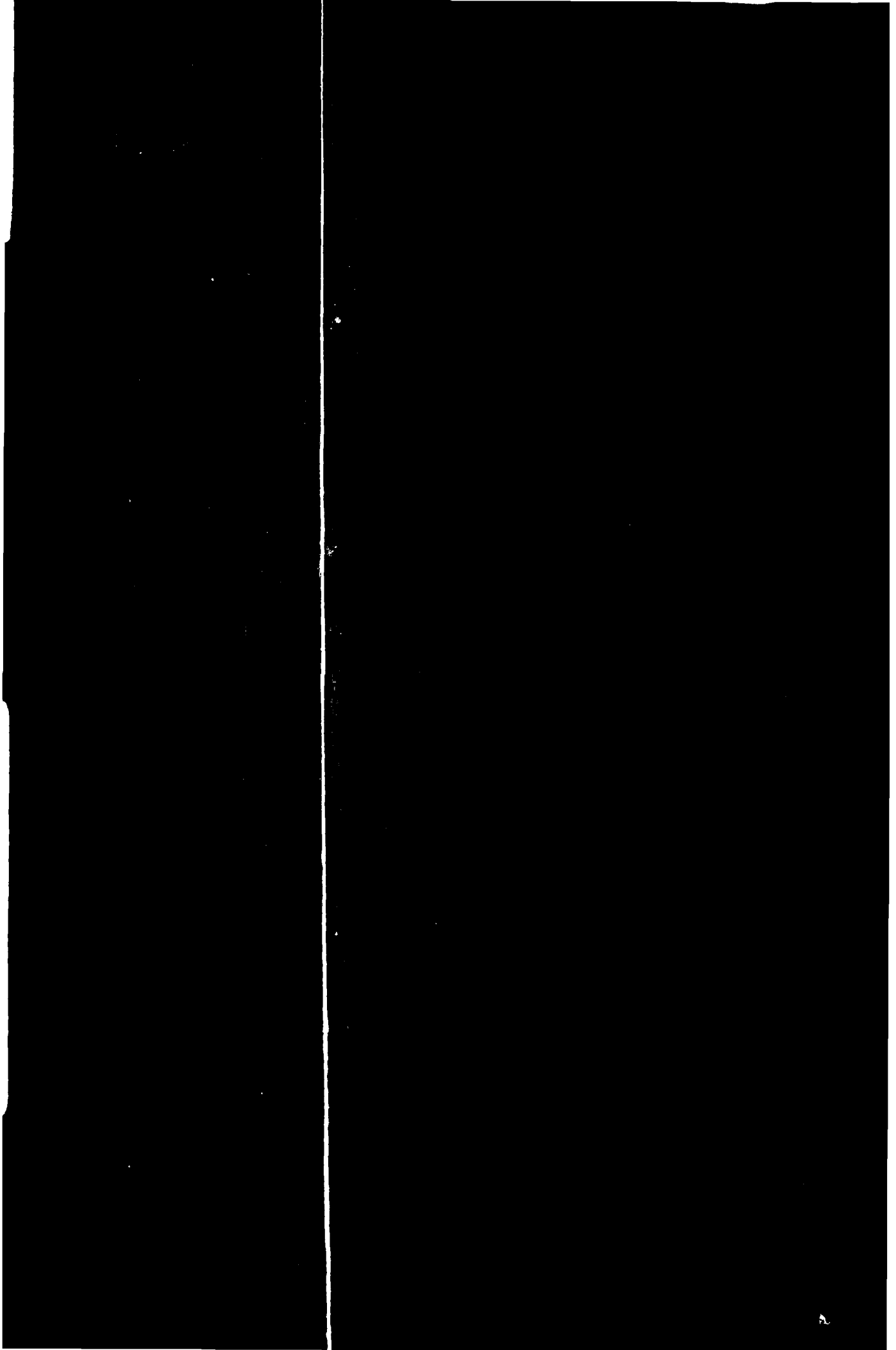
$Q_{P_2} = Q_{P_1}(1 - V_{AVE}/S) =$ 15,908 cfs

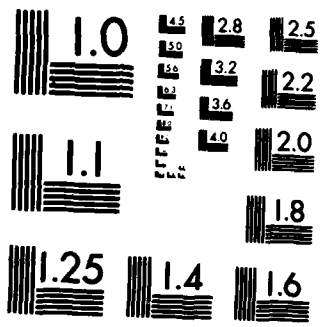
STAGE DISCHARGE = 15,908 cfs ELEV = 334.0

NEXT DOWNSTREAM SECTION 3[illegible]

AD-A142 761 NATIONAL PROGRAM FOR INSPECTION OF NON-FEDERAL DAMS NEW CANAAN RESERVOIR..(U) CORPS OF ENGINEERS WALTHAM MA NEW ENGLAND DIV FEB 80 2/2

UNCLASSIFIED F/G 13/13 NL





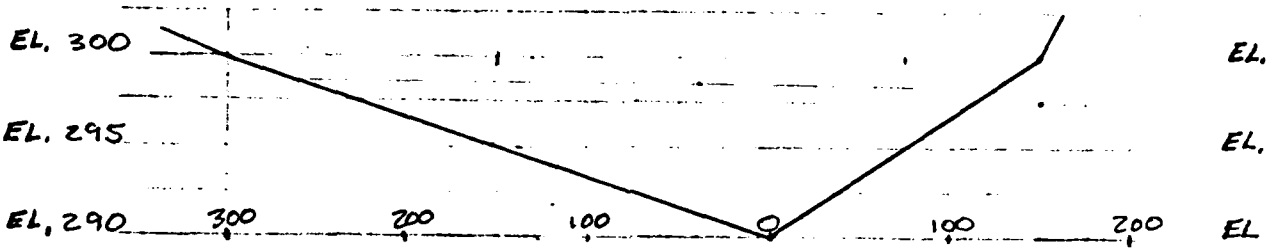
DOWNSTREAM W.S.EL. COMPUTATIONS

NAME OF DAM: NEW CANAAN RESERVOIR DAM

SECTION LOCATION: 9000' DOWNSTREAM OF DAM

USING: $Q = 1.486/n \, A \, R^{2/3} \, S^{1/2}$

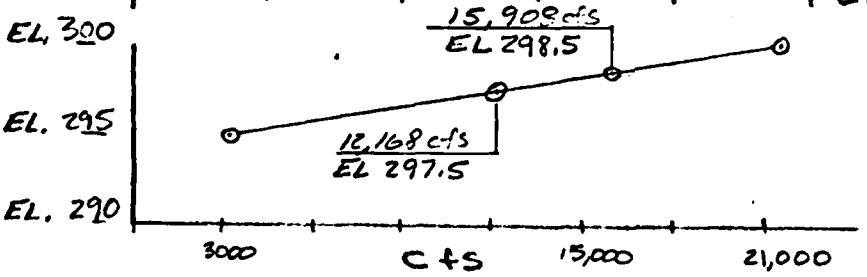
WHERE: n = 0.05 S = SLOPE = .011'/'



CHANNEL SECTION

Q_{P_1} = 15,908 cfs STORAGE (S) 532 Ac-ft

ELEV.	AREA	WP	R	$R^{2/3}$	$S^{1/2}$	1.486/n	Q	DEPTH
295	563	225	2.5	1.84	.11	29.72	3390	5
300	2250	450	5.00	2.92	.11	29.72	21,513	10
						29.72		



$V_1 = \frac{9.0+8.5}{2} \times \left(\frac{440+390}{2} \times 3000 \div 43,560 \right) 1/2 = 125$ Ac-ft (28.58)

Q_{P_2} (TRIAL) $= Q_{P_1}(1 - V_1/S) = 12,168$ cfs

$V_2 = \frac{9.0+7.5}{2} \times \left(\frac{440+370}{2} \times 3000 \div 43,560 \right) 1/2 = 115.$ $V_{AVE} = 120$ Ac-ft

$Q_{P_2} = Q_{P_1}(1 - V_{AVE}/S) = 12,320$ cfs

STAGE DISCHARGE = 12,320 cfs ELEV = 297.5 OR A D = 7.5

NEXT DOWNSTREAM SECTION 3000 ft.

PURCELL ASSOCIATES

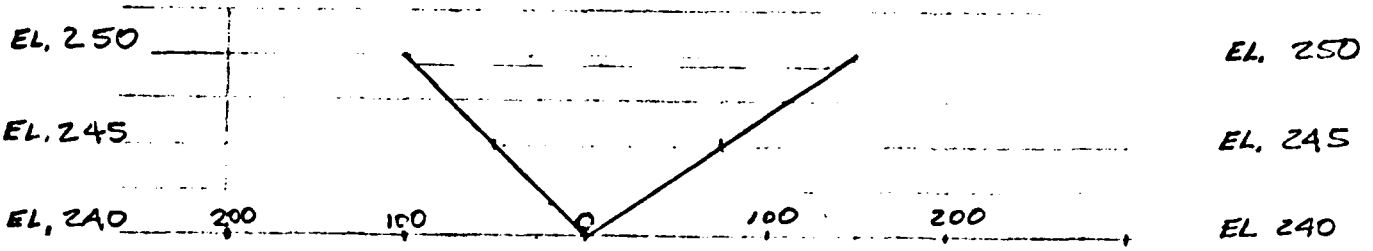
DOWNSTREAM W.S.EL. COMPUTATIONS

NAME OF DAM: NEW CANAAN RESERVOIR DAM

SECTION LOCATION: 12000 DOWNSTREAM OF DAM
JUST BEFORE RT. 123

USING: $Q = 1.486/n \, A \, R^{2/3} \, S^{1/2}$

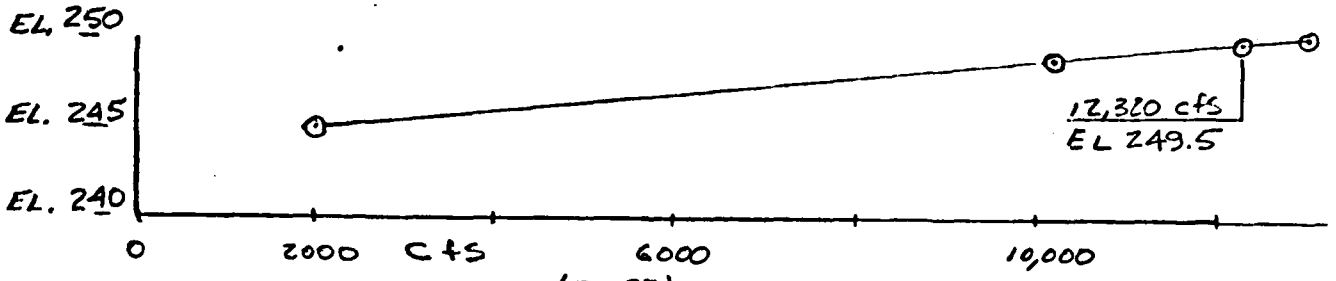
WHERE: n = 0.05 S = SLOPE = .014 ft/ft



CHANNEL SECTION

Q_{P_1} = 12,320 cfs STORAGE (S) 532

ELEV	AREA	WP	R	$R^{2/3}$	$S^{1/2}$	1.486/n	Q	DEPTH
245	313	125	2.50	1.84	.12	29.72	2046	5
250	1250	250	5.00	2.92	.12	29.72	13,039	10
						29.72		



$V_1 = \frac{7.5+9.5}{2} \times \left(\frac{370+235}{2} \text{(20.83)} \times 3000 \div 43560 \right) 1/2 = 88.5$ Ac-ft

Q_{P_2} (TRAIL) $= Q_{P_1}(1 - V/S) = 10,270$ cfs

$V_2 = \frac{7.5+9.0}{2} \times 20.83 \times 1/2 = 85.9$ $V_{AVE} = 87.2$ Ac-ft

$Q_{P_2} = Q_{P_1}(1 - V_{AVE}/S) = 10,300$ cfs

STAGE DISCHARGE = 10,300 cfs ELEV = 249.0 OR A D = 9.0

NEXT DOWNSTREAM SECTION 2500 ft.

PURCELL ASSOCIATES

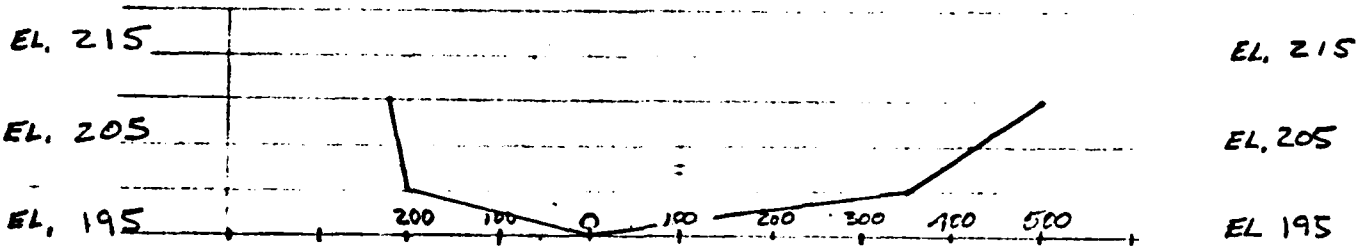
DOWNSTREAM W.S.EL. COMPUTATIONS

NAME OF DAM: NEW CANAAN RESERVOIR DAM

SECTION LOCATION: 14,500' DOWNSTREAM OF DAM @ MILL POND

USING: $Q = 1.486/n\ A\ R^{2/3}\ S^{1/2}$

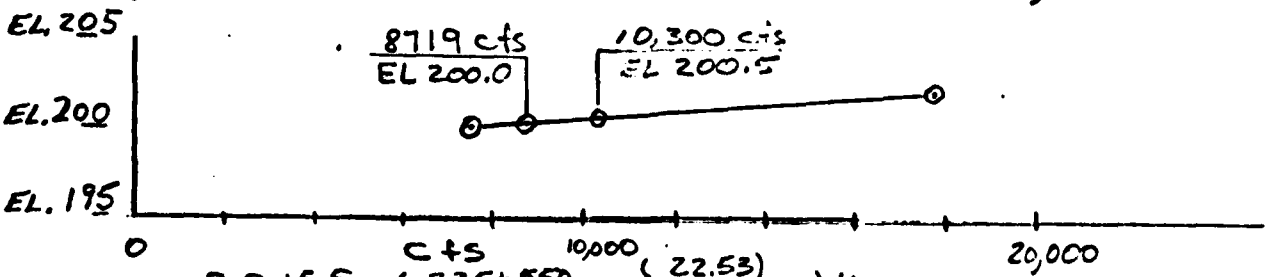
WHERE: n = 0.05 S = SLOPE = .008



CHANNEL SECTION

Q_{P_1} = 10,300 cfs STORAGE (S) 532

ELEV.	AREA	WP	R	$R^{2/3}$	$S^{1/2}$	$1.486/n$	Q cfs	DEPTH
200	1375	550	2.5	1.84	.09	29.72	6775	5
203	3115	595	5.24	3.02	.09	29.72	25,123	8
202	2515	585	4.3	2.64		29.72	17,787	7



$V_1 = 9.0 \frac{+5}{2} 5 \times \left(\frac{235+550}{2} \times 2500 \div 43{,}560 \right) (22.53) \times 1/2 = 81.7$ Ac. ft

Q_{P_2} (TRIAL) $= Q_{P_1}(1 - V_1/S) = 8719$ cfs

$V_2 = \frac{9.0+5.0}{2} \times 22.53 \times 1/2 = 78.9$ Ac-ft. $V_{AVE} = 80.3$ AC. FT

$Q_{P_2} = Q_{P_1}(1 - V_{AVE}/S) = 8745$ cfs

STAGE DISCHARGE = 8745 cfs ELEV = 200.0 OR A D = 5.0

NEXT DOWNSTREAM SECTION _____ ft.

PURCELL ASSOCIATES

RATING CURVE DEVELOPMENT

New Canaan Reservoir Dam

Spillway

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

$C = 3.33$

$L = 25.5$ feet

16 Inch Blowoff

$Q = c\ a\ (2gh)^{1/2}$

$c = .6$

$a = 1.4$ square feet

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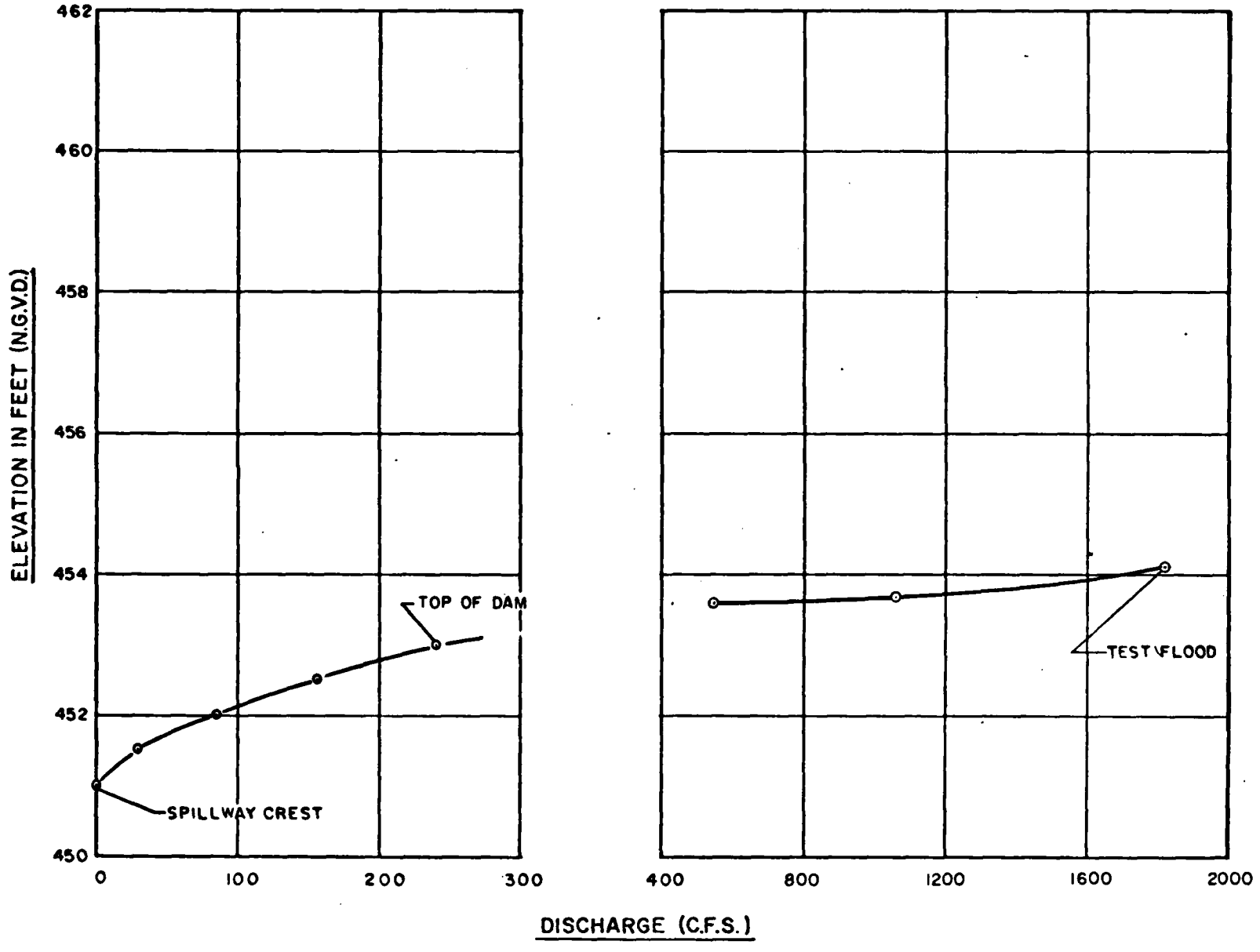
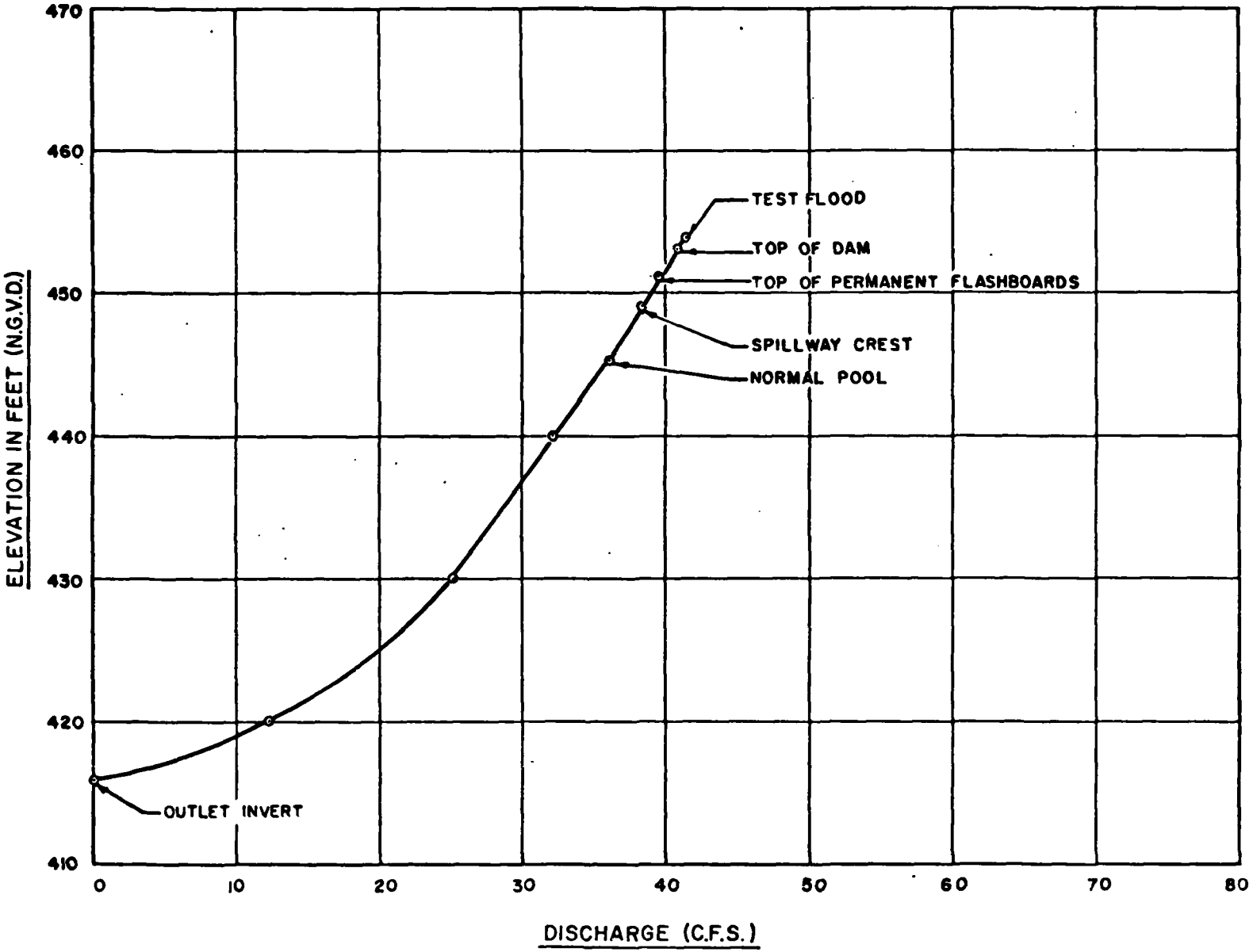
NEW CANAAN RESERVOIR DAM

SPILLWAY RATING CURVE





NEW CANAAN RESERVOIR DAM
16 INCH BLOWOFF
OUTLET WORKS RATING CURVE

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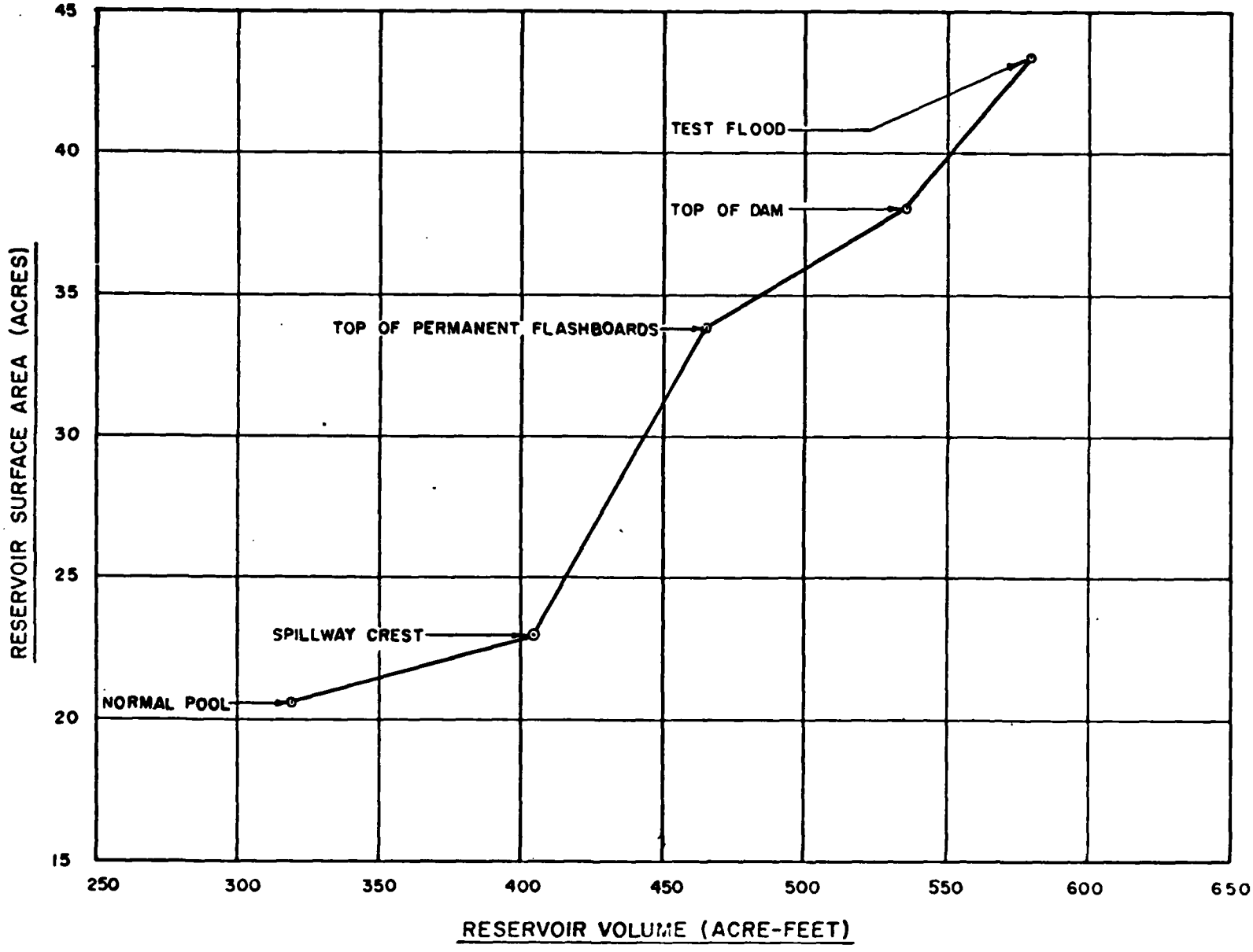

NEW CANAAN RESERVOIR DAM

RESERVOIR AREA-CAPACITY CURVE

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APPENDIX E

INFORMATION AS CONTAINED IN THE

NATIONAL INVENTORY OF DAMS

END

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