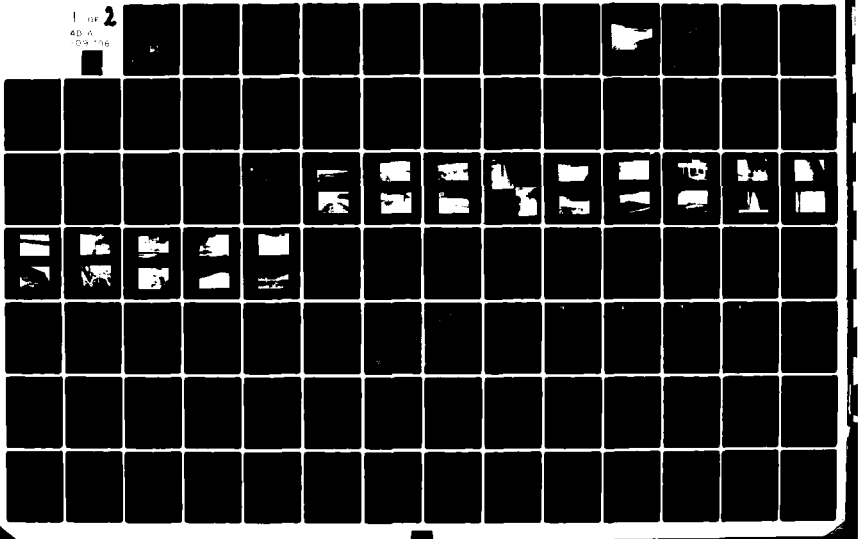
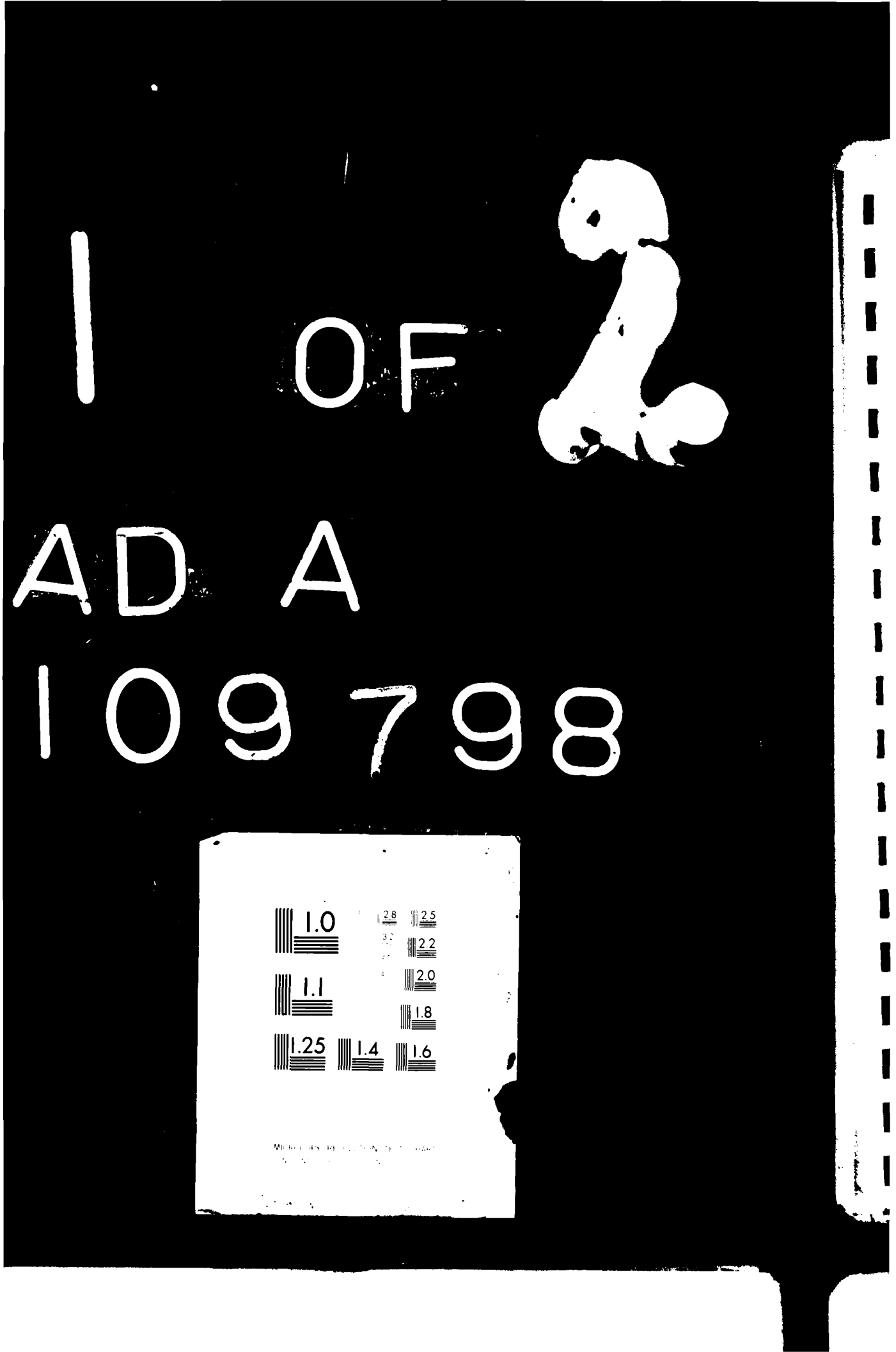
AD-A109 798 FLAHERTY-GIAVARA ASSOCIATES NEW HAVEN CT F/G 13/13
NATIONAL DAM SAFETY PROGRAM. WHETSTONE GULF STORAGE DAM (INVENT--ETC(U)
JUL 81 H C FLAHERTY DACW51-81-C-0006
UNCLASSIFIED NL




1 OF 2
AD A
109798
1.0
1.1
1.25
1.4
1.6
1.8
2.0
2.2
2.5
2.8

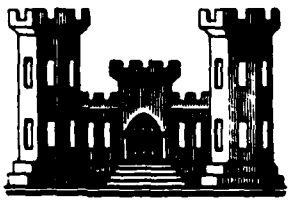
BLACK RIVER BASIN

LEVEL II

WHETSTONE GULF STORAGE DAM

LEWIS COUNTY, NEW YORK
INVENTORY No. N.Y. 544

PHASE I INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM



APPROVED FOR PUBLIC RELEASE;
DISTRIBUTION UNLIMITED

NEW YORK DISTRICT, CORPS OF ENGINEERS
JULY 1981

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

REPORT DOCUMENTATION PAGE — READ INSTRUCTIONS BEFORE COMPLETING FORM

1. REPORT NUMBER	2. GOVT ACCESSION NO. AD-A109 778
3. RECIPIENT'S CATALOG NUMBER	
4. TITLE (and Subtitle) Phase I Inspection Report Whetstone Gulf Storage Dam Black River Basin, Lewis County, N.Y. Inventory No. 544	5. TYPE OF REPORT & PERIOD COVERED Phase I Inspection Report National Dam Safety Program
	6. PERFORMING ORG. REPORT NUMBER
7. AUTHOR(s) HUGH C. FLAHERTY	8. CONTRACT OR GRANT NUMBER(s) DACW51-81-C-0006
9. PERFORMING ORGANIZATION NAME AND ADDRESS Flaherty-Giavara Associates One Columbus Plaza New Haven, CT 06510	10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS
11. CONTROLLING OFFICE NAME AND ADDRESS Department of the Army 26 Federal Plaza New York District, CofE New York, New York 10287	12. REPORT DATE
	13. NUMBER OF PAGES
14. MONITORING AGENCY NAME & ADDRESS (if different from Controlling Office) Department of the Army 26 Federal Plaza New York District, CofE New York, NY 10237	15. SECURITY CLASS. (of this report) UNCLASSIFIED
	15a. DECLASSIFICATION/DOWNGRADING SCHEDULE

16. DISTRIBUTION STATEMENT (of this Report)

Approved for public release; Distribution unlimited.

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

18. SUPPLEMENTARY NOTES

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

Dam Safety	Whetstone Gulf Storage Dame
National Dam Safety Program	Lewis County
Visual Inspection	Black River Basin
[illegible]ology, [illegible] [illegible]bility	

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

This report [illegible] information [illegible] analysis on the physical condition of the [illegible] [illegible] information and analysis are based on visual inspection [illegible] the performing organization.

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

DD FORM 1473 1 JAN 73 EDITION OF 1 NOV 65 IS OBSOLETE

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

Using the Corps of Engineers' screening criteria for the initial review of spillway adequacy, it has been determined that the embankment would be overtopped by all storms exceeding 71 percent of the Probable Maximum Flood (PMF). Consequently, the spillway cannot adequately discharge the peak outflow from the full PMF, however, it will pass one half the PMF. Therefore, the spillway is adjudged to be inadequate.

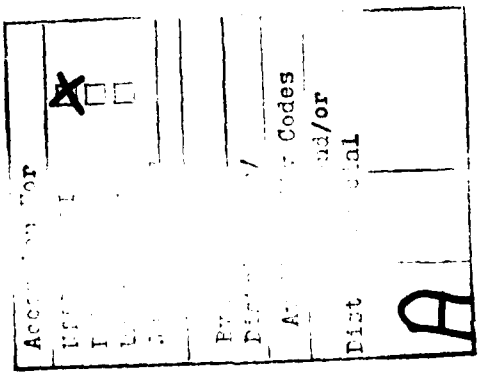
PREFACE

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

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

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

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



PHASE I INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM
WHETSTONE GULF STORAGE DAM
INVENTORY NO. NY 544
BLACK RIVER BASIN
LEWIS COUNTY, NEW YORK

TABLE OF CONTENTS

APPENDICES

PHASE I INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM

Name of Dam: Whetstone Gulf Storage Dam

State Located: New York

County: Lewis

Watershed: Black River Basin

Watercourse: Whetstone Creek

Date of Inspection: April 10, 1981

ASSESSMENT

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

Using the Corps of Engineers' screening criteria for the initial review of spillway adequacy, it has been determined that the embankment would be overtopped by all storms exceeding 71 percent of the Probable Maximum Flood (PMF). Consequently, the spillway cannot adequately discharge the peak outflow from the full PMF, however, it will pass one half the PMF. Therefore, the spillway is adjudged to be inadequate.

It is recommended that the following additional investigation be performed by a registered professional engineer engaged by the owner:

1. Investigate the wet, swampy areas at the downstream toe of slope of the right embankment, especially during dry summer months and when the reservoir operation level is high, to determine if they are still present, and if so, are they a result of seepage through the embankment. If seepage is occurring, the cause should be investigated and remedial actions undertaken, if necessary.

It is recommended that within 3 months of the final approval date of this report, the additional investigation should be initiated and within 18 months, appropriate remedial measures should be completed.

The following remedial measures should be completed within 12 months to correct existing deficiencies:

1. In order to provide sufficient freeboard along the entire length of dam, fill and regrade the depressed areas adjacent to both spillway abutments to their original level and cross section as shown on the plans in Appendix G. Strip all topsoil, and remove all brush and trees prior to filling these areas, and reseed or sod the areas after filling.

2. Clear the brush and trees from the embankments, including stump removal and backfilling, establish a vegetative cover, and cut the grass and weeds on the embankments at least annually.

3. Fill in any animal burrows on the embankment slopes.

4. Develop and implement a flood warning and emergency evacuation plan to alert downstream residents in the event conditions occur which could result in failure of the dam.

5. A program for regular maintenance should be developed and implemented.

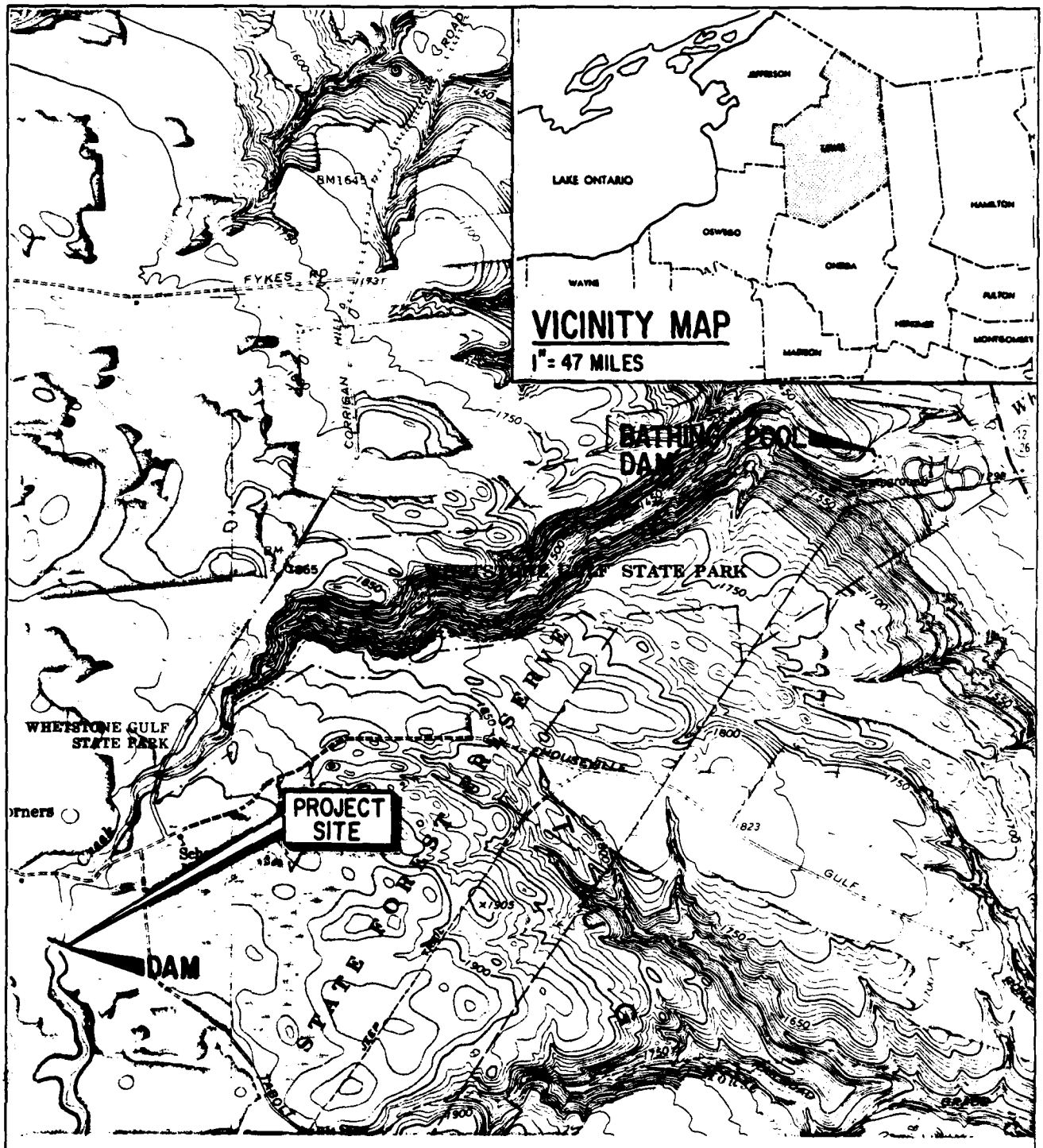
Submitted by: FLAHERTY GIAVARA ASSOCIATES, P.C.

Hugh C. Flaherty, P.E. & L.S.
Chairman of the Board
New York License No. 58508

Approved by: Richard E. Mayo LTC
for Col. W. M. Smith, Jr.
New York District Engineer

Date: 17 Sept 1981

PHOTO #1: Overview of
Whetstone Gulf Storage Dam
Inventory No. NY 544



LOCATION MAP

WHETSTONE GULF STORAGE DAM
INVENTORY No. NY 544

BLACK RIVER BASIN
LEWIS COUNTY
MARTINSBURG, NEW YORK

FLAHERTY · GIAVARA ASSOCIATES, P.C.

NATIONAL DAM SAFETY PROGRAM
PHASE I INSPECTION REPORT
WHETSTONE GULF STORAGE DAM
INVENTORY NO. NY 544
D.E.C. NO. 101B-2862
BLACK RIVER BASIN
LEWIS COUNTY, NEW YORK

SECTION 1 - PROJECT INFORMATION

1.1 GENERAL

a. Authority

The Phase I Inspection reported herein was authorized by the Department of the Army, New York District, Corps of Engineers, to fulfill the requirements of the National Dam Inspection Act, Public Law 92-367. Flaherty Giavara Associates, P.C. has been retained by the New York District to inspect and report on selected dams in the State of New York. Authorization and notice to proceed was issued to Flaherty Giavara Associates, P.C. under a letter of December 24, 1980 from W. M. Smith Jr., Colonel, Corps of Engineers. Contract No. DACW 51-81-C-0006 has been assigned by the Corps of Engineers for this work.

b. Purpose

Evaluation of the existing conditions of the subject dam to identify deficiencies and hazardous conditions, determine if they constitute hazards to life and property and recommend remedial measures where necessary.

1.2 DESCRIPTION OF PROJECT

a. Description of Dam and Appurtenances

The Whetstone Gulf Storage Dam consists of earthen embankments separated by a concrete overflow spillway located slightly to the left of the center of the dam. The overall length of the dam is 301 feet. Plans, profiles, and sections of the dam prepared in 1960 by the New York State Conservation Department, Division of Lands and Forests, Bureau of Camps and Trails, are included in Appendix G.

The earthen embankment is approximately 17 feet high adjacent to the spillway structure. The downstream slopes are approximately 1.5 horizontal to 1 vertical for the embankment left of the overflow spillway and 4 to 1 for the right embankment. The embankments are constructed of

compacted "mineral soil" as indicated by the Item Specifications in Appendix E. A concrete cutoff wall projects across the upstream slope of the embankment, the top of which is elevation 1899.0 (NGVD). It was designed to extend to a depth of at least 3 feet below the original ground surface. There is riprap on the upstream slope below the cutoff wall. The upstream slopes above the cutoff wall are grass and brush-covered, as are the downstream slopes. Toe drains were not constructed along the embankment.

The concrete overflow spillway is 60 feet wide and 12 feet high from the apron to the crest; the spillway crest is at elevation 1898.0 (NGVD) and the downstream apron is at elevation 1886.0 (NGVD). The spillway is equipped with a 3 foot square gated orifice at the streambed level. Underdrains were installed beneath the spillway apron and weep holes were incorporated into the downstream spillway abutments. The tops of the abutments are at elevation 1903.1 (NGVD), which is 5.1 feet above the weir crest level. The walls extend upstream to join with the cutoff wall, then angle out and away from the spillway to form retaining walls for the approach channel. In the downstream direction, the walls extend to the end of the spillway apron.

b. Location

The Whetstone Gulf Storage Dam is located off an unimproved road approximately 5.7 miles southwest of the village of Glenfield in the Town of Martinsburg, New York. The dam is located at latitude north 43°-41.0' and longitude west 75°-30.5' on the U.S. Geological Survey 7.5 minute series topographic map "Page, New York". The Location Map on page i indicates where the dam is situated.

c. Size Classification

The maximum height of the dam is 23 feet and the maximum storage capacity is 3742 acre-feet at the top of dam. Therefore, Whetstone Gulf Storage Dam is classified as an "Intermediate" dam as defined by the Recommended Guidelines for Safety Inspection of Dams.

d. Hazard Classification

There are ten roads (including New York State Routes 12 and 12D/26), approximately 2 dwellings, 4 buildings and the Whetstone Gulf State Park campground and bathing area (See Photo No. 28) within the dam failure flood hazard area. Therefore, the dam is in the "High" hazard category as defined by the Recommended Guidelines for Safety Inspection of Dams.

e. Ownership

The dam is owned by the State of New York and administered by the Thousand Islands Park Commission. The addresses and telephone numbers are as follows:

Owner

Contact: Mr. Roger Frary
Senior Park Engineer
Thousand Islands Regional Office
Keewaydin State Park
Alexandria Bay, New York 13607

Telephone: (315) 482-2593

Contact: Mr. Robert Berry
Park Foreman
Whetstone Gulf State Park
R.D. 2
Lowville, New York 13367

Telephone: (315) 376-6630

f. Purpose

The primary purposes of this dam are flood control and regulation of the water level of Whetstone Creek for recreational use.

g. Design and Construction History

The dam was designed in 1960 by the New York State Conservation Department, Division of Lands and Forests, Bureau of Camps and Trails. It was constructed in 1961 by the Law Brothers Contracting Corporation of Lyons Falls, New York. The only post construction modification noted was the grouting of cracks located in the downstream face of the overflow spillway and in the crest of the overflow spillway weir with epoxy cement in the fall of 1975.

h. Normal Operating Procedure

The only regular operating procedures in effect for this dam involve opening or closing the reservoir drain to regulate stream flow in Whetstone Creek. The normal water level in the lake is maintained by the crest elevation of the overflow spillway weir at 1898.0 (NGVD).

1.3 PERTINENT DATA

a. Drainage Area (Square Miles)	8.09
b. Discharge at Dam Site (CFS)	
- Top of Dam	2186
- Crest of Overflow Spillway	140
- Reservoir Drain Inlet	-
c. Elevations (NGVD)	
- Top of Dam	1903.1
- Crest of Overflow Spillway	1898.0
- Reservoir Drain Inlet	1886.0
d. Reservoir Surface Area (Acres)	
- Top of Dam	640
- Crest of Overflow Spillway	385
e. Storage (Acre-Feet)	
- Top of Dam	3742
- Crest of Overflow Spillway	1446
f. Dam	
- Type: Earthfill with a concrete core wall	
- Length (Feet)	301
- Upstream Slope (H:V)	1.5-2.0:1
- Downstream Slope (H:V)	1.5-4.0:1
- Crest Width (Feet)	10
g. Overflow Spillway	
- Type: Concrete weir with concrete wingwalls, abutments and apron	
- Length (Feet)	60
- Width (Feet)	49
- Side Slopes (H:V)	vertical
- Channel Bottom Slopes (Feet/Foot)	
upstream	-
downstream (apron)	level
- Control: None	
i. Reservoir Drain	
- Type: 36 inch high by 36 inch wide square opening in	

spillway (7 feet long)

- Control: 36 inch by 36 inch slide gate

SECTION 2 - ENGINEERING DATA

2.1 GEOTECHNICAL DATA

a. Geology

The Whetstone Gulf Storage Dam is located on Whetstone Creek, a northeasterly flowing tributary to the Black River, about 5.7 miles southwest of Glenfield in the Tug Hill Plateau physiographic province of New York State. The plateau has a summit elevation of approximately 2000 feet above mean sea level.

The caprock of the plateau is the Oswego Sandstone of the Late Ordovician age. The Oswego is approximately 100 feet thick and consists of greenish-gray, thin to thick-bedded, fine to medium-textured, cross-bedded sandstone, with interbedded seams of red, green, and gray shales.

The region was glaciated during the Pleistocene Epoch, the latest advance being the Wisconsin stage. As the glacier retreated, it deposited a heterogenous layer of clay, silt, sand, gravel, and rock debris known as glacial till over the bedrock surface.

b. Subsurface Conditions

The "Foreword" section of an undated, untitled report (containing Item Specifications) refers to test pits excavated at the site. It is not known if records of the test pit locations and logs were prepared; however, none were available for review. The above report states "Test pits revealed no evidence of bedrock at the dam site nor (were) there other evidences of bedrock in the vicinity of the dam site. Under 9 to 12 inches of top soil the soil is a fairly impervious mixture of clay and gravel."

Based on this description, the clay and gravel is believed to be glacial till. Therefore, it is assumed that the dam embankment and overflow spillway are bearing on glacial till and that the embankment portions of the dam were constructed of glacial till.

2.2 DESIGN RECORDS

This dam was designed in 1960 by the New York Conservation Department, Division of Lands and Forests, Bureau of Camps and Trails. Some hydrologic/hydraulic and structural design information is included in Appendix E. No other design records were obtained.

2.3 CONSTRUCTION RECORDS

This dam was constructed in 1961 by the Law Brothers Contracting Corporation of Lyons Falls, New York. The contract drawings and specifications which were prepared by the New York Conservation Department, Division of Lands and Forests, Bureau of Camps and Trails, are included in Appendix G. No other construction records were obtained.

2.4 OPERATION RECORDS

No operation records were obtained for this dam.

2.5 EVALUATION OF DATA

The data presented herein was obtained primarily from the files of the New York State Department of Environmental Conservation (DEC). This information appears to be reliable and adequate for the purposes of a Phase I Inspection Report.

SECTION 3 - VISUAL INSPECTION

3.1 FINDINGS

a. General

A visual inspection of the Whetstone Gulf Storage Dam was conducted on April 10, 1981. The weather was sunny and the temperature was 60±°F. At the time of the inspection, water was flowing in the overflow spillway (See Photos No. 5, 7 and 10) and also in the reservoir drain (See Photo No. 15).

b. Dam

The dam has an embankment section on each side of the overflow spillway (See Photos No. 3 and 4) with a concrete core wall within each section (See Photos No. 22 and 23); these embankments are generally in good condition. There is no visible evidence of lateral movement, major erosion, or other serious defects.

The following specific items were noted:

1. The embankment crest sloped downward for a distance of 25 to 30 feet along the left embankment toward the spillway abutment to a point 2.5 feet below and immediately adjacent to the left spillway abutment (See Photo No. 3). Adjacent to the right spillway abutment, the crest sloped downward over a length of 10 to 12 feet to a point 1.6 feet below the right spillway abutment. Beyond these sloping areas, the crest appeared to be at approximately the same elevation as the top of the spillway abutments.

2. Minor surface erosion has occurred, particularly in footpaths on the embankment crest and on the upstream and downstream slopes adjacent to the spillway abutments.

3. Considerable portions of the crest, the downstream slope and the upstream slope above the cutoff wall were covered with brush and small trees (See Photos No. 3, 4 and 22).

4. Several wet, spongy areas were observed along the toe of the downstream embankment between the overflow spillway and right abutment (See Photo No. 25). No flow or seepage was detected. It is probable that these wet areas were due to frost or snow melt or to runoff from the right abutment area.

5. Several animal burrows were observed on the right embankment, some near the downstream toe of slope and others on the upstream slope near the crest.

c. Overflow Spillway

The overflow spillway consists of a 60 foot long broad-crested concrete weir with wingwalls, abutments and an apron, all of which are in good condition (See Photos No. 6, 7, 8, 10 and 12). Sealed cracks were observed in the crest and the downstream face of the overflow spillway (See Photos No. 18 and 19). Reportedly, these cracks were repaired with epoxy cement in the fall of 1975. The concrete wingwalls flare out at 45° to the abutments to form the approach to the overflow spillway. A one quarter inch crack has developed at the junction of the right upsteam abutment and core wall (See Photo No. 21). Each concrete abutment has four 3 inch diameter weep holes located downstream of the spillway face (See Photo No. 16). The weep holes for the left downstream abutment had a very minor flow (See Photo No. 17). The 60 foot wide concrete apron extends 35.5 feet downstream from the face of the spillway and has two 12 inch high by 12 inch wide longitudinal sills, one of which has a few cracks (See Photo No. 20). In addition, minor undermining of the downstream end of the apron at the right abutment has occurred (See Photo No. 24).

d. Reservoir Drain

The reservoir drain is a 36 inch high by 36 inch wide square opening in the concrete spillway (See Photo No. 15) which is controlled by a 36 inch slide gate and handwheel (See Photo No. 14) which was partially open at the time of inspection (See Photo No. 15).

e. Downstream Channel

The natural channel downstream of the dam has a width of 20± feet and a depth of 8 inches (See Photo No. 26). The channel bed is gravel with grassed and wooded side slopes and appeared to be stable at the time of inspection.

Approximately one half mile downstream of the dam, the creek flows through a steep ravine called Whetstone Gulf (See Photo No. 27) for a distance of 2± miles before it reaches the Whetstone Gulf State Park campground and bathing area (See Photo No. 28).

f. Reservoir - Storage Pool Area

The reservoir is bordered by relatively flat woodlands (See Photo No. 2). There is no significant possibility

of landslides into the reservoir affecting the safety of the dam.

3.2 EVALUATION OF OBSERVATIONS

The visual inspection revealed some deficiencies on this structure. The following observations were made:

a. The embankment crest sloped downward toward the spillway abutments on either side of the spillway.

b. Minor surface erosion was noted on the embankment crest and slopes.

c. Considerable portions of the embankment were covered by brush and small trees.

d. Several wet, spongy areas were observed along the toe of the right downstream embankment slope.

e. Minor undermining of the downstream end of the spillway apron was evident at the right spillway abutment.

f. Cracks were noted at the junction of the right upstream spillway abutment and core wall and in the right longitudinal sill of the spillway apron.

SECTION 4 - OPERATION AND MAINTENANCE PROCEDURES

4.1 PROCEDURES

The normal water surface level is maintained by the crest of the overflow spillway weir at elevation 1898.0 (NGVD). The only operational procedure in effect at this time is the opening or closing of the reservoir drain to regulate stream flow in Whetstone Creek.

4.2 MAINTENANCE OF DAM

There was no evidence of any routine maintenance operations at the Whetstone Gulf Storage Dam; however, cracks in the crest and downstream face of the overflow spillway were grouted with epoxy cement in the fall of 1975. In addition, spalling and erosion of the lower portion of the right concrete spillway abutment near the outlet to the reservoir drain is scheduled for repair in the autumn of 1981 by the Thousand Island Parks Commission.

4.3 WARNING SYSTEM

No warning system is presently in effect.

4.4 EVALUATION

Presently, few maintenance procedures are in effect for this dam. Therefore, a program for regular maintenance should be developed and implemented.

SECTION 5 - HYDROLOGIC/HYDRAULIC

5.1 DRAINAGE AREA CHARACTERISTICS

The dam is located in the Town of Martinsburg on Whetstone Creek, approximately 17,200 feet upstream of the campground at Whetstone Gulf State Park. Whetstone Creek joins the Black River near the village of Glenfield, approximately fifty-four miles upstream of Lake Ontario near Watertown, New York.

The watershed (shown on the Watershed Map on Page C-5 in Appendix C) consists of 5,180 acres (8.09 square miles) located on a high plateau with typical slopes of less than five percent. Land within the watershed is primarily undeveloped with extensive woodlands and some open fields. A large wetland (370± acres) is located one mile upstream from the dam; however, no waterbodies are situated within the watershed.

The watercourse upon which the reservoir is located, is a perennial stream with a typical flow width of 20 feet and a typical flow depth of 12 inches.

5.2 ANALYSIS CRITERIA

The purpose of the hydrologic/hydraulic analysis is to evaluate the spillway capacity and the potential for overtopping. The analysis of the spillway capacity of the dam and storage of the reservoir was performed using the Corps of Engineers' HEC-1 Computer Model - Dam Safety Version. The procedure included determining the Probable Maximum Flood (PMF) runoff from the watershed and routing the inflow hydrograph through the impoundment to determine the outflow hydrograph. The unit hydrograph was defined by the Snyder Synthetic Unit Hydrograph method, and the Modified Puls routing procedure was incorporated.

The initial rainfall loss was assumed to be 1.0 inches, and the uniform rainfall loss was assumed to be 0.1 inches per hour. In accordance with recommended guidelines of the Corps of Engineers, the Probable Maximum Precipitation (PMP) was 18.6 inches (24 hour duration, 200 square mile area).

The analysis was conducted for both the full PMF and for several fractional PMF conditions. The PMF inflow of 9,813 CFS was routed through the reservoir and the peak outflow was determined to be 4,876 CFS.

5.3 SPILLWAY CAPACITY

The total outlet capacity is the discharge from the overflow spillway.

The overflow spillway consists of a 60 foot long broad-crested reinforced concrete weir and a reinforced concrete discharge apron with one foot high by one foot wide longitudinal sills.

The stage discharge data for the spillway capacity was calculated for the stages tabulated below:

Stage (Feet)	Discharge Capacity (CFS)	Element of Structure
1898.0	0	Overflow Spillway Crest
1899.0	180	--
1900.0	509	--
1900.6	755	Low Embankment Reach
1901.0	939	--
1901.8	1350	--
1902.0	1463	--
1902.3	1642	--
1902.7	1903	--
1903.0	2114	--
1903.1	2186	Top of Dam

The total spillway capacity at the top of dam is 2186 CFS.

5.4 RESERVOIR CAPACITY

The storage capacity of the impoundment was obtained from the "Capacity Curve" on sheet 2 of 5 of the contract drawings in Appendix G for the stages indicated below:

Stage (Feet)	Storage (Acre-Feet)	Storage (Inches of Runoff)
1898.0	1446	3.35
1903.1	3742	8.67

5.5 FLOODS OF RECORD

No data regarding flood levels was obtained for this dam; however, in the spring of 1972, heavy rains caused high discharge flows over the spillway (See Photos No. 9 and 11) and flooding downstream (See Photos No. 13 and 29).

5.6 OVERTOPPING POTENTIAL

The results of the HEC-1 DB computer analysis indicate that the crest of the dam is overtopped by all storms exceeding 71 percent of the PMF event. The PMF discharge rate of 4,876 cubic feet per second (CFS) would occur at a peak flood stage of 1904.8 feet, which is 1.7 feet above the crest of the dam.

The results of the analysis are tabulated below:

Flood Condition	Peak Inflow (CFS)	Peak Outflow (CFS)	Maximum Stage Elevation (NGVD)
0.5 PMF	4907	1110	1901.3
1.0 PMF	9813	4876	1904.8

5.7 EVALUATION

Using the Corps of Engineers' screening criteria for the initial review of spillway adequacy, it has been determined that the capacity of the overflow spillway is not adequate to pass the full PMF, but it will pass one half the PMF; approximately 71 percent of the PMF can be safely passed before overtopping will occur. The PMF event would overtop the dam for a duration of 11 hours and the maximum depth of flow over the crest would be 1.7 feet. Therefore, the spillway is adjudged to be inadequate.

SECTION 6 - STRUCTURAL STABILITY

6.1 EVALUATION OF STRUCTURAL STABILITY

a. Visual Observations

There was no visible evidence of major erosion, lateral movement, structural deterioration or other signs of overall structural instability of the dam during the site examination. The embankment crest was found to be irregular, sloping downward to the overflow spillway structure; however, there was no evidence that this irregular level is the result of foundation or embankment settlement. Therefore, based on the conditions that were observed, there is no reason to question the static structural stability of the dam.

b. Design and Construction Data

There is no construction data to confirm the actual physical properties and configuration of the earthfill in the embankments. However, the dam proportions are considered to be reasonable for the soils that were available at the site and therefore, the dam would be expected to have adequate safety margins with respect to stability under static loading conditions.

c. Operating Records

No operating records were obtained for Whetstone Gulf Storage Dam.

d. Post Construction Changes

Contract drawings for the Whetstone Gulf Storage Dam in Appendix G show a configuration and cross section for the dam embankment consisting of an 8 foot wide crest, 3 horizontal to 1 vertical upstream slopes above the cutoff wall and approximately 5 to 3 slopes for the riprap slope below and downstream slopes are shown to be 2 to 1. The actual constructed section has a wider crest and the downstream slope of the left embankment and both upstream slopes are steeper than shown on the contract drawings.

6.2 STRUCTURAL STABILITY ANALYSIS

Design drawings available for review show a plan, upstream and downstream elevation, and typical cross sections through the spillway, abutment and wingwall sections. Some previously performed stability computations (1960) are included on pages E-3 through E-7 in Appendix E; however, it is not certain that these analyses refer to the as-built conditions in the actual location of the dam. As part of the present

study, stability evaluations have been performed for the overflow spillway and the spillway abutments. Where information concerning the foundation materials or properties of the dam was not available, reasonable assumptions were made. The stability computations assumed a structural cross section based on dimensions indicated by the plans included in Appendix G of this report.

The stability analysis is presented in Appendix D. The results of the stability computations are summarized in the following table:

Loading Condition (Spillway Section)	[1]Factors of Safety: Overturning	[2]Sliding	[3]Location of Resultant Passing Through Base
1. Normal operating condition: water level 1 foot above spillway crest	2.74	2.49	0.36b
2. Maximum operating condition: water level at top of dam (5.1 feet above spillway crest)	2.62	2.14	0.39b
3. Full PMF condition: water level at El. 1904.8 (6.8 feet above spillway crest)	2.48	1.99	0.37b
4. Ice loading condition: 5.0 Kips per foot acting at top of spillway	1.44	1.50	0.17b
5. Seismic loading condition: water level at 1 foot above spillway crest plus seismic effects applicable to Zone 3	2.08	1.93	0.31b

[1]These factors of safety indicate the ratio of moments resisting overturning to those moments causing overturning, and the ratio of forces resisting sliding to those causing sliding.

[2]As determined applying the friction-shear method

[3]Indicated in terms of the base dimension of the dam (b), measured from the toe of the dam

Note: All loading conditions include an uplift force equal to 2/3 the height of the overflow spillway multiplied by the hydrostatic pressure acting upon it which was applied in conjunction with all overturning forces.

The analysis indicates that both the overflow spillway section and the abutment/wingwall sections are stable against overturning and sliding effects under normal operating conditions, maximum operating conditions and full PMF conditions. However, less than desirable overturning and sliding factors of safety result under ice loading conditions, but the continuous shear keys along the bottom and sides of the spillway combined with the spillway slope should add sufficient additional stability to offset the theoretical ice loading. Further stabilizing the spillway section are dowels extending from the abutment toe section.

The Whetstone Gulf Storage Dam is located in Seismic one 2, near the boundary with Zone 3 and in accordance with Phase I guidelines, the seismic stability analysis was performed for the overflow spillway assuming a seismic coefficient of 0.1 for normal conditions with the water level one foot above the spillway crest. As a result of this analysis, less than desirable safety factors for overturning and sliding were determined for these seismic loading conditions.

The discussed analyses apply to a dam in structurally good condition. The field observations indicate some surface cracks (which have been repaired) but no major structural faults which would significantly alter the stability or soundness of the structure.

SECTION 7 - ASSESSMENT/RECOMMENDATIONS

7.1 ASSESSMENT

a. Condition

On the basis of the visual examination, there were no signs of impending structural failure or other conditions which would warrant urgent remedial action; however, there is a concern relative to first, the portions of the embankment crest which slope downward toward the overflow spillway structure and second, the wet areas at the downstream toe of the right embankment.

b. Adequacy of Information

The evaluation of this dam is based primarily on visual examination, reference to the 1960 contract drawings, approximate hydraulic and hydrologic computations, and application of engineering judgement. The available information that was obtained is adequate for the purposes of a Phase I assessment.

c. Need for Additional Investigations

It is recommended that the following additional investigation be performed by a registered professional engineer engaged by the owner:

1. Investigate the wet, swampy areas at the downstream toe of slope of the right embankment, especially during dry summer months and when the reservoir operation level is high, to determine if they are still present, and if so, are they a result of seepage through the embankment. If seepage is occurring, the cause should be investigated and remedial actions undertaken, if necessary.

d. Urgency

It is recommended that within 3 months of the final approval date of this report, the additional investigation described in Section 7.1c should be initiated and within 18 months, appropriate remedial measures should be completed. The recommended corrective measures presented in Section 7.2 should be completed within 12 months of final approval.

7.2 RECOMMENDED MEASURES

It is considered important that the following items be accomplished in addition to any items required as a result of the additional investigations recommended in Section 7.1c:

a. In order to provide sufficient freeboard along the entire length of dam, fill and regrade the depressed areas adjacent to both spillway abutments to their original level and cross section, as shown on the plans in Appendix G. Strip all topsoil, and remove all brush and trees prior to filling these areas, and reseed or sow the areas after filling.

b. Clear the brush and trees from the embankments, including stump removal and backfilling, establish a vegetative cover, and cut the grass and weeds on the embankments at least annually.

c. Fill in any animal burrows on the embankment slopes.

d. Develop and implement a flood warning and emergency evacuation plan to alert downstream residents in the event conditions occur which could result in the failure of the dam.

e. A program for regular maintenance should be developed and implemented.

APPENDIX A

PHOTOGRAPHS

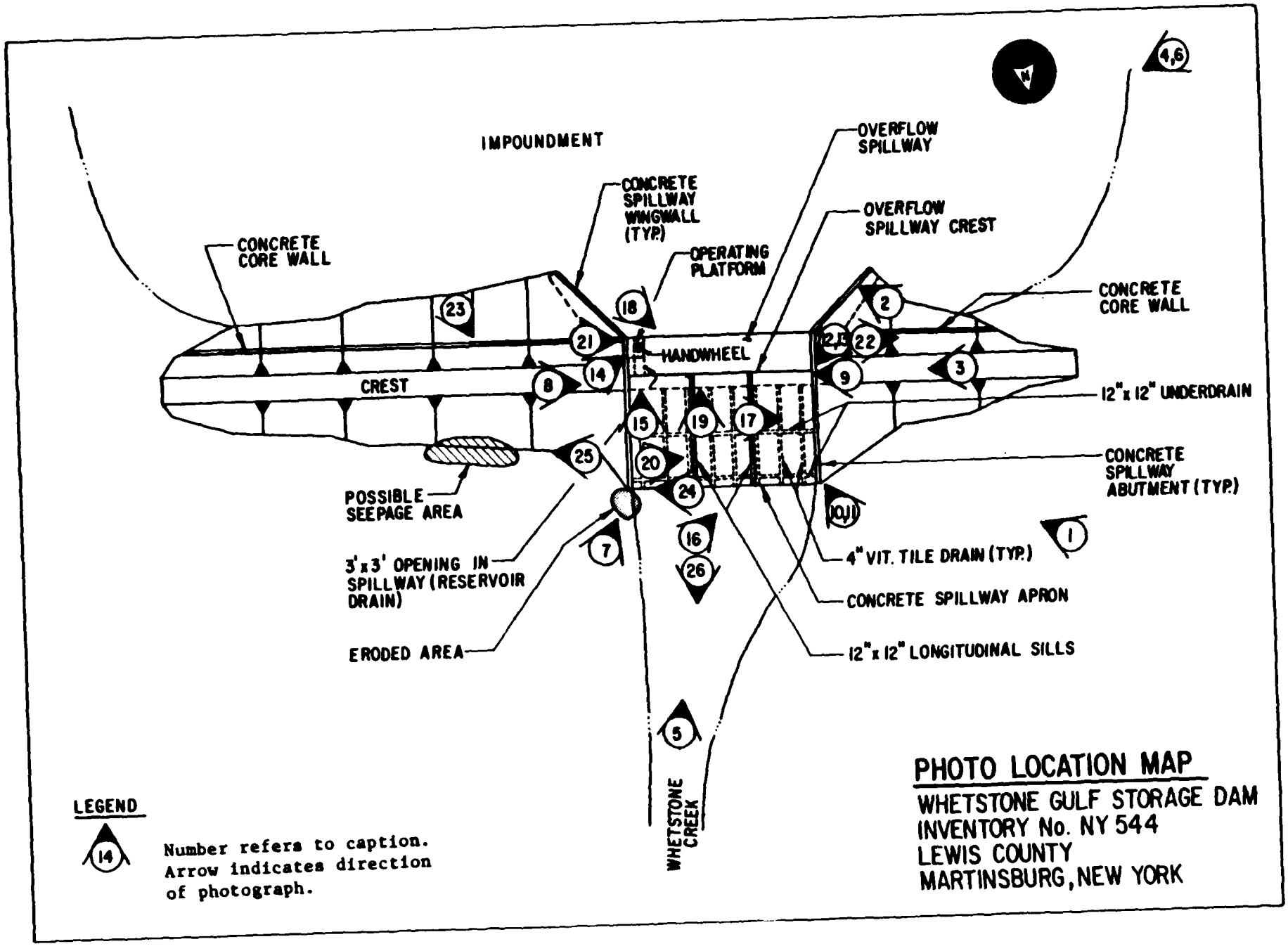

IMPOUNDMENT
OVERFLOW SPILLWAY
CONCRETE SPILLWAY WINGWALL (TYP.)
OVERFLOW SPILLWAY CREST
OPERATING PLATFORM
CONCRETE CORE WALL
CONCRETE CORE WALL
HANDWHEEL
CREST
12"x 12" UNDERDRAIN
CONCRETE SPILLWAY ABUTMENT (TYP.)
POSSIBLE SEEPAGE AREA
4" VIT. TILE DRAIN (TYP.)
3'x3' OPENING IN SPILLWAY (RESERVOIR DRAIN)
CONCRETE SPILLWAY APRON
ERODED AREA
12"x 12" LONGITUDINAL SILLS
WHETSTONE CREEK
LEGEND
Number refers to caption.
Arrow indicates direction of photograph.
PHOTO LOCATION MAP
WHETSTONE GULF STORAGE DAM
INVENTORY No. NY 544
LEWIS COUNTY
MARTINSBURG, NEW YORK

PHOTO #2: Overview of impoundment

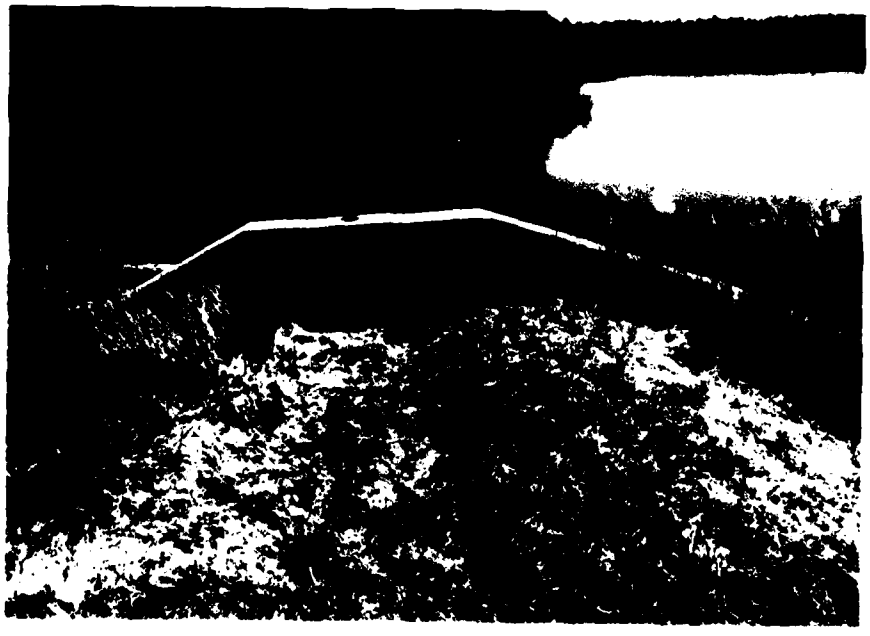


PHOTO #3: Crest of dam looking toward right abutment

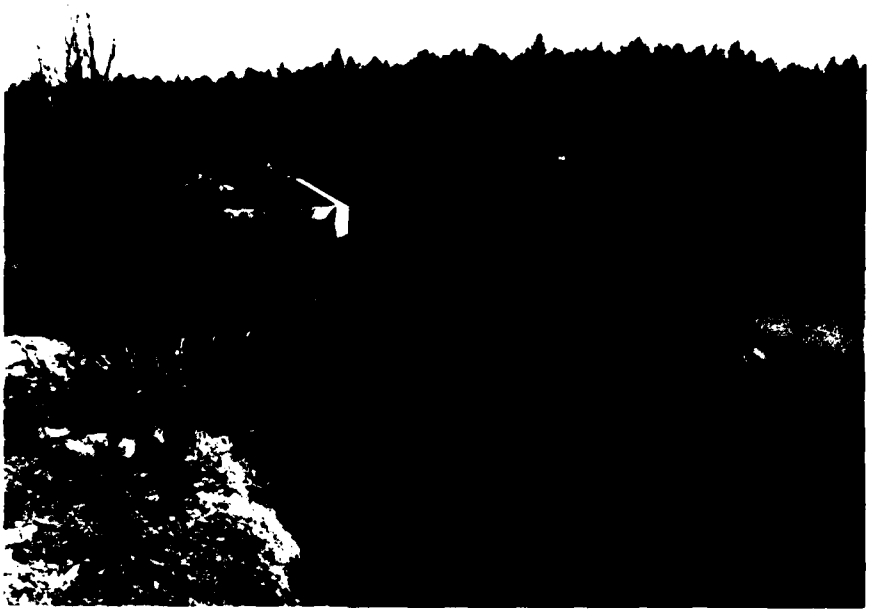


PHOTO #4: Overview of upstream face of dam

PHOTO #5: Overview of downstream face of dam

PHOTO #6: Upstream face of dam

PHOTO #7: Downstream face of dam

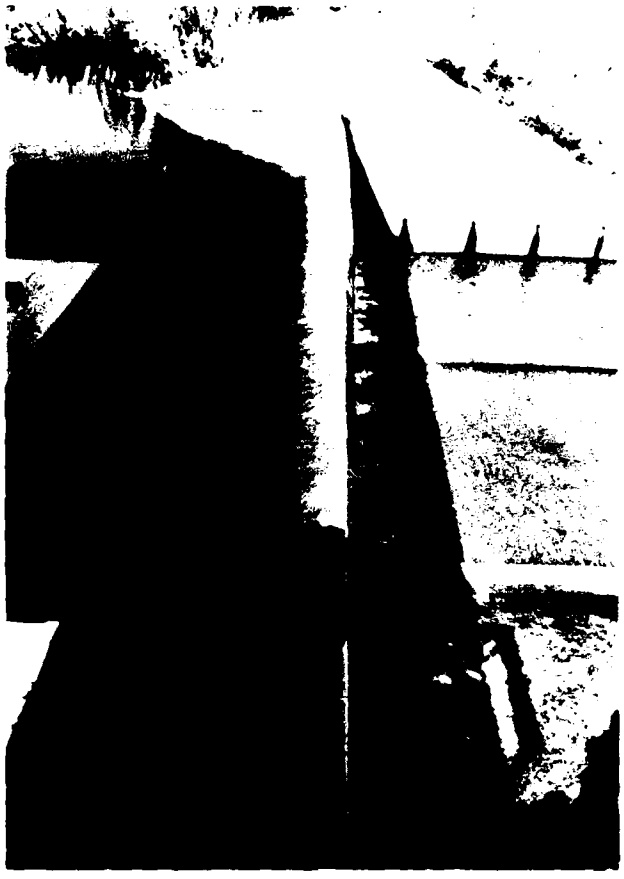


PHOTO #8: Crest of spillway looking toward left abutment

PHOTO #9: Crest of spillway looking toward right abutment during flood in spring, 1972

PHOTO #10: Spillway from left downstream spillway abutment

PHOTO #11: Spillway from left downstream spillway abutment during flood in spring, 1972

PHOTO #12: Spillway apron and downstream channel conditions from spillway

PHOTO #13: Downstream channel conditions from spillway during flood in spring, 1972

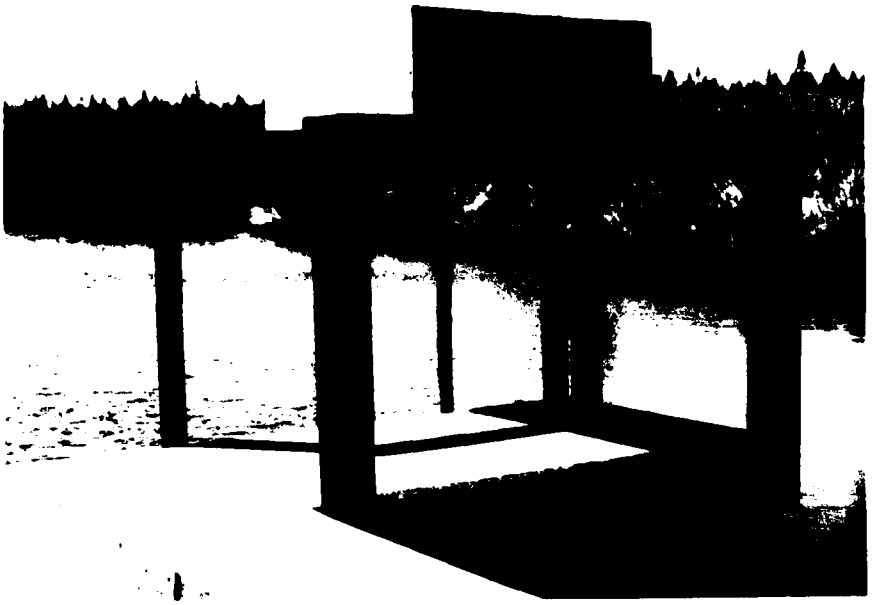


PHOTO #14: Hand wheel (under wooden housing) and operating platform for 36 inch high by 36 inch wide reservoir drain

PHOTO #15: Reservoir drain outlet at downstream face of spillway

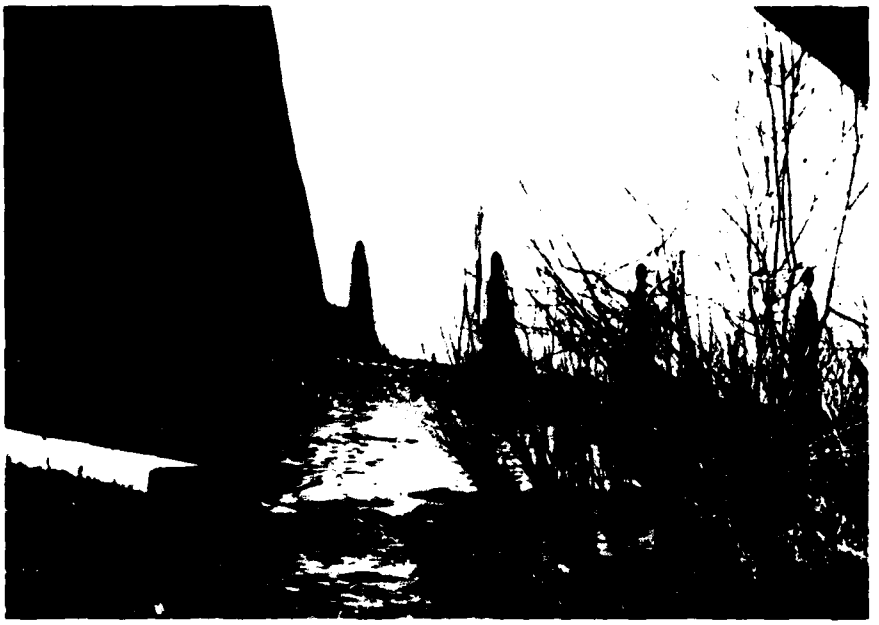


PHOTO #16: 3 inch diameter weep holes in left downstream spillway abutment

PHOTO #17: Close-up of 3 inch diameter weep hole (flowing)

PHOTO #18: Grouted crack in crest of spillway weir

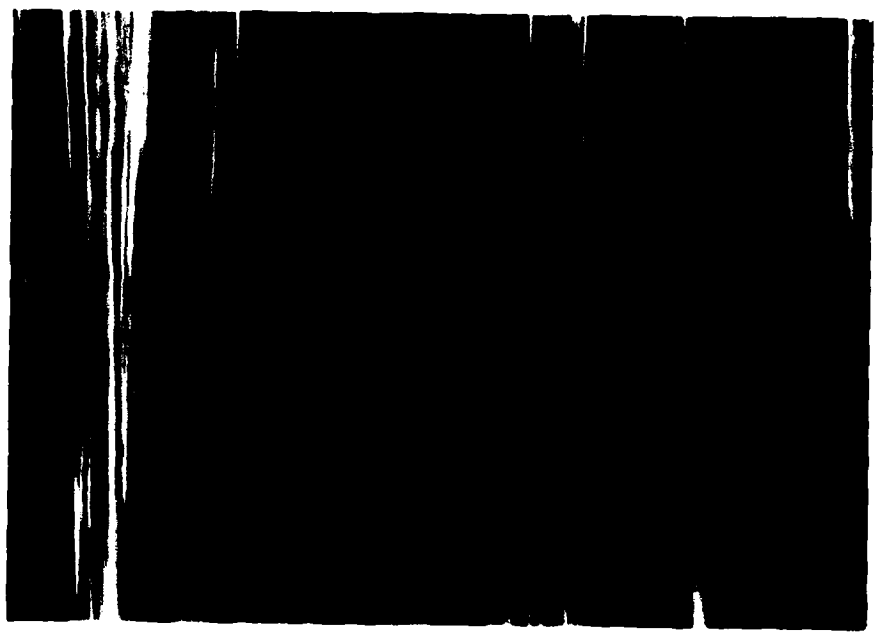


PHOTO #19: Grouted crack in downstream face of spillway

PHOTO #20: Cracks in 12 inch high by 12 inch wide longitudinal sill

PHOTO #21: Crack at intersection of right upstream spillway abutment and core wall

PHOTO #22: Core wall in embankment section left of spillway

PHOTO #23: Core wall in embankment section right of spillway

PHOTO #24: Erosion at end of right downstream spillway abutment

PHOTO #25: Seepage at downstream toe of slope right of spillway

PHOTO #26: Downstream channel conditions

PHOTO #27: Aerial view of Whetstone Gulf (downstream of dam)

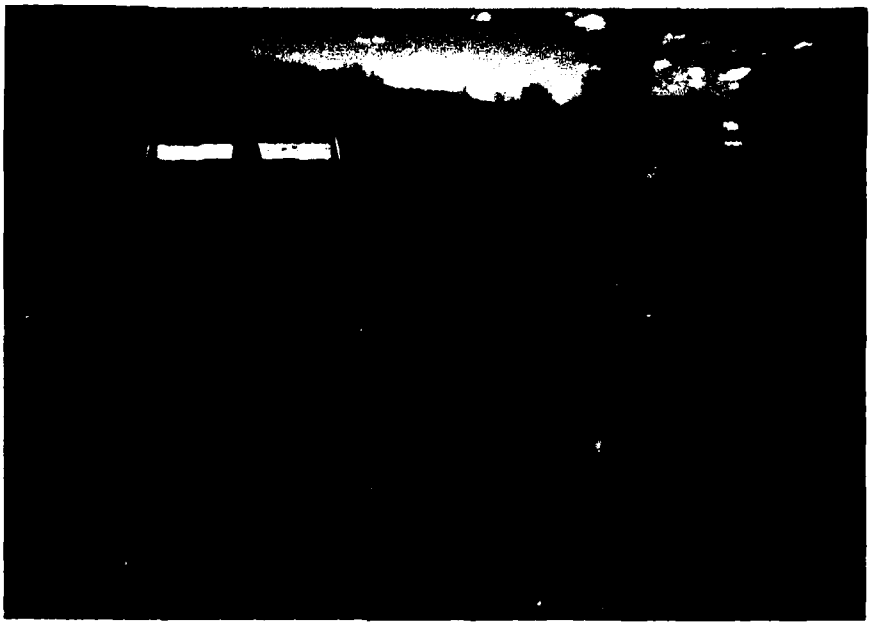


PHOTO #28: Bathing Pool Dam and appurtenant structures at Whetstone Gulf State Park (downstream of dam)

PHOTO #29: Bathing Pool Dam and appurtenant structures at Whetstone Gulf State Park (downstream of dam) during flood of spring, 1972

APPENDIX B

VISUAL INSPECTION CHECKLIST

VISUAL INSPECTION CHECKLIST

1) **Basic Data**

a. **General**

Name of Dam Whetstone Gulf Storage Dam

Fed. I.D. # NY 544 **DEC Dam No.** 101B-2862

River Basin Black

Location: Town Martinsburg **County** Lewis

Stream Name Whetstone Creek

Tributary of Black River

Latitude (N) 43°-41.0' **Longitude (W)** 75°-30.5'

Type of Dam Earthfill embankment with a concrete overflow spillway

Hazard Category High

Date(s) of Inspection April 10, 1981

Weather Conditions Sunny, 60° ± F.

Reservoir Level at Time of Inspection Elevation 1898.1 ± (NGVD)

b. **Inspection Personnel** T. L. Ward & R. A. Criscuolo of Flaherty Giavara Associates, P. C.; J. J. Rixner & C. W. Eller of Haley & Aldrich, Inc.; B. McL. Whittingham of Salmon Associates

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

Mr. Roger Frary, Senior Park Engineer	Mr. Robert Berry, Park Foreman
Thousand Islands Regional Office	Whetstone Gulf State Park
Keewaydin State Park Alexandria Bay, New York 13607	R. D. 2 Lowville, New York 13367
(315) 482-2593	(315) 376-6630

d. **History:**

Date Constructed 1961 **Date(s) Reconstructed** Never

Designer New York State Conservation Department, Division of Lands and Forests, Bureau of Camps and Trails

Constructed By Law Brothers Contracting Corporation

Owner State of New York (Thousand Islands Park Commission)

2) **Embankment**

a. **Characteristics**

(1) **Embankment Material** Glacial Till

(2) **Cutoff Type** Core wall to 3 feet below original ground

(3) **Impervious Core** Concrete core wall with a top elevation of 1899.0(NGVD)

(4) **Internal Drainage System** None observed

(5) **Miscellaneous** No comments

b. **Crest**

(1) **Vertical Alignment** Fair; surface generally irregular; crest slopes downward to a point 2.5 feet below the left spillway abutment and 1.6 feet below the right spillway abutment

(2) **Horizontal Alignment** Good; substantially straight

(3) **Surface Cracks** None observed

(4) **Miscellaneous** Minor surface erosion along footpath; grass-covered; shrubs along edges

c. **Upstream Slope**

(1) **Slope (Estimate - V:H)** 1:1.5-2.0

(2) **Undesirable Growth or Debris, Animal Burrows** Brush, shrubs and several small trees behind concrete core wall; no animal burrows were noted

(3) **Sloughing, Subsidence or Depressions** Minor surface erosion noted along spillway abutments

(4) Slope Protection Blocky stone riprap observed upstream of concrete core wall

(5) Surface Cracks or Movement at Toe None evident

d. Downstream Slope

(1) Slope (Estimate - V:H) 1:1.5 -4.0

(2) Undesirable Growth or Debris, Animal Burrows Brush, shrubs and numerous small trees; no animal burrows were noted

(3) Sloughing, Subsidence or Depressions Minor surface erosion along spillway abutments

(4) Surface Cracks or Movement at Toe None observed

(5) Seepage Wet area observed to the right of overflow spillway at downstream toe of slope; may be due to frost or snow melt

(6) External Drainage System (Ditches, Trenches, Blanket) None apparent

(7) Condition Around Outlet Structure Good; except for minor undermining of the downstream end of the concrete spillway apron at the right spillway abutment

(8) Seepage Beyond Toe None evident

e. Abutments - Embankment Contact

Left: Good condition

Right: Good condition

(1) **Erosion at Contact** None apparent

(2) **Seepage Along Contact** None evident

3) **Drainage System**

a. **Description of System** Broad-crested concrete weir and concrete apron

b. **Condition of System** Good; except for very minor surface cracks in concrete of spillway abutment and longitudinal sills of spillway apron

c. **Discharge from Drainage System** Concrete apron with longitudinal sills leading to natural discharge channel

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

None observed

5) **Reservoir**

a. **Slopes** Relatively flat woodlands on plateau

b. **Sedimentation** None observed

c. **Unusual Conditions Which Affect Dam** None noted

6) **Area Downstream of Dam**

a. **Downstream Hazard (No. of Homes, Highways, etc.)** Approximately 2 dwellings, 4 buildings, the Whetstone Gulf State Park campground and bathing area and ten roads(including New York State Routes 12 and 12D/26) are within the dam failure flood hazard area

b. **Seepage, Unusual Growth** None observed

c. **Evidence of Movement Beyond Toe of Dam** None evident

d. **Condition of Downstream Channel** Good; streambed is gravel and channel has grassed and wooded side slopes.

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

Overflow spillway and spillway apron

a. **General** Overflow spillway handles all major flows; reservoir drain (3 foot high by 3 foot wide opening in spillway) handles normal flows

b. **Condition of Overflow Spillway** Good; cracks in spillway crest and downstream spillway face have been grouted with epoxy cement

c. Condition of Emergency Spillway Not applicable

d. Condition of Spillway Apron Good; except for very minor undermining of the downstream end at the right spillway abutment and cracks in the longitudinal sills

8) Reservoir Drain/Outlet

Type: Pipe _____ Conduit _____ Other Square opening in spillway

Material: Concrete reinforced Metal _____ Other _____

Size: 36 inches high by 36 inches wide Length 7 feet

Invert Elevations: Entrance 1886.0 (NGVD) Exit 1886.0 (NGVD)

Physical Condition (Describe): Unobservable _____

Material: Good

Joints: None Alignment Good

Structural Integrity: Appears to be good

Hydraulic Capability: Good

Means of Control: Gate 36" by 36" slide gate Valve _____ Uncontrolled _____

Operation: Operable _____ Inoperable _____ Uncontrolled _____

Present Condition (Describe): Good; slide gate is operated regularly to adjust stream flow

9) Structural

a. **Concrete Surfaces** Concrete of the spillway crest, wingwalls, abutments and apron was in good condition with only minor surface cracks

b. **Structural Cracking** No evidence of any structural cracks; only minor surface cracks, possible due to shrinkage

c. **Movement - Horizontal & Vertical Alignment (Settlement)** None observed

d. **Junctions with Abutments or Embankments** Good; however, a minor crack (one quarter inch wide) has developed in the top 2 inches of the right upstream spillway abutment at its junction with the core wall

e. **Drains - Foundation, Joint, Face** Four 3 inch diameter weep holes located at left and right downstream spillway abutments (weep holes at left downstream abutment have continuous, very low volume flow); 12 inch high by 12 inch wide underdrain trenches drained by 4 inch diameter tile pipes provide drainage beneath the concrete spillway apron

f. **Water Passages, Conduits, Sluices** Good condition; reservoir drain and slide gate are used regularly to adjust stream flows

g. **Seepage or Leakage** No signs of seepage or leakage

h. Joints - Construction, etc. Good condition

i. Foundation Inaccessible

j. Abutments See 9) d. above

k. Control Gates 36 inch high by 36 inch wide slide gate controls the reservoir drain and is operated regularly to adjust the stream flow of Whetstone Creek

l. Approach & Outlet Channels Upstream: wingwalls at 45 degrees to the spillway abutments are in good condition. Downstream: concrete spillway apron with longitudinal sills is in good condition except for the slight undermining and cracks described in 7) d. above

m. Energy Dissipators (Plunge Pool, etc.) Reinforced concrete spillway apron

n. Intake Structures Not applicable

o. Stability Appears to be stable

p. Miscellaneous No comments

10) Appurtenant Structures (Power House, Lock, Gatehouse, Other)

a. Description and Condition None observed

APPENDIX C

HYDROLOGIC/HYDRAULIC ENGINEERING DATA AND COMPUTATIONS

CHECK LIST FOR DAMS
HYDROLOGIC AND HYDRAULIC
ENGINEERING DATA

AREA-CAPACITY DATA:

	Elevation (ft.)	Surface Area (acres)	Storage Capacity (acre-ft.)
1) Top of Dam	1903.1	640	3742
2) Design High Water (Max. Design Pool)	--	--	--
3) Overflow Spillway Crest	1898.0	385	1446
4) Pool Level with Flashboards	--	--	--
5) Reservoir Drain Invert	1886.0	0	0

DISCHARGES:

	Volume (cfs)
1) Average Daily	Unknown
2) Overflow Spillway @ Maximum High Water (Top of Dam)	2186
3) Emergency Spillway @ Design High Water	--
4) Principal Spillway @ Emergency Spillway Crest	--
5) Low Level Outlet @ Overflow Spillway Crest	140
6) Total (of all facilities) @ Maximum High Water	2326
7) Maximum Known Flood	Unknown
8) At Time of Inspection	6 ±

CREST: ELEVATION: 1903.1 (NGVD)

Type: Earthen embankment with a concrete core wall

Width: 10 feet Length: 301 feet

Spillover: Concrete overflow spillway weir

Location: Left center section of embankment

SPILLWAY:

OVERFLOW		EMERGENCY
1898.0 (NGVD)	Elevation	
Broad-crested weir	Type	
49 feet	Width	
	Type of Control	
Weir	Uncontrolled	
--	Controlled	
None	Type: (Flashboards; gate)	
One	Number	
60 foot long weir	Size/Length	
Concrete	Invert Material	
Continuously	Anticipated Length of Operating Service	
Unknown	Chute Length	
12 feet	Height Between Spillway Crest & Approach Channel Invert (Weir Flow)	

Type: _____

Location: _____

Records:

Date Unknown

Max. Reading Unknown

FLOOD WATER CONTROL SYSTEM:

Warning System None in effect

Method of Controlled Releases (mechanisms) Manually controlled slide gate to drain the impoundment

DRAINAGE AREA: 5,180 acres = 8.09 square miles

DRAINAGE BASIN RUNOFF CHARACTERISTICS:

Land Use - Type Rural, State Park

Terrain - Relief Relatively flat uplands (plateau)

Surface - Soil Glacial till

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

Primarily woodlands with scattered open fields; glacial till soils; average watershed slope is less than 5 percent

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

None

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

"Railroad grade road" on the southern edge of the reservoir would be inundated

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

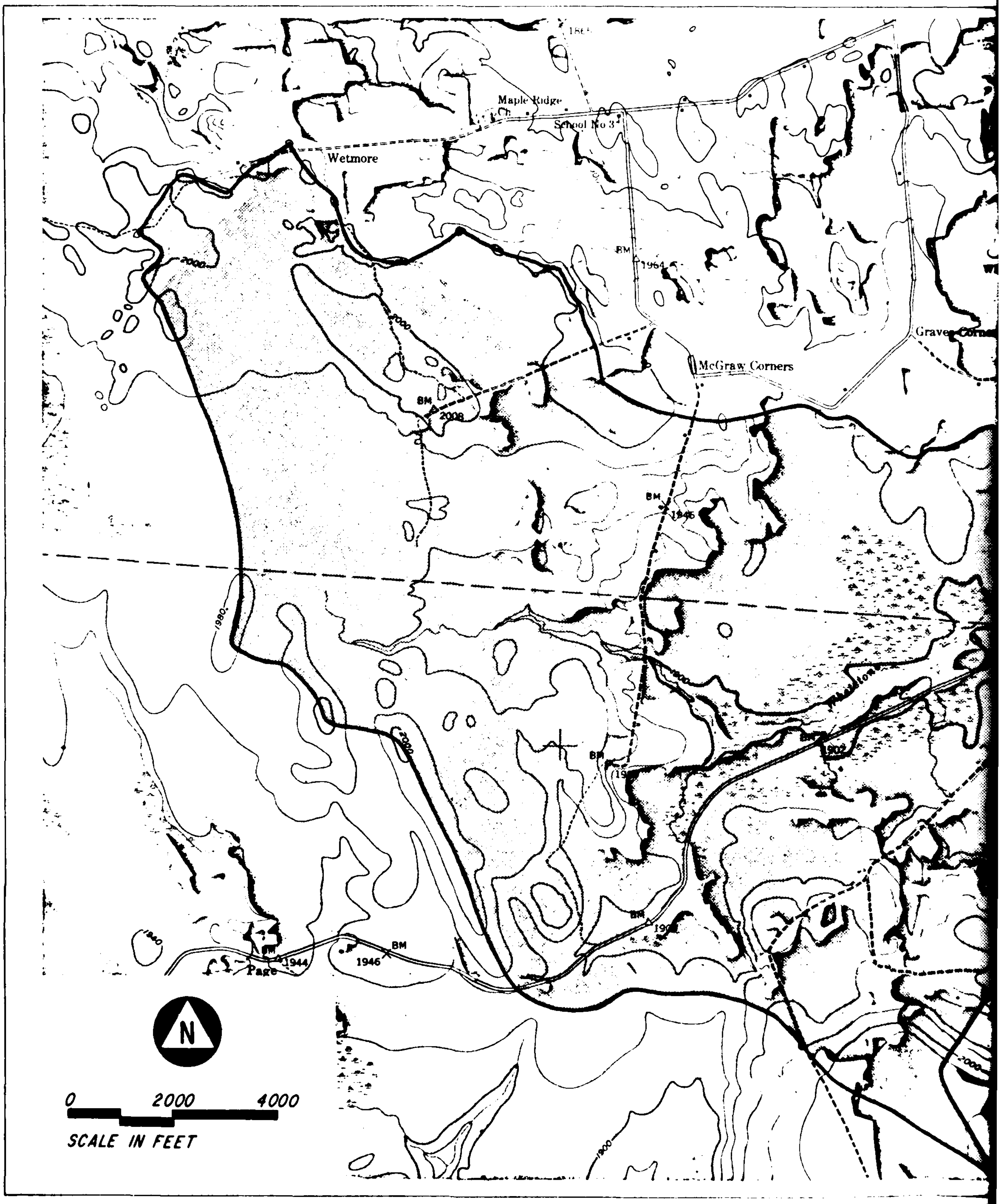
Location: Low reach ("railroad grade road") on southern edge of reservoir

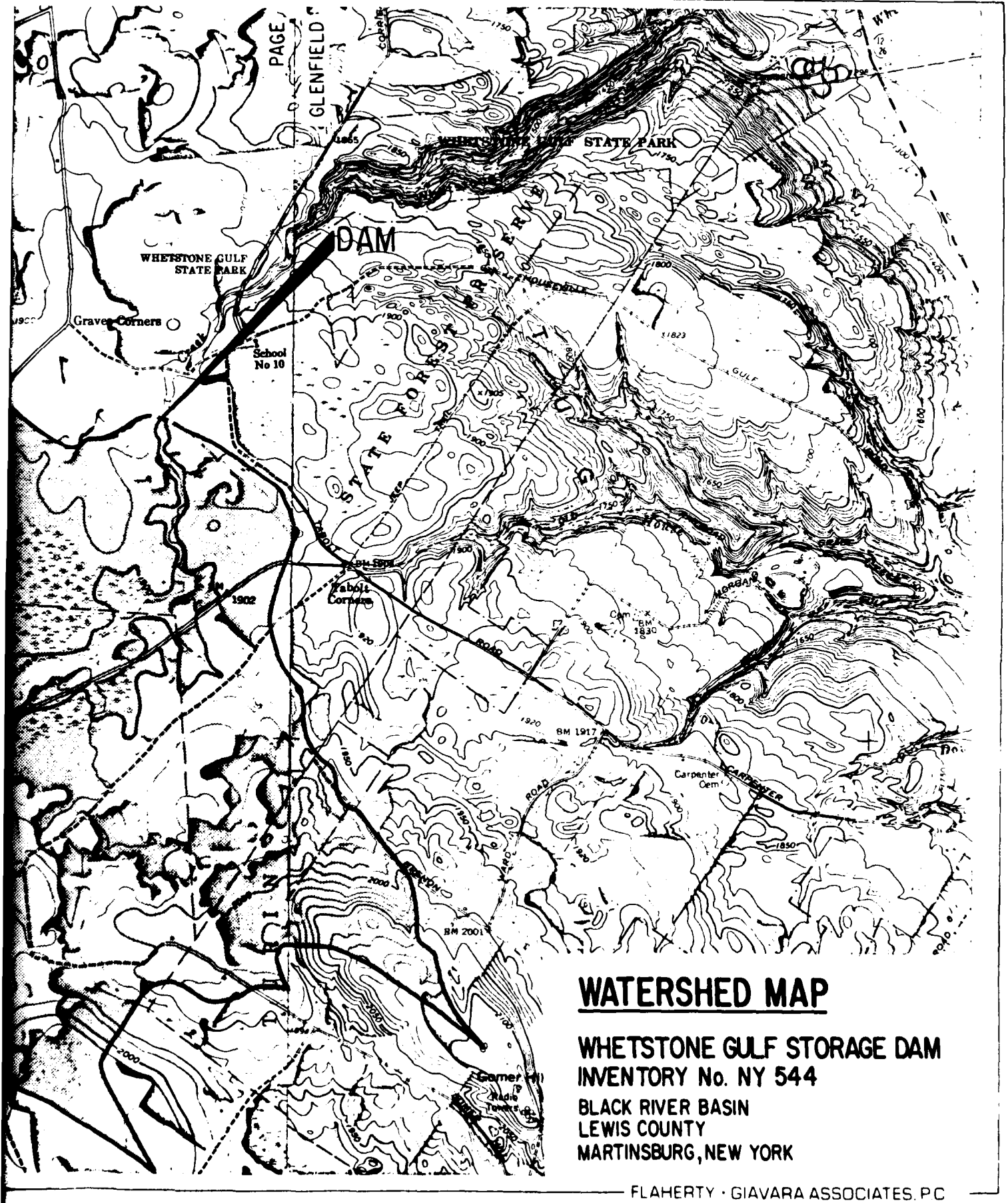
Elevation: 1898.0 (NGVD)

Reservoir:

Length @ Maximum Pool 12,000 ± feet = 2.3 miles (Miles)

Length of Shoreline (@ Spillway Crest) 30,000 ± feet = 5.7 miles (Miles)


Maple Ridge
Ch
School No 3
Wetmore
BM
1964
2000
2000
BM
2008
McGraw Corners
Graves Corners
BM
1946
1980
2000
BM
1902
BM
1900
BM
1944
Page
1946
BM
1900
N
0
2000
4000
SCALE IN FEET



WATERSHED MAP

WHETSTONE GULF STORAGE DAM
INVENTORY No. NY 544

BLACK RIVER BASIN
LEWIS COUNTY
MARTINSBURG, NEW YORK

FLAHERTY · GIAVARA ASSOCIATES, P.C.

CALCULATIONS

PROJECT CORPS WORKS
NY 544

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

SHEET NO. 1 OF I
BY RAC DATE 4-16-81
CHK'D. BY TLW DATE 4-21-81

WATERSHED DATA FOR HEC-1 SNYDER HYDROGRAPH

1) TIME TO PEAK

$L = 39{,}000' = 5.68$ miles
$L_C = 13{,}500' = 2.56$ miles
$C_T = 2.2$ for flat slopes

$$T_p = C_T (L \times L_C)^{0.3}$$
$$= 2.2 (5.68 \times 2.56)^{0.3} = 4.91 \text{ Hours}$$

$$t_r = \frac{t_p}{5.5} = \frac{4.91}{5.5} = 0.89 \quad \text{USE } t_R = 0.5$$

$$t_{pR} = t_p + 0.25(t_R - t_r)$$
$$= 4.91 + 0.25(0.5 - 0.89)$$
$$= 4.81 \text{ Hours}$$

2) $C_p = 0.63$ for HIGHLAND AREA

3) % IMPERVIOUS

ROADS - 16,000 LF x 25' = 400,000 ft²
HOUSES - ±7 @ 1000 ft² = 7,000 ft²
407,000 ft²

407,000 ft² = 9.3 acres

$$\frac{9.3 \text{ acres}}{5184 \text{ acres}} = 0.18\ \%$$

4) WATERSHED AREA

$$5184 \text{ acres} / 640 = 8.10 \text{ Square Miles}$$

Based on 1" = 2000' USGS Map

5) RAINFALL DATA – (FROM HYDROMETEOROLOGICAL REPORT NO. 33)

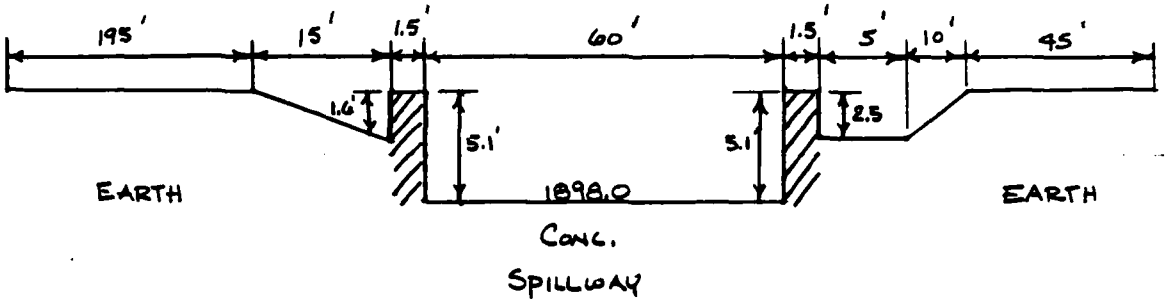
24 HOUR PMP = 18.6 inches for 200 square miles

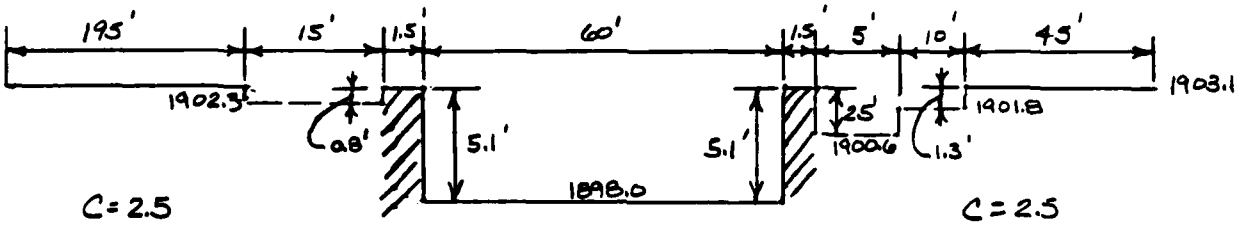
DURATION (HRS)	ADJ FACTOR %
6	111
12	122
24	133
48	143

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

STAGE DISCHARGE DATA

NTS





STAGE	$Q=(3.0)LH^{1.5}$	$Q=(2.5)LH^{1.5}$				DISCHARGE
1898.0	-					0
1899.0	$3(60)(1)^{1.5}$					180.0
1900.0	$3(60)(2)^{1.5}$					509.1
1900.6	$3(60)(2.6)^{1.5}$					754.6
1901.0	$3(60)(3)^{1.5}$	$2.5(5)(.4)^{1.5}$				938.5
1901.8	$3(60)(3.8)^{1.5}$	$2.5(5)(1.4)^{1.5}$				1349.5
1902.0	$3(60)(4)^{1.5}$	$2.5(5)(1.4)^{1.5}$	$2.5(10)(.2)^{1.5}$			1462.9
1902.3	$3(60)(4.3)^{1.5}$	$2.5(5)(1.7)^{1.5}$	$2.5(10)(.5)^{1.5}$			1641.5
1902.7	$3(60)(4.7)^{1.5}$	$2.5(5)(2.1)^{1.5}$	$2.5(10)(.9)^{1.5}$	$2.5(15)(.4)^{1.5}$		1903.0
1903.0	$3(60)(5)^{1.5}$	$2.5(5)(2.4)^{1.5}$	$2.5(10)(1.2)^{1.5}$	$2.5(15)(.7)^{1.5}$		2113.8
1903.1	$3(60)(5.1)^{1.5}$	$2.5(5)(2.5)^{1.5}$	$2.5(10)(1.3)^{1.5}$	$2.5(15)(.8)^{1.5}$		2186.4
1904.0	$3(60)(6)^{1.5}$ $3(3)(.9)^{1.5}$	$2.5(5)(3.4)^{1.5}$	$2.5(10)(2.2)^{1.5}$	$2.5(15)(1.7)^{1.5}$	$2.5(240)(.9)^{1.5}$	3408.5
1905.0	$3(60)(7)^{1.5}$ $3(3)(1.9)^{1.5}$	$2.5(5)(4.4)^{1.5}$	$2.5(10)(3.2)^{1.5}$	$2.5(15)(2.7)^{1.5}$	$2.5(240)(1.9)^{1.5}$	5353.4

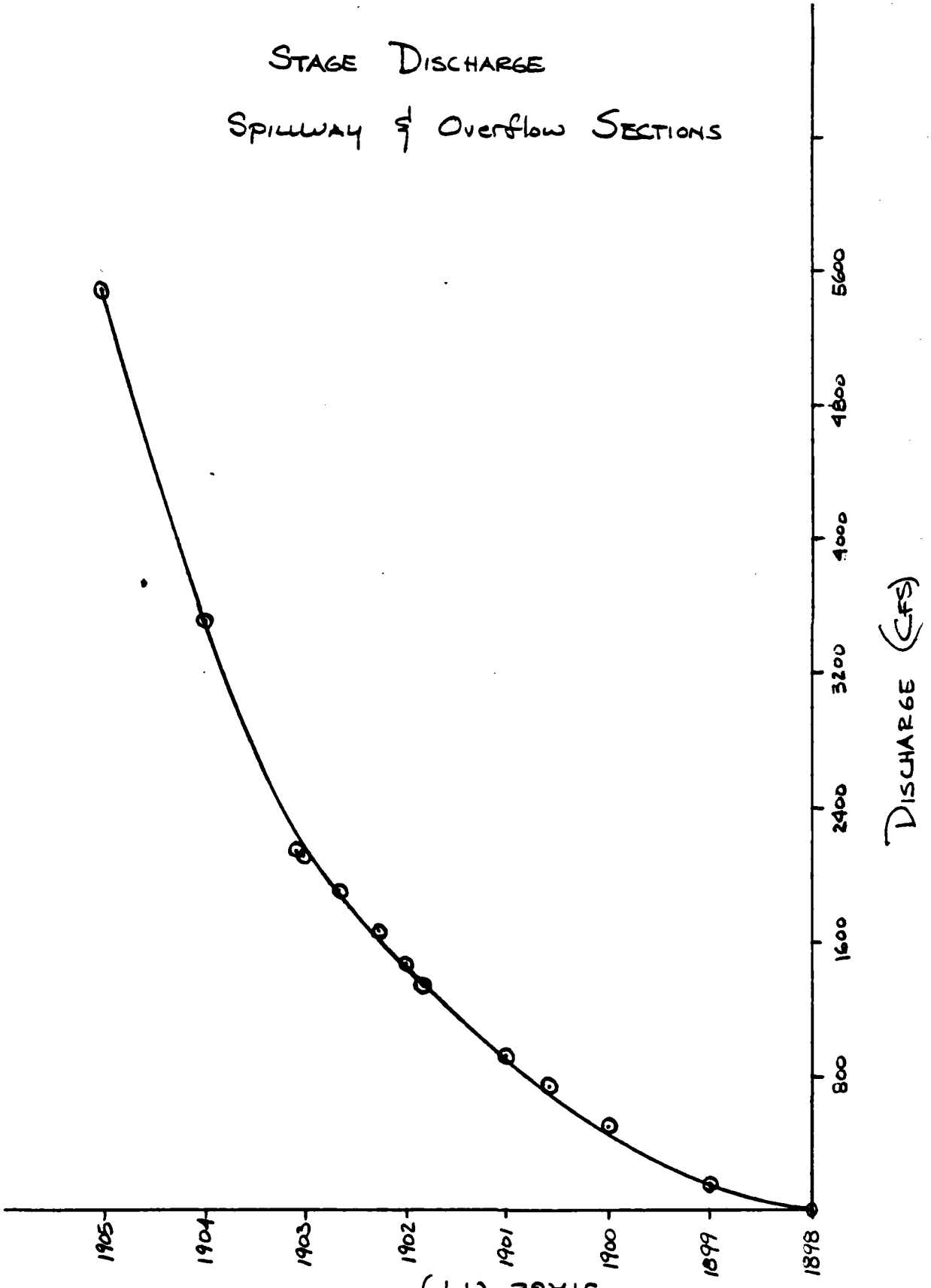
PROJECT Corps Dams
NY 544

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

SHEET NO. 4 OF 4
BY RAC DATE 4-20-81
CHK'D. BY TLW DATE 4-21-81

STAGE DISCHARGE

SPILLWAY & OVERFLOW SECTIONS



HEC-1 FLOOD HYDROGRAPH COMPUTATIONS

```
FLAHERTY GIAVARA ASSOCIATES, P.C.
**********************************
FLOOD HYDROGRAPH PACKAGE (HEC-1)
DAM SAFETY VERSION     JULY 1978
  LAST MODIFICATION  26 FEB 79
**********************************
     1                A1 NATIONAL DAM INSPECTION PROGRAM, PHASE I REPORT, CORPS OF ENGINEERS - NEW YORK DISTRICT
     2                A2 DAM INVENTORY NO. NY 544, WHETSTONE GULF STORAGE DAM, LEWIS COUNTY, NEW YORK, APRIL 20, 1981
     3                A3 PREPARED BY FLAHERTY GIAVARA ASSOCIATES, P.C., ONE COLUMBUS PLAZA, NEW HAVEN, CONNECTICUT
     4                B    120       0      30       0       0       0       0       2       0       0
     5                B1     5
     6                J     1       7       1
     7                J1  0.50    0.68    0.69    0.70    0.71    0.72    0.73    0.74    1.00
     8                K     0       1                       0       0       1       0
     9                K1 INFLOW HYDROGRAPH - SNYDER METHOD
    10                M     1       1    8.09               0       0                       1
    11                P     0    18.6     111     122     133     143
    12                T                                                       1     0.1          0.0018
    13                W  4.81    0.63
    14                X  -2.0   -0.10     1.5
    15                K     1       1                       0       1       1       0
    16                K1 RESERVOIR ROUTING - MODIFIED PLUS METHOD
    17                Y                               1       1
    18                Y1    1                                                 0      -1
    19                Y1878.0  1897.0  1900.0  1900.5  1901.0  1901.5  1902.0  1902.5  1902.7  1903.0
    20                Y1903.1  1904.0  1905.0  1907.0
    21                Y3    0   180.0   309.1   754.6   938.5  1349.5  1462.9  1641.5  1903.0  2113.8
    22                Y32186.4  2896.2  3782.0  5810.2
    23                $S   0.0    23.0    68.9   279.5   737.4  1446.8  2279.7  3742.0
    24                $E1886.0  1890.0  1892.0  1894.0  1896.0  1898.0  1900.0  1903.1
    25                $$1878.0
    26                $D1903.1     2.5     1.5   241.0
    27                K    99
                           PREVIEW OF SEQUENCE OF STREAM NETWORK CALCULATIONS
                                   RUNOFF 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: 8/20/
     TIME: 2:53 PM

                      NATIONAL DAM INSPECTION PROGRAM, PHASE I REPORT, CORPS OF ENGINEERS - NEW YORK DISTRICT
                      DAM INVENTORY NO. NY 544, WHETSTONE GULF STORAGE DAM, LEWIS COUNTY, NEW YORK, APRIL 20, 1981
                      PREPARED BY FLAHERTY GIAVARA ASSOCIATES, P.C., ONE COLUMBUS PLAZA, NEW HAVEN, CONNECTICUT

                                                JOB SPECIFICATION
                       NQ      NHR     NMIN     IDAY     IHR     IMIN    METRC     IPLT     IPRT    NSTAN
                      120        0       30        0       0        0        0        2        0        0
                                         JOPER      NWT    LROPT    TRACE
                                             5        0        0        0
```

MULTI-PLAN ANALYSES TO BE PERFORMED
NPLAN= 1 NRTIO= 9 LRTIO= 1
RTIOS= 0.50 0.68 0.69 0.70 0.71 0.72 0.73 0.74 1.00

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

SUB-AREA RUNOFF COMPUTATION

INFLOW HYDROGRAPH - SNYDER METHOD

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

HYDROGRAPH DATA

IHYDO	IUHG	TAREA	SNAP	TRSDA	TRSPC	RATIO	ISNOW	ISAME	LOCAL
1	1	8.09	0.00	8.09	0.00	0.000	0	1	0

PRECIP DATA

SPFE	PMS	R6	R12	R24	R48	R72	R96
0.00	18.60	111.00	122.00	133.00	143.00	0.00	0.00

TRSPC COMPUTED BY THE PROGRAM IS 0.800

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	1.00	0.10	0.00	0.00

UNIT HYDROGRAPH DATA
TP= 4.81 CP=0.63 NTA= 0

RECESSION DATA
STRTQ= -2.00 QRCSN= -0.10 RTIOR= 1.50

APPROXIMATE CLARK COEFFICIENTS FROM GIVEN SNYDER CP AND TP ARE TC=10.86 AND R= 8.62 INTERVALS

UNIT HYDROGRAPH 52 END-OF-PERIOD ORDINATES, LAG= 4.79 HOURS, CP= 0.63 VOL= 1.00

23.	84.	170.	268.	374.	482.	577.	647.	690.	706.	
686.	628.	559.	498.	443.	395.	351.	313.	279.	248.	
221.	197.	179.	156.	139.	124.	110.	98.	87.	78.	
69.	62.	55.	49.	43.	39.	34.	31.	27.	24.	
22.	19.	17.	15.	14.	12.	11.	10.	9.	8.	
7.	6.									

END-OF-PERIOD FLOW

MO. DA	HR. MN	PERIOD	RAIN	EXCS	LOSS	COMP Q	MO. DA	HR. MN	PERIOD	RAIN	EXCS	LOSS	COMP Q
1.01	0.30	1	0.00	0.00	0.00	16.	1.02	6.30	61	0.14	0.09	0.05	49.
1.01	1.00	2	0.00	0.00	0.00	15.	1.02	7.00	62	0.14	0.09	0.05	56.
1.01	1.30	3	0.00	0.00	0.00	14.	1.02	7.30	63	0.14	0.09	0.05	70.
1.01	2.00	4	0.00	0.00	0.00	14.	1.02	8.00	64	0.14	0.09	0.05	98.
1.01	2.30	5	0.00	0.00	0.00	13.	1.02	8.30	65	0.14	0.09	0.05	123.
1.01	3.00	6	0.00	0.00	0.00	13.	1.02	9.00	66	0.14	0.09	0.05	163.
1.01	3.30	7	0.00	0.00	0.00	12.	1.02	9.30	67	0.14	0.09	0.05	210.
1.01	4.00	8	0.00	0.00	0.00	12.	1.02	10.00	68	0.14	0.09	0.05	263.
1.01	4.30	9	0.00	0.00	0.00	11.	1.02	10.30	69	0.14	0.09	0.05	320.
1.01	5.00	10	0.00	0.00	0.00	11.	1.02	11.00	70	0.14	0.09	0.05	378.
1.01	5.30	11	0.00	0.00	0.00	10.	1.02	11.30	71	0.14	0.09	0.05	434.
1.01	6.00	12	0.00	0.00	0.00	10.	1.02	12.00	72	0.14	0.09	0.05	485.
1.01	6.30	13	0.01	0.00	0.01	10.	1.02	12.30	73	0.83	0.78	0.05	547.

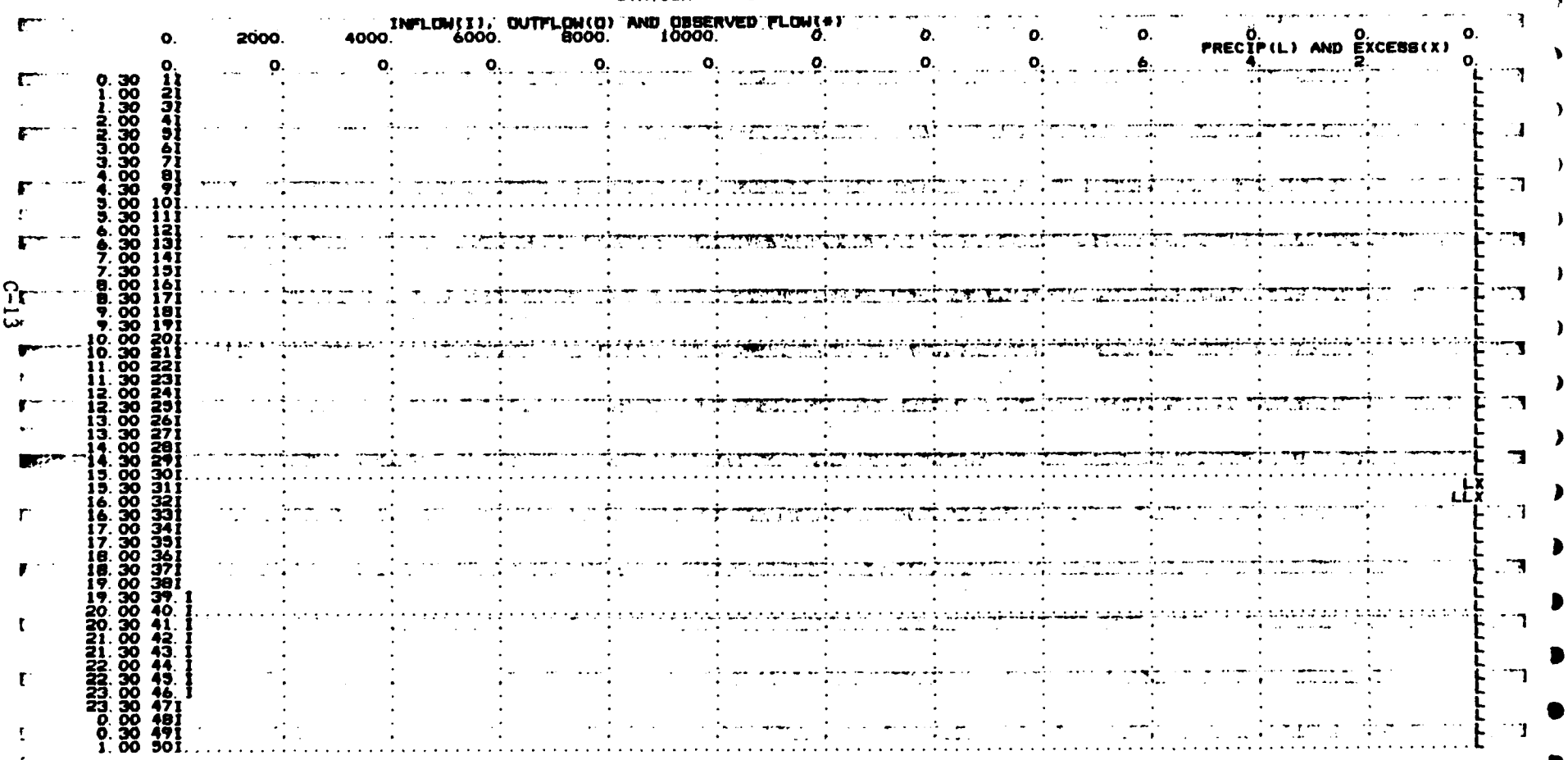
1.01	7.00	14	0.01	0.00	0.01	9.	1.02	13.00	74	0.83	0.78	0.05	645.
1.01	7.30	15	0.01	0.00	0.01	9.	1.02	13.30	75	0.99	0.94	0.05	803.
1.01	8.00	16	0.01	0.00	0.01	9.	1.02	14.00	76	0.99	0.94	0.05	1034.
1.01	8.30	17	0.01	0.00	0.01	8.	1.02	14.30	77	1.24	1.19	0.05	1354.
1.01	9.00	18	0.01	0.00	0.01	8.	1.02	15.00	78	1.24	1.19	0.05	1778.
1.01	9.30	19	0.01	0.00	0.01	8.	1.02	15.30	79	1.51	1.46	0.05	2308.
1.01	10.00	20	0.01	0.00	0.01	7.	1.02	16.00	80	4.77	4.72	0.05	3017.
1.01	10.30	21	0.01	0.00	0.01	7.	1.02	16.30	81	1.16	1.11	0.05	3937.
1.01	11.00	22	0.01	0.00	0.01	7.	1.02	17.00	82	1.16	1.11	0.05	4988.
1.01	11.30	23	0.01	0.00	0.01	6.	1.02	17.30	83	0.91	0.86	0.05	6089.
1.01	12.00	24	0.01	0.00	0.01	6.	1.02	18.00	84	0.91	0.86	0.05	7171.
1.01	12.30	25	0.06	0.00	0.06	6.	1.02	18.30	85	0.08	0.03	0.05	8168.
1.01	13.00	26	0.06	0.00	0.06	6.	1.02	19.00	86	0.08	0.03	0.05	8978.
1.01	13.30	27	0.07	0.00	0.07	6.	1.02	19.30	87	0.08	0.03	0.05	9531.
1.01	14.00	28	0.07	0.00	0.07	5.	1.02	20.00	88	0.08	0.03	0.05	9811.
1.01	14.30	29	0.09	0.00	0.09	5.	1.02	20.30	89	0.08	0.03	0.05	9813.
1.01	15.00	30	0.07	0.00	0.07	5.	1.02	21.00	90	0.08	0.03	0.05	9529.
1.01	15.30	31	0.11	0.00	0.11	5.	1.02	21.30	91	0.08	0.03	0.05	8960.
1.01	16.00	32	0.36	0.09	0.27	7.	1.02	22.00	92	0.08	0.03	0.05	8265.
1.01	16.30	33	0.09	0.04	0.05	13.	1.02	22.30	93	0.08	0.03	0.05	7537.
1.01	17.00	34	0.09	0.04	0.05	24.	1.02	23.00	94	0.08	0.03	0.05	6807.
1.01	17.30	35	0.07	0.02	0.05	38.	1.02	23.30	95	0.08	0.03	0.05	6114.
1.01	18.00	36	0.07	0.02	0.05	56.	1.03	0.00	96	0.08	0.03	0.05	5480.
1.01	18.30	37	0.01	0.00	0.01	76.	1.03	0.30	97	0.00	0.00	0.00	4915.
1.01	19.00	38	0.01	0.00	0.01	98.	1.03	1.00	98	0.00	0.00	0.00	4410.
1.01	19.30	39	0.01	0.00	0.01	113.	1.03	1.30	99	0.00	0.00	0.00	3957.
1.01	20.00	40	0.01	0.00	0.01	127.	1.03	2.00	100	0.00	0.00	0.00	3550.
1.01	20.30	41	0.01	0.00	0.01	136.	1.03	2.30	101	0.00	0.00	0.00	3183.
1.01	21.00	42	0.01	0.00	0.01	139.	1.03	3.00	102	0.00	0.00	0.00	2852.
1.01	21.30	43	0.01	0.00	0.01	136.	1.03	3.30	103	0.00	0.00	0.00	2553.
1.01	22.00	44	0.01	0.00	0.01	128.	1.03	4.00	104	0.00	0.00	0.00	2282.
1.01	22.30	45	0.01	0.00	0.01	117.	1.03	4.30	105	0.00	0.00	0.00	2037.
1.01	23.00	46	0.01	0.00	0.01	106.	1.03	5.00	106	0.00	0.00	0.00	1816.
1.01	23.30	47	0.01	0.00	0.01	95.	1.03	5.30	107	0.00	0.00	0.00	1617.
1.02	0.00	48	0.01	0.00	0.01	85.	1.03	6.00	108	0.00	0.00	0.00	1440.
1.02	0.30	49	0.05	0.00	0.05	76.	1.03	6.30	109	0.00	0.00	0.00	1282.
1.02	1.00	50	0.05	0.00	0.05	68.	1.03	7.00	110	0.00	0.00	0.00	1141.
1.02	1.30	51	0.05	0.00	0.05	61.	1.03	7.30	111	0.00	0.00	0.00	1016.
1.02	2.00	52	0.05	0.00	0.05	56.	1.03	8.00	112	0.00	0.00	0.00	905.
1.02	2.30	53	0.05	0.00	0.05	52.	1.03	8.30	113	0.00	0.00	0.00	917.
1.02	3.00	54	0.05	0.00	0.05	49.	1.03	9.00	114	0.00	0.00	0.00	880.
1.02	3.30	55	0.05	0.00	0.05	47.	1.03	9.30	115	0.00	0.00	0.00	845.
1.02	4.00	56	0.05	0.00	0.05	46.	1.03	10.00	116	0.00	0.00	0.00	812.
1.02	4.30	57	0.05	0.00	0.05	46.	1.03	10.30	117	0.00	0.00	0.00	779.
1.02	5.00	58	0.05	0.00	0.05	46.	1.03	11.00	118	0.00	0.00	0.00	748.
1.02	5.30	59	0.05	0.00	0.05	46.	1.03	11.30	119	0.00	0.00	0.00	719.
1.02	6.00	60	0.05	0.00	0.05	47.	1.03	12.00	120	0.00	0.00	0.00	690.
									SUM	21.28	17.60	3.68	182711.
										(540.)	(447.)	(94.)	(5185.12)

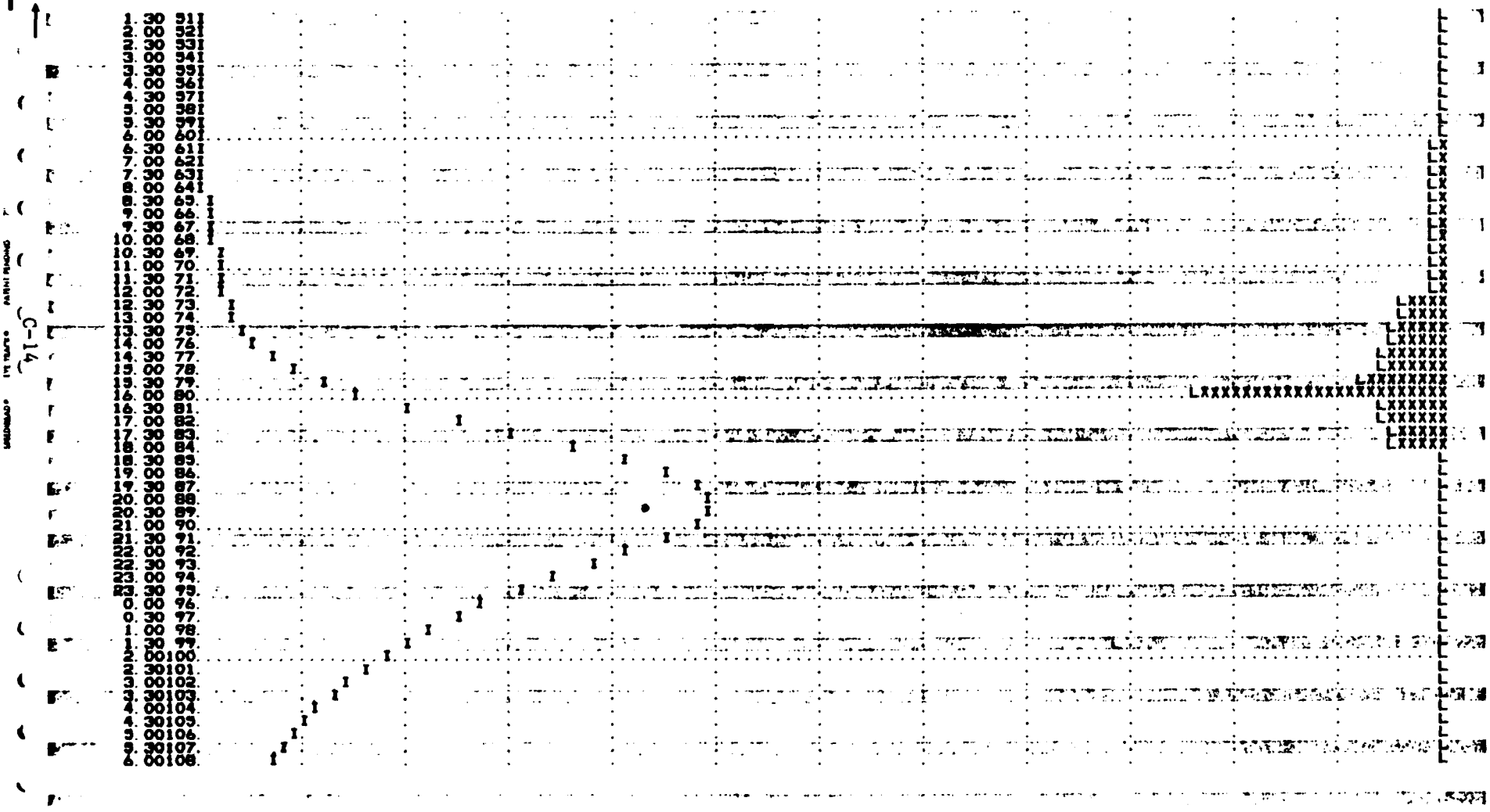
	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	9813.	8387.	3707.	1923.	182798.
CMS	278.	238.	105.	43.	5175.
INCHES		9.69	17.05	17.51	17.51
MM		245.01	433.10	444.81	444.81
AC-FT		4160.	7353.	7552.	7552.
THOUS CU M		5131.	9070.	9315.	9315.

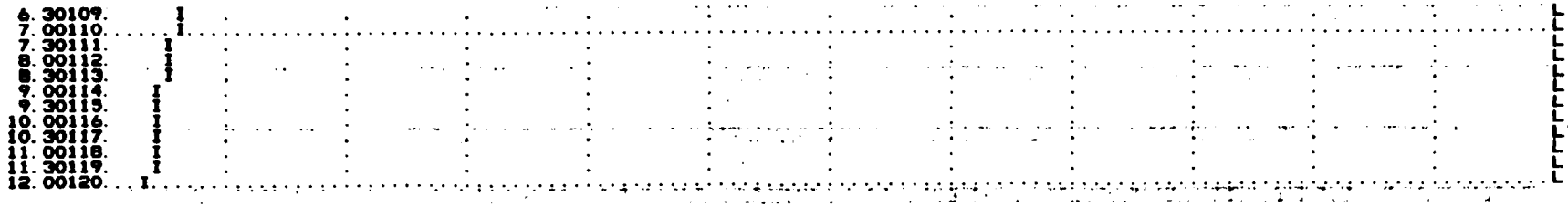
OVF

STATION 1

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




1.30 511
2.00 521
2.30 531
3.00 541
3.30 551
4.00 561
4.30 571
5.00 581
5.30 591
6.00 601
6.30 611
7.00 621
7.30 631
8.00 641
8.30 65.
9.00 66.
9.30 67.
10.00 68.
10.30 69.
11.00 70.
11.30 71.
12.00 72.
12.30 73.
13.00 74.
13.30 75.
14.00 76.
14.30 77.
15.00 78.
15.30 79.
16.00 80.
16.30 81.
17.00 82.
17.30 83.
18.00 84.
18.30 85.
19.00 86.
19.30 87.
20.00 88.
20.30 89.
21.00 90.
21.30 91.
22.00 92.
22.30 93.
23.00 94.
R3.30 95.
0.00 96.
0.30 97.
1.00 98.
1.30 99.
2.00100.
2.30101.
3.00102.
3.30103.
4.00104.
4.30105.
5.00106.
5.30107.
6.00108.



OVN

HYDROGRAPH AT STA 1 FOR PLAN 1, RTIO 1

8.	7.	7.	7.	7.	6.	6.	6.	6.	5.
5.	5.	5.	5.	4.	4.	4.	4.	4.	4.
4.	3.	3.	3.	3.	3.	3.	3.	3.	3.
2.	3.	7.	12.	19.	28.	38.	48.	57.	63.
68.	70.	68.	64.	59.	53.	47.	42.	38.	34.
31.	28.	26.	25.	24.	23.	23.	23.	23.	23.
24.	28.	39.	46.	62.	81.	105.	132.	160.	189.
217.	243.	273.	323.	401.	517.	677.	889.	1154.	1509.
1969.	2494.	3044.	3585.	4084.	4489.	4766.	4906.	4907.	4760.
4480.	4132.	3769.	3405.	3057.	2740.	2457.	2205.	1978.	1775.
1592.	1426.	1276.	1141.	1019.	908.	807.	720.	641.	571.
508.	477.	456.	440.	423.	406.	390.	374.	359.	345.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	4707.	4194.	1854.	761.	91379.
CMS	133.	119.	52.	22.	2588.
INCHES		4.82	8.53	8.76	8.76
MM		122.50	216.55	222.40	222.40
AC-FT		2080.	3677.	3776.	3776.
THOUS CU M		2565.	4535.	4658.	4658.

HYDROGRAPH AT STA 1 FOR PLAN 1, RTIO 2

11.	10.	10.	9.	9.	9.	8.	8.	8.	7.
7.	7.	7.	6.	6.	6.	6.	5.	5.	5.
5.	5.	4.	4.	4.	4.	4.	4.	4.	3.
5.	5.	9.	16.	26.	38.	52.	65.	77.	86.
92.	95.	92.	87.	80.	72.	65.	58.	51.	46.
42.	38.	36.	34.	32.	32.	31.	31.	32.	32.
33.	38.	48.	63.	84.	111.	143.	179.	217.	257.
295.	330.	372.	439.	546.	703.	921.	1209.	1570.	2052.
2677.	3392.	4140.	4876.	5554.	6105.	6481.	6672.	6673.	6474.
6093.	5620.	5125.	4630.	4157.	3726.	3342.	2999.	2691.	2414.
2165.	1939.	1736.	1551.	1385.	1235.	1100.	979.	872.	776.
691.	649.	623.	599.	578.	552.	530.	509.	489.	469.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	6673.	5704.	2521.	1036.	124276.
CMS	189.	162.	71.	29.	3519.
INCHES		6.56	11.59	11.91	11.91

MM	166.60	294.51	302.47
AC-FT	2829.	5000.	5135.
THOUS CU M	3489.	6168.	6334.

		10.	9.	9.	9.	8.	8.	8.	7.
11.	10.	7.	6.	6.	6.	6.	5.	5.	5.
7.	7.	4.	4.	4.	4.	4.	4.	4.	4.
5.	5.	9.	16.	27.	39.	52.	66.	78.	88.
3.	5.	74.	88.	81.	73.	65.	58.	52.	47.
94.	96.	36.	34.	33.	32.	32.	32.	32.	32.
42.	39.	48.	64.	85.	112.	145.	182.	221.	261.
34.	39.	377.	445.	554.	713.	934.	1226.	1593.	2082.
299.	335.	4201.	4948.	5636.	6195.	6577.	6770.	6771.	6569.
2717.	3442.	3201.	4698.	4219.	3781.	3391.	3043.	2730.	2449.
6183.	5703.	1761.	1574.	1409.	1293.	1118.	993.	885.	787.
2196.	1968.	632.	607.	583.	560.	538.	516.	496.	476.
701.	659.								

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	6771.	5788.	2936.	1051.	128103.
CMS	192.	164.	72.	30.	3571.
INCHES		6.66	11.77	12.08	12.08
MM		169.05	298.84	306.92	306.92
AC-FT		2870.	5074.	5211.	5211.
THOUS CU M		3540.	6258.	6428.	6428.

HYDROGRAPH AT STA 1 FOR PLAN 1, RTIO 4

		10.	10.	9.	9.	9.	8.	8.	8.
11.	10.	7.	6.	6.	6.	6.	6.	5.	5.
7.	7.	5.	4.	4.	4.	4.	4.	4.	4.
5.	5.	9.	17.	27.	39.	53.	67.	77.	89.
3.	5.	95.	89.	82.	74.	66.	59.	53.	48.
95.	97.	37.	35.	33.	33.	32.	32.	32.	33.
43.	39.	49.	65.	86.	114.	147.	184.	224.	264.
34.	39.	383.	452.	562.	724.	948.	1244.	1618.	2112.
304.	340.	4262.	5020.	5717.	6285.	6672.	6868.	6869.	6664.
2756.	3492.	3276.	4766.	4280.	3836.	3440.	3087.	2770.	2485.
6272.	5785.	1787.	1597.	1426.	1271.	1132.	1008.	897.	799.
2228.	1996.	642.	616.	992.	968.	946.	924.	903.	483.
711.	668.								

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	6869.	5872.	2995.	1066.	127931.
CMS	195.	166.	73.	30.	3623.
INCHES		6.75	11.94	12.26	12.26
MM		171.50	303.17	311.36	311.36
AC-FT		2912.	5147.	5286.	5286.
THOUS CU M		3592.	6349.	6521.	6521.

HYDROGRAPH AT STA 1 FOR PLAN 1, RTIO 5

		10.	10.	9.	9.	9.	8.	8.	8.
11.	11.	7.	7.	6.	6.	6.	6.	5.	5.
7.	7.	5.	4.	4.	4.	4.	4.	4.	4.
5.	5.	9.	17.	27.	40.	54.	68.	80.	90.
4.	5.	97.	91.	83.	75.	67.	60.	54.	49.
97.	99.	39.	36.	34.	33.	33.	33.	33.	33.
44.	40.								

35.	40.	50.	66.	87.	116.	149.	187.	227.	268.
308.	345.	388.	458.	570.	734.	962.	1262.	1639.	2142.
2796.	3542.	4323.	5091.	5799.	6374.	6767.	6966.	6967.	6799.
6362.	5868.	5351.	4835.	4341.	3891.	3490.	3131.	2809.	2520.
2260.	2025.	1812.	1620.	1446.	1289.	1148.	1022.	910.	810.
721.	678.	651.	625.	600.	576.	553.	531.	510.	490.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	6967.	5956.	2632.	1081.	129758.
CMS	197.	169.	75.	31.	3674.
INCHES		6.83	12.11	12.43	12.43
MM		173.95	307.50	315.81	315.81
AC-FT		2953.	5221.	5362.	5362.
THOUS CU M		3643.	6440.	6614.	6614.

HYDROGRAPH AT STA 1 FOR PLAN 1, RTIO 6

11.	11.	10.	10.	10.	9.	9.	8.	8.	8.
7.	7.	7.	7.	6.	6.	6.	6.	5.	5.
5.	5.	5.	4.	4.	4.	4.	4.	4.	4.
4.	5.	9.	17.	28.	40.	55.	69.	81.	91.
98.	100.	98.	92.	84.	76.	68.	61.	54.	49.
44.	41.	38.	36.	34.	33.	33.	33.	33.	34.
35.	40.	50.	66.	89.	117.	151.	189.	230.	272.
312.	349.	394.	465.	578.	744.	975.	1280.	1668.	2172.
2835.	3592.	4384.	5163.	5881.	6464.	6863.	7064.	7066.	6855.
6492.	5951.	5427.	4903.	4402.	3946.	3539.	3175.	2849.	2556.
2292.	2054.	1838.	1643.	1466.	1307.	1164.	1037.	923.	822.
732.	687.	660.	634.	609.	584.	561.	539.	517.	497.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	7066.	6040.	2669.	1097.	131586.
CMS	200.	171.	76.	31.	3726.
INCHES		6.95	12.28	12.61	12.61
MM		176.40	311.83	320.26	320.26
AC-FT		2995.	5294.	5437.	5437.
THOUS CU M		3694.	6530.	6707.	6707.

HYDROGRAPH AT STA 1 FOR PLAN 1, RTIO 7

11.	11.	10.	10.	10.	7.	7.	7.	8.	8.
8.	7.	7.	7.	6.	6.	6.	6.	6.	5.
5.	5.	5.	5.	4.	4.	4.	4.	4.	4.
4.	5.	10.	17.	28.	41.	56.	70.	83.	93.
99.	102.	99.	93.	86.	77.	69.	62.	55.	50.
45.	41.	38.	36.	35.	34.	34.	34.	34.	34.
36.	41.	51.	67.	90.	119.	153.	192.	233.	276.
317.	354.	399.	471.	586.	755.	989.	1298.	1685.	2203.
2874.	3642.	4449.	5239.	5962.	6554.	6958.	7162.	7164.	6950.
6541.	6033.	5502.	4971.	4463.	4000.	3588.	3219.	2888.	2591.
2324.	2082.	1863.	1666.	1487.	1329.	1181.	1051.	936.	833.
742.	697.	669.	643.	617.	592.	569.	546.	525.	504.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	7164.	6124.	2706.	1112.	133413.
CMS	203.	173.	77.	31.	3778.
INCHES		7.04	12.45	12.78	12.78
MM		178.85	316.17	324.71	324.71

AC-FT	3037.	5368.	5513.		5513.				
THOUS CU M	3746.	6621.	6800.		6800.				

HYDROGRAPH AT STA 1 FOR PLAN 1, RTIO 8

11.	11.	11.	10.	10.	9.	9.	9.	8.	8.
8.	7.	7.	7.	7.	6.	6.	6.	6.	5.
5.	5.	5.	5.	4.	4.	4.	4.	4.	4.
4.	3.	10.	18.	28.	42.	56.	71.	84.	94.
101.	103.	100.	94.	87.	78.	70.	63.	56.	50.
45.	42.	39.	37.	35.	34.	34.	34.	34.	35.
36.	41.	52.	68.	91.	120.	155.	195.	237.	279.
321.	397.	485.	478.	394.	765.	1002.	1315.	1708.	2233.
2914.	3491.	4506.	5307.	6044.	6644.	7053.	7260.	7262.	7045.
6631.	6116.	5577.	5039.	4524.	4055.	3637.	3263.	2928.	2627.
2356.	2111.	1889.	1688.	1507.	1344.	1197.	1065.	949.	845.
752.	708.	678.	651.	629.	601.	577.	554.	532.	511.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	7262.	6208.	2743.	1127.	135241.
CMS	206.	176.	78.	32.	3830.
INCHES		7.14	12.62	12.96	12.96
MM		181.30	320.50	329.16	329.16
AC-FT		3078.	5441.	5588.	5588.
THOUS CU M		3797.	6712.	6893.	6893.

HYDROGRAPH AT STA 1 FOR PLAN 1, RTIO 9

16.	15.	14.	14.	13.	13.	12.	12.	11.	11.
10.	10.	10.	9.	9.	9.	8.	8.	8.	7.
7.	7.	6.	6.	6.	6.	6.	5.	5.	5.
5.	7.	13.	24.	38.	56.	76.	96.	113.	127.
136.	139.	136.	128.	117.	106.	99.	89.	79.	68.
61.	56.	52.	49.	47.	46.	46.	46.	46.	47.
49.	56.	70.	92.	123.	163.	210.	263.	320.	378.
434.	485.	547.	645.	803.	1034.	1354.	1778.	2308.	3017.
3937.	4788.	6089.	7171.	8167.	8978.	9331.	9811.	9813.	9320.
8960.	8265.	7537.	6809.	6114.	5480.	4915.	4410.	3957.	3550.
3183.	2852.	2553.	2282.	2037.	1816.	1617.	1440.	1282.	1141.
1016.	955.	917.	880.	845.	812.	779.	748.	719.	690.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	9813.	8389.	3707.	1523.	182758.
CMS	278.	238.	105.	43.	5175.
INCHES		9.65	17.05	17.51	17.51
MM		245.01	433.10	444.81	444.81
AC-FT		4160.	7353.	7552.	7552.
THOUS CU M		5131.	9070.	9315.	9315.

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

HYDROGRAPH ROUTING

RESERVOIR ROUTING - MODIFIED PULS METHOD

ISTAG	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO

		1	1	0	0	0	1	1	0	0

ROUTING DATA

GLOSS	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	0.	-1

STAGE	1898.00	1899.00	1900.00	1900.60	1901.00	1901.80	1902.00	1902.30	1902.70	1903.00
	1903.10	1904.00	1905.00	1907.00						
FLOW	0.00	180.00	509.10	754.60	938.50	1349.50	1462.90	1641.50	1903.00	2113.80
	2186.40	2876.20	3782.00	5810.20						
CAPACITY=	0.	23.	69.	276.	758.	1446.	2296.	3742.		
ELEVATION=	1884.	1890.	1892.	1894.	1896.	1898.	1900.	1903.		

CREL	SPWID	COGW	EXPW	ELEVL	COGL	CAREA	EXPL
1898.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

DAM DATA

TOPEL	COGD	EXPD	DAMWID
1903.1	2.5	1.5	241.

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.	0.	0.	0.	0.	0.	0.	3.	88.	170.
302.	428.	543.	651.	743.	828.	898.	937.	1008.	1047.
1075.	1094.	1109.	1110.	1108.	1102.	1091.	1077.	1059.	1039.
1016.	993.	969.	946.	925.	905.	884.	864.	844.	825.

STORAGE

0.	1.	1.	1.	2.	2.	2.	2.	3.	3.
3.	3.	3.	4.	4.	4.	4.	4.	5.	5.
5.	5.	5.	5.	5.	5.	5.	6.	6.	6.
6.	6.	6.	7.	7.	8.	10.	11.	14.	16.
19.	22.	24.	27.	30.	32.	34.	36.	38.	39.
40.	42.	43.	44.	45.	46.	47.	48.	49.	50.
51.	52.	53.	55.	57.	60.	64.	68.	74.	82.
90.	100.	110.	122.	137.	156.	181.	213.	256.	311.
382.	475.	589.	726.	884.	1061.	1253.	1452.	1653.	1847.
2028.	2191.	2334.	2456.	2563.	2650.	2721.	2779.	2825.	2860.
2886.	2903.	2914.	2918.	2917.	2911.	2901.	2888.	2872.	2853.
2833.	2812.	2790.	2769.	2748.	2728.	2707.	2687.	2667.	2647.

STAGE

1886.1	1886.1	1886.2	1886.2	1886.3	1886.3	1886.4	1886.4	1886.4	1886.5
1886.5	1886.6	1886.6	1886.6	1886.7	1886.7	1886.7	1886.7	1886.8	1886.8
1886.8	1886.8	1886.9	1886.9	1886.9	1886.9	1887.0	1887.0	1887.0	1887.0
1887.0	1887.1	1887.1	1887.2	1887.3	1887.4	1887.7	1888.0	1888.4	1888.8
1889.3	1889.8	1890.1	1890.2	1890.3	1890.4	1890.5	1890.6	1890.6	1890.7
1890.8	1890.8	1890.9	1890.9	1890.9	1891.0	1891.0	1891.1	1891.1	1891.2
1891.2	1891.2	1891.3	1891.4	1891.5	1891.6	1891.8	1892.0	1892.1	1892.1
1892.2	1892.3	1892.4	1892.5	1892.7	1892.8	1893.1	1893.4	1893.8	1894.1
1894.4	1894.8	1895.3	1895.9	1896.4	1896.9	1897.4	1898.0	1898.5	1898.9
1899.4	1899.8	1900.1	1900.3	1900.6	1900.8	1900.9	1901.0	1901.1	1901.2
1901.3	1901.3	1901.3	1901.3	1901.3	1901.3	1901.3	1901.3	1901.2	1901.2
1901.2	1901.1	1901.1	1901.0	1901.0	1900.9	1900.9	1900.8	1900.8	1900.8

PEAK OUTFLOW IS 1110. AT TIME 52.00 HOURS

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	1110.	1076.	968.	227.	27285.
CMS	31.	30.	15.	6.	773.
INCHES		1.24	2.61	2.61	2.61
MM		31.44	66.41	66.41	66.41
AC-FT		934.	1127.	1127.	1127.
THOUS CU M		658.	1391.	1391.	1391.

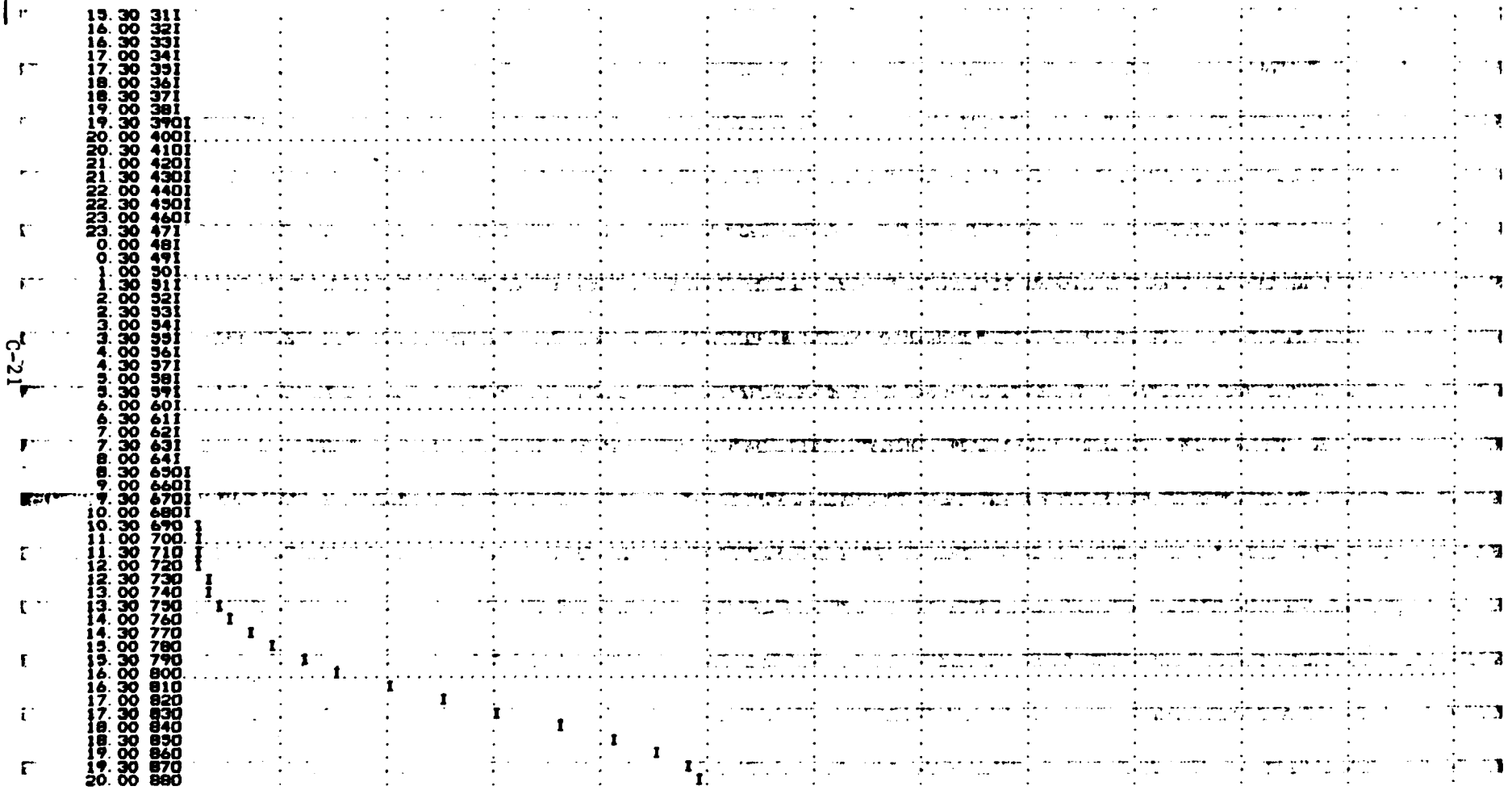
OVF

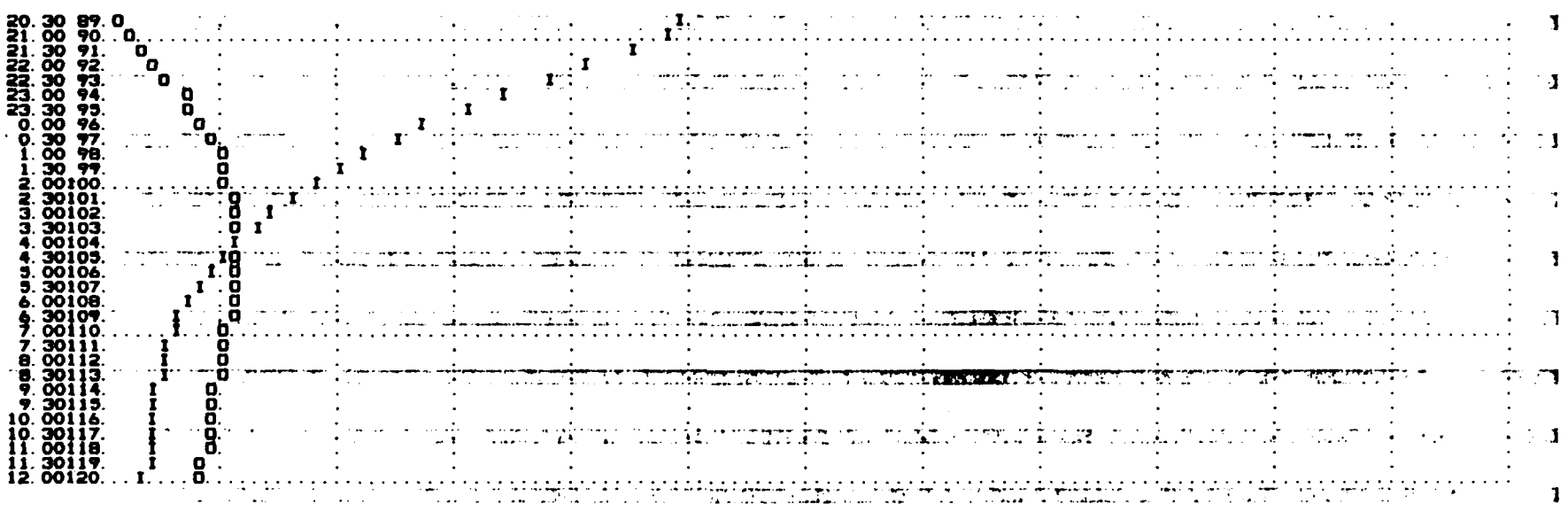
STATION 1

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

0. 1000. 2000. 3000. 4000. 5000. 0. 0. 0. 0. 0. 0.

0.30	11	I
1.00	21	I
1.30	31	I
2.00	41	I
2.30	51	I
3.00	61	I
3.30	71	I
4.00	81	I
4.30	91	I
5.00	101	I
5.30	111	I
6.00	121	I
6.30	131	I
7.00	141	I
7.30	151	I
8.00	161	I
8.30	171	I
9.00	181	I
9.30	191	I
10.00	201	I
10.30	211	I
11.00	221	I
11.30	231	I
12.00	241	I
12.30	251	I
13.00	261	I
13.30	271	I
14.00	281	I
14.30	291	I
15.00	301	I


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 3901
20.00 4001
20.30 4101
21.00 4201
21.30 4301
22.00 4401
22.30 4501
23.00 4601
23.30 471
0.00 481
0.30 491
1.00 501
1.30 511
2.00 521
2.30 531
3.00 541
3.30 551
4.00 561
4.30 571
5.00 581
5.30 591
6.00 601
6.30 611
7.00 621
7.30 631
8.00 641
8.30 6501
9.00 6601
9.30 6701
10.00 6801
10.30 690
11.00 700
11.30 710
12.00 720
12.30 730
13.00 740
13.30 750
14.00 760
14.30 770
15.00 780
15.30 790
16.00 800
16.30 810
17.00 820
17.30 830
18.00 840
18.30 850
19.00 860
19.30 870
20.00 880



OVN

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.	108.	253.	459.	666.
880.	1094.	1285.	1454.	1605.	1732.	1834.	1909.	1966.	2001.
2018.	2020.	2009.	1987.	1955.	1916.	1873.	1826.	1776.	1722.
1666.	1613.	1563.	1514.	1466.	1422.	1378.	1337.	1300.	1263.

STORAGE

0.	1.	1.	2.	2.	2.	3.	3.	3.	4.
4.	4.	5.	5.	5.	5.	6.	6.	6.	6.

6.	7.	7.	7.	7.	7.	7.	8.	8.	8.	
8.	8.	9.	9.	10.	11.	13.	16.	18.	22.	
26.	29.	33.	37.	40.	43.	46.	49.	51.	53.	
55.	57.	58.	60.	61.	62.	63.	65.	66.	67.	
69.	70.	72.	74.	77.	81.	86.	93.	101.	111.	
122.	135.	150.	167.	187.	213.	246.	290.	348.	422.	
520.	645.	801.	987.	1203.	1444.	1701.	1965.	2226.	2479.	
2703.	2904.	3077.	3221.	3340.	3434.	3506.	3560.	3597.	3620.	
3632.	3633.	3626.	3611.	3590.	3564.	3534.	3501.	3465.	3426.	
3386.	3346.	3307.	3269.	3231.	3195.	3159.	3125.	3091.	3057.	

STAGE

1886.1	1886.2	1886.2	1886.3	1886.4	1886.4	1886.5	1886.5	1886.6	1886.6
1886.7	1886.7	1886.8	1886.8	1886.9	1886.9	1887.0	1887.0	1887.0	1887.1
1887.1	1887.2	1887.2	1887.2	1887.2	1887.3	1887.3	1887.3	1887.4	1887.4
1887.4	1887.4	1887.5	1887.6	1887.7	1888.0	1888.3	1888.7	1889.2	1889.8
1890.1	1890.3	1890.4	1890.6	1890.8	1890.9	1891.0	1891.1	1891.2	1891.3
1891.4	1891.5	1891.5	1891.6	1891.6	1891.7	1891.8	1891.8	1891.9	1891.9
1892.0	1892.0	1892.0	1892.1	1892.1	1892.1	1892.2	1892.2	1892.3	1892.4
1892.5	1892.6	1892.8	1892.9	1893.1	1893.4	1893.7	1894.1	1894.3	1894.6
1895.0	1895.5	1896.1	1896.7	1897.3	1898.0	1898.6	1899.2	1899.8	1900.5
1900.9	1901.3	1901.7	1902.0	1902.2	1902.4	1902.6	1902.7	1902.8	1902.8
1902.9	1902.9	1902.9	1902.8	1902.8	1902.7	1902.7	1902.6	1902.5	1902.4
1902.3	1902.3	1902.2	1902.1	1902.0	1901.9	1901.9	1901.8	1901.7	1901.6

PEAK OUTFLOW IS 2020 AT TIME 51.00 HOURS

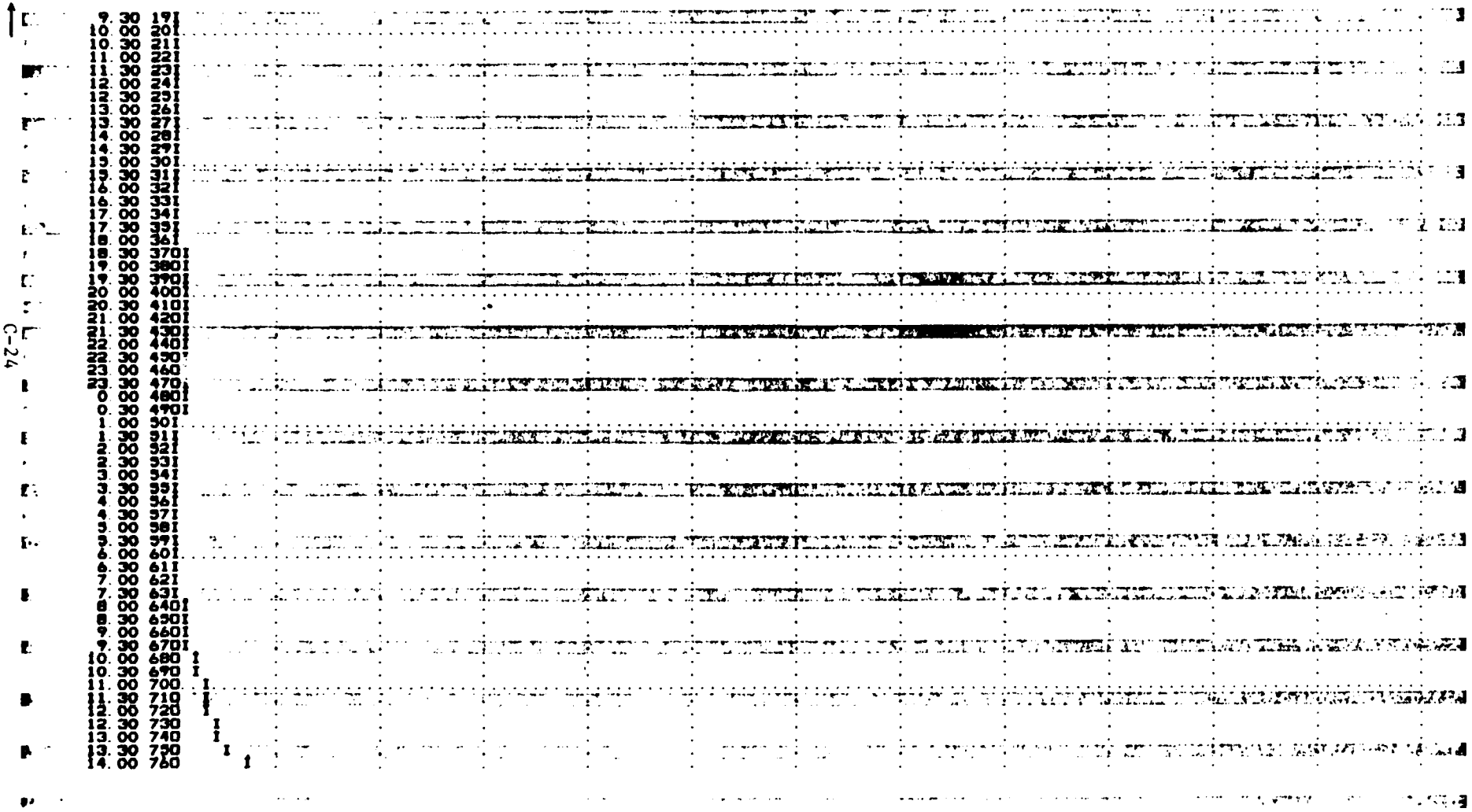
	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	2020.	1941.	1047.	419.	90237.
CMS	57.	55.	30.	12.	1423.
INCHES		2.23	4.81	4.81	4.81
MM		56.68	122.27	122.27	122.27
AC-FT		962.	2076.	2076.	2076.
THOUS CU M		1187.	2561.	2561.	2561.

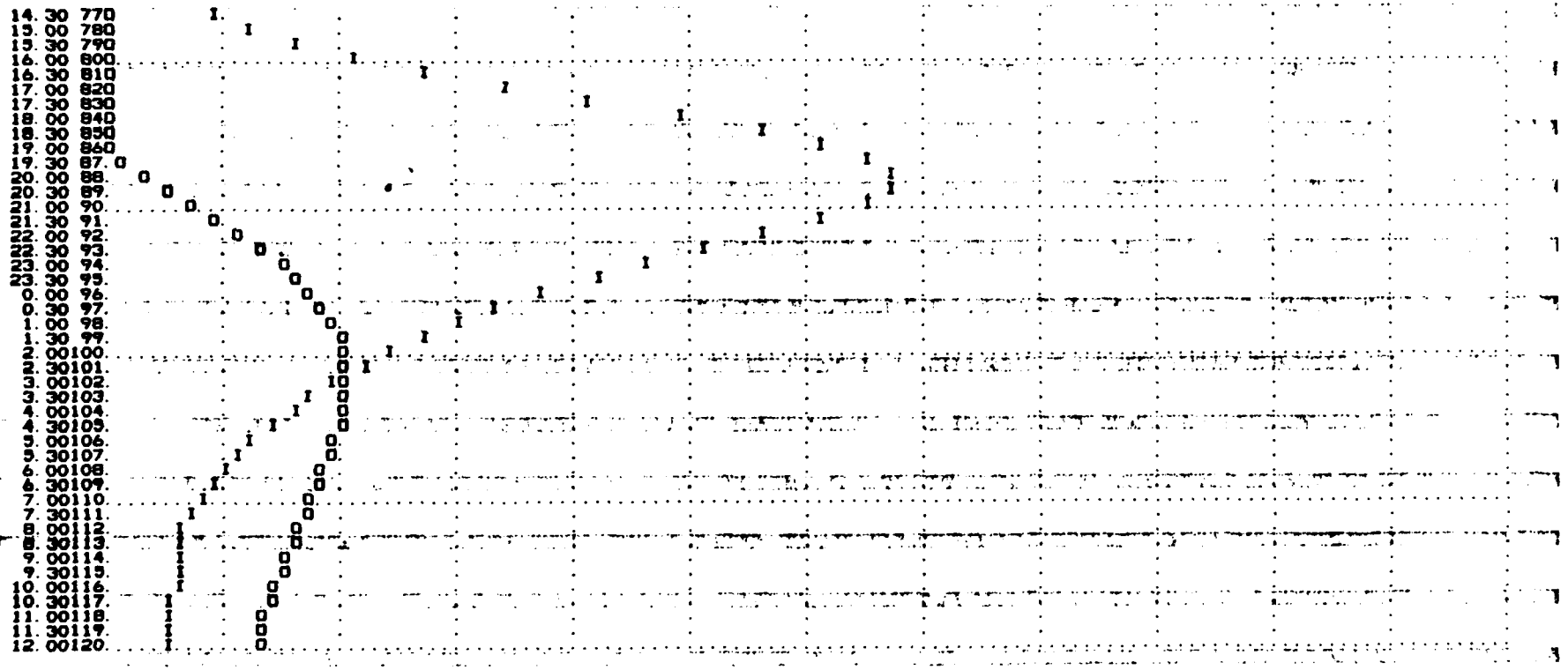
OVF

STATION 1

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

	0.	1000	2000	3000	4000	5000	6000	7000	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	13												
7.00	14												
7.30	15												
8.00	16.												
8.30	171												
9.00	181												


9:30 19
10:00 20
10:30 21
11:00 22
11:30 23
12:00 24
12:30 25
13:00 26
13:30 27
14:00 28
14:30 29
15:00 30
15:30 31
16:00 32
16:30 33
17:00 34
17:30 35
18:00 36
18:30 370
19:00 380
19:30 390
20:00 400
20:30 410
21:00 420
21:30 430
22:00 440
22:30 450
23:00 460
23:30 470
0:00 480
0:30 490
1:00 50
1:30 51
2:00 52
2:30 53
3:00 54
3:30 55
4:00 56
4:30 57
5:00 58
5:30 59
6:00 60
6:30 61
7:00 62
7:30 63
8:00 640
8:30 650
9:00 660
9:30 670
10:00 680
10:30 690
11:00 700
11:30 710
12:00 720
12:30 730
13:00 740
13:30 750
14:00 760



OVN

STATION 1, PLAN 1, RATIO 3

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.	8.	118.	275.	480.	696.
915.	1136.	1328.	1506.	1659.	1790.	1891.	1970.	2026.	2060.
2075.	2076.	2063.	2039.	2006.	1965.	1918.	1868.	1816.	1761.
1703.	1646.	1594.	1544.	1495.	1448.	1404.	1361.	1322.	1285.

STORAGE

0.	1.	1.	2.	2.	2.	3.	3.	3.	4.
4.	4.	5.	5.	5.	6.	6.	6.	6.	6.
7.	7.	7.	7.	7.	7.	8.	8.	8.	8.
8.	8.	9.	9.	10.	11.	13.	16.	19.	22.
26.	30.	34.	37.	41.	44.	47.	50.	52.	54.
56.	57.	59.	60.	62.	63.	64.	66.	67.	68.
70.	71.	73.	75.	78.	82.	88.	94.	103.	113.
124.	137.	152.	169.	190.	216.	250.	294.	353.	429.
528.	655.	813.	1002.	1220.	1465.	1726.	1993.	2258.	2509.
2739.	2942.	3116.	3262.	3381.	3475.	3547.	3600.	3637.	3659.
3670.	3670.	3662.	3646.	3624.	3597.	3565.	3530.	3493.	3454.
3413.	3372.	3331.	3292.	3254.	3217.	3180.	3145.	3110.	3076.

STAGE

1886.1	1886.2	1886.2	1886.3	1886.4	1886.4	1886.5	1886.5	1886.6	1886.7
1886.7	1886.8	1886.8	1886.9	1886.9	1886.9	1887.0	1887.0	1887.1	1887.1
1887.1	1887.2	1887.2	1887.2	1887.3	1887.3	1887.3	1887.3	1887.4	1887.4
1887.4	1887.5	1887.5	1887.6	1887.7	1888.0	1888.3	1888.7	1889.3	1889.8
1890.1	1890.3	1890.5	1890.6	1890.8	1890.9	1891.0	1891.2	1891.3	1891.3
1891.4	1891.5	1891.6	1891.6	1891.7	1891.7	1891.8	1891.9	1891.9	1892.0
1892.0	1892.0	1892.0	1892.1	1892.1	1892.1	1892.2	1892.2	1892.3	1892.4
1892.5	1892.7	1892.8	1893.0	1893.2	1893.4	1893.8	1894.1	1894.3	1894.6
1895.0	1895.6	1896.2	1896.7	1897.3	1898.0	1898.7	1899.3	1899.8	1900.3
1900.9	1901.4	1901.8	1902.1	1902.3	1902.5	1902.7	1902.8	1902.9	1902.9
1902.9	1902.9	1902.9	1902.9	1902.8	1902.8	1902.7	1902.6	1902.6	1902.5
1902.4	1902.3	1902.2	1902.1	1902.1	1902.0	1901.9	1901.8	1901.7	1901.7

PEAK OUTFLOW IS 2076. AT TIME 51.00 HOURS

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	2076.	1993.	1079.	430.	91602.
CMS	59.	56.	30.	12.	1461.
INCHES		2.29	4.94	4.94	4.94
MM		58.21	125.59	125.59	125.59
AC-FT		988.	2132.	2132.	2132.
THOUS CU M		1219.	2630.	2630.	2630.

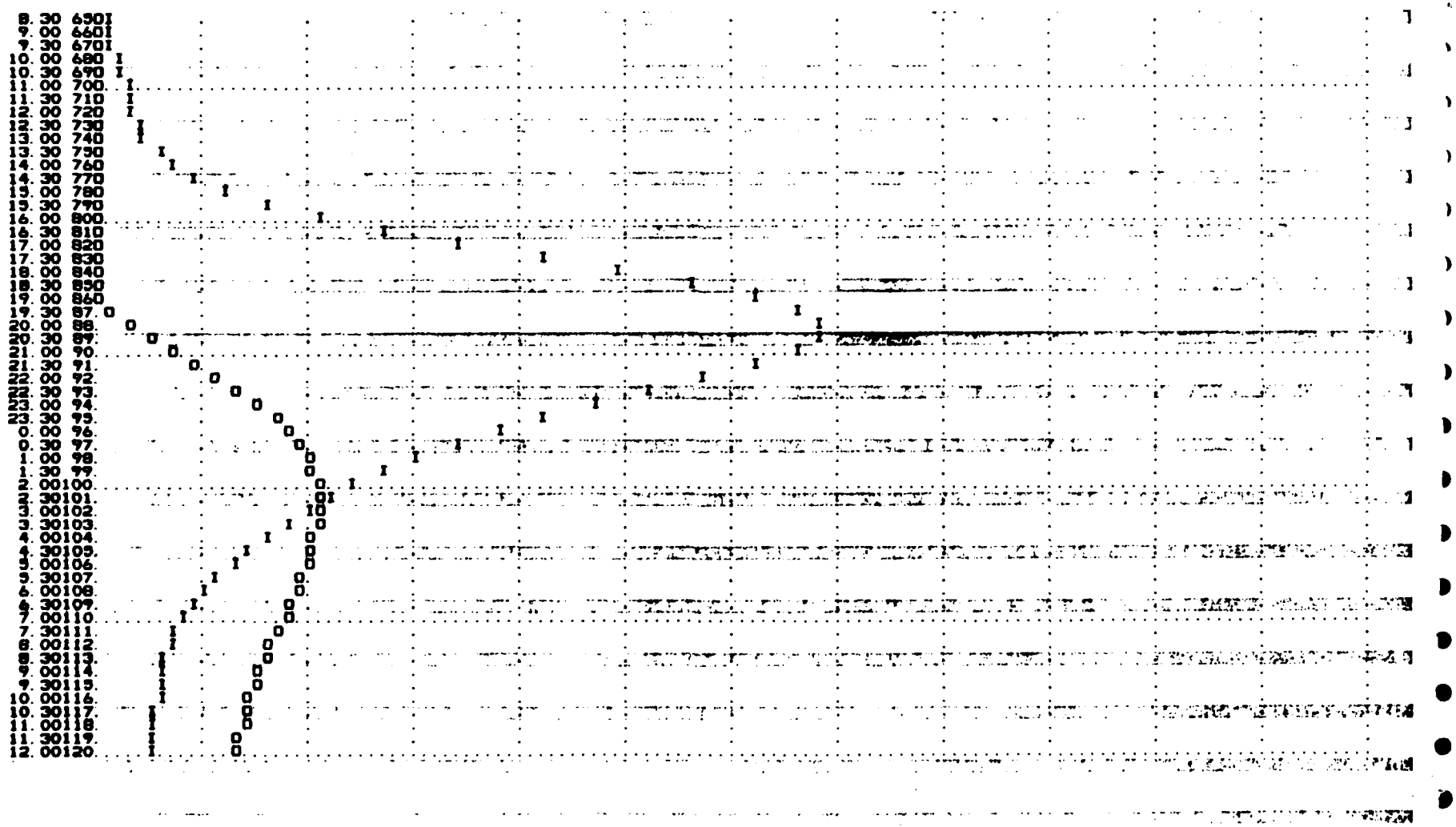
#OVF#

STATION I

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

		0.	1000.	2000.	3000.	4000.	5000.	6000.	7000.	0.	0.	0.	0.	0.
0.30	1I	.	.	.	.	.	.	.	.	.	.	.	.	.
1.00	2I	.	.	.	.	.	.	.	.	.	.	.	.	.
1.30	3I	.	.	.	.	.	.	.	.	.	.	.	.	.
2.00	4I	.	.	.	.	.	.	.	.	.	.	.	.	.
2.30	5I	.	.	.	.	.	.	.	.	.	.	.	.	.
3.00	6I	.	.	.	.	.	.	.	.	.	.	.	.	.

3.30 7I
4.00 8I
4.30 9I
5.00 10I
5.30 11I
6.00 12I
6.30 13I
7.00 14I
7.30 15I
8.00 16I
8.30 17I
9.00 18I
9.30 19I
10.00 20I
10.30 21I
11.00 22I
11.30 23I
12.00 24I
12.30 25I
13.00 26I
13.30 27I
14.00 28I
14.30 29I
15.00 30I
15.30 31I
16.00 32I
16.30 33I
17.00 34I
17.30 35I
18.00 36I
18.30 370I
19.00 380I
19.30 390I
20.00 400I
20.30 410I
21.00 420I
21.30 430I
22.00 440I
22.30 450I
23.00 460I
23.30 470I
0.00 480I
0.30 490I
1.00 50I
1.30 51I
2.00 52I
2.30 53I
3.00 54I
3.30 55I
4.00 56I
4.30 57I
5.00 58I
5.30 59I
6.00 60I
6.30 61I
7.00 62I
7.30 63I
8.00 640I


8:30 650
9:00 660
9:30 670
10:00 680
10:30 690
11:00 700
11:30 710
12:00 720
12:30 730
13:00 740
13:30 750
14:00 760
14:30 770
15:00 780
15:30 790
16:00 800
16:30 810
17:00 820
17:30 830
18:00 840
18:30 850
19:00 860
19:30 870
20:00 880
20:30 890
21:00 900
21:30 910
22:00 920
22:30 930
23:00 940
23:30 950
0:00 960
0:30 970
1:00 980
1:30 990
2:00 1000
2:30 1010
3:00 1020
3:30 1030
4:00 1040
4:30 1090
5:00 1060
5:30 1070
6:00 1080
6:30 1090
7:00 1100
7:30 1110
8:00 1120
8:30 1130
9:00 1140
9:30 1190
10:00 1160
10:30 1170
11:00 1180
11:30 1190
12:00 1200

OVN

STATION 1, PLAN 1, RATIO 4

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.	17.	129.	297.	504.	726.
953.	1179.	1375.	1557.	1716.	1848.	1952.	2031.	2089.	2118.
2132.	2131.	2116.	2090.	2055.	2012.	1963.	1909.	1855.	1798.
1740.	1680.	1624.	1573.	1523.	1475.	1429.	1385.	1343.	1305.

STORAGE

0.	1.	1.	2.	2.	2.	3.	3.	4.	4.
4.	4.	5.	5.	5.	5.	6.	6.	6.	6.
7.	7.	7.	7.	7.	8.	8.	8.	8.	8.
8.	8.	9.	9.	10.	12.	13.	16.	19.	22.
26.	30.	34.	38.	42.	45.	48.	50.	53.	55.
57.	58.	60.	61.	63.	64.	65.	67.	68.	70.
71.	72.	74.	77.	80.	84.	89.	96.	104.	114.
126.	139.	154.	172.	193.	219.	254.	299.	358.	435.
535.	665.	825.	1016.	1238.	1486.	1750.	2021.	2289.	2543.
2775.	2980.	3156.	3303.	3422.	3516.	3588.	3640.	3676.	3698.
3707.	3706.	3697.	3680.	3656.	3628.	3596.	3560.	3521.	3481.
3439.	3397.	3355.	3319.	3276.	3238.	3201.	3165.	3130.	3095.

STAGE

1886.1	1886.2	1886.2	1886.3	1886.4	1886.4	1886.5	1886.6	1886.6	1886.7
1886.7	1886.8	1886.8	1886.9	1886.9	1887.0	1887.0	1887.1	1887.1	1887.1
1887.2	1887.2	1887.2	1887.3	1887.3	1887.3	1887.3	1887.4	1887.4	1887.4
1887.4	1887.5	1887.5	1887.6	1887.8	1888.0	1888.3	1888.8	1889.3	1889.9
1890.1	1890.3	1890.5	1890.7	1890.8	1890.9	1891.1	1891.2	1891.3	1891.4
1891.5	1891.5	1891.6	1891.7	1891.7	1891.8	1891.8	1891.9	1892.0	1892.0
1892.0	1892.0	1892.1	1892.1	1892.1	1892.1	1892.2	1892.3	1892.3	1892.4
1892.6	1892.7	1892.8	1893.0	1893.2	1893.5	1893.8	1894.1	1894.3	1894.7
1895.1	1895.6	1896.2	1896.8	1897.4	1898.1	1898.7	1899.4	1900.0	1900.5
1901.0	1901.5	1901.8	1902.2	1902.4	1902.6	1902.8	1902.9	1903.0	1903.0
1903.0	1903.0	1903.0	1903.0	1902.9	1902.9	1902.8	1902.7	1902.6	1902.5
1902.4	1902.4	1902.3	1902.2	1902.1	1902.0	1901.9	1901.9	1901.8	1901.7

PEAK OUTFLOW IS 2132. AT TIME 50.50 HOURS

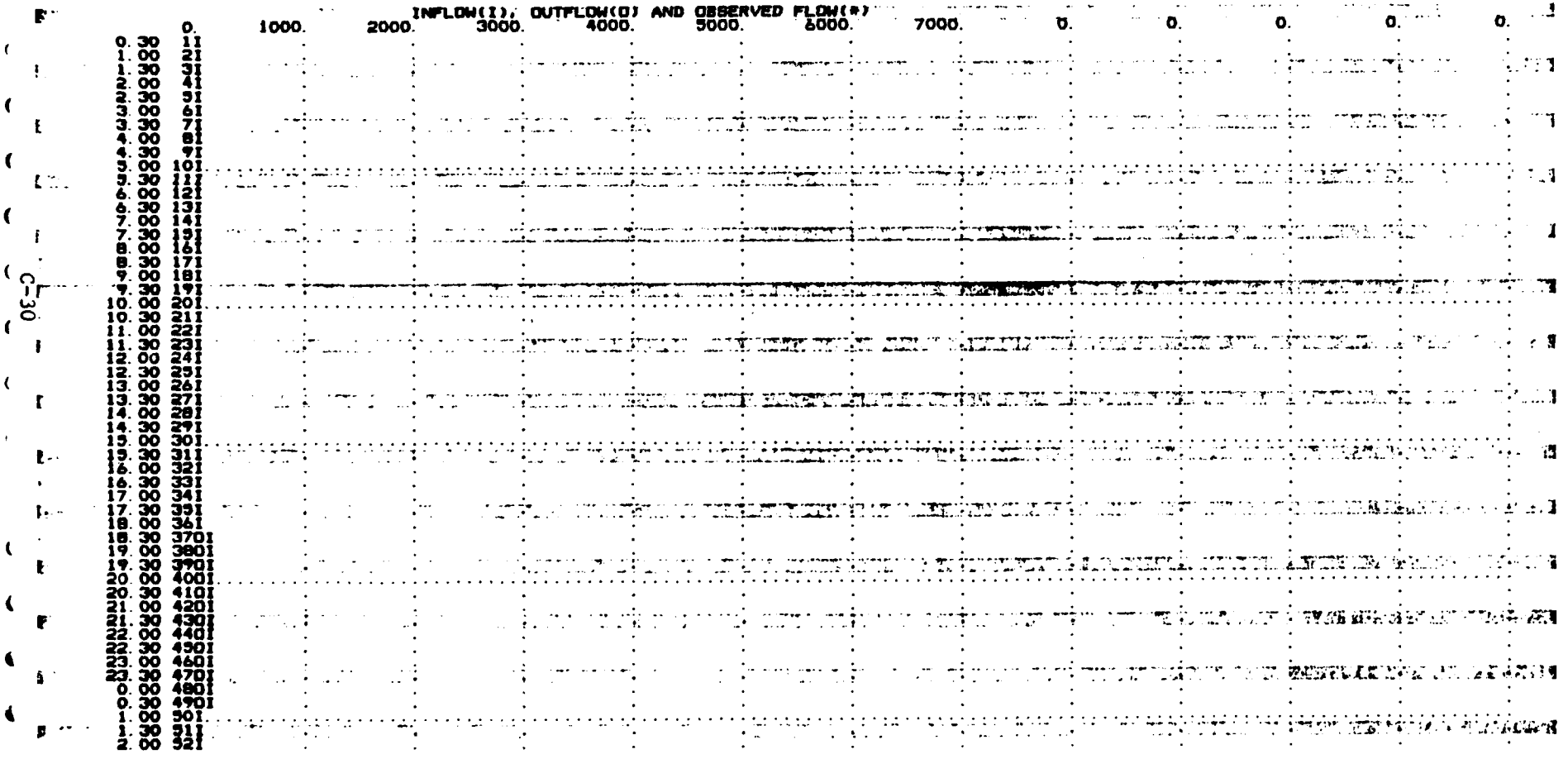
	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	2132.	2047.	1104.	441.	52974.
CMS	60.	58.	31.	13.	1500.
INCHES		2.39	5.08	5.08	5.08
MM		59.79	128.93	128.93	128.93
AC-FT		1015.	2189.	2189.	2189.
THOUS CU M		1252.	2700.	2700.	2700.

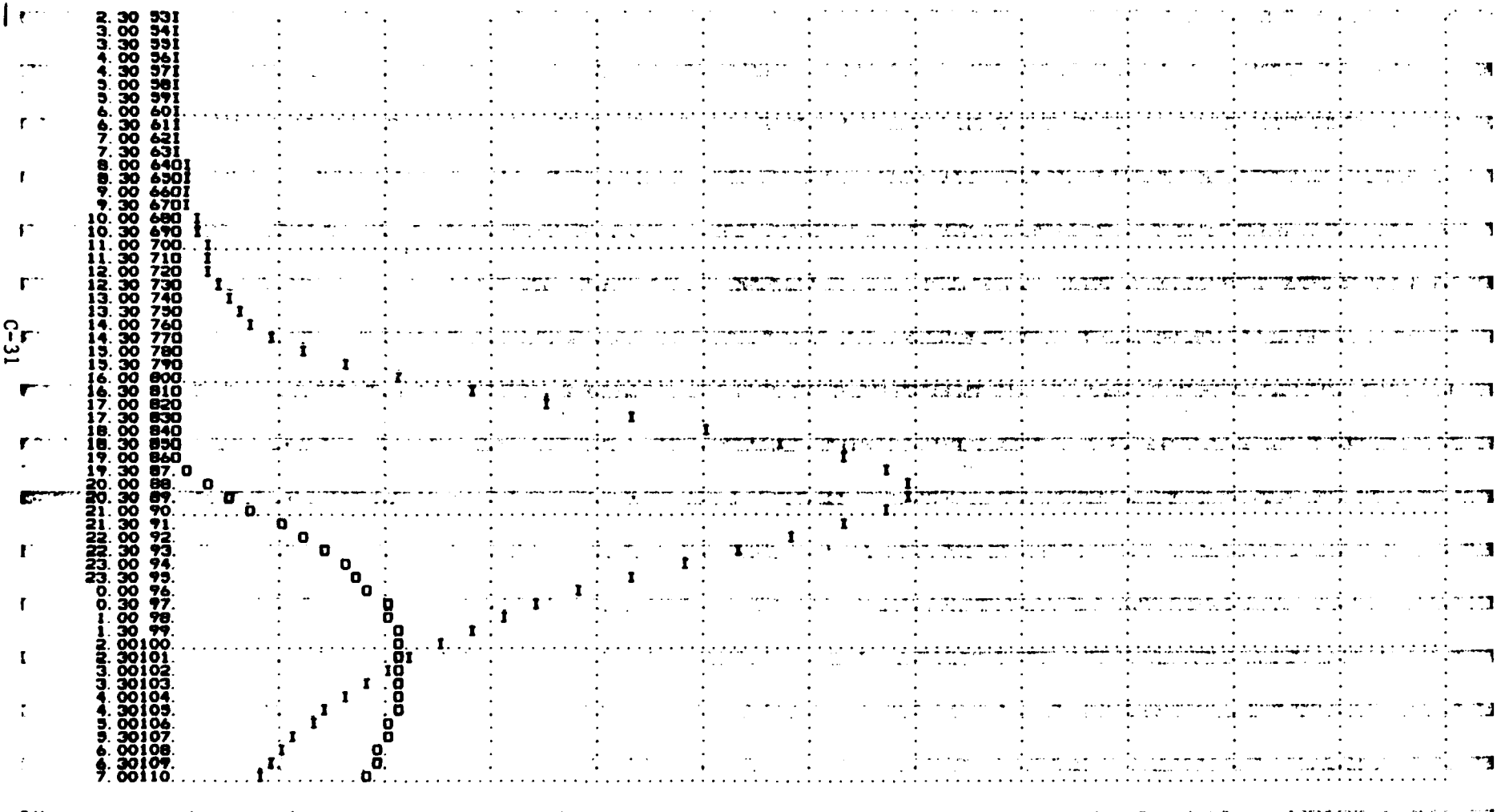
C-29

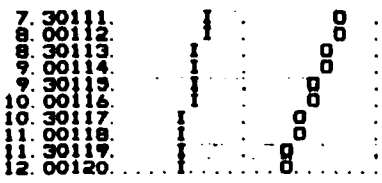
OVF

STATION 1

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




2.30 531
3.00 541
3.30 551
4.00 561
4.30 571
5.00 581
5.30 591
6.00 601
6.30 611
7.00 621
7.30 631
8.00 6401
8.30 6501
9.00 6601
9.30 6701
10.00 680
10.30 690
11.00 700
11.30 710
12.00 720
12.30 730
13.00 740
13.30 750
14.00 760
14.30 770
15.00 780
15.30 790
16.00 800
16.30 810
17.00 820
17.30 830
18.00 840
18.30 850
19.00 860
19.30 87.
20.00 88.
20.30 89.
21.00 90.
21.30 91.
22.00 92.
22.30 93.
23.00 94.
23.30 95.
0.00 96.
0.30 97.
1.00 98.
1.30 99.
2.00100.
2.30101.
3.00102.
3.30103.
4.00104.
4.30105.
5.00106.
5.30107.
6.00108.
6.30109.
7.00110.



OVN

STATION 1, PLAN 1, RATIO 5

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.	26.	139.	318.	930.	735.
992.	1220.	1422.	1608.	1773.	1905.	2012.	2090.	2145.	2177.
2190.	2187.	2170.	2142.	2104.	2060.	2009.	1953.	1894.	1836.
1776.	1715.	1656.	1602.	1551.	1502.	1454.	1409.	1366.	1326.

STORAGE

0.	1.	1.	2.	2.	3.	3.	3.	4.	4.
4.	4.	5.	5.	5.	6.	6.	6.	6.	6.
7.	7.	7.	7.	7.	8.	8.	8.	8.	8.
8.	9.	9.	9.	10.	12.	14.	16.	19.	23.
27.	31.	35.	39.	42.	45.	48.	51.	53.	55.
57.	59.	61.	62.	64.	65.	66.	68.	69.	70.
72.	73.	75.	77.	80.	85.	90.	97.	106.	116.
128.	141.	156.	174.	195.	222.	257.	303.	363.	441.
543.	674.	836.	1031.	1256.	1507.	1775.	2049.	2319.	2576.
2811.	3018.	3195.	3343.	3462.	3556.	3628.	3680.	3715.	3736.
3744.	3742.	3732.	3713.	3689.	3659.	3626.	3589.	3549.	3507.
3464.	3421.	3379.	3338.	3298.	3259.	3221.	3185.	3149.	3114.

STAGE

1886.1	1886.2	1886.2	1886.3	1886.4	1886.4	1886.5	1886.6	1886.6	1886.7
1886.7	1886.8	1886.8	1886.9	1886.9	1887.0	1887.0	1887.1	1887.1	1887.1
1887.2	1887.2	1887.2	1887.3	1887.3	1887.3	1887.4	1887.4	1887.4	1887.4
1887.5	1887.5	1887.5	1887.6	1887.8	1888.0	1888.4	1888.8	1889.3	1890.0
1890.8	1890.3	1890.5	1890.7	1890.8	1891.0	1891.1	1891.2	1891.3	1891.4
1891.5	1891.6	1891.6	1891.7	1891.8	1891.8	1891.9	1891.9	1892.0	1892.0
1892.0	1892.0	1892.1	1892.1	1892.1	1892.2	1892.2	1892.3	1892.4	1892.5
1892.6	1892.7	1892.8	1893.0	1893.2	1893.5	1893.8	1894.1	1894.4	1894.7
1895.1	1895.7	1896.2	1896.8	1897.4	1898.1	1898.8	1899.4	1900.1	1900.8
1901.1	1901.5	1901.9	1902.2	1902.5	1902.7	1902.9	1903.0	1903.0	1903.1

1903.1 1903.1 1903.1 1903.0 1903.0 1902.9 1902.9 1902.8 1902.7 1902.6
1902.5 1902.4 1902.3 1902.2 1902.1 1902.1 1902.0 1901.9 1901.8 1901.8

PEAK OUTFLOW IS 2190. AT TIME 50.50 HOURS

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	2190.	2101.	1132.	453.	54348.
CMS	62.	59.	32.	13.	1539.
INCHES		2.42	5.21	5.21	5.21
MM		61.37	132.28	132.28	132.28
AC-FT		1042.	2246.	2246.	2246.
THOUS CU M		1285.	2770.	2770.	2770.

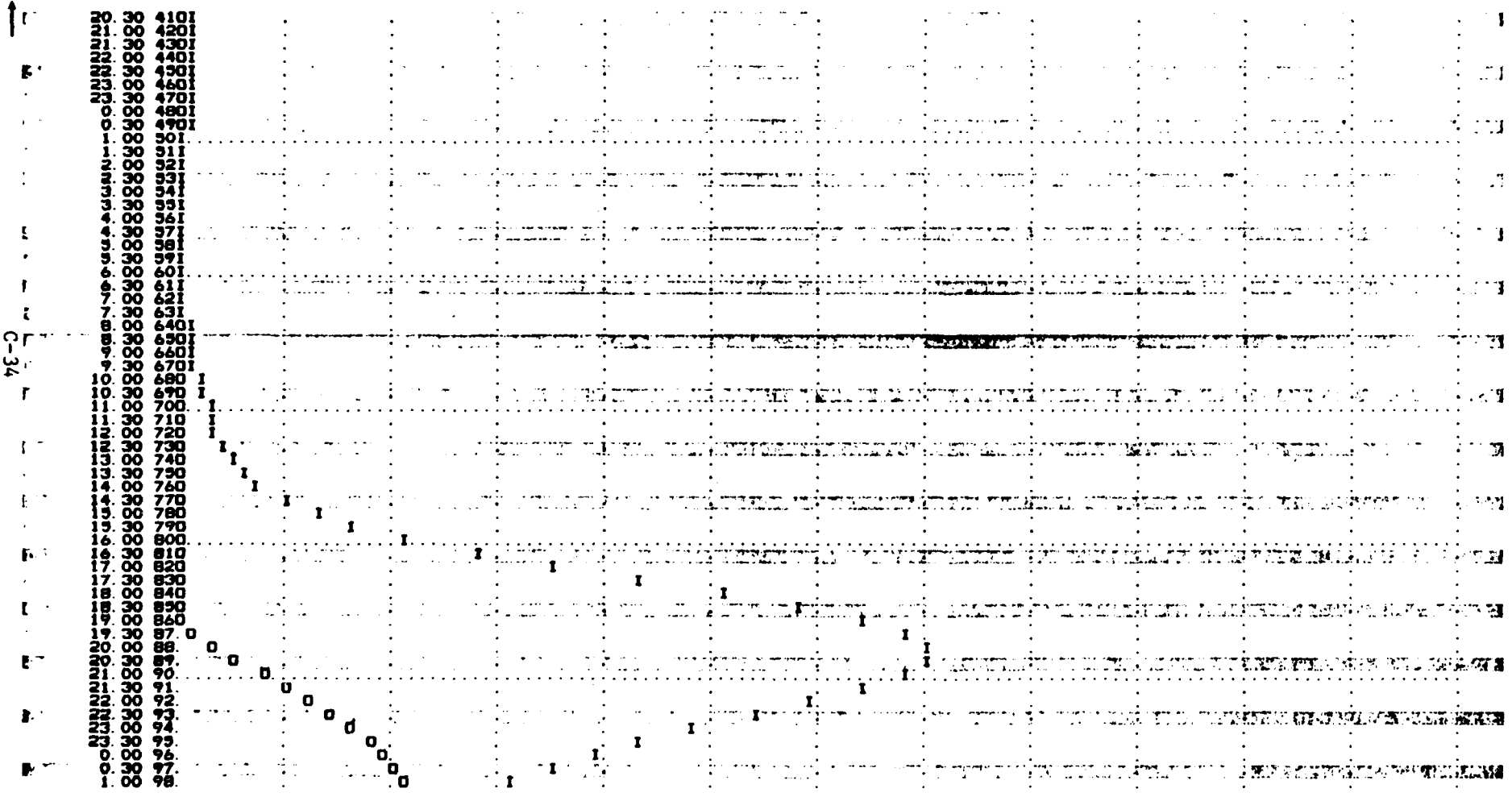
OVF

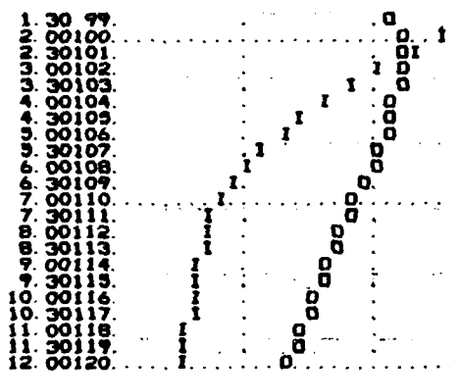
STATION 1

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

0. 1000. 2000. 3000. 4000. 5000. 6000. 7000. 0. 0. 0. 0. 0.

0.30 11I
1.00 21I
1.30 31I
2.00 41I
2.30 51I
3.00 61I
3.30 71I
4.00 81I
4.30 91I
5.00 101I
5.30 111I
6.00 121I
6.30 131I
7.00 141I
7.30 151I
8.00 161I
8.30 171I
9.00 181I
9.30 191I
10.00 201I
10.30 211I
11.00 221I
11.30 231I
12.00 241I
12.30 251I
13.00 261I
13.30 271I
14.00 281I
14.30 291I
15.00 301I
15.30 311I
16.00 321I
16.30 331I
17.00 341I
17.30 351I
18.00 361I
18.30 3701I
19.00 3801I
19.30 3901I
20.00 4001I


20.30 4101
21.00 4201
21.30 4301
22.00 4401
22.30 4501
23.00 4601
23.30 4701
0.00 4801
0.30 4901
1.00 501
1.30 511
2.00 521
2.30 531
3.00 541
3.30 551
4.00 561
4.30 571
5.00 581
5.30 591
6.00 601
6.30 611
7.00 621
7.30 631
8.00 6401
8.30 6501
9.00 6601
9.30 6701
10.00 680
10.30 690
11.00 700
11.30 710
12.00 720
12.30 730
13.00 740
13.30 750
14.00 760
14.30 770
15.00 780
15.30 790
16.00 800
16.30 810
17.00 820
17.30 830
18.00 840
18.30 850
19.00 860
19.30 87
20.00 88
20.30 89
21.00 90
21.30 91
22.00 92
22.30 93
23.00 94
23.30 95
0.00 96
0.30 97
1.00 98



OVN

STATION 1, PLAN 1, RATIO 6

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.	35.	150.	339.	557.	788.
1032.	1262.	1470.	1662.	1830.	1966.	2073.	2152.	2209.	2250.
2265.	2257.	2230.	2191.	2151.	2103.	2051.	1993.	1932.	1870.
1809.	1747.	1686.	1629.	1577.	1527.	1478.	1431.	1387.	1344.

STORAGE

0.	1.	1.	2.	2.	3.	3.	3.	4.	4.
4.	5.	5.	5.	5.	6.	6.	6.	6.	7.
7.	7.	7.	7.	8.	8.	8.	8.	8.	8.
9.	9.	9.	10.	10.	12.	14.	16.	20.	23.
27.	31.	35.	39.	43.	46.	49.	52.	54.	56.
58.	60.	62.	63.	64.	66.	67.	69.	70.	71.
73.	74.	76.	77.	82.	86.	91.	99.	107.	118.
130.	143.	159.	176.	198.	225.	261.	307.	368.	447.
551.	683.	848.	1045.	1274.	1528.	1799.	2077.	2350.	2610.
2847.	3056.	3235.	3383.	3503.	3597.	3668.	3720.	3754.	3773.
3780.	3777.	3764.	3748.	3719.	3688.	3654.	3619.	3579.	3532.
3488.	3444.	3401.	3359.	3318.	3279.	3240.	3203.	3166.	3131.

STAGE

1886.1	1886.2	1886.2	1886.3	1886.4	1886.4	1886.5	1886.6	1886.6	1886.7
1886.7	1886.8	1886.8	1886.9	1886.9	1887.0	1887.0	1887.1	1887.1	1887.1
1887.2	1887.2	1887.3	1887.3	1887.3	1887.3	1887.4	1887.4	1887.4	1887.5
1887.5	1887.5	1887.6	1887.7	1887.8	1888.1	1888.4	1888.9	1889.4	1890.0
1890.2	1890.4	1890.5	1890.7	1890.9	1891.0	1891.1	1891.3	1891.4	1891.4
1891.5	1891.6	1891.7	1891.7	1891.8	1891.9	1891.9	1892.0	1892.0	1892.0
1892.0	1892.1	1892.1	1892.1	1892.1	1892.2	1892.2	1892.3	1892.4	1892.5
1892.6	1892.7	1892.9	1893.0	1893.2	1893.5	1893.9	1894.1	1894.4	1894.7
1895.1	1895.7	1896.3	1896.8	1897.5	1898.2	1898.8	1899.5	1900.1	1900.7
1901.2	1901.6	1902.0	1902.3	1902.6	1902.8	1902.9	1903.1	1903.1	1903.2
1903.2	1903.2	1903.1	1903.1	1903.1	1903.0	1902.9	1902.8	1902.7	1902.7
1902.6	1902.5	1902.4	1902.3	1902.2	1902.1	1902.0	1901.9	1901.9	1901.8

PEAK OUTFLOW IS 2265. AT TIME 50.50 HOURS

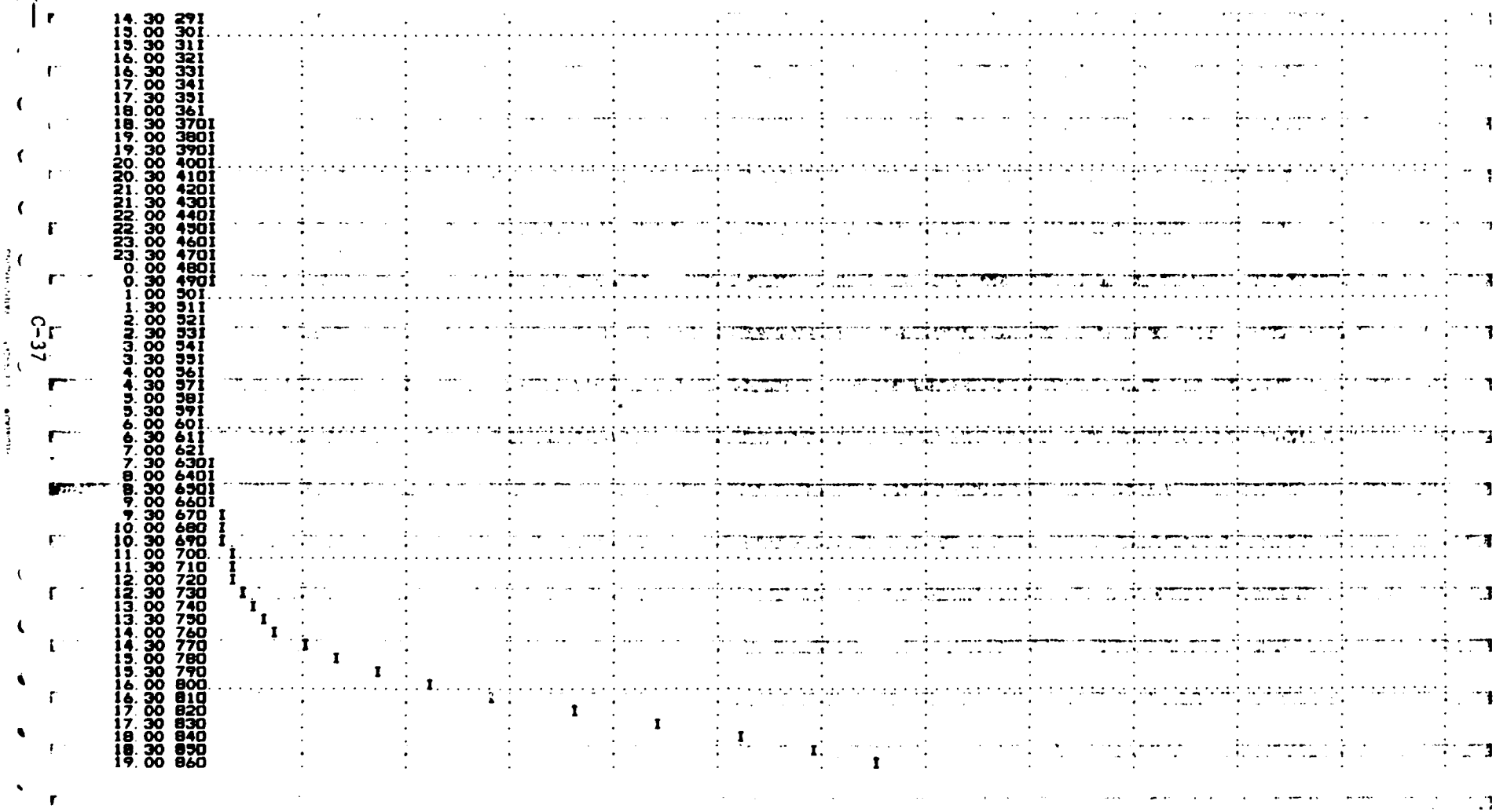
	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	2265.	2159.	1162.	465.	55762.
CMS	64.	61.	33.	13.	1579.
INCHES		2.48	5.34	5.34	5.34
MM		63.06	135.72	135.72	135.72
AC-FT		1071.	2304.	2304.	2304.
THOUS CU M		1321.	2842.	2842.	2842.

OVF

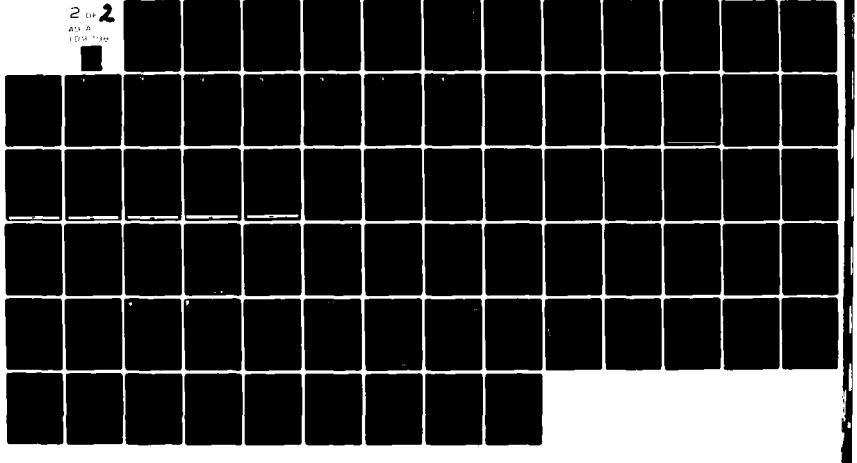
STATION 1

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

	0.	1000.	2000.	3000.	4000.	5000.	6000.	7000.	8000.	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												

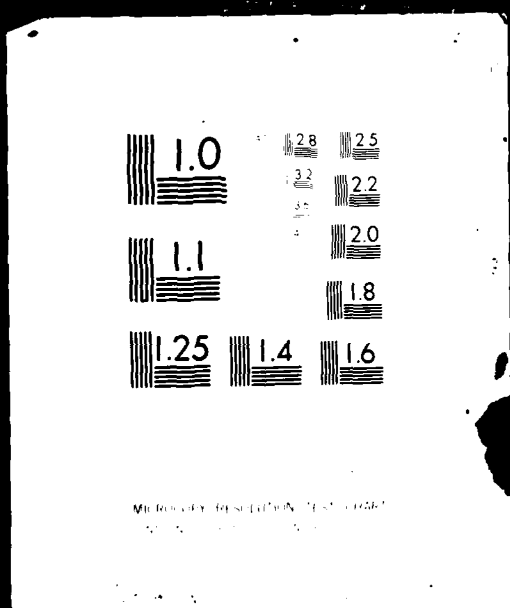

14.30 291
15.00 301
15.30 311
16.00 321
16.30 331
17.00 341
17.30 351
18.00 361
18.30 3701
19.00 3801
19.30 3901
20.00 4001
20.30 4101
21.00 4201
21.30 4301
22.00 4401
22.30 4501
23.00 4601
23.30 4701
0.00 4801
0.30 4901
1.00 501
1.30 511
2.00 521
2.30 531
3.00 541
3.30 551
4.00 561
4.30 571
5.00 581
5.30 591
6.00 601
6.30 611
7.00 621
7.30 6301
8.00 6401
8.30 6501
9.00 6601
9.30 670
10.00 680
10.30 690
11.00 700
11.30 710
12.00 720
12.30 730
13.00 740
13.30 750
14.00 760
14.30 770
15.00 780
15.30 790
16.00 800
16.30 810
17.00 820
17.30 830
18.00 840
18.30 850
19.00 860

AD-A109 798 FLAHERTY-GIAVARA ASSOCIATES NEW HAVEN CT F/G 13/13
NATIONAL DAM SAFETY PROGRAM. WHETSTONE GULF STORAGE DAM (INVENT--ETC(U)
JUL 81 H C FLAHERTY DACW51-81-C-0006
UNCLASSIFIED NL



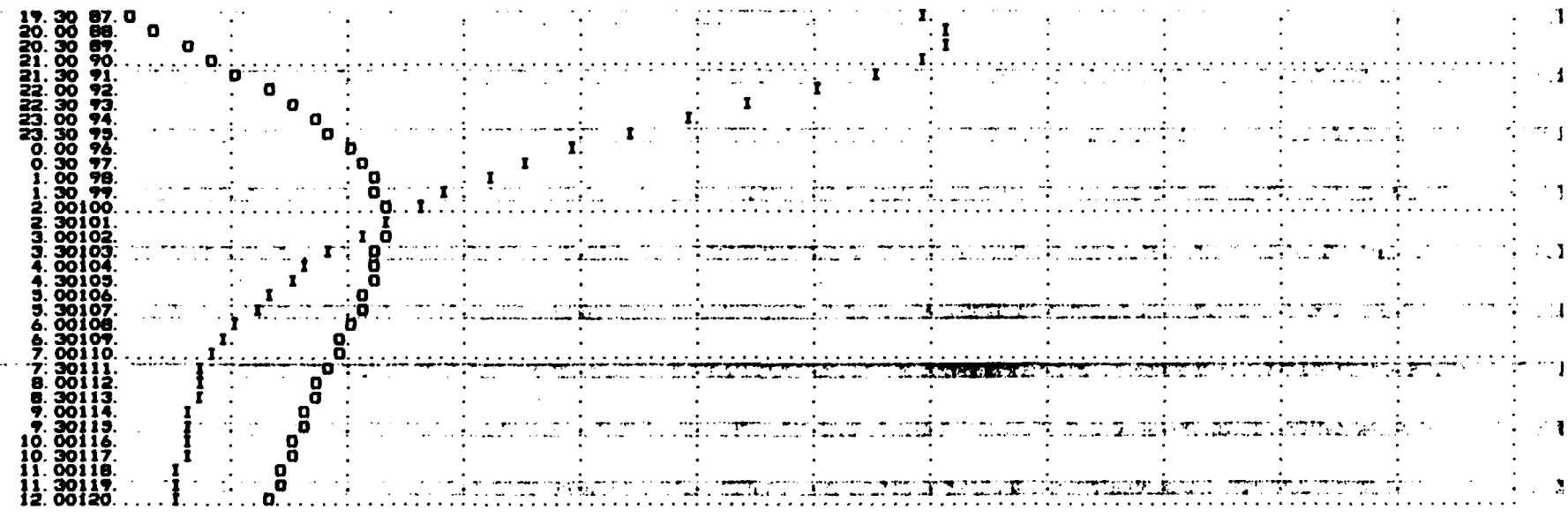
2 OF 2

AD A
109798



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

SHEET NO. 1 OF 7
BY ______ DATE 7/24/81
CHK'D. BY ______ DATE ______



OVN

STATION 1, PLAN 1, RATIO 7

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.	43.	160.	361.	584.	821.
1071.	1304.	1520.	1718.	1886.	2027.	2134.	2219.	2292.	2333.
2345.	2331.	2298.	2250.	2195.	2144.	2089.	2031.	1968.	1903.
1840.	1777.	1715.	1655.	1601.	1550.	1500.	1452.	1407.	1363.

STORAGE

0.	1.	1.	2.	2.	3.	3.	3.	4.	4.
4.	5.	5.	5.	5.	6.	6.	6.	6.	7.
7.	7.	7.	7.	8.	8.	8.	8.	8.	9.
9.	9.	9.	10.	11.	12.	14.	17.	20.	23.
27.	32.	36.	40.	43.	47.	50.	52.	55.	57.
59.	61.	62.	64.	65.	67.	68.	70.	71.	72.
74.	75.	77.	80.	83.	87.	93.	100.	109.	119.
131.	145.	161.	179.	201.	228.	264.	312.	373.	453.
556.	693.	860.	1060.	1295.	1549.	1824.	2105.	2381.	2643.
2883.	3094.	3274.	3423.	3544.	3638.	3708.	3759.	3792.	3809.
3814.	3809.	3794.	3773.	3747.	3715.	3679.	3640.	3599.	3555.
3510.	3465.	3421.	3379.	3337.	3297.	3258.	3220.	3183.	3147.

STAGE

1886.1	1886.2	1886.2	1886.3	1886.4	1886.4	1886.5	1886.6	1886.6	1886.7
1886.8	1886.8	1886.9	1886.9	1887.0	1887.0	1887.0	1887.1	1887.1	1887.2
1887.2	1887.2	1887.3	1887.3	1887.3	1887.4	1887.4	1887.4	1887.5	1887.5
1887.5	1887.5	1887.6	1887.7	1887.8	1888.1	1888.4	1888.9	1889.4	1890.0
1890.2	1890.4	1890.6	1890.7	1890.9	1891.0	1891.2	1891.3	1891.4	1891.5
1891.6	1891.6	1891.7	1891.8	1891.8	1891.9	1892.0	1892.0	1892.0	1892.0
1892.0	1892.1	1892.1	1892.1	1892.1	1892.2	1892.2	1892.3	1892.4	1892.5
1892.6	1892.7	1892.9	1893.1	1893.3	1893.5	1893.9	1894.1	1894.4	1894.7
1895.2	1895.7	1896.3	1896.9	1897.5	1898.2	1898.9	1899.5	1900.2	1900.7
1901.3	1901.7	1902.1	1902.4	1902.7	1902.9	1903.0	1903.1	1903.2	1903.2
1903.3	1903.2	1903.2	1903.2	1903.1	1903.0	1903.0	1902.9	1902.8	1902.7
1902.6	1902.5	1902.4	1902.3	1902.2	1902.1	1902.1	1902.0	1901.9	1901.8

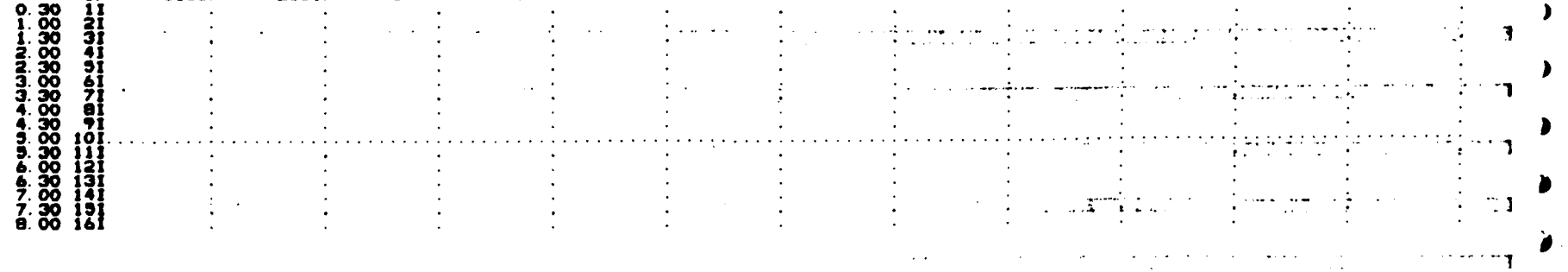
PEAK OUTFLOW IS 2345. AT TIME 50.50 HOURS

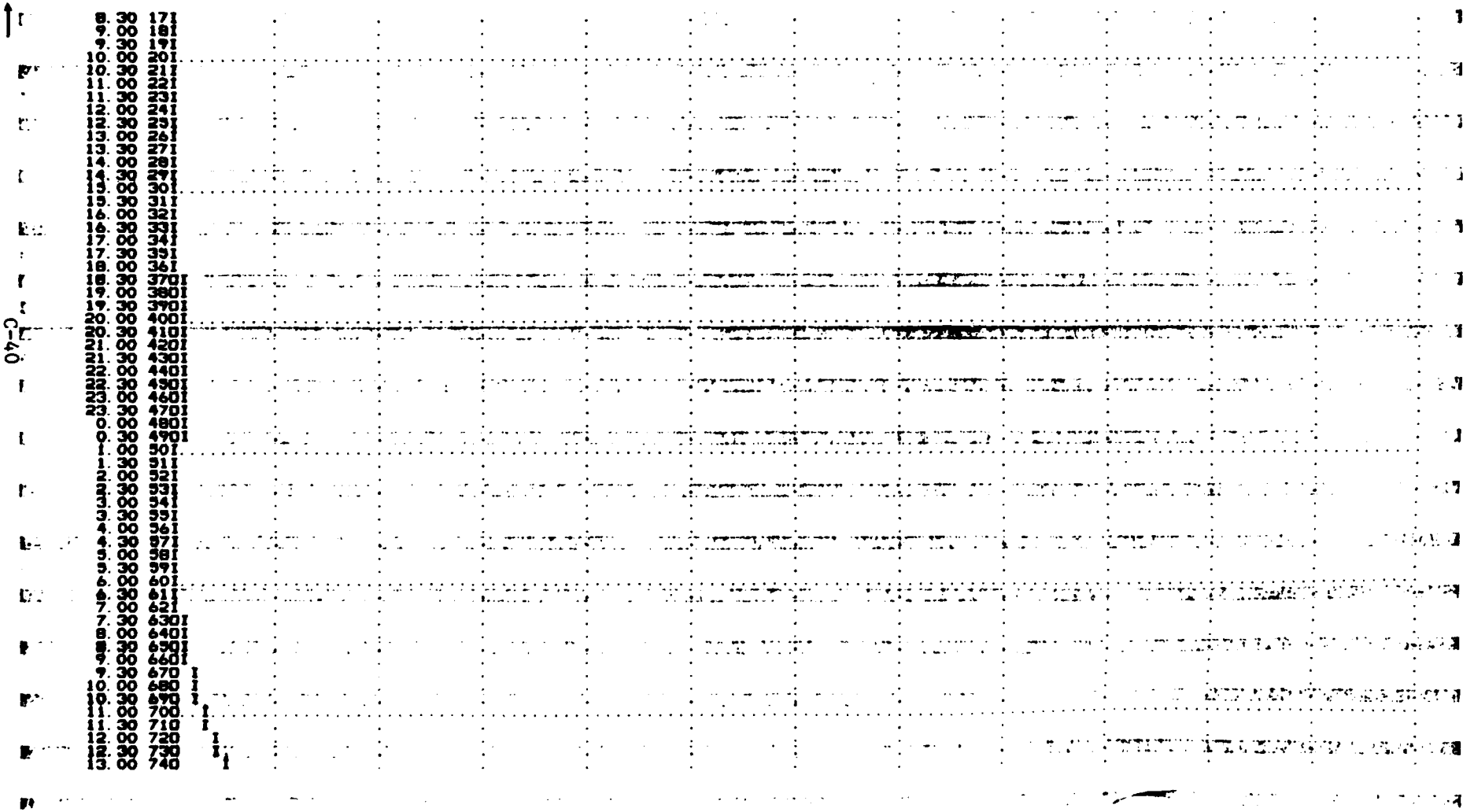
	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	2345.	2222.	1192.	477.	57206.
CMS	66.	63.	34.	13.	1620.
INCHES		2.93	5.48	5.48	5.48
MM		64.88	139.23	139.23	139.23
AC-FT		1102.	2364.	2364.	2364.
THOUS CU M		1359.	2916.	2916.	2916.

OVF

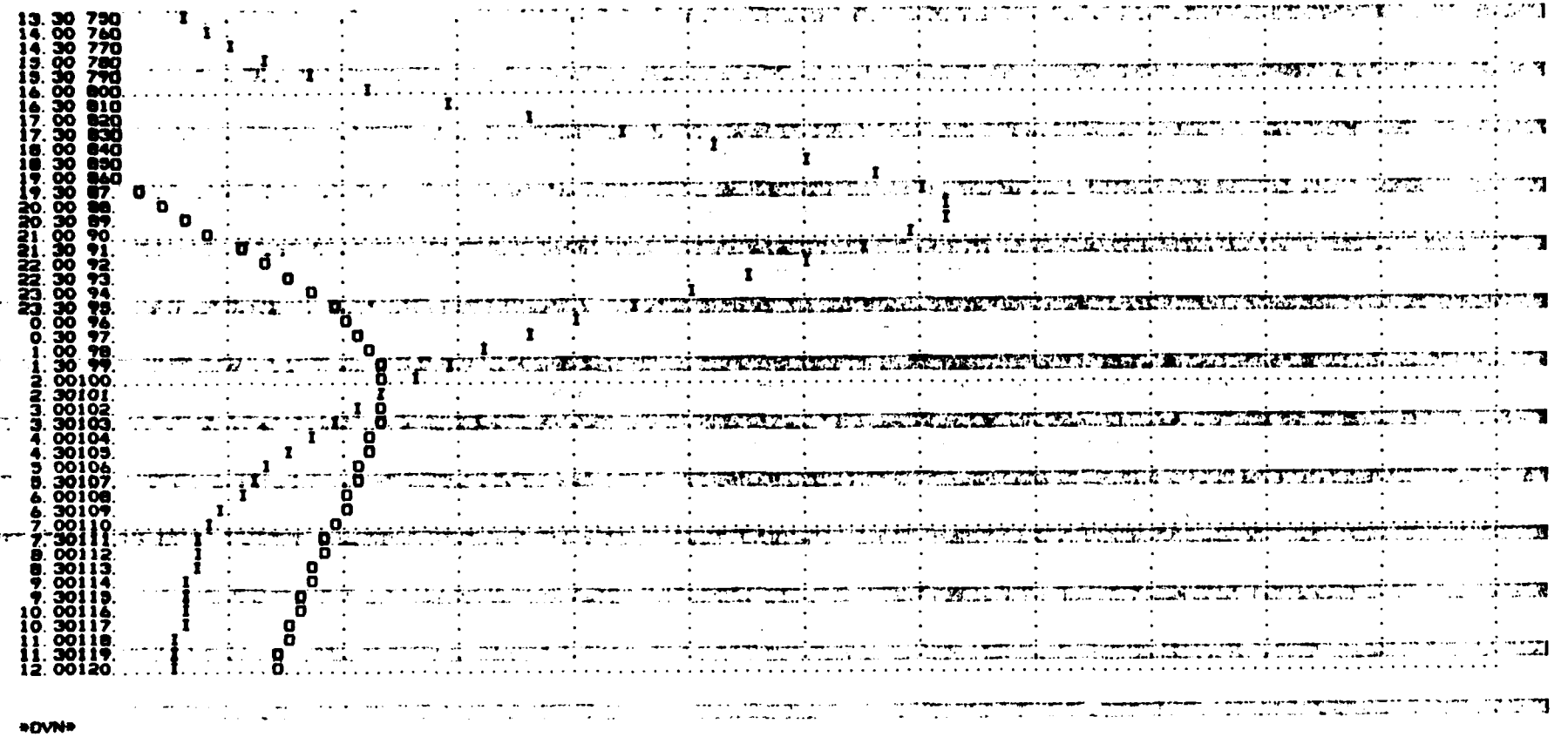
STATION 1

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




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 3701
19.00 3801
19.30 3901
20.00 4001
20.30 4101
21.00 4201
21.30 4301
22.00 4401
22.30 4501
23.00 4601
23.30 4701
0.00 4801
0.30 4901
1.00 501
1.30 511
2.00 521
2.30 531
3.00 541
3.30 551
4.00 561
4.30 971
5.00 581
5.30 591
6.00 601
6.30 611
7.00 621
7.30 6301
8.00 6401
8.30 6501
9.00 6601
9.30 670
10.00 680
10.30 690
11.00 700
11.30 710
12.00 720
12.30 730
13.00 740

C-40



»OVN»

STATION 1, PLAN 1, RATIO 8

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.	0.	0.
0.	0.	0.	0.	0.	92.	170.	383.	611.	855.
1111.	1345.	1570.	1774.	1946.	2087.	2197.	2305.	2381.	2420.
2427.	2408.	2367.	2311.	2247.	2182.	2129.	2069.	2001.	1934.
1868.	1804.	1741.	1681.	1624.	1572.	1521.	1472.	1426.	1382.

STORAGE

0.	1.	1.	2.	2.	3.	3.	3.	4.	4.
4.	5.	5.	5.	6.	6.	6.	6.	7.	7.
7.	7.	7.	8.	8.	8.	8.	8.	8.	9.
9.	9.	9.	10.	11.	12.	14.	17.	20.	24.
28.	32.	36.	40.	44.	47.	50.	53.	56.	58.
60.	62.	63.	65.	66.	68.	69.	70.	72.	73.
75.	76.	78.	81.	84.	88.	94.	101.	110.	121.
133.	147.	163.	181.	203.	231.	268.	316.	378.	460.
566.	702.	872.	1074.	1309.	1570.	1848.	2132.	2412.	2677.
2919.	3132.	3313.	3463.	3584.	3678.	3748.	3797.	3828.	3844.
3847.	3839.	3823.	3800.	3772.	3739.	3703.	3663.	3620.	3576.
3530.	3485.	3440.	3397.	3355.	3314.	3274.	3236.	3198.	3162.

STAGE

1886.1	1886.2	1886.2	1886.3	1886.4	1886.5	1886.5	1886.6	1886.6	1886.7
1886.8	1886.8	1886.9	1886.9	1887.0	1887.0	1887.1	1887.1	1887.1	1887.2
1887.2	1887.3	1887.3	1887.3	1887.4	1887.4	1887.4	1887.4	1887.5	1887.5
1887.5	1887.6	1887.6	1887.7	1887.9	1888.1	1888.5	1888.9	1889.5	1890.0
1890.2	1890.4	1890.6	1890.7	1890.9	1891.1	1891.2	1891.3	1891.4	1891.5
1891.6	1891.7	1891.8	1891.8	1891.9	1891.9	1892.0	1892.0	1892.0	1892.0
1892.1	1892.1	1892.1	1892.1	1892.1	1892.2	1892.2	1892.3	1892.4	1892.5
1892.6	1892.8	1892.9	1893.1	1893.3	1893.6	1893.9	1894.2	1894.4	1894.8
1895.2	1895.8	1896.3	1896.9	1897.6	1898.3	1898.9	1899.6	1900.2	1900.8
1901.3	1901.8	1902.2	1902.5	1902.8	1903.0	1903.1	1903.2	1903.3	1903.3
1903.3	1903.3	1903.3	1903.2	1903.2	1903.1	1903.0	1902.9	1902.8	1902.7
1902.6	1902.5	1902.5	1902.4	1902.3	1902.2	1902.1	1902.0	1901.9	1901.9

PEAK OUTFLOW IS 2427. AT TIME 50.50 HOURS

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	2427.	2287.	1222.	489.	58673.
CMS	69.	65.	35.	14.	1661.
INCHES		2.63	5.62	5.62	5.62
MM		66.80	142.80	142.80	142.80
AC-FT		1134.	2425.	2425.	2425.
THOUS CU M		1399.	2991.	2991.	2991.

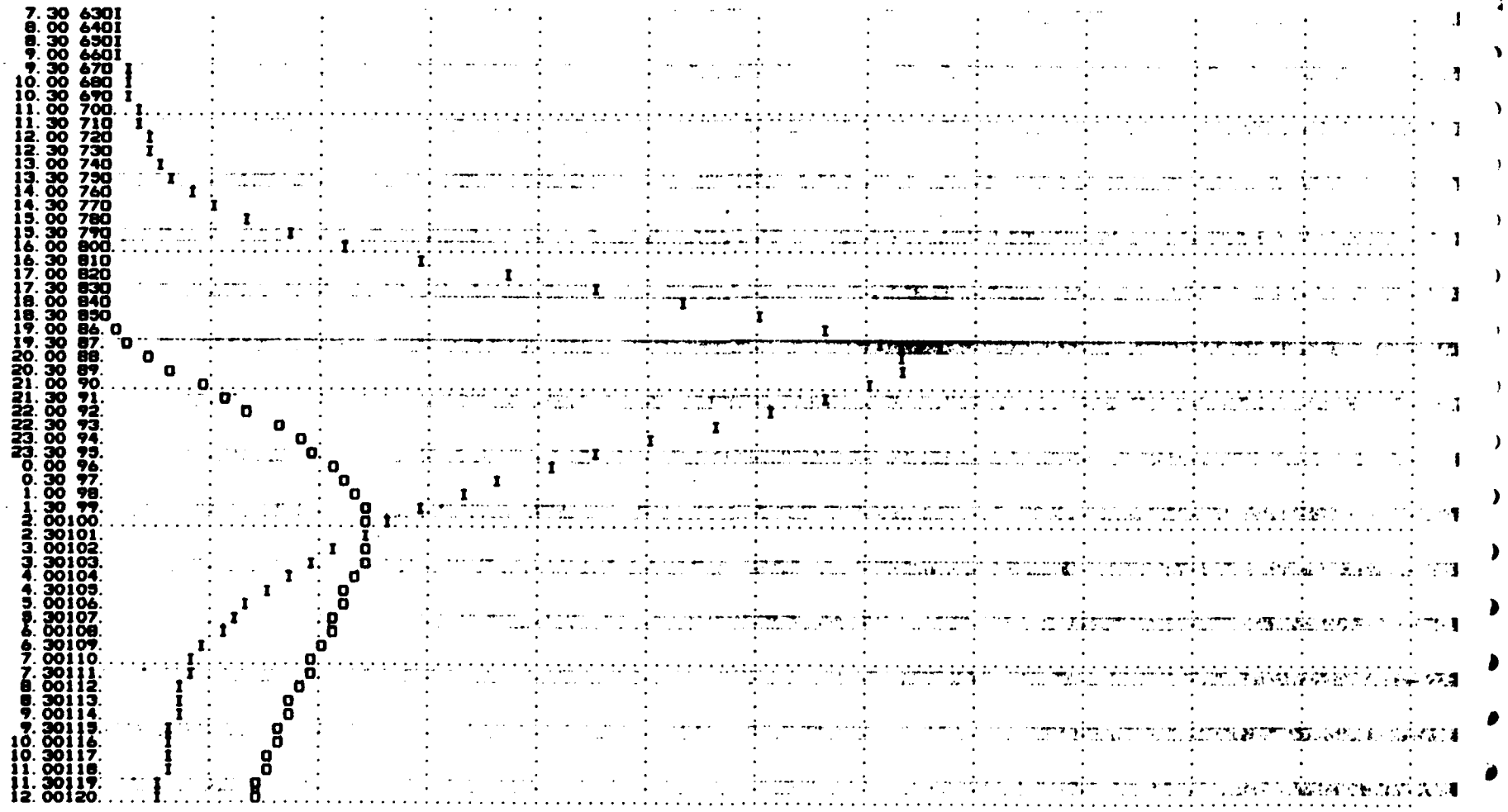
#OVF#

STATION 1

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

		0.	1000.	2000.	3000.	4000.	5000.	6000.	7000.	8000.	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	3701
19.00	3801
19.30	3901
20.00	4001
20.30	4101
21.00	4201
21.30	4301
22.00	4401
22.30	4501
23.00	4601
23.30	4701
0.00	4801
0.30	4901
1.00	5001
1.30	511
2.00	521
2.30	531
3.00	541
3.30	551
4.00	561
4.30	571
5.00	581
5.30	591
6.00	601
6.30	611
7.00	621


7.30 630I
8.00 640I
8.30 650I
9.00 660I
9.30 670 I
10.00 680 I
10.30 690 I
11.00 700 I
11.30 710 I
12.00 720 I
12.30 730 I
13.00 740 I
13.30 750 I
14.00 760 I
14.30 770 I
15.00 780 I
15.30 790 I
16.00 800 I
16.30 810 I
17.00 820 I
17.30 830 I
18.00 840 I
18.30 850 I
19.00 86. O I
19.30 87. O I
20.00 88. O I
20.30 89. O I
21.00 90. O I
21.30 91. O I
22.00 92. O I
22.30 93. O I
23.00 94. O I
23.30 95. O I
0.00 96. O I
0.30 97. O I
1.00 98. O I
1.30 99. O I
2.00100. O I
2.30101. O I
3.00102. O I
3.30103. O I
4.00104. O I
4.30105. O I
5.00106. O I
5.30107. O I
6.00108. O I
6.30109. O I
7.00110. O I
7.30111. O I
8.00112. O I
8.30113. O I
9.00114. O I
9.30115. O I
10.00116. O I
10.30117. O I
11.00118. O I
11.30119. O I
12.00120. O I

OVN

STATION 1, PLAN 1, RATIO 9

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.	2.	136.	365.	663.	1020.	1417.	1857.
2353.	3067.	3737.	4266.	4619.	4813.	4876.	4840.	4731.	4571.
4377.	4161.	3939.	3706.	3478.	3269.	3064.	2872.	2693.	2528.
2377.	2248.	2152.	2075.	2002.	1931.	1865.	1803.	1743.	1684.

STORAGE

1.	1.	2.	2.	3.	4.	4.	5.	5.	6.
6.	6.	7.	7.	8.	8.	8.	9.	9.	9.
9.	10.	10.	10.	11.	11.	11.	11.	11.	12.
12.	12.	13.	13.	15.	17.	19.	23.	27.	32.
38.	43.	49.	54.	59.	64.	68.	72.	75.	78.
81.	83.	85.	87.	89.	91.	93.	95.	97.	99.
101.	103.	106.	109.	113.	119.	127.	137.	149.	163.
180.	199.	220.	245.	275.	313.	362.	427.	511.	621.
765.	949.	1178.	1452.	1766.	2110.	2471.	2836.	3191.	3523.
3817.	4061.	4247.	4378.	4462.	4506.	4521.	4512.	4488.	4450.
4405.	4353.	4297.	4239.	4180.	4120.	4060.	4001.	3942.	3884.
3827.	3772.	3720.	3670.	3621.	3574.	3529.	3484.	3441.	3399.

STAGE

1886.1	1886.2	1886.3	1886.4	1886.5	1886.6	1886.7	1886.8	1886.9	1887.0
1887.0	1887.1	1887.2	1887.2	1887.3	1887.4	1887.4	1887.5	1887.5	1887.6
1887.6	1887.7	1887.7	1887.8	1887.8	1887.9	1887.9	1888.0	1888.0	1888.0
1888.1	1888.1	1888.2	1888.3	1888.5	1888.9	1889.4	1890.0	1890.2	1890.4
1890.6	1890.9	1891.1	1891.4	1891.6	1891.8	1892.0	1892.0	1892.1	1892.1
1892.1	1892.1	1892.2	1892.2	1892.2	1892.2	1892.2	1892.3	1892.3	1892.3
1892.3	1892.3	1892.4	1892.4	1892.4	1892.5	1892.6	1892.7	1892.8	1892.9
1893.1	1893.3	1893.5	1893.7	1894.0	1894.2	1894.4	1894.6	1895.0	1895.4
1896.0	1896.6	1897.2	1898.0	1898.8	1899.6	1900.4	1901.2	1901.9	1902.6
1903.3	1903.8	1904.2	1904.5	1904.6	1904.7	1904.8	1904.8	1904.7	1904.6
1904.5	1904.4	1904.3	1904.2	1904.0	1903.9	1903.8	1903.7	1903.5	1903.4
1903.3	1903.2	1903.1	1902.9	1902.8	1902.7	1902.6	1902.5	1902.5	1902.4

PEAK OUTFLOW IS 4876. AT TIME 48.50 HOURS

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	4876.	4375.	2093.	837.	100451.
CMS	138.	124.	59.	24.	2844.
INCHES		9.03	9.63	9.63	9.63
MM		127.78	244.48	244.48	244.48

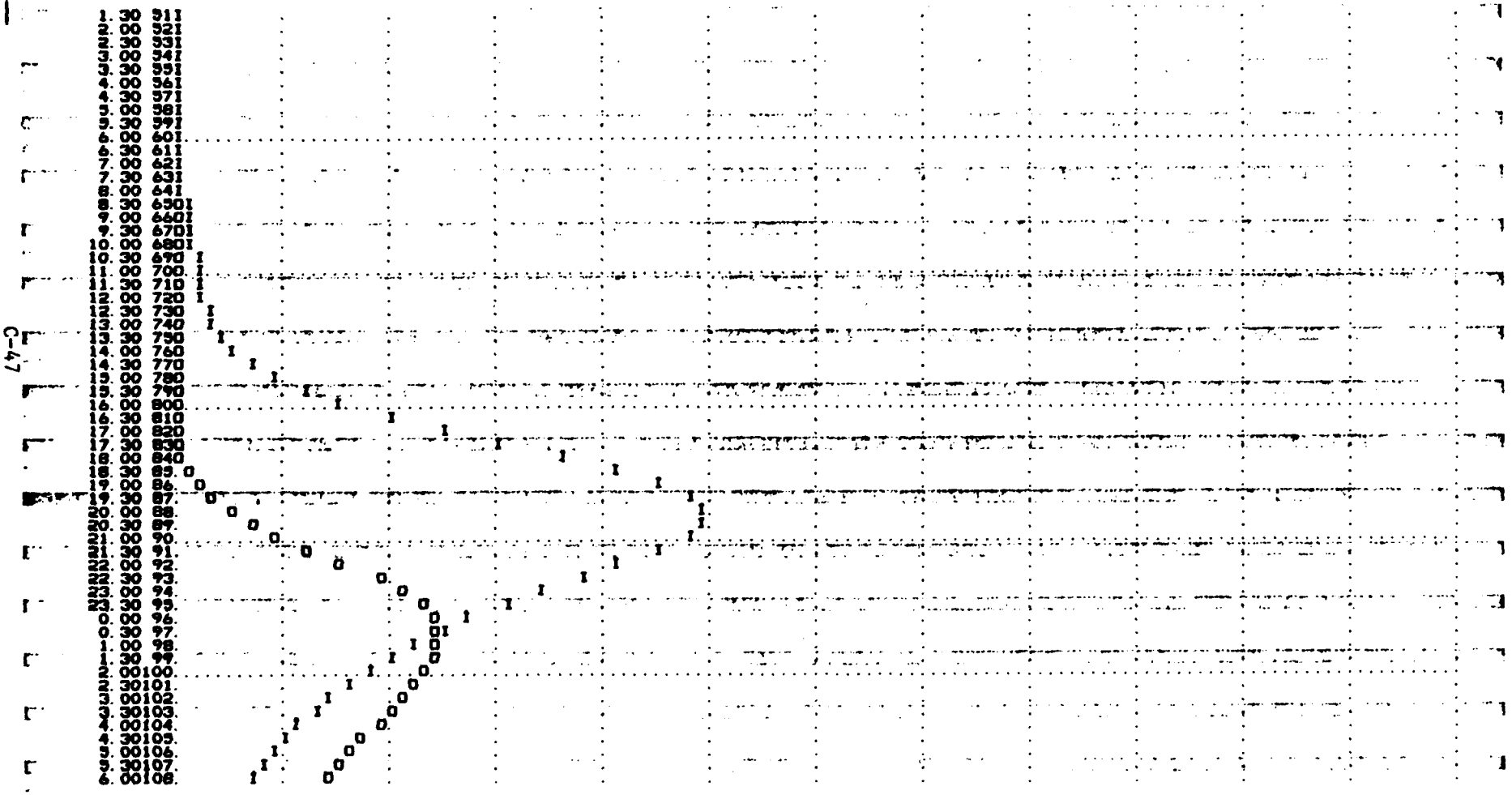
AC-FT	2170.	4151.	4151.	4151.
THOUS CU M	2676.	5120.	5120.	5120.

DVF

STATION 1

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

	0.	2000.	4000.	6000.	8000.	10000.	0.	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	3901												
20.00	4001												
20.30	4101												
21.00	4201												
21.30	4301												
22.00	4401												
22.30	4501												
23.00	4601												
23.30	471												
0.00	481												
0.30	491												
1.00	501												


1.30 911
2.00 921
2.30 931
3.00 941
3.30 951
4.00 961
4.30 971
5.00 981
5.30 991
6.00 601
6.30 611
7.00 621
7.30 631
8.00 641
8.30 650I
9.00 660I
9.30 670I
10.00 680I
10.30 690 I
11.00 700 I
11.30 710 I
12.00 720 I
12.30 730 I
13.00 740 I
13.30 750 I
14.00 760 I
14.30 770 I
15.00 780 I
15.30 790 I
16.00 800 I
16.30 810 I
17.00 820 I
17.30 830 I
18.00 840 I
18.30 85. O I
19.00 86. O
19.30 87. O
20.00 88. O
20.30 89. O
21.00 90. O
21.30 91. O
22.00 92. O
22.30 93. O
23.00 94. O
23.30 95. O
0.00 96. O
0.30 97. OI
1.00 98. O I
1.30 99. O I
2.00100. O I
2.30101. O I
3.00102. O I
3.30103. O I
4.00104. O I
4.30105. O I
5.00106. O I
5.30107. O I
6.00108. O I

```
 6.30109.    I    O
 7.00110.    I    O
 7.30111.    I    O
 8.00112.    I    O
 8.30113.    I    O
 9.00114.    I    O
 9.30115.    I    O
10.00116.    I    O
10.30117.    I    O
11.00118.    I    O
11.30119.    I    O
12.00120.    I    O
```

OVN

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

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

OPERATION	STATION	AREA	PLAN	RATIOS APPLIED TO FLOWS								
				RATIO 1 0.50	RATIO 2 0.68	RATIO 3 0.69	RATIO 4 0.70	RATIO 5 0.71	RATIO 6 0.72	RATIO 7 0.73	RATIO 8 0.74	RATIO 9 1.00
HYDROGRAPH AT	1	8.07 (20.95)	1	4707. (138.94)	6673. (188.96)	6771. (191.74)	6867. (194.52)	6967. (197.29)	7068. (200.07)	7164. (202.85)	7262. (205.63)	7813. (277.88)
ROUTED TO	1	8.09 (20.95)	1	1110. (31.43)	2020. (57.20)	2076. (58.78)	2132. (60.38)	2190. (62.03)	2265. (64.14)	2345. (66.41)	2427. (68.73)	4876. (138.08)

SUMMARY OF DAM SAFETY ANALYSIS

PLAN 1

	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
ELEVATION	1886.00	1898.00	1903.10
STORAGE	0.	1446.	3742.
OUTFLOW	0.	0.	2186.

RATIO OF PMF	MAXIMUM RESERVOIR W.S. ELEV	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
0.50	1901.33	0.00	2918.	1110.	0.00	52.00	0.00
0.68	1902.87	0.00	3633.	2020.	0.00	51.00	0.00
0.69	1902.95	0.00	3670.	2076.	0.00	51.00	0.00
0.70	1903.03	0.00	3707.	2132.	0.00	50.50	0.00
0.71	1903.10	0.00	3744.	2190.	1.00	50.50	0.00
0.72	1903.18	0.08	3780.	2265.	3.00	50.50	0.00
0.73	1903.25	0.15	3814.	2345.	4.00	50.50	0.00
0.74	1903.32	0.22	3847.	2427.	4.50	50.50	0.00

1.00 1904.77 1.67 4521. 4876. 11.00 48.50 0.00

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

APPENDIX D

STRUCTURAL STABILITY ANALYSIS

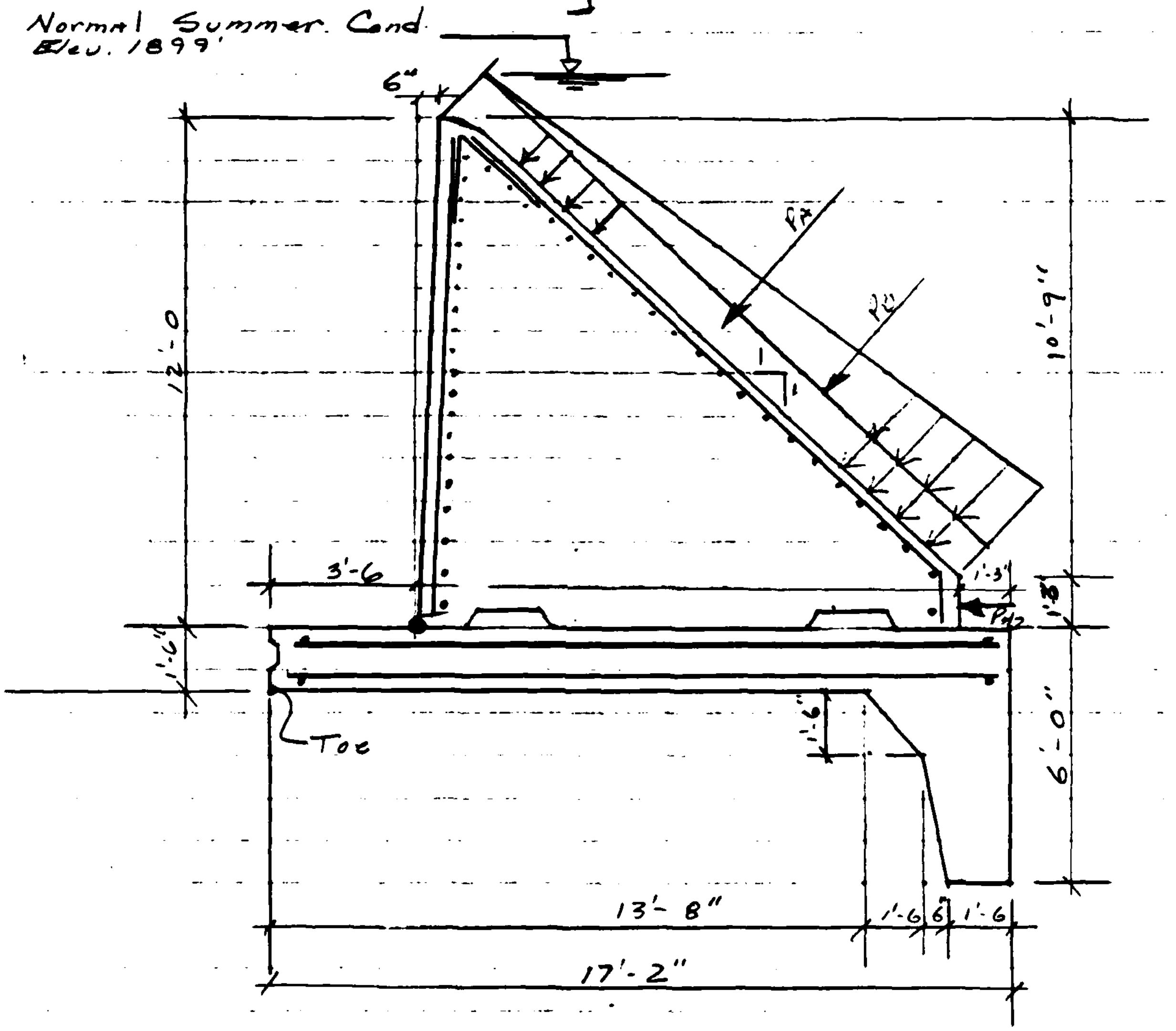
PROJECT Wnc- ... Gulf - Campsite DAM

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

SHEET NO. 1 OF 7
BY RW DATE 7/24/81
CHK'D. BY ____ DATE ____

Spillway Data: Exist. Dwg's as applicable

Peak flow (Spillway Crest + 5') El. 1903'



Section	Wt.	dist.	Mom. (Toe)
(1) $.5 \times \frac{12}{2} \times .15 =$	0.45^K	$(3.5+\frac{1.0}{3})$ 3.84	$1.73^{'K}$
(2) $\frac{11.917' \times 10.75}{2} \times .15 =$	9.61^K	$(4+\frac{11.917}{3})$ 7.97'	$76.61^{'K}$
(3) $1.25 \times 12.417 \times .15 =$	2.33^K	$(3.5+\frac{12.417}{2})$ 9.71 =	$22.62^{'K}$
(4) $1.5 \times 17.17 \times .15 =$	3.86	$\frac{17.17}{2}$	= 33.17
(5) $1.75 \times 4.5 \times .15 =$	1.18^K	16.3'	= 19.23
	17.43^K		$130.74^{'K}$

$P_{A\,vert.} = 1' \times .0624 \times 16.05' = 1^K \quad \times (.707 \times 8.03 + .5) = 6.21^K$

$P_{B\,vert} = 0.0624 \times \frac{16.05^2}{2} \times .707 = 5.68^K \quad \times (.707 \times 10.7') + .5 = 45.82'^K$

$\Sigma V = 24.11 \qquad \Sigma m_R = 182.76'^K$

$\Sigma F_{H_2} = 1.25 \times .0624 \times 1.25 + 10.75 \times .0624 \times 1.25 = 0.94$

$\Sigma F_{Hor.2} = .94 + 1^K + 5.68 = 7.62^K$

$\Sigma m_{o.T.} = 1^K (12 - (8.03 \cos 0)) + 5.68 \times (1.25 + 5.35 \sin 45) + .94 \times .625$
$= 6.32 + 28.56 + .59 = 35.49'^K$

Upl. ft = $12 \times .0624 \times \frac{13.67}{2} = 5.12^K \uparrow \quad \times (13.67 \times .67) = 46.6'^K$

Using 2/3 U for Stability Comps.

$2/3 \times 5.12 \times 2/3 (13.67) = 31.11'^K$

$e = \frac{182.76 - (35.5 + 31.11)}{24.11 - 5.12} = 6.12' \div 17.17 = .36b$

$F.S._{o.T.} = \frac{182.76}{35.5 + 31.11} = 2.74$ O.K.

$F.S._{Sl.} = \frac{24.11 - 5.12}{7.62} = 2.49$ OK

Soil Press. $e = \frac{17.17}{2} - 6.12 = 2.47$

$P = \frac{24.11}{17.17}\left(1 \pm \frac{2.47 \times 6}{17.17}\right) = \begin{pmatrix} 1.86 \\ .14 \end{pmatrix} = \frac{2.61^{K/SF}}{0.20^{K/SF}}$ Toe / Heel

---

Ice Load + Normal Loading:

Horiz. Force 5K/ft. Ice at top of Spillway:

$\Sigma F_H = 7.62 + 5 = 12.62^K \qquad M_{OT} = 66.61 + 5 \times 12' = 126.61'^K$

$F.S._{Sl.} = \frac{24.11 - 5.12}{12.62} = 1.50$ (Low) $\qquad F.S._{o.T.} = \frac{182.76}{126.61} = 1.44$ (Less than desirable)

Max. Oper. Load. Top of water = to top of dam
5.1' above Crest of Spillway
$P = 5.1 \times .0624 = .318^K/SF$

$P_{A_V} = P_{A_H} = .318 \times 16.05' = 5.1^K \times ((0.03 \times 707) + .5) = 49.32'^K$ (6.17+3.5)
$P_D = 5.68 \times (8.63 + 3.5) = 68.90'^K$

$\Sigma P_V = .45 + 9.61 + 2.33 + 3.86 + 1.18 + 5.1 + 5.68 = 28.21^K$
$\Sigma P_H = 5.68 + 5.1 = 10.78^K$

$\Sigma M_K = 130.74 + 49.32 + 68.9 = 248.96'^K$
$\Sigma M_{O.T.} = 5.1 \times 6.93' + 5.68 \times 5.03 + 31.11 = 95.04'^K$

Loc. of Res. $\frac{248.96 - 95.04}{(28.21 - 5.12)} = 6.67 \div 17.17 = .39$

$e = \frac{17.17}{2} - 6.67 = 1.92$ $P = \frac{28.21}{17.17'}\left(1 \pm \frac{6 \times 1.92}{17.17}\right) = \begin{matrix} 1.67 \\ (+.33) \end{matrix}$

S.P.S. Toe $2.74^K/SF$
Heel $0.54^K/SF$

Reinf Conc. Section Adequate. for Soil Press.

$F.S._{O.T.} = \frac{248.96}{95.04} = 2.62$ OK

$F.S._{SL} = \frac{(28.21 - 5.12)}{10.78} = 2.14$ OK.

PROJECT Wheeler Gulf Composite Dam

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

SHEET NO. 4 OF 7
BY R.K.W. DATE 7/27/81
CHK'D. BY _____ DATE _____

P.M.F. 6.8' above crest of spillway

$P = 6.8 \times .0624 = 0.424^{K/FT}$

$P_{\alpha U \& H} = .424 \times 16.05 = 6.81^{K} \times 9.67' = 65.85^{1K}$

$P_B = 5.68 \times 12.13 = 68.90^{1K}$

$\Sigma P_V = 28.21 + (6.81 - 5.1) = 29.92^{K}$

$\Sigma P_H = 6.81 + 5.68 = 12.49^{K}$

$\Sigma M_R = 130.79 + 65.85 + 68.9 = 265.49$

$\Sigma M_{O.T.} = 6.81 \times 6.93 + 5.68 \times 5.03' = 75.8^{1K}$

$F.S._{O.T.} = \frac{265.49}{(75.8 + 31.11)} = 2.480K'$

$F.S._{SL} = \frac{29.92 - 5.12}{12.49} = 1.99$ O.K. w/addl resistance to sliding provided by shear key.

Loc. of Res.: $\frac{265.49 - 106.91}{(29.92 - 5.12)} = 6.39' \pm 17.17' = 0.37\,b$

S.P. & $e = \frac{17.17}{2} - 6.39 = 2.20$ $S.P. = \frac{29.92}{17.17}\left(1 \pm \frac{6 \times 2.2}{17.17}\right)\frac{1.76}{.24}$

Toe: 3.07 K/SF
Heel = 0.42 K/SF

Add'l Mom. due to inertial effects of dam & H_2O
(Horiz. accel. effects of 0.1 G on Mass of Dam)

$1.5 \times 17.17 \times .15 \times .1 = .38 \times .75 = .29^{1K}$

$1.25 \times 12 \times .15 \times .1 = .23 \times (.625 + 1.5) = 0.49^{1K}$

$.5 \times 11.917 \times .1075 \times .15 \times .1 = 0.96^{1K} \times (5 + 1.5) = 6.24^{1K}$

7.02^{1K}

Ma due to Vert accel. .05G on Mass of Dam.

$.05 \times 130.74 = 6.54^{1K}$

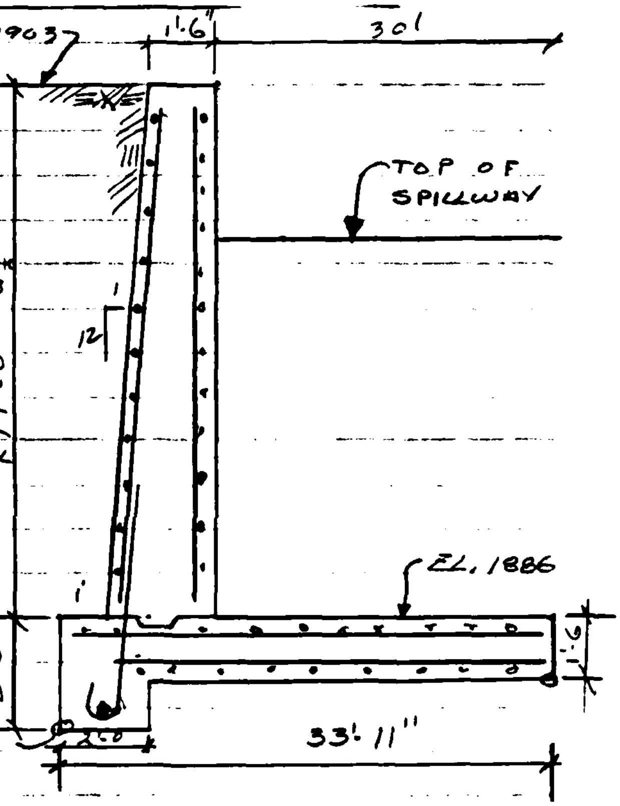
Ma due to wave action $= .707 \times .1 \times (.0624 \times 12)(12^2) = 7.62^{1K}$

$F.S._{O.T.} = \frac{182.76}{(66.6 + 7.02 + 7.62 + 6.54)} = 2.08$ O.K. $F.S._{SL} = \frac{24.11 - 5.12}{(7.62 + 2.2)} = 1.93$ O.K.

PROJECT Whetstone / Earth Dam Site [illegible]

FLAHERTY-GIAVARA ASSOCIATES SHEET NO. 5 OF 7
ENVIRONMENTAL DESIGN CONSULTANTS BY RW DATE 7/27/8[illegible]
ONE COLUMBUS PLAZA, NEW HAVEN, CONN. 06510/203/789-1260 CHK'D. BY ______ DATE ______

Loc. of Res. $\frac{182.76 - 87.79}{24.11 - 5.12 - (.05 \times 17.43)} = 5.24' \div 17.17$ = 0.31 b



Soil Wt. 120 PCF
E.F. Press. 36 PCF
Soil wet 55 PCF

TOP OF FTG.

$P_1 = (\gamma_{DRY}) = 4' \times .036^{K}/CF \times \frac{4 \times 1}{2} = .288^{K} \times 14.33 - 4.13$

$P_2 = (\gamma_{wet})\ 4' \times .055 \times 13 \times 1 = 2.86^{K} \times \frac{13'}{2} = 18.6'^{K}$

$P_3 = (\gamma_{wet})\ .055 \times \frac{13^2}{2} = 4.64 \times 4.33' = 20.1'^{K}$

Mom. @ BOTT of FTG.

$P_1\ .288 \times 15.83 = 4.56'^{K}$

$P_2 = 4 \times .055 \times 14.5 \times 1 = 3.19^{K} \times 7.25 = 23.13'^{K}$

$P_3 = .055 \frac{(14.5)^2}{2} = 5.78 \times 4.83 = 27.94'^{K}$

$\Sigma M_{Top\ of\ FTG.}$: $42.83'^{K}$ $\Sigma M_{BOTT\ of\ FTG}$: $55.63'^{K}$

$A_{S\ BASE\ of\ Stem} = \frac{42.83}{1.44 \times 30.94"} = 0.96\ in^2/Ft$

#7 @ 6" c $A_s = 1.2 > .96$ OK

Mom. about Toe: Resist.

$1 \times 2 \times .15 = 0.3^{K}$	$\times 32.917$	=	$9.88'^{K}$
$1.5 \times 33.917 \times .15 = 7.63^{K}$	$\times \frac{33.917}{2}$	=	$129.42'^{K}$
$1.5 \times 17 \times .15 = 3.83^{K}$	$\times 30.75$	=	$117.62'^{K}$
$\frac{1.42}{2} \times 17 \times .15 = 1.81^{K}$	$\times 31.97$	=	$57.87'^{K}$
$1 \times .120 \times 17 = 2.04^{K}$	$\times 33.42$	=	$68.17'^{K}$
15.61			$382.96'^{K}$

$M_{OT} = 55.63^{1K}$ $M_{Res.} = 382.96^{1K}$

$F.S._{\circlearrowleft} = \frac{383}{56} = 6.84$

$F.S._{sl} = \frac{15.61^{K} \times .6}{9.26^{K}} = 1.01$ (Low-OK)

Toe bulks other toe ∴ No slidg

$x = \frac{383 - 55.6}{15.61} = 20.97'$ $e = \frac{33.917}{2} - 20.97 = 4.01'$

$SP = \frac{15.61}{33.917}\left(1 \pm \frac{6 \times 4.01}{33.917}\right) = \frac{1.71}{.29} = .13$ toe. .187 heel

PROJECT Whetstone Gulf - Comp Site Dam

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

SHEET NO. 7 OF 7
BY KLC DATE 7/25/91
CHK'D. BY _____ DATE _____

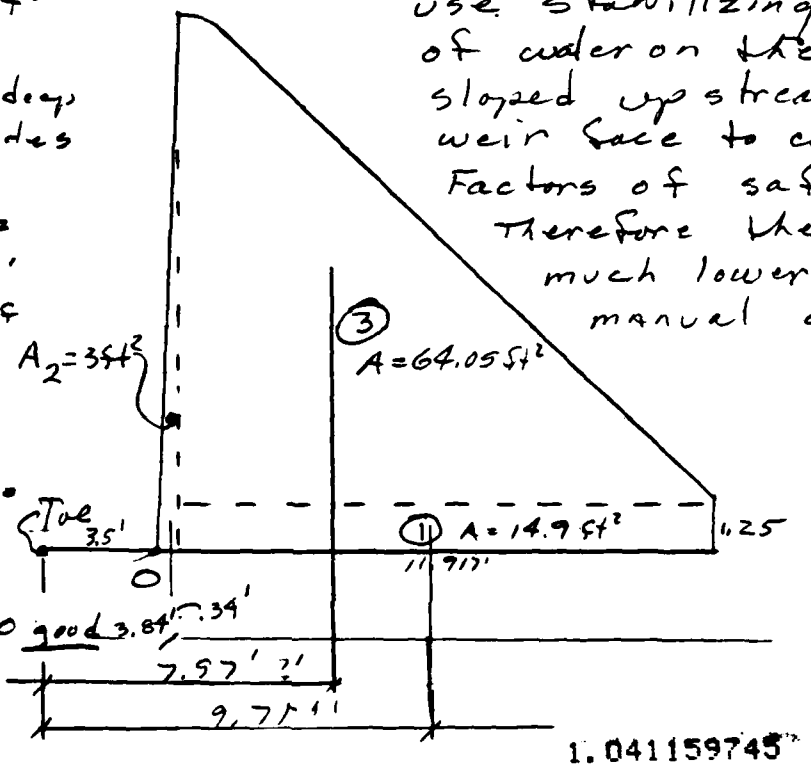
Program Analysis

6" Shear Keys provide sliding resistance of 7.9 K/FT.
Vert. Key. 6" deep x 12" wide provides

$2\sqrt{f'c} \times 6" \times 12" =$
$7.9^K/_{FT} \times 12'$
$= 94.6^K/_{side\ of}$ Spillway

assume acting at 6' up.
M_R add'l $= 94.6 \times 6 =$ 568'K
+ 109.03 = 577.'K
F.S. $= \frac{577}{95.6} = 7.0$ good
w/ice.

Note: This calculator program does not use stabilizing wt. of water on the sloped upstream weir face to compute Factors of safety: Therefore they are much lower than manual calcs.



1.041159745
.6741624324 ①
1.118752289

Loading Conditions:
1. Normal Summer Conditions

2. Normal Conditions plus Ice load ($5^K/_{FT}$) @ Top of Spillway

3. Analyze Spillway at max. Water level equal to top of dam

4. Normal Conditions with Seismic loads using 0.1 Coefficient

.6408376386 .3736148297 1.014598275 ④ .8189702519

-9.557670437 -2.467092113 ③ .2453672921 -3.76956351

② .5725718638 .7055194618 .8414372608 ⑤ .6118176583

5. Full PMF Conditions: D-7 Water level at El. 1904.8

STABILITY ANALYSIS PROGRAM - WORK SHEET

INPUT ENTRY		ANALYSIS CONDITION				
		1	2	3	4	5
Unit Weight of Dam (K/ft^3)	0	0.15	0.15	0.15	0.15	0.15
Area of Segment No. 1 (ft^2)	1	14.9	14.9	14.9	14.9	14.9
Distance from Center of Gravity of Segment No. 1 to Downstream Toe (ft)	2	9.71'	9.71'	9.71'	9.71'	9.71'
Area of Segment No. 2 (ft^2)	3	3	3	3	3	3
Distance from Center of Gravity of Segment No. 2 to Downstream Toe (ft)	4	3.84	3.84	3.84	3.84	3.84
Area of Segment No. 3 (ft^2)	5	64.05	64.05	64.05	64.05	64.05
Distance from Center of Gravity of Segment No. 3 to Downstream Toe (ft)	6	7.97	7.97	7.97	7.97	7.97
Base Width of Dam (Total) (ft)	7	17.17	17.17	17.17	17.17	17.17
Height of Dam (ft)	8	12'	12'	12'	12'	12'
Ice Loading (K/L ft.)	9	—	5.0	—	—	—
Coefficient of Sliding	10	1.0	1.0	1.0	1.0	1.0
Unit Weight of Soil (K/ft^3) (deduct 18)	11	—	—	—	—	—
Active Soil Coefficient - Ka	12	1.0	1.0	1.0	1.0	1.0
Passive Soil Coefficient - Kp	13	—	—	—	—	—
Height of Water over Top of Dam or Spillway (ft)	14	1'	1'	5.1'	1'	6.8'
Height of Soil for Active Pressure (ft)	15	12'	12'	12'	12'	12'
Height of Soil for Passive Pressure (ft)	16	—	—	—	—	—
Height of Water in Tailrace Channel (ft)	17	—	—	—	—	—
Weight of Water (K/ft^3)	18	.0624	.0624	.0624	.0624	.0624
Area of Segment No. 4 (ft^2)	19	—	—	—	—	—
Distance from Center of Gravity of Segment No. 4 to Downstream Toe (ft)	20	—	—	—	—	—
Height of Ice Load or Active Water (ft) (does not include 14)	46	12	12	12	12	12
Seismic Coefficient (g)	50	—	—	—	.1	—
RESULTS OF ANALYSIS						
Factor of Safety vs. Overturning		1.04	.64	.87	1.01	0.81
Distance From Toe to Resultant		.67	-9.56	-2.47	.25	-3.77
Factor of Safety vs. Sliding		1.12	.57	.71	0.84	0.61

APPENDIX E

PREVIOUS INSPECTION REPORTS/AVAILABLE DOCUMENTS

DESIGN DATA

FOREWORD

This campsite is located in Lewis County about 10 miles southerly along State Highway Route 12 D from Lowville, N. Y. The campsite facilities have been repeatedly damaged by high water in Whetstone Creek which flows through the campaite.

To prevent such damage in the future a dam is to be constructed on Whetstone Creek upstream from the campsite which will create an impounding basin to store a part of the flood waters.

Hydraulics

The drainage area of Whetstone Creek above the dam site is 8.1 square miles of which it is estimated that 20 per cent is swamp or water surface, 70 per cent is wooded area and 10 per cent is pasture. The slopes on tha drainage area are very moderate.

There is no gaging station on Whetstone Creek or on any other small stream in the vicinity, but for the study of the effect of regulation of spring floods the stream flow records of larger streams in the vicinity are useful. Stream flow records are available for a station on Otter Creek at Glenfield six miles from the dam site, from Sept. 30, 1924 to July 8, 1933. Tha drainage area of Otter Creek above the Glenfield station is 62 square miles. There are also stream flow records of Independence River at Sperryville, 12 miles distant, where the drainage area is 85 square miles, from December 7, 1927 to June 30, 1942 and at Donnattsburg, where the drainage area is 91.7 square miles from July 1, 1941 to Sept. 30, 1945. A study of all these records reveal no unusual daily discharge; the greatest being at Sperryville on April 8, 1928, which was 2990 cubic feet per second, or 35 cfs per square mile of drainage area.

The slope of the bed of Whetstone Creek through the campsite averag 2.8 feet per hundred. Assuming the value of C in Chezy formula to be 30 it is estimated that a stream bed 20 feet wide and one foot deep will accomodate 96 cfs without overflowing the banks. Assuming the entrance factor to be 0.7 in the standard formula for the flow through orifices, the data for the orifice discharge curve shown on the drawing has been computed.

Storage Dam

After taking into account all of the stream flow data available and the computations mentioned herein it has been decided that a dam with a spillway crest at elevation 1898, U.S.G.S. datum, an d 60 feet long with a 2' x 2' orifice at the stream bed level will be required to prevent the stream from overflowing its ban ks in the campsite and provide sufficient spillway capacity to insure the safety of the dam in the event of an extraordinary flood or the closing or partial closing of the 2' x 2' orifice.

Test pits revealed no evidence of bed rock at the dam site nor there other evidences of bed rock in the vicinity of the dam site. Un 9 to 12 inches of top soil the soil is a fairly impervious mixture of clay and gravel. To meet the soil conditions at the dam site and provide a permanent structure, a hollow reinforced concrete spillway with reinforced concrete abutments and earth embankment with reinforced concrete core wall ends to the dimensions shown on the drawings has been designed. The estimated cost of the storage dam is $17,900.

Clearing

Practically all of the area subject to flooding is densely covered with brush and comparatively small trees. The area below the 1897 foot contour is 330 acres. The area above the 1897 foot contour will be flooded so seldom and for such short periods of time that clearing will not be required.

Roads

Parts of an aban doned railroad grade, now used as a highway, will be subject to flooding. Two methods of treating this item have been studied. The first method is to raise the grade of the low places on the present location. The second method would be to improve about 2.9 mi of abandoned town road outside the area subject to flooding. Estimate of costs of the two methods show that the second method would cost more than twice as much as the first method. The cost of raising 3750 linear feet of the railroad grade road to the cross section shown on the drawing and to a minimum grade elevation of 1898 feet is estimated to be $6000.

Facilities

The existing camping an d picnicking facilities in Whetstone Gulf public campsite include a modern administration building, 1/3 mile of gravel access road, one mile of water pipe line from a spring and spring house to the campsite, two sets of old latrines and a number of fireplaces and picnic tables.

The facilities to be provided by this project include a bathing pool dam, three sets of 4-unit latrines with stone-lined cesspools, one set of 12-unit bath houses, one assembly area with 1200-person capacity, 1600 linear feet of 1½ and 1-inch water pipe and 14 combination water outlets.

Bathing Pool Dam

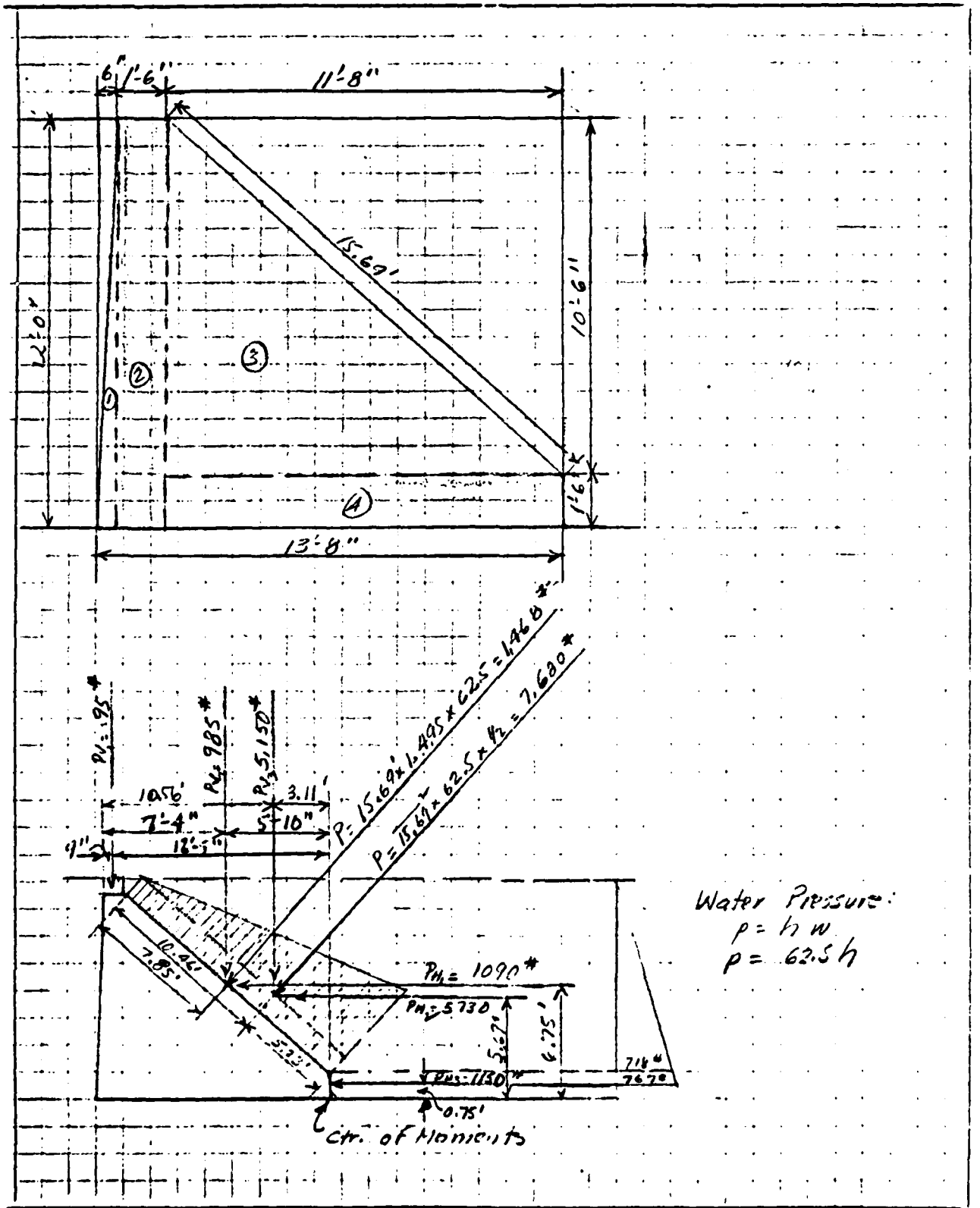
The bathing pool dam will consist of a low reinforced concrete spillway 60 feet long with stone masonry abutments all founded on bed rock with a low earth embankment at each end to an elevation 6 feet above the top of the concrete spillway. The spillway will be equipped with flashboards 3 feet high supported to 2" diameter standard iron pipes 5 feet apart designed to fail when overtopped by two feet of water. The estimated cost of the bathing pool dam is $5100.

STRUCTURAL CALCULATIONS

Form B. &G. C-7-A-1. 11-56-20M (6B-132)
Ord. IIC C-05-87

Subject Whitestone Gulf - N.Y.S. Conserv. Dept

Sheet No. 1
Total No. Sheets
Date



Water Pressure:
$p = h w$
$p = 62.5 h$

Computed by Peck Date 2/9/60
Checked by Date

OVERTURNING MOMENTS (ctr. of Moments at heel)

① = 0.5 × 12.0' × ½ × 1.0' × 150 #/ft³ =	450 #	×	13.33'	=	6,000 ft#
② = 1.5' × 12.0' × 1.0' × 150 #/ft³ =	2700 #	×	12.42'	=	33,600 ft#
③ = 10.5' × 11.67' × ½ × 1.0' × 150 #/ft³ =	9200 #		7.78'	=	71,600 ft#
④ = 1.5' × 11.67' × 1.0' × 150 #/ft³ =	2635 #	×	5.83'	=	15,300 ft#
P_{V_1} =	95 #	×	12.50'	=	1,190 ft#
P_{V_2} =	985 #	×	5.83'	=	5,710 ft#
P_{V_3} =	5,150 #	×	3.92'	=	20,200 ft#
	21,215 #				153,600 ft#
P_{H_1} = 1090		×	6.75'	=	6,350 ft#
P_{H_2} = 5730		×	5.67'	=	32,540 ft#
P_{H_3} = 1150		×	0.75	=	860 ft#
					193,350 ft#

193,350 ft# ÷ 21,215 # = 9.12'

⅔ × 13.67' = 9.23'

Section O.K. within ⅔ point of base.

Factor of Safety v.s. Sliding:

Σ Horizontal thrusts = 1,090 # + 5,730 # + 1,150 # = 7,970 #

Σ Vertical load = 21,215 #

Factor of Safety = 21,215 # ÷ 7,970 # = 2.68 to 1

Computed by Date

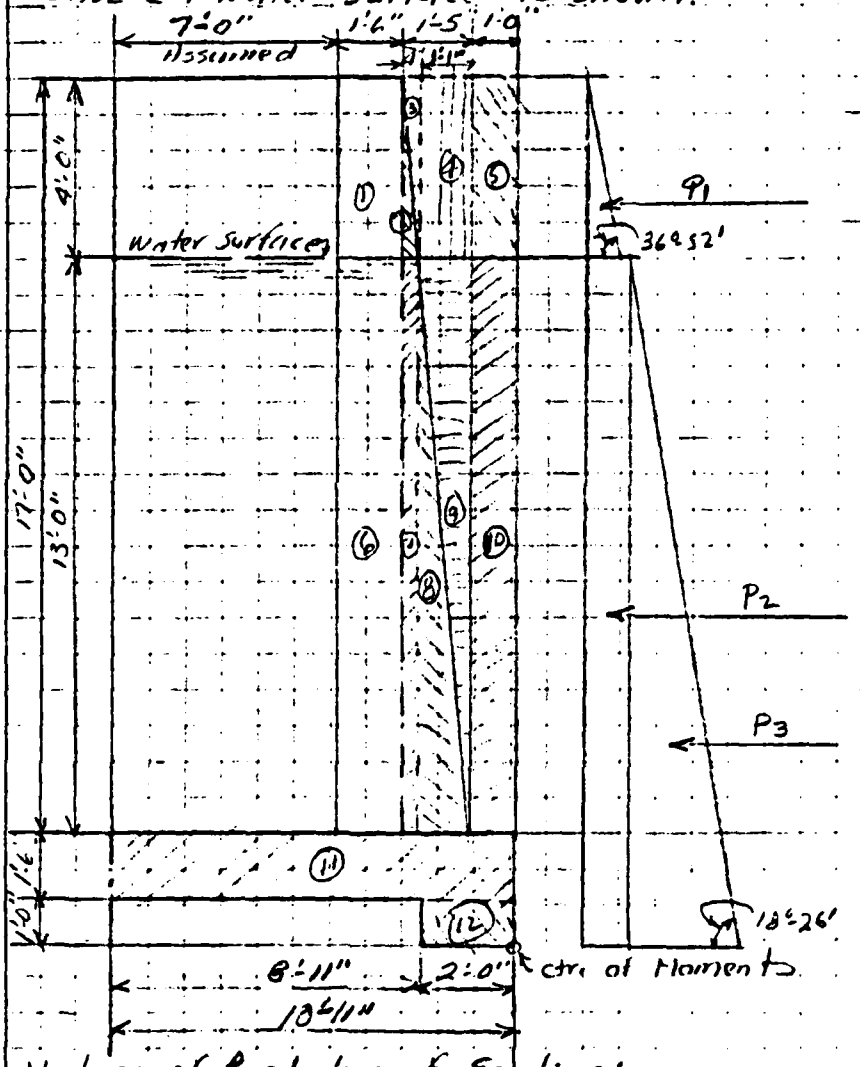
Checked by Date

Subject Whetstone Gulf - N.Y.S. Conserv. Dept.

Sheet No. 3
Total No. Sheets
Date

INVESTIGATION OF ABUTMENT WALL SECTION

CASE I: Water Surface as Shown.



Earth behind wall assumed as Clay, gravel and sand, dry @ 100 #/ft.³
Equiv. Fluid Pr. = 25 #/ft.²
" Fl. Pr. Submerged = 51.9 #/ft.².
Clay, gravel and sand Submerged wt @ 65 #/ft.³
Equiv. Fl. Pr. = 34.7 #/ft.²
wt of water = 62.5 #/ft.³
wt. of Submerged Conc. 90 #/ft.³
Assume 1'-0" width of wall.

Values of P at top of Footing:

$P_1 = 4.0' \times 25\ \#/ft^3 \times 1/2 \times 4.0' \times 1.0 = 200\ \# \times 11.33' = 2870\ ft\#$

$P_2 = 4.0' \times 51.9\ \#/ft^3 \times 13.0' \times 1.0' = 2700\ \# \times 6.50' = 17,550\ ft\#$

$P_3 = 13.0' \times 34.7\ \#/ft^3 \times 1/2 \times 13.0' \times 1.0' = 2930\ \# \times 9.33' = 12,690\ ft\#$

$33,100\ ft\#$

Values of P at bottom of Footing:

$P_1 = 4.0' \times 25\ \#/ft^3 \times 1/2 \times 4.0' \times 1.0' = 200\ \# \times 15.83' = 3,170\ ft\#$

$P_2 = 4.0' \times 51.9\ \#/ft^3 \times 14.5' \times 1.0' = 3010\ \# \times 7.25' = 21,800\ ft\#$

$P_3 = 14.5' \times 34.7\ \#/ft^3 \times 1/2 \times 14.5' \times 1.0' = 3,750\ \# \times 4.83' = 18,130\ ft\#$

$43,100\ ft\#$

Computed by Peck Date 3/4/60
Checked by Date

INVESTIGATION OF ABUTMENT WALL SECTION (Continuation)

CASE I

① = 4.0' × 1.5' × 1.0' × 150 #/ft³	=	900 #	×	3.17'	= 2,850 #ft
② = 4.0' × 0.33' × ½ × 1.0' × 150 #/ft³	=	990 #	×	2.30'	= 2,280 #ft
③ = 4.0' × 0.33' × ½ × 1.0' × 100 #/ft³	=	65 #	×	2.19'	= 140 #ft
④ = 4.0' × 1.08' × 1.0' × 100 #/ft³	=	435 #	×	1.54'	= 670 #ft
⑤ = 4.0' × 1.0' × 1.0' × 100 #/ft³	=	400 #	×	0.68'	= 200 #ft
⑥ = 13.0' × 1.5' × 1.0' × 90 #/ft³	=	1.755 #	×	3.17'	= 5,560 #ft
⑦ = 13.0' × 0.33' × 1.0' × 90 #/ft³	=	390 #	×	2.25	= 880 #ft
⑧ = 13.0' × 1.08' × ½ × 1.0' × 90 #/ft³	=	635 #	×	1.72	= 1090 #ft
⑨ = 13.0' × 1.08' × ½ × 1.0' × 65 #/ft³	=	455 #	×	1.36	= 620 #ft
⑩ = 13.0' × 1.0' × 1.0' × 65 #/ft³	=	845 #	×	0.50	= 420 #ft
		6870 #			14,710 #ft
⑪ = 10.92' × 1.5' × 1.0' × 90 #/ft³	=	1475 #	×	5.46'	= 8065 #ft
⑫ = 1.0' × 2.0' × 1.0' × 90 #/ft³	=	185 #	×	1.0'	= 185 #ft
		8,530 #			22960 #ft

Values at top of footing:

Σ(1) to (10) inc	=	6870 #	= 14,710 #ft
ΣP			= 33,100 #ft
			47,810 #ft

Values at bottom of footing:

Σ(1) to (12) inc	=	8,530 #	= 22,960 #ft
ΣP			= 43,100 #ft
			66,060 #ft

66,060 #ft ÷ 8,530 # = 7.76'

⅔ point of base = 10.92 × ⅔ = 7.28' O.K.

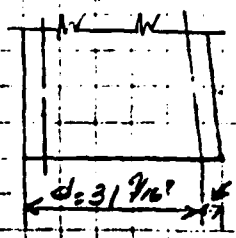
INVESTIGATION OF WALL STEM

Overturning moment at top of footing = 33,100 #ft

Wall Section: 1.5' × 17.0' × 1.0' × 150 #/ft³ = 3820 #

1.92 × 17.0' × 1.0' × ½ × 150 #/ft³ = 1810 #

5630 #



Req'd A_s = $\frac{33,100 \text{ ft} \times 12}{18,000 \times 0.875 \times 31.56"} - \frac{5630 \#}{18,000}$

= 0.798 in² − 0.313 in² = 0.480 in²

Used ⅝" ϕ bars @ 6" ctrs = 1.202 in² O.K.

Spacing of bars could be increased.

Computed by Peck Date 3/7/60

Checked by Date

Sheet No. 5

Subject Whitestone Gulf - N.Y. State Conserv. Dept.

Total No. Sheets

Date

INVESTIGATION OF ABUTMENT WALL SECTION.

CASE II: Assuming no percolation of water to submerge earth behind wall, Buoyancy for Concrete wall Section only.

Value of P at top of Footing:

$P_1 = 17.0' \times 25.0\#/ft^3 \times 1/2 \times 17.0' \times 1.0 = 3.610\# \times 5.67' = 20,450'\#$

Value of P at bottom of Footing:

$P_1 = 19.0' \times 25.0\#/ft^3 \times 1/2 \times 19.0' \times 1.0' = 4510\# \times 6.33' = 28,600'\#$

(1) $4.0' \times 1.5' \times 1.0' \times 150\#/ft^3$	$= 900\#$	$\times 3.17'$	$= 2,850'\#$
(2) $4.0' \times 0.33' \times 1.0' \times 1/2 \times 1.0' \times 150\#/ft^3$	$= 990\#$	$\times 2.30'$	$= 2,280'\#$
(3) $4.0 \times 0.33' \times 1.0' \times 1/2 \times 1.0' \times 100\#/ft$	$= 65\#$	$\times 2.19'$	$= 140'\#$
(4) $4.0' \times 1.08' \times 1.0' \times 100\#/ft^3$	$= 435\#$	$\times 1.54'$	$= 670'\#$
(5) $4.0' \times 1.0' \times 1.0' \times 100\#/ft^3$	$= 400\#$	$\times 0.50'$	$= 200'\#$
(6) $13.0' \times 1.5' \times 1.0' \times 90\#/ft^3$	$= 1755\#$	$\times 3.17'$	$= 5,560'\#$
(7) $13.0' \times 0.33' \times 1.0' \times 90\#/ft^3$	$= 390\#$	$\times 2.25'$	$= 860'\#$
(8) $13.0' \times 1.08' \times 1/2 \times 1.0' \times 90\#/ft^3$	$= 635\#$	$\times 1.72'$	$= 1090'\#$
(9) $13.0' \times 1.08' \times 1/2 \times 1.0' \times 100\#/ft^3$	$= 700\#$	$\times 1.36'$	$= 950'\#$
(10) $13.0' \times 1.0' \times 1.0' \times 100\#/ft^3$	$= 1300\#$	$\times 0.50'$	$= 650'\#$
	$7570\#$		$15,270'\#$
(11) $10.92' \times 1.5 \times 1.0' \times 90\#/ft^3$	$= 1475\#$	$\times 5.46'$	$= 8,065'\#$
(12) $1.0' \times 2.0' \times 1.0' \times 90\#/ft^3$	$= 185\#$	$\times 1.0'$	$= 185'\#$
	$9,230$		$23,520'\#$

Values at top of footing:

Σ(1) to (10) inc.	$= 7570\#$	$= 15,270'\#$
ΣP		$= 20,450'\#$
		$35,710'\#$

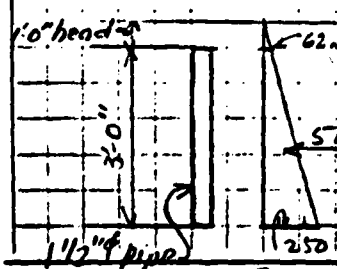
Values at bottom of footing:

Σ(1) to (12) inc.	$= 9,230\#$	$= 23,520'\#$
ΣP		$= 28,600'\#$
		$52,320'\#$

$52,320'\# \div 9,230\# = 5.67'$

2/3 point of base $= 10.92' \times 2/3 = 7.28'$ O.K.

INVESTIGATION OF FLUSH BOARDS



$62.5\#$ $(250.0 - 62.5) \times 3.0' \times 1/2 = 281.25\# \times 1.0 = 281.25'\#$

$187.5 \quad 62.5 \times 3.0' = 187.5\# \times 1.5 = 386.25'\#$

$573.75 \times 1.35 \quad 773.50'\#$

5'0" ctr. to ctr. supports

Cantilever Moment $= 573.75\#/ft. \times 5.0' \times 1.35' = 3,875'\#$

Required $I_c = \frac{3,875'\# \times 12}{12,000\#/in^2} = 0.65 in^4$

1½" ϕ Std pipe $= 0.310 in^4$

Computed by Peck Date 3/7/60

Checked by Date

TECHNICAL SPECIFICATIONS

SPECIAL SPECIFICATIONS

1. Borrow Pits

All materials required for backfill and for earth embankment, which are not available from required excavation, shall be taken from borrow pits. The borrow pit or pits may be on State owned land, if suitable material is found on State owned land. The borrow pit sites shall, however, be approved by the Conservation Department representative before any borrow is taken from them. If sufficient suitable material is not found on State owned land, the contractor will be required to obtain borrow from privately owned land at his own expense. The sites of all borrow pits shall be stripped of top soil and other materials not suitable for earth embankment. All borrow pits on State owned land shall be left so they will be self-draining. Payment for the work described in this paragraph will be included in the price bid for embankment.

2. Preparation of Earth Foundation for Conc rete Slab

When the excavation for the reinforced concrete floor slab has reached the stage within 6 inches of the finished subgrade or before, the area being worked on shall be unwatered and kept unwatered until the reinforced concrete slab has been placed. The final excavation to subgrade shall be done by hand. If the excavation is extended below the specified subgrade without written direction, this overcut shall not be backfilled with earth but with concrete at the contractor's expense. The excavation for the downstream face of the cutoff wall under the heel of the deck and the upstream face of the cutoff wall under the downstream end of the apron shall be made to neat lines so that no forms will be required. Payment for the work described in this paragraph shall be included in the unit price bid for excavation (Item 4) and diversion and care of water during construction (Item 3)

3. Preparation of Rock Foundation for Stone Masonry and Concrete

The surface of all rock foundations upon which or against which stone masonry or concrete is to be placed shall be prepared to provide adequate bond between the rock and the stone masonry or concrete by roughening and cleaning the rock surface. All rock fragments that may be pried loose with a crowbar, spalls, dirt, gravel and other objectionable materials shall be removed from the surface of the rock. Immediately before placing stone masonry or concrete upon or against any rock surface, the surface shall be thoroughly cleaned by the use of stiff brooms, hammers, picks, jets of water, and air applied at high velocity. After cleaning and before any stone masonry or concrete is placed, all water shall be removed from depressions so as to permit thorough inspection and proper bond of stone masonry and concrete with the foundation rock. Payment for the work described in this paragraph shall be included in the price bid for excavation.

ITEM SPECIFICATIONS

Item 1 - Clearing and Grubbing

Under this item the areas to be used for the storage dam, the bathing pool, the area to be flooded by the bathing pool dam when there is six inches of water over the top of the flashboards and all other necessary structures and improvements where this work is not specifically included in that item shall be cleared of all trees, stumps, roots, brush and rubbish. No other clearing shall be permitted without the specific approval of the Conservation Department representative. All timber and wood shall remain the property of the State of New York and shall be piled as and where directed by the representative of the Conservation Department.

All stumps, roots, brush, rubbish, and unusable timber shall be hauled to open areas and completely burned or otherwise disposed of as directed. Extreme care shall be taken so that no trees may be scorched or damaged. Payment will be made for the lump sum bid for this item. This item does not include any work to be done on the area to be flooded by the storage dam which work will be paid for under Item 2.

Item 2 - Clearing Flow

Under this item all of the area subject to flow by the storage dam below the 1897 contour, U.S.G.S. datum, shall be cleared of all standing and down vegetable growth and other articles that might float. All brush and trees four inches in diameter, 12 inches above the ground at their bases, or less, shall be cut within 4 inches of the ground. All trees over four inches in diameter, 12 inches above the ground at their bases, shall be cut within a distance from the ground equal to the diameter of the tree 12 inches above the ground. All timber and wood shall remain the property of the State of New York and shall be piled as and where directed by the representative of the Conservation Department. All unusable wood, timber, brush and rubbish shall be completely burned or otherwise disposed of as directed. No stick or other object more than 20 inches in length that may float shall be left on the area to be cleared. Payment will be made for the number of acres cleared at the unit price bid.

Item 3 - Diversion and Care of Water During Construction

The contractor shall construct and maintain all necessary cofferdams, channels, flumes, or other temporary diversion and protective works shall furnish all materials required therefor; and shall furnish, install, maintain, and operate all necessary pumping and other equipment for unwatering the various parts of the work, and for maintaining the foundation, cutoff trenches and other parts of the work free from water as required for constructing each part of the work. The contractor shall determine for himself the probable maximum discharges that he will have to provide for with cofferdams and other diversion facilities.

After having served their purpose all cofferdams and other temporary protective works for both the storage dam and the bathing pool dam shall be removed or leveled to give a sightly appearance as directed. Payment will be made for the lump sum bid for this item.

Item 4 - Excavation, except Stripping

This item includes the removal of all earth or rock to the lines and grades shown on the plans for the storage dam, the bathing pool dam, the assembly area piers and at such other places as directed by the representative of the Conservation Department. Maximum payment lines shall not exceed two feet outside the base of the masonry with slopes of 2 on 1. The excavation for the reinforced concrete foundation slab and apron of the storage dam shall not exceed the depth shown on the drawing except in the event the material at the bottom of the trench for the cutoff wall under the heel of the deck is, in the opinion of the Conservation Department representative, not sufficiently impervious, in which event the contractor, upon written order, shall continue the trench in whole or in part to a depth not exceeding three feet below the grade shown on the drawing. All excavated material suitable for backfill may be used for that purpose and all other excavated material shall be disposed of where it will not be unsightly or as directed by the Conservation Department representative. Payment will be made for the actual number of cubic yards of earth and rock excavated within the maximum payment lines exclusive of stripping which will be paid for under Item 5.

Item 5 - Stripping

Under this item the sod and other vegetable matter shall be removed from the areas to be used for the earth embankment portions of the storage dam and the bathing pool dam down to mineral soil--an average depth of 9 inches of stripping. All stripping suitable for growing vegetation shall be stored for spreading on the top and downstream slopes of the earth embankment sections of the two dams. The cost of removing and piling the stripping will be paid for under this item at the unit price bid. The cost of spreading the stripping on the top and downstream slopes of the earth embankment sections of the two dams will be paid for as earth embankment under item 7.

Item 6 - Earth Embankment for Road

This item covers the furnishing and depositing of mineral soil for widening and raising the grade of the old railroad grade road as shown by the plan, profile and typical cross section on the drawing. The material furnished shall be free from roots and other vegetable matter. All stones over 5 inches in greatest dimension shall be removed from the middle 10-foot area to the outside of the fill. Payment will be made for the actual number of cubic yards of acceptable fill material in place, exclusive of the riprap, at the unit price bid for this item.

Item 7 - Earth Embankment for Dams

This item includes the earth embankment parts of the dams and the backfill back of the retaining walls and both sides of the core walls. For backfilling only clear mineral soil free from roots and other vegetable matter shall be used. The backfill shall be deposited in layers not more than 6 inches in thickness and thoroughly tamped in place before the next layer is deposited. The fill material shall have a moisture content such that when squeezed in the hand it will form a roll that will stay together when held horizontal by one end. Before depositing any earth embankment the foundation shall be free from roots or other vegetable matter. Earth embankment shall be placed in layers not more than 6 inches in thickness and each layer shall be thoroughly compacted by rolling, tamping, or by other satisfactory means. The earth for embankment shall be free from roots and other vegetable matter. No stones having maximum diamensions of more than 5 inches shall be left in the earth embankment. No material shall be placed in embankment when either the material or the foundation or embankment on which it would be placed is frozen. The embankment shall conform to the lines shown on the drawings. Payment will be made for the number of cubic yards actually placed in backfill and earth embankment, exclusive of the riprap yardage, but inclusive of the stripping yardage which shall be spread evenly on the top and downstream slopes of the earth embankment sections of the two dams and on the upstream slopes of the two dams from the top of the riprap to the top of the dams, and within the lines shown on the drawings at the unit price bid for earth embankment.

Item 8 - Concrete for Dams

For both the storage dam and the bathing pool dam, the concrete shall be proportioned as follows: one part of portland cement, to two parts of sand and 3 3/4 parts of broken stone or screened, washed, and well-graded gravel. The proportions of sand and coarse aggregate may be slightly varied to obtain a denser concrete if so directed by the representative of the Conservation Department on the job. Only sufficient water shall be used to make a workable consistency. The slump, as shown on the standard American Society of Testing Materials test, shall not exceed 4 inches. At least one slump test shall be made for each pour of concrete.

The cement used shall have been tested and approved by the State Department of Public Works. The sand to be used shall be approved by the Conservation Department and washed. A sample of the sand it is proposed to use shall be forwarded to the Conservation Department, Albany, N. Y., prepaid, in sufficient time to have tests made and a report sent back to the contractor in time not to delay the progress of the work. Good, clean, hard, broken stone or gravel will be acceptable for coarse aggregate. The maximum size of aggregate permitted will pass through a 2½ screen.

The mixing of the concrete, unless otherwise specifically authorized, shall be done in a batch mixer of approved type which will insure a uniform distribution of the materials throughout the mass. The entire contents of the drum shall be discharged before recharging. The volume of the mixed material per batch shall not exceed the

manufacturer's rated capacity of the mixer. The mixing of each batch shall continue not less than two minutes after all materials are in the mixer, during which time the mixer shall rotate at a perpheral speed of about 200 feet per minute.

Good, substantial, well-braced forms shall be used. The concrete shall be placed in the forms and well spaded or vibrated before it has taken its initial set. Before placing freshly mixed concrete against concrete that has taken its initial set, all laitance shall be removed, the surface thoroughly wetted and cleaned, and a layer of mortar 3/4 inch thick spread over the surface. All concrete shall be kept moist for a period of two weeks, protected from the sun's rays for three days, and the temperature kept above 50°F for three days.

Expansion joints and construction joints shall be located where, and only where, shown on the drawings or directed by the Conservation Department representative and shall conform with the detail shown on the drawing or as directed in writing by the Conservation Department representative. The contractor shall furnish all labor, materials, tools, and equipment required for this item except the reinforcing steel and sheet copper and asphalt joint filler for expansion joints which will be paid for under items 10, 11, and 12. Payment will be made for the number of cubic yards of concrete for dams in place, except no payment will be made for an over run in concrete due to an overcut in excavation without a written order, at the unit price bid for concrete for dams.

Item 9 - Concrete other than for Dams

This item covers the materials and labor required to construct the concrete piers supporting the log seats and the speaker's platform at the assembly area, and filling cracks and small depressions in the bathing pool bottom as directed. The concrete shall be proportioned as follows: 1 part of portland cement to 2½ parts of sand and 4½ parts of broken stone or gravel measured by volume. The proportions of sand and coarse aggregate may be slightly varied to obtain a denser concrete if so directed by the representative of the Conservation Department on the job. Only sufficient water shall be used to make a workable consistency. The slump, as shown on the standard American Society of Testing Materials test, shall not exceed 4 inches. At least one slump test shall be made for each pour of concrete.

The cement used shall have been tested and approved by the State Department of Public Works. The sand to be used shall be approved by the Conservation Department and washed. A sample of the sand it is proposed to use shall be forwarded to the Conservation Department, Albany, N. Y., prepaid, in sufficient time to have tests made and a report sent back to the contractor in time not to delay the progress of the work. Good, clean, hard broken stone or gravel will be acceptable for coarse aggregate. The maximum size of aggregate permitted will pass through a 2½ screen.

The mixing of the concrete, unless otherwise specifically authorized, shall be done in a batch mixer of approved type which will insure a uniform distribution of the materials throughout the mass. The entire contents of the drum shall be discharged before recharging. The volume

of the mixed material per batch shall not exceed the manufacturer's rated capacity of the mixer. The mixing of each batch shall continue not less than two minutes after all materials are in the mixer, during which time the mixer shall rotate at a peripheral speed of about 200 feet per minute.

Item 10 - Reinforcing Steel

Under this item round deformed bars of the size and location shown on the drawings shall be incorporated in the structures as shown. All bars shall meet the physical properties and tests of A.S.T.M. specifications A-15-39 for intermediate or hard grade. The bars when used shall be free from dirt and rust. The bars shall be accurately positioned and secured against displacement. The bars shall be fastened together at crossings with suitable clips or wired together with not smaller than No. 18 gauge annealed wire at sufficient intervals to prevent displacement. The bars shall be supported by metal or concrete chairs, spacers, or by metal hangers. When splicing bars they shall be lapped not less than 40 bar diameters. No bars shall be more than 5 per cent under the standard weight for bars of the size specified. No direct payment will be made for the tie wire, clips, chairs, hangers, etc. as the cost of these items will be included in the unit price bid for reinforcing steel. Payment will be made for the actual number of pounds of steel reinforcing in place.

Item 11 - Sheet Copper

No. 20 gauge annealed sheet copper shall be cut into strips 12 inches wide folded as shown on the drawing and placed in all expansion joints to make watertight barriers at the expansion joints. Payment will be made for the number of pounds of sheet copper in place.

Item 12 - Asphalt Joint Filler

To make room for expansion and to protect the sheet copper water stop, ½ inch of asphalt joint filler shall be spread on the first placed face of the expansion joint, after which the concrete on the other side of the expansion joint shall be placed. Care shall be taken that the layer of joint filler is not disturbed nor the concrete next to it is not porous. The asphalt joint filler shall consist of not less than 17 per cent of pure asbestos fiber and not more than 50 to 60 per cent of asphalt, 5 to 6 per cent of pitch and 30 to 40 per cent of volatile spirits.

Item 13 - No. 2 Crushed Stone Underdrains

This item covers the furnishing of all materials and labor for the filling of drainage ditches under the storage dam and apron with No. 2 crushed stone at the locations shown on the drawings. The crushed stone shall be clean, hard and durable and shall be slightly compacted by tamping. After compaction, the stone filled trenches shall be covered with one-ply tarpaper. The excavation of trenches will be included in Item 4- Excavation. All other costs including the tarpaper will be included in the unit price bid for No. 2 crushed stone underdrains in place.

Item 14 - Stone Riprap

Under this item the contractor shall furnish and place field or quarry stone riprap on the upstream slope of the earth embankment sections of the two dams to the lines and grades shown on the drawings and on the easterly slope of the road embankment along the old railroad grade location. The stones furnished shall be hard and durable one-man or two-man stones. The toe of the riprap shall be set in a trench at least 12 inches deep with one side of the trench parallel with the face of the riprap and 12 inches below it, and the other side of the tren ch normal to the face of the riprap as shown on the drawings. The riprap shall be 12 inches thick, including 3- inch sand cushion. The stones shall be hand placed with principal bedding planes generally normal to the face of the riprap and with the interstices between the larger stones filled with spalls or smaller stones so as to make an even and close finished surface. No direct payment will be made for the necessary excavation to prepare the bed for the riprap, but the cost of such excavation will be included in the unit price bid for stone riprap. Payment will be made for the number of cubic yards in place, including the sand cushion, at the unit price bid for this item.

Item 15 - 4-inch Vitrified Pipe, 2-foot lengths

Under this item the contractor shall furnish and incorporate in the storage dam at the locations shown on the drawing common 4-inch vitrified sewer pipe to conduct water from the underdrainage system through the cutoff walls. Payment will be made for the number of linear feet of pipe incorporated in the work as shown on the drawing or as directed by the Conservation Department representative at the unit price bid.

Item 16 - Gravel Surfacing for Road

This item covers the furnishing and spreading of a 6-inch layer, loose measure, of run-of-bank gravel on the raised railroad grade road as shown on the drawing. All stones over 2½ inches in greatest dimension shall be screened or cast out. If ruts or other depressions develop during the placing of the gravel surfacing they shall be brought to grade by the addition of more gravel. The gravel shall be of a quality approved by the Conservation Department representative. Payment will be made for the number of cubic yards of gravel spread on the road, exclusive of the stones scree ed or cast out, at the unit price bid.

Item 17 - Gravel Surfacing for Assembly Area

This item covers the furnishing and spreading of a 2-inch layer, loose measure, of run-of-bank gravel over the entire assembly area except the area occupied by the speaker's platform and the piers supporting the log seats. All stones over 1½ inches in greatest dimension shall be screened or cast out. The gravel shall be of a quality approved by the Conservation Department representative. Paymen t will be made for the number of cubic yards of gravel spread on the assembly area, exclusive of the stones screen ed or cast out, at the unit price bid.

Item 18 - Stone Masonry

The abutments of the bathing pool shall consist of uncoursed rubble masonry laid with cement an d sand mortar joint. Skilled stone masons shall be employed for the placing of the stone masonry. The stones shall be prepared for laying by removing the sharp projections and weak angles and all dust and dirt and wetting the stone. The stones shall generally be laid on their broadest faces and headers and stretchers shall be alternated so as to effectively bond the work together. Headers shall comprise at least 25% of the mass and 25% of the area of the faces. The vertical joint between any two stones shall not be directly above the vertical joint between two stones immediately below. To level the bed to receive a stone, spalls or stone chips shall be placed in a mortar bed and a generous layer of mortar spread over the area to be covered by the stone. Extreme care shall be exercised to make sure that all joints, both horizontal and vertical, shall be completely filled with mortar. The mortar used shall consist of one part of portlan d cement and two parts of sand. The cement used shall be approved by the Conservation Department, and sand to be used shall be from a pit or pits approved by the Conservation Department and washed. The contractor shall furnish all materials, tools, an d equipment required for the work described in this paragraph for the unit price bid for stone masonry.

Item 19 - 2½-inch Galvanized iron pipe sleeves

This item covers the furnishing and installing of 2½-inch diameter standard galvanized iron pipe sleeves in the crest of the bathing pool dam as shown on the drawing. The sleeves shall be accurately set as to spacing, alignment and verticality and shall be securely fastened in plac so as not to be displaced while the concrete is being placed around them. The bottoms of the sleeves shall be closed by caps or other means to prevent the fresh concrete from entering the sleeves. The top of the sleeves shall be flush with the top of the concrete spillway. Payment will be made for the number of linear feet of 2½-inch stan dard galvanize iron pipe properly incorporated in the work.

Item 20 - 2-inch Galvanized Iron Pipe Flashboard Supports

This item covers the furnishing and installing of 2-inch standard galvanized iron pipe flashboard supports in sleeves set in the crest of the bathing pool dam as shown on the drawing. Payment will be made for the number of linear feet of 2-inch standard galvan ized iron pipe properly incorporated in the work.

Item 21 - 3-inch Oak Stop Planks

This item covers the furnishing and installing of 3-inch T&G oak stop planks in the bathing pool dam as shown on the drawing. The stop planks shall be ma de watertight by tacking sheet rubber or canvas to the upstream side of the stop planks so as to prevent water from passing under or around the ends of the stop planks or by other approved method. Payment will be made for the lump sum bid for this item.

Item 22 - 2-inch Flashboards

This item covers the furnishing and installing of 2-inch T&G spruce hemlock or yellow pine flashboards on the bathing pool dam as shown on the drawing. The flashboards shall be made watertight by tacking sheet rubber or canvas to the upstream side of the flashboards so as to prevent water from passing under, around the end, or between the flashboards or by other approved method. Payment will be made for the lump sum bid for this item.

Item 23 - Water lines

This item covers the extension of the existing water supply system to connect it to the new outlets and the pipe line to the administration building. This will require the furnishing and laying of 1250 linear fee of 1½-inch and 350 linear feet of 1-inch galvanized iron pipe with all th necessary fittings, such as tees, unions, ells, reducers, drains and shutoffs at the locations shown on the drawing or as directed by the Conservation Department representative. The pipe shall be laid about one foot below the ground surface and all dips shall b e provided with drains and shutoffs. The cost of excavating trenches for the pipe and backfilling them shall be included in this item. Payment will be made for the completed extension of the water supply system as shown on the drawing or outlined herein for the lump sum bid for this item.

Item 24 - Water Outlets

This item covers the furnishing of all materials and labor for the installation of combination self-closing drinking fountains and self-closing hydrants at the locations shown on the drawings or directed by the Conservation Department representative. The materials required for each outlet include the following:

1 cu. yd. of No. 3 broken stone
4 lin. ft. of 6" vit. tile pipe
20 lin. ft. of 4" vit. tile pipe
2 7½-inch diameter brass strainers
2 14" stepping logs for children, bolted to 14" post 4 feet long with a ½" bolt 42 inches long and to the ground by a ½" bolt 30 inches long
1 self-closing fountain
1 ½" self-closing faucet

The unit price bid for this item shall include the necessary excavation and backfill, all plumbing and all cleanup as directed by the Conservation Department representative.

Item 25 - Removing Pine Trees

This item covers the painstaking removal of trees from a white pine plantation at the site of the assembly area and the delivery of the trees to the Conservation Department representative at the campsite for replanting. Only the trees designated by the Conservation

Department representative for removal shall be removed. Trees bordering on the assembly area and not designated to be removed shall be protected from damage. The time and method of removal of the trees shall be approved by the Conservation Department representative. Payment will be made for the number of trees removed and delivered to the Conservation Department at the unit price bid.

Item 26 - Smoothing Assembly Area Ground

This item covers the backfilling of the depressions left by the removal of the pine trees and the filling of other depressions so as to make a fairly even surface over the assembly area. Payment will be for the number of square yards smoothed at the unit price bid.

Item 27 - Dowels

Under this item round deformed steel bars of the diameter and length shown on the drawing shall be furnished and set in the concrete piers to hold in place the 8-inch diameter floor joists for the speaker's platform and the 14-inch diameter log seats for the assembly area. The dowels shall be set in the centers of the tops of the piers and vertical. Payment will be made for the number of pounds of dowels in place at the unit price bid.

Item 28 - 8-inch Logs for Platform Floor Joists

This item covers the furnishing and incorporating in the assembly area speaker's platform 8-inch diameter floor joists. The logs shall be peeled hemlock sound and straight. They shall be dapped on the under side to fit the concrete piers and fastened to the piers by one 3/4-inch dowel at each pier. The upper side of the logs shall be hewed or sawed to a level surface so that when the plank floor is in place it will be level and each plank shall be supported by each of the four floor joists. At each end of the platform 8-inch diameter logs shall be fitted in between the floor joists as shown on the drawing. Payment will be made for the number of board feet, computed by the Doyle rule, of 8" diameter logs incorporated in the work at the unit price bid.

Item 29 - 14-inch Log Seats

This item covers the furnishing, fitting, and placing of 14-inch diameter log seats in the assembly area in compliance with the details shown on the drawing. The logs shall be peeled hemlock, sound, straight, and free of sharp knots. They shall be dapped on the under side to fit the concrete piers and shall be fastened to the piers by one 3/4-inch dowel at each end of each log. 3/4-inch holes shall be bored in the bottoms of the logs to en gage 3/4-inch dowels set in the top of the concrete piers, The upper side of the logs shall be hewed or sawed to a smooth surface and to the slope and width shown on the drawing. Payment will be made for the number of board feet, computed by the Doyle rule, of 14-inch logs made into log seats at the unit price bid.

Item 30 - 2-inch Plank Floor for Speaker's Platform

This item covers the furnishing of 2-inch hemlock, spruce, or yellow pine plank d 4s and 40 d common nails and the labor of securely nailing the plank to the 8-inch diameter floor joists. The plank shall be 12 feet long and of random widths and shall be laid one half inch apart. Payment will be made for the humber of board feet of plank in place at the unit price bid.

Item 31 - Cesspools, Stone-lined

One stone-lined cesspool shall be constructed for each set of two 4-unit latrines at the location shown on the drawing or as directed by the Conservation Department representative. The walls shall be of dry stone masonry with open joints. Care shall be observed to break vertical joints, but vertical joints may be two inches wide. The concrete and reinforcing in the top shall conform to the specifications for those items. No direct payment will be made for excavation or backfill. Payment will be made for the number of cesspools constructed at the unit price bid. With the written approval of the Conservation Department representative, log-lined cesspools may be substituted for stone-lined cesspools at the unit price bid for stone-lined cesspools.

Item 32 - 24-inch Corrugated Galvanized Iron Pipe, 14-gage

This item includes the furnishing and laying of 24-inch diameter, 14-gage galvanized corrugated iron pipe culverts with the necessary connecting bands at the locations shown on the drawings or as directed by the Conservation Department representative on the work. It also includes the necessary excavation and backfill required to properly lay the culverts, but does not include the excavation of drainage ditches leading from the culverts. The culverts shall be so placed that there will be at least one foot of cover over them when the road is completed. The culverts shall be supported on original ground throughout their entire length and the backfill shall be hand tamped so as to completely fill the trench under and both sides of the culvert. Payment will be made for the number of linear feet of pipe in place at the unit price bid.

SCHEDULE AND ESTIMATE OF COST

Item						
1	Clearing and Grubbing	All			L.S.	$200.0(
2	Clearing Flow	330	acres	at	$50.00	16500.0(
3	Diversion and Care of Water during construction	All			L.S.	700.0
4	Excavation, except stripping	670	cu.yd.	at	2.00	1340.0(
5	Stripping	304	cu. yd.	at	0.50	152.0
6	Earth Embankment for Road	5000	cu. yd.	at	0.60	3000.0
7	Earth Embankment for Dams	2180	cu. yd.	at	1.50	3270.0
8	Concrete for Dams	613	cu. yd.	at	20.00	12260.0
9	Concrete, other than for Dams	25	cu. yd.	at	25.00	625.0
10	Reinforcing Steel	37,300	lb.	at	0.06	2238.0
11	Sheet Copper	140	lb.	at	0.25	35.0
12	Asphalt Joint Filler	400	lb.	at	0.10	40.0
13	No. 2 Crushed Stone, Underdrains	15	cu. yd.	at	3.00	45.0
14	Stone Riprap	480	cu. yd.	at	4.75	2280.0
15	4" vit. pipe - 2' lengths	14	lin.ft.	at	1.00	14.0
16	Gravel Surfacing for Roads	830	cu. yd.	at	1.50	1245.0
17	Gravel Surfacing for Assembly Area	85	cu. yd.	at	2.00	170.0
18	Stone Masonry	64	cu. yd.	at	30.00	1920.0
19	2½" Galvanized Iron Pipe, Sleeves	24	lin.ft.	at	1.00	24.0
20	2" Galv. Iron Pipe, Flashboard Supports	60	lin.ft.	at	0.60	36.0
21	3" Oak Stop Planks	All			L.S.	15.0
22	2" Flashboards	All			L.S.	85.0
23	Water Lines	All			L.S.	640.0
24	Water Outlets	14	each	at	30.00	420.0
25	Removing Pine Trees	200	trees	at	1.50	300.0
26	Smoothing Assembly Area Ground	1500	sq. yd.	at	0.05	75.0
27	Dowels	1050	lb.	at	0.10	105.0
28	8" diam. logs for platform floor joints	120	bd. ft.	at	0.30	36.0
29	14" diam. log seats	15000	bd. ft.	at	0.06	900.0
30	2" Plank Floor for Speaker's Platform	580	bd. ft.	at	0.10	58.0
31	Cesspools, stone-lined	3	each	at	300.00	900.0
32	24" Galvanized Iron Pipe, 14-gage	64	lin.ft.	at	3.00	192.0
				TOTAL		$49,820.0

Respectfully submitted

Charles H. Hurley

WHETSTONE GULF PUBLIC CAMPSITE
ENGINEER'S ESTIMATE
STORAGE DAM AND BATHING POOL DAM

Item	Description	Quantity	Unit	Unit Price	Estimated Price
1WB	Applying Water	-	L.S.		
2	Unclassified Excavation		C.Y.		
2EA	Embankment in Place (Dam)		C.Y.		
2E	Embankment in Place		C.Y.		
5	Trench, Culvert and Bridge Excavation		C.Y.		
5R	Trench, Culvert and Bridge Excavation, Rock		C.Y.		
V9	Sewer Pipe (Vitrified)		L.F.		
11	Corrugated Metal Pipe		L.F.		
15-2A	Portland Cement, Type 2A		BBL.		
18	Structural Concrete		C.Y.		
24	Stone Masonry		C.Y.		
28	Bar Reinforcement for Structures		LBS.		
29	Structural Steel		LBS.		
42AB	Bottom Course-ROB Material-Loose Measure		C.Y.		
80B	Stone Rip Rap		S.Y.		
82S	Cofferdams	-	L.S.		
107A	Timber - Stop Planks		B.F.		
121	Topsoil placed from stockpiles		C.Y.		
200	No. 2 Crushed Stone Underdrain		C.Y.		
201	Furnish and Install 36" x 36" Water Control Gate	-	L.S.		
202	Bronze Grill		EA		
203	Flashboards	-	L.S.		

WHETSTONE GULF CAMPSITE
STORAGE DAM AND BATHING POOL DAM

DETAILED SPECIFICATIONS

All contract items shall meet the requirements as set forth in the New York State Public Works Specifications adopted January 2, 1957, except as may be modified under Special Specifications.

WHETSTONE GULF CAMPSITE # STORAGE DAM AND BATHING POOL DAM

SPECIAL SPECIFICATIONS

Item 1WB - Applying Water. The specifications for Item 1WA will apply except that payment will be by lump sum.

Item 2EA - Embankment in Place - Dams.

The specifications for Item 2E will apply except as follows:

Earth embankment shall be placed in layers not more than 6" thickness and each layer thoroughly compacted as outlined in the standard specifications. There shall be no stone or rock having a maximum dimension of more than 5 inches used in embankment constructed under this item.

Item 42AB - Bottom Course-ROB Gravel-Loose Measure

The specifications for Item 42A shall apply except that the material shall be Run of Bank Gravel.

Item 80B - Dry Rip Rap

The specifications for Item 80 shall apply except as noted:

a - Materials. Dry rip rap shall consist of durable field or quarry stone each shaped as nearly as practicable in the form of a right rectangular prism. At least fifty per cent of the stones shall weigh in excess of 100 pounds each, and no stone shall weigh less than 50 pounds each. One dimension of each of the stones furnished shall be the thickness of the rip rap as shown on the plans, and the stones shall be so laid that this dimension is perpendicular to the prepared bed.

b - All dry rip rap shall be properly aligned and in close contact and shall rest on a 3 inch sand cushion. The sand cushion shall meet the requirements for cushion sand as outlined in the standard specifications Part II, "M-3 Fine Aggregates".

Item 82-S - Cofferdams

The specifications for Item 82 shall apply except that payment will be by lump sum.

Item 107-A - Timber and Lumber - Stop Planks

a - Work. Under this item the Contractor shall furnish and place 3-inch T & G oak stop planks in the bathing pool dam as shown in the plans. The stop planks shall be made watertight by tacking sheet rubber or canvas to the upstream side of the stop planks so as to prevent water from passing under or around the ends of the stop planks, or by other approved methods.

b - Material. Lumber furnished under this item shall be sound, square-edged, free from shakes, loose knits or decay.

c - Measurement and Payment. The quantity to be paid for under this item shall be the number of board feet, placed in the completed work. In measuring dressed timber and lumber, the cross-section of any piece will be taken as the minimum nominal commercial size of undressed material from which the piece could have been cut. The length of any piece will be taken as the actual length in the finished work, making no deductions for bevels, notches or splices. The unit price bid will also include furnishing and installing sheet rubber, canvas or other acceptable material as outlined in paragraph "a".

Item 200 - No. 2 Crushed Stone Underdrain.

a - Work. Under this Item the Contractor shall furnish and place No. 2 Crushed Stone Underdrains as shown on the plans. Stone shall be slightly compacted by tamping; after compaction the trenches shall be covered by one ply tar paper.

b - Material. The crushed stone shall be approved material meeting the requirements for Type A, B or C in accordance with the specifications for Crushed Stone, "M-4 Coarse Aggregates" in part II of the Standard Specifications. The stone shall be classified as No. 2 size.

c - Measurement and Payment. The quantity to be paid for under this item will be the number of cubic yards of stone measured in its final compacted position, placed as required by the plans. The cost of tar paper shall be included in the unit price bid. Excavation shall be paid for as "Trench, Culvert and Bridge Excavation, Item 5.

Item 201 - Furnish and Install 36" x 36" Water Control Gate

a - Work. Under this item the Contractor shall furnish and erect complete one 36" x 36", slide gate Armco Model 115 or equal, with 6'-0" high frame, fabricated so as not to extend above gate opening , machined cast iron slide and seat, and spigot back seat, one handwheel lift with bronze lift nut Armco HB24 or equal, one 1½" Dia. x 19' long hot rolled stem Armco or equal, 2 Armco fully adjustable stem guides or equal all necessary anchor bolts, one Locking Device Armco or equal and one Padlock Corbin Model 2863½ or equal with brass case and wrought brass shackle, lock to be supplied with two keys.

b - Payment. Payment will be made at the lump sum price bid for this item. The price bid shall include the cost of furnishing all labor, materials, and equipment necessary to complete the work to the satisfaction of the Engineer.

Item 202 - Furnish and Install Bronze Grills.

a - Work. Under this item the Contractor shall furnish and install complete, to the satisfaction of the engineer, two approved circular cast bronze grills as indicated on the plans.

b - Material. The grill shall have a flange and be firmly affixed to the concrete abutment. The grill shall be slotted or of other approved type, and shall have the maximum area of openings.

c - Payment. The quantity to be paid for under this item will be the number of bronze grills furnished and installed.

Item 203 - Flashboards for Bathing Pool Dam.

a - Work. Under this item the Contractor shall furnish and install all necessary material to construct and erect flashboards at the bathing pool dam as shown on the plans.

b - Material. This item covers the furnishing and installing of 2" standard galvanized iron pipe sleeves, 1½" standard galvanized iron pipe flashboard supports and 2 inch T & G spruce, hemlock or yellow pine flashboards, together with all necessary hardware to affix flashboard to supports and sheet rubber or canvas to make the flashboards watertight.

The sleeves shall be accurately set as to spacing, alignment and verticality and shall be securely fastened in place so as not to be displaced while the concrete is being placed around them. The bottom of the sleeves shall be closed by caps and the tops shall be flush with the top of the concrete spillway.

Flashboards shall be made watertight by tacking sheet rubber, canvas or other approved material to the upstream side of the flashboards so as to prevent water from passing under, around the end or between the flashboards.

c - Payment. Payment for this item shall be by lump sum and shall include the complete cost of fabricating and installing the flashboard according to the plans.

DAM CONSTRUCTION PERMIT APPLICATION

Form E-61. (SD-104) 2M 4-58
Ord. 7-05-7

STATE OF NEW YORK

DEPARTMENT OF PUBLIC WORKS

ALBANY

Received March 16, 1960 Dam No. 113-~~2863~~ 2862

Disposition Approve March 30, 1960 Watershed Black River

Foundation inspected .....

Structure inspected .....

Application for the Construction or Reconstruction of a Dam

Application is hereby made to the Superintendent of Public Works, Albany, N. Y., in compliance with the provisions of Section 948 of the Conservation Law (see third page of this application) for the approval of specifications and detailed drawings, marked Whetstone Gulf Public Campsite, Storage Dam

herewith submitted for the { construction / ~~reconstruction~~ } of a dam herein described. All provisions of law will be complied with in the erection of the proposed dam. It is intended to complete the work covered by the application about October 30, 1960 (Date)

1. The dam will be on Whetstone Creek flowing into Black River in the town of Martinsburg County of Lewis and 2-3/4± miles upstream from intersection of state hwy. 12D & Whetstone Creek (Give exact distance and direction from a well-known bridge, dam, village, main cross-roads or mouth of a stream)

2. Location of dam is shown on the ..... quadrangle of the United States Geological Survey.

3. The name of the owner is NEW YORK STATE CONSERVATION DEPT.

4. The address of the owner is Albany, N. Y.

5. The dam will be used for Stream Regulation & Flood Control

6. Will any part of the dam be built upon or its pond flood any State lands? Yes

7. The watershed above the proposed dam is 8.1 square miles.

8. The proposed dam will create a pond area at the spillcrest elevation of 380 acres and will impound 60 million cubic feet of water.

9. The maximum height of the proposed dam above the bed of the stream is 17 feet -- inches.

10. The lowest part of the natural shore of the pond is 0 feet vertically above the spillcrest, and everywhere else the shore will be at least 0 feet above the spillcrest.

11. State if any damage to life or to any buildings, roads or other property could be caused by any possible failure of the proposed dam. No damage other than flooding of state-owned land is contemplated

12. The natural material of the bed on which the proposed dam will rest is (clay, sand, gravel, boulders, granite, shale, slate, limestone, etc.) / Clay & gravel

13. Facing downstream, what is the nature of material composing the right bank? Clay & gravel

14. Facing downstream, what is the nature of the material composing the left bank? Clay & gravel

15. State the character of the bed and the banks in respect to the hardness, perviousness, water bearing, effect of exposure to air and to water, uniformity, etc. There is no evidence of bedrock at the dam site. Under 9 to 12 inches of topsoil the soil is fairly impervious mixture of clay and gravel

16. Are there any porous seams or fissures beneath the foundation of the proposed dam? No

17. WASTES. The spillway of the above proposed dam will be 60 feet long in the clear; the waters will be held at the right end by an earth embankment the top of which will be 5 feet above the spillcrest, and have a top width of 8 feet; and at the left end by an earth embankment the top of which will be 5 feet above the spillcrest, and have a top width of feet.

18. The spillway is designed to safely discharge 334 cubic feet per second.

19. Pipes, sluice gates, etc., for flood discharge will be provided through the dam as follows:
One 3' x 3' oriface with 36" x 36" slide gate. Oriface is to be located 2'-0 off right end

20. What is the maximum height of flash boards which will be used on this dam? NONE

21. APRON. Below the proposed dam there will be an apron built of Reinforced concrete 35'6" feet long across the stream, 60 feet wide and 1'0" & 1'6" feet thick.

22. Does this dam constitute any part of a public water supply? No

PREVIOUS REPORTS

15 (12 75)

New York State Department of Environmental Conservation

MEMORANDUM

TO: THE FILES
FROM: G. Koch
SUBJECT: Dam at Whetstone Gulf State Park - #101-2862 Black River

DATE: June 11, 1976

The present operating procedure on the dam involves draining the lake in the Fall to provide storage for Spring run-off. Burrell Puffington, biologist from Watertown requested that minimum water surface be kept at about 4 feet below spillway crest in order to provide a lake for fish.

My hydrologic investigation indicates that when water surface is at spillway crest the reservoir provides a large amount of flood storage and I, therefore, recommended that the water surface be raised to the level requested by Mr. Puffington. This information was conveyed to the three members of the Thousand Island State Park Commission and they agreed to comply with the higher water surface to provide for fishing in the reservoir. The water surface has to be kept below the spillway crest because at this level, an upstream dike will be overtopped.

The concrete spillway was in good condition. During the Fall of 1975 it was grouted with epoxy cement. I informed the Park Commission that maintenance should be performed on the earth embankment so that the top of the dam is level with the top of wall on the spillway. The earth presently drops down 2 feet at the intersection of the wall and top of dam.

G KOCH

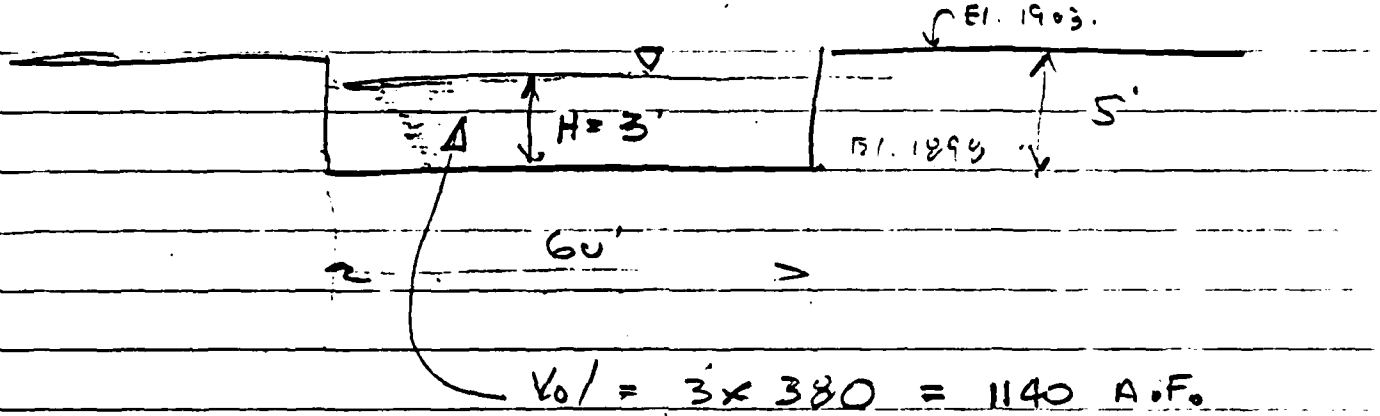
WHITESTONE GULF DAM #43-2863

D.A = 8.1 Sq Mi

Surface Area = 380 Acres

Reservoir = 60 Million C.F.

$$Vol = \frac{60,000,000}{43,560} = 1500 \text{ A.F.}$$



$Vol = 3 \times 380 = 1140$ A.F.

SPILLWAY

$Q = CLh^{3/2}$

$Q = 3.1 (60) (3)^{3/2}$

$Q = 960$ cfs

Peak Inflow = $37 \times 8.1 = 295$ cfs

DESIGN FLOOD

100 Yr - 6 Hr P = 3.7"

RUNOFF

P = 3.7" } R = 1.1"
CN = 70 }

Vol Runoff = $\frac{1.1}{12} \times 8.1 \times 640 = 480$ A.F.

SUMMARY: O.K. TO ROUTE W.S. TO SPILLWAY CREST (1898.0)

STORAGE = 1140 AF Runoff 10-Yr = 480 A.F.

PREVIOUS INSPECTION REPORTS

1970

[illegible] OF PARKS AND RECREATION
[illegible] STRUCTURE INVENTORY

[illegible]: Thousand Islands   [illegible] 1

Location of Park or Use Area	Name of Lake	Type of Dam			Dimensions		Capacity Acre Ft.	Water Shed Sq. Miles	Purpose or Use	Year Built	Condition			When and by whom was dam last inspected
		Conc.	Earth	Other	L	H					G	F	P	
[illegible] Flow State Park	Spring [illegible] Creek		X		20'+	7'+	35+		Fish & wild-life Nature Trail	1970	X			1/14/76 H.D. [illegible]
[illegible] Gulf State Park - [illegible]	Black River Basin, Whetstone Creek				40'+	20'+	10,000+		Water Supply Recreational Fish & Wild-life Flood Control	[illegible]	X			1/6/76 R. Berry
Whetstone Gulf State Park - [illegible]	Black River Basin, Whetstone Creek	X			30'+	10'+	5+		Swimming	1960	X			1/5/76 R. Berry
Wellesley Island State Park - Nature Center	St. Lawrence River Basin Stream		X		700'+	14'+	63+		Fish & Wild-life Nature Trail	1971	X			1/1[illegible]/76 R. Wakefield
Jacques Cartier State Park	St. Lawrence River Basin	(Timber stone fill, crib abutment, wood dam w/ concrete overflow)		X	15'+	15'+	5+		Fish & wild-life				X	(See remarks)

Remarks: Beaver dam upstream actually retaining water. Timber cribbing, etc., very poor [illegible] visible [illegible] and [illegible] be replaced or removed.

OFFICE OF PARKS AND RECREATION
DAM STRUCTURE INVENTORY

1980

REGION: Thousand Islands

Location of Park or Other Area	Name of Lake	Type of Dam			Dimensions		Capacity Acre Ft.	Water Shed Sq. Miles	Purpose or Use	Year Built	Condition			When and by whom was dam last inspected?
		Mas	Earth	Other	L	H					G	F	P	
Wellesley Island Nature Center	St. Lawrence River Basin Stream		X		310'+ 535'+	3'+ 145'+	63+		Fish & Wildlife Nature Trail	1971	X			7/79 L. Geoghegan (see attached)
Jacques Cartier *State Park*	St. Lawrence River Basin Stream	Stone filled timber crib abutments wooden dam		X	15'+	15'+	5+		Fish & Wildlife	Circa 1963			X	7/79 L. Geoghegan (see attached)
St. Lawrence State Park Gulf Course	Pond		X		25'+	15'+	1/2+		Wildlife & Golf Course	1969		X		7/79 L. Geoghegan (see attached)
Higley Flow State Park	Spring Fed Creek		X		20'+	7'+	35+		Fish & Wildlife Nature Trail	1970		X		7/79 L. Geoghegan (see attached)
Whetstone Gulf State Park - Upper	Black River Basin *Whetstone Creek*	X			40'+	20'+	10,000+		Water Supply Recreational Fish & Wildlife Flood Control	1959		X		7/79 L. Geoghegan (see attached)

OFFICE OF PARKS AND RECREATION
DAM STRUCTURE INVENTORY

REGION: Thousand Islands PAGE: 4 OF 4

5) Whetstone Gulf State Park Dam - Upper

This is a concrete dam with concrete abutments, spillsways, etc.

a) The lower portion of the concrete abutment wall, adjacent to the spillway shows erosive wear and spalling. This should be corrected at this time.

6) Macomb Reservation State Park Dam

This is a concrete dam with concrete abutments, spillways, etc.

a) Trees existing on adjacent earthen embankments.
b) Scaling and spalling of concrete increasing on lower spillway vertical walls.
c) Control gate hand wheel still missing.

These are the exact same problems revealed by last year's inspection. To date nothing has been done.

Again we also request one of the dam experts from D.E.C. inspect this structure.

1981

OFFICE OF PARKS AND RECREATION
DAM STRUCTURE INVENTORY

Region 1000 ISLANDS

Location (Park or Area)	Name of Lake	Type of Dam			Dimensions		Capacity Acre Ft.	Water Shed Sq. Miles	Purpose or use	Year Built	Condition			When and by whom was dam last inspected?
		Mas.	Earth	Other	L	H					G	F	P	
St. Law. State Park Golf Course	NO NAME		X		25'±	15'±	1/2±		Wildlife & Golf Course Hazard-Fire Protection	1969 rebuilt 1981	X			7/80 L. Geoghegan (See Attached)
Jacques Cartier State Park	St. Lawrence River Basin Stream			ABANDONED - DEMOLISHED - REMOVED FROM					INVENTORY					SEE ATTACHED
Whetstone Gulf State Park Upper	Black River Basin Whetstone Creek	X			40±	20±	10,000+		Water supply Recreational Fish & Wildlife - Flood Control	1961		X		7/80 L. Geoghegan (See Attached)
Whetstone Gulf State Park Lower	Black River Basin - Whetstone Creek	X			30±	10±	5+		Swimming	1961		X		7/80 L. Geoghegan
Macomb Preserve State Park	Salmon River Basin Stream	X			80±	15±	120+		Recreation Fish & Wildlife	1950				7/80 L. Geoghegan (See Attached)

OFFICE OF PARKS & RECREATION
DAM STRUCTURE INVENTORY

REGION: THOUSAND ISLANDS

1) St. Lawrence State Park Golf Course

This dam was rebuilt in the spring of 1981. The overflow/intake structure consists of 4' - 0" diameter RCCP manhole riser sections, covered by a steel-grid trash rack. Connected to the bottom MH section is 30" diameter RCCP which carries through the earthen dam to an end section and is spilled over large stones. Approximately 20' from the manhole riser along the 30" RCCP, a concrete anti-seep collar was constructed.

2) Jacques Cartier State Park

This dam was demolished and removed from our inventory.

3) Whetstone Gulf State Park (Upper)

The lower portion of the concrete abutment wall, adjacent to the spillway is scheduled for repair after Labor Day.

4) Macomb Reservation State Park

At the time of inspection, heavy rain precluded taking photos. These will be forwarded at a later date.

The deficiencies and corrections since last years report:

a) Trees on earthen embankment have been removed.

b) Scaling & spalling on lower spillway vertical walls has not increased. Cracks identified for observation and possible treatment in DEC Inspection Report were monitored over last fall and winter. Observations indicate no further movement is occuring. Cracks to be repaired 9/81.

c) Control gate hand wheel and flanged gate adapter restored 6/81. Control gate is functional.

d) No further problems observed.

5) Wellesley Island State Park Nature Center

Last year's deficiencies were corrected. Mowing and general maintenance takes place annually after July 1. This enables all nesting birds and animals to be clear of the areas to be maintained.

APPENDIX F

REFERENCES

REFERENCES

1. Chow, Ven Te, Editor - Handbook of Applied Hydrology. McGraw-Hill Book Company, New York, New York, 1964.

2. Hydrologic Engineering Center, U.S. Army Corps of Engineers, HEC-1 Flood Hydrograph Package, Users Manual. Davis, California, January 1973.

3. Hydrologic Engineering Center, U.S. Army Corps of Engineers, Flood Hydrograph Package (HEC-1), Users Manual for Dam Safety Investigations, Davis, California, September 1978.

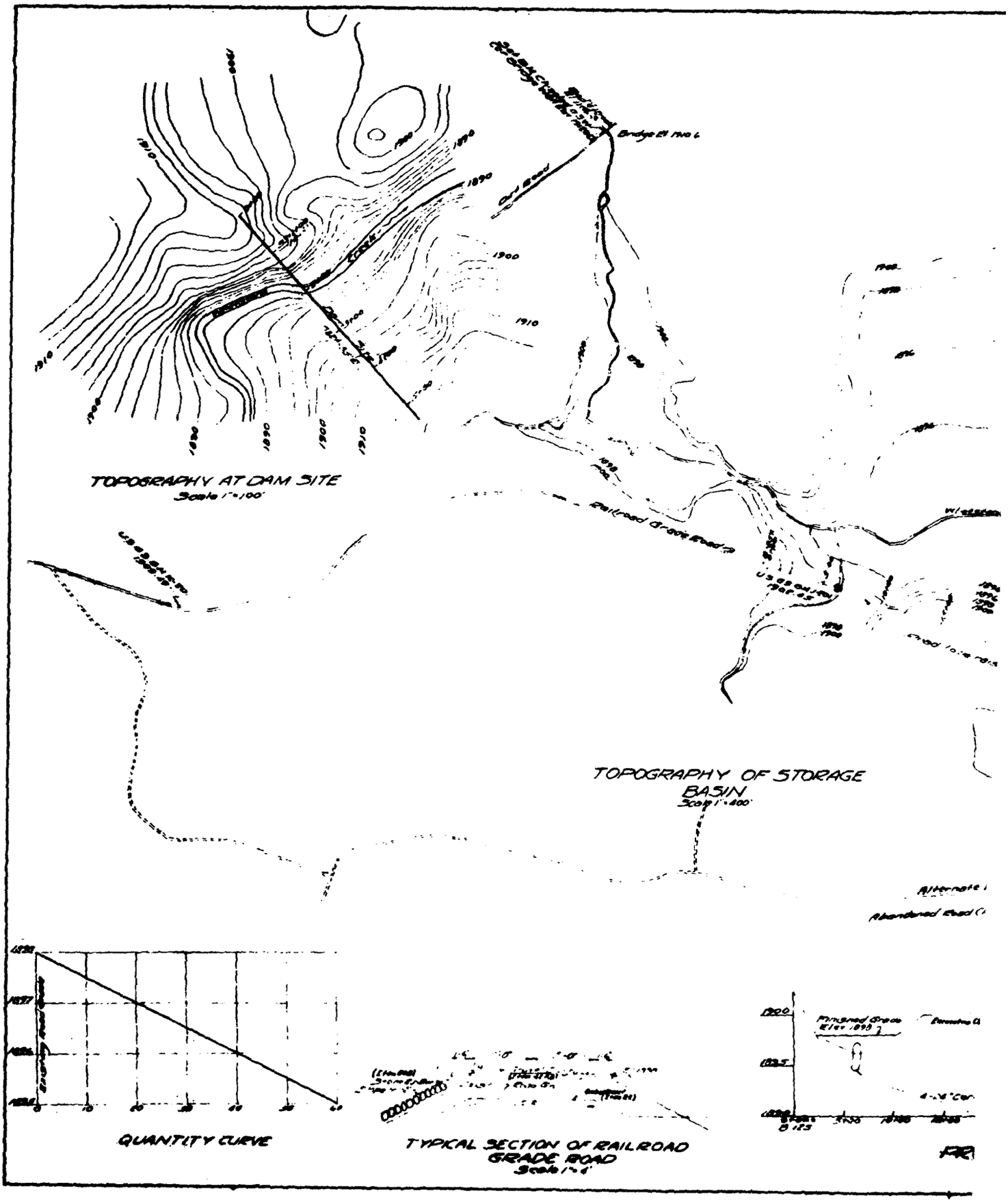
4. King, Horace and Brater, Ernest. Handbook of Hydraulics, 5th Edition. McGraw-Hill Book Company, New York, New York, 1963.

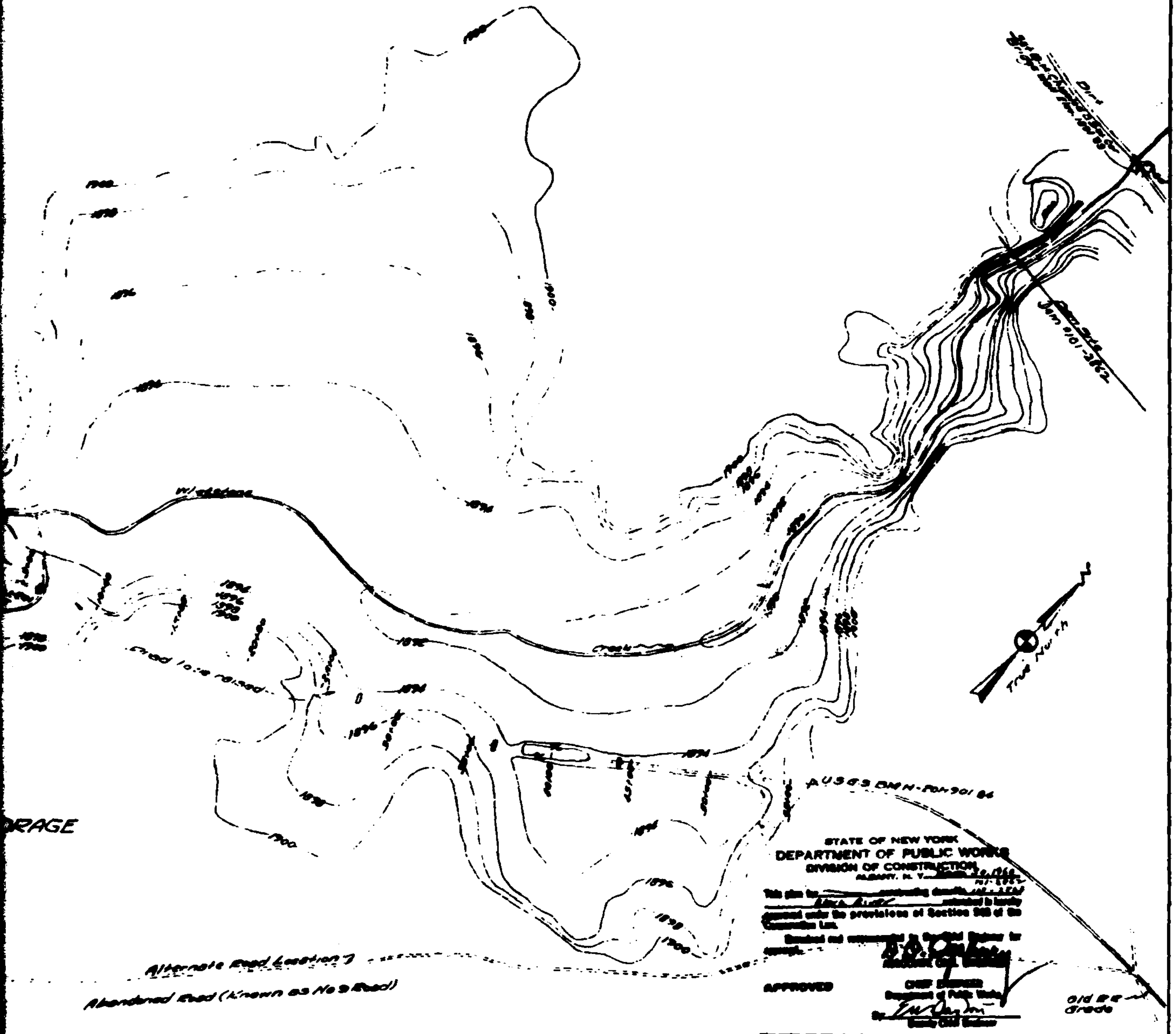
5. Riedel, J.T., Appleby, J.F. and Schloemer, R.W. Seasonal Variation of the Probable Maximum Precipitation East of the 105th Meridian for Areas from 10 to 1000 Square Miles and Durations of 6, 12, 24, and 48 Hours (Hydrometeorological Report No. 33) U.S. Department of Commerce - Weather Bureau and U.S. Department of the Army - Corps of Engineers, Washington, D.C., April 1956

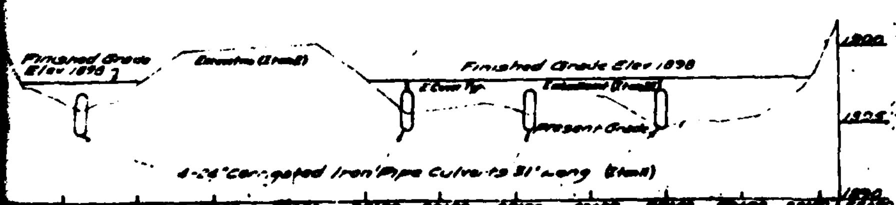
6. U.S. Department of the Interior, Bureau of Reclamation, Design of Small Dams, Second Edition, Washington, D.C., 1973.

APPENDIX G

DRAWINGS


TOPOGRAPHY AT DAM SITE
Scale 1"=100'
TOPOGRAPHY OF STORAGE BASIN
Scale 1"=400'
QUANTITY CURVE
TYPICAL SECTION OF RAILROAD GRADE ROAD
Scale 1"=4'



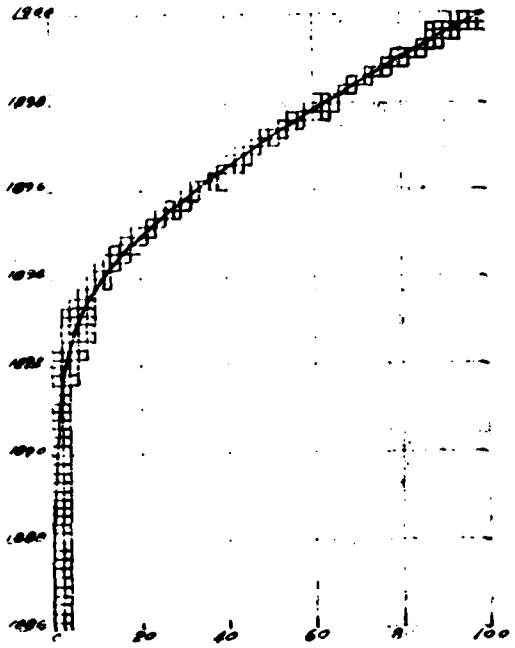


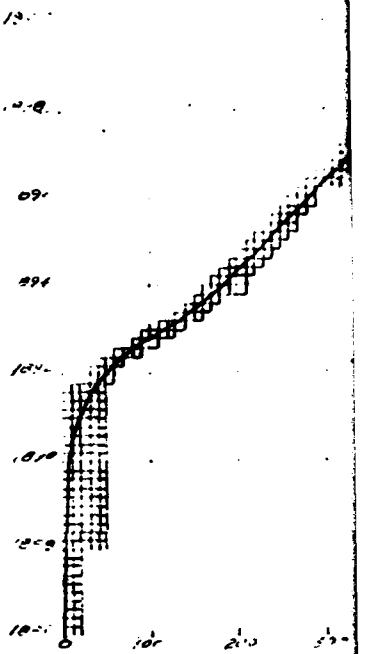
PROFILE OF RAILROAD GRADE ROAD

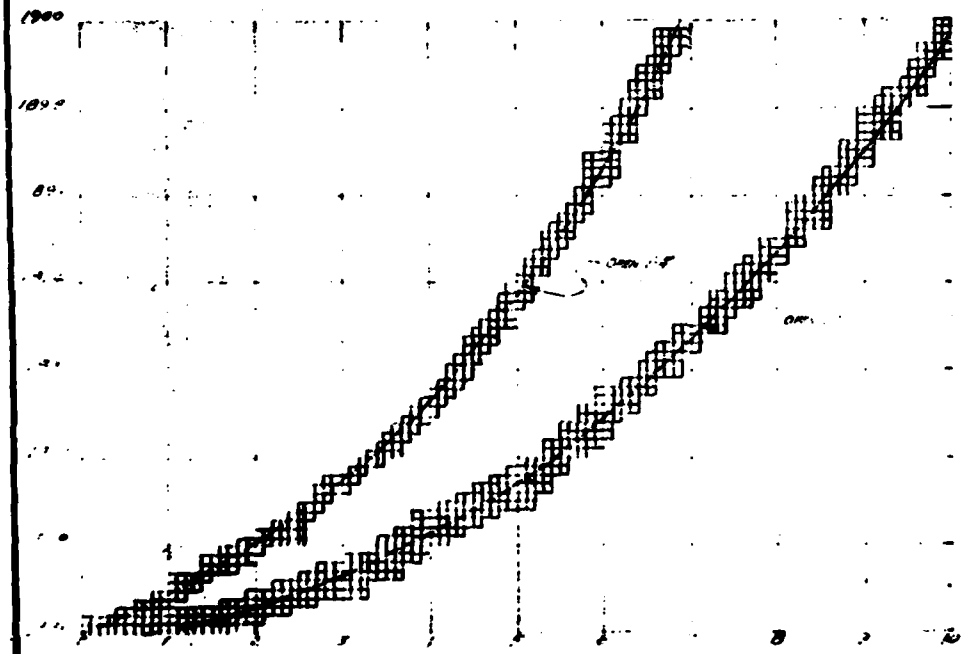
WHETSTONE GULF PUBLIC CAMPSITE NEAR LOWVILLE LEWIS COUNTY – NEW YORK		
Drawn By C H H.	CONSTRUCTION	Spec No
Traced By E M N.	PUBLIC CAMPSITE DEVELOPMENT	Date
Checked By	TOPOGRAPHY OF STORAGE BASIN AND DAM SITE AND ROAD IMPROVEMENT DESIGN	Scale As Shown
Checked By	CHARLES H. HURLEY CONSERVATION DEPT. DIVISION OF LANDS & FORESTS	Drawing 1 of 5

101-2862 – BLACK

12



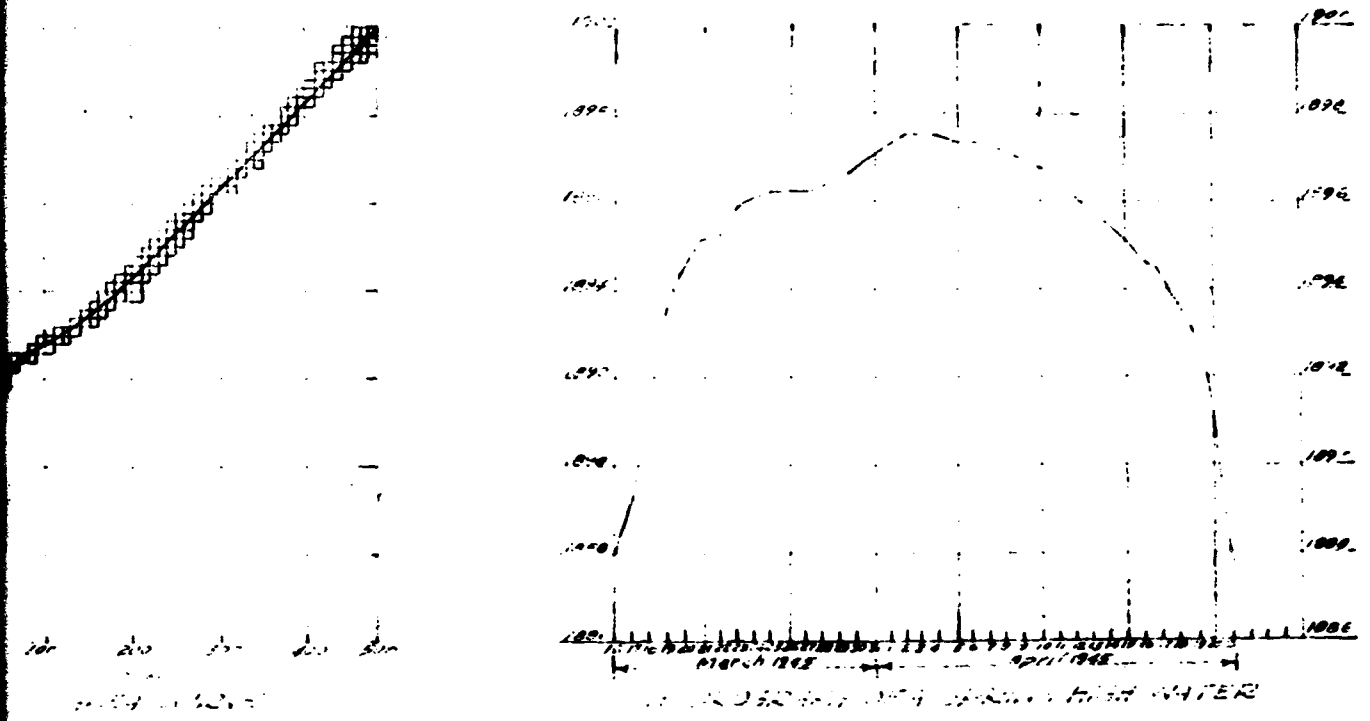




MILLION CUBIC FT. PER DAY THRU 5'-5" ORIFICE

ORIFICE DISCHARGE CURVE

TYPICAL CROSS SECTION OF

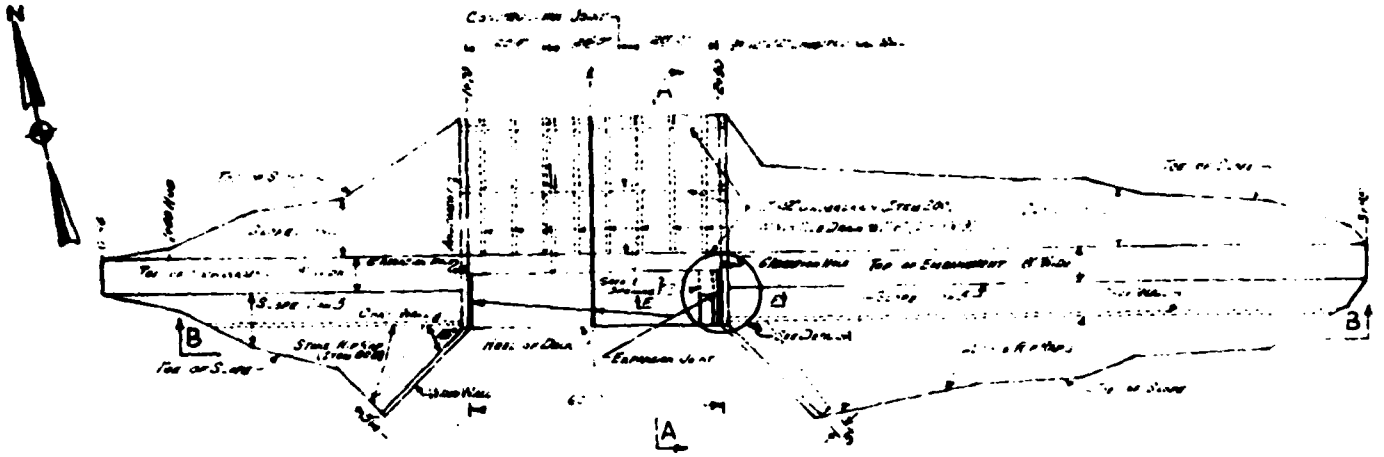


33 SECTION OF EARTH EMBANKMENT PART OF STORAGE DAM
Scale Full.

CONSTRUCTION

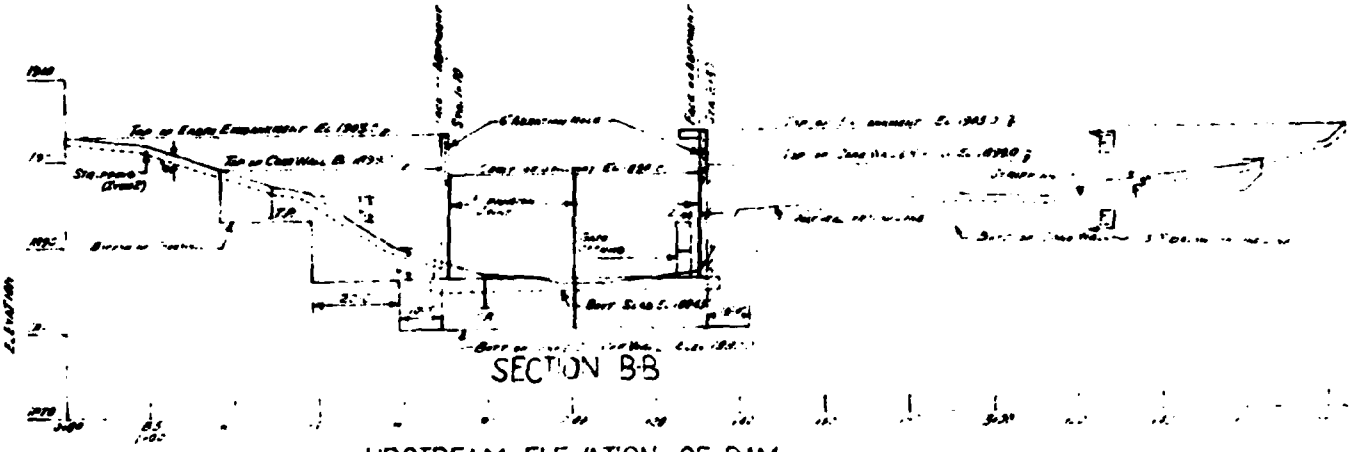
BUREAU OF CAMPS & TRAILS

Sheet No. 2 of 5



PLAN OF STORAGE DAM

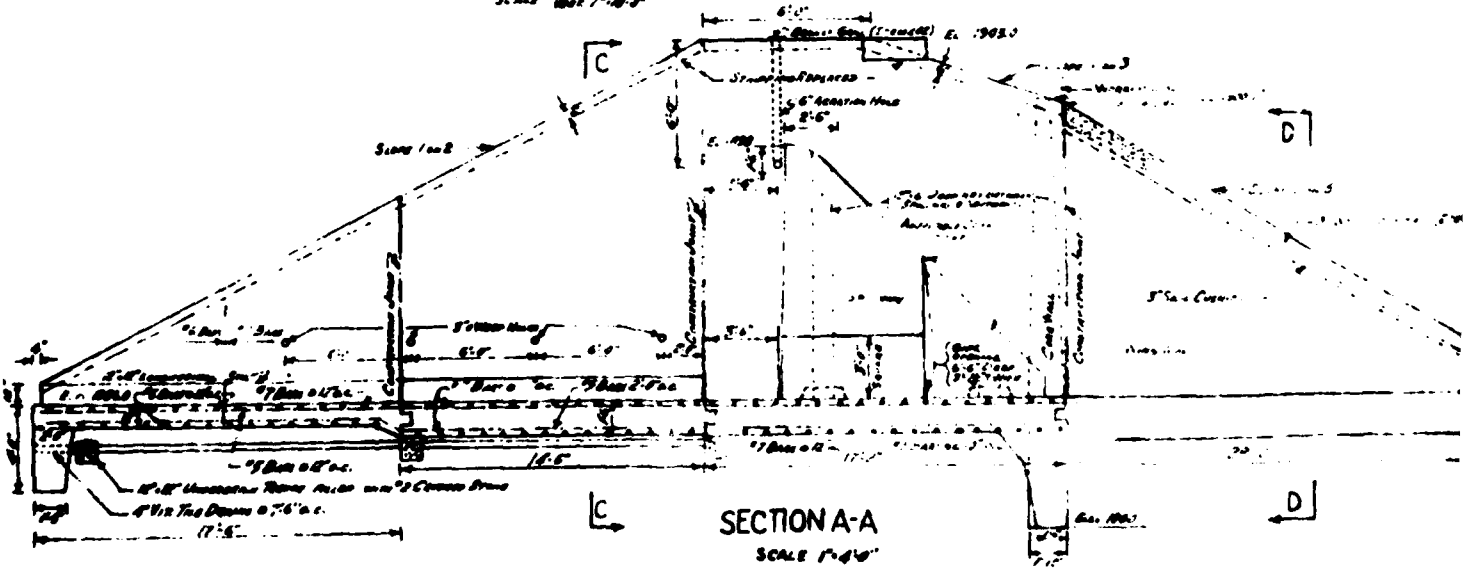
SCALE 1"=20'



SECTION B-B

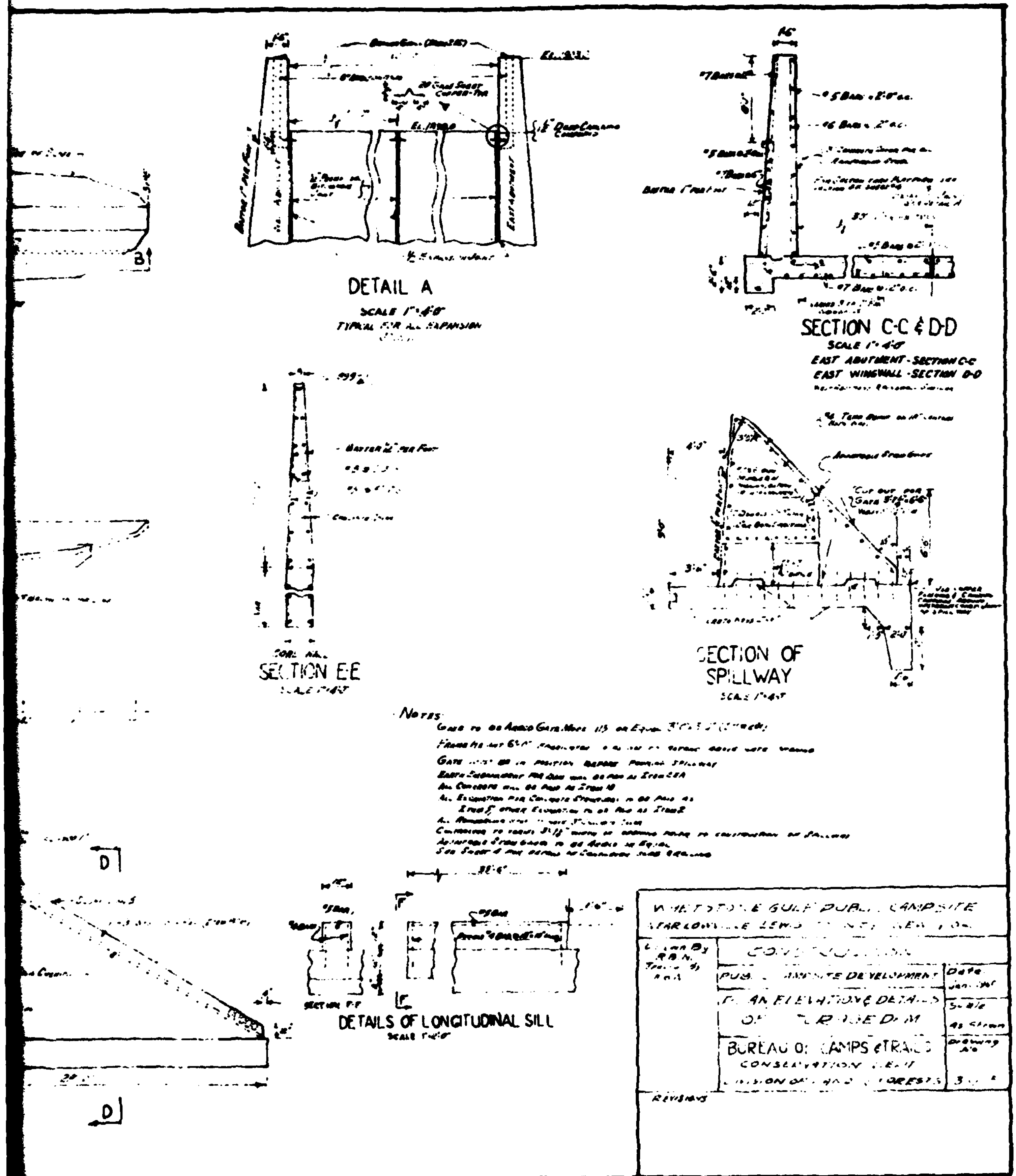
UPSTREAM ELEVATION OF DAM

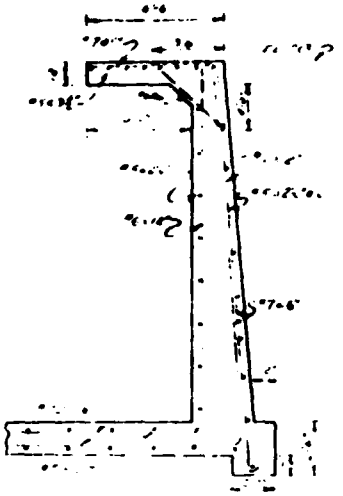
SCALE



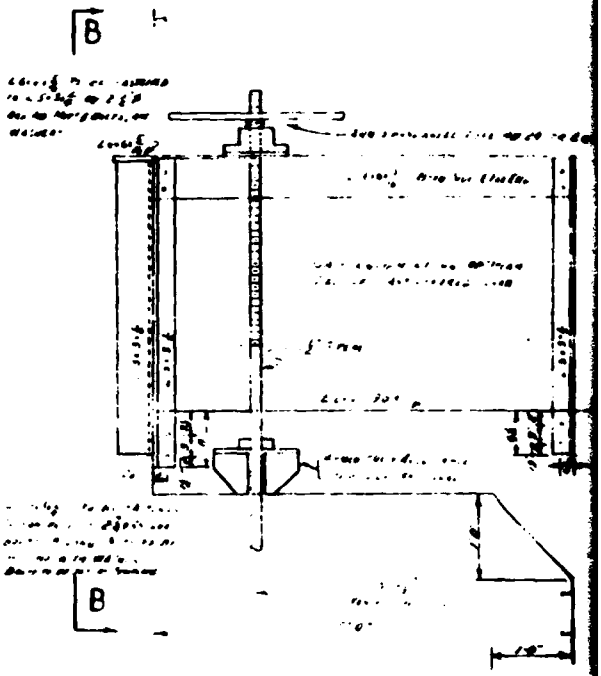
SECTION A-A

SCALE

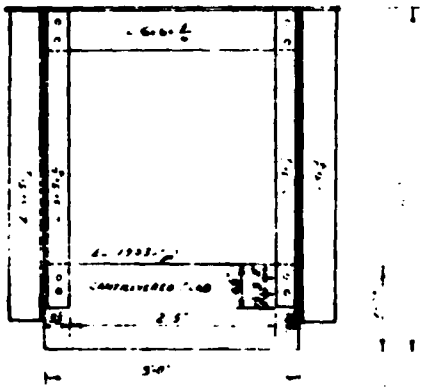

DETAIL A
SCALE 1"=4'-0"
SECTION C-C & D-D
SCALE 1"=4'-0"
EAST ABUTMENT - SECTION C-C
EAST WINGWALL - SECTION D-D
SECTION E-E
SECTION OF SPILLWAY
Notes:
DETAILS OF LONGITUDINAL SILL
SECTION F-F
BUREAU OF CAMPS & TRAILS
REVISIONS



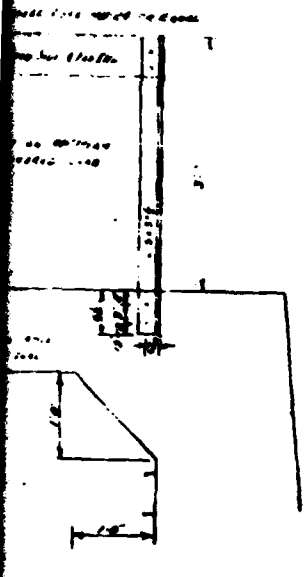
SECTION F-F

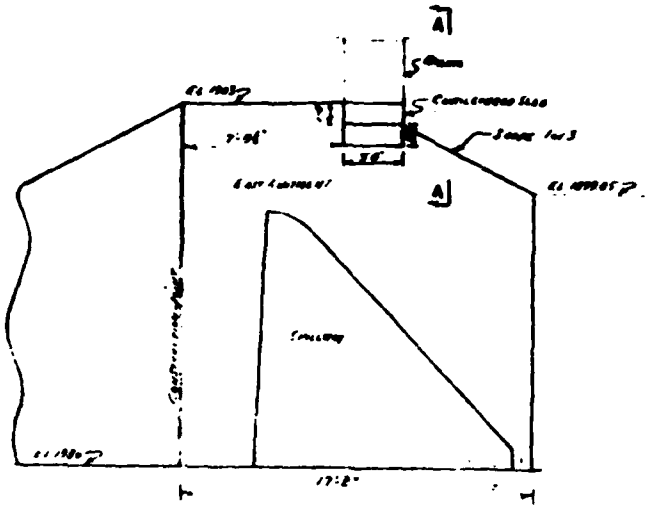


SECTION A-A
DETAILS OF RAILING



SECTION B-B





LOCATION OF CANTILEVER SLAB

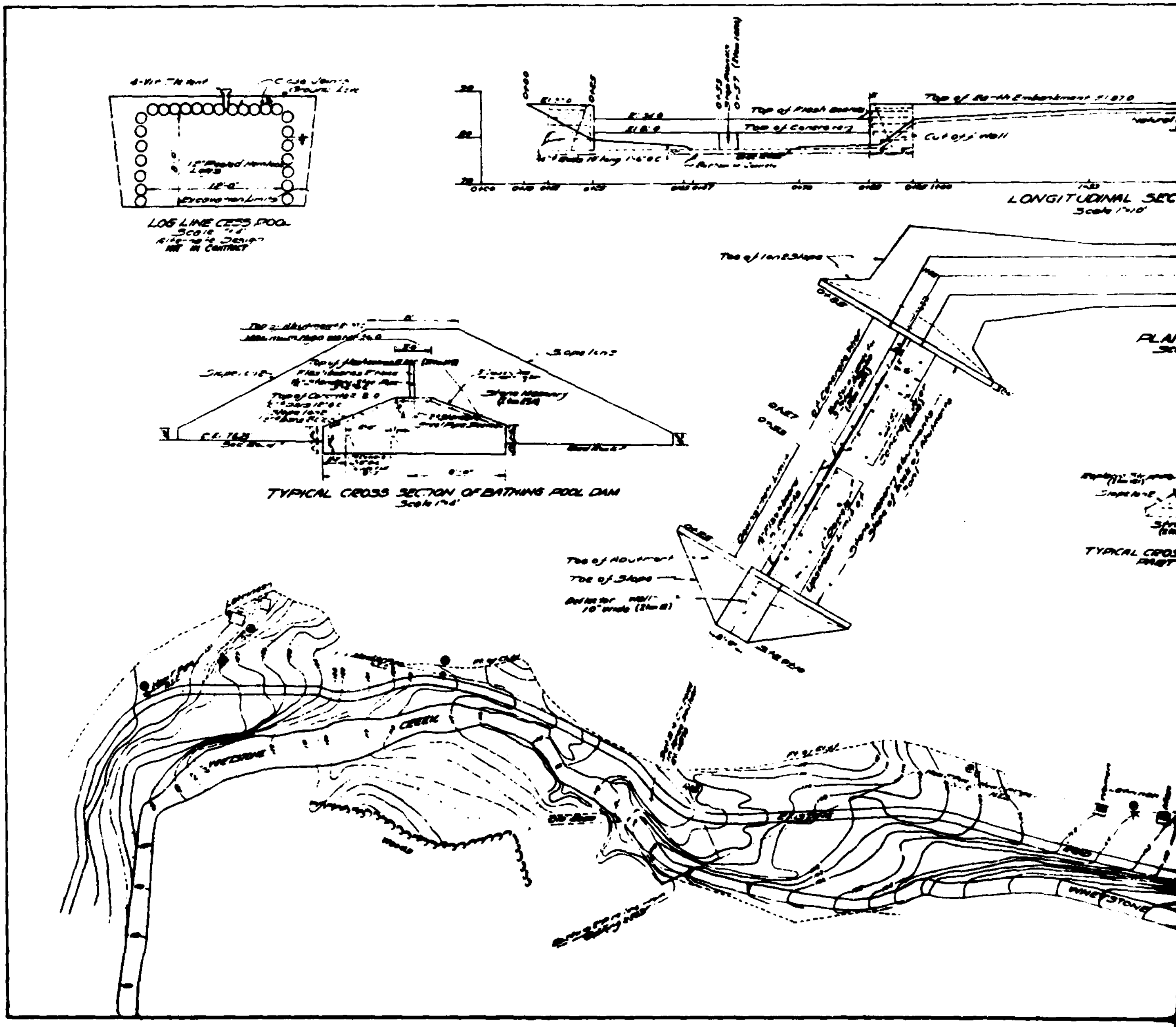
SCALE 1" = 8'

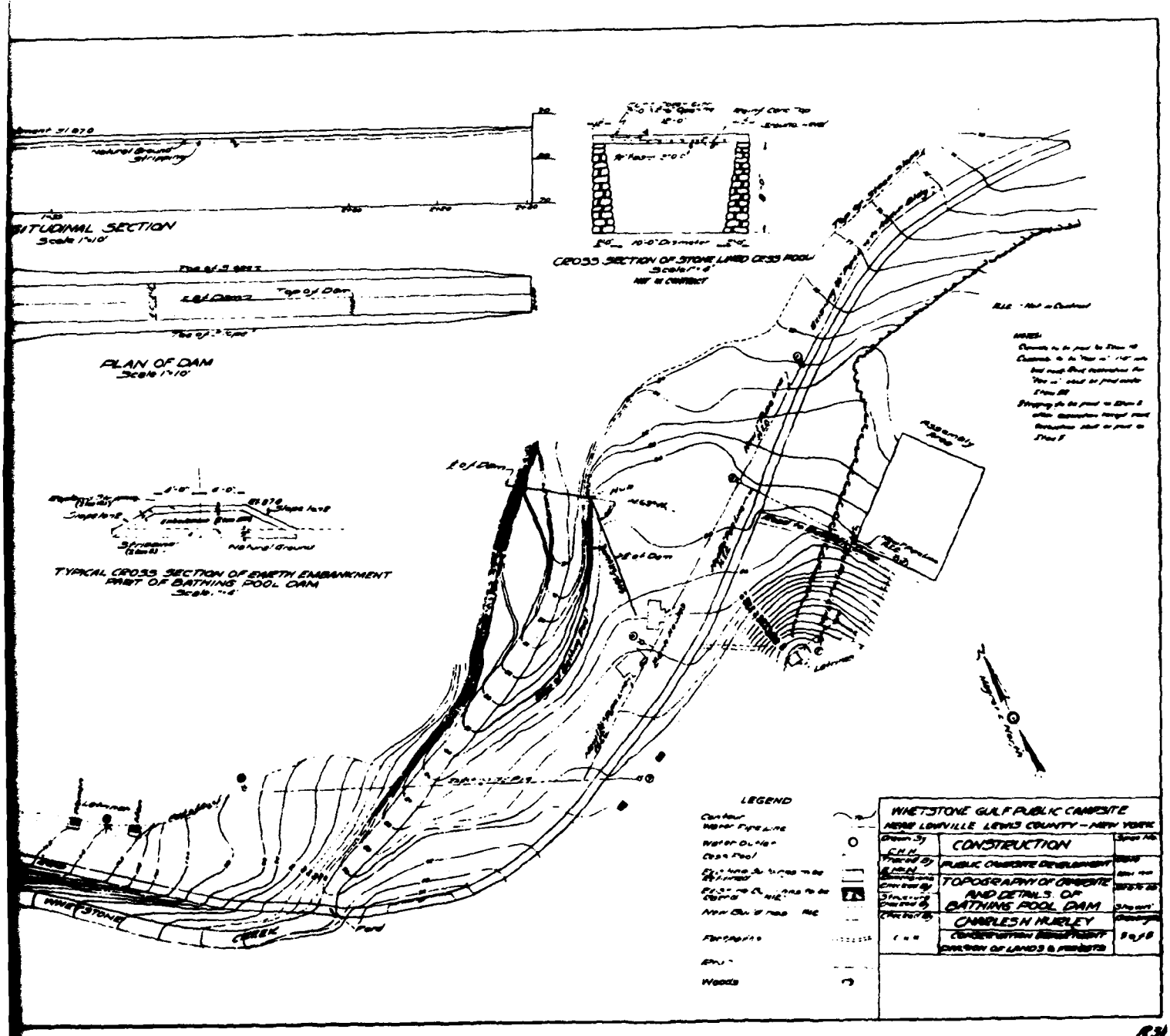
WHETSTONE GULF PUBLIC CAMPSITE
NEAR LOWVILLE LEWIS COUNTY - NEW YORK

Drawn By R.B.N. Traced By E.R.C.	CONSTRUCTION
	PUBLIC CAMPSITE DEVELOPMENT — Date Jan 1961
	DETAILS OF CANTILEVER SLAB — Scale As Shown
	BUREAU OF CAMPS & TRAILS, CONSERVATION DEPARTMENT, DIVISION OF LANDS & FORESTS — Drawing No. 4 of 5

REVISIONS:

Approved by _____ Date _____


LOG LINE CESS POOL
Excavation Limits
Top of Flash Boards
Top of Concrete
Top of Earth Embankment
Cut off Wall
LONGITUDINAL SECT
Top of 1 on 2 Slope
PLAN
Slope 1 on 2
Stone Masonry
TYPICAL CROSS SECTION OF BATHING POOL DAM
Top of Abutment
Toe of Slope
TYPICAL CROS
CREEK


GITUDINAL SECTION
Scale 1"=10'
CROSS SECTION OF STONE LINED CROSS POOL
Scale 1"=5'
PLAN OF DAM
Scale 1"=10'
TYPICAL CROSS SECTION OF EARTH EMBANKMENT
PART OF BATHING POOL DAM
Scale 1"=5'
LEGEND
Woods
WHETSTONE GULF PUBLIC CAMPSITE
NEAR LOWVILLE LEWIS COUNTY — NEW YORK
CONSTRUCTION
PUBLIC CAMPSITE DEVELOPMENT
TOPOGRAPHY OF CAMPSITE
AND DETAILS OF
BATHING POOL DAM
CHARLES H HURLEY
CONSERVATION DEPARTMENT
DIVISION OF LANDS & FORESTS

R31

1 2