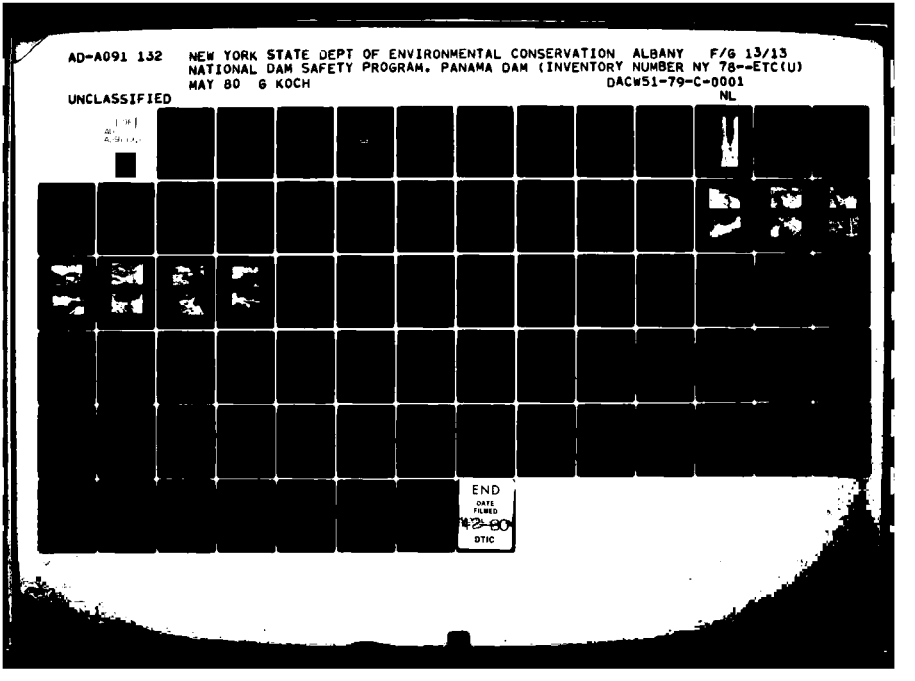
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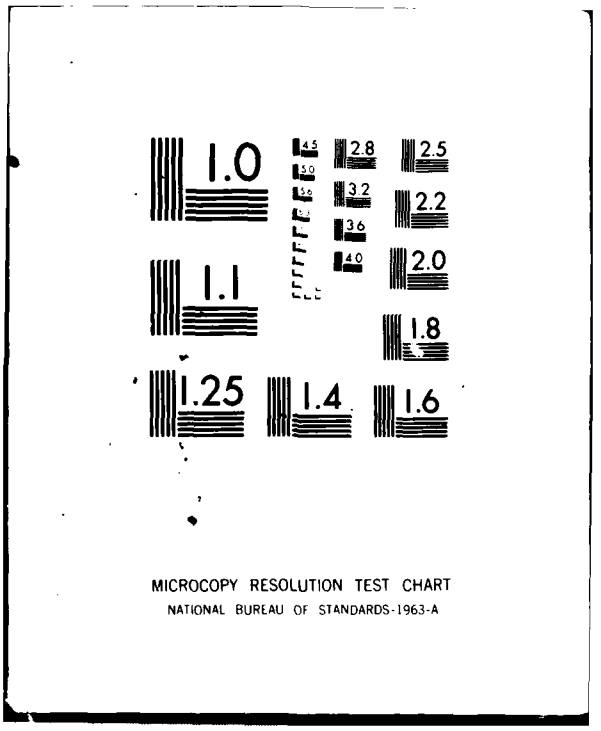

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19. KEY WORDS (Continue on reverse side if necessary and identify by block number)

Dam Safety
National Dam Safety Program
Visual Inspection
Hydrology, Structural Stability
Panama Dam
Chautauqua County
Little Brokenstraw Creek

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

This report provides information and analysis on the physical condition of the dam as of the report date. Information and analysis are based on visual inspection of the dam by the performing organization.

The examination of documents and the visual inspection of Panama Dam did not reveal conditions which constitute an immediate hazard to human life or property. However, the dam has some deficiencies which require additional studies to further evaluate conditions affecting the dam.

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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 for all storms in excess of 5% of the PMF (Probable Maximum Flood). This determination has been confirmed by the overtopping of the dam during the September 14, 1979 storm, which resulted in the need for evacuation of Panama Village residents and the closing of NYS Route #474 due to extensive erosion. The spillway is, therefore, adjudged as "seriously inadequate" and the dam is assessed as unsafe, non-emergency.

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

It is, therefore recommended that within 3 months of notification to the owner, detailed hydrological hydraulic investigations of the structure should be undertaken to more accurately determine the site specific characteristics of the watershed and their affect upon the overtopping potential of the dam. The results of these investigations will determine the appropriate remedial measures which will be required to achieve a spillway capacity adequate to discharge the outflow from at least the 1/2 PMF. In the interim, a detailed emergency action plan must be developed and implemented during periods of unusually heavy precipitation. Also, around-the-clock surveillance of the structure must be provided during these periods.

In addition the dam has a number of problem areas, which if left uncorrected, have the potential for the development of hazardous conditions and must be corrected within 1 year. These areas are:

1. The concrete retaining walls which form the upstream face of the dam are deteriorated and require repair.

2. Erosion at the entrance to the 5 feet by 5 feet concrete box highway culvert (right abutment), and near the penstock intake require repair.

3. The eroded concrete of the spillway cap requires repair.

4. The reservoir drain system has not been operated recently. This system should be restored to operational condition.

5. The penstock and penstock intake gate system requires repair.

6. Provide a program of periodic cutting and mowing of the dams highway embankment, and appurtenances.

7. Provide a program of periodic inspection and maintenance of the dam and appurtenances including yearly operation and lubrication of the reservoir drain and penstock systems. Document this information for future reference.

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ALLEGANY RIVER BASIN

PANAMA DAM

CHAUTAUQUA COUNTY NEW YORK

INVENTORY NO. N.Y. 784

PHASE I INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM

NEW YORK DISTRICT CORPS OF ENGINEERS

DECEMBER, 1975

(Inventory Number NY784)

(6) PHASE I INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM
PANAMA DAM [illegible]
ALLEGHENY RIVER BASIN
CHAUTAUQUA COUNTY,

Phase I Inspection Report.

TABLE OF CONTENTS

(10) George Keel

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PREFACE

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

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

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

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

PHASE I REPORT
NATIONAL DAM SAFETY PROGRAM

Name of Dam:	Panama Dam I.D. No. NY 784
State Located:	New York
County:	Chautauqua
Watershed:	Allegheny River Basin
Stream:	Little Brokenstraw Creek
Dates of Inspection:	October 3 and November 9, 1979

ASSESSMENT

The examination of documents and the visual inspection of Panama Dam did not reveal conditions which constitute an immediate hazard to human life or property. However, the dam has some deficiencies which require additional studies to further evaluate conditions affecting the dam.

Using the Corps of Engineers Screening Criteria for the initial review of spillway adequacy, it has been determined that the embankment would be overtopped for all storms in excess of 5% of the PMF (Probable Maximum Flood). This determination has been confirmed by the overtopping of the dam during the September 14, 1979 storm, which resulted in the need for evacuation of Panama Village residents and the closing of NYS Route #474 due to extensive erosion. The spillway is, therefore, adjudged as "seriously inadequate" and the dam is assessed as unsafe, non-emergency.

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

It is, therefore recommended that within 3 months of notification to the owner, detailed hydrological hydraulic investigations of the structure should be undertaken to more accurately determine the site specific characteristics of the watershed and their affect upon the overtopping potential of the dam. The results of these investigations will determine the appropriate remedial measures which will be required to achieve a spillway capacity adequate to discharge the outflow from at least the 1/2 PMF. In the interim, a detailed emergency action plan must be developed and implemented during periods of unusually heavy precipitation. Also, around-the-clock surveillance of the structure must be provided during these periods.

In addition the dam has a number of problem areas, which if left uncorrected, have the potential for the development of hazardous conditions and must be corrected within 1 year. These areas are:

1. The concrete retaining walls which form the upstream face of the dam are deteriorated and require repair.

2. Erosion at the entrance to the 5 feet by 5 feet concrete box highway culvert (right abutment), and near the penstock intake require repair.

3. The eroded concrete of the spillway cap requires repair.

4. The reservoir drain system has not been operated recently. This system should be restored to operational condition.

5. The penstock and penstock intake gate system requires repair.

6. Provide a program of periodic cutting and mowing of the dams highway embankment, and appurtenances.

7. Provide a program of periodic inspection and maintenance of the dam and appurtenances including yearly operation and lubrication of the reservoir drain and penstock systems. Document this information for future reference.

George Koch

George Koch
Chief, Dam Safety Section
New York State Department
of Environmental Conservation
NY License No. 45937

Approved By:

Col. Clark H. Benn
New York District Engineer

Date: 22 MAY 80

Overview of Panama Dam
Upstream Face
Photo #1 A & B

PHASE I INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM
PANAMA DAM
I.D. No. NY 784
DEC #4C-278
ALLEGHENY RIVER BASIN
CHAUTAUQUA COUNTY, NEW YORK

SECTION 1: PROJECT INFORMATION

1.1 GENERAL

a. Authority

The Phase 1 inspection reported herein was authorized by the Department of the Army, New York District, Corps of Engineers, to fulfill the requirements of the National Dam Inspection Act, Public Law 92-367.

b. Purpose of Inspection

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

1.2 DESCRIPTION OF PROJECT

a. Description of Dam and Appurtenances

Panama Dam consists of a 30.5 feet wide concrete capped masonry spillway with two adjacent earth embankments. The maximum height of the dam is 18 feet. The upstream slope is vertical, formed by a concrete retaining wall. The crest is nearly level and a highway embankment obscures the downstream slope. The highway embankment is generally higher than the dam. A 12 feet diameter corrugated metal pipe passes the spillway flow through the highway embankment.

A 12 inch diameter pipe, with a bolted cover plate at the downstream end, located at the base of the spillway serves as the reservoir drain. A 16 inch diameter pipe with intake at the left abutment serves as a penstock for power generation at the mill below the dam. At the right abutment a 5 feet by 5 feet concrete box culvert beneath the highway embankment provides sqale drainage of Rout #474 and during extreme flows serves to augment the capacity.

b. Location

The dam is located on the Little Brokenstraw, a tributory of the Big Brokenstraw Creek and the Allegheny River. The Village of Panama is less than 1 mile downstream of the dam.

c. Size Classification

The dam is 18 feet high and impounds approximately 110 acre feet. The dam is classified as "small" in size (50 to 1000 acre-feet of storage).

d. Hazard Classification

The dam is classified as high hazard, because of its location immediately above the lumber mill and the Village of Panama.

e. Ownership

The dam is owned and operated by Mr. Gerry A. Green, Box 155 Panama N.Y. 14767, Tel: (716) 782-3225.

f. Purpose
The dam provides storage for the generation of power for the lumber mill immediately downstream.

g. Design and Construction History
The dam was constructed about 1910 and the spillway walls and highway embankment were reconstructed in 1975 by the NYS Department of Transportation. No other information is available.

h. Normal Operating Procedures
Normal flows are discharged through the spillway. A limited quantity is discharged for power generation.

1.3 PERTINENT DATA

a. Drainage Area (sq. mi)	4.22
Height of Dam (feet)	18'
b. Discharge at Dam Site	
Maximum known flood	Unknown
Spillway at Top of dam (cfs)	385.
Reservoir Drains (18")	inoperable
c. Elevations (feet, USGS dtm.)	
Top of Dam	1649.35
Spillway Crest	1646.85
Drain Invert.	1635
d. Reservoir (acres)	
Surface Area Top of Dam	55
Surface Area Spillway Crest	18
e. Storage (acre feet)	
Top of Dam	210
Spillway Crest	110
f. Dam	
Type: Masonry and Concrete spillway with glacial till embankments	
Length (feet):	175'
Upstream slope:	vertical
Downstream slope:	unknown (highway embankment constructed on downstream back of dam)
g. Spillway	
Type: Ungated concrete channel, dropping to 12' CMP through Road/dam embankment.	
Weir Length (feet)	30.5'
h. Auxillary Spillway	None
i. Reservoir Drain	Inoperable

SECTION 2: ENGINEERING DATA

2.1 Geology

Panama Dam is located in the glaciated portion of the Appalachian Uplands (northern entrance of the Appalachian Plateau) physiographic province of New York State. These uplands were formed by the dissection of the uplifted but flat lying saidstones, siltstones, and shales of the Late Upper Devonian Period (345 to 365 million years ago). The plateau surface is represented by flat-topped divides with drainage generally southward toward the Allegheny River System.

Glacial cover is generally thin, the deposits of which have resulted from glaciations during the Wisconsin glaciation, approximately 11,000 years ago.

The "Preliminary Brittle Structures Map of New York" developed by Yngvar W. Isachsen and William G. McKendree (dated 1977), does not indicate the presence of any faulting or other brittle deformations within the vicinity of the dam and inpoundment.

2.2 Subsurface Investigation

No subsurface investigation could be located for this dam. The "General Soil Map of New York State" prepared by Cornell University Agriculture Experimental Station indicates that the surficial soils are Volusia soils of glacial till origin. These soils are formed on mostly thick glacial till from siltstone, shale, and sandstone, and are composed of stony sandy silt with a trace of clay. The permeability is slow, and runoff is rapid. Boulders are common, and the depth to bedrock is variable. Bedrock was observed outcropping in the downstream channel below the highway embankment.

2.3 Embankment and Appurtenant Structures

The dam was built about 1910. No engineering information is available other than the inspection report included in Appendix F. The dam is 18 feet high, 172 feet long. The 30.5 feet wide spillway is abutted by 2 earth embankments. A 12 inch pipe serves as a reservoir drain and a 16 inch pipe near the left abutment provides water for power generation.

2.4 Construction Records

No construction records were located for the dam.

2.5 Operation Record

No operation records are maintained for the dam.

2.6 Evaluation of Data

The data presented in this report has been compiled from information obtained from Mr. Gerry Green, owner, and the NYS Department of Environmental Conservation files. This information appears adequate and reliable for Phase I inspection purposes.

SECTION 3: VISUAL INSPECTION

3.1 FINDINGS

a. General

Visual inspection of Panama Dam was conducted on October 3, and November 11, 1979. The weather was cloudy with rain during the second inspection and the temperature ranged in the forties. The water surface at the time of the inspection was approximately 1 inch above the spillway crest at elevation 1647±.

b. Embankment

The following conditions were observed in connection with the earth embankments:

1. The concrete wall which forms the upstream face of both embankments is cracked and deteriorated. The wall of the left embankment is severly cracked and settlement of the wall has occurred. This has resulted in a tilting of the wall estimated to be 6 inches toward the reservoir. The downstream slope is obscured by a highway embankment. (See photos #1,2, 6 & 8)

2. The swale area at the right abutment of the right embankment has eroded by headward erosion at the entrance to the 5 feet by 5 feet concrete highway box culvert, which was initiated by overtopping of the dam during the storm of September 19, 1979. (See Photos #4 & 5)

No other signs of instability, seepage or unusual growth were noted.

3. A depression in the backfill was observed directly behind the penstock intake. This area was eroded during overtopping. (See Photos #1 & 8)

c. Spillway

Spillway flow was masking the downstream face of the spillway, however, the following conditions were noted:

1. The new concrete spillway and culvert entrance walls constructed by NYS Department of Transportation have decreased the spillway length by approximately 3 feet. In addition, the vertical alignment of the roadway was reduced near the left abutment. (See Photos #1,2 & 3) The resulting flow from the overtopping of the aforementioned storm was directed, as a consequence of these modifications, down NYS Route #474. This flow, reported to be in excess of 1 foot in depth caused extensive erosion of the shoulders and side slopes of the roadway. (See Photo #9) Additional erosion of a retaining wall in the Village of Panama also resulted. Residents in low lying areas were evacuated prior to overtopping.

2. The concrete capping on the spillway is eroding at several locations. (See Photos #2 & 3)

d. Reservoir Drain

The 12 inch diameter reservoir drain located at the base of the spillway has not been operated in the recent past. This drain is operated by removing the bolted downstream end cover.

e. Power Generating System

The intake for the 16 inch diameter penstock is keyed into the concrete of the left embankment retaining wall. This area at one time included a gate system which has been removed. (See Photos #6 & 8) The concrete surrounding the intake is cracked and deteriorated. The pipe traverses beneath the highway in a southeasterly direction to an octagonal concrete venting structure located on the south side of the highway. The pipe supported on bents then follows the slope of the hill to the lumber mill where a valve controls the flow to the turbine. (See Photo #7) The sloped section of the pipe is rusted through in several locations and the pipe is distorted near the crest of the hill where one of the bents has shifted away from the pipe. The penstock system appears to be operational and could be used to lower the reservoir level below the spillway crest.

f. Downstream Channel

The downstream channel below the highway embankment is bedrock formed. Some debris and boulders were evident (See Photos #10 & 11) in the channel. The Little Brokenstraw Creek flows beneath the Lumber Mill (See Photos #12 & 13)

g. Reservoir

There are no visible signs of instability or sedimentation problems within the reservoir area.

h. Highway Embankment

The highway embankment immediately below the dam appears stable. There was no evidence of movement, misalignment, seepage, surface cracks, erosion, or sloughing. Vegetative growth on the embankment must be removed to aid in future inspection of the area and avoid the problems associated with tree growth. (See Photos #9, 10 & 11)

3.2 Evaluation

The problem areas observed during the inspection and the recommended remedial action or investigation are as follows:

1. Repair the deteriorated concrete retaining walls which form the upstream face of the dam.

2. Repair the erosion of the swale area adjacent to the right abutment of the right embankment and investigate the use of the 5 feet by 5 feet box culvert as a potential source of additional spillway capacity. This would require the construction of an approach channel through the dam.

3. The recently constructed concrete walls (by NYSDOT) have reduced the spillway capacity. Investigate the options available to increase the spillway capacity.

4. Repair the concrete capping of the spillway where erosion has occurred.

5. Investigate the condition of the reservoir drain, and return the system to operational status.

6. Repair the penstock intake gate system. Repair the penstock where rusted and unsupported.

7. Repair the eroded area near the penstock intake.

8. Provide a program of periodic inspection and maintenance of of the dam and appurtenances, including yearly operation and lubrication of the reservoir drain system.

9. The NYS Department of Transportation should provide a program of periodic mowing and cutting of the highway embankment surfaces.

10. Develop an emergency action plan for notification of downstream residents and the proper governmental authorities in the event of overtopping.

SECTION 4: OPERATION AND MAINTENANCE PROCEDURES

4.1 Procedures

The normal water surface elevation is approximated by the crest of the spillway. Downstream flows are limited by the discharge capacity of the 12 feet diameter corrugated highway culvert immediately below the spillway. Up until February 1979, when the lumber mill burned down, the 16 inch diameter penstock at the left abutment of the dam provided flow for the generation of power at the mill.

4.2 Maintenance of the Dam

Maintenance of the dam has been provided by the owner in the past. However, the responsibility for maintenance is currently in question.

4.3 Warning System

There is no warning system in effect or in preparation.

4.4 Evaluation

The dam and appurtenances have not been maintained in satisfactory condition as noted in "Section 3: Visual Inspection".

SECTION 5: HYDROLOGIC/HYDRAULIC

5.1 Drainage Area Characteristics

Delineation of the watershed of Panama Dam was made using the USGS 7.5 minute quadrangles for North Clymer and Panama, New York. The watershed consists of woodlands and fields situated in a rural section. Relief is generally steep, with interspersed swamps. There are two small wildlife dams on the Little Brokanstraw upstream and another in the headwaters, all of which have no significant storage. The drainage area is 2700 acres or 4.2 square miles.

5.2 Analysis Criteria

The analysis of the spillway capacity of the dam and storage of the reservoir was performed using the Corps of Engineers HEC-1 computer program, incorporating the "Snyder Synthetic Unit Hydrograph" method, and the "Modified Puls" flood routing procedure. The spillway design flood selected for analysis was the PMF in accordance with the "Recommended Guidelines" of the U.S. Army Corps of Engineers.

5.3 Spillway Capacity

The concrete capped masonry spillway is an ungated structure. The spillway operator under weir or orifice flow conditions depending upon the floodwater inflow to the reservoir pool. The spillway has sufficient capacity for discharging 5% of the peak outflow from the PMF. This corresponds to a peak outflow of 385 cfs before overtopping of the dam occurs.

5.4 Reservoir Capacity

The storage capacity at normal elevation, assumed to be the spillway crest is 110 acre-feet. The storage available between the spillway crest and top of dam is 100 acre feet which is of little significance when routing a flood through the reservoir, as 100 acre feet is equivalent to 0.44 inches of runoff. Total capacity to top of dam is 210 acre feet.

5.5 Flood of Record

The most recent flooding occurred September 14, 1979 which overtopped the dam and caused quite severe flooding along NYS Route #474, Panama. Locals estimated a flow of approximately 1 foot in depth over Route #474. No other information was available on previous flood events.

5.6 Overtopping Potential

Analysis using the PMF and 1/2 the PMF indicate that the dam does not have sufficient spillway capacity. With no significant storage the routed outflow can be assumed equal to inflow. For a PMF inflow of 7219 cfs, the spillway capacity of 385 cfs is only 5% of the necessary flow. Hence, the embankment is overtopped by a computed

depth of 5.1 feet during a PMF event. For 1/2 the PMF, a peak inflow of 3610 cfs, the dam will be overtopped by 3.0 feet.

5.7 Evaluation

Overtopping of this dam would create major flooding in the town of Panama as it has already in the recent past. Flooding occurs primarily over the left embankment and follows NYS Route #474 away from the dam and towards the town of Panama. This is the potential danger of this dam, overtopping would occur flooding the town of Panama, and may pose a serious breaching condition with consequential flood wave danger.

The spillway is, therefore, adjudged as "seriously inadequate", and the dam is assessed as unsafe, non-emergency.

SECTION 6: STRUCTURAL STABILITY

6.1 Evaluation of Structural Stability

a. Visual Observations

No signs of major distress were observed in connection with the earth embankments or spillway. However, the dam was overtopped during the September 14, 1979 storm due to insufficient spillway capacity and the dam was reported to have been overtopped in the past.

b. Design and Construction Data

No design or construction information could be located concerning the structural stability of the spillway or embankment sections of the dam. A stability analysis for this structure is beyond the scope of this report, due to the presence of the highway embankment which abuts the downstream face of the spillway and the unknown foundation and embankment conditions of the structure. Extensive subsurface investigation and analysis will be required before a meaningful analysis of the dam's stability could be performed. The dam is located in Seismic Zone 2.

c. Post Construction Changes

The original bridge which traversed the spillway outlet channel was removed and replaced with a 12 feet diameter corrugated metal culvert in 1975. In addition a concrete headwall and wingwalls were constructed inside the spillway walls, thus reducing the capacity of the spillway. During 1978 the highway was regraded and flows which, during overtopping, originally were directed back toward the downstream channel are now directed over the left embankment and down the highway section of NYS Route #474. During the September 14, 1979 storm, the dam was overtopped by approximately 1 foot and extensive erosion of the highway was encountered. Additional erosion was initiated at the right abutment of the right embankment in the vicinity of the 5 feet by 5 feet concrete highway box culvert. Prior to overtopping the low lying areas of the Village of Panama were evacuated.

SECTION 7: ASSESSMENT/RECOMMENDATIONS

7.1 Assessment

a. Safety

The Phase I Inspection of Panama Dam revealed that the spillway is "seriously inadequate"based upon the Corps of Engineers "screening criteria" and outflows from any storm in excess of 5% of the PMF will overtop the dam. This overtopping could cause breaching of the dam and the resulting flood-wave would significantly increase the hazard to downstream residents. For this reason, the dam has been assessed as unsafe, non-emergency.

In addition, the dam has a number of problem areas which if left uncorrected, have the potential for the development of hazardous conditions. These areas are:

1. The concrete retaining walls on the upstream face of the dam, particularly at the left embankment, are tilting, cracked and deteriorated.

2. Headward erosion of the swale area near the right abutment of the right embankment and erosion of the backfill near the penstock intake were initiated during the September 14, 1979 storm.

3. The recently constructed concrete walls for the inlet of the highway culvert have reduced the spillway length by approximately 3 feet.

4. The concrete capping of the spillway is eroding.

b. Adequacy of Information

The information reviewed is considered adequate for Phase I Inspection purposes.

c. Need for Additional Investigations

Since the spillway is considered to be "seriously inadequate", additional hydrologic/hydraulic investigations are required to more accurately determine the site specific characteristics of the watershed. After the indepth hydrologic/hydraulic investigations have been completed, mitigating remedial measures to provide sufficient spillway capacity can be determined.

d. Urgency

The additional hydrologic/hydraulic investigations which are required must be initiated within 3 months from the date of notification. Within 1 year of notification, remedial measures as a result of these investigations must be initiated and completed within the following year. In the interim develop an emergency action plan for the notification of downstream residents and the proper governmental authorities in the event of overtopping and provide round-the-clock surveillance of the dam during periods of extreme run-off. The other problem areas listed below must be corrected within 1 year form notification.

7.2 Recommended Measures

1. The results of the aforementioned investigations will determine the appropriate remedial actions required.

2. Repair the deteriorated concrete retaining walls which form the upstream face of the dam.

3. Repair the eroded areas at the entrance to the 5 feet by 5 feet concrete box culvert and near the penstock intake.

4. Repair the eroded concrete cap of the spillway.

5. Investigate and restore the reservoir drain system to operational condition.

6. Repair the penstock and penstock intake gate system.

7. Provide a program of periodic cutting and mowing of the dam, highway embankment and appurtenances.

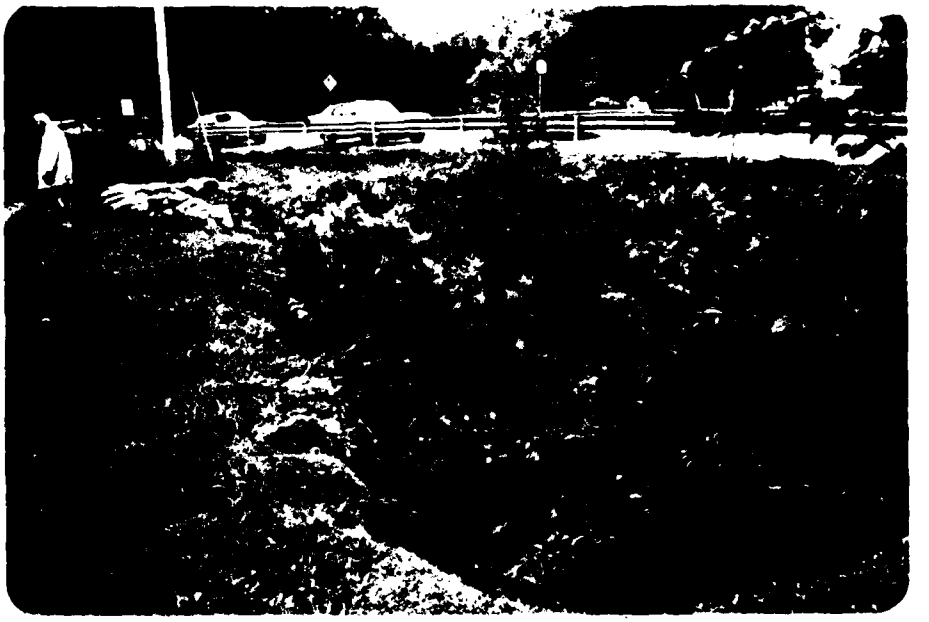
8. Provide a program of periodic inspection and maintenance of the dam and appurtenances, including yearly operation and lubrication of the reservoir drain and penstock systems. Document this information for future reference.

APPENDIX A

PHOTOGRAPHS

Left Spillway Wall and Crest
Photo #2

Spillway Crest and Highway Culvert
Photo #3



Right Embankment & Erosion Above 5'x5' Box Culvert
Photo #4

5'x5' Box Culvert
Note Erosion
Photo #5

Intake For Penstock
Note Deteriorated Concrete
Photo #6

Penstock Viewed from Mill
Photo #7

Left Embankment
Note Tilting of Retaining Wall
Photo #8

Crest of Highway Embankment
Note Overtopping occurred by car
& flowed down highway at extreme right
Photo #9

Downstream Face of Highway Embankment
Photo #10

Highway Embankment viewed from
Downstream Channel
Photo #11

Burned-out Lumber Mill
Note flow beneath building
Photo #12

Exit of flow from Mill
Photo #13

Old Photographs Dated 1915

APPENDIX B

ENGINEERING DATA CHECKLIST

Check List
Engineering Data
Design Construction Operation

Name of Dam Power Dam
I.D. # NY 789
Dec # 4C-278

Item	Remarks		
	Plans	Details	Typical Sections
Dam			
Spillway(s)	None		
Outlet(s)			
Design Reports			
Design Computations			
Discharge Rating Curves	None		
Dam Stability			
Seepage Studies			
Subsurface and Materials Investigations			

Item	Remarks
Construction History	None
Surveys, Modifications, Post-Construction Engineering Studies and Reports	None
Accidents or Failure of Dam Description, Reports	Dam overtopped during September 14, 1979 Storm
Operation and Maintenance Records Operation Manual	None

APPENDIX C

VISUAL INSPECTION CHECKLIST

VISUAL INSPECTION CHECKLIST

1) **Basic Data**

a. General

Name of Dam Panama Dam

Fed. I.D. # NY 789 DEC Dam No. 4C-278 Allegheny River Basin

River Basin Allegheny

Location: Town Harmony County Chautauqua

Stream Name Little Birdsall Creek

Tributary of Big Birdsall Ck. & Allegheny River

Latitude (N) 42° 9.5' Longitude (W) 79° 29.5'

Type of Dam masonry & concrete spillway, earth embankments

Hazard Category "C" High

Date(s) of Inspection 10/3/79 & 11/9/79

Weather Conditions Cloudy, Rain, Temp = 40's

Reservoir Level at Time of Inspection Approx 1 inch over spillway (El 1647)

b. Inspection Personnel Ken Harmon, Bob McCurdy

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

Gerry A. Green, Box 155 Panama N.Y. 14767

Tel 716 782-3225

d. History:

Date Constructed 1910 Date(s) Reconstructed 1975 by DEC

in spillway section

Designer Unknown

Constructed By Unknown

Owner Gerry A. Green

2) Embankment

a. Characteristics

(1) Embankment Material glacial till

(2) Cutoff Type None

(3) Impervious Core None

(4) Internal Drainage System None

(5) Miscellaneous concrete wall on upstream face of earth embankments

b. Crest

(1) Vertical Alignment good

(2) Horizontal Alignment good

(3) Surface Cracks none evident

(4) Miscellaneous

c. Upstream Slope

(1) Slope (Estimate) (V:H) vertical due to concrete wall

(2) Undesirable Growth or Debris, Animal Burrows none

(3) Sloughing, Subsidence or Depressions concrete wall of left embankment is deteriorated and some sections have moved in toward the reservoir upper 6 inches

(4) Slope Protection concrete wall

(5) Surface Cracks or Movement at Toe not observable

d. Downstream Slope

(1) Slope (Estimate - V:H) varies due to highway embankment

(2) Undesirable Growth or Debris, Animal Burrows

none

(3) Sloughing, Subsidence or Depressions

none evident

(4) Surface Cracks or Movement at Toe none evident

except for erosion noted in #6 below

(5) Seepage none evident

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

swale area at right abut of right embankment has eroded due to headward erosion at entrance to highway box culvert 5'x5'

(7) Condition Around Outlet Structure good condition

(8) Seepage Beyond Toe none evident

e. Abutments - Embankment Contact

good condition

(1) Erosion at Contact none

(2) Seepage Along Contact none

3) Drainage System

a. Description of System 12 foot diameter corrugated highway embankment culvert below spillway with 5'x5' concrete box at right abutment of highway for swale drainage - this changes to a 5' diam corrugated culvert

b. Condition of System good condition culverts 4 years old

c. Discharge from Drainage System dependent upon flows

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

Bench mark at left corner of spillway culvert pipe headwall=El. 1651.10

5) **Reservoir**

a. Slopes appear stable

b. Sedimentation no problems reported

c. Unusual Conditions Which Affect Dam low area of left abutment was overtopped during september 19 1979 storm

6) **Area Downstream of Dam**

a. Downstream Hazard (No. of Homes, Highways, etc.) lumber mill dam owner's home, the village of Panama

b. Seepage, Unusual Growth none evident

c. Evidence of Movement Beyond Toe of Dam none evident

d. Condition of Downstream Channel trees & rock debris in channel, bedrock controlled, step rock sides

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

concrete capped masonry

a. General broad crested top 30.5 feet wide upstream edge slopes approximately 1.5 feet down to downstream edge which is 25.0 feet wide vertical downstream face before entering 12' diam highway culvert = 10 feet overall

b. Condition of Service Spillway

some erosion of concrete crest

flow too great to inspect downstream face of spillway

c. Condition of Auxiliary Spillway none

a 16" steel pipe serves to convey water from the left embankment area to the lumber mill below the dam. This pipe was used to generate power for the mill prior to the mill burning down in February 1979

d. Condition of Discharge Conveyance Channel

12' diam highway culvert Ages old

good condition

the support for the 16" penstock near the highway is shifted approx. 8 inches. the pipe is rusted and several holes were evident

8) Reservoir Drain/Outlet

Type: Pipe ✓ Conduit _____ Other _____

Material: Concrete _____ Metal ✓ Other _____

Size: estimated 12" Length unknown

Invert Elevations: Entrance unknown Exit 1632 ±

Physical Condition (Describe): Unobservable ✓

Material: _____

Joints: _____ Alignment _____

Structural Integrity: _____

_____

Hydraulic Capability: _____

_____

Means of Control: Gate _____ Valve _____ Uncontrolled _____

Operation: Operable _____ Inoperable _____ Other unknown

Present Condition (Describe): Steel plate is bolted over end of pipe, unused in recent past

9) Structural

a. Concrete Surfaces concrete erosion on spillway crest, concrete walls at upstream edge of embankments is deteriorated on at left abutment has moved approximately 6" toward reservoir

b. Structural Cracking

cracking of upstream embankment concrete walls

c. Movement - Horizontal & Vertical Alignment (Settlement)

left embankment walls have moved toward reservoir approx. 6"

d. Junctions with Abutments or Embankments

appears to be in good condition

e. Drains - Foundation, Joint, Face

none other than reservoir drain on 16" I.D. penstock

f. Water Passages, Conduits, Sluices

Reservoir drain = unobservable

Penstock is rusting through

g. Seepage or Leakage none evident in structural elements however flow over spillway masks downstream face of masonry

h. Joints - Construction, etc. where observed joints are deteriorated and require repair

i. Foundation reported to be bedrock, but unobservable

j. Abutments new spillway walls constructed by DOT in 1975, good condition

k. Control Gates none other than reservoir drain plate over end of pipe, and valve near mill for penstock

l. Approach & Outlet Channels approach channel unobservable, outlet channel is 12' dirt, highway embankment

m. Energy Dissipators (Plunge Pool, etc.) none - bedrock in downstream channel is only dissipater

n. Intake Structures Intake area for penstock: gate missing, concrete surrounding pipe is cracked, deteriorated and has settled

o. Stability stability of left embankment wall is poor - dam stability appears adequate

p. Miscellaneous

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

a. Description and Condition

At corner of left embankment a 16" I.D. steel pipe and concrete wall serves as the intake for the penstock. The pipe traverses beneath the highway in a south easterly direction. On the south side of the highway an octagonal concrete structure with a vertical pipe serves as a venting device. The pipe heads steeply downhill toward the mill. At the mill a valve serves to control the flow. The pipe is routed through in several locations and the pipe supports near the top of the hill is shifted causing the pipe to bend. The system, however is serviceable.

APPENDIX D

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	1649.35	55	210 AC FT.
2) Design High Water (Max. Design Pool)	N/A	—	—
3) Auxiliary Spillway Crest	N/A	—	—
4) Pool Level with Flashboards	N/A	—	—
5) Service Spillway Crest	1646.85	18	110

DISCHARGES

	Volume (cfs)
1) Average Daily	Varies
2) Spillway @ Maximum High Water	385 cfs @ 1649.4' EL.
3) Spillway @ Design High Water	—
4) Spillway @ Auxiliary Spillway Crest Elevation	—
5) Low Level Outlet	NON OPERATIONAL
6) Total (of all facilities) @ Maximum High Water	385 cfs @ 1649.4' EL.
7) Maximum Known Flood — September 14, 1979	Estimated 1000 cfs Dam overtopped
8) At Time of Inspection	2.5

CREST: **ELEVATION:** 1649.35

Type: Masonry spillway - w/ 2 Earth embankments

Width: 19 feet **Length:** 172 feet

Spillover masonry w/ concrete cap

Location center of dam

SPILLWAY:

SERVICE		AUXILIARY
1646.85	Elevation	N/A
broad crested concrete	Type	
30.5 feet	Width	
	Type of Control	
✓	Uncontrolled	
	Controlled:	
	Type (Flashboards; gate)	
	Number	
30.5' wide x 2.5' high	Size/Length	
	Invert Material	
	Anticipated Length of operating service	
9 feet	Chute Length	
10 to 15 feet	Height Between Spillway Crest & Approach Channel Invert (Weir Flow)	

HYDROMETEROLOGICAL GAGES:

Type : None

Location: _____

Records:

Date - _____

Max. Reading - _____

FLOOD WATER CONTROL SYSTEM:

Warning System: None

_____

Method of Controlled Releases (mechanisms):

None

_____

DRAINAGE AREA: 2700 ACRES OR 4.2 SQ. MILES

DRAINAGE BASIN RUNOFF CHARACTERISTICS:

Land Use - Type: Forest & Agriculture

Terrain - Relief: Steep slopes interspersed with swamps

Surface - Soil: Glacial Till (EWe) Volusia Soils

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

None

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

None reported

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

N/A

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

Location: None

Elevation:

Reservoir:

Length @ Maximum Pool 1/3 MILE (Miles)

Length of Shoreline (@ Spillway Crest) 3/10 Mile (Miles)

```
**********************************                    **********************************
FLOOD HYDROGRAPH PACKAGE (HEC-1)                      NEW YORK STATE
DAM SAFETY VERSION     JULY 1978                      DEPT OF ENVIRONMENTAL CONSERVATION
  LAST MODIFICATION  26 FEB 79                        FLOOD PROTECTION BUREAU
  MODIFIED FOR HONEYWELL APR 79
**********************************                    **********************************
    1              A1  PANAMA DAM
    2              A2   PMF ANALYSIS
    3              A3   16 APRIL 1980
    4              B    200       0       15        0        0        0        0        0        0        0
    5              B1     5

    6              J      1       6        1

    7              J1    .2      .4       .5       .6       .8        1

    8              K      0       1                                    1

    9              K1  INFLOW TO RESERVOIR

   10              M      1       1     4.22                                                     1

   11              P      0    22.7      111      123      133      142

   12              T                                                          1.0      0.1

   13              W    4.0     .63

   14              X    -2.      2.        1

   15              K      1       1                                    1

   16              K1  ROUTE THRU RESERVOIR

   17              Y                                    1        1

   18              Y1     1                                                -1646.83      -1

   19              Y41646.9  1647.9   1648.9   1649.4   1650.4   1653.4

   20              Y5     0      97      275      385      640     1620

   21              $S     0      10       20       50      110      223

   22              $E  1629    1634     1637     1643     1647     1650

   23              $$1646.9

   24              $D1649.4     3.0      1.5      150

   25              K     99

   26              A

   27              A

   28              A

   29              A

   30              A
```

PREVIEW OF SEQUENCE OF STREAM NETWORK CALCULATIONS

RUNOFF HYDROGRAPH AT	1
ROUTE HYDROGRAPH TO	1
END OF NETWORK	

```
**********                                        **********
FLOOD HYDROGRAPH PACKAGE (HEC-1)                  NEW YORK STATE
DAM SAFETY VERSION      JULY 1978                 DEPT OF ENVIRONMENTAL CONSERVATION
  LAST MODIFICATION  26 FEB 79                    FLOOD PROTECTION BUREAU
  MODIFIED FOR HONEYWELL APR 79
**********                                        **********

RUN  DATE 04/25/80

                    PANAMA DAM
                     PMF ANALYSIS
                     16 APRIL 1980

                                JOB SPECIFICATION
      NO      NHR     NMIN     IDAY      IHR     IMIN    METRC     IPLT     IPRT    NSTAN
     200        0       15        0        0        0        0        0        0        0
                          JOPER      NWT    LROPT    TRACE
                              5        0        0        0


                          MULTI-PLAN ANALYSES TO BE PERFORMED
                                NPLAN= 1 NRTIO= 6 LRTIO= 1
          RTIOS=   0.20    0.40    0.50    0.60    0.80    1.00

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

                          SUB-AREA RUNOFF COMPUTATION

          INFLOW TO RESERVOIR
                     ISTAQ   ICOMP   IECON   ITAPE    JPLT    JPRT   IAME  ISTAGE   IAUTO
                         1       0       0       0       0       0       1       0       0

                                HYDROGRAPH DATA
      IHYDG     IUHG    TAREA     SNAP    TRSDA    TRSPC    RATIO   ISNOW    ISAME    LOCAL
          1        1     4.22       0.     4.22       0.       0.       0        1        0

                                PRECIP DATA
                     SPFE      PMS       R6      R12      R24      R48      R72      R96
                       0.    22.70   111.00   123.00   133.00   142.00     0.       0.
TRSPC COMPUTED BY THE PROGRAM IS 0.800

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

                          UNIT HYDROGRAPH DATA
                        TP=  4.00    CP=0.63    NTA=  0

                          RECESSION DATA
                     STRTQ=   -2.00    QRCSN=    2.00    RTIOR= 1.00
APPROXIMATE CLARK COEFFICIENTS FROM GIVEN SNYDER CP AND TP ARE TC=17.65 AND R=14.64 INTERVALS

          UNIT HYDROGRAPH 87 END-OF-PERIOD ORDINATES, LAG=   4.03 HOURS, CP= 0.64  VOL= 1.00
       7.      26.      53.      85.     120.     158.     198.     239.     282.     322.
     358.     387.     411.     428.     439.     443.     440.     425.     401.     374.
     350.     326.     305.     285.     266.     248.     232.     217.     202.     189.
     177.     165.     154.     144.     134.     125.     117.     109.     102.      95.
      89.      83.      78.      73.      68.      63.      59.      55.      52.      48.
      45.      42.      39.      37.      34.      32.      30.      28.      26.      24.
      23.      21.      20.      19.      17.      16.      15.      14.      13.      12.
      11.      11.      10.       9.       9.       8.       8.       7.       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	0.15	1	0.00	0.	0.00	8.	1.02	1.15	101	0.03	0.01	0.03	49.
1.01	0.30	2	0.00	0.	0.00	8.	1.02	1.30	102	0.03	0.01	0.03	48.
1.01	0.45	3	0.00	0.	0.00	8.	1.02	1.45	103	0.03	0.01	0.03	46.
1.01	1.00	4	0.00	0.	0.00	8.	1.02	2.00	104	0.03	0.01	0.03	45.
1.01	1.15	5	0.00	0.	0.00	8.	1.02	2.15	105	0.03	0.01	0.03	45.
1.01	1.30	6	0.00	0.	0.00	8.	1.02	2.30	106	0.03	0.01	0.03	44.
1.01	1.45	7	0.00	0.	0.00	8.	1.02	2.45	107	0.03	0.01	0.03	44.
1.01	2.00	8	0.00	0.	0.00	8.	1.02	3.00	108	0.03	0.01	0.03	45.
1.01	2.15	9	0.00	0.	0.00	8.	1.02	3.15	109	0.03	0.01	0.03	45.
1.01	2.30	10	0.00	0.	0.00	8.	1.02	3.30	110	0.03	0.01	0.03	46.
1.01	2.45	11	0.00	0.	0.00	8.	1.02	3.45	111	0.03	0.01	0.03	47.
1.01	3.00	12	0.00	0.	0.00	8.	1.02	4.00	112	0.03	0.01	0.03	48.
1.01	3.15	13	0.00	0.	0.00	8.	1.02	4.15	113	0.03	0.01	0.03	49.
1.01	3.30	14	0.00	0.	0.00	8.	1.02	4.30	114	0.03	0.01	0.03	50.
1.01	3.45	15	0.00	0.	0.00	8.	1.02	4.45	115	0.03	0.01	0.03	51.
1.01	4.00	16	0.00	0.	0.00	8.	1.02	5.00	116	0.03	0.01	0.03	52.
1.01	4.15	17	0.00	0.	0.00	8.	1.02	5.15	117	0.03	0.01	0.03	53.
1.01	4.30	18	0.00	0.	0.00	8.	1.02	5.30	118	0.03	0.01	0.03	54.
1.01	4.45	19	0.00	0.	0.00	8.	1.02	5.45	119	0.03	0.01	0.03	55.
1.01	5.00	20	0.00	0.	0.00	8.	1.02	6.00	120	0.03	0.01	0.03	55.
1.01	5.15	21	0.00	0.	0.00	8.	1.02	6.15	121	0.09	0.07	0.02	56.
1.01	5.30	22	0.00	0.	0.00	8.	1.02	6.30	122	0.09	0.07	0.02	59.
1.01	5.45	23	0.00	0.	0.00	8.	1.02	6.45	123	0.09	0.07	0.02	62.
1.01	6.00	24	0.00	0.	0.00	8.	1.02	7.00	124	0.09	0.07	0.02	68.
1.01	6.15	25	0.01	0.	0.01	8.	1.02	7.15	125	0.09	0.07	0.02	76.
1.01	6.30	26	0.01	0.	0.01	8.	1.02	7.30	126	0.09	0.07	0.02	86.
1.01	6.45	27	0.01	0.	0.01	8.	1.02	7.45	127	0.09	0.07	0.02	98.
1.01	7.00	28	0.01	0.	0.01	8.	1.02	8.00	128	0.09	0.07	0.02	113.
1.01	7.15	29	0.01	0.	0.01	8.	1.02	8.15	129	0.09	0.07	0.02	131.
1.01	7.30	30	0.01	0.	0.01	8.	1.02	8.30	130	0.09	0.07	0.02	151.
1.01	7.45	31	0.01	0.	0.01	8.	1.02	8.45	131	0.09	0.07	0.02	173.
1.01	8.00	32	0.01	0.	0.01	8.	1.02	9.00	132	0.09	0.07	0.02	196.
1.01	8.15	33	0.01	0.	0.01	8.	1.02	9.15	133	0.09	0.07	0.02	222.
1.01	8.30	34	0.01	0.	0.01	8.	1.02	9.30	134	0.09	0.07	0.02	248.
1.01	8.45	35	0.01	0.	0.01	8.	1.02	9.45	135	0.09	0.07	0.02	275.
1.01	9.00	36	0.01	0.	0.01	8.	1.02	10.00	136	0.09	0.07	0.02	302.
1.01	9.15	37	0.01	0.	0.01	8.	1.02	10.15	137	0.09	0.07	0.02	329.
1.01	9.30	38	0.01	0.	0.01	8.	1.02	10.30	138	0.09	0.07	0.02	355.
1.01	9.45	39	0.01	0.	0.01	8.	1.02	10.45	139	0.09	0.07	0.02	379.
1.01	10.00	40	0.01	0.	0.01	8.	1.02	11.00	140	0.09	0.07	0.02	402.
1.01	10.15	41	0.01	0.	0.01	8.	1.02	11.15	141	0.09	0.07	0.02	423.
1.01	10.30	42	0.01	0.	0.01	8.	1.02	11.30	142	0.09	0.07	0.02	443.
1.01	10.45	43	0.01	0.	0.01	8.	1.02	11.45	143	0.09	0.07	0.02	462.
1.01	11.00	44	0.01	0.	0.01	8.	1.02	12.00	144	0.09	0.07	0.02	479.
1.01	11.15	45	0.01	0.	0.01	8.	1.02	12.15	145	0.50	0.48	0.02	498.
1.01	11.30	46	0.01	0.	0.01	8.	1.02	12.30	146	0.50	0.48	0.02	524.
1.01	11.45	47	0.01	0.	0.01	8.	1.02	12.45	147	0.50	0.48	0.02	560.
1.01	12.00	48	0.01	0.	0.01	8.	1.02	13.00	148	0.50	0.48	0.02	608.
1.01	12.15	49	0.03	0.	0.03	8.	1.02	13.15	149	0.60	0.58	0.02	671.
1.01	12.30	50	0.03	0.	0.03	8.	1.02	13.30	150	0.60	0.58	0.02	750.
1.01	12.45	51	0.03	0.	0.03	8.	1.02	13.45	151	0.60	0.58	0.02	848.
1.01	13.00	52	0.03	0.	0.03	8.	1.02	14.00	152	0.60	0.58	0.02	965.
1.01	13.15	53	0.04	0.	0.04	8.	1.02	14.15	153	0.76	0.73	0.02	1104.
1.01	13.30	54	0.04	0.	0.04	8.	1.02	14.30	154	0.76	0.73	0.02	1266.
1.01	13.45	55	0.04	0.	0.04	8.	1.02	14.45	155	0.76	0.73	0.02	1450.
1.01	14.00	56	0.04	0.	0.04	8.	1.02	15.00	156	0.76	0.73	0.02	1654.
1.01	14.15	57	0.05	0.	0.05	8.	1.02	15.15	157	0.77	0.74	0.02	1878.
1.01	14.30	58	0.05	0.	0.05	8.	1.02	15.30	158	1.53	1.51	0.03	2123.
1.01	14.45	59	0.05	0.	0.05	8.	1.02	15.45	159	4.29	4.26	0.02	2416.
1.01	15.00	60	0.05	0.	0.05	8.	1.02	16.00	160	1.07	1.05	0.03	2770.
1.01	15.15	61	0.05	0.	0.05	8.	1.02	16.15	161	0.71	0.68	0.02	3168.
1.01	15.30	62	0.10	0.	0.10	8.	1.02	16.30	162	0.71	0.68	0.02	3589.

1.01	16.15	65	0.05	0.02	0.03	17.	1.02	17.15	165	0.55	0.53	0.02	5314.
1.01	16.30	66	0.05	0.02	0.03	23.	1.02	17.30	166	0.55	0.53	0.02	5727.
1.01	16.45	67	0.05	0.02	0.03	31.	1.02	17.45	167	0.55	0.53	0.02	6113.
1.01	17.00	68	0.05	0.02	0.03	39.	1.02	18.00	168	0.55	0.53	0.02	6113.
1.01	17.15	69	0.04	0.01	0.03	49.	1.02	18.15	169	0.05	0.02	0.03	6453.
1.01	17.30	70	0.04	0.01	0.03	60.	1.02	18.30	170	0.05	0.02	0.03	6736.
1.01	17.45	71	0.04	0.01	0.03	72.	1.02	18.45	171	0.05	0.02	0.03	6956.
1.01	18.00	72	0.04	0.01	0.03	84.	1.02	19.00	172	0.05	0.02	0.03	7111.
1.01	18.15	73	0.00	0.	0.00	95.	1.02	19.15	173	0.05	0.02	0.03	7199.
1.01	18.30	74	0.00	0.	0.00	106.	1.02	19.30	174	0.05	0.02	0.03	7219.
1.01	18.45	75	0.00	0.	0.00	116.	1.02	19.45	175	0.05	0.02	0.03	7165.
1.01	19.00	76	0.00	0.	0.00	125.	1.02	20.00	176	0.05	0.02	0.03	7026.
1.01	19.15	77	0.00	0.	0.00	132.	1.02	20.15	177	0.05	0.02	0.03	6812.
1.01	19.30	78	0.00	0.	0.00	138.	1.02	20.30	178	0.05	0.02	0.03	6559.
1.01	19.45	79	0.00	0.	0.00	141.	1.02	20.45	179	0.05	0.02	0.03	6287.
1.01	20.00	80	0.00	0.	0.00	142.	1.02	21.00	180	0.05	0.02	0.03	6000.
1.01	20.15	81	0.00	0.	0.00	141.	1.02	21.15	181	0.05	0.02	0.03	5704.
1.01	20.30	82	0.00	0.	0.00	137.	1.02	21.30	182	0.05	0.02	0.03	5402.
1.01	20.45	83	0.00	0.	0.00	133.	1.02	21.45	183	0.05	0.02	0.03	5100.
1.01	21.00	84	0.00	0.	0.00	128.	1.02	22.00	184	0.05	0.02	0.03	4801.
1.01	21.15	85	0.00	0.	0.00	122.	1.02	22.15	185	0.05	0.02	0.03	4508.
1.01	21.30	86	0.00	0.	0.00	116.	1.02	22.30	186	0.05	0.02	0.03	4227.
1.01	21.45	87	0.00	0.	0.00	110.	1.02	22.45	187	0.05	0.02	0.03	3963.
1.01	22.00	88	0.00	0.	0.00	104.	1.02	23.00	188	0.05	0.02	0.03	3717.
1.01	22.15	89	0.00	0.	0.00	98.	1.02	23.15	189	0.05	0.02	0.03	3487.
1.01	22.30	90	0.00	0.	0.00	92.	1.02	23.30	190	0.05	0.02	0.03	3272.
1.01	22.45	91	0.00	0.	0.00	86.	1.02	23.45	191	0.05	0.02	0.03	3071.
1.01	23.00	92	0.00	0.	0.00	81.	1.03	0.	192	0.05	0.02	0.03	2883.
1.01	23.15	93	0.00	0.	0.00	76.	1.03	0.15	193	0.	0.	0.	2708.
1.01	23.30	94	0.00	0.	0.00	72.	1.03	0.30	194	0.	0.	0.	2544.
1.01	23.45	95	0.00	0.	0.00	68.	1.03	0.45	195	0.	0.	0.	2390.
1.02	0.	96	0.00	0.	0.00	64.	1.03	1.00	196	0.	0.	0.	2245.
1.02	0.15	97	0.03	0.01	0.03	60.	1.03	1.15	197	0.	0.	0.	2110.
1.02	0.30	98	0.03	0.01	0.03	57.	1.03	1.30	198	0.	0.	0.	1982.
1.02	0.45	99	0.03	0.01	0.03	54.	1.03	1.45	199	0.	0.	0.	1862.
1.02	1.00	100	0.03	0.01	0.03	51.	1.03	2.00	200	0.	0.	0.	1748.
									SUM	25.79	22.08	3.71	216902.
										(655.)(	561.)(	94.)(	6141.98)

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	7219.	5906.	2210.	1080.	216047.
CMS	204.	167.	63.	31.	6118.
INCHES		13.02	19.48	19.84	19.84
MM		330.69	494.86	504.02	504.02
AC-FT		2929.	4383.	4464.	4464.
THOUS CU M		3613.	5406.	5506.	5506.

HYDROGRAPH AT STA 1 FOR PLAN 1, RTIO 1

2.	2.	2.	2.	2.	2.	2.	2.	2.	2.
2.	2.	2.	2.	2.	2.	2.	2.	2.	2.
2.	2.	2.	2.	2.	2.	2.	2.	2.	2.
2.	2.	2.	2.	2.	2.	2.	2.	2.	2.
2.	2.	2.	2.	2.	2.	2.	2.	2.	2.
2.	2.	2.	2.	2.	2.	2.	2.	2.	2.
2.	2.	2.	2.	3.	5.	6.	8.	10.	12.
14.	17.	19.	21.	23.	25.	26.	28.	28.	28.
28.	27.	27.	26.	24.	23.	22.	21.	20.	18.
17.	16.	15.	14.	14.	13.	12.	11.	11.	10.
10.	10.	9.	9.	9.	9.	9.	9.	9.	9.
9.	10.	10.	10.	10.	10.	11.	11.	11.	11.
11.	12.	12.	14.	15.	17.	20.	23.	26.	30.
35.	39.	44.	50.	55.	60.	66.	71.	76.	80.
				100.	105.	112.	122.	134.	150.

634.	718.	804.	891.	978.	1063.	1145.	1223.	1291.	1347.
1391.	1422.	1440.	1444.	1433.	1405.	1362.	1312.	1257.	1200.
1141.	1080.	1020.	960.	902.	845.	793.	743.	697.	654.
614.	577.	542.	509.	478.	449.	422.	396.	372.	350.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	1444.	1181.	442.	216.	43209.
CMS	41.	33.	13.	6.	1224.
INCHES		2.60	3.90	3.97	3.97
MM		66.14	98.97	100.80	100.80
AC-FT		586.	877.	893.	893.
THOUS CU M		723.	1081.	1101.	1101.

HYDROGRAPH AT STA 1 FOR PLAN 1, RTIO 2

3.	3.	3.	3.	3.	3.	3.	3.	3.	3.
3.	3.	3.	3.	3.	3.	3.	3.	3.	3.
3.	3.	3.	3.	3.	3.	3.	3.	3.	3.
3.	3.	3.	3.	3.	3.	3.	3.	3.	3.
3.	3.	3.	3.	3.	3.	3.	3.	3.	3.
3.	3.	3.	3.	3.	3.	3.	3.	3.	3.
3.	3.	4.	5.	7.	9.	12.	16.	20.	24.
29.	33.	38.	43.	47.	50.	53.	55.	57.	57.
56.	55.	53.	51.	49.	46.	44.	42.	39.	37.
35.	32.	31.	29.	27.	26.	24.	23.	22.	21.
20.	19.	18.	18.	18.	18.	18.	18.	18.	18.
19.	19.	20.	20.	20.	21.	21.	22.	22.	22.
23.	23.	25.	27.	30.	34.	39.	45.	52.	60.
69.	79.	89.	99.	110.	121.	131.	142.	152.	161.
169.	177.	185.	192.	199.	210.	224.	243.	268.	300.
339.	386.	442.	506.	580.	662.	751.	849.	966.	1108.
1267.	1435.	1608.	1782.	1955.	2126.	2291.	2445.	2581.	2694.
2782.	2844.	2880.	2888.	2866.	2810.	2725.	2624.	2515.	2400.
2281.	2161.	2040.	1920.	1803.	1691.	1585.	1487.	1395.	1309.
1228.	1153.	1083.	1017.	956.	898.	844.	793.	745.	699.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	2888.	2363.	884.	432.	86419.
CMS	82.	67.	25.	12.	2447.
INCHES		5.21	7.79	7.94	7.94
MM		132.28	197.94	201.61	201.61
AC-FT		1171.	1753.	1786.	1786.
THOUS CU M		1445.	2162.	2202.	2202.

HYDROGRAPH AT STA 1 FOR PLAN 1, RTIO 3

4.	4.	4.	4.	4.	4.	4.	4.	4.	4.
4.	4.	4.	4.	4.	4.	4.	4.	4.	4.
4.	4.	4.	4.	4.	4.	4.	4.	4.	4.
4.	4.	4.	4.	4.	4.	4.	4.	4.	4.
4.	4.	4.	4.	4.	4.	4.	4.	4.	4.
4.	4.	4.	4.	4.	4.	4.	4.	4.	4.
4.	4.	5.	6.	8.	12.	15.	20.	25.	30.
36.	42.	48.	53.	58.	63.	66.	69.	71.	71.
70.	69.	66.	64.	61.	58.	55.	52.	49.	46.
43.	41.	38.	36.	34.	32.	30.	28.	27.	26.
25.	24.	23.	23.	22.	22.	22.	22.	23.	23.
23.	24.	24.	25.	26.	26.	26.	27.	27.	28.
28.	29.	31.	34.	38.	43.	49.	57.	65.	75.
86.	98.	111.	124.	137.	151.	164.	177.	189.	201.
212.	222.	231.	240.	249.	262.	280.	304.	335.	375.
424.	483.	552.	633.	725.	827.	939.	1062.	1208.	1385.
1584.	1794.	2010.	2227.	2444.	2657.	2863.	3056.	3227.	3368.
3478.	3555.	3600.	3610.	3582.	3513.	3406.	3280.	3143.	3000.
2852.	2701.	2550.	2400.	2254.	2114.	1982.	1858.	1743.	1636.

1535. 1442. 1354. 1272. 1194. 1123. 1055. 991. 931. 874.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	3610.	2953.	1105.	540.	108023.
CMS	102.	84.	31.	15.	3059.
INCHES		6.51	9.74	9.92	9.92
MM		165.35	247.43	252.01	252.01
AC-FT		1464.	2191.	2232.	2232.
THOUS CU M		1806.	2703.	2753.	2753.

HYDROGRAPH AT STA 1 FOR PLAN 1, RTIO 4

5.	5.	5.	5.	5.	5.	5.	5.	5.	5.
5.	5.	5.	5.	5.	5.	5.	5.	5.	5.
5.	5.	5.	5.	5.	5.	5.	5.	5.	5.
5.	5.	5.	5.	5.	5.	5.	5.	5.	5.
5.	5.	5.	5.	5.	5.	5.	5.	5.	5.
5.	5.	5.	5.	5.	5.	5.	5.	5.	5.
5.	5.	6.	7.	10.	14.	18.	24.	29.	36.
43.	50.	57.	64.	70.	75.	79.	83.	85.	85.
84.	82.	80.	77.	73.	70.	66.	62.	59.	55.
52.	49.	46.	43.	41.	38.	36.	34.	32.	31.
30.	29.	28.	27.	27.	27.	27.	27.	27.	28.
28.	29.	29.	30.	31.	31.	32.	32.	33.	33.
34.	35.	37.	41.	46.	52.	59.	68.	78.	90.
104.	118.	133.	149.	165.	181.	197.	213.	227.	241.
254.	266.	277.	287.	299.	314.	336.	365.	403.	450.
509.	579.	662.	760.	870.	993.	1127.	1274.	1450.	1662.
1901.	2153.	2412.	2673.	2933.	3188.	3436.	3668.	3872.	4041.
4173.	4266.	4319.	4331.	4299.	4215.	4067.	3935.	3772.	3600.
3422.	3241.	3060.	2880.	2705.	2536.	2378.	2230.	2092.	1963.
1842.	1730.	1625.	1526.	1434.	1347.	1266.	1189.	1117.	1049.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	4331.	3544.	1326.	648.	129628.
CMS	123.	100.	38.	18.	3671.
INCHES		7.81	11.69	11.91	11.91
MM		198.42	296.92	302.41	302.41
AC-FT		1757.	2630.	2678.	2678.
THOUS CU M		2168.	3244.	3304.	3304.

HYDROGRAPH AT STA 1 FOR PLAN 1, RTIO 5

7.	7.	7.	7.	7.	7.	7.	7.	7.	7.
7.	7.	7.	7.	7.	7.	7.	7.	7.	7.
7.	7.	7.	7.	7.	7.	7.	7.	7.	7.
7.	7.	7.	7.	7.	7.	7.	7.	7.	7.
7.	7.	7.	7.	7.	7.	7.	7.	7.	7.
7.	7.	7.	7.	7.	7.	7.	7.	7.	7.
7.	7.	7.	10.	14.	18.	24.	31.	39.	48.
57.	67.	76.	85.	93.	100.	106.	110.	113.	114.
113.	110.	106.	102.	98.	93.	88.	83.	78.	73.
69.	65.	61.	58.	54.	51.	48.	46.	43.	41.
39.	38.	37.	36.	36.	35.	35.	36.	36.	37.
37.	38.	39.	40.	41.	42.	42.	43.	44.	44.
45.	47.	50.	55.	61.	69.	79.	91.	105.	121.
138.	157.	177.	198.	220.	241.	263.	284.	303.	321.
339.	354.	369.	383.	398.	419.	448.	487.	537.	600.
678.	772.	883.	1013.	1160.	1324.	1502.	1699.	1933.	2216.
2534.	2871.	3216.	3564.	3910.	4251.	4581.	4890.	5162.	5389.
5564.	5688.	5759.	5775.	5732.	5621.	5450.	5247.	5029.	4800.
4563.	4322.	4080.	3841.	3607.	3382.	3171.	2974.	2789.	2617.
2457.	2307.	2166.	2035.	1912.	1796.	1688.	1585.	1489.	1398.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	5775.	4725.	1768.	864.	172838.

CMS	184.	1[illegible].	56.	24.	4594.
INCHES		10.42	15.59	15.87	15.87
MM		264.56	395.89	403.22	403.22
AC-FT		2343.	3506.	3571.	3571.
THOLS CU M		2890.	4325.	4405.	4405.

HYDROGRAPH AT STA 1 FOR PLAN 1, RTIO 6

8.	8.	8.	8.	8.	8.	8.	8.	8.	8.
8.	8.	8.	8.	8.	8.	8.	8.	8.	8.
8.	8.	8.	8.	8.	8.	8.	8.	8.	8.
8.	8.	8.	8.	8.	8.	8.	8.	8.	8.
8.	8.	8.	8.	8.	8.	8.	8.	8.	8.
8.	8.	8.	8.	8.	8.	8.	8.	8.	8.
8.	8.	9.	12.	17.	23.	31.	39.	49.	60.
72.	84.	95.	106.	116.	125.	132.	138.	141.	142.
141.	137.	133.	128.	122.	116.	110.	104.	98.	92.
86.	81.	76.	72.	68.	64.	60.	57.	54.	51.
49.	48.	46.	45.	45.	44.	44.	45.	45.	46.
47.	48.	49.	50.	51.	52.	53.	54.	55.	55.
56.	59.	62.	68.	76.	86.	98.	113.	131.	151.
173.	196.	222.	248.	275.	302.	329.	355.	379.	402.
423.	443.	462.	479.	498.	524.	560.	608.	671.	750.
848.	965.	1104.	1266.	1450.	1654.	1878.	2123.	2416.	2770.
3168.	3589.	4020.	4455.	4888.	5314.	5727.	6113.	6453.	6736.
6956.	7111.	7199.	7219.	7165.	7026.	6812.	6559.	6287.	6000.
5704.	5402.	5100.	4801.	4508.	4227.	3963.	3717.	3487.	3272.
3071.	2883.	2708.	2544.	2390.	2245.	2110.	1982.	1862.	1748.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	7219.	5906.	2210.	1080.	216047.
CMS	204.	167.	63.	31.	6118.
INCHES		13.02	19.48	19.84	19.84
MM		330.69	494.86	504.02	504.02
AC-FT		2929.	4383.	4464.	4464.
THOLS CU M		3613.	5406.	5506.	5506.

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HYDROGRAPH ROUTING

ROUTE THRU RESERVOIR

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

ROUTING DATA

QLOSS	CLOSS	AVG	IRES	ISAME	IOPT	IPMP	LSTR
0.	0.	0.	1	1	0	0	0

NSTPS	NSTDL	LAG	AMSKK	X	TSK	STORA	ISPRAT
1	0	0	0.	0.	0.	-1647.	-1

STAGE	1646.90	1647.90	1648.90	1649.40	1650.40	1653.40
FLOW	0.	97.00	275.00	385.00	640.00	1620.00
CAPACITY=	0.	10.	20.	50.	110.	223.
ELEVATION=	1629.	1634.	1637.	1643.	1647.	1650.

CREL	SPWID	COOW	EXPW	ELEVL	CCOL	CAREA	EXPL
1646.9	0.	0.	0.	0.	0.	0.	0.

DAM DATA

TOPEL	COQD	EXPD	DAMWID
1649.4	3.0	1.5	150.

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.	1.	1.	1.	1.
1.	1.	1.	1.	1.	1.	1.	1.	1.	1.
1.	1.	1.	1.	1.	1.	2.	2.	2.	2.
2.	2.	2.	2.	2.	2.	2.	3.	3.	4.
5.	6.	7.	8.	9.	10.	11.	12.	13.	13.
14.	15.	16.	16.	17.	17.	17.	17.	18.	18.
18.	18.	18.	17.	17.	17.	17.	16.	16.	16.
16.	15.	15.	15.	14.	14.	14.	14.	13.	13.
13.	13.	13.	12.	12.	12.	12.	12.	12.	12.
12.	12.	12.	12.	12.	12.	13.	13.	14.	14.
15.	16.	18.	19.	21.	23.	25.	27.	30.	32.
35.	37.	40.	43.	46.	49.	52.	55.	59.	63.
68.	74.	81.	89.	100.	119.	141.	165.	192.	223.
257.	301.	353.	427.	565.	713.	853.	979.	1090.	1190.
1270.	1332.	1377.	1407.	1421.	1420.	1403.	1373.	1333.	1285.
1234.	1179.	1123.	1067.	1013.	958.	905.	854.	805.	759.
715.	675.	637.	601.	568.	537.	508.	481.	456.	433.

STORAGE

108.	108.	108.	108.	108.	108.	108.	108.	108.	108.
108.	108.	108.	108.	108.	108.	108.	108.	108.	108.
108.	108.	108.	108.	108.	108.	108.	108.	108.	108.
108.	108.	109.	109.	109.	109.	109.	109.	109.	109.
109.	109.	109.	109.	109.	109.	109.	109.	109.	109.
109.	109.	109.	109.	109.	109.	109.	109.	109.	109.
109.	109.	109.	109.	109.	109.	109.	109.	109.	109.
109.	109.	110.	110.	110.	110.	110.	111.	111.	111.
112.	112.	112.	112.	113.	113.	113.	113.	113.	113.
113.	113.	113.	113.	113.	113.	113.	113.	113.	112.
112.	112.	112.	112.	112.	112.	112.	112.	111.	111.
111.	111.	111.	111.	111.	111.	111.	111.	111.	111.
111.	111.	111.	111.	111.	111.	111.	111.	112.	112.
112.	113.	113.	114.	114.	115.	116.	117.	118.	119.
120.	121.	122.	123.	124.	125.	126.	128.	129.	131.
133.	135.	138.	141.	144.	149.	153.	158.	164.	170.
178.	186.	195.	204.	213.	221.	228.	233.	238.	242.
245.	247.	248.	249.	250.	250.	249.	248.	247.	245.
243.	241.	239.	237.	235.	233.	230.	228.	226.	224.
221.	219.	217.	215.	214.	212.	210.	208.	207.	205.

STAGE

1646.9	1646.9	1646.9	1646.9	1646.9	1646.9	1646.9	1646.9	1646.9	1646.9
1646.9	1646.9	1646.9	1646.9	1646.9	1646.9	1646.9	1646.9	1646.9	1646.9
1646.9	1646.9	1646.9	1646.9	1646.9	1646.9	1646.9	1646.9	1646.9	1646.9
1646.9	1646.9	1646.9	1646.9	1646.9	1646.9	1646.9	1646.9	1646.9	1646.9
1646.9	1646.9	1646.9	1646.9	1646.9	1646.9	1646.9	1646.9	1646.9	1646.9
1646.9	1646.9	1646.9	1646.9	1646.9	1646.9	1646.9	1646.9	1646.9	1646.9
1646.9	1646.9	1646.9	1646.9	1646.9	1646.9	1646.9	1646.9	1646.9	1646.9
1646.9	1647.0	1647.0	1647.0	1647.0	1647.0	1647.0	1647.0	1647.0	1647.0
1647.0	1647.1	1647.1	1647.1	1647.1	1647.1	1647.1	1647.1	1647.1	1647.1
1647.1	1647.1	1647.1	1647.1	1647.1	1647.1	1647.1	1647.1	1647.1	1647.1
1647.1	1647.1	1647.1	1647.1	1647.0	1647.0	1647.0	1647.0	1647.0	1647.0
1647.0	1647.0	1647.0	1647.0	1647.0	1647.0	1647.0	1647.0	1647.0	1647.0
1647.0	1647.0	1647.0	1647.0	1647.0	1647.0	1647.0	1647.0	1647.0	1647.0
1647.1	1647.1	1647.1	1647.1	1647.1	1647.1	1647.2	1647.2	1647.2	1647.2

1647.6	1647.7	1647.7	1647.8	1647.9	1648.0	1648.1	1648.3	1648.4	1648.6
1648.8	1649.0	1649.3	1649.5	1649.7	1650.0	1650.1	1650.3	1650.4	1650.5
1650.6	1650.6	1650.7	1650.7	1650.7	1650.7	1650.7	1650.7	1650.6	1650.6
1650.5	1650.5	1650.4	1650.4	1650.3	1650.3	1650.2	1650.1	1650.1	1650.0
1650.0	1649.9	1649.9	1649.8	1649.8	1649.7	1649.7	1649.6	1649.6	1649.5

PEAK OUTFLOW IS 1421. AT TIME 43.75 HOURS

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	1421.	1150.	395.	192.	38465.
CMS	40.	33.	11.	5.	1089.
INCHES		2.54	3.48	3.53	3.53
MM		64.40	88.50	89.74	89.74
AC-FT		570.	784.	795.	795.
THOUS CU M		704.	967.	980.	980.

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.	1.	1.
1.	1.	2.	2.	2.	2.	2.	2.	2.	2.
2.	3.	3.	3.	3.	3.	3.	3.	3.	3.
3.	3.	3.	3.	3.	3.	3.	3.	3.	3.
3.	3.	3.	3.	3.	3.	3.	3.	3.	3.
3.	3.	3.	3.	4.	4.	5.	5.	6.	8.
10.	11.	12.	14.	15.	17.	19.	21.	22.	24.
26.	27.	29.	30.	31.	32.	33.	33.	33.	34.
34.	34.	34.	33.	33.	33.	32.	32.	31.	31.
30.	30.	29.	29.	28.	28.	27.	27.	26.	26.
25.	25.	25.	24.	24.	24.	24.	24.	24.	24.
23.	23.	24.	24.	24.	24.	25.	26.	27.	29.
30.	33.	35.	38.	42.	46.	50.	54.	59.	64.
69.	75.	80.	86.	91.	98.	109.	120.	133.	147.
163.	182.	203.	228.	258.	295.	342.	399.	526.	687.
866.	1054.	1257.	1457.	1652.	1842.	2026.	2201.	2364.	2509.
2632.	2730.	2802.	2847.	2863.	2849.	2804.	2733.	2644.	2544.
2435.	2322.	2207.	2090.	1974.	1861.	1751.	1647.	1548.	1456.
1369.	1288.	1212.	1141.	1075.	1016.	959.	905.	854.	805.

STORAGE

108.	108.	108.	108.	108.	108.	108.	108.	108.	108.
108.	108.	108.	108.	108.	108.	109.	109.	109.	109.
109.	109.	109.	109.	109.	109.	109.	109.	109.	109.
109.	109.	109.	109.	109.	109.	109.	109.	109.	109.
109.	109.	109.	109.	109.	109.	109.	109.	109.	109.
109.	109.	109.	109.	109.	109.	109.	109.	109.	109.
109.	109.	109.	109.	109.	109.	109.	109.	109.	110.
110.	110.	111.	112.	112.	113.	113.	114.	115.	116.
116.	117.	117.	118.	118.	119.	119.	119.	119.	119.
119.	119.	119.	119.	119.	119.	119.	119.	118.	118.
118.	118.	118.	117.	117.	117.	117.	117.	116.	116.
116.	116.	116.	116.	116.	116.	116.	115.	115.	115.
115.	115.	115.	115.	116.	116.	116.	116.	117.	117.
118.	119.	120.	121.	122.	124.	126.	127.	129.	131.
133.	135.	137.	140.	142.	144.	146.	149.	152.	154.
158.	162.	166.	172.	178.	185.	193.	202.	211.	220.
229.	237.	244.	251.	258.	264.	269.	275.	279.	284.
287.	290.	292.	293.	293.	293.	292.	290.	287.	284.
281.	278.	275.	271.	268.	264.	261.	257.	254.	251.
248.	245.	243.	240.	237.	235.	233.	230.	228.	226.

STAGE

1646.9	1646.9	1646.9	1646.9	1646.9	1646.9	1646.9	1646.9	1646.9	1646.9
1646.9	1646.9	1646.9	1646.9	1646.9	1646.9	1646.9	1646.9	1646.9	1646.9
1646.9	1646.9	1646.9	1646.9	1646.9	1646.9	1646.9	1646.9	1646.9	1646.9
1646.9	1646.9	1646.9	1646.9	1646.9	1646.9	1646.9	1646.9	1646.9	1646.9
1646.9	1646.9	1646.9	1646.9	1646.9	1646.9	1646.9	1646.9	1646.9	1646.9
1646.9	1646.9	1646.9	1646.9	1646.9	1646.9	1646.9	1646.9	1646.9	1646.9
1646.9	1646.9	1646.9	1646.9	1646.9	1646.9	1646.9	1647.0	1647.0	1647.0
1647.0	1647.0	1647.0	1647.0	1647.1	1647.1	1647.1	1647.1	1647.1	1647.1
1647.2	1647.2	1647.2	1647.2	1647.2	1647.2	1647.2	1647.2	1647.2	1647.2
1647.2	1647.2	1647.2	1647.2	1647.2	1647.2	1647.2	1647.2	1647.2	1647.2
1647.2	1647.2	1647.2	1647.2	1647.2	1647.2	1647.2	1647.2	1647.2	1647.2
1647.2	1647.2	1647.2	1647.2	1647.1	1647.1	1647.1	1647.1	1647.1	1647.1
1647.1	1647.1	1647.1	1647.1	1647.1	1647.2	1647.2	1647.2	1647.2	1647.2
1647.2	1647.2	1647.3	1647.3	1647.3	1647.4	1647.4	1647.5	1647.5	1647.6
1647.6	1647.7	1647.7	1647.8	1647.8	1647.9	1648.0	1648.0	1648.1	1648.2
1648.3	1648.4	1648.5	1648.6	1648.8	1649.0	1649.2	1649.4	1649.7	1649.9
1650.1	1650.4	1650.6	1650.7	1650.9	1651.1	1651.2	1651.4	1651.5	1651.6
1651.7	1651.8	1651.8	1651.9	1651.9	1651.9	1651.8	1651.8	1651.7	1651.6
1651.6	1651.5	1651.4	1651.3	1651.2	1651.1	1651.0	1650.9	1650.8	1650.7
1650.7	1650.6	1650.5	1650.5	1650.4	1650.3	1650.3	1650.2	1650.1	1650.1

PEAK OUTFLOW IS 2863. AT TIME 43.75 HOURS

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	2863.	2345.	829.	403.	80662.
CMS	81.	66.	23.	11.	2284.
INCHES		5.17	7.31	7.41	7.41
MM		131.30	185.71	188.18	188.18
AC-FT		1163.	1645.	1667.	1667.
THOUS CU M		1434.	2029.	2056.	2056.

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.	1.	1.	1.	2.	2.	2.
2.	2.	2.	3.	3.	3.	3.	3.	3.	3.
3.	3.	4.	4.	4.	4.	4.	4.	4.	4.
4.	4.	4.	4.	4.	4.	4.	4.	4.	4.
4.	4.	4.	4.	4.	4.	4.	4.	4.	4.
4.	4.	4.	4.	5.	5.	6.	7.	8.	10.
11.	13.	14.	16.	18.	20.	23.	25.	27.	30.
32.	34.	35.	37.	38.	39.	40.	41.	41.	42.
42.	42.	42.	42.	41.	41.	40.	40.	39.	38.
38.	37.	36.	36.	35.	34.	34.	33.	32.	32.
32.	31.	31.	30.	30.	30.	30.	30.	29.	29.
29.	29.	29.	29.	30.	30.	31.	32.	34.	36.
38.	41.	44.	48.	52.	57.	62.	68.	74.	80.
87.	93.	103.	115.	127.	139.	151.	164.	179.	195.
214.	237.	263.	298.	341.	393.	511.	662.	828.	1007.
1208.	1427.	1652.	1881.	2111.	2339.	2563.	2778.	2978.	3157.
3308.	3427.	3514.	3566.	3583.	3563.	3503.	3411.	3297.	3169.
3033.	2890.	2745.	2599.	2454.	2311.	2174.	2044.	1921.	1806.
1698.	1597.	1503.	1414.	1331.	1253.	1180.	1111.	1049.	991.

STORAGE

108.	108.	108.	108.	108.	108.	108.	108.	108.	108.
108.	108.	109.	109.	109.	109.	109.	109.	109.	109.
109.	109.	109.	109.	109.	109.	109.	109.	109.	109.
109.	109.	109.	109.	109.	109.	109.	109.	109.	109.
109.	109.	109.	109.	109.	109.	109.	109.	109.	109.

107.	107.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
111.	111.	112.	112.	113.	114.	115.	116.	117.	118.
119.	119.	120.	121.	121.	122.	122.	122.	122.	122.
122.	122.	122.	122.	122.	122.	122.	122.	121.	121.
121.	121.	120.	120.	120.	120.	119.	119.	119.	119.
118.	118.	118.	118.	118.	118.	118.	118.	118.	118.
118.	118.	118.	118.	118.	118.	118.	119.	119.	120.
121.	122.	123.	125.	127.	128.	130.	133.	135.	137.
140.	142.	145.	148.	150.	153.	155.	158.	161.	165.
169.	173.	179.	185.	193.	201.	210.	219.	227.	235.
242.	250.	258.	265.	272.	279.	285.	291.	296.	301.
305.	308.	310.	312.	312.	312.	310.	308.	305.	302.
298.	294.	290.	286.	282.	278.	274.	270.	266.	263.
259.	256.	253.	250.	247.	244.	241.	239.	236.	234.

STAGE

1646.9	1646.9	1646.9	1646.9	1646.9	1646.9	1646.9	1646.9	1646.9	1646.9
1646.9	1646.9	1646.9	1646.9	1646.9	1646.9	1646.9	1646.9	1646.9	1646.9
1646.9	1646.9	1646.9	1646.9	1646.9	1646.9	1646.9	1646.9	1646.9	1646.9
1646.9	1646.9	1646.9	1646.9	1646.9	1646.9	1646.9	1646.9	1646.9	1646.9
1646.9	1646.9	1646.9	1646.9	1646.9	1646.9	1646.9	1646.9	1646.9	1646.9
1646.9	1646.9	1646.9	1646.9	1646.9	1646.9	1646.9	1646.9	1646.9	1646.9
1646.9	1646.9	1646.9	1646.9	1646.9	1647.0	1647.0	1647.0	1647.0	1647.0
1647.0	1647.0	1647.0	1647.1	1647.1	1647.1	1647.1	1647.2	1647.2	1647.2
1647.2	1647.2	1647.3	1647.3	1647.3	1647.3	1647.3	1647.3	1647.3	1647.3
1647.3	1647.3	1647.3	1647.3	1647.3	1647.3	1647.3	1647.3	1647.3	1647.3
1647.3	1647.3	1647.3	1647.3	1647.3	1647.3	1647.2	1647.2	1647.2	1647.2
1647.2	1647.2	1647.2	1647.2	1647.2	1647.2	1647.2	1647.2	1647.2	1647.2
1647.2	1647.2	1647.2	1647.2	1647.2	1647.2	1647.2	1647.2	1647.2	1647.3
1647.3	1647.3	1647.4	1647.4	1647.4	1647.5	1647.5	1647.6	1647.7	1647.7
1647.8	1647.9	1647.9	1648.0	1648.1	1648.1	1648.2	1648.3	1648.4	1648.5
1648.6	1648.7	1648.8	1649.0	1649.2	1649.4	1649.7	1649.9	1650.1	1650.3
1650.5	1650.7	1650.9	1651.1	1651.3	1651.5	1651.6	1651.8	1651.9	1652.1
1652.2	1652.3	1652.3	1652.4	1652.4	1652.4	1652.3	1652.3	1652.2	1652.1
1652.0	1651.9	1651.8	1651.7	1651.6	1651.5	1651.3	1651.2	1651.1	1651.1
1651.0	1650.9	1650.8	1650.7	1650.6	1650.6	1650.5	1650.4	1650.4	1650.3

PEAK OUTFLOW IS 3583. AT TIME 43.75 HOURS

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	3583.	2935.	1047.	509.	101869.
CMS	101.	83.	30.	14.	2885.
INCHES		6.47	9.24	9.36	9.36
MM		164.32	234.57	237.65	237.65
AC-FT		1455.	2077.	2105.	2105.
THOUS CU M		1795.	2562.	2596.	2596.

STATION 1, PLAN 1, RATIO 4

END-OF-PERIOD HYDROGRAPH ORDINATES

OUTFLOW

0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	1.	1.	1.	2.	2.	2.	2.	3.	3.
3.	3.	3.	3.	4.	4.	4.	4.	4.	4.
4.	4.	4.	4.	4.	5.	5.	5.	5.	5.
5.	5.	5.	5.	5.	5.	5.	5.	5.	5.
5.	5.	5.	5.	5.	5.	5.	5.	5.	5.
5.	5.	5.	5.	5.	6.	7.	8.	10.	11.
13.	14.	16.	19.	21.	24.	27.	29.	32.	35.
38.	40.	42.	44.	46.	47.	48.	49.	49.	50.
50.	50.	50.	50.	49.	49.	48.	47.	47.	46.
45.	44.	43.	43.	42.	41.	40.	40.	39.	38.
38.	37.	37.	36.	36.	36.	36.	35.	35.	35.
35.	35.	35.	35.	36.	36.	37.	39.	41.	43.

109.	123.	137.	151.	164.	177.	191.	206.	222.	241.
264.	293.	330.	374.	458.	593.	749.	915.	1091.	1296.
1521.	1764.	2023.	2290.	2562.	2833.	3099.	3355.	3594.	3806.
3984.	4125.	4226.	4286.	4304.	4276.	4201.	4087.	3948.	3794.
3628.	3457.	3282.	3106.	2931.	2760.	2596.	2440.	2293.	2155.
2026.	1905.	1792.	1686.	1587.	1494.	1407.	1325.	1247.	1174.

STORAGE

108.	108.	108.	108.	108.	108.	108.	108.	108.	108.
109.	109.	109.	109.	109.	109.	109.	109.	109.	109.
109.	109.	109.	109.	109.	109.	109.	109.	109.	109.
109.	109.	109.	109.	109.	109.	109.	109.	109.	109.
109.	109.	109.	109.	109.	109.	109.	109.	109.	109.
109.	109.	109.	109.	109.	109.	109.	109.	109.	109.
109.	109.	109.	109.	109.	109.	110.	110.	110.	111.
111.	112.	113.	113.	114.	115.	117.	119.	119.	120.
121.	122.	123.	123.	124.	124.	125.	125.	125.	126.
126.	126.	126.	125.	125.	125.	125.	125.	124.	124.
124.	123.	123.	123.	122.	122.	122.	122.	121.	121.
121.	121.	121.	120.	120.	120.	120.	120.	120.	120.
120.	120.	120.	120.	120.	120.	121.	121.	122.	123.
124.	125.	127.	129.	131.	133.	135.	138.	141.	144.
147.	150.	152.	155.	158.	161.	164.	167.	170.	174.
179.	185.	191.	198.	207.	215.	223.	231.	238.	246.
253.	261.	269.	277.	285.	293.	300.	306.	312.	318.
322.	326.	328.	329.	330.	329.	327.	325.	321.	317.
313.	309.	304.	300.	295.	291.	286.	282.	277.	273.
269.	266.	262.	259.	255.	252.	249.	247.	244.	241.

STAGE

1646.9	1646.9	1646.9	1646.9	1646.9	1646.9	1646.9	1646.9	1646.9	1646.9
1646.9	1646.9	1646.9	1646.9	1646.9	1646.9	1646.9	1646.9	1646.9	1646.9
1646.9	1646.9	1646.9	1646.9	1646.9	1646.9	1646.9	1646.9	1646.9	1646.9
1646.9	1646.9	1646.9	1646.9	1646.9	1646.9	1646.9	1646.9	1646.9	1646.9
1646.9	1646.9	1646.9	1646.9	1646.9	1646.9	1647.0	1647.0	1647.0	1647.0
1647.0	1647.0	1647.0	1647.0	1647.0	1647.0	1647.0	1647.0	1647.0	1647.0
1647.0	1647.0	1647.0	1647.0	1647.0	1647.0	1647.0	1647.0	1647.0	1647.0
1647.0	1647.0	1647.1	1647.1	1647.1	1647.1	1647.2	1647.2	1647.2	1647.3
1647.3	1647.3	1647.3	1647.4	1647.4	1647.4	1647.4	1647.4	1647.4	1647.4
1647.4	1647.4	1647.4	1647.4	1647.4	1647.4	1647.4	1647.4	1647.4	1647.4
1647.4	1647.4	1647.3	1647.3	1647.3	1647.3	1647.3	1647.3	1647.3	1647.3
1647.3	1647.3	1647.3	1647.3	1647.3	1647.3	1647.3	1647.3	1647.3	1647.3
1647.3	1647.3	1647.3	1647.3	1647.3	1647.3	1647.3	1647.3	1647.3	1647.3
1647.4	1647.4	1647.4	1647.5	1647.5	1647.6	1647.7	1647.7	1647.8	1647.9
1648.0	1648.0	1648.1	1648.2	1648.3	1648.4	1648.4	1648.5	1648.6	1648.7
1648.8	1649.0	1649.2	1649.3	1649.6	1649.8	1650.0	1650.2	1650.4	1650.6
1650.8	1651.0	1651.2	1651.4	1651.6	1651.8	1652.0	1652.2	1652.4	1652.5
1652.6	1652.7	1652.8	1652.8	1652.8	1652.8	1652.8	1652.7	1652.6	1652.5
1652.4	1652.3	1652.2	1652.0	1651.9	1651.8	1651.7	1651.6	1651.4	1651.3
1651.2	1651.1	1651.0	1650.9	1650.9	1650.8	1650.7	1650.6	1650.6	1650.5

PEAK OUTFLOW IS 4304. AT TIME 43.75 HOURS

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	4304.	3525.	1266.	616.	123125.
CMS	122.	100.	36.	17.	3487.
INCHES		7.77	11.16	11.31	11.31
MM		197.37	283.55	287.24	287.24
AC-FT		1748.	2511.	2544.	2544.
THOLS CU M		2156.	3097.	3138.	3138.

STATION 1, PLAN 1, RATIO 5

END-OF-PERIOD HYDROGRAPH ORDINATES

OUTFLOW

0.	0.	0.	0.	0.	0.	0.	0.	1.	1.
2.	2.	2.	3.	3.	3.	4.	4.	4.	4.
5.	5.	5.	5.	5.	5.	5.	6.	6.	6.
6.	6.	6.	6.	6.	6.	6.	6.	6.	6.
6.	6.	6.	6.	6.	7.	7.	7.	7.	7.
7.	7.	7.	7.	7.	7.	7.	7.	7.	7.
7.	7.	7.	7.	7.	8.	9.	10.	12.	13.
15.	18.	21.	24.	27.	31.	34.	38.	42.	46.
49.	53.	55.	58.	60.	62.	63.	65.	65.	66.
66.	66.	66.	66.	65.	65.	64.	63.	62.	61.
60.	59.	58.	57.	55.	54.	53.	53.	52.	51.
50.	50.	49.	48.	48.	48.	47.	47.	47.	47.
47.	47.	47.	47.	49.	48.	50.	52.	54.	57.
61.	65.	71.	77.	83.	91.	101.	117.	134.	150.
167.	184.	200.	217.	233.	249.	266.	287.	313.	342.
376.	440.	545.	673.	818.	978.	1157.	1356.	1571.	1815.
2097.	2412.	2752.	3105.	3464.	3823.	4176.	4515.	4829.	5107.
5340.	5522.	5651.	5726.	5744.	5700.	5595.	5438.	5248.	5039.
4817.	4586.	4351.	4116.	3883.	3655.	3436.	3228.	3033.	2850.
2679.	2519.	2369.	2229.	2097.	1974.	1858.	1749.	1646.	1549.

STORAGE

108.	108.	108.	108.	108.	108.	108.	108.	109.	109.
109.	109.	109.	109.	109.	109.	109.	109.	109.	109.
109.	109.	109.	109.	109.	109.	109.	109.	109.	109.
109.	109.	109.	109.	109.	109.	109.	109.	109.	109.
109.	109.	109.	109.	110.	110.	110.	110.	110.	110.
110.	110.	110.	110.	110.	110.	110.	110.	110.	110.
110.	110.	110.	110.	110.	110.	110.	110.	111.	111.
112.	113.	114.	115.	117.	118.	120.	121.	123.	124.
125.	127.	128.	129.	130.	130.	131.	131.	132.	132.
132.	132.	132.	132.	132.	131.	131.	131.	130.	130.
129.	129.	129.	128.	128.	127.	127.	127.	126.	126.
126.	125.	125.	125.	125.	125.	125.	125.	124.	124.
124.	124.	124.	124.	125.	125.	126.	126.	127.	128.
130.	132.	134.	136.	139.	142.	145.	148.	152.	155.
159.	162.	166.	169.	173.	176.	180.	184.	188.	193.
199.	205.	212.	219.	226.	233.	241.	248.	255.	263.
271.	281.	290.	300.	309.	318.	327.	335.	342.	349.
354.	358.	361.	362.	363.	362.	359.	356.	352.	347.
342.	337.	331.	325.	320.	314.	308.	303.	298.	293.
288.	284.	280.	275.	272.	268.	264.	261.	257.	254.

STAGE

1646.9	1646.9	1646.9	1646.9	1646.9	1646.9	1646.9	1646.9	1646.9	1646.9
1646.9	1646.9	1646.9	1646.9	1646.9	1646.9	1646.9	1646.9	1646.9	1646.9
1646.9	1646.9	1647.0	1647.0	1647.0	1647.0	1647.0	1647.0	1647.0	1647.0
1647.0	1647.0	1647.0	1647.0	1647.0	1647.0	1647.0	1647.0	1647.0	1647.0
1647.0	1647.0	1647.0	1647.0	1647.0	1647.0	1647.0	1647.0	1647.0	1647.0
1647.0	1647.0	1647.0	1647.0	1647.0	1647.0	1647.0	1647.0	1647.0	1647.0
1647.0	1647.0	1647.0	1647.0	1647.0	1647.0	1647.0	1647.0	1647.0	1647.0
1647.1	1647.1	1647.1	1647.1	1647.2	1647.2	1647.3	1647.3	1647.3	1647.4
1647.4	1647.4	1647.5	1647.5	1647.5	1647.5	1647.6	1647.6	1647.6	1647.6
1647.6	1647.6	1647.6	1647.6	1647.6	1647.6	1647.6	1647.5	1647.5	1647.5
1647.5	1647.5	1647.5	1647.5	1647.5	1647.5	1647.5	1647.4	1647.4	1647.4
1647.4	1647.4	1647.4	1647.4	1647.4	1647.4	1647.4	1647.4	1647.4	1647.4
1647.4	1647.4	1647.4	1647.4	1647.4	1647.4	1647.4	1647.4	1647.5	1647.5
1647.5	1647.6	1647.6	1647.7	1647.8	1647.8	1647.9	1648.0	1648.1	1648.2
1648.3	1648.4	1648.5	1648.6	1648.7	1648.8	1648.9	1649.0	1649.1	1649.2
1649.4	1649.5	1649.7	1649.9	1650.1	1650.3	1650.5	1650.7	1650.8	1651.1
1651.3	1651.5	1651.8	1652.0	1652.3	1652.5	1652.8	1653.0	1653.2	1653.3
1653.5	1653.6	1653.7	1653.7	1653.7	1653.7	1653.6	1653.5	1653.4	1653.3
1653.2	1653.0	1652.9	1652.7	1652.6	1652.4	1652.3	1652.1	1652.0	1651.9
1651.7	1651.6	1651.5	1651.4	1651.3	1651.2	1651.1	1651.0	1650.9	1650.8

PEAK OUTFLOW IS 5744. AT TIME 43.75 HOURS

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	5744.	4705.	1704.	828.	165700.
CMS	163.	133.	48.	23.	4692.
INCHES		10.37	15.03	15.22	15.22
MM		263.45	381.65	386.57	386.57
AC-FT		2333.	3380.	3424.	3424.
THOLS CU M		2878.	4169.	4223.	4223.

STATION 1, PLAN 1, RATIO 6

END-OF-PERIOD HYDROGRAPH ORDINATES

OUTFLOW

0.	0.	0.	0.	0.	0.	0.	1.	2.	2.
3.	3.	4.	4.	4.	5.	5.	5.	6.	6.
6.	6.	6.	7.	7.	7.	7.	7.	7.	7.
7.	8.	8.	8.	8.	8.	8.	8.	8.	8.
8.	8.	8.	8.	8.	8.	8.	8.	8.	8.
8.	8.	8.	8.	8.	8.	8.	8.	8.	8.
8.	8.	8.	9.	9.	10.	11.	12.	14.	16.
18.	22.	25.	29.	33.	38.	43.	47.	52.	57.
61.	65.	69.	72.	75.	77.	79.	80.	81.	82.
82.	83.	82.	82.	81.	80.	80.	78.	77.	76.
75.	73.	72.	71.	69.	68.	67.	66.	64.	64.
63.	62.	61.	61.	60.	60.	59.	59.	59.	58.
58.	58.	58.	59.	59.	61.	62.	64.	67.	71.
76.	82.	88.	96.	110.	127.	144.	163.	182.	201.
221.	241.	260.	281.	304.	328.	352.	379.	425.	498.
586.	691.	812.	952.	1115.	1309.	1521.	1751.	2009.	2310.
2661.	3056.	3481.	3923.	4371.	4818.	5257.	5679.	6069.	6413.
6699.	6922.	7078.	7166.	7184.	7124.	6986.	6786.	6545.	6281.
6001.	5712.	5418.	5123.	4831.	4546.	4272.	4014.	3770.	3543.
3329.	3130.	2943.	2768.	2605.	2451.	2307.	2171.	2043.	1923.

STORAGE

108.	108.	108.	108.	108.	108.	109.	109.	109.	109.
109.	109.	109.	109.	109.	109.	109.	109.	109.	109.
109.	109.	110.	110.	110.	110.	110.	110.	110.	110.
110.	110.	110.	110.	110.	110.	110.	110.	110.	110.
110.	110.	110.	110.	110.	110.	110.	110.	110.	110.
110.	110.	110.	110.	110.	110.	110.	110.	110.	110.
110.	110.	110.	110.	110.	110.	110.	111.	112.	112.
113.	115.	116.	117.	119.	121.	123.	125.	126.	128.
130.	132.	133.	134.	135.	136.	137.	137.	138.	138.
138.	138.	138.	138.	138.	137.	137.	137.	136.	136.
135.	135.	134.	134.	133.	133.	132.	132.	131.	131.
131.	130.	130.	130.	130.	129.	129.	129.	129.	129.
129.	129.	129.	129.	129.	130.	130.	131.	132.	134.
136.	138.	140.	143.	147.	150.	154.	158.	162.	166.
170.	174.	178.	183.	187.	191.	195.	199.	204.	209.
215.	220.	226.	232.	239.	246.	253.	261.	269.	278.
288.	299.	310.	321.	331.	342.	352.	361.	370.	377.
383.	388.	391.	393.	393.	392.	385.	385.	380.	374.
368.	362.	355.	349.	342.	336.	329.	323.	317.	311.
306.	300.	295.	291.	286.	282.	278.	274.	270.	266.

STAGE

1646.9	1646.9	1646.9	1646.9	1646.9	1646.9	1646.9	1646.9	1646.9	1646.9
1646.9	1646.9	1646.9	1646.9	1646.9	1646.9	1647.0	1647.0	1647.0	1647.0
1647.0	1647.0	1647.0	1647.0	1647.0	1647.0	1647.0	1647.0	1647.0	1647.0
1647.0	1647.0	1647.0	1647.0	1647.0	1647.0	1647.0	1647.0	1647.0	1647.0
1647.0	1647.0	1647.0	1647.0	1647.0	1647.0	1647.0	1647.0	1647.0	1647.0

1647.0	1647.0	1647.0	1647.0	1647.0	1647.0	1647.0	1647.0	1647.0	1647.1
1647.1	1647.1	1647.2	1647.2	1647.2	1647.3	1647.3	1647.4	1647.4	1647.5
1647.5	1647.6	1647.6	1647.6	1647.7	1647.7	1647.7	1647.7	1647.7	1647.7
1647.8	1647.8	1647.7	1647.7	1647.7	1647.7	1647.7	1647.7	1647.7	1647.7
1647.7	1647.7	1647.6	1647.6	1647.6	1647.6	1647.6	1647.6	1647.6	1647.6
1647.5	1647.5	1647.5	1647.5	1647.5	1647.5	1647.5	1647.5	1647.5	1647.5
1647.5	1647.5	1647.5	1647.5	1647.5	1647.5	1647.5	1647.6	1647.6	1647.6
1647.7	1647.7	1647.8	1647.9	1648.0	1648.1	1648.2	1648.3	1648.4	1648.5
1648.6	1648.7	1648.8	1648.9	1649.0	1649.1	1649.3	1649.4	1649.5	1649.6
1649.8	1649.9	1650.1	1650.2	1650.4	1650.6	1650.8	1651.0	1651.2	1651.5
1651.7	1652.0	1652.3	1652.6	1652.9	1653.2	1653.4	1653.7	1653.9	1654.1
1654.2	1654.4	1654.5	1654.5	1654.5	1654.5	1654.4	1654.3	1654.2	1654.0
1653.9	1653.7	1653.5	1653.3	1653.2	1653.0	1652.8	1652.7	1652.5	1652.3
1652.2	1652.1	1651.9	1651.8	1651.7	1651.6	1651.5	1651.3	1651.2	1651.1

PEAK OUTFLOW IS 7184. AT TIME 43.75 HOURS

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	7184.	5885.	2143.	1042.	208332.
CMS	203.	167.	61.	29.	5869.
INCHES		12.97	18.89	19.13	19.13
MM		329.52	479.89	486.02	486.02
AC-FT		2918.	4250.	4304.	4304.
THOLS CU M		3600.	5242.	5309.	5309.

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

PEAK FLOW AND STORAGE (END OF PERIOD) SUMMARY FORMULTIPLE 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 0.20	RATIO 2 0.40	RATIO 3 0.50	RATIO 4 0.60	RATIO 5 0.80	RATIO 6 1.00
HYDROGRAPH AT	1	4.22 (10.93)	1	1444. (40.88)	2888. (81.77)	3610. (102.21)	4331. (122.65)	5775. (163.54)	7219. (204.42)
ROUTED TO	1	4.22 (10.93)	1	1421. (40.25)	2863. (81.08)	3583. (101.47)	4304. (121.86)	5744. (162.64)	7184. (203.42)

SUMMARY OF DAM SAFETY ANALYSIS

PLAN 1 .....

	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
ELEVATION	1646.85	1646.90	1649.40
STORAGE	108.	108.	200.
OUTFLOW	0.	0.	385.

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
0.20	1650.71	1.32	250.	1421.	9.25	43.75	0.
0.40	1651.87	2.47	293.	2863.	10.75	43.75	0.
0.50	1652.37	2.97	312.	3583.	11.25	43.75	0.
0.60	1652.84	3.44	330.	4304.	11.50	43.75	0.
0.80	1653.71	4.31	363.	5744.	12.25	43.75	0.
1.00	1654.51	5.11	393.	7184.	13.00	43.75	0.

LIST OF REFERENCES

APPENDIX E

APPENDIX E

REFERENCES

1) U.S. Department of Commerce, Technical Paper No. 40, Rainfall Frequency Atlas of the United States, May 1961.

2) Soil Conservation Service, National Engineering Handbook, Section 4, Hydrology, August 1972 (U.S. Department of Agriculture).

3) H.W. King and E.F. Brater, Handbook of Hydraulics, 5th edition, McGraw-Hill, 1963.

4) T.W. Lambe and R.V. Whitman, Soil Mechanics, John Wiley and Sons, 1965.

5) W.D. Thornbury, Principles of Geomorphology, John Wiley and Sons, 1969.

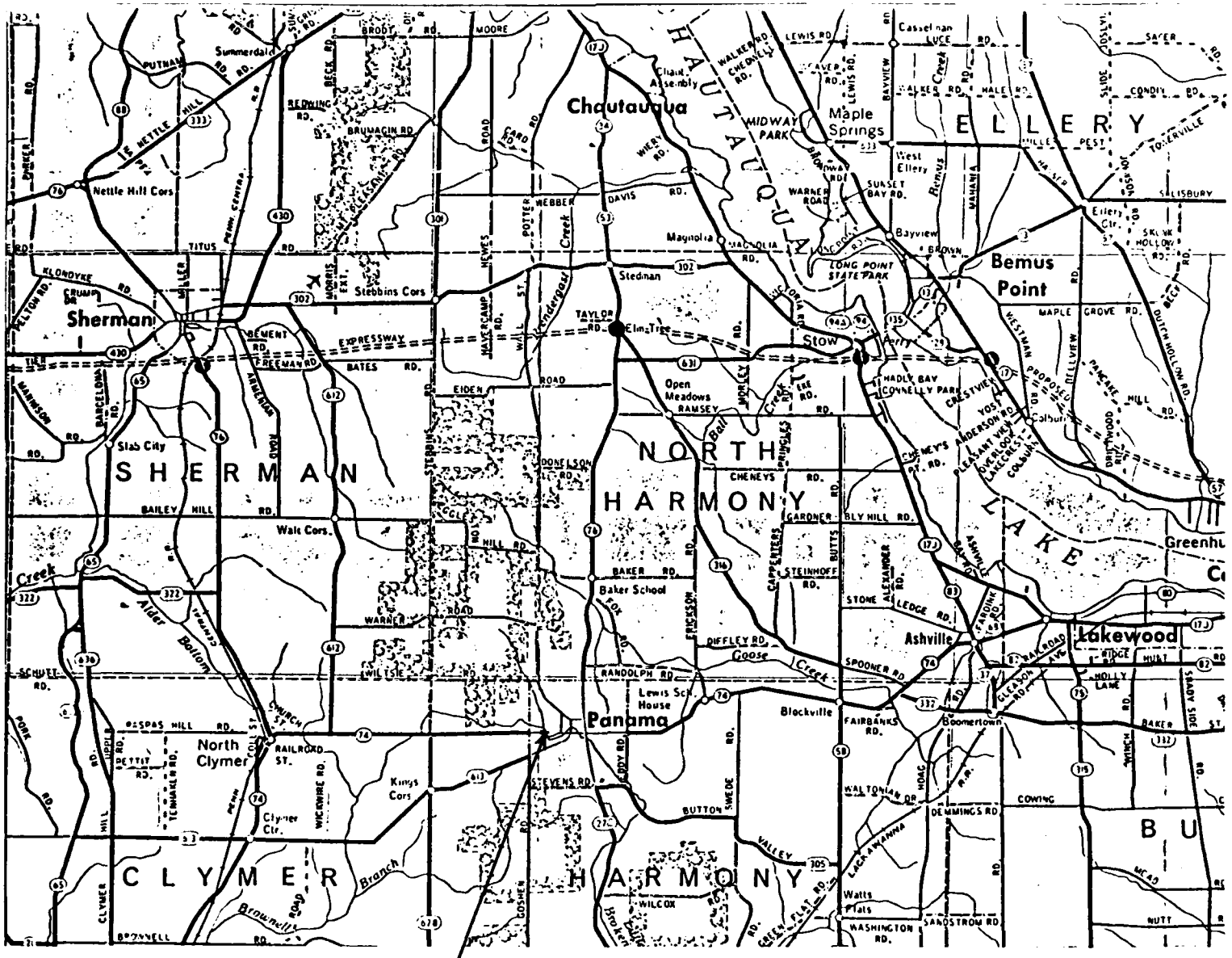
6) University of the State of New York, Geology of New York, Education Leaflet 20, Reprinted 1973.

7) Cornell University Agriculture Experiment Station (compiled by M.G. Cline and R.L. Marshall), General Soil Map of New York State and Soils of New York Landscapes, Information Bulletin 119, 1977.

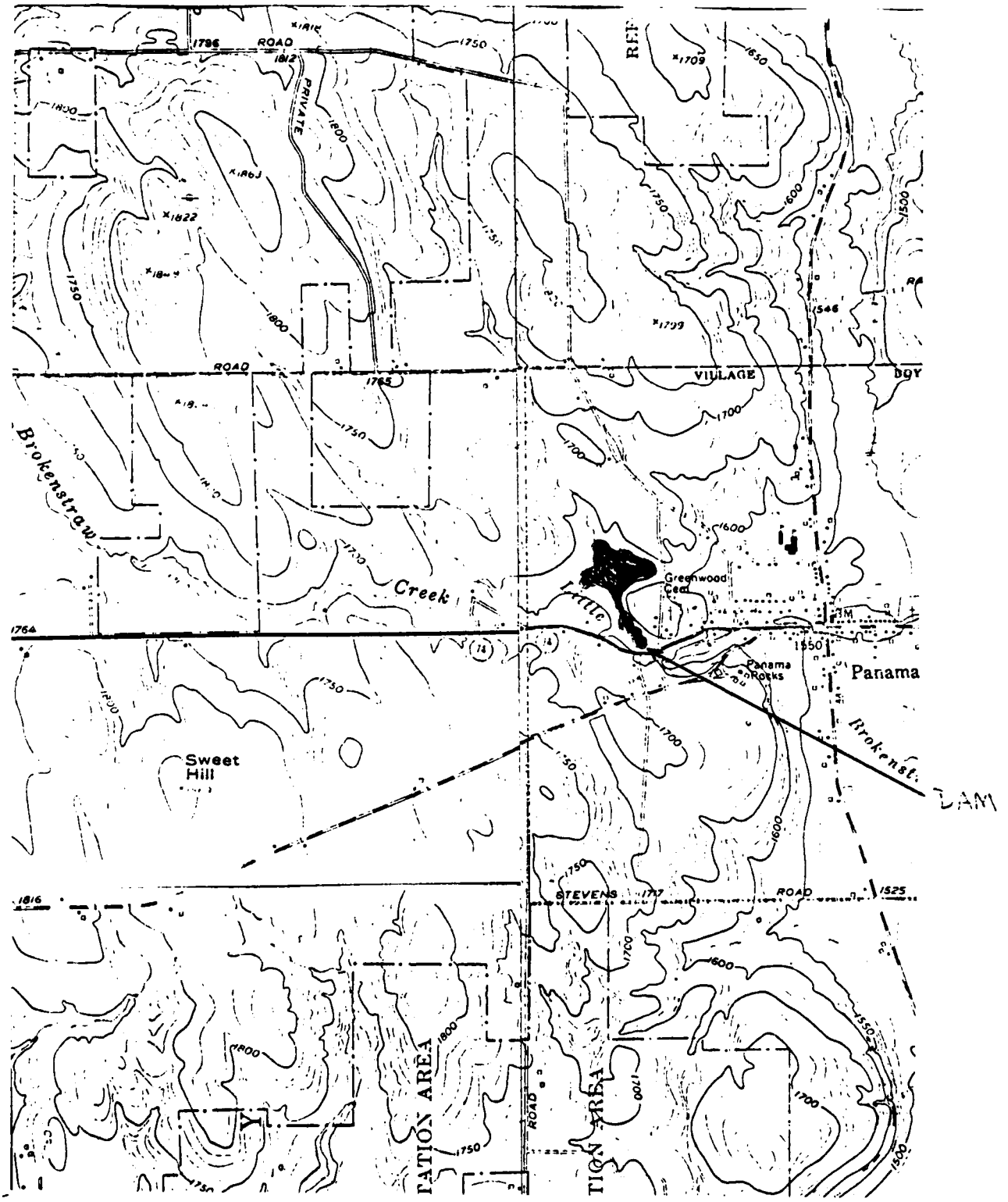
APPENDIX F

DRAWINGS

VICINITY MAP



DAM



TOPOGRAPHIC MAP

Form IW51. 11-6-14-1000 (16-1038) Acc. 382

2/28 Allegheny

(NOTICE: After filling out one of these forms as completely as possible for each dam in your district, return it at once to the Conservation Commission, Albany.)

STATE OF NEW YORK

CONSERVATION COMMISSION

ALBANY

Map - 4 C

DAM REPORT

6/5/ (Date), 19N

CONSERVATION COMMISSION,

DIVISION OF INLAND WATERS.

Panama Electric Light Co

GENTLEMEN:

I have the honor to make the following report in relation to the structure known as the Panama Power Dam.

This dam is situated upon the Brockenstraw Creek (Give name of stream)

in the Town of Harmony Chautauqua County,

about 1/2 mile (State distance) from the Village ~~or City~~ of Panama.

The distance down (Up or down) stream from the dam, to the North Clymer Road Bridge (Give name of nearest important stream or of a bridge)

is about 50 (State distance).

The dam is now owned by Walter Tanner Panama N.Y. (Give name and address in full)

and was built in or about the year 1910, and was extensively repaired or reconstructed during the year —.

As it now stands, the spillway portion of this dam is built of Concrete and Steel Reinforcement (State whether of masonry, concrete or timber)

and the other portions are built of Concrete and earth (State whether of masonry, concrete, earth or timber with or without rock fill).

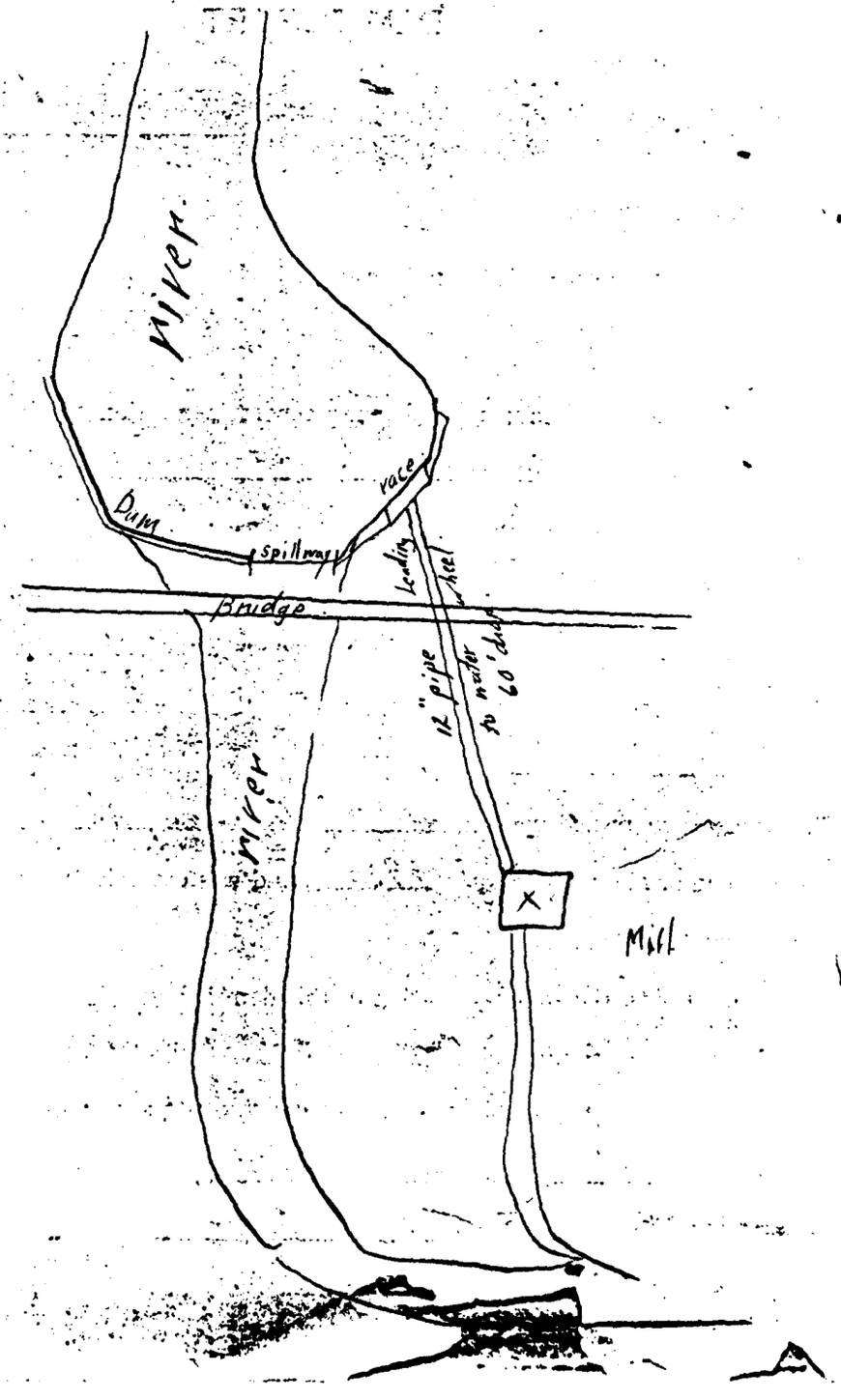
As nearly as I can learn, the character of the foundation bed under the spillway portion of the dam is solid rock and under the remaining portions such foundation bed is earth and rock.

D. G. about 5 A.E. mi

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

III

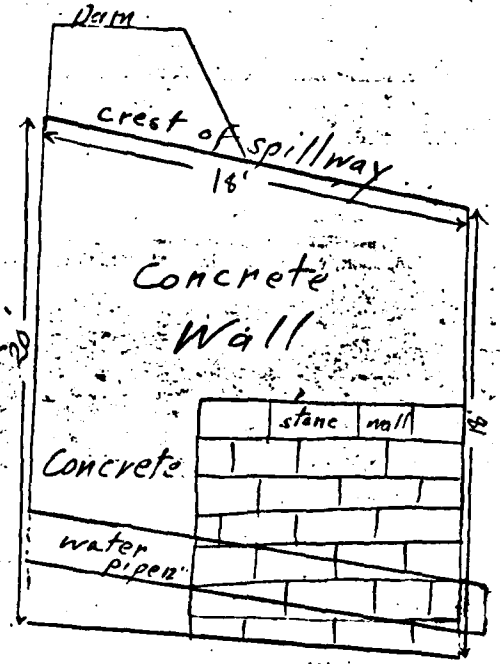
General View of Dam and Surroundings.



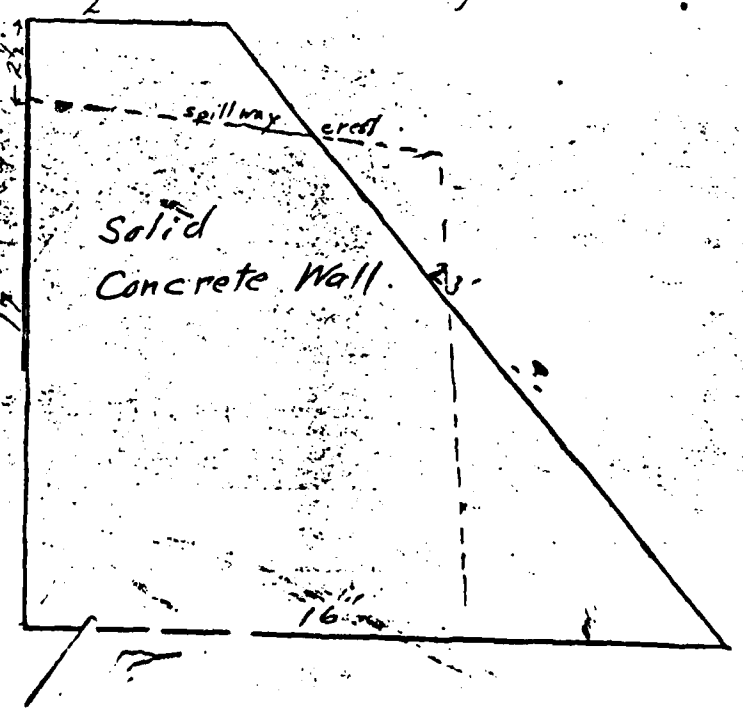
(In the space below, make one sketch showing the form and dimensions of a cross section through the spillway or waste-weir of this dam, and a second sketch showing the same information for a cross section through the other portion of the dam. Show particularly the greatest height of the dam above the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

I

Cross-Section of Spillway.



II Cross Section of Dam.



The total length of this dam is 160 feet. The spillway or waste-weir portion, is about 50 feet long, and the crest of the spillway is about 2 1/2 feet below the top of the dam.

The number, size and location of discharge pipes, waste pipes or gates which may be used for drawing off the water from behind the dam, are as follows: one pipe at bottom of spillway 12" diameter; also water does not run over spillway only in very high water, and can be well taken care of.

At the time of this inspection the water level above the dam was 1 ft. — in. below ~~above~~ the crest of the spillway.

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

This dam is in excellent condition. It is built very strongly. Foundation of the spillway being in solid rock. The high water can easily be taken care of. There are no leaks and no noticable erosion of the concrete wall. There is a drop of 60' from the dam to the mill and about 150 horsepower is developed by an iron pipe running from the race entrance down to the mill. The pipe is 12" diameter of riveted tinned iron 1/2" thick.

Reported by Carl B. Cooper
(Signature)

Box 697
(Address—Street and number, P. O. Box or R. F. D. route)

Amen N.Y.
(Name of place)