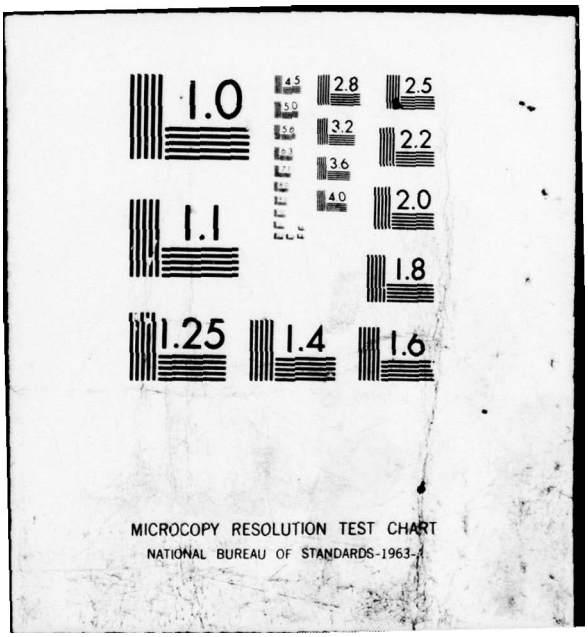
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NATIONAL DAM SAFETY PROGRAM. NEWTON FALLS DAM (INVENTORY NUMBER--ETC(U)
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OSWEGATCHIE RIVER BASIN

NEWTON FALLS DAM

ST. LAWRENCE COUNTY
NEW YORK

INVENTORY Nº 472

PHASE I INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM

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2 OCT 1978

NANEN-F

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

Dear Governor Carey:

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

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

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

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

NANEN-F
Honorable Hugh L. Carey

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

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

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

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

Sincerely yours,

CLARK H. BENN
Colonel, Corps of Engineers
District Engineer

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

REPORT DOCUMENTATION PAGE		READ INSTRUCTIONS BEFORE COMPLETING FORM
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4. TITLE (and Subtitle) Phase I Inspection Report Newton Falls Dam Oswegatchie River Basin, St. Lawrence Co., N.Y. Inventory No. N.Y. 472		5. TYPE OF REPORT & PERIOD COVERED Phase I Inspection Report National Dam Safety Program 6. PERFORMING ORG. REPORT NUMBER
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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
Newton Falls Dam
St. Lawrence County
Oswegatchie River

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

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

Newton Falls Dam was judged to be unsafe-non-emergency, Due to a seriously inadequate spillway.

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Figure 2 - Plan and Section of Fore Bay
Figure 3 - General Plans of Dam and Sections

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PHASE I REPORT
NATIONAL DAM SAFETY PROGRAM

Name of Dam Newton Falls Dam NY472

State Located New York
County Located St. Lawrence
Stream Oswegatchie River
Date of Inspection August 25, 1978

ASSESSMENT OF GENERAL CONDITIONS

The Newton Falls Dam is a concrete gravity structure approximatley 640 feet long with a maximum height of approximatley 40 feet. The storage capacity of the impoundment is estimated at between 1,000 and 50,000 acre feet placing the dam in the Intermediate Size Category. The dam is located immediately upstream from the Newton Falls Paper Company. The receiving stream flows beneath the mill structure. Newton Falls Dam is used to supply water for power generating purposes for the Newton Falls Paper Company. The drainage area of the dam is 178.8 square miles. The impoundment surface area is approximately 819 acres. This Phase I investigation has determined that the dam is in need of further investigative work and possible structural modification and repair work. The main area of concern is the spillway which has been determined to be severely inadequate since it is capable of passing only 10 percent of the Probable Maximum Flood (PMF). In addition, the dam could be topped as much as 5 feet by the PMF causing possible dam instability.

Using the Corps of Engineers screening criteria for initial review of spillway adequacy, it has been determined that the dam would be overtopped for all storms exceeding approximately 10% of the PMF. 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, however, that based on an initial screening, and preliminary computations, there appears to be a serious deficiency in spillway capacity so that if a severe storm were to occur, overtopping and failure of the dam would take place, significantly increasing the hazard to loss of life downstream from the dam.

It is, therefore, recommended that within 2 months from the date of notification to the governor of the State of New York, owners engage the services of a

professional consultant to determine by more sophisticated methods and procedures the adequacy of the spillway. Within 12 months of the date of notification to the governor, appropriate remedial mitigating measures should have been completed. In the interim, a detailed emergency operation plan and warning system should be promptly developed. Also, during periods of unusually heavy precipitation, around-the-clock surveillance should be provided.

Other areas of concern have been noted which should receive attention:

1) Seepage conditions in areas around the forebay and through the fill north of the forebay should be investigated and remedial action taken to repair this seepage.

2) The sluice gates should be placed in operating condition and, a program of maintenance and surveillance of the dam and its appurtenances should be adopted by the owner.

3) The stability analysis indicates that the factors of safety computed for the spillway section, even while neglecting the possibility of uplift pressure, are still dangerously low (Factors of Safety 1.04 for overturning, 1.06 sliding). Investigations to determine the geological condition at the dam structure should be conducted. An engineering analysis should be undertaken to fully evaluate the stability of the structure when subject to static loadings which could occur at the reservoir. Investigations should include subsurface exploration through the dam and through the foundation to determine the properties of the foundation material.

The work on all areas requiring remedial measures should be performed under the direction of a professional engineer. While these problem areas do not appear to be significant under normal flow conditions, they could be sources of dam instability during a severe flood event.

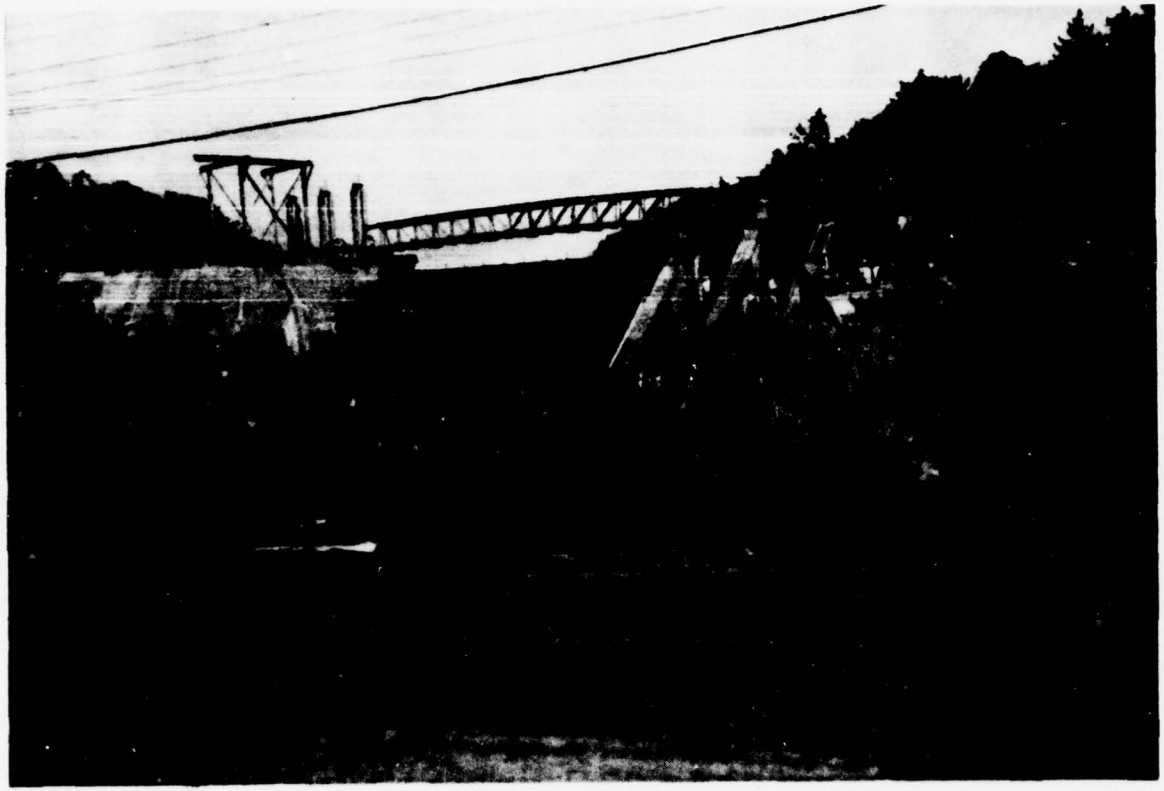


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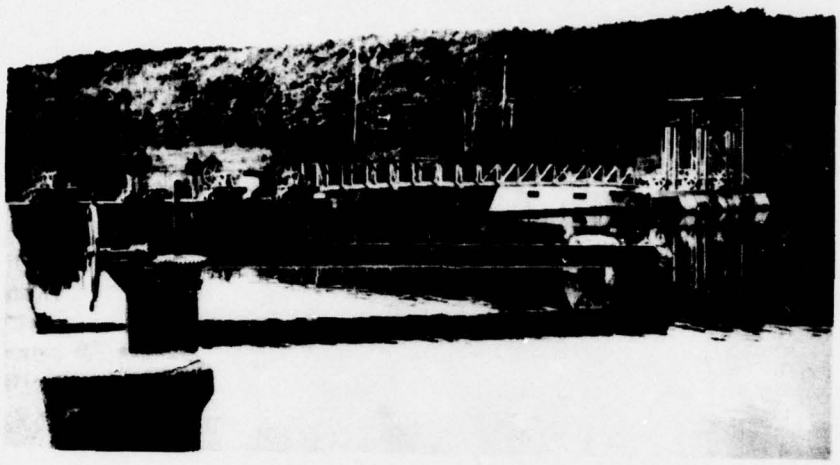
John B. Stetson, President

Approved By:
Date: 29 September 75

Col. Clark H. Benn
New York District Engineer



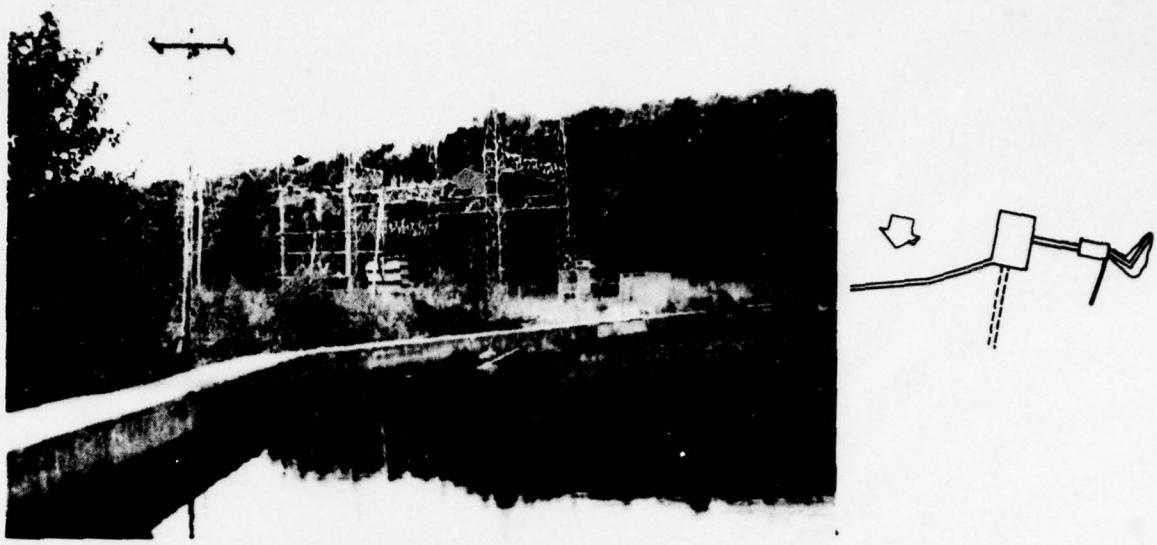
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1. View of upstream area in front of the controlled and uncontrolled spillways and hydropower supply conduit forebay structure and its sluice gate controls.



2. View looking back across dam from north abutment.



3. View looking towards north abutment. Notice electric substation on fill area behind dam. The portion of the reservoir upstream is rather shallow.



4. Closeup from behind uncontrolled spillway and forebay structure. Notice channel below spillway is on rock.



5. Another picture from behind forebay looking across to gated spillway area.



6. View looking up channel toward gated spillway. Discharge is through closed gates which leak.



7. Closeup of gated spillway area. Notice cracks in gunite surface.



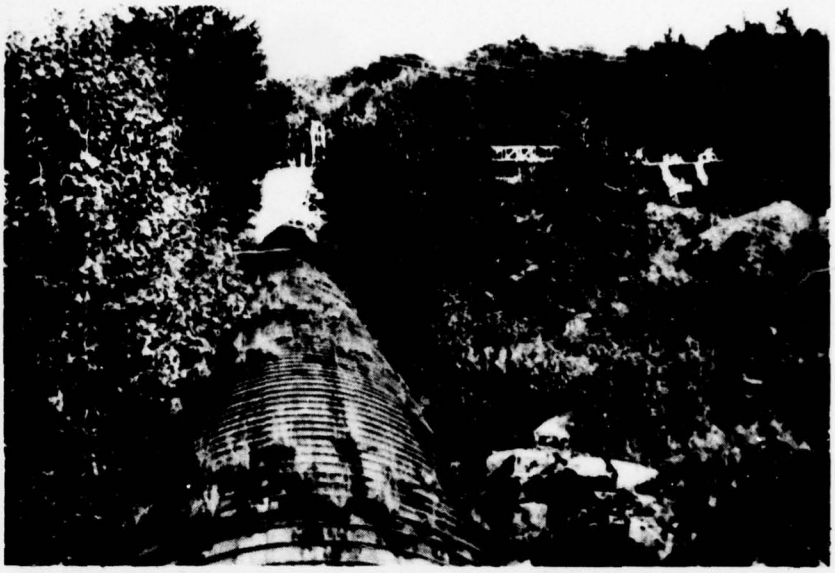
8. Forebay downstream wall has seepage through construction joint.



9. Another closeup of downstream wall of forebay showing another seepage area. Wood staved pipe carries flow to hydro power facility downstream.



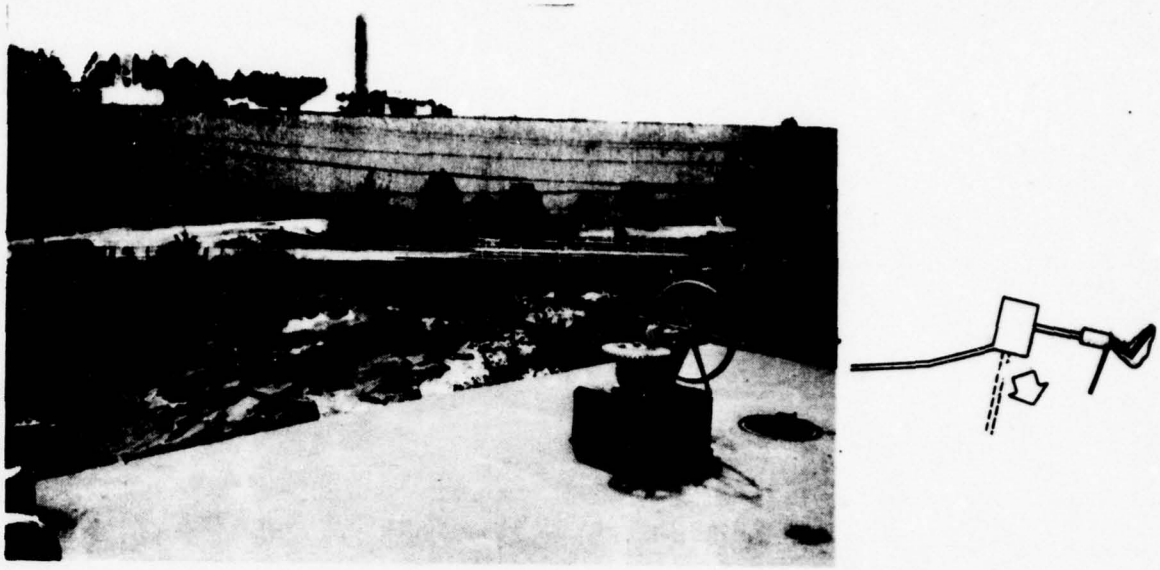
10. On downstream embankment on north side of forebay a limited amount of seepage was located.



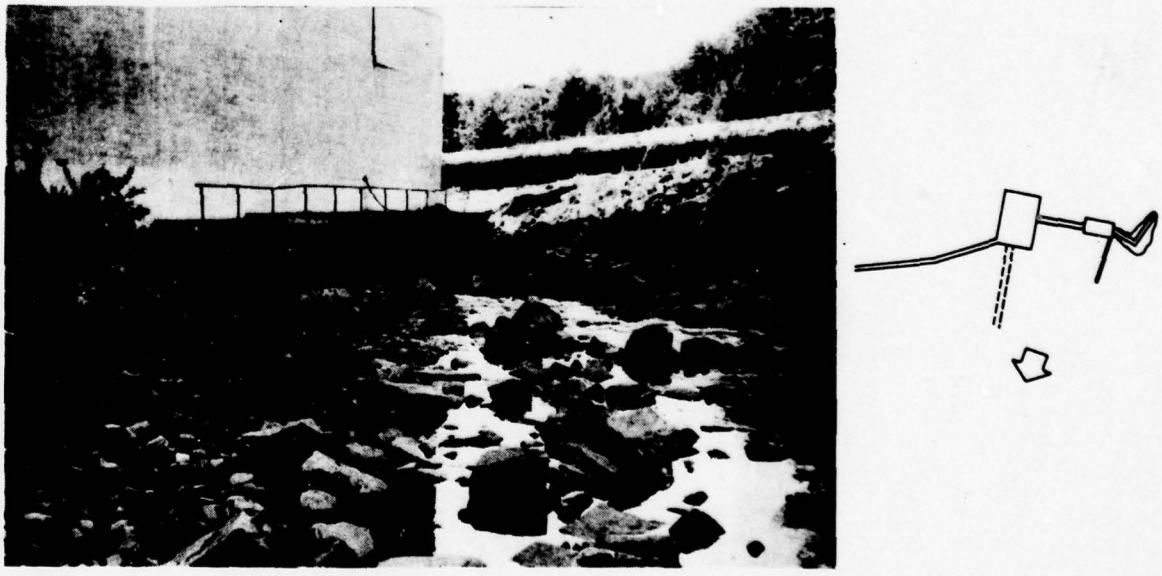
11. View looking up wood staved pipe toward dam.



12. Downstream channel looking away from spillway area. Notice paper mill is immediately downstream.



13. Another view showing building below dam.



14. Closeup of channel culvert section which flows under the building.

PHASE I INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM
NAME OF DAM - NEWTON FALLS ID# - NY472

SECTION 1 - PROJECT INFORMATION

1.1 GENERAL

a. Authority

Authority for this report is provided by the National Dam Inspection Act, Public Law 92-367 of 1972. It has been prepared in accordance with a contract for professional services between Dale Engineering Company and The New York State Department of Environmental Conservation.

b. Purpose of Inspection

The purpose of this inspection is to evaluate the structural and hydraulic condition of the Newton Falls Dam and appurtenant structures, owned by the Newton Falls Paper Company, and to determine if the dam constitutes a hazard to human life or property and to transmit findings to the State of New York.

This Phase I inspection report does not relieve an Owner or Operator of a dam of the legal duties, obligations or liabilities associated with the ownership or operation of the dam. In addition, due to the limited scope of services for these Phase I investigations, the investigators had to rely upon the data furnished to them. Therefore, this investigation is limited to visual inspection, review of data prepared by others, and simplified hydrologic, hydraulic and structural stability evaluations where appropriate. The investigators do not assume responsibility for defects or deficiencies in the dam or in the data provided.

1.2 DESCRIPTION OF PROJECT

a. Description of Dam and Appurtenances

The Newton Falls Dam is a concrete gravity structure approximately 640 feet long with a maximum height of approximately 40 feet. The alignment and the description of the various sections of the dam are shown in Figure 3. The southerly abutment of the concrete gravity section terminates in a shear rock wall. Fill has been placed just downstream from the dam south of the spillway. The north abutment also shows sign of bedrock at the abutment. Fill also has been placed downstream from this section of the dam. The center section of the dam consists of three distinct sections. The southerly portion of the center section is equipped with four - 7 foot by 8 foot sluice gates which may be used to control flow from lower elevations in the impoundment. Just north of the controlled gate section is an ogee shaped spillway section approximately 55 feet long. Just north of this ungated spillway is located a concrete chamber which supplies

water to the generating station located below the dam. This chamber is known as the forebay. Flow into the forebay is controlled through three sluice gates located in the upstream face of the structure. Flow from the forebay to the powerhouse is conducted through a nine foot diameter wood stave pipe. No provision has been made for draining the impoundment.

b. Location

The Newton Falls Dam is located in the Town of Clifton, St. Lawrence County, New York.

c. Size Classification

The maximum height of the dam is approximately 40 feet. No data is available regarding the actual storage capacity of the impoundment. However, the impoundment is estimated to be between 1,000 and 50,000 acre feet. Therefore, the dam is in the Intermediate Size Category as defined by The Recommended Guidelines for Safety Inspection of Dams.

d. Hazard Classification

The Oswegatchie River, the receiving stream from the impoundment flows beneath a mill of the Newton Falls Paper Company. 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 Newton Falls Paper Company.

f. Purpose of Dam

The Newton Falls Dam is used to supply water for power generating purposes for the Newton Falls Paper Company.

g. Design and Construction History

The Newton Falls Dam was constructed in 1927. The dam replaced a dam that was constructed in 1895. No information was available regarding the construction history of the dam. Observations in the field indicate that portions of the structure have received cover coats of gunite. No information was available to determine when this work took place.

h. Normal Operational Procedures

The dam site is immediately adjacent to the mill of the Newton Falls Paper Company. A full-time staff is available at the mill. The Owner's Representative indicated that there are currently no operational procedures in effect other than to maintain flow for power generation.

1.3 PERTINENT DATA

a. Drainage Area

The drainage area of Newton Falls Dam is 178.8 square miles.

b. Discharge at Dam Site

No discharge records are available for this site.

Computed discharges:

Gates spillway capability not considered in analysis. Results are from the Snyder's Method computations.

Ungated spillway, top of dam	1331 cfs
Ungated spillway, design flood	37036 cfs (PMF)
	16712 cfs (1/2 PMF)

Elevation (feet above MSL)

Top of dam	1425
Maximum pool - design discharge	1432 (PMF)
	1429 (1/2 PMF)
Spillway crest	1421
Stream bed at centerline of dam	1410 (approx.)

d. Reservoir

Length of normal pool	4600 feet

e. Storage

Design surcharge (Normal pool to top of dam)	2800 acre feet

f. Reservoir Area

Spillway pool	819 acre

g. Dam

Type - Concrete gravity.
Length - 640 feet.
Height - 40 feet. (Maximum Section)
Freeboard between normal reservoir and top of dam - 4 feet.
Top width - Varies - see details in plans.
Side slopes - Varies - see details in plans.
Zoning - Not applicable.
Impervious Core - None known.
Grout Curtain - None known.

h. Spillway

Type - Ogee weir.
Length - 55 feet.
Width - 5.5 feet.
Crest Elevation - 1421 (MSL).
Gates - 4 - 7 x 7 foot sluice gates (estimated).
U/S Channel - None.
D/S Channel - Natural river bed.

j. Regulating Outlets

9 foot diameter wood stave conduit.

The only way to draw down the reservoir is through the wood stave conduit through the powerhouse.

SECTION 3 - VISUAL INSPECTION

3.1 SUMMARY

a. General

The visual inspection of the Newton Falls Dam took place on August 25, 1978. The Owner's Representative was not available for the inspection, although he was available for a brief interview after the inspection.

b. Dam

The dam and spillway visually conform to the plans as provided in this report. Soil fill material has been placed downstream from the dam in the areas north and south of the main spillway. The area south of the spillway showed no evidence of leakage through the dam or in the area of the fill in back of the dam. Seepage was detected in the fill material to the north of the main spillway near the electric substation which is located near the north abutment. Seepage was also noted in the walls of the forebay at construction joints. A small section of the crest of the dam near the north abutment is severely spalled.

c. Spillway

The spillway is constructed on a rock foundation. Flashboards were in place at the time of the inspection and appeared to be in good condition. A steel bridge allows pedestrian passage across the ungated spillway. This bridge is in good condition.

The gated portion of the spillway is generally in good condition. Four - 7 foot by 8 foot sluice gates are located in this section. The operating mechanism from one of the sluice gates has been removed. One of the sluice gates is operated by an electric motor, although no electric service was provided for this motor. Discussions with the Owner's Representative indicate that these sluice gates may not be operable.

d. Appurtenant Structures

Water from the forebay structure is conducted to the generating station through a nine foot diameter wood stave pipe. This wood stave pipe is in poor condition with numerous leaks and many areas where repairs have been attempted.

e. Downstream Channel

The downstream channel is in bedrock and conducts flow toward the Newton Falls Paper Company Mill which is located immediately downstream from the structure. Flow is conducted through a conduit beneath the Paper Mill.

SECTION 4 - OPERATIONAL PROCEDURES

4.1 PROCEDURES

Operational procedures have not been documented by the owner nor were they demonstrated to the inspection team. Operational procedures consist only of supplying adequate flow to the power house for generating electrical power for the Newton Falls Paper Company Mill. No other operational procedures are conducted by the Paper Company staff.

4.2 MAINTENANCE OF THE DAM

The Newton Falls Paper Company staff is available on this site at all times, however, the operation and maintenance of this facility has been neglected. The working condition of the sluice gates were unknown to the Owner's Representative.

SECTION 5 - HYDROLOGY AND HYDRAULICS

5.1 EVALUATION OF FEATURES

The Newton Falls Dam lies at the western end of its reservoir on the Oswegatchie River. The drainage area of the dam is 172 square miles as planimetered from U.S.G.S. quad sheets, the reservoir is 0.870 miles long with a surface area of 1.28 square miles. Cranberry Lake is located six miles upstream of the dam and has a surface area of 10.805 square miles. For the dam's location, no historical information was available on the occurrence of flood events. Also, no information relevant to the design of the dam was available for this investigation. Therefore, this analysis is based on information obtained from the field inspection, the plans included herein, U.S.G.S. quadrangle mapping and other sources of information and references listed in Appendix E. The hydrologic and hydraulic analysis is provided in Appendix C.

The purpose of this investigation is to evaluate the dam and spillway with respect to their flood control potential and adequacy. This has been assessed through the evaluation of the Probable Maximum Flood (PMF) for the watershed and the subsequent routing of the flood through the reservoir and the dam's spillway system. The PMF event is that hypothetical flow induced by the most critical combination of precipitation, minimum infiltration loss and concentration runoff of a specific location that is considered reasonably possible for a particular drainage area. Since this dam is in the Intermediate Category and is a High Hazard, the guidelines criteria (Ref. 1) require that the dam be capable of passing the Probable Maximum Flood.

The hydrologic analysis was performed using the unit hydrograph method to develop the flood hydrograph. Due to the limited scope of this Phase I investigation, certain assumptions, based on experience, were used in this analysis and in the determination of the dam's spillway capacity to pass the PMF. This was done with the concept, that if the dam was unable to satisfy this criteria, further refined hydrologic investigations would be required. In preparing the unit hydrographs, both Clark and Snyder coefficients were estimated. Since Cranberry Lake is located upstream, the analysis was performed using two sub areas. For the Clark Method, values of Tc = 16.70 and R = 16.70 were computed for the 115 square mile upstream area with Tc = 6.2 and R = 6.2 for the downstream area. The values of R/(Tc + R) was estimated at 0.50 for the analysis. For the Snyder Method, values of Tp = 12.67 and Cp = 0.625 were computed upstream and Tp = 6.2 and Cp = 0.62 downstream. The two sets of unit hydrographs were developed from these parameters as well as two sets of PMF hydrographs. The resulting PMF hydrographs developed from the two methods were then compared and evaluated. The PMF hydrograph was determined using the Probable Maximum Precipitation rainfall data obtained in Hydrometeorological Report No. 33. An index rainfall of 16.9 inches for 200 square miles for a period of 24 hours was used in the anal-

ysis. Base flow for the basin was assumed to be 2 cubic feet per second per square mile, while loss rates were set at 1.0 inches initial abstraction and 0.1 inches/hour continuous loss rate. The loss rate functions for the basin yielded 12.34 inches of runoff from 15.66 inches of precipitation. The flood surcharge storage effect from the lake was assumed to vary linearily with the spillway elevation surface area (the lake's spillway elevation surface area times the surcharge depth yields storage - See Sheets C-6 and C-6a). The upstream dam's spillway was roughly estimated by scaling the dam's width from a U.S.G.S. quad sheet assuming weir flow. For the Newton Falls Dam, only the service spillway was evaluated for the PMF hydrograph. The sluice gates were assumed to be either closed or not functionable. Although there is a maintenance staff at the site, no one is not assigned at the dam on a full-time basis. In addition, the gates operated from a control device in the center of the dam which may not be accessible during a severe flood event. The spillway capacity (up to the top of the dam elevation) considering the service spillway only is estimated at 1331 cfs. This was based on an effective spillway length of 52 feet with a discharge coefficient of 3.2. The top of the dam section was assumed to be elevation 1425. The elevation of the lake was assumed to be at the spillway crest, elevation 1421, at the initiation of the flood event.

The U. S. Army Corps of Engineers, Hydrologic Engineering Center's Computer Program HEC-1 using the Modified Puls Method for flood routing was used to evaluate the dam and spillway capacity. The flood hydrographs were routed through the reservoirs and combined, however no river routing was performed in the analysis. The results of this analysis are shown below:

HEC-1 PMF ANALYSIS

	CLARK'S METHOD		SNYDER'S METHOD		
Percent Of PMF	Run-off Discharge (CFS)	Routed Discharge (CFS)	Run-off Discharge (CFS)	Routed Discharge (CFS)	Routed Flood Stage (FT)
10	3854	1147	3944	1547	1425
20	7708	3903	7888	4383	1426
30	11562	8127	11832	8738	1427
40	15416	11939	15776	12645	1428
50	19270	15514	19720	16112	1429
60	23124	19780	23708	20900	1430
70	26979	23685	27747	24835	1431
80	30833	27422	31785	28816	1431
100	38547	34933	39859	37062	1432

Based on the above results, the spillway is capable of passing only 10% of the PMF. Since this value is less than 50% according to the guidelines, the spillway is deemed to be severely inadequate. This

analysis indicates the dam would be overtopped by approximately 7 feet from the PMF. A more indepth study in regards to the evaluation of the spillway capacity is therefore recommended. If futher analysis confirms these Phase I investigation results, it is then recommended that the owner modify the structure to provide for additional spillway capacity.

SECTION 6 - STRUCTURAL STABILITY

6.1 EVALUATION OF STRUCTURAL STABILITY

a. Visual Observations And Data Review

The various segments of this concrete dam retain structural stability at this time with no indication of misalignment, settlement, or other structural movement. The dam's southerly abutment is formed where the concrete section meets a vertical face of bedrock; much of the northerly and center sections of the dam have most of their area founded on a visible surface of the areas bedrock. Generally, the concrete surfaces of the various dam areas are in relatively good condition. However, cracks exist at various locations, including the spillway and forebay areas through which limited seepage does occur. A limited section of the northerly segment of dam, near the general vicinity of the electrical substation which is immediately adjacent to the downstream side of the dam/impounding area, shows spalling of the concrete face and an indication of hollowness beneath the top cap.

Concrete buttresses for the gated section of the dam (4 gates) next to the main spillway are generally in good condition. Vegetation brush is growing in the rock floor of the area between buttresses of the most southerly two gates, however.

Bedrock is exposed below the downstream toe of the gated spillway and the forebay sections of dam. This rock material appears to be sound. Limited quantities of impounded water was passing into this downstream area through the gated sections, the top of the spillway between its flashboards/stop plank joint, and leaking dam cracks/joints. It did appear that little/no seepage was occurring at the construction joint between the dam section and its rock foundation.

Earth fill of various height, apparently placed beyond that which is indicated by design drawings dated 1927, has been placed against the downstream side of the northerly segment of dam (between the forebay area and substation referred to above) and also the southerly segment of dam (angle-cornered section south of the gated segment). Damp surface conditions for the earth adjacent to the northern segment of dam indicate some seepage is occurring in this general area. No evidence of seepage was noted in the ground surface area adjacent to the southerly segment of dam.

b. Geology and Seismic Stability

The dam is sited on Precambrian alaskite, a variety of granite. Both banks are of the same rock type and the south abutment is a vertical cliff of this same rock. A letter of June 6, 1927 indicates that the foundation had been carried down to bedrock with large keyways excavated.

Three major joint sets are present. Two sets are high angle in nature, with dips ranging from 70° to vertical and trend N80°E and from N20E to N30E. One set has a slight dip of about 5° upstream. This last joint set gives the appearance of layering or bedding. No porous seams, fissures, shear zones or fracturing were observed.

The New York State Geology Map (1970) shows no faults present in the immediate area. Buddington (1972) mentions no evidence of faulting in the area. The Preliminary Brittle Structures Map of New York (1977) does show several lineaments of unknown origin in the vicinity of the reservoir.

Although numerous minor earthquakes have been recorded in the region, the only earthquake of significance (V on the Modified Mercalli scale) occurred about 26 miles northwest of the dam in 1922. In 1974, nine minor earthquakes were recorded as having occurred about 14 miles north-northwest of the reservoir and 102 events were recorded in the Blue Mountain Lake region, about 30 miles to the southeast.

The area is designated as being in Zone 2 of the Seismic Probability Map. Medium intensity earthquakes of VI - VII (Modified Mercalli) are considered possible.

c. Data Review and Stability Evaluation

Design drawings available for review are limited to those which show representative cross-sections of the various segments of dam and the plan layout (drawings dated 1927). Information on the foundation material is not indicated on the drawings but the earlier referred to June 6, 1927 letter indicates a foundation of bedrock. As part of the present study, stability evaluations have been performed. Sections which appear as the most critical on the 1927 drawings have been studied (i.e., the spillway section and the dams southerly segment, because of the greatest height to cross-section ratio). For these stability studies, properties for the dam material and foundation rock (an implied presence) have been assumed.

For both dam sections analyzed, a condition for a reservoir elevation at the approximate top of existing spillway stop planks was assumed, with ice and foundation uplift forces acting.

The analysis performed (Appendix D) indicate unsatisfactory stability against overturning and sliding for certain combinations of conditions, as summarized in the tabulation below. The indicated factors of safety show the ratio of moments/forces resisting movement as those causing movement; a ratio less than unity represents instability.

RESULTS OF STABILITY COMPUTATION

	Case	Uplift	Factors of Safety Overturning	Sliding
(1)	Spillway section: water level at top of existing spillway stop planks, downstream water level at base of section, ice acting.	Yes	0.88	0.71
		No	1.04	1.06
(2)	Dam Section, south end: water level at top of existing spillway stop planks, downstream water level at base of section, ice acting.	Yes	2.2	4.5
		No	4.1	--

Critical to the analysis and resulting indication of stability are the items of uplift water pressures acting on the base of the dam and the permeability of the site foundation rock. The analysis uplift force was based on full headwater hydrostatic pressure acting on the dams upstream corner (of the base) and a zero tailwater hydrostatic pressure acting at the dams downstream corner. The resulting triangular pressure pattern was applied to 100 percent of the dam base area. The uplift force resulting represents a condition that is, to the analysis, very significant in arriving at the computed unsatisfactory factor of safety against overturning and sliding.

The assigned uplift force is conservative, but could be too severe if the dam is embedded in sound rock. The predicition of uplift acting on the base of a gravity dam supported on rock, without boring information on the permeability/seepage properties of the rock stratum, represents an analysis area of great uncertainty. If the rock is very sound and impermeable, seepage would be very low and uplift pressures of significance would require a long period of time to develop. A conclusion for such a condition is that the computed uplift may not exist at the present time, and only develop at a future time. Site conditions imply the existence of sound rock, with no observations indicating seepage pressures at the downstream construction joint between concrete dam and foundation rock.

For the spillway section, however, the factors of safety computed while neglecting the possibility of uplift pressure are still dangerously low. It would be prudent to remove the stop planks to reduce the hydrostatic force presently behind the dam while planning a program to accurately evaluate the forces (uplift included) in action on the section, with the anticipation that enlargement and/or reinforcement of the spillway section will be necessary.

The northerly segment of dam, in the vicinity of the electrical substation, apparently is an area of seepage. The condition should be investigated furtheruto ascertain the need for corrective measures.

As a minimum, location where seepage occurs through joints/cracks in the concrete section should be checked at frequent intervals, to detect changes in conditions which indicate the need for immediate attention. Any program to improve the spillway section should be extended to also repair other sections where seepage occurs.

SECTION 7 - ASSESSMENT/REMEDIAL MEASURES

7.1 DAM ASSESSMENT

The following assessments are based on the Phase I visual examination and analysis of the hydrology and hydraulics and analysis of structrual stability:

1) The dam visually conforms to the details provided in the construction drawings. There are no signs of deformation or structural distress to the dam.

2) Minor seepage exists in the section north of the forebay near the electric substation.

3) Minor seepage exists in construction joints of the exposed walls of the forebay.

4) Maintenance of the sluice gates has been neglected. No evidence exists at the present that these gates are operative.

5) The hydrology and hydraulic analysis indicates that the spillway capacity, using the criteria set forth in this report, is severely inadequate.

6) No evidence could be found to indicate that peak flows through the reservoir could pass through a natural emergency channel into the Little River drainage basin.

7) The stability analysis indicates that the factors of safety computed for the spillway section, even while neglecting the possibility of uplift pressure, are still dangerously low.

8) No formal program of dam maintenance or surveillance has been adopted by the owner.

9) Flows across the spillway are directed through a conduit which passes underneath the mill of the Newton Falls Paper Company. Excessive flows in this channel could cause structural damage to the mill.

7.2 REMEDIAL MEASURES

Based on the above assessments of the dam, the following remedial measures are recommended:

1) Investigations should be undertaken to determine the cause of seepage through the fill north of the forebay. Based on the findings of this investigation, remedial measures should be taken to eliminate the seepage.

2) The seepage through the joints of the walls of the forebay should be monitored and repairs made to eliminate the seepage.

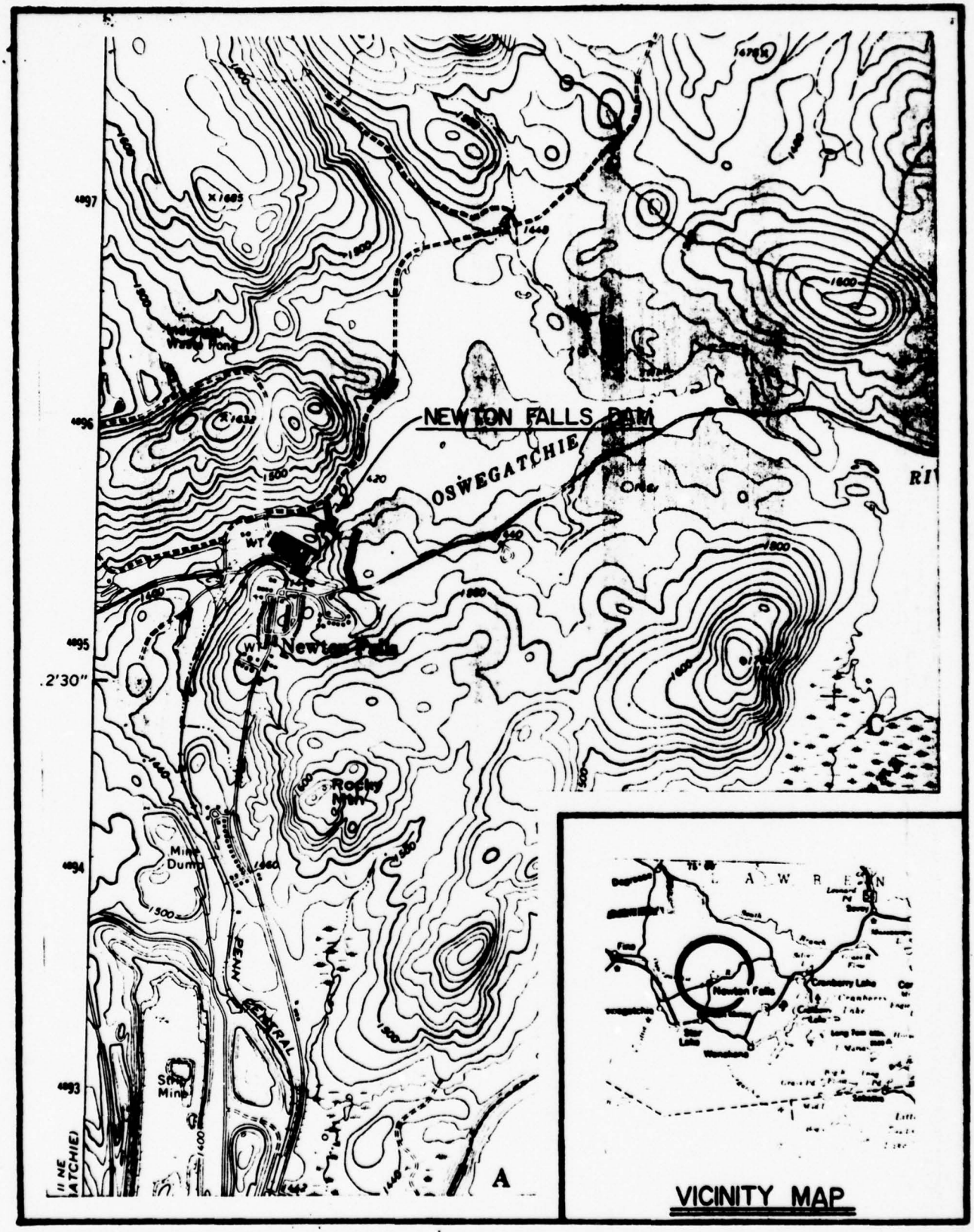
3) The sluice gates should be placed in operating condition and maintained.

4) Additional hyrologic and hydraulic studies should be undertaken to determine the capacity of the spillway. Investigations should be undertaken to determine if an emergency outlet through the Little River does exist as indicated in correspondence by the designer of the dam. Based on the findings of these additional investigations, spillway capacity should be increased to accommodate peak flows.

5) Investigations to determine the geological conditions at the dam structure should be conducted. An engineering analysis should be undertaken to fully evaluate the stability of the structure when subject to static loadings which could occur in the reservoir area. This field investigation should include subsurface exploration through the dam into the foundation to determine the properties of the foundation material. Remedial work should be undertaken based on the findings of these additional investigations.

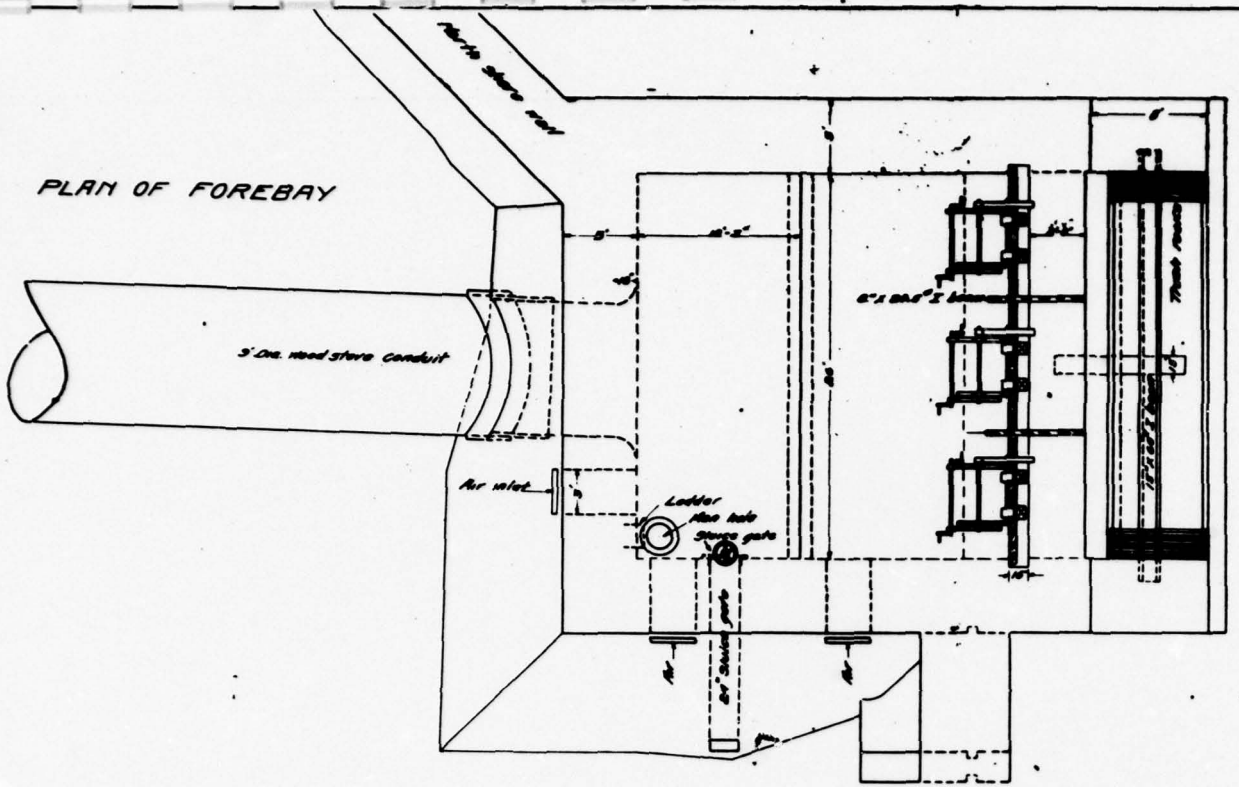
6) The owner should immediately institute a formal program of operation and surveillance. This program should pay special attention to periods of high runoff.

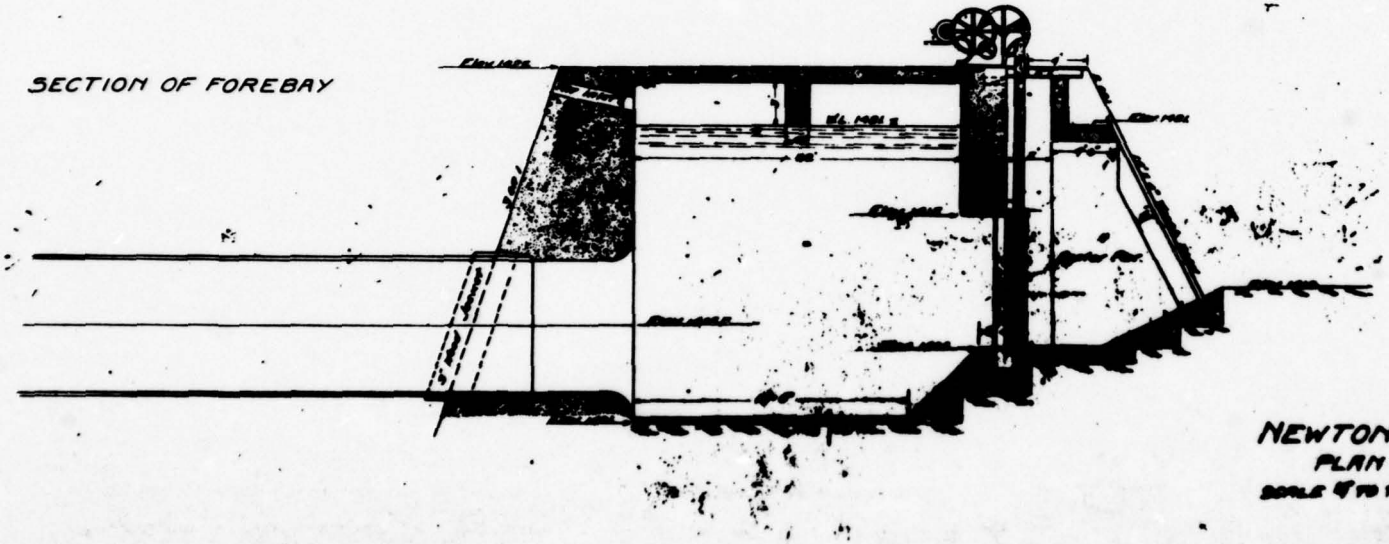
7) Analysis should be made of the capacity of the channel which flows beneath the Paper Mill. Remedial measures should be taken to either reroute the outlet channel or to accommodate peak flows in the channel in its existing location.



LOCATION PLAN

FIGURE 1





NEWTON FALLS P...
PLAN AND SECTION ...
SCALE 4' TO THE FEET

FIGURE 2

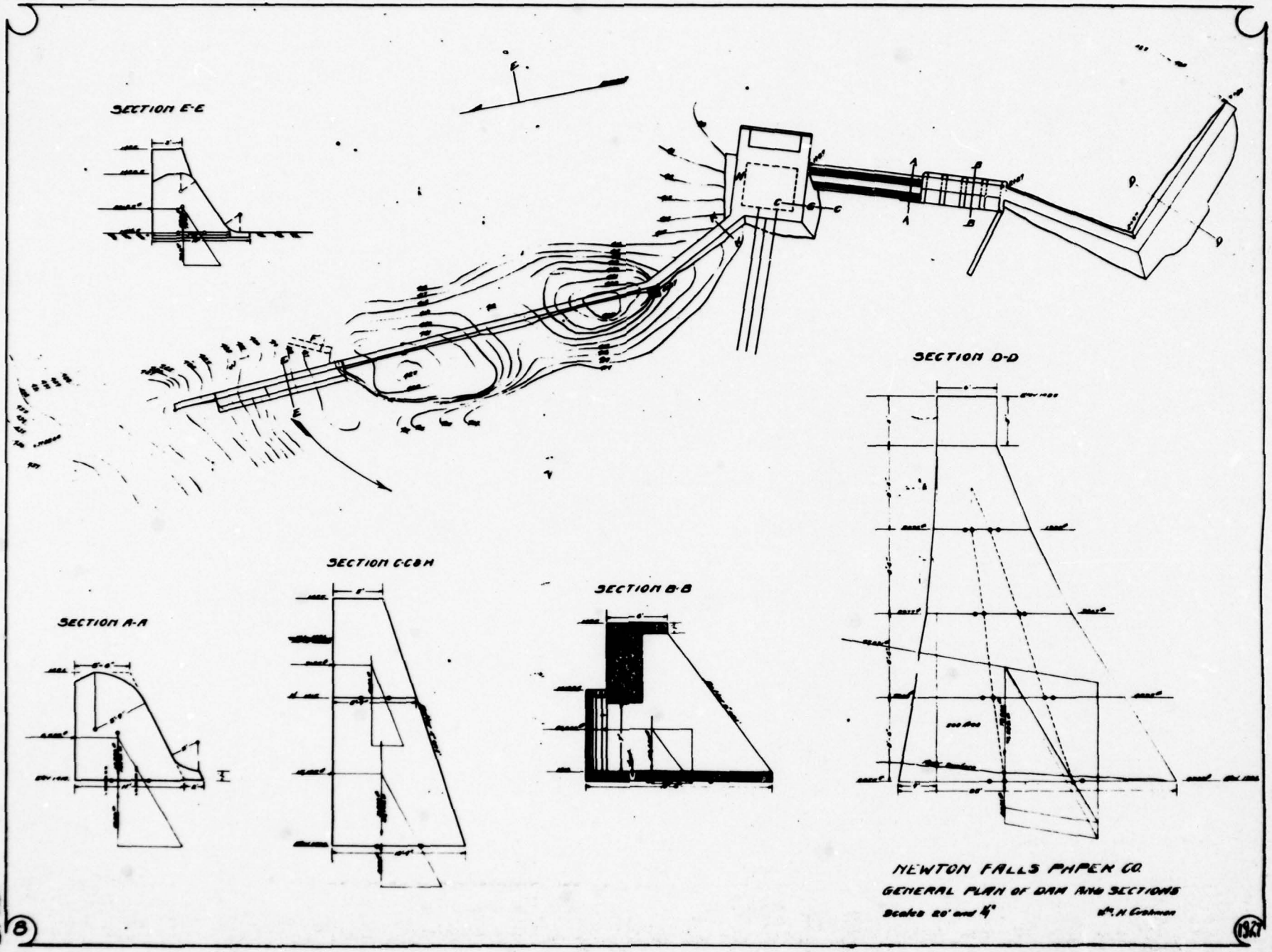

SECTION E-E
SECTION D-D
SECTION C-C & M
SECTION B-B
SECTION A-A
NEWTON FALLS PAPER CO.
GENERAL PLAN OF DAM AND SECTIONS
Scales 20' and 4'
8th N Coleman
8
1927

FIGURE 3

APPENDIX A

FIELD INSPECTION REPORT

CHECK LIST
VISUAL INSPECTION

PHASE 1

Name Dam NEWTON FALLS DAM County ST. LAWRENCE State NEW YORK ID # 472

Type of Dam CONCRETE GRAVITY Hazard Category HIGH

Date(s) Inspection AUGUST 25, 1978 Weather SUNNY Temperature 70° F.

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

Inspection Personnel:

N. F. DUNLEVY	DALE ENGINEERING CO.		
F. W. BYSZEWSKI	DALE ENGINEERING CO.		
D. F. McCARTHY	DALE ENGINEERING CO.		
H. MUSKATT	DALE ENGINEERING CO.		

N. F. DUNLEVY Recorder

CONCRETE/MASONRY DAMS

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
ANY NOTICEABLE SEEPAGE	Limited seepage in forebay downstream face through construction joints. Seepage also noted north of forebay in earthen embankment behind concrete wall section.	The earthen seepage area has little head and the reservoir area is shallow in this portion of the dam.
STRUCTURE TO ABUTMENT/EMBANKMENT JUNCTIONS	Gradual sloping of dam structure up to the abutment areas. No problems noted.	
DRAINS	None noted.	
WATER PASSAGES	None.	
FOUNDATION	Not visible. Dam surrounded by soil cover.	

CONCRETE/MASONRY DAMS

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SURFACE CRACKS CONCRETE SURFACES	Some cracks noted in forebay wall.	
STRUCTURAL CRACKING	None noted.	
VERTICAL & HORIZONTAL ALIGNMENT	Good alignment.	
MONOLITH JOINTS	None noted.	
CONSTRUCTION JOINTS	Seepage in forebay joints.	
STAFF GAGE OF RECORDER	None noted.	

EMBANKMENT

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SURFACE CRACKS	N/A	
UNUSUAL MOVEMENT OR CRACKING AT OR BEYOND THE TOE	N/A	
SLOUGHING OR EROSION OF EMBANKMENT AND ABUTMENT SLOPES	N/A	
VERTICAL AND HORIZONTAL ALINEMENT OF THE CREST	N/A	
RIPRAP FAILURES	N/A	

EMBANKMENT

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
JUNCTION OF EMBANKMENT AND ABUTMENT, SPILLWAY AND DAM	N/A	
ANY NOTICEABLE SEEPAGE	N/A	
STAFF GAGE AND RECORDER	N/A	
DRAINS	N/A	

UNGATED SPILLWAY

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONCRETE WEIR	Has flashboards. In good condition.	
APPROACH CHANNEL	Reservoir upstream.	
DISCHARGE CHANNEL	Founded on rock.	
BRIDGE AND PIERS	Steel bridge across ungated spillway in good condition.	

GATED SPILLWAY

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONCRETE SILL	Generally in good condition.	Gated spillway is not operated. Some gates may not be operable.
APPROACH CHANNEL	Reservoir is upstream.	
DISCHARGE CHANNEL	Founded on rock.	
BRIDGE AND PIERS	Gunite. Some cracking evident. Should be monitored.	
GATES AND OPERATION EQUIPMENT	Gates need repair in order to operate; also leak.	

OUTLET WORKS

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CRACKING AND SPALLING OF CONCRETE SURFACES IN OUTLET CONDUIT	None.	Wood stave pipe, low level outlet. It goes from the forebay to the power house. The gated spillway can also lower the reservoir but not all the way down. No other outlet works.
INTAKE STRUCTURE	None.	
OUTLET STRUCTURE	None.	
OUTLET CHANNEL	None.	
EMERGENCY GATE	Gated spillway provides capability.	

DOWNSTREAM CHANNEL

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONDITION (OBSTRUCTIONS, DEBRIS, ETC.)	The channel contains large rocks. It goes under the plant building.	
SLOPES	Mile slope.	
APPROXIMATE NO. OF HOMES AND POPULATION	Large plant building downstream.	

INSTRUMENTATION

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
MONUMENTATION/SURVEYS	None.	
OBSERVATION WELLS	None.	
WEIRS	None.	
PIEZOMETERS	None.	
OTHER	None.	

RESERVOIR

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SLOPES	Some rock outcropping.	
SEDIMENTATION	None noted.	

CHECK LIST
ENGINEERING DATA
DESIGN, CONSTRUCTION, OPERATION
PHASE 1

NAME OF DAM Newton Falls Dam

ID # 472

ITEM	REMARKS
AS-BUILT DRAWINGS	Some additional data is believed to be in the owner's file.
REGIONAL VICINITY MAP	See this report.
CONSTRUCTION HISTORY	See owner.
TYPICAL SECTIONS OF DAM	See this report.
OUTLETS - PLAN - DETAILS - CONSTRAINTS - DISCHARGE RATINGS	See this report.
RAINFALL/RESERVOIR RECORDS	None.

ITEM	REMARKS
DESIGN REPORTS	See owner for available data. Not known to exist.
GEOLOGY REPORTS	See owner for available data. Not known to exist.
DESIGN COMPUTATIONS HYDROLOGY & HYDRAULICS DAM STABILITY SEEPAGE STUDIES	See owner for available data. Not known to exist.
MATERIALS INVESTIGATIONS BORING RECORDS LABORATORY FIELD	See owner for available data. Not known to exist.
POST-CONSTRUCTION SURVEYS OF DAM	See owner for available data. Not known to exist.
BORROW SOURCES	See owner for available data. Not known to exist.

ITEM	REMARKS
MONITORING SYSTEMS	None.
MODIFICATIONS	See owner.
HIGH POOL RECORDS	No data.
POST CONSTRUCTION ENGINEERING STUDIES AND REPORTS	No data.
PRIOR ACCIDENTS OR FAILURE OF DAM DESCRIPTION REPORTS	No data.
MAINTENANCE OPERATION RECORDS	No data. Only records known relate to hydropower generation amounts.

ITEM	REMARKS
SPILLWAY PLAN SECTIONS DETAILS	See this report.
OPERATING EQUIPMENT PLANS & DETAILS	See this report.

NEWTON FALLS DAM
I.D. # 472

CHECK LIST
HYDROLOGIC & HYDRAULIC
ENGINEERING DATA

DRAINAGE AREA CHARACTERISTICS: 178.8 sq. mi.

ELEVATION TOP NORMAL POOL (STORAGE CAPACITY): 1421

ELEVATION TOP FLOOD CONTROL POOL (STORAGE CAPACITY): --

ELEVATION MAXIMUM DESIGN POOL: --

ELEVATION TOP DAM: 1425

CREST:

a. Elevation 1421
b. Type Ogee
c. Width 5.5 ft.
d. Length 52 ft.
e. Location Spillover South end of dam.
f. Number and Type of Gates 4 Sluice gates.

OUTLET WORKS:

a. Type Wood staved pipe to power plant plus gated spillway.
b. Location Center of dam.
c. Entrance Inverts 1410
d. Exit Inverts 1398
e. Emergency Draindown Facilities Gated spillway. and staved pipe. Gated spillway may not be operatable.

HYDROMETEOROLOGICAL GATES:

a. Type None
b. Location None
c. Records None

MAXIMUM NON-DAMAGING DISCHARGE: ---

APPENDIX B

PREVIOUS INSPECTION REPORTS

AND CORRESPONDENCE

3-28-21-1000 (C-1505)

STATE OF NEW YORK
DEPARTMENT OF

State Engineer and Surveyor

ALBANY

Received Mar 17, 1927 Dam No. 138-756 Oswegatchie Watershed

Disposition Approved May 13, 1927 Serial No.

Foundation inspected

Structure inspected

Application for the Construction or Reconstruction of a Dam

Application is hereby made to the State Engineer, Albany, N. Y., in compliance with the provisions of Chapter LXV of the Consolidated Laws and Chapter 647, Laws of 1911, Section 22 as amended, for the approval of specifications and detailed drawings, marked NEWTON FALLS PAPER CO. No. 2 and No 3 and dated 1927 herewith submitted for the {construction / ~~reconstruction~~} of a dam located as stated below. 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 Dec 1st, 1927 (Date)

1. The dam will be on Oswegatchie River flowing into StLawrence River in the town of Newton Falls, County of StLawrence and at the upper falls in Newton Falls village (Give exact distance and direction from a well-know bridge, dam, village main cross-roads or mouth of a stream)

2. The name and address of the owner is Newton Falls Paper Co.

3. The dam will be used for producing hydraulic power

4. Will any part of the dam be built upon or its pond flood any State lands? No.

5. The watershed at the proposed dam draining into the pond to be formed thereby is 170 sq-mi square miles.

6. The proposed dam will have a pond area at the spillcrest elevation of not known acres and will impound not known cubic feet of water.

7. The lowest part of the natural shore of the pond is (1) foot feet vertically above the spillcrest, and everywhere else the shore will be at least (5) feet feet above the spillcrest.

8. The maximum known flow of the stream at the dam site was 1930 cubic feet per second on Mar 24th 1921 (Date)

9. 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 nothing in the river gorge below until the storage pool above Brown's Falls development is reached. Dam replaces another

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

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11. The material of the right bank, in the direction with the current, is granite; at the spillcrest elevation this material has a top slope of (3) inches vertical to a foot horizontal on the center line of the dam, a vertical thickness at this elevation of unknown feet, and the top surface extends for a vertical height of 100 feet above the spillcrest.

12. The material of the left bank is Granite; has a top slope of cliff inches to a foot horizontal, a thickness of unknown feet, and a height of 100 feet. Left abutment is a vertical cliff

13 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 From previous construction and visible indications, this is an impervious granite formation at all points beneath the site and its adjacent structures.

14. If the bed is in layers, are the layers horizontal or inclined? inclined If inclined what is the direction of the horizontal outcropping relative to the axis of the main dam and the inclination and direction of the layers in a plane perpendicular to the horizontal outcropping slight dip upstream

15. What is the thickness of the layers? from 15" upwards

16. Are there any porous seams or fissures? some surface checking but otherwise solid granite ledge with no soft seams

17. WASTES. The spillway of the above proposed dam will be 48. feet long in the clear; the waters will be held at the right end by a concrete wall the top of which will be 3. 4. feet above the spillcrest, and have a top width of 3. feet; and at the left end by a non-spillway dam the top of which will be 4. feet above the spillcrest, and have a top width of 6. feet.

18. There will be also for flood discharge a ~~xxx~~ 4 gates 8'x7' ~~xxxxxxxxxxxxxxxxxxxx~~ and the bottom will be 11' feet below the spillcrest, a sluice or gate 2' feet wide in the clear by 2' feet high, and the bottom will be 19.75' feet below the spillcrest. A 9' diameter conduit leads from dam to P.H. 456 cf capacity

19. APRON. Below the proposed dam there will be an apron built of concrete of varying width feet long across the stream, ... feet wide and ..... feet thick. The downstream side of the apron will have a thickness of ..... feet for a width of ..... feet.

20. PLANS. Each application for a permit of a dam over 12 feet in height must be accompanied by a location map and complete working drawings in triplicate of the proposed structure, one set of which will be returned if they are approved. Each drawing should have a title giving the parts shown, the name of the town and county in which the dam site is located, and the name of the owner and of the engineer.

The location map (U. S. Geological Quadrangle or other map) should show the exact location of the proposed dam; of buildings below the dam which might be damaged by any failure of the dam; of roads adjacent to or crossing the stream below the dam, giving the lowest elevation of the roadway above the stream bed and giving the shape,

the height and the width of stream openings; and of any embankments or steep slopes that any flood could pass over. Also indicate the character and use made of the ground below the dam.

The complete working drawings should give all the dimensions necessary for the calculations of the stability of the structure, and all the information asked for below under "Sketches." There may be attached to the application any written reports, calculations, investigations or opinions that may aid in showing the data and method used by the designer. State the assumed ice and uplift pressures and the conditions on which based.

21. SKETCHES. For small and unimportant structures, if plans have not been made, on the back of this application make a sketch to scale for each different cross-section at the highest point; giving the height and the depth from the surface of the foundation, the bottom width, the top width (for a concrete or masonry spill at 18 inches below the crest), the elevation of the top in reference to the spillcrest, the length of the section, and the material of which the section is to be constructed; on the spillway section show a cross section of the apron, giving its width, thickness and material, and show the abutment or wash wall at the end of the spillway, giving its heights and thickness. Mark each section with a capital letter. Also sketch a plan; show the above sections by their top lines, giving the mark and the length of each; the openings by their horizontal dimensions; the abutments by their top width and top lengths from the upstream face of the spillcrest; and outline the apron. Also sketch an elevation of each end of the dam with a cross section of the banks, giving the depth and width excavated into the banks.

22. ELEVATIONS. Also give the elevations, if possible from the Mean Sea Level, of at least two permanent Bench Marks; of the spillcrest for any existing dam on the proposed dam site, at the middle and at the ends of the spill; of the spillcrest for the above proposed dam; and of the spillcrest of any adjacent dams.

23. SAMPLES. When so instructed, send samples of the materials to be used in the construction of the proposed dam, using shipping tags which will be furnished. For sand, one-half a cubic foot is desired (exclusive of any stone over ½ inch in size mixed therewith); for cement, three pints; and for the natural bed, twenty cubic inches if of ledge and one-half a cubic foot if of soil.

24. INSPECTION. State how inspection is to be provided for during construction. Supervision by Engineers acting for Newton Falls Paper Co.

25. WATER SUPPLY. Are the waters impounded by the above dam to be used for a public water supply? Yes. Has an application under the provisions of Article IX of the Conservation Law for such use been made to the Water Control Commission, Albany, N. Y.?

When the impounded water reaches an elevation of more than one foot above spillway, part of the discharge will pass out of the pond by way of Little River, a branch which enters the Oswegatchie a few miles below. It is proposed to control this flood relief feature by installing gates and dyke as experience warrants.

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The above information is correct to the best of my knowledge and belief.

Trust Co Bldg. Watertown N.J. — P. H. Cushman

(Address of signer)

Mar 10th 1927 — Consulting Engineer

(Date)

(A person signing for owner should indicate his title or authority)

M. AM. SOC. C. E.
DAMS, CANALS AND HYDRAULIC
POWER DEVELOPMENT

PHONE 2305
SUPERVISION OF CONSTRUCTION
WATER POWER APPRAISALS

WILLIAM H. CUSHMAN
CIVIL AND HYDRAULIC ENGINEER
TRUST COMPANY BUILDING
WATERTOWN, N. Y.

Watertown, N.Y. Nov 15th, 1926.

State Engineer And Surveyor.

Albany, New York.

Dear Sir:-

I am designing a dam for the Newton Falls Paper Co. at their plant location on the Oswegatchie river.

I would like the blanks which you require to be filled out giving you the proper information to pass upon the design.

I have mislaid previous information dealing with the requirments as to "upward pressure" ~~requirements~~.

I may say that the dam will be 40 feet high but that this highest portion is not an overfall section.

Thanking you for prompt service, I remain:

Yours very respectfully:

Wm H. Cushman

ARMcK-BW

November 16, 1926.

Mr. William H. Cashman,
Trust Company Building,
Watertown, N. Y.

Dear Sir:

Acknowledgment is made of your letter of Nov. 15, 1926 concerning the reconstruction of a dam for the Newton Falls Paper Co. on the Oswegatchie River.

This company owns several dams, and a U. S. G. S. sheet No. 138 is enclosed to mark the exact location of these dams. The scale of the map is one inch to the mile. There are also enclosed report forms to be filled out for the dams of the company other than the one to be reconstructed.

There is also enclosed an application form for the construction of a dam. Kindly fill out the application as completely as possible, making the sketches as requested under Section 21, if drawings are not prepared.

If the bed is an impervious granite rock, the uplift pressure under the dam can be taken at 1/4 of the pressure due to the upstream maximum static head at the intersection of the upstream face with the base line of the dam, and decreasing uniformly along the line of the base to 1/4 of the pressure due to the downstream maximum static head at the intersection of the downstream face bevel with the base line of the dam. If the bed is of earth, use 2/3 instead of 1/4 in the above.

On the spillway section it should be assumed that on account of the velocity of high flows, there will be no weight from the waters on the crest or on the downstream face. The weight of the concrete must not be assumed greater than 140.6 pounds per cubic foot or 2-1/4 times the weight of water.

For a dam 40 feet in height above any point in the bed the ice pressure should be taken as at least 7000 pounds per linear foot for a vertical upstream face. This can be reduced one-half if the spillway be provided with a bevel at

at the top of the upstream face of at least ½ foot horizontal to 2 feet vertical rounded at the top and this bevel, carried up on the non-overflow parts.

We believe the maximum vertical flow would be 40 second feet per square mile of the drainage area.

Very truly yours,

Roy C. Finch,
State Engineer.

By
Deputy State Engineer.

Encl.

M. AM. SOC. C. E.
DAMS, CANALS AND HYDRAULIC
POWER DEVELOPMENT

138-756

PHONE 1310
SUPERVISION OF CONSTRUCTION
WATER POWER APPRAISALS

WILLIAM H. CUSHMAN
CIVIL AND HYDRAULIC ENGINEER
TRUST COMPANY BUILDING
WATERTOWN, N. Y.

Watertown, N.Y. Mar 21st, 1927'

Mr. Thos. L. Watkins

Office of State Engineer, Albany, N.Y.

Dear Sir:-

I have your letter of inquiry dated Mar 16th.

In the seven years of recorded gaugings, taken at Newton Falls and Cranberry Lake, the highest discharge is dated Mar 24th, 1921, i.e. 1930 c.f.s. Your maximum requirment, as per letter of Mr. Lannigan dated Nov 16th, 1926, is 40 c.f.s. per sq-mi, which applied to 166 sq-mi of drainage area gives 6640. c.f.s.

Using a maximum water elevation of (1425) as compared to this theoretical maximum discharge, our calculations show our designs to be capable of the following discharge capacity. Viz.

45 lin ft of spillway at (1421) i.e. 4' debth	1287.4	c.f.s.
4 sluice gates 7' x 8' at 11.5' foot head	4928.	"
discharge through 9' penstock	400.	"
Sluice valve in Forebay 2' x 2'	71.	"
Total discharge capacity, ———	6686.4	"

This discharge capacity covers the extreme maximum condition requirment.

As a matter of actual practice this water elevation would not be reached as, when the pond elevation exceeds (1422.3) a portion of the water would back up into Chaumont swamp, flow over the "divide" and be discharged through Little River.

The limit of this relief discharge capacity, via Little River, is limited only by a reasonable consideration of the rights of property owners (other than the Newton Falls Paper Co) along that stream.

The large sluice gate capacity designed is expressly intended to keep the head water elevation below (1422.3) and divert no water through Little River. If experience warrants it this Company proposes to build a dyke at the Chaumont Swamp "divide" with emergency flood gates; this is for the future however and meantime the situation seems to be entirely safe.

Respectfully submitted:

Wm H Cushman

March 16, 1927

Mr. Wm. F. Cushman,
Trust Company Building,
Watertown, N. Y.

Dear Sir:

Application and plans for the construction of a dam for the Newton Falls Paper Company on the Oswegatchie river at Newton Falls have been received from you.

It is noted that a spillway length of but 48 feet is provided and essentially a head on the crest of but one foot is contemplated (See Section CC). At most there is only 4 feet between the crest of the spillway and the non-overflow portion of the dam.

It is clear that you intend to take care of flood waters via Little River but there is not sufficient data for us to determine the adequacy of this means of discharge. Please furnish in more detail the maximum facilities you intend to provide for taking care of discharge of flood waters.

Very truly yours,

THOS. H. MATHIS,

Acting State Engineer.

JPH/F.

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DAMS, CANALS AND HYDRAULIC
POWER DEVELOPMENT

SUPERVISION OF CONSTRUCTION
WATER POWER APPRAISALS

WILLIAM H. CUSHMAN
CIVIL AND HYDRAULIC ENGINEER
TRUST COMPANY BUILDING
WATERTOWN, N. Y.

Newton
Edl Commun Comm
copy

Watertown, N.Y. May 5th, 1927.

Mr. Thos. L. Watkins.

Department of Public Works.

Albany, New York.

Newton

Dear Sir:-

I received your letter of Mar 25th, 1927, returning Sheet No 3 of the designs for the Newton Falls Paper Company's proposed construction, with suggested alterations.

I am submitting a new Sheet, No 8, showing changed design intended to meet your criticism to Sheet No 3.

Taking up Section " C-C"; I may say that the full section, 25 feet high, only occurs at the point marked "G" (No 8) on the south wall of the Forebay. The Forebay design, as shown on No 4, is a box like structure with internal dimensions 22' x 26', imbedded in the solid rock formation. The North Forebay wall is, at its extreme hight, only 15 feet above rock level (at H). This north wall is rendered still more stable on account of the top floor construction shown on No 4.

When the Forebay is full the pressure at "H" is a "balanced pressure"; when the Forebay is empty the wall "H" is supported by the other walls, acting as buttresses, and by the top floor construction; or by the whole forebay structure acting as a unit.

At the point "G" no ice pressure can occur as ice, if it could conceivably be formed in the rapid flowing water, would subject the turbines to hazard and require the closing of the Forebay gates and consequently emptying the Forebay.

At the point "K-K" the wall is only 10 feet high above rock and shows, on No 8, an ample factor against all pressures to which it could be subjected.

In deference to your views a new section "B-B" is submitted on No 8. The thickness of the breast wall has been increased and the base widened. The factor of safety, without condidering the weight of the gate hoist (6000#) and stems, seems to be high enough to meet all requirments. This is essentially a reinforced structure but the steel design had not been figured at the time Sheet No 3 was submitted to you.

In order to get a proper delivery of the gates, hoists

and Gate frames, the Company contracted for this material. On that account I have left the Sluice Gate pier widths at 2 feet. As the total pressure, if concentrated on a one foot section of the base, is only 1/20 of the crushing strength of concrete, I judge that you will approve this later design.

Generally considered the flow of the Oswegatchie is closely regulated at Newton Falls. The 14 years of gaugings shows around 300 c.f.s. for 9-1/2 months in the year with very little variation. The total Annual Average flow is only 351 c.f.s. Showing the close regulation that is maintained.

The Newton Falls Paper Company's use of this 300 c.f.s. during the 24 hour period, averages 3/5 for the day and 2/5 for the night period. This is stated to show average conditions with reference to ice pressure. Normally the ice above the dam disintegrates in the pond long after the "spring freshet" period has passed. Ice jams at flood peak do not occur. At other times during the winter period water level is maintained close to crest level, for obvious reasons, and any ice pressure would have to be figured as applying at this elevation. As 3/5 of the daily flow is used daytimes and 2/5 nights, a fluctuation of pond level necessarily occurs, which would probably prevent a rigid connection between field ice and the dam.

However, on the theory that this Company might discontinue the operation of their water power and, on the rather remote possibility of their not drawing down the pond by opening the Sluice Gates, in case of such discontinuance; then the close manipulation of the flow might cease and the conditions favor an onobstructed spillway. To meet your views, in this respect, I am submitting, on No 8, a rollway section 60 foot long (A-A) with the bridge over it eliminated. (somewhat longer than the crest of the next dam above).

At the point marked "F" (on No 8) a timber dam is now in use; its function being to prevent water, above elevation 1417, from flowing down a portion of the river bed indicated by the arrow. The territory between the timber dam location ("F") and the proposed Forebay is mostly bald granite ledge. The old river bed, as indicated by the arrow, is similarly a rocky gorge leading directly to the present main channel. I am showing, on No 8, an additional spillway, 66 feet long, with a crest level 1'- 6" above the main dam (Section A-A). In the event of extreme high water, these two spillways would cover your requirment.

I am sending you copies of sheets No 4 and No 8 to enable you to check up my statements. I have written rather fully in order to show you the whole situation, as I see it, but most distinctly, not to argue or to exhibit any "pride of opinion".

I trust that you will approve these amended designs.

Respectfully submitted:-



C O P Y

Watertown,N.Y.,
June 6, 1927

Mr. Roy F. Hall,
District Engineer,
Watertown, N. Y.

Dear Sir:

On June 4th I made an inspection of the foundation for the fore bay and the north wall section of the dam being built by the Newton Falls Paper Company at Newton Falls, N. Y.

I found that the foundation had been carried down to bed rock with large keyways excavated. All fragments of loose rock have been removed.

I did not notice any seams in the foundation rock. Before the concrete is poured the foundation rock will be thoroughly washed.

The foundation is satisfactory.

Yours very truly,

CHARLES C. CASSEL,

Resident Engineer

CCC/J

S 138-K.

Form W51. 5-12-16-2000 (16-1675S) Acc. 382

(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

DAM REPORT

Superseded by 138-T50

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June 19 (Date), 1919

CONSERVATION COMMISSION,

DIVISION OF WATERS.

GENTLEMEN:

I have the honor to make the following report in relation to the structure known as the Newton Falls Paper Co. Dam.

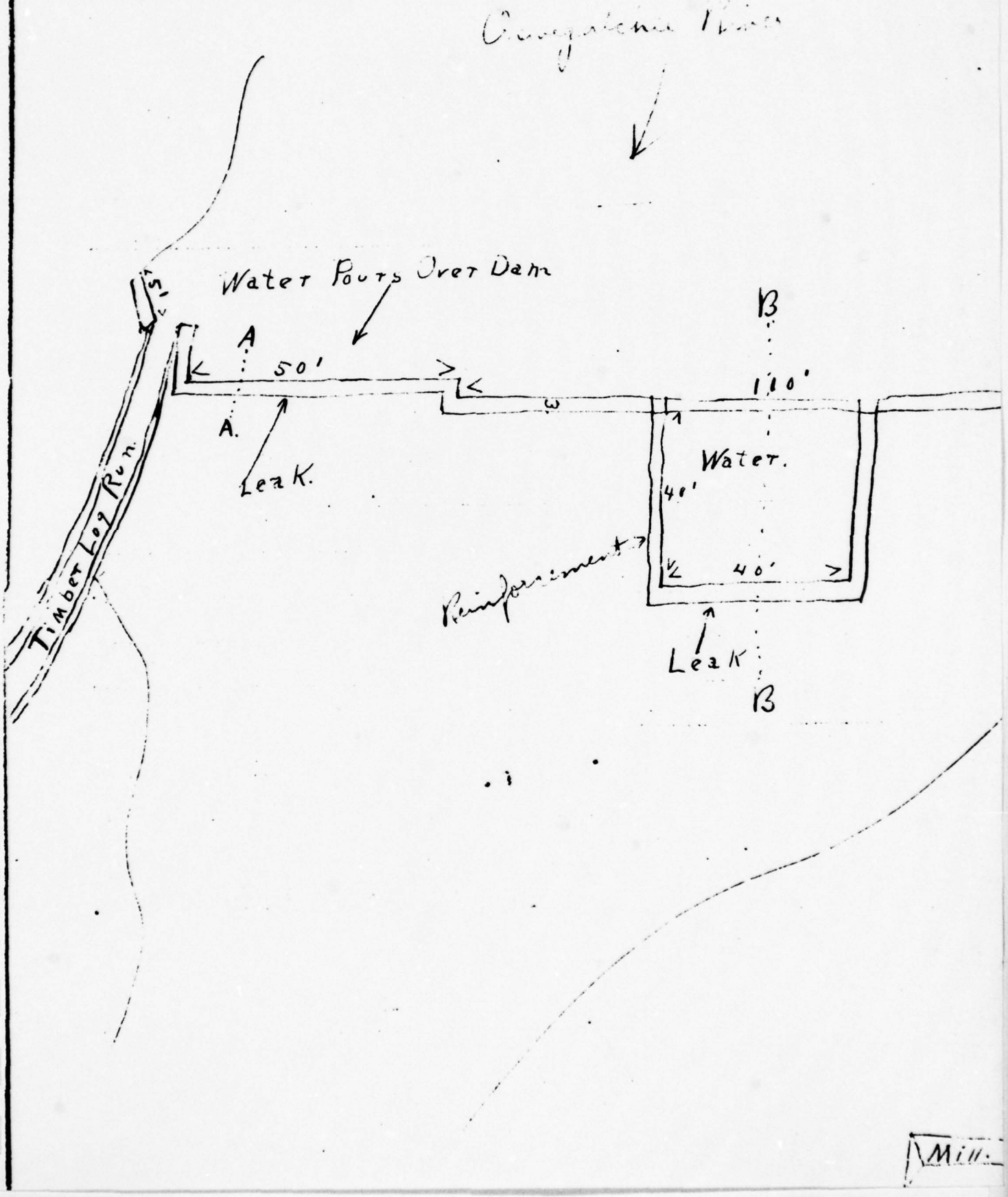
This dam is situated upon the Oswegatchie River (Give name of stream)
in the Town of Fine, St. Lawrence County,
about ½ mile (State distance) from the Village or City of Newton Falls.
The distance down (Up or down) stream from the dam, to the Paper Mill (Give name of nearest important stream or of a bridge),
is about 400 ft. (State distance).

The dam is now owned by Newton Falls Paper Co Newton Falls. (Give name and address in full)
and was built in or about the year 1895, and was extensively repaired or reconstructed
during the year 1915.

As it now stands, the spillway portion of this dam is built of masonry (State whether of masonry, concrete or timber)
and the other portions are built of concrete & masonry (State whether of masonry, concrete, earth or timber with or without rock fill)

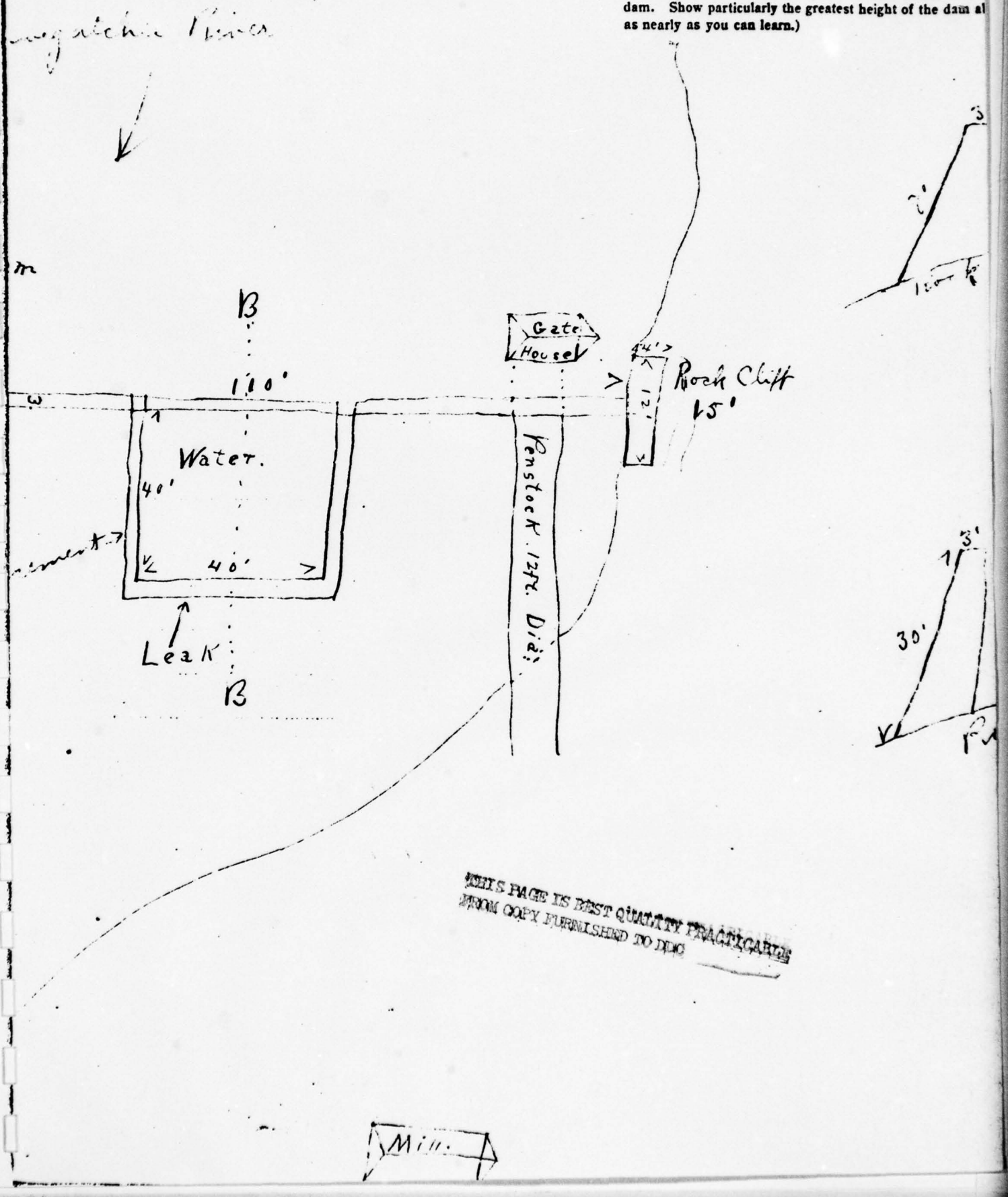
As nearly as I can learn, the character of the foundation bed under the spillway portion of the dam is rock and under the remaining portions such foundation bed is rock.

(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.)



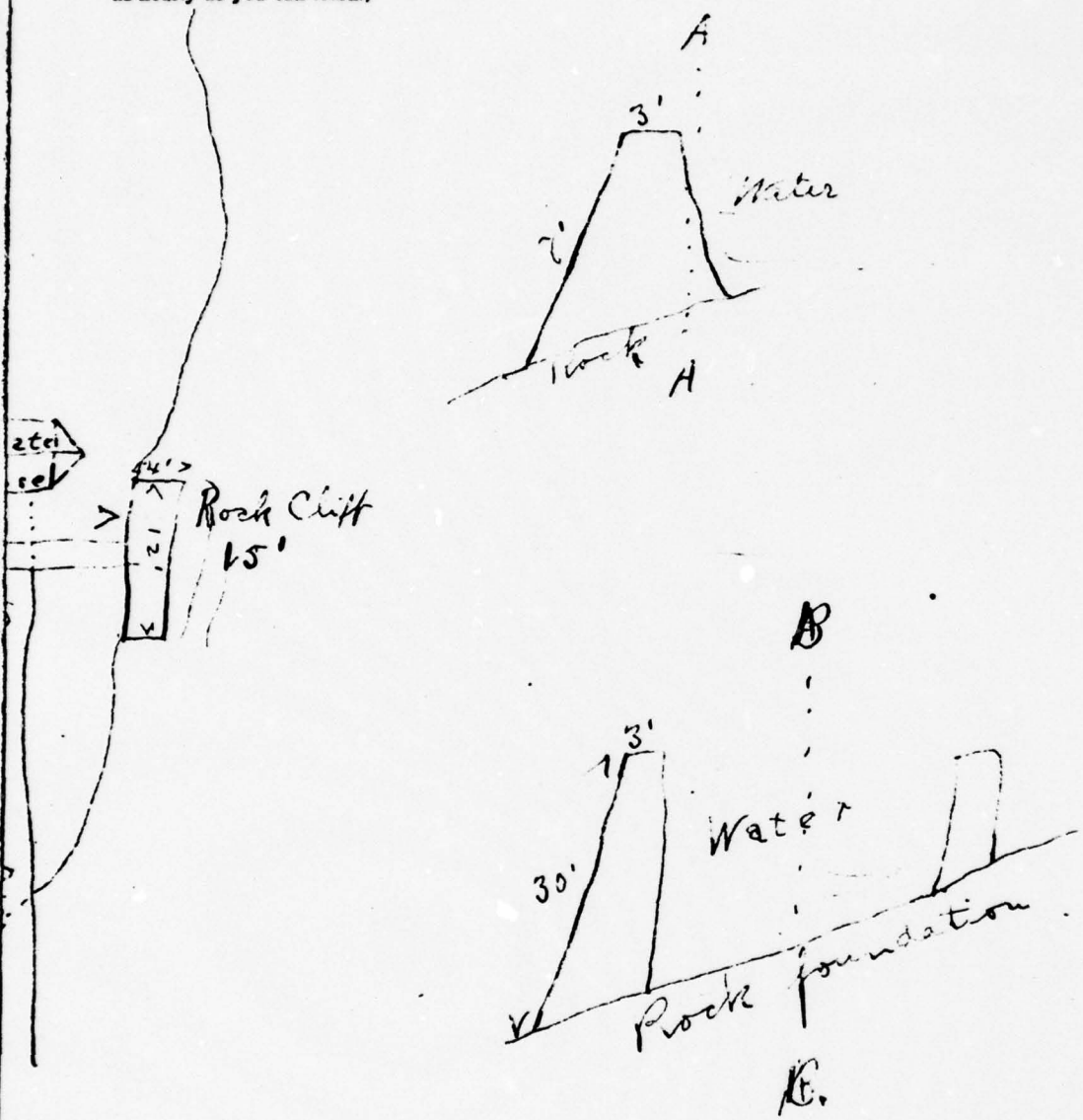
of the dam, and its approximate position in relation to buildings or

(In the space below, make one sketch showing the form s
dam and outline the abutment, and a second sketch show
dam. Show particularly the greatest height of the dam a
as nearly as you can learn.)



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(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 outline the abutment, 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.)



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The total length of this dam is 107 feet. The spillway or waste-weir portion, is about 50 feet long, and the crest of the spillway is about 4 feet below the abutment.

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: 12" pipe thru dam

At the time of this inspection the water level above the dam was ft. 2 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 or erosions which you may have observed.)

Dam is in fair condition. Has a few small leaks. Backs up a large body of water. Would do considerable damage to property below

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Reported by Earl J. Gilmore
(Signature)

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

Raymond Wis.
(Name of place)

APPENDIX C

HYDROLOGIC AND HYDRAULIC COMPUTATIONS

STETSON • DALE BANKERS TRUST BUILDING UTICA • NEW YORK • 13501
TEL 315•797•5800

DESIGN BRIEF

PROJECT NAME NY DAM INSPECTION DATE 9.14.78

SUBJECT NEWTON FALLS DAM PROJECT NO. 2210

DRAWN BY JPG

ESTIMATE OF CLARK'S PARAMETERS

ESTIMATE OF T_c

$$T_c = 11.9\,(L^3/H)^{.385} = (11.9\,(8.712)^3/65.)^{.385} = 6.338 \text{ HRS}$$

SCS

$$L = \frac{L^{.8}\,(S+1)^{.7}}{1900\,Y^{.5}} = \frac{(46000)^{.8}\,(3.89+1)^{.7}}{1900\,(5.3)^{.5}}$$

$$S = \frac{1000}{C_N} - 10 = 3.89$$

$$= \frac{16320.09}{4374.13} = 3.73$$

$$T_c = L/1.6 = 6.218 \text{ HRS}$$

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DESIGN BRIEF

PROJECT NAME NY DAM INSPECTION DATE 9.15.78

SUBJECT NEWTON FALLS DAM PROJECT NO. 2210

DRAWN BY JPG

ESTIMATES OF SNYDER'S PARAMETERS

640 C_p =

C_p = .625

$t_p = C_t (L \cdot L_{CA})^{.3}$

$= 2.0 (8.712 \times 3.788)^{.3}$

$= 5.71$,

$t_r = t_p / 5.5 = 5.71 / 5.5 = 1.038$

$t_{pr} = t_p + .25 (t_R - t_r) = 5.71 + .25 (3.0 - 1.038)$

$= 6.20$

SUMMARY OF PARAMETERS

CLARK'S

BDR T_c = 6.338

SCS (C_N METHOD) T_c = 6.218

SNYDER'S

C_p = .625

t_{pr} = 6.20,

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DESIGN BRIEF

PROJECT NAME NY DAM INSPECTION DATE 9.18.78

SUBJECT CRANBERRY LAKE PROJECT NO. 2210

DRAWN BY JPG

ESTIMATES OF CLARK'S PARAMETERS

ESTIMATE OF T_C

$$T_C = 11.9 (L^3/H)^{.385} = (11.9 (29.988)^3/1014)^{.385} = 9.16 \text{ Hr}$$

SCS

$$L = \frac{S^{.8} (S+1)^{.7}}{1900 Y^{.5}} = \frac{(158150)^{.8} (3.89+1)^{.7}}{1900 (5.3)^{.5}}$$

$$= \frac{43830.00}{4374.13} = 10.02$$

$$T_C = L/.6 = 10.02/.6 = 16.70 \text{ Hr}$$

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DESIGN BRIEF

PROJECT NAME NY DAM INSPECTION DATE 9.18.78

SUBJECT CRANBERRY LAKE PROJECT NO. 2210

DRAWN BY JPG

ESTIMATE OF SNYDER'S PARAMETER

640 C_p =

$C_p = .625$

$t_p = C_t (L \cdot L_{ca})^{.3}$

$= 2.0 (29.948 \cdot 14.98)^{.3}$

$= 12.491$

$t_r = t_p / 5.5 = 2.271$

$t_{pr} = t_p + .25 (t_R - t_r) = 12.491 + .25 (3.0 - 2.271)$

$= 12.67$

SUMMARY OF PARAMETERS

CLARK'S		SNYDER'S
BPR	$T_c = 9.16$	$C_p = .625$
SCS (CN METHOD)	$T_c = 14.70$	$t_{pr} = 12.67$

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DESIGN BRIEF

PROJECT NAME NY DAM INSPECTION DATE 9.19.78

SUBJECT NEWTON FALLS PROJECT NO. 2210

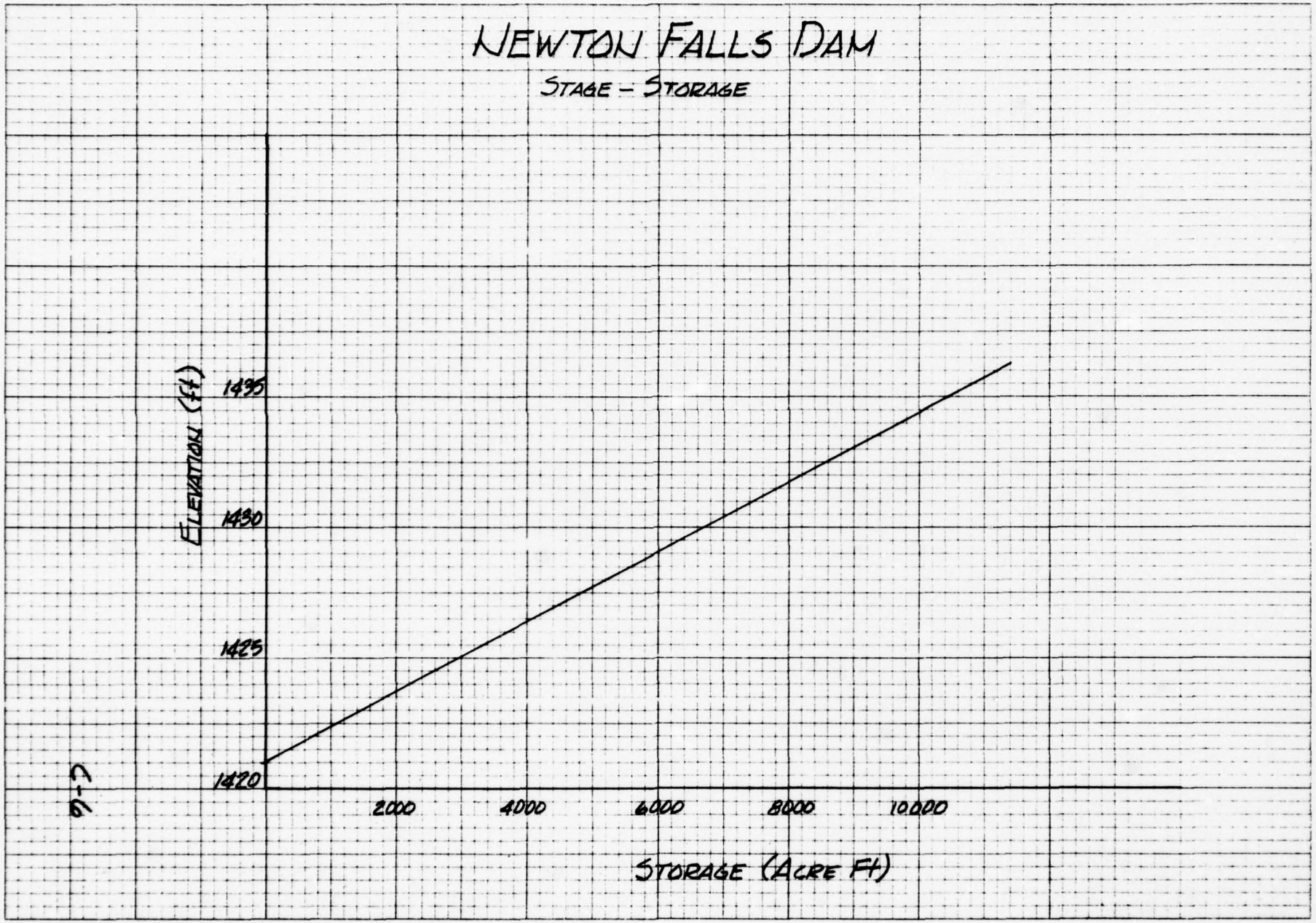
DRAWN BY JPG

HYDROMETEOROLOGICAL REPORT № 33

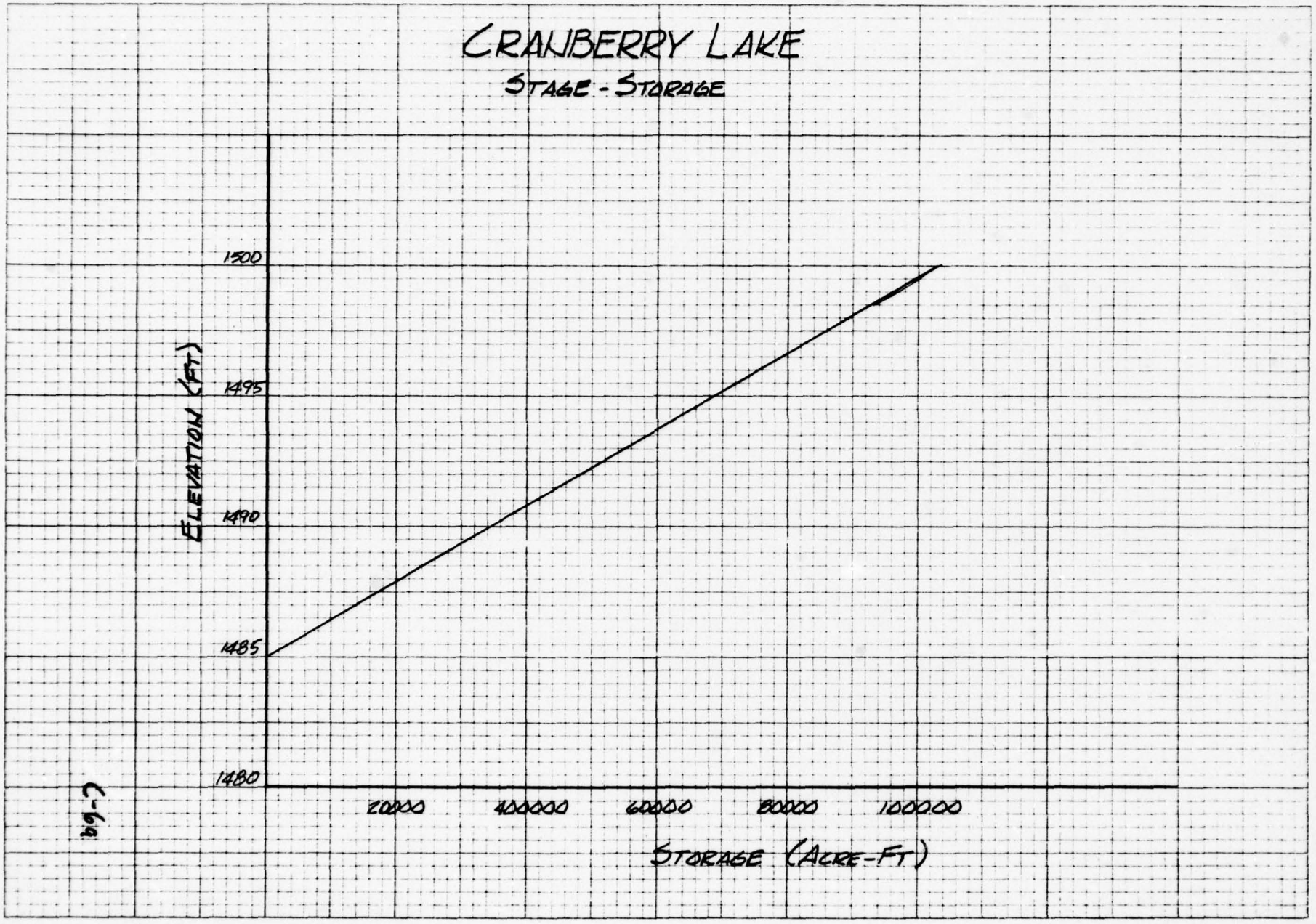
PMP INDEX RAINFALL
24 HR, 200 MI² - 16.9"

DURATION	%	DEPTH
6 HR	77	14.78"
12 HR	91	15.38"
24 HR	102	17.24"
48 HR	108	18.25"

NO. 340-10 DIETZGEN GRAPH PAPER
DIETZGEN CORPORATION



NO. 340 10 DIETZGEN GRAPH PAPER
DIETZGEN CORPORATION



69-7

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DESIGN BRIEF

PROJECT NAME NY DAM INSPECTION DATE 9.18.78

SUBJECT NEWTON FALLS DAM PROJECT NO. 2210

DRAWN BY JPG

STAGE - DISCHARGE (FROM CREST OF SPILLWAY)

ELEV	Q PRINCIPAL SPILLWAY	Q DAM	Q TOTAL
1421	—	—	—
1422	166.40	—	166.40
1423	470.65	—	470.65
1424	864.64	—	864.64
1425 (Top of Dam)	1331.20	—	1331.20
1426	1860.41	1470.00	3330.41
1427	2445.57	4157.79	6603.36
1428	3081.77	7638.34	10720.11
1429	3765.20	11760.00	15525.20
1430	4492.80	16435.10	20927.90
1431	5262.03	21604.50	26866.53
1432	6070.75	27224.78	33295.52
1433	6917.12	33262.30	40179.42
1434	7799.53	39690.00	47489.53
1435	8716.57	46485.48	55202.05

LENGTH
SPILLWAY - 52'
DAM - 588'

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DESIGN BRIEF

PROJECT NAME NY DAM INSPECTION DATE 9.18.78

SUBJECT CRANBERRY LAKE PROJECT NO. 2210

DRAWN BY JPG

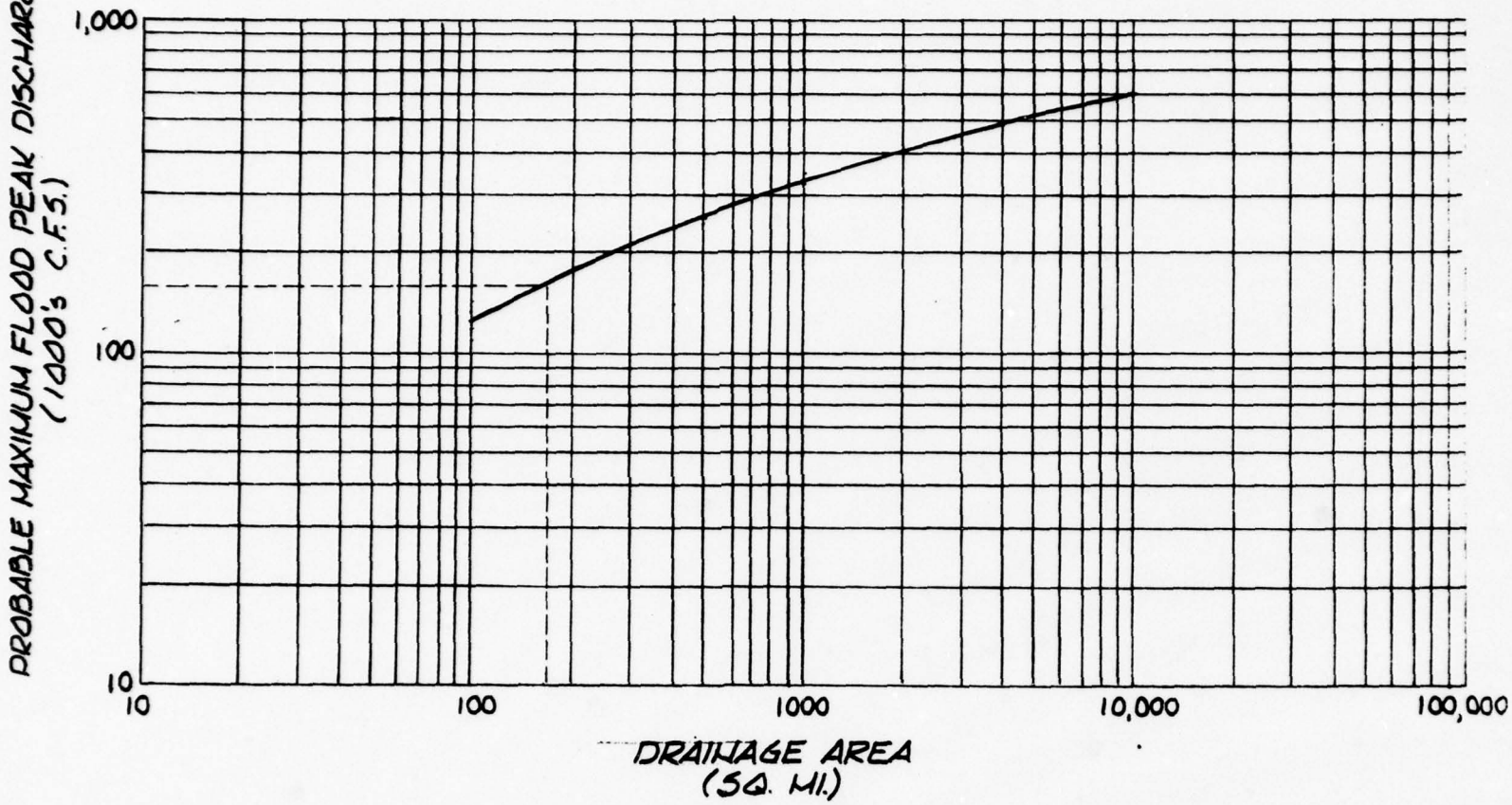
STAGE - DISCHARGE (FROM CREST OF SPILLWAY)

ELEV	Q
1485	
1486	640
1487	1810
1488	3325
1489	5120
1490	7155
1491	9406
1492	11852
1493	14481
1494	17280
1495	20238
1496	
1497	26664
1498	
1499	33525
1500	

STETSON • DALE

JOB	DATE
2210	9.15.78
APP'D	DRAWN
	JPG

C-9



NEWTON FALLS DAM

ESTIMATE OF PROBABLE MAXIMUM FLOOD USING
NUCLEAR REGULATORY COMMISSION CURVES

```
0010 A       NEWTON FALLS DAM
0110 A   RESERVOIR ROUTING OF P.M.F. - SNYDER METHOD
0120 A          FOOT-UNCONTROLLED SPILLWAY ONLY
0130 B    90      1
0140 I     5
0150 J     1      9      1
0160 I    .1     .2     .3     .4     .5     .6     .7     .8    1.0
0170 K     0      1
0180 M     1      1  115.2      0  115.2                            1
0190 P     0   16.9     77     91    102    108
0200 T                                          1.0    0.1
0210 W 12.67  0.625
0220 X   230    230      1
0230 K     1      1
0240 Y                        1      1
0250 I     1                                   -1
0260 2     0   6912  13824  27648  41472  55296  69120  82944  96768
0270 3     0    640   1810   5120   9406  14481  20238  26604  33525
0280 K     0      2
0290 M     1      1     57      0     57                            1
0300 P     0   16.9     77     91    102    108
0310 T                                          1.0    0.1
0320 W   6.2  0.625
0330 X   115    115      1
0340 K     2      2
0350 K     1      2
0360 Y                        1      1
0370 I     1                                   -1
0380 2     0   1640   4095   6552   9009  11466
0390 3     0    470   3330  15525  33295  55202
0400 K    99
0410 A
0420 A
0430 A
0440 A
0450 A
```

```
0010 A       NEWTON FALLS DAM
0110 A    RESERVOIR ROUTING OF P.M.F. - CLARK METHOD
0120 A          FOOT-UNCONTROLLED SPILLWAY ONLY
0130 B     90       1
0140 1      5
0150 J      1       9       1
0160 1     .1      .2      .3      .4      .5      .6      .7      .8     1.0
0170 K      0       1
0180 M      1       0   115.2       0   115.2                               1
0190 P      0    16.9      77      91     102     108
0200 T                                                  1.0     0.1
0210 V  16.70   16.70
0220 X    230     230       1
0230 K      1       1
0240 Y                              1       1
0250 1      1                                           -1
0260 2      0    6912   13824   27648   41472   55296   69120   82944   96768
0270 3      0     640    1810    5120    9406   14481   20238   26604   33525
0280 K      0       2
0290 M      1       0      57       0      57                               1
0300 P      0    16.9      77      91     102     108
0310 T                                                  1.0     0.1
0320 V    6.2     6.2
0330 X    115     115       1
0340 K      2       2
0350 K      1       2
0360 Y                              1       1
0370 1      1                                           -1
0380 2      0    1640    4095    6552    9009   11466
0390 3      0     470    3330   15525   33295   55202
0400 K     99
0410 A
0420 A
0430 A
0440 A
0450 A
```

IMTDG	IUHG	TAREA	SNAP	TKSUB	TKSPC	RATIO	ISNOW	ISAME	LOCAL
1	1	115.20	0.0	115.20	0.0	0.0	0	1	0

PRECIP DATA

SPFE	PMS	R6	R12	R24	R48	R72	R96
0.0	16.90	77.00	91.00	102.00	108.00	0.0	0.0

SPC COMPUTED BY THE PROGRAM IS 0.870

LOSS DATA

STRKR	DLTKR	RTIOL	ERAIN	STRKS	RTIOK	STRTL	CNSTL	ALSMX	RTIMP
0.0	0.0	1.00	0.0	0.0	1.00	1.00	0.10	0.0	0.0

UNIT HYDROGRAPH DATA

TP# 12.67 CP#0.63 NTA# 0

RECESSION DATA

STRTQ# 230.00 QRCSN# 230.00 RTIOR# 1.00

PROXIMATE CLARK COEFFICIENTS FROM GIVEN SNYDER CP AND TP ARE TC#14.11 AND R#11.58 INTERVALS

UNIT HYDROGRAPH 69 END-OF-PERIOD ORDINATES, LAG# 12.66 HOURS, CP# 0.63 VOL# 1.00

32.	307.	626.	999.	1407.	1840.	2290.	2730.	3112.	3410.
3625.	3757.	3800.	3734.	3521.	3233.	2965.	2720.	2495.	2288.
2099.	1925.	1766.	1620.	1486.	1363.	1250.	1147.	1052.	965.
885.	812.	744.	683.	626.	574.	527.	483.	443.	407.
373.	342.	314.	288.	264.	242.	222.	204.	187.	171.
157.	144.	132.	121.	111.	102.	94.	86.	79.	72.
66.	61.	56.	51.	47.	43.	39.	36.	33.	

END-OF-PERIOD FLOW

TIME	RAIN	EXCS	COMP Q
1	0.01	0.00	230.
2	0.01	0.00	230.
3	0.01	0.00	230.
4	0.01	0.00	230.
5	0.01	0.00	230.
6	0.01	0.00	230.
7	0.02	0.00	230.
8	0.02	0.00	230.
9	0.02	0.00	230.
10	0.02	0.00	230.
11	0.02	0.00	230.
12	0.02	0.00	230.
13	0.07	0.00	230.
14	0.08	0.00	230.
15	0.10	0.00	230.
16	0.25	0.00	230.
17	0.09	0.00	230.
18	0.07	0.00	230.
19	0.01	0.00	230.
20	0.01	0.00	230.
21	0.01	0.00	230.
22	0.01	0.00	230.
23	0.01	0.00	230.
24	0.01	0.00	230.
25	0.11	0.00	230.
26	0.11	0.01	231.
27	0.11	0.01	233.
28	0.11	0.01	238.
29	0.11	0.01	245.
30	0.11	0.01	256.
31	0.34	0.24	289.
32	0.34	0.24	379.
33	0.34	0.24	548.
34	0.34	0.24	807.
35	0.34	0.24	1165.

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37	1.13	1.03	2259.
38	1.36	1.26	3192.
39	1.70	1.60	4545.
40	4.30	4.20	6624.
41	1.59	1.49	9629.
42	1.25	1.15	13414.
43	0.16	0.06	17738.
44	0.16	0.06	22339.
45	0.16	0.06	26989.
46	0.16	0.06	31493.
47	0.16	0.06	35635.
48	0.16	0.06	39147.
49	0.0	0.0	41839.
50	0.0	0.0	43614.
51	0.0	0.0	44399.
52	0.0	0.0	44178.
53	0.0	0.0	42976.
54	0.0	0.0	40828.
55	0.0	0.0	38098.
56	0.0	0.0	35245.
57	0.0	0.0	32485.
58	0.0	0.0	29917.
59	0.0	0.0	27530.
60	0.0	0.0	25314.
61	0.0	0.0	23259.
62	0.0	0.0	21359.
63	0.0	0.0	19611.
64	0.0	0.0	18007.
65	0.0	0.0	16535.
66	0.0	0.0	15186.
67	0.0	0.0	13948.
68	0.0	0.0	12813.
69	0.0	0.0	11771.
70	0.0	0.0	10816.
71	0.0	0.0	9940.
72	0.0	0.0	9136.
73	0.0	0.0	8399.
74	0.0	0.0	7723.
75	0.0	0.0	7103.
76	0.0	0.0	6534.
77	0.0	0.0	6012.
78	0.0	0.0	5534.
79	0.0	0.0	5095.
80	0.0	0.0	4692.
81	0.0	0.0	4323.
82	0.0	0.0	3984.
83	0.0	0.0	3673.
84	0.0	0.0	3388.
85	0.0	0.0	3127.
86	0.0	0.0	2887.
87	0.0	0.0	2667.
88	0.0	0.0	2466.
89	0.0	0.0	2281.
90	0.0	0.0	2111.
SUM	15.89	12.58	935574.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	44399.	42972.	30572.	12937.	935574.
INCHES		3.47	9.87	12.54	12.59
AC-FT		21319.	60669.	77018.	77360.

HYDROGRAPH AT STA 1 FOR PLAN 1, RTIO 1

23. 23. 23. 23. 23. 23. 23. 23. 23. 23.

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29.	38.	55.	81.	116.	163.	226.	319.	455.	662.
963.	1341.	1774.	2234.	2699.	3149.	3564.	3915.	4184.	4361.
4446.	4418.	4298.	4083.	3816.	3524.	3249.	2992.	2753.	2531.
2326.	2136.	1961.	1801.	1654.	1519.	1395.	1281.	1177.	1082.
994.	914.	840.	772.	710.	653.	601.	553.	509.	469.
432.	398.	367.	339.	313.	289.	267.	247.	228.	211.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	4446.	4297.	3057.	1294.	93557.
INCHES		0.35	0.99	1.25	1.26
AC-FT		2132.	6067.	7702.	7736.

HYDROGRAPH AT STA 1 FOR PLAN 1, RTIO 2

46.	46.	46.	46.	46.	46.	46.	46.	46.	46.
46.	46.	46.	46.	46.	46.	46.	46.	46.	46.
46.	46.	46.	46.	46.	46.	47.	48.	49.	51.
58.	76.	110.	161.	233.	325.	452.	638.	909.	1325.
1926.	2683.	3548.	4468.	5398.	6299.	7127.	7829.	8368.	8723.
8888.	8836.	8595.	8166.	7620.	7049.	6497.	5983.	5506.	5063.
4652.	4272.	3922.	3601.	3307.	3037.	2790.	2563.	2354.	2163.
1988.	1827.	1680.	1545.	1421.	1307.	1202.	1107.	1019.	938.
865.	797.	735.	678.	625.	577.	533.	493.	456.	422.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	8880.	8594.	6114.	2587.	187114.
INCHES		0.69	1.97	2.51	2.52
AC-FT		4264.	12134.	15403.	15472.

HYDROGRAPH AT STA 1 FOR PLAN 1, RTIO 3

69.	69.	69.	69.	69.	69.	69.	69.	69.	69.
69.	69.	69.	69.	69.	69.	69.	69.	69.	69.
69.	69.	69.	69.	69.	69.	70.	71.	74.	77.
87.	114.	164.	242.	349.	488.	678.	958.	1364.	1987.
2889.	4024.	5321.	6702.	8097.	9448.	10690.	11744.	12552.	13084.
13320.	13253.	12893.	12248.	11429.	10573.	9746.	8975.	8259.	7594.
6978.	6408.	5883.	5402.	4961.	4556.	4184.	3844.	3531.	3245.
2982.	2741.	2520.	2317.	2131.	1960.	1804.	1660.	1528.	1408.
1297.	1195.	1102.	1017.	938.	866.	800.	740.	684.	633.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	13320.	12892.	9171.	3881.	280671.
INCHES		1.04	2.96	3.76	3.78
AC-FT		6396.	18201.	23105.	23208.

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HYDROGRAPH AT STA 1 FOR PLAN 1, RTIO 4

92.	92.	92.	92.	92.	92.	92.	92.	92.	92.
92.	92.	92.	92.	92.	92.	92.	92.	92.	92.
92.	92.	92.	92.	92.	92.	93.	95.	98.	102.
116.	152.	219.	323.	466.	650.	904.	1277.	1818.	2649.
3852.	5366.	7095.	8936.	10796.	12597.	14254.	15659.	16736.	17446.
17760.	17671.	17191.	16331.	15239.	14098.	12994.	11967.	11012.	10125.
9304.	8544.	7844.	7203.	6614.	6074.	5579.	5125.	4709.	4326.
3976.	3655.	3360.	3089.	2841.	2614.	2405.	2214.	2038.	1877.
1729.	1594.	1469.	1355.	1251.	1155.	1067.	986.	912.	844.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	17760.	17189.	12229.	5175.	374228.
INCHES		1.39	3.95	5.01	5.04
AC-FT		8528.	24268.	30807.	30944.

HYDROGRAPH AT STA 1 FOR PLAN 1, RTIO 5

115.	115.	115.	115.	115.	115.	115.	115.	115.	115.
115.	115.	115.	115.	115.	115.	115.	115.	115.	115.
115.	115.	115.	115.	115.	115.	116.	119.	123.	128.
145	196	274	403	582	813	1129	1594	2273	3212

22199.	22089.	21488.	20414.	19049.	17622.	16243.	14958.	13765.	12657.
11630.	10680.	9805.	9003.	8268.	7593.	6974.	6406.	5886.	5408.
4970.	4568.	4200.	3862.	3551.	3267.	3006.	2767.	2547.	2346.
2161.	1992.	1837.	1694.	1564.	1444.	1334.	1233.	1140.	1055.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	22199.	21486.	15286.	6468.	467786.
INCHES		1.73	4.94	6.27	6.30
AC-FT		10660.	30335.	38509.	38680.

HYDROGRAPH AT STA 1 FOR PLAN 1, RTIO 6

138.	138.	138.	138.	138.	138.	138.	138.	138.	138.
138.	138.	138.	138.	138.	138.	138.	138.	138.	138.
138.	138.	138.	138.	138.	138.	140.	143.	147.	154.
174.	228.	329.	484.	699.	975.	1355.	1915.	2727.	3974.
5777.	8049.	10643.	13404.	16193.	18896.	21381.	23488.	25103.	26168.
26639.	26507.	25786.	24496.	22859.	21147.	19491.	17950.	16518.	15188.
13955.	12816.	11766.	10804.	9921.	9112.	8369.	7688.	7063.	6490.
5964.	5482.	5040.	4634.	4262.	3920.	3607.	3320.	3057.	2815.
2594.	2391.	2204.	2033.	1876.	1732.	1600.	1479.	1368.	1267.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	26639.	25783.	18343.	7762.	561343.
INCHES		2.08	5.92	7.52	7.55
AC-FT		12792.	36401.	46210.	46416.

HYDROGRAPH AT STA 1 FOR PLAN 1, RTIO 7

161.	161.	161.	161.	161.	161.	161.	161.	161.	161.
161.	161.	161.	161.	161.	161.	161.	161.	161.	161.
161.	161.	161.	161.	161.	161.	163.	166.	172.	179.
203.	266.	383.	565.	815.	1138.	1581.	2234.	3182.	4637.
6740.	9390.	12416.	15638.	18892.	22045.	24944.	27403.	29287.	30530.
31079.	30924.	30083.	28579.	26668.	24671.	22740.	20942.	19271.	17720.
16281.	14951.	13727.	12605.	11575.	10630.	9764.	8969.	8240.	7571.
6958.	6395.	5879.	5406.	4972.	4574.	4209.	3874.	3566.	3285.
3026.	2789.	2571.	2372.	2189.	2021.	1867.	1726.	1596.	1478.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	31079.	30080.	21400.	9056.	654900.
INCHES		2.43	6.91	8.77	8.81
AC-FT		14924.	42468.	53912.	54152.

HYDROGRAPH AT STA 1 FOR PLAN 1, RTIO 8

184.	184.	184.	184.	184.	184.	184.	184.	184.	184.
184.	184.	184.	184.	184.	184.	184.	184.	184.	184.
184.	184.	184.	184.	184.	184.	186.	190.	196.	205.
231.	303.	438.	646.	932.	1301.	1807.	2554.	3636.	5299.
7703.	10731.	14190.	17872.	21591.	25195.	28508.	31318.	33471.	34891.
35519.	35342.	34381.	32662.	30478.	28196.	25988.	23933.	22024.	20251.
18607.	17087.	15689.	14405.	13228.	12149.	11158.	10250.	9417.	8653.
7952.	7309.	6719.	6179.	5682.	5227.	4810.	4427.	4076.	3754.
3458.	3187.	2939.	2711.	2502.	2310.	2134.	1973.	1824.	1689.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	35519.	34378.	24457.	10349.	748457.
INCHES		2.78	7.90	10.03	10.07
AC-FT		17056.	48535.	61614.	61888.

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HYDROGRAPH AT STA 1 FOR PLAN 1, RTIO 9

230.	230.	230.	230.	230.	230.	230.	230.	230.	230.
230.	230.	230.	230.	230.	230.	230.	230.	230.	230.
230.	230.	230.	230.	230.	231.	233.	238.	245.	256.
289.	379.	548.	807.	1165.	1626.	2259.	3192.	4545.	6624.
9629.	13414.	17738.	22339.	26989.	31493.	35635.	39147.	41839.	43614.
44399.	44177.	42974.	40827.	38098.	35245.	32485.	29917.	27598.	25514.

9940.	9136.	8399.	7723.	7103.	6534.	6012.	5534.	5095.	4692.
4323.	3984.	3673.	3388.	3127.	2887.	2667.	2466.	2281.	2111.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	44399.	42972.	30572.	12937.	935571.
INCHES		3.47	9.87	12.54	12.59
AC-FT		21319.	60669.	77017.	77360.

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

HYDROGRAPH ROUTING

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

ROUTING DATA

QLOSS	CLOSS	AVG	IRES	ISAME
0.0	0.0	0.0	1	1

NSTPS	NSTDL	LAG	AMSKK	X	TSK	STORA
1	0	0	0.0	0.0	0.0	-1.

STORAGE#	0.	6912.	13824.	27648.	41472.	55296.	69120.	82944.	96768.	0.
OUTFLOW#	0.	640.	1810.	5120.	9406.	14481.	20238.	26604.	33525.	0.

STATION 1, PLAN 1, RTIO 1

23.	23.	23.	23.	23.	23.	23.	23.	23.	23.
23.	23.	23.	23.	23.	23.	23.	23.	23.	23.
23.	23.	23.	23.	23.	23.	23.	23.	23.	23.
23.	23.	23.	24.	24.	25.	26.	28.	31.	35.
41.	49.	61.	76.	94.	116.	140.	168.	197.	228.
260.	292.	323.	352.	380.	405.	428.	448.	467.	483.
498.	511.	523.	533.	542.	550.	557.	563.	568.	573.
576.	579.	581.	583.	584.	585.	585.	585.	585.	584.
583.	582.	580.	578.	577.	574.	572.	570.	567.	565.

STOR

248.	248.	248.	248.	248.	248.	248.	248.	248.	248.
248.	248.	248.	248.	248.	248.	248.	248.	248.	248.
248.	248.	248.	248.	248.	248.	248.	248.	249.	249.
249.	250.	252.	255.	262.	271.	285.	305.	335.	378.
442.	534.	658.	818.	1015.	1248.	1515.	1811.	2130.	2466.
2809.	3153.	3487.	3806.	4102.	4372.	4618.	4839.	5039.	5218.
5378.	5521.	5648.	5759.	5858.	5944.	6018.	6082.	6137.	6183.
6222.	6253.	6277.	6296.	6309.	6317.	6320.	6320.	6315.	6308.
6297.	6283.	6266.	6248.	6227.	6204.	6180.	6154.	6126.	6098.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	585.	585.	577.	313.	22956.
INCHES		0.05	0.19	0.30	0.31
AC-FT		290.	1144.	1864.	1898.

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STATION 1, PLAN 1, RTIO 2

46.	46.	46.	46.	46.	46.	46.	46.	46.	46.
46.	46.	46.	46.	46.	46.	46.	46.	46.	46.
46.	46.	46.	46.	46.	46.	46.	46.	46.	46.
46.	46.	47.	47.	48.	50.	53.	57.	62.	70.
82.	99.	122.	151.	188.	231.	280.	335.	395.	457.
520.	584.	651.	758.	857.	947.	1028.	1100.	1165.	1222.
1273.	1317.	1356.	1389.	1418.	1442.	1463.	1479.	1493.	1504.
1512.	1517.	1520.	1522.	1521.	1519.	1515.	1510.	1504.	1497.
1488.	1479.	1469.	1459.	1448.	1436.	1424.	1411.	1398.	1385.

STOR

497.	497.	497.	497.	497.	497.	497.	497.	497.	497.
498.	500.	504.	511.	523.	542.	570.	611.	670.	757.
885.	1063.	1316.	1636.	2029.	2495.	3029.	3622.	4261.	4932.
5619.	6305.	6975.	7609.	8195.	8726.	9204.	9632.	10013.	10351.
10650.	10911.	11139.	11337.	11506.	11650.	11771.	11871.	11951.	12014.
12061.	12093.	12113.	12120.	12117.	12104.	12082.	12053.	12016.	11973.
11924.	11870.	11812.	11749.	11683.	11613.	11541.	11466.	11389.	11311.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	1522.	1519.	1481.	777.	56744.
INCHES		0.12	0.48	0.75	0.76
AC-FT		754.	2939.	4624.	4692.

STATION 1, PLAN 1, RTIO 3

69.	69.	69.	69.	69.	69.	69.	69.	69.	69.
69.	69.	69.	69.	69.	69.	69.	69.	69.	69.
69.	69.	69.	69.	69.	69.	69.	69.	69.	69.
69.	69.	70.	71.	73.	75.	79.	85.	93.	105.
123.	148.	183.	227.	282.	347.	421.	503.	592.	722.
895.	1067.	1234.	1392.	1537.	1668.	1786.	1925.	2056.	2171.
2271.	2358.	2432.	2495.	2548.	2591.	2626.	2653.	2673.	2687.
2696.	2699.	2698.	2692.	2683.	2671.	2655.	2637.	2617.	2594.
2570.	2544.	2516.	2488.	2458.	2428.	2397.	2365.	2332.	2299.

STOR

745.	745.	745.	745.	745.	745.	745.	745.	745.	745.
745.	745.	745.	745.	745.	745.	745.	745.	745.	745.
745.	745.	745.	745.	745.	745.	745.	745.	746.	746.
747.	750.	755.	766.	785.	813.	855.	916.	1005.	1135.
1327.	1601.	1974.	2454.	3044.	3743.	4544.	5433.	6391.	7396.
8421.	9438.	10423.	11353.	12211.	12987.	13684.	14304.	14852.	15332.
15751.	16113.	16423.	16685.	16905.	17086.	17232.	17345.	17430.	17488.
17523.	17537.	17531.	17508.	17470.	17418.	17353.	17278.	17192.	17098.
16997.	16889.	16774.	16655.	16531.	16404.	16274.	16141.	16005.	15868.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	2699.	2692.	2598.	1351.	98512.
INCHES		0.22	0.84	1.31	1.33
AC-FT		1336.	5156.	8043.	8146.

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STATION 1, PLAN 1, RTIO 4

92.	92.	92.	92.	92.	92.	92.	92.	92.	92.
92.	92.	92.	92.	92.	92.	92.	92.	92.	92.
92.	92.	92.	92.	92.	92.	92.	92.	92.	92.
92.	93.	93.	95.	97.	100.	106.	113.	124.	140.
164.	198.	244.	303.	376.	462.	561.	696.	911.	1136.
1365.	1592.	1813.	2106.	2374.	2615.	2829.	3018.	3184.	3329.
3454.	3561.	3652.	3728.	3790.	3840.	3879.	3908.	3928.	3939.
3943.	3941.	3932.	3918.	3900.	3877.	3850.	3820.	3787.	3751.
3713.	3672.	3630.	3587.	3542.	3496.	3450.	3402.	3354.	3306.

STOR

994.	994.	994.	994.	994.	994.	994.	994.	994.	994.
994.	994.	994.	994.	994.	994.	994.	994.	994.	994.
994.	994.	994.	994.	994.	994.	994.	994.	994.	995.
996.	1000.	1007.	1022.	1047.	1085.	1140.	1221.	1339.	1513.
1769.	2135.	2632.	3272.	4059.	4991.	6058.	7242.	8515.	9842.
11194.	12536.	13836.	15059.	16178.	17184.	18079.	18869.	19562.	20166.
20689.	21137.	21516.	21833.	22093.	22302.	22465.	22585.	22668.	22716.
22733.	22723.	22687.	22629.	22551.	22455.	22344.	22217.	22079.	21929.
21770.	21602.	21427.	21245.	21058.	20867.	20672.	20473.	20273.	20070.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	3943.	3934.	3795.	1986.	144632.
INCHES		0.32	1.22	1.92	1.95

STATION 1, PLAN 1, RTIO 5

115.	115.	115.	115.	115.	115.	115.	115.	115.	115.
115.	115.	115.	115.	115.	115.	115.	115.	115.	115.
115.	115.	115.	115.	115.	115.	115.	115.	115.	115.
115.	116.	117.	118.	121.	126.	132.	141.	155.	175.
205.	247.	305.	379.	470.	578.	752.	1001.	1268.	1547.
1840.	2238.	2621.	2980.	3309.	3603.	3864.	4094.	4295.	4470.
4620.	4748.	4856.	4945.	5018.	5075.	5118.	5157.	5182.	5194.
5194.	5183.	5163.	5134.	5103.	5070.	5032.	4990.	4944.	4895.
4843.	4789.	4733.	4675.	4615.	4554.	4492.	4429.	4366.	4302.

STOR

1242.	1242.	1242.	1242.	1242.	1242.	1242.	1242.	1242.	1242.
1242.	1242.	1242.	1242.	1242.	1242.	1242.	1242.	1242.	1242.
1242.	1242.	1242.	1242.	1242.	1242.	1242.	1242.	1243.	1244.
1245.	1250.	1259.	1277.	1308.	1356.	1425.	1527.	1674.	1891.
2212.	2669.	3290.	4090.	5074.	6239.	7571.	9043.	10623.	12272.
13951.	15612.	17212.	18712.	20083.	21313.	22403.	23364.	24204.	24934.
25562.	26096.	26546.	26918.	27220.	27458.	27639.	27767.	27848.	27886.
27886.	27851.	27786.	27693.	27577.	27438.	27280.	27104.	26913.	26709.
26493.	26267.	26031.	25788.	25539.	25285.	25025.	24763.	24498.	24230.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	5194.	5179.	4986.	2628.	191250.
INCHES		0.42	1.61	2.55	2.57
AC-FT		2569.	9894.	15643.	15814.

STATION 1, PLAN 1, RTIO 6

138.	138.	138.	138.	138.	138.	138.	138.	138.	138.
138.	138.	138.	138.	138.	138.	138.	138.	138.	138.
138.	138.	138.	138.	138.	138.	138.	138.	138.	138.
138.	139.	140.	142.	145.	151.	158.	170.	186.	210.
246.	297.	366.	454.	564.	737.	1006.	1304.	1624.	2018.
2495.	2967.	3421.	3847.	4235.	4584.	4892.	5175.	5480.	5743.
5966.	6154.	6309.	6435.	6534.	6610.	6664.	6698.	6715.	6717.
6705.	6680.	6644.	6598.	6544.	6482.	6413.	6338.	6259.	6175.
6087.	5996.	5902.	5807.	5709.	5610.	5511.	5410.	5309.	5208.

STOR

1490.	1490.	1490.	1490.	1490.	1490.	1490.	1490.	1490.	1490.
1490.	1490.	1490.	1490.	1490.	1490.	1490.	1490.	1490.	1490.
1490.	1490.	1490.	1490.	1490.	1490.	1490.	1491.	1491.	1492.
1494.	1500.	1511.	1533.	1570.	1627.	1710.	1832.	2009.	2270.
2654.	3203.	3948.	4908.	6088.	7485.	9077.	10836.	12723.	14691.
16686.	18657.	20554.	22331.	23954.	25408.	26696.	27827.	28811.	29657.
30377.	30983.	31484.	31890.	32210.	32453.	32627.	32739.	32794.	32799.
32759.	32679.	32563.	32415.	32240.	32040.	31818.	31577.	31320.	31049.
30766.	30473.	30171.	29862.	29548.	29229.	28908.	28584.	28258.	27933.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	6717.	6696.	6393.	3346.	243362.
INCHES		0.54	2.06	3.24	3.28
AC-FT		3322.	12687.	19918.	20123.

STATION 1, PLAN 1, RTIO 7

161.	161.	161.	161.	161.	161.	161.	161.	161.	161.
161.	161.	161.	161.	161.	161.	161.	161.	161.	161.
161.	161.	161.	161.	161.	161.	161.	161.	161.	161.
161.	162.	163.	166.	170.	176.	185.	198.	217.	245.
287.	346.	426.	530.	672.	947.	1261.	1607.	2047.	2593.
3146.	3692.	4217.	4709.	5169.	5688.	6144.	6541.	6884.	7178.
7426.	7633.	7803.	7939.	8044.	8121.	8174.	8204.	8214.	8206.
8182.	8144.	8093.	8031.	7960.	7879.	7791.	7696.	7595.	7490.
7380.	7267.	7151.	7033.	6912.	6791.	6668.	6545.	6421	6298

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STOR

1739.	1739.	1739.	1739.	1739.	1739.	1739.	1739.	1739.	1739.
1739.	1739.	1739.	1739.	1739.	1739.	1739.	1739.	1739.	1739.
1739.	1739.	1739.	1739.	1739.	1739.	1739.	1739.	1740.	1741.
1743.	1749.	1763.	1788.	1832.	1898.	1995.	2137.	2344.	2648.
3096.	3737.	4606.	5725.	7103.	8727.	10578.	12622.	14814.	17094.
19403.	21682.	23876.	25932.	27806.	29479.	30950.	32230.	33337.	34285.
35086.	35755.	36302.	36739.	37078.	37328.	37497.	37594.	37627.	37602.
37525.	37402.	37239.	37039.	36807.	36547.	36262.	35956.	35632.	35291.
34938.	34573.	34198.	33817.	33429.	33037.	32641.	32244.	31845.	31446.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	8214.	8187.	7817.	4096.	297844.
INCHES		0.66	2.52	3.97	4.01
AC-FT		4062.	15512.	24388.	24628.

STATION 1, PLAN 1, RTIO 8

184.	184.	184.	184.	184.	184.	184.	184.	184.	184.
184.	184.	184.	184.	184.	184.	184.	184.	184.	184.
184.	184.	184.	184.	184.	184.	184.	184.	184.	184.
184.	185.	187.	189.	194.	201.	211.	226.	248.	280.
328.	395.	487.	606.	843.	1157.	1514.	1949.	2545.	3165.
3793.	4413.	5009.	5698.	6353.	6934.	7444.	7888.	8269.	8595.
8869.	9096.	9281.	9430.	9561.	9655.	9715.	9744.	9747.	9725.
9683.	9622.	9544.	9451.	9355.	9257.	9149.	9035.	8914.	8787.
8656.	8521.	8383.	8242.	8100.	7956.	7811.	7665.	7519.	7373.

STOR

1987.	1987.	1987.	1987.	1987.	1987.	1987.	1987.	1987.	1987.
1987.	1987.	1987.	1987.	1987.	1987.	1987.	1987.	1987.	1987.
1987.	1987.	1987.	1987.	1987.	1987.	1987.	1988.	1988.	1990.
1993.	1999.	2015.	2044.	2093.	2169.	2281.	2443.	2679.	3026.
3538.	4276.	5264.	6543.	8114.	9965.	12074.	14403.	16894.	19483.
22105.	24694.	27186.	29514.	31625.	33500.	35145.	36574.	37806.	38856.
39748.	40473.	41068.	41538.	41895.	42150.	42312.	42393.	42400.	42342.
42226.	42059.	41847.	41595.	41308.	40990.	40644.	40274.	39884.	39476.
39053.	38618.	38173.	37719.	37259.	36795.	36327.	35857.	35386.	34916.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	9747.	9711.	9241.	4855.	352857.
INCHES		0.78	2.98	4.78	4.75
AC-FT		4818.	18338.	28903.	29177.

STATION 1, PLAN 1, RTIO 9

230.	230.	230.	230.	230.	230.	230.	230.	230.	230.
230.	230.	230.	230.	230.	230.	230.	230.	230.	230.
230.	230.	230.	230.	230.	230.	230.	230.	230.	230.
231.	231.	233.	237.	242.	251.	264.	283.	310.	350.
410.	494.	609.	854.	1185.	1574.	2104.	2796.	3535.	4302.
5080.	6061.	7010.	7893.	8691.	9399.	10129.	10759.	11296.	11748.
12123.	12427.	12668.	12851.	12984.	13070.	13114.	13122.	13097.	13043.
12964.	12861.	12739.	12599.	12444.	12276.	12097.	11908.	11711.	11507.
11298.	11084.	10867.	10648.	10427.	10205.	9983.	9762.	9541.	9334.

STOR

2484.	2484.	2484.	2484.	2484.	2484.	2484.	2484.	2484.	2484.
2484.	2484.	2484.	2484.	2484.	2484.	2484.	2484.	2484.	2484.
2484.	2484.	2484.	2484.	2484.	2484.	2484.	2485.	2486.	2487.
2491.	2499.	2518.	2555.	2617.	2711.	2851.	3053.	3349.	3783.
4423.	5338.	6580.	8175.	10129.	12432.	15054.	17941.	21026.	24234.
27483.	30683.	33744.	36591.	39167.	41450.	43442.	45157.	46620.	47851.
48872.	49701.	50357.	50857.	51217.	51451.	51573.	51595.	51527.	51380.
51163.	50884.	50551.	50170.	49748.	49290.	48801.	48287.	47750.	47195.
46625.	46043.	45453.	44855.	44254.	43650.	43045.	42441.	41840.	41241.

CFS	13122.	13072.	12376.	6473.	47@218.
INCHES		1.@6	4.@@	6.27	6.33
AC-FT		6485.	24561.	38539.	38881.

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

SUB-AREA RUNOFF COMPUTATION

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME
2	@	@	@	@	@	@

HYDROGRAPH DATA

IHYDG	IUHG	TAREA	SNAP	TRSDA	TRSPC	RATIO	ISNOW	ISAME	LOCAL
1	1	57.@@	@.@	57.@@	@.@	@.@	@	1	@

PRECIP DATA

SPFE	PMS	R6	R12	R24	R48	R72	R96
@.@	16.9@	77.@@	91.@@	1@2.@@	1@8.@@	@.@	@.@

SPC COMPUTED BY THE PROGRAM IS @.853

LOSS DATA

STRKR	DLTKR	RTIOL	ERAIN	STRKS	RTIOK	STRTL	CNSTL	ALSMX	RTIMP
@.@	@.@	1.@@	@.@	@.@	1.@@	1.@@	@.1@	@.@	@.@

UNIT HYDROGRAPH DATA

TP# 6.2@ CP#@.63 NTA# @

RECESSION DATA

STRTQ# 115.@@ QRCSN# 115.@@ RTIOR# 1.@@

PROXIMATE CLARK COEFFICIENTS FROM GIVEN SNYDER CP AND TP ARE TC# 7.18 AND R# 5.54 INTERVALS

UNIT HYDROGRAPH 34 END-OF-PERIOD ORDINATES, LAG# 6.17 HOURS, CP# @.63 VOL# 1.@@

224.	819.	1623.	2496.	3244.	3689.	3781.	3442.	2889.	2411.
2@12.	1678.	14@1.	1169.	975.	814.	679.	567.	473.	394.
329.	275.	229.	191.	16@.	133.	111.	93.	77.	65.
54.	45.	38.	31.						

END-OF-PERIOD FLOW

TIME	RAIN	EXCS	COMP Q
1	@.@1	@.@@	115.
2	@.@1	@.@@	115.
3	@.@1	@.@@	115.
4	@.@1	@.@@	115.
5	@.@1	@.@@	115.
6	@.@1	@.@@	115.
7	@.@2	@.@@	115.
8	@.@2	@.@@	115.
9	@.@2	@.@@	115.
1@	@.@2	@.@@	115.
11	@.@2	@.@@	115.
12	@.@2	@.@@	115.
13	@.@7	@.@@	115.
14	@.@8	@.@@	115.
15	@.1@	@.@@	115.
16	@.25	@.@@	115.
17	@.@9	@.@@	115.
18	@.@7	@.@@	115.
19	@.@1	@.@@	115.
2@	@.@1	@.@@	115.
21	@.@1	@.@@	115.
22	@.@1	@.@@	115.
23	@.@1	@.@@	115.
24	@.@1	@.@@	115.
25	@.11	@.@@	115.

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27	0.11	0.01	120.
28	0.11	0.01	128.
29	0.11	0.01	141.
30	0.11	0.01	158.
31	0.34	0.24	230.
32	0.34	0.24	440.
33	0.34	0.24	835.
34	0.34	0.24	1428.
35	0.34	0.24	2191.
36	0.34	0.24	3054.
37	1.11	1.01	4109.
38	1.33	1.23	5595.
39	1.67	1.57	7780.
40	4.22	4.12	11478.
41	1.55	1.45	17047.
42	1.22	1.12	23728.
43	0.16	0.06	30418.
44	0.16	0.06	35642.
45	0.16	0.06	38349.
46	0.16	0.06	38285.
47	0.16	0.06	35537.
48	0.16	0.06	31245.
49	0.0	0.0	26763.
50	0.0	0.0	22675.
51	0.0	0.0	19191.
52	0.0	0.0	16217.
53	0.0	0.0	13668.
54	0.0	0.0	11483.
55	0.0	0.0	9618.
56	0.0	0.0	8046.
57	0.0	0.0	6733.
58	0.0	0.0	5637.
59	0.0	0.0	4723.
60	0.0	0.0	3960.
61	0.0	0.0	3323.
62	0.0	0.0	2792.
63	0.0	0.0	2348.
64	0.0	0.0	1978.
65	0.0	0.0	1664.
66	0.0	0.0	1401.
67	0.0	0.0	1182.
68	0.0	0.0	999.
69	0.0	0.0	847.
70	0.0	0.0	719.
71	0.0	0.0	593.
72	0.0	0.0	482.
73	0.0	0.0	386.
74	0.0	0.0	229.
75	0.0	0.0	172.
76	0.0	0.0	133.
77	0.0	0.0	129.
78	0.0	0.0	125.
79	0.0	0.0	122.
80	0.0	0.0	119.
81	0.0	0.0	117.
82	0.0	0.0	115.
83	0.0	0.0	115.
84	0.0	0.0	115.
85	0.0	0.0	115.
86	0.0	0.0	115.
87	0.0	0.0	115.
88	0.0	0.0	115.
89	0.0	0.0	115.
90	0.0	0.0	115.

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	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	38349.	34913.	17830.	6367.	460528.
INCHES		5.70	11.64	12.47	12.53
AC-FT		17321.	35384.	37909.	38080.

HYDROGRAPH AT STA 2 FOR PLAN 1, RTIO 1

11.	11.	11.	11.	11.	11.	11.	11.	11.	11.
11.	12.	12.	12.	12.	12.	12.	12.	12.	12.
12.	12.	12.	12.	12.	12.	12.	13.	14.	16.
23.	44.	83.	143.	219.	305.	411.	560.	778.	1148.
1705.	2373.	3042.	3564.	3835.	3829.	3554.	3125.	2676.	2268.
1919.	1622.	1367.	1148.	962.	805.	673.	564.	472.	396.
332.	279.	235.	198.	166.	140.	118.	100.	85.	72.
59.	48.	38.	23.	17.	13.	13.	12.	12.	12.
12.	11.	11.	11.	11.	11.	11.	11.	11.	11.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	3835.	3491.	1783.	637.	46053.
INCHES		0.57	1.16	1.25	1.25
AC-FT		1732.	3538.	3791.	3808.

HYDROGRAPH AT STA 2 FOR PLAN 1, RTIO 2

23.	23.	23.	23.	23.	23.	23.	23.	23.	23.
23.	23.	23.	23.	23.	23.	23.	23.	23.	23.
23.	23.	23.	23.	23.	23.	24.	26.	28.	32.
46.	88.	167.	286.	438.	611.	822.	1119.	1556.	2296.
3409.	4746.	6084.	7128.	7670.	7657.	7107.	6249.	5353.	4535.
3838.	3243.	2734.	2297.	1924.	1609.	1347.	1127.	945.	792.
665.	558.	470.	396.	333.	280.	236.	200.	169.	144.
119.	96.	76.	46.	34.	27.	26.	25.	24.	24.
23.	23.	23.	23.	23.	23.	23.	23.	23.	23.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	7670.	6983.	3566.	1273.	92104.
INCHES		1.14	2.33	2.49	2.51
AC-FT		3464.	7077.	7582.	7616.

HYDROGRAPH AT STA 2 FOR PLAN 1, RTIO 3

34.	34.	34.	34.	34.	34.	34.	34.	34.	34.
34.	34.	34.	35.	35.	35.	35.	35.	35.	35.
35.	35.	35.	35.	35.	35.	36.	38.	42.	47.
69.	132.	250.	428.	657.	916.	1233.	1679.	2334.	3443.
5114.	7118.	9125.	10693.	11505.	11486.	10661.	9374.	8029.	6803.
5757.	4865.	4100.	3445.	2886.	2414.	2020.	1691.	1417.	1188.
997.	837.	704.	594.	499.	420.	355.	300.	254.	216.
178.	144.	114.	69.	52.	40.	39.	37.	36.	36.
35.	34.	34.	34.	34.	34.	34.	34.	34.	34.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	11505.	10474.	5349.	1910.	138157.
INCHES		1.71	3.49	3.74	3.76
AC-FT		5196.	10615.	11372.	11424.

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HYDROGRAPH AT STA 2 FOR PLAN 1, RTIO 4

46.	46.	46.	46.	46.	46.	46.	46.	46.	46.
46.	46.	46.	46.	46.	46.	46.	46.	46.	46.
46.	46.	46.	46.	46.	46.	48.	51.	56.	63.
92.	176.	334.	571.	876.	1222.	1644.	2238.	3112.	4591.
6819.	9491.	12167.	14257.	15339.	15314.	14215.	12498.	10705.	9070.
7677.	6487.	5467.	4593.	3847.	3218.	2693.	2255.	1889.	1584.
1329.	1117.	939.	791.	665.	560.	473.	400.	339.	288.
237.	193.	152.	91.	69.	53.	51.	50.	49.	48.
47.	46.	46.	46.	46.	46.	46.	46.	46.	46.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	15339.	13965.	7132.	2547.	184210.
INCHES		2.28	4.66	4.99	5.01
AC-FT		6928.	14154.	15163.	15232.

HYDROGRAPH AT STA 2 FOR PLAN 1, RTIO 5

57.	57.	57.	57.	57.	57.	57.	57.	57.	57.
57.	57.	57.	57.	58.	58.	58.	58.	58.	58.
58.	58.	58.	58.	58.	58.	60.	64.	70.	79.
115.	220.	417.	714.	1095.	1527.	2055.	2798.	3890.	5739.
8523.	11864.	15209.	17821.	19174.	19143.	17768.	15623.	13381.	11338.
9596.	8109.	6834.	5741.	4809.	4023.	3366.	2819.	2361.	1980.
1661.	1396.	1174.	989.	832.	701.	591.	500.	423.	360.
296.	241.	198.	114.	86.	67.	64.	62.	61.	60.
58.	57.	57.	57.	57.	57.	57.	57.	57.	57.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	19174.	17456.	8915.	3184.	230262.
INCHES		2.85	5.82	6.23	6.26
AC-FT		8660.	17692.	18954.	19040.

HYDROGRAPH AT STA 2 FOR PLAN 1, RTIO 6

69.	69.	69.	69.	69.	69.	69.	69.	69.	69.
69.	69.	69.	69.	69.	69.	69.	69.	69.	69.
69.	69.	69.	69.	69.	70.	72.	77.	84.	95.
138.	264.	501.	857.	1314.	1832.	2465.	3357.	4668.	6887.
10228.	14237.	18251.	21385.	23009.	22971.	21322.	18747.	16058.	13605.
11515.	9730.	8201.	6890.	5771.	4828.	4040.	3382.	2834.	2376.
1994.	1675.	1409.	1187.	998.	841.	709.	599.	508.	432.
356.	289.	228.	137.	103.	80.	77.	75.	73.	71.
70.	69.	69.	69.	69.	69.	69.	69.	69.	69.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	23009.	20947.	10698.	3820.	276315.
INCHES		3.42	6.98	7.48	7.52
AC-FT		10393.	21230.	22745.	22848.

HYDROGRAPH AT STA 2 FOR PLAN 1, RTIO 7

80.	80.	80.	80.	80.	80.	80.	80.	80.	80.
80.	80.	80.	80.	80.	81.	81.	81.	81.	81.
81.	81.	81.	81.	81.	81.	84.	89.	98.	111.
161.	308.	584.	1000.	1534.	2138.	2876.	3917.	5446.	8034.
11933.	16610.	21293.	24949.	26844.	26809.	24876.	21872.	18734.	15873.
13434.	11352.	9567.	8038.	6733.	5632.	4713.	3946.	3306.	2772.
2326.	1954.	1644.	1385.	1165.	981.	827.	699.	593.	503.
415.	337.	266.	160.	120.	93.	90.	87.	85.	83.
82.	80.	80.	80.	80.	80.	80.	80.	80.	80.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	26844.	24439.	12481.	4457.	322368.
INCHES		3.99	8.15	8.73	8.77
AC-FT		12125.	24769.	26536.	26656.

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HYDROGRAPH AT STA 2 FOR PLAN 1, RTIO 8

92.	92.	92.	92.	92.	92.	92.	92.	92.	92.
92.	92.	92.	92.	92.	92.	92.	92.	92.	92.
92.	92.	92.	92.	92.	93.	96.	102.	112.	126.
184.	352.	668.	1142.	1753.	2443.	3287.	4476.	6224.	9182.
13637.	18982.	24334.	28514.	30679.	30628.	28429.	24996.	21410.	18140.
15353.	12974.	10934.	9186.	7695.	6437.	5386.	4510.	3778.	3168.
2658.	2233.	1879.	1583.	1331.	1121.	946.	799.	677.	575.
474.	385.	304.	183.	137.	107.	103.	100.	97.	95.
93.	92.	92.	92.	92.	92.	92.	92.	92.	92.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	30679.	27930.	14264.	5094.	368426.

AC-FT		13857.	28307.	30327.		30464.			

HYDROGRAPH AT STA 2 FOR PLAN 1, RTIO 9

115.	115.	115.	115.	115.	115.	115.	115.	115.	115.
115.	115.	115.	115.	115.	115.	115.	115.	115.	115.
115.	115.	115.	115.	115.	116.	120.	128.	141.	158.
230.	440.	835.	1428.	2191.	3054.	4109.	5595.	7780.	11478.
17047.	23728.	30418.	35642.	38348.	38285.	35537.	31245.	26763.	22675.
19191.	16217.	13668.	11483.	9618.	8046.	6733.	5637.	4723.	3960.
3323.	2792.	2348.	1978.	1664.	1401.	1182.	999.	847.	719.
593.	482.	380.	229.	172.	133.	129.	125.	122.	119.
117.	115.	115.	115.	115.	115.	115.	115.	115.	115.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	38348.	34912.	17830.	6367.	460525.
INCHES		5.70	11.64	12.47	12.53
AC-FT		17321.	35384.	37908.	38080.

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

COMBINE HYDROGRAPHS

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

SUM OF 2 HYDROGRAPHS AT 2 PLAN 1 RTIO 1

34.	34.	34.	34.	34.	34.	34.	34.	34.	34.
34.	34.	34.	34.	34.	34.	34.	35.	35.	35.
35.	35.	35.	35.	35.	35.	35.	36.	37.	39.
46.	67.	107.	166.	243.	330.	437.	588.	809.	1183.
1746.	2422.	3103.	3640.	3929.	3944.	3694.	3292.	2874.	2496.
2179.	1914.	1690.	1501.	1342.	1209.	1101.	1012.	939.	879.
830.	790.	758.	731.	709.	690.	675.	663.	653.	644.
635.	627.	619.	606.	601.	598.	598.	598.	597.	596.
595.	593.	592.	590.	588.	586.	584.	581.	579.	576.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	3944.	3600.	2022.	950.	69009.
INCHES		0.19	0.44	0.62	0.62
AC-FT		1786.	4012.	5655.	5706.

SUM OF 2 HYDROGRAPHS AT 2 PLAN 1 RTIO 2

69.	69.	69.	69.	69.	69.	69.	69.	69.	69.
69.	69.	69.	69.	69.	69.	69.	69.	69.	69.
69.	69.	69.	69.	69.	69.	70.	72.	74.	78.
92.	134.	214.	333.	487.	661.	875.	1176.	1618.	2366.
3491.	4844.	6205.	7280.	7858.	7888.	7388.	6584.	5747.	4992.
4359.	3827.	3384.	3055.	2781.	2556.	2375.	2228.	2109.	2014.
1937.	1875.	1825.	1785.	1750.	1722.	1699.	1679.	1662.	1647.
1630.	1613.	1596.	1567.	1555.	1546.	1541.	1535.	1528.	1520.
1512.	1502.	1492.	1482.	1471.	1459.	1447.	1434.	1421.	1408.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	7888.	7201.	4124.	2050.	148848.
INCHES		0.39	0.89	1.33	1.34
AC-FT		3572.	8183.	12205.	12308.

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SUM OF 2 HYDROGRAPHS AT 2 PLAN 1 RTIO 3

103.	103.	103.	103.	103.	103.	103.	103.	103.	103.
103.	103.	103.	103.	103.	103.	103.	103.	103.	103.
103.	103.	103.	103.	103.	104.	105.	107.	111.	116.

5237.	7267.	9308.	10920.	11786.	11832.	11082.	9877.	8621.	7525.
6653.	5933.	5335.	4837.	4422.	4082.	3806.	3616.	3473.	3359.
3268.	3196.	3137.	3089.	3047.	3011.	2981.	2953.	2927.	2903.
2874.	2843.	2812.	2761.	2735.	2710.	2694.	2674.	2653.	2630.
2605.	2578.	2551.	2522.	2493.	2462.	2431.	2399.	2367.	2334.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	11832.	10801.	6338.	3261.	236670.
INCHES		0.58	1.37	2.11	2.13
AC-FT		5359.	12578.	19416.	19570.

SUM OF 2 HYDROGRAPHS AT 2 PLAN 1 RTIO 4

138.	138.	138.	138.	138.	138.	138.	138.	138.	138.
138.	138.	138.	138.	138.	138.	138.	138.	138.	138.
138.	138.	138.	138.	138.	138.	140.	143.	148.	155.
184.	269.	427.	666.	973.	1322.	1749.	2351.	3236.	4731.
6982.	9689.	12411.	14560.	15715.	15776.	14776.	13194.	11616.	10206.
9041.	8079.	7280.	6699.	6221.	5833.	5522.	5273.	5073.	4912.
4783.	4678.	4591.	4519.	4455.	4400.	4352.	4307.	4266.	4227.
4188.	4133.	4084.	4010.	3968.	3930.	3901.	3870.	3835.	3798.
3759.	3718.	3676.	3633.	3588.	3542.	3496.	3448.	3400.	3352.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	15776.	14405.	8652.	4533.	328843.
INCHES		0.78	1.87	2.94	2.96
AC-FT		7147.	17169.	26986.	27191.

SUM OF 2 HYDROGRAPHS AT 2 PLAN 1 RTIO 5

172.	172.	172.	172.	172.	172.	172.	172.	172.	172.
172.	172.	172.	172.	172.	172.	172.	172.	172.	172.
172.	172.	172.	172.	172.	173.	175.	179.	185.	194.
230.	336.	534.	832.	1217.	1652.	2187.	2939.	4045.	5914.
8728.	12111.	15514.	18200.	19644.	19720.	18520.	16623.	14650.	12885.
11436.	10347.	9455.	8722.	8118.	7626.	7231.	6913.	6657.	6450.
6282.	6144.	6030.	5934.	5849.	5775.	5709.	5657.	5605.	5553.
5490.	5424.	5353.	5248.	5189.	5136.	5096.	5052.	5005.	4955.
4902.	4847.	4790.	4732.	4673.	4612.	4550.	4487.	4423.	4359.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	19720.	18037.	10997.	5811.	421513.
INCHES		0.97	2.38	3.77	3.80
AC-FT		8948.	21824.	34597.	34854.

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SUM OF 2 HYDROGRAPHS AT 2 PLAN 1 RTIO 6

207.	207.	207.	207.	207.	207.	207.	207.	207.	207.
207.	207.	207.	207.	207.	207.	207.	207.	207.	207.
207.	207.	207.	207.	207.	208.	210.	215.	222.	233.
276.	403.	641.	999.	1460.	1983.	2624.	3527.	4854.	7097.
10474.	14533.	18616.	21840.	23573.	23708.	22328.	20051.	17681.	15623.
14010.	12698.	11622.	10737.	10007.	9411.	8932.	8558.	8314.	8119.
7960.	7829.	7718.	7622.	7533.	7451.	7373.	7298.	7223.	7149.
7060.	6969.	6872.	6735.	6647.	6562.	6490.	6413.	6332.	6246.
6157.	6065.	5971.	5876.	5778.	5679.	5579.	5479.	5378.	5277.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	23708.	21686.	13415.	7166.	519678.
INCHES		1.17	2.90	4.65	4.68
AC-FT		10759.	26622.	42663.	42971.

SUM OF 2 HYDROGRAPHS AT 2 PLAN 1 RTIO 7

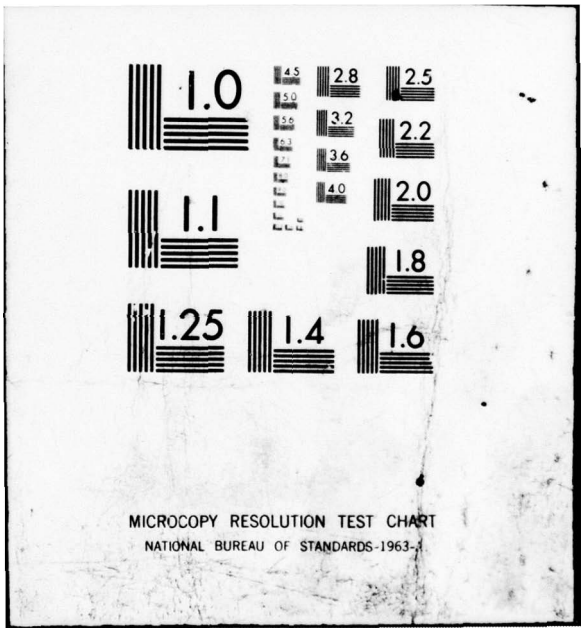
AD-A065 524 NEW YORK STATE DEPT OF ENVIRONMENTAL CONSERVATION ALBANY F/G 13/2
NATIONAL DAM SAFETY PROGRAM. NEWTON FALLS DAM (INVENTORY NUMBER--ETC(U)
SEP 78 J B STETSON DACW51-78-C-0035

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5.6
MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS-1963-A

241.	241.	241.	241.	241.	242.	245.	250.	259.	272.
322.	470.	748.	1165.	1703.	2313.	3061.	4114.	5663.	8279.
12219.	16956.	21719.	25480.	27516.	27747.	26136.	23478.	20781.	18466.
16580.	15044.	13784.	12747.	11902.	11320.	10857.	10487.	10190.	9949.
9752.	9588.	9447.	9324.	9208.	9102.	9001.	8903.	8807.	8710.
8597.	8481.	8359.	8191.	8080.	7972.	7881.	7783.	7680.	7573.
7462.	7347.	7231.	7113.	6993.	6871.	6749.	6625.	6502.	6378.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	27747.	25346.	15894.	8554.	620213.
INCHES		1.37	3.43	5.54	5.58
AC-FT		12575.	31542.	50924.	51284.

SUM OF 2 HYDROGRAPHS AT 2 PLAN 1 RTIO 8

276.	276.	276.	276.	276.	276.	276.	276.	276.	276.
276.	276.	276.	276.	276.	276.	276.	276.	276.	276.
276.	276.	276.	276.	276.	277.	280.	286.	297.	311.
368.	537.	854.	1332.	1946.	2644.	3498.	4702.	6472.	9462.
13965.	19378.	24822.	29119.	31522.	31785.	29943.	26945.	23955.	21305.
19146.	17387.	15944.	14885.	14048.	13371.	12831.	12397.	12048.	11763.
11527.	11329.	11159.	11013.	10892.	10776.	10660.	10543.	10424.	10301.
10157.	10007.	9848.	9634.	9493.	9363.	9252.	9135.	9011.	8882.
8750.	8613.	8475.	8334.	8192.	8048.	7903.	7757.	7611.	7465.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	31785.	29023.	18399.	9949.	721278.
INCHES		1.57	3.98	6.45	6.49
AC-FT		14399.	36513.	59230.	59641.

SUM OF 2 HYDROGRAPHS AT 2 PLAN 1 RTIO 9

345.	345.	345.	345.	345.	345.	345.	345.	345.	345.
345.	345.	345.	345.	345.	345.	345.	345.	345.	345.
345.	345.	345.	345.	345.	346.	350.	358.	371.	388.
461.	672.	1068.	1665.	2433.	3385.	4373.	5878.	8090.	11828.
17456.	24222.	31027.	36496.	39533.	39859.	37641.	34041.	30297.	26978.
24272.	22278.	20678.	19375.	18310.	17445.	16862.	16396.	16019.	15708.
15446.	15219.	15016.	14830.	14647.	14471.	14296.	14121.	13944.	13763.
13557.	13343.	13119.	12828.	12616.	12409.	12225.	12033.	11832.	11626.
11415.	11199.	10982.	10763.	10542.	10320.	10098.	9877.	9656.	9449.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	39859.	36433.	23558.	12841.	930744.
INCHES		1.97	5.09	8.32	8.38
AC-FT		18075.	46752.	76447.	76961.

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HYDROGRAPH ROUTING

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

ROUTING DATA

QLOSS	CLOSS	AVG	IRES	ISAME
0.0	0.0	0.0	1	1

NSTPS	NSTDL	LAG	AMSKK	X	TSK	STORA
1	0	0	0.0	0.0	0.0	-1.

STORAGE#	0.	1640.	4095.	6552.	9009.	11466.	0.	0.	0.	0.
0 FLOW#	0.	470.	3330.	15525.	33295.	55202.	0.	0.	0.	0.

STATION 2, PLAN 1, RTIO 1

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34.	34.	34.	34.	34.	34.	34.	34.	34.	34.
34.	34.	34.	34.	34.	35.	35.	35.	35.	35.
35.	35.	37.	39.	43.	48.	56.	67.	82.	103.
135.	181.	241.	314.	396.	503.	808.	1055.	1241.	1373.
1462.	1516.	1542.	1547.	1535.	1511.	1479.	1440.	1397.	1352.
1307.	1261.	1216.	1173.	1131.	1092.	1054.	1019.	986.	955.
926.	899.	873.	849.	827.	806.	787.	770.	754.	739.
726.	714.	703.	692.	683.	674.	666.	658.	651.	644.

STOR

120.	120.	120.	120.	120.	120.	120.	120.	120.	120.
120.	120.	120.	120.	120.	120.	120.	120.	120.	120.
120.	120.	120.	120.	120.	120.	120.	120.	121.	121.
122.	123.	128.	136.	149.	169.	197.	234.	285.	360.
471.	630.	841.	1097.	1380.	1669.	1930.	2142.	2302.	2416.
2492.	2538.	2560.	2564.	2554.	2534.	2506.	2473.	2436.	2397.
2358.	2319.	2281.	2243.	2208.	2174.	2141.	2111.	2083.	2056.
2031.	2008.	1986.	1966.	1946.	1928.	1912.	1897.	1884.	1871.
1860.	1849.	1840.	1831.	1823.	1815.	1808.	1802.	1795.	1790.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	1547.	1522.	1274.	670.	48844.
INCHES		0.08	0.28	0.43	0.44
AC-FT		755.	2528.	3987.	4839.

STATION 2, PLAN 1, RTIO 2

69.	69.	69.	69.	69.	69.	69.	69.	69.	69.
69.	69.	69.	69.	69.	69.	69.	69.	69.	69.
69.	69.	69.	69.	69.	69.	69.	69.	69.	69.
70.	71.	73.	78.	86.	97.	113.	134.	164.	206.
270.	361.	518.	1090.	1685.	2253.	2748.	3137.	3646.	4233.
4383.	4285.	4053.	3770.	3480.	3296.	3220.	3135.	3046.	2956.
2866.	2778.	2693.	2611.	2534.	2460.	2391.	2327.	2267.	2210.
2158.	2109.	2062.	2018.	1976.	1937.	1901.	1868.	1837.	1808.
1781.	1756.	1732.	1710.	1688.	1668.	1648.	1629.	1610.	1592.

STOR

241.	241.	241.	241.	241.	241.	241.	241.	241.	241.
241.	241.	241.	241.	241.	241.	241.	241.	241.	241.
241.	241.	241.	241.	241.	241.	241.	241.	241.	242.
243.	247.	255.	271.	299.	338.	393.	468.	571.	720.
943.	1261.	1681.	2172.	2683.	3171.	3595.	3929.	4159.	4277.
4307.	4287.	4241.	4184.	4125.	4066.	4008.	3928.	3852.	3774.
3697.	3621.	3548.	3478.	3411.	3348.	3289.	3234.	3182.	3134.
3089.	3047.	3007.	2969.	2933.	2899.	2868.	2840.	2813.	2789.
2766.	2744.	2724.	2704.	2686.	2668.	2651.	2635.	2619.	2603.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	4383.	4062.	3107.	1654.	120352.
INCHES		0.22	0.67	1.07	1.08
AC-FT		2015.	6166.	9849.	9952.

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STATION 2, PLAN 1, RTIO 3

103.	103.	103.	103.	103.	103.	103.	103.	103.	103.
103.	103.	103.	103.	103.	103.	103.	103.	103.	103.
103.	103.	103.	103.	103.	104.	104.	104.	104.	104.
104.	106.	110.	117.	128.	145.	169.	201.	245.	310.
405.	753.	1445.	2241.	3078.	5368.	7441.	8475.	8738.	8512.
8027.	7437.	6823.	6232.	5686.	5198.	4771.	4410.	4116.	3878.
3686.	3531.	3407.	3324.	3300.	3275.	3250.	3224.	3198.	3172.
3146.	3119.	3092.	3064.	3035.	3007.	2979.	2952.	2925.	2899.
2873.	2847.	2821.	2795.	2769.	2742.	2715.	2687.	2659.	2631.

STOR

241	241	241	241	241	241	241	241	241	241

361.	361.	361.	361.	361.	361.	361.	361.	362.	363.
365.	370.	383.	407.	448.	508.	590.	702.	856.	1080.
1414.	1883.	2477.	3160.	3879.	4586.	4923.	5132.	5185.	5139.
5041.	4922.	4799.	4680.	4570.	4471.	4385.	4313.	4253.	4205.
4167.	4136.	4110.	4090.	4069.	4048.	4026.	4004.	3981.	3959.
3937.	3914.	3891.	3867.	3842.	3817.	3793.	3770.	3747.	3725.
3703.	3681.	3658.	3636.	3613.	3590.	3567.	3543.	3519.	3495.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	8738.	8105.	5221.	2737.	198899.
INCHES		0.44	1.13	1.77	1.79
AC-FT		4021.	10361.	16292.	16446.

STATION 2, PLAN 1, RTIO 4

138.	138.	138.	138.	138.	138.	138.	138.	138.	138.
138.	138.	138.	138.	138.	138.	138.	138.	138.	138.
138.	138.	138.	138.	138.	138.	138.	138.	138.	139.
139.	141.	146.	156.	171.	194.	225.	268.	327.	413.
746.	1443.	2325.	3486.	7399.	10240.	11954.	12645.	12564.	12001.
11192.	10296.	9405.	8583.	7860.	7236.	6706.	6260.	5890.	5585.
5334.	5128.	4960.	4822.	4708.	4613.	4532.	4463.	4403.	4350.
4300.	4251.	4203.	4158.	4095.	4045.	4001.	3962.	3925.	3888.
3851.	3813.	3773.	3733.	3691.	3648.	3604.	3559.	3513.	3466.

STOR

482.	482.	482.	482.	482.	482.	482.	482.	482.	482.
482.	482.	482.	482.	482.	482.	482.	482.	482.	482.
482.	482.	482.	482.	482.	482.	482.	482.	483.	484.
486.	493.	516.	543.	597.	677.	786.	935.	1142.	1446.
1877.	2475.	3233.	4116.	4915.	5487.	5833.	5972.	5955.	5842.
5679.	5498.	5319.	5153.	5008.	4882.	4775.	4685.	4611.	4549.
4499.	4457.	4423.	4396.	4373.	4353.	4337.	4323.	4311.	4300.
4290.	4281.	4271.	4260.	4249.	4239.	4230.	4222.	4215.	4207.
4200.	4192.	4184.	4176.	4168.	4159.	4150.	4141.	4132.	4122.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	12645.	11775.	7682.	3922.	284844.
INCHES		0.64	1.66	2.54	2.56
AC-FT		5842.	15246.	23348.	23553.

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STATION 2, PLAN 1, RTIO 5

172.	172.	172.	172.	172.	172.	172.	172.	172.	172.
172.	172.	172.	172.	172.	172.	172.	172.	172.	172.
172.	172.	172.	172.	172.	173.	173.	173.	173.	173.
174.	177.	183.	194.	214.	242.	282.	335.	409.	651.
1263.	2104.	3180.	7429.	11341.	14180.	15980.	16712.	16217.	15203.
14167.	13052.	11980.	10996.	10119.	9354.	8698.	8145.	7682.	7298.
6981.	6719.	6504.	6327.	6179.	6054.	5948.	5858.	5780.	5712.
5647.	5582.	5516.	5443.	5367.	5297.	5236.	5181.	5129.	5078.
5027.	4975.	4922.	4867.	4811.	4754.	4695.	4635.	4573.	4511.

STOR

602.	602.	602.	602.	602.	602.	602.	602.	602.	602.
602.	602.	602.	602.	602.	602.	602.	602.	602.	602.
602.	602.	602.	602.	602.	602.	602.	602.	603.	605.
608.	617.	638.	679.	746.	846.	983.	1169.	1427.	1795.
2321.	3043.	3966.	4921.	5709.	6281.	6615.	6716.	6648.	6487.
6278.	6054.	5838.	5639.	5463.	5309.	5177.	5065.	4972.	4894.
4830.	4778.	4735.	4699.	4669.	4644.	4622.	4604.	4589.	4575.
4562.	4549.	4535.	4521.	4505.	4491.	4479.	4468.	4457.	4447.
4437.	4426.	4416.	4405.	4393.	4382.	4370.	4358.	4346.	4333.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	16712.	15410.	10136.	5185.	376442.
INCHES		0.83	2.19	3.36	3.39

STATION 2, PLAN 1, RTIO 6

207.	207.	207.	207.	207.	207.	207.	207.	207.	207.
207.	207.	207.	207.	207.	207.	207.	207.	207.	207.
207.	207.	207.	207.	207.	207.	207.	207.	207.	208.
209.	212.	219.	233.	257.	291.	338.	402.	552.	1050.
1760.	2747.	5877.	10762.	14828.	18638.	20654.	20900.	19964.	18446.
16772.	15284.	14221.	13185.	12228.	11370.	10622.	9983.	9456.	9034.
8696.	8423.	8202.	8021.	7870.	7741.	7629.	7529.	7438.	7352.
7268.	7182.	7093.	6994.	6891.	6793.	6702.	6617.	6534.	6450.
6366.	6279.	6190.	6099.	6007.	5912.	5816.	5718.	5620.	5520.

STOR

722.	722.	722.	722.	722.	722.	722.	722.	722.	722.
722.	722.	722.	722.	722.	722.	722.	722.	722.	722.
722.	722.	722.	722.	722.	722.	722.	723.	724.	725.
729.	740.	765.	814.	896.	1015.	1180.	1403.	1710.	2138.
2748.	3595.	4608.	5592.	6411.	6982.	7261.	7295.	7166.	6955.
6724.	6503.	6289.	6081.	5888.	5715.	5564.	5435.	5329.	5244.
5176.	5121.	5077.	5040.	5010.	4984.	4961.	4941.	4923.	4905.
4888.	4871.	4853.	4833.	4812.	4793.	4774.	4757.	4740.	4724.
4707.	4689.	4671.	4653.	4634.	4615.	4596.	4576.	4556.	4536.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	20900.	19228.	12622.	6527.	473649.
INCHES		1.04	2.73	4.23	4.26
AC-FT		9539.	25048.	38857.	39165.

STATION 2, PLAN 1, RTIO 7

241.	241.	241.	241.	241.	241.	241.	241.	241.	241.
241.	241.	241.	241.	241.	241.	241.	241.	241.	241.
241.	241.	241.	241.	241.	242.	242.	242.	242.	243.
244.	247.	256.	272.	299.	339.	394.	469.	873.	1433.
2243.	3503.	8893.	13899.	19124.	23039.	24835.	24822.	23583.	21761.
19810.	17970.	16334.	15079.	14141.	13286.	12534.	11900.	11368.	10926.
10560.	10257.	10005.	9794.	9614.	9458.	9320.	9195.	9079.	8970.
8862.	8752.	8639.	8515.	8386.	8264.	8149.	8041.	7936.	7831.
7724.	7615.	7504.	7391.	7276.	7159.	7040.	6920.	6799.	6677.

STOR

843.	843.	843.	843.	843.	843.	843.	843.	843.	843.
843.	843.	843.	843.	843.	843.	843.	843.	843.	843.
843.	843.	843.	843.	843.	843.	843.	843.	844.	846.
851.	863.	893.	950.	1045.	1184.	1376.	1637.	1986.	2467.
3162.	4130.	5216.	6224.	7050.	7591.	7839.	7837.	7666.	7414.
7145.	6890.	6664.	6462.	6273.	6100.	5949.	5822.	5715.	5625.
5552.	5491.	5440.	5397.	5361.	5330.	5302.	5277.	5253.	5231.
5210.	5187.	5165.	5140.	5114.	5089.	5066.	5044.	5023.	5002.
4980.	4958.	4936.	4913.	4890.	4866.	4843.	4818.	4794.	4769.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	24835.	22975.	15142.	7896.	572849.
INCHES		1.24	3.27	5.12	5.16
AC-FT		11398.	30050.	47000.	47367.

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STATION 2, PLAN 1, RTIO 8

276.	276.	276.	276.	276.	276.	276.	276.	276.	276.
276.	276.	276.	276.	276.	276.	276.	276.	276.	276.
276.	276.	276.	276.	276.	276.	276.	276.	277.	277.
279.	283.	292.	311.	342.	388.	451.	730.	1176.	1800.
2710.	5786.	11339.	17059.	23162.	27870.	28816.	28644.	27174.	25083.
22848.	20739.	18864.	17277.	15983.	15090.	14413.	13881.	13263.	12801.
12407.	12074.	11792.	11552.	11348.	11173.	11018.	10876.	10743.	10613.
10482.	10346.	10204.	10046.	9882.	9727.	9584.	9451.	9322.	9194.
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

STOR

963.	963.	963.	963.	963.	963.	963.	963.	963.	963.
963.	963.	963.	963.	963.	963.	963.	963.	963.	963.
963.	963.	963.	963.	963.	963.	963.	964.	965.	967.
972.	987.	1020.	1086.	1194.	1354.	1573.	1863.	2246.	2781.
3563.	4590.	5709.	6764.	7688.	8148.	8390.	8366.	8163.	7874.
7564.	7273.	7014.	6794.	6615.	6464.	6328.	6205.	6096.	6003.
5924.	5857.	5800.	5751.	5710.	5675.	5644.	5615.	5588.	5562.
5536.	5509.	5480.	5448.	5415.	5384.	5355.	5328.	5302.	5277.
5251.	5224.	5197.	5170.	5143.	5114.	5086.	5057.	5028.	4999.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	28816.	26658.	17657.	9273.	672614.
INCHES		1.44	3.82	6.01	6.06
AC-FT		13226.	35040.	55206.	55617.

STATION 2, PLAN 1, RTIO 9

345.	345.	345.	345.	345.	345.	345.	345.	345.	345.
345.	345.	345.	345.	345.	345.	345.	345.	345.	345.
345.	345.	345.	345.	345.	345.	345.	345.	346.	347.
348.	353.	366.	389.	428.	529.	833.	1227.	1756.	2509.
4419.	10008.	16173.	24267.	30593.	35035.	37036.	36392.	34118.	31476.
28784.	26249.	24053.	22200.	20655.	19377.	18354.	17560.	16937.	16443.
16044.	15717.	15463.	15279.	15095.	14912.	14732.	14554.	14377.	14198.
14015.	13823.	13621.	13401.	13170.	12946.	12732.	12527.	12324.	12122.
11917.	11709.	11499.	11286.	11070.	10853.	10634.	10414.	10193.	9975.

STOR

1284.	1284.	1284.	1284.	1284.	1284.	1284.	1284.	1284.	1284.
1284.	1284.	1284.	1284.	1284.	1284.	1284.	1284.	1284.	1284.
1284.	1284.	1284.	1284.	1284.	1284.	1284.	1285.	1286.	1289.
1215.	1233.	1275.	1357.	1493.	1698.	1951.	2290.	2744.	3391.
4314.	5440.	6642.	7761.	8635.	9284.	9429.	9356.	9101.	8758.
8385.	8035.	7731.	7475.	7261.	7085.	6943.	6833.	6747.	6679.
6624.	6578.	6539.	6502.	6465.	6429.	6392.	6356.	6321.	6285.
6248.	6209.	6168.	6124.	6077.	6032.	5989.	5948.	5907.	5866.
5825.	5783.	5741.	5698.	5654.	5611.	5567.	5522.	5478.	5434.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	37036.	34109.	22842.	12133.	879821.
INCHES		1.84	4.94	7.87	7.92
AC-FT		16922.	45330.	72237.	72750.

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PEAK FLOW SUMMARY FOR MULTIPLE PLAN-RATIO ECONOMIC COMPUTATIONS

			RATIOS APPLIED TO FLOWS								
PERATION	STATION	PLAN	0.10	0.20	0.30	0.40	0.50	0.60	0.70	0.80	1.00
YDROGRAPH AT	1	1	4440.	8880.	13320.	17760.	22199.	26639.	31079.	35519.	44399.
		2	0.	0.	0.	0.	0.	0.	0.	0.	0.
OUTE TO	1	1	585.	1522.	2699.	3943.	5194.	6717.	8214.	9747.	13122.
		2	0.	0.	0.	0.	0.	0.	0.	0.	0.
YDROGRAPH AT	2	1	3835.	7670.	11505.	15339.	19174.	23009.	26844.	30679.	38348.
		2	0.	0.	0.	0.	0.	0.	0.	0.	0.
2 CO INED	2	1	3944.	7888.	11832.	15776.	19720.	23708.	27747.	31785.	39859.
		2	0.	0.	0.	0.	0.	0.	0.	0.	0.
NITED TO	2	1	1547.	4393.	8738.	12445.	16712.	20988.	24835.	28814.	37834.

****
C-1 VERSION DATED JAN 1973
DATE AUG 74
HANGE NO. 01
****

NEWTON FALLS DAM
RESERVOIR ROUTING OF P.M.F. - CLARK METHOD
FOOT-UNCONTROLLED SPILLWAY ONLY

JOB SPECIFICATION

NQ	NHR	NMIN	IDAY	IHR	IMIN	METRC	IPLT	IPRT	NSTAN
98	1	0	0	0	0	0	0	0	0

JOPER	NWT
5	0

MULTI-PLAN ANALYSES TO BE PERFORMED
NPLAN= 1 NRTIO= 9 LRTIO= 1
RTIOS= 0.10 0.20 0.30 0.40 0.50 0.60 0.70 0.80 1.00

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

SUB-AREA RUNOFF COMPUTATION

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

HYDROGRAPH DATA

IHYDG	IUHG	TAREA	SNAP	TRSDA	TRSPC	RATIO	ISNOW	ISAME	LOCAL
1	0	115.20	0.0	115.20	0.0	0.0	0	1	0

PRECIP DATA

SPFE	PMS	R6	R12	R24	R48	R72	R96
0.0	16.90	77.00	91.00	102.00	108.00	0.0	0.0

PC [illegible]MPUTED BY THE PROGRAM IS 0.870

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LOSS DATA

STRKR	DLTKR	RTIOL	ERAIN	STRKS	RTIOK	STRTL	CNSTL	ALSMX	RTIMP
0.0	0.0	1.00	0.0	0.0	1.00	1.00	0.10	0.0	0.0

UNIT HYDROGRAPH DATA
TC= 16.70 R= 16.70 NTA= 0

RECESSION DATA
STRTQ= 230.00 QRCSN= 230.00 RTIOR= 1.00

UNIT HYDROGRAPH 98 END-OF-PERIOD ORDINATES, LAG= 15.51 HOURS, CP= 0.58 VOL= 1.00

45.	169.	347.	558.	793.	1047.	1315.	1593.	1875.	2137.
2360.	2543.	2686.	2787.	2845.	2852.	2785.	2649.	2495.	2350.
2214.	2085.	1964.	1849.	1742.	1641.	1545.	1455.	1371.	1291.
1216.	1145.	1079.	1016.	957.	901.	849.	800.	753.	709.
668.	629.	593.	558.	526.	495.	466.	439.	414.	390.
367.	346.	326.	307.	289.	272.	256.	241.	227.	214.
202.	190.	179.	168.	159.	149.	141.	133.	125.	118.
111.	104.	98.	93.	87.	82.	77.	73.	69.	65.
61.	57.	54.	51.	48.	45.	42.	40.	38.	35.
33.	31.	30.	28.	26.	25.	23.	22.		

END-OF-PERIOD FLOW

TIME	RAIN	EXCS	COMP Q
1	0.01	0.00	230.
2	0.01	0.00	230.
3	0.01	0.00	230.
4	0.01	0.00	230.

6	0.01	0.00	230.
7	0.02	0.00	230.
8	0.02	0.00	230.
9	0.02	0.00	230.
10	0.02	0.00	230.
11	0.02	0.00	230.
12	0.02	0.00	230.
13	0.07	0.00	230.
14	0.08	0.00	230.
15	0.10	0.00	230.
16	0.25	0.00	230.
17	0.09	0.00	230.
18	0.07	0.00	230.
19	0.01	0.00	230.
20	0.01	0.00	230.
21	0.01	0.00	230.
22	0.01	0.00	230.
23	0.01	0.00	230.
24	0.01	0.00	230.
25	0.11	0.00	230.
26	0.11	0.01	230.
27	0.11	0.01	232.
28	0.11	0.01	234.
29	0.11	0.01	238.
30	0.11	0.01	244.
31	0.34	0.24	263.
32	0.34	0.24	313.
33	0.34	0.24	407.
34	0.34	0.24	553.
35	0.34	0.24	756.
36	0.34	0.24	1021.
37	1.13	1.03	1385.
38	1.36	1.26	1925.
39	1.78	1.68	2715.
40	4.38	4.28	3933.
41	1.59	1.49	5699.
42	1.25	1.15	7945.
43	0.16	0.06	10548.
44	0.16	0.06	13384.
45	0.16	0.06	16365.
46	0.16	0.06	19410.
47	0.16	0.06	22427.
48	0.16	0.06	25386.
49	0.0	0.0	27987.
50	0.0	0.0	30110.
51	0.0	0.0	31862.
52	0.0	0.0	33137.
53	0.0	0.0	33989.
54	0.0	0.0	34146.
55	0.0	0.0	33838.
56	0.0	0.0	32972.
57	0.0	0.0	31635.
58	0.0	0.0	30061.
59	0.0	0.0	28440.
60	0.0	0.0	26866.
61	0.0	0.0	25365.
62	0.0	0.0	23936.
63	0.0	0.0	22576.
64	0.0	0.0	21285.
65	0.0	0.0	20062.
66	0.0	0.0	18909.
67	0.0	0.0	17823.
68	0.0	0.0	16800.
69	0.0	0.0	15837.
70	0.0	0.0	14930.

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72	0.0	0.0	13270.
73	0.0	0.0	12512.
74	0.0	0.0	11798.
75	0.0	0.0	11125.
76	0.0	0.0	10492.
77	0.0	0.0	9895.
78	0.0	0.0	9333.
79	0.0	0.0	8804.
80	0.0	0.0	8305.
81	0.0	0.0	7836.
82	0.0	0.0	7394.
83	0.0	0.0	6977.
84	0.0	0.0	6585.
85	0.0	0.0	6216.
86	0.0	0.0	5868.
87	0.0	0.0	5540.
88	0.0	0.0	5231.
89	0.0	0.0	4940.
90	0.0	0.0	4666.
SUM	15.89	12.58	884551.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	34146.	33311.	26048.	12228.	884550.
INCHES		2.69	8.41	11.85	11.90
AC-FT		16526.	51692.	72799.	73141.

HYDROGRAPH AT STA 1 FOR PLAN 1, RTIO 1

23.	23.	23.	23.	23.	23.	23.	23.	23.	23.
23.	23.	23.	23.	23.	23.	23.	23.	23.	23.
23.	23.	23.	23.	23.	23.	23.	23.	24.	24.
26.	31.	41.	55.	76.	102.	139.	192.	271.	393.
570.	794.	1055.	1338.	1636.	1941.	2243.	2531.	2791.	3011.
3186.	3314.	3391.	3415.	3384.	3297.	3163.	3006.	2844.	2687.
2537.	2394.	2258.	2128.	2006.	1891.	1782.	1680.	1584.	1493.
1407.	1327.	1251.	1180.	1113.	1049.	990.	933.	880.	831.
784.	739.	698.	658.	622.	587.	554.	523.	494.	467.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	3415.	3331.	2605.	1223.	88454.
INCHES		0.27	0.84	1.18	1.19
AC-FT		1653.	5169.	7280.	7314.

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HYDROGRAPH AT STA 1 FOR PLAN 1, RTIO 2

46.	46.	46.	46.	46.	46.	46.	46.	46.	46.
46.	46.	46.	46.	46.	46.	46.	46.	46.	46.
46.	46.	46.	46.	46.	46.	46.	47.	48.	49.
53.	63.	81.	111.	151.	204.	277.	385.	543.	787.
1140.	1589.	2110.	2677.	3273.	3882.	4485.	5061.	5581.	6022.
6372.	6627.	6782.	6829.	6768.	6594.	6327.	6012.	5688.	5373.
5073.	4787.	4515.	4257.	4012.	3782.	3565.	3360.	3167.	2986.
2815.	2654.	2502.	2360.	2225.	2098.	1979.	1867.	1761.	1661.
1567.	1479.	1395.	1317.	1243.	1174.	1108.	1046.	988.	933.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	6829.	6662.	5210.	2446.	176909.
INCHES		0.54	1.68	2.37	2.38
AC-FT		3305.	10338.	14560.	14628.

HYDROGRAPH AT STA 1 FOR PLAN 1, RTIO 3

69.	69.	69.	69.	69.	69.	69.	69.	69.	69.
69.	69.	69.	69.	69.	69.	69.	69.	69.	69.
69.	69.	69.	69.	69.	69.	69.	70.	72.	73.
79.	94.	122.	166.	227.	306.	416.	577.	814.	1180.
1710.	2383.	3164.	4015.	4909.	5823.	6728.	7592.	8272.	8833.

7618.	7181.	6773.	6385.	6019.	5673.	5347.	5040.	4751.	4479.
4222.	3981.	3754.	3539.	3338.	3148.	2969.	2800.	2641.	2492.
2351.	2218.	2093.	1975.	1865.	1760.	1662.	1569.	1482.	1400.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	10244.	9993.	7814.	3668.	265364.
INCHES		0.81	2.52	3.55	3.57
AC-FT		4958.	15507.	21839.	21942.

HYDROGRAPH AT STA 1 FOR PLAN 1, RTIO 4

92.	92.	92.	92.	92.	92.	92.	92.	92.	92.
92.	92.	92.	92.	92.	92.	92.	92.	92.	92.
92.	92.	92.	92.	92.	92.	93.	94.	95.	98.
105.	125.	163.	221.	302.	408.	554.	770.	1086.	1573.
2280.	3178.	4219.	5353.	6546.	7764.	8971.	10123.	11163.	12044.
12745.	13255.	13564.	13658.	13535.	13189.	12654.	12024.	11376.	10746.
10146.	9574.	9030.	8514.	8025.	7564.	7129.	6720.	6335.	5972.
5630.	5308.	5005.	4719.	4450.	4197.	3958.	3733.	3522.	3322.
3134.	2957.	2791.	2634.	2486.	2347.	2216.	2092.	1976.	1867.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	13658.	13324.	10419.	4891.	353819.
INCHES		1.08	3.37	4.74	4.76
AC-FT		6610.	20677.	29119.	29256.

HYDROGRAPH AT STA 1 FOR PLAN 1, RTIO 5

115.	115.	115.	115.	115.	115.	115.	115.	115.	115.
115.	115.	115.	115.	115.	115.	115.	115.	115.	115.
115.	115.	115.	115.	115.	115.	116.	117.	119.	122.
132.	156.	203.	276.	378.	510.	693.	962.	1357.	1967.
2850.	3972.	5274.	6692.	8182.	9705.	11213.	12653.	13953.	15055.
15931.	16569.	16955.	17073.	16919.	16486.	15817.	15038.	14220.	13433.
12683.	11968.	11288.	10642.	10031.	9455.	8912.	8400.	7918.	7465.
7037.	6635.	6256.	5899.	5563.	5246.	4948.	4667.	4402.	4153.
3918.	3697.	3489.	3292.	3108.	2934.	2770.	2616.	2470.	2333.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	17073.	16655.	13024.	6114.	442273.
INCHES		1.34	4.21	5.92	5.95
AC-FT		8263.	25846.	36399.	36570.

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HYDROGRAPH AT STA 1 FOR PLAN 1, RTIO 6

138.	138.	138.	138.	138.	138.	138.	138.	138.	138.
138.	138.	138.	138.	138.	138.	138.	138.	138.	138.
138.	138.	138.	138.	138.	138.	139.	140.	143.	147.
158.	188.	244.	332.	454.	612.	831.	1155.	1629.	2360.
3420.	4767.	6329.	8030.	9819.	11646.	13456.	15184.	16744.	18066.
19117.	19882.	20346.	20487.	20303.	19783.	18981.	18036.	17064.	16120.
15219.	14362.	13546.	12771.	12037.	11345.	10694.	10080.	9502.	8958.
8445.	7962.	7507.	7079.	6675.	6295.	5937.	5600.	5282.	4983.
4702.	4436.	4186.	3951.	3729.	3520.	3324.	3139.	2964.	2800.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	20487.	19986.	15629.	7337.	530728.
INCHES		1.61	5.05	7.11	7.14
AC-FT		9916.	31015.	43679.	43884.

HYDROGRAPH AT STA 1 FOR PLAN 1, RTIO 7

161.	161.	161.	161.	161.	161.	161.	161.	161.	161.
161.	161.	161.	161.	161.	161.	161.	161.	161.	161.
161.	161.	161.	161.	161.	161.	162.	164.	167.	171.
184.	219.	285.	387.	529.	715.	970.	1347.	1900.	2753.
3990.	5561.	7383.	9369.	11455.	13587.	15699.	17714.	19535.	21077.
22303.	23196.	23737.	23902.	23687.	23080.	22144.	21043.	19908.	18866.
17756.	16755.	15883.	14899.	14043.	13234.	12474.	11760.	11091.	10471.

3485. 3176. 4884. 4697. 4351. 4197. 3878. 3662. 3458. 3266.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	23902.	23317.	18233.	8560.	619182.
INCHES		1.88	5.89	8.29	8.33
AC-FT		11568.	36184.	50959.	51199.

HYDROGRAPH AT STA 1 FOR PLAN 1, RTIO 8

184.	184.	184.	184.	184.	184.	184.	184.	184.	184.
184.	184.	184.	184.	184.	184.	184.	184.	184.	184.
184.	184.	184.	184.	184.	184.	185.	187.	191.	196.
210.	250.	325.	442.	605.	817.	1108.	1540.	2172.	3146.
4559.	6356.	8438.	10707.	13092.	15528.	17941.	20245.	22325.	24088.
25489.	26510.	27128.	27317.	27071.	26377.	25308.	24049.	22752.	21493.
20292.	19149.	18061.	17028.	16050.	15127.	14258.	13440.	12669.	11944.
11260.	10616.	10009.	9438.	8900.	8393.	7916.	7467.	7043.	6644.
6269.	5915.	5582.	5268.	4972.	4694.	4432.	4185.	3952.	3733.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	27317.	26648.	20838.	9782.	707637.
INCHES		2.15	6.73	9.48	9.52
AC-FT		13221.	41353.	58239.	58513.

HYDROGRAPH AT STA 1 FOR PLAN 1, RTIO 9

230.	230.	230.	230.	230.	230.	230.	230.	230.	230.
230.	230.	230.	230.	230.	230.	230.	230.	230.	230.
230.	230.	230.	230.	230.	230.	232.	234.	238.	244.
263.	313.	407.	553.	756.	1021.	1385.	1925.	2715.	3933.
5699.	7945.	10548.	13384.	16365.	19410.	22427.	25306.	27906.	30110.
31862.	33137.	33909.	34146.	33838.	32972.	31635.	30061.	28440.	26866.
25365.	23936.	22576.	21285.	20062.	18909.	17823.	16800.	15837.	14929.
14075.	13270.	12512.	11798.	11125.	10492.	9895.	9333.	8804.	8305.
7836.	7394.	6977.	6585.	6215.	5867.	5540.	5231.	4940.	4666.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	34146.	33310.	26048.	12228.	884546.
INCHES		2.69	8.41	11.85	11.90
AC-FT		16526.	51691.	72798.	73141.

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HYDROGRAPH ROUTING

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

ROUTING DATA

QLOSS	CLOSS	AVC	IRES	ISAME
0.0	0.0	0.0	1	1

NSTPS	NSTDL	LAG	AMSKK	X	TSK	STORA
1	0	0	0.0	0.0	0.0	-1.

STORAGE#	0.	6912.	13824.	27648.	41472.	55296.	69120.	82944.	96768.	0.
OUTFLOW#	0.	646.	1810.	5120.	9486.	14481.	20238.	26684.	33525.	0.

STATION 1, PLAN 1, RTIO 1

23.	23.	23.	23.	23.	23.	23.	23.	23.	23.
23.	23.	23.	23.	23.	23.	23.	23.	23.	23.
23.	23.	23.	23.	23.	23.	23.	23.	23.	23.
23.	23.	23.	23.	24.	24.	25.	26.	28.	30.
33.	38.	45.	54.	65.	78.	93.	111.	130.	151.
174.	197.	221.	245.	270.	293.	315.	336.	356.	375.
392.	407.	422.	436.	448.	459.	470.	480.	488.	496.
504.	510.	516.	521.	526.	530.	534.	537.	540.	543.

STOR

248.	248.	248.	248.	248.	248.	248.	248.	248.	248.
248.	248.	248.	248.	248.	248.	248.	248.	248.	248.
248.	248.	248.	248.	248.	248.	248.	248.	248.	249.
249.	249.	250.	252.	256.	261.	269.	281.	298.	323.
360.	413.	486.	581.	699.	841.	1007.	1196.	1406.	1634.
1876.	2130.	2389.	2651.	2911.	3164.	3406.	3634.	3847.	4045.
4229.	4400.	4558.	4704.	4838.	4962.	5075.	5179.	5274.	5360.
5439.	5510.	5574.	5631.	5683.	5729.	5769.	5804.	5834.	5860.
5882.	5900.	5914.	5925.	5932.	5937.	5939.	5938.	5934.	5929.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	550.	550.	528.	269.	19764.
INCHES		0.04	0.17	0.26	0.27
AC-FT		273.	1049.	1600.	1634.

STATION 1, PLAN 1, RTIO 2

46.	46.	46.	46.	46.	46.	46.	46.	46.	46.
46.	46.	46.	46.	46.	46.	46.	46.	46.	46.
46.	46.	46.	46.	46.	46.	46.	46.	46.	46.
46.	46.	46.	47.	47.	48.	50.	52.	55.	60.
67.	77.	90.	108.	129.	156.	186.	221.	260.	303.
347.	394.	442.	491.	539.	586.	631.	700.	772.	838.
899.	955.	1006.	1053.	1096.	1135.	1170.	1202.	1230.	1256.
1279.	1299.	1317.	1332.	1346.	1357.	1366.	1374.	1380.	1385.
1388.	1390.	1391.	1390.	1389.	1386.	1383.	1378.	1373.	1368.

STOR

497.	497.	497.	497.	497.	497.	497.	497.	497.	497.
497.	497.	497.	497.	497.	497.	497.	497.	497.	497.
497.	497.	497.	497.	497.	497.	497.	497.	497.	497.
498.	498.	501.	505.	512.	522.	538.	561.	595.	645.
720.	827.	973.	1162.	1398.	1682.	2014.	2391.	2811.	3267.
3753.	4259.	4779.	5303.	5822.	6328.	6811.	7266.	7689.	8079.
8439.	8770.	9074.	9351.	9604.	9834.	10042.	10230.	10400.	10551.
10686.	10806.	10910.	11002.	11081.	11148.	11204.	11249.	11285.	11312.
11331.	11342.	11346.	11343.	11334.	11320.	11299.	11274.	11245.	11211.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	1391.	1389.	1339.	648.	47485.
INCHES		0.11	0.43	0.63	0.64
AC-FT		689.	2657.	3858.	3926.

STATION 1, PLAN 1, RTIO 3

69.	69.	69.	69.	69.	69.	69.	69.	69.	69.
69.	69.	69.	69.	69.	69.	69.	69.	69.	69.
69.	69.	69.	69.	69.	69.	69.	69.	69.	69.
69.	69.	70.	70.	71.	73.	75.	78.	83.	90.
100.	115.	135.	161.	194.	234.	280.	332.	390.	454.
521.	592.	663.	816.	946.	1072.	1192.	1304.	1408.	1503.
1591.	1672.	1745.	1814.	1900.	1977.	2046.	2108.	2163.	2211.
2253.	2289.	2320.	2346.	2367.	2384.	2397.	2407.	2413.	2416.
2416.	2414.	2409.	2401.	2392.	2380.	2367.	2353.	2336.	2319.

STOR

745.	745.	745.	745.	745.	745.	745.	745.	745.	745.
745.	745.	745.	745.	745.	745.	745.	745.	745.	745.
745.	745.	745.	745.	745.	745.	745.	745.	745.	746.
746.	748.	751.	757.	767.	784.	807.	842.	893.	968.
1080.	1240.	1459.	1743.	2097.	2523.	3021.	3587.	4217.	4901.
5629.	6389.	7167.	7949.	8719.	9464.	10171.	10833.	11446.	12012.
12531.	13008.	13443.	13840.	14199.	14522.	14811.	15068.	15296.	15497.
15672.	15823.	15953.	16061.	16151.	16222.	16277.	16317.	16343.	16355.
16356.	16345.	16324.	16293.	16254.	16207.	16152.	16090.	16023.	15949.

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	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	2416.	2412.	2329.	1120.	81852.
INCHES		0.19	0.75	1.08	1.10
AC-FT		1197.	4623.	6665.	6768.

STATION 1, PLAN 1, RTIO 4

92.	92.	92.	92.	92.	92.	92.	92.	92.	92.
92.	92.	92.	92.	92.	92.	92.	92.	92.	92.
92.	92.	92.	92.	92.	92.	92.	92.	92.	92.
92.	92.	93.	93.	95.	97.	100.	104.	110.	120.
133.	153.	180.	215.	259.	312.	373.	443.	521.	605.
700.	910.	1084.	1258.	1430.	1595.	1753.	1937.	2128.	2303.
2462.	2607.	2739.	2857.	2963.	3058.	3142.	3216.	3281.	3337.
3385.	3426.	3460.	3487.	3509.	3525.	3536.	3542.	3543.	3541.
3535.	3525.	3513.	3497.	3479.	3458.	3435.	3410.	3383.	3354.

STOR

994.	994.	994.	994.	994.	994.	994.	994.	994.	994.
994.	994.	994.	994.	994.	994.	994.	994.	994.	994.
994.	994.	994.	994.	994.	994.	994.	994.	994.	994.
995.	997.	1001.	1009.	1023.	1045.	1076.	1123.	1190.	1291.
1440.	1653.	1945.	2324.	2797.	3364.	4028.	4783.	5623.	6535.
7504.	8510.	9536.	10564.	11576.	12556.	13485.	14352.	15151.	15883.
16549.	17154.	17702.	18196.	18639.	19034.	19385.	19695.	19966.	20201.
20403.	20573.	20715.	20829.	20919.	20986.	21031.	21056.	21063.	21053.
21028.	20988.	20935.	20869.	20792.	20706.	20609.	20504.	20392.	20272.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	3543.	3537.	3438.	1662.	121287.
INCHES		0.29	1.11	1.61	1.63
AC-FT		1755.	6823.	9892.	10029.

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STATION 1, PLAN 1, RTIO 5

115.	115.	115.	115.	115.	115.	115.	115.	115.	115.
115.	115.	115.	115.	115.	115.	115.	115.	115.	115.
115.	115.	115.	115.	115.	115.	115.	115.	115.	115.
115.	115.	116.	117.	118.	121.	125.	130.	138.	149.
167.	191.	225.	269.	324.	389.	466.	554.	660.	852.
1055.	1266.	1482.	1697.	1951.	2240.	2513.	2766.	2998.	3210.
3403.	3578.	3736.	3877.	4004.	4116.	4216.	4303.	4378.	4443.
4498.	4544.	4581.	4611.	4632.	4648.	4656.	4659.	4657.	4649.
4637.	4621.	4601.	4577.	4550.	4520.	4488.	4452.	4415.	4376.

STOR

1242.	1242.	1242.	1242.	1242.	1242.	1242.	1242.	1242.	1242.
1242.	1242.	1242.	1242.	1242.	1242.	1242.	1242.	1242.	1242.
1242.	1242.	1242.	1242.	1242.	1242.	1242.	1242.	1242.	1243.
1244.	1246.	1252.	1262.	1279.	1306.	1345.	1403.	1488.	1614.
1800.	2067.	2432.	2906.	3496.	4205.	5034.	5979.	7028.	8164.
9366.	10613.	11884.	13159.	14413.	15620.	16759.	17815.	18786.	19672.
20478.	21208.	21867.	22458.	22987.	23456.	23871.	24234.	24550.	24821.
25051.	25242.	25398.	25520.	25612.	25675.	25712.	25724.	25714.	25683.
25633.	25565.	25481.	25381.	25269.	25144.	25007.	24860.	24704.	24539.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	4659.	4651.	4530.	2213.	161397.
INCHES		0.38	1.46	2.14	2.17
AC-FT		2308.	8989.	13174.	13345.

STATION 1, PLAN 1, RTIO 6

138.	138.	138.	138.	138.	138.	138.	138.	138.	138.
138.	138.	138.	138.	138.	138.	138.	138.	138.	138.
138.	138.	138.	138.	138.	138.	138.	138.	138.	138.
138.	138.	139.	140.	142.	145.	149.	156.	165.	179.
200.	230.	270.	323.	388.	467.	559.	684.	897.	1126.

4334.	4539.	4723.	4888.	5036.	5180.	5327.	5455.	5565.	5658.
5735.	5797.	5846.	5883.	5908.	5923.	5927.	5923.	5911.	5892.
5865.	5832.	5794.	5750.	5702.	5649.	5593.	5533.	5470.	5405.

STOR

1490.	1490.	1490.	1490.	1490.	1490.	1490.	1490.	1490.	1490.
1490.	1490.	1490.	1490.	1490.	1490.	1490.	1490.	1490.	1490.
1490.	1490.	1490.	1490.	1490.	1490.	1490.	1491.	1491.	1491.
1493.	1495.	1502.	1514.	1535.	1567.	1615.	1684.	1786.	1936.
2159.	2480.	2918.	3487.	4195.	5046.	6041.	7173.	8427.	9782.
11216.	12704.	14220.	15735.	17219.	18644.	19988.	21234.	22376.	23419.
24365.	25220.	25991.	26681.	27296.	27840.	28317.	28730.	29083.	29383.
29631.	29832.	29990.	30108.	30190.	30237.	30252.	30239.	30200.	30137.
30051.	29945.	29821.	29680.	29524.	29355.	29173.	28980.	28778.	28567.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	5927.	5914.	5723.	2804.	204484.
INCHES		0.48	1.85	2.72	2.75
AC-FT		2934.	11356.	16696.	16902.

STATION 1, PLAN 1, RTIO 7

161.	161.	161.	161.	161.	161.	161.	161.	161.	161.
161.	161.	161.	161.	161.	161.	161.	161.	161.	161.
161.	161.	161.	161.	161.	161.	161.	161.	161.	161.
161.	162.	162.	164.	166.	169.	174.	182.	193.	209.
233.	268.	315.	377.	453.	545.	663.	886.	1132.	1399.
1681.	2040.	2460.	2879.	3288.	3682.	4053.	4397.	4712.	4999.
5300.	5602.	5872.	6112.	6323.	6509.	6669.	6807.	6924.	7021.
7100.	7163.	7210.	7243.	7262.	7270.	7267.	7253.	7230.	7199.
7160.	7113.	7061.	7002.	6938.	6870.	6797.	6720.	6640.	6557.

STOR

1739.	1739.	1739.	1739.	1739.	1739.	1739.	1739.	1739.	1739.
1739.	1739.	1739.	1739.	1739.	1739.	1739.	1739.	1739.	1739.
1739.	1739.	1739.	1739.	1739.	1739.	1739.	1739.	1739.	1740.
1741.	1745.	1752.	1766.	1791.	1828.	1884.	1965.	2083.	2259.
2519.	2893.	3404.	4068.	4894.	5888.	7048.	8364.	9820.	11394.
13059.	14786.	16539.	18287.	19998.	21643.	23192.	24628.	25943.	27142.
28227.	29203.	30074.	30847.	31529.	32127.	32644.	33089.	33466.	33779.
34035.	34236.	34388.	34494.	34558.	34583.	34572.	34528.	34454.	34353.
34226.	34077.	33907.	33718.	33512.	33291.	33057.	32810.	32552.	32284.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	7270.	7254.	7020.	3449.	251226.
INCHES		0.59	2.27	3.34	3.38
AC-FT		3599.	13931.	20534.	20773.

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STATION 1, PLAN 1, RTIO 8

184.	184.	184.	184.	184.	184.	184.	184.	184.	184.
184.	184.	184.	184.	184.	184.	184.	184.	184.	184.
184.	184.	184.	184.	184.	184.	184.	184.	184.	184.
184.	185.	185.	187.	189.	193.	199.	208.	220.	239.
267.	306.	360.	430.	518.	623.	833.	1087.	1367.	1671.
2066.	2535.	3011.	3485.	3950.	4396.	4816.	5231.	5690.	6186.
6480.	6815.	7113.	7377.	7609.	7811.	7985.	8133.	8258.	8360.
8442.	8505.	8551.	8581.	8596.	8597.	8586.	8563.	8530.	8487.
8436.	8377.	8310.	8237.	8158.	8074.	7985.	7892.	7796.	7696.

STOR

1987.	1987.	1987.	1987.	1987.	1987.	1987.	1987.	1987.	1987.
1987.	1987.	1987.	1987.	1987.	1987.	1987.	1987.	1987.	1987.
1987.	1987.	1987.	1987.	1987.	1987.	1987.	1987.	1988.	1989.
1990.	1994.	2002.	2019.	2046.	2089.	2153.	2245.	2381.	2582.
2879.	3307.	3890.	4649.	5593.	6729.	8051.	9550.	11208.	13000.
14894.	16853.	18840.	20821.	22762.	24625.	26380.	28005.	29487.	30828.

38364.	38567.	38715.	38810.	38858.	38863.	38826.	38753.	38647.	38509.
38343.	38152.	37938.	37702.	37448.	37176.	36890.	36590.	36278.	35955.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	8597.	8579.	8302.	4101.	298601.
INCHES		0.69	2.68	3.97	4.02
AC-FT		4256.	16475.	24417.	24691.

STATION 1, PLAN 1, RTIO 9

230.	230.	230.	230.	230.	230.	230.	230.	230.	230.
230.	230.	230.	230.	230.	230.	230.	230.	230.	230.
230.	230.	230.	230.	230.	230.	230.	230.	230.	230.
230.	231.	232.	234.	237.	242.	249.	260.	276.	299.
333.	383.	450.	538.	653.	893.	1171.	1486.	1846.	2378.
2938.	3518.	4186.	4692.	5389.	6819.	6684.	7296.	7851.	8352.
8801.	9202.	9585.	9954.	10275.	10550.	10784.	10979.	11138.	11265.
11362.	11431.	11475.	11495.	11494.	11473.	11435.	11381.	11312.	11229.
11135.	11030.	10915.	10791.	10660.	10522.	10378.	10229.	10075.	9917.

STOR

2484.	2484.	2484.	2484.	2484.	2484.	2484.	2484.	2484.	2484.
2484.	2484.	2484.	2484.	2484.	2484.	2484.	2484.	2484.	2484.
2484.	2484.	2484.	2484.	2484.	2484.	2484.	2484.	2485.	2486.
2488.	2492.	2503.	2523.	2558.	2612.	2691.	2807.	2976.	3227.
3599.	4133.	4863.	5811.	6991.	8406.	10049.	11912.	13973.	16196.
18537.	20956.	23411.	25860.	28256.	30549.	32693.	34665.	36457.	38072.
39522.	40815.	41961.	42966.	43838.	44588.	45225.	45756.	46191.	46536.
46800.	46988.	47107.	47162.	47159.	47104.	46999.	46851.	46663.	46438.
46181.	45895.	45582.	45245.	44888.	44512.	44119.	43713.	43294.	42865.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	11495.	11467.	11031.	5478.	398557.
INCHES		0.93	3.56	5.31	5.36
AC-FT		5689.	21890.	32613.	32956.

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

SUB-AREA RUNOFF COMPUTATION

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

HYDROGRAPH DATA

IHYDG	IUNG	TAREA	SNAP	TRSDA	TRSPC	RATIO	ISNOW	ISAME	LOCAL
1	0	57.00	0.0	57.00	0.0	0.0	0	1	0

PRECIP DATA

SPFE	PMS	R6	R12	R24	R48	R72	R96
0.0	16.90	77.00	91.00	102.00	108.00	0.0	0.0

SPC COMPUTED BY THE PROGRAM IS 0.853

LOSS DATA

STRKR	DLTKR	RTIOL	ERAIN	STRKS	RTIOK	STRTL	CNSTL	ALSMX	RTIMP
0.0	0.0	1.00	0.0	0.0	1.00	1.00	0.10	0.0	0.0

UNIT HYDROGRAPH DATA

TC= 6.20 R= 6.20 NTA= 0

RECESSION DATA

STRTQ= 115.00 QRCSN= 115.00 RTIOR= 1.00

UNIT HYDROGRAPH 37 END-OF-PERIOD ORDINATES, LAG= 5.60 HOURS, CP= 0.57 VOL= 1.00

251.	925.	1841.	2779.	3472.	3751.	3522.	3019.	2568.	2185.
1858	1581	1285	1144	978	829	785	688	518	424

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73. 62. 53. 45. 38. 33. 28.

END-OF-PERIOD FLOW

TIME	RAIN	EXCS	COMP Q
1	0.01	0.00	115.
2	0.01	0.00	115.
3	0.01	0.00	115.
4	0.01	0.00	115.
5	0.01	0.00	115.
6	0.01	0.00	115.
7	0.02	0.00	115.
8	0.02	0.00	115.
9	0.02	0.00	115.
10	0.02	0.00	115.
11	0.02	0.00	115.
12	0.02	0.00	115.
13	0.07	0.00	115.
14	0.08	0.00	115.
15	0.10	0.00	115.
16	0.25	0.00	115.
17	0.09	0.00	115.
18	0.07	0.00	115.
19	0.01	0.00	115.
20	0.01	0.00	115.
21	0.01	0.00	115.
22	0.01	0.00	115.
23	0.01	0.00	115.
24	0.01	0.00	115.
25	0.11	0.00	115.
26	0.11	0.00	116.
27	0.11	0.01	120.
28	0.11	0.01	129.
29	0.11	0.01	144.
30	0.11	0.01	163.
31	0.34	0.24	242.
32	0.34	0.24	475.
33	0.34	0.24	918.
34	0.34	0.24	1575.
35	0.34	0.24	2388.
36	0.34	0.24	3265.
37	1.11	1.01	4281.
38	1.33	1.23	5757.
39	1.67	1.57	8070.
40	4.22	4.12	12088.
41	1.55	1.45	18129.
42	1.22	1.12	25251.
43	0.16	0.06	31893.
44	0.16	0.06	36390.
45	0.16	0.06	37893.
46	0.16	0.06	36241.
47	0.16	0.06	32570.
48	0.16	0.06	28430.
49	0.0	0.0	24535.
50	0.0	0.0	21155.
51	0.0	0.0	18218.
52	0.0	0.0	15648.
53	0.0	0.0	13397.
54	0.0	0.0	11436.
55	0.0	0.0	9747.
56	0.0	0.0	8310.
57	0.0	0.0	7087.
58	0.0	0.0	6046.
59	0.0	0.0	5161.
60	0.0	0.0	4408.
61	0.0	0.0	3767.

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63	0.0	0.0	2758.
64	0.0	0.0	2363.
65	0.0	0.0	2028.
66	0.0	0.0	1742.
67	0.0	0.0	1499.
68	0.0	0.0	1287.
69	0.0	0.0	1106.
70	0.0	0.0	953.
71	0.0	0.0	822.
72	0.0	0.0	711.
73	0.0	0.0	617.
74	0.0	0.0	518.
75	0.0	0.0	429.
76	0.0	0.0	345.
77	0.0	0.0	213.
78	0.0	0.0	164.
79	0.0	0.0	130.
80	0.0	0.0	127.
81	0.0	0.0	123.
82	0.0	0.0	121.
83	0.0	0.0	119.
84	0.0	0.0	117.
85	0.0	0.0	115.
86	0.0	0.0	115.
87	0.0	0.0	115.
88	0.0	0.0	115.
89	0.0	0.0	115.
90	0.0	0.0	115.
SUM	15.66	12.34	460522.

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	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	37893.	33903.	17589.	6367.	460518.
INCHES		5.53	11.48	12.47	12.53
AC-FT		16820.	34986.	37908.	38079.

HYDROGRAPH AT STA 2 FOR PLAN 1, RTIO 1

11.	11.	11.	11.	11.	11.	11.	11.	11.	11.
11.	12.	12.	12.	12.	12.	12.	12.	12.	12.
12.	12.	12.	12.	12.	12.	12.	13.	14.	16.
24.	48.	92.	157.	239.	326.	428.	576.	807.	1209.
1813.	2525.	3189.	3639.	3789.	3624.	3257.	2843.	2453.	2116.
1822.	1565.	1340.	1144.	975.	831.	709.	605.	516.	441.
377.	322.	276.	236.	203.	174.	150.	129.	111.	95.
82.	71.	62.	52.	43.	34.	21.	16.	13.	13.
12.	12.	12.	12.	11.	11.	11.	11.	11.	11.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	3789.	3390.	1759.	637.	46052.
INCHES		0.55	1.15	1.25	1.25
AC-FT		1682.	3491.	3791.	3808.

HYDROGRAPH AT STA 2 FOR PLAN 1, RTIO 2

23.	23.	23.	23.	23.	23.	23.	23.	23.	23.
23.	23.	23.	23.	23.	23.	23.	23.	23.	23.
23.	23.	23.	23.	23.	23.	24.	26.	29.	33.
48.	95.	184.	315.	478.	653.	856.	1151.	1614.	2418.
3626.	5050.	6379.	7278.	7579.	7248.	6514.	5686.	4907.	4231.
3644.	3130.	2679.	2287.	1949.	1662.	1417.	1209.	1032.	882.
753.	644.	552.	473.	406.	348.	300.	257.	221.	191.
164.	142.	123.	104.	86.	69.	43.	33.	26.	25.
25.	24.	24.	23.	23.	23.	23.	23.	23.	23.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	7579.	6781.	3518.	1273.	92102.

AC-FT		3364.	6981.	7581.		7616.			

HYDROGRAPH AT STA 2 FOR PLAN 1, RTIO 3

34.	34.	34.	34.	34.	34.	34.	34.	34.	34.
34.	34.	34.	35.	35.	35.	35.	35.	35.	35.
35.	35.	35.	35.	35.	35.	36.	39.	43.	49.
72.	143.	275.	472.	717.	979.	1284.	1727.	2421.	3626.
5439.	7575.	9568.	10917.	11368.	10872.	9771.	8529.	7360.	6347.
5465.	4695.	4019.	3431.	2924.	2493.	2126.	1814.	1548.	1322.
1130.	967.	827.	709.	608.	523.	450.	386.	332.	286.
247.	213.	185.	155.	129.	103.	64.	49.	39.	38.
37.	36.	36.	35.	34.	34.	34.	34.	34.	34.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	11368.	10171.	5277.	1910.	138154.
INCHES		1.66	3.44	3.74	3.76
AC-FT		5046.	10472.	11372.	11424.

HYDROGRAPH AT STA 2 FOR PLAN 1, RTIO 4

46.	46.	46.	46.	46.	46.	46.	46.	46.	46.
46.	46.	46.	46.	46.	46.	46.	46.	46.	46.
46.	46.	46.	46.	46.	46.	48.	52.	58.	65.
97.	190.	367.	630.	955.	1306.	1712.	2303.	3228.	4835.
7252.	10100.	12757.	14556.	15157.	14496.	13028.	11372.	9814.	8462.
7287.	6259.	5359.	4574.	3899.	3324.	2835.	2418.	2064.	1763.
1507.	1289.	1103.	945.	811.	697.	600.	515.	443.	381.
329.	284.	247.	207.	171.	138.	85.	66.	52.	51.
49.	48.	47.	47.	46.	46.	46.	46.	46.	46.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	15157.	13561.	7036.	2547.	184206.
INCHES		2.21	4.59	4.99	5.01
AC-FT		6728.	13962.	15163.	15231.

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HYDROGRAPH AT STA 2 FOR PLAN 1, RTIO 5

57.	57.	57.	57.	57.	57.	57.	57.	57.	57.
57.	57.	57.	57.	58.	58.	58.	58.	58.	58.
58.	58.	58.	58.	58.	58.	60.	65.	72.	81.
121.	238.	459.	787.	1194.	1632.	2141.	2878.	4035.	6044.
9065.	12625.	15946.	18195.	18947.	18121.	16285.	14215.	12267.	10578.
9109.	7824.	6699.	5718.	4874.	4155.	3543.	3023.	2580.	2204.
1883.	1611.	1379.	1182.	1014.	871.	750.	643.	553.	476.
411.	356.	308.	259.	214.	172.	107.	82.	65.	63.
62.	60.	59.	58.	57.	57.	57.	57.	57.	57.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	18947.	16951.	8795.	3184.	230258.
INCHES		2.77	5.74	6.23	6.26
AC-FT		8410.	17453.	18954.	19039.

HYDROGRAPH AT STA 2 FOR PLAN 1, RTIO 6

69.	69.	69.	69.	69.	69.	69.	69.	69.	69.
69.	69.	69.	69.	69.	69.	69.	69.	69.	69.
69.	69.	69.	69.	69.	70.	72.	78.	86.	98.
145.	285.	551.	945.	1433.	1959.	2569.	3454.	4842.	7253.
10877.	15150.	19136.	21834.	22736.	21745.	19542.	17058.	14721.	12693.
10931.	9389.	8038.	6861.	5848.	4986.	4252.	3628.	3096.	2645.
2260.	1933.	1655.	1418.	1217.	1045.	899.	772.	664.	572.
493.	427.	370.	311.	257.	207.	128.	98.	78.	76.
74.	72.	71.	70.	69.	69.	69.	69.	69.	69.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	22736.	20342.	10553.	3820.	276309.
INCHES		3.32	6.89	7.48	7.52
AC-FT		10092	20942	22745	22847

HYDROGRAPH AT STA 2 FOR PLAN 1, RTIO 7

80.	80.	80.	80.	80.	80.	80.	80.	80.	80.
80.	80.	80.	80.	80.	81.	81.	81.	81.	81.
81.	81.	81.	81.	81.	81.	84.	91.	101.	114.
169.	333.	643.	1102.	1672.	2285.	2997.	4030.	5649.	8462.
12690.	17675.	22325.	25473.	26525.	25369.	22799.	19901.	17174.	14808.
12753.	10954.	9378.	8005.	6823.	5817.	4961.	4232.	3613.	3085.
2637.	2255.	1931.	1654.	1419.	1219.	1049.	901.	775.	667.
576.	498.	432.	362.	300.	241.	149.	115.	91.	89.
86.	85.	83.	82.	80.	80.	80.	80.	80.	80.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	26525.	23732.	12312.	4457.	322361.
INCHES		3.87	8.04	8.73	8.77
AC-FT		11774.	24434.	26535.	26655.

HYDROGRAPH AT STA 2 FOR PLAN 1, RTIO 8

92.	92.	92.	92.	92.	92.	92.	92.	92.	92.
92.	92.	92.	92.	92.	92.	92.	92.	92.	92.
92.	92.	92.	92.	92.	93.	96.	103.	115.	130.
193.	380.	734.	1260.	1911.	2612.	3425.	4605.	6456.	9670.
14503.	20200.	25514.	29112.	30315.	28993.	26056.	22744.	19628.	16924.
14574.	12519.	10718.	9148.	7798.	6648.	5669.	4837.	4129.	3526.
3014.	2578.	2206.	1891.	1622.	1394.	1199.	1030.	885.	762.
658.	569.	493.	414.	343.	276.	170.	131.	104.	101.
99.	97.	95.	93.	92.	92.	92.	92.	92.	92.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	30315.	27122.	14071.	5094.	368413.
INCHES		4.43	9.19	9.98	10.02
AC-FT		13456.	27924.	30326.	30463.

HYDROGRAPH AT STA 2 FOR PLAN 1, RTIO 9

115.	115.	115.	115.	115.	115.	115.	115.	115.	115.
115.	115.	115.	115.	115.	115.	115.	115.	115.	115.
115.	115.	115.	115.	115.	116.	120.	129.	144.	163.
242.	475.	918.	1575.	2388.	3265.	4281.	5757.	8069.	12088.
18129.	25250.	31893.	36390.	37893.	36241.	32570.	28430.	24535.	21155.
18218.	15648.	13397.	11436.	9747.	8310.	7086.	6046.	5161.	4408.
3767.	3222.	2758.	2363.	2028.	1742.	1499.	1287.	1106.	953.
822.	711.	617.	518.	429.	345.	213.	164.	130.	127.
123.	121.	119.	117.	115.	115.	115.	115.	115.	115.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	37893.	33903.	17589.	6367.	460516.
INCHES		5.53	11.48	12.47	12.53
AC-FT		16820.	34985.	37988.	38079.

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COMBINE HYDROGRAPHS

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

SUM OF 2 HYDROGRAPHS AT 2 PLAN 1 RTIO 1

34.	34.	34.	34.	34.	34.	34.	34.	34.	34.
34.	34.	34.	34.	34.	34.	34.	35.	35.	35.
35.	35.	35.	35.	35.	35.	35.	36.	37.	39.
47.	71.	115.	181.	263.	351.	453.	602.	835.	1239.
1846.	2563.	3234.	3693.	3854.	3702.	3350.	2954.	2584.	2267.
1996.	1762.	1561.	1389.	1244.	1124.	1024.	941.	872.	815.
768.	730.	698.	672.	651.	634.	620.	608.	599.	592.

357.	358.	359.	360.	361.	361.	361.	361.	361.	360.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	3854.	3465.	1931.	985.	65816.
INCHES		0.19	0.42	0.59	0.59
AC-FT		1719.	3832.	5391.	5442.

SUM OF 2 HYDROGRAPHS AT 2 PLAN 1 RTIO 2

69.	69.	69.	69.	69.	69.	69.	69.	69.	69.
69.	69.	69.	69.	69.	69.	69.	69.	69.	69.
69.	69.	69.	69.	69.	69.	70.	72.	75.	79.
94.	141.	230.	362.	525.	701.	906.	1203.	1669.	2477.
3692.	5127.	6469.	7386.	7788.	7484.	6701.	5907.	5167.	4534.
3991.	3524.	3122.	2778.	2489.	2248.	2048.	1909.	1804.	1719.
1652.	1599.	1558.	1526.	1501.	1483.	1470.	1459.	1452.	1447.
1443.	1441.	1440.	1436.	1431.	1426.	1499.	1497.	1496.	1410.
1413.	1414.	1414.	1413.	1412.	1409.	1496.	1401.	1396.	1391.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	7708.	6929.	3880.	1921.	139588.
INCHES		0.37	0.84	1.25	1.26
AC-FT		3438.	7700.	11439.	11542.

SUM OF 2 HYDROGRAPHS AT 2 PLAN 1 RTIO 3

103.	103.	103.	103.	103.	103.	103.	103.	103.	103.
103.	103.	103.	103.	103.	103.	103.	103.	103.	103.
103.	103.	103.	103.	103.	104.	105.	108.	112.	118.
142.	212.	345.	542.	788.	1052.	1359.	1805.	2504.	3716.
5539.	7690.	9703.	11078.	11562.	11106.	10051.	8861.	7751.	6800.
5987.	5286.	4702.	4246.	3870.	3565.	3318.	3118.	2956.	2826.
2721.	2638.	2573.	2523.	2500.	2500.	2496.	2494.	2494.	2496.
2499.	2502.	2505.	2501.	2496.	2488.	2461.	2456.	2452.	2454.
2453.	2450.	2444.	2436.	2426.	2415.	2402.	2387.	2371.	2353.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	11562.	10394.	5903.	3030.	220007.
INCHES		0.56	1.28	1.96	1.98
AC-FT		5157.	11714.	18038.	18192.

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SUM OF 2 HYDROGRAPHS AT 2 PLAN 1 RTIO 4

138.	138.	138.	138.	138.	138.	138.	138.	138.	138.
138.	138.	138.	138.	138.	138.	138.	138.	138.	138.
138.	138.	138.	138.	138.	138.	140.	144.	150.	157.
189.	282.	460.	723.	1050.	1403.	1812.	2407.	3338.	4955.
7385.	10253.	12937.	14771.	15416.	14808.	13401.	11815.	10334.	9067.
8027.	7170.	6443.	5832.	5328.	4919.	4587.	4355.	4192.	4066.
3969.	3896.	3842.	3802.	3774.	3754.	3741.	3730.	3723.	3718.
3714.	3710.	3707.	3694.	3680.	3663.	3621.	3607.	3595.	3592.
3584.	3574.	3560.	3544.	3525.	3504.	3481.	3456.	3429.	3400.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	15416.	13858.	7990.	4200.	305494.
INCHES		0.75	1.73	2.73	2.75
AC-FT		6875.	15857.	25055.	25260.

100

SUM OF 2 HYDROGRAPHS AT 2 PLAN 1 RTIO 5

172.	172.	172.	172.	172.	172.	172.	172.	172.	172.
172.	172.	172.	172.	172.	172.	172.	172.	172.	172.
172.	172.	172.	172.	172.	173.	175.	180.	187.	196.
236.	353.	575.	904.	1313.	1753.	2265.	3008.	4173.	6193.
9231.	12817.	16172.	18464.	19270.	18510.	16751.	14769.	12927.	11429.

5287.	5187.	5115.	5059.	5018.	4987.	4965.	4946.	4931.	4920.
4909.	4900.	4889.	4869.	4847.	4820.	4763.	4741.	4722.	4713.
4699.	4682.	4660.	4636.	4608.	4578.	4545.	4510.	4473.	4433.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	19270.	17323.	10126.	5397.	391656.
INCHES		0.94	2.19	3.50	3.53
AC-FT		8594.	20095.	32128.	32385.

SUM OF 2 HYDROGRAPHS AT 2 PLAN 1 RTIO 6

207.	207.	207.	207.	207.	207.	207.	207.	207.	207.
207.	207.	207.	207.	207.	207.	207.	207.	207.	207.
207.	207.	207.	207.	207.	208.	210.	216.	224.	236.
283.	424.	690.	1085.	1575.	2104.	2718.	3610.	5007.	7432.
11077.	15380.	19406.	22157.	23124.	22212.	20102.	17742.	15617.	13819.
12299.	11009.	9943.	9129.	8471.	7950.	7538.	7212.	6954.	6752.
6594.	6472.	6378.	6307.	6252.	6225.	6227.	6228.	6229.	6230.
6228.	6224.	6216.	6194.	6165.	6129.	6055.	6022.	5989.	5967.
5939.	5905.	5865.	5820.	5771.	5718.	5662.	5602.	5539.	5474.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	23124.	20790.	12282.	6625.	480715.
INCHES		1.12	2.65	4.29	4.33
AC-FT		10315.	24374.	39441.	39749.

SUM OF 2 HYDROGRAPHS AT 2 PLAN 1 RTIO 7

241.	241.	241.	241.	241.	241.	241.	241.	241.	241.
241.	241.	241.	241.	241.	241.	241.	241.	241.	241.
241.	241.	241.	241.	241.	242.	245.	252.	262.	275.
330.	494.	805.	1266.	1838.	2455.	3171.	4212.	5842.	8671.
12924.	17943.	22640.	25856.	26979.	25914.	23462.	20787.	18307.	16207.
14433.	12994.	11838.	10883.	10111.	9499.	9014.	8629.	8324.	8084.
7936.	7857.	7803.	7766.	7743.	7728.	7719.	7708.	7698.	7688.
7676.	7660.	7641.	7605.	7562.	7511.	7416.	7368.	7321.	7287.
7246.	7198.	7144.	7084.	7019.	6950.	6877.	6801.	6721.	6638.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	26979.	24272.	14462.	7906.	573588.
INCHES		1.31	3.12	5.13	5.16
AC-FT		12042.	28700.	47669.	47428.

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SUM OF 2 HYDROGRAPHS AT 2 PLAN 1 RTIO 8

276.	276.	276.	276.	276.	276.	276.	276.	276.	276.
276.	276.	276.	276.	276.	276.	276.	276.	276.	276.
276.	276.	276.	276.	276.	277.	280.	287.	299.	314.
377.	565.	920.	1447.	2100.	2805.	3624.	4813.	6676.	9909.
14770.	20507.	25874.	29543.	30833.	29616.	26889.	23831.	20995.	18595.
16641.	15054.	13729.	12634.	11748.	11044.	10486.	10067.	9819.	9632.
9494.	9393.	9320.	9268.	9231.	9205.	9184.	9163.	9143.	9123.
9100.	9074.	9044.	8995.	8938.	8873.	8756.	8694.	8634.	8589.
8535.	8473.	8405.	8330.	8250.	8166.	8077.	7984.	7888.	7788.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	30833.	27764.	16684.	9195.	667815.
INCHES		1.50	3.61	5.96	6.01
AC-FT		13774.	33109.	54743.	55154.

SUM OF 2 HYDROGRAPHS AT 2 PLAN 1 RTIO 9

345.	345.	345.	345.	345.	345.	345.	345.	345.	345.
345.	345.	345.	345.	345.	345.	345.	345.	345.	345.
345.	345.	345.	345.	345.	346.	350.	359.	374.	393.

18462.	25633.	32343.	36928.	38547.	37134.	33741.	27916.	20388.	13333.
21156.	19166.	17503.	16127.	15056.	14329.	13771.	13342.	13012.	12760.
12568.	12424.	12344.	12318.	12303.	12292.	12283.	12266.	12245.	12218.
12184.	12142.	12091.	12013.	11922.	11818.	11648.	11545.	11442.	11356.
11258.	11150.	11033.	10908.	10775.	10637.	10493.	10344.	10190.	10032.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	38547.	34768.	21190.	11845.	859074.
INCHES		1.88	4.58	7.68	7.73
AC-FT		17249.	42052.	70521.	71035.

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HYDROGRAPH ROUTING

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

ROUTING DATA

QLOSS	CLOSS	AVC	IRES	ISAME
0.0	0.0	0.0	1	1

NSTPS	NSTDL	LAG	AMSKK	X	TSK	STORA
1	0	0	0.0	0.0	0.0	-1.

STORAGE#	0.	1640.	4095.	6552.	9009.	11466.	0.	0.	0.	0.
OUTFLOW#	0.	470.	3330.	15525.	33295.	55202.	0.	0.	0.	0.

STATION 2, PLAN 1, RTIO 1

34.	34.	34.	34.	34.	34.	34.	34.	34.	34.
34.	34.	34.	34.	34.	34.	34.	34.	34.	34.
34.	34.	34.	34.	34.	35.	35.	35.	35.	35.
35.	35.	37.	39.	44.	58.	58.	69.	84.	107.
140.	188.	252.	327.	408.	535.	810.	1025.	1185.	1299.
1376.	1422.	1444.	1447.	1435.	1412.	1381.	1344.	1304.	1262.
1219.	1175.	1133.	1092.	1052.	1015.	979.	945.	914.	885.
858.	832.	809.	788.	768.	749.	732.	716.	701.	687.
675.	664.	655.	646.	638.	631.	625.	619.	614.	609.

STOR

120.	120.	120.	120.	120.	120.	120.	120.	120.	120.
120.	120.	120.	120.	120.	120.	120.	120.	120.	120.
120.	120.	120.	120.	120.	120.	120.	120.	121.	121.
122.	124.	128.	137.	152.	174.	203.	241.	294.	372.
489.	658.	879.	1141.	1423.	1696.	1932.	2117.	2254.	2352.
2417.	2457.	2476.	2478.	2468.	2448.	2422.	2390.	2356.	2320.
2283.	2245.	2209.	2174.	2140.	2107.	2077.	2048.	2021.	1996.
1973.	1951.	1931.	1913.	1896.	1880.	1865.	1851.	1838.	1827.
1816.	1807.	1799.	1791.	1784.	1778.	1773.	1768.	1763.	1759.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	1447.	1423.	1192.	630.	46812.
INCHES		0.08	0.26	0.41	0.41
AC-FT		706.	2365.	3753.	3805.

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STATION 2, PLAN 1, RTIO 2

69.	69.	69.	69.	69.	69.	69.	69.	69.	69.
69.	69.	69.	69.	69.	69.	69.	69.	69.	69.
69.	69.	69.	69.	69.	69.	69.	69.	69.	69.
70.	71.	74.	79.	87.	100.	116.	138.	168.	213.
280.	377.	503.	1184.	1768.	2300.	2736.	3064.	3291.	3717.
3903.	3853.	3673.	3427.	3283.	3199.	3103.	2999.	2894.	2790.
2689.	2591.	2498.	2410.	2328.	2251.	2180.	2114.	2054.	1998.
1947.	1901.	1859.	1820.	1785.	1752.	1721.	1692.	1666.	1642.
1621.	1602.	1585.	1569.	1555.	1541.	1529.	1518.	1507.	1496.

STOR

241.	241.	241.	241.	241.	241.	241.	241.	241.	241.
241.	241.	241.	241.	241.	241.	241.	241.	241.	241.
241.	241.	241.	241.	241.	241.	241.	241.	241.	242.
243.	247.	257.	275.	305.	348.	405.	482.	588.	743.
978.	1315.	1754.	2252.	2754.	3211.	3585.	3867.	4062.	4173.
4210.	4200.	4164.	4114.	4055.	3983.	3900.	3811.	3721.	3632.
3545.	3461.	3381.	3305.	3235.	3169.	3108.	3051.	2999.	2952.
2908.	2868.	2832.	2799.	2768.	2740.	2714.	2689.	2667.	2646.
2628.	2612.	2597.	2584.	2571.	2560.	2549.	2539.	2530.	2521.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	3983.	3644.	2889.	1539.	112050.
INCHES		0.20	0.62	1.00	1.01
AC-FT		1008.	5734.	9162.	9265.

STATION 2, PLAN 1, RTIO 3

103.	103.	103.	103.	103.	103.	103.	103.	103.	103.
103.	103.	103.	103.	103.	103.	103.	103.	103.	103.
103.	103.	103.	103.	103.	104.	104.	104.	104.	104.
105.	106.	110.	118.	131.	149.	174.	207.	253.	320.
420.	844.	1565.	2376.	3198.	5609.	7301.	8034.	8127.	7837.
7346.	6764.	6162.	5587.	5067.	4607.	4211.	3873.	3588.	3351.
3283.	3227.	3170.	3113.	3058.	3007.	2960.	2918.	2879.	2844.
2812.	2783.	2757.	2734.	2712.	2692.	2672.	2653.	2634.	2618.
2603.	2589.	2576.	2563.	2551.	2539.	2527.	2515.	2502.	2490.

STOR

361.	361.	361.	361.	361.	361.	361.	361.	361.	361.
361.	361.	361.	361.	361.	361.	361.	361.	361.	361.
361.	361.	361.	361.	361.	361.	361.	361.	362.	363.
365.	371.	385.	412.	457.	521.	608.	723.	882.	1115.
1467.	1961.	2580.	3276.	3981.	4554.	4895.	5043.	5061.	5003.
4904.	4787.	4665.	4550.	4445.	4352.	4272.	4204.	4147.	4099.
4054.	4007.	3958.	3909.	3862.	3818.	3778.	3741.	3708.	3677.
3650.	3626.	3604.	3583.	3565.	3547.	3530.	3513.	3498.	3484.
3471.	3459.	3448.	3437.	3426.	3416.	3406.	3395.	3385.	3374.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	8127.	7568.	4808.	2524.	183624.
INCHES		0.41	1.04	1.64	1.65
AC-FT		3755.	9542.	15029.	15183.

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STATION 2, PLAN 1, RTIO 4

138.	138.	138.	138.	138.	138.	138.	138.	138.	138.
138.	138.	138.	138.	138.	138.	138.	138.	138.	138.
138.	138.	138.	138.	138.	138.	138.	138.	138.	139.
139.	142.	147.	158.	175.	199.	232.	276.	337.	426.
825.	1559.	2481.	4056.	7813.	10298.	11593.	11939.	11645.	10983.
10154.	9284.	8441.	7657.	6950.	6328.	5792.	5343.	4979.	4689.
4461.	4281.	4141.	4032.	3949.	3886.	3839.	3804.	3778.	3758.
3744.	3733.	3725.	3716.	3707.	3695.	3677.	3655.	3637.	3622.
3611.	3600.	3589.	3576.	3562.	3546.	3527.	3507.	3485.	3461.

STOR

482.	482.	482.	482.	482.	482.	482.	482.	482.	482.
482.	482.	482.	482.	482.	482.	482.	482.	482.	482.
482.	482.	482.	482.	482.	482.	482.	482.	483.	484.
487.	495.	513.	550.	609.	695.	810.	963.	1175.	1487.
1945.	2575.	3366.	4241.	4998.	5499.	5760.	5829.	5770.	5637.
5470.	5295.	5125.	4967.	4824.	4699.	4591.	4500.	4427.	4369.
4323.	4287.	4258.	4236.	4220.	4207.	4198.	4190.	4185.	4181.
4178.	4176.	4175.	4173.	4171.	4168.	4165.	4161.	4157.	4154.
4152.	4149.	4147.	4145.	4142.	4138.	4135.	4131.	4126.	4121.

CFS	11939.	11102.	6939.	3597.	261402.
INCHES		0.60	1.50	2.33	2.35
AC-FT		5500.	13770.	21416.	21621.

STATION 2, PLAN 1, RTIO 5

172.	172.	172.	172.	172.	172.	172.	172.	172.	172.
172.	172.	172.	172.	172.	172.	172.	172.	172.	172.
172.	172.	172.	172.	172.	173.	173.	173.	173.	173.
174.	177.	184.	197.	218.	249.	290.	345.	421.	715.
1350.	2246.	3482.	8192.	11825.	14230.	15388.	15514.	14947.	14005.
12913.	11794.	10719.	9725.	8838.	8080.	7448.	6929.	6505.	6162.
5885.	5665.	5490.	5353.	5246.	5163.	5100.	5051.	5013.	4983.
4960.	4941.	4925.	4910.	4892.	4872.	4845.	4813.	4785.	4762.
4743.	4725.	4707.	4687.	4665.	4640.	4613.	4584.	4553.	4519.

STOR

602.	602.	602.	602.	602.	602.	602.	602.	602.	602.
602.	602.	602.	602.	602.	602.	602.	602.	602.	602.
602.	602.	602.	602.	602.	602.	602.	602.	603.	605.
608.	618.	642.	687.	761.	869.	1013.	1204.	1469.	1851.
2402.	3165.	4126.	5074.	5807.	6291.	6524.	6550.	6436.	6246.
6026.	5800.	5584.	5383.	5205.	5052.	4925.	4820.	4735.	4666.
4610.	4565.	4530.	4503.	4481.	4464.	4452.	4442.	4434.	4428.
4423.	4420.	4416.	4413.	4410.	4406.	4400.	4394.	4388.	4384.
4380.	4376.	4372.	4368.	4364.	4359.	4354.	4348.	4341.	4334.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	15514.	14499.	9213.	4770.	346534.
INCHES		0.78	1.99	3.09	3.12
AC-FT		7193.	18283.	28397.	28654.

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STATION 2, PLAN 1, RTIO 6

207.	207.	207.	207.	207.	207.	207.	207.	207.	207.
207.	207.	207.	207.	207.	207.	207.	207.	207.	207.
207.	207.	207.	207.	207.	207.	207.	207.	207.	208.
209.	213.	221.	236.	262.	299.	348.	414.	509.	1124.
1871.	2914.	6717.	11504.	15295.	18607.	19780.	19385.	18140.	16565.
15101.	13928.	12753.	11658.	10685.	9843.	9128.	8531.	8038.	7635.
7307.	7044.	6833.	6666.	6535.	6434.	6363.	6317.	6287.	6267.
6254.	6245.	6236.	6225.	6210.	6188.	6156.	6116.	6078.	6044.
6013.	5982.	5949.	5913.	5873.	5829.	5782.	5731.	5676.	5619.

STOR

722.	722.	722.	722.	722.	722.	722.	722.	722.	722.
722.	722.	722.	722.	722.	722.	722.	722.	722.	722.
722.	722.	722.	722.	722.	722.	722.	723.	724.	726.
730.	742.	770.	824.	914.	1043.	1215.	1445.	1759.	2201.
2842.	3738.	4777.	5742.	6586.	6978.	7140.	7086.	6914.	6696.
6467.	6230.	5993.	5773.	5577.	5407.	5263.	5143.	5044.	4962.
4896.	4843.	4801.	4767.	4741.	4720.	4706.	4697.	4691.	4687.
4684.	4682.	4681.	4678.	4675.	4671.	4664.	4656.	4649.	4642.
4636.	4629.	4623.	4615.	4607.	4599.	4589.	4579.	4568.	4556.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	19780.	17962.	11421.	5982.	434397.
INCHES		0.97	2.47	3.88	3.91
AC-FT		8911.	22666.	35611.	35919.

STATION 2, PLAN 1, RTIO 7

241.	241.	241.	241.	241.	241.	241.	241.	241.	241.
241.	241.	241.	241.	241.	241.	241.	241.	241.	241.
241.	241.	241.	241.	241.	242.	242.	242.	242.	243.
244.	248.	257.	276.	305.	349.	406.	522.	935.	1516.
2369.	4214.	9687.	14642.	19749.	22831.	23685.	22967.	21393.	19490.
17571.	15796.	14575.	13481.	12465.	11560.	10776.	10110.	9554.	9095.

7719.	7702.	7685.	7664.	7636.	7603.	7555.	7500.	7447.	7398.
7354.	7309.	7262.	7211.	7157.	7098.	7035.	6969.	6898.	6823.

STOR

843.	843.	843.	843.	843.	843.	843.	843.	843.	843.
843.	843.	843.	843.	843.	843.	843.	843.	843.	843.
843.	843.	843.	843.	843.	843.	843.	843.	845.	847.
352.	865.	898.	962.	1066.	1216.	1418.	1684.	2040.	2538.
3270.	4273.	5376.	6374.	7136.	7562.	7680.	7581.	7363.	7100.
6835.	6589.	6361.	6140.	5936.	5753.	5595.	5461.	5349.	5256.
5182.	5125.	5083.	5052.	5030.	5014.	5002.	4994.	4988.	4983.
4979.	4976.	4972.	4968.	4963.	4956.	4946.	4935.	4924.	4915.
4906.	4897.	4887.	4877.	4866.	4854.	4842.	4828.	4814.	4799.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	23685.	21686.	13699.	7243.	525810.
INCHES		1.17	2.96	4.69	4.73
AC-FT		10759.	27185.	43118.	43478.

STATION 2, PLAN 1, RTIO 8

276.	276.	276.	276.	276.	276.	276.	276.	276.	276.
276.	276.	276.	276.	276.	276.	276.	276.	276.	276.
276.	276.	276.	276.	276.	276.	276.	276.	277.	277.
279.	283.	294.	315.	349.	398.	464.	793.	1247.	1895.
2854.	6598.	12246.	18208.	23721.	26713.	27422.	26473.	24604.	22391.
20194.	18194.	16444.	15094.	14106.	13183.	12360.	11651.	11070.	10612.
10255.	9979.	9767.	9606.	9485.	9394.	9326.	9274.	9233.	9199.
9169.	9141.	9113.	9081.	9042.	8996.	8934.	8863.	8795.	8733.
8674.	8616.	8556.	8492.	8423.	8350.	8272.	8190.	8104.	8013.

STOR

963.	963.	963.	963.	963.	963.	963.	963.	963.	963.
963.	963.	963.	963.	963.	963.	963.	963.	963.	963.
963.	963.	963.	963.	963.	963.	963.	964.	965.	968.
973.	989.	1027.	1099.	1218.	1390.	1620.	1917.	2307.	2863.
3686.	4754.	5891.	6923.	7685.	8099.	8197.	8066.	7807.	7501.
7198.	6921.	6679.	6465.	6266.	6080.	5914.	5771.	5654.	5562.
5490.	5435.	5392.	5359.	5335.	5317.	5303.	5293.	5284.	5277.
5271.	5266.	5260.	5254.	5246.	5237.	5224.	5210.	5196.	5184.
5172.	5160.	5148.	5135.	5121.	5106.	5091.	5074.	5057.	5039.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	27422.	25221.	15965.	8512.	617813.
INCHES		1.36	3.45	5.52	5.56
AC-FT		12513.	31683.	50674.	51085.

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STATION 2, PLAN 1, RTIO 9

345.	345.	345.	345.	345.	345.	345.	345.	345.	345.
345.	345.	345.	345.	345.	345.	345.	345.	345.	345.
345.	345.	345.	345.	345.	345.	345.	345.	346.	347.
349.	354.	368.	394.	436.	500.	596.	1298.	1838.	2622.
5063.	10844.	17546.	25410.	31083.	34345.	34933.	33267.	30911.	28171.
25490.	23038.	20873.	19006.	17435.	16173.	15281.	14694.	14178.	13738.
13372.	13074.	12839.	12666.	12545.	12461.	12402.	12358.	12323.	12292.
12261.	12228.	12190.	12143.	12083.	12011.	11916.	11807.	11701.	11598.
11499.	11399.	11294.	11184.	11067.	10944.	10815.	10680.	10539.	10394.

STOR

1284.	1284.	1284.	1284.	1284.	1284.	1284.	1284.	1284.	1284.
1284.	1284.	1284.	1284.	1284.	1284.	1284.	1284.	1284.	1284.
1284.	1284.	1284.	1284.	1284.	1284.	1284.	1285.	1287.	1210.
1217.	1236.	1283.	1374.	1523.	1734.	2005.	2351.	2814.	3407.
4144.	5089.	6831.	7919.	8703.	9127.	9193.	9005.	8679.	8300.
7930.	7591.	7291.	7033.	6816.	6642.	6503.	6385.	6281.	6192.
6118.	6058.	6011.	5976.	5952.	5935.	5923.	5914.	5907	5901

5894.	5888.	5880.	5871.	5859.	5844.	5825.	5803.	5781.	5761.
5741.	5721.	5700.	5677.	5654.	5629.	5603.	5576.	5548.	5518.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	34933.	32118.	20522.	11123.	807649.
INCHES		1.74	4.43	7.21	7.27
AC-FT		15935.	40726.	66219.	66733.

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

PEAK FLOW SUMMARY FOR MULTIPLE PLAN-RATIO ECONOMIC COMPUTATIONS

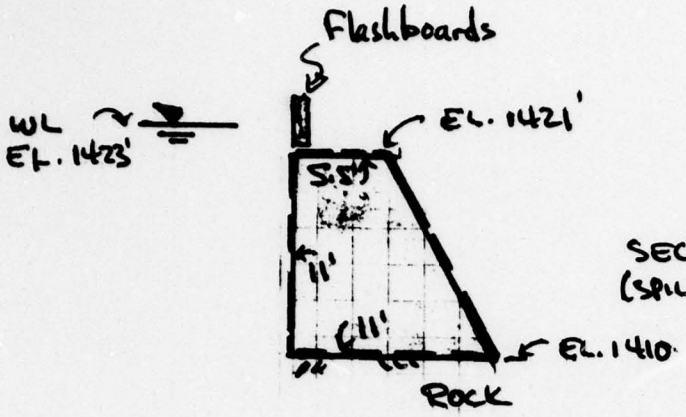
			RATIOS APPLIED TO FLOWS								
PERATION	STATION	PLAN	0.10	0.20	0.30	0.40	0.50	0.60	0.70	0.80	1.00
HYDROGRAPH AT	1	1	3415.	6829.	10244.	13658.	17073.	20487.	23902.	27317.	34146.
		2	0.	0.	0.	0.	0.	0.	0.	0.	0.
OUTED TO	1	1	550.	1391.	2416.	3543.	4659.	5927.	7270.	8597.	11495.
		2	0.	0.	0.	0.	0.	0.	0.	0.	0.
YDROGRAPH AT	2	1	3789.	7579.	11368.	15157.	18947.	22736.	26525.	30315.	37893.
		2	0.	0.	0.	0.	0.	0.	0.	0.	0.
2 COMBINED	2	1	3854.	7708.	11562.	15416.	19270.	23124.	26979.	30833.	38547.
		2	0.	0.	0.	0.	0.	0.	0.	0.	0.
OUTED TO	2	1	1447.	3903.	8127.	11939.	15514.	19780.	23685.	27422.	34933.
		2	0.	0.	0.	0.	0.	0.	0.	0.	0.

APPENDIX D

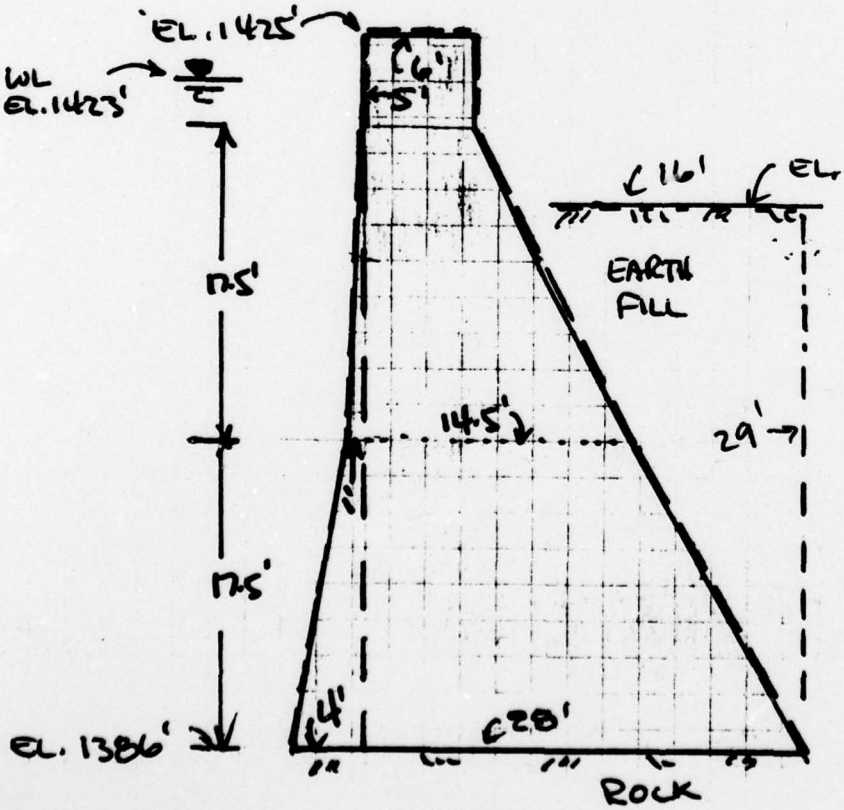
STABILITY ANALYSIS

NEWTON FALLS

DAM SECTIONS FOR STABILITY EVALUATIONS - TAKEN FROM DRAWING TITLED "NEWTON FALLS PAPER CO. GENERAL PLAN OF DAM AND SECTIONS" DATED 1927.



SECTION A-A
(SPILLWAY SECTION)

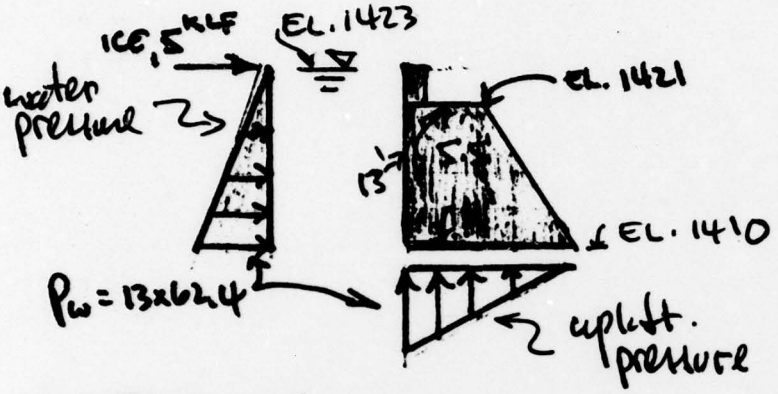


SECTION D-D
(SOUTH END)

STABILITY - OVERTURNING & SLIDING

SECTION A-A (SPILLWAY SECTION)

I. Assumed conditions
- WL at Elev. 1423'
- Ice at Elev. 1423'
- Uplift acts upon base of dam (100% of area); apply full simple hydrostatic pressure at upstream corner and zero pressure at downstream corner



A. OVERTURNING

Moment causing overturning due to horiz. water pressure + ice + uplift water pressure

$$\Sigma M_{toe} = \left(13' \times 62.4 \text{ pcf} \times \frac{13}{2} \times \frac{13}{3}\right) + \left(5^{KLF} \times 13'\right) + \left(13 \times 62.4 \times \frac{11}{2} \times \frac{11}{3}\right) =$$

$$= 22.85^{1K} + 65^{1K} + 16.4^{1K} = 104.2^{1K}$$

Moment resisting overturning due to mass of section

$$\Sigma M_{toe} = \left(11' \times 5.5' \times 0.150^{KCF}\right)\left(5.5 + \frac{5.5}{2}\right) + \left(\frac{1}{2} \times 11 \times 5.5 \times 0.150\right)\left(\frac{2}{3} \times 5.5\right)$$

$$74.9^{1K} + 16.6^{1K} = 91.5^{1K}$$

$$\text{FS against overturning} = \frac{91.5}{120.6} = 0.88 \pm \quad \text{(uplift acting)}$$

$$= \frac{91.5}{87.9} = 1.04 \pm \quad \text{(no uplift)}$$

B. SLIDING

Forces causing sliding = water pressure behind spillway + ice

$= \left(13' \times 62.4 \text{ pcf} \times \frac{13}{2}\right) + 5{,}000 \text{ \#/LF} = 10.3^{k}$

Force resisting sliding = friction at base

$= \left[\text{coeff. friction (conc/rock)}\right] (\text{wt. section} - \text{uplift})$

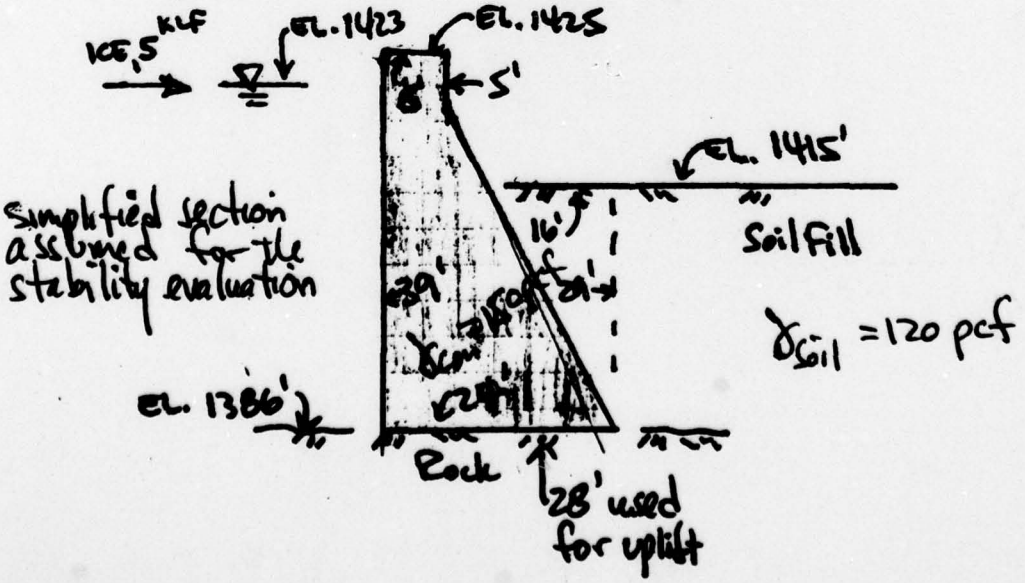
$= (0.8)\left[\left(5.5\frac{'}{2} \times 11' \times 11' \times .150\right) - \left(13 \times 62.4 \times \frac{11}{2}\right)\right] = 7.3^{k}$

FS against sliding $= \frac{7.3^{k}}{10.3^{k}} = 0.71 \pm$ (uplift acting)

$= \frac{10.9^{k}}{10.3^{k}} = 1.06 \pm$ (no uplift)

SECTION B-B (SOUTH END OF DAM)

I. Assumed conditions
- WL at Elev. 1423'
- Ice at Elev. 1423
- Uplift acts upon base of dam (100%)
- Earth fill placed against downstream face has unit weight of 120 pcf, $K_p = 3$



A. OVERTURNING

Moment causing overturning due to horiz. water pressure + uplift water pressure

$$\Sigma M_{toe} = \left(37' \times 62.4\,pcf \times \frac{37}{2} \times \frac{37}{3}\right) + \left(5000^{\#} \times 37'\right) + \left(37 \times 62.4 \times \frac{28}{2} \times \frac{2 \times 28}{3}\right)$$

$$= 526.8^{1K} + 185^{1K} + 603.4^{1K} = 1315^{1K}$$

Moment resisting overturning due to mass of dam section + fill soil overlying downstream face + passive pressure of soil fill against downstream face

$$\Sigma M_{toe} = (39 \times 6 \times .150 \times 21') + \left(35 \times 18 \times \tfrac{1}{2} \times .150 \times \frac{2 \times 18}{3}\right) +$$

$$+ \left(\underbrace{\tfrac{1}{2} \times 16 \times 29 \times .120 \times \frac{16}{3}}_{\text{fill over face}}\right) + \left(\underbrace{\tfrac{1}{2} \times .120 \times 3 \times 29 \times 29 \times \frac{29}{3}}_{\text{passive press.}}\right) =$$

$$= 737^{1K} + 567^{1K} + 148.5^{1K} + 1463^{1K} = 2915.5^{1K}$$

FS against overturning $= \dfrac{2396^{1K}}{1315^{1K}} = 2.2$ (uplift acting, passive earth pressure acting against downstream face)

$= \dfrac{2396}{712} = 4.1$ (no uplift, passive pressure acts)

$= \dfrac{784}{712} = 1.8$ (no uplift, no passive pressure)

B. SLIDING

Forces causing sliding due to horiz. water pressure behind section + ice

$= \left(37' \times 62.4 \times \frac{37}{2}\right) + 5{,}000 = 47.7^{K}$

Forces resisting sliding = friction at base + friction due to fill soil overlying face of dam + passive pressure

where friction = coef. friction (rock/conc) $\times$ [wt. dam + soil − uplift]

$= (0.8)\left[82.3 + 27.8 - 32.3\right] = 0.8(77.8) = 62.2^{K}$

since wt. dam $= (39 \times 6 \times .150) + \left(35 \times \frac{18}{2} \times .150\right) = 82.3^{K}$ (approx.)

wt. soil overlying dam face $= \left(\frac{1}{2} \times 16' \times 29' \times .120^{kcf}\right) = 27.8^{K}$

uplift $= \left(37' \times 62.4 \times \frac{28'}{2}\right) = 32.3^{K}$

Total resisting force $= 62.2^{K}$ + passive soil pressure =

$= 62.2 + \left(\frac{1}{2} \times 29 \times 3 \times .120 \times 29\right) =$

$= 62.2 + 151.4 = 213.6^{K}$

FS against sliding $= \frac{213.6^{K}}{47.7^{K}} = 4.5\pm$ (uplift acting, passive soil pressure acting)

$= \frac{40}{47.7} = 0.84\pm$ (uplift acting, no soil pressure downstream face)

$= \frac{40}{43} = 0.94\pm$ (no uplift, no soil passive downstream face)

APPENDIX E

REFERENCES

APPENDIX

REFERENCES

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