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NATIONAL DAM SAFETY PROGRAM. WESTON MILLS POND DAM (NJ00164), R--ETC(U)
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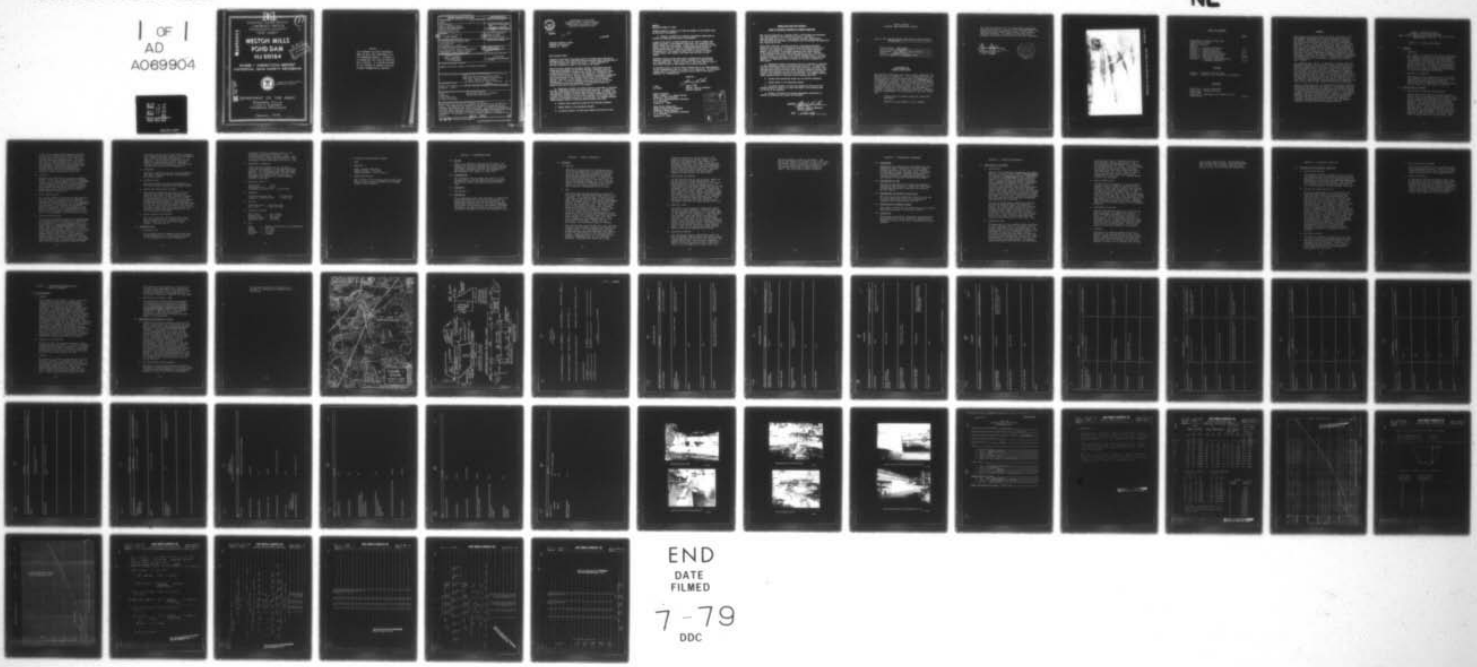

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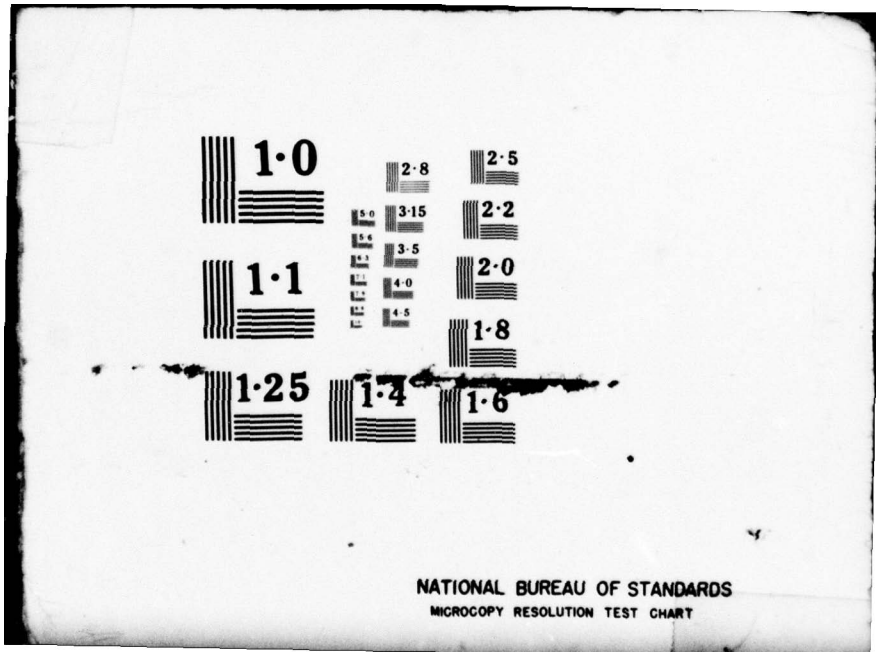
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LAWRENCE BROOK
MIDDLESEX COUNTY
NEW JERSEY

WESTON MILLS POND DAM NJ 00164

PHASE 1 INSPECTION REPORT NATIONAL DAM SAFETY PROGRAM

DEPARTMENT OF THE ARMY
Philadelphia District
Corps of Engineers
Philadelphia, Pennsylvania

February, 1979

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

REPORT DOCUMENTATION PAGE

READ INSTRUCTIONS BEFORE COMPLETING FORM

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Westons Mills Pond Dam
Middlesex County, N.J.

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100 Halstead St.
East Orange, N.J. 07019

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18. SUPPLEMENTARY NOTES

Copies are obtainable from National Technical Information Service, Springfield, Virginia, 22151.

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

Dams
Spillways
Visual Inspection
Structural Analysis
National Dam Inspection Act Report
Westons Mills Pond Dam, N.J.

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

This report cites results of a technical investigation as to the dam's adequacy. The inspection and evaluation of the dam is as prescribed by the National Dam Inspection Act, Public Law 92-367. The technical investigation includes visual inspection, review of available design and construction records, and preliminary structural and hydraulic and hydrologic calculations, as applicable. An assessment of the dam's general condition is included in the report.

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SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

DEPARTMENT OF THE ARMY
PHILADELPHIA DISTRICT, CORPS OF ENGINEERS
CUSTOM HOUSE—2 D & CHESTNUT STREETS
PHILADELPHIA, PENNSYLVANIA 19106

IN REPLY REFER TO
NAPEN-D

410 891

6 JUN 1979

Honorable Brendan T. Byrne
Governor of New Jersey
Trenton, NJ 08621

Dear Governor Byrne:

Inclosed is the Phase I Inspection Report for Weston Mills Pond Dam in Middlesex County, New Jersey which has been prepared under authorization of the Dam Inspection Act, Public Law 92-367. A brief assessment of the dam's condition is given in the front of the report.

Based on visual inspection, available records, calculations and past operational performance, Weston Mills Pond Dam, initially listed as a high hazard potential structure, but reduced to a significant hazard potential structure as a result of this inspection, is judged to be in fair overall condition. However, the spillway is considered inadequate since seven percent of the Spillway Design Flood (SDF) would overtop the dam. (The SDF, in this instance, is one half of the Probable Maximum Flood.) To insure continued structural stability of the dam the following actions are recommended to be undertaken within six months of the date of approval of this report:

a. Engineering studies and analysis should be performed to determine the dam's foundation condition and structural stability. A collapse of this dam could endanger the upper Weston Mills Arch Dam, therefore, these investigations should include both dams and their hydraulic interface due to their close proximity, as well as the influence of the Burnet Street Bridge on the hydraulic capacity of the study dam. Any remedial measures found necessary should be initiated within calendar year 1980.

b. Provide slope protection around the two spillway abutments.

c. Remove debris in the downstream channel.

d. To prevent erosion, the berm area behind the left end of the

NAPEN-D
Honorable Brendan T. Byrne

spillway should be raised to at least the height of the concrete pier at the end of the spillway.

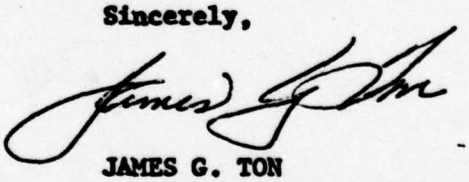
e. Develop a checklist for periodic maintenance inspections so records of conditions and repairs are available.

A copy of the report is being furnished to Mr. Dirk C. Hofman, New Jersey Department of Environmental Protection, the designated State Office contact for this program. Within five days of the date of this letter, a copy will also be sent to Congressman Edward Patton of the Fifteenth District. Under the provision of the Freedom of Information Act, the inspection report will be subject to release by this office, upon request, five days after the date of this letter.

Additional copies of this report may be obtained from the National Technical Information Services (NTIS), Springfield, Virginia 22161 at a reasonable cost. Please allow four to six weeks from the date of this letter for NTIS to have copies of the report available.

An important aspect of the Dam Safety Program will be the implementation of the recommendations made as a result of the inspection. We accordingly request that we be advised of proposed actions taken by the State to implement our recommendations.

Sincerely,



1 Incl
As stated

JAMES G. TON
Colonel, Corps of Engineers
District Engineer

Copies furnished:
Dirk C. Hofman, P.E., Deputy Director
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N. J. Dept. of Environmental Protection
P. O. Box CN029
Trenton, NJ 08625

John O'Dowd, Acting Chief
Bureau of Flood Plain Management
Division of Water Resources
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Trenton, NJ 08625

WESTON MILLS POND DAM (NJ00164)

CORPS OF ENGINEERS ASSESSMENT OF GENERAL CONDITIONS

This dam was inspected on 1 December 1978 by Louis Berger and Associates, Inc. under contract to the State of New Jersey. The State, under agreement with the U. S. Army Engineer District, Philadelphia, had this inspection performed in accordance with the National Dam Inspection Act, Public Law 92-367.

Weston Mills Pond Dam, initially listed as a high hazard potential structure, but reduced to a significant hazard potential structure as a result of this inspection, is judged to be in fair overall condition. However, the spillway is considered inadequate since seven percent of the Spillway Design Flood (SDF) would overtop the dam. (The SDF, in this instance, is one half of the Probable Maximum Flood.) To insure continued structural stability of the dam the following actions are recommended to be undertaken within six months of the date of approval of this report:

a. Engineering studies and analysis should be performed to determine the dam's foundation condition and structural stability. A collapse of this dam could endanger the upper Weston Mills Arch Dam, therefore, these investigations should include both dams and their hydraulic interface due to their close proximity, as well as the influence of the Burnet Street Bridge on the hydraulic capacity of the study dam. Any remedial measures found necessary should be initiated within calendar year 1980.

b. Provide slope protection around the two spillway abutments.

c. Remove debris in the downstream channel.

d. To prevent erosion, the berm area behind the left end of the spillway should be raised to at least the height of the concrete pier at the end of the spillway.

e. Develop a checklist for periodic maintenance inspections so records of conditions and repairs are available.

APPROVED: James G. Ton

JAMES G. TON
Colonel, Corps of Engineers
District Engineer

DATE: 6 Jan 1979

PHASE I REPORT
NATIONAL DAM INSPECTION PROGRAM

Name of Dam Westons Mills Pond Dam Fed ID# NJ 00164, NJ ID# 25-3

State Located New Jersey
County Located Middlesex
Coordinates Lat. 4029.0 - Long. 7424.8
Stream Lawrence Brook
Date of Inspection 1 December 1978

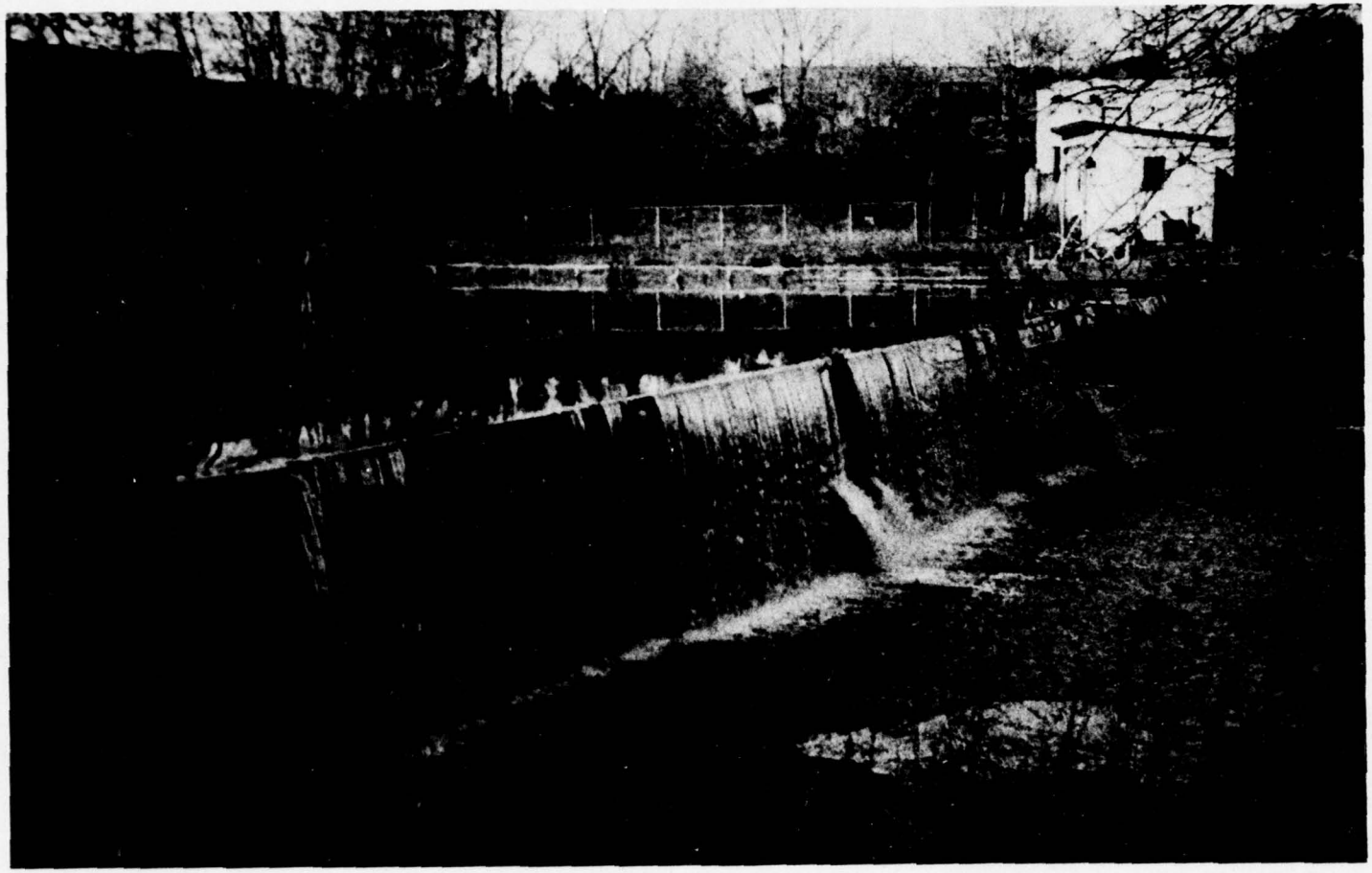
ASSESSMENT OF GENERAL CONDITIONS

Westons Mills Pond Dam is in fair overall condition but the spillway is inadequate. It is recommended that its hazard classification be downgraded to significant as overtopping or collapse would cause only minimal damage to downstream property. Little engineering information is available and because the dam is 90 years old, it is recommended that the owner provide, in the near future, detailed foundation investigations and engineering studies to ascertain its continued stability. Remedial actions recommended to be undertaken in the near future are:

- Construction of slope protection around the abutments.
- Removal of large debris in the channel.

The spillway capacity for the downgraded significant hazard structure is 6 percent of the design flood. No appreciable improvement can be made to the existing spillway capacity. A collapse of this dam could endanger the Westons Mills Arch Dam 600 feet upstream.

F. Keith Jolls P.E.
Project Manager



OVERVIEW OF WESTONS MILLS POND DAM

DECEMBER, 1978

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PREFACE

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

In reviewing this report, it should be realized that the reported condition of the dam is based on observations of field conditions at the time of inspection along with data available to the inspection team. It is important to note that the condition of a dam depends on numerous and constantly changing internal and external conditions, and is evolutionary in nature. It would be incorrect to assume that the present condition of the dam will continue to represent the condition of the dam at some point in the future. Only through continued care and inspection can there be any chance that unsafe conditions be detected.

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

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM
NAME OF DAM: WESTONS MILLS POND DAM, FED ID# NJ 00164
NJ ID# 25-3

SECTION 1 - PROJECT INFORMATION

1.1 GENERAL

a. Authority

This report is authorized by the Dam Inspection Act, Public Law 92-367, and has been prepared in accordance with Contract FPM-36 between Louis Berger & Associates, Inc. and the State of New Jersey and its Department of Environmental Protection, Division of Water Resources. The State, in turn, is under agreement with the U.S. Army Corps of Engineers, Philadelphia to have this inspection performed.

b. Purpose of Inspection

The purpose of this inspection is to evaluate the structural and hydraulic condition of the Westons Mills Pond Dam and appurtenant structures, and to determine if the dam constitutes a hazard to human life or property.

1.2 DESCRIPTION OF PROJECT

a. Description of Dam and Appurtenances

Westons Mills Pond Dam is a straight-walled masonry gravity structure with two sluice gates at the east spillway abutment and a water supply intake chamber adjoining the west spillway abutment. The east abutment is an 18' wide, stepped, concrete pier with hand-cranked gate stems to the 30" sluice gates affixed to the upstream face. The west abutment is 8' wide and adjoins the water supply intake chamber of the City of New Brunswick. It contains a 30" diameter intake pipe which runs to the water plant located about 200' to the north. The

crest of the random ashlar masonry spillway is 154 feet long and 4'6" wide at the top. The six-inch thick cap has a one-foot wide chamfer along the upstream edge. The spillway crest is approximately 13.5 feet high with respect to the downstream riverbed and is reportedly founded on underlying bedrock. Two four-feet wide masonry buttresses, located on the vertical downstream face, extend to within six feet of the crest.

b. Location

Westons Mills Pond dam is located at Westons Mills, in The City of New Brunswick, Middlesex County. It is approximately 0.5 mile northwest of Interchange 9 of the New Jersey Turnpike, and is situated between a high-level concrete arch bridge carrying Route 18 over Lawrence Brook and a newer steel stringer bridge on Burnet Street to the north.

c. Size Classification

The maximum height of the dam is approximately 15.5 feet above streambed and the maximum storage area is estimated to be 1,965 acre-feet. The dam is therefore placed in the intermediate size category in accordance with Corps of Engineer directives. For the purposes of the Phase I inspection, the upstream Weston Mills Arch dam (N.J. 00382) is considered as a low weir in the impounded reservoir above the dams.

d. Hazard Classification

The dam was initially classified as high hazard by governing authorities but as a result of this inspection, it is recommended that it be downgraded to a significant hazard classification. The town of Westons Mills is situated immediately downstream. However, all residential areas are approximately 20 to 30 feet above flood elevation and should failure occur, it appears there would be only minor property damage, mainly involving a downstream marina and other marine-related facilities. The downstream channel area is principally tidal marshland and the bridges spanning Lawrence Brook

(at Burnet Street and the New Jersey Turnpike) have adequate hydraulic capacity to accommodate 100 to 500 year floods (see Section 5). In summary, a failure would cause only minimal damage to these bridges and not endanger traffic using these crossings. The adjoining residential areas would be unaffected.

e. Ownership

The dam is owned by the City of New Brunswick, City Hall, 78 Bayard Street, New Brunswick, New Jersey 08903.

f. Purpose of Dam

The dam provides the intake impoundment for the City of New Brunswick water supply system.

g. Design and Construction History

This dam was reputedly erected in 1888 and replaced an earlier timber dam which was built in 1867 about 25 feet upstream. Nothing is known regarding the designer or erection except that the structure is reputedly founded on sandstone/shale bedrock. The embankment behind the left spillway abutment was overtopped by the July 1975 flood and certain portions of the water intake facilities were rebuilt, but no records or plans were made available by the City Engineering Department.

h. Normal Operating Procedures

The dam, along with the Weston Mills Arch dam, is operated as an integral part of the intake system for the City water supply system. (See Section 4).

1.3 PERTINENT DATA

a. Drainage Area

The drainage area for Westons Mills Pond Dam is 42.0 square miles. The general direction of the drainage is from the southwest to

northeast with the northerly third of the watershed extensively developed. The southern portion also contains numerous areas of more recent residential development. The topography varies from gently rolling to flat.

b. Discharge at Damsite

Total spillway capacity at top of dam is 1,645 cfs as indicated in the appended calculations. No discharge records are available. However, it is estimated that the 1975 flood was about 10% greater than the 100 year frequency and resulted in a peak discharge of about 4,700 cfs.

c. Elevation (M.S.L.)

Top of dam - +15.5
Recreation pool - +13.5
Streambed at centerline - 0 (sea level)

d. Reservoir

Length of maximum pool - 14,100 feet
Length of recreation pool - 13,200 feet

e. Storage

Recreation pool - 1,060 acre feet
Top of dam - 1,965 acre feet

f. Reservoir Surface

Top of dam - 214 ± acres
Maximum pool - 214 ± acres
Recreation pool - 162 acres
Spillway crest - 162 acres

g. Dam

Type - Masonry gravity wall and embankment
Length - 309 feet
Height - 15.5 feet
Top width - 4.5 feet
Zoning - Unknown

h. Diversion and Regulating Tunnel

None

i. Spillway

Type - narrow crest weir
Length of weir - 154 feet
Crest elevation - +13.5 (M.S.L.)

j. Regulating Outlets

Two 30 inch x 4'-6" sluice gates (right abutment) and one 30-inch diameter water supply intake (left abutment).

SECTION 2 - ENGINEERING DATA

2.1 DESIGN

There is no detailed information available concerning the design of Westons Mills Pond Dam. All information and data obtained was gained hearsay from local residents and the City Engineer of New Brunswick, Mr. Robert C. Kane, P.E.

2.2 CONSTRUCTION

No information was available pertaining to the construction of the dam except that it replaced the earlier timber dam which was destroyed by fire.

2.3 OPERATION

See Section 4

2.4 EVALUATION

As no engineering data was available to assess the structural stability of the dam and nothing is known regarding the geotechnical make-up of the underlying foundations it is virtually impossible to evaluate the stability of the masonry spillway. Therefore, the data relating to the structure is considered inadequate to base any assessment upon.

SECTION 3 - VISUAL INSPECTION

3.1 FINDINGS

a. General

The on-site inspections of the Weston Mills Pond dam revealed that the masonry structure is in a fair condition although the entire spillway was inundated and was functioning as an uncontrolled overflow. In view of the fact that the structure is 90 years old, it can be reasonably assumed that it is solidly built, but without further data and investigation it can only be assumed to be in a fair condition commensurate with its age.

b. Dam

The top of the masonry spillway is in fairly true alignment and basically level within 1 or 2 inches. The capstones are 6" thick by 4'-6" wide (with a one-foot chamfer on the upstream side) and appear secure. Two masonry buttresses roughly 2 feet wide by 4 feet thick brace the wall on the downstream side. The exact thickness of the gravity structure and its depth below the downstream channel are unknown, but in view of its present alignment (after 90 years of storms) is fairly certain to be founded on the underlying New Brunswick shales. Early (circa 1917) records state that the structural height of the masonry wall is 22 feet and is stepped on the upstream face to a 12 feet width at the base. Except for the buttresses, the downstream face is vertical.

Some top-of-bank areas beyond the right spillway abutment show surficial erosion but this is of a minor nature. An old masonry wall extends downstream from the right abutment and connects to the flared wingwall of the Burnet Street bridge. Likewise, there is a low masonry wall extending downstream at the left spillway abutment. Although both walls are in poor

condition, they have little effect on the overall condition of the dam except to help stabilize the embankment areas below the spillway abutments. The right retaining wall intercepts the naturally occurring embankment slope while the left wall stabilizes the edge of the relatively level berm area. However, this is the area where the most serious damage occurred during the 1975 flood.

c. Appurtenant Structures

At the easterly end of the spillway, there are two 30" by 4'-6" sluice gates and at the westerlyconcrete intake structure a 30" intake line feeds the City water supply system. A trash screen is positioned diagonally across the northwest corner of the reservoir immediately above the water supply intake. Further to the left, there is an old, inoperative water supply gate which is no longer used. These structures are in moderately fair condition but numerous cracks and spalled areas were observed. The two sluice gates at the right abutment are operative, but have not been opened since 1975.

d. Reservoir Area

The depth of the reservoir immediately above the dam is approximately 4.5 feet at each end of the spillway and deepens to an unknown depth in the middle of the reservoir. The reservoir area extends under the Route 18 bridge and upstream to the Weston Mills arch dam which acts as a control weir in the overall reservoir length (which extends further southward several miles to the Farrington dam). The reservoir is quite restricted by relatively steep natural banks. Most of the contiguous urban development is well above maximum flood levels.

e. Downstream Channel

The downstream channel immediately below the dam is somewhat restricted by the Burnet Street bridge when periods of heavy rain coincide with maximum high tide. This bridge is approximately 104 feet downstream, has a span of 102 feet, a clear headroom in excess of 15 feet

and was erected in 1965 by the NJDOT. The bed of the channel is roughly at sea level with an average tidal fluctuation of about 3.5 feet. There are several large trees and debris in the channel and heavy siltation along the sides. The river bed is quite irregular.

SECTION 4 - OPERATIONAL PROCEDURES

4.1 PROCEDURES

Operational procedures were not observed by the inspection team. Because of the water supply intake facilities at this dam, city personnel are normally on duty 24 hours a day. According to the City Engineer, operational activity consists primarily of periodic inspections and the removal of floating driftwood and debris.

4.2 MAINTENANCE OF DAM

The dam is periodically inspected and repairs undertaken when required. After the 1975 flood, the dam was thoroughly inspected and repaired by City forces.

4.3 MAINTENANCE OF OPERATING FACILITIES

The only operating facilities in use are the two 30 inch sluice gates which are periodically inspected and maintained by the City.

4.4 DESCRIPTION OF WARNING SYSTEM

None exists except for the monitoring by City Water Department personnel during major storms.

4.5 EVALUATION

The present operational procedures and safeguards during periods of heavy flows were deemed to be adequate in view of the lack of serious downstream hazards.

SECTION 5 - HYDRAULIC/HYDROLOGIC

5.1 EVALUATION OF FEATURES

a. Design Data

Based on the Recommended Guidelines for Safety, the dam at Westons Mills Pond is intermediate in size and of significant hazard. Accordingly the design flood selected by the inspection team is to be one-half the probable maximum flood. Maximum discharge without overtopping the abutments was computed to be 1,645 cfs. Inflow to the reservoir was calculated utilizing precipitation data from Hydrometeorological Report No. 33 by the HEC-1 program, which gave a peak inflow of 27,340 cfs for the ½ PMF. The inflow PMF was then routed through the reservoir which slightly reduced the peak discharge to 27,315 cfs. Employing the routed SDF, the spillway discharge will accommodate approximately 6% of the SDF.

In view of maintaining consistency with the previously prepared upper dam inspection report, the ½ PMF inflow value of 27,340 cfs is equal to the outflow calculated for the upstream Westons Mills Arch Dam. During periods of high flows, the arch dam acts as a low weir in the reservoir (its crest elevation is only about 5 feet higher than the spillway crest elevation at the study dam).

b. Experience Data

Although there is no recorded stream flow data at the study dam, there is a gaging station 4 miles upstream at the Farrington Dam. Log-Pearson Type III flood frequency analyses were performed by the U.S. Geological Survey utilizing weighted WRC map skews on the historical data available from this station. The transposed 100- and 500-year floods are 5,800 cfs and 9,680 cfs respectively. Floods of these magnitudes would overtop the embankment

by more than 4 feet. Observations made by City personnel during the storm of July, 1975 indicate the embankment was overtopped by approximately 2 to 3 feet. Earlier records of a flood in 1882 stated that the water overtopped the older dam (which also had a 150 foot crest) by 3 feet. There is also a tidal gage station at the Burnet Street bridge but no high tide (i.e. maximum flood) records are available.

c. Visual Observations

The spillway crest appears in good hydraulic condition with no humps or dips along its length. A small amount of debris is collecting behind the crest, however in the event of a flood this would be swept away. In the downstream channel there is a large tree which lies just below the dam. The two sluice gates in the east abutment were last operated in 1975 but appear to be in working order. However, their hydraulic capacity has little numerical effect on the spillway capacity or overtopping potential.

d. Overtopping Potential

Hearsay information states that this dam has been repeatedly overtopped in the past. This overtopping potential will continue to exist in view of the spillway capacity. Furthermore, the bridge downstream from the dam could act as a constriction during heavy flooding, which combined with abnormal tides could cause a high tailwater. This could reduce the spillway capacity even further.

e. Drawdown

The ability to dewater Westons Mills Pond depends on the serviceability of the sluice gates. Should they be in good working order and the entrances unclogged, the lower lake would take just over an hour to draw down. However, if there is a tailwater due to high

tide in the Raritan River, the drawdown may take several hours longer. With the upstream dam in place, the low water drawdown capability is felt to be relatively unimportant.

SECTION 6 - STRUCTURAL STABILITY

6.1 EVALUATION OF STRUCTURAL STABILITY

a. Visual Observations

The masonry spillway is judged to be in a fair to moderately good condition, although one area near the left end of the spillway has bowed out downstream a few inches (see appended photographs) and settled a negligible amount. The concrete in the abutments is cracked and spalled but is in a fairly integral and serviceable condition.

b. Design and Construction Data

No design computations or construction plans were available except early records which indicated the total structural height from crest to bottom of footing to be 22 feet and the footing to be 12 feet wide. These facts could not be verified by the City Engineer. The upstream face is stepped or sloped in some unknown fashion. The width to height ratio of 0.6 is conservative enough to allow the wall to withstand several feet of head without causing undue concern regarding the overturning factor of safety. If the footing is keyed in any manner into the underlying rock, the factor of safety against sliding is also thought to be satisfactory. However, the New Brunswick shales prevalent in this area are susceptible to weathering when exposed. Therefore, further investigations should include a geotechnical review of the underlying foundation material with special concern regarding weathering, especially under the footing.

c. Operating Records

The dam has operated satisfactorily for many years but has been overtopped numerous times, the most recent being in 1975 when the left abutment area was breached. The City is presently engaged in legal action regarding this flooding and has in its possession photographs of that flood.

d. Post Construction Changes

There is no evidence of recent modifications to the spillway structure. Some of the water intake structure is of recent vintage but no plans were available to the inspection team.

e. Seismic Stability

As the dam is located in Seismic Zone 1 and is relatively low, little hazard exists from earthquake forces and the potential vulnerability is negligible if further investigation reveals that the dam has adequate stability under static loads. Experience indicates that if this requirement is fulfilled, dynamic loading conditions will not be critical.

SECTION 7 - ASSESSMENT/RECOMMENDATIONS/ REMEDIAL MEASURES

7.1 DAM ASSESSMENT

a. Safety

On the basis of the Phase I visual inspection, the existing masonry dam is functioning adequately for the City of New Brunswick as a control structure for the water supply intake and is adjudged to be in a overall fair condition. No major detrimental assessments are made except for the unknown structural geometry of the spillway wall and the condition of the underlying foundations. The dam is 90 years old and its continued long-term stability remains questionable until further engineering surveys and analyses are conducted. This assessment is subject to the limitations inherent in the visual inspection procedures set forth by the Corps of Engineers. Overtopping of the embankment behind the left spillway abutment could damage the water supply intake facilities, but it is felt that little damage would be incurred at the Burnet Street bridge or further downstream (except for possibly at the water-related facilities along the river banks).

b. Adequacy of Information

Except for what was visually observed, little information was available as no design drawings, or modification plans were located. No recent surveys have been made. Therefore, additional information will be required to fully evaluate the structural stability of the dam.

c. Urgency

No urgency is attached to implementing further studies. However, a collapse of this dam could endanger the upper Weston Mills Arch Dam by causing a washout of the riprap protection immediately below this dam. This downstream channel fill below the upper dam is felt to materially help stabilize that structure. Future investigations should include

both dams and their hydraulic interface due to their close proximity. Also, the Burnet Street bridge might have an influence on the hydraulic capacity of the study dam due to the bridge's hydraulic capacity at high tides.

d. Necessity for Further Study

The inspection revealed that improvements to the spillway are impractical although its capacity does not meet the requirements of the Recommended Guidelines for Safety Inspection of Dams, passing only 6 percent of the SDF. However, due to the unknown condition of the spillway structure, additional studies and structural analyses appear to be warranted.

7.2 RECOMMENDATIONS/REMEDIAL ACTIONS

a. Inasmuch as original stability analysis and design computations are unavailable and this dam is classified in the significant hazard category, it is recommended that further studies be undertaken in the near future. It is recommended that the owner provide stability computations and additional data on the foundation conditions. This information is considered essential to completely assess the continued stability as its structural condition is classified as questionable, based principally on the lack of knowledge of the foundations. Remedial measures recommended are the construction of concrete or riprap slope protection above and below the spillway abutments and the removal of the large debris presently in the channel. The berm area behind the left end of the spillway should be raised to at least the height of the concrete pier at the end of the spillway.

b. O&M Maintenance and Procedures

Because the City of New Brunswick presently maintains a close monitoring of the dam, little is foreseen as improvements to O&M procedures. However, a check list should be developed

for periodic maintenance inspections so records of conditions and repairs can be maintained.

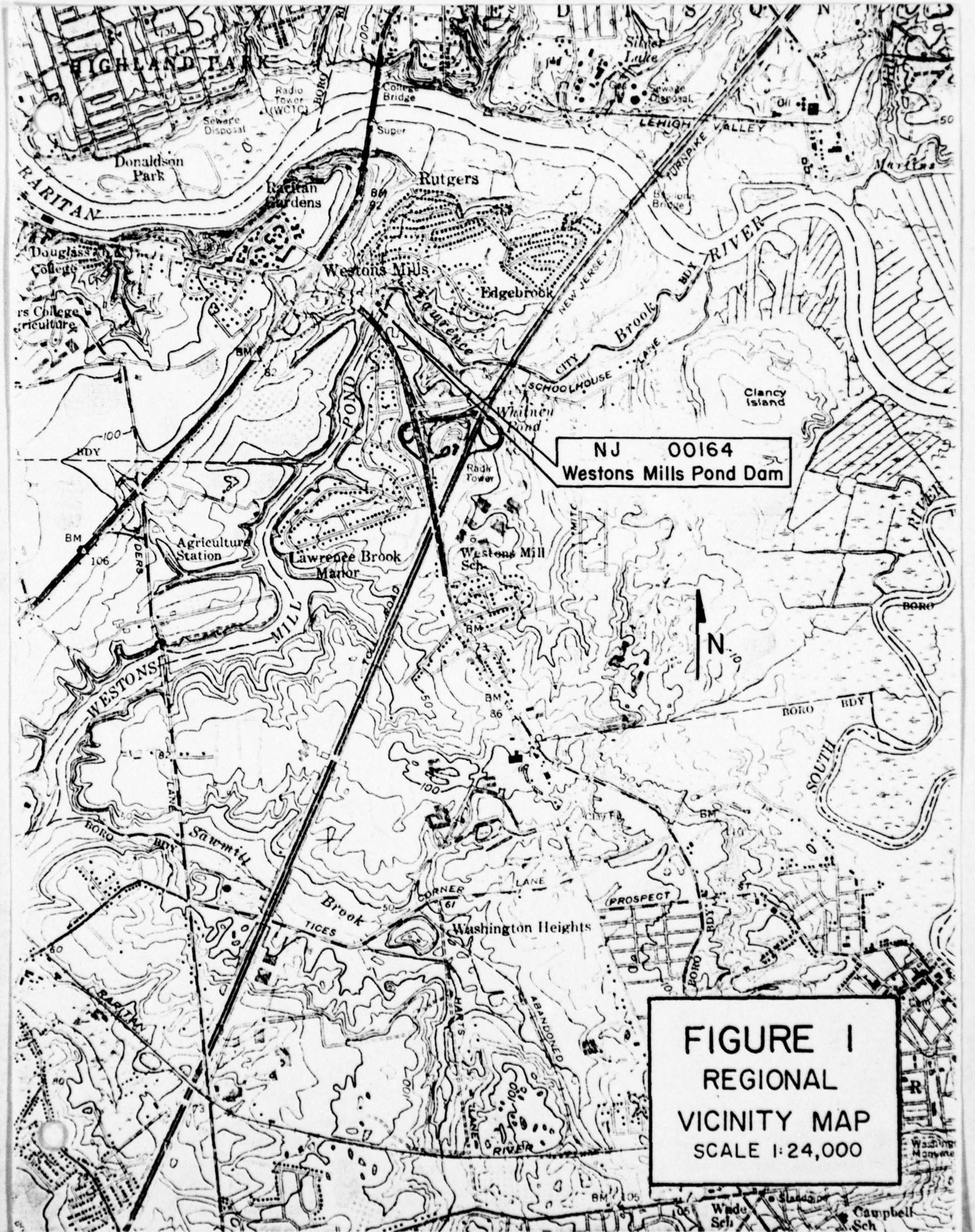
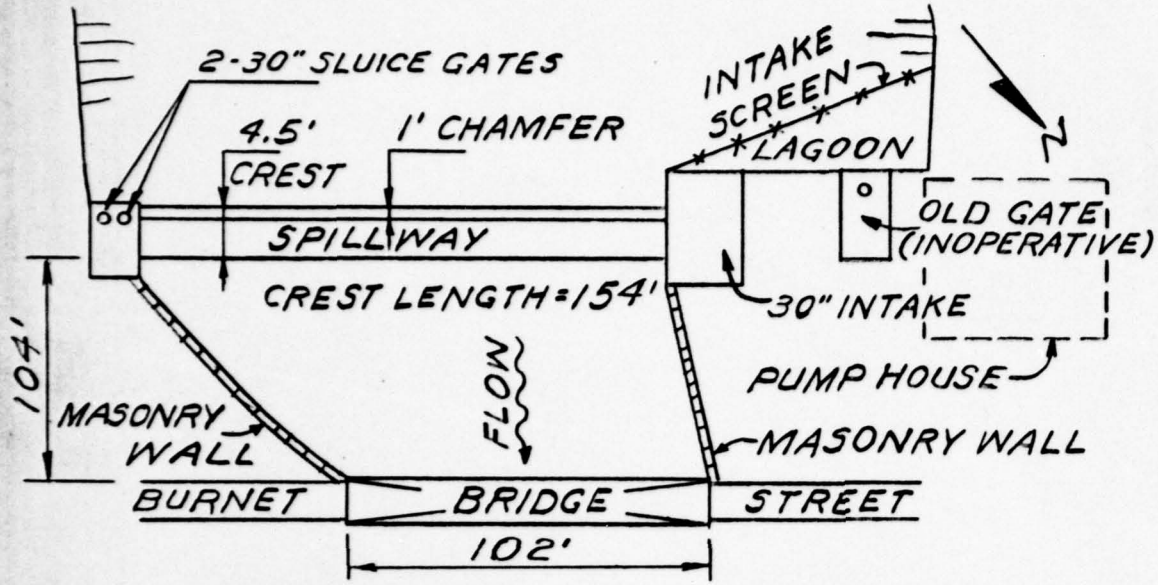
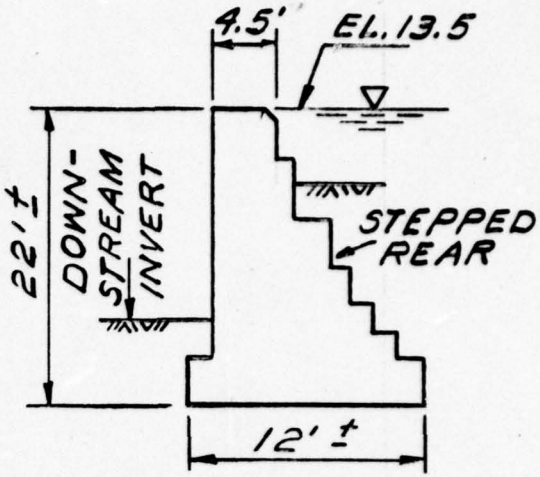

HIGHLAND PARK
Donaldson Park
RARITAN
Raritan Gardens
Rutgers
Douglass College
Westons Mills
Edgebrook
Lawrence
SCHOOLHOUSE LANE
NEW JERSEY TURNPIKE
LEHIGH VALLEY
RIVER
Clancy Island
Whitney Pond
NJ 00164
Westons Mills Pond Dam
Agriculture Station
Lawrence Brook Manor
Westons Mill Sch
WESTONS MILL POND
Sawmill Brook
CORNER LANE
TICES
PROSPECT
Washington Heights
SOUTH RIVER
ABANDONED
N

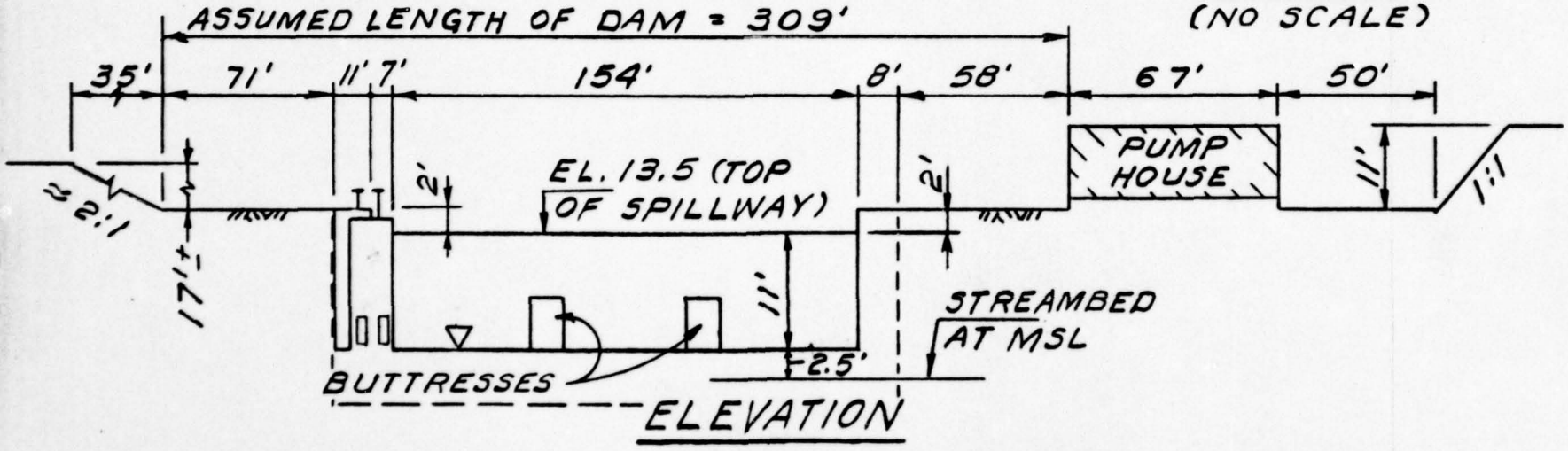
FIGURE I
REGIONAL VICINITY MAP
SCALE 1:24,000



GENERAL PLAN



TYPICAL SECTION
(NO SCALE)



ELEVATION

FIG. 1

Check List
Visual Inspection
Phase 1

Name Dam Weston Mills Pond County Middlesex State New Jersey Coordinators NJDEP

Date(s) Inspection 1,6 Dec. 78 Weather Clear Temperature 38°

Pool Elevation at Time of Inspection 13.7± M.S.L. Tailwater at Time of Inspection 2± M.S.L.

Inspection Personnel:

T. Chapter E. Simone

K. Jolls M. Carter

C. Chhut

T. Chapter Recorder

DAM NO. NJ-00370

CONCRETE/MASONRY DAMS

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SEE PAGE ON LEAKAGE		Entire spillway submerged
STRUCTURE TO ABUTMENT/EMBANKMENT JUNCTIONS	Satisfactory. No seepage observed	Masonry crest with concrete abutments at each end.
DRAINS	None	
WATER PASSAGES	None	
FOUNDATION	Dam built on shale/sandstone bedrock. Depth of footing unknown.	Bedrock in area close to surface. New Brunswick shale area.

CONCRETE/MASONRY DAMS

VISUAL EXAMINATION OF	OBERSVATIONS	REMARKS OR RECOMMENDATIONS
SURFACE CRACKS ONCRETE SURFACES	Unknown	Masonry work very old and condition of mortar joints suspect.
STRUCTURAL CRACKING	Minor	
VERTICAL AND HORIZONTAL LIGNMENT	Satisfactory. No differential settlement observed.	
MONOLITH JOINTS	N/A	
CONSTRUCTION JOINTS	N/A	

EMBANKMENT

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SURFACE CRACKS	None	Narrow embankment width at east abutment.
UNUSUAL MOVEMENT OR CRACKING AT OR BEYOND THE TOE	None observed	
SLOUGHING OR EROSION OF EMBANKMENT AND ABUTMENT SLOPES	Minor erosion at west abutment (footpath area).	
VERTICAL AND HORIZONTAL ALINEMENT OF THE CREST	Satisfactory	There is no real constructed embankment beyond the spillway (no blackslopes).
RIPRAP FAILURES	None	

EMBANKMENT

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
JUNCTION OF EMBANKMENT ND ABUTMENT, SPILLWAY ND DAM	Satisfactory	West abutment area - City water supply intake structure area. Fairly level and flat.
ANY NOTICEABLE SEEPAGE	None observed.	
STAFF GAGE AND RECORDER	None	
DRAINS		

OUTLET WORKS

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CRACKING AND SPALLING OF CONCRETE SURFACES IN OUTLET CONDUIT	See Conc./Masonry structure	
INTAKE STRUCTURE		
OUTLET STRUCTURE	2 hand-operated sluices (30" x 54" - E. abutment)	Gates are operable.
OUTLET CHANNEL	Clogged with sediment. Large tree (2' $\pm$ Ø) in channel	
EMERGENCY GATE	None	

UNGATED SPILLWAY

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONCRETE WEIR	Masonry crest (4.5' x 154')	Alignment straight except for one slightly bowed area.
APPROACH CHANNEL	Weston Mill Pond	
DISCHARGE CHANNEL	Tidal channel of Lawrence Brook.	
BRIDGE AND PIERS	Old masonry wall between east abut and bridge wingwall in poor shape (see photographs)	Burnet St. highway bridge 104' downstream.

GATED SPILLWAY

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONCRETE SILL	None	
APPROACH CHANNEL	N/A	
DISCHARGE CHANNEL	N/A	
BRIDGE AND PIERS	N/A	
GATES AND OPERATION EQUIPMENT	N/A	30" line intake to City water supply system.

INSTRUMENTATION

VISUAL EXAMINATION	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
MONUMENTATION/SURVEYS	None	
OBSERVATION WELLS	None	
WEIRS	None	
PIEZOMETERS	None	
OTHER	Farrington Lake gage 4 miles upstream. Tidal gaging station at Burnet St. bridge.	U.S.G.S Survey NJ-76-1

RESERVOIR

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SLOPES	Reservoir extends several miles up Lawrence Brook.	
SEDIMENTATION	Unknown. Siltation observed along banks.	

DOWNSTREAM CHANNEL

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONDITION (OBSTRUCTIONS, DEBRIS, ETC.)	Debris, trees in channel:	Tidal area below dam.
SLOPES	Steep natural banks.	
APPROXIMATE NO. OF HOMES AND POPULATION	None	All homes well above (20' ±) high tide elevation.

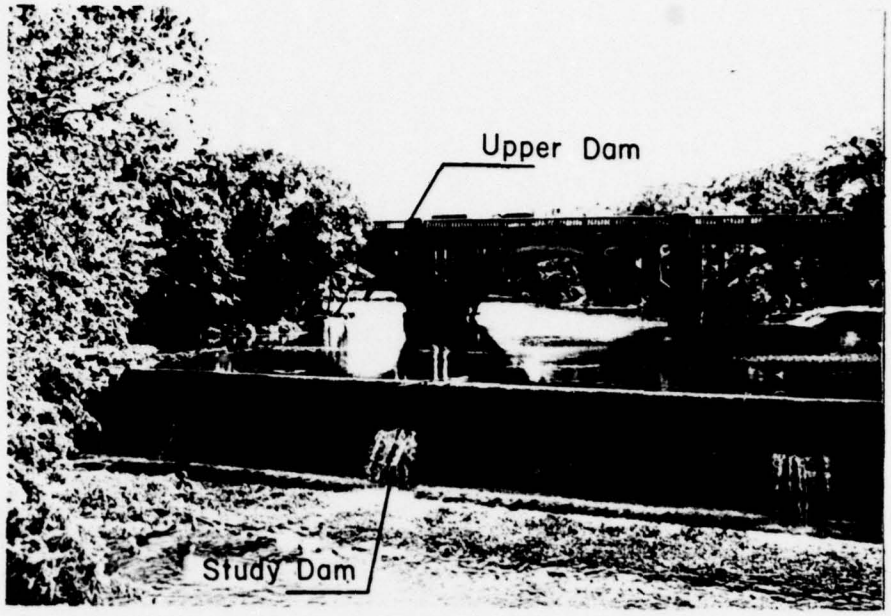
CHECK LIST
ENGINEERING DATA
DESIGN, CONSTRUCTION, OPERATION

ITEM	REMARKS
PLAN OF DAM	Not available from State or City Engineer.
REGIONAL VICINITY MAP	Available
CONSTRUCTION HISTORY	N/A
TYPICAL SECTIONS OF DAM	Unknown
HYDROLOGIC/HYDRAULIC DATA	Available at Farrington dam.
OUTLETS - PLAN - DETAILS -CONSTRAINTS -DISCHARGE RATINGS	None
RAINFALL/RESERVOIR RECORDS	Not available at site.

ITEM	REMARKS
DESIGN REPORTS	N/A
GEOLOGY REPORTS	N/A
DESIGN COMPUTATIONS HYDROLOGY & HYDRAULICS DAM STABILITY SEEPAGE STUDIES	N/A
MATERIALS INVESTIGATIONS BORING RECORDS LABORATORY FIELD	N/A
POST-CONSTRUCTION SURVEYS OF DAM	Unknown
BORROW SOURCES	Unknown

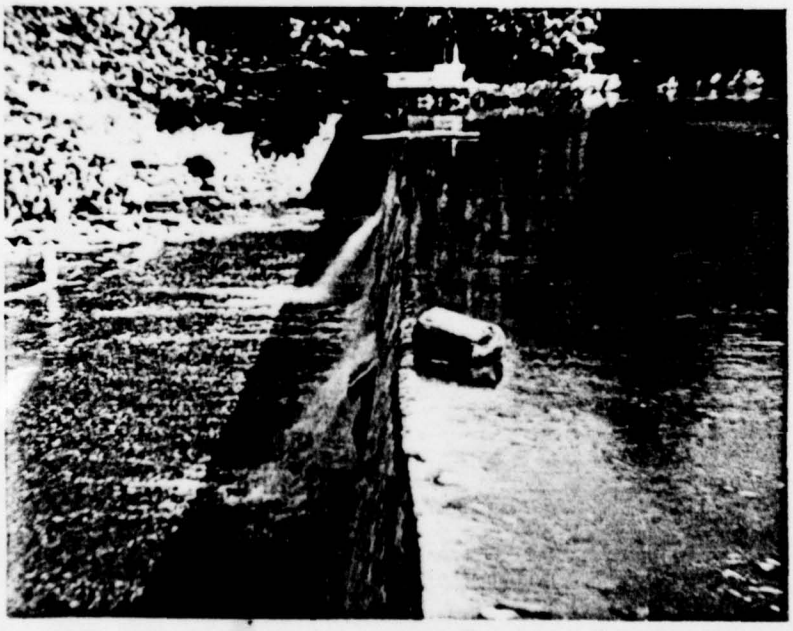
ITEM	REMARKS
MONITORING SYSTEMS	None
MODIFICATIONS	Unknown
HIGH POOL RECORDS	Not available
POST CONSTRUCTION ENGINEERING STUDIES AND REPORTS	Unknown
PRIOR ACCIDENTS OR FAILURE OF DAM DESCRIPTION REPORTS	None
MAINTENANCE OPERATION RECORDS	N/A

ITEM	REMARKS
SPILLWAY PLAN	Available (source: hearsay)
SECTIONS	N/A
DETAILS	N/A
OPERATING EQUIPMENT PLANS & DETAILS	N/A



Downstream view of dam

6/78



View of dam crest from west abutment

6/78

Downstream view of west abutment

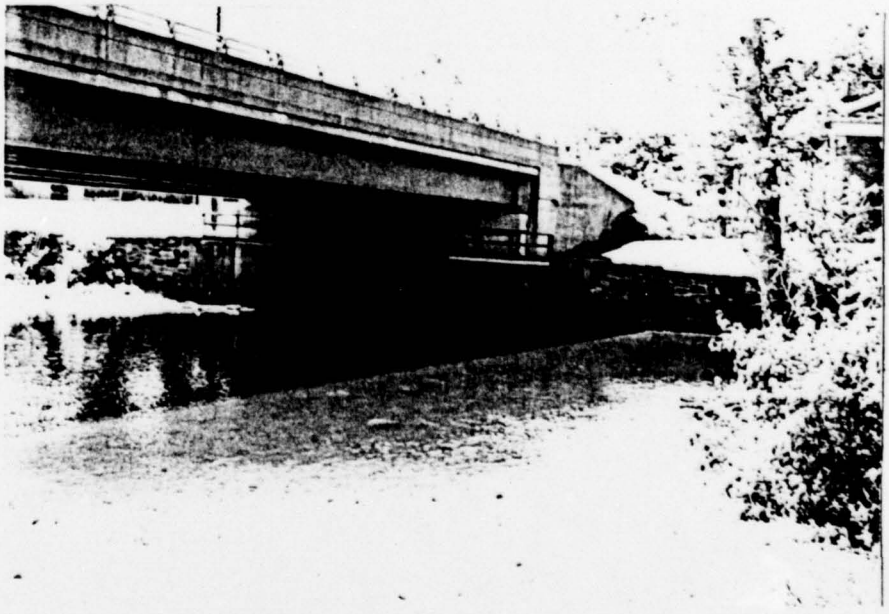
6/78

View of intake structure

6/78

View of dam from beneath Burnet Street bridge

6/78



Burnet Street bridge 104' downstream from dam

6/78

Westons Pond

Dam No. 00370

CHECK LIST
HYDROLOGIC AND HYDRAULIC DATA
ENGINEERING DATA

DRAINAGE AREA CHARACTERISTICS: 42.0 sq. mi.

ELEVATION TOP NORMAL POOL (STORAGE CAPACITY): 13.5 (1060 AF)

ELEVATION TOP FLOOD CONTROL POOL (STORAGE CAPACITY): 15.5 (1965 AF)

ELEVATION MAXIMUM DESIGN POOL: 15.5

ELEVATION TOP DAM: 15.5

CREST:

a. Elevation 13.5
b. Type Narrow Crest Weir
c. Width 4.5'
d. Length 154'
e. Location Spillover None
f. Number and Type of Gates 2 - 30" x 4'-6"

OUTLET WORKS:

a. Type 30" intake to water plant
b. Location West abut.
c. Entrance inverts Unknown
d. Exit inverts Unknown
e. Emergency draindown facilities 2'-30" x 4'-6"

HYDROMETEOROLOGICAL GAGES:

a. Type Water Stage recorder
b. Location Harrington Dam (4 mi. upstream)
c. Records 1927 - present

MAXIMUM NON-DAMAGING DISCHARGE: 1645 ± cfs.

BY D.J.M DATE 2-79 **LOUIS BERGER & ASSOCIATES INC.** SHEET NO. A1 OF

CHKD. BY DATE Westons Mills Pond Dam PROJECT G227

SUBJECT

HYDROLOGY

All hydrologic information obtained from Phase I Report (National Dam Inspection program) for Westons Mills Arch Dam (NJ 00382) which lies approximately 600' upstream.

The outflow hydrograph from the arch dam 600' upstream was taken as the inflow hydrograph for the dam under consideration here.

The lake area and storage values in section 1 of the report are based on the combined values for the arch dam reservoir and the reservoir under consideration here.

BY ____ DATE 12/4

CHKD. BY ____ DATE ____

SUBJECT ____

LOUIS BERGER & ASSOCIATES INC.

Western Mills Pond Dam

Spillway Discharge Capacity

SHEET NO. A2 OF ____

PROJECT C-227

154'

Over maincrest

H	C	Q
1.0	3.0	450
2.0	3.0	1273
3.0	3.0	2338
4.0	3.0	3600
5.0	3.0	5031
6.0	3.0	6614
7.0	3.0	8334
8.0	3.0	10182
9.0	3.0	12150
10.0	3.0	14230
11.0	3.0	16855

15'

Over abutments

H	C	Q	L
1.0	2.8	42	108
2.0	2.8	119	109
3.0	2.8	218	109
4.0	2.8	336	110
5.0	2.8	470	110
6.0	2.8	617	111
7.0	2.8	778	111
8.0	2.8	950	112
9.0	2.8	1134	112

108' to 185'

Over banks right side

H	C	Q
1.0	2.6	281
2.0	2.6	802
3.0	2.6	1473
4.0	2.6	2288
5.0	2.6	3198
6.0	2.6	4242
7.0	2.6	5345
8.0	2.6	6589
9.0	2.6	7862

Flow through sluices (2)

$C \approx 0.57$

$Q = ca\sqrt{2gh}$

H	Q
12.0	356
13.0	372
14.0	386
15.0	398
16.0	412
17.0	424
18.0	436
19.0	449
20.0	460
21.0	472
22.0	482

Over banks (left side)

L = 71' (+)

L	H	C	Q
71	1.0	2.6	185
72	2.0	2.6	529
72	3.0	2.6	973
73	4.0	2.6	1518
73	5.0	2.6	2122
74	6.0	2.6	2828
74	7.0	2.6	3563
75	8.0	2.6	4412

Abutment (left side)

L = 11'

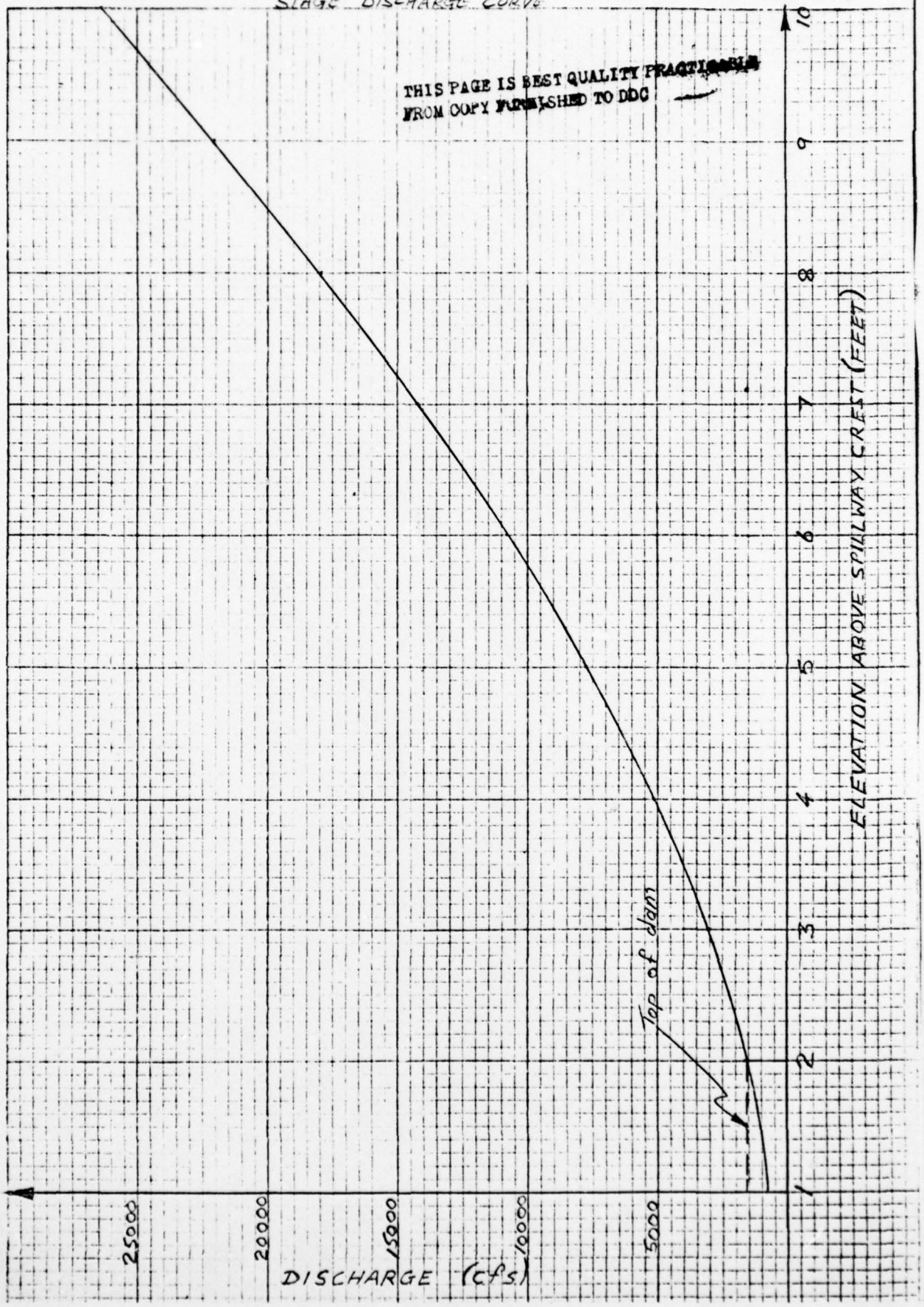
H	C	Q
1.0	2.8	31
2.0	2.8	87
3.0	2.8	160
4.0	2.8	246
5.0	2.8	344
6.0	2.8	453
7.0	2.8	570
8.0	2.8	697

ΣQ

H (feet)	Q (cfs)
1	806
2	1,645
3	3,047
4	5,135
5	7,750
6	10,795
7	14,202
8	17,956
9	22,014
10	26,374
11	31,442

Calculations assume sluices open under storm conditions which is normal practice at this site

STAGE DISCHARGE CURVE



BY DJM DATE

CHKD. BY DATE

SUBJECT

LOUIS BERGER & ASSOCIATES INC.

WESTONS MILLS POND DAM

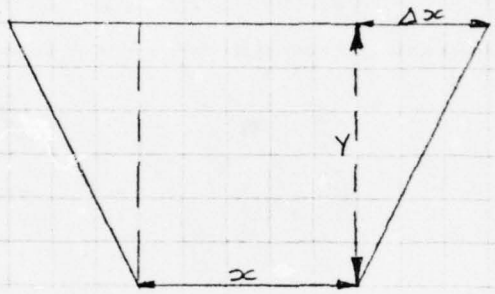
SHEET NO. A4 OF

PROJECT C-227

Lake between Westons Mills Pond Dam & Arch Dam

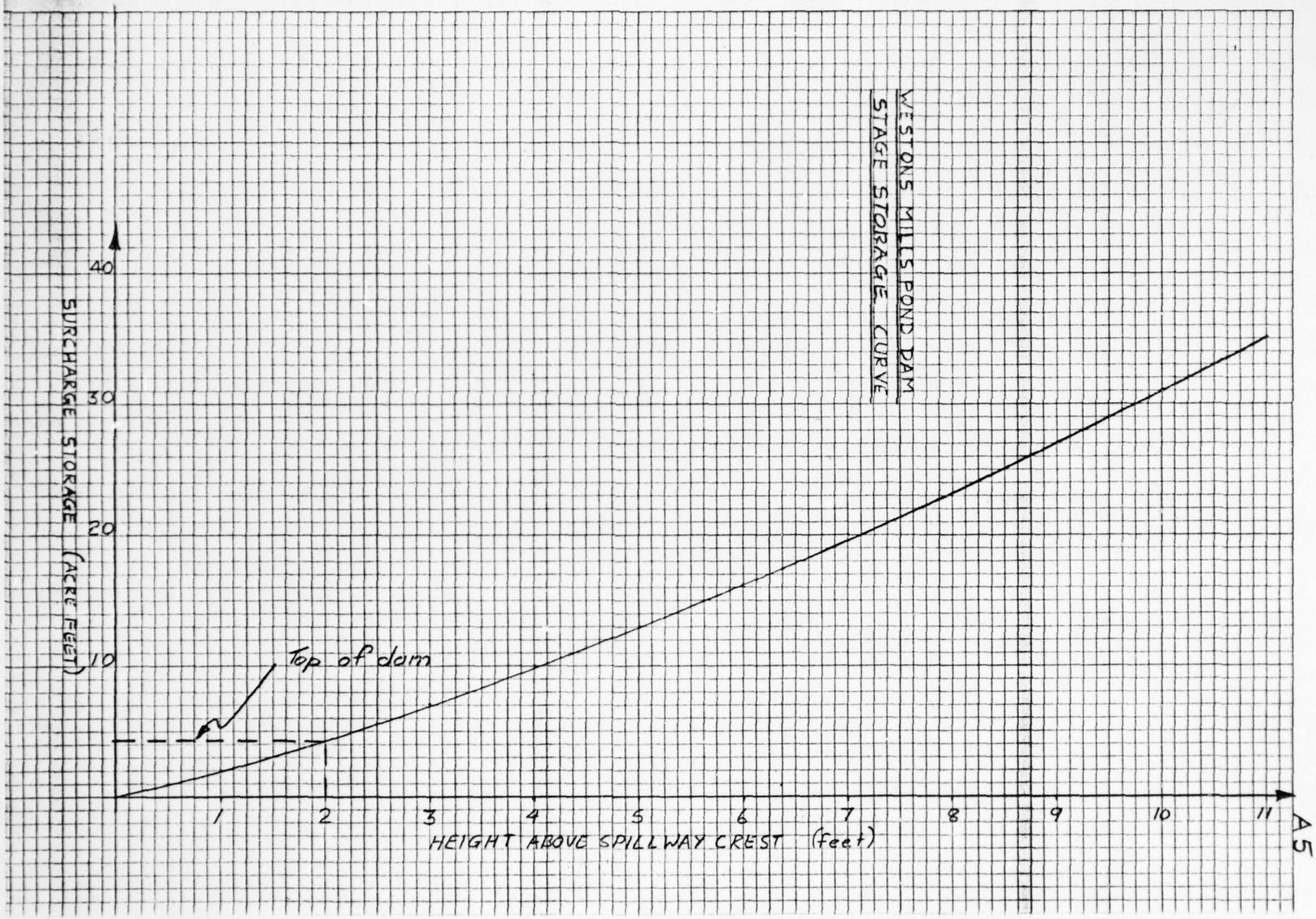
Area of lake @ El. +13.5 = 2.1 acres

Area of contour @ El. +20.0 = 3.4 acres



Increment in volume $\Delta V = (x + \Delta x) Y$

height above crest (ft)	Surcharge Storage (acre feet)
1	2
2	5
3	7
4	10
5	13
6	16
7	20
8	23
9	27
10	31
11	35



BY D J M DATE 11-78 **LOUIS BERGER & ASSOCIATES INC.** SHEET NO. A 6 OF

CHKD. BY DATE WESTONS MILLS DAM INSPECTION PROJECT C227

SUBJECT Approximate drawdown calculations for lower lake

Due to small size assume half water drains under 8.25' head Volume = 10 Acre feet = 435,600 cubic feet.

135 cfs mflow from upper dam

Discharge through sluices $Q = 2 c a \sqrt{2gH}$

take $c = 0.55$ $a = 4.5 \times 2.5$

$\therefore Q = 285$ cfs $- 135 = 150$ cfs

$\therefore$ time (hours) $= \frac{435,600}{2 \times 150 \times 3600} \approx 0.4$ hour

assume next ¼ drains under 7.44' head

$c = 0.5$

$Q = 246 - 135 \approx 110$ cfs time $= \frac{435600}{4 \times 110 \times 3600} \approx 0.28$ hours

assume last ¼ drains under 5.81' head

$c = 0.5$

$Q = 218$ cfs $-135 \approx 80$ cfs $\therefore$ time $= \frac{435600}{4 \times 80 \times 3600} \approx 0.38$ hours

Σ time ≈ 1.0 hours

assumes no tailwater

UPDATED AUG 74
CHANGE NO. 31

WESTONS MILLS DAM INSPECTION JOB#C227
BY D J MULLIGAN
DECEMBER 1978

JOB SPECIFICATION

NQ	NHR	NMIN	IDAY	IHR	IMIN	METRC	IPLT	IPRT	NSTAN
70	1	0	0	0	0	0	0	0	0

JOPER	NWT
3	0

SUB-AREA RUNOFF COMPUTATION

INFLOW HYDROGRAPH FOR HALF PMF

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

HYDROGRAPH DATA

IHYDG	IUHG	TAREA	SNAP	TRSDA	TRSPC	RATIO	ISNOW	ISAME	LOCAL
0	-1	42.00	0.0	42.00	0.0	0.500	0	0	0

PRECIP DATA

NP	STORM	DAJ	DAK
6	0.0	0.0	0.0

PRECIP PATTERN

0.10	1.00	1.80	9.90	3.60	1.80

LOSS DATA

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

GIVEN UNIT GRAPH, NUHGO= 29

147.	684.	1500.	2526.	3194.	3406.	3194.	2705.	2151.	1711.
1336.	1059.	815.	619.	489.	372.	274.	212.	163.	127.
98.	65.	49.	45.	38.	33.	27.	23.	18.	

UNIT GRAPH TOTALS 27080. CFS OR 1.00 INCHES OVER THE AREA

RECESSION DATA

STRTQ= 0.0 QRCSN= 0.0 RTIOR= 1.00

END-OF-PERIOD FLOW

TIME	RAIN	EXCS	COMP Q
1	0.10	0.10	15.
2	1.00	1.00	215.
3	1.80	1.80	1099.
4	9.90	9.90	4439.
5	3.60	3.60	12846.
6	1.80	1.80	25658.
7	0.0	0.0	41113.
8	0.0	0.0	53009.
9	0.0	0.0	58434.
10	0.0	0.0	56822.

11	0.0	0.0	50125.
12	0.0	0.0	41304.
13	0.0	0.0	33097.
14	0.0	0.0	26041.
15	0.0	0.0	20508.
16	0.0	0.0	15926.
17	0.0	0.0	12248.
18	0.0	0.0	9501.
19	0.0	0.0	7279.
20	0.0	0.0	5489.
21	0.0	0.0	4185.
22	0.0	0.0	3203.
23	0.0	0.0	2472.
24	0.0	0.0	1891.
25	0.0	0.0	1362.
26	0.0	0.0	1018.
27	0.0	0.0	843.
28	0.0	0.0	715.
29	0.0	0.0	618.
30	0.0	0.0	514.
31	0.0	0.0	417.
32	0.0	0.0	310.
33	0.0	0.0	106.
34	0.0	0.0	32.
35	0.0	0.0	0.
36	0.0	0.0	0.
37	0.0	0.0	0.
38	0.0	0.0	0.
39	0.0	0.0	0.
40	0.0	0.0	0.
41	0.0	0.0	0.
42	0.0	0.0	0.
43	0.0	0.0	0.
44	0.0	0.0	0.
45	0.0	0.0	0.
46	0.0	0.0	0.
47	0.0	0.0	0.
48	0.0	0.0	0.
49	0.0	0.0	0.
50	0.0	0.0	0.
51	0.0	0.0	0.
52	0.0	0.0	0.
53	0.0	0.0	0.
54	0.0	0.0	0.
55	0.0	0.0	0.
56	0.0	0.0	0.
57	0.0	0.0	0.
58	0.0	0.0	0.
59	0.0	0.0	0.
60	0.0	0.0	0.
61	0.0	0.0	0.
62	0.0	0.0	0.
63	0.0	0.0	0.
64	0.0	0.0	0.
65	0.0	0.0	0.
66	0.0	0.0	0.
67	0.0	0.0	0.
68	0.0	0.0	0.
69	0.0	0.0	0.
70	0.0	0.0	0.

SUM 18.20 18.20 492854.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	58434.	50135.	20378.	7041.	492855.
INCHES		11.10	18.05	18.19	18.19
AC-FT		24873.	40440.	40753.	40753.

RUNOFF MULTIPLIED BY 0.50

7.	108.	549.	2220.	6423.	12829.	20557.	26505.	29217.	28411.
25063.	20652.	16548.	13020.	10254.	7963.	6124.	4751.	3639.	2745.
2092.	1602.	1236.	946.	681.	509.	421.	358.	309.	257.
208.	155.	53.	16.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	29217.	25067.	10189.	3520.	246427.
INCHES		5.55	9.03	9.10	9.10
AC-FT		12436.	20220.	20376.	20376.

HYDROGRAPH ROUTING

ROUTING THROUGH RESERVOIR

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME
22	1	0	0	1	0	1

ROUTING DATA

QLOSS	CLOSS	AVG	IRES	ISAME
0.0	0.0	0.0	1	0

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

STORAGE=	0.	5.	10.	13.	16.	20.	23.	27.	31.	35.
OUTFLOW=	0.	1645.	5135.	7750.	10795.	14202.	17956.	22014.	26374.	31442.

TIME	EOP STOR	AVG IN	EOP OUT
1	0.	7.	14.
2	0.	58.	95.
3	2.	328.	530.
4	6.	1384.	2140.
5	11.	4321.	6365.
6	18.	9626.	12722.
7	25.	16693.	20489.
8	31.	23531.	26438.
9	33.	27661.	29230.
10	33.	28814.	28413.
11	30.	26737.	25127.
12	26.	22857.	20688.
13	22.	18600.	16603.
14	19.	14784.	13045.
15	16.	11637.	10306.
16	13.	9109.	7967.
17	11.	7043.	6169.
18	9.	5437.	4748.
19	8.	4195.	3679.
20	7.	3192.	2738.

BY_____DATE_____ LOUIS BERGER & ASSOCIATES INC. SHEET NO. A9 OF

BY ____________ DATE ________

CHKD. BY ______ DATE ________

LOUIS BERGER & ASSOCIATES INC.

SHEET NO. A10 OF __

PROJECT ____________

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21	6.	2419.	2121.
22	5.	1847.	1594.
23	4.	1419.	1268.
24	3.	1091.	938.
25	2.	613.	706.
26	2.	595.	499.
27	1.	465.	436.
28	1.	390.	350.
29	1.	333.	319.
30	1.	283.	252.
31	1.	233.	216.
32	0.	182.	152.
33	0.	104.	63.
34	0.	35.	10.
35	0.	8.	6.
36	-0.	0.	0.
37	-0.	0.	0.
38	-0.	0.	0.
39	-0.	0.	0.
40	-0.	0.	0.
41	-0.	0.	0.
42	-0.	0.	0.
43	-0.	0.	0.
44	-0.	0.	0.
45	-0.	0.	0.
46	-0.	0.	0.
47	-0.	0.	0.
48	-0.	0.	0.
49	-0.	0.	0.
50	-0.	0.	0.
51	-0.	0.	0.
52	-0.	0.	0.
53	-0.	0.	0.
54	-0.	0.	0.
55	-0.	0.	0.
56	-0.	0.	0.
57	-0.	0.	0.
58	-0.	0.	0.
59	-0.	0.	0.
60	-0.	0.	0.
61	-0.	0.	0.
62	-0.	0.	0.
63	-0.	0.	0.
64	-0.	0.	0.
65	-0.	0.	0.
66	-0.	0.	0.
67	-0.	0.	0.
68	-0.	0.	0.
69	-0.	0.	0.
70	-0.	0.	0.
SUM			246434.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	29230.	25064.	10188.	3520.	246434.
INCHES		5.55	9.03	9.10	9.10
AC-FT		12435.	20219.	20377.	20377.

RUNOFF SUMMARY, AVERAGE FLOW

		PEAK	6-HOUR	24-HOUR	72-HOUR	AREA
HYDROGRAPH AT	2	29217.	25067.	10189.	3520.	42.00
ROUTED TO	22	29230.	25064.	10188.	3520.	42.00