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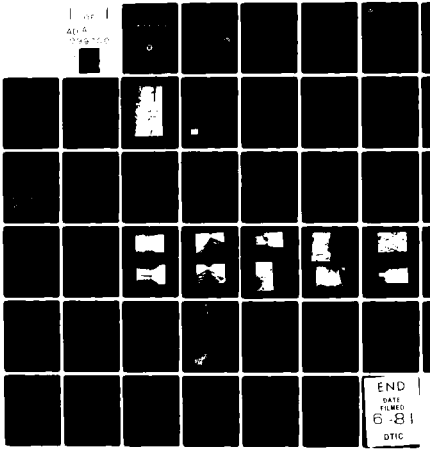

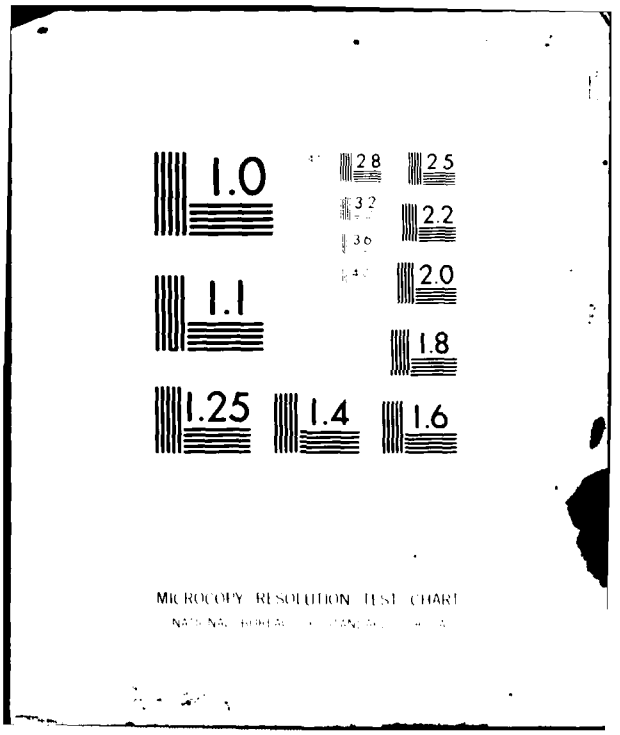
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MICROCOPY RESOLUTION TEST CHART

PASSAIC RIVER BASIN,
TRIBUTARY TO WHIPPANY RIVER
MORRIS COUNTY,
NEW JERSEY.

POWDER MILL POND
NJ 00803

PHASE 1 INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM.

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

Rept. no. DAEN/NAP-53842/NJ00803-81/03

MARCH 1981

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

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(19) REPORT DOCUMENTATION PAGE

READ INSTRUCTIONS BEFORE COMPLETING FORM

(18)

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4. TITLE (and Subtitle): ~~Phase I Inspection Report~~ National Dam Safety Program. Powder Mill Pond (NJ00803) Passaic River Basin, Tributary to Whippany River, Morris County, New Jersey. Phase I Inspection Report.

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6. PERFORMING ORG. REPORT NUMBER: (15)

7. AUTHOR(s): Yu, Peter

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9. PERFORMING ORGANIZATION NAME AND ADDRESS: Langan Engineering Assoc. Inc., 990 Clifton Ave., Clifton, NJ 07013

10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS:

11. CONTROLLING OFFICE NAME AND ADDRESS: NJ Department of Environmental Protection, Division of Water Resources, P.O. Box CN029, Trenton, NJ 08625

12. REPORT DATE: (11) Mar 1981

13. NUMBER OF PAGES: 40

14. MONITORING AGENCY NAME & ADDRESS (if different from Controlling Office): U.S. Army Engineer District, Philadelphia, Custom House, 2d & Chestnut Streets, Philadelphia, PA 19106 (12) 72

15. SECURITY CLASS. (of this report): Unclassified

15a. DECLASSIFICATION/DOWNGRADING SCHEDULE:

16. DISTRIBUTION STATEMENT (of this Report)

Approved for public release; distribution unlimited.

DTIC ELECTE JUN 3 1981 D C

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

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
Embankments
Visual Inspection
Structural Analysis
National Dam Safety Program
Powder Mill Pond Dam, N.J.
Whippany River, N.J.
Spillways
Embankments

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—2D & CHESTNUT STREETS
PHILADELPHIA, PENNSYLVANIA 19106

IN REPLY REFER TO
NAPEN-N

22 MAY 1981

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

Dear Governor Byrne:

Inclosed is the Phase I Inspection Report for Powder Mill Pond Dam in Morris 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, Powder Mill Pond Dam, a high hazard potential structure, is judged to be in fair overall condition. The spillway is considered seriously inadequate since a flow equivalent to 15 percent of the Probable Maximum Flood (PMF) would cause the dam to be overtopped. The seriously inadequate spillway is assessed as an UNSAFE, non-emergency condition, until more detailed studies prove otherwise or corrective measures are completed. The classification of UNSAFE applied to a dam because of a seriously inadequate spillway is not meant to indicate 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 could take place, significantly increasing the hazard of loss of life downstream from the dam. To ensure adequacy of the structure, the following actions, as a minimum, are recommended.

a. The spillway's adequacy should be determined by a qualified professional consultant engaged by the owner using more sophisticated methods, procedures and studies within three months from the date of approval of this report. Within three months of the consultant's findings remedial measures to ensure spillway adequacy should be initiated. 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.

b. The following remedial measures should be initiated within three months from the date of approval of this report:

(1) Perform additional investigation to determine seepage conditions through and under the embankment; provide horizontal drainage on the downstream face of the embankment if necessary.

(2) Perform additional investigation to determine the engineering properties of the embankment and foundation materials, and whether or not conventional safety margins exist under more severe stress conditions than those observed during our inspection, and what modifications may be required to achieve such safety margins.

c. The following remedial measures should be initiated within six months from the date of approval of this report:

(1) Repair undermining of the culvert footings and remove debris accumulating in the culvert, approach and discharge channels.

(2) Repair cracks existing in the concrete of the culvert approach walls and culvert.

d. The following remedial measures should be initiated within one year from the date of approval of this report:

(1) Provide proper slope protection on upstream slope of the embankment.

(2) Provide low level drawdown and additional spillway facilities for emergency and non-emergency purposes.

(3) Properly remove all trees and provide adequate filter coverage on the downstream face of the embankment to prevent any piping which may occur as a result of future root decay.

(4) Repair erosion resulting from footpaths on both upstream and downstream slopes.

e. The owner should develop written operating procedures and a periodic maintenance plan to ensure the safety of the dam within one year from the date of approval of this report.

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 Congresswoman Fenwick of the Fifth 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.

NAPEN-N
Honorable Brendan T. Byrne

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 Inspection 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.

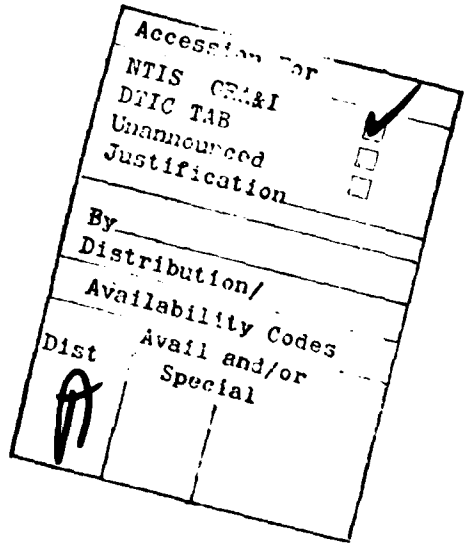
Sincerely,

for JAMES G. TON
Colonel, Corps of Engineers
District Engineer

1 Incl
As stated

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

Mr. John O'Dowd, Acting Chief
Bureau of Flood Plain Regulation
Division of Water Resources
N.J. Dept. of Environmental Protection
P.O. Box CN029
Trenton, NJ 08625



POWDER MILL POND DAM (NJ00803)

CORPS OF ENGINEERS ASSESSMENT OF GENERAL CONDITIONS

This dam was inspected on 10 and 12 September and 3 December 1980 by Langan Engineering 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.

Powder Mill Pond Dam, a high hazard potential structure, is judged to be in fair overall condition. The spillway is considered seriously inadequate since a flow equivalent to 15 percent of the Probable Maximum Flood (PMF) would cause the dam to be overtopped. The seriously inadequate spillway is assessed as an UNSAFE, non-emergency condition, until more detailed studies prove otherwise or corrective measures are completed. The classification of UNSAFE applied to a dam because of a seriously inadequate spillway is not meant to indicate 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 could take place, significantly increasing the hazard of loss of life downstream from the dam. To ensure adequacy of the structure, the following actions, as a minimum, are recommended.

a. The spillway's adequacy should be determined by a qualified professional consultant engaged by the owner using more sophisticated methods, procedures and studies within three months from the date of approval of this report. Within three months of the consultant's findings remedial measures to ensure spillway adequacy should be initiated. 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.

b. The following remedial measures should be initiated within three months from the date of approval of this report:

(1) Perform additional investigation to determine seepage conditions through and under the embankment; provide horizontal drainage on the downstream face of the embankment if necessary.

(2) Perform additional investigation to determine the engineering properties of the embankment and foundation materials, and whether or not conventional safety margins exist under more severe stress conditions than those observed during our inspection, and what modifications may be required to achieve such safety margins.

c. The following remedial measures should be initiated within six months from the date of approval of this report:

(1) Repair undermining of the culvert footings and remove debris accumulating in the culvert, approach and discharge channels.

(2) Repair cracks existing in the concrete of the culvert approach walls and culvert.

d. The following remedial measures should be initiated within one year from the date of approval of this report:

(1) Provide proper slope protection on upstream slope of the embankment.

(2) Provide low level drawdown and additional spillway facilities for emergency and nonemergency purposes.

(3) Properly remove all trees and provide adequate turf coverage on the downstream face of the embankment to prevent any piping which may occur as a result of future root decay.

(4) Repair erosion resulting from footpaths on both upstream and downstream slopes.

e. The owner should develop written operating procedures and a periodic maintenance plan to ensure the safety of the dam within one year from the date of approval of this report.

APPROVED: for JAMES C. TON
Colonel, Corps of Engineers
District Engineer

DATE: 29 May 1981

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

IN REPLY REFER TO
NAPEN-N

20 MAY 1981

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

Dear Governor Byrne:

This is in reference to our ongoing National Program for Inspection of Non-Federal Dams within the State of New Jersey. Powder Mill Pond Dam (Federal I.D. No. NJ00803), a high hazard potential structure, has recently been inspected. The dam is owned by the New Jersey Transit Corporation, and is located on a tributary of the Whippany River in Mount Tabor, Morris County.

Using Corps of Engineers screening criteria, it has been determined that the dam's spillway is seriously inadequate because a flow equivalent to 29 percent of the Probable Maximum Flood would cause the dam to be overtopped. The seriously inadequate spillway is assessed as an UNSAFE, non-emergency condition, until more detailed studies prove otherwise, or corrective measures are completed. The classification of UNSAFE applied to a dam because of a seriously inadequate spillway is not meant to indicate 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 could take place, significantly increasing the hazard potential to loss of life downstream from the dam. As a result of this UNSAFE determination, it is recommended that the dam's owners take the following measures within 30 days of the date of this letter:

a. Engage the services of a qualified professional consultant to more accurately determine the spillway adequacy by using more detailed and sophisticated hydrologic and hydraulic analyses, and to recommend any remedial measures required to prevent overtopping of the dam.

NAPEN-N
Honorable Brendan T. Byrne

b. In the interim, a detailed emergency operation plan and downstream warning system should be promptly developed. Also, around the clock surveillance should be provided during periods of unusually heavy precipitation.

A final report on this Phase I Inspection will be forwarded to you within two months.

Sincerely,

JAMES G. TON
Colonel, Corps of Engineers
District Engineer

Copies Furn shed:
Mr. Dirk C. Hofman, P.E., Deputy Director
Division of Water Resources
N.J. Dept. of Environmental Protection
P.O. Box CN029
Trenton, NJ 08625

Mr. John O'Dowd, Acting Chief
Bureau of Flood Plain Regulation
Division of Water Resources
N.J. Dept. of Environmental Protection
P.O. Box CN029
Trenton, NJ 08625

UNSAFE DAM
NATIONAL PROGRAM OF INSPECTION OF DAMS

a. NAME: Powder Mill Pond

b. ID NO.: NJ00803

c. LOCATION State: New Jersey, County: Morris.

d. HEIGHT: 35 feet

e. MAXIMUM IMPOUNDMENT CAPACITY: 212 ac. ft.

River or Stream: Tributary of Whippany River

Nearest D/S City or Town: Mount Tabor

f. TYPE: Earthfill, Railroad Embankment

g. OWNER: New Jersey Transit Corporation

h. DATE GOVERNOR NOTIFIED OF UNSAFE CONDITIONS: 21 May 1981

i. CONDITION OF DAM RESULTING IN UNSAFE ASSESSMENT: Preliminary report calculations indicate 15% of the PMF would overtop the dam.

l. URGENCY CATEGORY: High Hazard, UNSAFE, Non-Emergency.

m. EMERGENCY ACTIONS TAKEN:
Gov. notified of this condition by District Engineer's letter of 21 May 1981.

n. REMEDIAL ACTIONS TAKEN:
N.J.D.E.P. will notify dam's owner upon receipt of our letter.

o. REMARKS: Final report, to be issued within six weeks, will have WHITE cover.

j. DESCRIPTION OF DANGER INVOLVED: High Hazard potential, overtopping and failure of the dam would significantly increase hazard potential to loss of life and property downstream of dam.

k. RECOMMENDATIONS GIVEN TO GOVERNOR:
Within 30 days of the date of the District Engineer's letter the owner should do the following:
a. Engage the services of a qualified professional consultant to more accurately determine the spillway adequacy by using more detailed and sophisticated hydrologic and hydraulic analyses, and to recommend any remedial measures required to prevent overtopping of the dam.
b. In the interim, a detailed emergency operation plan and downstream warning system should be developed. Also, around the clock surveillance should be provided during periods of unusually heavy precipitation.

T.B. Heverin

T.B. HEVERIN, Coordinator
Dam Inspection Program
U.S.A.E.D., Philadelphia

PHASE I INSPECTION REPORT

NATIONAL DAM SAFETY PROGRAM

NAME OF DAM:	POWDER MILL POND
ID NUMBER:	FED ID No NJ 00803
STATE LOCATED:	NEW JERSEY
COUNTY LOCATED:	MORRIS
STREAM:	TRIBUTARY TO WHIPPANY RIVER
RIVER BASIN:	HUDSON RIVER
DATE OF INSPECTION:	SEPTEMBER & DECEMBER 1980

ASSESSMENT OF GENERAL CONDITIONS

The embankment bordering the east side of Powder Mill Pond appears to have been constructed as a railroad embankment and may not have been designed as a dam. However, significant amounts of water could be impounded by the embankment during periods of unusually heavy precipitation. The ability of the embankment to withstand stresses and seepage conditions induced by higher than normal water levels in Powder Mill Pond and the future performance of the embankment is uncertain. The arched culvert which allows water to flow through the embankment is in a deteriorated condition. There is water flowing from the toe and from the base of the vertical stone block wall on the downstream side of the embankment. The surficial soils of the embankment are in a loose condition. No riprap or other slope protection was observed and erosion has occurred in numerous areas of the embankment. There is essentially no available information concerning the design, construction or subsequent modifications of the embankment. Additional investigation is necessary to adequately evaluate the future performance of the embankment.

The spillway capacity as determined by the Corps of Engineers Screening criteria is "seriously inadequate". The embankment can adequately pass only 14% of the PMF. The spillway adequacy should be determined using more precise and sophisticated methods and procedures.

The following measures are recommended to be taken very soon:

Perform additional investigation to determine seepage conditions through and under the embankment, provide horizontal drainage on the downstream face of the embankment if necessary. Perform additional investigation to determine the engineering properties of the embankment and foundation materials, and whether or not conventional safety margins exist under more severe stress

conditions than those observed during our inspection, and what modifications may be required to achieve such safety margins. The spillway capacity of the embankment is "seriously inadequate" as defined in the Corps of Engineers ETL 1110-2-234. The need for and type of mitigating measures should be determiend, around-the-clock surveillance during periods of unusual heavy precipitation provided and a warning system established.

The following measures are recommended to be taken soon:

Repair undermining of the culvert footings and remove debris accumulating in the culvert, approach and dishcarge channels. Repair cracks existing in the concrete of the culvert approach walls and culvert.

The following measures are recommended to be taken in the near future:

Provide proper slope protection on upstream slope of the embankment. Provide low level drawdown and additional spillway facilities for emergency and non-emergency purposes. Properly remove all trees and provide adequate filter coverage on the downstream face of the embankment to prevent any piping which may occur as a result of future root decay. Repair erosion resulted from footpaths in both upstream and downstream slopes.

K. Peter Yu, P.E.

OVERALL VIEW

POWDER MILL POND
AND
RAILROAD EMBANKMENT

10 September 1980

PHASE I INSPECTION REPORT

NATIONAL DAM SAFETY PROGRAM

NAME OF DAM:	POWDER MILL POND
ID NUMBER:	FED ID No NJ 00803
STATE LOCATED:	NEW JERSEY
COUNTY LOCATED:	MORRIS
STREAM:	TRIBUTARY TO WHIPPANY RIVER
RIVER BASIN:	HUDSON RIVER
DATE OF INSPECTION:	SEPTEMBER & DECEMBER 1980

LANGAN ENGINEERING ASSOCIATES, INC.

Consulting Civil Engineers
990 CLIFTON AVENUE
CLIFTON, NEW JERSEY
201-472-9366

CONTENTS

NATIONAL DAM SAFETY REPORT

POWDER MILL POND FED ID NO NJ 00803

PREFACE

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

In reviewing this report, it should be realized that the reported condition of the dam is based on observations of field conditions at the time of inspection along with data available to the inspection team. 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.

SECTION 1 PROJECT INFORMATION

1.1 General

Authority to perform the Phase I Safety Inspection of Powder Mill Pond was received from the State of New Jersey, Department of Environmental Protection, Division of Water Resources by letter dated 12 August 1980. This Authority was given pursuant to the National Dam Inspection Act, Public Law 92-367 and by agreement between the State and the US Army Engineers District, Philadelphia.

The purpose of the Phase I Investigation is to develop an assessment of the general conditions with respect to safety of Powder Mill Pond and appurtenances based upon available data and visual inspection, and determine any need for emergency measures and conclude if additional studies, investigations and analyses are necessary and warranted. The assessment is made using screening criteria established in Recommended Guidelines for Safety Inspection of Dams prepared by the Department of Army, Office of the Chief of Engineers. It is not the purpose of the inspection report to imply that a dam meeting or failing to meet the screening criteria is, per se, certainly adequate or inadequate.

1.2 Description of Project

a. Description of Dam and Appurtenances

Powder Mill Pond is bordered along the east side by approximately 660 ft of a 2 track railroad embankment. The top of the embankment is about 11 feet above the normal pond surface and about 35 feet at its highest point above natural ground surface on the downstream side. The upstream and downstream slopes of the embankment vary between 2H:1V earthfill to vertical stone block retaining walls. The retaining walls vary in height from a few feet to about 20 feet. There is a 6 ft wide by 7 to 10 ft high culvert through the railroad embankment at the south end of the pond. There is no spillway associated with the pond or railroad embankment. The railroad embankment and south end of the pond is crossed by a one lane road (Powder Mill Pond Road). The road crosses the pond on an earthfill causeway. Water in the pond is allowed to pass through the causeway to the railroad embankment culvert by means of three 36-in-dia concrete pipes. There are no other outlets associated with the pond to our knowledge other than the 3 pipes and culvert.

b. Location

Powder Mill Pond is located in Mount Tabor, Morris County, New Jersey. Powder Mill Pond Road, which is located off Tabor Road (Rt 53) crosses the embankment and south end of the pond. It is at north latitude 40°52.0' and west longitude 74°28.7'. A regional vicinity map is given in Figure 1.

c. Size Classification

Powder Mill Pond is classified as small based on its maximum storage capacity of approximately 212 ac ft which is more than 50 ac ft but less than 1,000 ac ft. It is classified as small based on the railroad embankment maximum height of 35 feet which is less than 40 feet. Accordingly, Powder Mill Pond is classified as "small" in size.

d. Hazard Classification

Powder Mill Pond is classified as having a "High Hazard Potential" in the National Inventory of Dams on the basis that failure of the railroad embankment would cause excessive property damage to residences downstream and could potentially cause more than a few deaths. Visual inspection revealed a large number of homes and structures along the downstream channel and the use of the embankment by commuter train; both of which could be seriously affected in the event of a failure of the railroad embankment. It is, therefore, proposed to keep the Hazard Potential Classification as "High".

e. Ownership

Ownership of the railroad embankment is by New Jersey Transit Corp., Macarter Highway & Market Street, P. O. Box 10009, Newark, New Jersey 07101.

f. Purpose of Dam

The purpose of the dam structure is an embankment track bed for an active railroad. Powder Mill Pond is used for recreation.

g. Design and construction History

There is no information available on the design and construction history of the railroad embankment.

h. Normal Operational Procedures

There are no known operational procedures for the regulation of water flow from Powder Mill Pond.

1.3 Pertinent Data

a.	Drainage Areas	1.66 sq. mi.
b.	Discharge at Damsite	
	Maximum known flood at damsite	unknown
c.	Elevation (Arbitrary - El 100.0 top of concrete retaining wall over culvert)	
	Top Dam	102.13 (low point at south end)
	Normal pool	Approx 92
	Spillway crest	No Spillway
	Maximum tailwater	Unknown

d.	Reservoir	
	Length of maximum pool	Approx 1800 ft
	Length of normal pool	Approx 1000 ft
e.	Storage (acre-feet)	
	Normal pool	Approx 96 ac ft
	Top of railroad embankment	Approx 212 ac ft
f.	Reservoir Surface (acres)	
	Top of railroad embankment	Approx 15.3
	Normal pool	Approx 8.0
	Spillway crest	N/A
g.	Dam	
	Type	Earthfill railroad embankment
	Length	660 ft
	Height	Approx 35 ft
	Top Width	25 ft
	Side Slopes	Variable (2H:1V to vertical)
	Zoning	Unknown
	Impervious Core	Unknown
	Cutoff	Unknown
	Grout curtain	Unknown
h.	Spillway	No spillway
i.	Regulating Outlets	6 ft wide by 7 to 10 ft high masonry arched culvert under railroad embankment. No controlled outlets.

SECTION 2 ENGINEERING DATA

There is no information available concerning the design or construction of the railroad embankment. There are no operational procedures concerning the railroad embankment with respect to water levels in Powder Mill Pond.

SECTION 3 VISUAL INSPECTION

Our visual inspection of the Powder Mill Pond revealed the east side of the pond is bordered by a 2 track railroad embankment which at its low point was approximately 10 1/2 ft higher than the pond water level at the time of the inspection. The embankment and pond are crossed at the southern end by Powder Mill Pond Road which is supported by an earthen causeway. The low point of the causeway is only 1 to 2 ft above normal pool level. Under this portion of the causeway are three 36-in-dia concrete pipes through which water discharges and flows along the west side of the railroad embankment to a 6 ft wide, 7 to 10 foot high arched stone and masonry culvert through the railroad embankment. On the east side of the embankment water runs down a steep slope formed by rock outcrop to a stream bed approximately 20 feet below.

The upstream and downstream slopes of the railroad embankment vary from maximum of approximately 2H:1V to vertical stone block and concrete retaining walls. The slopes are vegetated with brush and small diameter trees below the ballast line of the railroad tracks. There is seepage of water running from the toe and from the base of the stone block retaining wall on the downstream side. The seepage appeared to be clear at the time of the inspection. The surficial soil on the slopes is generally in an uncompacted state. Walking on the slopes leaves footprints and depressions in many areas. There are many areas of surficial erosion along the embankment slopes.

The upstream railroad embankment is protected from erosion for approximately 60 ft north of the culvert by a vertical concrete retaining wall. There is a horizontal crack along most of the length of this wall which has experienced about 2 inches of translational movement. No protective riprap was observed along the upstream embankment.

The culvert which passes under the railroad embankment is constructed of various materials. The middle section of the culvert, approximately 23 ft long, is constructed of vertical stone block walls to the springline with a brick arch. To both ends of this has been added approximately 7 ft long reinforced concrete culvert sections of the same cross sectional dimensions. The concrete sections are supported on stone foundations. The date 1902 is inscribed in the concrete which appears to be the date of the extensions.

Inspection of the culvert shows that the stream has extensively eroded and undermined the stone foundations of the culvert walls. The concrete arch is severely cracked. No mortar was observed in the joints of the stone block. There are railroad ties, plywood, dead branches and other debris in the culvert.

There are approximately 6 homes along the southwestern side of Powder Mill Pond. The homes appear to be built at or above the elevation of the top of the railroad embankment. The remaining shore areas are swamp and woodlands.

The downstream channel from the east side culvert outlet is a steep rock outcrop streambed dropping approximately 30 feet in a distance of less than 500 ft to a streambed formed between NJ Rt 53 and the railroad embankment.

SECTION 4 OPERATIONAL PROCEDURES

There are no operational procedures for Powder Mill Pond. Maintenance of the railroad embankment is by Conrail, Inc. and the New Jersey Transit Corp.

SECTION 5 HYDRAULICS/HYDROLOGIC

Powder Mill Pond is bordered along its east side by a railroad embankment. Water discharges through three concrete pipes under the causeway and flows along the upstream toe of the embankment to a stone and masonry arched culvert passing through the embankment. This is, to our knowledge, the only outlet for the pond water.

The hydraulic/hydrologic evaluation is based on a Spillway Design Flood (SDF) equal to the Probable Maximum Flood chosen in accordance with the evaluation guidelines for dams classified as high hazard and small in size. Hydrologic design data for the embankment was not available. The PMF has been determined by developing a synthetic hydrograph based on the maximum probable precipitation of 22.2 inches (200 sq. mi. -24 hour). The Corps of Engineers has recommended the use of the SCS triangular unit hydrograph with the curvilinear transformation. Hydrologic computations are presented in Appendix 3. The PMF peak inflow determined for the subject watershed is 5005 cfs.

The capacity of the culvert at maximum pool elevation at the top of the railroad embankment is estimated to be 528 cfs which is significantly less than the SDF. Flood routing for the 1/2 PMF and PMF indicates the railroad embankment will overtop by 1.04 ft and 1.86 ft, respectively. We estimate the culvert can adequately pass only 14% of the PMF. Based on our knowledge of the dam as an earthfill railroad embankment and our knowledge of the degree of overtoppping potential, it is our opinion that overtopping by the 1/2 PMF would likely cause failure.

The immediate potential damage center is located at the embankment on which active commuter trains travel. The downstream potential damage center, which is approximately 1500 ft from the embankment, is comprised of Rt 53 and numerous homes and structures located along the stream for a distance of about a mile. Based on the above observations it is our opinion that failure of the railroad embankment from overtopping would significantly increase the hazard potential for economic loss and loss of life downstream of the embankment from that which would exist just before overtopping failure. Therefore, the spillway capacity of Powder Mill Pond Dam is considered to be "seriously inadequate" as defined in the Corps of Engineers ETL 1110-2-234.

There is, to our knowledge, no drawdown structure associated with the pond.

SECTION 6 STRUCTURAL STABILITY

The embankment to the east of Powder Mill Pond appears to have been intended for use as a railroad embankment and not to perform as an earth dam. Based on visual observation, no immediate instability appears to exist in the railroad embankment under normal conditions. However, downstream seepage, deteriorated retaining walls and culvert structures exist and can lead to serious structural stability problems if deficiencies are uncorrected. The embankment has the potential to impound significant amounts of water during periods of unusually heavy precipitation. Vibration induced by the active commuter trians presents additional unfavorable conditions. The structural stability of the embankment under such conditions are uncertain and are probably unsatisfactory.

There are no design or construction data available concerning the construction of the railroad embankment or subsequent modifications, consequently analysis of the degree of stability of the embankment cannot be made without gross assumptions concerning the engineering properties of the embankment and foundation materials.

There are no operating records of the railroad embankment pertaining to Powder Mill Pond.

The track bed appears to have been widened about 1902 as judged by the different materials used in construction of the culvert and the date inscribed in the concrete of the culvert. The structural adequacy of the culvert and upstream wingwall may not be satisfactory as evidenced by the severely cracked concrete of these structures and should be further evaluated.

The railroad embankment is located in Seismic Zone I of the Seismic Zone Map of Contiguous States. The degree of stability of the embankment under static loading is uncertain and may be unstable under earthquake loading.

SECTION 7 ASSESSMENT, RECOMMENDATIONS/REMEDIAL MEASURES

7.1 Dam Assessment

The embankment bordering the east side of Powder Mill Pond appears to have been constructed as a railroad embankment and may not have been designed as a dam. However, significant amounts of water could be impounded by the embankment during periods of unusually heavy precipitation. The ability of the embankment to withstand stresses and seepage conditions induced by higher than normal water levels in Powder Mill Pond and the future performance of the embankment is uncertain. The arched culvert which allows water to flow through the embankment is in a deteriorated condition. There is water flowing from the toe and from the base of the vertical stone block wall on the downstream side of the embankment. The surficial soils of the embankment are in a loose condition. No riprap or other slope protection was observed and erosion has occurred in numerous areas of the embankment.

There is essentially no available information concerning the design, construction or subsequent modifications of the embankment. Additional investigation is necessary to adequately evaluate the future performance of the embankment.

The spillway capacity as determined by the Corps of Engineers Screening criteria is "seriously inadequate". The embankment can adequately pass only 14% of the PMF. The spillway adequacy should be determined using more precise and sophisticated methods and procedures.

7.2 Recommendations/Remedial Measures

The following measures are recommended to be taken very soon:

1. Perform additional investigation to determine seepage conditions through and under the embankment; provide horizontal drainage on the downstream face of the embankment if necessary.

2. Perform addtional investigation to determine the engineering properties of the embankment and foundation materials, and whether or not conventional safety margins exist under more severe stress conditoins than those observed during our inspection, and what modifications may be required to achieve such safety margins.

3. The spillway capacity of the embankment is "seriously inadequate" as defined in the Corps of Engineers ETL 1110-2-234. The need for and type of mitigating measures should be determined, around-the-clock surveillance during periods of unusual heavy precipitation provided and a warning system established.

The following measures are recommended to be taken soon:

1. Repair undermining of the culvert footings and remove debris accumulating in the culvert, approach and discharge channels.

2. Repair cracks existing in the concrete of the culvert approach walls and culvert.

The following measures are recommended to be taken in the near future:

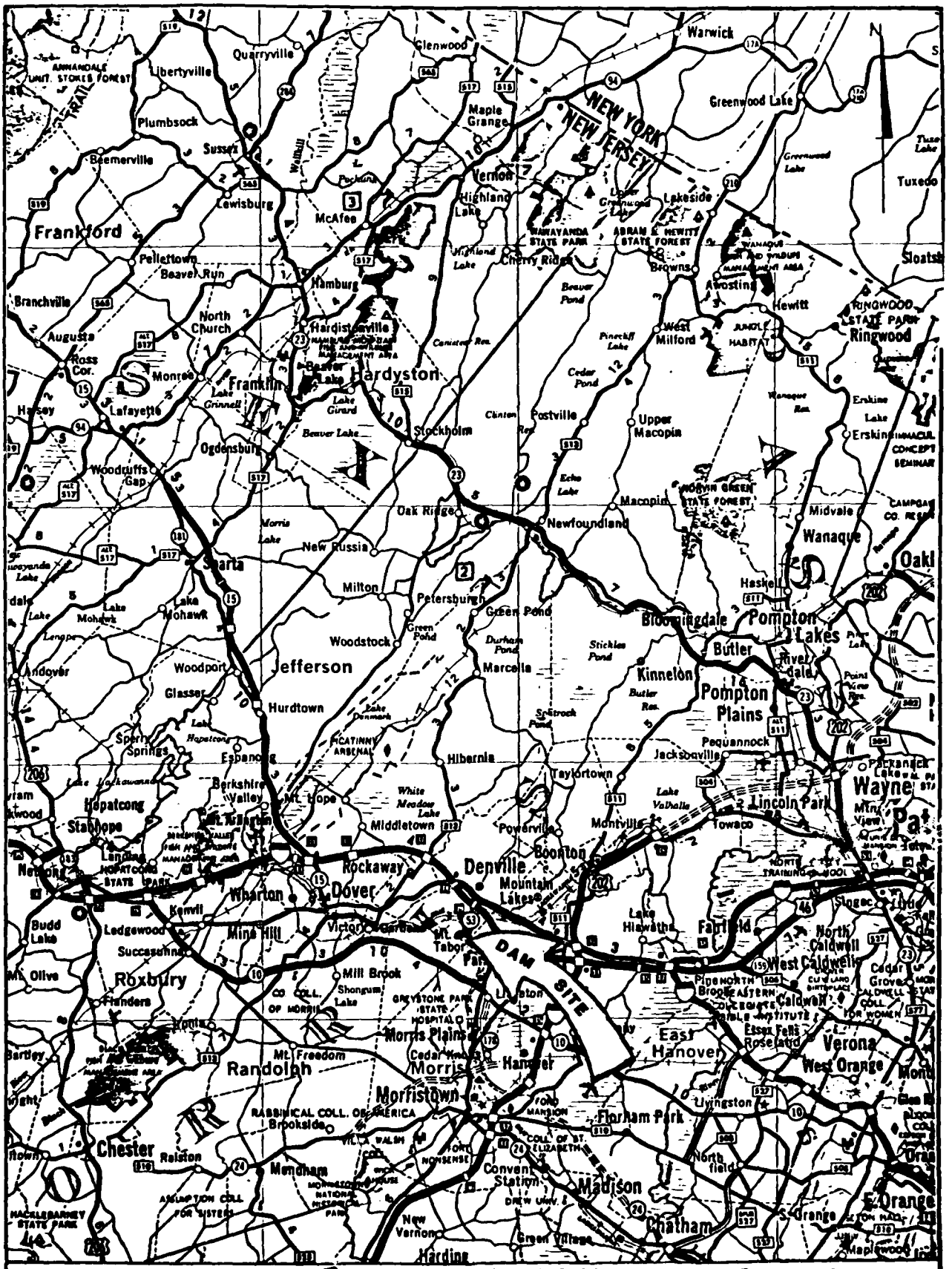
1. Provide proper slope protection on upstream slope of the embankment.

2. Provide low level drawdown and additional spillway facilities for emergency and non-emergency purposes.

3. Properly remove all trees and provide adequate filter coverage on the downstream face of the embankment to prevent any piping which may occur as a result of future root decay.

4. Repair erosion resulted from footpaths on both upstream and downstream slopes.

FIGURES



BY _____ DATE _____ REGIONAL VICINITY MAP JOB NO. 80145

CKD. _____ DATE _____ POWDER MILL POND Fig. No. 1

Scale: 1" ≈ 2 MILES

TAB

HOUSE

STONE WALL

N.J. TRANSIT - MORRISTOWN COMMUTER LINE - MAIN LINE (FORMERLY ERIE LACKAWANNA, CONRAIL)

225

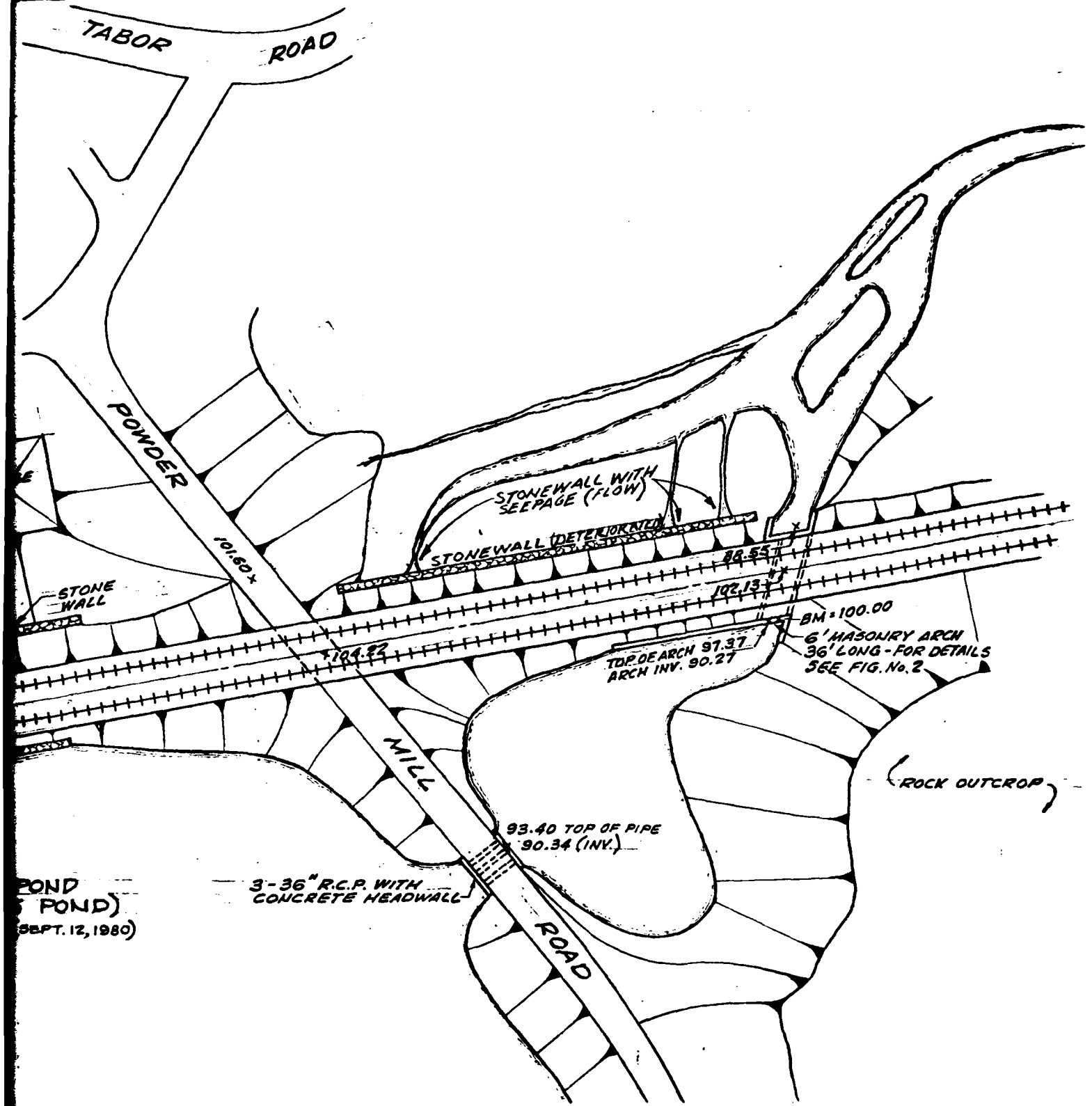
×108.24

×104.11

STONE WALL DETERIORATED

POWDER MILL POND
(FORMERLY HOWELL'S POND)
W.S. 91.85± (SEPT. 12, 1980)

NOTE



NOTE:

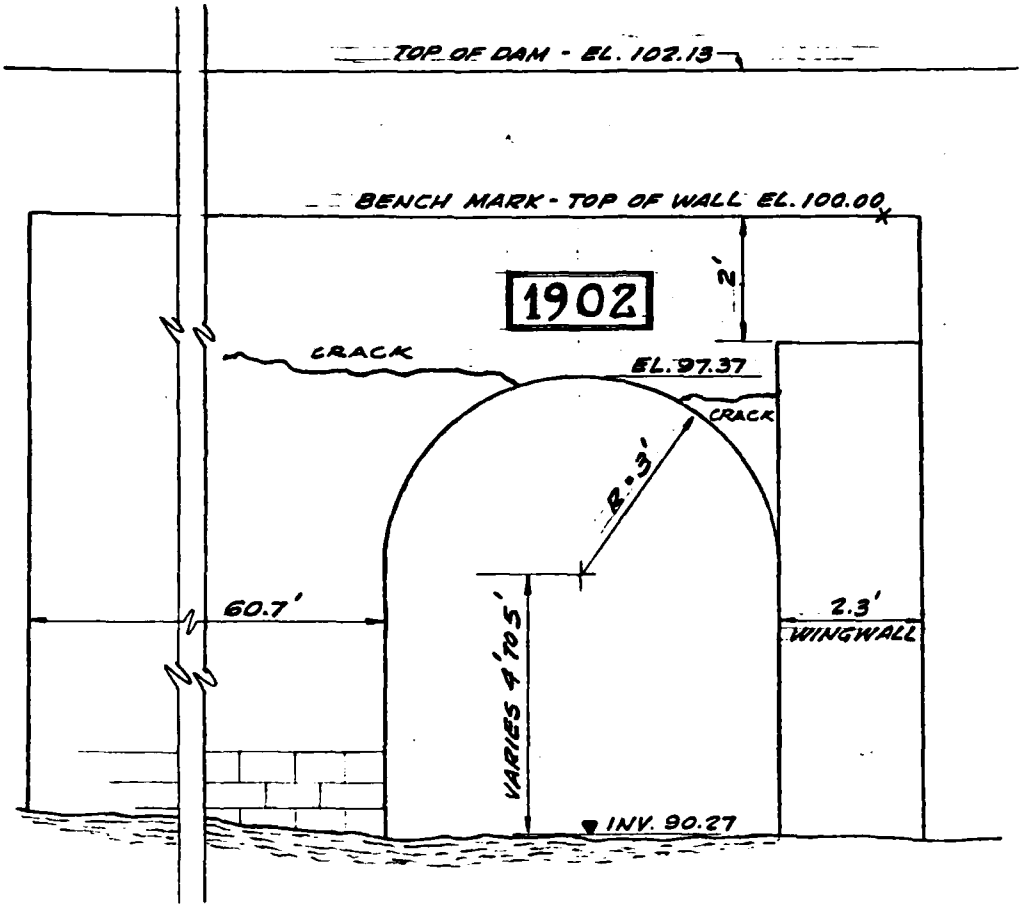
FIGURE ADAPTED FROM DRAWING "ERIE-LACKAWANNA R.R., MORRIS AND ESSEX DIVISION, MAIN LINE, MORRIS COUNTY, PARSIPPANY-TROY HILLS TOWNSHIP, STATE BOARD OF TAXES & ASSESSMENT" DATED FEBRUARY, 1928. ARBITARY B.M. OF EL. 100.00 ON TOP OF ARCH WALL ABOVE CULVERT WAS USED FOR FIELD SPOT CHECK

PLAN OF RAILROAD EMBANKMENT AND APPURTENANCES
POWDER MILL POND

MT. TABOR — MORRIS COUNTY, N.J.

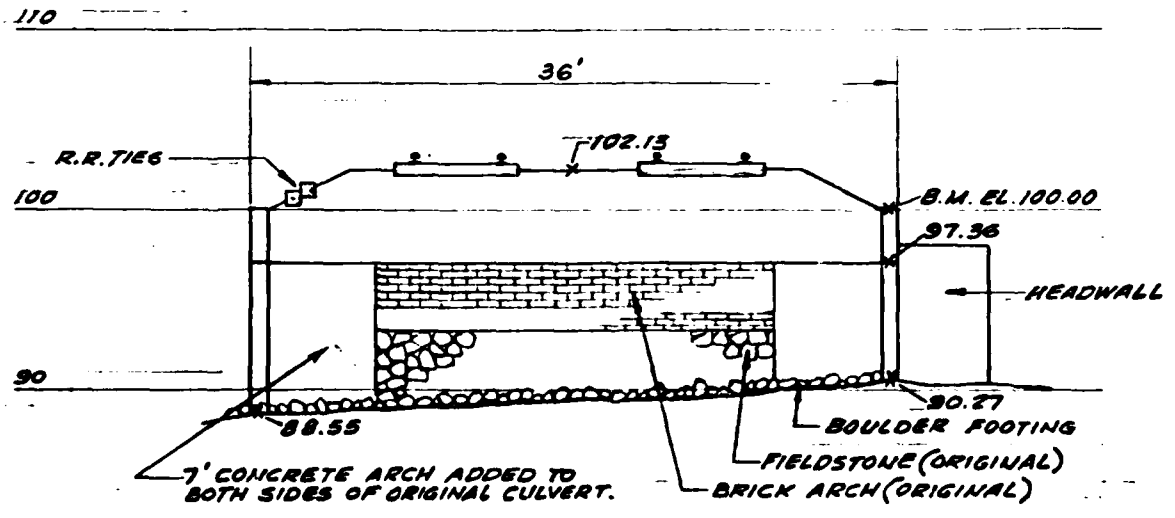
LANGAN ENGINEERING ASSOCIATES, INC.
990 CLIFTON AVENUE CLIFTON, N.J. 07013

DRN. BY: R.D.	SCALE: 1" = 50'±	JOB No. 80145
CK'D. BY: V.U.	DATE: 9-17-80	FIG. No. 2



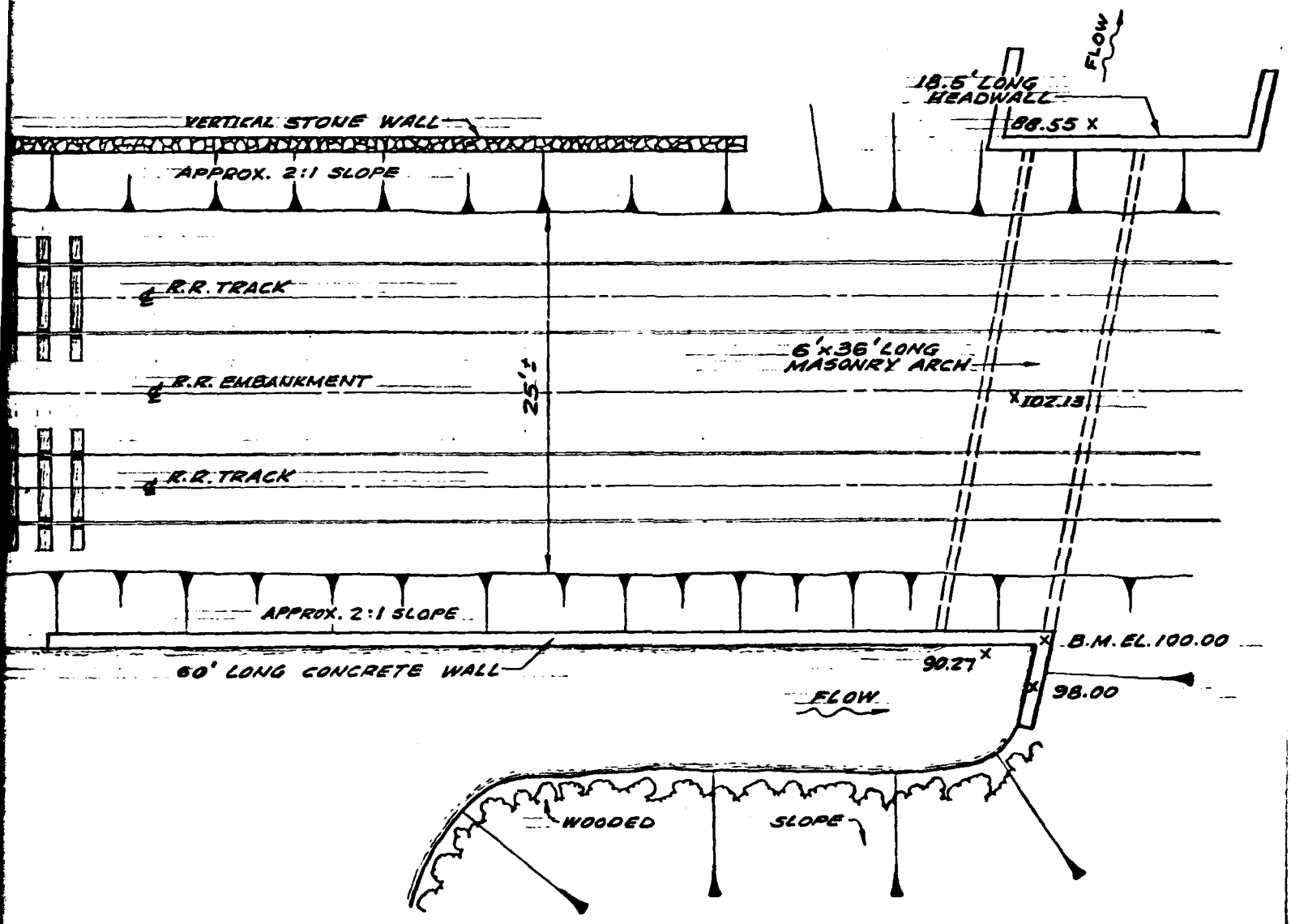
UPSTREAM ELEVATION OF MASONRY ARCH

1" = 3' ±



PROFILE THRU 6' MASONRY ARCH CULVERT

SCALE: 1"=10' ±



PLAN OF OUTLET STRUCTURE

1" = 10'±

NOTE:

FIGURE ADAPTED FROM DRAWING "ERIE-LACKAWANNA R.R., MORRIS AND ESSEX DIVISION MAIN LINE, MORRIS COUNTY, PARSIPPANY-TROY HILLS TOWNSHIP, STATE BOARD OF TAXES & ASSESSMENT" DATED FEBRUARY 1928 ARBITARY B.M. OF EL. 100.00 ON TOP OF ARCH WALL ABOVE CULVERT WAS USED FOR FIELD SPOT CHECK.

CULVERT DETAILS

POWDER MILL POND

MT. TABOR — MORRIS COUNTY, N.J.

LANGAN ENGINEERING ASSOCIATES, INC.

990 CLIFTON AVENUE CLIFTON, N.J. 07013

DRN. BY: R.D.	SCALE: AS SHOWN	JOB No. 80145
CK'D. BY: V.U.	DATE: 9-17-80	FIG. No. 3

APPENDIX 1

CHECK LIST, HYDROLOGIC AND HYDRAULIC DATA

CHECK LIST, VISUAL INSPECTION

CHECK LIST
HYDROLOGIC AND HYDRAULIC DATA
ENGINEERING DATA

DRAINAGE AREA CHARACTERISTICS: 1.66 sq. mi., wooded & forest land

ELEVATION TOP NORMAL POOL (STORAGE CAPACITY): El 92± (96 ac ft)

ELEVATION TOP MAXIMUM POOL (STORAGE CAPACITY): Approx El 102 (212 ac ft)

ELEVATION MAXIMUM DESIGN POOL: Unknown

ELEVATION TOP RAILROAD EMBANKMENT: 102.12, low point

CREST: of Railroad Embankment

a. Elevation 102.13, low point
b. Type Earth Embankment
c. Width 25 ft ±
d. Length 660 ft
e. Location Spillover None
f. Number and Type of Gates None

OUTLET WORKS: Culvert

a. Type 6 ft wide, 7 ft high masonry & stone arched culvert
b. Location South end of RR embankment
c. Entrance inverts 90.3±
d. Exit inverts 88.5±
e. Emergency draindown facilities None

HYDROMETEOROLOGICAL GAGES: None
a. Type
b. Location
c. Records

MAXIMUM NON-DAMAGING DISCHARGE: Unknown

NOTE: All Elevations based on arbitrary datum.

Check List
Visual Inspection
Phase 1

Name Dam Powder Mill Pond County Morris State New Jersey Coordinators NJ DEP

Date(s) Inspection 10 Sep 1980 Weather Clear Temperature Mid 70's

Pool Elevation at Time of Inspection 91.85* M.S.L. Tailwater at Time of Inspection 88.55* M.S.L.

*Elevation referenced to artibrary datum of 100 at top of concrete retaining wall over culvert (see Fig. 2)

Inspection Personnel:

Richard W. Greene (LEA) 10 Sep & 12 Sep 1980

Dennis J. Leary (LEA) 3 Dec 1980

Larry Lindgren (NJ DEP) 10 Sep 1980

V. Urban (LEA) 12 Sep 1980

K. Peter Yu (LEA) 3 Dec 1980

Brian Mulvenna (AC of E) 10 Sep 1980

R. W. Greene Recorder

EMBANKMENT

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SURFACE CRACKS	NONE OBSERVED	
UNUSUAL MOVEMENT OR CRACKING AT OR BEYOND THE TOE	NONE OBSERVED	
SLOUGHING OR EROSION OF EMBANKMENT AND ABUTMENT SLOPES	EROSION WHERE PATHS HAVE BEEN MADE ON BOTH UPSTREAM AND DOWNSTREAM EMBANKMENTS. EMBANKMENT MATERIAL LOOSE, LEFT FOOT PRINTS 2 TO 3 INCHES DEEP IN PLACES	REPAIR EROSION.
VERTICAL AND HORIZONTAL ALINEMENT OF THE CREST	STRAIGHT, APPROX 25 FT WIDE 2 TRACK, ACTIVE RAILROAD	
RIPRAP FAILURES	NO RIPRAP SEEN. 2 VERTICAL UNMORTARED FIELD STONE WALLS OBSERVED. 1 UPSTREAM FACE, 1 DOWNSTREAM FACE. OCCASIONAL BLOCKS MISSING FROM TOP OF WALL.	PROVIDE PROPER PROTECTION ON UPSTREAM SLOPE OF EMBANKMENT.

EMBANKMENT

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
	UPSTREAM AND DOWNSTREAM EMBANKMENTS HAVE NUMEROUS SMALL DIAMETER TREES AND BRUSH.	REMOVE TREES AND BRUSH; PROVIDE ADEQUATE FILTER COVERAGE ON THE DOWNSTREAM FACE OF THE EMBANKMENT.
JUNCTION OF EMBANKMENT AND ABUTMENT, SPILLWAY AND DAM	NO SPILLWAY - 6 FOOT WIDE BY 7 TO 10 FT HIGH ARCHED CULVERT CONCRETE APPROACH WALLS, CONCRETE WALLS VERY CRACKED AND SPALLED.	REPAIR DETERIORATED CULVERT STRUCTURE.
ANY NOTICEABLE SEEPAGE	WATER FLOWING FROM BASE OF DOWNSTREAM VERTICAL STONE WALL.	YOUNG BOY WHO LIVES IN AREA SAID THIS HAD BEEN FLOWING SINCE HE COULD REMEMBER.
STAFF GAGE AND RECORDER	NONE OBSERVED	
DRAINS	NONE OBSERVED	

UNGATED SPILLWAY - NO SPILLWAY

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONCRETE WEIR	NO SPILLWAY ASSOCIATED WITH RAILROAD EMBANKMENT.	
APPROACH CHANNEL		
DISCHARGE CHANNEL		
BRIDGE AND PIERS		

OUTLET WORKS

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CRACKING AND SPALLING OF CONCRETE SURFACES IN OUTLET CONDUIT	FACES OF ARCHED CULVERT UNDER EMBANKMENT VERY CRACKED AND SPALLED. DATE ON ARCHED CULVERT 1902. FOOTINGS OF TUNNEL BEING UNDERMINED BY STREAM FLOW. DEBRIS IN CULVERT.	REPAIR DETERIORATED STRUCTURE. REPAIR UNDERMINED FOOTINGS. REMOVE DEBRIS.
INTAKE STRUCTURE	NONE.	
OUTLET STRUCTURE	NONE.	
OUTLET CHANNEL	NATURAL BOULDER STREAMBED.	
EMERGENCY GATE	NONE.	

INSTRUMENTATION

VISUAL EXAMINATION	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
MONUMENTATION/SURVEYS	NEW JERSEY GEODETIC SURVEY CONTROL STATION NO 123 ON SOUTHERLY UPSTREAM CONCRETE WALL OF CULVERT.	CHECKED WITH NJ GEODETIC SURVEY: THEY SAY THIS DISC HAS NOT BEEN INSTALLED BY THEM. OWNERS AND ELEVATION OF SURVEY MONUMENT ARE UNKNOWN.
OBSERVATION WELLS	NONE OBSERVED.	
WEIRS	NONE OBSERVED.	
PIEZOMETERS	NONE OBSERVED.	
OTHER	NONE.	

RESERVOIR

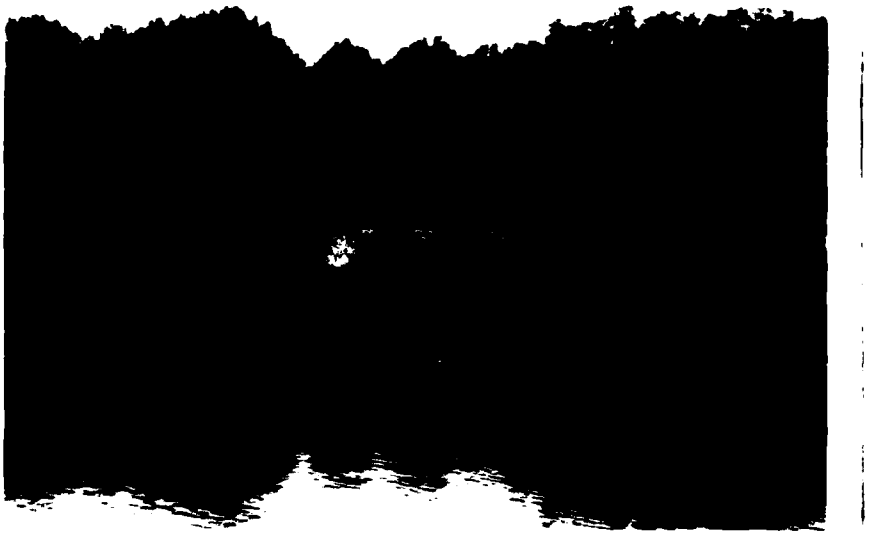
VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SLOPES	SOUTH SHORELINE STEEP NATURAL MOUNTAINOUS SLOPES, APPROX 1H:1V TO 2H:1V. NORTH SHORELINE FLATTER WOODED SLOPES APPROX 10H:1V.	
SEDIMENTATION	ROCKY BOTTOM OF POND VISIBLE. OCCASIONAL DEAD BRANCHES. VERY LITTLE TO NO SILT OBSERVED ALONG SOUTH END OF POND.	

DOWNSTREAM CHANNEL

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONDITION (OBSTRUCTIONS, DEBRIS, ETC.)	VERY LITTLE DEBRIS. OCCASIONAL PIECES OF WOOD AND BROKEN BOTTLES. MAINLY NATURAL BOULDER STREAMBED. PIECES OF PLYWOOD IN CULVERT.	
SLOPES	STEEP TO BOTTOM OF RAILROAD EMBANKMENT, THEN FLAT SLOPE IN STREAM CHANNEL.	
APPROXIMATE NO. OF HOMES AND POPULATION	NONE IMMEDIATELY VISIBLE FROM RAILROAD EMBANKMENT. NUMEROUS HOMES, STRUCTURES AND RECREATIONAL FACILITIES FURTHER SOUTH ALONG STREAM CHANNEL, BETWEEN APPROX 1500 TO 5000 FT DOWNSTREAM.	ACTIVE COMMUTER TRAINS TRAVEL ON EMBANKMENT.

APPENDIX 2

PHOTOGRAPHS

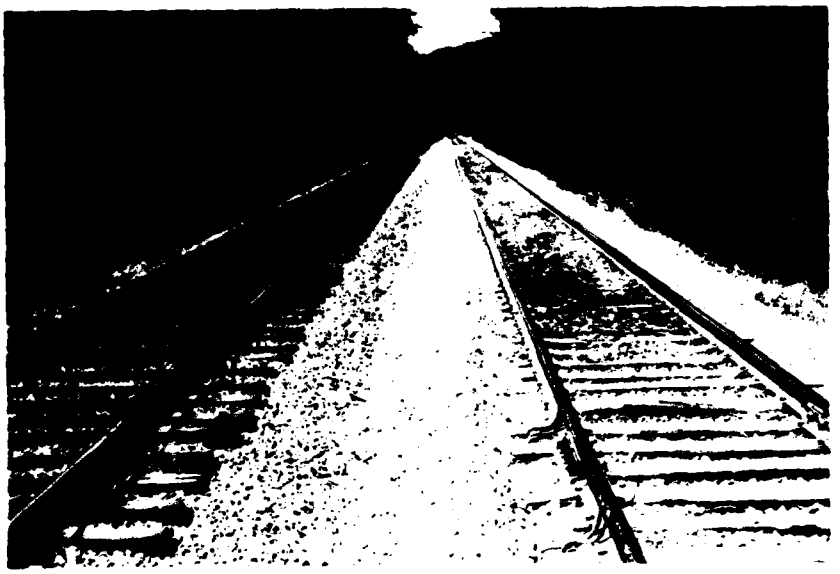


Upstream face of railroad embankment bordering pond.

10 September 1980

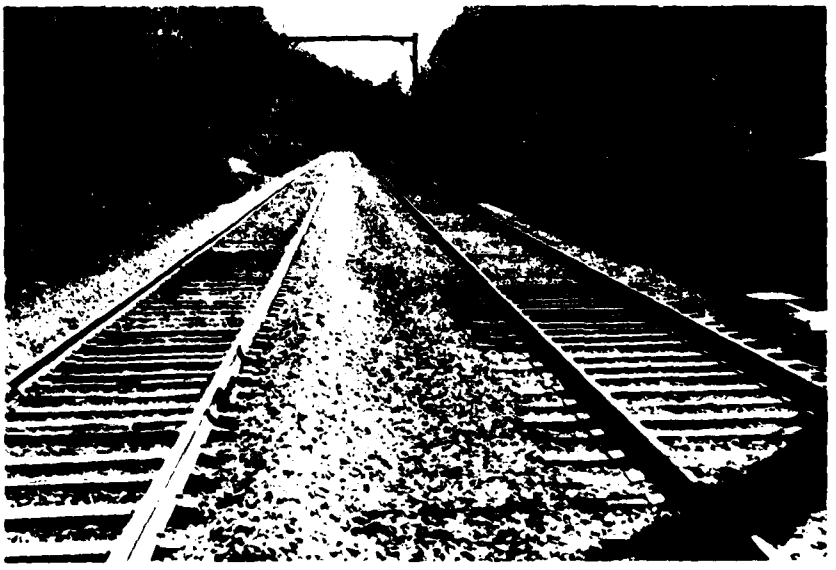
Railroad embankment and Powder Mill Road crossing south end of pond.

10 September 1980



Crest of railroad embankment looking north from Powder Mill Road crossing.

10 September 1980



Crest of railroad embankment looking south from Powder Mill Road crossing.

10 September 1980

South end of pond leading to approach channel of culvert.
Note prominent horizontal crack in railroad embankment retaining wall.

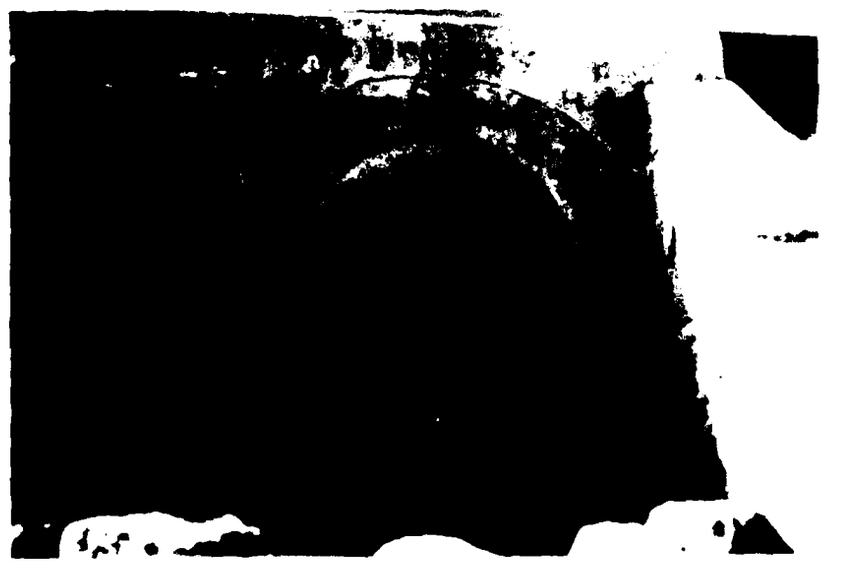
10 September 1980

Approach channel just before entering culvert. Note erosion around wingwall and cracks in wingwall.

10 September 1980

Upstream entrance of culvert through railroad embankment.
Note severe cracking of concrete and debris in culvert.

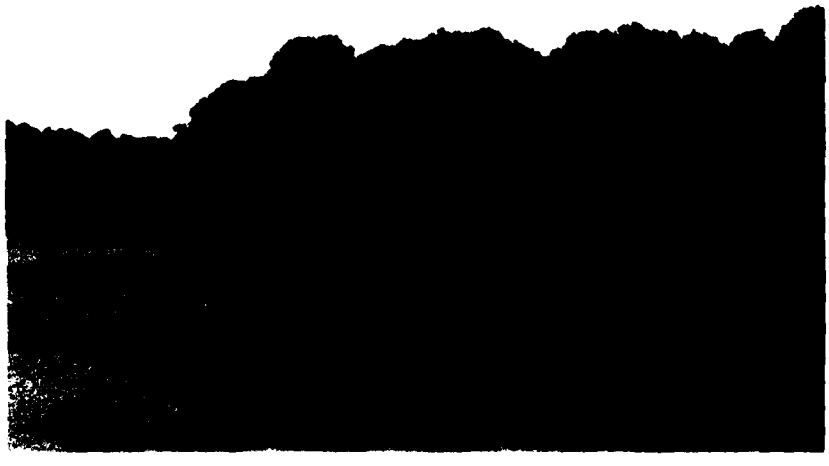
10 September 1980



Downstream face of culvert through railroad embankment.
Note severe cracking of concrete.

10 September 1980

Discharge channel immediately downstream of culvert. 10 September 1980



Pond looking upstream. 10 September 1980

APPENDIX 3

HYDROLOGIC COMPUTATIONS

LANGAN ENGINEERING ASSOCIATES, INC.

HYDROLOGICAL COMPUTATIONS
POWDER MILL POND DAM

A. Location: Morris County, N.J. Whippany River

B. Drainage Area: 1.66 sq.mi (1065 acres)

C. Lake Area: 8.03 acres

D. Classification: Size - SMALL
Hazard - High

E. Spillway Design Flood: PMF

F. PMP

1. Dam located in Zone 6 (close to boundary of Zone 1)
PMP = 22.2 inches (for 200 sq.mi, 24 hr, "all season envelope")*

2. PMF must be adjusted by a factor of 0.80** to account for basin size under 10 sq.mi

% Factor (for 10 sq.mi)			
Duration	Zone 1	Zone 6	Avg
0-6	111	113	112
0-12	123	123	123
0-24	133	132	132
0-48	142	142	142

* HMR #33
** Page 48 "Design of Small Dams"

BY VAL DATE ____ Powder Mill Pond Dam JOB NO. 80145
CKD [illegible] DATE 2/23/81 SHEET NO. 1 OF ____

LANGAN ENGINEERING ASSOCIATES, INC.

6. UNIT HYDROGRAPH

Corps of Engineers has indicated that the SCS triangular unit hydrograph with curvilinear transformation be used for analysis

Drainage area = 1065 ac (a)

average slope = 3.25% (Y)

1) hydraulic length (l)

from drainage map

$l \doteq 12000$ ft

Soil group B, * wood or forest land CN = 66 to 55 ** use 60

$$S = \frac{1000}{CN} - 10 = \frac{1000}{60} - 10 = 6.67$$

Lag time (L)

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

$$L = \frac{12000^{0.8}(6.67+1)^{0.7}}{1900(3.25)^{0.5}}$$

$$L = 2.23 \text{ HRS}$$

$$T_c = \frac{L}{.6} = 3.72 \text{ HRS}$$

* County Soil Survey - Sussex NJ (SCS)

** Table 2-2, SCS TR-55

BY RWG	DATE 11/18/00	LAG Time Calculations	JOB NO. 80145
CKD. [illegible]	DATE 12/21/11	Powder Mill POND	SHEET NO. 2 OF

LANGAN ENGINEERING ASSOCIATES, INC.

2) From Nomograph (Small Dams pg 71)

T_c for $\left\{ \begin{array}{l} L = 12{,}000 \\ H = 900 - 510 = 390 \end{array} \right\}$ $T_c = 0.62$

$Lag = .6\,T_c = 0.37$ Hr

③ Estimate T_c from velocity and watercourse lengths

length = 12000 ft

avg slope = 3.25%

∴ avg velocity* = 2 ft/sec

$$t_c = \frac{12000 \text{ ft}}{2 \text{ ft/sec}} = 6000 \text{ sec} = 1.67 \text{ HR}$$

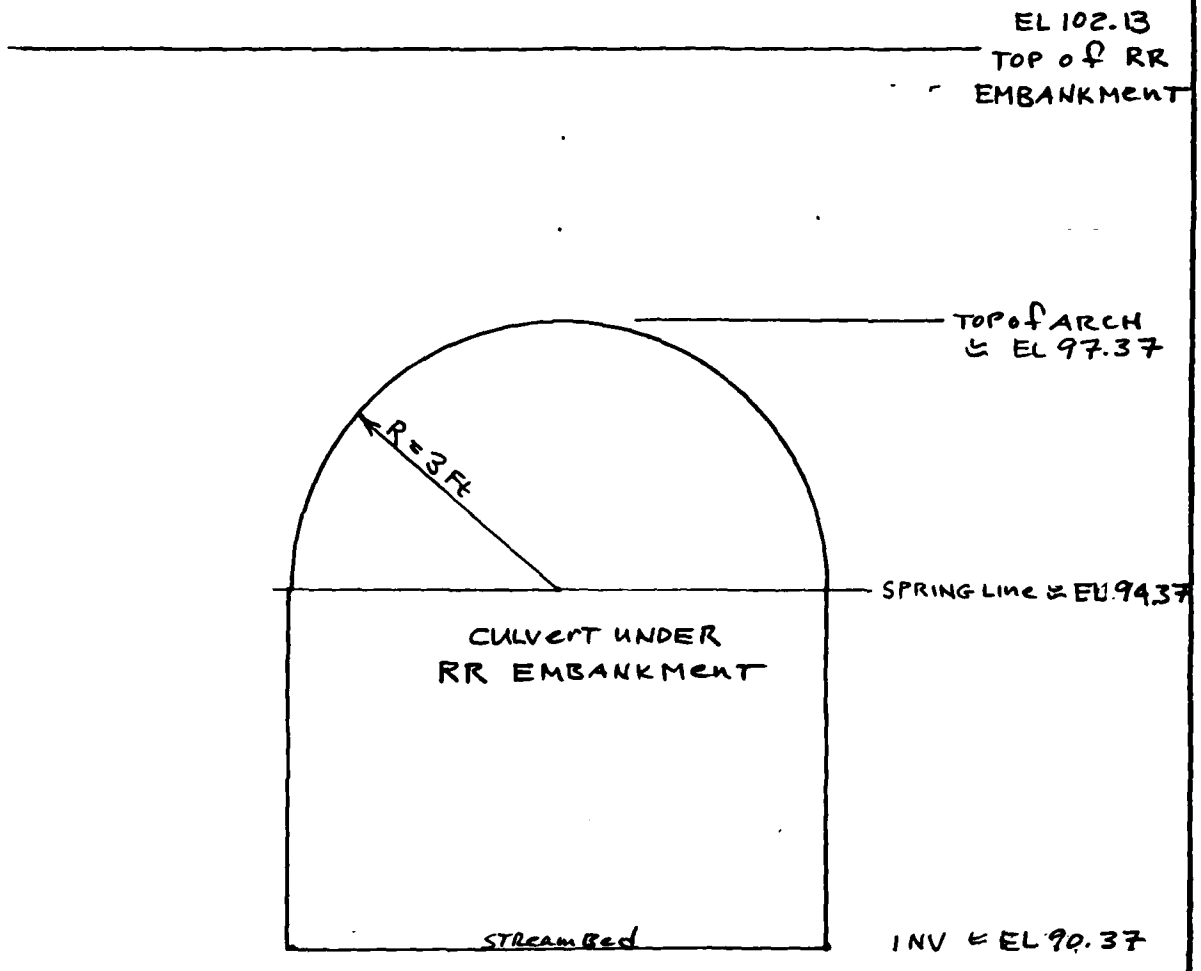
$$Lag = .6(T_c) = 0.6\,(1.67) = 1.0 \text{ HR}$$

$$\text{Use } L = \frac{2.24 + 1.0}{2} = 1.6 \text{ HR}$$

* from Small Dams pg 70

BY RWG	DATE 11/18/80	LAG TIME CALCULATIONS	JOB NO. 80195
CKD. [illegible]	DATE 4/23/81	POWDER MILL POND	SHEET NO. 3 OF

LANGAN ENGINEERING ASSOCIATES, INC.



$$\text{AREA} = (4\,\text{ft} \times 6\,\text{ft}) + \frac{\pi (3)^2}{2} = 38.14\ \text{ft}^2$$

∴ ASSUME RECTANGULAR CULVERT 5.45 ft WIDE × 7 ft HIGH

BY RWG DATE 11/18/81 CULVERT UNDER RR JOB NO. 80145

CKD. RJ DATE 11/23/81 EMBANKMENT, POWDER MILL POND SHEET NO. 4 OF ____

LANGAN ENGINEERING ASSOCIATES, INC.

BY RWG DATE 11/19/80 OUT FLOW CLACULATIONS JOB NO. 80145

CKD. [illegible] DATE 2/3/81 POWDER MILL POND SHEET NO. 5 OF ___

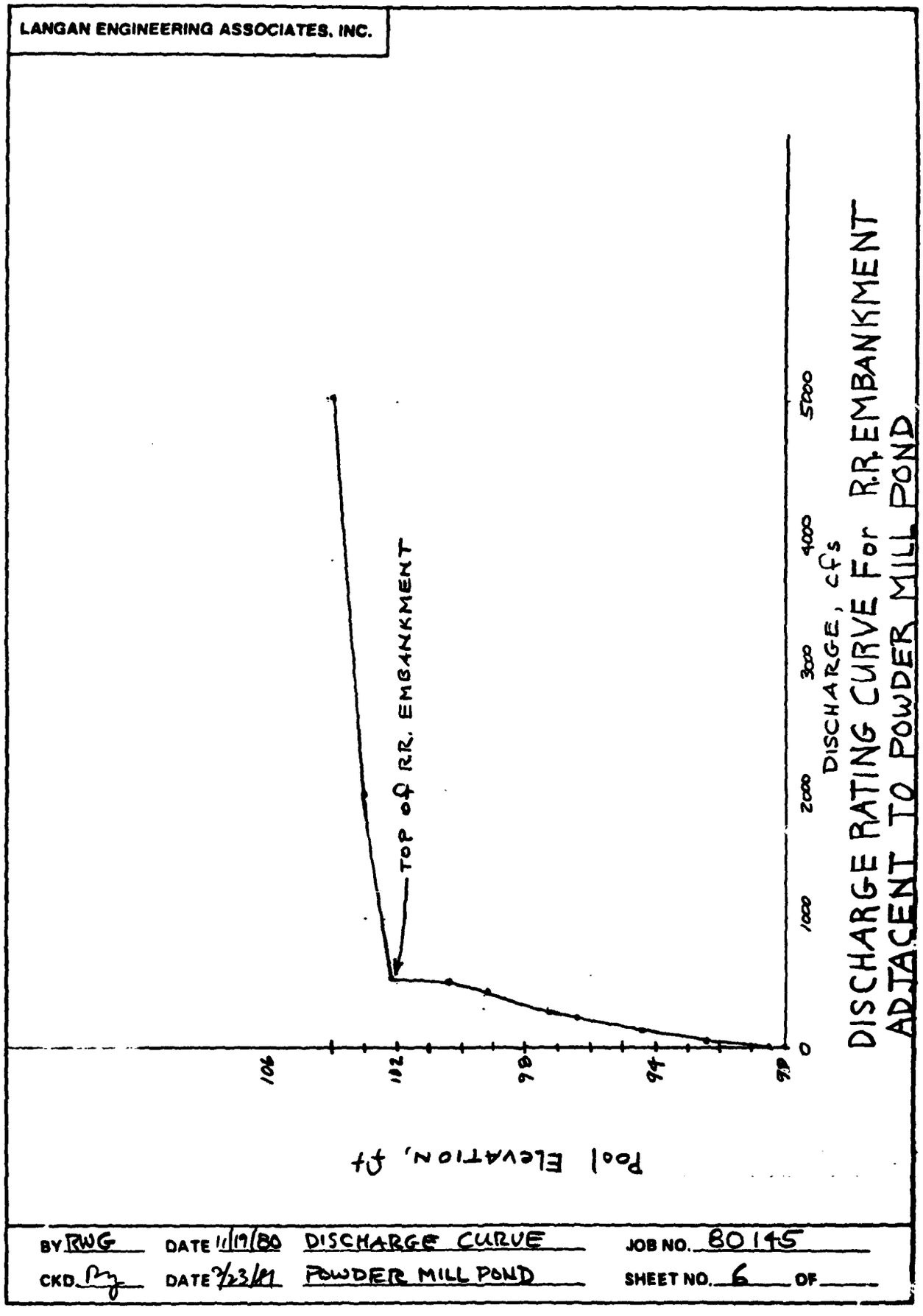
POOL ELEVATION	CULVERT DISCHARGE WEIR AND ORIFICE L= 5.45			WEIR DISCHARGE OVER RR EMBANKMENT L= 660 ft			ΣQ cfs
	H, ft	C	Q, cfs	H, ft	C	Q, cfs	
90.37	0	—					0
92.37	2	2.63	41				41
94.37	4	2.63	115				115
96.37	6	2.63	211				211
97.37	7	2.63	266				266
ORIFICE FLOW 99.37	5.5	0.6	430				430
101.37	7.5	0.6	502				502
102.13	8.26	0.6	528	0			528
103.0	9.13	0.6	555	0.87	2.64	1414	1969
104.0	10.13	0.6	584	1.87	2.63	4439	5023

WEIR FLOW $Q = C L H^{3/2}$, C FROM, HANDBOOK of HYDRAULICS, Pg 5-46, TABLE 5-3.

ORIFICE FLOW $Q = C_a \sqrt{2gh}$, FROM HANDBOOK of HYDRAULICS, EQ 4-10, [illegible]

C FROM TABLE 4-8, MODEL E, C = 0.6

LANGAN ENGINEERING ASSOCIATES, INC.



BY RWG	DATE 11/19/80	DISCHARGE CURVE	JOB NO. 80145
CKD. [illegible]	DATE 2/23/81	POWDER MILL POND	SHEET NO. 6 OF

LANGAN ENGINEERING ASSOCIATES, INC.

Reservoir Storage Capacity

Powder Mill Pond is approximately rectangular in shape, measuring about 1000 ft in length by 350 ft average width with the water elevation at normal pool (arbitrary el 92)

Surface area with water level @ el 92
= 1000 ft × 350 ft = 8.03 Ac.

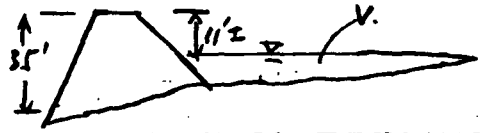
Take average side slope in close proximity of the pond
= 1V : 10 H.

∴ for every foot of water above or below el 92, the length and width of the pond increase or decrease by
= 1 × 10 × 2 = 20 ft.

Elev. (ft)	Length (ft)	Width (ft)	Area of Pond (Acres)	
90	1060	310	7.54	
92	1000	350	8.03	
102.13	1202.6	552.6	15.26	← Top of Embankment
104.0	1240	590	16.80	

Storage capacity vs elevation to be calculated by HEC-1

Estimate storage at normal pool (el 92)



$V = 8.03 \times \frac{35-11}{2}$

$\doteq 96$ Ac-ft.

BY [illegible] DATE 2/23/81 DOWDER MILL POND JOB NO. 80145

CKD RWG DATE 3/3/81 SHEET NO. 7 OF

LANGAN ENGINEERING ASSOCIATES, INC.

Summary of Hydrograph and Flood Routing

1) Hydrograph & Routing calculated using HEC-1

2) PMF Peak inflow for Powder Mill Pond is 5005 cfs routed to 4991 cfs.

3) Routing of the PMF indicates the Railroad Embankment will overtop by 1.86 Ft

4) Routing of the ½ PMF indicates the Railroad Embankment will overtop by 1.04 Ft.

BY RWG DATE 11/20/80 HEC-1 Summary JOB NO. 80145

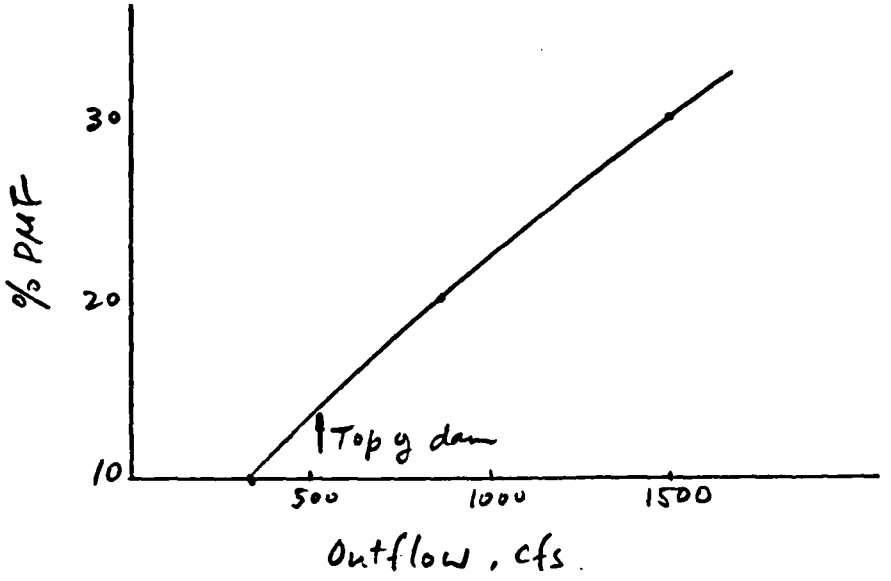
CKD [illegible] DATE 2/23/81 Powder Mill Pond SHEET NO. 8 OF ____

LANGAN ENGINEERING ASSOCIATES, INC.

OVERTOPPING POTENTIAL

1) Various % of PMF have been routed using HEC-1

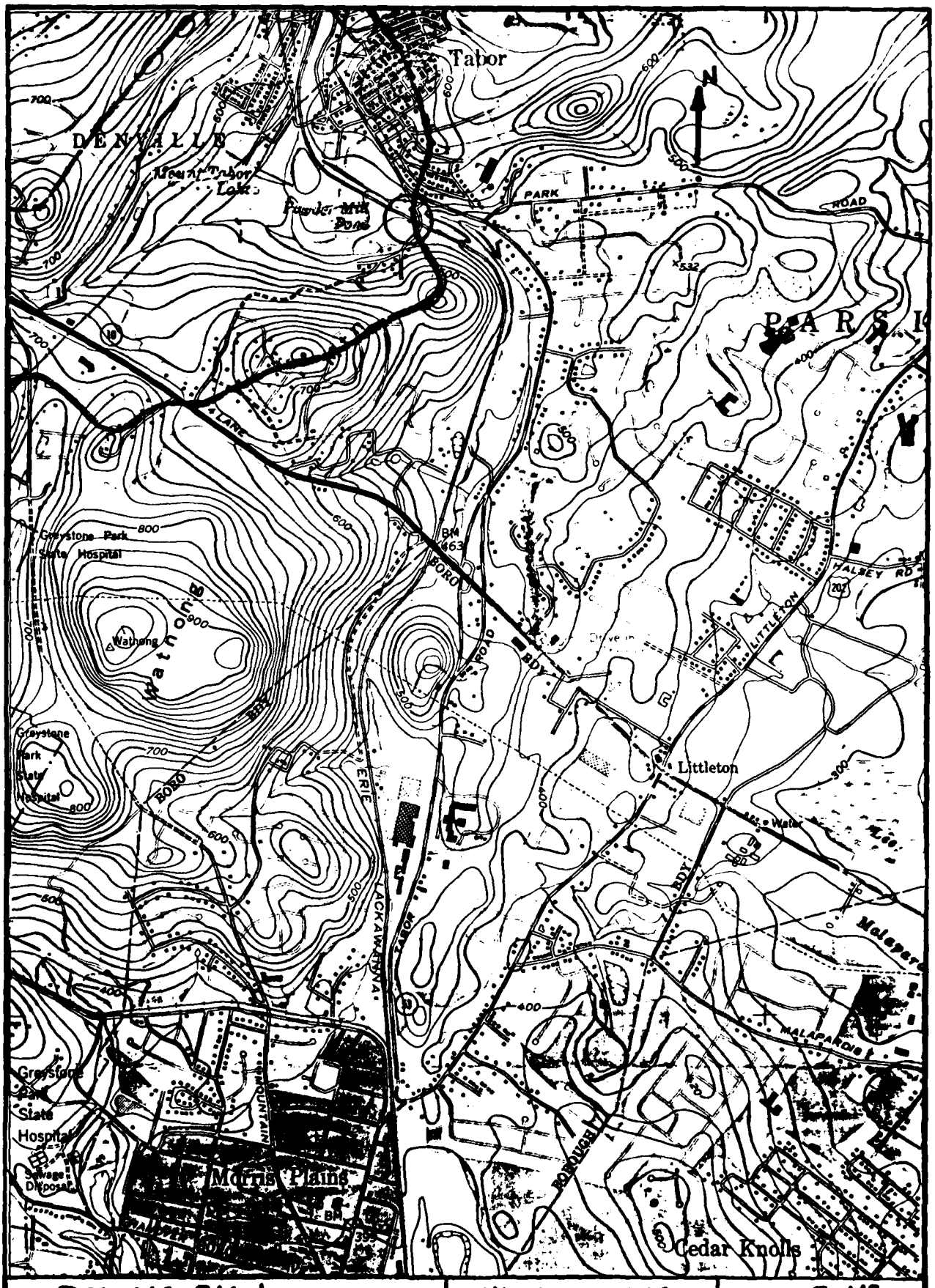
2) Plot peak outflow vs % PMF



3) Dam overtops at elevation 102.13 with Q = 528 cfs.
∴ dam can pass approximately 14% of the PMF.

BY. DJ DATE 2/23/81 POWDER MILL POND JOB NO. 80145

CKD. RWG DATE 3/3/81 SHEET NO. 9 OF



DRAINAGE BASIN	MAP SOURCE USGS	PROJ NO 80145
POWDER MILL POND	MORRISTOWN SCALE: 1"=2000'	SHEET ____ OF ____

LANGAN ENGINEERING ASSOCIATES, INC.

HEC-1 OUTPUT

POWDER MILL POND

```
                                EEEEEEEEEEE  CC           HHHHHHHHHHHH OO        OO
                                EEEEEEEEEEE  CC           HHHHHHHHHHHH OO        OO
                                EE           CC           HH        HH OO        OO
                                EE           CC           HH        HH OO        OO
                                EE           CC           HH        HH OO        OO
                                EE           CC           HH        HH OO        OO
                                EE           CCC       CC HH        HH OOO      OOO
                                EEEEEEEEEEE   CCCCCCCCCC  HH        HH  OOOOOOOOOO
                                EEEEEEEEEEE    CCCCCCCC   HH        HH   OOOOOOOO
```

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1**********************************
 FLOOD HYDROGRAPH PACKAGE (HEC-1)
 DAM SAFETY VERSION     JULY 1978
   LAST MODIFICATION  26 FEB 79
 **********************************
     1                A1              POWDER MILL POND (00803)
     2                A2              INFLOW HYDROGRAPHY AND ROUTING
     3                A3              N.J. DAM INSPECTION
     4                B    290       0       10       0       0              0       0       0       0
     5                B1     3
     6                K      0       1                                       1
     7                K1 COMPUTE HYDROGRAPH
     8                M      1       2     1.66                    .80
     9                P      0    22.2     112      123     132     142
    10                T                                                      1     .15
    11                M2           1.6
    12                X     -2                1
    13                K      1       2                                       1
    14                K1 ROUTING COMPUTATIONS
    15                Y                               1
    16                Y1     1                                                      -1
    17                Y4 90.37   92.37   94.37   96.37   97.37   99.37  101.37  102.13   103.0   104.0
    18                YS     0      41     115     211     266     430     502     528    1969    5023
    19                $A  7.54    8.03   15.26   16.80
    20                $E    90      92  102.13   104.0
    21                $$ 90.37
    22                $D102.13
    23                K     99
1                           PREVIEW OF SEQUENCE OF STREAM NETWORK CALCULATIONS

                                RUNOFF HYDROGRAPH AT          1
                                ROUTE HYDROGRAPH TO           2
                                END OF NETWORK

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

RUN DATE= 81/03/03.
TIME= 12.47.34.

POWDER MILL POND (00803)
INFLOW HYDROGRAPHY AND ROUTING
N.J. DAM INSPECTION

JOB SPECIFICATION

NQ	NHR	NMIN	IDAY	IHR	IMIN	METRC	IPLT	IPRT	NSTAN
290	0	10	0	0	0	0	0	0	0
			JOPER	NWT	LROPT	TRACE			
			3	0	0	0			

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

SUB-AREA RUNOFF COMPUTATION

COMPUTE HYDROGRAPH

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

HYDROGRAPH DATA

IHYDG	IUHG	TAREA	SNAP	TRSDA	TRSPC	RATIO	ISNOW	ISAME	LOCAL
1	2	1.66	0.00	1.66	.80	0.000	0	0	0

PRECIP DATA

SPFE	PMS	R6	R12	R24	R48	R72	R96
0.00	22.20	112.00	123.00	132.00	142.00	0.00	0.00

LOSS DATA

LROPT	STRKR	DLTKR	RTIOL	ERAIN	STRKS	RTIOK	STRTL	CNSTL	ALSMX	RTIMP
0	0.00	0.00	1.00	0.00	0.00	1.00	1.00	.15	0.00	0.00

UNIT HYDROGRAPH DATA
TC= 0.00 LAG= 1.60

RECESSION DATA
STRTQ= -2.00 QRCSN= 0.00 RTIOR= 1.00

UNIT HYDROGRAPH 50 END OF PERIOD ORDINATES, TC= 0.00 HOURS, LAG= 1.60 VOL= 1.00

14.	47.	89.	145.	220.	309.	385.	439.	469.	476.
472.	446.	414.	377.	331.	276.	227.	192.	163.	138.
120.	102.	88.	73.	63.	53.	46.	39.	33.	28.
24.	20.	17.	15.	13.	11.	9.	8.	7.	6.
5.	4.	4.	3.	3.	2.	2.	1.	1.	0.

0 END-OF-PERIOD FLOW

MO.DA	HR.MN	PERIOD	RAIN	EXCS	LOSS	COMP Q	MO.DA	HR.MN	PERIOD	RAIN	EXCS	LOSS	COMP Q
1.01	.10	1	.00	0.00	.00	3.	1.02	.20	146	.02	0.00	.02	3.
1.01	.20	2	.00	0.00	.00	3.	1.02	.30	147	.02	0.00	.02	3.
1.01	.30	3	.00	0.00	.00	3.	1.02	.40	148	.02	0.00	.02	3.
1.01	.40	4	.00	0.00	.00	3.	1.02	.50	149	.02	0.00	.02	3.
1.01	.50	5	.00	0.00	.00	3.	1.02	1.00	150	.02	0.00	.02	3.
1.01	1.00	6	.00	0.00	.00	3.	1.02	1.10	151	.02	0.00	.02	3.
1.01	1.10	7	.00	0.00	.00	3.	1.02	1.20	152	.02	0.00	.02	3.
1.01	1.20	8	.00	0.00	.00	3.	1.02	1.30	153	.02	0.00	.02	3.
1.01	1.30	9	.00	0.00	.00	3.	1.02	1.40	154	.02	0.00	.02	3.
1.01	1.40	10	.00	0.00	.00	3.	1.02	1.50	155	.02	0.00	.02	3.
1.01	1.50	11	.00	0.00	.00	3.	1.02	2.00	156	.02	0.00	.02	3.

1.01	2.00	12	.00	0.00	.00	3.	1.02	2.10	157	.02	0.00	.02	3.
1.01	2.10	13	.00	0.00	.00	3.	1.02	2.20	158	.02	0.00	.02	3.
1.01	2.20	14	.00	0.00	.00	3.	1.02	2.30	159	.02	0.00	.02	3.
1.01	2.30	15	.00	0.00	.00	3.	1.02	2.40	160	.02	0.00	.02	3.
1.01	2.40	16	.00	0.00	.00	3.	1.02	2.50	161	.02	0.00	.02	3.
1.01	2.50	17	.00	0.00	.00	3.	1.02	3.00	162	.02	0.00	.02	3.
1.01	3.00	18	.00	0.00	.00	3.	1.02	3.10	163	.02	0.00	.02	3.
1.01	3.10	19	.00	0.00	.00	3.	1.02	3.20	164	.02	0.00	.02	3.
1.01	3.20	20	.00	0.00	.00	3.	1.02	3.30	165	.02	0.00	.02	3.
1.01	3.30	21	.00	0.00	.00	3.	1.02	3.40	166	.02	0.00	.02	3.
1.01	3.40	22	.00	0.00	.00	3.	1.02	3.50	167	.02	0.00	.02	3.
1.01	3.50	23	.00	0.00	.00	3.	1.02	4.00	168	.02	0.00	.02	3.
1.01	4.00	24	.00	0.00	.00	3.	1.02	4.10	169	.02	0.00	.02	3.
1.01	4.10	25	.00	0.00	.00	3.	1.02	4.20	170	.02	0.00	.02	3.
1.01	4.20	26	.00	0.00	.00	3.	1.02	4.30	171	.02	0.00	.02	3.
1.01	4.30	27	.00	0.00	.00	3.	1.02	4.40	172	.02	0.00	.02	3.
1.01	4.40	28	.00	0.00	.00	3.	1.02	4.50	173	.02	0.00	.02	3.
1.01	4.50	29	.00	0.00	.00	3.	1.02	5.00	174	.02	0.00	.02	3.
1.01	5.00	30	.00	0.00	.00	3.	1.02	5.10	175	.02	0.00	.02	3.
1.01	5.10	31	.00	0.00	.00	3.	1.02	5.20	176	.02	0.00	.02	3.
1.01	5.20	32	.00	0.00	.00	3.	1.02	5.30	177	.02	0.00	.02	3.
1.01	5.30	33	.00	0.00	.00	3.	1.02	5.40	178	.02	0.00	.02	3.
1.01	5.40	34	.00	0.00	.00	3.	1.02	5.50	179	.02	0.00	.02	3.
1.01	5.50	35	.00	0.00	.00	3.	1.02	6.00	180	.02	0.00	.02	3.
1.01	6.00	36	.00	0.00	.00	3.	1.02	6.10	181	.05	.03	.03	4.
1.01	6.10	37	.00	0.00	.00	3.	1.02	6.20	182	.05	.03	.03	5.
1.01	6.20	38	.00	0.00	.00	3.	1.02	6.30	183	.05	.03	.03	8.
1.01	6.30	39	.00	0.00	.00	3.	1.02	6.40	184	.05	.03	.03	12.
1.01	6.40	40	.00	0.00	.00	3.	1.02	6.50	185	.05	.03	.03	18.
1.01	6.50	41	.00	0.00	.00	3.	1.02	7.00	186	.05	.03	.03	27.
1.01	7.00	42	.00	0.00	.00	3.	1.02	7.10	187	.05	.03	.03	39.
1.01	7.10	43	.00	0.00	.00	3.	1.02	7.20	188	.05	.03	.03	52.
1.01	7.20	44	.00	0.00	.00	3.	1.02	7.30	189	.05	.03	.03	65.
1.01	7.30	45	.00	0.00	.00	3.	1.02	7.40	190	.05	.03	.03	79.
1.01	7.40	46	.00	0.00	.00	3.	1.02	7.50	191	.05	.03	.03	93.
1.01	7.50	47	.00	0.00	.00	3.	1.02	8.00	192	.05	.03	.03	106.
1.01	8.00	48	.00	0.00	.00	3.	1.02	8.10	193	.05	.03	.03	118.
1.01	8.10	49	.00	0.00	.00	3.	1.02	8.20	194	.05	.03	.03	129.
1.01	8.20	50	.00	0.00	.00	3.	1.02	8.30	195	.05	.03	.03	139.
1.01	8.30	51	.00	0.00	.00	3.	1.02	8.40	196	.05	.03	.03	147.
1.01	8.40	52	.00	0.00	.00	3.	1.02	8.50	197	.05	.03	.03	154.
1.01	8.50	53	.00	0.00	.00	3.	1.02	9.00	198	.05	.03	.03	159.
1.01	9.00	54	.00	0.00	.00	3.	1.02	9.10	199	.05	.03	.03	164.
1.01	9.10	55	.00	0.00	.00	3.	1.02	9.20	200	.05	.03	.03	168.
1.01	9.20	56	.00	0.00	.00	3.	1.02	9.30	201	.05	.03	.03	172.
1.01	9.30	57	.00	0.00	.00	3.	1.02	9.40	202	.05	.03	.03	175.
1.01	9.40	58	.00	0.00	.00	3.	1.02	9.50	203	.05	.03	.03	177.
1.01	9.50	59	.00	0.00	.00	3.	1.02	10.00	204	.05	.03	.03	179.
1.01	10.00	60	.00	0.00	.00	3.	1.02	10.10	205	.05	.03	.03	181.
1.01	10.10	61	.00	0.00	.00	3.	1.02	10.20	206	.05	.03	.03	183.
1.01	10.20	62	.00	0.00	.00	3.	1.02	10.30	207	.05	.03	.03	184.
1.01	10.30	63	.00	0.00	.00	3.	1.02	10.40	208	.05	.03	.03	185.
1.01	10.40	64	.00	0.00	.00	3.	1.02	10.50	209	.05	.03	.03	186.
1.01	10.50	65	.00	0.00	.00	3.	1.02	11.00	210	.05	.03	.03	187.
1.01	11.00	66	.00	0.00	.00	3.	1.02	11.10	211	.05	.03	.03	188.
1.01	11.10	67	.00	0.00	.00	3.	1.02	11.20	212	.05	.03	.03	188.
1.01	11.20	68	.00	0.00	.00	3.	1.02	11.30	213	.05	.03	.03	189.
1.01	11.30	69	.00	0.00	.00	3.	1.02	11.40	214	.05	.03	.03	189.
1.01	11.40	70	.00	0.00	.00	3.	1.02	11.50	215	.05	.03	.03	189.
1.01	11.50	71	.00	0.00	.00	3.	1.02	12.00	216	.05	.03	.03	190.
1.01	12.00	72	.00	0.00	.00	3.	1.02	12.10	217	.33	.31	.03	194.
1.01	12.10	73	.03	0.00	.03	3.	1.02	12.20	218	.33	.31	.03	207.
1.01	12.20	74	.03	0.00	.03	3.	1.02	12.30	219	.33	.31	.03	232.
1.01	12.30	75	.03	0.00	.03	3.	1.02	12.40	220	.33	.31	.03	273.
1.01	12.40	76	.03	0.00	.03	3.	1.02	12.50	221	.33	.31	.03	334.
1.01	12.50	77	.03	0.00	.03	3.	1.02	13.00	222	.33	.31	.03	419.

1.01	13.00	78	.03	0.00	.03	3.	1.02	13.10	223	.40	.37	.03	527.
1.01	13.10	79	.03	0.00	.03	3.	1.02	13.20	224	.40	.37	.03	652.
1.01	13.20	80	.03	0.00	.03	3.	1.02	13.30	225	.40	.37	.03	788.
1.01	13.30	81	.03	0.00	.03	3.	1.02	13.40	226	.40	.37	.03	930.
1.01	13.40	82	.03	0.00	.03	3.	1.02	13.50	227	.40	.37	.03	1075.
1.01	13.50	83	.03	0.00	.03	3.	1.02	14.00	228	.40	.37	.03	1219.
1.01	14.00	84	.03	0.00	.03	3.	1.02	14.10	229	.50	.47	.03	1361.
1.01	14.10	85	.04	0.00	.04	3.	1.02	14.20	230	.50	.47	.03	1499.
1.01	14.20	86	.04	0.00	.04	3.	1.02	14.30	231	.50	.47	.03	1631.
1.01	14.30	87	.04	0.00	.04	3.	1.02	14.40	232	.50	.47	.03	1753.
1.01	14.40	88	.04	0.00	.04	3.	1.02	14.50	233	.50	.47	.03	1870.
1.01	14.50	89	.04	0.00	.04	3.	1.02	15.00	234	.50	.47	.03	1983.
1.01	15.00	90	.04	0.00	.04	3.	1.02	15.10	235	.45	.43	.03	2093.
1.01	15.10	91	.03	0.00	.03	3.	1.02	15.20	236	.76	.73	.03	2202.
1.01	15.20	92	.06	0.00	.06	3.	1.02	15.30	237	1.36	1.34	.03	2323.
1.01	15.30	93	.10	0.00	.10	3.	1.02	15.40	238	3.40	3.38	.03	2495.
1.01	15.40	94	.26	.19	.07	6.	1.02	15.50	239	.98	.96	.03	2731.
1.01	15.50	95	.07	.05	.03	13.	1.02	16.00	240	.60	.58	.03	3012.
1.01	16.00	96	.05	.02	.03	23.	1.02	16.10	241	.46	.44	.03	3352.
1.01	16.10	97	.04	.01	.03	36.	1.02	16.20	242	.46	.44	.03	3755.
1.01	16.20	98	.04	.01	.03	54.	1.02	16.30	243	.46	.44	.03	4184.
1.01	16.30	99	.04	.01	.03	76.	1.02	16.40	244	.46	.44	.03	4551.
1.01	16.40	100	.04	.01	.03	98.	1.02	16.50	245	.46	.44	.03	4811.
1.01	16.50	101	.04	.01	.03	116.	1.02	17.00	246	.46	.44	.03	4960.
1.01	17.00	102	.04	.01	.03	129.	1.02	17.10	247	.36	.34	.03	5005.
1.01	17.10	103	.03	.00	.03	136.	1.02	17.20	248	.36	.34	.03	4975.
1.01	17.20	104	.03	.00	.03	141.	1.02	17.30	249	.36	.34	.03	4859.
1.01	17.30	105	.03	.00	.03	140.	1.02	17.40	250	.36	.34	.03	4697.
1.01	17.40	106	.03	.00	.03	136.	1.02	17.50	251	.36	.34	.03	4496.
1.01	17.50	107	.03	.00	.03	131.	1.02	18.00	252	.36	.34	.03	4249.
1.01	18.00	108	.03	.00	.03	122.	1.02	18.10	253	.03	.00	.03	3966.
1.01	18.10	109	.00	0.00	.00	110.	1.02	18.20	254	.03	.00	.03	3693.
1.01	18.20	110	.00	0.00	.00	97.	1.02	18.30	255	.03	.00	.03	3450.
1.01	18.30	111	.00	0.00	.00	87.	1.02	18.40	256	.03	.00	.03	3219.
1.01	18.40	112	.00	0.00	.00	77.	1.02	18.50	257	.03	.00	.03	2986.
1.01	18.50	113	.00	0.00	.00	69.	1.02	19.00	258	.03	.00	.03	2749.
1.01	19.00	114	.00	0.00	.00	61.	1.02	19.10	259	.03	.00	.03	2499.
1.01	19.10	115	.00	0.00	.00	54.	1.02	19.20	260	.03	.00	.03	2244.
1.01	19.20	116	.00	0.00	.00	48.	1.02	19.30	261	.03	.00	.03	1990.
1.01	19.30	117	.00	0.00	.00	41.	1.02	19.40	262	.03	.00	.03	1752.
1.01	19.40	118	.00	0.00	.00	36.	1.02	19.50	263	.03	.00	.03	1527.
1.01	19.50	119	.00	0.00	.00	31.	1.02	20.00	264	.03	.00	.03	1321.
1.01	20.00	120	.00	0.00	.00	27.	1.02	20.10	265	.03	.00	.03	1133.
1.01	20.10	121	.00	0.00	.00	24.	1.02	20.20	266	.03	.00	.03	965.
1.01	20.20	122	.00	0.00	.00	21.	1.02	20.30	267	.03	.00	.03	817.
1.01	20.30	123	.00	0.00	.00	18.	1.02	20.40	268	.03	.00	.03	695.
1.01	20.40	124	.00	0.00	.00	16.	1.02	20.50	269	.03	.00	.03	593.
1.01	20.50	125	.00	0.00	.00	14.	1.02	21.00	270	.03	.00	.03	507.
1.01	21.00	126	.00	0.00	.00	12.	1.02	21.10	271	.03	.00	.03	434.
1.01	21.10	127	.00	0.00	.00	11.	1.02	21.20	272	.03	.00	.03	372.
1.01	21.20	128	.00	0.00	.00	10.	1.02	21.30	273	.03	.00	.03	319.
1.01	21.30	129	.00	0.00	.00	9.	1.02	21.40	274	.03	.00	.03	273.
1.01	21.40	130	.00	0.00	.00	8.	1.02	21.50	275	.03	.00	.03	233.
1.01	21.50	131	.00	0.00	.00	7.	1.02	22.00	276	.03	.00	.03	200.
1.01	22.00	132	.00	0.00	.00	7.	1.02	22.10	277	.03	.00	.03	172.
1.01	22.10	133	.00	0.00	.00	6.	1.02	22.20	278	.03	.00	.03	149.
1.01	22.20	134	.00	0.00	.00	6.	1.02	22.30	279	.03	.00	.03	129.
1.01	22.30	135	.00	0.00	.00	6.	1.02	22.40	280	.03	.00	.03	111.
1.01	22.40	136	.00	0.00	.00	5.	1.02	22.50	281	.03	.00	.03	96.
1.01	22.50	137	.00	0.00	.00	5.	1.02	23.00	282	.03	.00	.03	83.
1.01	23.00	138	.00	0.00	.00	5.	1.02	23.10	283	.03	.00	.03	72.
1.01	23.10	139	.00	0.00	.00	4.	1.02	23.20	284	.03	.00	.03	62.
1.01	23.20	140	.00	0.00	.00	4.	1.02	23.30	285	.03	.00	.03	53.
1.01	23.30	141	.00	0.00	.00	4.	1.02	23.40	286	.03	.00	.03	45.
1.01	23.40	142	.00	0.00	.00	4.	1.02	23.50	287	.03	.00	.03	39.
1.01	23.50	143	.00	0.00	.00	4.	1.03	0.00	288	.03	.00	.03	34.

1.02	0.00	144	.00	0.00	.00	4.	1.03	.10	289	0.00	0.00	0.00	30.	
1.02	.10	145	.02	0.00	.02	4.	1.03	.20	290	0.00	0.00	0.00	27.	

SUM 25.22 20.44 4.78 132061.
(641.)(519.)(121.)(3739.55)

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	5005.	3061.	899.	455.	132091.
CMS	142.	87.	25.	13.	3740.
INCHES		17.15	20.15	20.56	20.56
MM		435.48	511.89	522.26	522.26
AC-FT		1518.	1783.	1819.	1819.
THOUS CU M		1872.	2200.	2244.	2244.

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HYDROGRAPH ROUTING

ROUTING COMPUTATIONS

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

ROUTING DATA

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

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

STAGE	90.37	92.37	94.37	96.37	97.37	99.37	101.37	102.13	103.00	104.00
FLOW	0.00	41.00	115.00	211.00	266.00	430.00	502.00	528.00	1969.00	5023.00
SURFACE AREA=	8.	8.	15.	17.						
CAPACITY=	0.	16.	132.	162.						
ELEVATION=	90.	92.	102.	104.						

CREL	SPWID	COQW	EXPW	ELEVL	COQL	CAREA	EXPL
90.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0

DAM DATA

TOPEL	COQD	EXPD	DAMWID
102.1	0.0	0.0	0.

END-OF-PERIOD HYDROGRAPH ORDINATES

NO.DA	HR.MN	PERIOD	HOURS	INFLOW	OUTFLOW	STORAGE	STAGE
1.01	.10	1	.17	3.	0.	0.	90.0
1.01	.20	2	.33	3.	0.	0.	90.0
1.01	.30	3	.50	3.	0.	0.	90.0
1.01	.40	4	.67	3.	0.	0.	90.0
1.01	.50	5	.83	3.	0.	0.	90.0
1.01	1.00	6	1.00	3.	0.	0.	90.0
1.01	1.10	7	1.17	3.	0.	0.	90.0
1.01	1.20	8	1.33	3.	0.	0.	90.1
1.01	1.30	9	1.50	3.	0.	0.	90.1
1.01	1.40	10	1.67	3.	0.	1.	90.1
1.01	1.50	11	1.83	3.	0.	1.	90.1
1.01	2.00	12	2.00	3.	0.	1.	90.1

1.01	2.20	14	2.33	3.	0.	1.	90.1
1.01	2.30	15	2.50	3.	0.	1.	90.1
1.01	2.40	16	2.67	3.	0.	1.	90.1
1.01	2.50	17	2.83	3.	0.	1.	90.1
1.01	3.00	18	3.00	3.	0.	1.	90.1
1.01	3.10	19	3.17	3.	0.	1.	90.1
1.01	3.20	20	3.33	3.	0.	1.	90.1
1.01	3.30	21	3.50	3.	0.	1.	90.1
1.01	3.40	22	3.67	3.	0.	1.	90.1
1.01	3.50	23	3.83	3.	0.	1.	90.1
1.01	4.00	24	4.00	3.	0.	1.	90.1
1.01	4.10	25	4.17	3.	0.	1.	90.2
1.01	4.20	26	4.33	3.	0.	1.	90.2
1.01	4.30	27	4.50	3.	0.	1.	90.2
1.01	4.40	28	4.67	3.	0.	1.	90.2
1.01	4.50	29	4.83	3.	0.	1.	90.2
1.01	5.00	30	5.00	3.	0.	1.	90.2
1.01	5.10	31	5.17	3.	0.	1.	90.2
1.01	5.20	32	5.33	3.	0.	1.	90.2
1.01	5.30	33	5.50	3.	0.	2.	90.2
1.01	5.40	34	5.67	3.	0.	2.	90.2
1.01	5.50	35	5.83	3.	0.	2.	90.2
1.01	6.00	36	6.00	3.	0.	2.	90.2
1.01	6.10	37	6.17	3.	0.	2.	90.2
1.01	6.20	38	6.33	3.	0.	2.	90.2
1.01	6.30	39	6.50	3.	0.	2.	90.2
1.01	6.40	40	6.67	3.	0.	2.	90.2
1.01	6.50	41	6.83	3.	0.	2.	90.2
1.01	7.00	42	7.00	3.	0.	2.	90.3
1.01	7.10	43	7.17	3.	0.	2.	90.3
1.01	7.20	44	7.33	3.	0.	2.	90.3
1.01	7.30	45	7.50	3.	0.	2.	90.3
1.01	7.40	46	7.67	3.	0.	2.	90.3
1.01	7.50	47	7.83	3.	0.	2.	90.3
1.01	8.00	48	8.00	3.	0.	2.	90.3
1.01	8.10	49	8.17	3.	0.	2.	90.3
1.01	8.20	50	8.33	3.	0.	2.	90.3
1.01	8.30	51	8.50	3.	0.	2.	90.3
1.01	8.40	52	8.67	3.	0.	2.	90.3
1.01	8.50	53	8.83	3.	0.	2.	90.3
1.01	9.00	54	9.00	3.	0.	2.	90.3
1.01	9.10	55	9.17	3.	0.	3.	90.3
1.01	9.20	56	9.33	3.	0.	3.	90.3
1.01	9.30	57	9.50	3.	0.	3.	90.3
1.01	9.40	58	9.67	3.	0.	3.	90.3
1.01	9.50	59	9.83	3.	0.	3.	90.4
1.01	10.00	60	10.00	3.	0.	3.	90.4
1.01	10.10	61	10.17	3.	0.	3.	90.4
1.01	10.20	62	10.33	3.	0.	3.	90.4
1.01	10.30	63	10.50	3.	0.	3.	90.4
1.01	10.40	64	10.67	3.	0.	3.	90.4
1.01	10.50	65	10.83	3.	0.	3.	90.4
1.01	11.00	66	11.00	3.	1.	3.	90.4
1.01	11.10	67	11.17	3.	1.	3.	90.4
1.01	11.20	68	11.33	3.	1.	3.	90.4
1.01	11.30	69	11.50	3.	1.	3.	90.4
1.01	11.40	70	11.67	3.	1.	3.	90.4
1.01	11.50	71	11.83	3.	1.	3.	90.4
1.01	12.00	72	12.00	3.	1.	3.	90.4
1.01	12.10	73	12.17	3.	1.	3.	90.4
1.01	12.20	74	12.33	3.	1.	3.	90.4
1.01	12.30	75	12.50	3.	1.	3.	90.4
1.01	12.40	76	12.67	3.	1.	3.	90.4
1.01	12.50	77	12.83	3.	1.	3.	90.4
1.01	13.00	78	13.00	3.	2.	3.	90.4
1.01	13.10	79	13.17	3.	2.	3.	90.4

1.01	13.20	80	13.33	3.	2.	3.	90.5
1.01	13.30	81	13.50	3.	2.	3.	90.5
1.01	13.40	82	13.67	3.	2.	3.	90.5
1.01	13.50	83	13.83	3.	2.	3.	90.5
1.01	14.00	84	14.00	3.	2.	4.	90.5
1.01	14.10	85	14.17	3.	2.	4.	90.5
1.01	14.20	86	14.33	3.	2.	4.	90.5
1.01	14.30	87	14.50	3.	2.	4.	90.5
1.01	14.40	88	14.67	3.	2.	4.	90.5
1.01	14.50	89	14.83	3.	2.	4.	90.5
1.01	15.00	90	15.00	3.	2.	4.	90.5
1.01	15.10	91	15.17	3.	2.	4.	90.5
1.01	15.20	92	15.33	3.	2.	4.	90.5
1.01	15.30	93	15.50	3.	2.	4.	90.5
1.01	15.40	94	15.67	6.	2.	4.	90.5
1.01	15.50	95	15.83	13.	3.	4.	90.5
1.01	16.00	96	16.00	23.	3.	4.	90.5
1.01	16.10	97	16.17	36.	4.	4.	90.6
1.01	16.20	98	16.33	54.	6.	5.	90.6
1.01	16.30	99	16.50	76.	8.	6.	90.7
1.01	16.40	100	16.67	98.	11.	7.	90.9
1.01	16.50	101	16.83	116.	14.	8.	91.1
1.01	17.00	102	17.00	129.	18.	10.	91.2
1.01	17.10	103	17.17	136.	22.	11.	91.4
1.01	17.20	104	17.33	141.	26.	13.	91.6
1.01	17.30	105	17.50	140.	30.	14.	91.8
1.01	17.40	106	17.67	136.	34.	16.	92.0
1.01	17.50	107	17.83	131.	37.	17.	92.2
1.01	18.00	108	18.00	122.	40.	18.	92.3
1.01	18.10	109	18.17	110.	44.	19.	92.5
1.01	18.20	110	18.33	97.	48.	20.	92.5
1.01	18.30	111	18.50	87.	50.	21.	92.6
1.01	18.40	112	18.67	77.	52.	21.	92.7
1.01	18.50	113	18.83	69.	53.	21.	92.7
1.01	19.00	114	19.00	61.	54.	22.	92.7
1.01	19.10	115	19.17	54.	54.	22.	92.7
1.01	19.20	116	19.33	48.	54.	22.	92.7
1.01	19.30	117	19.50	41.	53.	21.	92.7
1.01	19.40	118	19.67	36.	53.	21.	92.7
1.01	19.50	119	19.83	31.	51.	21.	92.7
1.01	20.00	120	20.00	27.	50.	21.	92.6
1.01	20.10	121	20.17	24.	49.	20.	92.6
1.01	20.20	122	20.33	21.	47.	20.	92.5
1.01	20.30	123	20.50	18.	46.	20.	92.5
1.01	20.40	124	20.67	16.	44.	19.	92.4
1.01	20.50	125	20.83	14.	42.	19.	92.4
1.01	21.00	126	21.00	12.	41.	18.	92.4
1.01	21.10	127	21.17	11.	40.	18.	92.3
1.01	21.20	128	21.33	10.	39.	18.	92.3
1.01	21.30	129	21.50	9.	38.	17.	92.2
1.01	21.40	130	21.67	8.	37.	17.	92.2
1.01	21.50	131	21.83	7.	36.	16.	92.1
1.01	22.00	132	22.00	7.	35.	16.	92.1
1.01	22.10	133	22.17	6.	34.	16.	92.0
1.01	22.20	134	22.33	6.	33.	15.	92.0
1.01	22.30	135	22.50	6.	32.	15.	91.9
1.01	22.40	136	22.67	5.	31.	15.	91.9
1.01	22.50	137	22.83	5.	30.	14.	91.8
1.01	23.00	138	23.00	5.	29.	14.	91.8
1.01	23.10	139	23.17	4.	28.	14.	91.8
1.01	23.20	140	23.33	4.	28.	13.	91.7
1.01	23.30	141	23.50	4.	27.	13.	91.7
1.01	23.40	142	23.67	4.	26.	13.	91.6
1.01	23.50	143	23.83	4.	25.	12.	91.6
1.02	0.00	144	24.00	4.	24.	12.	91.6

1.02	.20	146	24.33	3.	23.	12.	91.5
1.02	.30	147	24.50	3.	22.	11.	91.5
1.02	.40	148	24.67	3.	22.	11.	91.4
1.02	.50	149	24.83	3.	21.	11.	91.4
1.02	1.00	150	25.00	3.	20.	10.	91.4
1.02	1.10	151	25.17	3.	20.	10.	91.3
1.02	1.20	152	25.33	3.	19.	10.	91.3
1.02	1.30	153	25.50	3.	19.	10.	91.3
1.02	1.40	154	25.67	3.	18.	10.	91.3
1.02	1.50	155	25.83	3.	18.	9.	91.2
1.02	2.00	156	26.00	3.	17.	9.	91.2
1.02	2.10	157	26.17	3.	17.	9.	91.2
1.02	2.20	158	26.33	3.	16.	9.	91.2
1.02	2.30	159	26.50	3.	16.	9.	91.1
1.02	2.40	160	26.67	3.	15.	9.	91.1
1.02	2.50	161	26.83	3.	15.	8.	91.1
1.02	3.00	162	27.00	3.	14.	8.	91.1
1.02	3.10	163	27.17	3.	14.	8.	91.1
1.02	3.20	164	27.33	3.	14.	8.	91.0
1.02	3.30	165	27.50	3.	13.	8.	91.0
1.02	3.40	166	27.67	3.	13.	8.	91.0
1.02	3.50	167	27.83	3.	13.	8.	91.0
1.02	4.00	168	28.00	3.	12.	7.	91.0
1.02	4.10	169	28.17	3.	12.	7.	91.0
1.02	4.20	170	28.33	3.	12.	7.	90.9
1.02	4.30	171	28.50	3.	11.	7.	90.9
1.02	4.40	172	28.67	3.	11.	7.	90.9
1.02	4.50	173	28.83	3.	11.	7.	90.9
1.02	5.00	174	29.00	3.	10.	7.	90.9
1.02	5.10	175	29.17	3.	10.	7.	90.9
1.02	5.20	176	29.33	3.	10.	7.	90.9
1.02	5.30	177	29.50	3.	10.	6.	90.8
1.02	5.40	178	29.67	3.	9.	6.	90.8
1.02	5.50	179	29.83	3.	9.	6.	90.8
1.02	6.00	180	30.00	3.	9.	6.	90.8
1.02	6.10	181	30.17	4.	9.	6.	90.8
1.02	6.20	182	30.33	5.	9.	6.	90.8
1.02	6.30	183	30.50	8.	9.	6.	90.8
1.02	6.40	184	30.67	12.	9.	6.	90.8
1.02	6.50	185	30.83	18.	9.	6.	90.8
1.02	7.00	186	31.00	27.	9.	6.	90.8
1.02	7.10	187	31.17	39.	10.	7.	90.9
1.02	7.20	188	31.33	52.	11.	7.	90.9
1.02	7.30	189	31.50	65.	13.	8.	91.0
1.02	7.40	190	31.67	79.	15.	9.	91.1
1.02	7.50	191	31.83	93.	18.	10.	91.2
1.02	8.00	192	32.00	106.	21.	11.	91.4
1.02	8.10	193	32.17	118.	24.	12.	91.5
1.02	8.20	194	32.33	129.	27.	13.	91.7
1.02	8.30	195	32.50	139.	31.	15.	91.9
1.02	8.40	196	32.67	147.	35.	16.	92.1
1.02	8.50	197	32.83	154.	39.	18.	92.3
1.02	9.00	198	33.00	159.	44.	19.	92.5
1.02	9.10	199	33.17	164.	51.	21.	92.6
1.02	9.20	200	33.33	168.	58.	22.	92.8
1.02	9.30	201	33.50	172.	64.	24.	93.0
1.02	9.40	202	33.67	175.	71.	25.	93.2
1.02	9.50	203	33.83	177.	76.	27.	93.3
1.02	10.00	204	34.00	179.	82.	28.	93.5
1.02	10.10	205	34.17	181.	88.	29.	93.6
1.02	10.20	206	34.33	183.	93.	31.	93.8
1.02	10.30	207	34.50	184.	98.	32.	93.9
1.02	10.40	208	34.67	185.	102.	33.	94.0
1.02	10.50	209	34.83	186.	107.	34.	94.1
1.02	11.00	210	35.00	187.	111.	35.	94.3
[illegible]							

1.02	11.20	212	35.33	188.	120.	37.	94.5
1.02	11.30	213	35.50	189.	124.	38.	94.6
1.02	11.40	214	35.67	189.	129.	39.	94.7
1.02	11.50	215	35.83	189.	132.	40.	94.7
1.02	12.00	216	36.00	190.	136.	41.	94.8
1.02	12.10	217	36.17	194.	140.	41.	94.9
1.02	12.20	218	36.33	207.	144.	42.	95.0
1.02	12.30	219	36.50	232.	149.	43.	95.1
1.02	12.40	220	36.67	273.	155.	45.	95.2
1.02	12.50	221	36.83	334.	165.	47.	95.4
1.02	13.00	222	37.00	419.	178.	49.	95.7
1.02	13.10	223	37.17	527.	196.	53.	96.1
1.02	13.20	224	37.33	652.	220.	59.	96.5
1.02	13.30	225	37.50	788.	253.	65.	97.1
1.02	13.40	226	37.67	930.	303.	73.	97.8
1.02	13.50	227	37.83	1075.	365.	82.	98.6
1.02	14.00	228	38.00	1219.	431.	93.	99.4
1.02	14.10	229	38.17	1361.	462.	104.	100.3
1.02	14.20	230	38.33	1499.	495.	117.	101.2
1.02	14.30	231	38.50	1631.	554.	132.	102.1
1.02	14.40	232	38.67	1753.	1519.	141.	102.7
1.02	14.50	233	38.83	1870.	1764.	143.	102.9
1.02	15.00	234	39.00	1983.	1900.	145.	103.0
1.02	15.10	235	39.17	2093.	2032.	146.	103.0
1.02	15.20	236	39.33	2202.	2163.	146.	103.1
1.02	15.30	237	39.50	2323.	2276.	147.	103.1
1.02	15.40	238	39.67	2495.	2427.	148.	103.1
1.02	15.50	239	39.83	2731.	2637.	149.	103.2
1.02	16.00	240	40.00	3012.	2902.	150.	103.3
1.02	16.10	241	40.17	3352.	3218.	152.	103.4
1.02	16.20	242	40.33	3755.	3596.	154.	103.5
1.02	16.30	243	40.50	4184.	4015.	156.	103.7
1.02	16.40	244	40.67	4551.	4409.	158.	103.8
1.02	16.50	245	40.83	4811.	4712.	160.	103.9
1.02	17.00	246	41.00	4960.	4905.	161.	104.0
1.02	17.10	247	41.17	5005.	4991.	161.	104.0
1.02	17.20	248	41.33	4975.	4990.	161.	104.0
1.02	17.30	249	41.50	4859.	4909.	161.	104.0
1.02	17.40	250	41.67	4697.	4763.	160.	103.9
1.02	17.50	251	41.83	4496.	4577.	159.	103.9
1.02	18.00	252	42.00	4249.	4349.	158.	103.8
1.02	18.10	253	42.17	3966.	4079.	156.	103.7
1.02	18.20	254	42.33	3693.	3800.	155.	103.6
1.02	18.30	255	42.50	3450.	3544.	154.	103.5
1.02	18.40	256	42.67	3219.	3308.	152.	103.4
1.02	18.50	257	42.83	2986.	3076.	151.	103.4
1.02	19.00	258	43.00	2749.	2841.	150.	103.3
1.02	19.10	259	43.17	2499.	2596.	148.	103.2
1.02	19.20	260	43.33	2244.	2342.	147.	103.1
1.02	19.30	261	43.50	1990.	2087.	146.	103.0
1.02	19.40	262	43.67	1752.	1876.	144.	102.9
1.02	19.50	263	43.83	1527.	1678.	142.	102.8
1.02	20.00	264	44.00	1321.	1465.	140.	102.7
1.02	20.10	265	44.17	1133.	1264.	138.	102.6
1.02	20.20	266	44.33	965.	1082.	137.	102.5
1.02	20.30	267	44.50	817.	920.	135.	102.4
1.02	20.40	268	44.67	695.	781.	134.	102.3
1.02	20.50	269	44.83	593.	664.	133.	102.2
1.02	21.00	270	45.00	507.	568.	132.	102.2
1.02	21.10	271	45.17	434.	526.	131.	102.1
1.02	21.20	272	45.33	372.	523.	129.	102.0
1.02	21.30	273	45.50	319.	517.	127.	101.8
1.02	21.40	274	45.67	273.	510.	124.	101.6
1.02	21.50	275	45.83	233.	502.	120.	101.4
1.02	22.00	276	46.00	200.	493.	114.	101.1
1.02	22.10	277	46.17	171.	489.	112.	100.8

1.02	22.20	278	46.33	149.	471.	108.	100.5
1.02	22.30	279	46.50	129.	459.	103.	100.2
1.02	22.40	280	46.67	111.	447.	99.	99.8
1.02	22.50	281	46.83	96.	435.	94.	99.5
1.02	23.00	282	47.00	83.	412.	90.	99.1
1.02	23.10	283	47.17	72.	383.	85.	98.8
1.02	23.20	284	47.33	62.	356.	81.	98.5
1.02	23.30	285	47.50	53.	330.	77.	98.1
1.02	23.40	286	47.67	45.	305.	73.	97.8
1.02	23.50	287	47.83	39.	281.	70.	97.5
1.03	0.00	288	48.00	34.	261.	67.	97.3
1.03	.10	289	48.17	30.	246.	64.	97.0
1.03	.20	290	48.33	27.	232.	61.	96.7

PEAK OUTFLOW IS 4991. AT TIME 41.17 HOURS

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	4991.	3023.	874.	440.	127679.
CMS	141.	86.	25.	12.	3615.
INCHES		16.94	19.60	19.87	19.87
MM		430.29	497.74	504.82	504.82
AC-FT		1499.	1734.	1759.	1759.
THOUS CU M		1849.	2139.	2169.	2169.

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RUNOFF SUMMARY, AVERAGE FLOW IN CUBIC FEET PER SECOND (CUBIC METERS PER SECOND)
AREA IN SQUARE MILES(SQUARE KILOMETERS)

		PEAK	6-HOUR	24-HOUR	72-HOUR	AREA
HYDROGRAPH AT	1	5005.	3061.	899.	455.	1.66
		(141.71)(	86.68)(	25.46)(	12.90)(	4.30)
ROUTED TO	2	4991.	3023.	874.	440.	1.66
		(141.33)(	85.60)(	24.76)(	12.47)(	4.30)

1 SUMMARY OF DAM SAFETY ANALYSIS

PLAN 1 .....

	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
ELEVATION	90.00	90.37	102.13
STORAGE	0.	3.	132.
OUTFLOW	0.	0.	528.

RATIO OF PMF	MAXIMUM RESERVOIR W.S.ELEV	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
0.00	103.99	1.86	161.	4991.	6.67	41.17	0.00

1**********
FLOOD HYDROGRAPH PACKAGE (HEC-1)
DAM SAFETY VERSION JULY 1978
LAST MODIFICATION 26 FEB 79
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0BYE

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POWSOUT    14:13 MAR 03,'81

1**********
 FLOOD HYDROGRAPH PACKAGE (HEC-1)
 DAM SAFETY VERSION      JULY 1978
   LAST MODIFICATION  26 FEB 79
 **********
                    PREVIEW OF SEQUENCE OF STREAM NETWORK CALCULATIONS
1
                              RUNOFF HYDROGRAPH AT          1
                              ROUTE HYDROGRAPH TO           2
                              END OF NETWORK


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

 RUN  DATE= 81/03/03.
      TIME= 14.11.42.

                    POWDER MILL POND (00803)
                    INFLOW HYDROGRAPHY AND ROUTING
                    N.J. DAM INSPECTION

                                  JOB SPECIFICATION
      NQ     NHR     NMIN    IDAY     IHR     IMIN    METRC     IPLT     IPRT    NSTAN
     290       0       10       0       0        0        0        0        4        0
                          JOPER      NWT   LROPT   TRACE
                              5        0       0       0

                        MULTI-PLAN ANALYSES TO BE PERFORMED
                            NPLAN= 1 NRTIO= 5 LRTIO= 1
          RTIOS=     .10     .20     .30     .40     .50

********** ********** ********** ********** **********
                        SUB-AREA RUNOFF COMPUTATION

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

                                HYDROGRAPH DATA
     IHYDG     IUNG     TAREA     SNAP   TRSDA   TRSPC   RATIO   ISNOW   ISAME   LOCAL
         1        2      1.66     0.00    1.66     .80   0.000       0       0       0

                                  PRECIP DATA
                SPFE      PMS       R6      R12      R24      R48      R72      R96
                0.00    22.20   112.00   123.00   132.00   142.00     0.00     0.00

                                  LOSS DATA
     LROPT   STRKR   DLTKR   RTIOL   ERAIN   STRKS   RTIOK   STRTL   CNSTL   ALSMX   RTIMP
         0    0.00    0.00    1.00    0.00    0.00    1.00    1.00     .15    0.00    0.00

                    UNIT HYDROGRAPH DATA
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TC= 0.00 LAG= 1.60

RECESSION DATA

STRTQ= -2.00 QRCSN= 0.00 RTIOR= 1.00

END-OF-PERIOD FLOW

MO.DA	HR.MN	PERIOD	RAIN	EXCS	LOSS	COMP Q	MO.DA	HR.MN	PERIOD	RAIN	EXCS	LOSS	COMP Q
									SUM	25.22	20.44	4.78	132061.
										(641.)(	519.)(	121.)(	3739.55)

****

HYDROGRAPH ROUTING

ROUTING COMPUTATIONS

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

ROUTING DATA

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

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

STAGE	90.37	92.37	94.37	96.37	97.37	99.37	101.37	102.13	103.00	104.00
FLOW	0.00	41.00	115.00	211.00	266.00	430.00	502.00	528.00	1969.00	5023.00
SURFACE AREA=	8.	8.	15.	17.						
CAPACITY=	0.	16.	132.	162.						
ELEVATION=	90.	92.	102.	104.						

CREL	SPWID	COQW	EXPW	ELEVL	COQL	CAREA	EXPL
90.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0

DAM DATA

TOPEL	COQD	EXPD	DAMWID
102.1	0.0	0.0	0.

PEAK OUTFLOW IS 328. AT TIME 42.67 HOURS

PEAK OUTFLOW IS 859. AT TIME 42.00 HOURS

PEAK OUTFLOW IS 1494. AT TIME 41.33 HOURS

PEAK OUTFLOW IS 1997. AT TIME 41.33 HOURS

PEAK OUTFLOW IS 2496. AT TIME 41.17 HOURS

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

OPERATION	STATION	AREA	PLAN	RATIOS APPLIED TO FLOWS RATIO 1 .10	RATIO 2 .20	RATIO 3 .30	RATIO 4 .40	RATIO 5 .50
HYDROGRAPH AT	1	1.66	1	500.	1001.	1501.	2002.	2502.
	(	4.30)	(	14.17)(	28.34)(	42.51)(	56.69)(	70.86)(
ROUTED TO	2	1.66	1	328.	859.	1494.	1997.	2496.
	(	4.30)	(	9.29)(	24.33)(	42.30)(	56.54)(	70.68)(

1 SUMMARY OF DAM SAFETY ANALYSIS

PLAN 1 .....

	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
ELEVATION	90.00	90.37	102.13
STORAGE	0.	3.	132.
OUTFLOW	0.	0.	528.

RATIO OF PMF	MAXIMUM RESERVOIR W.S.ELEV	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
.10	98.13	0.00	77.	328.	0.00	42.67	0.00
.20	102.33	.20	135.	859.	1.50	42.00	0.00
.30	102.71	.58	141.	1494.	3.00	41.33	0.00
.40	103.01	.88	145.	1997.	3.83	41.33	0.00
.50	103.17	1.04	148.	2496.	4.67	41.17	0.00

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FLOOD HYDROGRAPH PACKAGE (HEC-1)
DAM SAFETY VERSION JULY 1978
LAST MODIFICATION 26 FEB 79
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APPENDIX 4

REFERENCES

APPENDIX 4

REFERENCES

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