

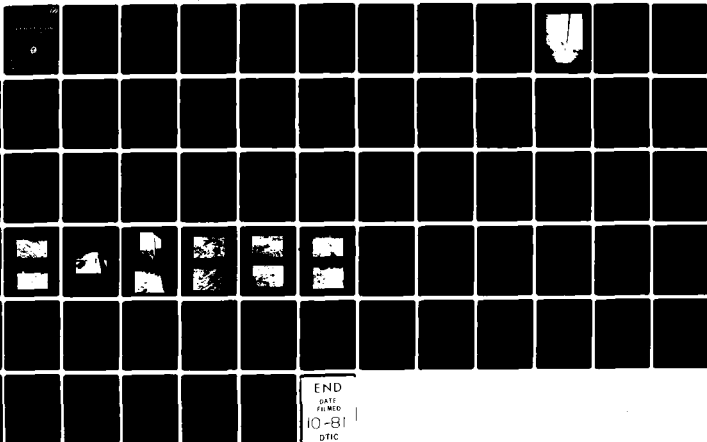
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NATIONAL DAM SAFETY PROGRAM. DEER PARK POND DAM (NJ00502), DELA--ETC(U)
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LEVEL II
DELAWARE RIVER BASIN,
TRIBUTARY TO MUSCONETCONG RIVER,
WARREN COUNTY,
NEW JERSEY.

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DEER PARK POND DAM (NJ 00502)

PHASE I INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM



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DEPARTMENT OF THE ARMY

Philadelphia District
Corps of Engineers

Philadelphia, Pennsylvania

REPT. NO. DAEN/NAP-53842/NJ00502-81/08

AUGUST 1981

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4. TITLE (and Subtitle) Phase I Inspection Report National Dam Safety Program Deer Park Pond Dam, NJ00502 Warren County, New Jersey		5. TYPE OF REPORT & PERIOD COVERED FINAL
7. AUTHOR(s) Guinan, Warren, P.E.		6. PERFORMING ORG. REPORT NUMBER
9. PERFORMING ORGANIZATION NAME AND ADDRESS Anderson-Nichols 150 Causeway St. Boston, MA 02114		8. CONTRACT OR GRANT NUMBER(s) DACW61-79-C-0011 ✓
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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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DEPARTMENT OF THE ARMY
PHILADELPHIA DISTRICT, CORPS OF ENGINEERS
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31 AUG 1981

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

Dear Governor Byrne:

Inclosed is the Phase I Inspection Report for Deer Park Pond Dam in Warren 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, Deer Park 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 poor overall condition. The dam's spillway is considered inadequate because a flow equivalent to 26 percent of the Spillway Design Flood - SDF - would cause the dam to be overtopped. (The SDF, in this instance, is one half of the Probable Maximum Flood). 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.

b. Within six months from the date of approval of this report the owner should engage a qualified professional consultant to perform the following:

(1) Design and oversee procedures for the removal of trees and their root systems from the downstream slope and for a distance of 25 feet from the downstream toe of the dam or to the limits of the owner's property.

(2) Design and oversee the installation of erosion protection for the upstream slope of the dam.

(3) Design and oversee repairs for the eroded area on the downstream slope to the left of the spillway.

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Honorable Brendan T. Byrne

(4) Investigate the reasons for the uneven surface of the dam crest, including the depressions to the right and left of the spillway and design remedial measures as needed.

(5) Investigate the seepage and ponding of water at and downstream of the toe of the dam and design remedial measures as required.

(6) Design and oversee repairs to the spillway aprons.

(7) Design and oversee repairs to the service bridge steel beam and supports.

c. Within three months from the date of approval of this report the following remedial actions should be initiated:

(1) Clear fallen trees from the spillway discharge channel and maintain the channel free of debris.

(2) Start a program of checking the condition of the dam periodically.

(3) Establish grass vegetation on the embankment and start a program for maintaining the embankment free of weeds, brush and trees.

(4) Clear trees, brush and debris from the discharge channel and from a zone 25 ft. wide on either side of the discharge channel for a distance of 100 ft. downstream from the end of spillway apron or to the property line whichever is the lesser.

d. 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.

e. An emergency action plan and warning system should be developed which outlines actions to be taken by the owner to minimize the downstream effects of an emergency at the dam within six months 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 Congressman Courter of the Thirteenth 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.

NAPEN-N

Honorable Brendan T. Byrne

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,



ROGER L. BALDWIN
Lieutenant Colonel, Corps of Engineers
Commander and District Engineer

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

DEER PARK POND DAM (NJ00502)

CORPS OF ENGINEERS ASSESSMENT OF GENERAL CONDITIONS

This dam was inspected on 23 April 1981 by Anderson-Nichols and Co. 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.

Deer Park 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 poor overall condition. The dam's spillway is considered inadequate because a flow equivalent to 26 percent of the Spillway Design Flood - SDF - would cause the dam to be overtopped. (The SDF, in this instance, is one half of the Probable Maximum Flood). 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.

b. Within six months from the date of approval of this report the owner should engage a qualified professional consultant to perform the following:

(1) Design and oversee procedures for the removal of trees and their root systems from the downstream slope and for a distance of 25 feet from the downstream toe of the dam or to the limits of the owner's property.

(2) Design and oversee the installation of erosion protection for the upstream slope of the dam.

(3) Design and oversee repairs for the eroded area on the downstream slope to the left of the spillway.

(4) Investigate the reasons for the uneven surface of the dam crest, including the depressions to the right and left of the spillway and design remedial measures as needed.

(5) Investigate the seepage and ponding of water at and downstream of the toe of the dam and design remedial measures as required.

(6) Design and oversee repairs to the spillway aprons.

(7) Design and oversee repairs to the service bridge steel beam and supports.

c. Within three months from the date of approval of this report the following remedial actions should be initiated:

(1) Clear fallen trees from the spillway discharge channel and maintain the channel free of debris.

(2) Start a program of checking the condition of the dam periodically.

(3) Establish grass vegetation on the embankment and start a program for maintaining the embankment free of weeds, brush and trees.

(4) Clear trees, brush and debris from the discharge channel and from a zone 25 ft. wide on either side of the discharge channel for a distance of 100 ft. downstream from the end of spillway apron or to the property line whichever is the lesser.

d. 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.

e. An emergency action plan and warning system should be developed which outlines actions to be taken by the owner to minimize the downstream effects of an emergency at the dam within six months from the date of approval of this report.

APPROVED:



ROGER L. BALDWIN
Lieutenant Colonel, Corps of Engineers
Commander and District Engineer

DATE:

31 Aug 81

PHASE I INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM

Name of Dam:	Deer Park Pond Dam
Identification No.:	Fed ID No. NJ00502
State Located:	New Jersey
County Located:	Warren
Stream:	Tributary of Musconetcong River
River Basin:	Delaware
Date of Inspection	April 23, 1981

ASSESSMENT OF GENERAL CONDITIONS

Deer Park Pond Dam is probably about 100 years old and is in poor condition. It is an earth embankment 410 feet long with a concrete and stone masonry spillway. The low-level outlets consist of two 12-inch cast iron pipes 15 feet apart that run under this spillway. The dam has a hydraulic height of 16.4 feet and a crest width ranging from 15 to 20 feet. An access road, along the full length of the dam, spans the spillway with a low, concrete-slab bridge. The dam is small in size and its hazard classification is significant. Trees are growing on the downstream slope and in the area downstream of the toe. A 2.5 foot diameter tree is growing on the right spillway training wall just downstream from the crest of the spillway. Wet, soft areas, standing pools of water, and seepage along the downstream toe and beyond are indicative of seepage through and under the dam. The dam crest is uneven and several large depressions on the upstream crest could be indicative of internal erosion of the embankment. Extensive erosion has taken place on the upstream slope at and above the waterline. An erosion path from crest to the downstream toe along the left side of the spillway is susceptible to further erosion from rainfall runoff or overtopping damage, should overtopping occur. Overflow at the spillway disappears about half way down the placed stone apron and reappears from under the apron at the downstream toe. The upstream spillway apron has two transverse cracks in the concrete. The spillway has a capacity of 114 cfs, which is sufficient to handle a storm 25% the size of the one-half PMF spillway design flood. Thus the spillway is considered inadequate.

The owner should engage a professional engineer qualified in the design and construction of dams to accomplish the following in the time periods specified. In the near future: design and oversee procedures for the removal of trees and their root systems from the downstream slope for a distance of 25 feet from the downstream toe or to the property line, whichever is less; design and oversee the installation of erosion protection

for the upstream slope of the dam; design and oversee repairs for the eroded area on the downstream slope to the left of the spillway; investigate the reasons for the uneven surface of the dam crest, including the depressions to the right and left of the spillway and design remedial measures as needed; investigate the seepage and ponding of water at and downstream of the toe of the dam and design remedial measures as required; design and oversee repairs to the spillway aprons; and design and oversee repairs to the service bridge steel beams and supports. In the future: perform a more detailed hydrologic/hydraulic evaluation of the inadequacy of the spillway and design and implement necessary remedial measures.

It is further recommended that the owner accomplish the following tasks as part of operational and maintenance procedures. Beginning soon: clear fallen trees from the spillway discharge channel and maintain the channel free of debris; check the condition of the dam periodically; establish grassy vegetation on the embankment and start a program for maintaining the embankment free of weeds, brush, and trees; and clear trees and brush for about 25 feet downstream from the toe of the dam and from the banks of the discharge channel for a distance of 100 feet downstream from the spillway or to the property line whichever is less. In the near future: develop an emergency action plan which outlines actions to be taken by the owner to minimize the downstream effects of an emergency at the dam. In the future: develop written operating procedures and a periodic maintenance plan to ensure the safety of the dam.

ANDERSON-NICHOLS & COMPANY, INC.


Warren A. Guinan, P.E.
Project Manager
New Jersey 16848



April 22, 1981

DEER PARK DAM
OVERVIEW PHOTO

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 reasonable possible storm runoff), or fractions thereof. The test flood provides a measure of relative spillway capacity and serves as an aid in determining the need for more detailed hydrologic and hydraulic studies, considering the size of the dam, its general condition and the downstream damage potential.

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PHASE I INSPECTION REPORT
NATIONAL DAM SAFETY INSPECTION PROGRAM
DEER PARK POND DAM
FED ID NO. #NJ00502

SECTION 1
PROJECT INFORMATION

1.1 General

a. Authority. Authority to perform the Phase I Safety Inspection of Deer Park Pond Dam was received from the State of New Jersey, Department of Environmental Protection, Division of Water Resources by letter dated 12 December 1980 under Basic Contract No. FPM-39 and Contract No. A01093 dated 10 October 1979. This Authority was given pursuant to the National Dam Inspection Act, Public Law 92-367 and by agreement between the State and the U.S. Army Engineers District, Philadelphia. The inspection discussed herein was performed by Anderson-Nichols & Company, Inc.

b. Purpose: The purpose of the Phase I Investigation is to develop an assessment of the general conditions with respect to the safety of Deer Park Pond Dam and appurtenances. Conclusions are based upon available data and visual inspection. The results of this study were used to determine any need for emergency measures and to conclude if additional studies, investigations, and analyses are necessary and warranted.

1.2 Project Description

a. Description of Dam and Appurtenances. Deer Park Pond Dam is a 410-foot long earthfill dam with concrete and stone masonry spillway. The dam has a hydraulic height of 16.4 feet and a structural height of 17.4 feet. The width of the dam crest ranges from 15 to 20 feet. The roadway, which runs along the crest of the dam, has standard highway guardrails on both sides at the spillway. Over the spillway is a concrete slab bridge; the concrete poured over timber decking. The spillway approach is a sloping concrete apron, the weir is an irregular, cut stone surface and the downstream face of the spillway is granite masonry. The spillway weir is 19.5 feet long and 12 feet wide. Both the spillway and the dam have an upstream slope of 4H:1V and a 2H:1V downstream slope. The upstream dam face shows significant sloughing. The downstream face is brush covered, exhibits sloughing and displacement of riprap. Trees are growing on the downstream face and at the toe.

b. Location. Deer Park Pond Dam is located on a tributary of the Musconetcong River, in Allamuchy Township, Warren County, New Jersey. The dam is at 40° 54.3' north latitude 74° 47.5' west longitude on the Tranquility, New Jersey Quadrangle. The dam may be reached by driving south on State Route 517 about 1.25 miles from the Allamuchy Exit on Interstate 80 and turning left on an unimproved road. The corner has a sign showing to "Deer Park Pond." The dam is about 1-1/2 miles eastward on this rough, winding road. A location map has been included as Figure 2.

c. Size Classification. Deer Park Pond Dam is classified as being small in size on the basis of storage at the dam crest of 456 acre-feet, which is less than 1000 acre-feet, but more than 50 acre-feet, and on the basis of its height of 17.4 feet, which is less than 40 feet, in accordance with criteria given in the Recommended Guidelines for Safety Inspection of Dams.

d. Hazard Classification. Waterloo Road is approximately 3200 feet downstream of Deer Park Pond Dam. The road passes over the stream on a small, open span bridge. Approximately 500 feet downstream of the bridge, the stream flows into Saxton Lake on the Musconetcong River. At this juncture, there is a seasonal cabin, whose elevation is within a few feet of the water surface. Dam failure flood flows would overtop and severely damage the bridge and cause extensive damage to the cabin. If the cabin were occupied at the time of the dam failure, there is potential for the loss of a few lives. For these reasons Deer Park Pond Dam should be classified significant hazard.

e. Ownership. The dam is part of Allamuchy Mountain State Park, and is owned by the State of New Jersey. For information, Nick Domico, Park Manager, may be contacted at (201) 398-7010.

f. Purpose. Deer Park Pond Dam was built for fishing and other recreational uses.

g. Design and Construction History. The dam was designed and constructed by the New Jersey Bureau of Parks and Recreation. No other information was obtained.

h. Normal Operational Procedure. No operational procedures were found for the dam.

i. Site Geology. No site specific geologic information (such as borings) was available at the time the dam was inspected. Information derived from the Geologic Map of New Jersey (Kummel and Johnson, 1912) and the Glacial Drift of New Jersey (Salisbury, Kummel, Peet and Whitson, 1902) indicates soils within the immediate site consist of ground till overlying bedrock. The previously mentioned map indicates that bedrock in that area consists of granitoid gneiss of Precambrian age.

1.3 Pertinent Data

a. Drainage Area

.82 square miles

b. Discharge at Damsite (cfs)

Maximum flood at damsite - unknown.

Total ungated spillway capacity at maximum pool
(top of dam) elevation - 114

c. Elevation (ft. above NGVD)

Top of dam - 936.4

Design surcharge (1/2 PMF) - 937.7

Recreation pool (at time of inspection) - 935.0

Spillway crest - 934.6

Streambed at centerline of principal spillway - 920.0

Maximum tailwater - 925 (estimated)

d. Reservoir (Length in feet)

Maximum pool - 1900 (estimated)

Spillway crest - 1800 (estimated)

e. Storage (acre-feet)

Spillway crest - 356.0

Top of dam - 455.8

Test flood - 538.0

f. Reservoir Surface (acres)

Top of dam - 60

Spillway crest - 51

g. Dam

Type - earthfill

Length - 410 feet

Height - 16.4 feet (hydraulic)

- 17.4 feet (structural)

Top width - 15 to 20 feet (varies)

Side slopes - upstream 4H:1V; downstream 2H:1V

Zoning - unknown

Impervious core - unknown

Cutoff - unknown

Grout curtain - unknown

h. Spillway

Type - Broad crested concrete spillway (concrete
upstream apron, sloped 4H:1; placed cutstone
downstream face on slope of 2H:1V)

Length of weir - 19.5 feet

Crest elevation - 934.6 feet NGVD

Low level outlet - See Item i below

U/S channel - Deer Park Pond

D/S channel - Unnamed tributary of Musconetcong River

i. Regulating Outlets

Type - Two 12-inch pipes

Length - 117 feet (estimated)

Upstream inlets not seen, pipes are 15
feet center to center

Access - each is about 2 feet centerward from spillway
training walls.

Invert Elevations: 920 and 921.7 (Downstream)

SECTION 2 ENGINEERING DATA

2.1 Design

No hydraulic, hydrologic, or other design engineering data were disclosed.

2.2 Construction

No recorded data concerning construction of the Deer Park Pond Dam were discovered.

2.3 Operation

No data pertaining to the operation of the dam were found.

2.4 Evaluation

a. Availability. A search of the New Jersey Department of Environmental Protection files, and contact with community officials revealed no information.

b. Adequacy. The visual inspection is deemed adequate to complete this Phase I Inspection Report.

SECTION 3 VISUAL INSPECTION

3.1 Findings

a. Dam. Trees are growing on the downstream slope and in the area at the downstream toe of the dam. In addition, many areas on the downstream slope are covered with dumped riprap. Extensive erosion has taken place on the upstream slope at and above the waterline.

Two major depressions were observed to the right of the spillway bridge at the crest of the upstream slope. The depressions were approximately 3 to 5 feet in diameter and approximately 1-foot deep. Similarly several depressions and holes were observed on the crest of the dam to the left of the spillway bridge.

The crest of the dam is rather uneven and is mostly bare of grass and vegetation due to pedestrian and vehicular traffic across the dam.

An erosion gully has developed on the downstream slope on either side of the spillway service bridge.

A zone of standing water, approximately 50 feet wide, was observed at the toe of the dam to the left of the spillway. Slight seepage was observed which was clear and showed no evidence of suspended fines. In addition, seepage was noted flowing from the left bank of the discharge channel just downstream from the spillway. The seepage contained some orange colored flocs with no evidence of suspended fines. The area downstream of the downstream toe of the dam is generally wet and soft and several ponds of standing water were observed.

b. Appurtenant Structures

A 2.5-foot diameter tree is growing on the right spillway training wall just downstream from the crest of the spillway. Reservoir-bottom vegetation is partially blocking the entrance to the spillway. Considerable water was observed exiting underneath the spillway apron at the toe of the slope.

- (1) Ungated Spillway. The upstream concrete apron has two transverse cracks and the concrete training wall on the right side has separated approximately 1/2 inch from the bridge pier. Minor leakage was observed through the mortared masonry abutment wall approximately 2 feet below the crest.

- (2) Service Bridge. The steel center supports are badly corroded at the bottom of each support providing very little support. Visible portions of bridge beams are badly rusted.
- (3) Low-Level Outlet. Two 12-inch cast iron pipes were observed at the toe of the spillway. However, no valves or inlet structure was observed at the time of inspection.

c. Reservoir Area

The watershed above the lake is gently to moderately sloping. The reservoir slopes appear to be stable. No evidence of significant sedimentation was observed.

SECTION 4
OPERATIONAL PROCEDURES

4.1 Procedures

No formal operating procedures were disclosed.

4.2 Maintenance of Dam

No formal maintenance procedures for the dam were found, but from its condition, it is apparent that maintenance is needed to prevent serious deterioration of the structure.

4.3 Maintenance of Operating Facility

No formal maintenance procedures for the operating facilities were disclosed.

4.4 Warning System

No description of any warning system was disclosed.

4.5 Evaluation of Operational Adequacy

Because of the lack of operation and maintenance procedures, the remedial measures described in Section 7.2 should be implemented as prescribed.

SECTION 5 HYDROLOGIC/HYDRAULIC

5.1 Evaluation of Features

a. Design Data. Because no hydrologic or hydraulic data were revealed an evaluation could not be performed.

b. Experience Data. No experience data were found.

c. Visual Observation. No valves or upstream inlets for the two 12-inch low-level outlets were visible. The inlets may have flap gates that are located off shore in the reservoir; neither pipe was leaking. The small discharge over the weir at the time of the inspection, was confined to the left side. The water disappeared in the placed stone of the downstream face and reappeared at the right center of the toe of the masonry apron. A small amount of bottom vegetation had accumulated in the mouth of the spillway and some had washed over the crest and was caught on the stone masonry on the right side of the apron.

d. Deer Pond Park Overtopping Potential. The hydraulic/hydrologic evaluation for the dam is based on a selected Spillway Design Flood (SDF) equal to one-half the Probable Maximum Flood (PMF) in accordance with the range of test floods given in the evaluation guidelines, for dams classified as Significant Hazard and small in size. The PMF was determined by application of a 24-hour Probable Maximum Precipitation (PMP) of 22.9 inches to the SCS dimensionless unit hydrograph for the area. Hydrologic computations are given in Appendices 3 and 4. The routed half-PMF peak inflow to the reservoir is 1957 cfs, the peak outflow is 1618 cfs.

The minimum elevation of the dam allows 1.8 feet of depth above the spillway, before overtopping occurs. Under this head the total spillway capacity is 114 cfs.

Flood routing calculations indicate that Deer Park Pond Dam will be overtopped for 6.4 hours to a maximum depth of 1.3 feet under half-PMF conditions. It is estimated that the spillway capacity is adequate to pass a storm 25% the size of the one half-PMF without overtopping the dam; thus, the spillway is considered inadequate.

e. Draw-down Capacity. Assuming the two low-level outlets currently in place are in operable condition, it is estimated that the lake can be drained in approximately 10 days assuming no significant inflow. This time period is considered marginally acceptable for draining the reservoir in an emergency situation.

SECTION 6 STRUCTURAL STABILITY

6.1 The presence of considerable dumped riprap makes it difficult to perform an adequate inspection of the downstream slope of the embankment.

Trees growing on the downstream slope of the embankment and in the area downstream of the toe may blow over and pull out their roots, or they may die and their roots rot. In either case, serious seepage and erosion problems could result.

The crest of the dam is uneven. Although the cause of the unevenness cannot be determined on the basis of the visual inspection alone, it may be a sign of potential stability problems. The presence of several large depressions on the upstream slope near the crest could be an indication of internal erosion of the embankment which, if not stopped, could lead to breaching of the dam.

The bare roadway along the crest of the dam is susceptible to erosion if the dam were overtopped, which might, in turn, lead to breaching of the dam.

The erosion path, from the crest to the downstream toe of the embankment to the left of the spillway is susceptible to erosion and consequent damage to the embankment owing to both runoff of rainfall and overtopping, if the latter should occur.

The soft, wet areas and seepage at and immediately downstream of the toe of the dam is indicative of seepage either through or under the dam which, if not properly controlled, could lead to failure of the dam by piping or sloughing of the downstream slope.

Based on the visual inspection alone, it is not possible to determine the character of the dam and spillway foundations, or the interior of the cross section of the embankment or the slope of the upstream side of the embankment. Therefore, it is not possible to evaluate the factor of safety of the dam and spillway against slope failure.

6.2 Design and Construction Data. No design or construction data pertinent to the structural stability of the dam are available.

6.3 Operating Records. No records pertinent to the structural stability of the dam were found.

6.4 Post-Construction Changes. No record of post-construction changes was available. However, the concrete in the upstream spillway training walls, apron, and bridge slab probably are rather recent additions.

6.5 Seismic Stability. This dam is in Seismic Zone 1. According to the Recommended Guidelines, dams located in Seismic Zone 1 "may be assumed to present no hazard from earthquake provided static stability conditions are satisfactory and conventional safety margins exist." The visual observations made during the inspection provided an indicator of unstable embankments as mentioned in Section 6.1. However, because no data are available concerning the engineering of the embankment and foundation materials for this dam or the condition at the base of the corewall, it is not possible to make an engineering evaluation of the stability of the slopes or the factor of safety under static conditions.

SECTION 7
ASSESSMENT, RECOMMENDATIONS/REMEDIAL MEASURES

7.1 Dam Assessment

a. Condition. Deer Park Pond Dam is estimated to be about 100 years old and is in poor overall condition.

b. Adequacy of Information. The information available is such that the assessment of the dam must be based primarily on the results of the visual inspection.

c. Urgency. The recommendations made in 7.2.a and 7.2.b should be implemented by the owner as prescribed.

d. Necessity for Additional Data/Evaluation. The information available from the visual inspection is adequate to identify the potential problems which are listed in 7.2.a. These problems require the attention of a professional engineer who will have to make additional engineering studies to design or specify remedial measures to rectify the problems. If left unattended, the problems could lead to failure of the dam.

7.2 Recommendations/Remedial Measures

a. Recommendations. The owner should retain a professional engineer qualified in the design and construction of dams to accomplish the following items in the time periods specified:

In the near future:

- (1) Design and oversee procedures for the removal of trees and their root systems from the downstream slope and for a distance of 25 feet from the downstream toe of the dam or to the limits of the owner's property.
- (2) Design and oversee the installation of erosion protection for the upstream slope of the dam.
- (3) Design and oversee repairs for the eroded area on the downstream slope to the left of the spillway.
- (4) Investigate the reasons for the uneven surface of the dam crest, including the depressions to the right and left of the spillway and design remedial measures as needed.
- (5) Investigate the seepage and ponding of water at and downstream of the toe of the dam and design remedial measures as required.

- (6) Design and oversee repairs to the spillway aprons.
- (7) Design and oversee repairs to the service bridge steel beam and supports.

In the future:

Perform a more detailed hydrologic/hydraulic evaluation of the inadequacy of the spillway and design and implement necessary increased capacity.

b. Alternatives. If dam is required for recreational use, no alternatives are recommended.

c. Operating and Maintenance Procedures

The owner should accomplish the following soon:

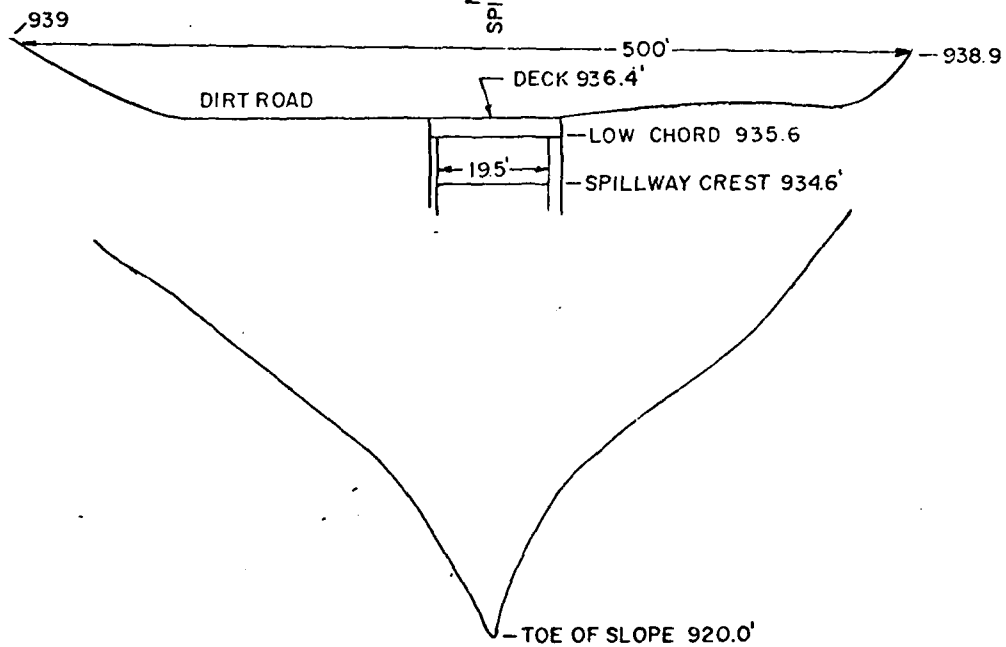
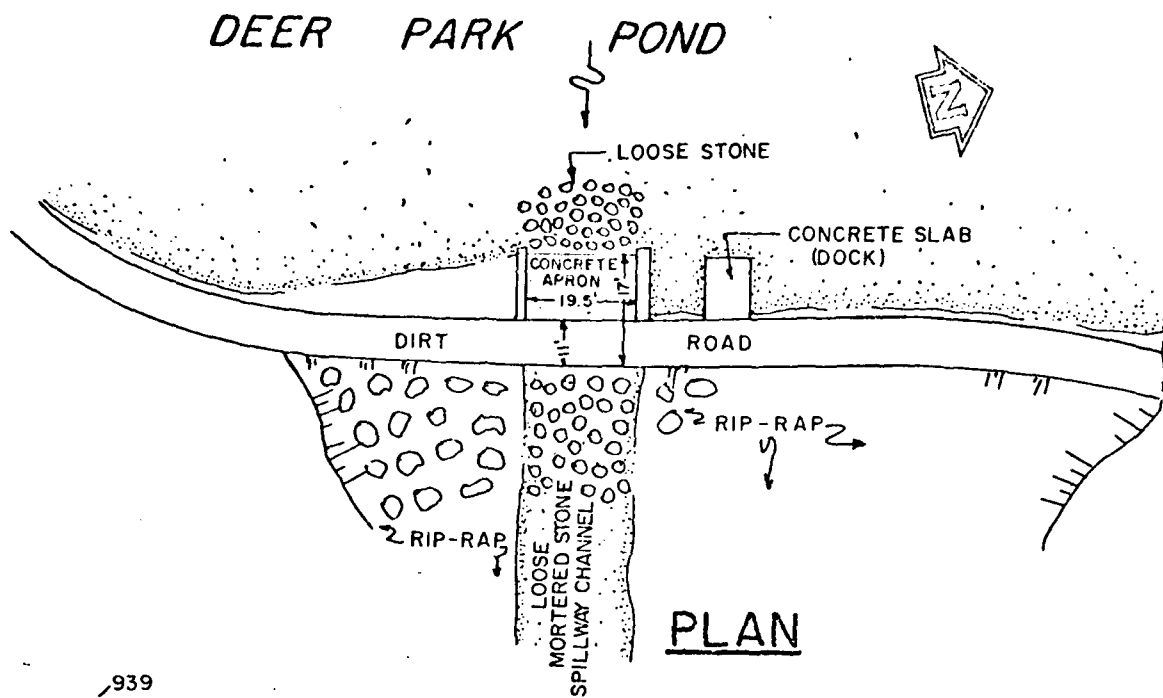
1. Clear fallen trees from the spillway discharge channel and maintain the channel free of debris.
2. Start a program of checking the condition of the dam periodically.
3. Establish grass vegetation on the embankment and start a program for maintaining the embankment free of weeds, brush and trees.
4. Clear trees, brush and debris from the discharge channel and from a zone 25 ft. wide on either side of the discharge channel for a distance of 100 ft. downstream from the end of spillway apron or to the property line whichever is the lesser.

The Owner should do the following in the near future:

Develop written operating procedures and a periodic maintenance plan to ensure the safety of the dam.

The Owner should do the following in the future:

Develop an emergency action plan which outlines actions taken by the owner to minimize downstream effects of an emergency at the dam.



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BOSTON		CORPS OF ENGINEERS	
MASSACHUSETTS		PHILADELPHIA, PA	
NATIONAL PROGRAM OF INSPECTION OF NON-FED DAMS			
DEER PARK POND DAM			
TRIB. TO MUSCONETCONG RIVER		NEW JERSEY	
		SCALE: NOT TO SCALE	
		DATE: JUNE 1981	

FIGURE-1



MAP BASED ON STATE OF NEW JERSEY
OFFICIAL MAP & GUIDE.

APPENDIX 1

CHECK LIST

VISUAL INSPECTION

DEER PARK POND DAM

Check List
Visual Inspection
Phase 1

Name Dam Deer Park Pond County Warren State NJ (00502) Coordinators NJDEP
 Date(s) Inspection 2/16/81 4/22/81 Weather Sunny Overcast Temperature 55° 35°
 Pool Elevation at Time of Inspection 934.7' NGVD Tailwater at Time of Inspection 920.5 NGVD

Inspection Personnel:

<u>W.. Guinan</u>	<u>D. Deane</u>
<u>S. Gilman</u>	<u>K. Stuart</u>
<u>R. Murdock</u>	<u>C. Plaud</u>

S. Gilman/R. Murdock/C. Plaud Recorder

The owner was not present during inspection

EMBANKMENT

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SURFACE CRACKS	None observed.	
UNUSUAL MOVEMENT OR CRACKING AT OR BEYOND THE TOE	None	
SLOUGHING OR EROSION OF EMBANKMENT AND ABUTMENT SLOPES	Significant sloughing on upstream face, sloughing and displacement of riprap on downstream face; trees on slope and at toe.	Remove trees on slope and at toe under proper supervision.
VERTICAL AND HORIZONTAL ALIGNMENT OF THE CREST	Horizontal - good. Vertical - undulation of surface.	
RIPRAP FAILURES	Vertical scarps along upstream face, riprap missing in many locations.	Repair riprap.

EMBANKMENT

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
RAILINGS	None	
JUNCTION OF EMBANKMENT AND ABUTMENT, SPILLWAY AND DAM	Erosion on both sides of spillway on downstream slope.	Repair eroded areas and install erosion protection.
ANY NOTICEABLE SEEPAGE	Wet and soft along toe to left of spillway - large pool standing water noted adjacent to toe.	Investigate problem and correct.
STAFF GAGE AND RECORDER	None	
DRAINS	None	

OUTLET WORKS

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CRACKING AND SPALLING OF CONCRETE SURFACES IN OUTLET CONDUIT	N/A	
INTAKE STRUCTURE	Not visible	
OUTLET PIPE	2 - 12-inch C.I.P. at base of spillway. No leakage noted. No gates visible at time of inspection.	
OUTLET CHANNEL	N/A	
EMERGENCY GATE	Not visible	

UNGATED SPILLWAY

REMARKS OR RECOMMENDATIONS

OBSERVATIONS

VISUAL EXAMINATION OF

Weir crest is cut stone with irregular surface and numerous open joints between stone.

CONCRETE WEIR

Repair cracks

Concrete apron 2-in - 4-in below crest. Sloping u/s surface has eroded. Two transverse cracks 1/4-in wide in concrete near left side. Concrete abutments - fair
Right u/s concrete wing wall has separated from bridge. Pier approx. 1/2-inch.
Channel itself, clear and unobstructed.

APPROACH CHANNEL

Repair mortar and rock face.
Remove tree and roots under proper supervision. Clear debris.

Surface is grouted loose rock - 3-inch - 6-inch in size. Much of the mortar is cracked. Water overflowing spillway crest is flowing into mortared rock face and exiting at the bottom. A few of the rocks are missing. Abutment walls are mortared stone masonry walls. Tree on right side has roots growing out into spillway surface. A little leakage noted 2 ft below crest exiting from abutment wall.
Channel has boulders, debris and some fallen trees.

DISCHARGE CHANNEL

Investigate extent of corrosion and repair.

Poured concrete over wood deck. Deck surface in good condition. Some spalling at each end of deck. Both abutments in fair condition. Center support angles are badly corroded at the bottom - providing very little support. Visible portions of steel beams are badly rusted. Galvanized metal bridge railing - good condition.

BRIDGE AND PIERS
OVER SPILLWAY

DOWNSTREAM CHANNEL

REMARKS OR RECOMMENDATIONS

OBSERVATIONS

VISUAL EXAMINATION OF

Very steep, rocky, fallen trees in channel; overbanks have large trees; no brush. Also see comments for spillway channel.

Steep side slopes on channel.

One house on d/s left overbank at Waterloo Road crossing, approximately 4 feet above road elevation may be reached; stream is channelized u/s of Waterloo Road.

CONDITION
(OBSTRUCTIONS,
DEBRIS, ETC.)

SLOPES

APPROXIMATE NO.
OF HOMES AND
POPULATION

RESERVOIR

REMARKS OR RECOMMENDATIONS	OBSERVATIONS	VISUAL EXAMINATION OF
SLOPES	Gradual to steeply sloped, wooded.	
SEDIMENTATION	No significant sedimentation observed.	

CHECK LIST
ENGINEERING DATA
DESIGN, CONSTRUCTION, OPERATION

ITEM	REMARKS
PLAN OF DAM	None found
REGIONAL VICINITY MAP	Prepared for this report
CONSTRUCTION HISTORY	None found
TYPICAL SECTIONS OF DAM	None found
HYDROLOGIC/HYDRAULIC DATA	None found
OUTLETS - PLAN	
- DETAILS	
- CONSTRAINTS	None found
- DISCHARGE RATINGS	
RAINFALL/RESERVOIR RECORDS	None found

ITEM	REMARKS
DESIGN REPORTS	None found
GEOLOGY REPORTS	None found
DESIGN COMPUTATIONS HYDROLOGY & HYDRAULICS DAM STABILITY SEEPAGE STUDIES	None found
MATERIALS INVESTIGATIONS BORING RECORDS LABORATORY FIELD	None found
POST-CONSTRUCTION SURVEYS OF DAM	None found
BORROW SOURCES	Unknown

ITEM	REMARKS
MONITORING SYSTEMS	None found
MODIFICATIONS	None found
HIGH POOL RECORDS	None found
POST CONSTRUCTION ENGINEERING STUDIES AND REPORTS	None found
PRIOR ACCIDENTS OR FAILURE OF DAM DESCRIPTION REPORTS	None found
MAINTENANCE OPERATION RECORDS	None found

ITEMS	REMARKS
SPILLWAY PLAN	
SECTIONS	None found
DETAILS	
OPERATING EQUIPMENT	
PLANS & DETAILS	None found

CHECK LIST
HYDROLOGIC AND HYDRAULIC DATA
ENGINEERING DATA

DRAINAGE AREA CHARACTERISTICS: .82 square miles, woods,
.01 square miles, wetlands

ELEVATION TOP NORMAL POOL (STORAGE CAPACITY): 934.6' NGVD (356.0
acre feet)

ELEVATION TOP FLOOD CONTROL POOL (STORAGE CAPACITY) Not applicable

ELEVATION MAXIMUM TEST FLOOD POOL: 937.7' NGVD

ELEVATION TOP DAM: 936.4' NGVD

SPILLWAY CREST: Uncontrolled stone

a. Elevation 934.6' NGVD

b. Type Irregular cut masonry

c. Width 12 feet

d. Length 19.5 feet

e. Location Spillover Center of dam

f. Number and Type of Gates None

OUTLET WORKS: Low level outlet

a. Type 2 12-inch pipes

Approximately 2 feet from either spillway wall

b. Location Next to stilling basin on downstream side

HYDROMETEOROLOGICAL GAGES: None

MAXIMUM NON-DAMAGING DISCHARGE: 114 cfs

APPENDIX 2

PHOTOGRAPHS

DEER PARK POND DAM



April 22, 1981

View of crest toward right abutment from center of spillway bridge.



April 22, 1981

View looking along upstream side of dam and bridge over spillway. Note concrete training walls and apron leading to spillway crest under concrete-slab bridge.



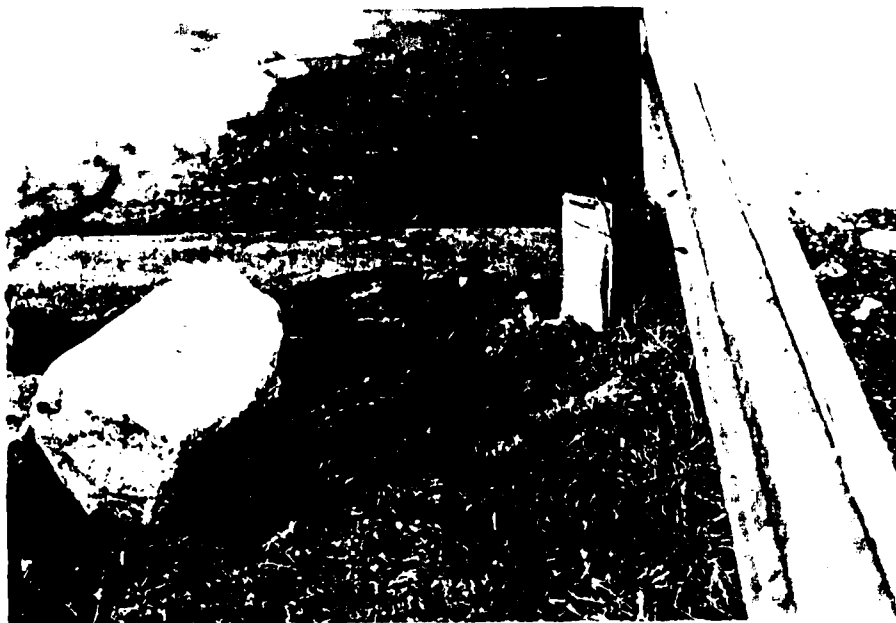
April 22, 1981

View looking upstream at left side of spillway; note that water disappears into rock bottom at approximately the center of the photo. Note also erosion from trespassing below guard rail.



April 22, 1981

View looking at spillway crest and downstream face of spillway; note that water disappearing into bottom reappears at spillway toe.



April 22, 1981

View of right spillway training wall
on upstream side; note spalled concrete.



April 22, 1981

View of underside of road bridge over spillway;
note that bridge column nearly rusted away at
footing.



April 22, 1981

Cracks in concrete apron of spillway on upstream side.



April 22, 1981

Outlet end of 12-inch cast iron pipe of low-level outlet under left side of downstream spillway face.



April 22, 1981

Outlet end of 12-inch cast iron pipe of low-level outlet under right side of downstream spillway face. (These pipes are 15 feet center to center.)



April 22, 1981

View of zone of standing water about 50 feet wide at toe of dam to left of spillway.



April 22, 1981

Slight seepage, adjacent to red flagging, slightly above pond shown in view above.



April 22, 1981

View of large wet area 30 feet wide and extending from 30 feet to 60 feet downstream of dam left of the downstream channel.



April 22, 1981

View of left edge of downstream channel; note seepage from channel bank and from rocks at left side of photo.

APPENDIX 3

HYDROLOGIC COMPUTATIONS

DEER PARK POND DAM

JOB NO.

SQUARES
1/4 IN. SCALE

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30

Time of Concentration① Texas Highway Method

Overland 3,800 ft. Slope = $\frac{1100-935}{3800} = 0.043 = 4.3\%$

for woodlands, $v = 2.0 \text{ fps} \rightarrow \text{Time} = \frac{3800}{2} = 1900 \text{ sec} = 0.53 \text{ hr}$

no channel.

② Soil and Water Conservation

$$L = 0.6 T_c = \frac{l^{0.8} (S+1)^{1.67}}{9,000 y^{0.5}}$$

$$\rightarrow T_c = \frac{l^{0.8} (S+1)^{1.67}}{(0.6) 9,000 y^{0.5}}$$

$$l = 3800 \text{ ft}$$

$$y = 4.3\%$$

CN = 70 for good condition woods of soil groups

$$\rightarrow S = \frac{1000}{70} - 10 = 4.29$$

$$T_c = \frac{3,800^{0.8} 5.29^{1.67}}{0.6 (9,000) 4.3^{0.5}} = 1.05 \text{ hrs.}$$

③ Weston, or SCS T.R. #55

Overland slope = 4.3% $\rightarrow v = 0.5 \text{ fps}$ (from T.R. 55 graph for forest (pine)) length = 3,800 ft

$$T_c = \frac{3800}{0.5} = 7,600 \text{ sec} = 2.11 \text{ hrs.}$$

No channel

JOB NO.

SQUARES
1/4 IN. SCALE

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29

1

2

3

4

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7

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40

(4) Kerby

$$\text{Overland, } T_c = 0.83 \left(\frac{112}{\sqrt{S}} \right)^{0.467} \quad N=0.7, L=3800, S=0.013$$

$$= 0.83 \left(\frac{0.7 \cdot 3800}{\sqrt{0.013}} \right)^{0.467} = 68.8 \text{ min} = 1.15 \text{ hrs.}$$

$$\text{Avg} = \frac{0.53 + 1.05 + 2.11 + 1.15}{4} = 1.21 \text{ hrs.} \rightarrow L = 0.6 T_c = 0.73 \text{ hrs}$$

$$\text{Drainage area} = 0.82 \text{ sq. mi.}$$

JOB NO.

SQUARES
1/4 IN. SCALE

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30

Stage-Discharge Curve

The hydraulic profile of Deer Park Pond Dam is shown on page 4. Assume 12" pipes closed.

Spillway

from 934.6 to 935.6, weir: $Q = 3.0 (19.5) (E - 934.6)^{3/2}$

from 935.6 to 936.4, orifice: $Q = C_a \sqrt{2g} \sqrt{h}$

0.72, King Handbook of Hydraulics, $C \approx 0.64$

h = height above orifice = $E - 935.1$

$$Q = 0.64 (19.5 \sqrt{2}) (\sqrt{E - 935.1})$$

$$= 100.2 \sqrt{E - 935.1}$$

from 936.4 up, orifice + weir over top: $Q = 100.2 \sqrt{E - 935.1} + 3.0 (19.5) (E - 936.4)^{3/2}$

Top of Dam

Sections 3, 4, 6, 17 *

from 936.4 to 936.9, $Q = 2.8 (38.5) (E - 936.4) (0.5 (E - 936.4))^{3/2}$

$$+ 2.8 (180.5) (E - 936.4)^{3/2} + 2.8 (166.7) (E - 936.4) (0.5 (E - 936.4))^{3/2}$$

from 936.9 to 937.0, $Q = 2.8 (38.5) (E - 936.4) (0.5 (E - 936.4))^{3/2} + 2.8 (180.5) (E - 936.9)^{3/2}$

$$+ 2.8 (166.7) (E - 936.4) (0.5 (E - 936.4))^{3/2} + 2.8 (600) (E - 936.9) (0.5 (E - 936.9))^{3/2}$$

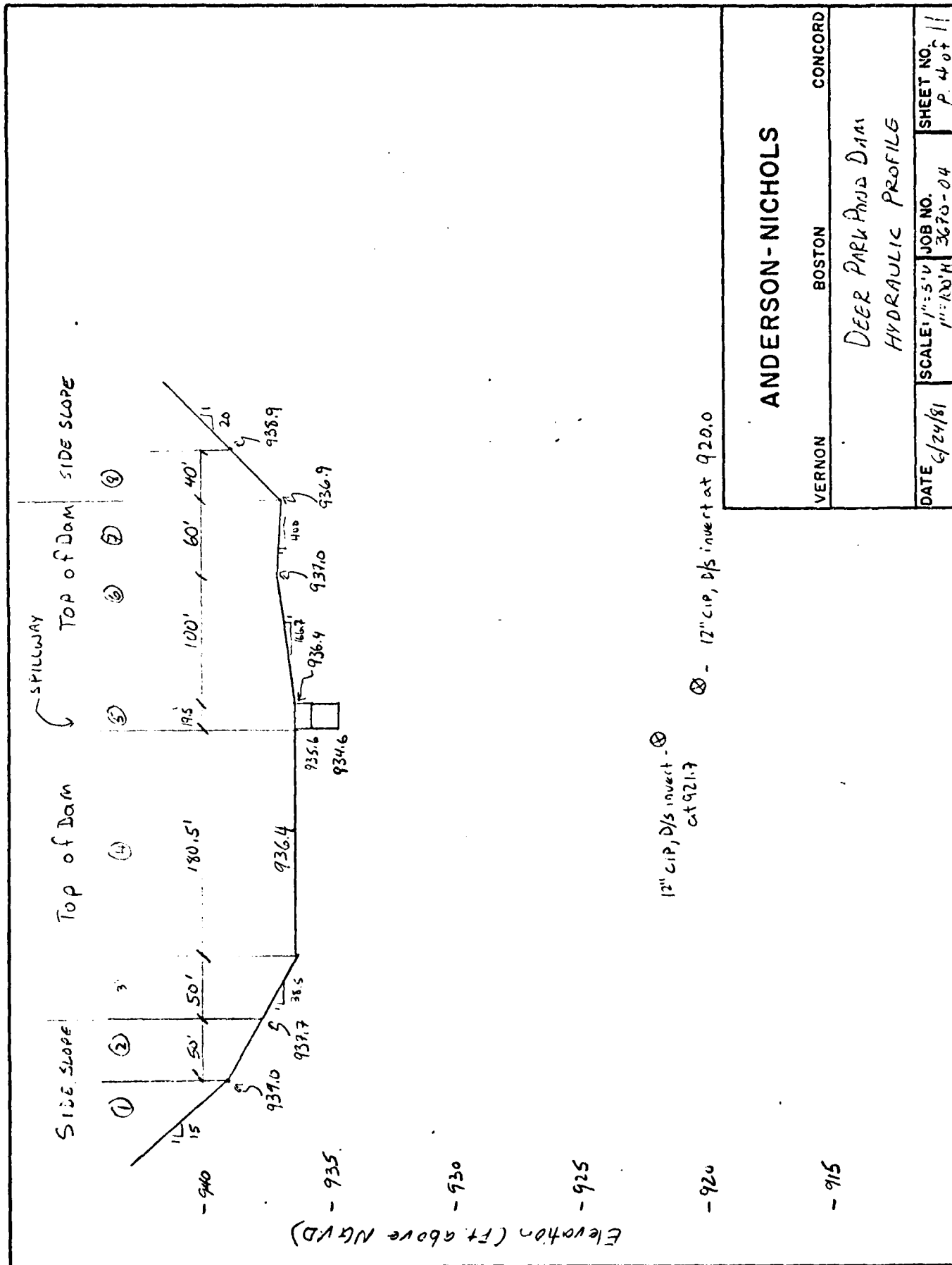
from 937.0 to 937.7, $Q = 2.8 (38.5) (E - 936.4) (0.5 (E - 936.4))^{3/2} + 2.8 (180.5) (E - 937.0)^{3/2}$

$$+ 2.8 (100) (E - 936.7)^{3/2} + 2.8 (60) (E - 936.95)^{3/2}$$

from 937.7 up, $Q = 2.8 (50) (E - 937.05)^{3/2} + 2.8 (180.5) (E - 936.4)^{3/2}$

$$+ 2.8 (100) (E - 936.7)^{3/2} + 2.8 (60) (E - 936.95)^{3/2}$$

* for a sloping weir, $Q = C L H_{\text{avg}}^{3/2}$



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DEER PARK POND DAM
HYDRAULIC PROFILE

DATE 6/24/81 SCALE: 1"=5' V, 1"=100' H JOB NO. 3670-04 SHEET NO. P. 4 of 11

JOB NO.

AREAS
IN. SCALE

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30

Side SlopesSections 1, 2, 48from 936.9 to 937.7

$$Q = 2.6 (20) (E-936.9) \left[(0.5) (E-936.9) \right]^{3/2}$$

from 937.7 to 939.0

$$Q = 2.6 (20.5) (E-937.7) \left[(0.5) (E-937.7) \right]^{3/2} + 2.6 (20) (E-936.9) \left[(0.5) (E-936.9) \right]^{3/2}$$

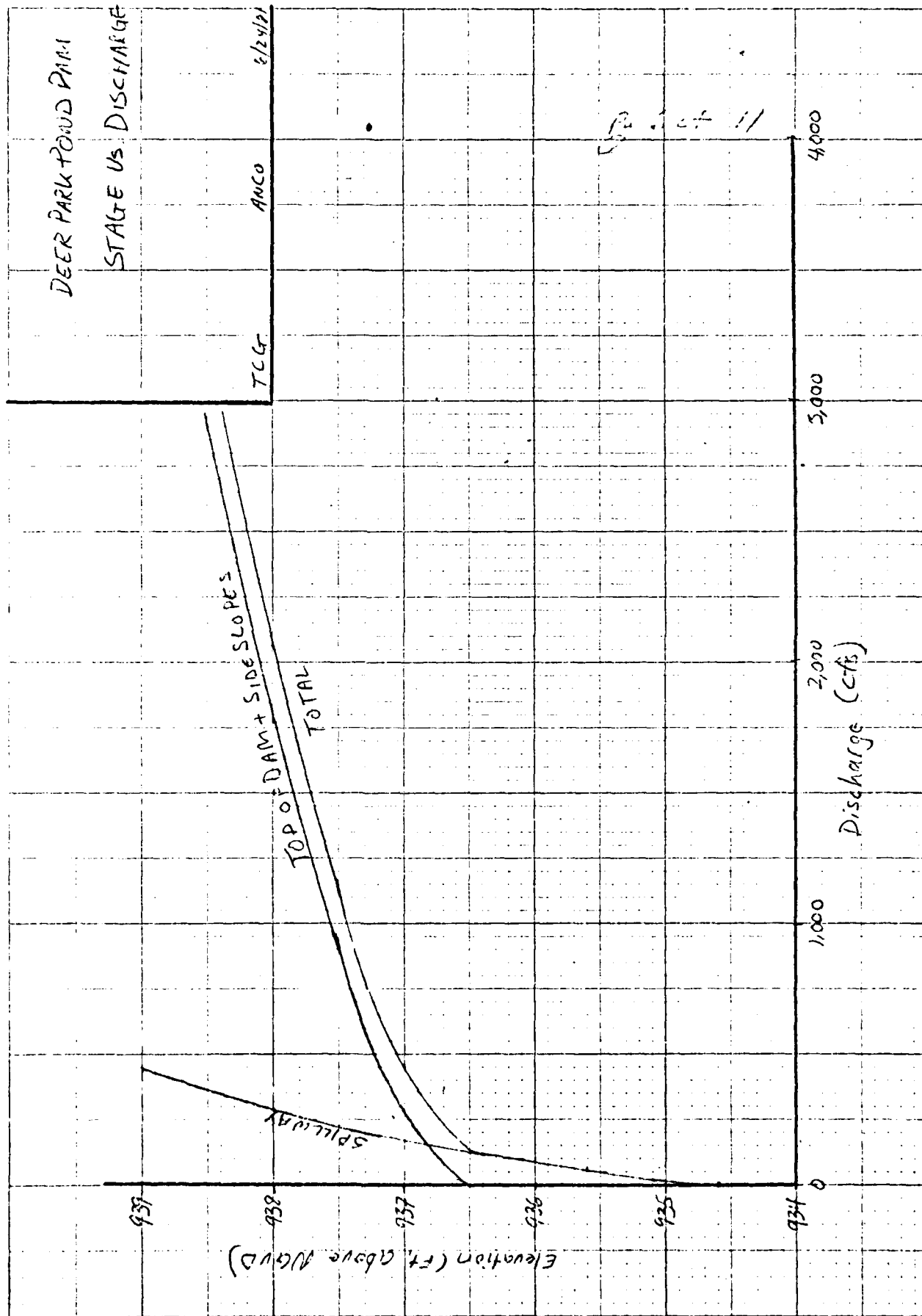
$$\left[(0.5) (E-936.9) \right]^{3/2}$$

from 939.0 up

$$Q = 2.6 (15) (E-939.0) \left[(0.5) (E-939.0) \right]^{3/2} + 2.6 (20) (E-937.7) \left[(0.5) (E-937.7) \right]^{3/2}$$

$$+ 2.6 (20) (E-936.9) \left[(0.5) (E-936.9) \right]^{3/2}$$

22	ELEVATION	DESCRIPTION	HEAD FEET	SPILLWAY	RT. FEET	RT. FEET	RT. FEET
23	(H. O. G. E. 10)						
24							
25	939.6	spillway crest	0.0	0	0	0	0
26	935.1		0.5	20.7	0	0	20.7
27	935.6	top of spillway	1.0	58.5	0	0	58.5
28	936.0		1.4	95.1	0	0	95.1
29	936.4	top of dam	1.8	114	0	0	114
30	937.0		2.4	165	213	0	456
31	937.5		2.9	223	900	5	1,129
32	938.0		3.4	289	1,748	25	2,062
33	939.0		4.4	443	3,970	186	4,599
34							
35							
36							
37							
38							
39							



JOB NO.

SQUARES
1/4 IN. SCALE

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30

Stage Vs. Storage

Area at Pond Surface = 51.2 acres (934.6 ft.)
 at Elev. 940 = 76.8 acres
 at Elev. 960 = 128 acres

Assume linear increase in Area between points. Assume storage
 = 0.0 at 920.0, = 356 acre-ft at normal pool (934.6 ft.)

elevation (ft. above NAVD)	Surface Area (Acres)	Avg. S.A. (Acres)	INCREMENTAL STORAGE (Ac.-ft)	CUMULATIVE STORAGE (Ac.-ft)
920.0	-	-	-	0
934.6	51.2	-	356	356
935.1	53.6	52.4	26.2	382.2
935.6	55.9	54.75	27.4	409.6
936	57.8	56.85	27.7	437.3
936.4	57.7	58.75	23.5	455.8
937	62.6	61.15	36.7	492.5
937.5	64.9	63.75	31.9	524.4
938	67.3	66.1	33.0	557.4
939	72.1	69.7	69.7	627.1

DEER PARK FLOOD DAM
STAGE VS. STORAGE

P. 809 11

6/24/81

ANCO

TCG

CRP

STORAGE (AL-F)

0 100 200 300 400 500 600 700

939

938

937

936

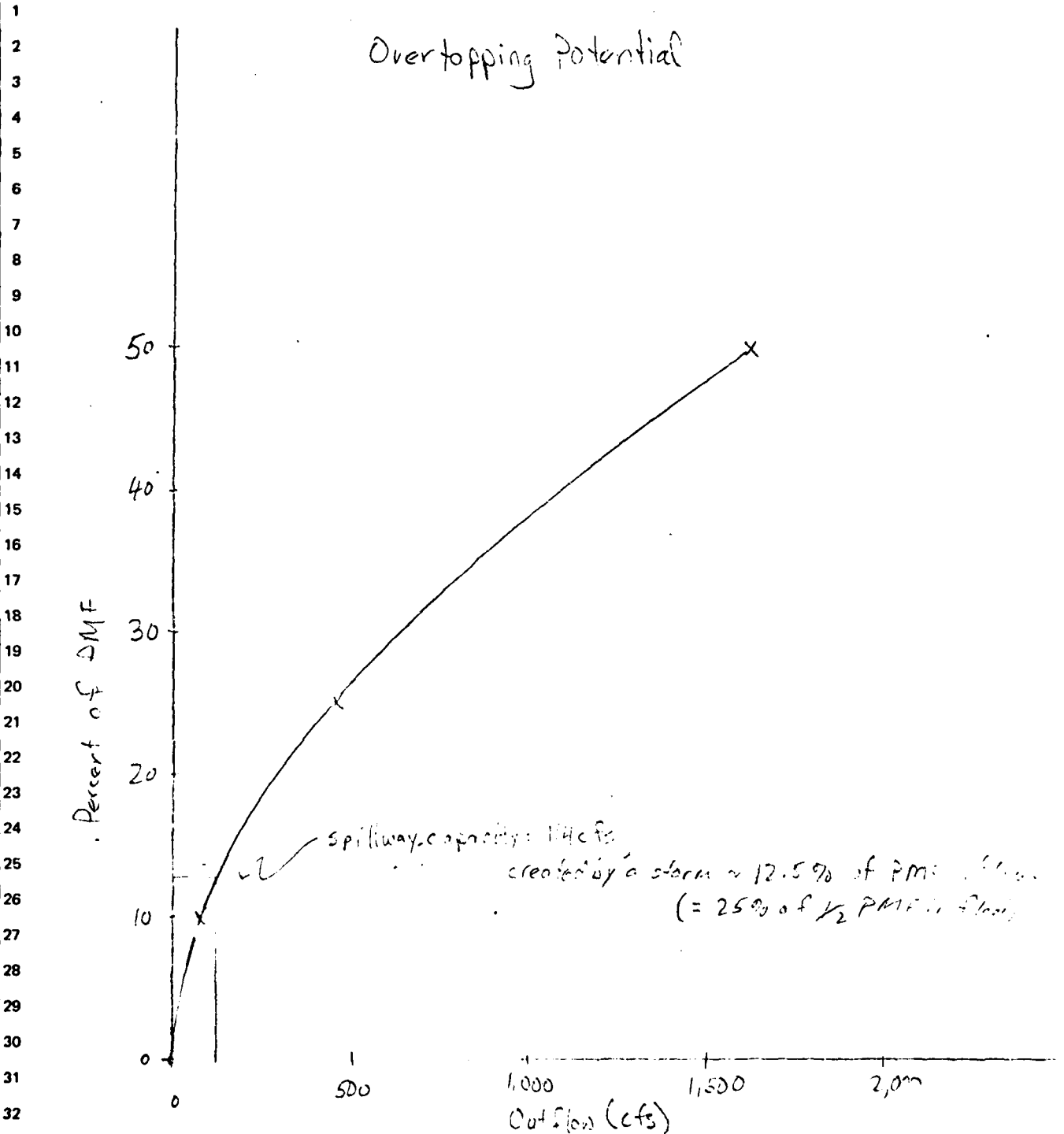
935

934

JOB NO.

SQUARES
1/4 IN. SCALE

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30



JOB NO. SQUARES
1/4 IN. SCALE

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30

Drawdown Time

2-12" pipes for drawdown, 2/s inverts at 921.7 and 920.5.

① Assume both open, acting as orifices with inlet control. Assume

 $c = 0.61$, and v/s inverts at same elevation as D/s.

$$Q = Q_1 + Q_2 = C_1 A_1 \sqrt{2g} \sqrt{H_1} + C_2 A_2 \sqrt{2g} \sqrt{H_2}$$

$$C_1 = C_2 = 0.61$$

$$A_1 = A_2 = \pi (0.5)^2 = 0.785 \text{ ft}^2$$

$$H_1 = \text{Height above } 920.5 = E - 920.5$$

$$H_2 = \text{Height above } 922.2 = E - 922.2$$

$$\text{So } Q = 3.84 (\sqrt{E - 920.5} + \sqrt{E - 922.2})$$

② As for storage below water surface, assume: Storage $A h^N$ at elev. 934.6, $h = 14.6$, storage = 56. At 935.1, $h = 15.6$, storage = 409.6. So:

$$409.6 = A (15.6)^N$$

$$\ln 409.6 = \ln A + N \ln 15.6$$

$$\ln A = 6.02 - 2.75N$$

$$\text{and } 356 = A (14.6)^N$$

$$\ln 356 = \ln A + N \ln 14.6$$

$$\ln 356 = 6.02 - 2.75N + N \ln 14.6$$

$$5.87 - 6.02 = -2.75N + 2.68N$$

$$N = 2.14$$

$$\rightarrow \ln A = 6.02 - 2.75(2.14)$$

$$= 0.135 \rightarrow A = 1.14$$

$$\text{So Storage} = 1.14 h^{2.14}$$

③ $1.58 \text{ cfs} = 1.58 \text{ cfs}$

④ Days =

$$\frac{\Delta S}{A_c \cdot 1440 \text{ day}}$$

⑤ No inflow

Anderson-Nichols & Company, Inc.

Subject Deer Park Pond

Sheet No. 11 of 11
 Date 5/2/21
 Computed CEP
 Checked CEP

JOB NO.

SQUARES 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30
 1/4 IN. SCALE

	Elevation (Ft above NGVD)	Storage (Ac.-Ft)	ΔS (Ac.-Ft)	Q (CFS)	Q _{AVG} (CFS)	Ac.-Ft per Day	DAYS
1							
2							
3							
4							
5	934.6	356		27.9			
6			124		26.45	52.4	2.37
7	932	232		25.0			
8			75		23.8	47.1	1.59
9	930	157		22.6			
10			59		21.2	42.0	1.40
11	928	98		17.8			
12			45		18.15	35.9	1.25
13	926	53		16.5			
14			31		14.4	28.5	1.09
15	924	22		12.3			
16			17		8.5	16.8	1.01
17	922	5		4.7			
18			5		2.35	4.7	1.07
19	0	0		0			
20							
21							
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$\Sigma = 9.78 \text{ days}$

APPENDIX 4

HEC-1 OUTPUT

DEER PARK POND DAM

 * U.S. ARMY CORPS OF ENGINEERS
 * THE HYDROLOGIC ENGINEERING CENTER
 * 609 SECOND STREET
 * DAVIS, CALIFORNIA 95616
 * (916) 440-3285 (R (FIS) 448-3285
 * *****

 * L000 HYDROGRAPH PACKAGE (HEC-1)
 * FEBRUARY 1981
 *
 * RUN DATE 06/30/81 TIME 11.44.23
 * *****

DEER PARK POND DAM OVERTOPPING ANALYSIS TOM GOUGH ANCO
 NEW JERSEY DAM NO. 502 - WARREN COUNTY - ALLAMUCKY TOWNSHIP
 0.1,0.25,0.5 MULTIPLES OF PMF FROM 24-HOUR PMF

5 10 OUTPUT CONTROL VARIABLES 2 PRINT CONTROL
 1 PLOT CONTROL
 1 HYDROGRAPH PLOT SCALE
 YES PRINT DIAGNOSTIC MESSAGES
 11 HYDROGRAPH TIME DATA 5 MINUTES IN COMPUTATION INTERVAL
 1 0000 STARTING DATE
 300 NUMBER OF HYDROGRAPH ORDINATES
 2 0055 ENDING DATE
 COMPUTATION INTERVAL 0.06 HOURS
 TOTAL TIME BASE 24.92 HOURS

ENGLISH UNITS
 GRAVITACE AREA SQUARE MILES
 PRECIPITATION DEPTH INCHES
 LENGTH, (LEVATION) FEET
 STORAGE VOLUME CUBIC FEET PER SECOND
 SURFACE AREA ACRES
 TEMPERATURE DEGREES FAHRENHEIT

JP MULTI-PLAN OPTION 1 NUMBER OF PLANS
 JR MULTI-RATIO OPTION 0.50
 RATIOS OF RUNOFF 0.10

7 KK A1

DEVELOP INFLOW HYDROGRAPH TO DEER PARK POND

INFLOW FROM SCS UNIT GRAPH COMPUTATIONS

SUBBASIN RUNOFF DATA

9 BA SUBBASIN CHARACTERISTICS
 AREA 0.82 SUBBASIN AREA

10 BF BASE FLOW CHARACTERISTICS
 STRTQ 2.50 INITIAL FLOW
 ORCSN 2.50 BEGIN BASE FLOW RECESSION
 FRIOR 1.00000 RECESION CONSTANT

PRECIPITATION DATA

11 PM PROBABLE MAXIMUM STORM INDEX PRECIPITATION
 TSPC 22.90 CM
 TRSDA 0.00 TRANSPORTATION COEFFICIENT
 SMD 0.00 TRANSPORTATION AREA
 WSD 0.00 USL SMD DISTRIBUTION

PERCENT OF INDEX PRECIPITATION OCCURRING IN GIVEN TIME
 16-HR 13.0 24-HR 132.0 48-HR 0.0 72-HR 0.0 96-HR 0.0

12 LU UNIFORM LOSS RATE 1.00 INITIAL LOSS RATE
 SCS 0.70 UNIFORM LOSS RATE
 RIMP 0.00 PERCENT IMPERVIOUS AREA

13 UD SCS DIMENSIONLESS UNITGRAPH FLAG 0.73 LAG

UNIT HYDROGRAPH ORDINATES
 46. END-OF-PERIOD ORDINATES
 18. 59. 112. 185. 280. 378. 453.
 481. 443. 399. 342. 277. 236. 189.
 16. 14. 12. 10. 8. 7. 6.
 13. 12. 12. 11. 1. 0. 0.

509.
 512.
 134.
 123.
 119.
 4.

HYDROGRAPH AT STATION A1

DA	MON	HR:MN	ORD	RAIN	LOSS	EXCESS	COMP	Q
1	1	1	1	0.01	0.01	0.00	3.	263.
2	2	2	2	0.01	0.01	0.00	3.	230.
3	3	3	3	0.01	0.01	0.00	3.	403.
4	4	4	4	0.01	0.01	0.00	3.	474.
5	5	5	5	0.01	0.01	0.00	3.	553.
6	6	6	6	0.01	0.01	0.00	3.	624.
7	7	7	7	0.01	0.01	0.00	3.	694.
8	8	8	8	0.01	0.01	0.00	3.	764.
9	9	9	9	0.01	0.01	0.00	3.	834.
10	10	10	10	0.01	0.01	0.00	3.	904.
11	11	11	11	0.01	0.01	0.00	3.	974.
12	12	12	12	0.01	0.01	0.00	3.	1044.
13	13	13	13	0.01	0.01	0.00	3.	1114.
14	14	14	14	0.01	0.01	0.00	3.	1184.
15	15	15	15	0.01	0.01	0.00	3.	1254.
16	16	16	16	0.01	0.01	0.00	3.	1324.
17	17	17	17	0.01	0.01	0.00	3.	1394.
18	18	18	18	0.01	0.01	0.00	3.	1464.
19	19	19	19	0.01	0.01	0.00	3.	1534.
20	20	20	20	0.01	0.01	0.00	3.	1604.
21	21	21	21	0.01	0.01	0.00	3.	1674.
22	22	22	22	0.01	0.01	0.00	3.	1744.
23	23	23	23	0.01	0.01	0.00	3.	1814.
24	24	24	24	0.01	0.01	0.00	3.	1884.
25	25	25	25	0.01	0.01	0.00	3.	1954.
26	26	26	26	0.01	0.01	0.00	3.	2024.
27	27	27	27	0.01	0.01	0.00	3.	2094.
28	28	28	28	0.01	0.01	0.00	3.	2164.
29	29	29	29	0.01	0.01	0.00	3.	2234.
30	30	30	30	0.01	0.01	0.00	3.	2304.
31	31	31	31	0.01	0.01	0.00	3.	2374.
32	32	32	32	0.01	0.01	0.00	3.	2444.
33	33	33	33	0.01	0.01	0.00	3.	2514.
34	34	34	34	0.01	0.01	0.00	3.	2584.
35	35	35	35	0.01	0.01	0.00	3.	2654.
36	36	36	36	0.01	0.01	0.00	3.	2724.
37	37	37	37	0.01	0.01	0.00	3.	2794.
38	38	38	38	0.01	0.01	0.00	3.	2864.
39	39	39	39	0.01	0.01	0.00	3.	2934.
40	40	40	40	0.01	0.01	0.00	3.	3004.
41	41	41	41	0.01	0.01	0.00	3.	3074.
42	42	42	42	0.01	0.01	0.00	3.	3144.
43	43	43	43	0.01	0.01	0.00	3.	3214.
44	44	44	44	0.01	0.01	0.00	3.	3284.
45	45	45	45	0.01	0.01	0.00	3.	3354.
46	46	46	46	0.01	0.01	0.00	3.	3424.
47	47	47	47	0.01	0.01	0.00	3.	3494.
48	48	48	48	0.01	0.01	0.00	3.	3564.
49	49	49	49	0.01	0.01	0.00	3.	3634.
50	50	50	50	0.01	0.01	0.00	3.	3704.
51	51	51	51	0.01	0.01	0.00	3.	3774.
52	52	52	52	0.01	0.01	0.00	3.	3844.
53	53	53	53	0.01	0.01	0.00	3.	3914.
54	54	54	54	0.01	0.01	0.00	3.	3984.
55	55	55	55	0.01	0.01	0.00	3.	4054.
56	56	56	56	0.01	0.01	0.00	3.	4124.
57	57	57	57	0.01	0.01	0.00	3.	4194.
58	58	58	58	0.01	0.01	0.00	3.	4264.
59	59	59	59	0.01	0.01	0.00	3.	4334.
60	60	60	60	0.01	0.01	0.00	3.	4404.
61	61	61	61	0.01	0.01	0.00	3.	4474.
62	62	62	62	0.01	0.01	0.00	3.	4544.
63	63	63	63	0.01	0.01	0.00	3.	4614.
64	64	64	64	0.01	0.01	0.00	3.	4684.
65	65	65	65	0.01	0.01	0.00	3.	4754.
66	66	66	66	0.01	0.01	0.00	3.	4824.
67	67	67	67	0.01	0.01	0.00	3.	4894.
68	68	68	68	0.01	0.01	0.00	3.	4964.
69	69	69	69	0.01	0.01	0.00	3.	5034.
70	70	70	70	0.01	0.01	0.00	3.	5104.
71	71	71	71	0.01	0.01	0.00	3.	5174.
72	72	72	72	0.01	0.01	0.00	3.	5244.
73	73	73	73	0.01	0.01	0.00	3.	5314.
74	74	74	74	0.01	0.01	0.00	3.	5384.
75	75	75	75	0.01	0.01	0.00	3.	5454.
76	76	76	76	0.01	0.01	0.00	3.	5524.
77	77	77	77	0.01	0.01	0.00	3.	5594.
78	78	78	78	0.01	0.01	0.00	3.	5664.
79	79	79	79	0.01	0.01	0.00	3.	5734.
80	80	80	80	0.01	0.01	0.00	3.	5804.
81	81	81	81	0.01	0.01	0.00	3.	5874.
82	82	82	82	0.01	0.01	0.00	3.	5944.
83	83	83	83	0.01	0.01	0.00	3.	6014.
84	84	84	84	0.01	0.01	0.00	3.	6084.
85	85	85	85	0.01	0.01	0.00	3.	6154.
86	86	86	86	0.01	0.01	0.00	3.	6224.
87	87	87	87	0.01	0.01	0.00	3.	6294.
88	88	88	88	0.01	0.01	0.00	3.	6364.
89	89	89	89	0.01	0.01	0.00	3.	6434.
90	90	90	90	0.01	0.01	0.00	3.	6504.
91	91	91	91	0.01	0.01	0.00	3.	6574.
92	92	92	92	0.01	0.01	0.00	3.	6644.
93	93	93	93	0.01	0.01	0.00	3.	6714.
94	94	94	94	0.01	0.01	0.00	3.	6784.
95	95	95	95	0.01	0.01	0.00	3.	6854.
96	96	96	96	0.01	0.01	0.00	3.	6924.
97	97	97	97	0.01	0.01	0.00	3.	6994.
98	98	98	98	0.01	0.01	0.00	3.	7064.
99	99	99	99	0.01	0.01	0.00	3.	7134.
100	100	100	100	0.01	0.01	0.00	3.	7204.

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PEAK FLOW (CFS)	TIME {HR}	6-HR (CFS)	24-HR (INCHES)	MAXIMUM AVERAGE FLOW 72-HR	24-HR 24-HR
3913.	16.25	1708.	47.6	459.	24,922-HR
		19,367	21,590	21,994	459.
		847.	944.	21,944.	21,944.
CUMULATIVE AREA =			0.82 SQ MI		

HYDROGRAPH AT STATION
PLAIN 1. RATIO = 0.50 A1

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1 0540 71 356.0 0 934.6 1 1410 171 14. 424.0 5 935.0 1 107. 271 235 2240 1 1 937.7 0055 936.0
1 0545 72 356.0 0 934.6 1 1410 173 14. 424.5 5 935.0 1 106. 273 235 2240 1 1 937.7 0055 936.0
1 0550 73 356.0 0 934.6 1 1410 174 14. 425.0 5 935.0 1 105. 274 235 2240 1 1 937.7 0055 936.0
1 0555 74 356.0 0 934.6 1 1410 175 14. 425.5 5 935.0 1 104. 275 235 2240 1 1 937.7 0055 936.0
1 0600 75 356.0 0 934.6 1 1410 176 14. 426.0 5 935.0 1 103. 276 235 2240 1 1 937.7 0055 936.0
1 0605 76 356.0 0 934.6 1 1410 177 14. 426.5 5 935.0 1 102. 277 235 2240 1 1 937.7 0055 936.0
1 0610 77 356.0 0 934.6 1 1410 178 14. 427.0 5 935.0 1 101. 278 235 2240 1 1 937.7 0055 936.0
1 0615 78 356.0 0 934.6 1 1410 179 14. 427.5 5 935.0 1 100. 279 235 2240 1 1 937.7 0055 936.0
1 0620 79 356.0 0 934.6 1 1410 180 14. 428.0 5 935.0 1 99. 280 235 2240 1 1 937.7 0055 936.0
1 0625 80 356.0 0 934.6 1 1410 181 14. 428.5 5 935.0 1 98. 281 235 2240 1 1 937.7 0055 936.0
1 0630 81 356.0 0 934.6 1 1410 182 14. 429.0 5 935.0 1 97. 282 235 2240 1 1 937.7 0055 936.0
1 0635 82 356.0 0 934.6 1 1410 183 14. 429.5 5 935.0 1 96. 283 235 2240 1 1 937.7 0055 936.0
1 0640 83 356.0 0 934.6 1 1410 184 14. 430.0 5 935.0 1 95. 284 235 2240 1 1 937.7 0055 936.0
1 0645 84 356.0 0 934.6 1 1410 185 14. 430.5 5 935.0 1 94. 285 235 2240 1 1 937.7 0055 936.0
1 0650 85 356.0 0 934.6 1 1410 186 14. 431.0 5 935.0 1 93. 286 235 2240 1 1 937.7 0055 936.0
1 0655 86 356.0 0 934.6 1 1410 187 14. 431.5 5 935.0 1 92. 287 235 2240 1 1 937.7 0055 936.0
1 0700 87 356.0 0 934.6 1 1410 188 14. 432.0 5 935.0 1 91. 288 235 2240 1 1 937.7 0055 936.0
1 0705 88 356.0 0 934.6 1 1410 189 14. 432.5 5 935.0 1 90. 289 235 2240 1 1 937.7 0055 936.0
1 0710 89 356.0 0 934.6 1 1410 190 14. 433.0 5 935.0 1 89. 290 235 2240 1 1 937.7 0055 936.0
1 0715 90 356.0 0 934.6 1 1410 191 14. 433.5 5 935.0 1 88. 291 235 2240 1 1 937.7 0055 936.0
1 0720 91 356.0 0 934.6 1 1410 192 14. 434.0 5 935.0 1 87. 292 235 2240 1 1 937.7 0055 936.0
1 0725 92 356.0 0 934.6 1 1410 193 14. 434.5 5 935.0 1 86. 293 235 2240 1 1 937.7 0055 936.0
1 0730 93 356.0 0 934.6 1 1410 194 14. 435.0 5 935.0 1 85. 294 235 2240 1 1 937.7 0055 936.0
1 0735 94 356.0 0 934.6 1 1410 195 14. 435.5 5 935.0 1 84. 295 235 2240 1 1 937.7 0055 936.0
1 0740 95 356.0 0 934.6 1 1410 196 14. 436.0 5 935.0 1 83. 296 235 2240 1 1 937.7 0055 936.0
1 0745 96 356.0 0 934.6 1 1410 197 14. 436.5 5 935.0 1 82. 297 235 2240 1 1 937.7 0055 936.0
1 0750 97 356.0 0 934.6 1 1410 198 14. 437.0 5 935.0 1 81. 298 235 2240 1 1 937.7 0055 936.0
1 0755 98 356.0 0 934.6 1 1410 199 14. 437.5 5 935.0 1 80. 299 235 2240 1 1 937.7 0055 936.0
1 0800 99 356.0 0 934.6 1 1410 200 14. 438.0 5 935.0 1 79. 300 235 2240 1 1 937.7 0055 936.0
1 0805 100 356.0 0 934.6 1 1410 201 14. 438.5 5 935.0 1 78. 301 235 2240 1 1 937.7 0055 936.0
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PEAK OUTFLOW IS 1618. AT TIME 16.58 HOURS

PEAK FLOW (CFS) 1618.	TIME (HR) 16.58	MAXIMUM AVERAGE FLOW 72-HR 192.	24.92-HR 192.
PEAK STORAGE (AC-FT) 536.	TIME (HR) 16.58	MAXIMUM AVERAGE STORAGE 72-HR 411.	24.92-HR 411.
PEAK STAGE (FEET) 937.70	TIME (HR) 16.58	MAXIMUM AVERAGE STAGE 72-HR 935.56	24.92-HR 935.56
CUMULATIVE AREA = 0.82 SQ MI			

PEAK FLOW AND STAGE (END-OF-PERIOD) SUMMARY FOR MULTIPLE PLAN-RATIO ECONOMIC COMPUTATIONS
 FLOWS IN CUBIC FEET PER SECOND, AREA IN SQUARE MILES
 TIME TO PEAK IN HOURS

OPERATION	STATION	AREA	PLAN	RATIOS APPLIED TO FLOWS		
				RATIO 1 0.10	RATIO 2 0.25	RATIO 3 0.50
HYDROGRAPH AT	A1	0.82	1	391 16.25	978 16.25	1957 16.25
ROUTED TO	A2	0.82	1	83 18.87	448 17.42	1618 16.58
** PEAK STAGES IN FEET **				935.87	936.98	937.70
1				18.87	17.42	16.58

SUMMARY OF DAM DRAINAGING/UPPER ANALYSIS FOR STATION A2

PLAN 1

RATIO OF PMF	ELEVATION STORAGE OUTFLOW	INITIAL VALUE 434.60 356. 0.	SPILLWAY CREST 934.60 356. 0.	TOP OF DAM 936.50 450. 114.	DURATION OVER TOP HOURS	MAXIMUM OUTFLOW CFS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
0.10	935.87	425.	83.	0.0	0.0	18.67	0.0	0.0
0.25	939.98	491.	458.	4.42	17.38	16.38	0.0	0.0
0.50	939.70	538.	1613.	6.42	17.38	16.38	0.0	0.0

*** NORMAL END OF JOB ***

APPENDIX 5

REFERENCES

DEER PARK POND DAM

APPENDIX 5
REFERENCES

DEER PARK POND DAM

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