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NATIONAL DAM SAFETY PROGRAM. OAKFORD LAKE DAM (NJ 00544), DELAW--ETC(U)
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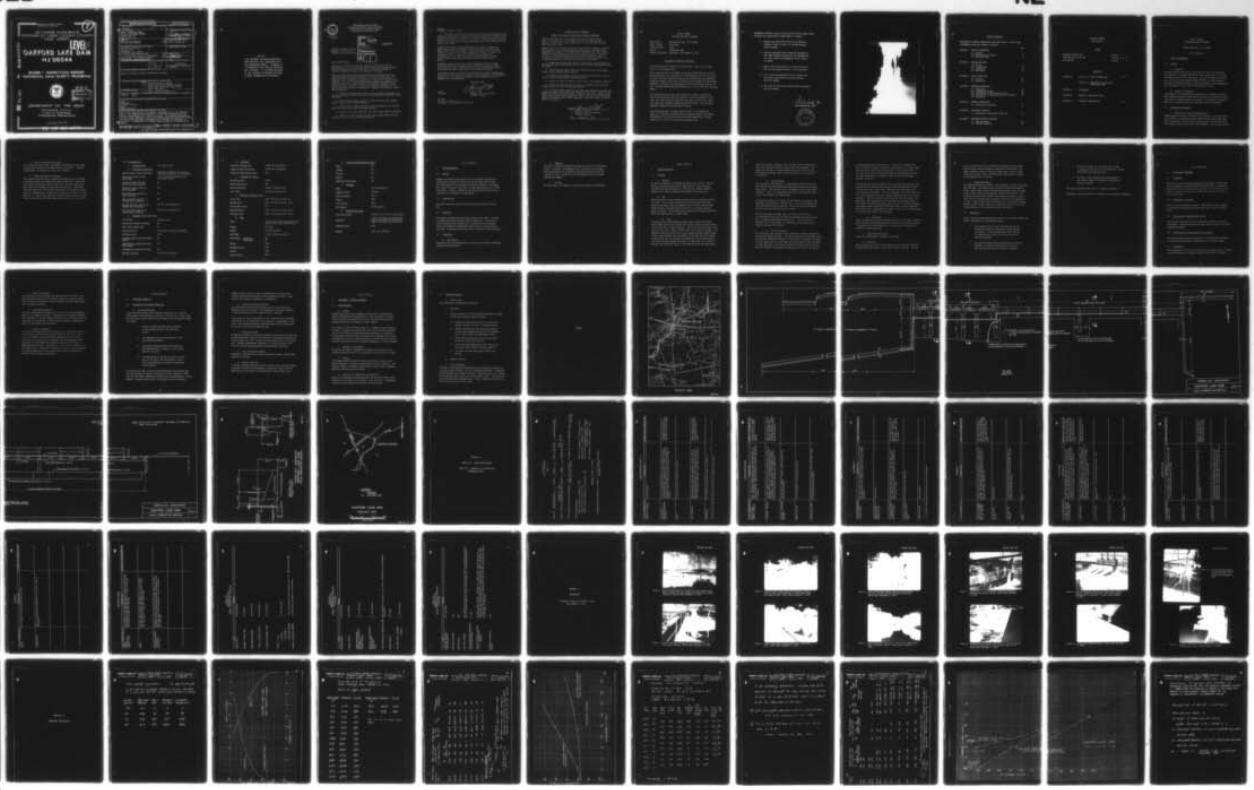

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DELAWARE RIVER BASIN
CROSSWICKS CREEK, OCEAN COUNTY
NEW JERSEY

LEVEL II

OAKFORD LAKE DAM
NJ 00544

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PHASE 1 INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM

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

January, 1979

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SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

REPORT DOCUMENTATION PAGE

READ INSTRUCTIONS BEFORE COMPLETING FORM

1. REPORT NUMBER: NJ00544
2. GOVT ACCESSION NO.
3. RECIPIENT'S CATALOG NUMBER

4. TITLE (and Subtitle): Phase I Inspection Report
National Dam Safety Program
Oakford Lake Dam
Ocean County, N.J

5. TYPE OF REPORT & PERIOD COVERED: FINAL Report
6. PERFORMING ORG. REPORT NUMBER

7. AUTHOR(s): Robert Gershowitz, P.E.

8. CONTRACT OR GRANT NUMBER(s): DACW61-78-C-0124

9. PERFORMING ORGANIZATION NAME AND ADDRESS
Harris-ECI Associates
453 Amboy Ave.
Woodbridge, N.J. 07095

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

11. CONTROLLING OFFICE NAME AND ADDRESS
U.S. Army Engineer District, Philadelphia
Custom House, 2d & Chestnut Streets
Philadelphia, Pennsylvania 19106

12. REPORT DATE: January 1979
13. NUMBER OF PAGES: 72

14. MONITORING AGENCY NAME & ADDRESS (if different from Controlling Office)

15. SECURITY CLASS. (of this report): Unclassified
15a. DECLASSIFICATION/DOWNGRADING SCHEDULE

16. DISTRIBUTION STATEMENT (of this Report)

Approved for public release; distribution unlimited.

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

18. SUPPLEMENTARY NOTES

National Dam Safety Program.
Oakford Lake Dam (NJ ØØ544), Delaware River Basin, Crosswicks Creek, Ocean County, New Jersey.
Phase I Inspection Report.

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
Structural Analysis
Safety
Visual Inspection

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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PHILADELPHIA, PENNSYLVANIA 19106

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19 MAR 1979

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

Dear Governor Byrne:

Inclosed is the Phase I Inspection Report for Oakford Lake Dam in Ocean 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, Oakford Lake Dam, initially listed as a "high" hazard potential structure, but reduced to a "low" hazard potential structure as a result of this inspection, is judged to be in poor overall condition. The "low" hazard potential classification means that in the event of failure of the dam, no loss of life and only minimal economic loss is expected. However, to assure the continued functioning of the dam and its impoundment, as a recreational facility, the following actions are recommended:

a. Within one year sheeting should be driven around the perimeter of the right and left abutment dike and all voids within the embankments should be filled.

b. Within eighteen months repair the cracked buttress and stilling basin at the low level outlet sections.

c. Within eighteen months fill in the area downstream of the concrete weir with heavy riprap stone to prevent scouring.

d. Within two years the right low level outlet gate should be repaired.

e. Within six months replace and repair the railing on the dike and walkway so that it serves its intended purpose.

NAPEN-D
Honorable Brendan T. Byrne

f. The owner should upgrade the operating and maintenance procedures by issuing a manual and check list for recommended procedures. Inspection and maintenance visits should be logged. Records of pond levels should be kept during routine visits and during severe storms. An annual site inspection should be conducted using a visual inspection check list similar to the one used in 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 Edwin B. Forsythe of the Sixth District. Under the provisions of the Freedom of Information Act, the inspection report will be subject to release by this office, upon request, five days after the date of this letter.

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

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

Sincerely yours,

JAMES G. TON
Colonel, Corps of Engineers
District Engineer

1 Incl
As stated

Cy furn:
Mr. Dirk C. Hofman, P.E.
Department of Environmental Protection

OAKFORD LAKE DAM (NJ00544)

CORPS OF ENGINEERS ASSESSMENT OF GENERAL CONDITIONS

This dam was inspected on 7 September 1978 and 23 October 1978 by Harris - ECI Associates, under contract to the U.S. Army Engineer District, Philadelphia, in accordance with the National Dam Inspection Act, Public Law 92-367.

Oakford Lake Dam, initially listed as a "high" hazard potential structure, but reduced to a "low" hazard potential structure as a result of this inspection, is judged to be in poor overall condition. The "low" hazard potential classification means that in the event of failure of the dam, no loss of life and only minimal economic loss is expected. However, to assure the continued functioning of the dam and its impoundment, as a recreational facility, the following actions are recommended:

a. Within one year sheeting should be driven around the perimeter of the right and left abutment dike and all voids within the embankments should be filled.

b. Within eighteen months repair the cracked buttress and stilling basin at the low level outlet sections.

c. Within eighteen months fill in the area downstream of the concrete weir with heavy riprap stone to prevent scouring.

d. Within two years the right low level outlet gate should be repaired.

e. Within six months replace and repair the railing on the dike and walkway so that it serves its intended purpose.

f. The owner should upgrade the operating and maintenance procedures by issuing a manual and check list for recommended procedures. Inspection and maintenance visits should be logged. Records of pond levels should be kept during routine visits and during severe storms. An annual site inspection should be conducted using a visual inspection check list similar to the one used in this report.

APPROVED: James G. Ton

JAMES G. TON
Colonel, Corps of Engineers
District Engineer

DATE: 19 May 79

PHASE I REPORT
NATIONAL DAM SAFETY PROGRAM

Name of Dam:	Oakford Lake Dam, I.D. NJ 00544
State Located:	New Jersey
County Located:	Ocean
Stream:	Crosswicks Creek
Date of Inspection:	September 7 and October 23, 1978

Assessment of General Conditions

The overall physical condition of Oakford Dam is poor to fair, especially in the abutment area.

Event though the dam is not capable of passing a flood equal to the Spillway Design Flood, this situation is not considered to be critical due to the fact that the tailwater elevations are controlled by the downstream bridge and channel, and even at relatively low discharges the dam becomes submerged. Therefore, any hypothetical failure of the dam would not result in higher downstream water elevations or in any significant increased damage.

The concrete facing on the right abutment is severely cracked with sections missing while the entire facing on the left abutment is missing. The left buttress of the low level outlet section has a three-inch wide crack extending through the stilling basin. This has been apparently caused by undercutting of the toe.

Even though the dam is in great need of repair, it withstood the August 31, 1978 flood, when the water was approximately 13 feet above the spillway crest, with the only noticeable damage being a slight widening of a crack in the buttress described above.

Recommended remedial actions to be carried out by the owner within 24 months are listed below in their order of urgency:

1. Replace and repair the railing on the dike and walkway so that it serves its intended purpose within 6 months.

2. Sheeting should be driven around the perimeter of the right abutment dike and the left abutment and all voids within the embankments filled within 12 months.

3. Repair the cracked buttress and stilling basin at the low level outlet sections within 18 months.

4. Fill in the area downstream of the concrete weir with heavy riprap stone to prevent scouring within 18 months.

5. The right low level outlet gate should be repaired within 24 months.

Robert Gershowitz, P.E.

Photo taken September 7, 1978

OAKFORD LAKE DAM

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ASSESSMENT OF GENERAL CONDITION OF DAM WITH RESPECT TO SAFETY AND RECOMMENDED ACTION WITH DEGREE OF URGENCY

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PHASE I REPORT
NATIONAL DAM SAFETY PROGRAM

OAKFORD LAKE DAM, I.D. NJ 00544

S E C T I O N 1

1. PROJECT INFORMATION

1.1 General

a. Authority

The Dam Inspection Act, Public Law 92-367 of August 1972 authorizes the Secretary of the Army, through the Corps of Engineers to initiate a national program of dam inspection. Inspection of Oakford Lake Dam was carried out under Contract DACW61-77-0100 to the Department of the Army, Philadelphia District, Corps of Engineers by the engineering firm of Harris-ECI Associates of Woodbridge, New Jersey.

b. Purpose of Inspection

The purpose of the inspection and evaluation is to identify conditions which threaten the public safety and thus permit the correction of the conditions in a timely manner by the owners. The National Inventory of Dams will be updated by the data acquired during the inspection.

1.2 Description of Project

a. Description of Dam and Appurtenances

Oakford Lake Dam consists of three distinct sections, a fixed concrete weir spillway, a concrete low level outlet structure containing three steel slide gates that also serve as spillway weirs when closed, and a paved masonry dike section at the right abutment. The concrete spillway

is 56-foot long and 7.5-foot high and is located between the left abutment and the outlet gate structure. The spillway has a center concrete buttress on the downstream side and a 3-foot wide 4-inch thick concrete walkway 1.5 feet above the crest. The walkway rests on 7-inch wide concrete piers spaced 10 feet apart.

The outlet structure is 24-foot long and has a concrete walkway at the same elevation as that over the spillway. This section is reinforced by three concrete buttresses on the downstream side. Three steel slide gates 3 ft.-6 in. wide by 5 ft.-6 in. high are mounted on the upstream face, and are operated by hand cranked controls mounted on top of a 2 ft.-9 in. concrete parapet wall at the upstream face.

The paved dike section is approximately 85-foot long and 20 to 25-foot wide, and extends from the low level outlet structure to the right shoreline. The embankment appears to be retained by timber piling with a 6-inch concrete facing. The top of the dike has a 3 to 4 in. asphalt topping.

The low level outlet structure appears to have a concrete foundation extending from approximately 2 feet on the upstream side to 2 feet beyond the buttresses. The spillway has a concrete base extending 2 feet beyond the downstream face; the extent on the upstream side could not be ascertained due to a heavy layer of silt in the reservoir. Information as to the depth of the concrete base and whether or not it is supported on foundation piles is not available.

b. Location

Oakford Lake Dam is located on Crosswicks Creek in Plumsted Township, Ocean County, New Jersey. The dam is approximately 300 ft. upstream of Main Street in the portion of the Township known as New Egypt.

c. Size Classification

According to the "Recommended Guidelines for Safety Inspection" by the U.S. Department of the Army, Office of the Chief of Engineers, the dam is classified in the dam size category as being "Small", since its storage area of 99 acre-feet is less than 1,000 acre-feet. The dam is also classified as small because its height of 7.5 feet is less than 40 feet. The overall size classification of Oakford Lake Dam is small.

d. Hazard Classification

The dam has been classified as having High Hazard Potential. Based on visual inspection, the normal water surface elevation upstream of the dam is only 3 feet higher than the water levels downstream and the hydraulic/hydrologic computations indicate that the dam will become submerged at relatively low stream discharges. The tailwater is controlled perhaps by the waterway opening of the Main Street (Route 528) bridge and the conveyance capacity of the stream channel, downstream of it. Failure of the dam at any stream discharge will not appreciably change the prevailing water surface elevations downstream, and the dam cannot be considered a hazard to life and property by virtue of its hypothetical failure. Accordingly, the dam is classified as having a 'Low' Hazard Potential.

e. Ownership

Oakford Lake Dam is owned by the Township of Plumsted, New Jersey.

f. Purpose of Dam

The purpose of the dam is to impound water for recreational purposes. The normal uses are small boating and fishing. Swimming is presently discouraged because of unsuitable bacterial counts in the water.

g. Design on Construction History

It was reported orally by Mr. John DeMeo, Committeeman for the Township that the dam was built around 1914 by a grist mill. No other documentation is available to verify this statement.

h. Normal Operational Procedures

The discharge from the lake is normally unregulated, and is allowed to naturally balance discharge with inflow to the lake. During the heavy rains and eventual flood on August 31, 1978, the slide gates were opened in an attempt to draw down the lake level. The normal operating condition is to have the slide gates in a nominally closed position, allowing water to spill over the top of the gates, in a weir fashion. The top of the slide gates in the closed position is approximately Elev. 63.03, while the fixed spillway crest is at Elev. 63.15.

1.3 Pertinent Data

a. Drainage Area	35.7 square miles
b. Discharge at Dam Site	
Maximum known flood at dam site:	Estimated at 4900 cfs on Aug. 31, 1978, dam abutements were overtopped
Warm water outlet at pool elevations:	270 cfs at pool elevation 63.15 (low level outlet)
Diversion tunnel low pool outlet at pool elevation:	NA
Diversion tunnel outlet at pool elevation:	NA
Gated spillway capacity at pool elevation:	NA
Gated spillway capacity at maximum pool elevation:	NA
Ungated spillway capacity at maximum pool elevation:	530 cfs at elevation 65.0
Total spillway capacity at maximum pool elevation:	530 cfs at elevation 65.0
c. Elevation (Feet above MSL)	
Top of dam:	Elevation 65.0
Maximum pool design surcharge:	NA
Full flood control pool:	NA
Recreation pool:	63.03 (Top of Closed Slide Gates)
Spillway crest:	63.15
Upstream portal invert diversion tunnel:	NA
Downstream at centerline diversion tunnel:	NA
Streambed at centerline of dam:	57.5
Maximum tailwater:	Varies with discharge

d. Reservoir

Length of maximum pool:	8,000 feet (estimated)
Length of recreation pool:	8,000 feet (estimated)
Length of flood control pool:	NA

e. Storage (acre-feet)

Recreation pool:	99 AF
Flood control pool:	NA
Design surcharge:	250 AF at elevation 65
Top of dam:	250 AF at elevation 65

f. Reservoir Surface (acres)

Top of dam:	Area = 90 acres at elev. 65
Maximum pool:	Area = 34 acres at elev. 63.15
Flood control pool:	NA
Recreation pool:	Area = 33 acres at elev. 63.03
Spillway crest:	Area = 34 acres at elev. 63.15

g. Dam

Type:	Concrete with earth and rubble filled masonry faced right abutment dike
Length:	165 feet
Height:	7.5 feet maximum
Top width:	3 feet (spillway section)
Side Slopes - Upstream:	NA
- Downstream:	NA
Zoning:	None
Impervious core:	None
Cutoff:	None
Grout curtain:	None

h. Diversion and Regulating Tunnel

Type:	NA
Length:	NA
Closure:	NA
Access:	NA
Regulating facilities:	NA

i. Spillway

Type:	Concrete overflow
Length of weir:	56 feet
Crest elevation:	63.15
Gates:	None
U.S. Channel:	None
D/S Channel:	Stilling basin

j. Regulating Outlets

Low level outlet:	Three 3.5 ft.x 5.5 ft. outlet gates
Controls:	Steel slide gates on upstream face, manually operated rack and pinion gears with safety ratchet and pawl
Emergency gate:	None
Outlet:	Into stilling basin

SECTION 2

2. ENGINEERING DATA

2.1 Design

Drawings or computations pertaining to the original construction, modification or repair of the dam are not available from the New Jersey Department of Environmental Protection (NJ-DEP) or the owner. Data from soil borings, soil tests or other geotechnical data is also unavailable. However, sketches of the dam obtained during the field inspection are included in the appendices.

2.2 Construction

No records have been found as to the construction history of the dam.

2.3 Operation

No records of operation of the lake are kept by the owner. The lake is allowed to operate naturally without regulation. On August 31, 1978, following a day of heavy rain, a flash flood hit New Egypt raising the height of Oakford Lake approximately 13 feet above the dam crest. According to officials, this is the worst flood on record.

2.4 Evaluation

a. Availability

Engineering data and documentation of the physical features of Oakford Lake Dam are non-existent.

b. Adequacy

The lack of in-depth engineering data did not allow for a definitive review. Therefore, the adequacy of this dam could not be assesed from the standpoint of reviewing design and construction data, but is based on visual inspection, past performance history and sound engineering judgment.

c. Validity

Not applicable, as no design or construction records are available.

SECTION 3

3. VISUAL INSPECTION

3.1 Findings

a. General

The physical condition of Oakford Lake Dam is poor to fair. The low masonry structure has been able to withstand all lake discharges, including the flood on August 31, 1978, but has suffered extensive damage to the concrete facing of the abutments over the years.

b. Dam

Oakford Lake Dam is approximately one half spillway structure and one half dike. The spillway consisting of a 56-foot long fixed crest concrete spillway at the left abutment, and a 24-foot long low level outlet concrete structure that also serves as a spillway when the gates are closed. The upstream face of both the spillways are vertical while the downstream has a slight batter.

- Dike

The dike portion, approximately 85-foot long, extends from the low level outlet section to the right bank and has vertical concrete facing 6-inch thick over a timber structure. The top of the dike, which varies from 20 to 24 feet in width is paved with 3 to 4 inches of asphalt. The concrete facing on the dike section has cracked and deteriorated extensively on the upstream face and channel side by the low level outlets. On the channel side of the dike, the damage to the concrete facing is such that the space between the cracks, in some cases is 2 inches or greater, and the entire corner of the downstream face has washed away.

According to local residents, last year when divers inspected the dike, they reported extensive voids in the dike embankment. The asphalt on the top is in good condition, but the railing for the downstream and channel side is either missing or so loose that it is a hazard.

- Fixed Spillway

The concrete of the spillway is in serviceable condition with surface spalling on both upstream and downstream faces due to spillway water action. The spillway crest is acceptably smooth, level and in alignment. There is no observable distress at the monolith joints with no misalignment or offsets noted.

The concrete surface of the piers for the walkway has eroded at the interface joint between it and the crest. The concrete walkway has some longitudinal surface cracking. The railing on the downstream side has some sections missing and is loose.

The stilling basin was under water and could not be observed. The concrete facing on the spillway left abutment and upstream wingwall is severely deteriorated and missing. The facing on the upstream side of the abutment is completely missing, exposing the timber piling and fill material.

- Low Level Outlet

The concrete of the low level outlet section has spalling on both the upstream and downstream faces. The left buttress has a structural crack running down through the footing. At the time of inspection, the separation was approximately 3-inch wide, which according to local officials is wider than what it was before the flood of August 1978 hit the area. The crack appears to be caused by undercutting of the footing and the

resulting settlement of the buttress. Probing the streambed area left of buttress footing, revealed the bottom to be 3 to 4-foot deeper than that at the end of the stilling basin. The stilling basin was under water and could not be observed but probing the area seems to indicate the basin is cracked as shown on the reconnaissance sketches (Figure 2).

Oakford Lake Dam contains three low level outlet gates mounted on the upstream face of the concrete section controlling openings that are 3.5-foot wide and 5.5-foot high. The gates are steel plates with steel operating mechanisms. The lifting mechanism for each slide gate is a rack and pinion gear with a safety ratchet and pawl and is lever operated. During the initial inspection, the left and center slide gates were fully opened and right slide gate was partially opened. Since then, the gates have been closed, but the right slide gate which was damaged during the August 1978 flood cannot be closed completely. and remains open approximately 3 inches. There is a structural crack in the gear base plate of the left gate.

- Foundation

Boring information as to the foundation material of the dam is unavailable, but data from the Geologic Map of New Jersey and the New Jersey "Engineering Soil Survey Report No. 8, Ocean County" indicate the material is Vincentown Sand.

c. Appurtenant Structures

There are no appurtenant structures on this dam.

d. Reservoir

The reservoir rim is flat to very gently sloping with many properties adjoining the lake shore in the immediate area of the dam. The rim

area up to the shore line is covered with substantial tree growth, which has been locally removed in connection with the homes. No readily apparent signs of instability were noted in the rim areas adjoining the lake. Heavy siltation of the lake bottom is evident at the upstream face of the dam.

e. Downstream Channel

The immediate downstream channel is well defined, and tree lined along the right bank. The banks are 6 to 9-foot high and are moderately sloped. Main Street crosses the downstream channel by way of a deep girder bridge structure approximately 300 feet from the dam. The clearance from the water surface to the bottom of girders is only 5 feet, while the distance from the water to the top of the parapet is 12 feet. There are only four structures on or near the banks between the dam and the bridge, three on the right bank and one at the left bridge abutment, all at about Main Street grade level.

3.2 Evaluation

Visual inspection shows that Oakford Lake Dam is in a deteriorated condition, particularly in the following areas:

1. The concrete facing of the right dike section has extensive structural cracking and missing portions of concrete. Also, the embankment within the dike is reported to be washing away creating voids in the dike structure.

2. The concrete facing on the upstream face of the left abutment is either so deteriorated or missing in sections that the dike fill material is exposed.

3. The stilling basin for the outlet gates section is undercut at the toe of the left buttress, causing the buttress to settle and crack.

4. The right slide outlet gate has been damaged in the flood of August 1978 making it impossible to close all the way.

The visual inspection check list is included in Appendix A.

Photographs taken during the site inspection are included in Appendix B.

SECTION 4

4. OPERATIONAL PROCEDURES

4.1 Procedures

There are no formal operating procedures established. Oakford Lake Dam is operated as a simple overflow structure with all discharges passing over the top of the outlet gates and over the spillway crest. There is normally no attempt to regulate flow by means of the low level outlet gates.

4.2 Maintenance of the Dam

There is no dam maintenance program. The extensive repairs needed to rehabilitate the dam have not been done due to lack of Township funds.

4.3 Maintenance of Operating Facilities

The low level outlet gates are in operational condition, except as noted above. They were opened during the flood but there is no normal maintenance program.

4.4 Description of any Warning System in Effect

No warning system has been established to alert downstream residents of possible dam misfunction, overtopping or high stream stages.

4.5 Evaluation

The maintenance of this dam has fallen below acceptable levels. Maintenance and operational procedures should be improved by the owners.

SECTION 5

5. HYDRAULIC / HYDROLOGY

5.1 Evaluation of Features

a. Design Data

A crest-stage partial record station at the State Route 528 bridge in New Egypt is maintained by the U.S. Geological Survey. This gage is 300 feet downstream from the Oakford Lake Dam. The drainage area at the gaging site is 37.5 square miles and at the dam itself it is 35.7 square miles.

McGuire Air Force Base and Fort Dix Military Reservation occupy most of the drainage area west and south of the dam. Most of the development in the basin is included in the Air Force installations and generally on the west side of Browns Mills-Cookstown Road. The south eastern portion of the basin consists of bogs.

The evaluation of the hydraulic and hydrologic features of the Oakford Lake Dam was based on criteria set forth in the Corps' Guidelines, Section 4.3 and additional guidance provided by the Philadelphia District Corps of Engineers.

Based on the classification of the dam's Hazard Potential as 'Low' and 'Small' dam size, the appropriate Spillway Design Flood would fall in the range of a 50- to 100-year discharge. The 100-year discharge for Crosswicks Creek at New Egypt has been computed as 1,750 cfs, following methods as outlined in Special Report #38. These computations are included in Appendix D.

As mentioned before, the U.S. Geological Survey maintains a crest-stage partial record station 300 feet downstream of the dam. Stage discharge records are available for ten years and have been used to plot a tail-water rating curve for the dam. This curve is shwon on Sheet 9 of Appendix D. The spillway rating curve and reservoir capacity curve are shown on Sheets 9 and 2 of Appendix D. From this curve, it is seen that at discharges as low as 670 cfs, the tailwater is at Elevation 63 which is almost the crest elevation of the spillway.

Except for very low heads and discharges, the structure acts like a submerged weir and the dam has little or no effect on water surface elevations upstream or downstream. These elevations are controlled, perhaps, by the Route 528 bridge section or by the downstream channel itself, or a combination of both.

b. Experience Data

The most recent storm of record occurred in August 1978 and the resulting flood and water surface elevation drew the attention of the news media. From inquiries made of local inhabitants, it was learned that the water level crested at the level of the guard rail on the Route 528 bridge. The elevation of the guard rail is about 76 MSL. The discharge for this flood has been tentatively estimated at 4,900 cfs by the U.S. Geological Survey, but is subject to revision.

The next highest flood of record occurred in August 1971, when the water level rose to Elevation 69.76. This water level is just above the roadway surface of Route 528 and caused cellar flooding of some buildings fronting on Route 528 near the creek. For both these major flooding events, the presence of the dam did not add to the flooding damage experienced. The discharge for this flood has been estimated as 1,940 cfs by the U.S. Geological Survey and is considered to be close to the 100-year event for this site by the U.S. Geological Survey.

c. Visual Observation

At the spillway crest elevation, the surface area of the lake is 34 acres and being shallow has no effective storage to regulate inflow. Over the years, deposition of silt has occurred, and has reduced whatever storage was provided.

d. Overtopping Potential

The dam is submerged by discharges as low as 670 cfs and overtopping seems to be a common occurrence. Inasmuch as the tailwater elevations are independent of the dam, complete failure of the structure would not contribute to any increase in water surface elevations downstream or result in more damage and destruction.

e. Reservoir Drawdown

The reservoir drawdown below the spillway crest elevation 63.15 MSL is accomplished by permitting discharge through the three 3 ft.-6 in. x 5 ft.-6 in. outlet gates whose invert elevations are at 57.5 MSL. If no flow into the reservoir is assumed, then the reservoir can be drawn down to the minimum-flow tailwater elevation of 59.8 MSL in approximately eight and a quarter hours. If a reservoir inflow of 2 cfs per square mile is assumed for an inflow of 72 cfs, then the reservoir can only be drawn down to the corresponding tailwater elevation of 60.4 MSL in approximately eight hours.

SECTION 6

6. STRUCTURAL STABILITY

6.1 Evaluation of Structural Stability

a. Visual Observations

Visual observations have been recorded in Section 3.1.b., and the deficiencies of the facility are listed in that section. Visual signs casting doubts on the stability and strength on the structure are noted as follows:

1. Severely cracked and deteriorated condition of the concrete facing of the right dike section.

2. The suspected erosion of and cavities in the dike embankment material.

3. The missing concrete facing of the left abutment exposing the fill material to the erosive action of the water.

4. The undercutting of the outlet section stilling basin at the toe of the left buttress, resulting in the settlement, cracking and separation of the buttress.

On the positive side, in spite of being neglected, the structure has survived 64 years of service including the flood on August 31, 1978 when the lake waters topped the spillway crest by approximately 13 feet. However, increased crack width in the buttress has been observed.

Another positive factor is that the differential head across the structure drastically decreases as the discharge increases as indicated in the hydraulic computations in Appendix D.

b. Design and Construction Data

No construction plans or cross-sections exist for the dam and no foundation data is available. No assessment of structural stability is possible without a set of coherent as-built drawings.

On the basis of visual examination of the structure and as indicated in Section 6.1, the stability of the structure is questionable. However, a more definitive analysis should be made upon the acquisition of the required plans and foundation data.

c. Operating Records

No operating records are available relating to the stability of the dam. As mentioned above, the dam has withstood all overtopping including the flood of August 31, 1978. Concern has been expressed as to its safety by a Township Committeeman, according to a letter existing in the files of the New Jersey Department of Environmental Protection.

d. Post Construction Changes

Apparently, there have been no post construction changes affecting the stability of the dam.

e. Seismic Stability

In general, projects located in Seismic Zones 0, 1 and 2 may be assumed to present no hazard from earthquake, provided the static stability conditions are satisfactory and conventional safety margins exist.

SECTION 7

7. ASSESSMENT / REMEDIAL MEASURES

7.1 Dam Assessment

a. Safety

Oakford Lake Dam has been inspected visually and a review has been made of the available engineering data. This assessment is subject to the limitations inherent in the visual inspection procedures stipulated by the Corps of Engineers' Phase I Report.

Even though the dam's spillway capacity is inadequate and overtopping the dam is a frequent occurrence, the 'Low' Hazard Potential classification is justified since the dam becomes submerged at a relatively low discharge and the tailwater elevations are independent of the dam. A hypothetical failure of the dam would not increase the water surface elevation downstream to levels considered dangerous to life or property.

b. Adequacy of Information

No data on the type of foundation or engineering properties of the foundation material exists for assessment of the stability of the dam.

c. Urgency

Even though Oakford Lake Dam has been classified as having a 'Low' Hazard Potential, it should be maintained in a better condition. The remedial actions to be taken, listed below in their order of urgency, should be completed within 24 months.

d. Necessity for Additional Investigations

Based on the information presented above, the need for further investigations in this phase of the program is not indicated. Recommended actions to be carried out by the owner are listed below.

7.2 Remedial Measures

a. Alternatives

The alternatives for Oakford Lake Dam are:

1. No action.

2. Restore the dam to a fully maintained condition by implementing the following remedial program:

   a) Replace and repair the railing on the dike and walkway so that it serves its intended purpose.

   b) Sheeting should be driven around the perimeter of the right abutment dike and the left abutment and all voids within the embankments filled.

   c) Repair the cracked buttress and stilling basin at the low level outlet section.

   d) Fill in the area downstream of the concrete weir with heavy riprap stone to prevent scouring.

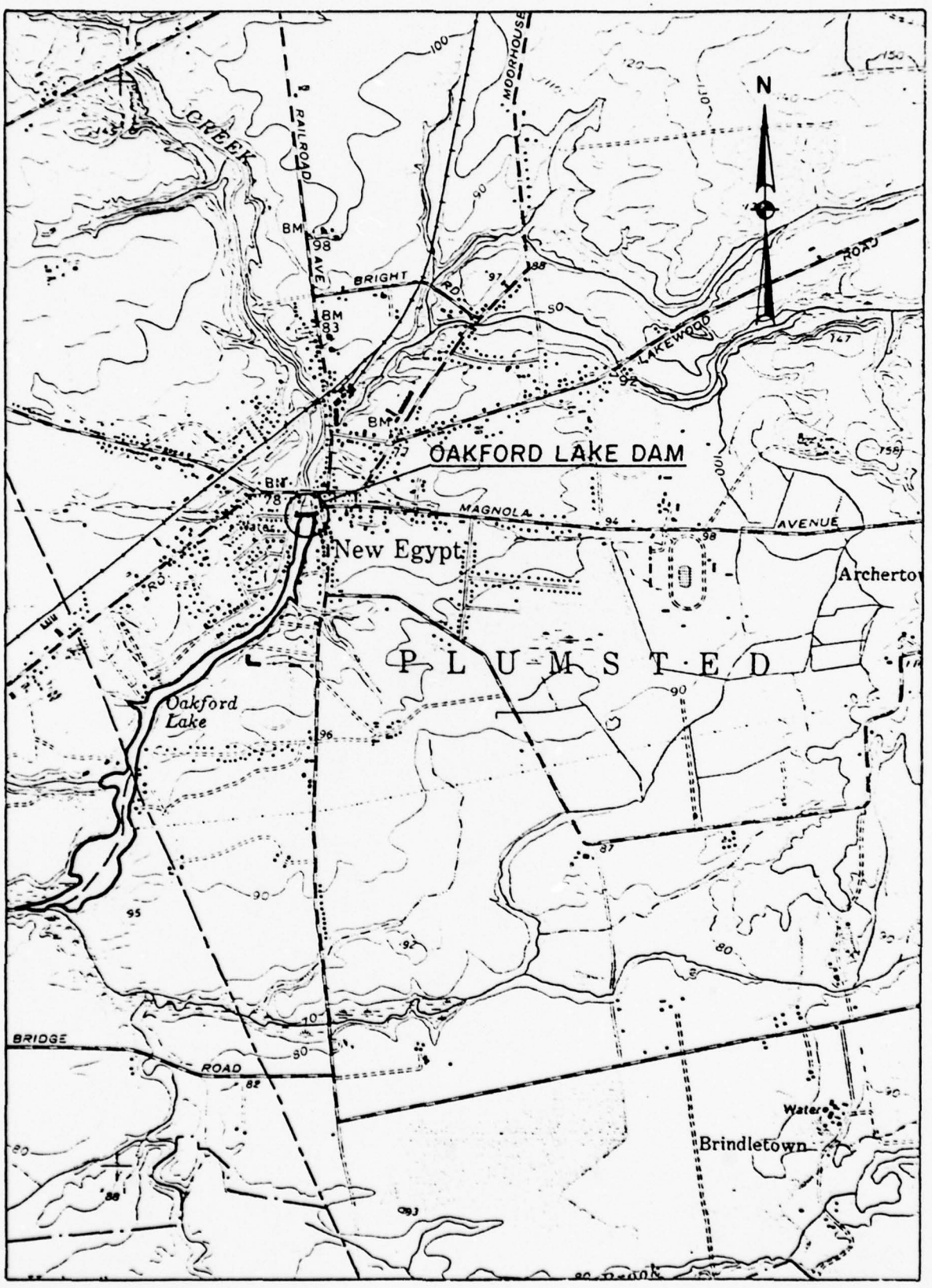
   e) The right low level outlet gate should be repaired.

3. Demolish the dam.

b. O & M Procedures

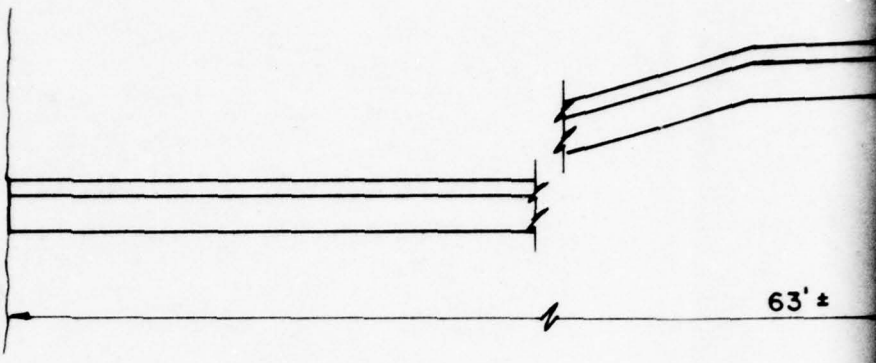
The owners should upgrade the operating and maintenance procedures by issuing a manual and check list for recommended procedures. Inspection and maintenance visits should be logged. Records of pond levels should be kept during routine visits and during severe storms. An annual site inspection should be conducted using a visual inspection check list similar to the one used in this report.

PLATES

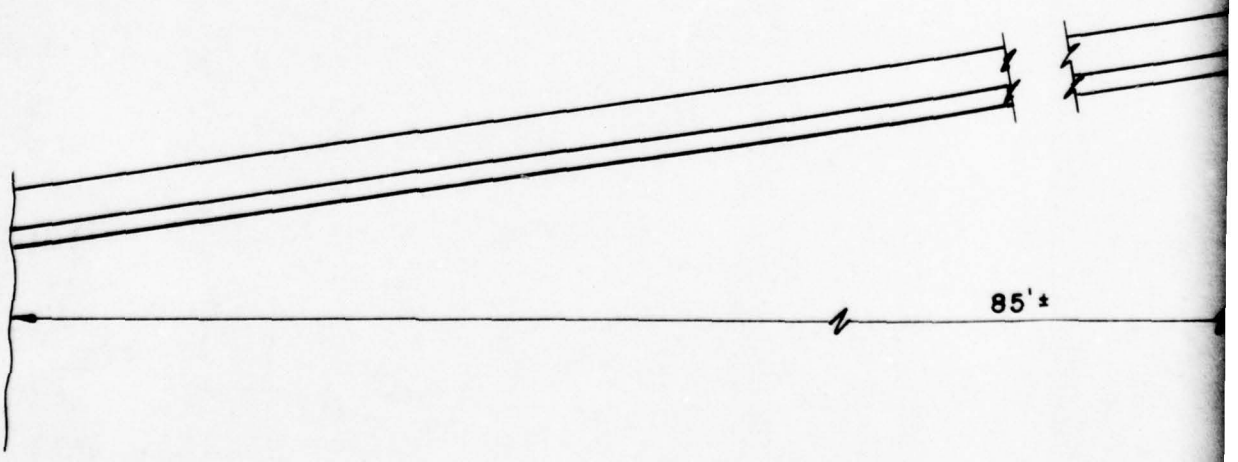


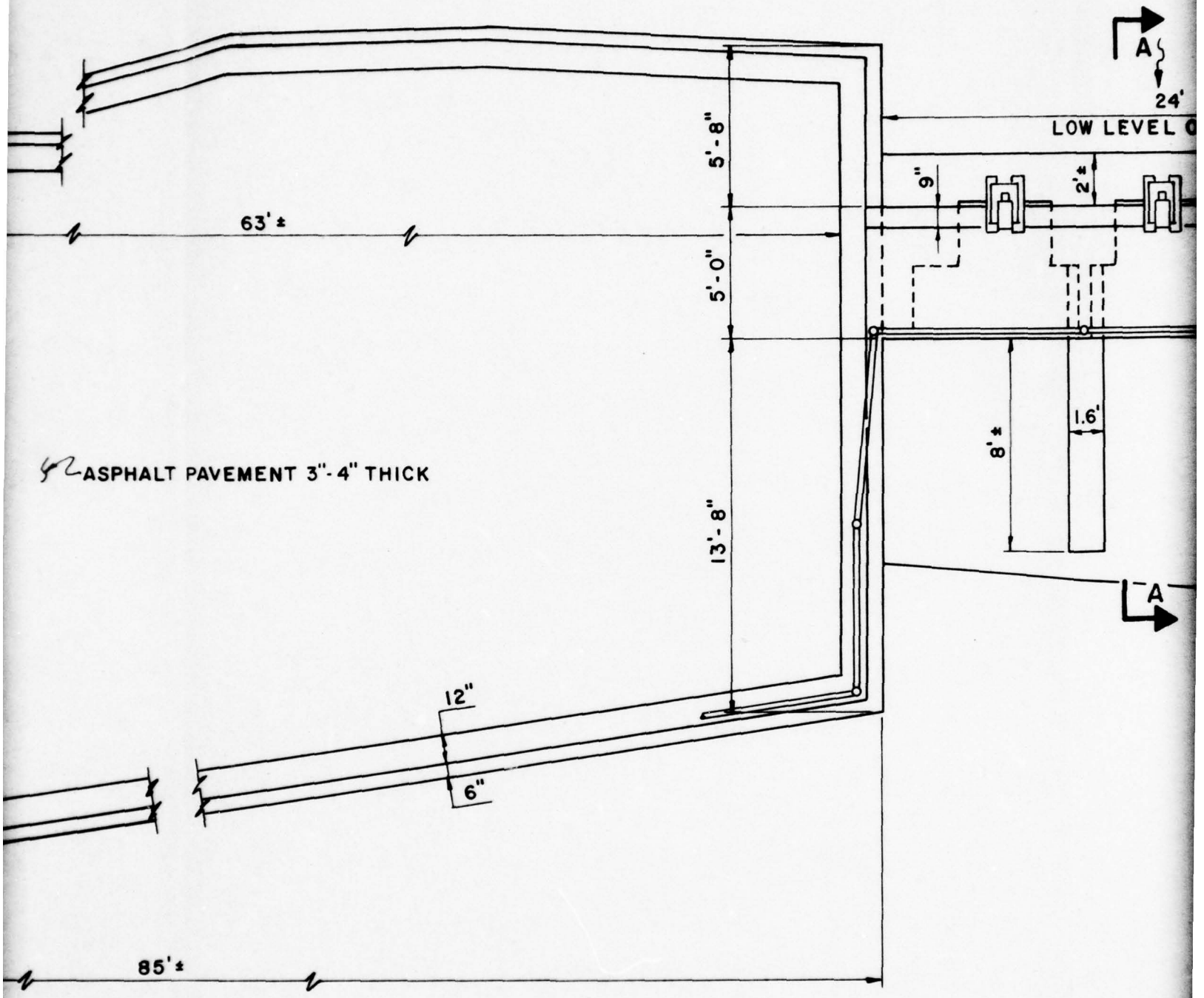
VICINITY MAP

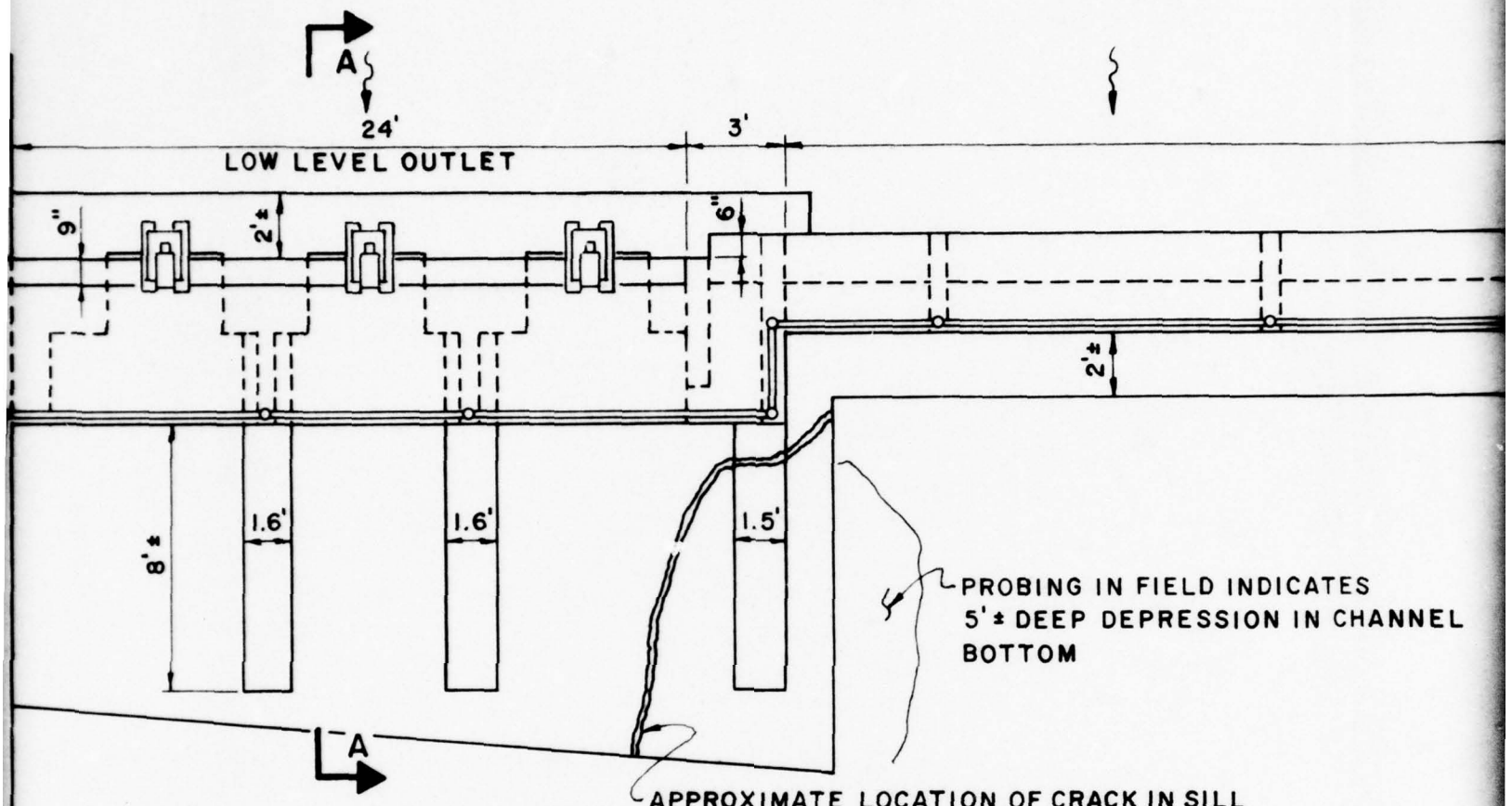
DWG. NO. 1



ASPHALT PAVEMENT 3

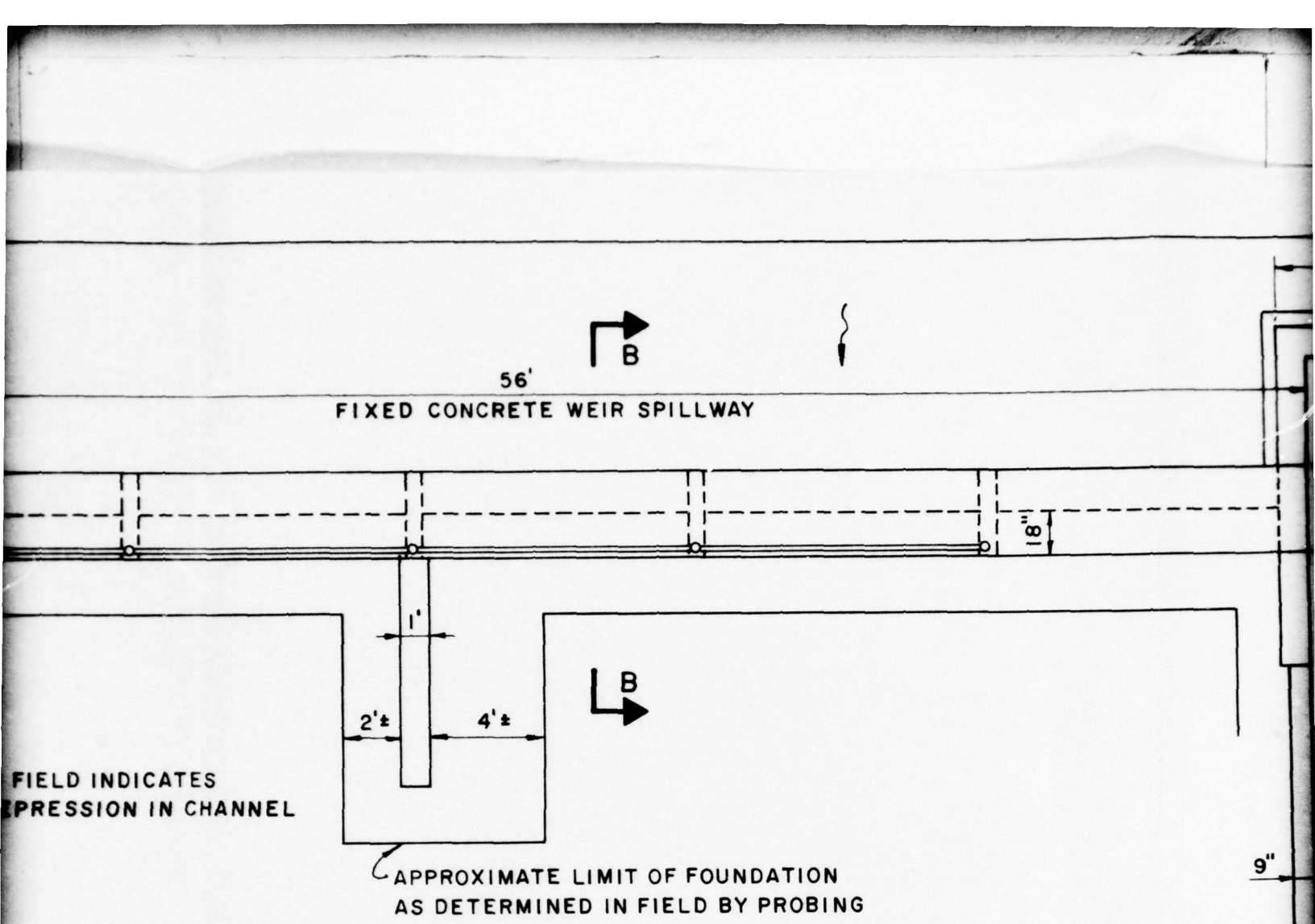



A
24'
LOW LEVEL
5'-8"
9"
2'±
63'±
5'-0"
1.6'
8'±
ASPHALT PAVEMENT 3"-4" THICK
13'-8"
A
12"
6"
85'±



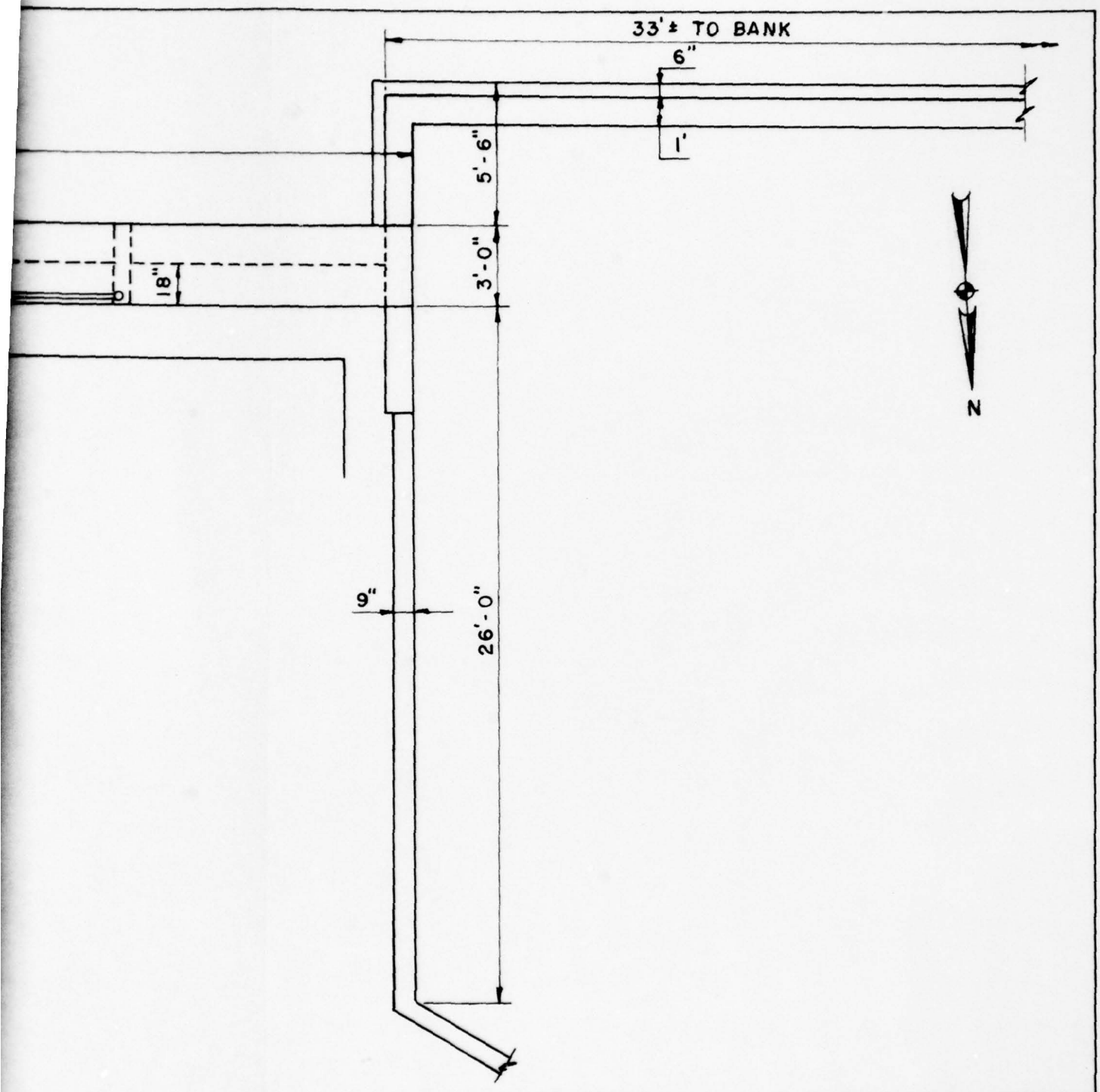
PLAN

SCALE: 1" = 5'

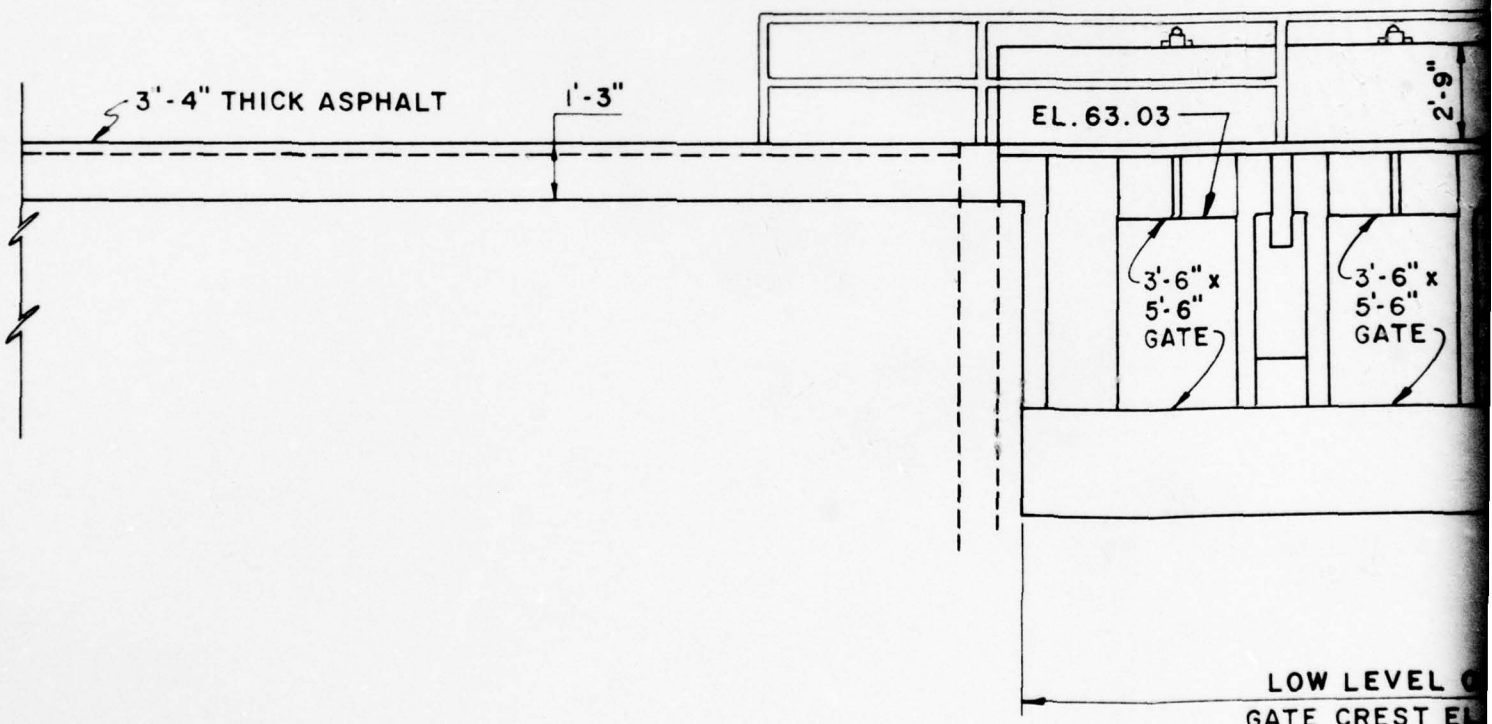


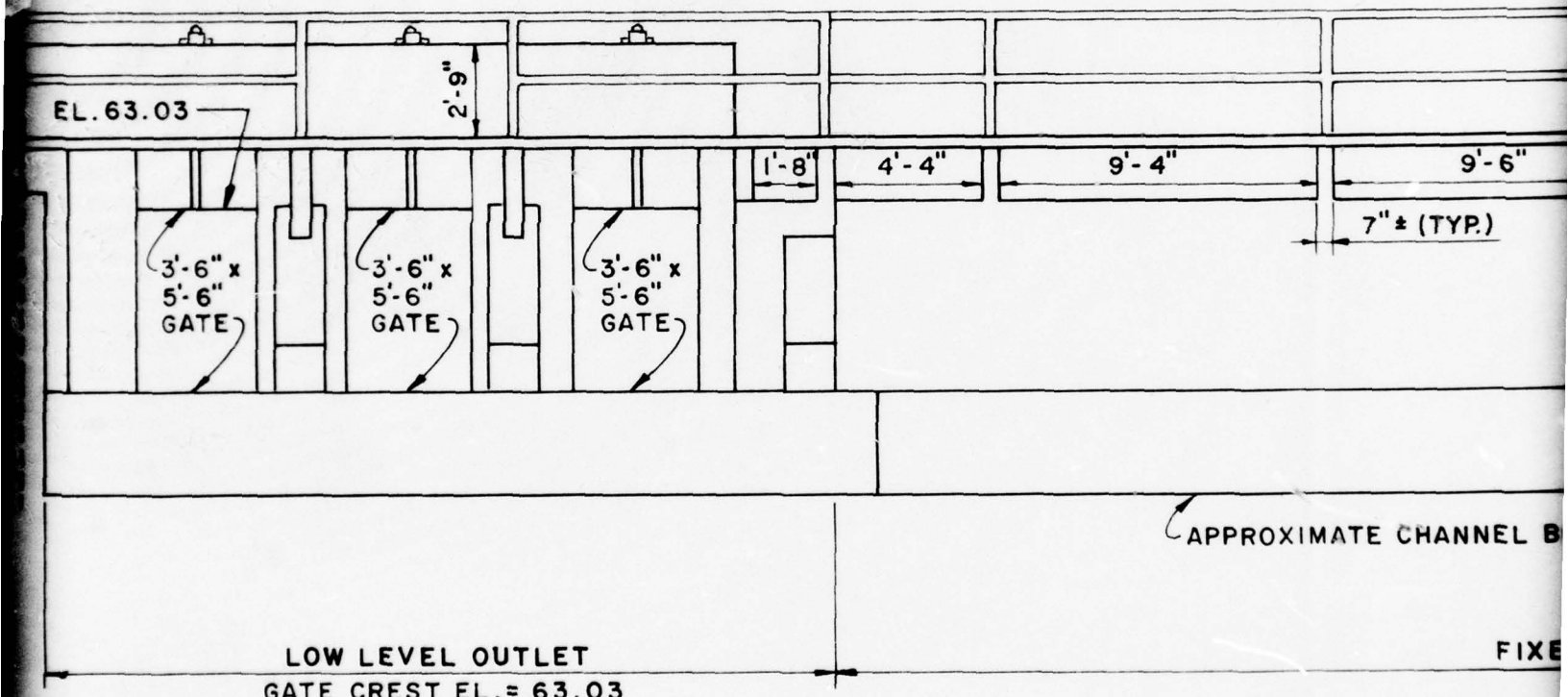
FIELD INDICATES
EPRESSION IN CHANNEL

K IN SILL
BING



HARRIS-ECI ASSOCIATES	
OAKFORD LAKE DAM	DWG. NO. 2
FIELD INSPECTION SKETCH	

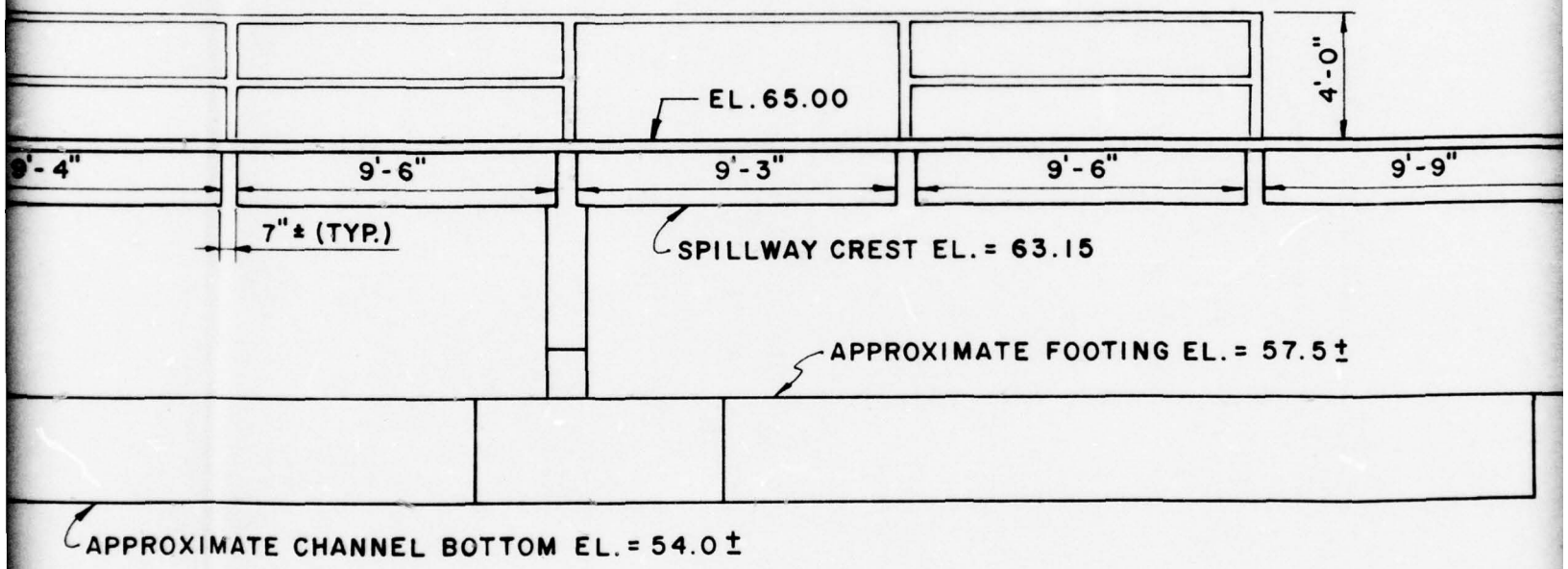

3'-4" THICK ASPHALT
1'-3"
EL. 63.03
2'-9"
3'-6" x
5'-6"
GATE
3'-6" x
5'-6"
GATE
LOW LEVEL
GATE CREST EL



ELEVATION - DOWNSTREAM FACE

SCALE: 1" = 5'

NOTE: ELEV
FRO

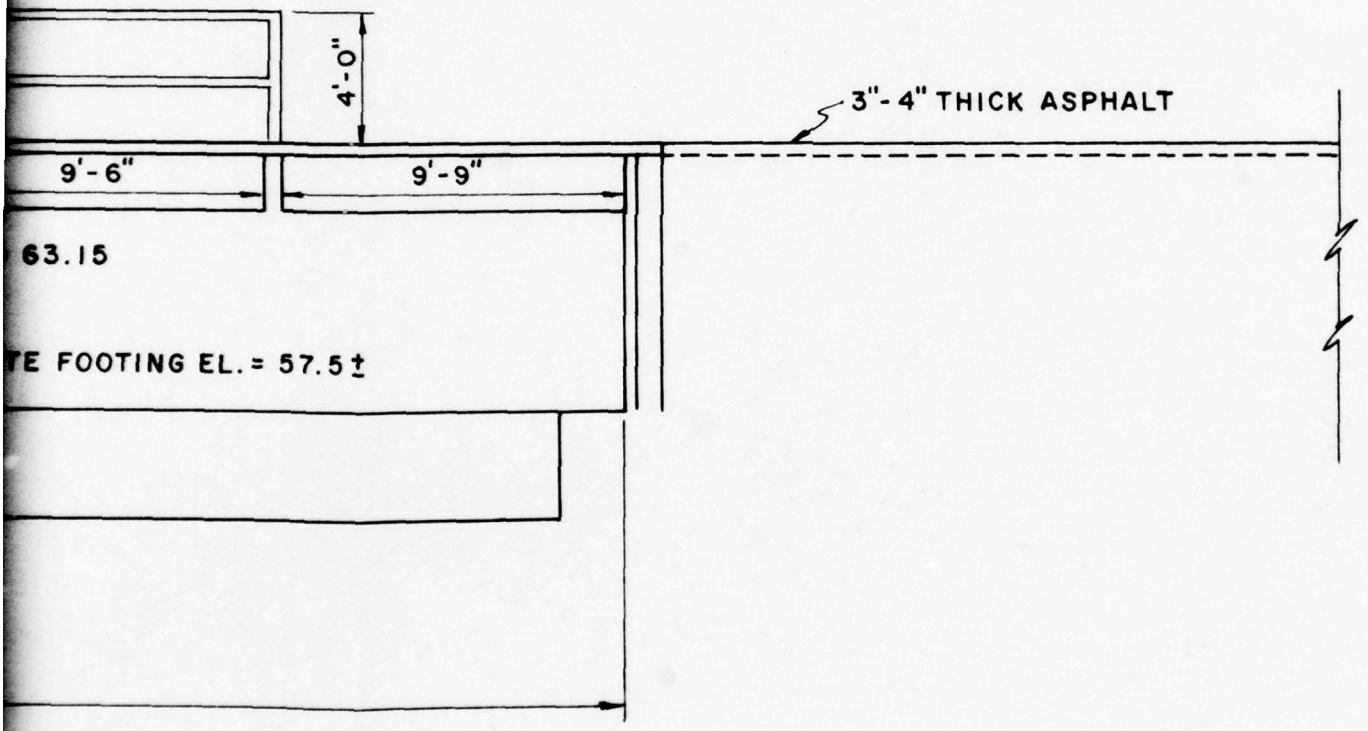


FIXED CONCRETE WEIR SPILLWAY

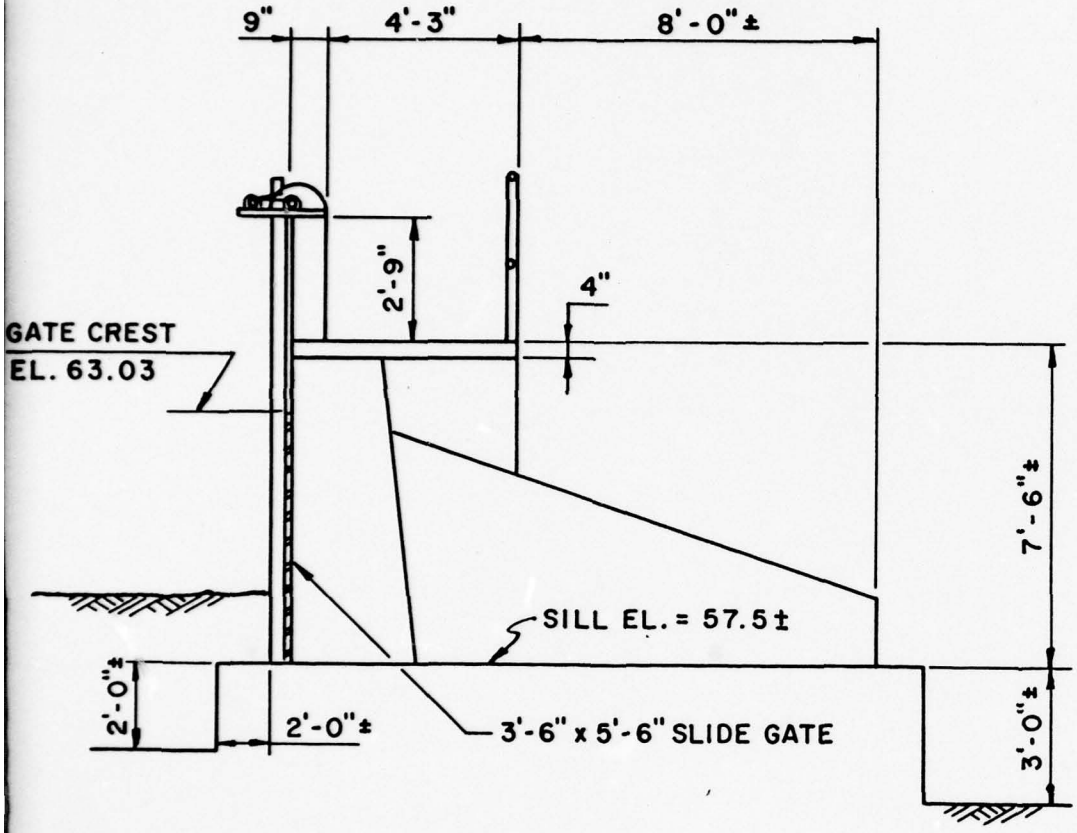
VNSTREAM FACE

1" = 5'

NOTE: ELEVATION OF CONCRETE WALKWAY DETERMINED FROM U.S.G.S. MAP.

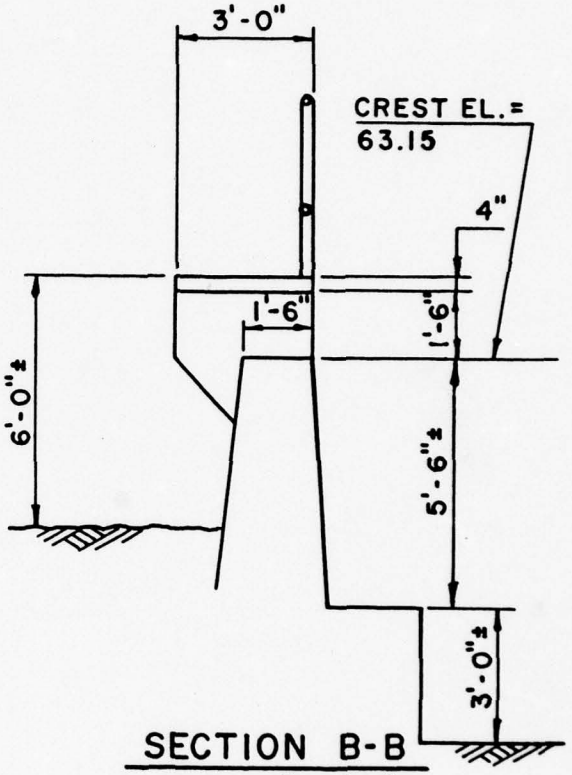


HARRIS-ECI ASSOCIATES	
OAKFORD LAKE DAM	DWG. NO. 3
FIELD INSPECTION SKETCH	



SECTION A-A

SCALE: 1" = 4'-0"



SECTION B-B

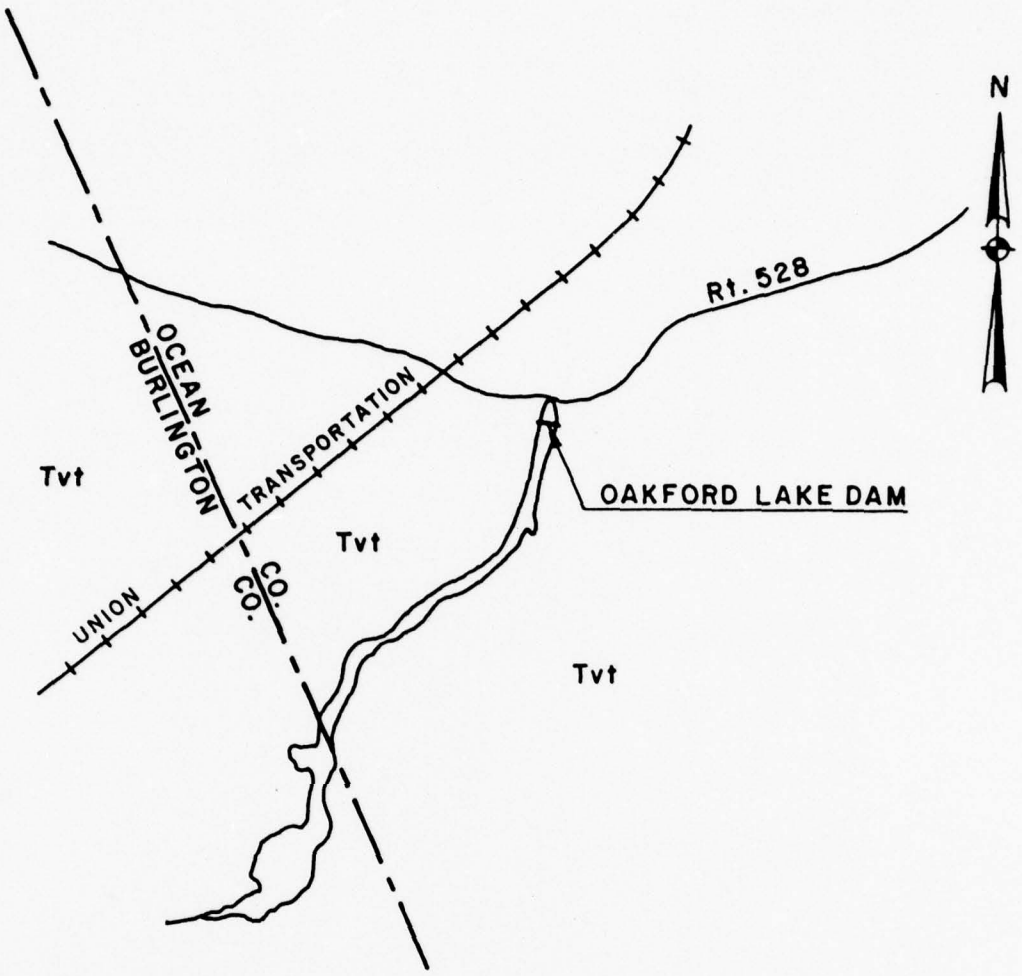
SCALE: 1" = 4'-0"

HARRIS-ECI ASSOCIATES

OAKFORD LAKE DAM

FIELD INSPECTION SKETCH

DWG. NO. 4



LEGEND:

TERTIARY

Tvt Vincentown Sand

OAKFORD LAKE DAM

GEOLOGIC MAP

2000 0 2000 4000

SCALE IN FEET

DWG. NO. 5

APPENDIX A

CHECK LIST - VISUAL OBSERVATIONS

CHECK LIST - ENGINEERING, CONSTRUCTION MAINTENANCE DATA

CHECK LIST
VISUAL INSPECTION
PHASE 1

Name Dam Oakford Lake Dam County Ocean State New Jersey Coordinators NJ-DEP

Date(s) Inspection September 7, 1978
October 23, 1978 Weather Sunny Temperature 85-90
65-70 degrees

Pool Elevation at Time of Inspection 60.5 M.S.L.on 9/7/78
63.6 M.S.L.on 10/23/78 Tailwater at Time of Inspection 60.0 M.S.L.on both dates

Inspection Personnel:

Robert Gershowitz, September 7, 1978

Seymour Roth, October 23, 1978

Joseph Sirianni, September 7 & October 23, 1978

Henry King, September 7 & October 23, 1978

Siddharta Bagchi, September 7, 1978

William Zink, Philadephia District, Corps of Engineers, September 7, 1978

John Garofalo, NJ-DEP, September 7, 1978

Recorder: Joseph E. Sirianni

Representing the Township of Plumsted: Mr. John DeMeo, Committeeman
September 7, 1978

CONCRETE/MASONRY DAMS (1)

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS AND RECOMMENDATIONS
SEEPAGE OR LEAKAGE	None observed.	
STRUCTURE TO ABUTMENT/EMBANKMENT JUNCTIONS	Joint of outlet structure to right abutment separated on downstream face. Upstream joint is tight. Concrete facing of left abutment is missing at both upstream and downstream side of spillway juncture exposing timber pilings.	Concrete facing of both abutments should be replaced and all joints sealed.
DRAINS	No drains have been installed in the dam.	
WATER PASSAGES	Water passages of low level outlets on either side of dam are not available for inspection because they are below head and tailwater level. Probing of left outlet stilling basin indicates a crack near left buttress.	Outlet section stilling basin should be dewatered to determine extent of crack.
FOUNDATIONS	No information available on type of foundation.	

(1) Pertains to concrete spillway section and low level outlet section.

CONCRETE/MASONRY DAMS

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SURFACE CRACKS CONCRETE SURFACES	Heavy spalling on both upstream and downstream faces of dam. Interfaces between walkway piers and spillway crest severely spalled. Some longitudinal cracking left portion of walkway.	Surface repair of eroded sections of piers recommended.
STRUCTURAL CRACKING	The left buttress of the outlet structure has cracked and separated approx. 3 in. from apparent undercutting and settlement. Concrete facing right abutment severely cracked with sections mission, left abutment concrete facing missing from upstream and channel side.	Cause of buttress cracking should be corrected and buttress repaired. Concrete facing on both abutment should be replaced.
VERTICAL & HORIZONTAL ALIGNMENT	The spillway alignment is good in both horizontal and vertical directions.	
MONOLITH JOINTS	No misalignments or offsets were observed.	
CONSTRUCTION JOINTS	No construction joint offsets could be observed. Water flow over the weir was smooth.	

EMBANKMENT (1)

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SURFACE CRACKS	The tops of the right abutment dike and the left abutment are paved with 2 to 4 inches of asphalt which is in good condition.	
UNUSUAL MOVEMENT OR CRACKING AT OR BEYOND THE TOE	None observed.	
SLOUGHING OR EROSION OF EMBANKMENT AND ABUTMENT SLOPES	None observed, but according to local residents, divers have found cavities within the right dike embankment. Cause is due to the severely deteriorated condition of the concrete facing.	The presence and extent of the cavities should be determined. They should be filled in and a new facing added.
VERTICAL & HORIZONTAL ALIGNMENT OF THE CREST	No misalignments were detected.	
RIPRAP FAILURES	Not applicable.	

(1) Includes right abutment dike section and left abutment.

EMBANKMENT

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
JUNCTION OF EMBANKMENT AND ABUTMENT, SPILLWAY AND DAM	Concrete facing on right dike abutment is cracked and separated. The facing on the upstream and channel side of the left abutment completely missing exposing the fill material and some timber piling.	The areas of both abutments should be dewatered, the existing facing removed and all voids filled. Then a new impervious facing added.
ANY NOTICEABLE SEEPAGE	None observed.	
STAFF GAGE AND RECORDER	Crest-stage partial record station at upstream side of bridge on State Route 528 in New Egypt and 300 feet downstream from Oakford Lake Dam.	
DRAINS	None.	

OUTLET WORKS

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS AND RECOMMENDATIONS
CRACKING & SPALLING OF CONCRETE SURFACES IN STILLING BASIN	The upstream and downstream faces of the structure are spalled. The left buttress has a 2-inch wide structural crack running through the stilling basin. Water passages of three 3 ft.-6 in. x 5 ft.-6 in. slide gates were not observable due to depth of headwater and tailwater.	Section of stilling basin by left buttress should be dewatered and cause of buttress cracking corrected. The buttress should be rebuilt.
INTAKE STRUCTURE	Intake structure consists of 3 slide gates mounted on upstream face of outlet structure. All gates are operable but right gate damaged in Aug. 1978 flood remains open 3 in. Operating mechanisms are on 3-foot high wall on walkway. Left gate mechanism has a cracked plate.	Damaged gate and mechanism should be repaired.
OUTLET STRUCTURE	None provided. Slide gates discharge directly into channel.	
OUTLET FACILITIES	None.	
EMERGENCY GATE	None.	

UNGATED SPILLWAY

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS AND RECOMMENDATIONS
CONCRETE WEIR	Concrete surface of weir is in serviceable condition, the top is relatively smooth and well aligned.	
APPROACH CHANNEL	None.	
DISCHARGE CHANNEL	Stilling basin downstream of spillway not visible under high tailwater.	Inspect stilling basin concrete and end sill for erosion and undercutting either in dry or by diver.
BRIDGE AND PIERS	The walkway has some longitudinal surface cracks by left abutment. Sections of railing on downstream side of walkway are missing. The upstream face of walkway and the interface joint of piers with the crest have heavy spalling.	

GATED SPILLWAY

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS AND RECOMMENDATIONS
CONCRETE SILL	Not applicable.	
APPROACH CHANNEL	Not applicable.	
DISCHARGE CHANNEL	Not applicable.	
BRIDGE AND PIERS	Not applicable.	
GATES & OPERATION EQUIPMENT	Not applicable.	

INSTRUMENTATION

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

RESERVOIR

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS AND RECOMMENTATIONS
SLOPES	Rim slopes are flat to very gently sloping.	
SEDIMENTATION	There is considerable sedimentation and organic muck on the bottom.	

DOWNSTREAM CHANNEL

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS AND RECOMMENDATIONS
CHANNEL (OBSTRUCTIONS, DEBRIS, ETC.)	The channel is well defined down to the Main Street Bridge (approximately 300 feet downstream), beyond the bridge the channel becomes less defined.	
SLOPES	The bank slopes are well defined as far as the bridge. The left bank has some light vegetation along it while the right bank is lined with large trees.	
APPROXIMATE NUMBER OF HOMES AND POPULATION	Between the dam and Main Street bridge, there are three buildings on the right bank and one by the bridge on the left bank, which will be subject to cellar flooding at SDF discharges.	

CHECK LIST
ENGINEERING DATA
DESIGN, CONSTRUCTION, OPERATION

ITEM	REMARKS
PLAN OF DAM	Not Available
REGIONAL VICINITY MAP	Available
CONSTRUCTION HISTORY	Not available
TYPICAL SECTIONS OF DAM	Not available
HYDROLOGIC/HYDRAULIC DATA	Not available
OUTLETS - PLAN	Not available
- DETAILS	
- CONSTRAINTS	
- DISCHARGE RATINGS	Crest-stage partial record station by U.S.G.S. 300 feet downstream
RAINFALL / RESERVOIR RECORDS	Rainfall gage at McGuire Air Force Base

CHECK LIST
ENGINEERING DATA
DESIGN, CONSTRUCTION, OPERATION
(continued)

ITEM	REMARKS
DESIGN REPORTS	Not available
GEOLOGY REPORTS	Not available
DESIGN COMPUTATIONS HYDROLOGY & HYDRAULICS DAM STABILITY SEEPAGE STUDIES	Not available
MATERIALS INVESTIGATIONS BORING RECORDS LABORATORY FIELD	Not available
POST-CONSTRUCTION SURVEYS OF DAM	Small sketches were found in files of N.J. Department of Environmental Protection
BORROW SOURCES	Not known
SPILLWAY PLAN - SECTIONS - DETAILS	Not available

CHECK LIST
ENGINEERING DATA
DESIGN, CONSTRUCTION, OPERATION
(continued)

ITEM	REMARKS
OPERATING EQUIPMENT PLANS AND DETAILS	Not available
MONITORING SYSTEMS	None
MODIFICATIONS	None
HIGH POOL RECORDS	Not available at dam site except for oral data from Mr. John DeMeo, Committeeman of Plumsted Township, on the flood of August 31, 1978, described below.
POST CONSTRUCTION ENGINEERING STUDIES AND REPORTS	None
PRIOR ACCIDENTS OF FAILURE OF DAM - DESCRIPTION - REPORTS	No formal report exists. On August 31, 1978, after a day of heavy rain, a flash flood hit the New Egypt area. According to Mr. DeMeo, the water level reached the top of the railing on the Main Street bridge. This put the water 11 feet over the top of the walkway and 13 feet over the spillway crest causing heavy damages in the area.
MAINTENANCE OPERATION RECORDS	None

APPENDIX B

PHOTOGRAPHS

PHOTOGRAPHS TAKEN ON SEPTEMBER 7, 1978
AND OCTOBER 23, 1978

Photo 1 - View of downstream face of dam from Main Street Bridge. Note left gate that was damaged and could not be raised completely.(Photo taken September 7, 1978)

Photo 2 - View of concrete spillway and left abutment from low level outlet section. (Photo taken September 7, 1978)

Photo 3 - Upstream face of dam taken from left bank. Grassy area at lower left of picture is normal water level with gates closed. (Photo taken September 7, 1978)

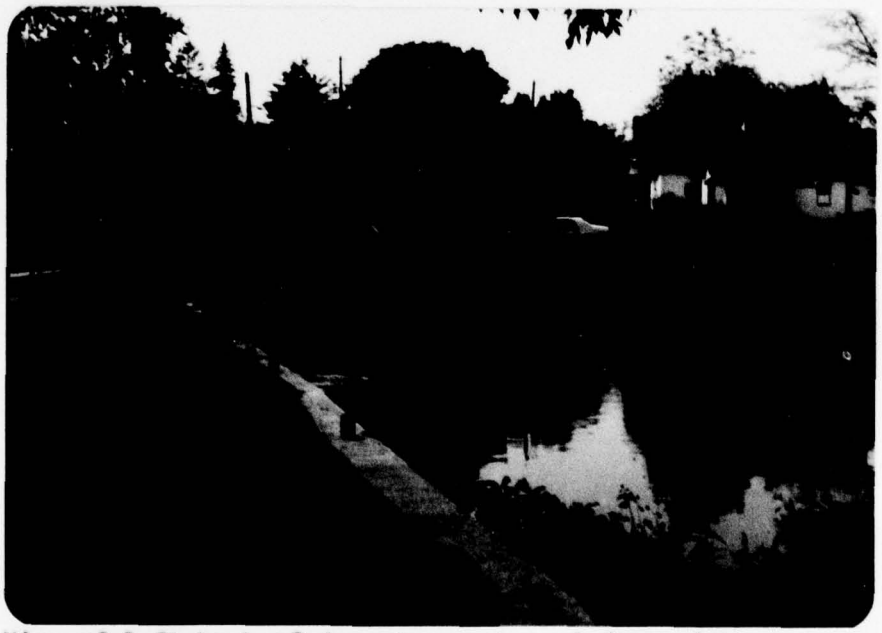


Photo 4 - View of left bank of downstream channel from right bank. (Photo taken September 7, 1978)

Photo 5 - View of downstream channel and Main Street Bridge from dam. Bridge controls tailwater at the dam. (Photo taken September 7, 1978)

Photo 6 - View of reservoir from dam. Tree line is normal water level with gates closed. (Photo taken September 7, 1978)

Photo 7 - Upstream face of left abutment showing missing and deteriorated concrete facing. (Photo taken September 7, 1978)

Photo 8 - Upstream channel side of left abutment. Concrete facing is missing exposing fill material and timber piling. (Photo taken September 7, 1978)

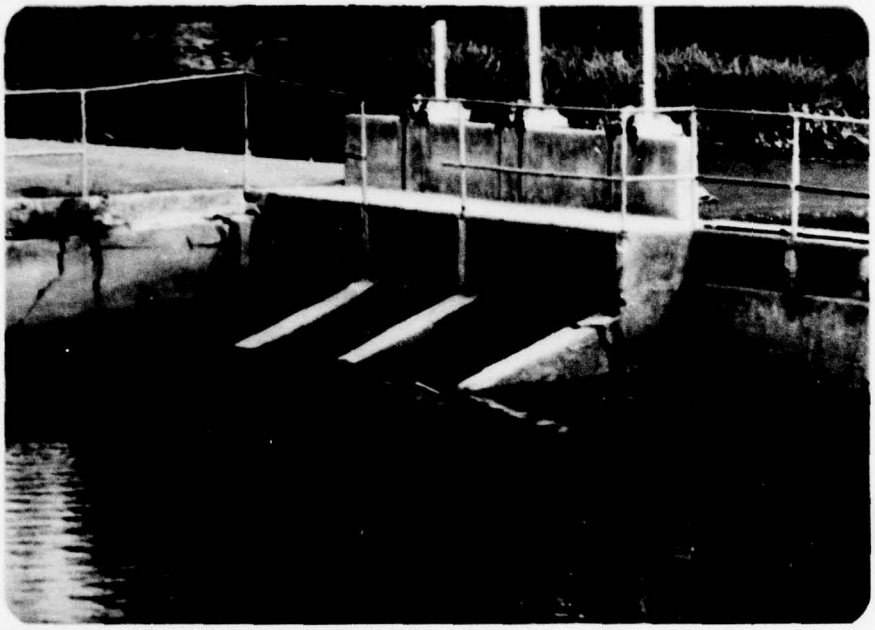


Photo 9 - View of downstream face of low level outlet section showing cracked left buttress. Also note cracked abutment wall to the left. (Photo taken September 7, 1978)

Photo 10 - Close up of cracked buttress. (Photo taken September 7, 1978)

Photo 11 - Cracked concrete facing of right abutment dike on discharge channel side. (Photo taken September 7, 1978)

Photo 12 - Operating mechanism of left outlet gate showing cracked plate. (Photo taken September 7, 1978)

APPENDIX C

SUMMARY OF ENGINEERING DATA

CHECK LIST
HYDROLOGIC AND HYDRAULIC DATA
ENGINEERING DATA

Name of Dam: OAKFORD LAKE DAM

Drainage Area Characteristics: 35.67 square miles

Elevation Top Normal Pool (Storage Capacity): 63.15 (99 AF)

Elevation Top Flood Control Pool (Storage Capacity): NA

Elevation Maximum Design Pool: 63.15

Elevation Top Dam: 65.0

SPILLWAY CREST:

a. Elevation 63.15
b. Type Concrete weir
c. Width 18 inches
d. Length 56 feet
e. Location Spillover At natural stream channel of Crosswicks Creek
f. No. and Type of Gates None

OUTLET WORK:

a. Type Three 3 ft.-6 in. x 5 ft.-6 in. slide gates
b. Location Upstream face of spillway wall
c. Entrance Inverts 57.5±
d. Exit Inverts 57.5±
e. Emergency Draindown Facilities None

HYDROMETEOROLOGICAL GAGES:

a. Type Crest-stage
b. Location Upstream side of bridge on SR 528, New Egypt, 300 ft. downstream of dam
c. Records Partial record 1968-1977

MAXIMUM NON-DAMAGING DISCHARGE None estimated

APPENDIX D

HYDROLOGIC COMPUTATIONS

FREDERIC R. HARRIS, INC.
CONSULTING ENGINEERS

SUBJECT N.J. Dam Safety Inspection — SHEET NO. ____ OF ____
Oakford Lake Dam — JOB NO. 10-924-04
COMPUTED BY SAA — CHECKED BY EMK — DATE 4/12/79

Area capacity computations — New Egypt quadrangle

In the absence of specific elevations for the structure it is assumed that the normal pool elevation is El. 63.0

Contour Elevation	Planimeter Reading	Area in Acres	Storage in acre-feet	Cumulative Storage, ac-ft.
57.5	0.0	0	0	0
63	0.36	33	99	99
70	3.80	349	1337	1436
80	14.12	1297	8230	9666

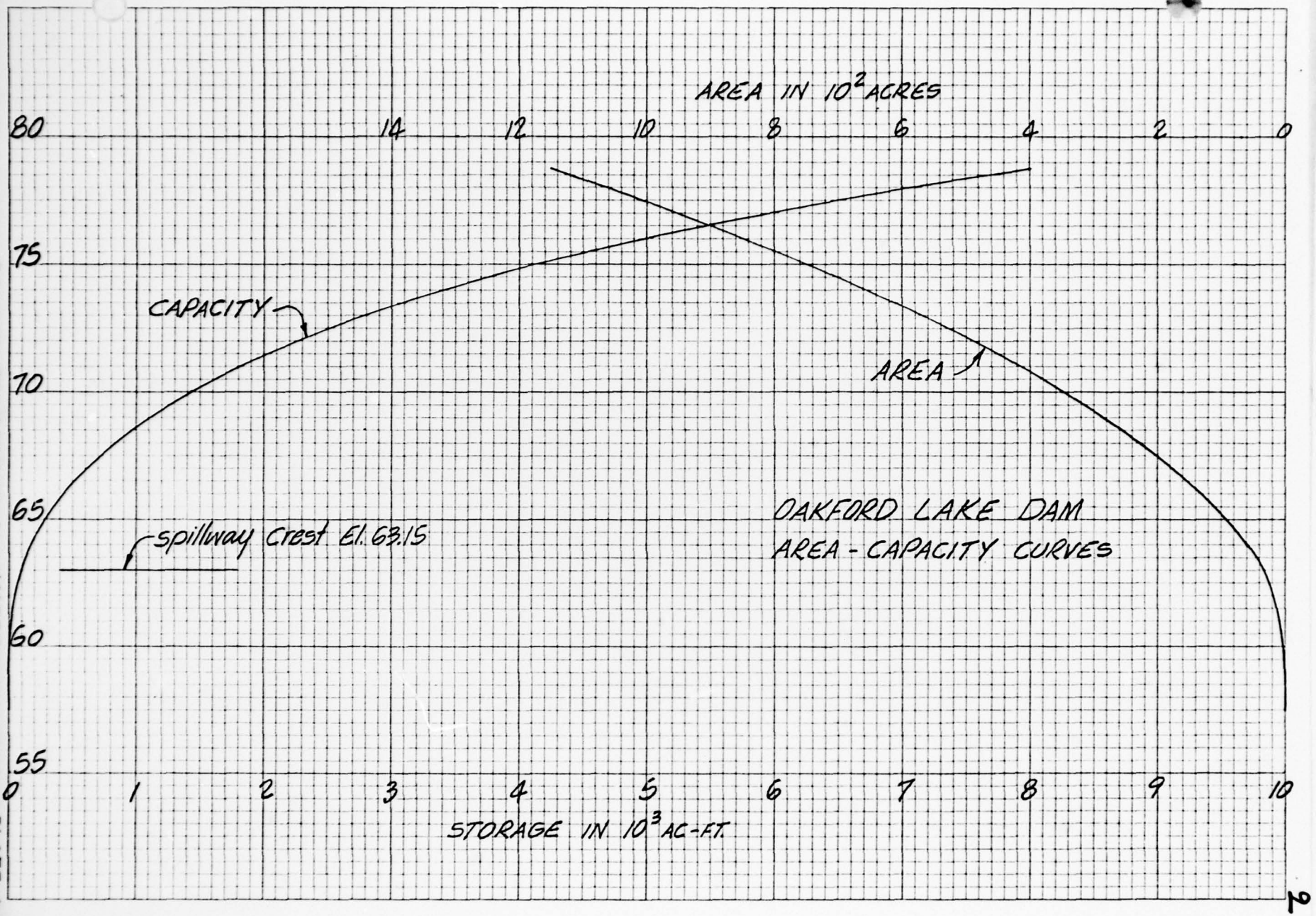

AREA IN 10^2 ACRES
14
12
10
8
6
4
2
0
80
75
70
65
60
55
CAPACITY
AREA
spillway crest El. 63.15
OAKFORD LAKE DAM
AREA - CAPACITY CURVES
ELEVATION IN FEET ABOVE MSL
0
1
2
3
4
5
6
7
8
9
10
STORAGE IN 10^3 AC-FT.

PLATE 2

FREDERIC R. HARRIS, INC.
CONSULTING ENGINEERS

SUBJECT N.J. Dam Safety Inspection — Oakford Lake Dam
SHEET NO. ____ OF ____
JOB NO. 10-924-04
COMPUTED BY SAA CHECKED BY GMC DATE 1/16/79

Cosswicks creek at New Egypt, NJ
Stage discharge data recorded by USGS

Datum of gage = 43.46 ft.

Gage Height ft	Elevation	Q, cfs	Gage Height ft	Elevation	Q, cfs
17.0	60.46	260	24.0	66.46	1500
17.50	60.96	328	26.3	69.76	1940
18.0	61.46	410			
18.5	61.96	495			
19.0	62.46	585			
19.5	62.96	670			
19.60	63.06	700			
19.75	63.21	720			
19.77	63.23	720			
20.0	63.46	755			
20.92	64.38	925			
21.30	64.76	1000			
22.0	65.46	1120			
22.48	65.94	1200			

FOR PLOT OF TW CURVE SEE SHEET

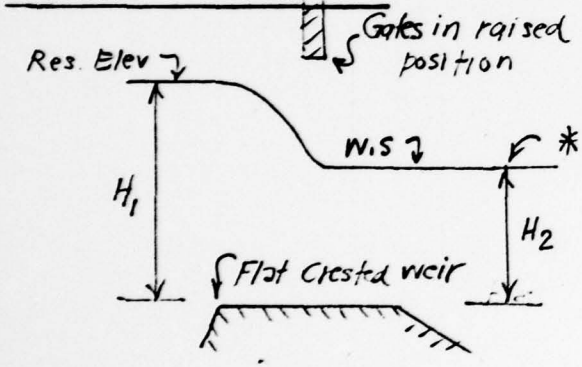
FREDERIC R. HARRIS, INC.
CONSULTING ENGINEERS

SUBJECT NJ Dam Safety Inspection
Oradell Lake Dam
COMPUTED BY SMR CHECKED BY
JOB NO. 10.021-011
DATE JAN 79
SHEET NO. 4 OF

Three Sluices Open Discharge Rating Curve
Reservoir Crest Elev 57.5 TW TW H_1/H_2 ** $\frac{Q_{submerged}}{Q_{free\ falling}}$
Elev CL = 2.63 × 10.5 = 27.6 Q* El.*

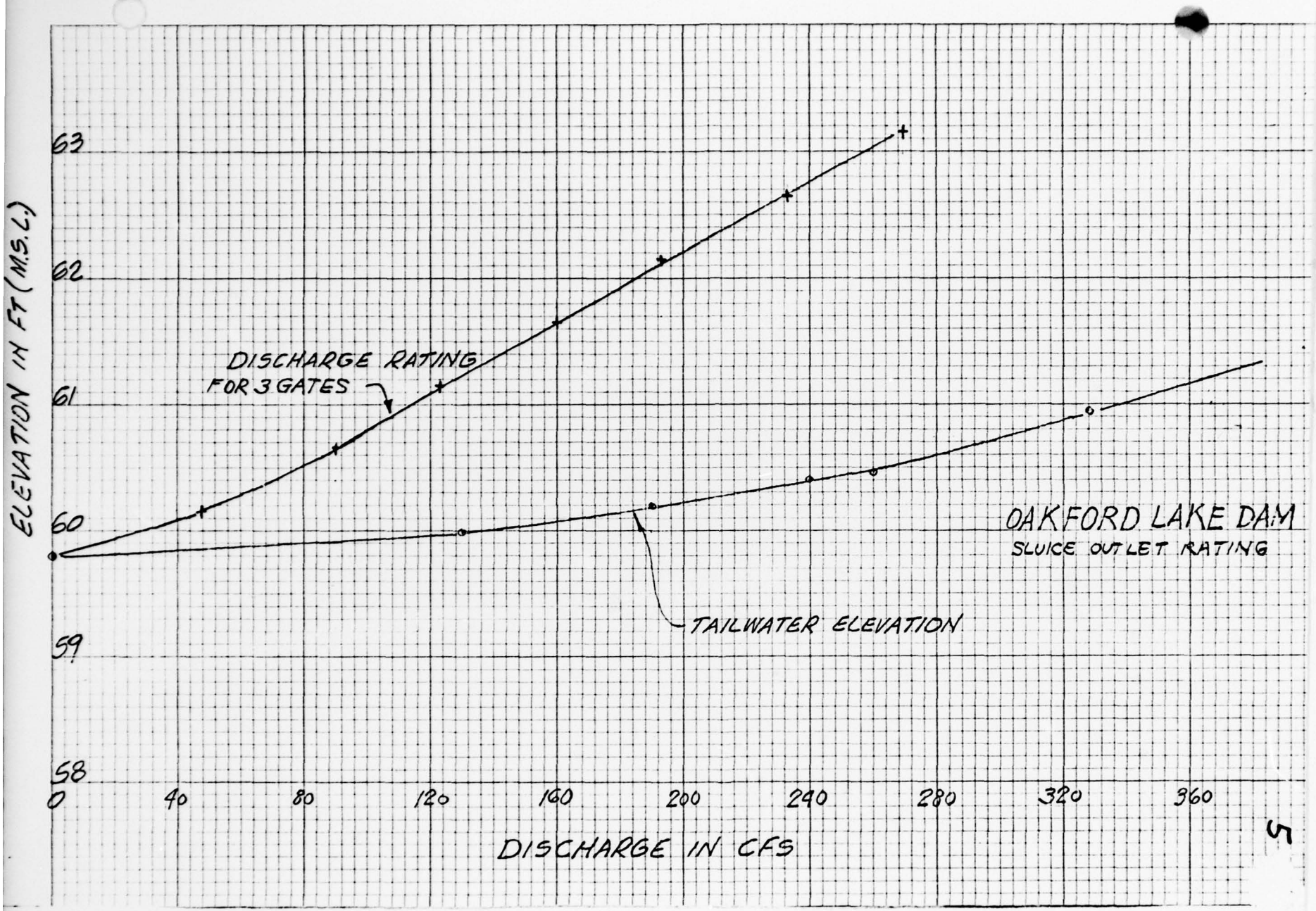
	H_1	Q free falling	Q submerged		TW Q*	TW El.*	H_1/H_2	**
63.15	5.65	370	270	✓	260	60.5	3.0/5.65 = .53	.73
62.65	5.15	323	233	✓	230	60.35	285/5.15 = .55	.725
62.15	4.65	276	193	✓	195	60.20	2.70/4.65 = .58	.70
61.65	4.15	233	160	✓	160	60.08	2.58/4.15 = .62	.685
61.15	3.65	193	123	✓	130	60.0	2.5/3.65 = .68	.64
60.65	3.15	155	90	✓	95	59.98	2.4/3.15 = .76	.58
60.15	2.65	119	48	✓	50	59.85	2.35/2.65 = .89	.40

DEFINITION DIAGRAM



* TAILWATER LEVEL FROM DATA ON SHEET 3 & GRAPH ON SHEET

** Sluice discharge rating computed as submerged weir according to King & Brater "Hand book of Hydraulics" pg 5-18 Fig 5-5


ELEVATION IN FT (M.S.L.)
63
62
61
60
59
58
DISCHARGE RATING
FOR 3 GATES
OAKFORD LAKE DAM
SLUICE OUTLET RATING
TAILWATER ELEVATION
0
40
80
120
160
200
240
280
320
360
DISCHARGE IN CFS

FREDERIC R. HARRIS, INC.
CONSULTING ENGINEERS

SUBJECT N.J. Dam Safety Inspection
Oakford Lake Dam
COMPUTED BY SMR CHECKED BY

SHEET NO. OF
JOB NO. 10-924-04
DATE 1/16/79

DRAWDOWN TIME COMPUTATIONS Continued

Normal Pool Elev to start 63.15
TW Elev varies El. 59.8 min TW @ no flow

Drainage Area 35.7 sq. mi
Inflow @ 2 cfs/s.m = 72 cfs.

Res. Elev	Area acres	Aver. Area acres	Volume ac. ft.	Ave Res Elev	Q Ave outlet Discharge cfs	t_1 hrs. Time to drawdown $\frac{Vol \times 24}{1.98 \times Q}$	Cum Time	Time to drawdown 2.0 csm $\frac{72 \times t_1}{Q}$	Cum Time
63.15	34								
		33.5	5.05	63.08	266	0.23	0.23	0.06	0.29
63.0	33								
		31.5	16.75	62.75	242	0.79	1.02	0.24	1.32
62.5	30							.30	
		28.5	14.25	62.25	202	0.86	1.88	0.31	2.19
62.0	27							.61	
		25.5	12.75	61.75	168	0.92	2.80	0.40	3.21
61.5	24							1.01	
		22.5	11.25	61.25	134	1.02	3.82	0.55	5.37
61.0	21							1.52	
		19.5	9.75	60.75	100	1.13	5.00	0.85	7.41
60.5	18							2.41	
		17.5	1.75	60.45	78	0.27	5.27	0.25	7.93
60.4	17							2.66	
		16.0	6.4	60.2	50	1.29	6.56		
60.0	15								
		14.0	2.8	59.9	20	1.69	8.25		
59.8	13								

1 cfs per day = 1.98 ac. ft

In the preceding tabulation surface area of the reservoir is assumed to vary linearly from 33 acres at El. 63 to 0 acres at El. 57.5 which is considered to be the streambed at the dam.

(A) Time of complete drawdown with no natural inflows:

8.25 hours - minimum pool Elev 59.8

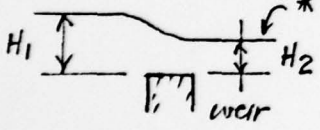
(B) Time of complete drawdown with natural inflow at 2.0 Cfsm or 72 cfs.:

8 hours - minimum pool Elev. 60.4

FREDERIC R. HARRIS, INC.
CONSULTING ENGINEERS

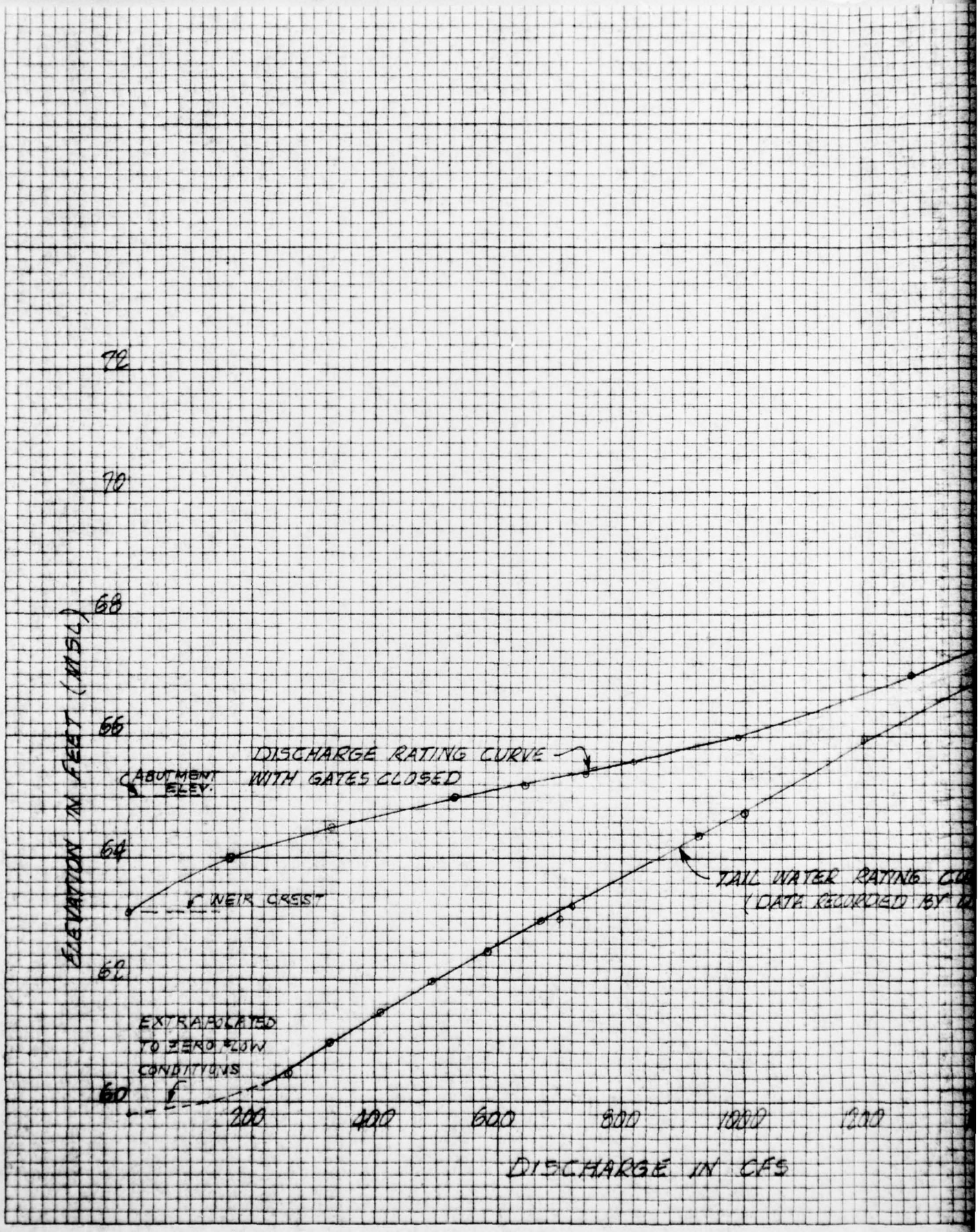
SUBJECT NJ Dam Inspections DOR Spy Lake Dam SHEET NO. 8 OF
SPILLWAY RATING CURVE
COMPUTED BY SMR CHECKED BY JOB NO. 10-927-04
DATE JAN 1979

Reservoir Elev	Center Portion of Dam CL = 3.3 × 63.3 = 211			End Sections of Dam CL = 2.65 × 96 = 255			Q_{TOT} subm. weir	* TW Elev	H_1/H_2 Center portion / end portions	** $\frac{Q_{subm.}}{Q_{free\ falling}}$
	H_1	Q free falling crest Elev. 63.15	Q subm. weir	H_1	Q free falling crest Elev 65.0	Q subm weir				
64.0	0.85	165								
64.5	1.35	330								
65.0	1.85	530								
65.2	2.05	618		0.2	26	-	644 ✓	62.3	-	
65.4	2.25	715	680 ✓	0.4	64	-	744 ✓	63.4	0.25/2.25 = .11	.95 ✓
65.6	2.45	810	700	0.6	120	-	820 ✓	63.8	0.65/2.45 = .27	.87 ✓
66.0	2.85	1015	740	1.0	255		990 ✓	64.75	1.60/2.85 = .56	.73
67.0	3.85	1600	825	2.0	720	460	1285 ✓ ←	66.35	320/3.85 = .83	.515
									1.35/2.0 = .67	.64
68.0	4.85	2250	860	3.0	1330	665	1500 ✓	67.5	4.35/4.85 = .90	.38
									2.5/3.0 = .83	.50
69.0	5.85	3000	945	4.0	2040	815	1760 / 1700 ✓	68.55	5.40/5.85 = .925	.315
									3.55/4.0 = .89	.40
70.0	6.85	3800	990	5.0	2860	925	1915 ✓	69.62	6.48/6.85 = .945	.26
									4.62/5.0 = .925	.325



* TW Elev. from Data on Sheet 3 & graph on sheet

** Weir discharge rating computed on submerged basis according to King & Brater "Handbook of Hydraulics" pg 5-18 Fig 5-5



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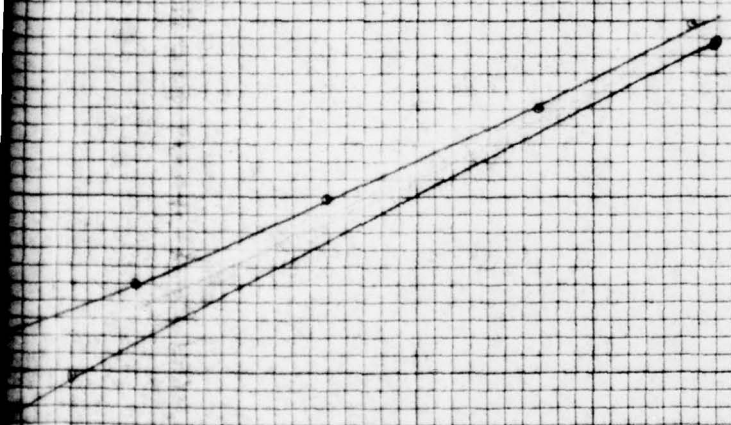
K+E 10 X 10 TO THE INCH • 10 X 15 INCHES
KEUFFEL & ESSER CO. MADE IN U.S.A.



OAKFORD LAKE DAM

STAGE DISCHARGE CURVE

RATING CURVE
SURVEYED BY USGS)

1200 1400 1600 1800 2000

FREDERIC R. HARRIS, INC.
CONSULTING ENGINEERS

SUBJECT N.J. Dam Safety Inspection — SHEET NO. ____ OF ____
Oakford Lake Dam — JOB NO. W-424-04
COMPUTED BY SAA — CHECKED BY SMK — DATE 12/4/78

Computation of 100-year flood discharge for Crosswicks Creek at the dam site following procedures outlined in "Magnitude And Frequency of Floods in New Jersey With Effects of Urbanization" Special Report 38 by Stephen J. Stankowski, US Geological Survey.

1. Drainage area at dam site, A = 35.7 sq. mi.

2. Main channel slope, S

(a) Length of stream channel with the greater drainage area = 41000 ft or

(b) Streambed elevation at point 10% (0.78 mile) above damsite = El. 65

(c) Streambed elevation at point 85% (6.60 mile) above damsite = El. 100

(d) ∴ Slope $S = \frac{100-65}{6.60-0.78} = \frac{35}{5.82} = 6.0$ ft/mile

3. Area of lakes & swamps within the drainage basin

Area = 3.88 sq. mi.

% of total = $\frac{3.88}{35.67} \times 100 = 10.88$

Then Surface Storage Index, $S_t = 10.88 + 1.0 = 11.88\%$

5. Population Density, D

Locality	Pop. Est.	Area sq. mi	Density Persons/mi²	Area within Drainage Boundary
(a) Chesterfield	3240 (1976)	21.81	148.6	0.12
(b) New Hanover	27410 (1972)	21.85	8091.5*	2.71
(c) North Hanover	9858 (1972)	17.38	567.2	12.82
(d) Springfield	2470 (1976)	29.34	84.2	0.96
(e) Wrightstown	1865 (1976)	0.34	5485	0.34
(f) Plumsted	4625 (1976)	40.70	113.6	7.77
(g) Rem. Ft. Dix	—	—	—	10.95
				35.67 sq. mi

* This density is obtained on the assumption that 80%

of the total population of New Hanover lives in Fort Dix which has an area of 2.71 sq. mi. within the drainage boundary.

$$\text{Weighted Pop. Density} = \frac{(148.6\times0.12)+(8091.5\times2.71)+(567.2\times12.82)+(84.2\times0.96)+(5485\times0.34)+(113.6\times7.77)}{35.67}$$

$$D = \frac{32045.7}{35.67} = 898.4 \text{ persons/sq. mi.}$$

6. Manmade impervious cover index I

$$I = 0.117D^{0.792-0.039\log D}$$

$$I = 0.117(898.4)^{0.792-0.039\log 898.4}$$

$$= 11.67\%$$

7. $$Q_{100} = 136A^{0.84}S^{0.26}S_t^{-0.51}I^{0.14}$$

$$= 136(35.67)^{0.84}\times(6)^{0.26}\times(11.88)^{-0.51}\times(11.67)^{0.14}$$

$$= 1742 \text{ cfs} \quad \text{say } 1750 \text{ cfs}$$