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NEW JERSEY DEPT OF ENVIRONMENTAL PROTECTION TRENTON F/G 13/13
NATIONAL DAM SAFETY PROGRAM. YOUNGS POND DAM (NJ00270) DELAWARE--ETC(U)
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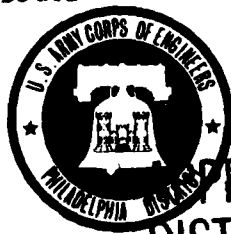
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YOUNGS POND DAM NJ 00270

PHASE 1 INSPECTION REPORT NATIONAL DAM SAFETY PROGRAM

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REPORT DOCUMENTATION PAGE		READ INSTRUCTIONS BEFORE COMPLETING FORM
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19. KEY WORDS (Continue on reverse side if necessary and identify by block number) Dams National Dam Safety Program Embankments Youngs Pond Dam, New Jersey Structural Analysis Seepage Visual Inspection Erosion		
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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Honorable Brendan T. Byrne
Governor of New Jersey
Trenton, New Jersey 08621

29 JUL 1980

Dear Governor Byrne:

Inclosed is the Phase I Inspection Report for Youngs 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, Youngs Pond Dam, a high hazard potential structure, is judged to be in fair overall condition. The spillway is considered seriously inadequate because a flow equivalent to nine percent of the Probable Maximum Flood (PMF) would cause the dam to be overtopped. The seriously inadequate spillway is assessed as an UNSAFE, non-emergency condition, until more detailed studies prove otherwise or corrective measures are completed. The classification of UNSAFE applied to a dam because of a seriously inadequate spillway is not meant to indicate the same degree of emergency as would be associated with an UNSAFE classification applied for a structural deficiency. It does mean, however, that based on an initial screening, and preliminary computations, there appears to be a serious deficiency in spillway capacity so that if a severe storm were to occur, overtopping and failure of the dam would take place, significantly increasing the hazard of loss of life downstream from the dam. To ensure adequacy of the structure, the following actions, as a minimum, are recommended.

a. The spillway's adequacy should be determined by a qualified professional consultant engaged by the owner using more sophisticated methods, procedures, and studies within six months from the date of approval of this report. Within three months of the consultant's findings, remedial measures to ensure spillway adequacy should be initiated. In the interim, a detailed emergency operation plan and warning system should be promptly developed. Also during periods of unusually heavy precipitation, around the clock surveillance should be provided.

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Honorable Brendan T. Byrne

b. Within six months from the date of approval of this report, engineering studies and analyses should be performed to:

(1) Investigate the seepage and standing water near the toe of the dam and design remedial measures, if needed.

(2) Design or specify repairs for the erosion on the upstream and downstream slopes of the dam.

(3) Design control valves to be installed at the upstream end of the low-level outlet pipes to replace the existing valves near the downstream end of the pipes.

(4) Design or specify and inspect the installation of suitable erosion protection for the emergency spillway channel and the exposed banking south of the emergency spillway.

(5) Evaluate the erosion resistance of the emergency spillway channel and design remedial measures, if needed.

c. 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.

d. Within thirty days from the date of approval of this report, a program should be initiated to check the condition of the dam periodically and monitor the seepage near the downstream toe until remedial measures are effected.

e. The following actions should be completed within six months from the date of approval of this report:

(1) Cut trees on the embankment.

(2) Mow weeds and brush on the embankment.

(3) Clear trees and brush from the end of the emergency spillway down to the main stream channel.

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.

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Honorable Brendan T. Byrne

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

An important aspect of the Dam 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,



JAMES G. TON
Colonel, Corps of Engineers
District Engineer

1 Incl
As stated

Copies furnished:

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

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

YOUNGS POND DAM (NJ00270)

CORPS OF ENGINEERS ASSESSMENT OF GENERAL CONDITIONS

This dam was inspected on 6 November 1979 by Anderson-Nichols and Company, 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.

Youngs Pond Dam, a high hazard potential structure, is judged to be in fair overall condition. The spillway is considered seriously inadequate because a flow equivalent to nine percent of the Probable Maximum Flood (PMF) would cause the dam to be overtopped. The seriously inadequate spillway is assessed as an UNSAFE, non-emergency condition, until more detailed studies prove otherwise or corrective measures are completed. The classification of UNSAFE applied to a dam because of a seriously inadequate spillway is not meant to indicate the same degree of emergency as would be associated with an UNSAFE classification applied for a structural deficiency. It does mean, however, that based on an initial screening, and preliminary computations, there appears to be a serious deficiency in spillway capacity so that if a severe storm were to occur, overtopping and failure of the dam would take place, significantly increasing the hazard of loss of life downstream from the dam. To ensure adequacy of the structure, the following actions, as a minimum, are recommended.

a. The spillway's adequacy should be determined by a qualified professional consultant engaged by the owner using more sophisticated methods, procedures, and studies within six months from the date of approval of this report. Within three months of the consultant's findings, remedial measures to ensure spillway adequacy should be initiated. In the interim, a detailed emergency operation plan and warning system should be promptly developed. Also during periods of unusually heavy precipitation, around the clock surveillance should be provided.

b. Within six months from the date of approval of this report, engineering studies and analyses should be performed to:

(1) Investigate the seepage and standing water near the toe of the dam and design remedial measures, if needed.

(2) Design or specify repairs for the erosion on the upstream and downstream slopes of the dam.

(3) Design control valves to be installed at the upstream end of the low-level outlet pipes to replace the existing valves near the downstream end of the pipes.

(4) Design or specify and inspect the installation of suitable erosion protection for the emergency spillway channel and the exposed banking south of the emergency spillway.

(5) Evaluate the erosion resistance of the emergency spillway channel and design remedial measures, if needed.

c. 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.

d. Within thirty days from the date of approval of this report, a program should be initiated to check the condition of the dam periodically and monitor the seepage near the downstream toe until remedial measures are effected.

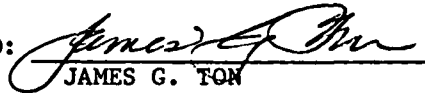
e. The following actions should be completed within six months from the date of approval of this report:

(1) Cut trees on the embankment.

(2) Mow weeds and brush on the embankment.

(3) Clear trees and brush from the end of the emergency spillway down to the main stream channel.

APPROVED:



JAMES G. TON

Colonel, Corps of Engineers
District Engineer

DATE:

11 JULY 1980

UNSAFE DAM
NATIONAL PROGRAM OF INSPECTION OF DAMS

- a. NAME: Youngs Pond Dam b. ID NO.: NJ00270 c. LOCATION State: New Jersey, County: Warren.
- d. HEIGHT: 18 feet e. MAXIMUM IMPOUNDMENT CAPACITY: 391 ac. ft.
River or Stream: Jacksonburg Creek.
Nearest D/S City or Town: Jacksonburg.
- f. TYPE: Earthfill.
- g. OWNER: Kenneth W. Young.
- h. DATE GOVERNOR NOTIFIED OF UNSAFE CONDITIONS: 19 June 1980
- i. CONDITION OF DAM RESULTING IN UNSAFE ASSESSMENT:
Preliminary report calculations indicate nine percent of the PMF would overtop the dam.
- l. URGENCY CATEGORY: High Hazard, UNSAFE, Non-Emergency.
- m. EMERGENCY ACTIONS TAKEN:
Gov. notified of this condition by District Engineer's letter of 19 June 1980
- j. DESCRIPTION OF DANGER INVOLVED: High Hazard potential, overtopping and failure of the dam would significantly increase hazard potential to loss of life and property downstream of dam.
- n. REMEDIAL ACTIONS TAKEN:
N.J.D.E.P. will notify dam's owner upon receipt of our letter.
- o. REMARKS: Final report, to be issued within six weeks, will have WHITE cover.
- k. RECOMMENDATIONS GIVEN TO GOVERNOR:
Within 30 days of the date of the District Engineer's letter the owner should do the following:
a. Engage the services of a qualified professional consultant to more accurately determine the spillway adequacy by using more detailed and sophisticated hydrologic and hydraulic analyses, and to recommend any remedial measures required to prevent overtopping of the dam.
b. In the interim, a detailed emergency operation plan and downstream warning system should be developed. Also, around-the-clock surveillance should be provided during periods of unusually heavy precipitation.

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



IN REPLY REFER TO

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

19 JUN 1980

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

Dear Governor Byrne:

This is in reference to our ongoing National Program for Inspection of Non-Federal Dams within the State of New Jersey. Youngs Pond Dam (Federal I.D. No. NJ00270), a high hazard potential structure has recently been inspected. The dam is owned by Kenneth W. Young and is located on Jacksonburg Creek in Jacksonburg.

Using Corps of Engineers screening criteria, it has been determined that the dam's two spillways are seriously inadequate because a flow equivalent to seven percent of the Probable Maximum Flood would cause the dam to be overtopped. The seriously inadequate spillways are assessed as an UNSAFE, non-emergency condition, until more detailed studies prove otherwise, or corrective measures are completed. The classification of UNSAFE applied to a dam because of a seriously inadequate spillway is not meant to indicate the same degree of emergency as would be associated with an UNSAFE classification applied for a structural deficiency. It does mean, however, that based on an initial screening and preliminary computations, there appears to be a serious deficiency in spillway capacity so that if a severe storm were to occur, overtopping and failure of the dam could take place, significantly increasing the hazard potential to loss of life downstream from the dam. As a result of this UNSAFE determination, it is recommended that the dam's owner take the following measures within 30 days of the date of this letter:

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

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Honorable Brendan T. Byrne

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

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

Sincerely,



JAMES G. TON
Colonel, Corps of Engineers
District Engineer

Copies 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

PHASE I INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM

Name of Dam: Youngs Pond Dam
Identification No.: FED ID No. NJ00270
State Located: New Jersey
County: Warren
Stream: Jacksonburg Creek
River Basin: Delaware
Date of Inspection: 6 November 1979

ASSESSMENT OF GENERAL CONDITIONS

Youngs Pond Dam is 8 years old and in fair overall condition. It is small in size and is classified as high hazard. An area of seepage and standing water near the toe of the dam was observed. Erosion areas occur on the upstream and downstream slopes of the dam. Erosion was further noted on the slopes adjacent to the emergency spillway. Youngs Pond Dam has two spillways. Together they can pass less than 8 percent of the PMF which is approximately 16 percent of the selected half-PMF test flood, and are seriously inadequate.

It is recommended that the owner retain the services of a professional engineer, qualified in the design and inspection of dams, to accomplish the following in the near future: investigate the seepage and standing water near the toe of the dam and design remedial measures, if needed; design and specify repairs for erosion on the upstream and downstream slopes of the dam; design control valves to be installed at the upstream end of the low-level outlet pipes to replace the existing valves near the downstream end of the pipes; design and specify repairs for erosion on the slopes adjacent to the emergency spillway; evaluate the erosion resistance of the emergency spillway channel and design remedial measures, if needed; conduct additional hydrologic and hydraulic analyses of the watershed, reservoir, dam and spillways to determine the need, type and extent of mitigating measures required. It is further recommended that starting immediately, the owner begin a program of checking the condition of the dam on a regular basis and monitoring the seepage near the downstream toe of the dam. In addition, in the future the owner should: cut trees on the embankment; mow weeds and brush on the embankment; clear trees and brush from the end of the emergency spillway down to the main stream channel; establish a surveillance program for use during and after periods of heavy rainfall and establish a warning program to follow in case of emergency conditions. Within one year from the date of approval of this report, the owner should develop written operating procedures and a periodic maintenance plan to insure the safety of the dam.

ANDERSON-NICHOLS & COMPANY, INC.

Warren A. Guinan

Warren A. Guinan, P.E.
Project Manager
New Jersey No. 16848



6 NOVEMBER 1979

OVERVIEW
YOUNGS POND DAM

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YOUNGS POND DAM NJ NO. 615 FED ID NO. NJ00270

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PREFACE

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

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

Phase I inspections are not intended to provide detailed hydrologic and hydraulic analyses. In accordance with the established Guidelines, the Spillway Test Flood is based on the estimated "Probable Maximum Flood" for the region (greatest reasonably possible storm runoff), or fractions thereof. The test flood provides a measure of relative spillway capacity and serves as an 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.

PHASE I INSPECTION REPORT
NATIONAL DAM SAFETY INSPECTION PROGRAM
YOUNGS POND DAM
FED ID NO. NJ00270 - NJ NO. 615

1.1 General

a. Authority. Authority to perform the Phase I Safety Inspection of Youngs Pond Dam was received from the State of New Jersey, Department of Environmental Protection, Division of Water Resources by a letter dated 26 October 1979, under Contract FPM No. 39 dated 28 June 1978. This authority was given pursuant to the National Dam Inspection Act, Public Law 92-367 and by agreement between the State and U.S. Army Engineers District, Philadelphia. The inspection discussed herein was performed by Anderson-Nichols & Company, Inc. on 6 November 1979.

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

1.2 Project Description

a. Description of Dam and Appurtenances. Youngs Pond Dam is an 18 foot high, 460 foot long earth embankment dam built in 1972. The downstream face of the dam is earth with 2H:1V slope. The principal spillway is a drop spillway and is 50 feet from the south abutment and 8 feet from the upstream face of the dam. The emergency spillway is adjacent to the south abutment. The principal spillway is 62 feet around and is a rectangular free overflow flat crested drop spillway. Discharge drops over the spillway and into an 8 foot wide by 7 foot high by 107 foot long concrete box culvert which passes under the dam embankment. The emergency spillway is an unpaved excavated channel with a 20 foot bottom width and 1H:1V side slopes. The emergency spillway measures 410 feet from the upstream face of the dam to where it joins the spillway discharge channel downstream. Two 12-inch diameter cast iron low level outlet pipes pass through the dam 250 feet from the north abutment. Access to the low level outlet gate mechanism is through a manhole 60 feet downstream of the dam crest at the toe of the dam. Essential features of the dam are given in Figure 1 and Figure 2 and shown in the design plans in Appendix 4.

b. Location. The dam is located in Warren County, New Jersey on Jacksonburg Creek, a tributary to Paulins Kill in Jacksonburg. It is at north latitude $41^{\circ}01.3'$ and west longitude $74^{\circ}59.0'$. A location map is given in Figure 3.

c. Size Classification. Youngs Pond Dam is classified as being "small" in size in accordance with criteria given in the Recommended Guidelines for Safety Inspection of Dams on the basis of storage at the dam crest of 492 acre feet, which is less than 1000 acre feet, but more than 50 acre feet, and on a height of 18 feet, which is less than 40 feet.

d. Hazard Classification. Visual inspection of the downstream area and the breach analysis contained herein show that a breach of Youngs Pond Dam could cause excessive damage to 3 residences located downstream of the dam and the potential exists for loss of 10 or more lives. Accordingly, Youngs Pond Dam is classified as High Hazard.

e. Ownership. The dam is owned by Kenneth W. Young, 18 Young Avenue, Cedar Grove, New Jersey 07009.

f. Purpose of Dam. Youngs Pond Dam was designed and constructed and currently is used for recreation and the preservation and propagation of fish life.

g. Design and Construction History. The dam was designed and built by Morris Engineers Inc., P.O. Box 289, Ledgewood, New Jersey 07852 in 1972. A set of plans consisting of 10 sheets was recovered from NJDEP files. Applications and pertinent plan sheets are included in Appendix 4. The design plans show fill was added to an "existing grade" indicating a dam was in place at the time of the Morris design drawings. Additionally on the "Report for Dam Application" dated 29 June 1972 an earthfill dam was indicated as existing. No additional information relating to the existing dam was revealed either in NJDEP files or communication with the present dam owner. Applications and pertinent plan sheets are included in Appendix 4. The plans were approved by the New Jersey Department of Environmental Protection, Division of Water Resources, Bureau of Water Control on 30 June 1972.

h. Normal Operational Procedures. The owner of the dam, Mr. Kenneth W. Young indicated that the low level outlet has been operated at irregular intervals. No formal written operating procedures were disclosed.

i. Site Geology. Limited boring data indicated that the dam is founded on "gray decomposed shale." Information derived from a Geologic Map of New Jersey (Lewis and Kummel, 1912) indicates that soils within the immediate site area consist of ground moraine overlying bedrock.

The map indicates that the underlying bedrock consists of black slatey shale with thin interbeds of sandstone, which are Ordovician in age.

1.3 Pertinent Data

a. Drainage Area

4.5 square miles

b. Discharge at Damsite (cfs)

Maximum flood at damsite - unknown

Low-level outlet at pool elevation (at spillway crest) - 18

Principal spillway (at top of dam) - 1025

Emergency spillway (at top of dam) - 125

Total spillway capacity (at top of dam) - 1150

c. Elevation (feet above NGVD)

Top of dam - 707.3

Maximum pool - ($\frac{1}{2}$ PMF) - 710.4

Principal spillway crest (normal pool) - 698.2

Emergency spillway crest - 706.0

Downstream invert low-level outlet - 680.2

Streambed at centerline of dam - 684.2

Maximum tailwater (estimated) - 688.4

d. Reservoir

Length of maximum pool (estimated) - 1800 feet

Length of normal pool - 1100 feet

e. Storage (acre-feet)

Principal spillway crest (normal pool) - 172

Top of dam - 332

Maximum pool ($\frac{1}{2}$ PMF) - 391

f. Reservoir (acres)

Top of dam - 28

Spillway crest - 14

g. Dam

Type - earth embankment with earth facing

Length - 460 feet

Height (structural) - 18 feet

(hydraulic) - 12 feet

Topwidth - 15 feet

Side slopes (upstream) - 3H:1V

(downstream) 2H:1V

Zoning - "compacted fill in 6 inch layers" (from design plans)

Impervious core - no impervious core shown on design plans

Cutoff - no cutoff shown on design plans

Grout curtain - no grout curtain shown on design plans

h. Spillways

Principal spillway

Type - free overflow, flat crested, rectangular, drop
spillway

Length - 62 feet

Crest Elevation - 698.2 NGVD

Gates - none

Emergency spillway

Type - free overflow exposed shale spillway

Length - 20 feet

Crest elevation - 706.0 NGVD

Gates - none

Upstream Channel - Youngs Pond

Downstream Channel - Jacksonburg Creek

i. Regulating Outlets

2 - 12" cast iron low level outlet pipes. Valving
mechanism access is through a manhole 60 feet downstream of the
dam crest.

SECTION 2 ENGINEERING DATA

2.1 Design

A copy of the design plans for the spillway, dam and low-level outlet dated 4 January 1972 was received from NJDEP files. The design plans consist of ten sheets. The plans show: a key map; sheet 1: 1"=100' scale contour map of the proposed lake; sheet 2: detail sheet for the low-level outlet manhole access; sheet 3: detail sheet for the principal spillway; sheet 4: detail sheet showing the placement of the reinforcing steel and concrete for the principal spillway; sheet 4: detail sheet for the principal spillway; sheet 5: cross sections of the dam and boring logs; sheet 6: cross sections of the dam and profiles of the lake bottom; sheet 7, sheet 8 and sheet 9: profiles of the lake bottom. These plans were drawn for Mr. Kenneth W. Young by Morris Engineers Inc. and filed in accordance with NJDEP regulations concerning stream encroachment. These plans were approved by the New Jersey Department of Environmental Protection, Division of Water Resources, Bureau of Water Control on 30 June 1972.

2.2 Construction

No recorded data concerning the construction of Youngs Pond Dam was revealed. Communication with Mr. Kenneth W. Young indicates that the dam was built in 1972. Additional original construction data was not disclosed.

2.3 Operation

No engineering operational data were found.

2.4 Evaluation

a. Availability. A search of NJDEP files and contact with the owner of the dam revealed only a limited amount of recorded information in addition to the design plans.

b. Adequacy. Because of the limited amount of recorded information available the evaluation was based primarily on visual observations.

c. Validity. The validity of the information retrieved was generally substantiated by visual inspection, however several discrepancies were noted. The dam crest elevation shown on design drawing 3 is 703.61. The crest elevation measured in the field, and related to the principal spillway crest elevation shown on the drawings was 707.3. This indicates that the dam was built 3.7 feet higher than originally designed. Discrepancies found relative to hydraulic design data are discussed in section 5.1.

SECTION 3
VISUAL INSPECTION

3.1 Findings

a. Dam. Extensive seepage was observed around the perimeter of a small basin at the downstream toe of the dam between the discharge end of the low level outlet pipes and a small weir immediately downstream. Some standing water near the downstream toe of the dam close to the north abutment was noted. Numerous erosion channels exist on the upstream and downstream slopes and on the contact between the upstream slope and the south abutment. Vehicle tracks and ruts on the contact between the downstream slope and the north abutment in the area immediately downstream of the toe of the dam and on the crest of the dam were also noted. Pine trees have been planted on the downstream slope at the south end of the dam between the ungated drop spillway discharge channel and the emergency spillway. A thick growth of grass, weeds, and berry bushes on the upstream and downstream slopes makes it impossible to inspect the slopes adequately.

b. Appurtenant Structures. An emergency spillway has been excavated in the natural ground of the south abutment. A bedrock exposure in the bottom of the emergency spillway at one location was observed. No erosion protection on the north side of the emergency spillway channel exists where the end of the embankment section of the dam is exposed. Additionally, no erosion protection exists on the south abutment adjacent to the emergency spillway channel. Fallen trees and erodable soil along the bank may lead to slope instability. Several logs and some cut brush in the emergency spillway channel were also noted. Trees are growing at the downstream end of the excavated emergency spillway.

c. Reservoir Area. The watershed above the pond is moderately to steeply sloping and heavily wooded, except for a zone close to the reservoir where logging operations were underway at the time of the inspection. Slopes adjacent to the lake appeared to be stable. No evidence of significant sedimentation was observed. A settling basin has been built to collect runoff from the logging area before it discharges into the pond.

d. Downstream Channel. Some trees overhang the discharge channel downstream from the low level outlet and one tree has fallen across the channel.

SECTION 4 OPERATIONAL PROCEDURES

4.1 Procedures

According to the owner no formal operating procedures are followed. Normal operating procedures are described in Section 1.2 h.

4.2 Maintenance of Dam

From the condition of the dam it is apparent that a maintenance program is followed, though no written procedures exist.

4.3 Maintenance of Operating Facilities

According to the owner no formal maintenance procedures for the low level outlet are followed. The low level outlet is operated at irregular intervals.

4.4 Warning System

No formal warning system is in effect.

4.5 Evaluation of Operational Adequacy

A regular operational and maintenance program should be established for Youngs Pond Dam. This program should include measures described in Section 7.2 and be implemented as prescribed.

SECTION 5 HYDROLOGIC/HYDRAULIC

5.1 Evaluation of Features

a. Design Data. Original hydrologic data used for the design of the drop spillway revealed that the drop spillway design is based on a 50-year discharge frequency developed from the North and Central New Jersey curves. Approval for the design criteria was given by the New Jersey Department of Environmental Protection, Department of Water Resources, Bureau of Water Control on 30 June 1972. The Report on Dam Application obtained from NJDEP files and included in Appendix 4 shows the design discharge as weir flow of 1670 cfs under a spillway head of 4.25 feet. A sheet of unknown origin attached to the application report verifies this weir computation and also shows an orifice calculation for the outlet conduit which indicates a discharge of 1100 cfs with 13.94 feet of head on the spillway conduit. Computations prepared for this inspection report indicated that the principal spillway discharge capacity will be controlled by the weir up to a head of 2.6 feet and by the capacity of the rectangular discharge conduit at greater heads. This indicates that under the design head of 4.25 feet the spillway capacity is 850 cfs not 1670 cfs or 1100 cfs. The maximum spillway capacity shown on the Report on Dam Application is 57,000 cfs. No computational backup is provided, however this figure is clearly in error. Calculations for this report show a combined principal and emergency spillway discharge at top of dam of 1150 cfs. The emergency spillway was apparently added after the dam was built.

b. Experience Data. Data recieved through conversation with Mr. Kenneth W. Young, owner, indicated that since Youngs Pond Dam was built he has never seen the dam overtopped. No written experience data were disclosed indicating an overtopping problem in the past.

c. Overtopping Potential. The hydraulic/hydrologic evaluation for Youngs Pond Dam is based on a Spillway Design Flood (SDF) equal to one-half the Probable Maximum Flood ($\frac{1}{2}$ PMF) in accordance with the range of test floods given in the evaluation guidelines for dams classified as high hazard and small in size. The PMF has been determined by application of the SCS Dimensionless Unit Hydrograph procedure to a 24 hour probable maximum storm of 25.4 inches. Hydrologic computations are given in Appendix 3. The routed half PMF peak discharge for the subject drainage area is 8168 cfs. The maximum elevation of the dam allows 9.1 feet of depth over the principal drop spillway and 1.3 feet of depth in the emergency spillway before embankment overtopping occurs. The low-level outlet is assumed closed. Under this head the combined spillway capacity is 1150 cfs which is less than the selected SDF.

Flood routing calculations indicate that Youngs Pond Dam will be overtopped for more than 6 hours to a maximum depth of 3.1 feet over the dam crest under $\frac{1}{2}$ PMF conditions.

After passing over Youngs Pond Dam, the discharge channel, Jacksonburg Creek, continues about 1500 feet downstream and under Mohican Road. Approximately 6400 feet downstream of this road bridge is a second road crossing. About 3800 feet downstream of the second road crossing is a third road crossing, Jacksonburg Road. Three residences line the west side of Jacksonburg Creek adjacent to the third road crossing. Jacksonburg Creek is a steeply sloping and deeply channeled stream downstream of Youngs Pond Dam. These characteristics when combined with the storm that could cause the dam to overtop, pose the threat of flooding to the three residences downstream.

The overflow from the dam was routed through four cross sections representative of the stream and channel downstream. The water depth occurring at the third road crossing, Jacksonburg Road, determines the depth of inundation for the Jacksonburg Road residences. The analysis determines the depth of flooding experienced under two conditions of the dam. These conditions are that the dam is overtopped and does not fail, and that the dam is overtopped and does fail. Failure is assumed to occur when overtopping begins. The analysis indicates that under a storm representing 20 percent of the PMF, which is less than the selected test flood, overtopping and failure would significantly increase the hazard to loss of life at the damage area by causing a flood elevation 4 feet higher than that which would occur without failure of the dam. This 4 foot increase would increase the inundation at one house from 2 feet to 6 feet, at another house from 1 foot to 5 feet, and cause the flood wave to reach the first floor sill of another house which is unaffected by the non-failure discharge. Because the stream is steep, very high flow velocities would occur.

The dam is classified as high hazard and the hazard to loss of life is increased by failure of the dam due to overtopping over that which exists just prior to overtopping failure. Together the principal and emergency spillways can pass less than 8 percent of the PMF without causing the dam to overtop and are considered seriously inadequate.

e. Drawdown Capability. If the low-level outlet currently in place is fully operable, it is estimated that the pond can be entirely drained in approximately 9.3 days, assuming no significant inflow. This time period would be considered marginal for draining the reservoir in an emergency situation. However, the reservoir can be drawn down to 4 feet deep and 22 acre-feet of storage within 5 days which is considered adequate because this effectively removes the hazard associated with breaching of the dam.

SECTION 6 STRUCTURAL STABILITY

6.1 Visual Inspection. Seepage and standing water at the toe of the dam are signs of potential stability problems, the magnitude of which cannot be evaluated on the basis of the visual inspection alone. Erosion on the upstream slope, the downstream slope and the contact between the upstream slope and the south abutment, if not controlled, could cause new seepage problems to develop in the embankment. A lack of erosion protection lowers the resistance of the dam in case of overtopping, and could, if given the opportunity to continue unchecked, result in breaching of the dam. Vehicle tracks and ruts on the downstream toe area and on the contact between the downstream slope and the north abutment, lower the erosion resistance in those areas and may cause new seepage problems to develop. If the trees that have been planted on the downstream slope grow to significant size, they can cause serious seepage and erosion problems if they blow over and pull out their roots or if a tree dies or is cut and its roots rot.

6.2 Design and Construction Data. No design or construction data pertinent to the structural stability of the dam are available. The design of the dam was approved by the New Jersey Department of Environmental Protection, Division of Water Resources, Bureau of Water Control on 30 June 1972.

6.3 Operating Records. No operating records pertinent to the structural stability of the dam are available.

6.4 Post-Construction Changes. Design plans prepared by Morris Engineers, Inc. dated 4 January 1972 are available. These plans indicate that there was an existing dam at the site at that time and that additional fill was placed on the embankment and downstream toe area. Borings were taken on the upstream slope of the dam but there is no information about the character of the central part of the cross-section. The drawings show a proposed valve near the downstream end of the low-level outlet pipes. Visual inspection substantiated the information found on the drawing concerning the valve placement. This type of valve placement does not prevent reservoir water from entering the pipes should they break or develop significant leaks within the embankment.

The owner excavated an emergency spillway in the south abutment after the dam was built. Although there appears to be a bedrock exposure at one location in the bottom of the spillway, it cannot be determined on the basis of visual inspection alone whether this spillway has adequate erosion resistance. No erosion protection has been placed on the end of the embankment dam which is exposed on the north side of the spillway channel.

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". None of the visual observations made during the inspection are indicative of unstable slopes. However, because of the limited data available concerning the engineering properties of the embankment and foundation materials for this dam, 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. Youngs Pond Dam is 8 years old and is in fair overall condition.

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

c. Urgency. The owner should implement the recommendations made in 7.2 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. If left unattended, the problems could lead to instability of the structure.

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 in the near future:

- (1) Investigate the seepage and standing water near the toe of the dam and design remedial measures, if needed.
- (2) Design or specify repairs for the erosion on the upstream and downstream slopes of the dam.
- (3) Design control valves to be installed at the upstream end of the low-level outlet pipes to replace the existing valves near the downstream end of the pipes.
- (4) Design or specify and inspect the installation of suitable erosion protection for the emergency spillway channel and the exposed banking south of the emergency spillway.
- (5) Evaluate the erosion resistance of the emergency spillway channel and design remedial measures, if needed.
- (6) Conduct additional hydrologic and hydraulic analyses of the watershed, reservoir, dam, and spillways to determine the need, type, and extent of mitigating measures required.

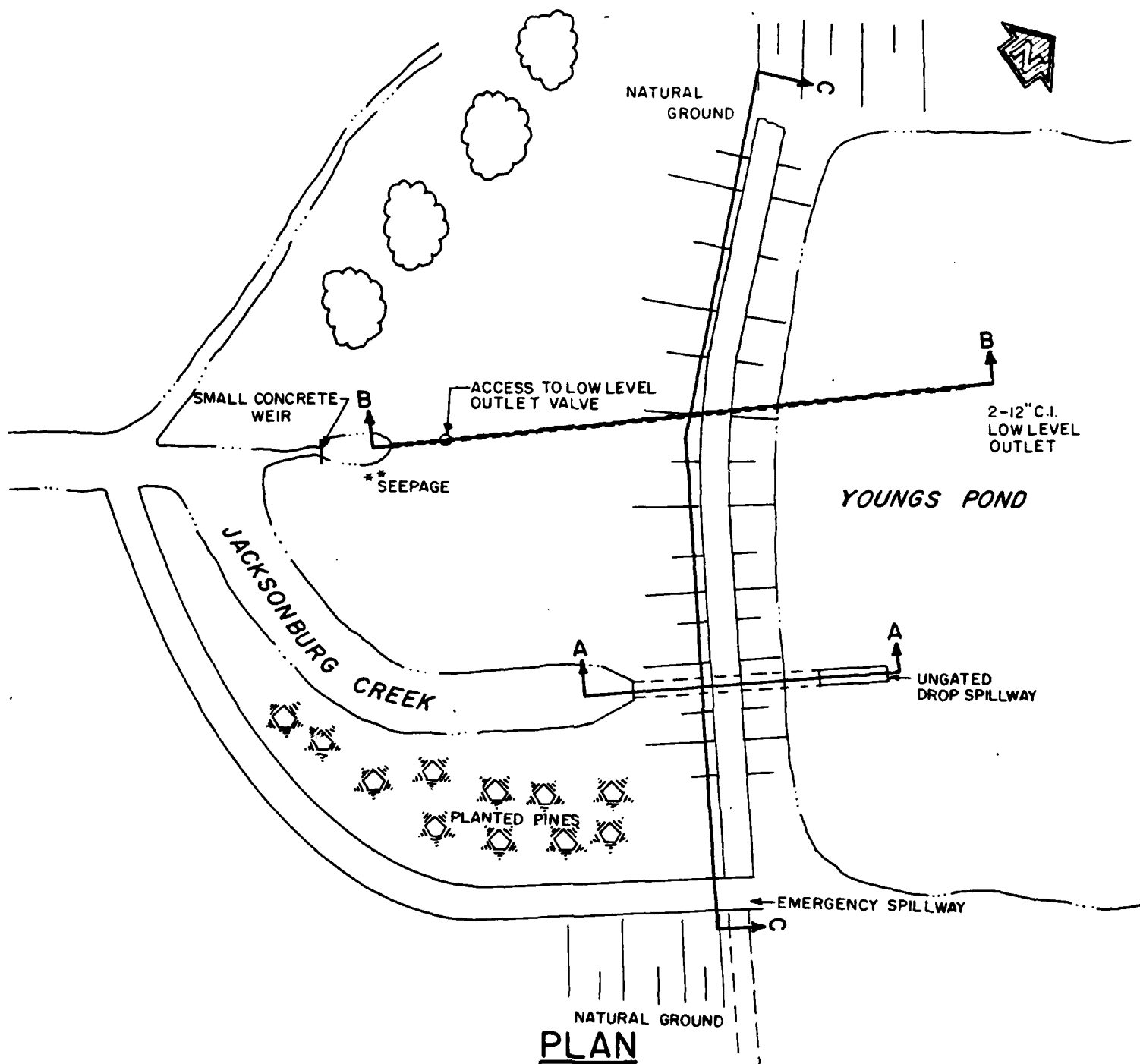
b. Operating and Maintenance Procedures. The owner should do the following immediately:

- (1) Start a program of checking the condition of the dam on a regular basis and monitoring the seepage near the downstream toe of the dam.

The owner should do the following in the near future:

- (1) Cut trees on the embankment.
- (2) Mow weeds and brush on the embankment.
- (3) Clear trees and brush from the end of the emergency spillway down to the main stream channel.
- (4) Establish a surveillance program for use during and after periods of heavy rainfall and also a warning program to follow in case of emergency conditions.

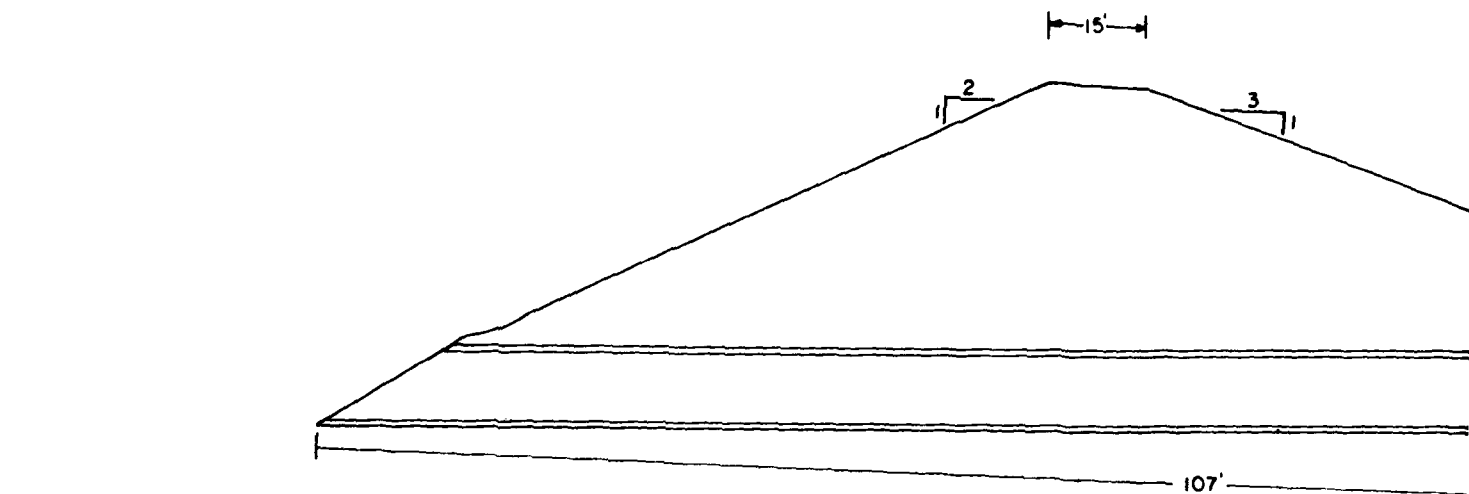
Within one year from the date of approval of this report, the owner should develop written operating procedures and a periodic maintenance plan to insure the safety of the dam.



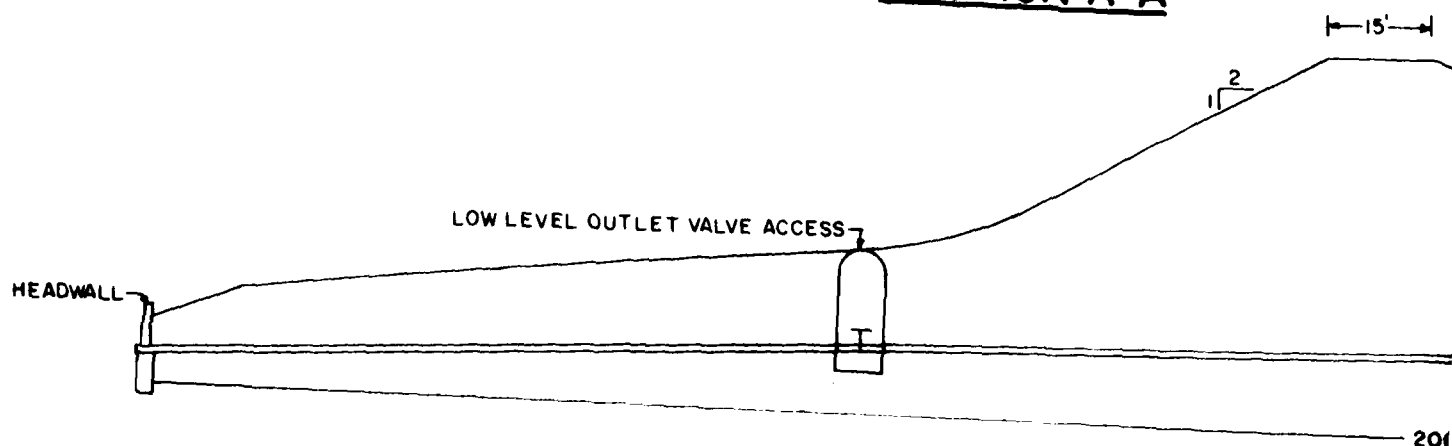
DETAIL FROM DESIGN PLANS AND FIELD INSPECTION 11/6/79

Anderson-Nichols & Co, Inc.		U.S. ARMY ENGINEER DIST PHILADELPHIA	
CONCORD		CORPS OF ENGINEERS PHILADELPHIA, PA.	
NEW HAMPSHIRE			
NATIONAL PROGRAM OF INSPECTION OF NON-FED. DAMS			
YOUNGS POND DAM			
JACKSONBURG CREEK		NEW JERSEY	
		SCALE: NOT TO SCALE	
		DATE: JANUARY 1980	

FIGURE 1



SECTION A-A



SECTION B-B

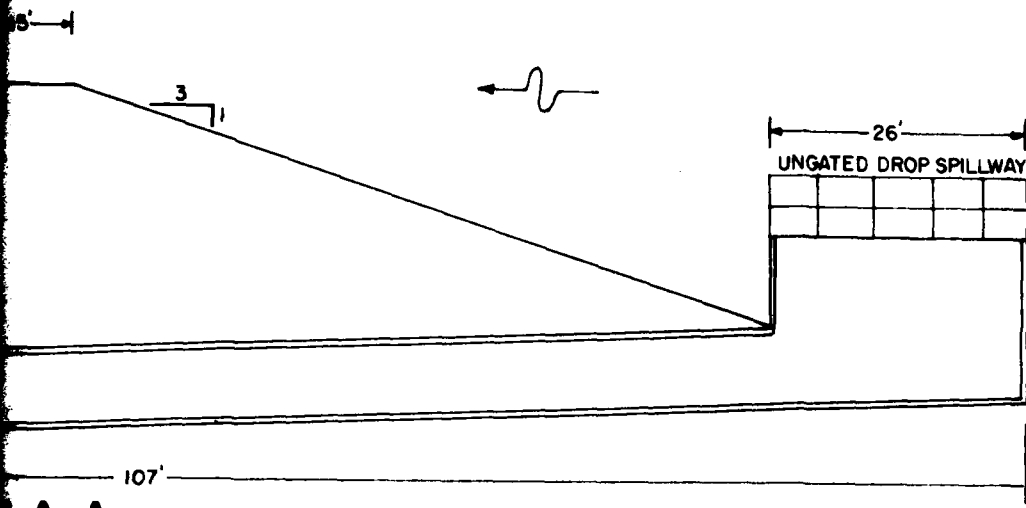


2-12" CI LOW LEVEL OUTLET

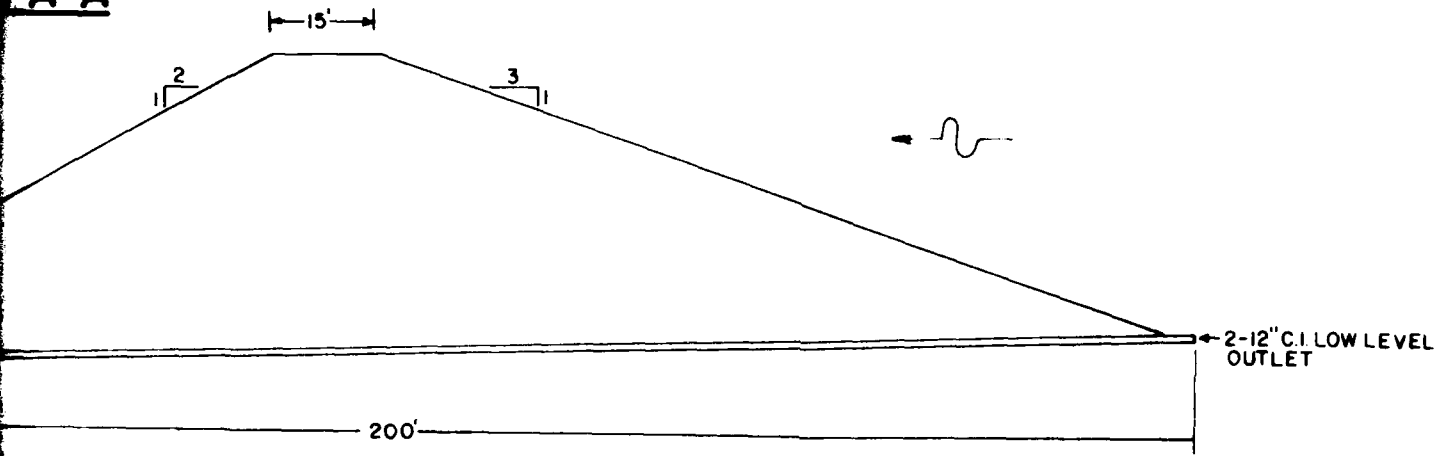


OUTLET
DROP SP

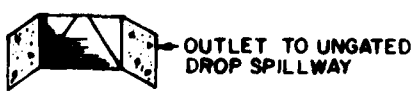
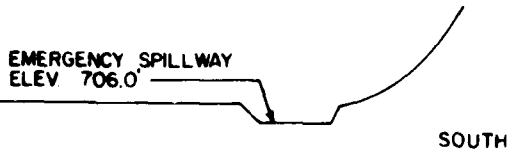
ELEVATION C-C



A-A



SECTION B-B



ON C-C

DETAIL FROM DESIGN PLANS AND FIELD INSPECTION 11/6/79

Anderson-Nichols & Co, Inc		U.S. ARMY ENGINEER DIST PHILADELPHIA	
CONCORD		CORPS OF ENGINEERS	
NEW HAMPSHIRE		PHILADELPHIA, PA	
NATIONAL PROGRAM OF INSPECTION OF NON-FED DAMS			
YOUNGS POND DAM			
JACKSONBURG CREEK		NEW JERSEY	
		SCALE: NOT TO SCALE	
		DATE: JANUARY 1980	

FIGURE 2

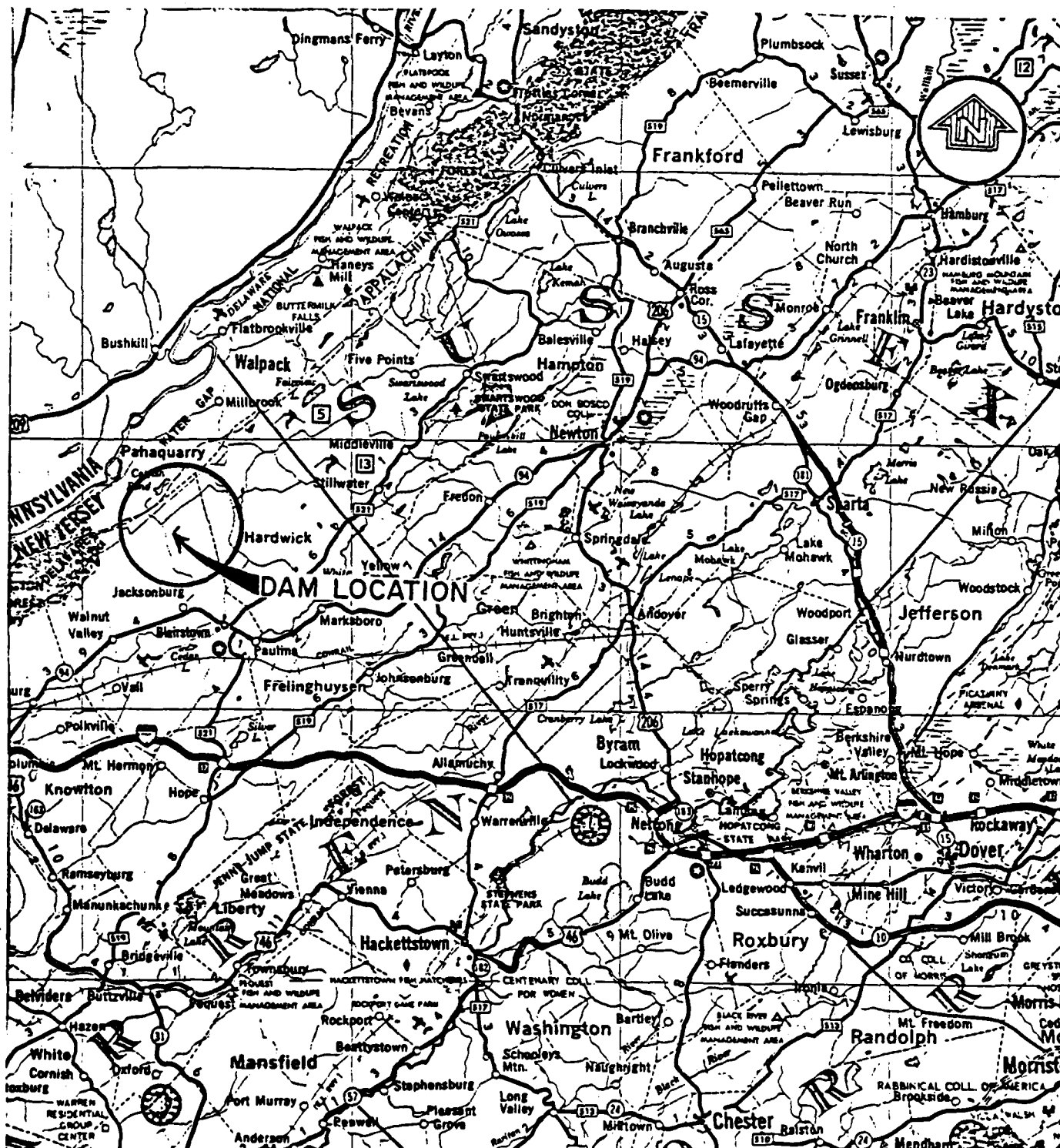


FIGURE-3

APPENDIX 1
VISUAL INSPECTION
CHECKLIST

YOUNGS POND DAM

Check List
Visual Inspection
Phase 1

Name Dam Youngs Pond Dam County Warren State N.J. Coordinators NJDEP
 Date(s) Inspection 6 November 1979 Weather cloudy Temperature 35°
 Pool Elevation at Time of Inspection 698.2 NGVD Tailwater at Time of Inspection 688.9 NGVD

Inspection Personnel:

<u>Warren Guinan</u>	<u>Ronald Hirschfeld</u>
<u>Steve Gilman</u>	<u>K. Young, Owner</u>
<u>Ken Stuart</u>	<u></u>

Gilman/Hirschfeld Recorder

EMBANKMENT

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SURFACE CRACKS	None observed.	
UNUSUAL MOVEMENT OR CRACKING AT OR BEYOND THE TOE	None observed.	
SLOUGHING OR EROSION OF EMBANKMENT AND ABUTMENT SLOPES	Erosion rills on both upstream and downstream slopes. Do not appear to be actively eroding. Grass and weeds now growing in most of the rills.	Repair erosion and establish grassy vegetation.
VERTICAL AND HORIZONTAL ALIGNMENT OF THE CREST	Good.	No action required.
RIPRAP FAILURES	No riprap.	

EMBANKMENT

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
RAILINGS	No railings.	
JUNCTION OF EMBANKMENT AND ABUTMENT, SPILLWAY AND DAM	Some erosion at upstream and downstream slope contacts with south abutment; does not appear to be currently active. Wheel tracks down downstream slope adjacent to north abutment are covered with grassy vegetation.	Repair erosion and establish grassy vegetation.
ANY NOTICEABLE SEEPAGE	Standing water at toe of dam near north abutment. Extensive clear seepage around perimeter of small basin between low-level outlet and small weir immediately downstream of low-level outlet.	Engage engineer to study sources of standing water and seepage and to design remedial measures if needed.
STAFF GAGE AND RECORDER	None observed.	
DRAINS	None observed. Owner says none were installed.	

**UNGATED SPILLWAY
DROP-INLET SPILLWAY**

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONCRETE WEIR	Good condition. No indication of deterioration.	
APPROACH CHANNEL	Clear and unobstructed.	
DISCHARGE CHANNEL	One log across channel. Some trees overhanging channel.	Clear trees and brush from either side of discharge channel a sufficient distance to prevent fallen trees from blocking the channel. Maintain the channel free of debris.
BRIDGE AND PIERS OVER SPILLWAY	Aluminum railings around ungated drop spillway in good condition.	

EMERGENCY SPILLWAY

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONCRETE WEIR	None.	
APPROACH CHANNEL	Clear and unobstructed.	
DISCHARGE CHANNEL	Several logs and some cut brush lying in channel. Trees growing on downstream valley slope beyond end of discharge channel. Bedrock exposed in bottom and left bank of channel just downstream of dam axis.	Clear debris from channel and maintain channel clear. Clear trees from downstream valley slope beyond end of discharge channel.
BRIDGE AND PIERS OVER SPILLWAY	None.	

LOW-LEVEL OUTLET WORKS

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CRACKING AND SPALLING OF CONCRETE SURFACES IN OUTLET CONDUIT	Concrete in good condition.	No action required.
INTAKE STRUCTURE	Not applicable.	
OUTLET PIPE	Two 12" ductile pipes in good condition.	No action required.
OUTLET CHANNEL	One log lying across channel. Some trees overhanging channel.	Clear trees and brush from either side of discharge channel a sufficient dis- tance to prevent fallen trees from blocking the channel. Maintain the channel free of debris.
EMERGENCY GATE	Vales for two 12" ductile pipes are operable. Owner reports recent operation. No leakage was observed in outlet pipe.	Valves are on downstream end of pipes.

RESERVOIR

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SLOPES	Logging operation underway on right bank upstream of dam. Sedimentation pond being used to control erosion from logging area. Other slopes are wooded.	
SEDIMENTATION	No evidence of significant sedimentation observed.	

DOWNSTREAM CHANNEL

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONDITION (OBSTRUCTIONS, DEBRIS, ETC.)	Some trees overhang the discharge channel downstream from the low-level outlet and one tree has fallen across the channel.	Clear trees which overhang discharge channel.
SLOPES	Steep narrow valley.	
APPROXIMATE NO. OF HOMES AND POPULATION	Three homes in Jacksonburg Creek flood-plain adjacent to Jacksonburg Road approximately 2.5 miles downstream of dam. Estimated population of 10 persons.	Inundation will increase significantly under breach of dam. Velocity of flow will be very high.

INSTRUMENTATION

VISUAL EXAMINATION	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
MONUMENTATION/SURVEYS	None observed.	
OBSERVATION WELLS	None observed.	
WEIRS	Small weir located downstream of low-level outlet but it is not used for measuring flow.	
PIEZOMETERS	None observed.	
OTHER	None observed.	

CHECK LIST
ENGINEERING DATA
DESIGN, CONSTRUCTION, OPERATION

ITEM	REMARKS
PLAN OF DAM	Plans for this report were developed from visual inspection 6 Nov. 1979 and a set of original design plans by Morris Engineers, Inc., P.O. Box 289, Ledgewood, N.J. 07852 dated 4 January 1972.
REGIONAL VICINITY MAP	Prepared for this report.
CONSTRUCTION HISTORY	Records retrieved from NJDEP revealed design plans from Morris Engineers, Inc., no other records were retrieved.
TYPICAL SECTIONS OF DAM	Sections of dam were developed from design plans by Morris Engineers.
HYDROLOGIC/HYDRAULIC DATA	Original hydrologic/hydraulic was revealed in Morris Engineers design of principal drop spillway.
OUTLETS - PLAN	From Morris Engineers, Inc. 1972 design plans.
- DETAILS	From Morris Engineers, Inc. 1972 design plans.
- CONSTRAINTS	None disclosed.
- DISCHARGE RATINGS	From Morris Engineers computations which accompany dam application 29 June 1972.
RAINFALL/RESERVOIR RECORDS	Reservoir acreages vs. reservoir elevations from letter by Morris Engineers dated 18 September 1972.

ITEM	REMARKS
DESIGN REPORTS	Original design plans from Morris Engineers 4 January 1972.
GEOLOGY REPORTS	None disclosed.
DESIGN COMPUTATIONS HYDROLOGY & HYDRAULICS DAM STABILITY SEEPAGE STUDIES	From Morris Engineers computations which accompany dam application 29 June 1972. None disclosed.
MATERIALS INVESTIGATIONS BORING RECORDS LABORATORY FIELD	Boring log information on design plans by Morris Engineers 4 January 1972.
POST-CONSTRUCTION SURVEYS OF DAM	None disclosed.
BORROW SOURCES	Unknown.

ITEM	REMARKS
MONITORING SERVICES	Unknown.
MODIFICATIONS	Emergency spillway added by owner Kenneth W. Young. Emergency spillway not shown on design plans or in documents retrieved at NJDEP.
HIGH POOL RECORDS	None disclosed.
POST CONSTRUCTION ENGINEERING STUDIES AND REPORTS	None disclosed.
PRIOR ACCIDENTS OR FAILURE OF DAM DESCRIPTION REPORTS	None disclosed.
MAINTENANCE OPERATION RECORDS	None disclosed.

ITEM	REMARKS
SPILLWAY PLAN	Plans and sections for this report were developed from visual inspection 6 November 1979 and a set of original design plans by Morris Engineers dated 4 January 1972.
SECTIONS	
DETAILS	
OPERATING EQUIPMENT	2-12" ductile iron low-level outlet.
PLANS & DETAILS	Plans and details for this report were developed from visual inspection 6 November 1979 and a set of original design plans by Morris Engineers dated 4 January 1972.

CHECK LIST
HYDROLOGIC AND HYDRAULIC DATA
ENGINEERING DATA

DRAINAGE AREA CHARACTERISTICS: 4.5 square miles moderately to steeply sloping
and heavily wooded

ELEVATION TOP NORMAL POOL (STORAGE CAPACITY): 698.2 (NGVD) 172 acre-feet

ELEVATION TOP FLOOD CONTROL POOL (STORAGE CAPACITY): 707.3 (NGVD) 490 acre-feet

ELEVATION MAXIMUM DESIGN POOL: 710.4 (NGVD) ($\frac{1}{2}$ PMF)

ELEVATION TOP DAM: 707.3 (NGVD)

PRINCIPAL DROP SPILLWAY CREST: Rectangular free overflow flat crested concrete drop

- a. Elevation 698.2
- b. Type drop
- c. Circumference 62 feet
- d. Location Spillover 50 feet from south abutment, 8 feet into pond
- e. Number and Type of Gates none

EMERGENCY SPILLWAY CREST: Free overflow excavated channel

- a. Elevation 706.0
- b. Type free overflow
- c. Width 20 feet
- d. Length 410 feet
- e. Location adjacent to south abutment
- f. Number and Type of Gates none

OUTLET WORKS: Low-level outlet

- a. Type 2-12" cast iron pipes
- b. Location 250 feet from north abutment
- c. Entrance Inverts unknown
- d. Exit Inverts 680.2
- e. Emergency Draindown Facilities described above

HYDROMETEOROLOGICAL GAGES: none disclosed

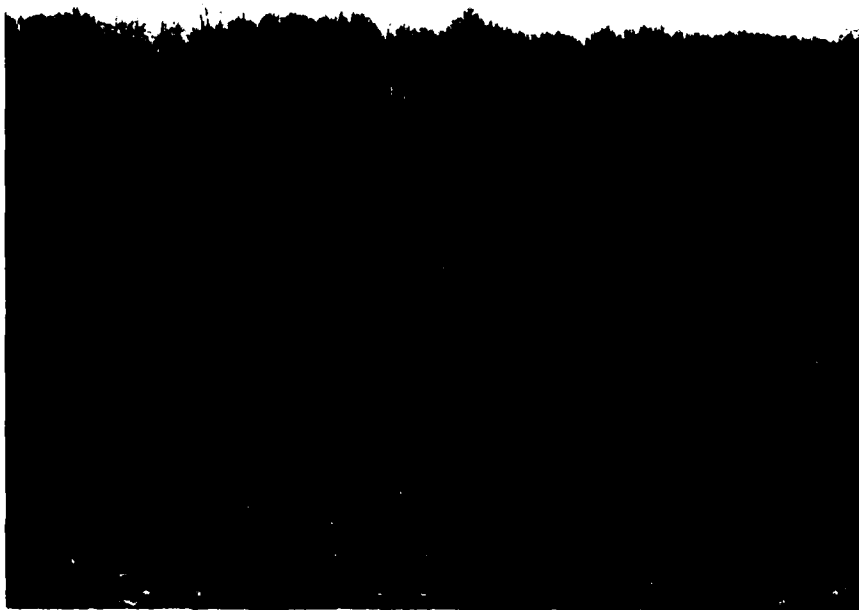
- a. Type
- b. Location
- c. Records

MAXIMUM NON-DAMAGING DISCHARGE: 1150 cfs

APPENDIX 2

PHOTOGRAPHS

YOUNGS POND DAM



6 NOVEMBER 1979

VIEW FROM NORTH ABUTMENT LOOKING ALONG DAM CREST TO SOUTH
ABUTMENT. NOTE FALLEN TREES IN RECENTLY EXCAVATED EMERGENCY
SPILLWAY.



6 NOVEMBER 1979

VIEW FROM SOUTH EDGE OF RESERVOIR LOOKING AT PRINCIPAL
DROP SPILLWAY.

YOUNGS POND DAM

2-1



6 NOVEMBER 1979
VIEW FROM SOUTH EDGE OF RESERVOIR LOOKING AT EMERGENCY
SPILLWAY CHANNEL. NOTE ERODABLE BANK AND FALLEN TREES.



6 NOVEMBER 1979
FROM THE SOUTH EDGE OF RESERVOIR LOOKING AT THE UPSTREAM
FACE OF DAM.



6 NOVEMBER 1979
 VIEW SHOWING THE OUTLET AND STEPPED DISCHARGE CHANNEL
 FROM THE PRINCIPAL DROP SPILLWAY. NOTE BRUSH AND GRASS
 ON DOWNSTREAM FACE OF DAM.



LOW-LEVEL OUTLET PIPES

YOUNGS POND DAM

6 NOVEMBER 1979



6 NOVEMBER 1979
VIEW FROM SOUTH ABUTMENT SHOWING UPSTREAM FACE OF DAM.



6 NOVEMBER 1979
VIEW FROM SOUTH SIDE AND DOWNSTREAM OF DAM SHOWING DOWNSTREAM
FACE OF DAM, SPILLWAY DISCHARGE CHANNEL AND PLANTED PINE TREES
IN FOREGROUND.



6 NOVEMBER 1979
VIEW FROM DAM CREST LOOKING DOWNSTREAM AT STEPPED SPILLWAY
DISCHARGE CHANNEL AND LOW-LEVEL OUTLET CHANNEL.

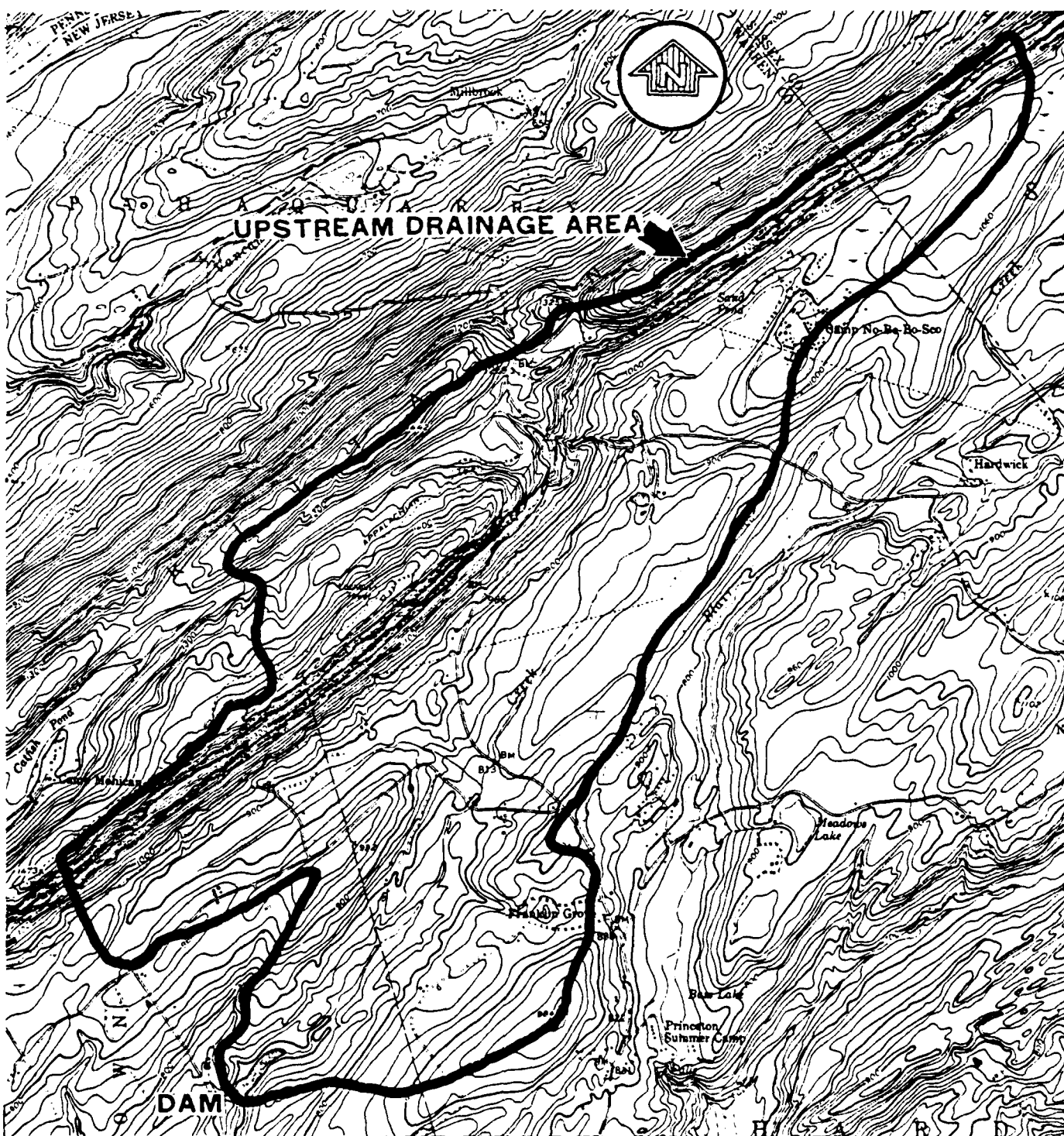


6 NOVEMBER 1979
VIEW FROM DAM CREST LOOKING UPSTREAM AT YOUNGS POND.

YOUNGS POND DAM

APPENDIX 3
HYDROLOGIC COMPUTATIONS

YOUNGS POND DAM



NATIONAL PROGRAM OF INSPECTION OF
NON-FED. DAMS

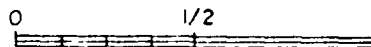
YOUNGS POND DAM
JACKSONBURG, NEW JERSEY
REGIONAL VICINITY MAP
JANUARY 1980

DEPARTMENT OF THE ARMY
PHILADELPHIA DISTRICT, CORPS OF ENGINEERS
PHILADELPHIA, PENNSYLVANIA

ANDERSON-NICHOLS & CO., INC.

CONCORD, NH

SCALE IN MILES



MAP BASED ON U.S.G.S. 7.5 MINUTE QUADRANGLE
SHEET. FLATBROOKVILLE, N.J.-N.Y. 1954.
REVISED 1971.

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 SCALEHYDROLOGIC COMPUTATIONS

NAME: YOUNG POND DAM

LOCATION: WARREN COUNTY, NEW JERSEY

DRAINAGE AREA: 4.5 SQUARE MILES

SURFACE AREA: 14 ACRES

EVALUATION CRITERIA: SIZE: SMALL

HAZARD: HIGH

SPILLWAY DESIGN FLOOD: BASED ON SIZE AND HAZARD CLASSIFICATION

THE SPILLWAY DESIGN FLOOD WILL BE THE 1/2 PMF

(PROBABLE MAXIMUM FLOOD) WITH A PEAK

INFLOW OF 8165 CFS.

JOB NO. 3409-15

YOUNG'S POND DAM

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 SCALETIME OF CONCENTRATIONYOUNG'S POND DAM BASIN

OVERLAND FLOW LENGTH = 6500'

ELEVATION DIFFERENCE FROM WATERSHED DIVIDE TO THE

JACKSONBURG CREEK STREAM THREAD = 520'

SLOPE FOR OVERLAND FLOW = .080 OR 8.0%

ALSO

LENGTH OF STREAMFLOW (JACKSONBURG CREEK) FROM

THE END OF OVERLAND FLOW TO THE INLET = 22000'

ELEVATION DIFFERENCE FROM END OF OVERLAND FLOW

TO THE INLET = 282'

SLOPE FOR THIS SECTION OF JACKSONBURG CREEK = .0128 OR 1.3%

ALSO

THE REPRESENTATIVE CROSS SECTION FOR THE BASIN WAS

DRAWN TO DETERMINE AN APPROXIMATE STREAMFLOW

VELOCITY AT A WATER DEPTH OF 6'

JOB NO. 3409-15

YOUNG'S POND DAM

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. SCALETIME OF CONCENTRATION (CONT.)

REPRESENTATIVE SECTION (CONT.)

AREA OF CROSS SECTION = 40 SQ. FT.

WETTED PERIMETER = 22.1 FT.

HYDRAULIC RADIUS = 1.8 FT.

CHANNEL "n" = .055

OVERBANK "n" = .075

$$V = \frac{1.49}{n} (R)^{2/3} (S)^{1/2}$$

$$V = 4.5 \text{ fps}$$

THE TIME OF CONCENTRATION FOR STREAMFLOW OF

$$\text{JACKSONBURG CREEK} = \frac{22000}{4.5(60)} = 81.5 \text{ MINUTES}$$

JOB NO. 3409-15

YOUNG'S POND DAM

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. SCALETIME OF CONCENTRATION (CONT.)THREE METHODS FOR DETERMINING T_c ARE AVERAGEDWESTON

$$L = 6500'$$

$$b = .080$$

$$V = 1.8 \text{ fps}$$

$$\frac{6500}{1.8(60)} = 60.2 \text{ FOR } T_c \text{ OVERLAND} + 81.5 \text{ MIN} = 2.4 \text{ HOURS}$$

$$T_c = 2.4 \text{ HRS.}$$

HERBY

$$T_c = 0.83 \left(\frac{NL}{Vb} \right)^{0.467}$$

$$T_c = .83 \left(\frac{.6(6500)}{V(.080)} \right) = 71.1 \text{ MIN. FOR } T_c \text{ OVERLAND} + 81.5 \text{ MIN} = 152.6$$

$$T_c = 2.5 \text{ HRS.}$$

JOB NO. 3409-15

YOUNG'S POND DAM

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. SCALETIME OF CONCENTRATION (CONT.)DESIGN OF SMALL DAMS

USING TEXAS HIGHWAY CHARTS FOR VELOCITIES

CHANNEL VELOCITY = 3.0 fps , OVERLAND VELOCITY = 3.0 fps

LENGTH (OVERLAND) = 6500'

LENGTH (STREAM) = 22000'

$$T_c = \frac{28500}{3} = 9500 \text{ SEC.} = 158 \text{ MIN.}$$

$$T_c = 2.6 \text{ HRS.}$$

AVERAGE T_c FOR YOUNG'S POND BASIN = 2.5 HOURS T_L FOR YOUNG'S POND BASIN = 1.5 HOURS

JOB NO. 3409-15YOUNG POND DAMSQUARES 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△ STORAGE - ELEVATION DETERMINATION

ELEVATION FEET	AREA ACRES	Δ H FT.	AVG. AREA ACRES	Δ STORAGE ACRE-FT.	STORAGE ACRE-FT.
698.2	14				172
		2	15	30	
700.2	16				202
		2	17	34	
702.2	18				236
		1.4	19	27	
703.6	20				263

△△ MAXIMUM RESERVOIR DEPTH @ 698.2 = 19'

AVERAGE RESERVOIR DEPTH @ 698.2 = 12'

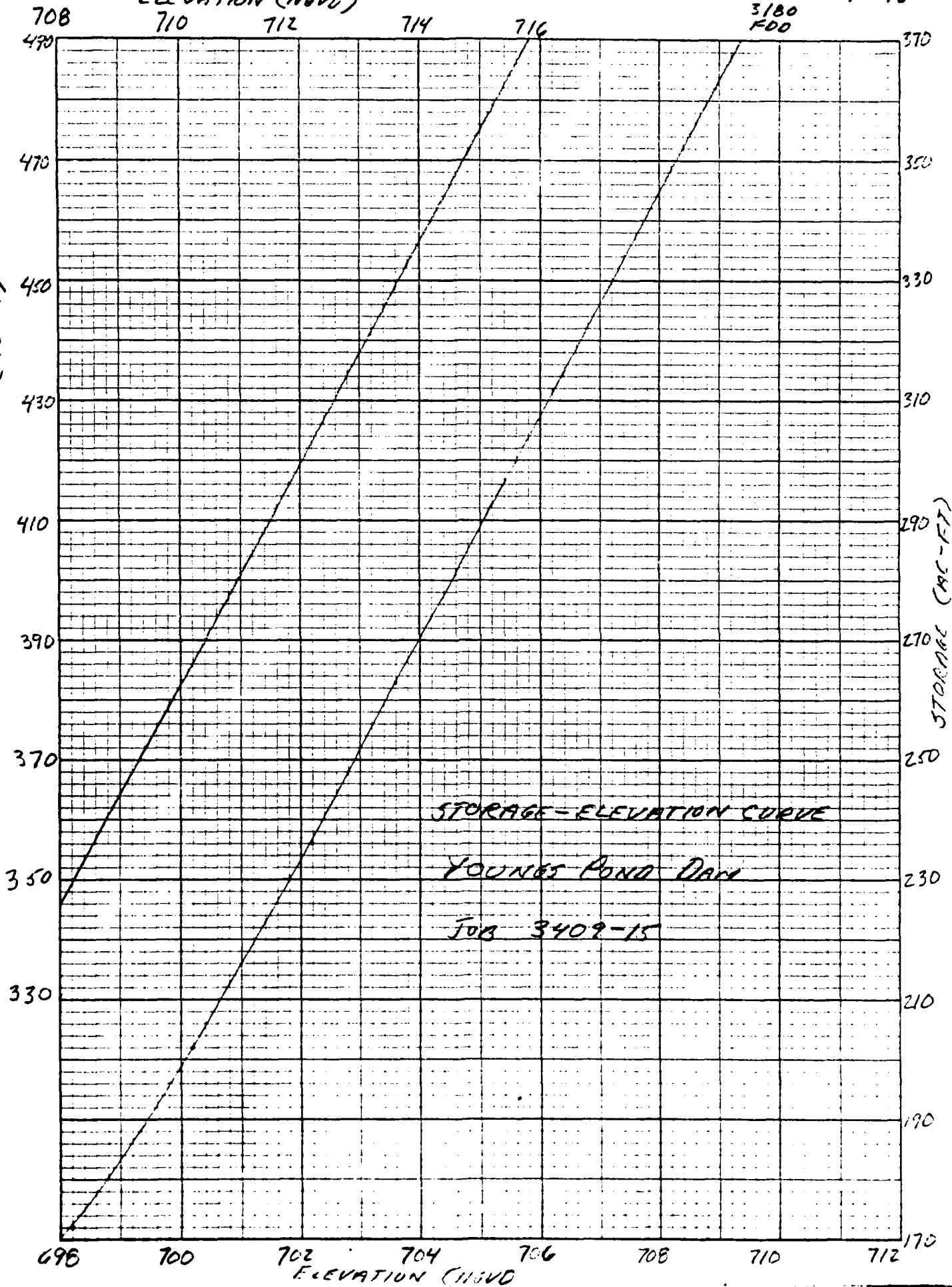
△ FROM LETTER BY MORRIS ENGINEERS INC. , 18 SEPT. 1972

△△ FROM "REPORT ON DAM APPLICATION , 29 JUNE 1972

STORAGE (AC-FT)

ELEVATION (NGVD)

SHEET NO. 70416
3180
FDD



JOB NO. 3409-15

YOUNGS POND DAM

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

SPILLWAY CAPACITY

YOUNGS POND DAM HAS TWO UNCONTROLLED SPILLWAYS. THE PRINCIPAL DROP SPILLWAY CAPACITY IS CONTROLLED BY WEIR DISCHARGE UP TO ELEVATION 700.8. ABOVE 700.8 CAPACITY IS CONTROLLED BY THE 8 X 7 FOOT OUTLET CONDUIT ENTRANCE (ORIFICE FLOW). THE SLOPE OF THE OUTLET CONDUIT IS GREATER THAN CRITICAL FOR ALL DEPTHES THUS SURFACE FRICTION IS NOT A FACTOR. THE CALCULATIONS BELOW DO NOT AGREE WITH PRINCIPAL SPILLWAY ANALYSIS BY MORRIS ENGINEERS INC. WHERE ONLY WEIR FLOW WAS CONSIDERED.

16	ELEVATION	PRINCIPAL SPILLWAY						EMERGENCY SPILLWAY			DAM CREST			TOTAL Q	
17	NGVD	WEIR FLOW		ORIFICE FLOW				SPILLWAY			CREST			Q	
18		H	Q	D	HW	HW/D	Q/Q	H	L	Q	H	L	Q	(CFS)	
19															
20	695.2	0	0	7	11.6	1.66	-	-						0	
21	699.2	1	190	7	12.6	1.8	88	704						190	
22	700.2	2	540	7	13.6	1.94	95	760						540	
23	701.2	3	1000	7	14.6	2.09	101	806*						808	
24	702.2	4	1540	7	15.6	2.22	105	840						840	
25	703.2	5	2150	7	16.6	2.37	110	880						880	
26	704.2	6	2825	7	17.6	2.51	115	920						920	
27	705.2	7	3560	7	18.6	2.66	119	952						952	
28	706.0	7.8	4190	7	19.4	2.77	122	976	0	0	0			976	
29	707.0	8.8	5020	7	20.4	2.91	126	1010	1	28	78			1068	
30	707.3	9.1	5260	7	20.7	2.96	128	1025	13	30	125	0	385	0	1150
31	708.0	9.8	5710	7	21.4	3.06	130	1040	2	30	240	17	405	615	1690
32	709.0	10.8	6320	7	22.4	3.2	133	1065	3	36	525	1.7	410	2305	3955
33	710.0	11.8	7790	7	23.4	3.34	137	1100	4	36	810	2.7	470	4845	6755
34	711.0	12.8	8800	7	24.4	3.49	140	1120	5	36	1130	3.7	420	7770	10020
35	712.0	13.8		7	25.4	3.63	144	1150	6	36	1480	4.7	420	11130	13760
36	713.0	14.8		7	26.4	3.77	149	1190	7	36	1810	5.7	420	14830	17920
37															

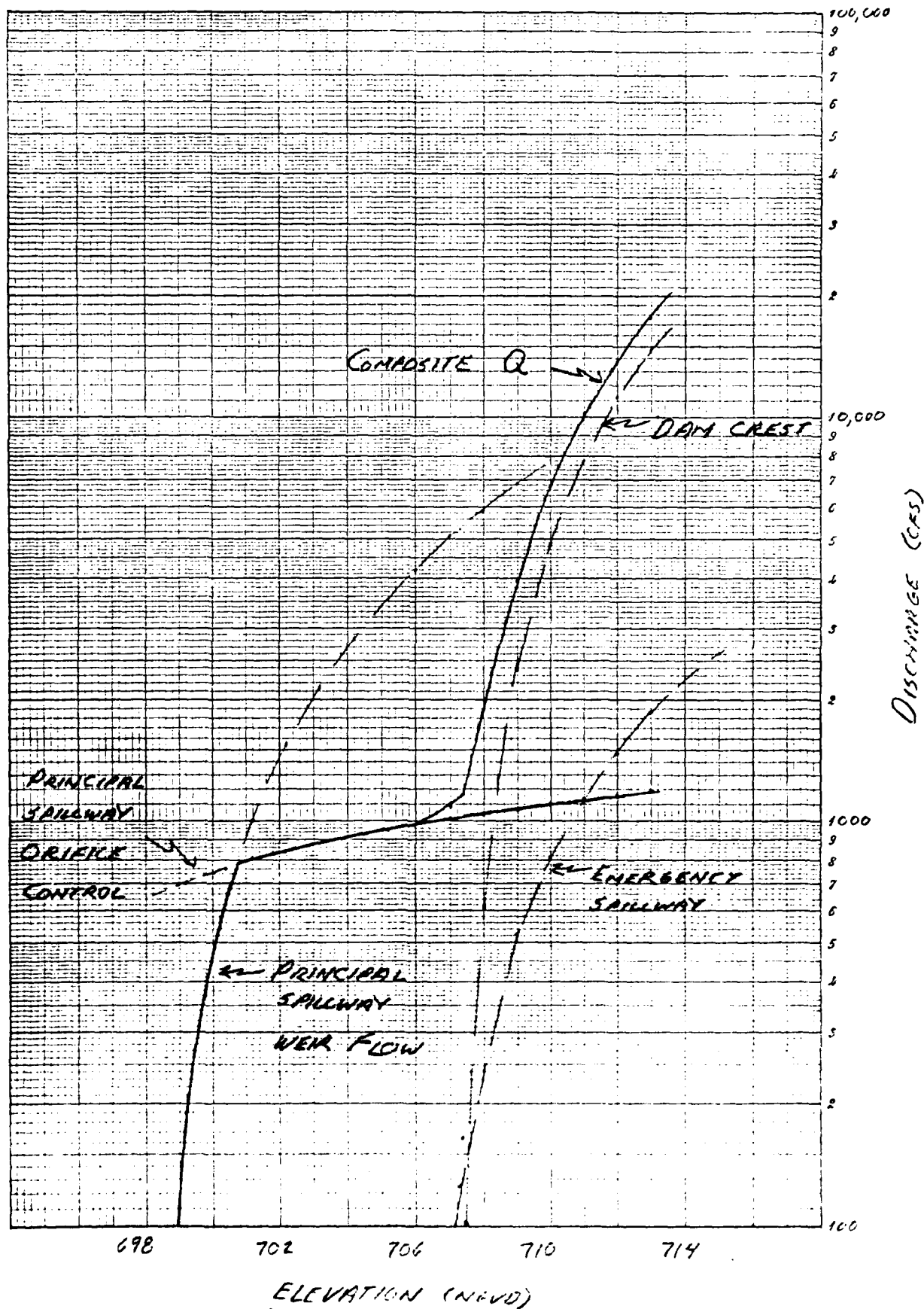
L=62' C=3.1

C=2.8

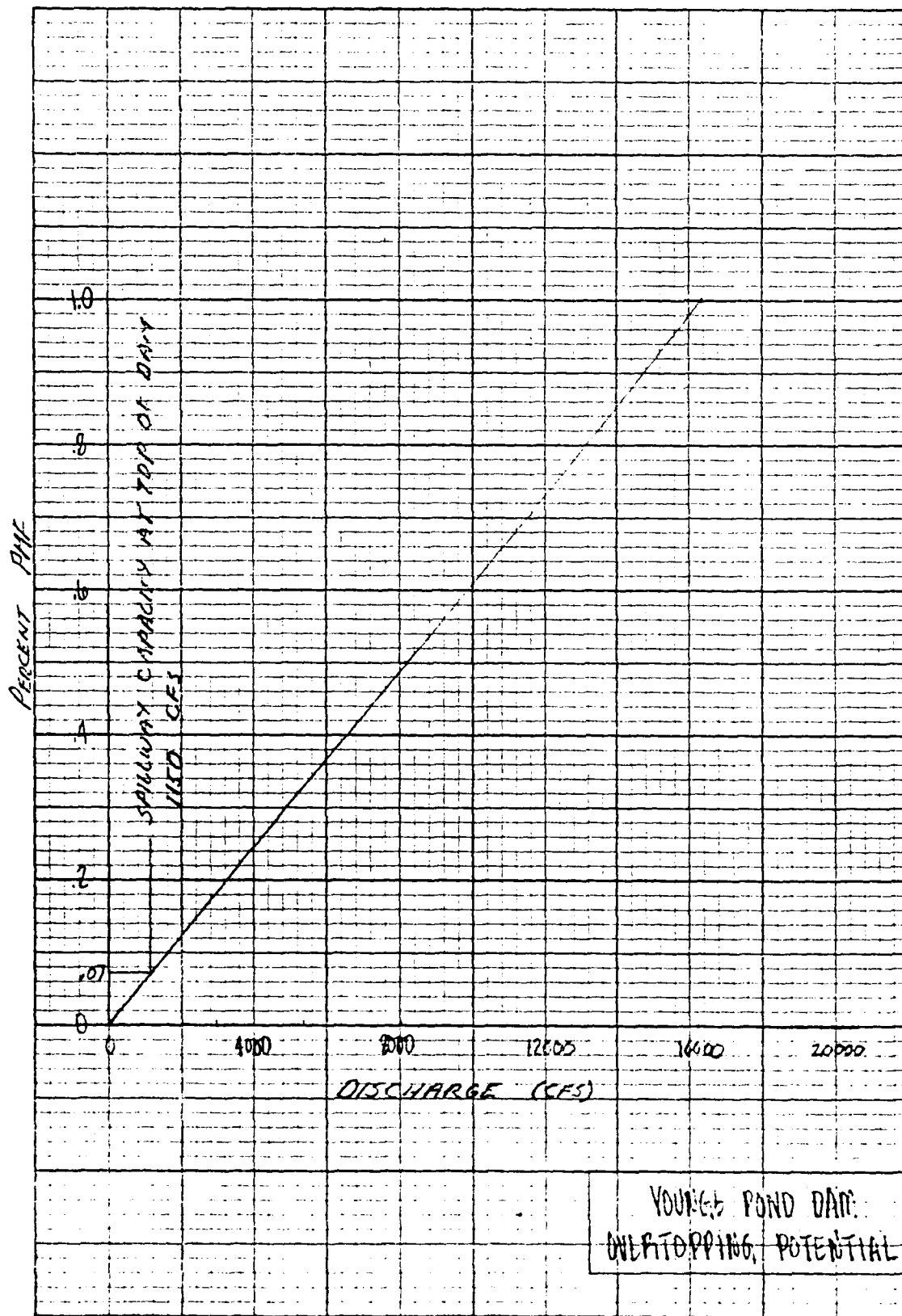
C=2.6

*Orifice flow control begins - Reference FMA Hydraulic Eng. Circ. No 5 Chart 2

SHEET No. 9/16
3/80
FDD



SHT 10 OF 16
DATE: 1/1/80
BY: KJS
CHKD: FCO



JOB NO. 3409-15

YOUNG'S POND DAM

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 SCALEDRAWDOWN CALCULATIONS

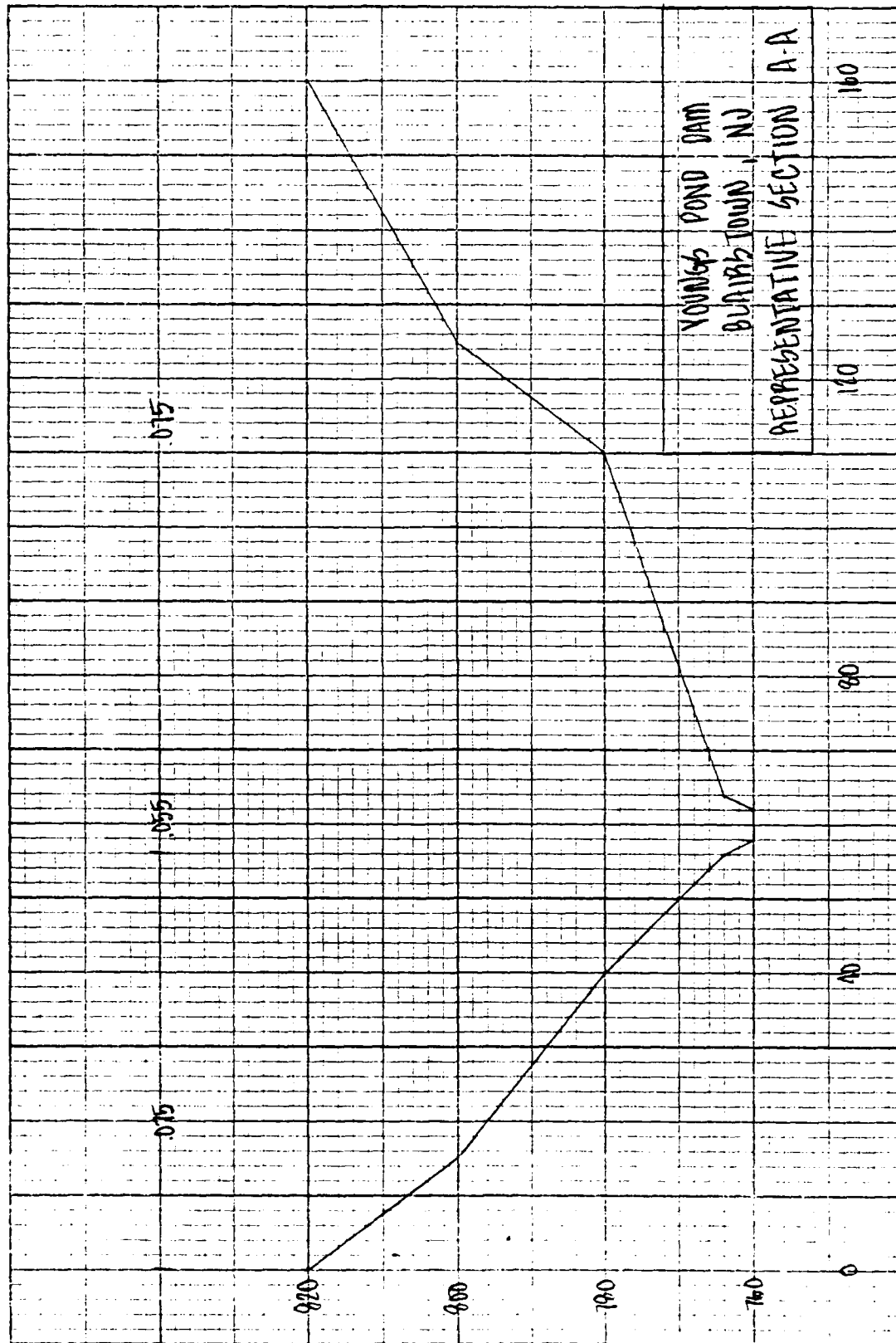
CALCULATIONS ASSUME ① NO SIGNIFICANT INFLOW ② TWO - 12" DUCTILE IRON LOW LEVEL OUTLET TO BE FULLY OPERABLE ③ $Q_p = C_p (H^{1/2})$
④ ACRE-FT./DAY = $1.9835 \cdot (\text{AVG. } Q)$ ⑤ DAYS = $\Delta \text{STOR.} / \text{AC-FT./DAY}$

ELEVATION'	STORAGE ACRE-FT.	Δ STOR. AC.-FT.	H FT.	Q CFS	AVG. Q	AC-FT/ DAY	DAYS
698	172		16	18.0			
696	151	21	14	17.1	17.6	35.2	.6
694	129	22	12	15.9	16.5	33.0	.7
692	108	21	10	14.5	15.2	30.4	.7
690	86	22	8	13.0	13.8	27.6	.8
688	64	22	6	11.2	12.1	24.2	.9
686	43	21	4	9.2	10.2	20.4	1.0
684	22	21	2	6.5	7.9	15.8	1.3
682	0	22	0	0	3.3	6.6	3.3

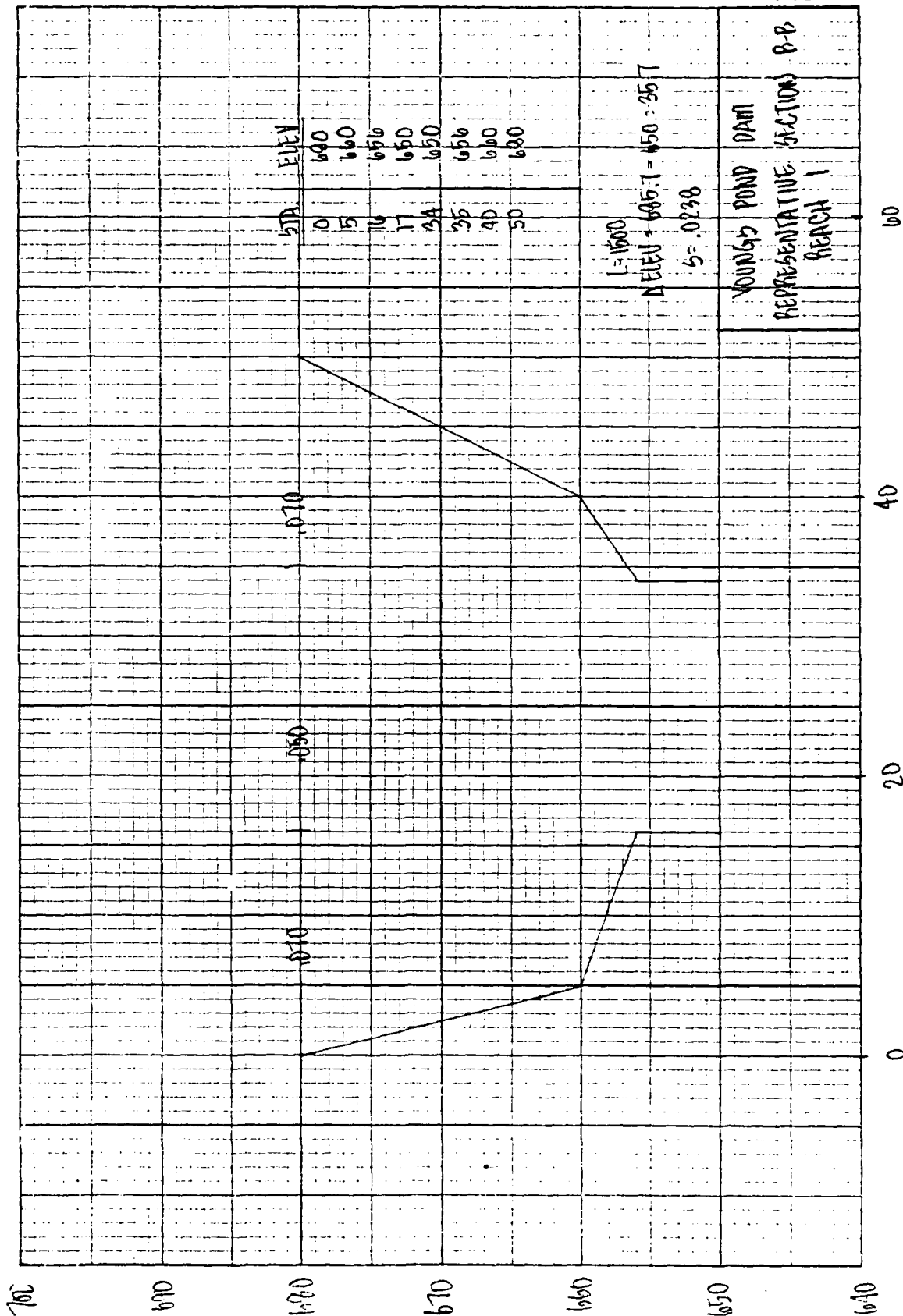
9.3 DAYS

$$C_p = 2.29 (2) = 4.58$$

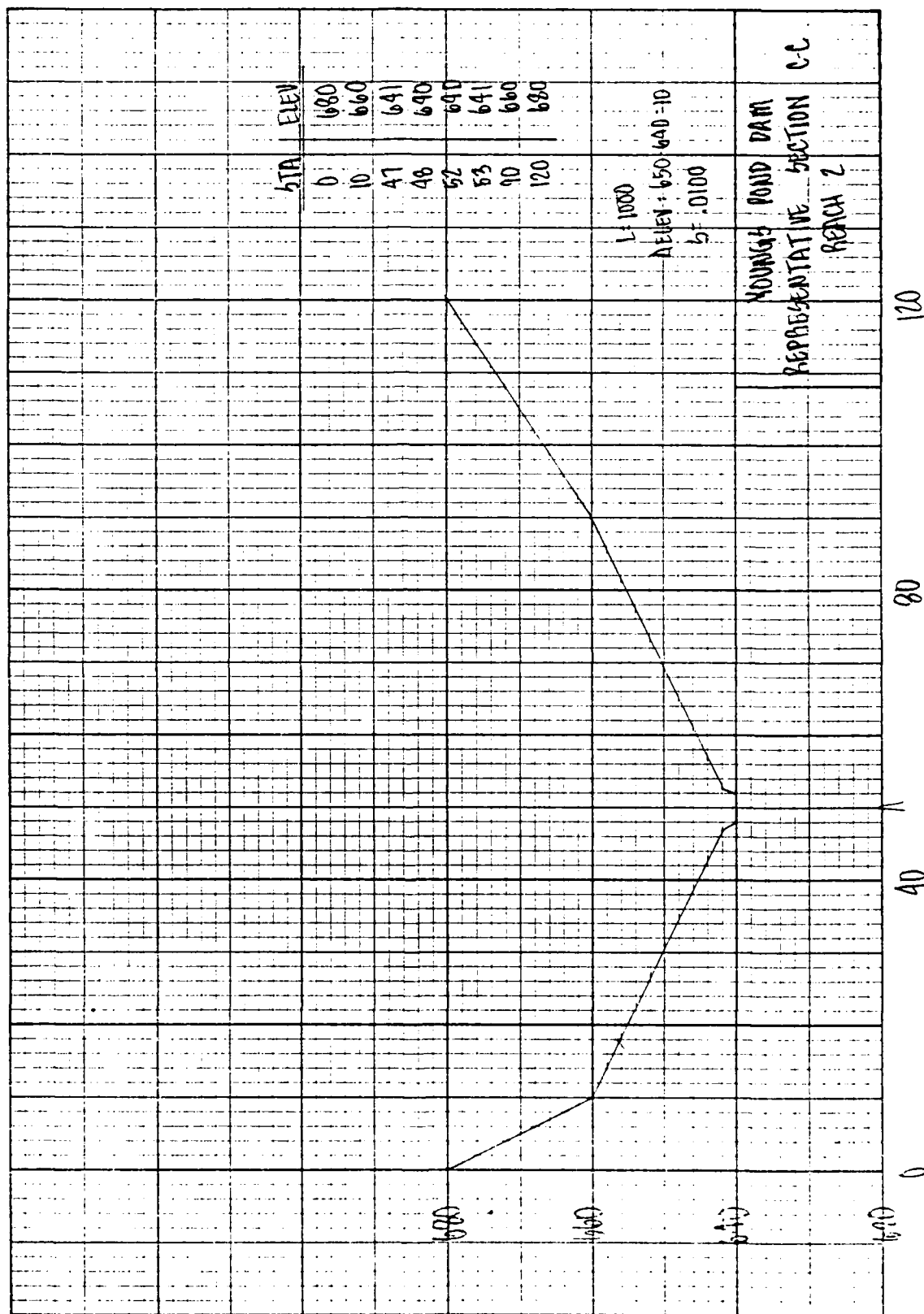
SHT. 12 OF 16
DATE: 11/80
BY: KJB
CHKD: FDD



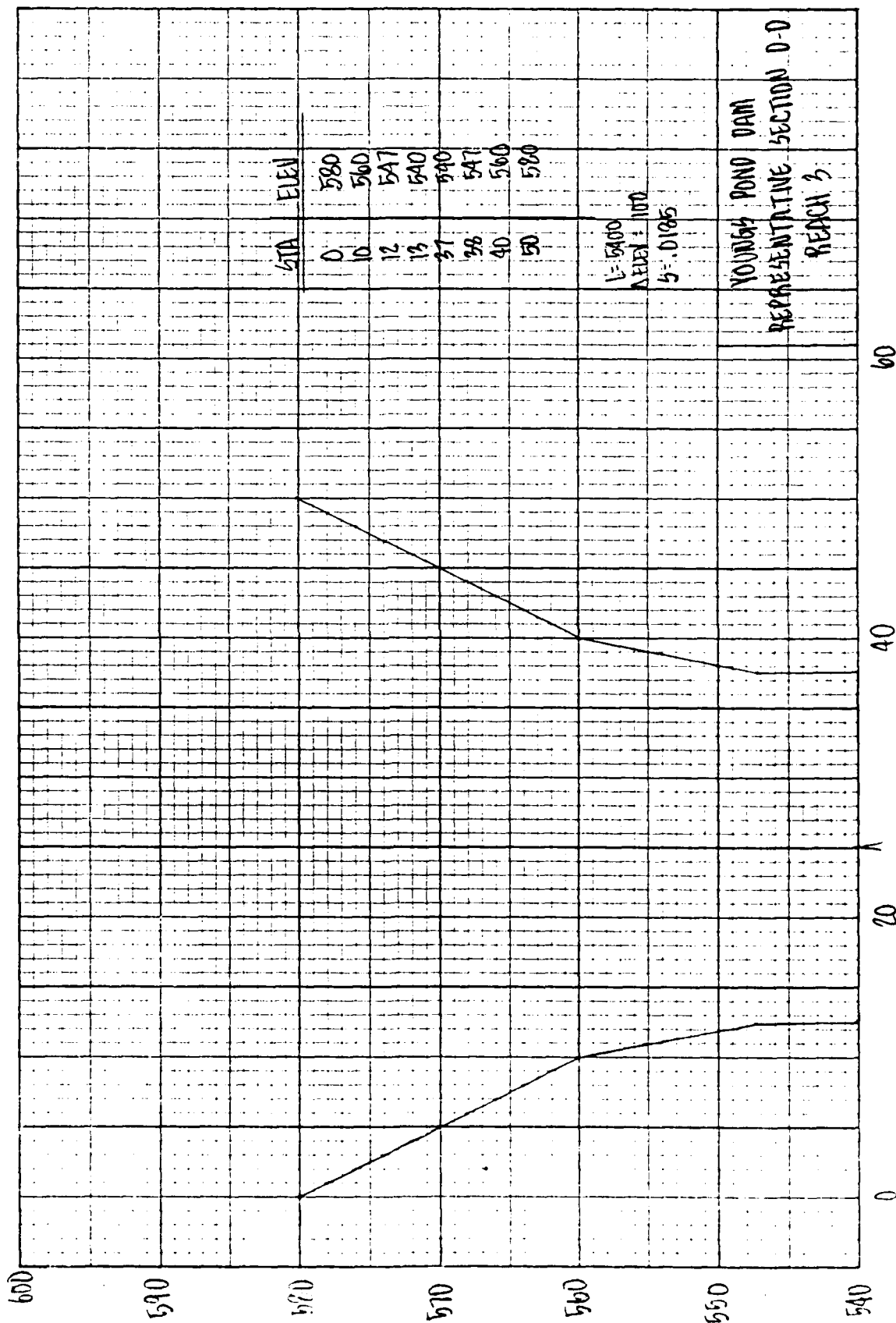
SHT. 13 OF 16
DATE 1/1/60
BY KJS
CHKD FOD



SHT. 14 OF 16
DATE: 11/20
BY: KJS
CHKD: FSD



SHT. 15 OF 16
DATE: 1/80
BY: KJB
CHKD: FDD



ELEV

STA

420
430
440
450
460
470

0
10
16
17
41
42
50
90

L=5800
 $\Delta \text{ELEV} = 150$
 $S = .0315$

APPROXIMATE WATER SURFACE FOR
.20 PPF CONDITIONS

BREACH

HOUSE #1

HOUSE #2

HOUSE #3

NON-BREACH

YOUNG'S POND DAM
REPRESENTATIVE SECTION E-E
BEACH A

HEC-1 INPUT/OUTPUT
OVERTOPPING AND BREACH ANALYSIS

YOUNGS POND DAM

AT YOUNG'S POND DAM CRYPTOTYPING AND BREACH ANALYSIS • V. STUART ANDERSON-NICHOLS •

[illegible]

11
 12
 13
 14
 15
 16
 17
 18
 19

V7	SP.	547.	40.	560.	50.	580.	1
1	1	A1					1
11	CHANNEL ROUTING	W00 PULS.	THIRD ROAD CROSSING				1
Y	1						1
Y1	1						1
Y1	.070	.050	.070	390.	420.	3800.	0.0395
Y7	0.	420.	10.	400.	16.	390.	17.
Y7	42.	290.	50.	400.	70.	420.	
K	00						

390.

41.

390.

PREVIEW OF SEQUENCE OF STEEP NETWORK CALCULATIONS

PUNOFF HYDROGRAPH AT A1
 ROUTE HYDROGRAPH TO A2
 ROUTE HYDROGRAPH TO A3
 ROUTE HYDROGRAPH TO A4
 ROUTE HYDROGRAPH TO A5
 ROUTE HYDROGRAPH TO A6

END OF NETWORK

0114 0876 • 90/02/21.
0115 13.40.21.

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MULTI-PLAN ANALYSES TO BE PERFORMED
PLAN= 2 NRATIO= 3 (NRATIO= 1
      .50 1.00
PTIO:- .20

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.....

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.....

SUP-AREA RUNOFF COMPUTATION

.....

YOUNGS POND INFLU HYDROGRAPH

.....

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JFRT	INAME	ISTAGE	IAUTG
AJ	0	0	0	0	0	I	0	0

HYDROGRAPH DATA									
IMYC	IUNC	TYPEA	SNAP	IRSDA	CPSC	RATIO	ISNOW	ISAVE	LOCAL
1	2	4.50	0.00	4.50	.00	0.000	0	1	0

	PFC	PC	R12	R4R	R72	RSC
SFFI	0.00	113.00	123.00	0.00	0.00	0.00
PRECIP DATA						
	0.00	113.00	123.00	0.00	0.00	0.00

LOSS DATA										
FEET	STARR	PLINK	RTIO	ERAIN	STPKS	RTIOK	STPIL	CNSTL	ALSMY	RTIPT
2	0.00	0.00	1.00	0.00	0.00	1.00	1.00	0.00	0.00	0.00

UNIT HYDROGRAPH DATA
TC= 0.70 LAG= 1.50

```

PRECISION DATA
STEP= 1.00  QRCSE= 7.00  E10E= 1.00

```

[illegible]

1.

TOP-OF-TERRIOR FLOW

NO. OF	PR. IN	PERIOD	RATE	EXCS	LOSS	COMP	NO. OF	PR. IN	PERIOD	RATE	EXCS	LOSS	COMP
1.01	1.01	1	.02	0.00	.02	14.	1.01	15.10	91	.52	.51	.02	7027.
1.01	1.01	2	.02	0.00	.02	14.	1.01	15.20	92	.87	.86	.02	7760.
1.01	1.01	3	.02	0.00	.02	14.	1.01	15.30	93	1.57	1.56	.02	7740.
1.01	1.01	4	.02	0.00	.02	14.	1.01	15.40	94	3.03	3.01	.02	8224.
1.01	1.01	5	.02	0.00	.02	14.	1.01	15.50	95	1.13	1.12	.02	9135.
1.01	1.01	6	.02	0.00	.02	14.	1.01	16.00	96	.70	.69	.02	10130.
1.01	1.01	7	.02	0.00	.02	14.	1.01	16.10	97	.54	.52	.02	11250.
1.01	1.01	8	.02	0.00	.02	14.	1.01	16.20	98	.54	.52	.02	12700.
1.01	1.01	9	.02	0.00	.02	14.	1.01	16.30	99	.54	.52	.02	14100.
1.01	1.01	10	.02	0.00	.02	14.	1.01	16.40	100	.54	.52	.02	15291.
1.01	1.01	11	.02	0.00	.02	14.	1.01	16.50	101	.54	.52	.02	16017.
1.01	1.01	12	.02	0.00	.02	14.	1.01	17.00	102	.54	.52	.02	16329.
1.01	1.01	13	.02	0.00	.02	14.	1.01	17.10	103	.42	.40	.02	16220.
1.01	1.01	14	.02	0.00	.02	14.	1.01	17.20	104	.42	.40	.02	16017.
1.01	1.01	15	.02	0.00	.02	14.	1.01	17.30	105	.42	.40	.02	15400.
1.01	1.01	16	.02	0.00	.02	14.	1.01	17.40	106	.42	.40	.02	14910.
1.01	1.01	17	.02	0.00	.02	14.	1.01	17.50	107	.42	.40	.02	13907.
1.01	1.01	18	.02	0.00	.02	14.	1.01	18.00	108	.42	.40	.02	13033.
1.01	1.01	19	.02	0.00	.02	14.	1.01	18.10	109	.03	.01	.02	12118.
1.01	1.01	20	.02	0.00	.02	14.	1.01	18.20	110	.03	.01	.02	11320.
1.01	1.01	21	.02	0.00	.02	14.	1.01	18.30	111	.03	.01	.02	10570.
1.01	1.01	22	.02	0.00	.02	14.	1.01	18.40	112	.03	.01	.02	9854.
1.01	1.01	23	.02	0.00	.02	14.	1.01	18.50	113	.03	.01	.02	9125.
1.01	1.01	24	.02	0.00	.02	14.	1.01	19.00	114	.03	.01	.02	8331.
1.01	1.01	25	.02	0.00	.02	14.	1.01	19.10	115	.03	.01	.02	7508.
1.01	1.01	26	.02	0.00	.02	14.	1.01	19.20	116	.03	.01	.02	6777.
1.01	1.01	27	.02	0.00	.02	14.	1.01	19.30	117	.03	.01	.02	5989.
1.01	1.01	28	.02	0.00	.02	14.	1.01	19.40	118	.03	.01	.02	5138.
1.01	1.01	29	.02	0.00	.02	14.	1.01	19.50	119	.03	.01	.02	4445.
1.01	1.01	30	.02	0.00	.02	14.	1.01	20.00	120	.03	.01	.02	3814.
1.01	1.01	31	.02	0.00	.02	14.	1.01	20.10	121	.03	.01	.02	3251.
1.01	1.01	32	.02	0.00	.02	14.	1.01	20.20	122	.03	.01	.02	2763.
1.01	1.01	33	.02	0.00	.02	14.	1.01	20.30	123	.03	.01	.02	2357.
1.01	1.01	34	.02	0.00	.02	14.	1.01	20.40	124	.03	.01	.02	2025.
1.01	1.01	35	.02	0.00	.02	14.	1.01	20.50	125	.03	.01	.02	1747.
1.01	1.01	36	.02	0.00	.02	14.	1.01	21.00	126	.03	.01	.02	1514.
1.01	1.01	37	.02	0.00	.02	14.	1.01	21.10	127	.03	.01	.02	1318.
1.01	1.01	38	.02	0.00	.02	14.	1.01	21.20	128	.03	.01	.02	1147.
1.01	1.01	39	.02	0.00	.02	14.	1.01	21.30	129	.03	.01	.02	1004.
1.01	1.01	40	.02	0.00	.02	14.	1.01	21.40	130	.03	.01	.02	884.
1.01	1.01	41	.02	0.00	.02	14.	1.01	21.50	131	.03	.01	.02	785.
1.01	1.01	42	.02	0.00	.02	14.	1.01	22.00	132	.03	.01	.02	702.
1.01	1.01	43	.02	0.00	.02	14.	1.01	22.10	133	.03	.01	.02	631.
1.01	1.01	44	.02	0.00	.02	14.	1.01	22.20	134	.03	.01	.02	570.
1.01	1.01	45	.02	0.00	.02	14.	1.01	22.30	135	.03	.01	.02	518.
1.01	1.01	46	.02	0.00	.02	14.	1.01	22.40	136	.03	.01	.02	473.
1.01	1.01	47	.02	0.00	.02	14.	1.01	22.50	137	.03	.01	.02	434.
1.01	1.01	48	.02	0.00	.02	14.	1.01	23.00	138	.03	.01	.02	400.
1.01	1.01	49	.02	0.00	.02	14.	1.01	23.10	139	.03	.01	.02	371.
1.01	1.01	50	.02	0.00	.02	14.	1.01	23.20	140	.03	.01	.02	346.
1.01	1.01	51	.02	0.00	.02	14.	1.01	23.30	141	.03	.01	.02	327.
1.01	1.01	52	.02	0.00	.02	14.	1.01	23.40	142	.03	.01	.02	313.
1.01	1.01	53	.02	0.00	.02	14.	1.01	23.50	143	.03	.01	.02	302.
1.01	1.01	54	.02	0.00	.02	14.	1.01	24.00	144	.03	.01	.02	293.
1.01	1.01	55	.02	0.00	.02	14.	1.01	24.10	145	.03	.01	.02	285.

HYDROGRAPH AT STA A1 FOR FLAS 1, R11C 2									
	7.	7.	7.	7.	7.	7.	7.	7.	7.
170.	7.	7.	7.	7.	7.	7.	7.	7.	7.
320.	7.	7.	7.	7.	7.	7.	7.	7.	7.
307.	7.	7.	7.	7.	7.	7.	7.	7.	7.
1033.	7.	7.	7.	7.	7.	7.	7.	7.	7.
3513.	8.	10.	10.	20.	20.	20.	20.	20.	20.
0000.	105.	219.	240.	259.	274.	287.	297.	306.	313.
0200.	325.	330.	333.	336.	339.	341.	343.	345.	346.
1077.	348.	357.	362.	369.	374.	379.	384.	389.	394.
1000.	1674.	1916.	2152.	2380.	2598.	2798.	2984.	3164.	3342.
1000.	3604.	3870.	4162.	4567.	5065.	5675.	6384.	7091.	7647.
1000.	8165.	8800.	9485.	10215.	11000.	11845.	12750.	13715.	14750.
1000.	4927.	4562.	4166.	3754.	3338.	2920.	2509.	2104.	1707.
1000.	1381.	1170.	1013.	873.	757.	658.	574.	502.	442.
1000.	351.	316.	285.	259.	236.	217.	200.	186.	173.
1000.	157.	151.	146.	142.	138.	133.	128.	121.	112.
1000.	793.	73.	73.	64.	55.	48.	41.	35.	31.
1000.	24.	21.	19.	17.	15.	14.	13.	12.	11.
1000.	10.	9.	9.	8.	8.	8.	8.	8.	7.

HYDROGRAPH AT STA A1 FOR FLAS 1, R11C 2				
PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
P165.	42294	1464.	1173.	211071.
231.	1404	41.	33.	5977.
	10.19	12.11	12.12	12.12
	258.82	307.51	307.85	307.85
	2049.	2904.	2907.	2907.
	3015.	3582.	3586.	3586.

CFS
CFS
INCHES
AC-FT
THOUS CU M

HYDROGRAPH ROUTING

ROUTE HYDROGRAPH THROUGH YOUNGS POND

ISTAD	ICOMP	IECON	ITAPF	JPLY	JPAT	INAME	ISTAGE	TAUTO
A2	1	0	0	0	0	1	0	0

ALL PLANS HAVE SAME

ROUTING DATA

PLCSS	CLCSS	AVG	IRCS	ISAKE	IOPT	IFMP	LSIR
0.0	0.000	0.00	1	1	0	0	0

PTCS	NSDOL	LAG	AMSKK	X	TSK	STORA	ISPPAT
1	0	0	0.000	0.000	0.000	172.	-1

ITAPF	605.20	707.30	5.00	1150.00	700.20	701.20	702.20	703.20	704.20	705.20	706.00	707.00
					700.00	710.00	711.00	712.00	713.00			
					500.00	600.00	640.00	680.00	720.00	752.00	786.00	807.00
					3955.00	6755.00	10020.00	13760.00	17920.00			

CAPACITY

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COLLEGE PARK, MARYLAND

SUBJECT: HUMAN RIGHTS

CUTLACE									
1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
1.	6.	6.	6.	7.	7.	7.	7.	7.	7.
2.	7.	7.	7.	7.	7.	7.	7.	7.	7.
3.	7.	7.	7.	7.	7.	7.	7.	7.	7.
4.	7.	7.	7.	7.	7.	7.	7.	7.	7.
5.	7.	7.	7.	7.	7.	7.	7.	7.	7.
6.	7.	7.	7.	7.	7.	7.	7.	7.	7.
7.	7.	7.	7.	7.	7.	7.	7.	7.	7.
8.	7.	7.	7.	7.	7.	7.	7.	7.	7.
9.	7.	7.	7.	7.	7.	7.	7.	7.	7.
10.	7.	7.	7.	7.	7.	7.	7.	7.	7.
11.	7.	7.	7.	7.	7.	7.	7.	7.	7.
12.	7.	7.	7.	7.	7.	7.	7.	7.	7.
13.	7.	7.	7.	7.	7.	7.	7.	7.	7.
14.	7.	7.	7.	7.	7.	7.	7.	7.	7.
15.	7.	7.	7.	7.	7.	7.	7.	7.	7.
16.	7.	7.	7.	7.	7.	7.	7.	7.	7.
17.	7.	7.	7.	7.	7.	7.	7.	7.	7.
18.	7.	7.	7.	7.	7.	7.	7.	7.	7.
19.	7.	7.	7.	7.	7.	7.	7.	7.	7.
20.	7.	7.	7.	7.	7.	7.	7.	7.	7.
21.	7.	7.	7.	7.	7.	7.	7.	7.	7.
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46.	7.	7.	7.	7.	7.	7.	7.	7.	7.
47.	7.	7.	7.	7.	7.	7.	7.	7.	7.
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51.	7.	7.	7.	7.	7.	7.	7.	7.	7.
52.	7.	7.	7.	7.	7.	7.	7.	7.	7.
53.	7.	7.	7.	7.	7.	7.	7.	7.	7.
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55.	7.	7.	7.	7.	7.	7.	7.	7.	7.
56.	7.	7.	7.	7.	7.	7.	7.	7.	7.
57.	7.	7.	7.	7.	7.	7.	7.	7.	7.
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59.	7.	7.	7.	7.	7.	7.	7.	7.	7.
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63.	7.	7.	7.	7.	7.	7.	7.	7.	7.
64.	7.	7.	7.	7.	7.	7.	7.	7.	7.
65.	7.	7.	7.	7.	7.	7.	7.	7.	7.
66.	7.	7.	7.	7.	7.	7.	7.	7.	7.
67.	7.	7.	7.	7.	7.	7.	7.	7.	7.
68.	7.	7.	7.	7.	7.	7.	7.	7.	7.
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74.	7.	7.	7.	7.	7.	7.	7.	7.	7.
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81.	7.	7.	7.	7.	7.	7.	7.	7.	7.
82.	7.	7.	7.	7.	7.	7.	7.	7.	7.
83.	7.	7.	7.	7.	7.	7.	7.	7.	7.
84.	7.	7.	7.	7.	7.	7.	7.	7.	7.
85.	7.	7.	7.	7.	7.	7.	7.	7.	7.
86.	7.	7.	7.	7.	7.	7.	7.	7.	7.
87.	7.	7.	7.	7.	7.	7.	7.	7.	7.
88.	7.	7.	7.	7.	7.	7.	7.	7.	7.
89.	7.	7.	7.	7.	7.	7.	7.	7.	7.
90.	7.	7.	7.	7.	7.	7.	7.	7.	7.
91.	7.	7.	7.	7.	7.	7.	7.	7.	7.
92.	7.	7.	7.	7.	7.	7.	7.	7.	7.
93.	7.	7.	7.	7.	7.	7.	7.	7.	7.
94.	7.	7.	7.	7.	7.	7.	7.	7.	7.
95.	7.	7.	7.	7.	7.	7.	7.	7.	7.
96.	7.	7.	7.	7.	7.	7.	7.	7.	7.
97.	7.	7.	7.	7.	7.	7.	7.	7.	7.
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99.	7.	7.	7.	7.	7.	7.	7.	7.	7.
100.	7.	7.	7.	7.	7.	7.	7.	7.	7.
101.	7.	7.	7.	7.	7.	7.	7.	7.	7.
102.	7.	7.	7.	7.	7.	7.	7.	7.	7.
103.	7.	7.	7.	7.	7.	7.	7.	7.	7.
104.	7.	7.	7.	7.	7.	7.	7.	7.	7.
105.	7.	7.	7.	7.	7.	7.	7.	7.	7.
106.	7.	7.	7.	7.	7.	7.	7.	7.	7.
107.	7.	7.	7.	7.	7.	7.	7.	7.	7.
108.	7.	7.	7.	7.	7.	7.	7.	7.	7.
109.	7.	7.	7.	7.	7.	7.	7.	7.	7.
110.	7.	7.	7.	7.	7.	7.	7.	7.	7.
111.	7.	7.	7.	7.	7.	7.	7.	7.	7.
112.	7.	7.	7.	7.	7.	7.	7.	7.	7.
113.	7.	7.	7.	7.	7.	7.	7.	7.	7.
114.	7.	7.	7.	7.	7.	7.	7.	7.	7.
115.	7.	7.	7.	7.	7.	7.	7.	7.	7.
116.	7.	7.	7.	7.	7.	7.	7.	7.	7.
117.	7.	7.	7.	7.	7.	7.	7.	7.	7.
118.	7.	7.	7.	7.	7.	7.	7.	7.	7.
119.	7.	7.	7.	7.	7.	7.	7.	7.	7.
120.	7.	7.	7.	7.	7.	7.	7.	7.	7.
121.	7.	7.	7.	7.	7.	7.	7.	7.	7.
122.	7.	7.	7.	7.	7.	7.	7.	7.	7.
123.	7.	7.	7.	7.	7.	7.	7.	7.	7.
124.	7.	7.	7.	7.	7.	7.	7.	7.	7.
125.	7.	7.	7.	7.	7.	7.	7.	7.	7.
126.	7.	7.	7.	7.	7.	7.	7.	7.	7.
127.	7.	7.	7.	7.	7.	7.	7.	7.	7.
128.	7.	7.	7.	7.	7.	7.	7.	7.	7.
129.	7.	7.	7.	7.	7.	7.	7.	7.	7.
130.	7.	7.	7.	7.	7.	7.	7.	7.	7.
131.	7.	7.	7.	7.	7.	7.	7.	7.	7.
132.	7.	7.	7.	7.	7.	7.	7.	7.	7.
133.	7.	7.	7.	7.	7.	7.	7.	7.	7.
134.	7.	7.	7.	7.	7.	7.	7.	7.	7.
135.	7.	7.	7.	7.	7.	7.	7.	7.	7.
136.	7.	7.	7.	7.	7.	7.	7.	7.	7.
137.	7.	7.	7.	7.	7.	7.	7.	7.	7.
138.	7.	7.	7.	7.	7.	7.	7.	7.	7.
139.	7.	7.	7.	7.	7.	7.	7.	7.	7.
140.	7.	7.	7.	7.	7.	7.	7.	7.	7.
141.	7.	7.	7.	7.	7.	7.	7.	7.	7.
142.	7.	7.	7.	7.	7.	7.	7.	7.	7.
143.	7.	7.	7.	7.	7.	7.	7.	7.	7.
144.	7.	7.	7.	7.	7.	7.	7.	7.	7.
145.	7.	7.	7.	7.	7.	7.	7.	7.	7.
146.	7.	7.	7.	7.	7.	7.	7.	7.	7.
147.	7.	7.	7.	7.	7.	7.	7.	7.	7.
148.	7.	7.	7.	7.	7.	7.	7.	7.	7.
149.	7.	7.	7.	7.	7.	7.	7.	7.	7.
150.	7.	7.	7.	7.	7.	7.	7.	7.	7.
151.	7.	7.	7.	7.	7.	7.	7.	7.	7.
152.	7.	7.	7.	7.	7.	7.	7.	7.	7.
153.	7.	7.	7.	7.	7.	7.	7.	7.	7.
154.	7.	7.	7.	7.	7.	7.	7.	7.	7.
155.	7.	7.	7.	7.	7.	7.	7.	7.	7.
156.	7.	7.	7.	7.	7.	7.	7.	7.	7.
157.	7.	7.	7.	7.	7.	7.	7.	7.	7.
158.	7.	7.	7.	7.	7.	7.	7.	7.	7.
159.	7.	7.	7.	7.	7.	7.	7.	7.	7.
160.	7.	7.	7.	7.	7.	7.	7.	7.	7.
161.	7.	7.	7.	7.	7.	7.	7.	7.	7.
162.	7.	7.	7.	7.	7.	7.	7.	7.	7.
163.	7.	7.	7.	7.	7.	7.	7.	7.	7.
164.	7.	7.	7.	7.	7.	7.	7.	7.	7.
165.	7.	7.	7.	7.	7.	7.	7.	7.	7.
166.	7.	7.	7.	7.	7.	7.	7.	7.	7.
167.	7.	7.	7.	7.	7.	7.	7.	7.	7.
168.	7.	7.	7.	7.	7.	7.	7.	7.	7.
169.	7.	7.	7.	7.	7.	7.	7.	7.	7.
170.	7.	7.	7.	7.	7.	7.	7.	7.	7.
171.	7.	7.	7.	7.	7.	7.	7.	7.	7.
172.	7.	7.	7.	7.	7.	7.	7.	7.	7.
173.	7.	7.	7.	7.	7.	7.	7.	7.	7.
174.	7.	7.	7.	7.	7.	7.	7.	7.	7.
175.	7.	7.	7.	7.	7.	7.	7.	7.	7.
176.	7.	7.	7.	7.	7.	7.	7.	7.	7.
177.	7.	7.	7.	7.	7.	7.	7.	7.	7.
178.	7.	7.	7.	7.	7.	7.	7.	7.	7.
179.	7.	7.	7.	7.	7.	7.	7.	7.	7.
180.	7.	7.	7.	7.	7.	7.	7.	7.	7.
181.	7.	7.	7.	7.	7.	7.	7.	7.	7.
182.	7.	7.	7.	7.	7.	7.	7.	7.	7.
183.	7.	7.	7.	7.	7.	7.	7.	7.	7.
184.	7.	7.	7.	7.	7.	7.	7.	7.	7.
185.	7.	7.	7.	7.	7.	7.	7.	7.	7.
186.	7.	7.	7.	7.	7.	7.	7.	7.	7.
187.	7.	7.	7.	7.	7.	7.	7.	7.	7.
188.	7.	7.	7.	7.	7.	7.	7.	7.	7.

STOP AGT

[illegible]

STAFF

[illegible]

687.0	687.5	687.2	681.9	681.5	681.2	680.8	680.4	680.0	689.7
687.3	687.0	687.7	687.4	687.2	687.0	687.0	687.6	687.4	687.3
687.2	687.1	687.0	686.9	686.8	686.7	686.7	686.6	686.6	686.5
686.5	686.5	686.4	686.4	686.4	686.4	686.4	686.3	686.3	686.3
686.3	686.3	686.2	686.2	686.2	686.2	686.1	686.1	686.1	686.0
686.0	686.0	686.0	686.0	685.9	685.9	685.9	685.9	685.9	685.9
685.9	685.9	685.9	685.8	685.8	685.8	685.8	685.8	685.8	685.8

PEAK OUTFLOW IS NINE. AT TIME 17.17 HOURS

PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
8130.	5416.	1551.	1242.	223521.
230.	153.	44.	35.	6329.
	11.20	12.82	12.83	
	284.39	325.70	326.01	
	2866.	3076.	3079.	
	3313.	3798.	3798.	

CFS
CFS
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THE FATH FLEACH HYDROGRAPH WAS DEVELOPED USING A TIME INTERVAL OF .021 HOURS DURING FLEACH FORMATION.
 DOWNSTREAM CALCULATIONS WILL USE A TIME INTERVAL OF .167 HOURS.
 THIS TABLE COMPARES THE HYDROGRAPH FOR DOWNSTREAM CALCULATIONS WITH THE COMPUTED FLEACH HYDROGRAPH.
 INTERMEDIATE FLOWS ARE INTERPOLATED FROM END-OF-PERIOD VALUES.

TIME (HOURS)	TIME FROM BEGINNING OF FLEACH (HOURS)	INTERPOLATED FLEACH HYDROGRAPH (CFS)	COMPUTED FLEACH HYDROGRAPH (CFS)	ERROR (CFS)	ACCUMULATED ERROR (CFS)	ACCUMULATED ERROR (CFS)
14.667	0.000	1808.	1808.	0.	0.	0.
14.688	.021	2101.	2110.	-9.	-9.	-9.
14.709	.042	2354.	2434.	-80.	-89.	-89.
14.729	.063	2686.	2781.	-94.	-144.	-144.
14.750	.083	2979.	3104.	-125.	-269.	-269.
14.771	.104	3272.	3396.	-124.	-393.	-393.
14.792	.125	3565.	3648.	-83.	-476.	-476.
14.813	.146	3857.	3910.	-52.	-528.	-528.
14.833	.167	4150.	4150.	0.	-528.	-528.
14.854	.188	4368.	4370.	-2.	-530.	-530.
14.875	.209	4586.	4569.	17.	-513.	-513.
14.896	.229	4804.	4750.	54.	-459.	-459.
14.917	.250	5022.	4914.	108.	-351.	-351.
14.938	.271	5240.	5141.	99.	-252.	-252.
14.958	.292	5457.	5400.	57.	-195.	-195.
14.979	.313	5675.	5655.	20.	-175.	-175.
15.000	.333	5893.	5893.	0.	-175.	-175.
15.021	.354	6064.	6112.	-48.	-223.	-223.
15.042	.375	6234.	6313.	-79.	-302.	-302.
15.063	.396	6405.	6493.	-88.	-390.	-390.
15.083	.417	6575.	6655.	-80.	-470.	-470.
15.104	.438	6746.	6804.	-58.	-528.	-528.
15.125	.458	6916.	6969.	-53.	-581.	-581.
15.146	.479	7087.	7120.	-33.	-614.	-614.
15.167	.500	7257.	7257.	0.	-614.	-614.
15.188	.521	7325.	7365.	-40.	-654.	-654.
15.208	.542	7393.	7470.	-77.	-731.	-731.
15.229	.563	7461.	7502.	-41.	-772.	-772.
15.250	.583	7529.	7605.	-76.	-848.	-848.
15.271	.604	7597.	7779.	-182.	-1030.	-1030.
15.292	.625	7664.	7824.	-160.	-1190.	-1190.
15.313	.646	7732.	7812.	-80.	-1270.	-1270.
15.333	.667	7800.	7800.	0.	-1270.	-1270.
15.354	.688	7740.	7770.	-30.	-1300.	-1300.
15.375	.709	7679.	7725.	-46.	-1346.	-1346.
15.396	.729	7618.	7725.	-107.	-1453.	-1453.
15.417	.750	7558.	7632.	-74.	-1527.	-1527.
15.438	.771	7498.	7609.	-110.	-1637.	-1637.
15.458	.792	7437.	7556.	-119.	-1756.	-1756.
15.479	.813	7377.	7500.	-123.	-1879.	-1879.
15.500	.833	7317.	7437.	-120.	-1999.	-1999.
15.521	.854	7257.	7394.	-137.	-2136.	-2136.
15.542	.875	7197.	7372.	-175.	-2311.	-2311.
15.563	.896	7137.	7402.	-265.	-2576.	-2576.
15.583	.917	7077.	7432.	-355.	-2931.	-2931.
15.604	.937	7017.	7464.	-447.	-3378.	-3378.
15.625	.958	6957.	7496.	-539.	-3917.	-3917.
15.646	.979	6897.	7528.	-631.	-4548.	-4548.
15.667	1.000	6837.	7560.	-723.	-5271.	-5271.

STATISTICS

(6) THERMAL-RELATED REACT-HYDROGRAPH
(7) COMPUTED REACT-HYDROGRAPH

1951
(1951)

	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050	2051	2052	2053	2054	2055	2056	2057	2058	2059	2060	2061	2062	2063	2064	2065	2066	2067	2068	2069	2070	2071	2072	2073	2074	2075	2076	2077	2078	2079	2080	2081	2082	2083	2084	2085	2086	2087	2088	2089	2090	2091	2092	2093	2094	2095	2096	2097	2098	2099	2100	2101	2102	2103	2104	2105	2106	2107	2108	2109	2110	2111	2112	2113	2114	2115	2116	2117	2118	2119	2120	2121	2122	2123	2124	2125	2126	2127	2128	2129	2130	2131	2132	2133	2134	2135	2136	2137	2138	2139	2140	2141	2142	2143	2144	2145	2146	2147	2148	2149	2150	2151	2152	2153	2154	2155	2156	2157	2158	2159	2160	2161	2162	2163	2164	2165	2166	2167	2168	2169	2170	2171	2172	2173	2174	2175	2176	2177	2178	2179	2180	2181	2182	2183	2184	2185	2186	2187	2188	2189	2190	2191	2192	2193	2194	2195	2196	2197	2198	2199	2200	2201	2202	2203	2204	2205	2206	2207	2208	2209	2210	2211	2212	2213	2214	2215	2216	2217	2218	2219	2220	2221	2222	2223	2224	2225	2226	2227	2228	2229	2230	2231	2232	2233	2234	2235	2236	2237	2238	2239	2240	2241	2242	2243	2244	2245	2246	2247	2248	2249	2250	2251	2252	2253	2254	2255	2256	2257	2258	2259	2260	2261	2262	2263	2264	2265	2266	2267	2268	2269	2270	2271	2272	2273	2274	2275	2276	2277	2278	2279	2280	2281	2282	2283	2284	2285	2286	2287	2288	2289	2290	2291	2292	2293	2294	2295	2296	2297	2298	2299	2300	2301	2302	2303	2304	2305	2306	2307	2308	2309	2310	2311	2312	2313	2314	2315	2316	2317	2318	2319	2320	2321	2322	2323	2324	2325	2326	2327	2328	2329	2330	2331	2332	2333	2334	2335	2336	2337	2338	2339	2340	2341	2342	2343	2344	2345	2346	2347	2348	2349	2350	2351	2352	2353	2354	2355	2356	2357	2358	2359	2360	2361	2362	2363	2364	2365	2366	2367	2368	2369	2370	2371	2372	2373	2374	2375	2376	2377	2378	2379	2380	2381	2382	2383	2384	2385	2386	2387	2388	2389	2390	2391	2392	2393	2394	2395	2396	2397	2398	2399	2400	2401	2402	2403	2404	2405	2406	2407	2408	2409	2410	2411	2412	2413	2414	2415	2416	2417	2418	2419	2420</
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[illegible]

A 5x5 grid of dotted lines for handwriting practice. The grid is composed of 5 rows and 5 columns of dotted lines. On the far left, there is a solid vertical line. On the far right, there is a solid vertical line. The grid is intended for practicing letter formation and alignment.

OUTLINE

STORAGE

HYDROGRAPH ROUTING

CHANNEL ROUTING FOR FIVE FIRST ROAD CROSSING

STAG	ICPP	ICCN	ITAF	JFT	JFT	ISTAG	IAUTO
1	1	0	0	0	1	1	0
ALL PLAINS HAVE SAME ROUTING DATA							
QLOSS	CLSS	AVG	IRIS	ISAMF	IOPT	IIMP	ISTR
0.0	0.000	0.00	1	1	0	0	0
NOTES	PSTCI	LAC	ANSPK	X	ISPRAT	ISPRAT	
1	0	0	0.000	0.000	1.0	0	

NORMAL WITH CHANNEL ROUTING

0641) 0642) 0643) 0644) 0645) 0646) 0647) 0648) 0649) 0650)

0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00

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STATION A3, PLAN 1, RTIO 2

	2.	34	4.	9.	5.	5.	6.
76.	113.	139.	139.	156.	101.	200.	249.
70.	282.	301.	301.	309.	316.	321.	330.
67.	339.	347.	347.	359.	381.	418.	550.
61.	424.	802.	802.	918.	956.	1040.	3718.
50.	7833.	7330.	7470.	5750.	4715.	5334.	6511.
45.	7983.	8101.	8099.	7941.	7667.	7326.	6026.
35.	9211.	4549.	4549.	4163.	3760.	3382.	2313.
30.	1736.	1296.	1296.	1127.	979.	857.	5758.
20.	4624.	374.	374.	339.	308.	281.	237.
03.	190.	170.	170.	163.	156.	151.	141.
28.	121.	105.	105.	97.	00.	72.	65.
17.	47.	38.	38.	34.	31.	26.	22.
09.	17.	16.	16.	15.	14.	13.	11.

0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
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Page	150.0	150.1	150.2	150.3	150.4	150.5	150.6	150.7	150.8	150.9	151.0	151.1	151.2	151.3	151.4	151.5	151.6	151.7	151.8	151.9	152.0	152.1	152.2	152.3	152.4	152.5	152.6	152.7	152.8	152.9	153.0	153.1	153.2	153.3	153.4	153.5	153.6	153.7	153.8	153.9	154.0	154.1	154.2	154.3	154.4	154.5	154.6	154.7	154.8	154.9	155.0	155.1	155.2	155.3	155.4	155.5	155.6	155.7	155.8	155.9	156.0	156.1	156.2	156.3	156.4	156.5	156.6	156.7	156.8	156.9	157.0	157.1	157.2	157.3	157.4	157.5	157.6	157.7	157.8	157.9	158.0	158.1	158.2	158.3	158.4	158.5	158.6	158.7	158.8	158.9	159.0	159.1	159.2	159.3	159.4	159.5	159.6	159.7	159.8	159.9	160.0	160.1	160.2	160.3	160.4	160.5	160.6	160.7	160.8	160.9	161.0	161.1	161.2	161.3	161.4	161.5	161.6	161.7	161.8	161.9	162.0	162.1	162.2	162.3	162.4	162.5	162.6	162.7	162.8	162.9	163.0	163.1	163.2	163.3	163.4	163.5	163.6	163.7	163.8	163.9	164.0	164.1	164.2	164.3	164.4	164.5	164.6	164.7	164.8	164.9	165.0	165.1	165.2	165.3	165.4	165.5	165.6	165.7	165.8	165.9	166.0	166.1	166.2	166.3	166.4	166.5	166.6	166.7	166.8	166.9	167.0	167.1	167.2	167.3	167.4	167.5	167.6	167.7	167.8	167.9	168.0	168.1	168.2	168.3	168.4	168.5	168.6	168.7	168.8	168.9	169.0	169.1	169.2	169.3	169.4	169.5	169.6	169.7	169.8	169.9	170.0	170.1	170.2	170.3	170.4	170.5	170.6	170.7	170.8	170.9	171.0	171.1	171.2	171.3	171.4	171.5	171.6	171.7	171.8	171.9	172.0	172.1	172.2	172.3	172.4	172.5	172.6	172.7	172.8	172.9	173.0	173.1	173.2	173.3	173.4	173.5	173.6	173.7	173.8	173.9	174.0	174.1	174.2	174.3	174.4	174.5	174.6	174.7	174.8	174.9	175.0	175.1	175.2	175.3	175.4	175.5	175.6	175.7	175.8	175.9	176.0	176.1	176.2	176.3	176.4	176.5	176.6	176.7	176.8	176.9	177.0	177.1	177.2	177.3	177.4	177.5	177.6	177.7	177.8	177.9	178.0	178.1	178.2	178.3	178.4	178.5	178.6	178.7	178.8	178.9	179.0	179.1	179.2	179.3	179.4	179.5	179.6	179.7	179.8	179.9	180.0	180.1	180.2	180.3	180.4	180.5	180.6	180.7	180.8	180.9	181.0	181.1	181.2	181.3	181.4	181.5	181.6	181.7	181.8	181.9	182.0	182.1	182.2	182.3	182.4	182.5	182.6	182.7	182.8	182.9	183.0	183.1	183.2	183.3	183.4	183.5	183.6	183.7	183.8	183.9	184.0	184.1	184.2	184.3	184.4	184.5	184.6	184.7	184.8	184.9	185.0	185.1	185.2	185.3	185.4	185.5	185.6	185.7	185.8	185.9	186.0	186.1	186.2	186.3	186.4	186.5	186.6	186.7	186.8	186.9	187.0
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TOTAL VOLUME
227516.
6329.
12.92
326.00
7079.
7798.

72-HOUR
1242.
35.
12.83
326.00
3079.
3798.

24-HOUR
1551.
44.
12.82
325.70
3076.
3794.

6-HOUR
5416.
153.
11.20
284.37
2686.
3313.

PEAK
8141.
231.

CFS
CMS
INCHES
MPH
AC-FT
THOUS CU FT

MAXIMUM STORAGE = 16.

6.66.4

STATION EX. PLAN PART 10 2

INLET		OUTFLOW		STOP	
1	2	3	4	5	6
0.	2.	0.	0.	0.	0.
1.	6.	0.	0.	0.	0.
2.	7.	0.	0.	0.	0.
3.	7.	0.	0.	0.	0.
4.	7.	0.	0.	0.	0.
5.	7.	0.	0.	0.	0.
6.	7.	0.	0.	0.	0.
7.	7.	0.	0.	0.	0.
8.	7.	0.	0.	0.	0.
9.	7.	0.	0.	0.	0.
10.	7.	0.	0.	0.	0.
11.	7.	0.	0.	0.	0.
12.	7.	0.	0.	0.	0.
13.	7.	0.	0.	0.	0.
14.	7.	0.	0.	0.	0.
15.	7.	0.	0.	0.	0.
16.	7.	0.	0.	0.	0.
17.	7.	0.	0.	0.	0.
18.	7.	0.	0.	0.	0.
19.	7.	0.	0.	0.	0.
20.	7.	0.	0.	0.	0.
21.	7.	0.	0.	0.	0.
22.	7.	0.	0.	0.	0.
23.	7.	0.	0.	0.	0.
24.	7.	0.	0.	0.	0.
25.	7.	0.	0.	0.	0.
26.	7.	0.	0.	0.	0.
27.	7.	0.	0.	0.	0.
28.	7.	0.	0.	0.	0.
29.	7.	0.	0.	0.	0.
30.	7.	0.	0.	0.	0.
31.	7.	0.	0.	0.	0.
32.	7.	0.	0.	0.	0.
33.	7.	0.	0.	0.	0.
34.	7.	0.	0.	0.	0.
35.	7.	0.	0.	0.	0.
36.	7.	0.	0.	0.	0.
37.	7.	0.	0.	0.	0.
38.	7.	0.	0.	0.	0.
39.	7.	0.	0.	0.	0.
40.	7.	0.	0.	0.	0.
41.	7.	0.	0.	0.	0.
42.	7.	0.	0.	0.	0.
43.	7.	0.	0.	0.	0.
44.	7.	0.	0.	0.	0.
45.	7.	0.	0.	0.	0.
46.	7.	0.	0.	0.	0.
47.	7.	0.	0.	0.	0.
48.	7.	0.	0.	0.	0.
49.	7.	0.	0.	0.	0.
50.	7.	0.	0.	0.	0.
51.	7.	0.	0.	0.	0.
52.	7.	0.	0.	0.	0.
53.	7.	0.	0.	0.	0.
54.	7.	0.	0.	0.	0.
55.	7.	0.	0.	0.	0.
56.	7.	0.	0.	0.	0.
57.	7.	0.	0.	0.	0.
58.	7.	0.	0.	0.	0.
59.	7.	0.	0.	0.	0.
60.	7.	0.	0.	0.	0.
61.	7.	0.	0.	0.	0.
62.	7.	0.	0.	0.	0.
63.	7.	0.	0.	0.	0.
64.	7.	0.	0.	0.	0.
65.	7.	0.	0.	0.	0.
66.	7.	0.	0.	0.	0.
67.	7.	0.	0.	0.	0.
68.	7.	0.	0.	0.	0.
69.	7.	0.	0.	0.	0.
70.	7.	0.	0.	0.	0.
71.	7.	0.	0.	0.	0.
72.	7.	0.	0.	0.	0.
73.	7.	0.	0.	0.	0.
74.	7.	0.	0.	0.	0.
75.	7.	0.	0.	0.	0.
76.	7.	0.	0.	0.	0.
77.	7.	0.	0.	0.	0.
78.	7.	0.	0.	0.	0.
79.	7.	0.	0.	0.	0.
80.	7.	0.	0.	0.	0.
81.	7.	0.	0.	0.	0.
82.	7.	0.	0.	0.	0.
83.	7.	0.	0.	0.	0.
84.	7.	0.	0.	0.	0.
85.	7.	0.	0.	0.	0.
86.	7.	0.	0.	0.	0.
87.	7.	0.	0.	0.	0.
88.	7.	0.	0.	0.	0.
89.	7.	0.	0.	0.	0.
90.	7.	0.	0.	0.	0.
91.	7.	0.	0.	0.	0.
92.	7.	0.	0.	0.	0.
93.	7.	0.	0.	0.	0.
94.	7.	0.	0.	0.	0.
95.	7.	0.	0.	0.	0.
96.	7.	0.	0.	0.	0.
97.	7.	0.	0.	0.	0.
98.	7.	0.	0.	0.	0.
99.	7.	0.	0.	0.	0.
100.	7.	0.	0.	0.	0.

	FRAC	6-HOUR	24-HOUR	72-HOUR	TOTAL	VOLUME
UIC	917.	4017.	1464.	1172.	21103.	
C/S		136.	41.	32.		5976.
TRUCK		9.96	12.11	12.12		12.12
AF		252.05	307.42	307.70		307.79
AC-FT		2240.	2404.	2407.		2407.
THOUS (C/F		2247.	2522.	2522.		2522.

CHANNEL ROUTING, MOD PULS VALLEY

ISTAD	TCOMP	TECON	ITYPE	JPLY	JFRT	TNAME	ISTAGE	IAUTO
A	1	0	0	0	1	1	0	0

ALL PLANS HAVE SAME ROUTING DATA

GROSS	CROSS	AVG	IRCS	ISAME	INDT	ITMP	LSTR
0.0	0.000	0.00	1	1	0	0	0

WSTPS	WSTOL	LAG	AMSK	X	TSK	STCRA	ISPRAT
1	0	0	0.000	0.000	0.000	1	0

WORLDWIDE ROUTING

00(1)	00(2)	00(3)	L NV T	E L M A X	P L N T H
.0796	.8500	.0700	(40.0	60.0	1000 .01000

REF ID: A67345, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100, 101, 102, 103, 104, 105, 106, 107, 108, 109, 110, 111, 112, 113, 114, 115, 116, 117, 118, 119, 120, 121, 122, 123, 124, 125, 126, 127, 128, 129, 130, 131, 132, 133, 134, 135, 136, 137, 138, 139, 140, 141, 142, 143, 144, 145, 146, 147, 148, 149, 150, 151, 152, 153, 154, 155, 156, 157, 158, 159, 160, 161, 162, 163, 164, 165, 166, 167, 168, 169, 170, 171, 172, 173, 174, 175, 176, 177, 178, 179, 180, 181, 182, 183, 184, 185, 186, 187, 188, 189, 190, 191, 192, 193, 194, 195, 196, 197, 198, 199, 200, 201, 202, 203, 204, 205, 206, 207, 208, 209, 210, 211, 212, 213, 214, 215, 216, 217, 218, 219, 220, 221, 222, 223, 224, 225, 226, 227, 228, 229, 230, 231, 232, 233, 234, 235, 236, 237, 238, 239, 240, 241, 242, 243, 244, 245, 246, 247, 248, 249, 250, 251, 252, 253, 254, 255, 256, 257, 258, 259, 260, 261, 262, 263, 264, 265, 266, 267, 268, 269, 270, 271, 272, 273, 274, 275, 276, 277, 278, 279, 280, 281, 282, 283, 284, 285, 286, 287, 288, 289, 290, 291, 292, 293, 294, 295, 296, 297, 298, 299, 300, 301, 302, 303, 304, 305, 306, 307, 308, 309, 310, 311, 312, 313, 314, 315, 316, 317, 318, 319, 320, 321, 322, 323, 324, 325, 326, 327, 328, 329, 330, 331, 332, 333, 334, 335, 336, 337, 338, 339, 340, 341, 342, 343, 344, 345, 346, 347, 348, 349, 350, 351, 352, 353, 354, 355, 356, 357, 358, 359, 360, 361, 362, 363, 364, 365, 366, 367, 368, 369, 370, 371, 372, 373, 374, 375, 376, 377, 378, 379, 380, 381, 382, 383, 384, 385, 386, 387, 388, 389, 390, 391, 392, 393, 394, 395, 396, 397, 398, 399, 400, 401, 402, 403, 404, 405, 406, 407, 408, 409, 410, 411, 412, 413, 414, 415, 416, 417, 418, 419, 420, 421, 422, 423, 424, 425, 426, 427, 428, 429, 430, 431, 432, 433, 434, 435, 436, 437, 438, 439, 440, 441, 442, 443, 444, 445, 446, 447, 448, 449, 450, 451, 452, 453, 454, 455, 456, 457, 458, 459, 460, 461, 462, 463, 464, 465, 466, 467, 468, 469, 470, 471, 472, 473, 474, 475, 476, 477, 478, 479, 480, 481, 482, 483, 484, 485, 486, 487, 488, 489, 490, 491, 492, 493, 494, 495, 496, 497, 498, 499, 500, 501, 502, 503, 504, 505, 506, 507, 508, 509, 510, 511, 512, 513, 514, 515, 516, 517, 518, 519, 520, 521, 522, 523, 524, 525, 526, 527, 528, 529, 530, 531, 532, 533, 534, 535, 536, 537, 538, 539, 540, 541, 542, 543, 544, 545, 546, 547, 548, 549, 550, 551, 552, 553, 554, 555, 556, 557, 558, 559, 560, 561, 562, 563, 564, 565, 566, 567, 568, 569, 570, 571, 572, 573, 574, 575, 576, 577, 578, 579, 580, 581, 582, 583, 584, 585, 586, 587, 588, 589, 590, 591, 592, 593, 594, 595, 596, 597, 598, 599, 600, 601, 602, 603, 604, 605, 606, 607, 608, 609, 610, 611, 612, 613, 614, 615, 616, 617, 618, 619, 620, 621, 622, 623, 624, 625, 626, 627, 628, 629, 630, 631, 632, 633, 634, 635, 636, 637, 638, 639, 640, 641, 642, 643, 644, 645, 646, 647, 648, 649, 650, 651, 652, 653, 654, 655, 656, 657, 658, 659, 660, 661, 662, 663, 664, 665, 666, 667, 668, 669, 670, 671, 672, 673, 674, 675, 676, 677, 678, 679, 680, 681, 682, 683, 684, 685, 686, 687, 688, 689, 690, 691, 692, 693, 694, 695, 696, 697, 698, 699, 700, 701, 702, 703, 704, 705, 706, 707, 708, 709, 710, 711, 712, 713, 714, 715, 716, 717, 718, 719, 720, 721, 722, 723, 724, 725, 726, 727, 728, 729, 730, 731, 732, 733, 734, 735, 736, 737, 738, 739, 740, 741, 742, 743, 744, 745, 746, 747, 748, 749, 750, 751, 752, 753, 754, 755, 756, 757, 758, 759, 760, 761, 762, 763, 764, 765, 766, 767, 768, 769, 770, 771, 772, 773, 774, 775, 776, 777, 778, 779, 780, 781, 782, 783, 784, 785, 786, 787, 788, 789, 790, 791, 792, 793, 794, 795, 796, 797, 798, 799, 800, 801, 802, 803, 804, 805, 806, 807, 808, 809, 810, 811, 812, 813, 814, 815, 816, 817, 818, 819, 820, 821, 822, 823, 824, 825, 826, 827, 828, 829, 830, 831, 832, 833, 834, 835, 836, 837, 838, 839, 840, 841, 842, 843, 844, 845, 846, 847, 848, 849, 850, 851, 852, 853, 854, 855, 856, 857, 858, 859, 860, 861, 862, 863, 864, 865, 866, 867, 868, 869, 870, 871, 872, 873, 874, 875, 876, 87

[illegible]

5,600,000

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3

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2

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 6
 7
 8

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	2009	2008	2007	2006	2005	2004	2003	2002	2001	2000	1999	1998
NUMBER	0.00	0.00	22.54	22.54	546.42	1059.07	172.54	2776.72	4036.87	5610.90	7500.57	10070.70
	0.00	0.00	1255.47	1550.71	1827.32	2258.01	2656.57	3052.52	35476.09	40332.49	45127.10	50070.00
TIME	0.00	0.00	602.11	604.21	606.32	608.42	610.52	652.63	654.74	656.04	658.55	660.00
	0.00	0.00	602.11	604.21	606.32	608.42	610.52	652.63	654.74	656.04	658.55	660.00
TIME	0.00	0.00	602.11	604.21	606.32	608.42	610.52	652.63	654.74	656.04	658.55	660.00
	0.00	0.00	602.11	604.21	606.32	608.42	610.52	652.63	654.74	656.04	658.55	660.00

STATION . . . A4, FLAN 1, RTIO 2

[illegible][illegible]

A4, PLAN 2, RTIO 2

510

HYDROGRAPH ROUTING

CHANNEL ROUTING FOR FIVE SECOND ROAD (BOSSIR)

ISTAO	ICCPY	IECON	ITATE	JPLT	JPRY	INAME	ISTAGE	IAUTO
AS	1	0	0	0	1	1	0	0

ALL PLANS HAVE SAME

ROUTING DATA

CROSS	CROSS	AVG	IRIS	ISAME	ICPT	IFPP	LSTR
0.0	0.000	0.00	1	1	0	0	0

NSIPS	NSDPL	LAG	APSKM	X	ISK	STORA	ISPRAT
1	0	0	0.000	0.000	0.000	1.	0

NORMAL DEPTH CHANNEL ROUTING

QNI1	QNI2	QNI3	ELHVT	ELMAX	RLNTH	SEL
0.00	0.000	0.0700	540.0	580.0	5400.	0.0150

CROSS SECTION COORDINATES--STA+ELEV+STAGE+ELEV--ETC

STA	ELEV	STAGE	ELEV	STA	ELEV	STAGE	ELEV
0.00	540.00	10.00	540.00	13.00	540.00	37.00	540.00
38.00	547.00	40.00	540.00	50.00	540.00		

STORAGE	OUTFLOW	STAGE	FLOW	STAGE	FLOW	STAGE	FLOW
0.00	0.00	540.00	0.00	540.00	0.00	540.00	0.00
70.80	0.00	541.05	0.00	542.11	0.00	543.16	0.00
12917.14	12917.14	15212.02	12917.14	15212.02	12917.14	15212.02	12917.14
19350	19350	19350	19350	19350	19350	19350	19350
26.31	26.31	26.31	26.31	26.31	26.31	26.31	26.31
107.61	107.61	107.61	107.61	107.61	107.61	107.61	107.61
118.19	118.19	118.19	118.19	118.19	118.19	118.19	118.19
3954.70	3954.70	3954.70	3954.70	3954.70	3954.70	3954.70	3954.70
26163.90	26163.90	26163.90	26163.90	26163.90	26163.90	26163.90	26163.90
550.53	550.53	550.53	550.53	550.53	550.53	550.53	550.53
571.58	571.58	571.58	571.58	571.58	571.58	571.58	571.58
3754.70	3754.70	3754.70	3754.70	3754.70	3754.70	3754.70	3754.70
26163.90	26163.90	26163.90	26163.90	26163.90	26163.90	26163.90	26163.90
552.63	552.63	552.63	552.63	552.63	552.63	552.63	552.63
573.68	573.68	573.68	573.68	573.68	573.68	573.68	573.68
7030.30	7030.30	7030.30	7030.30	7030.30	7030.30	7030.30	7030.30
32747.96	32747.96	32747.96	32747.96	32747.96	32747.96	32747.96	32747.96
554.74	554.74	554.74	554.74	554.74	554.74	554.74	554.74
575.79	575.79	575.79	575.79	575.79	575.79	575.79	575.79
828.04	828.04	828.04	828.04	828.04	828.04	828.04	828.04
36328.50	36328.50	36328.50	36328.50	36328.50	36328.50	36328.50	36328.50
556.84	556.84	556.84	556.84	556.84	556.84	556.84	556.84
577.89	577.89	577.89	577.89	577.89	577.89	577.89	577.89
828.04	828.04	828.04	828.04	828.04	828.04	828.04	828.04
36328.50	36328.50	36328.50	36328.50	36328.50	36328.50	36328.50	36328.50
558.95	558.95	558.95	558.95	558.95	558.95	558.95	558.95
580.00	580.00	580.00	580.00	580.00	580.00	580.00	580.00
10702.36	10702.36	10702.36	10702.36	10702.36	10702.36	10702.36	10702.36
40105.60	40105.60	40105.60	40105.60	40105.60	40105.60	40105.60	40105.60

STATION A5, PLAN 1, R110 2

		CUTFLOW									
		1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
24.	12.	7.	6.	5.	4.	3.	2.	1.	0.	0.	0.
6.	6.	6.	6.	6.	6.	6.	6.	6.	6.	6.	6.
7.	7.	7.	7.	7.	7.	7.	7.	7.	7.	7.	7.
7.	7.	7.	7.	7.	7.	7.	7.	7.	7.	7.	7.
7.	7.	7.	7.	7.	7.	7.	7.	7.	7.	7.	7.
47.	62.	90.	119.	140.	162.	184.	205.	225.	245.	265.	285.
242.	250.	271.	293.	302.	310.	320.	326.	330.	336.	344.	354.
338.	337.	339.	349.	362.	385.	424.	484.	564.	664.	784.	924.
640.	754.	814.	882.	920.	976.	1223.	2333.	4657.	9311.	18621.	37241.
6465.	7518.	7662.	7395.	6635.	5195.	4913.	5535.	6111.	6834.	7666.	8511.
7444.	7869.	8072.	8123.	8021.	7787.	7479.	7093.	6667.	6222.	5755.	5272.
5014.	5439.	5091.	4730.	4358.	3969.	3598.	3212.	2843.	2518.	2151.	1851.
2210.	1915.	1661.	1461.	1260.	1103.	962.	851.	755.	666.	582.	501.
500.	523.	467.	419.	378.	341.	310.	292.	272.	252.	232.	212.
214.	217.	203.	190.	180.	171.	163.	157.	151.	145.	139.	133.
130.	133.	126.	112.	111.	103.	95.	87.	79.	71.	64.	57.
64.	58.	52.	47.	43.	38.	35.	31.	29.	26.	24.	22.
24.	22.	20.	17.	16.	15.	14.	13.	12.	11.	10.	9.

STOR

		STOR									
		1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
1.	1.	2.	2.	3.	3.	4.	4.	5.	5.	6.	6.
5.	5.	6.	6.	7.	7.	8.	8.	9.	9.	10.	10.
7.	7.	7.	7.	7.	7.	7.	7.	7.	7.	7.	7.
10.	11.	12.	13.	13.	13.	13.	13.	13.	13.	13.	13.
40.	50.	50.	49.	48.	47.	46.	45.	44.	43.	42.	41.
40.	51.	52.	52.	51.	50.	49.	48.	47.	46.	45.	44.
42.	41.	39.	37.	35.	33.	31.	29.	27.	25.	23.	21.
23.	21.	19.	18.	16.	15.	13.	12.	11.	10.	9.	8.
9.	9.	8.	7.	7.	7.	6.	6.	6.	6.	5.	5.
5.	4.	4.	4.	4.	4.	3.	3.	3.	3.	3.	3.
3.	3.	3.	2.	2.	2.	2.	2.	2.	2.	2.	2.
1.	1.	1.	1.	1.	1.	1.	1.	1.	1.	1.	1.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.

STAGE

		STAGE									
		1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
540.2	540.1	540.0	540.0	540.0	540.0	540.0	540.0	540.0	540.0	540.0	540.0
540.0	540.0	540.0	540.0	540.0	540.0	540.0	540.0	540.0	540.0	540.0	540.0
540.0	540.0	540.0	540.0	540.0	540.0	540.0	540.0	540.0	540.0	540.0	540.0
540.0	540.0	540.0	540.0	540.0	540.0	540.0	540.0	540.0	540.0	540.0	540.0
540.3	540.4	540.5	540.7	540.8	540.9	541.0	541.1	541.2	541.3	541.4	541.5
541.7	541.8	541.9	542.0	542.1	542.2	542.3	542.4	542.5	542.6	542.7	542.8
543.3	543.7	543.9	544.0	544.1	544.2	544.3	544.4	544.5	544.6	544.7	544.8
545.1	545.3	545.5	545.6	545.7	545.8	545.9	546.0	546.1	546.2	546.3	546.4
547.4	547.7	547.9	548.0	548.1	548.2	548.3	548.4	548.5	548.6	548.7	548.8
549.1	549.2	549.3	549.4	549.5	549.6	549.7	549.8	549.9	550.0	550.1	550.2
551.3	551.7	552.0	552.2	552.3	552.4	552.5	552.6	552.7	552.8	552.9	553.0
553.5	553.7	553.9	554.0	554.1	554.2	554.3	554.4	554.5	554.6	554.7	554.8
556.2	556.3	556.4	556.5	556.6	556.7	556.8	556.9	557.0	557.1	557.2	557.3
559.2	559.3	559.4	559.5	559.6	559.7	559.8	559.9	560.0	560.1	560.2	560.3
561.7	561.8	561.9	562.0	562.1	562.2	562.3	562.4	562.5	562.6	562.7	562.8
563.1	563.2	563.3	563.4	563.5	563.6	563.7	563.8	563.9	564.0	564.1	564.2
565.2	565.3	565.4	565.5	565.6	565.7	565.8	565.9	566.0	566.1	566.2	566.3
567.4	567.5	567.6	567.7	567.8	567.9	568.0	568.1	568.2	568.3	568.4	568.5
569.1	569.2	569.3	569.4	569.5	569.6	569.7	569.8	569.9	570.0	570.1	570.2
570.4	570.5	570.6	570.7	570.8	570.9	571.0	571.1	571.2	571.3	571.4	571.5
572.1	572.2	572.3	572.4	572.5	572.6	572.7	572.8	572.9	573.0	573.1	573.2
574.0	574.1	574.2	574.3	574.4	574.5	574.6	574.7	574.8	574.9	575.0	575.1
576.0	576.1	576.2	576.3	576.4	576.5	576.6	576.7	576.8	576.9	577.0	577.1
578.0	578.1	578.2	578.3	578.4	578.5	578.6	578.7	578.8	578.9	579.0	579.1
580.0	580.1	580.2	580.3	580.4	580.5	580.6	580.7	580.8	580.9	581.0	581.1
582.0	582.1	582.2	582.3	582.4	582.5	582.6	582.7	582.8	582.9	583.0	583.1
584.0	584.1	584.2	584.3	584.4	584.5	584.6	584.7	584.8	584.9	585.0	585.1
586.0	586.1	586.2	586.3	586.4	586.5	586.6	586.7	586.8	586.9	587.0	587.1
588.0	588.1	588.2	588.3	588.4	588.5	588.6	588.7	588.8	588.9	589.0	589.1
590.0	590.1	590.2	590.3	590.4	590.5	590.6	590.7	590.8	590.9	591.0	591.1
592.0	592.1	592.2	592.3	592.4	592.5	592.6	592.7	592.8	592.9	593.0	593.1
594.0	594.1	594.2	594.3	594.4	594.5	594.6	594.7	594.8	594.9	595.0	595.1
596.0	596.1	596.2	596.3	596.4	596.5	596.6	596.7	596.8	596.9	597.0	597.1
598.0	598.1	598.2	598.3	598.4	598.5	598.6	598.7	598.8	598.9	599.0	599.1
600.0	600.1	600.2	600.3	600.4	600.5	600.6	600.7	600.8	600.9	601.0	601.1
602.0	602.1	602.2	602.3	602.4	602.5	602.6	602.7	602.8	602.9	603.0	603.1
604.0	604.1	604.2	604.3	604.4	604.5	604.6	604.7	604.8	604.9	605.0	605.1
606.0	606.1	606.2	606.3	606.4	606.5	606.6	606.7	606.8	606.9	607.0	607.1
608.0	608.1	608.2	608.3	608.4	608.5	608.6	608.7	608.8	608.9	609.0	609.1
610.0	610.1	610.2	610.3	610.4	610.5	610.6	610.7	610.8	610.9	611.0	611.1
612.0	612.1	612.2	612.3	612.4	612.5	612.6	612.7	612.8	612.9	613.0	613.1
614.0	614.1	614.2	614.3	614.4	614.5	614.6	614.7	614.8	614.9	615.0	615.1
616.0	616.1	616.2	616.3	616.4	616.5	616.6	616.7	616.8	616.9	617.0	617.1
618.0	618.1	618.2	618.3	618.4	618.5	618.6	618.7	618.8	618.9	619.0	619.1
620.0	620.1	620.2	620.3	620.4	620.5	620.6	620.7	620.8	620.9	621.0	621.1
622.0	622.1	622.2	622.3	622.4	622.5	622.6	622.7	622.8	622.9	623.0	623.1
624.0	624.1	624.2	624.3	624.4	624.5	624.6	624.7	624.8	624.9	625.0	625.1
626.0	626.1	626.2	626.3	626.4	626.5	626.6	626.7	626.8	626.9	627.0	627.1
628.0	628.1	628.2	628.3	628.4	628.5	628.6	628.7	628.8	628.9	629.0	629.1
630.0	630.1	630.2	630.3	630.4	630.5	630.6	630.7	630.8	630.9	631.0	631.1
632.0	632.1	632.2	632.3	632.4	632.5	632.6	632.7	632.8	632.9	633.0	633.1
634.0	634.1	634.2	634.3	634.4	634.5	634.6	634.7	634.8	634.9	635.0	635.1
636.0	636.1	636.2	636.3	636.4	636.5	636.6	636.7	636.8	636.9	637.0	637.1
638.0	638.1	638.2	638.3	638.4	638.5	638.6	638.7	638.8	638.9	639.0	639.1
640.0	640.1	640.2	640.3	640.4	640.5	640.6	640.7	640.8	640.9	641.0	641.1
642.0	642.1	642.2	642.3	642.4	642.5	642.6	642.7	642.8	642.9	643.0	643.1
644.0	644.1	644.2	644.3	644.4	644.5	644.6	644.7	644.8	644.9	645.0	645.1
646.0	646.1	646.2	646.3	646.4	646.5	646.6	646.7	646.8	646.9	647.0	647.1
648.0	648.1	648.2	648.3	648.4	648.5	648.6	648.7	648.8	648.9	649.0	649.1
650.0	650.1	650.2	650.3	650.4	650.5	650.6	650.7	650.8	650.9	651.0	651.1
652.0	652.1	652.2	652.3	652.4	652.5	652.6	652.7	652.8	652.9	653.0	653.1
654.0	654.1	654.2	654.3	654.4	654.5	654.6	654.7	654.8	654.9	655.0	655.1
656.0	656.1	656.2	656.3	656.4	656.5	656.6	656.7	656.8	656.9	657.0	657.1
658.0	658.1	658.2	658.3	658.4	658.5	658.6	658.7	658.8	658.9	659.0	659.1
660.0	660.1	660.2	660.3	660.4	660.5	660.6	660.7	660.8	660.9	661.0	661.1
662.0	662.1	662.2	662.3	662.4	662.5	662.6	662.7	662.8	662.9	663.0	663.1
664.0	664.1	664.2	664.3	664.4	664.5	664.6	664.7	664.8	664.9	665.0	665.1

AD-A087 537

NEW JERSEY DEPT OF ENVIRONMENTAL PROTECTION TRENTON F/G 13/13
NATIONAL DAM SAFETY PROGRAM. YOUNGS POND DAM (NJ00270) DELAWARE--ETC(U)
FEB 80 W A GUINAN DACW61-79-C-0011

UNCLASSIFIED

NL

2 of 2

AD-A087 537

END
DATE
FILMED
9-80
DTIC

FT	PEAK	4-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
123.	230.	1413.	1551.	1242.	22529.
CM		153.	44.	35.	6330.
INCHES		11.19	12.82	12.84	17.84
MM		284.19	325.68	326.02	326.02
AC-FT		2684.	3076.	3079.	3079.
THOUS CU YD		3311.	3798.	3798.	3798.

MAXIMUM STORAGE = 52.

MAXIMUM STAGE IS 556.0

STATION A5, PLAN 2, RTID 2

		OUTFLOW			
24.	12.	7.	4.	5.	5.
6.	6.	6.	6.	6.	7.
7.	7.	7.	7.	7.	7.
7.	7.	7.	7.	7.	7.
7.	7.	7.	7.	7.	7.
47.	62.	70.	10.	13.	17.
242.	258.	119.	140.	162.	184.
336.	337.	293.	302.	310.	320.
665.	754.	349.	382.	395.	424.
1200.	1376.	402.	420.	420.	481.
1693.	2001.	417.	452.	483.	508.
2171.	254.	797.	775.	734.	685.
2764.	317.	459.	385.	340.	309.
3360.	374.	141.	1147.	1091.	1057.
3960.	438.	926.	894.	876.	858.
4560.	502.	496.	357.	307.	281.
5160.	566.	157.	132.	120.	109.
5760.	630.	50.	45.	40.	35.
6360.	694.	18.	15.	14.	12.

CHANNEL ROUTING MOD PULS THIRD ROAD CROSSING

ISIAO AK	ICOMP	RECON	ITAP	JPL	JPR	INAME	ISAGE	IAUTO
	1	0	0	0	1		0	0

ALL PLANS HAVE SAME

GROSS		CLOSS	Avg	IACS	ISAMC	IOPt	IPMP	LSTR	0
-6.0	8.000	0.00	1	1	1	0	D		
MSTPS	NSTNL	LAG	AMSKE	X	TSK	STORA	ISPRAV		
1	0	0	0.000	0.000	0.000	1.			

PERSONAL OFFICE CHANNEL ROUTING

QN(1)	QN(2)	QN(3)	ELNVT	ELMAX	ALNTH	SEL
.0700	.0500	.0700	390.0	420.0	3400.	.03950

CROSS SECTION COORDINATES--STA, ELEV, STA, ELEV--ETC

17.00	330.00	41.00	390.00
-------	--------	-------	--------

STOCK	6.00	3.30	6.76	10.24	13.82	17.93	22.01	26.30	30.54	34.23
STOCK	6.00	3.30	6.76	10.24	13.82	17.93	22.01	26.30	30.54	34.23
OUTFLC	10.00	16.00	20.00	24.00	28.00	32.00	36.00	40.00	44.00	48.00
STOCK	6.00	3.30	6.76	10.24	13.82	17.93	22.01	26.30	30.54	34.23
OUTFLC	10.00	16.00	20.00	24.00	28.00	32.00	36.00	40.00	44.00	48.00
STOCK	6.00	3.30	6.76	10.24	13.82	17.93	22.01	26.30	30.54	34.23
OUTFLC	10.00	16.00	20.00	24.00	28.00	32.00	36.00	40.00	44.00	48.00
STOCK	6.00	3.30	6.76	10.24	13.82	17.93	22.01	26.30	30.54	34.23
OUTFLC	10.00	16.00	20.00	24.00	28.00	32.00	36.00	40.00	44.00	48.00

AR. PLAN 1. P. 10 2

OUTFLUX

STOR

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

OPERATION	STATION	AREA	PLAN	RATIOS APPLIED TO FLOWS			
				RATIO 1	RATIO 2	RATIO 3	RATIO 4
				.20	.50	1.00	
HYDROGRAPH AT	A1	4.50	1	3267.	8165.	16329.	
	(	11.65)	(	92.48)	231.20)	462.39)	
	2		2	3266.	8165.	16329.	
	(		(	92.48)	231.20)	462.39)	
ROUTED TO	A2	4.50	1	7471.	8139.	16308.	
	(	11.65)	(	211.56)	230.43)	461.79)	
	2		2	3257.	8168.	16341.	
	(		(	92.52)	231.29)	462.71)	
ROUTED TO	A3	4.50	1	7511.	8141.	16302.	
	(	11.65)	(	212.69)	230.53)	461.63)	
	2		2	3263.	8173.	16351.	
	(		(	92.40)	231.44)	463.00)	
ROUTED TO	A4	4.50	1	7462.	8128.	16290.	
	(	11.65)	(	211.29)	230.17)	461.29)	
	2		2	3252.	8170.	16350.	
	(		(	92.10)	231.34)	462.99)	
ROUTED TO	A5	4.50	1	7288.	8123.	16264.	
	(	11.65)	(	204.38)	230.02)	460.56)	
	2		2	3255.	8145.	16326.	
	(		(	92.16)	230.65)	462.30)	
ROUTED TO	A6	4.50	1	7320.	8128.	16272.	
	(	11.65)	(	207.29)	230.15)	460.76)	
	2		2	3244.	8147.	16299.	
	(		(	91.87)	230.71)	461.54)	

SUMMARY OF DAM SAFETY ANALYSIS

PLAN 1

RATIO OF PMF	MAXIMUM RESERVOIR W.S.-FTV	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
.20	708.66	.76	346.	7553.	.42	17.10	16.50
.50	708.03	.73	346.	8138.	.42	17.17	14.67
1.00	708.29	.99	350.	16308.	.48	17.17	13.73

INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
698.20	698.20	707.30
172.	172.	332.
0.	0.	1150.

ELEVATION
STORAGE
OUTFLOW

PLAN 2

RATIO OF PMF	MAXIMUM RESERVOIR W.S.-FTV	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
.20	708.66	1.36	358.	3297.	3.43	17.17	0.00
.50	710.43	3.13	391.	8168.	6.17	17.17	0.00
1.00	712.62	5.32	431.	16341.	7.83	17.17	0.00

INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
698.20	698.20	707.30
172.	172.	332.
0.	0.	1150.

ELEVATION
STORAGE
OUTFLOW

PLAN 1 STATION A3

RATIO	MAXIMUM FLOW-CFS	MAXIMUM STAGE-FT	TIME HOURS
.20	7511.	665.7	17.17
.50	8141.	666.4	17.17
1.00	16302.	673.6	17.17

PLAN 2 STATION A3

RATIO	MAXIMUM FLOW-CFS	MAXIMUM STAGE-FT	TIME HOURS
.20	3263.	660.3	17.17
.50	8172.	666.4	17.17
1.00	16351.	673.7	17.17

PLAN 1 STATION A4

RATIO	MAXIMUM FLOW-CFS	MAXIMUM STAGE-FT	TIME HOURS
.20	7462.	660.5	17.17
.50	8109.	666.5	17.17

1.00 14290. 665.7 17.17

PLAN 2 STATION A4

RATIO	MAXIMUM FLOW, CFS	MAXIMUM STAGE, FT	TIME HOURS
.20	3252.	653.4	17.17
.50	8170.	659.5	17.17
1.00	16350.	665.7	17.17

PLAN 1 STATION A5

RATIO	MAXIMUM FLOW, CFS	MAXIMUM STAGE, FT	TIME HOURS
.20	7200.	555.0	17.17
.50	8123.	556.0	17.33
1.00	16244.	564.1	17.33

PLAN 2 STATION A5

RATIO	MAXIMUM FLOW, CFS	MAXIMUM STAGE, FT	TIME HOURS
.20	3855.	549.4	17.33
.50	8145.	556.0	17.17
1.00	16326.	564.1	17.17

PLAN 1 STATION A6

RATIO	MAXIMUM FLOW, CFS	MAXIMUM STAGE, FT	TIME HOURS
.20	7320.	401.4	17.33
.50	8120.	402.1	17.33
1.00	16272.	407.2	17.33

PLAN 2 STATION A6

RATIO	MAXIMUM FLOW, CFS	MAXIMUM STAGE, FT	TIME HOURS
.20	3200.	397.3	17.33
.50	8147.	402.1	17.33
1.00	16200.	407.3	17.17

APPENDIX 4
ENGINEERING DATA

YOUNGS POND DAM

Dam Application No. 615Map No. 21-63

State of New Jersey
Division of Water Policy and Supply

REPORT ON DAM APPLICATION

Application of Kenneth W. Young

filed February 24, 1972 for approval of plans and for a permit to construct

a dam for the impoundment of Young's Pond across Jacksonburg Creek

tributary to Paulins Creek in the Township of Blairstown

County, New Jersey, has been examined by S.A. Aziz

PRINCIPAL FEATURES

Purpose of dam	Preservation and promotion of fish life	Type of dam	earthfill - existing
Site inspected	-	Foundation material	sandy, clayey silt
Location:	21-33-7-5-3	Maximum height	25.57 feet
Drainage area	4.5 sq. mi.	Length of dam	425 feet
Elevation of flow line	698.15	Top width of dam	15 feet
Area of lake	12 acres	Downstream slope	2:1
Capacity of lake	--- million gallons	Upstream slope	3:1
Type of spillway drop inlet			
Length of spillway	62 feet	C =	3.1
Design flood flow	1670 cubic feet per second	=	372 sec. ft. per sq. mi.
Head on spillway for design flood flow	4.25 feet		
Freeboard	1.21 feet		
Maximum spillway capacity (dam over)	= 57,000 cubic feet per second		
	= 12,650 sec. ft. per sq. mi.		
Outlet other than spillway 12 inch C.I.P.			
Drawings filed by Ilmar Aasma, P.E.			
Ledgewood, Consulting Engineers, N.J.			

Hydrology:

Q 50 Mean of N and CJ curves = 1670 cfs.

Hydraulic:

Weir flow L = 62'
 C = 3.1 ---
 H = 4.26

$$\begin{aligned} Q &= 3.1 \times 62 \times 4.25^{3/2} \\ &= 192 \times 8.7 \\ &= 1670.0 \text{ cfs} \end{aligned}$$

Culvert flow

Area 8' x 7' = 56 ft²

H

$$p = 13.94 \text{ feet}$$

Length = 63 feet

$$Q = 1100 \text{ cfs.}$$

Embankment:

Slopes of the existing dam have been modified to increase stability factor.

DAM APPLICATION NO. 615

The drawings prepared by Mr. Ilmar Aasma of Morris Engineers, Inc. are hereby approved.

<u>Sheet No.</u>	<u>Date</u>
1	August 21, 1971, March 20, 1972, April 29, 1972 and May 20, 1972.
2	April 25, 1972 and May 20, 1972.
3	April 20, 1972, revised May 4, 1972, May 20, 1972 and May 31, 1972.
4	April 25, 1972 and May 20, 1972.
5	January 4, 1972, March 20, 1972 and April 26, 1972.
6	April 25, 1972, March 20, 1972 and May 31, 1972

It has been found that the site for the dam is suitable and the plans adequate to insure the construction of a structure which will not be a menace to life or property under design flood conditions. It is therefore recommended that the plans be approved and that a permit be issued subject to standard conditions and to the following special conditions:

The following drawings prepared by Ilmar Aasmaa of Morris Engineers, Inc., are hereby approved.

<u>Sheet No.</u>	<u>Dated</u>
1	August 21, 1971, March 20, 1972, April 29, 1972 and May 20, 1972.
2	April 25, 1972 and May 20, 1972.
3	April 20, 1972, revised May 4, 1972, May 20, 1972 and May 31, 1972.
4	April 25, 1972 and May 20, 1972.
5	January 4, 1972, March 20, 1972, and April 26, 1972.
6	April 25, 1972, March 20, 1972 and May 31, 1972



Chief, Bureau of Water Control

Chief Engineer

Trenton, New Jersey

June 29 , 19 72



MORRIS ENGINEERS INC.

STRUCTURES • FOUNDATIONS • SEWAGE DISPOSAL • MUNICIPAL ENGINEERING • PLANNING

P.O. BOX 288
LEDGEWOOD
NEW JERSEY 07852

SUB. 504-4142
RES. 501-827-8106

September 18, 1972

Mr. Syed Aziz
Department of Environmental Protection
State of New Jersey
Division of Water Resources
P.O. Box 1390
Trenton, New Jersey, 08620

Re.: Jacksonburg Creek Dam, Application No. 615.
Drawing Number One of the project.

Dear Mr. Aziz:

On your request we have computed the areas under water at the Young's pond during four different flood levels and came up with the following:

1. Operating level at Elevation 698.15 -
approximately 622,709 sq. ft. or 14.30 Acres.
2. Flood line at Elev. 700.15 -
approximate area 711,797 Sq. ft. or 16.34 Acres.
3. Flood line at Elev. 702.15 -
approximate area 778,460 sq. ft. or 17.87 Acres.
4. Flood line at crest of dam - Elev. 703.61 -
approximate area 876,732 sq.ft., or 20.13 Acres.

At this time the construction of concrete spillway is well under way and a good progress can be expected shortly.

Very truly yours,

Ilmar Aasma, Pres.
Ilmar Aasma, Pres.

P.S.

MEMORANDUM

DATE: 3/22/72

TO: Robert L. Hardman, Assistant Director
Division of Water Resources

FROM: Russell A. Cookingham, Director
Division of Fish, Game and Shellfisheries

SUBJECT: PROPOSED DAM CONSTRUCTION
Application No. 615

Receipt is acknowledged of notice furnished February 29, 1972
of the application filed on February 24, 1972 by

Kenneth W. Young
18 Young Avenue
Cedar Grove, N.J.

for permit to construct a dam across Jacksouburg Creek
in the Township of Blaiirstown, Warren County.

Pertinent features of the proposed dam:

State Atlas Sheet Location:	21.33.7.5.3
Drainage Area:	4.5 square miles
Normal Water Surface Area:	12 acres
Normal Volume of Impoundment:	--- million gallons
Type of Dam:	Earthfill - Existing Dam
Maximum Height:	19 feet
Length:	425 feet
Top Width:	18 feet

With respect to the necessity for incorporation of
a fish ladder in the subject proposed dam, please be advised
that

no fish ladder is required at this site.
However, a cold water release structure is
recommended for the dam.

Director



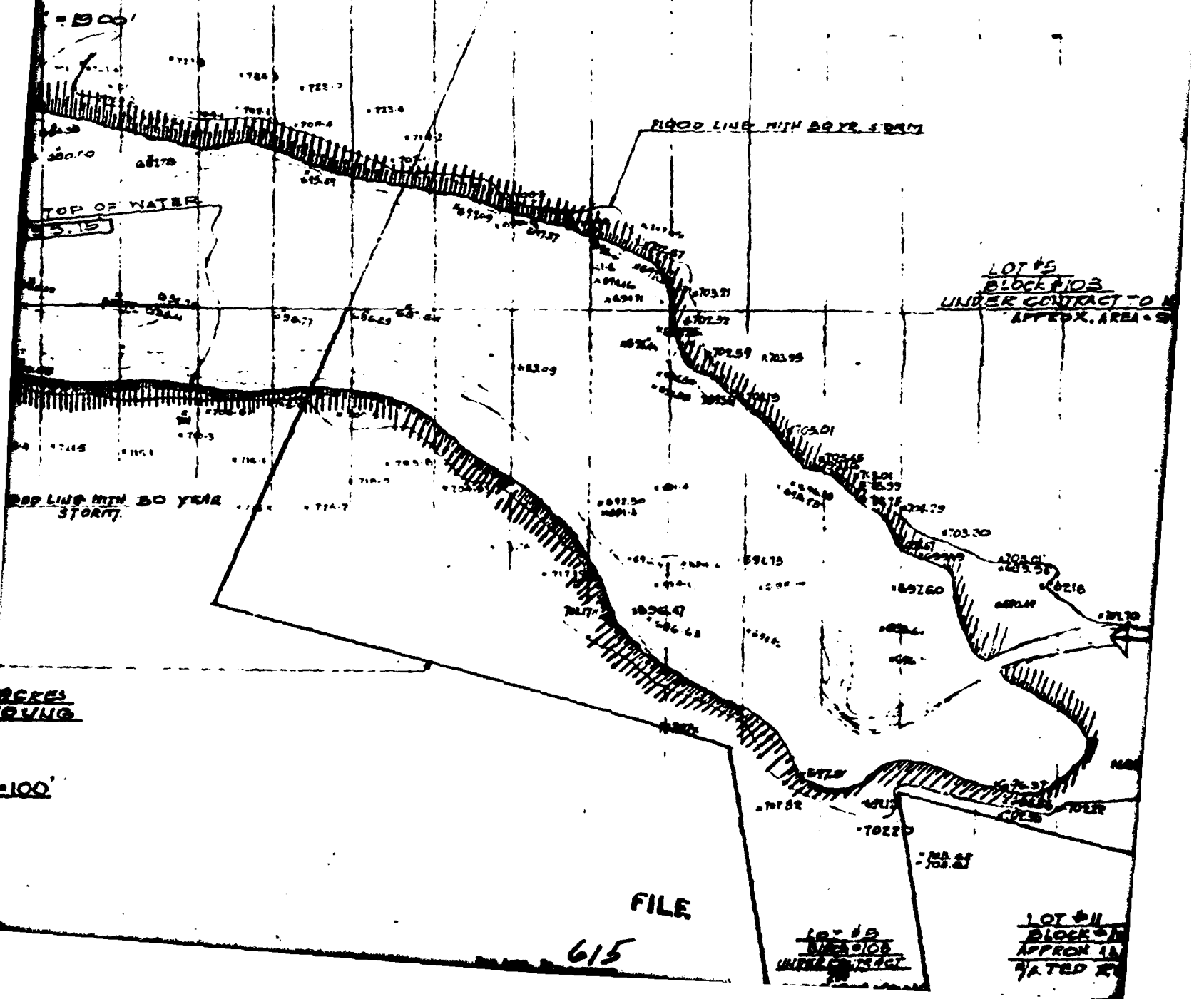
LOT # 9
BLOCK # 103
AREA = 173.5 ACRES
KENNETH YOUNG

SCALE :- 1" = 100'

SECTION 16

PROPERTY OF KENNETH J. COUG

J K L M N O P Q R S T U V W



FILE

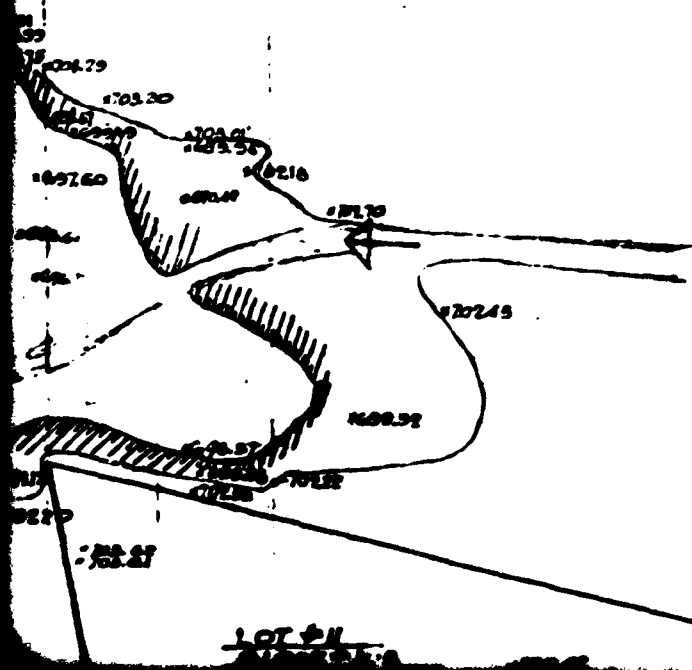
615

LOT #5
BLOCK #103
UNDER CONTRACT TO M
APPROX. AREA - 5

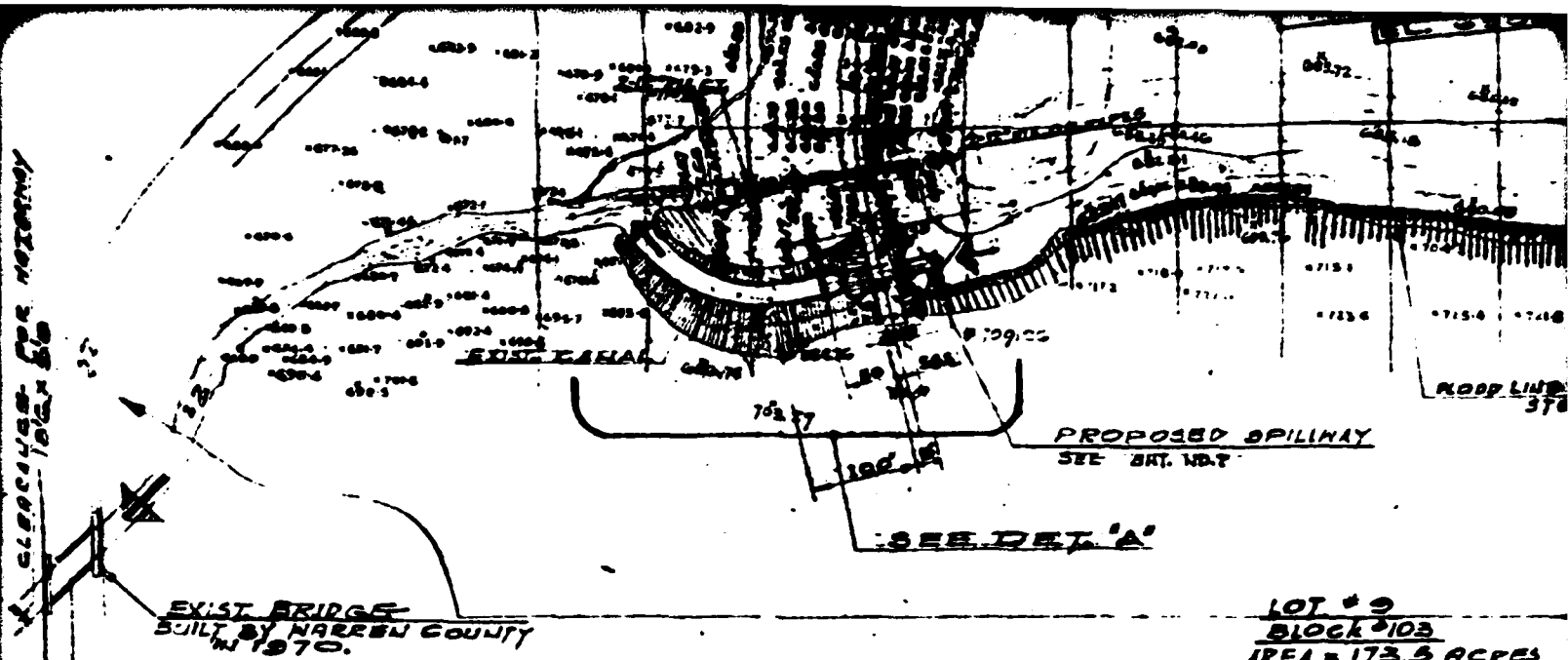
LOT #11
BLOCK #11
UNDER CONTRACT TO M
APPROX. AREA - 5

U V W

LOT #5
BLOCK #103
UNDER CONTRACT TO KENNETH YOUNG
APPROX. AREA = 9262 AC.



1. CLEARANCE FOR HIGHWAY



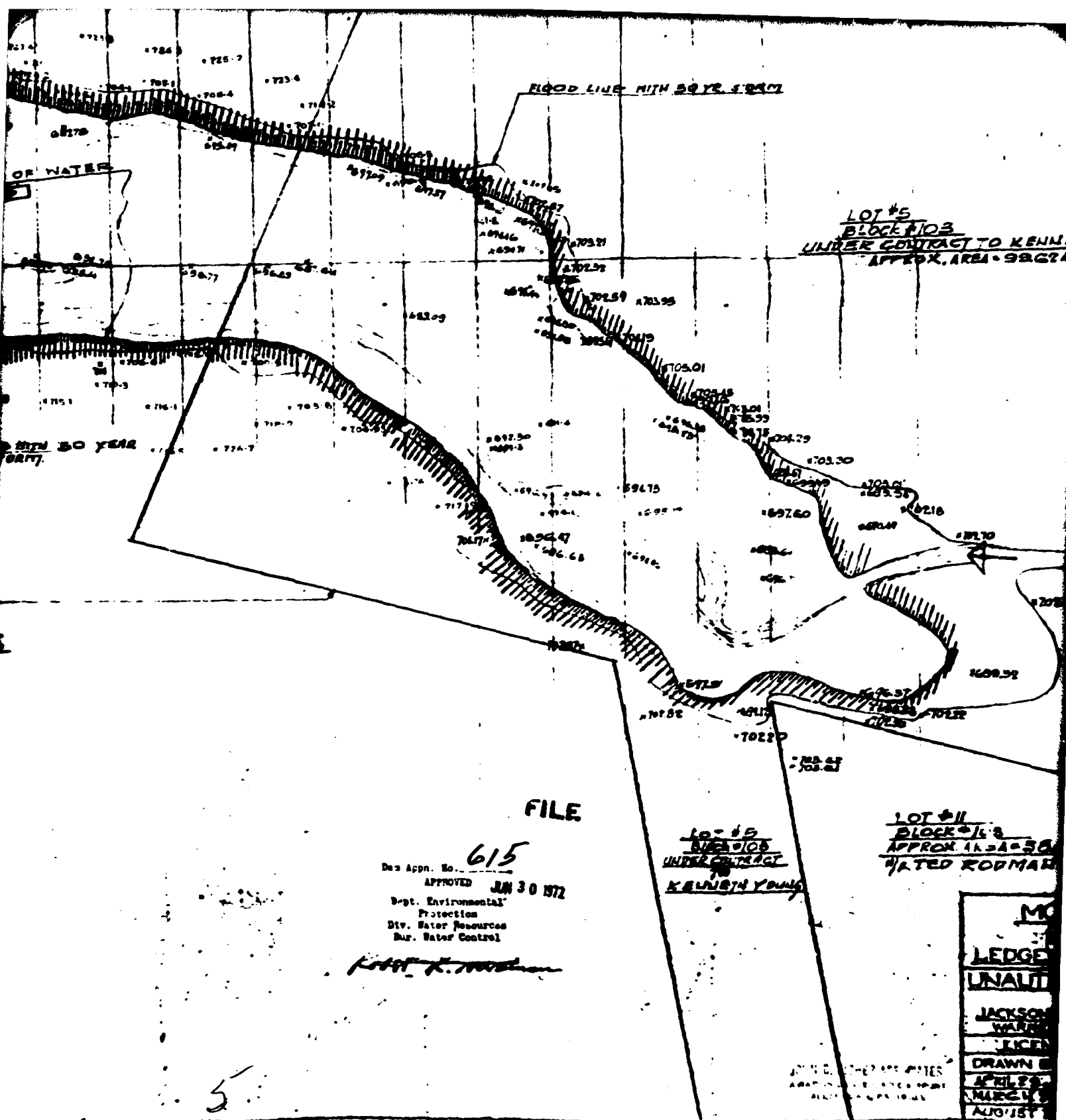
EXIST BRIDGE
BUILT BY WARREN COUNTY
IN 1970.

PROPOSED SPILLWAY
SEE DET. NO. 7

SEE DET. A

LOT # 9
BLOCK # 103
AREA = 173.5 ACRES
KENNETH YOUNG

SCALE: 1" = 100'



FILE

615

Des Appn. No. 615
APPROVED JAN 30 1972
Dept. Environmental
Protection
Div. Water Resources
Bureau Water Control

Robert K. [Signature]

LOT #5
BLOCK #103
UNDER CONTRACT TO KENN
APPROX. AREA - 98674

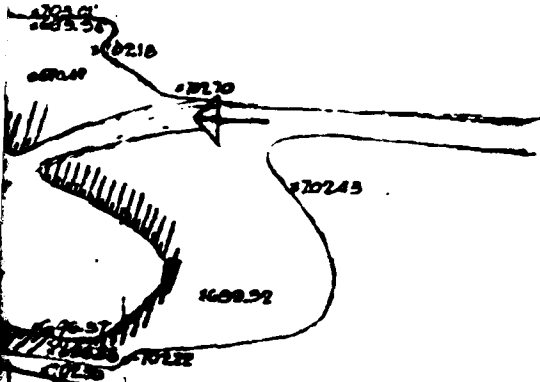
LOT #5
BLOCK #103
UNDER CONTRACT
KENNETH YOUNG

LOT #11
BLOCK #113
APPROX. AREA - 4050
HATED RODMAN

MO
LEDGE
UNAUT
JACKSON
WARR
LIGER
DRAWN E
APRIL 28
MAY 14
AUGUST

5

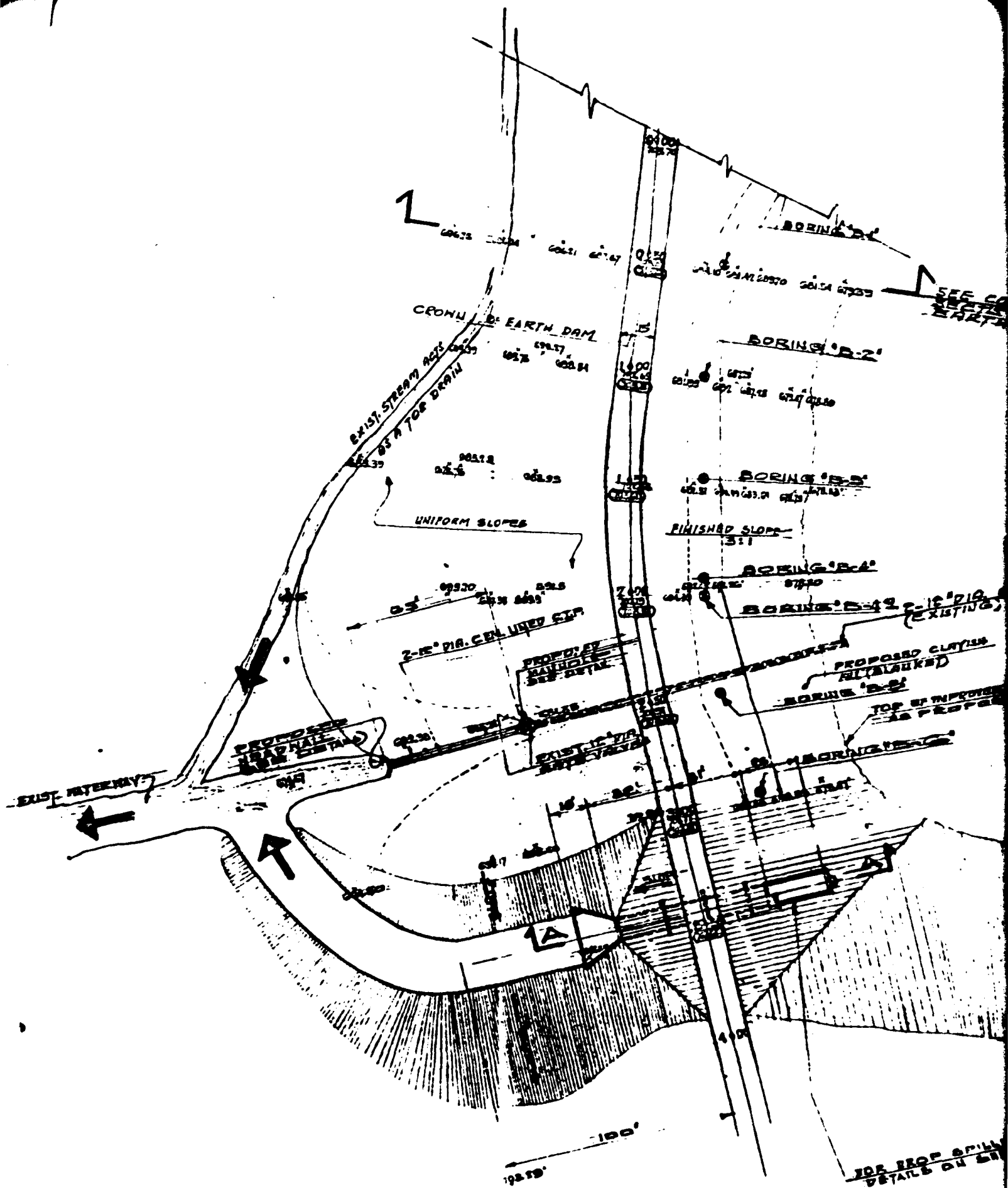
OT #5
 BLOCK #103
 CONTRACT TO KENNETH YOUNG
 APPROX. AREA - 9867 AC.



LOT #11
 BLOCK #103
 APPROX. AREA - 3805 AC.
 HATED RODMAN

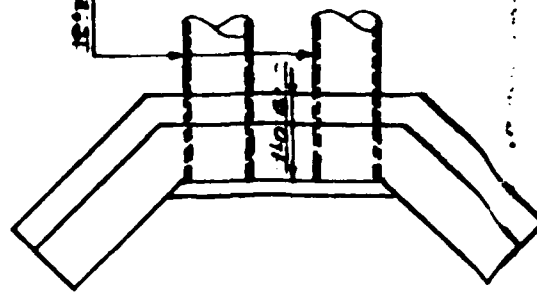
MORRIS ENGINEERS, INC.	
BY: <i>[Signature]</i>	
LEDGEWOOD CONSULT. ENGRS., N.J.	
UNAUTHORISED ENCROACHMENT	
NO. - E-358	
JACKSONBURG CREEK, TWP. OF BLAIRSTOWN	
WARREN COUNTY, STATE OF NEW JERSEY	
LICENSE NO. - 10614	
DRAWN BY - H.F.	CHECKED BY - A
APRIL 2, 1972	
MARCH 10, 1972	
AUGUST 2, 1971	

1

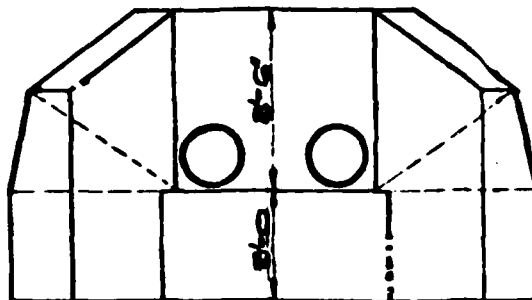


DET. A

J. A. HARRIS

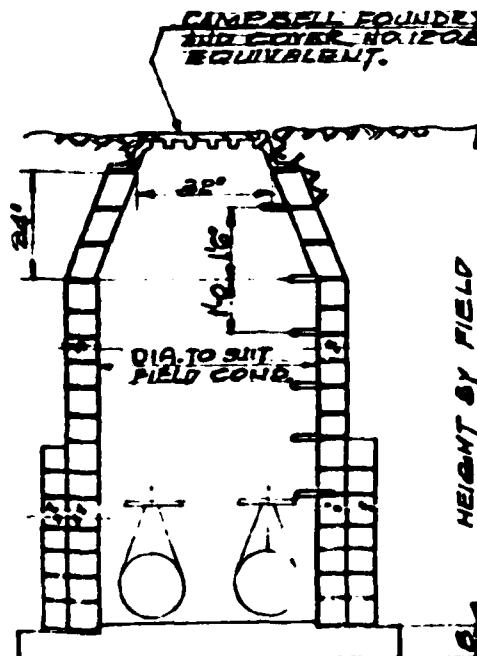


PLAN



FRONT ELEV.

HEADWALL DETAIL
N.T.S.



HEIGHT OF FIELD

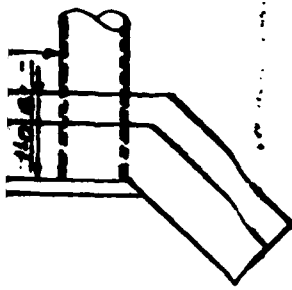
SEE CORRESPONDING
SHEETS THAT IMPROVED
EARTH DRAIN ON SHEETS NO. 5 & 6

2-12" DIA. C.I. PIPES
(EXISTING)

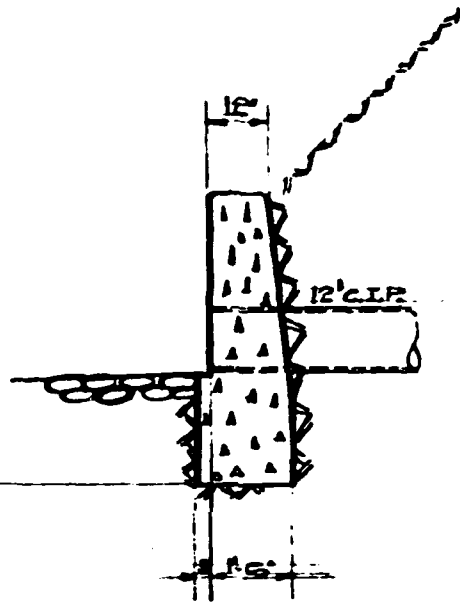
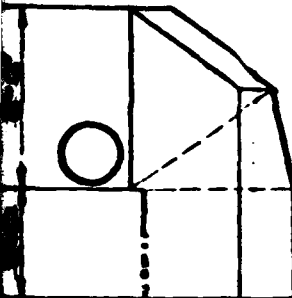
AND CLAYISH
SAND

OF IMPROVED SLOPE
AS PER PLAN

NO. 1206 OR
EQUIV. OR BETT.



LAN

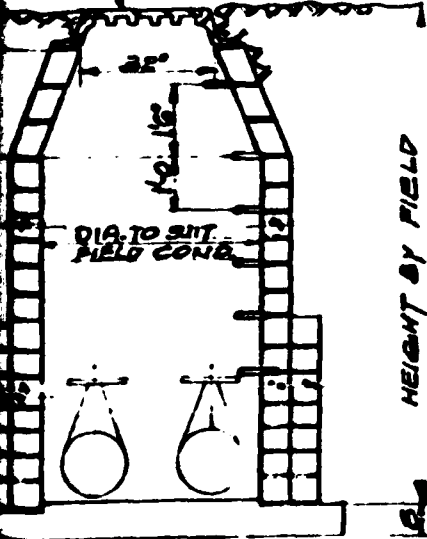


INT ELEV.

EXT ELEV.

HEADWALL DETAILS

CAMPBELL FOUNDRY FRAME
AND COVER NO. 1206 OR
EQUIVALENT.



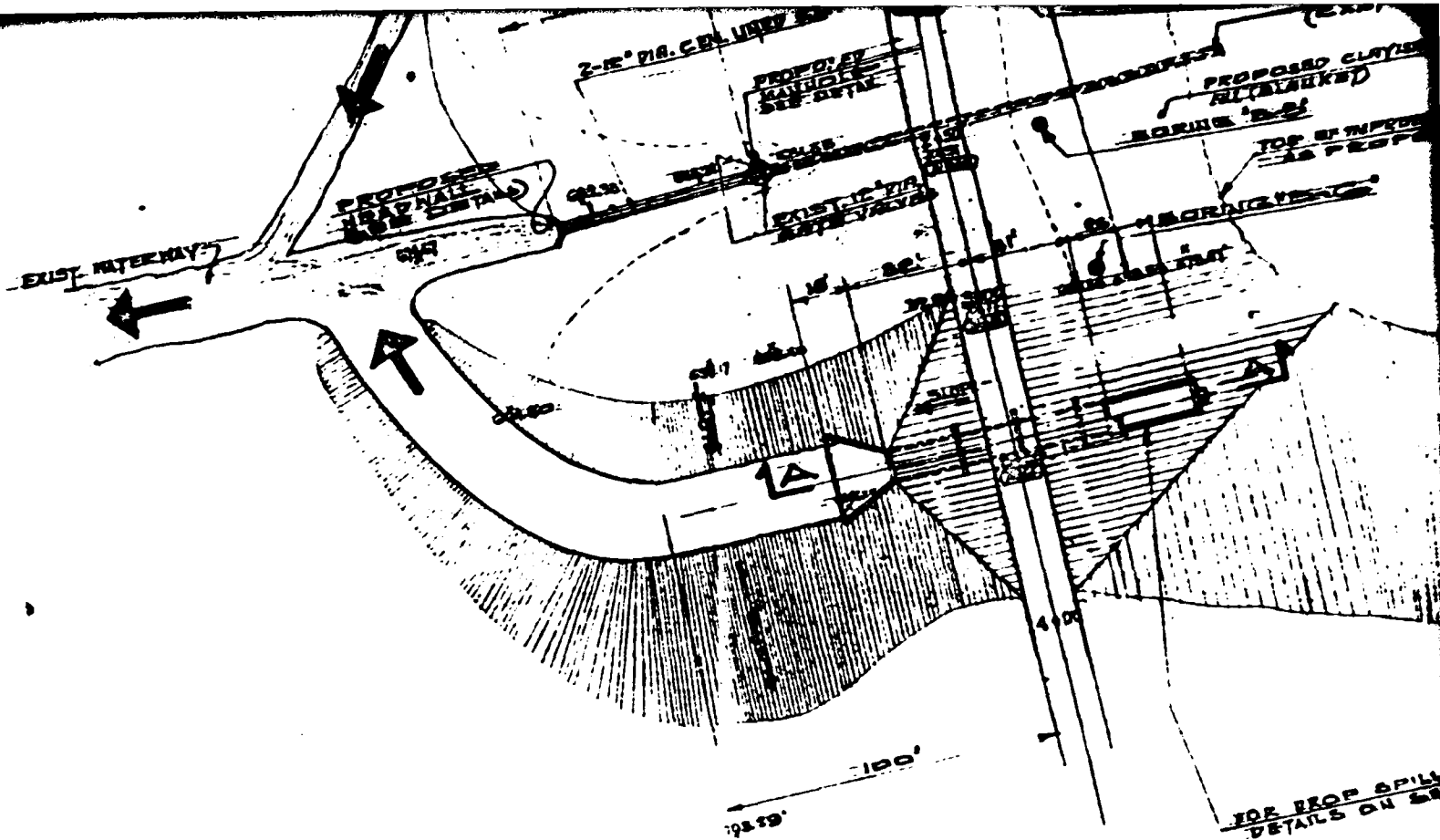
HEIGHT BY FIELD

FILE

615

APPROVED JUN 30 1972
Dist. Engineer
Div. Water Control

Robert L. Hardman

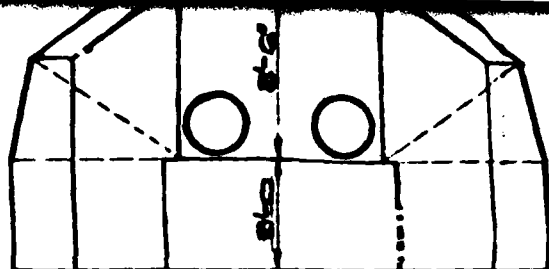


DET. 'A'

SCALE: 1"=50'

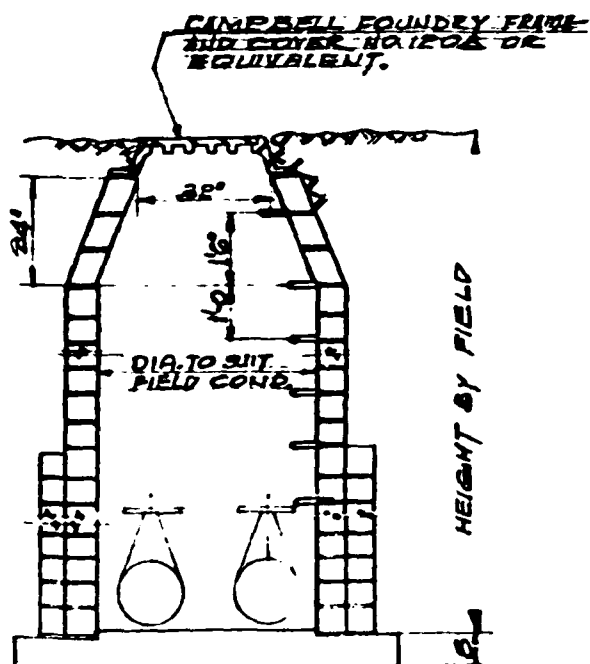
689.75 THIS INDICATES EXIST. GRADE
708.61 INDICATES FINISHED GRADE

4



FRONT ELEV.

HEADWALL DETAIL
N.T.S.



DETAIL OF MANHOLE

2-12" DIA. C.I. PIPES
(EXISTING)

RED CLAY BRICK
WORK

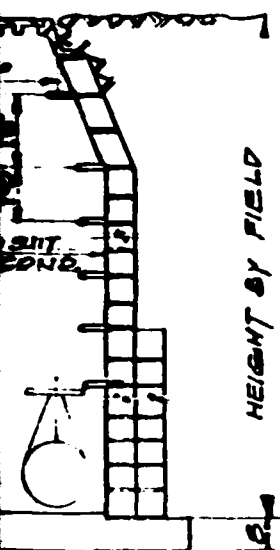
BY IMPROVED SLOPE
AS REQUIRED

PROP SPILLWAY SEE
PLANS ON SHEET 4 & 5

ELEV. [REDACTED] ELEV.

ADWALL DETAILS
N.T.S.

MANHOLE FOUNDRY FRAME
COVER NO. 1206 OR
EQUIVALENT.



FILE

615

APPROVED JUN 30 1972
Dist. Engineer
Div. Water Control

Robert L. Hardman

OF MANHOLE

JOHN B. AICHER ASSOCIATES	
MORRIS ENGINEERS, INC.	
BY <i>Matthew</i>	
LEDGEWOOD, CONSULT. ENGINEERS, N.J.	
UNAUTHORIZED ENCROACHMENT	
NOI-E-356	
JACKSONBURG CREEK, TWP. OF BLAIRSTOWN	
WARREN COUNTY, STATE OF NEW JERSEY	
LICENSE NO. 1004	
DRAWN BY: LA	CHECKED BY: LA
4/23/72	
5/20/72	

2

BOY. SECTION OF CANAL

18'0"

18'0"

1A

17

17

32'0"

17'0"

18'0"

3 - #6 BENTONS
C.C. & D.C. (15)

REINFORCING ST.
AS SHOWN ON SPEC. 9-9

REINFORCING ST.
AS SHOWN ON SPEC. 9-9

3 - #6 BENTONS
C.C. & D.C. (15)

3 - #6 BENTONS
C.C. & D.C. (15)

304.26

40 BARS 21'0" (15)

2 - 15 BARS (15)

3 - #6 BENTONS
C.C. & D.C. (15)

18'0"

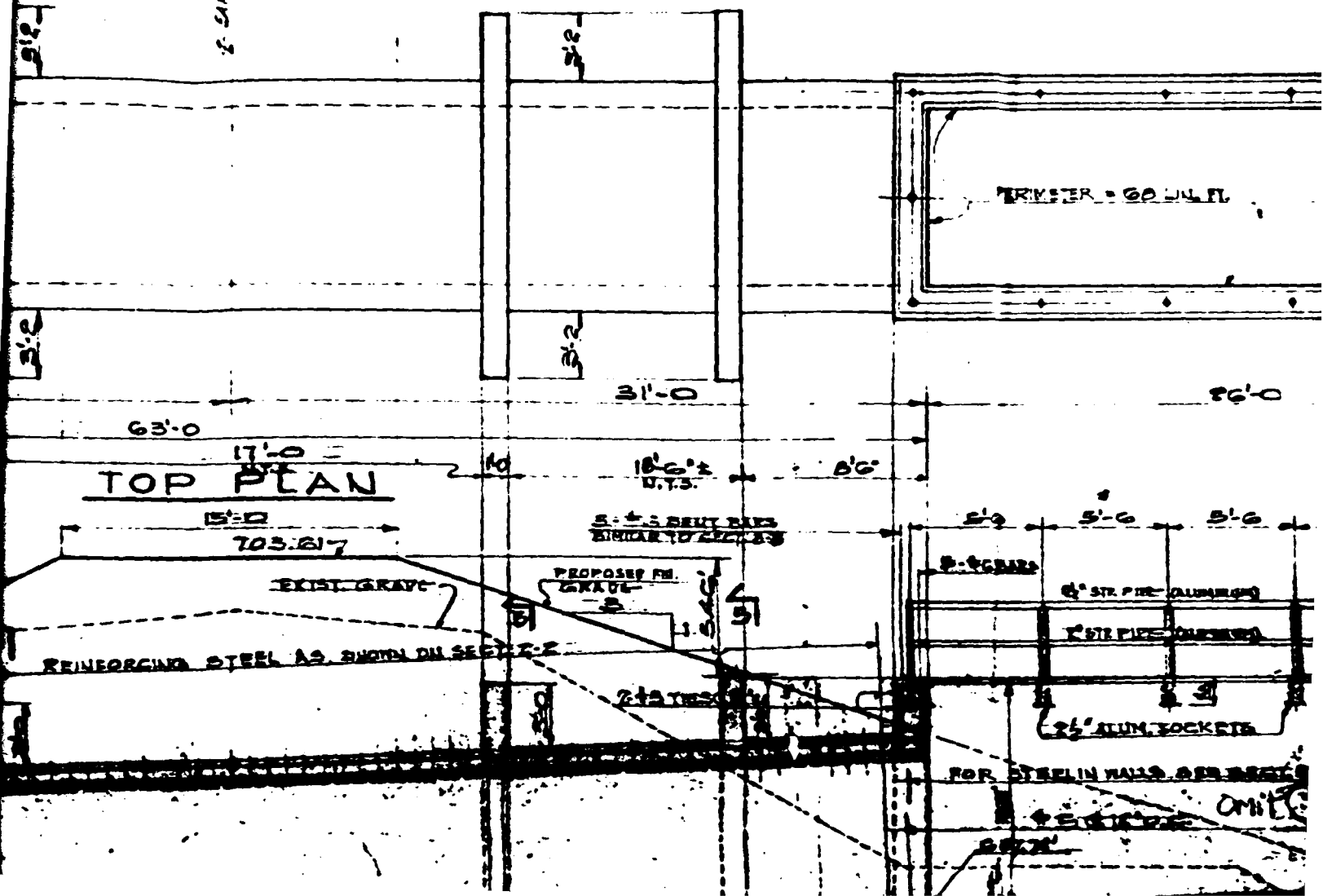
1A

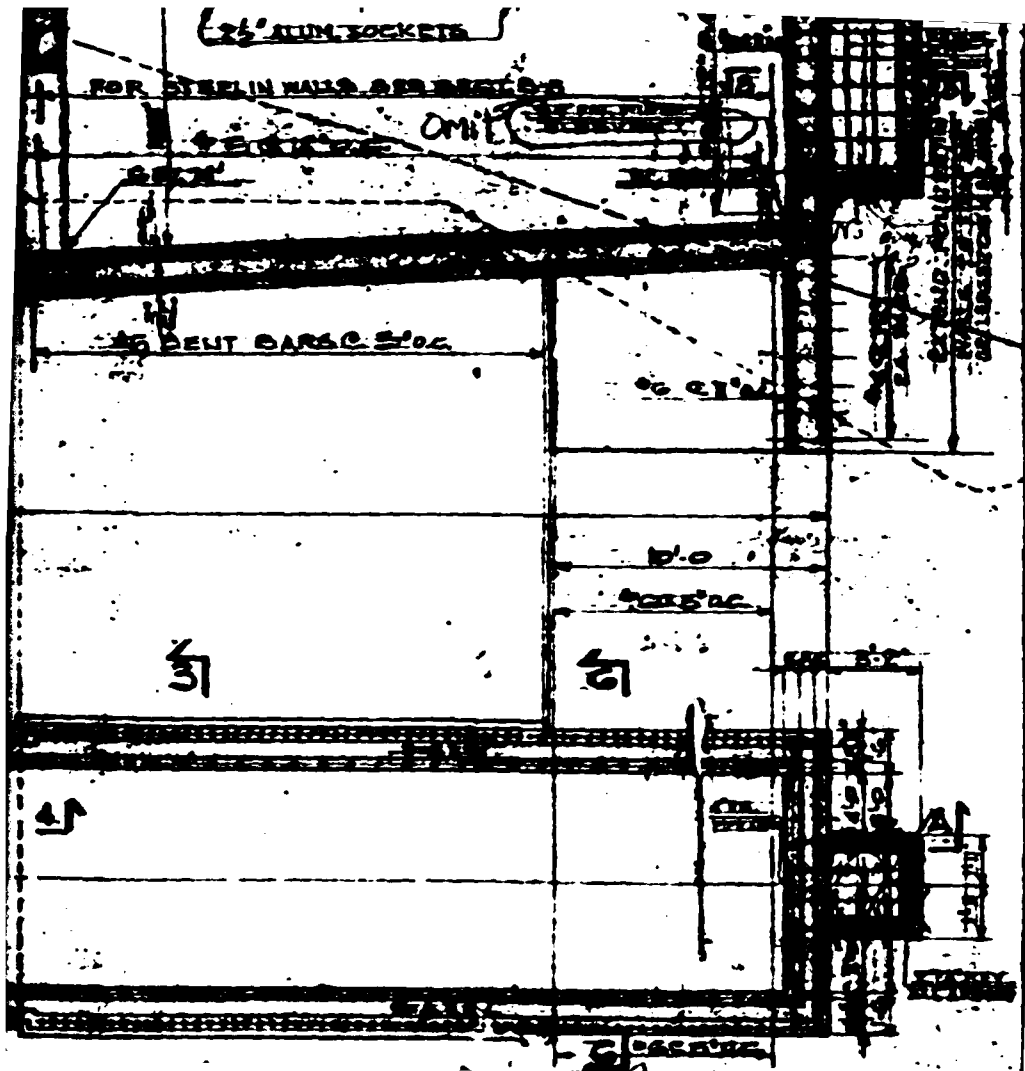
12'0" O.C.

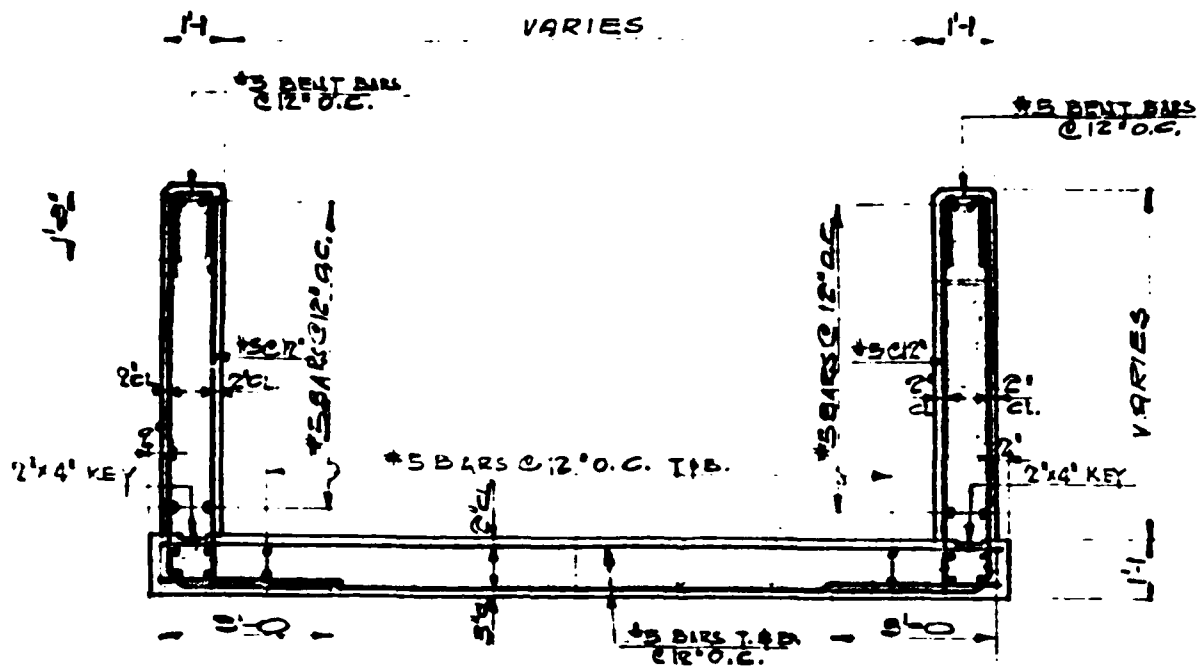
51

2

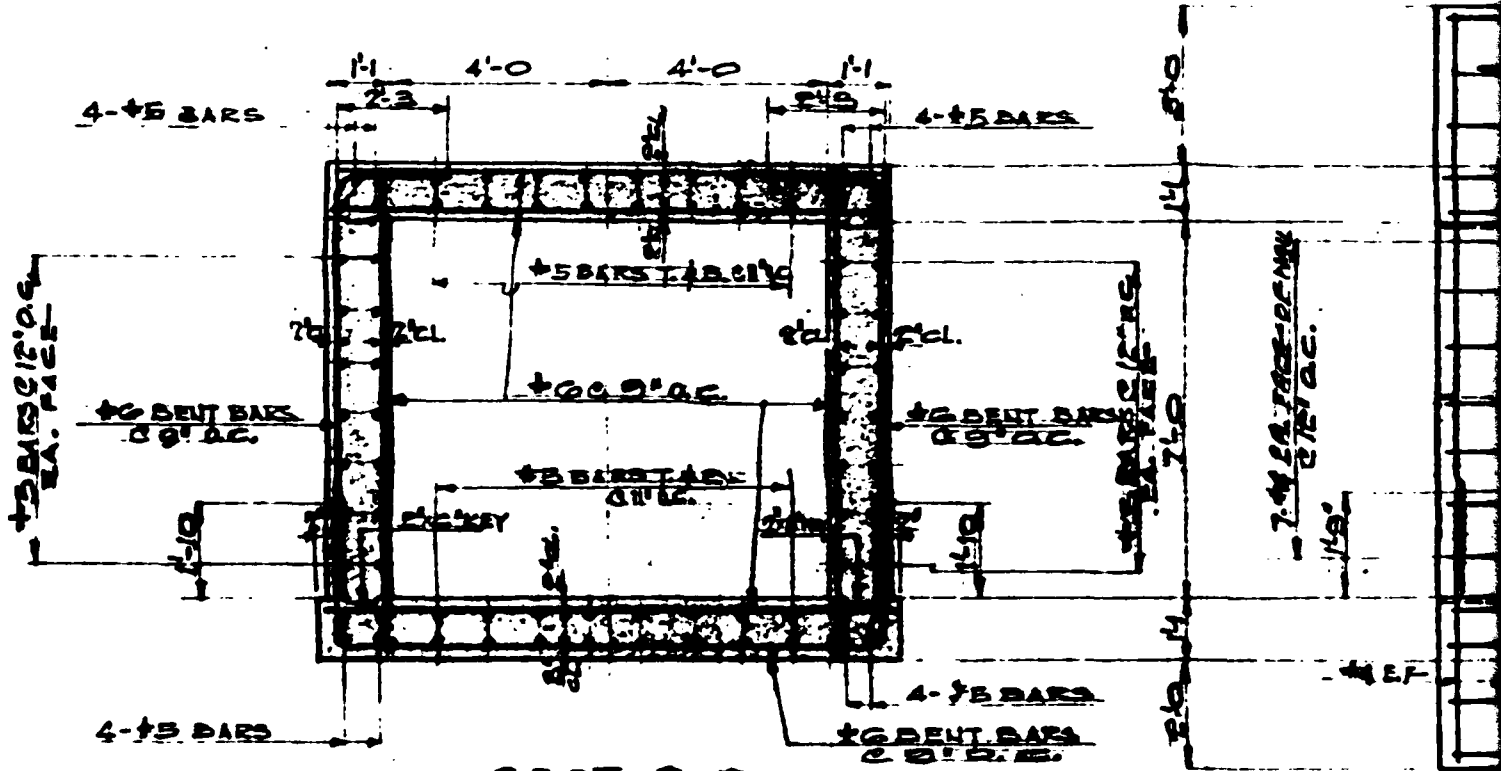
2-SIXTH PLAN



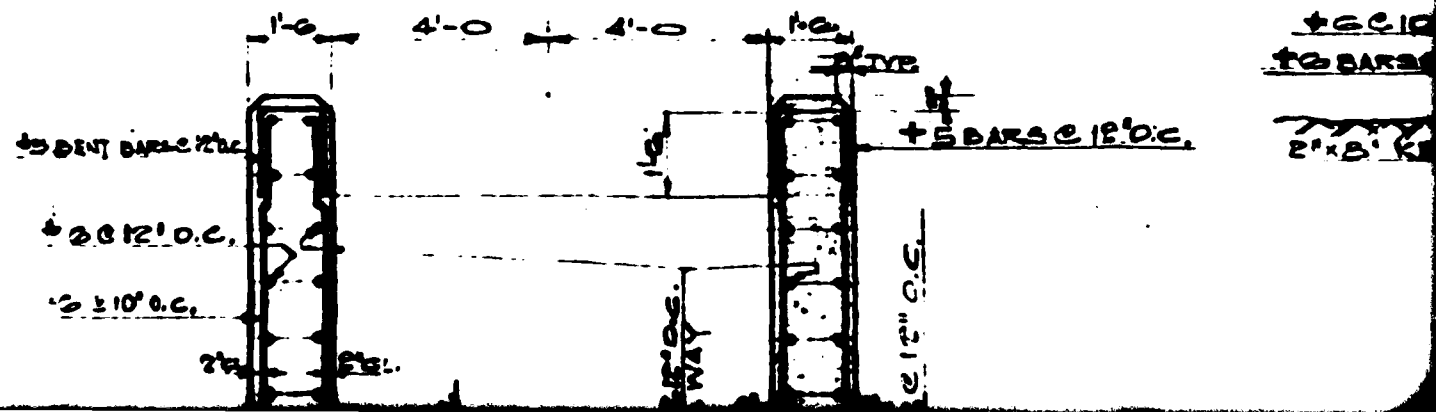


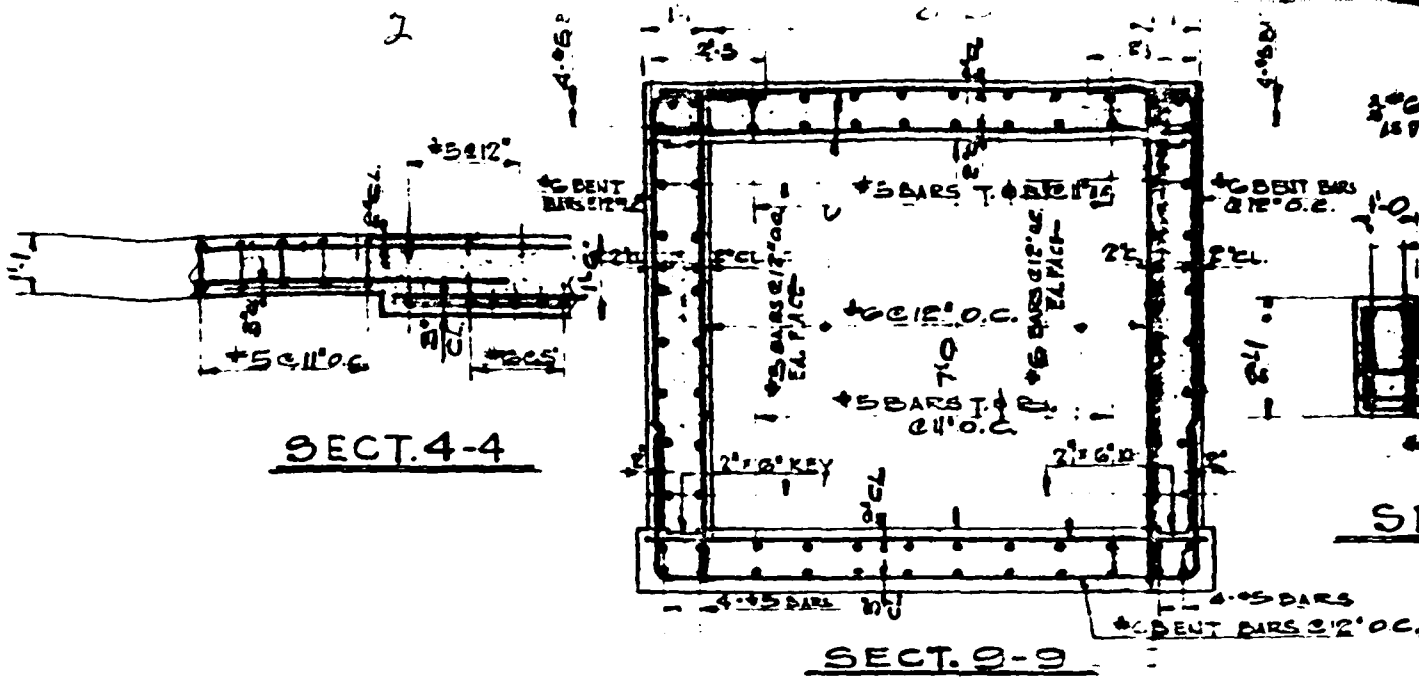


SECT. 1-1



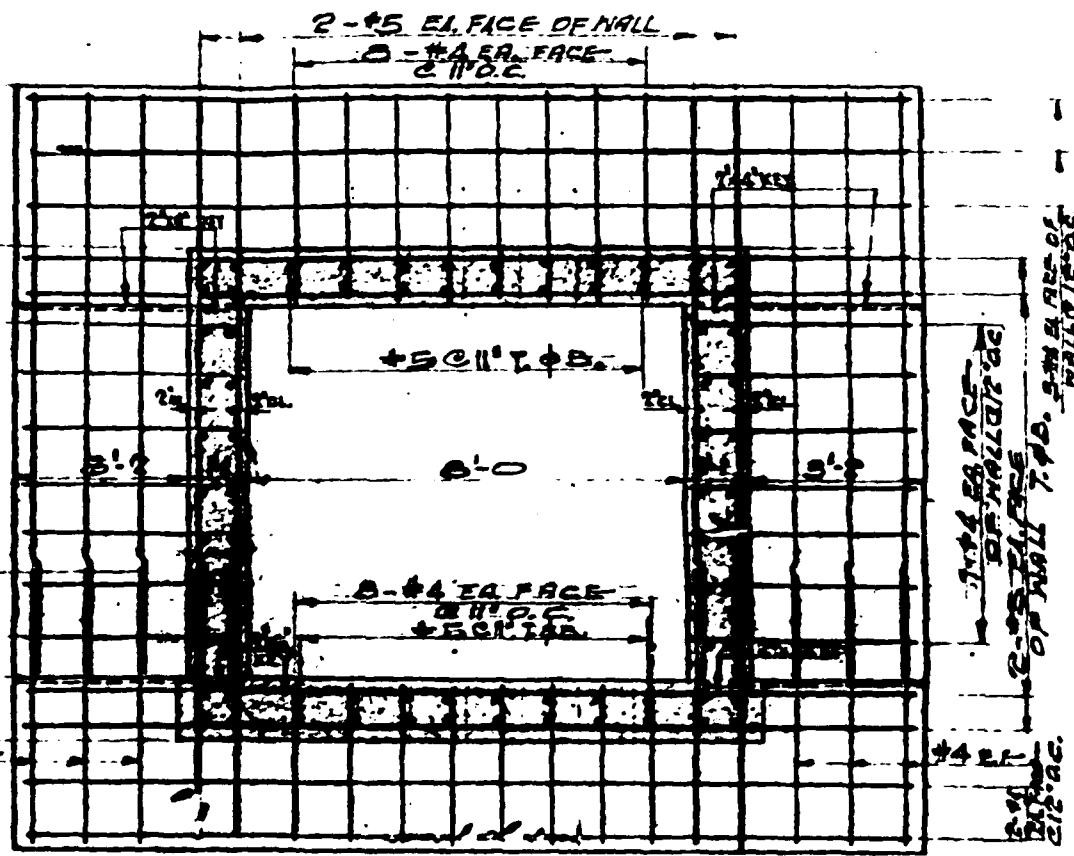
SECT. 2-2



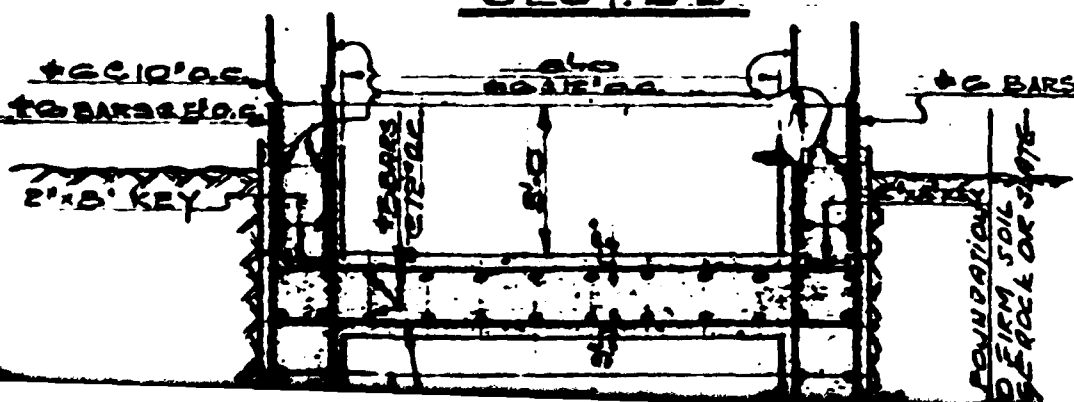


SECT. 4-4

SECT. 9-9



SECT. 5-5

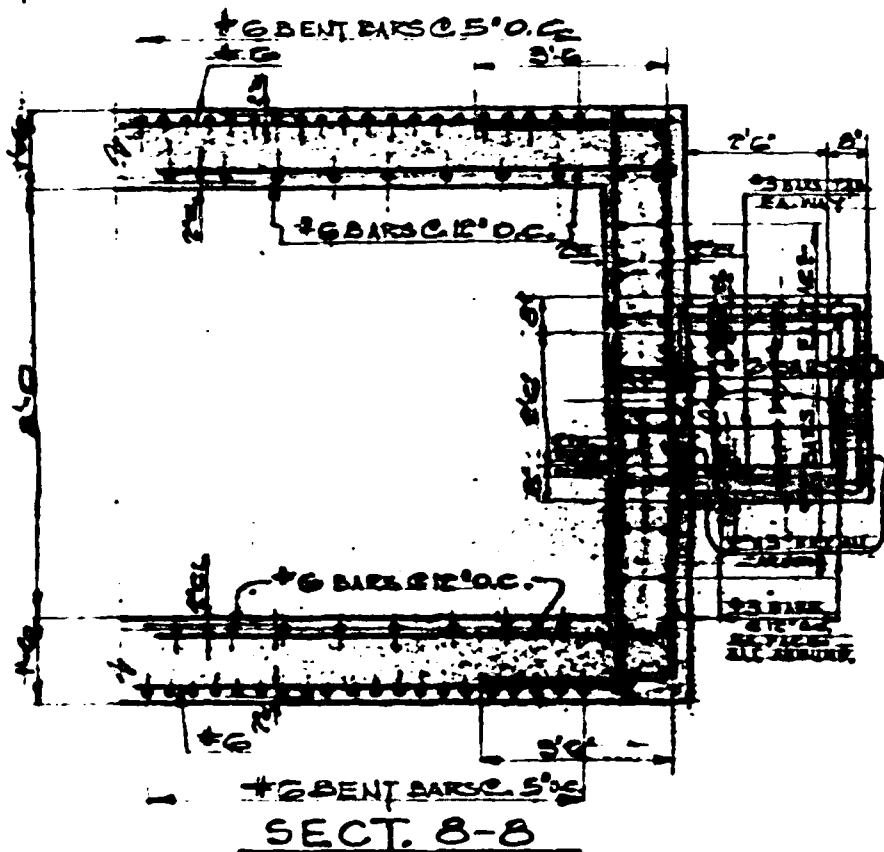
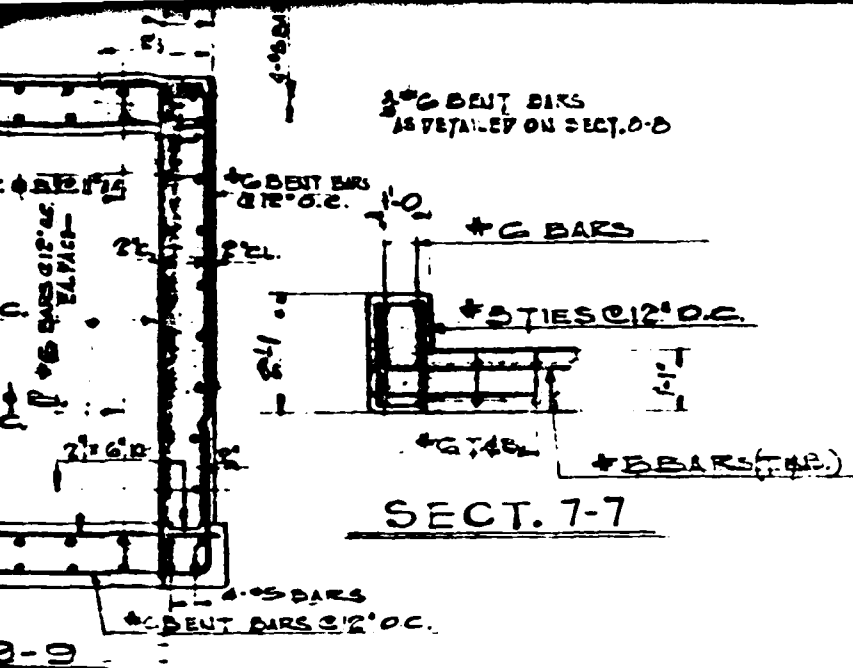


NOTES:

THE CONTRACTOR SHALL COMPRESSION STRENGTH ALL CEMENT SHALL BE PORTLAND CEMENT SHALL BE CLEAN FROM ALL IMPURITIES SHALL BE KEPT AT TEMPERATURE AFTER POURING. NO ADJUSTMENT PERMITTED.

REINFORCING STEEL SHALL BE AND SHALL CONFORM TO A.S.T.M. A-305.

REINFORCING STEEL SHALL BE AND SHALL BE KEPT SO ON ALL CONSTRUCTION JOINTS ALL WORK SHALL BE DONE IN ACCORDANCE WITH THE



NOTES:

THE CONTRACTOR SHALL FURNISH CONCRETE WHICH SHALL DEVELOP COMPRESSION STRENGTH OF 3000 LBS. PER SQ. IN. WITHIN 28 DAYS. ALL CEMENT SHALL BE PORTLAND AND SHALL CONFORM TO A.S.T.M. C-150 TYPE I. MATERIAL SHALL BE CLEAN FROM OILS, ACIDS, SALTS OR OTHER INJURIOUS SUBSTANCES. THE AGGREGATES SHALL BE FREE OF FROZEN LUMPS OR SNOW. THE CONCRETE SHALL BE KEPT AT TEMPERATURE OF 70° DEGREES F° FOR 72 HOURS AFTER POURING. NO ADMIXTURES TO PREVENT FREEZING SHALL BE PERMITTED.

REINFORCING STEEL SHALL BE NEW BILLET STEEL OF INTERMEDIATE GRADE AND SHALL CONFORM TO A.S.T.M. A-15. BARS SHALL BE DEFORMED TO CONFORM TO A.S.T.M. A-508.

REINFORCING STEEL SHALL BE FREE FROM SCALE, OIL AND STRUCTURAL DEFECTS AND SHALL BE KEPT SO ON THE JOB.

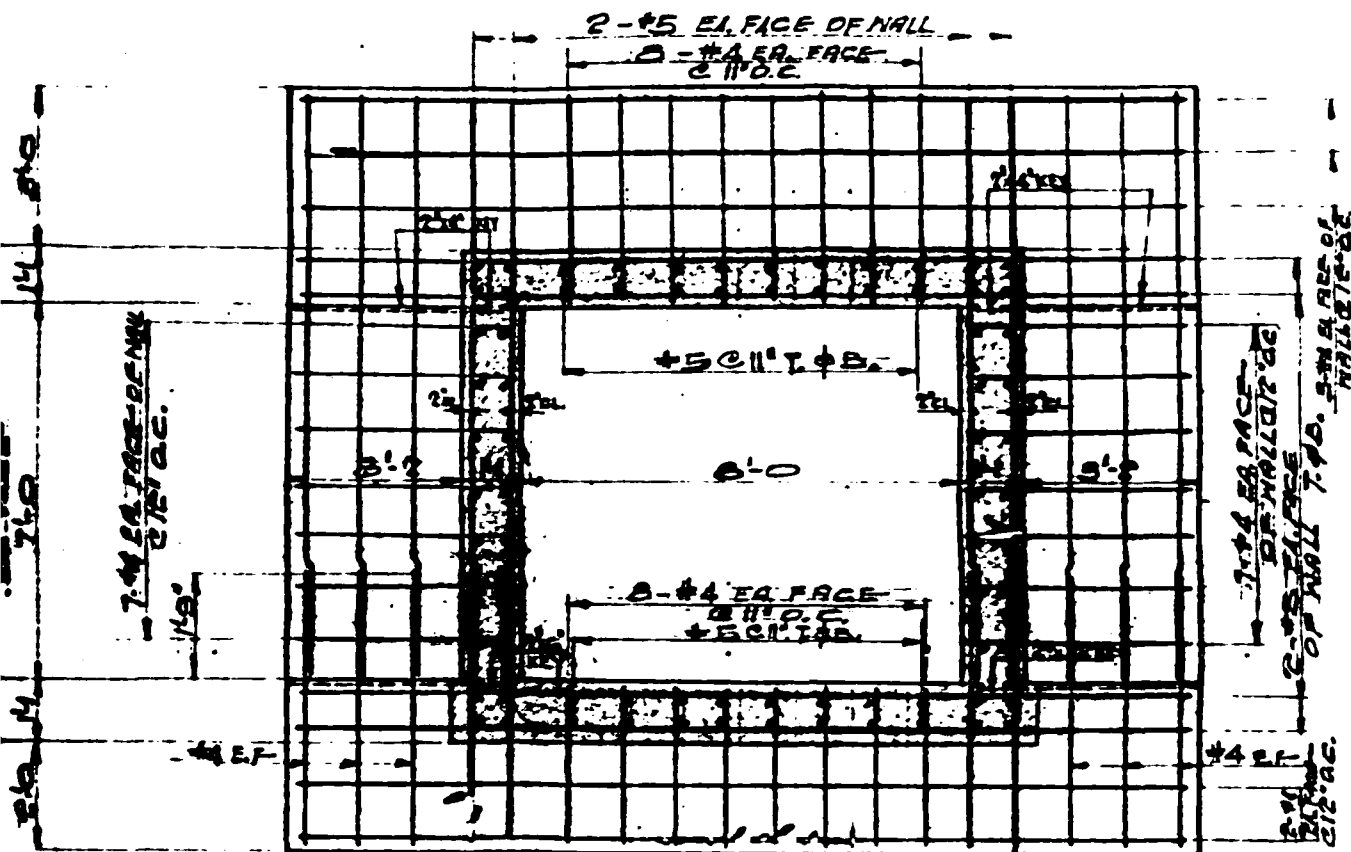
ALL CONSTRUCTION JOINTS SHALL BE KEYED AND DOWELLED.

ALL WORK SHALL BE DONE IN ACCORDANCE WITH CURRENT BUILDING CODE AND IN ACCORDANCE WITH APPROVAL OF STATE OF NEW JERSEY.

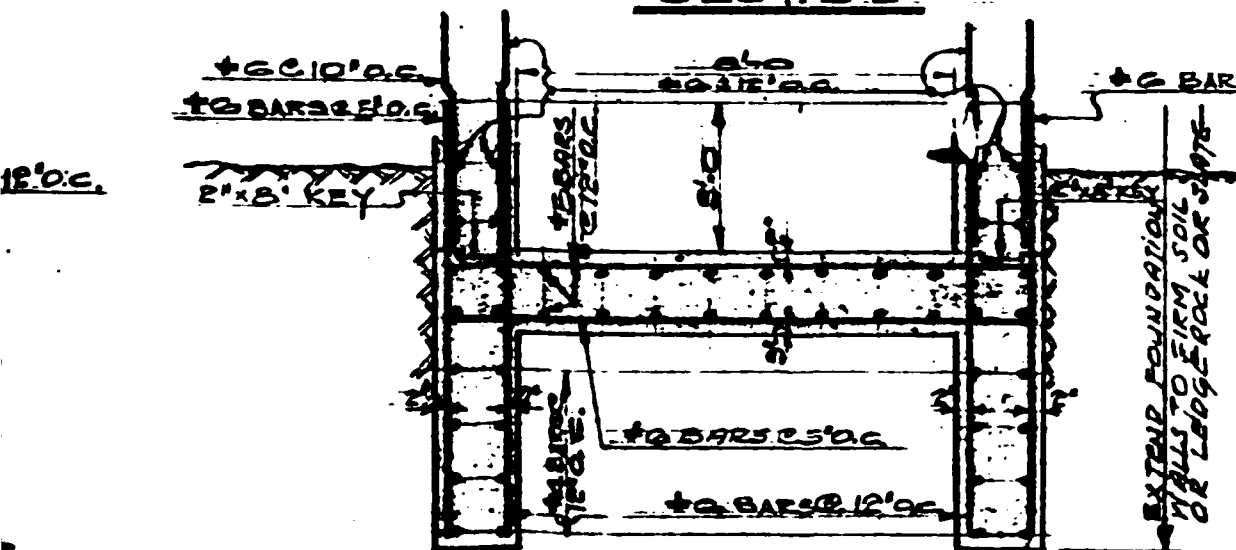
[illegible][illegible]

4

SECT. 2-9



SECT. 5-5



NOTES:

THE CONTRACTOR SHALL COMPRESSION ALL CEMENT SHALL BE CEMENT. ALL MATERIALS SHALL BE CHECKED BY THE AGGREGATES SHALL BE KEPT IN A SEPARATE PILE AFTER POURING. REINFORCING STEEL SHALL CONFORM TO A.S.T.M. A-36 REINFORCING STEEL SHALL BE KEPT IN ALL CONSTRUCTION. ALL WORK SHALL BE DONE IN ACCORDANCE

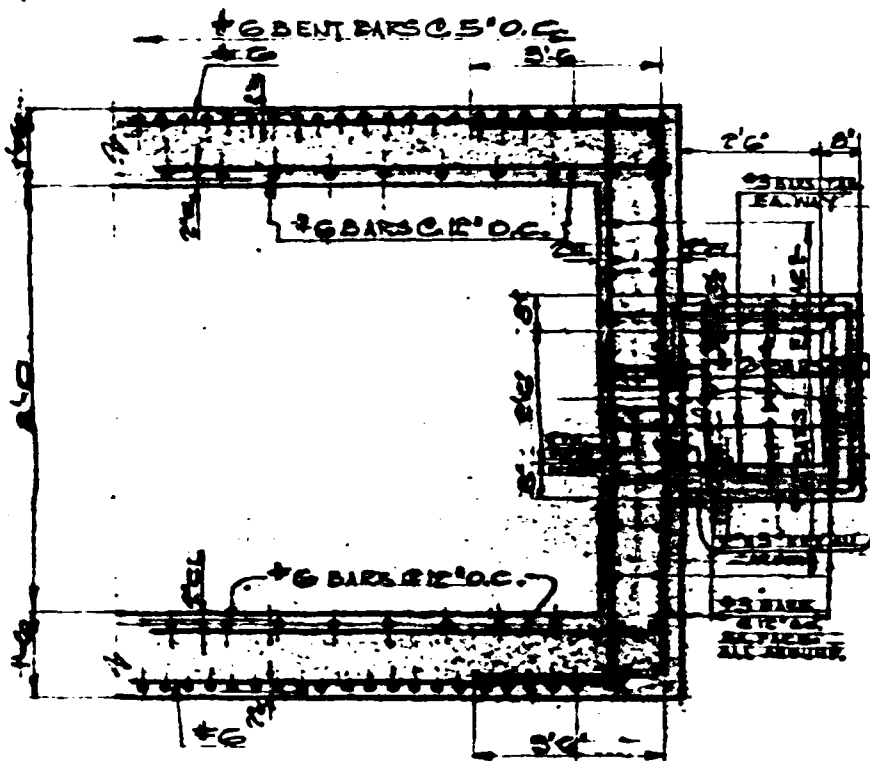
SECT. 6-6

6-#10 @ 10' O.C.

APPROVED
 Div. Chief
 Div. Chief
 Div. Chief

Robert L. L.

LL 4-3 BARS
#6 BENT BARS @ 2' O.C.



#6 BENT BARS @ 5' O.C.
SECT. 8-8

NOTES:

THE CONTRACTOR SHALL FURNISH CONCRETE WHICH SHALL DEVELOP COMPRESSION STRENGTH OF 3000 LBS. PER SQ. IN. WITHIN 28 DAYS. ALL CEMENT SHALL BE PORTLAND AND SHALL CONFORM TO A.S.T.M. C-150 TYPE I. AGGREGATES SHALL BE FREE FROM OILS, ACIDS, SALTS OR OTHER INJURIOUS SUBSTANCES. THE CONCRETE SHALL BE KEPT AT TEMPERATURE OF 70° DEGREES F° FOR 72 HOURS AFTER POURING. NO ADMIXTURES TO PREVENT FREEZING SHALL BE PERMITTED. REINFORCING STEEL SHALL BE NEW BILLET STOCK OF INTERMEDIATE GRADE AND SHALL CONFORM TO A.S.T.M. A-15, BARS SHALL BE DEFORMED TO CONFORM TO A.S.T.M. A-208. REINFORCING STEEL SHALL BE FREE FROM SCALE, OIL AND STRUCTURAL DEFECTS AND SHALL BE KEPT SO ON THE JOB. ALL CONSTRUCTION JOINTS SHALL BE KEYED AND DONELLED. ALL WORK SHALL BE DONE IN ACCORDANCE WITH CURRENT BUILDING CODES AND IN ACCORDANCE WITH APPROVAL OF STATE OF NEW JERSEY.

FILE

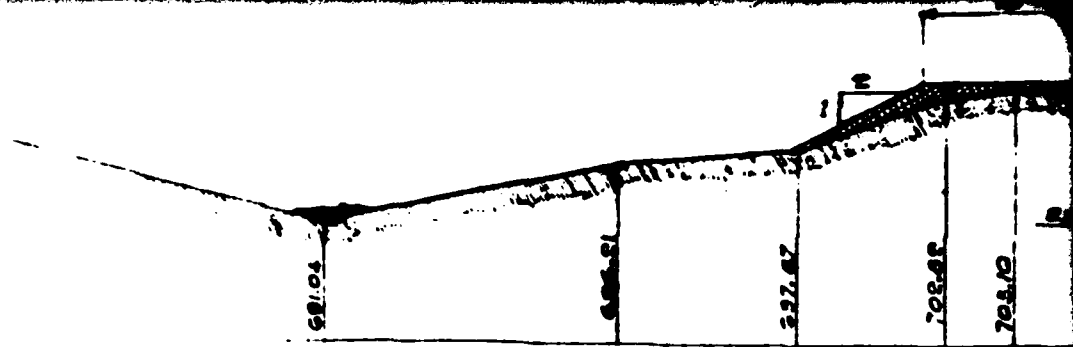
As Appd. To **615**
APPROVED **JAN 30 1972**
Dept. Environmental
Protection
Div. Water Resources
Dir. Water Control

Robert L. Hartman

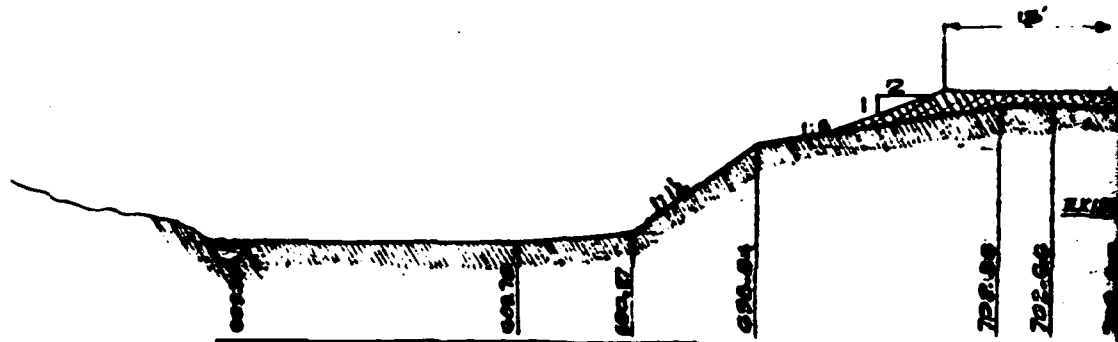
JOHN B. AICHER ASSOCIATES	
MORRIS ENGINEERS, INC.	
BY <i>John A. Mac</i> LEDGEWOOD CONSULT. ENGINEERS - N.J.	
UNAUTHORIZED ENCROACHMENT	
NO. E-262	
JACKSONBURG CREEK TRP. OF BLAIRSTOWN WARREN COUNTY, STATE OF NEW JERSEY	
LICENSE NO. 10014	
DRAWN BY LL	MAY 31, 1972
APR 23 1972	
MAY 20 1972	
SCALE: 1" = 1'-0"	

4

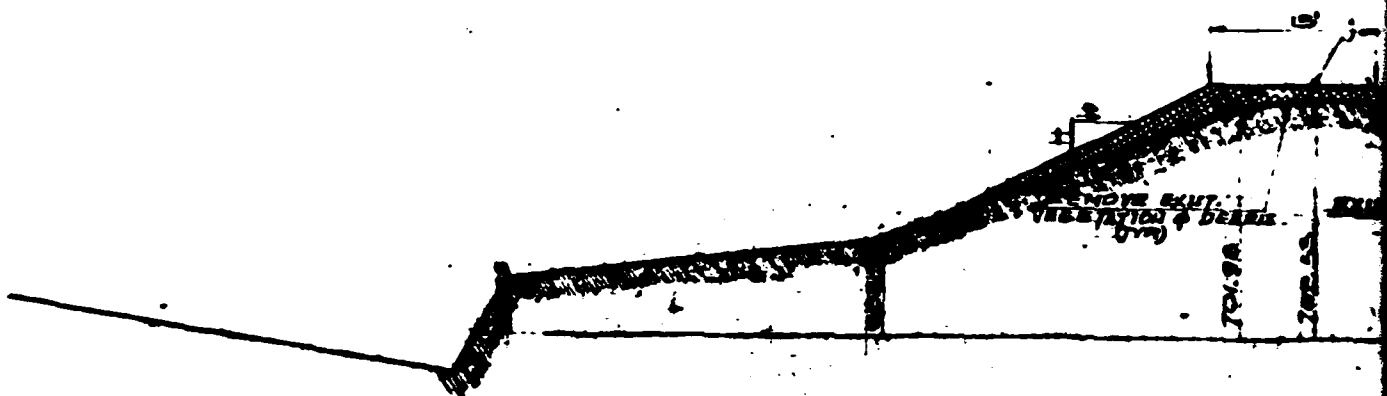
6



STA. 0+50



STA. 1+00



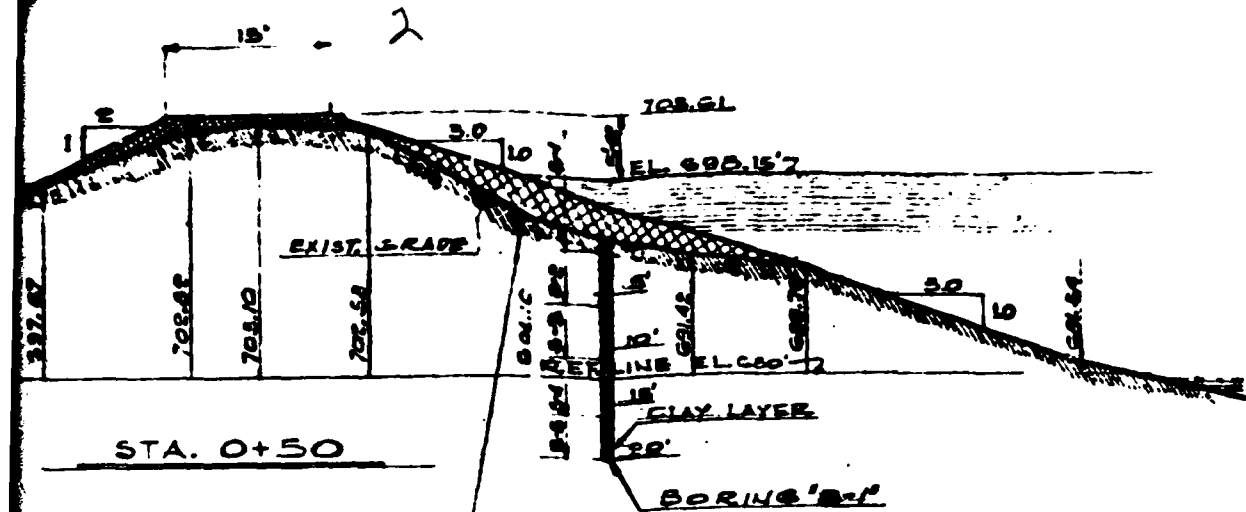
STA. 1+50



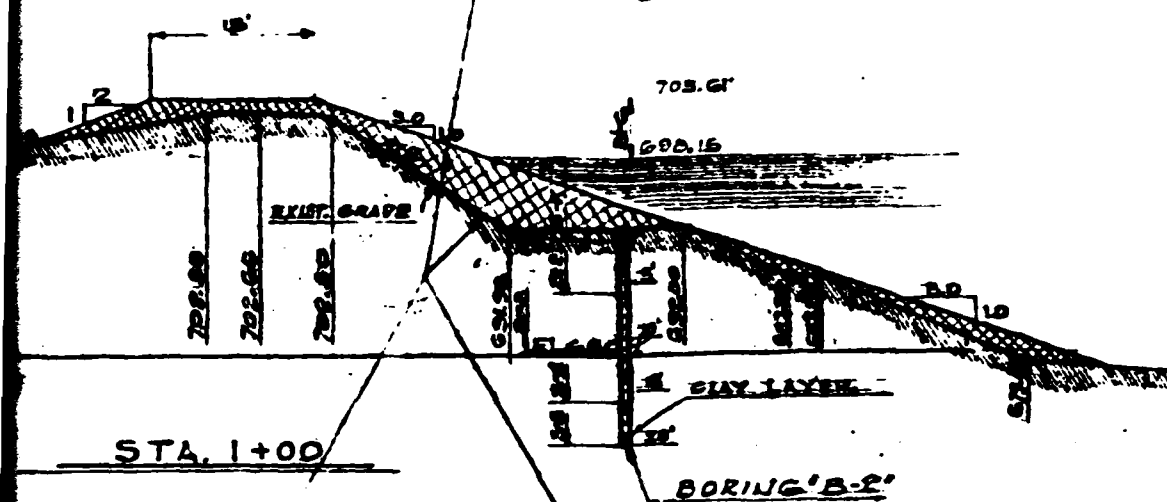
STA. 2+00

SECTION

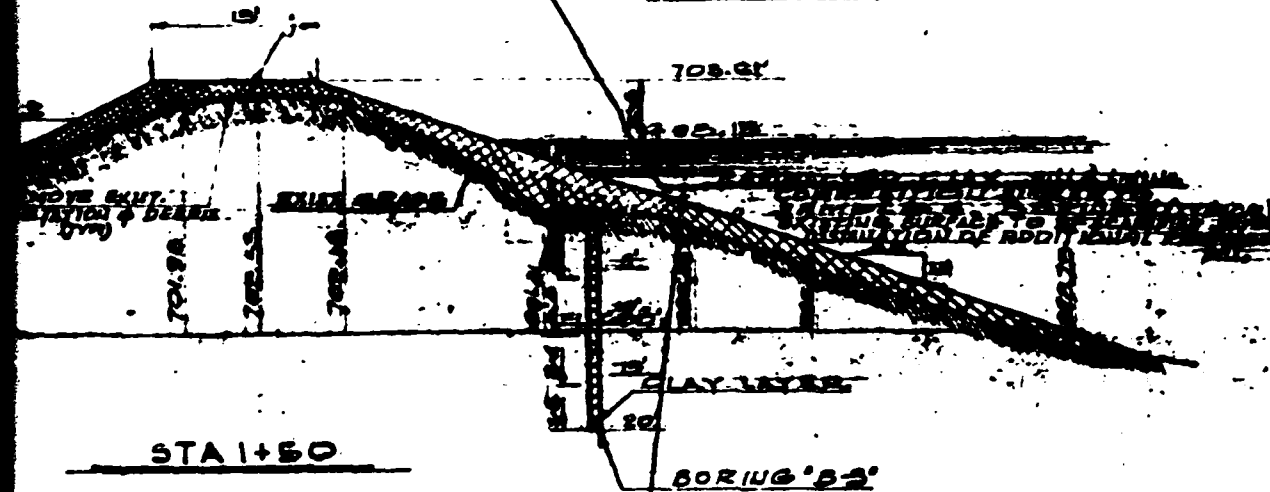
CONCRETE PAVEMENT



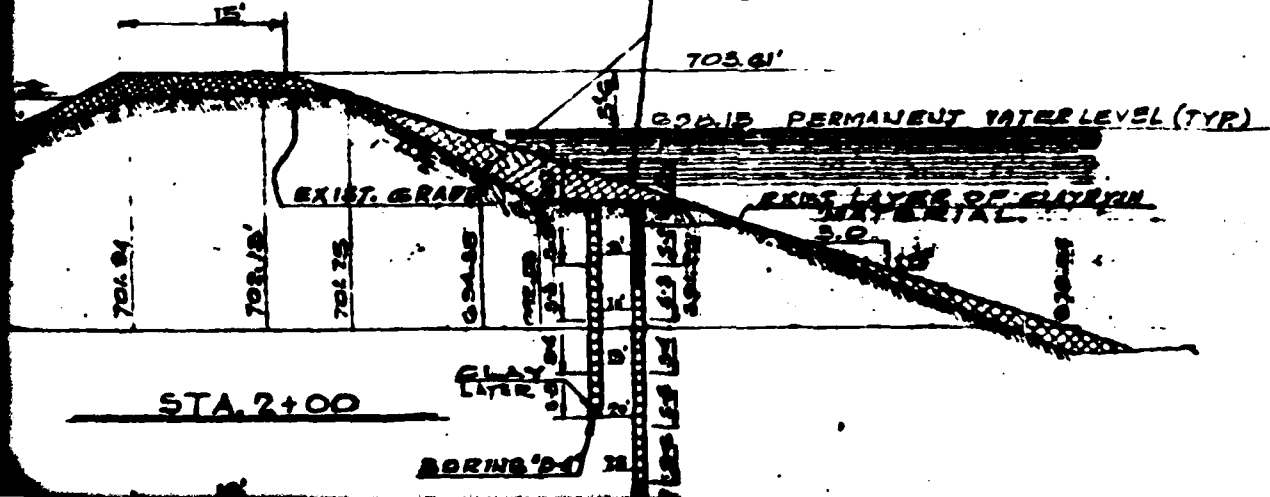
BORING	
SAMPLE	SOIL CLASSIFICATION BY JERSEY
S-1	YEL-BRN. CLAY, TRIG
S-2	YEL.-GRAY, CRS.-FINE
S-3	YEL.-GRAY, CRS.-FINE
S-4	YEL.-GRAY, CRS.-FINE
S-5	GRAY, CLAY, SOME



BORING	
SAMPLE	SOIL CLASSIFICATION BY JERSEY
S-1	GRAY-BRN. CLAY
S-2	GRAY-YEL. MEDIUM
S-3	GRAY, MEDIUM-FINE
S-4	GRAY, CRS.-FINE
S-5	GRAY, CLAY, TRAC



BORING	
SAMPLE	SOIL CLASSIFICATION BY JERSEY
S-1	GRAY-BRN. CR.
S-2	GRAY, MEDIUM
S-3	YEL.-GRAY MEDIUM
S-4	GRAY, CRS.-FINE
S-5	GRAY CLAY,



BORING	
SAMPLE	SOIL CLASSIFICATION ANALYZED BY
S-1	YELLOW-BRN AND CLAYEY MTD, CR.
S-2	GRAY CRS.-FINE
S-3	YEL. GRAY CR.
S-4	GRAY DUTY CL
S-5	GRAY CRS.-FINE

3

BORING 'B-1'	
SAMPLE	SOIL CLASSIFICATION (SAMPLES TAKEN & ANALYZED BY JERSEY DRILLING & BORING CORP.)
8-1	YEL-BRN. CLAY, TRACE FINE SAND, TRACE FINE GRAVEL.
8-2	YEL.-GRAY. CRS.-FINE SAND, LITTLE MED.-FINE GRAVEL, TRACE Silt.
8-3	YEL.-GRAY. CRS.-FINE SAND, TRACE FINE GRAVEL, TRACE Silt.
8-4	YEL.-GRAY. CRS.-FINE SAND, TRACE FINE GRAVEL, TRACE Silt.
8-5	GRAY. CLAY, SOME MEDIUM-FINE GRAVEL, TRACE C-FINE SAND.

BORING 'B-2'	
SAMPLE	SOIL CLASSIFICATION - SAMPLES TAKEN & ANALYZED BY JERSEY DRILLING & BORING CORP.
8-1	GRAY-BRN. CLAY, TRACE CRS.-FINE SAND, LITTLE Silt.
8-2	GRAY-YELN. MEDIUM-FINE GRAVEL, SOME C-FINE SAND, TRACE Silt.
8-3	GRAY. MEDIUM-FINE GRAVEL, TRACE C-FINE SAND.
8-4	GRAY. CRS.-FINE SAND, LITTLE CLAYEY Silt, LITTLE MEDIUM-FINE SAND.
8-5	GRAY. CLAY, TRACE COURSE-FINE SAND, TRACE MEDIUM-FINE SAND.

BORING 'B-3'	
SAMPLE	SOIL CLASSIFICATION - SAMPLES TAKEN & ANALYZED BY JERSEY DRILLING & BORING CORP.
8-1	GRAY-BRN. CRS.-FINE SAND, LITTLE MED-FINE GRAVEL, LITTLE CLAYEY Silt.
8-2	GRAY. MEDIUM-FINE GRAVEL.
8-3	YEL.-GRAY MED.-FINE GRAVEL, TRACE CRS.-FINE SAND.
8-4	GRAY. CRS.-FINE SAND, SOME (C) CLAYEY Silt, LITTLE MED-FINE GRAVEL.
8-5	GRAY CLAY, LITTLE FINE SAND, LITTLE MED-FINE GRAVEL.

BORING 'B-4'	
SAMPLE	SOIL CLASSIFICATION - SAMPLES TAKEN & ANALYZED BY JERSEY DRILLING & BORING CORP.
8-1	YELLOW-BRN AND GRAY. CRS.-FINE SAND, LITTLE CLAYEY Silt, SOME (C) MED.-FINE GRAVEL (FILL)
8-2	GRAY CRS.-FINE SAND, SOME MED.-FINE GRAVEL, LITTLE Silt, (FILL).
8-3	YEL. GRAY. COURSE FINE SAND, TRACE FINE GRAVEL, TRACE Silt.
8-4	GRAY DUTY CLAY, TRACE FINE GRAVEL, LITTLE CRS.-FINE SAND.
8-5	GRAY ORN.-FINE SAND, SOME MED.-FINE GRAVEL, LITTLE CLAYEY Silt.

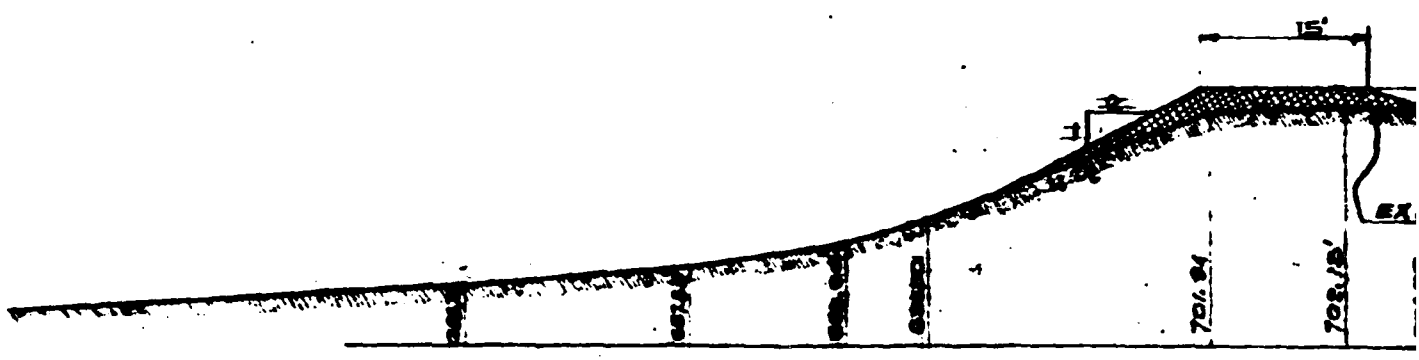
FILE

Dec 1, 1971 615
 APPROVED JUN 30 1972
 Dept. Environmental
 Protection
 Div. Water Resources
 Bur. Water Control

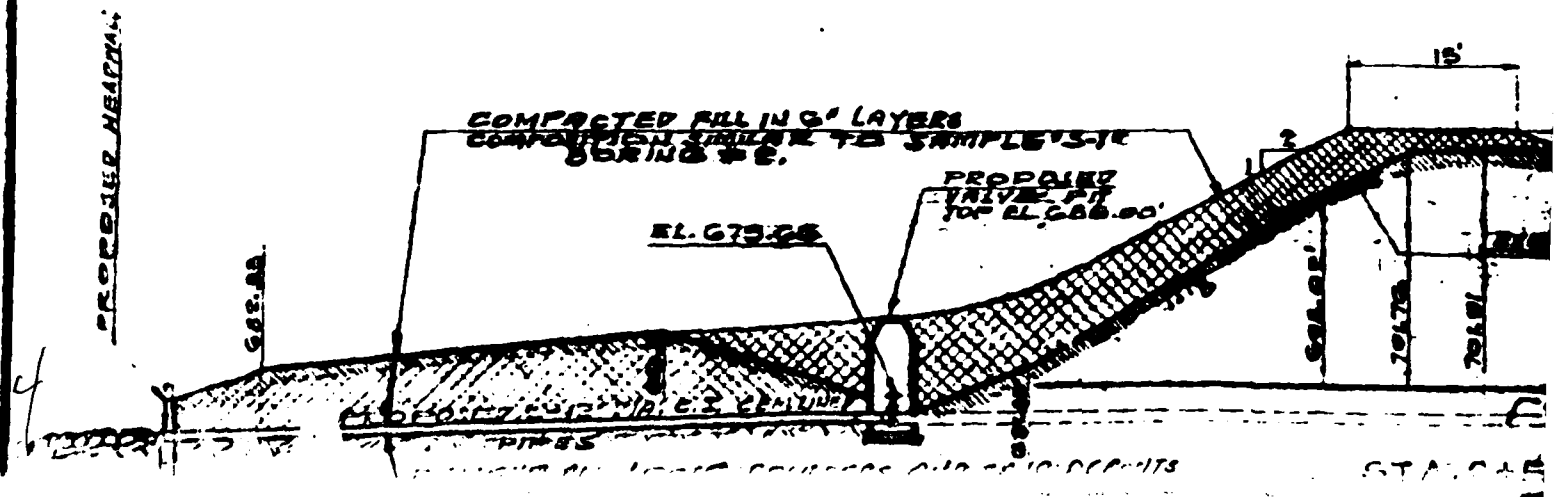
Robert L. Hardman



STA 1+50



STA 2+00



STA 2+00

BORING 'B-3'

DESCRIPTION - SAMPLES TAKEN & ANALYZED BY JERSEY DRILLING & BORING CORP.
 0-10' CRG - FINE SAND, LITTLE MER-FINE SAND
 10-15' LITTLE CLAYEY SILT
 15-20' MEDIUM - FINE GRAVEL
 20-25' LITTLE MER-FINE SAND, TRACE CRG-FINE SAND
 25-30' CRG - FINE SAND, SOME (C) CLAYEY SILT
 30-35' LITTLE MER-FINE SAND
 35-40' CLAY, LITTLE FINE SAND, LITTLE MER-FINE SAND

BORING 'B-4'

DESCRIPTION - SAMPLES TAKEN & ANALYZED BY JERSEY DRILLING & BORING CORP.
 0-10' CRG - FINE SAND, LITTLE CLAYEY MER-FINE GRAVEL (FILL)
 10-15' CRG - FINE SAND, SOME MER-FINE GRAVEL, LITTLE SILT (FILL)
 15-20' CRG - FINE SAND, TRACE FINE GRAVEL, TRACE SILT
 20-25' CLAY, TRACE FINE GRAVEL, LITTLE CRG - FINE SAND
 25-30' FINE SAND, SOME MER-FINE GRAVEL, LITTLE CLAYEY SILT

BORING 'B-5'

DESCRIPTION - SAMPLES TAKEN & ANALYZED BY JERSEY DRILLING & BORING CORP.
 0-10' CLAY, LITTLE CRG - FINE SAND, LITTLE SILT
 10-15' LITTLE CRG - FINE SAND, LITTLE FINE SAND
 15-20' CRG - FINE SAND, SOME CRG - FINE SAND
 20-25' LITTLE CLAYEY SILT

BORING 'B-6'

DESCRIPTION - SAMPLES TAKEN & ANALYZED BY JERSEY DRILLING & BORING CORP.
 0-10' CRG - FINE SAND, LITTLE CLAYEY MER-FINE GRAVEL (FILL)
 10-15' CRG - FINE SAND, SOME MER-FINE GRAVEL, LITTLE SILT (FILL)
 15-20' CRG - FINE SAND, TRACE FINE GRAVEL, TRACE SILT
 20-25' CLAY, TRACE FINE GRAVEL, LITTLE CRG - FINE SAND
 25-30' FINE SAND, SOME MER-FINE GRAVEL, LITTLE CLAYEY SILT

FILE

Doc App. No. 615
 APPROVED JAN 30 1972
 Dept. Environmental Protection
 Div. Water Resources
 Bur. Water Control

Robert L. Hartman

JOHN D. H. 157
 4000 N. 10th St. N.J.
 08054-1000

MORRIS ENGINEERS, INC.

LEDGEWOOD, CONSULT. ENGRS, N.J.

UNAUTHORISED ENCROACHMENT

NO: E-356

JACKSONBURG CREEK, TWP. OF BLAIRSTOWN
 WARREN COUNTY, STATE OF NEW JERSEY

LICENSE NO: 10614

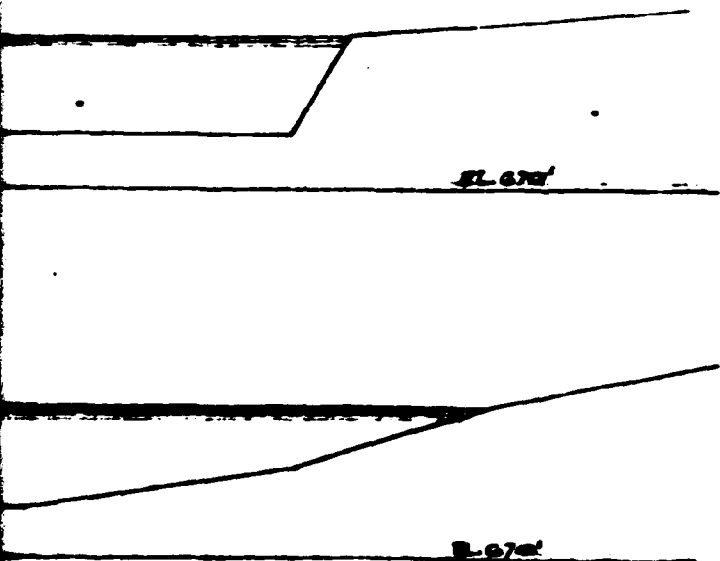
DRAWN BY: LA CHECKED BY: LA

56

SCALE 1" = 20'

3

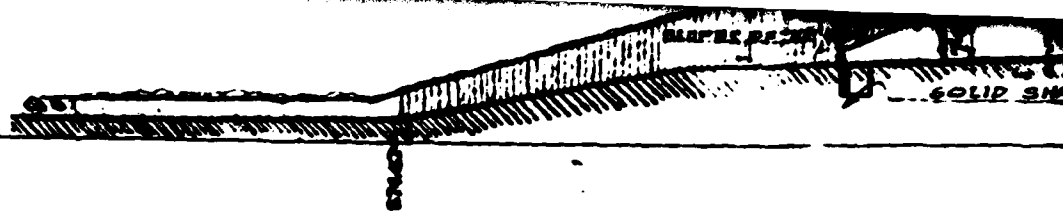
BORING N26	
SAMPLE	SOIL CLASSIFICATION - SAMPLES TAKEN & ANALYZED BY TERREY DRILLING & BORING CORP.
S-1	YEL. CLAY & SHALE
S-2	GRAY MED-FINE SAND, LITTLE CLAYISH SILT, TRACE FINE GRAVEL.
S-3	YELLOW-GRAY CLAYISH SILT, SOME MEDIUM-FINE GRAVEL, TRACE CR. FINE SAND.
S-4	GRAY MED-FINE SAND, LITTLE CLAYISH SILT, LITTLE MED-FINE GRAVEL.
S-5	GRAY DECOMPOSED SHALE



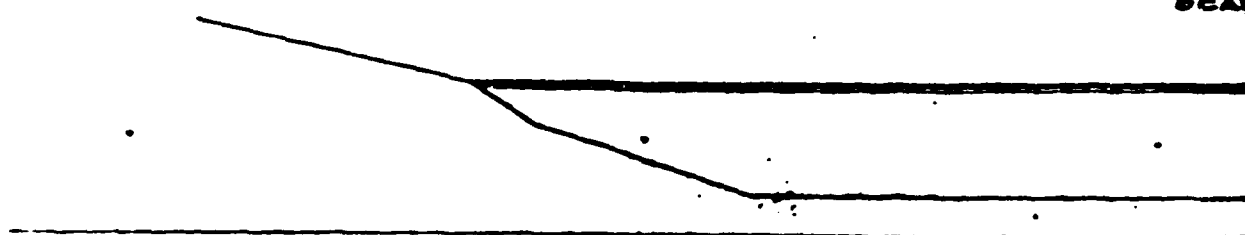
FILE

615

JUN 30 1972



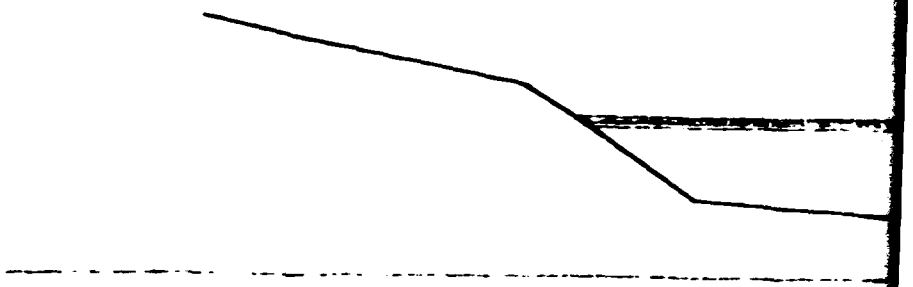
LONG. PR
SCA



PA
50



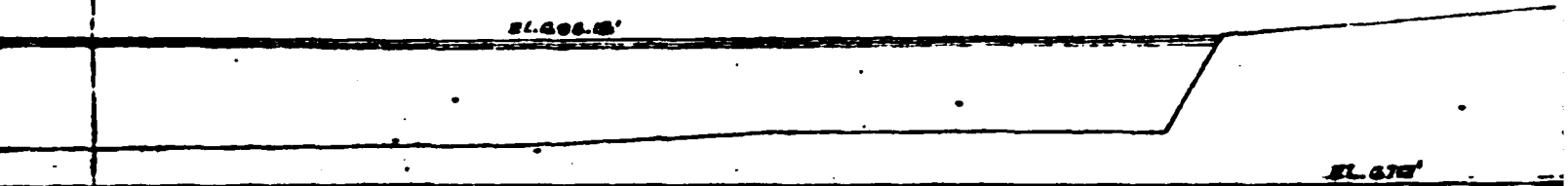
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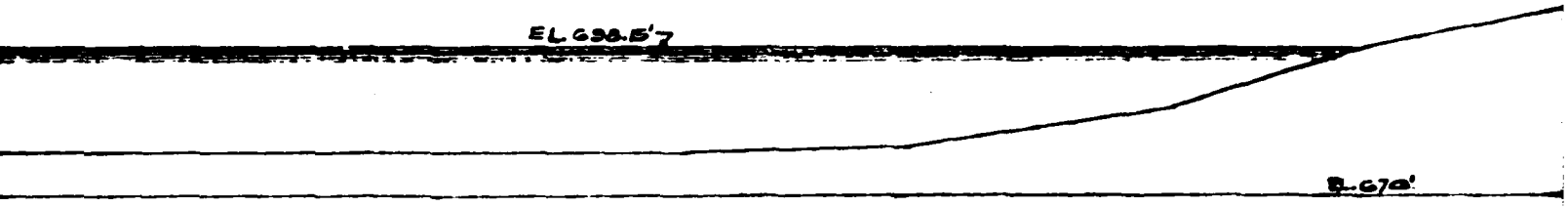
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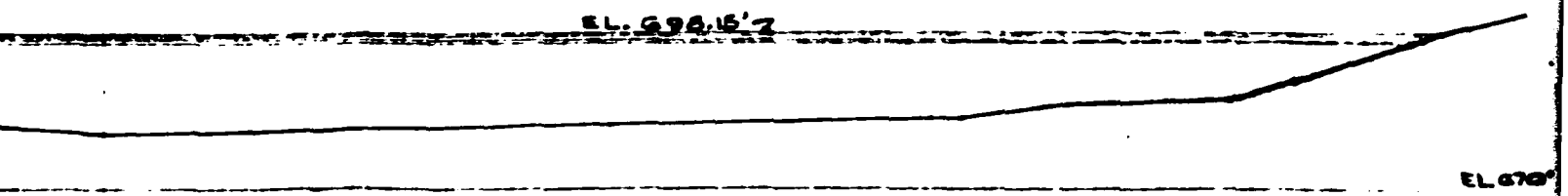
PROFILE THRU SPILLWAY
SCALE: 1" = 20'



PROFILE 'B'
SCALE: 1" = 20'



PROFILE 'C'
SCALE: 1" = 20'



PROFILE 'D'
SCALE: 1" = 20'

5

FILE

615

JUN 30 1972

Robert A. Morris

MORRIS ENGINEERS, INC.

BY *Robert A. Morris*

LEDGEWOOD CONSULT. ENGRS. - N. J.

UNAUTHORIZED ENCHROACHMENT

NO. - E-356

JACKSONBURG CREEK, TWP OF BLAIRSTOWN
WARREN COUNTY, STATE OF NEW JERSEY

LICENSE NO. 10814

DRAWN BY LA

16 5

WATERSHED
PROPOSED

K

PROPOSED FOLD
TOP OF WATER AT EL. 600

PROPOSED DAM
EAST BRIDGE

CHICKADEE CREEK

CHICKADEE CREEK

CHICKADEE CREEK

BLAKESTOWN

K

APPLICATION

KENN

2

DELAWARE RIVER

MILLBROOK

WATERSHED AREA ON UPSTREAM OF
PROPOSED DAM (APPROX. 4.5 SQ. MILES)

KITTATINNY MOUNTAINS

FAIRVIEW

NEEDS LAKE

COUNTY OF WARREN
COUNTY OF SUSSEX

KEY MAP

SCALE: 1"=2000 FT.

FOR DAM ON JACKSONBURG CREEK

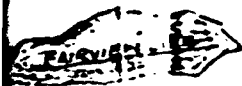
BY

YOUNG

FILE

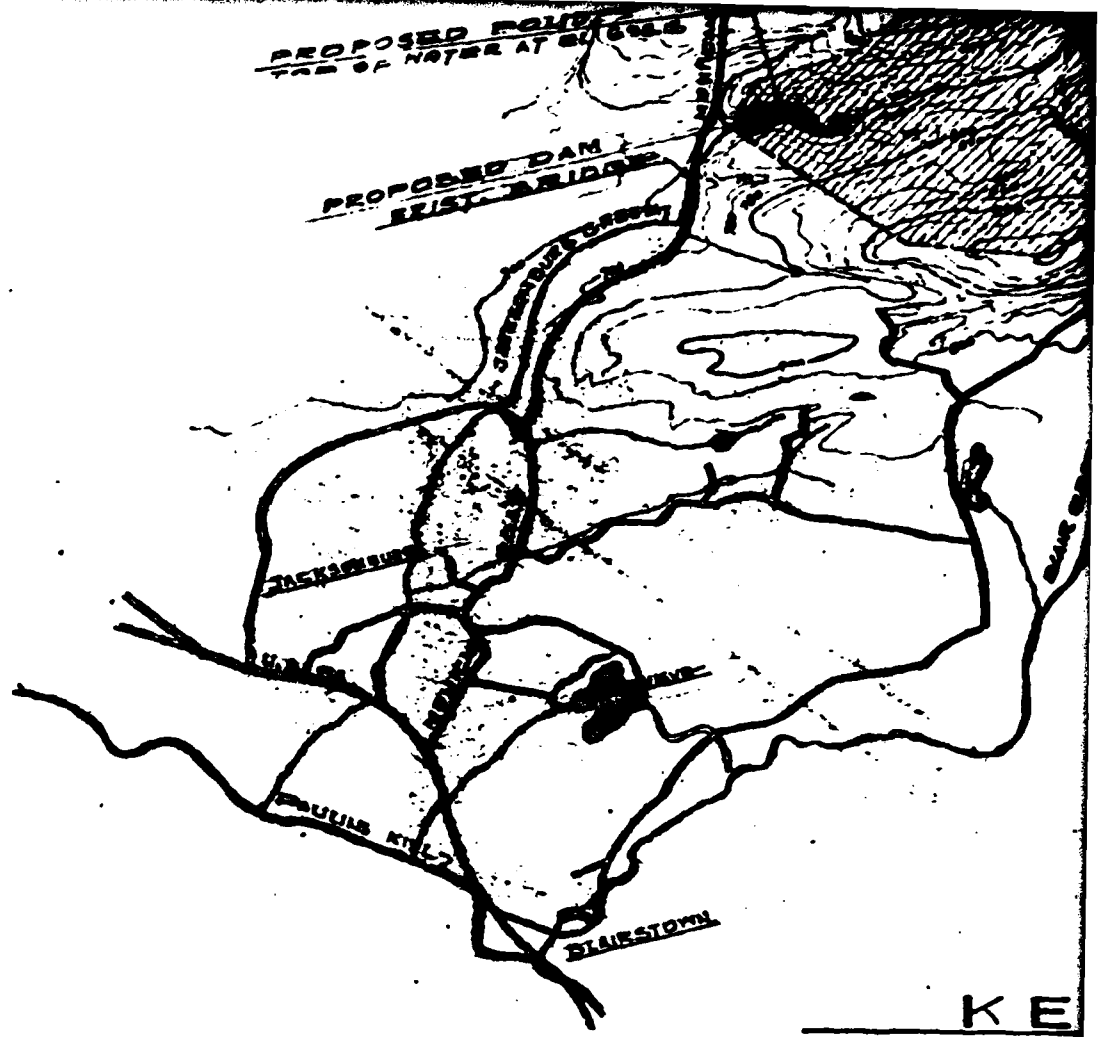
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FILE



PROPOSED ROUTE
TOWARD NORTHEAST AT 6000

PROPOSED DAM
EXIST. BRIDGE



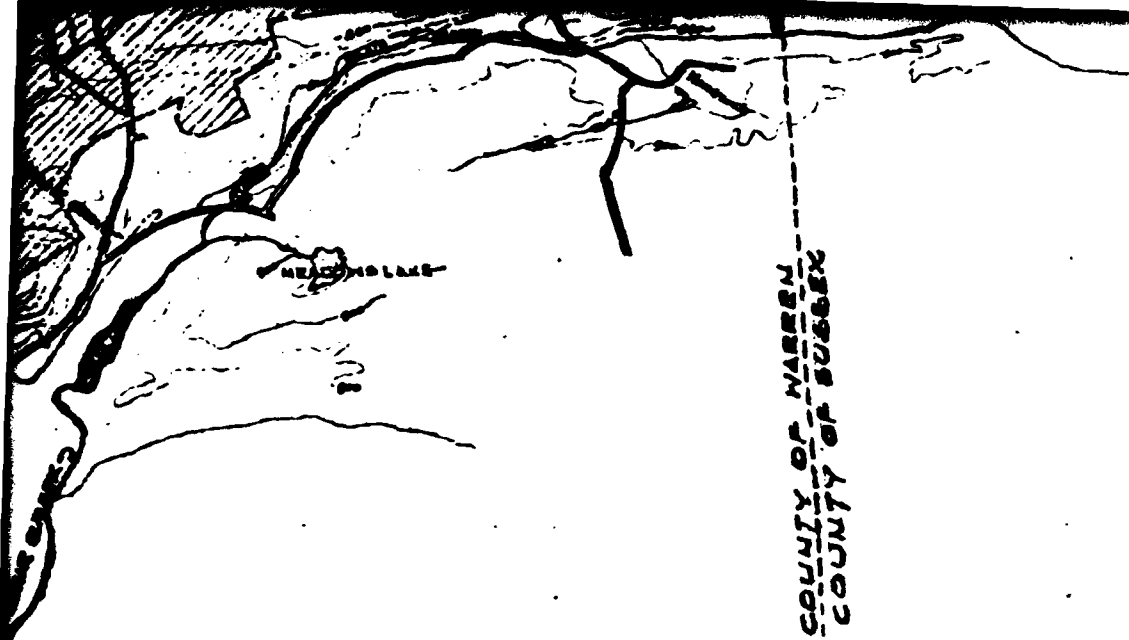
KE

SCA

APPLICATION FOR

KENNET

4



KEY MAP

SCALE: 1" = 2000 FT.

OR DAM ON JACKSONBURG CREEK
BY
ETH YOUNG

5

6
MORRIS ENGINEERS, INC.
LEDGEWOOD, N. J.
41478, 3/20/72, 41478

APPENDIX 5

REFERENCES

YOUNGS POND DAM

APPENDIX 5

REFERENCES

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