LEVEL II

1

SUSQUEHANNA RIVER BASIN
RACKET BROOK, WAYNE COUNTY

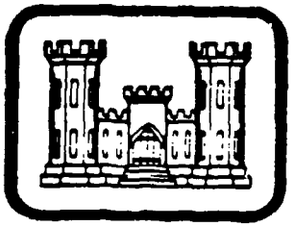
PENNSYLVANIA

RESERVOIR NO. 7 DAM

NDI ID NO. PA 00090
DER ID NO. 64-1

FARVIEW STATE HOSPITAL

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM



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DEPARTMENT OF THE ARMY
Baltimore District, Corps of Engineers
Baltimore, Maryland 21203

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RACKET BROOK, WAYNE COUNTY

PENNSYLVANIA

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FARVIEW STATE HOSPITAL

PHASE I INSPECTION REPORT

NATIONAL DAM INSPECTION PROGRAM

Prepared By:

DEPARTMENT OF THE ARMY
Baltimore District, Corps of Engineers
Baltimore, Maryland 21203

SEPTEMBER 1981

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 frequent inspections can unsafe conditions be detected and only through continued care and maintenance can these conditions be prevented or corrected.

Phase I inspections are not intended to provide detailed hydrologic and hydraulic analyses. In accordance with the established guidelines, the spillway design flood is based on the estimated "Probable Maximum Flood" for the region (greatest reasonably possible storm runoff), or fractions thereof. The spillway design 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.

NDI ID No. PA-00090, DER ID No. 64-1

PHASE I INSPECTION REPORT

NATIONAL DAM INSPECTION PROGRAM

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PHASE I INSPECTION REPORT

NATIONAL DAM INSPECTION PROGRAM

BRIEF ASSESSMENT OF GENERAL CONDITION
AND
RECOMMENDED ACTION

Name of Dam: Reservoir No. 7 Dam
NDI ID No. PA 00090
DER ID No. 64-1

Size: Small (Height: 12.9 feet; Storage: 134 acre-feet)

Hazard Classification: High

Owner: Farview State Hospital
Commonwealth of Pennsylvania

State Located: Pennsylvania

County Located: Wayne

Stream: Racket Brook

Date of Inspection: 5 November 1980

The visual inspection and review of available design and construction data indicate that Reservoir No. 7 Dam is in fair condition. In accordance with the guidance provided, the Spillway Design Flood (SDF) ranges between 1/2 the Probable Maximum Flood (PMF) and the full PMF. Based on the extent of downstream hazard for the dam, the SDF selected for this facility was the one-half the PMF.

The hydrologic and hydraulic computations indicate that the combination of reservoir storage and spillway discharge capacity will pass 42% of the PMF prior to overtopping the embankment. The dam was judged not to fail under 1/2 PMF conditions. Therefore, in accordance with the recommended criteria for Phase I inspections, the spillway for Reservoir No. 7 Dam is considered to be inadequate, but not seriously inadequate.

The following recommendations should be implemented without delay:

1. The owner should immediately retain a qualified professional engineer to perform detailed hydrologic and hydraulic studies to determine remedial measures necessary for providing adequate spillway capacity for this facility. Alternatively, the low areas of the embankment could be raised to elevation 1803.3, and the debris cleared from the spillway weir to provide a capacity of 58% of the PMF.

2. The spillway wingwalls and discharge channel walls should be repaired and all debris cleared from in front of the spillway weir and from the discharge channel.

3. The operational condition of the outlet works should be determined and necessary maintenance performed, including clearing the obstructions from the discharge end of the conduit.

4. The trees should be cleared from the left abutment area.

5. The right abutment area should be protected from erosion at the discharge point of a natural drainage ditch on the reservoir slope.

6. A formal surveillance and downstream emergency warning system should be developed for use during periods of heavy or prolonged precipitation.

7. An operation and maintenance manual or plan should be prepared for use as a guide in the operation and maintenance of the dam during normal and emergency conditions.

8. A schedule of regular inspection by a qualified engineer should be developed.

APPROVED:

DEPARTMENT OF THE ARMY
BALTIMORE DISTRICT, CORPS OF ENGINEERS

James W. Peck

JAMES W. PECK
Colonel, Corps of Engineers
District Engineer

DATE: 18 Sep 1981

RESERVOIR NO. 7 DAM

OVERVIEW

SECTION 1

PROJECT INFORMATION

1.1 General

a. Authority. The Dam Inspection Act, Public Law 92-367, authorized the Secretary of the Army, through the Corps of Engineers, to initiate a program of inspection of non-federal dams throughout the United States.

b. Purpose. The purpose of this inspection is to determine if the dam constitutes a hazard to human life and property.

1.2 Description of Project.

a. Description of Dam and Appurtenances. Reservoir No. 7 Dam is an earthfill structure appproximately 12.9 feet high and 300 feet in length (including spillway). The 30 foot wide spillway is an uncontrolled sharp-crested concrete weir located near the right abutment of the dam. The outlet works consist of a 10 inch diameter cast iron pipe through the embankment with a sluice gate control on the upstream end, and a gate valve near the downstream toe.

NOTE: All elevations in this report are referenced to assumed spillway crest elevation taken from U.S.G.S. Quad Sheet, Waymart, Pa.

b. Location: Canaan Township, Wayne County, Pennsylvania
U.S.G.S. Quadrangle - Waymart, Pennsylvania
Latitude 41° 34.9'; Longitude 75° 27.3'
Refer to Plates E-I and E-II.

c. Size Classification: Small: Height - 12.9 feet
Storage: 134 acre-feet.

d. Hazard Classification: High (Refer to Section 3.1.e).

e. Ownership: Farview State Hospital
Commonwealth of Pennsylvania

f. Purpose: Water Supply.

g. Design and Construction History: No information exists on the original design and construction of this dam. The spillway and embankment were revised sometime after 1952 in accordance with plans developed by the firm of Von Storch, Evans, Scandale and Burkavage, Waverly, Pennsylvania. Refer to Appendix E for copies of these plans. A PennDER inspection report dated 8 April 1965 stated the dam was in "OK" condition.

h. Normal Operating Procedure. The reservoir is normally maintained at or near the level of the spillway crest, but fluctuates depending on the

degree of pumping done for water supply draft. Large inflows are discharged through the spillway section.

1.3 Pertinent Data.

a. Drainage Area (square miles)

From files:	0.35
Computed for this report:	0.33
Use:	0.33

b. Discharge at Damsite (cubic feet per second)

Maximum known flood	Unknown
Outlet works with maximum pool (El. 1802.9)	9
Spillway with maximum pool (El. 1802.9)	324

c. Elevations (feet above mean sea level)

Top of Dam	1802.9
Normal pool	1800.5
Spillway Crest	1800.5
Outlet Works	
Upstream invert	1790.5
Downstream invert	1790.0
Streambed at toe	1790.0

d. Reservoir Length (feet)

Normal pool (El. 1800.5)	1400
Maximum pool (El. 1802.9)	1500

e. Storage (acre-feet)

Normal pool (El. 1800.5)	95
Maximum pool (El. 1802.9)	134

f. Reservoir Surface (acres)

Normal pool (El. 1800.)	15.0
Maximum pool (El. 1802.9)	17.0

g. Dam

Type	Earthfill
Length	300 feet (including spillway)

Top Width	Varies, 9 feet to 14 feet
Height	12.9 feet
Side Slopes	
Upstream	1V:1.5H
Downstream	1V:2.7H
Zoning	None
Cutoff	None
Grouting	None

h. Outlet Works

Type	10 inch cast iron pipe
Closure	10 inch sluice gate on u/s end; gate valve in manhole near d/s toe.

i. Spillway

Type	Sharp-crested concrete weir.
Location	Near right abutment.
Length	30 feet
Crest Elevation	1800.5 M.S.L.
Freeboard	2.4 feet
Approach Channel	Reservoir
Discharge Channel	Rectangular concrete channel.
Bridge	None

SECTION 2

ENGINEERING DATA

2.1 Design.

The available data for Reservoir No. 7 Dam consists of files provided by PennDER. Information available includes an engineering report dated 22 October 1914, with a general description of the dam and appurtenances, PennDER inspection reports, and various related correspondence. Drawings dated February 1953, showing plans, sections and details of proposed modifications to the dam are also available.

2.2 Construction.

No information is available concerning the construction of the dam.

2.3 Operation.

No formal records of operation or maintenance are known to exist.

The most recent PennDER inspection indicated that the dam was in "OK" condition.

2.4 Evaluation.

a. Availability. All available written information was contained in the permit files provided by PennDER.

b. Adequacy. The available data, including that collected during the recent detailed visual inspection, are considered to be adequate to make a reasonable assessment of the dam.

SECTION 3

VISUAL INSPECTION

3.1 Observations.

a. General. The overall appearance and general condition of Reservoir No. 7 dam is fair. Noteworthy observations are described briefly below. The visual inspection checklist, field sketch and crest profile are provided in Appendix A. Photographs taken during the inspection are reproduced in Appendix C.

The reservoir pool was 1.3 feet below the normal pool level (spillway crest) on the day of the inspection. This was apparently due to a combination of water supply withdrawal and the recent drought. A representative of the owner was present during the inspection.

b. Embankment. The crest width of this earth embankment varies from 9 feet to the left of the spillway to 14 feet to the right of the spillway. The vertical alignment of the crest varies about 0.4 foot across the majority of the dam with the exception of a low point adjacent to the left spillway wall. This point is 0.6 foot below the top of the spillway wall. The apparent cause of this low area is settlement due to inadequate compaction of the embankment material adjacent to the wall. A well-maintained growth of grass covers the entire crest. The upstream face of the dam slopes at 1V:1.5H for the portion to the left of the spillway and 1V:5H to the right. This slope is protected for its full height by hand-placed riprap, which is in good condition. Some weeds and brush have been allowed to grow to a height of one to two feet near the crest. The downstream face slopes at 1V:2.7H for the portion left of the spillway and 1V:8H to the right. This slope supports a good stand of grass, although weeds are growing in the vicinity of the toe. No signs of instability or seepage were observed. Several trees are growing at the crest and on the slopes at the junction of the embankment with the left abutment. A small natural drainage ditch discharges onto the upstream slope at the right abutment.

c. Appurtenant Structures. The outlet works for this facility consist of a 10 inch diameter cast iron pipe through the left side of the dam. At the upstream end of the pipe is a 10 inch sluice gate. This gate is mounted on a concrete pier which extends to approximately the same height as the dam. The control rod appears rusted and in fair condition above the waterline. The location of the operator is unknown. The height of the concrete pier was increased to match the dam height when the crest was raised about 1953. This is clearly indicated by a crack which extends around the perimeter of the pier at an elevation approximately equal to the original dam height. This crack is not a concern at this time. Access to the tower is provided by two railroad rails which extend from the embankment crest. A gate valve is also provided on this outlet pipe near the downstream toe. Access to this valve is through a manhole, the cover of which is locked in place. Neither valve was operated during the inspection. The discharge end of the pipe is located just beyond

the toe. Only the top one foot of the concrete headwall is visible at this point. The outlet is partially buried by silt. A small pool of stagnant water is adjacent to the headwall. The discharge channel is the original streambed of Racket Brook.

The spillway is located near the right end of the embankment. The control section, which is slightly upstream of the centerline of the dam, is a sharp-crested weir. The plans for this spillway, dated 1953, show that the weir was to be a triangular section of concrete with a 6 inch x 6 inch angle imbedded at the crest. Presently the weir is covered by welded steel plates which have raised the crest about 0.5 foot. These plates are in fair condition and appear secure. The approach to the spillway is the reservoir. There are no obstructions except for a pile of mud and sticks, which have been placed against the upstream side of the weir by beavers. The spillway approach wingwalls are cracked and deteriorating in two places. The discharge channel at and below the weir is a converging, rectangular concrete chute. Several vertical cracks are evident along the side walls; however, no displacement is occurring. This channel, which is in otherwise fair condition, ends beyond the toe of the dam. For the first 50 feet beyond the end of the concrete channel, there is loose stone paving. This channel joins the original streambed about 100 feet beyond the stone paving. The entire portion of the spillway discharge channel which is beyond the concrete chute is obstructed by brush and trees.

d. Reservoir Area. The slopes adjacent to this reservoir are wooded and relatively flat. A pump house, which is used to withdraw water from the lake for water supply, is located on the shoreline approximately 1,000 feet upstream of the dam. Sedimentation is not reported to be a problem.

e. Downstream Channel. The initial 1,000 feet of channel below Reservoir No. 7 Dam is a wooded area with moderate channel and side slopes which confine the flow. Within this reach are two abandoned railroad embankments which are approximately 400 feet and 550 feet downstream of the dam. The first embankment is about 25 feet high with two, 3 foot square hand-placed rock culverts. The second fill is 45 feet high and has a single hand-placed stone culvert 4 feet wide x 5.5 feet high. At the end of this reach is the pool of Carbondale No. 4 Dam, DER No. 35-13, a high hazard, intermediate size facility. The dam for this impoundment is 2,000 feet beyond this point. A Phase I inspection of this structure, dated February 1979, assessed the dam to be in good condition and the spillway rated inadequate (59% PMF). Subsequent to that inspection, the low spot on the embankment was raised. This increased the spillway capacity to about 72% PMF. Below this dam, the channel of Racket Brook is steep and confined through woods before entering Brownell Reservoir, at a point 1.3 miles downstream of Reservoir No. 7 Dam. US Route 6 crosses Racket Brook approximately 700 feet downstream of Carbondale No. 4 Dam. Brownell Dam, DER No. 35-12, an intermediate size, high hazard structure is 500 feet downstream. A Phase I inspection report, dated May 1978, assessed

this dam to be in good condition but the spillway was rated seriously inadequate. Subsequent maintenance work, including filling the low area of the embankment, has resulted in an increase in spillway capacity from 27% to 43% of the PMF; however, the spillway is still rated seriously inadequate.

Downstream of Brownell Dam, Racket Brook flows through a wooded area in a steep and confined channel before passing through the City of Carbondale and joining the Lackawanna River 3.1 miles downstream of Reservoir No. 7 Dam. US Routes 6 and 106 cross the channel 0.2 mile upstream of the confluence with the Lackawanna River. At this point, Racket Brook is confined in a 6 foot deep x 25 foot wide stone walled channel. Several homes, whose first floors are 6 feet above the streambed, are located adjacent to Racket Brook at this point. The location of these homes with respect to the stream creates the potential for the loss of more than a few lives and extensive property damage should Reservoir No. 7 Dam fail. Therefore, a high hazard classification is warranted for Reservoir No. 7 Dam.

f. Evaluation. The deficiencies noted during this inspection are basically maintenance related. The operational condition of the sluice gate and valve on the outlet works conduit should be determined and repairs made. The upstream gate should be closed and the downstream valve left open to prevent pressure within the pipe. The discharge end of the conduit should be cleared of obstructions. The deterioration of the spillway wingwalls and discharge channel walls should be repaired. All debris should be removed from in front of the weir, as well as with all trees in the discharge channel immediately below the concrete chute. In addition, the trees should be removed from the left end of the dam, and the low areas of the embankment should be backfilled to at least elevation 1803.3.

SECTION 4

OPERATIONAL PROCEDURES

4.1 Normal Operating Procedure. The lake is normally maintained near the spillway crest, elevation 1800.5. The lake level fluctuates somewhat due to pumping out for water supply. Inflow in excess of this draft is allowed to flow over the spillway crest.

4.2 Maintenance of Dam. The reservoir is observed daily from the pump house. Reports on the condition are not sent to the owner on a regular basis; however, periodic water level readings are made. Maintenance of the facility is done basically on an as needed basis. The spillway has become clogged and the gate valve for the outlet works has poor access on the upstream side. A few trees are growing at the left end of the dam. No formal maintenance manual exists.

4.3 Maintenance of Operating Facilities. The valve and sluice gate on the outlet works pipe have not been opened for some time. The upstream sluice gate has poor access and the downstream end of the outlet works pipe was submerged. A visual inspection of the downstream end of the outlet pipe could not be made. Some cracking and deterioration of the spillway walls have occurred.

4.4 Warning System. No formal warning system exists.

4.5 Evaluation. Maintenance of the facility appears fair due to the condition of the upstream outlet works gate valve and spillway entrance and walls. The gate valve should be examined to determine if the valve is still operational. In addition, the beaver dam which has clogged the spillway and has reduced the efficiency of emergency spillway should be removed, and the embankment low spots should be filled to elev. 1803.3. Formal manuals of operation and maintenance are recommended to ensure all needed maintenance is identified and performed regularly. In addition, a formal warning system for the protection of downstream inhabitants should be developed. Included in the plan should be provisions for around-the-clock surveillance of the facility during periods of unusually heavy precipitation.

SECTION 5

HYDROLOGIC/HYDRAULIC EVALUATION

5.1 Design Data. No formal design reports or calculations are known to exist for the facility. Design drawings of the dam and spillway, dated 1953, are shown in Appendix E of this report. These drawings indicate approximately a 4 foot raising of the embankment and new spillway to be built. Spillway calculations are found in the PennDER files and indicate a discharge capacity of 450 cfs.

5.2 Experience Data. Records of reservoir levels and/or spillway discharges are available on a random basis. Daily records are not available; however, the reservoir is viewed daily. No drawdowns other than that which occurred in 1913 are known. During that time, a portion of the embankment was replaced. No other records of past performance are available.

5.3 Visual Observations. On the date of the inspection, two problems were identified that may prevent the facility from operating safely during the flood event. As noted in Section 4.5, the emergency spillway has become partially obstructed, thereby reducing the spillway capacity. Also, the condition of the outlet works and the uncertainty that the gate valve and sluice gate operate suggest that this condition should be examined. See Appendix A for the field sketch of the facility and Appendix C showing the problems noted above.

5.4 Method of Analysis. The facility has been analyzed in accordance with procedures and guidelines established by the US Army Corps of Engineers, Baltimore District, for Phase I hydrologic and hydraulic evaluations. This analysis has been performed using a modified version of the HEC-1 computer program developed by the US Army Corps of Engineers, Hydrologic Engineering Center, Davis, California. Capabilities of the program are briefly outlined in the preface contained in Appendix D.

5.5 Summary of Analysis.

a. Spillway Design Flood (SDF). In accordance with the procedures and guidelines contained in the National Guidelines for Safety Inspection of Dams for Phase I Investigations, the SDF for Reservoir No. 7 ranges between the 1/2 Probable Maximum Flood (PMF) and the full PMF. This classification is based on the relative size of the dam (small) and the potential hazard from failure to downstream development (high). Due to the distance to downstream development in the town of Carbondale, PA and the storage of the downstream reservoirs, Carbondale No. 4 Dam and Brownell Dam, the selected SDF for Reservoir No. 7 was the 1/2 PMF

b. Results of the Analysis. Reservoir No. 7 was evaluated under near normal operating conditions. The assumed starting lake level was elevation 1800.5, the spillway crest. For this study, the outlet works was assumed blocked. Flood hydrographs and the spillway capacities were calculated for

existing and modified conditions (removal of debris at the entrance of spillway, and fill the embankment low areas to elevation 1803.3).

	CFS
Spillway Capacity at Top of Dam	
Existing	324
Modified	480
SDF (1/2 PMF) peak inflow	527

The overtopping analysis (using HEC-1DB) indicated that the existing storage/discharge capacity of Reservoir No. 7 is 42% of the PMF prior to overtopping the embankment. Under 1/2 PMF conditions, the dam is overtopped for 2.6 hours to a maximum height of 0.42 foot. It was judged that under 1/2 PMF conditions the dam would not fail; therefore, no breach analysis is required.

5.6 Spillway Adequacy. Under existing conditions, Reservoir No. 7 can accommodate 42% of the PMF prior to overtopping the embankment. Under 1/2 PMF (SDF) conditions the dam is judged not to fail, the spillway is rated inadequate, but not seriously inadequate. If the debris is removed from the spillway and the embankment low areas filled to elevation 1803.3, the facility could accommodate 58% of the PMF prior to overtopping the embankment.

SECTION 6

STRUCTURAL STABILITY

6.1 Evaluation of Structural Stability.

a. Visual Observations.

(1) Embankment. Reservoir No. 7 Dam is an earth embankment in good condition. It is reasonably well maintained, but requires more frequent maintenance to keep small brush and weeds down. The upstream face is protected by hand-placed riprap approximately 15 inches in size. No signs of seepage, sloughing or instability were observed. The embankment from the left abutment to the spillway has a crest width of 9 feet, upstream slope of 1V: 1.5H and a downstream slope of 1V:2.7H. Between the spillway and right abutment the crest is 14 feet wide, the upstream slope is 1V:5H and the downstream slope varies between 1V:8H and 1V:11H. A small natural drainage ditch on the right reservoir slope discharges onto the upstream slope of the right abutment; the abutment should be protected against erosion at this point.

(2) Appurtenant Structures. Two control structures exist at Reservoir No. 7, a sharp crested spillway and an outlet works. The outlet works consist of a pipe through the embankment, approximately 100 feet from the left abutment. An upstream closure structure is located about 20 feet out in the reservoir. A valve is also located on the downstream slope in a concrete structure with access through a manhole. A concrete headwall is located at the outlet discharge, but a pool of stagnant water prevented observation of the outlet pipe. No seepage was observed. Near the right end of the dam is a 30 foot wide concrete spillway channel. The weir consists of steel plates fashioned as a sharp crested weir. Beavers have raised the height of the spillway crest by constructing a dam against the upstream face of the weir. This beaver dam should be removed. The concrete spillway channel carries the water beyond the downstream embankment toe before discharging into a channel with riprap. Several cracks were observed in the channel walls and the concrete is spalling on the channel bottom. Both of these areas require repairs.

b. Design and Construction Data.

(1) Embankment. No design data exists for the original embankment. A report for the Water Commission of Pennsylvania in 1914 indicates that the dam is an earthen embankment, 250 feet long, with no cut-off or core walls, a 10 foot top width and 11 foot maximum height. The slopes were irregular, with an upstream slope of 1V:2.25H and a downstream slope of 1V:2H.

(2) Appurtenant Structures. No design data exists for the original structures. The existing blow-off pipe or outlet works was installed about 1913 or 1914. A single blueprint exists for the outlet works. The outlet works consist of a 10 inch CI pipe regulated by an upstream sluice gate that is operated from a concrete pier in the reservoir. A valve is also located at

the downstream toe of the embankment in a concrete vault. The small wasteway near the right end of the dam had no design data. The wasteway was replaced sometime after 1952 with the present spillway for which design drawings are available. The drawings indicate that the spillway is a reinforced concrete structure with 6 foot cutoff walls at the centerline of dam and at the downstream end of the concrete spillway channel.

c. Operation Records. None.

d. Post Construction Changes. Since the 1914 report for the Water Commission of Pennsylvania, several changes have been made. The small wasteway near the right end of the embankment was replaced with the present spillway sometime after 1952. The embankment was also raised by several feet.

e. Seismic Stability. The dam is located in Seismic Zone 1. From visual observations, the dam is considered to be statically stable. Therefore, the seismic stability is considered adequate.

SECTION 7

ASSESSMENT AND RECOMMENDATIONS

7.1 Dam Assessment.

a. Safety. The visual inspection and review of available design and construction data indicate that Reservoir No. 7 Dam is in fair condition. In accordance with the guidance provided, the Spillway Design Flood (SDF) ranges between 1/2 the Probable Maximum Flood (PMF) and the full PMF. Based on the distance to the nearest downstream development, and the storage of downstream reservoirs, the SDF selected for this facility was the 1/2 PMF.

The hydrologic and hydraulic computations indicate that the combination of reservoir storage and spillway discharge capacity will pass 42% of the selected SDF prior to overtopping the embankment. The dam was judged not to fail under 1/2 PMF conditions. Therefore, in accordance with the criteria outlined and evaluated in Section 5.5, the spillway for Reservoir No. 7 Dam is considered to be inadequate, but not seriously inadequate.

b. Adequacy of Information. The design and construction data contained in PennDER files, in conjunction with data collected during the recent visual inspection, are considered to be adequate for making a reasonable assessment of this dam.

c. Urgency. The recommendations presented below should be implemented without delay.

d. Necessity for Additional Studies. The results of this inspection indicate a need for additional detailed hydrologic and hydraulic studies by a qualified professional engineer to further evaluate the need for additional spillway capacity for this dam. Alternatively, removal of the debris clogging the spillway crest and raising the embankment low area to elevation 1803.3 would provide 58% of the recommended spillway capacity.

7.2 Recommendations.

1. The owner should immediately retain a qualified professional engineer to perform detailed hydrologic and hydraulic studies to determine remedial measures necessary for providing adequate spillway capacity for this facility, unless action noted in paragraph 7.1d above is taken to provide adequate spillway capacity.

2. The spillway wingwalls and discharge channel walls should be repaired and all debris cleared from in front of the spillway weir and from the discharge channel.

3. The operational condition of the outlet works should be determined and necessary maintenance performed, including clearing the obstructions from the discharge end of the conduit.

4. The trees should be cleared from the left abutment area.

5. The right abutment area should be protected from erosion at the discharge point of a natural drainage ditch on the reservoir slope.

6. A formal surveillance and downstream emergency warning system should be developed for use during periods of heavy or prolonged precipitation.

7. An operation and maintenance manual or plan should be prepared for use as a guide in the operation and maintenance of the dam during normal and emergency conditions.

8. A schedule of regular inspection by a qualified engineer should be developed.

APPENDIX A

CHECKLIST - VISUAL INSPECTION

APPENDIX A

Check List
Visual Inspection
Phase 1

Name Dam Reservoir No. 7 Dam, DER I.D. No. 64-1 County Wayne State Pennsylvania

Date(s) Inspection 5 Nov 80 Weather Cloudy w/flurries Temperature 40°

Pool Elevation at Time of Inspection 1799.2 M.S.L. Tailwater at Time of Inspection None M.S.L.

Inspection Personnel:

J. Bianco, C.O.E.
B. Cortright, C.O.E.
J. Evans, C.O.E.
E. Hecker, C.O.E.
Mr. Ed Conrad, Owner's Rep.

B. Cortright Recorder

EMBANKMENT

VISUAL EXAMINATION OF	OBSERVATIONS
Noticeable Seepage	None. Standing water at outlet of blow-off pipe.
Junction of Embankment with: Abutments Spillway	Abutments - Good. Spillway - Low point of dam adjacent to left spillway wall.
Surface Cracks	None.
Crest Alignment Vertical Horizontal	Vertical - Varies 0.4 foot generally. Low spot 0.6 foot below top of spillway wall. Horizontal - Good.
Unusual Movement or Cracking at or beyond the Toe	None.

EMBANKMENT

VISUAL EXAMINATION OF	OBSERVATIONS
Sloughing or Erosion: Embankment Crest/Slopes Abutment Slopes	Minor erosion on u/s side of right abutment contact.
Riprap	Hand placed; good condition. None observed on u/s face to the right of spillway.
Instrumentation	None.
Staff Gage	None. Water level readings taken at pumphouse.
Miscellaneous	A few trees growing at left abutment contact. Weeds and brush (1-2 feet high) on upstream face.

OUTLET WORKS

VISUAL EXAMINATION OF	OBSERVATIONS
Intake Structure	Concrete headwall w/backwall equal to top of dam. Plans show trashrack. Continuous crack at construction joint where backwall raised in 1953. Access from dam by 2 railroad rails.
Outlet Conduit	10-inch cast iron pipe according to plans. Unable to observe.
Gates or Valves	10-inch sluice gate on u/s end; control rod rusted. 10-inch valve in vault near downstream toe. Access locked. Neither valve viewed or operated.
Outlet Structure	Concrete headwall in good condition but buried to within one foot of top.
Outlet Channel	Original streambed. Siltation has created pools of stagnant water at and below headwall. Trees on sides.

SPILLWAY

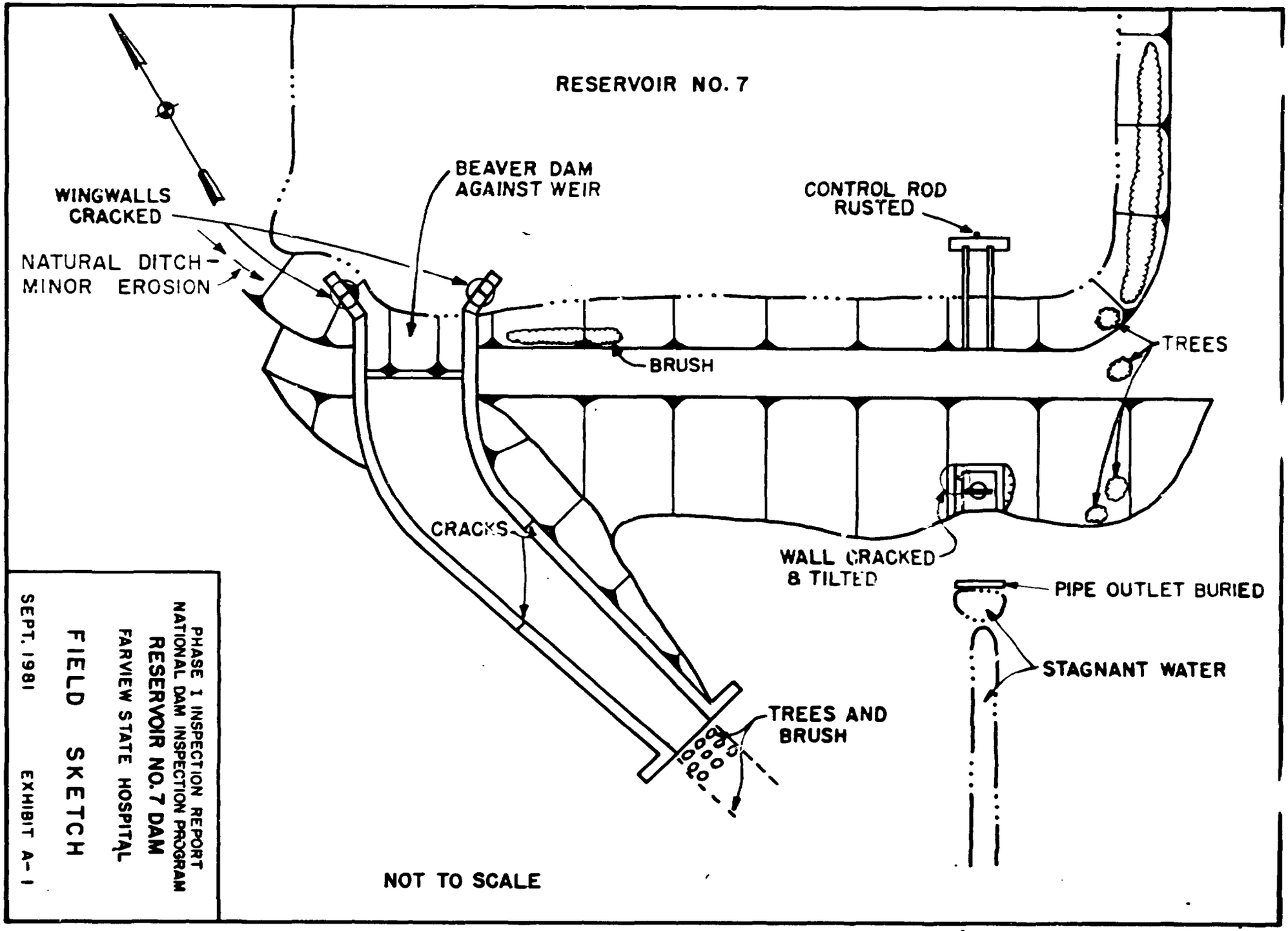
VISUAL EXAMINATION OF	OBSERVATIONS
Approach Channel	Reservoir. Beavers have filled in u/s of weir with mud and sticks for distance of 4-5 feet upstream and to height of weir.
Concrete Weir and Walls	Wingwalls u/s of weir cracked and spalling in several locations. Steel plates placed over original concrete weir has raised crest 0.5 feet.
Discharge Channel	Rectangular shaped concrete for about 75 feet. Several vertical cracks in walls. Slab has minor cracking. Trees block channel immediately d/s of concrete slab.

RESERVOIR

VISUAL EXAMINATION OF	OBSERVATIONS
Slopes	Wooded and flat.
Sedimentation	None observed or reported.
Miscellaneous	Pump house for water supply withdrawal on shoreline approximately 1,000 feet u/s dam.

DOWNSTREAM CHANNEL

VISUAL EXAMINATION OF	OBSERVATIONS
Condition: Obstructions, etc.	Two large railroad embankments 400 and 550 feet d/s. Two, 3 foot square rock culverts through first and one 4.5 x 5.5 culvert through second. Carbondale No. 4 Dam 3,000 feet d/s. Brownell Dam. 1.3 miles d/s. City of Carbondale 3.0 miles d/s.
Slopes	Moderate to steep side slopes; moderate channel slope. Wooded.
Approximate Number of homes	Several homes in City of Carbondale approximately 3.0 miles downstream of dam.



PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

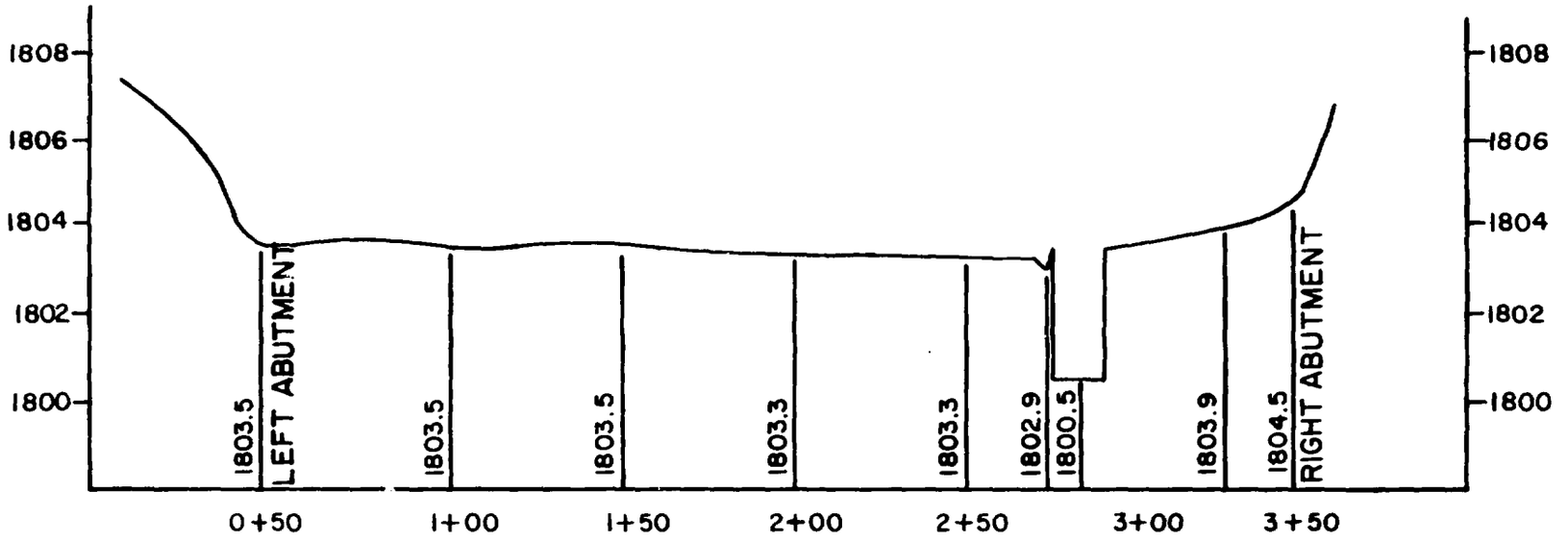
RESERVOIR NO. 7 DAM

FARVIEW STATE HOSPITAL

FIELD SKETCH

SEPT. 1981

EXHIBIT A-1



TOP OF DAM--PROFILE

SCALE- HORIZ. 1 IN. = 50FT.
VERT. 1 IN = 4 FT

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

RESERVOIR NO. 7 DAM

FARVIEW STATE HOSPITAL

PROFILE

SEPT, 1981

EXHIBIT A-2

APPENDIX B

CHECKLIST - ENGINEERING DATA

APPENDIX B

Check List
Design, Construction, Operation
Phase I

NAME DAM Reservoir No. 7 Dam

DER ID No. 70-64-1

ITEM	REMARKS
As-built Drawings	Design Drawings dated in 1953 show plans for spillway, outlet works, and embankment.
Regional Vicinity Map	U.S.G.S. Quadrangle Sheet entitled Waymart, PA. This quad sheet is 7-1/2 minute series. See Appendix E, plate E-II.
Construction History	No data on original design and construction.
Typical Sections of Dam	See Appendix E for plans.
Outlets - Plan Detail Constraints Discharge Ratings	1-10" Cast iron pipe with 10" sluice gate on upstream end. See plans in Appendix E of this report.
Rainfall/Reservoir Records	None.

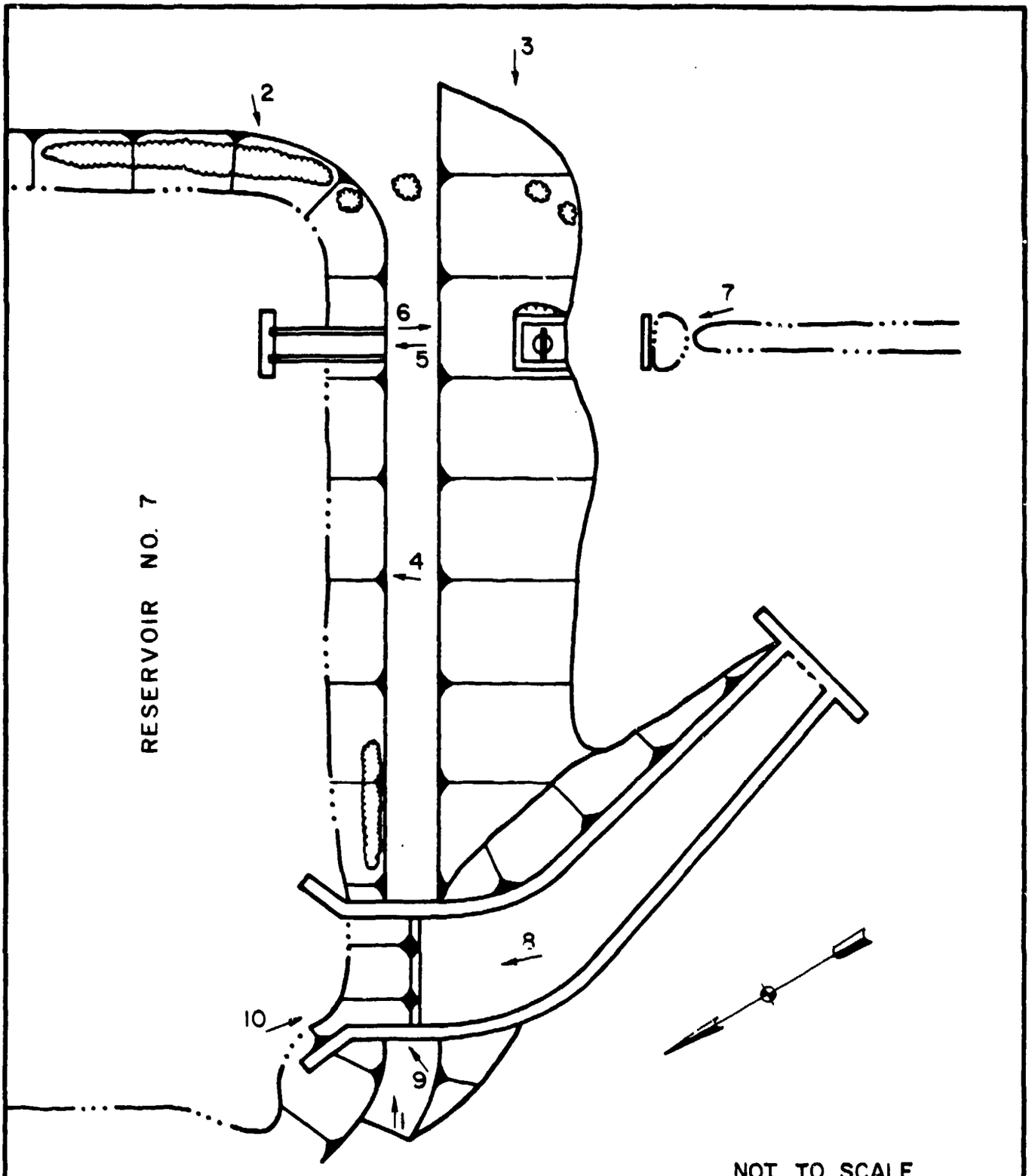
ITEM	REMARKS
Design Reports	None.
Geology Reports	None.
Design Computations Hydrology & Hydraulics Dam Stability Seepage Studies	None.
Materials Investigations Boring Records Laboratory Field	None.
Post-Construction Surveys of Dam	None.
Borrow Sources	No data.

ITEM	REMARKS
Monitoring Systems	None.
Modifications	Improvements made to outlet works, spillway and embankment in 1953.
High Pool Records	None.
Post-Construction Engineering Studies and Reports	Improvements made to outlet works, spillway and embankment in 1953.
Prior Accidents or Failure of Dam Description Reports	N/A.
Maintenance Operation Records	None.

ITEM	REMARKS
Spillway Plan Sections Details	See Appendix E of this Report.
Operating Equipment Plans & Details	N/A.
Specifications	No Data.
Miscellaneous	Previous inspection reports by PennDER.

APPENDIX C

PHOTOGRAPHS



NOT TO SCALE

← LOCATION AND ORIENTATION OF CAMERA

2 PHOTOGRAPH IDENTIFICATION NUMBER

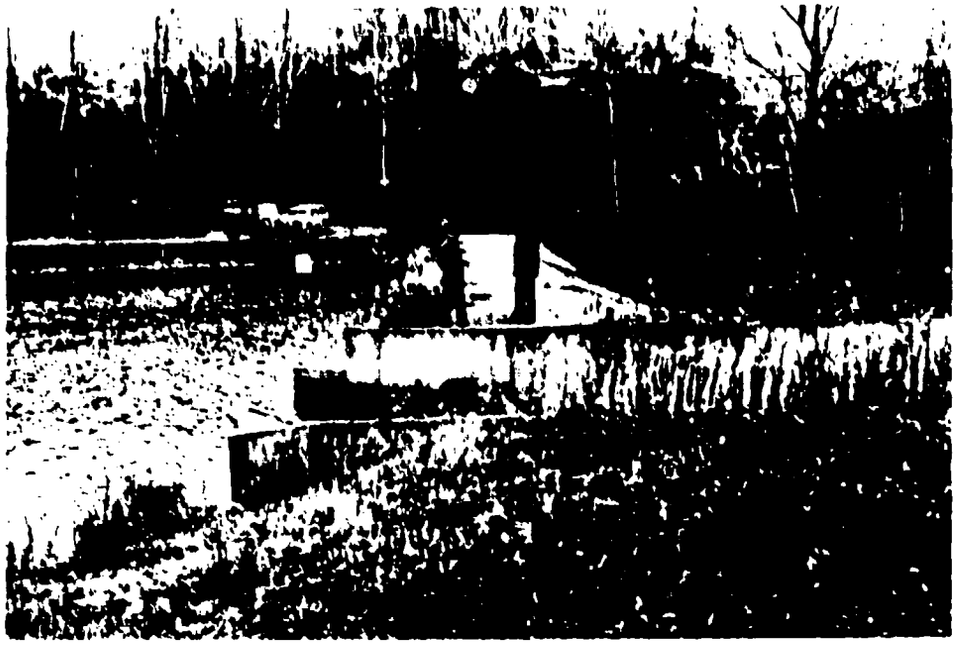
PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

RESERVOIR NO. 7 DAM

FARVIEW STATE HOSPITAL

PHOTOGRAPH LOCATION PLAN

SEPT, 1981 EXHIBIT C-1

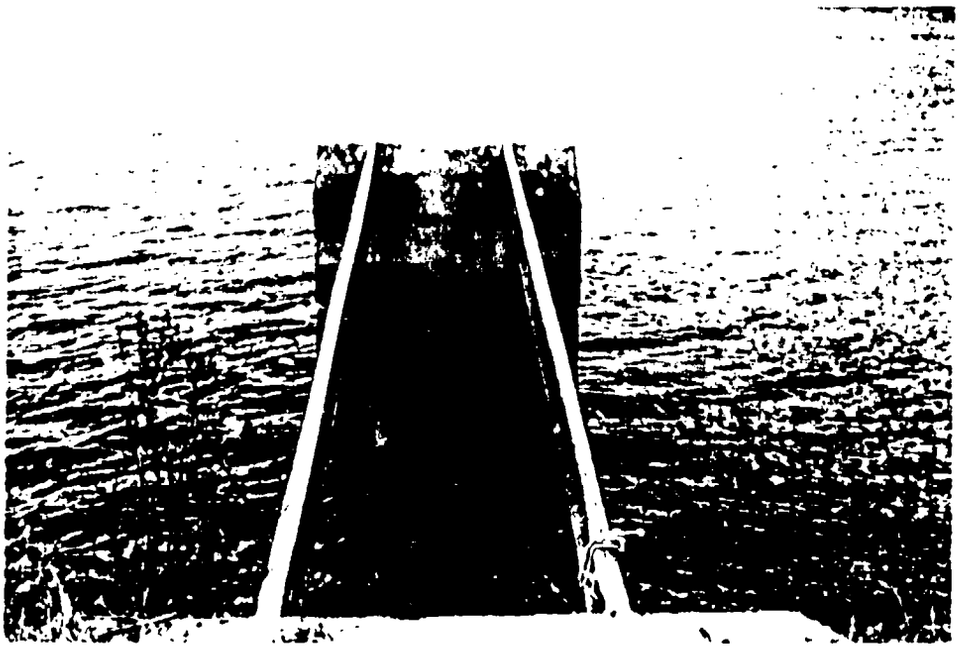


[illegible] and left abutment steel spillway in foreground.

Upstream face and right abutment. Pier at right is intake end of outlet works.

3. Downstream face with spillway discharge channel in background.

4. Reservoir area. Pumphouse at extreme right.



5. Support pier for outlet works intake. Control rod on far side.

6. Outlet works discharge channel.

7. Downstream end of outlet works.

8. Spillway weir and approach.

[illegible] looking at left spillway wingwall and beaver dam against weir.

[illegible] Spillway discharge channel with weir in foreground.

11. Downstream hazard area looking upstream from U.S. Route 6 bridge (3.0 miles d/s).

APPENDIX D

HYDROLOGY AND HYDRAULICS

PREFACE

The modified HEC-1 program is capable of performing two basic types of hydrologic analyses: 1) the evaluation of the overtopping potential of the dam; and 2) the estimation of the downstream hydrologic-hydraulic consequences resulting from assumed structural failures of the dam. Briefly, the computational procedures typically used in the dam overtopping analysis are as follows:

a. Development of an inflow hydrograph(s) to the reservoir.

b. Routing of the inflow hydrograph(s) through the reservoir to determine if the event(s) analyzed would overtop the dam.

c. Routing of the outflow hydrograph(s) from the reservoir to desired downstream locations. The results provide the peak discharge(s), time(s) of the peak discharge(s), and the maximum stage(s) of each routed hydrograph at the downstream end of each reach.

The evaluation of the hydrologic-hydraulic consequence resulting from an assumed structural failure (breach) of the dam is typically performed as shown below.

a. Development of an inflow hydrograph(s) to the reservoir.

b. Routing of the inflow hydrograph(s) through the reservoir.

c. Development of a failure hydrograph(s) based on specified breach criteria and normal reservoir outflow.

d. Routing of the failure hydrograph(s) to desired downstream locations. The results provide estimates of the peak discharge(s), time(s) to peak and maximum water surface elevations of failure hydrographs for each location.

HYDROLOGY & HYDRAULIC ANALYSIS
DATA BASE

NAME OF DAM: RESERVOIR NO. 7 DAM

PROBABLE MAXIMUM PRECIPITATION (PMP) = 22.2 INCHES/24 HOURS (1)

SUSQUEHANNA RIVER BASIN

STATION	1	2	3
STATION DESCRIPTION	RESERVOIR NO. 7 DAM		
DRAINAGE AREA (SQUARE MILES)	0.33		
CUMULATIVE DRAINAGE AREA (SQUARE MILES)	0.33		
ADJUSTMENT OF PMF FOR (1) DRAINAGE AREA LOCATION (%)	96%		
ADJUSTED VALUES:			
6 Hours	112.3		
12 Hours	121.9		
24 Hours	130.6		
48 Hours	137.3		
72 Hours	139.2		
SNYDER HYDROGRAPH PARAMETERS			
Zone (2)	11		
C_p (3)	0.62		
C^t (3)	1.50		
L^t (MILES) (4)	1.36		
L_{ca} (MILES (4)	0.38		
$tp = C_t (L \cdot L_{ca})^{0.3}$ (HOURS)	1.23		
SPILLWAY DATA			
CREST LENGTH (FEET)	30.0		
FREEBOARD (FEET)	2.4		

(1) HYDROMETEOROLOGICAL REPORT - 40, U. S. Army Corps of Engineers, 1955.

(2) Hydrologic zone defined by Corps of Engineers, Baltimore District, For Determination of Snyder Coefficients (C_p and C_t).

(3) Snyder Coefficients

(4) L = Length of longest watercourse from dam to basin divide.
L_{ca} = Length of longest watercourse from dam to point opposite basin centroid.

BALTIMORE DISTRICT, CORPS OF ENGINEERS PAGE _____

SUBJECT DAM SAFETY ANALYSIS

COMPUTATIONS RESERVOIR No. 7 DAM SHEET 1 OF _____ SHEETS

COMPUTED BY JPB CHECKED BY _____ DATE 6-3-81

DAM CLASSIFICATION:

SIZE OF DAM - SMALL
HAZARD - HIGH
REQUIRED SDF - ½ PMF TO FULL PMF

DAM STATISTICS:

HEIGHT OF DAM - 12.9 FEET
STORAGE AT NORMAL POOL - 95 AC-FT
STORAGE AT TOP OF DAM - 134 AC-FT
DRAINAGE AREA ABOVE DAMSITE - 0.33 mi^2

ELEVATIONS: (MSL)

TOP OF DAM LOW POINT (FIELD) - 1802.9
NORMAL POOL - 1800.5
SPILLWAY CREST - 1800.5
STREAMBED AT TOE - 1790.0

HYDROGRAPH PARAMETERS:

RIVER BASIN - SUSQUEHANNA RIVER BASIN
ZONE - 11
SNYDER COEFFICIENTS
C_p = 0.62
C_t = 1.50
MEASURED PARAMETERS *

L = LENGTH OF LONGEST WATERCOURSE — L = 7180 FEET 1.36 miles
L_{CA} = LENGTH OF LONGEST WATERCOURSE TO CENTROID OF BASIN — L_{CA} = 2000 FEET 0.38 miles

* FROM U.S.G.S. QUAD SHEET ENTITLED WAYMART, PA. 7½ MINUTE SERIES, SCALE 1:24000

NADB FORM 1232, 28 MAR 74

BALTIMORE DISTRICT, CORPS OF ENGINEERS — PAGE

SUBJECT DAM SAFETY ANALYSIS

COMPUTATIONS RESERVOIR No. 7 DAM — SHEET 2 OF ____ SHEETS

COMPUTED BY JPB — CHECKED BY ____ — DATE 6-3-81

NOTE: ELEVATIONS ARE REFERENCED TO TOPOGRAPHIC DATA. NORMAL POOL WAS ASSUMED TO BE AT SPILLWAY CREST, ELEVATION 1800.5. ALL ELEVATIONS WERE REFERENCED TO THIS VALUE.

t_p = SYNDER BASIN LAG TIME, HOURS

$t_p = C_t (LL_{CA})^{0.3} = 1.50(1.36(0.38))^{0.3} = 1.23$

$t_p = 1.23$ HOURS

RESERVOIR CAPACITY:

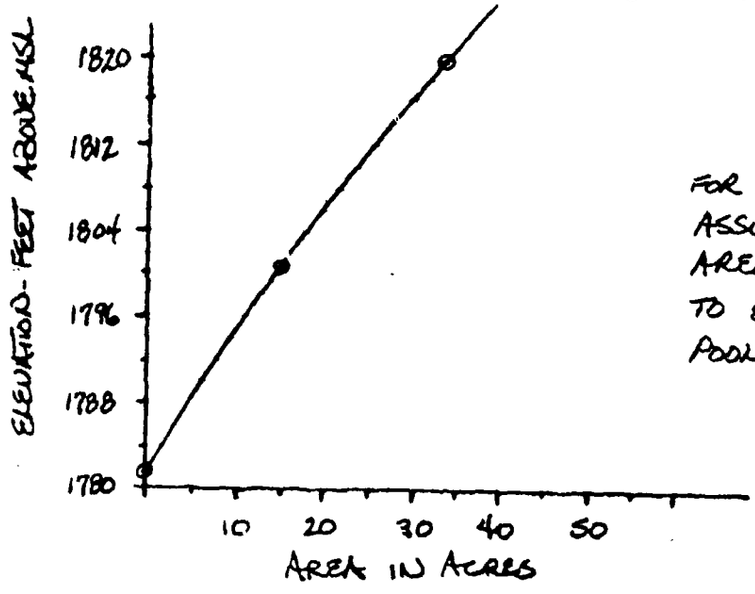
SURFACE AREA AT NORMAL POOL (EL 1800.5) - 15 ACRES
SURFACE AREA AT ELEVATION 1820.0 - 32 ACRES

ASSUME CONICAL METHOD APPLIES TO FIND LOW POINT IN POOL BELOW NORMAL POOL.

VOLUME AT NORMAL POOL - 95 AC-FT. (FROM PENNDER FILES)

$V = \frac{1}{3} AH$, $H = \frac{3V}{A} = \frac{3(95 \text{ AC-FT})}{15 \text{ AC}} = 19$ FEET

∴ ZERO STORAGE AT ELEVATION 1781.5



FOR FLOOD ROUTING PURPOSES, ASSUME THE AVERAGE END AREA METHOD IS SUITABLE TO ELEVATIONS ABOVE NORMAL POOL.

$\Delta V = \left(\frac{A_1 + A_2}{2}\right) \Delta H$

MADB FORM 1232, 28 MAR 74

BALTIMORE DISTRICT, CORPS OF ENGINEERS PAGE _____

SUBJECT DAM SAFETY ANALYSIS

COMPUTATIONS RESERVOIR NO. 7 DAM SHEET 3 OF _____ SHEETS

COMPUTED BY JMB CHECKED BY _____ DATE 6-3-81

ELEVATION - STORAGE TABLE:

ELEVATION (MSL)	AREA (ACRES)	ΔH (FT)	$\Delta V = \left(\frac{A_1 + A_2}{2}\right)\Delta H$ (AC-FT)	CUMULATIVE VOLUME (AC-FT)
1781.5	0	-	-	0
1800.5	15	-	95	95
1801.0	15.7	0.5	7.7	102.7
1802.0	16.3	1.0	16.0	118.7
1802.9 (TOD)*	17.0	0.9	15.0	133.7
1803.0	17.1	0.1	2.0	135.7
1805.0	19.0	2.0	36.1	171.8
1810.0	23.0	5.0	105.0	276.8

NOTE: DRAINAGE AREA ABOVE DAMSITE IS 0.33 mi^2

ELEVATION (MSL)	STORAGE (AC-FT)
1781.5	0
1800.5	95
1801.0	103
1802.0	119
1802.9	134
1803.0	136
1805.0	172
1810.0	277

THIS DATA TO BE INPUT ON #S AND #E CARDS.

* TOD - TOP OF DAM (LOW POINT FROM FIELD INSPECTION)

NADS FORM 1232, 28 MAR 74

BALTIMORE DISTRICT, CORPS OF ENGINEERS PAGE

SUBJECT DAM SAFETY ANALYSIS

COMPUTATIONS RESERVOIR No. 7 DAM SHEET 4 OF SHEETS

COMPUTED BY JPB CHECKED BY DATE 6-3-81

PMP CALCULATIONS:

- APPROXIMATE RAINFALL INDEX - 22.2 INCHES
  (CORRESPONDS TO A DURATION OF 24 HOURS AND A DRAINAGE AREA OF 200 mi^2)
- SUSQUEHANNA RIVER BASIN
- DEPTH-AREA-DURATION HYDROMET 40 VALUES
  GEOGRAPHIC AREA ADJUSTMENT MADE BY HYDROMET 40 FIGURE 2 IS 96%
- ASSUME VALUES CORRESPONDING TO A 10 mi^2 AREA MAY BE USED ON THIS 0.33 mi^2 AREA.

DURATION (HRS)	PERCENT OF INDEX RAINFALL		
6	117		112.3
12	127	x(0.96) =	121.9
24	136		130.6
48	143		137.3
72	145		139.2

NOTE: HOP BROOK FACTOR IS INTERNALLY COMPUTED BY THE HEC1 PROGRAM. FOR A DRAINAGE AREA LESS THAN 10 mi^2, THE ADJUSTMENT FACTOR = 0.80. THIS ADJUSTMENT IS FOR BASIN SHAPE AND THE LESS LIKLIHOOD OF A SEVERE STORM CENTERING OVER A SMALL BASIN.

SDF: BASED ON THE SMALL STORAGE AND HEIGHT, THE SELECTED SDF IS ½ THE PMF.

THEREFORE, SDF = ½ PMF

NADB FORM 1232, 28 MAR 74

BALTIMORE DISTRICT, CORPS OF ENGINEERS PAGE

SUBJECT DAM SAFETY ANALYSIS

COMPUTATIONS RESERVOIR No. 7 DAM SHEET 5 OF SHEETS

COMPUTED BY JAB CHECKED BY DATE 6-4-81

EMERGENCY SPILLWAY CAPACITY:

THE SPILLWAY IS LOCATED NEAR THE RIGHT ABUTMENT, SEE FIELD SKETCH IN APPENDIX A, EXHIBIT 1, AND PHOTOGRAPHS IN APPENDIX C.

THIS ANALYSIS WILL ASSUME THAT UNDER EXISTING CONDITIONS THE C VALUE FOR THE SPILLWAY WILL BE 2.90. THIS WILL ASSUME A BROAD-CRESTED WEIR DUE TO DEBRIS PILED IN FRONT OF THE SHARPCRESTED WEIR.

THE SECOND ANALYSIS WILL ASSUME A SHARPCRESTED WEIR WITH THE DEBRIS REMOVED. UNDER THIS MODIFIED CONDITION, THE C VALUE WILL BE ASSUMED AT 3.40. THE FOLLOWING CALCULATIONS WILL REFLECT THE ABOVE DISCUSSION. IN ADDITION A SMALL LOW AREA WILL BE RAISED FROM 1802.9 to 1803.3. THEREFORE, NEW TOD WOULD BE 1803.3.

SPILLWAY DATA:

TYPE - EXISTING - BROAD-CRESTED WEIR DUE TO DEBRIS IN ENTRANCE AREA
MODIFIED - SHARP-CRESTED WEIR - REMOVAL OF DEBRIS IN ENTRANCE AREA

LENGTH - 30 FEET

CREST ELEVATION - 1800.5

TOP OF DAM (LOW POINT) - 1802.9 (EXISTING) 1803.3 (MODIFIED)

SPILLWAY FREEBOARD - 2.4 FEET (EXISTING), 2.8 FEET (MODIFIED)

C VALUES SPILLWAY - EXISTING - 2.90
MODIFIED - 3.40
EMBANKMENT - 2.85

NADB FORM 1232, 28 MAR 74

BALTIMORE DISTRICT, CORPS OF ENGINEERS PAGE

SUBJECT DAM SAFETY ANALYSIS

COMPUTATIONS RESERVOIR No. 7 DAM SHEET 6 OF SHEETS

COMPUTED BY JPB CHECKED BY DATE 6-4-81

SPILLWAY RATING CURVE:

$L = 30$ FEET

POOL ELEVATION (MSL)	H (FT)	EXISTING C	EXISTING Q* (CFS)	MODIFIED C	MODIFIED Q* (CFS)
1800.5	0	2.9	0	3.4	0
1801.0	0.5	2.9	3.0	3.4	3.6
1802.0	1.5	2.9	159.8	3.4	187.4
1802.9 (TOD**)	2.4	2.9	323.5	3.4	379.3
1803.0	2.5	2.9	343.9	3.4	403.2
1803.3 (MIDDLE TOD)	2.8	2.9	407.6	3.4	477.9
1805.0	4.5	2.9	830.5	3.4	973.7
1810.0	9.5	2.9	2547.5	3.4	2986.7

* $Q = CLH^{3/2}$

** TOD = TOP OF DAM, LOW POINT MEASURED IN THE FIELD

EMBANKMENT RATING TABLE:

THIS ANALYSIS ASSUMES THAT THE EMBANKMENT BEHAVES AS A BROAD-CRESTED WEIR IF OVERTOPPING OCCURS. THIS DISCHARGE CAN BE ESTIMATED BY:

$$Q = CL_1 H_w^{3/2}$$

where: Q = DISCHARGE OVER EMBANKMENT, IN CFS
L = LENGTH OF EMBANKMENT, IN FEET
H_w = WEIGHTED HEAD, IN FEET, AVERAGE FLOW AREA
C = COEFFICIENT OF DISCHARGE

$C = 2.85$ FROM VARNELL & NAGLER FOR BROAD-CRESTED WEIRS

NADB FORM 1232, 29 MAR 74

BALTIMORE DISTRICT, CORPS OF ENGINEERS PAGE

SUBJECT DAM SAFETY ANALYSIS

COMPUTATIONS RESERVOIR NO. 7 DAM SHEET 7 OF SHEETS

COMPUTED BY JJB CHECKED BY DATE 6-4-81

LENGTH OF EMBANKMENT VS. RESERVOIR ELEVATION: EXISTING

RESERVOIR ELEVATION (MSL)	EMBANKMENT LENGTH (ft)
1802.9	0
1803.0	5
1804.0	260
1805.0	300
1810.0	300

EMBANKMENT RATING: (EXISTING) C=2.85

RESERVOIR ELEVATION (MSL)	L_1 (ft)	L_2 (ft)	INCREMENTAL HEAD, H_i (ft)	① INCREMENTAL FLOW AREA, A_i (ft^2)	TOTAL FLOW AREA, A_T (ft^2)	② WEIGHTED HEAD, H_w (ft)	③ Q (CFS)
1802.9	0	-	-	-	-	-	0
1803.0	5	0	0.1	0.25	0.25	0.05	0.2
1803.3	60	5	0.3	9.75	10.00	0.17	12.0
1804.0	260	60	0.7	112.0	122.0	0.47	238.7
1805.0	300	260	1.0	280.0	402.0	1.34	1326.2
1810.0	300	300	5.0	1500.0	1902.0	6.34	13648.9

① $A_i = [(L_1+L_2)/2]\,H_i$

② $H_w = A_T/L_1$

③ $Q = CL_1H_w^{3/2}$

MODIFIED CONDITIONS C=2.85

RESERVOIR ELEVATION (MSL)	L_1 (ft)	L_2 (ft)	INCREMENTAL HEAD H_2 (ft)	① INCREMENTAL FLOW AREA A_2 (ft^2)	TOTAL FLOW AREA A_T (ft^2)	② WEIGHTED HEAD, H_w (ft)	③ Q (CFS)
1803.3	0	-	-	-	-	-	0
1804.0	260	0	0.7	91.0	91	0.35	153.4
1805.0	300	260	1.0	280.0	371	1.24	1180.0
1810.0	300	300	5.0	1500.0	1871	6.24	13327.0

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SUBJECT DAM SAFETY ANALYSIS

COMPUTATIONS RESERVOIR NO. 7 DAM SHEET 8 OF _____ SHEETS

COMPUTED BY JPB CHECKED BY _____ DATE 6-4-81

TOTAL FACILITY RATING CURVE:

RESERVOIR ELEVATION (MSL)	EXISTING $Q_{EMBANKMENT}$ (CFS)	EXISTING $Q_{SPILLWAY\ EXIST}$ (CFS)	EXISTING Q_{TOTAL} (CFS)	MODIFIED Q_{EMB} (CFS)	MODIFIED $Q_{SPILL\ MODIFIED}$ (CFS)	MODIFIED Q_{TOTAL} (CFS)
1800.5	0	0	0	0	0	0
1801.0	0	3	3	0	4	4
1802.0	0	160	160	0	187	187
1802.9	0	324	324	0	379	379
1803.0	0.2	344	344.2	0	403	403.2
1803.3	12.0	407.6	419.6	0	477.9	477.9
1805.0	1326	830.5	2156.5	1180	973.7	2154
1810.0	13649	2548	16197	13327	2986.7	16314

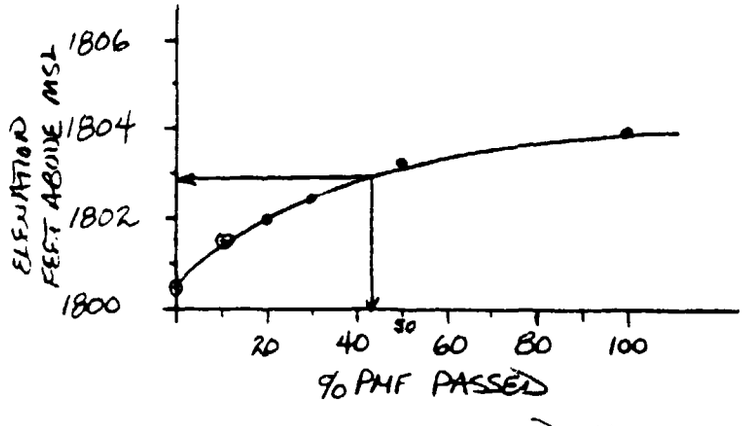
THIS DATA WILL BE INPUT ON Y4 & Y5 CARDS.

RESULTS OF THE OVERTOPPING ANALYSIS:

EXISTING CONDITIONS - SPILLWAY AS IS

FROM PAGE D-19, THE FOLLOWING CURVE CAN BE DRAWN FROM THE SUMMARY TABLE IN THIS APPENDIX.

TOP OF DAM ELEVATION - 1802.9



RESERVOIR NO. 7 DAM CAN PASS 42% OF THE PMF PRIOR TO OVERTOPPING THE EMBANKMENT

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BALTIMORE DISTRICT, OF ENGINEERS PAGE

SUBJECT DAM SAFETY ANALYSIS

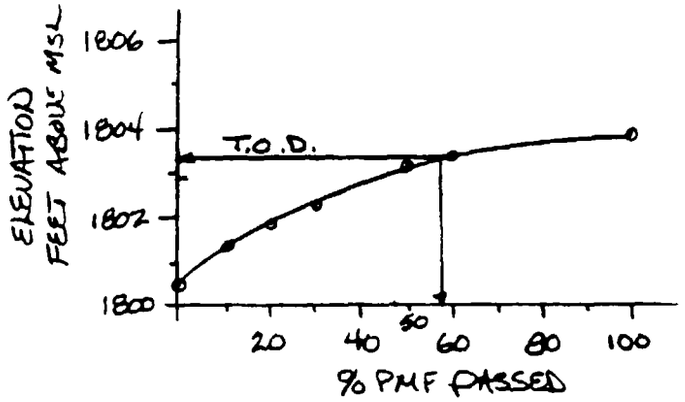
COMPUTATIONS RESERVOIR NO. 7 DAM SHEET 9 OF SHEETS

COMPUTED BY JPB CHECKED BY DATE 6-4-81

AS EXISTING, THIS FACILITY CAN CONTROL 42% OF THE PMF. AT THE SDF(½ PMF) THE DAM IS OVERTOPPED TO A MAXIMUM HEIGHT OF 0.4 FEET FOR 2.7 HOURS. SINCE THE FACILITY IS JUDGED NOT TO FAIL AT ½ PMF CONDITIONS, THE SPILLWAY IS RATED INADEQUATE.

MODIFIED CONDITIONS:

REMOVAL OF THE DEBRIS IN THE ENTRANCE OF THE SHARPCREST WEIR WOULD RESULT IN THE FOLLOWING. IN ADDITION THE LOW AREA ADJACENT TO THE LEFT SPILLWAY WALL WOULD BE FILLED IN.



MODIFIED, RESERVOIR NO. 7 DAM CAN PASS 58% OF THE PMF PRIOR TO OVERTOPPING THE EMBANKMENT.

NOTE TOP OF DAM AT 1803.3

AT MODIFIED CONDITIONS, THE DAM COULD HANDLE 58% OF THE PMF. THEREFORE, UNDER MODIFIED CONDITIONS THE SPILLWAY WOULD BE RATED ADEQUATE.

NADB FORM 1232, 28 MAR 74

BALTIMORE DISTRICT, CORPS OF ENGINEERS PAGE

SUBJECT DAM SAFETY ANALYSIS

COMPUTATIONS RESERVOIR NO. 7 DAM SHEET 10 OF SHEETS

COMPUTED BY JPB CHECKED BY DATE 6-4-81

OUTLET WORKS:

THE TOP OF THE MANHOLE COVER WAS FIELD MEASURED AT ELEVATION 1793.4. FROM DESIGN PLANS IN APPENDIX E, INVERT ELEVATION IS 1790.5 AND DOWNSTREAM INVERT IS ELEVATION 1790.0. THE LENGTH OF THE 10" PIPE IS APPROXIMATELY 60 feet WITH A SLOPE OF 0.0083 FT/FT, PIPE IS MADE OF CAST IRON.

THE OUTLET WORKS IS SHOWN IN APPENDIX E OF THIS REPORT. THE WALLS ARE PARALLEL TO THE DIRECTION OF FLOW.

NOTE: PRESENTLY THE DOWNSTREAM END OF OUTLET WORKS IS BLOCKED. THIS ANALYSIS ASSUMES THAT THE DEBRIS IS REMOVED AND THAT THE GATE OPERATES SATISFACTORY.

ASSUME THAT THE DOWNSTREAM END OF THE OUTLET WORKS IS SUBMERGED BY 1 FOOT OF WATER.

$\therefore$ TAILWATER IS $1790.0 + 1 + 0.833 = 1791.83 \sim 1791.8$

$H = HW - h_o + LS_o \qquad LS_o = 0.5$ feet

H: DIFFERENTIAL HEAD BETWEEN UPSTREAM POOL ELEVATION AND DOWNSTREAM TAILWATER - ASSUMED ELEV OF 1791.8.

THE FOLLOWING DATA AND CHART CAN BE FOUND IN APPENDIX B OF HYDRAULIC CHARTS FOR THE SELECTION OF HIGHWAY CULVERTS, U.S. DEPARTMENT OF COMMERCE, DEC. 1965. THIS ANALYSIS WILL ASSUME OUTLET CONTROL.

$K_e = 0.5$

MADB FORM 1232, 28 MAR 74

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SUBJECT DAM SAFETY ANALYSIS

COMPUTATIONS RESERVOIR NO. 7 DAM SHEET 11 OF SHEETS

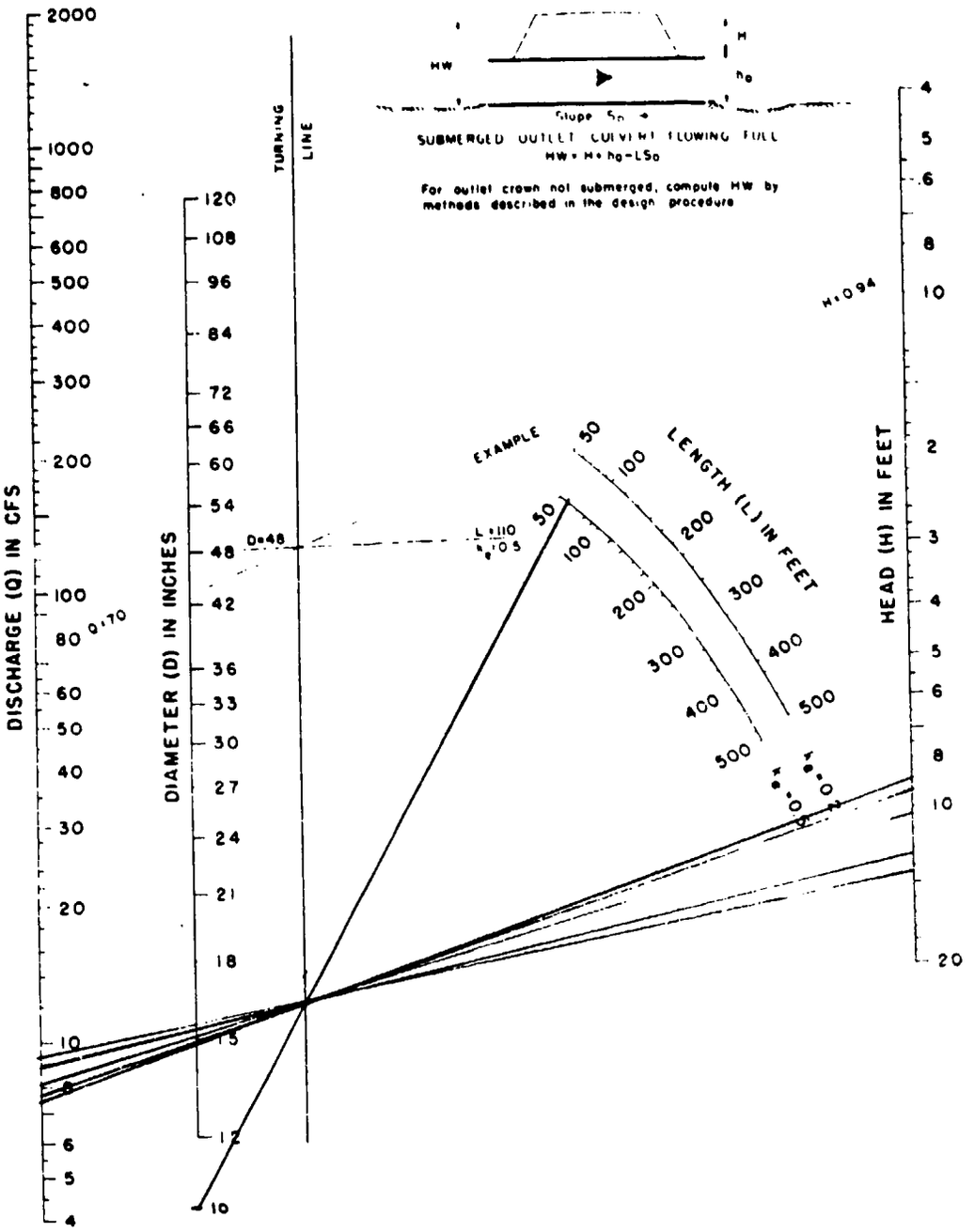
COMPUTED BY JPC CHECKED BY DATE 6-4-81

POOL ELEVATION (MSL)	TAILWATER (MSL)	H FEET	Q CFS	REMARKS for OUTLET
1800.5	1791.8	8.7	7.0	SPILLWAY CAP.
1801.0	1791.8	9.2	7.5	
1802.0	1791.8	10.2	8.0	
1802.9	1791.8	11.1	8.5	TOP OF DAM
1804.0	1791.8	12.2	9.0	
1805.0	1791.8	13.2	9.3	

NOTE: FROM CHOW n VALUES ARE APPROXIMATELY EQUAL FOR CAST IRON PIPE AND CONCRETE CONDUITS.

NADB FORM 1232, 28 MAR 74

CHART 9



HEAD FOR
CONCRETE PIPE CULVERTS
FLOWING FULL
n = 0.012

BUREAU OF PUBLIC ROADS JAN 1963

RESERVOIR No. 7 DAM

D-15

```
!*******************************
FLOOD HYDROGRAPH PACKAGE (HEC-1)
DAM SAFETY VERSION     JULY 1978
  LAST MODIFICATION  01 APR 80
*******************************
    1             A1     RESERVOIR NO. 7 DAM  DER NO.  70-64-1
    2             A2   DAM SAFTEY INSPECTION PROGRAM     6-4-81
    3             A3    OVERTOPPING ANALYSIS    *** PRELIMINARY   ***
    4             B   144       0      20       0       0       0       0       0       0       0
    5             B1    5       0       0       0       0       0       0       0       0       0
    6             J     1       5       1
    7             J1  0.10    0.20    0.30    0.50    1.00
    8             K     0       1       0       0       0       0       1       0       0       0
    9             K1   RUNOFF FROM DRAINAGE AREA ABOVE RESERVOIR NO. 7  DAM
   10             M     1       1    0.33       0    0.33       0       0       0       1       0
   11             P     0    22.2   112.3   121.9   130.6   137.3   139.2
   12             T     0       0       0       0       0       0     1.0    0.05       0       0
   13             W  1.23    0.62
   14             X  -1.5   -0.05       2
   15             K     1       1       0       0       0       0       1       0       0       0
   16             K1   ROUTING %PMF'S THRU RESERVOIR NO. 7  DAM AND SPILLWAY
   17             Y     0       0       0       1       1       0       0       0       0       0
   18             Y1    1       0       0       0       0       0   -1800.5    -1       0       0
   19             Y41800.5    1801    1802  1802.9    1803  1803.3    1805    1810
   20             Y5    0       3     160     324   344.2   418.6  2156.5   16197
   21             $S    0      95     103     119     134     136     172     277
   22             $E1781.5  1800.5    1801    1802  1802.9    1803    1805    1810
   23             $$1800.5
   24             $D1802.9
   25             K    99
1                          PREVIEW OF SEQUENCE OF STREAM NETWORK CALCULATIONS

                                RUNOFF HYDROGRAPH AT          1
                                ROUTE HYDROGRAPH TO           1
                                END OF NETWORK


!*******************************
FLOOD HYDROGRAPH PACKAGE (HEC-1)
DAM SAFETY VERSION     JULY 1978
  LAST MODIFICATION  01 APR 80
*******************************

RUN  DATE* 81/08/14.
     TIME* 06.26.23.
```

RESERVOIR NO.7 DAM
OVERTOPPING ANALYSIS
Sheet 1/4

RESERVOIR NO. 7 DAM DER NO. 70-64-1
DAM SAFTEY INSPECTION PROGRAM 6-4-81
OVERTOPPING ANALYSIS *** PRELIMINARY ***

JOB SPECIFICATION

NO	NHR	NMIN	IDAY	IHR	IMIN	METRC	IPLT	IPRT	NSTAN
144	0	20	0	0	0	0	0	0	0

JOPER	NWT	LROPT	TRACE
5	0	0	0

MULTI-PLAN ANALYSES TO BE PERFORMED
NPLAN= 1 NRTIO= 5 LRTIO= 1
RTIOS= .10 .20 .30 .50 1.00

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

SUB-AREA RUNOFF COMPUTATION

RUNOFF FROM DRAINAGE AREA ABOVE RESERVOIR NO. 7 DAM

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

HYDROGRAPH DATA

IHYDG	IUHG	TAREA	SNAP	TRSDA	TRSPC	RATIO	ISNOW	ISAME	LOCAL
1	1	.33	0.00	.33	0.00	0.000	0	1	0

PRECIP DATA

SPFE	PMS	R6	R12	R24	R48	R72	R96
0.00	22.20	112.30	121.90	130.60	137.30	139.20	0.00

TRSPC COMPUTED BY THE PROGRAM IS .800

LOSS DATA

LROPT	STRKR	DLTKR	RTIOL	ERAIN	STRKS	RTIOK	STRTL	CNSTL	ALSMX	RTIMP
0	0.00	0.00	1.00	0.00	0.00	1.00	1.00	.05	0.00	0.00

UNIT HYDROGRAPH DATA
TP= 1.23 CP= .62 NTA= 0

RECESSION DATA
STRTQ= -1.50 QRCSN= -.05 RTIOR= 2.00
APPROXIMATE CLARK COEFFICIENTS FROM GIVEN SNYDER CP AND TP ARE TC= 4.21 AND R= 3.48 INTERVALS

UNIT HYDROGRAPH 21 END-OF-PERIOD ORDINATES. LAG= 1.23 HOURS, CP= .62 VOL= 1.00

13.	47.	85.	105.	96.	73.	55.	41.	31.	23.
17.	13.	10.	7.	5.	4.	3.	2.	2.	1.
1.									

RESERVOIR NO.7 DAM
OVERTOPPING ANALYSIS
Sheet 2/4

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

HYDROGRAPH ROUTING

ROUTING XPMF'S THRU RESERVOIR NO. 7 DAM AND SPILLWAY

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

ROUTING DATA

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

NSTPS	NSTDL	LAG	AMSKK	X	TSK	STORA	ISPRAT
1	0	0	0.000	0.000	0.000	-1801.	-1

STAGE	1800.50	1801.00	1802.00	1802.90	1803.00	1803.30	1805.00	1810.00
FLOW	0.00	3.00	160.00	324.00	344.20	418.50	2156.50	16197.00
CAPACITY=	0.	95.	103.	119.	134.	136.	172.	277.
ELEVATION=	1782.	1801.	1801.	1802.	1803.	1803.	1805.	1810.

CREL	SPWID	COGW	EXPW	ELEVL	COOL	CAREA	EXPL
1800.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0

DAM DATA

TOPEL	COGD	EXPD	DAMWID
1802.9	0.0	0.0	0.

RESERVOIR NO. 7 DAM
OVERTOPPING ANALYSIS
sheet 3/4

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

1

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

OPERATION	STATION	AREA	PLAN	RATIOS APPLIED TO FLOWS RATIO 1 .10	RATIO 2 .20	RATIO 3 .30	RATIO 4 .50	RATIO 5 1.00
HYDROGRAPH AT	1	.33	1	105.	211.	316.	527.	1054.
	(	.85)	(	2.98)(	5.97)(	8.95)(	14.92)(	29.84)(
ROUTED TO	1	.33	1	78.	162.	249.	434.	1027.
	(	.85)	(	2.20)(	4.59)(	7.05)(	12.29)(	29.07)(

1 SUMMARY OF DAM SAFETY ANALYSIS

PLAN 1 .....

	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
ELEVATION	1800.50	1800.50	1802.90
STORAGE	95.	95.	134.
OUTFLOW	0.	0.	324.

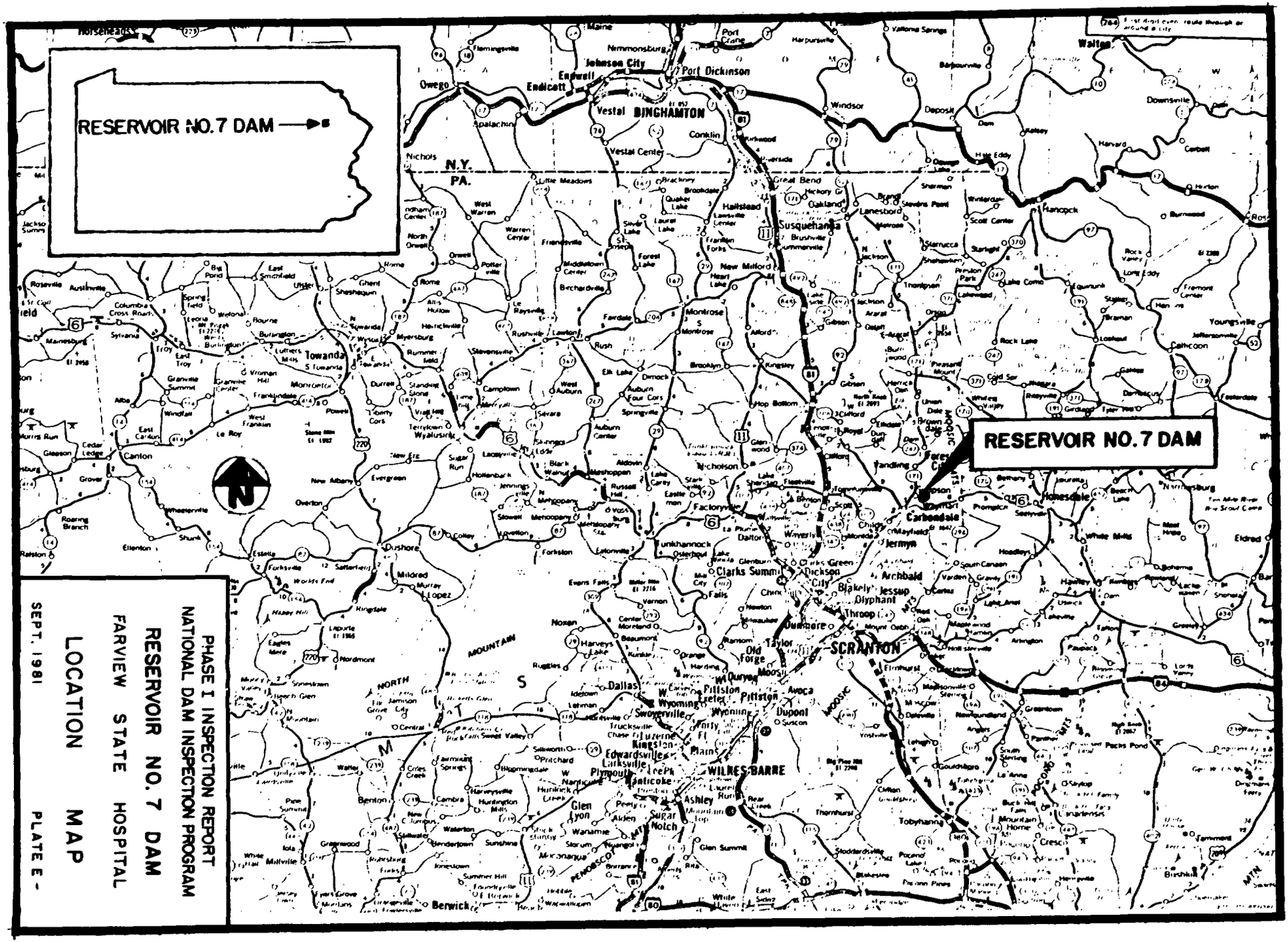
RATIO OF PMF	MAXIMUM RESERVOIR W.S.ELEV	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
.10	1801.48	0.00	111.	78.	0.00	41.67	0.00
.20	1802.01	0.00	119.	162.	0.00	41.67	0.00
.30	1802.49	0.00	127.	249.	0.00	41.67	0.00
.50	1803.32	.42	142.	434.	2.67	41.33	0.00
1.00	1803.89	.99	152.	1027.	5.00	41.00	0.00

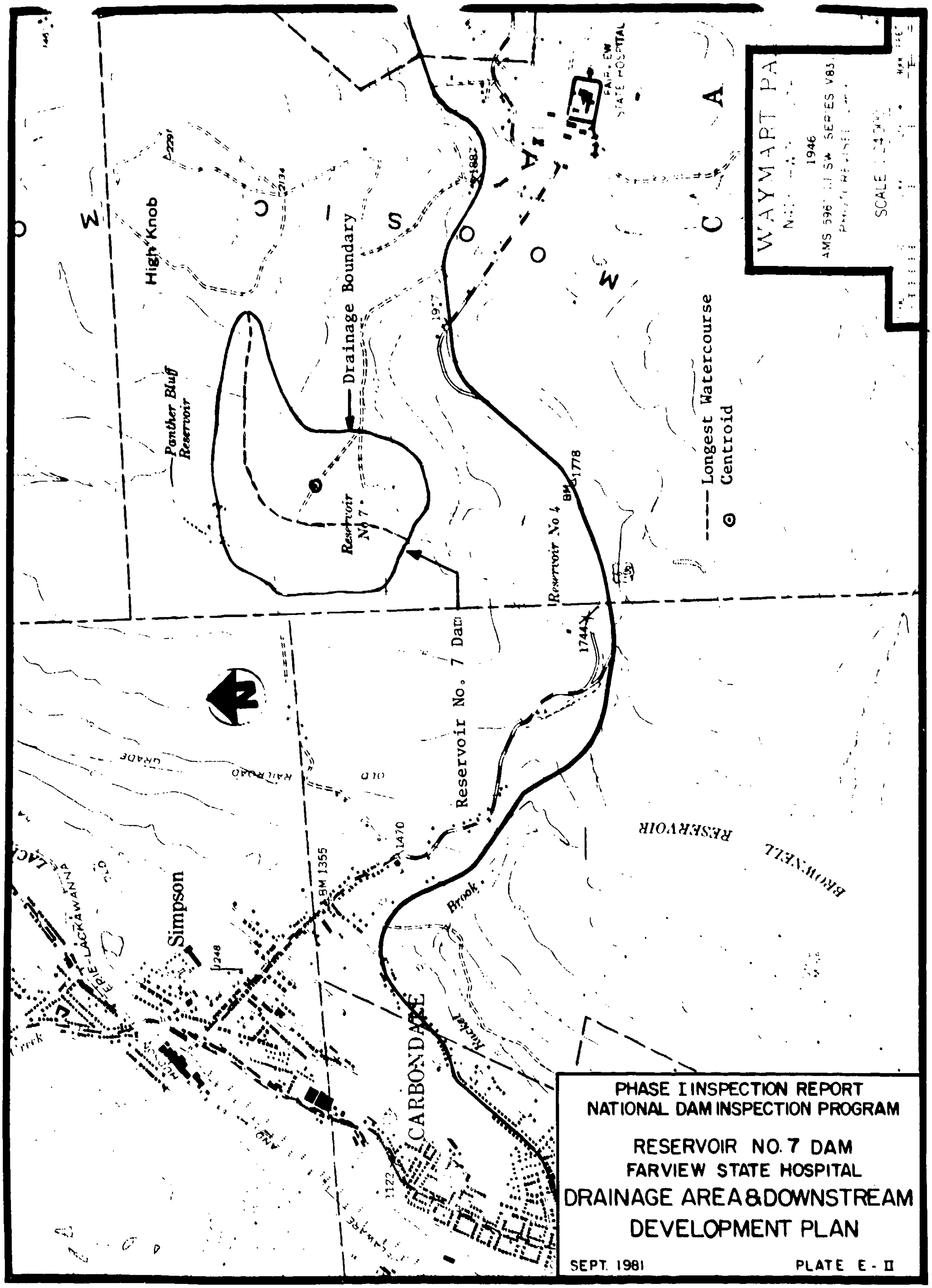
1**********
FLOOD HYDROGRAPH PACKAGE (HEC-1)
DAM SAFETY VERSION JULY 1978
LAST MODIFICATION 01 APR 80
****

RESERVOIR NO. 7 DAM
OVERTOPPING ANALYSIS
Sheet 4/4

APPENDIX E

PLATES


RESERVOIR NO.7 DAM
RESERVOIR NO.7 DAM
PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM
RESERVOIR NO. 7 DAM
FARVIEW STATE HOSPITAL
LOCATION MAP
SEPT. 1981
PLATE E -

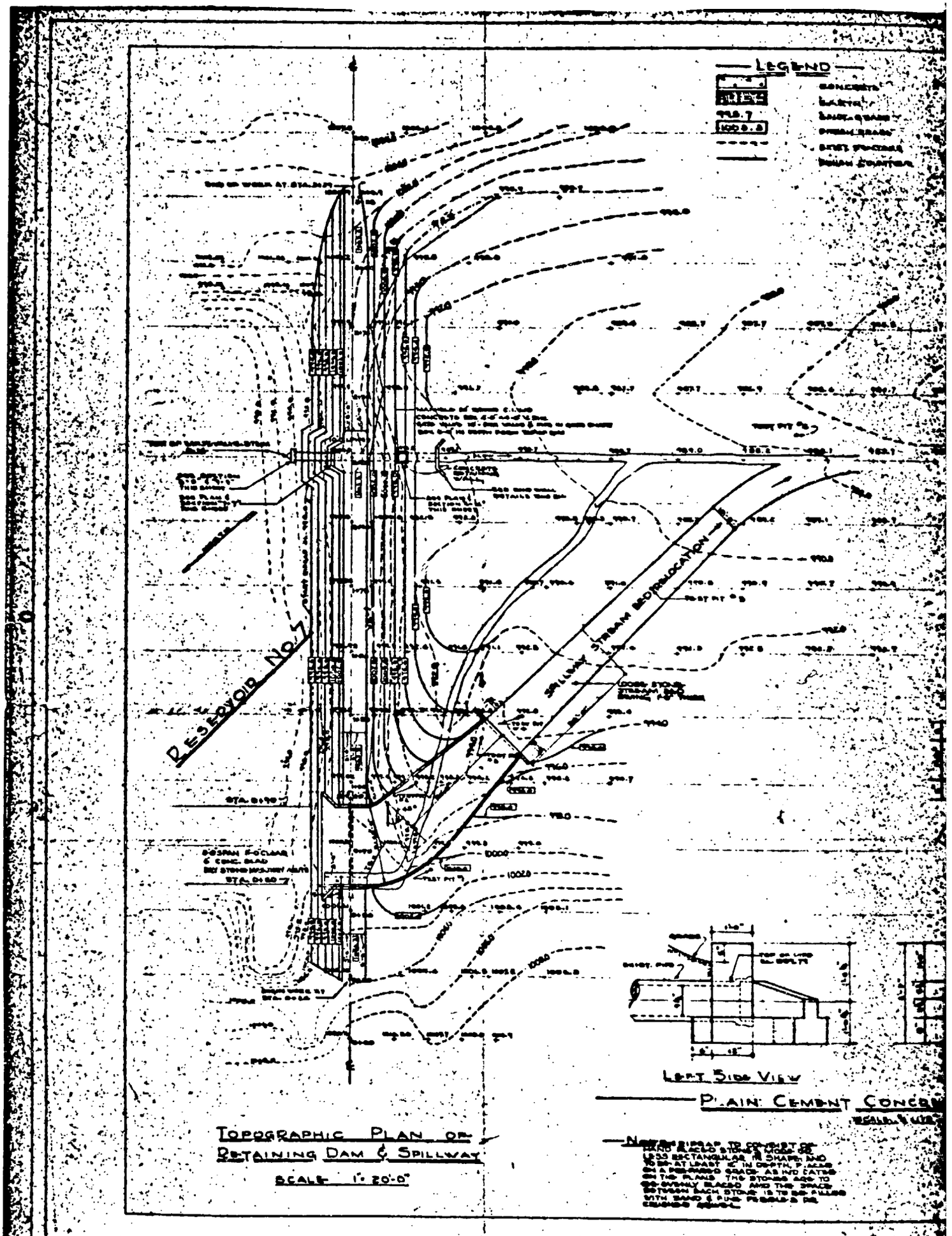


PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

RESERVOIR NO. 7 DAM
FARVIEW STATE HOSPITAL

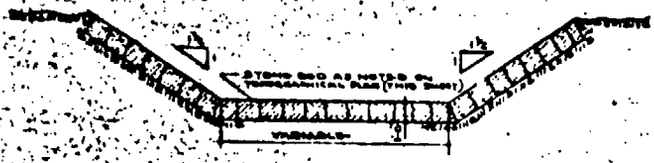
DRAINAGE AREA & DOWNSTREAM DEVELOPMENT PLAN

SEPT. 1981 PLATE E - II

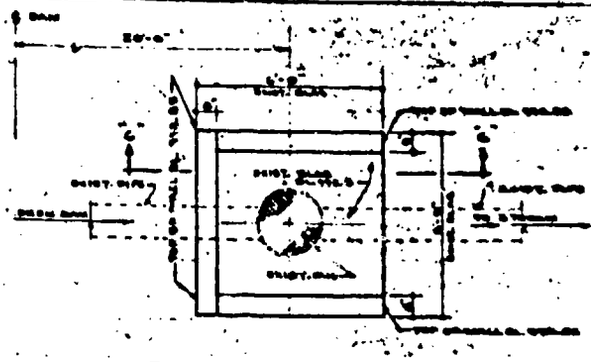


TOPOGRAPHIC PLAN OF RETAINING DAM & SPILLWAY

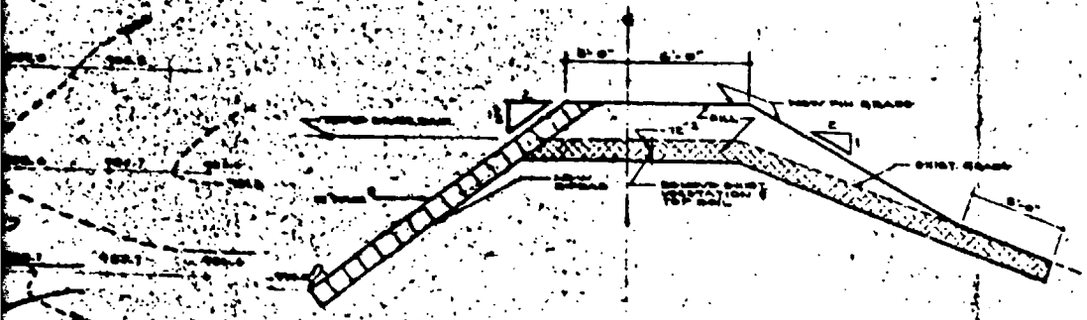
SCALE 1" = 20'-0"



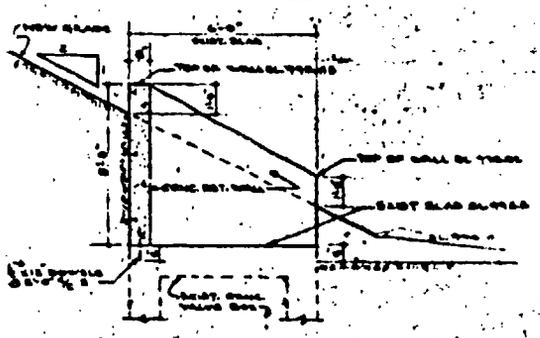
TYPICAL SECTION THRU SPILLWAY STREAM

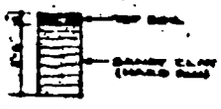


PLAN OF RETAINING WALL

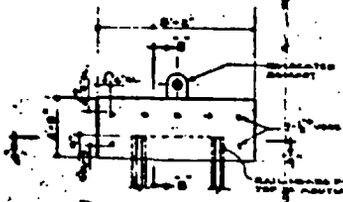


TYPICAL SECTION THRU DAM

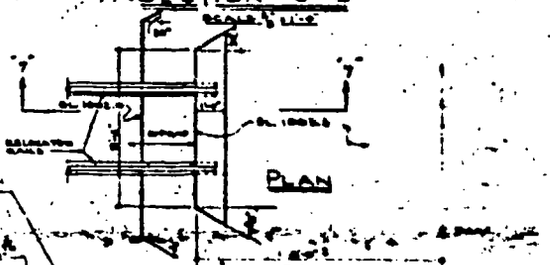




TEST PIT NO. 1, 2, 3, 4, 5 & 6

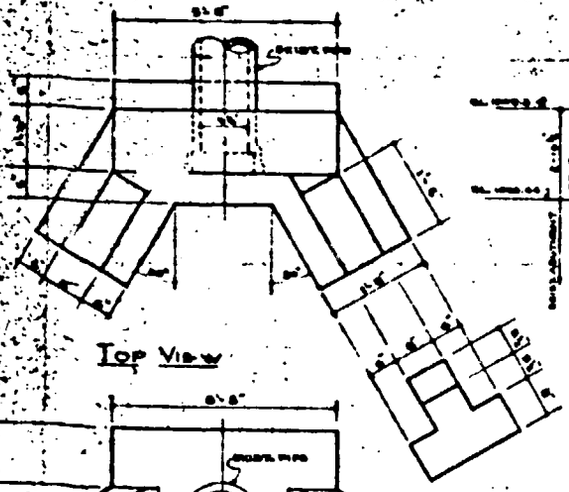


PLAN OF ABUTMENT

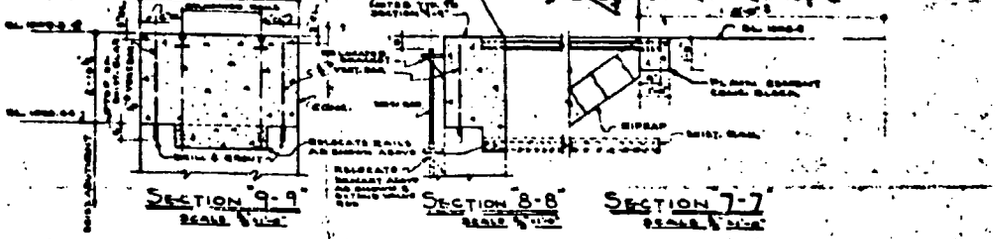


SECTION "6-6"

PLAN



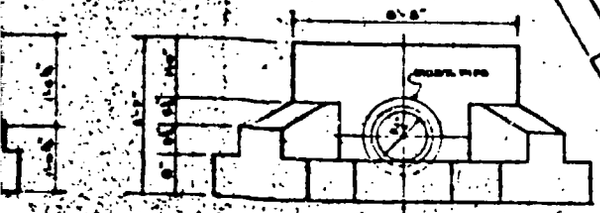
TOP VIEW



SECTION "9-9"

SECTION "8-8"

SECTION "7-7"



FRONT VIEW

NT CONCRETE END WALL

NOTE:

REVISED

APPROVAL

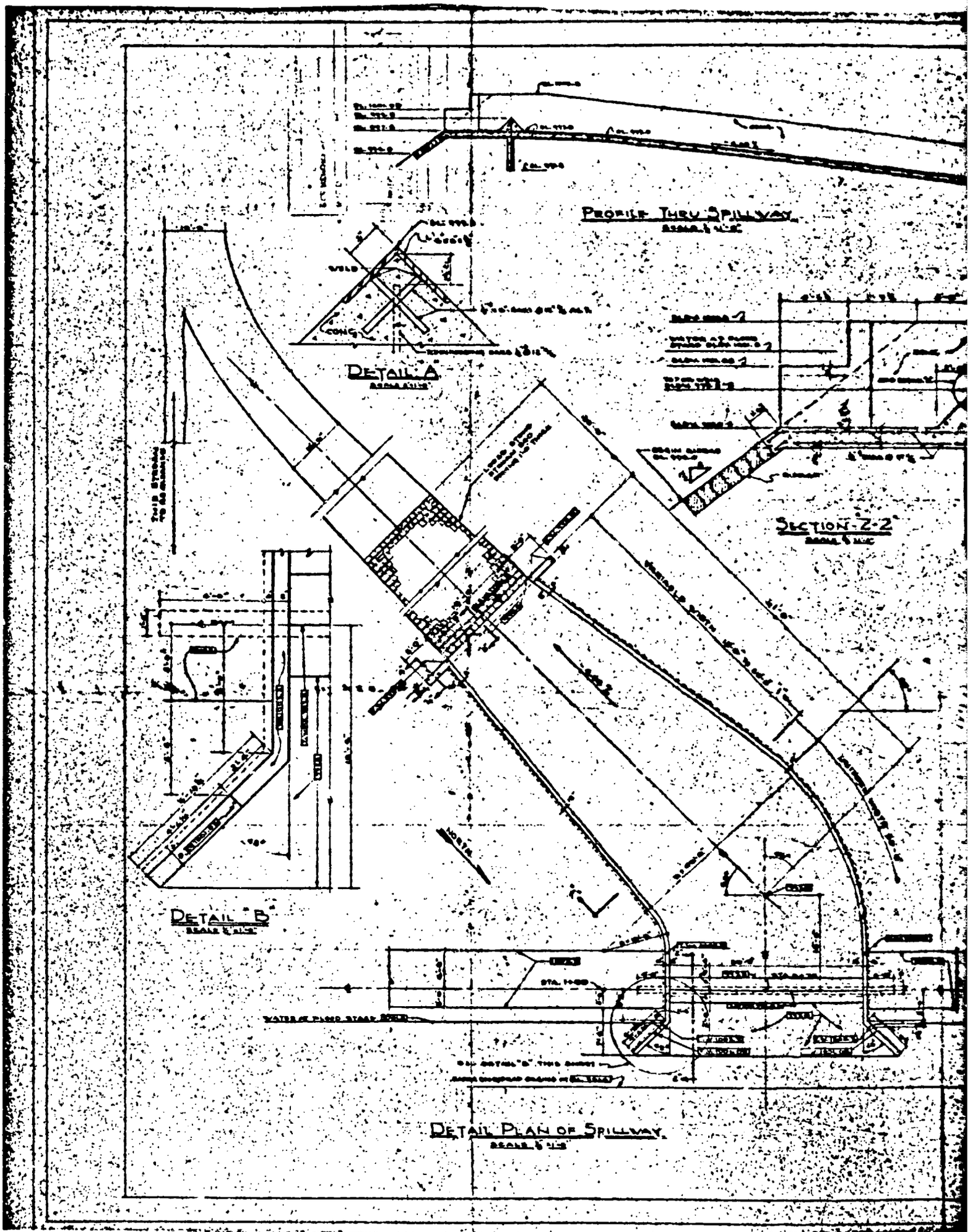
PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

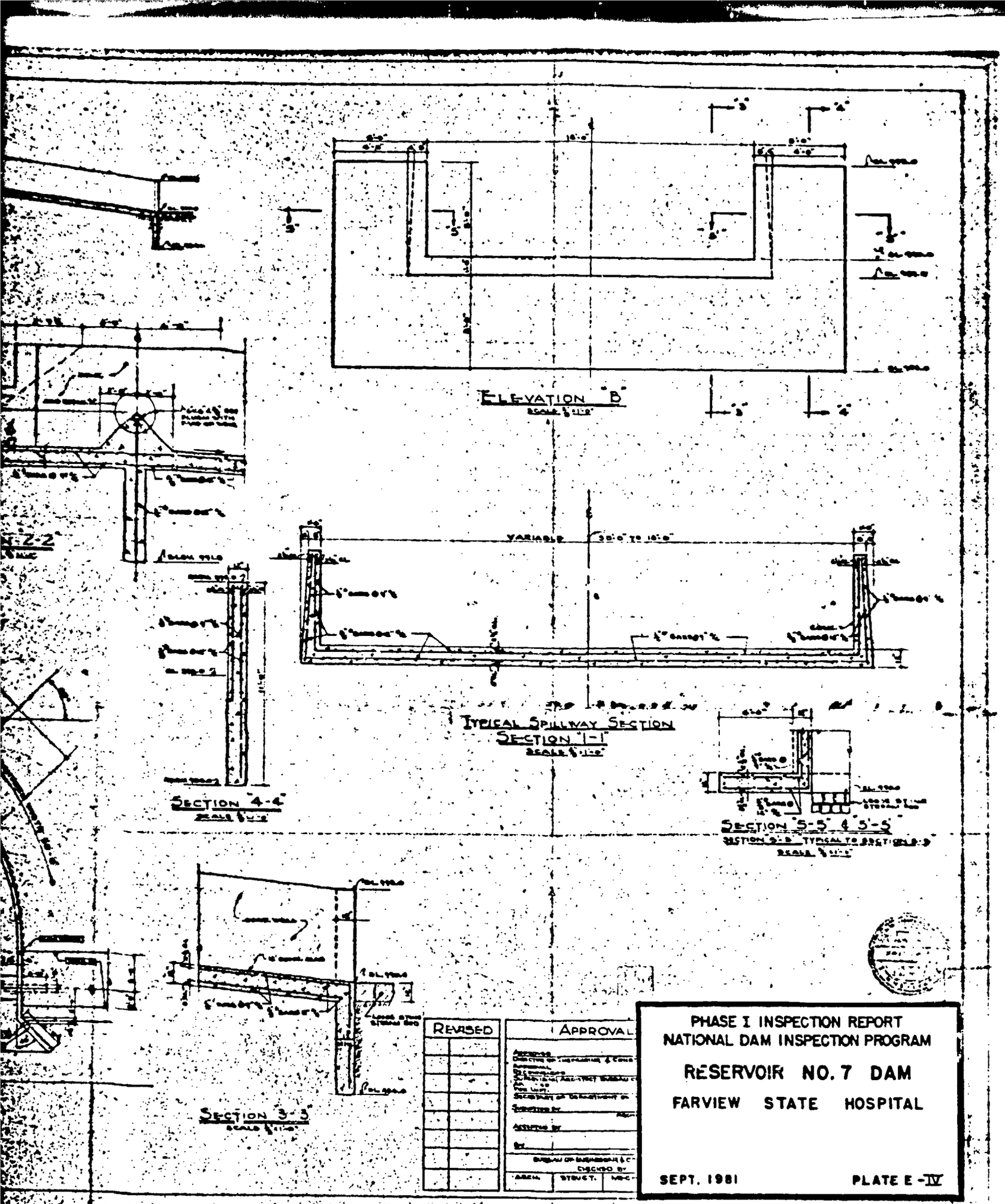
RESERVOIR NO. 7 DAM

FARVIEW STATE HOSPITAL

SEPT. 1981

PLATE E-III


PROFILE THRU SPILLWAY
DETAIL A
SECTION Z-Z
DETAIL B
DETAIL PLAN OF SPILLWAY.



REVISED		APPROVAL

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

RESERVOIR NO. 7 DAM

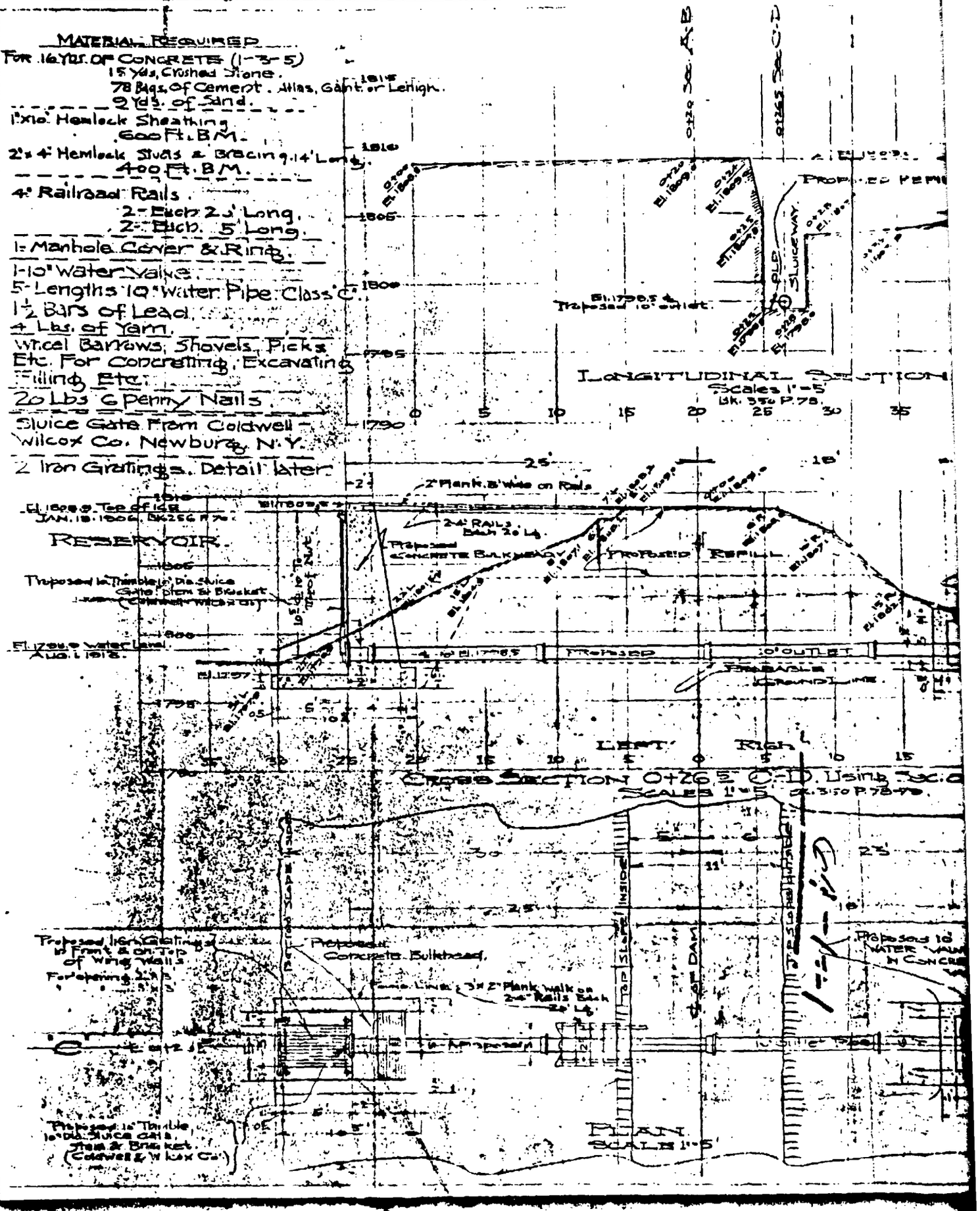
FARVIEW STATE HOSPITAL

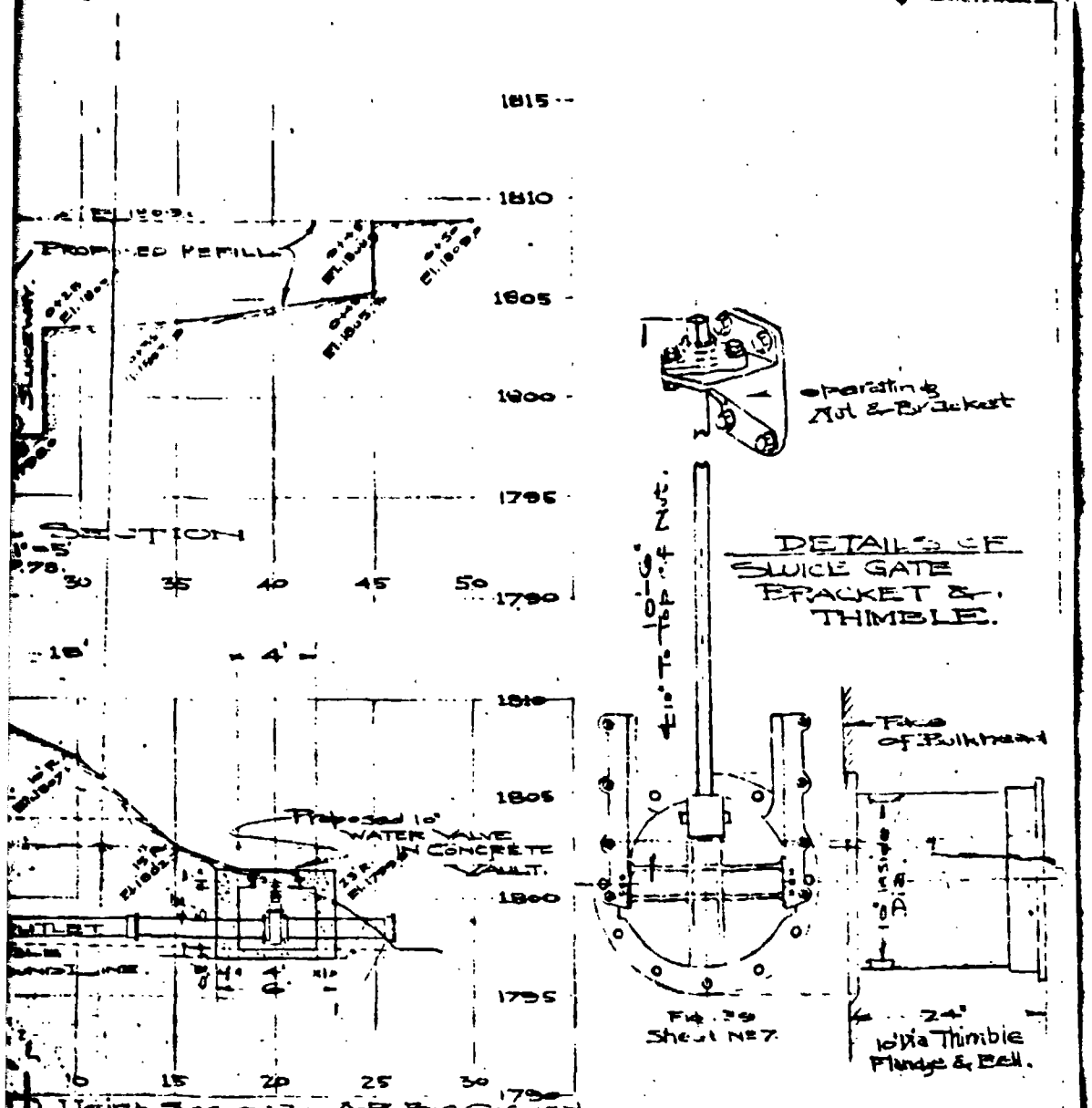
SEPT. 1981

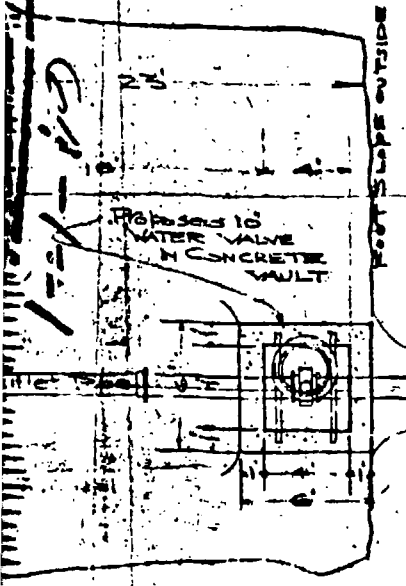
PLATE E-IV

MATERIAL REQUIRED

For 16 Yds. of Concrete (1-3-5)
15 Yds. Crushed Stone.
78 Bags of Cement. Atlas, Giant or Lehigh.
9 Yds. of Sand.
1"x10" Hemlock Sheathing
600 Ft. B.M.
2"x 4" Hemlock Studs & Bracing 9-14' Long.
400 Ft. B.M.
4" Railroad Rails.
2- Each 2.5' Long.
2- Each 5' Long.
1- Manhole Cover & Ring.
1-10" Water Valve.
5- Lengths 10" Water Pipe Class 'C'.
1½ Bars of Lead.
4 Lbs. of Yarn.
Wheel Barrows, Shovels, Picks
Etc. For Concreting, Excavating
Filling Etc.
20 Lbs 6 Penny Nails.
Sluice Gate From Coldwell-
Wilcox Co. Newburg, N.Y.
2 Iron Gratings. Detail later.







PLAN & SECTIONS
SHOWING
PROPOSED 10' OUTLET ETC. REPLACING SLUICEWAY
AT
NO. 7 DAM
CANAAN TOWNSHIP, WAYNE CO.
THE C.W.S.CO.
CARBONDALE DIVISION.

Sept. 24. 19
SCALES AS SHOWN.

H. F. Cope
Chief Engineer

Including Everything Necessary For The Full Completion Of The Work. $ 400.00

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

RESERVOIR NO. 7 DAM

FARVIEW STATE HOSPITAL

SEPT. 1981

PLATE E-V

APPENDIX F

GEOLOGY

GENERAL GEOLOGY

Bedrock at Reservoir No. 7 dam is the Duncannon Member of the Catskill Formation. It is interbedded red and gray sandstone, red siltstone and red mudstone. The sandstone is fine and very-fine grained, silty, poorly sorted, micaceous, and locally conglomeratic. The rock is well bedded, medium-thick to massive with both planar and cross bedding. Joints are well developed in a blocky and tabular pattern, generally closely spaced (2 inches to 2 feet) except widely spaced in mudstone, open, narrow and steeply inclined to bedding. Rock exposures are slightly weathered to a shallow depth; weathered surfaces are hackly except smooth on mudstone. Fragments are blocky, 2 inches to 2 feet with a thin overlying mantle. A thin glacial till may be present but top of rock appears to be close to the surface.

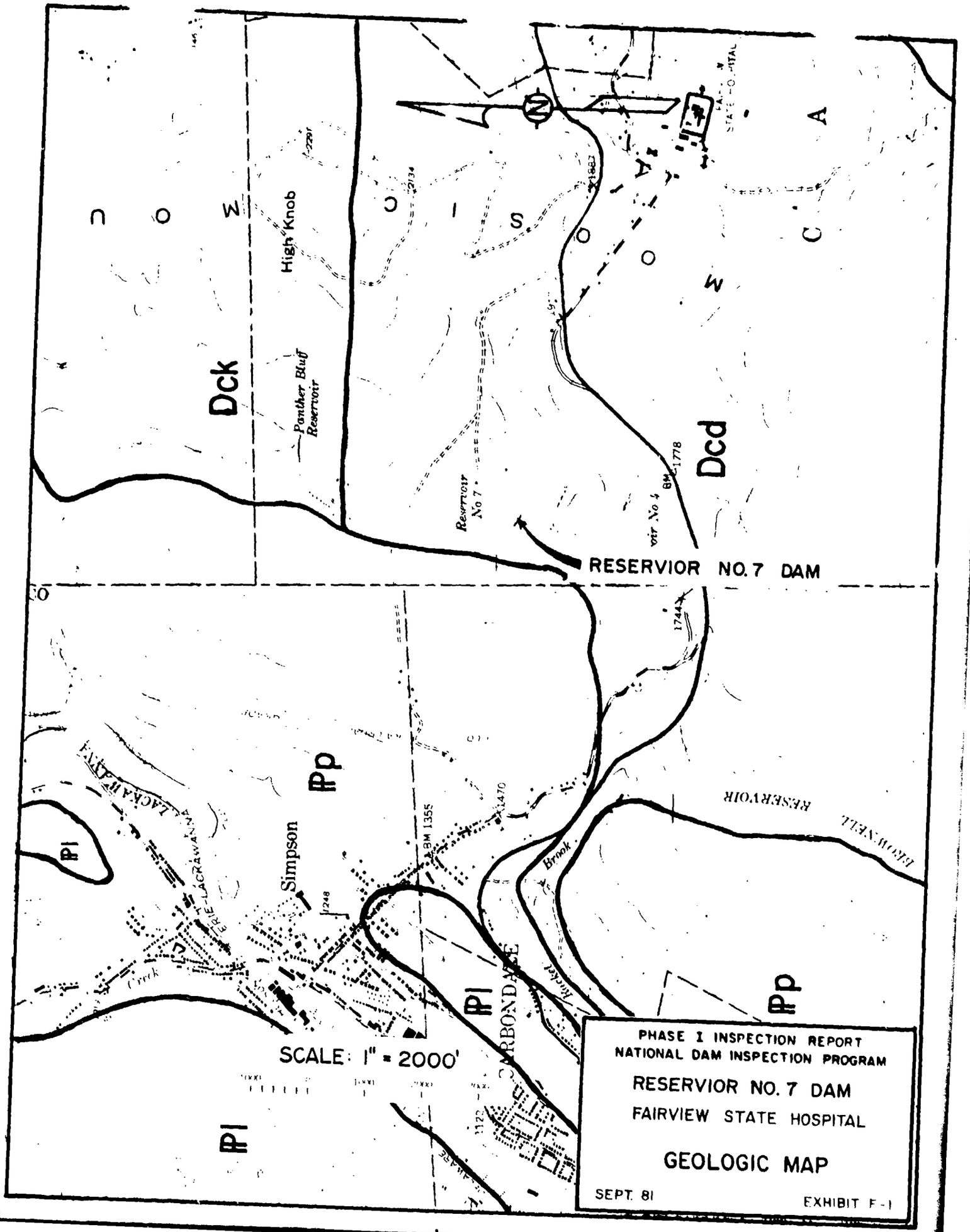
Legend
(Bedrock)

Dcd — CATSKILL FORMATION, DUNCANNON MEMBER - Grayish-red sandstone, siltstone, and claystone in fining-upward cycles; conglomerate occurs at base of some cycles.

Dck — CATSKILL FORMATION UNDIVIDED - Succession of grayish-red sandstone, siltstone, and shale, generally in fining-upward cycles; some gray sandstone and conglomerate.

l LLEWELLYN FORMATION - Gray, fine- to coarse-grained sandstone, siltstone, shale, conglomerate, and numerous anthracite coals in repetitive sequences.

p POTTSVILLE GROUP - Gray conglomerate, fine- to coarse-grained sandstone, and siltstone and shale containing minable anthracite coals. Includes three formations. In descending order: Sharp Mountain--conglomerate and conglomeratic sandstone; Schuylkill--sandstone and conglomeratic sandstone; Tumbling Run--conglomeratic sandstone and sandstone.


RESERVIOR NO. 7 DAM
Dck
Dcd
Pp
Pl
High Knob
Panther Bluff Reservoir
Reservoir No 7
Simpson
Brook
SCALE: 1" = 2000'
PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM
RESERVIOR NO. 7 DAM
FAIRVIEW STATE HOSPITAL
GEOLOGIC MAP
SEPT. 81
EXHIBIT F-1