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NATIONAL DAM INSPECTION PROGRAM. SPEEDWELL FORGE DAM (NDS-PA-00--ETC(U)
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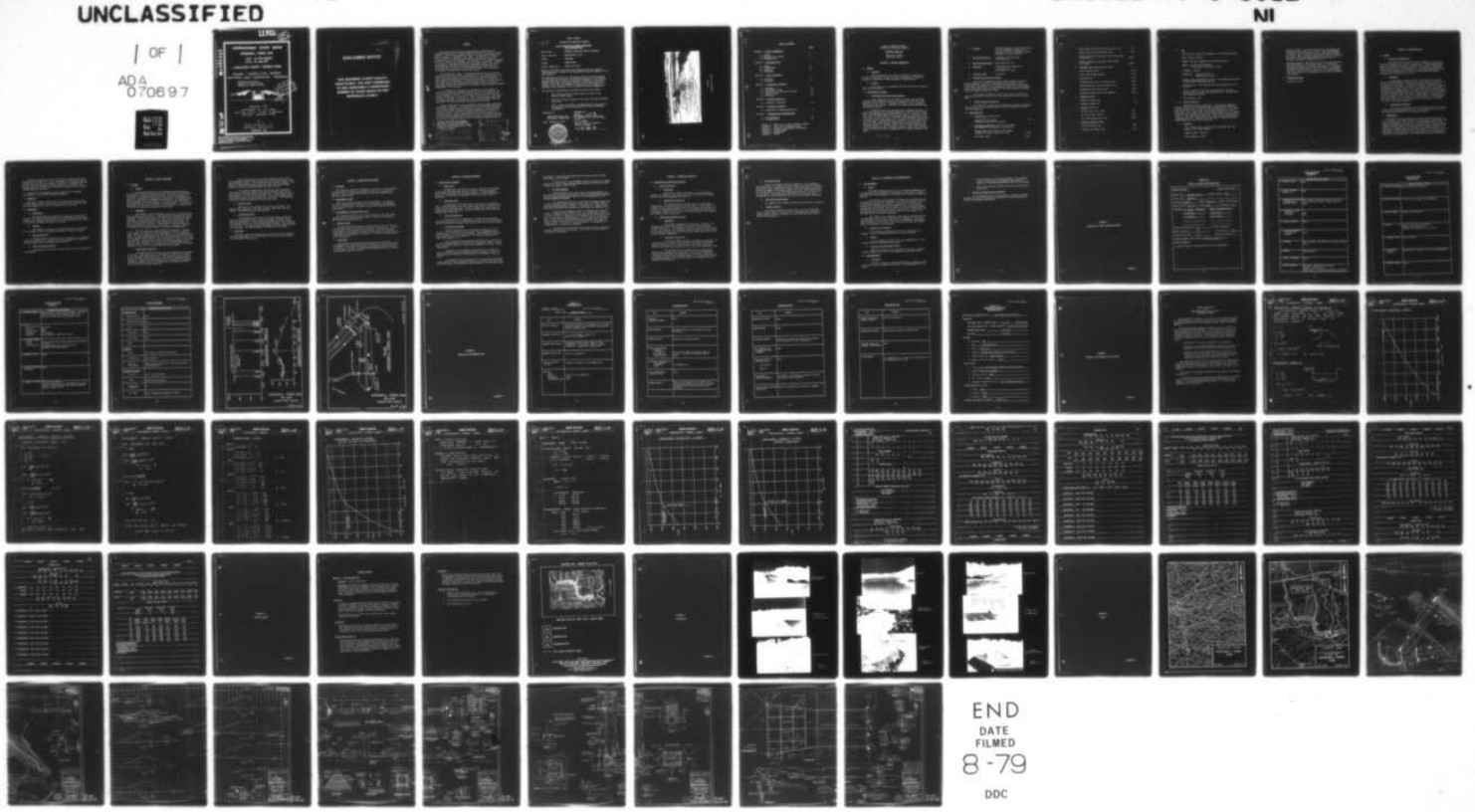

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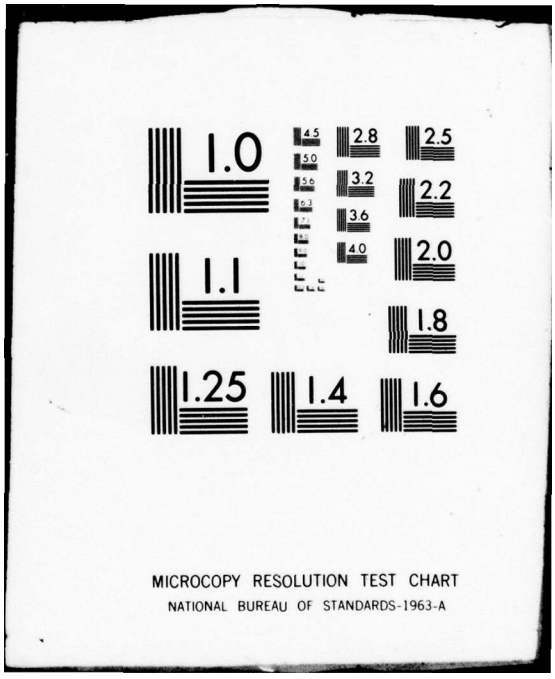
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SUSQUEHANNA RIVER BASIN

SPEEDWELL FORGE DAM

NDS No. PA-00345
DER No. 36-257

LANCASTER COUNTY, PENNSYLVANIA

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

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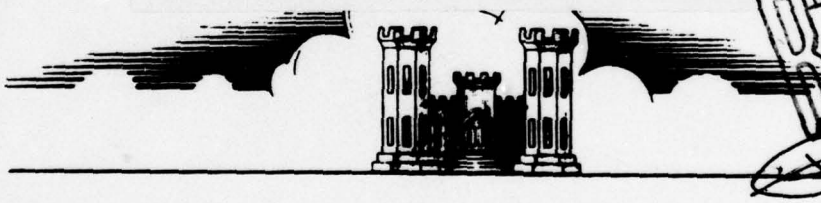

PREPARED FOR

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

BY

Berger Associates, Inc.
Harrisburg, Pennsylvania

FEBRUARY 1979

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PREFACE

This report has been 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. In cases where the reservoir was lowered or drained prior to inspection, such action, while improving the stability and safety of the dam, removes the normal load on the structure and may obscure certain conditions which might otherwise be detectable if inspected under the normal operating environment of the structure.

It is important to note that the condition of a dam depends on numerous and constantly changing internal and external conditions, and is evoluntionary 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.

PHASE I REPORT

NATIONAL DAM INSPECTION PROGRAM

[CONT'D FROM P. 1]

BRIEF ASSESSMENT OF GENERAL CONDITIONS AND RECOMMENDATIONS

Name of Dam:	SPEEDWELL FORGE DAM, NDS NO. PA-00345
State & State No.	PENNSYLVANIA, 36-257
County:	LANCASTER
Stream:	HAMMER CREEK
Date of Inspection:	October 30, 1978

Based on the visual inspection, past performance and the available engineering data, the dam and its appurtenant structures appear to be in good condition.

The hydrologic and hydraulic calculations indicate that the spillway for this dam has the capacity for passing 47 percent of the Probable Maximum Flood (PMF) without overtopping the embankment. Although 1/2 PMF will cause some overtopping, the depth of flow due to the overtopping is less than that judged to cause failure and therefore, the spillway, while inadequate, is not considered seriously inadequate.

The following recommendations are made for action by the owner:

1. That the low areas in the dam breast be raised to the original design height.

2. That heavy riprap be placed at the end of the right stilling basin slab.

3. That a formal surveillance and downstream warning system be developed to be used during periods of high or prolonged precipitation.

SUBMITTED BY:

BERGER ASSOCIATES, INC.
HARRISBURG, PENNSYLVANIA

DATE: February 20, 1979

COMMONWEALTH OF PENNSYLVANIA
REGISTERED PROFESSIONAL
HENDRIK JONGSMA
ENGINEER
No. 5557E

APPROVED BY:

G. K. WITHERS
Colonel, Corps of Engineers
District Engineer

DATE 21 Mar 79

OVERVIEW

SPEEDWELL FORGE DAM

TABLE OF CONTENTS

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

SPEEDWELL FORGE DAM

NDS-ID NO. PA-00345
DER-ID NO. 36-257

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 inspections of dams throughout the United States.

B. Purpose

The purpose 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

Note: Elevations in this report are based upon the datum provided on the designers construction drawings with the top of dam elevation at 125.0 which is approximately equal to M.S.L. Elevation 405.0 on the U.S.G.S. map. Therefore, all design elevations have been increased by 280 feet.

Speedwell Forge Dam, formerly known as Hammer Creek Dam, is a zoned earthfill dam with a maximum height of 35 feet above the streambed. The embankment length is 830 feet and the top of dam has a width of 18 feet. A cutoff trench was excavated along the centerline of the dam to the top of solid rock. A 120 foot long trapezoidal spillway weir is located in the right abutment at an elevation of 10 feet below the top of the dam. The concrete spillway ends in a stilling basin, from which the water flows through a riprap lined discharge channel to the original creekbed. A concrete control tower is located upstream just off the breast of the dam. Discharge through a 4-foot square concrete conduit is regulated either by stop logs or by opening a 30-inch sluice gate.

→ [CONT'D ON P. ii]

B. Location: Elizabeth Township, Lancaster County, PA
U.S.G.S. Quadrangle, Lititz, PA
Latitude 40°-12.2', Longitude 76°-18.5'
(Appendix F, Plates I and II)

C. Size Classification: Intermediate (35 feet high, 2,299 acre-feet)

D. Hazard Classification: High (Section 3.1.E)

E. Ownership: Pennsylvania Fish Commission
P. O. Box 1673
Harrisburg, PA 17120

F. Purpose of Dam: Recreation

G. *Design and Construction History*

This dam was designed by Jordan, McNee, Parnum & Yule, Consulting Engineers, located in Philadelphia, Pennsylvania, for the Pennsylvania Fish Commission. The design and construction was accomplished under supervision of the General State Authority of Pennsylvania. Final construction plans were approved in 1964 and a permit for construction was issued on January 12, 1965.

The Contractor, Roger E. Gerhart from Lititz, Pennsylvania, started construction in April, 1965, and completed the work in January, 1966.

H. Normal Operating Procedures

The reservoir is used only for recreation, fishing and boating. The reservoir has been lowered several times for maintenance of docks and fish management.

1.3 PERTINENT DATA

A. Drainage Area (square miles)

Computed for this report (original design used 24.95 sq.mi.)	24.1

B. Discharge at Dam Site (cubic feet per second)
See Appendix C for hydraulic calculations.

Maximum known flood, June 22, 1972 (Agnes) estimated on basis of pool Elev. 401.0	6,740
Warm water outlet	None

	Outlet works low-pool outlet at pool Elev. 376	50
	Outlet works at pool level Elev. 394.4	135
	Spillway capacity at pool Elev. 404.6 (low point) (top of dam)	12,850
	Spillway capacity at pool Elev. 405 (Design - top of dam)	13,660
C.	Elevation (feet above mean sea level)	
	Top of dam (low point)	404.6
	Top of dam, design elevation	405.0
	Spillway crest	395.0
	Upstream portal invert of outlet tunnel	369.7
	Downstream portal invert of outlet tunnel	369.0
	Streambed at centerline of dam	370.0
	Maximum tailwater about (from Designer)	384.0
D.	Reservoir (miles)	
	Length of maximum pool	2.5
	Length of normal pool	1.5
E.	Storage (acre-feet)	
	Spillway crest (Elev. 395)	970
	Top of dam (Elev. 404.6)	2,299
	Top of dam (Design Elev. 405)	2,372
F.	Reservoir Surface (acres)	
	Top of dam (Elev. 405)	186
	Spillway crest (Elev. 395)	106

G. Dam

See Plates III through VII, Appendix F, for plan and sections.

Type: Rolled earthfill.

Length: 830 feet embankment and 120 feet spillway.

Height: 35 feet above streambed.
45 feet above bottom cutoff trench.

Top Width: 18 feet.

Sideslopes: Upstream 2.5H to 1V
Downstream 2.5H to 1V.

Zoning: Impervious material in core. Less impervious material in upstream and downstream sections.

Impervious Core: Top width 18 feet with side slopes of 1.0H to 1.5V.

Cutoff: Trench on centerline dam excavated to rock and a bottom width of 20 feet, side slopes 1H to 1V. Trench filled with impervious material.

Grout Curtain: None.

H. Outlet Facilities

The outlet facility consists of a 4-foot square reinforced concrete conduit with an upstream headwall, wingwalls and trash rack from the upstream toe to a control tower located adjacent to the breast of the dam. The concrete tower, with inside dimensions of 4 feet 6 inches by 6 feet 5 inches, has a 30-inch square sluice gate for drawdown and 5 feet long stoplogs for normal pool level control. The concrete conduit, with a total length of 180 feet, ends at the downstream end in a riprapped channel. Provisions have been made to block off the discharge channel to form a fish catch basin.

I. Spillway

Type: Uncontrolled, concrete lined trapezoidal weir and channel at the right abutment.

Length of Weir: 120 feet.

Crest Elevation: 395.0

Upstream Channel: The forebay area has been excavated to an elevation of 3 feet below top of weir. The right embankment is excavated into the hillside and is protected with riprap. On the left side, a concrete retaining wall retains the embankment slope. The water approaching the spillway has to go through a considerable change of direction.

Downstream Channel: The spillway drops 2 feet below the weir and then descends on a 20 percent slope to a 4 feet deep stilling basin with a trapezoidal cross section. The width of the spillway narrows down to a 90 foot width. The stilling basin has a 30 foot long low flow notch. The channel beyond the stilling basin has a trapezoidal section and is protected with riprap.

J. Regulating Outlets

See Section 1.3.H.

SECTION 2 - ENGINEERING DATA

2.1 DESIGN

A. Hydrology and Hydraulics

The design for this dam was based on PennDER's C curve and a hydrologic analysis was not made. The files of the Pennsylvania Department of Environmental Resources (PennDER) did not contain hydrographs, storage area curves, nor discharge curves. The hydraulic computations available were limited to the design of the spillway length based on the C-curve and the maximum depth of tailwater with maximum discharge, calculated as 10.8 feet for 14,100 cfs.

B. Embankment

The embankment design was based on data obtained from test borings and auger borings drilled along the centerline of the dam and in the proposed borrow areas. A foundation report was prepared by the designer and is available in the files of PennDER. This report discusses the geology of the site, the results of field exploration, laboratory tests and soil classifications. The report also includes slope stability analyses for the maximum section for three cases; (1) end of construction, (2) steady seepage normal pool and (3) sudden drawdown. The factors of safety are shown as 2.79, 1.92 and 1.15 respectively. A downstream toe drain is included in the design over the full length of the embankment. The cutoff trench was to be excavated to the top of rock or two feet into rock if rock was fragmented.

C. Appurtenant Structures

The files of PennDER did not contain design criteria or design analysis for the appurtenant structures. The available data consists of the construction drawings and the foundation report.

2.2 CONSTRUCTION

Construction of these facilities was under daily supervision of a G.S.A. inspector and weekly inspection by the designer and PennDER. The trench was excavated to the top of rock and backfilled with a clayey material excavated for the spillway. Sand and gravel excavated from the spillway area was placed in the upstream zone and shaley material excavated from the forebay area was placed in the downstream area of the embankment. Regular compaction tests were made in the field, but only a few results were in the file. The results appear to be satisfactory. Construction photographs are in the file and indicate good workmanship.

During the excavation of the stilling basin, springs were exposed having a head of about 4 to 5 feet. The weight of the concrete slab and the water in the basin were considered sufficient to prevent uplift and no weep holes were installed to relieve pressure in the basin. The spillway chute was partially over excavated by about one foot and back-filled with gravel and sand.

Compaction of the embankment was accomplished with sheepsfoot rollers and a 17-ton Buffalo-Springfield compactor.

2.3 OPERATION

No formal records of operation have been maintained by the owner. The lake level has been lowered quite often (1971, 1972, 1975 and 1976) for fish management and repair or installation of boat docks.

2.4 EVALUATION

A. Availability

The engineering data available for review was in the files of PennDER. The design consultants did not have additional design data in their files. Drawings in the Office of the Fish Commission were limited to construction drawings and some shop drawings.

B. Adequacy

The available construction and engineering data is considered to be adequate to make a reasonable assessment of these facilities.

C. Operating Records

Formal records of operation are not maintained. The inspection reports of PennDER do not indicate that major problems have occurred at these facilities since construction was completed.

D. Post Construction Changes

No changes have been made to these facilities since construction was completed.

SECTION 3 - VISUAL INSPECTION

3.1 FINDINGS

A. General

The general appearance of the Speedwell Forge Dam was good. The relatively recently constructed dam has required little maintenance. No mowing of the seeded areas has been done. The visual inspection check list is contained in Appendix A of this report. Photographs made during the inspection are reproduced in Appendix E. The inspection was made in company of Mr. Jon Grindall, P.E., of the Bureau of Fisheries and Engineering, and Mr. Ray Stichler, Field Supervisor. At the time of inspection, the pool level was about 4 to 5 feet below the spillway weir for control of weed growth during the winter months.

B. Embankment

The upstream slope is riprapped to five feet above normal pool and is seeded above that level. The riprap was in good condition and no sloughage or erosion was noticed. The top of dam is covered with grass and weeds. The downstream slope has a good cover consisting of crown vetch, which however prevents a close inspection of the surface. No signs of distress were detected. Trucks, used for some maintenance work, have scarred the surface at a few places. These bare areas will be reseeded in the spring according to the owner's representative.

Two low areas were noticed during the inspection. Half the breast width of the dam has a low area adjacent to the left spillway wall, reducing the actual top of the dam to half of its intended surface width. The area immediately next to the right spillway wall is also low and the seepage key is exposed. The toe of the dam is dry and no seepage was detected. A survey of the profile of the dam (Appendix A, Plate A-I) indicates that the dam breast is lower than the design height over a length of about 700 feet. At a point near the left abutment the maximum difference of 0.4 feet lower than design elevation occurs.

C. Appurtenant Structures

The intake control structure is located adjacent to the breast of the dam. Steel rungs lead to a platform at elevation 397.0, which is two feet above spillway elevation. The tower was in good condition and the 30-inch x 30-inch sluice gate was partially opened during the inspection. Normal pool level variations are controlled with stoplogs. The outlet channel for the 4 feet square concrete conduit has heavy riprap and was in excellent condition.

The spillway, located in the right abutment, has an 8-inch wide trapezoidal concrete weir and did not show any deterioration except some shrinkage cracking. The approach was clear and well defined. The entrance training walls appear to be short and riprap was dislodged during the relatively high discharges with Agnes in 1972.

The concrete abutment walls and spillway chute lining and walls were in excellent condition, as was the stilling basin and the sloped paving on the side of the stilling basin. Some erosion occurred during Agnes at the end of the right slab. Concrete was pumped under the slab and riprap was placed at the end of the slab. Some additional heavy stone should be placed at the end of that slab.

D. Reservoir Area

The banks of the impounded lake are flat and stable. The immediate area adjacent to the lake is mostly wooded with some agriculture. No sedimentation has been reported.

E. Downstream Channel

The discharge channel below the stilling basin is wide and clear and unobstructed until it joins the original creekbed. About 1,000 feet downstream, 5 farm buildings and houses are located close to the floodplain before the creek crosses under a highway. It is expected that more than a few lives would be endangered if the dam would fail due to overtopping. The hazard category is considered to be "High".

3.2 EVALUATION

The visual inspection indicates that the dam is in good condition. Some minor maintenance work is required to fill the low areas adjacent to the spillway abutment walls.

SECTION 4 - OPERATIONAL PROCEDURES

4.1 PROCEDURE

This lake was created for fishing and small boats. Fish management requires good weed control and the level of the lake is adjusted as required. The sluice gate and stoplogs are adjusted frequently (at least six times a year).

4.2 MAINTENANCE OF DAM

There is no regular procedure for dam maintenance. No mowing of the top is done and the crown vetch on the downstream slope requires little or no maintenance. The owner is aware that brush growth should be prevented.

4.3 MAINTENANCE OF OPERATING FACILITIES

The operating facilities are in good condition. The sluice gate operator stand is greased and small areas of erosion which occurred during Agnes have been repaired.

4.4 WARNING SYSTEM

The Fish Commission maintains a Regional Office near the lake and patrol officers visit the dam site on at least a daily basis. A copy of an emergency plan was shown to the inspectors. This plan lists the phone number of the Regional DER Office in Harrisburg and stipulates the conditions the patrolman has to watch for. It does not include a downstream warning plan.

4.5 EVALUATION

The maintenance procedures are satisfactory at the present. It is recommended that a formal surveillance and warning system be developed. A concern is the operator's stand at an elevation only two feet above the spillway. In case of an emergency this drawdown facility could not be used during high pool levels.

SECTION 5 - HYDROLOGY/HYDRAULICS

5.1 EVALUATION OF FEATURES

A. Design Data

The Hydrologic and Hydraulic Analyses available from PennDER for Speedwell Forge Dam were not very extensive. No stage-storage curve, stage discharge curve, flood hydrographs or flood routings were available. The spillway was designed to pass the C-curve flood of 14,100 cfs.

B. Experience Data

The maximum record flood event at this dam site occurred in 1972. During this event, the water surface was noted to be about 6 feet higher than the spillway crest. With the exception of some erosion in the approach channel and under the right spillway slab, this flood was passed without difficulty.

C. Visual Observations

On the date of the inspection, no conditions were observed that would indicate that the appurtenant structures of the dam could not operate satisfactorily during a flood event, until the dam is overtopped.

D. Overtopping Potential

Speedwell Forge Dam has a total storage capacity of 2,299 acre-feet at the elevation of the low point in the embankment and an overall height of 35 feet above streambed. These dimensions indicate a size classification of "Intermediate". The hazard classification is "High" (see Section 3.1.E).

The recommended Spillway Design Flood (SDF) for a dam having the above classifications is the Probable Maximum Flood (PMF). For this dam, the PMF peak inflow is 27,480 cfs (See Appendix C for HEC-1 inflow computations).

Comparison of the estimated PMF peak inflow of 27,480 cfs with the estimated existing spillway discharge capacity of 12,850 cfs indicates that a potential for overtopping of the Speedwell Forge Dam exists.

An estimate of the storage effect of the reservoir and routing of the computed inflow hydrograph through the reservoir shows that this dam does not have the necessary storage available to pass the PMF without

overtopping. The present spillway-reservoir system can pass a flood event equal to 47% of a PMF.

If the low area in the embankment would be raised to the design elevation of 405.0, the spillway-reservoir system would be able to pass a flood event equal to 51% of a PMF.

E. Spillway Adequacy

The intermediate size category and high hazard category, in accordance with the Corps of Engineers criteria and guidelines, indicates that the Spillway Design Flood (SDF) for this dam should be the full Probable Maximum Flood (PMF).

The calculations show that the spillway discharge capacity and reservoir storage capacity combine to handle 47% of the (PMF) without overtopping the dam (refer to Sheet 5, of Appendix C). These calculations have considered the existing low point along the embankment crest.

Being an earth embankment dam, it is judged that a breach is likely to develop when the depth of flow over the embankment crest is 0.5 foot or greater. These studies also indicate that the depth of flow over the crest of the embankment due to one-half PMF is less than 0.5 foot. On the basis of this information, it is judged that a one-half PMF will cause some overtopping of the embankment but not enough to cause a breach. Therefore, the spillway capacity is considered to be inadequate, but not seriously inadequate.

The hydrologic analysis for this investigation was based upon existing conditions of the watershed. The effects of future development were not considered.

SECTION 6 - STRUCTURAL STABILITY

6.1 EVALUATION OF STRUCTURAL STABILITY

A. Visual Observation

1. Embankment

There were no visual indications of undue embankment stresses or sloughage. The slopes were stable and dry and no seepage near the toe of the embankment was detected.

2. Appurtenant Structures

The visual inspection did not detect any structural instabilities of the control tower or outlet works. A small amount of cracking of the spillway abutment walls had occurred, but they were not a result of structural instability. The erosion which was reported in the approach channel and at the end of the stilling basin wall indicates that heavier riprap is required.

B. Design and Construction Data

1. Embankment

The available engineering data listed in Section 2.1.B indicates that the dam was designed in accordance with acceptable engineering practice. The embankment section is adequate for this type of dam. The presence of an inspector and the regular visits and reports of the designer during the construction period insure that the fill was placed with good workmanship.

2. Appurtenant Structures

Although no design criteria or analysis was available for the appurtenant structures, the construction drawings show detailed plans of the conduit and the control tower. The conduit has three concrete cutoff collars, of which one is located in the impervious zone.

The spillway weir is anchored into the shale and the abutments have seepage fins projecting 5.5 feet into the embankment. The spillway chute slab and sloping walls are 10-inches thick, well reinforced and supported on a 8-inch gravel bed with weep drains placed at regular intervals. The structure appears to be adequate for the expected flow conditions.

C. Operating Records

There are no formal records of operation. It is estimated that during Agnes the maximum pool level attained was about 6 feet above the spillway crest. During that storm in 1972, eddies near the forebay entrance dislodged a considerable amount of riprap. This indicates that the training walls are not functioning properly and that the flow lines are not smooth. Riprap was also displaced at the end of the right sloping wall of the stilling basin and the slab was slightly undermined.

D. Post Construction Changes

No changes to the original construction are evident or reported.

E. Seismic Stability

This dam is located in Seismic Zone 1 and it is considered that the static stability is sufficient to withstand minor earthquake induced dynamic forces. No studies or calculations have been made to confirm this assumption.

SECTION 7 - ASSESSMENT AND RECOMMENDATIONS

7.1 DAM ASSESSMENT

A. Safety

The visual inspection, the review of available design data and the operational history indicates that Speedwell Forge Dam is in good condition and has been designed in accordance with acceptable engineering practice.

The results of the hydrologic and hydraulic investigations, in accordance with the Corps of Engineers' evaluation guidelines, indicates the spillway discharge and reservoir storage have the capacity for passing 47% of the PMF without overtopping the dam. The calculations in Section 5 show, however, that the depth of the overtopping caused by one-half PMF is less than that judged to cause failure. On the basis of this information, the spillway for this facility is considered to be inadequate but not seriously inadequate.

The results of the inspection survey show an uneven profile of the embankment crest. Refer to Plate A-II in Appendix A. While this condition does not affect the stability of the embankment, providing a uniform elevation at the design crest level would provide some improvement to the capacity of the facility.

B. Adequacy of Information

The information available for review is considered to be adequate to make a reasonable assessment of these facilities.

C. Urgency

It is considered important that the recommendations in this section should be implemented without delay.

D. Necessity for Additional Studies

Additional studies are not required at this time. However, attention should be given to the recommendations presented below.

7.2 RECOMMENDATIONS

A. Facilities

In order to assure a continued satisfactory operation of this dam the following recommendations are made for implementation by the owner:

1. The low areas of the dam breast adjacent to the spillway should be filled and the embankment breast should be raised to its intended design height over the full length.

2. Heavy riprap should be placed at the end of the stilling basin slab.

B. Operation and Maintenance Procedures

It is recommended that the owner develop a formal downstream warning system with its surveillance program to be used during periods of high or prolonged precipitation.

APPENDIX A

CHECKLIST OF VISUAL INSPECTION REPORT

CHECK LIST

PHASE I - VISUAL INSPECTION REPORT

PA DER # 36-257 NDI NO. PA-00 345

NAME OF DAM Speedwell Forge HAZARD CATEGORY High

TYPE OF DAM Earthfill

LOCATION Elizabeth TOWNSHIP Lancaster COUNTY, PENNSYLVANIA

INSPECTION DATE 10/30/78 WEATHER Sunny TEMPERATURE 50's

INSPECTORS: H. Jongsma (Recorder) OWNER'S REPRESENTATIVE(s):

A. Bartlett Jon Grindall

R. Shireman Ray Stichler

NORMAL POOL ELEVATION: 395 AT TIME OF INSPECTION:

BREAST ELEVATION: 405 POOL ELEVATION: 390.6

SPILLWAY ELEVATION: 395 TAILWATER ELEVATION:

MAXIMUM RECORDED POOL ELEVATION: Unknown, estimated at 401

GENERAL COMMENTS:

As-built drawings in Bellefonte Office of Fish Commission.

NDI NO. PA-00 345

VISUAL INSPECTION
EMBANKMENT

	OBSERVATIONS AND REMARKS
A. SURFACE CRACKS	None.
B. UNUSUAL MOVEMENT BEYOND TOE	None.
C. SLOUGHING OR EROSION OF EMBANKMENT OR ABUTMENT SLOPES	None noticed on downstream slope, which has a heavy crown vetch cover. None on upstream slope.
D. ALIGNMENT OF CREST: HORIZONTAL: VERTICAL:	 Good. Good.
E. RIPRAP FAILURES	None.
F. JUNCTION EMBANKMENT & ABUTMENT OR SPILLWAY	Good.
G. SEEPAGE	None detected. Pool about 4 feet below spillway crest.
H. DRAINS	None detected.
J. GAGES & RECORDER	None.
K. COVER (GROWTH)	Upstream: Riprap and crown vetch. Breast: Unmowed grass. Downstream: Crown vetch and weeds. A few bare spots caused by trucks during maintenance work.

NDI NO. PA-00 345

VISUAL INSPECTION
OUTLET WORKS

	OBSERVATIONS AND REMARKS
A. INTAKE STRUCTURE	Concrete tower with stoplogs.
B. OUTLET STRUCTURE	4 feet by 4 feet conduit with wingwalls.
C. OUTLET CHANNEL	Riprap - good condition.
D. GATES	One 30" x 30" gate for drawdown. Opened during inspection. Stoplogs for normal pool level control.
E. EMERGENCY GATE	30" x 30" gate.
F. OPERATION & CONTROL	Opened about six times a year for fish management.
G. BRIDGE (ACCESS)	None.

NDI NO. PA-00 345

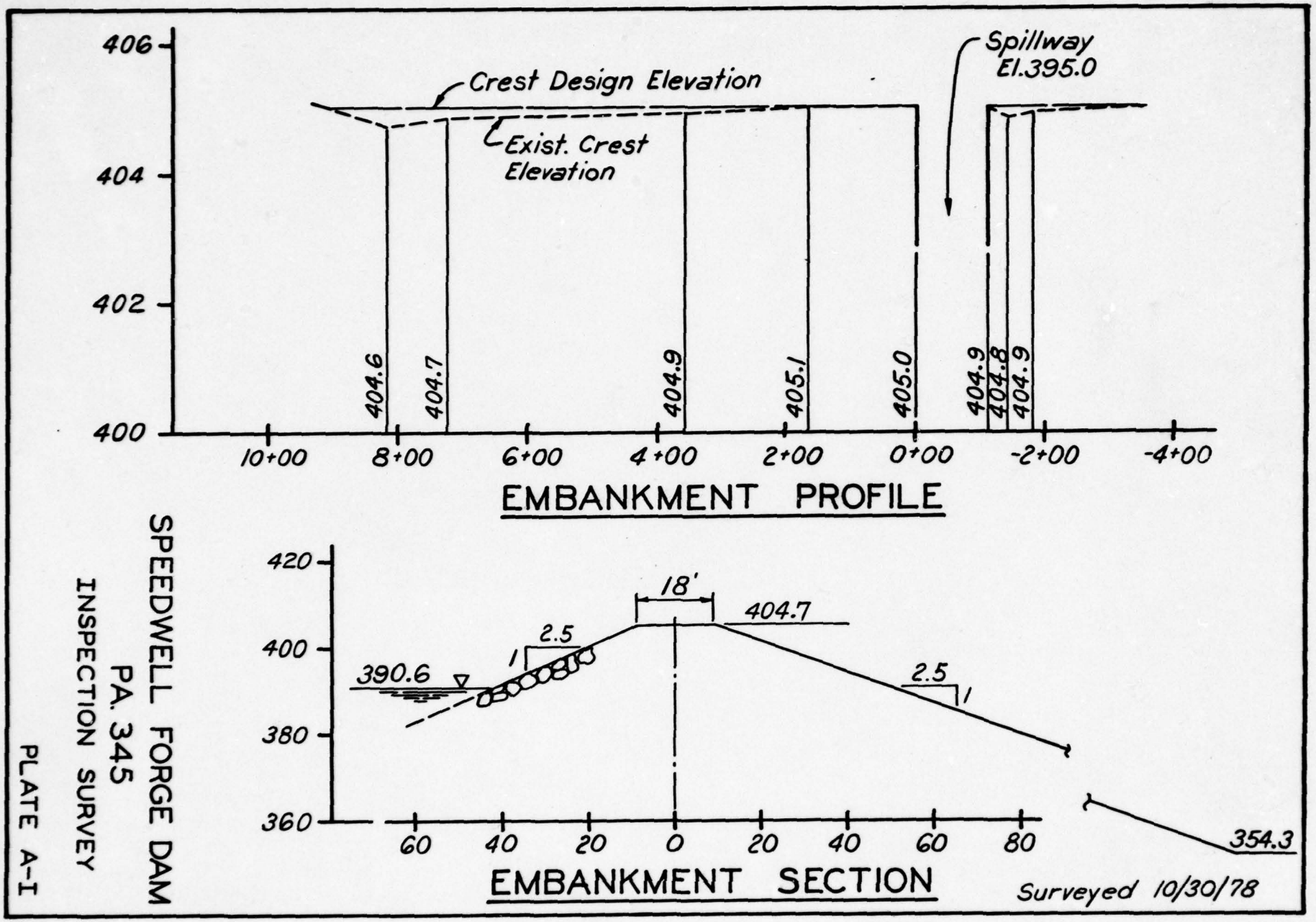
VISUAL INSPECTION
SPILLWAY

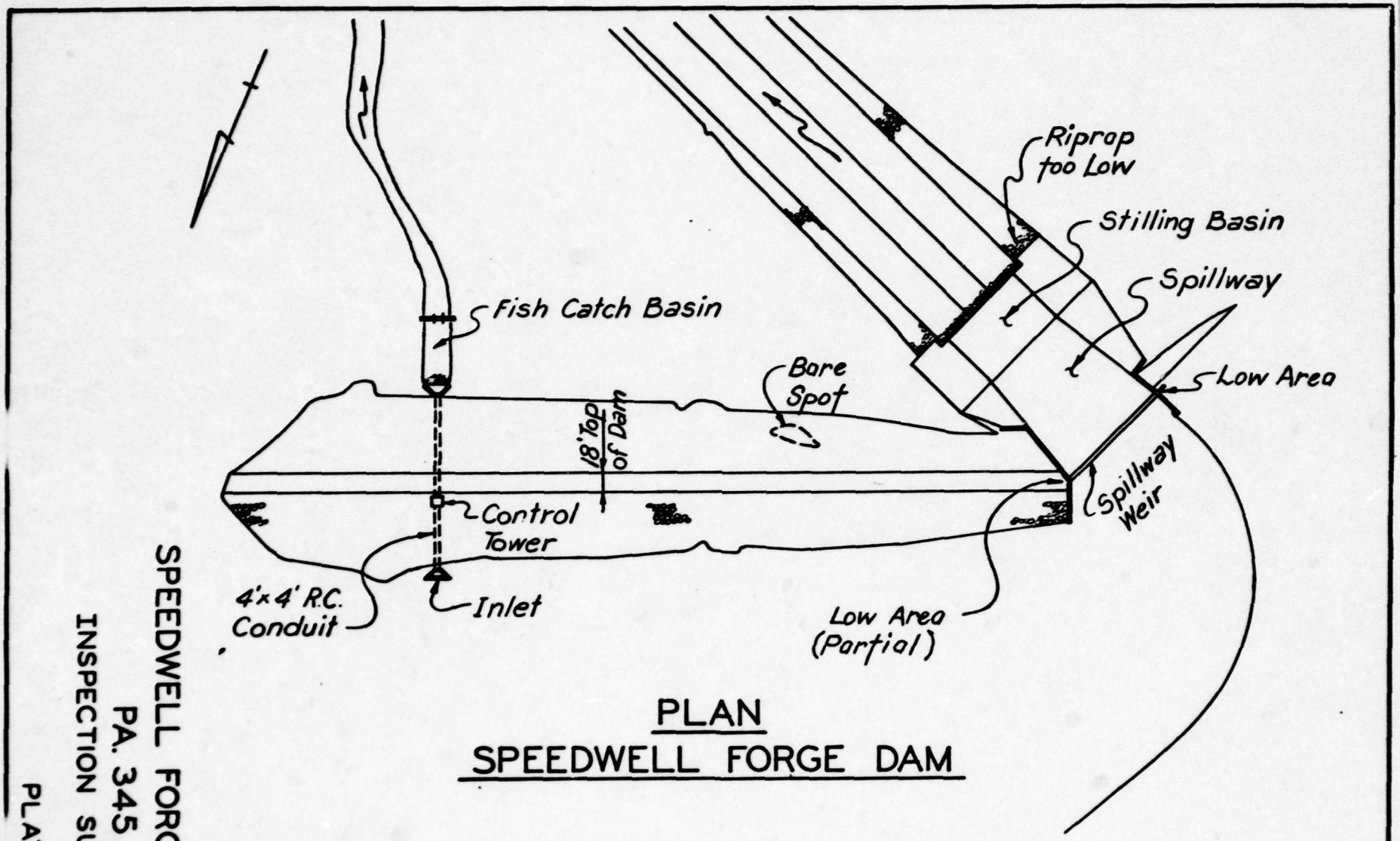
	OBSERVATIONS AND REMARKS
A. APPROACH CHANNEL	Open and clear. Some riprap on banks. Training walls relatively short, causing eddies and erosion of forebay area during Agnes (1972).
B. WEIR: Crest Condition Cracks Deterioration Foundation Abutments	 Excellent. None. None. Not visible. Good condition - some minor cracks.
C. DISCHARGE CHANNEL: Lining Cracks Stilling Basin	 Concrete lined with sloping sidewalls & weepholes. No cracks. Concrete endsill with a low flow notch. Riprapped downstream channel.
D. BRIDGE & PIERS	None.
E. GATES & OPERATION EQUIPMENT	None.
F. CONTROL & HISTORY	No records available. Right stilling basin wall undermined during Agnes (1972). Concrete pumped under slab and riprap placed at end of slab.

NDI NO. PA-00 345

VISUAL INSPECTION

	OBSERVATIONS AND REMARKS
INSTRUMENTATION	
Monumentation	None.
Observation Wells	None.
Weirs	None.
Piezometers	None.
Staff Gauge	None.
Other	
RESERVOIR	
Slopes	Flat slopes, wooded and agriculture.
Sedimentation	None reported.
Watershed Description	Upper reaches wooded hills, lower reaches about 50% agriculture.
DOWNSTREAM CHANNEL	
Condition	Good - natural stream.
Slopes	Wooded and some meadows.
Approximate Population	20
No. Homes	About 5 homes before highway crossing.


406
404
402
400
Crest Design Elevation
Exist. Crest Elevation
Spillway El.395.0
404.6
404.7
404.9
405.1
405.0
404.9
404.8
404.9
10+00
8+00
6+00
4+00
2+00
0+00
-2+00
-4+00
EMBANKMENT PROFILE
420
400
380
360
18'
404.7
2.5
1
390.6
2.5
1
60
40
20
0
20
40
60
80
354.3
EMBANKMENT SECTION
Surveyed 10/30/78
SPEEDWELL FORGE DAM
PA. 345
INSPECTION SURVEY
PLATE A-I



PLAN

SPEEDWELL FORGE DAM

Surveyed 10/30/78

SPEEDWELL FORGE DAM
PA. 345
INSPECTION SURVEY
PLATE A-II

APPENDIX B

CHECKLIST OF ENGINEERING DATA

CHECK LIST
ENGINEERING DATA

PA DER # 36-257 NDI NO. PA-00 345

NAME OF DAM Speedwell Forge

ITEM	REMARKS
AS-BUILT DRAWINGS	Construction drawings in PennDER files. As-built drawings perhaps in Fish Commission Engineering Office, Bellefonte, Pa.
REGIONAL VICINITY MAP	U.S.G.S. Quadrangle , Lititz, Pa. See Plate II, Appendix F
CONSTRUCTION HISTORY	Designed by Jordan, McNee, Parnum & Yule, Philadelphia - Contractor, Roger E. Gerhart, Lititz, PA. Completed in January 1966.
GENERAL PLAN OF DAM	Plate III, Appendix F.
TYPICAL SECTIONS OF DAM	Plates IV, Appendix F and PennDER Files.
OUTLETS: PLAN DETAILS CONSTRAINTS DISCHARGE RATINGS	 Plates V & VI, Appendix F None None

NDI NO. PA-00 345

ENGINEERING DATA

ITEM	REMARKS
RAINFALL & RESERVOIR RECORDS	None.
DESIGN REPORTS	Foundation Report by Design Engineer dated May, 1964.
GEOLOGY REPORTS	Included in Foundation Report.
DESIGN COMPUTATIONS: HYDROLOGY & HYDRAULICS DAM STABILITY SEEPAGE STUDIES	 None, except design of spillway based on C-curve. Included in Foundation Report. None.
MATERIALS INVESTIGATIONS: BORING RECORDS LABORATORY FIELD	 In PennDER files.
POST CONSTRUCTION SURVEYS OF DAM	None.
BORROW SOURCES	Shown on topographic map in PennDER files. Construction reports indicate that excavation of spillway and forebay area was used in embankment.

NDI NO. PA-00 345

ENGINEERING DATA

ITEM	REMARKS
MONITORING SYSTEMS	None.
MODIFICATIONS	None.
HIGH POOL RECORDS	Estimated by approximate waterline on parking lot to be about 6.0 feet during Agnes.
POST CONSTRUCTION ENGINEERING STUDIES & REPORTS	None.
PRIOR ACCIDENTS OR FAILURE OF DAM Description: Reports:	None.
MAINTENANCE & OPERATION RECORDS	No records. Some damage to riprap in forebay area and at end of spillway.
SPILLWAY PLAN, SECTIONS AND DETAILS	Plate VII, Appendix F, and files of PennDER.

ENGINEERING DATA

ITEM	REMARKS
OPERATING EQUIPMENT, PLANS & DETAILS	Plate VI, Appendix F.
CONSTRUCTION RECORDS	Some progress reports in PennDER files.
PREVIOUS INSPECTION REPORTS & DEFICIENCIES	None.
MISCELLANEOUS	In PennDER file is a "Report on the Application" for construction of a dam.

NDI NO. PA-00 345

CHECK LIST
HYDROLOGIC AND HYDRAULIC
ENGINEERING DATA

DRAINAGE AREA CHARACTERISTICS: 50% wooded, 50% agriculture.

ELEVATION:

TOP NORMAL POOL & STORAGE CAPACITY: Elev. 395 970 Acre-Feet

TOP FLOOD CONTROL POOL & STORAGE CAPACITY: Elev. 405 2372 Acre-Feet

MAXIMUM DESIGN POOL: Elev. 405

TOP DAM: Elev. 405

SPILLWAY:

a. Elevation 395

b. Type Trapezoidal weir.

c. Width 120 feet.

d. Length 120 feet and a 60 feet stilling basin.

e. Location Spillover Right abutment.

f. Number and Type of Gates None.

OUTLET WORKS:

a. Type 4' x 4' cast-in-place reinforced concrete conduit.

b. Location Near old streambed.

c. Entrance inverts 369.7

d. Exit inverts 369.0

e. Emergency drawdown facilities 30 x 30-inch sluice gate

HYDROMETEOROLOGICAL GAGES:

a. Type None.

b. Location None.

c. Records None.

MAXIMUM NON-DAMAGING DISCHARGE: 15,000 cfs.

APPENDIX C

HYDROLOGY AND HYDRAULIC CALCULATIONS

SUMMARY DESCRIPTION
OF
FLOOD HYDROGRAPH PACKAGE (HEC-1)
DAM SAFETY VERSION

The hydrologic and hydraulic evaluation for this inspection report has employed computer techniques using the Corps of Engineers computer program identified as the Flood Hydrograph Package (HEC-1) Dam Safety Version.

The program has been designed to enable the user to perform two basic types of hydrologic analyses: (1) the evaluation of the overtopping potential of the dam, and (2) the capability to estimate the downstream hydrologic-hydraulic consequences resulting from assumed structural failures of the dam. A brief summary of the computation procedures typically used in the dam overtopping analysis is shown below.

- Development of an inflow hydrograph to the reservoir.
- Routing of the inflow hydrograph(s) through the reservoir to determine if the event(s) analyzed would overtop the dam.
- Routing of the outflow hydrograph(s) of the reservoir to desired downstream locations. The results provide the peak discharge, time of the peak discharge and maximum stage of each routed hydrograph at the outlet of the reach.

The output data provided by this program permits the comparison of downstream conditions just prior to a breach failure with that after a breach failure and the determination as to whether or not there is a significant increase in the hazard to loss of life as a result of such a failure.

The results of the studies conducted for this report are presented in Section 5.

For detailed information regarding this program refer to the Users Manual for the Flood Hydrograph Package (HEC-1) Dam Safety Version prepared by the Hydrologic Engineering Center, U. S. Army Corps of Engineers, Davis, California.

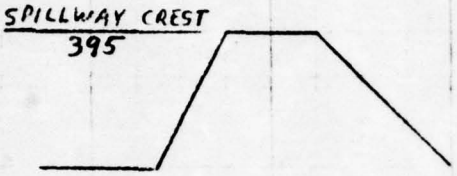
BY RLS DATE 12/7/78 **BERGER ASSOCIATES** SHEET NO. 1 OF

CHKD. BY DATE PROJECT 08490

SUBJECT SPEEDWELL FORGE DAM

MAXIMUM KNOWN FLOOD AT DAMSITE

THE MAXIMUM KNOWN FLOOD AT SPEEDWELL FORGE DAM OCCURRED IN 1972. AT THAT TIME THE WATER LEVEL IN THE POOL REACHED AN ELEVATION ABOUT 6' HIGHER THAN THE SPILLWAY CREST.



$C = 3.6$
$L = 120'$
$H = 6'$

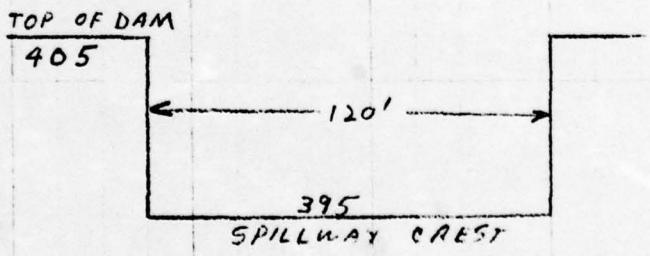
$Q = CLH^{3/2}$

$= 3.6 \times 120 \times (6)^{1.5}$

$= 6349$ CFS SAY 6350 CFS

$C = 3.6$
(REF: M. KANOWITZ)

SPILLWAY CAPACITY



$C = 3.6$
$L = 120'$
$H = 10'$

$Q = CLH^{3/2}$

$= 3.6 \times 120 \times (10)^{1.5}$

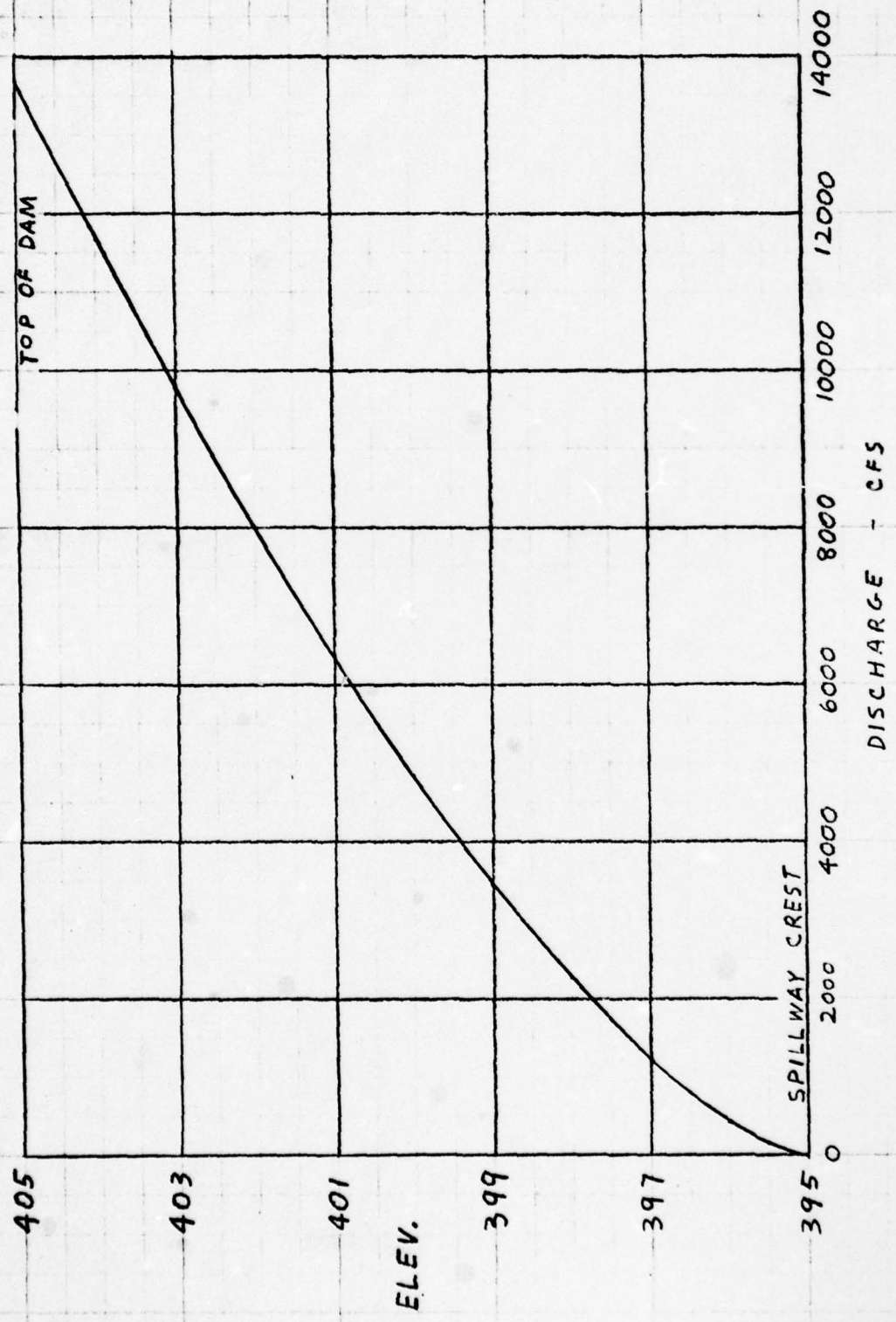
$= 13661$ CFS SAY 13660 CFS

BY RLS DATE 2/12/79 **BERGER ASSOCIATES** SHEET NO. 2 OF

CHKD. BY DATE PROJECT D8490

SUBJECT SPEEDWELL FORGE DAM

SPILLWAY RATING CURVE



BY RLS DATE 12/13/78 **BERGER ASSOCIATES** SHEET NO. 3 OF
CHKD. BY DATE PROJECT D8490
SUBJECT SPEEDWELL FORGE DAM

DISCHARGE THROUGH OUTLET WORKS

ASSUME TAILWATER ELEV = 373

FOR DISCHARGE OF 50 CFS

$L = 99$
$N = .015$ $C = 0.6$
$A = 16$
$R = 1$

$$Q = \frac{1.486}{N} A R^{2/3} S^{1/2}$$

$$50 = \frac{1.486}{.015} \times 16 \times 1 \times S^{1/2}$$

$S = .000995 = \frac{H_1}{L}$
$H_1 = .0985'$

$$Q = CA\sqrt{2gH_2} \qquad A = 2.5^2$$

$$50 = .6 \times 2.5^2 \times (2 \times 32.2 \times H_2)^{1/2}$$
$H_2 = 2.7605'$

$L = 65'$

$$Q = \frac{1.486}{N} A R^{2/3} S^{1/2}$$

$$50 = \frac{1.486}{.015} \times 16 \times 1 \times S^{1/2}$$

$S = .000995 = \frac{H_3}{L}$
$H_3 = .0647$

$H_1 + H_2 + H_3 + 373 = H$
$373 + .0985 + 2.7605 + .0647 = 375.9237'$ SAY $376'$

BY RLS DATE 12/18/78 **BERGER ASSOCIATES** SHEET NO. 4 OF
CHKD. BY DATE PROJECT D8490
SUBJECT SPEEDWELL FORGE DAM

DISCHARGE THROUGH OUTLET WORKS

FOR DISCHARGE OF 135 CFS

$L = 99'$

$$Q = \frac{1.486}{N} A R^{2/3} S^{1/2}$$

$$135 = \frac{1.486}{.015} \times 16 \times 1 \times S^{1/2}$$

$$S = .00725 = \frac{H_1}{L}$$

$$H_1 = .718'$$

$$Q = CA\sqrt{2gH_2}$$

$$135 = .6 \times 2.5^2 \times (2 \times 32.2 \times H_2)^{1/2}$$

$$H_2 = 20.124'$$

$L = 65'$

$$Q = \frac{1.486}{N} A R^{2/3} S^{1/2}$$

$$135 = \frac{1.486}{.015} \times 16 \times 1 \times S^{1/2}$$

$$S = .00725 = \frac{H_3}{L}$$

$$H_3 = .472$$

$$373 + H_1 + H_2 + H_3 = H$$

$373 + .718 + 20.124 + .472 = 394.31$ SAY $394.4'$

WITH STOP LOGS IN PLACE

BY RLS DATE 1/11/79 **BERGER ASSOCIATES** SHEET NO. 5 OF
CHKD. BY DATE PROJECT D8490
SUBJECT SPEEDWELL FORGE

EMBANKMENT RATING

404.7

$2.7 \times 88 \times .05^{3/2} = 3$

404.9

$2.7 \times 88 \times .25^{3/2} = 30$
$2.7 \times 370 \times .1^{3/2} = 32$
$2.7 \times 58 \times .05^{3/2} = 2$ $\Sigma = 64$

405

$2.7 \times 88 \times .35^{3/2} = 49$
$2.7 \times 370 \times .2^{3/2} = 89$
$2.7 \times 190 \times .05^{3/2} = 6$
$2.7 \times 58 \times .15^{3/2} = 9$ $\Sigma = 153$

405.2

$2.7 \times 88 \times .55^{3/2} = 97$
$2.7 \times 370 \times .4^{3/2} = 253$
$2.7 \times 190 \times .25^{3/2} = 64$
$2.7 \times 367 \times .2^{3/2} = 89$
$2.7 \times 58 \times .35^{3/2} = 32$ $\Sigma = 535$

405.5

$2.7 \times 88 \times .85^{3/2} = 186$
$2.7 \times 370 \times .7^{3/2} = 585$
$2.7 \times 190 \times .55^{3/2} = 209$
$2.7 \times 367 \times .5^{3/2} = 350$
$2.7 \times 58 \times .65^{3/2} = 82$ $\Sigma = 1412$

406

$2.7 \times 88 \times 1.35^{3/2} = 373$
$2.7 \times 370 \times 1.2^{3/2} = 1313$
$2.7 \times 190 \times 1.05^{3/2} = 552$
$2.7 \times 367 \times 1^{3/2} = 991$
$2.7 \times 58 \times 1.15^{3/2} = 193$ $\Sigma = 3422$

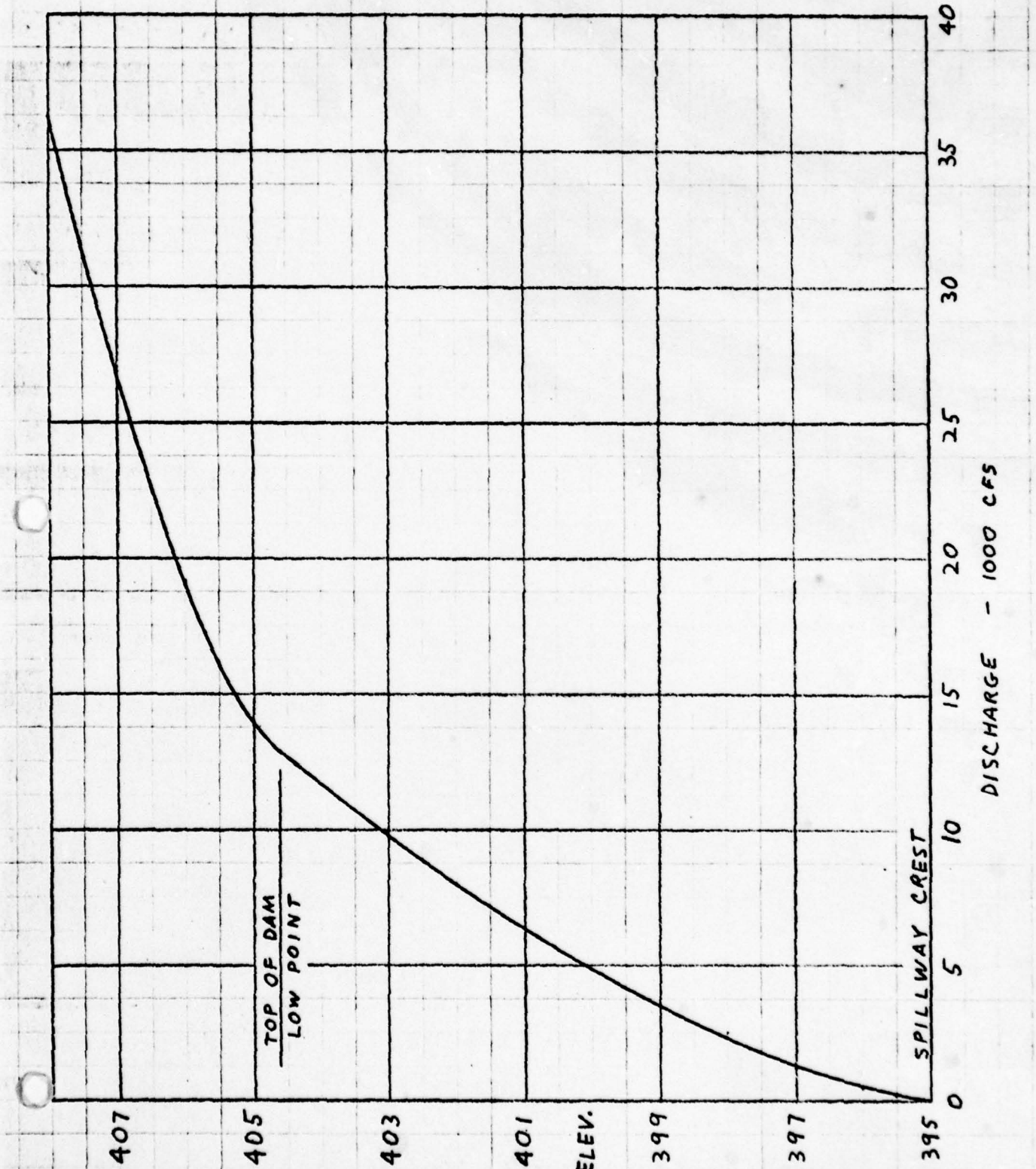
407

$2.7 \times 88 \times 2.35^{3/2} = 856$
$2.7 \times 370 \times 2.2^{3/2} = 3260$
$2.7 \times 190 \times 2.05^{3/2} = 1506$
$2.7 \times 367 \times 2^{3/2} = 2803$
$2.7 \times 58 \times 2.15^{3/2} = 494$ $\Sigma = 8919$

BY RLS DATE 2/12/79 BERGER ASSOCIATES SHEET NO. 6 OF
CHKD. BY DATE PROJECT DB490
SUBJECT SPEEDWELL FORGE DAM

DISCHARGE CAPACITY CURVE

INCLUDES SPILLWAY AND EMBANKMENT



BY RLS DATE 12/28/78 BERGER ASSOCIATES SHEET NO. 7 OF
CHKD. BY DATE PROJECT D8490
SUBJECT SPEEDWELL FORGE DAM

SIZE CLASSIFICATION

MAXIMUM STORAGE = 2299 ACRE-FEET

MAXIMUM HEIGHT = 35 FEET

SIZE CLASSIFICATION IS INTERMEDIATE.

HAZARD CLASSIFICATION

SEVERAL HOUSES AND FARM BUILDINGS SIT ALONG THE STREAM CHANNEL ABOUT 1000 FEET DOWNSTREAM OF THE DAM.

USE "HIGH".

RECOMMENDED SPILLWAY DESIGN FLOOD

THE ABOVE CLASSIFICATIONS INDICATE USE OF AN SDF EQUAL TO THE PROBABLE MAXIMUM FLOOD.

BY RLS DATE 1/31/79 | BERGER ASSOCIATES | SHEET NO. 8 OF
CHKD. BY DATE | PROJECT D8490
SUBJECT SPEEDWELL FORGE DAM

HEC-1 DATA

DRAINAGE AREA = 24.1 SQ. MI.

SUSQUEHANNA BASIN REGION 15C

$C_P = 0.82$

$C_T = 2.78$

LONGEST WATER COURSE = 57600' = 10.91 MI.

L TO CENTROID = 31000' = 5.87 MI.

$T_P = C_T (L \times L_{CA})^{.3}$

$T_P = 9.68$

RAINFALL (HMR-33)

INDEX = 23.3"

ZONE 6

INCREMENTAL RAINFALL

6 HR	104 %
12 HR	114 %
24 HR	123 %
48 HR	135 %

PLANIMETERED AREAS (FROM CONSTRUCTION DRAWINGS)

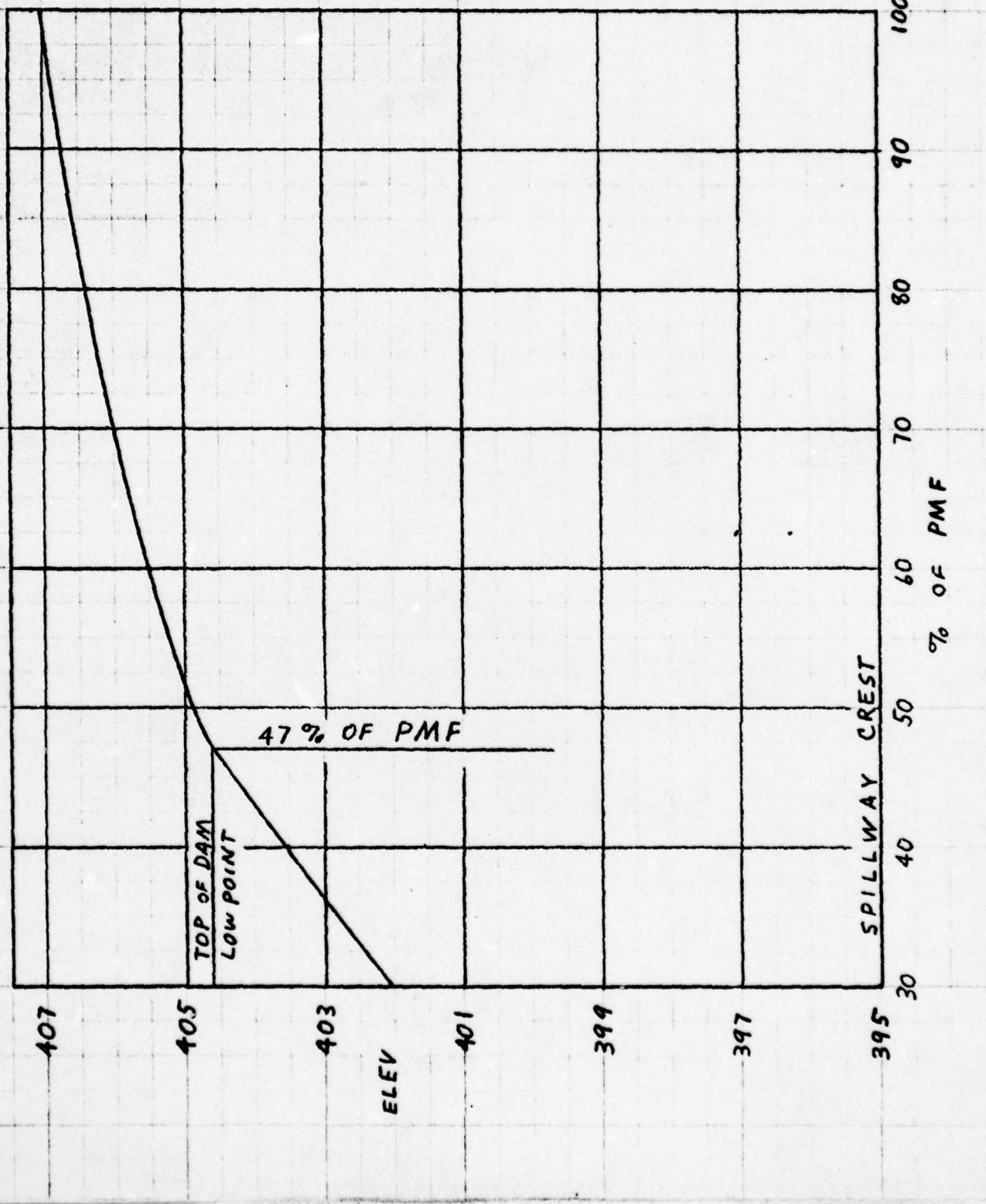
ELEV.		
380	=	17.97 ACRES
385		40.12
390		73.71
395		106.4
400		135.33
405		185.83
420		357.82 (FROM QUAD SHEET)

ZERO STORAGE ELEV = 380 - (STORAGE x 3/AREA)

ELEV = 363.3

BY RLS DATE 2/13/79 BERGER ASSOCIATES SHEET NO. 9 OF
CHKD. BY DATE PROJECT D8490
SUBJECT SPEEDWELL FORGE DAM

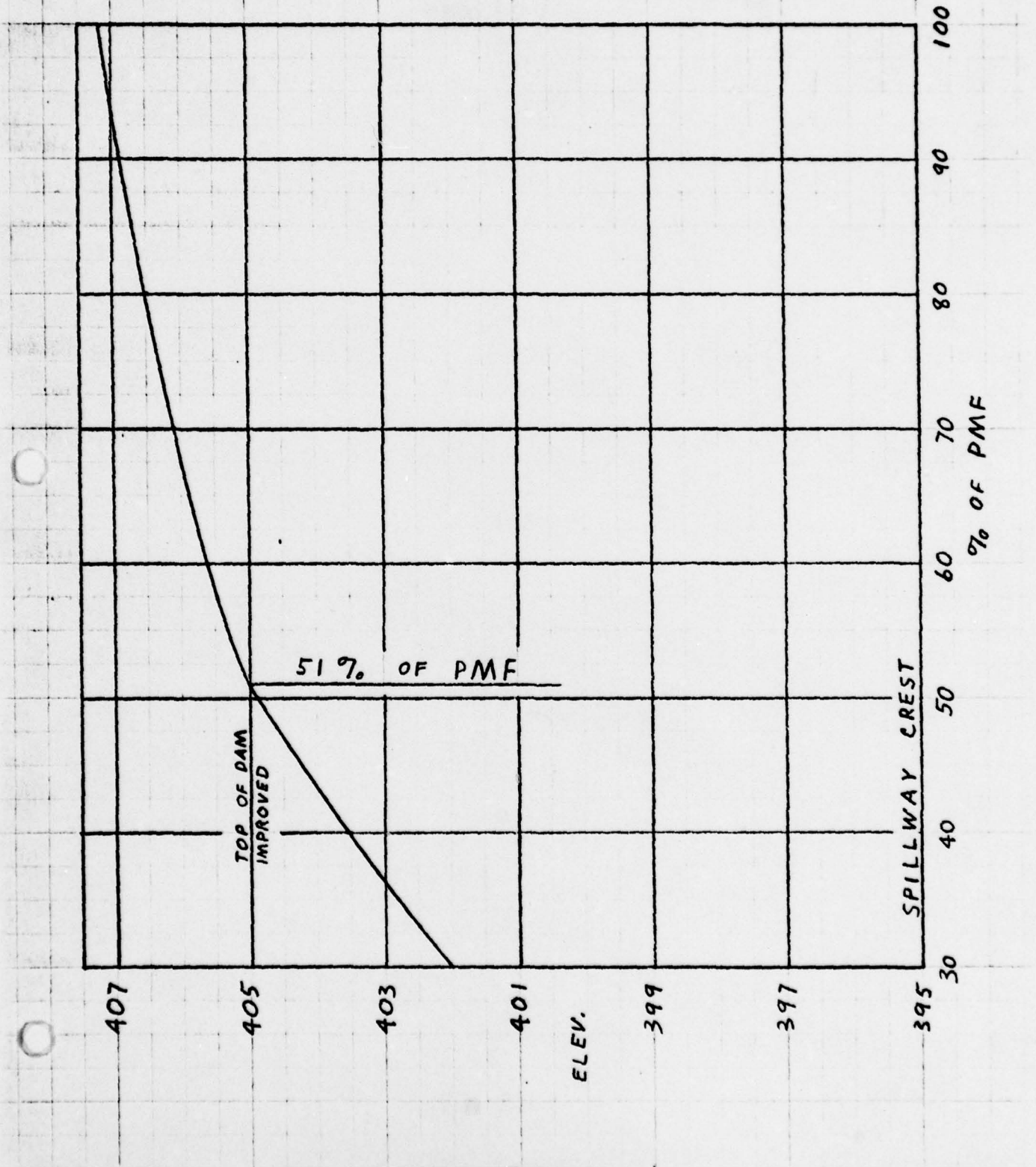
SPILLWAY CAPACITY CURVE



BY RLS DATE 2/13/79 BERGER ASSOCIATES SHEET NO. 10 OF
CHKD. BY DATE PROJECT D8490
SUBJECT SPEEDWELL FORGE DAM

SPILLWAY CAPACITY CURVE

IMPROVED EMBANKMENT



FLOOD HYDROGRAPH PACKAGE (HEC-1)
DAM SAFETY VERSION JULY 1978
LAST MODIFICATION 21 AUG 78
****

OVERTOPPING ANALYSIS
1/4

```
    1          A1    SPEEDWELL FORGE DAM  ****  HAMMER CREEK
    2          A2    ELIZABETH TWP., LANCASTER CO., PA.
    3          A3    NDI # PA-00345    PA DER # 36-257
    4          B   300     0    15     0     0     0     0     0    -4     0
    5          B1    5
    6          J     1     9     1
    7          J1    1    .9    .8    .7    .6    .5    .4    .3   .15
    8          K           1                                 1
    9          K1              INFLOW HYDROGRAPH
   10          M     1     1  24.1                                     1
   11          P          23.3   104   114   123   135
   12          T                                           1    .05
   13          W  9.68    .82
   14          X  -1.5   -.05     2
   15          K     1     2                                 1
   16          K1              RESERVOIR ROUTING
   17          Y                       1     0
   18          Y1    1                                   970    -1
   19          Y4  395  395.5   396   397   398   399   400   401   402   403
   20          Y4  404  404.6 404.7 404.9   405 405.2 405.5   406   407   408
   21          Y5    0   153   432  1222  2245  3456  4830  6350  8000  9775
   22          Y5 11664 12850 13054 13521 13814 14608 16110 19183 26877 36182
   23          $A    0 17.97 40.12 73.71 106.40 135.33 185.83 357.82
   24          $E 363.3   380   385   390   395   400   405   420
   25          $$  395
   26          $D 404.6
   27          K    99
1                  PREVIEW OF SEQUENCE OF STREAM NETWORK CALCULATIONS

                                RUNOFF HYDROGRAPH AT        1
                                ROUTE HYDROGRAPH TO         2
                                END OF NETWORK

1**********
 FLOOD HYDROGRAPH PACKAGE (HEC-1)
 DAM SAFETY VERSION     JULY 1978
   LAST MODIFICATION  21 AUG 78
 **********

 RUN  DATE# 79/02/13.
      TIME# 06.00.07.

                SPEEDWELL FORGE DAM  ****  HAMMER CREEK
                ELIZABETH TWP., LANCASTER CO., PA.
                NDI # PA-00345    PA DER # 36-257

                              JOB SPECIFICATION
          NQ     NHR    NMIN   IDAY    IHR    IMIN   METRC   IPLT   IPRT  NSTAN
         300       0      15      0      0      0      0      0     -4      0
                            JOPER    NWT  LROPT  TRACE
                                5      0      0      0

                        MULTI-PLAN ANALYSES TO BE PERFORMED
                                NPLAN= 1 NRTIO= 9 LRTIO= 1
 RTIOS=  1.00     80     80     70     60     50     40     30     15
```

300	0	15	0	0	0	0	0	-4	0
			JOPER	NWT	LROPT	TRACE			
			5	0	0	0			

MULTI-PLAN ANALYSES TO BE PERFORMED

NPLAN= 1 NRTIO= 9 LRTIO= 1

RTIOS= 1.00 .90 .80 .70 .60 .50 .40 .30 .15

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

SUB-AREA RUNOFF COMPUTATION

INFLOW HYDROGRAPH

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

HYDROGRAPH DATA

IHYDG	IUHG	TAREA	SNAP	TRSDA	TRSPC	RATIO	ISNOW	ISAME	LOCAL
1	1	24.10	0.00	24.10	0.00	0.000	0	1	0

PRECIP DATA

SPFE	PMS	R6	R12	R24	R48	R72	R96
0.00	23.30	104.00	114.00	123.00	135.00	0.00	0.00

TRSPC COMPUTED BY THE PROGRAM IS .829

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= 9.68 CP= .82 NTA= 0

RECESSION DATA

STRTQ= -1.50 QRCSN= -.05 RTIOR= 2.00

UNIT HYDROGRAPH100 END-OF-PERIOD ORDINATES, LAG= 9.60 HOURS, CP= .81 VOL= .99

8.	29.	60.	96.	136.	179.	224.	270.	318.	367.
416.	466.	516.	565.	615.	665.	714.	763.	811.	859.
906.	953.	999.	1045.	1090.	1134.	1177.	1215.	1249.	1278.
1302.	1323.	1339.	1352.	1361.	1367.	1370.	1369.	1365.	1359.
1350.	1337.	1322.	1305.	1284.	1260.	1234.	1204.	1170.	1132.
1089.	1038.	976.	912.	852.	796.	743.	694.	649.	606.
566.	529.	494.	461.	431.	403.	376.	351.	328.	307.
287.	268.	250.	234.	218.	204.	190.	178.	166.	155.
145.	135.	127.	118.	110.	103.	96.	90.	84.	79.
73.	69.	64.	60.	56.	52.	49.	46.	43.	40.

0 END-OF-PERIOD FLOW

MO.DA	HR.MN	PERIOD	RAIN	EXCS	LOSS	COMP Q	MO.DA	HR.MN	PERIOD	RAIN	EXCS	LOSS	COMP Q

SUM	26.07	23.62	2.45	1464632.
	(662.)	(600.)	(62.)	(41473.76)

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

HYDROGRAPH ROUTING

HYDROGRAPH ROUTING

RESERVOIR ROUTING

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

ROUTING DATA

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

NSTPS	NSTDL	LAG	AMSKK	X	TSK	STORA	ISPRAT
1	0	0	0.000	0.000	0.000	970.	-1

STAGE	395.0	395.5	396.0	397.0	398.0	399.0	400.0	401.0	402.0	403.0
	404.0	404.6	404.7	404.9	405.0	405.2	405.5	406.0	407.0	408.0
FLOW	0.	153.	432.	1222.	2245.	3456.	4830.	6350.	8000.	9775.
	11664.	12850.	13054.	13521.	13814.	14608.	16110.	19183.	26877.	36182.
SURFACE AREA=	0.	18.	40.	74.	106.	135.	186.	358.		
CAPACITY=	0.	100.	242.	522.	970.	1573.	2372.	6380.		
ELEVATION=	363.	380.	385.	390.	395.	400.	405.	420.		

CREL	SPWID	COQW	EXPW	ELEVL	COQL	CAREA	EXPL
395.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

DAM DATA

TOPEL	COQD	EXPD	DAMWID
404.6	0.0	0.0	0.

ITERATIVE SOLUTION DID NOT CONVERGE 194 1 0.000 4.070E+02 -5.039E+02 4.070E+02 8.200E+02

PEAK OUTFLOW IS 27833. AT TIME 48.50 HOURS

PEAK OUTFLOW IS 24686. AT TIME 48.75 HOURS

PEAK OUTFLOW IS 21945. AT TIME 48.75 HOURS

PEAK OUTFLOW IS 19183. AT TIME 48.75 HOURS

PEAK OUTFLOW IS 16432. AT TIME 48.75 HOURS

PEAK OUTFLOW IS 13470. AT TIME 49.50 HOURS

PEAK OUTFLOW IS 10760. AT TIME 49.50 HOURS

PEAK OUTFLOW IS 8063. AT TIME 49.50 HOURS

PEAK OUTFLOW IS 4018. AT TIME 49.50 HOURS

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 1.00	RATIO 2 .90	RATIO 3 .80	RATIO 4 .70	RATIO 5 .60	RATIO 6 .50	RATIO 7 .40	RATIO 8 .30	RATIO 9 .15
HYDROGRAPH AT	1	24.10	1	27477.	24730.	21982.	19234.	16486.	13739.	10991.	8243.	4122.
		(62.42)		(778.08)(	700.27)(	622.46)(	544.65)(	466.85)(	389.04)(	311.23)(	233.42)(	116.71)
ROUTED TO	2	24.10	1	27437.	24690.	21942.	19190.	16420.	13445.	10758.	8066.	4016.
		(62.42)		(776.92)(	699.13)(	621.32)(	543.41)(	464.96)(	380.73)(	304.65)(	228.41)(	113.72)

SUMMARY OF DAM SAFETY ANALYSIS

PLAN 1 .....

	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
ELEVATION	395.00	395.00	405.00
STORAGE	970.	970.	2372.
OUTFLOW	0.	0.	13661.

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
1.00	407.15	2.15	2795.	27437.	11.00	48.75	0.00
.90	406.82	1.82	2727.	24690.	10.25	48.75	0.00
.80	406.47	1.47	2656.	21942.	9.00	48.75	0.00
.70	406.08	1.08	2579.	19190.	7.75	48.75	0.00
.60	405.63	.63	2491.	16420.	5.50	48.75	0.00
.50	404.89	0.00	2353.	13445.	0.00	49.50	0.00
.40	403.53	0.00	2110.	10758.	0.00	49.50	0.00
.30	402.04	0.00	1868.	8066.	0.00	49.50	0.00
.15	399.42	0.00	1495.	4016.	0.00	49.50	0.00

****
FLOOD HYDROGRAPH PACKAGE (HEC-1)
DAM SAFETY VERSION JULY 1978
LAST MODIFICATION 21 AUG 78
****
EOI ENCOUNTERED.

FLOOD HYDROGRAPH PACKAGE (HEC-1)
DAM SAFETY VERSION JULY 1978
LAST MODIFICATION 21 AUG 78
****

OVERTOPPING ANALYSIS
IMPROVED EMBANKMENT

1/4

```
     1          A1     SPEEDWELL FORGE DAM  ****  HAMMER CREEK
     2          A2     ELIZABETH TWP., LANCASTER CO., PA.
     3          A3     NDI # PA-00345    PA DER # 36-257
     4          B  300     0    15     0     0     0     0     0    -4     0
     5          B1   5
     6          J    1     9     1
     7          J1   1    .9    .8    .7    .6    .5    .4    .3   .15
     8          K              1                              1
     9          K1                INFLOW HYDROGRAPH
    10          M    1     1  24.1                                    1
    11          P               23.3   104   114   123   135
    12          T                                          1   .05
    13          W 9.68   .82
    14          X -1.5  -.05     2
    15          K    1     2                              1
    16          K1                RESERVOIR ROUTING - (DESIGN ELEV. TOP OF DAM)
    17          Y                             1     0
    18          Y1   1                                  970
    19          $A   0 17.97 40.12 73.71 106.40 135.33 185.83 357.82
    20          $E 363.3   380   385   390   395   400   405   420
    21          $$  395   120   3.6   1.5
    22          $D  405   2.7   1.5  1073
    23          K   99
1
                        PREVIEW OF SEQUENCE OF STREAM NETWORK CALCULATIONS

                                RUNOFF HYDROGRAPH AT          1
                                ROUTE HYDROGRAPH TO           2
                                END OF NETWORK

1**********
 FLOOD HYDROGRAPH PACKAGE (HEC-1)
 DAM SAFETY VERSION     JULY 1978
   LAST MODIFICATION  21 AUG 78
 **********

 RUN  DATE# 79/02/13.
      TIME# 05.46.06.

                        SPEEDWELL FORGE DAM  ****  HAMMER CREEK
                        ELIZABETH TWP., LANCASTER CO., PA.
                        NDI # PA-00345    PA DER # 36-257

                                JOB SPECIFICATION
                    NQ    NHR   NMIN   IDAY    IHR   IMIN  METRC   IPLT   IPRT  NSTAN
                   300      0     15      0      0      0      0      0     -4      0
                                      JOPER    NWT  LROPT  TRACE
                                          5      0      0      0

                        MULTI-PLAN ANALYSES TO BE PERFORMED
                                NPLAN= 1 NRTIO= 9 LRTIO= 1
                RTIOS=  1.00   .90   .80   .70   .60   .50   .40   .30   .15
```

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

SUB-AREA RUNOFF COMPUTATION

INFLOW HYDROGRAPH

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

HYDROGRAPH DATA

IHYDG	IUHG	TAREA	SNAP	TRSDA	TRSPC	RATIO	ISNOW	ISAME	LOCAL
1	1	24.10	0.00	24.10	0.00	0.000	0	1	0

PRECIP DATA

SPFE	PMS	R6	R12	R24	R48	R72	R96
0.00	23.30	104.00	114.00	123.00	135.00	0.00	0.00

TRSPC COMPUTED BY THE PROGRAM IS .829

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= 9.68 CP= .82 NTA= 0

RECESSION DATA

STRTQ= -1.50 QRCSN= -.05 RTIOR= 2.00

UNIT HYDROGRAPH100 END-OF-PERIOD ORDINATES, LAG= 9.60 HOURS, CP= .81 VOL= .99

8.	29.	60.	96.	136.	179.	224.	270.	318.	367.
416.	466.	516.	565.	615.	665.	714.	763.	811.	859.
906.	953.	999.	1045.	1090.	1134.	1177.	1215.	1249.	1278.
1302.	1323.	1339.	1352.	1361.	1367.	1370.	1369.	1365.	1359.
1350.	1337.	1322.	1305.	1284.	1260.	1234.	1204.	1170.	1132.
1089.	1038.	976.	912.	852.	796.	743.	694.	649.	606.
566.	529.	494.	461.	431.	403.	376.	351.	328.	307.
287.	268.	250.	234.	218.	204.	190.	178.	166.	155.
145.	135.	127.	118.	110.	103.	96.	90.	84.	79.
73.	69.	64.	60.	56.	52.	49.	46.	43.	40.

0 END-OF-PERIOD FLOW

MO.DA	HR.MN	PERIOD	RAIN	EXCS	LOSS	COMP Q	MO.DA	HR.MN	PERIOD	RAIN	EXCS	LOSS	COMP Q

SUM	26.07	23.62	2.45	1464632.
	(662.)	(600.)	(62.)	(41473.76)

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

HYDROGRAPH ROUTING

RESERVOIR ROUTING - (DESIGN ELEV. TOP OF D

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

ROUTING DATA

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

NSTPS	NSTDL	LAG	AMSKK	X	TSK	STORA	ISPRAT
1	0	0	0.000	0.000	0.000	970.	0

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

HYDROGRAPH ROUTING

RESERVOIR ROUTING - (DESIGN ELEV. TOP OF D

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

ROUTING DATA

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

NSTPS	NSTDL	LAG	AMSKK	X	TSK	STORA	ISPRAT
1	0	0	0.000	0.000	0.000	970.	0

SURFACE AREA=	0.	18.	40.	74.	106.	135.	186.	358.
CAPACITY=	0.	100.	242.	522.	970.	1573.	2372.	6380.
ELEVATION=	363.	380.	385.	390.	395.	400.	405.	420.

CREL	SPWID	COQW	EXPW	ELEVL	COQL	CAREA	EXPL
395.0	120.0	3.6	1.5	0.0	0.0	0.0	0.0

DAM DATA

TOPEL	COQD	EXPD	DAMWID
405.0	2.7	1.5	1073.

PEAK OUTFLOW IS 27437. AT TIME 48.75 HOURS

PEAK OUTFLOW IS 24690. AT TIME 48.75 HOURS

PEAK OUTFLOW IS 21942. AT TIME 48.75 HOURS

PEAK OUTFLOW IS 19190. AT TIME 48.75 HOURS

PEAK OUTFLOW IS 16420. AT TIME 48.75 HOURS

PEAK OUTFLOW IS 13445. AT TIME 49.50 HOURS

PEAK OUTFLOW IS 10758. AT TIME 49.50 HOURS

PEAK OUTFLOW IS 8066. AT TIME 49.50 HOURS

PEAK OUTFLOW IS 4016. AT TIME 49.50 HOURS

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

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	RATIO 2	RATIO 3	RATIO 4	RATIO 5	RATIO 6	RATIO 7	RATIO 8	RATIO 9
				1.00	.90	.80	.70	.60	.50	.40	.30	.15
HYDROGRAPH AT	1	24.10	1	27477.	24730.	21982.	19234.	16486.	13739.	10991.	8243.	4122.
		(62.42)		(778.08)	(700.27)	(622.46)	(544.65)	(466.85)	(389.04)	(311.23)	(233.42)	(116.71)
ROUTED TO	2	24.10	1	27833.	24686.	21945.	19183.	16432.	13470.	10760.	6063.	4018.
		(62.42)		(788.14)	(699.04)	(621.41)	(543.21)	(465.32)	(381.42)	(304.69)	(228.32)	(113.79)

SUMMARY OF DAM SAFETY ANALYSIS

PLAN 1	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
ELEVATION	395.00	395.00	404.60
STORAGE	970.	970.	2299.
OUTFLOW	1.	0.	12850.

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
1.00	407.02	2.42	2767.	27833.	11.75	48.50	0.00
.90	406.72	2.12	2705.	24686.	10.75	48.75	0.00
.80	406.36	1.76	2634.	21945.	9.75	48.75	0.00
.70	406.00	1.40	2563.	19183.	8.50	48.75	0.00
.60	405.55	.95	2476.	16432.	6.50	48.75	0.00
.50	404.88	.28	2350.	13470.	3.00	49.50	0.00
.40	403.52	0.00	2109.	10760.	0.00	49.50	0.00
.30	402.04	0.00	1868.	8063.	0.00	49.50	0.00
.15	399.41	0.00	1494.	4018.	0.00	49.50	0.00

****
FLOOD HYDROGRAPH PACKAGE (HEC-1)
DAM SAFETY VERSION JULY 1978
LAST MODIFICATION 21 AUG 78
****
EOI ENCOUNTERED.
N>

APPENDIX D

GEOLOGIC REPORT

GEOLOGIC REPORT

Bedrock - Dam and Reservoir

Formation: Cocalico Formation.

Lithology: The Cocalico Formation consists of dark gray to bluish black fissile shale, that weathers to a light brown color. Locally the shale is limy and a few beds of shaly limestone are present. Some beds of hard, brown sandstone are also present in the formation. Bedding is frequently obscure and the dominant parting is fracture cleavage.

Structure

The beds at Speedwell Forge have been intensely folded and thrusted. Isoclinal, recumbent folds have been mapped in the area. Folding is hard to recognize in the Cocalico because the bedding is frequently obscured by cleavage. Fracture cleavage in the are strikes N70° to 90°E and dips gently to the north or south.

Fracture traces in the area trend: N10°E, N20°E, N30°E, N60°E, N80°E, N15°W and N80°W.

Overburden

Overburden here consists of weathered bedrock, and some alluvium. The weathered zone of the bedrock is nine to twenty feet thick. The alluvium in the creek valley was nine to fourteen thick, and consisted of clay, silt, sand and some sand and gravel.

Aquifer Characteristics

The Cocalico shale is an essentially impermeable rock, and ground water movement is along cleavage planes, joints and fractures and to a lesser extent along bedding. The upper weathered zone is quite permeable. Permeability decreased with depth in the fresh rock. Some solution of the more limy beds by ground water movement is possible. Solution openings are generally clogged with clay derived from the decomposed shale.

Discussion

The dam was constructed with a cutoff trench dug into fresh rock. Some movement of water through fractures beneath the cutoff trench is possible. Enlargement of these fractures by solution is theoretically possible in the limy beds, but is inhibited by the large amount of clay present. Large scale leakage is considered unlikely, and small leakage is unlikely to increase.

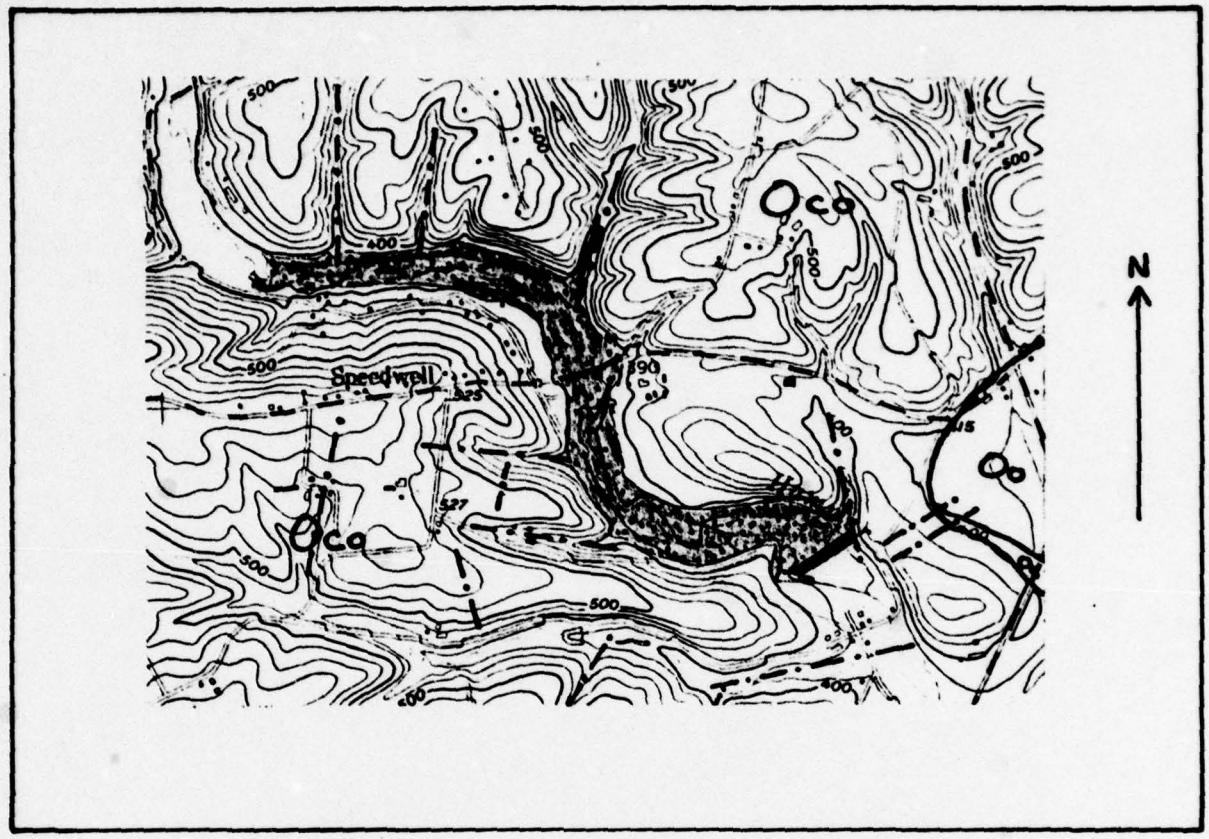
Sources of Information

1. Meisler, Harold and Becher, A.E. (1971) "Hydrogeology of the Lancaster 15-Minute Quadrangle". Pa. Geological Survey Ground Water Report W26.

2. Air Photographs, dated 1969, sacle 1:24,000.

3. Core boring logs in file.

GEOLOGIC MAP - Hammer Creek Dam



(geology from Pa. Geol. Surv. Report W26)

Oco	Cocalico Fm.
Oa	Annville Fm.
Oo	Ontelaunee Fm.

—·—·— air photo fracture trace

SCALE 1:24000

1 0 1 MILE

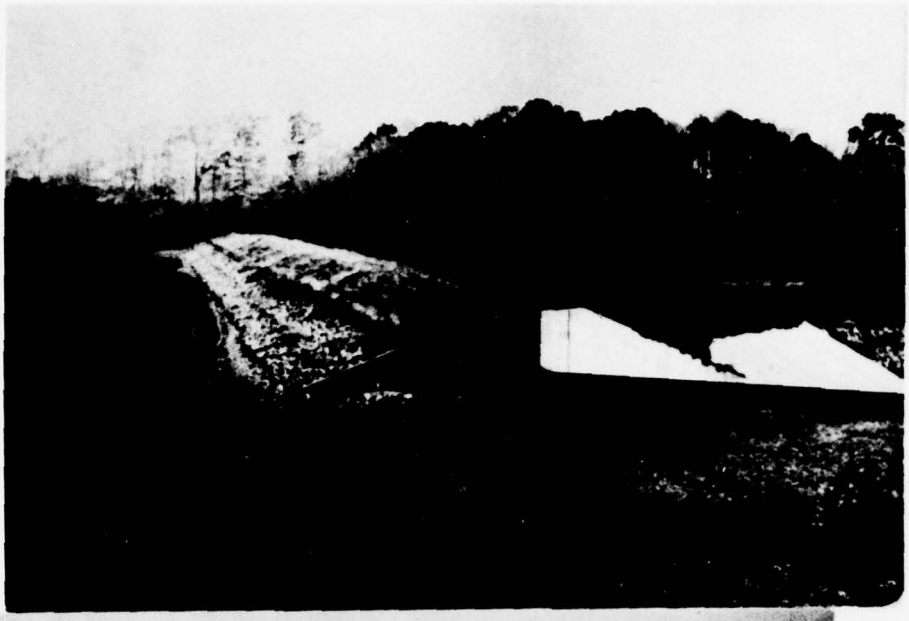
1000 0 1000 2000 3000 4000 5000 6000 7000 FEET

1 .5 0 1 KILOMETER

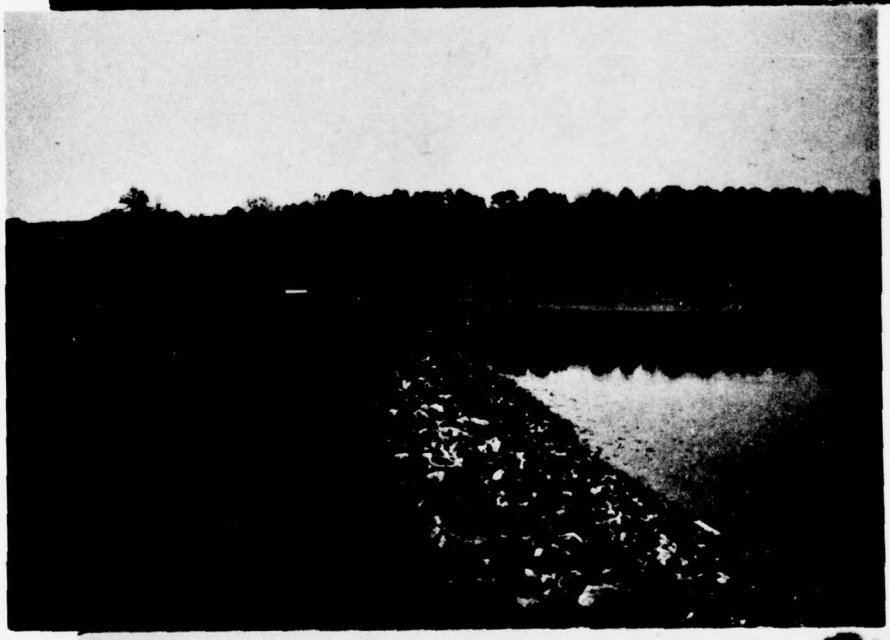
CONTOUR INTERVAL 20 FEET
DOTTED LINES REPRESENT 10-FOOT CONTOURS
DATUM IS MEAN SEA LEVEL

APPENDIX E

PHOTOGRAPHS



Upstream Slope
and Forebay

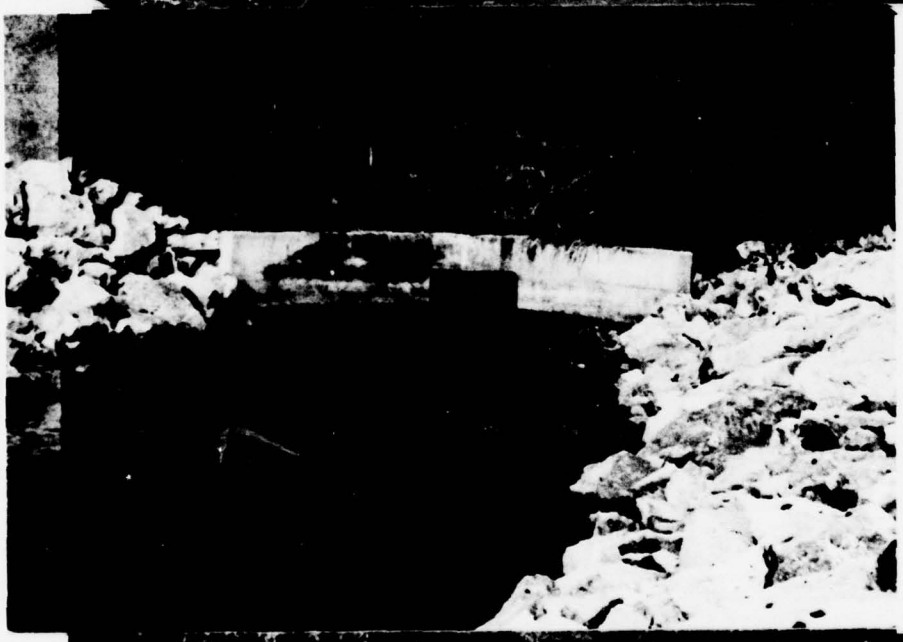


Upstream Slope
and
Control Structure

Downstream Slope

PA-345
PLATE E-I

Reservoir



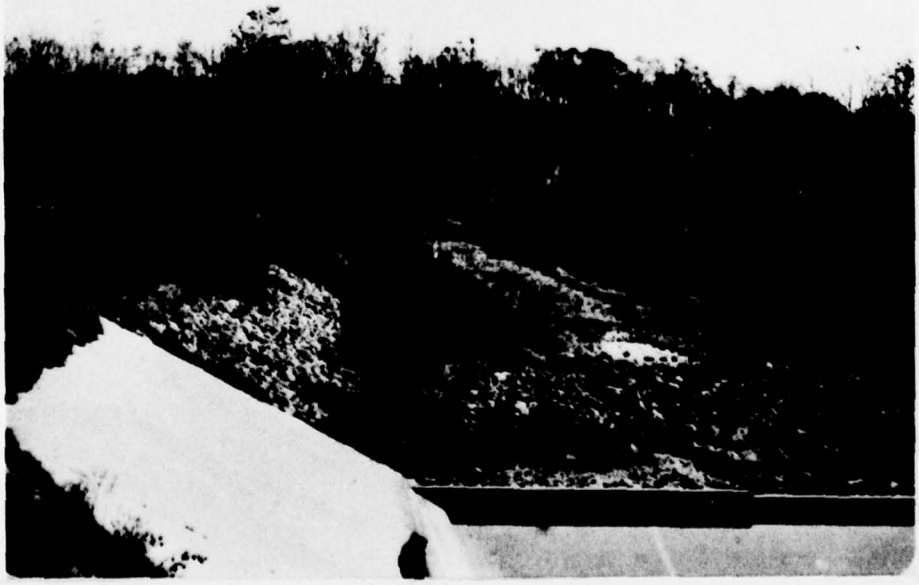
Conduit Outlet
Looking Upstream

Conduit Outlet
Channel

PA-345
PLATE E-II

Spillway Weir

Spillway Chute
and
Stilling Basin

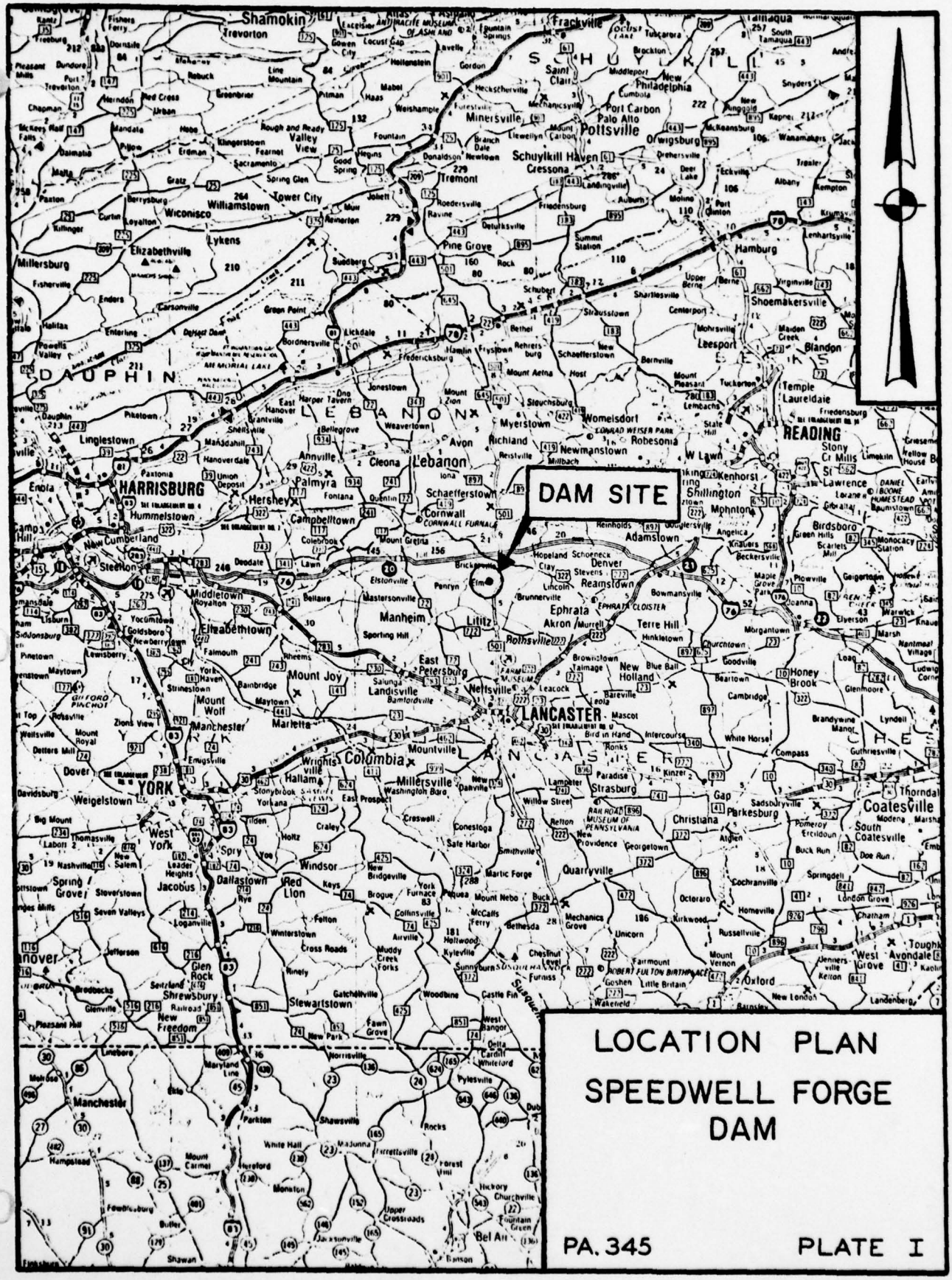


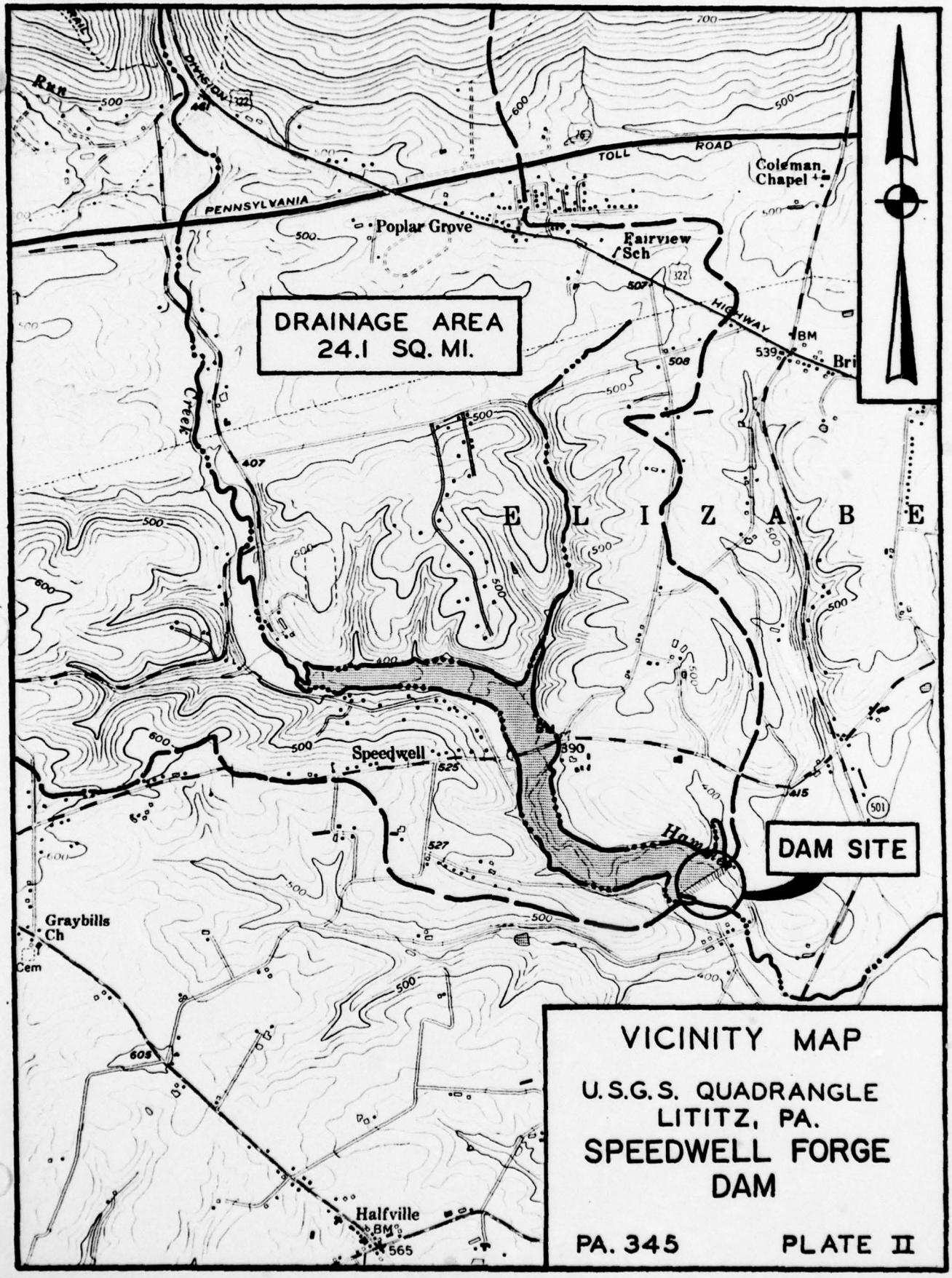
Spillway
Downstream Channel

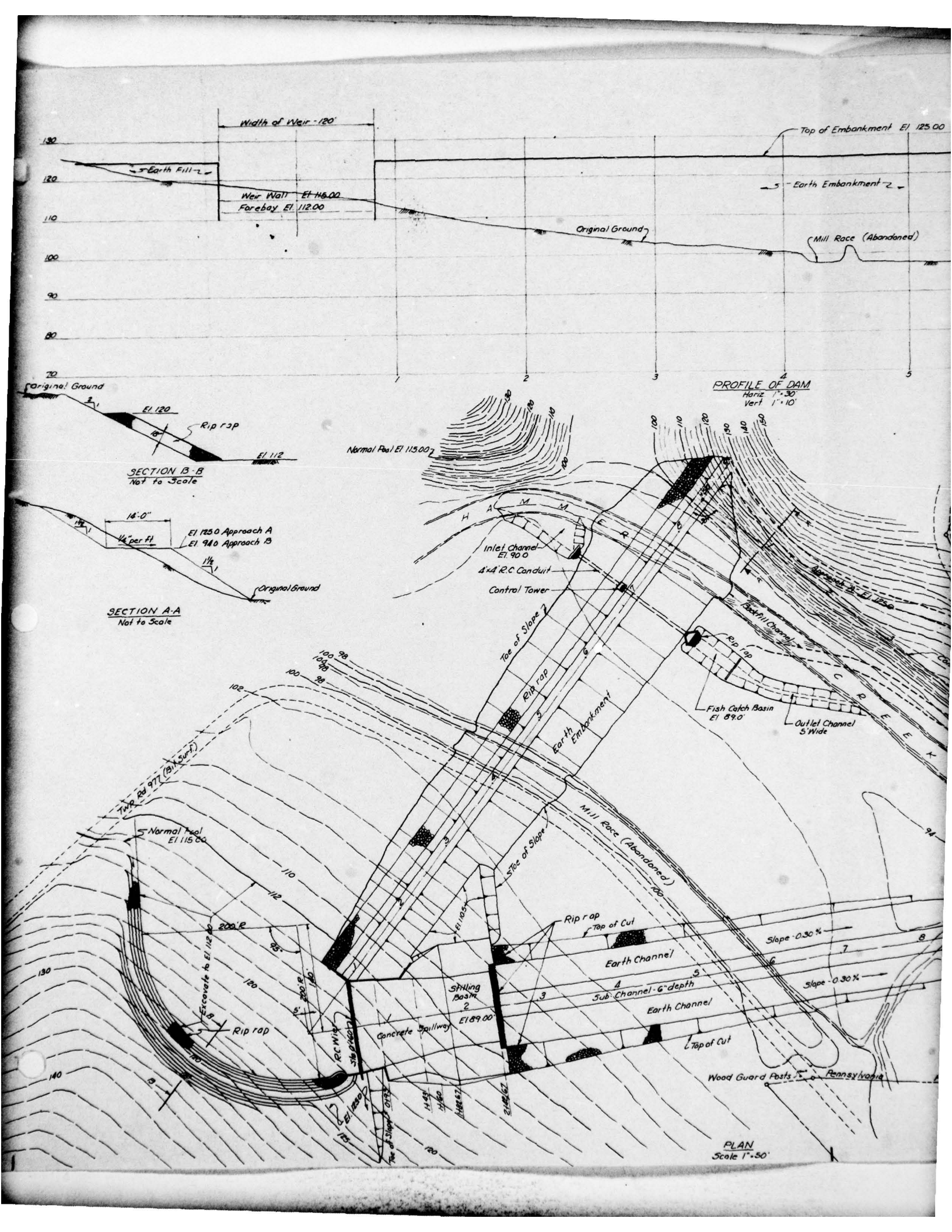
PA-345
PLATE E-III

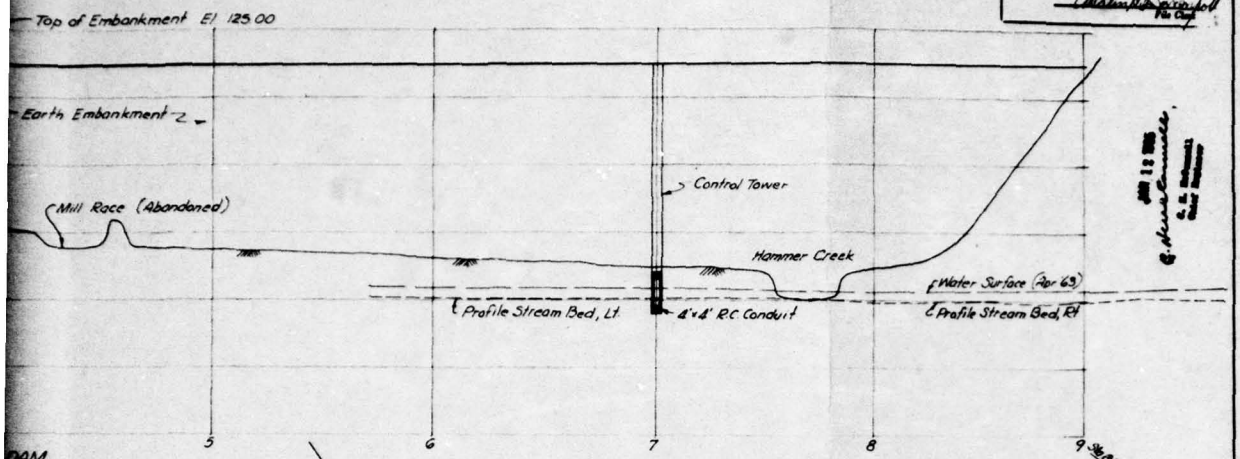
APPENDIX F

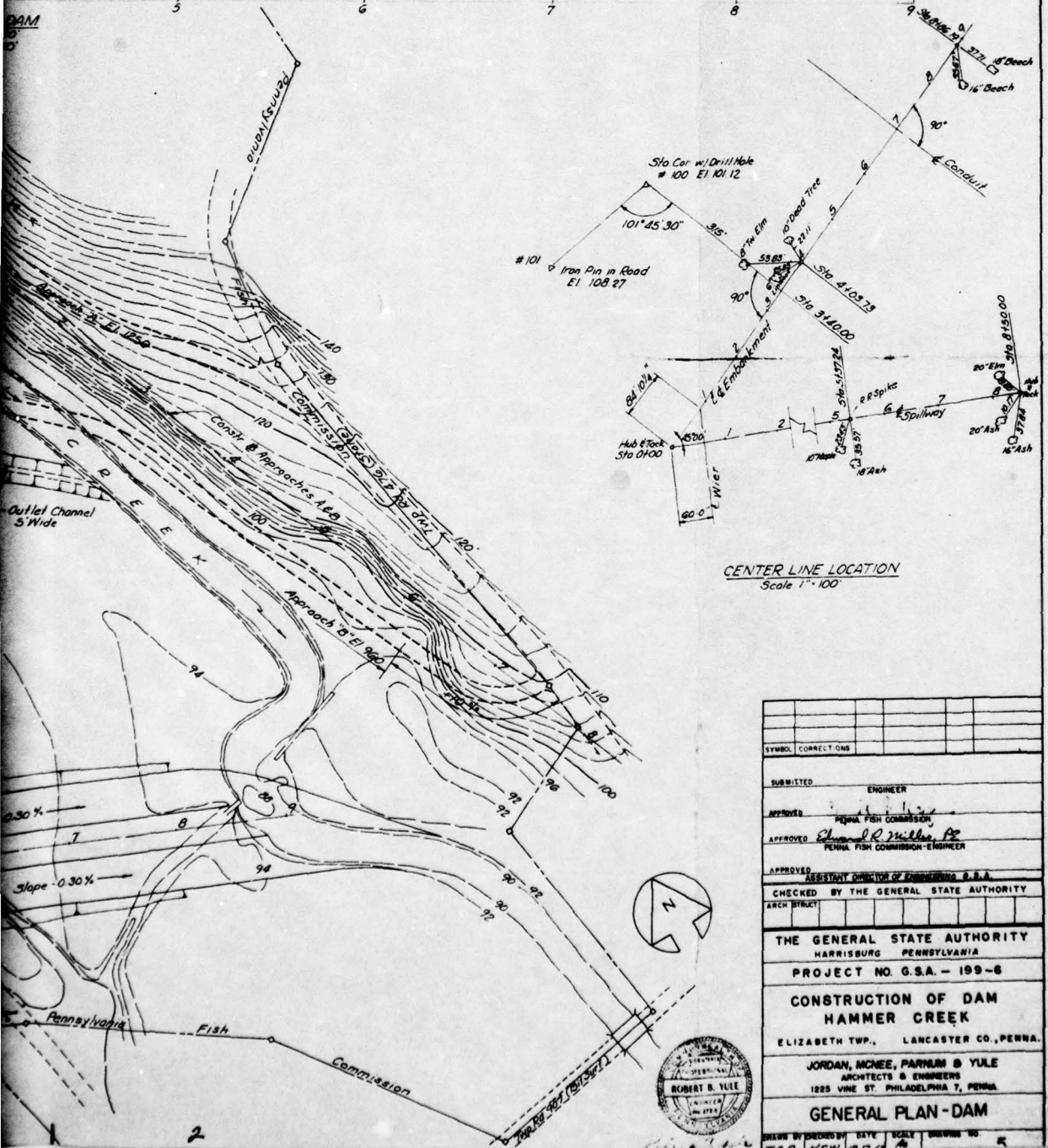
PLATES


DAM SITE
LOCATION PLAN
SPEEDWELL FORGE
DAM
PA. 345
PLATE I


DRAINAGE AREA
24.1 SQ. MI.
DAM SITE
E L I Z A B E
PENNSYLVANIA
TOLL ROAD
Poplar Grove
Coleman Chapel
Fairview Sch
HIGHWAY
Speedwell
Graybills Ch
Cem
Halfville
BM
565
539
890
415
501
322
VICINITY MAP
U.S.G.S. QUADRANGLE
LITITZ, PA.
SPEEDWELL FORGE
DAM
PA. 345
PLATE II


Width of Weir - 120'
Top of Embankment El 125.00
Earth Fill
Weir Wall El 116.00
Forebay El 112.00
Earth Embankment
Original Ground
Mill Race (Abandoned)
PROFILE OF DAM
Horiz 1"=30'
Vert 1"=10'
Original Ground
El 120
Rip rap
El 112
SECTION B-B
Not to Scale
16'-0"
El 125.0 Approach A
El 94.0 Approach B
Original Ground
SECTION A-A
Not to Scale
Normal Pool El 115.00
Inlet Channel El. 90.0
4'x4' R.C. Conduit
Control Tower
Backfill Channel
Rip rap
Toe of Slope
Earth Embankment
Fish Catch Basin El. 89.0'
Outlet Channel 5' Wide
T&R Rd 977 (8' x Surf.)
Normal Pool El 115.00
Mill Race (Abandoned)
Toe of Slope
El 105
Rip rap
Top of Cut
Slope - 0.30 %
Earth Channel
Sub Channel - 6" depth
Earth Channel
Slope - 0.30 %
Top of Cut
Stilling Basin 2 El 89.00'
Concrete Spillway
R.C. Wing
Excavate to El 112.00
Rip rap
Wood Guard Posts
Pennsylvania
PLAN
Scale 1"=50'





CENTER LINE LOCATION
Scale 1" = 100'

SYMBOL CORRECTIONS	
SUBMITTED	ENGINEER
APPROVED	PENNA. FISH COMMISSION
APPROVED	Edmund R. Miller, PE PENNA. FISH COMMISSION - ENGINEER
APPROVED	ASSISTANT DIRECTOR OF ENGINEERING G.S.A.
CHECKED BY THE GENERAL STATE AUTHORITY	
ARCH STRUCT	

THE GENERAL STATE AUTHORITY
HARRISBURG PENNSYLVANIA

PROJECT NO. G.S.A. - 199-6

CONSTRUCTION OF DAM HAMMER CREEK

ELIZABETH TWP., LANCASTER CO., PENNA.

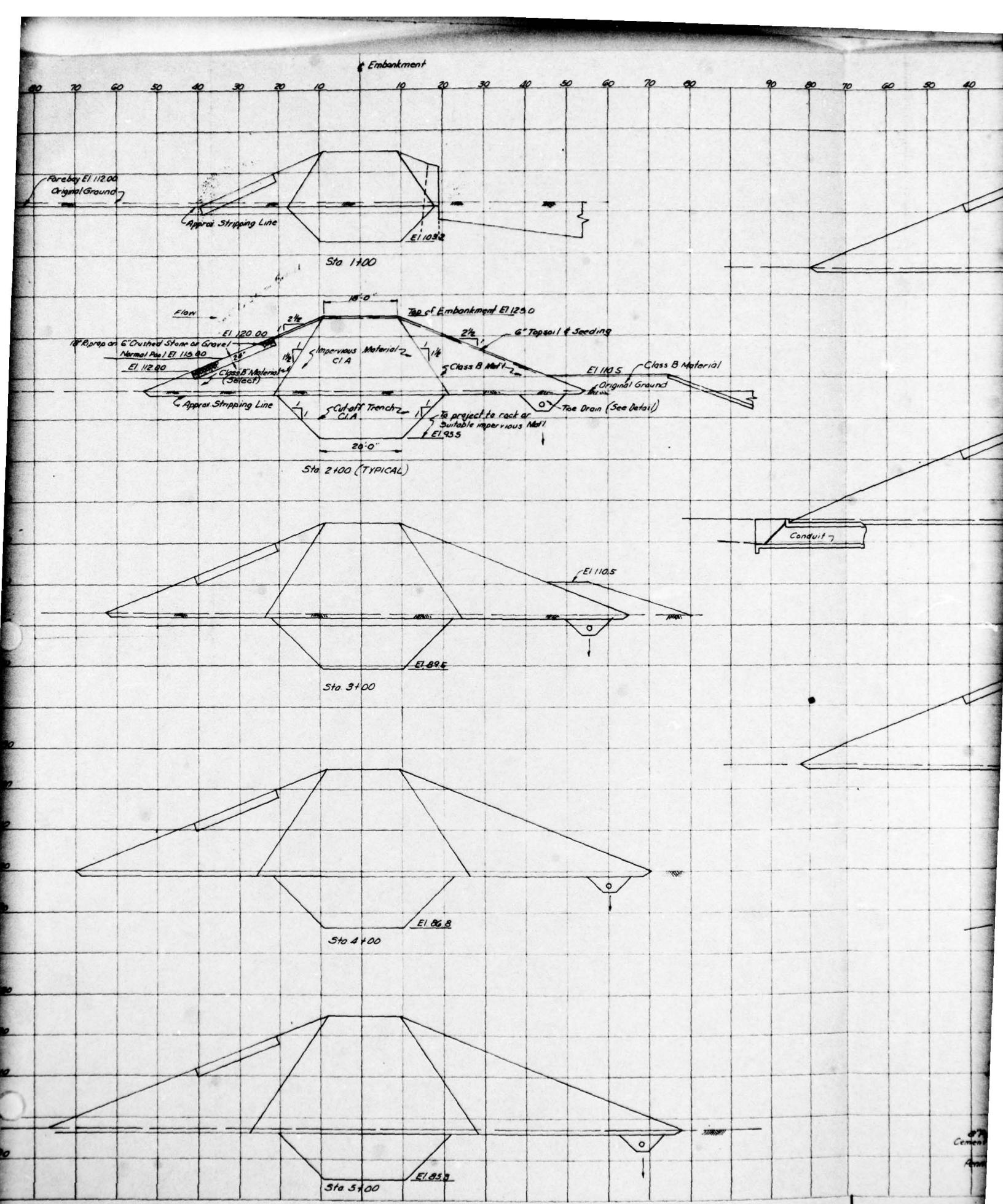
JORDAN, McNEE, PARNUM & YULE
ARCHITECTS & ENGINEERS
1225 VINE ST. PHILADELPHIA 7, PENNA.

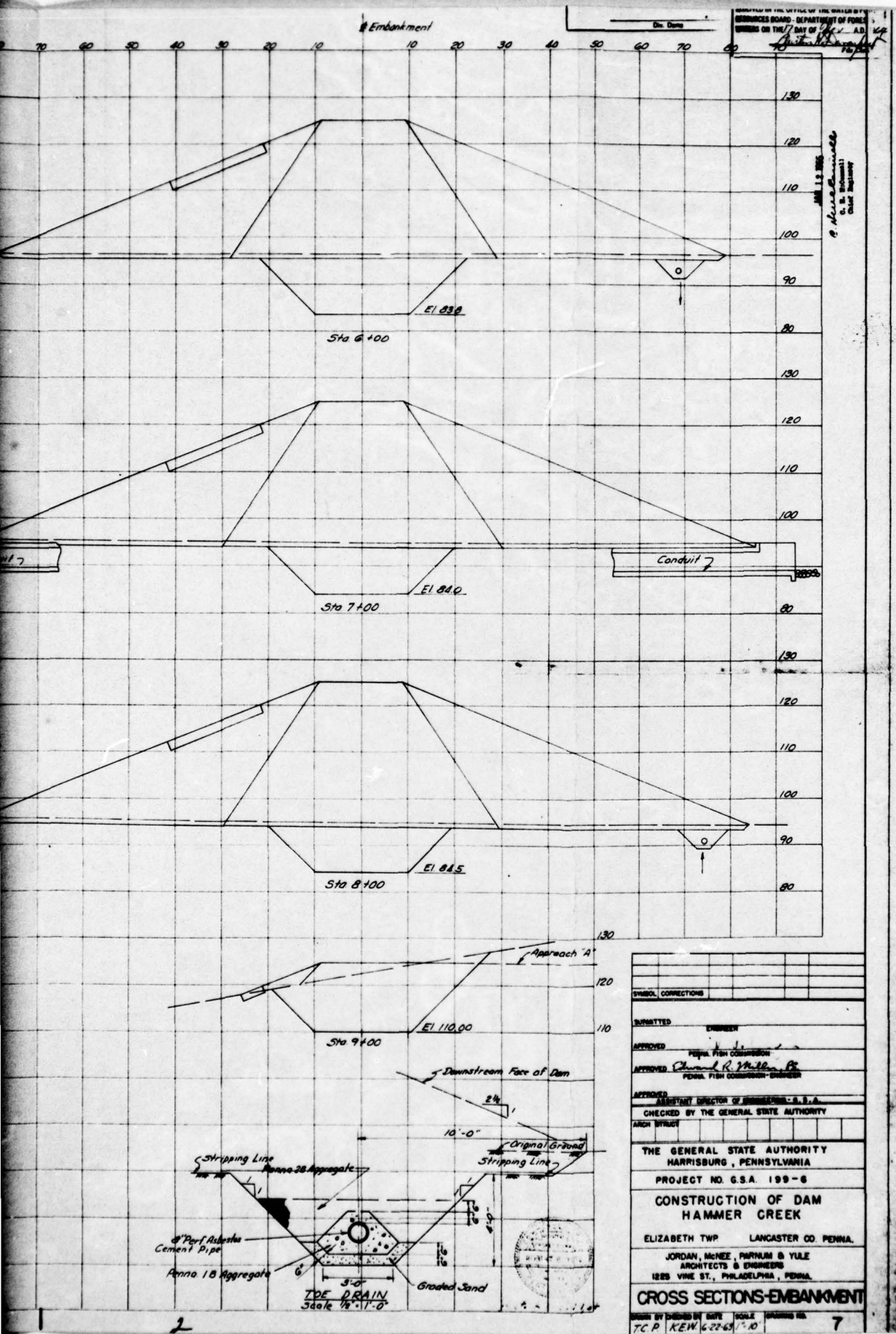
GENERAL PLAN - DAM

DRAWN BY	CHECKED BY	DATE	SCALE	DRAWING NO.
TAB	WEW	1969	As	5

ROBERT B. YULE

PA. 345
PLATE III


℄ Embankment
Forebay El 112.00
Original Ground
Approx Stripping Line
El 103.2
Sta 1+00
Flow
El 120.00
18" Riprap on 6" Crushed Stone or Gravel
Normal Pool El 115.90
El 112.00
Class B Material (Select)
Approx Stripping Line
Impervious Material Cl A
Cut-off Trench Cl A
18'-0"
20'-0"
Top of Embankment El 129.0
6" Topsoil & Seeding
Class B Mat'l
To project to rock or Suitable Impervious Mat'l
El 93.5
El 110.5
Class B Material
Original Ground
Toe Drain (See Detail)
Sta 2+00 (TYPICAL)
Conduit
El 110.5
El 89.5
Sta 3+00
El 86.8
Sta 4+00
El 85.3
Sta 5+00



SYMBOL CORRECTIONS

SUBMITTED ENGINEER

APPROVED PENNA. FISH COMMISSION

APPROVED Edward R. Miller Jr. PENNA. FISH COMMISSION - ENGINEER

APPROVED ASSISTANT DIRECTOR OF ENGINEERING - G.S.A.

CHECKED BY THE GENERAL STATE AUTHORITY

ARCH STRUCT

THE GENERAL STATE AUTHORITY
HARRISBURG, PENNSYLVANIA

PROJECT NO. G.S.A. 199-6

CONSTRUCTION OF DAM HAMMER CREEK

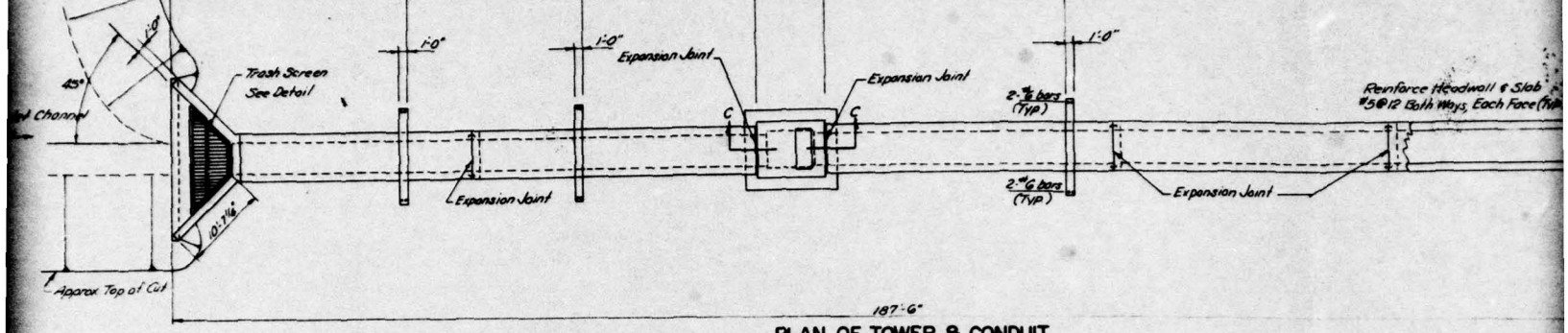
ELIZABETH TWP. LANCASTER CO. PENNA.

JORDAN, McNEE, PARNUM & YULE
ARCHITECTS & ENGINEERS
1225 VINE ST., PHILADELPHIA, PENNA.

CROSS SECTIONS-EMBANKMENT

DRAWN BY	CHECKED BY	DATE	SCALE	DRAWING NO.
TCP	KEW	6-22-69	1"=10'	7

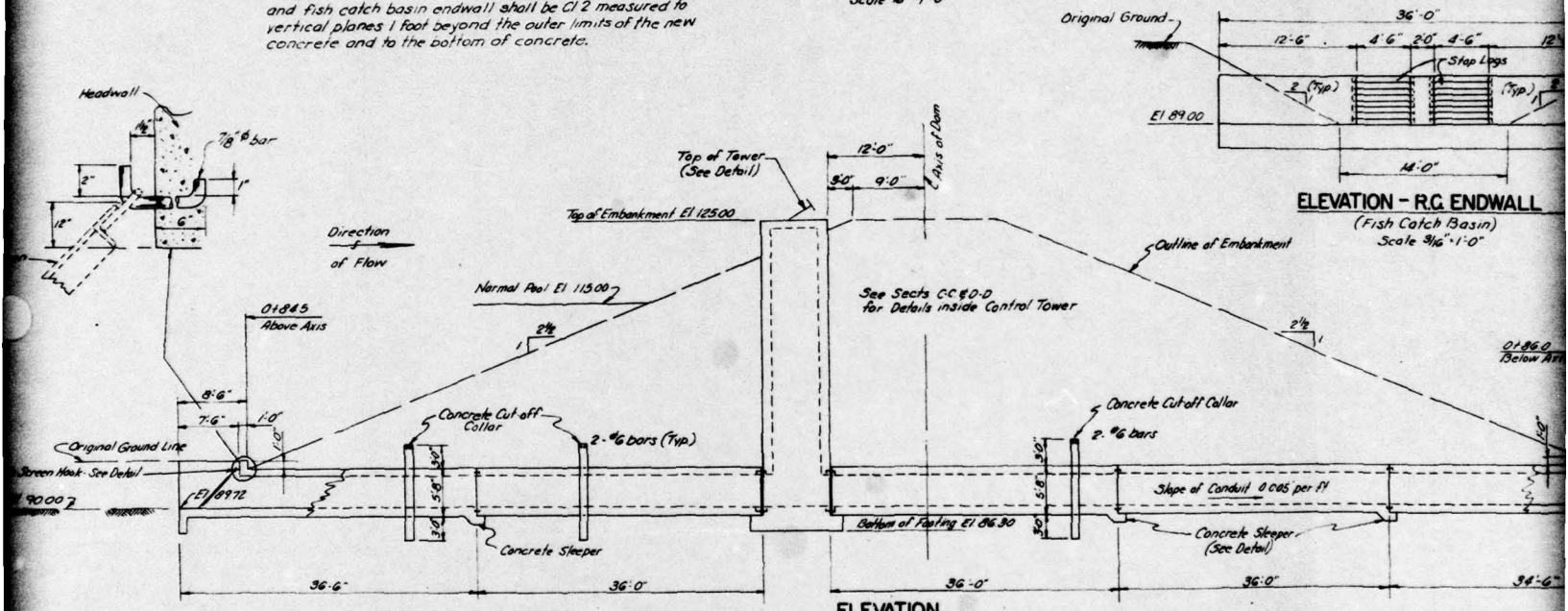
PA. 345
PLATE IV



PLAN OF TOWER & CONDUIT

Scale 1/8" = 1'-0"

Note: All excavation for the conduit and control tower and fish catch basin endwall shall be Cl 2 measured to vertical planes 1 foot beyond the outer limits of the new concrete and to the bottom of concrete.



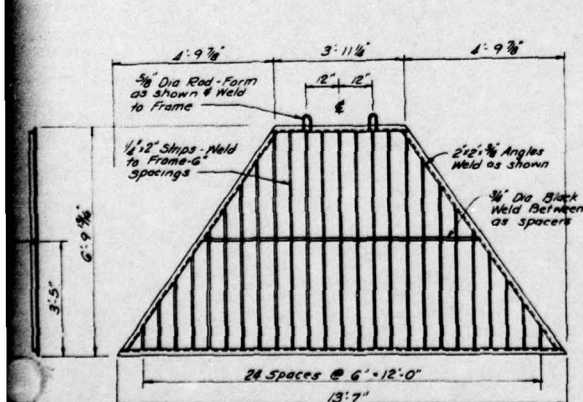
ELEVATION

Scale 1/8" = 1'-0"

ELEVATION - R.C. ENDWALL

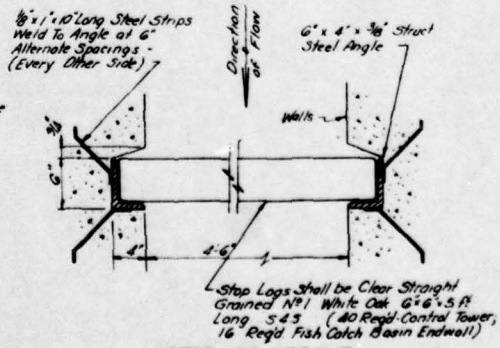
(Fish Catch Basin)

Scale 3/16" = 1'-0"



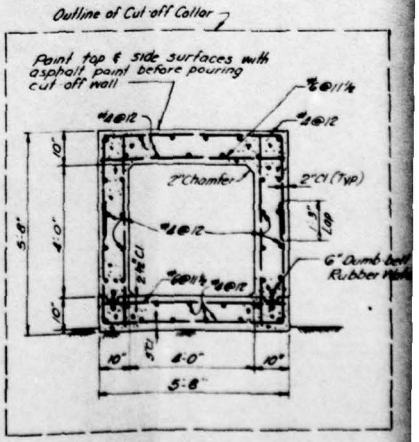
TRASH SCREEN

Scale ½" = 1'-0"



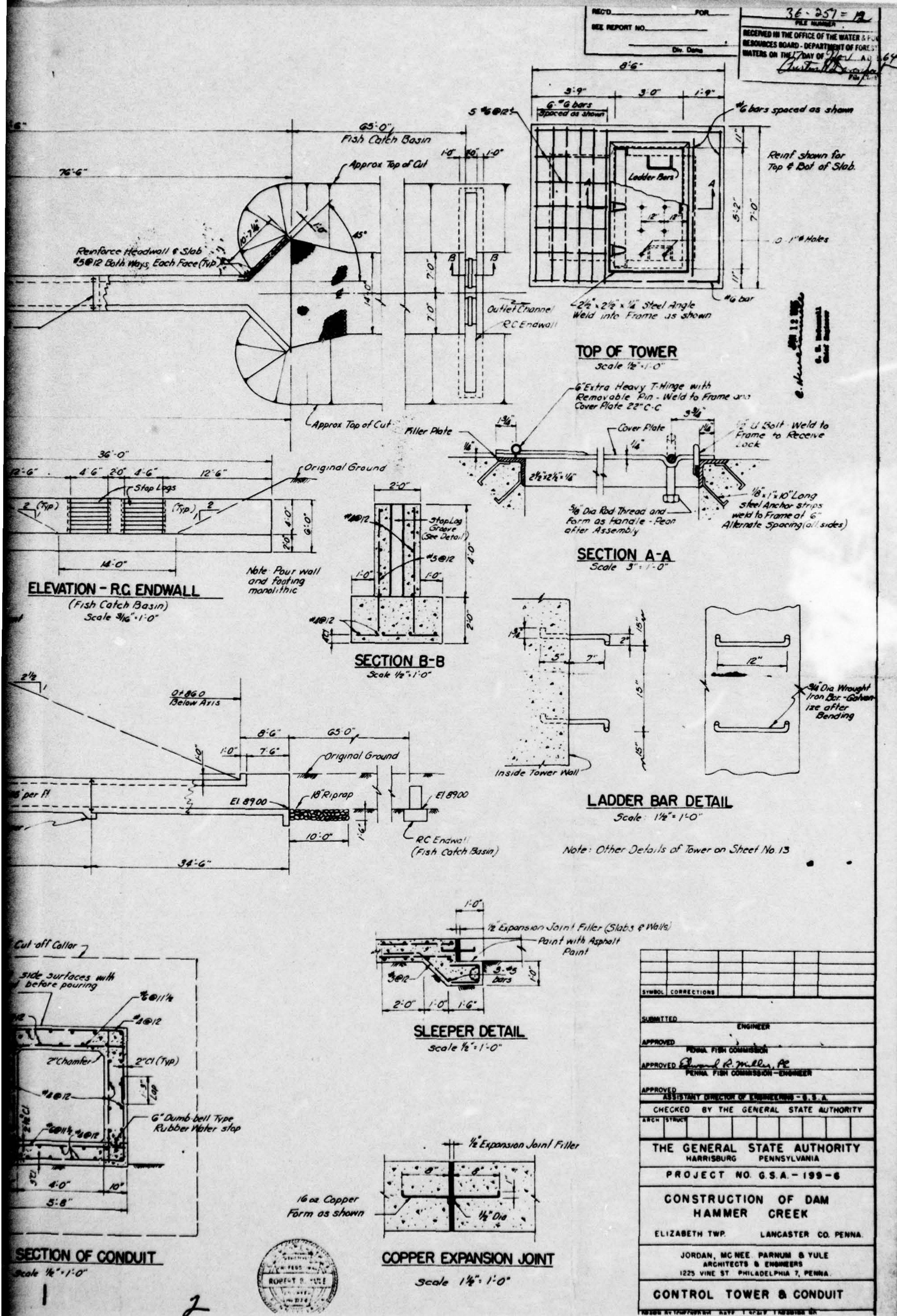
STOP LOG GROOVE

Scale 1½" = 1'-0"



CROSS SECTION OF CONDUIT

Scale ½" = 1'-0"



SYMBOL	CORRECTIONS				

SUBMITTED ____ ENGINEER

APPROVED ____ PENNA. FISH COMMISSION

APPROVED Edward R. Miller, PE — PENNA. FISH COMMISSION - ENGINEER

APPROVED ____ ASSISTANT DIRECTOR OF ENGINEERING - G.S.A.

CHECKED BY THE GENERAL STATE AUTHORITY

ARCH | STRUCT

THE GENERAL STATE AUTHORITY
HARRISBURG PENNSYLVANIA

PROJECT NO. G.S.A. - 199-6

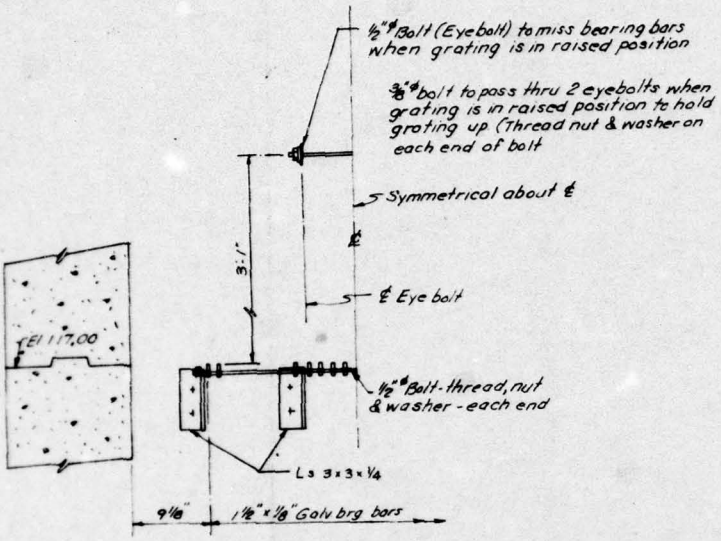
CONSTRUCTION OF DAM
HAMMER CREEK

ELIZABETH TWP. LANCASTER CO. PENNA.

JORDAN, MC NEE PARNUM & YULE
ARCHITECTS & ENGINEERS
1225 VINE ST PHILADELPHIA 7, PENNA.

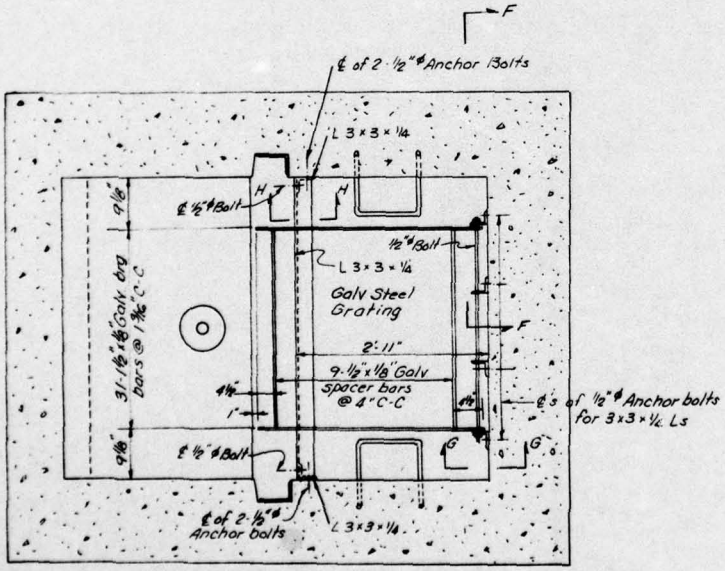
CONTROL TOWER & CONDUIT

PA. 345
PLATE V



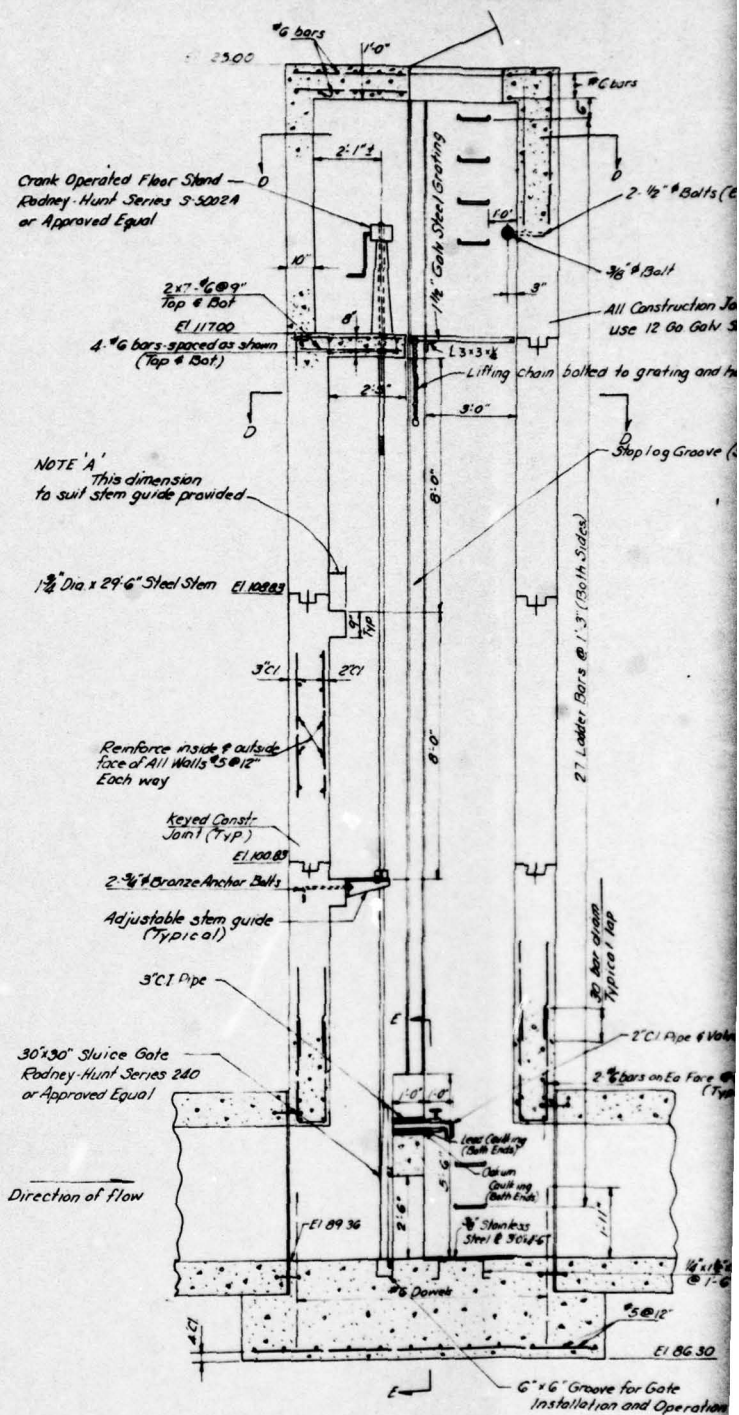
SECTION F - F

Scale : 1½" = 1'-0"



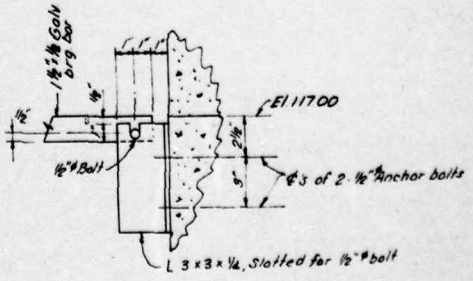
SECTIONAL PLAN AT ELEVATION 117.00

Scale : 1" = 1'-0"



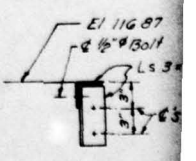
SECTION C-C

Scale ½" : 1'-0"



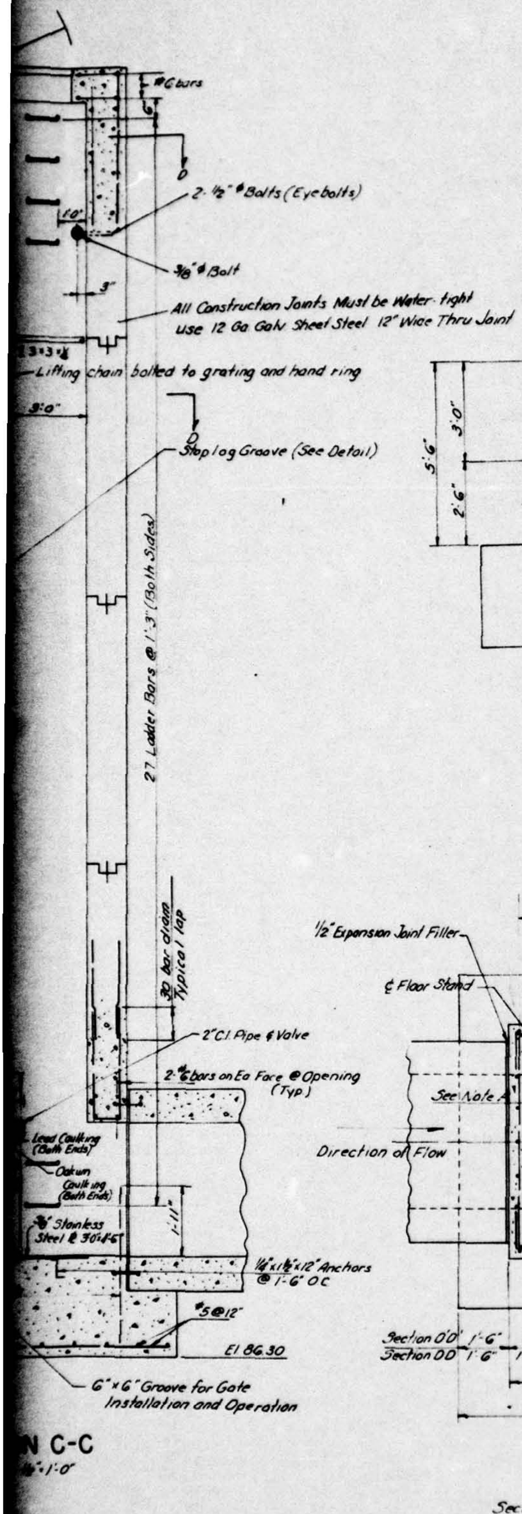
SECTION G-G

Scale : 3" = 1'-0"



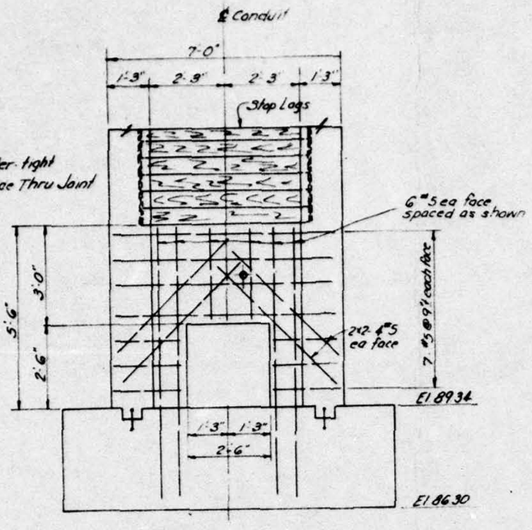
SECTION H

Scale : 1½" = 1'



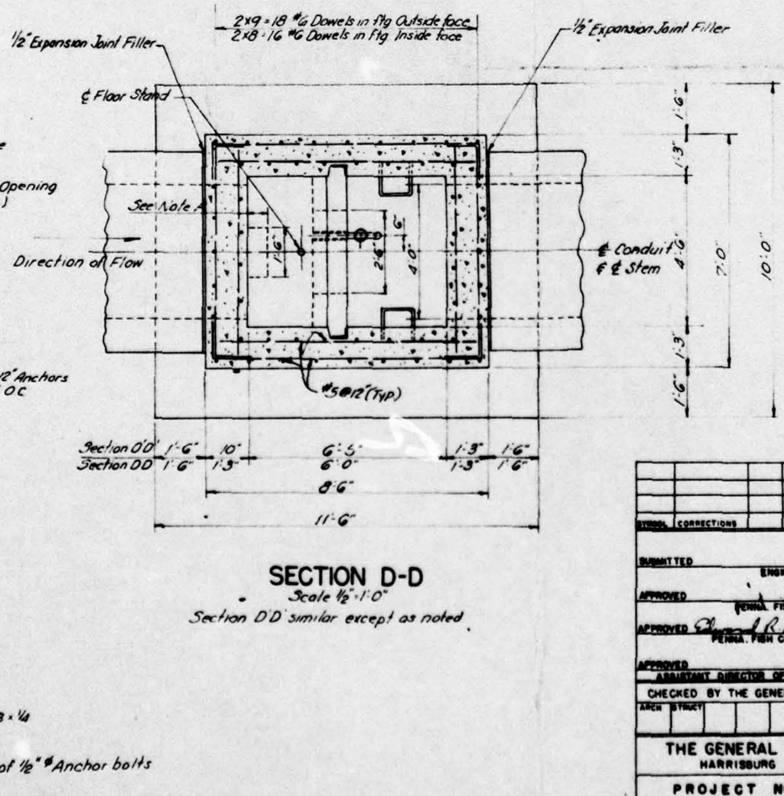
N C-C

1/4"=1'-0"



SECTION E-E

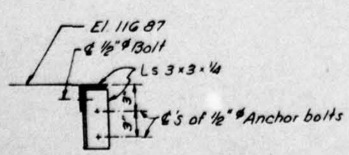
Scale 1/2" = 1'-0"



SECTION D-D

Scale 1/2" = 1'-0"

Section D'D' similar except as noted



SECTION H-H

Scale: 1 1/2" = 1'-0"

SYMBOL	CORRECTIONS				

SUBMITTED ______ ENGINEER

APPROVED ______ PENNA. FISH COMMISSION

APPROVED Edward R. Miller, P.E. PENNA. FISH COMMISSION - ENGINEER

APPROVED ______ ASSISTANT DIRECTOR OF ENGINEERING - G.S.A.

CHECKED BY THE GENERAL STATE AUTHORITY

ARCH | STRUCT

THE GENERAL STATE AUTHORITY
HARRISBURG PENNSYLVANIA

PROJECT NO. G.S.A. - 199 - 6

CONSTRUCTION OF DAM
HAMMER CREEK

ELIZABETH TWP. LANCASTER CO. PENNA.

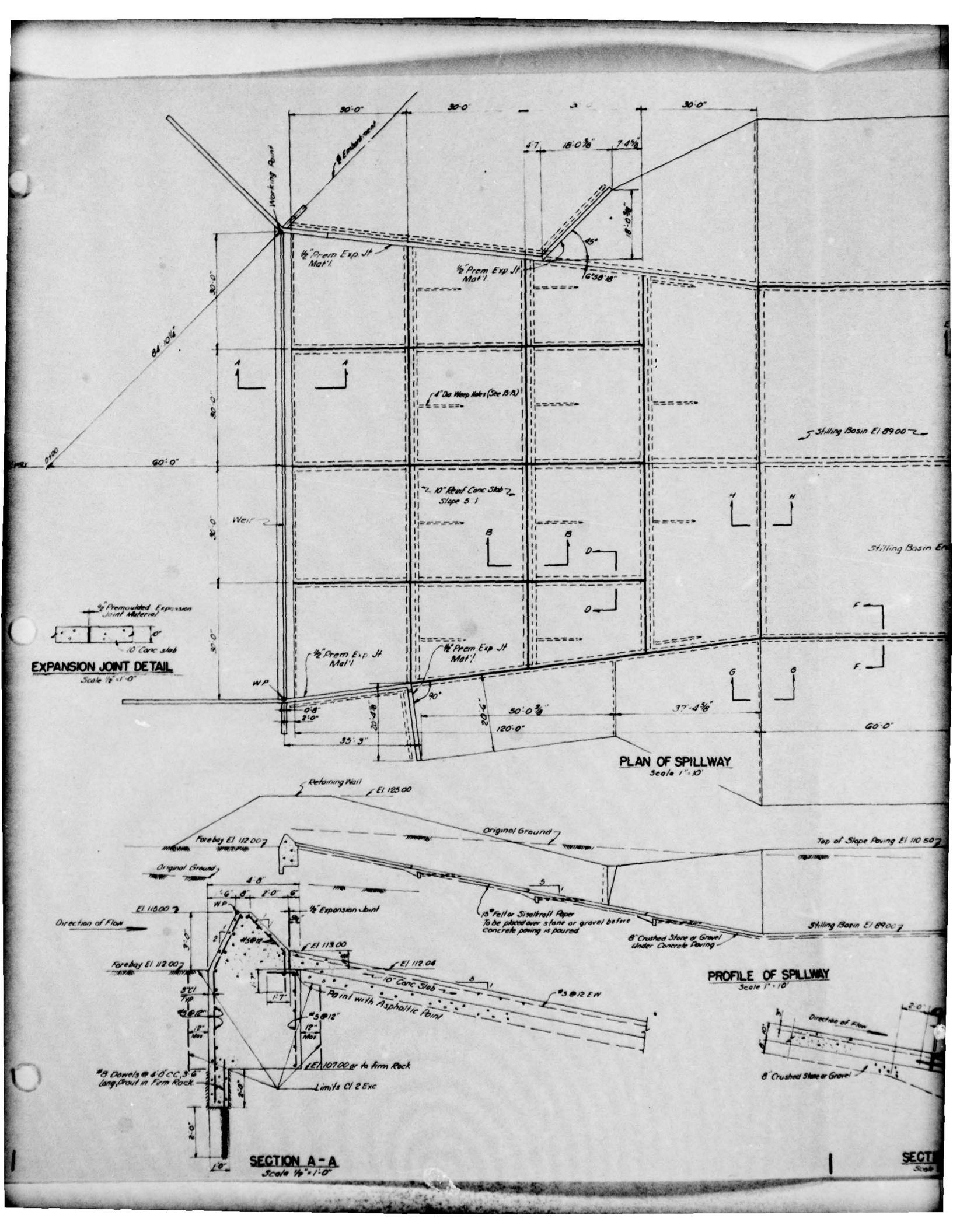
JORDAN, MC NEE, FARNUM & YULE
ARCHITECTS & ENGINEERS
1225 VINE ST. PHILADELPHIA 7, PENNA.

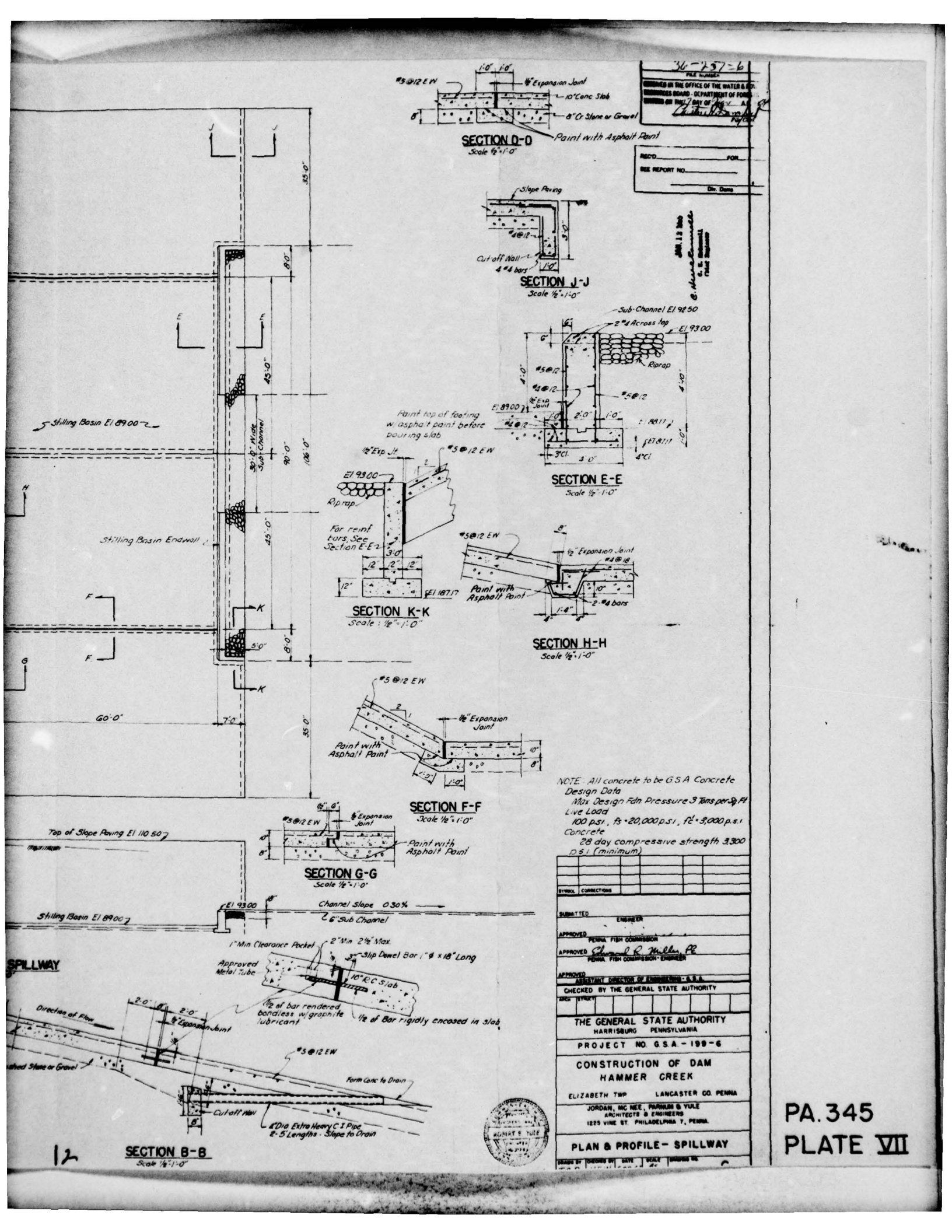
CONTROL TOWER & CONDUIT

DRAWN BY | CHECKED BY | DATE | SCALE | DRAWING NO.

PA. 345
PLATE VI

2


30'-0"
30'-0"
30'-0"
Working Point
℄ Embankment
½" Prem Exp Jt Mat'l
½" Prem Exp Jt Mat'l
45°
4" Dia Weep Holes (See B/A)
Stilling Basin El 89.00
10" Reinf Conc Slab Slope 3:1
Weir
Stilling Basin El
60'-0"
½" Premoulded Expansion Joint Material
10" Conc Slab
EXPANSION JOINT DETAIL
Scale ½"=1'-0"
½" Prem Exp Jt Mat'l
½" Prem Exp Jt Mat'l
WP
90°
50'-0 3/8"
37'-4 5/8"
120'-0"
35'-3"
60'-0"
PLAN OF SPILLWAY
Scale 1"=10'
Retaining Wall
El 125.00
Forebay El 112.00
Original Ground
Original Ground
Top of Slope Paving El 110.50
4'-8"
El 113.00
WP
½" Expansion Joint
Direction of Flow
15" Felt or Sisaltrail Paper To be placed over stone or gravel before concrete paving is poured
Stilling Basin El 89.00
8" Crushed Stone or Gravel Under Concrete Paving
#5@12
El 113.00
Forebay El 112.00
El 112.04
10" Conc Slab
#5@12 E W
Point with Asphaltic Point
#5@12
#8 Dowels @ 4'-0" C.C. 3'-6" Long, Grout in Firm Rock.
EL 107.00 or to firm Rock
Limits Cl 2 Exc
PROFILE OF SPILLWAY
Scale 1"=10'
Direction of Flow
8" Crushed Stone or Gravel
SECTION A-A
Scale ½"=1'-0"



36-257-6
FILE NUMBER

RECEIVED IN THE OFFICE OF THE WATER & POWER RESOURCES BOARD - DEPARTMENT OF FORESTS AND WATERS ON THIS 7 DAY OF MAY A.D.

RECD. FOR
SEE REPORT NO.
Div. Dams

JAN 13 1960
C. E. Maxwell
Chief Engineer

NOTE: All concrete to be G.S.A. Concrete
Design Data
Max. Design Fdn. Pressure 3 Tons per Sq. Ft.
Live Load
100 p.s.f., fs = 20,000 p.s.i., fc' = 3,000 p.s.i.
Concrete
28 day compressive strength 3,300 p.s.i. (minimum)

SYMBOL	CORRECTIONS

SUBMITTED
ENGINEER
APPROVED
PENNA. FISH COMMISSION
APPROVED Edward R. Miller, PE
PENNA. FISH COMMISSION - ENGINEER
APPROVED
ASSISTANT DIRECTOR OF ENGINEERING - G.S.A.
CHECKED BY THE GENERAL STATE AUTHORITY

ARCH.	STRUCT.

THE GENERAL STATE AUTHORITY
HARRISBURG PENNSYLVANIA

PROJECT NO. G.S.A. - 199 - 6

CONSTRUCTION OF DAM
HAMMER CREEK

ELIZABETH TWP LANCASTER CO. PENNA

JORDAN, MC NEE, PARNUM & YULE
ARCHITECTS & ENGINEERS
1225 VINE ST. PHILADELPHIA 7, PENNA.

PLAN & PROFILE - SPILLWAY

DRAWN BY	CHECKED BY	DATE	SCALE	DRAWING NO.

PA. 345
PLATE VII