SUSQUEHANNA RIVER BASIN
EAST BRANCH TUNKHANNOCK CREEK
SUSQUEHANNA COUNTY
PENNSYLVANIA

LEVEL II

ROSS DAM

NDI ID NO. PA-00978
DER ID NO. 58-134

~~BRUCE E. & NANCY W. ROSS~~

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

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

409111

SUSQUEHANNA RIVER BASIN

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PHASE I INSPECTION REPORT

NATIONAL DAM INSPECTION PROGRAM

Prepared By:

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

JUNE 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, DC 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 observatins 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 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 studies, considering the size of the dam, its general condition, and the downstream damage potential.

NDI ID No. PA-00978, DER ID No. 58-134

PHASE I INSPECTION REPORT

NATIONAL DAM INSPECTION PROGRAM

CONTENTS

APPENDICES

PHASE I INSPECTION REPORT

NATIONAL DAM INSPECTION PROGRAM

BRIEF ASSESSMENT OF GENERAL CONDITION
AND
RECOMMENDED ACTION

Name of Dam:	Ross Dam NDI ID NO. PA 00978 DER ID NO. 58-134
Size:	Small (20.7 feet high; 70-acre-feet)
Hazard Classification:	Significant
Owners:	Bruce E. & Nancy W. Ross Village Road Green Village, New Jersey 07935
State Located:	Pennsylvania
County Located:	Susquehanna
Stream:	East Branch of Tunkhannock Creek
Date of Inspection:	25 March 1981

The visual inspection and review of available design and construction data indicate that Ross Dam is in fair condition. The deteriorated condition of the spillway ways and the adjacent low areas of the embankment are the primary deficiencies which require maintenance work to assure the operational safety of this facility. In accordance with the recommended guidelines, the spillway design flood (SDF) for this facility is in the range of the 100 year flood to the 1/2 PMF. Based on the size of this dam and the degree of downstream hazard, the selected SDF is the 100 year flood.

The hydrologic and hydraulic computations indicate that the combination of reservoir storage and spillway discharge capacity will pass the SDF (100 year flood) prior to overtopping the embankment. Therefore, in accordance with the criteria outlined and evaluated in Section 5.5 of this report, the spillway for Ross Dam is considered to be adequate.

The following recommendations should be implemented by the owner without delay:

a. Necessary remedial measures should be implemented under the guidance of a qualified engineer to repair the deteriorated spillway walls and fill in the adjacent low areas of the embankment.

b. The control rod for the outlet works slide gate control should be repaired prior to maintaining a permanent pool.

c. Remove brush from embankment.

d. The pipes on the spillway crest should be removed.

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

f. 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.

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

APPROVED BY:

DEPARTMENT OF THE ARMY
BALTIMORE DISTRICT, CORPS OF ENGINEERS

JAMES W. PECK
Colonel, Corps of Engineers
Commander and District Engineer

DATE: 3 Aug 81

ROSS DAM

PHASE I INSPECTION REPORT

NATIONAL DAM INSPECTION PROGRAM

ROSS DAM

NDI ID No. PA 00978
DER ID No. 58-134

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. Ross Dam is an earthfill structure approximately 20.7 feet high and 286 feet in length (including spillway). The spillway is an uncontrolled concrete ogee weir located near the right abutment, and has a length of 35 feet between two concrete walls. A concrete stilling basin is located immediately downstream of the spillway weir. The outlet works consist of a 12 inch corrugated metal conduit with a slide gate control at the intake.

b. Location: Herrick Township, Susquehanna County, Pa.
U.S.G.S. Quadrangle - Clifford, Pa.
Latitude 41° 44.3'; Longitude 75° 33.7'
Refer to Plates I & II, App. E

c. Size Classification: Small: Height-20.7 feet, Storage-70 acre feet

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

e. Ownership: Bruce E. & Nancy W. Ross
Village Road
Green Village, New Jersey 07935

f. Purpose: Future Land Development

g. Design and Construction History:

The dam was designed by Mr. L. F. Burlein, P.E., Honesdale, Pa.

Construction was completed in November 1974.

A final inspection by PennDER on 9 December 1974 found the dam to have been constructed in a generally satisfactory manner; however, several items were noted for correction. The primary items noted included a need for riprap in the wasteway channel, a need to remove the fishscreen posts located across the spillway, and a need to get proper compaction of the backfill behind the spillway retaining walls. There is no evidence that the owner ever corrected these items.

h. Normal Operating Procedure

At the present time, the outlet works gate control is left in an op n position and the lake is essentially drained except during periods of heavy rainfall. Inflow in excess of the outlet works capacity is stored until reaching the spillway crest. The excess will then flow over the uncontrolled ogee weir.

1.3 Pertinent Data

NOTE: Elevations are based on an assumed elevation of 1820.0 for the invert of the intake pipe. This datum was inferred from the elevations shown on the U.S.G.S. quad sheet (Plate E-II). The elevations shown on the design drawings are based on some other datum.

a. Drainage Area (square miles)

From files:	0.85
Computed for this report:	0.85
Use:	0.85

b. Discharge at Damsite (cubic feet per second)

Maximum known flood	Unknown
Outlet works with maximum pool (El. 1836.6)	8
Spillway with maximum pool (El. 1836.6)	2,000

c. Elevations (feet above mean sea level)

Top of Dam	
Design	unknown
Existing (Field)	1836.6
Normal Pool	1820.0

Spillway Crest	1830.0
Outlet Works	
Upstream invert	1820.0
Downstream invert	1815.9
Streambed at toe	1815.9

d. Reservoir Length (feet)

Normal pool (El. 1820.0)	0
Spillway crest (El. 1830.0)	1,200
Maximum pool (El. 1836.6)	2,200

e. Storage (acre-feet)

Normal pool (El. 1820.0)	0
Spillway crest (El. 1830.0)	13
Maximum pool (El. 1836.6)	70

f. Reservoir Surface (acres)

Normal pool (El. 1820.0)	0
Spillway crest (El. 1830.0)	4
Maximum pool (El. 1836.6)	15

g. Dam

Note: Refer to plates in Appendix E for plans and sections.

Type	Homogeneous earthfill
Length	286 feet (including spillway)
Top Width	16.5 feet
Height	20.7 feet
Side Slopes	
Upstream	1V:2.5H (exist.); 1V:3H (design)
Downstream	1V:2H (exist.); 1V:2.5H (design)
Zoning	None

	Cutoff	Trapezoidal trench 4 feet deep, 8 feet wide bottom
	Grouting	None
h.	Outlet Works.	
	Type	18 inch (Design) 12 inch (Existing)
	Closure	Slide gate mounted on upstream end.
i.	Spillway	
	Type	Concrete ogee weir
	Location	Near right abutment
	Length	35 feet (gross) 31.7 feet (effective)
	Crest Elevation	1830.0 msl
	Freeboard	6.6 feet
	Approach Channel	Reservoir
	Downstream Channel	Earth, cut in natural ground; dike on left

SECTION 2

ENGINEERING DATA

2.1 Design.

The available data for Ross Dam consist of files provided by PennDER. Information available includes a permit application report, dated 27 August 1970, with a general description of the facility, PennDER inspection reports and various related correspondence. Specifications and drawings providing cross-sections, profiles and details of the dam are also available.

2.2 Construction.

Information concerning construction of the dam is limited to the correspondence contained in the PennDER files which indicated that the dam was built in general accordance with the plans and specifications.

2.3 Operation.

No formal records of operation or maintenance exist. The owner currently keeps the lake drawn down, with the exception of periods of heavy rainfall when inflow exceeds the outlet works capacity.

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 Ross Dam is fair. Noteworthy deficiencies are described below. The visual inspection checklist and field sketch are provided in Appendix A. Photographs taken during the inspection are reproduced in Appendix C.

On the day of the inspection, no water was impounded and all inflow was discharging through the outlet works. The owner was not present during the inspection; however, his son, who lives nearby, was interviewed. He stated that no water is stored in the reservoir except briefly when the inflow exceeds the capacity of the outlet works. Mr. John Chernesky of PennDER was present during the inspection.

b. Embankment. The 16.5 foot wide embankment crest is approximately four feet higher than originally designed. The low point is located adjacent to the left spillway wall. The embankment is actually lower than the top of the wall at this point; however, flow is prevented from passing behind the spillway wall by a seepage cutoff wall which is equal in height to the spillway wall. According to design drawings, the seepage cutoff wall extends nine feet into the embankment. The horizontal alignment of the crest is good. Small trees and brush are growing on the upstream face above the spillway crest elevation. There is no riprap on the upstream face, although it was specified in the design drawings. No sloughing is evident on any portion of the embankment. The upstream slope is 1V:2.5H except near the toe where the slope flattens to 1V:4H. The downstream slope is 1V:2H. The embankment is reported to contain a toe drain with a discharge pipe through the outlet conduit headwall. This pipe was not found.

c. Appurtenant Structures. The spillway consists of a concrete ogee overflow weir with a concrete stilling basin and concrete walls. The walls extend 17 feet upstream and downstream of the weir. Ten steel pipes, 4 inches in diameter, are spaced across the crest of the weir. The spillway walls are severely cracked and spalled in several places. The seepage cutoff walls are broken at their junction with the spillway walls. The approach to the spillway is the reservoir and there are no obstructions. Downstream of the stilling basin the channel is cut in earth. An earth dike along the left side of the discharge channel protects the downstream face of the embankment from spillway flows. Approximately 200 feet downstream of the weir, the channel narrows to 12 feet in width and bends sharply to the left to join the original streambed. There is no erosion protection in the bottom or on the sides of the channel.

The outlet works appears to have been constructed in general accordance with the plans shown in Appendix E except that the outlet conduit is only 12 inches in diameter. The slide gate is in the open position. The control rod for this gate extends to the crest of the dam along the upstream slope.

Although supported in several locations along its length, the control rod is severely bent in two locations below the spillway crest. The cause of the deformation is reported to be ice forces. In this present condition the gate is essentially inoperable. The 12 inch corrugated metal conduit and the outlet structure are in good condition. The discharge channel is the original streambed with trees and brush along the banks.

d. Reservoir Area. The reservoir slopes are partially wooded and flat. There is no residential development on the reservoir slopes.

e. Downstream Channel. The dam is located on the East Branch of Tunkhannock Creek. The initial 2,500 feet of channel below the dam are confined with moderate side slopes and a narrow floodplain. The floodplain increases slightly in width for the next 0.5 mile before narrowing again and passing under Pennsylvania Legislative Route 57044 and Township Route T-470 approximately 1.4 miles downstream of the dam. One house is located within 40 feet of the streambed just upstream of LR 57044. The first floor of this structure is approximately 15 feet above streambed. About 4,000 feet further downstream, the channel is again confined and flows through an uninhabited area for the next two miles before crossing Legislative Route 57043. Two houses with first floors located six feet above streambed are within 75 feet of the stream and just downstream of L.R. 57043. Failure of Ross Lake Dam could cause property damage and the loss of a few lives at the first downstream residence due to backwater effects from the roadway crossings. This flood flow may also result in damage to these roads which are heavily traveled access roads to the Elk Mountain Ski Area and associated residential development. Additional property damage and loss of life may occur at the second downstream damage area should the dam fail. The downstream development is shown on Plate E-II. A significant hazard classification is appropriate for Ross Dam.

f. Evaluation. Since no permanent pool is presently impounded, this facility is evaluated as a dry lake. The primary concerns for the safety of this facility are the poor condition of the spillway walls and the low areas behind the left spillway wall. If a permanent pool is maintained in the future, the sluice gate control rod should be replaced such that it is protected from damage due to ice loading.

SECTION 4

OPERATIONAL PROCEDURES

4.1 Normal Operating Procedure. The lake is normally dry with inflow passing through the 12 inch conduit. The invert of the intake is at elevation 1820. Flow in excess of the conduit capacity would be stored until reaching the spillway crest, elevation 1830.0. Inflows would then be discharged through the emergency spillway.

4.2 Maintenance of Dam. The condition of the dam and its appurtenances as observed by the inspection team was fair. The closure facility for the 12 inch conduit has been damaged and does not operate as designed. In addition, the spillway walls and crest have undergone deterioration and cracks have developed. No formal maintenance manual exists.

4.3 Maintenance of Operating Facilities. Operation of the outlet works slidegate closure is restricted due to the bent operating rod.

4.4 Warning System. No formal warning system exists.

4.5 Evaluation. Maintenance of the facility appears to be insufficient. Spalled and cracked areas of the spillway crest and walls should be repaired. The operating mechanism for the outlet works should be repaired to operate as designed before a full reservoir is maintained. In addition, a formal warning system for the protection of downstream inhabitants should be developed. Included in the plan should be provision for around-the-clock surveillance of the facility during periods of unusually heavy precipitation.

SECTION 5

HYDRAULICS AND HYDROLOGY

5.1 Design Data. No design reports, calculations or miscellaneous design data are known to exist for the facility; however, a few drawings of the facility were in PennDER files. In a report upon the application of the dam, a spillway value of 1225 cfs was computed as a minimum value acceptable. As noted in Appendix D, the spillway capacity exceeds this minimum value.

5.2 Experience Data. Records of reservoir levels and/or spillway discharges are not available. The dam was completed in 1974 and no major flooding at the facility has been experienced. No records of performance are available.

5.3 Visual Observations. On the date of the inspection, no conditions were observed that would prevent the facility from operating as designed during a flood event. The significant spalling and cracking of the concrete spillway and walls should be repaired. See Appendix C for photographs of the outlet works closure mechanism and the spillway area.

5.4 Method of Analysis. The facility has been analyzed in accordance with procedures and guidelines established by the U.S. Army Corps of Engineers, Baltimore District, for Phase I hydrologic and hydraulic evaluations.

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 Ross Dam ranges between the 100 year flood and $1/2$ Probable Maximum Flood (PMF). This classification is based on the relative size of the dam (small) and the potential hazard of failure to downstream development (significant). Due to the small storage (less than 100 ac-ft) and small height (approximately 21 feet), the SDF selected is the 100 year flood.

b. Results of the Analysis. The 100 year flood peak is derived by averaging the peak flow value obtained from two regression equations. The first regression equation is from Bulletin 13, Floods in Pennsylvania Water Resources Bulletin. Guidelines are provided to determine the peak value by use of regional statistical data. The second regression equation is from the Hydrologic Study, Tropical Storm Agnes, North Atlantic Division, U.S. Army Corps of Engineers, 1975. Guidelines are provided to determine the flood peak by use of map coefficients and logarithmic equations. The following results are obtained.

100 year flood peak	CFS
Bulletin 13	500
North Altantic Division- Tropical Storm Agnes	1000
Average 100 year flood peak	750

To determine the adequacy of the spillway, the average value for the 100 year flood is compared against the maximum outflow at low point top of dam. If the maximum outflow exceeds the 100 year average peak value derived above, then the spillway is rated adequate. If, however, the 100 year average peak value exceeds the maximum outflow at top of dam, the spillway is rated inadequate. Results are as follows:

	CFS
Maximum Outflow at top of dam -	2000
Average 100 year flow peak	750

5.6 Spillway Adequacy. Under existing conditions, Ross Dam can pass the 100 year flood peak value. Since this structure can pass the selected SDF (100 year flood), the spillway is rated adequate.

SECTION 6

STRUCTURAL STABILITY

6.1 Evaluation of Structural Stability.

a. Visual Observations.

(1) Embankment. Visual observations of Ross Dam indicate that the dam is in fair condition. The embankment is constructed of onsite glacial material consisting of silty, clayey, gravelly sand. The dam is approximately 20.7 feet high, has a crest width of 16.5 feet, a downstream slope of 2H:1V and upstream slope of 2.5H:1V. Brush covers the upstream slope above the spillway elevation. Only a few pieces of riprap were found on the upstream slope. No seepage was observed since a reservoir was not being retained. The embankment adjacent to the left spillway wall is low. This is probably due to settlement; PennDER noted in 1974 that this area appeared poorly compacted. Erosion was not found to be a problem, but continued settlement could concentrate runoff and cause erosion.

(2) Appurtenant Structures

The spillway is a 35 foot long concrete structure that has an ogee weir and a stilling basin. Ten 4-inch pipes are set into the spillway weir for securing a fish screen. Spillway flow could be restricted by floating debris. The concrete spillway walls are broken and spalled. This appears to be a problem caused by poor quality concrete.

The outlet works consists of a 12 inch CMP concrete encased. It has a slide gate closure operated by a hand wheel from the crest. Over the slide gate is a trash rack. With the exception of the bent operator rod, the outlet appears to be in good condition.

b. Design and Construction Data.

(1) Embankment. Design drawings and specifications were produced by Mr. L. F. Burlein, a civil engineer. The dam was designed to have a trapezoidal cutoff trench 8 feet wide at the bottom and 4 feet deep. The cutoff trench was to be filled and the embankment constructed of homogeneous impervious material. A gravel filled toe drain with a 6 inch diameter perforated CMP shown on Plate E-IV could not be located during the inspection. The embankment was designed to have a 14 foot wide crest, a downstream slope of 2.5H:1V, upstream slope of 3H:1V and a height of 17 feet.

(2) Appurtenant Structures. Drawings and specifications are as stated in 6.1b(1). No notable differences were observed during the inspection from the design, except the change in size of the outlet conduit and gate.

c. Operating Records. None.

d. Post Construction Changes. No formal construction changes are recorded. The embankment dimensions vary from design dimensions in crest width, slopes, and height. Several noted differences from the design drawings were observed. There is essentially no riprap on the upstream embankment slope, and the spillway channel is not riprapped. The toe drain from the left abutment to the outlet works outlet was apparently changed or deleted. The embankment is about 4 feet higher than designed.

e. Seismic Stability. The dam is located in Seismic Zone 1. On the basis of visual observations, it is 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 Ross Dam is in fair condition. The deteriorated condition of the spillway walls and the adjacent low areas of the embankment are the primary deficiencies which cause concern for the safety of this facility. In accordance with the recommended guidelines, the spillway design flood (SDF) for this facility is in the range of the 100-year flood to the 1/2 PMF. Based on the size of the dam and the degree of downstream hazard, the selected SDF is the 100-year flood.

The hydrologic and hydraulic computations indicate that the combination of reservoir storage and spillway discharge capacity will pass the SDF (100 year flood) prior to overtopping the embankment. Therefore, in accordance with the criteria outlined and evaluated in Section 5.5, the spillway for Ross Dam is considered to be adequate.

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 no need for additional studies at the present time.

7.2 Recommendations.

a. Necessary remedial measures should be implemented under the guidance of a qualified engineer to repair the deteriorated spillway walls and fill in the adjacent low areas of the embankment.

b. The control rod for the outlet works slide gate control should be repaired prior to maintaining a permanent pool.

c. Remove brush from the embankment.

d. The pipes on the spillway crest should be removed.

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

f. 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.

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

APPENDIX A

CHECKLIST - VISUAL INSPECTION

Check List
Visual Inspection
Phase 1

Name Dam Ross Dam DER ID No. 58-134 County Susquehanna State Pennsylvania

Date(s) Inspection 25 Mar 81 Weather Ptly Cloudy Temperature 40's

Pool Elevation at Time of Inspection 1820.0 M.S.L. Tailwater at Time of Inspection 1816.2 M.S.L.

Inspection Personnel:

J. Bianco, C.O.E.
E. Hecker, C.O.E.
J. Chernesky, PennDER
B. Cortright, C.O.E.
J. Evans, C.O.E.

B. Cortright Recorder

EMBANKMENT

VISUAL EXAMINATION OF	OBSERVATIONS
Any Noticeable Seepage	None; no water impounded
Junction of Embankment with:	
Abutments	Abutments - Low at left side; no cracking or sloughing
Spillway	Spillway - Low behind spillway walls
Surface Cracks	None.
Crest Alignment:	
Vertical	Vertical - Crest about 4 feet above spillway walls except low at walls and left abutment.
Horizontal	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 of embankment slope near spillway due to lack of vegetation
Riprap	None except for bedding and a few stones on u/s slope.
Miscellaneous	Small trees and brush on upstream slope Brush on downstream slope.
Instrumentation	None.
Staff Gage and Recorder	None.

OUTLET WORKS

VISUAL EXAMINATION OF	OBSERVATIONS
Conduit	12" Corrug. metal; fair condition
Intake Structure	Conc. slab with trashrack; good condition.
Emergency Gate	Slide gate on surface of intake structure. Control rod bent; gate inoperable.
Outlet Structure	Concrete headwall; fair condition.
Outlet Channel	Original streambed; earth & rock with trees and brush on sides.

SPILLWAY

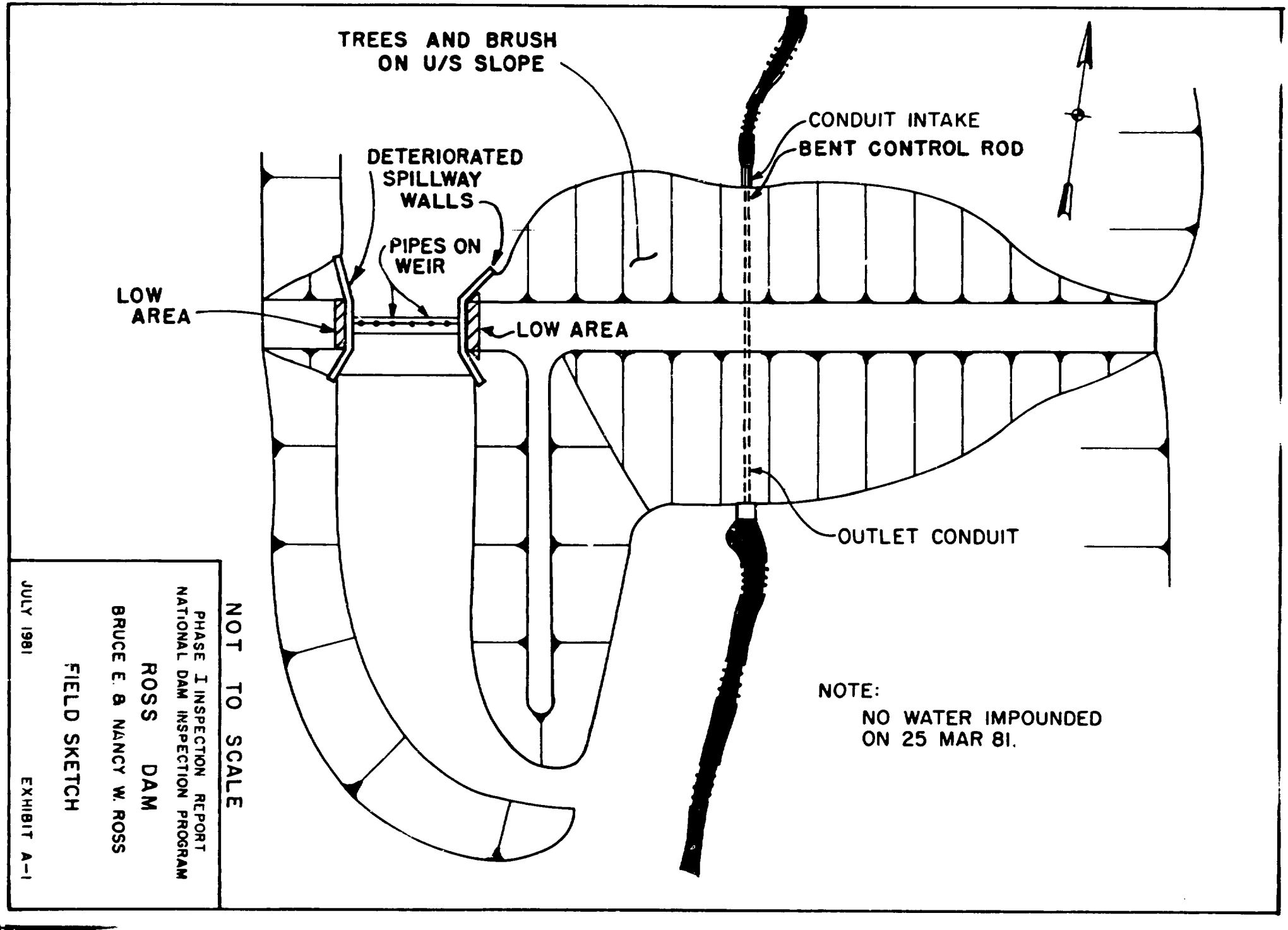
VISUAL EXAMINATION OF	OBSERVATIONS
Concrete Weir and Walls	Ogee crest; good condition. Ten pipes (4" diam.) across crest. Walls cracked & spalled; poor quality concrete.
Approach Channel	Reservoir; unobstructed.
Discharge Channel	Cut in earth; dike on left side. Some erosion of bottom and sides.
Bridge and Piers	None.

RESERVOIR

VISUAL EXAMINATION OF	OBSERVATIONS
Slopes	Flat; appear stable. Minor sloughing along left bank near dam. Apparently due to frost action.
Sedimentation	None; no water impounded except when capacity of outlet conduit exceeded.

DOWNSTREAM CHANNEL

VISUAL EXAMINATION OF	OBSERVATIONS
Condition (Obstructions, etc.)	Brush adjacent to streambed. Crosses LR 57044 & Township Route T-470 approx. 1.4 miles downstream of dam.
Slopes	Moderate slopes initially; then mild
Approximate Number of Homes	One house 1.4 miles d/s. First floor 15 feet above streambed. Two houses 4 mi. d/s w/ff 6 ft. above streambed.



NOT TO SCALE

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

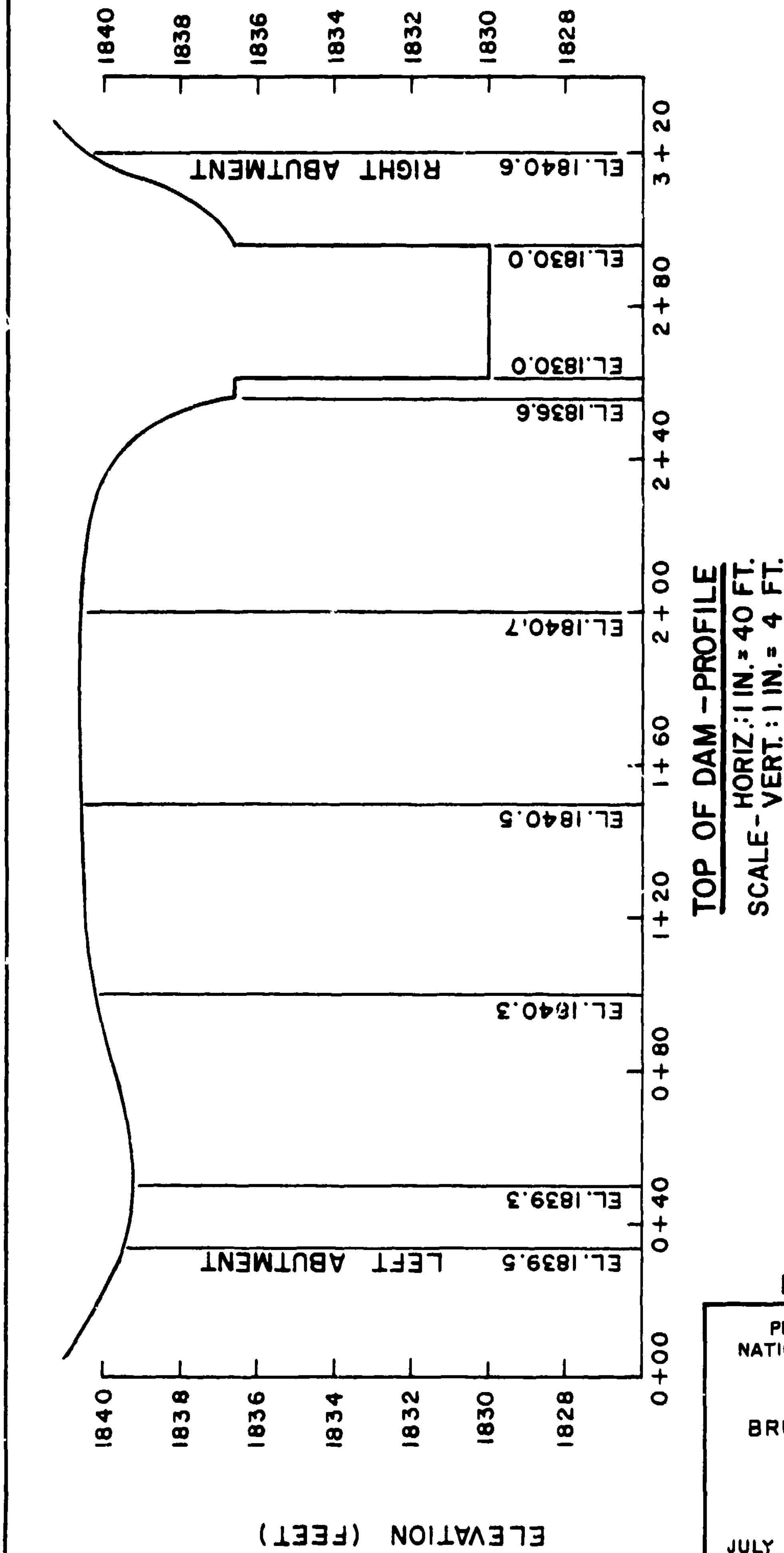
ROSS DAM

BRUCE E. & NANCY W. ROSS

FIELD SKETCH

JULY 1981

EXHIBIT A-1



NOT TO SCALE

PHASE I INSPECTION REPORT
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ROSS DAM

BRUCE E. & NANCY W. ROSS

PROFILE

JULY 1981 EXHIBIT A-2

APPENDIX B

CHECKLIST - ENGINEERING DATA

Check List
Design, Construction, Operation
Phase I

NAME OF DAM - Ross Dam

ID # 70-58-134

ITEM	REMARKS
As-built Drawings	Cross-Section and Profile of Dam. Reservoir area, spillway section data. See Appendix E of this report.
Regional Vicinity Map	U.S.G.S. Clifford, PA., quadrangle sheet, 7-1/2 minute quad sheet, see Appendix E, Plate E-II.
Construction History	Dam was designed by Mr. L. F. Burlein, and was completed in November 1974.
Typical Sections of Dam	See Appendix E, for cross sections.
Outlets - Plan Details Constraints Discharge Ratings	Outlet plans are shown in Appendix E. The 12 inch CMP has been built with an inclined gate control valve, having a positive upstream closure.
Rainfall/Reservoir Records	None.

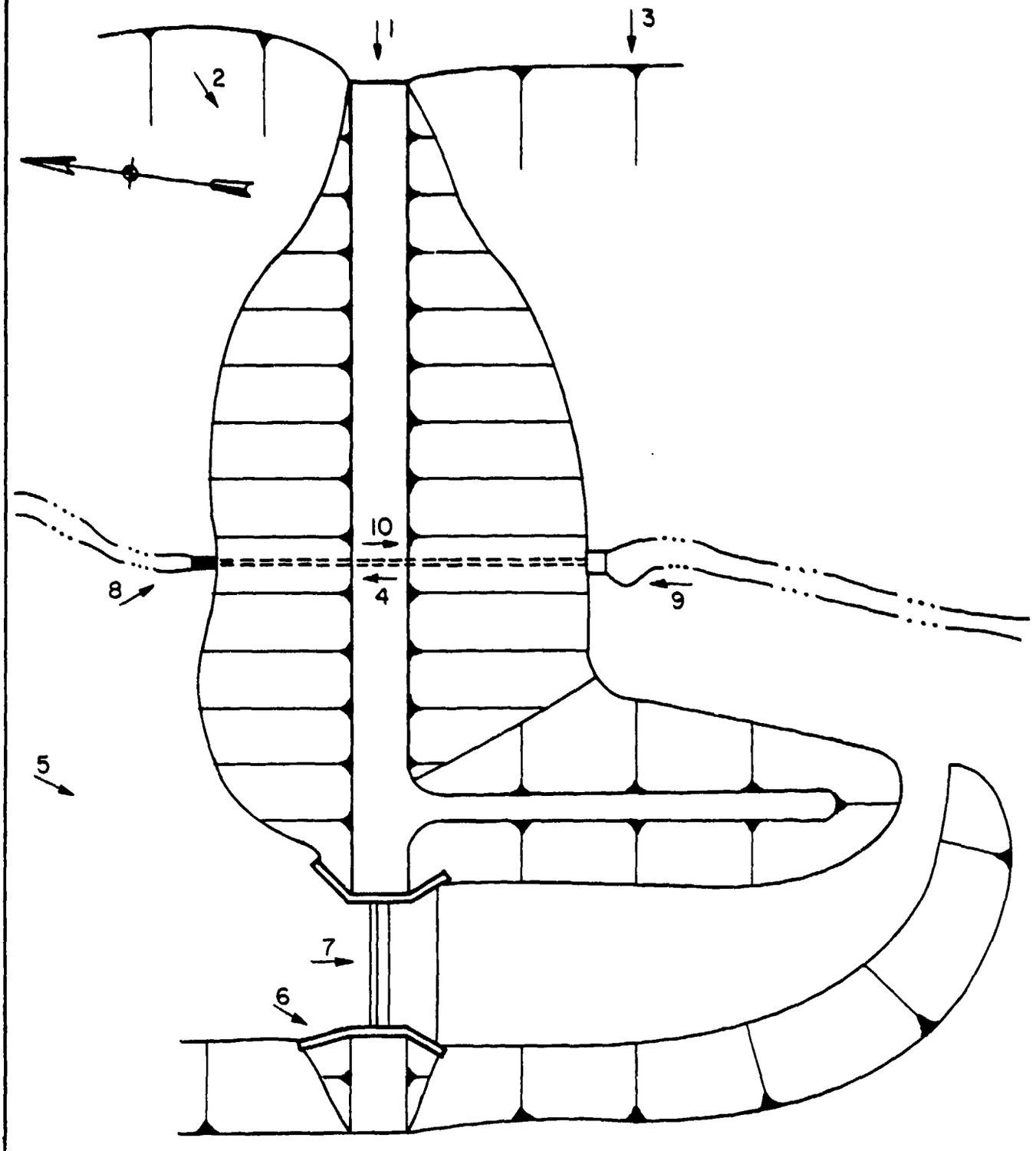
ITEM	REMARKS
Design Reports	Hydrologic data from U.S. Department of Agriculture (SCS) was found in the PennDER files.
Geology Reports	Soil Analysis performed by the engineer on the design of the facility. This can be found in the PennDER files.
Design Computations Hydrology and Hydraulics Dam Stability Seepage Studies	Hydrologic data from U.S. Department of Agriculture (SCS) No other data.
Materials Investigations Boring Records Laboratory Field	Borings are described in detail in report entitled Specifications for Construction of Earthen Dam and Concrete Spillway Test Holes are Indicated on Design Drawings, (See Plate E-VI)
Post-Construction Surveys of Dam	None.
Borrow Sources	At site location.

ITEM	REMARKS
Monitoring Systems	None.
Modifications	None.
High Pool Records	None.
Post-Construction Engineering Studies and Reports	None reported.
Prior Accidents or Failure of Dam Description Reports	N/A.
Maintenance Operation Records	None.

ITEM	REMARKS
Spillway Plan Sections Details	Spillway section and details are shown in Appendix E of this report. This information is from PennDER files.
Operating Equipment Plans & Details	N/A.
Specifications	None.
Miscellaneous	PennDER Inspection Reports, photographs of embankment during construction.

APPENDIX C

PHOTOGRAPHS



NOT TO SCALE

3 PHOTOGRAPH IDENTIFICATION NUMBER

← LOCATION AND ORIENTATION OF CAMERA

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

ROSS DAM

BRUCE E. & NANCY W. ROSS

PHOTOGRAPH LOCATION PLAN

JULY 1981 EXHIBIT C-1

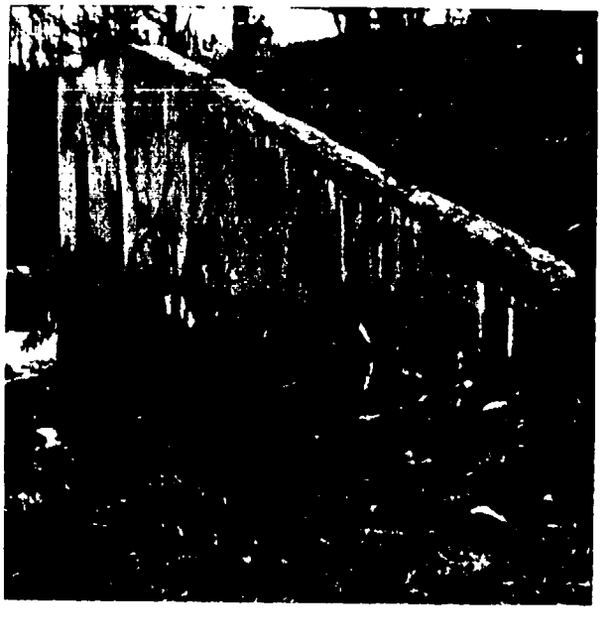
1. West and right abutments.

2. Upstream face. Lower limit of brush is at same elevation as spillway crest.

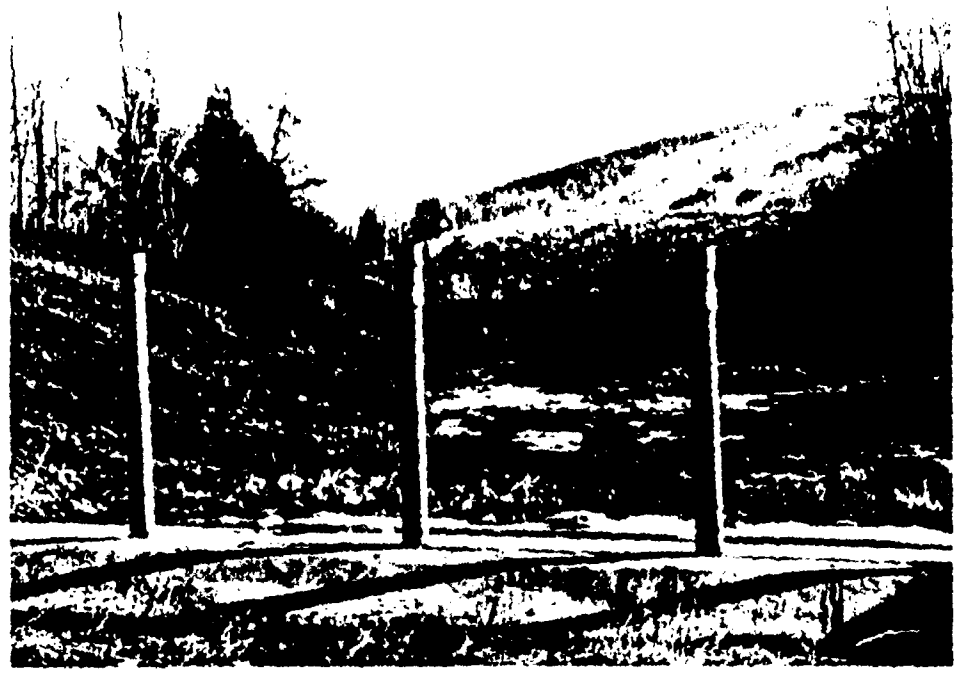
3. Downstream [illegible]
side of spillway as seen from right bank.

4. Reservoir area.

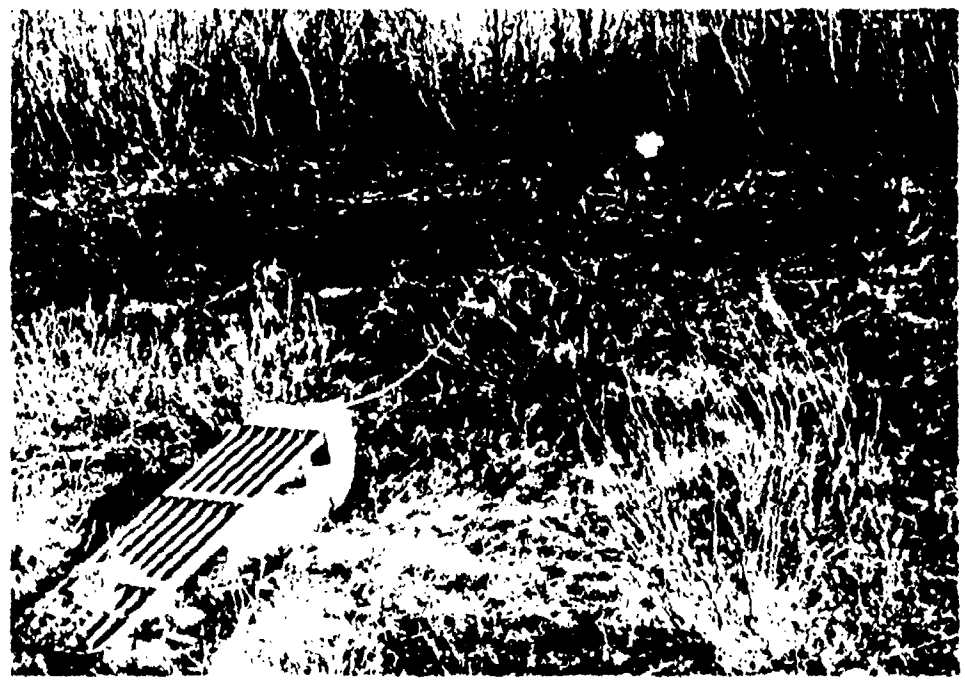
5. Spillway Approach.



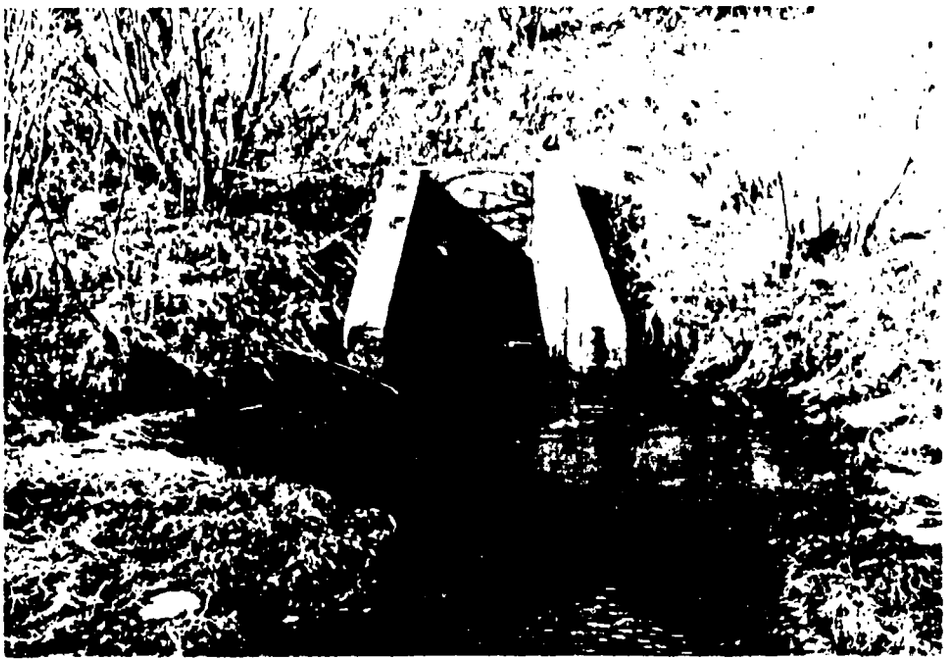
6. Right spillway wall.



7. Spillway discharge channel. Bern on left and weir in foreground.



8. Outlet works intake structure. Note boat and rail road.



9. Headwall on downstream end of outlet works conduit.

10. Downstream channel immediately beyond toe of dam.

11. First downstream res den

12. Second downstream residence

APPENDIX D

HYDROLOGY AND HYDRAULICS

BALTIMORE DISTRICT, CORPS OF ENGINEERS PAGE _____

SUBJECT DAM SAFETY ANALYSIS

COMPUTATIONS ROSS DAM SHEET 1 OF _____ SHEETS

COMPUTED BY JPB CHECKED BY _____ DATE 4-14-81

DAM CLASSIFICATION :

SIZE OF DAM - SMALL
HAZARD - SIGNIFICANT
REQUIRED SDF - 100 YEAR FLOOD TO ½ PMF

DAM STATISTICS :

HEIGHT OF DAM	-	20.7 FEET
STORAGE AT NORMAL POOL	-	0 AC-FT
STORAGE AT TOP OF DAM	-	70 AC-FT
DRAINAGE AREA ABOVE DAMSITE	-	0.85 mi^2

ELEVATIONS: (M.S.L.)

TOP OF DAM LOW POINT (FIELD)	-	1836.6
NORMAL POOL	-	1820.0
STREAMBED AT TOE OF DAM	-	1815.9
SPILLWAY CREST	-	1830.0
OUTLET WORKS		
INTAKE INVERT	-	1820.0
OUTLET INVERT	-	1815.9

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 = 7000 FT = 1.33 mi

L_{CA} = LENGTH OF LONGEST WATERCOURSE TO CENTROID OF THE BASIN — L_{CA} = 3800 FT = 0.72 mi

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

MADB FORM 1232, 28 MAR 74

BALTIMORE DISTRICT, CORPS OF ENGINEERS PAGE

SUBJECT DAM SAFETY ANALYSIS

COMPUTATIONS ROSS DAM SHEET 2 OF SHEETS

COMPUTED BY JPB CHECKED BY DATE 4-14-81

NOTE: ELEVATIONS ARE REFERENCED TO U.S.G.S. QUAD SHEET ENTITLED CLIFFORD, PA. ELEVATION 1820 WAS ASSUMED TO BE THE ELEVATION OF THE INVERT OF THE INTAKE.

t_p = SNYDERS BASIN LAGTIME TO PEAK, IN HOURS

$$t_p = C_t (L L_{CA})^{0.3}$$

$$= 1.50 (0.72(1.33))^{0.3} = 1.48 \text{ hours}$$

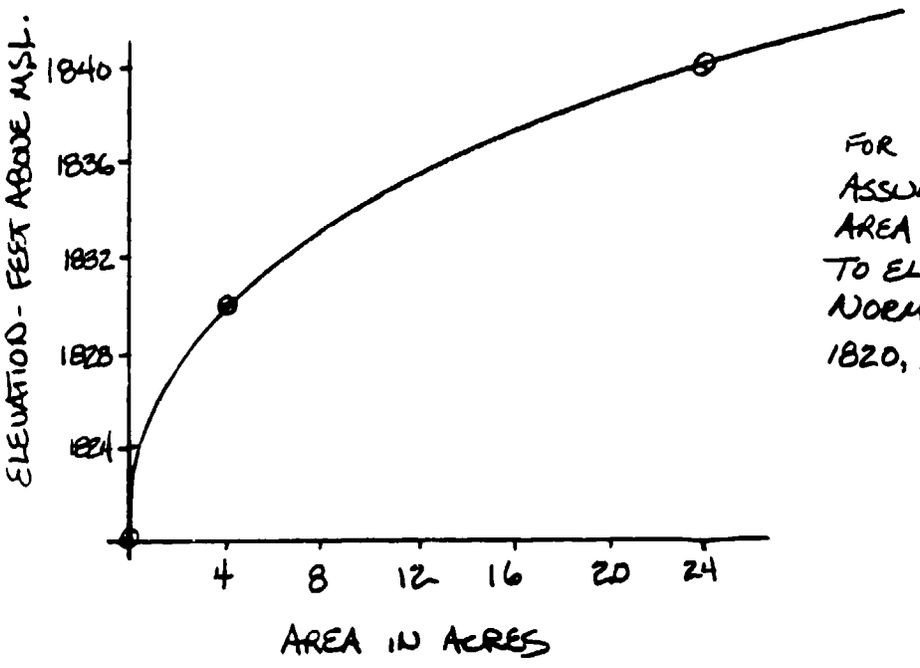
RESERVOIR CAPACITY:

- SURFACE AREA AT SPILLWAY CREST (1830.0) - 4
- SURFACE AREA AT ELEVATION 1840.0 - 24
  (PLANIMETERED VALUE)

ASSUME CONICAL METHOD APPLIES TO FIND VOLUME IN POOL AT SPILLWAY CREST.

$$V = \frac{1}{3} A H = \frac{1}{3}(4)(10) = 13.33 \text{ AC-FT.}$$

∴ STORAGE AT ELEVATION 1820.0 = 0 AC-FT.
STORAGE AT SPILLWAY CREST 1830.0 = 13 AC-FT.



FOR FLOOD ROUTING PURPOSES ASSUME THE AVERAGE END AREA METHOD IS SUITABLE TO ELEVATIONS ABOVE NORMAL POOL - ELEVATION 1820, AND $\Delta V = \left(\frac{A_1 + A_2}{2}\right) \Delta H$

NADB FORM 1232, 28 MAR 74

BALTIMORE DISTRICT, CORPS OF ENGINEERS PAGE _____

SUBJECT DAM SAFETY ANALYSIS

COMPUTATIONS ROSS DAM SHEET 3 OF _____ SHEETS

COMPUTED BY JPB CHECKED BY _____ DATE 4-14-81

ELEVATION - STORAGE TABLE :

ELEVATION (MSL)	AREA (AC)	ΔH (ft)	$\Delta V = \left(\frac{A_1+A_2}{2}\right)\Delta H$ (AC-FT)	CUMULATIVE VOLUME (AC-FT)	
1820.0	0	–	–	0	0
1830.0	4	–	13.3	13.3	13
1832.0	6.5	2.0	10.5	23.8	24
1834.0	9.5	2.0	16.0	39.8	40
1836.0	13.0	2.0	22.5	62.3	60
1836.6 (T.O.D)*	15.0	0.6	8.4	70.7	70
1838.0	18.0	1.4	23.1	93.8	90
1840.0	24.0	2.0	42.0	135.8	140
1842.0	31.0	2.0	55.0	190.8	190

* TOD = TOP OF DAM

NOTE: DRAINAGE AREA ABOVE DAM = 0.85 mi^2

ELEVATION (MSL)	STORAGE (AC-FT)
1820.0	0
1830.0	13
1832.0	24
1834.0	40
1836.0	60
1836.6 (TOD)	70
1838.0	90
1840.0	140
1842.0	190

NADB FORM 1232, 28 MAR 74

BALTIMORE DISTRICT, CORPS OF ENGINEERS

SUBJECT DAM SAFETY ANALYSIS PAGE

COMPUTATIONS Ross DAM SHEET 4 OF SHEETS

COMPUTED BY JPB CHECKED BY DATE 5-11-81

SDF: BASED ON THE SMALL HEIGHT OF DAM AND THE SMALL STORAGE, THE SDF SELECTED FOR THIS POND WAS THE 100 YEAR FLOOD. THIS IS IN ACCORDANCE WITH THE GUIDENCE PROVIDED.

∴ USE SDF = 100 YEAR FLOOD

AMP CALCULATIONS:

SINCE THE SDF SELECTED FOR THIS POND HAS BEEN THE 100 YEAR FLOOD, NO CALCULATIONS ARE NECESSARY TO COMPUTE THE PROBABLE MAXIMUM PRECIPITATION (AMP) OR PROBABLE MAXIMUM FLOOD (PMF).

NADB FORM 1232, 28 MAR 74

BALTIMORE DISTRICT, CORPS OF ENGINEERS PAGE

SUBJECT DAM SAFETY ANALYSIS

COMPUTATIONS ROSS DAM SHEET 5 OF SHEETS

COMPUTED BY JMB CHECKED BY DATE 4-15-81

EMERGENCY SPILLWAY CAPACITY:

SPILLWAY IS LOCATED NEAR RIGHT ABUTMENT OF DAM. SEE FIELD SKETCH IN APPENDIX A, EXHIBIT 1.

SPILLWAY DATA:

TYPE - OGEE CREST WEIR
LENGTH - 35 FEET, effective length is 35 - 10(4") = 31.7 FEET
CREST ELEVATION - 1830.0 M.S.L.
LOW POINT TOP OF DAM - 1836.6 M.S.L.
SPILLWAY FREEBOARD - 6.6 FEET
C VALUE: VARIES FOR SPILLWAY CREST
2.85 FOR EMBANKMENT

ASSUME DESIGN HEIGHT ON WEIR IS $H_o = 6$ FEET, AND $P = 2$ FEET THEREFORE $\frac{P}{H_o} = 0.333$.
(THIS IS FROM DESIGN OF SMALL DAMS, PAGE 378. USE FIGURE 249 AND FIGURE 250 to COMPUTE C AS IT VARIES WITH HEAD.)

WITH $\frac{P}{H_o} = 0.333$, $C_o = 3.70$ $L = 31.7$ FEET (effective Length)

SPILLWAY RATING TABLE:

POOL ELEVATION (MSL)	H_e (ft)	H_o (ft)	$\frac{H_e}{H_o}$ (RATIO)	$\frac{C}{C_o}$ (RATIO)	C	$Q = CLH_e^{3/2}$ (CFS)	USE
1830.0	0	6	...	...	...	...	0
1831.0	1	6	0.167	0.84	3.11	98.6	100
1832.0	2	6	0.333	0.89	3.29	294.0	290
1833.0	3	6	0.500	0.92	3.40	560.0	560
1834.0	4	6	0.667	0.95	3.52	892.7	890
1835.0	5	6	0.833	0.97	3.59	1272.4	1270
1836.0	6	6	1.000	1.00	3.70	1723.8	1720
1836.6 (TOD)	6.6	6	1.100	1.01	3.73	2004.9	2000
1840.0	10	6	1.667	1.07	3.96	3969.7	3970

NADB FORM 1232, 28 MAR 74

BALTIMORE DISTRICT, CORPS OF ENGINEERS PAGE

SUBJECT DAM SAFETY ANALYSIS

COMPUTATIONS ROSS DAM SHEET 6 OF SHEETS

COMPUTED BY JMB CHECKED BY DATE 5-11-81

100 YEAR FLOOD ANALYSIS:

THE SELECTED SDF FOR ROSS DAM HAS BEEN THE 100 YEAR FLOOD. THIS IS BASED ON THE SIZE OF THE DAM AND THE HAZARD CATAGOREY OF THE DAM.

TO DEVELOP THE 100 YEAR FLOOD, TWO REGRESSION EQUATIONS WILL BE USED TO DETERMINE THE PEAK VALUE. THE AVERAGE OF THE TWO REGRESSION PEAKS WILL BE THE 100 YEAR FLOOD PEAK USED IN THIS ANALYSIS.

BULLENTIN 13 FLOOD PEAK:

FROM PLATE 1 - ROSS DAM IS IN REGION 2.

∴ REGRESSION EQUATION IS

$$Q_T = CA^X$$

where:

Q_T = PEAK FLOW FOR RETURN PERIOD T, IN YEARS
C = REGRESSION CONSTANT
A = DRAINAGE AREA IN SQUARE MILES
X = REGRESSION COEFFICIENT

RECALL DRAINAGE AREA = $0.85\ mi^2$

FOR 100 YEAR ANALYSIS:

$T = 100$ $\quad A = 0.85\ mi^2$

$C = 564$ $\quad X = 0.744$

$$\therefore Q_{100} = CA^X = 564(0.85)^{0.744} = 499.8$$

$$\therefore Q_{100} \doteq 500 \text{ CFS FROM BULLENTIN 13}$$

NOW, COMPUTE THE 100 YEAR FLOOD PEAK FROM HYDROLOGIC STUDY - TROPICAL STORM AGNES, NORTH ATLANTIC DIVISION, 1975.

NADB FORM 1232, 28 MAR 74

$$Log(Q_m) = C_m + 0.75 \log(A)$$

where: C_m = a map coefficient for mean log of annual peaks
Q_m = geometric mean of annual flood peaks, in cfs
A = drainage area in square miles

From figure 21 $C_m = 2.15$

$$\therefore Log(Q_m) = 2.15 + 0.75 \log(0.85) = \underline{2.0971}$$

now, compute the standard deviation

$$S = C_s - 0.05 \log(A)$$

where: S = standard deviation
C_s = a map coefficient for standard deviation

From figure 22 $C_s = 0.35$

$$S = 0.35 - 0.05 \log(0.85)$$

$$S = \underline{0.3535}$$

now compute the 100 year flood peak from the following

$$Log(Q_{(p)}) = \log(Q_m) + K(P,g)S$$

where:

$\log(Q_{(p)})$ = log of the annual flood peaks for a given exceedence frequency

$\log(Q_m)$ = mean logarithm of annual flood peaks

$K(P,g)$ = standard deviate for a given exceedence frequency (P) and skew coefficient (g)

S = standard deviation, logs of annual peaks

$\therefore$ we need to have skew coefficient, from figure 23

$g = 0.30$

NADB FORM 1232, 28 MAR 74

BALTIMORE DISTRICT, CORPS OF ENGINEERS PAGE

SUBJECT DAM SAFETY ANALYSIS

COMPUTATIONS ROSS DAM SHEET 8 OF SHEETS

COMPUTED BY GPB CHECKED BY DATE 5-11-81

$K(P,g) = \underline{\underline{2.55}}$

THIS IS AN INTERPOLATED VALUE FROM EXHIBIT 39 - STATISTICAL METHODS IN HYDROLOGY, LEO R. BEARD, JAN. 1962.

$$\text{Log}(Q_{100}) = \text{Log}(Q_m) + K(P,g)S$$

$$\therefore \quad \text{Log}(Q_{100}) = 2.0971 + (2.55)(0.3535)$$

$$\text{Log}(Q_{100}) = 2.9985$$

$$Q_{100} = 996.6 \quad \sim 1000 \text{ CFS}$$

THEREFORE, $Q_{100} = 1000$ CFS FROM TROPICAL STORM AGNES REPORT, NORTH ATLANTIC DIVISION

NOW, COMPUTE THE 100 YEAR FLOOD PEAK BY AVERAGING THE TWO REGRESSION EQUATIONS.

$$\therefore Q_{100} = \frac{500 + 1000}{2} = 750 \text{ CFS}$$

SPILLWAY ADEQUACY:

THE SPILLWAY IS CONSIDERED ADEQUATE IF THE MAXIMUM OUTFLOW THROUGH THE SPILLWAY AT LOW POINT TOP OF DAM IS GREATER THAN THE Q_{100} PEAK CALCULATED ABOVE.

THEREFORE,

MAXIMUM OUTFLOW AT TOP OF DAM = 2000 CFS
MAXIMUM INFLOW FOR 100 YEAR FLOOD = 750 CFS

SINCE, THE MAXIMUM OUTFLOW IS GREATER THAN THE MAXIMUM INFLOW, THE SPILLWAY IS RATED ADEQUATE.

NADB FORM 1232, 28 MAR 74

OUTLET WORKS:

THE OUTLET WORKS CONSIST OF A 12 INCH CMP ENCASED IN CONCRETE. INVERT OF UPSTREAM IS AT ELEVATION 1820.0 AND DOWNSTREAM INVERT AT ELEVATION 1815.9.

FOR THIS ANALYSIS ASSUME OUTLET CONTROL DUE TO EXIT CHANNEL FOR SPILLWAY IS 150 FEET DOWNSTREAM. THE STRUCTURE WAS ASSUMED TO HAVE A HEAD WALL THAT IS MITERED TO CONFORM TO SLOPE, THEREFORE K_e=0.7. ASSUME LENGTH IS APPROXIMATELY 100 FEET AND FROM THE HYDRAULIC CHARTS FOR THE SELECTION OF HIGHWAY CULVERTS, U.S. DEPARTMENT OF COMMERCE, DEC 1965.

K_e = 0.7
L = 100 FEET
DIA = 12 INCH

SUBMERGED OUTLET CULVERT FLOWING FULL

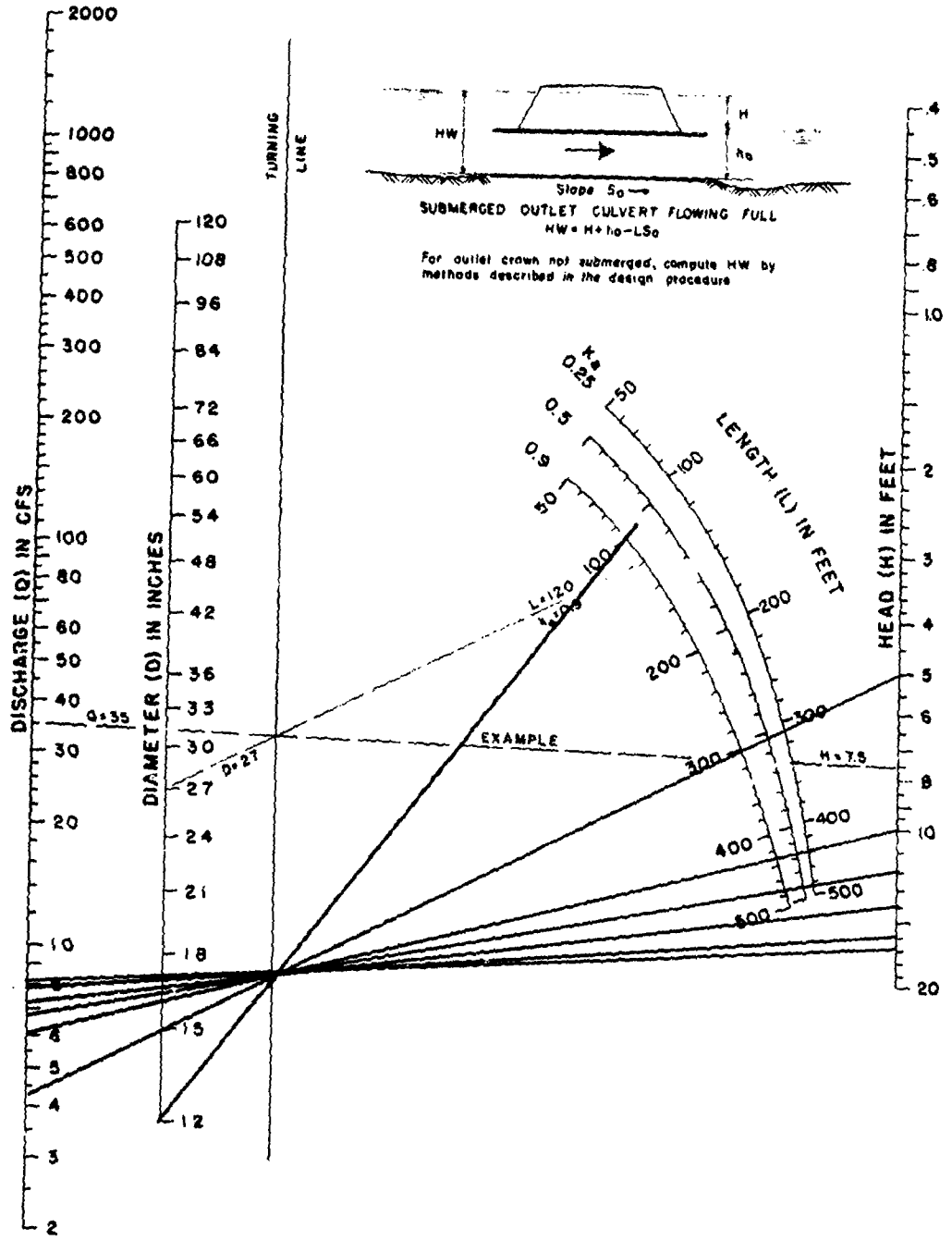
① ASSUME THAT OUTLET END OF PIPE IS SUBMERGED BY 3.1 FEET
∴ TAILWATER IS AT ELEVATION - 1820.0

H = DIFFERENTIAL HEAD BETWEEN UPSTREAM POOL ELEVATION AND DOWNSTREAM TAILWATER

POOL ELEVATION (MSL)	TW (MSL)	H (FT)	Q (CFS)	REMARKS
1825.0	1820.0	5.0	4.3	
1830.0	1820.0	10.0	6.0	SPILLWAY CREST
1832.0	1820.0	12.0	7.0	
1834.0	1820.0	14.0	7.5	
1836.0	1820.0	16.0	7.9	
1836.6	1820.0	16.6	8.2	MAXIMUM POOL

NADB FORM 1232, 28 MAR 74

CHART 11



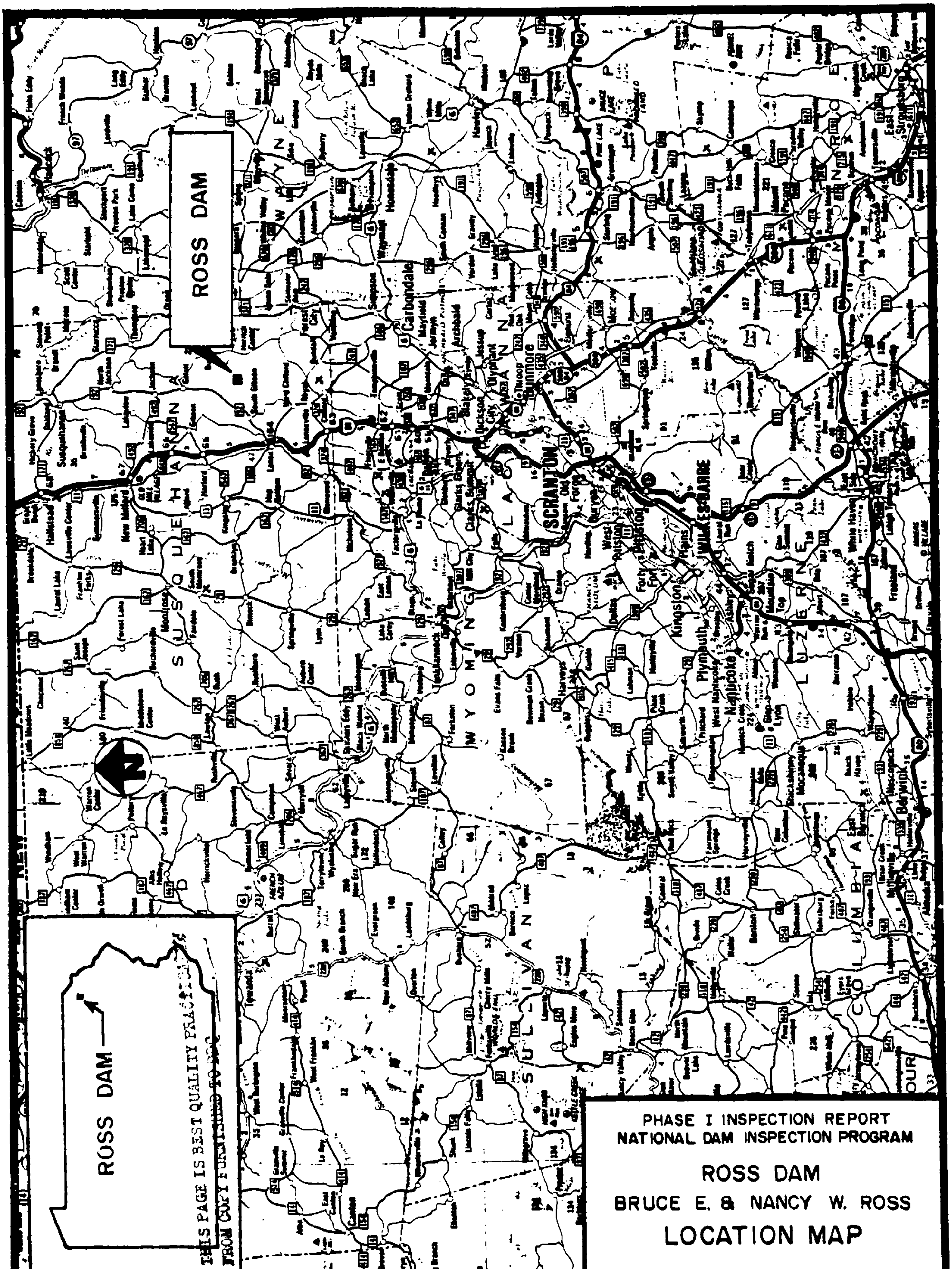
HEAD FOR
STANDARD
C. M. PIPE CULVERTS
FLOWING FULL
n = 0.024

BUREAU OF PUBLIC ROADS JAN. 1963

ROSS DAM

APPENDIX E

PLATES



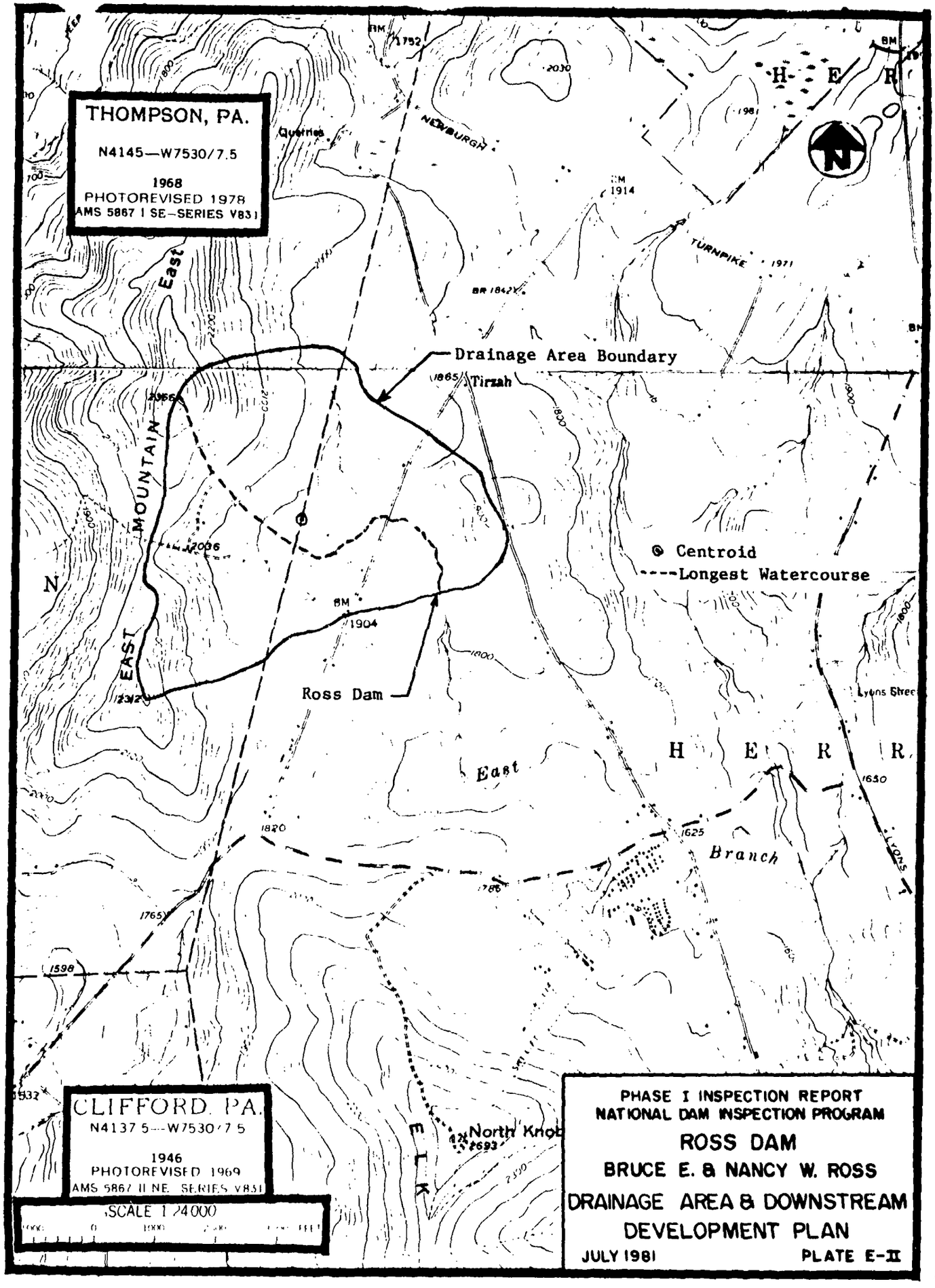
PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

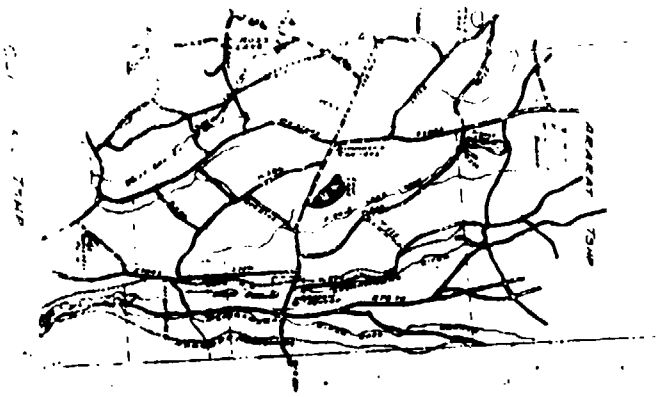
ROSS DAM

BRUCE E. & NANCY W. ROSS

LOCATION MAP

JULY 1981 PLATE E-I


THOMPSON, PA.
N4145—W7530/7.5
1968
PHOTOREVISED 1978
AMS 5867 I SE—SERIES V831
Drainage Area Boundary
Centroid
Longest Watercourse
Ross Dam
Tirzah
NEWBURGH
TURNPIKE
MOUNTAIN
East
Branch
CLIFFORD, PA.
N4137.5—W7530/7.5
1946
PHOTOREVISED 1969
AMS 5867 II NE. SERIES V831
SCALE 1:24000
PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM
ROSS DAM
BRUCE E. & NANCY W. ROSS
DRAINAGE AREA & DOWNSTREAM
DEVELOPMENT PLAN
JULY 1981
PLATE E-II

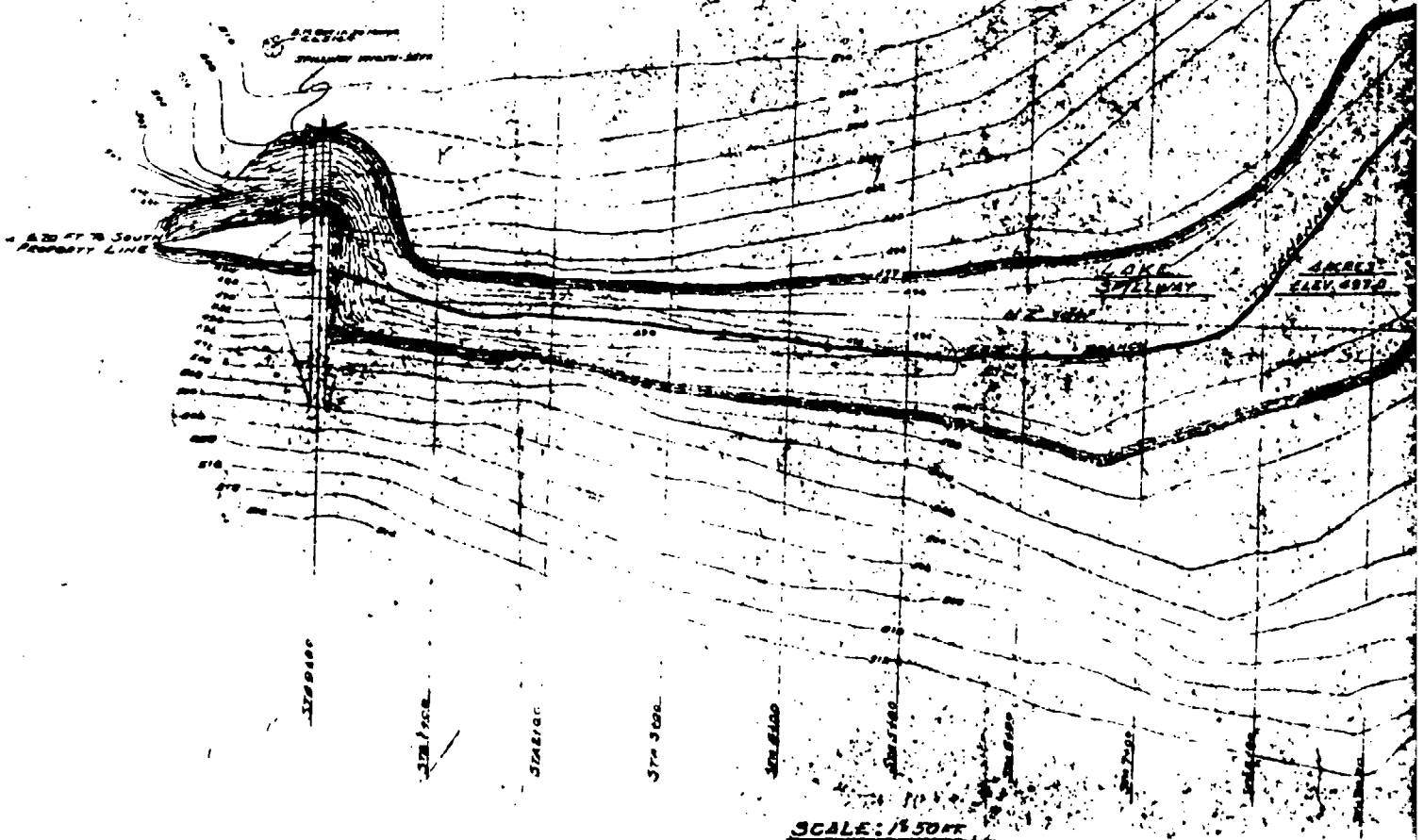


TOTAL PROPERTY ACREAGE = 358 Ac±

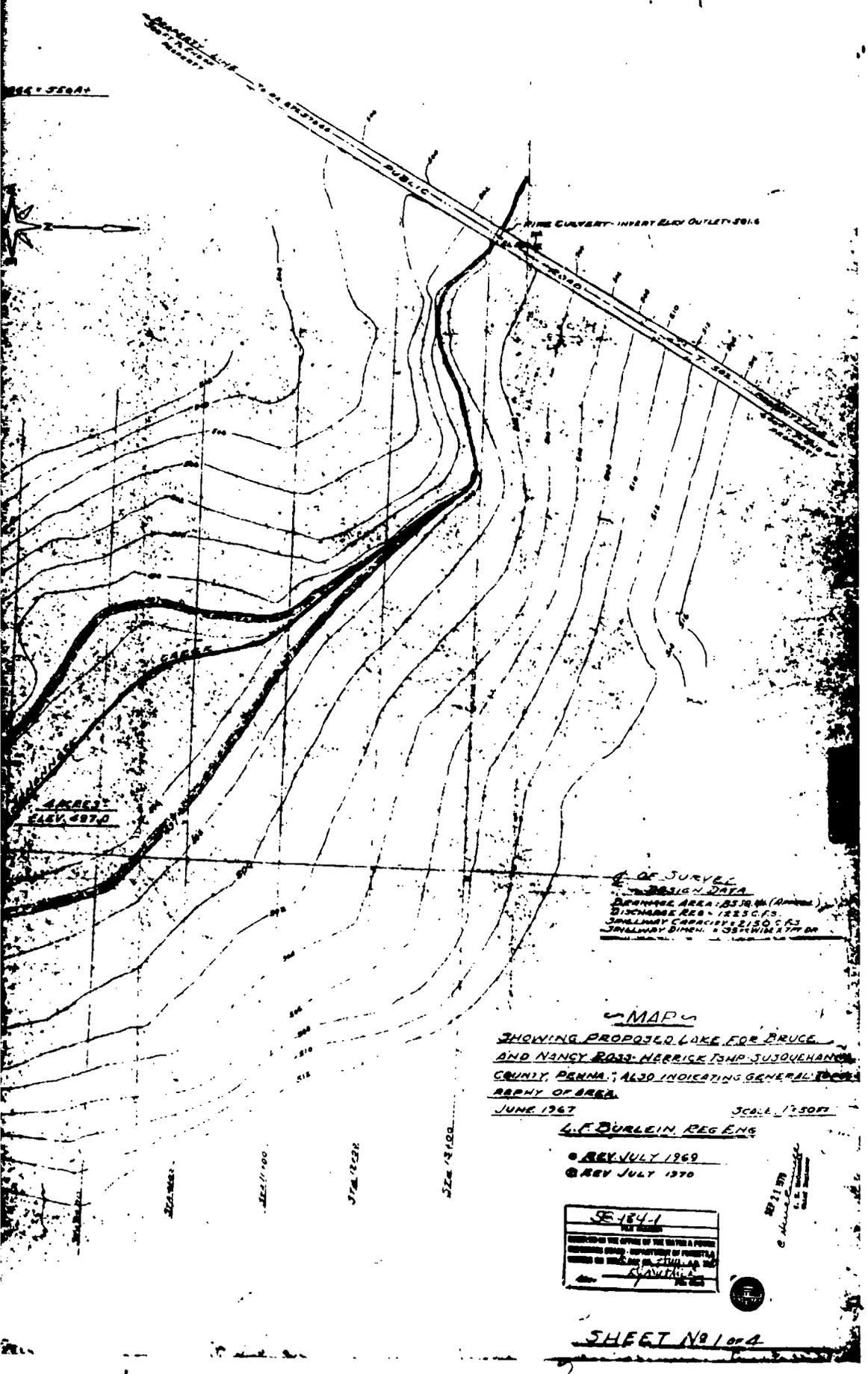
SUSQUEHANNA COUNTY

MAP
SHOWING LOCATION OF PROPOSED
DAM AND LAKE
HERRICK TOWNSHIP

MAP SCALE



SCALE: 1" = 50 FT



MAP

SHOWING PROPOSED LAKE FOR BRUCE AND NANCY ROSS - HERRICK TWP - SUSQUEHANNA COUNTY, PENNA.; ALSO INDICATING GENERAL TOPOGRAPHY OF AREA.

JUNE 1967 SCALE 1" = 50FT

L.F. BURLEIN, REG. ENG.

• REV JULY 1969

@ REV JULY 1970

SE 484-1

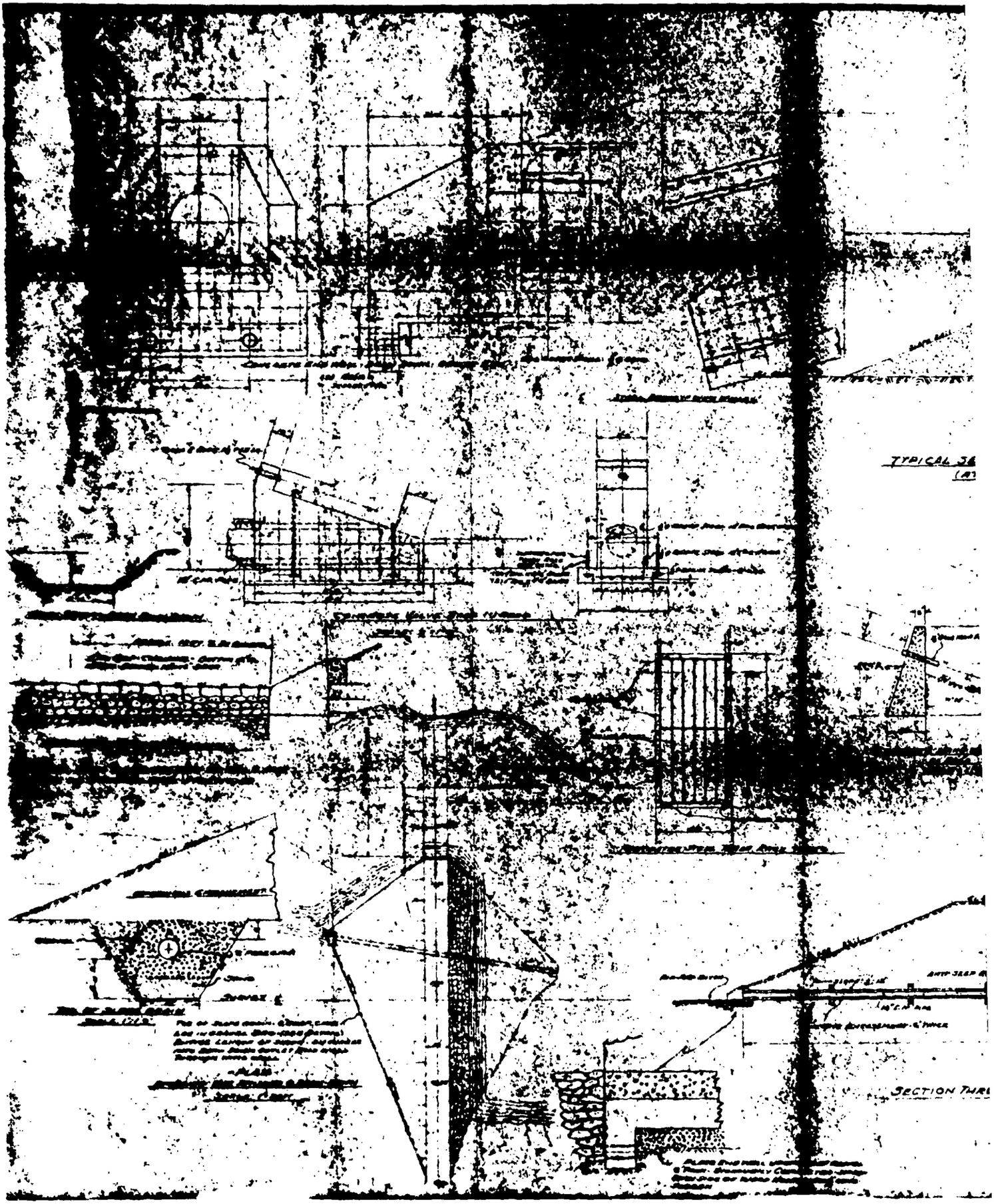
SHEET No 1 of 4

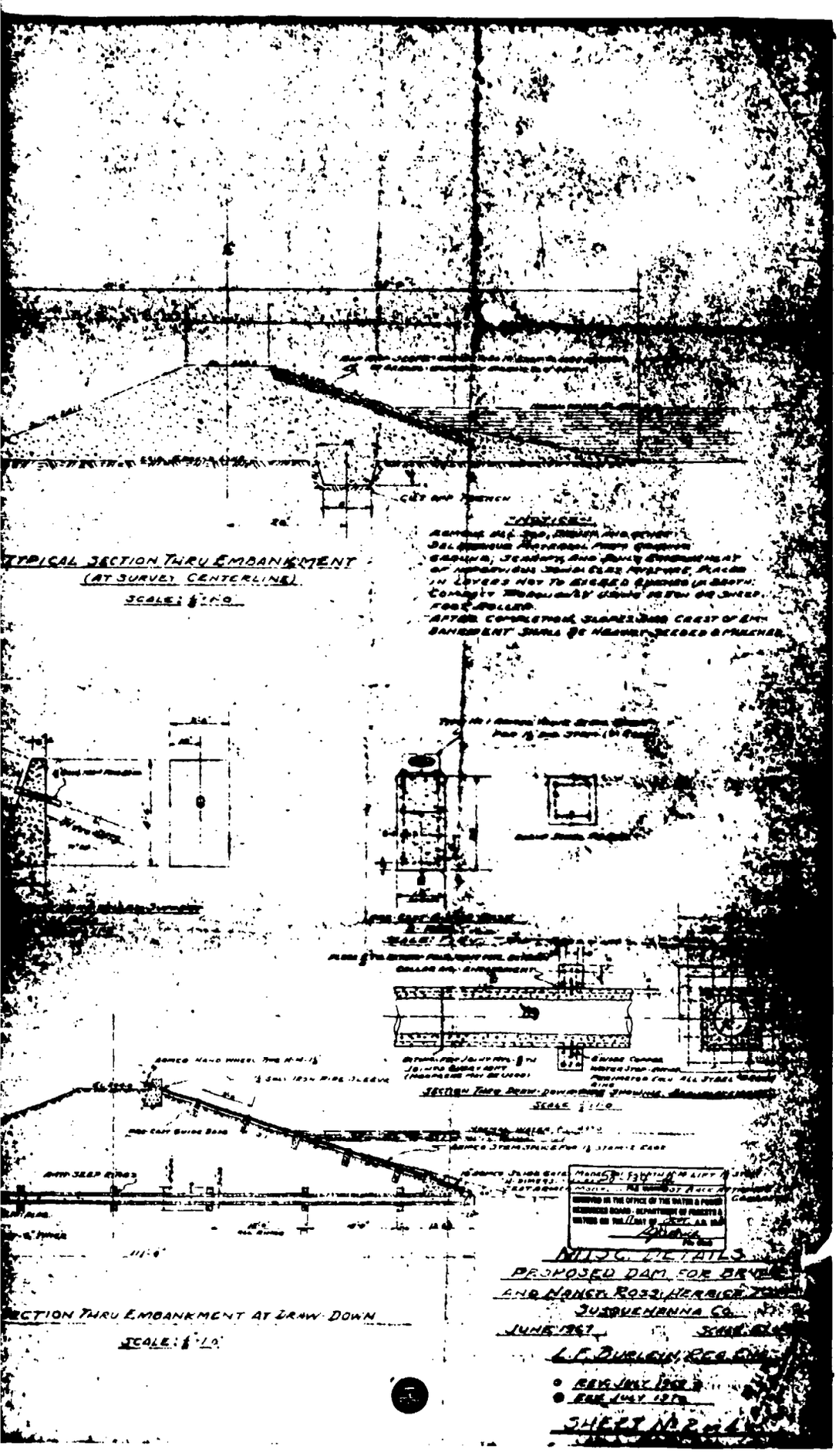
PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

ROSS DAM

BRUCE E. & NANCY W. ROSS

JULY 1981 PLATE E-1

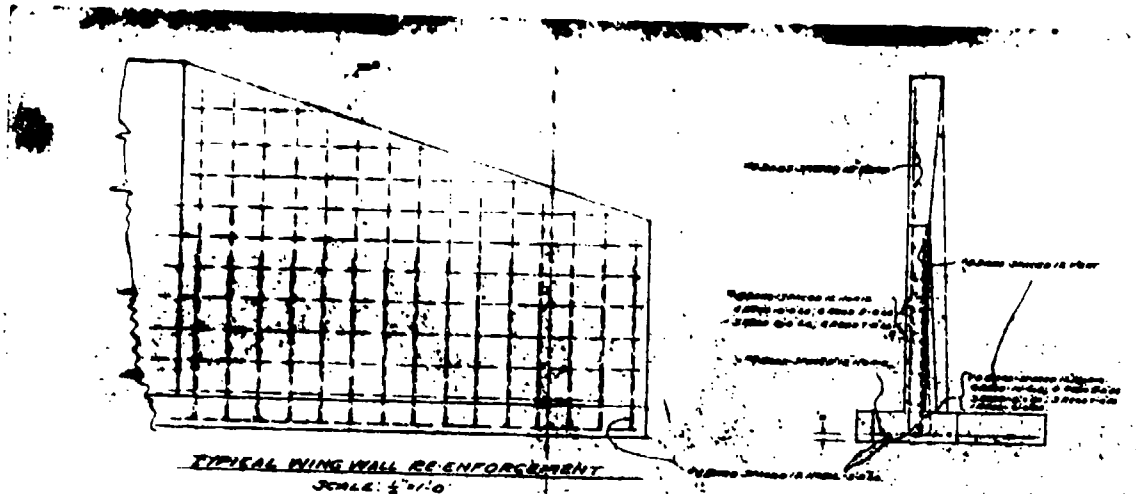

TYPICAL 36
(A)
SECTION THRU



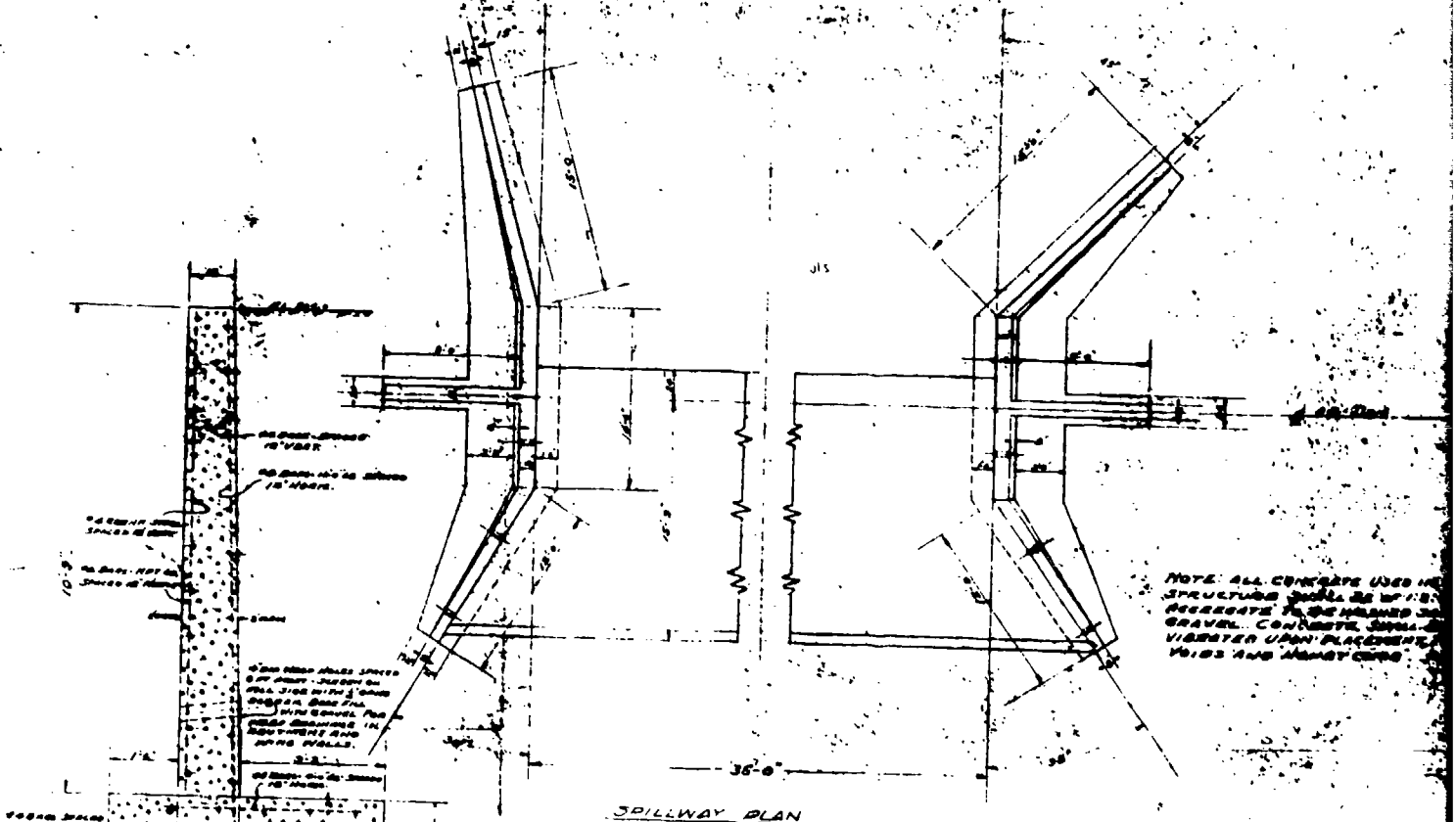
PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

ROSS DAM
BRUCE E. & NANCY W. ROSS

JULY 1981 PLATE E-IV



TYPICAL WING WALL RE-ENFORCEMENT
SCALE: 1/2"=1'-0"



SPILLWAY PLAN

SPILLWAY DETAILS
SCALE: 1/2"=1'-0"

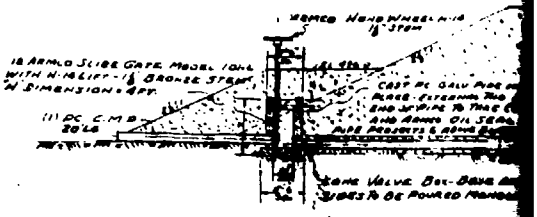
NOTE: ALL CONCRETE USED IN STRUCTURES SHALL BE OF 1:2:3 AGGREGATE TO BE WASHED GRAVEL. CONCRETE SHALL BE VIBRATED UPON PLACEMENT. VOIDS AND HONEY COMB

SECTION THRU ABUTMENT
SCALE: 1/2"=1'-0"

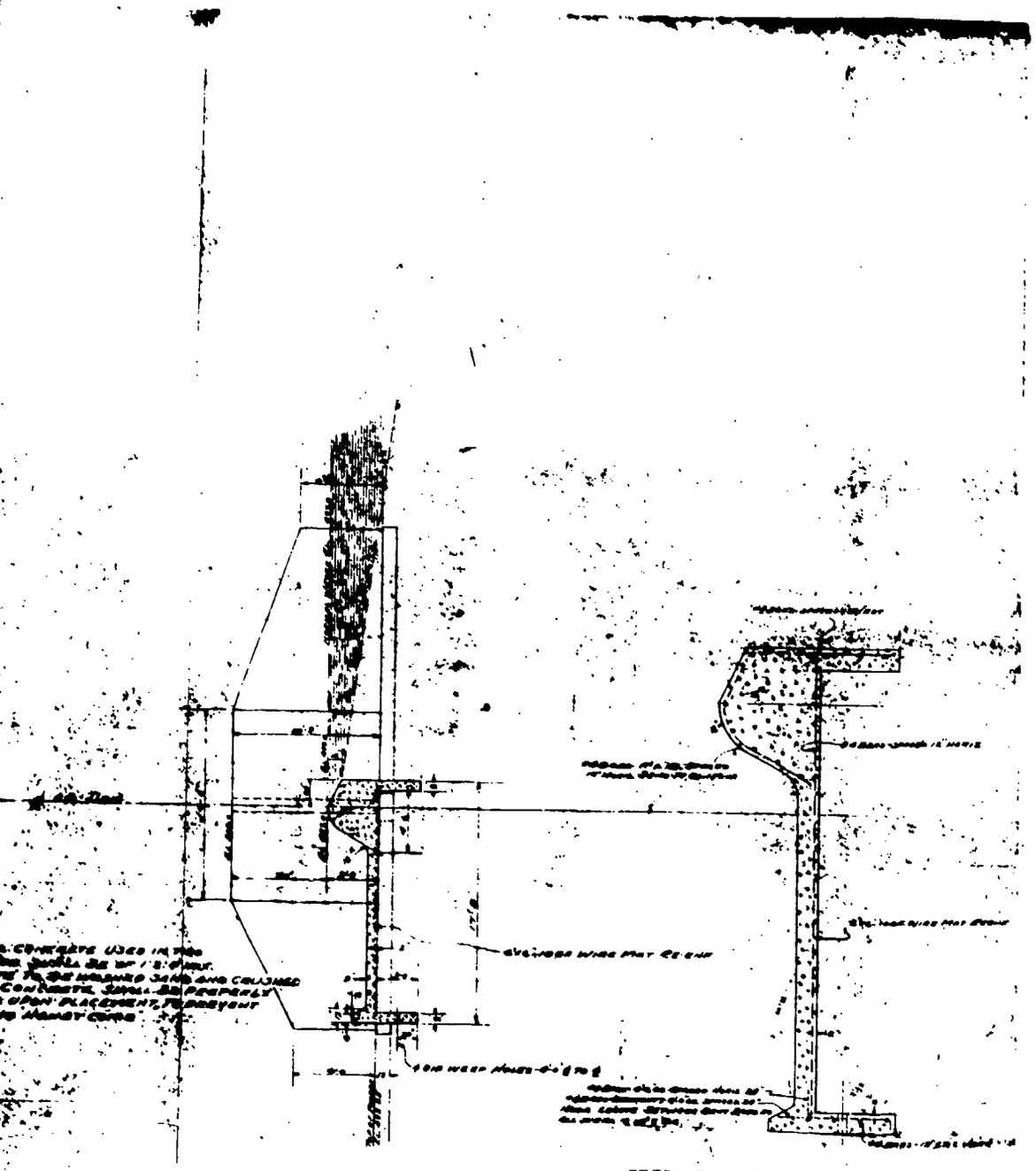
MISC DETAILS

DAM AND SPILLWAY FOR BRUCE AND NANCY ROSS- HERRICK TWP- SUSQUEHANNA CO.
JUNE 1967
SCALE: AS SHOWN
L.F. BURLEIN, REG ENG

- REV. JULY 1968
- REV. JULY 1970



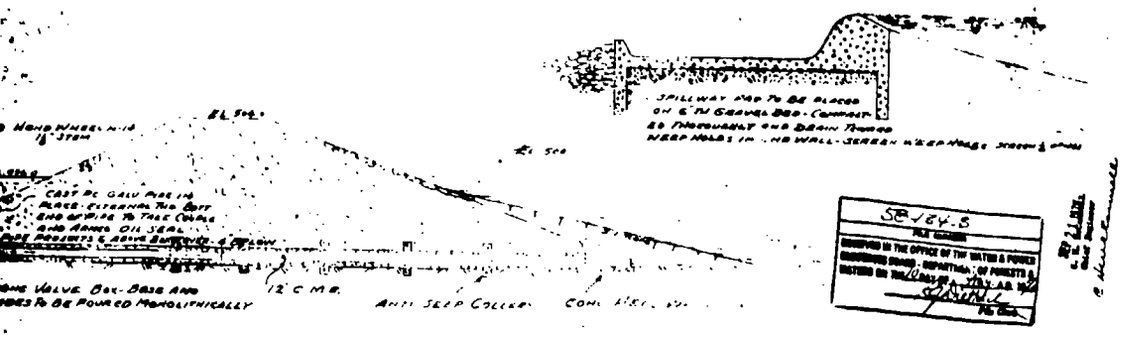
ALTERN



SPILLWAY ELEVATION

STEEL REINFORCING - WEIR AND SPILLWAY PAD

SCALE: 1" = 1'-0"



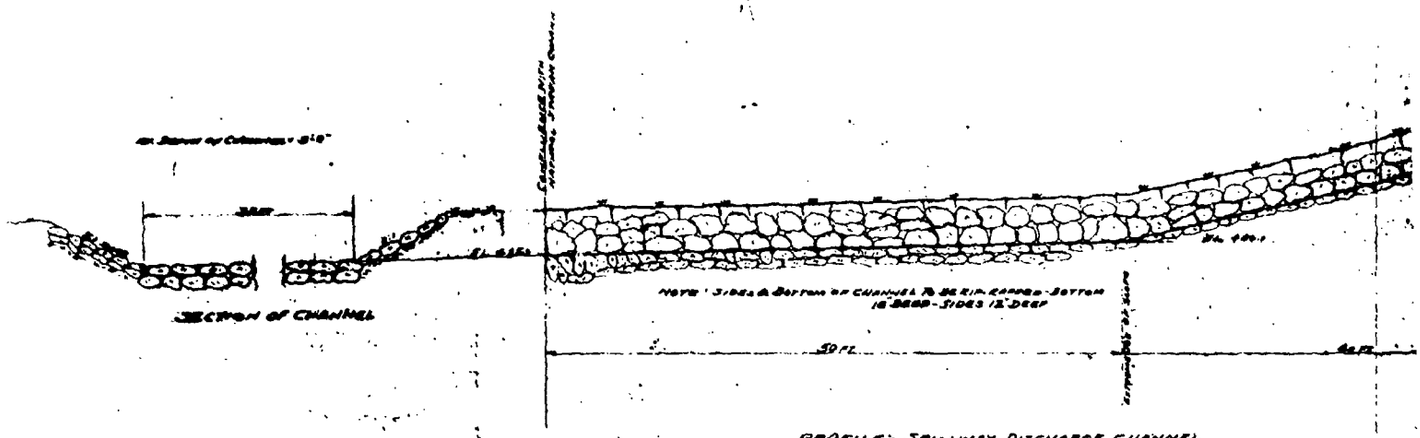
ALTERNATE DESIGN OF DRAW DOWN ON UPSTREAM END
(NOT TO BE USED)

SHEET No 3 of 4

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

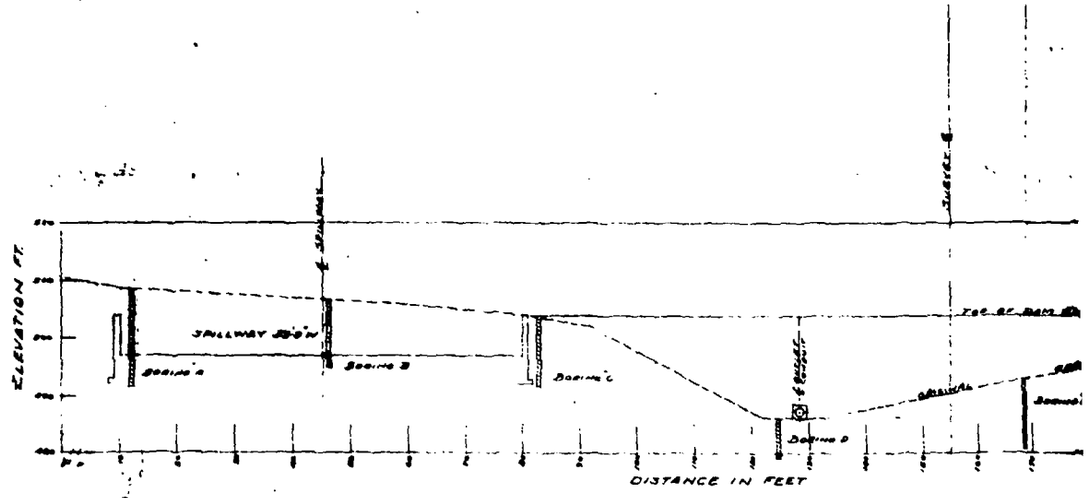
ROSS DAM
BRUCE E. & NANCY W. ROSS

JULY 1981 PLATE E-



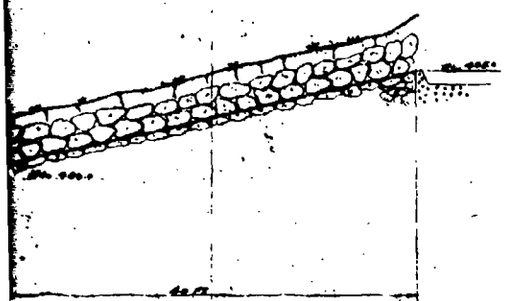
PROFILE:- SPILLWAY DISCHARGE CHANNEL

SCALE: 1" = 5FT

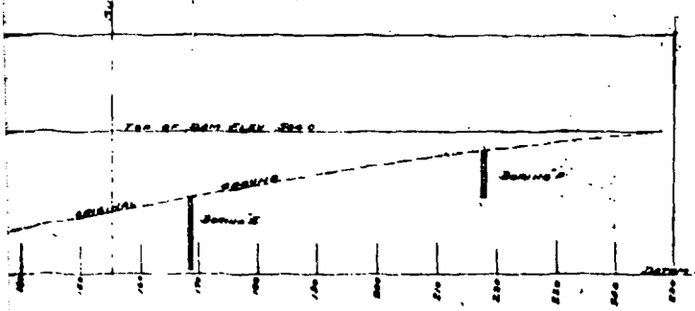


LONGITUDINAL SECTION AT DAM

SCALE: HORIZ: 1" = 100 FT
VERT: 1" = 10 FT



BORING	DEPTH OF BORING	TYPE OF SOIL	REMARKS
A	0 - 1.5	STONY LOAM - 15% COARSE FRAGMENTS	
A	1.5' - 3.0'	CLAY-SAND-LOAM - 25% COARSE FRAGMENTS	
A	3.0' - 6.0'	SILT-CLAY - 20% COARSE FRAGMENTS	
A	6.0' - 12.0'	CLAY-LOAM (WEATHERED) 20% COARSE STONE	
B	0 - 1.5	STONY LOAM - 12% COARSE FRAGMENTS	
B	1.5' - 3.5'	CLAY-SAND-LOAM - 25% COARSE FRAGMENTS	
B	3.5' - 7.5'	SILTY CLAY-LOAM - 25% COARSE FRAGMENTS	
B	7.5' - 12.0'	CLAY-LOAM - 20% COARSE FRAGMENTS	
C	0 - 1.0	STONY LOAM - 10% COARSE FRAGMENTS	
C	1.0' - 3.5'	CLAY-SAND-LOAM - 20% COARSE FRAGMENTS	
C	3.5' - 6.0'	SILT-CLAY - 20% COARSE FRAGMENTS	
C	6.0' - 12.0'	CLAY LOAM - 20% COARSE FRAGMENTS	
D	0 - 2.0	STONY LOAM - 25% COARSE FRAGMENTS	
D	2.0 - 5.0	SAND-LOAM-CLAY - 15% COARSE FRAGMENTS	
D	5.0 - 8.0	CLAY-SILT - 30% COARSE FRAGMENTS	
E	0 - 1.5	STONY LOAM - 10% COARSE FRAGMENTS	
E	1.5 - 4.5	CLAY-SAND-LOAM - 20% COARSE FRAGMENTS	
E	4.5 - 7.5	SILT - CLAY - SAND - 25% COARSE FRAGMENTS	
E	7.5 - 12.0	CLAY - LOAM - 30% COARSE FRAGMENTS	
F	0 - 1.5	STONY LOAM - 15% COARSE FRAGMENTS	
F	1.5 - 3.5	CLAY SAND-LOAM - 30% COARSE FRAGMENTS	
F	3.5 - 6.5	SILT - CLAY - 20% COARSE FRAGMENTS	
F	6.5 - 9.0	CLAY - LOAM - 30% COARSE FRAGMENTS	



SB 154-1

PROPOSED DAM
FOR BRUCE AND NANCY ROSS, HERRICK
TSHP - SUSQUEHANNA COUNTY, PA
REV JULY 1969
L F BURLEIN, PE

SHEET N° 3 OF 4

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

ROSS DAM
BRUCE E. & NANCY W. ROSS

JULY 1981 PLATE E-VI

APPENDIX F

GEOLOGY

ROSS DAM

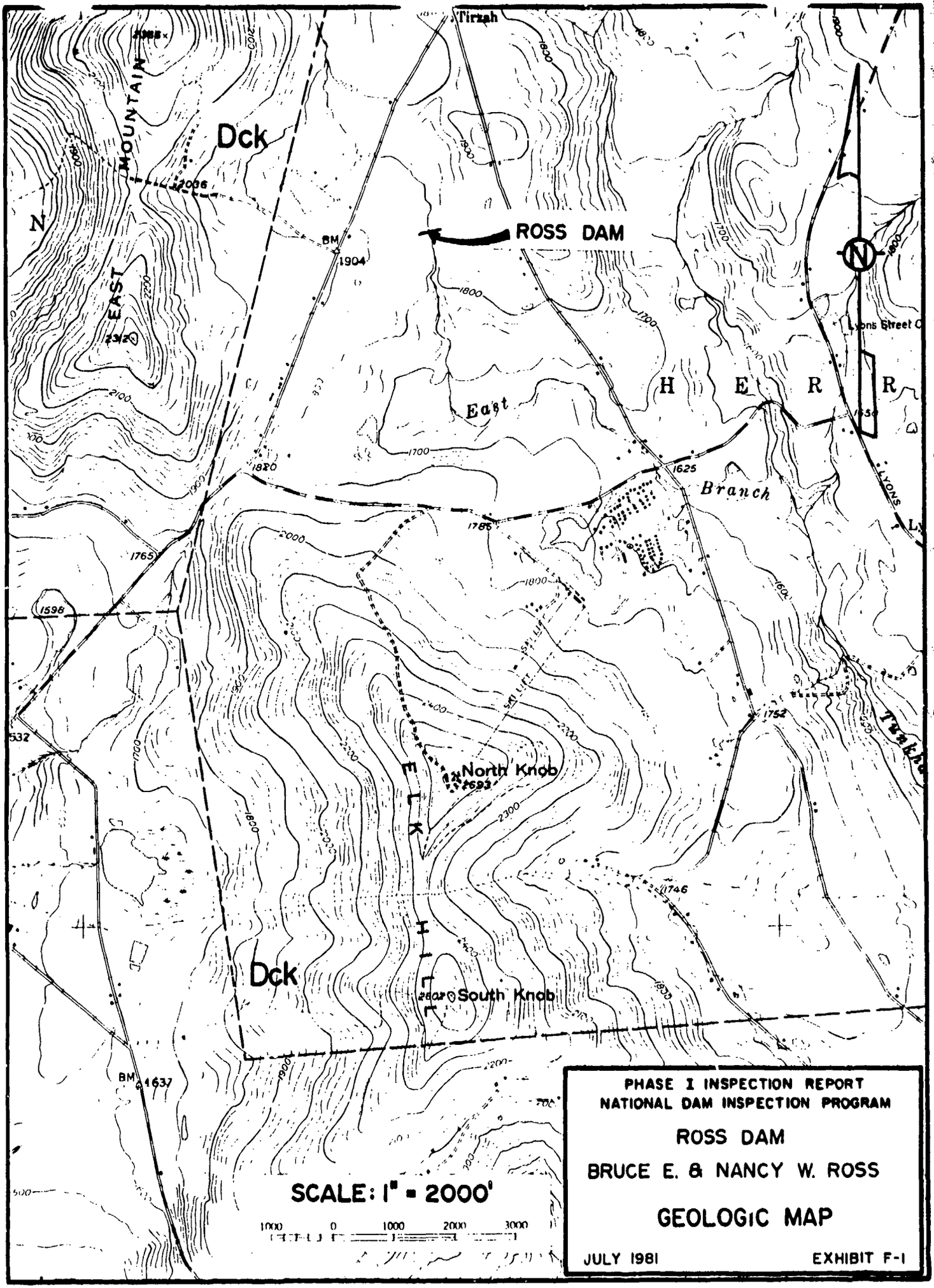
GENERAL GEOLOGY

Bedrock at Ross Dam is gray to red siltstone and shale of the Catskill Formation. It is well bedded in thin to medium beds with closely spaced, well developed joints. Siltstone is moderately resistant to weathering and breaking along joints and bedding fractures into tabular and blocky fragments. Glacial till exists at the site and is at least 5 feet thick in the valley.

Legend

(Bedrock)

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



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ROSS DAM

BRUCE E. & NANCY W. ROSS

GEOLOGIC MAP

JULY 1981 EXHIBIT F-1