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NATIONAL DAM INSPECTION PROGRAM. LAKE WALTER DAM (NDI I.D. NUMB--ETC(U)
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LEVEL II

SUSQUEHANNA RIVER BASIN
TRIBUTARY OF MESSHOPPEN CREEK, SUSQUEHANNA COUNTY

PENNSYLVANIA

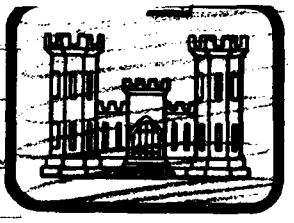
DTIC ELECTE MAY 1 8 1981 S D C

LAKE WALTER DAM

NDI I.D. PA-0080
DER I.D. 058-135
~~OWNER: MR. R. O. WALTER~~

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

Lake W[illegible] Dam (NDI I.D. PA-0080 DER I.D. [illegible]) Susquehanna River B[illegible] Tributary of Messhoppen Creek, Susquehanna County, Pennsylvania. Phase I Inspection Report,



PREPARED FOR
Laurence D. Andersen
DEPARTMENT OF THE ARMY
BALTIMORE DISTRICT, CORPS OF ENGINEERS
BALTIMORE, MARYLAND 21203

DACW31-81-C-0014 BY

D'APPOLONIA CONSULTING ENGINEERS
10 DUFF ROAD
PITTSBURGH, PA. 15235

19 May 81

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PREFACE

This report is prepared under guidance contained in the Recommended Guidelines for Safety Inspection of Dams, for Phase I Investigations. Copies of these guidelines may be obtained from the Department of the Army, 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 visual observations and review of available data. Detailed investigations and analyses involving topographic mapping, subsurface investigations, material testing, and detailed computational evaluations are beyond the scope of a Phase I investigation; however, the inspection is intended to identify any need for such studies which should be performed by the owner.

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 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 the dam depends on numerous and constantly changing internal and external factors which are evolutionary in nature. It would be incorrect to assume that the present condition of the dam will continue to represent the condition of the dam at some point in the future. Only through frequent inspections can unsafe conditions be detected and only through continued care and maintenance can these conditions be prevented or corrected.

Phase I inspections are not intended to provide detailed hydrologic and hydraulic analyses. In accordance with the established Guidelines, the spillway design flood is based on the estimated "Probable Maximum Flood" for the region (greatest reasonably possible storm runoff), or fractions thereof. The spillway design flood provides a measure of relative spillway capacity and serves as an aid in determining the need for more detailed hydrologic and hydraulic studies, considering the size of the dam, its general condition and the downstream damage potential.

The assessment of the conditions and recommendations was made by the consulting engineer in accordance with generally and currently accepted engineering principles and practices.

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PHASE I REPORT
NATIONAL DAM INSPECTION PROGRAM

NAME OF DAM: Lake Walter Dam
STATE LOCATED: Pennsylvania
COUNTY LOCATED: Susquehanna
STREAM: Spring Run, Tributary of Meshoppen Creek
SIZE CLASSIFICATION: Small
HAZARD CLASSIFICATION: High
OWNER: Mr. Ray O. Walter
DATE OF INSPECTION: November 13, 1980 and February 5, 1981

ASSESSMENT: Based on the evaluation of the existing conditions, the condition of Lake Walter Dam is considered to be good. A condition noted, which raised concern, was the lack of erosion protection in the emergency spillway channel. In view of the layout of the channel which follows the toe of the embankment, flows through the emergency spillway may erode the toe of the dam, leading to a possible failure. The emergency spillway should be provided with adequate erosion protection. A swampy condition was noted along the downstream toe. It is considered advisable that this area be periodically observed to document whether seepage is developing. If it is, necessary action should be taken.

The spillway capacity was evaluated according to the recommended procedures and was found to pass 100 percent of the PMF. This capacity fulfills the recommended spillway capacity of full PMF. Therefore, the spillway capacity is rated as adequate.

The following recommendations should be implemented immediately or on a continuing basis.

1. The owner should provide erosion protection in the emergency spillway discharge channel as was required by the original design.

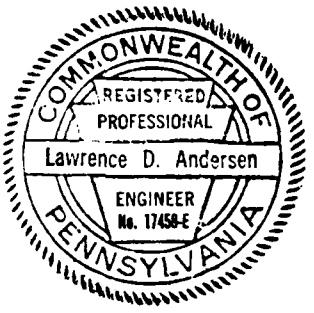
2. The owner should confirm the operational condition of the valve at the upstream end of the low level outlet pipe and develop the facilities for operating this valve.

3. The wet area located at the toe of the dam near the downstream end of the outlet pipe should be monitored. Necessary remedial work should be performed if seepage conditions develop.

4. Brush and trees on the upstream and downstream faces of the dam should be cleared.

5. Around-the-clock surveillance should be provided during unusually heavy runoff and a formal warning system should be developed to alert the downstream residents in the event of an emergency.

6. The dam and appurtenant structures should be inspected regularly and necessary maintenance should be performed.



Lawrence D. Andersen, P.E.
Vice President

March 19, 1981
Date

Approved by:

JAMES W. PECK
Colonel, Corps of Engineers
District Engineer

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Date

LAKE WALTER DAM
NDI I.D. PA-00830
DER I.D. 058-135
NOVEMBER 13, 1980

Looking Downstream

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PHASE I REPORT
NATIONAL DAM INSPECTION PROGRAM
LAKE WALTER DAM
NDI I.D. PA-0080
DER I.D. 058-135

SECTION 1
PROJECT INFORMATION

1.1 General

a. Authority. The inspection was performed pursuant to the authority granted by The National Dam Inspection Act, Public Law 92-367, to the Secretary of the Army, through the Corps of Engineers, to conduct inspections of dams throughout the United States.

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

1.2 Description of Project

a. Dam and Appurtenances. Lake Walter Dam consists of an earth embankment approximately 750 feet long with a maximum height of 32 feet from the downstream toe and a crest width of 12 feet. The upstream side of the dam is protected by riprap, while the downstream slope is covered with grass and thick brush. The flood discharge facilities for the dam consist of an earth channel emergency spillway and a drop inlet primary spillway, both located near the left abutment. The control section of the emergency spillway is located downstream of the center line of the dam and is oriented perpendicular to the center line of the dam. The discharge channel of the emergency spillway is an earth channel which terminates at the toe in line with the center of the dam. A small riprap-lined channel within the emergency spillway channel is the discharge channel of the primary spillway. The outlet facilities consist of a 12-inch steel pipe extending through the embankment near the center line of the dam. Only the downstream end of the pipe is visible. Design drawings indicate that flow through the outlet pipe is controlled by a valve located near the upstream end. This outlet facility constitutes the emergency drawdown system for the reservoir.

b. Location. Lake Walter Dam is located (N41° 39.4', W75° 56.2') on Spring Run, approximately one mile upstream of its confluence with Meshoppen Creek in Springville Township, Susquehanna County, Pennsylvania. Plate 1 illustrates the location of the dam.

c. Size Classification. Small (based on 32-foot height and 510 acre-feet maximum storage capacity).

d. Hazard Classification. The dam is classified to be in the high hazard category. Downstream from the dam, Spring Run flows under State Route 29, approximately one-half mile from the dam, and joins Meshoppen Creek. One house one-half mile from the dam along Spring Run and one house near the confluence with Meshoppen Creek constitute the main impact area of a flood in the event of a dam failure. It is estimated that State Route 29 would also be damaged due to a dam failure. Failure of the dam would probably cause loss of more than a few lives and appreciable property damage in this area.

e. Ownership. Mr. Ray O. Walter, R.D. #1, Box 167, Springville, Pennsylvania 18844.

f. Purpose of Dam. Recreation.

g. Design and Construction History. The dam was designed in 1967 by Mr. Glenn E. Jacoby, a professional engineer from Tunkhannock, Pennsylvania with the assistance of the U.S. Department of Agriculture, Soil Conservation Service, Susquehanna County office. The dam was constructed by the owner with completion in 1968.

h. Normal Operating Procedure. The reservoir is normally maintained at Elevation 1130, the uncontrolled primary spillway crest elevation, leaving 6.8 feet of freeboard to the top of the dam at Elevation 1136.8. Inflow occurring when the lake level is at or above primary spillway level is discharged through the drop inlet spillway up to Elevation 1131, and through the emergency spillway when above Elevation 1131.

1.3 Pertinent Data. Elevations referred to in this and subsequent sections of the report were calculated based on approximate field measurements, assuming the primary spillway crest to be at Elevation 1130 (USGS Datum), which is the elevation shown as the normal pool elevation on the USGS 7.5-minute Springville quadrangle. Elevations on the design drawings appear to be from an arbitrary site datum.

a. Drainage Area — 0.49 square mile[1]

b. Discharge at Dam Site (cfs)

Maximum known flood at dam site	Unknown
Outlet conduit at maximum pool	Unknown
Gated spillway capacity at maximum pool	Not applicable
Ungated spillway capacity at maximum pool	6500
Total spillway capacity at maximum pool	6500

[1] Planimetered from USGS topographic map. State files indicate the drainage area to be 0.37 square mile.

c. Elevation (USGS Datum) (feet)

Top of dam	1136.8 (measured low spot)
Maximum pool	1136.8
Normal pool	1130.0
Upstream invert outlet works	Unknown
Downstream invert outlet works	1105
Maximum tailwater	Unknown
Toe of dam	1105.0

d. Reservoir Length (feet)

Normal pool level	1950
Maximum pool level	2230+

e. Storage (acre-feet)

Normal pool level	300
Maximum pool level	510

f. Reservoir Surface (acres)

Normal pool level	24
Maximum pool level	39

g. Dam

Type	Earth embankment
Length	750 feet
Height	32 feet
Top width	12 feet
Side slopes	Downstream: 3H:1V; Upstream: 3H:1V
Zoning	No
Impervious core	No
Cutoff	Cutoff trench
Grout curtain	No

h. Regulating Outlet

Type	12-inch steel pipe (only downstream end of pipe was visible)
Length	120+ feet
Closure	Upstream valve (could not be observed)
Access	Not accessible
Regulating facilities	Upstream valve

i. Spillway	Primary:	Emergency:
Type	Drop inlet	Earth channel
Length	7.85 feet perimeter	100± feet (perpendicular to flow)
Crest elevation	1130.0	1131.0 feet
Upstream channel	Lake	Lake
Downstream channel	Two-foot-diameter steel pipe and earth channel	Earth channel

SECTION 2
DESIGN DATA

2.1 Design

a. Data Available. The available data consist of files provided by the Commonwealth of Pennsylvania, Department of Environmental Resources (PennDER), which contain design drawings, correspondence, and inspection reports.

(1) Hydrology and Hydraulics. The available information includes the design capacity of the spillway.

(2) Embankment. The available information consists of various design drawings, construction specifications, construction progress reports, and past state inspection reports.

(3) Appurtenant Structures. The available information consists of design drawings.

b. Design Features

(1) Embankment. Plate 2 illustrates the plan of the dam and the reservoir. As illustrated in Plate 3, the dam is a homogeneous embankment with a cutoff trench on the center line of the embankment, extending the full length of the dam. Plate 4 shows the typical cross section of the cutoff trench. The average depth of the cutoff trench is shown to be 10 feet, with a top width of 40 feet, and a bottom width of 20 feet. The internal drainage system for the embankment consists of a horizontal filter blanket of graded sand and gravel beneath the downstream slope, extending from the cutoff trench to the downstream toe of the embankment. The embankment was designed to have a 3:1 (horizontal to vertical) slope on the upstream and downstream faces. The upstream face was to be protected with a 12-inch-thick layer of riprap over a 6-inch sand base extending 3 feet above and 3 feet below the normal pool level.

(2) Appurtenant Structures. The appurtenant structures of the dam consist of primary, emergency spillways, and the outlet works. The primary spillway is a 30-inch-diameter steel drop inlet structure at Elevation 1130, discharging into a 24-inch-diameter steel pipe through the dam which terminates at the downstream toe near the left abutment. Antiseep collars were provided at 10-foot intervals along the pipe. The design drawings indicate that the upstream end of the pipe is equipped with a reinforced concrete base to serve as a foundation for the drop inlet structure. The emergency spillway discharge channel is an earth channel parallel to the toe of the dam extending from the left abutment to the original streambed. The emergency spillway control section is a grass-lined trapezoidal section with the crest elevation one foot above the primary spillway invert.

The design drawings indicate that the low level outlet facility for the dam consists of a 12-inch steel pipe equipped with a gate valve at the upstream end. The gate valve is shown to be controlled by a one-inch-diameter steel rod which extends from the upstream toe to the dam crest. During the field investigation, the valve control rod could not be located.

c. Design Data

(1) Hydrology and Hydraulics. No hydrology or hydraulic information is available. A state report entitled "Report Upon the Application of Ray O. Walter," dated October 2, 1967, notes the design capacity of the emergency spillway.

(2) Embankment. Available information indicates that a material investigation consisting of excavation of test pits and laboratory testing was performed by the U.S. Department of Agriculture, Soil Conservation Service. Findings of the investigation are included in a report entitled, Preliminary Geology Report, dated March 15, 1967. The report includes classification of soils, index and strength test results. No reference was found to indicate whether any engineering analyses, such as slope stability or seepage analyses, were performed based on the results of the soils investigation.

(3) Appurtenant Structures. No design calculations are available for the appurtenant structures.

2.2 Construction. In general, the construction of the dam was apparently conducted in accordance with the drawings and specifications prepared by the design engineer. The most significant deficiency between the design requirements and as-built construction is the lack of riprap in the emergency spillway discharge channel. The design required 12-inch riprap and a 6-inch sand base. In addition, the controls for the outlet pipe could not be located. With the exception of a few construction progress reports, the state files contain very limited information on the construction history of the dam. The available information indicates that the embankment was placed in six-inch layers and compacted by construction equipment.

No reports were found to indicate any major postconstruction change of the dam structure.

2.3 Operation. There are no formal operating records maintained for the dam. The normal reservoir water level is maintained by discharge through the primary spillway.

2.4 Other Investigations. None reported.

2.5 Evaluation

a. Availability. The available information was provided by PennDER.

b. Adequacy

(1) Hydrology and Hydraulics. The available information is very limited. The 1967 state report indicates that the capacity of the emergency spillway (555 cfs) meets the state's "C" curve criteria. The report further notes that sufficient storage is provided between normal pool and emergency spillway crest level to store runoff from the 100-year flood.

(2) Embankment. Other than design drawings and the material investigation study, no other design information is available to determine the adequacy of the design of the dam. The design apparently lacks such considerations as embankment slope stability and seepage analyses and other quantitative data to aid in the assessment of the design. However, the design incorporated such basic components as an impervious cutoff trench, internal drainage system, and riprap protection of the upstream slope of the dam.

(3) Appurtenant Structures. As noted in Section 2.2, the emergency spillway discharge channel lacks erosion protection which was required by the original design. Further, the operating facilities for the low level outlet pipe could not be located. Further evaluation of the observed conditions is required.

SECTION 3
VISUAL INSPECTION

3.1 Findings

a. General. The onsite inspection of Lake Walter Dam consisted of:

1. Visual inspection of the embankment, abutments, and embankment toe.

2. Visual examination of the spillway and the visible portions of the outlet works.

3. Evaluation of downstream area hazard potential.

The specific observations are illustrated in Plate 5.

b. Embankment. The general inspection of the embankment consisted of searching for indications of structural distress, such as cracks, subsidence, bulging, wet areas, seeps and boils, and observing general maintenance conditions, vegetative cover, erosion, and other surficial features.

In general, the condition of the dam is considered to be good. One wet area was observed at the toe of the dam near the outlet pipe. No seepage flow appeared to be associated with this area. The downstream face of the dam was covered with thick brush which precluded adequate inspection of the dam.

The top of the dam was surveyed relative to the spillway crest elevation and was found to have some vertical irregularities. Although the design freeboard for the dam is 6.5 feet, the field survey indicated freeboards ranging from 6.8 feet to 7.8 feet. The lowest area occurred in a section adjacent to the emergency spillway. The dam crest profile according to field measurements is illustrated in Plate 6.

c. Appurtenant Structures. The appurtenant structures were examined for deterioration or other signs of distress and obstructions that would limit flow. In general, the structures were found to be in good condition. The most significant condition noted in the spillway structures was the lack of erosion protection in the emergency spillway discharge channel. This condition is considered to be significant because the emergency spillway will be used frequently due to the small discharge capacity of the primary spillway and the toe of the dam will be subject to erosion due to flows in the emergency spillway discharge channel.

The only visible portion of the low level outlet was the downstream end of the outlet pipe. The stem for the upstream gate valve could not be located.

d. Reservoir Area. A map review indicates that the watershed is predominantly covered by rural residential areas. No signs of landslide activity were found in the vicinity of the reservoir. A review of the regional geology is included in Appendix F.

e. Downstream Channel. Downstream from the dam, Spring Run flows approximately one mile and passes under State Route 29 to its confluence with Meshoppen Creek. A further description of the downstream conditions is included in Section 1.2 d.

3.2 Evaluation. The condition of Lake Walter Dam is considered to be good. The only significant condition noted which requires further attention is the lack of erosion protection in the emergency spillway discharge channel. The swampy condition at the toe of the dam is not considered to be significant at this time; however, the condition should be monitored to document if seepage is developing.

The design drawings indicate that the upstream end of the outlet pipe is equipped with a gate valve. However, it appears that there is no means to operate this gate valve. Therefore, the owner should confirm the operational condition of this upstream control and develop a means of operation.

SECTION 4
OPERATIONAL FEATURES

4.1 Procedure. There are no formal operating procedures for the dam. The reservoir is normally maintained at the primary spillway crest level. Inflow into the reservoir in excess of the capacity of the drop inlet is discharged through the emergency spillway.

4.2 Maintenance of the Dam. The maintenance of the dam is considered to be fair. Some small trees are growing on the upstream face. The downstream face of the dam is covered with grass and thick brush. The brush and trees should be cleared from the dam.

4.3 Maintenance of Operating Facilities. Only the downstream end of the outlet pipe was visible. As previously noted, the operating equipment for the outlet pipe valve could not be located.

4.4 Warning System. No formal warning system exists for the dam. Telephone communication facilities are available via residences near the shoreline of the reservoir.

4.5 Evaluation. The maintenance of the dam is considered to be fair. It is considered advisable to place erosion protection along the embankment side of the emergency spillway channel as required by the original design and to remove the small trees and thick brush on the upstream and downstream slopes of the embankment and to develop a means to operate the outlet pipe valve.

SECTION 5
HYDRAULICS AND HYDROLOGY

5.1 Evaluation of Features

a. Design Data. Lake Walter Dam has a watershed of 0.49 square mile and impounds a reservoir with a surface area of 24 acres at normal pool level. The flood discharge facilities for the dam consist of an open channel emergency spillway channel and a 30-inch-diameter drop inlet type primary spillway, both located near the left abutment. The combined spillway capacity was estimated to be 6500 cfs, based on 6.8 feet of available freeboard relative to the low spot on the crest of the dam.

b. Experience Data. As previously stated, Lake Walter Dam is classified as a small dam in the high hazard category. Under the recommended criteria for evaluating emergency spillway discharge capacity, such impoundments are required to pass one-half to full PMF. In view of the downstream damage potential, full PMF is considered to be applicable to this dam.

The PMF inflow hydrograph for the reservoir was determined utilizing the Dam Safety Version of the HEC-1 computer program developed by the Hydrologic Engineering Center of the U.S. Army, Corps of Engineers. The data used for the computer input are presented in Appendix D. The PMF inflow hydrograph was found to have a peak flow of 1392 cfs, while the one-half PMF inflow hydrograph had a peak flow of 696 cfs. The computer input and summary of the computer output are also included in Appendix D.

c. Visual Observations. On the date of inspection, no conditions were observed that would indicate that the spillway capacity would be significantly reduced in the event of a flood. However, as noted before, flows through the emergency spillway may pose a potential for erosion of the embankment toe.

d. Overtopping Potential. Various percentages of the PMF inflow hydrograph were routed through the reservoir to determine the percent of PMF inflow that the dam can pass without significantly overtopping the embankment. The computer analyses indicate that the spillway can pass 100 percent PMF without overtopping. This would result in a maximum water surface elevation of 1133.3 within the reservoir, leaving approximately three feet of freeboard to the top of the dam.

e. Spillway Adequacy. The spillway capacity was found to fulfill the recommended spillway design capacity requirements and is, therefore, classified as adequate.

SECTION 6
STRUCTURAL STABILITY

6.1 Evaluation of Structural Stability

a. Visual Observations

(1) Embankment. As discussed in Section 3, the field observations did not reveal any signs of distress that would significantly affect the performance of the structure, and no unsatisfactory conditions have been reported in the past.

(2) Appurtenant Structures. The emergency spillway discharge channel was found to lack erosion protection. In view of the condition that the embankment forms the right side of the spillway discharge channel, large flows through the spillway may cause erosion of the embankment, thereby threatening the stability of the embankment. It is, therefore, considered advisable that adequate erosion protection be placed in the spillway discharge channel to protect the embankment.

b. Design and Construction Data

(1) Embankment. The available design and construction information does not provide any quantitative data to aid in the assessment of stability. However, as previously noted, the field observations did not reveal any signs of distress which would significantly affect the stability of the dam at this time and none were reported in the past.

(2) Appurtenant Structures. A review of the design drawings indicates that there are no apparent structural deficiencies that would significantly affect the performance of the appurtenant structures.

c. Operating Records. The structural stability of the dam is not considered to be affected by the operational features of the dam.

d. Postconstruction Changes. There have been no reported postconstruction modifications to the original design that would affect the structural stability of the embankment.

e. Seismic Stability. The dam is located in Seismic Zone 1, and based on visual observations, the static stability of the dam is considered to be adequate. Therefore, based on the recommended criteria for evaluation of seismic stability of dams, the structure is presumed to present no hazard as a result of earthquakes.

SECTION 7
ASSESSMENT AND RECOMMENDATIONS/PROPOSED REMEDIAL MEASURES

7.1 Dam Assessment

a. Assessment. The visual observations indicate that the condition of Lake Walter Dam is good. A condition which raised concern was the lack of erosion protection in the emergency spillway channel. In view of the layout of the channel which follows the toe of the embankment, flows through the emergency spillway may erode the toe of the dam, leading to reduced stability. Therefore, it is recommended that the emergency spillway discharge channel be provided with adequate erosion protection.

The spillway capacity was evaluated according to the recommended procedures and was found to pass the required spillway design flood of 100 percent of the PMF. Therefore, the spillway capacity is rated as adequate.

b. Adequacy of Information. The available information, in conjunction with the visual observations, is considered to be sufficient to make a Phase I evaluation.

c. Urgency. The following recommendations should be implemented as soon as possible or on a continuing basis.

d. Necessity for Additional Investigation. None required.

7.2 Recommendations/Remedial Measures. It is recommended that:

1. The owner should provide erosion protection in the emergency spillway discharge channel as was required in the original design.

2. The owner should confirm the operational condition of the valve at the upstream end of the low level outlet pipe and develop the facilities for operating this valve.

3. The wet area located at the toe of the dam near the downstream end of the outlet pipe should be monitored. Necessary remedial work should be performed if seepage conditions develop.

4. Brush and trees on the upstream and downstream faces of the dam should be cleared.

5. Around-the-clock surveillance should be provided during unusually heavy runoff and a formal

warning system should be developed to alert the downstream residents in the event of an emergency.

5. The dam and appurtenant structures should be inspected regularly and necessary maintenance should be performed.

APPENDIX A

CHECKLIST
VISUAL INSPECTION
PHASE I

APPENDIX A

CHECKLIST
VISUAL INSPECTION
PHASE I

DER: 058-1[illegible]

NAME OF DAM Lake Walter COUNTY Susquehanna STATE Pennsylvania ID# NDI: PA-0080

TYPE OF DAM Earth HAZARD CATEGORY High

DATE(S) INSPECTION November 13, 1980 WEATHER Sunny TEMPERATURE 50's

POOL ELEVATION AT TIME OF INSPECTION 1129.5 M.S.L. TAILWATER AT TIME OF INSPECTION 1105± M.S.L.

INSPECTION PERSONNEL:	REVIEW INSPECTION PERSONNEL: (February 5, 1981)
Douglas Cosler	Lawrence D. Andersen
Arthur Smith	James H. Poellot
Bilgin Erel	Bilgin Erel

Owner's Representative:
Ray Walter (Owner)

Bilgin Erel RECORDER

VISUAL INSPECTION
PHASE I
EMBANKMENT

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SURFACE CRACKS	None observed.	
UNUSUAL MOVEMENT OR CRACKING AT OR BEYOND THE TOE	None observed.	
SLOUGHING OR EROSION OF EMBANKMENT AND ABUTMENT SLOPES	None observed.	
VERTICAL AND HORIZONTAL ALIGNMENT OF THE CREST	See Plate 6 for dam crest profile. No significant horizontal misalignment observed.	
RIPRAP FAILURES	Upstream slope riprap in fair condition.	

VISUAL INSPECTION
PHASE I
EMBANKMENT

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
JUNCTION OF EMBANKMENT AND ABUTMENT, SPILLWAY AND DAM	No signs of distress observed.	
ANY NOTICEABLE SEEPAGE	No measurable seepage was found. There is a wet area below the toe of the dam. See Plate 5 for location.	
STAFF GAGE AND RECORDER	None	
DRAINS	None	

VISUAL INSPECTION
PHASE I
OUTLET WORKS

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CRACKING AND SPALLING OF CONCRETE SURFACES IN OUTLET CONDUIT	Primary Spillway: 24-inch steel pipe in good condition. Outlet Pipe: 12-inch steel pipe (only downstream end of pipe was visible).	
INTAKE STRUCTURE	Primary Spillway: 30-inch steel drop inlet pipe with trash rack. Outlet Pipe: Intake submerged (not visible).	
OUTLET STRUCTURE	Primary Spillway: No problems observed. Outlet Pipe: No problems observed.	
OUTLET CHANNEL	Primary Spillway: Riprapped channel. Outlet Pipe: No outlet channel. Pipe outlet partially blocked with debris.	
EMERGENCY GATE	Flow through the outlet pipe is controlled by an upstream valve. Valve is submerged and not accessible.	Means for operating the outlet pipe valve should be developed.

VISUAL INSPECTION
PHASE I
UNGATED SPILLWAY

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONCRETE WEIR	Emergency spillway is an open channel earth spillway. There is no overflow structure.	
APPROACH CHANNEL	Wide. Free of debris and obstructions.	
DISCHARGE CHANNEL	Seeded earth channel.	
BRIDGE AND PIERS	None	

VISUAL INSPECTION
PHASE I
GATED SPILLWAY

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONCRETE SILL	The dam has no gated spillway.	
APPROACH CHANNEL	N/A	
DISCHARGE CHANNEL	N/A	
BRIDGE PIERS	N/A	
GATES AND OPERATION EQUIPMENT	N/A	

VISUAL INSPECTION
PHASE I
INSTRUMENTATION

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

VISUAL INSPECTION
PHASE I
RESERVOIR

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SLOPES	No problems observed.	
SEDIMENTATION	Unknown	
UPSTREAM RESERVOIRS	None	

VISUAL INSPECTION
PHASE I
DOWNSTREAM CHANNEL

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONDITION (OBSTRUCTIONS, DEBRIS, ETC.)	No problems observed.	
SLOPES	No problems observed.	
APPROXIMATE NUMBER OF HOMES AND POPULATION	Two houses. Population (approximately) = 8.	

APPENDIX B

CHECKLIST
ENGINEERING DATA
DESIGN, CONSTRUCTION, OPERATION
AND HYDROLOGIC AND HYDRAULIC
PHASE I

APPENDIX B

CHECKLIST
ENGINEERING DATA
DESIGN, CONSTRUCTION, OPERATION
PHASE I

NAME OF DAM Lake Walter

ID# NDI: PA-0080
DER: 058-135

ITEM	REMARKS
AS-BUILT DRAWINGS	The design drawings are available in state files.
REGIONAL VICINITY MAP	See Plate 1.
CONSTRUCTION HISTORY	The dam was designed by Mr. Glenn E. Jacoby, a professional engineer from Tunkhannock, Pennsylvania.
TYPICAL SECTIONS OF DAM	See Plate 3.
OUTLETS - PLAN - DETAILS - CONSTRAINTS - DISCHARGE RATINGS	See Plate 3.

CHECKLIST
ENGINEERING DATA
DESIGN, CONSTRUCTION, OPERATION
PHASE I

ITEM	REMARKS
RAINFALL/RESERVOIR RECORDS	None available.
DESIGN REPORTS	None available.
GEOLOGY REPORTS	A preliminary geologic report for the dam site was prepared by the Soil Conservation Service and is available in state files.
DESIGN COMPUTATIONS HYDROLOGY & HYDRAULICS DAM STABILITY SEEPAGE STUDIES	No computations available.
MATERIALS INVESTIGATIONS BORING RECORDS LABORATORY FIELD	A materials investigation report for the dam site was prepared by the Soil Conservation Service and is available in state files.

CHECKLIST
ENGINEERING DATA
DESIGN, CONSTRUCTION, OPERATION
PHASE I

ITEM	REMARKS
POST CONSTRUCTION SURVEYS OF DAM	None available.
BORROW SOURCES	Material was obtained from borrow areas within the proposed pond.
MONITORING SYSTEMS	None
MODIFICATIONS	None reported.
HIGH POOL RECORDS	None recorded.

CHECKLIST
ENGINEERING DATA
DESIGN, CONSTRUCTION, OPERATION
PHASE I

ITEM	REMARKS
POST CONSTRUCTION ENGINEERING STUDIES AND REPORTS	None available.
PRIOR ACCIDENTS OR FAILURE OF DAM DESCRIPTION REPORTS	None reported.
MAINTENANCE OPERATION RECORDS	No maintenance records available.
SPILLWAY PLAN SECTIONS DETAILS	See Plate 2 for spillway plan.
OPERATING EQUIPMENT PLANS AND DETAILS	See Plate 3.

CHECKLIST
ENGINEERING DATA
HYDROLOGIC AND HYDRAULIC

DRAINAGE AREA CHARACTERISTICS: 0.49 square mile (wooded)

ELEVATION, TOP OF NORMAL POOL AND STORAGE CAPACITY: 1130.0 (300 acre-feet)

ELEVATION, TOP OF FLOOD CONTROL POOL AND STORAGE CAPACITY: 1136.8 (510 acre-feet)

ELEVATION, MAXIMUM DESIGN POOL: 1136.5 (as designed)

ELEVATION, TOP OF DAM: 1136.8 (measured low spot)

SPILLWAY:

a. Elevation Primary: 1130.0; Emergency: 1131.0

b. Type Primary: Circular steel drop inlet; Emergency: Earth channel

c. Width Primary: 30-inch inlet; Emergency: 200 feet (perpendicular to flow)

d. Length Primary: 120 feet + (24-inch horizontal pipe); Emergency: N/A

e. Location Spillover None observed

f. Number and Type of Gates None

OUTLET WORKS:

a. Type 12-inch steel pipe

b. Location Center line of dam near base

c. Entrance Inverts Not available

d. Exit Inverts 1105 ±

e. Emergency Drawdown Facilities 12-inch steel blowoff pipe (only downstream end of pipe was visible)

HYDROMETEOROLOGICAL GAGES:

a. Type No gages

b. Location N/A

c. Records None

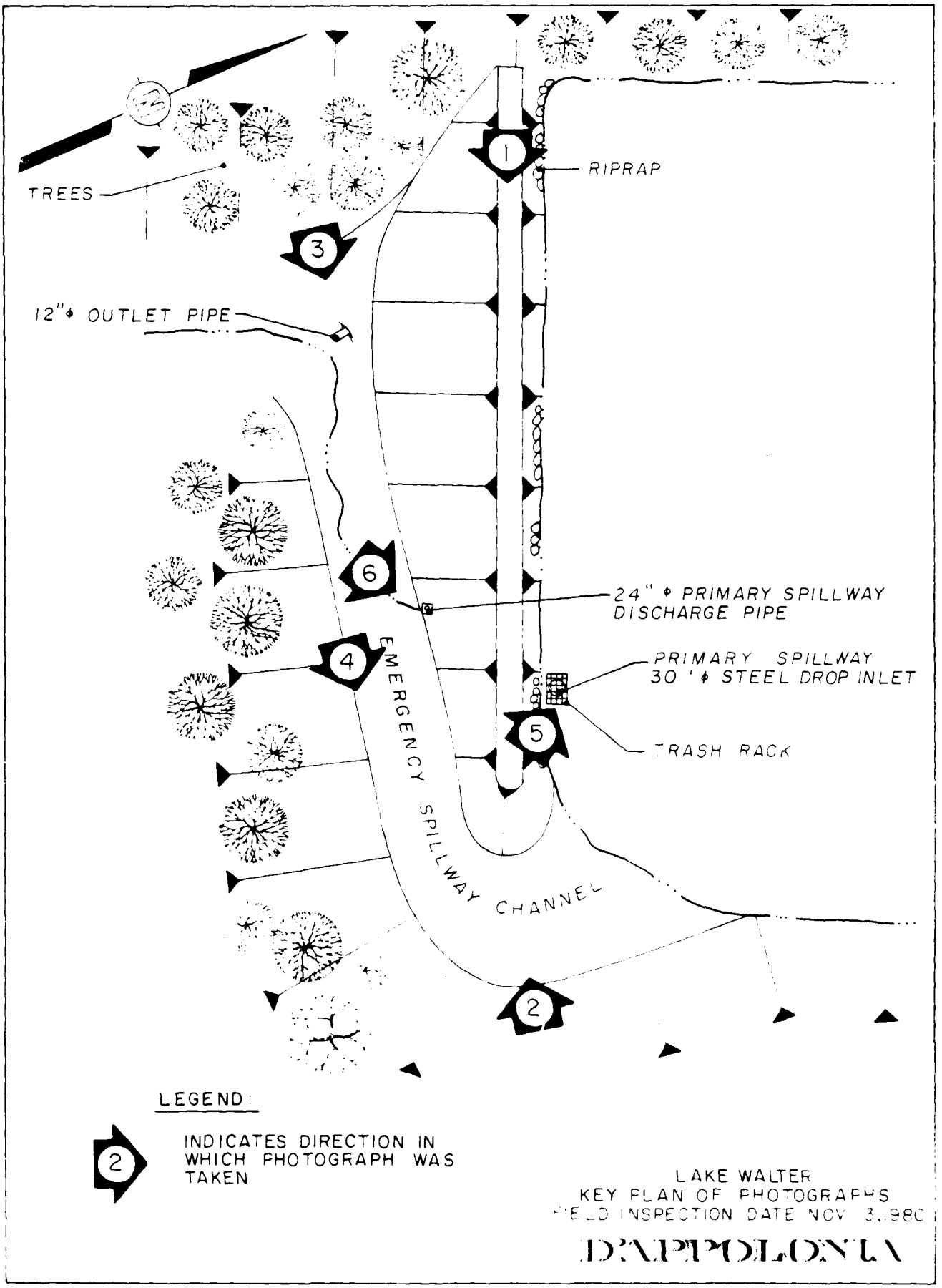
MAXIMUM NONDAMAGING DISCHARGE: Spillway capacity (6500 cfs)

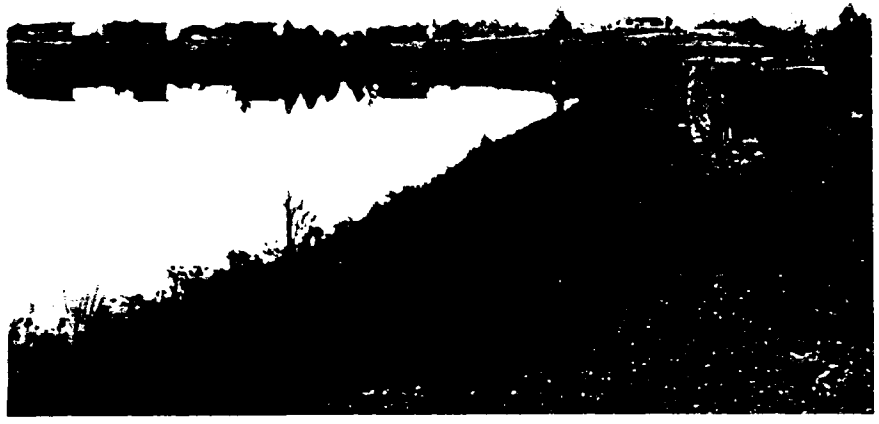
APPENDIX C

PHOTOGRAPHS

LIST OF PHOTOGRAPHS
LAKE WALTER DAM
NDI I.D. NO. PA-0080
NOVEMBER 13, 1980

PHOTOGRAPH NO.	DESCRIPTION
1	Crest (looking east).
2	Emergency spillway crest.
3	Downstream face of dam.
4	Emergency spillway discharge channel (looking upstream).
5	Primary spillway intake structure.
6	Primary spillway (downstream end).
7	Highway (mile 1.0).
8	House (mile 1.3).


TREES
RIPRAP
12"ϕ OUTLET PIPE
24" ϕ PRIMARY SPILLWAY
DISCHARGE PIPE
PRIMARY SPILLWAY
30 'ϕ STEEL DROP INLET
TRASH RACK
EMERGENCY SPILLWAY CHANNEL
1
2
3
4
5
6
LEGEND:
INDICATES DIRECTION IN WHICH PHOTOGRAPH WAS TAKEN
LAKE WALTER
KEY PLAN OF PHOTOGRAPHS
FIELD INSPECTION DATE NOV 3, 1980
DAPPOLONIA

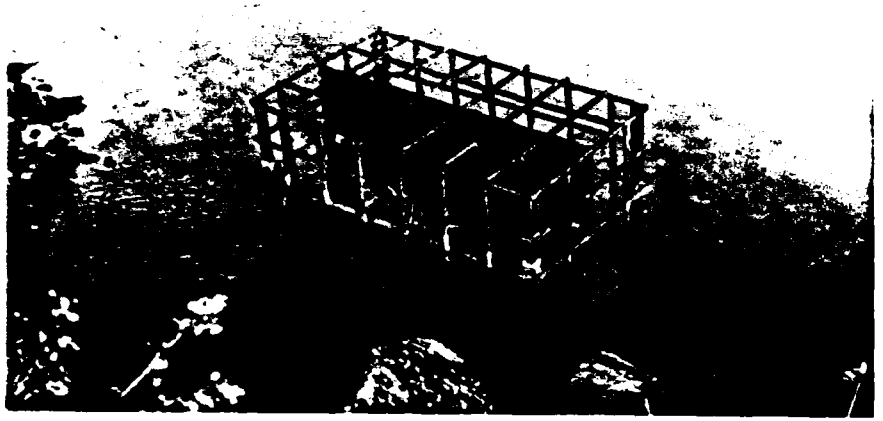


PHOTOGRAPH NO 1

PHOTOGRAPH NO 2

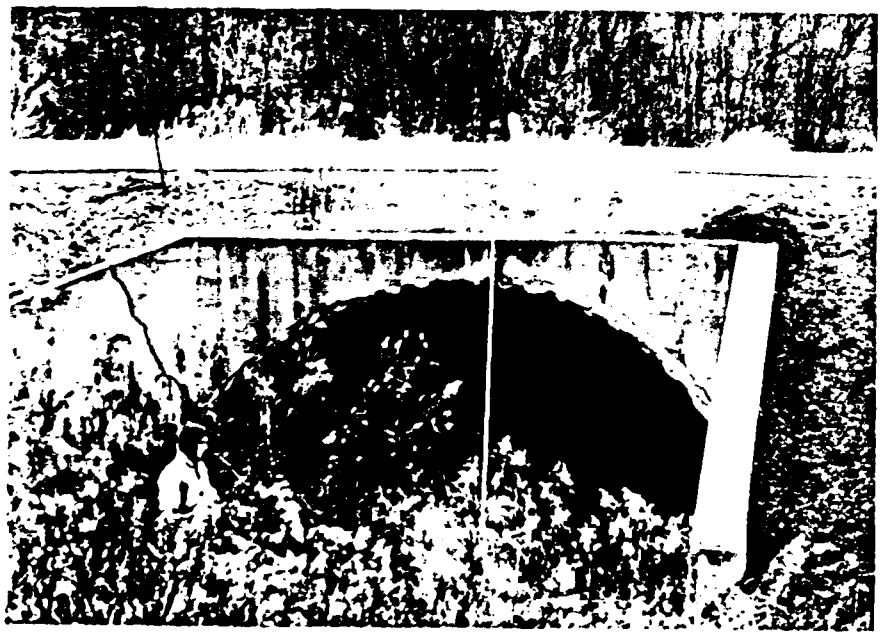
PHOTOGRAPH NO 3

PHOTOGRAPH NO 4



PHOTOGRAPH NO 5

PHOTOGRAPH NO 6



PHOTOGRAPH NO 7

PHOTOGRAPH NO 8

APPENDIX D

HYDROLOGY AND HYDRAULICS ANALYSES

HYDROLOGY AND HYDRAULIC ANALYSIS
DATA BASE

NAME OF DAM: Lake Walter Dam

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

STATION	1	2	3	4	5
Station Description	Lake Walter Reservoir	Lake Walter Dam			
Drainage Area (square miles)	0.49	-			
Cumulative Drainage Area (square miles)	0.49	0.49			
Adjustment of PMF for Drainage Area (%)(1)	95%				
6 Hours	117	-			
12 Hours	127	-			
24 Hours	136	-			
48 Hours	145	-			
72 Hours	-	-			
Snyder Hydrograph Parameters					
Zone(2)	11	-			
C_p/C_t(3)	0.62/1.5	-			
L (miles)(4)	1.14	-			
L_{ca} (miles)(4)	0.57	-			
$t_p = C_t(L \cdot L_{ca})^{0.3}$ (hours)	1.32	-			
Spillway Data		Primary:	Emergency:		
Crest Length (ft)	-	30-inch diameter	Trapezoidal: 100-foot width; 12:1 sideslopes		
Freeboard (ft)	-				
Discharge Coefficient	-	See rating curve calculations	See rating curve calculations		
Exponent	-				

(1) Hydrometeorological Report 40, U.S. Weather Bureau, 1965.
(2) Hydrological zone defined by Corps of Engineers, Baltimore District, for determining Snyder's Coefficients (C_p and C_t).
(3) Snyder's Coefficients.
(4) L = Length of longest water course from outlet to basin divide.
L_{ca} = Length of water course from outlet to point opposite the centroid of drainage area.

STORAGE VS. ELEVATION

ELEVATION	ΔH, FEET	AREA (acres)(1)	ΔVOLUME (acre-feet)(2)	STORAGE (acre-feet)
1140		45.0		619
	10		319	
1130 (Normal Pool El.)		23.9		300
	-		300(3)	
Reservoir Bottom		-		0

(1) Planimetered from USGS maps.
(2) $\Delta Volume = \Delta H/3 \ (A_1 + A_2 + \sqrt{A_1 A_2})$.
(3) Estimated.

```
**********
FLOOD HYDROGRAPH PACKAGE (HEC-1)
DAM SAFETY VERSION      JULY 1978
  LAST MODIFICATION   01 APR 80
**********
    1                 A1       SNYDER UNIT HYDROGRAPH, SPILLWAY AND DAM OVERTOPING ANALYSES
    2                 A2       LAKE WALTER DAM,(DER 58-135),SUSQUEHENNA COUNTY,PA. PROJECT NO.80-556-10
    3                 A4       FOR 20%,30%,40%,50%,60%,70%,80%,90%,AND 100% PROBABLE MAXIMUM FLOOD(PMF)
    4                 R     300       0      10       0       0       0       0       0      -4       0
    5                 B1      5
    6                 J       1       9       1
    7                 J1   0.20    0.30    0.40    0.50    0.60    0.70    0.80    0.90    1.00
    8                 K       0       1                                       1
    9                 K1       CALCULATION OF SNYDER INFLOW HYDROGRAPH TO LAKE WALTER DAM,(DER 58-135)
   10                 M       1       1    0.49            0.49                                    1
   11                 P               21.1     117     127     136     145
   12                 T                                                       1.0     0.5             0.0770
   13                 W    1.32    0.62
   14                 X    -1.5   -0.05     2.0
   15                 K       1       2                                       1
   16                 K1       ROUTING FLOW THROUGH LAKE WALTER DAM,(DER 58-135)
   17                 Y                                       1       1
   18                 Y1      1                                               -1130.0      -1
   19                 Y41130.0  1131.0  1131.5  1132.0  1132.5  1133.0  1133.5  1134.0  1134.5  1135.0
   20                 Y41135.5  1136.0  1136.5  1137.0  1138.0  1139.0  1140.0  1141.0  1142.0  1143.0
   21                 Y5    0.0    23.0   143.0   367.0   674.0  1057.0  1510.0  2049.0  2658.0  3345.0
   22                 Y54109.0  4953.0  5879.0  6888.0  9162.0 11790.0 14785.0 18160.0 21930.0 26106.0
   23                 $A   23.9    45.0    75.3
   24                 $E1130.0  1140.0  1160.0
   25                 $$1130.0
   26                 $D1136.8    2.65     1.5   750.0
   27                 $L   20.0   100.0   150.0   350.0   450.0   550.0   650.0   750.0
   28                 $V1136.2  1136.8  1136.9  1137.1  1137.4  1137.6  1137.7  1137.8
   29                 K      99
```

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 .20	RATIO 2 .30	RATIO 3 .40	RATIO 4 .50	RATIO 5 .60	RATIO 6 .70	RATIO 7 .80	RATIO 8 .90	RATIO 9 1.00
HYDROGRAPH AT	1	.49	1	278.	418.	557.	696.	835.	975.	1114.	1253.	1392.
	(	1.27)	(	7.88) (	11.83) (	15.77) (	19.71) (	23.65) (	27.59) (	31.54) (	35.48) (	39.42)
ROUTED TO	2	.49	1	198.	335.	477.	610.	748.	884.	1015.	1152.	1286.
	(	1.27)	(	5.59) (	9.49) (	13.52) (	17.27) (	21.19) (	25.02) (	28.74) (	32.62) (	36.42)

SUMMARY OF DAM SAFETY ANALYSIS

PLAN 1 .....

	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
ELEVATION	1130.00	1130.00	1136.80
STORAGE	0.	0.	207.
OUTFLOW	0.	0.	6556.

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
.20	1131.62	0.00	41.	198.	0.00	42.00	0.00
.30	1131.93	0.00	49.	355.	0.00	41.67	0.00
.40	1132.18	0.00	56.	477.	0.00	41.50	0.00
.50	1132.40	0.00	63.	610.	0.00	41.33	0.00
.60	1132.60	0.00	68.	748.	0.00	41.33	0.00
.70	1132.77	0.00	73.	884.	0.00	41.33	0.00
.80	1132.94	0.00	78.	1015.	0.00	41.33	0.00
.90	1133.10	0.00	83.	1152.	0.00	41.33	0.00
1.00	1133.25	0.00	87.	1286.	0.00	41.33	0.00

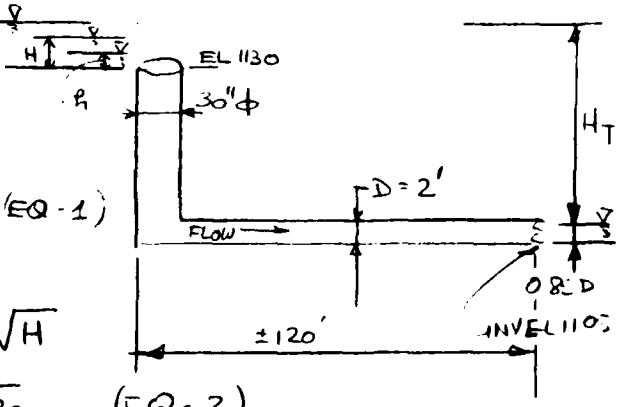
OVERTOPPING ANALYSIS SUMMARY

D'APPOLONIA
CONSULTING ENGINEERS, INC

By WTC Date 1-17-81 Subject LAKE WALTER DAM Sheet No. 1 of 2
Chkd. By DJC Date 2/20/81 PRIMARY SPILLWAY RATING CAPACITY Proj. No. 80-556-10

PRIMARY SPILLWAY CAPACITY

REFENCE: DESIGN OF SMALL DAMS 2nd EDITION



FOR WEIR FLOW CONTROL

$Q_W = CLh^{1.5} = (3.2)(\pi)(2.5)(h)^{1.5}$

$= 25.13\ h^{1.5} = 25.13\ (\text{LAKE EL} - 1130)^{1.5}$ (EQ-1)

FOR ORIFICE FLOW CONTROL

$Q_O = C_O A \sqrt{2gH} = 6.6\left(\frac{\pi 2.5^2}{4}\right)(64.4)^{1/2}\sqrt{H}$

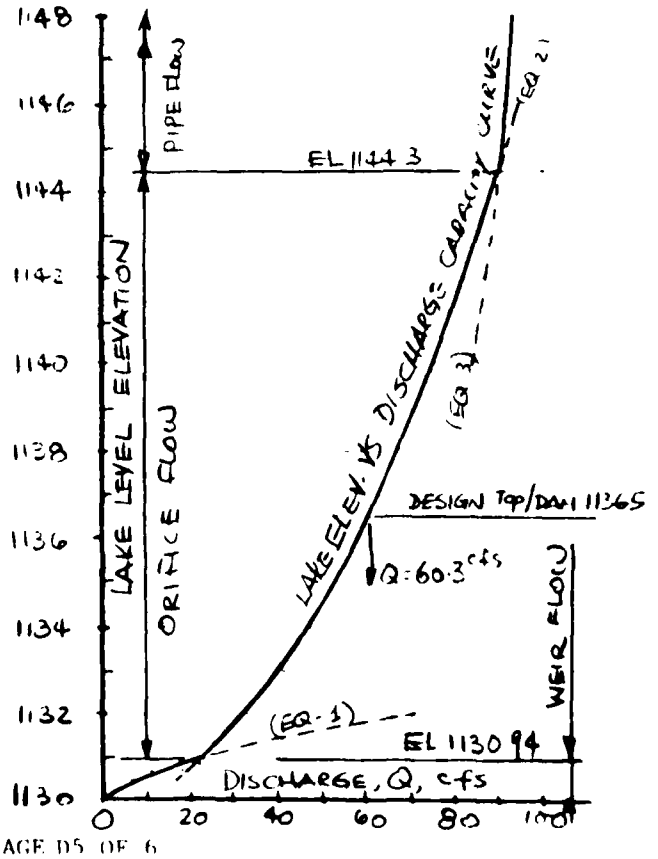
$= 23.64\sqrt{H} = 23.64\sqrt{\text{LAKE EL} - 1130}$ —(EQ-2)

FOR PIPE FLOW CONTROL

$$H_T = \left[\frac{2.5204(1+K_e)}{D^4} + \frac{466.18\,n^2 L}{D^{16/3}}\right]\left(\frac{Q_P}{10}\right)^2 = \left[\frac{(2.5204)(1.5)}{(2)^4} + \frac{(466.18)(0.013)^2(120)}{(2)^{16/3}}\right]\left(\frac{Q_P}{10}\right)^2$$

$Q_P = 14.57\sqrt{H_T} = 14.57\sqrt{\text{LAKE EL} - 1105 - 0.8D} = 14.57\sqrt{\text{LAKE EL} - 1106.7}$ (EQ-3)

LAKE LEVEL ELEVATION	EQ-1 Q_W cfs	EQ 2 Q_O cfs	EQ-3 Q_P cfs	SPILLWAY CAPACITY Q cfs
1120.0	0	0	0	0
1130.2	2.2			2.2
1130.4	6.4			6.4
1130.6	11.7	18.3		11.7
1130.8	18.0	21.1		18.0
1130.94	22.9	22.9		22.9
1132.0	71.1	32.4		32.4
1133		40.9		40.9
1134		47.3		47.3
1135		53.9		53.9
1136		57.9		57.9
1137		62.5		62.5
1138		66.9		66.9
1140		74.7	84.1	74.7
1142		21.9	86.6	81.9
1144.30		89.4	89.4	89.4
1146.0		94.5	91.4	91.4

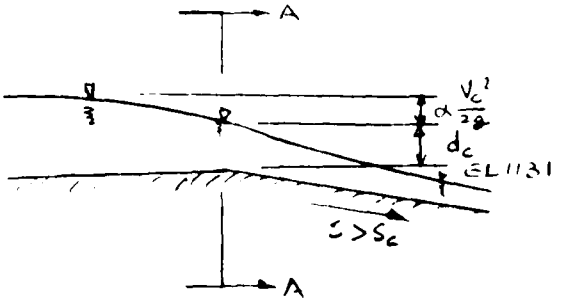


D'APPOLONIA
CONSULTING ENGINEERS, INC

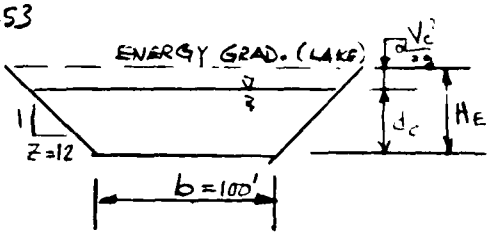
By WTC Date 1-17-81 Subject LAKE WALTER DAM Sheet No. 2 of 2
Chkd. By DJC Date 2/20/81 EMERGENCY SPILLWAY CAPACITY Proj. No. 80-556-10

EMERGENCY SPILLWAY CAPACITY

ASSUMPTION (1) SPECIFIC ENERGY $H_E = d + \alpha\frac{V^2}{2g}$
say $d = 1$ for NO ENTRANCE LOSS
H_E = LAKE LEVEL
(2) D/S CHANNEL IS STEEPER THAN CRITICAL SLOPE.



REFERENCE "DESIGN OF SMALL DAM" 2nd EDITION P 553



$$V_c = \sqrt{\frac{b+Z d_c}{b+2Z d_c} d_c g} \qquad (EQ-1)$$

$$H_E = d_c + \frac{V_c^2}{2g} = d_c + \left(\frac{b+Z d_c}{b+2Z d_c}\right)(d_c g)\left(\frac{1}{2g}\right)$$

$$= \frac{(3b+5Z d_c)\, d_c}{2b+4Z d_c}$$

THEN

$$d_c = \frac{-(3b-4H_E Z) + \sqrt{(3b-4H_E Z)^2 + (4H_E Z)(10b)}}{10Z} \qquad (EQ-2)$$

$$A_c = (Z d_c + b) d_c \qquad (EQ-3)$$

$$Q_c = (A_c)(V_c) \qquad (EQ-4)$$

LAKE LEVEL ELEVATION	H_E	EQ-2 d_c	EQ-3 A_c	EQ-1 V_c	EMERGENCY SPILLWAY Q_c	PRIMARY SPILLWAY Q	COMBINED SPILLWAY CAPACITY Q_s cfs
	FT	FT	FT^2	fps	cfs	cfs	
1130	—	—	—	—	—	0	0
1131	0	0	0	0	0	23	23
1131.5	0.5	0.3	35.1	3.2	113.6	28.9	143
1132.0	1.0	0.7	73.9	4.5	333.9	33.4	367
1132.5	1.5	1.0	116.3	5.5	636.7	37.4	674
1133.0	2.0	1.4	162.4	6.3	1016.5	40.9	1057
1133.5	2.5	1.8	212.2	6.9	1471.6	44.2	1516
1134.0	3.0	2.1	265.8	7.5	2002.0	47.3	2049
1134.5	3.5	2.5	323.1	8.1	2608.2	50.1	2658
1135.0	4.0	2.9	384.3	8.6	3291.6	52.9	3345
1135.5	4.5	3.2	449.2	9.0	4053.4	55.4	4109

LAKE LEVEL ELEVATION	H_E	EQ-2 d_c	EQ-3 A_c	EQ-1 V_c	EMERGENCY SPILLWAY Q_c	PRIMARY SPILLWAY Q	COMBINED SPILLWAY CAPACITY Q_s cfs
	FT	FT	FT^2	fps	cfs	cfs	
1136.0	5.0	3.6	517.9	9.5	4895.1	57.9	4953
1136.5	5.5	4.0	590.5	9.9	5818.5	60.3	5879
1137.0	6.0	4.4	666.8	10.2	6825.2	62.5	6888
1138.0	7.0	5.1	831.0	10.9	9095.5	66.9	9162
1139.0	8.0	5.9	1010.4	11.6	11719.2	70.9	11790
1140.0	9.0	6.7	1205.2	12.2	14710.3	74.7	14785
1141.0	10.0	7.5	1415.3	12.8	18082.3	78.4	18160
1142.0	11.0	8.2	1640.7	13.3	21846.2	81.9	21930
1143.0	12.0	9.0	1881.4	13.8	26021.9	85.2	26106

FOR DISCHARGE Q_s COMPUTED FOR LAKE LEVEL ABOVE EL 1136.5 ARE APPROXIMATE VALUES

APPENDIX E

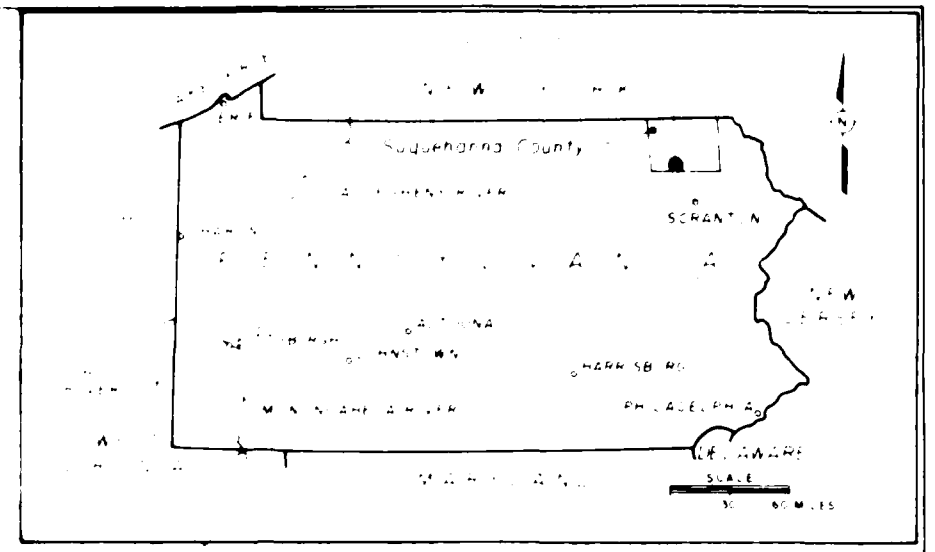
PLATES

DRAWN BY	CHECKED BY	DRAWING NUMBER
ACS 12-5-80	APPROVED BY	80-556 RIC

REFERENCE

U S G S SPRINGVILLE, PA QUADRANGLE
PHOTOREVISED 1969, SCALE 1:24000

19 1253 HERCULENE A&B SMITH CO PGH PA LT1530 1079



KEY PLAN

PLATE 1

LAKE WALTER DAM
VICINITY FLOOD PLAIN & WATERSHED MAP

SCALE
0 2000 4000 6000 FEET

DAMPOLADNLA

DRAWN BY	acs	CHECKED BY	RE	2-17-81	DRAWING NUMBER 80-556-B11
	12 31 80	APPROVED BY	[illegible]	[illegible]	

19 1253 HERCULENE AAB SMITH CO PGH PA L71530-1079

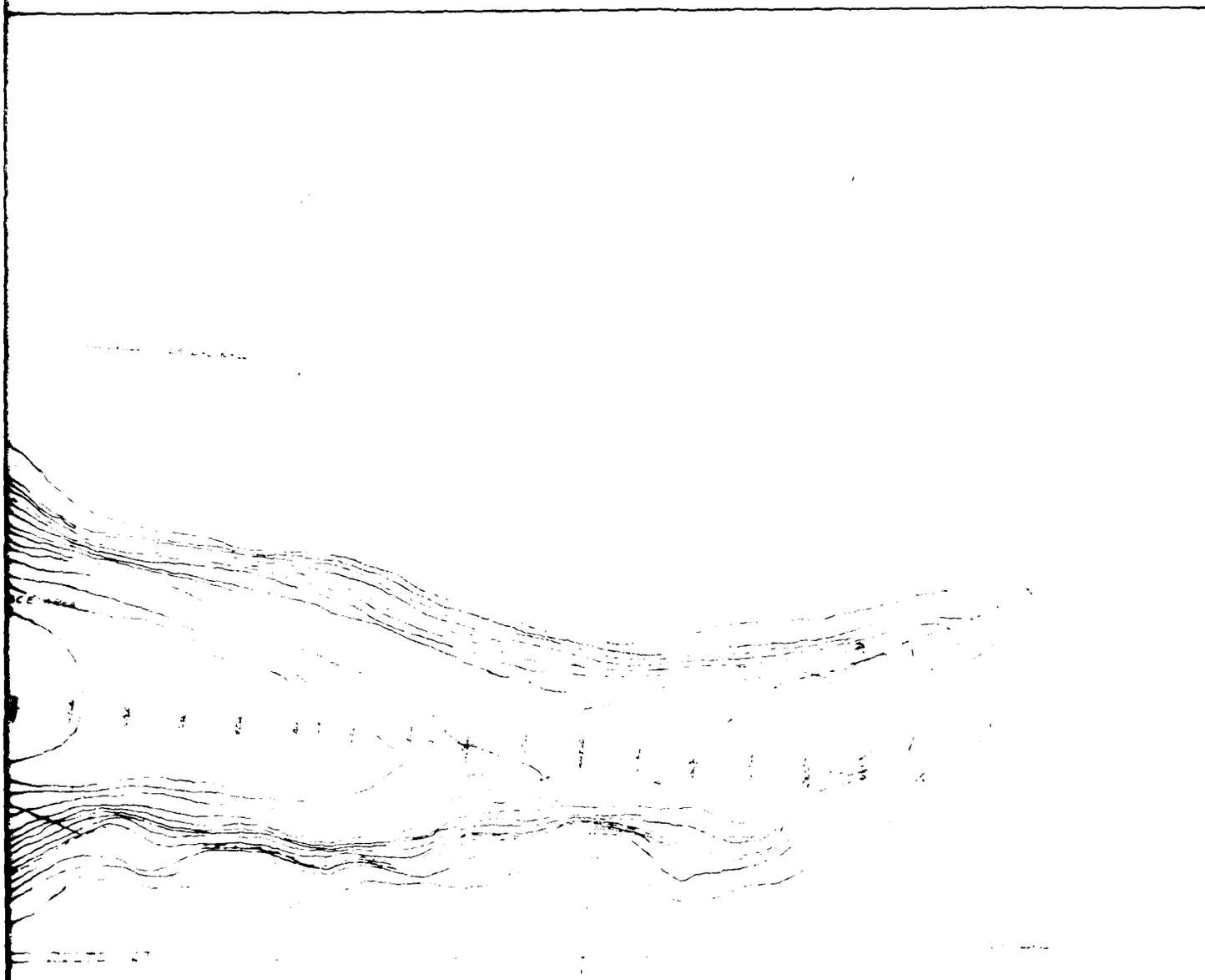


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PLATE 2

DTIC

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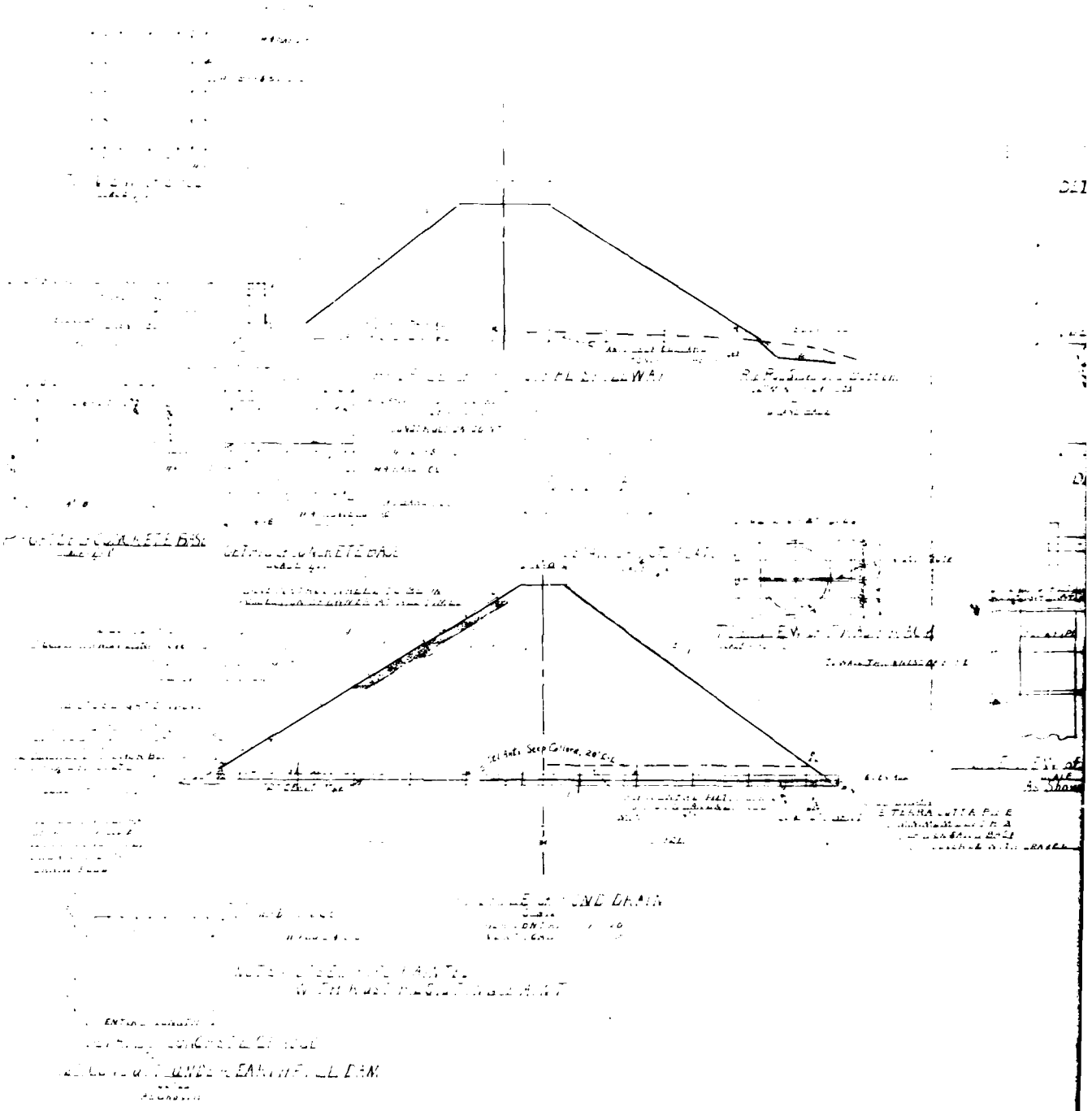
	JHR	80-556-B12



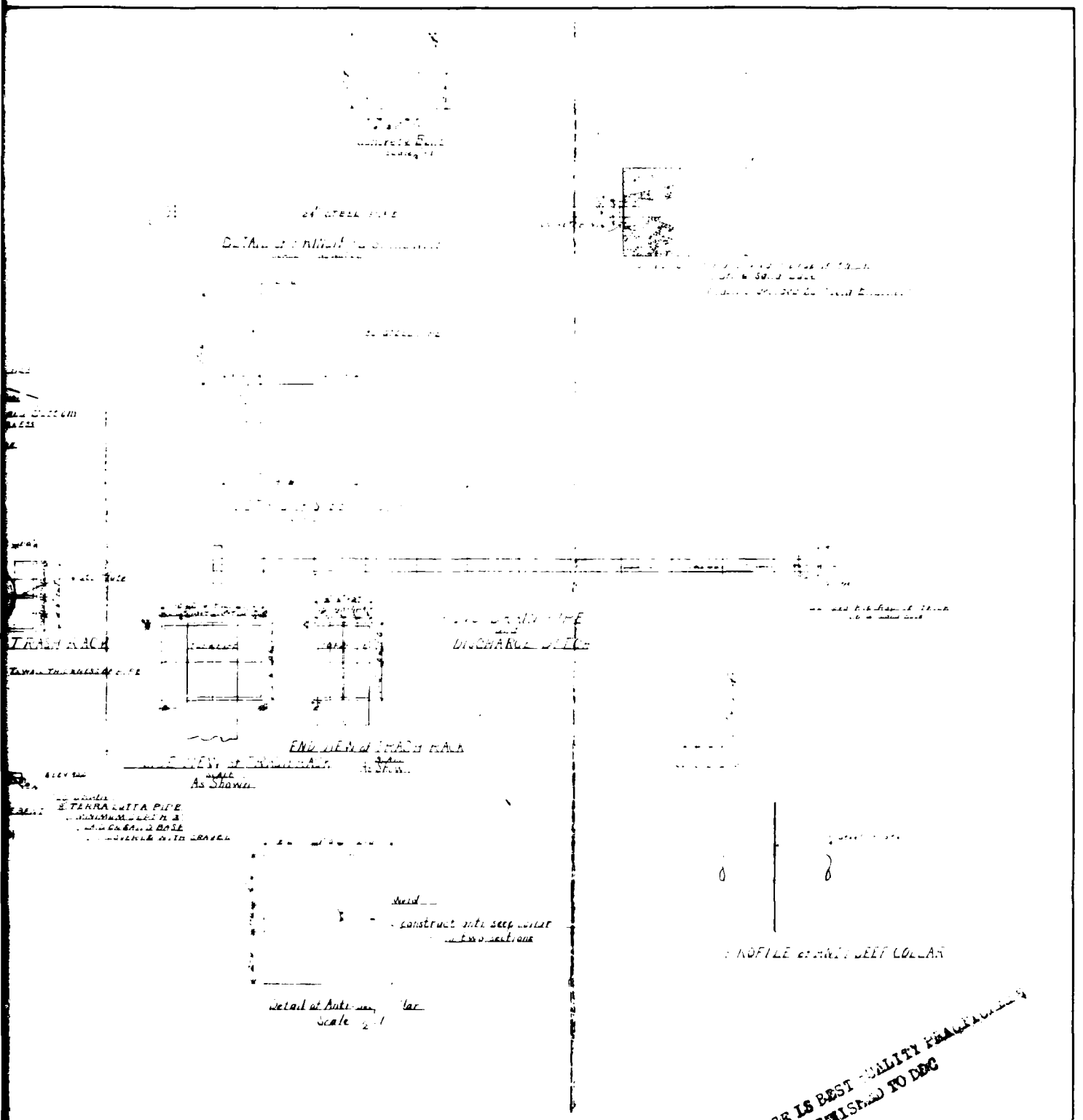


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PLATE 3

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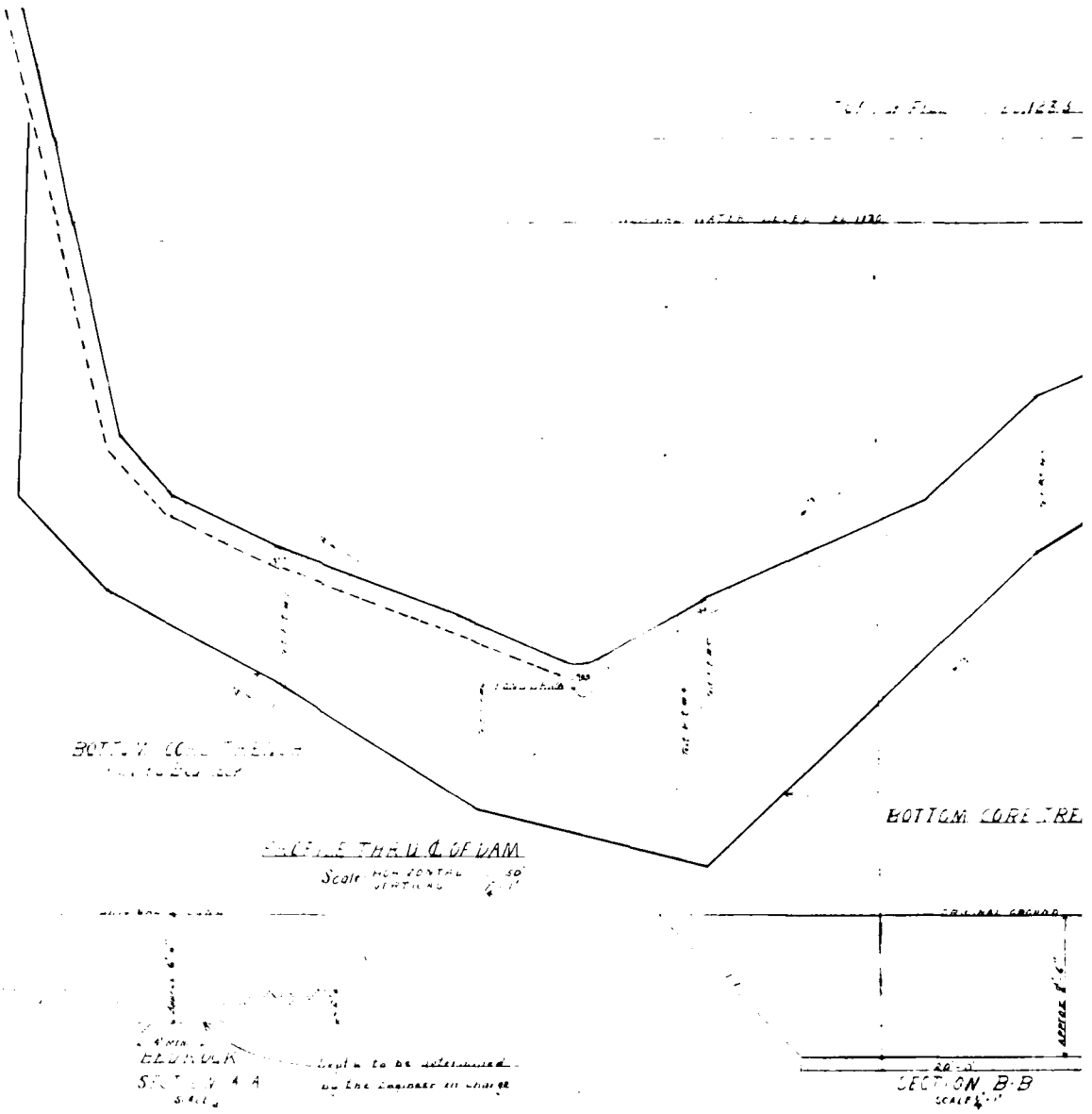
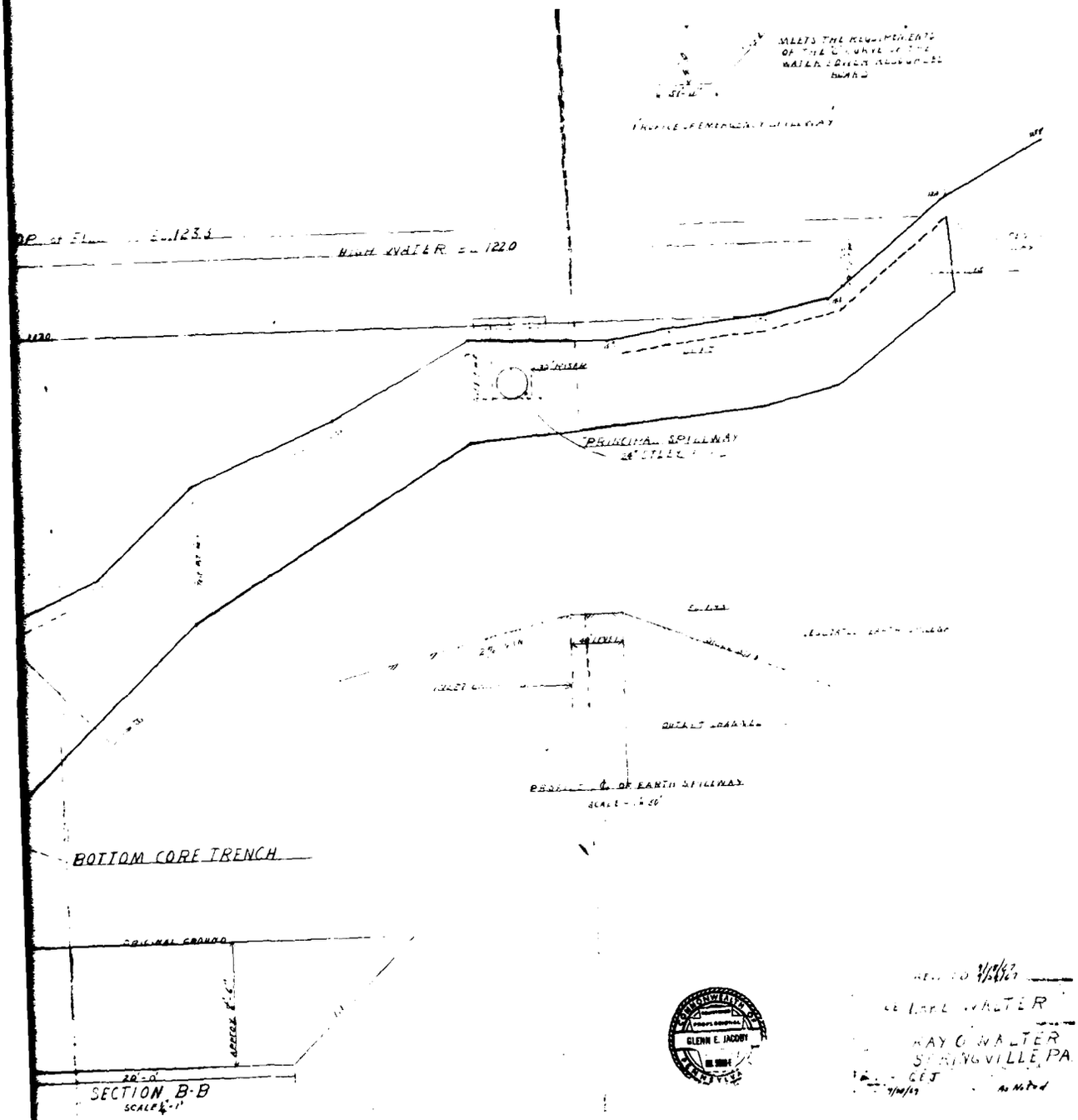
	12-31-80	APPROVED BY	JHO	7-17-81	



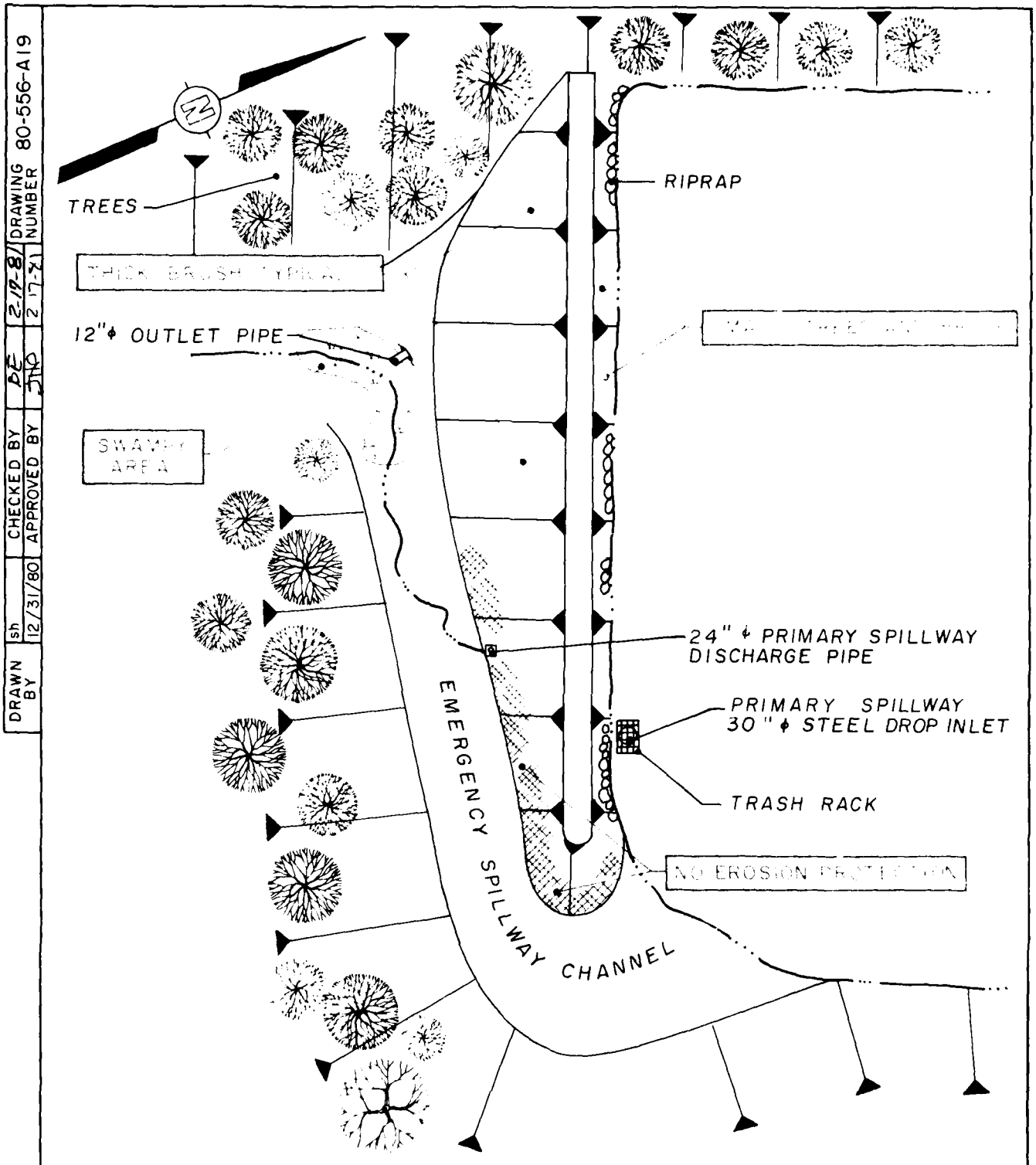


GLENN E. JACOBY

RAY C. WALTER
SELINSGROVE, PA.

PLATE 4

DAPPOLONIA



NOTE:

POOL LEVEL AT DATE OF INSPECTION:
6" BELOW PRIMARY SPILLWAY CREST

PLATE 5

LAKE WALTER
GENERAL PLAN
FIELD INSPECTION NOTES
FIELD INSPECTION DATE: NOV. 13, 1980

DAPPOLONIA

19 1253 HERCULENE AAB SMITH CO PGH PA LT1530 1079

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	12-22-80	APPROVED BY	SMD	2 17 81		

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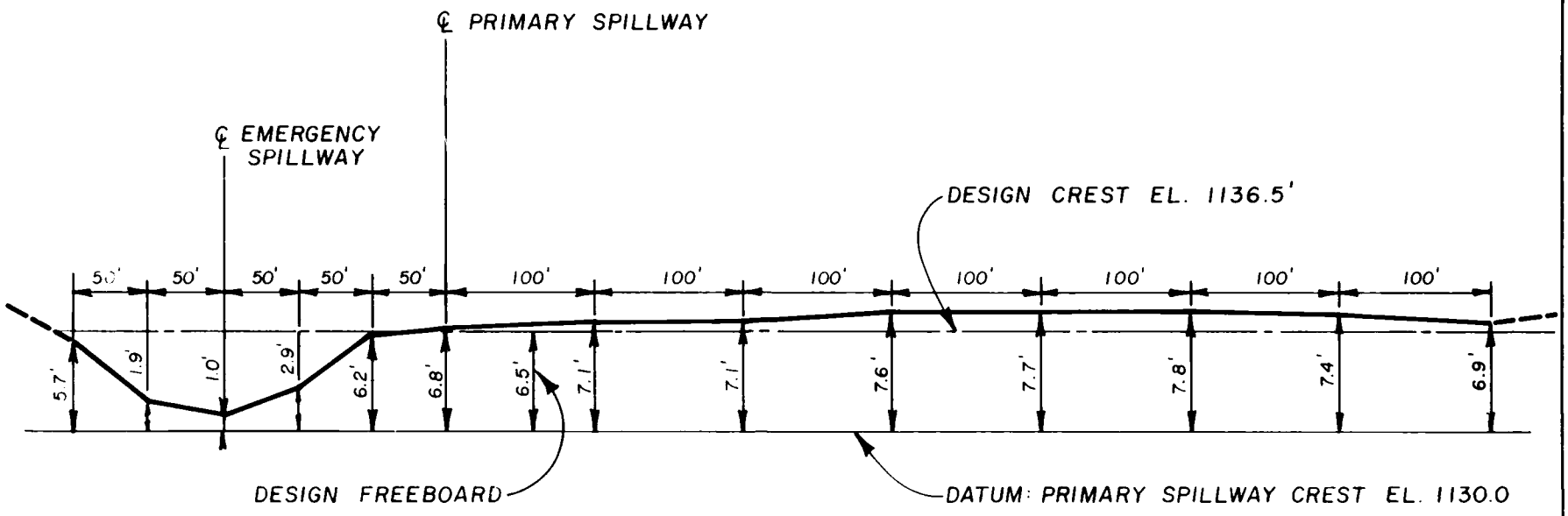

DAM CREST PROFILE
(LOOKING DOWNSTREAM)

NOTES

1. DAM CREST WAS SURVEYED RELATIVE TO SPILLWAY CREST LEVEL
2. DATUM ELEVATION PER U.S.G.S. MAP

PLATE 6

LAKE WALTER DAM
DAM CREST SURVEY
FIELD INSPECTION DATE NOV. 13, 1980

DAMTOLA

APPENDIX F

REGIONAL GEOLOGY

REGIONAL GEOLOGY
LAKE WALTER DAM

The Lake Walter Dam is located in the glaciated low plateaus section of the Appalachian Plateau physiographic province, characterized as a mature glaciated plateau of moderate relief.

The geologic structure consists of a series of northeast trending folds (approximately N70°E) which plunge gently to the southwest. The dip of the limbs of the folds in the vicinity of the Lake Walter Dam is less than two degrees, with the southeast limb steeper than the northwest limb. The dam is located approximately halfway between the Bernice Syncline to the south and the Wilmot Anticline to the north. In general, the discontinuity trends are northeast and northwest.

The stratigraphy consists of glacial till which will range in thickness from very thin to approximately 200 feet. The glacial till is underlain by the Devonian Catskill Formation, which is approximately 1,800 feet thick in this area. The Catskill Formation is continental in origin, consisting of red shale, cross-bedded red and green sandstone and siltstone. The shale strata tend to weather rapidly when exposed.

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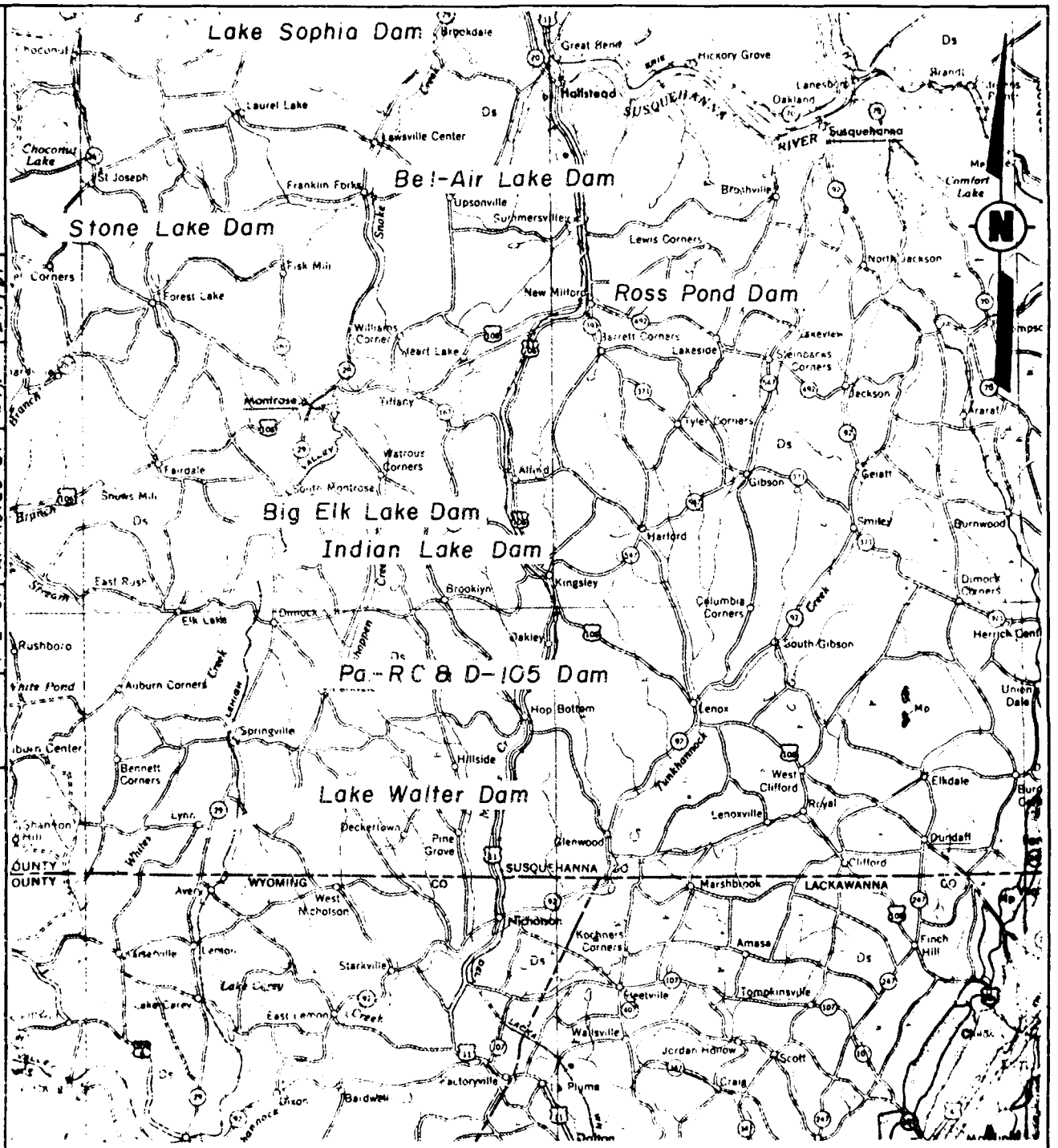

GEOLOGY MAP

REFERENCE

GEOLOGIC MAP OF PENNSYLVANIA PREPARED BY COMMONWEALTH OF PENNA DEPARTMENT OF ENVIRONMENTAL RESOURCES DATED 1960
SCALE 250,000

DAPPOLONIA

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PENNSYLVANIAN

APPALACHIAN PLATEAU

Pa — Allegheny Group

Includes ... Kittanning, and Clarion Formations

Pp — Pottsville Group

Predominantly sandstones and conglomerates with thin shales ... mineable locally

ANTHRACITE REGION

Pac — Post-Pottsville Formations

Pp — Pottsville Group

... Schuylkill and Tumbling Run Formations

MISSISSIPPIAN

Mmc — Mauch Chunk Formation

Mp — Pocono Group

DEVONIAN

UPPER

CENTRAL AND EASTERN PENNSYLVANIA

Doo — Oswayo Formation

... Oswayo not proved

Dck — Catskill Formation

Chiefly red to brownish shales and sandstones ... gray and greenish ... in the east

Marine beds

... Tully Limestone at base

Dr — Susquehanna Group

GEOLOGY MAP LEGEND

REFERENCE.

GEOLOGIC MAP OF PENNSYLVANIA PREPARED BY COMMONWEALTH OF PENNA., DEPARTMENT OF ENVIRONMENTAL RESOURCES, DATED 1960

SCALE 1 : 250,000

D'APPOLONIA

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APPROVED BY	[initials]	2-17-81
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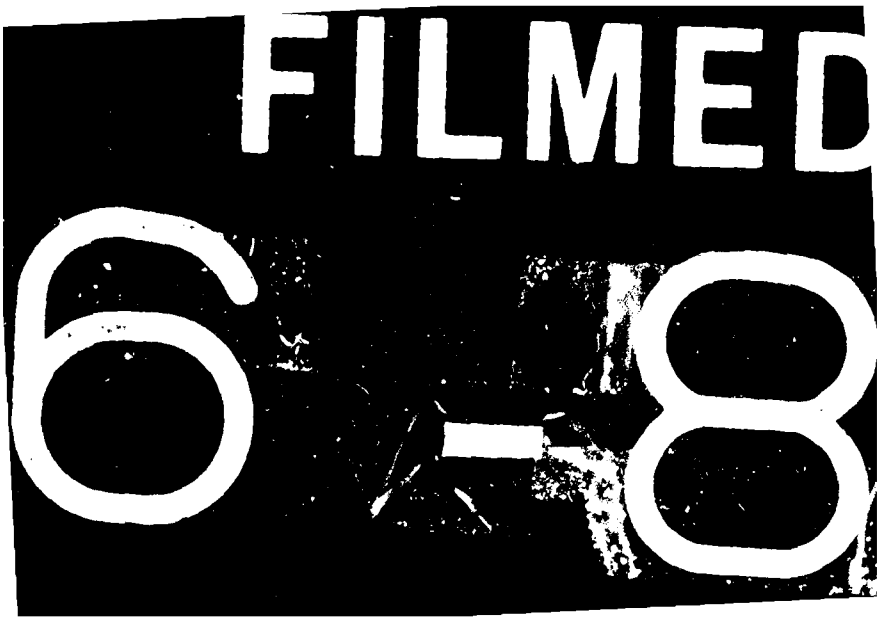
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