

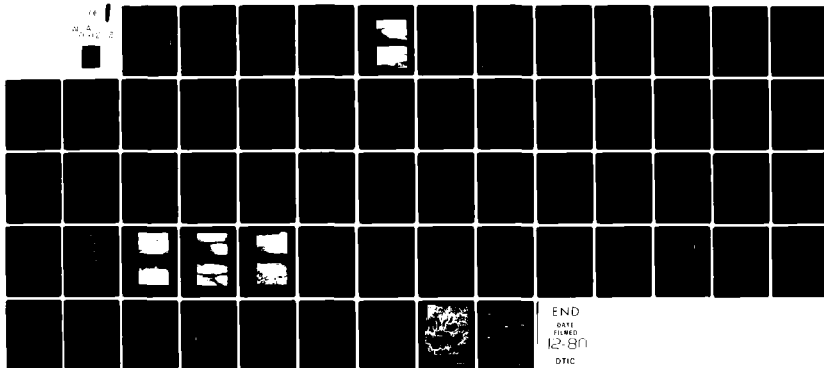
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D'APPOLONIA CONSULTING ENGINEERS INC PITTSBURGH PA
NATIONAL DAM INSPECTION PROGRAM. DOVERSPIKE NUMBER 1 DAM (NOI I-ETC(U))
AUG 80 L D ANDERSEN

F/G 13/13
DACW31-80-C-0022

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UNCLASSIFIED



OHIO RIVER BASIN
CHERRY RUN, JEFFERSON COUNTY

PENNSYLVANIA

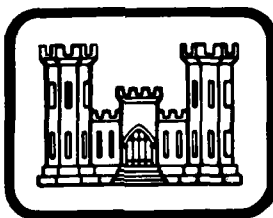
LEVEL

DOVERSPIKE NO. 1 DAM

NDI I.D. PA-01131

DER I.D. 33-56

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM



PREPARED FOR

DEPARTMENT OF THE ARMY
BALTIMORE DISTRICT, CORPS OF ENGINEERS
BALTIMORE, MARYLAND 21203

BY
DACW31-80-C-0022
D'APPOLONIA CONSULTING ENGINEERS

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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.

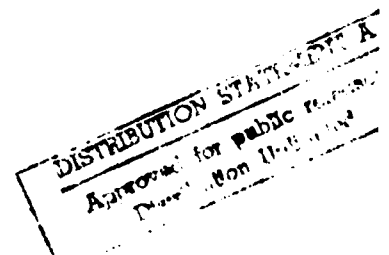
The purpose of a Phase I investigation is to identify expeditiously those dams which may pose hazards to human life or property. The assessment of the general condition of the dam is based upon visual observations and review of available data. Detailed investigations and analyses involving topographic 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.



PHASE I REPORT
NATIONAL DAM INSPECTION PROGRAM

NAME OF DAM: Doverspike No. 1 Dam
STATE LOCATED: Pennsylvania
COUNTY LOCATED: Jefferson
STREAM: Cherry Run, a Tributary of Little Sandy Creek
SIZE CLASSIFICATION: Intermediate
HAZARD CLASSIFICATION: High
OWNER: J. C. Enterprises
DATE OF INSPECTION: April 25, 1980 and May 1, 1980

ASSESSMENT: Based on the evaluation of the existing conditions, the condition of Doverspike No. 1 Dam is considered to be poor due to the inadequate size of the emergency spillway discharge channel. Field observations indicate that the capacity of the discharge channel is significantly less than the capacity of the emergency spillway overflow section, and a major portion of the flow passing the control section would spill onto the embankment, posing a potential for erosion of the embankment. The condition of the embankment is considered to be good.

According to the recommended criteria, intermediate size dams in the high hazard category are required to pass full probable maximum flood (PMF) without overtopping the embankment. The flood discharge capacity was evaluated according to the recommended criteria and was found to pass about 30 percent of the PMF without overtopping the embankment. Therefore, the spillway capacity is rated to be inadequate. Because overtopping of the embankment during the passage of 50 percent of the PMF for a duration of 3.2 hours with a maximum depth of 0.4 foot is not considered to present a serious breach potential, the spillway is not considered to be seriously inadequate.

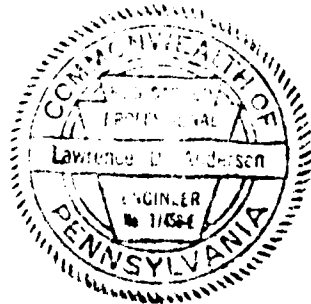
The following recommendations should be implemented immediately or on a continuing basis:

1. The owner should immediately retain an experienced professional engineer to conduct additional detailed hydrologic and hydraulic studies to determine the nature and extent of improvements required to provide adequate emergency spillway discharge channel capacity.
2. The operational condition of the outlet pipe valve should be evaluated and necessary maintenance performed.
3. Around-the-clock surveillance should be provided during unusually heavy runoff and a

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Formal warning system should be developed to alert the downstream residents in the event of emergencies.

4. The dam and appurtenant structures should be inspected regularly and a formal maintenance manual should be developed for future maintenance of the dam.



Lawrence D. Andersen
Lawrence D. Andersen, P.E.
Vice President

July 30, 1980
Date

Approved by:

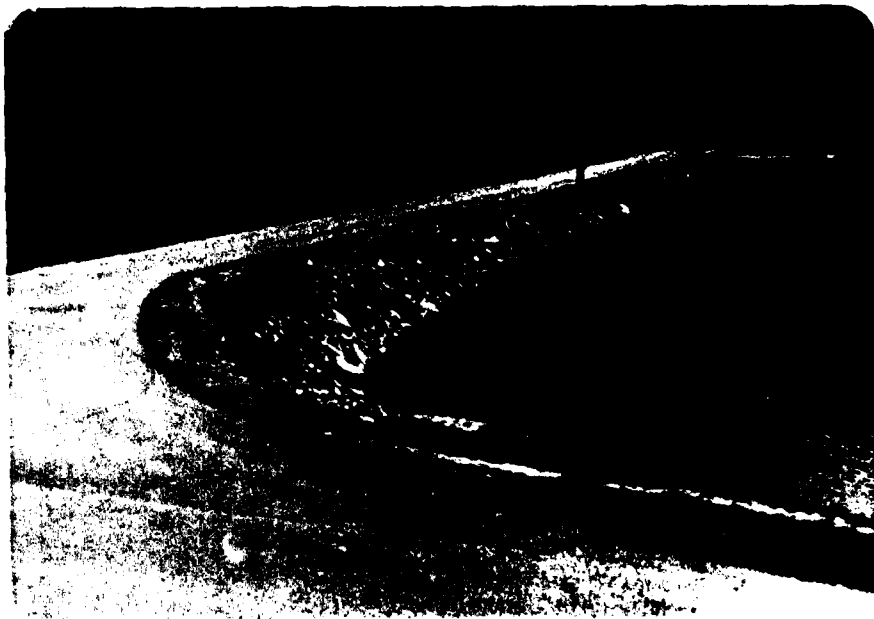
James W. Peck
JAMES W. PECK
Colonel, Corps of Engineers
District Engineer

Date 27 Aug 80

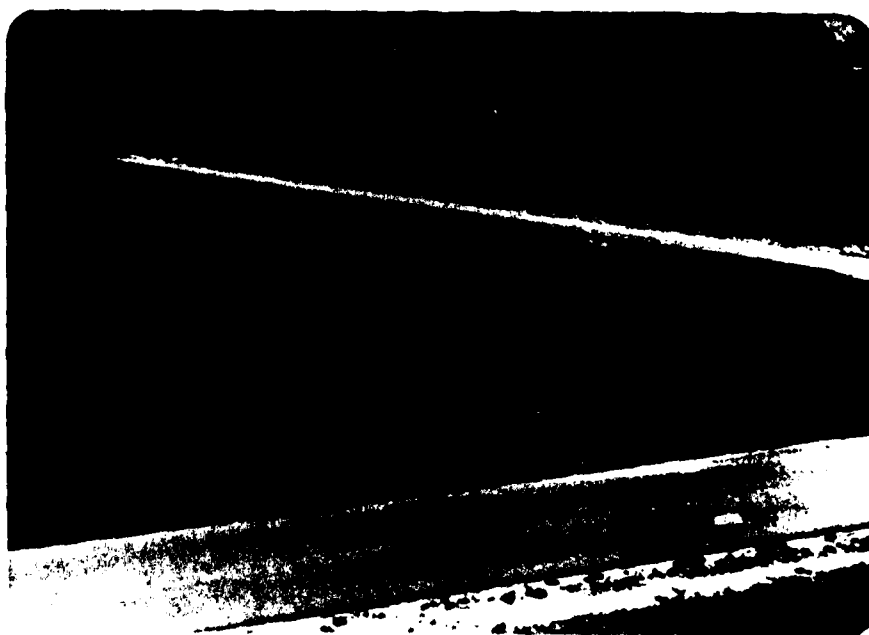
National Dam Inspection Program
Dor-rispike Number 1 Dam (NDI ID
PA-01131, DER ID 33-56). Ohio River
En-ins Cherry Run, Jefferson County,
Pennsylvania, Phase I Inspection
Report.

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DOVERSPIKE NO. 1 DAM
NDI I.D. PA-1131
DER I.D. 33-56
APRIL 25, 1980



Upstream Face



Downstream Face

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PHASE I REPORT
NATIONAL DAM INSPECTION PROGRAM
DOVERSPIKE NO. 1 DAM
NDI I.D. PA-1131
DER I.D. 33-56

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. Doverspike No. 1 Dam consists of an earth embankment approximately 450 feet long with a maximum height of 41 feet from the downstream invert level of the outlet pipe. The crest of the dam is 20 feet wide and is paved with asphalt as a roadway. The downstream slope of the dam is covered with grass and is on a slope of 3H to 1V. The upstream slope has riprap shoreline protection. The portion of the upstream slope above the normal pool level is on a slope of approximately 1.5H to 1V.

The flood discharge facilities for the dam consist of a riser pipe primary spillway which maintains the normal pool level and a concrete overflow structure located at the right abutment (looking downstream) as the emergency spillway. The riser pipe discharges into the low-level outlet pipe which is an 8-inch steel pipe. Flow through the outlet pipe is controlled by a valve immediately upstream of the riser pipe-outlet pipe connection. The stem of the valve rises through a pipe to above the normal pool level. The emergency spillway is a reinforced concrete structure with an overflow section approximately 30-1/2 feet wide and 2 feet deep. The crest of the emergency spillway is about 1.6 feet above the normal pool elevation. In the event the emergency spillway activates, flow through the section will discharge onto a concrete apron which, in turn, will discharge into an earth channel along the right abutment. The emergency spillway discharge channel initially follows the right abutment for approximately 200 to 300 feet and then turns left, discharging into the Cherry Run valley. The 8-inch low-level outlet pipe constitutes the emergency drawdown facility for the reservoir.

b. Location. Doverspike No. 1 Dam is located near the headwaters of Cherry Run, a tributary of Little Sandy Creek, northwest of the community of Ringgold in Ringgold Township, Jefferson County, Pennsylvania. Plate 1 illustrates the location of the dam.

c. Size Classification. Intermediate (based on 41-foot height and 115 acre-feet maximum storage capacity).

d. Hazard Classification. The dam is classified to be in the high hazard category. Below the dam, the stream flows east for approximately 1000 feet where it flows under Route 536. In this area, two residences are considered to be within the potential flood plain of the dam. It is estimated that failure of the dam may cause loss of life and property damage in this area and further downstream in rural residential areas.

e. Ownership. J. C. Enterprises (address: Mr. Mike McMeans, Box 90, Ringgold, Pennsylvania 15770).

f. Purpose of Dam. Recreation.

g. Design and Construction History. The dam was designed and constructed by the original owner, Doverspike Brothers, Inc., with completion in about 1970.

h. Normal Operating Procedure. As it presently exists, the reservoir is maintained at the top level of the uncontrolled riser pipe primary spillway.

1.3 Pertinent Data. Elevations referred to in this and subsequent sections of the report were calculated based on approximate field measurements assuming the normal pool level to be at Elevation 1384 which is the normal pool elevation indicated in the design drawings.

a. Drainage Area 0.4 square mile

b. Discharge at Dam Site (cfs)

Maximum known flood at dam site	Unknown
Outlet conduit at maximum pool	5+
Gated spillway capacity at maximum pool	Not applicable
Ungated spillway capacity at maximum pool	309
Total spillway capacity	309

c. Elevation (USGS Datum) (feet)

Top of Dam	1387.8 (measured low spot); 1388 (as designed)
------------	---

Maximum pool	1387.8
Normal pool	1384
Upstream invert outlet works	1348
Downstream invert outlet works	1347
Maximum tailwater	Unknown
Toe of Dam	1347
 d. <u>Reservoir Length (feet)</u>	
Normal pool level	800
Maximum pool level	900+
 e. <u>Storage (acre-feet)</u>	
Normal pool level	85
Maximum pool level	115
 f. <u>Reservoir Surface (acres)</u>	
Normal pool level	7.1
Maximum pool level	8+
 g. <u>Dam</u>	
Type	Earth
Length	450 feet
Height	41 feet
Top width	20 feet
Side slopes	Downstream: 3H:1V; Upstream: 1.5H:1V (portion above normal pool level); 2H:1V (as designed)
Zoning	Yes
Impervious core	Yes
Cutoff	Yes
Grout curtain	No
 h. <u>Regulating Outlet</u>	
Type	8-inch steel pipe
Length	200+ feet
Closure	Upstream valve
Access	Inaccessible
Regulating facilities	Upstream

i. Spillway

	<u>Primary</u>	<u>Emergency</u>
Type	Pipe drop inlet	Open channel
Length	Not applicable	30.5 feet (perpendicular to flow)
Crest elevation	1384	1385.6
Upstream channel	Lake	Lake
Downstream channel	8-inch-diameter outlet pipe	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, the engineer's report, and correspondence.

(1) Hydrology and Hydraulics. The available information consists of spillway design drawings.

(2) Embankment. The available information includes design drawings and the engineer's report on the subsurface investigation, materials testing, and stability analysis.

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

b. Design Features

(1) Embankment. Plate 2 illustrates the plan of the embankment and the appurtenant structures. As shown in Plate 3, the dam consists of a zoned earth embankment with a central impervious section with rock-fill zones upstream and downstream. The impervious section is shown to extend into a cutoff trench along the axis of the dam with a base width of 40 feet. The material of the impervious zone was described as compacted clay and shale. The available information indicates that the design of the dam was based on experience. However, an engineering investigation consisting of a subsurface investigation, materials testing, and seepage and stability analyses was conducted after the completion of the dam.

(2) Appurtenant Structures. The appurtenant structures consist of a riser pipe primary spillway (combined with outlet works) and an overflow emergency spillway located near the right abutment. The typical cross section of the primary spillway and the outlet works are shown in Plate 3. The primary spillway includes an 8-inch pipe extending from the outlet pipe to the normal pool elevation. Flow entering into the riser pipe is discharged through the outlet pipe. Flow through the outlet pipe is controlled by a gate immediately upstream of the junction of the riser pipe and the outlet pipe. The stem of the outlet pipe control valve was extended through a pipe to above the normal pool elevation. The outlet pipe is shown to be equipped with three antiseepage collars located beneath the upstream slope of the embankment. The emergency spillway

facilities include a concrete overflow section which discharges onto a concrete apron, which in turn discharges into an earth channel. The earth discharge channel initially follows the right abutment for approximately 200 to 300 feet and then turns left and discharges into the Cherry Run valley. The emergency spillway structures include an upstream reinforced concrete retaining structure and a reinforced concrete apron slab. A rectangular cutout in the retaining wall approximately 30.5 feet long and 2 feet deep constitutes the overflow section. The crest of the overflow section is located approximately 1.6 feet above the normal pool level. In the design drawings, a typical cross section of the emergency spillway discharge channel is shown to be triangular in cross section, approximately 4 feet deep, with a top width of about 15 feet.

c. Design Data

- (1) Hydrology and Hydraulics. No design data are available.
- (2) Embankment. Other than the design drawings, no engineering data are available on the design of the embankment.
- (3) Appurtenant Structures. No design data are available on the appurtenant structures.

2.2 Construction. Available records indicate that the dam was constructed by the original owner, Doverspike Brothers, Inc., with completion in about 1970.

2.3 Operation. There are no formal operating records maintained for the dam.

2.4 Other Investigations. The available information indicates that an engineering investigation was undertaken to investigate the stability of the dam in 1972. The engineer's report entitled, Stability Analysis for an Existing Earth Dam, Ringgold, Pennsylvania, prepared by Pittsburgh Testing Laboratories, dated September 12, 1972, summarizes the findings of this postconstruction engineering investigation. This work consisted of subsurface investigation, materials testing, and seepage and stability analyses. The steady-state seepage, downstream slope stability factor of safety was reported to be 2.8.

2.5 Evaluation

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

b. Adequacy

(1) Hydrology and Hydraulics. No design information is available to assess the adequacy of the spillway.

(2) Embankment. The results of the postconstruction engineering investigation, which included a subsurface investigation, materials testing, and stability analysis, are considered to be adequate.

(3) Appurtenant Structures. No design information is available to assess the structural adequacy of the appurtenant structures.

SECTION 3
VISUAL INSPECTION

3.1 Findings

a. General. The on-site inspection of Doverspike No. 1 Dam consisted of:

1. Visual inspection of the embankment, abutments, and embankment toe.
2. Visual examination of the spillway structures.
3. Evaluation of downstream area hazard potential.

The specific observations are illustrated in Plate 4.

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. A swampy area was located immediately below the downstream toe of the dam. However, no measurable seepage was found to be associated with this area. In its present extent and condition, this wet area is not considered to be a threat to the overall stability of the embankment at this time. However, periodic inspection would be required to insure that the conditions are not changing.

The crest of the dam was surveyed relative to the emergency spillway crest elevation and it was found to be generally at or above the design crest elevation. The dam crest profile is illustrated in Plate 5. The downstream slope was surveyed and found to be reasonably within the design slope of 3H to 1V.

c. Appurtenant Structures. The spillway structures were examined for deterioration and other signs of distress and obstructions that would limit flow. The most significant condition noted was the inadequate size of the emergency spillway discharge channel. Immediately downstream of the concrete apron of the emergency spillway, the discharge channel is approximately 10 to 15 feet wide and less than one foot deep. Visual observations indicate that in the event of flows through the emergency spillway, significant discharge would spill out of the discharge channel onto the downstream slope of the dam, posing potential for erosion of the embankment. Another condition noted was the erosion of the spillway discharge channel approximately 100 to 200 feet downstream from the overflow section.

As to the outlet works, only the downstream end of the outlet pipe and the stem of the outlet pipe valve within the reservoir were visible. The operational condition of the outlet pipe valve was not observed.

d. Reservoir Area. A map review and visual observations indicate that the watershed is predominantly covered by reclaimed strip-mined areas. No signs of landslide activity in the vicinity of the reservoir were found. A review of the regional geology is included in Appendix F.

e. Downstream Channel. There are two houses located approximately 1000 feet downstream from the dam which are considered to be within the potential flood plain in the event of a dam failure. A further description of the downstream conditions is included in Section 1.2d.

3.2 Evaluation. Except for the inadequate size of the emergency spillway discharge channel, the overall condition of the dam is considered to be good. The present extent of the swampy conditions along the downstream toe of the dam does not appear to be affecting the stability of the embankment at this time. However, continued inspection of this area is required to determine if the extent of the swampy area is increasing or if seepage or piping conditions are developing.

SECTION 4 OPERATIONAL FEATURES

4.1 Procedure. There are no formal operating procedures for the dam. As it presently exists, the reservoir is normally maintained at the crest level of the riser pipe primary spillway.

4.2 Maintenance of the Dam. The maintenance of the dam is considered to be good. The downstream face of the dam is covered with well-established grass which appears to be mowed periodically.

4.3 Maintenance of Operating Facilities. The only operational feature of the dam is the outlet pipe valve operated by a valve stem projecting above the normal pool level within the lake. The operational condition of the outlet pipe valve was not observed.

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

4.5 Evaluation. The maintenance condition of the dam is considered to be good. The embankment should be periodically inspected with emphasis on the swampy area along the downstream toe of the dam to determine that the conditions are not changing. The operational condition of the outlet pipe valve should be evaluated and necessary maintenance performed.

SECTION 5 HYDRAULICS AND HYDROLOGY

5.1 Evaluation of Features

a. Design Data. Doverspike No. 1 Dam has a watershed of 1.4 square miles and impounds a reservoir with a surface area of 7.1 acres at normal pool level. The flood discharge facilities consist of a riser pipe primary spillway and an overflow emergency spillway located near the right abutment. The capacity of the emergency spillway based on the available freeboard relative to the low spot on the crest of the dam was determined to be 309 cfs, as indicated in the computer output in Appendix D.

b. Experience Data. As previously stated, Doverspike No. 1 Dam is classified as an intermediate dam in the high hazard category. Under the recommended criteria for evaluating emergency spillway discharge capacity, such impoundments are required to pass full PMF.

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 analysis are presented in Appendix D. The 50 percent and full PMF hydrographs were found to have peak flows of 570 and 1139 cfs, respectively. Computer input and a summary of computer output for the PMF analysis are included in Appendix D.

c. Visual Observations. The field observations indicate that the discharge capacity of the spillway discharge channel is significantly less than the capacity of the overflow section. Therefore, in the event of flow through the emergency spillway, significant discharge would spill over the discharge channel onto the downstream face of the dam, posing a potential for erosion of the embankment.

d. Overtopping Potential. Various percentages of the PMF inflow hydrograph were routed through the reservoir, and it was found that the spillway can pass about 30 percent of the PMF without overtopping the embankment. At 50 percent of the PMF, it was found that the dam would be overtopped for a duration of 3.2 hours with a maximum depth of 0.4 foot over the dam crest. For full PMF, the overtopping duration would be 6.25 hours and the maximum depth over the dam would be 0.9 foot.

e. Spillway Adequacy. The spillway was found to pass about 30 percent of the PMF without overtopping the embankment. Overtopping of the embankment for a duration of 3.2 hours with a maximum depth

of 0.4 foot over the low point on the crest of the dam during the passage of 50 percent PMF is not considered to pose a significant breach potential because the dam crest is paved. Therefore, the spillway is classified to be inadequate, but not seriously inadequate.

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 stability of the dam at this time. However, in view of the presence of a swampy area below the toe of the dam, continued inspection of this area is required to determine if the extent of the wet area is increasing or if seepage or sloughing conditions are developing.

(2) Appurtenant Structures. As previously mentioned, the most significant condition noted in the appurtenant structures was the inadequate size of the emergency spillway discharge channel. Visual observations indicate that in the event of flow through the emergency spillway, a significant portion of the discharge would spill out of the discharge channel onto the downstream face of the dam, posing an erosion potential. Therefore, enlargement of the emergency spillway discharge channel to provide adequate discharge capacity is required.

b. Design and Construction Data

(1) Embankment. The available information indicates that in a postconstruction study, the stability of the embankment was analyzed for steady-state seepage and rapid drawdown conditions based on strength parameters obtained from laboratory tests. The factors of safety were reported to be 2.3 for the downstream slope under steady-state seepage and 1.2 for the upstream slope under rapid drawdown conditions. The strength parameters used for the stability analysis--internal friction angle, 33 degrees, and cohesion, 200 psf--appear to be in a reasonable range relative to the indicated classification of the embankment material. Based on the reported results of the engineering analysis and on visual observations, the stability of the dam is considered to be adequate.

(2) Appurtenant Structures. The available information does not include any quantitative data to evaluate the structural performance of the appurtenant structures.

c. Operating Records. There are no operating records kept for the dam.

d. Post-Construction Changes. None reported.

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

SECTION 7
ASSESSMENT AND RECOMMENDATIONS/REMEDIAL MEASURES

7.1 Dam Assessment

a. Assessment. Based on the evaluation of existing conditions, Doverspike No. 1 Dam is considered to be poor due to the inadequate size of the emergency spillway discharge channel. As previously discussed, in the event of flows through the emergency spillway, a significant portion of the discharge is likely to spill onto the downstream slope of the dam, posing an erosion potential. Another condition noted was a swampy area along the downstream toe of the dam. However, at its present extent, the swampy condition is not considered to be serious relative to the overall performance of the dam at this time. However, this area should be periodically observed to determine if the condition is changing.

The spillway capacity of 30 percent PMF was found to be less than the recommended spillway capacity of full PMF. For 50 percent of the PMF, it was found that the dam would be overtopped for a duration of 3.2 hours with a maximum depth of 0.4 foot, which is not considered to pose a significant breach potential. Therefore, the spillway is classified as inadequate, but not seriously inadequate, as discussed in Section 5.1e.

b. Adequacy of Information. Available information, in conjunction with visual observations, is considered to be sufficient to make the following recommendations.

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

d. Necessity for Additional Data. In view of the conditions described above relative to the flood discharge capacity of the dam, the owner should retain an experienced professional engineer to prepare and implement plans to provide adequate spillway capacity.

7.2 Recommendations/Remedial Measures. It is recommended that the following recommendations be implemented immediately or on a continuing basis:

1. The owner should immediately retain an experienced professional engineer to conduct additional detailed hydrologic and hydraulic studies to determine the nature and extent of improvements required to provide adequate emergency spillway discharge channel capacity.

2. The operational condition of the outlet pipe valve should be evaluated and necessary maintenance performed.
3. 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 emergencies.
4. The dam and appurtenant structures should be inspected regularly and a formal maintenance manual should be developed for future maintenance of the dam.

APPENDIX A
CHECKLIST
VISUAL INSPECTION
PHASE I

APPENDIX A

CHECKLIST VISUAL INSPECTION PHASE I

NAME OF DAM Doverspike No. 1 COUNTY Jefferson STATE Pennsylvania ID# NDI I.D. PA-1131
 TYPE OF DAM Earth HAZARD CATEGORY High DER I.D. 33-56
 DATE(S) INSPECTION April 25, 1980 WEATHER Partly Cloudy TEMPERATURE 60s
 POOL ELEVATION AT TIME OF INSPECTION 1384 M.S.L. TAILWATER AT TIME OF INSPECTION 1344 M.S.L.

INSPECTION PERSONNEL:

B. Erel

W. T. Chan

J. H. Poellot

OWNER'S REPRESENTATIVE:

Mike McMeans

REVIEW INSPECTION PERSONNEL: (May 1, 1980)

E. D'Appolonia

L. D. Andersen

B. Erel

B. Erel RECORDER

VISUAL INSPECTION
PHASE I
EMBANKMENT

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SURFACE CRACKS	None	
UNUSUAL MOVEMENT OR CRACKING AT OR BEYOND THE TOE	None	
SLOUGHING OR EROSION OF EMBANKMENT AND ABUTMENT SLOPES	None	
VERTICAL AND HORIZONTAL ALIGNMENT OF THE CREST	See Plate 5 for the longitudinal dam crest profile.	
RIPRAP FAILURES	None	

VISUAL INSPECTION
PHASE I
EMBANKMENT

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
JUNCTION OF EMBANKMENT AND ABUTMENT, SPILLWAY AND DAM	No signs of distress.	
ANY NOTICEABLE SEEPAGE	A swampy area along the toe of the dam. See Plate 4 for location.	
STAFF GAGE AND RECORDER	None	
DRAINS	None	

VISUAL INSPECTION
PHASE I
OUTLET WORKS

VISUAL EXAMINATION OF CRACKING AND SPALLING OF CONCRETE SURFACES IN OUTLET CONDUIT	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
	The outlet pipe is an 8-inch steel pipe. Only the downstream end was visible.	
INTAKE STRUCTURE	Submerged	
OUTLET STRUCTURE	The outlet pipe has no outlet structure.	
OUTLET CHANNEL	Earth channel	
EMERGENCY GATE	Flow through the outlet pipe is controlled by a valve located on the upstream side of the embankment. The operational condition of the outlet pipe gate was not observed.	The operational condition of the outlet pipe valve should be evaluated and necessary maintenance performed.

VISUAL INSPECTION
PHASE I
UNGATED SPILLWAY

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONCRETE WEIR	In good condition	
APPROACH CHANNEL	Lake	
DISCHARGE CHANNEL	Immediately downstream of the concrete apron, the emergency spillway discharge channel is approximately 10 to 15 feet wide and less than one foot deep.	The emergency spillway discharge channel should be enlarged to provide adequate discharge capacity.
BRIDGE AND PIERS	None	

VISUAL INSPECTION
 PHASE I
 GATED SPILLWAY

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONCRETE SILL	Not applicable	
APPROACH CHANNEL	Not applicable	
DISCHARGE CHANNEL	Not applicable	
BRIDGE PIERS	Not applicable	
GATES AND OPERATION EQUIPMENT	Not applicable	

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	Moderately steep to steep. No significant shoreline erosion or indications of landslides.	
SEDIMENTATION	Unknown	
UPSTREAM RESERVOIRS	None	

VISUAL INSPECTION
PHASE I
DOWNSTREAM CHANNEL

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONDITION (OBSTRUCTIONS, DEBRIS, ETC.)	There are no obstructions that would affect the discharge capacity of the spillways.	
SLOPES	No features pertinent to the safety of the dam.	
APPROXIMATE NUMBER OF HOMES AND POPULATION	Two homes located approximately 1000 feet downstream from the dam are considered to be within the potential flood plain of the dam in the event of a dam failure. Population: approximately 10.	

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 Doverspike No. 1

ID# NDI I.D. PA-1131

DER I.D. 33-56

ITEM	REMARKS
AS-BUILT DRAWINGS	Available in Commonwealth files.
REGIONAL VICINITY MAP	See Plate 1.
CONSTRUCTION HISTORY	The dam was designed and constructed by the original owner, Doverspike Brothers, Inc., with completion in about 1970.
TYPICAL SECTIONS OF DAM	See Plate 2.
OUTLETS - PLAN - DETAILS - CONSTRAINTS - DISCHARGE RATINGS	See Plate 2.

CHECKLIST
ENGINEERING DATA
DESIGN, CONSTRUCTION, OPERATION
PHASE I

ITEM	REMARKS
RAINFALL/RESERVOIR RECORDS	Not maintained.
DESIGN REPORTS	Stability Analysis for an Existing Earth Dam, Ringgold, Pennsylvania, by Pittsburgh Testing Laboratories, dated September 12, 1972.
GEOLOGY REPORTS	Same as above.
DESIGN COMPUTATIONS HYDROLOGY & HYDRAULICS DAM STABILITY SEEPAGE STUDIES	Included in the above-referenced design report.
MATERIALS INVESTIGATIONS BORING RECORDS LABORATORY FIELD	Included in the above-referenced design report.

CHECKLIST
ENGINEERING DATA
DESIGN, CONSTRUCTION, OPERATION
PHASE I

ITEM	REMARKS
POST CONSTRUCTION SURVEYS OF DAM	None reported
BORROW SOURCES	Unknown
MONITORING SYSTEMS	None
MODIFICATIONS	None reported
HIGH POOL RECORDS	Not recorded

CHECKLIST
ENGINEERING DATA
DESIGN, CONSTRUCTION, OPERATION
PHASE I

ITEM	REMARKS
POST CONSTRUCTION ENGINEERING STUDIES AND REPORTS	Stability Analysis for an Existing Earth Dam, Ringgold, Pennsylvania, by Pittsburgh Testing Laboratories, dated September 12, 1972.
PRIOR ACCIDENTS OR FAILURE OF DAM DESCRIPTION REPORTS	None reported
MAINTENANCE OPERATION RECORDS	Not maintained
SPILLWAY PLAN SECTIONS DETAILS	See Plate 2.
OPERATING EQUIPMENT PLANS AND DETAILS	See Plate 3.

CHECKLIST
ENGINEERING DATA
HYDROLOGIC AND HYDRAULIC

DRAINAGE AREA CHARACTERISTICS: 0.4 square mile (reclaimed strip-mined area)

ELEVATION, TOP OF NORMAL POOL AND STORAGE CAPACITY: 1384 (85 acre-feet)

ELEVATION, TOP OF FLOOD CONTROL POOL AND STORAGE CAPACITY: 1387.8 (115 acre-feet)

ELEVATION, MAXIMUM DESIGN POOL: 1388

ELEVATION, TOP OF DAM: 1387.8 (measured low spot); 1388 (as designed)

SPILLWAY: (EMERGENCY)

- a. Elevation 1385.6
- b. Type Concrete overflow section
- c. Width 30.5 feet (perpendicular to flow)
- d. Length Not applicable
- e. Location Spillover Low spot on dam crest
- f. Number and Type of Gates None

OUTLET WORKS:

- a. Type 8-inch steel pipe
- b. Location Center of embankment
- c. Entrance Inverts 1348
- d. Exit Inverts 1347± (as surveyed)
- e. Emergency Drawdown Facilities 8-inch outlet pipe

HYDROMETEOROLOGICAL GAGES:

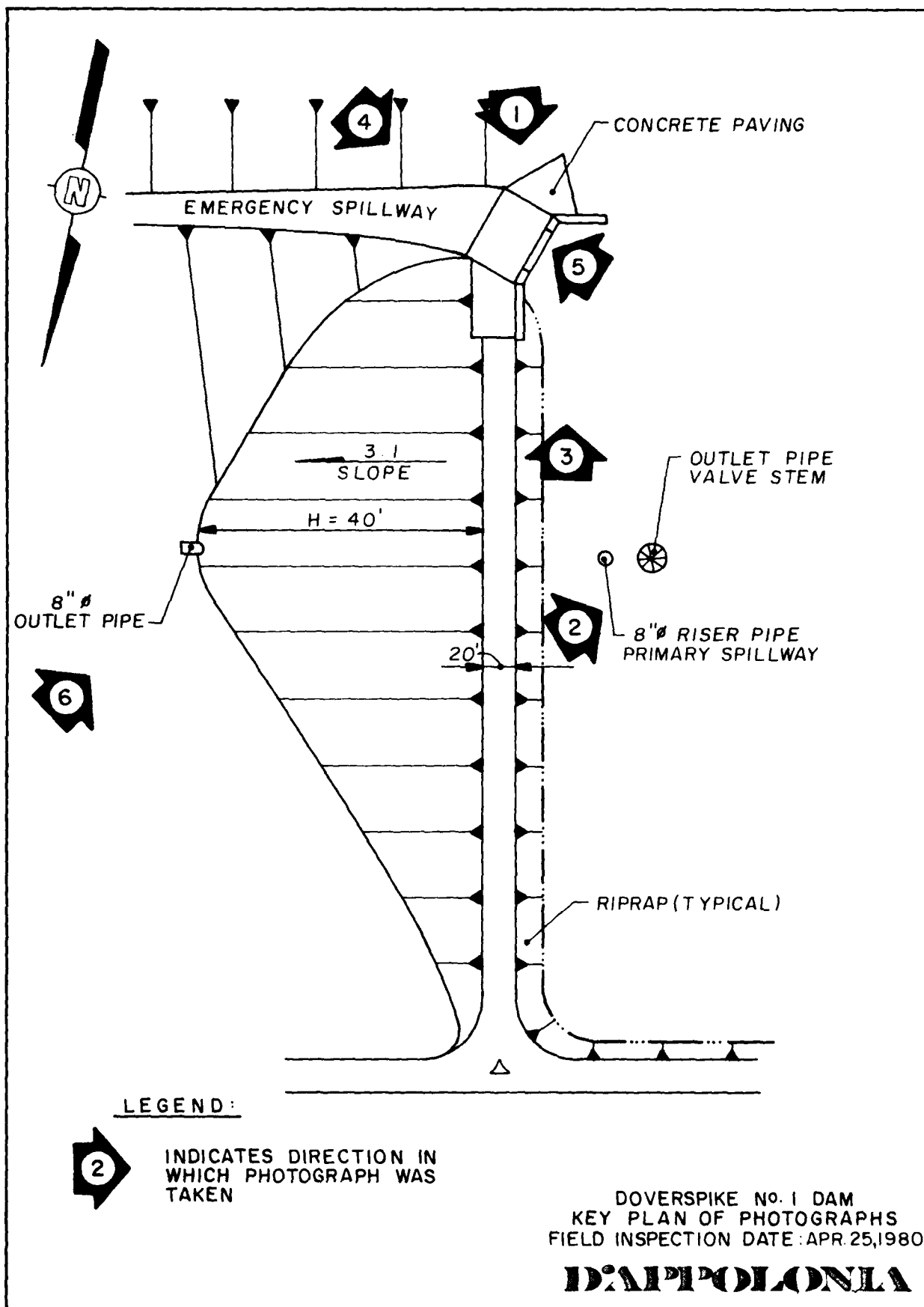
- a. Type None
- b. Location None
- c. Records None

MAXIMUM NONDAMAGING DISCHARGE: 10± cfs (discharge capacity of emergency spillway discharge channel)

APPENDIX C
PHOTOGRAPHS

LIST OF PHOTOGRAPHS
DOVERSPIKE NO. 1 DAM
NDI I.D. PA-1131
DER I.D. 33-56
APRIL 25, 1980

<u>PHOTOGRAPH NO.</u>	<u>DESCRIPTION</u>
1	Dam crest (looking north). Spillway discharge channel in foreground.
2	Riser pipe primary spillway and outlet pipe valve.
3	Emergency spillway approach channel.
4	Emergency spillway overflow structure and discharge channel.
5	Emergency spillway discharge channel (looking downstream).
6	Downstream end of outlet pipe (arrow pointing to pipe).

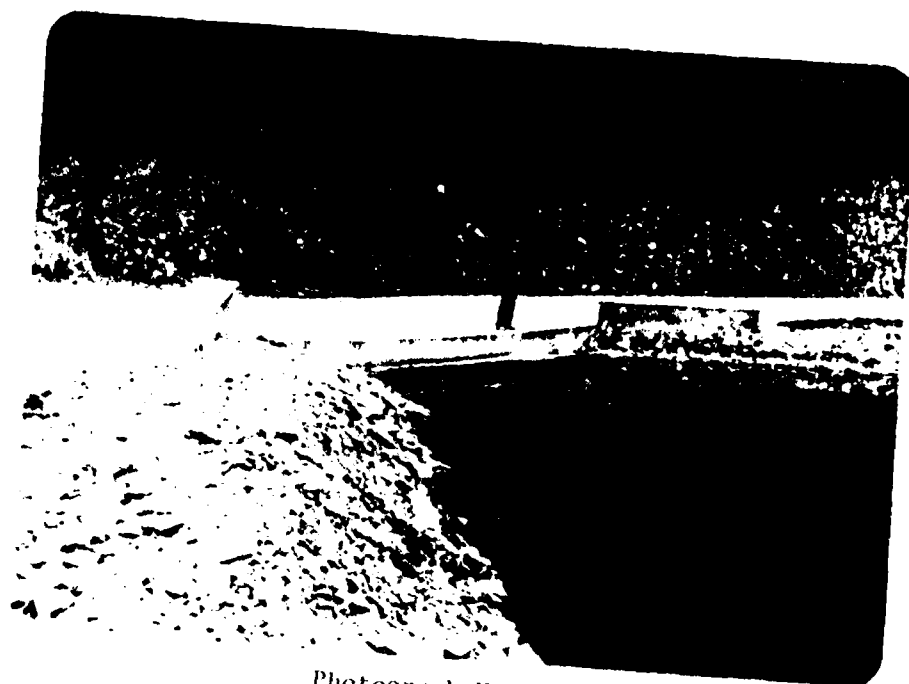




Photograph No. 1
 Dam crest (looking north). Spillway
 discharge channel in foreground.



Photograph No. 2
 River pipe primary spillway and outlet pipe valve.



Photograph No. 3
Emergency spillway approach channel.



Photograph No. 4
Emergency spillway overflow structure
and discharge channel.



Photograph No. 5
Emergency spillway discharge channel
(looking downstream).



Photograph No. 6
Downstream end of outlet pipe (arrow
pointing to pipe).

APPENDIX D
HYDROLOGY AND HYDRAULICS ANALYSES

HYDROLOGY AND HYDRAULIC ANALYSIS DATA BASE

NAME OF DAM: Doverspike No. 1 Dam (NDI I.D. PA-1131)

PROBABLE MAXIMUM PRECIPITATION (PMP) = 23.5 INCHES/24 HOURS⁽¹⁾

STATION	1	2	3	4	5
Station Description	Lake	Dam			
Drainage Area (square miles)	0.4	-			
Cumulative Drainage Area (square miles)	0.4	0.4			
Adjustment of PMP for Drainage Area (2) ⁽²⁾	(ZONE 7)				
6 Hours	102	-			
12 Hours	120	-			
24 Hours	130	-			
48 Hours	140	-			
72 Hours	-	-			
Snyder Hydrograph Parameters					
Zone (3)	24	-			
C_p/C_t (4)	0.45/1.6	-			
L (miles) (5)	0.7	-			
L_{ca} (miles) (5)	0.3	-			
$t_p = C_t(L - L_{ca})^{0.3}$ (hours)	1.0	-			
Spillway Data					
Crest Length (ft)	-	30.5			
Freeboard (ft)	-	2.2			
Discharge Coefficient	-	3.10			
Exponent	-	1.5			

(1) Hydrometeorological Report 33 (Figure 1), U.S. Army, Corps of Engineers, 1956.

(2) Hydrometeorological Report 33 (Figure 2), U.S. Army, Corps of Engineers, 1956.

(3) Hydrological zone defined by Corps of Engineers, Baltimore District, for determining Snyder's Coefficients (C_p and C_t).

(4) Snyder's Coefficients.

(5) 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)	$\Delta VOLUME$ (ACRE-Feet) (2)	STORAGE (ACRE-Feet)
Spillway 1384	1	7.1	7.3	85.2 ⁽³⁾
1385	5	7.5	39.8	92.5
1390		8.4		132.3

(1) Planimetered from USGS maps.

(2) $\Delta Volume = \Delta H/3 (A_1 + A_2 + \sqrt{A_1 A_2})$.

(3) From PennDER files.

 FLOOD HYDROGRAPH PACKAGE (HEC-1)
 DAM SAFETY VERSION JULY 1978
 LAST MODIFICATION U1 APR 80

1	A1	SNYDER UNIT HYDROGRAPH, FLOOD ROUTING AND DAM OVERTOPPING ANALYSES									
2	A2	DOVERSPIKE NO.1 DAM, JEFFERSON COUNTY, MDI-10, PA.1131 PROJECT NO.79-543-21									
3	A3	FOR 20%, 30%, 40%, 50%, 60%, 70%, 80%, 90%, AND 100% PMF									
4	B	300	0	15	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 DOVERSPIKE NO.1 DAM									
10	M	1	1	0.4							
11	P	1	23.5	102	120	130	140	1.0	.05		
12	T									0.0278	
13	W	1.0	0.45								
14	X	-1.0	-0.05	2.0							
15	Z	1	2								
16	K1	ROUTING FLOW THROUGH DOVERSPIKE NO.1 DAM (MDI-10, PA.1131).									
17	V	1	1								
18	V1	1								-1384.0	
19	S5	85.2	92.5	132.2							
20	S51384.0	1385.0	1590.0								
21	S51385.6	30.5	3.10								
22	S51387.8	3.10	1.5								
23	SL	50.0	150.0	230.0	305.0	355.0	405.0	430.0			
24	S51387.8	1387.9	1388.0	1388.1	1388.3	1388.7	1389.1	1389.4			
25	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	RATIO	RATIOS APPLIED TO FLOWS								
					RATIO 1	RATIO 2	RATIO 3	RATIO 4	RATIO 5	RATIO 6	RATIO 7	RATIO 8	RATIO 9
					.20	.30	.40	.50	.60	.70	.80	.90	1.00
HYDROGRAPH AT	1	.40	1	228.	342.	456.	570.	683.	797.	911.	1025.	1139.	
	(	1.04)	(	6.45)	9.68)	12.90)	16.13)	19.35)	22.58)	25.81)	29.03)	32.26)	
ROUTED TO	2	.40	1	205.	313.	445.	569.	684.	798.	913.	1027.	1142.	
	(	1.04)	(	5.80)	8.87)	12.60)	16.10)	19.37)	22.60)	25.85)	29.09)	32.34)	

FLOOD ROUTING SUMMARY

PAGE D3 OF 4

SUMMARY OF DAM SAFETY ANALYSIS

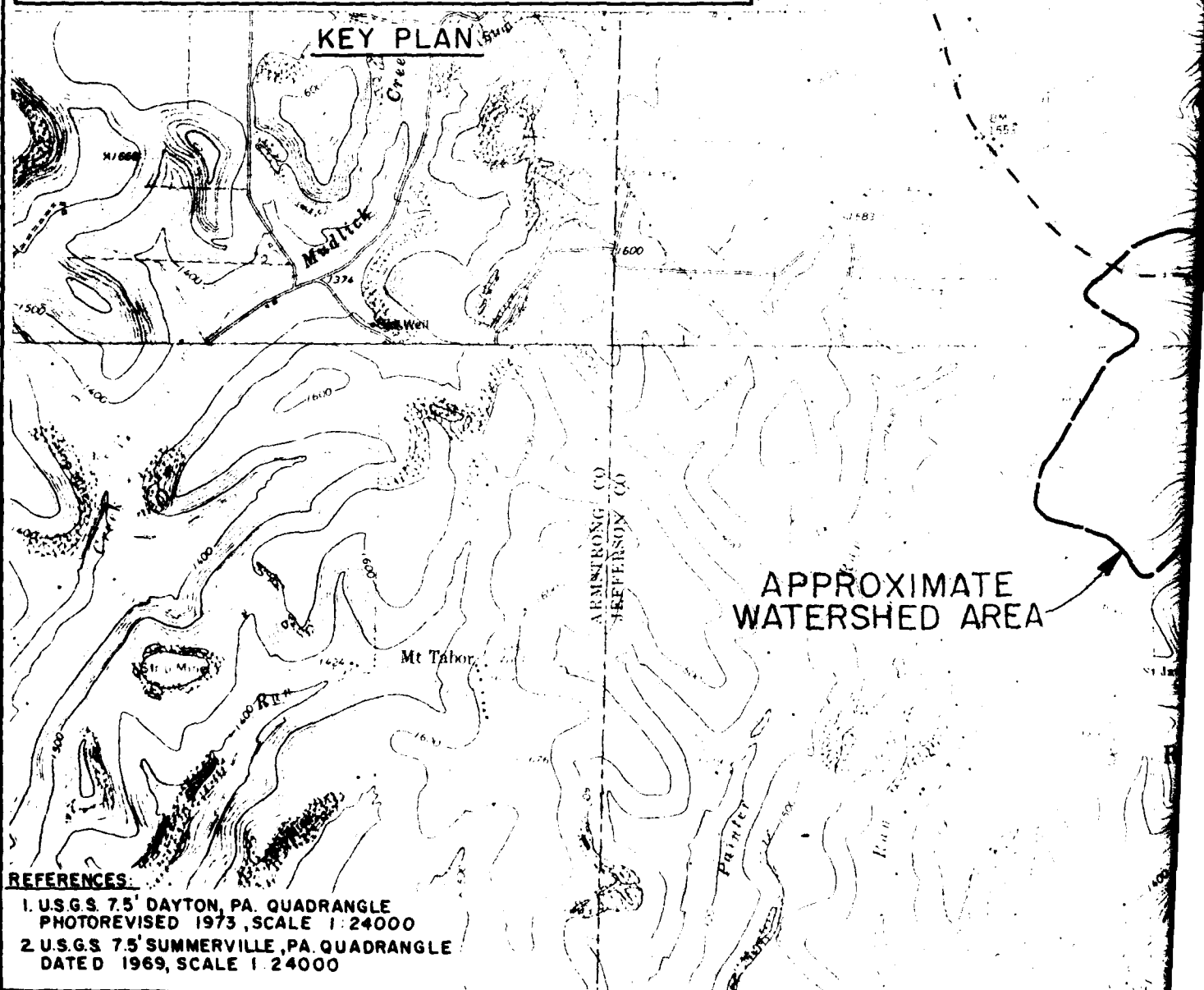
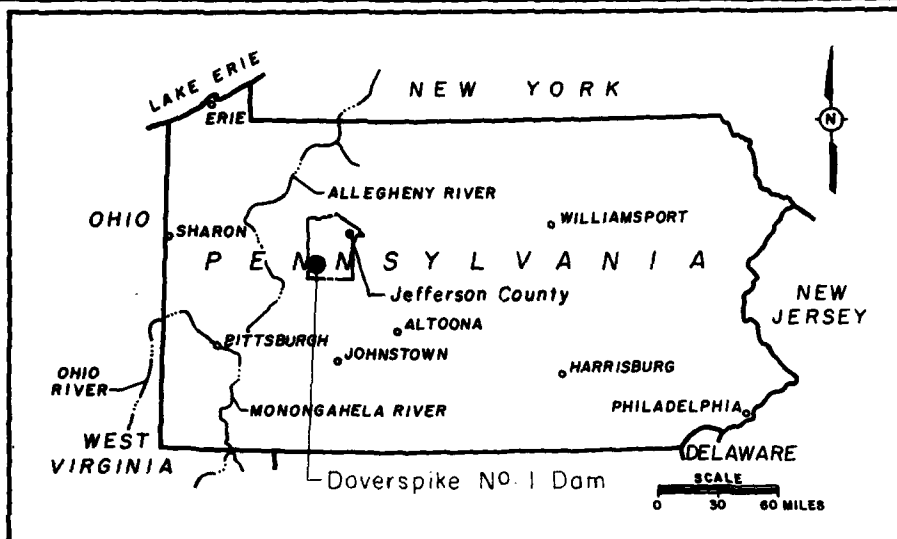
PLAN 1	ELEVATION STORAGE OUTFLOW	INITIAL VALUE 1384.00 85. 0.	SPILLWAY CREST 1385.60 97. 0.	TOP OF DAM 1387.80 115. 309.				
RATIO OF PMF	MAXIMUM RESERVOIR W.S.ELEV	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS	
.20	1387.27	0.00	111.	205.	0.00	41.25	0.00	
.30	1387.82	.02	115.	313.	.50	41.25	0.00	
.40	1388.09	.29	117.	445.	2.25	41.00	0.00	
.50	1388.24	.44	118.	569.	3.25	40.75	0.00	
.60	1388.35	.55	119.	684.	3.75	40.75	0.00	
.70	1388.44	.64	120.	798.	4.50	40.75	0.00	
.80	1388.53	.73	121.	913.	5.25	40.75	0.00	
.90	1388.61	.81	121.	1027.	5.75	40.75	0.00	
1.00	1388.69	.89	122.	1142.	6.25	40.75	0.00	

OVERTOPPING ANALYSIS SUMMARY

PAGE D4 OF 4

APPENDIX E
PLATES

DRAWN BY ACS CHECKED BY 726 P.M. 8-3 DRAWING 79-543-B75
 11-15-79 APPROVED BY 714 70 NUMBER 79-543-B75



- REFERENCES:**
1. U.S.G.S 7.5' DAYTON, PA. QUADRANGLE
 PHOTOREVISED 1973, SCALE 1:24000
 2. U.S.G.S 7.5' SUMMERVILLE, PA. QUADRANGLE
 DATED 1969, SCALE 1:24000

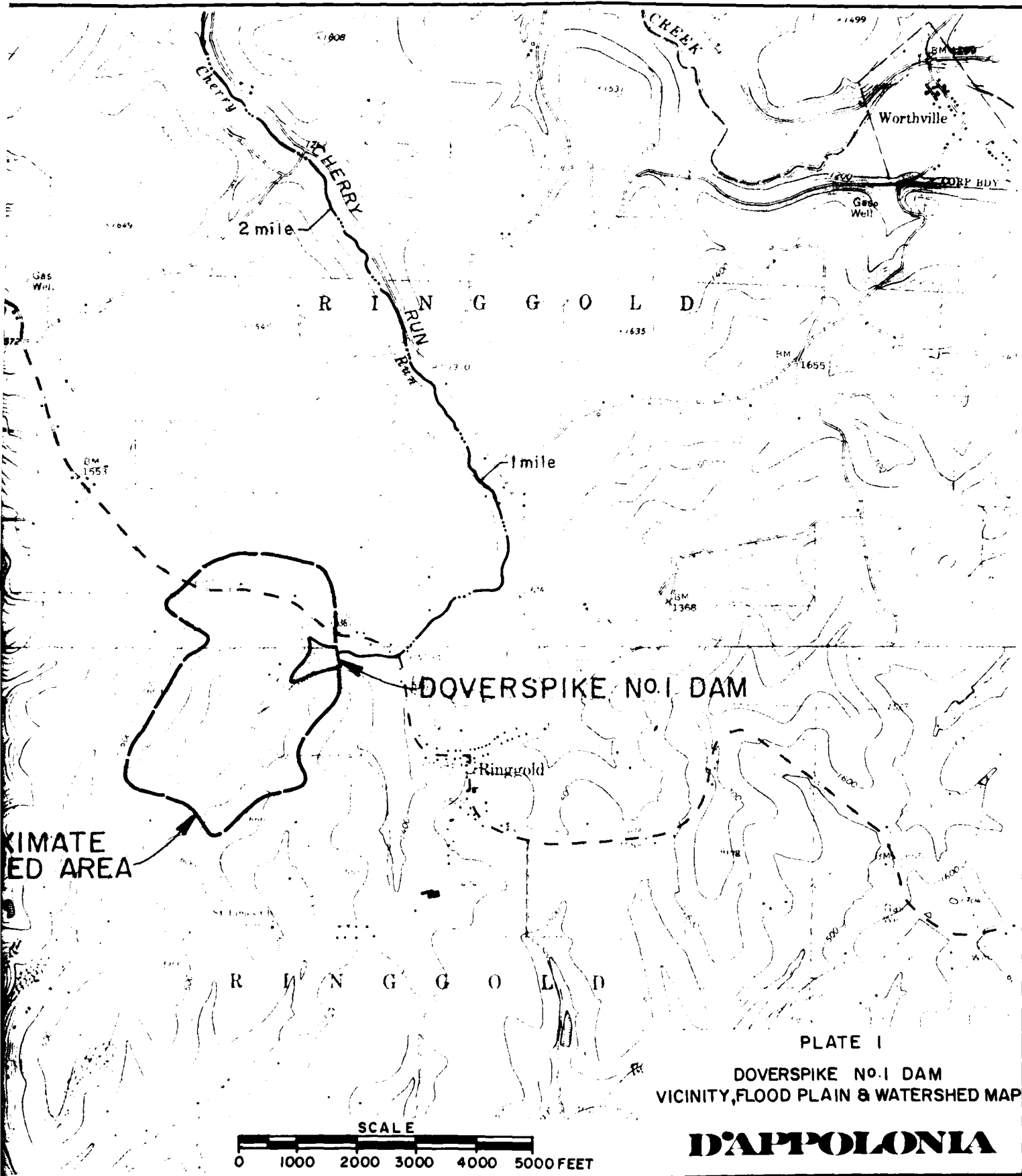
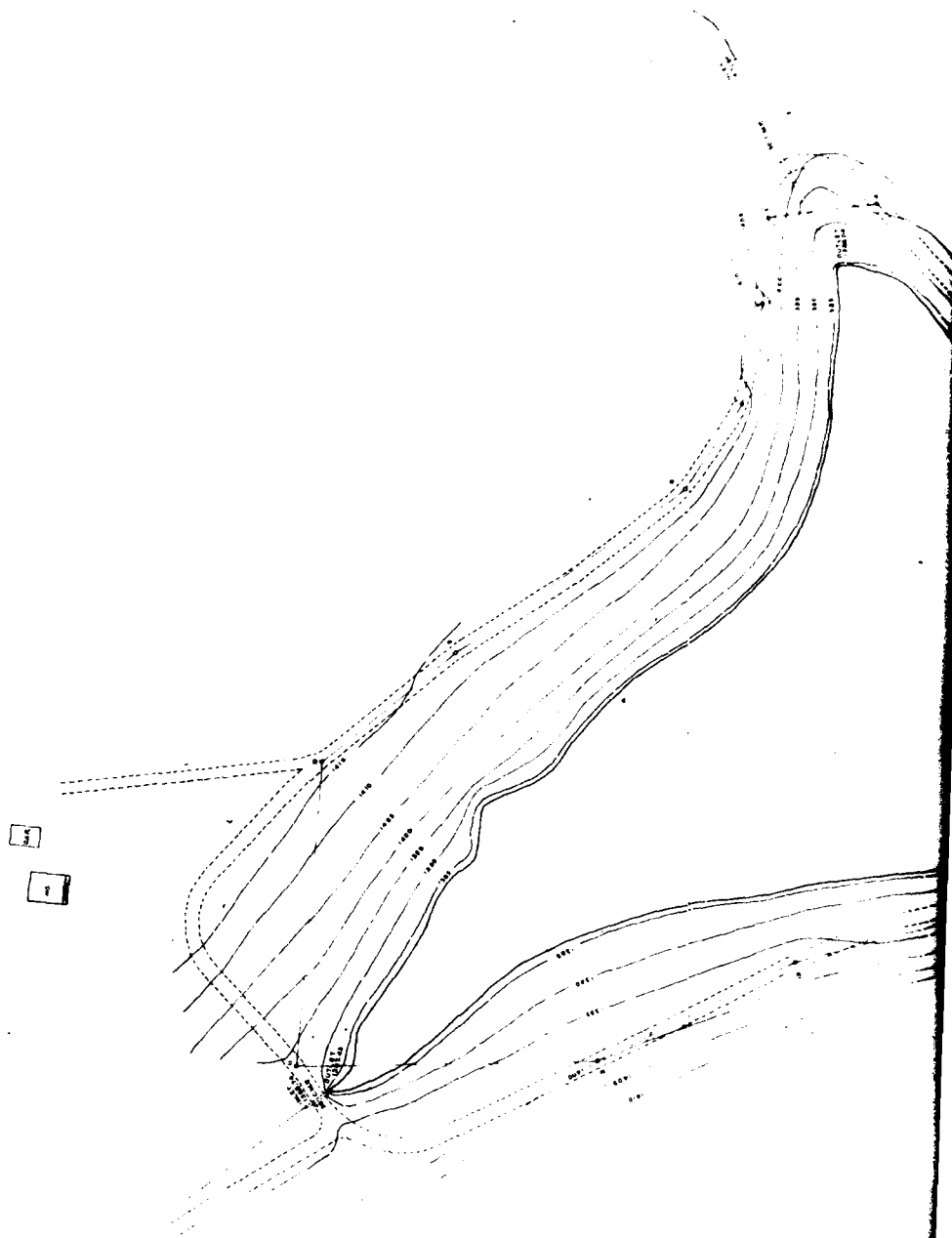


PLATE I
DOVERSPIKE No. 1 DAM
VICINITY, FLOOD PLAIN & WATERSHED MAP

D'APPOLONIA

DRAWN BY nel CHECKED BY BE DRAWING 79-543-B76
BY 6.10.80 APPROVED BY MD NUMBER 7.4.70



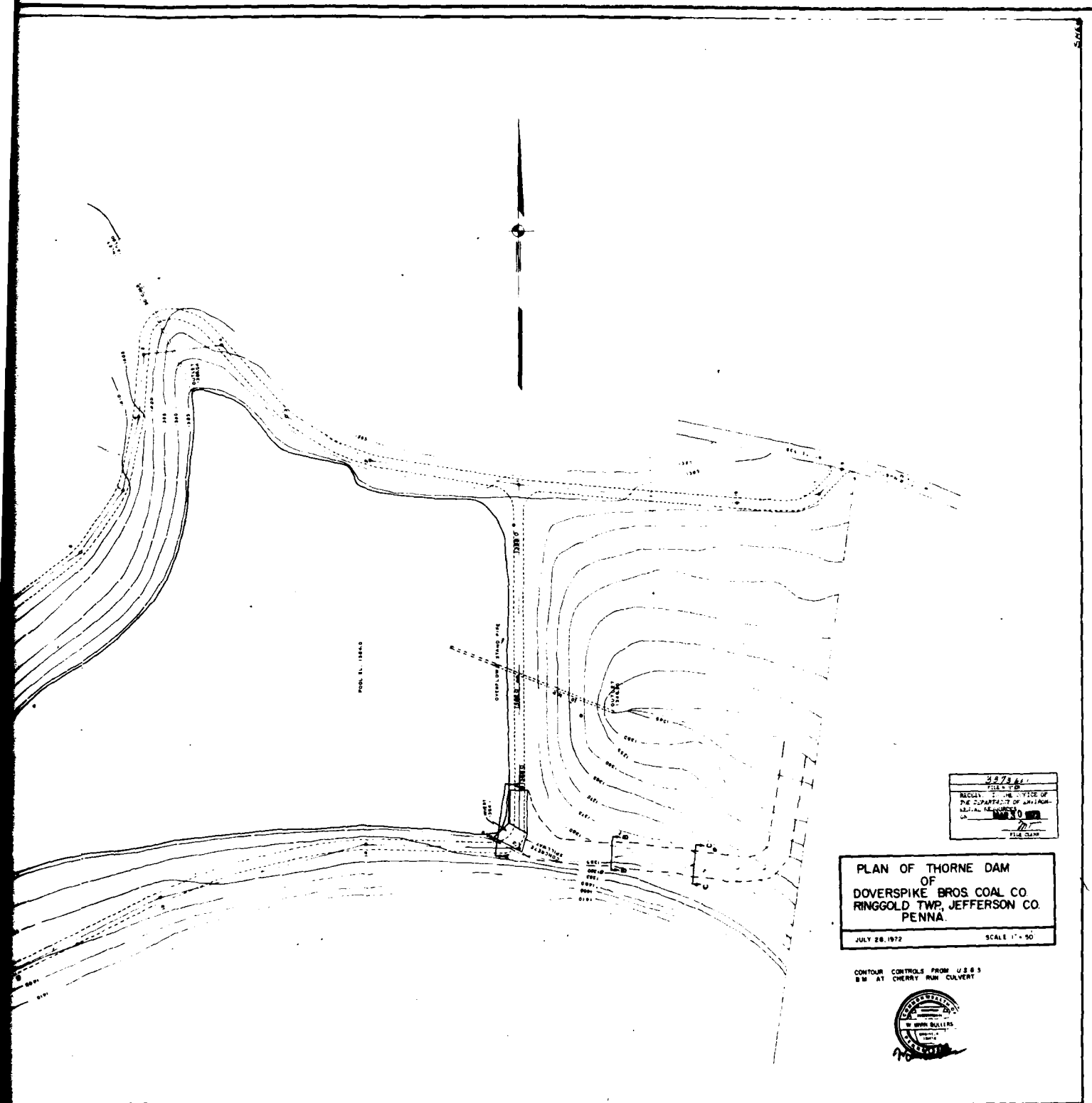
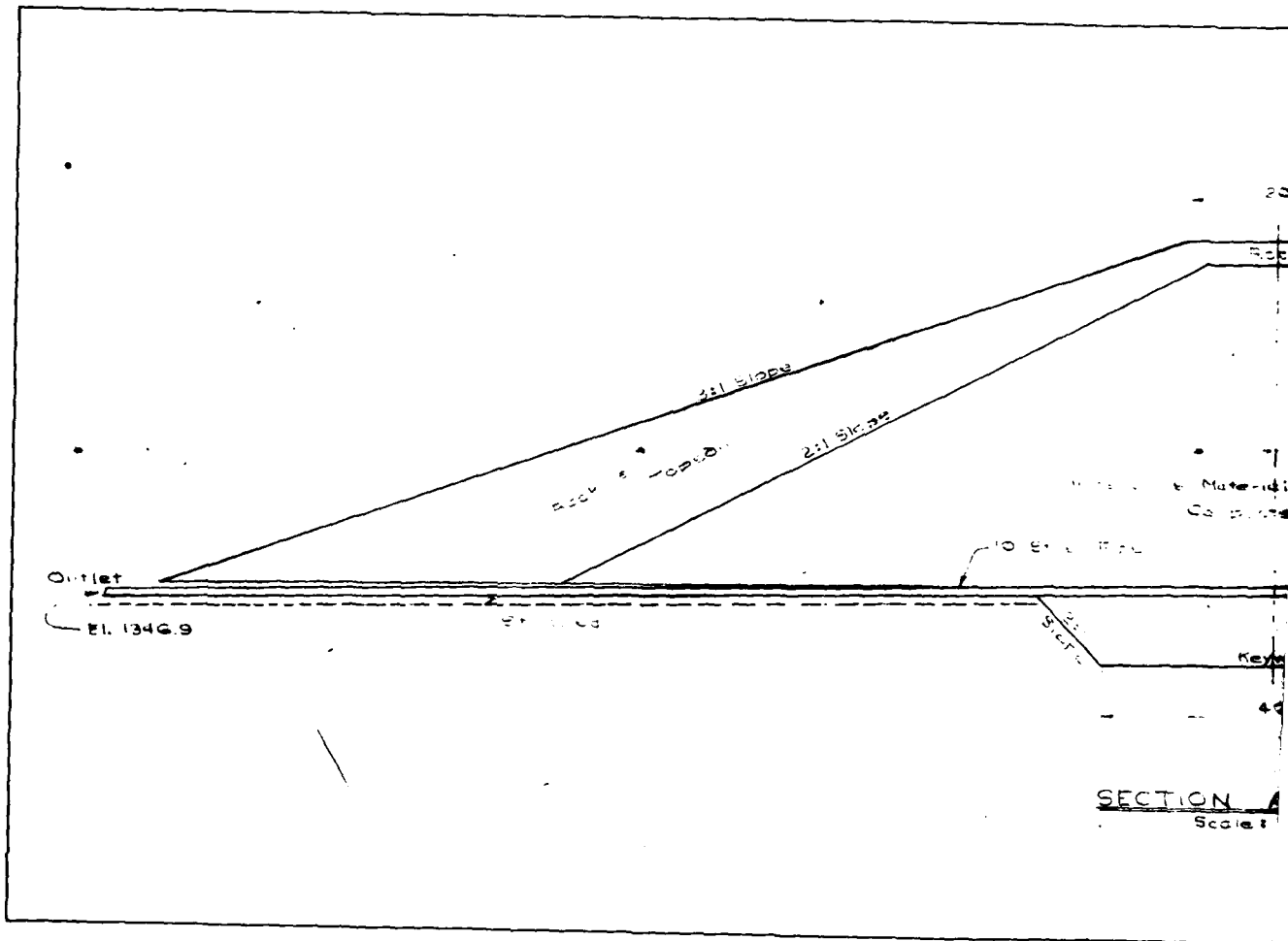


PLATE 2

D'APOLONIA

DRAWN BY	6.10.82	CHECKED BY	135	7-14-82	DRAWING 79-543-B91
	6.10.82	APPROVED BY	300	7.14.82	NUMBER



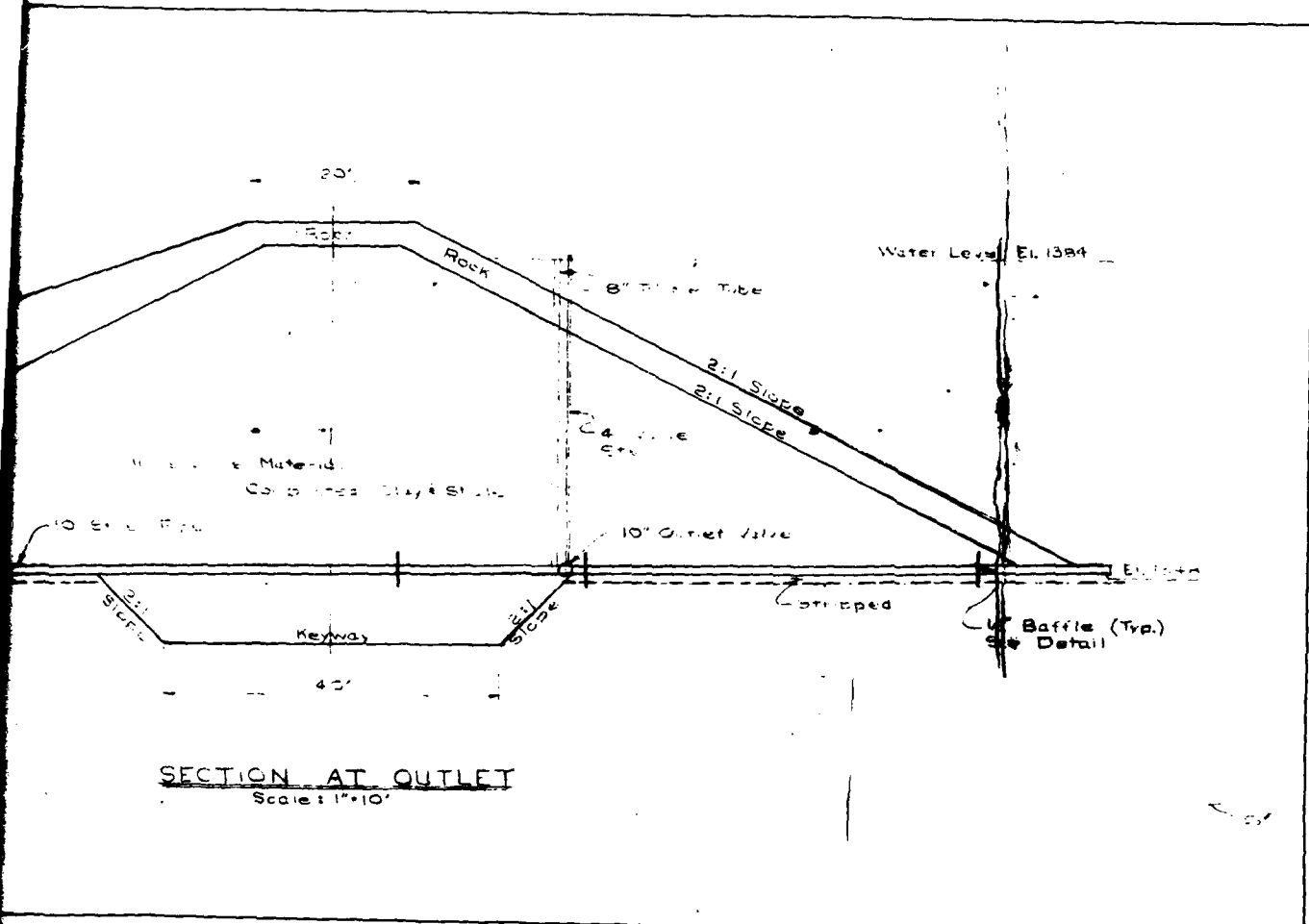
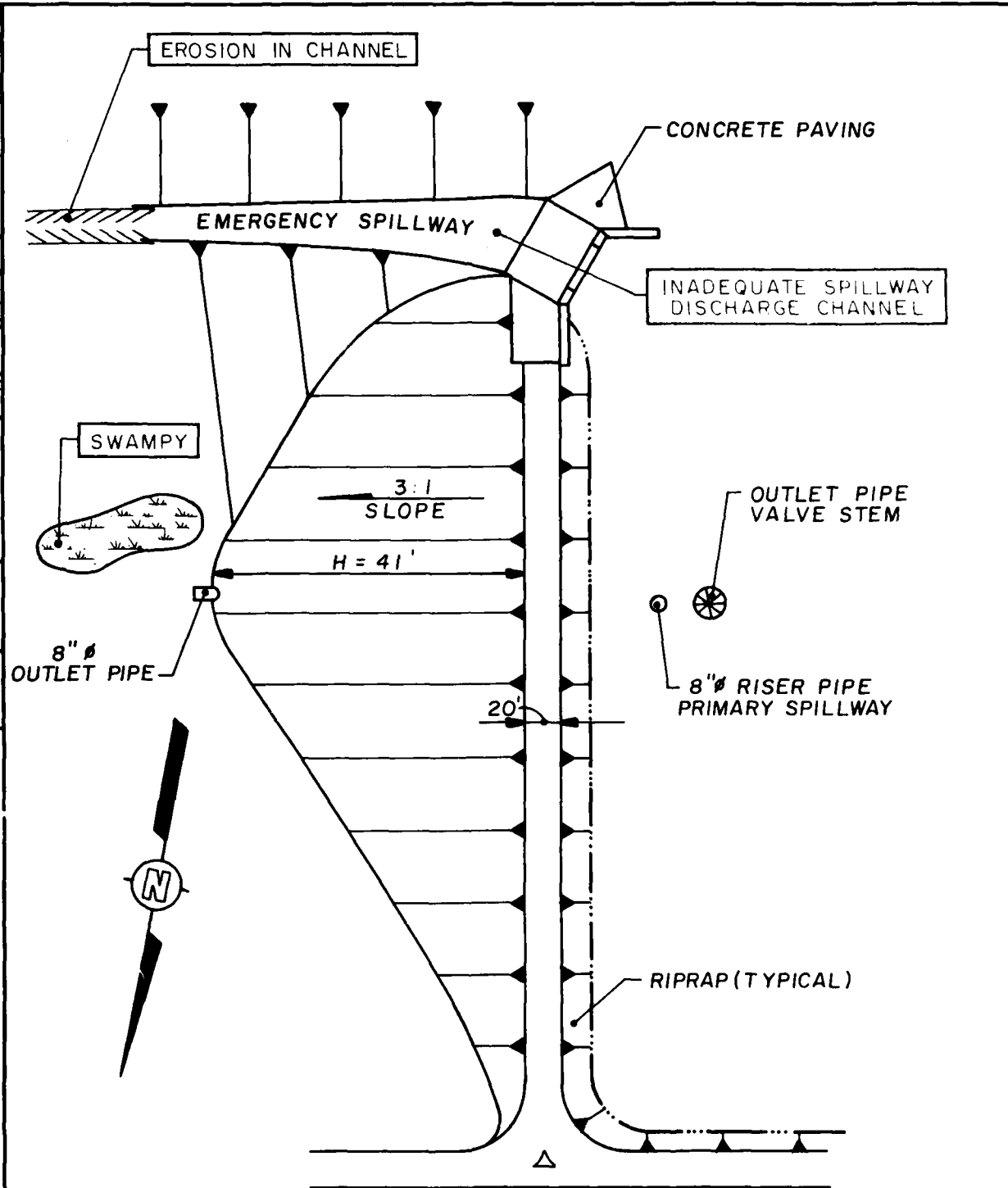


PLATE 3

D'APOLONIA

DRAWN BY	ACS	CHECKED BY	BE	7/14/80	DRAWING NUMBER	79-343-A49
	7-10-80	APPROVED BY	CHP	7-14-80		



NOTE

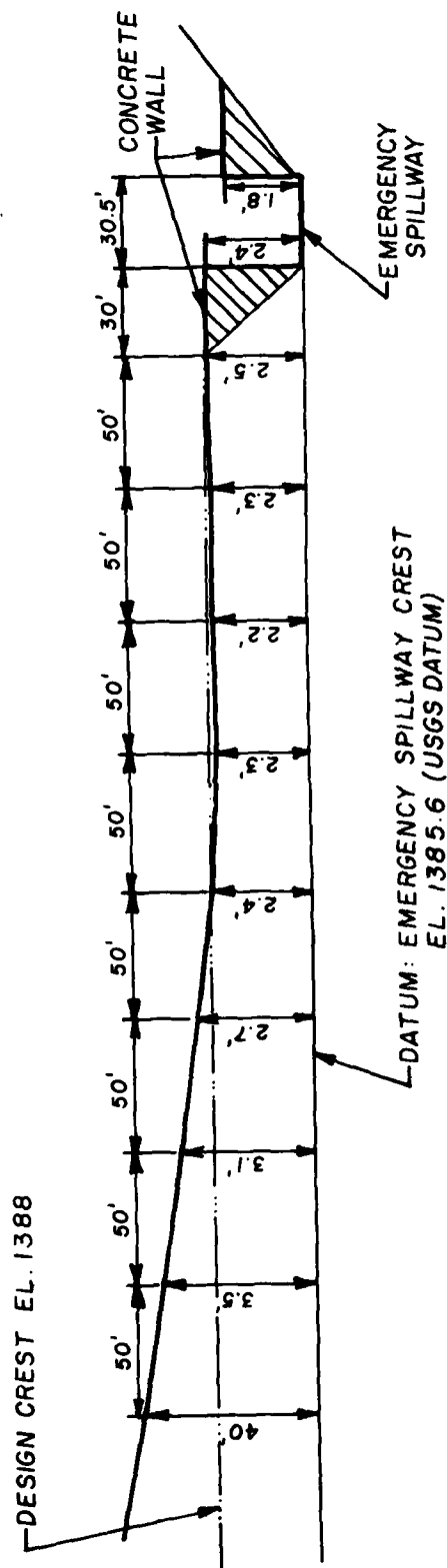
POOL LEVEL DATE OF INSPECTION:
1.6 FT BELOW EMERGENCY
SPILLWAY CREST

PLATE 4

DOVERSPIKE NO. 1 DAM
GENERAL PLAN
FIELD INSPECTION NOTES
FIELD INSPECTION DATE: APR. 25, 1980

D'APOLONA

DRAWN BY	SH	CHECKED BY	73E	DRAWING NUMBER	79-2	3-A50
	7-10-80	APPROVED BY	SPD		7.14	



DAM CREST PROFILE (LOOKING DOWNSTREAM)

NOTES:

1. DAM CREST IS SURVEYED RELATIVE TO SPILLWAY CREST LEVEL
2. DATUM ELEVATION PER DESIGN DATA

PLATE 5

DOVERSPIKE No.1 DAM
DAM CREST SURVEY
FIELD INSPECTION DATE: APR. 25, 1980

D'APOLONIA

APPENDIX F
REGIONAL GEOLOGY

APPENDIX F
REGIONAL GEOLOGY
DOVERSPIKE NO. 1 DAM

Doverspike No. 1 Dam is located in the central section of the Appalachian Plateau Province which is characterized by broad, nearly level ridges and deep steep valleys. The dam lies near the contact of the Allegheny and Conemaugh groups of Pennsylvanian Age. Strata have been gently warped and form a broad shallow basin known as the Leechburg Syncline which trends to the northeast.

The Allegheny Group is composed of shales and sandstones and several minable coals. The Upper Freeport Coal lies at the top of the Allegheny, thus delineating the Allegheny from the overlying Conemaugh Group. The Conemaugh Group is characterized by variegated shales and thick sequences of coarse-grained sandstones. The lower half of the Conemaugh, below the Ames Limestone, contains numerous claystones that are prone to landslides.

The Upper Freeport Coal has been stripped along the valley slopes in the area. No deep mines are known to exist in the area. Local stripping of the Lower Freeport Coal may also have taken place.

It should be noted that a boring drilled along the south abutment of the dam showed a loss of drilling water, indicating highly fractured rock. This could be a problem for excessive seepage and piping. It is not known if grouting was done along the center line and abutments to control seepage.

DRAWING 79-543-A16
NUMBER

DRAWN BY
ACS
CHECKED BY
12-31-79
APPROVED BY



REFERENCE
GEOLOGIC MAP OF PENNSYLVANIA PREPARED
BY COMMONWEALTH OF PENNA. DEPT. OF INTERNAL
AFFAIRS, DATED 1960, SCALE 1" = 4 MILES

DOVERSPIKE NO. 1 AND NO. 2 DAMS

GEOLOGY MAP

D'ARTOLONIA

DRAWN BY ACS 12-31-79 CHECKED BY JF 1/4/80 DRAWING NUMBER 7-543-A18

LEGEND



Conemaugh Formation

Cyclic sequences of red and gray shales and siltstones with thin limestone and coals; massive Mahoning Sandstone commonly present at base; Ames Limestone present in middle of section; Brush Creek Limestone in lower part of section.



Pottsville Group

Light gray to white, coarse grained sandstones and conglomerates with some movable coal; includes Sharp Mountain, Schuylkill, and Tumbling Run Formations.



Allegheny Group

Cyclic sequences of sandstone, shale, limestone and coal; numerous commercial coals; limestones thicker westward; Vancourt Limestone in lower part of section; includes Freeport, Kittanning, and Marion Formations.



Clinton Group

Predominantly Rose Hill Formation; reddish purple to greenish gray, thin to medium bedded fossiliferous shale with intertonguing "iron sandstones" and local gray, fossiliferous limestone; above the Rose Hill is brown to white quartzitic sandstone (Keeler) interbedded upward with dark gray shale (Rochester).



Marine beds

Gray to olive brown shales, argillaceous, and sandstones; contains "Chenoweth beds" and "Potomac beds" including Rickett, Brainerd, Havell, and Trimmers Rock; Tully Limestone at base.



Pocono Group

Predominantly gray, hard, massive, cross bedded conglomeratic sandstone with coals; shale included in the Appalachian Plateau, Hocking, Shenango, Conemaugh, Allegheny, Clarion, and Knappa Formations; includes part of "Onondaga" at M. L. Fuller in Pottsville and Tully sections.



Oriskany Formation

White to brown, thin bedded, grained, partly calcareous, heavily fossiliferous, considered as sandstone (Rafinesque) at the top; dark gray, cherty limestone with some interbedded shales and sandstones below (Shaffer).

Tioga Formation

White to gray, thin to thick bedded, fine grained, calcareous sandstone and argillaceous shale.

Marcellus Formation

Black, fossil, carbonaceous shale with thick brown sandstone (Turkey Ridge) in parts of central Pennsylvania.

Onondaga Formation

Greenish blue, thin bedded shale and dark blue to black, medium bedded limestone with shale predominant in most places; includes Schenango Limestone and Nemore Shale in central Pennsylvania and Butterfield Falls Limestone and Escopus Shale in easternmost Pennsylvania; in Lehigh Gap area includes Palmyra Sandstone and Roumanstown Chert.



Wills Creek Formation

Greenish gray, thin bedded, fossil shale with local limestone and sandstone zones; contains red shale and siltstone in the lower part.

Bloomsburg Formation

Red, thin and thick bedded shale and siltstone with local units of sandstone and thin impure limestone; some green shale in places.



McKenzie Formation

Greenish gray, thin bedded shale interbedded with gray, thin bedded, fossiliferous limestone; shale predominant at the base; intraformational breccia in the lower part; Absent in Harrisburg quadrangle and to the east.

Keyser Formation

Dark gray, highly fossiliferous, thick bedded, crystalline to nodular limestone; passes into Manitowish, Rondout, and Decker Formations in the east.



Tonoloway Formation

Gray, highly laminated, thin bedded, argillaceous limestone; passes into Rosardville and Foxboro Island beds in the east.



Catskill Formation

Chiefly red to brownish shales and sandstones; includes gray and greenish sandstone tongues named Elk Mountain, Honesdale, Shohola, and Delaware River in the east.

REFERENCE

GEOLOGIC MAP OF PENNSYLVANIA PREPARED BY COMMONWEALTH OF PENNA. DEPT. OF INTERNAL AFFAIRS, DATED 1960, SCALE 1" = 4 MILES

GEOLOGY MAP LEGEND

D'AIPOLONIA