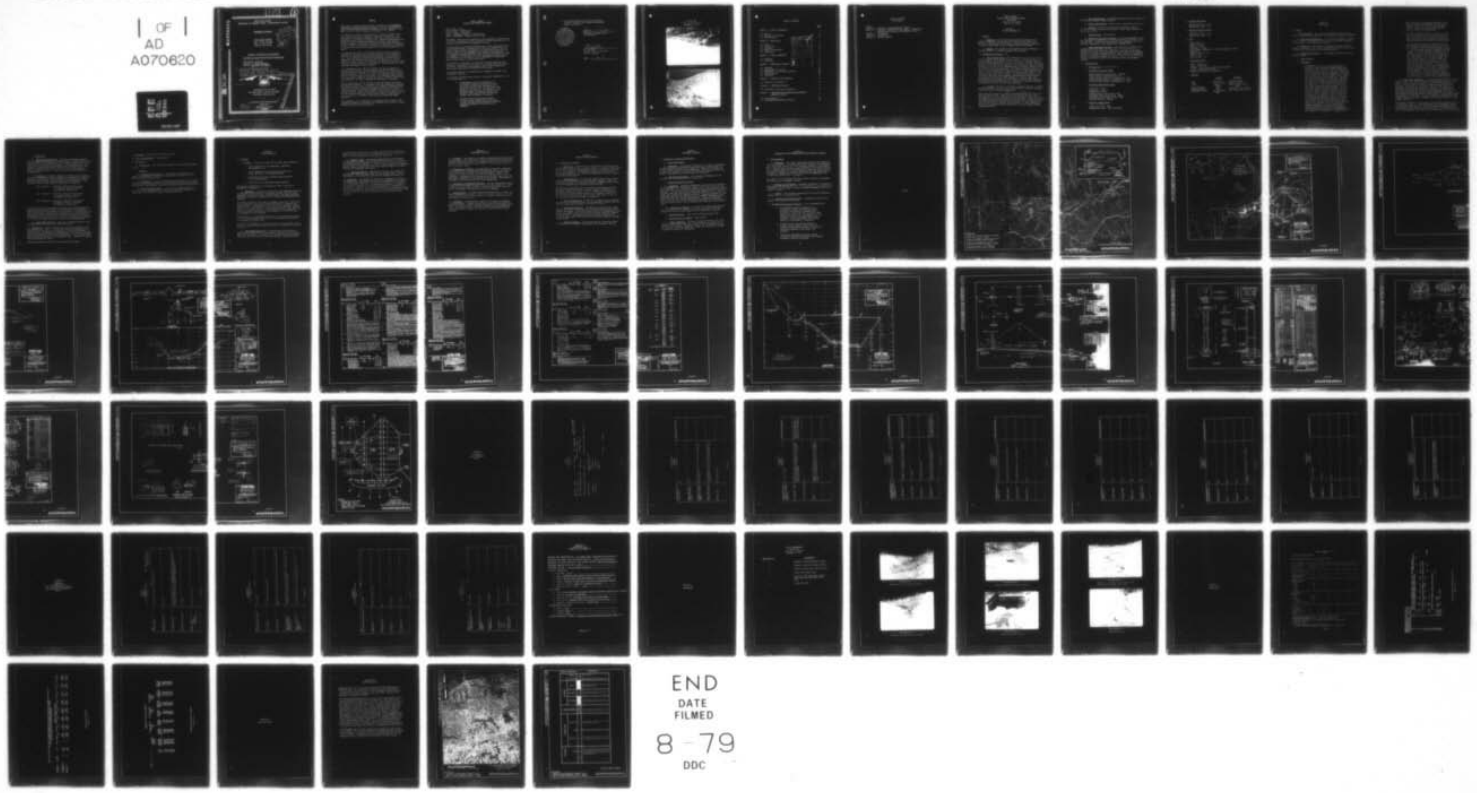
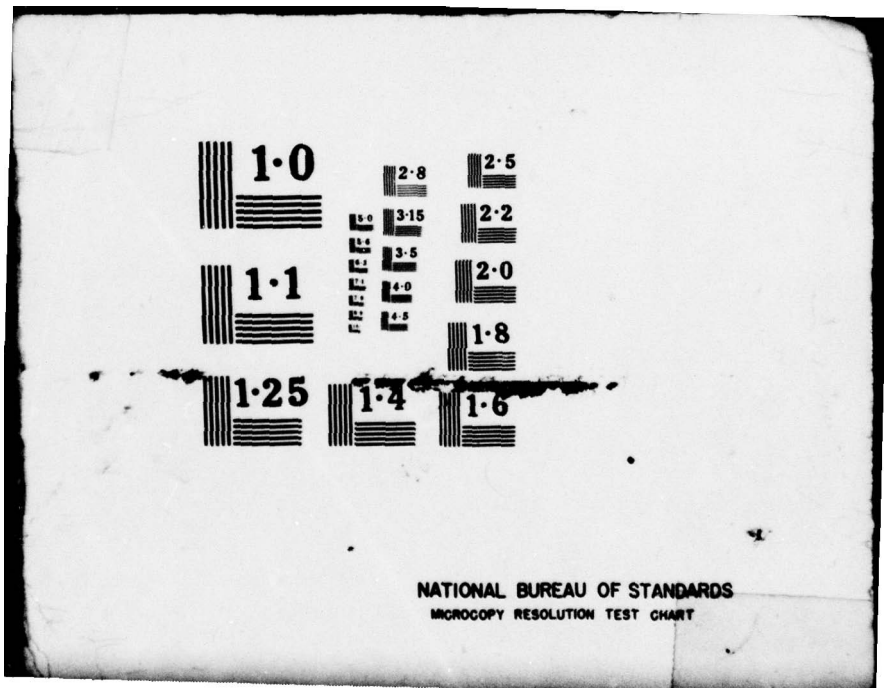
AD-A070 620 D'APPOLONIA CONSULTING ENGINEERS INC PITTSBURGH PA F/G 13/2
NATIONAL DAM INSPECTION PROGRAM. PA-484 DAM (NDI-ID-PA-489) (DE--ETC(U)
MAR 79 DACW31-79-C-0014
UNCLASSIFIED NL

| OF |
AD
A070620



END
DATE
FILMED
8-79
DDC


1·0
1·1
1·25
2·8
3·15
3·5
4·0
4·5
1·4
2·5
2·2
2·0
1·8
1·6
NATIONAL BUREAU OF STANDARDS
MICROCOPY RESOLUTION TEST CHART

LEVEL II

OHIO RIVER BASIN
TRIBUTARY OF HARMON CREEK , WASHINGTON COUNTY

PENNSYLVANIA

PA-484 DAM

NDI I.D. NO: PA-489
DER I.D. NO: 63-72

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

Distribution Unlimited
Approved for Public Release
Contract No. DACW31-79-C-0014

(15) (6) National Dam Inspection Program.
PA-484 Dam (NDI-ID-PA-489) (DER ID-63-72)
Ohio River Basin, Tributary of Harmon Creek,
Washington County, Pennsylvania. Phase I Inspection Report.

PREPARED FOR

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

BY

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

(12) 74 p.

(11) MARCH 1979

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 investigation 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: PA-484
STATE LOCATED: Pennsylvania
COUNTY LOCATED: Washington
STREAM: Unnamed tributary of Harmon Creek
DATE OF INSPECTION: December 5 and 20, 1978

ASSESSMENT: Based on the evaluation of the conditions as they existed on the dates of inspection and as revealed by visual observations, the condition of PA-484 dam is considered to be fair.

A swampy area with associated seepage exists on the lower one-third of the downstream slope. Although at this time this condition does not appear to pose instability problems, a concern exists as to the continued integrity of the embankment under maximum pool conditions. It is therefore considered advisable that necessary instrumentation, such as piezometers, be installed to monitor the phreatic surface through the embankment and the stability of the embankment be reevaluated based on the results of these observations.

On the dates of inspection, the pool was at primary spillway crest elevation, indicating that the orifice on the drop inlet structure is obstructed. Subsequent correspondence from the Soil Conservation Service indicated that this obstruction was removed.

The spillway capacity is classified to be adequate according to the recommended criteria.

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

1. The embankment should be evaluated by a professional engineer experienced in earth dam design and necessary instrumentation installed to monitor the wet area on the downstream slope of the dam. The stability of the embankment should be evaluated based on the results of these observations and necessary remedial work performed, if required.

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

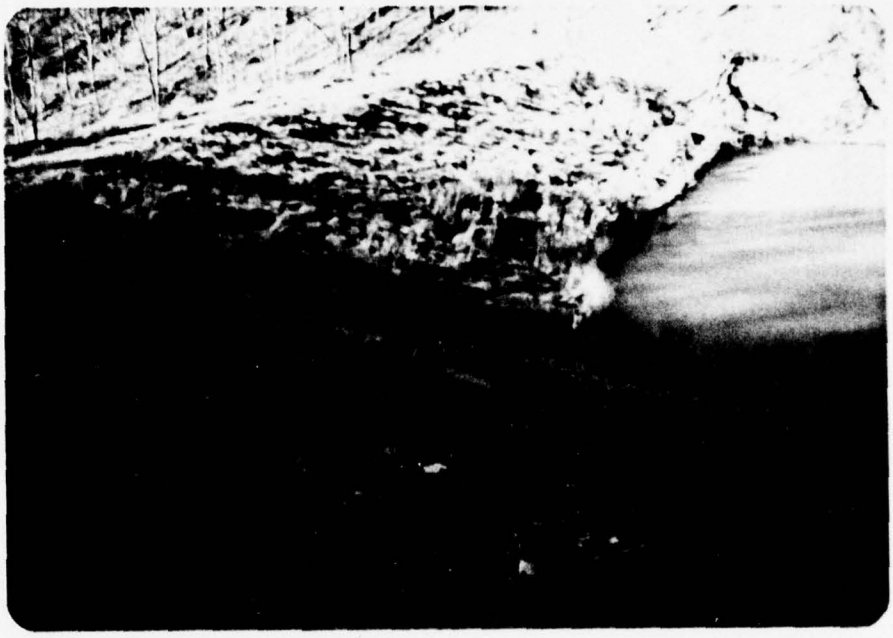
3. The dam and appurtenant structures should be inspected regularly and necessary maintenance should be performed.

Lawrence D. Andersen, P.E.
Vice President

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

DATE: 22 Apr 79

PA-484 DAM
NDI I.D. NO. PA-489
DECEMBER 5, 1978



Upstream Face

Downstream Face

TABLE OF CONTENTS

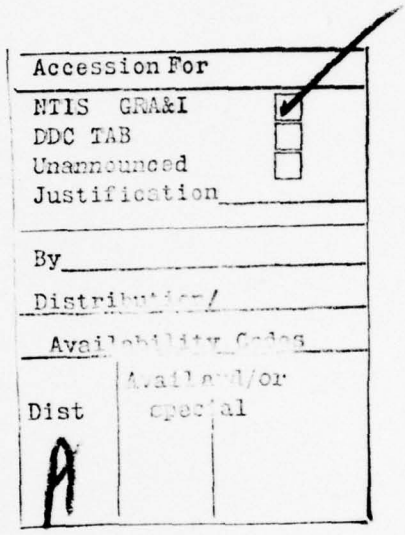


TABLE OF CONTENTS
(Continued)

PHASE I REPORT
NATIONAL DAM INSPECTION PROGRAM
PA-484 DAM
NDI I.D. NO. PA-489
DER I.D. NO. 63-72

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. The PA-484 Dam is one of the 14 flood control projects in the Harmon Creek watershed. The dam consists of an earth embankment approximately 320 feet long, with a maximum height of 67 feet from the downstream toe and a crest width of 14 feet. The flood discharge facilities for the dam consist of a drop inlet primary spillway located at the center of the embankment and an emergency spillway on the left abutment (looking downstream). The primary spillway structures consist of a two-stage reinforced concrete riser, a 24-inch-diameter reinforced concrete conduit and a reinforced concrete impact basin at the downstream end of the outlet conduit. The emergency spillway is a 50-foot-wide trapezoidal earth channel excavated into the left abutment. The reservoir outlet for the dam consists of a 12-inch steel pipe extending from the upstream toe of the dam to the drop inlet structure. Flow through the reservoir outlet is controlled by a manually operated sluice gate located in the drop inlet structure.

b. Location. The dam is located on an unnamed tributary of Harmon Creek approximately one mile west of Hanlon Station in Hanover Township, Washington County, Pennsylvania (Plate 1).

Downstream from the dam, the stream flows approximately 1000 feet south and joins Harmon Creek. There are no structures within this reach. Approximately 1-1/2 miles downstream of the confluence, there are about 20 residences within the flood plain of Harmon Creek. Further downstream, the Harmon Creek flows through the town of Collier, West Virginia, and joins the Ohio River at Weirton, West Virginia. It is estimated that failure of the dam would cause large loss of life and property damage along Harmon Creek.

c. Size Classification. Intermediate (Based on 67-foot height and 119 acre-feet maximum storage capacity.)

d. Hazard Classification. High (Based on downstream conditions.)

e. Ownership. County of Washington, Pennsylvania (address: Mr. Joseph Giecek, Administrative Assistant, Court House, Washington, Pennsylvania 15301).

f. Purpose of Dam. Flood control.

g. Design and Construction History. The dam was designed by the U.S. Department of Agriculture, Soil Conservation Service (SCS), during 1967 and 1968. The dam was constructed by Louis McMasters, Inc., of McMurray, Pennsylvania, with completion in September 1971.

h. Normal Operating Procedure. The reservoir is normally maintained at Elevation 919.3, the crest level of an orifice on the upstream face of the drop inlet structure. The crest of the primary spillway is located at Elevation 938.25, and the crest of the emergency spillway is located at Elevation 947.0. Under normal flow conditions, inflow is discharged through the orifice. Flood flows are discharged through the primary spillway or in conjunction with the emergency spillway.

1.3 Pertinent Data.

a. Drainage Area - 0.6 square miles

b. Discharge at Dam Site (cfs)

Maximum known flood at dam site - Unknown
Outlet conduit at maximum pool - 125
Gated spillway capacity at maximum pool - N/A
Ungated spillway capacity at maximum pool - 4263
Total spillway capacity at maximum pool - 4263

c. Elevation (USGS Datum) (feet)

Top of dam - 957.0
Maximum pool - 957.0
Normal pool - 919.3
Upstream invert outlet works - 900
Downstream invert outlet works - 889.0
Streambed at center line of dam - 889±
Maximum tailwater - Unknown

d. Reservoir Length (feet)

Normal pool level - 600
Maximum pool level - 2500 (estimated)

e. Storage (acre-feet)

Normal pool level - 14.8
Maximum pool level - 190

f. Reservoir Surface (acres)

Normal pool level - 1.6
Maximum pool level - 7.8

g. Dam

Type - Earth
Length - 320 feet
Height - 67 feet
Top width - 14 feet
Side slopes - Downstream: 2-1/2H:1V; Upstream: 3H:1V
Zoning - Yes
Impervious core - Yes
Cutoff - Yes
Grout curtain - No

h. Regulating Outlet

Type - 12-inch pipe
Length - 50± feet
Closure - Sluice gate at drop inlet structure
Access - Drop inlet structure
Regulating facilities - Sluice gate

i. Spillway

	Primary	Emergency
Type	Drop inlet	Trapezoidal earth channel 30 feet (channel bottom width)
Length	12 feet (crest width)	
Crest Elevation	938.25	947.0
Upstream Channel	Lake	Trapezoidal earth channel
Downstream Channel	24-inch outlet conduit	Trapezoidal earth channel

SECTION 2
DESIGN DATA

2.1 Design

a. Data Available. The available information was provided by SCS and the Pennsylvania Department of Environmental Resources (PennDER).

(1) Hydrology and Hydraulics. The available information consists of the principal, freeboard and emergency spillway inflow hydrographs and the results of the associated routings.

(2) Embankment. The available information consists of design drawings, geology and soils reports, laboratory soil test results, and the results of slope stability and seepage analyses.

(3) Appurtenant Structures. The available information includes design drawings.

b. Design Features

(1) Embankment

a. As designed, the dam is a zoned embankment including an internal drainage system beneath the downstream slope (Plate 2). Plate 3 illustrates the typical cross section of the dam. Three zones and one transition zone are identified. A 12-foot-wide inclined zone (Zone I) constitutes the impervious core section of the embankment. The Zone I material was classified as silty clay containing 83 to 96 percent fines and with liquid limits in the range of 44 percent and plasticity index in the range of 22. Zone I starts at a level five feet below the dam crest and terminates at a cut-off trench beneath the upstream slope. A five-foot-thick blanket of Zone I material covers the foundation from the upstream toe to the base of the core. Zones II and III constitute the shell sections of the embankment. Zone II material was described as weathered siltstone. The fines of this material had liquid limits in the range of 40 percent and the plasticity index in the range of 16. The Zone II material, the lower portion of the downstream shell, was described as weathered sandstone. A 35-foot-wide filter blanket beneath the downstream toe constitutes the internal drainage system of the embankment and was extended up the abutments to intersect the

Ames Limestone at approximately Elevation 920. Plate 4 illustrates the details of the internal drainage system. Two 12-inch pipes draining into the outlet works impact basin were provided to drain the filter blanket.

b. The dam was designed to have a 2-1/2 to 1 (horizontal to vertical) slope on the downstream face and a 3 to 1 slope on the upstream face with 10-foot-wide benches on the upstream and downstream faces at Elevations 920.3 and 921.0, respectively.

c. The subsurface investigation conducted for the dam consisted of numerous borings and test pits. The locations of these borings are shown in Plate 2. Selected boring logs are illustrated in Plates 5 and 6. A typical subsurface profile (Plate 7) consists of up to 6-1/2 feet of colluvium on the left abutment and 3-1/2 to 8 feet of alluvium at the valley bottom. On the right abutment, bedrock is at the surface. The rock beneath the site includes silts and sandstones. The Ames Limestone was encountered approximately 37 feet below the dam crest elevation. It is reported that rock permeability rates varied significantly between the different rock units. Permeabilities in the abutments, except in the Ames Limestone, ranged between no take and 6.2 feet per day (2×10^{-3} cm/sec). In the limestone, sandstone, and siltstone at the valley floor, permeabilities up to 30 feet per day (10^{-2} cm/sec) were measured.

(2) Appurtenant Structures. The appurtenant structures of the dam include a drop inlet, primary spillway, and emergency spillway. The primary spillway structures include a two-stage reinforced concrete riser, a 24-inch-diameter reinforced concrete conduit through the embankment terminating at a reinforced concrete impact basin at the downstream toe of the dam (Plates 8, 9, and 10). A 12-inch steel pipe from the upstream toe of the dam discharging into the drop inlet structure constitutes the reservoir outlet facilities for the dam. Flow through the reservoir outlet is controlled by a sluice gate located in the drop inlet structure. The outlet conduit is supported on a continuous concrete cradle and is equipped with reinforced concrete cutoff collars (Plate 11).

The emergency spillway is a trapezoidal earth channel excavated into the left abutment (Plate 2). The bottom width of the trapezoidal channel is 30 feet with side slopes 2:1 on both embankment and abutment sides. A 30-foot-wide level section located at Elevation 947 in line with the axis of the embankment constitutes the controlled section of the spillway.

c. Design Data

(1) Hydrology and Hydraulics. Available information indicates that the emergency spillway was designed to pass the PMF hydrograph with a peak of 4857 cfs corresponding to 25.8 inches of precipitation in 6 hours without overtopping the embankment. This hydrograph was routed through the reservoir starting at normal pool (Elevation 919.3), and producing a maximum pool at Elevation 957.0 with a peak emergency spillway outflow of 4263 cfs. The top of the dam was established at Elevation 957.0.

(2) Embankment. Available information indicates that laboratory tests for the embankment design consisted of classification, compaction, and shear strength tests. Shear strength tests consisted of consolidated undrained triaxial tests with pore pressure measurements. The following effective shear strength parameters were reported:

Zone I Material	- Effective internal friction angle, 21.5 degrees; effective cohesion, 325 pounds per square foot
Zone II Material	- Effective internal friction angle, 33 degrees; effective cohesion, 575 pounds per square foot
Zone III Material	- Effective internal friction angle, 33 degrees; effective cohesion, 975 pounds per square foot

It is reported that a slope stability analysis was conducted using the Modified Swedish Circle procedure. The stability of the downstream slopes under steady-state seepage and the stability of the upstream slope under rapid drawdown conditions were considered. For the steady-state seepage analysis, the pool level was taken at Elevation 947.0, which is the emergency spillway crest level. The factors of safety were reported to be 1.7 for the upstream slope and 1.8 for the downstream slope.

(3) Appurtenant Structures. Available information indicates that the appurtenant structures were standard SCS designs.

2.2 Construction. As-built drawings and construction progress reports were available for review. To the extent that can be determined, the construction of the dam was in conformance with SCS specifications. No unusual construction difficulties were reported. The dam was constructed under the supervision of SCS field representatives. It is reported that the earthwork was monitored by field density tests. However, the results were not available for review.

Available information indicates no postconstruction changes.

2.3 Operation. No records of operation are kept.

2.4 Other Investigations. None reported.

2.5 Evaluation

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

b. Adequacy.

(1) Hydrology and Hydraulics. The available information is considered to be adequate to assess the conformity of the design to the current spillway design criteria.

(2) Embankment. A review of the geotechnical aspects of the design indicated that the design generally followed currently accepted practices for subsurface investigation, laboratory testing, analyses, and construction.

(3) Appurtenant Structures. A review of the design drawings indicates that the appurtenant structures were designed and constructed in conformance with currently accepted engineering practices.

SECTION 3
VISUAL INSPECTION

3.1 Findings

a. General. The on-site inspection of PA-484 dam consisted of:

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

2. Visual examination of the emergency spillway and visual portions of the primary spillway.

3. Observation of factors affecting runoff potential of the drainage basin.

4. Evaluation of the downstream hazard potential.

The specific observations are illustrated in Plate 12 and in the photographs in Appendix C.

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.

The overall condition of the dam is considered to be fair. The portion of the downstream slope below the bench was found to be swampy with numerous seeps. The quantity of flow could not be estimated. Another swampy area was found below the toe of the dam near the right abutment. However, no seepage appeared to be associated with the swampy area. No signs of seepage were observed on the abutments or at the junction of the embankment and the abutments.

Although most of the embankment was found to be covered with grass and free of erosion problems, truck tracks on the downstream slope appear to be initiating erosion rills.

The top of the embankment was surveyed relative to the emergency spillway crest elevation and was found to be above the design crest elevation of 957.0.

c. Appurtenant Structures. The appurtenant structures were examined for deterioration or other signs of distress or obstructions that would limit flow. On the date of inspection, the pool was approximately at the crest level of the primary spillway (Elevation 938.25),

indicating that the orifice of the drop inlet structure is obstructed. Other than this problem, the structures were found to be in good condition. No other deficiencies were noted at this time.

d. Reservoir Area. A map review indicated that the watershed is predominantly covered with reclaimed strip mine areas. A review of the regional geology (Appendix E) indicates that only a minor portion of the slopes of the reservoir are likely to be susceptible to landslides. Massive landslides which might affect the storage volume of the reservoir are not considered to be likely.

e. Downstream Channel. Downstream of the dam, the stream flows approximately 2000 feet south where it joins Harmon Creek. Further description of the downstream conditions is included in Section 1.2b.

3.2 Evaluation. The condition of the dam is considered to be fair. The swampy area of the downstream slope of the embankment is considered to be significant relative to the overall stability of the embankment, but not serious at this time. No significant movements or sloughing was observed. However, it is considered advisable to instrument and monitor the seepage and reevaluate the stability of the embankment based on these observations. The erosion rills on the downstream slope of the dam should also be filled and vegetated to prevent future erosion problems.

SECTION 4
OPERATIONAL FEATURES

4.1 Procedure. The reservoir is normally maintained at the crest level of the orifice in the drop inlet structure, with the excess inflow discharging through the orifice. The reservoir outlet pipe can be used to draw down the permanent pool when required. The reservoir outlet pipe gate is normally closed.

4.2 Maintenance of the Dam. The maintenance of the dam is considered to be satisfactory. The downstream and upstream faces of the dam are covered with grass and appear to be annually mowed. However, some erosion rills exist in truck tracks on the downstream slope of the embankment. Washington County personnel reported there is no full-time dam tender responsible for the maintenance of the dam. Maintenance is performed by outside contractors on an as-needed basis.

4.3 Maintenance of Operating Facilities. The only operational feature of the dam is the reservoir outlet pipe sluice gate operated by a hoist located on the drop inlet structure. Since the drop inlet structure was not accessible, this facility could not be examined.

4.4 Warning System. No formal warning system exists for the dam. The dam is accessible via a short road from a secondary highway. Telephone communication facilities are available in residences approximately one mile downstream from the dam.

4.5 Evaluation. The maintenance condition of the dam is considered to be satisfactory. However, the orifice in the drop inlet structure should be cleaned to permit lowering the reservoir to its normal elevation. The erosion rills in the truck tracks on the downstream slope of the dam should be filled and vegetated to prevent future erosion problems.

SECTION 5
HYDRAULICS AND HYDROLOGY

5.1 Evaluation of Features

a. Design Data. PA-484 dam has a watershed of 0.6 square miles and impounds a reservoir with a surface area of 1.6 acres at normal pool level. The capacity of the emergency spillway is reported to be 4,263 cfs, with no freeboard. The emergency spillway was sized to pass a flood corresponding to 25.8 inches of precipitation in 6 hours, without overtopping the embankment.

b. Experience Data. As previously stated, PA-484 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 using the Dam Safety version of the HEC-1 computer program, developed by the Hydrologic Engineering Center of the U.S. Army Corps of Engineering. The data used for the computer analyses are presented in Appendix D. The PMF inflow hydrograph was found to have a peak flow of 1,688 cfs. The computer outputs are included in Appendix B.

c. Visual Observations. On the date of inspection, no conditions were observed that would indicate that the emergency spillway capacity would be significantly reduced in the event of a flood.

d. Overtopping Potential. The PMF inflow hydrograph was routed through the reservoir and it was found that the dam can pass the PMF without overtopping. To obtain an upper bound on the maximum pool level during the passage of PMF, the spillway discharge rating was conservatively based on a rectangular cross section, with the base of the rectangle taken equal to the base of the trapezoidal emergency spillway cross section.

e. Spillway Adequacy. The spillway capacity (100 percent PMF) is classified to be adequate according to the recommended criteria.

SECTION 6
STRUCTURAL STABILITY

6.1 Evaluation of Structural Stability

a. Visual Observations

(1) Embankment. As discussed in Section 3, in view of the presence of swamp areas on the downstream slope of the dam, a concern exists as to the continued integrity of the embankment. However, no movement or sloughing was observed to indicate the condition is serious at this time. However, instrumentation and monitoring are recommended.

(2) Appurtenant Structures. The structural performance of the appurtenances are considered to be satisfactory.

b. Design and Construction Data.

(1) Embankment. Available information indicates that the stability of the embankment was analyzed for steady-state seepage and rapid drawdown conditions, using the Modified Swedish Circle slope stability analysis procedure. The minimum factor of safety was reported to be 1.7 for the upstream slope under rapid drawdown conditions and 1.8 for the downstream slope under steady-state seepage conditions. Strength parameters for the embankment materials were obtained from consolidated undrained triaxial shear tests with pore pressure measurements. Construction progress reports indicate that the dam construction was under the supervision of SCS field representative and the earthwork was monitored by field density tests.

(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. There are no operating records kept.

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 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 for earthquakes.

SECTION 7
ASSESSMENT AND RECOMMENDATIONS/PROPOSED REMEDIAL MEASURES

7.1 Dam Assessment

a. Assessment. The visual observations indicate that PA-484 dam is in fair condition. The swampy area below the berm of the downstream slope raises some concern as to the continued integrity of the embankment. Although this condition is not considered to be serious relative to the overall stability of the embankment at this time, due to lack of any signs of movement or sloughing, instrumentation and monitoring are recommended. Reevaluation of the stability of the embankment based on these observations will be required.

The capacity of the spillway (100 percent PMF) is found to be adequate according to the recommended criteria.

b. Adequacy of Information. Available information in conjunction with visual observations and the previous experience of the inspectors is considered to be sufficient to make a reasonable assessment of the condition of the dam.

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

d. Necessity for Additional Data. No additional data are considered to be required at this time.

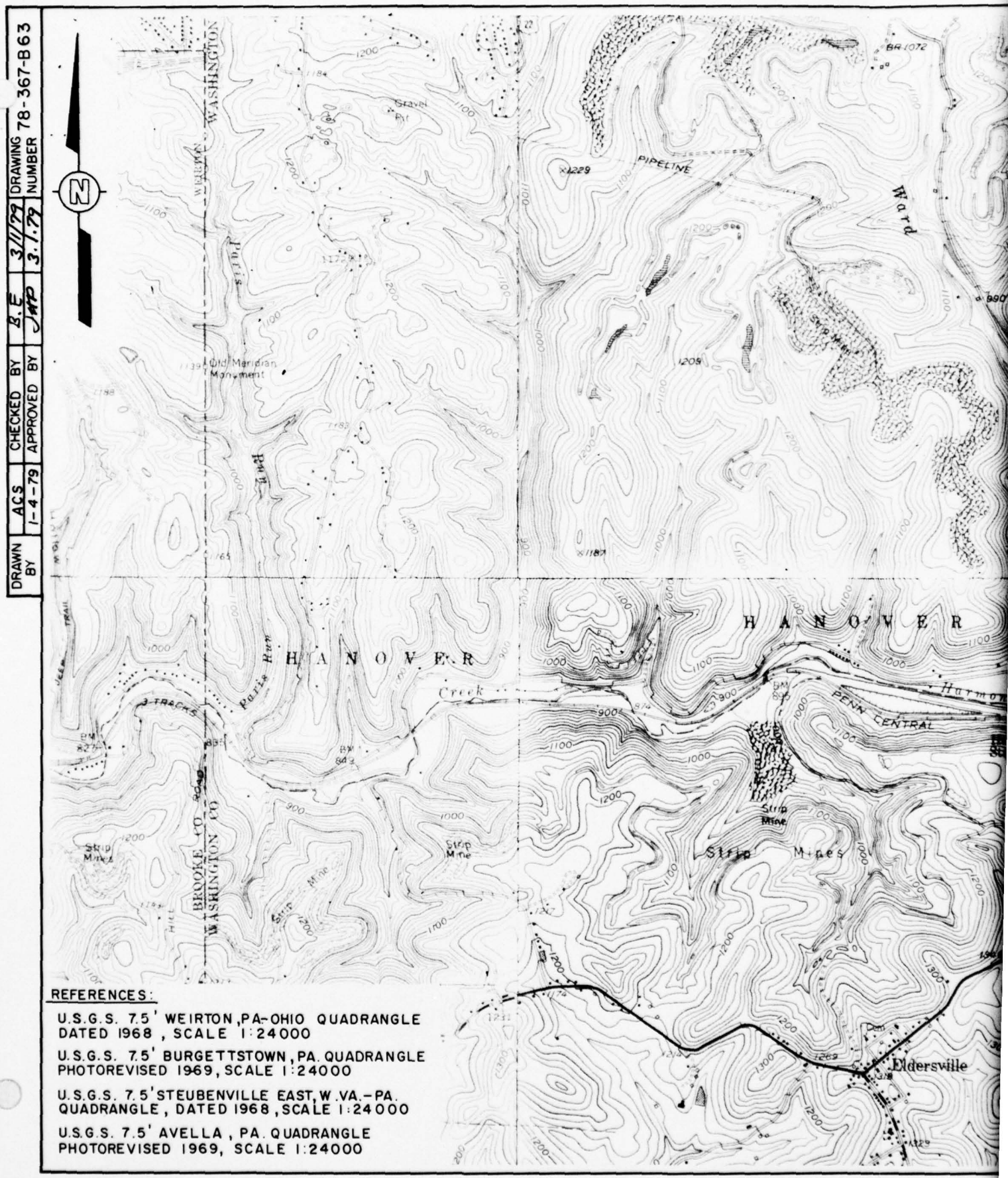
7.2 Recommendations/Remedial Measures. It is recommended that:

1. The embankment should be evaluated by a professional engineer experienced in earth dam design and necessary instrumentation installed to monitor the wet area on the downstream slope of the dam. The stability of the embankment should be evaluated based on the results of these observations and necessary remedial work performed, if required.

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

3. The dam and appurtenant structures should continue to be inspected regularly and necessary maintenance should be performed.

PLATES



REFERENCES:

U.S.G.S. 7.5' WEIRTON, PA-OHIO QUADRANGLE DATED 1968, SCALE 1:24000

U.S.G.S. 7.5' BURGETTSTOWN, PA. QUADRANGLE PHOTOREVISED 1969, SCALE 1:24000

U.S.G.S. 7.5' STEUBENVILLE EAST, W.VA.-PA. QUADRANGLE, DATED 1968, SCALE 1:24000

U.S.G.S. 7.5' AVELLA, PA. QUADRANGLE PHOTOREVISED 1969, SCALE 1:24000

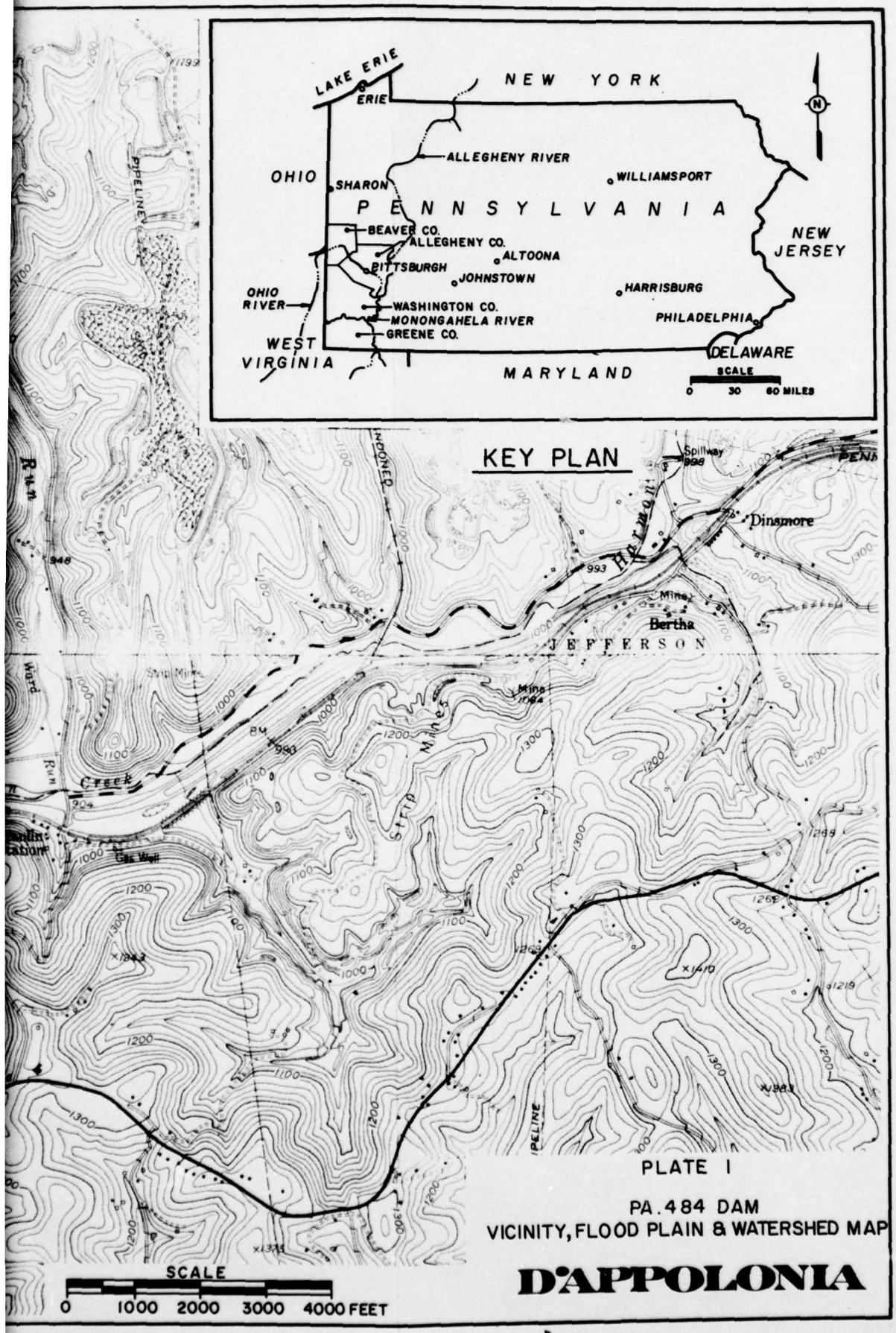
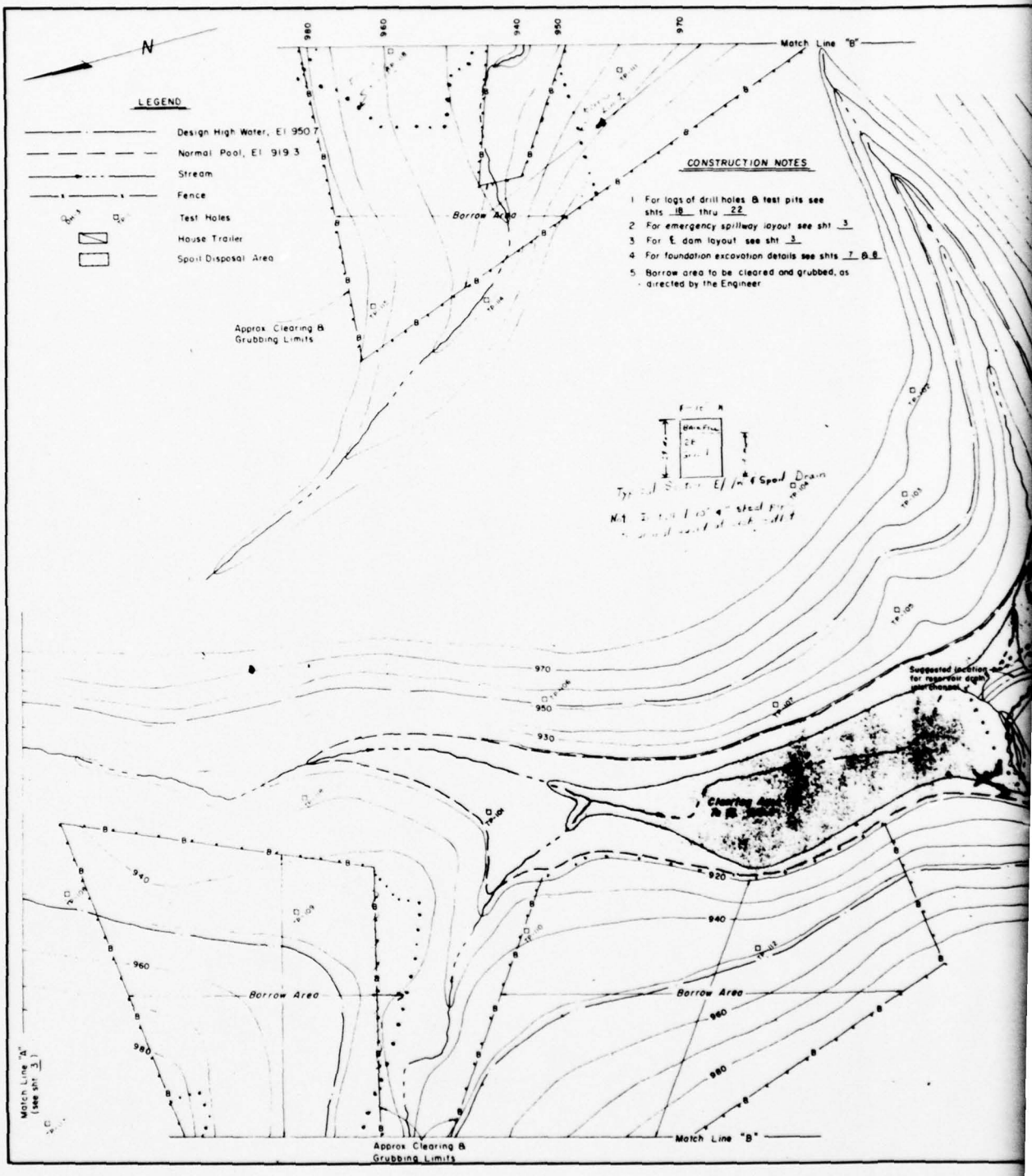


PLATE 1

PA. 484 DAM
VICINITY, FLOOD PLAIN & WATERSHED MAP

D'APPOLONIA

DRAWN BY	CHECKED BY	APPROVED BY	DRAWING NUMBER
RDB 1-4-79	GE 3/1/79	JMP 3.1.79	78-367-B64



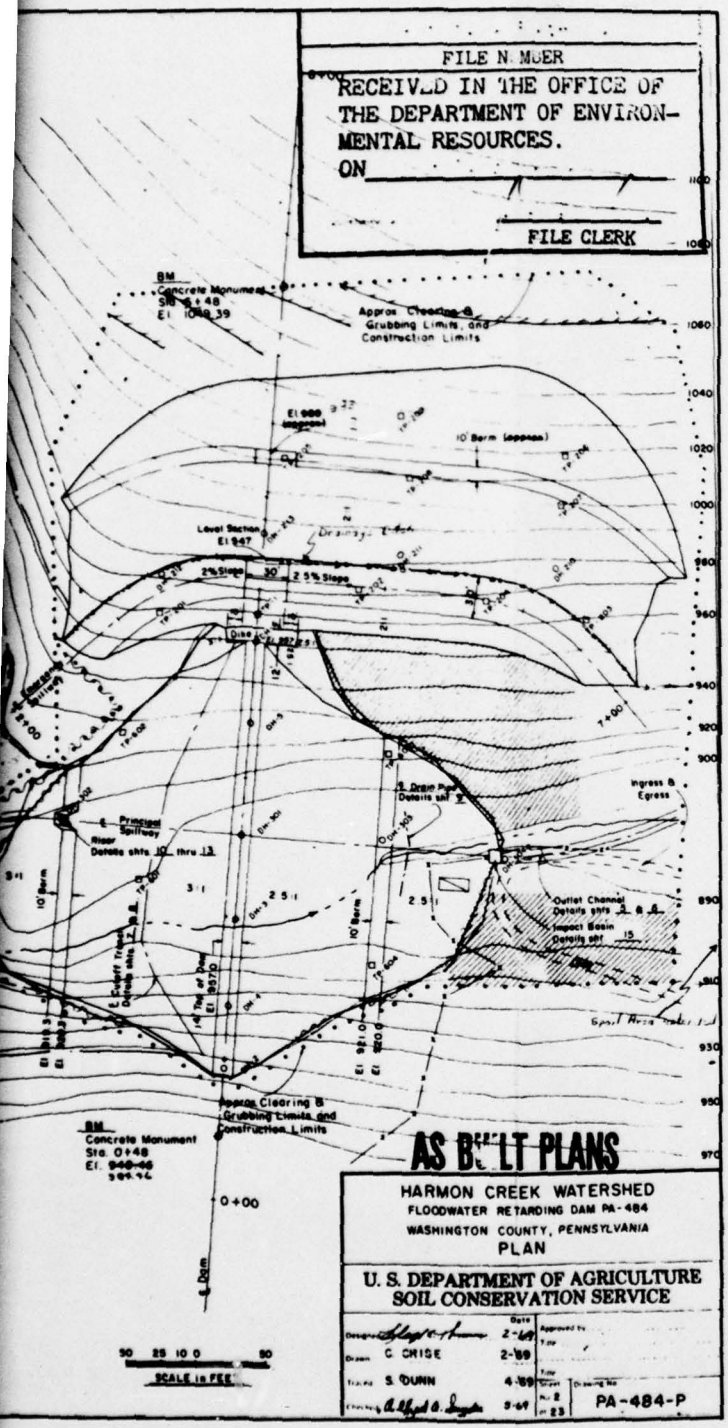


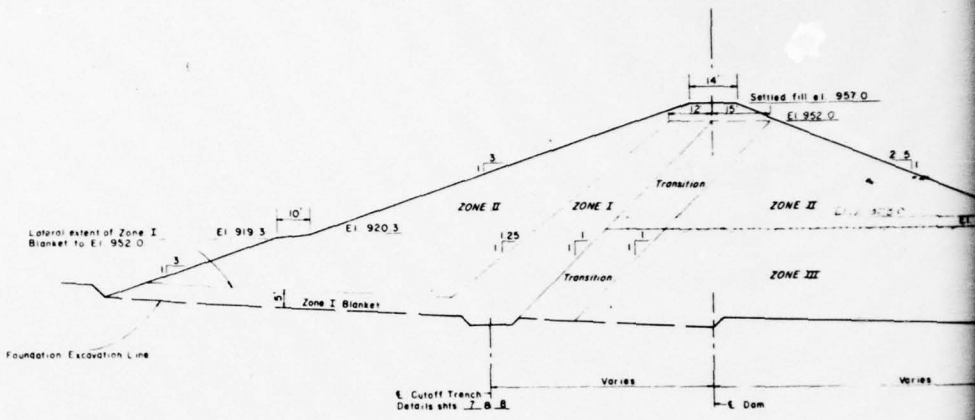
PLATE 2

2

D'APPOLONIA

1

DRAWN BY	ROB	CHECKED BY	BE	3/1/79	DRAWING NUMBER 78-367-B65
	1-4-79	APPROVED BY	JMP	3.1.79	



TYPICAL SECTION OF DAM

ZONE	MATERIAL	MAX. ROCK SIZE	
I	Material as represented by TP 112, depth 2.0'-4.5', classified as CL and TP 115, depth 2.0'-7.0', classified as CL	6"	
II [3]	Material as represented by TP 204, depth 4.0'-10.0', classified as GP (siltstone)	12"	
III [3]	Material as represented by TP 208, depth 6.0'-11.0', classified as GP (sandstone)	12"	

[1] For fill adjacent to structures, ma

[2] Maximum permissible lift thickne

[3] Water content of fill matrix at tim

[4] For typical compaction curves see

[5] The 15 foot wide transition section sha Zone III shall be accomplished by e or by selective mixing and placeme materials, as determined by the Engi gradational transition against Zone

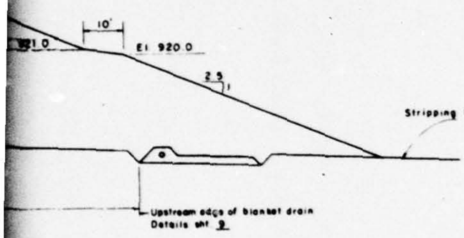
63-73-A.F4

FILE NUMBER

RECEIVED IN THE OFFICE OF THE DEPARTMENT OF ENVIRONMENTAL RESOURCES.

ON ________

FILE CLERK



Construction Notes

1. For constructed fill elevations see sht 7
2. Constructed slopes are:
   2.92 : 1 Upstream
   2.43 : 1 Downstream

MAX. LIFT [2]	REQ'D WATER CONTENT [3]	COMPACTION	
		Class	Definition
9"	Optimum ± 2.0%	A	At least 95 % of max density by ASTM D-698 Method A [4]
12"	See Const. Spec. 23	C	See Const. Spec. 23
12"	See Const. Spec. 23	C	See Const. Spec. 23

...m rock size = 3"
...h before compaction
...e of compaction
...e sht 23
...m in Zone II and ...ective placement ...of on-site borrow ...oser, to provide a ...1.

AS BUILT PLANS

20 10 5 0 20
SCALE in FEET

HARMON CREEK WATERSHED
FLOODWATER RETARDING DAM PA-484
WASHINGTON COUNTY, PENNSYLVANIA
FILL PLACEMENT

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

Designed		4-69
Drawn	C. CRISE	4-'69
Traced		
Checked		5-69

Approved by
Title
Title

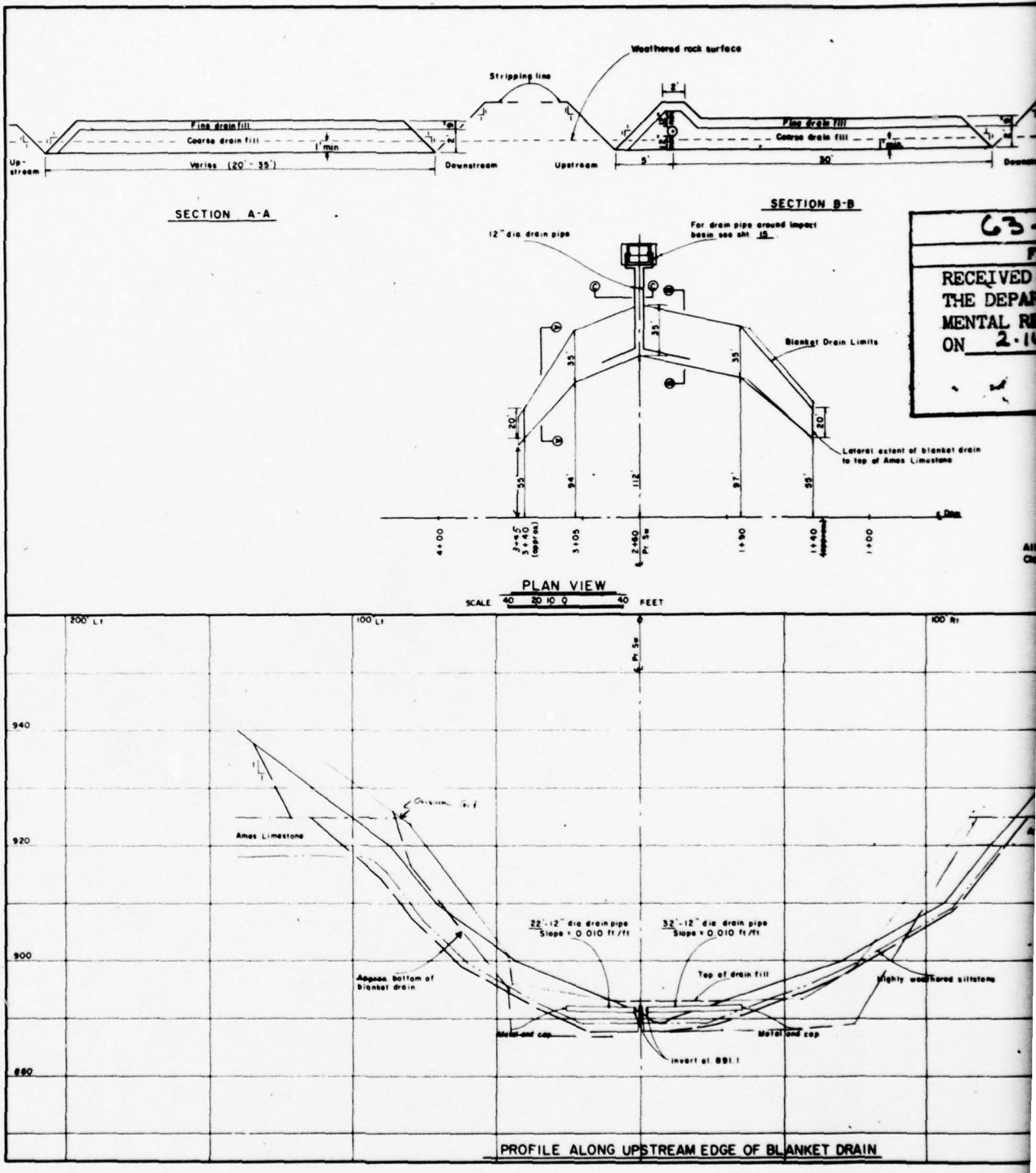
Sheet No. 4 of 23 | Drawing No. PA-484-P

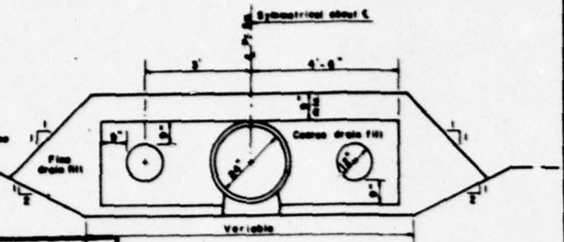
PLATE 3

2

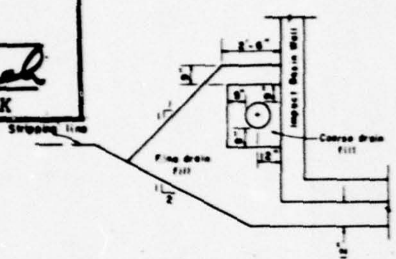
D'APPOLONIA

DRAWN BY	R D B	CHECKED BY	RE	3/1/79	DRAWING NUMBER 78-367-B66
	1-4-79	APPROVED BY	JHP	3.1.79	



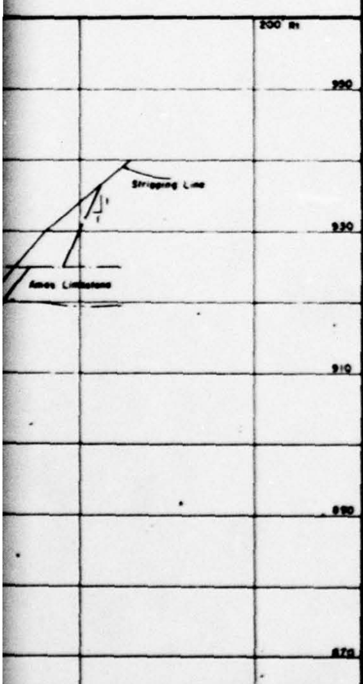


SECTION C-C



TYPICAL DRAIN FILL AROUND IMPACT BASIN

NOTE
All drain pipe shall be 12" dia., perforated, Class I, Shape I, Type B, 16 gage (Spec. 551)



QUANTITY SUMMARY

179'-6"	- 12" dia. drain pipe, perforated
5	- 1' x 2' 90° elbows
2	- 1' x 2'-6" 90° elbows
1	- 1' x 1' 90° elbow
2	- Metal end caps
2	- Small animal guards (details see 17)
203'-6"	Total

GRADATION LIMITS FOR DRAIN FILL

COARSE DRAIN FILL		FINE DRAIN FILL	
Sieve No.	% Passing (based on dry weight)	Sieve No.	% Passing (based on dry weight)
1-1/2"	100	no. 4	90 - 100
1"	82 - 100	no. 8	[illegible]
3/4"	70 - 100	no. 16	[illegible]
1/2"	50 - 95	no. 30	[illegible]
3/8"	40 - 85	no. 100	[illegible]
no. 4	18 - 50	no. 200	[illegible]
no. 10	0 - 30	no. 200	< 3
no. 20	0 - 8		
no. 200	< 3		

AS BUILT PLANS

HARMON CREEK WATERSHED
FLOODWATER RETARDING DAM PA-484
WASHINGTON COUNTY, PENNSYLVANIA
DRAINAGE

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

Designed		6-69
Drawn	C. CRISE	5-69
Traced		
Checked		6-69
Sheet No. 9 of 22	Drawing No. PA-484-P	

PLATE 4

D'APPOLONIA

DRAWN BY	RDB	CHECKED BY	BE	DRAWING NUMBER
	1-4-79	APPROVED BY	JHP 3/1/79 3.1.79	78-367-B 67

TP 1, ELEV. 958.0, 4+15, Centerline

Hole Depth From	To	Description of Materials	
0.0	0.5	Forest litter, roots, etc.	
0.5	1.1	Gravel, sand and silt, brn, slightly moist, 35% fine to med. gravel, 30% sand, 35% low plastic fines. Coarse particles are very soft shale.	GM
1.1	6.0	Shale, grn-gry, moist, excavates as 75% fine to med. gravel, 2[illegible]% sand. Trace of fines. Shale is thin bedded and can barely be scratched with fingernail. Particles are thin and platy. Shale breaks readily along close spaced joint and cleavage planes.	GP
6.0	10.0	Carbonaceous shale, moist to 7.5 ft. Below 7.5 ft. water film noted along bedding planes. Shale is very thin bedded and can be scratched with fingernail. Excavates as 60% fairly well-graded gravel, 35% sand. Some clay laminae noted between bedding planes. Coarse particles are thin and platy. No seepage noted into pit.	GP
10.0		Bottom of pit - wet hole.	

DH 2, ELEV. 955.2, 0+95, Centerline
Logged by: R. G. Hirnisey 9/19/67
Drilling Equipment: Joy 12-B Drill Rig

Hole Depth From	To	Description of Materials	Unif. Soil Class Symb.	STANDARD PENETRATION Blows Per 6"	Type Bit Used	No.	Type	SAMPLES From Ft.	To Ft.	% Rec.
		1.5 ft. cut away for drill		1-2-3	SpT	1	Jar	0.0	1.5	30
		set up. 0.5 ft. of forest		6-7-12	"	2	"	1.5	3.0	65
		litter, etc. starting at		[illegible]-27-40	"	3	"	3.0	4.5	60
		present ground level.		30-71-[illegible]7	"	4	"	4.5	6.0	65
0.0	3.5	Siltstone, dk. gry to blk.	GM-GP	15-23-38	"	5	"	6.0	7.5	75
		slightly moist, can be		22-33-52	"	6	"	7.5	9.0	80
		scratched with fingernail.		17-40-73	"	7	"	9.0	10.5	85
		Thin bedded, from 3.0-3.5'		19-45-71	"	8	"	10.5	12.0	65
		rock becomes softer with some			NXM			12.0	14.0	85
		thin clay laminae. Material			"			14.0	19.0	85
		from split spoon is GM-GP, 55%			"			19.0	24.0	95
		fine gravel, 35% sand, 10% non-			"			24.0	29.0	95
		plastic fines.			"			29.0	31.0	100
3.5	11.8	Siltstone, grn-gry with some	ML		"			31.0	36.0	90+
		red-brn, very highly weathered			"			36.0	41.0	95
		to ML with a trace of gravel,			"			41.0	46.0	100
		15% sand and 80% low plastic			"			46.0	51.0	95
		fines. Cemented coarse particles			"			51.0	56.0	100
		very soft, easily crushed and			"			56.0	61.0	100
		molded with fingers. Contains a few coal			"			61.0	66.0	100
		shale laminae.			"			66.0	71.0	100
11.8	15.5	Siltstone, red-brn and grn-gry, similar to silt-			"			71.0	76.0	100
		stone at 3.5-11.3' but slightly less weathered.			"			76.0	81.0	95
		Very soft, easily scratched and broken with fingernail. Cored pieces up to 0.5 ft. long with broken sections and some interbedded clay strata.								
15.5	25.5	Siltstone, gry; highly weathered grn-gry to red-brn; from 15.5-18.6, 19.3-19.9, & 22.7-24.0' siltstone can easily be scratched with fingernail. Core contains numerous broken zones with some very highly weathered clay strata. Heavy iron staining noted. Some vertical fractures noted. Cored pieces up to 0.3 ft. long and generally do not fit well together. Some sections are limy.								
25.5	30.3	Siltstone, dk. grn-gry, can be scratched with pencil. Below 27.8 ft. ± core return is highly broken with numerous gravel and sand size pieces. From 25.5-27.8' cored pieces up to 0.[illegible] ft. long. Some vertical fractures noted. Some heavy iron staining noted along bedding planes and fractures. Contains some interbedded clay strata. Limy								
30.3	38.0	Limestone (Ames), med. to lt. gry, fossiliferous, can barely be scratched with knife. Cored pieces 0.3-1.3 ft. long and fit fairly well together. Contains some vertical fractures with some iron staining. From 3[illegible].7-36.0': Siltstone, grn-gry to gry, can be scratched with fingernail; containing vertical fractures with heavy iron staining, lost drill water at 3[illegible].0 ft.								
38.0	38.3	Very thin coal seam and clay shale, highly weathered to CL. Black to grn-gry, very soft, some heavy iron staining noted.								
38.3	53.3	Siltstone, dk. gry, can be scratched with pencil point, limy, very active reaction with dilute HCl. Cored pieces 0.05-0.[illegible] ft. long. Core contains some highly broken zones and some clay strata. From 45.3-47.0' and 50.1-50.8': Limy conglomerate with fine gravel and sand size particles. Core contains some vertical fractures, slight iron staining noted in places along this horizon. Cored pieces fit only moderately well together.								
53.3	65.2	Siltstone, gry with lt. gry to pink limy inclusions to 58.0 ft. Soft, can be scratched with pencil, cored pieces 0.2-2.0' long and fit fairly well together. Contains some clay laminae along bedding planes. No iron staining noted, appears to be thin bedded.								
65.2	69.2	Siltstone, gry, can be scratched with fingernails, slicken sides noted from 65.2-66.4', dipping 55 to 65 degrees from horizonal, the foot wall appears to have been the up-thrown side, unable to tell amount of movement. Siltstone this horizon has distinct vertical fractures. Limy fracture filling noted down to 67.[illegible] ft. fracture filling appears to have been connected with faulting. Some weathering and clay strata noted along fractures, faults and bedding planes; no iron staining noted.								
69.2	73.9	Sandstone, gry, very fine grained sand to silty, can be scratched with pencil, cross-bedded, some of the beds are limy. Cored pieces 0.[illegible]-1.5' long and fit fairly well together. Contains some clay laminae. Sandstone is slightly micaceous.								
73.9	81.0	Siltstone, gry, can barely be scratched with pencil. Cored pieces up to 1.1 ft. long and fit fairly well together. No fractures or iron staining noted. Contains some thin clay laminae.								
81.0		Bottom of hole - wet hole. WL (9/22/67) 56.8' WL (10/2/67) 59.2'								

DH 3, ELEV. 895.6, 2+00, Centerline
Logged by: R. G. Hirnisey 9/20/67
Drilling Equipment: Joy 12-B Drill Rig

Hole Depth From	To	Description of Materials	Unif. Soil Class Symb.	STANDARD PENETRATION Blows Per 6"	Type Bit Used	No.	Type	SAMPLES From Ft.	To Ft.	% Rec.
0.0	0.5	Forest litter, roots, etc.		1-2-3	SpT	1	Jar	0.0	1.5	65
0.5	3.5	Silt, gravel and sand, brn,	ML-GM	3-2-3	"	2	"	1.5	3.0	55
		moist, from 0.5-1.5' & 3.0-		22-55-30	"	3	"	3.0	4.5	100
		3.5' contains 20% fine to med.		28-50/0.5	"	4	"	4.5	5.5	100
		gravel, 20% sand, fines are low			NXM			5.5	7.5	100
		plastic. From approx. 1.5-			"			7.5	12.5	95
		3.0' appears to be GM with			"			12.5	17.5	100
		45% fine to med. gravel, 30%			"			17.5	22.0	90
		sand and 25% nonplastic fines.			"			22.0	27.0	100
		Coarse particles are silt-			"			27.0	32.0	100
		stone with some sandstone								
Cont'd		and can be scratched with fingernail.								

DH 3 Cont'd

Hole Depth From	To	Description of Materials
3.5	10.1	Siltstone, gry, thin bedded. (shaley) Penetrated with split spoon sampler fro[m] 5.5'. From 5.5-10.1' siltstone, can be scratched with fingernail. Cored piece[s] to 0.25 ft. long; core return shows some very highly broken zones, contains so[me] bedded clay strata and vertical fractures. Some slight iron staining noted. S[ilt]stone limy below 7.5'.
10.1	15.2	Sandstone, lt. to med. gry, contains silt to very fine sand size particles. C[an be] scratched with knife. Cored pieces 0.3-0.9' long and fit fairly well together. shows crossbedding below 12.5 ft. Limy, very active reaction with dilute HCl. slight iron staining noted.
15.2	32.0	Siltstone, gry, can be scratched with pencil, limy in zones down to 18.0 ft., c[ored pieces] 0.2-1.3' long and fits fairly well together, especially below 18.0 ft. Some cl[ay] laminae noted along bedding planes. Some vertical fractures noted down to 19.0 with some slight iron staining.
32.0		Bottom of hole - wet hole. WL (9/25/67) 3.3' WL (9/26/67) 3.0'

DH 4, ELEV. 925.[illegible], 1+37, Centerline
Logged by: R. G. Hirnisey 9/26/67
Drilling Equipment: Joy 12-B Drill Rig

Hole Depth From	To	Description of Materials	Unif. Soil Class Symb.	STANDARD PENETRATION Blows Per 6"	Type Bit Used	No.	Type	SAMPLES From Ft.	To Ft.
		Approx. 0.6 ft. cut away from		2-3-2	SpT	1	Jar	0.0	1.5
		natural ground of which 0.4 ft.		1-1-2	"	2	"	1.5	3.0
		was forest litter, roots, etc.		1-3-21	"	3	"	3.0	4.5
0.0	5.0	Siltstone, grn-gry, very highly		31-93	"	4	"	4.5	5.5
		weathered to SC and CL with			NXM			5.5	8.0
		moderately plastic fines.			"			8.0	13.0
		Appears to contain some secon-			"			13.0	16.0
		dary brn clay strata. Per-			"			16.0	21.0
		cent of fines range from 30			"			21.0	26.0
		to 80%, coarse particles very			"			26.0	31.0
		soft.			"			31.0	36.0
5.0	8.0	Limestone (Ames), gry- weathered			"			36.0	41.0
		grn-gry. Core can be scratched			"			41.0	46.0
		with knife, core return is highly broken and contains some gravel size pieces; cored pieces up to 0.2 ft. long. [...] some distinct vertical fractures, heavy iron staining and secondary brn clay [...] noted along fractures and bedding planes. Limestone also contains some primary [...] strata. Limestone is fossiliferous. This horizon shows intense weathering.							
8.0	20.5±	Siltstone, highly weathered to grn-gry; dk. red-brn from 15.0-16.0'. Core retu[rn] highly broken with numerous gravel and some sand size pieces. Distinct vertic[al] fractures noted. Heavy iron staining and some brn secondary clay seams noted [...] bedding planes and vertical fractures. Siltstone also contains some primary [...] clay strata. Drillers noted very soft strata from 19.0-20.0', no recovery, si[...] is highly weathered; very soft, easily scratched with fingernails; limy, very [...] reaction with dilute HCl.							
20.5	26.0	Siltstone, gry, dk. red-brn from 21.5-24.0', however, iron staining is not as [...] this section. Core is highly broken except for one from 21.0-22.5'. Core is [...] soft with clay strata. This section is only slightly limy.							
26.0	30.5	Siltstone, gry, can be scratched with pencil, contains some thin clay strata, [...] pieces up to 0.6 ft. long and fit somewhat well together. Some slight iron st[...] noted along bedding planes. Contains some distinct vertical fractures. Old f[...] filling is limy.							
30.5	39.0	Siltstone, med. gry; can be scratched with pencil; thin bedded. Cored pieces [...] long and fit fairly well together. Core return broken from 34.1-34.4', only s[...] iron staining noted in this section.							
39.0	43.5	Sandstone, silt to fine grained sandy, cross bedded with light to med. gry la[...] some of which is limy. Can be scratched with knife, cored pieces 0.3-1.3' lo[ng] fit fairly well together. Contains some thin clay strata. Fault at 39.0-39.3' slicken sides noted. Foot wall appears to be downthrown side, fault dips app[...] 55 degrees from horizonal.							
43.5	46.0	Siltstone, gry; can be scratched with pencil, thin bedded, contains some inte[r...] sandy strata, core pieces 0.4-0.7' long and fit fairly well together. Contai[ns] very thin clay laminae along bedding planes. Some vertical fractures noted, [...] staining this section.							
46.0		Bottom of hole - wet hole. WL (10/[illegible]/67) 32.0' WL (10/5/67) 31.8'							

DH 5, ELEV. 926.1, 3+[illegible], Centerline
Logged by: R. G. Hirnisey 9/27/67
Drilling Equipment: Joy 12-B Drill Rig

Hole Depth From	To	Description of Materials	Unif. Soil Class Symb.	STANDARD PENETRATION Blows Per 6"	Type Bit Used	No.	Type	SAMPLES From Ft.	To Ft.
		Approx. 2.0 ft. was cut out		4-7-15	SpT	1	Jar	0.0	1.5
		from natural ground for set		65/0.5'	"	2	"	1.5	2.[illegible]
		up of drill rig. 0.0-0.5'			NXC1			2.0	3.[illegible]
		forest litter, etc. From			"			3.8	5.[illegible]
		0.5-2.0' siltstone, grn-			"			5.6	8.[illegible]
		gry; weathered brn with			"			8.5	13.[illegible]
		heavy iron staining, thin			"			13.0	17.[illegible]
		bedded, very soft.			"			17.0	22.[illegible]
		Starting from present ground			"			22.0	24.[illegible]
		level			"			24.5	26.[illegible]
0.0	2.0	Siltstone (as described above)			"			26.0	31.[illegible]
		2.0 ft. refusal of split spoon			"			31.0	36.[illegible]
		on Ames limestone.						36.0	41.[illegible]
2.0	8.5	Limestone (Ames) gry, weathered						41.0	46.[illegible]
		grn-gry, can be scratched with						46.0	50.[illegible]
		knife, fossiliferous, core return somewhat broken with some gravel size pieces. One piece of core 0.[illegible]' long. Limestone contains some distinct [...] fractures. Heavy iron staining and secondary brn clay seams noted along fr[...] and bedding planes. Limestone contains a few interbedded shale units. Drill[...] noted void 8.0-8.3', clay seam at 8.5', limestone shows high degree of weat[...]							
8.5	20.3	Siltstone, highly weathered to grn-gry; red-brn from 23.7-[illegible].3', can be scra[...] with fingernail; from 17.0-18.5' core yellow-brn and scratched with pencil. [...] return highly broken with numerous gravel size pieces, distinct vertical fr[...] noted in core, heavy iron staining along fractures and bedding planes. Con[...] primary and secondary clay strata. Siltstone is limy from 8.5-22.0'.							
20.3	41.8	Siltstone, med. gry, can be scratched with pencil, core contains some fract[...] some slight iron staining, cored pieces generally 0.3-0.4' long and up to 2.[...] Core return contains a few broken sections down to 33.0 ft. Below 36.0 ft. [...] fits fairly well together, contains some thin clay strata, both of primary [...] secondary origin. Siltstone contains pink limy inclusions from 26.[illegible]-34.0'.							
41.8 Cont'd	46.6	Sandstone, silty to fine grained sandy, crossbedded, lt. & med. gry, some of [...]							

DH 5 Cont'd

Hole Depth From	To	Description of Materials
		are limy. Cored pieces 0.4-2.7 ft. long and fit fairly well together. Core can be scratched with knife. Sandstone is slightly calcareous. Contains some clay laminae, no iron staining noted.
46.6	50.0	Siltstone, med. gry, can be scratched with pencil, core pieces 0.1-0.5' long and fit moderately well together. Contains a few fractures, some thin clay laminae between bedding planes, no iron staining noted.
50.0		Bottom of hole - wet hole. WL (10/3/67) 33.5' Unable to get further water level readings, rubber expanders from packer lodged in hole on 10/3/67.

DH 6, ELEV. 9*8.0, 3+95, Centerline
Logged by: E. G. Hirsimay 10/4/67
Drilling Equipment: 2½ Drill Rig - 12s

Hole Depth From	To	Description of Materials	Unif. Soil Class Symb.	STANDARD PENETRATION Blows Per 6"	Type Bit Used	No.	Type	SAMPLES From Ft.	To Ft.	% Rec.
		Approx. 2.6 ft. cut away for	CH	3-5-10	BpT	1	Jar	0.0	1.5	90
		set up. Of this 0.5' was		19-19-15	"	2	"	1.5	3.0	55
		Forest litter, roots, etc. &		16-19-28	"	3	"	3.0	4.5	80
		2.1' was CH containing 10%		39-31-56	"	4	"	4.5	6.0	95
		small cobbles, matrix (0-3")			NXM			6.0	8.0	85
		55% gravel, 30% sand & 15%			"			8.0	11.5	100
		nonplastic fines. Coarse			"			11.5	16.0	80
		particles are sandstone &			"			16.0	20.5	85
		some shale. Particles are			"			20.5	25.5	95
		not in uniform orientation.			"			25.5	30.5	95
		Starting from present ground			"			30.5	34.5	100
		level.			"			34.5	37.0	75
0.0	4.0	Gravel, silt, clayey and	GC		"			37.0	39.8	100
		sand, brn to grn-gry,			"			39.8	44.5	90
		slightly moist. Contains approx. 35% fine to med. gravel, 25% sand and 40% low plastic fines. From 1.5-3.0' appears to contain material similar to the above. Coarse particles are shale and some sandstone.								
4.0	7.0	Siltstone, grn-gry, moist, very soft and very highly weathered to ML, contains approx. 20% fine gravel, 15% sand, fines are low plastic, coarse particles are nondurable. Siltstone is limy.	ML							
7.0	11.5	Siltstone, grn-gry with some red-brn, highly weathered, siltstone can be scratched with pencil. Core return highly broken with numerous gravel size pieces. Contains clay strata up to 0.2 ft. thick. Highly fractured with heavy iron staining. Clay strata of both primary and secondary origin.								
11.5	24.5	Siltstone, grn-gry, some dk. red-brn from 15.0-16.0'. Core can be scratched with finger, siltstone highly weathered, core return contains numerous broken sections with gravel size pieces, cored pieces up to 0.3 ft. long and fit somewhat poorly together. Contains distinct vertical fractures. Heavy iron staining noted along fractures and some bedding planes. Contains some thin clay strata along bedding planes. Limy in zones below 17.9 ft.								
24.5	32.0	Limestone (Ames), grn-gry to 29.4' and dk. gry from 29.4 to 32.0'. Can be barely scratched with knife. Cored pieces up to 0.6 ft. long. Core return shows some broken zones but below 29.5 ft. core fit fairly well together. Contains some distinct vertical fractures, heavy iron staining noted along fracture and some bedding planes. Contains some secondary brn clay seams. A primary gry clay seam from 31.7-32.0'. Contains some interbedded limy siltstone; can be scratched with pencil; 24.9-25.5, 29.5-30.0' limestone is crossbedded and fossiliferous.								
32.0	44.5	Siltstone, limy, dk. gry to blk. 32.0-37.2', dk. red-brn 37.2-39.2', med. gry with some reddish gry 39.2-44.5'. Can be scratched with pencil, cored pieces fit somewhat poorly together, cored pieces up to 0.6 ft. long. Core return has some broken sections with gravel and sand size pieces. Contains some vertical fractures. Heavy iron staining noted along bedding planes and some fractures. Contains some thin clay strata.								
44.5		Bottom of hole - WL (10/9/67) 41.0' WL (10/10/67) 41.5' WL (10/11/67) 41.5'								

DH 301, ELEV. 897.0, 2+00, Centerline
Logged by: P. G. Hirsimay 9/19/67
Drilling Equipment: Joy 12-B Drill Rig

Hole Depth From	To	Description of Materials	Unif. Soil Class Symb.	STANDARD PENETRATION Blows Per 6"	Type Bit Used	No.	Type	SAMPLES From Ft.	To Ft.	% Rec.
0.0	0.5	Forest litter, roots, etc.		7-9-8	BpT	1	Jar	0.0	1.5	40
0.5	3.0	Silt, gravel and sand,	ML	9-11-13	"	2	"	1.5	3.0	55
		brn, slightly moist, 20%		13-40-48/0.2'	"	3	"	3.0	4.2	100
		fine to med. gravel, 20%			NXM			4.2	6.2	65
		sand, fines are non-			"			6.2	11.2	95
		plastic, coarse								

Cont'd

NOTE: Soil and rock descriptions and classifications in these logs are based on visual-manual methods. The Matrix as used in these logs is that portion of a soil finer than 3 inches.

AS BUILT PLANS

63-73 HARMON CREEK WATERSHED 43/18
FLOODWATER ... PA-484
... PENNSYLVANIA
FILE NUMBER
RECEIVED IN THE OFFICE OF
THE DEPARTMENT OF ENVIRONMENTAL RESOURCES
U.S. ... CONSERVATION SERVICE
ON 2-1-72
Designed / Drawn / Traced / Checked: J.C. Johnson May 69
FILE CLERK

PLATE 5

2

D'APPOLONIA

DRAWN BY	RDB	CHECKED BY	BE	3/1/79	DRAWING NUMBER 78-367-B68
	1-4-79	APPROVED BY	JHP	3.1.79	

DH 301 Cont'd

Hole Depth From	To	Description of Materials	Unif. Soil Class Symb.	STANDARD PENETRATION Blows Per 6"	Type Bit Used	No.	Type	SAMPLES From Ft.	To Ft.	% Rec.
		particles are siltstone and	ML		NXC1			11.2	16.2	100
		sandstone, thin & platy.			"			16.2	21.2	100
3.8	11.3	Siltstone, gry, easily scratch-			"			21.2	26.2	100
		ed with fingernail, contains some			"			26.2	31.2	95
		interbedded thin clay strata. Silt-			"			31.2	36.2	100
		stone is thin bedded, cored pieces			"			36.2	41.2	90
		0.05-0.45 ft. long. Core return broken 10.5-11.3'. Some vertical fractures noted. Heavy iron staining down to 5.7 ft.								
11.3	15.8	Sandstone, fine grained to silty, gry, can be scratched with knife. Cored pieces up to 1.2 ft. long and fit fairly well together. No iron staining noted except at lower sandstone - siltstone contact at 15.8 ft. A few vertical fractures noted. Sandstone is slightly limy.								
15.8	32.5	Siltstone, gry, can be scratched with pencil. Cored pieces 0.1-1.3' long and fit fairly well together. Core breaks along smooth bedding planes, no iron staining noted except at sandstone - siltstone contact, siltstone is thin bedded. No fractures noted. Some thin clay laminae noted between bedding planes.								
32.5	41.2	Sandstone, very fine grained to silty, gry, crossbedded with silty units in crossbedding. Can barely be scratched with fingernail, cored pieces 0.1-2.0' long and fit fairly well together. Dry clay laminae noted between some smooth bedding planes. No iron staining noted. Rock is limy in some zones.								
41.2		Bottom of hole - wet hole WL (9/20/67) 5.5' WL (9/21/67) 6.0' WL (9/22/67) 4.5' WL (9/25/67) 5.2'								

DH 302, ELEV. 908.5, 2+60, 130' U.S.
Logged by R. C. Birnisey 9/25/67
Drilling Equipment: Joy 12-B Drill Rig

Hole Depth From	To	Description of Materials	Unif. Soil Class Symb.	STANDARD PENETRATION Blows Per 6"	Type Bit Used	No.	Type	SAMPLES From Ft.	To Ft.	Rec.
0.0	0.5	Forest litter, roots, etc.		[illegible]	Sp	1	Jar	0.0	1.5	55
0.5	8.0	Gravel, sand, clay, silty &	GC	8-3-12	"	2	"	1.5	3.0	40
		cobbles, brn to yellow-brn		7-3-8		3		3.0	4.5	40
		& gry, moist, appears to be		12-16-20		4		4.5	6.0	80
		wet below 7.0 ft. Material		11-17-17		5		6.0	7.5	65
		appears to be similar to 2.4-		19-45-75		6		7.5	9.0	100
		3.5' in TP 601. Numerous			NX1			9.0	14.0	100
		sandstone cobbles encountered with split spoon. Material is stratified with CL lenses between GC material. Average matrix: approx. % gravel, 25 % sand and % moderately plastic fines. Coarse particles are very soft shale and coal shale and moderately soft sandstone.								
8.0	14.0	Siltstone, gry, weathered brn to 11.1 ft.; from 8.0-9.0' SL and GC driven with split spoon, very highly weathered. From 9.0-10.0' core return highly broken. Below 10.0 ft. core fits somewhat well together, core contains some vertical fractures and some clay strata. Core is highly weathered with heavy iron staining to 11.9 ft. and moderately weathered from 11.9-14.0' - no iron staining noted from 11.9-14.0'. Core can be scratched with fingernail.								
14.0		Bottom of hole - wet hole WL (9/26/67) 5.2' Hole caved 6.7 ft. 10/2/67 WL (10/4/67) 7.0'±								

DH 303, ELEV. 895.1, 2+66, 100' D.S.
Logged by R. C. Birnisey 9/26/67
Drilling Equipment: Joy 12-B Drill Rig

Hole Depth From	To	Description of Materials	Unif. Soil Class Symb.	STANDARD PENETRATION Blows Per 6"	Type Bit Used	No.	Type	SAMPLES From Ft.	To Ft.	Rec.
0.0	0.5	Forest litter, roots, etc.		2-4-6	SpT	1	Jar	0.0	1.5	35
0.5	3.0	Silt, clayey, sandy gravel,	[illegible]	4-4-4	"	2	"	1.5	3.0	25
		brn to yellow-brn, moist,		5-5-10	"	3		3.0	4.5	65
		contains approx. 20 % gravel,		56-15-22		4		4.5	6.0	65
		20 % sand, fines are moderately		75/0.5'		5		6.0	6.5	100
		plastic, coarse particles are			NX1			6.5	11.9	90
		very soft shale and coal shale and moderately soft sandstone particles. Material appears to be stratified, grade into GC below.								
3.0	4.2±	Gravel, sand and clay, silty, brn to yellow-brn, moist, contains approx. % fine to med. gravel, 30 % sand, fairly well graded and 30 % moderately plastic fines, coarse particles - same as above.	GC							
4.2	5.5±	Gravel, sand and cobbles, brn, moist, appears to be numerous small sandstone cobbles this horizon. Material appears similar to 2.4-3.5' in TP 601, unable to approximate matrix (0.0-3.0") from samples.								
5.5	11.0	Siltstone, gry, highly weathered, split spoon driven 5.5-6.0', core return is highly broken with vertical fractures. Clay strata up to 0.2 ft. noted. Cored pieces do not generally fit well together, core can be scratched with fingernail. Some slight iron staining noted.								
11.0		Bottom of hole - wet hole WL (10/2/67) 4.8'								

DH 304, ELEV. 891.5, 2+00, 190' D.S.
Logged by R. C. Birnisey 10/5/67
Drilling Equipment: Exposure in Streambank

Hole Depth From	To	Description of Materials	
0.0	0.5	Forest litter	
0.5	1.8	Gravel, sand and silt, clayey, moist to slightly moist, brn. Contains approximately 40% gravel, fine to med. size, 30 sand and 30 low plastic fines. Coarse particles are siltstone and sandstone. May be land fill from dirt road beside drill hole.	GM
1.8	4.3	Gravel, sand and silt, clayey, brn, moist. From 1.8-3.2' contains approximately 15% small cobbles, below 3.2 ft. cobbles increase to approx. 40% (1/2 over 6") Matrix: (0-3") 55% gravel, fairly well graded, 30 sand, 15% low plastic fines. Coarse particles are subround and platy sandstone with some siltstone. Coarse particles are not in uniform orientation.	GM

Cont'd

DH 304 Cont'd

Hole Depth From	To	Description of Materials
4.3	6.4	Siltstone, gry, can be scratched with fingernail, highly weathered. Appears to b thin bedded. 6.4 ft. bottom of stream cut. Water at approximately 4.2 ft.
6.4		Bottom of cut - wet

TP 601, ELEV. 898.4, 2+22, 70' U.S.

Hole Depth From	To	Description of Materials
0.0	0.6	Forest litter, roots, etc.
0.6	2.4	Silt, gravel and sand, dk. brn to grn, moist, 20% med. size gravel, 15% sand. Fines are nonplastic.
2.4	3.5	Cobbles, gravel, sand and clay, moist to 3.0 ft. and wet below 3.0 ft. Slow seepage into test pit. Contains approximately 40% small cobbles: matrix (0-3") 50% gravel, 25% sand, 25% plastic fines. Coarse particles are platy sandstone, can be scratched with knife. Particles are in relatively horizonal layers with clay interbeds.
3.5	4.5	Siltstone. gry, can be scratched with moderate pressure on fingernail, wet, slow seepage into pit, backhoe refusal at 4.5 ft.
4.5		Bottom of pit - wet hole.

TP 602, ELEV. 928.0, 3+25, 70' U.S.

Hole Depth From	To	Description of Materials
0.0	0.4	Forest litter, roots, etc.
0.4	4.5	Clay, gravel and sand, brn, slightly moist to 2.0 ft. and moist from 2.0-4.5', contains approximately 20% fine gravel, 25% sand and fines are moderately plastic. Coarse particles are nondurable siltstone and readily breakdown with fingers and water.
4.5	5.0	Limestone, brn to olive, moist, can be scratched with knife, durable, limy - moderate reaction with dilute HCl. Contains some calcite crystals. Backhoe refusal at 5.0 ft.
5.0		Bottom of pit - dry hole.

TP 603, ELEV. 913.0, 3+25, 100' D.S.

Hole Depth From	To	Description of Materials		SAMPLES No.	Type	From Ft.
0.0	0.4	Forest litter, roots, etc.				
0.4	1.5	Gravel, silt and sand, dk. brn, slightly moist, 35 % fine gravel, 25 % sand, 40 % nonplastic fines.	GM			
1.5	9.0	Highly weathered siltstone, red-brn and lt. gry, moist. limy below 4.5 ft., excavates as GC with 45 % fines to	GC-CL	1	S Bag	3.0
		CL with 65 % fines. Fines are moderately plastic. Coarse particles are nondurable, easily scratched and broken with fingers. Gravel constant ranges from 15 to 35 % and is fine to med. in size. Material is compact and appears to be relatively impermeable. Active reaction with dilute HCl below 4.5 ft.		2	S Bag	6.5
9.0	9.8	Limestone, lt. reddish gry, hard, can be barely scratched with knife, can be broken with small rock hammer after repeated heavy blows. No fossils noted.				
9.8	14.0	Siltstone, dk. red-brn and lt. grn-gry, moist, can be scratched with fingernail. Limy, excavates as 60 % fine to med. gravel, 35 % sand. Material is compact, thickness of bedding planes not readily apparent.	GC			
14.0		Bottom of pit - dry hole.				

TP 604, ELEV. 904.1, 1+75, 100' D.S.

Hole Depth From	To	Description of Materials
0.0	0.3	Forest litter, roots, etc.
0.3	2.5	Clay, gravel and sand, brn, moist, 15% gravel, fine to med., 25 % sand, fines are plastic. Coarse particles are siltstone, easily scratched and broken with fingernail. Limy below 1.9 ft.
2.5	5.5	Siltstone, red-brn to lt. grn-gry, siltstone weathered, can be scratched with fingernail, excavates as GP with % fairly well graded gravel, 35 % sand. Siltstone is limy.
5.5	7.7	Siltstone, lt. grn-gry to rusty brn, heavy iron staining, siltstone surrounds small nodular limestone concretions. Siltstone can be scratched with fingernail, limestone with knife, excavates as % small cobbles (Matrix 0-3") - 65% fairly well graded gravel and 35% sand.
7.7		Bottom of pit - dry hole.

Harmon Creek Watershed
PA-484
Summary of Field Permeability Tests

Hole No.	Type of Test	Depth of Test (Ft.)	Coefficient of Permeability (Ft. per day)
2	Open end	5.0- 6.0	1.8
	"	6.0- 9.0	Essentially zero
	"	9.0-12.0	"
	"	12.0-13.0	0.2
	"	13.0-29.0	0.8
	Pressure	30.0-35.0	70.5
	"	35.0-40.0	83.0
	"	40.0-45.0	Essentially zero
	"	45.0-50.0	0.39
	"	50.0-55.0	0.05
	"	67.5-62.0	0.1
	"	66.0-71.0	0.1
	"	71.0-76.0	Essentially zero
	"	76.0-81.0	"
3	Open hole	5.0- 5.5	0.2
	"	5.0-12.5	12.2
	"	12.5-17.0	10.1
	Pressure	7.0-12.0	70.3
	"	17.0-22.0	Essentially zero
	"	22.0-27.0	"
	"	27.0-32.0	1.2
4	Open hole	5.0- 5.5	1.0
	"	5.0-8.0	5.5
	"	8.0-13.0	6.2
	"	13.0-21.0	1.1
	"	21.0-31.0	1.2
	Pressure	31.0-38.0	15.1
	"	38.0-41.0	1.5
	"	42.0-48.0	Essentially zero
	"	32.0-41.0	16.0
5	Open hole	3.0- 3.8	1.2
	"	5.6-13.0	0.3
	"	13.0-17.0	0.4
	"	17.0-22.0	0.5
	"	22.0-25.0	0.5
	Pressure	25.0-30.0	Essentially zero
	"	30.0-35.0	"
	"	35.0-40.0	0.1
	"	40.0-45.0	2.3
	"	45.0-50.0	Essentially zero
6	Open hole	3.0- 6.0	"
	"	6.0-11.0	0.5
	"	13.5-20.5	0.1
	"	20.5-25.5	0.05
	"	25.5-30.5	0.1
	Pressure	30.5-35.5	Essentially zero
	"	34.5-39.5	"
	"	39.5-44.5	1.3
301	Open hole	3.0- 4.2	Essentially zero
	"	4.2-11.2	2.4
	"	11.2-26.2	5.8
	Pressure	7.0-12.0	3.3
	"	12.0-17.0	4.7
	"	17.0-26.2	2.2
	"	16.0-21.0	10.6*
	"	21.0-26.2	1.8
	"	26.0-31.0	Essentially zero
	"	31.0-36.0	0.9
	"	36.0-41.2	0.1
	"	41.0-41.2	0.7
302	Open hole	3.0- 6.0	0.4
	"	6.0- 8.0	0.1
	"	8.5-11.0	0.1
303	Open hole	3.0- 6.0	38.8
213	"	6.0- 9.7	Essentially zero
	"	9.7-17.0	0.*
	"	17.0-27.0	Essentially zero
	Pressure	33.0-38.0	25.6*
	"	38.0-43.0	18.5*
	"	43.0-48.0	22.6*
	"	38.0-77.0	1.6*
	"	43.0-77.0	0.3*
	"	66.0-71.0	0.1
	"	61.0-66.0	0.01
	"	67.0-72.0	0.1
	"	72.0-77.0	0.06
333	Open hole	6.0-11.0	4.4

* Indicates that test did not meet all criteria for valid results

A-219

NUMBER

THE OFFICE OF
NT OF ENVIRON-
RCES.

FILE CLERK

AS BUILT PLANS

HARMON CREEK WATERSHED
FLOODWATER RETARDING DAM PA-484
WASHINGTON COUNTY, PENNSYLVANIA
LOGS OF DRILL HOLES AND TEST PITS

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

PA-484-P

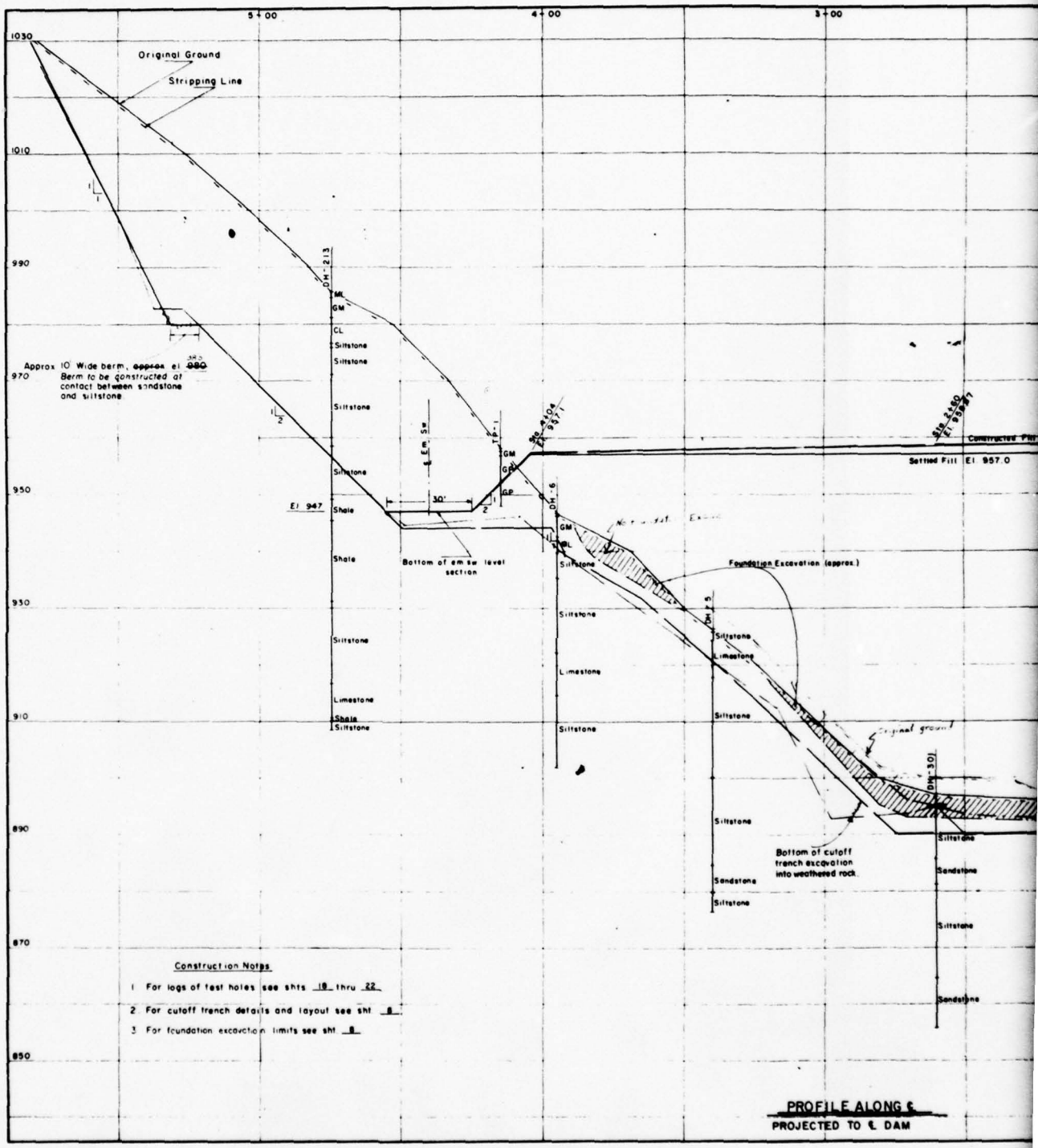
PLATE 6

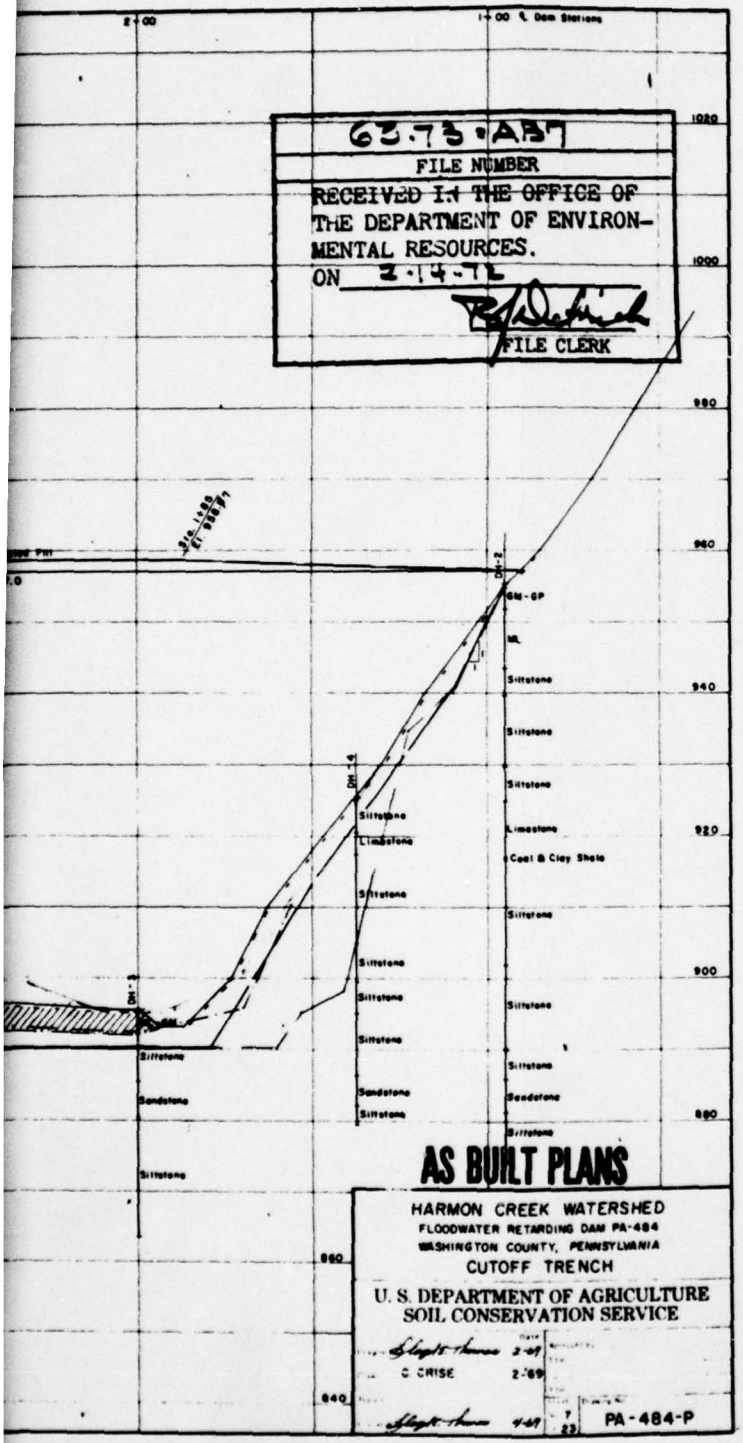
2

D'APPOLONIA

1

DRAWN BY	RDB	CHECKED BY		3/1/79	DRAWING NUMBER 78-367-B69
	1-4-79	APPROVED BY	JHP	3.1.79	





AS BUILT PLANS

HARMON CREEK WATERSHED
FLOODWATER RETARDING DAM PA-484
WASHINGTON COUNTY, PENNSYLVANIA
CUTOFF TRENCH

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

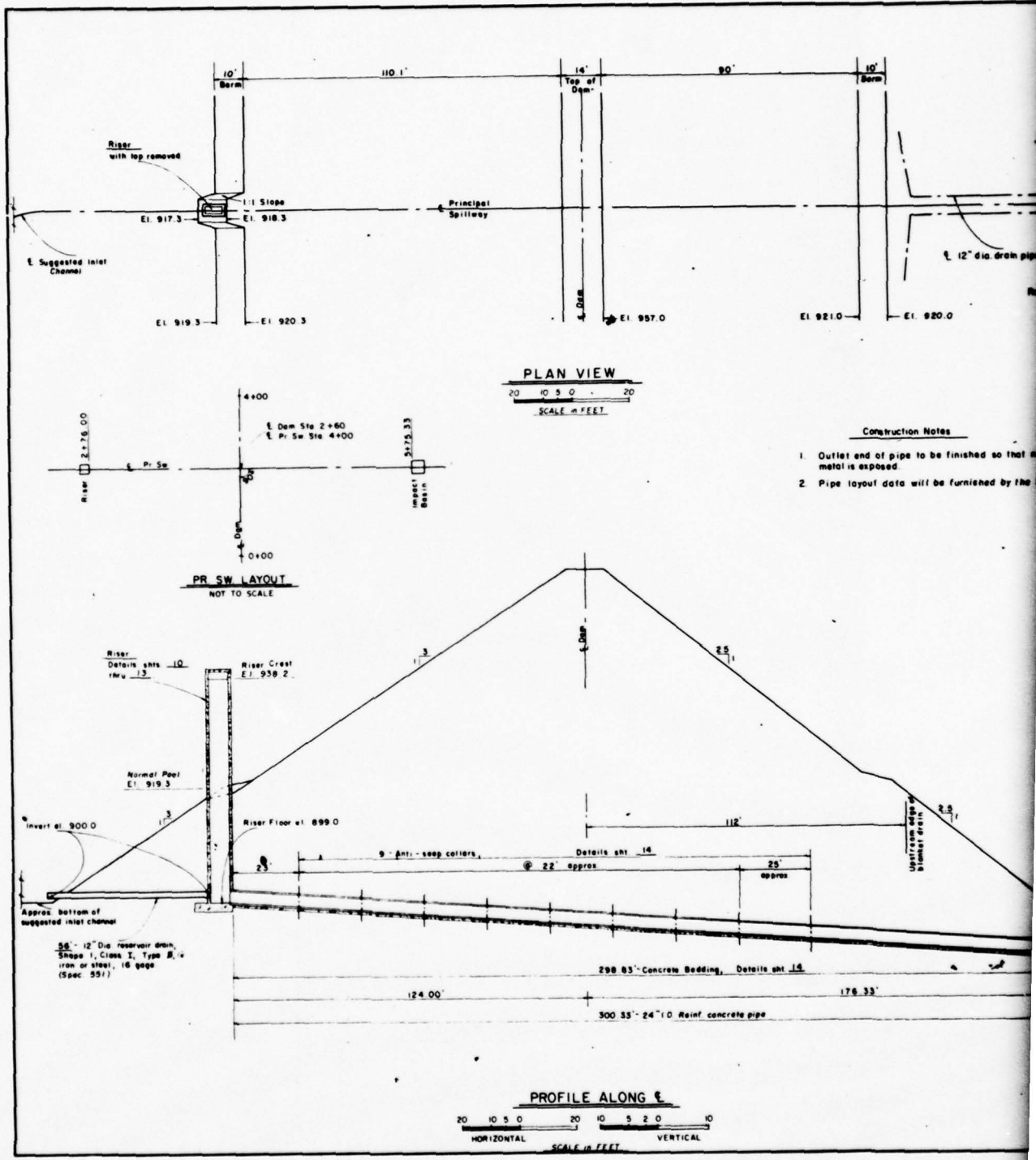
Designed	Date	
C CRISE	2-'69	
Checked	4-69	PA-484-P

PLATE 7

2

D'APPOLONIA

DRAWN BY	RDB	CHECKED BY	BE	3/11/77	DRAWING NUMBER 78-367-B70
	1-4-79	APPROVED BY	JHP	3.1.77	



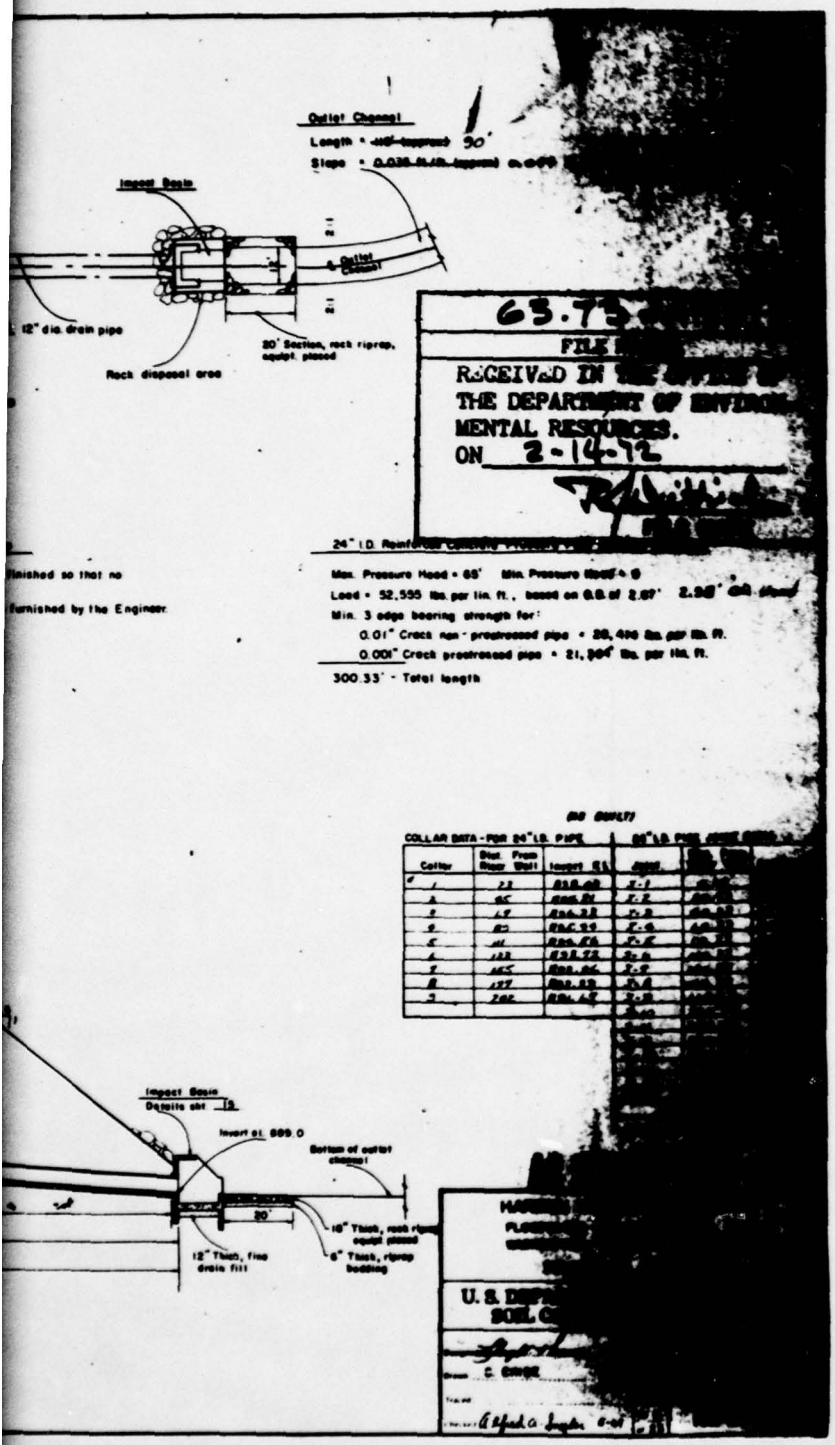
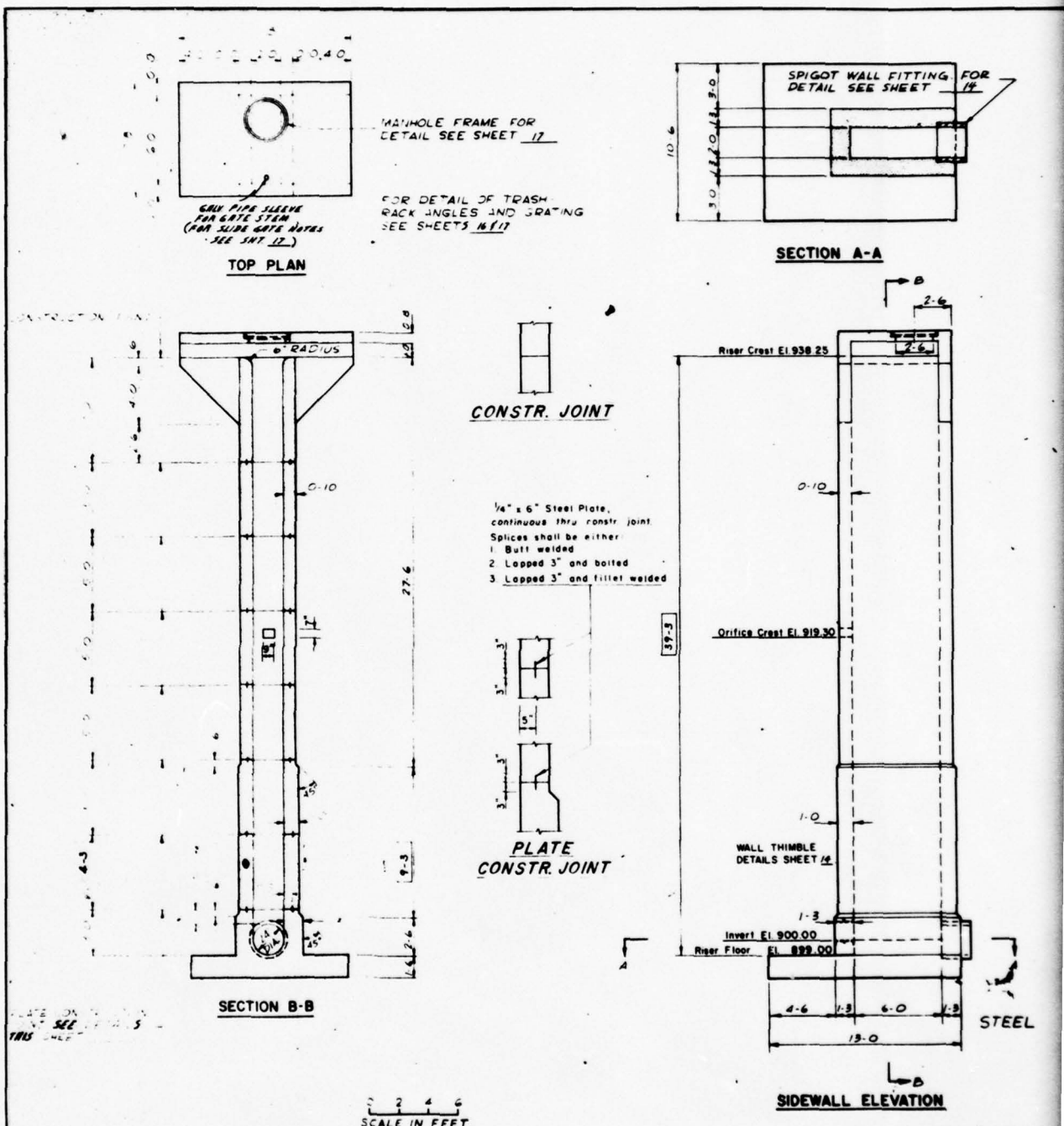


PLATE 8

D'APPOLONIA

DRAWN BY	R D B	CHECKED BY	RE	3/1/72	DRAWING
	1-4-79	APPROVED BY	JWP	3.1.72	NUMBER 78-367-B 71



STEEL SCHEDULE

MARK	SIZE	QUANTITY	LENGTH	TYPE	B	C	TOTAL LENGTH
B1	6	15	10-0	1	-	-	150-0
B2	6	11	12-6	1	-	-	137-6
B3	6	18	7-5	1	-	-	133-6
B4	9	18	6-9	21	3-2	3-7	121-6
B5	6	11	12-6	1	-	-	137-6
B6	6	14	10-0	1	-	-	140-0
B7	6	2	4-3	1	-	-	8-6
B8	5	5	4-6	21	1-0	3-6	22-6
B9	5	9	6-7	21	1-0	5-7	119-9
B10	5	16	6-7	21	1-0	5-7	105-4
B11	5	2	4-6	21	1-0	3-6	9-0
B12	6	8	6-8	1	-	-	53-4
B13	5	4	2-8	1	-	-	10-8
B14	5	10	7-10	21	2-11	4-11	78-4
B15	5	4	5-9	21	0-10	4-11	23-0
B16	5	4	5-7	21	0-8	4-11	22-4
B17	5	2	6-5	21	1-8	4-11	12-10
B18	7	4	8-0	21	3-0	5-0	32-0
B19	9	18	4-4	1	-	-	78-0
B20	5	5	3-8	1	-	-	18-4
B21	5	2	3-8	1	-	-	7-4
B22	5	2	2-5	1	-	-	4-10
B23	5	2	2-7	1	-	-	5-2
B24	5	8	2-4	41	-	-	19-8
R1	5	12	10-10	1	-	-	130-0
R2	5	4	10-10	1	-	-	43-4
R3	5	16	10-10	F-8	-	-	173-4
R4	5	8	8-9	1	-	-	70-0
R5	5	18	6-8	1	-	-	120-0
R6	5	10	2-8	1	-	-	26-8
R7	7	36	8-0	21	3-0	5-0	288-0
R8	6	16	6-8	1	-	-	93-4
R9	5	10	2-8	1	-	-	26-8
R10	6	36	7-8	21	2-10	4-10	276-0
R11	5	16	5-8	1	-	-	58-8
R12	5	8	3-8	1	-	-	29-4
R13	6	4	7-4	21	2-8	4-8	29-4
R14	5	10	11-7	1	-	-	115-10
R15	5	4	11-7	1	-	-	46-4
R16	5	12	11-7	1	-	-	139-0
R17	5	6	11-7	1	-	-	69-6
R18	5	20	6-8	1	-	-	133-4
R19	5	8	2-8	1	-	-	21-4
R20	6	40	7-4	21	2-8	4-8	293-4
R21	5	16	6-8	1	-	-	93-4
R22	5	8	2-8	1	-	-	21-4
R23	5	40	7-0	21	2-6	4-6	280-0
R24	5	10	11-7	1	-	-	115-10
R25	5	4	11-7	1	-	-	46-4
R26	5	12	11-7	1	-	-	139-0
R27	5	6	11-7	1	-	-	69-6
R28	5	10	6-8	1	-	-	66-8
R29	5	8	2-8	1	-	-	21-4
R30	5	24	7-0	21	2-6	4-6	168-0
R31	8	8	6-8	1	-	-	53-4
R32	5	8	2-8	1	-	-	21-4
R33	5	16	7-0	21	2-6	4-6	112-0

MARK	SIZE	QUANTITY	LENGTH	TYPE	B	C	TOTAL LENGTH
T1	5	10	6 6	1	-	-	65 0
T2	5	6	8 3	1	-	-	49 6
T3	5	10	6 9	1	-	-	67 6
T4	5	6	8 3	1	-	-	49 6
T5	5	12	6 8	1	-	-	80 0
T6	5	4	2 8	1	-	-	10 8
T7	5	2	3 8	1	-	-	7 4
T8	5	2	6 2	1	-	-	12 4
T9	5	2	8 8	1	-	-	17 4
T10	5	2	11 2	1	-	-	22 4
T11	5	24	7 0	21	2 6	4 6	68 0
T12	5	4	4 8	1	-	-	18 8
T13	5	4	3 5	1	-	-	13 8
T14	5	4	2 2	1	-	-	8 8
T15	5	4	7 3	19	1 8	5 7	29 0
T16	5	2	3 8	1	-	-	7 4
T17	5	2	5 2	1	-	-	12 4
T18	5	2	8 8	1	-	-	17 4
T19	5	2	11 2	1	-	-	22 4
T20	5	4	4 8	1	-	-	18 8
T21	5	4	3 5	1	-	-	13 8
T22	5	4	2 2	1	-	-	8 8
T23	5	4	7 3	19	1 8	5 7	29 0
T24	5	2	11 2	1	-	-	22 4
T25	4	12	5 8	1	-	-	60 0
T26	6	2	3 2	1	-	-	6 4
T27	4	6	11 2	1	-	-	67 0
T28	4	4	4 3	1	-	-	17 0
T29	5	20	5 11	21	1 5	4 6	118 4
T30	5	2	4 10	21	1 5	3 5	9 8
T31	5	2	2 3	21	1 5	0 10	4 6
T32	5	2	11 2	1	-	-	22 4
T33	4	6	11 2	1	-	-	67 0
T34	4	4	4 3	1	-	-	17 0

63-73-AD-16

FILE NUMBER

RECEIVED IN THE OFFICE OF THE DEPARTMENT OF ENVIRONMENTAL RESOURCES, ON 2-14-72

FILE CLERK

AS BUILT PLANS

QUANTITIES

EEL

4 BARS	254-6	170	LBS
5 BARS	3605-8	3884	LBS
6 BARS	1458-8	2191	LBS
7 BARS	820-0	664	LBS
9 BARS	199-6	678	LBS
		7543	LBS.

LS. - CU. YDS.

HARMON CREEK WATERSHED

FLOODWATER RETARDING DAM PA-484

WASHINGTON COUNTY, PENNSYLVANIA

RISER STRUCTURAL DETAILS

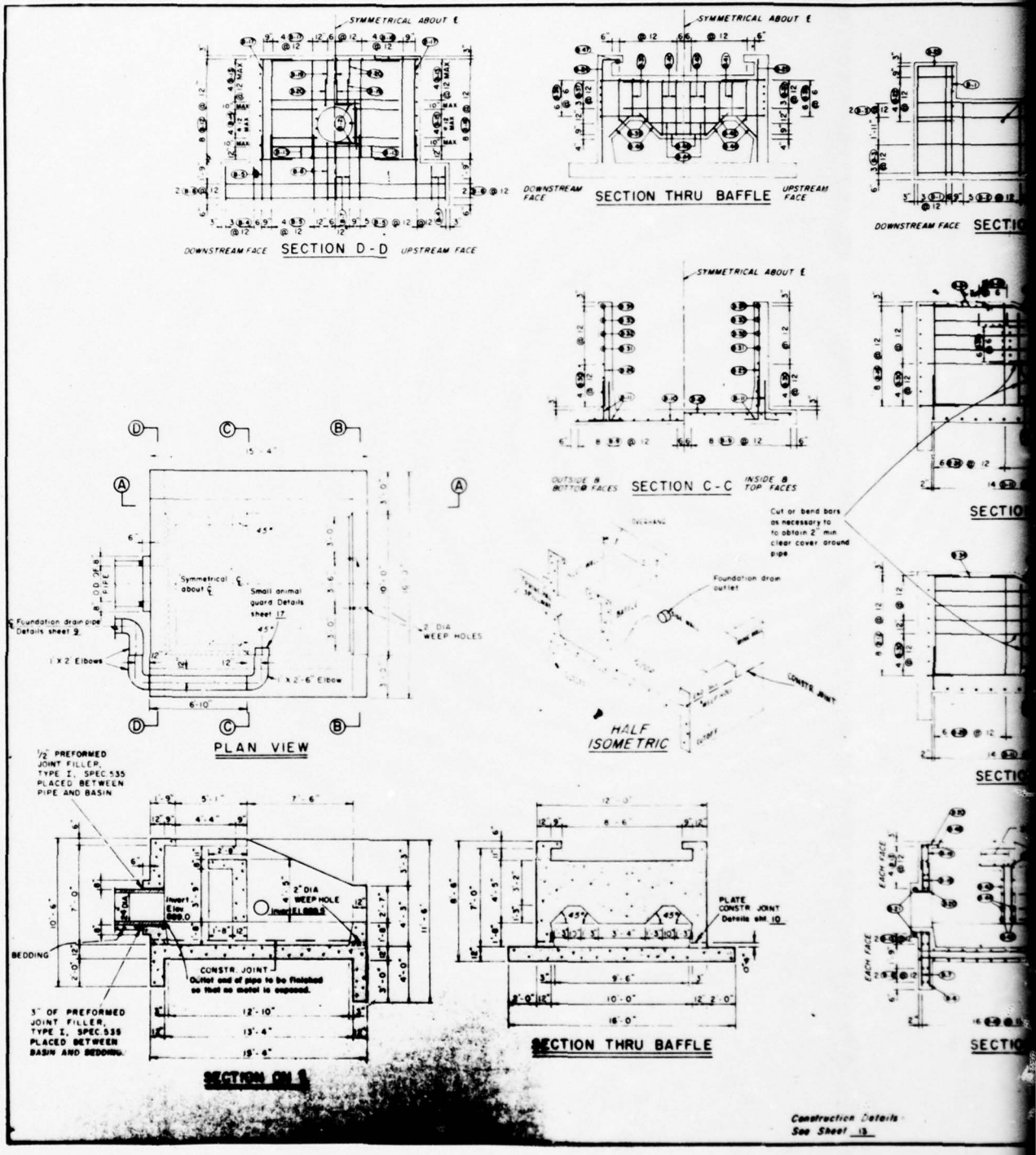
U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

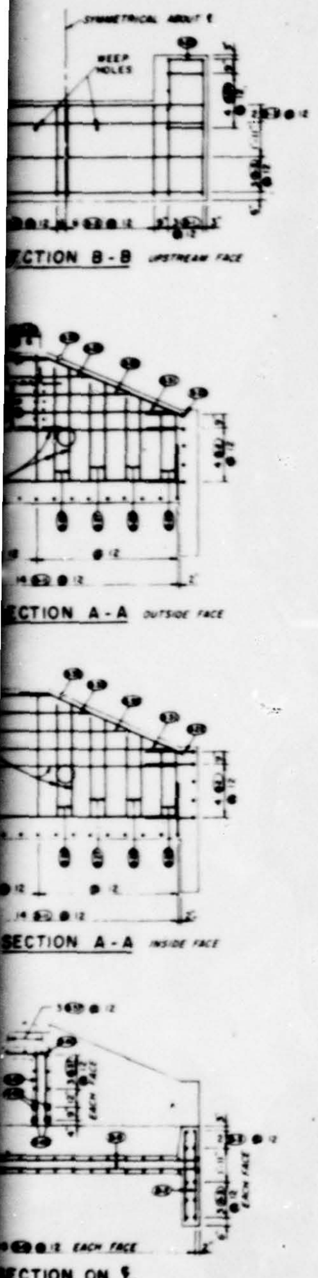
PA-484-P

PLATE 9

D'APPOLONIA

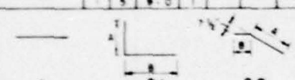
DRAWN BY	RDB	CHECKED BY	BE	3/1/79	DRAWING NUMBER 78-367-B72
	1-4-79	APPROVED BY	JMD	3.1.79	





STEEL SCHEDULE

BAR	LOCATION	QUAN	SIZE	LENGTH	TYPE	A	B	TOTAL FT
1	CUTOFF	14	5	7-9	1			108.50
2		21	5	5-3	1			110.25
3		10	5	15-6	1			155.00
4		10	5	2-7	1			25.83
5		20	5	5-0	1			100.00
6		2	5	5-0	21	4-0	1-0	10.00
7		3	5	4-0	1			12.00
8		4	5	15-6	1			62.00
9	FLOOR	32	5	15-0	1			480.00
10		32	5	15-6	1			496.00
11		56	5	4-0	21	3-0	1-0	224.00
12	INLET WALL	16	5	4-3	21	2-3	2-0	68.00
13		12	5	9-0	1			108.00
14		8	5	4-3	21	3-3	1-0	34.00
15		8	5	3-3	1			26.00
16		16	5	5-9	21	3-0	2-9	92.00
17		12	5	7-0	1			84.00
18		8	5	8-3	21	7-0	1-3	66.00
19		5	5	1-9	1			8.75
20		5	5	3-0	21	1-9	1-3	15.00
21		8	5	3-0	1			24.00
22	WING WALLS	10	5	5-2	21	2-7	2-7	51.67
23		10	5	4-1	21	2-0	2-1	40.83
24	SIDE WALLS	12	5	8-0	21	6-9	1-3	96.00
25		12	5	6-9	1			81.00
26		8	5	6-3	1			50.00
27		8	5	5-6	1			44.00
28		8	5	4-6	1			36.00
29		8	5	3-6	1			28.00
30		16	5	13-0	1			208.00
31		4	5	12-6	1			50.00
32		4	5	10-3	1			41.00
33		4	5	8-0	1			32.00
34		4	5	5-9	1			23.00
35		4	5	10-1	22	8-6	1-7	40.33
36	BAFFLE	34	5	4-0	21	3-0	1-0	136.00
37		9	5	8-6	1			76.50
38		2	5	4-9	21	2-6	2-3	9.50
39		4	5	5-1	21	2-10	2-3	20.33
40		4	5	6-1	21	3-10	2-3	24.33
41		2	5	2-6	1			5.00
42		4	5	2-9	1			11.00
43		4	5	3-9	1			15.00
44		2	5	5-0	1			10.00
45		2	5	3-3	1			6.50
46		8	5	2-3	1			18.00
47	OVERHANG	2	5	4-6	1			9.00
48		1	5	9-0	1			9.00



BAR TYPES

QUANTITIES THIS SHEET ONLY

REINFORCING STEEL
NO. 5 BARS 3481.32 LIN FT 3631.0 LBS

CONCRETE
CLASS 4000 25.0 CU YDS

FILE NUMBER

RECEIVED IN THE OFFICE OF THE DEPARTMENT OF ENVIRONMENTAL RESOURCES.
ON [illegible]

AS BUILT PLANS

FILE CLERK

HARMON CREEK WATERSHED
FLOODWATER RETARDING DAM PA-484
WASHINGTON COUNTY, PENNSYLVANIA
IMPACT BASIN DETAILS

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

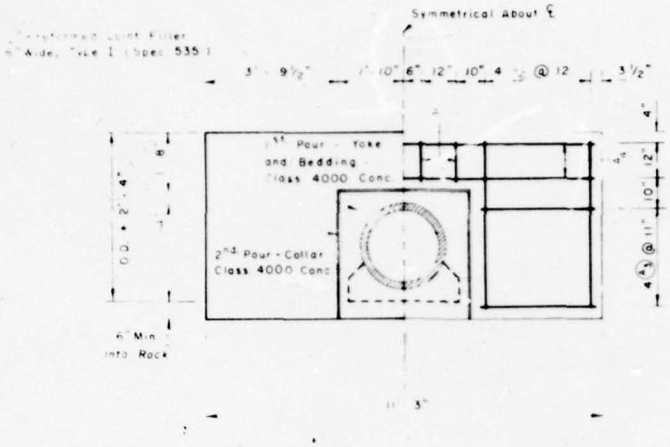
M. NIKOLICH
W. H. MORGAN
F. R. FARMER
SEPT 64
15
23
PA-484-P

PLATE 10

2

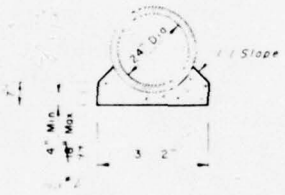
D'APPOLONIA

DRAWN BY	RDB	CHECKED BY	RE	3/1/73	DRAWING NUMBER 78-367-B73
	1-4-79	APPROVED BY	JMP	3.1.73	



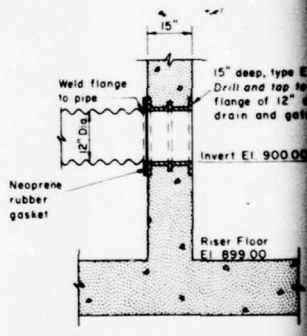
REINFORCED CONCRETE ANTI - SEEP COLLAR

9 - Req'd

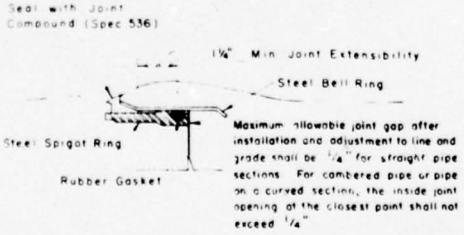


CONCRETE BEDDING

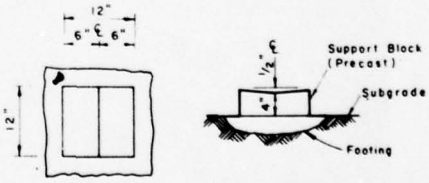
(Class 4000 Conc)



RESERVOIR DRAIN WALL TH



REINFORCED CONCRETE PIPE - JOINT DETAILS



PLAN FRONT ELEV.

SUGGESTED SUPPORT BLOCK

NOTE: The contractor shall determine the number and size of the blocks.

BAR TYPE

Length ①

ANTI-SEEP COLLAR STEEL SCHEDULE

Mark	Size	Length	Type	Quan / Collar	Total Quan	Total Length
A-1	4	5	1	4	36	405-0
A-2	4	4-6	1	6	72	342-0
A-3	4	3-3	1	8	72	234-0
A-4	4	10-9	1	2	18	193-6

NOTE

Bar lengths do not change with changes in outside diameter of pipe

QUANTITIES (This Sheet Only)

STEEL

No 4 Bar 814.5 Ft = 644 Lbs

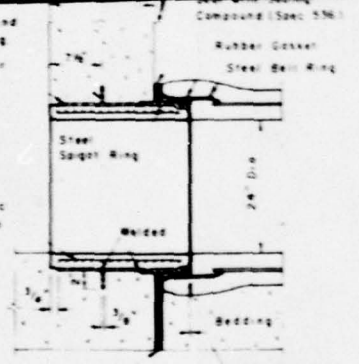
CONCRETE

FILE NUMBER

RECEIVED IN THE OFFICE OF THE DEPARTMENT OF ENVIRONMENTAL RESOURCES.

ON _____

FILE CLERK



SPIGOT WALL FITTING

AS BUILT PLANS

HARMON CREEK WATERSHED
FLOODWATER RETARDING DAM PA-484
WASHINGTON COUNTY, PENNSYLVANIA

CONDUIT DETAILS

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

PA-484-P

PLATE II

2

D'APPOLONIA

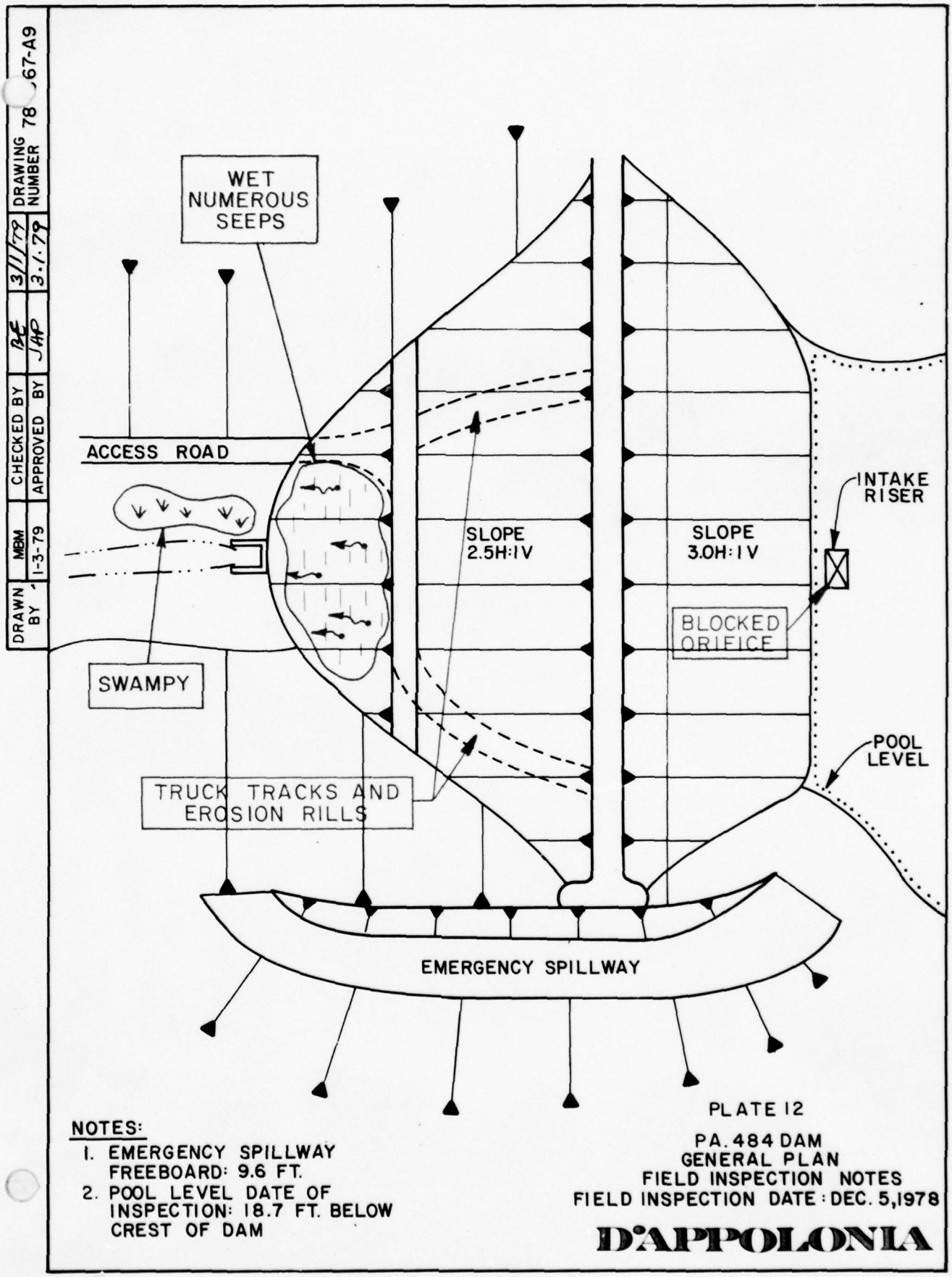


PLATE 12

PA. 484 DAM
GENERAL PLAN
FIELD INSPECTION NOTES
FIELD INSPECTION DATE: DEC. 5, 1978

NOTES:

1. EMERGENCY SPILLWAY FREEBOARD: 9.6 FT.
2. POOL LEVEL DATE OF INSPECTION: 18.7 FT. BELOW CREST OF DAM

D'APPOLONIA

APPENDIX A

CHECKLIST
VISUAL INSPECTION
PHASE I

APPENDIX A

CHECKLIST
VISUAL INSPECTION
PHASE I

NDI I.D. NO. PA-489
ID# DER I.D. NO. 63-73

NAME OF DAM PA-484 COUNTY Washington STATE Pennsylvania

TYPE OF DAM Earth HAZARD CATEGORY High

DATE(S) INSPECTION December 4, 1978 WEATHER Sunny TEMPERATURE 30s

POOL ELEVATION AT TIME OF INSPECTION 938.3 M.S.L. TAILWATER AT TIME OF INSPECTION 889.5± M.S.L.

INSPECTION PERSONNEL:	REVIEW INSPECTION PERSONNEL: (December 20, 1978)
Bilgin Erel	E. D'Appolonia
Wah-Tak Chan	L. D. Andersen
	J. H. Poellot
	B. Erel

Bilgin 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	Minor erosion rills in the truck tracks on the downstream face of the dam.	
VERTICAL AND HORIZONTAL ALIGNMENT OF THE CREST	Crest elevation is .2 to .8 foot above the design crest elevation (Elevation 957) relative to the emergency spillway crest level.	
RIPRAP FAILURES	No riprap on the dam.	

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	The downstream slope of the dam below berm level is swampy. There are numerous seeps which appear to be percolating back into the embankment. The quantity of the seepage could not be estimated.	Necessary instrumentation should be installed to monitor the wet area on the downstream slope of the embankment.
STAFF GAGE AND RECORDER	None.	
DRAINS	Embankment drainpipes drain into the sides of the outlet structure. The depth of the flow in the 12-inch drainpipes, left pipe (looking downstream) - 1/2 inch; right pipe, 2 inches.	

VISUAL INSPECTION
PHASE I
OUTLET WORKS

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CRACKING AND SPALLING OF CONCRETE SURFACES IN OUTLET CONDUIT	Visible portions of the outlet works are in good condition.	
INTAKE STRUCTURE	The pool is above normal pool elevation, indicating that the orifice on the drop inlet structure is obstructed.	The orifice in the drop inlet structure should be cleaned.
OUTLET STRUCTURE	Good condition.	
OUTLET CHANNEL	No significant obstructions.	
EMERGENCY GATE	Reservoir drainpipe hoist is located in the drop inlet structure. Not accessible for inspection.	The operational condition of reservoir drainpipe gate should be periodically evaluated.

VISUAL INSPECTION
PHASE I
UNGATED SPILLWAY

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONCRETE WEIR	The emergency spillway has no concrete overflow structure.	
APPROACH CHANNEL	A trapezoidal earth channel is in good condition.	
DISCHARGE CHANNEL	A trapezoidal earth channel is in good condition.	
BRIDGE AND PIERS	None.	

VISUAL INSPECTION
PHASE I
GATED SPILLWAY

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONCRETE SILL	N/A	
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	See Page A3 of 9 for description of the embankment drainpipes.	

VISUAL INSPECTION
PHASE I
RESERVOIR

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SLOPES	Steep to moderate.	
SEDIMENTATION	Unknown.	
UPSTREAM RESERVOIRS	None.	

VISUAL INSPECTION
PHASE I
DOWNSTREAM CHANNEL

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONDITION (OBSTRUCTIONS, DEBRIS, ETC.)	No apparent obstructions immediately downstream of the dam.	
SLOPES	No apparent instability (immediately downstream of the dam).	
APPROXIMATE NUMBER OF HOMES AND POPULATION	There are three homes approximately 1/2 mile downstream of the dam, and about 20 homes about 2 miles downstream of the dam. Population approximately 100 (first two-mile reach).	

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 PA-484

ID# NDI I.D. NO. 489
DER I.D. NO. 63-73

ITEM	REMARKS
AS-BUILT DRAWINGS	The drawings are available in the state and SCS files.
REGIONAL VICINITY MAP	See Plate 1.
CONSTRUCTION HISTORY	The dam was designed by the U.S. Department of Agriculture, Soil Conservation Service, during 1967 and 1968. It was constructed by Louis McMasters, Inc., of McMurray, Pennsylvania, with completion in September 1971.
TYPICAL SECTIONS OF DAM	See Plate 3.
OUTLETS - PLAN - DETAILS - CONSTRAINTS - DISCHARGE RATINGS	See Plates 8, 9, 10 and 11.

CHECKLIST
ENGINEERING DATA
DESIGN, CONSTRUCTION, OPERATION
PHASE I

ITEM	REMARKS
RAINFALL/RESERVOIR RECORDS	Not recorded.
DESIGN REPORTS	SCS internal memo dated March 6, 1968.
GEOLOGY REPORTS	Detailed geological investigation of dam sites, SCS Form 376, dated December 15, 1967.
DESIGN COMPUTATIONS HYDROLOGY & HYDRAULICS DAM STABILITY SEEPAGE STUDIES	Hydrologic computations, hydrology and hydraulics, geotechnical and structural calculations are available in the SCS files.
MATERIALS INVESTIGATIONS BORING RECORDS LABORATORY FIELD	Included in design and geology reports (see Plates 5 and 6 for selected boring logs and Plate 7 for typical subsurface profile).

CHECKLIST
ENGINEERING DATA
DESIGN, CONSTRUCTION, OPERATION
PHASE I

ITEM	REMARKS
POST CONSTRUCTION SURVEYS OF DAM	None reported.
BORROW SOURCES	Described in engineer's report.
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	None reported.
PRIOR ACCIDENTS OR FAILURE OF DAM DESCRIPTION REPORTS	None reported.
MAINTENANCE OPERATION RECORDS	Not maintained.
SPILLWAY PLAN SECTIONS DETAILS	See Plates 2, 7 and 8.
OPERATING EQUIPMENT PLANS AND DETAILS	Available in SCS files.

CHECKLIST
ENGINEERING DATA
HYDROLOGIC AND HYDRAULIC

DRAINAGE AREA CHARACTERISTICS: 0.6 square miles (reclaimed strip mined area)

ELEVATION; TOP NORMAL POOL AND STORAGE CAPACITY: 919.3 (14.8 acre-feet)

ELEVATION; TOP FLOOD CONTROL POOL AND STORAGE CAPACITY: 947.0 (92.9 acre-feet)

ELEVATION; MAXIMUM DESIGN POOL: 957.0

ELEVATION; TOP DAM: 957.0 (without overfill)

SPILLWAY: (Emergency)

a. Elevation 947.0

b. Type Trapezoidal open channel (critical depth overflow section)

c. Width 30 feet (base width perpendicular to flow direction)

d. Length 250 feet ± (from crest to the end of trapezoidal section)

e. Location Spillover Adjacent to emergency spillway

f. Number and Type of Gates None

OUTLET WORKS:

a. Type 12-inch reservoir drainpipe, 24-inch reinforced concrete outlet conduit

b. Location At center of embankment

c. Entrance Inverts Elevation 900 (invert of 12-inch pipe)

d. Exit Inverts Elevation 889.0 (exit invert of 24-inch pipe)

e. Emergency Draindown Facilities 12-inch pipe

HYDROMETEOROLOGICAL GAGES:

a. Type None

b. Location None

c. Records None

MAXIMUM NONDAMAGING DISCHARGE: Emergency spillway discharge capacity (4000 cfs ±)

APPENDIX C

PHOTOGRAPHS

LIST OF PHOTOGRAPHS
PA-484 DAM
NDI I.D. NO. PA-489
DECEMBER 5, 1978

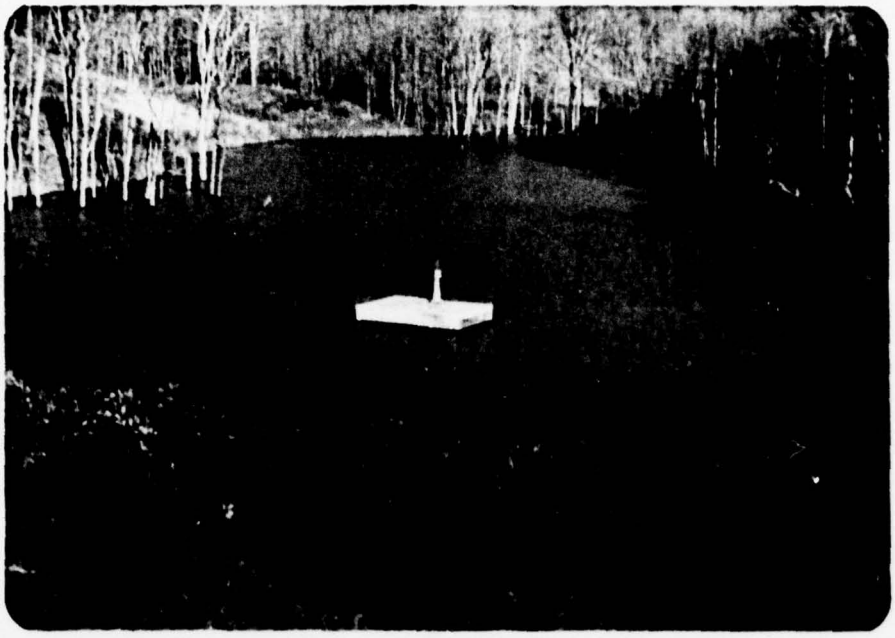
PHOTOGRAPH NO.	DESCRIPTION
1	Emergency spillway approach channel.
2	Emergency spillway discharge channel.
3	Primary spillway drop inlet structure.
4	Outlet pipe impact basin.
5	Wet area. Tall grass above impact basin indicates the extent of wet area.
6	Stream below dam.

Photograph No. 1

Emergency spillway approach channel.

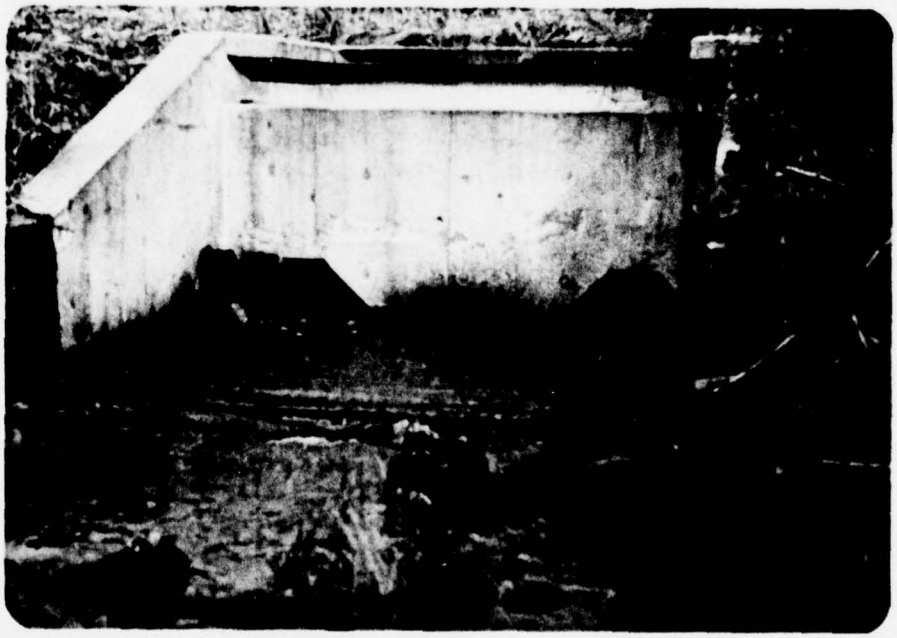
Photograph No. 2

Emergency spillway discharge channel.



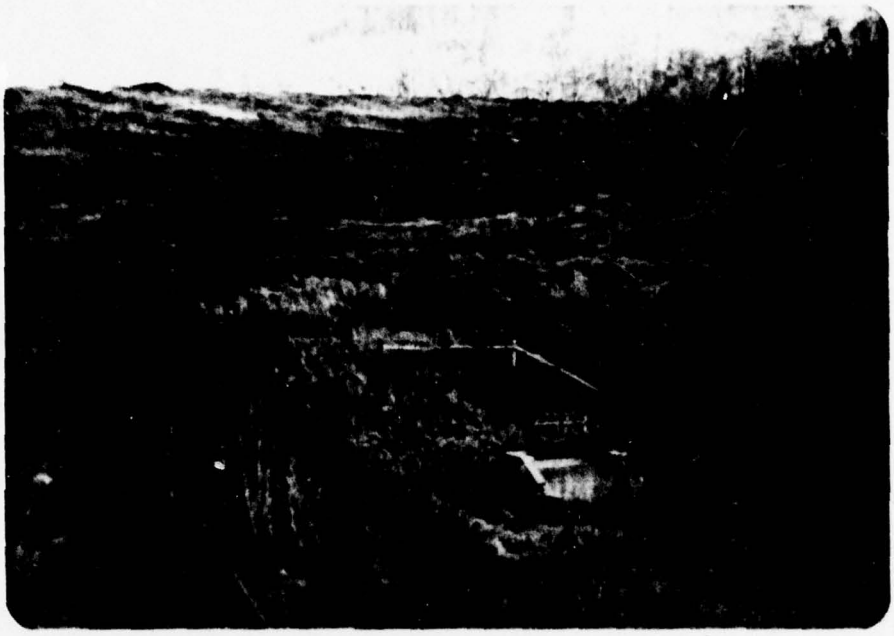
Photograph No. 3

Primary spillway drop inlet structure.



Photograph No. 4

Outlet pipe impact basin.



Photograph No. 5

Wet area. Tall grass above impact basin indicates the extent of wet area.

Photograph No. 6

Stream below dam.

APPENDIX D
CALCULATIONS

HYDROLOGY AND HYDRAULIC ANALYSIS
DATA BASE

NAME OF DAM: PA-484 (NDI I.D. PA-489)

PROBABLE MAXIMUM PRECIPITATION (PMP) = 24.2 INCHES/24 HOURS[1]

STATION	1	2	3	4	5
Station Description	Reservoir	Dam			
Drainage Area (square miles)	0.65	0			
Cumulative Drainage Area (square miles)	0.65	0.65			
Adjustment of PMF for Drainage Area (%)[2]					
6 Hours	102	-			
12 Hours	120	-			
24 Hours	130	-			
48 Hours	140	-			
72 Hours	-	-			
Snyder Hydrograph Parameters					
Zone[3]	28B	-			
C_p/C_t[4]	0.57/1.7	-			
L (miles)[5]	1.5	-			
L_{ca} (miles)[5]	0.7	-			
$t_p = C_t(L \cdot L_{ca})^{0.3}$ (hours)	1.7	-			
Spillway Data					
Crest Length (ft)	-	30			
Freeboard (ft)	-	10			
Discharge Coefficient	-	3.1			
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.

```
**********
FLOOD HYDROGRAPH PACKAGE (HEC-1)
DAM SAFETY VERSION      JULY 1978
  LAST MODIFICATION  26 FEB 79
**********
    1                 A1       SNYDER UNIT HYDROGRAPH,FLOOD ROUTING   DAM OVERTOPPING ANALYSES
    2                 A2       PA.484 DAM,WASHINGTON COUNTY,NDI-ID.PA489       PROJECT NO 78-367-09
    3                 A3       FOR 30%,40%,50%,60%,70%,80%,90%,AND 100% PMF
    4                 B     300        0       10        0        0        0        0        0       -4        0
    5                 B1      5
    6                 J       1        8        1
    7                 J1   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 INFLOW HYDROGRAPH TO PA.484 DAM,NDI-ID.PA489
   10                 M       1        1     0.65             0.65                                1
   11                 P              24.2      102      120      130      140
   12                 T                                                  1.0      .05             0.020
   13                 W     1.7     0.57
   14                 X    -1.0    -0.05      2.0
   15                 K       1        2                                          1
   16                 K1       ROUTING FLOW THROUGH PA.484 DAM NDI-ID.PA489
   17                 Y                                 1        1
   18                 Y1      1                                                  14.8
   19                 SS   14.8     60.0    190.0
   20                 SE  919.3    937.0    958.0
   21                 SS  947.0     30.0      3.1      1.5
   22                 SD  957.0      3.1      1.5    320.0
   23                 K      99
```

COMPUTER INPUT OVERTOPPING ANALYSIS

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 .30	RATIO 2 .40	RATIO 3 .50	RATIO 4 .60	RATIO 5 .70	RATIO 6 .80	RATIO 7 .90	RATIO 8 1.00
HYDROGRAPH AT	1	.65	1	507.	675.	844.	1013.	1182.	1351.	1520.	1688.
	(	1.68)	(	14.34)(	19.12)(	23.90)(	28.69)(	33.47)(	38.25)(	43.03)(	47.81)(
ROUTED TO	2	.65	1	460.	655.	826.	995.	1163.	1331.	1499.	1667.
	(	1.68)	(	13.01)(	18.55)(	23.40)(	28.17)(	32.92)(	37.68)(	42.44)(	47.20)(

SUMMARY OF DAM SAFETY ANALYSIS

PLAN 1 .....

	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
ELEVATION	919.30	947.00	957.00
STORAGE	15.	122.	184.
OUTFLOW	0.	0.	2941.

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
.30	949.90	0.00	140.	460.	0.00	42.00	0.00
.40	950.67	0.00	145.	655.	0.00	41.67	0.00
.50	951.29	0.00	148.	826.	0.00	41.50	0.00
.60	951.85	0.00	152.	995.	0.00	41.50	0.00
.70	952.39	0.00	155.	1163.	0.00	41.50	0.00
.80	952.89	0.00	158.	1331.	0.00	41.50	0.00
.90	953.38	0.00	161.	1499.	0.00	41.50	0.00
1.00	953.85	0.00	164.	1667.	0.00	41.50	0.00

OVERTOPPING ANALYSIS SUMMARY

APPENDIX E

REGIONAL GEOLOGY

APPENDIX E
REGIONAL GEOLOGY

Pennsylvania Dam 484 is located between the Aunt Clara Dome and the Gillespie Dome. The strata strike northeast and dip approximately 70 feet per mile to the northwest. The stratigraphic column consists of members of the Upper Conemaugh Group, with shale, siltstone, and sandstone the primary rock types.

The lowest stratigraphic member of interest is the Pittsburgh red beds, a thick sequence of reddish claystone and shale. Above the red bed material is the Ames Limestone, a thin gray marine limestone which acts as a marker bed. The Ames Limestone may be from 10 to 40 feet below the surface in the vicinity of the dam, is highly jointed, with these joints open or filled with clay. These joints are usually interconnected with a possibility of piping along the fractures. Above the Ames are 22 feet of a green-gray siltstone, 10 feet of calcareous shale, and 3 to 4 feet of a carbonaceous shale, which is equivalent to the Duquesne coal seam. Above the black shale is the Birmingham Shale, approximately 35 feet thick and consisting of a reddish claystone and shale, and then the Morgantown Sandstone. The Morgantown Sandstone is a hard, thick-bedded, gray, medium- to coarse-grained sandstone with high permeability where weathered. Above this formation is a varicolored soft siltstone. The Pittsburgh coal seam occurs approximately 215 feet above the Duquesne coal seam, at approximately Elevation 1150.

The Birmingham Shale is easily eroded and is known to be slide prone in the region. Less than 10 percent of the surrounding area is covered by slide deposits. One small old slide is evident near the west abutment of the dam. Information from the drilling conducted by the SCS indicates that slow sliding may be occurring in the rock strata.

DRAWN BY	CHECKED BY	DRAWING NUMBER
ACS		78 67-A 19
2-5-79	APPROVED BY	
	2-6-79	

SCALE

0 1 2 3 4 5 miles

PA 479, PA 482, PA 484, NEW, OLD AND CHERRY VALLEY DAMS

GEOLOGY MAP

REFERENCE

GREATER PITTSBURGH REGION GEOLOGIC MAP COMPILED BY W.R. WAGNER, J.L. CRAFT, L. HEYMAN AND J.A. HARPER, DATED 1975, SCALE 1:125000

DAPPOLONIA

DRAWN BY	ACS	CHECKED BY	BE	DRAWING NUMBER 78-7-A22
	2-5-79	APPROVED BY		2-6-79

GROUP	FORMATION		DESCRIPTION
	Alluvium	Qt	Sand, gravel, clay.
	Terrace deposits		Sand, clay, gravel on terraces above present rivers; includes Carmichaels Formation.
DUNKARD	Greene		Cyclic sequences of sandstone, shale, red beds, thin limestones and coals.
	Washington	Pw	Cyclic sequences of sandstone, shale, limestone, and coal; contains Washington coal bed at base.
	Waynesburg		Cyclic sequences of sandstone, shale, limestone and coal; contains Waynesburg coal bed at base.
MONONGAHELA		Pm	Cyclic sequences of shale, limestone, sandstone and coal; contains Pittsburgh coal bed at base.
CONEMAUGH	Casselman	Pcc	Cyclic sequence of sandstone, shale, red beds and thin limestone and coal.
	Ames		
	Glenshaw	Pcg	Cyclic sequences of sandstone, shale, red beds and thin limestone and coal; several fossiliferous limestone; Ames limestone bed at top.
ALLEGHENY	Vanport		Cyclic sequences of shale, sandstone, limestone, and coal; contains Brookville coal at base and Upper Freeport coal at top; within group are the commercial Vanport limestone and Kittanning and Clarion coals.
		Pa	

GEOLOGY MAP LEGEND

REFERENCE:

GREATER PITTSBURGH REGION GEOLOGIC MAP
COMPILED BY W.R. WAGNER, J.L. CRAFT, L. HEYMAN
AND J.A. HARPER, DATED 1975, SCALE 1:125000

DAPPOLONIA