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ACKENHEIL AND ASSOCIATES INC PITTSBURGH PA
NATIONAL DAM INSPECTION PROGRAM. COLONIAL DAM NUMBER 1. (NDI NU--ETC(U)
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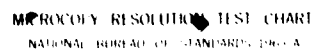
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OHIO RIVER BASIN
ALLEN RUN
FAYETTE COUNTY

LEVEL II

PENNSYLVANIA

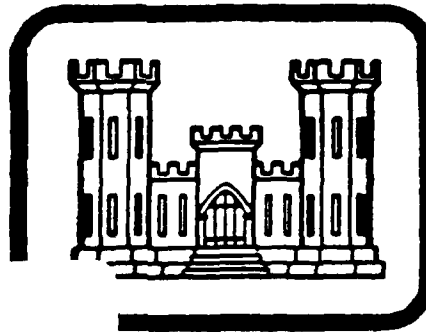
NDI No. PA 00206

PENN DER No. 26-12

COLONIAL DAM No. I

REDSTONE WATER COMPANY

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM



ACKENHEIL & ASSOCIATES
DACW31-80-C-0026 ✓

PREPARED FOR

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

BY

ACKENHEIL & ASSOCIATES GEO SYSTEMS, INC.
CONSULTING ENGINEERS
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PITTSBURGH, PENNSYLVANIA 15216

MAY 1980

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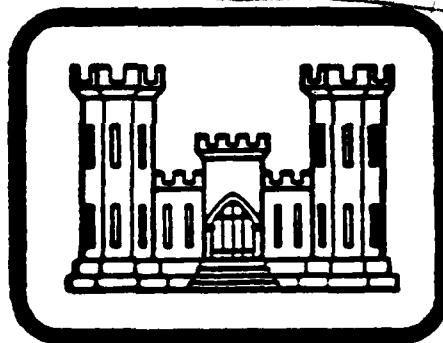
(6) National Dam Inspection Program
Colonial Dam Number 1.
(NDI Number PA-00206,
Penn DER Number 26-12)

OHIO RIVER BASIN, Allen Run,

COLONIAL DAM NO. 1
FAYETTE COUNTY, COMMONWEALTH OF PENNSYLVANIA,
NDI NO. PA 00206
PennDER NO. 26-12

REDSTONE WATER COMPANY

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM



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

Prepared by: VACKENHEIL & ASSOCIATES GEO SYSTEMS, INC.
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Date: 11, May 1980

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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, materials testing, and detailed computational evaluations are beyond the scope of a Phase I investigation; however, the investigation is intended to identify the 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 and safety of the dam, removes the normal load on the structure and may obscure certain conditions which might otherwise be detectable if inspected under the normal operating environment of the structure.

It is important to note that the condition of 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 time 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 investigations 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" (PMF) 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.

SYNOPSIS OF ASSESSMENT AND RECOMMENDATIONS

NAME OF DAM:	Colonial No. 1
STATE LOCATION:	Pennsylvania
COUNTY LOCATION:	Fayette
STREAM:	Allen Run, a tributary of Redstone Creek
DATE OF INSPECTION:	27 November 1979, 3 April 1980
COORDINATES:	Lat. 40°01'06" Long. 79°48'42"

Based on a review of available design information, engineering analyses, and visual observations of conditions as they existed on the date of the field inspection, the general condition of the Colonial Dam No. 1 is considered to be fair.

1. That the earth embankment is in good condition,
2. That the principal spillways are in poor physical condition and have "inadequate" capacity but are not "seriously inadequate", and
- (3) The existence of non-serious deficiencies which are considered correctable.

The structure is classified as a "small" size, "high" hazard dam. Corps of Engineers guidelines recommend 1/2 to one times the Probable Maximum Flood (PMF) for "small" size, "high" hazard dam. Colonial No. 1 Dam's Spillway Design Flood is 1/2 the Probable Maximum Flood (PMF). Spillway capacity is "inadequate" because the non-overflowing flood discharge capacity, as estimated using the HEC-1 computer program, was found to be 33 percent of the PMF. The spillway is not "seriously inadequate" because in the opinion of the evaluating engineer, the dam will not fail at the SDF.

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classification per [unclear]		
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STATIONERY		
Application # 7-1068		
Avaliable for		
Special		
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SYNOPSIS OF ASSESSMENT AND RECOMMENDATIONS (CONT'D)
Colonial Dam No. 1

RECOMMENDATIONS

1. Additional Investigations: Immediately retain a professional engineer knowledgeable in dam design and construction to:

a. Perform a detailed hydrologic/hydraulic analysis of the reservoir and spillway and make recommendations on increasing the capacity of the system to make it adequate.

b. Investigate the location and operability of the 18 inch diameter cast iron pipe and provide recommendations on installing positive upstream flow controls.

c. Provide recommendations on improving the physical condition of deteriorated spillway components.

d. Investigate the source of seepage in the erosional gulley on the left abutment and make recommendations on monitoring and/or control.

2. Remedial Work: The Phase I investigation of Colonial Dam No. 1 also disclosed several deficiencies of lower priority which should be corrected during routine maintenance.

a. Repair two eroded areas on the upstream slope.

b. Fill the embankment's crest to design elevation to eliminate wheel ruts.

c. Replace eroded material behind the left spillway's left wall.

d. Develop and implement formal maintenance and inspection procedures.

3. Emergency Operation and Warning Plan: Concurrent with the additional investigations recommended above, the owner should develop an Emergency Operation and Warning Plan including:

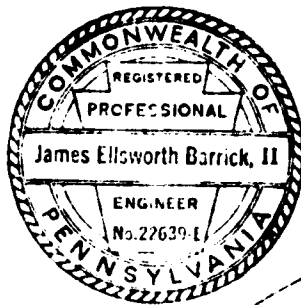
a. Guidelines for evaluating inflow during periods of heavy precipitation or runoff.

SYNOPSIS OF ASSESSMENT AND RECOMMENDATIONS (CONT'D)
Colonial Dam No. 1

b. Procedures for around the clock surveillance during periods of heavy precipitation or runoff.

c. Procedures for rapid drawdown of the reservoir under emergency conditions.

d. Procedures for notifying downstream residents and public officials, in case evacuation of downstream areas is necessary.



James P. Hannan 23 May 1980
James P. Hannan Date
Project Engineer

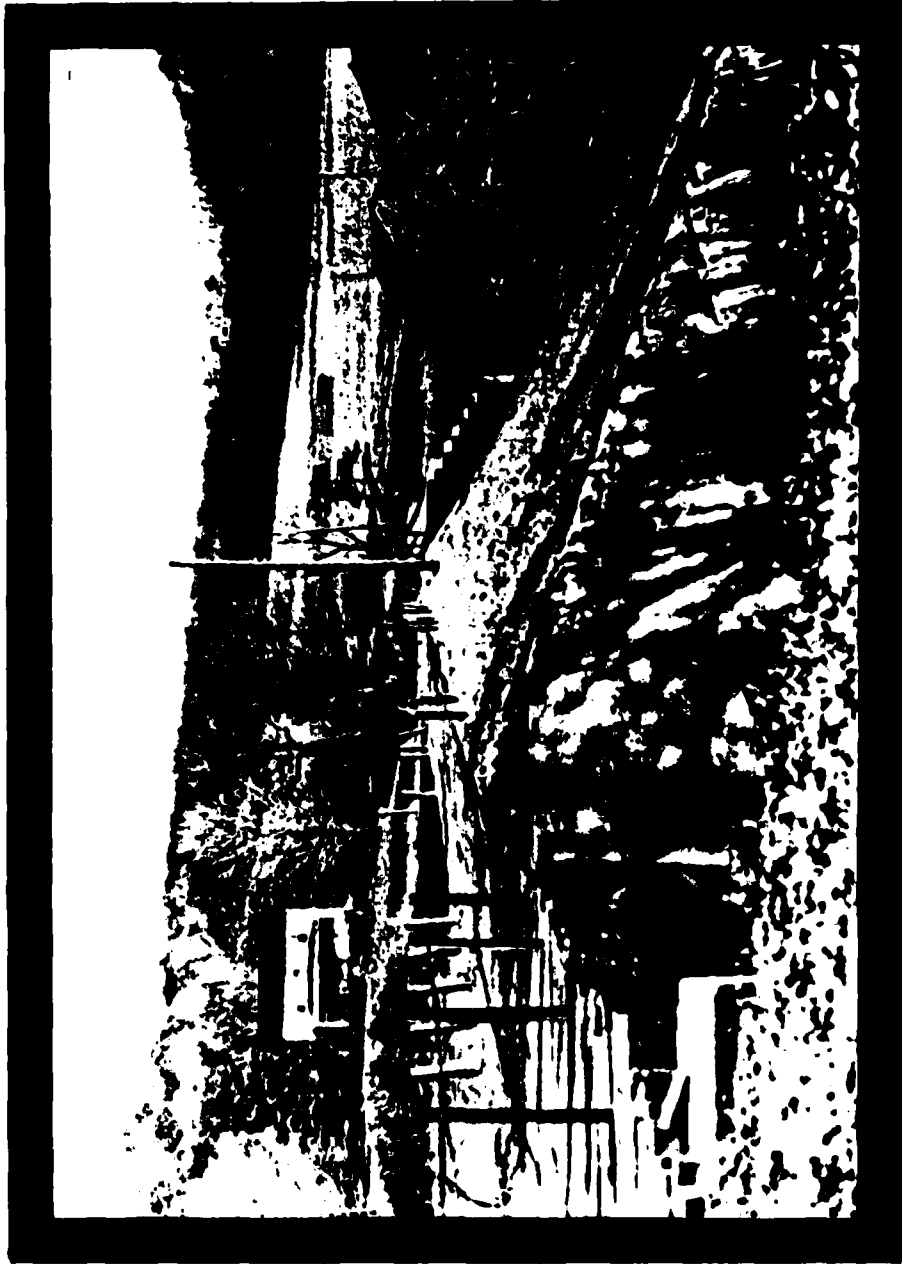
James E. Barrick 23 May 1980
James E. Barrick, P.E. Date
PA Registration No. 022639-E

Approved by:

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

30 JUNE 1980
Date

COLONIAL DAM No.1



OVERVIEW

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PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM
COLONIAL DAM NO. 1
NATIONAL I. D. NO. PA 00206
PENNDER NO. 26-12

SECTION 1
PROJECT INFORMATION

1.1 GENERAL

a. Authority: The Phase I investigation was performed pursuant to authority granted by Public Law 92-367 (National Dam Inspection Act) 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 the investigation is to determine whether or not the dam constitutes a hazard to human life or property.

1.2 DESCRIPTION OF PROJECT

a. Dam and Appurtenances:

(1) Embankment: Colonial Dam No. 1 embankment consists of two earthfill sections that have a total crest length of 390 feet. The right embankment section, which comprises the major portion of the dam, is 31 feet high, 215 feet long, and has a crest width of twelve feet. The upstream slope is 3H:2V and the downstream slope is 2.1H:1V near the crest flattening to 3.1H:1V near the toe. A french drain was installed beneath the downstream portion of the embankment during modifications completed in 1928.

The left embankment section is an earthfill dike with concrete core wall, constructed on the left abutment. The dike is 175 feet long, has a crest width of 20 feet, and has a 3H:2V upstream slope and a 2H:1V downstream slope. The height of the dike is approximately 7 feet.

(2) Outlet Works: An 18 inch diameter cast iron pipe was placed beneath the embankment to provide a water supply source and a pond drain. A branch at the downstream end provides a 12 inch diameter "blowoff" and an 8 inch diameter water supply line.

(3) Principal (and Emergency) Spillways: Two uncontrolled concrete ogee weir spillways, located at each end of the main embankment section, provide for maintenance of the reservoir pool level and for discharge of normal and flood flows. The right ogee has a 31 foot crest length and discharges to a concrete lined channel that discharges to a stilling pool at the toe of the dam. The left ogee has a crest length of 15 feet and discharges to a concrete lined channel that terminates 30 feet below the weir. Left spillway flows are then carried to the stilling pool in an unlined open channel with bedrock bottom.

(4) Downstream Conditions: Below Colonial Dam No. 1, Allen Run flows through a relatively narrow and steep-sided valley for approximately 4,000 feet, paralleling Pennsylvania State Route 51. Allen Run flows into Redstone Creek which eventually enters the Monongahela River north of Brownsville and approximately 9 miles downstream of the dam. In the first mile below the dam, at least three inhabited dwellings lie on the affected floodplain.

b. Location: Colonial Dam No. 1 is located in Franklin Township, Fayette County, Pennsylvania.

c. Size Classification: The dam has a maximum storage capacity of 278 acre-feet and a toe to crest height of 31 feet. Based on the Corps of Engineers guidelines, this dam is classified as a "small" size structure.

d. Hazard Classification: Colonial Dam No. 1 is classified as a "high" hazard dam. In the event of a dam failure, at least three inhabited dwellings and State Route 51, a major north-south highway, would be subjected to possible damage, and loss of life could result.

e. Ownership: Colonial Dam No.1 is owned by the Redstone Water Company. Correspondence should be addressed to:

Redstone Water Company, Inc.
Box 548
California, PA 15419
(412) 938-9164
Attn: Mr. Edward Yablonski

f. Purpose of Dam: Colonial Dam No. 1 was initially constructed to provide a water supply for coke ovens. More recently it has been used to impound water for residential and domestic use.

g. Design and Construction History: The dam was designed by E. J. Taylor of the Pittsburgh Coal Company. It was constructed by Owen Murphy in 1903. Modifications were undertaken in 1905, 1912, and 1927.

h. Normal Operating Procedure: Colonial Dam No. 1 was designed to operate as an uncontrolled structure. Under normal operating conditions, the pool level is maintained at Elevation 966.0 by the ogee weir crest of the right principal spillway.

1.3 PERTINENT DATA

- | | | |
|----|------------------------------------|------------------|
| a. | <u>Drainage Area:</u> | 3.2 square miles |
| b. | <u>Discharge at Dam Facility:</u> | |
| | Maximum Flood at Dam Facility, | 2992 cfs* |
| | 4 June 1941 | |
| | Principal Spillways Capacity at | 2242 cfs |
| | Design High Water | |
| | Principal Spillways Capacity at | 2242 cfs |
| | Top of Existing Embankment | |
| c. | <u>Elevation (Feet above MSL):</u> | |
| | Design Top of Dam | 971.5* |
| | Current Top of Dam (Low Point) | 971.5 |
| | Normal Pool | 966.0 |
| | Right Principal Spillway | 966.0 |
| | Overflow Crest | |
| | Left Principal Spillway | 966.25 |
| | Overflow Crest | |
| | Maximum Tailwater | Unknown |
| | Streambed at Toe of Dam | 940.5 |
| d. | <u>Reservoir Length:</u> | |
| | Length of Maximum Pool | 2000 feet |
| | Length of Normal Pool | 1800 feet |
| e. | <u>Reservoir Storage:</u> | |
| | Design Top of Dam | 278 acre-feet |
| | Current Top of Dam | 278 acre-feet |
| | Principal Spillways | 172 acre-feet* |
| | Overflow Crests | |
| | Normal Pool Level | 172 acre feet* |

g. Embankment:

Type	Earthfill
Length	390 feet
Height	31 feet
Design Crest Width	20 feet*
Existing Crest Width	12 feet
Slopes	
Downstream	2.1H:1V to 3.1H:1V
Upstream	1.5H:1V
Impervious Core	No*
Cutoff Provisions	Yes, clay puddle.*
	Also, cutoff wall
	into the left embankment
	from right side of left
	spillway, a cutoff at each
	side of right spillway.*
Grout Curtain	None Reported*

h. Reservoir Surface:

Current Top of Dam	25.9 acres
Principal (Ungated) Spillway	14.7 acres*
Overflow Crest	
Normal Pool	14.7 acres*

i. Right Principal Spillway:

Type	Concrete ogee weir
Length of Weir	31 feet
Weir Crest Elevation	966.0

j. Left Principal Spillway:

Type	Concrete ogee weir
Length of Weir	15 feet
Weir Crest Elevation	966.25

k. Outlet Works (Water Supply Pipeline):

Type	7.5 inch (O.D.) metal pipe siphon
Inlet	Unknown
Location	Left of Right Principal Spillway
Conduit Length	Unknown
Gate Valves	Unknown
Anti-seep Collars	None required

1. Outlet Works (Pond Drain):

Type	18 inch diameter cast iron pipe
Inlet	942+*
Location	Left of Right Principal Spillway
Conduit Length	115 feet+*
Gate Valves	3 observed downstream
Anti-seep Collars	2 concrete walls, one near inlet,* one in clay puddle.*

* Taken or derived from original design calculations and/or drawings.

SECTION 2
ENGINEERING DATA

2.1 DESIGN

a. Data Available: The following written information and data may be obtained from the Pennsylvania Department of Environmental Resources, Harrisburg, Pennsylvania. The information was reviewed for this study.

(1) Drawing "Plan of Storage Reservoir Dam for Franklin Water Company" dated 22 August 1903 and prepared by E. J. Taylor of the Pittsburgh Coal Company.

(2) Miscellaneous drawings related to modifications in 1905 and 1912.

(3) "Report Upon the Colonial Dam No. 1 of Franklin Township Water Company", dated 15 October 1914.

(4) Application of Franklin Township Water Company to increase the size of the reservoir dated 7 July 1927 and subsequent permit, dated 17 August 1927.

(5) Miscellaneous drawings and details of the modifications to Franklin Township Water Company's reservoir, dated June 1927 through May 1928.

b. Design Features:

(1) General: The original Franklin Water Company dam on Allen Run (now Colonial Dam No. 1) was designed by E. J. Taylor of the Pittsburgh Coal Company in August 1903.

(2) Embankment: The dam's embankment was designed as an earthfill structure 270 feet long (including spillway), 23 feet high and having a crest width of 30 feet at Elev. 961. The upstream slope was 2H:1V and the downstream slope was 3H:2V. The plans showed a "puddle" wall, 10 feet wide at the base, excavated to bedrock, and extending 2 to 3 feet above the original ground line.

(3) Outlet Works: An 18 inch diameter cast iron pipe was designed for placement in a foundation trench along the original creek channel. The pipe was

to have a 90° elbow, turned vertically, embedded in concrete beyond the upstream toe of the embankment. A second concrete block, 12 feet long (along the pipe), was to encase the pipe at the entrance to the upstream slope. A third block, 5 feet thick (along the pipe), 6.5 feet deep and 25 feet long (along the embankment crest), was to provide an anti-seep collar across the original stream bed at the embankment crest centerline.

(4) Principal (and Emergency) Spillway: A masonry lined, uncontrolled, open channel was designed to maintain the reservoir pool and to pass normal and storm flows. The spillway included a 3 foot wide level overflow crest, at Elev. 956, and a rectangular cross-section with 5 feet of free board. The discharge channel was to be paved with stone for a distance of 80 feet downstream.

2.2 CONSTRUCTION

a. Constructor: The dam was constructed by Owen Murphy.

b. Construction Period: Construction of the dam was begun in the fall of 1903 and, following a winter break, was completed in the summer of 1904.

2.3 MODIFICATION/REPAIR

a. 1905: The embankment crest was reportedly raised 2 feet, to Elev. 963, in 1905 and the spillway crest was raised 3.6 feet in order to obtain additional reservoir capacity.

b. 1912: A second spillway was constructed, at the right end of the embankment, to provide additional discharge capacity. The modification design drawing for the spillway addition, showed the existing embankment crest at Elev. 967 (indicating an addition of 6 feet to the crest instead of 2 feet).

The second spillway was to have concrete training walls with a concrete covered ogee crest, 13 feet wide. The discharge channel base was to be bedrock.

c. 1927: Extensive modifications were accomplished in 1927 to increase the reservoir capacity. The embankment crest was raised to Elev. 971.5, and the spillway crests were raised to Elev. 966. The embankment raising

included placement of a 7000 cubic yard buttress on the downstream slope with french drains in the foundation.

An embankment extension consisting of a 7 foot high earthen dike was constructed across the left abutment beyond the left spillway. The dike was 175 feet long, had a 20 foot crest width and included a concrete cutoff wall along the centerline. Structural modifications, including strengthened walls and slabs and installation of cutoff keys, were made to both spillways.

2.4 OPERATION

According to the Pennsylvania Department of Environmental Resources, the Redstone Water Company is currently responsible for operation of Colonial Dam No. 1.

The principal (and emergency) spillways are uncontrolled and performance and operation records are not maintained.

The water supply facilities are apparently operative and under full pressure through and over the embankment.

A dam tender is not normally required.

2.5 EVALUATION

a. Availability: Available design information and drawings were obtained from the Pennsylvania Department of Environmental Resources, Bureau of Dams and Waterways Management.

b. Adequacy: The available design information supplemented by field inspections and supporting engineering analyses presented in succeeding sections is adequate for the purpose of this Phase I inspection report.

c. Validity: Based on the available data, there appears to be no reason to question the validity of the available design information and drawings.

SECTION 3
VISUAL INSPECTION

3.1 FINDINGS

a. General: The visual inspection of Colonial Dam No. 1 and reservoir was performed on 16 November 1979 and consisted of:

- (1) Visual observations of the earth embankment crest and slopes, groins and abutments.
- (2) Visual observations of the left and right spillways including weirs, concrete walls and slabs, and "wasteway" channels.
- (3) Visual observations of exposed sections of the water supply pipelines.
- (4) Visual observations of downstream conditions and evaluation of the downstream hazard potential.
- (5) Visual observations of the reservoir shoreline and inlet stream channels.
- (6) Transit stadia survey of relative elevations along the embankment crest centerline, spillways and across the embankment slopes.
- (7) A geological reconnaissance of the site.

The visual observations were made during periods when the reservoir and tailwater were at normal operating levels.

The field plan, sections and visual observations checklist containing the observations and comments of the field inspection team are contained in Appendix A. Specific observations are illustrated on photographs in Appendix C. Detailed findings of the visual inspection are presented in the following sections.

b. Embankment:

- (1) Crest and Upstream Slope: The embankment crest contains a residential driveway which is gravel and earth surfaced. Several wheel ruts were observed, which contained standing water. The crest was straight

and narrow, twelve feet wide, and had a post and wire rope barrier on each side. The two bridges at each end of the embankment had wooden plank decks.

The upstream slope was steep, approximately 1.5H:1V, and had concrete slab erosion protection extending to just above the water line.

The erosion protection has failed at a point to the right of center of the embankment. One slab section is missing and two others are tilted, and a depression has developed in the slope. Also, the slab adjacent to the left wall of the right spillway has been undercut by erosion but has not yet failed. Otherwise the upstream slope is grassed and in generally good condition.

(2) Downstream Slope: The downstream slope was observed to be moderately flat, 2.1H:1V near the crest and flattening to 3.1H:1V near the toe. The slope was grassed and well maintained. No indication of slope instability or high ground water was observed. The toe of the slope was weed covered and bulgy but close inspection revealed rock and boulder deposits. No seeping water was observed.

Some minor erosion was observed near the end of the right spillway's left wall near the stilling pool.

(3) Reservoir Dike: Beyond the left spillway, an earthen dike has been constructed to contain the reservoir. The dike is 7 feet high, 20 feet wide at the crest and 175 feet long. The crest and downstream slope were grassed and well maintained and showed no signs of seepage or instability. The upstream slope was brush covered and in good condition.

(4) Groins (Junction of Spillway and Abutment): The right groin was in good condition with no seepage or significant erosion observed.

The groin behind the left spillway's left wall was badly eroded, apparently as the result of rainfall impinging on the spillway wall and running off along the toe of the wall.

c. Abutments:

(1) Right: The right abutment contains the access road to the spillway bridge and an upstream dwelling. In the area between the road and the spillway wall, the abutment is steep and wooded. No sign of slope instability was observed.

Below the end of the spillway, the abutment slope contains a surface runoff drainage swale that discharges to the stilling pool below the spillway discharge channel. Some erosion of the abutment has occurred in this area, apparently from channel flows, and several trees have fallen into the channel.

(2) Left: The left abutment, above the dam, contains the previously described earthen dike. Below the dike, the abutment is flat and contains a residential driveway and garage.

The abutment at and below the spillway is moderately steep and is vegetated by dense brush.

A deep erosional gully exists near the end of the left spillway's left wall and was observed to be discharging a considerable flow of water. Tile pipes were observed in the upper end of the gully, but flow appeared to be beneath the pipes. Origin of the water could not be determined.

The lower abutment comprises the left bank of the left spillway discharge channel. The slope was eroded in places and generally brush and tree covered.

d. Outlet Works:

(1) Water Supply Pipeline: A 7.5 inch (outside) diameter metal water supply pipe (siphon) runs from the lake to the toe of the embankment, along the left wall of the right spillway. The inlet could not be observed and no flow controls were seen.

(2) Pond Drain: The reported 18 inch diameter cast iron pond drain was not observed during the visual inspection. The only evidences of the drain were three gate valve stems in the stilling pool area below the dam. One of the valves was observed to be leaking badly, indicating water pressure in the pipeline.

e. Instrumentation: No instrumentation was observed during the inspection.

f. Right Principal Spillway:

(1) Concrete Weir: The flow control for the right spillway is a concrete ogee weir that is tilted slightly, as indicated by the variable flow depth at the weir crest. The weir was observed to be cracked and suffering from some deterioration. Water was flowing between the weir and right wall.

(2) Approach Channel: The approach channel was clear of obstructions and of sufficient width to permit full weir discharge.

(3) Discharge Channel: The discharge channel walls were observed to be deteriorating, particularly the left wall beneath the bridge. In this area, a concrete wall has been constructed atop an older masonry wall; the latter is deteriorating badly. A similar problem is developing in the right wall but is less advanced.

The massive concrete wall along the embankment side of the spillway has a large crack about two thirds of the way down the channel, and spalling and deterioration has occurred. Below this, numerous calcium deposits were observed on the wall.

A large crack has developed in the right wall near the stilling pool.

The discharge channel base slab was badly deteriorated over its entire length. Open joints, large cracks, and sinkholes were observed. The discharge channel terminates in a three foot overfall into a stilling pool. The concrete exposed on the overfall face was badly deteriorated.

(4) Bridge: The bridge spanning the spillway consists of wooden planks on three 15-inch I beams supported by the spillway walls. Wall deterioration has occurred at beam bearing points.

(g) Left Principal Spillway:

(1) Concrete Weir: The left spillway's flow control is a concrete ogee weir, whose crest elevation is slightly higher than the crest of the right ogee. No

flow was discharging over the weir but water was at the crest. The weir's concrete has cracked and spalled at several locations and water was leaking through and around the weir.

(2) Approach Channel: The approach channel was clear of obstructions and of sufficient width to permit full weir discharge. Approach channel walls had some spalling and deterioration, primarily near the water line.

(3) Discharge Channel: The discharge channel walls contained numerous horizontal and vertical cracks, spalling and considerable deterioration. The left wall had a particularly large vertical crack just downstream of the bridge, and considerable displacement of the downstream wall was indicated.

The base slab appeared to have been repaired and resurfaced recently, and was in reasonably good condition. The slab terminated at the end of the left wall. The channel below has a rock base and relatively steep side slopes.

(4) Bridge: The bridge spanning the spillway consists of wooden planks on three 15 inch I beams supported by the spillway walls. Wall deterioration has occurred at beam bearing points.

h. Downstream Conditions:

(1) Downstream Channel: Both spillway discharge channels flow into the stilling pool below the right spillway. The original Allen Run channel leaves the stilling pool, flowing south through a narrow, rock bottomed, steep-sided, heavily wooded valley. The channel was clear and nearly straight for the first 150 feet below the stilling pool.

(2) Flood Plain Development: In the first mile below the dam, three inhabited dwellings lie on the flood plain at elevations low enough to possibly be imperiled by a dam failure. Also State Route 51, a major north-south highway would be threatened.

i. Reservoir:

(1) Slopes: The reservoir's right shoreline is bounded by generally flat slopes and several homes have been constructed adjacent to the water. The left

shoreline is bounded by moderately steep slopes, which are heavily wooded. No indication of shoreline instability was observed.

(2) Sedimentation: The uppermost reach of both the right and left branch of the reservoir were observed to be swampy and appeared to contain deltaic sediment deposits. Both inlet streams enter the reservoir through broad, relatively flat valleys.

(3) Watershed: The watershed tributary to the reservoir was observed to be more or less as indicated on the U.S.G.S. topographic map; that is, mostly farm and woodland. An active strip mine was observed on the hillside along the unnamed tributary to the reservoir (eastern valley). Water and sediment control appeared to be good as there was no offsite indication of large flows or sediment deposits.

3.2 EVALUATION

a. Embankment: The Colonial Dam No. 1 embankment is considered to be in good condition, with only minor deficiencies observed. These include wheel ruts on the crest containing standing water, erosion of the upstream slope at two locations and an erosional cavity behind the left spillway's left wall.

b. Abutments: A deep erosional gully with flowing water on the left abutment is considered to be a potential problem. If the flow discharging around the tile pipe originates at the reservoir (which does not seem likely) continued erosion toward the source could ultimately result in a piping failure of the earthen dike or its foundation.

c. Outlet Works: The lack of location and operational information on the 18 inch cast iron pipeline or other pipes through the embankment is assessed to be a deficiency. The observed leakage at one of the three gate valves in the stilling pool indicates the existence of a pipeline that contains water under pressure.

d. Principal Spillways: The condition of the masonry and concrete structures that comprise the principal spillways is considered to be poor. This is based on observations of large cracks, spalling, deterioration, leakage and seepage at numerous locations at both spillways.

e. Hazard Classification: Based on the observed locations of inhabited dwellings and State Route 51 downstream of the dam, Colonial Dam No. 1 is considered to have a "high" hazard classification.

SECTION 4 OPERATIONAL FEATURES

4.1 PROCEDURES

Reservoir pool level is maintained by the uncontrolled ogee weir crest of the right principal spillway.

Three control gate valves for the 18 inch cast iron pipe were observed in the stilling pool below the dam, but their operational characteristics were not determined. It is not known if the 8 inch branch is still used for water supply purposes. However, one of the three valves in the stilling pool was leaking, indicating a pipe pressure condition.

The 7.5 inch diameter metal pipe over the embankment had no visible valves or flow controls.

Normal operating procedure does not require a dam tender.

4.2 MAINTENANCE OF DAM AND OPERATING FACILITIES

The embankment and appurtenances are maintained by the Redstone Water Company.

4.3 INSPECTION OF DAM

The Redstone Water Company is required by the State of Pennsylvania to inspect the dam annually and make needed repairs.

4.4 WARNING SYSTEM

There are no warning systems or formal emergency procedures to alert or evacuate downstream residents upon threat of a dam failure.

4.5 EVALUATION

There are no written operation, maintenance or inspection procedures, nor is there a warning system or formal emergency procedure for this dam. These procedures should be developed in the form of checklists and step by step instructions, and should be implemented as necessary.

SECTION 5 HYDROLOGY AND HYDRAULICS

5.1 EVALUATION OF FEATURES

a. Design Data. The Colonial Dam No. 1 has a watershed of 2,068 acres which is vegetated primarily by pasture and woodland. The watershed is about two miles long, one and one half miles wide and has a maximum elevation of 1,440 feet above Mean Sea Level (MSL). At normal pool, the dam impounds a reservoir with a surface area of 14.7 acres and a storage volume of 172 acre-feet. Normal pool level is maintained at Elev. 966.0 by the crest of the right principal spillway.

Design spillway capacity and embankment freeboard were made sufficient to accommodate 700 cubic feet per second per square mile which was considered sufficient for this structure and watershed at the time of design. Colonial Dam No. 1 spillway capacity for the observed cross sections and existing freeboard conditions was computed to be 2242 cfs. No additional hydrologic calculations were found relating reservoir/spillway performance to the Probable Maximum Flood or fractions thereof.

b. Experience Data: Continuous records of reservoir level or rainfall amounts are not kept. There is a record of overtopping of the embankment by 0.5 foot during the storm of 4 June 1941. According to the report, that stage corresponded to a total discharge of 2992 cfs.

c. Visual Observations: On the date of the field reconnaissance, extensive deterioration of spillway training walls was observed and their adequate performance during long duration storms is of some concern.

d. Overtopping Potential: Overtopping potential was investigated through the development of the Probable Maximum Flood (PMF) for the watershed and the subsequent routing of the PMF and fractions of the PMF through the reservoir and spillway. The Corps of Engineers guidelines recommend 0.5 to 1 times the PMF for "small" size, "high" hazard dams. Based on the observed existing downstream conditions, Colonial Dam No. 1 has a Spillway Design Flood (SDF) of one half PMF.

Hydrometeorological Report No. 33 indicates the adjusted 24 hour Probable Maximum Precipitation (PMP) for the subject site is 19.4 inches. No calculations are available to indicate whether the reservoir and spillway are sized to pass a flood corresponding to 19.4 inches of rainfall in 24 hours. Consequently, an evaluation of the reservoir/spillway system was performed to determine whether the spillway capacity is adequate under current Corps of Engineers guidelines.

The Corps of Engineers, Baltimore District, has directed that the HEC-1 Dam Safety Version computer program be utilized. The program was prepared by the Hydrologic Engineering Center (HEC), U.S. Army Corps of Engineers, Davis, California. The major methodologies and key input data for this program are discussed briefly in Appendix D.

The peak inflow to Colonial Dam No. 1 for the SDF was determined by HEC-1 to be 3374 cfs.

e. Spillway Adequacy: The capacity of the combined reservoir and spillway system was determined to be 0.33 PMF according to the HEC-1 analysis. An initial pool elevation of 966.0 was assumed prior to commencement of the storm.

According to the HEC-1 analysis, at 0.50 PMF, Colonial Dam No. 1 is overtopped by 0.76 feet of water for 3 hours and 40 minutes.

In the opinion of the evaluating engineer, this overtopping will not cause failure of the embankment. This is based on performance history and the observations made at the time of the inspection. An overtopping depth of at least one foot above the minimum elevation of the embankment was judged by the engineer to be necessary to cause failure of the dam. Consequently, a downstream routing and breach analysis were not performed.

Therefore, in accordance with Corps of Engineers guidelines, the spillway is rated as "inadequate" but not "seriously inadequate".

SECTION 6 STRUCTURAL STABILITY

6.1 AVAILABLE INFORMATION

a. Design and Construction Data: All available design documentation, calculations and other data received from the Pennsylvania Department of Environmental Resources were reviewed.

b. Operating Records: There are no written operating records or procedures for this dam.

c. Post-Construction Changes: Since construction of the dam in 1903, modifications were reported to have been undertaken in 1905, 1912 and in 1927.

6.2 EVALUATION

a. Design Documents: The design documentation was by itself, considered inadequate to evaluate the structure. There were no structural calculations associated with the stability of the embankment or of the appurtenant structures.

b. Visual Observation:

(1) Embankment: The field inspection disclosed no indication of slope instability of the embankment. There were no suspicious bulges, non-uniformities or sloughs that would suggest either local or general foundation and/or embankment movement. There was no observed seepage on or near the embankment that would suggest high ground water conditions. The embankment slopes appeared reasonable. Based on the observed geometry and seepage conditions, the embankment appeared to be stable.

(2) Principal Spillways: The weirs, walls, and slabs of the principal spillways were observed to be deteriorating. The structural capacity of critical walls and slabs is questionable in the event of a long duration storm.

The spillways' structural components were observed to be stable on the date of inspection. However, continued deterioration may reduce the structural capacity to questionable levels even under normal loading and flow conditions.

c. Performance: Numerous state inspection reports cite a significant seepage flow from the embankments' downstream toe area, and some earlier reports, prior to 1927 modifications, indicate a wet or soft area on the embankment. However, in 1941, the dam was overtopped to a depth of 0.5 foot without causing serious damage to the embankment or spillways.

d. Seismic Stability: According to the Seismic Risk Map of the United States, Colonial Dam No. 1 is located in Zone 1 where damage due to earthquakes would most likely be minor.

A dam located in Seismic Zone 1 may be assumed to present no hazard from an earthquake, provided static stability conditions are satisfactory and conventional safety margins exist. No computations were developed to confirm this assessment however.

SECTION 7

ASSESSMENT AND RECOMMENDATIONS

7.1 ASSESSMENT

a. Evaluation:

(1) Embankment: The Colonial Dam No. 1 embankment is considered to be in good condition with only minor deficiencies observed during the site inspection. These included wheel ruts on the embankment crest containing standing water, erosion of the upstream slope at two locations, and the most serious deficiency, erosion behind the left spillway's left wall.

(2) Abutments: A deep erosional gulley with a significant flow of unknown origin was observed on the left abutment near the left spillway.

(3) Outlet Works: The lack of location and operational information on the 18 inch diameter cast iron pipeline is a problem, and lack of an upstream flow control on the pipe is considered to be a deficiency.

(4) Principal Spillways: The condition of the principal spillways is considered to be poor. This is based on:

(a) The "inadequate" capacity rating determined using the HEC-1 computer program. The spillway was found to pass only 0.33 PMF. The Spillway Design Flood is 0.5 PMF because the dam's size and hazard classification.

(b) The physical condition of spillway components, particularly walls and slabs.

(5) Hazard Classification and Spillway Design Flood: Visual observations of flood plain conditions below Colonial Dam No. 1 indicate that the structure has a "high" hazard classification that requires a SDF of 0.5 PMF.

b. Adequacy of Information: The information available on design, construction, operation and performance history in combination with visual observations and

hydrology and hydraulic calculations were sufficient to evaluate the embankment and appurtenant structures in accordance with the Phase I investigation guidelines.

c. Urgency: The recommendations presented in Section 7.2a and 7.2c should be implemented immediately.

7.2 RECOMMENDATIONS

a. Additional Investigations: Immediately retain a professional engineer knowledgeable in dam design and construction to:

(1) Perform a detailed hydrologic/hydraulic analysis of the reservoir and spillway and make recommendations on increasing the capacity of the system to make it adequate.

(2) Investigate the location and operability of the 18 inch diameter cast iron pipe and provide recommendations on installing positive upstream flow controls.

(3) Provide recommendations on improving the physical condition of deteriorated spillway components.

(4) Investigate the source of seepage in the erosional gully on the left abutment and make recommendations on monitoring and/or control.

b. Remedial Work: The Phase I investigation of Colonial Dam No. 1 also disclosed several deficiencies of lower priority which should be corrected during routine maintenance.

(1) Repair two eroded areas on the upstream slope.

(2) Fill the embankment's crest to design elevation to eliminate wheel ruts.

(3) Replace eroded material behind the left spillway's left wall.

(4) Develop and implement formal maintenance and inspection procedures.

c. Emergency Operation and Warning Plan: Concurrent with the additional investigations recommended above, the owner should develop an Emergency Operation and Warning Plan including:

(1) Guidelines for evaluating inflow during periods of heavy precipitation or runoff.

(2) Procedures for around the clock surveillance during periods of heavy precipitation or runoff.

(3) Procedures for drawdown of the reservoir under emergency conditions.

(4) Procedures for notifying downstream residents and public officials, in case evacuation of downstream areas is necessary.

APPENDIX A
VISUAL INSPECTION CHECKLIST

VISUAL OBSERVATIONS CHECKLIST I
(NON-MASONRY IMPOUNDING STRUCTURE)

Name Dam Colonial No. 1 County Fayette State Pennsylvania National ID # PA 00206

Type of Dam Earthfill Hazard Category High

Date (s) Inspection 16 November 1979 Weather Cool, sunny Temperature 45°F

Pool Elevation at Time of Inspection 966 (MSL) Tailwater at Time of Inspection 940+ (MSL)

Inspection Personnel: J. E. Barrick, P.E. Ackenheil & Associates, Hydrologist and Project Manager.
J. P. Hannan Ackenheil & Associates, Geotechnical Engineer
S. G. Mazzella Ackenheil & Associates, Civil Engineer
J. B. Zeppieri Ackenheil & Associates, Geologist

Recorder J. E. Barrick

GEO Project G79153-E
PennDER I.D. No. 26-12

EMBANKMENT

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SURFACE CRACKS	None observed.	
UNUSUAL MOVEMENT OR CRACKING AT OR BEYOND THE TOE	None observed.	
SLOUCHING OR EROSION OF EMBANKMENT AND ABUTMENT SLOPES		Minor erosion observed at the extreme downstream end of the right spillway's left wingwall and at the right abutment immediately downstream of the end of the right spillway wall. Erosion of abutment is occurring in and below rock slope that comprises left wall of left spillway channel. Some rock is collapsing and several trees have fallen into the channel. On the right abutment below the dam, a drainage swale conveys surface water from above and below the dam down to the stilling pool at the foot of spillway. A tree at the perimeter of the stilling pool at the spillway base has been undercut. Erosion has occurred behind the left wall of the left spillway adjacent to the left groin. Appears to be result of surface runoff and rainfall impinging upon wall. Fifteen feet to left there is a drainage channel which has eroded a deep scarp into the groin. A flow of water emanates from a hole in the ground and is running in this 5 foot deep channel. Vitrified clay pipe is visible in the upper reach of the erosional cavity.

EMBANKMENT (CONT'D)

<u>VISUAL EXAMINATION OF</u>	<u>OBSERVATIONS</u>	<u>REMARKS OR RECOMMENDATIONS</u>
SLOUGHING OR EROSION OF EMBANKMENT AND ABUTMENT SLOPES (continued)	A grass covered lump or bulge exists at embankment toe but does not appear to be result of slumping. Close examination indicates rock and boulder debris. Upstream embankment slope is steep and lined with a concrete slab from just above the water line to an undetermined distance below water line. Immediately to right of the embankment center, a concrete slab is missing and two slabs have been tilted. Slumping or erosion appears to have occurred. The concrete exposed due to tilting of the slabs appears to have weathered to the same extent as intact slabs indicating that tilting occurred some time ago.	
VERTICAL AND HORIZONTAL ALIGNMENT OF THE CREST	Vertical alignment is good and crest appears to be level. The crest serves as a driveway and is gravel covered. There are a number of small depressions which are ponding water. Post and wire rope guard rails are located on both sides of the roadway. The embankment crest centerline is straight from the right abutment to the right end of bridge crossing the left spillway. Here the alignment turns 15° upstream.	
RIPRAP FAILURES	No riprap observed.	

EMBANKMENT (CONT'D)

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SETTLEMENT	No settlement observed except for ruts on roadway and cavity on upstream slope.	
JUNCTION OF EMBANKMENT AND ABUTMENT, PRINCIPAL SPILLWAYS AND DAM	No distress apparent at right spillway. Junction of abutment slope and spillway wall in good condition. No slumping or sinkholes present. Junction of spillway and dam on left side of right spillway in good condition. Some erosion has occurred at junction of upstream embankment slope and upstream wall. Here the concrete protecting the upstream slope has been undercut. Erosion also at toe of wingwall embankment connection. Erosion has occurred behind the left wall of the left spillway below the bridge, as previously noted. Also, the lower wall between embankment and spillway appears to be overturning.	
ANY NOTICEABLE SEEPAGE	None observed on dam or groins.	
STAFF GAGE AND RECORDER	None observed.	
DRAINS	None observed.	

INSTRUMENTATION

<u>VISUAL EXAMINATION OF</u>	<u>OBSERVATIONS</u>	<u>REMARKS OR RECOMMENDATIONS</u>
MONUMENTATION/SURVEYS	None observed.	
OBSERVATION WELLS	None observed.	
WEIRS	None observed.	
PIEZOMETERS	None observed.	
OTHER		

OUTLET WORKS

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CRACKING AND SPALLING OF CONCRETE SURFACES IN OUTLET CONDUIT	None observed.	
INTAKE STRUCTURE	None observed due to pool level.	
OUTLET STRUCTURE	No outlet works are evident. A 7-1/2 inch outside diameter metal pipe parallels the left wingwall of the right spillway. Pipe exits the lake at left of right spillway wall, rises to embankment crest, crosses crest beneath the roadway, parallels wall down the downstream embankment slope. Three valve stems appear in water of stilling pool at base of right spillway but the piping arrangement is unknown.	
EMERGENCY GATES	None observed.	

RIGHT PRINCIPAL (UNGATED) SPILLWAY

<u>VISUAL EXAMINATION OF</u>	<u>OBSERVATIONS</u>	<u>REMARKS OR RECOMMENDATIONS</u>
CONCRETE WEIR	Water flowing over most of ogee weir crest. Large crack runs laterally from the left wall and 8 feet into the weir. Heavy concentration of moss from crack to base of ogee suggests water flowing from crack when none flows over crest. Right end of ogee weir deteriorated. Spurting water apparent about halfway down weir coming from right wingwall.	
APPROACH CHANNEL	Approach channel short with wall on right and nothing on left. Wall has minor spalls at water line and at crest.	
DISCHARGE CHANNEL	Channel discharges over a three foot free fall into stilling pool below spillway. Surfaces on both spillway wall tops show spalling and deterioration. Left wall near ogee weir is deteriorated and junction between concrete wall and underlying old masonry wall has deteriorated considerably. Immediately beneath bridge, old masonry wall on left has collapsed due to seeping water. Right wall in satisfactory condition, with only minor cracking and spalling.	Discharge channel right wall has decaying mortar in some joints and open joints. Upper portions of wall have been remortared and repointed. Left wall has considerable spalling and some deterioration; a few diagonal, closed cracks present. Two thirds of the way down the discharge channel is a large crack and concrete is spalled and deteriorating. Significant deterioration of left wingwall near stilling pool. Calcium deposits present over much of wall.

RIGHT PRINCIPAL (UNGATED) SPILLWAY (CONT'D)

<u>VISUAL EXAMINATION OF</u>	<u>OBSERVATIONS</u>	<u>REMARKS OR RECOMMENDATIONS</u>
DISCHARGE CHANNEL (continued)	Base of discharge channel immediately below weir has some cracks and water is seeping beneath slab. Below this is considerable deterioration; several cracks present in upper reaches of spillway channel bottom. Further down channel where spillway turns about 45° to left, considerable distress is apparent in the concrete base slabs. A sinkhole is diverting a considerable amount of water beneath the slab. Here, the left wing-wall is undercut. At the end of the spillway discharge channel, water free falls 3 feet into a debris clogged stilling pool. Flows are impinging upon and eroding right abutment such that trees are collapsing into the pool.	
BRIDGE AND PIERS	The bridge spanning spillway consists of three steel "I" beams, each approximately 15 inches deep and each resting directly on spillway walls. Wall deterioration is present at bearing points on both sides of bridge.	

LEFT PRINCIPAL (UNGATED) SPILLWAY

<u>VISUAL EXAMINATION OF</u>	<u>OBSERVATIONS</u>	<u>REMARKS OR RECOMMENDATIONS</u>
CONCRETE WEIR	Ogee weir in fair condition with some deterioration at right wall. Here water is seeping around weir and wall junction and considerable wall erosion has occurred. Ogee weir has spalled at approximately mid-height and is leaking. This distress is two to three feet from left wingwall. Large crack on the right wall runs vertically from ogee weir crest approximately 1.5 feet, turns 45° downstream and extends to top of wall.	
APPROACH CHANNEL	Approach channel is short with walls on both sides. Right wall has minor spalls at and near waterline and crest. Left wall is slightly more deteriorated. Concrete in right approach channel wall has deteriorated at waterline.	
DISCHARGE CHANNEL	Discharge channel base slab appears to have been repaired and resurfaced recently. Walls are in poor condition; both have had horizontal and vertical cracks. Scarp exists at end of discharge channel slab and original ground visible beneath scarp. Below, channel is cut into rock and sides slopes 1H:1V. The right wall continues downstream as a training wall to protect the embankment. Wall has numerous vertical cracks, considerable weathering along construction joints, is badly spalled and significantly undercut. Top of wall badly broken and deteriorated; at its downstream end it is practically disintegrated. Left wall in better condition. One large crack immediately beneath bridge on left wall gives evidence of as much as 6 inches of displacement, i.e. downstream portion of wall has settled relative to wall beneath bridge.	

LEFT PRINCIPAL (UNGATED) SPILLWAY (CONT'D)

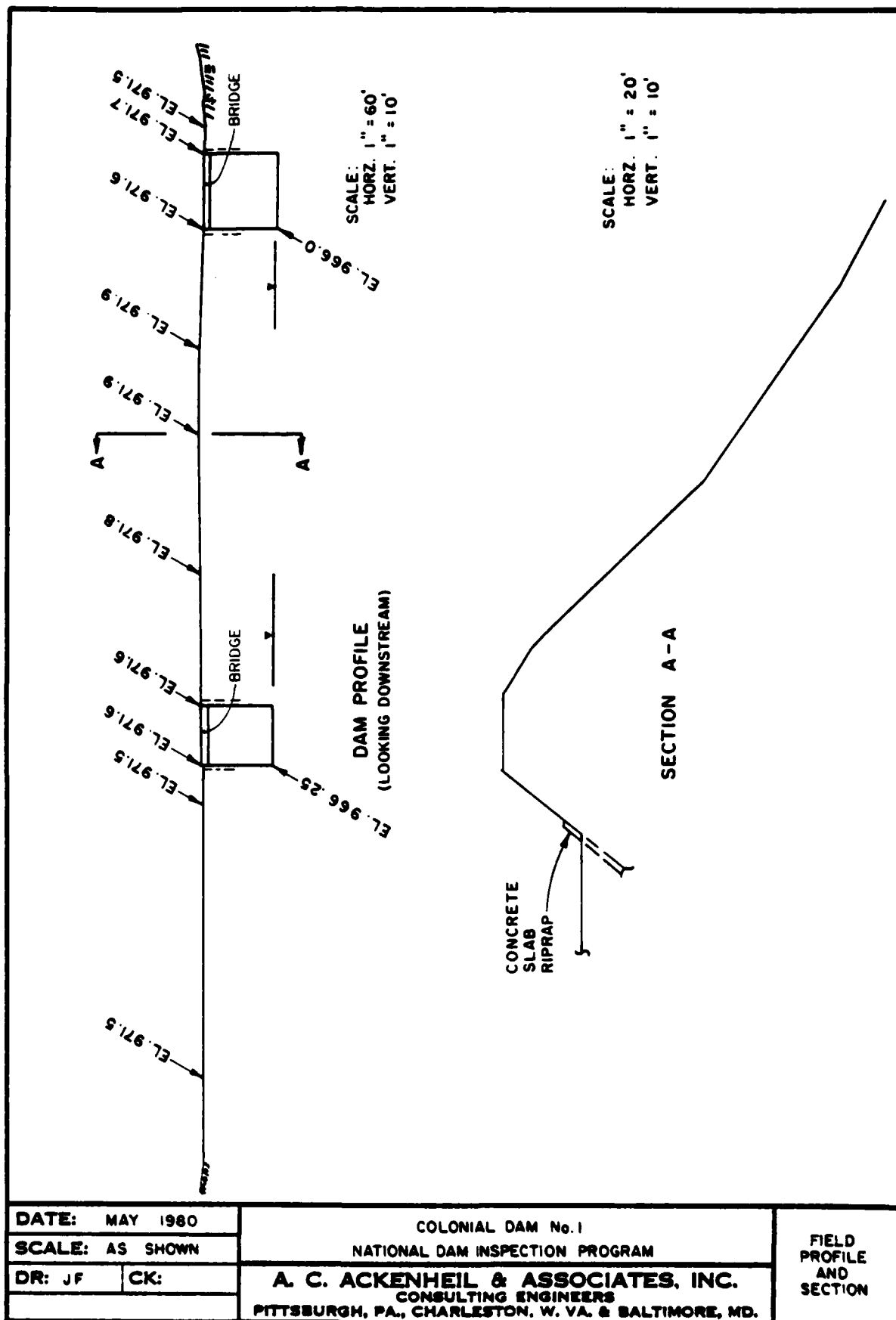
<u>VISUAL EXAMINATION OF</u>	<u>OBSERVATIONS</u>	<u>REMARKS OR RECOMMENDATIONS</u>
BRIDGE AND PIERS	Bridge spanning spillway consists of 3 steel "I" beams each approximately 15 inches deep; each is resting directly on a spillway wall. Some deterioration is present at bearing points on both sides of bridge.	

DOWNSTREAM CHANNEL

VISUAL EXAMINATION OF CONDITION (OBSTRUCTIONS, DEBRIS, ETC.)	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
	Outflow from left spillway enters stilling pool of right spillway just above point where original stream channel begins. Original stream channel proceeds downstream, nearly straight, for a distance of 150 feet. At this point channel is narrow, with a 50 feet wide flood plain and very steep sidewalls. Stream channel relatively clear and has rock/boulder bottom.	
SLOPES	Downstream slopes are steep, wooded, and considerable duntimber and brush present.	
APPROXIMATE NO. OF HOMES AND POPULATION	Three dwellings may be imperiled in first mile below dam. Also S.R. 51 would be damaged. Redstone Creek confluence at 4100 feet below dam.	

RESERVOIR

<u>VISUAL EXAMINATION OF</u>	<u>OBSERVATIONS</u>	<u>REMARKS OR RECOMMENDATIONS</u>
SLOPES	Right slope is relatively flat and several homes are present in close proximity to shoreline. Left slope is relatively steep, shows no signs of distress, and is heavily wooded.	
SEDIMENTATION	Small swampy area present at uppermost reach of right branch of reservoir. Similar swampy area present in the uppermost reach of left portion of reservoir. Some sedimentation may be occurring here.	
WATERSHED	The only noticeable disturbance in the watershed is an active strip mining operation. The mining appears to be progressing upstream, with downstream portions of mining operation being reclaimed. Sediment control facilities at mine appear operative. Mine is adjacent to road and no sedimentation of ditches or culverts beneath the road was observed. Reclamation appears to have been done carefully; slopes returned to approximately original configuration. Mining being performed by Farkas Coal Company, R.D. #1, Box 132, Vanderbilt, Pennsylvania. Remainder of watershed that was observed appears to be about as indicated on U.S.G.S. topographic map.	



APPENDIX B
ENGINEERING DATA CHECKLIST

CHECK LIST
ENGINEERING DATA
DESIGN, CONSTRUCTION, OPERATION
PHASE I

NAME OF DAM Colonial No. 1
I.D. No. PA 00206

ITEM	REMARKS
*Design Drawings	"Plan of Storage Reservoir Dam for Franklin Water Company" dated 22 August 1903 prepared by Pittsburgh Coal Company.
*Modification Drawings	"Plan for Raising Dam and Paving Spillway", Pittsburgh Coal Company, 19 April 1905. "Plan Showing Emergency Spillway and Highway Bridge at Colonial No. 1", by H. C. Frick Coke Company, dated 20 September 1912. Franklin Township Water Company drawings: **"Plan and Elevation of Main Spillway" dated 13 June 1927. **"Plan and Elevation of Emergency Spillway" dated 14 June 1927. **"Sections Taken Through Crest of Dam" dated 17 June 1927. **"Elevation of Main Spillway" dated 20 June 1927. **"Topography of Franklin Reservoir" Franklin Township Water Company dated 12 September 1922.

ITEM	REMARKS
*As-Built Drawings	**"Plan and Sections of Franklin Township Reservoir" dated 30 August 1927. Same drawing marked "Progress Report December 1 - 1927". Same drawing marked "Progress Report May 10 - 1928". Sheet #3, Drawing 12-E-49 untitled, undated showing left dike embankment on topographic plan of dam vicinity.
*Dam Profile Showing Depth of Overtopping	"View Looking Upstream", dated 20 August 1941.
Regional Vicinity Map	U.S.G.S. 7-1/2 Minute Fayette City Quadrangle. See Appendix E.
*Construction History	Designed by E. J. Taylor of the Pittsburgh Coal Company. Constructed in 1903 by Owen Murphy. Modified in 1905, 1912 and extensively in 1927. See Modification Drawings and As-Built Drawings above.
*Typical Sections of Dam	See Modification Drawings above.

ITEM	REMARKS
*Outlets - Plans Details Constraints	1- 18 inch C.I. pipe near right end of embankment, at toe of downstream face a 12 inch branch for a blow off and below this a reducer changing 18 inch pipe to 8 inch.
Outlet Discharge Ratings	None available.
Rainfall/Reservoir Records	None available.
*Design Reports	See "Report Upon the Colonial Dam No. 1 of the Franklin Township Water Company. A Subsidiary of the H. C. Frick Coke Company" dated Harrisburg, 15 October 1914 and "Report Upon the Application of the Franklin Township Water Company", dated Harrisburg, 8 August 1927.
Geology Report	None available.
*Hydrology and Hydraulics	Calculations for spillway capacity available in miscellaneous correspondence.
Design Computations Dam Stability Seepage Studies	None available.

ITEM	REMARKS
Materials Investigations Boring Records Laboratory Field	None available.
Post Construction Surveys of Dam	See Modification Drawings above.
Borrow Sources	Data not available.
Monitoring Systems	None reported.

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* Modifications

See Modification Drawings above.

- (1) In 1905 the top of the embankment was raised 2 feet and the top of the right spillway was raised 3.6 feet in order to increase capacity.
- (2) In 1912 an emergency spillway was constructed at the left end of the embankment.
- (3) In 1927 extensive modifications were undertaken to increase storage capacity and increase the head so that the water supply would operate by gravity, these included:
 - a. The top of the embankment was raised from 967.4 feet to 971.5 feet.

ITEM	REMARKS
* Modifications (continued)	
b.	The principal spillway flow line elevation was raised from 961.8 feet to 966.0 feet.
c.	Fill was placed on the downstream slope to reduce the slope to 2H:1V.
d.	Two french drains were placed under the new fill of the downstream embankment slope leading from the original toe to the new toe.
e.	The embankment top width was increased to 20 feet.
f.	Additional embankment totaling 175 feet was added to the left end to accommodate the higher water level.
g.	A concrete core wall was constructed along the centerline of this new embankment.
h.	The left abutment and wingwall of the right spillway were increased in height to form a retaining wall for the additional fill used for the downstream embankment slope.
i.	At the right spillway a cutoff wall was constructed at each abutment.
j.	The right spillway length was increased to 31 feet.

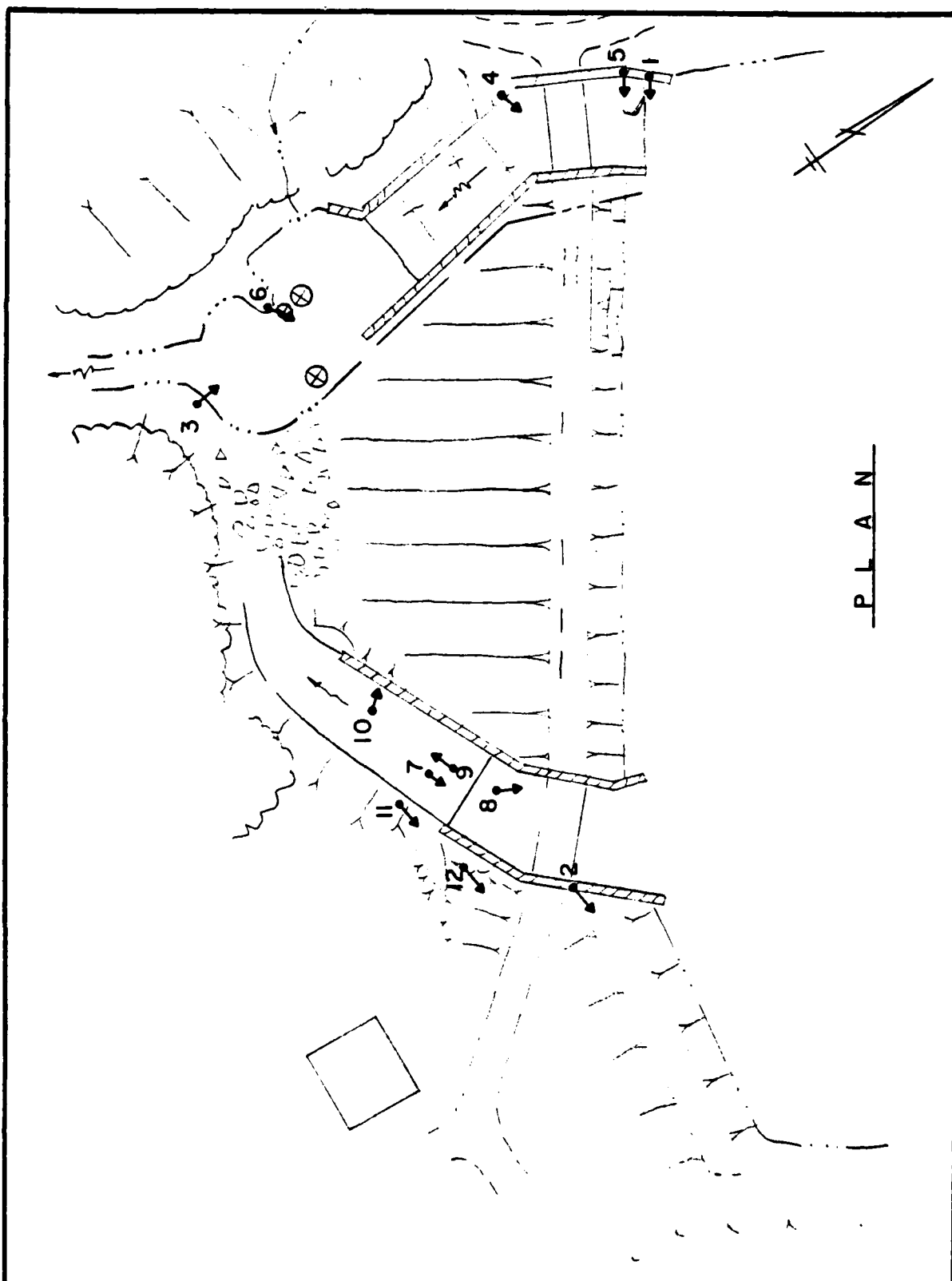
ITEM	REMARKS
*Modifications (continued)	k. At the left spillway, a 95 feet long and 2 feet thick long concrete retaining and abutment wall was constructed upstream of the spillway and a short cutoff wall was constructed extending into the embankment from the right abutment.
*High Pool Records	Flood of 4 June 1941 high water level 972.02 feet.
Post-Construction Engineering Studies and Reports	None Reported.
*Prior Accidents of Failure of Dam Description Reports	The embankment was overtopped during the flood of 4 June 1941 to an average depth of 0.4 feet over the embankment crest with maximum depths of 0.5 feet over the embankment crest. The head at the right spillway was 6.02 feet and the head at the left spillway was 5.70 feet. Total flow over the entire structure was estimated at 2992 cfs.
Maintenance Operation Records	None available.
*Spillway - Plan Sections Details	See Modification Drawings above.

ITEM	REMARKS
*Operating Equipment Plans and Details	See Modification Drawings above.
Specifications	None available.
Miscellaneous	Inspection reports by Water and Power Resources Board Personnel dated 15 October 1914 to 10 August 1961.
	Inspection report by owner to Water and Power Resources Board dated 12 June 1924.

*Information and data may be obtained from the Pennsylvania Department of Environmental Resources, Harrisburg, Pennsylvania.

**Reduced size copy presented in Appendix E.

APPENDIX C
PHOTOGRAPHS



P L A N

DATE: MAY 1980		COLONIAL DAM No.1 NATIONAL DAM INSPECTION PROGRAM		PHOTO KEY MAP
SCALE: NONE				
DR: PT	CK: JEB	A. C. ACKENHEIL & ASSOCIATES, INC. CONSULTING ENGINEERS PITTSBURGH, PA., CHARLESTON, W. VA. & BALTIMORE, MD.		

10 7189 ALBANY 4. S. S. SMITH CO., PENN., PA.

COLONIAL DAM No. 1



PHOTO 1. EMBANKMENT CREST AND SPILLWAYS



PHOTO 2. LEFT SPILLWAY TRAINING WALL AND EMBANKMENT

COLONIAL DAM No.1

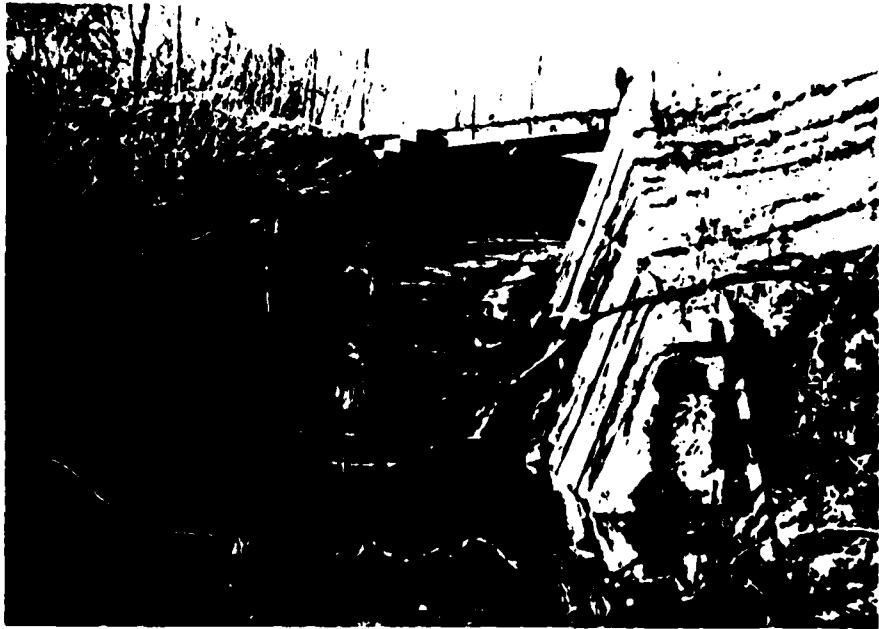


PHOTO 3. RIGHT SPILLWAY DISCHARGE CHANNEL

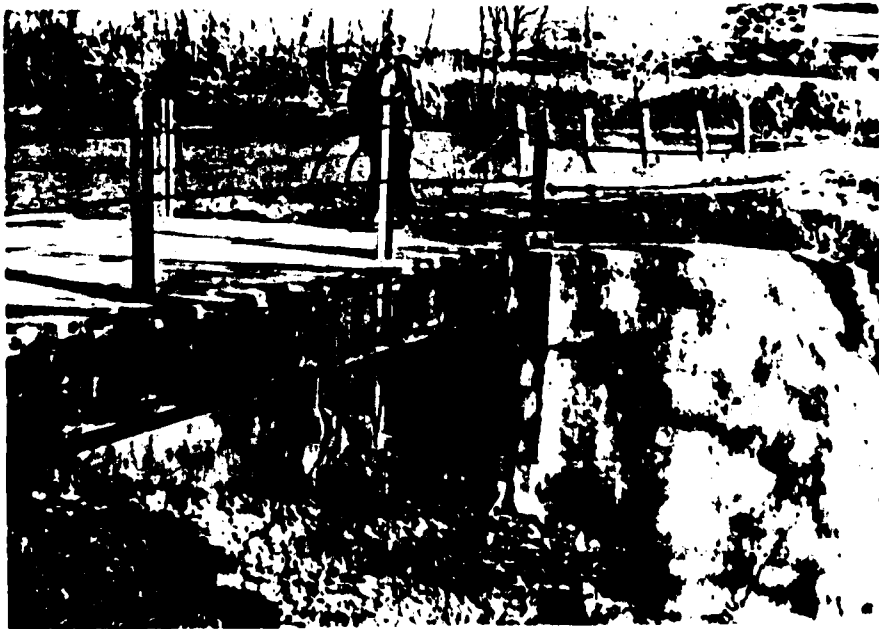


PHOTO 4. RIGHT SPILLWAY TRAINING WALL

COLONIAL DAM No.1



PHOTO 5. RIGHT SPILLWAY OGEE WEIR CREST

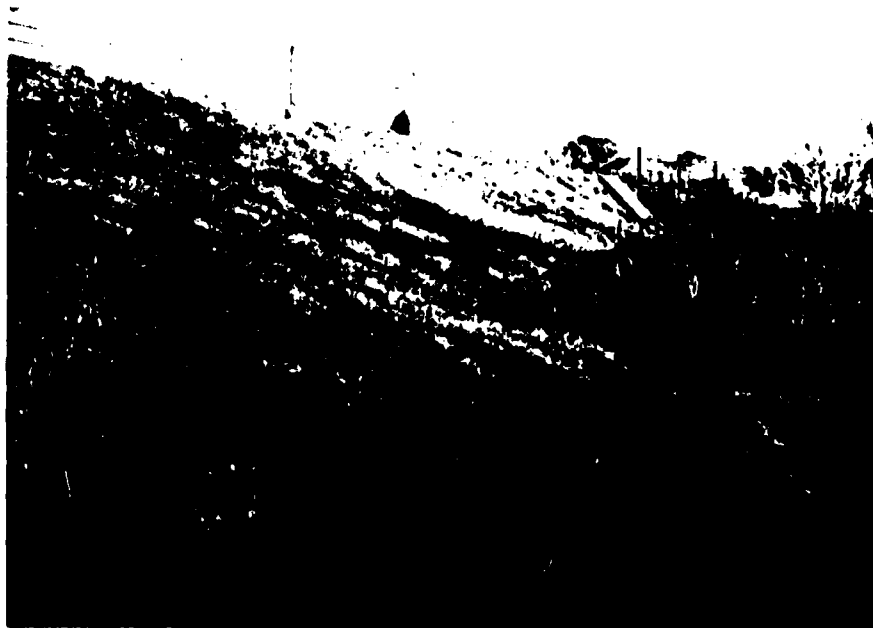


PHOTO 6. DOWNSTREAM SLOPE

COLONIAL DAM No 1

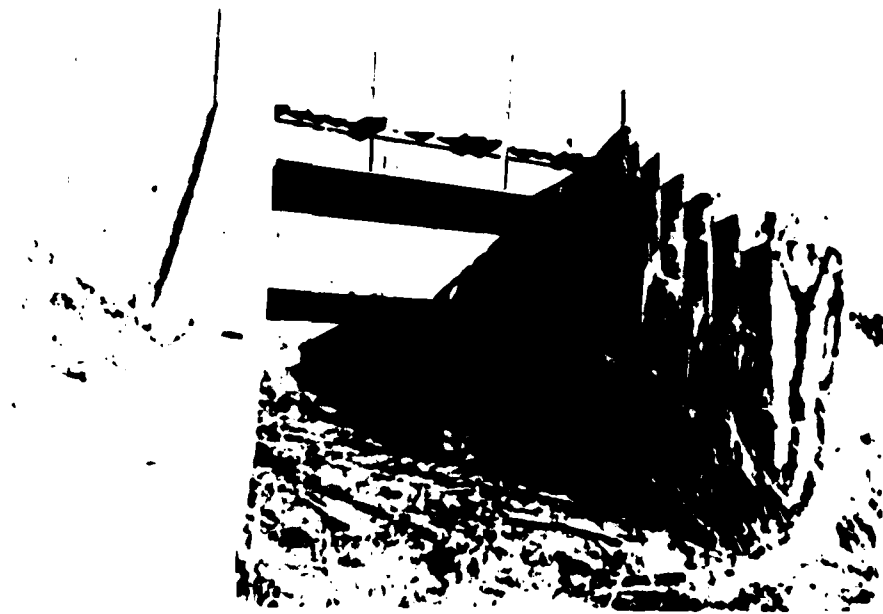


PHOTO 7. LEFT SPILLWAY

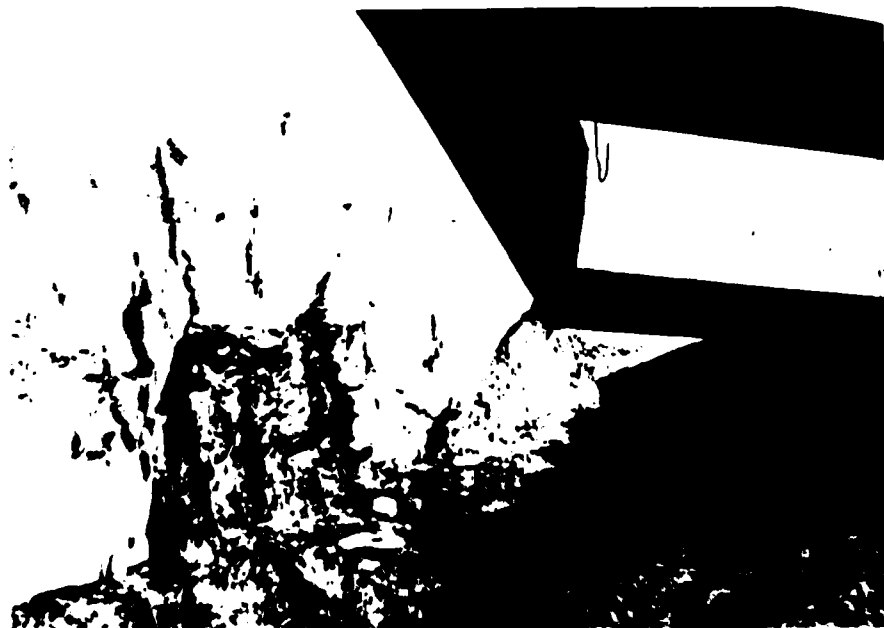


PHOTO 8. LEFT SPILLWAY TRAINING WALL

COLONIAL DAM No.1

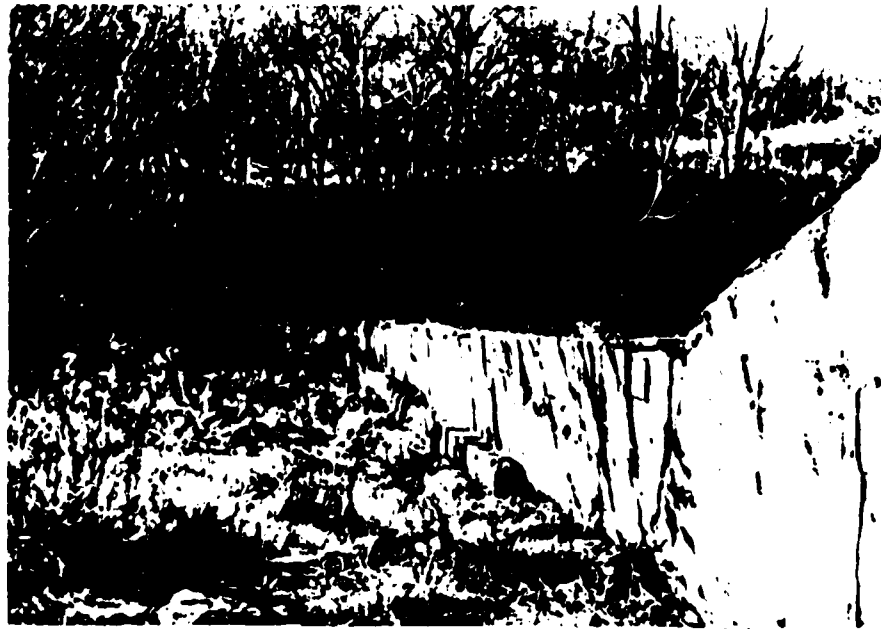


PHOTO 9. LEFT SPILLWAY DISCHARGE CHANNEL



PHOTO 10. LEFT SPILLWAY TRAINING WALL

COLONIAL DAM No. 1

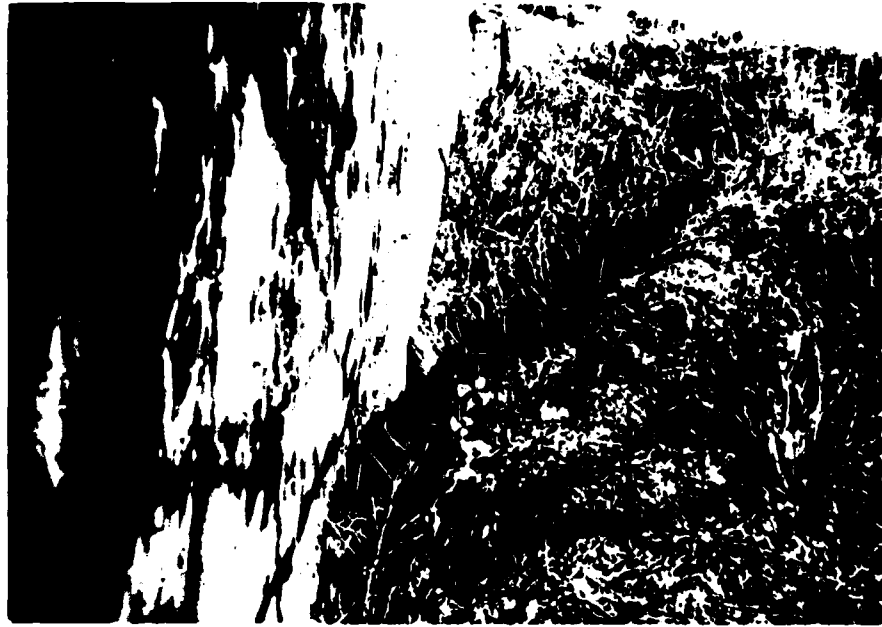


PHOTO 11. LEFT SPILLWAY TRAINING WALL ABUTMENT

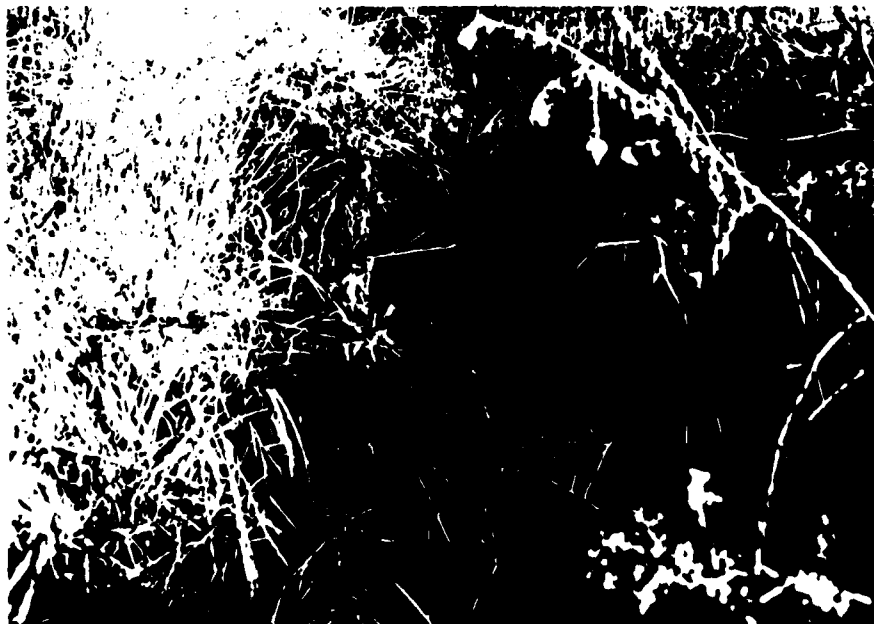


PHOTO 12. TILE PIPE DRAIN

DETAILED PHOTO DESCRIPTIONS

- Photo 1 Embankment Crest and Spillways from right abutment. Note depression in center of upstream slope at water level.
- Photo 2 Left Abutment Area showing the left spillway training wall and embankment as seen from the bridge over the left spillway.
- Photo 3 Right Spillway Discharge Channel looking upstream. Pond drain control valve is visible at end of training wall.
- Photo 4 Right Spillway Training Wall and bridge. Note deterioration of original (lower) wall.
- Photo 5 Right Spillway Ogee Weir Crest. Note deterioration of training wall below.
- Photo 6 Downstream Slope showing left spillway.
- Photo 7 Left Spillway as seen from discharge channel below.
- Photo 8 Left Spillway Training Wall showing wall and ogee crest deterioration.
- Photo 9 Left Spillway Training Wall showing cracks and undercutting.
- Photo 10 Left Spillway Discharge Channel as seen from above. Note deterioration of training wall.
- Photo 11 Left Spillway Training Wall, abutment side, showing erosion of backfill.
- Photo 12 Tile Pipe Drain. Ditch is in downstream left abutment, near left spillway's left training wall.

APPENDIX D
HYDROLOGY AND HYDRAULICS

APPENDIX D HYDROLOGY AND HYDRAULICS

Methodology: The dam overtopping analysis was accomplished using the systemized computer program HEC-1 (Dam Safety Version), July, 1978, prepared by the Hydrologic Engineering Center, U.S. Army Corps of Engineers, Davis, California. A brief description of the methodology used in the analysis is presented below.

1. Precipitation: The Probable Maximum Precipitation (PMP) is derived and determined from regional charts prepared from past rainfall records including "Hydrometeorological Report No. 33" prepared by the U.S. Weather Bureau.

The index rainfall is reduced from 10% to 20% depending on watershed size by utilization of what is termed the HOP Brook adjustment factor. Distribution of the total rainfall is made by the computer program using distribution methods developed by the Corps.

2. Inflow Hydrograph: The hydrologic analysis used in development of the overtopping potential is based on applying a hypothetical storm to a unit hydrograph to obtain the inflow hydrograph for reservoir routing.

The unit hydrograph is developed using the Snyder method. This method requires calculation of several key parameters. The following list gives these parameters, their definition and how they were obtained for these analyses.

<u>Parameter</u>	<u>Definition</u>	<u>Where Obtained</u>
Ct	Coefficient representing variations of watershed	From Corps of Engineers*
L	Length of main stream channel	From U.S.G.S. 7.5 minute topographic map
Lca	Length on main stream to centroid of watershed	From U.S.G.S. 7.5 minute topographic map

Cp	Peaking coefficient	From Corps of Engineers*
A	Watershed size	From U.S.G.S. 7.5 minute topographic map

3. Routing: Reservoir routing is accomplished by using Modified Puls routing techniques where the flood hydrograph is routed through reservoir storage. Hydraulic capacities of the outlet works, spillways and the crest of the dam are used as outlet controls in the routing.

The hydraulic capacity of the outlet works can either be calculated and input or sufficient dimensions input and the program will calculate an elevation-discharge relationship.

Storage in the pool area is defined by an area-elevation relationship from which the computer calculates storage. Surface areas are either planimetered from available mapping or U.S.G.S. 7.5 minute series topographic maps or taken from reasonably accurate design data.

4. Dam Overtopping: Using given percentages of the PMF the computer program will calculate the percentage of the PMF which can be controlled by the reservoir and spillway without the dam overtopping.

*Developed by the Corps of Engineers on a regional basis for Pennsylvania.

HYDROLOGIC AND HYDRAULIC
ENGINEERING DATA

DRAINAGE AREA CHARACTERISTICS: Predominately woodland and
pasture.

ELEVATION TOP NORMAL POOL (STORAGE
CAPACITY): 966.0 (172 acre-feet.)

ELEVATION TOP FLOOD CONTROL POOL (STORAGE
CAPACITY): 971.5 (278 acre-feet.)

ELEVATION MAXIMUM DESIGN POOL: Design 971.5

ELEVATION TOP DAM: Design 971.5, observed minimum 971.5

OVERFLOW SECTIONS

- a. Elevation 966.0 (right) 966.25 (left)
- b. Type Two concrete ogee weirs
- c. Width 15 feet (left), 31 feet (right)
- d. Length N/A
- e. Location Spillover Right abutment and 175 feet
from left abutment
- f. Number and Type of Gates None

OUTLET WORKS

- a. Type 7-1/2 inch outlet pipe
- b. Location Over dam near right abutment
- c. Entrance Inverts Unknown
- d. Exit Inverts Unknown
- e. Emergency Drawdown Facilities 18 inch cast iron
pond drain

HYDROMETEOROLOGICAL GAGES

- a. Type None
- b. Location N/A
- c. Records None

MAXIMUM REPORTED NON-DAMAGING
DISCHARGE 2,992 cfs (4 June 1941)

HEC-1 DAM SAFETY VERSION
HYDROLOGY AND HYDRAULIC ANALYSIS
DATA BASE

NAME OF DAM: Colonial Dam No. 1	NDI ID NO. PA 00206
Probable Maximum Precipitation (PMP)	24.2*
Drainage Area	3.2 sq. mi.
Reduction of PMP Rainfall for Data Fit	0.8 (24.2)
Reduce by 20%, therefore PMP rainfall =	19.4 inches
Adjustments of PMF for Drainage Area (Zone 7)	
6 hrs.	102%
12 hrs.	120%
24 hrs.	130%
Snyder Unit Hydrograph Parameters	
Zone	29**
C _p	0.5
C _t	1.6
L	2.5 mile
L _{ca}	1.0 mile
$t_p = C_t (L \cdot L_{ca})^{0.3} =$	2.1 hours
Loss Rates	
Initial Loss	1.0 inch
Constant Loss Rate	0.05 inch/hour
Base Flow Generation Parameters	
Flow at Start of Storm	1.5 cfs/sq.mi.=4.0 cfs
Base Flow Cutoff	0.05 x Q peak
Recession Ratio	2.0
Overflow Section Data	
Crest Length	15 feet and 31 feet
Freeboard	5.5 feet
Discharge Coefficient	3.1-4.1
Exponent	1.5
Discharge Capacity	2,242 cfs

* Hydrometeorological Report 33

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

ACKENHEIL & ASSOCIATES

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1000 Banksville Road
PITTSBURGH, PA. 15216
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Sheet _____ of _____

Job COLON 46 #1 DAM Job No. 7053E

Subject DATA INPUT

Made By JDH Date 4/23/80 Checked ETH Date 4/23/80

LOSS RATE AND BASE FLOW PARAMETERS

AS recommended BY CORPS of Engineers, BALTIMORE District

STRTL = 1 INCH
CNSTL = 0.05" / ft
STRTO = 1.5 cfs / mi²
QRCSN = 0.05 (5% OF PEAK FLOW)
RTIOR = 2.0

ELEVATION - AREA - CAPACITY RELATIONSHIPS

From USGS 7.5 MIN QUAD, DENK DER FILES AND
FIELD INSPECTION DATA

AT Elevation 966.0

Initial Storage = 172.0 ACRES-FT

POND Surface Area = 14.7 ACRES

AT Elevation 980 AREA = 43.2 ACRES

From Conic Method of Reservoir Volume
FLOOD Hydrograph Package (HEC-1)
Dam Safety Version (user's manual)

$$H = 3V/A = 3(172)/14.7 = 35.1 \text{ Feet}$$

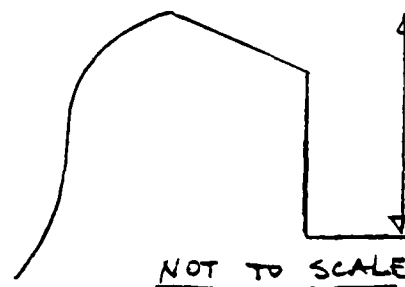
Elevation where Area equals zero

$$966.0 - 35.1 = 930.9$$

SA	AREA	CC	14.7	43.2
SE	ELEVATION	930.9	966.0	980.0

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Sheet _____ of _____
Job COLONIAL #1 Dam Job No. 79153E
Subject Spillway (Rightside) Rating Curve
Made By JAM Date 12-1-80 Checked EMB Date 4/23/80



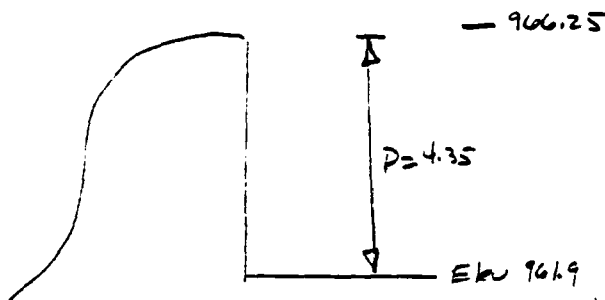
-EL. 966.0 $Q = CLH^{1.5}$
 $H_o = 5.5'$
 $C_o = 3.86$
 $P/H_o = 0.82; L = 31'$

ANALYSIS taken from "Design of Small Dams" US 32.

Elevation	HEAD	H_e/H_o	C_o	C/C_o	C	Q
966.0	0.00	0	3.86	0		0
966.25	0.25	0.05		0.80	3.09	11.97
966.5	0.5	0.09		0.82	3.17	34.74
967.0	1.0	0.18		0.85	3.28	101.68
967.5	1.5	0.27		0.87	3.36	191.35
968.0	2.0	0.36		0.89	3.44	301.62
968.5	2.5	0.45		0.91	3.52	431.33
969.0	3.0	0.55		0.93	3.59	578.25
969.5	3.5	0.64		0.95	3.67	744.95
970.0	4.0	0.73		0.96	3.71	920.28
970.5	4.5	0.82		0.97	3.74	1106.76
971.0	5.0	0.91		0.99	3.82	1323.48
971.5	5.5	1.00		1.00	3.86	1543.45
972.0	6.0	1.09		1.01	3.90	1776.86
972.5	6.5	1.18		1.02	3.94	2024.88
973.0	7.0	1.27		1.03	3.98	2288.62
974.0	8.0	1.45		1.06	4.09	2808.82

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Sheet _____ of _____
Job Colonial #1 Dam Job No. 79153
Subject Emergency Spillway Rating Curve
Made By JPH Date 4/23/80 Checked EHB Date 4/29/80



$$Q = CLH^{1.5}$$

$$H_o = 5.25$$

$$P/H_o = 0.83 \quad L = 5'$$

$$C_o = 3.87$$

NOT TO SCALE

ANALYSIS taken FROM "Design of Small Dams"
USBR

Elevation	Head	H_o/H_o	C_o	C/C_o	C	Q
966.0	0		3.87			0
966.25	0					0
966.5	0.25	0.05		0.80	3.10	5.82
967.0	0.75	0.14		0.84	3.25	31.66
967.5	1.25	0.24		0.86	3.33	69.81
968.0	1.75	0.33		0.89	3.44	119.46
968.5	2.25	0.43		0.91	3.52	178.20
969.0	2.75	0.52		0.93	3.60	246.26
969.5	3.25	0.62		0.94	3.64	319.90
970.0	3.75	0.71		0.96	3.72	405.21
970.5	4.25	0.81		0.98	3.79	493.10
971.0	4.75	0.90		0.99	3.83	594.74
971.5	5.25	1.00		1.00	3.87	693.30
972.0	5.75	1.10		1.01	3.91	805.67
972.5	6.25	1.19		1.02	3.95	925.73
973.0	6.75	1.29		1.03	3.99	1049.54
974.0	7.75	1.48		1.06	4.10	1326.87

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Sheet _____ of _____
Job Colonial #1 Dam Job No. _____
Subject Combined Spillway Rating Curve
Made By DH Date 4/23/30 Checked ETB Date 7/29/30

ELEVATION	Q (cfs)
966.0	0
966.25	12.0
966.5	40.6
967.0	133.3
967.5	261.2
968.0	421.1
968.5	609.5
969.0	824.5
969.5	1064.9
970.0	1325.3
970.5	1604.9
971.0	1913.7
971.5	2241.8
972.0	2585.5
972.5	2949.9
973.0	3334.6
974.0	4195.8

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Sheet _____ of _____

Job COLONIAL #1 Dam Job No. 79153 E

Subject DATA INPUT

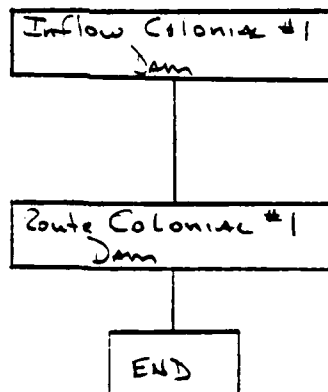
Made By JDH Date 4/23/83 Checked CHB Date 4/28/83

OVERTOP Parameters

Top of Dam Elevation (Minimum) = 971.5
Length of Dam (Excluding Spurway) = 395 Feet
Coefficient of Discharge = 3.1

\$L max 400 \$U max 975

Program Schedule



 FLOOD HYDROGRAPH PACKAGE (HEC-1)
 DAM SAFETY VERSION JULY 1978
 LAST MODIFICATION 26 FEB 79

1	A1	NATIONAL PROGRAM FOR THE INSPECTION OF NON FEDERAL DAMS									
2	A2	HYDROLOGIC AND HYDRAULIC ANALYSIS OF COLONIAL NO. 1 DAM									
3	A3	PROBABLE MAXIMUM FLOOD PMF/UNIT HYDROGRAPH BY SNYDER'S METHOD									
4	B	300	0	5	0	0	0	0	0	0	0
5	B1	5									
6	J	1	9	1							
7	J1	1	.9	.8	.7	.6	.5	.4	.2	.1	
8	K	0	1					1			
9	K1	INFLOW HYDROGRAPH FOR COLONIAL NO. 1 DAM									
10	M	1	1	3.2	3.2	1				1	
11	P		19.4	102	120	130					
12	T							1.0	0.05		
13	W	2.1	0.5								
14	X	-1.5	-0.05	2.0							
15	K	1	2								
16	K1	ROUTING AT COLONIAL NO. 1 DAM									
17	Y				1	1					
18	Y1	1						172.	-1		
19	Y4	966.	966.25	966.5	967.	967.5	968.	968.5	969.	969.5	970.
20	Y4	970.5	971.	971.5	972.	972.5	973.	974.			
21	Y5	0.	12.	40.6	133.3	261.2	421.1	609.5	824.5	1064.9	1325.3
22	Y5	1604.9	1918.7	2241.8	2585.5	2949.9	3334.6	4195.8			
23	\$A	0.0	14.7	43.2							
24	\$E	930.9	966.	980.							
25	\$S	966.									
26	\$D	971.5	3.1	1.5	395.						
27	\$L	175.	210.	220.	300.	390.	395.	400.			
28	\$V	971.5	971.6	971.7	971.8	971.9	972.	975.			
29	K	99									
30	A										
31	A										
32	A										
33	A										
34	A										

PREVIEW OF SEQUENCE OF STREAM NETWORK CALCULATIONS

RUNOFF HYDROGRAPH AT	1
ROUTE HYDROGRAPH TO	2
END OF NETWORK	

 FLOOD HYDROGRAPH PACKAGE (HEC-1)
 DAM SAFETY VERSION JULY 1978
 LAST MODIFICATION 26 FEB 79

RUN DATE: 29 APR 80
 RUN TIME: 5.39.19

NATIONAL PROGRAM FOR THE INSPECTION OF NON FEDERAL DAMS
 HYDROLOGIC AND HYDRAULIC ANALYSIS OF COLONIAL NO. 1 DAM
 PROBABLE MAXIMUM FLOOD PMF/UNIT HYDROGRAPH BY SNYDER'S METHOD

JOB SPECIFICATION									
NO	NHR	NMIN	IDAY	IHR	IMIN	METRC	IPLT	IPRT	NSTAN
300	0	5	0	0	0	0	0	0	0
			JOPER	NWT	LROPT	TRACE			
			5	0	0	0			

MULTI-PLAN ANALYSES TO BE PERFORMED

NPLAN=	1	NRTIO=	9	LRTIO=	1
RTIOS=	1.00	0.90	0.80	0.70	0.60
	0.50	0.40	0.30	0.20	0.10

SUB-AREA RUNOFF COMPUTATION

INFLOW HYDROGRAPH FOR COLONIAL NO. 1 DAM

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

HYDROGRAPH DATA									
IHYDG	IURG	TAREA	SNAP	TRSDA	TRSPC	RATIO	ISNOW	ISAME	LOCAL
1	1	3.20	0.0	3.20	1.00	0.0	0	1	0

PRECIP DATA								
SPFE	PMS	R6	R12	R24	R48	R72	R96	
0.0	19.40	102.00	120.00	130.00	0.0	0.0	0.0	

LOSS DATA										
LROPT	STKR	DLKR	RTOL	ERAIN	STKRS	RTIOK	STRTL	CNSTL	ALSMX	RTIMP
0	0.0	0.0	1.00	0.0	0.0	1.00	1.00	0.05	0.0	0.0

UNIT HYDROGRAPH DATA
TP= 2.10 CP=0.50 NTA= 0

RECESSION DATA		
STRTQ=	QRCNS=	RTIOR=
-1.50	-0.05	2.00

UNIT HYDROGRAPH100 END-OF-PERIOD ORDINATES, LAG= 2.10 HOURS, CP= 0.50 VOL= 0.92									
4.	14.	30.	48.	70.	93.	118.	144.	172.	201.
231.	262.	294.	326.	356.	383.	408.	430.	450.	468.
482.	494.	503.	508.	510.	507.	497.	482.	469.	455.
442.	429.	417.	405.	393.	382.	371.	360.	350.	340.
330.	321.	311.	302.	294.	285.	277.	269.	261.	254.
246.	239.	233.	226.	219.	213.	207.	201.	195.	190.
184.	179.	174.	169.	164.	159.	154.	150.	146.	142.
137.	134.	130.	126.	122.	119.	115.	112.	109.	106.
103.	100.	97.	94.	91.	89.	86.	84.	81.	79.
77.	74.	72.	70.	68.	66.	64.	62.	61.	59.

END-OF-PERIOD FLOW													
MO.DA	HR.MN	PERIOD	RAIN	EXCS	LOSS	COMP Q	MO.DA	HR.MN	PERIOD	RAIN	EXCS	LOSS	COMP Q
						SUM	25.22 23.34 1.88 522811.						
							(641.)(593.)(48.)(14804.38)						

HYDROGRAPH ROUTING

ROUTING AT COLONIAL NO. 1 DAM

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

ROUTING DATA								
GLOSS	GLOSS	AVG	IRIS	ISAME	IOPT	IPMP	LSTR	
0.0	0.0	0.0	1	1	0	0	0	

NSTPS	NSTD	LAG	AMSK	X	TSK	STORA	ISPRAT
1	0	0	0.0	0.0	0.0	172.	-1

STAGE	966.00	966.25	966.50	967.00	967.50	968.00	968.50	969.00	969.50	970.00
	970.50	971.00	971.50	972.00	972.50	973.00	974.00			
FLOW	0.0	12.00	40.60	133.30	261.20	421.10	609.50	824.50	1064.90	1325.30
	1604.90	1918.70	2241.80	2585.50	2949.90	3334.60	4195.80			
SURFACE AREA=	0.	15.	43.							
CAPACITY=	0.	172.	560.							
ELEVATION=	931.	966.	980.							

CNEL	SPWID	COOW	EXPW	ELEVL	COOL	CAREA	EXPL
966.0	0.0	0.0	0.0	7.0	0.0	0.0	0.0

DAM DATA		
TOPEL	COGD	EXPD
971.5	3.1	1.5
		395.

GREST LENGTH AT OR BELOW ELEVATION	175.	210.	220.	300.	390.	395.	400.
	971.5	971.6	971.7	971.8	971.9	972.0	975.0

PEAK OUTFLOW IS 6767. AT TIME 17.75 HOURS
 PEAK OUTFLOW IS 6089. AT TIME 17.75 HOURS
 PEAK OUTFLOW IS 5412. AT TIME 17.75 HOURS
 PEAK OUTFLOW IS 4732. AT TIME 17.75 HOURS
 PEAK OUTFLOW IS 4054. AT TIME 17.75 HOURS
 PEAK OUTFLOW IS 3374. AT TIME 17.83 HOURS
 PEAK OUTFLOW IS 2674. AT TIME 17.92 HOURS
 PEAK OUTFLOW IS 1303. AT TIME 18.25 HOURS
 PEAK OUTFLOW IS 645. AT TIME 18.33 HOURS

 PEAK FLOW AND STORAGE (END OF PERIOD) SUMMARY FOR MULTIPLE PLAN-RATIO ECONOMIC COMPUTATIONS
 FLOWS IN CUBIC FEET PER SECOND (CUBIC METERS PER SECOND)
 AREA IN SQUARE MILES (SQUARE KILOMETERS)

OPERATION	STATION	AREA	PLAN	RATIOS APPLIED TO FLOWS								
				RATIO 1	RATIO 2	RATIO 3	RATIO 4	RATIO 5	RATIO 6	RATIO 7	RATIO 8	RATIO 9
				1.00	0.90	0.80	0.70	0.60	0.50	0.40	0.20	0.10
HYDROGRAPH AT	1	3.20	1	6785.	6106.	5428.	4749.	4071.	3392.	2714.	1357.	678.
	(8.29)	(192.13)	(172.92)	(153.70)	(134.49)	(115.28)	(96.06)	(76.85)	(38.43)	(19.21)		
ROUTED TO	2	3.20	1	6767.	6089.	5412.	4732.	4054.	3374.	2674.	1303.	645.
	(8.29)	(191.62)	(172.43)	(153.25)	(134.01)	(114.79)	(95.53)	(75.71)	(36.90)	(18.26)		

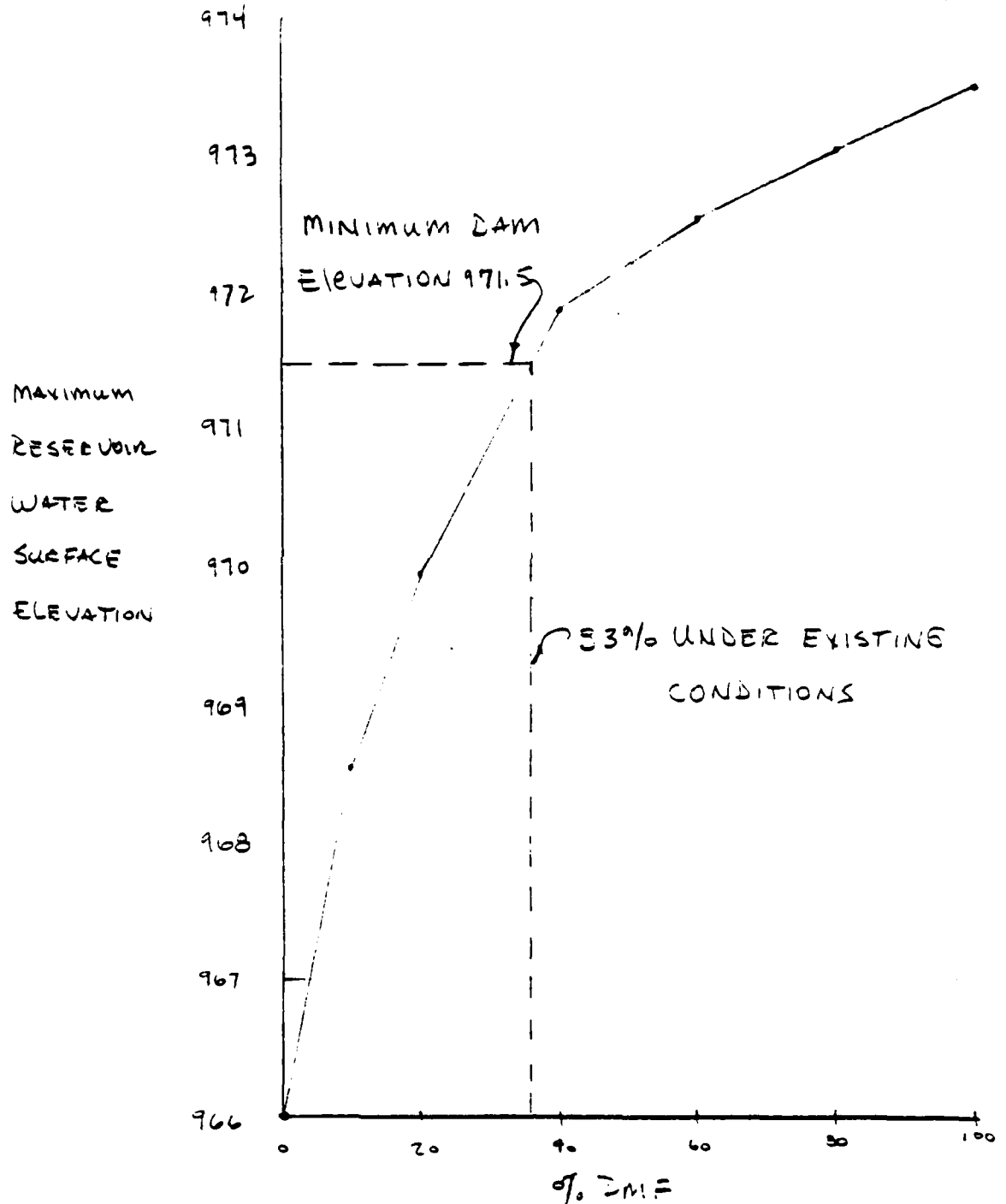
SUMMARY OF DAM SAFETY ANALYSIS

PLAN 1	ELEVATION	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
	966.00	966.00	971.50	
	172.	172.	278.	
	0.	0.	2242.	

RATIO OF PMF	MAXIMUM RESERVOIR W.S.ELEV	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
1.00	973.47	1.97	329.	6767.	7.25	17.75	0.0
0.90	973.26	1.76	323.	6089.	6.75	17.75	0.0
0.80	973.05	1.55	317.	5412.	6.08	17.75	0.0
0.70	972.81	1.31	311.	4732.	5.25	17.75	0.0
0.60	972.55	1.05	304.	4054.	4.50	17.75	0.0
0.50	972.26	0.76	296.	3374.	3.67	17.83	0.0
0.40	971.88	0.38	287.	2674.	2.25	17.92	0.0
0.20	969.96	0.0	243.	1303.	0.0	18.25	0.0
0.10	968.58	0.0	215.	645.	0.0	18.33	0.0

ACKENHEIL & ASSOCIATES
 GEO Systems, Inc.
 1000 Banksville Road
 PITTSBURGH, PA. 15216
 (412) 531-7111

Sheet _____ of _____
 Job COLONIAL #1 Dam Job No. 79153E
 Subject SPILLWAYS / Reservoir Rating Curve
 Made By DM Date _____ Checked CHB Date 4/23/80

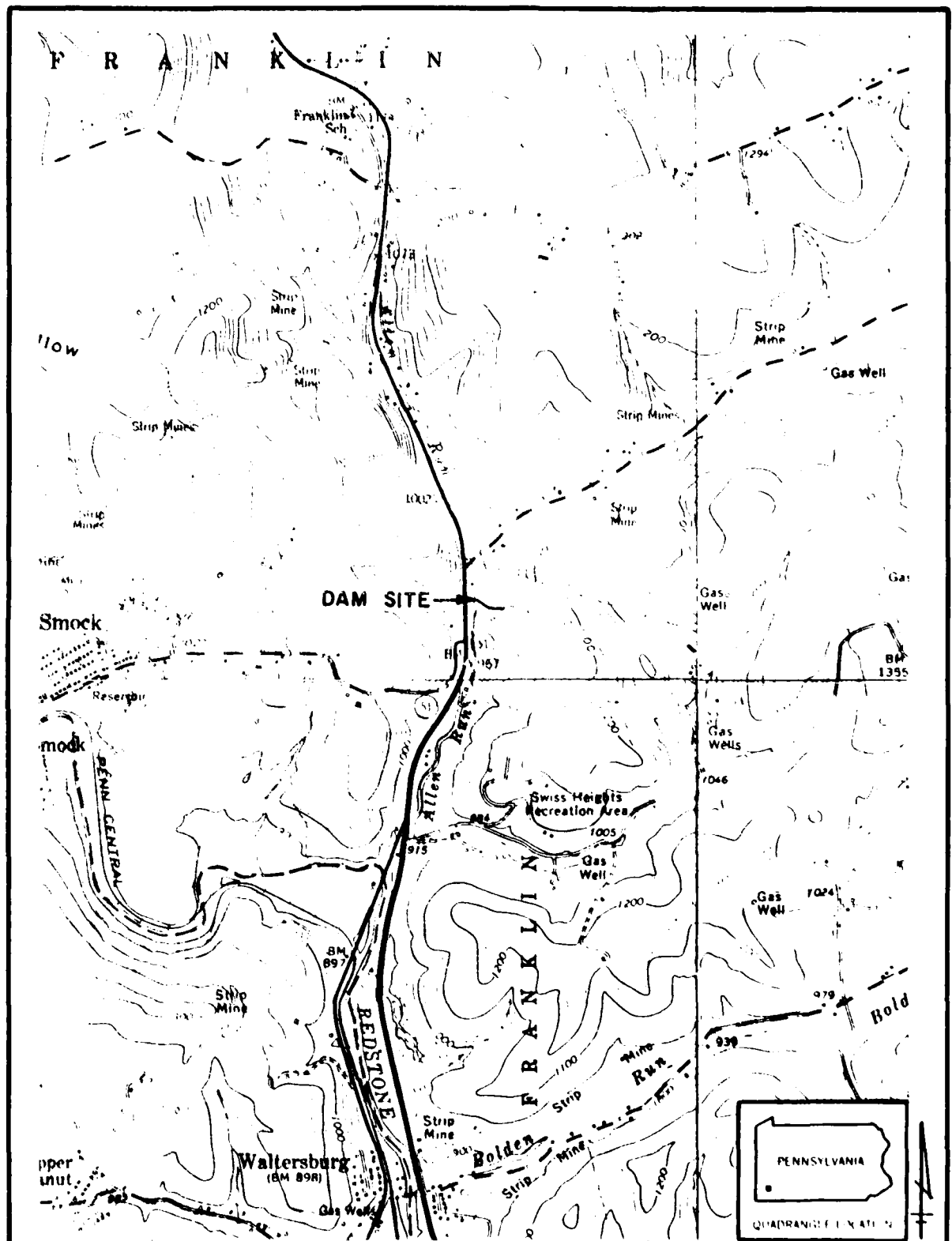


APPENDIX E

PLATES

LIST OF PLATES

Plate I	Regional Vicinity Map
Plate II	Topography of Franklin Reservoir
Plate III	Plan and Sections of Franklin Township Reservoir
Plate IV	Plan and Elevation of Main Spillway
Plate V	Plan and Elevation of Emergency Spillway
Plate VI	Sections Taken Through Crest of Dam
Plate VII	Elevation of Main Spillway



FAYETTE CITY, DAWSON, UNIONTOWN and NEW SALEM U.S.G.S. 7 1/2 min. QUADRANGLES

DATE: MAY 1980

SCALE: 1" = 2000'

DR: JF CK:

DWG. NO. PLATE I

COLONIAL DAM No. 1

NATIONAL DAM INSPECTION PROGRAM

A. C. ACKENHEIL & ASSOCIATES, INC.
CONSULTING ENGINEERS
PITTSBURGH, PA., CHARLESTON, W. VA. & BALTIMORE, MD.

REGIONAL
VICINITY
MAP

12-E-49

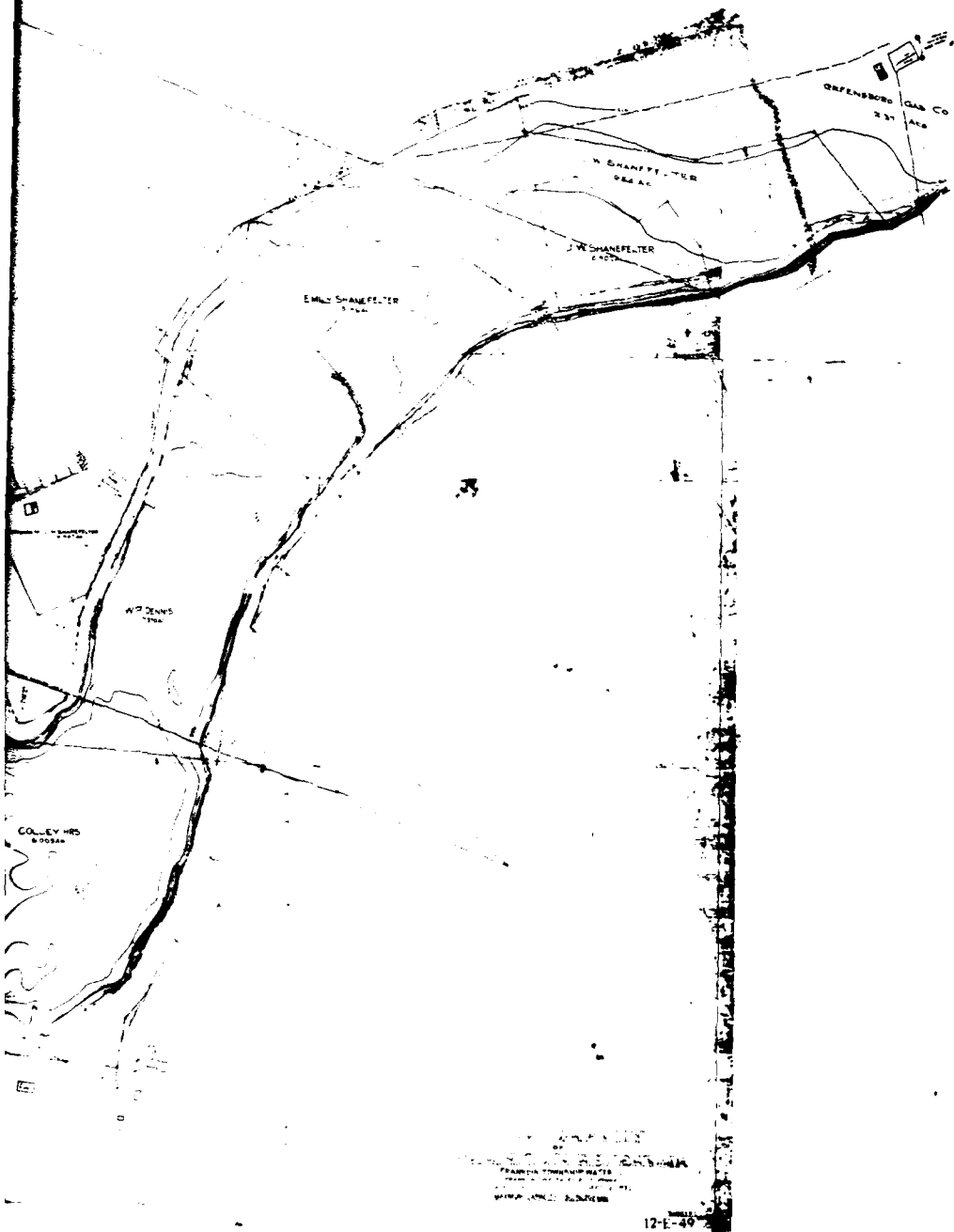
MURPHY
3-16-41

EMILY SHANEFELTER
3-16-41

W. DENNIS
3-16-41

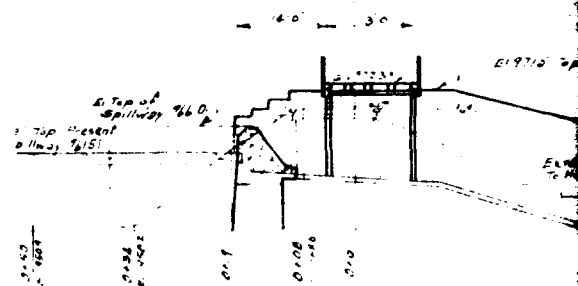
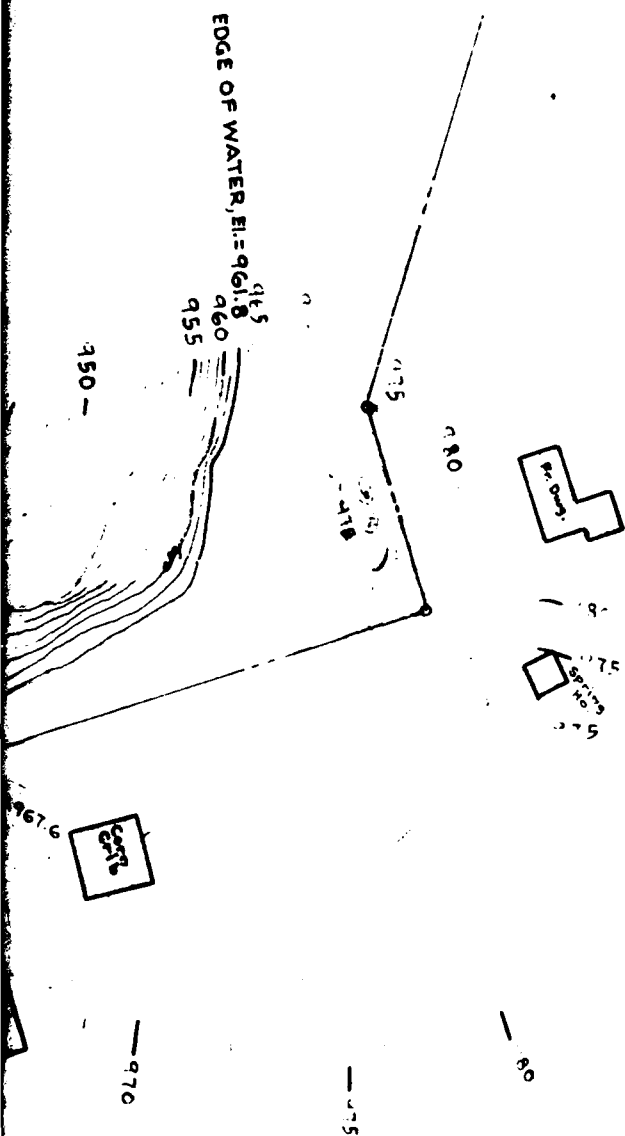
COLLEY HRS
3-16-41

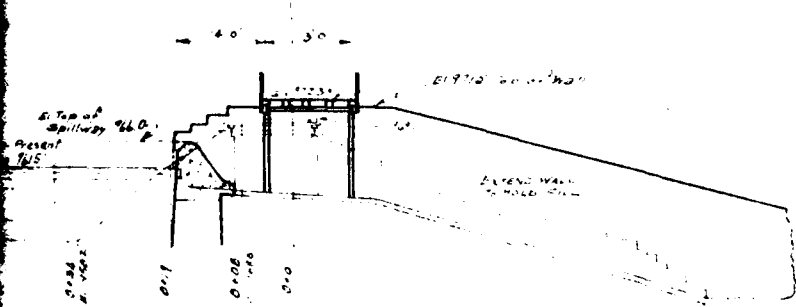
FRANKLIN
FRANKLIN TOWN
FRANKLIN, N.H.
MAY 1941



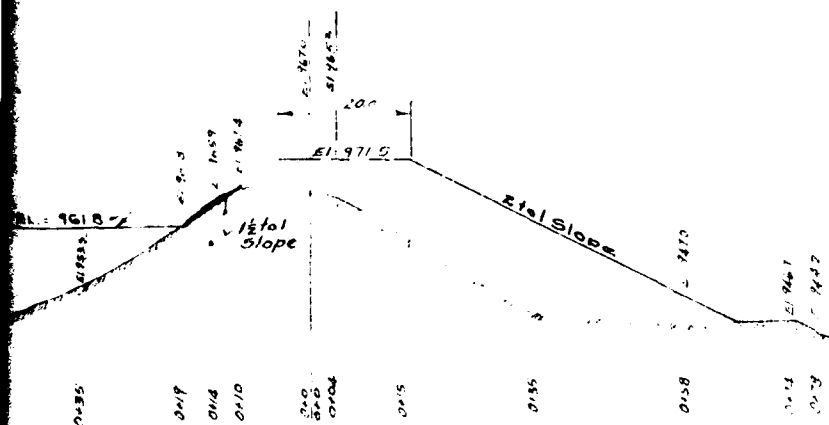
2

PLATE II





SECTION AT 0+40
BACK OF BRIDGE ON LEFT
Scale 1"=20'

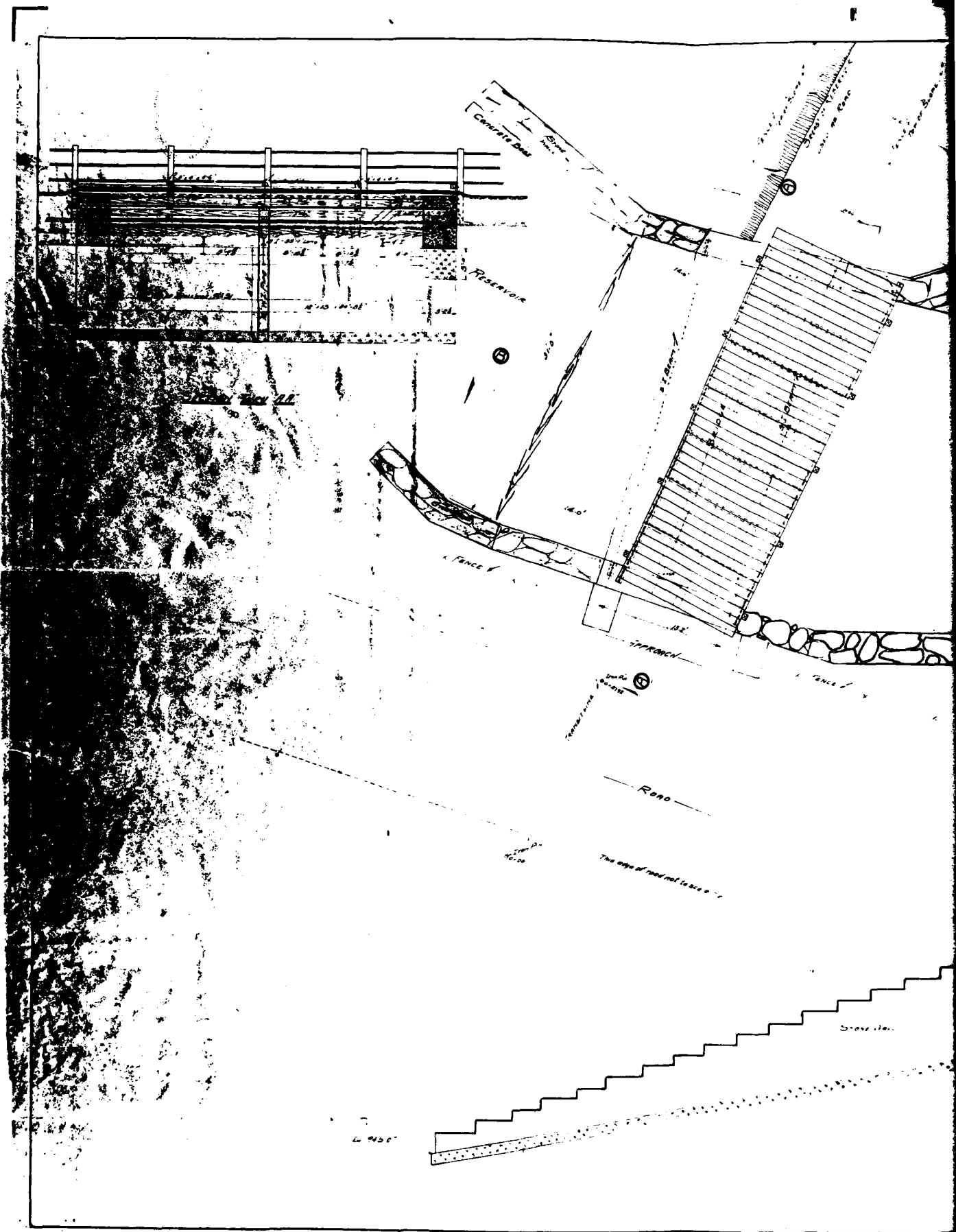


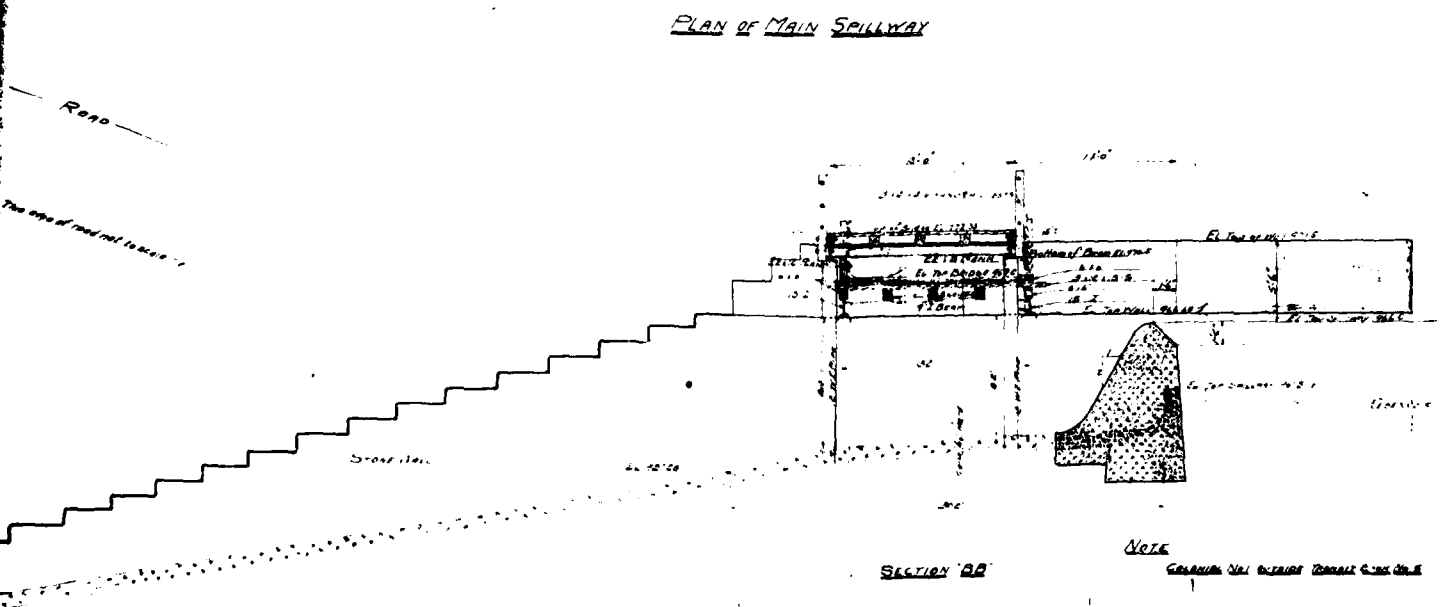
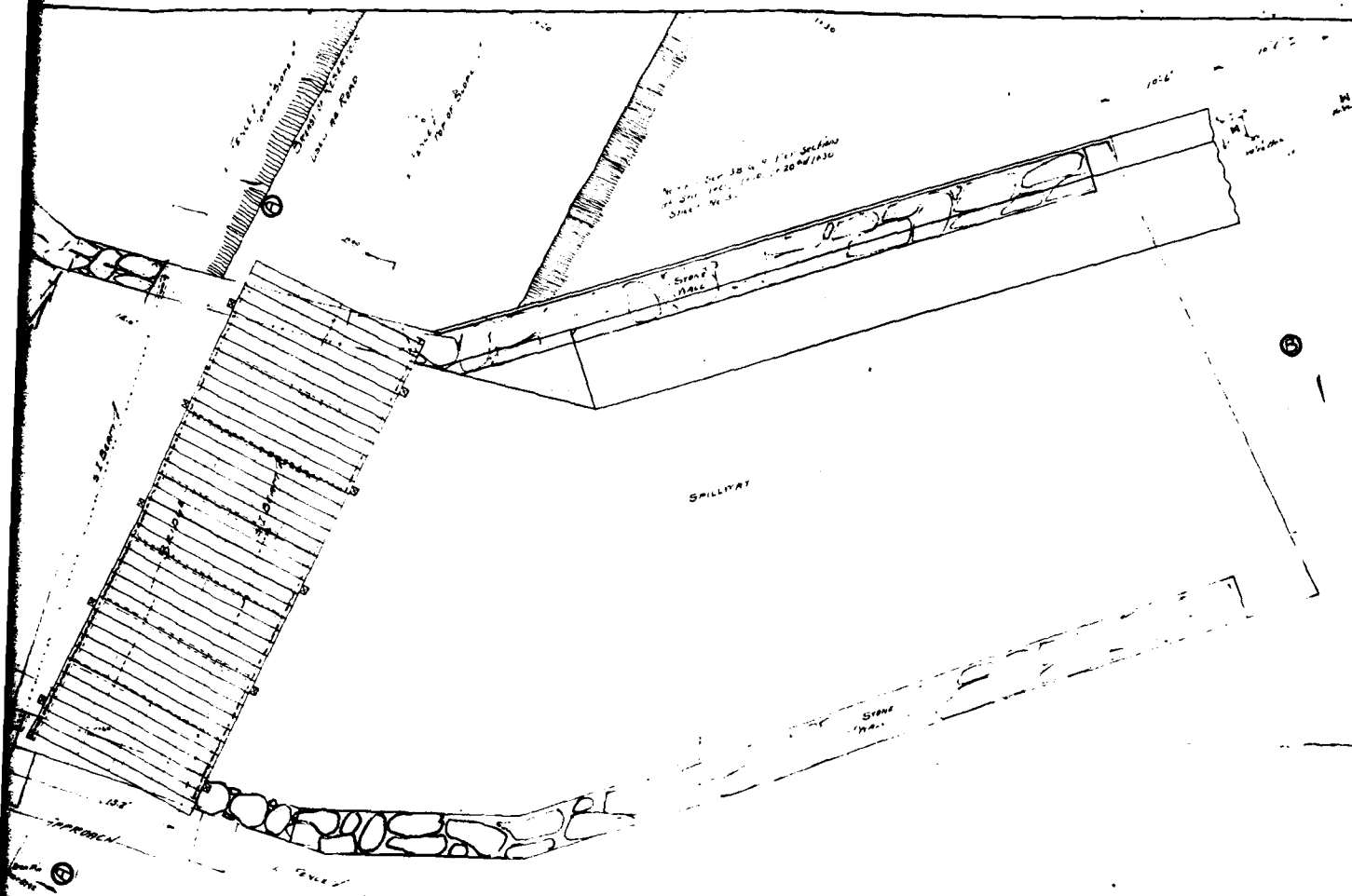
SECTION AT STA. 2+0.
Scale 1"=20'

PLAN ~~AND~~ SECTIONS
 OF
 FRANKLIN TOWNSHIP RESERVOIR

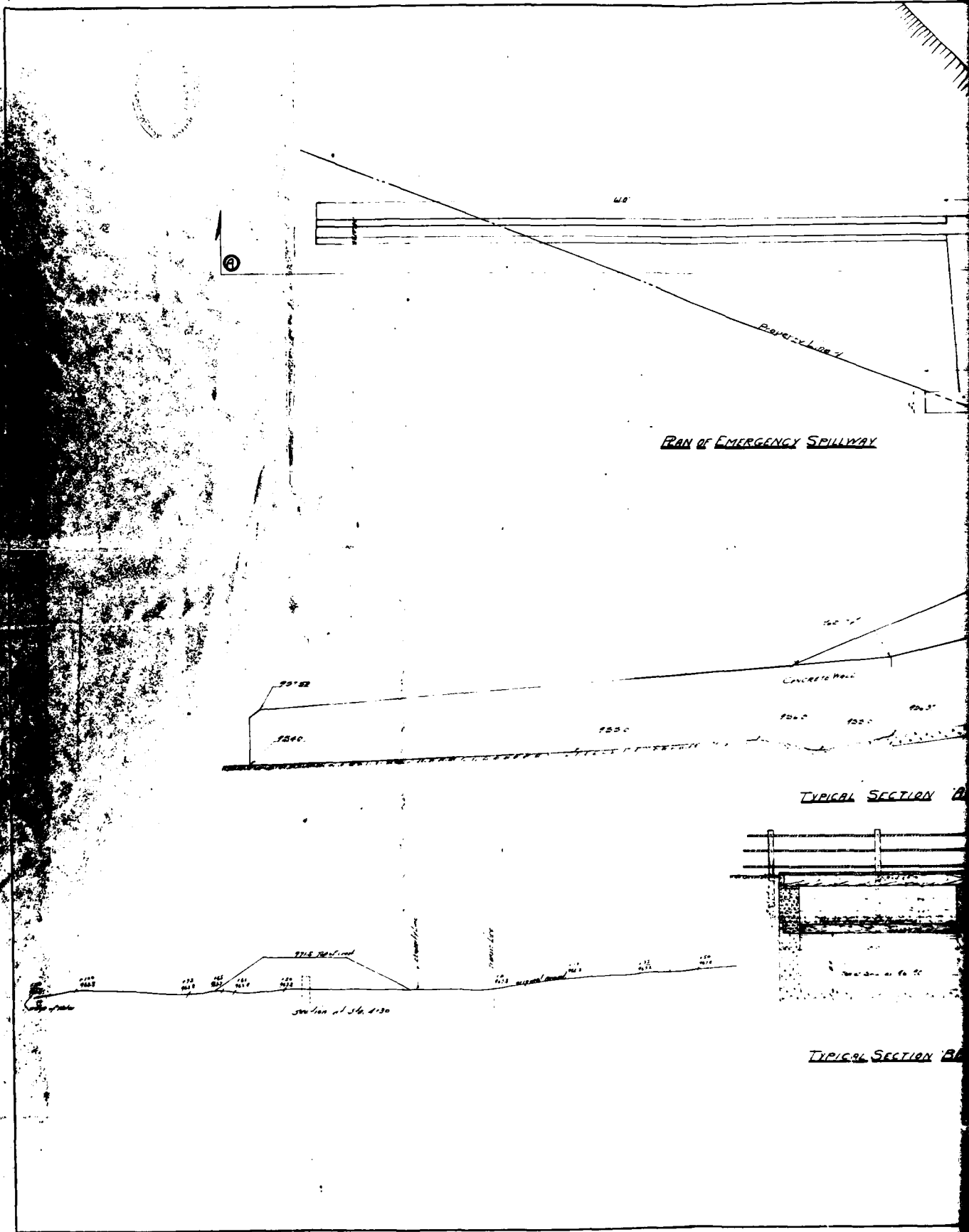
MADE BY J. E. L. H. R. J. A. 30-1927

Scales 1"=50'
 1"=20'



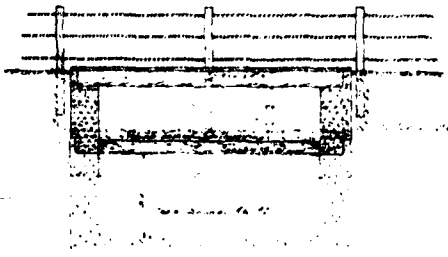


FRANKLIN TOWNSHIP WATER CO. FAYETTE CO PA	
Franklin Township Water Co. General Location of High Dam MADE BY J. H. H. & S. L. H. CHECKED BY CHECKED FOR SAFETY DEVICES SCALE 1" = 100' DRAWING NO. 1000	



PLAN OF EMERGENCY SPILLWAY

TYPICAL SECTION AA

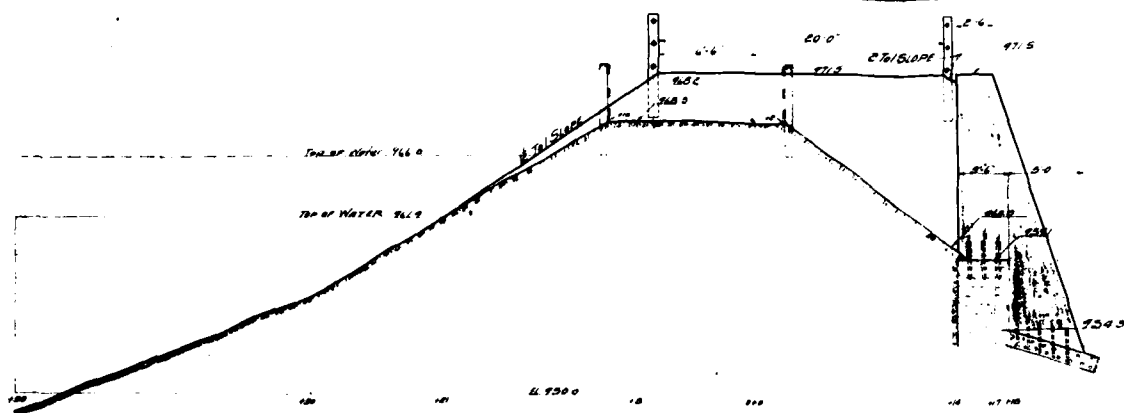


TYPICAL SECTION BB

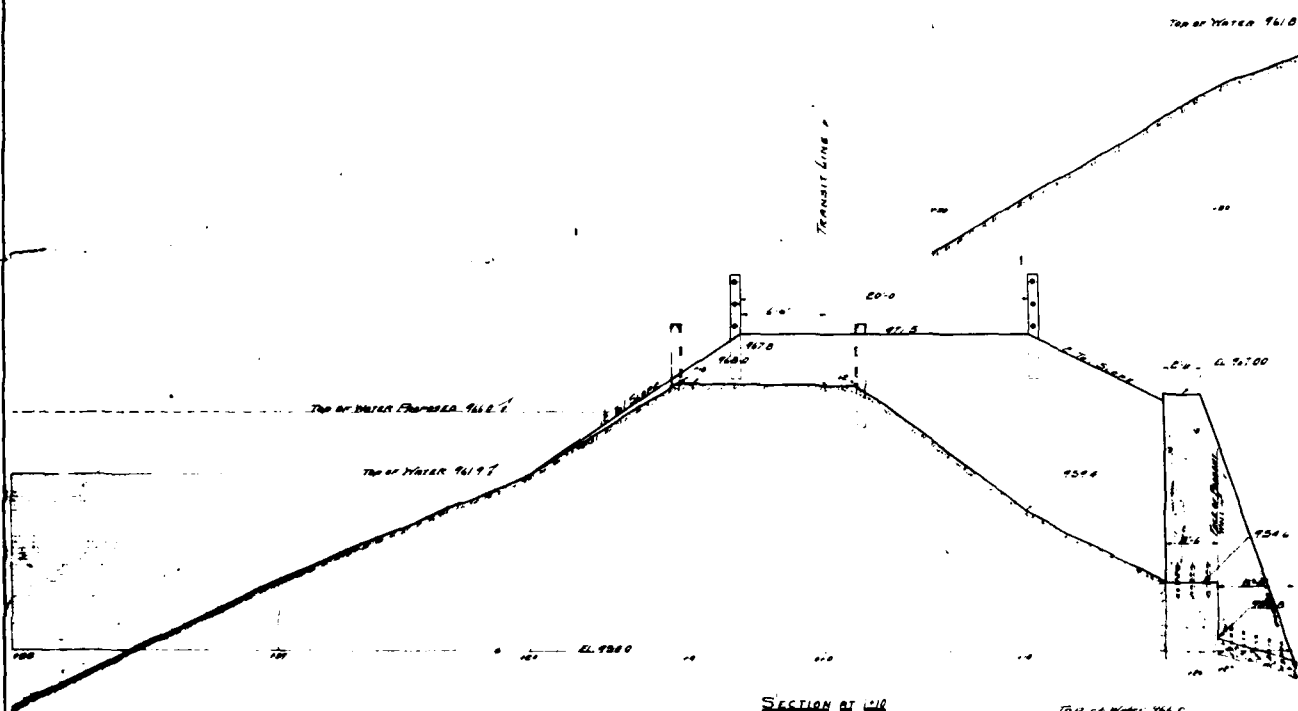
SCALE
1" = 10' HORIZONTAL
1" = 10' VERTICAL

2

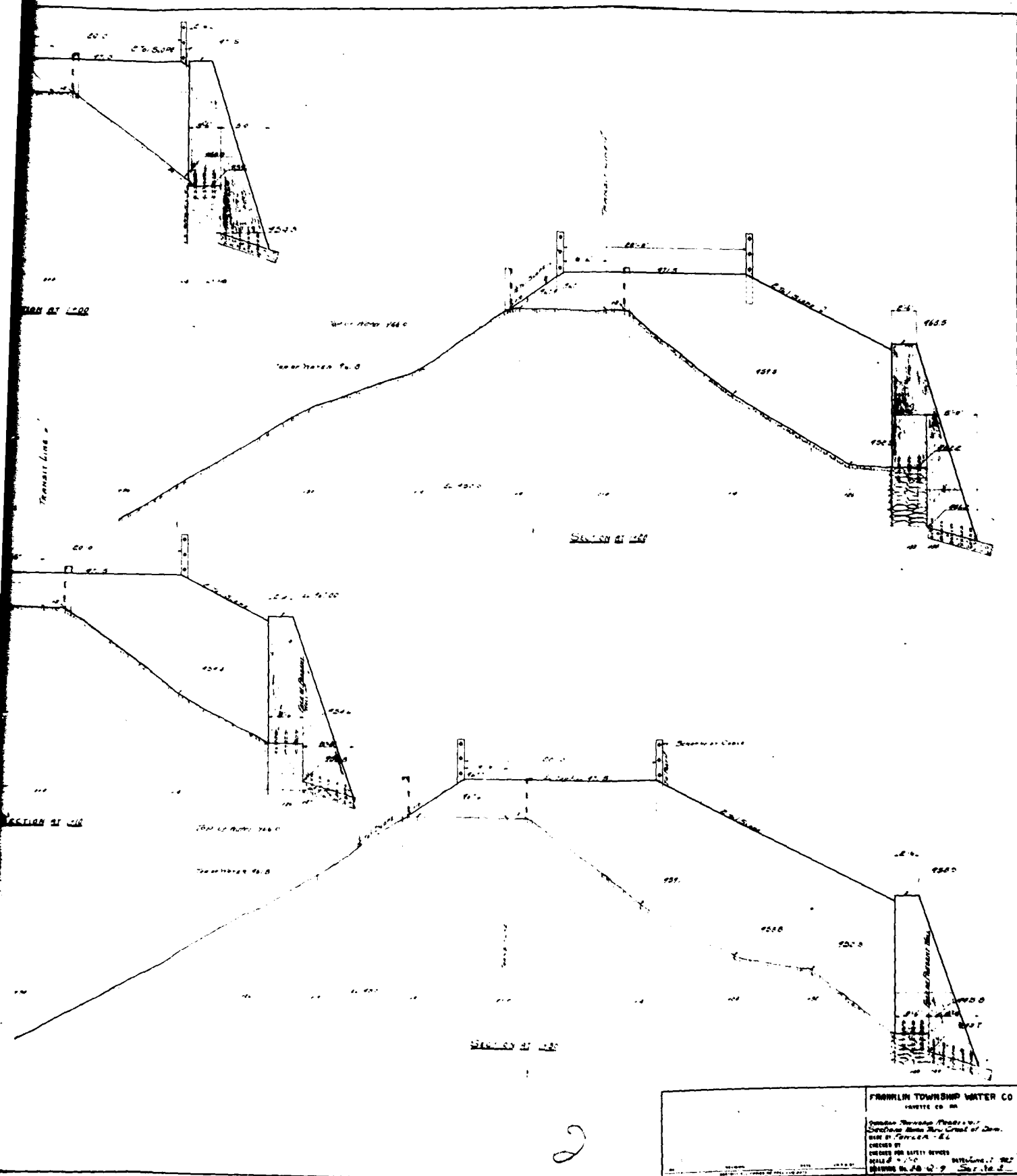
FRANKLIN TOWNSHIP WATER CO.	
DAYTON, OHIO	
DESIGNED BY: [Signature]	
CHECKED BY: [Signature]	
SCALE: 1" = 10'	SHEET NO. 1 OF 1
DRAWING NO. 100-100	



SECTION AT 1+00



SECTION AT 1+10



APPENDIX F

GEOLOGY

AD-A087 756

ACKENHEIL AND ASSOCIATES INC PITTSBURGH PA F/G 13/13
NATIONAL DAM INSPECTION PROGRAM. COLONIAL DAM NUMBER 1. (NDI NU--ETC(U)
MAY 80 J P HANNAN, J E BARRICK DACW31-80-C-0026
NL

UNCLASSIFIED

2-2

DATE

FORMED

DTIC

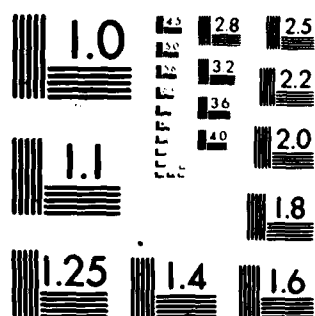
END

DATE

FORMED

9 80

DTIC



MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS 1963-A

GEOLOGY

Geomorphology

Colonial Dam No. 1 is located in the Pittsburgh Plateau section of the Appalachian Plateau physiographic province. This region is characterized by essentially flat lying strata at an altitude great enough to have permitted deep valley cutting by streams. The rounded hilltops near the dam are commonly at Elev. 1200 to 1300 feet and in a regional sense are part of a broad undulating plateau. The valley bottom near the dam site ranges from Elev. 900 to 1000 feet. The crest of the dam is about Elev. 971.5. Allen Run, on which the dam is located, is a tributary of Redstone Creek. Predominant control of topography is by differential susceptibilities to weathering, rather than by underlying structure.

Structure

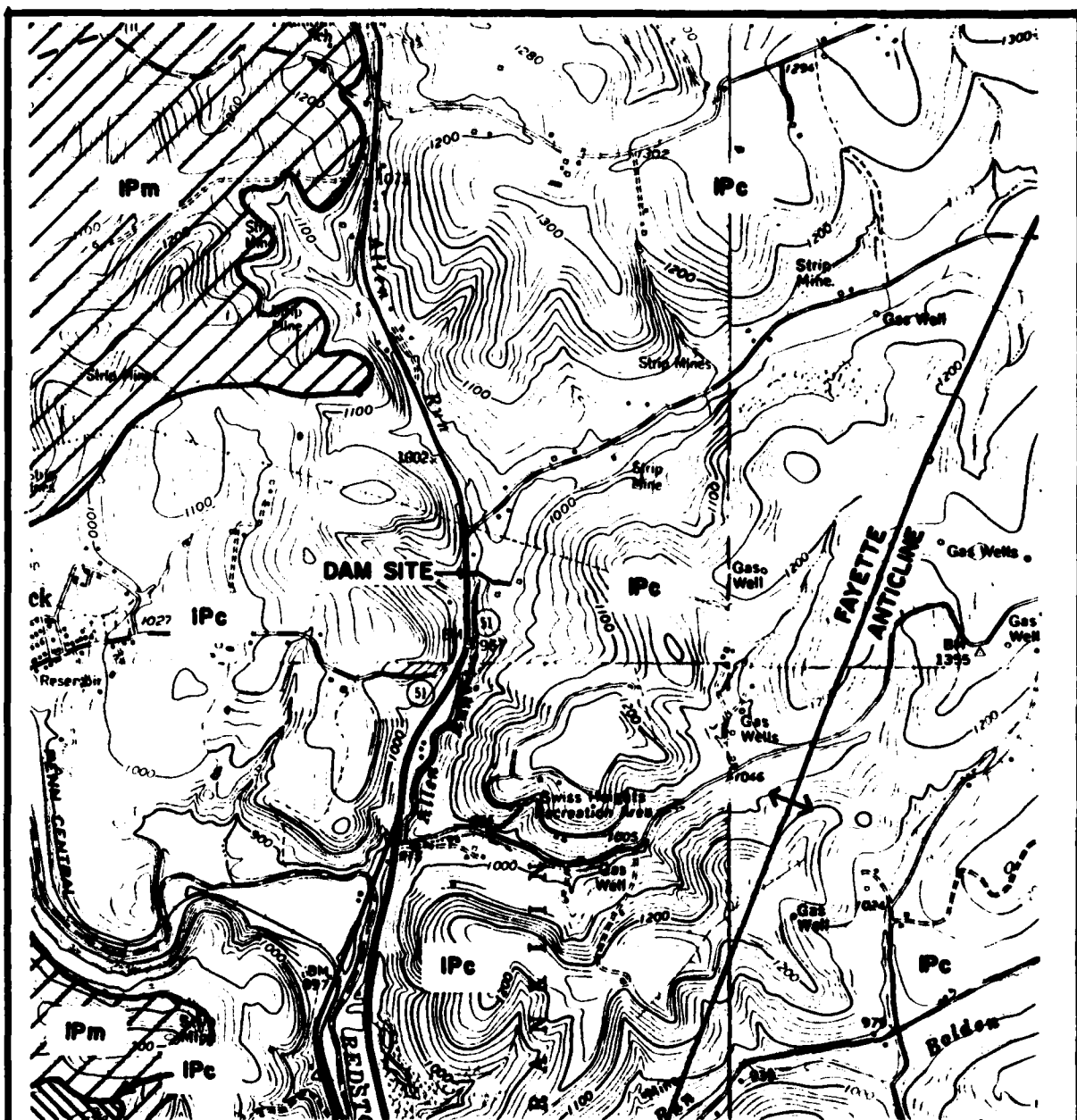
General: Colonial Dam No. 1 lies approximately 7/8 mile west of the axis of the Fayette Anticline. The general strike of this axis is N30°E. This anticline is typical of the broad series of anticlines and synclines of the Pittsburgh Plateau. A stratum near the dam site, believed to be the Saltsburg Sandstone, dips 5° to the northwest.

Faulting: No observations were made that would indicate faulting in the rocks outcropping around the dam site. In general, only a few evidences of faulting have been observed in all of Fayette County.

Stratigraphy

General: Rocks outcropping in the vicinity of Colonial Dam No. 1 are of Middle Pennsylvanian Age. They belong to the Saltsburg Member, which is part of the Glenshaw Formation, Conemaugh Group. The prominent bed which outcrops at the dam site is the Saltsburg Sandstone.

Saltsburg Sandstone: This member is highly variable in composition ranging from a massive thick bedded sandstone to a sandy shale or shale. Its thickness in the vicinity of Colonial Dam No. 1 is approximately 60 ft. Near Colonial Dam No. 1, the Saltsburg sandstone is separated from the overlying shales by an unconformity.



**FAYETTE CITY, DAWSON, NEW SALEM, AND UNIONTOWN QUADRANGLES
FAYETTE COUNTY, PENNSYLVANIA**

SCALE: 0 1/2 MILE 1:24000
CONTOUR INTERVAL 20 FT. DATUM IS MEAN SEA LEVEL
FORMATION CONTACT

DATA OBTAINED FROM PENNSYLVANIA TOPOGRAPHIC AND GEOLOGIC SURVEY, GEOLOGIC MAP OF FAYETTE COUNTY, PENNSYLVANIA, 1940 and COAL AND SURFACE STRUCTURE MAP OF FAYETTE COUNTY, PENNSYLVANIA, 1940

DATE: MAY 1980		COLONIAL DAM No. 1 NATIONAL DAM INSPECTION PROGRAM		GEOLOGIC MAP
SCALE: 1" = 2000				
DR:	CK:	A. C. ACKENHEIL & ASSOCIATES, INC. CONSULTING ENGINEERS PITTSBURGH, PA., CHARLESTON, W. VA. & BALTIMORE, MD.		

AGE	SCORE	PERCENT	COLUMNAR SECTION	PROMINENT BEDS
QUATERNARY				PLEISTOCENE GLACIAL OUTWASH, RIVER TERRACE DEPOSITS AND ALLUVIUM
PERMIAN	DURAND (P-1)	WYTHE		UPPER WASHINGTON LIMESTONE
		WASHINGTON		WASHINGTON COAL
		WYTHESSBURG		WYTHESSBURG SANDSTONE
		WYTHESSBURG		WYTHESSBURG COAL
PENNSYLVANIAN	MORGANTHAU (P-2)	LANCASTER		LANCASTER SANDSTONE LANCASTER COAL
		SEWICKLEY		SEWICKLEY COAL
		PITTSBURGH		PITTSBURGH SANDSTONE PITTSBURGH COAL
		PITTSBURGH		PITTSBURGH COAL
	CONEMAUGH (P-3)	CORNELIUSVILLE		CORNELIUSVILLE SANDSTONE
		MORGANTOWN		MORGANTOWN SANDSTONE
		AMES		AMES LIMESTONE PITTSBURGH RED BEDS
		BALTIMORE		BALTIMORE SANDSTONE
	ALLEGANY (P-4)	MANHATTAN		MANHATTAN SANDSTONE
		UPPER FREEPORT		UPPER FREEPORT COAL
		UPPER KITTANNING		UPPER KITTANNING COAL
		WORTHINGTON		WORTHINGTON SANDSTONE
	MARTINSBURG (P-5)	LOWER KITTANNING		LOWER KITTANNING COAL
		HORSEWOOD		HORSEWOOD SANDSTONE
		MERCER		MERCER SANDSTONE, SHALE & COAL
		CONROQUENESSING		CONROQUENESSING SANDSTONE
MISSISSIPPIAN	POTOMAC (P-6)	BURGOON		BURGOON SANDSTONE
		CUTWING		CUTWING SHALE
		BEREA		BEREA SANDSTONE

DATE: MAY 1980

SCALE: NONE

DR: JF

CK: JPH

COLONIAL DAM No. 1

NATIONAL DAM INSPECTION PROGRAM

A. C. ACKENHEIL & ASSOCIATES, INC.

CONSULTING ENGINEERS

PITTSBURGH, PA., CHARLESTON, W. VA. & BALTIMORE, MD.

GEOLOGIC
COLUMN

DATE
FILMED
9-8