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OHIO RIVER BASIN
YELLOW CREEK
INDIANA COUNTY

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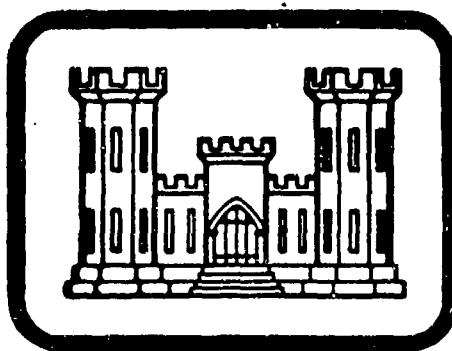
PENNSYLVANIA

NDI No. PA 00851
PENN DER No. 32-81

POND No.4 DAM

ROCHESTER AND PITTSBURGH COAL 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

BY

→ ACKENHEIL & ASSOCIATES GEO SYSTEMS, INC.
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JULY 1981

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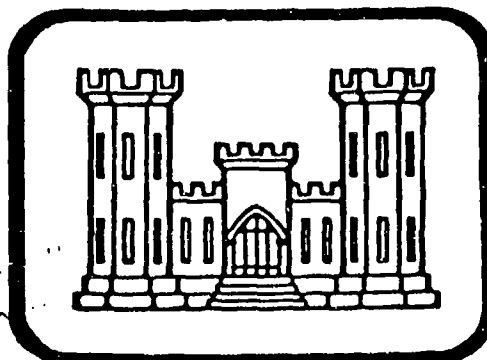
OHIO RIVER BASIN

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INDIANA COUNTY, COMMONWEALTH OF PENNSYLVANIA
NDI No. PA 00851
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Prepared for: DEPARTMENT OF THE ARMY
Baltimore District, Corps of Engineers
Baltimore, Maryland 21203

Prepared by: ACKENHEIL & ASSOCIATES GEO SYSTEMS, INC.
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1000 Banksville Road
Pittsburgh, Pennsylvania 15216

Date: July, 1981

PREFACE

This report is prepared under guidance contained in the Recommended Guidelines for Safety Inspection of Dams for Phase I investigations. Copies of these guidelines may be obtained from the Department of the Army, Office of Chief of Engineers, Washington, DC 20314.

The purpose of a Phase I investigation is to identify expeditiously those dams which may pose hazards to human life or property. The assessment of the general condition of the dam is based upon 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 detected 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 some 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

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

SYNOPSIS OF ASSESSMENT AND RECOMMENDATIONS

NAME OF DAM:	Pond No. 4 Dam
STATE LOCATION:	Pennsylvania
COUNTY LOCATION:	Indiana
STREAM:	Yellow Creek
DATE OF INSPECTION:	May 7, 1981
COORDINATES:	Lat. 40° 32.9'
	Long. 79° 4.9'

ASSESSMENT

Pond No. 4 Dam is classified as a "small" size, "significant" hazard dam, with a recommended 1/2 PMF spillway design flood.

(Probable maximum flood)
Based on the review and evaluation of available design information and visual observations of conditions as they existed on the dates of the field reconnoissances, the general condition of Pond No. 4 Dam is assessed poor.

This evaluation is specifically based on a steep upstream embankment slope, sparse vegetation cover on the crest and upstream slope, and minor slope distress and tree and woody shrub growth on the downstream embankment. Seeps located along the downstream embankment toe also represent a potential hazard and warrant periodic observation by the dam owner. In addition, the unprotected spillway channel bottom and sideslopes may also present hazard to the dam during large spillway discharges.

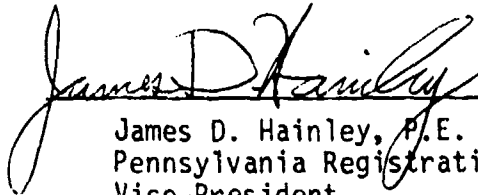
Analysis using the HEC-1 Dam Safety version computer program indicated the spillway channel section can pass the recommended 1/2 PMF spillway design flood without overtopping the embankment crest. Spillway discharge capacity is therefore considered adequate.

RECOMMENDATIONS

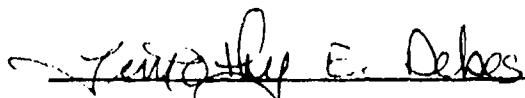
The following recommendations should be implemented as soon as possible:

1. Provide erosion protection for spillway channel sideslopes and bottom.
2. Periodically observe seepage located along the downstream embankment toe. If an increase in flow quantity or evidence of erosion is observed, immediately notify the Department of Environmental Resources, Dam Safety Division, and obtain the services of a qualified professional engineer experienced in the design of dams to develop a plan for correction.
3. Develop and institute a flood surveillance, warning, and evacuation plan.
4. Repair and seed disturbed and bare embankment crest and slope surface areas.
5. Remove tree and woody shrub growth from downstream embankment slope.
6. Develop and implement method for draining pond under emergency situations and provide means for upstream closure for all pipes installed through the embankment.

POND NO. 4 DAM
NDI I.D. No. PA 00851

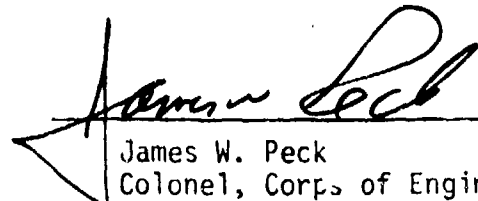

James D. Hainley, P.E.
Pennsylvania Registration No. 9453-E
Vice-President

7/16/81
Date


Timothy E. Debes, P.E.
Project Engineer

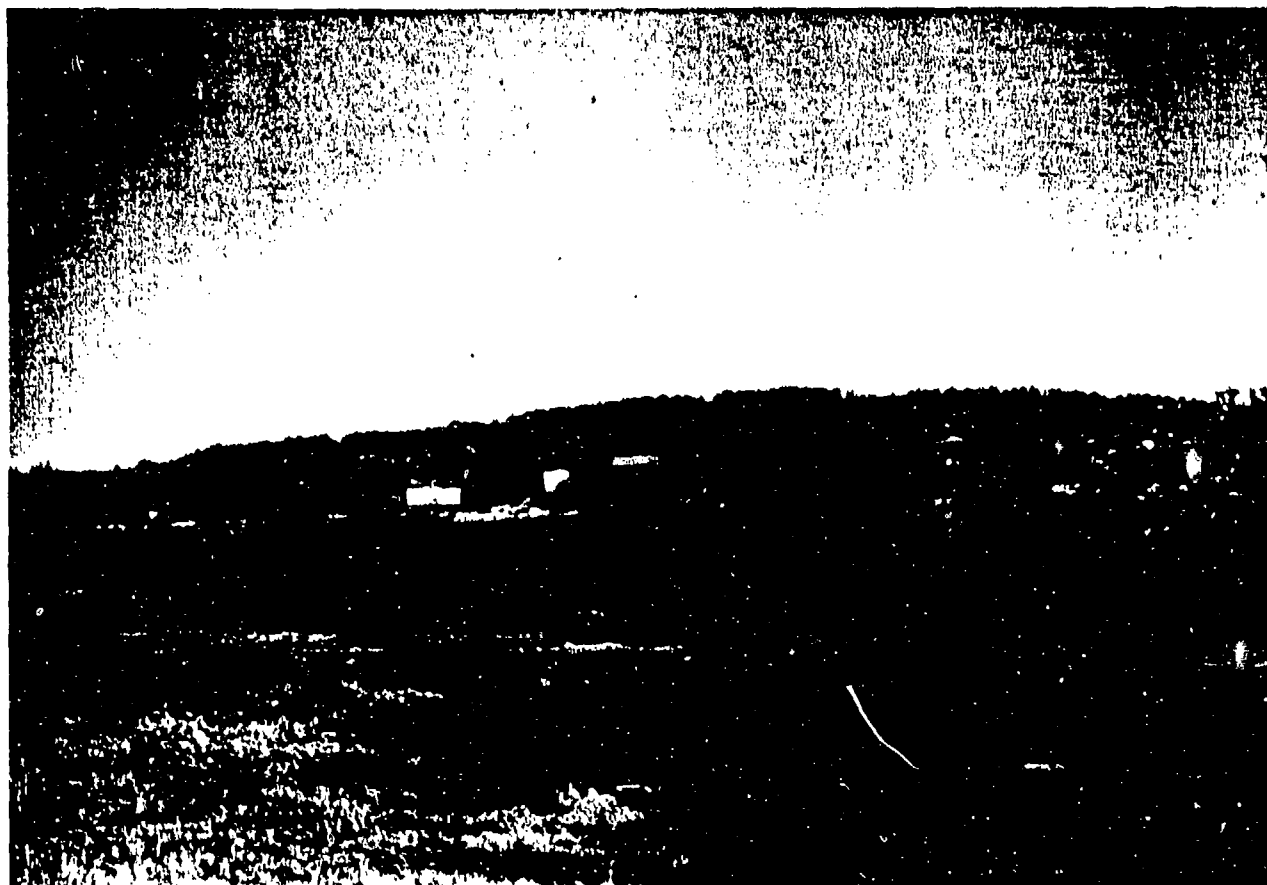
7/16/81
Date

APPROVED BY:


James W. Peck
Colonel, Corps of Engineers
Commander and District Engineer

11 Aug 81
Date

POND NO. 4 DAM



OVERVIEW OF DAM

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NATIONAL DAM INSPECTION PROGRAM
POND NO. 4 DAM
NATIONAL I.D. NO. PA 00851
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SECTION 1
PROJECT INFORMATION

1.1 GENERAL

- A. AUTHORITY: This 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 this investigation is to determine if the dam constitutes a hazard to human life or property.

1.2 DESCRIPTION OF PROJECT

A. DAM AND APPURTENANCES

1. Embankment: According to available information, Pond No. 4 Dam was constructed as a homogeneous earthfill structure. The dam embankment measures 4,060 feet long, 31.5 feet high, and has an average crest width of 12.5 feet. The upstream embankment slope is partially vegetated and very steep with a typical inclination of 1.2H:1V. The downstream embankment slope is inclined 2.5H:1V and has a dense grass covering. Refer to Field Sketch, Appendix A and Photographs No. 1, 2, 3 and 4.
2. Outlet Works: Outlet works consist of 6 inch diameter pipes used to decant coal slurry water from the settling pond. The pipes were installed both vertically and horizontally at selected locations along the dam embankment perimeter. Vertical decant pipes discharge into abandoned underground mines located beneath the settling pond. Four (4) vertical decant pipes were observed and these were located outside the pond area. The vertical drain pipes also appeared clogged. The horizontal decant pipes were installed through the embankment and reportedly discharged into treatment ponds located near the toe of the downstream embankment slope. Visual observations indicate only one of these drain pipes is functional.
3. Spillway Channel: The existing spillway section is an excavated open channel in the dam embankment. The spillway channel is trapezoidal in shape and has unprotected sideslopes and channel bottom. Existing pool level is maintained at El. 1062.5 by the channel bottom of the excavated spillway section. Water from the spillway is discharged onto a flat, partially vegetated land area located along an asphalt paved township road.

- B. LOCATION: Pond No. 4 Dam is located in Homer City, Indiana County, Pennsylvania, approximately 4 miles south of Indiana. The dam is not situated across a natural stream channel. Runoff from Pond No. 4 watershed is discharged into Yellow Creek, a south flowing tributary of Two Lick Creek. From this confluence, Two Lick Creek flows south into the Conemaugh River, which is part of the Ohio River Basin.

- C. SIZE CLASSIFICATION: Pond No. 4 Dam has a toe to crest height of 31.5 feet and a maximum storage volume of 292 acre feet at Elevation 1071.5. Based on Corps of Engineers guidelines, this dam is classified as a "small" size structure.
- D. HAZARD CLASSIFICATION: In the event of a dam failure, the Homer City Water Works and several inhabited dwellings located on the floodplain below the dam could be inundated and subject to possible damage. The loss of a few lives could also result. Pond No. 4 Dam is therefore classified as a "significant" hazard dam.
- E. OWNERSHIP: Pond No. 4 Dam is owned by the Rochester & Pittsburgh Coal Company. Correspondence should be addressed to:
- Rochester & Pittsburgh Coal Co.
655 Church St.
Indiana, Pa. 15701
Attn: Mr. James Schaeffer
Phone: (412) 349-5800.
- F. PURPOSE OF DAM: Pond No. 4 was designed and constructed as a coal slurry settling pond impoundment. The settling pond is not presently in use and has been temporarily abandoned.
- G. DESIGN & CONSTRUCTION HISTORY: Pond No. 4 Dam was designed and constructed by the Rochester & Pittsburgh Coal Co., Indiana, Pa. The dam embankment was reportedly constructed in 1961 by company personnel.
- H. NORMAL OPERATING PROCEDURE: Pond No. 4 was designed to operate as an uncontrolled impoundment. Under existing operating conditions, pool level is maintained by the channel bottom of the spillway section.

1.3 PERTINENT DATA

Note: The elevations given below are based on mean sea level and were interpreted from an undated topographic map prepared by the Rochester & Pittsburgh Coal Company.

A. <u>Drainage Area</u> :	0.9 sq. mi.
B. <u>Discharge at Dam Facility</u> :	
Maximum Flood at dam facility	Unknown
Spillway capacity at top of dam	1046 cfs
C. <u>Elevation (feet above MSL)</u>	
Design top of dam	Unknown
Existing top of dam (minimum)	1071.5
Existing top of dam (maximum)	1075
Spillway crest	
Design	Unknown
Existing	1062.5
Normal pool	
Design	Unknown
Existing	1062.5
Horizontal Decant Pipe inlet invert	1065.5
Horizontal Decant Pipe outlet invert	1065.0
Vertical Decant Pipe Inlets	Unknown

Vertical Decant Pipe Outlets
Streambed at dam centerline
Downstream embankment toe

Unknown
N/A
1040

D. Reservoir Length

Length of maximum pool
Length of normal pool

5880 feet
3820 feet

E. Reservoir Storage

Existing top of dam
Spillway crest
Existing pool
Sediment pool

292 acre-feet
92 acre-feet
92 acre-feet
Unknown

F. Reservoir Surface

Existing top of dam
Spillway crest
Existing pool
Sediment pool

26.8 acres
15.8 acres
15.8 acres
Unknown

G. Embankment

Type
Length
Height
Design
Existing
Crest width
Slopes
Downstream
Upstream
Cutoff provisions
Grout curtain

Earthfill
4060 feet
Unknown
31.5 feet
12.5 feet
2.5H:1V
1.2H:1V
None
None

H. Spillway Channel

Type
Width (Average)
Length
Approach Channel Slope
Discharge Channel Slope
Gate

Unprotected, trapezoidal earth channel
12.5 feet
40 feet
Unknown
Unknown
None

I. Outlet Works

1) Vertical Decant Pipes

Type
Length
Valve Control

6 inch dia. steel
Unknown
None

2) Horizontal Decant Pipes

Type
Upstream Flow Control
Length
Anti-seep Collars
Valve Control

6 inch dia. cast iron pipe
None
30 ft.
None
None

SECTION 2 ENGINEERING DATA

2.1 DESIGN

- A. DATA AVAILABLE: The Pennsylvania Department of Environmental Resources, Harrisburg, Pennsylvania, did not have on file any written information or data concerning Pond No. 4 Dam.

However, Rochester & Pittsburgh Coal Co., 655 Church St., Indiana, Pennsylvania, has the following drawings:

1. Silt Pond Cross Sections and Profile along Length of Silt Pond, dated 6/13/62.
2. Coal Refuse Reclamation Permit, Lucerne Silt Pond undated.

- B. DESIGN FEATURES: The engineering criteria used to design and construct the pond embankment in 1961 is unknown. Principal design features are illustrated on the Field Sketch, Appendix A, and Plan and Cross Section Drawings, Appendix E.

1. Embankment: The homogeneous earthfill embankment reportedly was constructed of predominately silt and clay soil without toe or blanket filter drains. Cross Section drawings indicate upstream and downstream embankment slopes were originally designed to be constructed at 1.5H:1V inclinations. Later modifications increased the crest width from 10 feet to approximately 12.5 feet and flattened the downstream embankment slope to a 2.5:1V inclination.
2. Outlet Works: Vertical decant pipes were installed above the locations of abandoned mine rooms and connecting tunnels. The steel pipes were installed in preaugered holes to specified installation depths. The top pipe end sections were capped and the top pipe wall sections perforated with 1 inch holes. Horizontal decant pipes were installed through the dam embankment at three locations. These pipes are made of cast iron and were designed to outlet into water treatment ponds. The pipes also serve as auxiliary outlets during periods of heavy rainfall.
3. Spillway Section: The existing spillway channel section was reportedly excavated into the dam embankment within the last two or three years, after the settling pond was abandoned. The sideslopes and bottom of the spillway channel are unprotected and have partially eroded earthfill surfaces. The spillway channel section measures 12.5 feet in height and has a width of 5 feet at the channel bottom and 20 feet at the dam crest.

- 2.2 CONSTRUCTION: Rochester & Pittsburgh Coal Company, Indiana, Pennsylvania, constructed Pond No. 4 Dam in 1961. Construction of the dam embankment was performed and supervised by company personnel.

- 2.3 MODIFICATIONS: In 1962 the embankment crest was widened and raised, and additional fill was placed on the downstream slope at a 2.5H:1V inclination. More recently, an open channel was excavated in the dam embankment to serve as a spillway outlet.

2.4 OPERATION: The Rochester and Pittsburgh Coal Company is responsible for the operation of Pond No. 4 Dam. Spillway and pipe outlets are uncontrolled and performance and operation records are not maintained. The dam does not have a dam tender.

2.5 EVALUATION

- A. AVAILABILITY: Available design information and drawings were obtained from the Rochester and Pittsburgh Coal Company, Indiana, Pennsylvania.
- B. ADEQUACY: The available design information and drawings, supplemented by engineering analysis presented in succeeding sections, is adequate for the purpose of this Phase I study.
- C. VALIDITY: Based on the available data, there appears to be no reason at this time to question the validity of the available design information and drawings.

SECTION 3
VISUAL INSPECTION

3.1 FINDINGS

A. GENERAL: The field reconnaissance of Pond No. 4 Dam was performed on May 7, 1981 and consisted of:

1. Visual observation of the embankment crest and slopes, abutments, and surficial conditions.
2. Visual observation of the spillway channel section, pond shoreline, and watershed.
3. Visual observation of downstream conditions and evaluation of the downstream hazard.
4. Transit stadia survey of relative elevations along a 600 feet section of embankment crest and across the spillway channel and embankment slopes.

Visual observations were made during a period when the pond was not in use, with pool level at approximately El. 1062.5.

The visual observation checklist, field plan, profile, and section are presented in Appendix A. Specific observations are illustrated on photographs in Appendix C.

B. EMBANKMENT:

1. Embankment Surface: The embankment crest and upstream slope were partially vegetated with grass and appeared to vary in elevation and inclination, respectively, around the embankment perimeter. However, no tension cracks or indications of settlement were observed. The downstream embankment slope had a dense grass covering and appeared generally stable. However, minor sloughing of embankment surface material was observed at the location shown on the Field Sketch. This localized slope failure is attributed to a steep embankment incline and lack of adequate vegetation cover. Tree and woody shrub growth were also observed at several locations on the downstream slope and along the embankment toe.

Field survey measurements indicated the upstream and downstream embankment slopes are inclined 1.2H:1V and 2.5H:1V, respectively, not 2H:1V as shown on design drawings. Refer to Photographs No. 1, 2, 3, and 4 and Plate No. 2, Appendix E.

2. Seepage: Seepage zones were observed along the downstream embankment toe at the locations shown on the Field Sketch. The seepage zones were generally small in surface area and had estimated flow rates of about 1 gpm. There was no visible evidence of erosion channels or movement of soil fines at either discharge. However, the dense vegetation cover may have obscured the presence of soil fines or erosion. A notable increase in vegetation cover and growth was also observed at these areas and along the embankment toe.

Ponded water and a marshy land area were also observed approximately 100 feet below the dam embankment. These land areas are situated in a topographic low and are subject to surface runoff and drainage from a roadside ditch.

Five (5) of six (6) water treatment ponds located at the downstream embankment toe were filled with water. The source of the water observed in the ponds is unknown, but may also be a result of surface runoff.

C. APPURTENANT STRUCTURES

1. Outlet Works: Four 6 inch diameter vertical decant pipes were observed at the locations shown on the Field Sketch. All vertical decant pipes were partially or fully clogged and buried within 2 to 3 feet of the capped top end section. None of the existing vertical decant pipes appeared functional. Refer to Photograph No. 6.

Two 6 inch diameter horizontal decant drain pipes were located. Both drain pipes were observed free of flow obstructions, but only one pipe functions as originally intended. This drain pipe is located approximately 3 feet above existing pool elevation. Refer to Photograph No. 5.

2. Spillway Channel Section: The existing spillway section is a trapezoidal open channel excavated into the dam embankment. The sideslopes and channel bottom are unprotected and have been subjected to surficial erosion caused by spillway discharges.

D. DOWNSTREAM CONDITIONS

1. Downstream Channel: The spillway discharges onto a flat, partially grassed land area located along a paved township road. The discharged water then drains into a shallow roadside drainage ditch, which eventually empties into Yellow Creek at the Route 119 bridge overpass, located approximately 1900 feet downstream from the spillway outlet.

Yellow Creek meanders approximately 1.2 miles through the center of Homer City before it converges with Two Lick Creek west of the city. Refer to Photograph No. 8 and Regional Vicinity Map.

2. Floodplain Development: Floodplain development below the pond consists of several inhabited dwellings and the Homer City Water Works. Most of these structures are situated at an elevation of greater than 10 feet above observed stream channel level. The structures are also located at a distance of greater than 0.5 mile downstream from the spillway outlet.

E. RESERVOIR

1. Slopes: Upstream reservoir slopes have moderate inclinations and are predominately covered by grass and woody shrubs. The pond shoreline is moderately steep and only partially vegetated around the embankment perimeter. No significant evidence of slope or shoreline erosion or instability was observed.

2. Sedimentation: Pond No. 4 served as a coal slurry impoundment, and as such, has a heavy sediment accumulation.
3. Watershed: Visual observations and a review of the Indiana, Pennsylvania U.S.G.S. quadrangle map indicate the watershed cover complex consists predominately of open field and forest.

3.2 EVALUATION

- A. EMBANKMENT: In general, Pond No. 4 Dam embankment crest and slopes are considered to be in poor condition. This evaluation is based on a steep upstream slope, sparse vegetation cover on upstream slope and crest, and minor slope distress, seepage and tree growth on the downstream embankment slope.

The seepage located at the downstream embankment toe is believed to originate from the pond, but this could not be conclusively established by visual observation. Although there was no visible evidence of erosion channels or movement of soil fines, dense vegetation cover may have obscured the presence of soil fines or erosion. These seeps may develop into a significant hazard. As a precautionary measure, the dam owner should periodically observe the seeps.

- B. OUTLET WORKS: The vertical decant pipes appeared clogged and are not believed functional. These drain pipes are therefore considered to be in poor condition. The horizontal decant pipes were observed free of flow obstructions and structural distress, and are assessed in good condition.
- C. SPILLWAY CHANNEL SECTION: Although the existing spillway channel section is in fair condition, the potential exists for severe erosion of the unprotected sideslopes and channel bottom. Riprap of adequate size and weight should be provided.
- D. HAZARD POTENTIAL: Based on observations of downstream conditions, Pond No. 4 Dam was assigned a "significant" hazard potential rating.

SECTION 4 OPERATIONAL FEATURES

- 4.1 PROCEDURE. Under existing conditions, settling pond pool level is maintained by the crest of the spillway. The spillway channel is ungated and does not have a dam tender.
- 4.2 MAINTENANCE OF DAM. The dam embankment is maintained by the Rochester & Pittsburgh Coal Company. Maintenance reportedly consists of periodically repairing eroded surfaces, removing debris, and occasionally dredging sections of the pond. Maintenance is generally performed on an as-needed basis.
- 4.3 INSPECTION OF DAM. The dam embankment is infrequently inspected by the dam owner. When performed, inspections generally consist of visually examining the embankment and spillway channel section for distress and erosion.
- 4.4 WARNING SYSTEM. There is no formal warning system or emergency procedure to alert downstream inhabitants upon the threat of a dam failure.
- 4.5 EVALUATION. Inspection and maintenance procedures at Pond No. 4 Dam are considered marginal. Formal flood surveillance, warning, and evacuation plans should be developed for the protection of downstream residents.

SECTION 5
HYDROLOGY AND HYDRAULICS

5.1 EVALUATION OF FEATURES

- A. DESIGN DATA: Pond No. 4 watershed cover complex consists predominately of forest and open field, and has an area of approximately 516 acres. The existing dam structure impounds about 92 acre-feet of water and unconsolidated coal fines. Top of dam storage capacity is an estimated 292 acre-feet. Normal pool level is maintained at El. 1062.5 by the crest of the excavated spillway channel.

No hydrologic calculations were available relating pond-spillway performance to a designated spillway design flood.

- B. EXPERIENCE DATA: Records are not kept of reservoir stage elevations or rainfall amounts. There is no record or report of the dam embankment ever being overtopped during a period of heavy rainfall.

- C. VISUAL OBSERVATIONS: Spillway channel sideslopes and bottom are not protected and have undergone surficial erosion. The potential exists for heavy spillway discharges to erode embankment materials and widen the spillway channel. Erosion of channel sideslopes and removal of embankment material is not considered likely to prevent the spillway channel from functioning. However, this potential erosion condition, unless prevented, will endanger dam stability.

- D. OVERTOPPING POTENTIAL: The U. S. Army Corps of Engineers dam safety guidelines recommend design storms of 100 year to 1/2 PMF (Probable Maximum Flood) for "small" size, "significant" hazard dams. Based on the evaluation of the downstream hazard and the potential for loss of life, a 1/2 PMF spillway design flood is considered appropriate.

The 1/2 PMF inflow hydrograph for Pond No. 4 Dam was modeled utilizing the HEC-1 Dam Safety version computer program. Computer computation of this hydrograph yielded a 1/2 PMF inflow rate of 880 cfs.

Varying percentages of the spillway design flood were routed through the spillway channel section to estimate the percent PMF outflow that can be passed without overtopping the dam embankment. HEC-1 Dam Safety version computer analysis indicated the spillway can hydraulically pass 1/2 PMF without overtopping. A Summary of the hydrologic/hydraulic analysis, including supporting calculations, is presented in Appendix D.

- E. ADEQUACY OF SPILLWAY CHANNEL: Spillway adequacy was evaluated in accordance with procedures and guidelines established by the U. S. Army Corps of Engineers for Phase I hydraulic and hydrologic studies. The recommended spillway design flood (SDF) is 1/2 PMF.

Routing analysis indicates the spillway channel has a maximum safe discharge capacity of 1046 cfs, or about 83 percent PMF. According to guideline criteria, Pond No. 4 Dam spillway capacity is adequate.

- F. DOWNSTREAM CHANNEL: Outflow from the spillway channel section is discharged onto a flat grassy land area, which empties into a

roadside drainage ditch. The drainage ditch parallels a paved township road and eventually empties into Yellow Creek, approximately 0.4 mile downstream of the spillway channel section. Yellow Creek meanders about 1.6 miles before it converges with Two Lick Creek, just outside the city limits of Homer City. Several dwellings located within the downstream floodplain are expected to be inundated, with the possible loss of a few lives.

roadside drainage ditch. The drainage ditch parallels a paved township road and eventually empties into Yellow Creek, approximately 0.4 mile downstream of the spillway channel section. Yellow Creek meanders about 1.6 miles before it converges with Two Lick Creek, just outside the city limits of Homer City. Several dwellings located within the downstream floodplain are expected to be inundated, with the possible loss of a few lives.

SECTION 6
STRUCTURAL STABILITY

6.1 AVAILABLE INFORMATION

- A. DESIGN AND CONSTRUCTION DATA: No calculations or references were found from the available information relating to subsurface explorations, laboratory testing, slope stability, or seepage analyses.
- B. OPERATING RECORDS: There are no written operating records or procedures for Pond No. 4 Dam.
- C. POST CONSTRUCTION CHANGES: In September 1962, the dam crest and downstream embankment slope were respectively raised and widened, and flattened to improve embankment stability. More recently, an open channel section was excavated into the dam embankment to serve as a spillway outlet.

6.2 EVALUATION

- A. DESIGN DOCUMENTS: The available design documentation was considered inadequate to evaluate the dam structure. No structural or stability calculations were available for review.
- B. VISUAL OBSERVATIONS
 - 1. Embankment: Field observation of seepage emanating from the downstream embankment slope was not adequate to ascertain the exact cause and origin of the seepage, but the seepage is believed to originate from the pond. It is recommended as a precautionary measure that the Rochester and Pittsburgh Coal Company periodically observe the seeps to note any change of conditions and if necessary obtain the services of a professional engineer experienced in the design of dams to develop corrective measures. Minor sloughing of surface soils, observed on the downstream embankment slope, is attributed to a steep inclination and lack of vegetation cover. However, this localized slope distress is not considered to represent a significant hazard at this time. Tree and woody shrub growth on the downstream embankment slope is also considered a detriment to dam stability. In general, the structural condition of the dam appears marginal at the present time.
 - 2. Spillway Channel: Visual observations of the spillway channel section revealed evidence of erosion on unprotected sideslopes and channel bottom. If this condition is not corrected, severe erosion may result and endanger dam stability.
- C. SEISMIC STABILITY: According to the Seismic Risk Map of the United States, Pond No. 4 Dam is located in Zone 1 where damage due to earthquakes would most likely be minor. Based upon this low seismic probability and recommended criteria for the evaluation of the seismic stability of dams, the seismic stability of Pond No. 4 Dam is presumed to be adequate under these earthquake conditions. However, no calculations were available or developed by this study to verify this assessment.

SECTION 7
ASSESSMENT AND RECOMMENDATIONS

7.1 ASSESSMENT

A. EVALUATION

1. Embankment: The seepage located along the toe of the downstream embankment slope is believed to originate from the pond, but this could not be conclusively established by visual observation. Although the seeps may not represent a significant hazard to the dam embankment at this time, the seeps should be periodically observed as a precautionary measure. Minor slope distress and unprotected embankment and crest surfaces are considered a detriment to dam safety and should be repaired and seeded, respectively.

Based on visual observations of surficial conditions reported in Section 3, Pond No. 4 Dam is considered to be in poor condition.

2. Outlet Works: The vertical decant pipes appeared clogged, are not believed functional, and are assessed in poor condition. The horizontal decant drain pipes were observed free of flow obstructions and are considered to be in good condition.
3. Spillway Channel:
 - a. Condition: The condition of the existing spillway channel is considered to be fair. This is based on the observation of unprotected and eroded channel sideslopes and bottom.
 - b. Adequacy: HEC-1 Dam Safety Version routing analysis indicates the spillway channel section can hydraulically pass about 83 percent PMF. The recommended spillway design flood (SDF) is 1/2 PMF. Spillway discharge capacity is therefore assessed adequate in accordance with U.S. Army Corps of Engineers dam safety criteria.
- B. ADEQUACY OF INFORMATION: The available construction and performance history information and data developed by this study, were sufficient to evaluate the condition and adequacy of the embankment and spillway in accordance with U.S. Army Corps of Engineers dam safety criteria.
- C. NECESSITY FOR FURTHER INVESTIGATION: The observed condition of Pond No. 4 Dam, as is presently exists, does not require additional investigation.
- D. URGENCY: The following recommendations should be implemented as soon as possible.

7.2 RECOMMENDATIONS

A. DAM AND APPURTENANT STRUCTURES

1. Provide erosion protection for spillway channel sideslopes and bottom.

2. Periodically observe seepage located along the toe of the downstream embankment slope for any change of conditions. If increased flow quantity or evidence of erosion is observed, immediately notify The Department of Environmental Resources, Dam Safety Division, and obtain the services of a qualified professional engineer experienced in the design of dams to develop corrective measures.
3. Repair and seed disturbed and bare embankment crest and slope surface areas.
4. Remove tree and woody shrub growth from the downstream embankment slope.
5. Develop and implement a method for draining the pond under emergency situations and provide means for upstream closure of all pipes installed through the embankment.

B. OPERATION AND MAINTENANCE PROCEDURES

Develop an emergency operation and warning plan. The plan should include but not be limited to the following:

1. Surveillance: Procedures for around-the-clock surveillance during periods of heavy precipitation or runoff.
2. Warning System: Procedures for notifying downstream residents and local police authorities in the event of expected high flood flows.
3. Evacuation Plans: Emergency contingency plans to evacuate downstream residents upon the threat of a dam failure.

APPENDIX A
VISUAL OBSERVATIONS CHECK LIST AND FIELD SKETCH

VISUAL OBSERVATION CHECK LIST

Name Dam Pond No. 4 Dam County Indiana State Pennsylvania National ID # PA00851

Type of Dam Earthfill Hazard Category Class II. Significant Hazard Temperature 60°

Date(s) Inspection May 7, 1981 Weather Clear, Cool

Inspection Review Date June 23, 1981

Pool Elevation at Time of Inspection 1062.5 est. Tailwater at Time of Inspection N/A M.S.L.

Inspection Personnel:

Edward Sokol	Rochester & Pittsburgh Coal Company
Thomas DeBerti	Rochester & Pittsburgh Coal Company
Larry Miller	Ackenheil & Associates Baltimore, Maryland, Inc.
Timothy Debes	Ackenheil & Associates Baltimore, Maryland, Inc.
James Hainley	Ackenheil & Associates Baltimore, Maryland, Inc.

Recorder Timothy Debes

EMBANKMENT

<u>VISUAL EXAMINATION OF</u>	<u>OBSERVATIONS</u>	<u>REMARKS OR RECOMMENDATIONS*</u>
SURFACE CRACKS	None observed. However, dense vegetation cover over sections of the embankment crest and slopes may have obscured evidence of tension cracks.	
UNUSUAL MOVEMENT OR CRACKING AT OR BEYOND THE TOE	None observed.	
SLOUGHING OR EROSION OF EMBANKMENT AND ABUTMENT SLOPES	Minor sloughing of downstream embankment slope was evident at one location. Embankment erosion was also observed at several unprotected slope areas. Refer to Field Sketch.	
VERTICAL AND HORIZONTAL ALIGNMENT OF THE CREST	Vertical and horizontal alignment of embankment crest is irregular. Irregularities attributed to dike construction and not settlement, movement, or erosion.	
RIPRAP FAILURES	None.	

*REFER TO REPORT SECTIONS 3 AND 7

EMBANKMENT

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SETTLEMENT	None observed.	
JUNCTION OF EMBANKMENT AND ABUTMENT, SPILLWAY AND DAM	Embankment-abutment junctions observed in good condition.	
ANY NOTICEABLE SEEPAGE	Seepage observed along downstream embankment toe at several locations. Seepage observed clear, with flow rates of about 1 gpm. location of seeps.	Refer to Field Sketch for
STAFF GAGE AND RECORDER	None.	
DRAINS	Steel drain pipes were originally used to decant collected coal slurry water into underground mine shafts and tunnels. The observed drain pipes were clogged and did not appear functional.	

OUTLET WORKS

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CRACKING AND SPALLING OF CONCRETE SURFACES IN OUTLET CONDUIT	N/A	
INTAKE STRUCTURE	N/A	
OUTLET STRUCTURE	N/A	
OUTLET PIPE		Outlet pipes consist of two 6 inch diameter cast iron pipes used to drain clarified coal slurry water into water treatment ponds. Outlet pipes were observed free of flow obstructions and appeared to be in good condition.
EMERGENCY GATE	None.	

UNGATED SPILLWAY

<u>VISUAL EXAMINATION OF</u>		<u>OBSERVATIONS</u>	<u>REMARKS OR RECOMMENDATIONS</u>
CONCRETE WEIR	None.		
APPROACH CHANNEL	None	Spillway section consists of an excavated open channel in the pond embankment. Spillway section located approximately 350 feet from the right abutment.	
DISCHARGE CHANNEL		Excavated spillway channel section discharges water downstream of the pond embankment onto a flat grassy area located along a paved township road.	
BRIDGE AND PIERS	None.		

INSTRUMENTATION

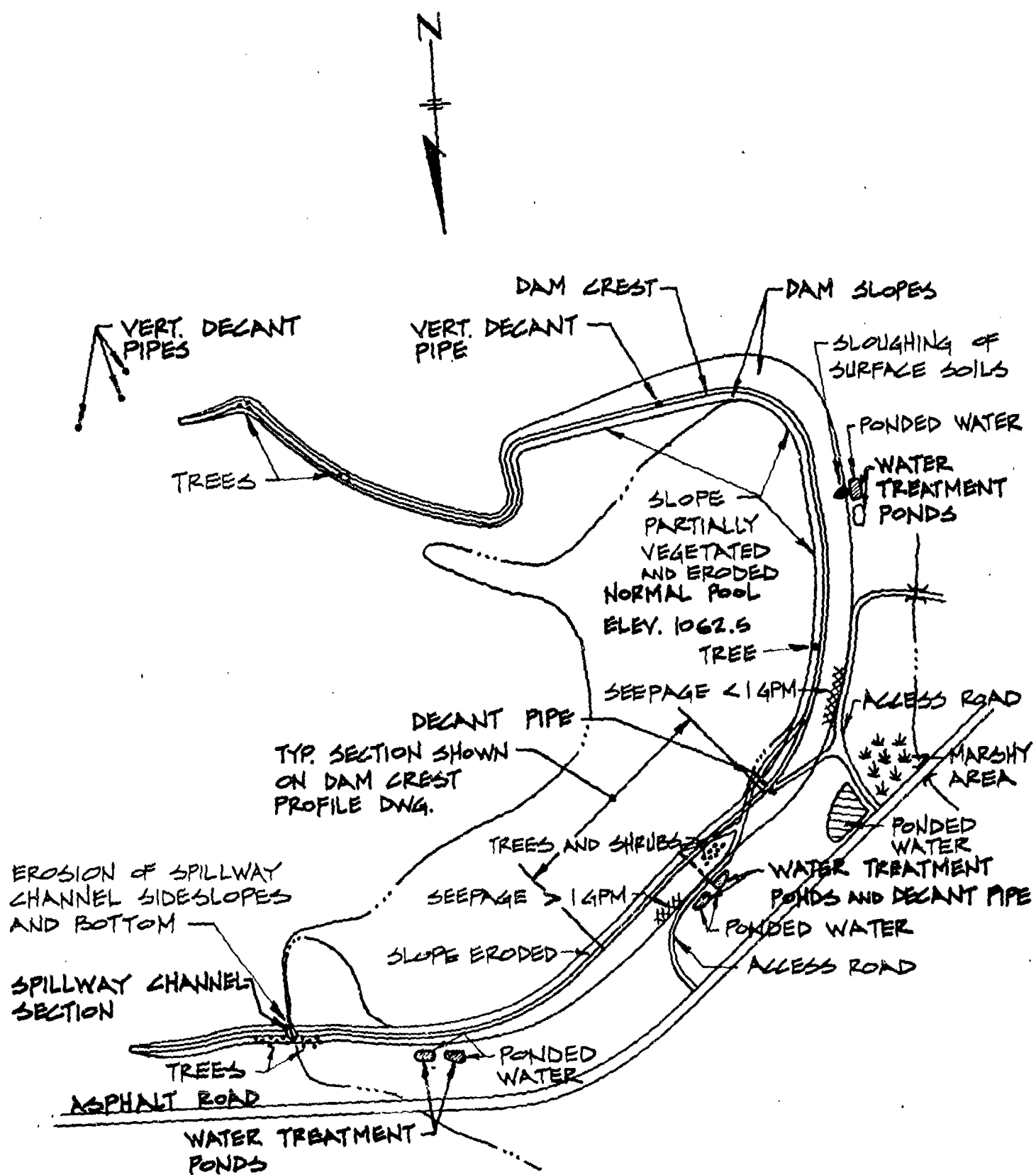
<u>VISUAL EXAMINATION OF</u>	<u>OBSERVATIONS</u>	<u>REMARKS OR RECOMMENDATIONS</u>
MONUMENTATION/SURVEYS	None observed or reported.	
OBSERVATION WELLS	None observed or reported.	
WEIRS	None observed or reported.	
PIEZOMETERS	None observed or reported.	
OTHER	N/A	

POND

VISUAL EXAMINATION OF		OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SLOPES		Pond shoreline observed to have steep inclinations and sparse vegetation cover. However, only minor evidence of slope erosion or sloughing was evident.	
SEDIMENTATION		Pond No. 4 served as a coal slurry impoundment, and as such, has a heavy sediment accumulation.	

DOWNSTREAM CHANNEL

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONDITION (OBSTRUCTIONS, DEBRIS, ETC.)	The immediate downstream channel reach consists of a flat, grassed land area and a shallow roadside drainage ditch, which eventually empties into Yellow Creek.	
SLOPES	Drainage ditch channel slopes are generally steep and unvegetated. Yellow Creek channel slopes have mild to moderate inclinations and generally have a dense vegetation cover.	
APPROXIMATE NO. OF HOMES AND POPULATION	Floodplain development below the pond consists of several inhabited dwellings and the Homer City Water Works. Most of these structures are situated at least 10 feet higher in elevation than the stream channel and at least 0.4 mile downstream of the spillway outlet. In the event of a dam failure these structures may be inundated with the possible loss of a few lives.	



FIELD SKETCH
POND No. 4 DAM

A-9

ELEV. (FT.)

1100

1080

1040

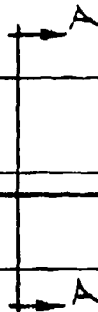
1075.2

1075

1075

|||||

|||||



TYP. SECTION OF DA
1" = 40' FOR LOCATION

ELEV. (FT.)

1080

1070

1060

12'

1.2

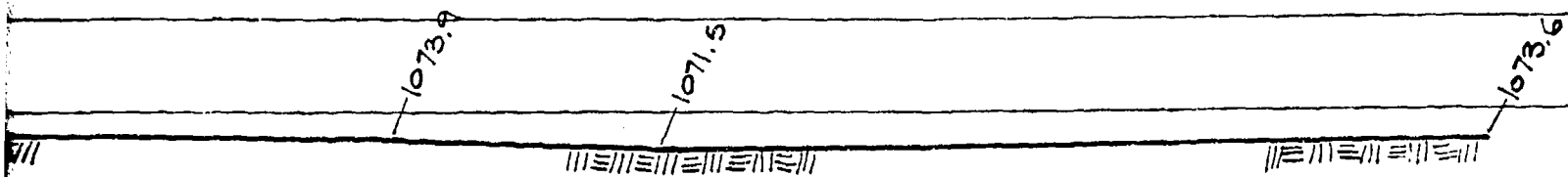
2.5



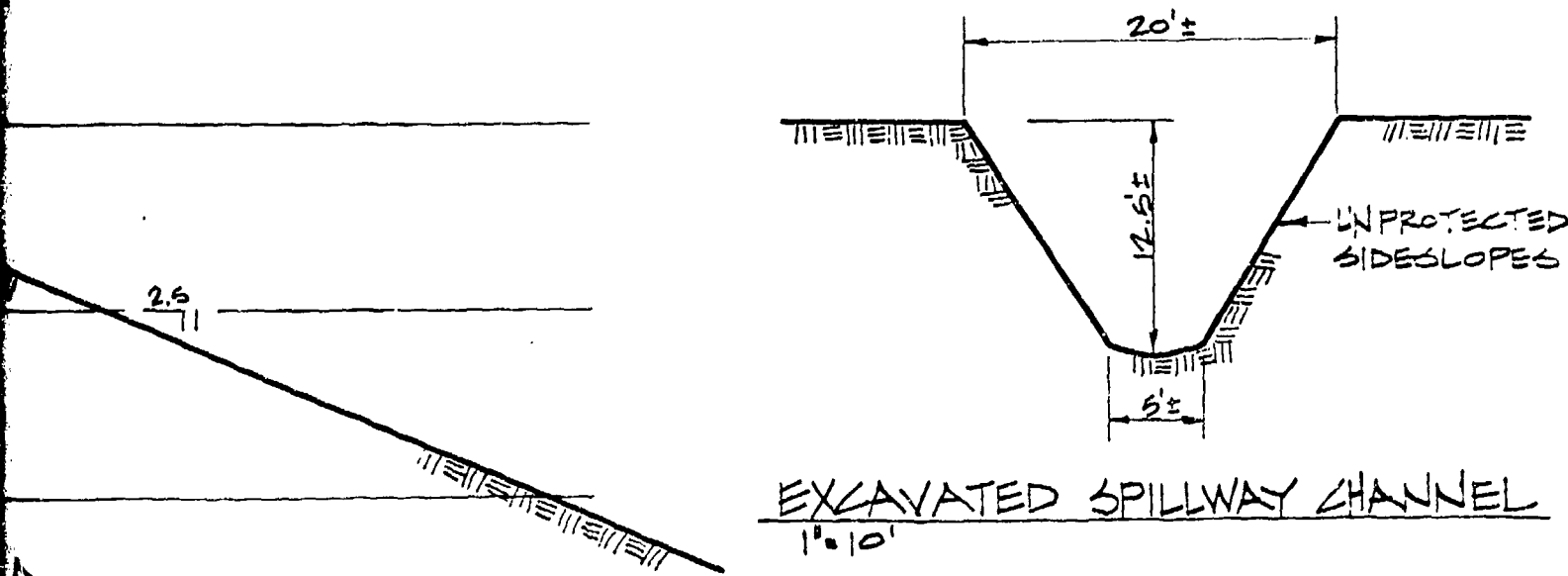
|||||

|||||

SECTION A-A
1" = 10'



N OF DAM CREST PROFILE (LOOKING UPSTREAM)
 LOCATION SEE FIELD SKETCH (DWG. A-9)



DATE: JUNE 29, 81	POND NO. 4 DAM	DAM CREST PROFILE AND SECTIONS
SCALE: AS SHOWN	NATIONAL DAM INSPECTION PROGRAM	
DR: JLM CK: TED	ACKENHEIL & ASSOCIATES CONSULTING	
DWG. NO. A-10	GEO SYSTEMS, INC. ENGINEERS 1000 BANKEVILLE RD/PITTSBURGH PA 15216	

APPENDIX B

CHECK LIST
ENGINEERING DATA
DESIGN, CONSTRUCTION, OPERATION
PHASE 1

CHECK LIST
ENGINEERING DATA
DESIGN, CONSTRUCTION, OPERATION
PHASE 1

NAME OF DAM Pond No. 4 Dam

ID # PA00851

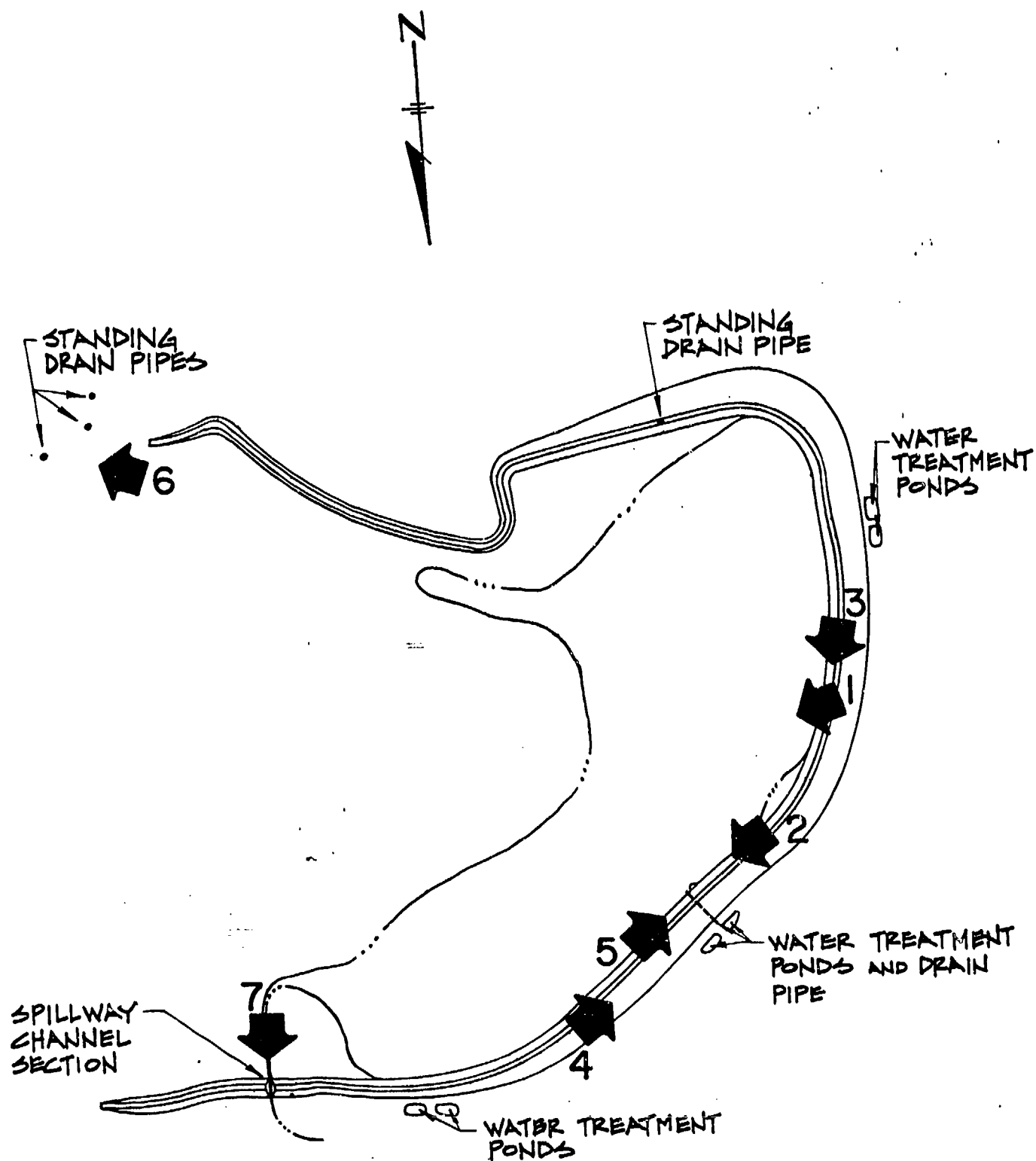
ITEM	REMARKS
AS-BUILT DRAWINGS	No as built drawings are available. Two (2) design drawings were provided by the Rochester & Pittsburgh Coal Company.
REGIONAL VICINITY MAP	See Appendix E. U.S.G.S. 7.5 minute Indiana, Pennsylvania Quadrangle Map showing dam site location.
CONSTRUCTION HISTORY	Pond embankment designed and constructed by Rochester & Pittsburgh Coal Company in 1961.
TYPICAL SECTIONS OF DAM	See Plate No. 2.
OUTLETS - PLAN DETAILS CONSTRAINTS DISCHARGE RATINGS	Non-Available.
RAINFALL/RESERVOIR RECORDS	Non-Available.

ITEM	REMARKS
DESIGN REPORTS	None available.
GEOLOGY REPORTS	None available.
DESIGN COMPUTATIONS HYDROLOGY & HYDRAULICS DAM STABILITY SEEPAGE STUDIES	None available.
MATERIALS INVESTIGATIONS BORING RECORDS LABORATORY FIELD	None available.
POST-CONSTRUCTION SURVEYS OF DAM	None reported.
BORROW SOURCES	Borrow reportedly obtained from on-site sources.

ITEM	REMARKS
MONITORING SYSTEMS	None reported.
MODIFICATIONS	Embankment crest raised and widened, and downstream slope flatten in 1962.
HIGH POOL RECORDS	None.
POST CONSTRUCTION ENGINEERING STUDIES AND REPORTS	None available.
PRIOR ACCIDENTS OR FAILURE OF DAM DESCRIPTION REPORTS	None reported.
MAINTENANCE OPERATION RECORDS	None available.

ITEM	REMARKS
SPILLWAY PLAN	
SECTIONS	None available. See Plan and Profile Section Drawing, Appendix A.
DETAILS	
OPERATING EQUIPMENT PLANS & DETAILS	None available.
SPECIFICATIONS	None available.
MISCELLANEOUS	See Report Section 2.1A, Data Available.

APPENDIX C
PHOTOGRAPHS



PHOTOGRAPH
KEY MAP

C-1

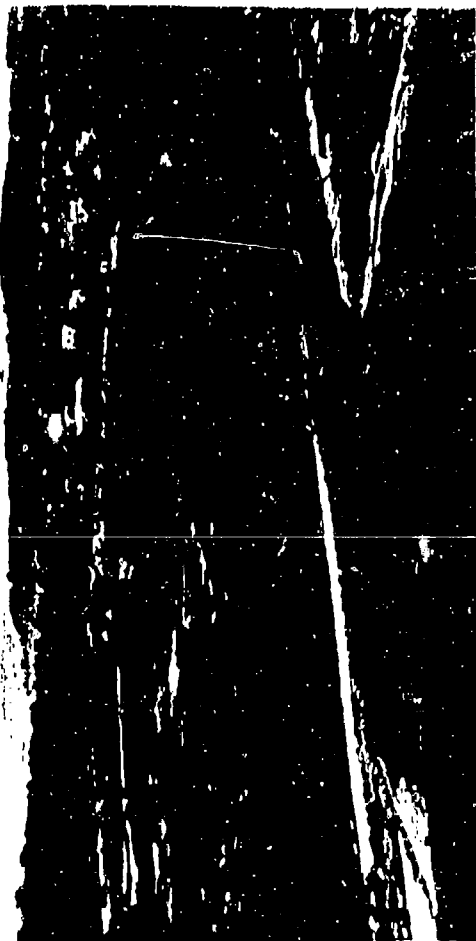
- PHOTOGRAPH 1 Overview of settling pond and dam embankment in background.
- PHOTOGRAPH 2 Overview of embankment crest and upstream slope, 1000 feet from right abutment. Note sparse vegetation cover and steep slope inclination.
- PHOTOGRAPH 3 View of embankment crest and slopes 1300 feet from right abutment. Note tree and brush growth on slopes and sparse vegetation cover on crest.
- PHOTOGRAPH 4 Overview of downstream embankment slope, 500 feet from right abutment.



2



4



1



3

C-2

PHOTOGRAPH 5

View of 6 inch diameter water treatment drain pipe.

PHOTOGRAPH 6

Close-up view of 6 inch diameter steel standing drain pipe. Note perforations in pipe.

PHOTOGRAPH 7

View of excavated spillway channel section, 350 feet from right abutment. Note unprotected and eroded sideslopes and channel bottom.

PHOTOGRAPH 8

Downstream hazard located approximately 0.5 miles below the spillway channel section.



6



5



7

8

C-3

APPENDIX D,
HYDROLOGIC AND HYDRAULIC
ENGINEERING AND
COMPUTER DATA

APPENDIX D HYDROLOGY AND HYDRAULICS

Methodology: The dam overtopping analysis was accomplished using the system-ized 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 of Engineers.

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 give these parameters, their definition and how they were obtained for these analyses.

<u>Parameter</u>	<u>Definition</u>	<u>Where Obtained</u>
C_t	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
L_{ca}	Length on main stream to centroid of watershed	From U.S.G.S. 7.5 minute topographic map
C_p	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: Watershed cover complex consists
predominately of forest and open field.

ELEVATION TOP NORMAL POOL (STORAGE CAPACITY): 1062.5 feet (92 acre feet)

ELEVATION TOP FLOOD CONTROL POOL (STORAGE CAPACITY): 1071.5 feet (292 acre-feet)

ELEVATION MAXIMUM DESIGN POOL: 1071.5 feet

ELEVATION TOP DAM: 1071.5 feet

- a. Elevation 1062.5 feet
- b. Type Trapezodial earth channel
- c. Width 5 feet at channel bottom, 20 feet at dam crest
- d. Length 40 feet
- e. Location 350 feet from right abutment
- f. Number and Type of Gates None

OUTLET WORKS

- a. Type 6 inch diameter steel and cast iron decant pipes.
- b. Location Left abutment and along perimeter of embankment
- c. Entrance Invert C.I. Pipe 1065.5
- d. Exit Invert C.I. Pipe 1065
- e. Emergency Drawdown Facilities None

HYDROMETEOROLOGICAL GAGES

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

MAXIMUM NON-DAMAGING DISCHARGE Approximately 1046 cfs.

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

NAME OF DAM:	Pond No. 4 Dam NDI ID. No. PA 00851
Probable Maximum Precipitation (PMP)	23.7 inches
Drainage Area	0.9 sq. mi.
Reduction of PMP Rainfall for Data Fit Reduce by 20% therefore PMP rainfall =	19.0 inches
Adjustments of PMF for Drainage Area	Zone 7
6 hrs.	102%
12 hrs.	120%
24 hrs.	130%
48 hrs.	140%
Snyder Unit Hydrograph Parameters	
Zone	Zone 24
C_p	0.45
C_t	1.6
L	2.0 miles
L_{ca}	1.2 miles
$t_p = C_t (L + L_{ca})^{0.3}$	2.08 hour
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.
Base Flow Cutoff	0.05 inch/hour
Recession Ratio	2.0
Spillway Section Data	
Channel Width (Average)	12.5 feet
Freeboard	12.5 feet
Discharge Coefficient	3.1
Exponent	1.5
Discharge Capacity	1046 cfs

*Hydrometeorological Report 33

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

BY TED
DATE 5-20-81
CHECKED KES
DATE 5-21-81

ACKENHEIL & ASSOCIATES
CONSULTING ENGINEERS
BALTIMORE, MARYLAND

PROJECT NO. 80074

SUBJECT: POND STORAGE VOLUME VS ELEVATION
POND NO. 4 DAM

SHEET NO. DS OF

1. SURFACE AREA

RESERVOIR SURFACE AREAS FOR STAGE
ELEVATIONS WERE PLANIMETERED FROM TOPOGRAPHIC
MAP PREPARED BY ROCHESTER + PITTSBURGH COAL
COMPANY.

<u>ELEVATION</u>	<u>SURFACE AREA</u>
	0 ACRES
1050 FT.	6.31
1055	10.80
1060	20.79
1065	24.28
1070	31.59
1075	

2. STORAGE VOLUME

STORAGE VOLUME WAS CALCULATED BY
AVERAGE END AREA METHOD.

ELEV	1050 - 1055	$VOL = (0 + 6.31) \div 2 \times 5 = 15.8$ ACRE-FT.
	1055 - 1060	$VOL = (6.31 + 10.80) \div 2 \times 5 = 42.8$
	1060 - 1065	$VOL = (10.80 + 20.79) \div 2 \times 5 = 78.98$
	1065 - 1070	$VOL = (20.79 + 24.28) \div 2 \times 5 = 112.68$
	1070 - 1075	$VOL = (24.28 + 31.59) \div 2 \times 5 = 139.68$

<u>ELEVATION</u>	<u>Σ VOLUME</u>
	0 ACRE FT
1050 FT.	15.8
1055	58.6
1060	137.6
1065	250.3
1070	389.9
1075	

BY TED
DATE 5-20-81
CHECKED KES
DATE 5-21-81

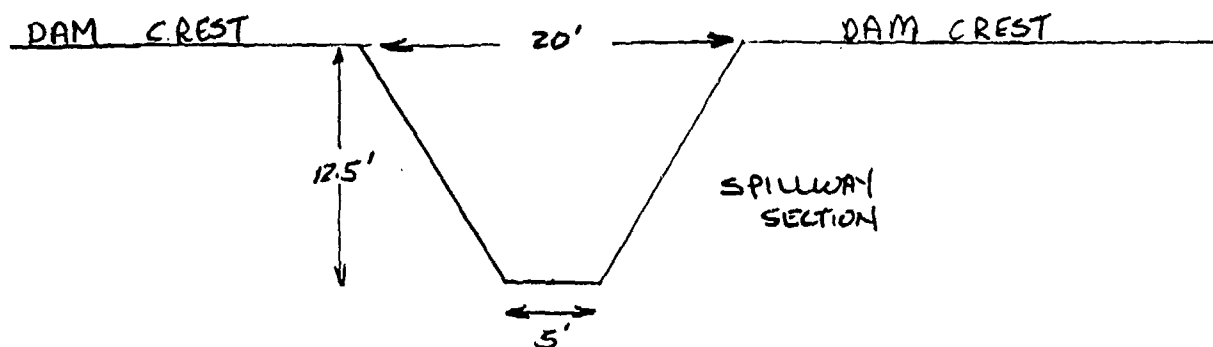
ACKENHEIL & ASSOCIATES
CONSULTING ENGINEERS
BALTIMORE, MARYLAND

PROJECT NO. 80074

SUBJECT: SPILLWAY SECTION DISCHARGE CAPACITY
POND NO. 4 DAM

SHEET NO. 06 OF

1. PROFILE OF SPILLWAY SECTION



2. FIND AREA OF TRAPEZOID

$$A = (20' + 5') \div 2 \times 12.5' = 156.25 \text{ ft}^2$$

3. FIND EQUIVALENT RECTANGLE DIMENSIONS
WITH $H = 12.5'$

$$\therefore 156.25 \text{ ft}^2 \div 12.5' = 12.5'$$

4. APPROXIMATE MAX DISCHARGE AT LOW POINT
OF DAM

$$C = 3.1 \quad H = 1071.5 - 1062.5 = 9 \text{ FT.}$$

$$L = 12.5'$$

$$Q = CLH^{1.5} = 3.1 (12.5) (9)^{1.5}$$

$$= \underline{1046 \text{ cfs}}$$

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

A1	NON-BREACH ANALYSIS - POND NO. 4 DAM									
A2	COAL SLURRY SETTLING POND									
A3	PMF UNIT HYDROGRAPH BY SNYDER METHOD									
B	300	0	30	0	0	0	0	0	-4	
B1	5									
J	1	5	1							
J1	0.2	0.3	0.4	0.5	1.0					
K	0	POND						1		
K1	INFLOW HYDROGRAPH FOR POND NO.4									
M	1	1	0.9		0				1	
P		23.7	102	120	130	140				
T							1.0	0.05		
W	2.08	0.45								
X	-1.5	-0.05	2.0							
K	1	DAM						1		
K1	MOD PULS ROUTING OF FLOW THROUGH SPILLWAY SECTION									
Y			1	1						
Y1	1									92
SS	0	16	59	138	250	391				562
SE	1050	1055	1060	1065	1070	1075				1080
\$\$\$	1062.5	12.5	3.1	1.5						
\$D	1071.5	3.1	1.5	1000						
K	99									
A										
A										
A										
A										
A										

PREVIEW OF SEQUENCE OF STREAM NETWORK CALCULATIONS

RUNOFF HYDROGRAPH AT	POND
ROUTE HYDROGRAPH TO	DAM
END OF NETWORK	

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

RUN DATE: 24 JUN 81
 RUN TIME: 10.19.13

NON-BREACH ANALYSIS - POND NO. 4 DAM
 COAL SLURRY SETTLING POND
 PMF UNIT HYDROGRAPH BY SNYDER METHOD

JOB SPECIFICATION

NQ	NHR	NMIN	IDAY	IHR	IMIN	METRC	IPLT	IPRT	NSTAN
300	0	30	0	0	0	0	0	-4	0
JOPER	NWT	LROPT	RACE						
5	0	0	0						

MULTI-PLAN ANALYSES TO BE PERFORMED
 NPLAN= 1 NRTIO= 5 LRTIO= 1
 RTIOS= 0.20 0.30 0.40 0.50 1.00

SUB-AREA RUNOFF COMPUTATION

INFLOW HYDROGRAPH FOR POND NO.4

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
POND	0	0	0	0	0	1	0	0

HYDROGRAPH DATA

IHYDG	IUHG	TAREA	SNAP	TRSDA	TRSPC	RATIO	ISNOW	ISAME	LOCAL
1	1	0.90	0.0	0.90	0.0	0.0	0	1	0

PRECIP DATA

SPFE	PMS	R6	R12	R24	R48	R72	R96
0.0	23.70	102.00	120.00	130.00	140.00	0.0	0.0

TRSPC COMPUTED BY THE PROGRAM IS 0.800

LOSS DATA

LROPT	STRKR	DLTKR	RTIOL	ERAIN	STRKS	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= 2.08 CP=0.45 NTA= 0

RECESSION DATA

STRTQ= -1.50 QRCSN= -0.05 RTIOR= 2.00

UNIT HYDROGRAPH 38 END-OF-PERIOD ORDINATES, LAG= 2.09 HOURS, CP= 0.45 VOL= 1.00

12.	45.	86.	117.	123.	110.	95.	81	70.	60.
51.	44.	38.	32.	28.	24.	21.	18	15.	13.
11.	10.	8.	7.	6.	5.	4.	4	3.	3.
2.	2.	2.	2.	1.	1.	1.	1.		

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 26.54 24.13 2.41 28701.
(674.)(613.)(61.)(812.72)

HYDROGRAPH ROUTING

MOD PULS ROUTING OF FLOW THROUGH SPILLWAY SECTION

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
DAM	1	0	0	0	0	1	0	0
ROUTING DATA								
QLOSS	CLOSS	AVG	IRES	ISAME	IOPT	IPMP		LSTR
0.0	0.0	0.0	1	1	0	0		0
NSTPS	NSTD	LAG	AMSKK	X	TSK	STORA	ISPRAT	
1	0	0	0.0	0.0	0.0	92.	0	
CAPACITY=	0.	16.	59.	138.	250.	391.	562.	
ELEVATION=	1050.	1055.	1060.	1065.	1070.	1075.	1080.	
CREL	SPWID	COQW	EXPW	ELEVL	COQL	CAREA	EXPL	
1062.5	12.5	3.1	1.5	0.0	0.0	0.0	0.0	
DAM DATA								
TOPEL	COQD	EXPD	DAMWID					
1071.5	3.1	1.5	1000.					

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)

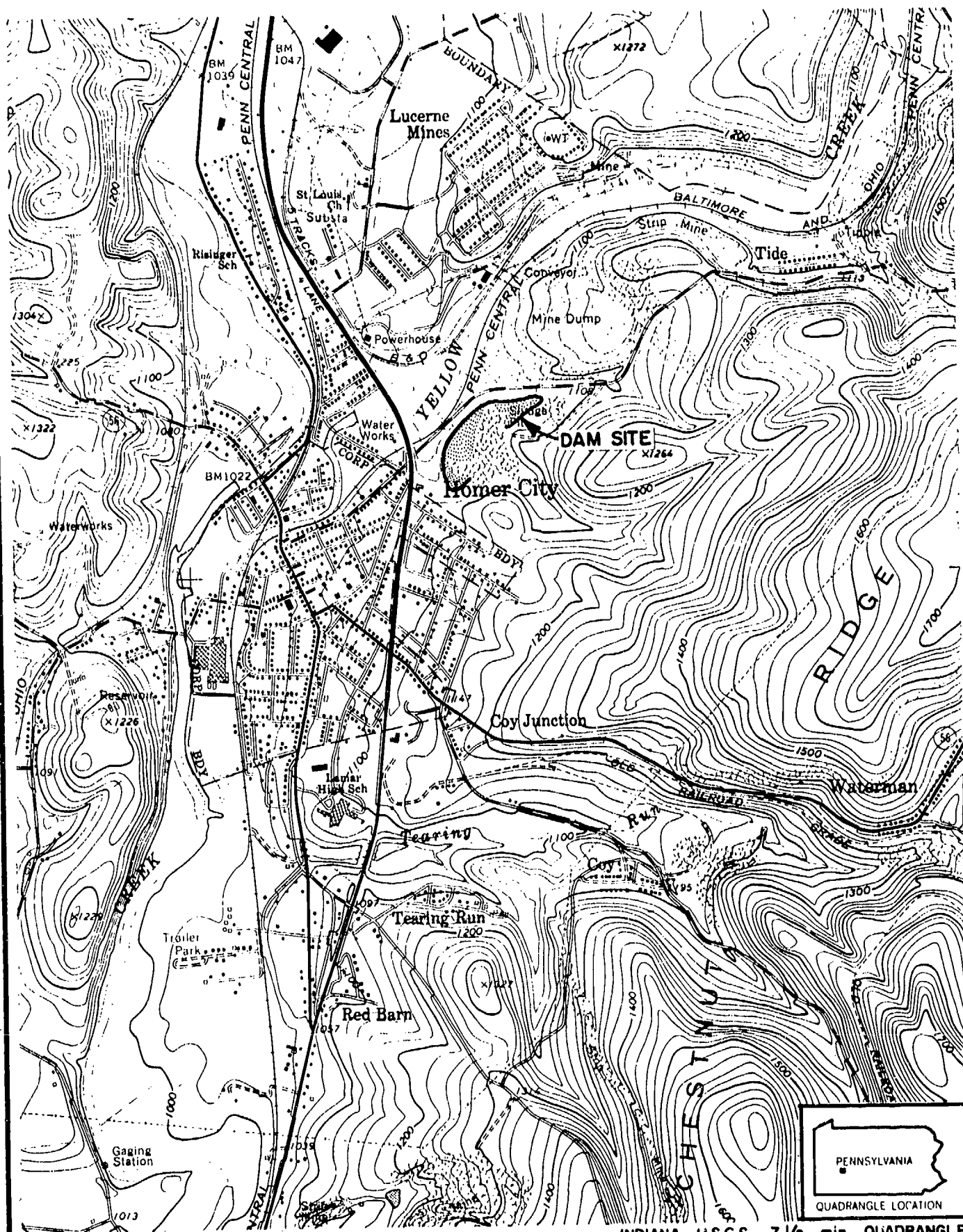
OPERATION	STATION	AREA	PLAN	RATIOS APPLIED TO FLOWS				
				RATIO 1 0.20	RATIO 2 0.30	RATIO 3 0.40	RATIO 4 0.50	RATIO 5 1.00
HYDROGRAPH AT	POND	0.90	1	351.	526.	701.	877.	1753.
	(	2.33)	(	9.93)(	14.89)(	19.86)(	24.82)(	49.65)(
ROUTED TO	DAM	0.90	1	261.	401.	547.	698.	1752.
	(	2.33)	(	7.39)(	11.36)(	15.48)(	19.77)(	49.62)(

SUMMARY OF DAM SAFETY ANALYSIS

PLAN 1		INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
ELEVATION		1062.09	1062.50	1071.50
STORAGE		92.	99.	292.
OUTFLOW		0.	0.	1046.

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
0.20	1066.07	0.0	162.	261.	0.0	44.00	0.0
0.30	1067.25	0.0	188.	401.	0.0	44.00	0.0
0.40	1068.34	0.0	213.	547.	0.0	44.00	0.0
0.50	1069.37	0.0	236.	698.	0.0	43.50	0.0
1.00	1071.85	0.35	302.	1752.	3.50	42.50	0.0

APPENDIX E
REGIONAL VICINITY MAP AND PLATES



INDIANA U.S.G.S. 7 1/2 min. QUADRANGLE

DATE: JUNE 29, 1981

SCALE: 1"=2000'

DR: F

CK: TED

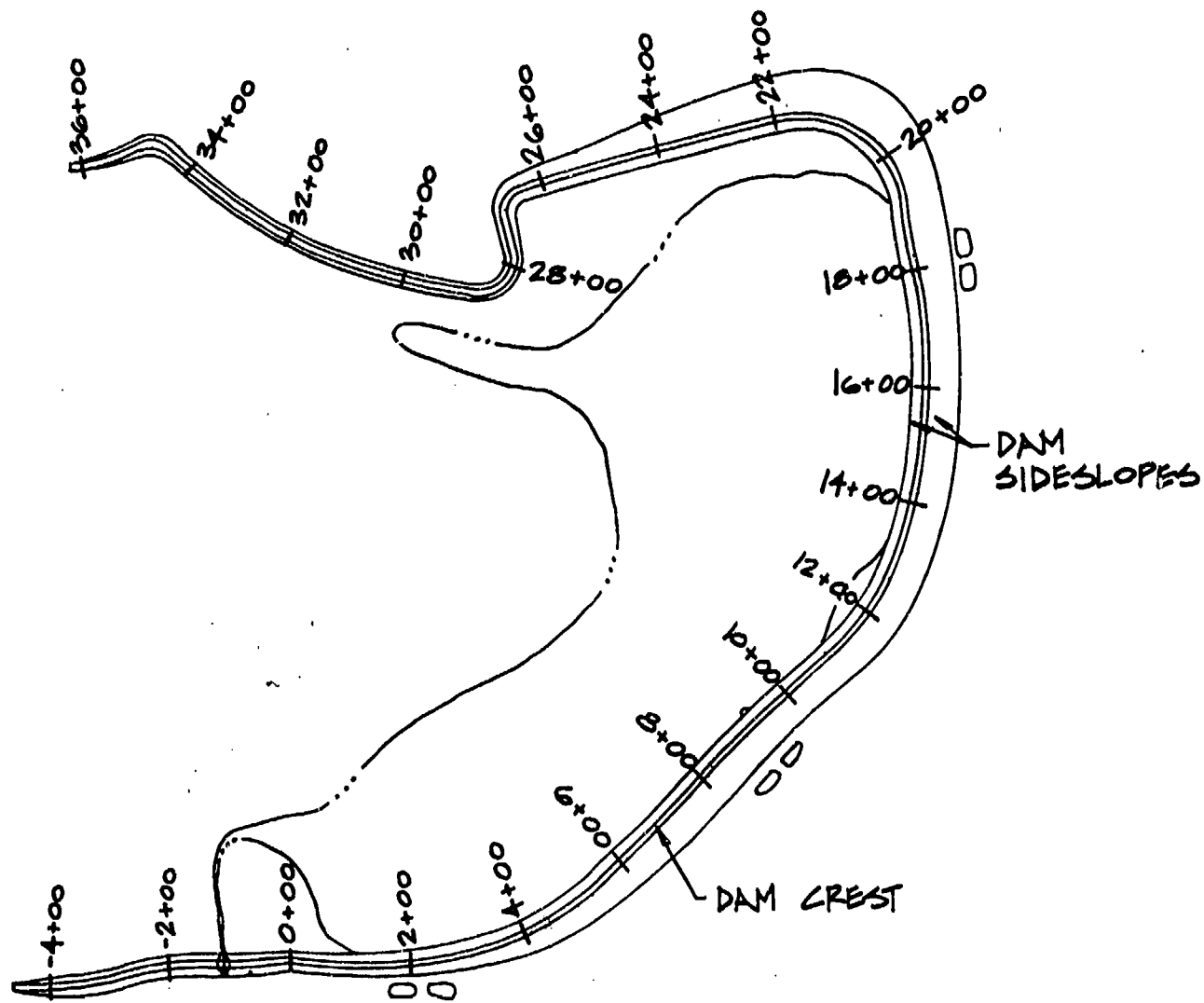
E-1

POND NO. 4 DAM
NATIONAL DAM INSPECTION PROGRAM

ACKENHEIL & ASSOCIATES CONSULTING ENGINEERS

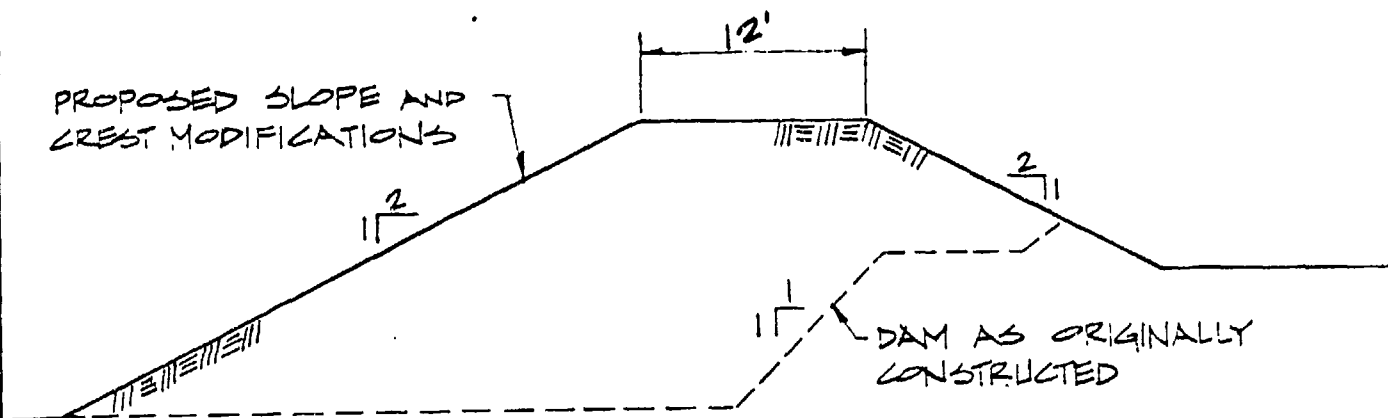
GEO SYSTEMS, INC.
1000 BANKSVILLE RD./PITTSBURGH, PA. 15216

REGIONAL
VICINITY
MAP

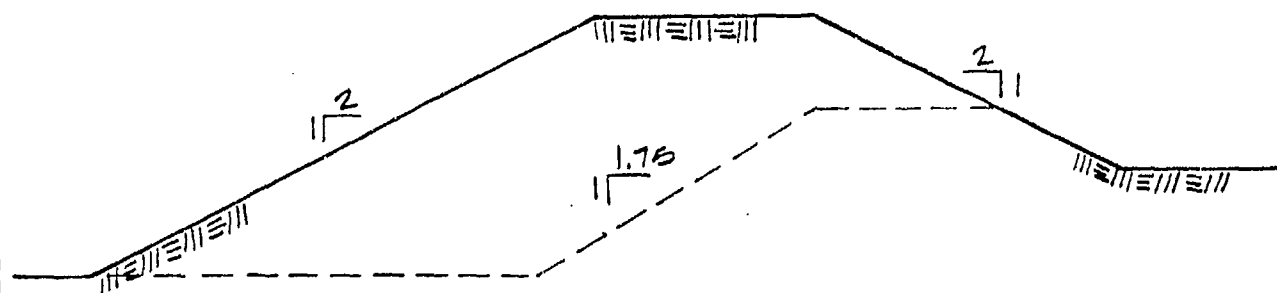


PLAN

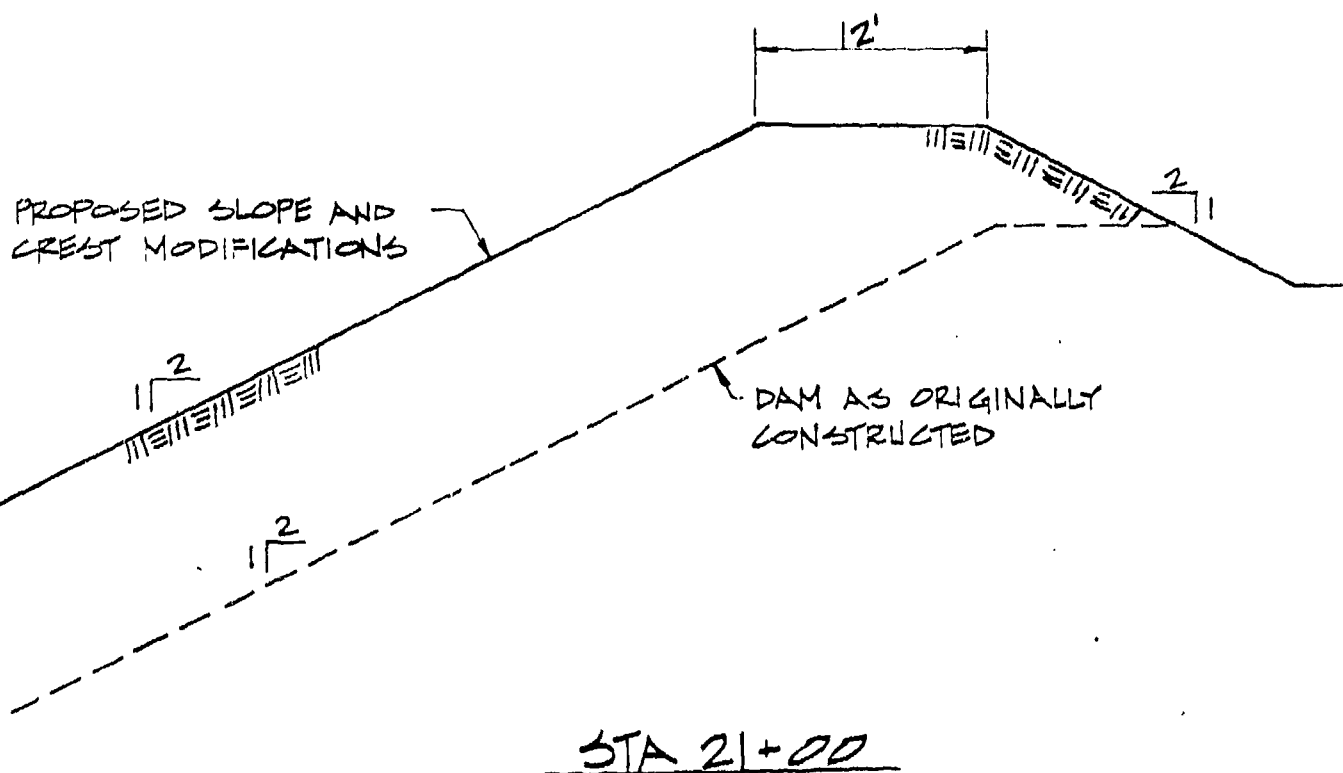
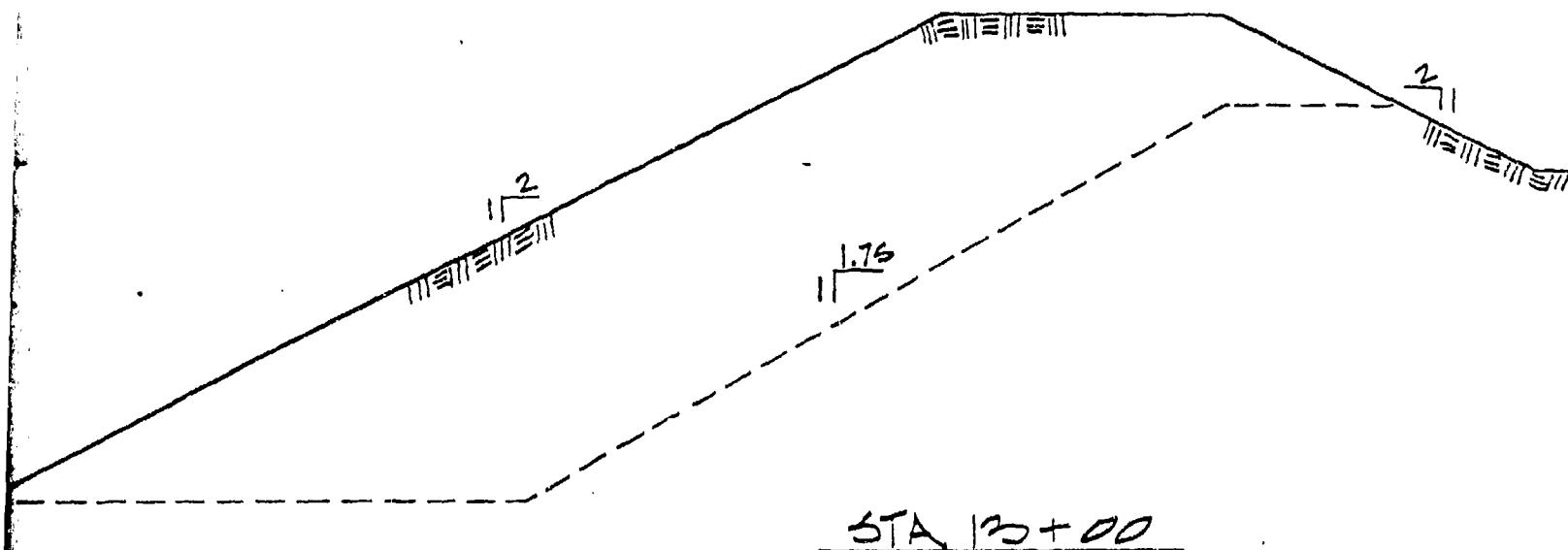
PROPOSED SLOPE AND
CREST MODIFICATIONS



STA. 4+00



STA. 25+00



SILT POND NO. 4 CROSS SECTION
 FROM DRAWING PREPARED BY
 ROCHESTER & PITTSBURGH COAL CO.
 DATED JUNE 13, 1962
 SCALE: 1" = 10'

PLATE NO. 2

DWG. NO. E-3

APPENDIX F
REGIONAL GEOLOGY

POND NO. 4 DAM
NDI ID. NO. PA 00851
REGIONAL GEOLOGY

Geomorphology

Pond No. 4 Dam is located within the Allegheny Mountain section of the Appalachian Physiographic Province. This region is characterized by sedimentary rock strata which form a series of broad, well developed structural folds paralleling the Allegheny front. Chestnut Ridge, the prominent topographic feature of this area, reaches elevations of over 1700 feet. Relief between the ridge and the gently undulating topography of the valley bottom to the west is as much as 700 feet.

Structure

The site is located between the axis of the Latrobe Syncline to the west and the axis of Chestnut Ridge Anticline to the east. Both structures trend northeast to southwest. Rock strata at the site dip to the northwest at a rate of about 3.5°. No major faults have been documented in the vicinity of the dam and no observations were made to indicate faulting in the rocks outcropping around the site.

Stratigraphy

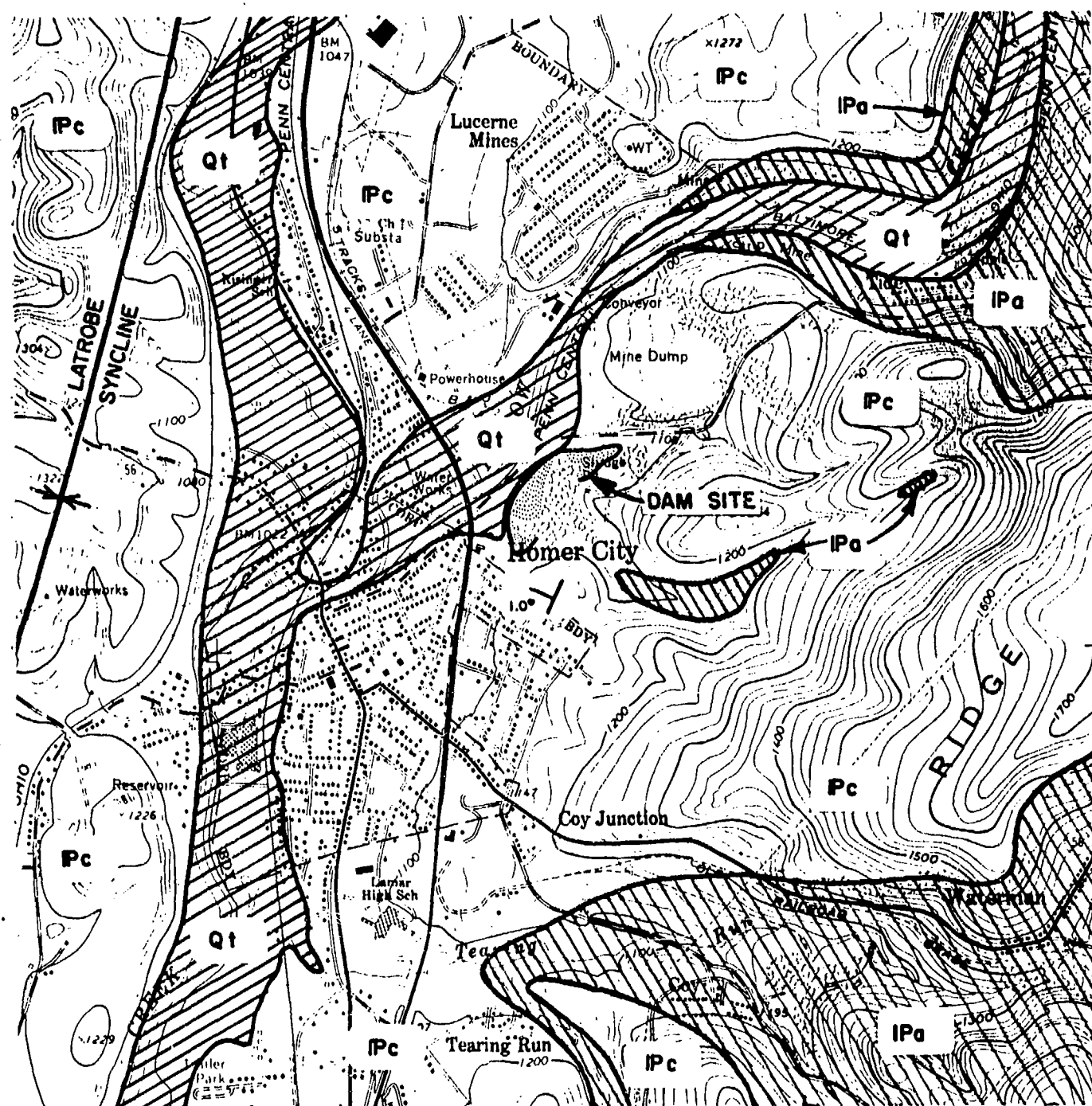
Rocks outcropping in the area of the dam site belong to the Allegheny Formation and the Conemaugh group which are of Pennsylvanian age. These formations consist of cyclic sequences of shale, sandstone, thin limestone and coal. The most prominent coal seam in the area, the Upper Freeport Coal, marks the boundary between the Allegheny and Conemaugh Formations. The floodplains of the streams are composed of alluvium, consisting of sand, clay, and silt.

Mining Activity

The Upper Freeport Coal seam has been extensively deep mined and strip mined to the east and south of Homer City. At the dam site, this coal lies at a shallow depth and has probably been mined out.

Site Geology Legend

Pa - Allegheny Group
Pc - Conemaugh Group
Qt - Alluvium



INDIANA QUADRANGLE, INDIANA COUNTY, PENNSYLVANIA

SCALE: 0 1/2 MILE 1:24000
 CONTOUR INTERVAL 20 FT. DATUM IS MEAN SEA LEVEL
 ——— FORMATION CONTACT
 FOR LEGEND SEE F-1

DATA OBTAINED FROM UNITED STATES GEOLOGIC SURVEY, GEOLOGIC ATLAS OF THE UNITED STATES, INDIANA FOLIO, PENNSYLVANIA, No. 102

DATE: JUNE 29, 1981	POND NO. 4 DAM	GEOLOGIC MAP
SCALE: 1"=2000'	NATIONAL DAM INSPECTION PROGRAM	
DR: J CK: TED	ACKENHEIL & ASSOCIATES CONSULTING ENGINEERS	
DWG. NO. F-2	GEO SYSTEMS, INC. 1000 BANKSVILLE RD./PITTSBURGH, PA. 15216	