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NATIONAL DAM INSPECTION PROGRAM. RAW WATER POND (NDI NUMBER PA---ETC(U)
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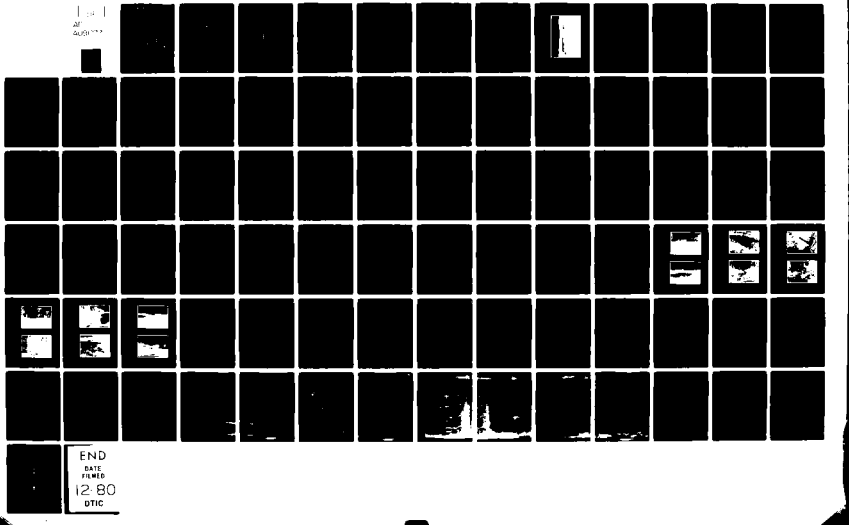

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LEVEL II

OHIO RIVER BASIN
SAWMILL CREEK
WASHINGTON COUNTY

(1)

AD A091277

PENNSYLVANIA

NDI No. PA 01137
PENN DER No. 63-90

RAW WATER POND

UNITED STATES STEEL CORPORATION
RAW MATERIALS DIVISION

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

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

DACW31-80-C-0026

ACKENHEIL & ASSOCIATES GEO SYSTEMS, INC.
CONSULTING ENGINEERS
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(1)

OHIO RIVER BASIN, Sawmill Creek, Washington County, Pennsylvania.

RAW WATER POND
~~WASHINGTON COUNTY, COMMONWEALTH OF PENNSYLVANIA~~
~~NDI NO. PA-00137~~
~~PennDER NO. 61-90~~

~~UNITED STATES STEEL CORPORATION~~

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

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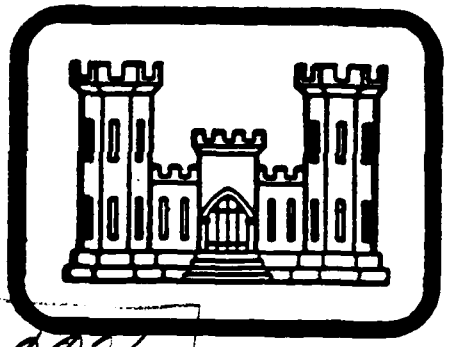

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(15) DACW 31-80-C-0026

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

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

(10) Samuel G. Magaziner
James F. Hamilton
James E. Barrick

Date: September 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.

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

SYNOPSIS OF ASSESSMENT AND RECOMMENDATIONS

NAME OF DAM:	Raw Water Pond
STATE LOCATION:	Pennsylvania
COUNTY LOCATION:	Washington
STREAM:	Unnamed tributary to Sawmill Creek.
DATE OF INSPECTION:	6 May 1980
COORDINATES:	Lat. 40°11'23" Long. 80°2[illegible]'04"

ASSESSMENT

Based on a review of available design information and visual observations of conditions as they existed on the date of the field inspection, the general condition of the Raw Water Pond is considered to be poor.

This assessment is based primarily on visual observations that indicate a possible inadequate margin of safety against slope failure of the embankment.

The structure is classified as a "small" size, "high" hazard dam. Corps of Engineers guidelines recommend 0.5 to one times the Probable Maximum Flood (PMF) as the Spillway Design Flood for a "small" size, "high" hazard dam. The Raw Water Pond's Spillway Design Flood is one half the Probable Maximum Flood. Spillway capacity is "inadequate" because the non-overtopping flood discharge was found, by using the HEC-1 computer program, to be in 0.18 PMF. At 0.5 PMF, the right abutment and the right end of the Raw Water Pond's embankment would be overtopped by 0.22 feet of water for a duration of twelve hours and 40 minutes. In the opinion of the evaluating engineer, this depth and duration of overtopping would not be sufficient to cause failure of the embankment.

The visual inspection indicated several minor deficiencies in addition to the inadequate spillway capacity and possible inadequate margin of safety against slope failure. The deficiencies can be corrected or improved through implementation of the following recommended evaluation, remedial, monitoring and/or maintenance efforts.

SYNOPSIS OF ASSESSMENT AND RECOMMENDATIONS (CONT'D)
Raw Water Pond

RECOMMENDATIONS

1. Additional Investigations: It is recommended that the owner immediately retain the services of a registered professional engineer knowledgeable and experienced in the design and construction of earth dams to provide an engineering evaluation of the Raw Water Pond. This evaluation should include but not be limited to the following:

a. Evaluation of spillway capacity and development of recommendations to provide adequate spillway capacity.

b. Investigation of the seepage and wet conditions and structural stability of the embankment.

c. Investigation of the outlet works with specific recommendations for upstream flow control.

2. 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.

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

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

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

3. Remedial Work. The Phase I Inspection of the Raw Water Pond also disclosed several other deficiencies which should be corrected during routine maintenance.

a. Remove trees from the embankment slopes to the extent that all roots greater than one half inch in diameter are excavated.

SYNOPSIS OF ASSESSMENT AND RECOMMENDATIONS (CONT'D)
Raw Water Pond

b. Mow dense vegetation on the embankment slopes.

c. Carefully inspect the slopes and backfill all slough zones, animal burrows and eroded areas.

Samuel G. Mazzella — Date
Project Engineer

James P. Hannan — Date
Project Engineer

James E. Barrick, P.E. — Date
PA Registration No. 022639-E

Approved by: JAMES W. PECK — 24 Sep 80 — Date
Colonel, Corps of Engineers
District Engineer

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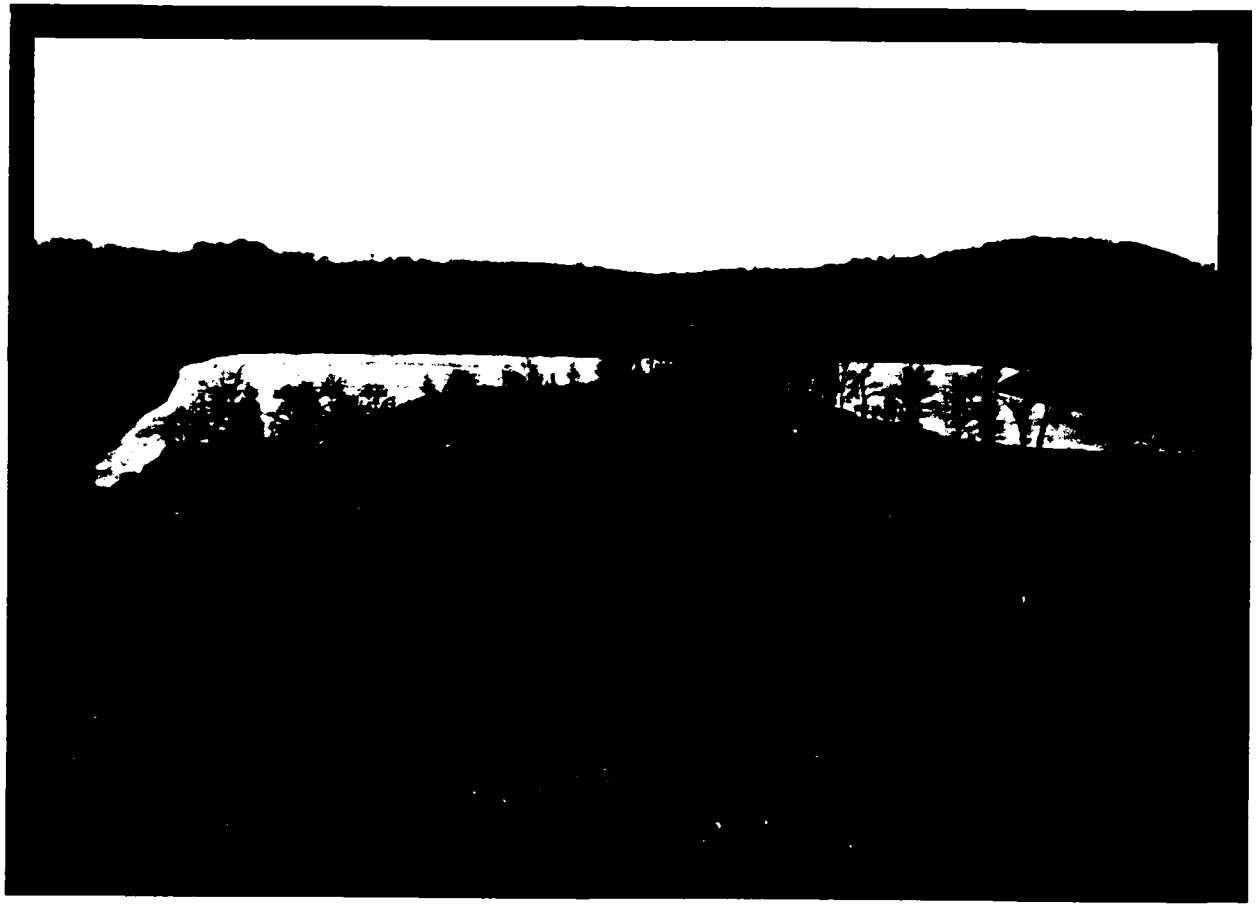
RAW WATER POND



OVERVIEW

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PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM
RAW WATER POND
NATIONAL I. D. NO. PA 01137
PennDER No. 61-90

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 make a determination on whether or not the dam constitutes a hazard to human life or property.

1.2 DESCRIPTION OF PROJECT

a. Dam and Appurtenances:

(1) Embankment: The Raw Water Pond was designed and constructed as a earthfill structure with clay core and cutoff along the centerline. The embankment is 1190 feet long, with a toe to crest height of 25.2 feet and a crest width of 25 feet. The embankment's upstream slope was observed to be 2.2H:1V above the waterline; the downstream slope was observed to range from 1.8H:1V on the upper slope to 2.7H:1V on the lower slope.

(2) Outlet Works: The Raw Water Pond outlet works is a 14 inch diameter steel pipe with an intake at the bottom of the Pond. The outlet works maintains the operating pool approximately 1.5 feet below the invert of the principal (and emergency) spillway. A gate valve and flow monitoring weir box are located downstream of the embankment. Outlet works flows are discharged to the Treated Water Pond below.

(3) Principal (and Emergency) Spillway: The principal (and emergency) spillway for the Raw Water Pond is an 8 inch diameter vitrified clay pipe which acts as the outlet for storm flows.

(4) Freeboard Conditions: Freeboard between the inlet of the principal (and emergency) spillway pipe and minimum height of the dam is 0.9 feet; freeboard is 2.4 feet between the operating pool and minimum dam elevation.

(5) Downstream Conditions: The Maple Creek Mine Treated Water Pond is immediately below the Raw Water Pond. The Treated Water Pond has a maximum toe to crest height of 58.8 feet and storage capacity at the spillway crest of 778 acre-feet. The unnamed creek below the Treated Water Pond flows through a relatively narrow, steep-sided valley for about 1.5 miles to a confluence with Sawmill Creek. Sawmill Creek flows into Pigeon Creek which enters the Monongahela River near Monongahela, Pennsylvania. In the first 1.5 miles below the Treated Water Pond at least 8 inhabited dwellings and State Route 917 lie on the floodplain.

(6) Reservoir: The Raw Water Pond is about 950 feet long at normal pool elevation and has a surface area of 3 acres. When the pool is at the crest of the dam, the reservoir length increases to 960 feet and the surface area is 3.03 acres.

(7) Watershed: The watershed contributing to the Raw Water Pond is a meadow with a diversion ditch traversing the area above the dam. The watershed is completely owned by the U.S. Steel Corporation.

b. Location: The Raw Water Pond is located in Fallowfield Township, Washington County, Pennsylvania approximately 4 miles west of Monongahela, Pennsylvania.

c. Size Classification: The dam has a maximum storage capacity of 27 acre-feet and a maximum toe to crest height of 25.2 feet. Based on the Corps of Engineers guidelines, this dam is classified as a "small" size structure.

d. Hazard Classification: The Raw Water Pond is classified as a "high" hazard dam. In the event of a dam failure, the sudden inflow to the Treated Water Pond may cause it to be overtopped, and several inhabited dwellings and State Route 917 could be subjected to substantial damage and loss of life could result.

e. Ownership: The Raw Water Pond is owned by the United States Steel Corporation, Raw Material Division,

Uniontown, Pennsylvania. Inquiries concerning the dam should be addressed to:

United States Steel Corporation
Raw Materials Division, Frick District
Fayette Bank Building, 5th Floor
Uniontown, Pennsylvania 15401
Attention: Mr. Robert Witt, Jr., Chief Engineer
(412) 438-3511, Ext. 256

f. Purpose of Dam: The Raw Water Pond was constructed to serve as a holding and settling impoundment for mine drainage water from the nearby U. S. Steel Maple Creek Mine.

g. Design and Construction History: The dam was designed by C. A. Burchfield of the U. S. Steel Corporation in 1966. No additional information on design or construction was found.

h. Normal Operating Procedures: The Raw Water Pond was designed to operate as an uncontrolled structure. Under normal operating conditions, the pool level is maintained by the outlet works. Mine water is piped to the site through the deep mine and is pumped to the surface through boreholes where it is discharged to the Raw Water Pond. The water then flows into the Treated Water Pond. A neutralization plant is now bypassed due to the mine water reportedly not being acidic enough to require treatment.

1.3 PERTINENT DATA

a. Drainage Area: 0.02 sq. mi.

b. Discharge at Dam Facility:

Maximum Flood at Dam Facility	Unknown
Principal (and Emergency) Spillway Capacity at Top of Dam	Negligible

c. Elevation (feet above MSL)**

Design Top of Dam	1135.0*
Current Top of Dam (low point)	1134.5±
Normal Pool	1133.0*
Principal (and Emergency) Spillway Overflow Crest	1133.0*
Operating Pool	1131.5
Maximum Tailwater	Unknown
Outlet Works Inlet Invert	1123.94*
Toe of Embankment	1109.3
Outlet Works Outlet Invert	1122.0*

d. Reservoir Length

Length of Maximum Pool	960 feet
Length of Normal Pool	950 feet
Length of Operating Pool	940 feet

e. Reservoir Storage

Design Top of Dam	Unknown
Current Top of Dam	27 acre-feet
Principal (and Emergency) Spillway Invert	24.6 acre-feet*
Normal Pool	24.6 acre-feet*

f. Reservoir Surface

Current Top of Dam	3.03 acres
Principal (and Emergency) Spillway Crest	3.0 acres*
Normal Pool	3.0 acres*

g. Embankment

Type	Earth
Length	1190 feet
Height	25.2 feet
Crest width	25 feet
Slopes	
Downstream	1.8H:1V to 2.7 H:1V
Upstream	2.2H:1V
Impervious core	Yes*
Cutoff provisions	Unknown*
Grout curtain	Unknown*

h. Outlet Works

Type	14 inch (nominal) Diameter Stainless Steel Pipe
Inlet	At bottom of pond*
Upstream Flow Control	No*
Conduit length	100 feet*
Gate Valve	Downstream
Anti-seep Collars	Yes, 4*

i. Principal (and Emergency) Spillway

Type	8 inch Diameter Vitrified Clay Pipe
Inlet	Concrete Slab with Trash Cage
Conduit Length	200 feet*
Gate Valve	No
Anti-seep Collars	Yes, 1*

*Taken or derived from original specifications and/or drawings.

SECTION 2
ENGINEERING DATA

2.1 DESIGN

The files of the Commonwealth of Pennsylvania, Department of Environmental Resources (PennDER) were reviewed but no engineering data related to the original design of the facility was found. Because of the small watershed, the Division of Dams and Encroachments, Pennsylvania DER, was not required to issue a permit for the construction or operation of this dam.

The dam was apparently designed by C. A. Burchfield of the United States Steel Corporation in 1966. The owner provided the design drawings listed in Appendix B and reproduced in Appendix E.

2.2 CONSTRUCTION

The Raw Water Pond was constructed in 1967 and 1968 by C. J. Langenfelder and Sons, Inc. of Baltimore, Maryland.

2.3 POST-CONSTRUCTION ENGINEERING STUDY

A post-construction engineering study was conducted by L. Robert Kimball Consulting Engineers in 1973 for both the Raw Water Pond and Treated Water Pond facilities. This report included the following investigation results:

1. Geology.

2. Seepage analysis.

3. Stability analyses:

    a. Simplified Bishop analysis.

    b. Modified Fellenius analysis.

    c. Translational (Wedge) Failure analysis.

4. Field investigations and laboratory testing related to the Raw Water Pond included:

a. Test borings (2).

b. Triaxial compression tests (1).

c. Grain size distributions (5).

d. Proctor densities (0).

e. In-situ densities (2).

f. Soil permeability tests (2).

5. Hydrologic Analyses:

a. Existing conditions.

b. Proposed conditions.

The report concluded that the embankment was stable for conditions analyzed, based on a recommended safety factor of 1.5. The analysis included earthquake induced forces. The report recommended:

1. Maintain and periodically check the water level in the observation wells installed in the embankment.

2. Maintain vegetal cover to minimize erosion.

3. Construct a trapezoidal spillway, 3 feet wide and 1.16 feet deep, with invert elevation at 1136.84* on the natural ground at the right abutment.

2.4 OPERATION

The dam was designed to operate without a dam tender.

The principal (and emergency) spillway is an 8 inch diameter unified clay overflow pipe. The reservoir pool is normally maintained 1.5 ft. below the invert of the principal spillway by the submerged inlet to the outlet works conduit.

Performance and operation records are not maintained. There is no information available on the operation of the outlet works.

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*Elevation based on L. Robert Kimball datum which is approximately 2.6 feet higher than elevations shown on U. S. Steel drawings.

2.5 EVALUATION

a. Availability: Engineering data was provided by PennDER Bureau of Dams and Waterway Management. The owner provided the design drawings listed in Appendix B and reproduced in Appendix E.

b. Adequacy: The available engineering information, though greatly limited, was supplemented by field inspections and supporting engineering analyses and is considered adequate for the purpose of this Phase I Inspection Report.

The reported observation wells and the proposed spillway were not observed during the field reconaissance.

c. Validity: Based on the review of the available information, there appears to be no reason to question the validity of the limited engineering data.

SECTION 3
VISUAL INSPECTION

3.1 FINDINGS

a. General: The visual observations of the Raw Water Pond were performed on 6 May 1980 and consisted of:

(1) Visual observations of the embankment crest and slopes, groins and abutments;

(2) Visual observations of the principal (and emergency) spillway and outlet works facilities;

(3) Visual observations of the embankment's downstream toe area including swamps, springs, and drainage channels;

(4) Visual observations of downstream conditions and evaluation of the downstream hazard potential;

(5) Visual observations of the reservoir shoreline and watershed;

(6) Transit stadia survey of relative elevations along the embankment crest centerline, spillway, and across the embankment slopes.

The visual observations were made during a period when the reservoir pool was at normal operating level.

The visual observations checklist, field plan, profile and section 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 field inspection are presented in the following sections.

b. Embankment:

(1) Crest: The crest of the embankment was observed to have the proper alignment. No offsets or indications of adverse horizontal displacement were noted. The crest appeared to be generally level through the mid-section but showed a lowering near both ends of the embankment.

The crest contains a gravel (reddog) surfaced access road and a few shallow wheel rut depressions were noted.

(2) Upstream Slope: The upstream slope of the embankment showed some signs of erosional distress, particularly along the east shoreline. However, the erosion had not significantly decreased the crest width.

(3) Downstream Slope: The downstream slope of the embankment was observed to have a generally uniform slope and dense vegetal cover including numerous trees. The slope was surveyed and found to be relatively steep at 1.8H:1V. Some flattening of the slope near the toe was observed along the central portion of the embankment in the vicinity of a large, soft, swampy zone.

An elevated "line of seepage" was observed throughout the central portion of the embankment where the embankment height is greatest. At one point, the "line" was located half-way up the slope. Dense cattails and very soft soils characterized this portion of the slope. Springs, seeps and animal burrows were also observed.

To the left of this zone, a small slough was observed immediately above a spring at the toe of the slope.

The area immediately below the central portion of the downstream slope contained an almost impenetrable growth of cattails, standing water, and very soft soils. Numerous springs and seeps were observed at and below the embankment toe.

Similar, but less extensive swamp zones were observed at each end of the embankment.

A large bench area has been constructed near the right end of the embankment where mine drainage pump facilities have been installed. The outslope of the bench area contained several depressions, erosion and slough zones, which were associated with swampy, soft soil conditions. The largest of the depressions appeared to have been intentionally excavated rather than eroded by surface or subsurface flows.

c. Abutments: The left and right abutments consisted of natural hillsides which were generally grass and brush covered. There were no observed signs of abutment instability or seepage conditions.

A depression was observed on the right abutment at the junction of the embankment.

Both abutments contained diversion channels. On the left, a ditch along the access road emptied into the Pond. On the right, a diversion channel from the watershed above the pond carried flows away from the Pond.

d. Outlet Works:

(1) Conduit: The outlet works conduit is a 14 inch diameter steel pipe.

(2) Intake Structure: The outlet works intake structure was not observed due to the reservoir pool level. There was no indication of the existence of an upstream flow control.

(3) Outlet Structures: The outlet works conduit has a gate valve located in a standard concrete man-hole embedded in the downstream slope. Below the valve, the conduit enters a concrete box containing baffles and a stainless steel weir. Flows are directed over the weir and into a submerged pipe that exits the downstream end of the box. A slide gate controls flows into the outlet pipe. The gate was observed to be rusted and corroded on the date of inspection. Below the weir box, the pipe flows into a 30 inch diameter CMP, set vertically as a wet well structure. A 10 inch diameter plastic pipe carries flows from the wet well to a free fall discharge into the Treated Water Pond below.

e. Principal (and Emergency) Spillway:

(1) Conduit: The Raw Water Pond principal (and emergency) spillway is an 8 inch diameter vitrified clay pipe that passes through the embankment just to the right of the outlet works.

(2) Inlet Structure: The pipe inlet lies above the operating pool elevation and is embedded in a concrete slab apron on the upstream slope. A 3 foot cube, steel bar trash cage protects the pipe inlet from larger debris.

(3) Outlet Structure: The pipe outlet is a concrete headwall located approximately 200 feet from the inlet. Discharge is directly to the Treated Water Pond below.

f. Instrumentation:

(1) Observation Levels: Observation wells were reported to have been installed during the 1973 dam investigation program. A bent pipe near the right end of the embankment may be the remnants of one such well. No other indications of observation wells were noted.

(2) Weir: The outlet works includes a weir box flow measuring device. The weir observed was sharp-crested, stainless steel, and one-half inch thick. The crest was rectangular, 54 inches long, and 3 feet above the bottom of the box. Two inches of water were flowing over the crest on the date of inspection.

g. Downstream Conditions:

(1) Treated Water Pond: The Maple Creek Mine Treated Water Pond lies immediately downstream of the Raw Water Pond. Flows from the Raw Water Pond outlet works, spillway and diversion channels are discharged directly to the Treated Water Pond.

The Treated Water Pond embankment is an earthen structure, 58.8 feet high, and has principal and emergency spillways near its right abutment.

(2) Natural drainage below the Treated Water Pond is via an unnamed tributary to Sawmill Creek. In the 1.5 mile reach between the Treated Water Pond and the confluence with Sawmill Creek, 8 inhabited dwellings were observed on the floodplain at elevations low enough to be imperiled by high flows. Also, a mine portal and loadout facility and State Route 917 lie near the bottom of the valley.

h. Reservoir:

(1) Slopes: The slopes of the reservoir were vegetated and appeared to be well maintained by the owner. Two small surface slumps were noted on the slope above the reservoir but they did not appear to threaten the impoundment.

Above the reservoir slope is a bench which diverts surface runoff. Bench flows are directed to a drainage swale at the far right end of the embankment.

(2) Inlet Stream: None.

(3) Sedimentation: None observed.

(4) Watershed: The watershed for the Raw Water Pond is quite small, consisting of the hillside immediately behind the Pond. The hillside contains considerable grassed area and some trees as well as mounded and heavily vegetated topsoil piles. No significant erosion or excavational areas were noted in the watershed.

3.2 EVALUATION

The following evaluations are based on the results of the visual inspection performed on 7 May 1980.

a. Embankment: The Raw Water Pond embankment is considered to be in poor condition. This is based primarily on observations of a high ground water level in the embankment, moderately steep embankment slopes, active springs and seeps on and below the embankment, soft to very soft soils on and below the embankment, and animal burrows on the embankment.

Numerous other deficiencies of a minor nature were also observed.

b. Outlet Works: The outlet works appeared to be functioning properly on the date of inspection. The gate valve and slide gate were not checked for operability.

The apparent lack of an upstream flow control for the conduit is considered to be a deficiency.

c. Principal (and Emergency) Spillway: The principal (and emergency) spillway facility could not be evaluated. Visible components however, appeared functional on the date of inspection. No trash, debris, or other flow obstructions were observed. However, the openings between the trash cage bars (6 inch c/c) are considered to be quite large relative to the pipe opening (8 inches) and pipe clogging could occur during extended storm flows.

d. Hazard Potential: The hazard potential of the Raw Water Pond was considered to be "high" based on visual observations of Pond depth and capacity and potential downstream conditions.

SECTION 4
OPERATIONAL FEATURES

4.1 PROCEDURE

Reservoir pool level is maintained at an elevation approximately 1.5 feet below the invert of the principal (and emergency) spillway pipe by the submerged outlet works intake.

The outlet works conduit is controlled by a gate valve located downstream of the embankment. The valve is normally open and the pipeline is under full pressure through the embankment. No upstream flow control was observed during the field inspection.

Normal operating procedure does not require a dam tender.

4.2 MAINTENANCE OF DAM

The embankment and appurtenances are maintained by the United States Steel Corporation. Maintenance reportedly consists of periodically repairing eroded areas and making miscellaneous repairs as necessary.

4.3 INSPECTION OF DAM

The United States Steel Corporation is required by the State of Pennsylvania to inspect the dam annually and make needed repairs.

The United States Steel Corporation is required by MSHA to inspect the dam at least once every seven days and to make an annual report and certification of the dam.

4.4 WARNING SYSTEM

There is no warning system and no formal emergency procedure to alert or evacuate downstream residents upon threat of a dam failure.

4.5 EVALUATION

Lack of an upstream flow control for the outlet works conduit is considered to be a deficiency.

The maintenance program should be continued. However, 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/HYDRAULICS

5.1 EVALUATION OF FEATURES

a. Design Data: The Raw Water Pond has a watershed of 13 acres which is vegetated primarily by grassland. The watershed is about 600 feet long and 1200 feet wide and has a maximum elevation of 1200 feet (MSL). At normal pool, the dam impounds a reservoir with a surface area of three acres and a storage volume of 24.6 acre-feet. Normal pool level is maintained at approximately Elev. 1133 by the principal (and emergency) spillway conduit. Because of the very small capacity of the facility, its operation was neglected in the hydrologic analysis.

There was no emergency spillway designed for this structure. In a post construction report by L. Robert Kimball Consulting Engineers, an open channel emergency spillway was recommended for the right abutment area. However, the recommended facility was not observed during the field inspection.

Owners representatives have advised that a drainage swale was constructed on the right abutment to serve as an emergency storm overflow.

b. Experience Data: Records are not kept of reservoir level or rainfall amounts. There is no record or report of the embankment ever being overtopped.

c. Visual Observations: On the date of the field inspection, the reservoir pool level was 1.5 feet below the principal (and emergency) spillway invert and the outlet works was functional.

A depression was observed on the right abutment at the junction of the embankment. This appeared to be the above noted drainage swale. Because of its location adjacent to the embankment, visual inspection indicated that storm flows through the swale might imperil the right end of the embankment.

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. The Corps of Engineers guidelines recommend 0.5 to 1 times the Probable Maximum Flood (PMF) for "small" size, "high" hazard dams. Based on observed downstream conditions, the Raw Water Pond has a Spillway Design Flood (SDF) of 0.5 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 one half of the runoff from 19.4 inches of rainfall in 24 hours. Consequently, an evaluation of the reservoir/spillway system was performed to determine whether the dam's 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, July, 1978. The major methodologies and key input data for this program are discussed briefly in Appendix D.

The peak inflow to the Raw Water Pond was determined by HEC-1 to be 92 cfs for a full PMF. The peak inflow for the SDF was determined to be 46 cfs.

An initial pool elevation of 1133 was assumed prior to commencement of the storm.

According to the HEC-1 analysis, at 0.50 PMF, the Raw Water Pond is overtopped by 0.22 feet of water for 12 hours and 40 minutes. The analysis is included in Appendix D.

e. Spillway Adequacy: The capacity of the reservoir system was determined to be 0.18 PMF by HEC-1. According to Corps of Engineers' guidelines, the Raw Water Pond's spillway is "inadequate."

A 0.50 PMF, the Raw Water Pond is overtopped by 0.22 feet of water for 12 hours and 40 minutes. In the opinion of the evaluating engineer, this overtopping depth and duration would not cause a failure of the embankment since the SDF overflow is restricted to a depression on the right abutment at the right end of the embankment. Consequently, it is estimated that there would be little or no damage to the impounding structure as the result of the occurrance of an SDF. Consequently, a downstream routing and breach analysis were not performed.

Therefore, in accordance with Corps of Engineers guidelines, the spillway is rated "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 and the United States Steel Corporation drawings were reviewed. This data is discussed in Section 2 and a detailed listing is included in Appendix B. Selected items are presented in Appendix E.

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

c. Visual Observations: Visual observations indicated strong evidence of a high ground water level in the embankment. These observations included a pronounced "line of seepage", springs, seeps, cattails, surface sloughs and animal burrows on the embankment slope and very soft embankment soil conditions.

The area at and beyond the toe of the embankment also exhibited soft, swampy conditions with springs and seeps indicative of significant groundwater flows.

The stadia survey showed a relatively steep slope at 1.8H:1V.

d. Performance: The Dam Safety Section, Pennsylvania Department of Environmental Resources has apparently never issued a permit for construction or operation of the Raw Water Pond. Consequently, there is no correspondence relative to this impoundment and no information available concerning performance over its operating life.

6.2 EVALUATION

a. Design Documentation: The design documentation was, by itself, considered inadequate to evaluate the structure.

A post-construction report by L. Robert Kimball Consulting Engineers presented safety factors against sliding for several embankment conditions. The results of these analyses are presented in Section 2. However, observations made during the field inspection suggest embankment ground water conditions different from those used in the stability analysis.

b. Embankment: The margin of safety against slope failure of the Raw Water Pond may be less than required by current Corps of Engineers guidelines for static stability conditions. This evaluation is based primarily on observed embankment slope geometry, materials and surficial evidence of ground water conditions.

c. Spillway and Outlet Works: The visible components of spillway and outlet works facilities appeared to be structurally stable on the date of the field inspection.

d. Seismic Stability: According to the Seismic Risk Map of the United States, Treated Water Pond dam 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.

Since there is concern regarding the static stability of the embankment, the seismic stability should be assessed as part of the investigations recommended in Section 7.

SECTION 7
ASSESSMENT AND RECOMMENDATIONS

7.1 ASSESSMENT

a. Evaluation:

(1) Embankment: The Raw Water Pond's embankment is considered to be in poor condition. This assessment is based primarily on the possibility that an adequate margin of safety against embankment failure may not exist. Evidence of soft soils, steep slopes and a high ground water level support this possibility.

(2) Outlet Works: The outlet works facility is considered to be in poor condition. This assessment is based primarily on the apparent lack of an upstream flow control device.

(3) Principal (and Emergency) Spillway: The principal (and emergency) spillway could not be evaluated for operability. The inlet end and outlet structures, however, appeared to be functional.

(4) Spillway Design Flood: The Spillway Design Flood (SDF) for the Raw Water Pond is one half the Probable Maximum Flood. This SDF is considered to be sufficient for the observed downstream conditions, and a "small" size, "high" hazard facility.

(5) Flood Discharge Capacity: The principal spillway discharge capacity is assessed to be "inadequate." This is based on hydrologic/hydraulic computations using the HEC-1 Dam Safety Version computer program, that indicated the existing reservoir/spillway system is capable of passing 0.18 PMF. At the SDF (0.5 PMF), the right abutment/embankment area is overtopped by a maximum 0.22 feet for 12 hours and 40 minutes. In the opinion of the evaluating engineer, this amount of overtopping is not sufficient to cause failure of the embankment.

(6) Downstream Conditions: Based on visual observations and the hydrologic/hydraulic computations, the lack of an emergency operation and warning plan is considered to be a deficiency.

b. Adequacy of Information: The information available on design, construction, operation and performance history in combination with visual observations and hydrologic and hydraulic calculations was sufficient to evaluate the embankment and appurtenant structures in accordance with the Phase I Investigation guidelines.

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

d. Necessity for Additional Data/Evaluation: Additional engineering information is required to adequately evaluate and improve the structural stability and hydraulic capacity of the facilities.

7.2 RECOMMENDATIONS

a. Additional Investigations: It is recommended that the owner immediately retain the services of a registered professional engineer knowledgeable and experienced in the design and construction of earth dams to provide an engineering evaluation of the Raw Water Pond. This evaluation should include but not be limited to the following:

(1) Evaluation of spillway capacity and development of recommendations to provide adequate spillway capacity.

(2) Investigation of the seepage and wet conditions and structural stability of the embankment.

(3) Investigation of the outlet works with specific recommendations for upstream flow control.

b. 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.

c. Remedial Work. The Phase I Inspection of the Raw Water Pond also disclosed several other deficiencies which should be corrected during routine maintenance.

(1) Remove trees from the embankment slopes to the extent that all roots greater than one half inch in diameter are excavated.

(2) Mow dense vegetation on the embankment slopes.

(3) Carefully inspect the slopes and backfill all slough zones, animal burrows and eroded areas.

APPENDIX A

VISUAL INSPECTION CHECKLIST

VISUAL OBSERVATIONS CHECKLIST I
(NON-MASONRY IMPOUNDING STRUCTURE)

Name Dam Raw Water Pond County Washington State Pennsylvania National ID # PA 01137

Type of Dam Earth Hazard Category High

Date of Inspection 6 May 1980 Weather Cloudy, mild Temperature 60°F

Pool Elevation at Time of Inspection 1131.5 (MSL)
Tailwater at Time of Inspection - 1093.4 (MSL) Treated Water Pond

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. D. Floris	U. S. Steel Corporation, Company Representative

Recorder J. E. Barrick

GEO Project G79153-V
PennDER I.D. No. 63-90

EMBANKMENT

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SURFACE CRACKS	No significant surface cracks were observed on or about the crest of the embankment. Numerous cracks with generally random orientation were noted on barren portions of the downstream slope. The cracks appeared to be related to drying rather than to tension in the soil.	
UNUSUAL MOVEMENT OR CRACKING AT OR BEYOND THE TOE	None observed.	
SLOUGHING OR EROSION OF EMBANKMENT AND ABUTMENT SLOPES	Several sloughs and small surface slide failures were observed at various locations on the downstream slope particularly near the toe. Generally, the slouging and surface distress of the downstream slope was associated with soft spots and seeps observed on the embankment and downstream toe area. The upstream slope of the embankment has suffered some erosional distress, apparently as the result of wave action. The left portion of the embankment has suffered moderately severe erosion while the right portion has suffered minor erosion in local areas. The observed erosion had not significantly decreased the crest width of the dam. No erosion or slouging of either abutment was observed. A large depression was observed in the slope of the bench area that contains the mine drainage pumps. The depression gave appearances of being a sinkhole	

EMBANKMENT (CONTINUED)

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SLOUGHING OR EROSION OF EMBANKMENT AND ABUTMENT SLOPES CONT'D	but contained a drainage outlet and was generally dry with hard soil. Discussion with the U. S. Steel representative indicated that the depression may have been caused by excavating borrow from the slope for use elsewhere in the vicinity.	
VERTICAL AND HORIZONTAL ALIGNMENT OF THE CREST	The crest was observed to have the approximate proper horizontal alignment. No discontinuities or offsets were observed indicating adverse movement or performance of the embankment. The vertical alignment of the crest was observed to be generally level throughout its entire length with the exception of the far right end of the embankment where the crest appeared to drop slightly as indicated by a reduction and freeboard in this area.	
RIPRAP FAILURES	None observed.	
SETTLEMENT	A portion of the crest near the far left end of the embankment in the vicinity of the outlet works was observed to be somewhat depressed relative to the remainder of the crest. The depression did not extend across the crest but was restricted to the downstream side of the crest centerline. The reason for this depression could not be ascertained. No cracking, toe bulging, or other indications of instability were observed below the depression. At this point, the embankment is relatively low, perhaps 8 feet high.	

EMBANKMENT (CONTINUED)

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
JUNCTION OF EMBANKMENT AND ABUTMENT SPILLWAY AND DAM	The junction of the embankment and the abutments was observed to be in generally good conditon. The contact zone between dam and abutment is quite small. No seeping water, erosion or other indications of dist-ess were observed. The junction of the embankment and the downstream toe area contained considerable seepage and several springs. Marshy conditions existed at the toe of the embankment on one half to two thirds of its entire contact zone along the downstream area. Three significant springs discharging between 1/2 and 2 gallons per minute were obseved in the central portions of the embankment. The downstream toe area is heavily vegetated with cattails and other water related vegetation.	
ANY NOTICEABLE SEEPAGE	Considerable seepage was observed on the embankment, at the toe of the embankment, and well below the toe of the embankment for a significant distance along the downstream perimeter of the embankment. A dense growth of cattails and other water related vegetation exists on and below the embankment for most of the central portion of the dam. Three significant springs were observed near the central portion of the embankment discharging two, one and one-half gallons per minute respectively. Near the center of the embankment, at the approximately the deepest section of the structure, the line of seepage was observed to be well up the slope, approaching	

EMBANKMENT (CONTINUED)

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
ANY NOTICEABLE SEEPAGE CONT'D	halfway up the slope in certain places. The line of seepage was quite pronounced as the embankment surface was hard above and very soft below this line. Associated with the seepage line, were several animal burrows. In this area in particular, cattails and other water related vegetation were growing on the embankment slope as well as below the embankment slope. Another less extensive area of seepage was observed near the upper left end of the embankment at the point where the embankment turns. In this area, some cattails and water related vegetation were observed and the ground area below the toe of the dam was observed to be soft and marshy. The area contained a drainage swale from the abutment above the dam. Several additional wet areas were observed below the toe of the embankment toward the right end. In the area below the mine drainage pumps, a small depression containing reeds and cattails and a standing water pool was observed. The water was observed to be stagnant. An additional wet swampy area was observed at and below the far right end of the embankment. In this area, several seeps were noted with quantities of flow too small to measure. Some seepage and cattails were observed on the toe of the embankment slope in this area.	
STAFF GAGE AND RECORDER	None observed.	
DRAINS	None observed.	

EMBANKMENT (CONTINUED)

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
VEGETATION	Vegetation covers the downstream slope entirely but was of a vine or spreading plant nature, such that considerable barren earth could be exposed beneath the vegetation. Vegetation on the upstream slope was generally sparse. A considerable number of trees were growing on upstream and downstream slopes of the embankment.	

OUTLET WORKS

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CRACKING AND SPALLING OF CONCRETE SURFACES IN OUTLET CONDUIT	The outlet conduit is 14 inch diameter (outside) steel pipe containing a handwheel operated gate valve located in a standard concrete manhole near the downstream toe of the embankment. The observed portion of the outlet conduit was in good condition, as was the gate valve control.	
INTAKE STRUCTURE	None observed because of reservoir pool level.	
OUTLET STRUCTURE	The outlet structure consists of a concrete outlet box with baffles into which the outlet conduit discharges. Flow is along the box and over the crest of a sharp crested weir at the lower end of the box. A submerged pipe removes water from the outlet box downstream to a wet well (30 inch diameter CMP, set vertically) where discharge is to a second pipe (10 inch diameter plastic) that discharges to the reservoir below. A slide gate, which was rusted and corroded, controls flow from the weir box. The conditon of concrete of the outlet works box was observed to be good. No condition was observed that would indicate malfunction or obstruction of outlet works flows.	
OUTLET CHANNEL	Discharge from the lower pipe in the outlet works system is directly to the Treated Water Pond below.	
EMERGENCY GATE	No control for upstream flow shutoff was observed.	

INSTRUMENTATION

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
MONUMENTATION/SURVEY	None observed.	
WEIRS	The weir in the outlet works control box was observed to be flowing to a depth of approximately 2 inches. The weir is stainless, sharp-crested and has a crest length of 54 inches. The approach velocity to the weir was observed to be significant. The height of the weir was measured to be 3 feet.	
PIEZOMETERS	None observed.	
OBSERVATION WELLS	None observed.	
OTHER	A bent pipe was observed embedded in the downstream slope near the right end of the dam but its purpose could not be ascertained. The U.S.S. representative could not provide information.	

RESERVOIR

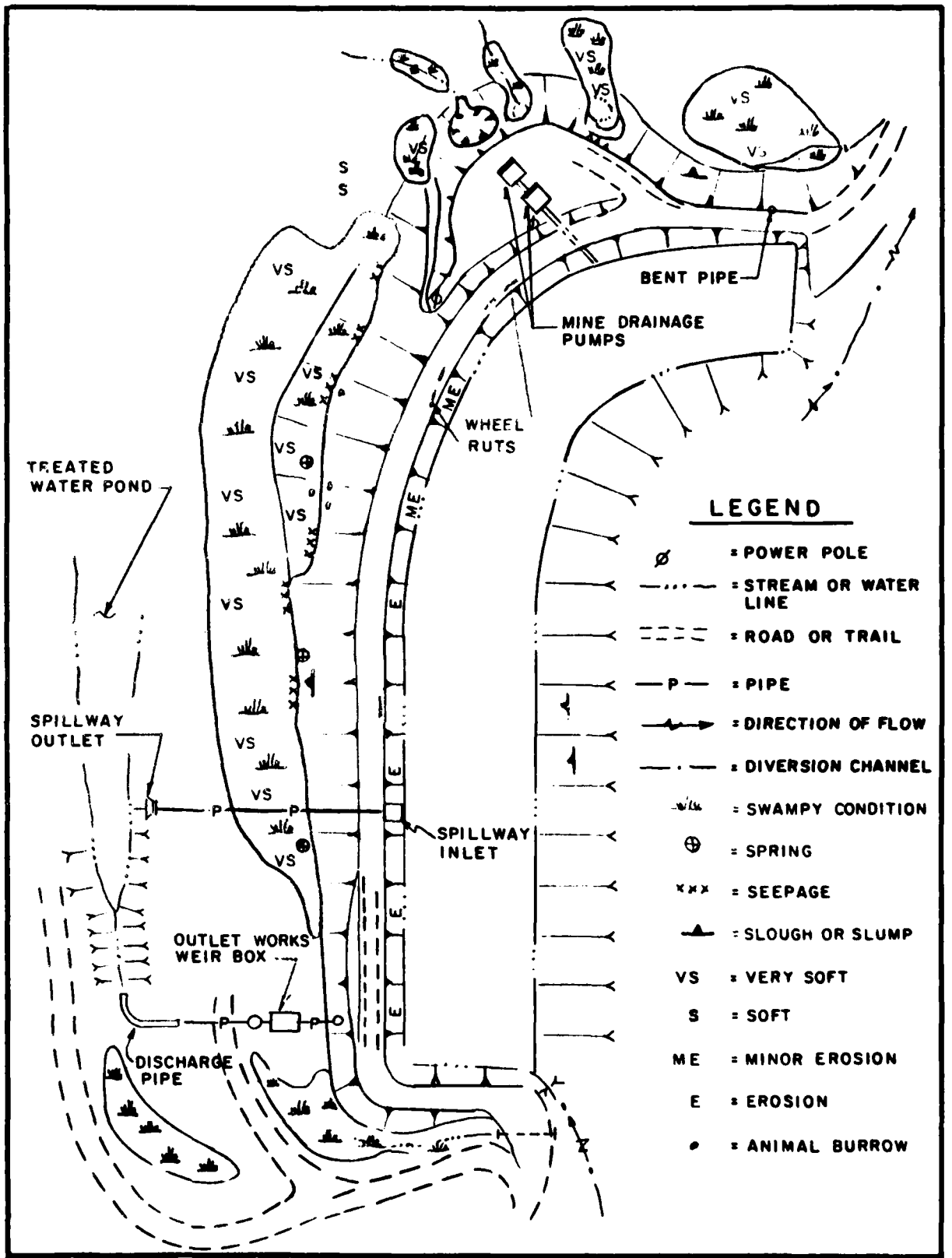
VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SLOPES	The slopes of the reservoir were observed to be in generally good condition being vegetated and maintained by the owner. Two small surface slumps were observed in the upstream slope above the reservoir but did not in any way threaten the impoundment. Above the resevoir slope, is a bench which appears to be a diversion for surface runoff. Bench discharge is to a drainage swale at the far right end of the embankment.	
SEDIMENTATION	None observed.	
INLET STREAM	None observed.	
WATERSHED	The watershed for the mine water pond is quite small consisting of the hillside immediately behind the pond. The hillside contains considerable grassed area and some trees as well as mounded and heavily vegetated topsoil piles. No significant erosion or excavational areas were noted in the watershed.	

PRINCIPAL (AND EMERGENCY) SPILLWAY

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
DESCRIPTION	A small overflow pipe has been constructed near the crest of the embankment to the right of the outlet works facilities. The outlet pipe is eight inch diameter vitrified clay, and is embedded in a concrete slab that lies on the upstream slope. The entrance to the pipe is protected by a welded steel rod (1/2 inch) trash cage. The cage is a three foot cube and bar spacing is 6 inches.	
APPROACH	The approach to the pipe was clear of debris and was unobstructed.	
DISCHARGE	The pipe discharges through a concrete headwall to the Treated Water Pond below.	

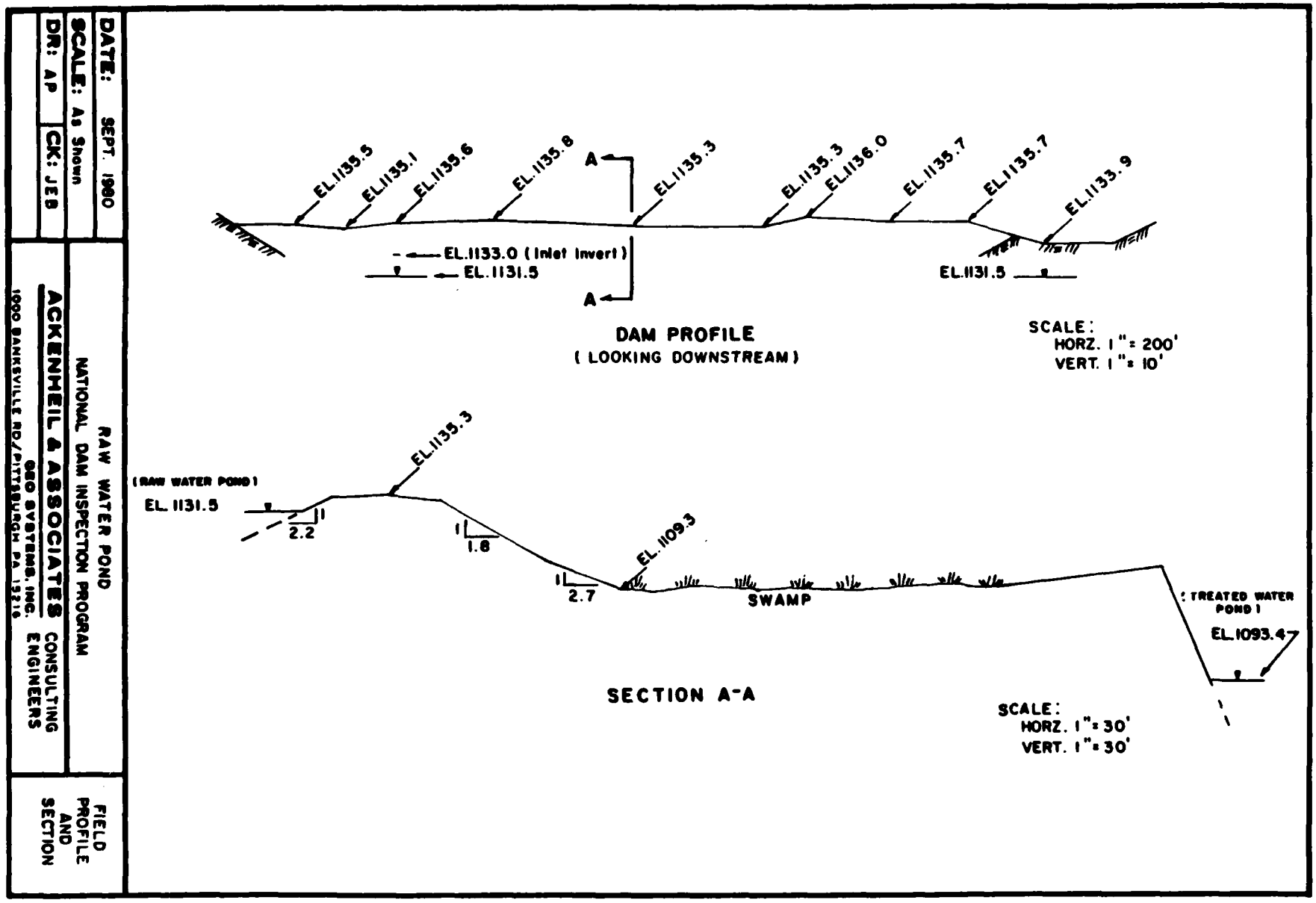
DOWNSTREAM CONDITIONS

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
DISCHARGE CONDITIONS (OBSTRUCTIONS, DEBRIS, ETC.)	The outlet works discharge pipe discharges by free fall to the upper end of the Treated Water Pond below. Flow to the Treated Water Pond is unobstructed.	
TREATED WATER POND	The United States Steel Corporations, Maple Creek Mine Treated Water Pond lies immediately downstream of the Raw Water Pond. The impounding structure is quite high and if full, would impound a significant amount of water.	
APPROXIMATE NO. OF HOMES AND POPULATION	Eight inhabited dwellings were observed in the creek valley in the first 1.5 miles below the Treated Water Pond. Also, a mine portal and coal loading facility would be threatened by high flows. Ginger Hill Road (State Route 917) parallels the creek down to the confluence with Sawmill Creek, two miles below the Raw Water Pond dam.	



DATE: SEPT 1980	RAW WATER POND NATIONAL DAM INSPECTION PROGRAM	FIELD PLAN
SCALE: NONE		
DR: AP CK: JEB	ACKENHEIL & ASSOCIATES CONSULTING ENGINEERS GEO SYSTEMS, INC. 1000 BANKSVILLE RD./PITTSBURGH, PA 15216	

.0 9545 CRYSTALENE AAB SMITH CO PGH PA LT1342-1278


EL.1135.5
EL.1135.1
EL.1135.6
EL.1135.8
A
EL.1135.3
EL.1135.3
EL.1136.0
EL.1135.7
EL.1135.7
EL.1133.9
EL.1133.0 (Inlet Invert)
EL.1131.5
EL.1131.5
A
DAM PROFILE
(LOOKING DOWNSTREAM)
SCALE:
HORZ. 1 "= 200'
VERT. 1 "= 10'
EL.1135.3
(RAW WATER POND)
EL. 1131.5
2.2
1.8
2.7
EL.1109.3
SWAMP
(TREATED WATER POND)
EL.1093.4
SECTION A-A
SCALE:
HORZ. 1"= 30'
VERT. 1"= 30'
DATE: SEPT. 1980
SCALE: As Shown
DR: AP
CK: JEB
ACKENHEIL & ASSOCIATES CONSULTING ENGINEERS
GEO SYSTEMS, INC.
1000 BANKSVILLE RD/PITTSBURGH PA 15216
RAW WATER POND
NATIONAL DAM INSPECTION PROGRAM
FIELD PROFILE AND SECTION
10 BEAR CRYSTALENE ABB SMITH CO PGH PA LT1382-1370
A13

APPENDIX B

ENGINEERING DATA CHECKLIST

CHECK LIST
ENGINEERING DATA
DESIGN, CONSTRUCTION, OPERATION
PHASE I

NAME OF DAM Raw Water Pond
I.D. No. PA 01137

ITEM	REMARKS
Design Drawings[1]	Maple Creek Mine - Ginger Hill Shaft, Mine Water Treatment Facilities, Plan; Drawing 70-Q-24, Sheet 1**. Maple Creek Mine - Ginger Hill Shaft, Mine Water Treatment Facilities, Test Holes Drawing 70-Q-24, Sheet 1B. Facility Plan, Mine Water Treatment Facilities, Ginger Hill Shaft - Maple Creek Mine; Drawing 70-Q-24, Sheets 1A and 1B**. Maple Creek Mine - Ginger Hill Shaft, Mine Water Treatment Facilities, Cross Sections for Raw Water Storage Pond: Drawing 70-Q-24, Sheet 2**. Maple Creek Mine - Ginger Hill Shaft, Mine Water Treatment Facilities, Enlarged Sections; Drawing No. 70-Q-24, Sheet 3**.
As-Built Drawings	None available.
Regional Vicinity Map	U.S.G.S. 7-1/2 Minute Hackett and Monongahela, Pennsylvania Quadrangle Map.
Construction History	Unknown

ITEM	REMARKS
Typical Sections of Dam[1]	Longitudinal and transverse sections, see Design Drawings.
Outlets-Plan[1] Details Constraints Discharge Ratings	See Design Drawings.
Rainfall/Reservoir Records	None available.
Design Reports	None available.
*Geology Reports	See Post-Construction Report below.
Design Computations	None available.
*Hydrology and Hydraulics	See Post-Construction Report below.
*Dam Stability	See Post-Construction Report below.
*Seepage Studies	See Post-Construction Report below.
*Materials Investigations, Boring Records, Laboratory, Field	See Post-Construction Report below.

ITEM	REMARKS
*Post-Construction Surveys of Dam	See Post-Construction Report below.
Borrow Sources	Data not available.
*Monitoring Systems	See Post-Construction Report below.
Modifications	None reported.
High Pool Records	None reported.
*Post-Construction Engineering Studies and Reports	"Engineering Report for Maple Creek Water Treatment Ponds on Sawmill Creek Watershed, Washington County, Pennsylvania," dated August 1973 by L. Robert Kimball Consulting Engineers, Ebensburg, Pennsylvania.
Maintenance, Operation, Records	None available.
Spillway† - Plan Sections Details	See Design Drawings above.
Operating Equipment† Plans and Details	See Design Drawings above.
Specifications	None available.

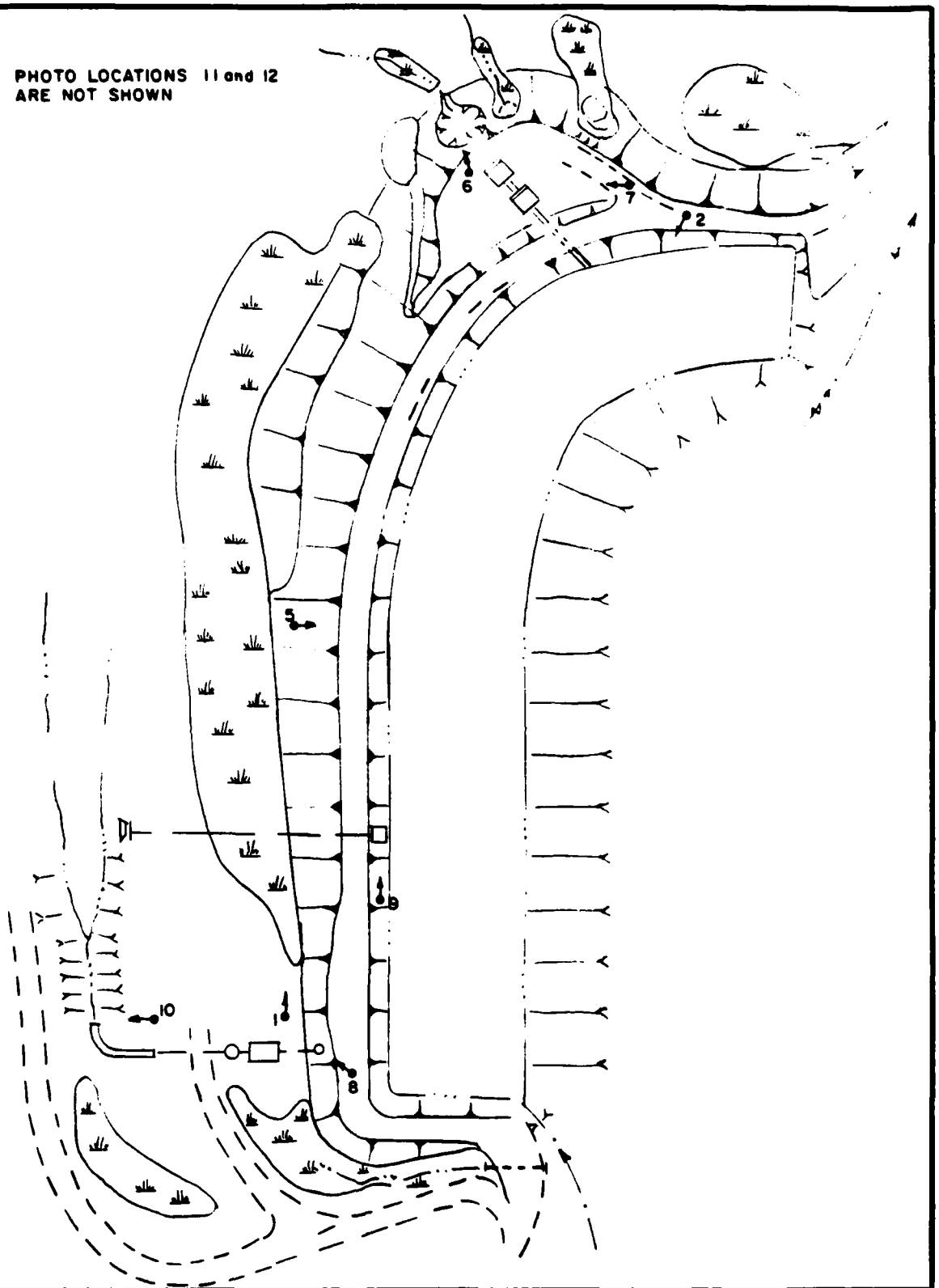
ITEM	REMARKS
Miscellaneous	
Prior Accidents or Failure of Dam Description Reports	None reported.

*Information and data may be obtained from the PennDER, Harrisburg, Pennsylvania.
**Reduced size reproductions contained in Appendix E.
[1] Drawings obtained from United States Steel Corporation.

APPENDIX C

PHOTOGRAPHS

PHOTO LOCATIONS 11 and 12
ARE NOT SHOWN



DATE: SEPT. 1980		RAW WATER POND NATIONAL DAM INSPECTION PROGRAM	PHOTO KEY MAP
SCALE: NONE			
DR: AP	CK: JEB	ACKENHEIL & ASSOCIATES CONSULTING ENGINEERS GEO SYSTEMS, INC. 1000 BANKSVILLE RD./PITTSBURGH, PA. 15216	
DWG. NO.			

10 9545 CRYSTALENE A&B SMITH CO PGH PA LT1342-1278

C1

RAW WATER POND

Photo 1 Downstream Slope, left center portion showing trees on embankment slope and swampy toe conditions.

Photo 2 Impoundment as seen from near right end of embankment.

Photo 3 Downstream Toe Area showing extreme swampy condition along central portion of toe.

Photo 4 Downstream Toe Area showing small swampy area near right end of embankment.

Photo 5 Animal Burrow on downstream slope near center of dam.

Photo 6 Depression on outslope of mine drainage pump area.

Photo 7 Mine Drainage Pumps.

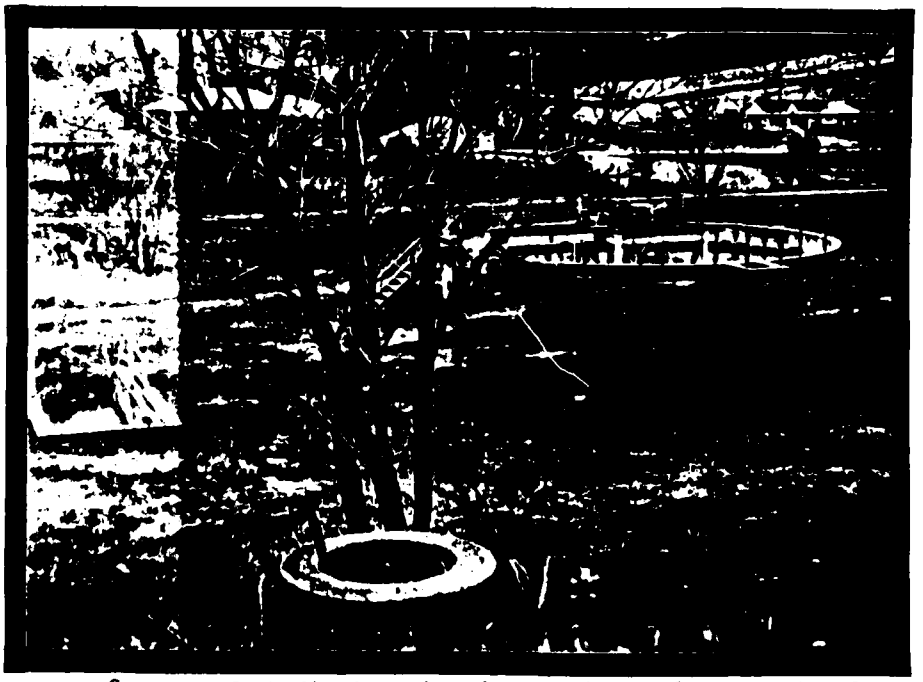


Photo 8 Outlet Works showing gate valve control manhole and outlet weir box below. Circular settling basin not used.

Photo 9 Spillway Inlet showing erosion protection slab and trash cage.

Photo 10 Outlet Works Discharge Pipe at inlet to Treated Water Pond reservoir.

RAW WATER POND

Photo 11 Treated Water Pond downstream of Raw Water Pond.

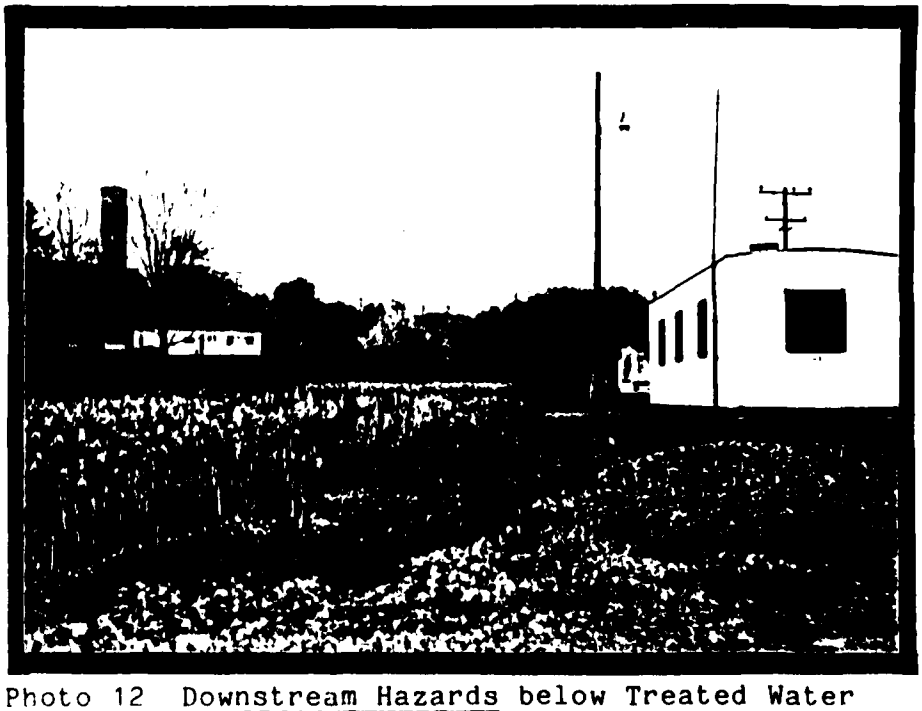


Photo 12 Downstream Hazards below Treated Water Pond.

APPENDIX D

HYDROLOGY AND HYDRAULICS ANALYSES

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.

Parameter	Definition	Where Obtained
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 of 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 grassland and water surface.

ELEVATION TOP NORMAL POOL (STORAGE CAPACITY): 1133.0 (24.6 acre-feet.)

ELEVATION TOP FLOOD CONTROL POOL (STORAGE CAPACITY): 1133.9 (27.0 acre-feet.)

ELEVATION MAXIMUM DESIGN POOL: 1135.0

ELEVATION TOP DAM: 1135.5 (average) 1133.9 (minimum)

OVERFLOW SECTION

a. Elevation Varies
b. Type Embankment crest
c. Width 25 feet
d. Length 1300+ feet
e. Location Spillover Right abutment
f. Number and Type of Gates None

OUTLET WORKS

a. Type 8 inch diameter vitrified clay
b. Location Left end of embankment
c. Entrance Inverts 1133.0
d. Exit Inverts 1122.0
e. Emergency Drawdown Facilities None

HYDROMETEOROLOGICAL GAGES

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

MAXIMUM REPORTED NON-DAMAGING DISCHARGE None reported

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

NAME OF DAM: Raw Water Pond	NDI ID NO. PA 01137
Probable Maximum Precipitation (PMP)	24.2*
Drainage Area	0.02 sq. mi.
Reduction of PMP Rainfall for Data Fit Reduce by 20%. therefore PMP rainfall =	0.8 (24.2) 19.4 in.
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	29**
C_p	0.5
C_t	1.6
L	0.23 mile
L_{ca}	0.08 mile
$t_p = C_t (L \cdot L_{ca})^{0.3}$ =	0.48 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=0.03 cfs
Base Flow Cutoff	0.05 x Q peak
Recession Ratio	2.0
Overflow Section Data	
Crest Length (Embankment and Right Abutment)	1300± feet
Freeboard	0.9 feet
Discharge Coefficient	3.09
Exponent	1.5

---

* Hydrometerological Report 33
** Hydrological zone defined by Corps of Engineers, Baltimore District, for determining Snyder's Coefficients (C_p and C_t).

Sheet _____ of _____

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

Job Raw Water Pond Job No. 79153 V

Subject Data Input

Made By JPH Date 7-8-80 Checked JEB Date 8/8/80

LOSS RATE AND BASE FLOW PARAMETERS

As Recommended by Corps of Engineers, Baltimore District

STRTL = 1 inch
CNSTL = 0.05 "/hr.
STRTQ = 1.5 cfs/mi²
QRCSN = 0.05 (5% of Peak Flow)
RTIOR = 2.0

ELEVATION-AREA-CAPACITY RELATIONSHIPS

From USGS 7.5 min Quad, Penn DER files and Field Inspection Data

At elevation 1133

Initial storage 24.6 acre feet

Pond Surface Area 3 acres

At Elevation $\begin{matrix}1180\\1200\end{matrix}$ Area = $\frac{5}{11}$ Acres

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

$$H = \frac{3V}{A} = \frac{3(24.6)}{3} = 24.6 \text{ feet}$$

Elevation where Area Equals Zero

1133 - 24.6 = 1108.4

$A	AREA	0.0	3.0	5.0	11.0
$E	ELEVATION	1108.4	1133	1180	1200

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

Sheet _____ of _____

Job Raw Water Pond Job No. 79153 V

Subject Data Input

Made By JPH Date 7-8-80 Checked JEB Date 8/8/80

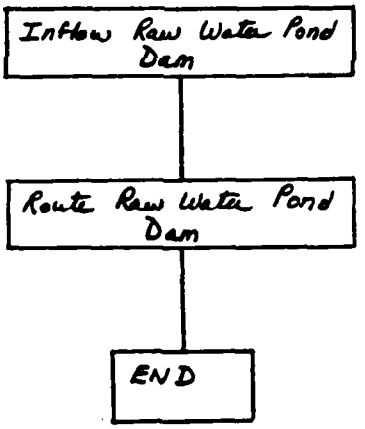
OVERTOP PARAMETERS

TOP OF DAM ELEVATION (MINIMUM) = 1133.9

LENGTH OF DAM = 1187.0

COEFFICIENT OF DISCHARGE = 3.09

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 RAW WATER POND
    3              A3       PROBABLE MAXIMUM FLOOD PMF/UNIT HYDROGRAPH BY SNYDER'S METHOD
    4              B    300       0      10       0       0       0       0       0      -4       0
    5              B1     5
    6              J      1       3       1
    7              J1    1.      .5      .4
    8              K      0       1                                               1
    9              K1       INFLOW HYDROGRAPH FOR RAW WATER POND
   10              M      1       1    0.02            0.02                                       1
   11              P             24.2     102     120     130     140
   12              T                                                       1.0     .05
   13              W   0.48    0.50
   14              X   -1.5   -0.05     2.0
   15              K      1       2                                               1
   16              K1       ROUTING AT RAW WATER POND
   17              Y                                       1       1
   18              Y1     1                                                 24.6
   19              $A    0.      3.      5.     11.
   20              $E1108.4  1133.0  1180.  1200.
   21              $$1133.9    0.01    3.09    1.5
   22              $D1133.9    3.09     1.5  1187.
   23              $L   90.0   910.0  1450.0
   24              $V1133.9  1135.3  1136.0
   25              K     99
   26              A
   27              A
   28              A
   29              A
   30              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: 8 SEP 80
RUN TIME: 12.24.57

NATIONAL PROGRAM FOR THE INSPECTION OF NON FEDERAL DAMS
HYDROLOGIC AND HYDRAULIC ANALYSIS OF RAW WATER POND
PROBABLE MAXIMUM FLOOD PMF/UNIT HYDROGRAPH BY SNYDER'S METHOD

JOB SPECIFICATION

NQ	NHR	NMIN	IDAY	IHR	IMIN	METRC	IPLT	IPRT	NSTAN
300	0	10	0	0	0	0	0	-4	0
			JOPER	NWT	LROPT	TRACE			
			5	0	0	0			

MULTI-PLAN ANALYSES TO BE PERFORMED
NPLAN= 1 NRTIO= 3 LRTIO= 1

RTIOS= 1.00 0.50 0.40

********** ********** ********** ********** **********

SUB-AREA RUNOFF COMPUTATION

INFLOW HYDROGRAPH FOR RAW WATER POND

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

HYDROGRAPH DATA

IHYDG	IUHG	TAREA	SNAP	TRSDA	TRSPC	RATIO	ISNOW	ISAME	LOCAL
1	1	0.02	0.0	0.02	0.0	0.0	0	1	0

PRECIP DATA

SPFE	PMS	R6	R12	R24	R48	R72	R96
0.0	24.20	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= 0.48 CP=0.50 NTA= 0

RECESSION DATA

STRTQ= -1.50 QRCSN= -0.05 RTIOR= 2.00

UNIT HYDROGRAPH 21 END-OF-PERIOD ORDINATES, LAG= 0.48 HOURS, CP= 0.50 VOL= 1.00

2.	8.	13.	13.	10.	8.	6.	4.	3.	2.
2.	1.	1.	1.	1.	0.	0.	0.	0.	0.
0.									

0 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	27.10	24.68	2.42	1920.
										(688.)(	627.)(	61.)(	54.37)

HYDROGRAPH ROUTING

ROUTING AT RAW WATER POND

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
2	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	NSTDL	LAG	AMSKK	X	TSK	STORA	ISPRAT
1	0	0	0.0	0.0	0.0	25.	0

SURFACE AREA=	0.	3.	5.	11.
CAPACITY=	0.	25.	211.	367.
ELEVATION=	1108.	1133.	1180.	1200.

CREL	SPWID	COQW	EXPW	ELEVL	COQL	CAREA	EXPL
1133.9	0.0	3.1	1.5	0.0	0.0	0.0	0.0

DAM DATA

TOPEL	COQD	EXPD	DAMWID
1133.9	3.1	1.5	1187.

CREST LENGTH AT OR BELOW ELEVATION	90.	910.	1450.
	1133.9	1135.3	1136.0

PEAK OUTFLOW IS 90. AT TIME 40.17 HOURS
PEAK OUTFLOW IS 44. AT TIME 40.17 HOURS
PEAK OUTFLOW IS 34. AT TIME 40.33 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 1.00	 RATIO 2 0.50	 RATIO 3 0.40
HYDROGRAPH AT	1	0.02	1	92.	46.	37.
	(	0.05)	(	2.61)(	1.30)(	1.04)(
ROUTED TO	2	0.02	1	90.	44.	34.
	(	0.05)	(	2.56)(	1.23)(	0.97)(

SUMMARY OF DAM SAFETY ANALYSIS

PLAN 1 .....

	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
ELEVATION	1133.00	1133.90	1133.90
STORAGE	25.	27.	27.
OUTFLOW	0.	0.	0.

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	1134.22	0.32	28.	90.	16.50	40.17	0.0
0.50	1134.12	0.22	28.	44.	12.67	40.17	0.0
0.40	1134.09	0.19	28.	34.	12.00	40.33	0.0

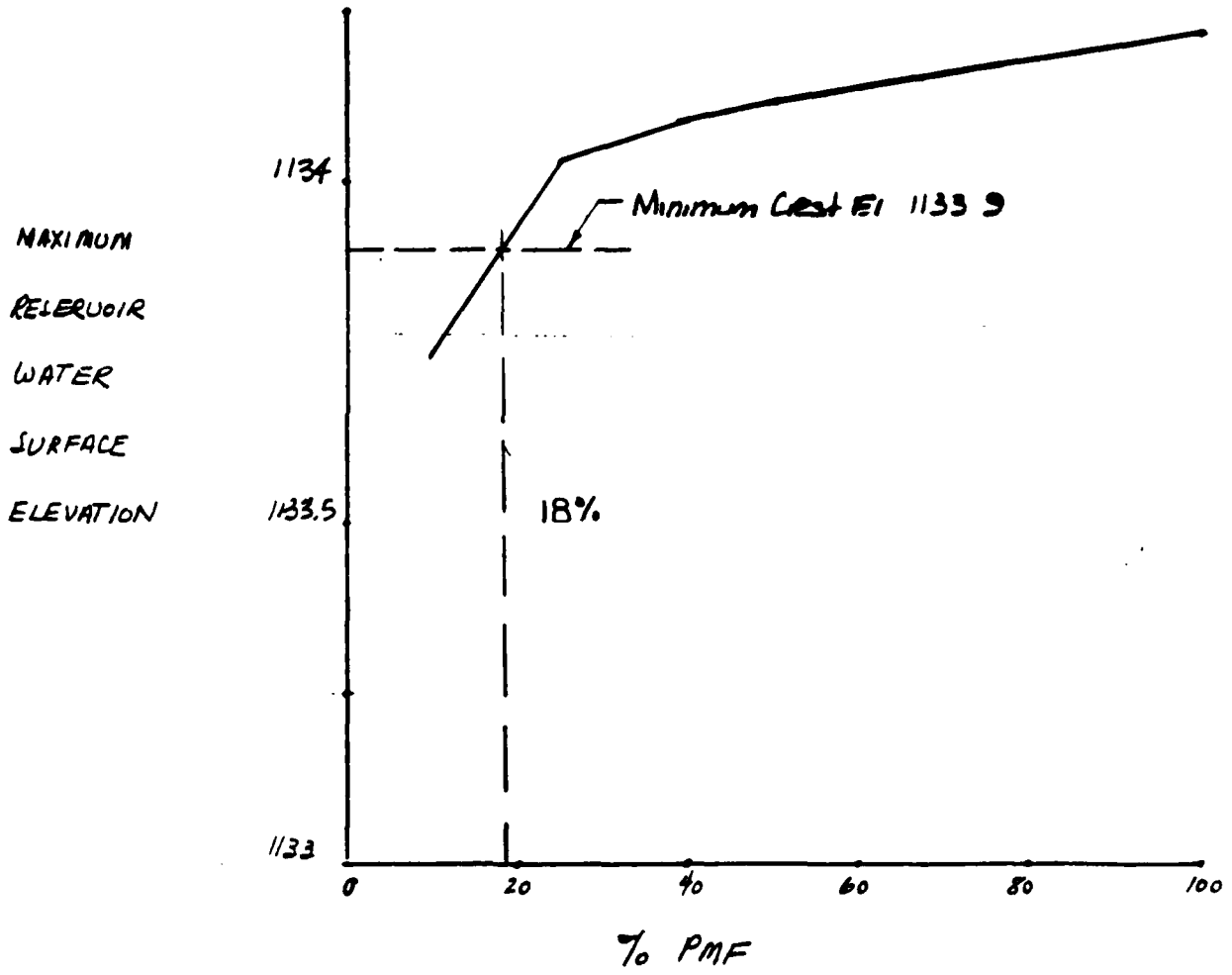
Sheet _____ of _____

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

Job Raw Water Pond Job No 791-2V

Subject Hydrologic Performance Plot

Made By JPH Date 7-8-80 Checked JEB Date 8/8/80

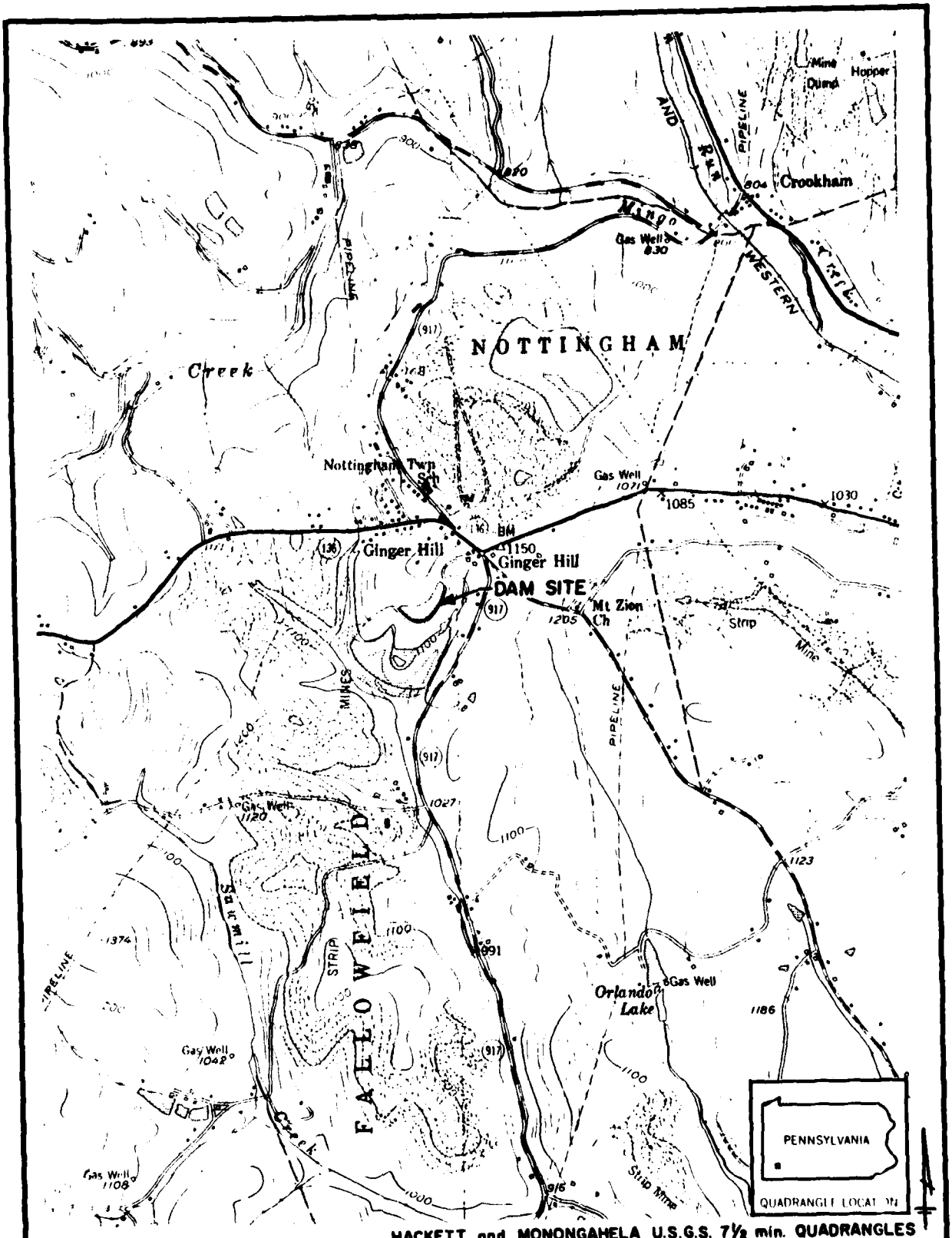


APPENDIX E

PLATES

LIST OF PLATES

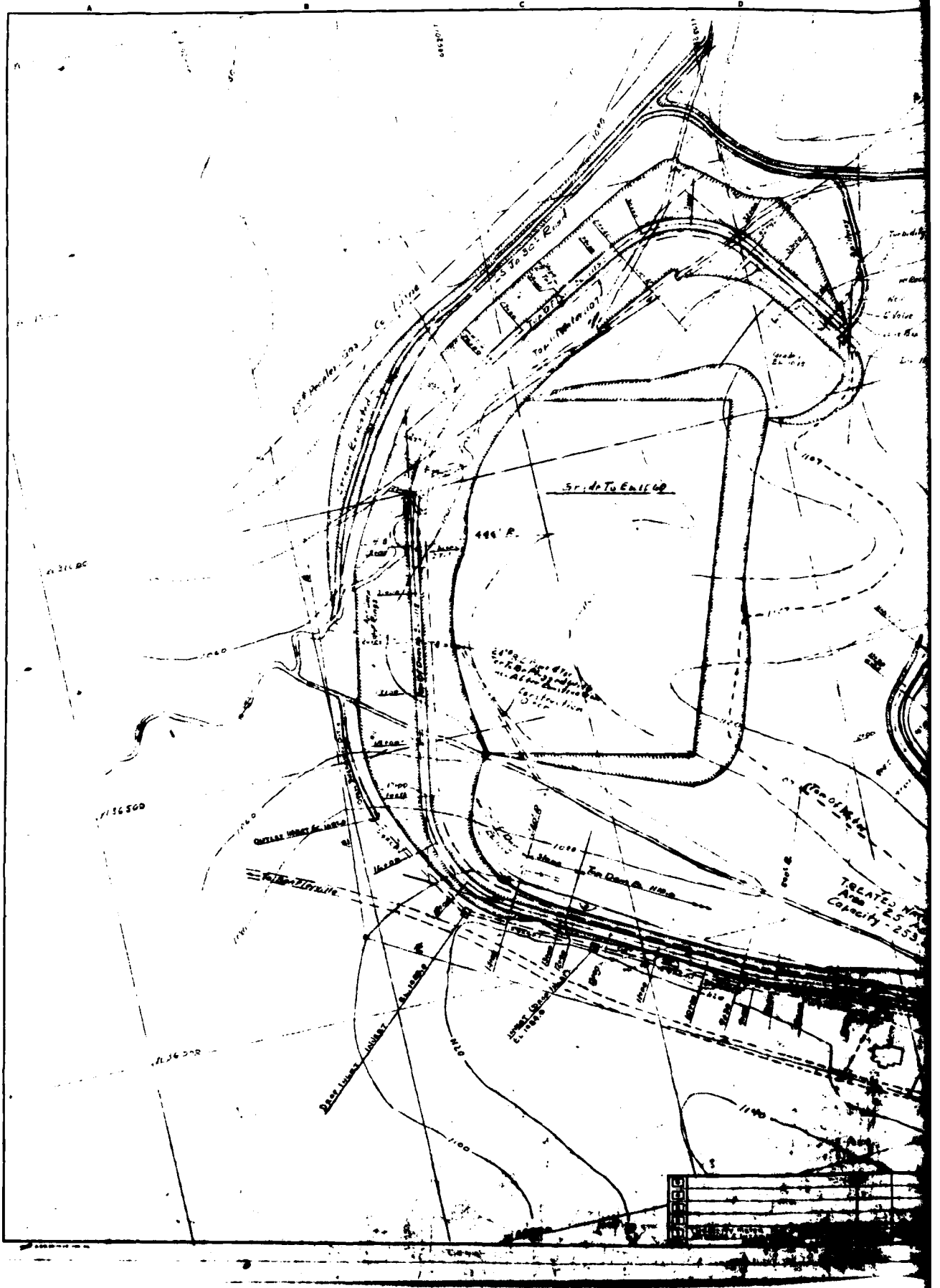
Plate I	Regional Vicinity Map.
Plate II	Maple Creek Mine - Ginger Hill Shaft, Mine Water Treatment Facilities, Plan.
Plate III	Facility Plans, Mine Water Treatment Facilities, Ginger Hill Shaft - Maple Creek Mine.
Plate IV	Maple Creek Mine - Ginger Hill Shaft, Mine Water Treatment Facilities, Cross-Sections for Raw Water Storage Pond.
Plate V	Maple Creek Mine - Ginger Hill Shaft, Mine Water Treatment Facilities, Enlarged Sections.

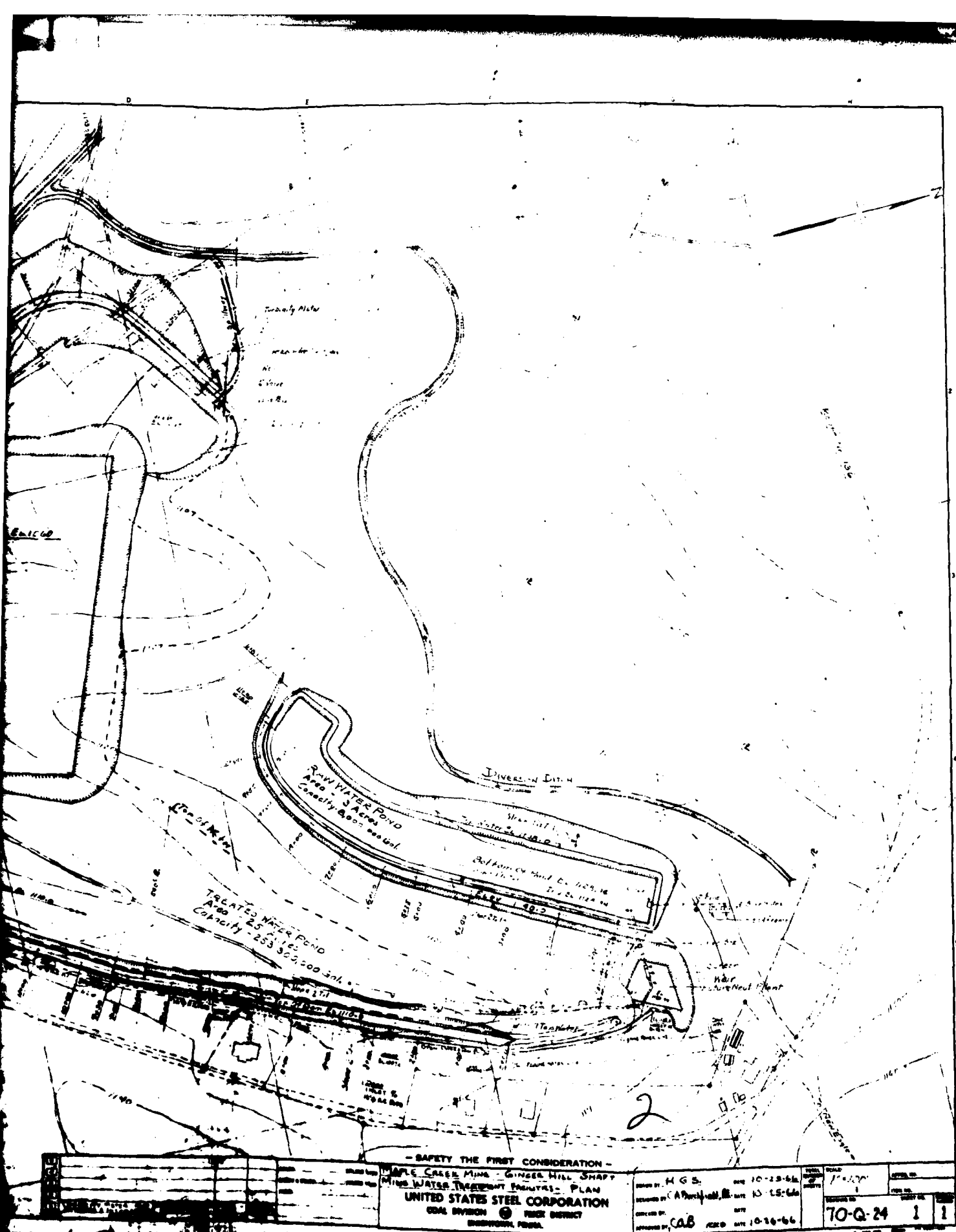


HACKETT and MONONGAHELA U.S.G.S. 7½ min. QUADRANGLES

DATE: SEPT. 1980	RAW WATER POND NATIONAL DAM INSPECTION PROGRAM	REGIONAL VICINITY MAP
SCALE: 1" = 2000'		
DR: JF CK:	ACKENHEIL & ASSOCIATES CONSULTING ENGINEERS GEO SYSTEMS, INC. 1000 BANKSVILLE RD/PITTSBURGH, PA. 15216	
DWG. NO. PLATE I		

10 8545 CRYSTALENE ABB SMITH CO PGH PA LT1342-1278


A
B
C
D
Str. to be Enlarged
Treated Water Storage Capacity - 2.5 MG
Treated Water Storage Capacity - 2.5 MG



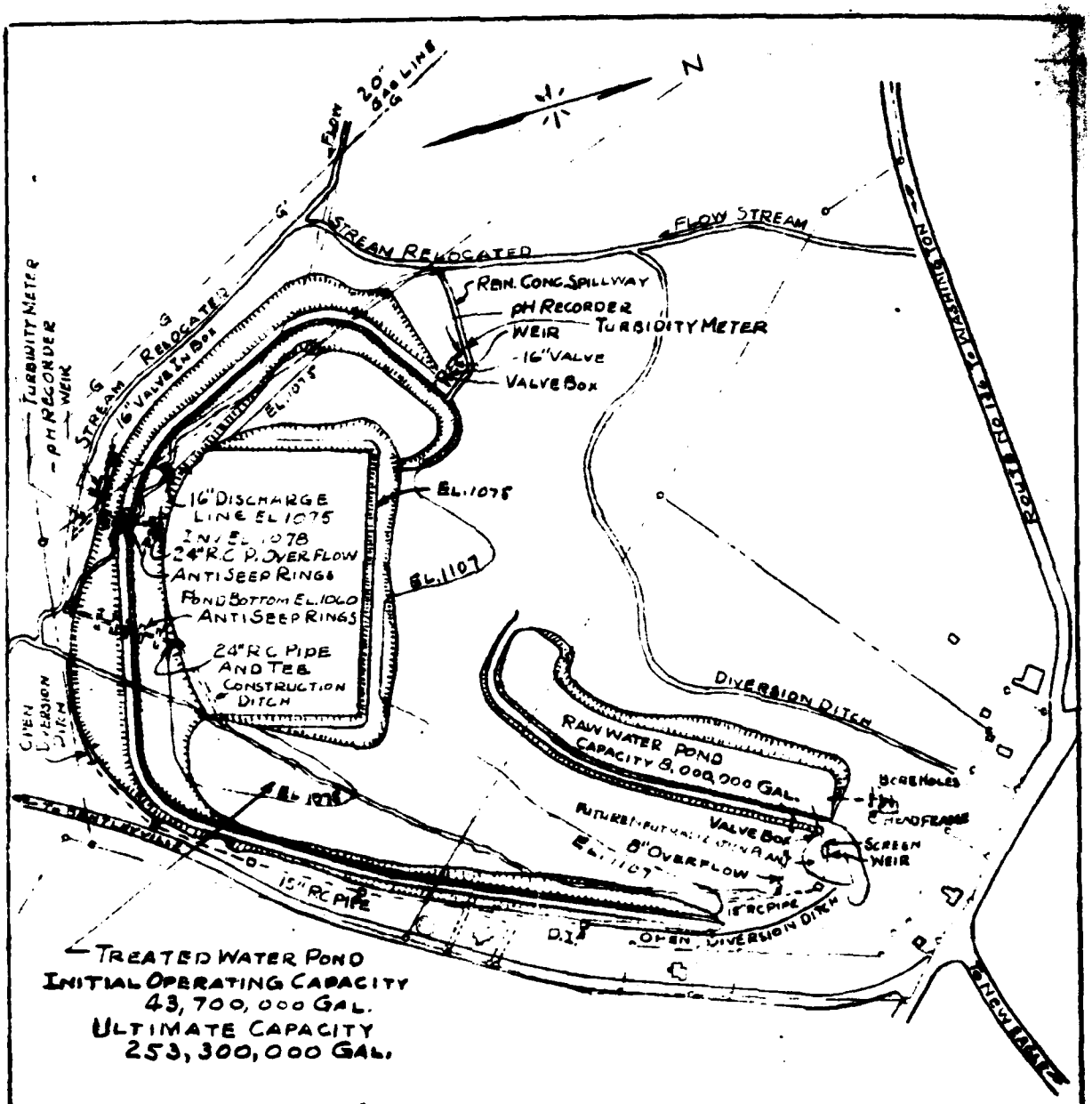
- SAFETY THE FIRST CONSIDERATION -

MAPLE CREEK MINE - GINGER HILL SHAFT
MINE WATER TREATMENT FACILITIES - PLAN
UNITED STATES STEEL CORPORATION
COAL DIVISION ⑤ PENCE DISTRICT
MASONTOWN, PENNA.

DRAWN BY H.G.S. DATE 10-13-66
DESIGNED BY C.A. Pierce Hall, III DATE 10-15-66
CHECKED BY DATE
APPROVED BY CAB FILED DATE 10-26-66

SCALE 1" = 200'
SHEETS 1
DRAWING NO. 70-Q-24
SHEET NO. 1
REVISION NO. 1

PLATE II



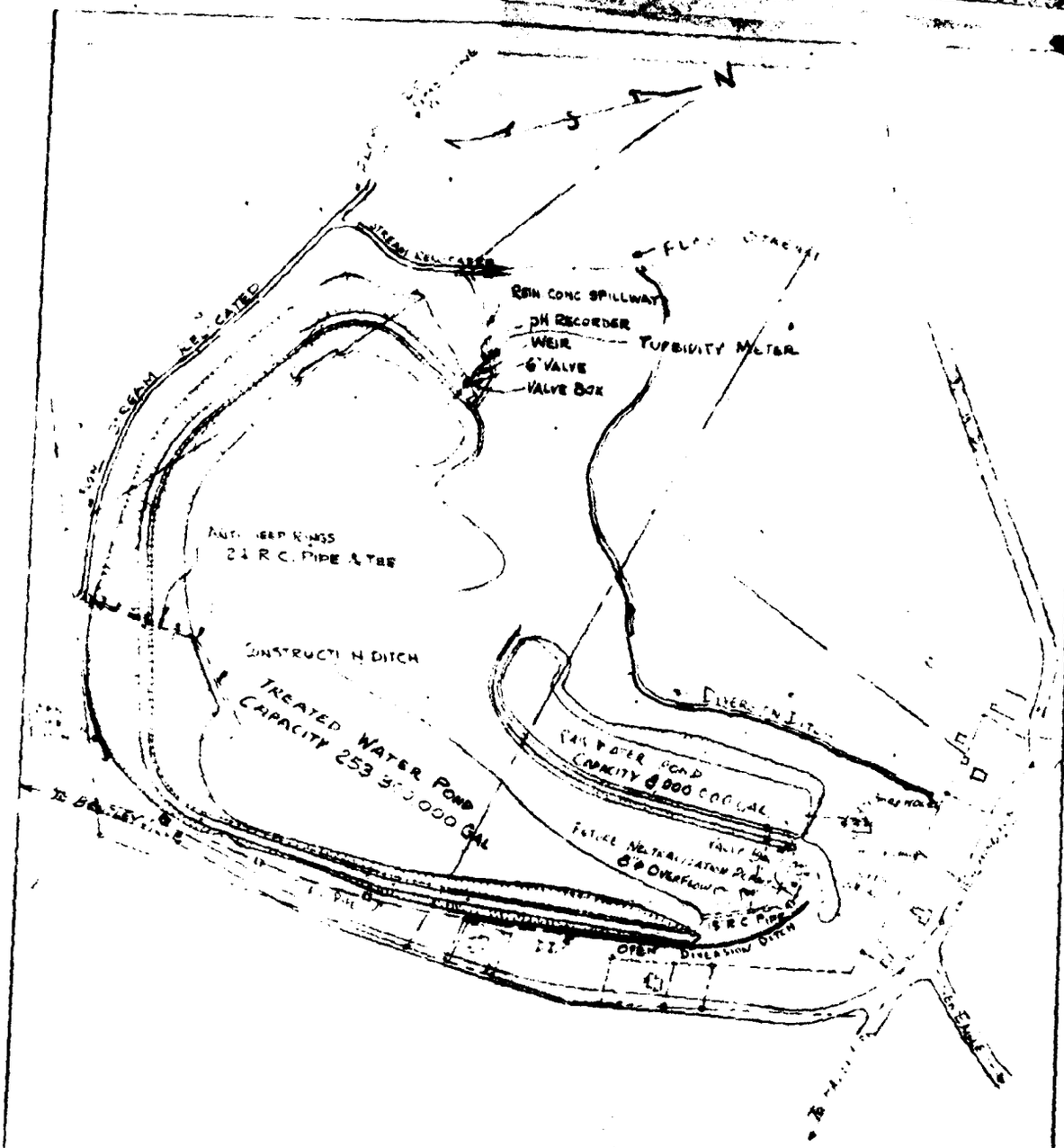
FACILITY PLAN
INITIAL OPERATING LEVEL
MINE WATER TREATMENT FACILITIES
GINGER HILL SHAFT - MAPLE CREEK MINE
FALLOWFIELD TWP. - WASHINGTON CO., PA.

SCALE: 1" = 400'

JANUARY 9, 1967.

H.G.S.

DWG. Nº 70-Q-24 SH 1B



FACILITY PLAN

MINE WATER TREATMENT FACILITIES

GINGER HILL SHAFT - MAPLE CREEK MINE

FALLOWFIELD TWP. - WASHINGTON CO., PA.

SCALE: 1" = 400'

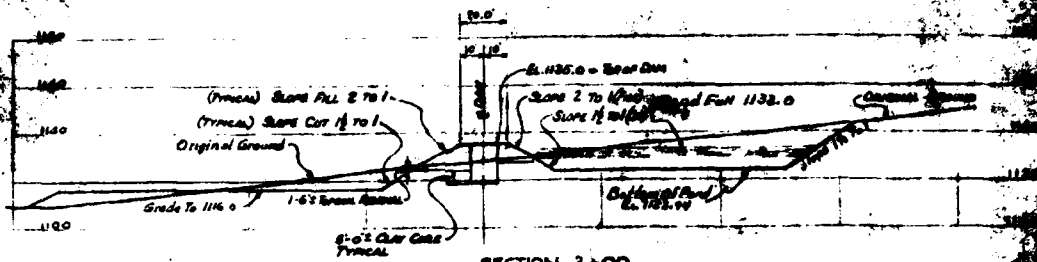
OCTOBER 26, 1966

J.C.R.

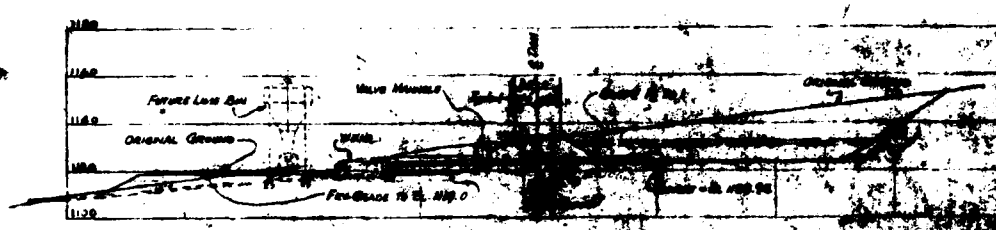
C.A.B 10/26/66 rev. 12-28-66

DWG Nº 70-Q-24, SH 1A REV. Nº 1 MRG

PLATE III



SECTION 2+00



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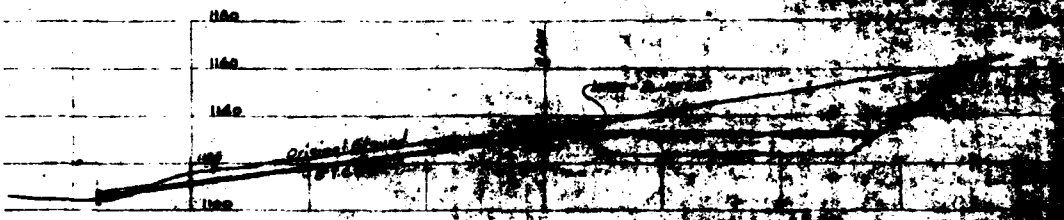

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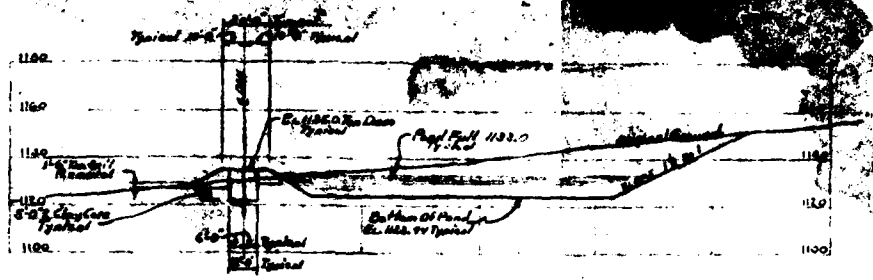

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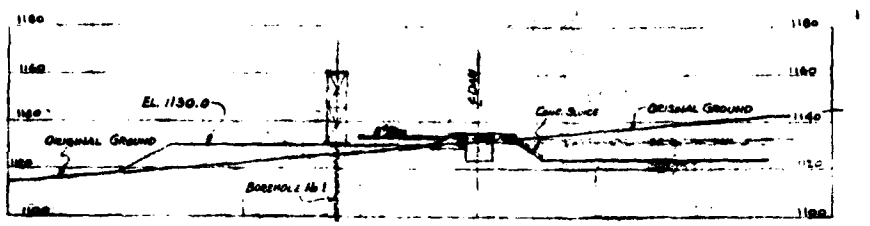

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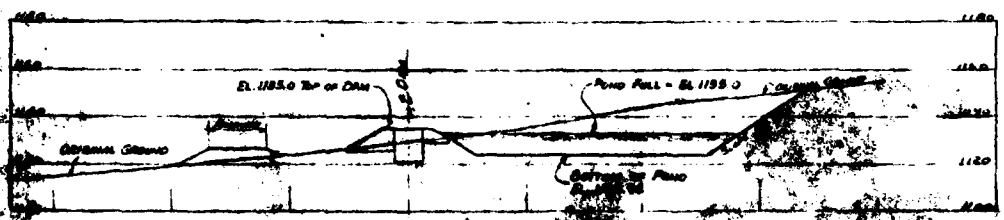


SECTION AT 12+00

SECTION AT 12+87

NOTE:

THE FOLLOWING DATA IS TYPICAL FOR ALL SECTIONS SHOWN ON THIS DRAWING:

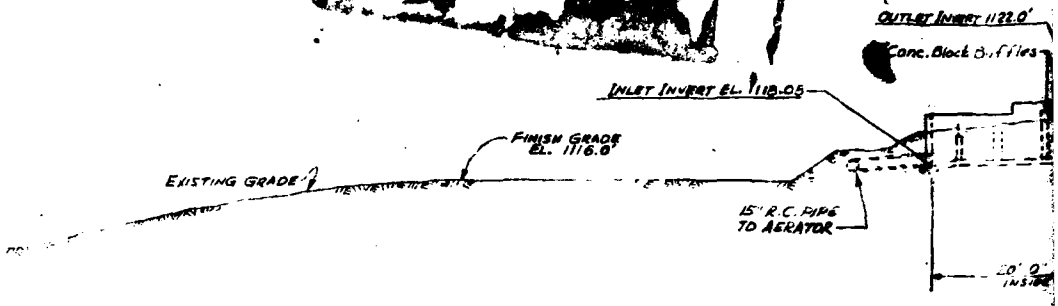
SLOPE ON CUTS = 1½ TO 1

SLOPE ON FILLS = 2 TO 1

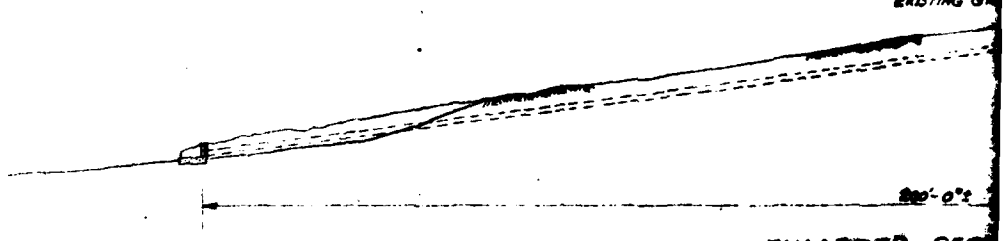
TOP OF DAM = EL. 1185.0

POND FULL = EL. 1183.0

BOTTOM OF POND = 1123.50



ENLARGED SECTIO



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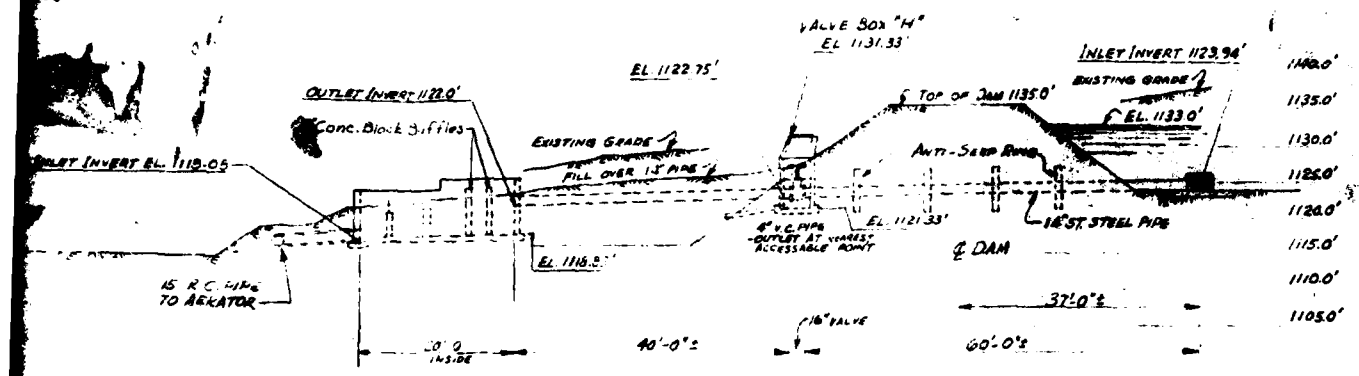
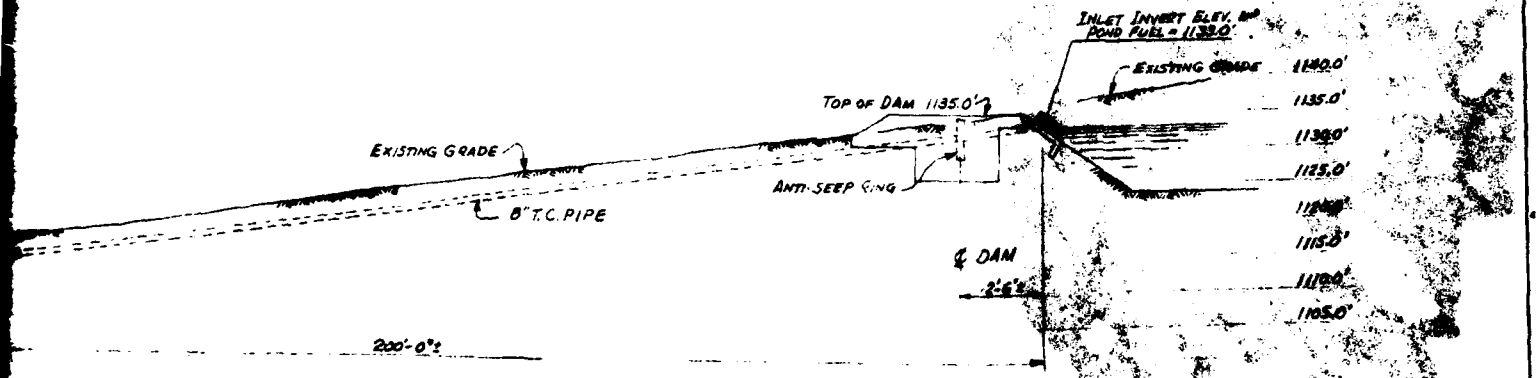


ENLARGED SECTION 2+50
RAW WATER POND
(SEE SHEET 2)



ENLARGED SECTION 4+00
RAW WATER POND

2

- SAFETY THE FIRST CONSIDERATION -

PLATE V

APPENDIX F

GEOLOGY

GEOLOGY

Geomorphology

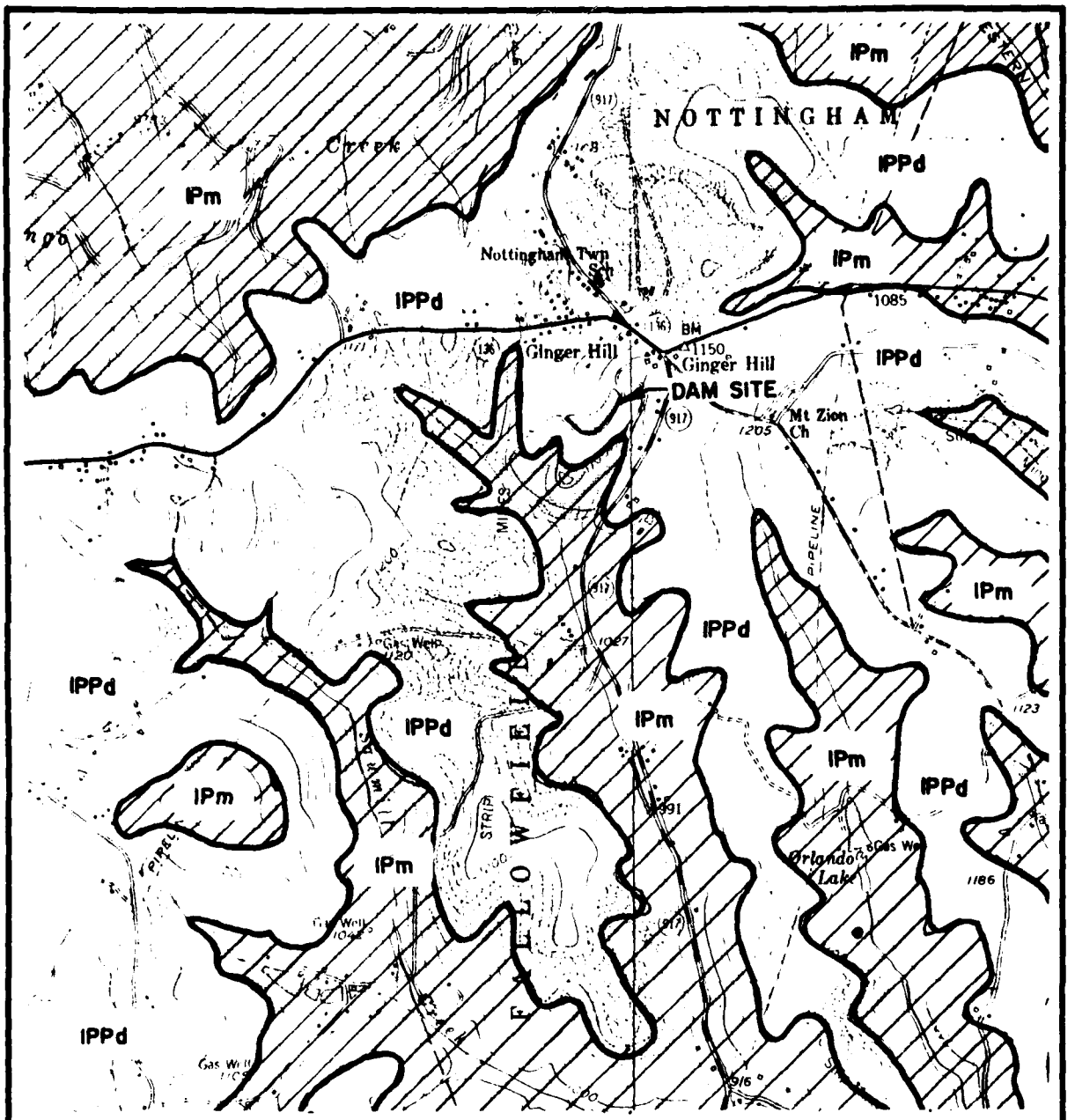
The Raw Water Pond is located within the Pittsburgh Plateau section of the Appalacian Plateau Physiographic Province. This area is characterized by essentially flat lying sedimentary rocks which have been deeply cut by streams to form steep sided valleys. The Raw Water Pond is located near the head of an unnamed tributary to Sawmill Creek. The valley bottom of the unnamed tributary is about 200 feet below the adjacent ridges. The rounded hilltops of these ridges are at Elevation 1200 to 1300 feet, and in a regional sense are part of a broad, undulating plateau.

Stratigraphy

General: The Raw Water Pond is located along the stratigraphic boundary of the Monongahela Group of Pennsylvania Age and the Dunkard Group of Permian Age. The Waynesburg Coal Seam, which marks the stratigraphic boundary between these two groups, outcrops near the dam site.

Mining Activity: The Waynesburg Coal Seam has been strip mined extensively in this area. The Pittsburgh Coal Seam, located about 300 feet below the dam, has been extensively deep mined.

Rock Types: Bedrock, which immediately underlies the site, consists of sandstones and shales.



HACKETT QUADRANGLE, WASHINGTON COUNTY, PENNSYLVANIA

SCALE: 0 1/2 MILE 1:24000

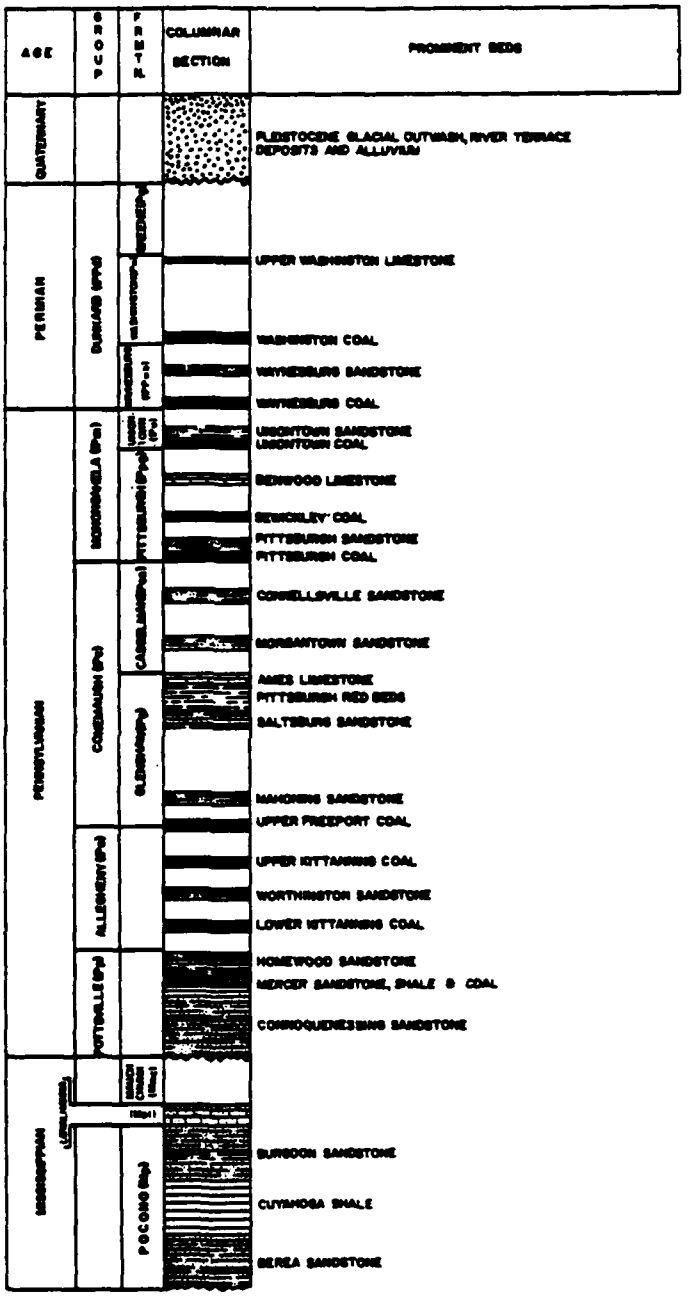
CONTOUR INTERVAL 20FT. DATUM IS MEAN SEA LEVEL

FORMATION CONTACT

DATA OBTAINED FROM PENNSYLVANIA TOPOGRAPHIC AND GEOLOGIC SURVEY GREATER PITTSBURGH REGION GEOLOGIC MAP AND CROSS SECTIONS, 1975 and GREATER PITTSBURGH REGION STRUCTURE CONTOUR MAP, 1975

DATE: SEPT. 1980		RAW WATER POND NATIONAL DAM INSPECTION PROGRAM	GEOLOGIC MAP
SCALE: 1" = 2000'			
DR: JF	CK:	ACKENHEIL & ASSOCIATES CONSULTING ENGINEERS GEO SYSTEMS, INC. 1900 BANKSVILLE RD/PITTSBURGH, PA 15216	

10 8545 CRYSTALENE A&B SMITH CO PGH PA LT1342-1278



DATE: SEPT. 1980	RAW WATER POND NATIONAL DAM INSPECTION PROGRAM	GEOLOGIC COLUMN
SCALE: None		
DR: AP CK:	ACKENHEIL & ASSOCIATES CONSULTING ENGINEERS GEO SYSTEMS, INC. 1000 BANKSVILLE RD./PITTSBURGH PA 15216	

KEUFFEL & ESSER CO. PGH. PA. LT1342-1278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