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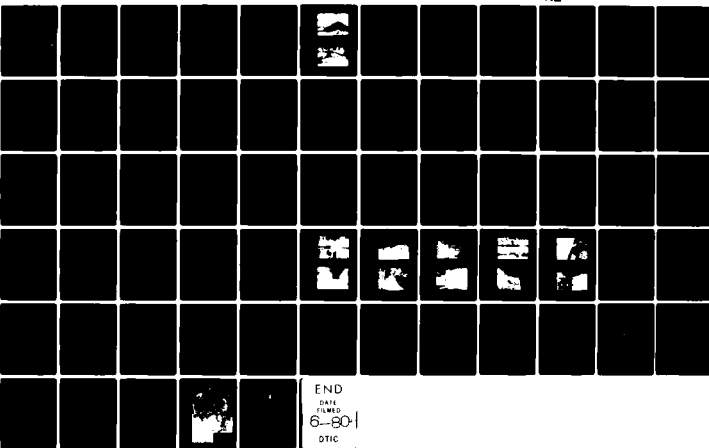
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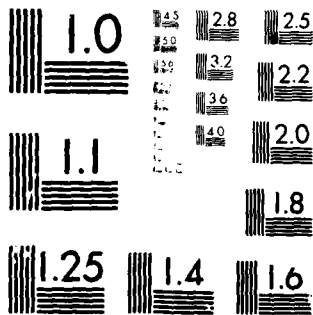
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OHIO RIVER BASIN
BRANCH OF DUTCH FORK, WASHINGTON COUNTY
PENNSYLVANIA

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CLAYSVILLE No. 1 DAM

NDI No. PA 00491
PennDER No. 63-35

LEVEL II

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

MICHAEL BAKER, JR., INC.

DACW 31-80-C-0025



prepared for

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

prepared by

MICHAEL BAKER, JR., INC.

Consulting Engineers
4301 Dutch Ridge Road
Beaver, Pennsylvania 15009

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JUN 6 1980

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March 1980

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OHIO RIVER BASIN

CLAYSVILLE No. 1 DAM
WASHINGTON COUNTY, COMMONWEALTH OF PENNSYLVANIA
NDI No. PA 00491
PennDER No. 63-35

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PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM.

Clayville

Number 1 Dam, NDI Number PA-00491,
PennDER Number 63-35, Ohio River
Basin, Branch of Dutch Fork, Washington
County, Commonwealth of Pennsylvania. Phase I
Inspection Report;

DTIC
ELECTE

JUN 6 1990

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

Prepared by: MICHAEL BAKER, JR., INC.
Consulting Engineers
4301 Dutch Ridge Road
Beaver, Pennsylvania 15009

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⑩ John A. Dziubek

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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 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 available data and visual inspections. Detailed investigation, and analyses involving topographic mapping, subsurface investigations, testing, and detailed computational evaluations are beyond the scope of a Phase I Investigation; however, the investigation is intended to identify any need for such studies.

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 a dam depends on numerous and constantly changing internal and external conditions, and is evolutionary in nature. It would be incorrect to assume that the present condition of the dam will continue to represent the condition of the dam at some point in the future. Only through frequent inspections can unsafe conditions be detected and only through continued care and maintenance can these conditions be prevented or corrected.

Phase I Inspections are not intended to provide detailed hydrologic and hydraulic analyses. In accordance with the established guidelines, the spillway design flood is based on the estimated "Probable Maximum Flood" for the region (greatest reasonably possible storm runoff), or fractions thereof. The spillway design flood provides a measure of relative spillway capacity and serves as an aid in determining the need for more detailed hydrologic and hydraulic studies, considering the size of the dam, its general condition and the downstream damage potential.

Accession For	NTIS 9-241	DEC TAB	Announced	Justification	By	Distribution	Availability	Available/Or Special
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PHASE I REPORT
NATIONAL DAM INSPECTION PROGRAM

Claysville No. 1 Dam, Washington County, Pennsylvania
NDI No. PA 00491, PennDER No. 63-35
Tributary of Dutch Fork of Buffalo Creek
Inspected 5 December 1979

ASSESSMENT OF
GENERAL CONDITIONS

Claysville No. 1 Dam is classified as a "High" hazard - "Small" size dam. The dam and reservoir, owned by the Claysville-Donnegal Municipal Water Authority, are used for water supply. The dam was found to be in fair overall condition at the time of inspection.

Hydraulic/hydrologic evaluations, performed in accordance with procedures established by the Baltimore District, Corps of Engineers, for Phase I Inspection Reports, revealed that the spillway will pass approximately 35 percent of the Probable Maximum Flood (PMF) before overtopping will occur. A spillway design flood (SDF) in the range of the 1/2 Probable Maximum Flood (1/2 PMF) to the PMF is required for Claysville No. 1 Dam. The PMF was chosen because an elementary school is located within the floodplain 900 feet downstream from the dam. Because the duration and depth of overtopping under the 1/2 PMF (2.83 hours and 0.59 foot, respectively) did not meet the limiting criteria for failure of the dam (2 hours and 1.0 foot), the spillway is assessed as "inadequate," but not "seriously inadequate." It is recommended that the owner immediately initiate an engineering study to develop recommendations for remedial measures to reduce the overtopping potential of the dam.

The inspection and review of information revealed certain items of work which should be performed without delay by the owner. Items 1 and 2 below should be completed by a qualified professional engineer experienced in the design of hydraulic and appurtenant structures for earth dams.

- 1) The owner should immediately initiate an engineering study to further evaluate the spillway capacity in order to develop recommendations for remedial measures to reduce the overtopping potential of the dam.
- 2) The condition and operability of the sluice gates and valves should be evaluated and the necessary maintenance performed. The operability of these components should be checked at least once a year in the future.

CLAYSVILLE No. 1 DAM

- 3) Repair the areas of spalled and deteriorated concrete on the spillway training walls and end sill of the stilling pool.
- 4) Fill the animal/rodent burrows in the embankment.
- 5) Fill the low areas on both the right and left sides of the spillway structure.
- 6) Remove the I-beams from the downstream channel.

In addition, the following operational measures are recommended to be undertaken by the owner:

- 1) Develop a detailed emergency operation and warning system.
- 2) During periods of unusually heavy rain, provide around-the-clock surveillance of the dam.
- 3) When warning of a storm of major proportions is given by the National Weather Service, the owner should activate the emergency operation and warning system.

It is further recommended that formal inspection, maintenance, and operation procedures and records be developed and implemented.

Submitted by:

MICHAEL BAKER, JR., INC.



John A. Dziubek
John A. Dziubek, P.E.
Engineering Manager-Geotechnical

Date: 26 March 1980

Approved by:

DEPARTMENT OF THE ARMY
BALTIMORE DISTRICT, CORPS OF ENGINEERS

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

Date: 29 April 1980

CLAYSVILLE No. 1 DAM



Overall View of Dam from the Left Abutment



Overall View of Dam from the Right Abutment

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PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM
CLAYSVILLE No. 1 DAM
NDI No. PA 00491, PennDER No. 63-35

SECTION 1 - PROJECT INFORMATION

1.1 GENERAL

- a. Authorization - The Dam Inspection Act, Public Law 92-367, authorized the Secretary of the Army, through the Corps of Engineers, to initiate a program of inspection of dams throughout the United States.
- b. Purpose of Inspection - The purpose of the inspection is to determine if the dam constitutes a hazard to human life or property.

1.2 DESCRIPTION OF PROJECT

- a. Description of Dam and Appurtenances - The Claysville No. 1 Dam is an earthfill dam approximately 31.5 feet high and 234 feet long. The crest width is 10 feet, the downstream slope is 2H:1V (Horizontal to Vertical), and the upstream slope is 2.5H:1V with riprap protection designed to cover the entire upstream slope. The embankment has two clay puddle cut-off trenches. The first one is near the toe of the upstream embankment and the second is at the centerline of the dam. Both clay puddle cut-off trenches are shown as six feet wide and the depth of the trench was designed to extend to impervious material. The actual depth is not known.

The spillway is located at the right abutment and consists of a broad crested weir and chute channel. The crest is at Elevation 1158.5 feet Mean Sea Level (M.S.L.) or 1.5 feet higher than the original design. The crest length perpendicular to flow is 12 feet. The rectangular chute channel partially curves toward the center of the dam in plan view and narrows to 8 feet wide from the original 12 foot width at the crest. A stilling pool structure is located at the toe of the embankment before the discharge enters the original streambed downstream from the dam.

The outlet works consist of a sluice gate chamber at the toe of the upstream slope and a 12 inch

cast-iron water supply pipe through the embankment. There are three intakes at Elevations 1152.5, 1143, and 1133.2 feet M.S.L. which can be closed by three 8 inch sluice gates. A 12 inch gate valve, located in the sluice gate chamber, provides closure for the 12 inch cast-iron pipe that passes through the embankment. At the downstream slope a "tee" is located on the 12 inch pipe. One pipe supplies water to the filter building and the other discharges into the stilling basin. The second pipe can be used for emergency drawdown by opening the valve at the downstream toe.

- b. Location - Claysville No. 1 Dam is located 1000 feet upstream of Main Street (U.S. Route 40) in the Borough of Claysville, Washington County, Pennsylvania. The coordinates of the dam are N 40° 7.1', W 80° 25.0'. The dam can be located on USGS 7.5 minute topographic quadrangle, Claysville, Pennsylvania.
- c. Size Classification - The maximum height of the dam is 31.5 feet. The reservoir volume to the top of dam (Elevation 1162.0 feet M.S.L.) is 47 acre-feet. The dam is therefore in the "Small" size category.
- d. Hazard Classification - In the event of failure of Claysville No. 1 Dam, it is likely that more than a few lives would be lost and economic losses would be excessive. The dam is therefore considered to be in the "High" hazard category.
- e. Ownership - The dam and reservoir are owned by the Claysville-Donnegal Municipal Water Authority, P.O. Box 467, Claysville, PA 15323. Mr. Robert W. Walker is the current chairman of the authority.
- f. Purpose of Dam - The dam and reservoir are used for water supply.
- g. Design and Construction History - The dam was designed by Mr. David C. Morrow of Washington, Pennsylvania. The original design drawing (Plate 3) is dated February 1926. The dam was constructed by Thompson Construction Company of Washington, Pennsylvania. Work started immediately after issue of the permit on 28 July 1926 and was complete, except for sluice gates and valves, by 1 November 1926.
- h. Normal Operational Procedures - Normal pool (crest elevation of the spillway weir) is at Elevation 1158.5 feet M.S.L. However, the pool elevation

fluctuates below that elevation because of water usage. The pool at the time of inspection was at Elevation 1158.0 feet M.S.L. or approximately 0.5 foot below the crest of the spillway. The spillway is uncontrolled and the various sluice gates and valves remain open for water supply. The amount of flow through the water supply outlet works is controlled at the filtration plant immediately downstream from the dam. The grass on the crest and downstream slope is well maintained.

1.3 PERTINENT DATA

a.	<u>Drainage Area (square miles)</u> -	0.28
b.	<u>Discharge at Dam Site (c.f.s.)</u> -	
	Maximum Flood -	Unknown
	Spillway Capacity	
	(at Pool El. 1162.0 ft.) -	243
c.	<u>Elevation¹ (feet above M.S.L.)</u> -	
	Design Top of Dam -	1162.5
	Minimum Top of Dam -	1162.0
	Spillway Crest -	1158.5
	Streambed at Toe of Dam -	1130.5
	Maximum Tailwater of Record -	Unknown
d.	<u>Reservoir (feet)</u> -	
	Length of Maximum Pool -	1500
	Length of Normal Pool -	1100
e.	<u>Storage (acre-feet)</u> -	
	Top of Dam (El. 1162.0 ft.) -	47
	Spillway Crest (El. 1158.5 ft.) -	25
f.	<u>Reservoir Surface (acres)</u> -	
	Maximum Pool (El. 1162.0 ft.) -	7.1
	Spillway Crest (El. 1158.5 ft.) -	4.9

¹The elevations presented are referenced to the spillway crest El. 1158.5 ft. M.S.L. This elevation is 1.5 feet higher than the original design drawing spillway crest El. 1157.0 ft. M.S.L. The difference is probably due to a modification during the construction of the dam.

g. Dam -

Type -	Earthfill
Length (feet) -	234
Maximum Height (feet) - Design -	32.0
Field -	31.5
Top Width (feet) -	10
Side Slopes - Upstream -	2.5H:1V
Downstream -	2H:1V
Zoning -	None
Impervious Core -	Homogeneous embankment
Cut-off -	Two 6 foot wide clay puddle trenches were designed to be installed along the centerline of the dam and at the toe of the upstream slope, respectively. The depth of the trenches as installed is not known. (See Plate 3 for the design details.)
Grout Curtain -	None
Drains -	One 4 inch terra cotta pipe drain was installed along the downstream right abutment spillway training wall. (See Plate 3 for location and details.)

h. Diversion and Regulating Tunnel - None

i. Spillway -

Type - Broad crested weir with chute channel
Crest Length Perpendicular to Flow (feet) - 12
Crest Elevation (feet M.S.L.) - 1158.5
Gates - None
Upstream Channel - Junction of embankment and abutment, earth-lined, and approximately 2 feet deep in front of the weir.
Chute Channel - Rectangular shaped concrete channel 12 feet wide at the weir, narrowing to 8 feet wide before exiting into the stilling pool. The channel is at a 20 percent slope until 20 feet before the stilling pool where the slope increases to 39 percent.
Downstream Channel - Original streambed

j. Regulating Outlets - Consists of a 12 inch cast-iron pipe placed on a 12 inch thick concrete cradle. One concrete anti-seep collar is installed near the upstream end of the pipe just downstream of the clay puddle cut-off trench. One gate valve is located on the pipe in the intake tower. Another gate valve at the toe of the downstream slope controls the flow

to the emergency drawdown pipe exiting into the stilling basin. Three intakes, controlled by 8 inch sluice gates, are indicated on the design drawing (Plate 3) at Elevations 1152.5, 1143, and 1133.2 feet.

SECTION 2 - ENGINEERING DATA

2.1 DESIGN

Information reviewed for the preparation of this report included the Pennsylvania Department of Environmental Resources' (PennDER) File 63-35 for the dam and information obtained by interviewing the owner's personnel. This included:

- 1) The design drawings entitled, "Storage Reservoir, Claysville Water Supply, Claysville, Pennsylvania."
- 2) Report on the application of the Borough of Claysville by the Water and Power Resources Board.
- 3) The original permit allowing the Borough of Claysville to construct the dam and reservoir.
- 4) Permit allowing the Borough of Claysville to install flashboard on the crest of the weir to raise the storage capacity by one foot. (Note: No specific dates of limitation in the use of the flashboard is included on the permit. In addition, no limitations as to when the flashboards should be removed in case of a heavy rainfall was on the permit.)
- 5) Various correspondence, memorandums, and inspection reports including the last recorded inspection on 13 September 1961.

2.2 CONSTRUCTION

The dam was constructed by the Thompson Construction Company, Washington, Pennsylvania. Construction was started on the dam sometime after 28 July 1926 and was completed by 1 November 1926. No construction progress reports or construction inspection reports were available in the PennDER file.

2.3 OPERATION

The owner, the Claysville-Donnegal Municipal Water Authority, is responsible for all operations and maintenance.

2.4 EVALUATION

- a. Availability - PennDER File No. 63-35 contains the design drawings, correspondence, memorandums, and inspection reports for Claysville No. 1 Dam.
- b. Adequacy - The information available is adequate for a Phase I Inspection of this dam.
- c. Validity - Observations and measurements performed during the visual inspection indicated a few deviations from the design drawings for this dam. These are:
 - 1) The weir of the spillway is 1.5 feet higher than shown on the drawings.
 - 2) The cut-off wall on the right side of the spillway wall was not installed.
 - 3) The two wing walls at the end of the stilling pool structure were not installed.
 - 4) It appears that the sedimentation basin for the water supply system, as shown on the design drawing, was not constructed.

SECTION 3 - VISUAL INSPECTION

3.1 FINDINGS

- a. General - The dam and its appurtenant structures were found to be in fair overall condition at the time of inspection. The visual inspection was performed on 5 December 1979 and no unusual weather conditions were present. Noteworthy deficiencies are described briefly below. The complete visual inspection check list, field sketch, top of dam profile, and typical cross-section are given in Appendix A.
- b. Dam - The embankment has a good, well maintained cover of grass growing on it. No problems were observed in the alignment or stability of the slopes. No erosion or seepage problems were observed during the visual inspection. Two animal burrows were present at Stations 1+33 and 1+49 (the stationing used during the visual inspection is shown on the field sketch in Appendix A) on the downstream slope approximately 10 feet below the crest of the dam. A low spot is present behind the right training wall. Also, the top of dam from the left training wall to approximately Station 2+00 is low.
- c. Appurtenant Structures - The concrete spillway appeared to be in fair overall condition at the time of inspection. Several areas of the training walls have started to deteriorate and are in need of repair. These include the right training wall above the crest elevation of the weir, the top of the left training wall at approximately the toe of the slope (see Photo 10), the end sill of the stilling pool, and other minor miscellaneous spots.

The water level in the intake riser chamber was at the same level as the reservoir; therefore, the interior condition of the riser and mechanical equipment could not be examined. According to the owner's representative, the gates and valves remain open all the time and the amount of water supplied is adjusted at the filtration plant. He does not recall when the gates and valves were last operated. The original design plans indicate three sluice gates and one gate valve with a total of four valve stems; however, only three valve stems were observed with one of those exiting the intake tower through the inspection manhole.

- d. Reservoir Area - No problems were observed in the reservoir area. Reservoir slopes are gently sloping to moderately steep with a cover of grass and trees.
- e. Downstream Channel - The downstream channel has some small (negligible) erosion problems along with some debris in the channel. The water filtration plant is located immediately downstream of the left half of the dam. Several (four) storage facilities are also located immediately downstream of the right half of the dam. Approximately 900 feet downstream is an elementary school and play-yard. Three residential structures are also located in the floodplain before the discharge would pass through a restrictive culvert (approximately 4.5 feet by 6 feet) at U.S. Route 40. An additional estimated 10 structures are located in the floodplain between U.S. Route 40 and a Baltimore and Ohio R.R. embankment and culvert. The amount of the flow that can be discharged by the R.R. culvert is also estimated to be low.

SECTION 4 - OPERATIONAL PROCEDURES

4.1 PROCEDURES

There are no formal written procedures in the event of impending failure of the dam. At the time of the visual inspection, there were no procedures for the inspection of the dam by the owner's representative. However, the pump house and filter building, located at the downstream toe, allows the owner's representative to make an occasional quick visual inspection of the embankment.

4.2 MAINTENANCE OF DAM

The Claysville-Donnegal Municipal Water Authority is responsible for maintenance of the dam. Maintenance of the dam has been performed on an as-needed basis. It is recommended that formal written maintenance procedures be developed and implemented.

4.3 MAINTENANCE OF OPERATING FACILITIES

The Claysville-Donnegal Municipal Water Authority is responsible for the maintenance of the operating facilities. Although maintenance of these facilities has been performed at various times in the past, no formal schedule or record of the maintenance is presently in use. It is recommended that operation and preventive maintenance schedules be developed and implemented.

4.4 DESCRIPTION OF ANY WARNING SYSTEM IN EFFECT

At the present time, there is no warning system or evacuation plan in effect in the event of a dam failure.

4.5 EVALUATION OF OPERATIONAL ADEQUACY

It is uncertain whether the existing valves and gates are currently operational; they should be evaluated. The owner keeps a boat on the left abutment in case access to the intake tower is required. The maintenance of the embankment is very good.

SECTION 5 - HYDRAULIC/HYDROLOGIC

5.1 EVALUATION OF FEATURES

- a. Design Data - No hydrologic or hydraulic design calculations are available for Claysville No. 1 Dam.
- b. Experience Data - No information concerning the effects of significant floods on the dam is available.
- c. Visual Observation - There is a low spot on the embankment behind the right training wall at the crest of the dam. The concrete in the spillway discharge channel has begun to deteriorate. No other conditions were observed at the time of the inspection that would indicate that the dam and appurtenant structures could not operate satisfactorily in the event of a flood.
- d. Overtopping Potential - Claysville No. 1 Dam is classified as a "High" hazard - "Small" size dam requiring evaluation for a spillway design flood (SDF) in the range of the 1/2 Probable Maximum Flood (1/2 PMF) to the Probable Maximum Flood (PMF). Since there is a school in the downstream floodplain and many lives could be lost in the event of a dam failure, the PMF was chosen as the SDF. The hydrologic capabilities of the dam, reservoir, and spillway were obtained by routing the PMF through the reservoir with the aid of the U.S. Army Corps of Engineers' Flood Hydrograph Package, HEC-1 DB. The hydrologic characteristics of the drainage basin, specifically, the Snyder's unit hydrograph parameters, were obtained from a regionalized study conducted by the Baltimore District of the U.S. Army Corps of Engineers.

The results of this analysis show that the spillway is capable of passing approximately 35 percent of the PMF without overtopping. During the 1/2 PMF, the dam is overtopped for 2.83 hours by a maximum depth of 0.59 foot. The PMF results in overtopping for 5.83 hours by a maximum depth of 1.14 feet.

- e. Spillway Adequacy - The dam, as outlined in the above analysis, would be overtopped by the PMF and 1/2 PMF. The criteria for spillway adequacy determination requires an estimate of the downstream damage increase due to failure by overtopping during 1/2 PMF conditions. Therefore, the following

conditions were used as the limiting criteria which are likely to cause failure of the dam:

- 1) Depth of overtopping by 1.0 foot or greater.
- 2) Duration of overtopping in excess of 2 hours.

The overtopping analysis of this dam yielded the following values:

- 1) 0.59 foot
- 2) 2.83 hours

Because of the small depth of overtopping (0.59 foot) and the well-maintained grass cover on the downstream slope, dam failure is unlikely to occur during 1/2 PMF conditions; therefore, the spillway is classified as "inadequate" rather than "seriously inadequate," according to the recommended criteria.

SECTION 6 - STRUCTURAL STABILITY

6.1 EVALUATION OF STRUCTURAL STABILITY

- a. Visual Observations - No signs of distress or seepage were observed on the embankment during the visual inspection. The deterioration of the spillway structure concrete noted during the visual inspection does not indicate concern at this time for the continued structural stability of the training walls.
- b. Design and Construction Data - Calculations of structural stability were not available for review. No information concerning the dam foundation materials or conditions are available. It is estimated for this dam, with its history of satisfactory performance of the slopes and the fact that no indications of instability were observed during the field inspection, that further assessments of the stability are not necessary for this Phase I Inspection Report. However, should future inspections observe signs of distress which would affect the structural stability of the embankment, additional evaluations and corrective measures may become necessary.
- c. Operating Records - Nothing in the operational information indicates concern relative to the structural stability of the dam.
- d. Post-Construction Changes - No known changes adversely affecting the structural stability of the dam have been performed.
- e. Seismic Stability - The dam is located in Seismic Zone 1 of the "Seismic Zone Map of the Contiguous United States," Figure 1, page D-30, "Recommended Guidelines for Safety Inspection of Dams." This is a zone of minor seismic activity. Therefore, further consideration of the seismic stability is not warranted.

SECTION 7 - ASSESSMENT, RECOMMENDATIONS/REMEDIAL MEASURES

7.1 DAM ASSESSMENT

- a. Safety - Claysville No. 1 Dam was found to be in fair overall condition at the time of inspection. The dam is a "High" hazard - "Small" size dam requiring a spillway capacity in the range of the 1/2 PMF to PMF. The PMF was chosen as the SDF because of a school located in the downstream floodplain and the potential number of lost lives in the event of a dam failure. As presented in Section 5, the spillway and reservoir are capable of passing 35 percent of the PMF without overtopping the dam. During the 1/2 PMF, the depth and duration of overtopping are 0.59 foot and 2.83 hours, respectively. Because a limiting criteria of one foot or greater depth of overtopping and duration in excess of 2 hours was estimated for this dam, it was concluded that a dam failure during the 1/2 PMF is unlikely to occur. Therefore, the spillway is considered to be "inadequate" but not "seriously inadequate."
- b. Adequacy of Information - The information and the observations made during the visual inspection are considered sufficient for this Phase I Inspection Report.
- c. Urgency - The owner should initiate the action discussed in paragraph 7.2 without delay, and immediately initiate the further investigation, as discussed in paragraph 7.1.d.
- d. Necessity for Additional Data/Evaluation - The hydraulic/hydrologic analysis performed in connection with this Phase I Inspection Report has indicated the need for additional spillway capacity. It is recommended that the owner of Claysville No. 1 Dam immediately initiate an engineering study to further evaluate the spillway capacity in order to develop recommendations for remedial measures to reduce the overtopping potential of the dam.

7.2 RECOMMENDATIONS/REMEDIAL MEASURES

The inspection and review of information revealed certain items of work which should be performed without delay by the owner. Items 1 and 2 below should be completed by a qualified professional engineer experienced in the design of hydraulic and appurtenant structures for earth dams.

- 1) The owner should immediately initiate an engineering study to further evaluate the spillway capacity in order to develop recommendations for remedial measures to reduce the overtopping potential of the dam.
- 2) The condition and operability of the sluice gates and valves should be evaluated and the necessary maintenance performed. The operability of these components should be checked at least once a year in the future.
- 3) Repair the areas of spalled and deteriorated concrete on the spillway training walls and end sill of the stilling pool.
- 4) Fill the animal/rodent burrows in the embankment.
- 5) Fill the low areas on both the right and left sides of the spillway structure.
- 6) Remove the I-beams from the downstream channel.

In addition, the following operational measures are recommended to be undertaken by the owner:

- 1) Develop a detailed emergency operation and warning system.
- 2) During periods of unusually heavy rain, provide around-the-clock surveillance of the dam.
- 3) When warning of a storm of major proportions is given by the National Weather Service, the owner should activate the emergency operation and warning system.

It is further recommended that formal inspection, maintenance, and operation procedures and records be developed and implemented.

APPENDIX A

**VISUAL INSPECTION CHECK LIST, FIELD SKETCH,
TOP OF DAM PROFILE, AND TYPICAL CROSS-SECTION**

Check List
Visual Inspection
Phase 1

Name of Dam Claysville No. 1 Dam County Washington State PA Coordinates Lat. N 40° 7.1'
NDI # PA 00491 Long. W 80° 25.0'
PennDER # 63-35
Date of Inspection 5 December 1979 Weather Cool and sunny Temperature 40° F.

Pool Elevation at Time of Inspection 1158.0 ft.* M.S.L. Tailwater at Time of Inspection 1129.1 ft.* M.S.L.

*All elevations referenced to the spillway crest (El. 1158.5 ft.). Note that the "as built" spillway crest elevation is 1.5 ft. higher than the design drawing Elevation of 1157.0 ft.

Inspection Personnel:

Michael Baker, Jr., Inc.:

James G. Ulinski
Jeffrey S. Maze
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PennDER:

Mr. Larry Busack

Field Review (18 March 1980)

John A. Dziubek
James G. Ulinski

James G. Ulinski Recorder

A-2

CONCRETE/MASONRY DAMS - Not Applicable

Name of Dam: CLAYSVILLE No. 1 DAM

NDI # PA 00491

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
LEAKAGE		
STRUCTURE TO ABUTMENT/EMBANKMENT JUNCTIONS		
DRAINS		
WATER PASSAGES		
FOUNDATION		

CONCRETE/MASONRY DAMS - Not Applicable

Name of Dam: CLAYSVILLE No. 1 DAM

NDI # PA 00491

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SURFACE CRACKS CONCRETE SURFACES		
STRUCTURAL CRACKING		
VERTICAL AND HORIZONTAL ALIGNMENT		
MONOLITH JOINTS		
CONSTRUCTION JOINTS		

EMBANKMENT

Name of Dam CLAYSVILLE No. 1 DAM
 NDI # PA 00491

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SURFACE CRACKS	None observed	
UNUSUAL MOVEMENT OR CRACKING AT OR BEYOND THE TOE	None observed	
SLOUGHING OR EROSION OF EMBANKMENT AND ABUTMENT SLOPES	No problems were observed. The embankment has a good cover of well maintained grass.	

EMBANKMENT

Name of Dam CLAYSVILLE No. 1 DAM
 NDI # PA 00491

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
VERTICAL AND HORIZONTAL ALIGNMENT OF THE CREST	The horizontal alignment of the dam is good. The top of dam is level except for areas on both sides of the spillway structure. The left side is 0.7 ft. low at the spillway training wall to 0.2 ft. low at the ft. to the left of the spillway. It appears the right abutment (adjacent to the spillway) was not raised to the top of dam elevation during original construction. Immediately to the right of the spillway training wall, this abutment is 3.0 ft. low; it then slopes up to El. 1102.5 ft. approximately 25 ft. to the right of the wall.	The low areas should be filled/ repaired to average top of dam El. 1162.5 ft.
RIPRAP FAILURES	None	
ANIMAL BURROWS/ RODENT HOLES	Two animal borrows/rodent holes were observed at Station 1 + 33 and 1 + 49 (the stationing using during the visual inspection is shown on the field sketch), approximately 10 ft. below the crest of the dam.	These animal burrows/rodent holes should be filled.

EMBANKMENT

Name of Dam CLAYSVILLE No. 1 DAM
 NDI # PA 00491

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
JUNCTION OF EMBANKMENT AND ABUTMENT, SPILLWAY AND DAM	No problems were observed except for the previously mentioned low spots on the right abutment.	
ANY NOTICEABLE SEEPAGE	None	
STAFF GAGE AND RECORDER	None	
DRAINS	Only one drain (a 4 in. terra cotta pipe) along the right abutment spillway training wall was installed. A small amount of drainage (less than 1 g.p.m.) was flowing at the time of inspection.	

OUTLET WORKS

Name of Dam: CLAYSVILLE No. 1 DAM
 NDI # PA 00491

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CRACKING AND SPALLING OF CONCRETE SURFACES IN OUTLET CONDUIT	The downstream end of the 12 in. C.I.P., where the emergency drawdown exits into the stilling basin, was in fair condition.	
INTAKE STRUCTURE	The intakes were submerged and could not be observed. The riser was filled with water and could not be examined. The portion of the riser above the water surface appeared to be in good condition except for some minor spalling of the concrete.	The spalled concrete should be repaired.
OUTLET STRUCTURE	The outlet pipe discharges into the stilling basin. No problems were observed with the stilling basin except for some deterioration and spalling of the concrete.	The spalled and deteriorated concrete should be repaired.
OUTLET CHANNEL	The outlet discharges into the stilling basin of the spillway. Approximately 100 ft. downstream of the spillway, the channel is partially restricted and obstructed.	It is recommended that the obstructions be removed from the channel.
EMERGENCY GATE	The intake sluice gates are kept open for water supply purposes. The valve for the emergency drawdown is at the toe of the embankment, just upstream (continued next page)	It is recommended that the condition of the sluice gates and valves be evaluated and their operability checked in all future inspections.

OUTLET WORKS

Name of Dam CLAYSVILLE No. 1 DAM
NDI # PA 00491

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
EMERGENCY GATE (continued)	of the stilling basin. At this point the outlet pipe splits, with a pipe installed to the filtration plant and the outlet continuing straight in plan into the stilling basin. The owners representative did not know when the valves were last operated.	

UNGATED SPILLWAY

Name of Dam: CLAYSVILLE No. 1 DAM
 NDI # PA 00491

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONCRETE WEIR	The concrete weir was in good condition. The weir was apparently constructed approximately 1.5 ft. higher than the design drawing elevation.	
APPROACH CHANNEL	The approach channel is formed by wing walls on both sides and the reservoir bottom. No problems in the spillway approach were observed.	
DISCHARGE CHANNEL	The discharge channel is a rectangular concrete chute curving toward the center of the dam. Some deterioration and spalling of the concrete has occurred, especially along the top of the walls and at the joints.	The spalled and deteriorated concrete should be repaired.
BRIDGE AND PIERS	Not Applicable	

A-10

GATED SPILLWAY - Not Applicable

Name of Dam: CLAYSVILLE No. 1 DAM
NDI # PA 00491

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
-----------------------	--------------	----------------------------

CONCRETE SILL

APPROACH CHANNEL

DISCHARGE CHANNEL

BRIDGE AND PIERS

GATES AND OPERATION
EQUIPMENT

A-11

INSTRUMENTATION - None

Name of Dam: CLAYSVILLE No. 1 DAM
NDI # PA 00491

VISUAL EXAMINATION	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
--------------------	--------------	----------------------------

MONUMENTATION/SURVEYS

OBSERVATION WELLS

WEIRS

PIEZOMETERS

OTHER

RESERVOIR

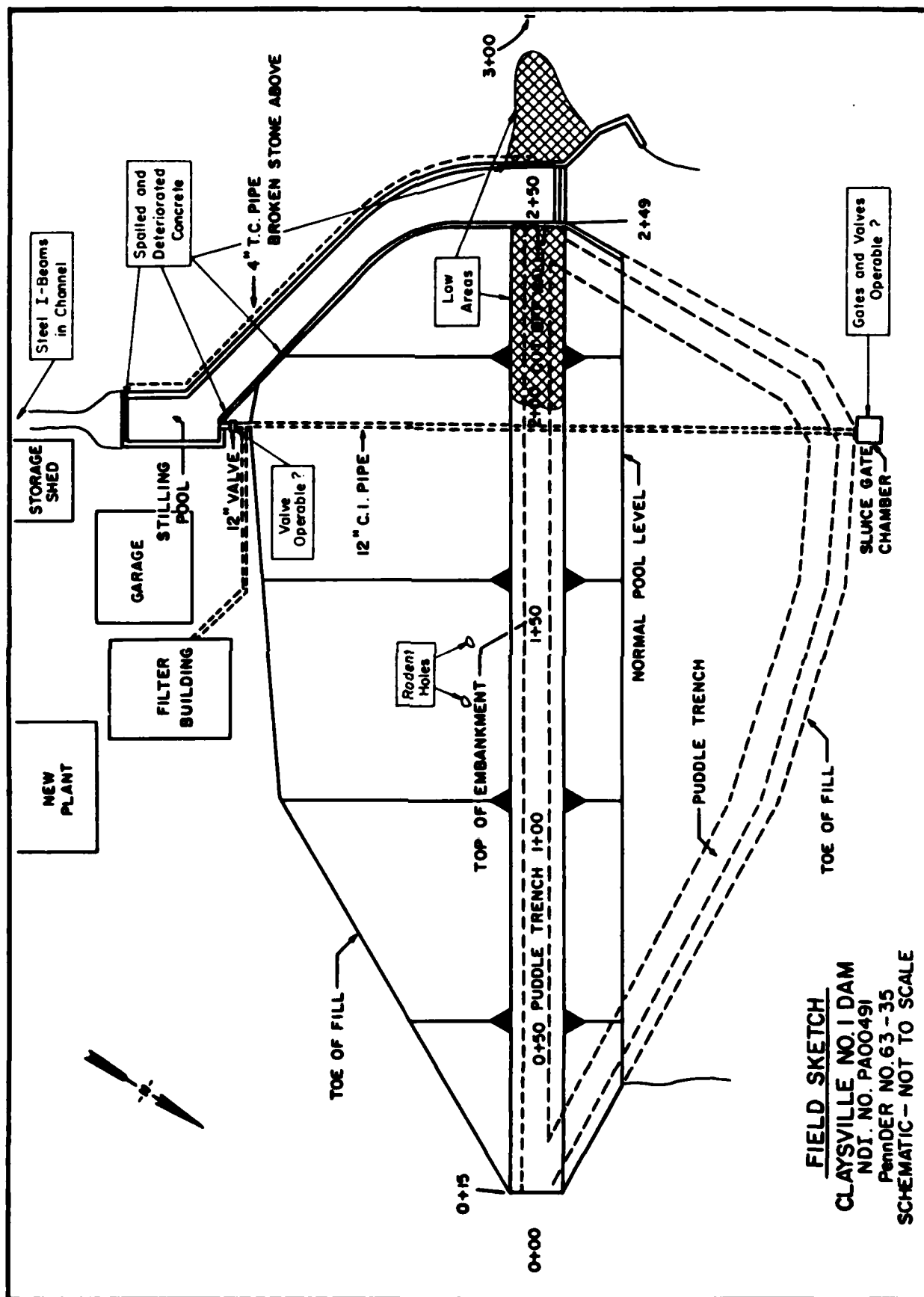
Name of Dam: CLAYSVILLE No. 1 DAM
NDI # PA 00491

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SLOPES	The reservoirs slopes are well forested and mild. No problems were observed.	
SEDIMENTATION	It is not known to what extent the water supply storage has been decreased by sedimentation for this reservoir. The amount of available flood storage has not been significantly affected by sedimentation.	

DOWNSTREAM CHANNEL

Name of Dam: CLAYSVILLE NO. 1 DAM
 NDI # PA 00491

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONDITION (OBSTRUCTIONS, DEBRIS, ETC.)	Approximately 100 ft. downstream of the stilling basin the channel is partially obstructed by a couple of steel I-beams.	It is recommended that for good housekeeping procedures and to minimize the potential of flooding the various storage buildings in the immediate area, the I-beams be removed from the channel. The channel should be kept free of debris and obstructions in the future.
SLOPES	The channel is located along the right valley slope. This slope (where it could be observed) is predominantly shale. No problems were observed from a soil mechanics point of view. The downstream channel slope is mild (estimated 2%).	
APPROXIMATE NO. OF HOMES AND POPULATION	The water filtration plant is located immediately downstream of the left half of the dam. Several (four) storage facilities are also located immediately downstream of the right half of the dam. Approximately 900 ft. downstream is an elementary school and play-yard. Three residential structures are also located in the floodplain before the discharge would pass through a restrictive (approximately 4.5 ft. by 6 ft.) road (U.S. Route 40) culvert. An additional estimated 10 structures are located in the floodplain between U.S. 40 and a Baltimore and Ohio R.R. embankment and culvert. The amount of the flow that can be discharged by the R.R. culvert is also estimated to be low.	



FIELD SKETCH
 CLAYSVILLE NO. 1 DAM
 NDI. NO. PA00491
 PENNER NO. 63-35
 SCHEMATIC - NOT TO SCALE

MICHAEL BAKER, JR., INC.

THE BAKER ENGINEERS

10 February 1980

Box 280

Beaver, Pa. 15009

CLAYSVILLE No. 1 DAM

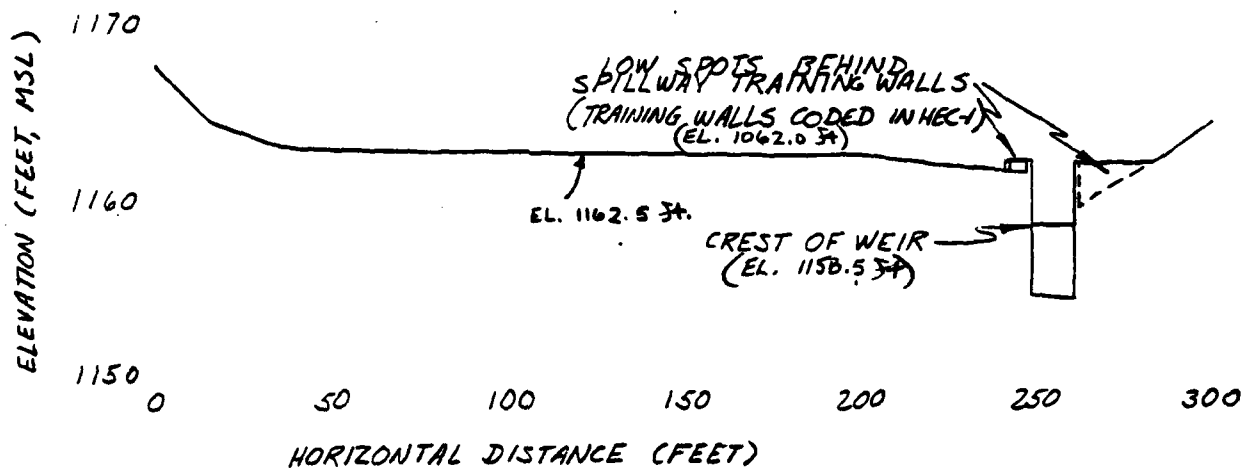
TOP OF DAM PROFILE

TYPICAL CROSS-SECTION

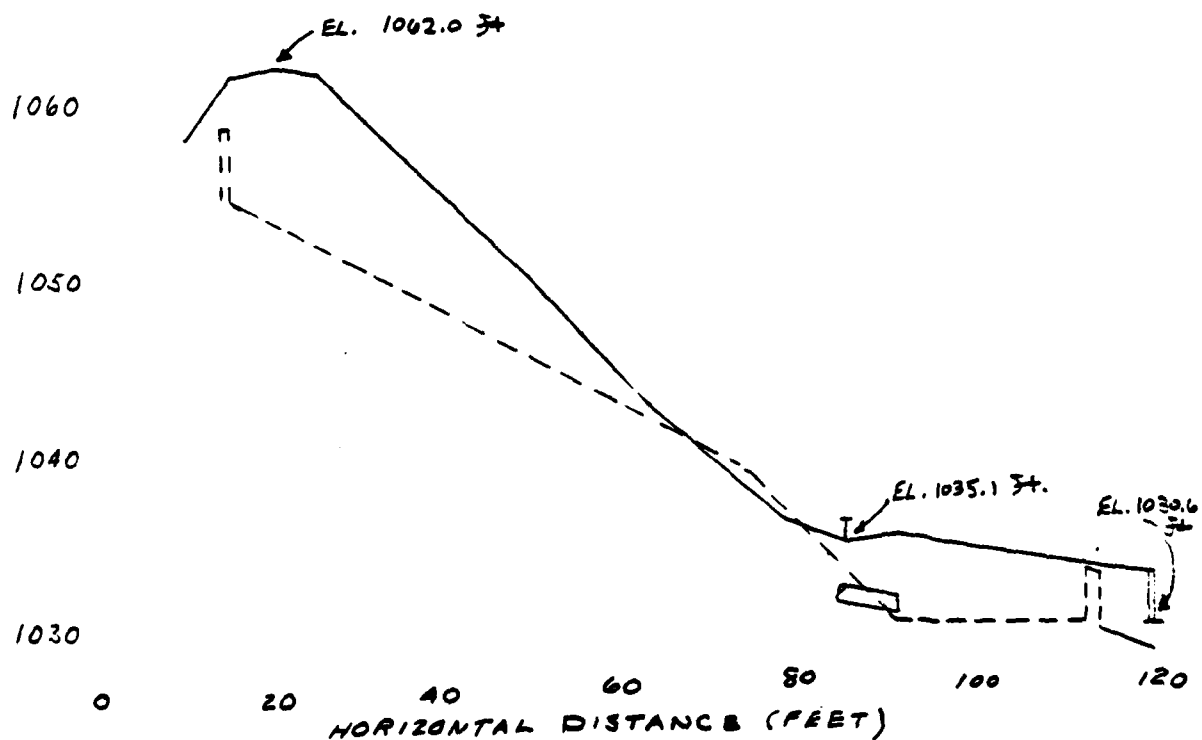
A-15

Date of Inspection: 5 December 1979

TOP OF DAM PROFILE (LOOKING DOWNSTREAM):



DAM CROSS SECTION:



APPENDIX B

ENGINEERING DATA CHECK LIST

**CHECK LIST
ENGINEERING DATA
DESIGN, CONSTRUCTION, OPERATION**

Name of Dam: CLAYSVILLE No. 1 DAM
NDI # PA 00491

<u>ITEM</u>	<u>REMARKS</u>
PLAN OF DAM	See Plate 3 of this report.
REGIONAL VICINITY MAP	USGS 7.5 minute topographic quadrangles, Claysville and West Middletown, Pennsylvania were used to prepared the vicinity map which is enclosed in this report as the Location Plan (Plate 1).
CONSTRUCTION HISTORY	The dam was designed by Mr. David C. Morrow of Washington, Pennsylvania. The original design drawing (Plate 3) is dated February 1926. The dam was constructed by Thompson Construction Company of Washington, Pennsylvania. Work started immediately after issue of the permit on 28 July 1926 and was complete, except for sluice gates and valves, by 1 November 1926.
TYPICAL SECTIONS OF DAM	See Plate 3
HYDROLOGIC/HYDRAULIC DATA	No information available
OUTLETS - PLAN	See Plate 3
- DETAILS	See Plate 3
- CONSTRAINTS	None
- DISCHARGE RATINGS	None available
RAINFALL/RESERVOIR RECORDS	None available

Name of Dam: CLAYSVILLE No. 1 DAM
NDI # PA 00491

B-2

ITEM	REMARKS
DESIGN REPORTS	None available
GEOLOGY REPORTS	No geology reports are available for the dam. See Appendix F for the regional geology.
DESIGN COMPUTATIONS HYDROLOGY & HYDRAULICS DAM STABILITY SEEPAGE STUDIES	No design computations are available.
MATERIALS INVESTIGATIONS BORING RECORDS LABORATORY FIELD	No information was available indicating that any type of material investigation was performed.
POST-CONSTRUCTION SURVEYS OF DAM	No information available
BORROW SOURCES	No information available

Name of Dam: CLAYSVILLE No. 1 DAM
NDI # PA 00491

B-3

ITEM	REMARKS
MONITORING SYSTEMS	None
MODIFICATIONS	Flashboards were installed in 1930 but were permanently removed at a later date. The water supply pipe to the filter building from the downstream toe of the embankment (and outlet pipe) was replaced when modifications to the filtration plant were constructed.
HIGH POOL RECORDS	No information available
POST-CONSTRUCTION ENGINEERING STUDIES AND REPORTS	The dam was inspected by Pennder or its predecessor on the following dates: 1) 21 April 1927, 2) 29 June 1928, 3) 14 April 1931, 4) 3 April 1935, 5) 7 July 1938, 6) 7 May 1945, 7) 13 September 1961. Copies of the inspection reports are available in the Pennder file for this dam.
PRIOR ACCIDENTS OR FAILURE OF DAM DESCRIPTION REPORTS	None
MAINTENANCE OPERATION RECORDS	None available

Name of Dam: CLAYSVILLE No. 1 DAM
NDI # PA 00491

B-4

ITEM	REMARKS
------	---------

SPILLWAY PLAN,

SECTIONS,
and
DETAILS

See Plate 3

OPERATING EQUIPMENT
PLANS & DETAILS

See Plate 3

CHECK LIST
HYDROLOGIC AND HYDRAULIC DATA
ENGINEERING DATA

DRAINAGE AREA CHARACTERISTICS: 0.28 sq.mi.

ELEVATION TOP NORMAL POOL (STORAGE CAPACITY): 1158.5 ft. (25 ac.-ft.)

ELEVATION TOP FLOOD CONTROL POOL (STORAGE CAPACITY): 1162.0 ft.

(47 ac.-ft.)

ELEVATION MAXIMUM DESIGN POOL: Unknown

ELEVATION TOP DAM: 1162.0 ft. (minimum elevation)

SPILLWAY:

- a. Crest Elevation: 1158.5 ft.
- b. Type Sharp crested concrete weir in rectangular concrete
- c. Width of Crest Parallel to Flow 1.0 ft. channel
- d. Length of Crest Perpendicular to Flow 12 ft.
- e. Location Spillover At right abutment of dam
- f. Number and Type of Gates None

OUTLET WORKS: Water Supply Intakes and Drawdown Facilities

- a. Type 12 in. C.I.P. installed on 12 in. thick concrete cradle
- b. Location 50 ft. left of the spillway
- c. Entrance Inverts 3-8 in. sluice gates: El. 1152.5, 1143,
- d. Exit Inverts El. 1131.08 ft. 1133.2 ft.; 12 in. C.I.P.:
El. 1133.15 ft.
- e. Emergency Drawdown Facilities Valve at toe of slope opening
discharge from 12 in. C.I.P.

HYDROMETEOROLOGICAL GAGES: None installed to stilling basin.

- a. Type _____
- b. Location _____
- c. Records _____

MAXIMUM NON-DAMAGING DISCHARGE Unknown

APPENDIX C

PHOTOGRAPH LOCATION PLAN AND PHOTOGRAPHS

DETAILED PHOTOGRAPH DESCRIPTIONS

Overall View of Dam

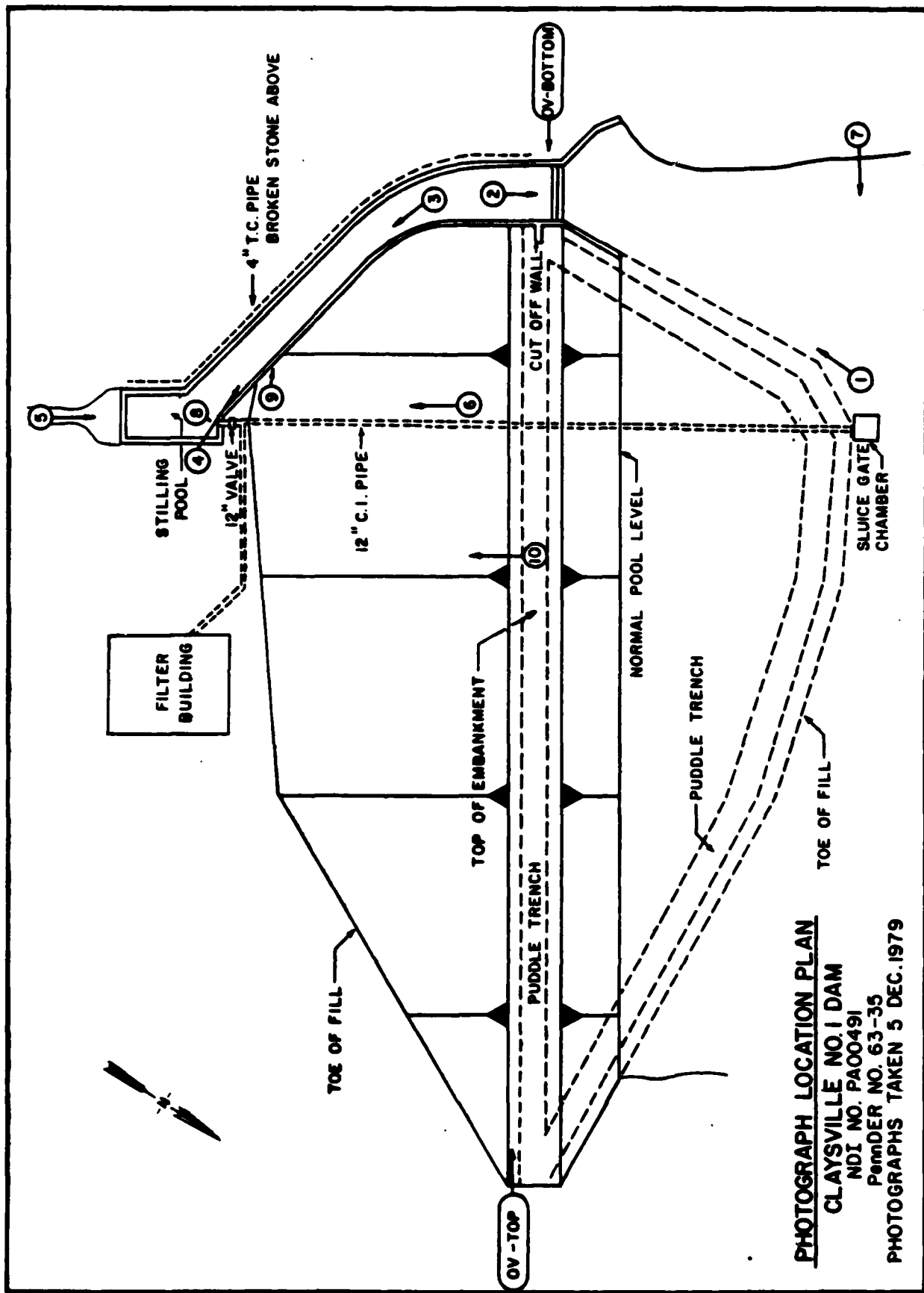
Top Photo - Overall View of Dam from Left Abutment
(OV-T)

Bottom Photo - Overall View of Dam from the Right
(OV-B) Abutment

Photograph Location Plan

- Photo 1 - View of the Spillway Approach from the Intake Riser
- Photo 2 - View Looking Upstream at the Spillway Crest from
Inside the Spillway Chute Channel
- Photo 3 - View Looking Downstream at the Spillway Chute Channel
- Photo 4 - View Looking Upstream at the Spillway Chute Channel
- Photo 5 - View Looking Upstream at the Stilling Basin
- Photo 6 - View Looking Downstream at the Downstream Channel
- Photo 7 - View of the Intake Riser from the Right Side of the
Reservoir Shoreline
- Photo 8 - View of the Discharge Pipe into the Stilling Basin
from the Outlet Works in the Dam
- Photo 9 - View of Some of the Spalled Concrete on the Left
Training Wall of the Chute Channel
- Photo 10 - View from the Crest of the Embankment Looking Down-
stream at the School Located within the Downstream
Channel Floodplain

Note: Photographs were taken on 5 December 1979.



PHOTOGRAPH LOCATION PLAN

CLAYSVILLE NO. 1 DAM

NDI NO. PA00491

Permdr NO. 63-35

PHOTOGRAPHS TAKEN 5 DEC. 1979

CLAYSVILLE No. 1 DAM



PHOTO 1. View of the Spillway Approach from the Intake Riser



PHOTO 2. View Looking Upstream at the Spillway Crest from Inside the Spillway Chute Channel

CLAYSVILLE No. 1 DAM



PHOTO 3. View Looking Downstream at the Spillway Chute Channel



PHOTO 4. View Looking Upstream at the Spillway Chute Channel

CLAYSVILLE No. 1 DAM



PHOTO 5. View Looking Upstream at the Stilling Basin



PHOTO 6. View Looking Downstream at the Downstream Channel

CLAYSVILLE No. 1 DAM



PHOTO 7. View of the Intake Riser from the Right Side of the Reservoir Shoreline



PHOTO 8. View of the Discharge Pipe into the Stilling Basin from the Outlet Works in the Dam

CLAYSVILLE No. 1 DAM



PHOTO 9. View of Some of the Spalled Concrete on the Left Training Wall of the Chute Channel



PHOTO 10. View from the Crest of the Embankment Looking Downstream at the School Located Within the Downstream Channel Floodplain

APPENDIX D

HYDROLOGIC AND HYDRAULIC COMPUTATIONS

MICHAEL BAKER, JR., INC.

THE BAKER ENGINEERS

Box 280
Beaver, Pa. 15009

Subject _____ S.O. No. _____
Claysville No. 1 - Hydrologic Sheet No. _____ of _____
and Hydraulic Computations Drawing No. _____
Computed by _____ Checked by _____ Date _____

Table of Contents

<u>SUBJECT</u>	<u>PAGE</u>
Preface _____	i
Hydrologic and Hydraulic Analysis Data Base _____	1
Drainage Area _____	2
Surface Area - Elevation _____	2
Snyder's Unit Hydrograph Parameters _____	2
Drainage Area Map _____	3
TOP OF DAM PROFILE _____	4
DAM CROSS SECTION _____	4
COMPUTER ANALYSIS _____	5

PREFACE

HYDROLOGIC AND HYDRAULIC COMPUTATIONS

The hydrologic determinations presented in this Phase I Inspection Report are based on the use of a Snyder's unit hydrograph developed by the U.S. Army Corps of Engineers. Due to the limited number of gaging stations available in this hydrologic region and the wide variations of watershed slopes, the Snyder's coefficients may yield results of limited accuracy for this watershed. As directed however, a further refinement of these coefficients is beyond the scope of this Phase I Investigation.

In addition, the conclusions presented pertain to present conditions, and the effect of future development on the hydrology has not been considered.

HYDROLOGY AND HYDRAULIC ANALYSIS DATA BASE

NAME OF DAM: CLAYSVILLE No. 1 DAM

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

STATION	1	2	3	4	5
Station Description	CLAYSVILLE No. 1 DAM				
Drainage Area (square miles)	0.28				
Cumulative Drainage Area (square miles)	0.28				
Adjustment of PMP for Drainage Area (%) ⁽²⁾	Zone 7				
6 Hours	102				
12 Hours	120				
24 Hours	130				
48 Hours	140				
72 Hours	-				
Snyder Hydrograph Parameters					
Zone ⁽³⁾	28B				
C_p/C_t ⁽⁴⁾	.57/1.7				
L (miles) ⁽⁵⁾	0.93				
L_{ca} (miles) ⁽⁵⁾	0.39				
$t_p = C_t (L \cdot L_{ca})^{0.3}$ (hours)	1.25				
Spillway Data					
Crest Length (ft)	12				
Freeboard (ft)	3.5				
Discharge Coefficient	3.09				
Exponent	1.5				

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

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

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

⁽⁴⁾ Snyder's Coefficients.

⁽⁵⁾ L = Length of longest water course from outlet to basin divide.

L_{ca} = Length of water course from outlet to point opposite the centroid of drainage area.

MICHAEL BAKER, JR., INC.
THE BAKER ENGINEERS

Box 280
Beaver, Pa. 15009

Subject CLAYSVILLE DAM #1 S.O. No. 13547-00-17A-0
DRAINAGE AREA, SURFACE AREAS, Sheet No. 2 of 9
SNYDERS UH PARAMETERS Drawing No. _____
Computed by JAQ Checked by WLS Date FEB 5, 1980

DRAINAGE AREA

DRAINAGE AREA ABOVE DAM (MEASURED ON
CLAYSVILLE AND WEST MIDDLETOWN, PA. QUADS)
= 1.95 SQ. W. = 0.28 SQ. MI.

DISTANCE FROM CENTROID TO DAM (MEASURED ALONG
FLOWLINE) = 2035 FT = 0.39 MILE

LONGEST FLOWLINE TO DAM (MEASURED FROM NORTH
END OF WATERSHED) = 4900 FT = 0.93 MILE.

SURFACE AREAS

NORMAL WATER : 4.92 ACRES (ELEV 1158.5)
① ELEV 1160 : 6.43 ACRES
② ELEV 1180 : 14.08 ACRES
③ ELEV 1143, assume area = 0 acres

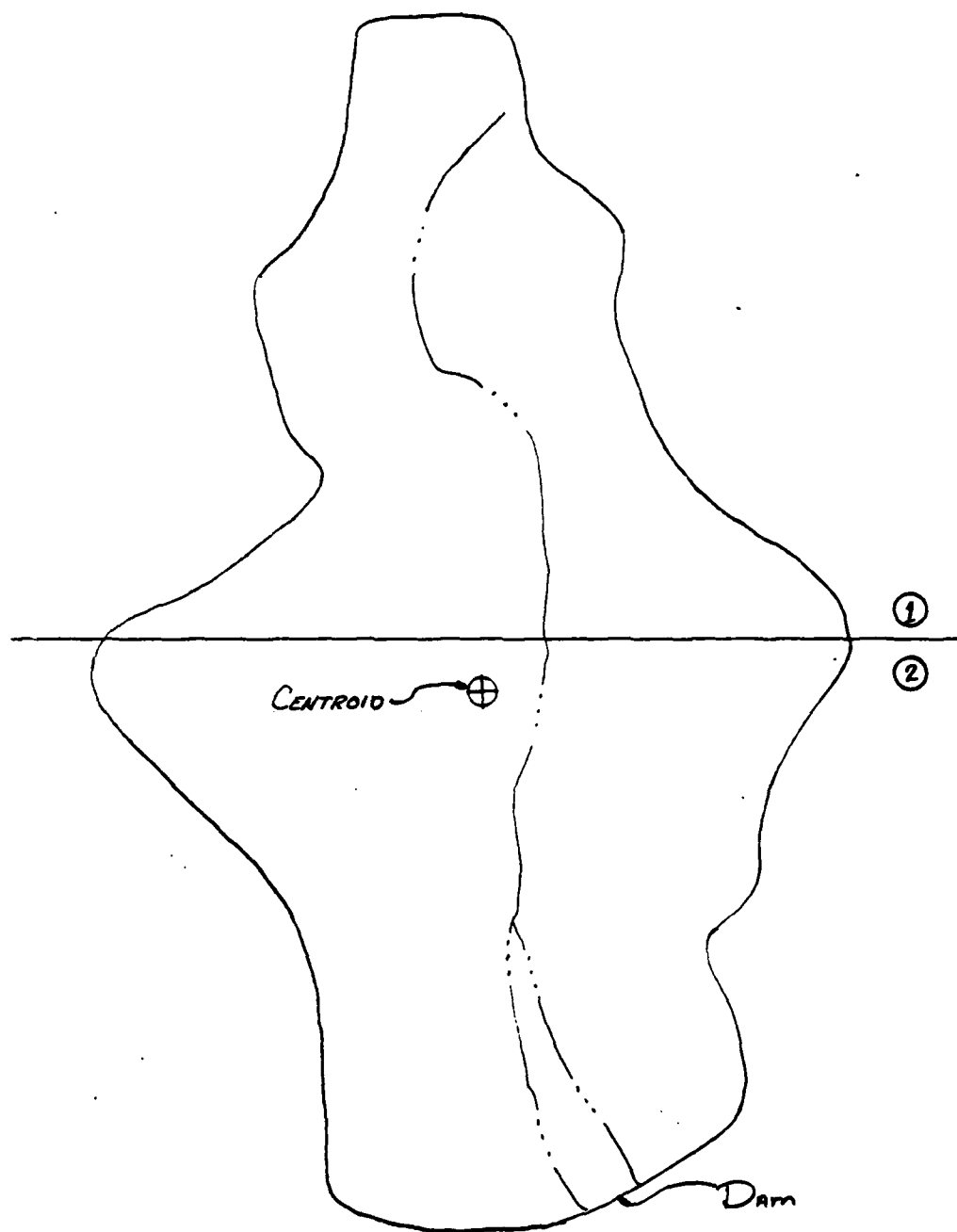
SNYDER'S UNIT HYDROGRAPH PARAMETERS (FROM MATERIAL PROVIDED BY) BALTIMORE DISTRICT, COE

$$L = 0.93 \text{ mile}$$

$$L_{ca} = 0.39 \text{ mile}$$

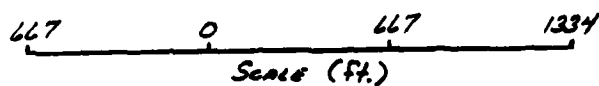
1. FROM INCL. 2, DAM IS IN ZONE 28 B
2. FROM INCL. 3, $C_p = 0.57$
3. FROM PLATE P, $C_T = 1.7$

$$\begin{aligned} t_p &= C_T (L \cdot L_{ca})^{0.3} \\ &= 1.7 (0.93 \times 0.39)^{0.3} \\ &= 1.25 \text{ hr} \end{aligned}$$



QUADS:

1. WEST MIDDLETOWN
2. CLAYSVILLE



CLAYSVILLE DAM No. 1
DRAINAGE AREA MAP

MICHAEL BAKER, JR., INC.
THE BAKER ENGINEERS

Box 280
Beaver, Pa. 15009

Subject CLAYSVILLE DAM #1

TOP OF DAM PROFILE;

DAM CROSS SECTION

Computed by JAQ

Checked by _____

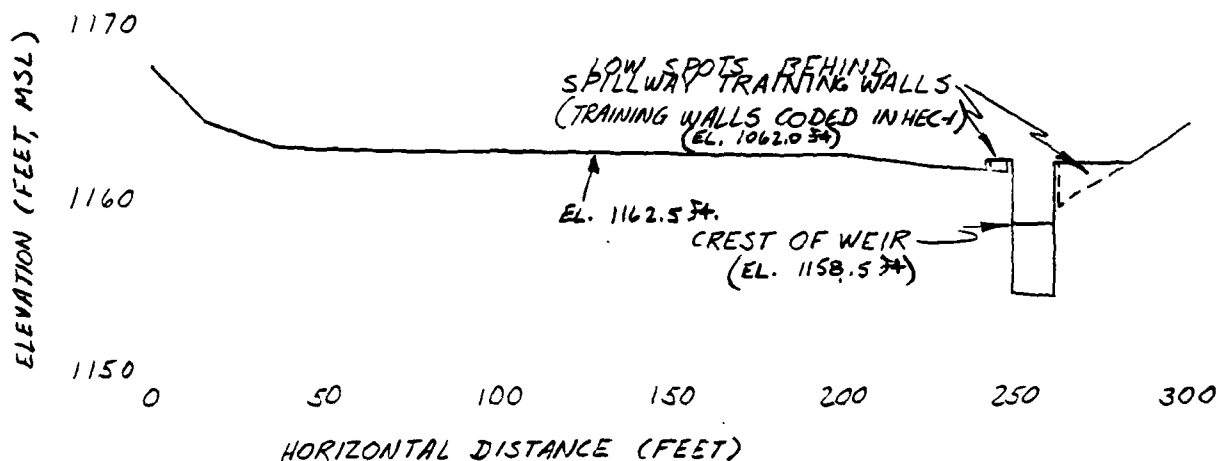
S.O. No. 13547-30-ARA-0

Sheet No. 4 of 9

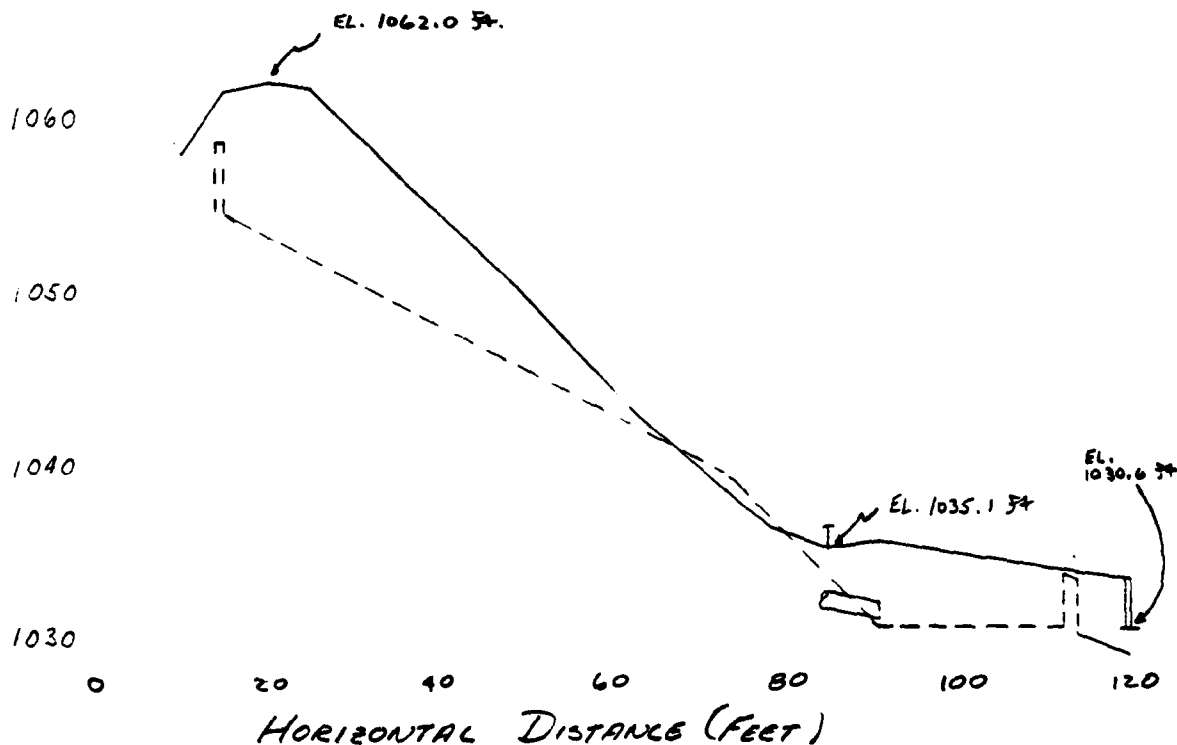
Drawing No. _____

Date FEB 10, 1980

TOP OF DAM PROFILE (LOOKING DOWNSTREAM):



DAM CROSS SECTION:



SHEET 5 OF 6

SUN DATE 03/24/80
TIME 14.36

NATIONAL PROGRAM FOR INSPECTION OF NON-FEDERAL DAMS
HYDROLOGIC AND HYDRAULIC ANALYSES OF CLAYVILLE 1 DAM
POSSIBLE MAXIMUM FLOOD, UNIT DAM BY HYDRAULIC METHOD

[illegible]

MULTI-PLAN ANALYSES TO BE PERFORMED
NPLAN= 1 NRTIO= 4 LRTIO= 1

SUB-AREA RUNOFF COMPUTATION

ICSTAQ	ICOMP	IECON	ITAPE	JPLY	JPRY	IMANE	ISTAGE	IAUTO
1	0	0	0	0	0	1	0	0

	JUNG	TAREA	SNAF	TRSDA	TSPPC	GATID	ISNOW	ISAME	LOCAL
HYDROGRAPHIC DATA	1	0.28	0.0	0.28	0.0	0.0	0	1	0

PRECIP DATA									
SPEED	PHS	R6	R12	R24	R48	R72	R96		
9.0	24.20	101.00	20.00	130.00	149.00	0.0	0.0		

TRASP COMPUED BY THE PROGRAM IS 0.000

LOSS DATA										
LRPT	STRK	DLTKR	RTIOL	ERRIN	STKRS	RTIOK	STRFL	CMSTL	ALSNR	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
1025 5250.57 MVA= 9

RECESSION DATA
STATO= -1.20 QRCEN= -9.01 R100= 2.00

UNIT HYDROGRAPH 49 END-OF-PERIOD ORDINATES. LAG 1.23 HOURS. C ₁ 0.57 VOL= 1.00						
	4.	16.	27.	43.	59.	72.
63.	56.	49.	44.	39.	34.	27.
19.	17.	15.	13.	12.	10.	8.
10.	5.	4.	4.	3.	3.	2.
2.						

0
 NO-DA HR-MN PERIOD RAIN EXCS LOSS COMP Q NO-DA HR-MN PERIOD MAIN EXCS LOSS LUMP Q
 END-OF-PERIOD FLOW
 SUM 27.10 24.68 2.42 26793.
 (688.11 627.11 61.11 758.891

HYDROGRAPH ROUTING

ROUTING FOR CLAYSVILLE 1 DAM

ISTAT ICOMP ISECON ITAPE IJPT IPRAT IMAHE ISTAGE IAUO
 0 0 0 0 0 0 0 0 0

ROUTING DATA
 LOSS LOSS AVE LOSS ISECON IJPT IPRAT IMAHE ISTAGE IAUO
 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0

NSTPS MSTDL LAG ANSKL X TSK STORA ISPRAT
 0 0 0 0 0 0 0 0 0 0

SURFACE AREA= 0. 5. 6. 14.
 CAPACITY= 0. 25. 34. 234.

ELEVATION 1144. 1199. 1144. 1100.
 CREL SPHED EPOCH ELEV ELEV COOL CAREA EXPL
 1158.5 12.0 1.1 1.5 0.0 0.0 0.0 0.0 0.0

DAM DATA

CREST LENGTH 0. 26. 144. 242. 254. 264. 271. 274.
 AT OR BELOW
 ELEVATION 1142.0 1142.0 1142.5 1143.0 1143.5 1144.0 1144.2 1145.0

PEAK OUTFLOW IS 93% AT TIME 40.83 HOURS

PEAK OUTFLOW IS 62% AT TIME 41.00 HOURS

PEAK OUTFLOW IS 40% AT TIME 41.17 HOURS

PEAK OUTFLOW IS 17% AT TIME 41.67 HOURS

SUMMARY OF DAN SAFETY ANALYSIS

SHEET 9 of 2

APPENDIX E

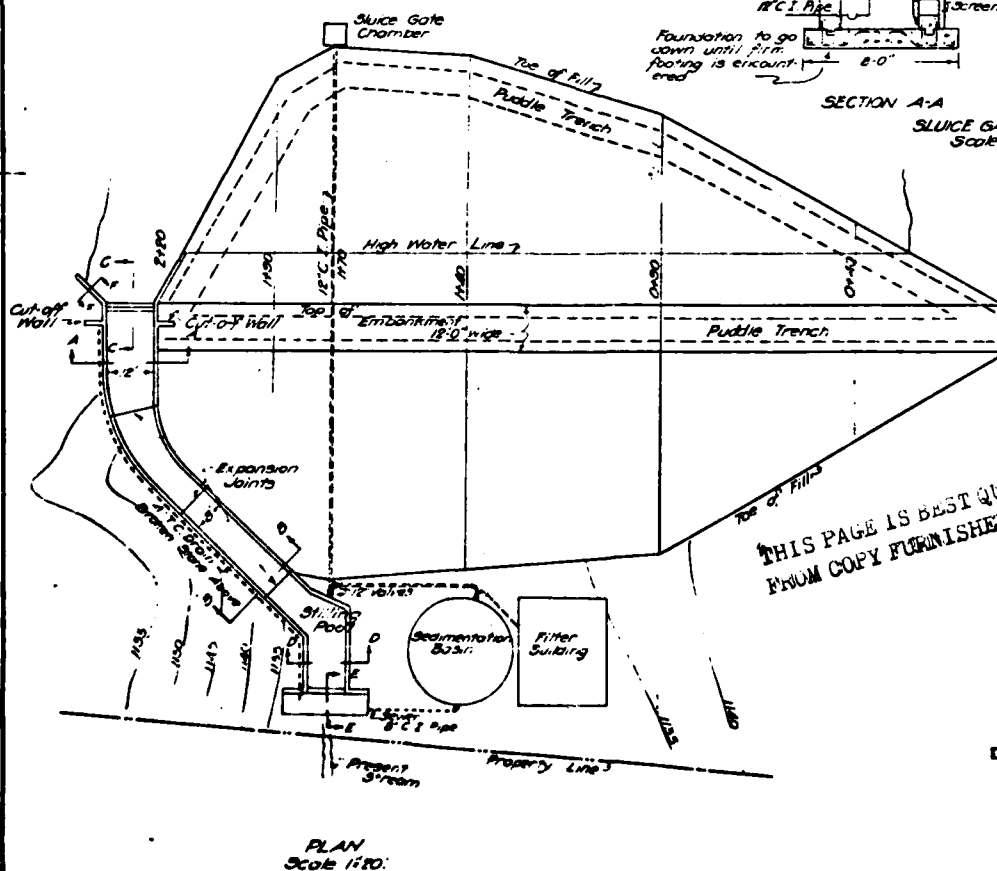
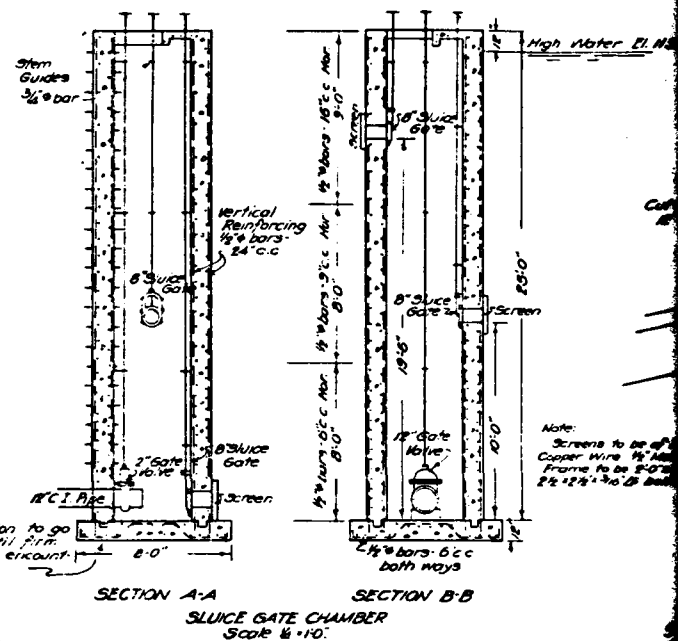
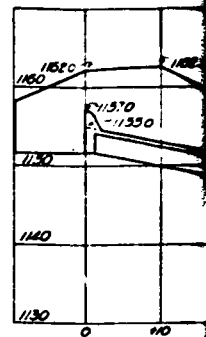
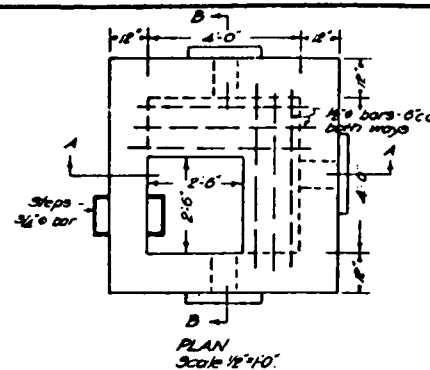
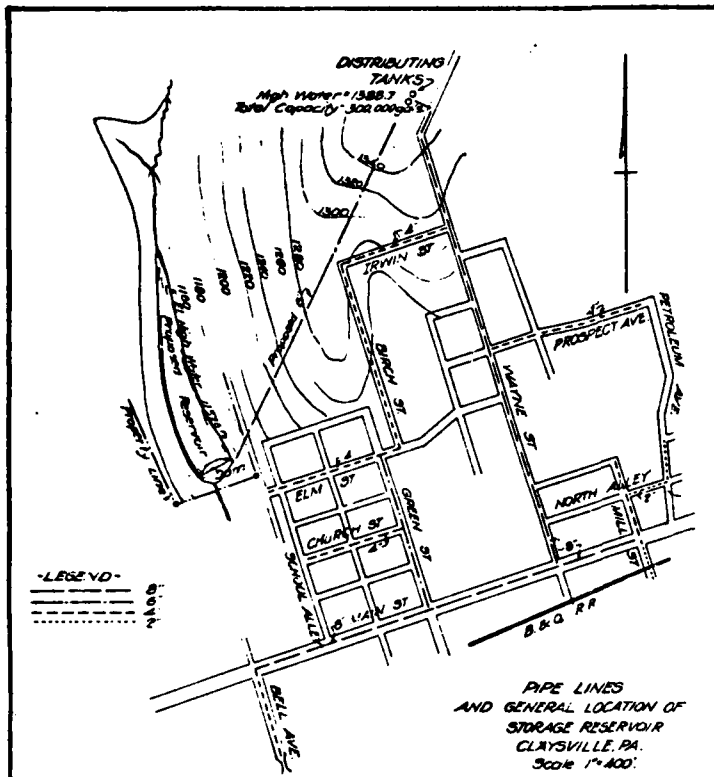
PLATES

CONTENTS

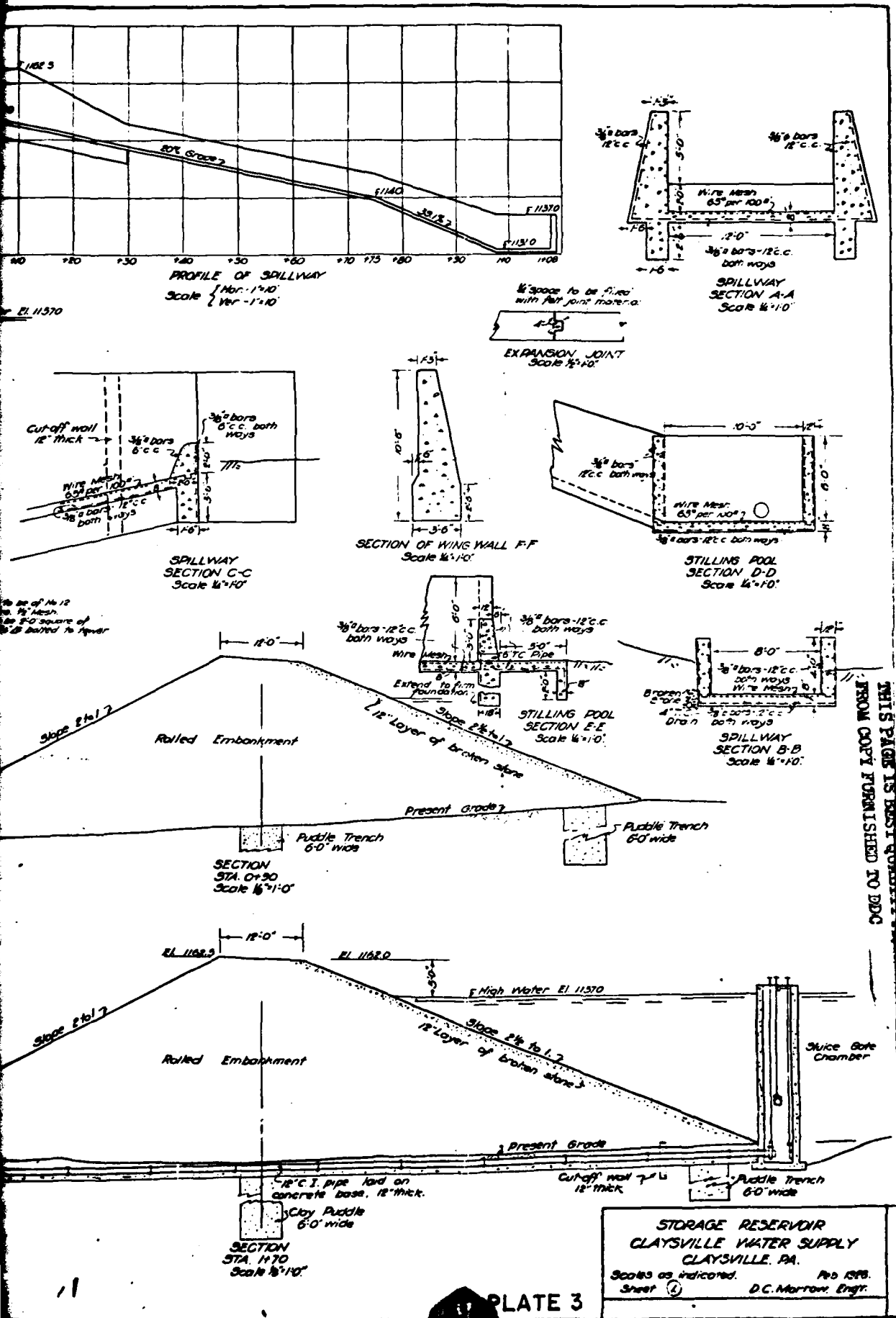
Plate 1 - Location Plan

Plate 2 - Watershed Map

Plate 3 - Original Design Drawing (dated February 1926)



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 FROM COPY FURNISHED TO DDO



THIS PAGE IS BEST QUALITY REPRODUCTION
 FROM COPY FURNISHED TO EDC

APPENDIX F

REGIONAL GEOLOGY

CLAYSVILLE No. 1 DAM
NDI No. PA 00491, PennDER No. 63-35

REGIONAL GEOLOGY

The dam and reservoir are located in an unglaciated area of the Appalachian Plateaus Physiographic Province. Bedrock units below the dam are members of the Washington Formation, Dunkard Group, Pennsylvanian System. These units are typically cyclic sequences of sandstone, shale, limestone, and coal. The dam is located approximately 1.5 miles east of the axis of the Claysville Anticline. The bedrock units are typically dipping 60 to 80 feet per mile in a southerly direction.

Coals located below the dam include the Washington coal (approximately 28 inches), Waynesburg coal (approximately 14 inches), Sewickley coal (inferred), Redstone coal (inferred), and the Pittsburgh coal (approximately 60 inches). The Pittsburgh coal mineral rights are indicated as being owned by the Valley Camp Coal Company - Mine No. 3. The Pittsburgh coal is located approximately 535 feet (Elevation 625 feet) below the top of the dam.

References:

1. "Bituminous Coal Resources in Western Pennsylvania," compiled by Mark A. Sholes and Viktoras W. Skerna, Pennsylvania Topographic and Geologic Survey Mineral Resources Report No. 68, 1974.
2. "Coal-Bearing Upper Pennsylvania and Lower Permian Rocks, Washington Area, Pennsylvania," by Henry L. Berryhill, Jr. and others, United States Geological Survey Professional Paper No. 621, 1971.
3. "Engineering Characteristics of the Rocks of Pennsylvania," by William G. McGlade and others, Pennsylvania Geological Survey Bulletin EG 1, 1972.
4. "Greater Pittsburgh Region Geologic Map," compiled by W.R. Wagner and others, Pennsylvania Topographic and Geologic Survey Map No. 42, 1975.
5. "Greater Pittsburgh Region Maps of Mined-Out Areas and Thickness of Rock Over the Pittsburgh Coal," compiled by S.E. Cortis and others, Pennsylvania Topographic and Geologic Survey Map No. 45, 1975.
6. "Greater Pittsburgh Region Structure Contour Map," compiled by W.R. Wagner and others, Pennsylvania Topographic and Geologic Survey Map No. 43, 1975.

7. "Greater Pittsburgh Region - Thickness of Rock Over the Upper Freeport Coal," compiled by J.L. Craft and others, Pennsylvania Topographic and Geologic Survey Map No. 49, 1976.



GEOLOGIC MAP
Claysville No. 1 Dam
NDI No. PA 00491, Washington County

Reproduced from
Greater Pittsburgh Region Geologic Map,
Compiled by W. R. Wagner and others, 1975

Scale: One Inch Equals Approximately Two Miles
See Legend, Next Page

GEOLOGY MAP LEGEND

GROUP FORMATION

DESCRIPTION

Alluvium		Ol	Sand, gravel, clay.
Terrace deposits			Sand, clay, gravel on terraces above present rivers; includes Carmichaels Formation.
DUNKARD	Greene		Cyclic sequences of sandstone, shale, red beds, thin limestones and coals.
	Washington	Pw	Cyclic sequences of sandstone, shale, limestone, and coal; contains Washington coal bed at base.
	Waynesburg		Cyclic sequences of sandstone, shale, limestone and coal; contains Waynesburg coal bed at base.
MONONGAHELA		Pm	Cyclic sequences of shale, limestone, sandstone and coal; contains Pittsburgh coal bed at base.
P: CONEMAUGH	Casselman	Pcc	Cyclic sequence of sandstone, shale, red beds and thin limestone and coal.
	Ames		
	Glenshaw	Pcg	Cyclic sequences of sandstone, shale, red beds and thin limestone and coal; several fossiliferous limestone; Ames limestone bed at top.
ALLEGHENY	Vanport	Pa	Cyclic sequences of shale, sandstone, limestone, and coal; contains Brookville coal at base and Upper Freeport coal at top; within group are the commercial Vanport limestone and Kittanning and Clarion coals.
		Pa	
POTTSVILLE		Pp	Sandstone and shale; contains some conglomerate and locally mineable coal.
Mauch Chunk		Mmc	Red and green shale with some sandstone; contains Wymys Gap and Loyahanna limestones.
Pocono		Mp	Sandstone and shale with Burgoon sandstone at top.