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WOODWARD-CLYDE CONSULTANTS PLYMOUTH MEETING PA

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NATIONAL DAM INSPECTION REPORT. KAERCHER CREEK DAM (PA-00722), --ETC(U)

JUL 78 J H FREDERICK, W S GARDNER

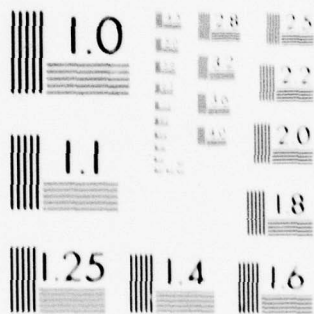
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SCHUYLKILL RIVER BASIN

KAERCHER CREEK DAM
BERKS COUNTY, PENNSYLVANIA
NATIONAL I.D. NO. PA 00722

6 National Dam Inspection Report. Kaercher
Creek Dam (PA-00722), Schuylkill River
Basin, Kaercher Creek, Berks County,
Pennsylvania. Phase I Inspection Report.

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

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Submitted to:

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

JULY, 1978

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PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

Name of Dam: Kaercher Creek Dam
County Located: Berks County
State Located: Pennsylvania
Stream: Kaercher Creek
Coordinates: Latitude 40° 33.4' Longitude 75° 58.2'
Date of Inspection: 18 July 1978

Abstract → Kaercher Creek Dam is owned by Berks County and was designed by the Soil Conservation Service in 1965. The dam is located on Kaercher Creek in Windsor Township, Berks County, Pennsylvania, approximately 3/4 mile east-northeast of Hamburg, Pennsylvania. The facility is considered to be in good condition and well maintained. The dam is considered a "High" hazard potential structure consistent with its potential for extensive property damage and loss of life along Kaercher Creek and in the town of Hamburg, Pennsylvania.

The design data was comprehensive and included hydrology and hydraulic calculations together with structural calculations and geologic data. Kaercher Creek Dam was designed to pass the probable maximum flood (PMF) without overtopping. Therefore, the spillway is considered "Adequate".

→ *Abstract*
A visual inspection of the dam and reservoir facilities detected no symptoms of uncontrolled seepage, instability, deterioration or other conditions that would suggest an impending hazardous condition. The pond drain valve was locked and a key was unavailable. The exterior portions of the valve were inspected and observed to be clean, painted and well lubricated. A wet area was noted on the downstream toe left of the

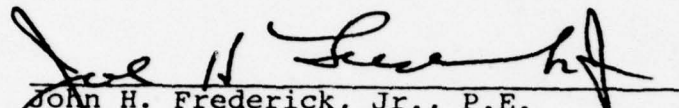
principal spillway impact basin. This wet condition was assessed to be a topographic low that collects rainfall runoff and not seepage through the embankment.

In summary, examination of available records and the visual inspection revealed no evidence or conditions detrimental to the integrity of Kaercher Creek Dam and its appurtenances. Considering the good condition of the dam, recommendations presented below are suggested to insure that the dam continues to function as designed, and to insure that residents downstream are notified when impending high flows are expected along the creek. The following recommendations are presented.

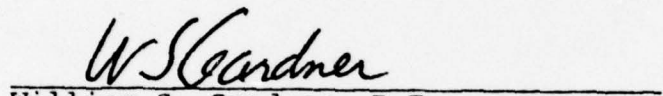
1. It is recommended that the Borough of Hamburg obtain a key to the pond drain valve in the event that it is necessary to drain the reservoir.
2. The owner and the operator should develop a maintenance procedure together with an inspection checklist, to insure that all critical items are inspected and maintained on a periodic basis. Because of the location downstream of a highly populated area, Hamburg, Pennsylvania, a formal procedure of observation and warning during periods of high precipitation should be developed and implemented.
3. Although not related to the function of the dam, the flood plain and channel, particularly along Kaercher Creek between the dam and the tunnel under Hamburg Plow Works factory, should be cleaned of debris to minimize the possibility of clogging the tunnel. The tunnel obstructions could result in damage to the factory.

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4. Hamburg City Officials should be aware of the possibility that property damage and possible loss of life could result from high flows in Kaercher Creek.

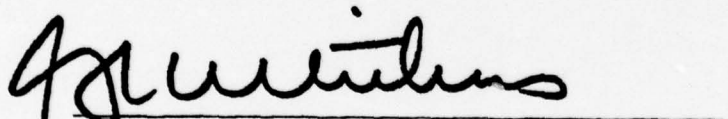

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8/24/78
Date

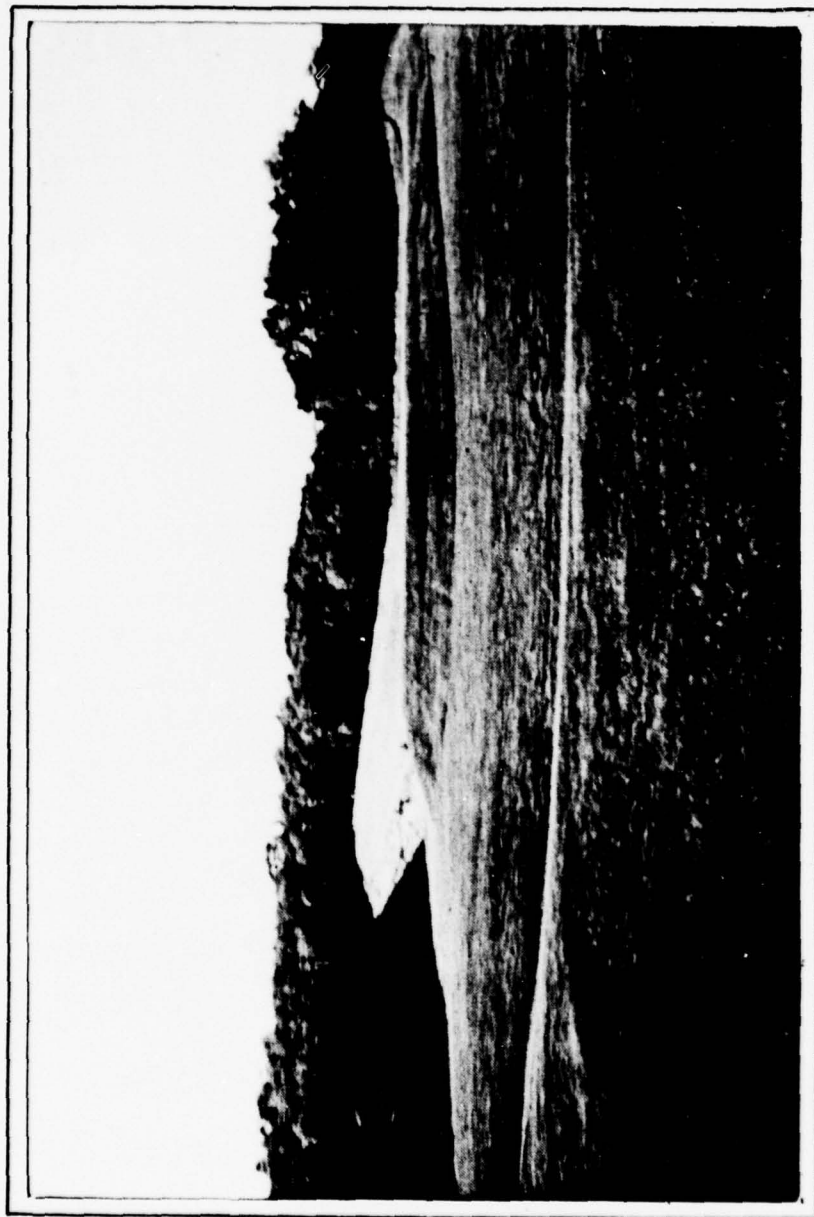

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8/22/78
Date

APPROVED BY:


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

11 Sep 78
Date



OVERVIEW
KAERCHER CREEK DAM, BERKS COUNTY, PENNSYLVANIA

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM
KAERCHER CREEK DAM
NATIONAL ID #PA 00722
DER #6-462

SECTION 1
PROJECT INFORMATION

1.1 General.

a. Authority. 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. 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. Dam and Appurtenances. Kaercher Creek Dam is a zoned earth embankment with a 10 foot wide transition zone. See Plate 10. The dam has a maximum height of 56 feet; a crest width of 16± feet; a length of 680 feet; and a cutoff trench excavated into rock just upstream of the center-line. The 157,000 cubic yard embankment impounds a 484 acre-feet reservoir forming a 1.39 square mile drainage basin. The dam has a downstream drainage blanket with two collector pipes which discharge on either side of the principal spillway. The upstream slope is 1.92:1(H:V) with a bench at elevation 446.8. The upstream slope is protected with riprap over a 12-inch filter bed between elevations 446.8 and 450.8. The downstream slope is Crownvetch covered and inclined at a slope of 2.43:1(H:V).

The intake riser, located upstream of the centerline, has an intake weir with a crest elevation of 447.8. An 18-inch diameter pond drain pipe extends from the reservoir to the base of the intake riser. The pond drain and the principal spillway water discharges through a common 24-inch diameter pipe into an impact basin. The

water flows over an 18-foot long riprap channel and through an abandoned railroad culvert into the natural stream channel. The invert elevations of the riser weir and pond drain are 447.8 and 403.7, respectively. The invert elevation of the impact basin is 402.9.

The emergency spillway, located in the right abutment, was excavated into decomposed rock. It has a 100 foot wide grass-lined channel with a control section at elevation 542.8. The downstream section slopes at 3 percent into the valley below the dam. A dike was constructed between the right abutment of the dam and the left abutment of the emergency spillway to protect the embankment. A plan of the dam and appurtenances is located on Plates 2 and 3 in Appendix E.

b. Location. Kaercher Creek Dam is located across Kaercher Creek in Windsor Township, Berks County, Pennsylvania. The site is located approximately 3/4 of a mile east-northeast of Hamburg, Pennsylvania with the reservoir approximately parallel to Route 22. The dam site and reservoir are shown on USGS Quadrangle entitled "Hamburg, Pennsylvania" at coordinates N40° 33.4', E75° 58.2'. A regional location plan of Kaercher Creek Dam is enclosed as Plate 1 Appendix E.

c. Size Classification. The dam is classified as an "Intermediate" dam consistent with its 56 foot height.

d. Hazard Classification. This dam has a "High" hazard classification because of the potential for extensive property damage and loss of life downstream in the town of Hamburg, Pennsylvania.

e. Ownership. The dam is mutiply owned by Berks County, Windsor Township and the Borough of Hamburg. Copies of the report should be sent to the County Recreation Department, Court House, Reading, Pennsylvania; Windsor Township Supervisors, RD Hamburg, Windsor Township, Pennsylvania, 19526; and Borough of Hamburg, 31 North Third Street, Hambrug, Pennsylvania, 19526.

f. Purpose of Dam. The reservoir is used for recreation and flood control.

g. Design and Construction History. The dam was designed in 1965 by the Soil Conservation Service. Construction inspection was performed by Soil Conservation Service personnel. A "Sedimentation and Erosion Control

Report" was prepared by McCloud, Scatchard, Derck and Edson of Lititz, Pennsylvania on July 14, 1976.

The application Report was submitted on March 3, 1969 and the Permit was issued by the State of Pennsylvania on March 6, 1969. "The Report Upon the Application" was issued on 23 April 1969. Cutoff trench excavation into decomposed rock was completed on April 22, 1971 and approved for backfill. By July 29, 1971 the embankment was approximately 50 percent complete and was within 15 feet of the crest by September 22, 1971. The dam was officially completed on November 8, 1971 and the final State inspection was performed on November 22, 1971.

Construction records submitted by the Soil Conservation Service reported that all density tests were greater than the specified 90 percent of the Standard Proctor density (ASTM D-698). Most of the test results were greater than 95 percent of the Standard Proctor density.

h. Normal Operating Procedures. Under normal conditions, there is no dam tender required as both principal and emergency spillways are ungated. Water is maintained at the normal pool elevation by the intake riser weir at elevation 447.8. It was reported by County representatives that the pond drain is exercised at least once per year to flush out pond sediment. The valve is lubricated and cleaned once per year.

The emergency spillway has a crest elevation of 452.8. To date, the emergency spillway has not discharged flood water. Typical cross sections of the principal spillway and emergency spillway are enclosed in Appendix E as plates 3 and 6.

1.3 Pertinent Data

- | | | |
|----|-----------------------------|-----------|
| a. | Drainage Area (sq. miles) | 1.39 |
| b. | Discharge at Dam Site (cfs) | |
| | Max. Known Flood at Site | |
| | (June 22, 1972) | 87 (est.) |
| | At Emerg. Spillway Crest | 88 |

	At Design High Water	2670
	At Top of Dam	6700
c.	Elevation (feet above MSL)	
	Top of Dam	461.2
	Design High Water	457.9
	Emerg. Spillway Crest	452.8
	Max. Pool of Record	450.2 (est)
	Principal Spillway	
	Weir Crest (Normal Pool)	447.8
	Pond Drain	403.7
	Outlet Invert	402.0
d.	Reservoir (miles)	
	Length at Normal Pool	0.6
	Fetch at Normal Pool	0.6
e.	Storage (acre-feet)	
	Sediment Pool	23
	Normal Pool	484
	To Emergency Spillway Crest	665
	To Top of Dam	1089
f.	Reservoir Surface (acres)	
	Sediment Pool	4.0
	Normal Pool	31.8
	Flood Water (Elev. 457.9)	52.0
g.	Dam Data	
	Type	zoned earth fill
	Volume	157,000 cubic yards
	Length	680
	Maximum Height	56 feet
	Top Width	18 feet
	Side Slope - Upstream	2.92H:1V
	- Downstream	2.43H:1V
	Cutoff	Trench into decomposed rock
	Grout Curtain	None
h.	Principal Spillway	
	Type	3 feet x 3 feet x 45 feet concrete riser discharging into a 24-inch concrete pipe and impact basin.

Elevations

Weir 447.8

Pond Drain (119 feet of
18-inch pipe) 403.7

Impact Basin End Still 402.0

Downstream Channel 18 feet of riprapped
channel discharging
through a railroad
embankment tunnel. In
Hamburg, the stream
passes under fac-
tories through
tunnels.

i. Emergency Spillway
Type

Size

Side Slopes

Downstream Channel

trapezoidal channel cut
through decomposed
rock; grass lined.

100 feet wide

3H:1V

Channel passes around
end of railroad em-
bankment and through
a dense stand of con-
ifers before entering
the natural streambed.

SECTION 2 ENGINEERING DATA

2.1 Design

a. Data Available. A summary of engineering data is presented in the checklist attached as Appendix A. Principal documents containing pertinent data used for this report are listed below.

1. "Report Upon the Application of the Borough of Hamburg" by the State of Pennsylvania, dated April 23, 1969, prepared by Joseph J. Ellam, Hydraulic Engineer.
2. "Sedimentation and Erosion Control Report and Plan for Kaercher Creek Watershed", Dam #PA-478, prepared by McCould, Scatchard, Derck and Edson, of Lititz, Pennsylvania, dated July 14, 1976.
3. As-built drawings prepared by the Soil Conservation Service, dated December, 1965, 18 sheets.
4. "Design Report", Dam #PA-476 prepared by the Soil Conservation Service, dated 1965.
5. Kaercher Creek Watershed Design Calculations, prepared by the Soil Conservation Service, Dam #PA-478, dated 1965.
6. "SCS Status of Construction Work Reports", prepared in 1970 and 1971 by Frederick H. Schuetz, Project Engineer, Soil Conservation Service.
7. "Inspection Reports", prepared by Mr. Joseph J. Ellam, Hydraulic Engineer, for the Pennsylvania Department of Environmental Resources.
8. "Inspection Reports", prepared by Mr. Walter Leidig, Hydraulic Engineer for the Pennsylvania Department of Environmental Resources.

9. Miscellaneous memos, correspondence and other pertinent data included in the State files.

b. Design Features. A complete description of the design features of this project is discussed in Section 1.2, "Description of Project".

2.2 Construction

A description of the available construction history as determined from DER files; discussions with Borough of Hamburg and Berks County representatives is described in Section 1.2.

2.3 Operational Data

There are no operational records maintained. There are no minimum flow requirements for the downstream channel. There are no water level measurements or rainfall records maintained within this watershed.

2.4 Evaluation

a. Availability. All engineering data produced in this report and studied for this investigation was provided by either the Department of Environmental Resources or the Soil Conservation Service. Verbal information was received from the Borough of Hamburg and Berks County representatives.

b. Adequacy. The data included in the State files together with supplemental data received from the Soil Conservation Service and verbal information received from the Borough of Hamburg and Berks County representatives is considered adequate to evaluate the dam and appurtenant structures.

c. Validity. There is no reason to question the validity of the data.

SECTION 3 VISUAL INSPECTION

3.1 Findings

a. General. The observations and comments of the field inspection team are contained in the checklist contained herein as Appendix B and are summarized and evaluated as follows. In general, the dam and its appurtenant facilities are in good condition and reasonably well maintained. It is noted that the Borough of Hamburg, who was indicated as the Owner on the "Report of the Application", does not have a key to open and operate the pond drain valve. Therefore, the valve could not be exercised. County representatives now maintain and operate the facilities.

b. Dam. During the visual inspection there were no indications or evidence observed of distortions in alignment or grade that would be indicative of movement of the embankment or the foundation. A careful inspection of the downstream slope and adjacent downstream areas disclosed no seepage flows. However, as shown on sheet 5a of Appendix B, a topographic low was noted to the left of the principal spillway impact basin. There were no signs of vegetation changes in this area to indicate that the moisture noted during the inspection was of a permanent nature. Although the as-built drawings indicate a crest width of 18 feet, field measurements of the width ranged from 15-1/2 to 18 feet with an overall average of 16± feet.

Upstream there were no signs of riprap distortion, movement, or deterioration. The quality of the riprap was good.

c. Appurtenant Structures. At the time of the inspection water was at the crest of the primary spillway. The accessible portions of the intake tower were thoroughly inspected and observed to be in good condition with no signs of distress, concrete spalling or other indications of poor construction or movement of the riser. The pond drain sluice gate could not be exercised because a key was not available. The impact

basin was thoroughly inspected and found to be in good condition. Similarly, the discharge channel between the impact basin and the abandoned railroad tunnel was also found to be quite stable and in good condition. Photographs No. 3 and 4 show these areas.

The grass channel of the emergency spillway side slopes were inspected and observed to be in good condition. There were no signs of significant deterioration, erosion or movement. The grass was lush, well maintained and in very good condition.

As shown in Photograph 5, an abandoned railroad tunnel is located 18 feet downstream of the impact basin. This tunnel can pass the maximum flow that could be discharged through the principal spillway without impounding water. The tunnel is stable without excessive deterioration or signs of instability. In the event of dam failure, it is believed that the railroad fill and tunnel would afford some detention and attenuation of the flood wave.

d. Reservoir. Reconnaissance of the reservoir disclosed no evidence of siltation, slope instability or other features that would significantly affect flood storage capacity of the reservoir. The drainage basin surrounding the reservoir was inspected and assessed to be quite stable and well vegetated or recently seeded. Residential areas are beginning to develop near the downstream portions of the basin. It is expected that future development of the basin will continue for the life of the reservoir.

e. Downstream Channel. Immediately below the railroad embankment the channel flows through a marshy, narrow flood plain bounded on each side with timber and dense underbrush. Approximately one-half mile downstream from the dam there are three houses adjacent to the stream. The stream passes under a bridge 0.3 miles downstream. This location is shown on Photograph No. 10. Before Kaercher Creek flows under Hamburg Plow Works factory, the channel narrows. The flood plain is covered with debris and factory equipment. At Hamburg Plow Works, the creek flows underneath the factory and under the city for approximately one block. Thereafter, the flow passes through another channel between houses and

businesses and discharges into the Schuylkill River via the old canal. The channel slope between the dam and the Schuylkill River is approximately one percent.

In the event of the probable maximum flood (PMF) or even lesser floods, damage and possible loss of life at the Hamburg Plow Works factory and in the city of Hamburg is expected.

3.2 Evaluation.

The inspection of the dam disclosed no evidence of apparent past or present movement that indicates existing instability of the dam, emergency or principal spillways. Since a key was not available to unlock the pond drain gate, the gate could not be exercised and could not be confirmed that it was operable. However, the gate system was cleaned, greased and in apparently good condition.

There was no debris noted in the reservoir or near the principal and emergency spillways. Downstream, significant debris and factory storage areas were noted on the flood plain. It is judged that, in the event of high flows along Kaercher Creek, debris would most likely be floated down the channel and would probably clog either the entrance to the tunnel or at the bend in the tunnel under the Hamburg Plow Works factory. This would store water eventually causing damage to the factory and to the homes in Hamburg. Additional evaluations of the flooding potential in Hambrug should be performed.

SECTION 4 OPERATIONAL PROCEDURES

4.1 Procedures

Operational procedures are discussed in detail in Section 1.2. As stated in Section 1.2, the operation of this dam does not require a dam tender. Under normal conditions, flow discharges over the weir of the principal spillway and excess water is stored up to elevation 452.8. Thereafter, water is discharged over the emergency spillway. In the event that it is necessary to drain the reservoir, this can be done by opening the sluice gate. The valve is located at the top of the principal spillway riser. There are no written procedures describing how and when to operate this valve.

4.2 Maintenance of the Dam

The dam is maintained by Berks County. County personnel periodically check the structures, mow the grass and perform repairs, as necessary.

4.3 Maintenance of Operating Facilities

The sluice gate valve is exercised at least once per year; cleaned and painted and the gears lubricated. This is the only mechanically operated item.

4.4 Warning Systems in Effect

The representative for the Borough reported that there are no formal warning systems or procedures established to be followed during periods of heavy rainfall. If hazardous conditions develop, or if high flow conditions are anticipated, the local Civil Defense authority would be notified by either Berks County representatives or the Borough of Hamburg.

4.5 Evaluation

It is judged that the current operating procedure which does not require a dam tender is a realistic means of operating the relatively simple control facilities

of Kaercher Creek Dam. It is recommended that a key for the pond drain be retained at the Borough offices in the event that it is necessary to drain the reservoir.

Since there are no formal warning procedures, it is recommended that a procedure be developed so downstream residents, including the industrial areas, be amply warned of possible high flows or potentially hazardous conditions. Operational procedures should also be formalized and documented together with a maintenance procedure and inspection checklist.

SECTION 5
HYDROLOGY/HYDRAULICS

5.1 Evaluation of Features

a. Design Data. A complete Design Report prepared by the Soil Conservation Service was available and reviewed. Also contained in the files was a copy of the SCS calculations.

The watershed is long, narrow and fairly small, 1.39 square miles, with elevations ranging from a high of 800 to a low of 448 at normal pool elevation. The hydrological design considered the watershed to be 79 percent open/farmland; 18 percent woods and 3 percent urban. These percentages are approximately the same according to current USGS maps and the visual inspection of the drainage basin. The 3 percent urbanization value is judged low for future conditions because the basin is expected to experience rapid growth in the future.

In accordance with the criteria established by the Federal (OCE) guidelines, the recommended spillway design flood for this "Intermediate" size dam and "High" hazard potential classification is the probable maximum flood (PMF). The Soil Conservation Service classified this dam as a "C" structure which is equivalent to a Corps of Engineers structure requiring the dam to pass the PMF.

b. Experience Data. There are no records of reservoir water levels or rainfall records. Kaercher Creek Dam is located in an area that experienced heavy rainfalls from Tropical Storm Agnes, June, 1972. This structure was inspected on June 27, 1972 by Mr. C. R. Kirk, SCS District Conservationist. The maximum pool elevation of 450.2 was estimated from high water marks. This corresponds to a discharge of 87 cfs through the principal spillway. It is not known whether or not the reservoir was at the normal pool elevation prior to the storm.

c. Visual Observations. On the date of the inspection, no conditions were observed that would

indicate that the outlet capacity would be reduced during a flood occurrence. Observations regarding the condition of the downstream channel, spillways, and reservoir are located in Appendix B.

d. Overtopping Potential. The dam was designed to pass the PMF without overtopping. The PMF inflow hydrographs and flood routing are presented in Appendix C. These calculations were reviewed and are judged adequate. In summary, the peak inflow was computed as 8800 cfs resulting from a six-hour storm with 29 inches of rainfall. This was computed to produce a runoff of 24.8 inches. This storm was routed through the reservoir to produce a peak discharge of 6700 cfs at a maximum water elevation of 461.2, to top of the dam.

e. Spillway Adequacy. The spillway systems for this dam are considered to be "Adequate" as the dam has been designed to pass the PMF without overtopping. The tailwater is estimated to be 50 feet or more below the top of the dam during the PMF.

f. Downstream Conditions. Immediately downstream of the impact basin, water is discharged over an 18 foot long riprap channel and passes through an abandoned railroad embankment tunnel. The tunnel has 7 feet vertical walls with a circular roof having a radius of 7.5 feet. The tunnel is constructed of stone and mortar and is assessed to be stable and capable of passing all flows discharged from the principal spillway. In the event of failure, this tunnel and embankment would retard flow and attenuate the flood wave.

The emergency spillway discharges water around the end of this embankment before entering the natural streambed below. Approximately 0.6 miles downstream of the dam, Kaercher Creek enters Hamburg and passes under a tunnel below the Hamburg Flow Works factory. At this point the stream enters the tunnel which is 8 feet high, 12 feet wide and has an "S" curve in it.

A rough estimate has only been made of the tunnel capacity under the factory. The capacity is estimated to be 1300 cfs or less. In any event, it is

judged that debris along the channel and the equipment stored in the flood plain area above this tunnel would float downstream and possibly block the entrance to the tunnel or form a blockage at the bend in the tunnel. At the time of the inspection, debris was collecting at the bend, including a long tree limb and a ladder. It is assessed that extreme damage would occur as a result of blocking this tunnel. In the event that Kaercher Creek Dam failed, water would back up behind the factory and would probably collapse the tunnel and produce excessive property damage. In summary, damage, including loss of life, would be significantly greater if the dam failed during the passing of the PMF, than damage resulting from large flows if the dam did not fail during the PMF. Thus, the dam is classified as a "High" hazard potential structure.

SECTION 6 STRUCTURAL STABILITY

6.1 Evaluation of Structural Stability

a. Visual Observations. The visual observations did not indicate any existing embankment stability problems. The upstream riprap was stable and in good condition. The quality of the rock was assessed to be quite good. The downstream slope was densely vegetated with Crownvetch and is thick, evenly distributed and well maintained. There were no exterior signs indicating that internal drainage systems were operating improperly. Water emanating from blanket drain pipes on either side of the impact basin was clear.

A careful inspection of the marshy area located to the right of the impact basin revealed that the zone was a topographic low which temporarily retains rainfall runoff. There was no evidence to indicate that this area was a source of uncontrolled seepage.

The exposed portions of the intake riser were inspected and judged to be in good condition. The emergency spillway was assessed to be in good condition. The channel and side slopes are well vegetated and maintained. The downstream channels of both the principal and emergency spillways were inspected and observed to be stable.

b. Design and Construction Data. Available design documentation included preliminary and final design reports together with the results of the soil and foundation investigation performed by the Soil Conservation Service. Also contained in the DER file was a complete set of as-built plans. All of this data was reviewed. Input parameters for slope stability were also included in the files and assessed. It was judged that these numbers and the methods of computations are reasonable and adequate. The design calculations and design recommendations were compared to the as-built drawings and no significant deviations were noted between the design recommendations and the as-constructed features of the embankment and appurtenant facilities.

c. Operating Records. There are no operational records for this structure.

d. Post-Construction Changes. There are no reports nor is there any evidence that modifications were made to this dam.

e. Seismic Stability. This dam is located in Seismic Zone I, normally it can be considered that if a dam in this zone is stable under static loading conditions, it can be assumed safe for any expected earthquake conditions. Since the static stability analyses indicates that the dam is stable under static loading conditions, by definition of the Corps of Engineers criteria, the seismic stability of the dam is also adequate.

SECTION 7
ASSESSMENT/REMEDIAL MEASURES

7.1 Dam Assessments

a. Evaluation. The visual inspection and review of the design and as-built documentation indicates that the dam, foundation and appurtenant structures of Kaercher Creek Dam are in good condition. The hydrologic and hydraulic computations presented in the design documents and shown in Appendix C, indicate that the dam will pass the PMF without overtopping. Therefore, the spillway systems of the structure are considered to be "Adequate". It is noted that, although the structure has been designed to pass the PMF, significant property damage would be likely downstream with flows on the order of one half the PMF.

b. Adequacy of Information. The design information available for this inspection was adequate and comprehensive. The summary of construction data prepared by Soil Conservation Service inspectors confirmed that the dam and appurtenant structures were constructed in accordance with the specifications.

c. Urgency. It is recommended that the suggestions presented in Section 7.2 be implemented as soon as practical.

7.2 Remedial Measures

a. Facilities. It is recommended that the Borough of Hamburg obtain a key to the pond drain valve in the event that it is necessary to drain the reservoir. Although not related with the function of the dam, downstream conditions, particularly along the channel between the dam and the tunnel at the Hamburg Plow Works should be cleaned of debris to minimize the possibility of clogging this tunnel during periods of high flow. Hamburg City Officials should also be aware of the possibility of extreme property damage and possible loss of life during the passage of high flows along Kaercher Creek.

b. Operation and Maintenance Procedures. The Owner should develop a maintenance procedure together with an inspection checklist to insure that all critical items are inspected and maintained on a periodic basis.

Because of the location of the dam upstream of a highly populated area, a formal procedure of observation and warning during periods of high precipitation should be developed and implemented. This procedure should include a method of warning or possibly evacuating downstream homes and industries.

APPENDIX

A

CHECK LIST
 ENGINEERING DATA
 DESIGN, CONSTRUCTION, OPERATION
 PHASE I

NAME OF DAM Kaercher Creek Dam
 ID # PA 00722

Sheet 1 of 4

REMARKS

ITEM

AS-BUILT DRAWINGS No. One set of 1/2 size drawings prepared by the Soil Conservation Service (SCS) was enclosed in DER files (Design Drawings).

REGIONAL VICINITY MAP

Yes. Data located on SCS drawings and on USGS Quadrangle entitled "Hamburg, Pennsylvania".

CONSTRUCTION HISTORY

There were no formal construction history documents but some of the work was reconstructed from progress reports, inspection reports and miscellaneous letters of correspondence.

TYPICAL SECTIONS OF DAM

Yes. Data located on SCS design drawings.

OUTLETS - PLAN

DETAILS

Data located on SCS design drawings.

CONSTRAINTS

DISCHARGE RATINGS

Complete flood routing data was included in DER files as prepared by SCS.

RAINFALL/RESERVOIR RECORDS

None available.

ITEM	REMARKS
DESIGN REPORTS	Yes. A complete SCS design report was available in DER files and reviewed.
GEOLOGY REPORTS	Yes. A geologic section was incorporated in the SCS design report.
DESIGN COMPUTATIONS HYDROLOGY & HYDRAULICS DAM STABILITY SEEPAGE STUDIES	All of this data was included in the SCS design report.
MATERIALS INVESTIGATIONS BORING RECORDS LABORATORY FIELD	The results of these analyses was incorporated in the design report prepared by the SCS.
POST-CONSTRUCTION SURVEYS OF DAM	None known.
BORROW SOURCES	Material sources recommended by SCS were used for construction.

ITEM	REMARKS
MONITORING SYSTEMS	<i>None</i>
MODIFICATIONS	<i>None</i>
HIGH POOL RECORDS	<i>None</i>
POST CONSTRUCTION ENGINEERING STUDIES AND REPORTS	<i>None known</i>
PRIOR ACCIDENTS OR FAILURE OF DAM DESCRIPTION REPORTS	<i>None</i>
MAINTENANCE OPERATION RECORDS	<i>None</i>

ITEM	REMARKS
SPILLWAY PLAN	} Details are included on the SCS drawings.
SECTIONS DETAILS	
OPERATING EQUIPMENT PLANS & DETAILS	Details are included on the SCS drawings.
MISCELLANEOUS	1. Construction Specifications as prepared by the Soil Conservation Service. 2. Design computations for hydrology, hydraulics, slope stability, soil strength, permeability and some geologic data. 3. "Design Report for Site PA-478", Kaersher Creek Dam, prepared by SCS includes hydraulics, hydrology, geologic data, soils, structural computations, quantities and specifications. 4. "Sedimentation and Erosion Control Report and Plan for Kaersher Creek Watershed" for Recreation Facilities of dam site PA-478, prepared by McCloud, Seatchard, Derok and Edson of Lititz, Pennsylvania. 5. "Report Upon the Application of the Borough of Hamburg" dated April 23, 1969.

APPENDIX

B

CHECK LIST
VISUAL INSPECTION
PHASE I

Sheet 1 of 11

Name Dam Kaencher Creek Dam County Berks State Pennsylvania National ID # PA 00722
Type of Dam Rolled Earth Hazard Category I (High)
Date(s) Inspection 18 July 1978 Weather Partly cloudy, warm, Temperature 80's
humid

Pool Elevation at Time of Inspection 447.0 M.S.L. Tailwater at Time of Inspection 402.4 M.S.L.

Inspection Personnel:

Brady Bisson Vince McKeever John H. Frederick, Jr.

Mary Beck John Boschuk, Jr.

John Boschuk, Jr. Recorder

Remarks:

The Owner's representative was not on site during the field inspection. The
valve could not be exercised because it was locked and the Municipal Authority
did not have the key.

CONCRETE/MASONRY DAMS

Sheet 2 of 11

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
ANY NOTICEABLE SEEPAGE	N/A	
STRUCTURE TO ABUTMENT/EMBANKMENT JUNCTIONS	N/A	
DRAINS	N/A	
WATER PASSAGES	N/A	
FOUNDATION	N/A	

CONCRETE/MASONRY DAMS

Sheet 3 of 11

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SURFACE CRACKS CONCRETE SURFACES	N/A	
STRUCTURAL CRACKING	N/A	
VERTICAL AND HORIZONTAL ALIGNMENT	N/A	
MOROLITH JOINTS	N/A	
CONSTRUCTION JOINTS	N/A	

EMBANKMENT

Sheet 4 of 11

<u>VISUAL EXAMINATION OF</u>	<u>OBSERVATIONS</u>	<u>REMARKS OR RECOMMENDATIONS</u>
------------------------------	---------------------	-----------------------------------

SURFACE CRACKS *None observed.*

UNUSUAL MOVEMENT OR
CRACKING AT OR BEYOND
THE TOE

None observed.

SLOUGHING OR EROSION OF
EMBANKMENT AND ABUTMENT
SLOPES

None observed upstream or downstream. Some woody vegetation is beginning to grow on the slope and should be removed.

VERTICAL AND HORIZONTAL
ALIGNMENT OF THE CREST

The vertical and horizontal alignment is very good. The width of the crest varies from 16 feet to 20 feet and averages a little more than 16 feet.

RIPRAP FAILURES

None observed. Riprap was of excellent quality and of good gradation.

EMBANKMENT

Sheet 5 of 11

<u>VISUAL EXAMINATION OF</u>	<u>OBSERVATIONS</u>	<u>REMARKS OR RECOMMENDATIONS</u>
------------------------------	---------------------	-----------------------------------

**JUNCTION OF EMBANKMENT
AND ABUTMENT, SPILLWAY
AND DAM**

No seeps, sloughing, erosion or other discontinuities observed.

ANY NOTICEABLE SEEPAGE

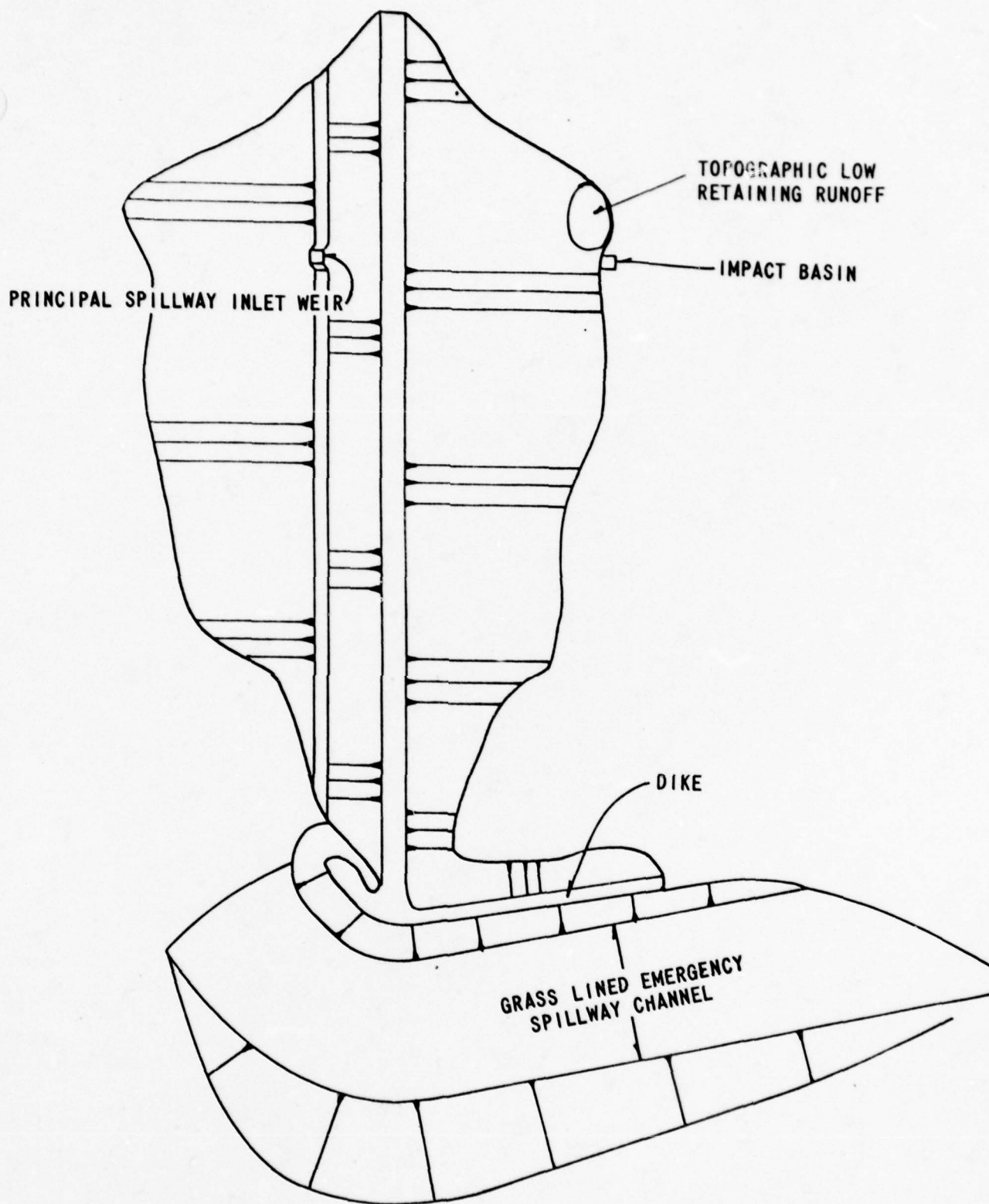
None observed on downstream side of the dam or around outlet works. Some standing water was observed just left of the impact basin. The area is a topographic low approximately 15 feet in diameter. There was no evidence to indicate the area was a source of seepage. See sheet 5a for the specific location.

STAFF GAGE AND RECORDER

None

DRAINS

Two 12" CMP drains (one on each side of the outlet wall) were observed, and flowing with one inch of water. All seepage was clear.



SEEPAGE LOCATION PLAN
KAERCHER CREEK DAM

SHEET 5a OF 11

OUTLET WORKS
(INTAKE RISER)

Sheet 6 of 11

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CRACKING AND SPALLING OF CONCRETE SURFACES IN OUTLET CONDUIT	None could be observed because the conduit is buried under the embankment.	
INTAKE STRUCTURE	No cracks, spalling, movements, or deterioration observed.	
OUTLET STRUCTURE	No cracks, spalling, deterioration or movements observed.	
OUTLET CHANNEL	The channel is rock lined and side slopes are stable. The outlet channel enters a tunnel 17 feet-4 inches downstream of the wingwall. The tunnel has the following dimensions: The circular roof has a seven foot radius and the vertical walls extend six feet from the channel. The tunnel is constructed of stone.	
EMERGENCY GATE	None	
CONTROL GATE	The gate was locked and could not be exercised. A key was not available from the Hamburg Municipal Authority.	Gate Specifications: Rodney Hunt Valve, Orange, Mass., Serial No. BS-2600, Valve No. 14675-2.

UNIGATED SPILLWAY

Sheet 7 of 11

<u>VISUAL EXAMINATION OF</u>	<u>OBSERVATIONS</u>	<u>REMARKS OR RECOMMENDATIONS</u>
CONCRETE WEIR	None. Grass channel. Side slopes are rock and the crest elevation is 452.8. Further downstream, the side slopes are 3:1 (H:V).	
APPROACH CHANNEL	Grass lined.	Channel is 190 feet long.
DISCHARGE CHANNEL	Grass lined. with 3:1 (H:V) side slopes which transition to the natural topography.	
BRIDGE AND PIERS	None	

GATED SPILLWAY

Sheet 8 of 11

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONCRETE SILL	<i>None</i>	
APPROACH CHANNEL	<i>None</i>	
DISCHARGE CHANNEL	<i>None</i>	
BRIDGE AND PIERS	<i>None</i>	
GATES AND OPERATION EQUIPMENT	<i>None</i>	

INSTRUMENTATION

Sheet 9 of 11

<u>VISUAL EXAMINATION</u>	<u>OBSERVATIONS</u>	<u>REMARKS OR RECOMMENDATIONS</u>
---------------------------	---------------------	-----------------------------------

MONUMENTATION/SURVEYS	None	
-----------------------	------	--

OBSERVATION WELLS	None	
-------------------	------	--

WEIRS	None	
-------	------	--

PIEZOMETERS	None	
-------------	------	--

OTHER	None	
-------	------	--

RESERVOIR

Sheet 10 of 11

<u>VISUAL EXAMINATION OF</u>	<u>OBSERVATIONS</u>	<u>REMARKS OR RECOMMENDATIONS</u>
------------------------------	---------------------	-----------------------------------

SLOPES

Side slopes were moderate, stable, well vegetated with grass on right side of reservoir and trees to water's edge on left side of reservoir. No debris evident.

SEDIMENTATION

Minimal sedimentation at upper end, no effect on flood storage.

DOWNSTREAM CHANNEL

Sheet 11 of 11

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

CONDITION
(OBSTRUCTIONS,
DEBRIS, ETC.)

Immediately below the dam the channel flows through marshy, narrow flood plain, boarded on each side with timber and dense underbrush. Before Kaercher Creek flows under Hamburg Flow Works, the banks are approximately 15 feet high and much debris is in the channel which tends to obstruct flow at the bend in the channel under the Hamburg Flow Works.

SLOPES

The channel slope is approximately one percent.

APPROXIMATE NO.
OF HOMES AND
POPULATION

Approximately 0.5 mile downstream three houses are built adjacent to the stream. Approximately 0.4 mile further downstream the channel goes under the Hamburg Flow Works.

APPENDIX

C

KAERCHER CREEK
CHECK LIST
HYDROLOGIC AND HYDRAULIC
ENGINEERING DATA

DRAINAGE AREA CHARACTERISTICS: Predominantly open farm land, less than 10% residential.

ELEVATION TOP NORMAL POOL (STORAGE CAPACITY): 447.8 (484 Acre-Feet)

ELEVATION TOP FLOOD CONTROL POOL (STORAGE CAPACITY): 461.2 (1089 Acre feet)

ELEVATION MAXIMUM DESIGN POOL: 457.84

ELEVATION TOP DAM: 461.2

EMERGENCY SPILLWAY:

a. Elevation 452.8

b. Type Trapezoidal channel cut through rock.

c. Width 100 feet.

d. Length Approximately 470 feet.

e. Location Spillover Right abutment.

f. Number and Type of Gates None

PRINCIPAL SPILLWAY:

a. Type Drop inlet riser, conduit and impact basin.

b. Location Approximately 180 feet from left abutment.

c. Entrance inverts 447.8

d. Exit inverts 402.0

e. Emergency draindown facilities 18 inch pond drain at 403.7

HYDROMETEOROLOGICAL GAGES:

a. Type None

b. Location _____

c. Records _____

MAXIMUM NON-DAMAGING DISCHARGE: 1300 cfs.

DAM SAFETY ANALYSIS
HYDROLOGIC/HYDRAULIC DATA

Date: 7/29/78
By: MFB
Sheet: 2 of 7

DAM Kaercher Creek

Nat. ID No. PA00722

DER No. 6-462

ITEM/UNITS	Permit/Design Files (A)	Calc. from Files/Other (B)	Calc. from Observations (C)
1. Min. Crest Elev., ft.	<u>461.2</u>		
2. Freeboard, ft.	<u>0</u>		
3. Spillway ⁽¹⁾ Crest Elev, ft.	<u>447.8</u>		
3a. Secondary ⁽²⁾ Crest Elev, ft.	<u>452.8</u>		
4. Max. Pool Elev., ft.	<u>461.2</u>		
5. Max. Outflow ⁽³⁾ , cfs	<u>6700</u>		
6. Drainage Area, mi ²	<u>1.39</u>		
7. Max Inflow ⁽⁴⁾ , cfs	<u>8800</u>		
8. Reservoir Surf. Area, Acre	<u>31.8</u>		
9. Flood Storage ⁽⁵⁾ , Acre-Feet	<u>605.0</u>		
10. Inflow Volume, ft ³	<u>-</u>		

Reference all figures by number or calculation on attached sheets:

Example: 3A - Drawing No. xxx by J. Doe, Engr., in State File No. yyyy.

NOTES:

- (1) Main emergency spillway.
- (2) Secondary ungated spillway.
- (3) At maximum pool, with freeboard, ungated spillways only.
- (4) For columns B, C, use PMF.
- (5) Between lowest ungated spillway and maximum pool.

Date: 7/29/78
By: MFB
Sheet: 3 of 7

HYDROLOGIC/HYDRAULIC CALCULATIONS (cont.)

Item (from Sheet 2)	Source
1A, 3A, 3aA, 6A	Construction Drawings stamped 'As-Built', dated '65 & '66
2A, 4A, 5A, 7A, 9A	Freeboard Flood Routing performed by SCS
8A	Design Book prepared by SCS

Pennsylvania

Kaercher Creek Watershed

L. Thomas 5/3/65

JMR

5-3-65

PA-478

Design & Work Plan Comparison

Item	Unit	Work Plan	Design	Remarks.
Drainage Area	Sq. mi.	1.39	1.39	
Stor. Capacity: Sediment	Ac-ft.	22.0	23.0	
Fish & Wildlife	Ac-ft.	461.2	461.2	
Floodwater	Ac-ft.	181.2	181.2	
total	Ac-ft.	664.4	665.4	
Surface Area: Sediment Pool	Ac	3.0	4.0	
Fish & Wildlife	Ac	30.0	31.8	a smaller
Floodwater Pool	Ac	45.0	52.0	D.H.W. is higher in design.
Volume of fill	Cu yd.	99,000	143,120 120,000	To P of dam is higher in design
Elevation top of dam	feet	456.3	461.2	Diff. in Stage-Storage.
Maximum height of dam	feet	51	56	" " " "
Emerg. Spillway: Crest Elev.	feet	449.0	452.8	" " " "
Bottom width	feet	100	100	
type	-	rock	rock	
% chance of Use	-	1	1	
Avg. Curve No. Cond II	-	72	72	
Emerg. SW Hydrograph: Rainfall (6 hr.)	in	13.8	14.5	Fletcher curve reduction was used in planning but not in design
Runoff	in	12.28	12.71	
Velocity of flow	fps.	9.6	9.3	
Discharge rate	cfs.	2,790	2,710	
Max. WS Elev	ft.	453.2	457.9	Higher in SW crest in design. Fletcher curve used in planning, not in design
Freeboard Hydrograph: Rainfall	in	27.60	29.0	
Runoff	in	23.42	24.80	
Velocity of flow	fps	12.6	12.7	
Discharge rate	cfs	6,290	6,700	
Max. WS Elev	feet	456.3	461.2	Higher crest used in design. 24" pipe used in design
Princ. SW Cap. Low Stage	cfs	104	88	
Capacity Equivalents: Sed. Vol.	in.	0.29	0.31	
Det. Vol.	in	2.44	2.44	
Spill. stor	in	4.71	5.66	
Class	-	C	C	

Ref: Kaercher Creek
Watershed
PA 478
Design Folder
prepared by
SCS, 1965

BY MFB DATE 7/29/78 SUBJECT Kaercher Creek SHEET 5 OF 7
CHKD. BY DATE Hydrology/Hydraulics JOB No.

Classification (Ref. - Recommended Guidelines for Safety Inspection of Dams)

1. The hazard potential is rated as HIGH as there would be loss of life if the dam failed.
2. The size classification is INTERMEDIATE based on its height of 56 ft. height and total storage of 1089 Ac-Ft (to top of dam).
3. The spillway design flood, based on size and hazard classification, is probable maximum flood (PMF).

Hydrologic/Hydraulic Analysis

The complete hydrologic/hydraulic design package prepared by the Soil Conservation Service was reviewed. The PMF inflow hydrograph and flood routing were determined according to procedures in National Engineering Handbook, Section 4.

The peak inflow rate for the freeboard (PMF) hydrograph was determined to be 8,800 cfs for a 6 hr. storm.

Contact with Col E, Baltimore District indicated that if no original design data was available, Kaercher Creek Watershed should be compared with a watershed of 4.0 sq. miles, estimated peak PMF of 6180 cfs on Furnace Creek.

$$\begin{aligned}\text{Estimated PMF} &= \left(\frac{1.39}{4.0}\right)^{0.8} 6180 \\ &= 2653 \text{ cfs} < 8,800 \text{ cfs} - \text{SCS value}\end{aligned}$$

Therefore, the SCS computed PMF inflow hydrograph is judged reasonable and the peak PMF inflow is 8,800 cfs

BY MFB DATE 7/29/78

SUBJECT

SHEET 6 OF 7

CHKD BY DATE

Kaercher Creek

JOB No.

Hydrology/ Hydraulics

Spillway Capacity (See sheet 7)

Calculations were reviewed and judged adequate.

During the PMF, water at top of dam, discharges are:

Emergency Spillway ~ 6600 cfs

Principal Spillway ~ 100 cfs

Freeboard (PMF) Routing (see sheet 7)

The routing was reviewed and judged adequate. The structure was designed to pass the PMF (peak inflow 8000 cfs) without over-topping (peak outflow 700 cfs), therefore, the spillway is "Adequate".

Tailwater Elevation

The tailwater elevation was estimated to be 50 ft or more below the top of the dam during passing of the PMF, therefore, will have no effect on emergency spillway discharge.

Downstream Conditions

Tunnel under Hamberg Plow Works (see Photo 12)

The entrance is about 12 ft. wide by 8 ft. high, the tunnel is 'S' shaped and the outlet is smaller than the entrance, the downstream channel is shown in Photo 13.

As a rough approximation of the capacity of the tunnel, open channel flow for the following section was computed

$$A = 12 \times 8 \text{ ft}^2$$

$$n = 0.025$$

$$s = 0.01$$

$$w.p. = 12 + 2 \times 8 = 28 \text{ ft}$$

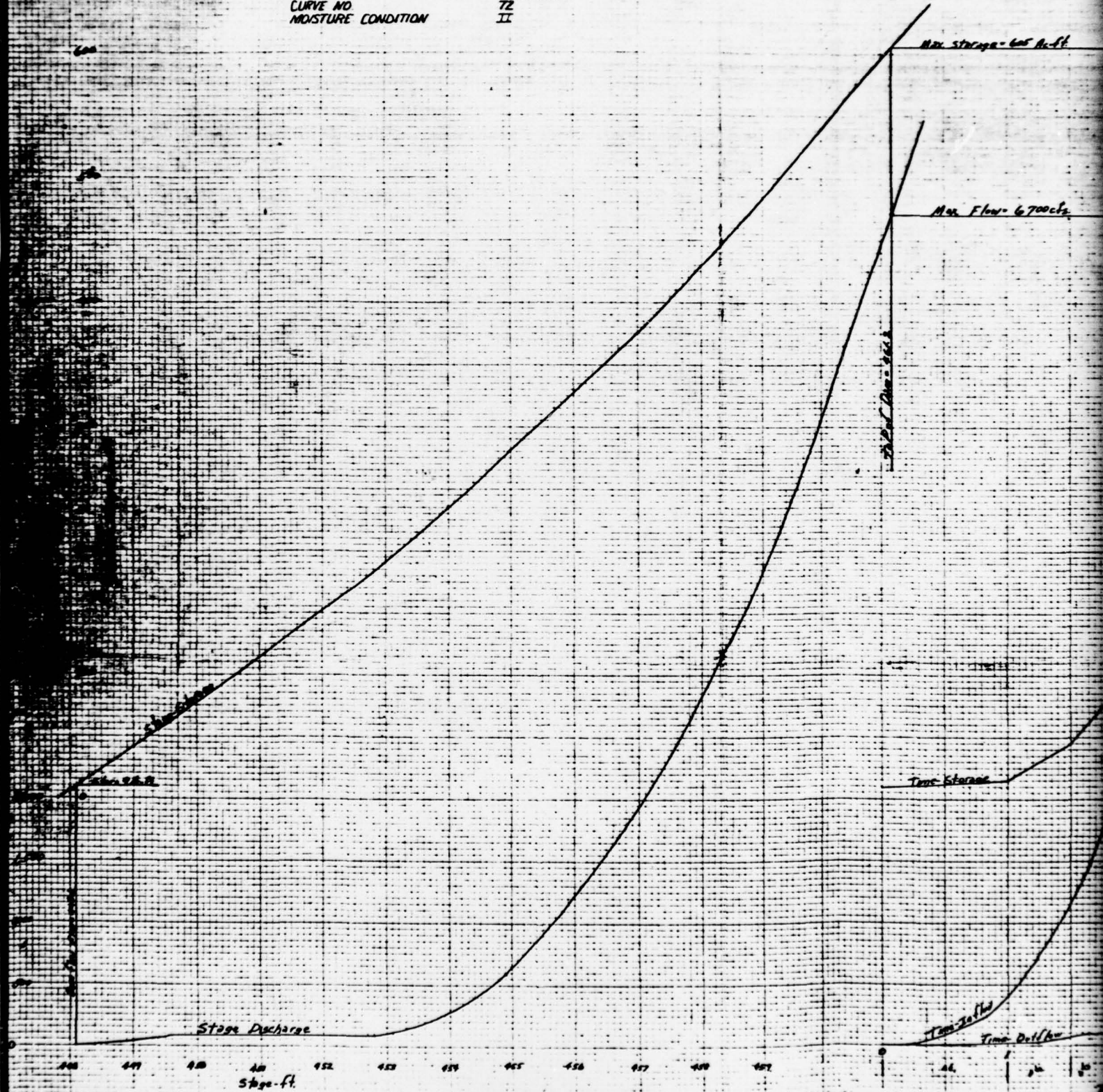
$$Q = 12 \times 8 \cdot \frac{1.486 \cdot (12 \cdot 8)^{4/3}}{0.025} \cdot 0.01^{1/2}$$

$$\approx 1300 \text{ cfs without backing up}$$

As the approach channel has considerable debris on the banks, and debris clogs at the first bend, 1300 cfs is probably high

HYDROLOGIC DATA

CLASS STRUCTURE	C
DRAINAGE AREA	1.39 SQ. MI.
RAINFALL	29.0 IN.
RUNOFF	24.8 IN.
E	1.56 HRS
CURVE NO.	72
MOISTURE CONDITION	II

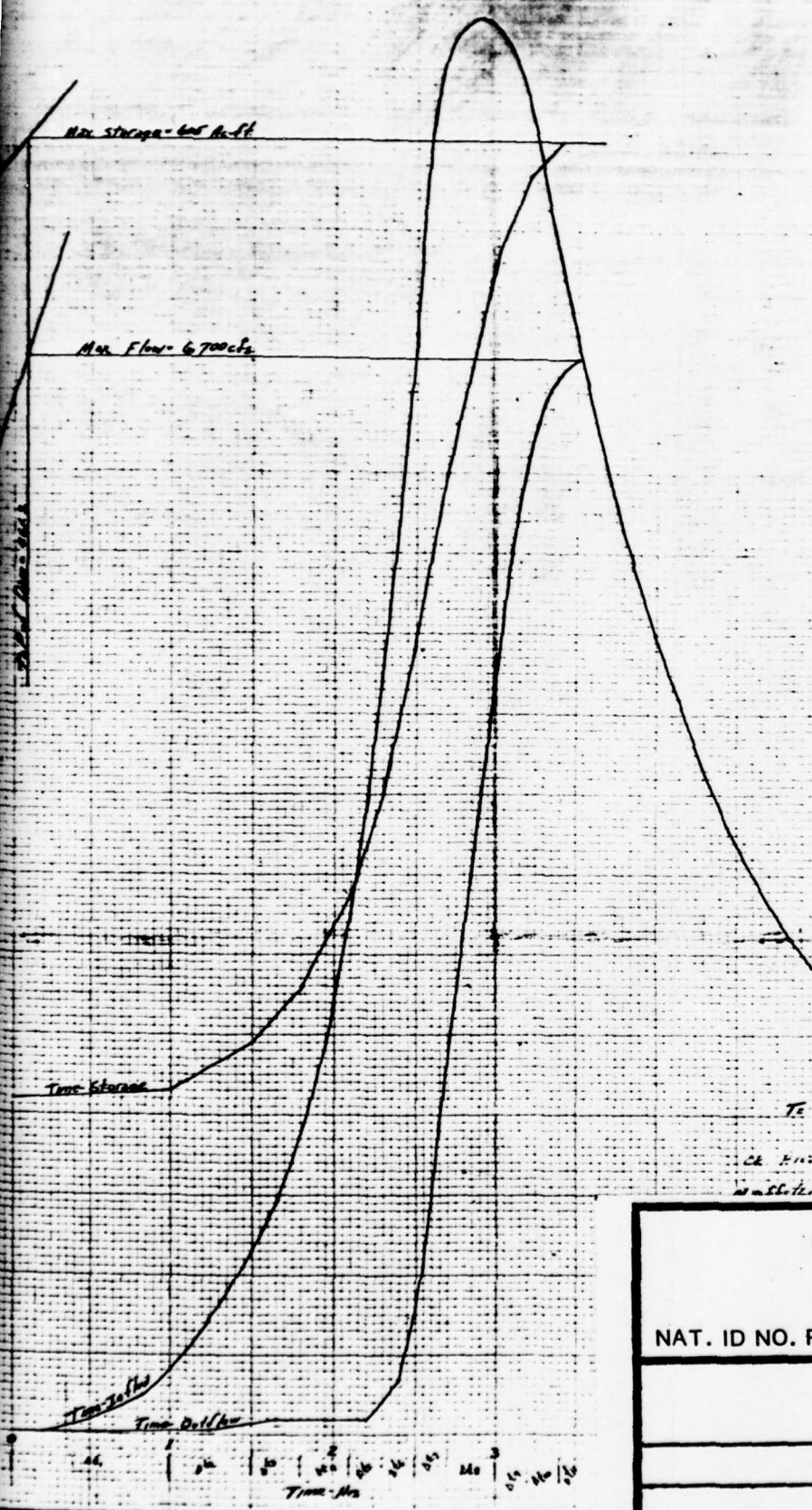


6-762-19

RECEIVED IN THE OFFICE OF THE WATER & POWER
RESOURCES BOARD, DEPARTMENT OF FOREST
WATERS ON THE 5 DAY OF *March* A.D. 19*62*

MAY 18 1962

C. H. Curren
U. S. Engineer
Chief Engineer



FREEBOARD (PMF) STORM FLOOD

KAERCHER CREEK DAM

NAT. ID NO. PA.00722

BERKS COUNTY

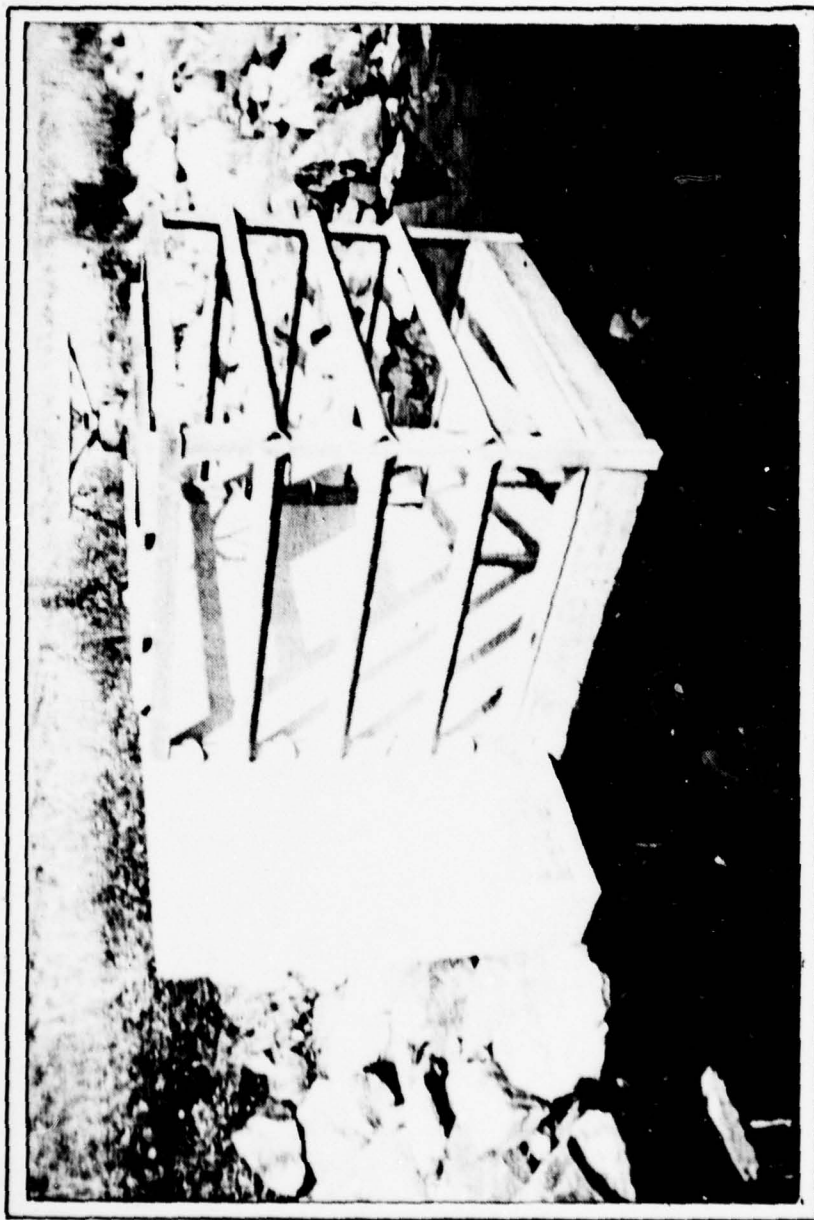
ROUTING PREPARED BY SCS

2

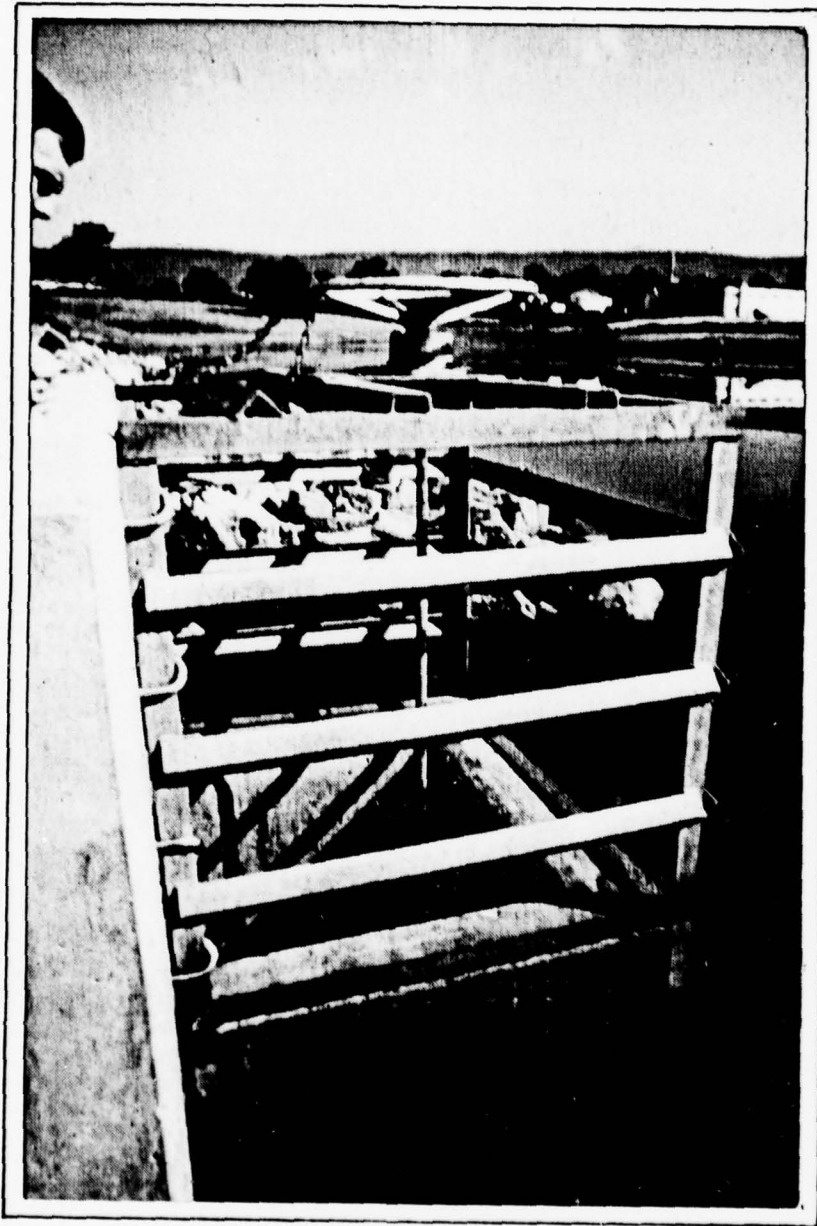
SHEET 7 OF 7

APPENDIX

D



RISER STRUCTURE ON UPSTREAM SIDE OF
DAM. NOTE 4 FT X 4 FT OVERFLOW WEIR
AND POND DRAIN VALVE.



VIEW OF INTAKE RISER, TRASH
RACKS AND POND DRAIN VALVE.



VIEW OF PRINCIPAL SPILLWAY OUTFALL
AND IMPACT BASIN

PHOTOGRAPH NO. 3



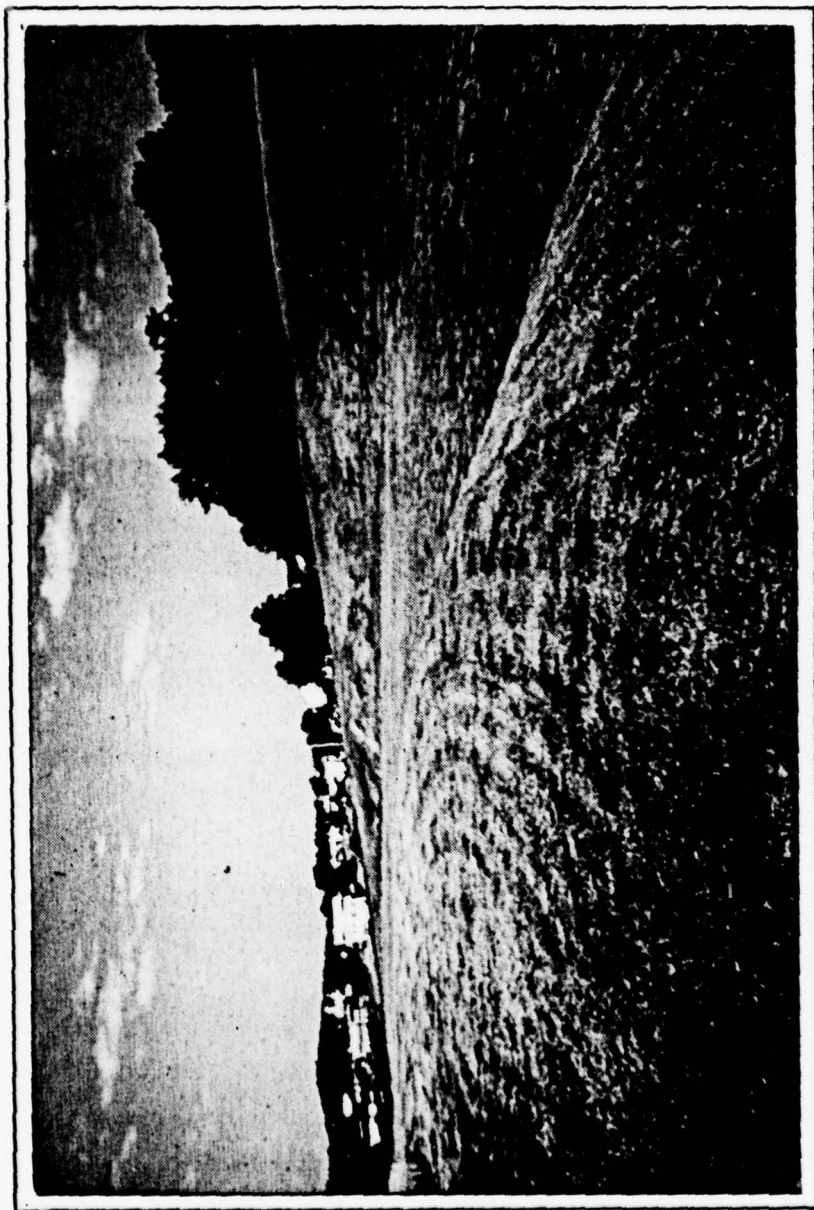
ARCH TUNNEL FROM AN ABANDONED RAIL-
ROAD EMBANKMENT APPROXIMATELY 18
FEET DOWN STREAM OF OUTFALL STRUC-
TURE. TUNNEL IS 14 FEET HIGH.



VIEW THROUGH TUNNEL DESCRIBED ON
PHOTOGRAPH NO. 4.



OVERVIEW OF EMBANKMENT FROM THE LEFT
ABUTMENT. THE GRASS LINED EMERGENCY
SPILLWAY IS IN THE BACKGROUND. CENTER
OF PHOTOGRAPH.



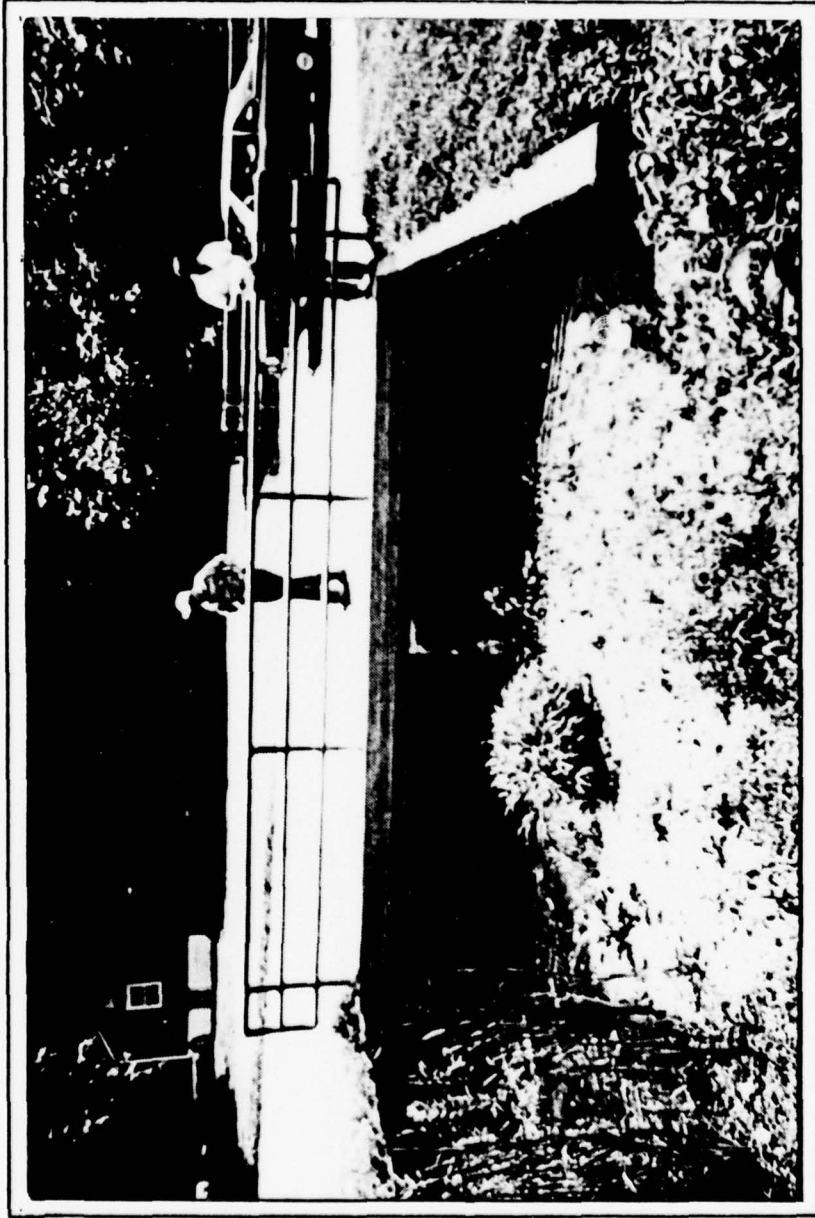
EMERGENCY SPILLWAY LOOKING DOWNSTREAM
JUST UPSTREAM OF CONTROL SECTION.



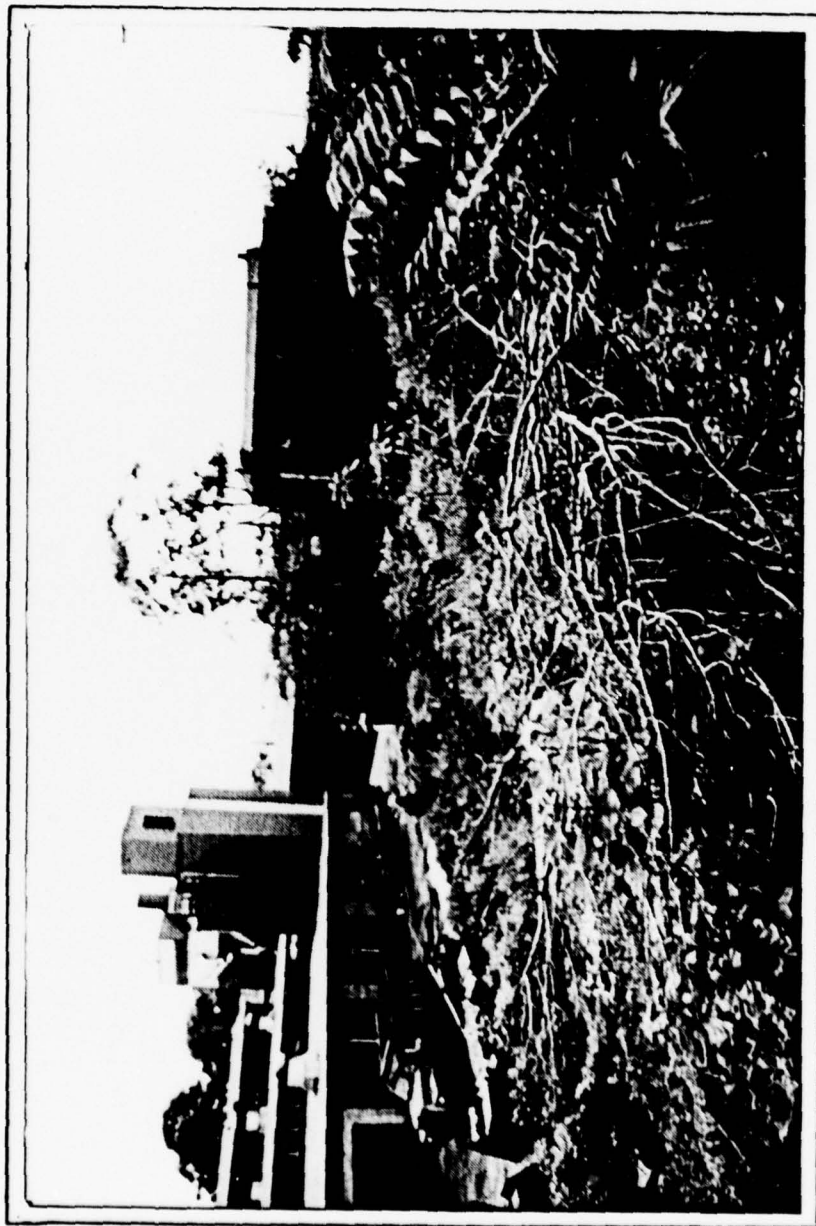
VIEW LOOKING TOWARDS DISCHARGE AREA
OF EMERGENCY SPILLWAY. THE STREAM CHAN-
NEL IS IN THE TREE LINED VALLEY.



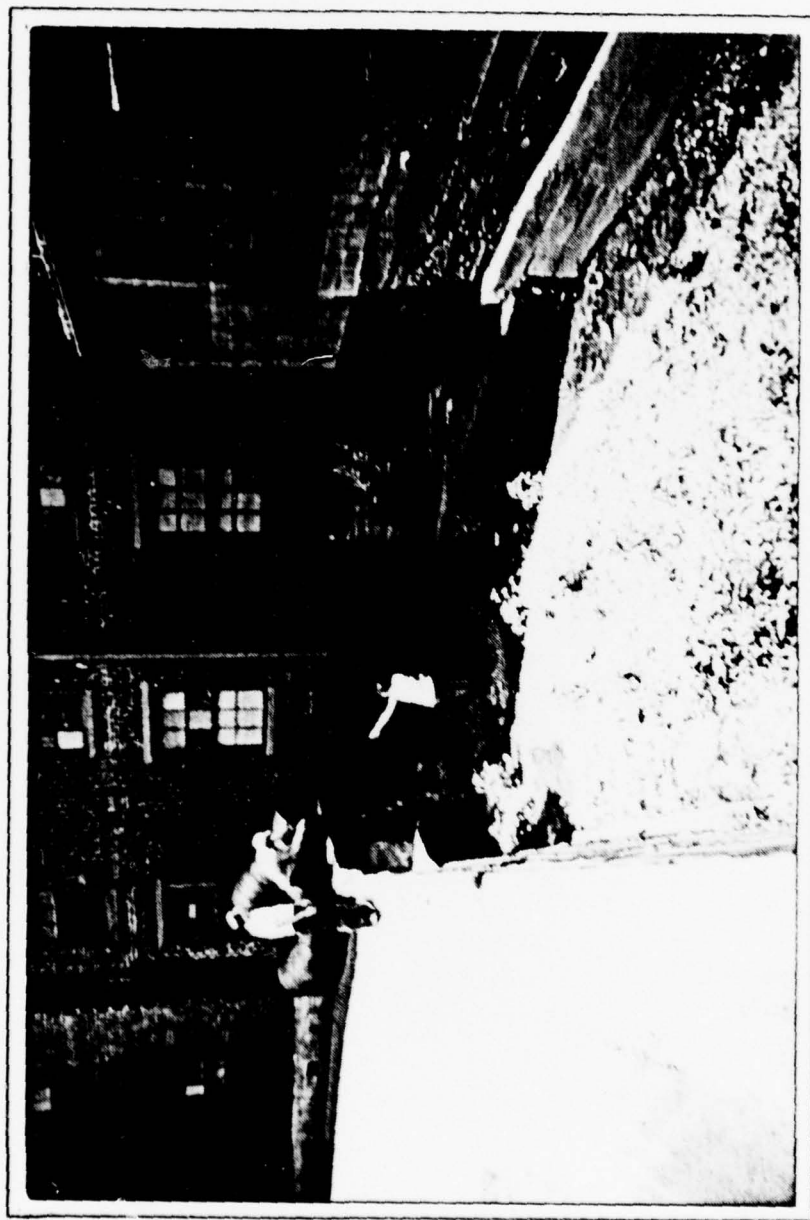
VIEW OF UPSTREAM RIPRAPPED SLOPE LOOKING
TOWARDS LEFT ABUTMENT.



FIRST BRIDGE DOWNSTREAM OF THE DAM.
HOMES ARE ON THE LEFT AND RIGHT.



VIEV OF INDUSTRIAL AREA (HAMBURG FLOW
FACTORY) WHERE STREAM FLOWS VIA A CON-
DUIT BENEATH THE FACTORY.



VIEW OF STONE CONDUIT LOOKING DOWNSTREAM
AT THE HAMBURG PLOW FACTORY.

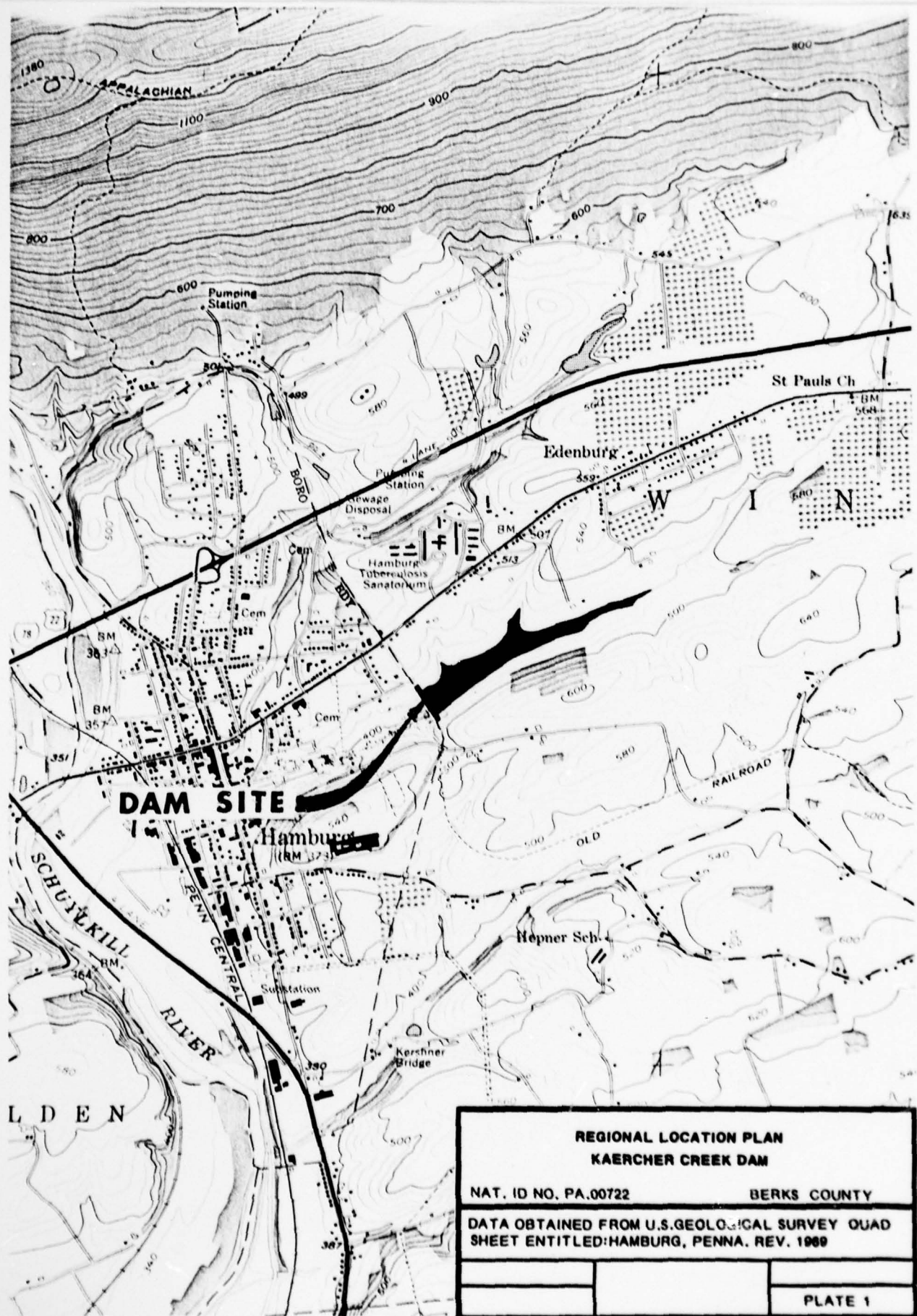


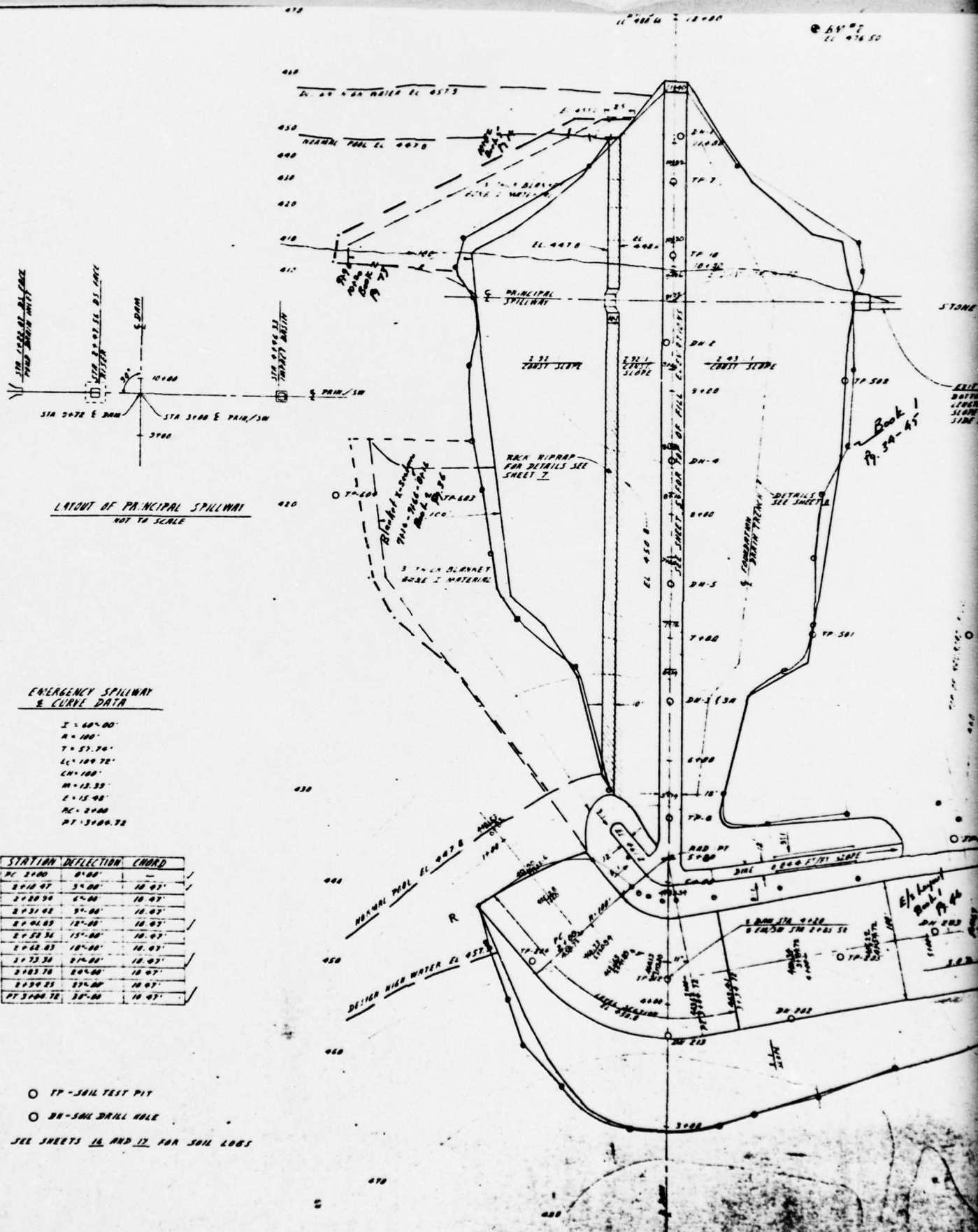
KAERCHER CREEK STREAM CHANNEL THROUGH
THE TOWN OF HAMBURG, PENNSYLVANIA.

APPENDIX

E

78 CO. 5-08





DISPERSED AREA FOR DATA
LARGER THAN 4" DIAMETER
SHALL BE DETERMINED BY THE ENGINEER.

POND DRAIN MUST
DETAILS SEE
CLASS 4000 CONCRETE

NOTE: BEAM REINFORCED
MAKING RIGID

10" ROCK RIPRAP

5' DIA. STE. 9" DIA.
5' DIA. STE. 9" DIA.

PRINCIPAL
SPILLWAY

2.92:1
CONST. SLOPE

8.99:1
CONST. SLOPE

2.43:1
CONST. SLOPE

20'-10"

FOR 10' SECTIONS OF PIPE
PRINCIPAL SPILLWAY PIPE JOINT DATA

JOINT	INVERT ELEVATION	AS BUILT ELEVATION
J-1	402.77	402.77
J-2	402.77	402.77
J-3	402.77	402.77
J-4	402.77	402.77
J-5	402.77	402.77
J-6	402.77	402.77
J-7	402.77	402.77
J-8	402.77	402.77
J-9	402.77	402.77
J-10	402.77	402.77
J-11	402.77	402.77
J-12	402.77	402.77
OUTLET	402.77	402.77

20'-10"

FOR 20' SECTIONS OF PIPE
PRINCIPAL SPILLWAY PIPE JOINT DATA

JOINT	INVERT ELEVATION	AS BUILT ELEVATION
J-1	402.77	402.77
J-2	402.77	402.77
J-3	402.77	402.77
J-4	402.77	402.77
J-5	402.77	402.77
J-6	402.77	402.77
J-7	402.77	402.77
J-8	402.77	402.77
J-9	402.77	402.77
J-10	402.77	402.77
J-11	402.77	402.77
J-12	402.77	402.77
OUTLET	402.77	402.77

NOTE: DIMENSIONS OF PIPE ARE BASED ON
MINIMUM SIZE AND DO NOT INCLUDE CREEP.

PRINCIPAL SPILLWAY ANTI-SEEP COLLAR DATA

COLLAR	INVERT ELEVATION	AS BUILT ELEVATION
I	402.77	402.77
II	402.77	402.77
III	402.77	402.77
IV	402.77	402.77
V	402.77	402.77

PLAN VIEW
NOT TO SCALE

POND DRAIN
NOT TO SCALE

10'-10"

FOR 10' SECTIONS OF PIPE
POND DRAIN PIPE JOINT DATA

JOINT	INVERT ELEVATION	AS BUILT ELEVATION
J-1	402.77	402.77
J-2	402.77	402.77
J-3	402.77	402.77
J-4	402.77	402.77
J-5	402.77	402.77
J-6	402.77	402.77
J-7	402.77	402.77
J-8	402.77	402.77
J-9	402.77	402.77
J-10	402.77	402.77
J-11	402.77	402.77
J-12	402.77	402.77
OUTLET	402.77	402.77

10'-10"

FOR 20' SECTIONS OF PIPE
POND DRAIN PIPE JOINT DATA

JOINT	INVERT ELEVATION	AS BUILT ELEVATION
J-1	402.77	402.77
J-2	402.77	402.77
J-3	402.77	402.77
J-4	402.77	402.77
J-5	402.77	402.77
J-6	402.77	402.77
J-7	402.77	402.77
J-8	402.77	402.77
J-9	402.77	402.77
J-10	402.77	402.77
J-11	402.77	402.77
J-12	402.77	402.77
OUTLET	402.77	402.77

NOTE: DIMENSIONS OF PIPE ARE BASED ON
MINIMUM SIZE AND DO NOT INCLUDE CREEP.

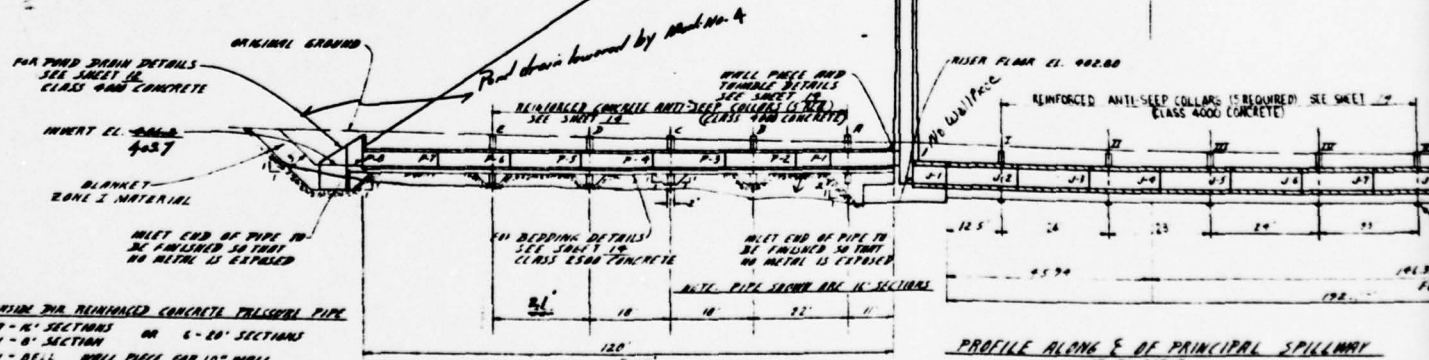
POND DRAIN ANTI-SEEP COLLAR DATA

COLLAR	INVERT ELEVATION	AS BUILT ELEVATION
A	402.77	402.77
B	402.77	402.77
C	402.77	402.77
D	402.77	402.77
E	402.77	402.77

Page 53, 54, 55
Book #2

SLIDE GATE NOTES

1. SLIDE GATE - 10" DIA. FLAT BACK 10-15 MINIMUM SELF-CONTAINED,
10' HEIGHT AT GATE DURING OPENING AND CLOSING IS TAKEN
BY GATE FRAME.
2. 1-TYPE WALL THIMBLE CIRCULAR OPENING, DRILLED AND TAPPED
TO ACCOMMODATE GATE, 6" MAXIMUM EXTENSION INTO WALL.
3. 10-15 MIN. RISING STEM-THREADED TURNING BRASS
4. FULLY ADJUSTABLE STEM GUIDES
5. STEM, STEM GUIDES, AND LIFT, SIZED AND SPACED
ACCORDING TO MANUFACTURER'S RECOMMENDATIONS.
6. BENCH STAND TYPE WHEEL SUPPORT.

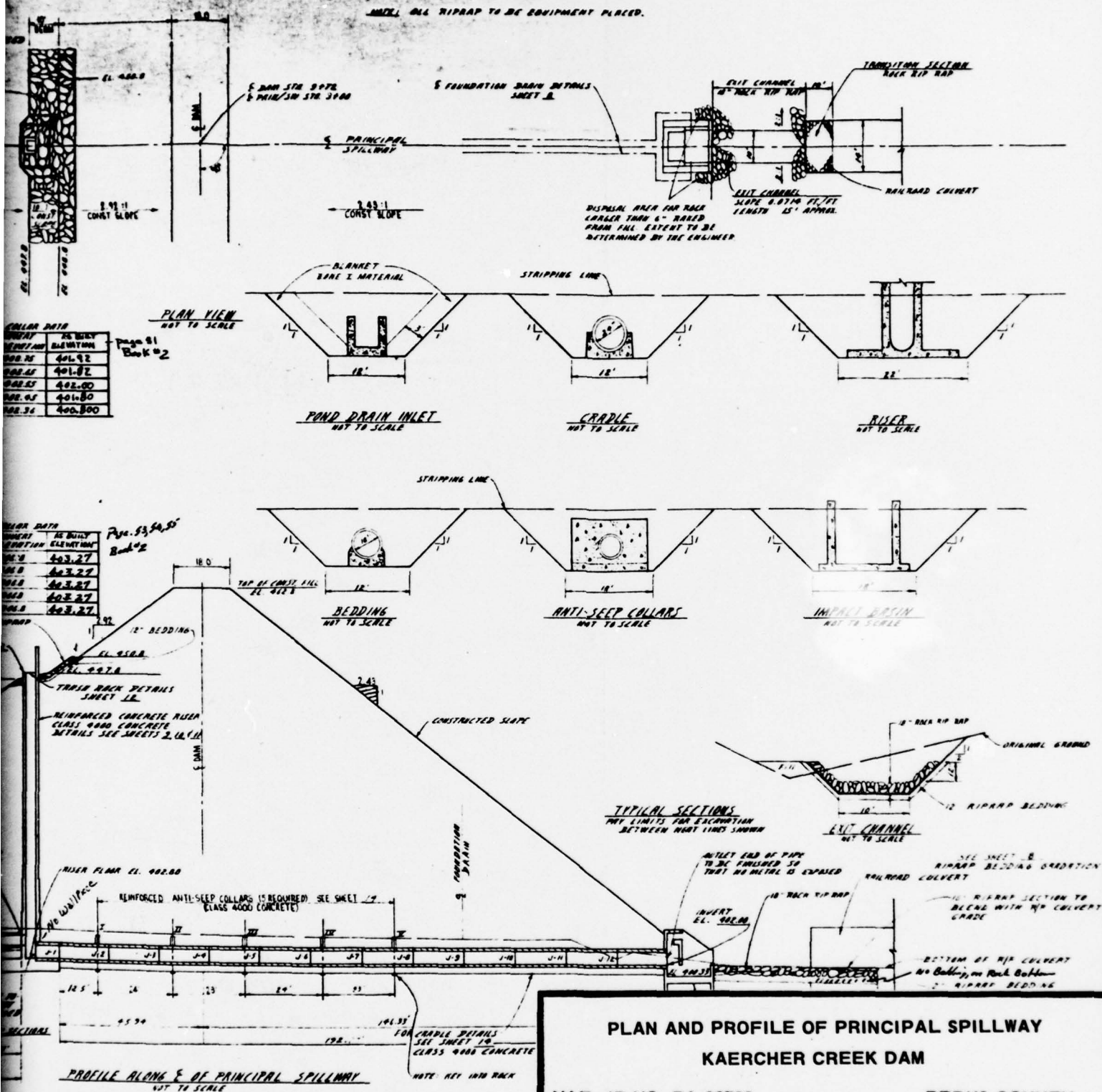


10" INSIDE DIA. REINFORCED CONCRETE PRESSURE PIPE
7'-10" SECTIONS OR 6'-10" SECTIONS
1'-0" SECTION
1'-0" WALL THIMBLE FOR 10" WALL
PRESSURE HEAD 53'
LOAD = 22,700 LBS PER LIN. FT. BASED ON O.D. OF 24"
MIN. 3 EDGE BEARING STRENGTH FOR:
0.81" CRACK NON-PRESTRESSED PIPE = 10,000 LBS PER LIN. FT.
0.001" CRACK PRESTRESSED PIPE = 2,000 LBS PER LIN. FT.
TOTAL LENGTH 121.0' 121.1'

Book 2
Page 61

20" INSIDE DIA. REINFORCED CONCRETE PRESSURE PIPE SPILLWAY CONDUIT
12'-10" SECTIONS OR 1'-0" SECTION
1'-0" SECTION
9'-10" SECTIONS
PRESSURE HEAD 40'
LOAD = 43,000 LBS PER LIN. FT. BASED ON O.D. OF 30"
MIN. 3 EDGE BEARING STRENGTH FOR:
0.81" CRACK NON-PRESTRESSED PIPE = 10,000 LBS PER LIN. FT.
0.001" CRACK PRESTRESSED PIPE = 2,000 LBS PER LIN. FT.
TOTAL LENGTH 200.3' 200.3'

Book 2
Page 66



**PLAN AND PROFILE OF PRINCIPAL SPILLWAY
KAERCHER CREEK DAM**

NAT. ID NO. PA.00722

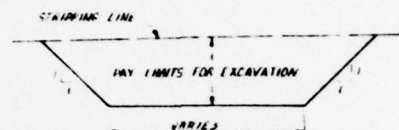
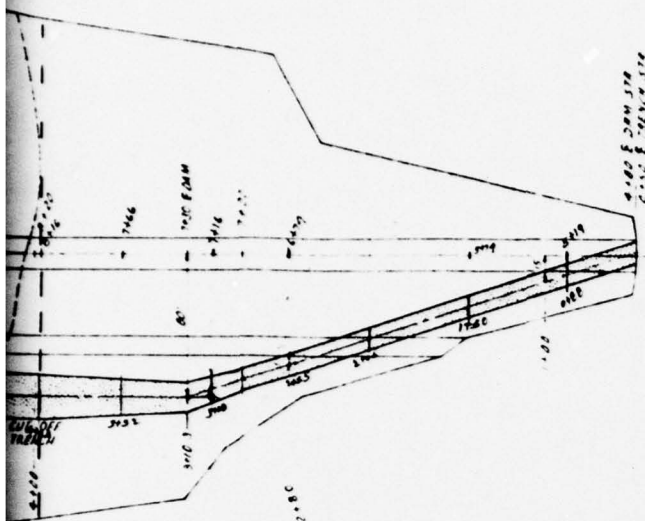
BERKS COUNTY

DATA OBTAINED FROM U.S. DEPT. OF AGRICULTURE, SOIL
CONSERVATION SERVICE, DWG. NO. PA-478-P, SHEET 7 OF 18,
DATED DEC. 1965

2

PLATE 3

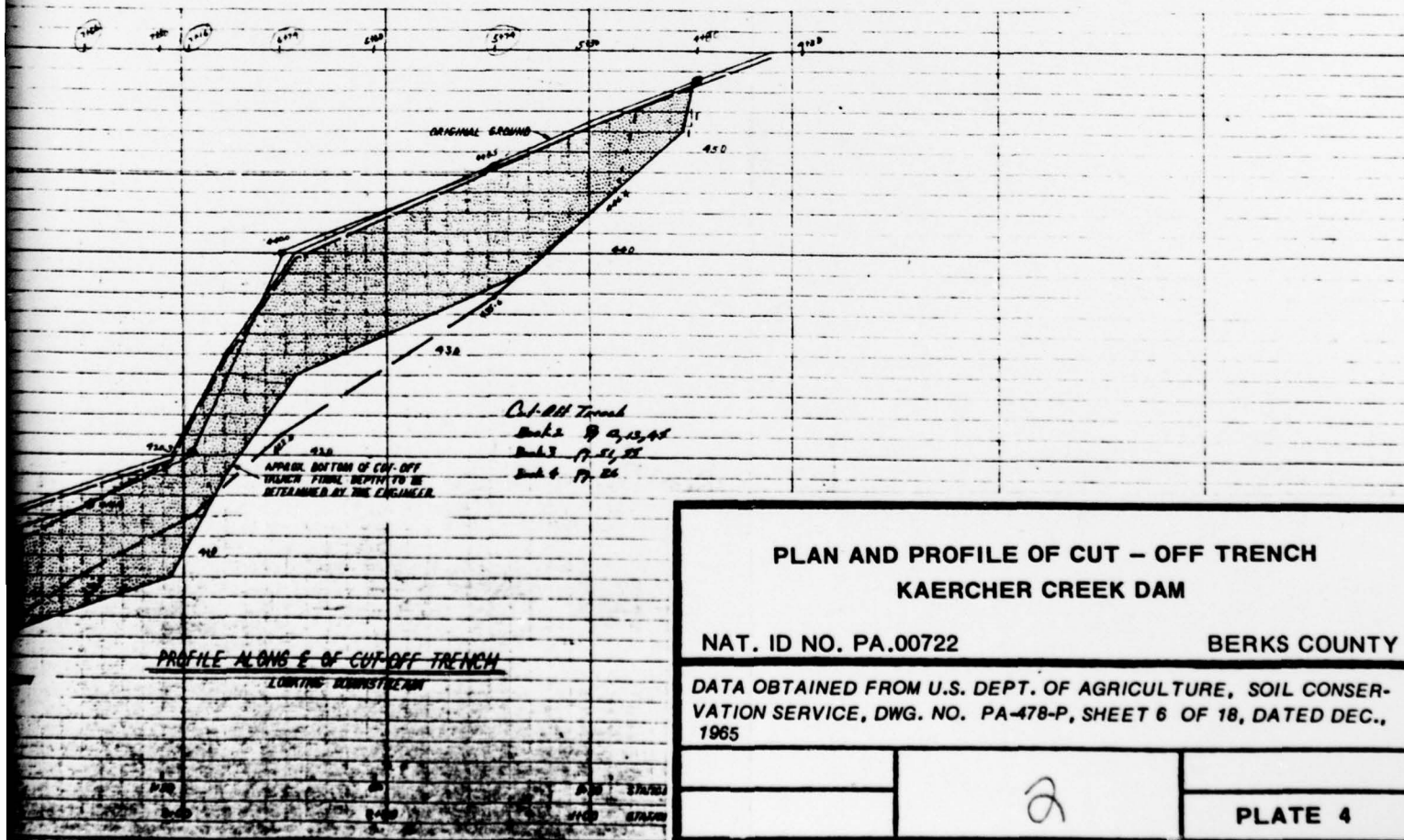
CUT-OFF TRENCH BOTTOM WIDTH		
E TRENCH STATION	S DAM STATION	WIDTH
0+50 TO 2+00	0+00 TO 1+00	12
2+00 TO 4+00	1+00 TO 3+00	TRANSITION
4+00 TO 6+00	3+00 TO 5+00	25
6+00 TO 7+00	5+00 TO 6+00	TRANSITION
7+00 TO 7+60	6+00 TO 6+55	12



TYPICAL SECTION OF CUT-OFF TRENCH
NOT TO SCALE

OF CUT OFF TRENCH
LOCATION EXCAVATION

50 100 FEET
SCALE



PLAN AND PROFILE OF CUT - OFF TRENCH KAERCHER CREEK DAM

NAT. ID NO. PA.00722

BERKS COUNTY

DATA OBTAINED FROM U.S. DEPT. OF AGRICULTURE, SOIL CONSERVATION SERVICE, DWG. NO. PA-478-P, SHEET 6 OF 18, DATED DEC., 1965

PLATE 4

3 20' SECTIONS
1 6' SECTION
1 20' ELBOW (2' x 1' x 1')
1 20' ELBOW (1' x 1' x 1')
1 20' ELBOW (1' x 2' x 3')
1 METAL END CAP
1 SMALL ANIMAL GUARD

70'-2" TOTAL

3 20' SECTION
1 6' SECTION
1 20' LADDER (2' x 10")
1 20' LADDER (1" x 8' x 3")
1 20' LADDER (1" x 8' x 3")
1 METAL END CAP
1 SMALL ANIMAL BOARD

78'-2" TOTAL

NOTE: ALL DRAIN PIPE TO BE
IRON OR STEEL, CLASS I,
SHAPE 1, COATING TYP D,
16 GAUGE

FOUNDATION DRAIN TRUCK

PLAN VIEW OF FOUNDATION DRAIN

A horizontal scale bar with vertical tick marks. The numbers 0, 20, 50, and 100 are placed above the bar. The word "FEET" is written to the right of the 100 mark. Below the bar, the word "SCALE" is written.

SECTION A-A

E DOM STAT POS	A	B
5470	12'	32'-6"
6450	10'	31'-6"
6400	33'	56'-6"
3472	40'	81'-6"
11400	12'	21'-6"

LINE	DATE	TIME	NO.	BY	REMARKS
318					
319					
320					
321					
322					
323					
324					
325					
326					
327					
328					
329					
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331					
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395					
396					
397					
398					
399					
400					

~~APPROX STRIPPING LINE~~
~~FINAL LINE TO BE~~
~~DETERMINED BY THE COMMANDER~~

ORIGINAL CAPTION:

APPROX BOTTOM OF FOUNDATION
DRAIN TRENCH
FURNISH LINE AND GRADE TO BE
PERFORMANCE OF THE ENGINEER

FRANKLIN A. SCHUBERT

INTERNAL 40277

PROFILE OF FOUNDATION DRAIN
LOOKING DOWNSTREAM

END CAP

—

SECRET-

PLAN VAN

FINE

61 902.771

12-5

TYPICAL

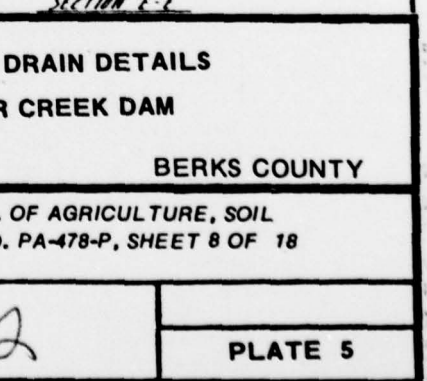
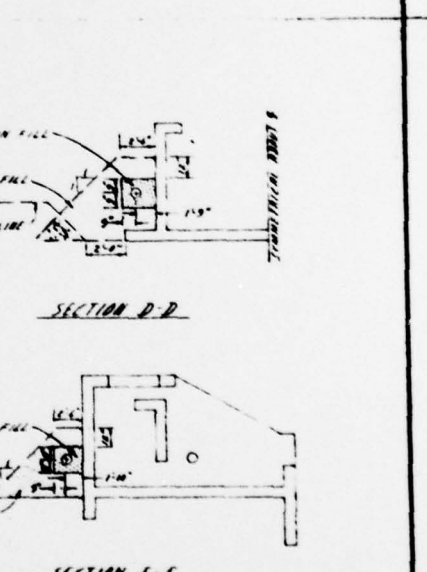
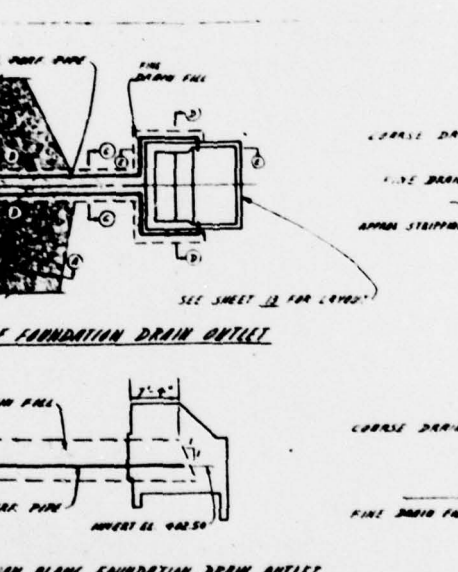
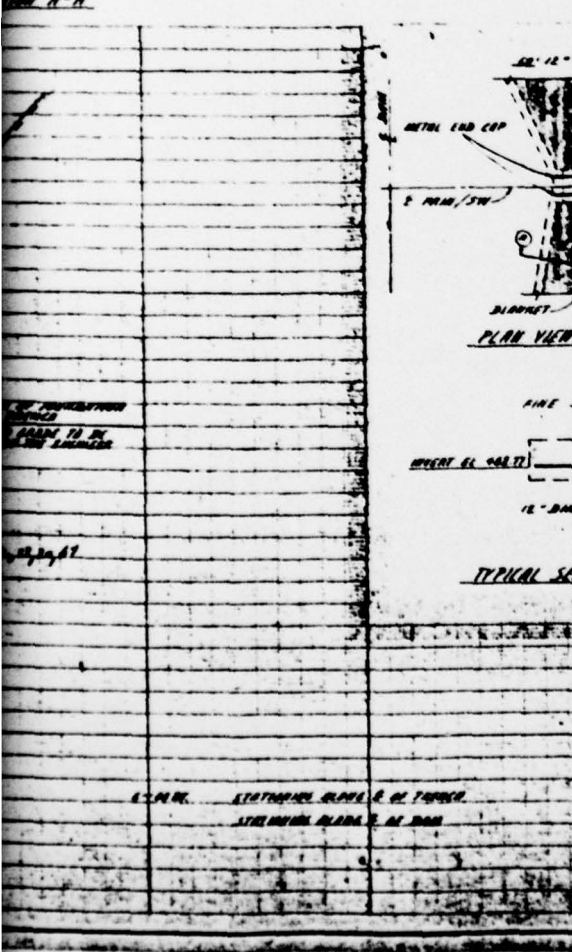
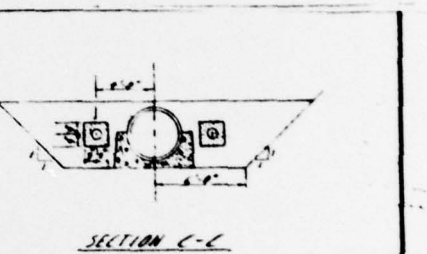
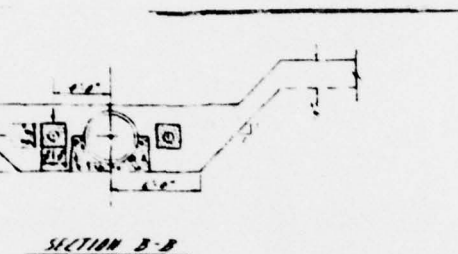
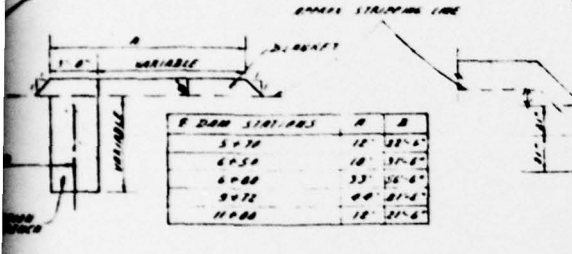
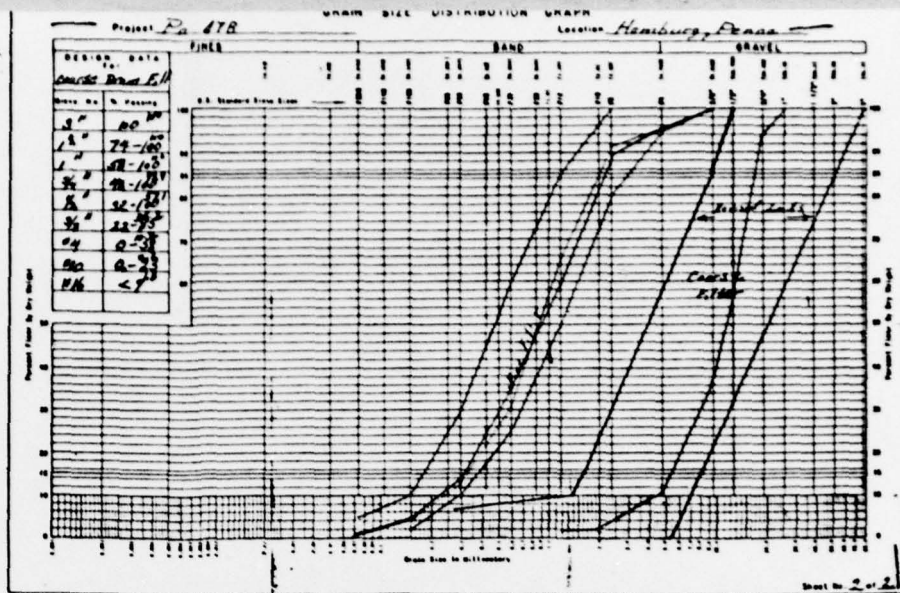
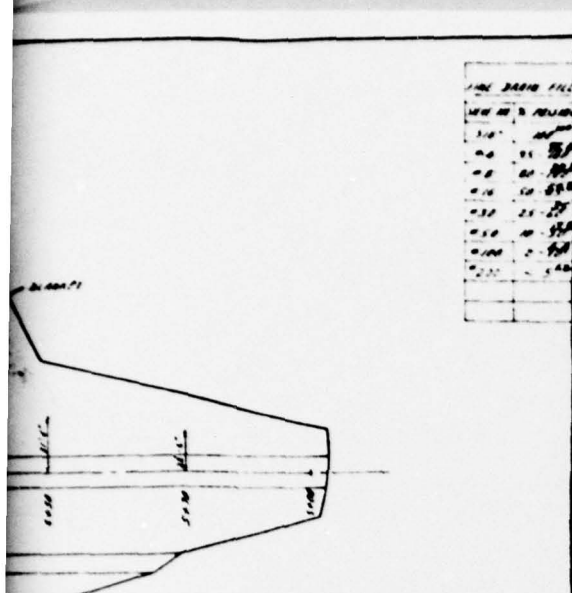
1998

100

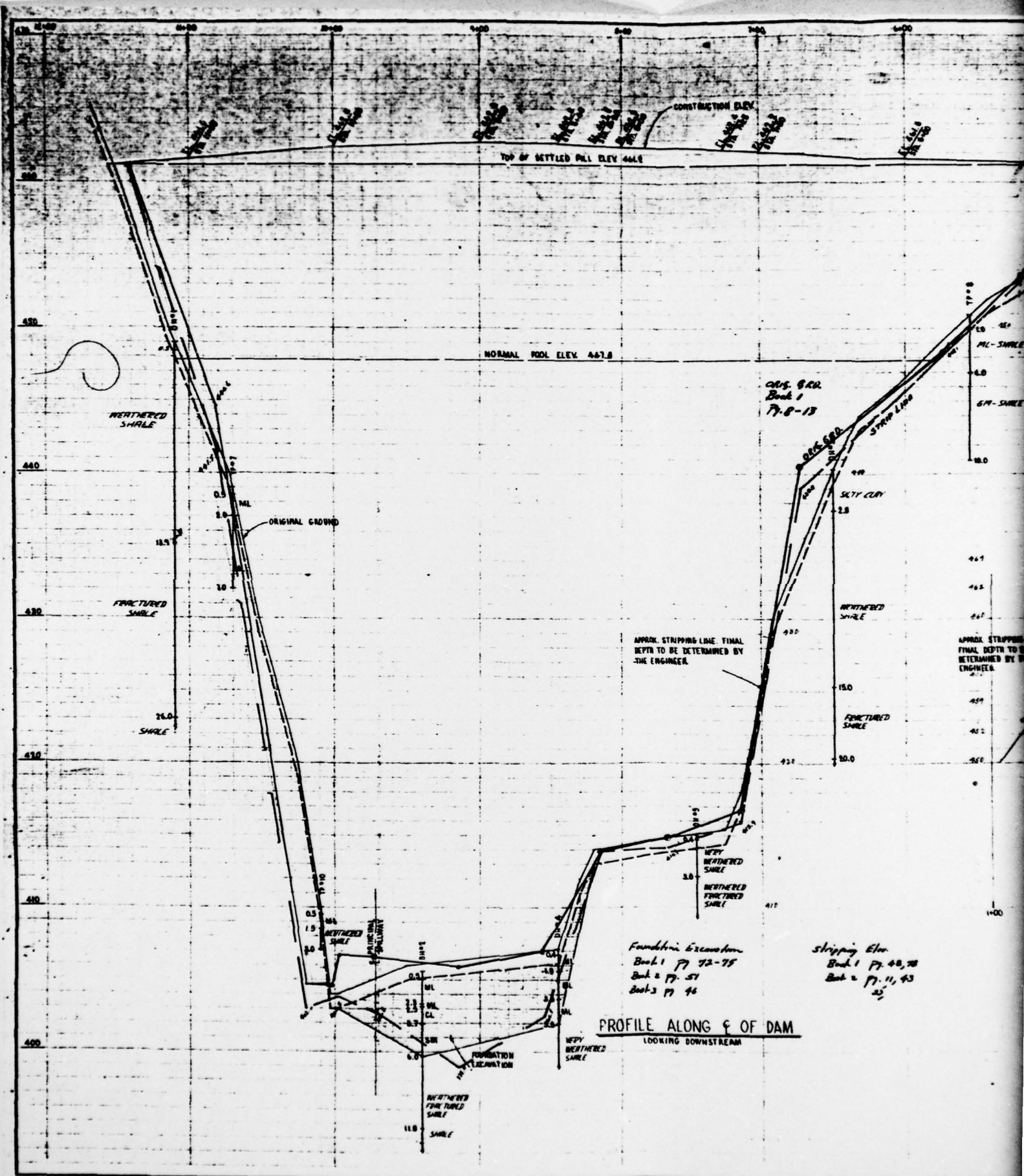
1998

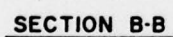
DECEMBER 1997

100



FOUNDATION DRAIN DETAILS	
KAERCHER CREEK DAM	
NAT. ID NO. PA.00722	BERKS COUNTY
DATA OBTAINED FROM U.S. DEPT. OF AGRICULTURE, SOIL CONSERVATION SERVICE, DWG. NO. PA-478-P, SHEET 8 OF 18 DATED DEC. 1965	
2	PLATE 5

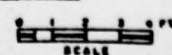


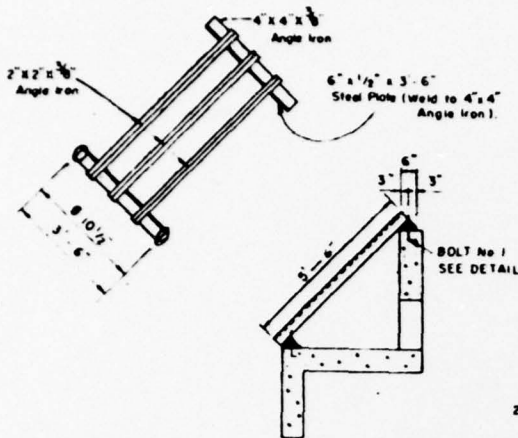


ROUND BOTTOM MAY BE
OBTAINED BY USE OF A PIPE
CUT LONGITUDINALLY *IN HALF*
OR BY REMOVABLE SEMI-CIRCULAR
FORM



PLATE 7

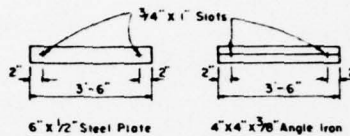




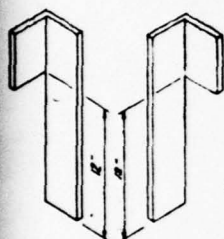
BILL OF MATERIAL				
LOCATION	ITEM	SIZE	LENGTH	QUAN
POND DRAIN INLET	STEEL PLATE	1/2" THICK	6' x 3' 6"	2
INLET	ANGLE IRON	2" x 2" x 3/8"	5'-6"	3
TRASH RACK	ANGLE IRON	4" x 4" x 3/8"	3'-6"	2
	BOLT No. 1	1/2" Dia	2" x 10 1/2"	4

NOTES

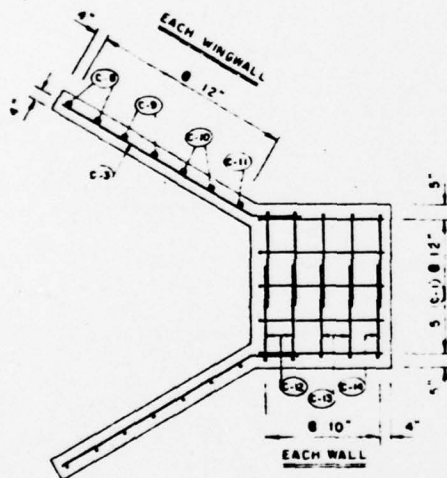
- 1 TRASH RACK TO BE GALVANIZED (AFTER ASSEMBLY)
- 2 WELD ALL POINTS OF CONTACT BETWEEN ANGLE IRON.
- 3 FOR GENERAL NOTES SEE SHEET 14



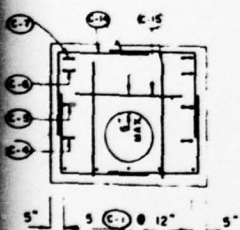
POND DRAIN INLET TRASH RACK DETAIL



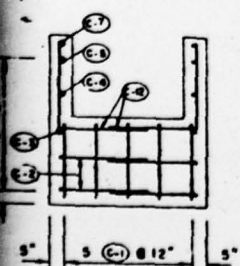
ANGLE IRON (F)



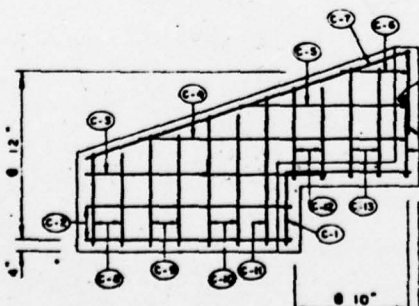
SECTION D-D



SECTION B-B



SECTION A-A

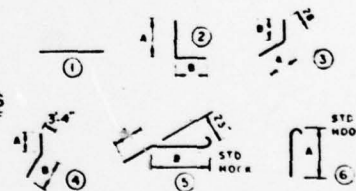


SECTION C-C

As Built

STEEL SCHEDULE									
MARK	LOCATION	QUAN	SIZE	LENGTH	TYPE	A	B	HOOK	TOTAL FT
C-1	POND	5	4	5'-9"	2	2-2	3-7		28.75
C-2	DRAIN	4	4	9'-5"	3	6-8	2-9		37.67
C-3	INLET	2	4	8'-0"	4	6-8	1-4		16.00
C-4		2	4	9'-0"	5	4-10	3-10	0-4	18.00
C-5		2	4	5'-6"	5	1-4	3-10	0-4	11.00
C-6		2	4	2'-4"	6	2-0		0-4	4.67
C-7		2	4	11'-3"	5	6-11	4-0	0-4	22.50
C-8		4	4	2'-8"	1				10.00
C-9		4	4	3'-2"	1				12.67
C-10		4	4	3'-9"	1				15.00
C-11		2	4	4'-3"	1				8.50
C-12		4	4	5'-6"	2	2-9	2-9		27.00
C-13		4	4	5'-11"	2	2-9	3-2		23.67
C-14		4	4	5'-4"	2	2-9	2-7		21.33
C-15		3	4	3'-6"	1				10.50

BAR TYPES



STEEL BURN POND DRAIN INLET

No. 4 BARS 262.25 LIN FT 175.2 LBS.

POND DRAIN INLET AND TRASH RACK DETAILS KAERCHER CREEK DAM

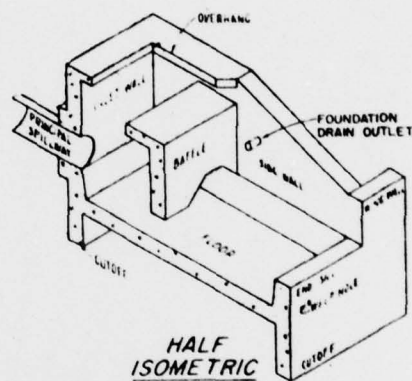
NAT. ID NO. PA.00722

BERKS COUNTY

DATA OBTAINED FROM U.S. DEPT. OF AGRICULTURE, SOIL CONSERVATION SERVICE, DWG. NO. PA-478-P, SHEET 12 OF 18, DATED DEC., 1965

2

PLATE 8



PLAN VIEW

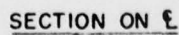
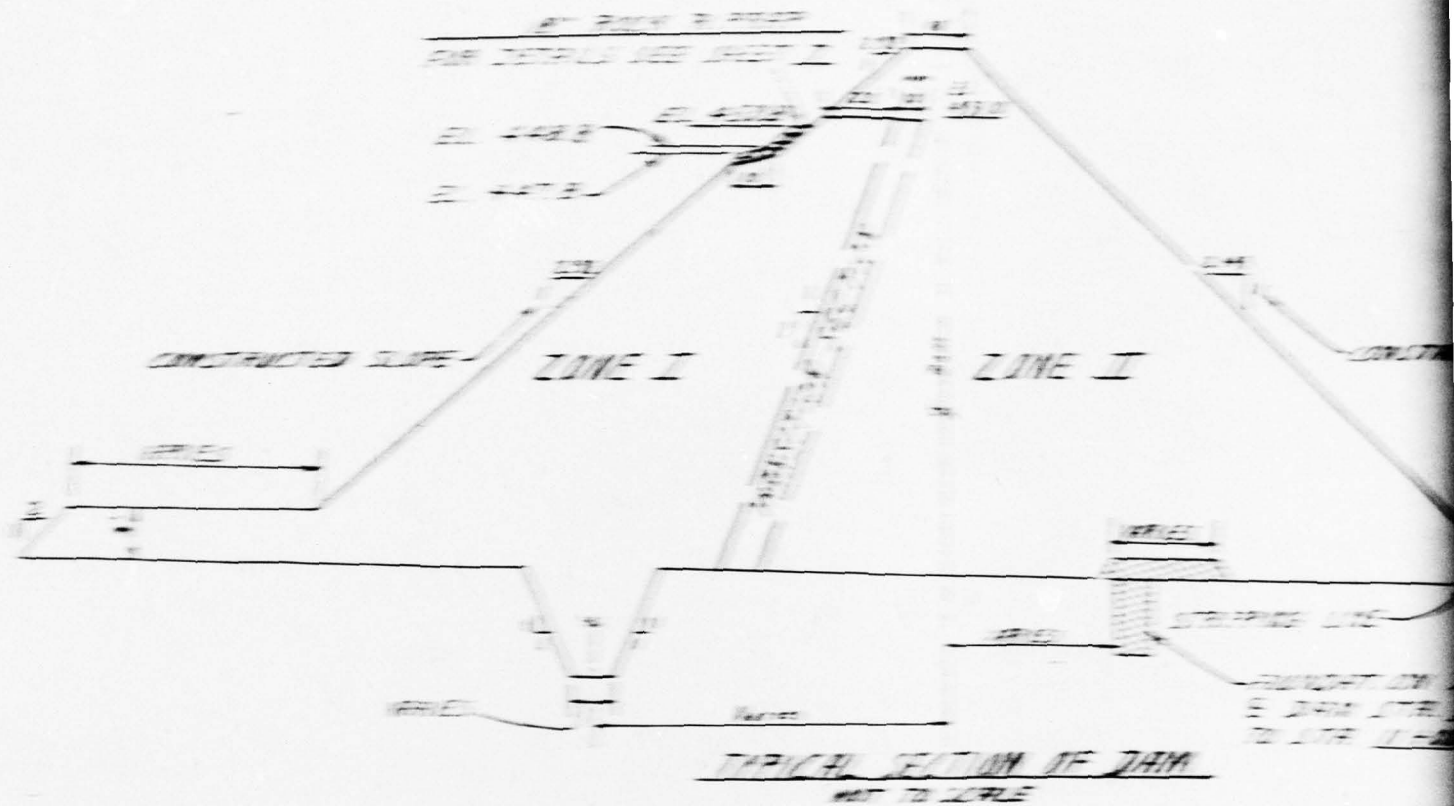


PLATE 9



EARTH FILL

ZONE I MATERIAL AS REPRESENTED BY TP-200, DEPTH 2'-3.5', CLASSIFIED AS WL AND TP-105 DEPTH 1'-4', CLASSIFIED AS GC.

SHALL BE REPRESENTED BY TP-200 FROM 10" TO 4.5", SHALL BE SELECTIVELY PLACED IN A 10" WIDE TRANSITION SECTION AT THE INTERFACE OF ZONE I AND ZONE II AS DIRECTED BY THE ENGINEER.

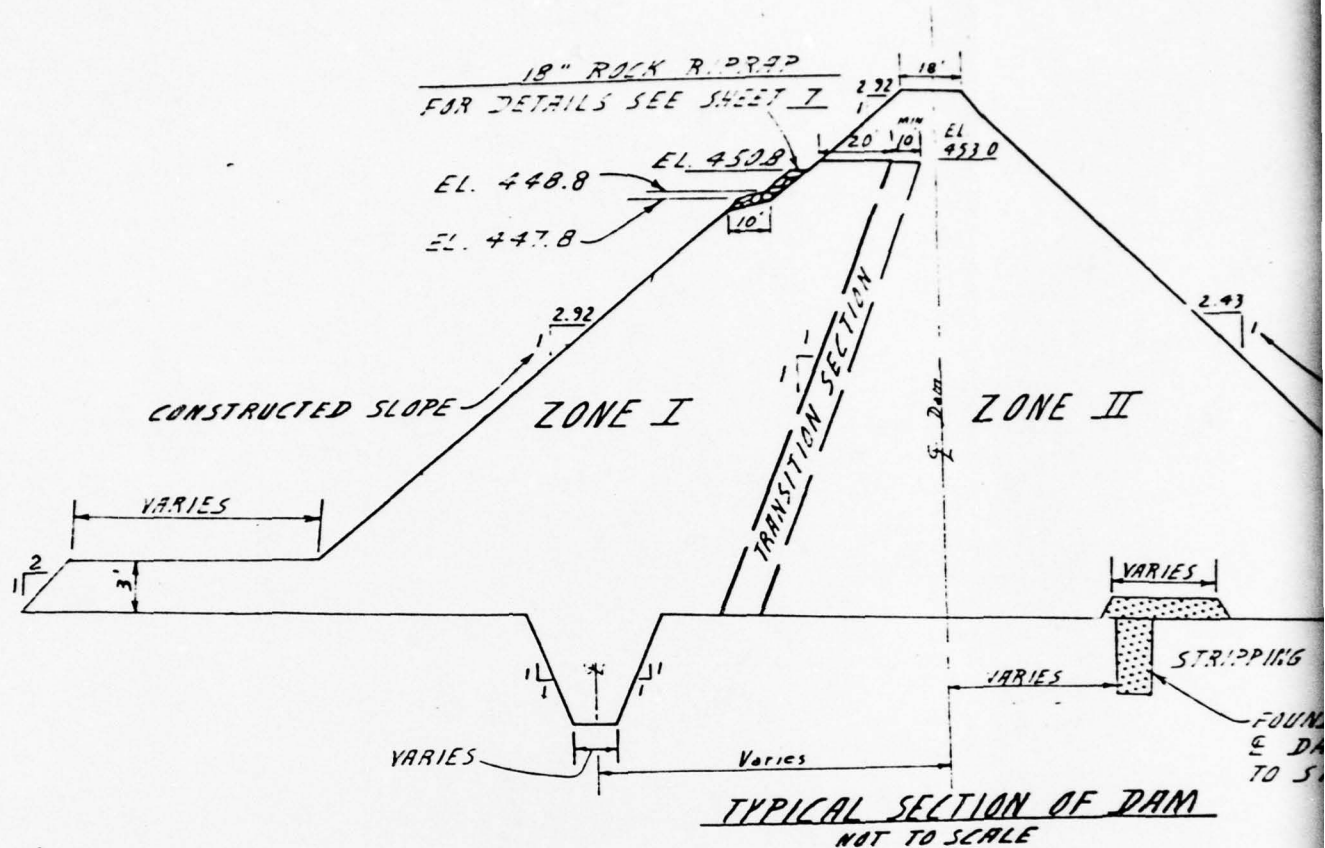
COMPACTION SHALL BE CLASS "B", THE FILL MATRIX SHALL BE COMPACTED TO AT LEAST 95% OF THE MAXIMUM DENSITY OBTAINED IN COMPACTION TESTS OF THE FILL MATERIALS, PERFORMED BY METHOD B, ASTM D-1556.

WATER CONTENT OF FILL MATRIX AT TIME OF COMPACTION SHALL BE 23.5% IF OPTIMUM.

ZONE II MATERIAL AS REPRESENTED BY TP-200, DEPTH 10'-15', CLASSIFIED AS WL, TP-210, DEPTH 5'-10', CLASSIFIED AS GC, AND TP-105, DEPTH 1'-4', CLASSIFIED AS GC.

COMPACTION SHALL

MAXIMUM LAYER THICKNESS
MAXIMUM SIZE OF FILL



EARTH FILL

ZONE I MATERIAL AS REPRESENTED BY TP-301, DEPTH 2'-3.5', CLASSIFIED AS ML, AND TP-105 DEPTH 1'-4', CLASSIFIED AS GC.

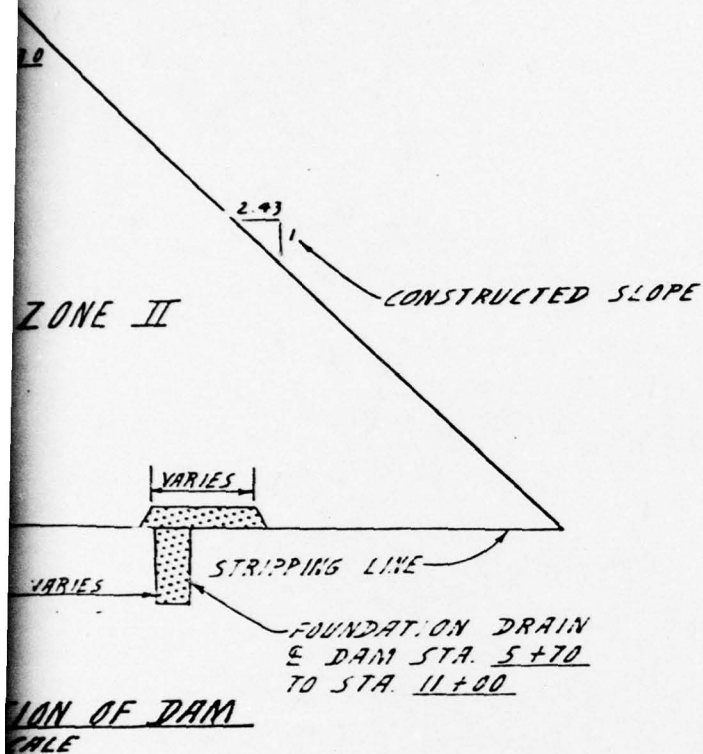
SHALE AS REPRESENTED BY TP-102 FROM 10' TO 11.5', SHALL BE SELECTIVELY PLACED IN A 10' WIDE TRANSITION SECTION AT THE INTERFACE OF ZONE I, AND ZONE II AS DIRECTED BY THE ENGINEER.

COMPACTION SHALL BE CLASS "A", THE FILL MATRIX SHALL BE COMPACTED TO AT LEAST 95% OF THE MAXIMUM DENSITY OBTAINED IN COMPACTION TESTS OF THE FILL MATERIALS, PERFORMED BY METHOD A, ASTM D-630.

WATER CONTENT OF FILL MATRIX AT TIME OF COMPACTION SHALL BE $\pm 3.5\%$ OF OPTIMUM.

ZONE II MATERIAL
 DEPTH 1.2'
 TP-212, 2'
 6W-6C,
 CLASSIFIED
 COMPACT

MAXIMUM LAYER
 MAXIMUM SIZE



ZONE II MATERIAL AS REPRESENTED BY TP-104, DEPTH 1.5'-6', CLASSIFIED AS 6W-GM, TP-212, DEPTH 5'-11', CLASSIFIED AS 6W-GC, AND TP-602, DEPTH 10'-11.5', CLASSIFIED AS 6C-GM.

COMPACTION SHALL BE CLASS T.

MAXIMUM LAYER THICKNESS IS 9" (BEFORE COMPACTION)
MAXIMUM SIZE OF ROCK FRAGMENTS IS 6"

TYPICAL EMBANKMENT SECTION
KAERCHER CREEK DAM

NAT. ID NO. PA.00722

BERKS COUNTY

DATA OBTAINED FROM U.S. DEPT. OF AGRICULTURE, SOIL
CONSERVATION SERVICE, DRAWING NO. PA-478-P, SHEET 2 OF 18,
DATED SEPT., 1965

2

PLATE 10

APPENDIX

F

SITE GEOLOGY KAERCHER CREEK DAM

The Kaercher Creek Dam is located in the Great Valley Section of the Valley and Ridge Physiographic Province. The bedrock at the site consists of the shales and sandstones of the Martinsburg Formation of Upper Ordovician age (see Plate F-1). At the site area, the Martinsburg Formation is bounded to the north-northwest by the sandstones and conglomerates of the Clinton and Tuscarora Formations. Bedding in the Martinsburg Formation is strongly deformed, forming a series of tight, asymmetrical folds trending approximately N70°E through the site area. Two prominent sets of joints have been observed in the Martinsburg Formation. The dominant set strikes N70°E and dips 60° to 70° SE, and is generally parallel to bedding. The weaker set strikes N10°W and dips nearly vertical, generally normal to bedding. Joint spacing tends to be variable, ranging from a few inches to several feet. No significant faulting has been observed in the area.

Downstream seepage should not be a major problem unless the major N70°E joint set is well developed, and is a zone of groundwater transport.

