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NATIONAL DAM INSPECTION PROGRAM. KAUFFMAN DAM (NDS PA-00691/DER--ETC(U)
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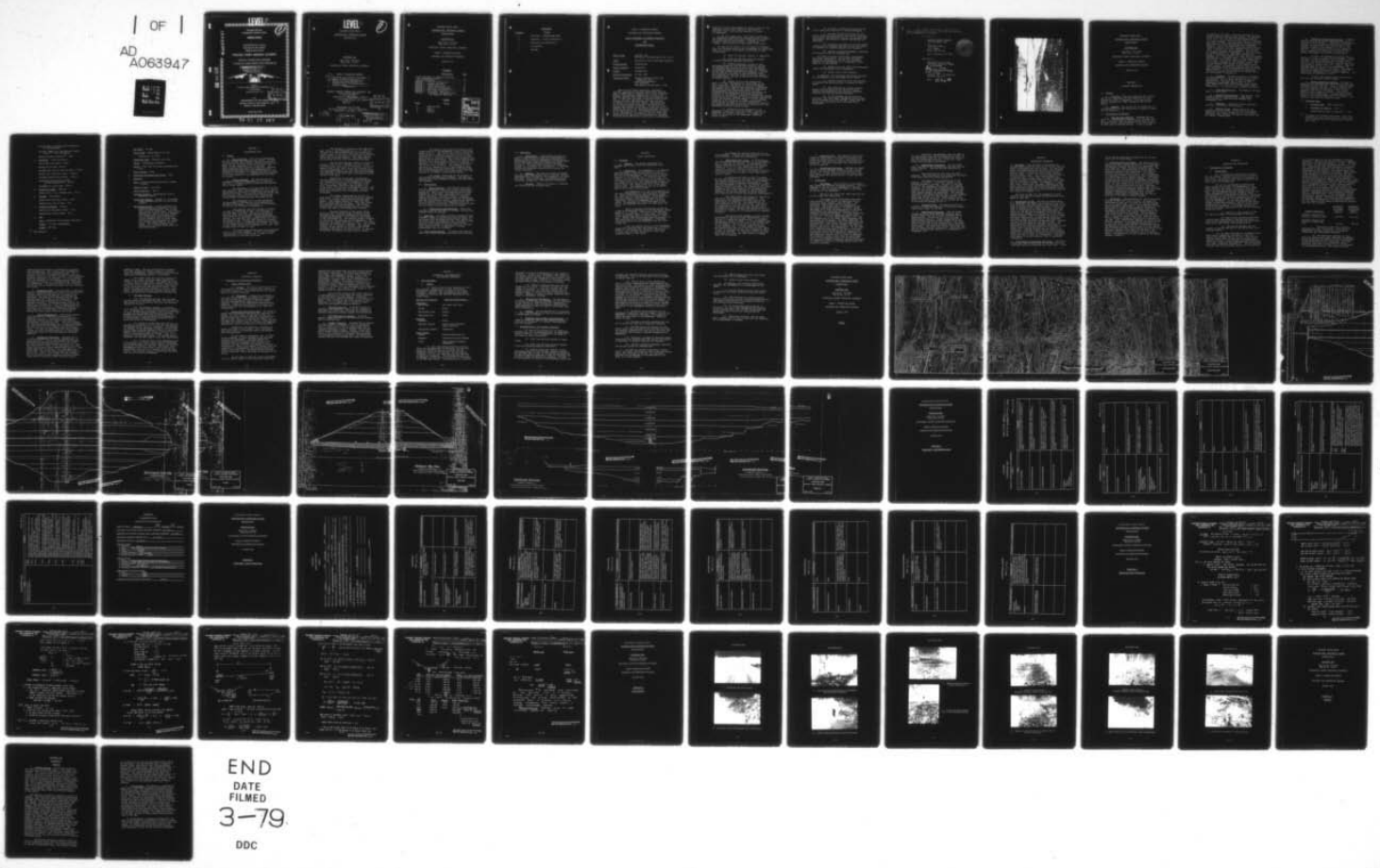

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DELAWARE RIVER BASIN
KAUFFMAN RUN, SCHUYLKILL COUNTY

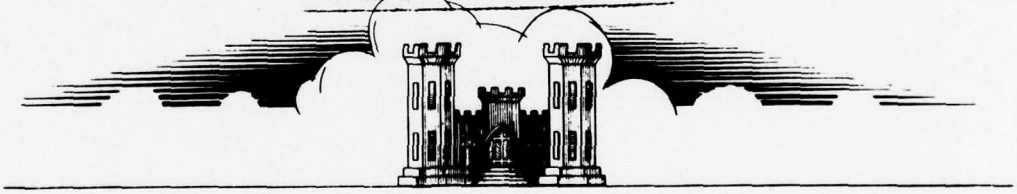
PENNSYLVANIA

KAUFFMAN DAM

NDS ID NO. PA-00691
DER ID NO. 54-54

SCHUYLKILL COUNTY MUNICIPAL AUTHORITY

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM



Prepared by
GANNETT FLEMING CORDDRY AND CARPENTER, INC.
Consulting Engineers
Harrisburg, Pennsylvania 17105

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

AUGUST 1978

LEVEL II

DELAWARE RIVER BASIN

KAUFFMAN RUN, SCHUYLKILL COUNTY

PENNSYLVANIA

KAUFFMAN DAM

NDS ID No. PA-00691
DER ID No. 54-54

SCHUYLKILL COUNTY MUNICIPAL AUTHORITY

PHASE I INSPECTION REPORT

NATIONAL DAM INSPECTION PROGRAM.
Kauffman Dam (NDS PA-00691/DER 54-54),
Delaware River Basin, Kauffman Run,
Schuylkill County, Pennsylvania. Phase I
Inspection Report.

Prepared by

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Contract No. DACW31-78-C-0046

For

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

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AUGUST 1978

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DELAWARE RIVER BASIN

KAUFFMAN RUN, SCHUYLKILL COUNTY

PENNSYLVANIA

KAUFFMAN DAM

NDS ID No. PA-00691
DER ID No. 54-54

SCHUYLKILL COUNTY MUNICIPAL AUTHORITY

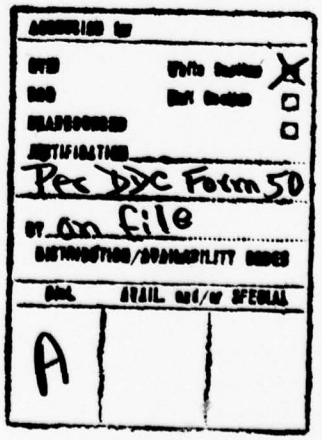
PHASE I INSPECTION REPORT

NATIONAL DAM INSPECTION PROGRAM

AUGUST 1978

CONTENTS

PLATES



APPENDICES

PHASE I INSPECTION REPORT

NATIONAL DAM INSPECTION PROGRAM

BRIEF ASSESSMENT OF GENERAL CONDITION

AND

RECOMMENDED ACTION

Name of Dam:	Kauffman Dam NDS ID No. PA-00691/DER ID No. 54-54
Owner:	Schuylkill County Municipal Authority
State Located:	Pennsylvania
County Located:	Schuylkill
Stream:	Kauffman Run
Date of Inspection:	18 July 1978
Inspection Team:	Gannett Fleming Corddry and Carpenter, Inc. Consulting Engineers P.O. Box 1963 Harrisburg, Pennsylvania 17105

Based on the visual inspection, available records, calculations and past operational performance, Kauffman Dam is judged to be in good condition. However, the existing spillway will not pass the Probable Maximum Flood (PMF) without overtopping the dam. It will pass one-half of the PMF without overtopping the dam. The existing spillway can pass 64 percent of the PMF peak inflow. The conditions at the spillway make an accurate determination of the spillway capacity difficult. If the top of embankment were raised to the design elevation that is shown on the plans, the spillway could pass 72 percent of the PMF peak inflow. If Kauffman Dam should fail due to overtopping, the hazard to loss of life downstream from the dam would be significantly increased from that which would exist just prior to overtopping.

Based on criteria established for these studies by the Department of the Army, Office of the Chief of Engineers (OCE), the spillway capacity is rated as inadequate.

It was also judged that, for present conditions, the embankment should have an adequate margin of safety for normal operating procedures. However, a sudden drawdown condition could result in embankment sliding. The spillway weir was judged to be stable.

In view of the concern for the safety of Kauffman Dam, the following measures are recommended in approximate order of priority, to be taken by the Owner as soon as practical:

(1) Clear the spillway channel of vegetation.

(2) Grade the spillway approach channel to provide adequate approach conditions.

(3) Perform additional studies to more accurately ascertain the spillway capacity required for Kauffman Dam, as well as the nature and extent of mitigation measures required to make the spillway and spillway channel hydraulically adequate. Filling in the existing low areas of the embankment would help increase the spillway capacity and this should be accomplished. The top of dam should also be graded to design template.

(4) Install four or more observation wells, or other instrumentation, downstream of the axis of the dam. The wells, or other instrumentation, should be at appropriate locations to determine the general water level in the downstream embankment. Data collected from observation wells or other instrumentation should be utilized in evaluating the stability of the embankment and assessing piping potential in the future. Continue to observe the seepage at the outlet works headwall and periodically measure and record the quantity of such seepage. If the seepage increases or if turbidity is noted, appropriate action should be taken to control seepage and turbidity with properly designed drains and an evaluation of the embankment stability should be made.

(5) Establish survey monuments on the embankment, especially near the bulges. Monitor the embankment at frequent intervals. If changes are noted, an evaluation of the embankment stability should be made.

(6) Provide a suitable operating bar for the 24-inch valve and have it readily available.

(7) Provide closure facilities for the outlet works pipe upstream of the concrete core wall for periodic inspection and for use in the event the pipe should leak severely, thereby endangering the embankment.

(8) Institute a program of detailed annual inspections for Kauffman Dam and utilize the results to ascertain if remedial measures are required.

(9) Develop a detailed emergency operation and warning system for Kauffman Dam.

In order to correct operational, maintenance, and repair deficiencies, and to more accurately assess the condition of the dam, the following measures are recommended to be undertaken by the Owner in a timely manner:

(1) Remove brush and trees from downstream slopes and downstream toe of embankment.

(2) Repair outlet works headwall.

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

(1) Provide round-the-clock surveillance of Kauffman Dam during periods of unusually heavy rains.

(2) When warnings of a storm of major proportions are given by the National Weather Service, the Owner should activate his emergency operation and warning system procedures.

(3) If the Kauffman Dam watershed is developed, see that proper safeguards are provided so as to ensure that, for the PMF, runoff does not exceed that which would have occurred before development.

(4) Should the reservoir ever be drawn down, release water at such a rate that the stability of the embankment is ensured.

Submitted by:

GANNETT FLEMING CORDDRY AND CARPENTER, INC.

A. C. HOOKE
Head, Dam Section

Date: September 20, 1978

Approved by:

DEPARTMENT OF THE ARMY
BALTIMORE DISTRICT, CORPS OF ENGINEERS

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

Date: 23 Sep 78

KAUFFMAN DAM

Upstream Slope of Embankment from Spillway Approach Channel.

DELAWARE RIVER BASIN

KAUFFMAN RUN, SCHUYLKILL COUNTY

PENNSYLVANIA

KAUFFMAN DAM

NDS ID No. PA-00691
DER ID No. 54-54

SCHUYLKILL COUNTY MUNICIPAL AUTHORITY

PHASE I INSPECTION REPORT

NATIONAL DAM INSPECTION PROGRAM

AUGUST 1978

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. Kauffman Dam consists of a homogeneous embankment with concrete core wall, a concrete gravity broad-crested spillway and an outlet works. The embankment is 573 feet long and 68 feet high at maximum section. It has a design

top width of 20.0 feet. Both the upstream and downstream slopes are covered with riprap. The upstream slope is 1V on 2.07H, and the downstream slope is 1V on 1.5H. The concrete spillway weir is located at the right abutment. It has a crest length of 34 feet. The crest is 5 feet below design top of dam and it is about level with the upstream and the downstream channels. The outlet works facilities consist of an intake structure, a 24-inch diameter cast-iron pipe (CIP) a valve house, and a headwall. The 24-inch CIP extends through the embankment to the valve house at the downstream toe. The pipe is encased in masonry. A 12-inch diameter CIP taps into the 24-inch diameter CIP at the valve house. The 24-inch diameter CIP extends to a headwall about 60 feet beyond the valve house. The outlet works headwall is located so as to permit drainage to the original stream. The 12-inch diameter CIP extends to the Owner's water supply system. The spillway channel joins the original stream about 300 feet downstream from the outlet works headwall. Various features of the dam are shown on the plates at the end of the report and on the photographs in Appendix D.

b. Location. The dam is located on Kauffman Run approximately 3.6 miles northwest of St. Clair, Pennsylvania, and 5.5 miles north of Pottsville, Pennsylvania. Kauffman Dam is shown on USGS Quadrangle, Shenandoah, Pennsylvania, with coordinates N40°45'55" - W76°13'40" in Schuylkill County, Pennsylvania. The location map is shown on Plate 1.

c. Size Classification. Intermediate (68 feet high, 413 acre-feet).

d. Hazard Classification. High hazard. Downstream conditions indicate that a high hazard classification is warranted for Kauffman Dam (Paragraph 5.1e.).

e. Ownership. Schuylkill County Municipal Authority, Pottsville, Pennsylvania.

f. Purpose of Dam. Water supply for the communities of St. Clair, Pottsville, Port Carbon, Shanetown, East Mines, Wadesville, East Norwegian, Norwegian, North Manheim, New Castle, Palo Alto, and Mt. Carbon, Pennsylvania.

g. Design and Construction History. Kauffman Dam was constructed between 1894 and 1896 for the Pottsville Water Company. Information concerning the designer of the dam was not available for review. However, drawings dated 1896 are available. The engineer's name on the drawings is A. B. Cochran and Son. These drawings also note that Thomas F. Kerns, apparently a contractor, constructed the masonry encasement for the outlet works pipe.

In 1930, the reservoir was drawn down to recover the body of a woman who had drowned. During drawdown, a slide occurred on the upstream slope of the dam. The slide extended over a length of 175 feet near the center of the dam. Near the core wall, the earthfill settled from 3 to 6 inches. Near the upstream edge of the top of the embankment, the earthfill settled from 6 to 24 inches. The Pennsylvania Water Supply Commission issued a permit to rebuild the embankment to its original template. The rebuilding was completed in 1930.

In 1961, the present Owner acquired the dam from the Pottsville Water Company.

h. Normal Operating Procedure. The pool is maintained at spillway crest with excess inflow discharging over the spillway. Water is normally drawn from the reservoir through a 24-inch diameter CIP. A 12-inch diameter CIP connects to the 24-inch diameter line at the valve house. The 12-inch diameter line transmits flows to a treatment plant about 2.8 miles downstream. Although the 24-inch diameter line extends downstream to a headwall, the valves on the line are normally closed.

1.3 Pertinent Data.

a. Drainage Area. 0.88 square mile.

b. Discharge at Damsite. (cfs.)

Maximum known flood at damsite(1) - 790.

(1) Estimated for Tropical Storm Agnes, June 1972, assuming the pool elevation was 0.5 foot below top of dam and that the outlet works valve was fully open.

Outlet works at maximum pool elevation - 80 (approximate).

Spillway capacity at maximum pool elevation (2) - 840 (low area).

Design spillway capacity(2) - 940.

c. Elevation. (Feet above msl.)

Top of dam (low area) - 1390.7.

Design top of dam - 1391.0.

Maximum pool (top of dam low area) - 1390.7.

Normal pool (spillway crest) - 1386.0.

Upstream invert outlet works - 1330.5.

Downstream invert outlet works - 24-inch diameter CIP - 1324.0.

Streambed at toe of dam - 1323.1.

d. Reservoir Length. (Miles.)

Normal pool - 0.32. Maximum pool - 0.34.

e. Storage. (Acre-feet)

Normal pool (spillway crest) - 319.

Maximum pool (top of dam) - 413.

f. Reservoir Surface. (Acres.)

Normal pool (spillway crest) - 19.2.

Maximum pool (top of dam) - 20.6.

g. Dam.

Type - Earthfill with concrete core wall.

Length - 573 feet (embankment).

Height - 68 feet.

(2) See Section 5.

Top Width - 20 feet.

Side slopes - Downstream 1V on 1.5H.

Upstream 1V on 2.07H.

Impervious core - Concrete core wall.

Zoning - Homogeneous earthfill.

Cutoff - Core wall in trench excavated into rock.

Grout curtain - None.

h. Diversion and Regulating Tunnel. None.

i. Spillway.

Type - Concrete broad-crested weir (width-3.0 feet).

Length of weir - 34.0 feet.

Crest elevation - 1386.0.

Upstream channel - Approximately flat at Elevation 1386.0.

Downstream channel - Channel on 1.6 percent slope extending 84 feet to rock-lined channel.

j. Regulating Outlets. 24-inch diameter CIP extending through embankment to valve house at downstream toe. Two 24-inch gate valves in valve house. One 12-inch diameter CIP taps off 24-inch diameter line between the 24-inch gate valves. One 12-inch gate valve provided on 12-inch diameter line in valve house. The 24-inch line discharges at a head-wall 60 feet downstream of the valve house. The 12-inch diameter line extends to a treatment plant about 2.8 miles downstream.

SECTION 2

ENGINEERING DATA

2.1 Design.

a. Data Available. Very little engineering data for the dam was available for review. In 1918, the Pennsylvania Water Supply Commission prepared a report on the structure based on interviews with the Owner, visual inspections, and other data. The report contains brief accounts of geology, construction methods and materials, and design features. A summary of hydrologic and hydraulic analyses is also included in the report. No engineering data pertinent to the 1930 repairs to the embankment was available for review.

b. Design Features. The dam consists of a homogeneous earthfill embankment with a concrete core wall, a concrete gravity broad-crested spillway and an outlet works.

The embankment is 68 feet high and 573 feet long (Plates 2 and 3, and Photographs A, B, C, and J). The design top elevation is 1391.0 and the design top width is 20.0 feet. The upstream slope is 1V on 2.07H. The downstream slope is 1V on 1.5H. Hand-placed riprap covers the upstream and downstream slopes.

The embankment fill is clay and gravel. The embankment is founded on a disintegrated conglomerate overburden. A description of the geology at the site is presented in Appendix E.

The concrete core wall extends to within 3.0 feet of design top of dam. The top width of the core wall is 3 feet. For the top 60 feet of the core wall, both the upstream and downstream faces have 20V on 1H batters. Below the battered section, the core wall has a uniform width of 9 feet. The bottom of the core wall was placed in a trench excavated in rock. Information concerning the width of the trench was not available for review. The depth of the trench varies up to a maximum of 22 feet. The average depth is about 10 feet.

An access road extends along the downstream valley to the left abutment. A fork in the access road extends to the outlet works. Access to the spillway weir is via the top of dam.

The spillway is located at the right abutment (Plate 2 and Photographs E, F, G, H, and I). The weir is a concrete broad-crested section with a crest length of 34 feet. The crest is at Elevation 1386.0 and it is less than 0.1 foot above the approach and discharge channels. The right side of the spillway is a cut into the natural hillside.

The spillway approach channel is level at Elevation 1386.0 and is benched into the natural hillside slopes with a cut on the right. A vertical masonry wall on the left side of the spillway retains the embankment fill. This wall extends along the embankment template and acts both as an approach wall upstream of the crest and a training wall downstream of the crest.

Downstream of the weir, an excavated channel extends on a 1.6-percent grade for 84 feet to a concrete sill with a top elevation of 1386.3. The sill is 30.7 feet long. At each end of the sill, the natural hillside rises on about a 1V on 2H slope. The sill has a rectangular notch. The notch is 8 feet long and 1 foot deep. The sill and notch were originally used to measure spillway discharges.

The channel downstream of the sill is rock-lined. It has a varying bottom width, approximate 1V on 1H side slopes, and varying but steep grades. The channel extends for about 100 feet past a natural knob on the left. This knob trains the flow away from the embankment. The channel extends down the hillside and runs out on a relatively flat area at the Kauffman Run overbank.

The main features of the outlet works facilities are a masonry intake structure at the upstream slope, a 24-inch diameter CIP extending through the embankment, and a masonry valve house at the downstream toe. The masonry intake structure is located at the upstream toe of embankment. The invert at the intake structure is 1330.5. The intake structure is founded on a concrete slab. The 24-inch diameter CIP is encased in masonry. Two seepage collars, extend around the top and sides of the encasement upstream of the axis of dam. At the axis of the dam, the masonry extends down to bedrock.

The masonry valve house is located at the downstream toe of the embankment (Plate 3 and Photographs C and J). Two 24-inch gate valves within the valve house are connected in series on the 24-inch diameter CIP. A 12-inch diameter CIP with 12-inch gate valves is connected to the 24-inch diameter line between the 24-inch valves. The 24-inch line extends from the valve house about 60 feet to a concrete headwall. At the headwall, the invert elevation of the 24-inch line is 1324.0. The headwall is also the point of discharge for a 4-inch diameter drain which extends from just downstream of the core wall. The 12-inch diameter CIP is a water supply line that extends to the Owner's distribution system.

The channel downstream of the headwall is the original Kauffman Run streambed. The spillway channel flows into Kauffman Run about 300 feet below the headwall.

2.2 Construction.

a. Data Available. Construction data available for review was limited to a brief description in the 1918 report by the Pennsylvania Water Supply Commission. This report was prepared for the components of the dam from interviews with the Owner, visual inspection, and other sources. Drawings showing the progress of construction for the embankment are available for review. Construction drawings for the repairs made to the embankment after the slide in 1930 are available. Other construction data for the repairs was not available for review.

b. Construction Considerations. Since the available construction data is limited, construction methods cannot be assessed.

2.3 Operation. No formal records of operation were reviewed. Based on information from the Owner, all structures have performed satisfactorily except for the slide noted in Paragraph 1.2g. The Owner stated that the outlet works was fully opened during Tropical Storm Agnes in June 1972 and that the pool level neared the top of embankment, although measurements were not obtained.

2.4 Other Investigations. No known investigations other than those previously described were reviewed.

2.5 Evaluation.

a. Availability. Engineering data was provided by the Division of Dams and Encroachments, Bureau of Water Quality Management, Department of Environmental Resources Commonwealth of Pennsylvania, and by the Owner, Schuylkill County Municipal Authority. The Owner made available the general manager and caretakers for information. A caretaker assisted in operating demonstrations during the visual inspection.

b. Adequacy. The type and amount of design data and other engineering data is limited, and the assessment must be based on the combination of available data, visual inspection, performance history, hydrologic assumptions, and hydraulic assumptions.

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

SECTION 3

VISUAL INSPECTION

3.1 Findings.

a. General. The general appearance of Kauffman Dam is good, with the exceptions noted below.

b. Embankment. The embankment is in generally good condition. A survey performed for this inspection revealed that there were two low areas on the top of the embankment. One low area is located adjacent to the spillway wall. This low area extends to the left of the spillway for 75 feet, and its lowest point is 0.3 foot below design grade. The other area is near the left abutment and it extends for 210 feet. Its lowest point is 0.2 foot below design grade. The remainder of the top of embankment is at or above design grade.

The embankment fill that was observable at the top of embankment is a gravelly sand (Photograph A). Some of this material has apparently eroded onto the slopes of the embankment. As determined by one cross section, which was surveyed for this inspection, the top of embankment has a distinct crown. The upstream and downstream edges of the top of the embankment are about 1.0 foot below the crown.

Brush is growing sporadically on the upstream and downstream slopes of the embankment (Photographs A, B, C and D). The brush on the upstream slope is typically about 1.0 foot high. The brush on the downstream slope is typically about 3 feet high. Mature trees are growing directly adjacent to the downstream toe of the embankment. Some dead trees have fallen on the embankment near the downstream toe.

Near the highest section of the embankment, bulges were observed near the downstream toe (Photograph D). The bulges are typically 5 feet wide, 15 feet long, and they are about 1.3 feet high, measured normal to the slope.

No seepage was observed along the toe of the embankment. Seepage was observed near the outlet works headwall, as described hereinafter.

c. Appurtenant Structures. No deficiencies were observed at the spillway weir or at the masonry wall to the left of the weir. As determined by a survey performed for this inspection, the approach channel is 0.1 to 0.7 foot above spillway crest elevation. Both the approach channel and the channel downstream of the weir are generally covered with thick brush that is about 2 feet high (Photographs E and F).

A concrete sill with a notch is located 84 feet downstream of the spillway weir (Photograph G). The channel downstream of the sill is quite narrow with heavily wooded overbanks (Photograph H). About 50 feet downstream of the sill, the channel extends down the natural hillside. The channel in this reach appears to have been eroded by the spillway flows. Beyond the toe of the hillside at the Kauffman Run overbank, the spillway channel is poorly defined. Many large piles of debris were observed (Photograph I).

The outlet works valve house is located at the toe of the embankment (Photograph J). The operation of the downstream 24-inch valve in the valve house was observed. The operating bar for this valve was not in the valve house. The bar in the caretaker's truck did not fit the valve stem. An operating bar was obtained from another dam in the Owner's system. Two men then opened the 24-inch valve about 5 percent in 20 minutes with no apparent problems.

The outlet works headwall is about 60 feet downstream of the valve house (Photographs K and L). The wall is completely deteriorated. It presently appears as a mound of rubble. A 4-inch diameter pipe was observed 10 feet to the left of the 24-inch CIP at the headwall. No water was flowing from the 4-inch diameter pipe. A small amount of seepage was observed near the end of the 24-inch CIP. About 10 feet to the right of this pipe, seepage of about 20 gpm was observed. As large sections of the headwall cover this area, the exact point of seepage could not be observed.

d. Reservoir Area. The reservoir slopes are wooded and quite flat. No evidence of creep, rock slides or landslides was visible. The Schuylkill County Municipal Authority owns and posts the entire watershed. The Owner indicated that sedimentation was not a problem.

e. Downstream Conditions. Kauffman Run below the outlet works headwall extends through a wooded valley. The access road to the dam extends along the stream. It was estimated that the access road might be impassable during periods of high spillway discharge.

3.2 Evaluation.

a. Embankment. The low areas on the embankment reduce the spillway discharge capacity. The fill observed at the top of the embankment is readily erodible. This is probably the cause of the crown on the top of the embankment.

Brush on the slopes and trees near the toe of the slopes are undesirable.

The bulges on the downstream slope were first noted in 1924 during an inspection by the Pottsville Water Company, then the Owner. The inspection report notes that the bulges were "re-laid". The bulges were not mentioned in the next eight inspection reports. A letter, dated September 1941, from the Commonwealth to the Owner noted bulges and suggested establishing survey monuments to monitor movement. The next inspection in 1942 noted that the suggestion had not been carried out. A letter, dated September 1945, from the Commonwealth to the Owner again suggested the monitoring of the bulges. The Owner responded, in the same month, and stated that the bulges had been monitored for a year and no movement had been observed. The bulges were not noted in the 1962 and 1971 inspections by the Commonwealth. In July 1972, after Tropical Storm Agnes, the dam was inspected by the Soil Conservation Service in company with representatives of the Pennsylvania Department of Environmental Resources and the Corps of Engineers. The inspection report states that the downstream slope of the embankment was 1V on 1H and bulged. The inspection report recommends immediate placement of compacted rockfill on the downstream slope "for stability purposes".

Apparently, measurements were not made on the downstream slope for the inspection in 1972, as the measurements made for this inspection indicate that the downstream slope is a 1V on 1.5H. The bulges have apparently stabilized.

b. Appurtenant Structures. All the conditions observed at the spillway can decrease the discharge capacity. They are further evaluated in Section 5.

The downstream 24-inch valve was fully operable. The availability of an operating bar would allow rapid operation during emergencies.

The cause of the deterioration at the headwall is unknown. It does not present a significant hazard to the dam. The pipe to the left of the 24-inch diameter CIP extends to an unknown location. No information concerning this pipe was available for review. The seepage observed to the right of the 24-inch CIP is probably from a drain that extends beneath the embankment. The drawings supplied by the Owner indicate that a 4-inch diameter drain pipe extends from two springs located just downstream of the core wall. The terminus of the drain is not exactly shown, but it is near the point of the observed seepage (Plate 2).

c. Reservoir Area. No conditions were observed in or near the reservoir which might present significant hazard to the dam.

d. Downstream Conditions. Lack of access during periods of high spillway discharge would prevent observation of potential problems during those periods. The dam is only 0.2 mile from Pennsylvania Route 61. Access during periods of high spillway discharge could probably be by foot along the hillside of the steep valley. The Owner did not report any access problems during Tropical Storm Agnes. He stated that during this storm, the dam was under constant observation. Additional discussion of downstream conditions is presented in Paragraph 5.1e.

SECTION 4

OPERATIONAL PROCEDURE

4.1 Procedure. The reservoir is maintained at spillway crest Elevation 1386.0 with excess reservoir inflow discharging over the spillway. At the valve house, the downstream valve on the 24-inch diameter line is normally closed and the upstream valve is normally open. The valve on the 12-inch diameter line is normally open. The 12-inch diameter line is a pressure main. Water taken from Kauffman Dam enters the pressure main where it flows by gravity. The main connects to pipes carrying flows from other dams in the Owner's system. It extends to a treatment plant located near the small community of Dark Water, about 2.8 miles downstream from Kauffman Dam. From there water flows into the distribution system. The communities served are in the Pottsville area and are listed in Paragraph 1.2f.

The Owner stated that the emergency 24-inch diameter line was fully opened during Tropical Storm Agnes in June 1972.

4.2 Maintenance of Dam. The dam is visited daily by a caretaker, who checks the security of the site. Pool elevations are taken weekly and delivered to the Owner's central office, where the data is filed and used to determine the storage remaining. The caretaker is responsible for observing the general condition of the dam and appurtenant structures and reporting any changes or deficiencies to the Owner's General Manager. Brush is usually cut every 2 years. Penn East Corporation, an engineering consultant to the Owner, makes an inspection of the Schuylkill County Municipal Authority system each year. Reports are sent to the Owner and are kept on file. The Owner apparently does not require a detailed inspection of the physical condition of the dam, as the annual reports place emphasis on the Authority's operations. Informal inspections are made by the caretakers during their daily visits to the damsite. These visits are mostly to obtain data for operating conditions and to check for trespassers. The Owner also employs a private security firm to apprehend trespassers.

4.3 Maintenance of Operating Facilities. The Owner stated that the 12-inch valve in the valve house is lubricated and fully operated once every year. There

is no regular maintenance program for the 24-inch valves in the valve house.

4.4 Warning Systems in Effect. The Owner gave the inspection team a verbal description of the emergency warning and operation system that is applicable for all Schuylkill County Municipal Authority dams. The Owner said that, during periods of heavy rainfall, available personnel are dispatched to the dams to observe conditions round-the-clock. All company vehicles are equipped with radios, and the personnel can communicate with a central facility. Evaluation of risk is made by the General Manager. He is also responsible for notification of emergency conditions to the Schuylkill-Pottsville Office of Civil Defense, which, in turn, would notify local authorities. The Office of Civil Defense does not have a detailed emergency warning plan for the Owner's dams, but it does have a detailed emergency warning plan for severe weather conditions and similar events. Detailed emergency operational procedures have not been formally established for Kauffman Dam, but are as directed by the Owner's General Manager.

4.5 Evaluation. The maintenance of the 12-inch valve located in the valve house is good. Although the downstream 24-inch valve located in the valve house was fully operational, the lack of a regular maintenance program is undesirable. The valve might not be functional if needed during emergency conditions. The growth of brush on the downstream slope of the embankment indicates that a more frequent brush cutting schedule would be warranted. The procedures used by the Owner to inspect the dam need improvement. During the annual inspection, there is insufficient emphasis placed on the physical condition of the dam. Also, insufficient emphasis is placed on the physical condition of the dam during the daily visits by the caretakers. The emergency operational procedures are too informal and not in sufficient detail. The emergency warning system is good, but the assessment of conditions that would require activation of the emergency warning system could be improved. The chain of command is too informal, not in sufficient detail, and apparently not well defined in the General Manager's absence.

SECTION 5

HYDROLOGY AND HYDRAULICS

5.1 Evaluation of Features.

a. Design Data.

(1) No hydrologic and hydraulic analysis for the original Kauffman Dam design was available for review. The spillway capacity was estimated in 1918 by the Pennsylvania Water Supply Commission for their report on Kauffman Dam.

(2) In the recommended guidelines for safety inspection of dams, the Department of the Army, Office of the Chief of Engineers (OCE) established criteria for rating the capacity of spillways. The recommended spillway design flood for the size (intermediate) and hazard potential (high) classification of Kauffman Dam is the PMF. If the dam and spillway are not capable of passing the PMF without overtopping failure, the spillway capacity is rated as inadequate. If the dam and spillway are capable of passing one-half of the PMF without overtopping failure, the spillway capacity is not rated as seriously inadequate. A spillway capacity is rated as seriously inadequate if all of the following conditions exist:

(a) There is a high hazard to loss of life from large flows downstream of the dam.

(b) Dam failure resulting from overtopping would significantly increase the hazard to loss of life downstream from the dam from that which would exist just before overtopping failure.

(c) The dam and spillway are not capable of passing one-half of the PMF without overtopping failure.

(3) In their 1918 report, the Pennsylvania Water Supply Commission estimated the spillway capacity of Kauffman Dam at 770 cfs. This was calculated using 4 feet of head and a spillway crest length of 50 feet. Calculations were performed for this study using spillway dimensions obtained during the visual inspection (Appendix C). The calculations indicate that the discharge capacity of the spillway

is 1,230 cfs with the top of embankment at design elevation. However, low spots at the top of embankment reduce the available head to 4.7 feet. For this condition, the spillway discharge capacity is 1,110 cfs. Computations were then performed to ascertain the effects of the concrete sill that is 84 feet downstream of the spillway. The computations indicated that the weir would be a control. Using simplifying assumptions, further calculations were performed assuming control at the sill and including backwater effects to the spillway weir (Appendix C). An approximate spillway capacity was determined. For the top of embankment at design elevation, the spillway capacity was estimated at 940 cfs. For the existing top of embankment elevation, the spillway capacity was estimated at 840 cfs. During the visual inspection, it was estimated that the channel downstream of the sill would not be able to convey higher spillway discharges without a significant backwater effect. Determination of these effects was beyond the scope of this study. If the overbanks of this channel were cleared of growth, the effects would be somewhat reduced. The following table summarizes the spillway discharges for the various conditions, but the effects of the channel downstream of the sill have not been included.

Control Assumption	Embankment at Design Elevation 1391.0	Embankment at Existing Elevation 1390.7
Spillway capacity with control at spillway weir	1,230 cfs	1,110 cfs
Spillway capacity with control at downstream sill	940 cfs	840 cfs

The value of 840 cfs is used to hydraulically rate the spillway. This value is approximate at best, because of the hydraulic assumptions and downstream conditions.

(4) The hydrologic analysis for this study was based on existing conditions of Kauffman Run watershed and the effects of future development of the watershed were not considered. The Owner indicated that some of the Schuylkill County Municipal Authority's property was to be exchanged in the immediate future. The Authority would

acquire Mud Run Reservoir in exchange for property near Kauffman Dam. The property near Kauffman Dam would be developed into a shopping center. The present plans are to exchange and develop less than 20 acres, which is less than 4 percent, of the Kauffman Reservoir watershed. At present, it is also planned that the developer of the shopping center divert runoff from the 20 acres to a discharge point downstream of Kauffman Dam. The proposed size of the diversion facilities and the design discharges were not available for review.

b. Experience Data. For this study, a PMF peak derived from generalized data supplied by the Baltimore District, Corps of Engineers for this area of the Delaware River Basin was adapted to Kauffman Run watershed. The peak inflow obtained from the generalized data was 1,700 cfs per square mile. The PMF peak flow was estimated to be 1,500 cfs at Kauffman Reservoir. The maximum known flood at the damsite is estimated to be 790 cfs during Tropical Storm Agnes in June 1972. Based on information from the Owner, the discharge was estimated assuming a pool elevation 0.5 foot below top of dam and assuming the outlet works valve was fully open.

c. Visual Observations. Some visual observations relevant to hydraulics are presented in Paragraph 5.1a.(3). On the day of the inspection, brush was observed in the channels upstream and downstream of the spillway weir. This would reduce the spillway discharge capacity. A survey performed for this inspection revealed that the approach channel was from 0.1 to 0.7 foot higher than the spillway crest. Although this would have only minor effects on peak spillway discharge capacity, it would have significant effect on low head spillway discharge capacity.

e. Downstream Conditions. Kauffman Dam is 3.6 miles northwest of St. Clair, Pennsylvania, as shown on Plate 1. Flows from Kauffman Dam proceed downstream on Kauffman Run about 0.2 mile to Mud Run after passing under Pennsylvania Route 61. Mud Run then flows 1.0 mile to its confluence with Mill Creek after passing under Pennsylvania Route 61. Mill Creek then flows 1.5 miles to its confluence with Wolf Creek. Mill Creek then proceeds downstream 1.3 miles to St. Clair. Mill Creek, Tar Run, and Mud Run in the above reaches generally parallel Pennsylvania Route 61 and cross under railroad tracks a

number of times. The road and railroad crossings for these streams are either bridges or culverts under low embankments, neither of which would provide significant mitigating effects to floodflows.

Mill Creek flows for 0.8 mile through the center of St. Clair, which has homes directly adjacent to the low river banks. The creek then flows 1.4 miles along the edge of a railroad yard and then flows for 0.6 mile through Port Carbon, Pennsylvania, to its confluence with the Schuylkill River. Port Carbon has homes directly adjacent to the low river banks. Downstream conditions indicate that a high hazard classification is warranted for Kauffman Dam.

f. Spillway Adequacy.

(1) The existing spillway will not pass the PMF without overtopping the dam. One-half of the PMF inflow is 750 cfs and is less than the spillway capacity of 840 cfs.

(2) The maximum tailwater is estimated to be Elevation 1327 at the spillway capacity of 840 cfs. At maximum pool elevation, there is a difference of about 64 feet between headwater and tailwater. If Kauffman Dam should fail due to overtopping, the hazard to loss of life downstream from the dam will be significantly increased from that which would exist just prior to overtopping.

(3) Based on established OCE criteria, as outlined in Paragraph 5.1a.(2), the spillway capacity of Kauffman Dam is rated as inadequate. Considering the effects of the surcharge storage of 94 acre-feet, the spillway discharge capacity of 840 cfs can accommodate a flood with a peak inflow of 965 cfs for a storm of the same duration as the PMF. This is 64 percent of the PMF peak inflow. The methods used to determine the spillway capacity were only approximate.

(4) If the low area of the embankment were to be raised up to grade, which could be considered a maintenance task, the spillway capacity of Kauffman Dam can be increased to 940 cfs. This would allow accommodation of a flood with a peak inflow of approximately 1,080 cfs or 72 percent of the PMF peak inflow. The spillway capacity of Kauffman Dam would then still be rated as inadequate.

SECTION 6

STRUCTURAL STABILITY

6.1 Evaluation of Structural Stability.

a. Visual Observations.

(1) General. The visual inspection of the dam resulted in a number of observations relevant to structural stability. These observations are listed herein for various features.

(2) Embankment. Seepage was observed at the outlet works headwall and survey data, acquired for this inspection, revealed differences between the existing embankment template and the design template. Bulges on the downstream slope were also observed. A detailed description and evaluation of these conditions are in Paragraphs 3.1b. and 3.2a., respectively.

b. Design and Construction Data. No record of design data or stability analysis was available for review. In their report on the dam in 1918, the Pennsylvania Water Supply Commission considered the dam to be well built. No mention was made of the spillway weir stability in the report. Based on data available for review, there is no record of numerical analyses for either the spillway or the embankment.

Analysis of the embankment stability is beyond the scope of this study. Also, sufficient data would have to be acquired before the analysis could be performed.

As was noted in Paragraph 1.2g., in 1930, during drawdown, a slide occurred on the upstream slope of the embankment. Although definitive information was not available for review, it is believed that the embankment was repaired with materials similar to those used during its initial construction. There is no reason to believe that the stability of the embankment was improved after the repairs were completed. The Owner should be aware of this condition, should drawdown be required in the future.

As was noted in Section 3 and in Paragraph 6.1a.(2) above, bulges on the downstream slope and

seepage near the downstream toe were observed during the visual inspection. The bulges have apparently stabilized. The seepage is from a known source and flows under the embankment through a pipe. The downstream 1V on 1.5H slope of the embankment is considerably steeper than current standard practice would allow. However, the concrete core wall is apparently functioning as designed, judging by the controlled seepage observed downstream of the dam. As such, it is felt that the embankment has an adequate margin of safety. Any changes in the bulges or the seepage should be cause for concern.

The existing spillway weir crest elevation is approximately 0.1 foot above the invert elevation of the downstream spillway channel. Stability analyses are not usually performed on structures this small. From a review of the cross section of this structure, it is judged that it should be stable under the anticipated loading conditions.

c. Operating Records. No formal records of operation were reviewed. There was no information available for review that indicated any evidence of previous stability problems, except as noted herein.

d. Post-Construction Changes. As noted herein, there have been no post-construction changes made to Kauffman Dam.

e. Seismic Stability. Kauffman Dam is located in Seismic Zone 1. 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 loading. However, since there are no formal static stability analyses, and since there is the potential of earthquake forces moving or cracking the concrete core wall, the theoretical seismic stability of Kauffman Dam cannot be assessed.

SECTION 7

ASSESSMENT, RECOMMENDATIONS, AND REMEDIAL MEASURES

7.1 Dam Assessment.

a. Safety.

(1) Based on the visual inspection, available records, calculations and past operational performance, Kauffman Dam is judged to be in good condition. However, some deficiencies were noted. A summary of features and observed deficiencies are listed below:

Feature and Location	Observed Deficiencies
Embankment:	
Top of dam	Low areas and crown.
Slopes	Brush.
Downstream slope	Bulges.
Downstream toe	Trees.
Spillway:	
Channels	Brush.
Approach channel	Invert above spillway crest elevation.
Downstream channel	Undersized.
Outlet Works:	
Valves	Missing operating bar.
Headwall	Deterioration and seepage.
Pipes	Under pressure beneath embankment.

(2) The overtopping potential analysis shows that Kauffman Dam, as existing, will be overtopped by the PMF but not by one-half the PMF. Therefore, based on OCE criteria, as outlined in Paragraph 5.1a.(2), the existing spillway capacity is rated as inadequate. The existing spillway can accommodate a flood with a peak inflow of 64 percent of the PMF peak inflow. The conditions at the spill-

way make an accurate determination of its capacity difficult. If the top of embankment were raised to the design elevation that is shown on the plans, the spillway capacity and surcharge storage effect would be sufficient to pass 1,080 cfs or 72 percent of the PMF peak inflow without overtopping of the dam.

(3) Stability computations were not performed for this study. The main spillway weir was judged to be stable. It was also judged that, for present conditions, the embankment should have an adequate margin of safety for normal operating procedures. However, a sudden drawdown condition could result in embankment sliding.

b. Adequacy of Information. The information available is such that an assessment of the condition of the dam can be inferred from the combination of visual inspection, past performance, computations performed prior to and as a part of this study, and other information.

c. Urgency. The recommendations in Paragraph 7.2 should be implemented as soon as practical or in a timely manner as noted.

d. Necessity for Further Investigations. In order to accomplish some of the remedial measures outlined in Paragraph 7.2, further investigations will be required.

7.2 Recommendations and Remedial Measures.

a. In view of the concern for the safety of Kauffman Dam, the following measures, in approximate order of priority, are recommended to be taken by the Owner as soon as practical:

(1) Clear the spillway channel of vegetation.

(2) Grade the spillway approach channel to provide adequate approach conditions.

(3) Perform additional studies to more accurately ascertain the spillway capacity required for Kauffman Dam, as well as the nature and extent of mitigation measures required to make the spillway and spillway channel hydraulically adequate. Filling in the existing low areas of the embankment would help

increase the spillway capacity and this should be accomplished. The top of dam should also be graded to design template.

(4) Install four or more observation wells, or other instrumentation, downstream of the axis of the dam. The wells, or other instrumentation, should be at appropriate locations to determine the general water level in the downstream embankment. Data collected from the observation wells or other instrumentation should be utilized in evaluating the stability of the embankment and assessing piping potential in the future. Continue to observe the seepage at the outlet works headwall and periodically measure and record the quantity of such seepage. If the seepage increases or if turbidity is noted, appropriate action should be taken to control seepage and turbidity with properly designed drains and an evaluation of the embankment stability should be made.

(5) Establish survey monuments on the embankment, especially near the bulges. Monitor the embankment at frequent intervals. If changes are noted, an evaluation of the embankment stability should be made.

(6) Provide a suitable operating bar for the 24-inch valve and have it readily available.

(7) Provide closure facilities for the outlet works pipe upstream of the concrete core wall for periodic inspection and for use in the event the pipe should leak severely, thereby endangering the embankment.

(8) Institute a program of detailed annual inspections for Kauffman Dam, and utilize the results to ascertain if remedial measures are required.

(9) Develop a detailed emergency operation and warning system for Kauffman Dam.

b. In order to correct operational, maintenance, and repair deficiencies, and to more accurately assess the condition of the dam, the following measures are recommended to be undertaken by the Owner in a timely manner:

(1) Remove brush and trees from slopes and downstream toe of embankment.

(2) Repair outlet works headwall.

c. In addition, the following operational measures are recommended to be undertaken by the Owner:

(1) Provide round-the-clock surveillance of Kauffman Dam during periods of unusually heavy rains.

(2) When warnings of a storm of major proportions are given by the National Weather Service, the Owner should activate his emergency operation and warning system procedures.

(3) If the Kauffman Dam watershed is developed, see that proper safeguards are provided so as to ensure that, for the PMF, runoff does not exceed that which would have occurred before development.

(4) Should the reservoir ever be drawn down, release water at such a rate that the stability of the embankment is ensured.

DELAWARE RIVER BASIN

KAUFFMAN RUN, SCHUYLKILL COUNTY

PENNSYLVANIA

KAUFFMAN DAM

NDS ID No. PA-00691
DER ID No. 54-54

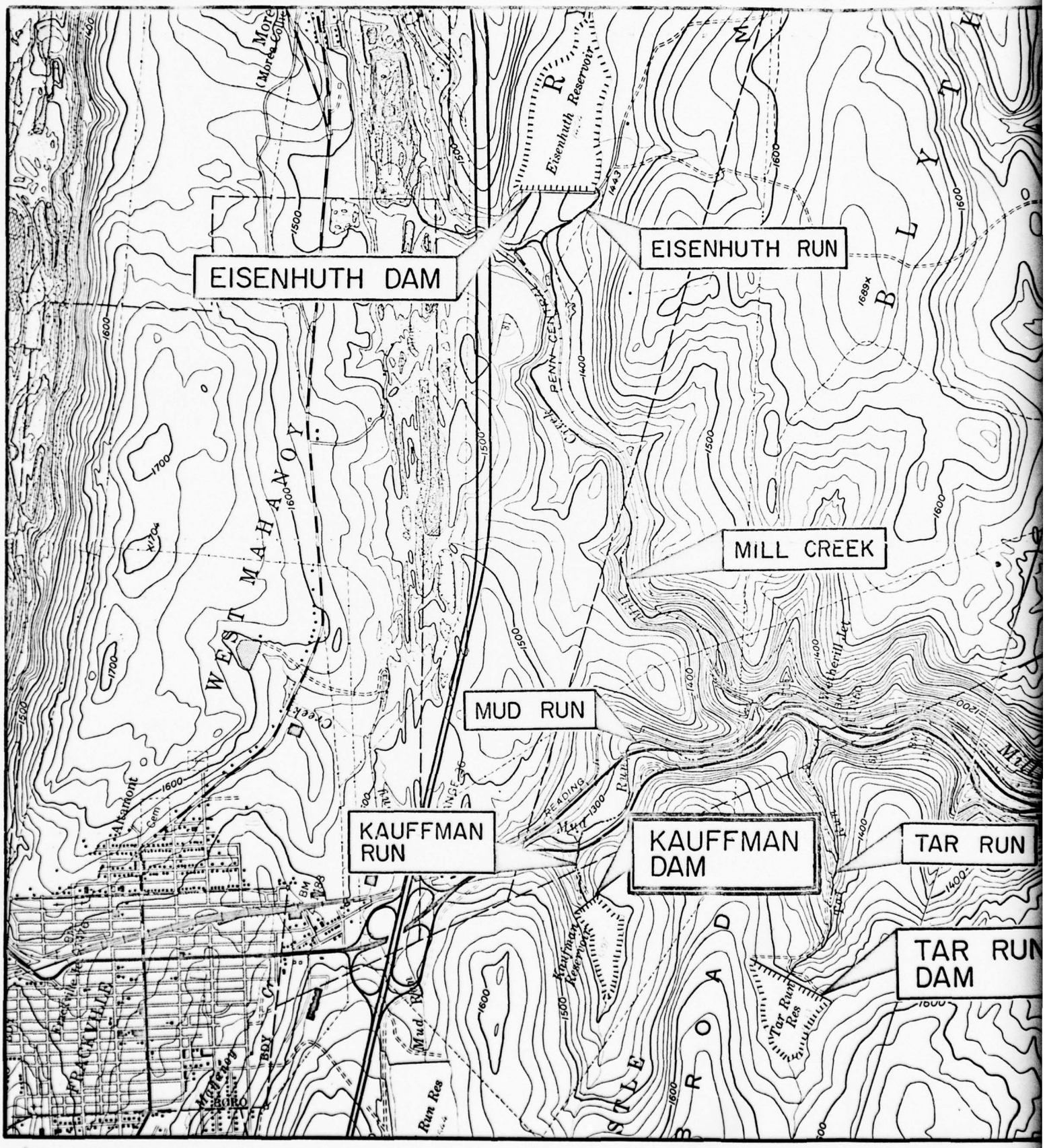
SCHUYLKILL COUNTY MUNICIPAL AUTHORITY

PHASE I INSPECTION REPORT

NATIONAL DAM INSPECTION PROGRAM

AUGUST 1978

PLATES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EISENHUTH RUN
MILL CREEK
MUD RUN
KAUFFMAN RUN
KAUFFMAN DAM
TAR RUN
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BLUFF
ROAD
Eisenhuth Reservoir
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Tar Run Res
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Mud Run Res
PENN CENTRAL
READING
Abbamont Cem
Rockville
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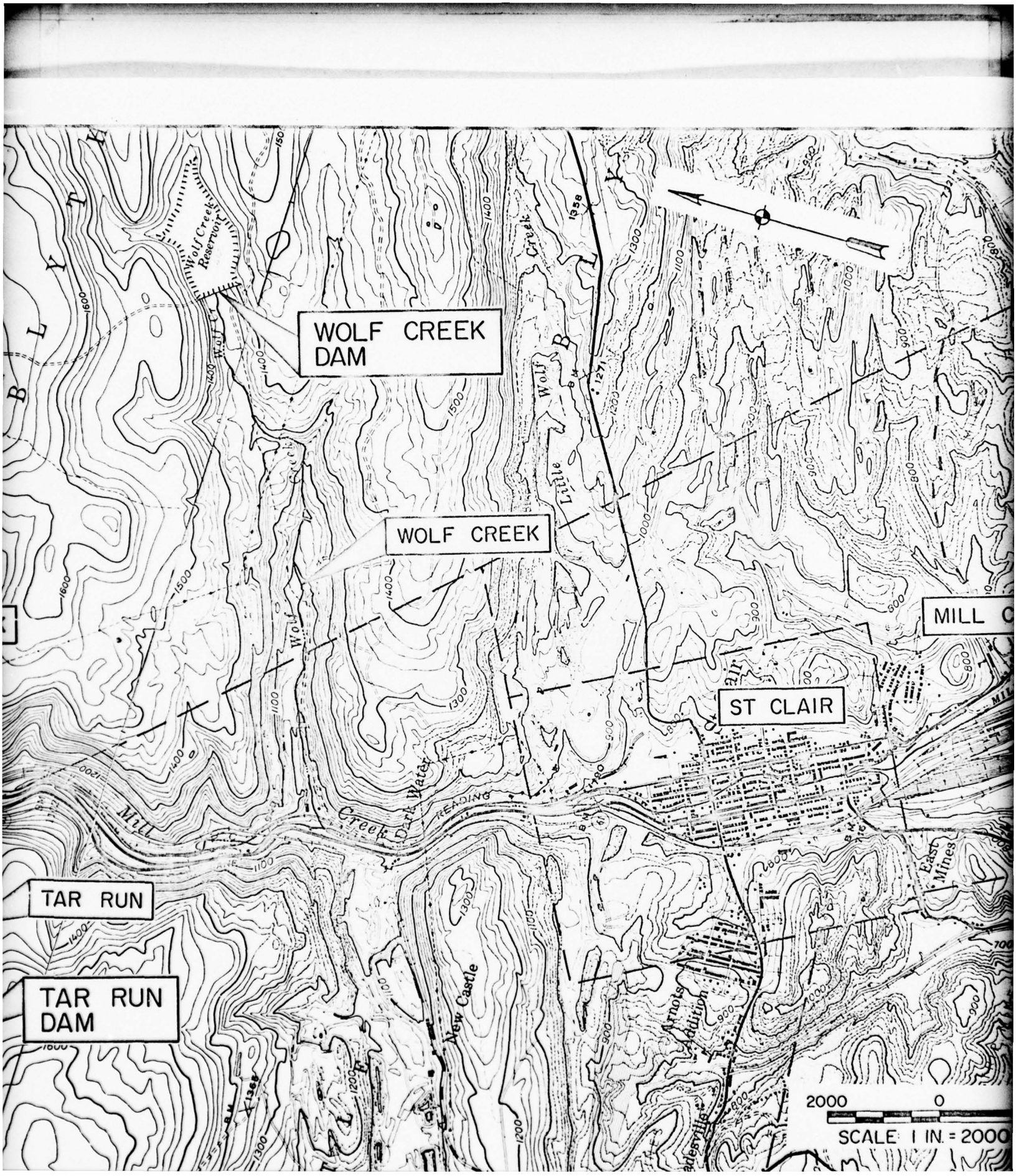
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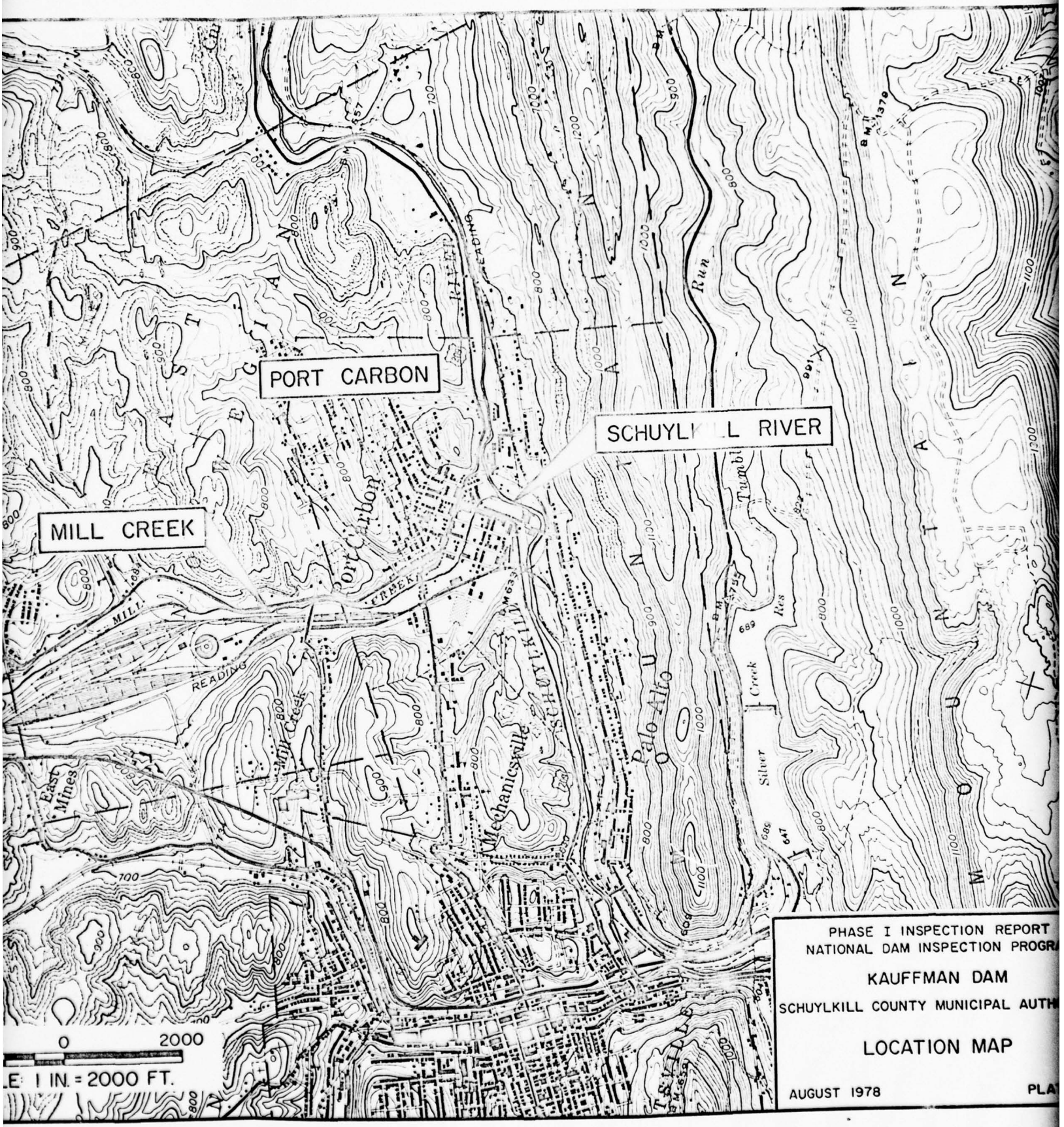

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KAUFFMAN DAM

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LOCATION MAP

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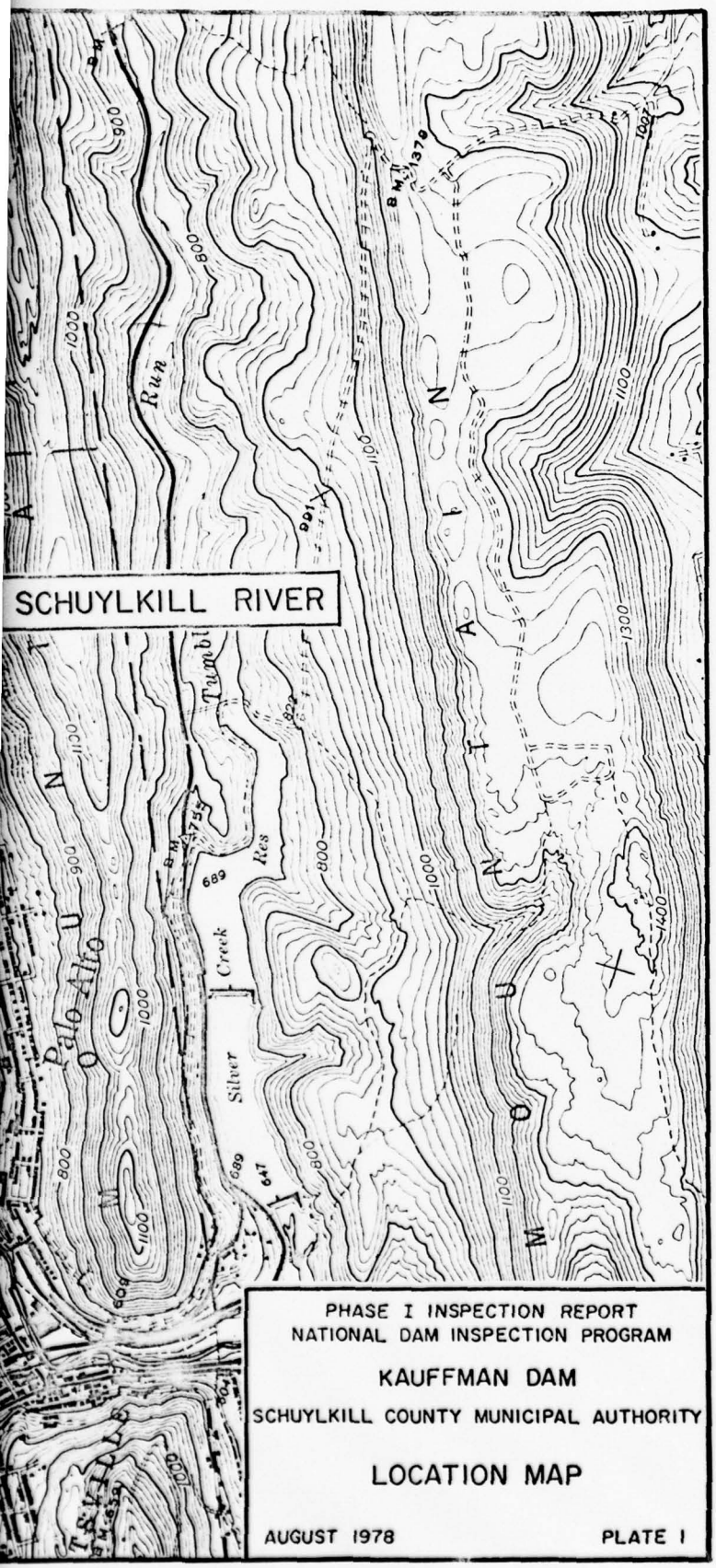

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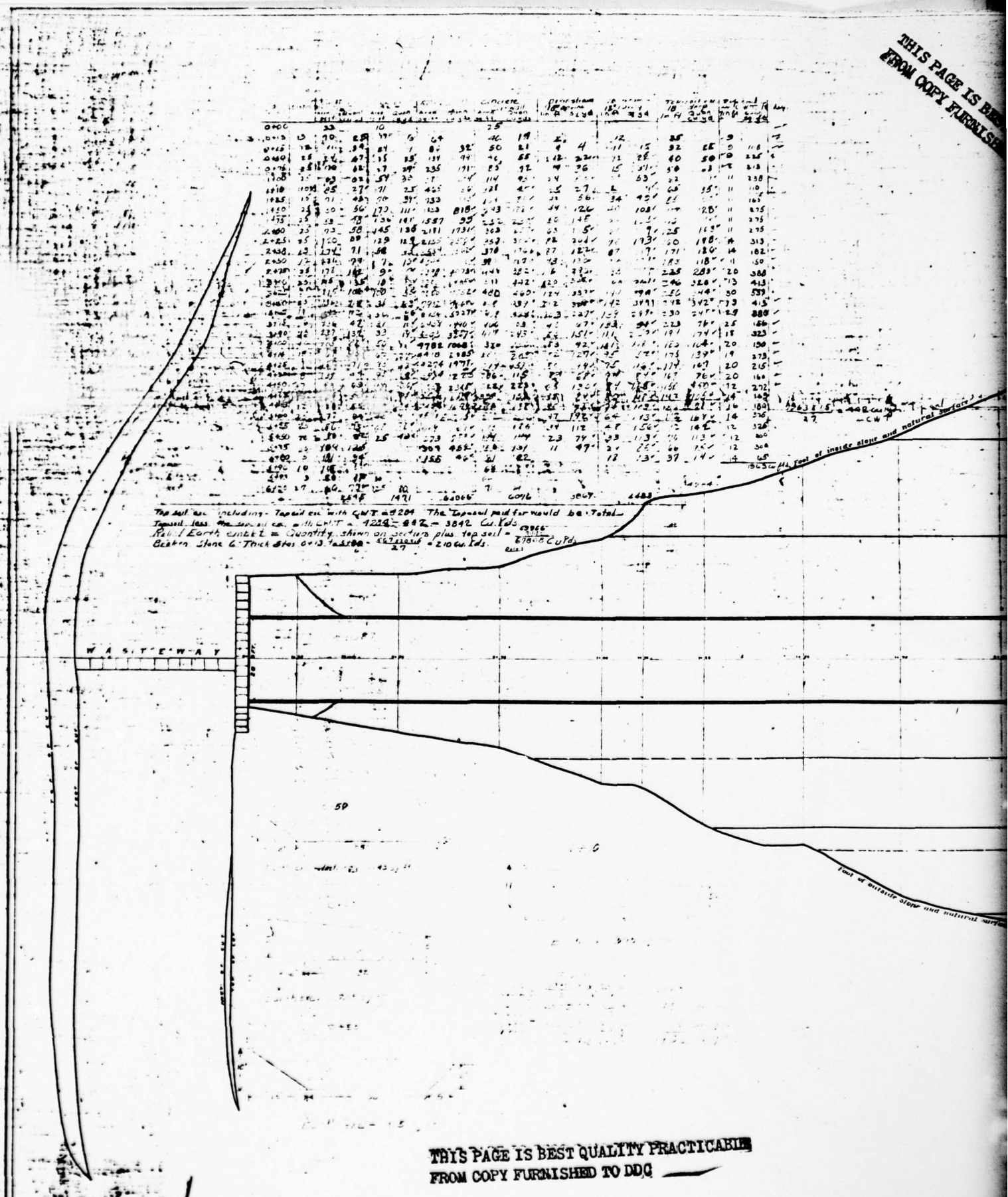
NATIONAL DAM INSPECTION PROGRAM

KAUFFMAN DAM

SCHUYLKILL COUNTY MUNICIPAL AUTHORITY

LOCATION MAP

AUGUST 1978 PLATE 1



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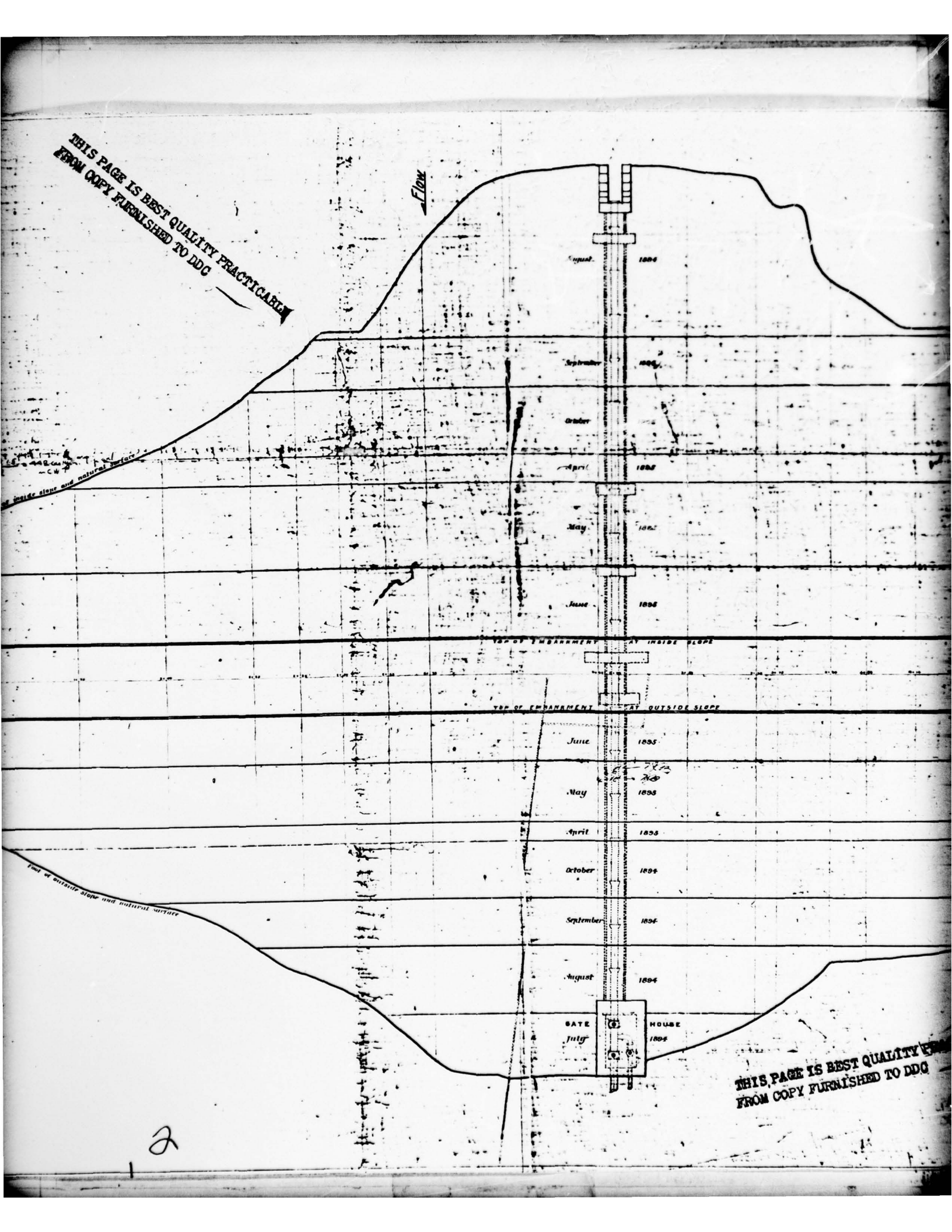

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KAUFFMAN'S RUN DAM

POTTSVILLE WATER CO.

GENERAL PLAN OF EMBANKMENT SHOWING PROGRESS OF CONSTRUCTION

Scale 10 feet per inch ____ Jan. 1896 ____ J. B. Cochran & Son, Engrs.

PHASE I INSPECTION
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SCHUYLKILL COUNTY MUNICIP
PLAN
AUGUST 1978

N DAM

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OF CONSTRUCTION

B Cochran & Son

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

KAUFFMAN DAM

SCHUYLKILL COUNTY MUNICIPAL AUTHORITY

PLAN

AUGUST 1978 PLATE 2

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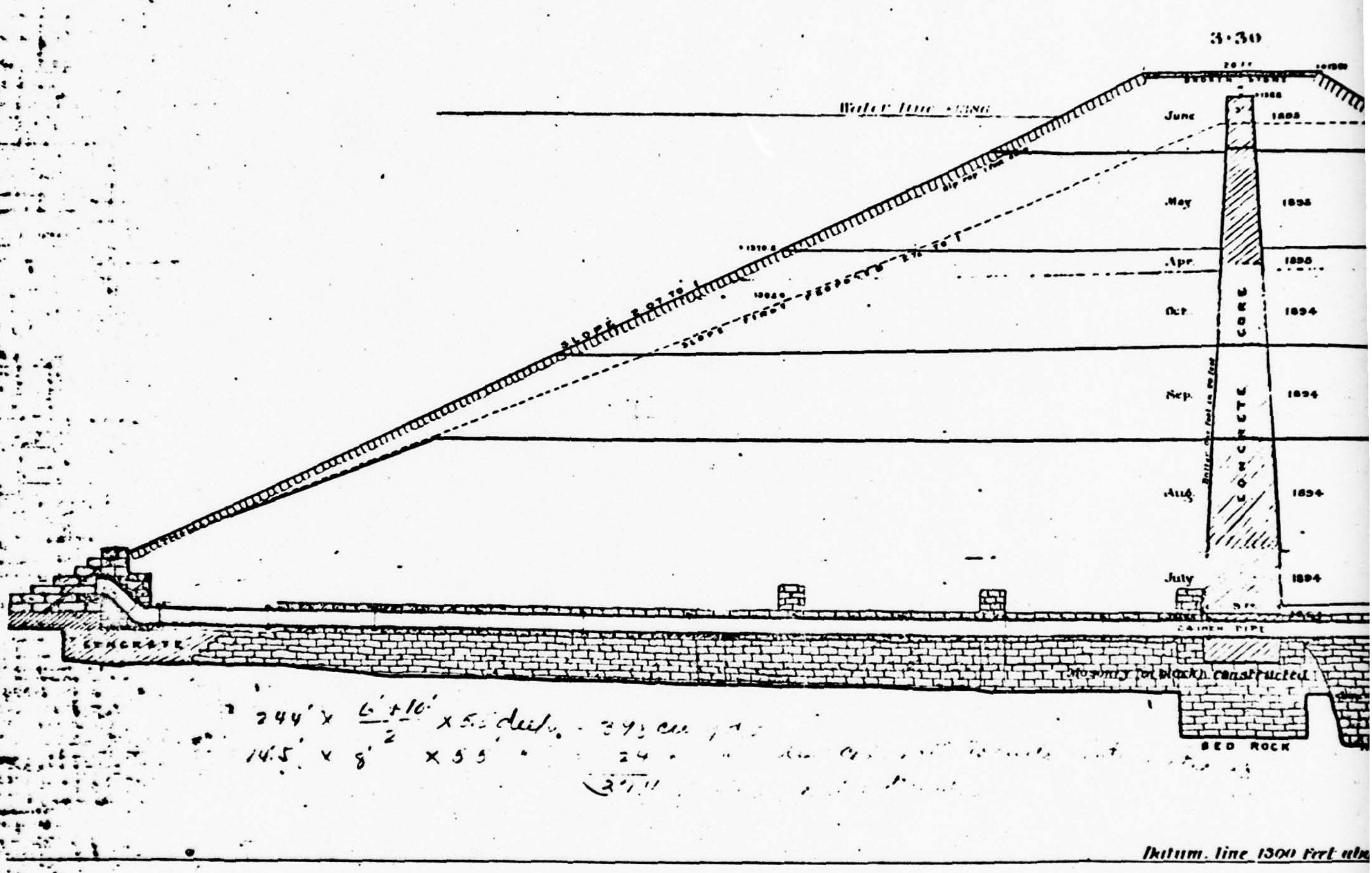

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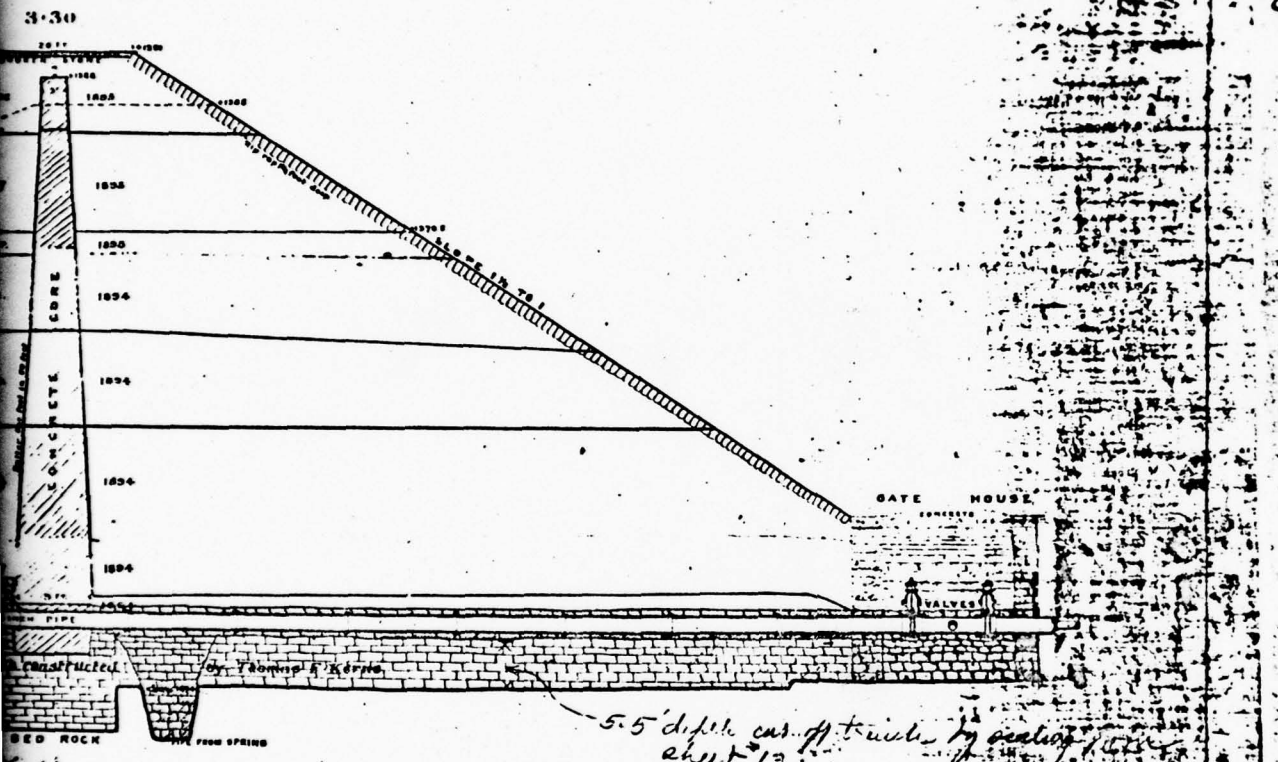

line 1500 Feet above Tide

Kauffman's Run Dam

Pottsville Water Company

Section of Embankment showing progress of construction piers, wall, etc.

Scale 10 feet per inch — Jan. 1896 — Wm. B. Corbran & Son

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NATIONAL DAM INSPECTION PROGRAM

KAUFFMAN DAM

SCHUYLKILL COUNTY MUNICIPAL AUTHORITY

SECTION

AUGUST 1978 PLATE 3

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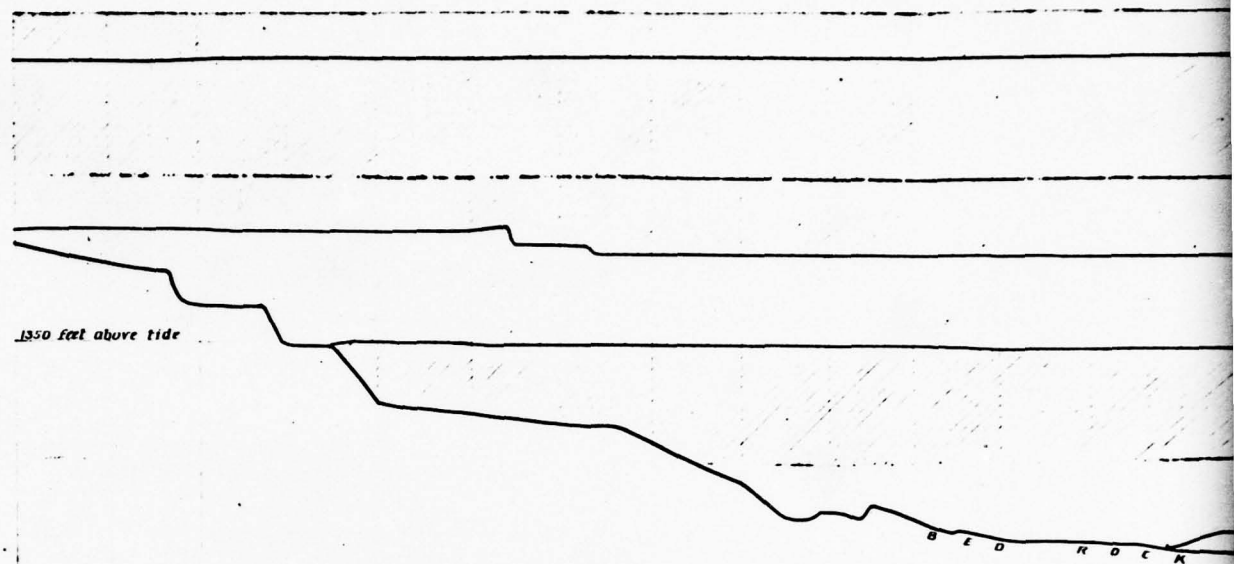

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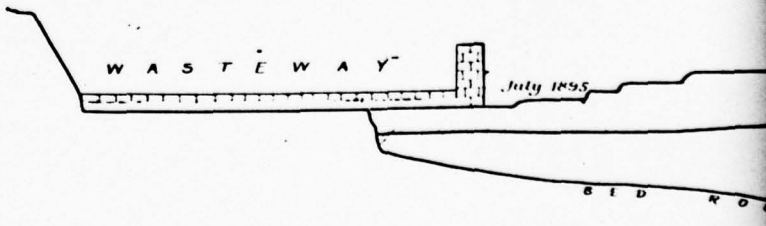
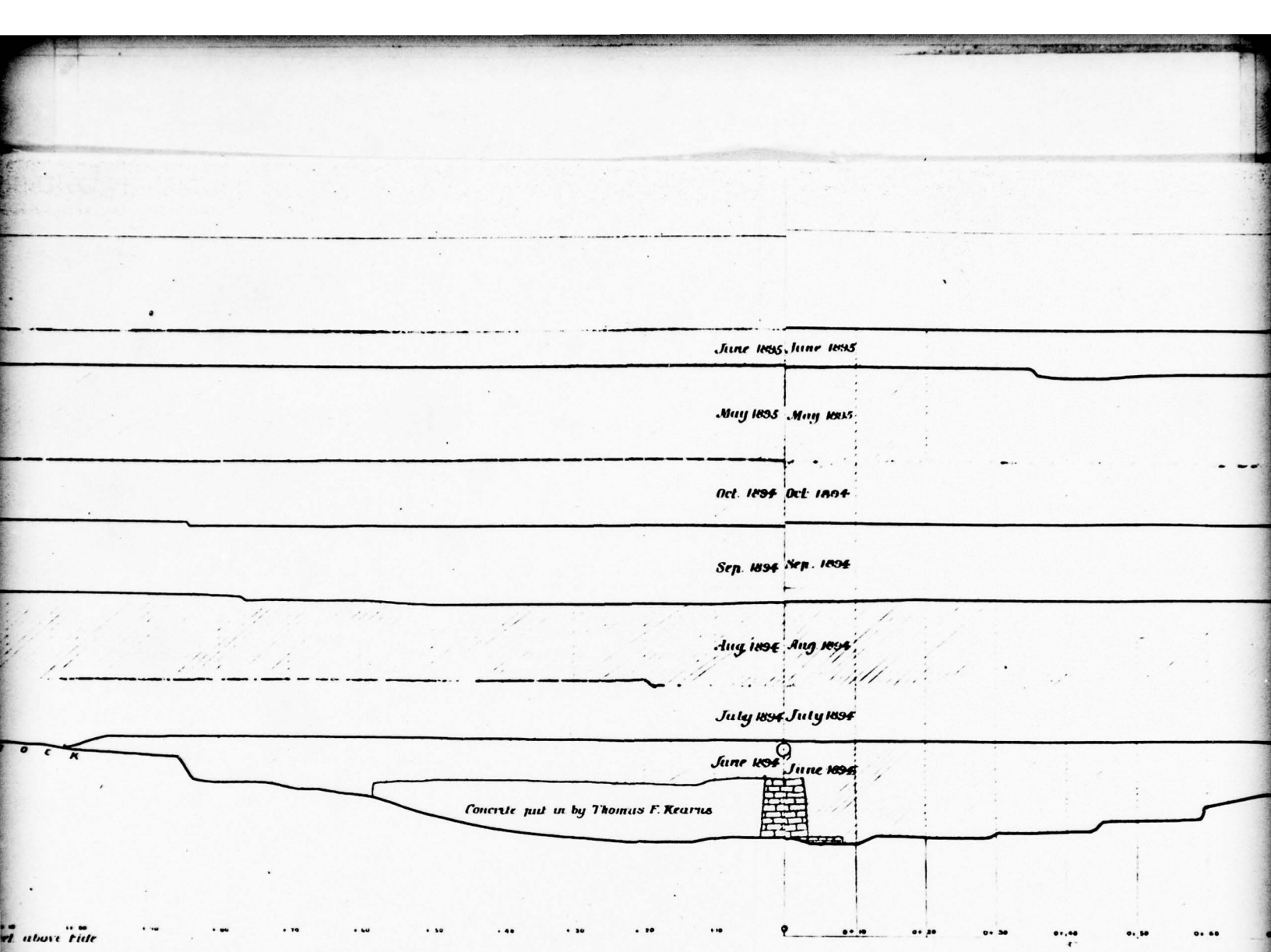


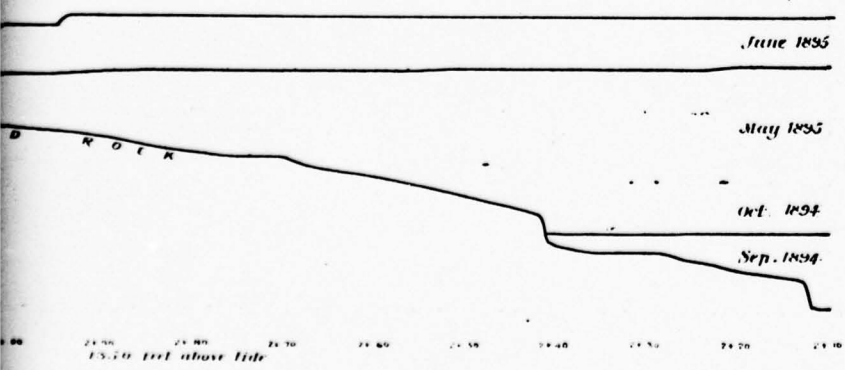
KAUFFMAN'S RUN DAM

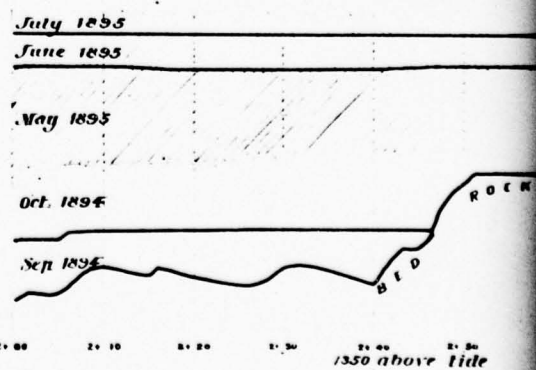
— Pottsville Water Co. —

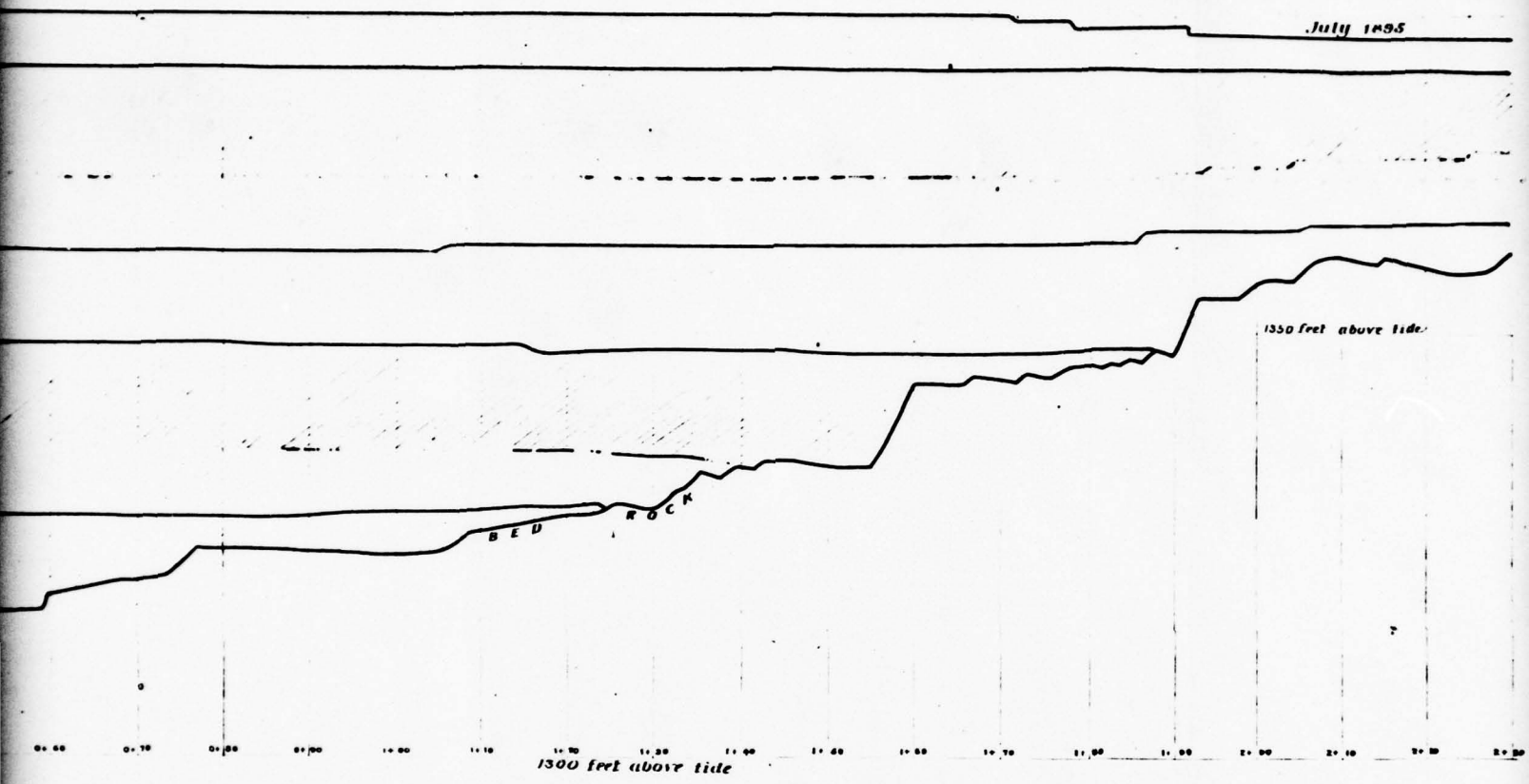
LONGITUDINAL SECTION OF CONCRETE SOUTH OF PIPE WALL

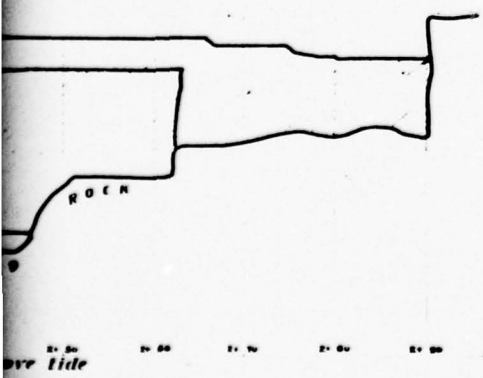
Scale 10 feet per inch Jan. 1896 J.B. Cochran & Son Engineers











KAUFFMAN'S RUN DAM

Pittsville Water Co.

LONGITUDINAL SECTION OF CONCRETE NORTH OF PIPE WALL

Scale 10 feet per inch Jan. 1896 A.B. Cochran & Son Engineers

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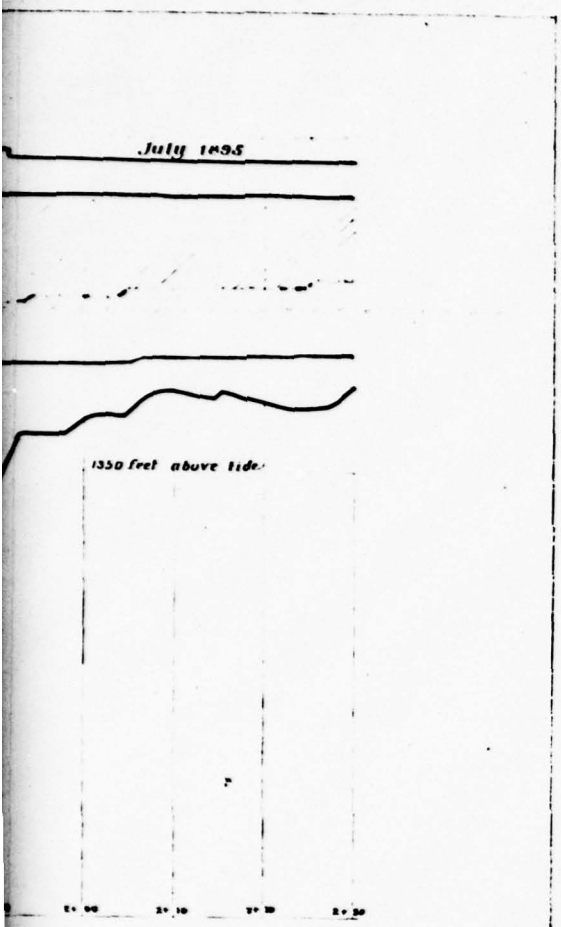
AUGUST 19



DAM

TH OF PIPE WALL

R. Cochran & Son

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

KAUFFMAN DAM

SCHUYLKILL COUNTY MUNICIPAL AUTHORITY

PROFILE

AUGUST 1978 PLATE 4

4

DELAWARE RIVER BASIN

KAUFFMAN RUN, SCHUYLKILL COUNTY

PENNSYLVANIA

KAUFFMAN DAM

NDS ID No. PA-00691
DER ID No. 54-54

SCHUYLKILL COUNTY MUNICIPAL AUTHORITY

PHASE I INSPECTION REPORT

NATIONAL DAM INSPECTION PROGRAM

AUGUST 1978

APPENDIX A

CHECKLIST - ENGINEERING DATA

CHECKLIST

ENGINEERING DATA

DESIGN, CONSTRUCTION, AND OPERATION
PHASE I

NAME OF DAM: Kauffman

NDS ID NO.: PA-00691 DER ID NO.: 54-54

ITEM	REMARKS
AS-BUILT DRAWINGS	Cross-section drawing of embankment as-built and construction drawings for repairs made to embankment in 1930.
REGIONAL VICINITY MAP	Project is shown on Shenandoah, Pennsylvania Quadrangel Sheet N4045-W7607.5/7.5, 1955 Photo revised 1969.
CONSTRUCTION HISTORY	Built 1894-1896 for the Pottsville Water Company. Designed by A. B. Cochran & Son, Engineers. Masonry constructed by Thomas F. Kerns.
TYPICAL SECTIONS OF DAM	Cross-section of embankment as-built and cross-sections and longitudinal section for repairs made to embankment in 1930.
OUTLETS: Plan Details Constraints Discharge Ratings	Outlet works plan and details shown on drawings for repairs made to embankment in 1930. No discharge ratings available.

ENGINEERING DATA

ITEM	REMARKS
RAINFALL/RESERVOIR RECORDS	None.
DESIGN REPORTS	None.
GEOLOGY REPORTS	Limited information in 1918 Water Supply Commission of Pennsylvania report.
DESIGN COMPUTATIONS: Hydrology and Hydraulics Dam Stability Seepage Studies	1918 spillway capacity estimate by W.S.C. of Pa. No stability or seepage studies.
MATERIALS INVESTIGATIONS: Boring Records Laboratory Field	Description of embankment material and construction methods in 1918 W.S.C. of Pa. report.
POSTCONSTRUCTION SURVEYS OF DAM	1930 survey to determine extent of settlement of embankment crest.

ENGINEERING DATA

ITEM	REMARKS
BORROW SOURCES	Unknown.
MONITORING SYSTEMS	None.
MODIFICATIONS	None.
HIGH POOL RECORDS	None.
POSTCONSTRUCTION ENGINEERING STUDIES AND REPORTS	1918 W.S.C. of Pa. report describes project and construction methods of project.
PRIOR ACCIDENTS OR FAILURE OF DAM: Description Reports	1930 the upstream half of the center of the embankment slipped when the reservoir was being drawn down to recover the body of a drowning victim. Plans for repair of the embankment available.

ENGINEERING DATA

ITEM	REMARKS
MAINTENANCE AND OPERATION RECORDS	No detailed operation records.
SPILLWAY: Plan Sections Details	Plan and cross-section of spillway on 1930 drawings for repair.
OPERATING EQUIPMENT: Plans Details	Plan and description of gate valves and conduits on 1930 repair drawings. No details available.
PREVIOUS INSPECTIONS Dates Deficiencies (Continued on page A-5)	1918: Initial inspection and description by Commonwealth. Seepage indicated at pipe drain from spring. 1922: No deficiencies noted. 1924: (By Owner) very slight, clear seepage in bottom center of embankment; relaid heaves in slope paving on downstream slope of embankment. 1926: Slight seepage below valve house. June 1930: Upstream half of embankment has settled over a length of about 300 feet so that over a width of 6 feet from the center, the embankment is about one foot low, while the next 5 feet are about 2.5 feet low - there are open cracks over this legth of embankment, one being at the upstream edge of embankment and the other at a distance of 5 feet toward the center; a stream of fair size emerges at a point about 50 feet downstream from the toe; some loose rocks in spillway channel.

ITEM	REMARKS
PREVIOUS INSPECTIONS (Continued from page A-4)	Dec. 1930: Crest is soft where recently repaired; slight erosion in wasteway channel. 1931: Small flow visible under large timber box about 75 feet below the toe of the dam. 1934: Scattered brush, two years old, on downstream face; small flow under timber tank in old channel below the toe; light brush in spillway approach and spillway. 1935: Small flows of water near the toe; weeds and brush growing in the spillway approach; small earth bars have formed in the spillway approach; spillway crest uneven - right end slightly lower than left. 1938: Bulges in riprap near toe of dam; small stream in blowoff channel to right of blowoff pipe; some weeds in spillway approach - also small earth bars; spillway crest uneven. 1941: Small brush on upstream face and downstream face; bulged riprap along toe; no apparent seepage; brush in spillway approach, spillway, and wasteway channel. 1942: Crest of Embankment is 12 inches lower than top of abutment; settlement and slides have caused the riprap to buckle on the downstream slope; considerable seepage in spillway floor; considerable seepage about 100 feet below the toe of slope in the center of the dam. 1945: Same as 1942, except that seepage was not observed in spillway floor due to the elevation of the water. 1962: Seepage near outlet in outlet channel; trees and brush in wasteway channel. 1971: Little brush in spillway approach. 1972: Dam crest needs grading and minor rebuilding; some brush and weeds at crest on upstream face; rock facing has slipped and should be rebuilt on downstream face - downstream face is steep - approx. 1:1; weed growth in spillway channel; no wet or spongy areas seen at lower toe.

CHECKLIST

ENGINEERING DATA

HYDROLOGY AND HYDRAULICS

NAME OF DAM: Kauffman NDS ID NO.: PA-00691 DER ID NO.: 54-54

ELEVATION TOP NORMAL POOL (STORAGE CAPACITY): El. 1386.0

ELEVATION TOP FLOOD CONTROL POOL (STORAGE CAPACITY): El. 1390.7

ELEVATION MAXIMUM DESIGN POOL: El. 1390.7

ELEVATION TOP DAM: El. 1390.7

SPILLWAY CREST:
- a. Elevation 1386.0
- b. Type Open channel excavated to solid material
- c. Width 3.0 feet
- d. Length 34 feet
- e. Location Spillover Right abutment
- f. Number and Type of Gates None

OUTLET WORKS:
- a. Type Cast-iron pipe through rubble masonry wall
- b. Location Near middle of embankment in old streambed
- c. Entrance Inverts El. 1330.5
- d. Exit Inverts El. 1324.0
- e. Emergency Draindown Facilities 24" diameter cast-iron pipe

HYDROMETEOROLOGICAL GAGES:
- a. Type None
- b. Location None
- c. Records None

MAXIMUM NONDAMAGING DISCHARGE: 840 cfs

DELAWARE RIVER BASIN

KAUFFMAN RUN, SCHUYLKILL COUNTY

PENNSYLVANIA

KAUFFMAN DAM

NDS ID No. PA-00691
DER ID No. 54-54

SCHUYLKILL COUNTY MUNICIPAL AUTHORITY

PHASE I INSPECTION REPORT

NATIONAL DAM INSPECTION PROGRAM

AUGUST 1978

APPENDIX B

CHECKLIST - VISUAL INSPECTION

CHECKLIST

VISUAL INSPECTION

PHASE I

Name of Dam: Kauffman County: Schuylkill State: Pennsylvania

NDS ID No.: PA-00691 DER ID No.: 54-54

Type of Dam: Earth with concrete core wall Hazard Category: High

Date(s) Inspection: 18-19 July 1978 Weather: Partly cloudy, hot & humid Temperature: 85°F

Camera 1: Canon FTb with 35 mm lens and Kodachrome 64 color slide film

Camera 2: Minolta SR-T 101 with 28 mm lens and Plus-X black and white print film

Pool Elevation at Time of Inspection: 1382.9 msl/Tailwater at Time of Inspection: 1323.2 msl

General Soil Condition: Dry

Inspection Personnel:

A. H. Whitman, Jr. (GFCC)	T. Stank (SCMA)	
D. R. Ebersole (GFCC)		
E. Hecker (NAB)		

J. M. Crouse (GFCC) Recorder

EMBANKMENT

Sheet 1 of 2

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SURFACE CRACKS	Upstream and downstream slopes are rock lined. No surface cracks on crest.	
UNUSUAL MOVEMENT OR CRACKING AT OR BEYOND THE TOE	See Riprap Failures below.	
SLOUGHING OR EROSION: Embankment Slopes Abutment Slopes	See Riprap Failures below.	
CREST ALIGNMENT: Vertical Horizontal	Vertical: alignment uneven. Horizontal: no irregularities.	Top of dam elevation varies from 1390.7 to 1391.5.
RIPRAP FAILURES	Sliding and bulging of riprap on downstream face around lower portion of embankment at several places. Typical bulge is 15" high, 5' wide and 15' long.	Brush of 3-foot height over 90% of the downstream slope of embankment. Sporadic brush 1-foot high on upstream slope of embankment.

EMBANKMENT

Sheet 2 of 2

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
JUNCTION OF EMBANKMENT WITH: Abutment Spillway Other Features	Large, mature trees, 120 feet high immediately below downstream toe of embankment. Dead, decaying 40-foot tree and other dead tree limbs on downstream slope of embankment near right abutment.	Coal found at left abutment 100 feet below dam.
ANY NOTICEABLE SEEPAGE	Seepage from around outlet pipe and from area about 10 feet to right of outlet.	Seepage is clear. Total discharge about 20 gpm. Seepage drains into old streambed channel.
STAFF GAGE AND RECORDER	None.	
DRAINS	4" drain from springs in bottom of core wall trench shown on 1930 repair plans. Drain outlet 35 feet to right of 24" blowoff.	Drain not found during inspection but a 4" drain was found 10 feet to left of blowoff. No discharge from drain.

OUTLET WORKS

Sheet 1 of 1

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CRACKING AND SPALLING OF CONCRETE SURFACES IN OUTLET CONDUIT	Outlet conduit is cast-iron pipe.	
INTAKE STRUCTURE	Intake structure was submerged. Condition is unknown.	
OUTLET STRUCTURE	Valve house contains two 24" valves and one 12" valve. Upstream 24" valve and 12" water supply valve normally open. Downstream 24" valve normally closed. Concrete roof of valve house was cracked and deteriorated over 30% of roof area.	Water supply regulation is obtained by operating two valves about 50 feet downstream of valve house. Masonry block joints of valve house need repointing. Scars of bullet holes were observed in valve house door.
OUTLET CHANNEL	Dry masonry headwall for 24" outlet was completely deteriorated and needs rebuilding.	a 50-foot tree had fallen and was decaying in the outlet channel immediately below the headwall.
EMERGENCY GATE	Two men opened downstream 24" valve in 20 minutes. All valves had been lubricated.	Improper valve operator was stored at valve house. Proper valve operator was borrowed from Tar Run Dam, but was well-rusted.

UNGATED SPILLWAY

Sheet 1 of 1

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
MASONRY WEIR	The masonry spillway weir is almost completely covered with weeds and brush.	Average weed and brush height is two feet.
APPROACH CHANNEL	Weeds were growing in the approach channel from the spillway crest up to 50 feet upstream of the crest. At several random points, the approach channel is higher than the masonry spillway crest.	The relatively flat spillway approach channel has permitted sediments to build up.
DISCHARGE CHANNEL	Weeds were growing in the discharge channel from the masonry spillway weir to a concrete weir 84 feet downstream of the masonry weir.	An eight-foot wide clear channel carries low discharges.
BRIDGE AND PIERS	None.	

INSTRUMENTATION

Sheet 1 of 1

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
MONUMENTATION/SURVEYS	None.	
OBSERVATION WELLS	None.	
WEIRS	A concrete weir had been constructed 84 feet downstream of the masonry weir, apparently to enable measurements of spillway channel flows.	The Owner said that measurements were no longer made at the concrete weir. Concrete weir may influence discharge capacity of spillway.
PIEZOMETERS	None.	
OTHER	None.	

RESERVOIR AND WATERSHED

Sheet 1 of 1

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SLOPES	Steep to moderate slopes; no evidence of creep, rock slides, or land slides.	
SEDIMENTATION	No sediment problem reported by Owner.	
WATERSHED DESCRIPTION	Predominately controlled and forested; minor development.	A proposed shopping mall would effect a small portion of the watershed.

DOWNSTREAM CHANNEL

Sheet 1 of 1

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONDITION: Obstructions Debris Other	The channel below the spillway was excavated to rock for some distance downstream of the concrete weir. After that, it appears that the discharge was permitted to carve its own way back to the natural streambed of Kauffman Run.	
SLOPES	Downstream channel is quite steep.	
APPROXIMATE NUMBER OF HOMES AND POPULATION	There is an asphalt plant about 0.2 mile downstream of the dam.	

DELAWARE RIVER BASIN

KAUFFMAN RUN, SCHUYLKILL COUNTY

PENNSYLVANIA

KAUFFMAN DAM

NDS ID No. PA-00691
DER ID No. 54-54

SCHUYLKILL COUNTY MUNICIPAL AUTHORITY

PHASE I INSPECTION REPORT

NATIONAL DAM INSPECTION PROGRAM

AUGUST 1978

APPENDIX C

HYDROLOGY AND HYDRAULICS

GANNETT FLEMING CORDDRY AND CARPENTER, INC.
HARRISBURG, PA.

SUBJECT KAUFFMAN DAM (54-54) FILE NO. 7613.20
HYDROLOGY AND HYDRAULICS ANALYSIS SHEET NO. 1 OF 6 SHEETS
FOR USCE - BALTIMORE DISTRICT
COMPUTED BY JAC DATE 8/4/78 CHECKED BY [illegible] DATE 9/7

CLASSIFICATION

HIGH HAZARD, SINCE DOWNSTREAM POPULATION IS SUBSTANTIAL, AND FAILURE OF THE DAM COULD RESULT IN MORE THAN A FEW LIVES LOST AND EXCESSIVE ECONOMIC LOSS

INTERMEDIATE SIZE, SINCE HEIGHT = 68 FEET AND CAPACITY = 413 AC-FT
REFERENCE: "RECOMMENDED GUIDELINES FOR SAFETY INSPECTION OF DAMS," p. D-8

SPILLWAY DESIGN FLOOD (SDF)

THE SDF SHOULD BE THE PMF (FROM p. D-12 OF "REC. GUIDELINES ...")

HYDROLOGY AND HYDRAULICS ANALYSIS

REFERENCE: PHASE I PROCEDURE PACKAGE

II. A. 2. PMF INFLOW HYDROGRAPH NOT AVAILABLE

a. BALTIMORE CONTACT, MIKE KANOWITZ, RECOMMENDS 1,700 CSM FOR THE PMF PEAK FLOW FOR THE KAUFFMAN DAM WATERSHED

PMF PEAK = 1,700 CFS/SQ.MI. x 0.88 SQ. MI. = 1,496 - SAY 1,500 CFS ✓

EFFECT OF UPSTREAM RESERVOIRS

NO UPSTREAM RESERVOIRS EXIST

B. ABILITY OF SPILLWAY TO PASS PMF

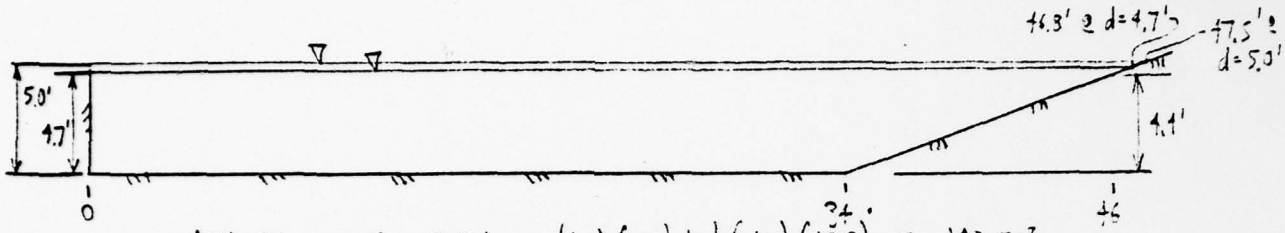
1. CAPACITY OF SPILLWAY —

DESIGN TOP OF DAM ELEV.	=	1391.0' ✓
ACTUAL TOP OF DAM ELEV.	=	1390.7' ✓
SPILLWAY CREST ELEVATION	=	1386.0' ✓
DESIGN HEAD ON SPILLWAY	=	5.0' ✓
AVAILABLE HEAD ON SPILLWAY	=	4.7' ✓

SINCE THE APPROACH CHANNEL IS NEARLY FLAT AND IS APPROXIMATELY AT THE SAME ELEVATION AS THE SPILLWAY WEIR, USE A COEFFICIENT OF DISCHARGE (C) OF 2.7

$Q = C L H^{3/2}$; $Q = 2.7 L H^{3/2}$

CREST LENGTH, L = AREA / DEPTH = A / 4.7 FOR EXISTING CONDITION
= A / 5.0 FOR DESIGN CONDITION



AREA FOR EXISTING CONDITION = $(4.7)(34) + \frac{1}{2}(4.7)(12.3) = 190$ FT²
AREA FOR DESIGN CONDITION = $(5.0)(34) + \frac{1}{2}(5.0)(13.5) = 204$ FT²

CREST LENGTH FOR EXISTING CONDITION = $A/d = 190/4.7 = 40.4$ FT
CREST LENGTH FOR DESIGN CONDITION = $A/d = 204/5.0 = 40.8$ FT.

DISCHARGE FOR EXISTING CONDITION = $Q = 2.7\ L\ H^{3/2} = 2.7(40.4)(4.7)^{3/2} = 1,111$ - SAY 1,110 CFS
DISCHARGE FOR DESIGN CONDITION = $Q = 2.7\ L\ H^{3/2} = 2.7(40.8)(5.0)^{3/2} = 1,232$ - SAY 1,230 CFS

3. THE PMF PEAK FLOW IS GREATER THAN THE SPILLWAY CAPACITY (1,500 > 1,110)
   b. ROUTING OF THE PMF IS NOT AVAILABLE
      (1.) THE SPILLWAY WILL PASS (1,110/1,500) = 0.740 = p = 74.0% OF THE PMF PEAK
      (2.) INCLUDE 3 METHOD TO ESTIMATE THE STORAGE EFFECT OF THE RESERVOIR
         (a) TRIANGULAR SHAPE FOR PMF HYDROGRAPH
         (b) ASSUME 24 INCHES OF RUNOFF AS PER INSTRUCTIONS FROM BALTIMORE CONTACT
         VOL = $\frac{1}{2}bh$; $b = 2\,VOL/h$
         VOL = 24" RUNOFF × 0.88 SQ. MI. × 640 ACRES/SQ. MI. = 13,517 AC-IN
         13,517 AC-IN × 1 FT/12 IN × 43,560 FT²-HR/3,600 AC-SEC = 13,629 CFS-HRS
         $b = \frac{2\,VOL}{h} = \frac{2 \times 13,629\ CFS\text{-}HRS}{1,500\ CFS} = 18.2$ HOURS

         $1-p = 1 - 0.740 = 0.260 = \Delta AOC/\Delta AOB$
         $\Delta AOB = \frac{1}{2}bh = VOL = 13,517$ AC-IN × (1 FT/12 IN) = 1,126 AC-FT
         SUBSTITUTING, $\Delta AOC = (1-p)\,\Delta AOB = 0.260\,(1,126) = 293$ AC-FT
         REQUIRED STORAGE = ΔAOC = 293 AC-FT.
         (c) INCREMENTAL STORAGE AVAILABLE BETWEEN NORMAL POOL ELEVATION AND MAXIMUM POOL ELEVATION
         NORMAL POOL ELEVATION = SPILLWAY CREST ELEVATION = 1336.0'
         MAXIMUM POOL ELEVATION = ELEVATION OF OVERTOPPING = 1390.7'

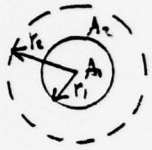
AREA OF RESERVOIR WITH W.S. AT SPILLWAY CREST = 19.2 ACRES.
AREA OF RESERVOIR WITH W.S. AT MAXIMUM POOL = ?

ASSUME RESERVOIR SIDE SLOPES OF 4H ON 1V AND ASSUME CIRCULAR SHAPE

$19.2 \text{ ACRES} \times 43{,}560 \text{ FT}^2/1 \text{ ACRE} = \pi r_1^2$

$266{,}219 \text{ FT}^2 = r_1^2$

$r_1 = 516.0 \text{ FT}.$



$r_2 = r_1 + \Delta H = r_1 + 4(\Delta V) = r_1 + 4(4.7') = 516.0 + 18.8 = 534.8'$

$A_2 = \pi r_2^2 - \pi (534.8')^2 = 898{,}530 \text{ FT}^2$

$A_2 = 20.6 \text{ ACRES}.$

$\text{INCREMENTAL STORAGE} = \left(\frac{A_1 + A_2}{2}\right) \Delta V = \left(\frac{19.2 + 20.6}{2}\right) 4.7'$

INCREMENTAL STORAGE = 94 AC-FT.

STORAGE REQUIRED = 203 AC-FT > STORAGE AVAILABLE = 94 AC-FT.

C. PROCEDURES FOR DETERMINATION OF ADEQUATE / INADEQUATE SPILLWAY CAPACITY

2. STORAGE REQUIRED FOR THE PMF IS GREATER THAN THE STORAGE AVAILABLE

a. ETL 1110-2- STATES THREE CONDITIONS THAT MUST EXIST BEFORE THE SPILLWAY CAPACITY IS CONSIDERED TO BE SERIOUSLY INADEQUATE. CHECK CONDITION "C." (IS THE SPILLWAY ABLE TO PASS ½ PMF W/O OVERTOPPING FAILURE ?)

b. REPEAT CALCULATIONS FOR ½ PMF PEAK

½ PMF PEAK = ½(1,500) = 750 CFS.

II. B. ABILITY OF SPILLWAY TO PASS ½ PMF

1. CAPACITY OF SPILLWAY = 1,110 CFS

2. ½ PMF FLOW IS LESS THAN THE SPILLWAY CAPACITY (750 < 1,110)

a. NO SPILLWAY ROUTING FOR ½ PMF IS NECESSARY

b. THE DAM CAN BE ASSUMED TO BE ABLE TO PASS ½ PMF WITHOUT OVERTOPPING ✓

II. C. 2. c. TAILWATER AT INSTANT BEFORE OVERTOPPING OCCURS

SPILLWAY CAPACITY DISCHARGE = 1,110 CFS. FROM HEC-2 COMPUTER RUN USING

A USGS TOPO SHEET CROSS-SECTION DOWNSTREAM OF DAM,

TAILWATER DEPTH @ Q = 1,110 CFS IS 4.1 FEET
TOP OF DAM ELEVATION = 1391'
HEIGHT OF DAM = 71'
BOTTOM OF DAM ELEV. = 1323.1
TAILWATER DEPTH = 4.1'
TAILWATER ELEVATION = 1327.2' USE 1327.0 FOR Q = 940
TOP OF DAM ELEV. − TAILWATER ELEV. = 1391' − 1327.' = 64'

PERCENT OF PMF THAT SPILLWAY CAN PASS
GENERAL FORMULA

$$\%\text{ OF PMF THAT SPILLWAY CAN PASS} = \frac{Q_T}{Q_{PMF}} \times 100\%,$$

WHERE $Q_T = Q_{SPILLWAY} + 2S/\Delta t$,

$S = \sum_{i=1}^{n} S_i$ FOR UPSTREAM RESERVOIR CASES,

AND T = TOTAL TIME OF PMF HYDROGRAPH

$$\%\text{ OF PMF} = \frac{1,110 + \left(\frac{2 \times 94\ \text{AC-FT}}{18.2\ \text{HOURS}} \times \frac{43,560\ \text{FT}^2\text{-HRS}}{3,600\ \text{AC-SECS}}\right)}{1,500} \times 100\%$$

$$= \frac{1,110 + 125}{1,500} \times 100\% = \frac{1235}{1500} \times 100\%$$

% OF PMF = 82 % (EXISTING CONDITIONS)

SPILLWAY CAPACITY THAT COULD BE REALIZED IF THE EMBANKMENT ELEVATION WERE BROUGHT UP TO THE DESIGN ELEVATION

$$\%\text{ OF PMF} = \frac{1,230 + 137.}{1,500} \times 100\% \approx \frac{1370}{1500} \times 100\%$$

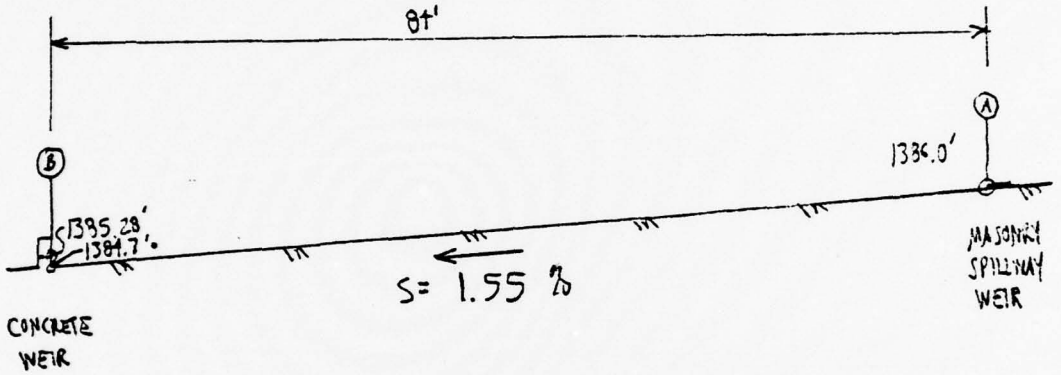
% OF PMF = 91 % (DESIGN CONDITIONS)

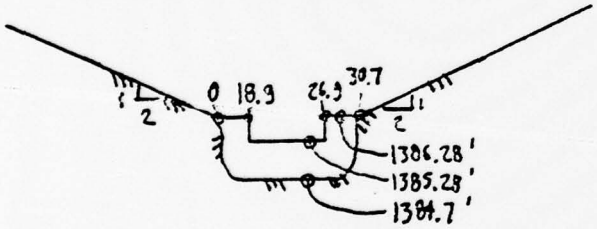
C-4

SP 11860A

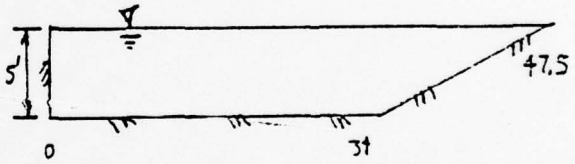
SPILLWAY CONTROL SECTION

DURING THE VISUAL INSPECTION OF KAUFFMAN DAM, IT WAS NOTED THAT THE HYDRAULIC CONTROL SECTION OF THE SPILLWAY CHANNEL MAY SHIFT FROM THE MASONRY SPILLWAY WEIR TO THE CONCRETE WEIR THAT IS APPROXIMATELY 84 FEET DOWNSTREAM OF THE MASONRY SPILLWAY WEIR. CHECK THE ENERGY REQUIRED AT THE DOWNSTREAM SECTION TO PASS THE DESIGN CONDITION DISCHARGE WITH THE RESERVOIR WATER SURFACE ELEVATION TO DETERMINE IF AN OBVIOUS SUBMERGENCE OF THE SPILLWAY WEIR EXISTS.





(B) AT CONCRETE WEIR



(A) AT MASONRY SPILLWAY WEIR

DEPTH OF FLOW AT (A), DESIGN Q = 1,230 CFS

SECTION IS NEARLY RECTANGULAR — SAY SECTION IS RECTANGULAR AND WIDTH ≈ 40', ASSUME $n = 0.035$

$$E = y + \frac{V^2}{2g} = 1391.0 - 1386.0 = 5.0' = y + \frac{Q^2}{y^2(2g)(40)^2} = y + \frac{14.7}{y^2}$$

$y = 4.15'$, $A = (4.15)(40) = 166\ ft^2$ $V = Q/A = 7.41$ fps

$V^2/2g = 0.85$ ft, $P = 4.15 + 34 + 11.34 = 50.09'$, $R = 3.31'$

$$S_f = \frac{V^2 n^2}{1.486^2 R^{4/3}} = \frac{(7.41)^2 (0.035)^2}{1.486^2 (3.31)^{4/3}} = 0.0062 \text{ FT/FT}$$

ASSUME CRITICAL DEPTH AT (B) AND DETERMINE WATER SURFACE ELEVATION

$$\frac{A^3}{B} = \frac{Q^2}{g}$$ (FOR NON-RECTANGULAR SECTION, p. 51, HENDERSON, OPEN CHANNEL FLOW)

$A^3/B = 1{,}230^2 / 32.2 = 46{,}984$

TRY $B = 46.7'$, $A = (8)(1) + (30.7)(4) + (2)(\frac{1}{2})(8)(4) = 162.8\ ft^2$
$A^3/B = 92{,}395$

TRY $B = 42.7'$, $A = 8 + (30.7)(3) + (2)(\frac{1}{2})(6)(3) = 118.1\ ft^2$
$A^3/B = 38{,}576$

TRY $B = 43.7'$, $A = 8 + (30.7)(3.25) + (2)(\frac{1}{2})(6.5)(3.25) = 123.9\ ft^2$
$A^3/B = 49{,}009$

$B \approx 43.5'$, $A^3 = 2{,}043{,}804$, $A = 127\ ft^2$

$d_c = 4.2'$, $V_{dc} = 1{,}230 / 127 = 9.69\ fps$

$E_{CRIT} = 1.5\, d_c = 1.5(4.2) = 6.3'$

$P = 7.16 + 18.9 + 1.0 + 8.0 + 1.0 + 3.8 + 7.16 = 47.02'$, $R = 2.70'$

$$S_f = \frac{V^2 n^2}{1.486^2 R^{4/3}} = \frac{(9.69)^2 (0.035)^2}{1.486^2 (2.70)^{4/3}} = 0.0139\ FT/FT$$

AVERAGE HEAD LOSS = $\frac{\text{SLOPE AT (A)} + \text{SLOPE AT (B)}}{2} \times \text{REACH DIST.} = \left(\frac{0.0062 + 0.0139}{2}\right) 84'$
$= 0.84\ FT$

HEAD AVAILABLE AT DOWNSTREAM SECTION = $1391.0' - 0.84' = 1390.16'$
$1390.16' - 1385.23 = 4.93'$

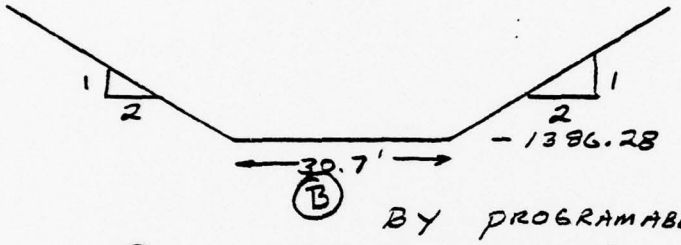
MINIMUM ENERGY REQUIRED AT CONCRETE WEIR = $6.3'$

∴ THE SPILLWAY DISCHARGE CAPACITY WILL BE REDUCED BY THE EFFECTS OF THE CONCRETE WEIR THAT IS 84 FEET DOWNSTREAM OF THE MASONRY SPILLWAY WEIR.

GANNETT FLEMING CORDDRY AND CARPENTER, INC.
HARRISBURG, PA.

SUBJECT KAUFFMAN DAM FILE NO.
SHEET NO. 6A OF 6 SHEETS
FOR
COMPUTED BY AHW DATE 8/15/78 CHECKED BY DATE

IN VIEW OF RESULTS A MORE ACCURATE DETERMINATION OF WATER SURFACE IS REQUIRED AT CONCRETE WEIR (B) 84 FEET downstream OF THE SPILLWAY WEIR



ASSUMED SECTION

BY PROGRAMABLE CALCULATOR

Q	W.S. AT CRITICAL depth	EGL AT CRITICAL depth
~~700~~	~~2.39 + 1386.28 = 1388.67~~	~~3.45 + 1386.28 = 1389.73~~
1200	3.35	1389.63	4.77	1391.05
1100	3.18	1389.46	4.54	1390.81
1000	2.99	1389.27	4.28	1390.56
900	2.80	1389.08	4.02	1390.30
800	2.60	1388.88	3.74	1390.02
700	2.39	1388.67	3.45	1389.73

AT SECTION (A) BY BACKWATER USING
$n = .035$ $C_{CONTRACTION} = 0.1$ $C_{EXPANSION} = 0.3$

H/Hc	Q	W.S.	depth	EG = POOL EL
	1200	1391.09	5.09	1391.6
	1100	1390.87	4.87	1391.43
	1000	1390.64	4.64	1391.17
	900	1390.42		1390.89
	800	1390.16		1390.59
	700			

INTERPOLATE FOR DESIGN Q & ELEV
1391.0 ≈ 940 CFS

INTERPOLATE FOR EXISTING Q & ELEV
1390.7 ≈ 840 CFS

SP 11860A

GANNETT FLEMING CORDDRY AND CARPENTER, INC.
HARRISBURG, PA.

SUBJECT KAUFFMAN DAM FILE NO.
SHEET NO. 6B OF 6 SHEETS
FOR
COMPUTED BY A HNT DATE 3/15/78 CHECKED BY DATE

	EXISTING	DESIGN
	840 CFS	940 CFS
FROM PAGE C-4 CFS OF EQUIVALENT STORAGE	125	137
Σ	965	1077 SAY 1080 CFS
% OF PMF PEAK OF 1,500 CFS	64.3%	72% - USE DESIGN

USE 64% - USE EXISTING

CONCLUSIONS: THE CONCRETE WEIR DOWNSTREAM OF THE SPILLWAY WEIR IS A CONTROL. HOWEVER THIS SECTION IS ONLY APPROXIMATE. FURTHERMORE, THE CHANNEL DOWNSTREAM OF THE CONCRETE WEIR IS NARROW WITH HEAVILY WOODED OVERBANKS. THIS COULD CREATE A FURTHER BACKWATER EFFECT.

RECOMMENDATIONS: FURTHER STUDY TO MORE ACCURATELY DETERMINE CAPACITY

DELAWARE RIVER BASIN

KAUFFMAN RUN, SCHUYLKILL COUNTY

PENNSYLVANIA

KAUFFMAN DAM

NDS ID No. PA-00691
DER ID No. 54-54

SCHUYLIILL COUNTY MUNICIPAL AUTHORITY

PHASE I INSPECTION REPORT

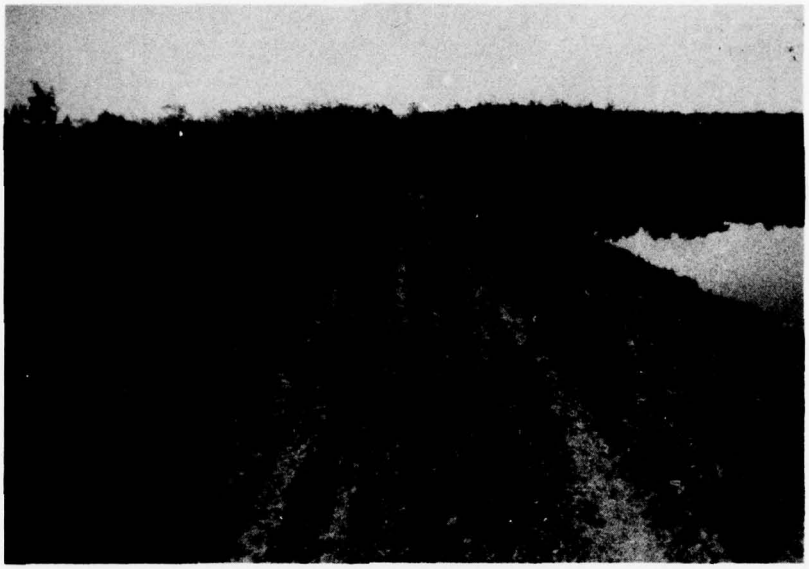
NATIONAL DAM INSPECTION PROGRAM

AUGUST 1978

APPENDIX D

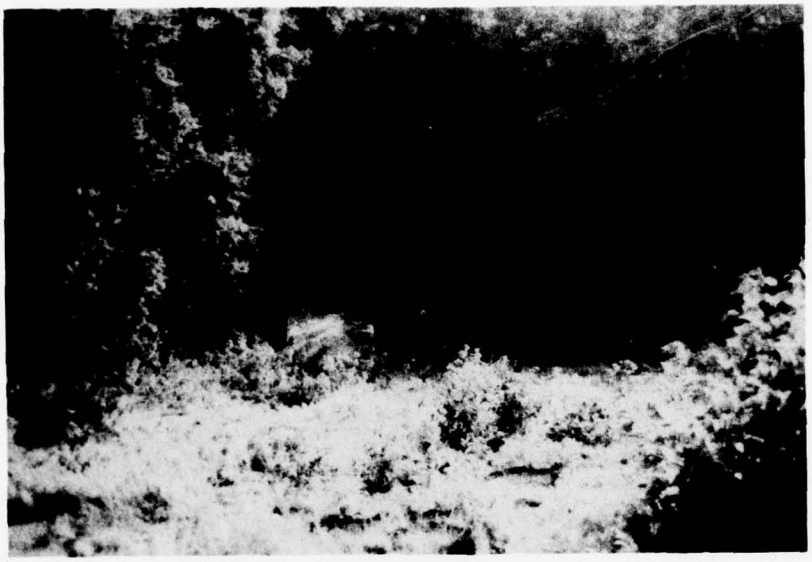
PHOTOGRAPHS

KAUFFMAN DAM



A. Embankment from Left Abutment.

B. Downstream Slope of Embankment from Left Abutment.



C. Valve House at Downstream Toe of Embankment and Downstream Conditions.

D. Bulge of Riprap Immediately Above Valve House.

E. Spillway Approach Channel — Looking Downstream.

F. Brush on Masonry Spillway Weir — Flow from Right to Left.

G. Spillway Outlet Channel —
Looking Downstream Towards Concrete Weir.

H. Spillway Outlet Channel Below Concrete Weir —
Looking Downstream.

I. Spillway Outlet Channel —
Looking Downstream Towards Kauffman Run.

J. Valve House at Toe of Downstream Slope of Embankment.

K. Outlet Works Headwall from Valve House.

L. Outlet Works Headwall — Looking Upstream.

DELAWARE RIVER BASIN

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APPENDIX E

GEOLOGY

KAUFFMAN DAM

APPENDIX E

GEOLOGY

1. General Geology. The dam and reservoir are located in Schuylkill County. The county lies entirely south of the Wisconsin and Illinoian drift borders. The Jerseyan drift border is believed to traverse the middle of the county, but very few definite deposits of drift have been located. The rock formations exposed in Schuylkill County range from the post-Pottsville formations, of Pennsylvania age, down to the Tuscarora sandstone, of Silurian age. The youngest formations, the post-Pottsville, crop out in the large Southern anthracite field and part of the Western Middle field. The oldest formation, the Tuscarora, crops out along Kittatinny (Blue) Mountain which forms the southern boundary of the county.

The geologic structure of Schuylkill County is complex. The strata have been sharply folded along northeast axes, and the truncated hard and soft beds now form an intricate system of long narrow ridges and valleys. The carboniferous rocks suffer the most intense folding and are overturned in many places. The most important structure feature economically is the large synclinorium of the Southern anthracite field which occupies the center of the county. This basin consists of a number of smaller connected basins, which become successively deeper and have steeper sides as they progress towards the south. In the southern part of the county, the Silurian and Devonian rocks have been folded for some distance on both sides of the Schuylkill River. An anticline passes eastward from Cressona, exposing the Cayuga group and part of the Clinton formation. A syncline extending west from Landingville exposes the Catskill group. The Lehighton anticline of Carbon County extends into Schuylkill County as far as Reynolds. The ridge north of Port Clinton is an anticlinal ridge exposing the Clinton formation, and a syncline crosses the Schuylkill River just north of Port Clinton exposing the Cayuga group.

The geology produces a complex runoff pattern in Schuylkill County whereby there is drainage in five different directions. The northwestern part is drained by Mahantango Creek, and smaller streams,

all of which drain into the Susquehanna River north of Harrisburg. The southwestern part is drained by Swatara Creek, which drains into the Susquehanna River south of Harrisburg. The northernmost part is drained by Catawissa Creek, which drains into the North Branch of the Susquehanna River upstream of Danville. The eastern portion of the county is drained by tributaries of the Lehigh River, which, in turn, drains into the Delaware River near Easton. The central and greater part of the county is drained by tributaries of the Schuylkill River, which, in turn, drains into the Delaware River near Philadelphia.

2. Site Geology. The damsite is underlain by gray, soft, disintegrated pebble conglomerate interbedded with hard, red, sandy shale stratifications of the Mauch Chunk formation in the highly faulted and folded Southern anthracite field in the center of the county. The area is drained by the Schuylkill River. The axis of an anticline called Eisenhuth anticline follows the approximate original streambed through the damsite and reservoir. The axis of the Boston syncline is located about 1/2 mile to the left of the Eisenhuth anticline; while the Reservoir syncline is located about 1/2 mile to the right of the Eisenhuth anticline. Two major faults, Mill Creek fault and Broad Mountain fault, pass through the reservoir and intersect each other about 500 feet to the right of the damsite. No effects from the faults were reported as being found during construction of the dam.

It was necessary to excavate through about 10 feet of disintegrated conglomerate in order to found the cutoff trench, along the axis of dam, on hard red shale. The trench was filled with concrete and served as a foundation for the concrete core wall that extended to 3 feet below the top of embankment.