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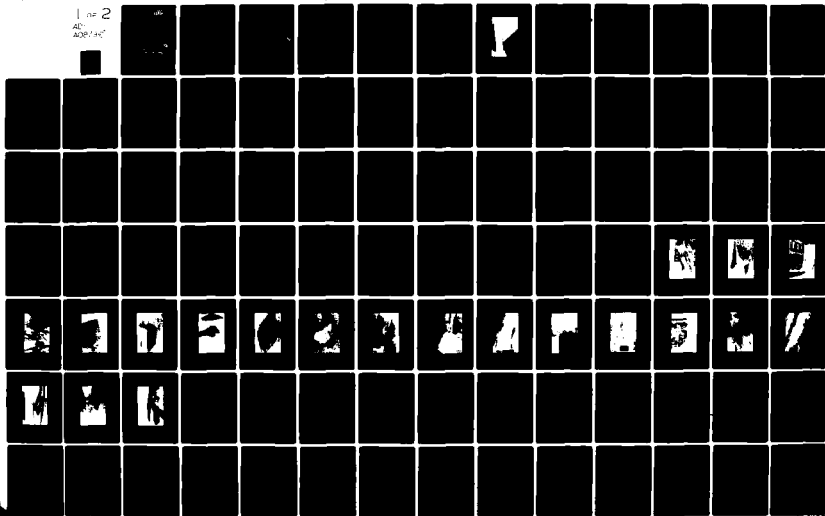
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NATIONAL DAM INSPECTION PROGRAM. LOWER OWL CREEK DAM (NDS ID NU--ETC(U)
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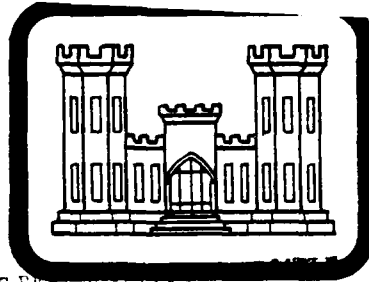
**DELAWARE RIVER BASIN
OWL CREEK, SCHUYLKILL COUNTY**

**PENNSYLVANIA
NDS ID PA. 00674
DER ID 54-2**

LOWER OWL CREEK DAM

**PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM**

✓ WOODWARD-CLYDE CONSULTANTS
✓ DACW31-80-C-0018



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⑥ National Dam Inspection Program
Lower Owl Creek Dam

DELAWARE RIVER BASIN

Owl Creek

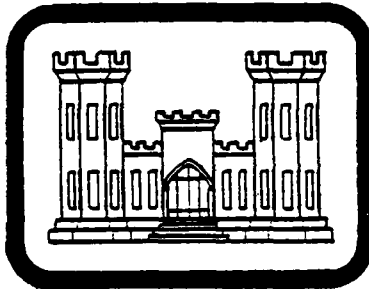
~~LOWER OWL CREEK DAM~~, SCHUYLKILL COUNTY,
PENNSYLVANIA

(NDS I.D. NO. PA 00674,
DER I.D. NO. 54-2)

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PHASE I INSPECTION REPORT,
NATIONAL DAM INSPECTION PROGRAM

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Prepared by:

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Submitted to:

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

JUNE 1980

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PREFACE

This report is prepared under guidance contained in the Recommended Guidelines for Safety Inspection of Dams for Phase I Investigations. Copies of these guidelines may be obtained from the Office of the Chief of Engineers, Washington, D.C. 20314. The purpose of a Phase I investigation is to expeditiously identify those dams which may pose hazards to human life or property. The assessment of the general condition of the dam is based upon available data and visual inspections. Detailed investigations, testing and detailed computational evaluations are beyond the scope of a Phase I investigation; however, the investigation is intended to identify the need for more detailed studies.

In reviewing this report, it should be realized that the reported condition of the dam is based on observations of field conditions at the time of inspection along with data available to the inspection team. In cases where the reservoir was lowered or drained prior to inspection, such action, while improving the stability and safety of the dam, removes the normal load on the structure and may obscure certain conditions which might otherwise be detectable if inspected under the normal operating environment of the structure.

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

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

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PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

Name of Dam: Lower Owl Creek Dam
County Located: Schuylkill County
State Located: Pennsylvania
Stream: Owl Creek
Coordinates: Latitude 40° 47.5'
Longitude 75° 56.1'
Date of Inspection: May 6, 1980

Lower Owl Creek Dam is owned by the Borough of Tamaqua, and the reservoir is used for water supply purposes. The original dam was built in 1882 or 1883, and several major renovations have been performed since, the latest being in 1928. The visual inspection disclosed that the emergency spillway has been partially filled in. The embankment is currently in good condition, and the siphon spillway is in fair condition.

In accordance with criteria established by Federal (OCE) Guidelines, the recommended spillway design flood for this "Small" size dam and "High" hazard classification is one-half to the full Probable Maximum Flood (PMF). The one-half PMF has been selected as the spillway design flood.

Hydrologic and hydraulic computations presented in Appendix D indicate that the combined siphon and emergency spillway structures are capable of discharging about 21 percent of the PMF without overtopping the embankment under existing conditions. If the emergency spillway was restored to its original condition, the spillway systems would be capable of discharging about 59 percent of the PMF without overtopping the embankment. As the structure will not pass the spillway design flood under existing conditions and is not assessed to fail during one-half the PMF, the spillway is considered to be "Inadequate" but not "Seriously Inadequate".

The following recommendations are presented in order of priority, but this does not infer that the latter recommendations are not important.

- (1) A hydrologic/hydraulic study should be made to determine the best method of increasing the spillway capacity to meet current hydrologic and hydraulic criteria. This work should be performed under the supervision of a registered professional engineer experienced in the design and construction of dams.

LOWER OWL CREEK DAM, NDS I.D. No. PA 00674

- (2) All pipes through the embankment should be fitted with an upstream closure device. All gate valves should be operated and lubricated periodically. This is to insure that they are operational if needed.
- (3) The interior of the siphon spillway tubes should be inspected for deteriorating concrete. This work should be performed under the supervision of a registered professional engineer experienced in the design and construction of dams.
- (4) The deteriorated exposed concrete of the control house wall and spillway structure should be repaired.
- (5) The seepage noted in the discharge channel and at the downstream end should be monitored for the development of turbidity or increased amounts.

Because of the potential for property damage in the event of failure, a formal procedure of observation and warning during periods of high precipitation should be developed and implemented for this facility. This procedure should include a method of warning downstream residents if high flows are expected and provisions for evacuating these people in the event of an emergency. It is recommended that an operation and maintenance manual be developed, including a checklist of items to be inspected regularly. It is further recommended that this manual include provisions for the maintenance of embankment vegetation in the best possible condition.

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6/30/80
Date

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6/30/80
Date

APPROVED BY:

[Signature]

31 July 1980
Date



OVERVIEW
LOWER OWL CREEK DAM, SCHUYLKILL COUNTY, PENNSYLVANIA

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PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM
LOWER OWL CREEK DAM
NATIONAL ID NO. PA 00674
DER NO. 54-2

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. Lower Owl Creek Dam is an earthen embankment, approximately 33 feet high, across Owl Creek. The 850 foot long dam impounds an estimated 160 acre-foot reservoir within a 1.99 square mile drainage basin. The present dam was constructed in 1928, by placing an embankment over and around a previously existing structure, which consists of the original rubble masonry dam, concrete wall, upstream and downstream embankments, and concrete spillway. A second concrete core wall was constructed at the upstream toe of the present dam and extends into the foundation rock and soil to a maximum depth of about 30 feet, as noted in a 1928 memorandum prepared by a state engineer after a visit to the site during construction. Pressure grouting was performed in the rock foundation area at the right end of the dam and to the left of the spillway. It is unknown if the grout curtain extends the full length of the dam. Both upstream and downstream embankment slopes are 2H:1V, the upstream embankment slope is protected with hand placed riprap to the top, shown on a 1928 photograph, and the crest is 16.5 feet wide. The dam deflects 90 degrees upstream to the right of the spillway, as shown on Plate 3, Appendix E. A 110 foot wide, 2.5 foot deep emergency spillway was constructed at the left end of the dam. It has since been filled in to a minimum depth of 1.4 feet. The minimum elevation of the top of the dam is about 1,061.4, and 1,060.4 is the minimum elevation in the vicinity of the emergency spillway.

A concrete spillway structure is located near the right end of the dam. In its present configuration, the spillway has one siphon tube and three tubes that have been modified to act as overflow weirs at elevation 1,058.0. Originally, all four tubes were constructed as siphons. The spillway is shown in Photograph 3, Appendix C. The spillway tubes discharge into a concrete basin that is drained through a 12 inch diameter pipe beneath the channel slab to a discharge point downstream. During large spillway flows, water ponds in this area so that a stilling basin is developed. The invert of the stilling basin rises approximately three feet before discharging into a masonry lined channel approximately 70 feet long, which outlets into Owl Creek. There are presently no other spillway facilities at the dam.

The control building is located to the right of the spillway. A 14 inch intake pipe conducts water to screen chambers. The treated water line exits through the downstream side of the control building, crosses the spillway channel, and continues to Tamaqua. Near the left side of the control building, a ten inch pipe crosses the corner of the building, discharging into the stilling basin (Photograph 3). A gate valve is located inside the control building with the intake adjacent to the supply line intake, shown in photographs in Department of Environmental Resources (DER) files. On the left side of the spillway channel at the downstream toe is a valve pit containing a gate valve. A 12 inch pipe from the pit discharges into the spillway channel (Photograph 13).

b. Location. The dam is located approximately 1.5 miles east of the intersection of Owl Creek Road and U.S. Route 309 in Rahn Township, Schuylkill County, Pennsylvania. The dam site and reservoir are shown on the USGS Quadrangle entitled "Tamaqua, Pennsylvania" at coordinates N 40° 47.5' W 75° 56.1'. A regional location plan is enclosed as Plate 1, Appendix E.

c. Size Classification. The dam is classified as a "Small" size structure by virtue of its 33 foot height and estimated 271 acre-foot total storage capacity.

d. Hazard Classification. In the event of a failure, a "High" hazard classification is assigned to the structure consistent with the potential for extensive property damage and possible loss of life along Owl Creek between the dam and the little Schuylkill River, about 1.5 miles downstream.

e. Ownership. The dam is owned by Tamaqua Borough Authority. All correspondence should be addressed to the Authority at 320 East Broad Street, Tamaqua, Pennsylvania 18252.

f. Purpose of Dam. The dam is used to provide a reservoir for water supply.

g. Design and Construction History. The original Lower Owl Creek Dam was constructed in 1882 or 1883, and consisted of a dry rubble retaining wall and upstream earth embankment. The wall was constructed with a five foot top width, a vertical downstream face and a 1H:6V upstream face. The wall was based on original ground, and the embankment was loose dumped earth placed against the upstream face. The embankment had a five foot wide crest and an upstream slope of 1.5H:1V. The rubble wall is shown on drawings to be at about the center of the present dam, with the top elevation of the rubble wall being approximately eight feet below the present dam crest (Plate 3, Appendix E).

Shortly after filling the reservoir, there was considerable seepage beneath the dam, especially in the vicinity of the right abutment. In an attempt to correct the seepage in 1902, a vertical concrete wall was built through the dam in line with the upstream edge of the crest of the dam from the right abutment to just south of the spillway on "solid shale". The spillway of the old dam was located at about the present spillway location. This additional construction had no effect on the seepage beneath the dam.

In 1904, distress was noted in the rubble wall, and an unreinforced concrete wall was constructed seven feet downstream from the face of the rubble wall. The concrete wall extended 100 feet to the right from the rubble wall and 15 to 20 feet into the right abutment shale. It was reported that the 550 foot long wall was founded on red shale in the right abutment and spillway area, and upon yellow clay throughout the rest of the length of the dam. The space between the rubble wall and the concrete wall was then filled with clay puddle, and rock fill was placed downstream of the wall. A new 19 foot wide, free overflow spillway with training walls was constructed by placing a concrete slab from the concrete wall to the upstream face of the dam. Construction work was stopped pending a decision on a new spillway location, leaving the downstream wing walls of the spillway unbuilt and the downstream embankment against the unreinforced concrete wall only partially completed. It was reported that the concrete construction was less than the quality associated with then current standards.

The concrete wall prevented seepage from exiting the dam right of the spillway, but considerable seepage continued around the spillway and at several locations along the length of the dam, indicating water was entering the right end of the dam and flowing along the rubble wall before exiting. Various

repair measures were attempted, especially in 1913. Also at about this time, a large crack opened in the unreinforced concrete wall to the left of the spillway, with outward movement of the wall. Temporary timber bracing was installed at the state's direction. The state also directed, as temporary repairs, that an emergency spillway be installed and plans and specifications be prepared for permanent repairs. In 1914, a 36 foot wide emergency overflow spillway was excavated in the left end of the embankment.

At this time, the following conduits passed through the dam. A 16 inch water supply line was located ten feet right of the spillway, having a ten inch tee blowoff 14 feet below the crest. An eight inch blowoff was located between the spillway and the supply line. A ten inch blowoff, 20 feet below the spillway crest, was located left of the spillway. No cutoffs were provided and all of the blowoffs were gated downstream of the dam.

Throughout the subsequent years, state inspection reports noted substantial seepage, yearly progressive deterioration and lack of maintenance of the dam. Occasional attempts were made to alleviate the seepage problem, but no substantial improvement was reported. These inspection reports also noted progressive settlement of the dam, particularly the puddled core.

In 1919, a new dam was constructed across Owl Creek, located 3,500 feet upstream of the existing dam. In March 1927, preliminary plans were submitted to the state for extensive repairs to the existing dam, which included raising the dam breast by about six feet, a dike at the right abutment to tie the raised embankment to natural ground, a concrete cutoff wall at the upstream toe, foundation grouting, a siphon spillway and an emergency spillway. In 1928, construction was started on the reconstruction of Lower Owl Creek Dam. Drawings and construction specifications were prepared by J. H. & W. L. Lance of Wilkes Barre, Pennsylvania. Specified changes to piping through the dam were the replacement of the original water supply line and relocation of the ten inch blowoff. No mention was made of the above noted eight inch blowoff. Periodic inspection reports by state personnel during the construction work are also available in DER files. Throughout these documents the contractor is not identified; however, reference is made to Mr. Yu Hsien Huang as the resident engineer for construction. Based upon the reports in DER files, it appears that the construction was generally performed in accordance with the project plans. In addition to the features discussed in Section 1.2, paragraph a, a dike was constructed across a low area of the right abutment and upstream of the dam axis. Of particular note is the grouting

that is briefly mentioned in the inspection reports, but is not shown on any of the drawings. Sections in the specifications indicate that grout pipes were to be spaced five feet on center and the grout holes were to be drilled 15 feet into the rock. The drawings also indicate that an emergency spillway, 110 feet wide with a crest 2.5 feet below the dam crest, was to be built at the left end of the dam embankment. However, there is no indication of a discharge channel on the downstream side of the emergency spillway. Towards the end of the construction season, concern was expressed in some of the reports about the possible incorporation of frozen material into the earth fill. Although the contractor took precautions against inclusion of frozen material, some was included in the embankment fill. Apparently at this time, the embankment was within several feet of finished elevation at the right end. A May 8, 1929 construction report noted that the embankment was practically completed.

The 1930 inspection report in DER files subsequent to the dam reconstruction noted seepage at the toe of the dam and particularly around the siphon spillway structure. Test borings were being made to determine the source of leakage. A 1931 inspection observed that the seepage appeared to have stopped except in the vicinity of the siphon spillway. The 1934 inspection report referred to a flood the previous year after which the seepage rate increased. Grouting was subsequently performed so that at the time of the report, the seepage at the embankment toe was reduced, but still continued in the vicinity of the siphon spillway.

Apparently during the 1933 flood, the discharge channel downstream of the siphon spillway was damaged. The siphon was subsequently modified so that three of the four tubes were vented with grates placed in the top slab of the spillway structure and no longer operated as siphons. A restriction was placed in the throat of the fourth siphon tube, reducing its area by one-half, and a grate was installed to vent this siphon at a level approximately 14 inches below the normal pool of the dam.

Subsequent inspection reports reported no major changes to the dam. A measuring V-weir below the siphon spillway is noted with measurements and estimates of seepage quantity. Photographs taken in 1962 show the presence of the emergency spillway at the left end of the embankment, but no discharge channel below the spillway. A photograph taken in 1971 at the left abutment is not labeled as "emergency spillway", but does show a depressed area. Photographs included in this report and the visual inspection indicate more fill has been added in the emergency spillway area. The photographs also show progressive deterioration of the concrete around the siphon spillway structure.

h. Normal Operating Procedures. Under normal operating procedures, water is discharged through the control house and routed to the principal customer, Atlas Powder Company. Excess flow of water passes through the siphon spillway and is discharged into Owl Creek. When necessary, water is supplied to the distribution system of Tamaqua Borough.

1.3 Pertinent Data.

A summary of pertinent data for Lower Owl Creek Dam and reservoir is presented as follows.

| | | |
|----|--|----------|
| a. | Drainage Area (square miles) | 1.99 |
| b. | Discharge at Dam Site (cfs) | |
| | Siphon Spillway | |
| | Existing Conditions (1,061.4) | 275 |
| | Design Conditions (1,061.5) | 290 |
| | Emergency Spillway | |
| | Existing, Crest at 1,060.2 | 280 |
| | Design, Crest at 1,059.0 | 1,875 |
| | Maximum Flood, 1955* | 280 |
| c. | Elevations (feet above MSL) ⁽¹⁾ | |
| | Top of Dam | |
| | Minimum Existing Crest | |
| | Elevation | 1,061.4 |
| | Design Crest Elevation | 1,061.5 |
| | Emergency Spillway Crest | |
| | Design | 1,059.0 |
| | Existing | 1,060.4 |
| | Spillway Weir Crest (normal pool) ⁽¹⁾ | 1,058.0 |
| | Stilling Basin Floor | 1,028 |
| | Spillay Channel Level Section | 1,032.0 |
| | 12 Inch Pipe Outlet Invert | 1,024.2± |
| | Tailwater (5/6/80) | 1,024.6± |
| | Stream Bed | 1,022.9± |
| | 10 Inch Blowoff Outlet | 1,035.0± |
| | 12 Inch Blowoff Outlet | 1,031.1± |
| d. | Reservoir (feet) | |
| | Length at Normal Pool | 2,800 |
| | Length at Maximum Pool | 3,300 |

* As reported in the Phase I Inspection Report on Upper Owl Creek Dam, February 1979

(1) Spillway crest elevation assumed to be 1,058 from USGS map. All other elevations are relative to this elevation.

| | | |
|----|---------------------------------------|--|
| e. | Storage (acre-feet) | |
| | Normal Pool | 160 |
| | Top of Dam | 271 |
| f. | Reservoir Surface (acres) | |
| | Normal Pool | 29 |
| g. | Dam Data | |
| | Type | Earth with concrete cutoff & core walls |
| | Length | 620 feet |
| | Height | 33 feet |
| | Crest Width | |
| | Dam | 16.5 feet |
| | Dike | 20 feet |
| | Volume | 17,000 cubic yards |
| | Side Slopes | |
| | Upstream (design) | 2H:1V |
| | Upstream (existing, above water line) | 2H:1V |
| | Downstream (design) | 2H:1V |
| | Downstream (existing) | 2H:1V |
| | Cutoff | Concrete wall at upstream toe of slope extending 30 feet (maximum) into foundation rock and soil |
| | Grout Curtain | In rock at right end of dam along core wall |
| h. | Spillway | |
| | Type | Three closed tubes, one siphon tube |
| | Size | Three closed tubes: 3.75' wide x 2.5' high; siphon tube: 1.88' (assumed) x 2.5' high |
| | Location | Near right abutment |
| i. | Outlet works* | |
| | Located In Control House | |
| | 14 Inch Water Supply Line | |
| | Inlet Invert | Unknown |
| | Outlet Invert | N/A |

* Note: All conduits through the embankment are controlled at the downstream end.

| | |
|-------------------------------|----------------------|
| 10 Inch Blowoff | |
| Inlet Invert | Same as water supply |
| | invert |
| Outlet Invert | 1,037.5± |
| Located Through Embankment to | |
| Left of the Concrete Spillway | |
| 12 Inch Blowoff | |
| Inlet Invert | Unknown |
| Outlet Invert | 1,032± |

SECTION 2
ENGINEERING DATA

2.1 Design.

a. Availability. A summary of the engineering data is presented on the checklist attached as Appendix B. Principal documents containing pertinent data used for this report include the "Report Upon the Investigation of the Owl Creek Dam of the Tamaqua Water Works" on April 3, 1914, design drawings, construction specifications, state inspection reports and photographs, and miscellaneous correspondence.

b. Design Features. A plan view of the dam, profile and a maximum section are presented in Appendix E. A summary of the design features is included in Section 1.3.

2.2 Construction.

Construction data are limited to state construction reports.

2.3 Operational Data.

There are no operational records maintained for this dam.

2.4 Evaluation.

a. Availability. All information presented herein was obtained from Department of Environmental Resources files and supplemented by conversations with the owner's representative.

b. Adequacy. The available data are not adequate to evaluate the engineering aspects of this dam. The presently existing discharge works and the present spillway configuration are not fully documented.

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

SECTION 3
VISUAL INSPECTION

3.1 Findings.

a. General. The observations and comments of the field inspection team are contained in the checklist presented in Appendix A and are summarized and evaluated in the following subsections. In general, the embankment appears to be in good condition and the exposed portions of the spillway appear to be in fair condition.

b. Dam. The vertical alignment of the dam crest was checked, and the profile is shown on sheet 5B, Appendix A. The crest elevation ranges from 1,061.4 to 1,061.9 as compared with an original design elevation of 1,061.5. The apparent low point along the crest (1,060.4) is the emergency spillway at the left end of the embankment, which was filled to the nominal crest elevation from its design elevation of 1,059.0 by recent grading operations, as shown in Photographs 5 and 7, Appendix C. The horizontal dry stone paving is visible at the upstream edge. No evidence of a downstream channel to carry flow away from the dam toe was observed, although a cutoff wall under the downstream edge of the crest would prevent flow from eroding through the dam at that point. The upstream slope is covered with a layer of hand placed riprap that, as shown in Photograph 6, appears to be in good condition. As shown in Photograph 8, the crest of the dam is protected by a thin layer of bituminous pavement. Occasional cracks were observed in the pavement and the owner's representative reported ruts had recently been repaired, indicating a softened subgrade. The low freeboard and clay core indicate capillary action as the possible cause of subgrade softening. The downstream face of the dam, as shown in Photograph 8, is covered with a miscellaneous thin growth of grass, weeds and vines. The vegetation appeared to be in only fair condition. Small trees and brush have been cut, but new growth has started. A small localized depression was noted on the downstream face of the embankment, which resulted from the removal of a bush. It is reported that the embankment is burned at least once a year to remove undesirable growth. The downstream slope was measured to be about 2H:1V, and the crest measured 16.5 feet.

The riprap on the upstream face, at the abutments of the dam, is carried around to the banks of the reservoir. At the right abutment, the riprap extends almost to the old well house located approximately 300 feet upstream from the dam. This entire area appears to have been generally filled in so

that there is an indistinct indication of the limits of the dike fill that was placed during the dam reconstruction.

On the downstream face of the dam, there is evidence of previous minor erosion to the left of the spillway retaining wall and erosion under the steps along the side of the control house, as shown on Photograph 17. Additional minor erosion was noted in the vicinity of the chlorine tank installed on the downstream face of the dam to the right of the control house; see Photograph 16. A small minor gully was noted at the downstream toe near the left end. Two small burrows were also noted on the downstream slope. There was no evidence of seepage noted along the downstream toe of the dam. However, there were occasional patches of vegetation observed that are believed to be associated with damp to marshy soil conditions.

c. Appurtenant Structures.

1. Spillway. As previously discussed in Section 1.2, paragraph g, the spillway was initially constructed as a siphon spillway containing four tubes. The spillway was subsequently modified so that three of the tubes no longer function as a siphon, and the fourth tube was constricted and may still function as a siphon. The top slab of the spillway structure is approximately flush with the crest of the dam and contains the three grates that were added to vent the siphon tubes and preclude siphon development (priming). The spillway intake is an underwater structure at normal pool elevation. As shown on Photographs 2 and 15, the concrete is in generally good condition, although there is some spalling around the corners of the structure. The discharge area of the spillway shows evidence of moderate to severe concrete deterioration and spalling, as shown in Photographs 3, 11 and 12, so that the reinforcing steel is exposed and rusted. An accumulation of concrete aggregate in the stilling basin under the tube adjacent to the left spillway retaining wall indicates possible concrete deterioration inside the tube. The left spillway retaining wall is in generally good condition. However, the right spillway wall is part of the control house structure and contains localized areas of severe concrete deterioration, as shown on Photographs 3, 9 and 10. "Weep" pipes were installed near the junction of the control building and spillway. Three were dry and the lowest one was dripping at the time of the inspection.

From the base of the spillway, the discharge channel invert rises in elevation approximately three feet and then enters a curved channel that is constructed of masonry walls and grouted stone paving. As shown in Photograph 13, the original left wing wall of the spillway has been increased in

height and transitioned into the masonry channel wall. A minor amount of seepage was observed in this left-hand channel wall, as shown in Photographs 13 and 14. A 12 inch pipe runs beneath the spillway channel from the grated inlet at the base of the spillway to discharge approximately 150 feet downstream, as shown in Photograph 4. At this point, there was observed to be water flowing from beneath the base slab of the spillway. The spillway discharge channel appears to be in generally good condition. A footbridge and the treated water line cross the channel.

2. Outlet Works. Outlet works were observed to consist of a 12 inch diameter blowoff pipe that discharges into the spillway channel through the left wall, as shown in Photograph 13. Discharge through this line is controlled by a gate valve located in a pit at the downstream toe of the dam, as also shown in Photograph 13. At the time of the inspection, no water was flowing through the blowoff, nor was the valve exercised. The valve has not been exercised for several years. It is noted that a ten inch diameter blowoff was identified as being in this area of the dam in 1914. On the right-hand spillway channel wall, as shown on Photograph 3, two pipes exit through the control building. The pipe to the right is the ten inch blowoff controlled by a valve within the control building. The pipe to the left is the screen chamber cleanout.

d. Reservoir. Reservoir side slopes were observed to be flat to moderate and vegetated with primarily coniferous trees to the water's edge. No sediment accumulation was observed at the upper end of the reservoir. No debris was noted along the reservoir edge.

e. Downstream Channel. The downstream channel appears to be in generally good condition. The channel flows in a fairly narrow stream valley with a gradient of about 0.017. About 1.6 miles downstream from the dam, Owl Creek enters a complex of unoccupied factory buildings (used for storage), a partially burned ice plant, an unoccupied house and two occupied mobile homes. Immediately upstream of the buildings is a small pond. Outflow from this area is restricted by a culvert (Photograph 20). Owl Creek then flows through a culvert beneath an abandoned railroad embankment and U.S. Route 309. The culvert discharges Owl Creek into the Little Schuylkill River.

3.2 Evaluation.

In summary, the visual inspection of the dam disclosed no evidence of apparent past or present movement

that would indicate existing instability of the dam. The vegetation is considered to be only in fair condition.

It was noted that the spillway has been modified from its original design and that the emergency spillway at the left end of the dam has been filled in. The influence of these conditions is further evaluated in Section 5 of this report.

The exposed portions of the concrete spillway and discharge channel structures were found to be in generally fair condition. Localized areas of the concrete in the spillway structure were found to be in poor condition, but are not believed to be so serious as to be presently affecting the integrity of the structures. However, these should be repaired as part of the routine maintenance of the structure. The possibility of more extensive concrete deterioration within the tubes should be investigated.

The blowoff gate valves should be exercised and lubricated on a routine basis. All pipes through the dam should be fitted with upstream closure devices. The seepage noted in the discharge channel and at its downstream end has apparently been occurring for a number of years. This small amount of seepage does not appear to be indicative of detrimental conditions.

SECTION 4
OPERATIONAL PROCEDURES

4.1 Procedures.

Lower Owl Creek Dam together with Upper Owl Creek Dam and Still Creek Reservoir, located approximately five miles north of Owl Creek, provide water for the Borough of Tamaqua. Water from Upper and Lower Owl Creek Dams is used primarily by an industrial user, Atlas Powder Company, although it can be fed into the distribution system of the borough itself. Normal procedures call for maintaining a certain reservoir level in Lower Owl Creek Reservoir, either by discharging from Upper Owl Creek Dam or pumping from wells located adjacent to the reservoir. Water for the distribution system is withdrawn through the control house located immediately downstream of the dam. Excess flow is discharged through the siphon spillway adjacent to the control house.

4.2 Maintenance of the Dam.

Maintenance of the dam is provided by Tamaqua Borough employees. It is reported that the downstream embankment is burned off once a year to remove undesirable vegetation.

4.3 Maintenance of Operating Facilities.

Borough employees also provide maintenance for the operating facilities. All piping and controls located within the control building appeared to be in good condition and were painted. However, it was noted that the gate valve controlling the blow off, located within the control building, had not been exercised for a long time, nor had the gate valve located in the pit adjacent to the left spillway channel wall.

4.4 Warning Systems In Effect.

There are no formal warning systems or procedures established during periods of exceedingly heavy rainfalls.

4.5 Evaluation.

There are no written operational procedures, maintenance procedures or any type of warning system. Maintenance

and operating procedures should be developed, including a checklist of items to be observed, operated and inspected on a regular basis and provisions for adequate maintenance of embankment vegetation.

Since a formal warning procedure does not exist, one should be developed and implemented during periods of extreme rainfall. This procedure should contain a method of warning downstream residents that potentially high flows are imminent or dangerous conditions are developing.

SECTION 5
HYDROLOGY/HYDRAULICS

5.1 Evaluation of Features.

a. Design/Evaluation Data. There are no original design data available for this dam, although the state specified some hydrologic/hydraulic criteria to be used for the redesign in 1927. Evaluation calculations are located in state files. Evaluation data concerning Upper Owl Creek Dam are located in a Phase I Inspection report, also located in Department of Environmental Resources files.

The watershed is a small mountain watershed that is approximately rectangular in shape. The watershed is about 0.9 mile wide by about 2.4 miles long, having a total drainage area of 1.99 square miles. Elevations range from about 1,540 along the sides of the watershed to 1,058 at the normal pool level. Upper Owl Creek Dam is located less than 600 feet upstream of the upper end of Lower Owl Creek Reservoir. Upper Owl Creek Dam controls about 1.5 square miles of the total watershed. The total watershed is over 90 percent wooded with very little residential development. It is not expected that the runoff characteristics of the watershed will change significantly in the near future.

When plans for the major renovation of Lower Owl Creek Dam were being prepared in 1927, the state indicated that a maximum runoff of 1,325 cfs from the 2.7 square miles of drainage area should be used to design the spillway systems. The consulting engineer and borough were of the opinion that the siphon spillway would provide the necessary discharge capacity. However, at the request of the state, the design provided for an emergency spillway 110 feet long and 2.5 feet deep, which would provide for the discharge of 1,325 cfs. There are no design or evaluation data for the siphon spillway as it presently exists with the air vents in three of the tubes and the reduced throat area in the fourth. It is noted that the drainage area was reported to be 2.7 square miles instead of the currently measured 1.99 square miles.

In accordance with criteria established by Federal (OCE) Guidelines, the recommended spillway design flood for this "Small" size dam and "High" hazard classification is one-half to the full Probable Maximum Flood (PMF). Based on the relatively small total storage capacity of the reservoir and limited number of inhabited downstream residences, the one-half PMF event has been selected as the spillway design flood.

b. Experience Data. Reservoir level records are currently maintained by the water superintendent, but have been for only about the last three years. Rainfall records are not maintained for this watershed although they are maintained at Still Creek Reservoir, five miles north of Lower Owl Dam, which is also owned by the Borough of Tamaqua. The reported maximum discharge from Upper Owl Creek Dam of an estimated 280 cfs occurred in 1955.

c. Visual Observations. At the time of the inspection, there were no conditions observed that would indicate a reduced siphon spillway capacity during an extreme event. The emergency spillway has been filled in to a minimum depth of 1.2 feet. The surficial material is crushed stone, but it is reported that a thin bituminous pavement underlies the crushed stone. Other observations regarding the condition of the downstream channel, spillway and reservoir are located in Appendix A and discussed in greater detail in Section 3.

d. Overtopping Potential. The overtopping potential of this dam was estimated using the HEC-1, Dam Safety Version, computer program. A brief description of the program is included in Appendix D. The inflow to Lower Owl Reservoir is composed of the discharge of Upper Owl and runoff from the uncontrolled reservoir areas. The peak discharge during one-half the PMF is estimated by the computer program to be 1,693 cfs, and the inflow during the full PMF is estimated to be 4,421 cfs. Siphon spillways function as weirs until the siphons prime or the reservoir water level exceeds the elevation of the top of the conduit. The vents installed in three of the tubes prevent them from priming or functioning as siphons. The fourth tube is assumed to prime and function as a siphon, although the throat area is reported reduced to half the original area. The discharge through the siphon spillway is estimated to be 275 cfs with the reservoir at the minimum elevation of the dam (1,061.4 feet), and the discharge through the emergency spillway is estimated to be 280 cfs, assuming no erosion of the surficial materials. If the emergency spillway is returned to its design configuration, the discharge through it at the minimum reservoir elevation is estimated to be 1,875 cfs. Under present conditions, the spillway systems are estimated capable of discharging about 21 percent of the PMF without overtopping the embankment. If the emergency spillway is returned to its original configuration, the dam would be capable of discharging approximately 59 percent of the PMF without overtopping the embankment.

e. Spillway Adequacy. The spillway for this structure is considered to be "Inadequate" as it will not pass the spillway design storm, one-half the PMF, under existing conditions without overtopping the embankment. As the

embankment is not assessed to fail during the one-half PMF, the spillways are not considered "Seriously Inadequate".

f. Downstream Conditions. Owl Creek flows through a narrow wooded valley for about one mile. The initial valley gradient is 0.067, leveling to an average gradient of 0.017. The valley gradient then increases to 0.05 for the next 2,000 feet before the floodplain widens, as shown on Plate 1, Appendix E. About 1.6 miles downstream of the dam, discharge enters a complex of buildings, shown on Plate 1. Outflow from this complex is restricted by the culverts under the building, shown in Photograph 20. Normal flow in Owl Creek is conveyed under the buildings by a culvert, eight feet wide and 34 inches high, and a pipe culvert with a maximum diameter of 18 inches. Flows exceeding the culvert's capacity will flow over the road and through a series of four inlets into the culvert or passageway under the buildings. Immediately downstream of the buildings is the 14 foot wide culvert under the highway and railroad embankments, discharging immediately into the Little Schuylkill River. Large flows are expected to flood the small pond from the upstream end, and very large flows, such as resulting from failure of the dam, are expected to pond behind the buildings, railroad and highway embankment, damaging the factory buildings and occupied mobile homes. High flows in Little Schuylkill River could impede the discharge from this culvert, further causing ponding in the building area. Therefore, a "High" hazard potential classification is justified.

SECTION 6
STRUCTURAL STABILITY

6.1 Evaluation of Structural Stability.

a. Visual Observations. Visual observations indicated no evidence of existing or pending embankment instability. The riprap is assessed to provide adequate protection to the embankment against wave action.

The concrete retaining walls around the spillway structure are considered to be in good condition. The poor condition of the deteriorating concrete in the exposed portion of the spillway structure is assessed to not have a major influence upon the integrity of the structure at this time.

At the left end of the dam where recent grading has apparently filled in the emergency spillway, it is assessed that any overtopping event of the dam could initiate erosion at this point. Indications are that the dry stone paving is in place under the fill which, together with the cutoff wall under the downstream edge of the crest, would prevent serious erosion at this point. However, there is no channel to direct flow away from the downstream toe and erosion could occur there.

b. Design and Construction Data. There are no data documenting the design analysis for the dam that are known to be available. There are several sets of calculations in Department of Environmental Resources (DER) files regarding the spillway capacities and structural design of the spillway retaining wall. These calculations were made by state personnel as part of the review process when application was made for a permit to reconstruct this dam. All data concerning the physical features of the dam were obtained from the design drawings, inspection reports, and other correspondence in DER files and supplemented by visual observations.

c. Operating Procedures. No operating procedures currently exist other than work that is necessary to supply adequate water to the service area and to treat this water.

d. Post-Construction Changes. As previously noted, several post-construction changes were made to the dam and its appurtenances. The modifications to the siphon spillway were discussed in Section 1.2, paragraph g; however, there has been no evaluation of the effects of these changes upon the spillway capacity. Apparently, the emergency spillway at the left end of the dam embankment has been filled in, but there

is no documentation of this work having been done. Another change has been the construction of the masonry discharge channel below the spillway. Other than these, there have been no post-construction changes to the dam that would influence its stability or performance.

e. Embankment Stability. There were no embankment stability evaluations in the design drawings or in the files. Based on the visual observations and geometric configurations, the dam appears to be stable at the present time, provided that overtopping does not occur.

f. Seismic Stability. The 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 conditions. Since the dam is qualitatively assessed to be stable at the present time under static loading conditions, it can also reasonably be considered to be stable under seismic loading conditions.

SECTION 7
ASSESSMENT/REMEDIAL MEASURES

7.1 Dam Assessment.

a. Evaluation. Visual inspection of the dam embankment indicated that, although the vegetation is only in fair condition, the embankment is in good condition. Inspection of the exposed concrete surfaces of the spillway indicated that the spillway is in fair condition.

In accordance with criteria established by Federal (OCE) Guidelines, the recommended spillway design flood for this "Small" size dam and "High" hazard classification is one-half to the full Probable Maximum Flood (PMF). Based on the relatively small total storage capacity of the reservoir and limited number of inhabited residences, the one-half PMF event has been selected as the spillway design flood.

Hydrologic and hydraulic computations presented in Appendix D indicate that the siphon and emergency spillway structures are capable of discharging about 21 percent of the PMF without overtopping the embankment under existing conditions. If the emergency spillway was restored to its original condition, the spillway system should be capable of discharging about 59 percent of the PMF without overtopping the embankment. As the structure will not pass the spillway design flood under existing conditions and is not assessed to fail during one-half the PMF, the spillway is considered to be "Inadequate" but not "Seriously Inadequate".

b. Adequacy of Information. The information located in Department of Environmental Resources files when combined with the visual inspection and simplified calculations presented in Appendix D were sufficient to indicate that further investigations are required for this structure.

c. Urgency. It is recommended that the measures presented in Section 7.2 be implemented as specified.

7.2 Remedial Measures.

a. Facilities. The following recommendations are presented in order of priority, but this does not infer that the latter recommendations are not important.

- (1) A hydrologic/hydraulic study should be made to determine the best method of increasing the spillway

capacity to meet current hydrologic and hydraulic criteria. This work should be performed under the supervision of a registered professional engineer experienced in the design and construction of dams.

- (2) All pipes through the embankment should be fitted with an upstream closure device. All gate valves should be operated and lubricated periodically. This is to insure that they are operational if needed.
- (3) The interior of the siphon spillway tubes should be inspected for deteriorating concrete. This work should be performed under the supervision of a registered professional engineer experienced in the design and construction of dams.
- (4) The deteriorated exposed concrete of the control house wall and spillway structure should be repaired.
- (5) The seepage noted in the discharge channel and at the downstream end should be monitored for the development of turbidity or increased amounts.

b. Operation and Maintenance Procedures. Because of the potential for property damage in the event of failure, a formal procedure of observation and warning during periods of high precipitation should be developed and implemented for this facility. This procedure should include a method of warning downstream residents if high flows are expected and provisions for evacuating these people in the event of an emergency. It is recommended that an operation and maintenance manual be developed, including a checklist of items to be inspected regularly. It is further recommended that this manual include provisions for the maintenance of embankment vegetation in the best possible condition.

APPENDIX

A

CHECK LIST
VISUAL INSPECTION
PHASE I

Sheet 1 of 11

Name Dam Lower Owl County Schuylkill State Pennsylvania National ID # PA 00674
Type of Dam Earth Hazard Category High
Date(s) Inspection 5/6/80 Weather Sunny Temperature 70's

Pool Elevation at Time of Inspection 1058.3 M.S.L. Tailwater at Time of Inspection 1,024.6±M.S.L.

Inspection Personnel:

Mary F. Beck (Hydrologist) Vincent McKeever (Hydrologist)
Raymond S. Lambert (Geologist) John H. Frederick (5/15/80)
Richard E. Mabry (Geotechnical) Mary F. Beck Recorder

Remarks:

Mr. Roger Bunnell, Assistant Manager, Tamaqua Boro., and Mr. David Christ were on site and provided assistance to the inspection team.

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 | |

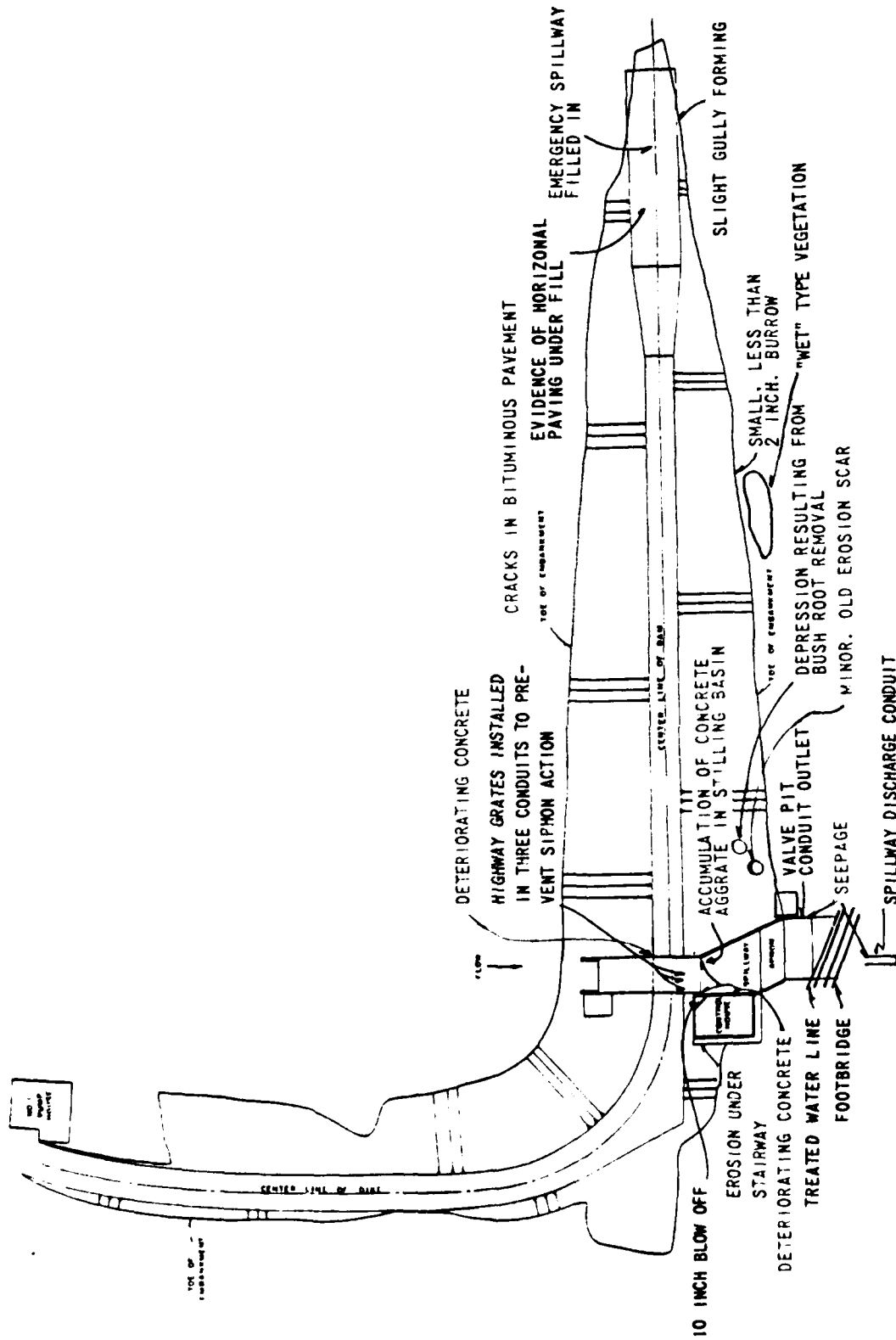
CONCRETE/MASONRY DAMS

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

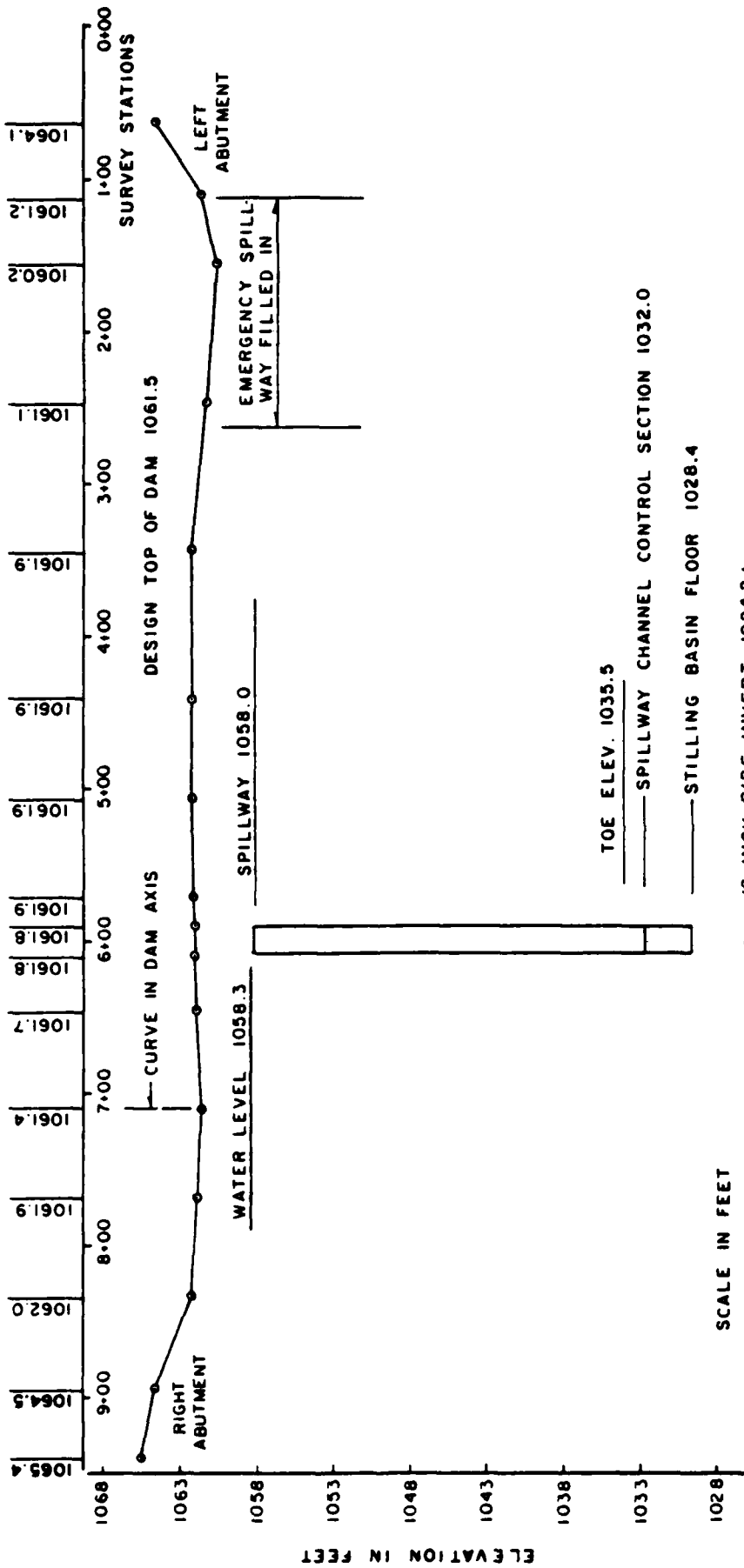
EMBANKMENT

Sheet 4 of 11

| <u>VISUAL EXAMINATION OF</u> | <u>OBSERVATIONS</u> | <u>REMARKS OR RECOMMENDATIONS</u> |
|--|---------------------|---|
| SURFACE CRACKS | | <i>None observed on embankments. Crest is protected by thin bituminous pavement which is cracked. The crest was, reportedly rutted requiring repairs.</i> |
| UNUSUAL MOVEMENT OR CRACKING AT OR BEYOND THE TOE | | <i>None observed.</i> |
| SLOUGHING OR EROSION OF EMBANKMENT AND ABUTMENT SLOPES | | <i>Minor, old, erosion noted on downstream slope near spillway. Installation of chlorine tank on slope to the right of the control building has resulted in some erosion near the stairs.</i> |
| VERTICAL AND HORIZONTAL ALIGNMENT OF THE CREST | | <i>See Sheet 5B of 11.</i> |
| RIPRAP FAILURES | | <i>Upstream protected with hand placed stone, no failures noted.</i> |



FIELD OBSERVATION PLAN
 LOWER OWL CREEK DAM
 SHEET 5A OF 11



FIELD OBSERVATION PROFILE
LOWER OWL CREEK DAM

LOOKING UPSTREAM

EMBANKMENT

Sheet 5 of 11

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

VEGETATION

Vegetation is in fair condition and consists of miscellaneous grass, weeds and vine type cover. Small trees and brush had been cut but new growth has started. There is one depression on the downstream embankment resulting from removal of a bush. Vegetation is reportedly burned off once a year.

JUNCTION OF EMBANKMENT
AND ABUTMENT, SPILLWAY
AND DAM

All junctions in good condition. Recent regrading of dam crest in vicinity of left abutment.

ANY NOTICEABLE SEEPAGE

None observed.

STAFF GAGE AND RECORDER

None

DRAINS

None

OUTLET WORKS

Sheet 6 of 11

| VISUAL EXAMINATION OF | OBSERVATIONS | REMARKS OR RECOMMENDATIONS |
|--|---|----------------------------|
| CRACKING AND SPALLING OF CONCRETE SURFACES IN OUTLET CONDUIT | N/A | |
| INTAKE STRUCTURE | None, intake under water. | |
| OUTLET STRUCTURE | N/A. treated water piped | |
| OUTLET CHANNEL | N/A | |
| EMERGENCY GATE | <p>There are two conduits which may drain the reservoir. The plans call for one 10-inch blow off pipe through the control building. There is a 10-inch line at a different location in the control building. The operator did not know its purpose nor had ever operated the gate valve. At the downstream toe of dam adjacent to the spillway left wall is a gate valve in a pit, apparently closing off the 12-inch line exiting through the left wall. No valves were exercised.</p> | |

UNGATED SPILLWAY

Sheet 7 of 11

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

CONCRETE WEIR

Spillway was designed as a siphon and interior cannot be inspected. Grates installed in top slab above weir prevent three of four conduits from functioning as siphons. The fourth conduit which had less flow through it at the time of inspection, may function as a siphon.

APPROACH CHANNEL

Intake under water.

DISCHARGE CHANNEL

The spillway conduits discharge into a paved channel. Normal flow is collected and piped under the channel floor. Spalling and deterioration of concrete has occurred as shown on Sheet 5A of 11. Some water seepage at base of left channel wall downstream from embankment toe.

BRIDGE AND PIERS

The treated water line and a footbridge cross the discharge channel, there are no piers.

GATED SPILLWAY

Sheet 8 of 11

| <u>VISUAL EXAMINATION OF</u> | <u>OBSERVATIONS</u> | <u>REMARKS OR RECOMMENDATIONS</u> |
|-------------------------------|---------------------|-----------------------------------|
| CONCRETE SILL | N/A | |
| APPROACH CHANNEL | N/A | |
| DISCHARGE CHANNEL | N/A | |
| BRIDGE AND PIERS | N/A | |
| GATES AND OPERATION EQUIPMENT | N/A | |

INSTRUMENTATION

Sheet 9 of 11

VISUAL EXAMINATION OBSERVATIONS REMARKS OR RECOMMENDATIONS

MONUMENTATION/SURVEYS

None

OBSERVATION WELLS

None

WEIRS

None

PIEZOMETERS

None

OTHER

None

RESERVOIR

Sheet 10 of 11

VISUAL EXAMINATION OF OBSERVATIONS REMARKS OR RECOMMENDATIONS

SLOPES

The reservoir side slopes are flat to moderate and vegetated to water's edge with trees.

SEDIMENTATION

There is no sediment at the upper end.

DOWNSTREAM CHANNEL

Sheet 11 of 11

VISUAL EXAMINATION OF OBSERVATIONS REMARKS OR RECOMMENDATIONS

CONDITION
(OBSTRUCTIONS,
DEBRIS, ETC.)

The downstream channel appears in stable condition with no bank undercutting or fallen trees or other obstructions noted.

SLOPES

The valley gradient below the dam is about 0.067 before reducing to an average gradient of 0.017 for the next mile.

APPROXIMATE NO.
OF HOMES AND
POPULATION

About 1.6 miles downstream of the dam, Owl Creek enters an area where there are unoccupied factory buildings, an unoccupied house and two occupied mobile homes. Outflow from the area is restricted by an abandoned railroad embankment.

APPENDIX

B

NAME OF DAM Lower Owl Creek Dam
ID # PA 00674

CHECK LIST
ENGINEERING DATA
DESIGN, CONSTRUCTION, OPERATION
PHASE I

Sheet 1 of 4

ITEM

REMARKS

AS-BUILT DRAWINGS

None known.

REGIONAL VICINITY MAP

Plate 1, Appendix E.

CONSTRUCTION HISTORY

See text, Section 1.2.

TYPICAL SECTIONS OF DAM

Appendix E.

OUTLETS - PLAN

DETAILS

Appendix E.

CONSTRAINTS

DISCHARGE RATINGS

Appendix D.

RAINFALL/RESERVOIR RECORDS

No rainfall records within watershed. Some reservoir records maintained.

ITEM _____ REMARKS _____

DESIGN REPORTS

None available.

GEOLOGY REPORTS

Appendix F.

DESIGN COMPUTATIONS
HYDROLOGY & HYDRAULICS
DAM STABILITY
SEEPAGE STUDIES

None except evaluation calculation made by state.

MATERIALS INVESTIGATIONS
BORING RECORDS
LABORATORY
FIELD

None known.

POST-CONSTRUCTION SURVEYS OF DAM

Unknown if there were any since 1927.

BORROW SOURCES

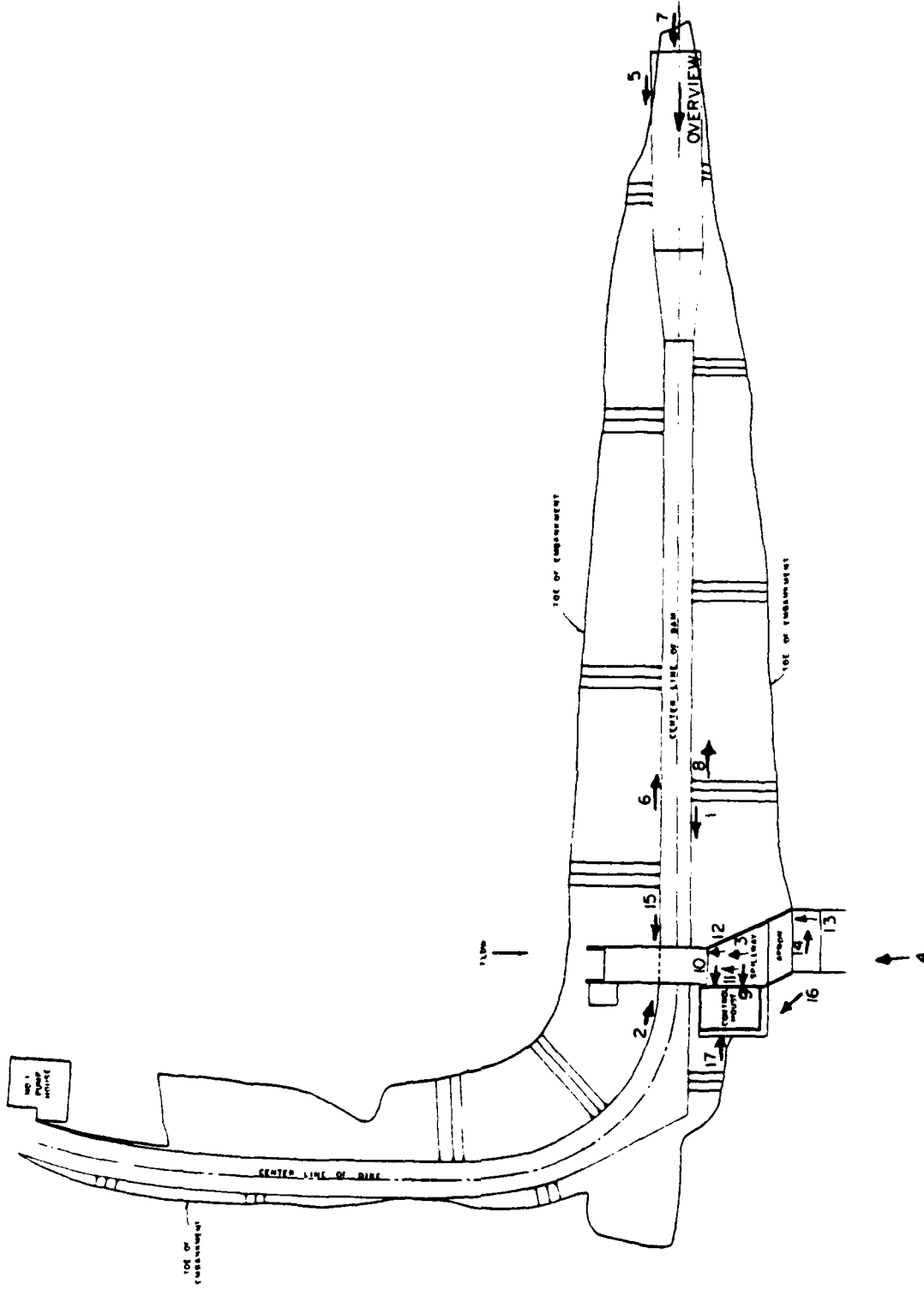
*1911 and 1912 embankment material obtained from reservoir.
1927 embankment material obtained from reservoir as shown in
Appendix E.*

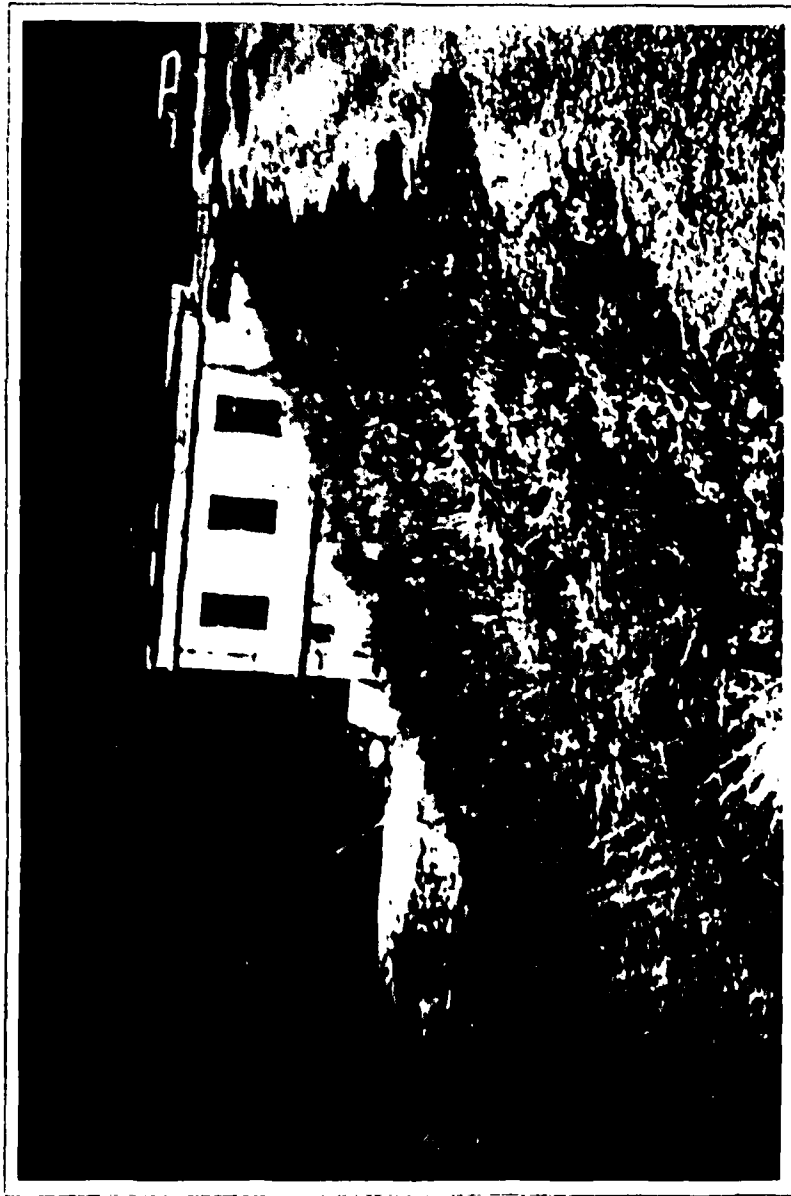
| ITEM | REMARKS |
|--|---|
| SPILLWAY PLAN | |
| SECTIONS | |
| DETAILS | Appendix E. |
| OPERATING EQUIPMENT PLANS & DETAILS | None |
| MISCELLANEOUS | All information available in DER files |
| | <ol style="list-style-type: none"> 1. Phase I Inspection Report, February 1979, for Upper Owl Dam. 2. "Report Upon the Investigation of the Owl Creek Dam of Tamaqua Water Works", April 3, 1914. 3. Design and As-built drawings for 1914 auxiliary spillway, 1914 reservoir drawing. 4. Four sheet set of design drawings for 1928 reconstruction of dam. 5. Evaluation calculations performed by state. 6. Dam inspection reports by the state. 7. Correspondence construction inspection reports and memorandum prepared by state. 8. 59 black and white photographs. |

APPENDIX

C

PHOTOGRAPH LOCATION PLAN
LOWER OWL CREEK DAM
PLATE C-1





OVERALL VIEW OF CONTROL HOUSE AND
DOWNSTREAM CHANNEL. SPILLWAY
STRUCTURE IS FLUSH WITH DAM CREST.

PHOTOGRAPH NO. 1



UPSTREAM END OF SPILLWAY STRUCTURE,
INTAKES ARE UNDERWATER.

PHOTOGRAPH NO. 2



CONTROL HOUSE AND DOWNSTREAM SIDE
OF SPILLWAY STRUCTURE. NORMAL FLOW
ENTERS GRATE AND IS CONVEYED DOWNSTREAM
UNDER CHANNEL FLOOR.

PHOTOGRAPH NO. 3



OUTLET OF CONDUIT UNDER
SPILLWAY CHANNEL.

PHOTOGRAPH NO. 4



RECORDS INDICATE A PAVED EMERGENCY
SPILLWAY IS UNDER THE FILL MATERIAL.

PHOTOGRAPH NO. 5



UPSTREAM SLOPE.



OVERALL VIEW OF CREST.
GRAVEL RECENTLY PLACED TO
FILL IN RUTS.

PHOTOGRAPH NO. 7



OVERALL VIEW OF DOWNSTREAM SLOPE.
CREST IS PROTECTED BY A THIN LAYER
OF BITUMINOUS PAVEMENT.

PHOTOGRAPH NO. 8



HOLE IN CONTROL BUILDING WALL IS 11
INCHES DEEP.

PHOTOGRAPH NO. 9



DETERIORATING CONCRETE ON SIDE OF
CONTROL BUILDING.

PHOTOGRAPH NO. 10



DETERIORATED CONCRETE AND
EXPOSED STEEL. NORMAL FLOW
ENTERS INLET IN CORNER. SLIGHT
SEEPAGE EXITING WALL AT TOP OF
SPALLED CONCRETE.

PHOTOGRAPH NO. 11



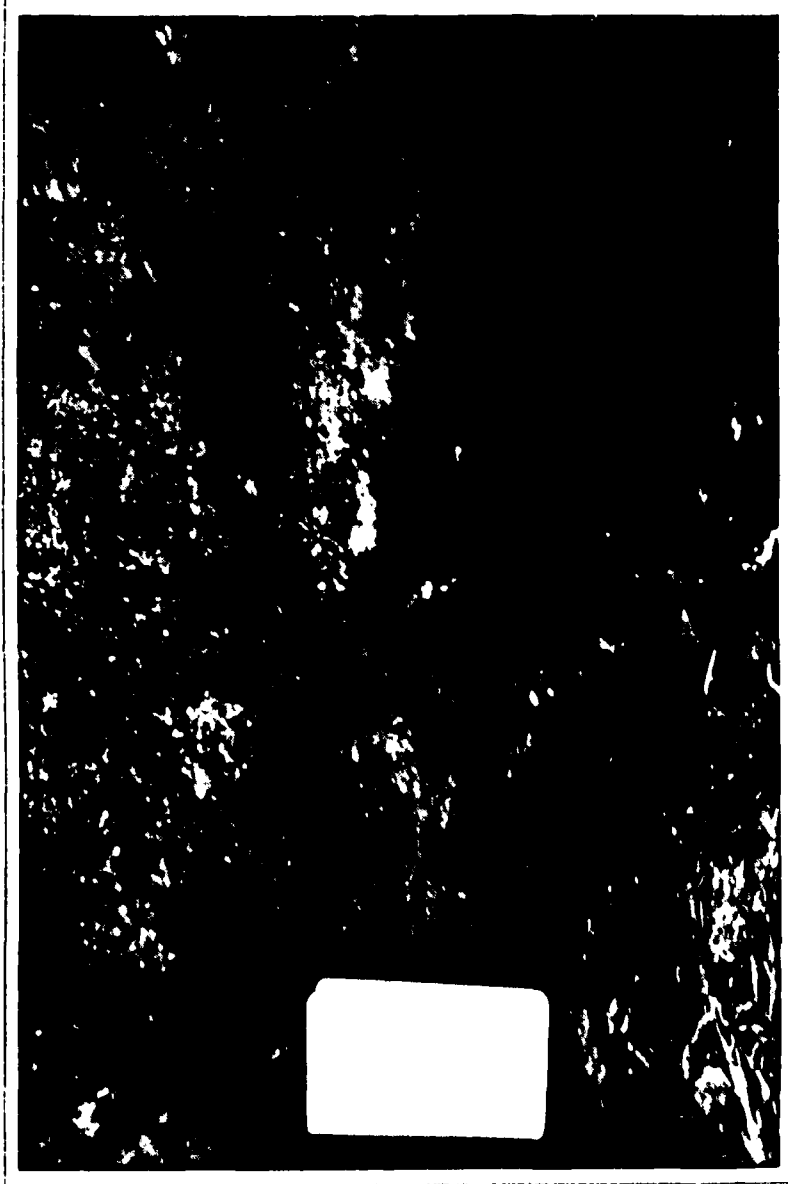
DETERIORATED CONCRETE. LEFT END
CONDUIT HAD LEAST DISCHARGE AT TIME
OF INSPECTION.

PHOTOGRAPH NO. 12



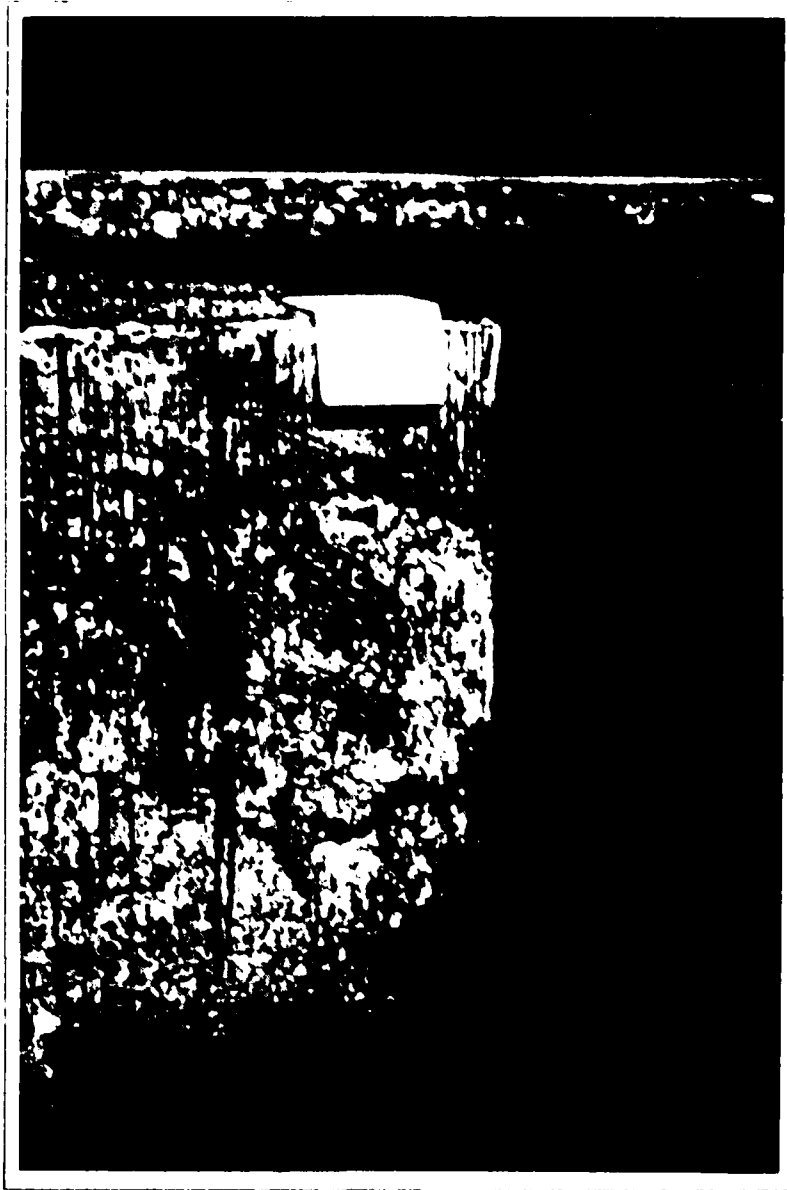
LEFT CHANNEL WALL. VALVE PIT COVER
SHOWN AT TOP OF PICTURE. CONDUIT
OUTLETS THROUGH CHANNEL WALL.

PHOTOGRAPH NO. 13



CLOSE-UP OF SEEPAGE SHOWN IN PHOTOGRAPH
13.

PHOTOGRAPH NO. 14



CONCRETE DETERIORATION OF UPSTREAM EDGE
OF SPILLWAY STRUCTURE.

PHOTOGRAPH NO. 15



EMBANKMENT BETWEEN CONTROL BUILDING AND
RIGHT ABUTMENT.

PHOTOGRAPH NO. 16



EROSION UNDER UPPER FLIGHT OF STEPS
SHOWN IN PHOTOGRAPH NO. 16.

PHOTOGRAPH NO. 17



SPELLWAY OF UPPER OWL CREEK DAM

PHOTOGRAPH NO. 18



LARGE FLOWS IN OWL CREEK WILL FLOOD THIS
POND. OCCUPIED MOBILE HOMES ARE IN THE
BACKGROUND.



OWL CREEK FLOWS UNDER BUILDINGS, RAILROAD
EMBANKMENT AND ROUTE 309 BEFORE ENTERING
LITTLE SCHUYLKILL RIVER.

APPENDIX

D

LOWER OWL CREEK DAM
CHECK LIST
HYDROLOGIC AND HYDRAULIC
ENGINEERING DATA

DRAINAGE AREA CHARACTERISTICS: Mountainous, 100% wooded, undeveloped.

ELEVATION TOP NORMAL POOL (STORAGE CAPACITY): 1058.0 feet (160 Acre-Feet).

ELEVATION TOP FLOOD CONTROL POOL (STORAGE CAPACITY): 1061.4 feet (285 Acre-Feet)

ELEVATION MAXIMUM DESIGN POOL: -----

ELEVATION TOP DAM: 1061.4 feet existing 1061.5 feet design (outside emergency spillway area).

SPILLWAY

- a. Elevation 1058.0 feet (spillway elevation from USGS map, all other elevations are relative).
- b. Type 4-tubes, one of which acts as siphon.
- c. Width Three 2.5 feet x 3.75 feet; one 2.5 feet x 1.88 feet wide.
- d. Length -----
- e. Location Spillover Near right abutment.
- f. Number and Type of Gates None

OUTLET WORKS:

- a. Type Water supply intake.
- b. Location Through control house to the right of the spillway.
- c. Entrance inverts 1017± feet.
- d. Exit inverts N/A
- e. Emergency draindown facilities 10 inch and 12 inch blow off pipes.

HYDROMETEOROLOGICAL GAGES: None within watershed.

- a. Type Standard rain gage.
- b. Location 5.5 miles north at Still Creek Reservoir.
- c. Records National Weather Service Reporting Station.

MAXIMUM NON-DAMAGING DISCHARGE: Not determined.

LOWER OWL CREEK DAM
HYDROLOGIC AND HYDRAULIC
BASE DATA

Sheet 2 of 12

DRAINAGE AREA: ⁽¹⁾ 1.99 square mile; 1.5 square mile controlled by Upper Owl Creek Dam.

PROBABLE MAXIMUM PRECIPITATION (PMP)
FOR 10 SQ. MILES IN 24 HOURS: ⁽²⁾ 22.6 inches.

ADJUSTMENT FACTORS FOR DRAINAGE AREA (%): ⁽³⁾

| | |
|----------|------------|
| Zone | <u>6</u> |
| 6 Hours | <u>113</u> |
| 12 Hours | <u>123</u> |
| 24 Hours | <u>132</u> |
| 48 Hours | <u>142</u> |

SNYDER HYDROGRAPH PARAMETERS: ⁽⁴⁾

| | <i>Lower Owl</i> | <i>Upper Owl*</i> |
|--|------------------|-------------------|
| Zone | <u>6</u> | <u>6</u> |
| C _p , C _t | <u>0.4, 1.35</u> | <u>0.4, 1.35</u> |
| L(5) | <u>0.85 mile</u> | <u>1.7 mile</u> |
| Lca (6) | <u>0.57 mile</u> | <u>0.93 mile</u> |
| tp=C _t (L·Lca) ^{0.3} | <u>1.09</u> | <u>1.55</u> |

| | <i>existing</i> | <i>design</i> |
|------------------------------|------------------|----------------|
| SPELLWAY CAPACITY AT MAXIMUM | <u>275cfs</u> | <u>290cfs</u> |
| WATER LEVEL (7) | <u>emergency</u> | <u>1875cfs</u> |

- (1) Measured from USGS maps.
 (2) Hydrometeorological Report No. 33, Figure 1.
 (3) Hydrometeorological Report No. 33, Figure 2.
 (4) Information received from Corps of Engineers, Baltimore District.
 (5) Length of longest water course from outlet to basin divide, measured from USGS maps.
 (6) Length of water course from outlet to point opposite the centroid of drainage area, (see Plate 1, Appendix E) measured from USGS maps.
 (7) See Sheet ___ of this Appendix.
 * Information obtained from Phase I Inspection Report, February, 1979. NDI No. PA 00673, DER No. 54-96

HEC-1, REVISED
FLOOD HYDROGRAPH PACKAGE

The original "Flood Hydrograph Package" (HEC-1), developed by the Hydrologic Engineering Center, Corps of Engineers, has been modified for use under the National Dam Inspection Program. The "Flood Hydrograph Package (HEC-1), Dam Safety Version", hereinafter referred to as, HEC-1, Rev., has been modified to require less detailed input and to include a dam breach analysis. The required input is obtained from the field inspection of a dam, any available design/evaluation data, relatively simple hydraulic calculations, or information from the USGS Quadrangle maps. The input format is flexible in order to reflect any unique characteristics of an individual dam.

HEC-1, Rev. computes a reservoir inflow hydrograph based on individual watershed characteristics such as: area, percentage of impervious surface area, watershed shape, and hydrograph characteristics determined from regional correlation studies by the Corps of Engineers, Baltimore District. The inflow is routed through the reservoir using spillway discharge data obtained from the field inspection or design data. Flood storage capacity is determined from USGS maps or design information and verified by the field inspection. In the event a spillway cannot discharge 0.5 PMF without overtopping and failure of the dam, downstream channel characteristics obtained from the field inspection and USGS maps are input and flows are routed downstream to the damage center and a dam breach analysis is performed.

Included in this Appendix are the HEC-1, Rev. pertinent input values and a summary print-out tables.

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

1. The hazard potential is "High" as there would be probable loss of life in the event of failure.
2. The size classification is "Small" based on its 33 ft height and 271 Ac-Ft total storage capacity.
3. The selected spillway design flood, based on size and hazard classification is 0.5 PMF (Probable Maximum Flood).

Hydrology and Hydraulic Analysis

1. Original Design Data. In 1928, the state requested an emergency spillway, with a capacity of 1325 cfs be included in the re-design. This discharge was based on a drainage area of 2.7 sq. miles, greater than measured from current USGS map. The state estimated the capacity of the concrete siphon spillway to be 95 cfs. By 1934, vents had been installed preventing 3 tubes from acting as siphons and the throat area of the 4th tube was reduced by half.
2. Evaluation Data - Data pertaining to Upper Owl Creek Dam was obtained from Phase I Inspection Report, February 1979.
 In flow hydrograph parameters are shown on sheet 2.

Out-flow hydrograph.

Elevation-Area Data - obtained from Plate 2, Appendix E and USGS map. See sheet 9

Elevation-Discharge Data - sheet 9

from reservoir level 1058 to 1060.5, tubes function as weirs.

$$Q = CLH^{3/2}$$

$$L = 3 \cdot 3.25 + \frac{1}{2} \cdot 3.75 = 13.13 \text{ ft}$$

$$C = 3.1 \text{ King \& Brater}$$

Hand book of Hydraulics, 2nd ed.

BY MEB DATE 6/2/80

SUBJECT

SHEET 5 OF 12CHKD. BY REM DATE 6.9.80Lower Owl Creek Dam
Hydrology / Hydraulics

JOB No.

| Water Surface | H | L | C | Q |
|---------------|-----|-------|-----|-----|
| 1058 | 0 | 13.13 | 3.1 | 0 |
| 1059 | 1 | | | 40 |
| 1060 | 2 | | | 115 |
| 1060.5 | 2.5 | | | 160 |

Water depth at the weir is critical depth (d_c), less than the head on the weir (reservoir level - spillway crest).
To estimate reservoir level when $d_c = 2.5$ ft, assume entrance loss is $0.2 \sqrt{v^2/g}$ and friction loss is $0.5 \sqrt{v^2/g}$.
(Cret-Soil Conservation Service, National Engineering Handbook, Section 5)

when $d_c = 2.5$ ft

$$\frac{v_c^2}{2g} = 1.25 \text{ ft} \quad v_c = 8.97 \text{ ft/sec}$$

$$Q = 8.97 (3.75 \times 2.5) \times 3 \text{ tubes} \\ = 252 \text{ cfs for 3 tubes}$$

$$\text{reservoir level} = \text{spillway crest} + d_c + \frac{v_c^2}{2g} + 0.5 \frac{v_c^2}{g} \\ = 1062.4 \text{ ft.}$$

The 4th tube will act as a siphon,
area of throat 2.5 ft high x 1.88 ft wide (reported)

$$Q = C \cdot D \cdot W \cdot \sqrt{2gH} \quad \text{where } C \text{ determined from Design of Small Dams, USBR, 2nd ed.}$$

$$R_c = \text{radius} = 12.5 \text{ ft from drawing}$$

$$R_d = \text{radius} = 13.75 \text{ ft from drawing}$$

$$D = \text{depth of throat} = 2.5 \text{ ft}$$

$$d = \text{depth of water at outlet} \sim 5.5 \text{ ft in stilling basin}$$

$$C \sim 0.90$$

$$Q = 0.9 \times 2.5 \times 1.88 \sqrt{2gH} \quad \text{@ reservoir level of } 1062.4, H \sim 30.7 \text{ ft} \\ = 188 \text{ cfs}$$

$$\text{total discharge w/ } \frac{1}{2} \text{ reservoir at } 1062.4 = 188 + 252 \\ = 440 \text{ cfs.}$$

BY MEB DATE 6/2/80

SUBJECT _____

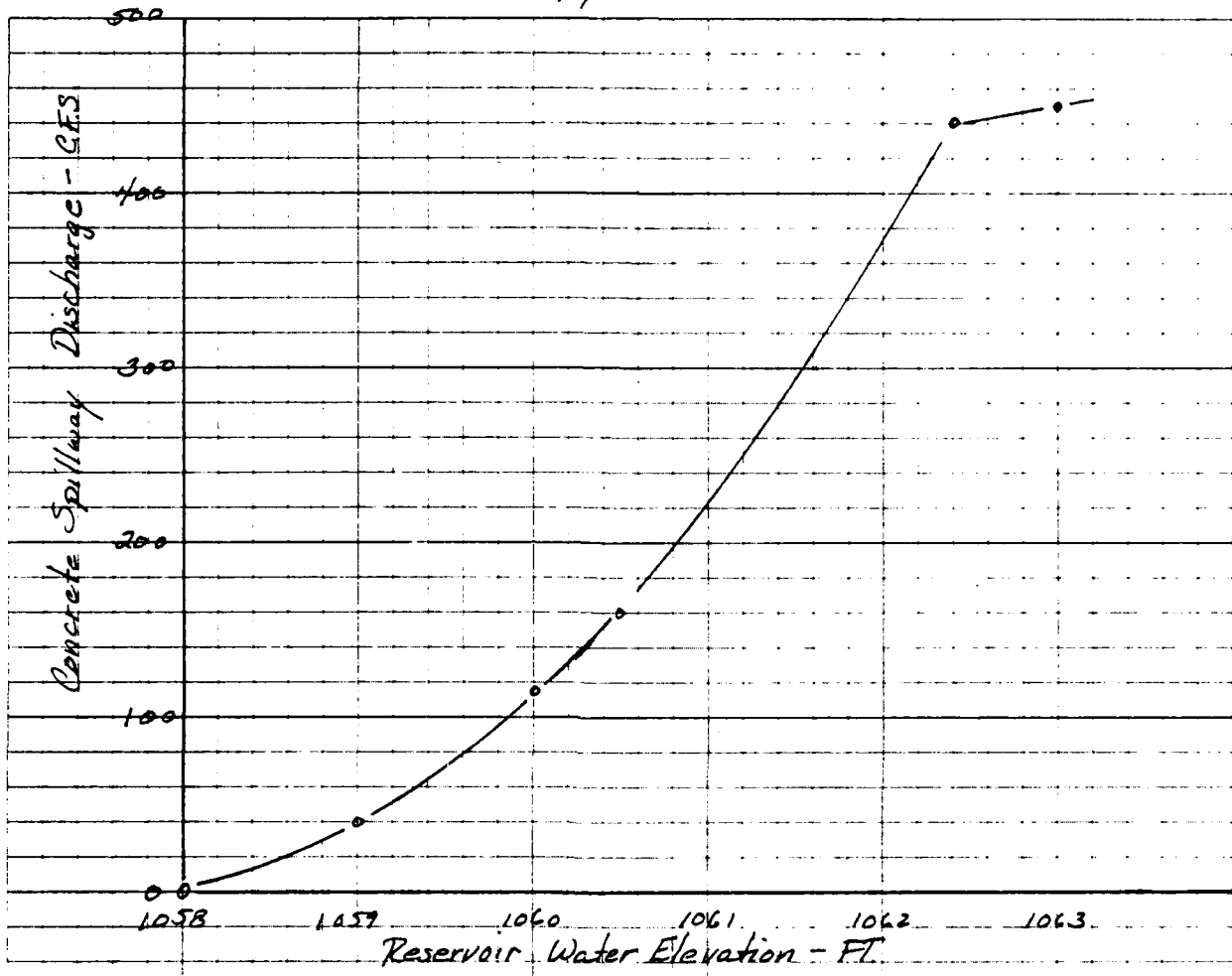
SHEET 6 OF 12

CHKD. BY _____ DATE _____

Lower Owl Creek Dam

JOB No. _____

Hydrology / Hydraulics



Discharge through emergency spillway area is calculated by computer by critical depth relationships. The dam crest profile, including emergency spillway, is entered, see sheets 9 & 12.

PREVIEW OF SEQUENCE OF STREAM NETWORK CALCULATIONS

```

RUNOFF HYDROGRAPH AT      U01
ROUTE HYDROGRAPH TO      U00
RUNOFF HYDROGRAPH AT      NLO
RUNOFF HYDROGRAPH AT      SLO
COMBINE 3 HYDROGRAPHS AT  TIN
ROUTE HYDROGRAPH TO      L00
ROUTE HYDROGRAPH TO      DS1
ROUTE HYDROGRAPH TO      DS2
END OF NETWORK
    
```

```

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

```

RUN DATE= 80/05/29.
TIME= 05.17.57.
    
```

LOWER OWL CREEK DAM
 MAT ID NO. PA 00674 PER NO. 54-2
 OVERTOPPING ANALYSIS

JOB SPECIFICATION

| NO | HHR | NMIN | IDAY | IHR | IMIN | METRC | IPLT | IPRT | RSTAN |
|-----|-----|------|-------|-----|-------|-------|------|------|-------|
| 200 | 0 | 15 | 0 | 0 | 0 | 0 | 0 | -4 | 0 |
| | | | JOPER | NUT | LROPT | TRACE | | | |
| | | | 5 | 0 | 0 | 0 | | | |

MULTI-PLAN ANALYSES TO BE PERFORMED
 NPLAN= 1 HRTIO= 6 LRTIO= 1
 RTIOS= .10 .20 .30 .40 .50 1.00

SUB-AREA RUNOFF COMPUTATION

UPPER OWL CREEK DAM INFLOW HYDROGRAPH

| ISTAB | ICOMP | IECON | ITAPE | JPLT | JPRT | IRAME | ISTAGE | IAUTO |
|-------|-------|-------|-------|------|------|-------|--------|-------|
| U01 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |

HYDROGRAPH DATA

| INBYG | LUNG | TAREA | SNAP | TRSDA | TRSPC | RATIO | ISNOW | ISANE | LOCAL |
|-------|------|-------|------|-------|-------|-------|-------|-------|-------|
| 1 | 1 | 1.50 | 0.00 | 1.99 | 0.00 | 0.000 | 0 | 1 | 0 |

PRECIP DATA

| SPFE | PMS | R6 | R12 | R24 | R48 | R72 | R96 |
|------|-------|--------|--------|--------|--------|------|------|
| 0.00 | 22.60 | 113.00 | 123.00 | 132.00 | 142.00 | 0.00 | 0.00 |

TRSPC COMPUTED BY THE PROGRAM IS .800

LOSS DATA

| LROPT | STRKR | DLIKR | RTIOI | ERAIN | STRKS | RTIOK | STRIL | ENSTL | ALSMI | RTIMP |
|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| 0 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 | 1.00 | 1.00 | .05 | 0.90 | 0.60 |

UNIT HYDROGRAPH DATA

IP= 1.55 CP= .40 RTA= 0

RECESSION DATA

SRTIO= -1.50 UNCSN= -.05 RTIOR= 2.00

UNIT HYDROGRAPH 65 END-OF-PERIOD ORDINATES, LAG= 1.56 HOURS, CP= .40 VOL= 1.00

| | | | | | | | | | |
|------|------|------|------|------|------|------|------|------|------|
| 13. | 50. | 103. | 161. | 212. | 244. | 250. | 235. | 215. | 198. |
| 101. | 166. | 152. | 140. | 128. | 118. | 108. | 99. | 91. | 83. |
| 76. | 70. | 64. | 59. | 54. | 50. | 45. | 42. | 38. | 35. |
| 32. | 30. | 27. | 25. | 23. | 21. | 19. | 18. | 16. | 15. |
| 14. | 12. | 11. | 10. | 10. | 9. | 8. | 7. | 7. | 6. |
| 6. | 5. | 5. | 4. | 4. | 4. | 3. | 3. | 3. | 3. |
| 2. | 2. | 2. | 2. | 2. | 2. | | | | |

END-OF-PERIOD FLOW

| NO. DA | HR. AM | PERIOD | RAIN | EXCS | LOSS | CONF 0 | NO. DA | HR. AM | PERIOD | RAIN | EXCS | LOSS | CONF 0 |
|--------|--------|--------|------|------|------|--------|--------|--------|--------|------|------|------|--------|
|--------|--------|--------|------|------|------|--------|--------|--------|--------|------|------|------|--------|

SUM 25.67 23.28 2.40 86457.
 (652.) (591.) (61.) (2153.85)

HYDROGRAPH ROUTING

UPPER OUL CREEK DAM OUTFLOW HYDROGRAPH

| | ISTAB | IICMP | IECID | ITAFE | JPLT | JPRT | IRARE | ISTAGE | TAUTO |
|---------------|---------|---------|---------|---------|---------|---------|--------|--------|-------|
| | 000 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |
| ROUTING DATA | | | | | | | | | |
| | QLOSS | CLOSS | AVG | IRRS | ISARE | ISPT | IFMP | ISTR | |
| | 0.0 | 0.000 | 0.00 | 1 | 1 | 0 | 0 | 0 | |
| | NSIPS | NSIDL | LAV | AMSKE | I | ISK | STORA | ISPRAT | |
| | 1 | 0 | 0 | 0.000 | 0.000 | 0.000 | -1092. | 1 | |
| STAGE | 1092.00 | 1093.00 | 1094.00 | 1095.00 | 1096.00 | 1097.00 | | | |
| FLOW | 0.00 | 168.00 | 485.00 | 907.00 | 1423.00 | 1980.00 | | | |
| SURFACE AREA* | 0. | 67. | 100. | 184. | | | | | |
| CAPACITY* | 0. | 859. | 1521. | 4317. | | | | | |
| ELEVATION* | 1053. | 1092. | 1100. | 1120. | | | | | |
| | CREL | SPWID | COBW | EIPW | ELEVL | COOL | CAREA | EIPL | |
| | 1092.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | |
| DAM DATA | | | | | | | | | |
| | TOPEL | COB | EXPD | DAMWID | | | | | |
| | 1095.4 | 0.0 | 0.0 | 0. | | | | | |
| CREST LENGTH | 0. | 550. | 1180. | 1350. | | | | | |
| AT OR BELOW | | | | | | | | | |
| ELEVATION | 1095.4 | 1095.7 | 1096.0 | 1097.0 | | | | | |

SUB-AREA RUNOFF COMPUTATION

SUBAREA NORTH OF LOWER OUL RESERVOIR

| | ISTAB | IICMP | IECID | ITAFE | JPLT | JPRT | IRARE | ISTAGE | TAUTO |
|-----------------|-------|--------|--------|--------|--------|-------|-------|--------|-------|
| | WLO | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |
| HYDROGRAPH DATA | | | | | | | | | |
| INTD | IUNG | IAREA | SWAP | IRSDA | IRSPC | RATIO | ISNOW | ISARE | ICOL |
| 1 | 1 | .19 | 0.00 | 1.99 | 0.00 | 0.000 | 0 | 1 | 0 |
| PRECIP DATA | | | | | | | | | |
| SPFE | PMS | RA | R12 | R24 | R48 | R72 | R96 | | |
| 0.00 | 22.00 | 113.00 | 123.00 | 132.00 | 142.00 | 0.00 | 0.00 | | |

IRSPC COMPUTED BY THE PROGRAM IS .000

LOSS DATA

| LRPT | STRR | DLTKR | RTDL | ERAIN | STRKS | RTDK | STRLE | ENSTL | ALSHL | RTIMV |
|------|------|-------|------|-------|-------|------|-------|-------|-------|-------|
| 0 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 | 1.00 | 1.00 | .05 | 0.00 | 0.00 |

UNIT HYDROGRAPH DATA

IP= 1.00 CP= .40 NTA= 0

RECESSION DATA

STRD= -1.50 DRCSH= .05 RTDR= 2.00

UNIT HYDROGRAPH 46 END-OF-PERIOD ORDINATES, LAB= 1.00 HOURS, CP= .40 VOL= 1.00

| | | | | | | | | | |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 4. | 18. | 31. | 42. | 45. | 41. | 36. | 32. | 28. | 25. |
| 22. | 20. | 17. | 15. | 13. | 12. | 11. | 9. | 8. | 7. |
| 8. | 6. | 5. | 4. | 4. | 3. | 3. | 3. | 2. | 2. |
| 2. | 2. | 1. | 1. | 1. | 1. | 1. | 1. | 1. | 1. |
| 1. | 0. | 0. | 0. | 0. | 0. | | | | |

| NO. DA | HR. AM | PERIOD | RAIN | EXCS | LOSS | COMP D | NO. DA | HR. AM | PERIOD | RAIN | EXCS | LOSS | COMP D |
|--------|--------|--------|------|------|------|--------|--------|--------|--------|------|------|------|--------|
|--------|--------|--------|------|------|------|--------|--------|--------|--------|------|------|------|--------|

SUM 25.67 23.20 2.40 11280.
 1 652.10 791.10 61.10 319.640

SUB-AREA RUNOFF COMPUTATION

SUBAREA SOUTH OF LOWER OWL RESERVOIR

ISTAG ICOMP IECON ITAPE JPLT JPRT INAME ISTAGE IAUTO
 SLO 0 0 0 0 0 0 1 0 0

HYDROGRAPH DATA

IHYG IUNG TAREA SNAP TRSBA TRSPE RATIO ISHOW ISAME LOCAL
 1 1 .30 0.00 1.99 0.00 0.000 0 1 0

PRECIP DATA

SPFE PHS R4 R12 R24 R48 R72 R96
 0.00 22.60 113.00 123.00 132.00 142.00 0.00 0.00

TRSPC COMPUTED BY THE PROGRAM IS .800

LOSS DATA

LROPT STRKR DLTKR RTIDL ERAIN STRKS RTLOK STRTL UNSIL ALSXK RTIMP
 0 0.00 0.00 1.00 0.00 0.00 1.00 1.00 .05 0.00 0.00

UNIT HYDROGRAPH DATA

TP= 1.07 CP= .40 NTA= 0

RECESSION DATA

STRTO= -1.30 BRCSN= -.05 RTIBR= 2.00

UNIT HYDROGRAPH 45 END-OF-PERIOD ORDINATES, LAG= 1.07 HOURS, CP= .40 VOL= 1.00

| | | | | | | | | | |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 1. | 25. | 49. | 67. | 71. | 65. | 57. | 51. | 45. | 39. |
| 35. | 31. | 27. | 24. | 21. | 19. | 17. | 15. | 13. | 11. |
| 10. | 9. | 8. | 7. | 6. | 5. | 5. | 4. | 4. | 3. |
| 3. | 3. | 2. | 2. | 2. | 2. | 1. | 1. | 1. | 1. |
| 1. | 1. | 1. | 1. | 1. | | | | | |

END-OF-PERIOD FLOW

| NO. DA | HR. AM | PERIOD | RAIN | EXCS | LOSS | COMP R | NO. DA | HR. AM | PERIOD | RAIN | EXCS | LOSS | COMP R |
|--------|--------|--------|------|------|------|--------|--------|--------|--------|------|------|------|--------|
|--------|--------|--------|------|------|------|--------|--------|--------|--------|------|------|------|--------|

SUM 25.67 23.28 2.40 17824.
 (652.1) (591.1) (61.1) (504.7)

LOWER OWL CREEK DAM OUTFLOW HYDROGRAPH

ISTAG ICOMP IECON ITAPE JPLT JPRT INAME ISTAGE IAUTO
 L00 1 0 0 0 0 1 0 0

ROUTING DATA

GLOSS CLOSS AVG IRES ISAME IOPT IPMP LSTR
 0.0 0.000 0.00 1 1 0 0 0

NSIPS NSTDL LAG ANSKK X TSK STORA ISPRAT
 1 0 0 0.000 0.000 0.000 -1058. -1

| STAGE | 1058.00 | 1059.00 | 1060.00 | 1060.50 | 1062.40 | 1063.00 |
|----------------------------------|---------|---------|---------|---------|---------|---------|
| FLOW | 0.00 | 40.00 | 115.00 | 160.00 | 440.00 | 450.00 |
| (THROUGH CONCRETE SPILLWAY ONLY) | | | | | | |
| SURFACE AREA* | 0. | 1. | 5. | 12. | 29. | 33. |
| CAPACITY* | 0. | 3. | 17. | 59. | 160. | 223. |
| ELEVATION* | 1038. | 1043. | 1048. | 1053. | 1058. | 1060. |

CREL SPWID CORM EXPW ELEV COUL CAREA EXPL
 1058.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0

DAM DATA

TOPEL COOD EXPD DAMWID
 1061.4 0.0 0.0 0.

CREST LENGTH AT 0R BELOW ELEVATION 1060.2 1061.0 1062.0 1064.1 INCLUDES THE EMERGENCY SPILLWAY AREA

HYDROGRAPH ROUTING

SECTION 290 FT DOWNSTREAM OF DAM

| ISTAD | ICDAP | IECON | ITAPE | JPLI | JPRI | INARE | ISTAGE | IAUTO |
|--------------|-------|-------|-------|-------|-------|-------|--------|-------|
| DS1 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |
| ROUTING DATA | | | | | | | | |
| LOSS | CLOSS | AVG | RES | ISARE | IUPT | IPMP | LSTR | |
| 0.0 | 0.000 | 0.00 | 1 | 1 | 0 | 0 | 0 | |
| NSIPS | NSTDL | LAG | AMSK | | ISK | STORA | ISPRAT | |
| 1 | 0 | 0 | 0.000 | 0.000 | 0.000 | 0. | 0 | |

NORMAL DEPTH CHANNEL ROUTING

| DN(1) | DN(2) | DN(3) | ELN(1) | ELMAX | RLRTH | SEL |
|-------|-------|-------|--------|--------|-------|--------|
| 10500 | 10550 | 10500 | 1020.0 | 1043.0 | 100. | 106.00 |

CROSS SECTION COORDINATES--STA,ELEV,STA,ELEV--ETC
 0.00 1043.50 110.00 1040.00 135.00 1039.50 150.00 1023.80 265.00 1020.00
 285.00 1038.10 300.00 1040.00 330.00 1043.40

| | | | | | | | | | | |
|---------|----------|----------|----------|----------|----------|----------|----------|-----------|-----------|-----------|
| STORAGE | 0.00 | 1.11 | 1.42 | 1.95 | 1.62 | 2.30 | 2.99 | 3.10 | 4.32 | 5.16 |
| | 5.91 | 6.68 | 7.45 | 8.25 | 9.05 | 9.87 | 10.73 | 11.77 | 13.09 | 14.68 |
| OUTFLOW | 0.00 | 114.34 | 126.04 | 2140.60 | 4951.73 | 8739.17 | 13337.46 | 18681.81 | 24726.39 | 31437.03 |
| | 18787.39 | 46756.77 | 55328.59 | 64489.52 | 74228.73 | 84567.34 | 96117.01 | 109151.01 | 123742.85 | 140204.07 |
| STAGE | 1020.00 | 1021.21 | 1022.42 | 1023.63 | 1024.84 | 1026.05 | 1027.26 | 1028.47 | 1029.68 | 1030.89 |
| | 1032.11 | 1033.32 | 1034.53 | 1035.74 | 1036.95 | 1038.16 | 1039.37 | 1040.58 | 1041.79 | 1043.00 |
| FLOW | 0.00 | 114.34 | 126.04 | 2140.60 | 4951.73 | 8739.17 | 13337.46 | 18681.81 | 24726.39 | 31437.03 |
| | 18787.39 | 46756.77 | 55328.59 | 64489.52 | 74228.73 | 84567.34 | 96117.01 | 109151.01 | 123742.85 | 140204.07 |

HYDROGRAPH ROUTING

SECTION AT DOWNSTREAM DAMAGE CENTER

| ISTAD | ICDAP | IECON | ITAPE | JPLI | JPRI | INARE | ISTAGE | IAUTO |
|--------------|-------|-------|-------|-------|-------|-------|--------|-------|
| DS2 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |
| ROUTING DATA | | | | | | | | |
| LOSS | CLOSS | AVG | RES | ISARE | IUPT | IPMP | LSTR | |
| 0.0 | 0.000 | 0.00 | 1 | 1 | 0 | 0 | 0 | |
| NSIPS | NSTDL | LAG | AMSK | | ISK | STORA | ISPRAT | |
| 1 | 0 | 0 | 0.000 | 0.000 | 0.000 | 0. | 0 | |

NORMAL DEPTH CHANNEL ROUTING

| DN(1) | DN(2) | DN(3) | ELN(1) | ELMAX | RLRTH | SEL |
|-------|-------|-------|--------|-------|-------|--------|
| 10400 | 10450 | 10400 | 772.5 | 785.7 | 8750. | 104000 |

CROSS SECTION COORDINATES--STA,ELEV,STA,ELEV--ETC
 0.00 785.50 0.00 782.50 477.00 780.00 477.00 772.50 489.00 772.50
 489.00 780.00 529.00 780.40 569.00 785.70

| | | | | | | | | | | |
|---------|---------|---------|---------|---------|---------|----------|----------|----------|----------|----------|
| STORAGE | 0.00 | 1.67 | 3.35 | 5.02 | 6.70 | 8.37 | 10.05 | 11.72 | 13.40 | 15.07 |
| | 16.75 | 19.01 | 18.78 | 78.39 | 137.24 | 211.91 | 288.76 | 366.59 | 444.44 | 522.28 |
| OUTFLOW | 0.00 | 40.26 | 119.66 | 221.53 | 338.68 | 466.94 | 603.58 | 748.76 | 895.13 | 1047.70 |
| | 1203.74 | 1375.96 | 2004.31 | 3695.58 | 6842.79 | 12354.33 | 20018.23 | 29284.28 | 40034.16 | 52194.70 |
| STAGE | 772.50 | 773.19 | 773.89 | 774.58 | 775.28 | 775.97 | 776.67 | 777.36 | 778.06 | 778.75 |
| | 779.45 | 780.14 | 780.84 | 781.53 | 782.23 | 782.92 | 783.62 | 784.31 | 785.01 | 785.70 |
| FLOW | 0.00 | 40.26 | 119.66 | 221.53 | 338.68 | 466.94 | 603.58 | 748.76 | 895.13 | 1047.70 |
| | 1203.74 | 1375.96 | 2004.31 | 3695.58 | 6842.79 | 12354.33 | 20018.23 | 29284.28 | 40034.16 | 52194.70 |

PEAK FLOW AND STORAGE (END OF PERIOD) SUMMARY FOR MULTIPLE PLAN-RATIO ECONOMIC COMPUTATIONS
 FLOWS IN CUBIC FEET PER SECOND (CUBIC METERS PER SECOND)
 AREA IN SQUARE MILES (SQUARE KILOMETERS)

| OPERATION | STATION | AREA | PLAN | RATIOS APPLIED TO FLOWS | | | | | |
|---------------|---------|-----------------|------|-------------------------|------------------|------------------|-------------------|-------------------|-------------------|
| | | | | RATIO 1 .10 | RATIO 2 .20 | RATIO 3 .30 | RATIO 4 .40 | RATIO 5 .50 | RATIO 6 1.00 |
| HYDROGRAPH AT | U01 | 1.50 (3.88) | 1 | 329. (9.32) | 658. (18.64) | 988. (27.96) | 1317. (37.28) | 1646. (46.61) | 3292. (93.21) |
| ROUTED TO | U00 | 1.50 (3.88) | 1 | 187. (5.30) | 435. (12.32) | 701. (19.84) | 944. (27.31) | 1280. (36.23) | 3235. (91.59) |
| HYDROGRAPH AT | MLO | .19 (.49) | 1 | 51. (1.44) | 102. (2.88) | 153. (4.33) | 204. (5.77) | 255. (7.21) | 509. (14.42) |
| HYDROGRAPH AT | SL0 | .30 (.78) | 1 | 81. (2.29) | 162. (4.57) | 242. (6.86) | 323. (9.15) | 404. (11.44) | 808. (22.87) |
| 3 COMBINED | T11 | 1.99 (5.15) | 1 | 253. (7.17) | 509. (14.42) | 764. (21.53) | 1021. (28.63) | 1278. (35.74) | 2541. (71.78) |
| ROUTED TO | L00 | 1.99 (5.15) | 1 | 176. (4.98) | 357. (10.17) | 533. (15.00) | 707. (20.00) | 886. (24.87) | 1772. (50.00) |
| ROUTED TO | DS1 | 1.99 (5.15) | 1 | 176. (4.98) | 357. (10.17) | 534. (15.00) | 707. (20.00) | 886. (24.87) | 1772. (50.00) |
| ROUTED TO | DS2 | 1.99 (5.15) | 1 | 176. (4.97) | 356. (10.16) | 531. (14.99) | 705. (20.00) | 884. (24.85) | 1767. (49.99) |

SUMMARY OF DAM SAFETY ANALYSIS
 UPPER OWL CREEK DAM

| | INITIAL VALUE | SPILLWAY CREST | TOP OF DAM |
|-----------|---------------|----------------|------------|
| ELEVATION | 1092.00 | 1092.00 | 1095.40 |
| STORAGE | 859. | 859. | 1109. |
| OUTFLOW | 0. | 0. | 1113. |

| RATIO OF PMF | MAXIMUM RESERVOIR U.S. ELEV | MAXIMUM DEPTH OVER DAM | MAXIMUM STORAGE AC-FT | MAXIMUM OUTFLOW CFS | DURATION OVER TOP HOURS | TIME OF MAX OUTFLOW HOURS | TIME OF FAILURE HOURS |
|--------------|-----------------------------|------------------------|-----------------------|---------------------|-------------------------|---------------------------|-----------------------|
| .10 | 1093.06 | 0.00 | 932. | 187. | 0.00 | 44.25 | 0.00 |
| .20 | 1093.84 | 0.00 | 989. | 435. | 0.00 | 43.75 | 0.00 |
| .30 | 1094.51 | 0.00 | 1039. | 701. | 0.00 | 43.50 | 0.00 |
| .40 | 1095.11 | 0.00 | 1086. | 964. | 0.00 | 43.50 | 0.00 |
| .50 | 1095.62 | .22 | 1127. | 1280. | 2.50 | 43.25 | 0.00 |
| 1.00 | 1096.29 | .89 | 1181. | 3235. | 6.50 | 41.75 | 0.00 |

SUMMARY OF DAM SAFETY ANALYSIS

LOWER OWL CREEK DAM

| | INITIAL VALUE | SPILLWAY CREST | TOP OF DAM |
|-----------|---------------|----------------|------------|
| ELEVATION | 1058.00 | 1058.00 | 1061.40 |
| STORAGE | 140. | 140. | 271. |
| OUTFLOW | 0. | 0. | 585. |

| RATIO OF PMF | MAXIMUM RESERVOIR U.S. ELEV | MAXIMUM DEPTH OVER DAM | MAXIMUM STORAGE AC-FT | MAXIMUM OUTFLOW CFS | DURATION OVER TOP HOURS | TIME OF MAX OUTFLOW HOURS | TIME OF FAILURE HOURS |
|--------------|-----------------------------|------------------------|-----------------------|---------------------|-------------------------|---------------------------|-----------------------|
| .10 | 1060.54 | 0.00 | 241. | 176. | 0.00 | 46.50 | 0.00 |
| .20 | 1061.37 | 0.00 | 270. | 357. | 3.00 | 43.50 | 0.00 |
| .30 | 1061.67 | .27 | 281. | 533. | 5.00 | 43.00 | 0.00 |
| .40 | 1061.86 | .46 | 288. | 707. | 7.25 | 42.75 | 0.00 |
| .50 | 1062.04 | .64 | 295. | 886. | 8.50 | 43.00 | 0.00 |
| 1.00 | 1062.83 | 1.43 | 325. | 1772. | 11.50 | 41.75 | 0.00 |

PLAN 1 STATION DS1

| RATIO | MAXIMUM FLOW, CFS | MAXIMUM STAGE, FT | TIME HOURS |
|-------|-------------------|-------------------|------------|
| .10 | 176. | 1021.3 | 46.50 |
| .20 | 357. | 1022.1 | 43.50 |
| .30 | 534. | 1022.6 | 43.00 |
| .40 | 707. | 1022.9 | 42.75 |
| .50 | 886. | 1023.2 | 43.00 |
| 1.00 | 1772. | 1024.8 | 41.75 |

PLAN 1 STATION DS2

| RATIO | MAXIMUM FLOW, CFS | MAXIMUM STAGE, FT | TIME HOURS |
|-------|-------------------|-------------------|------------|
| .10 | 176. | 774.3 | 46.75 |
| .20 | 356. | 776.4 | 43.75 |
| .30 | 531. | 778.2 | 43.00 |
| .40 | 705. | 779.8 | 43.00 |
| .50 | 884. | 780.5 | 43.25 |
| 1.00 | 1767. | 781.7 | 42.00 |

With emergency spillway as designed and constructed.

| | | | | |
|--------------|--------|--------|--------|--------|
| CREST LENGTH | 110. | 145. | 210. | 315. |
| AT OR BELOW | | | | |
| ELEVATION | 1059.0 | 1061.3 | 1062.0 | 1064.1 |

SUMMARY OF DAM SAFETY ANALYSIS

LOWER OWL CREEK DAM

| | | | |
|-----------|---------------|----------------|------------|
| | INITIAL VALUE | SPILLWAY CREST | TOP OF DAM |
| ELEVATION | 1058.00 | 1058.00 | 1061.40 |
| STORAGE | 160. | 160. | 271. |
| OUTFLOW | 0. | 0. | 1804. |

| RATIO OF PHF | MAXIMUM RESERVOIR W.S. ELEV | MAXIMUM DEPTH OVER DAM | MAXIMUM STORAGE AC-FT | MAXIMUM OUTFLOW CFS | DURATION OVER TOP HOURS | TIME OF MAX OUTFLOW HOURS | TIME OF FAILURE HOURS |
|--------------|-----------------------------|------------------------|-----------------------|---------------------|-------------------------|---------------------------|-----------------------|
| .10 | 1059.58 | 0.00 | 209. | 240. | 0.00 | 44.00 | 0.00 |
| .20 | 1060.13 | 0.00 | 227. | 573. | 0.00 | 43.25 | 0.00 |
| .30 | 1060.57 | 0.00 | 242. | 923. | 0.00 | 43.25 | 0.00 |
| .40 | 1060.93 | 0.00 | 255. | 1274. | 0.00 | 43.00 | 0.00 |
| .50 | 1061.29 | 0.00 | 267. | 1670. | 0.00 | 43.00 | 0.00 |
| 1.00 | 1062.44 | 1.04 | 310. | 4399. | 5.25 | 41.75 | 0.00 |

PLAN 1 STATION DS1

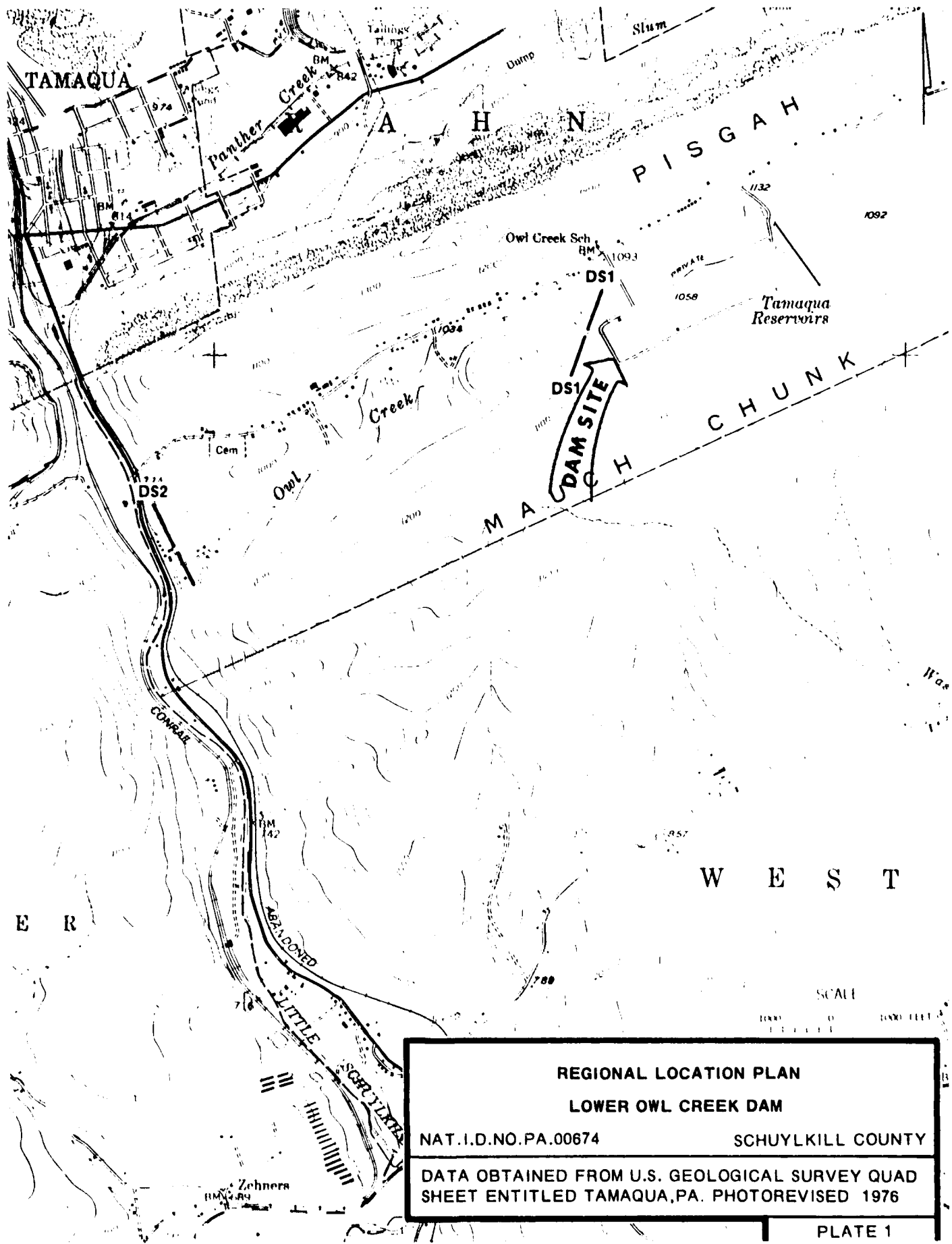
| RATIO | MAXIMUM FLOW, CFS | MAXIMUM STAGE, FT | TIME HOURS |
|-------|-------------------|-------------------|------------|
| .10 | 240. | 1021.5 | 44.00 |
| .20 | 573. | 1022.1 | 43.25 |
| .30 | 923. | 1022.4 | 43.25 |
| .40 | 1274. | 1022.9 | 43.00 |
| .50 | 1670. | 1023.2 | 43.00 |
| 1.00 | 4402. | 1024.6 | 41.75 |

PLAN 1 STATION DS2

| RATIO | MAXIMUM FLOW, CFS | MAXIMUM STAGE, FT | TIME HOURS |
|-------|-------------------|-------------------|------------|
| .10 | 239. | 774.7 | 44.00 |
| .20 | 572. | 776.5 | 43.50 |
| .30 | 923. | 778.2 | 43.25 |
| .40 | 1273. | 779.7 | 43.25 |
| .50 | 1650. | 780.4 | 43.50 |
| 1.00 | 4338. | 781.7 | 42.00 |

APPENDIX

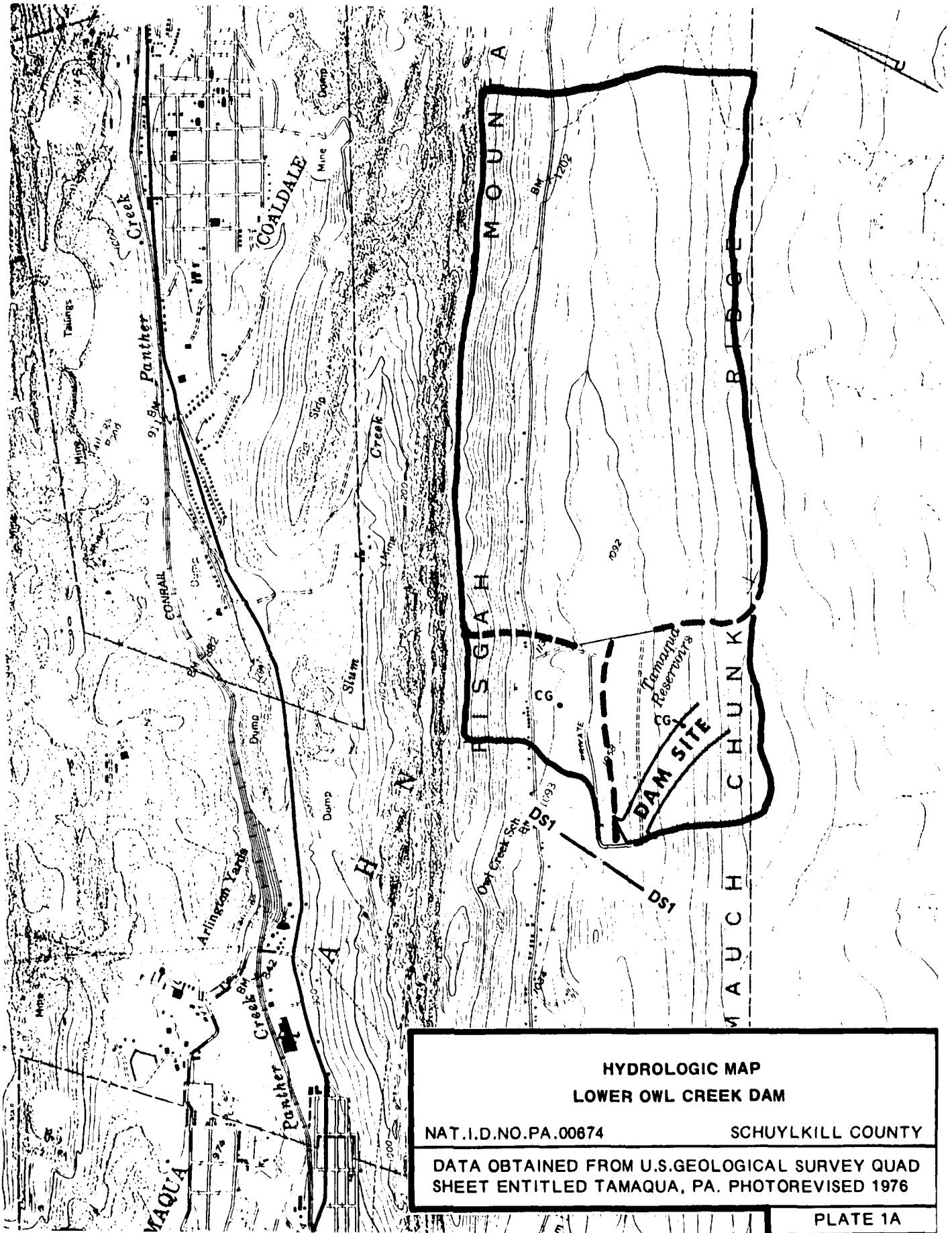
E



REGIONAL LOCATION PLAN
LOWER OWL CREEK DAM

NAT. I.D. NO. PA. 00674 SCHUYLKILL COUNTY

DATA OBTAINED FROM U.S. GEOLOGICAL SURVEY QUAD
 SHEET ENTITLED TAMAQUA, PA. PHOTOREVISED 1976

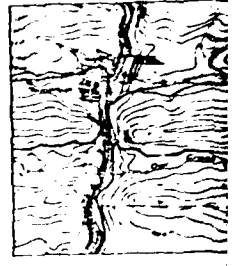
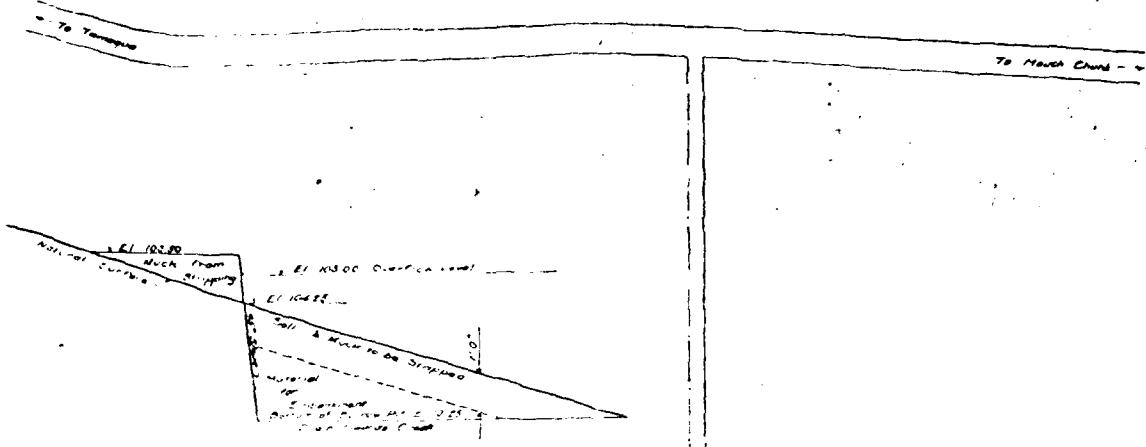


HYDROLOGIC MAP
LOWER OWL CREEK DAM

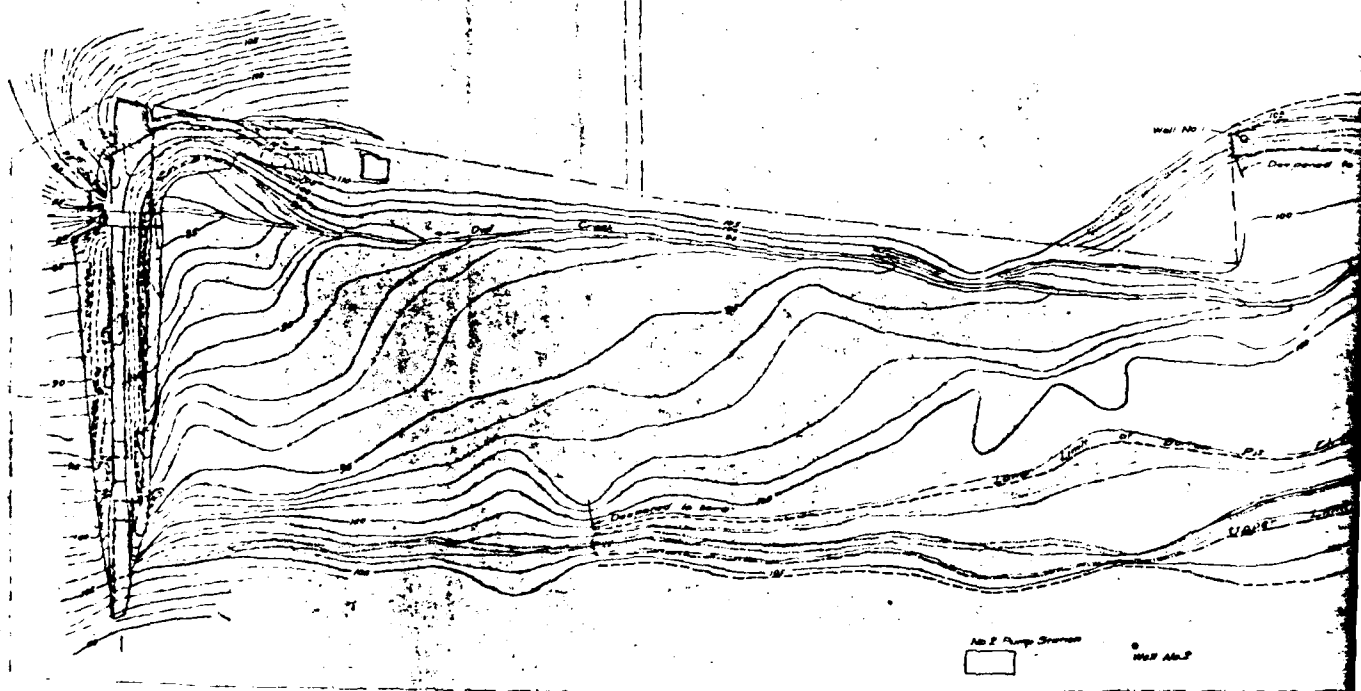
NAT. I. D. NO. PA. 00674 SCHUYLKILL COUNTY

DATA OBTAINED FROM U.S. GEOLOGICAL SURVEY QUAD SHEET ENTITLED TAMAQUA, PA. PHOTOREVISED 1976

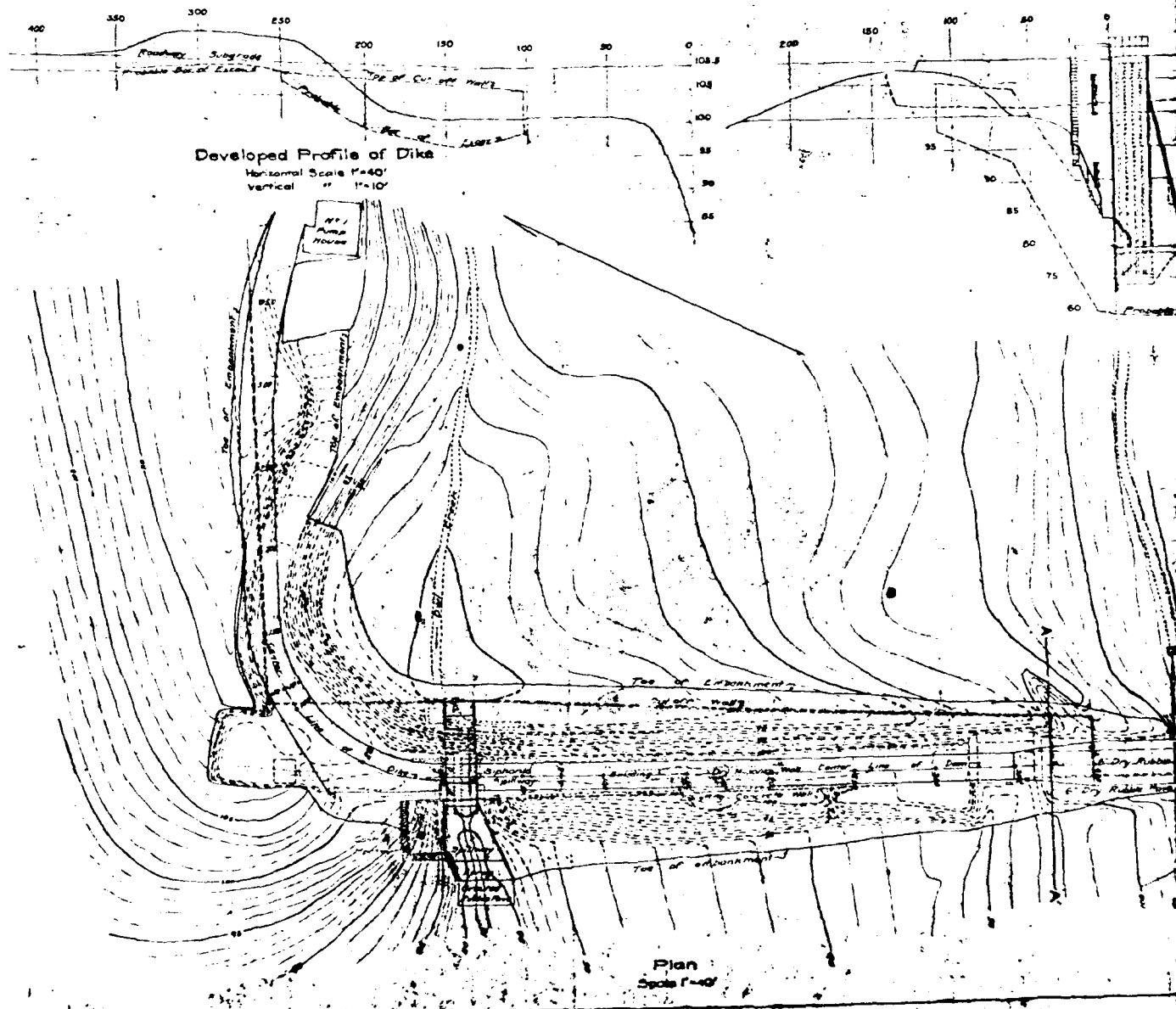
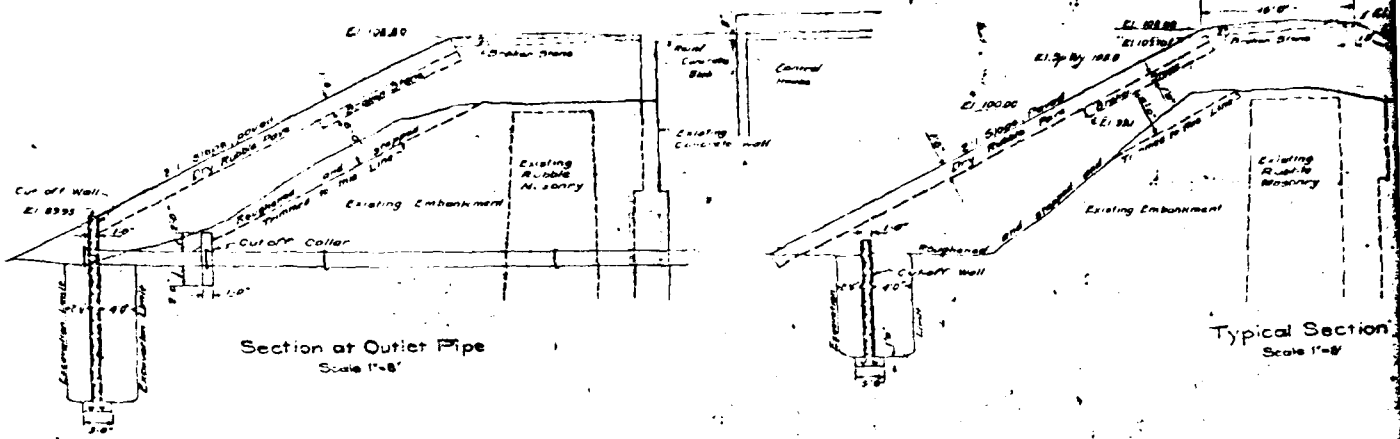
PLATE 1A



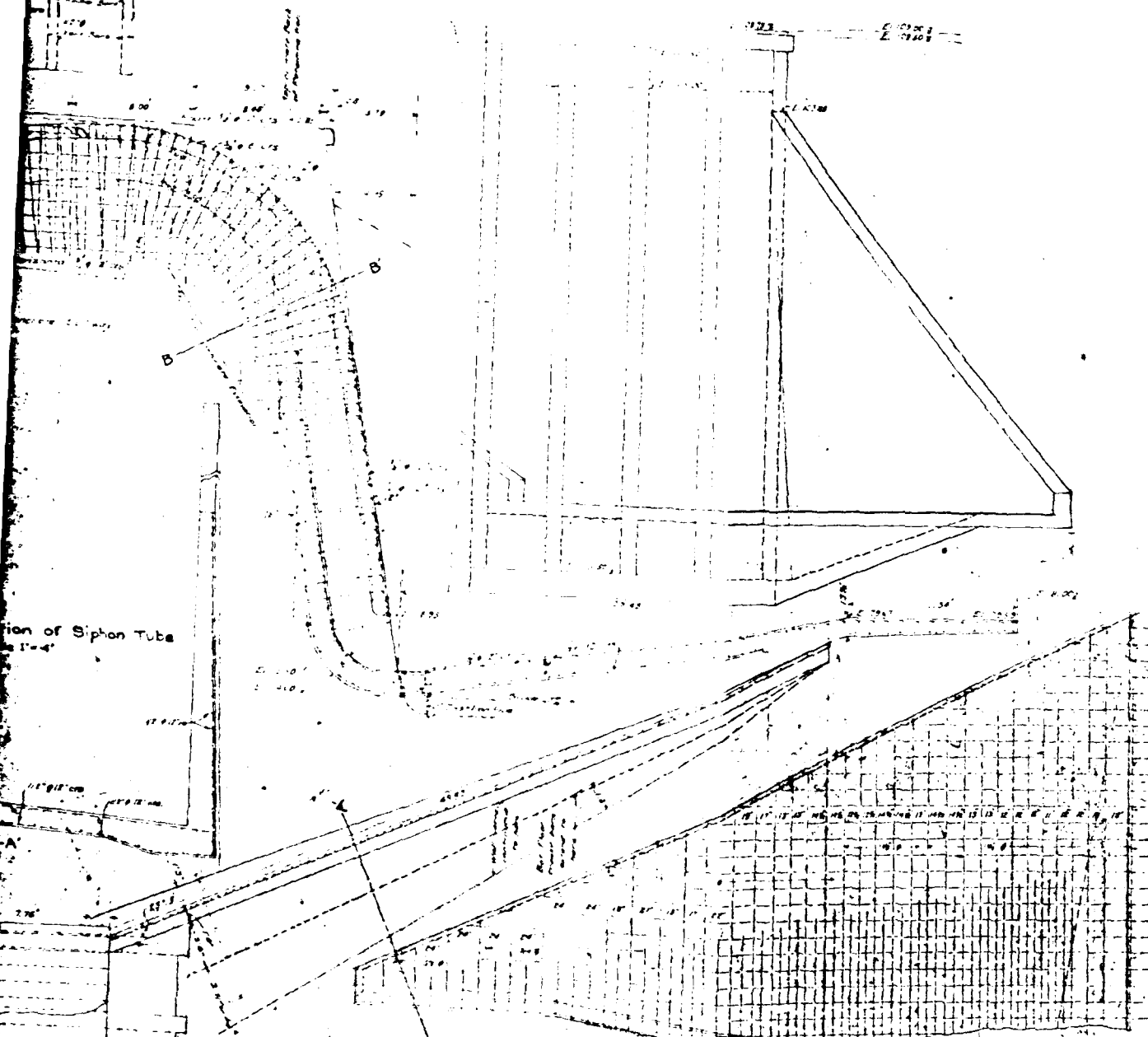
Typical Section of Shore Line
 Showing Stripping and Borrow Pit
 Horizontal Scale 1" = 20'
 Vertical Scale 1" = 2'



Topography Map
 Scale 1" = 100'



Section C-C'
Scale 1/4"



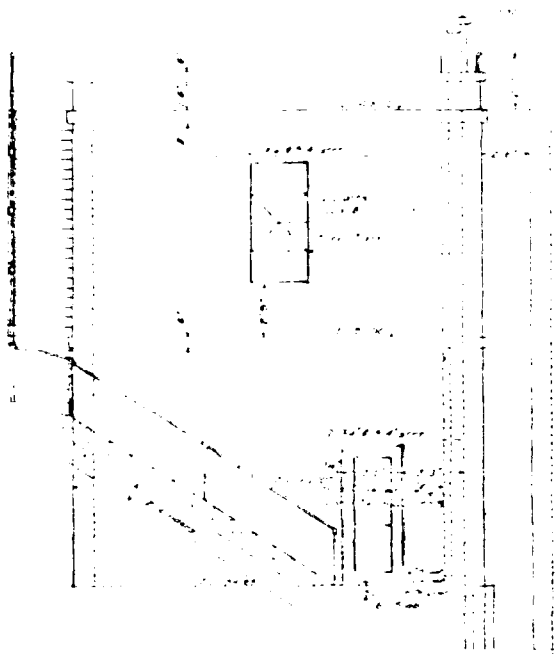
Location of Siphon Tube
1'-4"

Rear Elevation of Wing Wall
Scale Feet

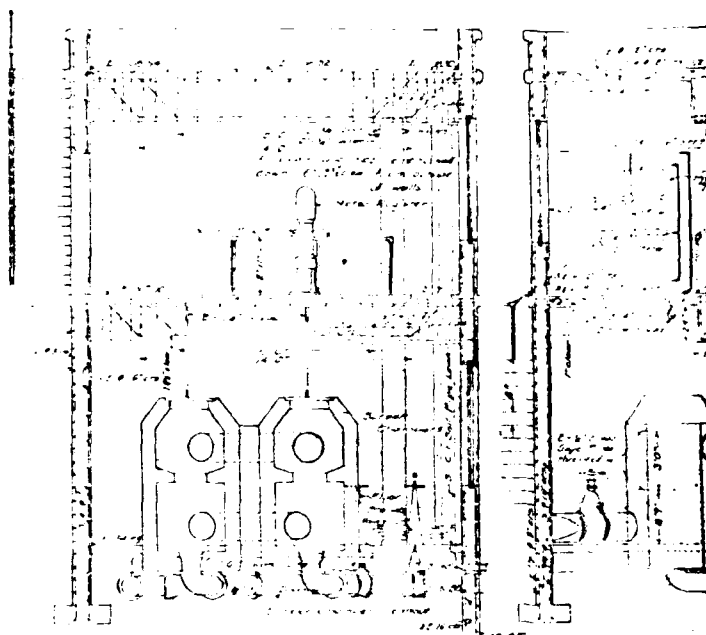
BOROUGH OF TAMAQUA, PA.
WATER WORKS COMMISSION.
OWL CREEK INTAKE RESERVOIR
RECONSTRUCTION
SPILLWAY

SHEET 3 OF 4 SHEETS
MARCH 4, 1927

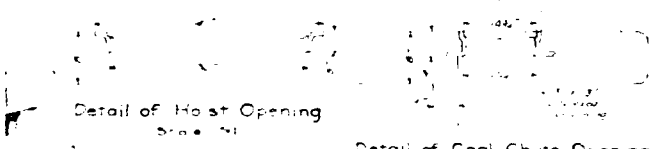
JH & WL LANCE, CONS ENGS.
WILKES-BARRE, PA.



West Elevation
Scale 1/4"



Section A-A
Scale 1/4"

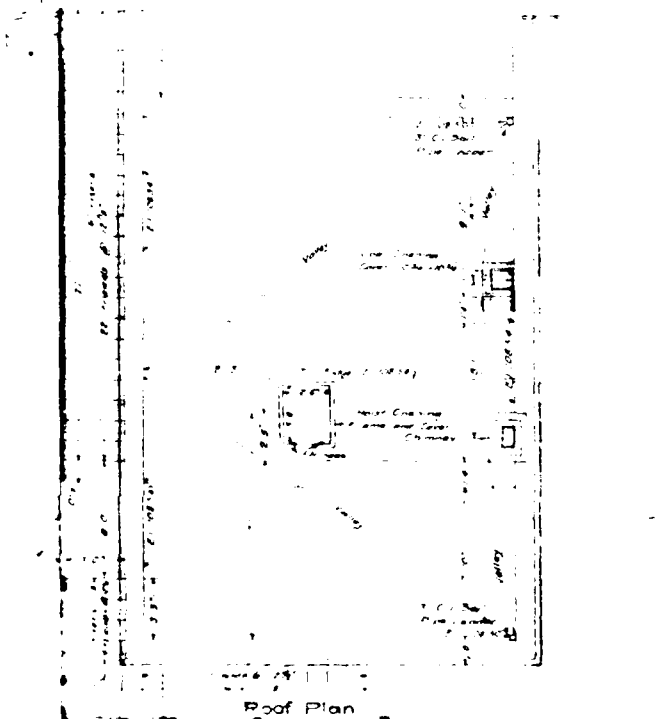


Detail of Hoist Opening
Scale 1/2"

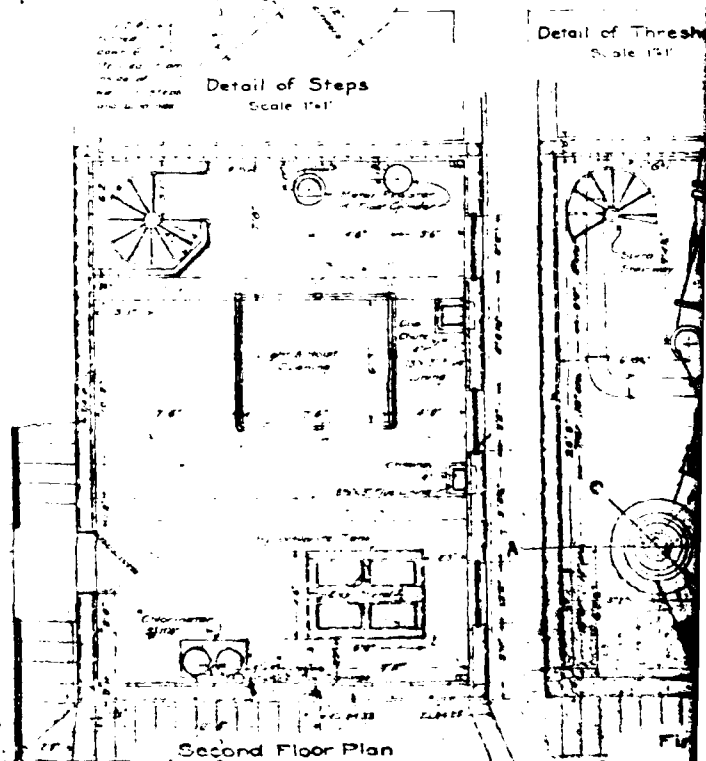


Typical
Wall Corner
Scale 1/2"

Detail of Coal Chute Opening
Scale 1/2"



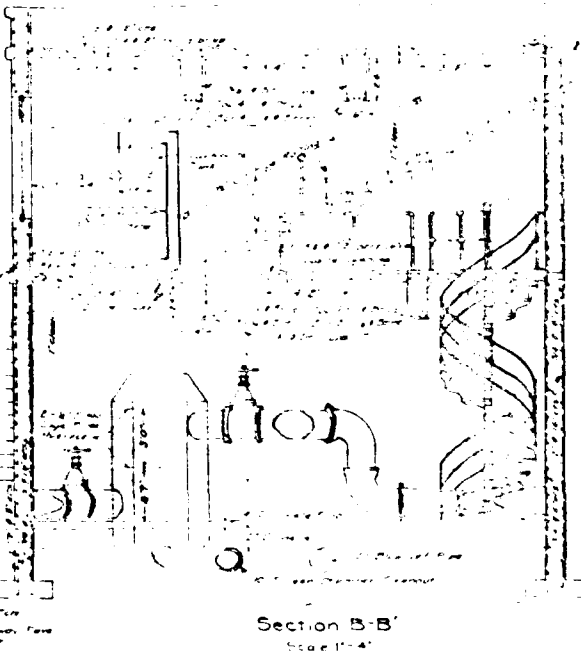
Roof Plan
Scale 1/4"



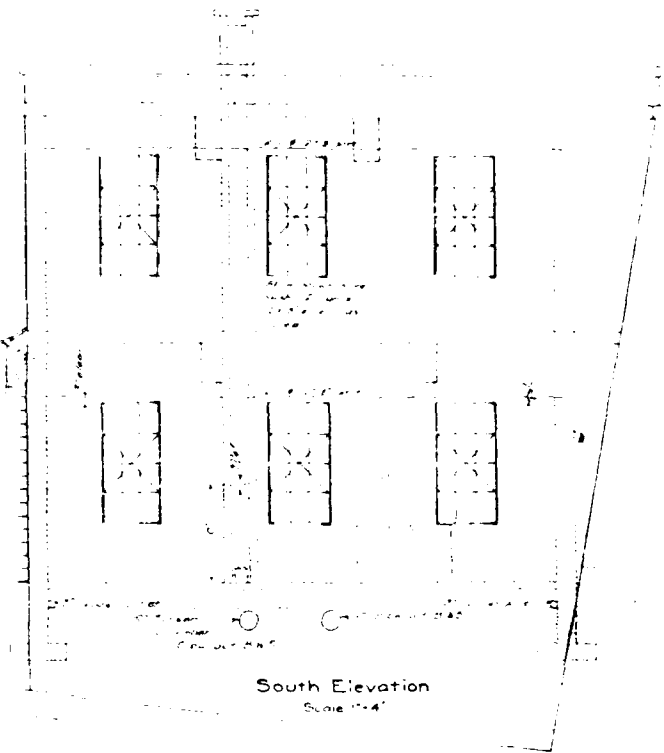
Second Floor Plan
Scale 1/4"

Detail of Thresh
Scale 1/2"

Detail of Steps
Scale 1/2"



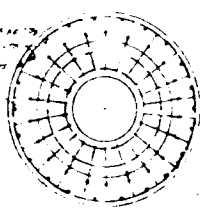
Section B-B'
Scale 1/4"



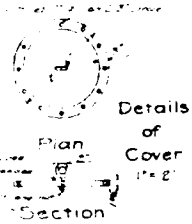
South Elevation
Scale 1/4"

Detail of Threshold
Scale 1/2"

Detail of
Corner Moulding
Scale 1/2"



Section D-D'



Details
of
Cover
Scale 1/2"

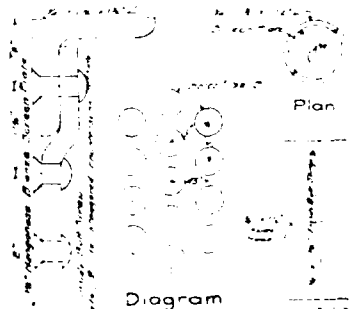
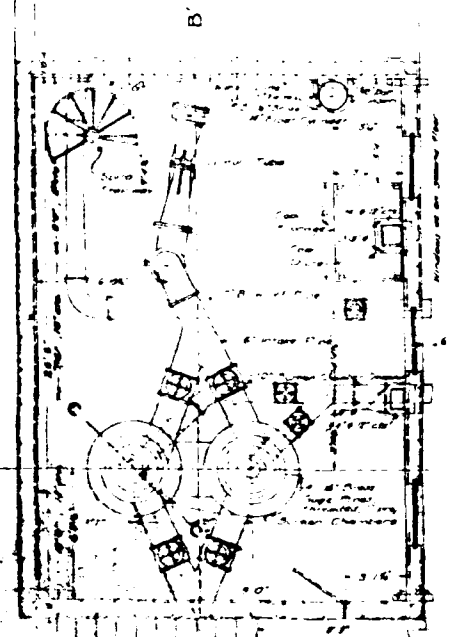
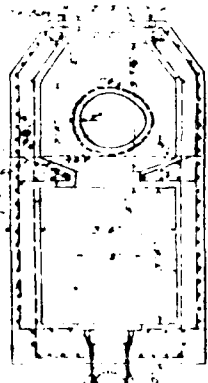


Diagram
of Screen
Punching
Scale 1/2"

Elevation
of Screen
Scale 1/2"



First Floor Plan
Scale 1/4"



Section C-C'

Details
of
Screen Chamber
Scale 1/2"

Detail of Screen
Scale 1/2"

BOROUGH OF TAMAQUA, PA
WATER WORKS COMMISSION
OWL CREEK INTAKE RESERVOIR
RECONSTRUCTION
CONTROL HOUSE

SHEET 4 OF 4 SHEETS
MARCH 4 1927

JH & WL LANGE, CONS. ENGS.
WILKES-BARRE, PA.

APPENDIX

F

AD-A087 916

WOODWARD-CLYDE CONSULTANTS PLYMOUTH MEETING PA
NATIONAL DAM INSPECTION PROGRAM. LOWER OWL CREEK DAM (NDS ID NU--ETC(U)
JUN 80

F/G 13/13

DACW31-80-C-0018

NL

UNCLASSIFIED

2 of 2
AD-A087 916



END

DATE

FORMED

9 80

DTIC

SITE GEOLOGY
LOWER OWL CREEK DAM

Lower Owl Creek Dam is located in the Appalachian Mountain Section of the Valley and Ridge Physiographic Province. As shown on Plate F-1, the dam is constructed upon the Mauch Chunk Formation of Upper Mississippian age. The Mauch Chunk consists of red-brown sandstone units with shale and siltstone interbeds, and red-brown shale and siltstone units with sandstone interbeds. In the creek bed at the downstream end of the spillway channel, an exposure of red-brown siltstone and shale strikes perpendicular to the dam axis at N 56° E and dips nearly vertical to the northwest. The predominant rock jointing strikes approximately parallel to the dam axis at N 20° W and dips upstream 65 degrees to the east. The dam site is located adjacent to the southern limit of the Minersville Synclinorium (a highly folded and faulted northeast trending regional structure) of the Southern Anthracite Field. The valley in which the dam is located is bordered by two northeast striking thrust faults which parallel the overall structural grain of this region of Pennsylvania.

