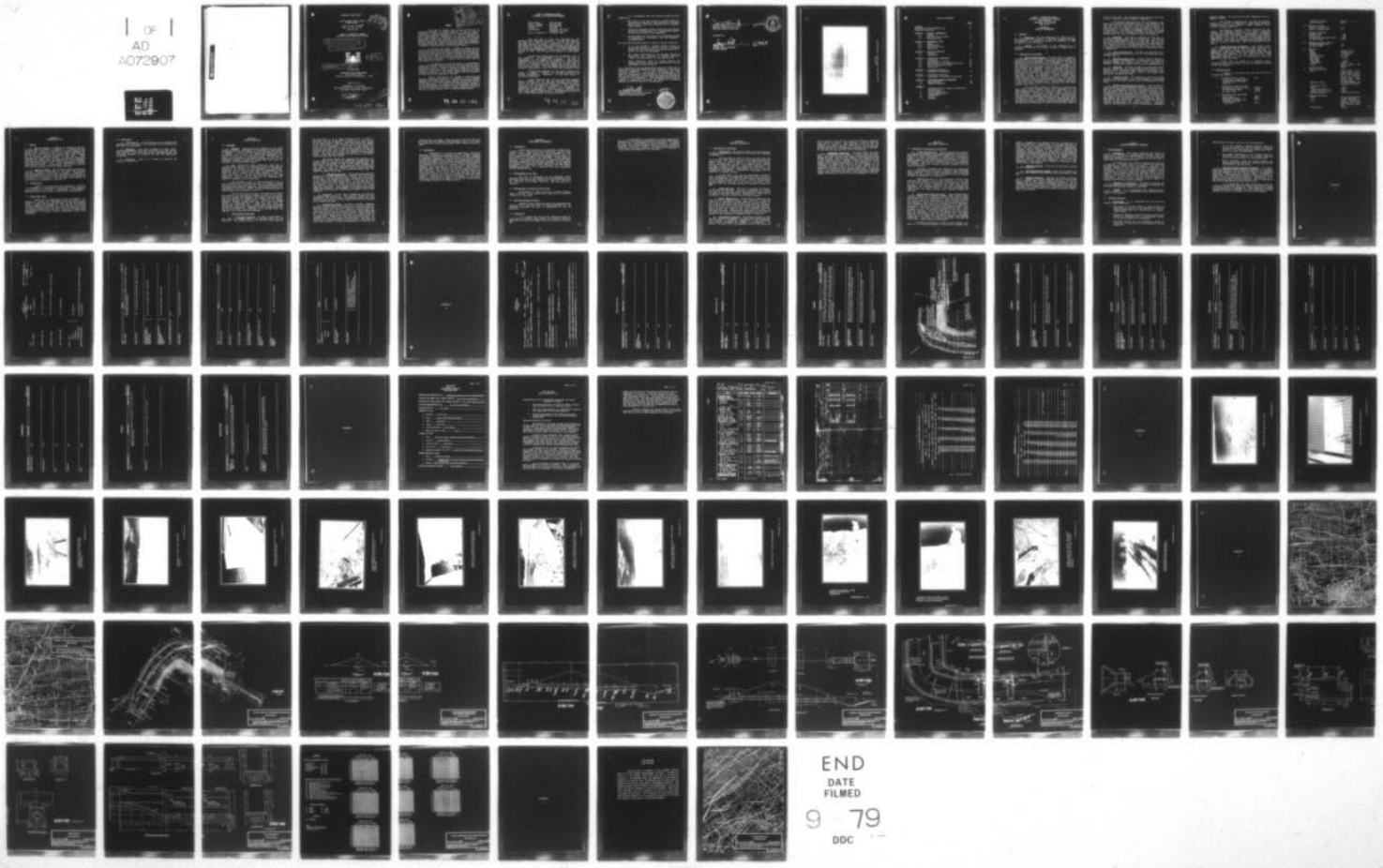
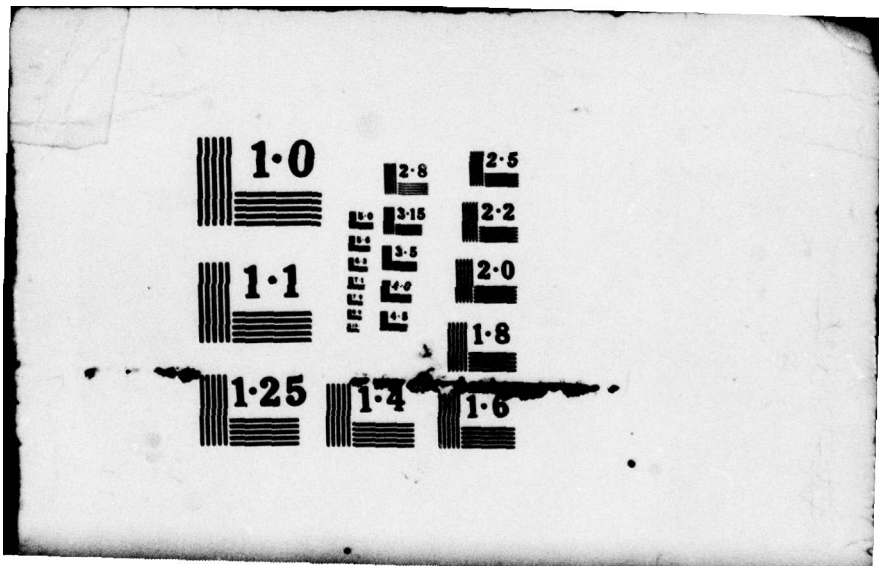
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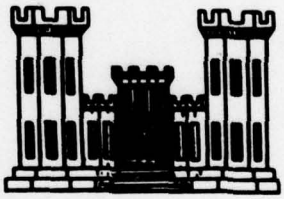
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PINE RUN DAM, BUCKS COUNTY PENNSYLVANIA

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PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

(6) National Dam Inspection Program. Pine Run Dam (SCS PA-616) (NDS ID PA ØØ8ØØ DER ID 9-17Ø), Delaware River Basin, Pine Run Creek, Bucks County, Pennsylvania, Phase I Inspection Report.



(12) 91 p.

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Prepared by:

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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.

79 08 15 095

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

Name of Dam:	Pine Run Dam
County Located:	Bucks County
State Located:	Pennsylvania
Stream:	Pine Run
Coordinates:	Latitude 40° 18.5'
	Longitude 75° 10.9'
Date of Inspection:	23 April 1979

Pine Run Dam is owned and maintained by the Neshaminy Water Resources Authority. The dam and reservoir are used as a flood control structure for the Pine Run Watershed upstream of Chalfont, Pennsylvania. This dam is one of a series of 10 either constructed or proposed flood control dams within the Neshaminy Watershed. The dam was designed by the United States Department of Agriculture, Soil Conservation Service, in 1971. The structure was completed in late summer 1974.

The dam and appurtenances are considered to be in fair condition. This assessment is due to the lack of maintenance of the slopes and embankment. The dam is classified as an "Intermediate" size dam with a "High" hazard potential consistent with the possibility, in the event of failure, for extensive property damage and probable loss of life along the creek. The main damage center is located at Chalfont, Pennsylvania, where Pine Run enters Neshaminy Creek.

Calculations presented in this report indicate the system is capable of passing the Probable Maximum Flood without overtopping. Therefore, the spillway system is considered "Adequate".

Visual inspection and review of available documentation indicate that the dam was designed with adequate factors of safety for the embankment and appurtenant structures, and the documentation reviewed for this inspection indicates that all work was performed in accordance with specification requirements. However, visual inspection revealed that maintenance of this structure is deficient and many items require rehabilitation. Recommendations pertaining to these deficiencies are presented below.

79 08 15 095

It is recommended that the following steps be taken immediately.

1. The crest of the dam should be rehabilitated and stabilized with gravel or other materials to prevent deterioration which has occurred due to unauthorized traffic.

2. Erosion on embankment slopes should be corrected and vegetation reestablished in a satisfactory manner on the entire slope of the embankment.

3. Erosion along the shoreline of the embankment should be stabilized in accordance with the designer's recommendations.

The following measures should be taken as soon as practical.

1. If at all possible, suitable devices should be constructed around the dam to prevent or minimize access of trail bikes and other unauthorized vehicles on the crest and embankment.

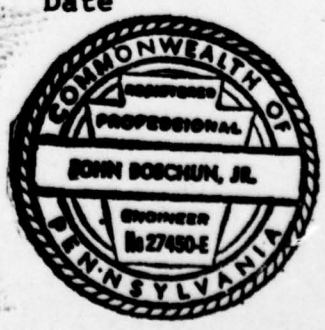
2. The channel downstream of the spillway should be stabilized with materials to prevent continued erosion and deterioration of the stream banks.

3. Woody vegetation along the stream channel and emergency spillway should be removed during routine maintenance of the structure.

It is understood that Neshaminy Water Resources Authority is preparing an operation and maintenance procedure in accordance with SCS guidelines. It is also understood that this procedure contains a warning system to be implemented in the event of an emergency. The procedures should be completed as soon as practical and should include the suggestions presented in Section 7.2, paragraph b. The procedures should then be issued to responsible personnel who should be thoroughly familiar with the contents of the procedure.

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Woodward-Clyde Consultants

6/13/79
Date



John H. Frederick, Jr., P.E.
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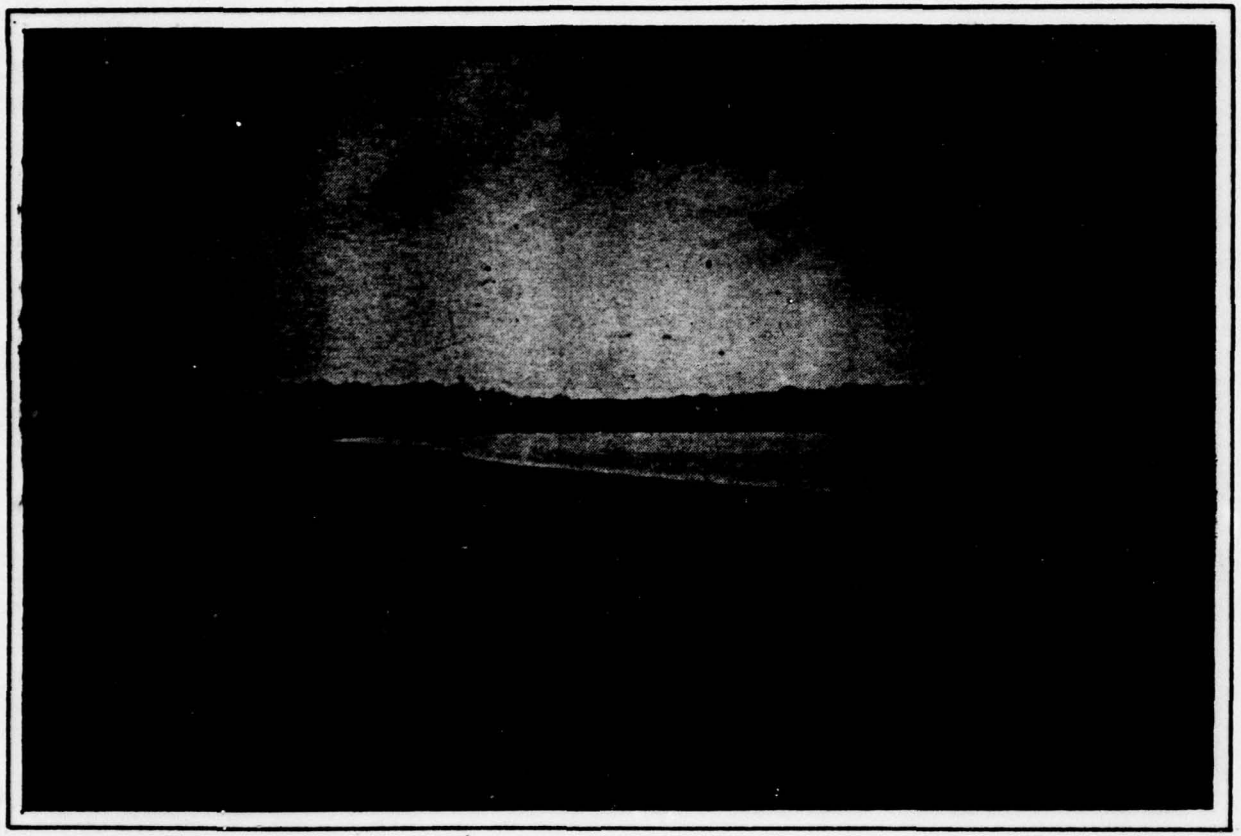
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Date



APPROVED BY:

17 July 79
Date

JAMES N. PECK
Colonel, Corps of Engineers
District Engineer



OVERVIEW
PINE RUN DAM, BUCKS COUNTY, PENNSYLVANIA

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PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM
PINE RUN DAM
NATIONAL ID #PA 00805
DER #9-170

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. Pine Run Dam is a homogeneous embankment with an impervious cutoff trench beneath the centerline of the embankment. ~~A typical plan of the dam and profile are shown on Plates 2 and 3, Appendix E.~~ The dam is approximately 2,700 feet long and the height, measured from the stream bed to the crest, is 31.8 feet. Embankment fill was obtained from emergency spillway excavation and borrow areas within the reservoir. Zone 1 materials used in the cutoff trench are classified as low plastic silts, and Zone 2 materials are slightly less plastic but still classified as low plastic silts. The embankment internal drainage system discharges through the sidewalls of Saint Anthony's Falls (SAF) stilling basin at the downstream toe. The upstream slope is 3H:1V and the downstream slope is 2.5H:1V. The crest is 14 feet wide at elevation 287.8. The upstream slope has a 15 foot wide berm at approximately elevation 265, the normal sediment pool level.

The principal spillway is composed of a single-stage drop inlet riser located within the embankment toe at approximately Station 26 + 50, a 129 foot long, 3.5 foot x 5.0 foot monolithic reinforced concrete conduit and an SAF stilling basin. The riser weir crest is at elevation 267.5 and the downstream channel elevation is 256. The pond drain consists of a 42-inch diameter reinforced pipe with an invert at elevation 258.5. A pipe is located at the upstream toe of the dam and discharges through the principal spillway conduit. The pond drain sluice gate is inside the riser and a hoist is

on top of the riser. The discharge conduit has five anti-seep collars, located as shown on Plate 5, Appendix E.

The emergency spillway is at the left abutment. The grass-lined emergency spillway channel is approximately 400 feet wide and the 1,000 foot long level control section at elevation 283.6 is parallel to the principal spillway. A small stream flows through the emergency spillway. See Plate 6, Appendix E. The channel discharges into the downstream valley, meeting the principal spillway discharge channel approximately 250 feet downstream of the stilling basin.

b. Location. The dam is located on Pine Run in Doylestown Township, Bucks County, Pennsylvania. The dam site is located approximately 3/4 of a mile due north of New Britain, Pennsylvania, northwest of Route 202. The dam site and reservoir are shown on USGS Quadrangle entitled "Doylestown, Pennsylvania" at coordinates N 40° 18.5' W 75° 10.9'. A regional location plan of Pine Run Dam is enclosed as Plate 1, Appendix E.

c. Size Classification. The dam is classified as an "Intermediate" size dam by virtue of its 3,440 acre-foot total storage capacity.

d. Hazard Classification. A "High" hazard classification is assigned consistent with the potential for extensive property damage and probable loss of life downstream in Chalfont, Pennsylvania, where Pine Run enters Neshaminy Creek.

e. Ownership. The dam is owned by the Neshaminy Water Resources Authority. All correspondence should be sent to Mr. William Taylor, Neshaminy Water Resources Authority, Post Office Box 6, Cross Keys Office Center, 4259 Swamp Road, Doylestown, Pennsylvania 18901.

f. Purpose of Dam. The purpose of this dam is flood control. Pine Run Dam is one of ten proposed or constructed flood control structures located within the Neshaminy drainage basin.

g. Design and Construction History. Pine Run Dam was constructed as a flood-retarding structure under the provisions of the Watershed Protection and Flood Prevention Act. The dam was designed by the Soil Conservation Service (SCS) and personnel from SCS provided resident engineering and inspection services throughout construction. The application to construct this dam was submitted on November 10, 1971, and the "Report Upon the Application" prepared by the State of Pennsylvania was issued June 7, 1972. Construction began in the fall of 1972, by Curtis T. Bedwell & Sons, Inc. of West Chester, Pennsylvania, the prime contractor. Reservoir clearing was performed by the Harlow Contracting & Equipment

Rentals Company. The dam was certified completed by SCS on August 27, 1974.

The resident engineers for the SCS were Messrs. Frederick H. Schuetz and James Metz. Additional inspectors included Messrs. Harlin Kemmerer, Russell Campbell, Barry Kintzer and Woodrow Malloch.

Construction progress reports prepared by Mr. Schuetz were submitted monthly to the State. Documents indicate that embankment materials were placed in accordance with specification requirements. Specifically, all embankment density tests met or exceeded minimum specification requirements of at least 95 percent of the Standard Proctor (ASTM D 698). Many construction summary records regarding the work are located in DER files, which were reviewed for this report.

h. Normal Operating Procedures. Under normal conditions, the pond drain gate is closed and water flows over the intake riser weirs through the principal spillway. A memorandum in DER files issued by the Bucks County Planning Commission, dated December 19, 1974, indicates that minimum flow downstream shall not be less than 1.48 cfs. The memorandum reported the flow is maintained by partially opening the pond drain gate.

Excess water is stored up to elevation 283.6. Thereafter, water is discharged through the emergency spillway at the left abutment.

1.3 Pertinent Data.

A summary of pertinent data for Pine Run Dam is presented as follows.

a.	Drainage Area (sq miles) (including drainage area of stream through emergency spillway)	9.89
b.	Discharge at Dam Site (cfs)	
	Maximum Known Flood at Site	Unknown
	At Design High Water	5,987
	At Top of Dam	24,613
c.	Elevation (feet above MSL)	
	Top of Dam	287.8
	Design High Water	285.3
	Emergency Spillway Crest	283.6
	Principal Spillway Weir Crest	267.5

	Pond Drain Invert	258.5
	Outlet Invert	256.0
d.	Reservoir (miles)	
	Length at Normal Pool	1.5
	Fetch at Normal Pool	1.5
e.	Storage (acre-feet)	
	Sediment Pool	128
	Normal Pool	128
	To Emergency Spillway Crest	2,244
	To Top of dam	3,441
f.	Reservoir Surface (acres)	
	Sediment/Normal Pool	39
	At Top of Dam	321
g.	Dam Data	
	Type	Rolled earth
	Volume	122,000 cu yd
	Length	2,700 feet
	Maximum Height	31 feet
	Top Width	14 feet
	Side Slope	
	Upstream	3H:1V
	Downstream	2.5H:1V
	Cutoff	Trench under dam centerline.
	Grout Curtain	None
h.	Principal Spillway	
	Type	Single-stage reinforced concrete drop inlet riser with a 3.5' x 5.0' concrete conduit and a reinforced SAF - type stilling basin.
	Reservoir Drain	42 inch diameter RCP connected to riser.
	Elevations (feet)	
	Weir	267.5
	Pond Drain Invert	258.5
	Conduit Outlet Invert	256.0
	Energy Dissipator	SAF stilling basin
i.	Emergency Spillway	
	Type	Grass-lined spillway at left abutment.
	Size	1,000' wide control section and 400' wide discharge channel.
	Side Slopes	3H:1V

SECTION 2
ENGINEERING DATA

2.1 Design.

a. Data Available. A summary of engineering data on Pine Run Dam is attached as Appendix A. Engineering data available for review is contained in a several hundred page design folder prepared by the United States Department of Agriculture, Soil Conservation Service (SCS), and a 44-page set of as-built drawings supplied by the Owner. These drawings were prepared by the SCS. In addition, other data included the "Report Upon the Application of the Neshaminy Water Resources Authority" submitted by the State of Pennsylvania and dated June 7, 1972. Other documentation included miscellaneous letters, correspondence and monthly construction reports prepared the SCS resident engineer.

b. Design Features. The principal design features of Pine Run Dam are illustrated on the plans and profiles enclosed in Appendix E as Plates 2 through 9. These plates were reproduced from as-built drawings prepared by the SCS. A detailed description of the design features is also described in Section 1.2, paragraph a, and pertinent data relative to the structure is presented in Section 1.3.

2.2 Construction.

Details of construction are presented in Section 1.2, paragraph g. Construction records used for the review of this project were obtained in Department of Environmental Resources (DER) files located in Harrisburg, Pennsylvania.

2.3 Operational Data.

There are no operational records maintained. Although the minimum flow requirements are not noted in the permit nor could they be confirmed with the Owner's representative, a memo dated December 19, 1974, by the Bucks County Planning Commission indicates that a minimum flow of 1.48 cfs is required downstream of the structure, and measuring weirs were above and below the reservoir. There are no water level measurements or rainfall records maintained within this watershed.

2.4 Evaluation.

a. Availability. All engineering data evaluated and reproduced for this report was provided by the Pennsylvania DER, SCS or by the Owner.

b. Adequacy. The data included in State files, supplemented with data obtained from Bucks County and information received from State and County representatives, are considered adequate to evaluate the dam and appurtenant structures.

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

SECTION 3
VISUAL INSPECTION

3.1 Findings.

a. General. Observations and comments of the field inspection team are contained in the checklist enclosed herein as Appendix B, and are summarized and evaluated as follows. In general, the dam and its appurtenant structures are considered to be in fair condition as the embankment is in need of a great deal of minor maintenance. At the time of inspection, stream flow was passing through the riser of the principal spillway, preventing access into the riser or inspection of the discharge conduit.

b. Dam. During the visual inspection, there were no indications of distortion in alignment or grade that would be indicative of movement of the embankment or foundation. Vegetative cover on the upstream slope is considered in poor condition and has patchy areas with scattered erosion all along the slope. Erosion has usually started in areas of trail bike traffic. Along the shoreline there is some embankment erosion since the slope is not protected with riprap or vegetation at the waterline.

The embankment crest is also considered to be in poor condition as it contains ruts up to 16 inches in depth with areas of ponded water and mud. The downstream slope also contains patchy areas of vegetation and erosion which can be attributed to trail bike traffic. One gully measured about 14 inches deep; see Photographs 12 and 13.

The vertical and horizontal alignments were checked and found to be satisfactory except for ruts in the road. Junctions between the embankment and abutment and the embankment and spillway are judged to be in good condition with no excessive erosion or deterioration. There is no seepage observed, although ponded water and soft areas were noted beyond the downstream toe. These soft wet areas are attributed to poor grading of the area and not due to seepage through the embankment. Embankment drains discharging into the stilling basin were observed to be flowing clear and appeared to be functioning as designed.

c. Appurtenant Structures.

1. Principal Spillway. As shown on Photograph 1, the riser is located within the upstream bench at the shoreline. The exposed portions of the riser were inspected

and evaluated to be in good condition with no signs of excessive concrete deterioration, spalling or other structural deficiencies or defects. Some minor debris was clogged in the trash racks of the spillway, which should be removed during routine maintenance. The interior of the intake riser could not be inspected as water was flowing through the principal spillway. It is noted that one grating was missing from the top of the riser, which is considered to be a safety hazard. The pond drain sluice gate could not be exercised since a stem cap was attached to the top of the hoist, preventing the stem from rising.

The outlet channel was inspected and observed to be in poor condition as there is insufficient riprap along the channel banks to prevent erosion and bank undercutting. The construction photographs in DER files, dated November 20, 1973, show that the first downstream bend was not protected with riprap. Thus, the observed erosion would have been expected. The condition of the downstream channel does not affect the safety of the dam.

2. Emergency Spillway. The grass-lined emergency spillway at the left abutment was inspected and found to be stable and in fairly good condition. There is minor erosion of the walls, and vegetation is spotty in places on the floor of the channel with some ponded water. It is noted that this channel contains a small stream going through the center of the channel, which is lined on either side with woody vegetation and trees. This vegetation should be cut during normal maintenance of the embankment. The stream channel side slopes are reasonably well vegetated and appear to be in good condition.

d. Reservoir. At the time of inspection, the pond was at sediment pool elevation. The reservoir slopes are well vegetated to the water's edge. Considerable debris was noted along the waterline, which could partially block flow through the principal spillway.

e. Downstream Channel. As shown on Plate 1, Appendix E, Pine Run flows west of New Britain to the North Branch of Neshaminy Creek at Chalfont, Pennsylvania, near the intersection of Routes 202 and 152. About 2.3 miles above the confluence of Pine Run with the North Branch, Peace Valley Dam NDS ID PA 00790 is across the North Branch. Peace Valley Dam is a multiple-purpose dam controlling 15.8 square miles of drainage area. Between the dam and the North Branch, the stream's 20 foot wide channel and three foot high banks are stable with a valley gradient of about 0.0015. Less than one mile below the dam is a housing development with some of the

houses subject to damage. About two miles below the dam, Pine Run flows through Chalfont, Pennsylvania, which is a highly populated area, clearly justifying a "High" hazard classification.

3.2 Evaluation.

Inspection of the dam and appurtenant facilities disclosed no evidence of apparent past or present movement that would indicate existing instability of the dam, principal or emergency spillways. Interior portions of the principal spillway and discharge pipe could not be inspected due to flow through the system. The principal spillway discharge channel was inspected and found to be in fair condition with some bank undercutting and a lack of suitable riprap protection to minimize this deterioration and erosion. The emergency spillway channel and area below the dam were observed to be in good condition. The reservoir shoreline contains debris and other materials which could float and partially clog the principal spillway. The crest of the dam contains soft muddy areas with other areas of erosion associated with trail bike traffic. Although the slopes are considered to be poorly maintained and in need of repairs, the overall classification of the dam's condition is judged as fair.

SECTION 4
OPERATIONAL PROCEDURES

4.1 Procedures.

Operational procedures are discussed in some detail in Section 1.2. Operation of the dam does not require a dam tender. Under normal conditions, flow discharges over the weir of the principal spillway and through the 3.5 foot by 5 foot conduit at the base of the embankment. Excess water is stored and then discharged over the crest of the emergency spillway. As reported by the Owner's representatives, water has never flowed over the emergency spillway. It is reported by the Owner's representative that operational and maintenance procedures are currently being prepared for the entire Neshaminy watershed. It is reported that these procedures will be issued shortly.

4.2 Maintenance of the Dam.

The dam is maintained by the Neshaminy Water Resources Authority who periodically check the embankment, mow the grass and remove woody vegetation. Apparently, based on the condition of the dam, this work has not been done recently.

4.3 Maintenance of Operating Facilities.

Maintenance of these facilities includes cleaning debris from the intake systems and checking the structural integrity of the system.

4.4 Warning Systems In Effect.

Neshaminy Water Resources Authority representatives indicate that a warning system is being developed for the Neshaminy watershed and will be implemented as soon as practical.

4.5 Evaluation.

It is judged that the current operating procedure, which does not require a dam tender, is a realistic means of operating the relatively simple control facilities at Pine Run Dam.

In conclusion, it is noted that formal operational/ maintenance and warning procedures are currently being developed and will be implemented as soon as practical. It should be noted that these procedures should include an inspection checklist, which would include a listing of items that should be checked during each inspection and repaired as necessary to insure proper performance of the structure.

SECTION 5
HYDROLOGY/HYDRAULICS

5.1 Evaluation of Features.

a. Design Data. The complete folder of design calculations was reviewed and portions of this folder are presented in Appendix C.

The watershed is about six miles long and from 0.25 to 2.25 miles wide, having a total area of approximately 9.89 square miles. An unusual feature of this dam is the stream, with a drainage area of about 0.3 square miles, flowing through the emergency spillway. Elevations range from 540 in the upper reaches to 267.5 at normal pool elevation. The watershed is predominantly open/farmland with 25 to 35 percent residential development. Residential development can be expected to progress rapidly.

In accordance with criteria established by Federal (OCE) Guidelines, the recommended spillway design flood for this "Intermediate" size dam and "High hazard classification is the Probable Maximum Flood (PMF). The Soil Conservation Service designed this dam as a Class C structure, which requires that the spillway systems be designed to pass the PMF.

b. Experience Data. There are no records of reservoir levels kept for this dam. Rainfall is measured and records are kept at the Neshaminy Water Resources Authority's office in nearby Cross Keys, Doylestown, Pennsylvania. There are no estimates or records of previous high water levels.

c. Visual Observations. On the date of inspection, the only condition observed that could indicate a possible reduction in emergency spillway capacity is the growth of fairly large trees along the stream in the emergency spillway. The trees would tend to prevent discharge from the reservoir from flowing over the entire width of the emergency spillway. Debris around the reservoir may also partially clog the principal spillway. Observations regarding the condition of the downstream channel, spillways and reservoir are located in Appendix B and discussed in greater detail in Section 3.

d. Overtopping Potential. The dam was designed to pass the PMF without overtopping. The PMF inflow hydrograph and flood routing are presented in Appendix C. This information was reviewed, evaluated and judged to be adequate. In summary, the peak inflow was computed as 25,878 cfs resulting

from a six-hour storm with 25.5 inches of rainfall, producing 22.89 inches of runoff. The storm was routed through the reservoir to produce a peak discharge of 24,613 cfs and maximum water level elevation 287.8 at the top of the dam. Spillway systems for this dam are considered to be "Adequate" as the dam will pass the PMF without overtopping.

e. Downstream Conditions. Pine Run enters the North Branch of Neshaminy Creek about 1.9 miles below the dam. About 3,000 feet farther downstream, the North Branch enters Neshaminy Creek. Pine Run Dam, together with Peace Valley Dam in the adjacent valley, provides relief from flooding in the rapidly urbanizing area. However, a high potential for flood damage still exists downstream of the structures. It is estimated that damage from flooding has been reduced but not eliminated through control of the upper reaches of the Neshaminy Watershed by flood control structures. In conclusion, it is evaluated that significantly greater downstream damage would result from failure of the dam during a PMF than damage resulting from large flows during passage of the PMF.

SECTION 6
STRUCTURAL STABILITY

6.1 Evaluation of Structural Stability.

a. Visual Observations. Visual observations detected no evidence of existing or impending embankment instability. Upstream and downstream slopes were stable, with no surficial slides or other indications of deep-seated instability. However, there is some potentially serious erosion, a lack of dense vegetation, and other indications of lack of surficial maintenance. There were no exterior signs or other evidence to indicate that the internal drainage systems were not operating properly.

No signs of seepage were observed at the downstream toe or in areas adjacent to the toe. However, areas of ponded water resulting in wet marshy conditions were noted and assessed to be a result of poor drainage and not of seepage through the embankment or foundation.

Exposed portions of the principal spillway were inspected and judged to be in good condition. It is noted that the pond drain sluice gate was not exercised as a cap was on top of the hoist, preventing the stem from rising. Similarly, the emergency spillway was also inspected and assessed to be in good condition, with some woody vegetation noted along the stream channel which passes through the spillway.

b. Design and Construction Data. Design documentation is very complete as a several hundred page design folder prepared by the Soil Conservation Service (SCS) was available and reviewed for this investigation. Data included in these files are a foundation report and structural calculations for the embankment, pertinent facilities and principal spillway. Also included in this report are a complete set of specifications and an estimate of the quantity of material used in the embankment. The report contains permeability tests, shear strength results and sediment analysis as well as a full stability analysis. The stability analysis for this embankment was performed by the SCS and showed that, for rapid drawdown, the minimum factor of safety was 2.0. A somewhat higher factor of safety was reported for steady state seepage conditions. According to Corps of Engineers' criteria, EM 1110-2-1902, these values are acceptable.

Documents pertaining to design also include a 44-sheet set of drawings prepared by the SCS and stamped "As-

Built". Included in this design folder is a complete set of hydrologic/hydraulic calculations. Principal features of this structure were extracted from these drawings and calculations, and are located in Appendix E and C, respectively. Progress reports prepared by SCS' resident engineer and inspection reports prepared by Department of Environmental Resources representatives indicate that work was performed in accordance with SCS requirements and that all compaction tests exceeded the minimum specification of 95 percent of the Standard Proctor as defined by ASTM D 698. Other testing, such as concrete tests and gradation tests, were also documented in the construction inspector's records to meet specification requirements.

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

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

e. Seismic Stability. 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. As the stability analysis resulted in a minimum factor of safety of two under rapid drawdown conditions, the most critical loading conditions, it can be assumed that seismic stability requirements are satisfied.

SECTION 7
ASSESSMENT/REMEDIAL MEASURES

7.1 Dam Assessment.

a. Evaluation. The visual inspection and review of design and construction documentation indicate that the appurtenant structures of Pine Run Dam are in good condition, while the embankment is in fair condition due to the lack of maintenance of the slopes and crest.

The hydrologic and hydraulic computations presented in Appendix C indicate that the structure will pass the probable maximum flood without overtopping. Therefore, the spillway systems of this structure are considered to be "Adequate". In the event that high flows are passed through the emergency spillway, significant property damage is still likely to occur along Pine Run and especially in the town of Chalfont, Pennsylvania, where there are many homes near the flood plain. In the event the dam fails while retaining a significant quantity of water, extreme property damage and possible loss of life would be expected.

b. Adequacy of Information. Information available for this investigation was sufficiently adequate to evaluate the structure and hydraulic aspects of the basin.

c. Urgency. It is recommended that suggestions presented in Section 7.2 be implemented during routine maintenance of the structure.

7.2 Remedial Measures.

a. Facilities. It is recommended that the following steps be taken immediately.

1. The crest of the dam should be rehabilitated and stabilized with gravel or other materials to prevent deterioration which has occurred due to unauthorized traffic.

2. Erosion on embankment slopes should be corrected and vegetation reestablished in a satisfactory manner on the entire slope of the embankment.

3. Shoreline erosion of the embankment should be stabilized in accordance with the designer's recommendations.

These measures should be taken as soon as practical.

1. If at all possible, suitable devices should be constructed around the dam to prevent or minimize access of trail bikes and other unauthorized vehicles on the crest and embankment.

2. The channel downstream of the spillway should be stabilized with materials to prevent continued erosion and deterioration of the stream banks.

3. Woody vegetation along the stream channel and emergency spillway should be removed during routine maintenance of the structure.

b. Operation and Maintenance Procedures. It is understood that Neshaminy Water Resources Authority is currently preparing operation and maintenance procedures in accordance with SCS guidelines for all existing dams in the Neshaminy Watershed. These procedures should include a checklist to insure that all items are periodically inspected and maintained in the best possible condition. Furthermore, it is also understood that a warning system is also in preparation and will be implemented as soon as practical.

It is recommended that these procedures provide for a period of observation after significant quantities of water are stored behind the embankment. These observations should include monitoring discharge from the embankment drainage system and looking for sources of uncontrolled seepage.

APPENDIX

A

CHECK LIST
ENGINEERING DATA
DESIGN, CONSTRUCTION, OPERATION
PHASE I

NAME OF DAM *Pine Run Dam*

ID # *PA 00809*

ITEM	REMARKS
AS-BUILT DRAWINGS	*Yes. See Appendix E.*
REGIONAL VICINITY MAP	*Yes. See Plate 1, Appendix E.*
CONSTRUCTION HISTORY	*Yes. See Section 1.2, paragraph g of report text.*
TYPICAL SECTIONS OF DAM	*Yes. See Appendix E.*
OUTLETS - PLAN	*See Appendix E.*
DETAILS	
CONSTRAINTS	
DISCHARGE RATINGS	*See SCS design file in DER files, Harrisburg, Pennsylvania.*
RAINFALL/RESERVOIR RECORDS	*None available.*

ITEM	REMARKS
DESIGN REPORTS	*Yes. Complete SCS design package is located in DER files, Harrisburg, Pennsylvania*
GEOLOGY REPORTS	*Yes. See Appendix F and SCS design folder in DER files.*
DESIGN COMPUTATIONS HYDROLOGY & HYDRAULICS DAM STABILITY SEEPAGE STUDIES	*All data in SCS design folder in DER files.*
MATERIALS INVESTIGATIONS BORING RECORDS LABORATORY FIELD	*See SCS design folder in DER files.*
POST-CONSTRUCTION SURVEYS OF DAM	*None*
BORROW SOURCES	*Data located on SCS drawings.*

ITEM	REMARKS
MONITORING SYSTEMS	*None*
MODIFICATIONS	*None*
HIGH POOL RECORDS	*None available.*
POST CONSTRUCTION ENGINEERING STUDIES AND REPORTS	*None*
PRIOR ACCIDENTS OR FAILURE OF DAM DESCRIPTION REPORTS	*None*
MAINTENANCE OPERATION RECORDS	*Yes. SCS has an O & M procedure.*

ITEM	REMARKS
SPILLWAY PLAN SECTIONS DETAILS	*See Appendix E.*
OPERATING EQUIPMENT PLANS & DETAILS	*See Appendix E.*
MISCELLANEOUS	1. *SCS Operation and Maintenance reports.* 2. *Miscellaneous letters.* 3. *Water Resources Inventory Form.* 4. *SCS Construction Inspection reports.* 5. *16 construction and inspection photographs.*

APPENDIX

B

CHECK LIST
VISUAL INSPECTION
PHASE I

Name Dam *Pine Run Dam* County *Bucks* State *Pennsylvania* National ID # *PA 00808*

Type of Dam *Earth* Hazard Category *I-High*

Date(s) Inspection *23 April 1979* Weather *Clear and warm* Temperature *60's*

Pool Elevation at Time of Inspection *267.6±* M.S.L. Tailwater at Time of Inspection *256.8* M.S.L.

Inspection Personnel:

John Boschuk, Jr. (Geotechncial) *Raymond Lambert (Geologist)* *John H. Frederick (Geotechncial)*

Mary F. Beck (Hydrologist) *Vincent McKeever (Hydrologist)*

John Boschuk, Jr. Recorder

Remarks:

Messrs. Wiliam Taylor and Charles Burger of the Neshaminy Water Resources Authority and Mr. Eugene B. McGaugh of William G. Major Associates, Inc., were on site and provided assistance to the inspection team.

CONCRETE/MASONRY DAMS

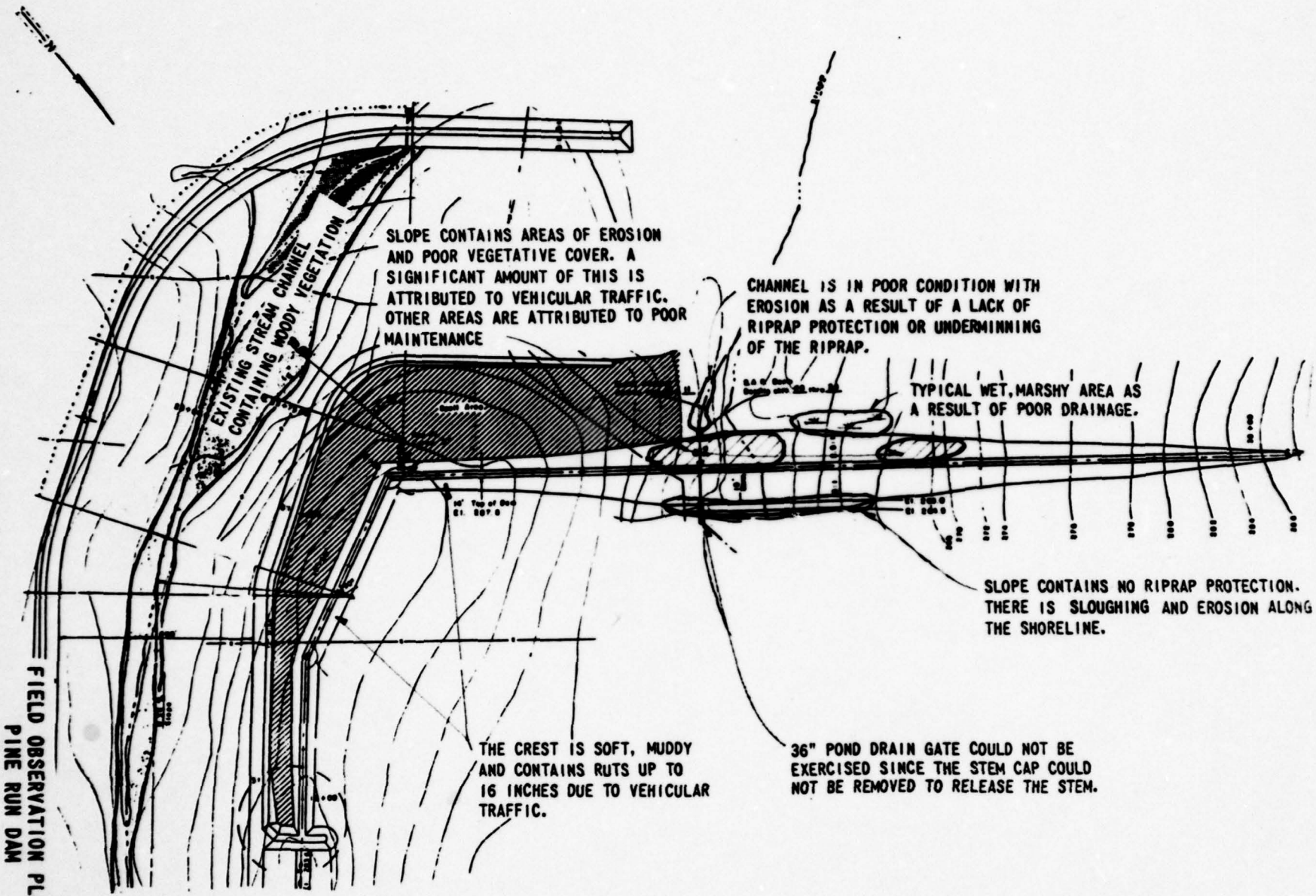
VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
ANY NOTICEABLE SEEPAGE	*N/A*	
STRUCTURE TO ABUTMENT/EMBANKMENT JUNCTIONS	*N/A*	
DRAINS	*N/A*	
WATER PASSAGES	*N/A*	
FOUNDATION	*N/A*	

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

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SURFACE CRACKS	*The embankment crest is in poor condition containing ruts up to 14 to 16 inches in depth with areas of ponded water and mud.*	
UPSTREAM SLOPE	*The vegetative cover is poor and has "patchy" areas with scattered erosion all along the slope. Erosion has usually started in areas of "trail-bike" traffic.*	
UNUSUAL MOVEMENT OR CRACKING AT OR BEYOND THE TOE	*None observed.*	
SLOUGHING OR EROSION OF EMBANKMENT AND ABUTMENT SLOPES	*Slopes contain many areas of erosion and general deterioration of vegetative cover attributed to vehicular traffic on the slope and, to some extent, attributed to the lack of maintenance.*	
VERTICAL AND HORIZONTAL ALIGNMENT OF THE CREST	*The vertical and horizontal alignment was checked and found to be satisfactory except for the ruts in the road.*	
RIPRAP FAILURES	*No riprap and upstream slope is in poor condition with erosion along shoreline.*	



FIELD OBSERVATION PLAN
PINE RUN DAM

SHEET 5A OF 11

EMBANKMENT

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
JUNCTION OF EMBANKMENT AND ABUTMENT, SPILLWAY AND DAM	*Reasonably good condition.*	
ANY NOTICEABLE SEEPAGE	*None observed but ponded water and soft areas were noted beyond the downstream toe. These areas are attributed to poor grading of the area.*	
STAFF GAGE AND RECORDER	*None*	
DRAINS	*Embankment drains discharging into SAF basin are flowing clear and it appears that the drains are functioning as designed.*	

OUTLET WORKS

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CRACKING AND SPALLING OF CONCRETE SURFACES IN OUTLET CONDUIT	*Could not inspect outlet tunnel due to water flowing through the system.*	
INTAKE STRUCTURE	*Generally good condition. One walkway grading is missing and should be replaced.*	
OUTLET STRUCTURE	*Good condition. No excessive spalling, cracking or deterioration was observed.*	
OUTLET CHANNEL	*Fair to poor condition with riprap displacement and general deterioration of the channel. See photographs in Appendix D.*	
POND DRAIN	*The pond drain gate could not be exercised because of the stem cap would not be removed to allow the gate to be raised.*	

UNGATED SPILLWAY

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONTROL SECTION	*The grass covered control section is in reasonably good condition with vegetation spotty in places.*	
APPROACH CHANNEL AND DISCHARGE CHANNEL	*The channel is in good condition and it is noted that a small stream currently passes through the channel as shown on Sheet 5a, Appendix B. This creek is lined with woody vegetation and small willow trees which should be removed during annual maintenance of the structure.*	
BRIDGE AND PIERS	*N/A*	

GATED SPILLWAY

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONCRETE SILL	*N/A*	
APPROACH CHANNEL	*N/A*	
DISCHARGE CHANNEL	*N/A*	
BRIDGE AND PIERS	*N/A*	
GATES AND OPERATION EQUIPMENT	*N/A*	

INSTRUMENTATION

VISUAL EXAMINATION	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
MONUMENTATION/SURVEYS	*None*	
OBSERVATION WELLS	*None*	
WEIRS	*None*	
PIEZOMETERS	*None*	
OTHER	*None*	

RESERVOIR

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SLOPES	*Reservoir slopes are moderate and vegetated to water's edge with grass and few trees.*	
SEDIMENTATION	*Little or no sedimentation, no effect on flood storage.*	

DOWNSTREAM CHANNEL

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONDITION (OBSTRUCTIONS, DEBRIS, ETC.)	*Some bank undercutting and erosion has occurred immediately downstream of the riprapped outlet channel for the principal spillway.*	
SLOPES	*The valley gradient is about 0.0015.*	
APPROXIMATE NO. OF HOMES AND POPULATION	*Less than one mile below the dam is a housing development with some of the houses subject to damage. About two miles below the dam, Pine Run flows through Chalfont, Pennsylvania.*	

APPENDIX

C

PINE RUN DAM
CHECK LIST
HYDROLOGIC AND HYDRAULIC
ENGINEERING DATA

DRAINAGE AREA CHARACTERISTICS: *Predominantly open/farm land, 25-35% developed.*

ELEVATION TOP NORMAL POOL (STORAGE CAPACITY): *267.5 feet (128 Acre-Feet).*

ELEVATION TOP FLOOD CONTROL POOL (STORAGE CAPACITY): *287.8 feet (3441 Acre-Feet).*

ELEVATION MAXIMUM DESIGN POOL: *285.3 Design High Water.*

ELEVATION TOP DAM: *287.8 feet.*

EMERGENCY SPILLWAY

a. Elevation *283.6 feet.*

b. Type *Grass lined trapezoidal channel.*

c. Width *1000 feet.*

d. Length *3000 feet.*

e. Location Spillover *Left abutment.*

f. Number and Type of Gates *None.*

PRINCIPAL SPILLWAY

a. Type *Drop inlet riser, conduit and SAF stilling basin.*

b. Location *Station 26+50.*

c. Entrance inverts *267.5 feet.*

d. Exit inverts *256.0 feet.*

e. Emergency draindown facilities *42-inch pipe at elevation 258.5 feet.*

HYDROMETEOROLOGICAL GAGES:

a. Type *Standard rain gage.*

b. Location *Neshaminy Water Resources Authority office at Cross Keys, Pennsylvania.*

c. Records *Kept at Cross Keys, three miles from dam.*

MAXIMUM NON-DAMAGING DISCHARGE: *Not estimated.*

PINE RUN DAM
Hydrology/Hydraulics

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

1. The hazard potential is rated as "High" as there would be loss of life if the dam failed.

2. The size classification is "Intermediate" based on 3441 Acre-Feet total storage capacity.

3. The spillway design flood, based on size and hazard classification, is the Probable Maximum Flood (PMF).

Hydrologic/Hydraulic Analysis

The complete H & H design folder was available for review. The PMF inflow hydrograph was determined according to procedures in the SCS National Engineering Handbook, Section 4. Hydrograph calculations and flood routing were performed by the SCS computer program, TR-20. Portions of the original design folder are included in this Appendix.

Original design parameters were checked against current information and/or criteria. The drainage area on Sheet 4 is listed as 9.89 square miles. Most drains through the reservoir and some through the emergency spillway. Measurements from USGS maps for this investigation disclose 9.6 square miles drains through the reservoir and an additional 0.3 square miles drains through emergency spillway.

Calculations for the inflow hydrograph were based on a 6-hour rainfall of 25.5 inches. Rainfall criteria established for this investigation by the Corps of Engineers indicate a 26.6 inch rainfall (Ref. Hydrometerological Report No. 33) and the use of Hop Brook factor, a point rainfall reduction factor. For a watershed of this size, the point rainfall is reduced by 20%, or to 21.2 inches. Thus, the design rainfall is conservative compared to Corps of Engineers criteria.

The "No-Freeboard" hydrograph (PMF) is calculated based on Runoff Curve Number 81 (CN 81). CN 81 is based on the hydrologic soil groups classification and expected future land use within the watershed. The future land use was

based on projections of the Bucks and Montgomery Planning Commission to year 2010. Projected land use includes commercial, 1%; industrial, 5%; and residential, 22% for a total developed area of 28%. The estimated current developed area of 28%. The estimated current developed area is between 25 and 35% from the 1973 USGS maps. As development, particularly industrial and commercial, increases the CN (and amount of rainfall rainoff), the possibility exists that the adequacy of the PMF inflow hydrograph may have to be re-evaluated at a future date.

Based on review of the design folder and the above evaluation of design assumptions and data input, the original PMF flood routing is judged adequate for the present.

State PA | Project NESHAMINY CREEK W/S

By G.K.B. | Date 15 SEPT 70 | Checked By | Date | Job No PA-616

Subject WORK PLAN - DESIGN COMPARISON | Sheet of

ITEM	UNIT	WORK PLAN	DESIGN	COMMENTS
DRAINAGE AREA	SQ MI.	9.39	9.89	
STORAGE CAPACITY				
SEDIMENT (INC. AERATED)	AC. FT.	204	204	
BENEFICIAL	AC FT.			
RETARDING	AC FT	1794	2029	
TOTAL	AC FT	1998	2233	
BETWEEN HIGH & LOW S.	AC FT	—	—	
SURFACE AREA				
NORMAL POOL	ACRE	39	39	
RETARDING POOL	ACRE	228	242	
DESIGN HIGH WATER	ACRE			
VOLUME OF FILL	CU YD.	107,100		
TOP OF DAM ELEV	FEET	287.3	287.8	
MAX. HEIGHT OF DAM	FEET	30.0	30.0	
EMERGENCY SPILLWAY				
CREST ELEVATION	FEET	282.8	283.6	
BOTTOM WIDTH	FEET	850.0	1000	
TYPE	—	SOD	SOD	
PERCENT CHANCE OF USE	—	1	1	
AVE CURVE NO COND. II	—	81	81	
EM. SP. HYDROGRAPH				
STORM RAINFALL - 6 HR.	IN.	10.5	10.5	
STORM RUNOFF	IN.	8.12	8.12	
VELOCITY OF FLOW - V	FPS	6.3	6.2	
PEAK DISCHARGE RATE	CFS	4930	5445	
MAX. WATER SURFACE EL	FEET	286.6	285.3	CHECK BY TR-20 & COMPUTER
FREEBOARD HYDROGRAPH				
STORM RAINFALL - 6 HR.	IN.	25.5	25.5	
STORM RUNOFF	IN.	22.09	22.09	
VELOCITY OF FLOW - V	FPS	10.6	11.0	
PEAK DISCHARGE RATE	CFS	24140	24847	
MAX WATER SURFACE EL	FEET	287.3	287.8	CHECK BY TR-20 & COMPUTER
PRINCIPAL SPILLWAY				
RISER SIZE	FT.	—	5 x 15	TRAPEZOIDAL RISER
MAX. LOW STAGE FLOW	CFS	—	—	
ORIFICE SIZE	FT.	—	—	
MAX. HIGH STAGE FLOW	CFS	—	524	WORK PLAN TO BE AMENDED
PIPE SIZE	DIA.	—	5.5' x 5.0'	HORIZONTAL ELLIPTICAL CONDUIT
CAPACITY EQUIVALENTS				
TOTAL SEDIMENT VOL.	IN.	0.41	0.387	
RETARDING STORAGE	IN	3.58	3.78	
EM. SPILLWAY STORAGE TO TOP OF DAM	IN.	2.50	2.18	
CLASS OF STRUCTURE	—	C	C	
CONSTRUCTION COSTS				Ref: SCS Design Folder
	—			
B-C RATIO	—			

Neshaminy Creek W/S — Sheet 5 of 7

Soil Cover Complex No

Future Land Use

Sub W/S	Present Cover	Hydro Soil Type	Cond'n Cond II No	% Land	% x RO No	Use Cond II	Cond III	Future Conditions Cover	Hydro Soil Class	C.N.	% of Land	% x CN	CN Used II	CN Used III
4Y	PA 616	SAME AS	PA 613					Cropland Treated (A)	C	86	25.0	2150		
								Meadow; Truck (A)	"	86.5	2.0	173		
								Row Crop (A)	"	86.5	3.5	303		
								Pasture	"	77	2.0	154		
								Grass	"	83	3.5	290		
								Idle	"	77	5.0	385		
								Woods	"	76.1	13.5	975		
								Public Bldgs; Public (Comm)	"	83	8.5	706		
								Commercial	"	89	1.0	89		
								Industrial	"	85	5.0	425		
								Residential 1/2 ac	"	86.4	8.5	735		
								" 20 m/1000	"	86.2	2.0	172		
								" 7m/1000	"	91	12.5	1138		
					79	94					100.0	8115	80	94
PA 617	SAME AS	PA 613						Cropland Treated (A)	C	86	16.0	1380		
								" Row Crop (A)	"	86.2	5.0	431		
								Pt. Row (A)	"	86.5	1.0	87		
								Pasture	"	77	1.0	77		
								Grass	"	83	2.5	208		
								Idle	"	76	2.0	152		
								Woods	"	76.1	28.5	1689		
								Public Comm - Industrial	"	83	3.0	249		
								Residential 1/2 ac - 1/1000	"	86.4	1.0	86		
								2m/1000	"	91.7	28.0	2567		
					79	94					100.0	8011	80	94

Ref: SCS Design Folder

*% Based on Bucks & Montgomery Planning Commission Projection To Year 2010

E. S. DESIGN AND FREEBOARD ROUTINGS.

NESHAMINY CREEK PA-616 JJL 4/70

CURVE NO. 81. TC 4.71 STORM DURATION 6.00

EMER. SPW. RAINFALL 10.50 FREEBOARD RAINFALL 25.50

CASE NO. 2. DRAINAGE AREA 9.89 EMER. SPW. CREST 283.5

~~BO1 600. L1 100. BO2 850. L2 100.~~ BO3 1000. L3 100. used.

ELEVATION	STORAGE	CFS	CFS	CFS
267.50	203.	0.	0.	0.
268.00	203.	31.	31.	31.
268.50	203.	87.	87.	87.
269.00	203.	160.	160.	160.
269.50	230.	246.	246.	246.
270.00	260.	343.	343.	343.
272.00	400.	388.	388.	388.
274.00	575.	415.	415.	415.
276.00	810.	440.	440.	440.
278.00	1105.	464.	464.	464.
280.00	1450.	486.	486.	486.
283.50	2175.	524.	524.	524.
284.00	2280.	877.	1022.	1109.
284.50	2425.	1698.	2183.	2474.
285.00	2550.	2891.	3871.	4459.
285.50	2700.	4384.	5984.	6944.
286.00	2815.	6417.	8862.	10329.
286.50	2995.	8474.	11774.	13754.
287.00	3150.	10878.	15177.	17758.
287.50	3300.	13463.	18838.	22063.
288.00	3490.	16508.	23008.	26968.
288.49	3620.	19561.	27472.	32219.

Ref: SCS Design Folder

FREEBOARD ROUTING.

NESHAMINY CREEK PA-616 JJL 4/70

BO = 1000. L = 100.

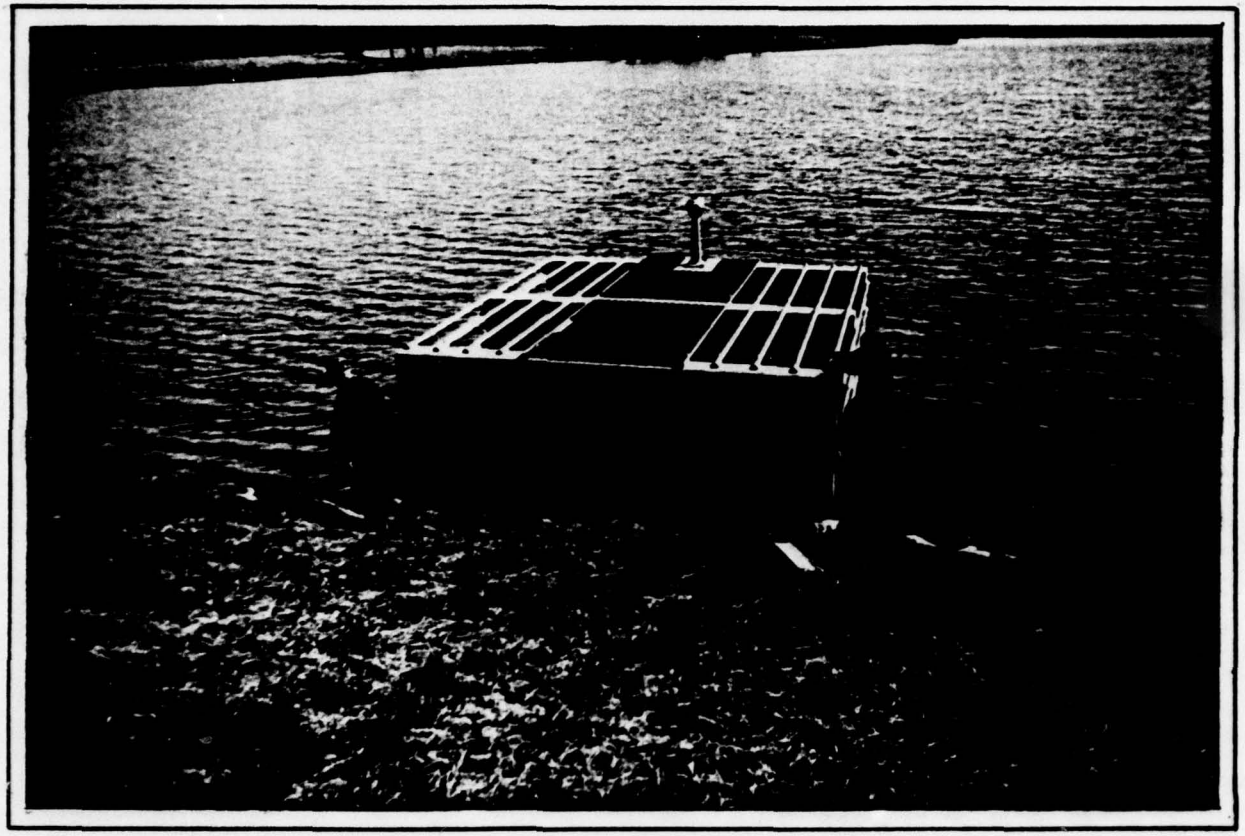
	TIME	INFLOW	AVE IN	OUTFLOW	ELEV.
	0.25	15.	7.	15.	267.74
	0.50	31.	23.	31.	268.00
	0.75	47.	39.	47.	268.14
	1.00	156.	102.	155.	268.97
	1.25	294.	225.	164.	269.02
	1.50	431.	362.	177.	269.10
	1.75	925.	678.	210.	269.29
	2.00	1724.	1325.	283.	269.69
	2.25	2522.	2123.	349.	270.26
	2.50	3672.	3097.	367.	271.07
	2.75	5601.	4637.	391.	272.26
	3.00	7531.	6566.	411.	273.72
	3.25	9521.	8526.	430.	275.21
	3.50	12195.	10858.	450.	276.83
	3.75	14869.	13532.	470.	278.57
	4.00	17543.	16206.	490.	280.37
	4.25	19646.	18595.	509.	282.18
	4.50	21650.	20648.	1386.	284.10
	4.75	23654.	22652.	6822.	285.47
	5.00	24738.	24196.	13515.	286.46
	5.25	25264.	25001.	18333.	287.06
	5.50	25790.	25527.	21623.	287.44
	5.75	25878.	25834.	23431.	287.63
	6.00	25287.	25583.	24337.	287.73
	6.25	24696.	24992.	24613.	287.76
PEAK	6.50	24018.	24357.	24505.	287.74
	6.75	22886.	23452.	24062.	287.70
	7.00	21755.	22321.	23329.	287.62
	7.25	20624.	21190.	22428.	287.53
	7.50	19355.	19990.	21344.	287.41
	7.75	18076.	18716.	20142.	287.27
	8.00	16797.	17437.	18905.	287.13

Ref: SCS Design Folder

Top of Dam 287.8

APPENDIX

D



INTAKE RISER AND POND DRAIN VALVE.

PHOTOGRAPH NO. 1



VIEW OF INTAKE RISER OVERFLOW WEIR.

PHOTOGRAPH NO. 2



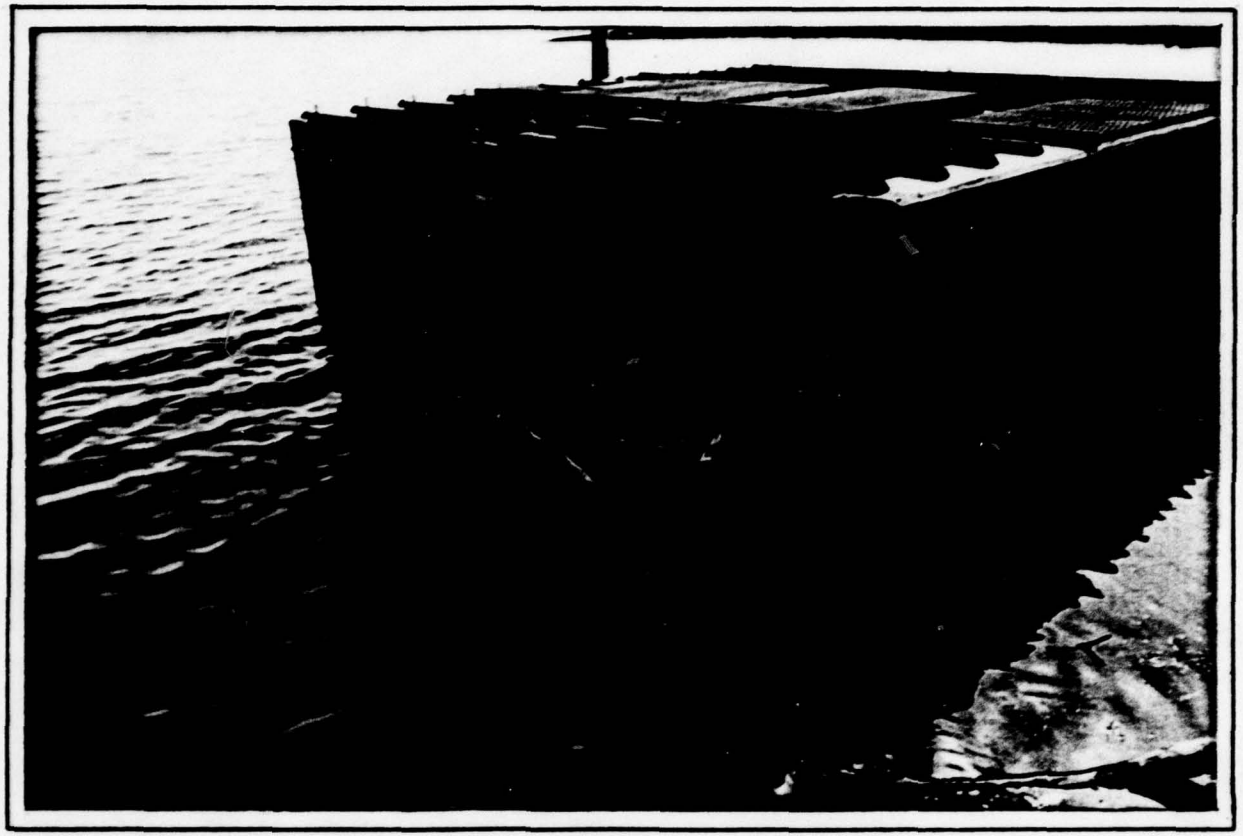
OVERVIEW OF SAF STRUCTURE AND DISCHARGE CHANNEL. NOTE SCOUR AND EROSION.

PHOTOGRAPH NO. 4



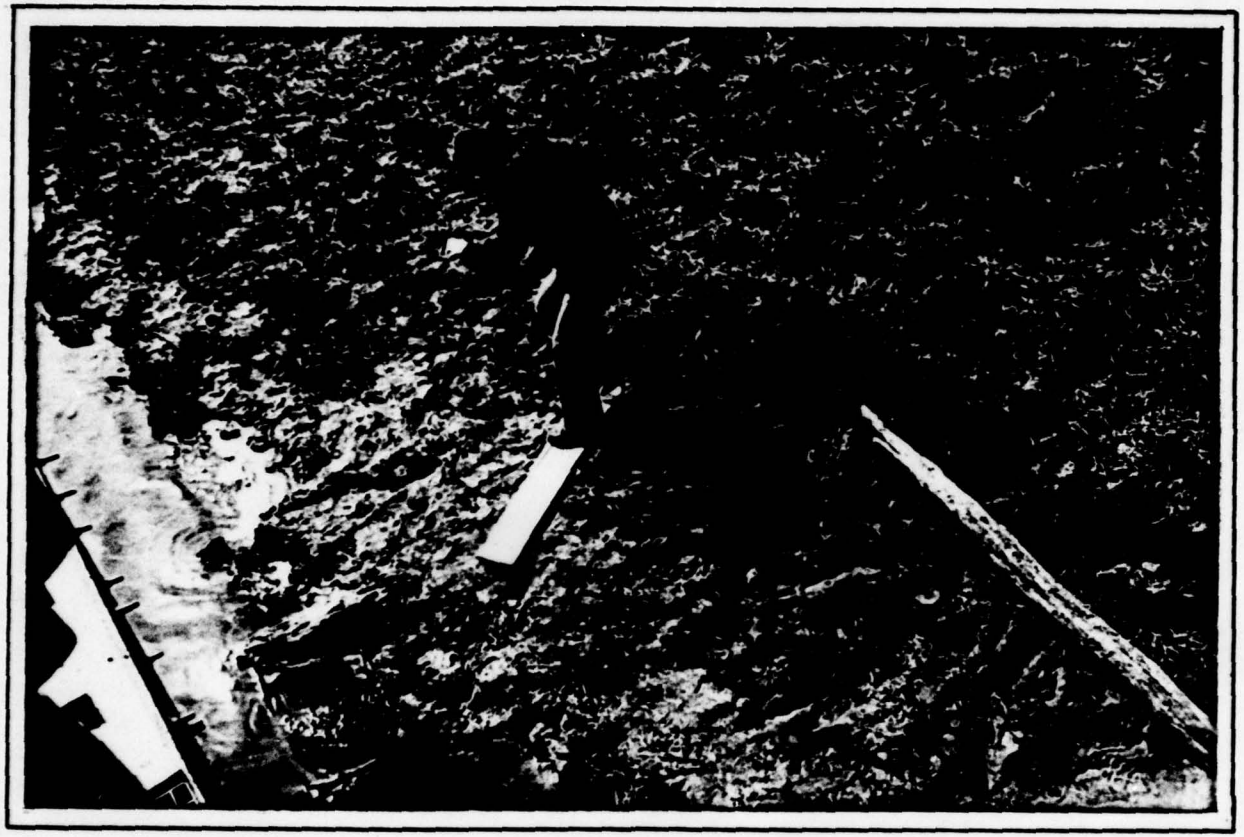
OVERVIEW OF GRASS LINED EMERGENCY SPILLWAY.

PHOTOGRAPH NO. 5



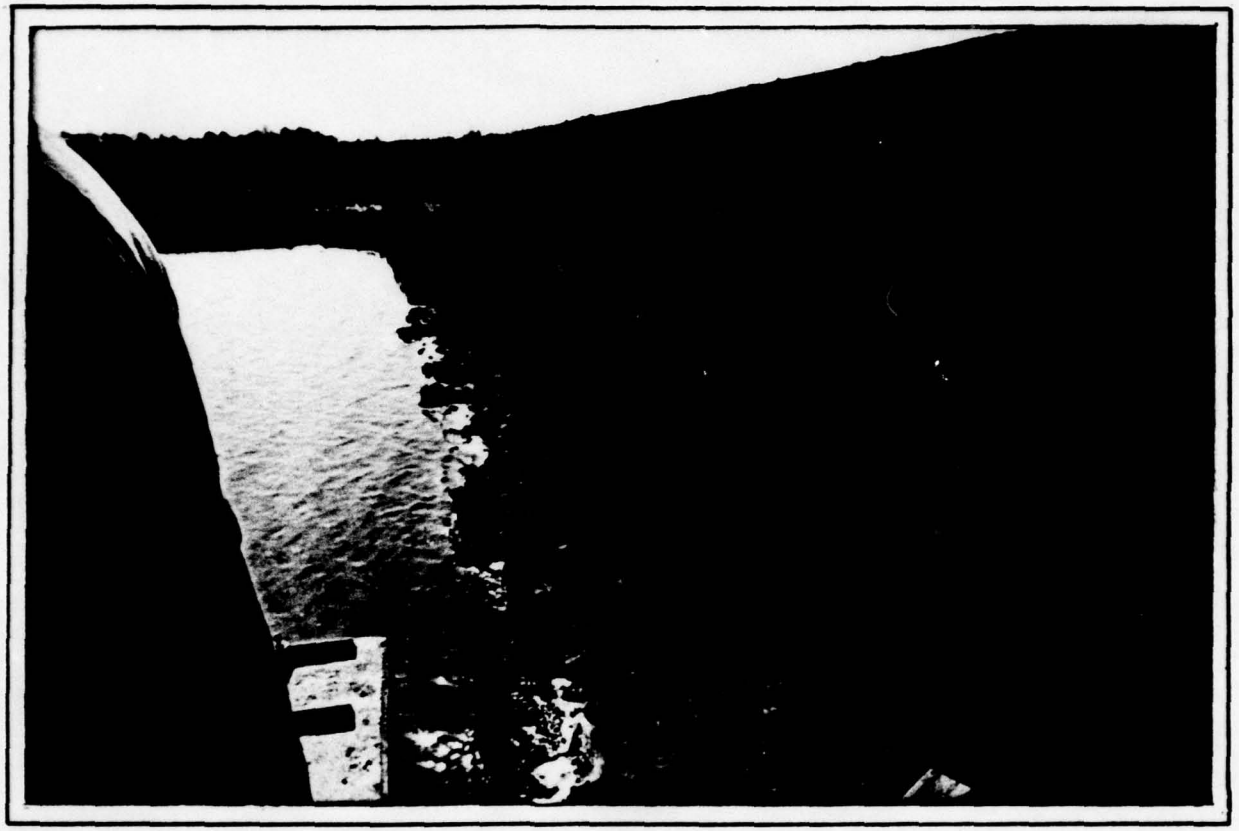
DEBRIS COLLECTION AGAINST TRASH RACKS
OF PRINCIPAL SPILLWAY.

PHOTOGRAPH NO. 6



SLOPE SLOUGHING AND SHORELINE EROSION
ALONG UPSTREAM SLOPE OF DAM AT
WATERLINE.

PHOTOGRAPH NO. 7



OVERVIEW OF SHORELINE DETERIORATION
DUE TO ABSENCE OF RIPRAP PROTECTION.

PHOTOGRAPH NO. 8



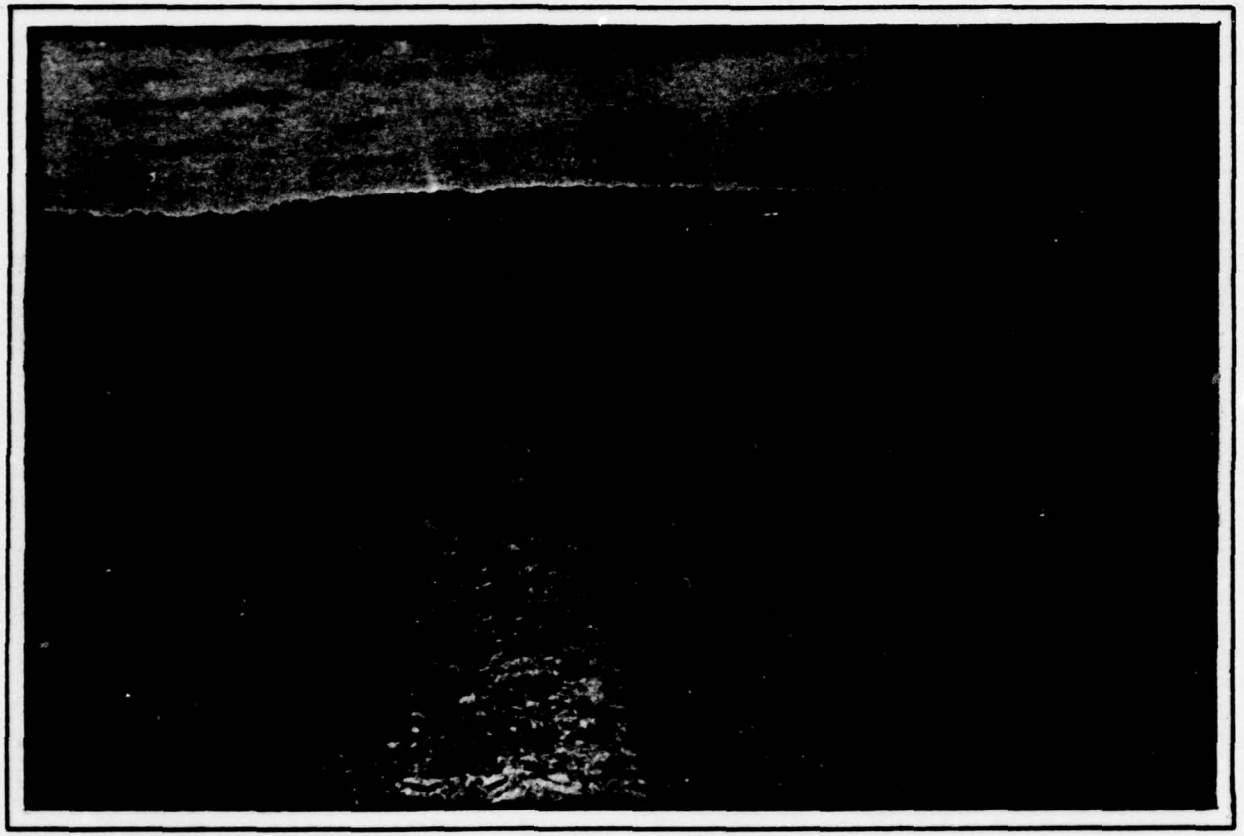
OVERVIEW OF EROSION AND SCOUR ALONG
PRINCIPAL SPILLWAY DISCHARGE CHANNEL.

PHOTOGRAPH NO. 9



OVERVIEW OF EMBANKMENT CREST DETERIORATION
DUE TO VEHICULAR TRAFFIC.

PHOTOGRAPH NO. 10



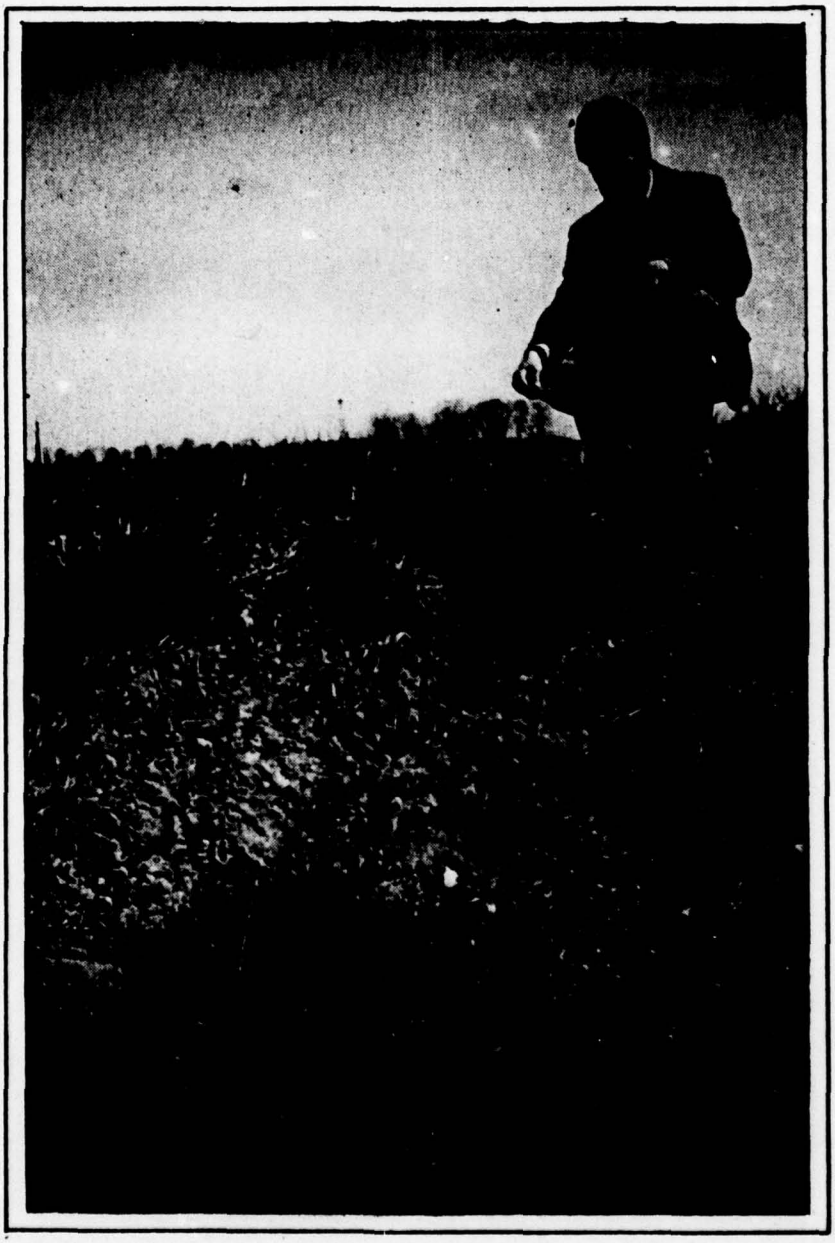
ALTERNATE VIEW OF CREST DETERIORATION.

PHOTOGRAPH NO. 11



UPSTREAM EMBANKMENT SLOPE
EROSION AND LACK OF
VEGETATION.

PHOTOGRAPH NO. 12



ALTERNATE VIEW OF GENERAL SLOPE
EROSION IN VICINITY OF PRINCIPAL
SPILLWAY OUTLET STRUCTURE.

PHOTOGRAPH NO. 13



GENERAL MUDDY AND MARSHY CONDITIONS AT DOWNSTREAM TOE DUE TO STANDING WATER AS A RESULT OF POOR SURFACE DRAINAGE.

PHOTOGRAPH NO. 14



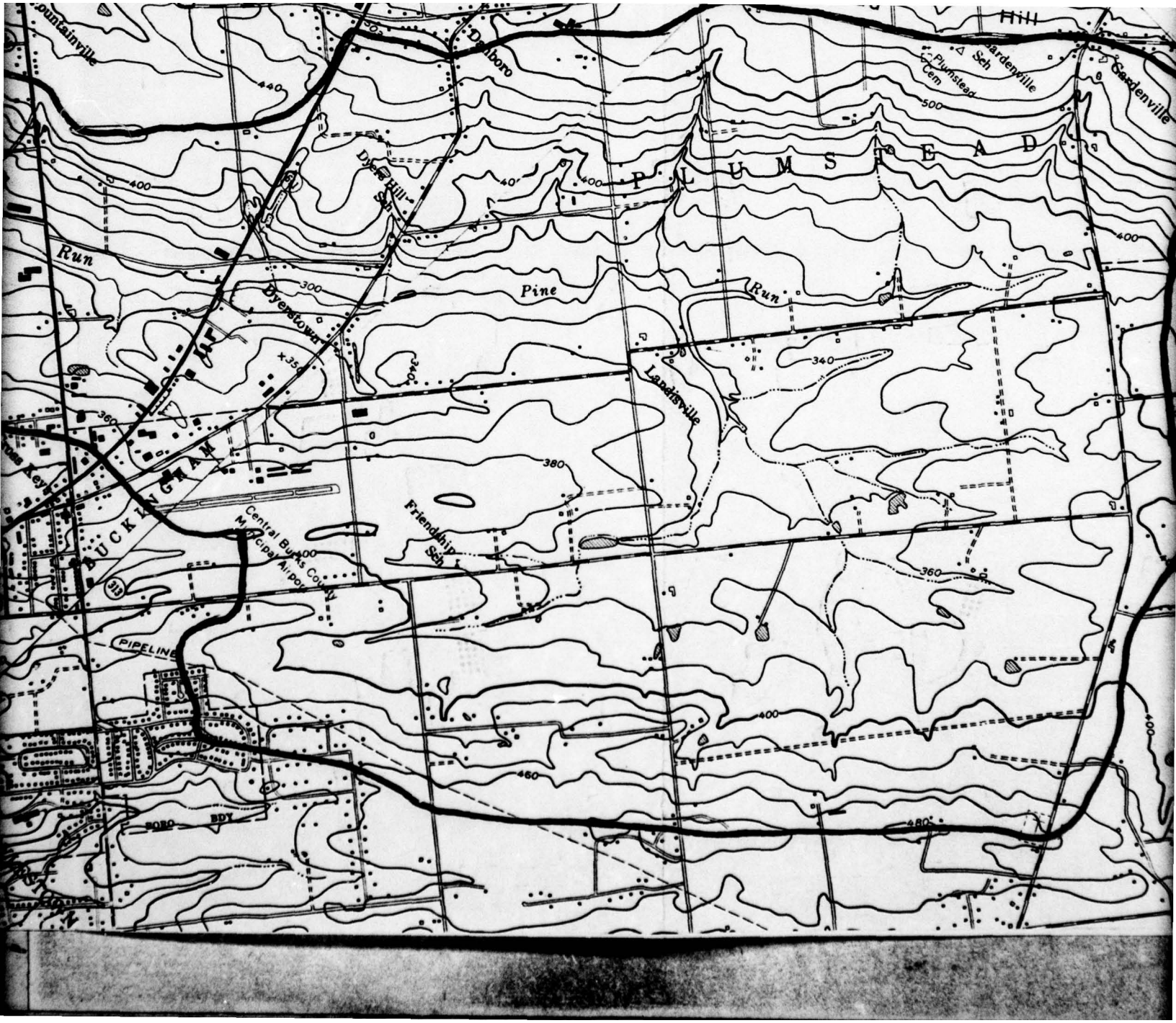
SLOPE EROSION AS A RESULT OF
UNAUTHORIZED VEHICULAR TRAFFIC.

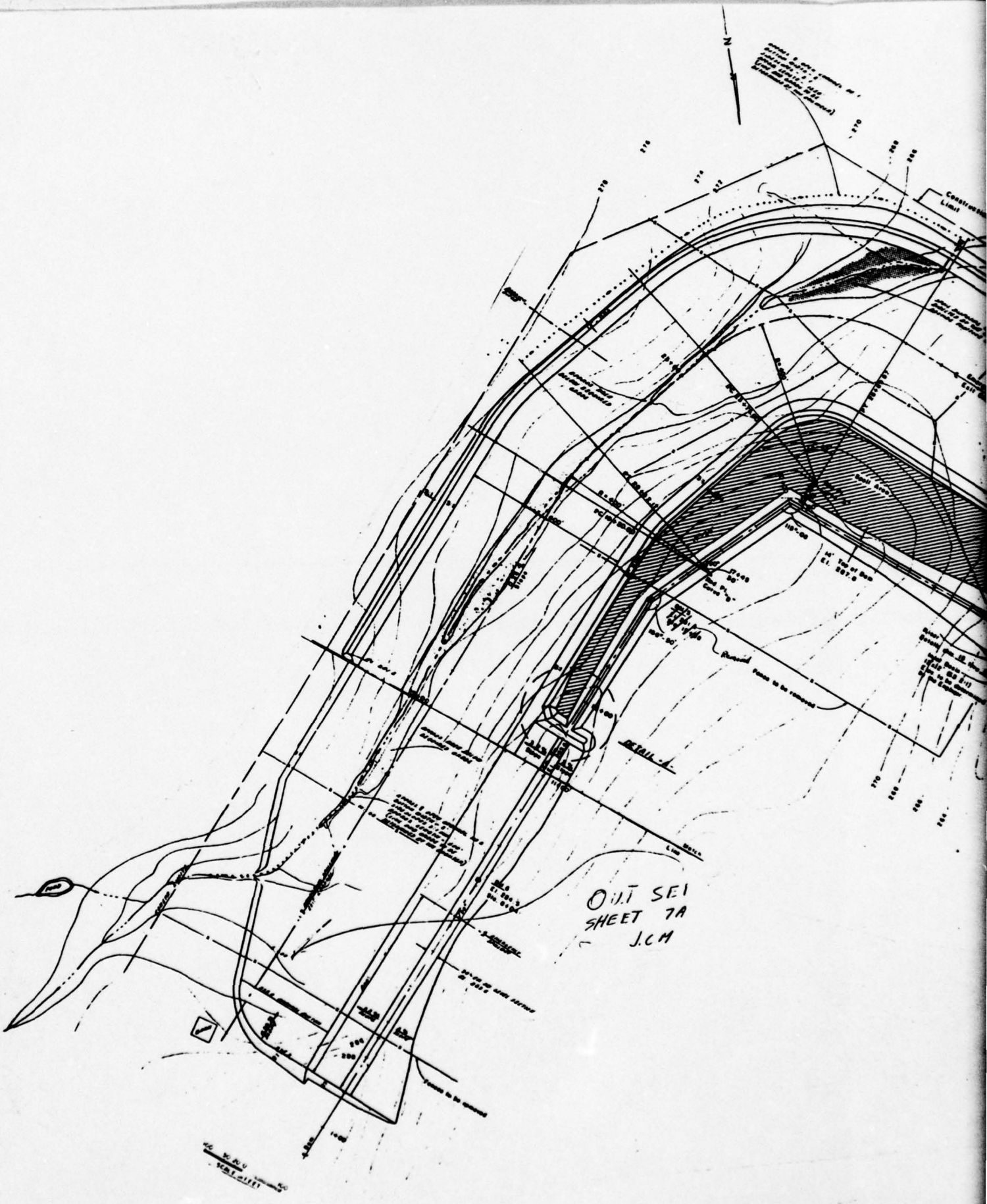
PHOTOGRAPH NO. 15

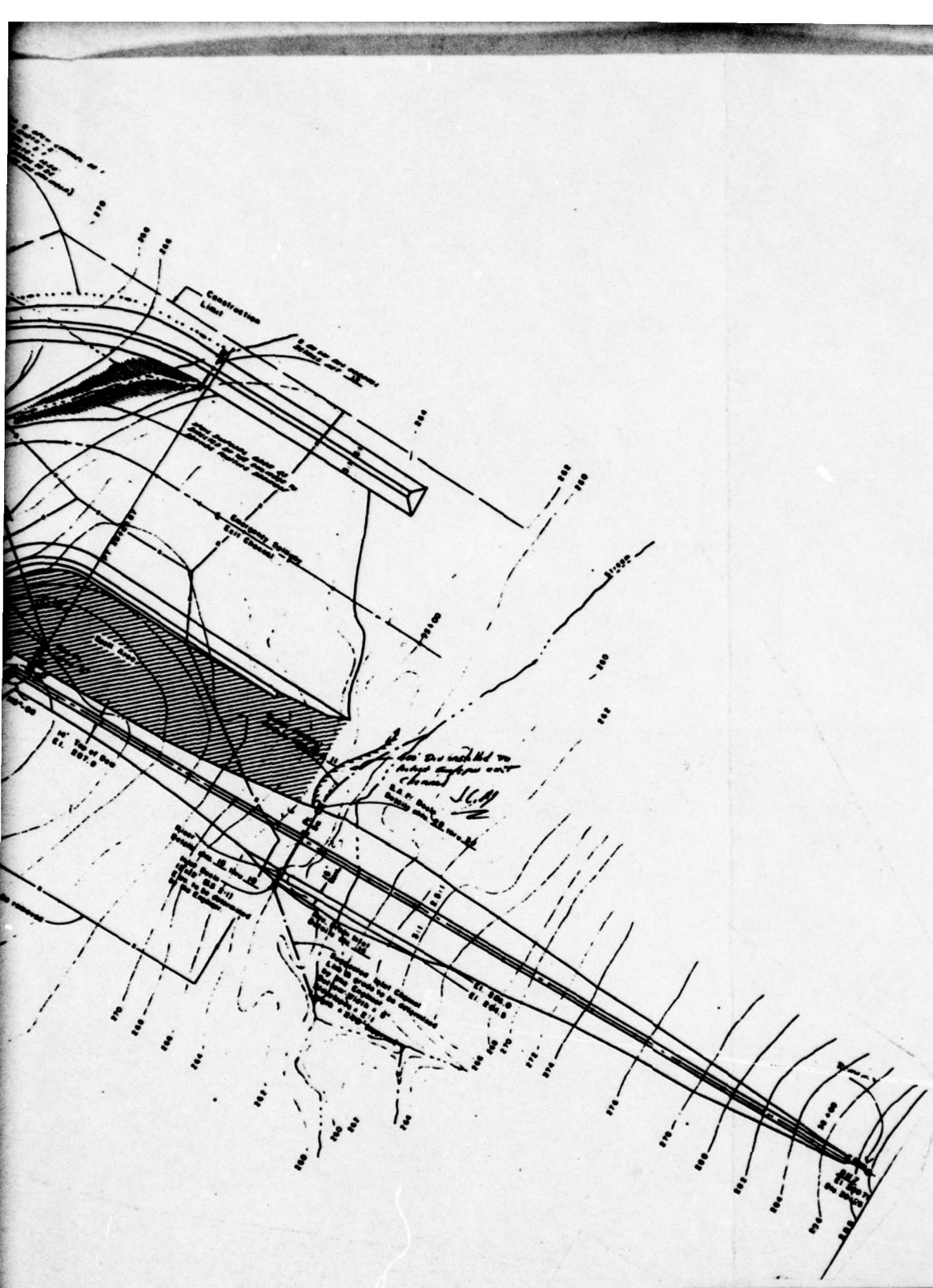
APPENDIX

E


DAM SITE
ELEV 322
ELEV 301
New Galena
Branch
Valley
Reservoir
Peace
Radio Tower
Trail
Cem.
Fountainville
Pine Run
Pine
Run
Cross Keys
PIPELINE
DOYLESTOWN
Sewage Disposal
Water Tower
Cemetery
Farm School
Delaware Valley College of Science and Agriculture
High Rock
READING
BUCKLI
BM
Sch.
Ch.
Ruins
Quarry
Pond
Ferry
Tr.
Ho.
Sta.
Ind.
Pk.
Ave.
Rd.
St.
Dr.
Ln.
Ct.
Pl.
Blvd.
Cir.
Sq.
Ter.
Hwy.
Mkt.
Bldg.
Mfg.
Co.
Inc.
Corp.
Assn.
Dept.
Univ.
Coll.
Lib.
Hosp.
Clin.
Pharm.
Rest.
Hotel
Motel
Inn
Gas
Oil
Auto
Repair
Service
Supply
Store
Shop
Office
Bank
Post
Fire
Police
Jail
Court
Church
Temple
Synagogue
Mosque
Park
Golf
Course
Field
Track
Stadium
Arena
Theater
Cinema
Museum
Gallery
Library
Hospital
Clinic
Pharmacy
Restaurant


Dyers Hill Sch
Pine
Run
Dyerstown
Landisville
Friendship Sch
Central Bucks County Municipal Airport
PIPELINE
BDY
Plumstead Cem
Gardenville
Sch
Hill
PLUMSTEAD
BUCKINGHAM
Run
Doylestown
Fountainville
Keystone
Dublin
400
440
500
300
340
360
380
460
480


OUT SET
SHEET 7A
J.C.M



AS BUILT PLANS

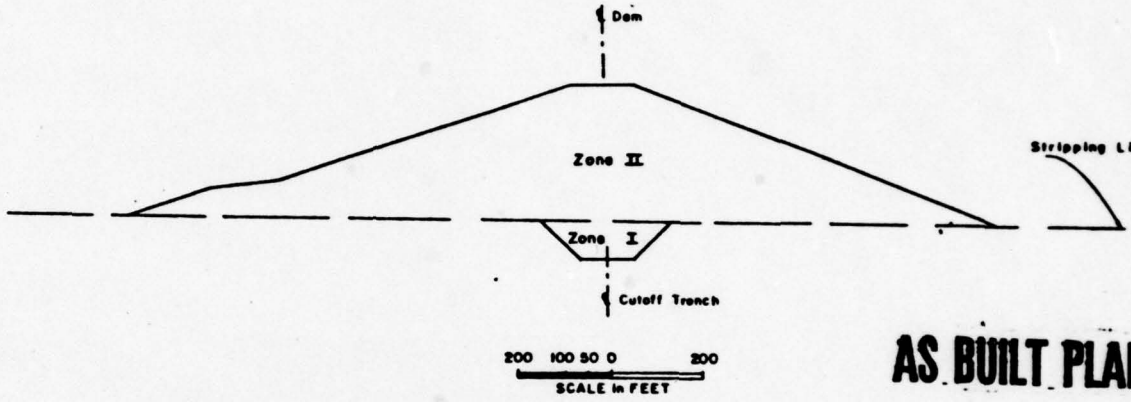
PLAN OF DAM AND APPURTENANT STRUCTURES

PINE RUN DAM

NAT.I.D.NO.PA.00808 BUCKS COUNTY

DATA OBTAINED FROM U.S. DEPT. OF AGRICULTURE, SOIL CONSERVATION SERVICE, DRAWING NO. PA-616-P, SHEET NOS. 6 & 7 OF 44, DATED 7/71

PLATE 2



AS BUILT PLANS

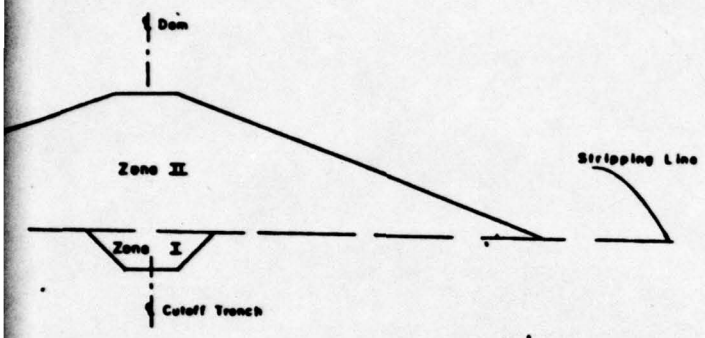
SELECTIVE PLACEMENT	MATERIAL	MAX 1 ROCK SIZE	2 MAX. LIFT	REQ'D 3 WATER CONTENT	COMPACTION 4 CLASS	COMPACTION 4 DEFINITION
ZONE I	MATERIAL AS REPRESENTED BY TP-117.1, DEPTH 1'-2.7', CLASSIFIED AS ML.	6"	9"	OPTIMUM TO -1 TO +2	A	95% MAX. DENSITY BY ASTM D-698, METHOD "A"
ZONE II	MATERIAL AS REPRESENTED BY TP-116.1, DEPTH 3'-4', CLASSIFIED AS ML., BY TP-118.4 DEPTH 1'-3', CLASSIFIED AS ML, BY TP-115.2, DEPTH 5'-8 5', CLASSIFIED AS WEATHERED SHALE.	6"	9"	OPTIMUM TO -1 TO +2	A	95% MAX. DENSITY BY ASTM D-698 METHOD "A"

1. FOR FILL ADJACENT TO STRUCTURES, MAX. ROCK SIZE 3".
2. MAXIMUM PERMISSIBLE LIFT THICKNESS BEFORE COMPACTION.
3. WATER CONTENT OF FILL MATRIX AT TIME OF COMPACTION. Variation from water content shown may be approved by the Engineer.
4. FOR TYPICAL COMPACTION CURVES SEE SHT. 40

CONSTRUCTION NOTES

1. CONSTRUCTED SLOPES ARE
   2.95 : 1 UPSTREAM
   2.46 : 1 DOWNSTREAM
2. FOR CONSTRUCTED FILL ELEVATIONS SEE SHT. 8.

FILL PLACEMENT



AS BUILT PLANS

REQ'D 3. WATER CONTENT	COMPACTION 4.	
	CLASS	DEFINITION
OPTIMUM TO -1 TO +2	A	95% MAX. DENSITY BY ASTM D-69', METHOD "A"
OPTIMUM TO -1 TO +2	A	95% MAX. DENSITY BY ASTM D-698 METHOD "A"

CONSTRUCTION NOTES

1. CONSTRUCTED SLOPES ARE
   2.95 : 1 UPSTREAM
   2.46 : 1 DOWNSTREAM
2. FOR CONSTRUCTED FILL ELEVATIONS SEE SHT. 8.

...ater content shown may be approved by the Engineer.

PLACEMENT

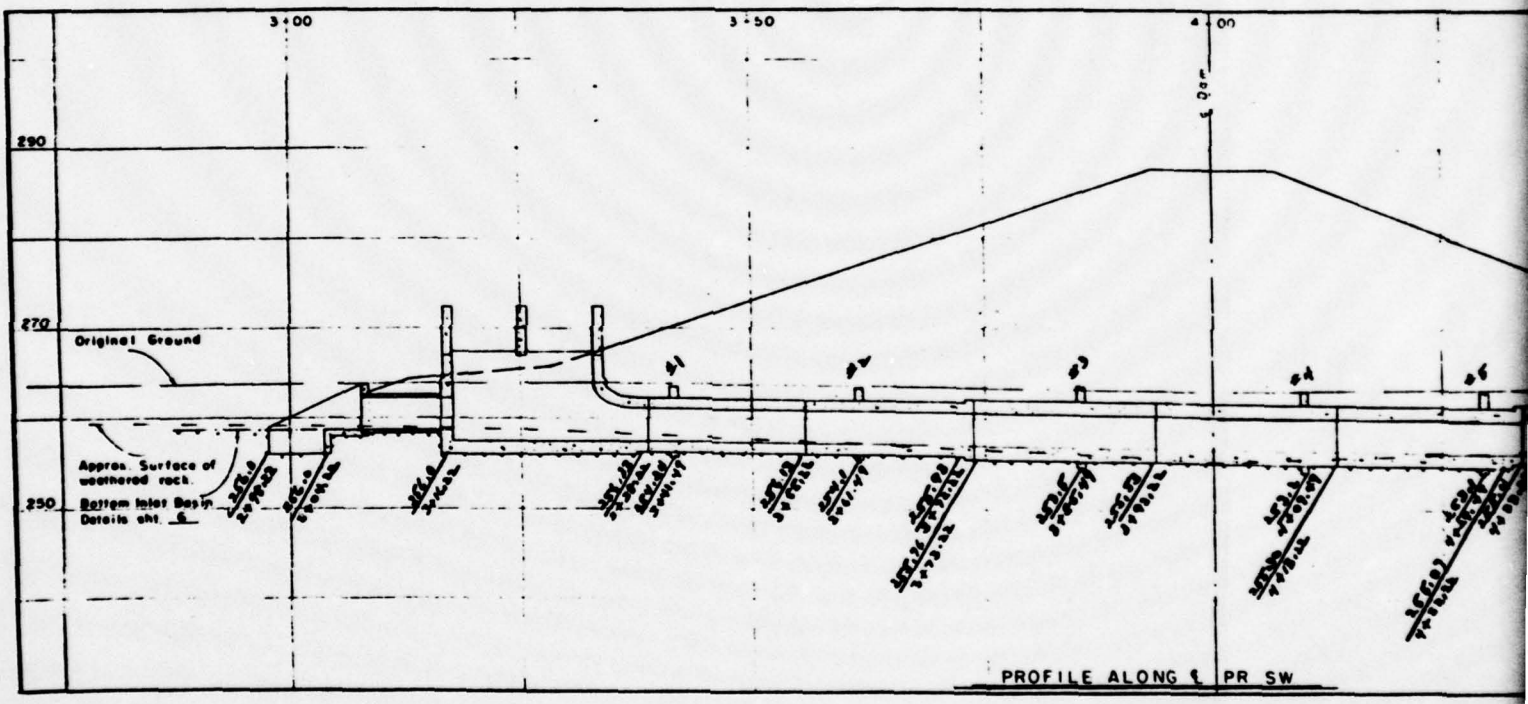
TYPICAL EMBANKMENT SECTION AND MATERIAL DESCRIPTION

PINE RUN DAM

NAT.I.D.NO.PA.00808 **BUCKS COUNTY**

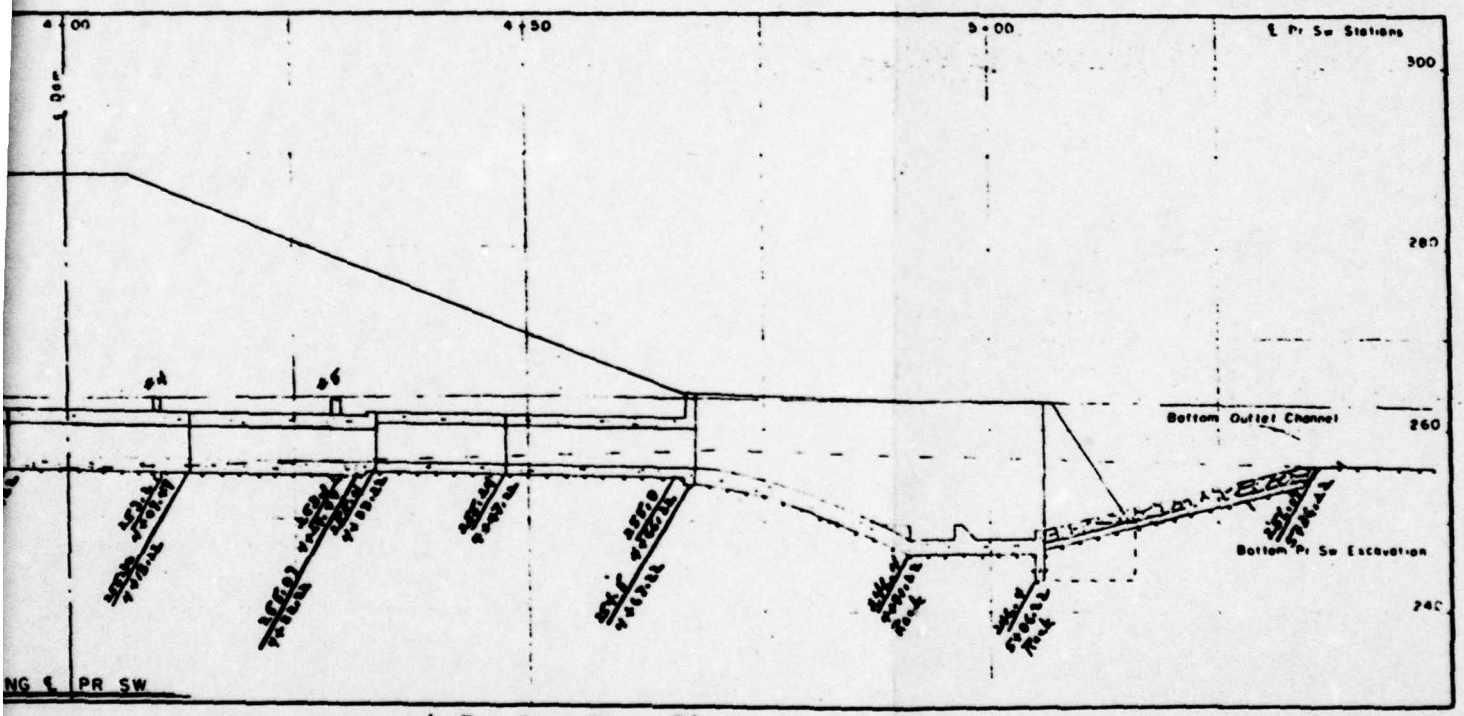
DATA OBTAINED FROM U.S. DEPT. OF AGRICULTURE, SOIL CONSERVATION SERVICE, DRAWING NO. PA-616-P SHEET NO. 7 OF 44, DATED 7/71

PLATE 3



EXC.
EXC.

AS BUILT PLANS



Exc. Anti-Seep Collar Base Bk of pipe as
Exc. Conduit " " pipe 23, 24, 19

PLANS

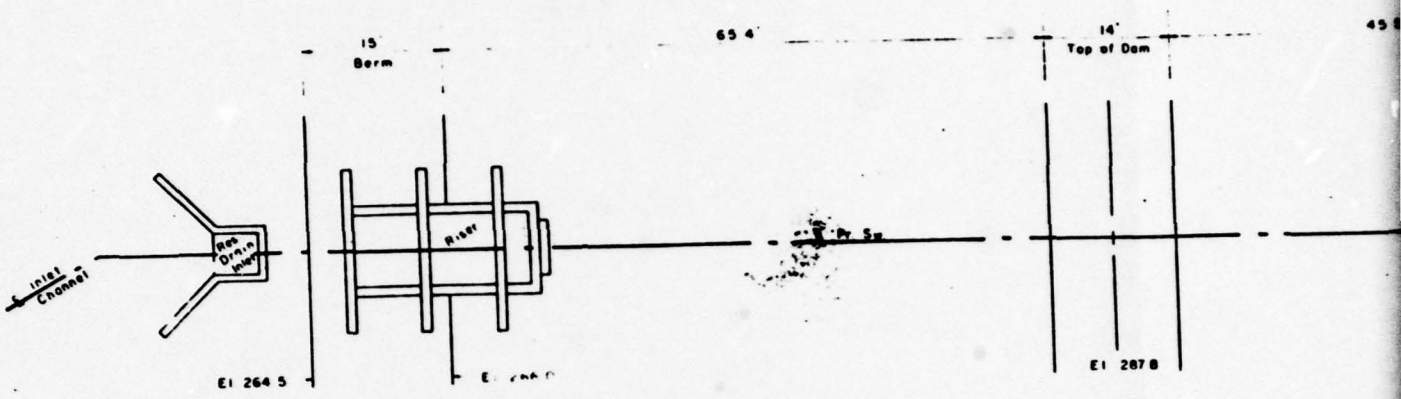
PRINCIPAL SPILLWAY EXCAVATION SECTION

PINE RUN DAM

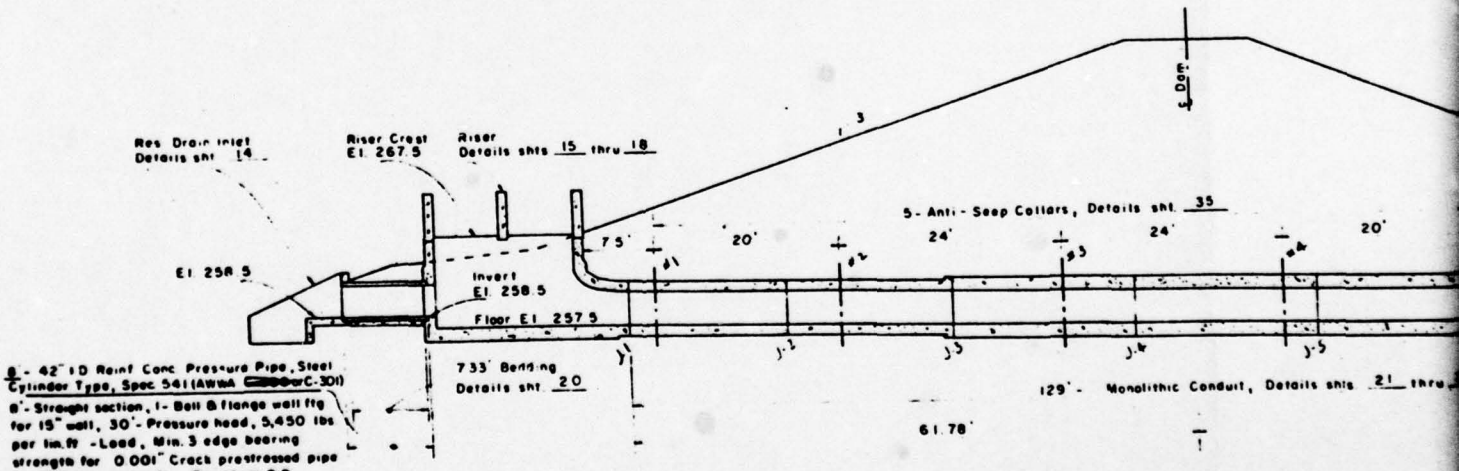
NAT.I.D.NO.PA.00808 BUCKS COUNTY

DATA OBTAINED FROM U.S. DEPT. OF AGRICULTURE, SOIL CONSERVATION SERVICE, DRAWING NO. PA-616-P SHEET NO. 11 OF 44, DATED 4171

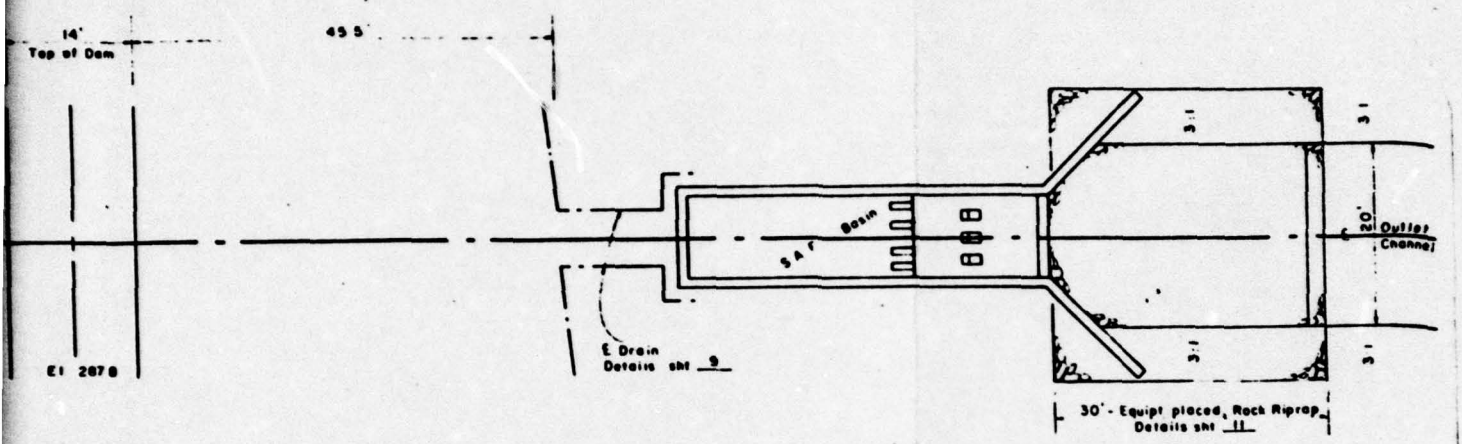
PLATE 4



PLAN VIEW



PROFILE ALONG ℄

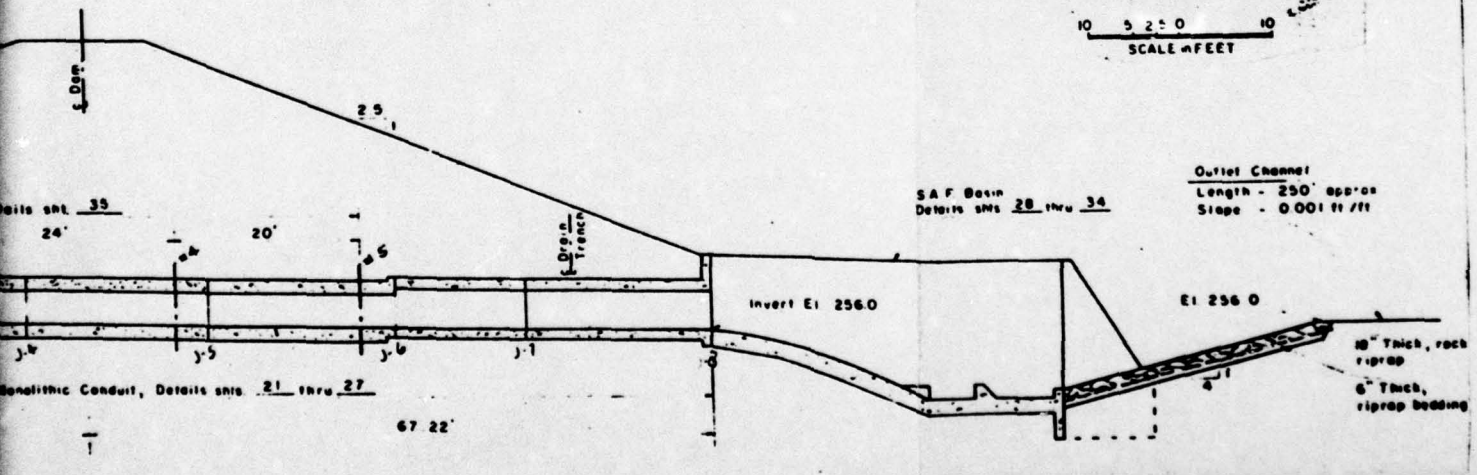


PLAN VIEW

AS BUILT PLANS

10 5 2.5 0 10

SCALE in FEET



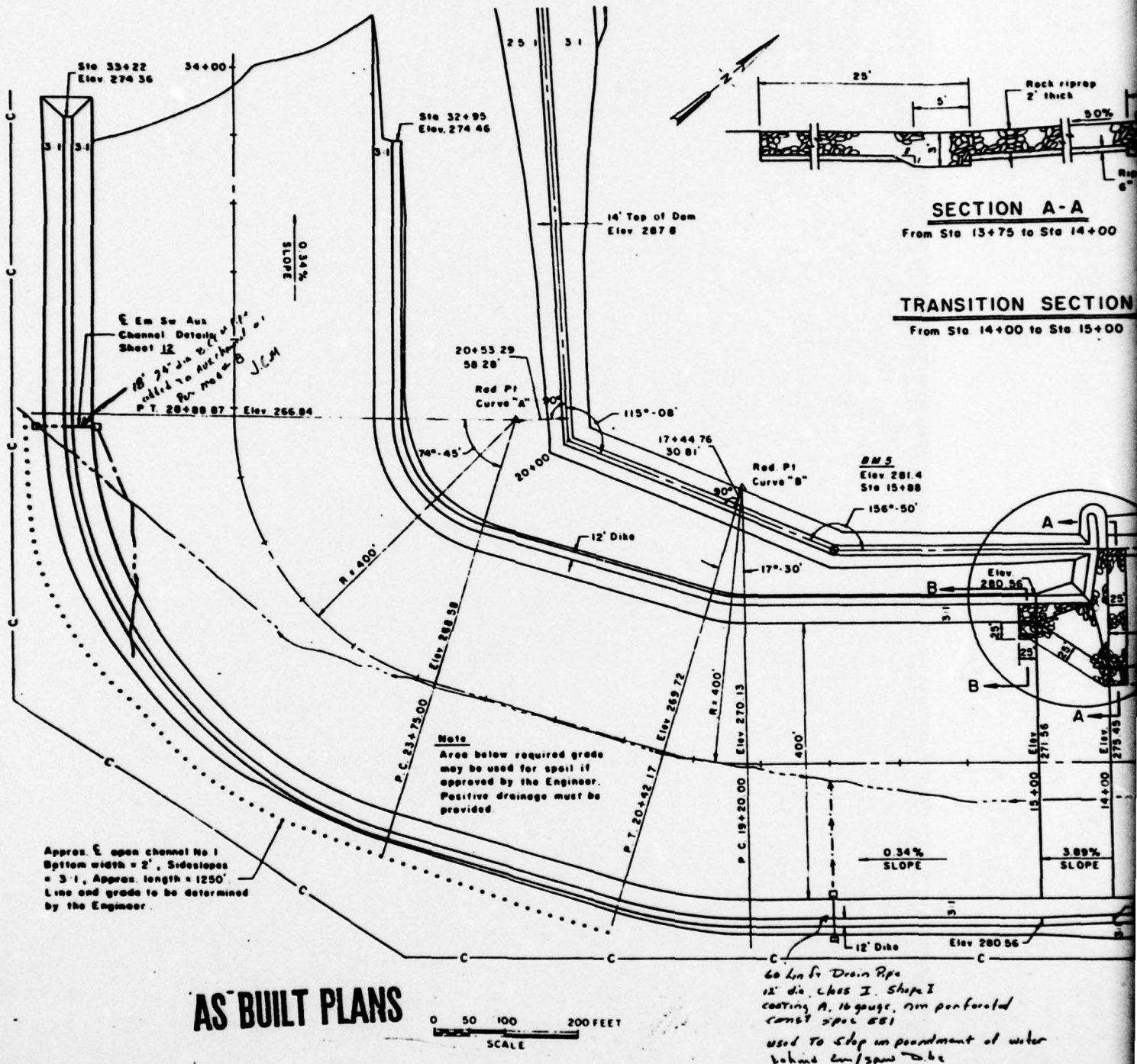
PROFILE ALONG ℄

PRINCIPAL SPILLWAY PLAN AND PROFILE
PINE RUN DAM

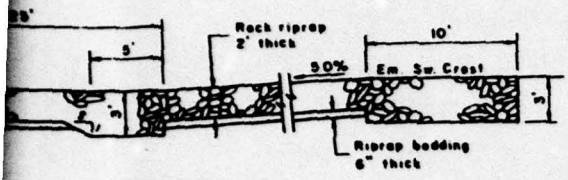
NAT.I.D.NO.PA.00808 BUCKS COUNTY

DATA OBTAINED FROM U.S. DEPT. OF AGRICULTURE, SOIL CONSERVATION SERVICE, DRAWING NO. PA-616-P SHEET NO. 10 OF 44, DATED 4/71

PLATE 5



AS BUILT PLANS

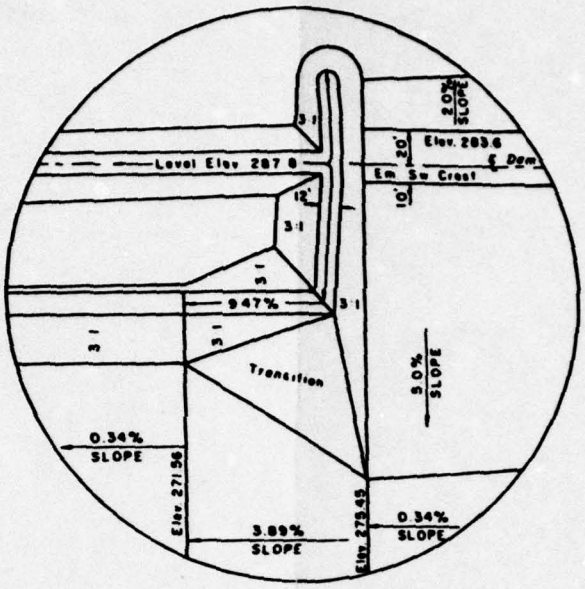


SECTION A-A

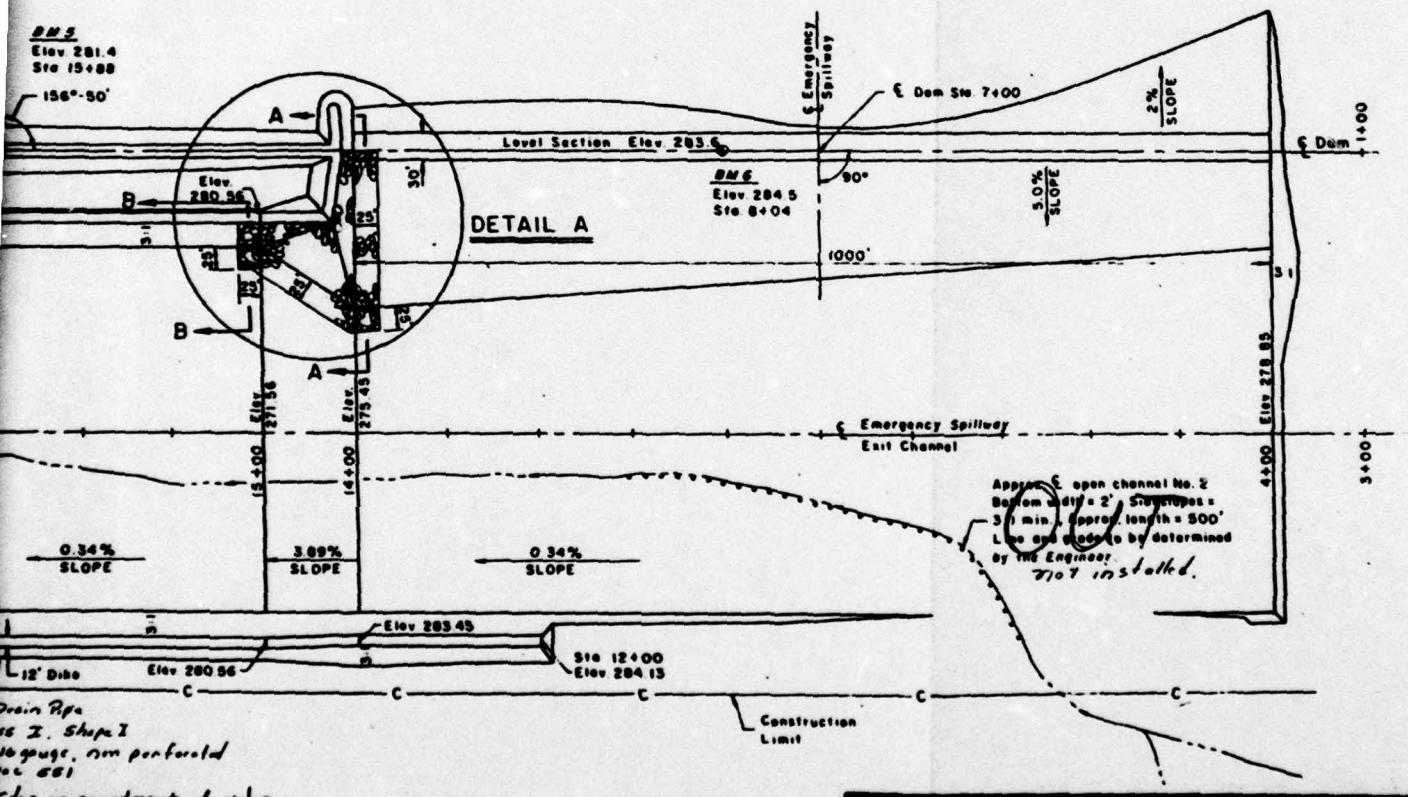
From Sta 13+75 to Sta 14+00

TRANSITION SECTION

From Sta 14+00 to Sta 15+00

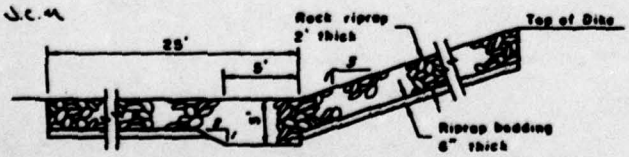


DETAIL A



Drain Pipe
16 I. Shape I
16 gauge, non perforated
ASTM 661
stop impairment of water
-/Sand Tube

J.C.M.



SECTION B-B

From Sta. 15+00 to Sta. 15+25

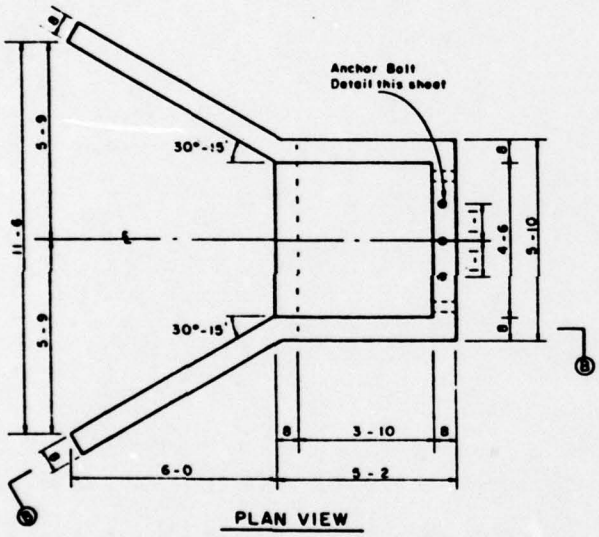
EMERGENCY SPILLWAY

PINE RUN DAM

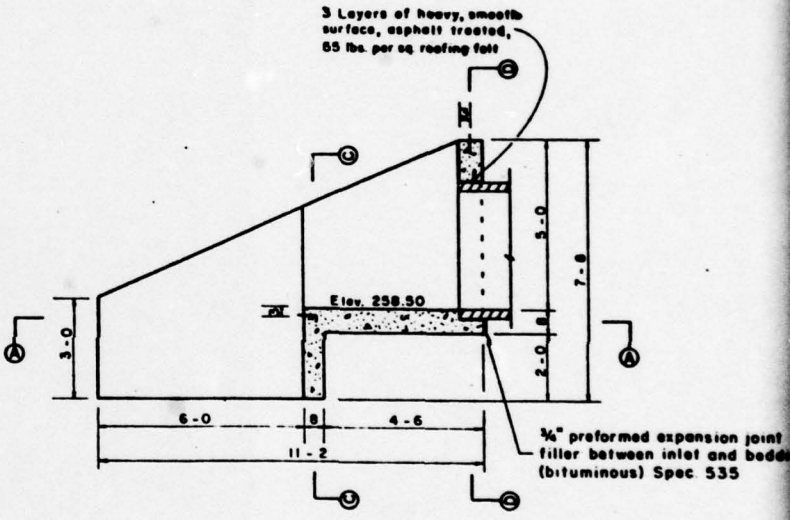
NAT.I.D.NO.PA.00808 BUCKS COUNT

DATA OBTAINED FROM U.S. DEPT. OF AGRICULTURE, SOIL CONSERVATION SERVICE, DRAWING NO. PA-816-P SHEET NO. 7A OF 44, DATED '73

PLATE 6



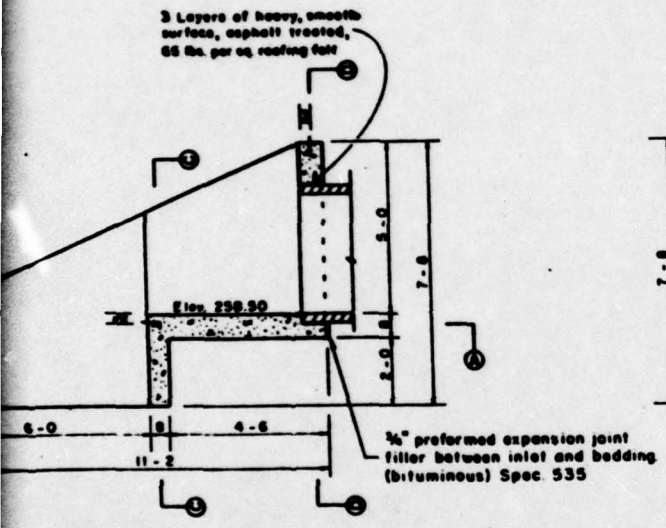
PLAN VIEW



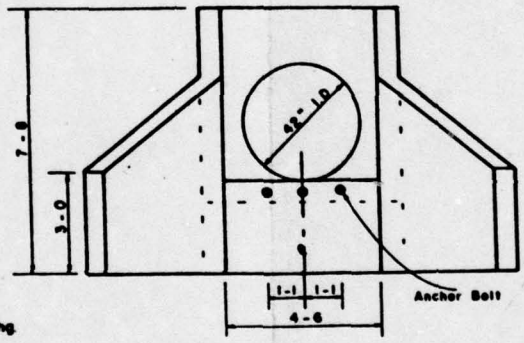
SECTION ALONG CENTERLINE

12 6 0 12 24 36
SCALE in INCHES

AS BUILT PLANS



SECTION ALONG CENTERLINE



UPSTREAM ELEVATION

12 6 0 12 24 36
SCALE in INCHES

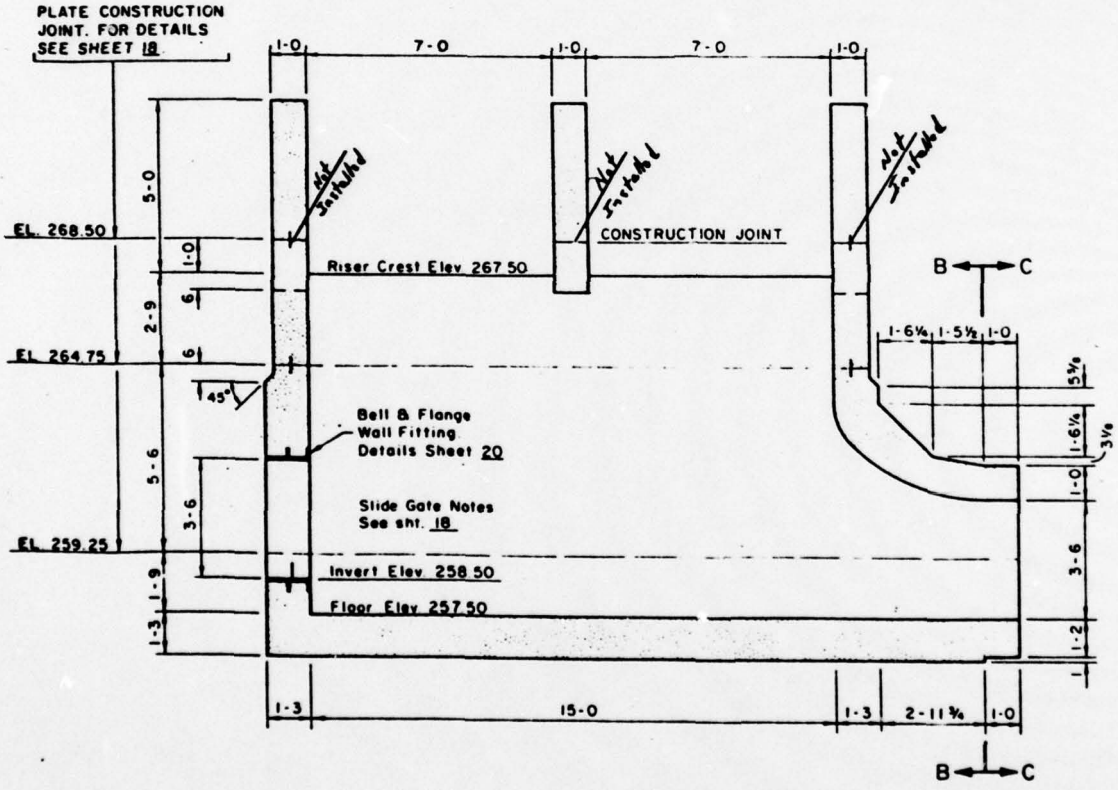
DETAILS OF INLET STRUCTURE

PINE RUN DAM

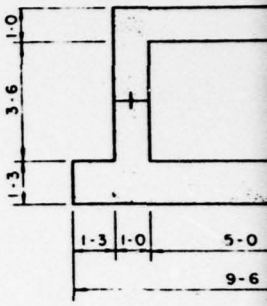
NAT.I.D.NO.PA.00808 **BUCKS COUNTY**

DATA OBTAINED FROM U.S. DEPT. OF AGRICULTURE, SOIL CONSERVATION SERVICE, DRAWING NO. PA-616-P SHEET NO. 14 OF 44, DATED 2/71

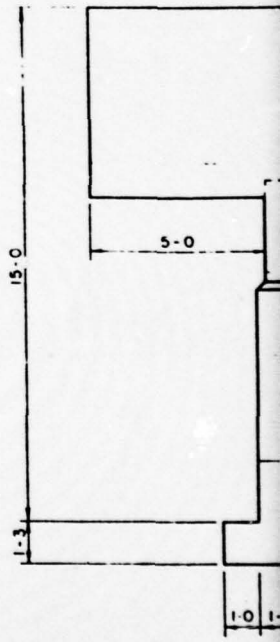
PLATE 7



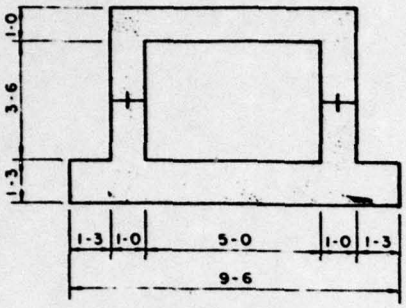
SECTION A-A



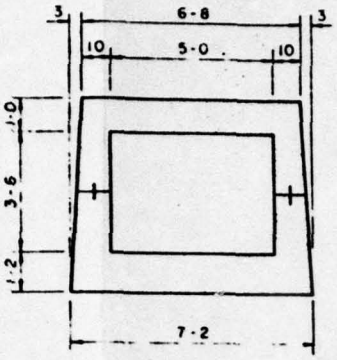
SECTION



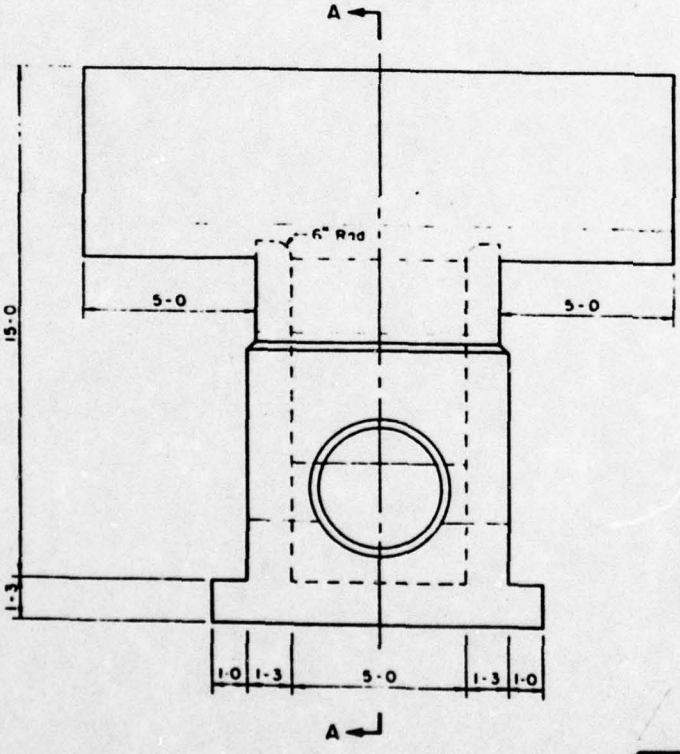
UPS



SECTION B-B

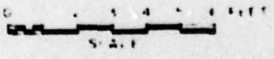


SECTION C-C



UPSTREAM ELEVATION

AS BUILT PLANS



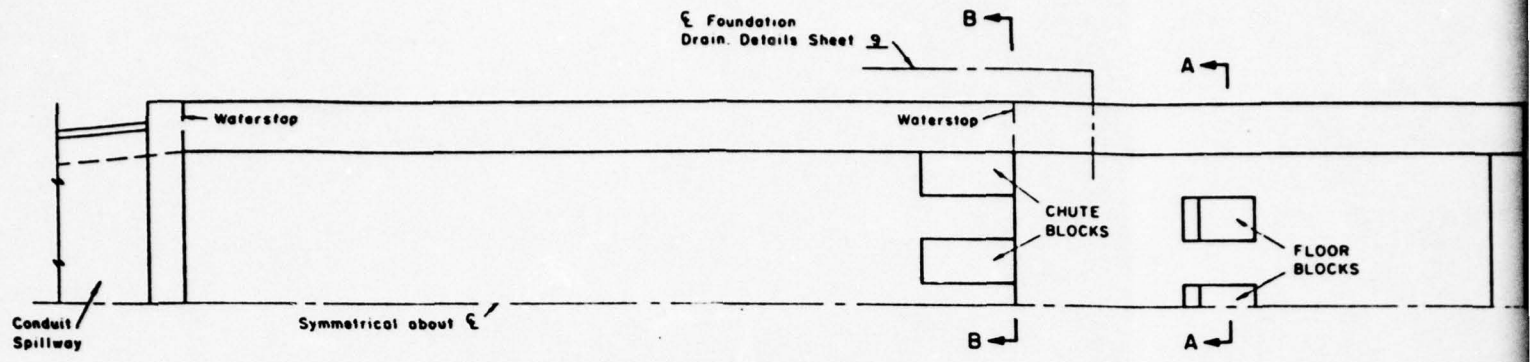
RISER DETAILS

PINE RUN DAM

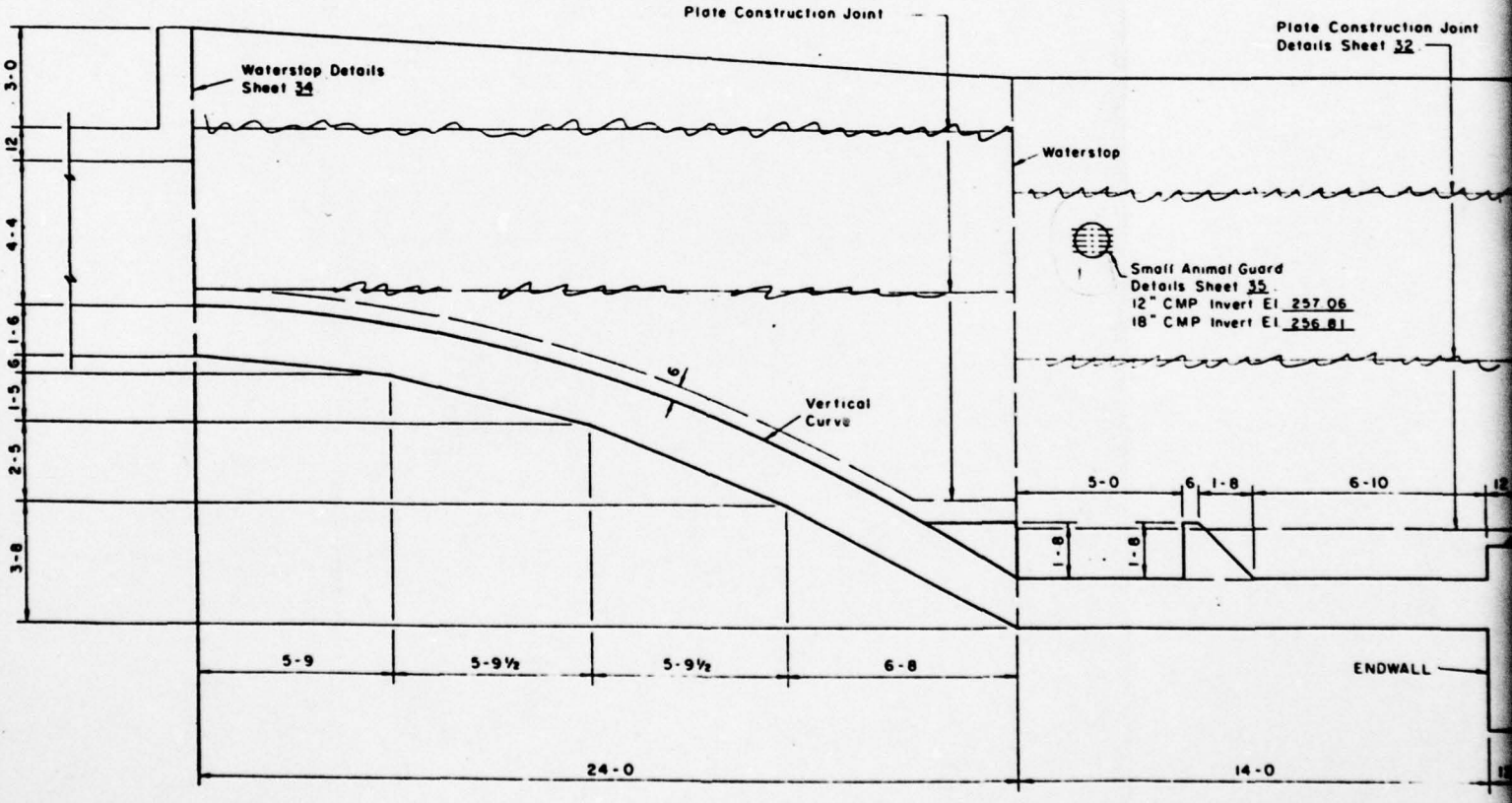
NAT.I.D.NO.PA.00808 BUCKS COUNTY

DATA OBTAINED FROM U.S. DEPT. OF AGRICULTURE, SOIL CONSERVATION SERVICE, DRAWING NO. PA-616-P SHEET NO. 15 OF 44, DATED 10/70

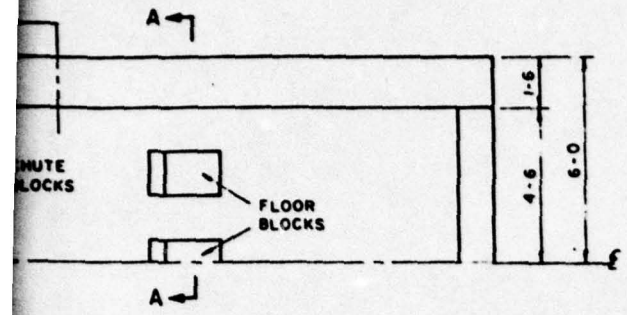
PLATE 8

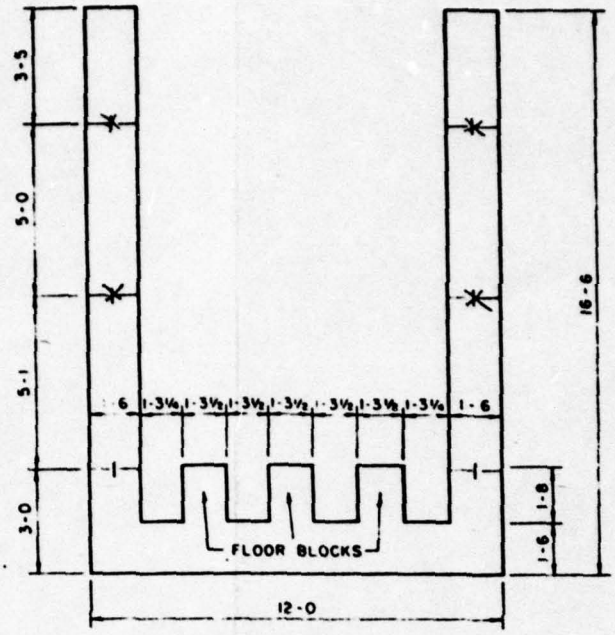


HALF PLAN

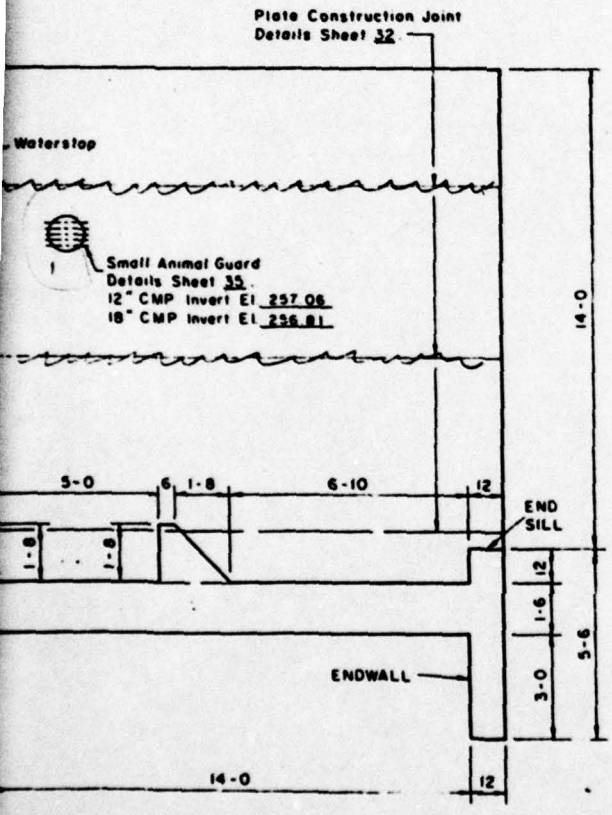


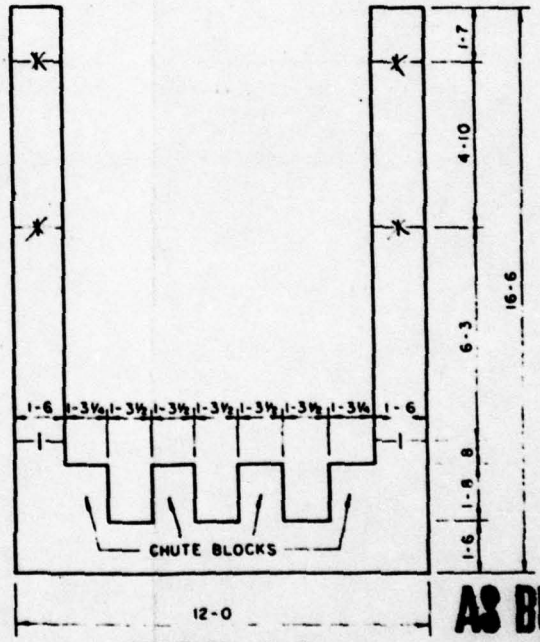
SECTION ALONG CENTERLINE





SECTION A-A





SECTION B-B

AS BUILT PLANS

0 1 2 3 4 5 6 FEET
SCALE

SAF BASIN DETAILS

PINE RUN DAM

NAT.I.D.NO.PA.00808 **BUCKS COUNTY**

DATA OBTAINED FROM U.S. DEPT. OF AGRICULTURE, SOIL CONSERVATION SERVICE, DRAWING NO. PA-616-P SHEET NO. 28 OF 44, DATED 10/71

PLATE 9

LEGEND

TEST HOLE NUMBERING SYSTEM

Centerline of Dam	1 - 99
Borrow area	101 - 199
Emergency spillway	201 - 299
Centerline of outlet structure	301 - 399
Stream channel	401 - 499
Relief wells	501 - 599
	601 - 699
	701 - 799

UNIFIED SOIL CLASSIFICATION SYSTEM SYMBOLS

GW	Well graded gravels, gravel-sand mixtures
GP	Poorly graded gravels
GM	Silty gravels, gravel-sand-silt mixtures
GC	Clayey gravels, gravel-sand-clay mixtures
SW	Well graded sands; sand-gravel mixtures
SP	Poorly graded sands
SM	Silty sands; sand-silt mixtures
SC	Clayey sands; sand-clay mixtures
ML	Silts; silty, very fine sands, sandy or clayey silts
CL	Clays of low to medium plasticity; silty, sandy or gravelly clays
CH	Clays of high plasticity, fat clays
MH	Elastic silts; micaceous or diatomaceous silts
OL	Organic silts and organic silty clays of low plasticity
OH	Organic clays or silts of medium to high plasticity

BEDROCK SYMBOLS

B	Basalt	Sc	Schist
Gn	Gneiss	Sh	Shale
Gr	Granite	Sis	Siltstone
Ls	Limestone	Sl	Slate
Ma	Marble	Ss	Sandstone

SAMPLES

DS	Disturbed
US	Undisturbed

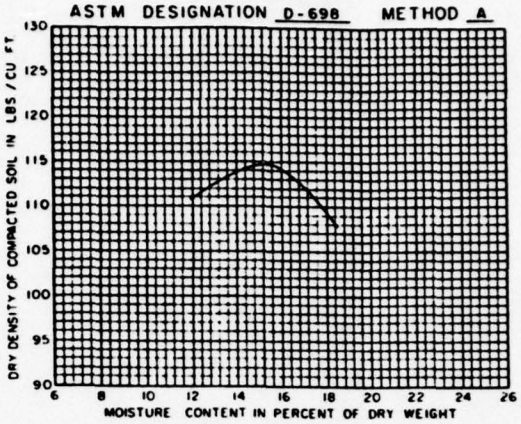
NOTE

All soil and rock classifications were determined by visual examination unless otherwise noted.

COMPACTION CURVE

LABORATORY SAMPLE NO 70 W 678

ASTM DESIGNATION D-698 METHOD A



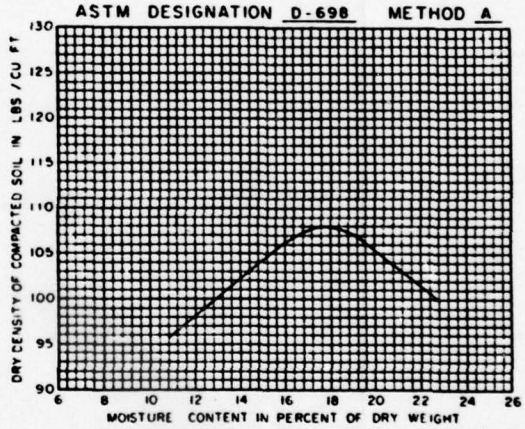
FIELD SAMPLE 116.1 DEPTH 3'-4'

LABORATORY CLASSIFICATION ML

COMPACTION CURVE

LABORATORY SAMPLE NO 70 W 679

ASTM DESIGNATION D-698 METHOD A



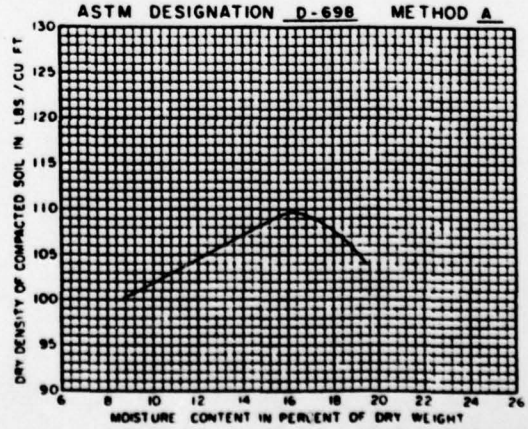
FIELD SAMPLE 117.1 DEPTH 1'-2.7'

LABORATORY CLASSIFICATION ML

COMPACTION CURVE

LABORATORY SAMPLE NO 70 W 680

ASTM DESIGNATION D-698 METHOD A



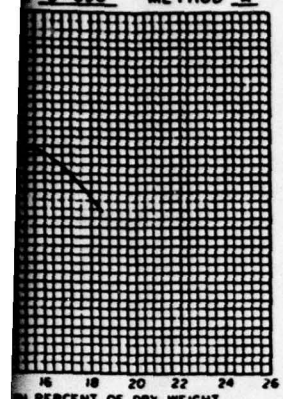
FIELD SAMPLE 118.1 DEPTH 1'-3'

LABORATORY CLASSIFICATION ML

ION CURVE

MPLE NO. 70 W 678

D-698 METHOD A



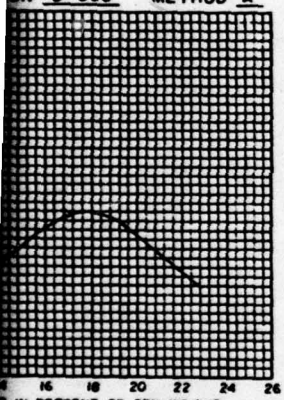
116.1 DEPTH 3'-4'

ASSIFICATION ML

TION CURVE

SAMPLE NO. 70 W 679

ON D-698 METHOD A



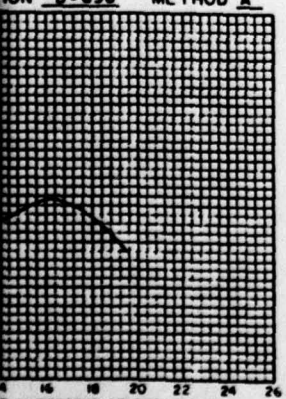
117.1 DEPTH 1'-2 7'

CLASSIFICATION ML

CTION CURVE

SAMPLE NO. 70 W 680

ION D-698 METHOD A



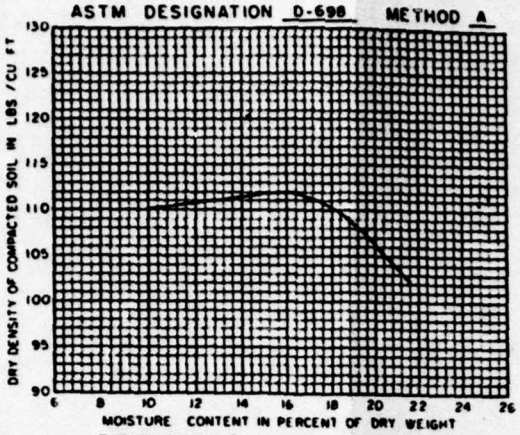
118.1 DEPTH 1'-3'

CLASSIFICATION ML

COMPACTION CURVE

LABORATORY SAMPLE NO. 70 W 681

ASTM DESIGNATION D-698 METHOD A



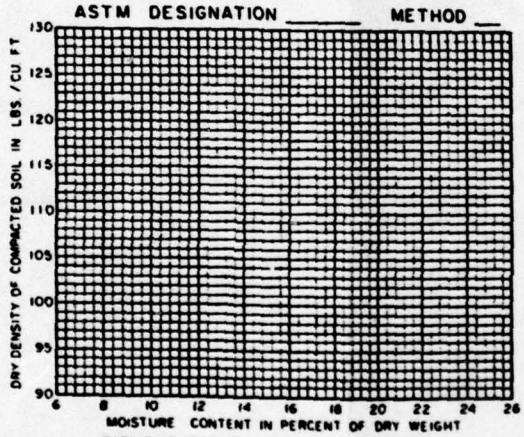
FIELD SAMPLE 118.2 DEPTH 5'-8.5'

LABORATORY CLASSIFICATION None

COMPACTION CURVE

LABORATORY SAMPLE NO. _____

ASTM DESIGNATION _____ METHOD __



FIELD SAMPLE _____ DEPTH _____

LABORATORY CLASSIFICATION ___

TYPICAL EMBANKMENT SOIL COMPACTION DATA

PINE RUN DAM

NAT.I.D.NO.PA.00808 **BUCKS COUNTY**

DATA OBTAINED FROM U.S. DEPT. OF AGRICULTURE, SOIL CONSERVATION SERVICE, DRAWING NO. PA-616-P SHEET NO. 40 OF 44, DATED 4/71

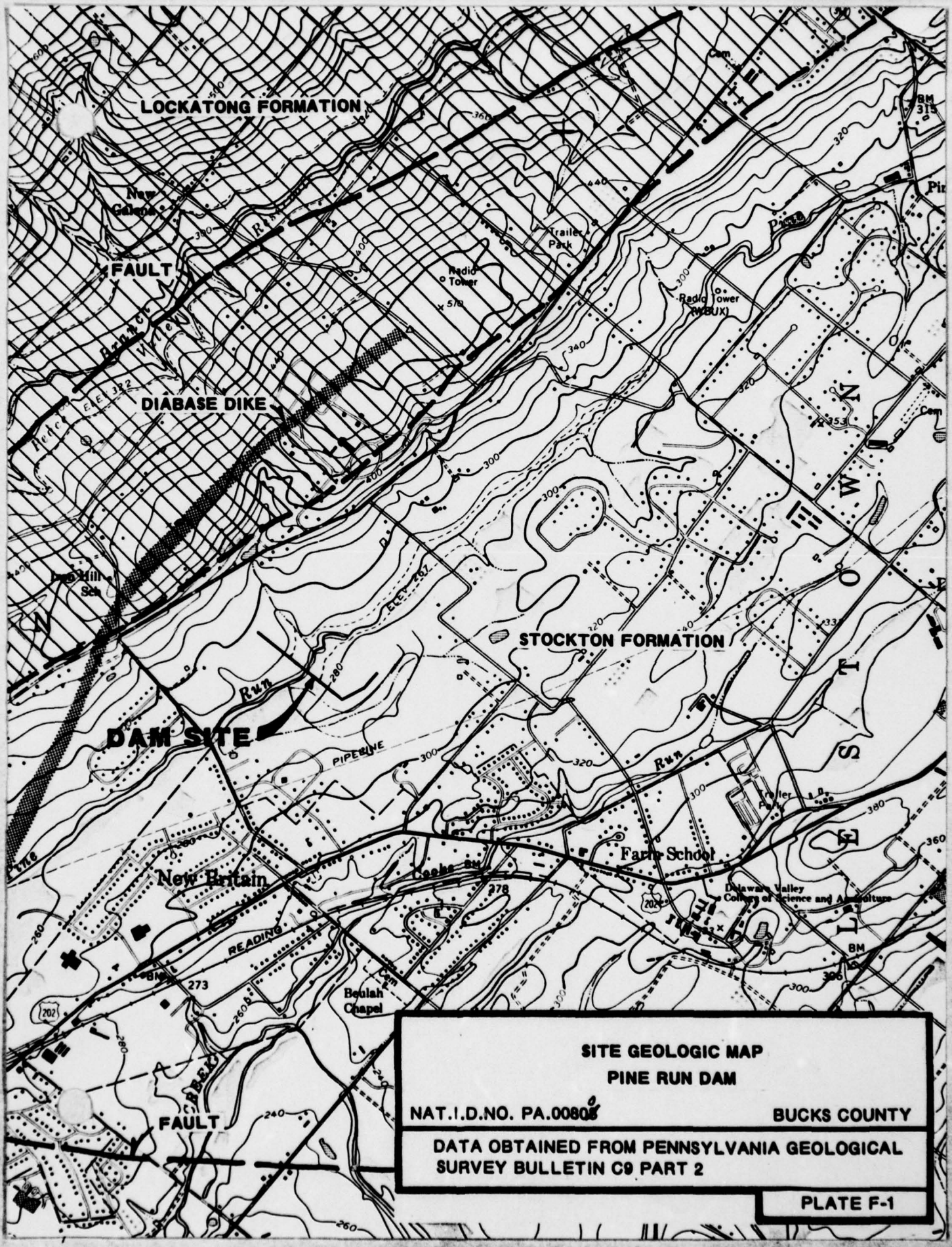
PLATE 10

APPENDIX

F

SITE GEOLOGY
PINE RUN DAM

Pine Run Dam is located in the Triassic Lowland Section of the Piedmont Physiographic Province. As shown on Plate F-1, the bedrock upon which the dam is constructed consists of interbedded shale and sandstone of the Stockton Formation of Triassic Age. Downstream from the dam along the banks of Pine Run are exposures of decomposed siltstone. The bedding strikes east-northeast (near-perpendicular to the dam axis) and dips 15 degrees to the north-northwest. High angle rock jointing was also observed to strike to the east-northeast and northwest. The orientation of rock jointing and the variable degree of rock weathering relative to rock type are conditions favorable to downstream seepage.



SITE GEOLOGIC MAP

PINE RUN DAM

NAT.I.D.NO. PA.00808 **BUCKS COUNTY**

DATA OBTAINED FROM PENNSYLVANIA GEOLOGICAL SURVEY BULLETIN C9 PART 2

PLATE F-1