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NATIONAL DAM INSPECTION PROGRAM. PEACE VALLEY DAM (ID PA-00790)--ETC(U)
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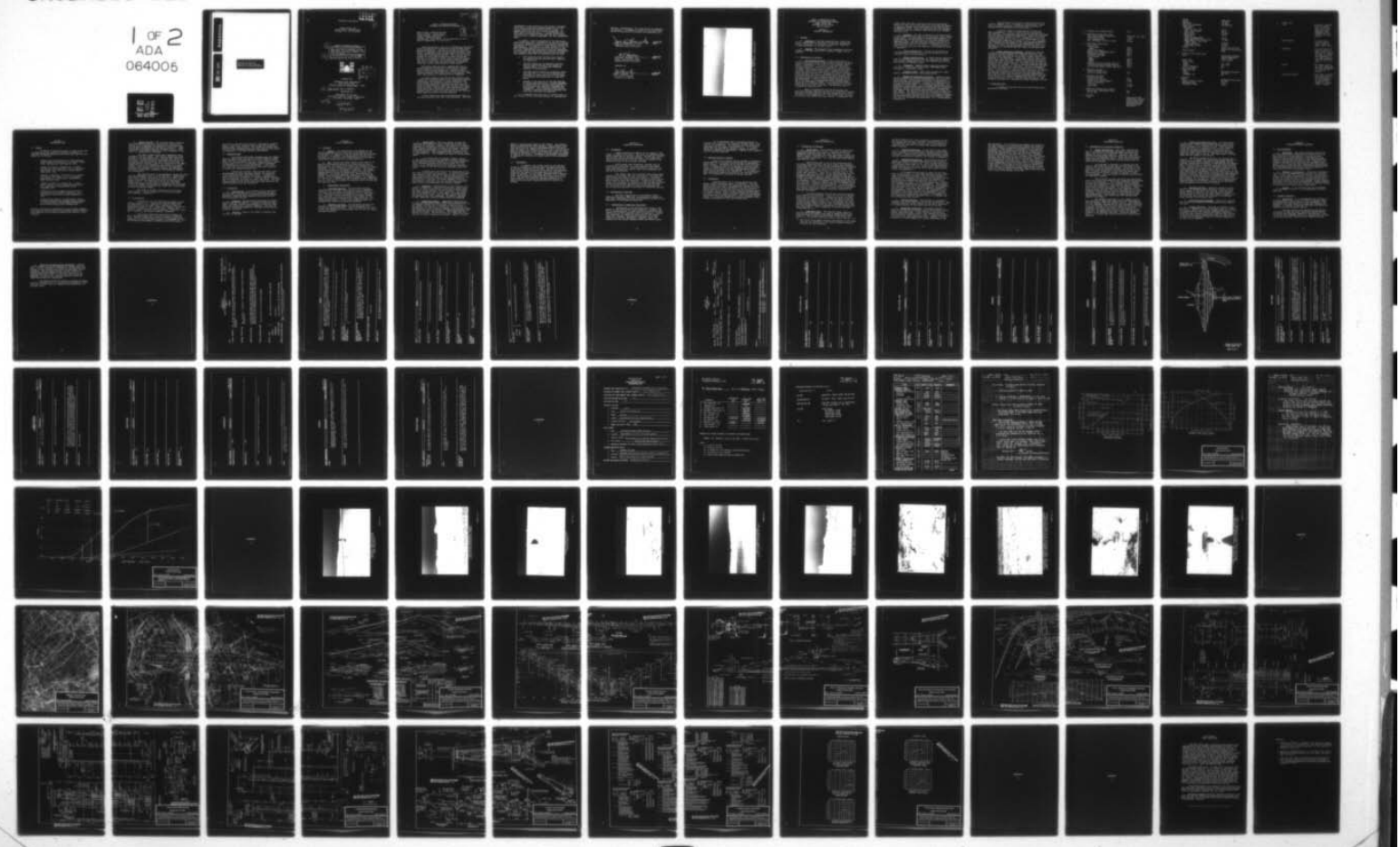

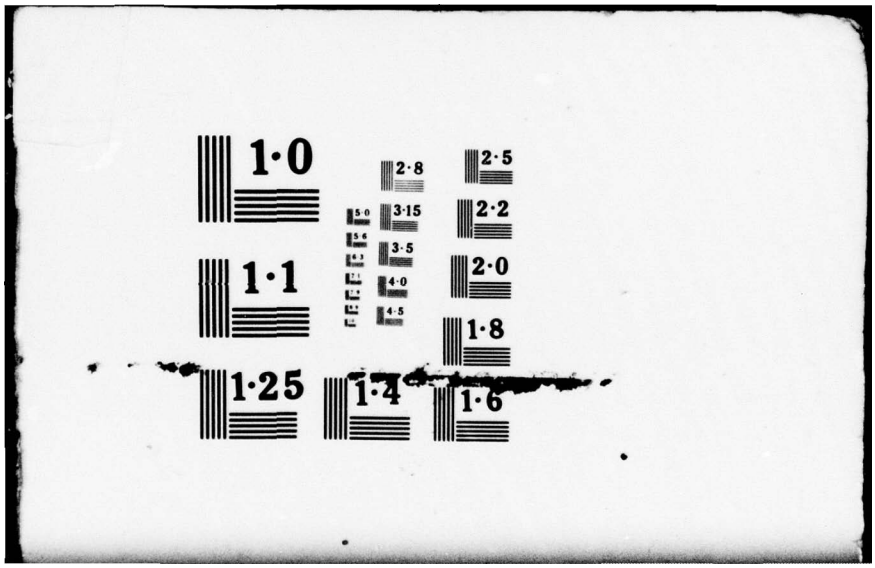
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LEVEL II

DELAWARE RIVER BASIN

PEACE VALLEY DAM
BUCKS COUNTY, PENNSYLVANIA
NATIONAL I.D. NO. PA 00790

(6) PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM.
Peace Valley Dam (ID PA-00790), Delaware River Basin, North Branch Neshaminy Creek, Bucks County, Pennsylvania. Phase I Inspection Report.

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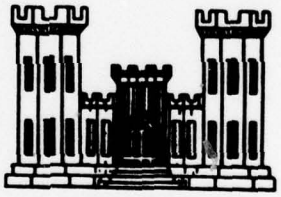

Prepared by:

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(15) DACW31-78-C-0048

Submitted to:

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

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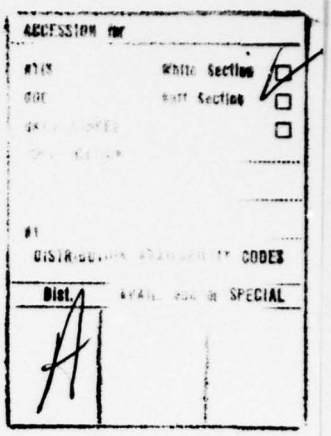

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

Name of Dam: Peace Valley Dam
County Located: Bucks County
State Located: Pennsylvania
Stream: Neshaminy Creek
Coordinates: Latitude 40° 19.0' Longitude 75° 12.1'
Date of Inspection: 20 June 1978

Peace Valley Dam is part of a proposed ten dam flood control system which is operated by the Neshaminy Water Resources Authority. The dam is located on the North Branch of Neshaminy Creek in New Britian Township, Bucks County, Pennsylvania and designed under the supervision of the Soil Conservation Service. The facility is considered to be in good condition and well maintained. The dam is considered a "High" hazard structure consistent with its potential for extensive property damage and loss of life along the North Branch of Neshaminy Creek and further along Neshaminy Creek proper.

The design data was quite comprehensive and included hydrology and hydraulic calculations together with structural calculations and a geologic report. Peace Valley Dam was designed to contain and pass the Probable Maximum Flood (PMF) without overtopping. Therefore, the spillway is considered to be "Adequate".

A visual inspection of the dam and reservoir facilities did not detect symptons of uncontrolled seepage, instability, deterioration or other conditions that would suggest an impending hazardous condition. All controlling systems were exercised and were observed to be in good operating condition, painted, well lubricated and clean. The control tower contained an operations manual which described each piece of equipment together with a listing of spare parts and the location where additional parts could be obtained.

A small marshy area was noted downstream right of the Saint Anthony Falls (SAF) stilling basin. This area

corresponds to the location of the original streambed. There was no evidence of seepage emanating from the toe or through the surrounding natural ground. It appears that this area is a natural topographic low which does not readily drain. A second marshy area was noted on the upstream side near the left abutment which is also a natural topographic low that accumulates water.

In summary, with the exception of the two marshy areas noted previously, examination of available records and visual inspection revealed no evidence or conditions detrimental to the integrity of Peace Valley Dam and its appurtenances. Considering the good condition of the dam, the recommendations presented below are suggested to assure that the dam continues to function as designed and to assure that downstream residents are notified that impending high flow is expected along the creek.

1. Rock talus from the spillway walls should be removed annually and the walls inspected for stability.

2. Periodic checks of the emergency spillway should be performed and woody vegetation removed before it affects the discharge capacity of the spillway.

3. The Owner should develop an inspection checklist and add it to its current maintenance procedure to insure that all critical items are inspected and maintained on a periodic basis.

4. Because of the location of the dam upstream of highly populated areas, a formal procedure of observation and warning during periods of high precipitation should be developed and implemented. This procedure should include a method of warning downstream residents that high flow conditions are expected.

It is suggested that the area of standing water in the vicinity of the old stream channel be regraded and

drained. Subsequently, this area should be inspected for seepage. If seepage is noted, an inverted filter should be constructed to protect the downstream toe.

John H. Frederick, Jr., P.E.
Maryland Registration 7301
Woodward-Clyde Consultants

16 Aug 78
Date

William S. Gardner, P.E.
Penna. Registration 4302E
Woodward-Clyde Consultants

16 Aug 78
Date

APPROVED BY:

JOHN H. KENWORTHY
LTC, Corps of Engineers
Acting District Engineer

15 Aug 78
Date

OVERVIEW
PEACE VALLEY DAM, BUCKS COUNTY, PENNSYLVANIA

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM
PEACE VALLEY DAM
NATIONAL ID # PA 00790
DER ID #9-169

SECTION I
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. Peace Valley Dam is a 66-foot high rolled earth zoned dam which crosses the North Branch of Neshaminy Creek in New Britain Township, Bucks County, Pennsylvania. The dam is 2,350 feet long with a 365 acre reservoir. The dam was designed to use locally available borrow materials and contains two primary material zones. The interior zone, Zone 1, consists of silty clays and clayey silts classified by the Unified Classification System as ML and CL. Encompassing Zone 1 are Zone 2 materials which are silty gravels and clayey gravels with a Unified Classification System designation of GM and GC. The dam contains a cut-off trench located upstream of the dam centerline. On the downstream slope, between Zones 1 and 2, the embankment contains an inclined chimney drain connected to a drainage trench. The elevation of the drain varies along the axis of the dam. The upstream slope is riprapped to elevation 330.

Water is discharged from the dam through the principal spillway through a 66-inch I.D. reinforced concrete pipe which extends under the dam and discharges into a stilling basin at the downstream toe. The intake tower contains an overflow weir system and sluice gates. In addition, the

intake tower also has a four-inch pipe which discharges water at a rate of not less than 2.37 cubic feet per second to maintain minimum flow requirements in the North Branch of Neshaminy Creek. Water is discharged over the emergency spillway on the left abutment when the lake level exceeds elevation 330.0.

b. Location. The dam is located on the North Branch of the Neshaminy Creek in New Britain Township, Bucks County, Pennsylvania. The embankment is located approximately 2.7 miles upstream at the confluence of the North Branch with Neshaminy Creek. The dam site and reservoir are shown on USGS Quadrangle entitled "Doylestown, Pennsylvania", at coordinates N 40° 19.0', W 75° 12.2'. A Regional Location Plan of Peace Valley Dam and Reservoir is enclosed as Plate 1, Appendix E.

c. Size Classification. The dam is classified as "Intermediate" by virtue of its 66-foot height and 6,539 acre-feet normal storage capacity.

d. Hazard Classification. A "High" hazard classification is assigned consistent with the potential for extensive property damage and loss of life downstream along the North Branch of Neshaminy Creek.

e. Ownership. Neshaminy Water Resource Authority. P.O. Box 6, Cross Keys Office Center, 4259 Swamp Road, Doylestown, Pennsylvania 18901.

f. Purpose of Dam. Flood water retardation, water supply, recreation and low flow augmentation.

g. Design and Construction History. Design of this dam was prepared by various consultants for the Soil Conservation Service, United States Department of Agriculture. Specifications were prepared for the Soil Conservation Service by the design engineer. Drawings were prepared in accordance with SCS format. E.H. Bourquard Associates, Inc., Harrisburg, Pennsylvania were the primary design consultants. Eugene J. Aufiero and Associates, Harrisburg, Pennsylvania, performed several structural calculations in the final design report. Dr. Dale T. Harroun was the soils engineer for this project. Mr. Richard J. Conlin of Lancaster, Pennsylvania, was a consulting geologist and the consulting engineer for the laboratory testing of the soil and foundation materials was F.T. Kitlinski and Associates, Inc., of Harrisburg, Pennsylvania.

The contractor for this work was the Devault Contracting Company, Inc., of Kimberton, Pennsylvania. There were no records available to determine the contractor's subcontractors associated with this project.

The first report of construction activity was made on December 7, 1971, at which time site preparation was underway. The principal spillway drain pipe was installed prior to general foundation preparation. Water was diverted through the pipe on June 27, 1972. Excavation of the core trench began the week of July 3, 1972 and placement of Zone 1 material was completed on October 9, 1972. Fill placement was suspended for the winter of 1973 and resumed on April 2, 1973. Filling of the reservoir was scheduled to begin on November 15, 1973, but was delayed until the Spring of 1974. The reasons for the delay were not found in available documentation.

h. Normal Operating Procedures. Reservoir flows are controlled at the principal and emergency spillway. The principal spillway consists of a concrete riser structure located at the upstream toe of the dam, slightly left of the midpoint of the embankment. Three water control gates along with trash racks, weir and minimum flow pipe are contained within the riser structure. The two upper gates are used for selective water supply releases. The third gate was used for diversion and closure. It can be used for reservoir drainage. All gates are electrically operated. The weir contained in the riser structure has a crest elevation of 321.7 (Normal Pool). A four-inch I.D. cast iron pipe placed near the bottom of the riser structure (elevation 278.0) provides the 2.37 cfs minimum release flow to satisfy low flow requirements. All flows into the riser structure discharge through the 394 feet, 66-inch I.D. concrete pressure pipe conduit. The end of the pipe transitions to a SAF type stilling basin. The emergency spillway is a trapezoidal channel excavated in rock.

1.3 Pertinent Data.

A summary of pertinent data for Peace Valley Dam is presented as follows:

a.	Drainage Area (square miles)	15.8
b.	Discharge at Dam Site (cfs)	
	Max. Known Flood at Dam Site	848 (Feb. 24, 1975)
	Design High Water	2,719
	Min. Required Flow	2.37
	Max. Discharge (at Top of Dam)	21,240
c.	Elevations (above MSL)	
	Top of Dam	
	Constructed	343.0
	Design	342.0
	Design High Water	333.1
	Normal Pool (Recreation Pool)	321.7
	Emergency Spillway	330.0
	Principal Spillway	321.7
	Sluice Gates	
	Upper	309.0
	Middle	294.0
	Lower	275.0
	Minimum Low Flow Release Pipe (4")	278.0
	Principal Spillway Outlet Invert	272.0
	SAF Stilling Basin Outlet (end sill)	265.0
d.	Reservoir (miles)	
	Length at Normal Pool	3.3
	Fetch at Normal Pool	2.5
e.	Storage (acre-feet)	
	Sediment Storage	366
	Conservation Storage	1,539
	Normal Pool (Water Supply)	6,539
	Crest of Emergency Spillway	10,002
	Top of Dam	17,132
f.	Reservoir Surface Area (acres)	
	Normal Pool (Recreation Pool)	365
	Top of Dam	730
g.	Dam Data	
	Type	Zoned earth with downstream inclined chimney drain and drain trench with upstream riprap protection.

Length	2446 feet
Height	66 feet
Top Width	24 feet
Volume of Embankment	632,000 yd^3
Side Slopes	
Upstream	
Crest to Elev. 330	3H:1V
Elev. 330 to Berm	4H:1V
Berm Width	30 feet
Berm to Toe	5H:1V
Downstream	
Crest to Upper Berm	3H:1V
Upper Berm Width (Elev. 320)	10 feet
Upper Berm to Lower Berm (Elev. 300)	3.5H:1V
Lower Berm Width	10 feet
Lower Berm to Toe	4H:1V
Zoning	Silty clay core encased in silty gravel
Grout Curtain	None

h. Diversion and Intake Riser

Type	Reinforced Concrete Riser Combination Intake Tower
Riser Size	5'6" x 16'3"
Sluice Gates	
Upper	42" x 48"
Middle	60" x 72"
Lower (diameter)	66"
Min. Flow Pipe	4"
Discharge Pipe	
Type	Reinforced Concrete
Length	385 feet
Diameter (ID)	66"

i. Spillway

Type	Excavation into Rock
Control Section Length	50 feet
Upstream Slope	0.01
Downstream Slope	0.0293

j.	Intake Tower Type	Reinforced concrete with two intake pipes. 2-20 inch cast iron pipes embedded in embankment at elevations 753.8 and 733.8
	Drain System	1-36 inch reinforced concrete pipe at base of tower (Elev. 389.6)
	Discharge	2-24 inch cast iron pipes at base of tower (Elev. 689.6) One pipe is connected below ground to the pumphouse and one pipe discharges into the stilling pond
	Access	The intake systems are under water and are only accessable if the tower is drained
	Regulating Method	Drain pipe is closed and intake pipes are open. Water is fed to pumphouse by gravity and pumped to storage tower on demand

SECTION 2
ENGINEERING DATA

2.1 Design.

A summary of engineering data on Peace Valley Dam is presented on the checklist attached as Appendix A. Principal documents containing pertinent data used for this report are as follows.

1. "Report Upon the Application of the Neshaminy Water Resources Authority", by Joseph J. Ellam, Chief, Dam Section, dated May 20, 1971.

2. "Report on Phase II, Contract No. 3, Earth Dam Geologic Investigation", by E.H. Bourquard Associates, Inc., Harrisburg, Pennsylvania, dated April 1969.

3. "Report on Phase III, Contract No. 3, Preliminary Design and Report", by E.H. Bourquard Associates, Inc., Harrisburg, Pennsylvania, dated December 1969.

4. "Report on Phase IV, Contract No. 3, Final Design Report", by E.H. Bourquard Associates, Inc., Harrisburg, Pennsylvania, dated September 1970.

5. Construction plans stamped "As-Built Plans", prepared by E.H. Bourquard Associates, Inc., Harrisburg, Pennsylvania, dated September 15, 1970.

6. Miscellaneous letters, correspondence, memos, including construction progress reports located in the Department of Environmental Resources main office in Harrisburg, Pennsylvania.

The data available was comprehensive and included computer print-outs for slope stability and seepage analysis together with summaries of the input parameters and results of the analyses.

b. Design Features. The principal design features are illustrated on the plan, profile and cross-section plates of the embankment and appurtenant structures that are enclosed in Appendix E as Plates 2 through 13. These plates were reproduced from the "As-Built Plans". A description of the design features is also discussed in Section 1.2, "Description of Project".

The dam is zoned rolled earth embankment which includes a cut-off trench. Two interior drains are incorporated in the dam construction. One two foot thick filter drain is located along the downstream side of the cut-off trench. The second drain, four feet in thickness, is located between the Zone 1 and Zone 2 materials on the downstream portion of the embankment and extends to a "drain trench". Both drains extend the width of the embankment and have been included to control seepage and hydrostatic pressures. Additional information is included in Section 1.2, paragraph a.

The upstream side of the embankment slopes are 3H:1V from the embankment crest to elevation 330.0. Below elevation 330.0, a slope inclination of 4.5H:1V is shown to elevation 296.0 where a 30-foot berm exists prior to a final slope of 5H:1V. The downstream side at the embankment slopes 3H:1V to a 10-foot berm at elevation 320.0 then 3.5H:1V to another 10-foot berm at elevatiion 300.0 and then to a 20-foot berm at elevation 285, which has a final slope of 3H:1V to natural ground.

The crest is 24 feet wide with a 14 foot wide paved roadway. Design features of the spillway systems are discussed in Section 5.

2.2 Construction.

A description of the construction history is presented in Section 1.2. Construction was performed under the supervision of Mr. Frederick H. Schuetz of the Soil Conservation Service, USDA. Other Soil Conservation Service personnel assigned to this project were: Messrs. Barry Kintzer, Project Engineer; Harlin Kemmerer, Inspector; James Metz, Inspector; and Russell Campbell, Inspector.

State files contained construction progress reports and photographs (34) of various stages of construction. The Soil Conservation Service provided construction inspection of both soils and concrete. On December 18, 1974, the construction documents, including field test results,

were sent to the SCS state office in Harrisburg, Pennsylvania. From there, they were sent to the SCS archives in Mechanicsburg, Pennsylvania. SCS inspection records document that the embankment materials and concrete were placed in accordance to the specification requirements.

2.3 Operation Data.

The construction permit together with the "Report Upon the Application" indicates that the discharge system shall maintain a minimum flow of 2.37 cfs, which is equivalent to 1,531,665 gallons per day, unless reservoir inflow is less than 2.37 cfs. If reservoir inflow is measured the discharge may be reduced accordingly. A four inch I.D. cast iron pipe was installed in the riser structure to assure the minimum required flow.

Operational records, which include water level measurements and some discharge records, are available at the Neshaminy Water Resources Office. A summary of these records was provided by the Owner's representative and are discussed in Section 5. Since the dam is relatively new, the emergency spillway has never functioned. All discharge systems in the intake tower have been operative and were exercised during the inspection.

2.4 Evaluation.

a. Availability. All engineering data reproduced in this report and studied for this investigation were provided by the Pennsylvania Department of Environmental Resources, Neshaminy Water Resources Authority and the Soil Conservation Service.

b. Adequacy. The design data provided was comprehensive and well documented. Construction data was adequate, although limited to photographs, inspection memoranda, and construction progress summaries. The data obtained is considered adequate to evaluate the dam and appurtenant structures.

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

SECTION 3
VISUAL INSPECTION

3.1 Findings.

a. General. The observations and comments of the field inspection team are contained in the checklist enclosed herein as Appendix B and are summarized and evaluated as follows. In general, the appearance of the facility indicates that the dam and its appurtenances were properly constructed, maintained, and in good condition.

b. Dam. During the visual survey, there were no indications or evidence observed of distortions in alignment or grade that would be indicative of movement of the embankment or the foundations. There were no surface cracks, sloughing, erosion, or misalignment observed. The riprap was in good condition and stable. There was no noticeable seepage observed along the downstream toe or along the embankment. All drains appeared to be functioning as designed. Some standing water was observed on the upstream side of the left abutment, as shown on Sheet 5 (a), Appendix B. This water is associated with rainfall runoff in that the area is a natural low between the upstream toe of the dam and the reservoir area.

c. Appurtenant Structures.

1. Principal Spillway. The principal spillway, consisting of a concrete riser section, was in excellent condition with no signs of cracked or spalled concrete. All gates were exercised and appeared to be in good condition. Each gate control mechanism was painted, cleaned and lubricated. An operating manual was located in the tower and attached to the gates for ready reference. The Stevens Type A Model 71 water level recording gauge was inspected and found to be operating properly.

2. Emergency Spillway. The emergency spillway was observed to be in good condition being excavated into erosion-resistance materials. Some rock spalling was noted on the left abutment of the spillway, but it will not affect spillway operation.

3. Outlet Works. Water was flowing through the discharge pipe during the field inspection and the pipe could not be inspected. However, the conduit was visually inspected at the upstream end and no distortion, misalignment, unusual settlement or spalling was noted. The downstream SAF stilling basin was inspected and found to be in good condition. The riprapped outlet channel was also in good condition. Some leakage was noted in closed sluice gates.

It is noted that the present roadway leading to the reservoir crossed the emergency spillway downstream of the dam and would be underwater in an extreme event, thus, preventing access to the control tower via this route. It is understood that other roads are available to gain access to the dam during an extremely heavy rainfall.

A marshy area was noted at the downstream toe to the right of the SAF stilling basin. A review of the drawings indicates that this marshy area was the location of the original stream channel. A careful observation of the downstream toe did not indicate any seepage eminating from the toe of the dam. All water appeared to be static and probably associated with the natural topographic low which acts as a storage basin for rainfall runoff.

d. Reservoir. Reconnaissance of the reservoir disclosed no evidence of significant siltation, slope instability, or other features that would significantly affect the flood storage capacity of the reservoir. All slopes were well vegetated, and in some cases, trees were growing to the water's edge. The drainage area surrounding the reservoir was also inspected. In general, the area is well vegetated, contains wooded areas and farmlands.

e. Downstream Channel. Immediately downstream of the SAF stilling basin, Peace Valley Dam discharge flows in a riprapped channel with no evidence of major erosion. The channel is lined for a distance of 300 feet prior to discharging into the natural streambed. The emergency spillway discharges into the natural streambed approximately 800 feet below the SAF stilling basin. The stream bank and channel are stable. The flood plain area immediately below the dam is densely vegetated and wooded. There is little

debris or obstructions noted in the channel. The channel grade is approximately three percent. Approximately 2,000 feet below the dam, housing developments were noted which would be subject to damage and loss of life if the dam fails. Many new homes (100 or more) have been built near the North Branch and Neshaminy Creek, which would be subject to damage in case of dam failure. Residential development downstream is expected to continue at a rapid rate for the foreseeable future.

3.2 Evaluation.

In summary, the visual survey of the dam disclosed no evidence of apparent past or present movements to indicate instability of the dam. The wet area to the right of the outlet structure at the toe of the downstream slope does not appear to be associated with potential piping or seepage. The principal spillway works (concrete riser, gates, conduit) were observed to be in good condition. The emergency spillway was also observed to be in good condition, but should be checked periodically to remove trees and heavy vegetation which is starting to develop.

SECTION 4
OPERATION PROCEDURES

4.1 Procedures.

Normal operating procedures do not require a dam tender to regulate the gates. The water is maintained under normal conditions by the weir system. The dam has a principal spillway and an emergency spillway. The normal pool level is maintained by a 33-foot long weir located on the downstream side of the principal spillway.

Below normal pool elevations, minimum flow is provided by a four-inch I.D. pipe located in the intake riser, elevation 278.0. Water entering the four-inch I.D. pipe flows through the concrete pipe that discharges into the SAF stilling basin.

The intake riser also contains three sluice gates located at elevations 309, 294.0 and 275.0. The upper two sluice gates are used to lower the reservoir. The lower gate was used for diversion control during construction and can be used to drain the reservoir. Access to the intake tower riser structure is achieved by a pre-stressed concrete access bridge between the crest of the dam and the tower. All sluice gates are normally electrically-operated but can be manually-operated in the event of electrical failure.

4.2 Maintenance of the Dam.

The dam is maintained by the Neshaminy Water Resources Authority (NWRA) and is periodically checked by the County Department of Parks and Recreation as well as the Department of Environmental Resources.

4.3 Maintenance of Operating Facilities.

Maintenance of the operating facilities is performed by the Bucks County Parks Authority. However, the dam is relatively new, in good condition, with little maintenance having been required since its completion. During the inspection, an operations manual was in the control tower and reviewed. This manual contained all of the essential guidelines necessary to operate, repair and rehabilitate the control systems within the control tower.

It is understood that a maintenance manual is available but could not be located at the park site at the time of the inspection. The contents of this manual were discussed with the Owner's representative. It is understood that the procedures include a listing of items to maintain, frequency of maintenance, together with a description of the work required.

4.4 Warning Systems in Effect.

There are no formal warning systems or procedures established to be followed during periods of exceedingly heavy rainfall. Personnel are at the park daily and available to inspect the dam during periods of critical conditions. A representative of the Neshaminy Water Resources Authority lives nearby and keeps appropriate keys and valve control devices in his automobile. It is understood that responsible people are always in the area and available if a potentially hazardous condition develops.

4.5 Evaluation.

Although there are no written operating procedures, current procedures appear satisfactory. The procedures used by the Owner for inspecting the dam are adequate and the fact that a representative familiar with the dam and operation of the dam lives in the area helps to assure that the discharge can be controlled during periods of extreme runoff. Since a formal warning procedure does not exist, a formal warning procedure should be implemented during periods of extreme rainfall. This procedure should consist of a detailed method for notifying residents downstream, particularly in the North Branch area.

SECTION 5
HYDROLOGY/HYDRAULICS

5.1 Evaluation of Features.

a. Design Data. Very complete original design data is contained in the State files. Principal sources for hydrologic/hydraulic data were the "Work Plan" for the Neshaminy Creek Watershed, May 1966; Preliminary Design and Report, Phase 3, Contract No. 3, December 1969, prepared by E.H. Bourquard Associates, Inc.; and the Application Report, dated May 20, 1971.

Peace Valley Dam is one of ten structures built to control flooding within the 232.8 square mile Neshaminy Creek Watershed. The Peace Valley Dam Watershed is generally rectangular in shape, 7.8 miles long with an average width of two miles, and a total area of 15.8 square miles. Elevations range from a high of 642 to a low of 321.7 at the normal pool elevation. There are no upstream ponds or dams. During the Work Plan studies, it was recognized that the Neshaminy Watershed was in a rapidly urbanizing area and an attempt was made to estimate future land use, as reflected in the use of Soil Conservation Service Runoff Curve No. 80.(1) As estimated in 1963, 37.5 percent of the watershed would remain farmland, 24 percent wooded, and only 4.5 percent would be commerical, industrial and residential. It is believed that the latter area is underestimated as adjacent watersheds are growing rapidly and portions of Peace Valley Watershed have recently had public sewers installed, indicative of proposed development.

Original spillway calculations rated the spillway to be capable of discharging a total of 2,717 cfs at design high water (elevation 333.1). Combined principal and emergency spillway capacity with the reservoir level at the top of the dam is rated at 21,240 cfs. In accordance with the criteria established by Federal (OCE) Guidelines, the recommended spillway design flood for this intermediate size dam and high hazard potential classification is the maximum probable flood (PMF). This corresponds to the SCS structure classification "C".

b. Experience Data. The reservoir water level is measured daily and records are kept at Neshaminy Water Resource Authority offices in Doylestown (Cross Keys), Pennsylvania. The maximum reservoir level of 328.0 feet oc-

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(1) The runoff curve number reflects the effects of soil type, land use and condition on the runoff production characteristics of the watershed.

curred on February 24, 1975, producing a discharge of 848 cfs through the principal spillway. Recorded rainfall at the Doylestown rain gaging station was 1.35 inches which combined with snow melt to produce the maximum reservoir water elevation.

c. Visual Observations. On the date of the inspection, no conditions were observed that would indicate the outlet capacity to be significantly reduced during a flood occurrence. Observations regarding the downstream channel, spillway condition and reservoir are located in Appendix B.

d. Overtopping Potential. Peace Valley Dam was designed to contain a probable maximum flood with a calculated peak inflow of 35,911 cfs. Such a storm would raise the reservoir water level to the top of the dam producing a peak outflow of 21,240 cfs. A mass curve flood routing method was employed by the SCS which used volume units of inches (see Appendix C).

No attempt has been made to check the SCS freeboard flood routing as a two-stage discharge system, principal and emergency spillways, does not yield reliable results with a shortcut flood routing and triangular inflow hydrograph as recommended by the Corps of Engineers in the preliminary engineering Technical Letter No. 1110-2, dated January 25, 1978. The SCS calculations were checked for reasonable assumptions and completeness. This evaluation indicated that the SCS calculations were in accordance with the state-of-the-art and were complete, reasonable, and thorough. During this check of SCS calculations, the calculated peak inflow (35,911 cfs) was compared to the watershed on the North Branch of the Neshaminy Creek with an area of 16.8 square miles (See Sheet 5 of Appendix C). This comparison appeared reasonable and it is assumed that the calculations are correct.

e. Spillway Adequacy. The spillway is considered "Adequate" as it will pass the PMF without overtopping. The tailwater elevation during passing of the PMF is estimated to be approximately 30 feet below the top of the dam.

f. Downstream Conditions. The primary purpose of Peace Valley Dam was to provide relief from flooding in the rapidly urbanizing area. Flood routing of the storm of record, Hurricane Diane, August, 1955, through the structure indicates a reduction of 5.2 feet in flood water depth in Chalfont and other downstream areas. However, a high potential for flood damage still exists downstream of the

the structure. It is estimated that damage from flooding has been reduced but not eliminated through the control of the upper reaches of Neshaminy Watershed by flood control structures. Flood damage is estimated to start when the discharge from the structure is 12,000 cfs, especially to the bridge approximately 2,000 feet below the structure. During the passing of the PMF, the weir, which currently monitors flow downstream of the structure, would be flooded together with the house adjacent to this weir. Between the downstream weir and the toe of the dam there are a few other houses near the flood plain. Due to the complexity of the downstream flood plain conditions, it was conservatively assumed that these structures would be affected by a PMF event. In conclusion, it is evaluated that a significant increase in downstream damage would result from the 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. The visual observations did not indicate any existing embankment stability problems. The riprap on the upstream slope was stable and appeared to be in good condition. Similarly, the crown vetch on the downstream slope was thick and evenly distributed over the embankment slope. There were no exterior signs indicating that internal drainage systems were not operating as designed.

As discussed in Appendix B, a marshy area was noted on the right side of the SAF stilling basin in the vicinity of the old streambed channel. This area is a topographic low which prevents drainage from the toe of the dam. A careful inspection of this area and marshy zone downstream did not reveal evidence of springs or uncontrolled seepage. This area should be drained and monitored for embankment seepage.

The principal spillway structure and appurtenant facilities within the structure were inspected and evaluated to be in good condition. The discharge conduit beneath the dam was inspected from the upstream end and observed to be in good condition. There were no signs of significant distortions, unusual settlement, or dislocations. Similarly, the SAF stilling basin was also inspected and the portions above the water level were observed to be in good condition. There was some minor erosion adjacent to the retaining walls but this erosion is judged to be minimal and insignificant. The channel was also inspected and appears to be stable.

The emergency spillway is also judged to be in good condition. Some minor spalling of rock was noted on the left abutment near the control section. Rock spalling is to be expected considering the joint systems of the rock. It is not believed that the minor amount of talus and rock fragments, located at the base of the vertical walls, would have any significant effect on the capacity of the spillway. Two manholes were noted within the downstream channel of the emergency spillway. During an extreme event, it is likely that erosion would occur around these manholes.

b. Design and Construction Data. Available design documentation included final design reports, preliminary design reports, and a complete soil and foundation investigation together with a geology report. Also contained in the DER file was a complete set of as-built plans. Stability and hydrology/hydraulic calculations were reviewed for completeness and reasonableness of the assumptions and other input criteria. They were found to be adequate and are assumed to be correct.

The design documentation was, for the most part, complete. It is judged that construction documentation, including DER photographs, inspection memorandums, and SCS progress reports were sufficient to conclude that the embankment was constructed in accordance with the disign requirements. Records indicate that the embankment materials were to be constructed to a density of at least 95 percent of the maximum density as defined by ASTM D-698, Method "A". It is also understood and documented in the as-built plans that the required placement water content tolerance was from minus one percent to plus two percent of the optimum moisture content. Evaluation of these requirements indicated that the placement criteria for the types of materials described on the as-built drawings are appropriate. There were no deficiencies visually noted on the exterior portions of the embankment which disagreed with the as-built drawings.

c. Operating Records. Operating records are maintained at the Neshaminy Water Resources Authority office and a summary of that data was reviewed. Since the weir system controls overflow in the dam, operating records consist mainly of high and low water levels, together with the recording charts which are produced by the Stevens Gauge, located in the control tower.

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

e. Seismic Stability. This dam is located in Seismic Zone 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 static stability analysis indicates that the dam is stable under static loading conditions, by definition of the Corps of Engineers criteria, a seismic stability of the dam is also adequate.

SECTION 7
ASSESSMENT/REMEDIAL MEASURES

7.1 Dam Assessment.

a. Evaluation. The visual inspection and review of design and as-built documentation indicates that the dam, foundation and appurtenant structures of Peace Valley Dam are in good condition. The hydrologic and hydraulic computations presented in the design documents indicate that the dam will pass the PMF. Therefore, the discharge systems of the structure are considered "Adequate". It is noted here that although the structure has been designed to pass the PMF, significant property damage is likely downstream due to high flow rates along the North Branch as well as Neshaminy Creek.

b. Adequacy of Information. The design information available for this inspection was adequate and comprehensive. It was noted that construction data included photographs, DER inspection memoranda, and SCS progress reports. It did not include testing of the construction materials. Appropriate material testing was performed during construction under the direction of SCS personnel. Summary reports prepared by SCS state that all materials met and were placed in accordance with specification requirements.

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

7.2 Remedial Measures.

a. Facilities. It is recommended that the area of standing water in the vicinity of the old stream channel be regraded and drained into the creek downstream. Subsequently, this area should be cleared and inspected for seepage. If seepage is observed, the flow rate should be monitored and the turbidity checked.

Periodic checks of the emergency spillway system should be made and woody vegetation removed before it effects the discharge capacity of the spillway. The talus and rock fragments, which are collecting at the base of the spillway wall, should also be removed annually.

b. Operation and Maintenance Procedures. Because of the location of the dam upstream of a highly populated area, a formal procedure of observation and warning during periods of high precipitation should be developed and implemented. This procedure should include a method of warning downstream residents that high flows are to be expected along the creek. If abnormally high flows are expected, procedures for evacuating persons within the flood plain should be implemented.

The Owner should also develop an inspection Checklist as an amendement to the maintenance procedure to insure that all critical items are inspected and maintained on a periodic basis.

APPENDIX

A

CHECK LIST
ENGINEERING DATA
DESIGN, CONSTRUCTION, OPERATION
PHASE I

NAME OF DAM *Peace Valley Dam*

ID # *PA 00790*

ITEM	REMARKS
AS-BUILT DRAWINGS	*Yes. 23 sheet full size set of design drawings stamped AS-BUILT prepared by Pickering, Corts and Summerson, Inc., and Justin and Courtney, Consulting Engineers.*
REGIONAL VICINITY MAP	*Yes. See Plate 1 Appendix E. USGS Quadrangle entitled "Doylestown, Pennsylvania".*
CONSTRUCTION HISTORY	*No formal documentation was available but many pieces of information were available in DER files and were reviewed. Data included progress reports by the SCS, inspection reports by the State, miscellaneous letters and 35 B&W and color photographs taken by State inspectors.*
TYPICAL SECTIONS OF DAM	*Data contained on the SCS design drawings.*
OUTLETS - PLAN	*Data contained on the SCS design drawings.*
DETAILS	
CONSTRAINTS	*None known*
DISCHARGE RATINGS	*Data contained on the SCS design drawings.*
RAINFALL/RESERVOIR RECORDS	*Data is obtained and stored by the Neshaminy Water Resources Authority (NWRA). It was available and reviewed.*

ITEM	REMARKS
DESIGN REPORTS	*Yes. Report entitled "Phase IV, Contract No. 3, Final Design, Dam PA-617," Neshaminy Creek Watershed, by E.H. Bourquard Associates, Inc., September, 1970. Contains hydraulic and structural calculations. Also see the other reports listed in this Appendix.*
GEOLOGY REPORTS	*Yes. See the report referenced below under Material Investigations.*
DESIGN COMPUTATIONS HYDROLOGY & HYDRAULICS DAM STABILITY SEEPAGE STUDIES	*All of this data was included in three reports which are listed in other sections of this Appendix.*
MATERIALS INVESTIGATIONS BORING RECORDS LABORATORY FIELD	*Yes. Report entitled "Phase II, Contract No. 3, Earth and Dam Geologic Investigation", Dam site PA-617 prepared by E.H. Bourguard Associates, Inc., April, 1969, and F.T. Kitlinski and Associates, Inc., March, 1969.*
POST-CONSTRUCTION SURVEYS OF DAM	*None known*
BORROW SOURCES	*Borrow sources were within the drainage area and were used as per the designer's recommendations.*

ITEM	REMARKS
MONITORING SYSTEMS	*None other than reservoir water level monitoring.*
MODIFICATIONS	*None known or reported in the documents reviewed.*
HIGH POOL RECORDS	*This data is maintained by the Neshaminy Water Resources Authority. Extreme values are presented in this report.*
POST CONSTRUCTION ENGINEERING STUDIES AND REPORTS	*None*
PRIOR ACCIDENTS OR FAILURE OF DAM DESCRIPTION REPORTS	*None*
MAINTENANCE OPERATION RECORDS	*None. However, the dam is checked periodically by the NWRA and work is performed as neccessary.*

ITEM	REMARKS
SPILLWAY PLAN SECTIONS DETAILS	*SCS design drawings provided this information.*
OPERATING EQUIPMENT PLANS & DETAILS	*Details were included in SCS drawings. A manual, including instructions for operation of equipment and description of equipment, was located in the control tower.*
OTHER REPORTS	1. *Report entitled "Phase III, Contract No. 3, Preliminary Design and Report, Dam PA-617", Neshaminy Creek Watershed, prepared by E.H Bourquard Associates, Inc., December, 1969. Report includes hydrology, hydraulics, embankment, and foundation designs, structural design, and appurtenant works data.* 2. *Report Upon the Application of the Neshaminy Water Resources Authority dated May 20,1971, prepared by the State of Pennsylvania.*

APPENDIX

B

CHECK LIST
VISUAL INSPECTION
PHASE I

Name Dam *Peace Valley Dam* County *Bucks* State *Pennsylvania* National ID # *PA 00790*

Type of Dam *Rolled Earth* Hazard Category *I (High)*

Date(s) Inspection *20 June 1978* Weather *Clear* Temperature *80's °F*

Pool Elevation at Time of Inspection *322.0* M.S.L. Tailwater at Time of Inspection *274.5* M.S.L.

Inspection Personnel:

Mary Beck (Hydrologist) *Vince McKeever (Hydrologist)*

John Boschuk (Geotechnical/Civil)

Brady Bisson (Geotechnical/Civil)

John Boschuk Jr. Recorder

Remarks:

Representatives included Messes. Charles Pfanstiel (Parks and Recreation)
William Taylor (Neshaminy Water Resources Authority)
Richard Hinkle (DER)

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

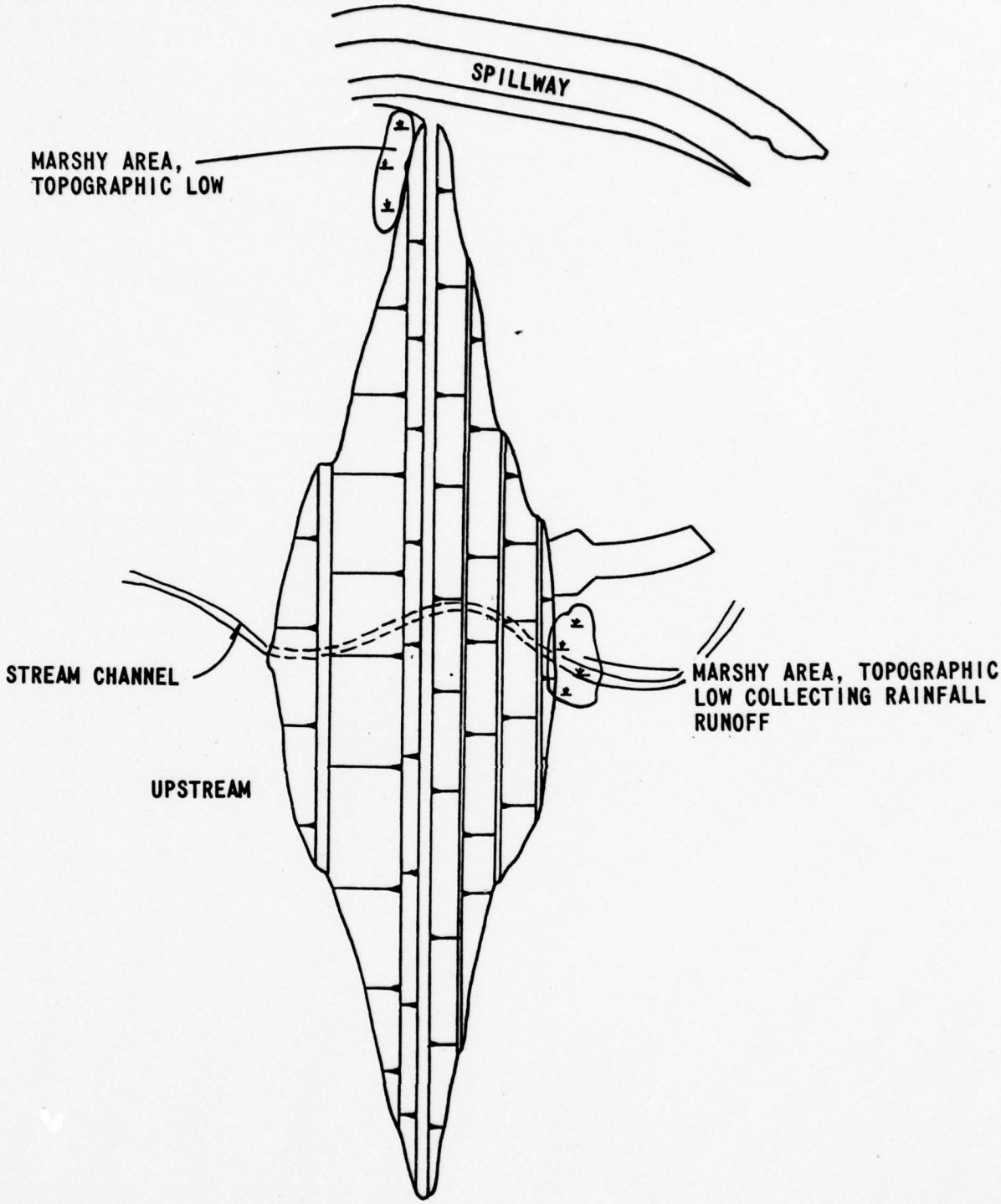
VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SURFACE CRACKS CONCRETE SURFACES	*N/A*	
STRUCTURAL CRACKING	*N/A*	
VERTICAL AND HORIZONTAL ALIGNMENT	*N/A*	
MONOLITH JOINTS	*N/A*	
CONSTRUCTION JOINTS	*N/A*	

EMBANKMENT

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SURFACE CRACKS	*None Observed*	
UNUSUAL MOVEMENT OR CRACKING AT OR BEYOND THE TOE	*None Observed*	
SLOUGHING OR EROSION OF EMBANKMENT AND ABUTMENT SLOPES	*None Observed*	
VERTICAL AND HORIZONTAL ALIGNMENT OF THE CREST	*None Observed*	
RIPRAP FAILURES	*None Observed*	

EMBANKMENT

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
JUNCTION OF EMBANKMENT AND ABUTMENT, SPILLWAY AND DAM	*All abutments were in good condition. Some standing water was observed on the upstream side of the dam at the toe near the left end of the embankment. See sheet 5a of 11.*	
ANY NOTICEABLE SEEPAGE	*None observed, but standing water was observed as described above and on the downstream toe where the old stream channel previously existed. See sheet 5a of 11.*	
STAFF GAGE AND RECORDER	*Yes. Located inside the intake tower. Stevens Type A, Model 71.*	
DRAINS	*Internal drainage system could not be inspected. There was no extenal evidence observed to indicate that these drains may not be functioning as designed.*	



SEEPAGE LOCATION PLAN
PEACE VALLEY DAM

SHEET 5a OF 11

OUTLET WORKS

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CRACKING AND SPALLING OF CONCRETE SURFACES IN OUTLET CONDUIT	*The 66 inch diameter conduit is buried in the embankment and a visual inspection was not possible because of flow through the system.*	
INTAKE STRUCTURE	*The intake structure consists of three vertical chambers, the upstream chamber contains the gates, the middle chamber acts as a collection chamber for water supply releases and the third chamber is a standard Soil Conservation Service riser for ungated discharge of flood water. The structure appears to be in good condition. All gates were exercised.*	
OUTLET STRUCTURE	*The 66 inch conduit discharges into a 7.5 ft. by 9 ft rectangular culvert which discharges into a SAF stilling basin.*	
OUTLET CHANNEL	*The channel downstream of the stilling basin is riprapped for a distance of 300 ft. The riprap is in good condition, with a slight amount of channel erosion at the end of the riprap.*	
EMERGENCY GATE	*The reservoir can be emptied by the 66 inch drain located at the base of the riser.*	
OUTLET SLUICE GATE VALVES	*All valves are 60x72 manufactured by E.I.M. Company, Houston, Texas. S#G52651-52653; Type NCHR 254X.*	

UNGATED SPILLWAY
(EMERGENCY SPILLWAY)

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONCRETE WEIR	*None. The spillway is cut through rock.*	
APPROACH CHANNEL	*150 ft. wide; 550 ft. long (observed along the centerline).*	
DISCHARGE CHANNEL	*150 ft. wide; 850 ft. long (as measured along the centerline). Rock talus is collecting at base of left wall, but has no effect on discharge capacity. A sewer line with two manholes is located approximately 450 feet downstream from level section, which has the potential for erosion. However, it will have no detrimental effect on the dam or the spillway capacity.*	
BRIDGE AND PIERS	*None at spillway.*	

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	*Weir for measuring flow in stream located about 2000 ft. below the dam.*	
PIEZOMETERS		
OTHER	*A standard rain gage is located at Neshaminy Water Resources Authority office in Cross Keys, about 4 miles east of dam.*	

RESERVOIR

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SLOPES	*Reservoir side slopes are moderate, stable, grass covered for a distance of 20 ft. (horizontal distance) from normal water level. Thereafter, the flood plain is either wooded or grass covered.*	
SEDIMENTATION	*As this is a fairly new dam, sedimentation is minimal and has no effect on flood water storage. Logs and debris are expected to present no problems during large flows.*	

DOWNSTREAM CHANNEL

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONDITION (OBSTRUCTIONS, DEBRIS, ETC.)	*The downstream channel banks are fairly stable, with very few obstructions or debris in channel. The flood plain is wooded immediately below the dam.*	
SLOPES	*The channel banks are steep, fairly stable with some erosion gullies under dense vegetation. The channel bottom is stoney and the valley gradient is about 0.3 percent.*	
APPROXIMATE NO. OF HOMES AND POPULATION	*Houses are located about 2000 feet below the dam which would be subject to damage and loss of life if the dam failed. Many new homes (a hundred or more) have been built near the North Branch and along Neshaminy Creek, that would be subject to damage in case of dam failure. Residential development downstream is continuing.*	

APPENDIX

C

PEACE VALLEY DAM
CHECK LIST
HYDROLOGIC AND HYDRAULIC
ENGINEERING DATA

DRAINAGE AREA CHARACTERISTICS: Predominantly open/farm land but urbanizing

ELEVATION TOP NORMAL POOL (STORAGE CAPACITY): 327.7 (5000 Ac.-Ft.)

ELEVATION TOP FLOOD CONTROL POOL (STORAGE CAPACITY): 330.0 (3463 Ac.-Ft.)

ELEVATION MAXIMUM DESIGN POOL: 333.1

ELEVATION TOP DAM: 342.0

EMERGENCY SPILLWAY:

a. Elevation 330.0

b. Type Channel cut through rock

c. Width 150 feet

d. Length approximately 1400 feet along centerline

e. Location Spillover Left abutment

f. Number and Type of Gates None

OUTLET WORKS:

a. Type Reinforced concrete intake structure

b. Location Approximately 1,300 feet from right abutment

c. Entrance inverts Gated intakes at 309, and 294, Ungated weir at 321.7

d. Exit inverts Stilling basin end sill-265.0

e. Emergency draindown facilities 66 inch pond drain at elev. 275.0

HYDROMETEOROLOGICAL GAGES:

a. Type Standard rain gage

b. Location Nashaminy Water Resources Authority office at Cross Keys, Pa.

c. Records Kept at Cross Keys, Pa., 3 miles from dam

MAXIMUM NON-DAMAGING DISCHARGE: Estimated at 12,000 cfs

DAM SAFETY ANALYSIS
HYDROLOGIC/HYDRAULIC DATA

Date: 7/6/78
By: HEB
Sheet: 2 of 8

DAM Peace Valley Dam Nat. ID No. PA 00790 DER No. 9-169

ITEM/UNITS	Permit/Design Files (A)	Calc. from Files/Other (B)	Calc. from Observations (C)
1. Min. Crest Elev., ft.		342.0 ft	
2. Freeboard, ft.		0	
3. Spillway(1) Crest Elev, ft.		321.7 ft	
3a. Secondary(2) Crest Elev, ft.		330.0 ft	
4. Max. Pool Elev., ft.		342.0 ft	
5. Max. Outflow(3), cfs		21,240 cfs	
6. Drainage Area, mi²	15.8 mile²	15.8 mile²	15.97 mile²
7. Max. Inflow(4), cfs		35,911 cfs	21,946 cfs
8. Reservoir Surf. Area	365 Ac		357 Ac
9. Flood Storage(5), ft³			
10. Inflow Volume, ft³			

Reference all figures by number or calculation on attached sheets:

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

NOTES:

(1) Principal Spillway

(2) Emergency Spillway

(3) *At maximum pool, with freeboard, ungated spillways only.*

(4) For Columns B, and C use PMF

(5) *Between lowest ungated spillway and maximum pool.*

Date: 7/6/78
By: MFB
Sheet: 3 of 8

HYDROLOGIC/HYDRAULIC CALCULATIONS (cont.)

Item (from Sheet 2)	Source
6A, 8A	Application Report dated May 20, 1971
1B, 3B, 3aB, 6B	"As Built" Plans dated Sept. 15, 1970
2B, 4B, 5B, 7B	Phase III, Contract No. 3, Preliminary Design and Report, Dec. 1969
6C, 8C	USGS Maps Doylestown (1973) Lumberville (1968) Bedminster (1973) Buckingham (1973)
7C	See sheet 4

State PENNA.		Project NESHAMINY		SHEET 4 OF 8
By HLW.	Date 10-24-67	Checked By RAS	Date 2-21-68	Job No PA-617
Subject WORK PLAN - DESIGN COMPARISON				Sheet 1 of

ITEM	UNIT	WORK PLAN	DESIGN	COMMENTS
DRAINAGE AREA	SQ. MI.	15.8 ✓	15.8	
STORAGE CAPACITY				
SEDIMENT (INC AERATED)	AC.FT.	366 ✓	866	
BENEFICIAL	AC.FT.	6173 ✓	6173	
RETARDING	AC.FT.	3500 ✓	3463.1	
TOTAL	AC.FT.	10,039 ✓	10,002.1	
BETWEEN HIGH & LOW S.	AC.FT.			
SURFACE AREA				
NORMAL POOL	ACRE	365 ✓	365	
RETARDING POOL	ACRE	482 ✓	482	
DESIGN HIGH WATER	ACRE			
VOLUME OF FILL	CU.YD	530,100 ✓		
TOP OF DAM ELEV.	FEET	341.5 ✓	342.0	
MAX. HEIGHT OF DAM	FEET	66.5 ✓	67.0	
EMERGENCY SPILLWAY				
CREST ELEVATION	FEET	330.0 ✓	330	
BOTTOM WIDTH	FEET	150 ✓	150	
TYPE	—	Sod ✓	Sod	(Weathered Rock)
PERCENT CHANCE OF USE	—	1 ✓	1	
AVE CURVE NO. COND. II	—	80 ✓	80	
EM. SP. HYDROGRAPH				
STORM RAINFALL - 6 HR.	IN.	10.5 ✓	10.5 (Point)	
STORM RUNOFF	IN.	7.85 ✓	7.7	
VELOCITY OF FLOW - V	F.P.S.	7.9 ✓	7.8	
PEAK DISCHARGE RATE	CFS	1800 ✓	2719	
MAX. WATER SURFACE EL.	FEET	333.1 ✓	333.1	
FREEBOARD HYDROGRAPH				
STORM RAINFALL - 6 HR.	IN.	25.5 ✓	25.5 (Point)	
STORM RUNOFF	IN.	22.33 ✓	21.97	
VELOCITY OF FLOW - V	FPS	16.6 ✓		
PEAK DISCHARGE RATE	CFS	17,400 ✓	21,240	
MAX. WATER SURFACE EL.	FEET	341.5 ✓	342.0	
PRINCIPAL SPILLWAY				
RISER SIZE	FT.			
MAX. LOW STAGE FLOW	CFS	875 ✓	862	
ORIFICE SIZE	FT.			
MAX HIGH STAGE FLOW	CFS			
PIPE SIZE	DIA.			
CAPACITY EQUIVALENTS				
TOTAL SEDIMENT VOL.	IN	0.43 ✓	0.43	
RETARDING STORAGE	IN.	4.15 ✓	4.11	
EM. SPILLWAT STORAGE TO TOP OF DAM	IN.	8.16 ✓	8.39	
CLASS OF STRUCTURE	—	C ✓	C	
CONSTRUCTION COSTS				

Reference:
Phase III,
Contract No. 3,
Preliminary Design
and Report
E.H. Bourquard Assoc.
December 1969

BY MFB DATE 2/2/78 SUBJECT Peace Valley Dam Hydrology/Hydraulics SHEET 5 OF 8

CHKD. BY RTC DATE 7/20/78 JOB No

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

1. The hazard potential is rated as HIGH

2. The size classification is INTERMEDIATE since the total storage is 17,201 Ac-Ft and the height is 46 ft. (p. D-8)

Spillway Design Flood (Ref. Recommeded Guidelines for Safety Inspection of Dams)

The spillway design flood should be the probable maximum flood (PMF) based on the above hazard and size classification (p. D-13)

PMF Inflow Hydrograph

The complete hydrologic/hydraulic design package prepared by Soil Conservation Service was reviewed. Mass inflow curves were determined according to procedures in National Engineering Handbook, Section 4.

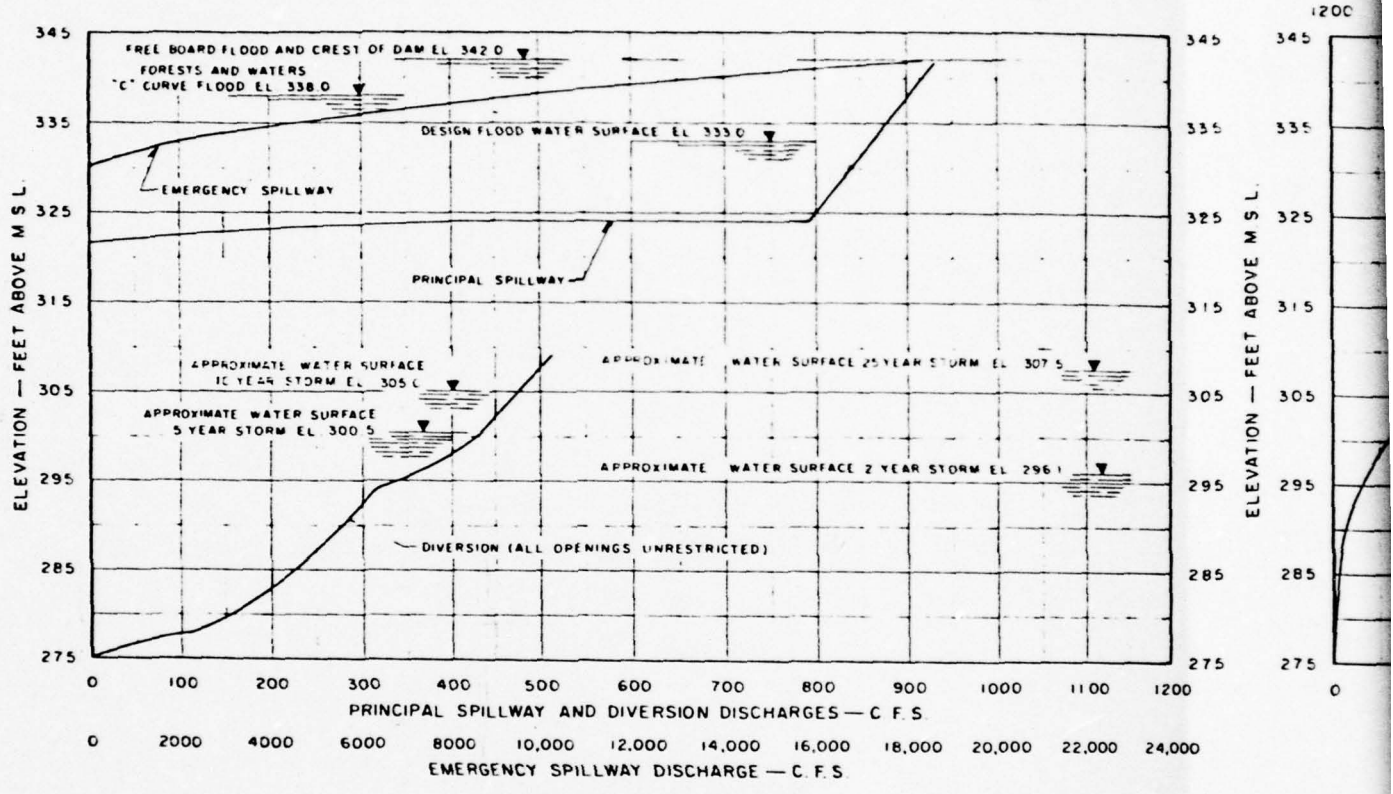
The peak inflow rate for the freeboard (PMF) hydrograph was determined to be 35,911 cfs for a 6-hr. storm.

Contact with C of E, Balt Dist indicated that if no original design data was available, Peace Valley Watershed should be compared with a watershed of area 16.8 sq. miles on North Branch with an estimated PMF of 22,420 cfs

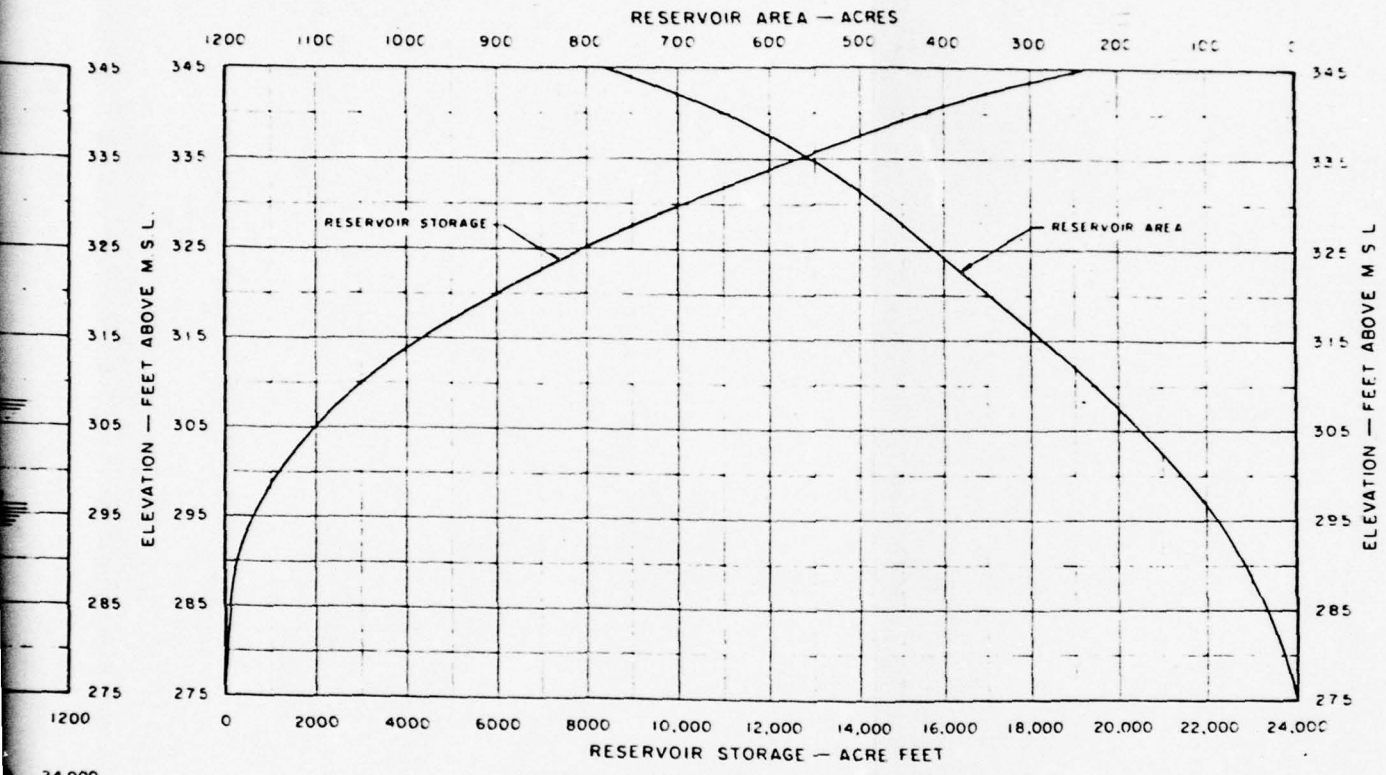
$$\text{Estimated PMF} = \left(\frac{15.8}{16.8}\right)^{0.8} 22420$$

$$= 21,346 \text{ cfs} < 35,911 \text{ cfs} - \text{SCS value}$$

Therefore, the SCS computed PMF inflow hydrograph is judged reasonable and the peak PMF inflow is 35,911 cfs



DISCHARGE CURVES



STORAGE AND AREA CURVES

RATING CURVES		
PEACE VALLEY DAM		
NAT. ID NO. PA.00790		**BUCKS COUNTY**
DATA OBTAINED FROM U.S. DEPT. OF AGRICULTURE, SOIL CONSERVATION SERVICE, DRAWING NO.PA-617-P , SHEET 2 OF 67		
		SHEET 6 OF 8

2

BY MEB DATE 7/7/78 SUBJECT Peace Valley Dam SHEET 7 OF 8

CHKD. BY RHC DATE 7/20/78 Hydrology/Hydraulics JOB No

Spillway Capacity (see sheet 6)

Calculations were reviewed and judged adequate.
During the PMF, water at top of dam, discharges are:
Emergency Spillway - 20,300 cfs
Principal Spillway - 950 cfs

Freeboard (PMF) Routing (see sheet 8)

The routing was reviewed and judged adequate. The structure was design to pass the PMF (peak inflow 35,911 cfs) without overtopping (peak outflow 21,240 cfs), therefore, the spillway is "Adequate".

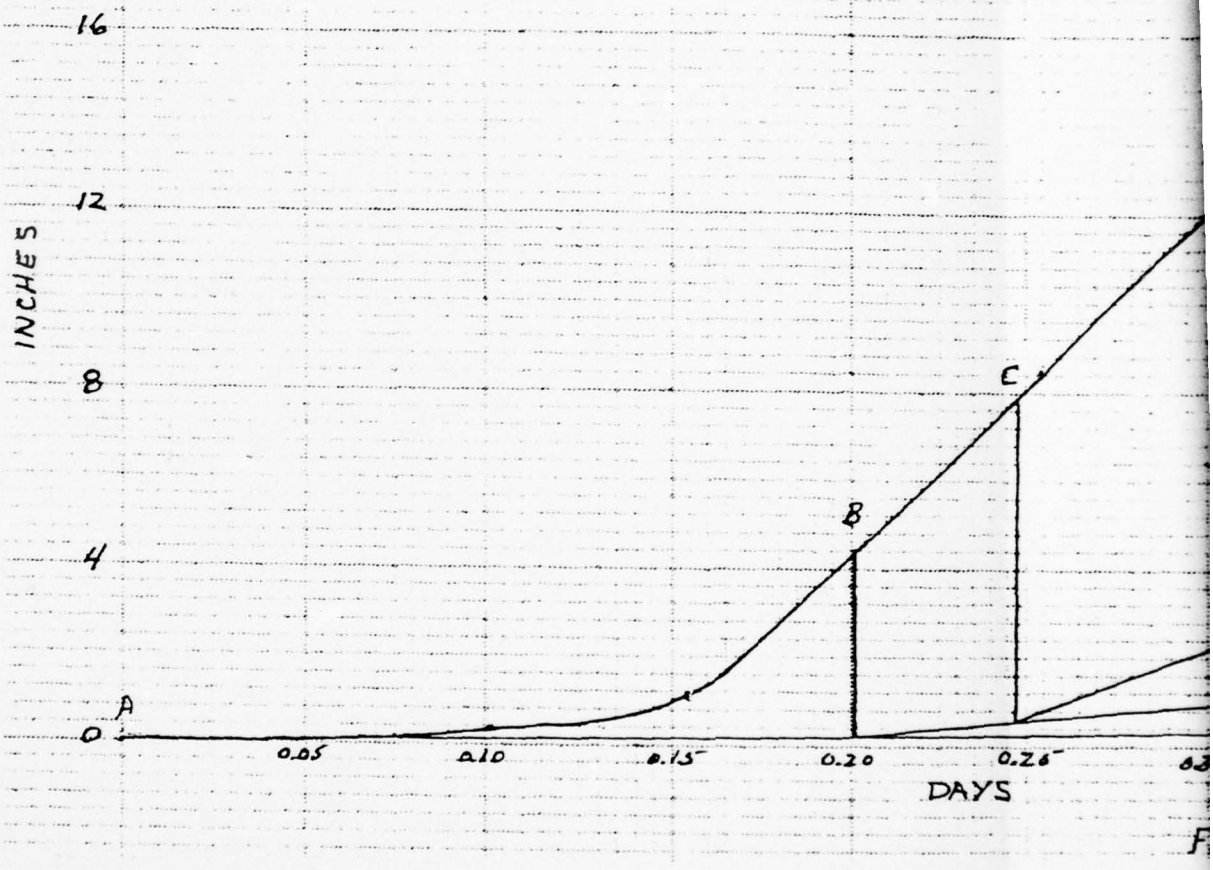
Tailwater Elevation

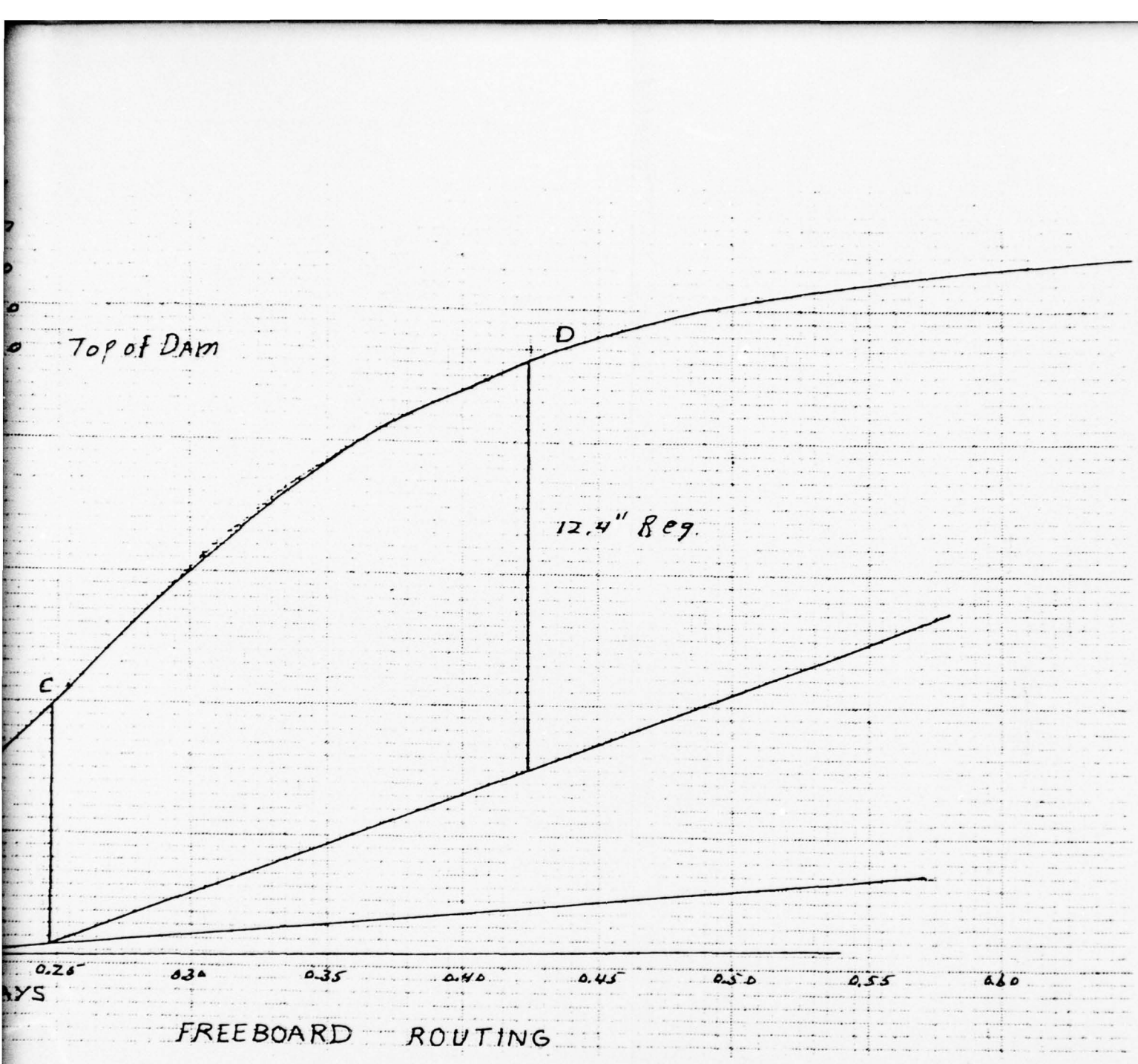
The tailwater elevation was estimated to be 30 ft. or more below the top of the dam during passing of the PMF, therefore, will have no effect on emergency spillway discharge.

Downstream Obstructions

Approximately 2000 ft downstream from the dam North Branch of Neshaminy pass thru a bridge under Callow Hill Road (L.R. 09076). The maximum flow thru the bridge was estimated in the field to be 12,000 cfs. Therefore, bridges floods out with PMF discharges but not for Emergency Spillway Storms (point rainfall of 10.5 inches).

Point	Storage	Disc.	Ave Disc	Elev	
A	0	0	0	321.7	
B	4.11	2.03	1.015	330.0	
C	7.25	11.88	6.95	335.0	
D	12.5	50.00	30.94	342.0	Top of D





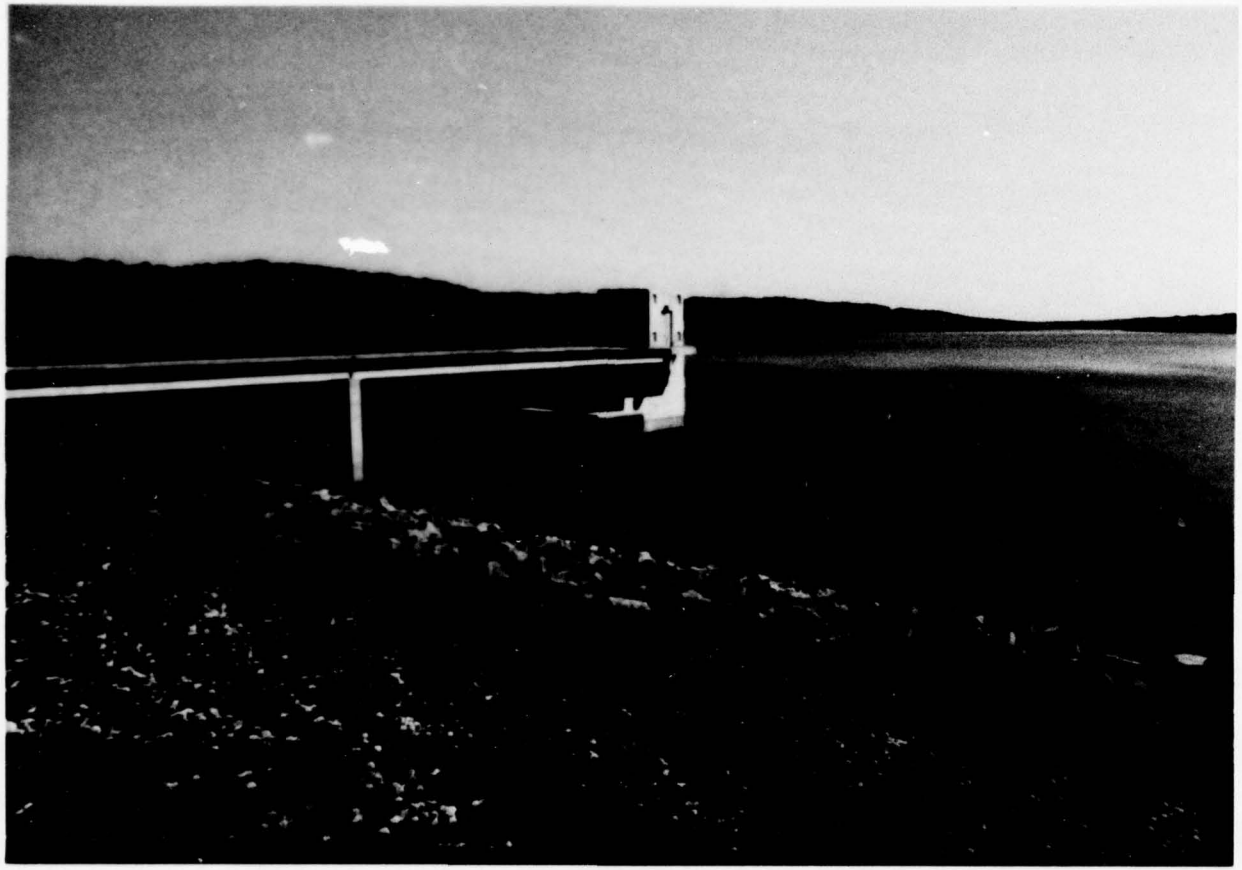
FREEBOARD ROUTING

FLOOD ROUTING PEACE VALLEY DAM	
NAT. ID NO. PA.00790	BUCKS COUNTY
DATA OBTAINED FROM E.H. BOURQUARD ASSOC. INC. PHASE III CONTRACT NO. 3 PRELIMINARY DESIGN AND REPORT	
	SHEET 8 OF 8

2

APPENDIX

D

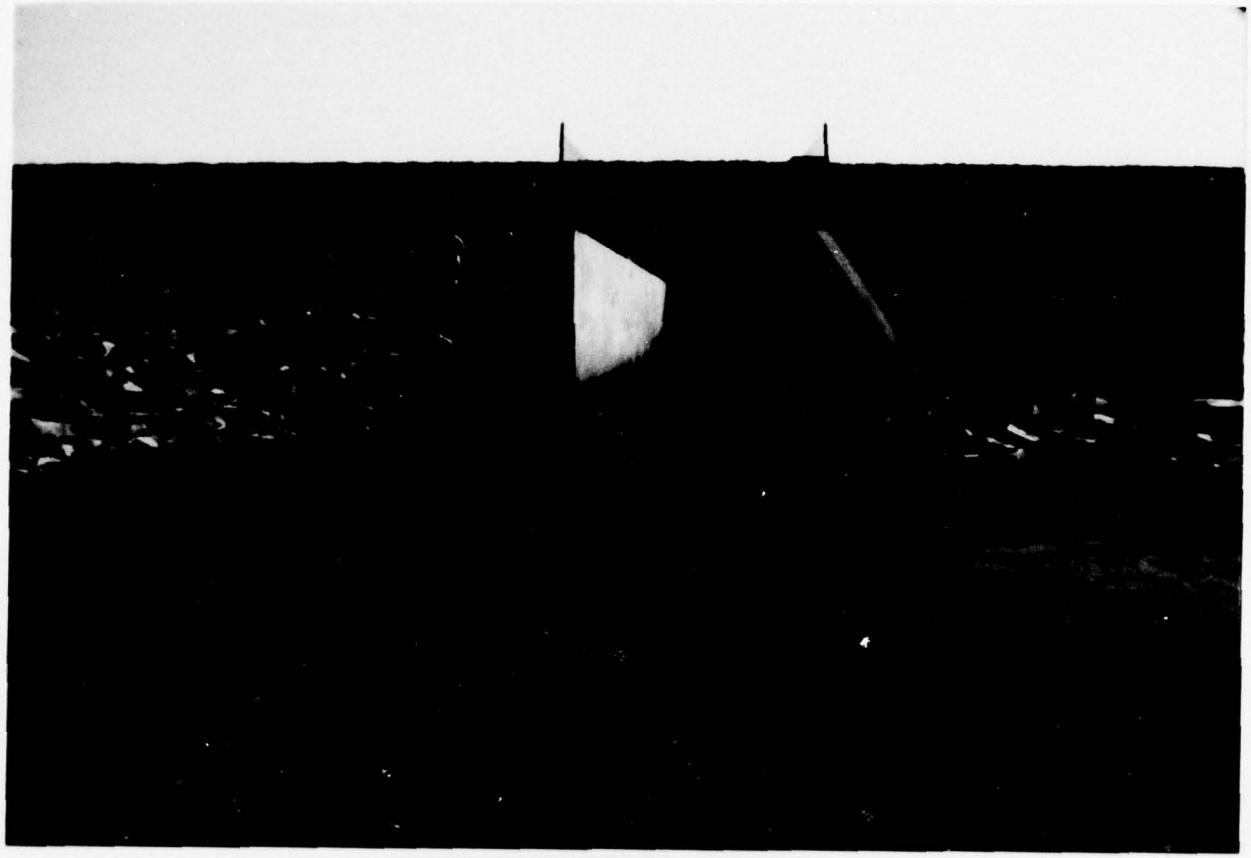


PRINCIPAL INTAKE STRUCTURE.
NOTE WEIR INLET AND INTAKE
TOWER COMPONENTS.

PHOTO NO.1

VIEW LOOKING DOWNSTREAM, TOWARDS
PRINCIPAL OUTLET BASIN AND CHANNEL.

PHOTO NO. 2



LOOKING UPSTREAM TOWARDS
STILLING BASIN.

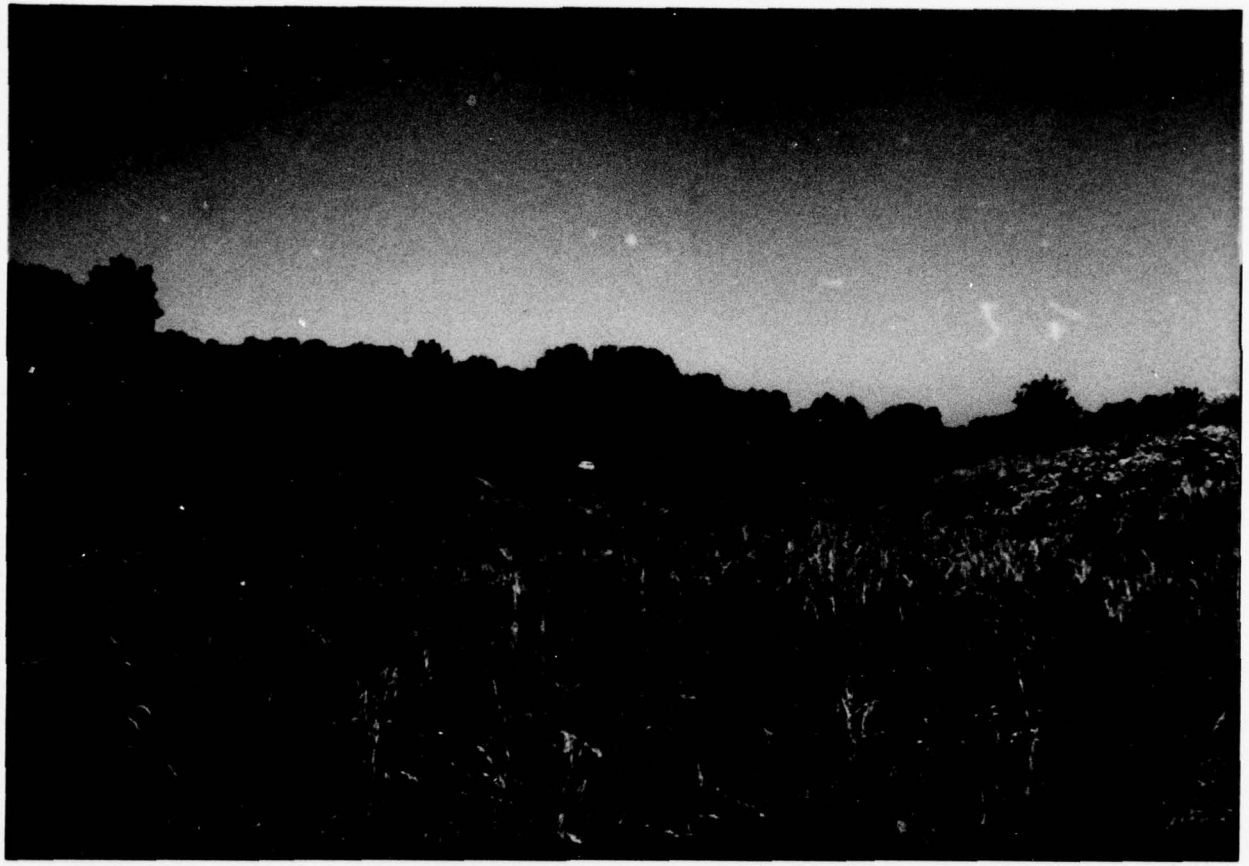
PHOTO NO. 3

VIEW OF STILLING BASIN.

PHOTO NO. 4

VIEW OF EMERGENCY SPILLWAY.
APPROACH CHANNEL IN CENTER OF PHOTO.

PHOTO NO. 5



VIEW FROM CENTER OF EMERGENCY
SPILLWAY LOOKING DOWNSTREAM.

PHOTO NO. 6

VIEW OF LEFT ABUTMENT OF
EMERGENCY SPILLWAY AT THE CONTROL SECTION.

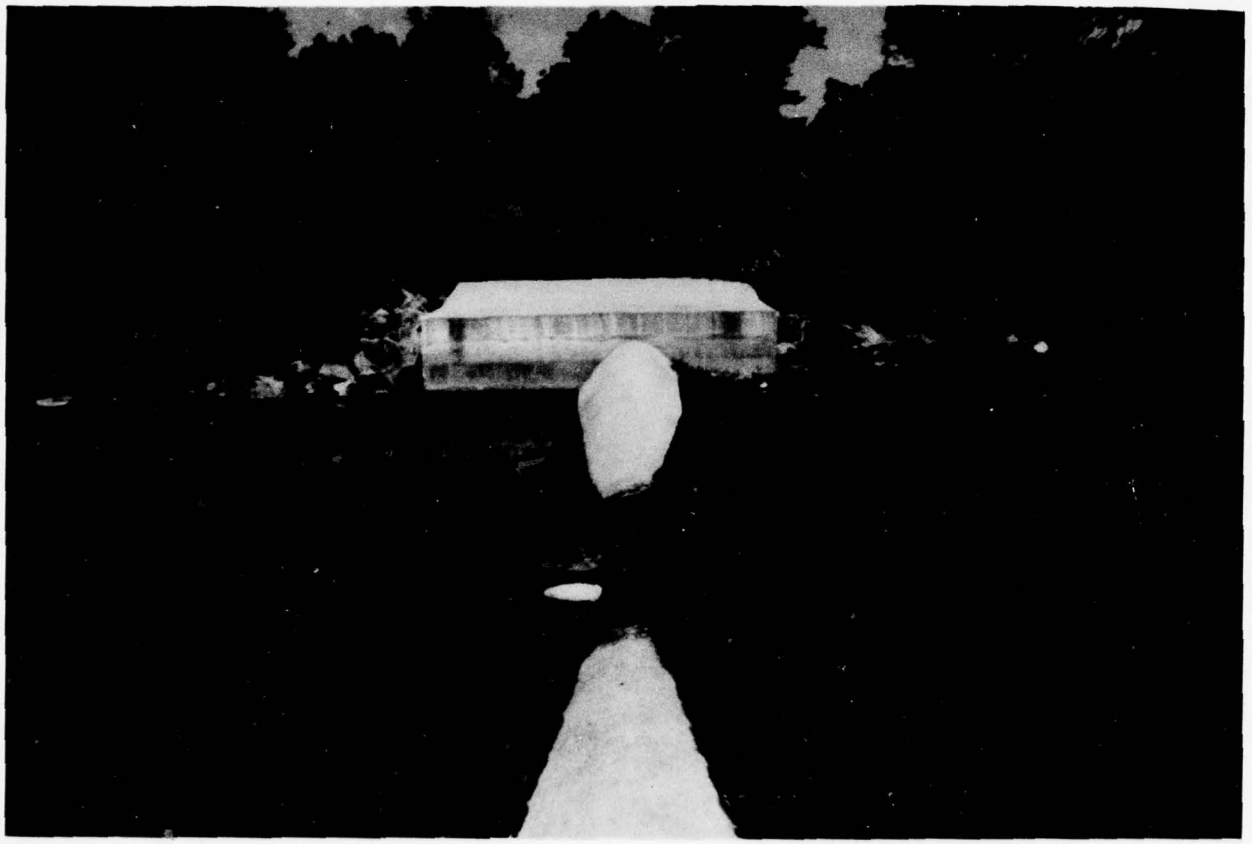
PHOTO NO. 7

VIEW LOOKING UPSTREAM TOWARDS LOCATION OF ORIGINAL STREAMBED.
PRINCIPAL OUTLET STRUCTURE IS ON THE RIGHT OUTSIDE OF
CAMERA VIEW. MARSHY CONDITIONS BUT NO SEEPAGE WAS OBSERVED.

PHOTO NO. 8

TYPICAL VIEW OF DOWNSTREAM CHANNEL CONDITIONS.

PHOTO NO. 9

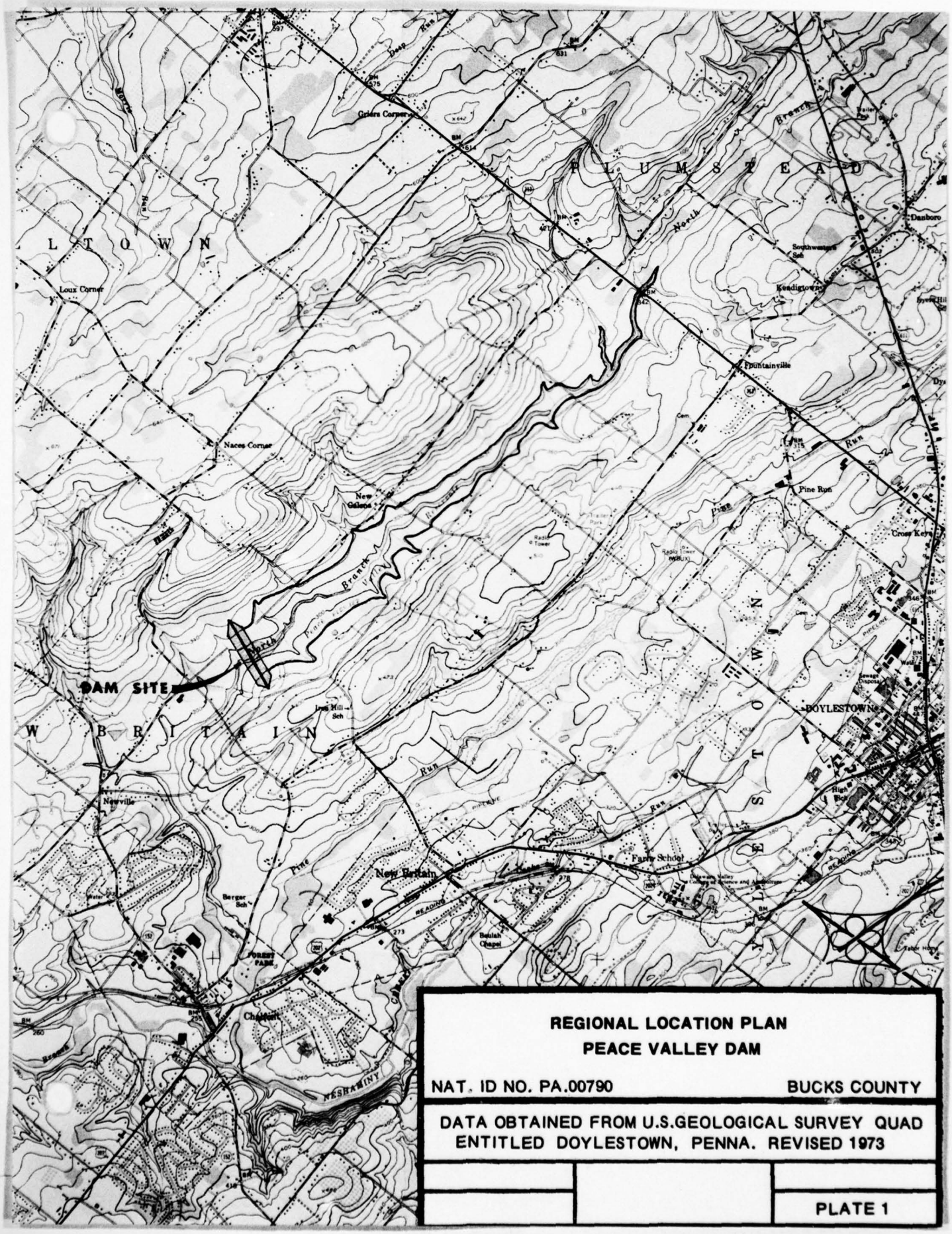


GAGING STATION WEIR LOCATED 2000 FEET DOWNSTREAM OF PEACE VALLEY DAM. HIGHEST KNOWN FLOW AT THIS SECTION WAS AT THE TOP OF THE ABUTMENT BLOCKS.

PHOTO NO. 10

APPENDIX

E

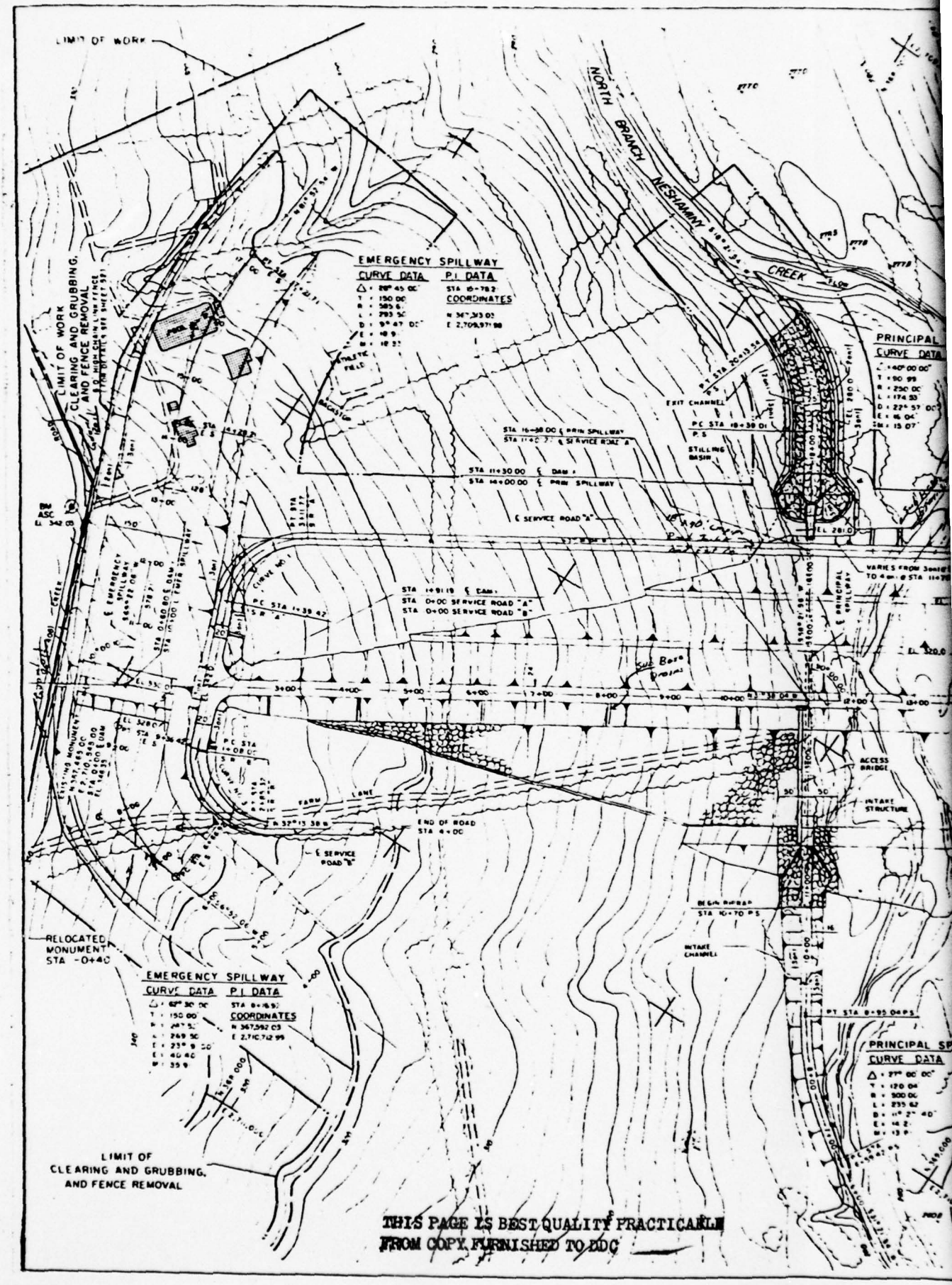


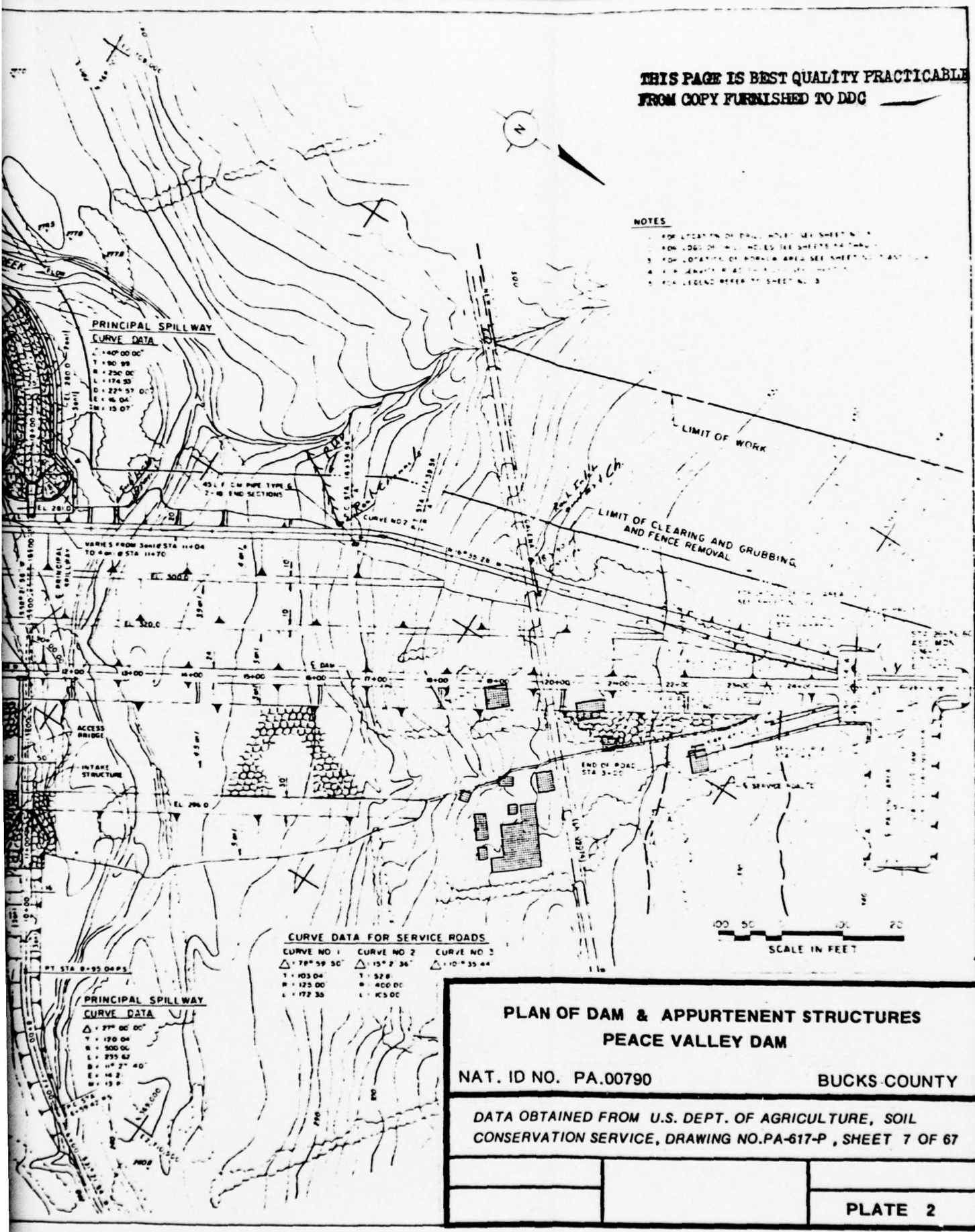
REGIONAL LOCATION PLAN
PEACE VALLEY DAM

NAT. ID NO. PA.00790 BUCKS COUNTY

DATA OBTAINED FROM U.S.GEOLOGICAL SURVEY QUAD ENTITLED DOYLESTOWN, PENNA. REVISED 1973

PLATE 1



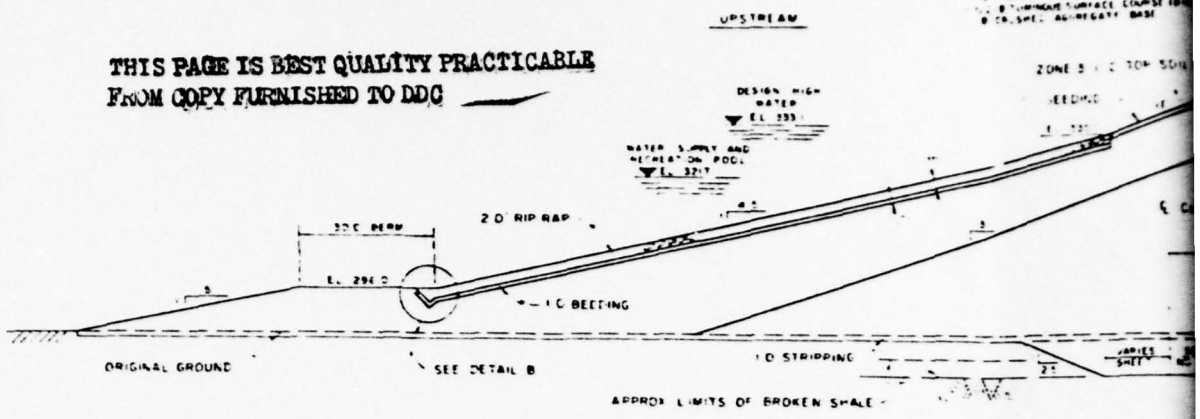


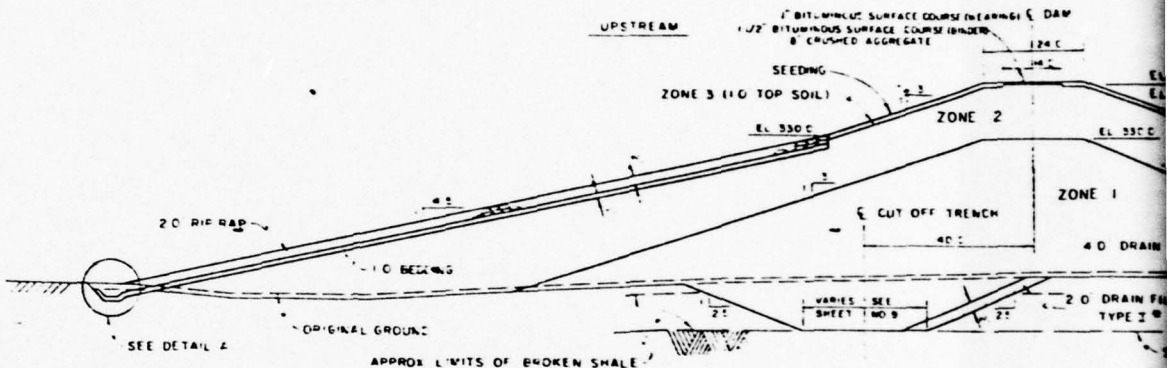
PLAN OF DAM & APPURTENENT STRUCTURES
PEACE VALLEY DAM

NAT. ID NO. PA.00790 BUCKS COUNTY

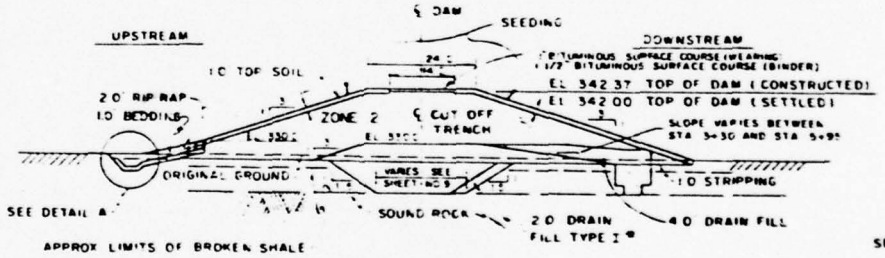
DATA OBTAINED FROM U.S. DEPT. OF AGRICULTURE, SOIL CONSERVATION SERVICE, DRAWING NO.PA-617-P , SHEET 7 OF 67

PLATE 2

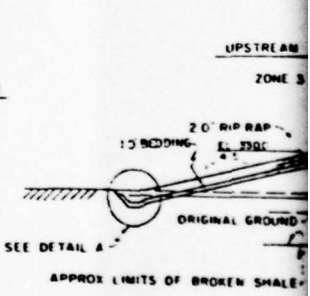




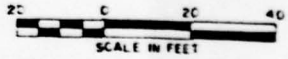
STA. 18+00



STA 4+00



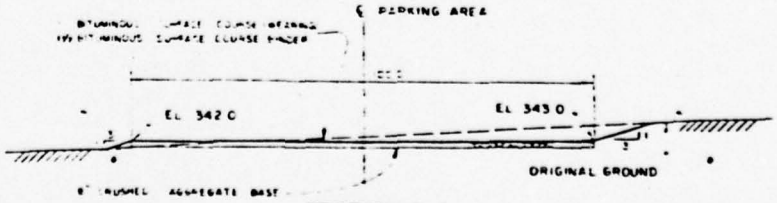
EMBANKMENT SECTIONS



GRADATION LIMITS FOR BEDDING

SIEVE SIZE	% PASSING
3"	100
2"	90-100
3/4"	73-88
3/8"	60-78
NO 4	50-65
NO 10	36-53
NO 20	24-40
NO 40	14-30
NO 100	8-15
NO 200	<3

NOTE FOR DRAIN FILL TYPE I, II, AND III GRADATION LIMITS SEE SHEET NO 11

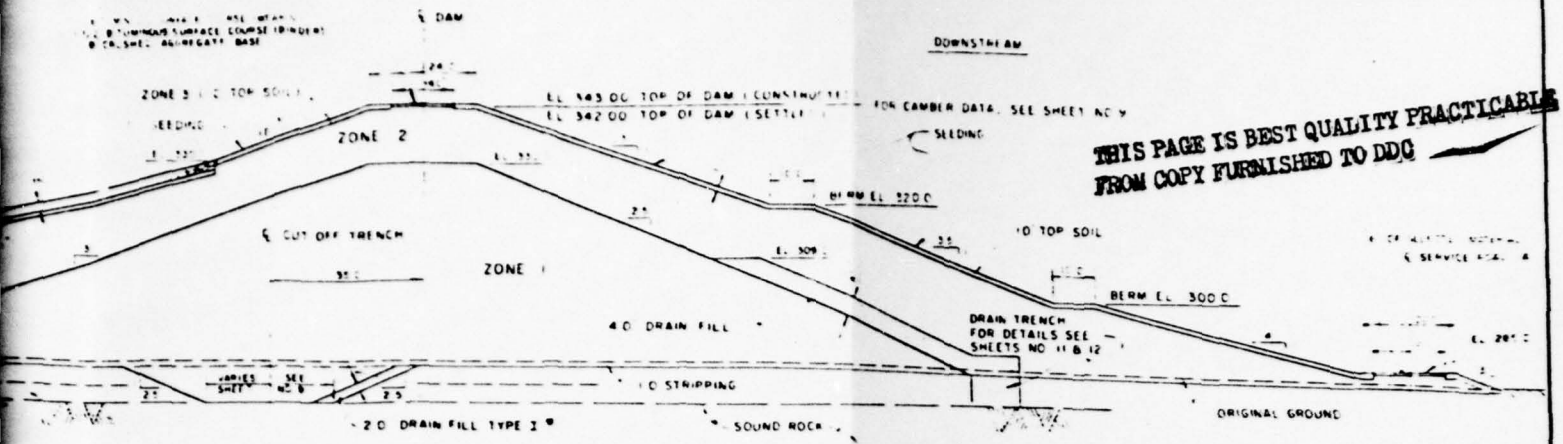


SECTION A-A

NOTE FOR LOCATION OF SECTION A-A SEE SHEET NO 52

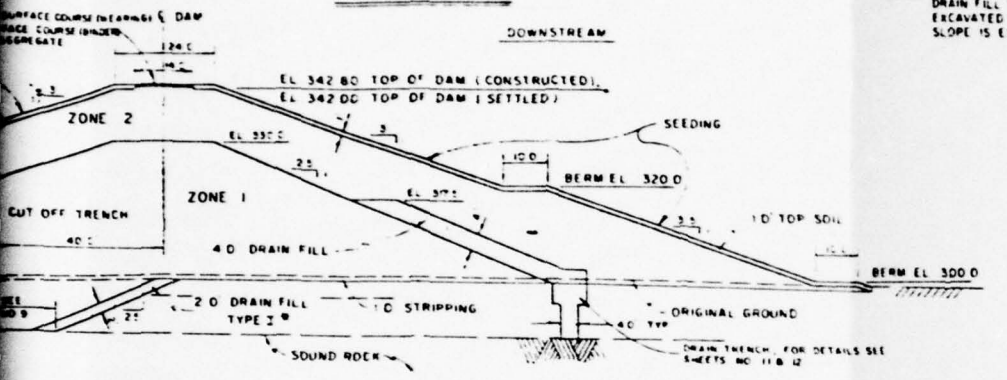
CONSTRUCTION DETAILS

1. THE FOUNDATION SURFACE THROUGHOUT THE BASE AREA OF THE EMBANKMENT SHALL BE SCARIFIED TO A DEPTH OF 4" AND COMPACTED PRIOR TO PLACEMENT OF EARTH FILL.

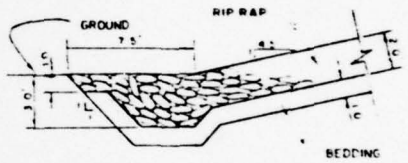


STA 11+00

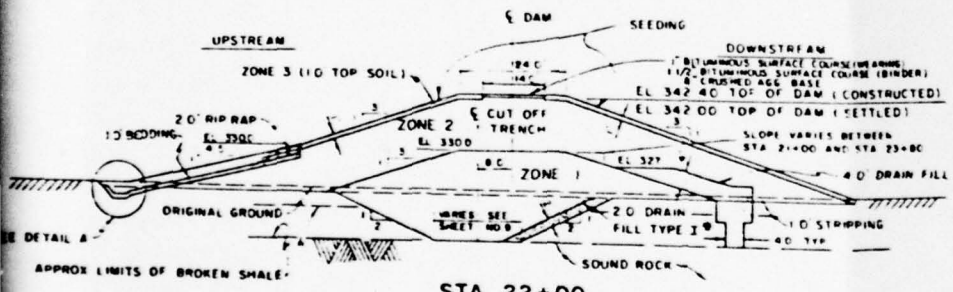
* NOTE TYPE, DEPTH, AND EXTENT OF CUT OFF TRENCH DRAIN FILL TO BE CONFIRMED AFTER TRENCH IS EXCAVATED AND BROKEN SHALE ON DOWNSTREAM SLOPE IS EXPOSED



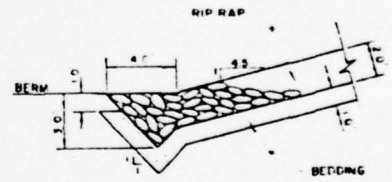
STA 18+00



DETAIL A
NO SCALE



STA 22+00



DETAIL B
NO SCALE

KMENT SECTIONS

0 20 40
SCALE IN FEET

D LIMITS FOR BEDDING

SIEVE SIZE	% PASSING
3"	100
2"	90-100
3/4"	73-86
3/8"	60-76
NO 4	50-65
NO 10	36-53
NO 20	24-40
NO 40	14-30
NO 100	9-19
NO 200	<3

NOTE FOR DRAIN FILL TYPE I, II, AND III GRADATION LIMITS SEE SHEET NO 11

DETAILS

DATION SURFACE THROUGHOUT THE A OF THE EMBANKMENT SHALL BE TO A DEPTH OF 4" AND COMPACTED PLACEMENT OF EARTH FILL

EARTH FILL REQUIREMENTS

ZONE	MATERIAL	MAX ROCK SIZE (1)	MAX LIFT (2)	REQ'D WATER CONTENT (3)	COMPACTION (4) CLASS	COMPACTION (4) DEFINITION
1	Silt & Clays (ML & CL) from excavations & borrow area represented by samples 101-20 153-30, 118-41, 184-22, 153-33	6"	9"	-1% to +2% of Optimum		95% Max density by A S T M D-698 Method "A"
2	Silty Gravels & Clayey Gravels (GM&GC) from excavations & borrow area represented by samples 199-71480, 205-130-501, 110-71, 604-24	6"	9"	-1% to + Optimum		
3	Topsoil	2"	9"			
Spoil Fill Areas	Topsoil & Waste Materials	-	12"			

(1) For fill adjacent to structures max. rock s
(2) Maximum permissable lift thickness prior t
(3) Water content of fill matrix at time of co
(4) For typical compaction curves, see sheet 64
(5) Moisture content to be approved by the eng

TYPICAL EMBANKMENT SECTIONS

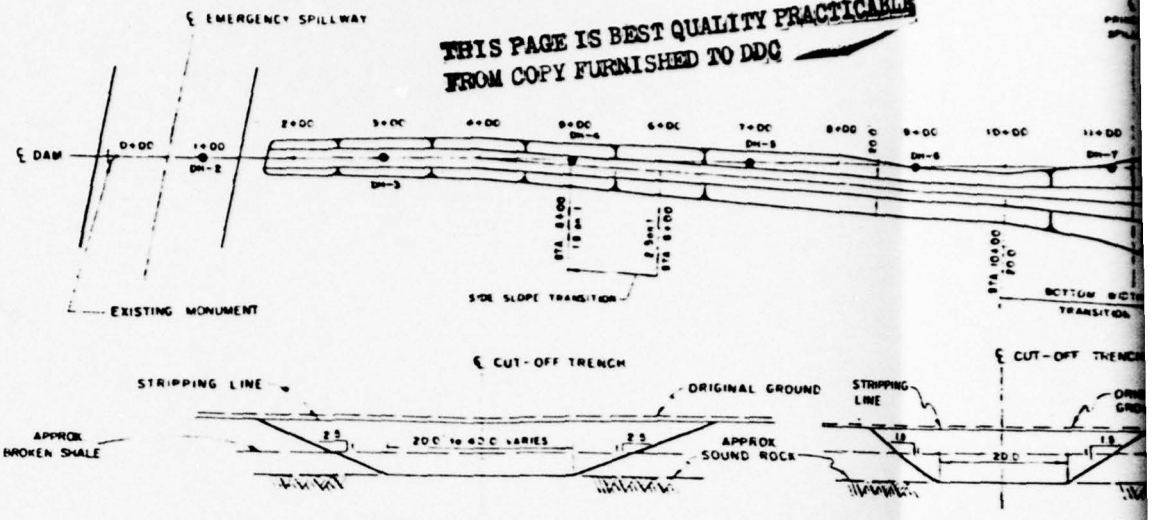
PEACE VALLEY DAM

NAT. ID NO. PA.00790 BUCKS COUNTY

DATA OBTAINED FROM U.S. DEPT. OF AGRICULTURE, SOIL CONSERVATION SERVICE, DRAWING NO.PA-617-P , SHEET 8 OF 67

PLATE 3

2



SECTION STATION 11+00

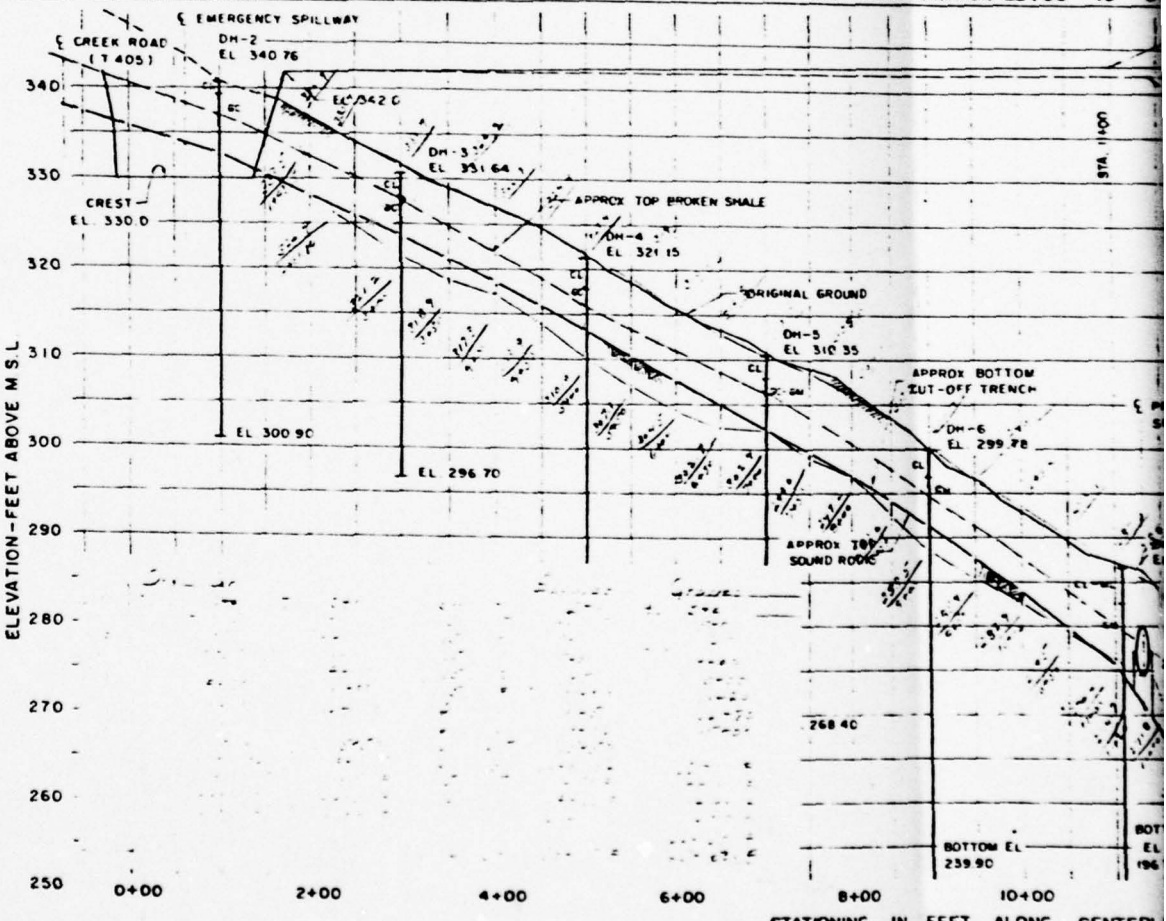
NO SCALE

TYPICAL FROM STATION 6+00 TO STATION 21+50

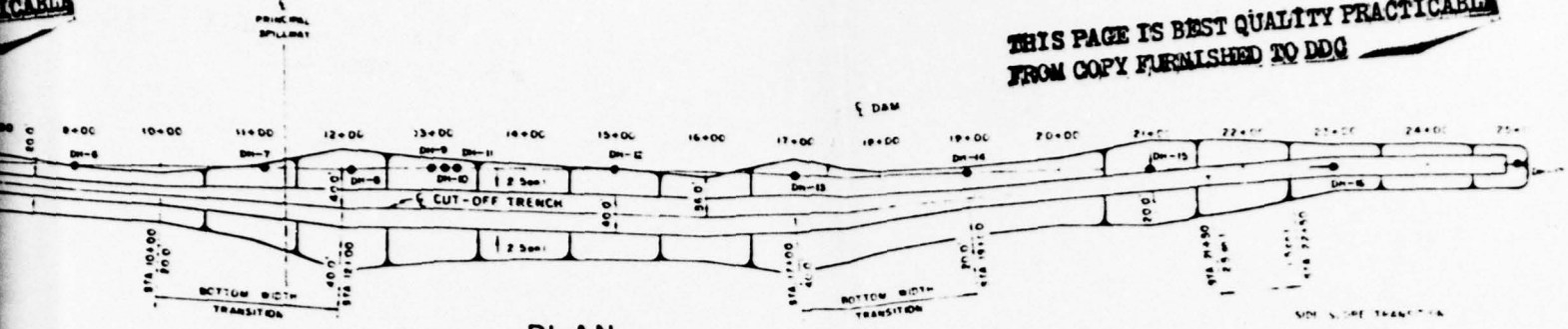
SECTION STATION 4+0

NO SCALE

TYPICAL FROM STATION 1+90 TO AND FROM STATION 22+50 TO S

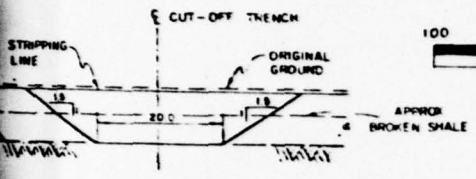


PROFILE — CUT-OFF TR



PLAN

SCALE IN FEET

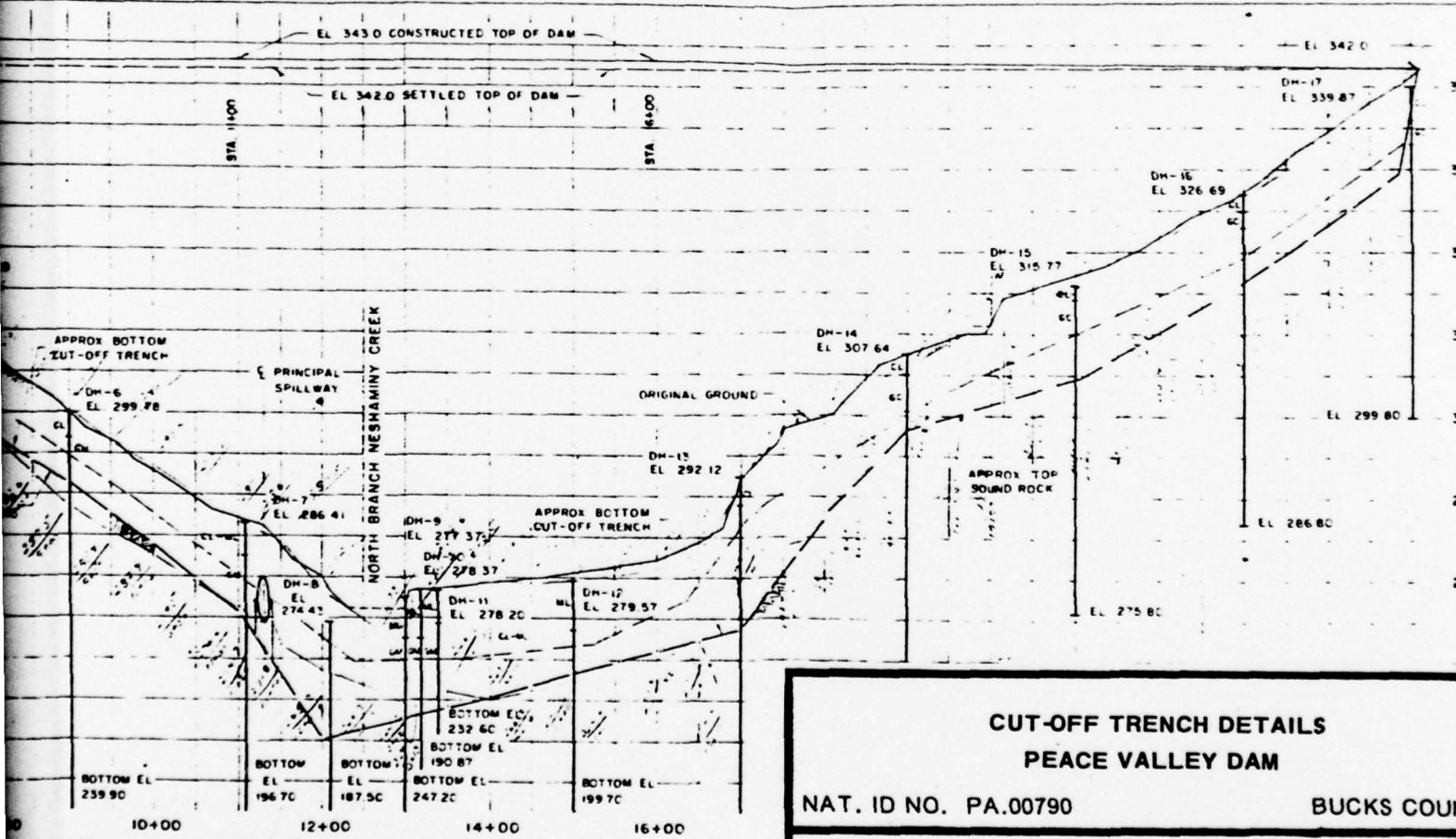


SECTION STATION 4+00

NOTES

1. THE EXCAVATION LIMITS ARE APPROXIMATE AND WILL BE ADJUSTED IN ACCORDANCE WITH CONDITIONS ENCOUNTERED.
2. ROCK EXPOSED IN THE BOTTOM OF THE CUTOFF TRENCH SHALL BE THOROUGHLY CLEANED AND SHALL BE INSPECTED BY THE ENGINEER PRIOR TO THE PLACEMENT OF EMBANKMENT FILL.
3. BROKEN SHALE EXPOSED ON DOWNSTREAM SLOPE OF CUT-OFF TRENCH SHALL BE INSPECTED BY THE ENGINEER FOR CONFIRMATION OF TYPE, DEPTH AND EXTENT OF DRAIN FILL TO BE PLACED ON SLOPE AS SHOWN ON SHEET NO. 8

AL FROM STATION 1+90 TO STATION 5+00
FROM STATION 22+50 TO STATION 24+85



IN FEET ALONG CENTERLINE OF DAM

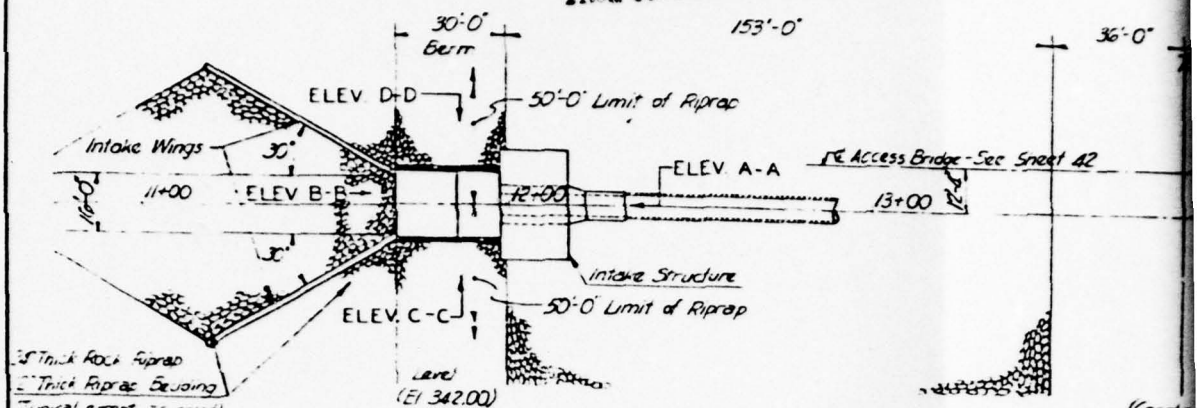
FILE – CUT-OFF TRENCH

CUT-OFF TRENCH DETAILS
PEACE VALLEY DAM

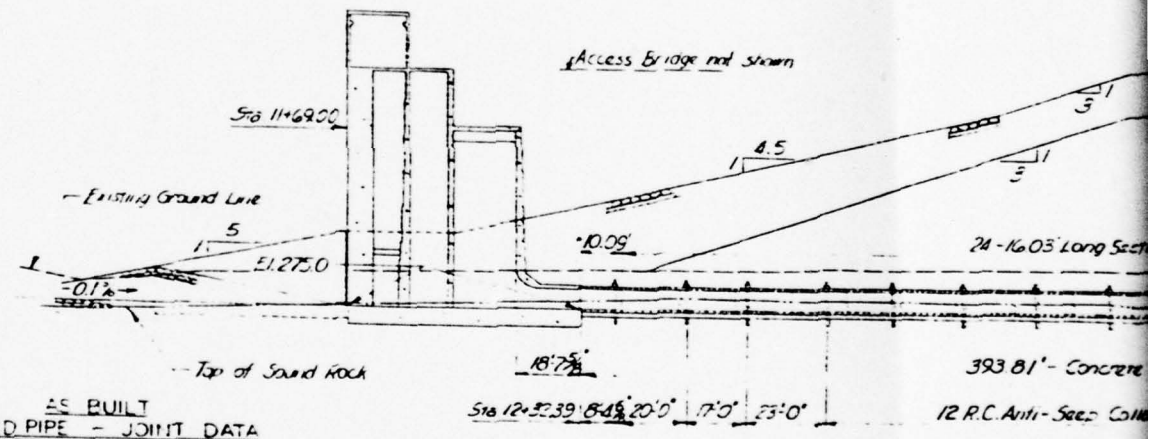
NAT. ID NO. PA.00790 BUCKS COUNTY

DATA OBTAINED FROM U.S. DEPT. OF AGRICULTURE, SOIL CONSERVATION SERVICE, DRAWING NO.PA-617-P , SHEET 9 OF 67

PLATE 4



PLAN



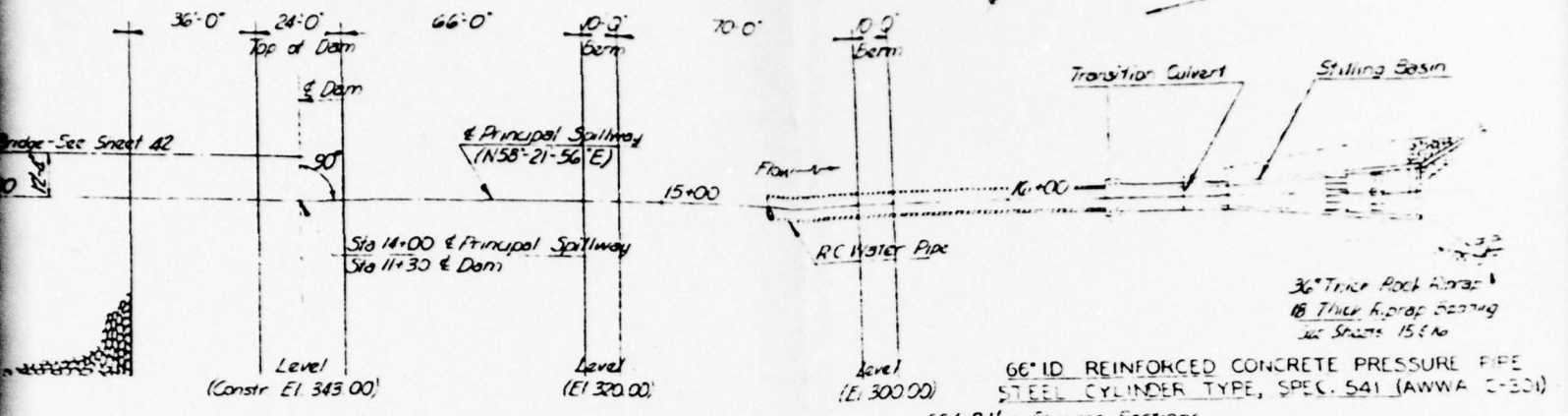
PROFILE ALON

AS BUILT
66"ID PIPE - JOINT DATA

Joint	Dist. From Riser Wall	Invert El
1	0.0	275.00
2	10.09	274.98
3	26.16	274.89
4	26.15	274.80
5	58.18	274.74
6	74.21	274.66
7	90.24	274.57
8	106.27	274.48
9	122.30	274.41
10	138.32	274.33
11	154.36	274.25
12	170.39	274.14
13	186.42	274.08
14	202.45	273.99
15	218.75	273.91
16	234.51	273.82
17	250.54	273.72
18	266.57	273.64
19	282.60	273.57
20	298.62	273.48
21	314.66	273.41
22	330.69	273.34
23	346.72	273.25
24	362.75	273.17
25	378.78	273.09
26	394.81	273.00

AS BUILT
66"ID PIPE - COLLAR DATA

Collar	Dist. From Riser Wall	Invert El.
1	8.3 H	273.67
2	26.4	270.87
3	42.4	270.78
4	58.4	270.68
5	74.4	270.58
6	106.4	270.48
7	122.4	270.38
8	138.4	270.28
9	154.4	270.18
10	170.4	270.08
11	186.4	269.98
12	202.4	269.88
13	218.4	269.78
14	234.4	269.68
15	250.4	269.58

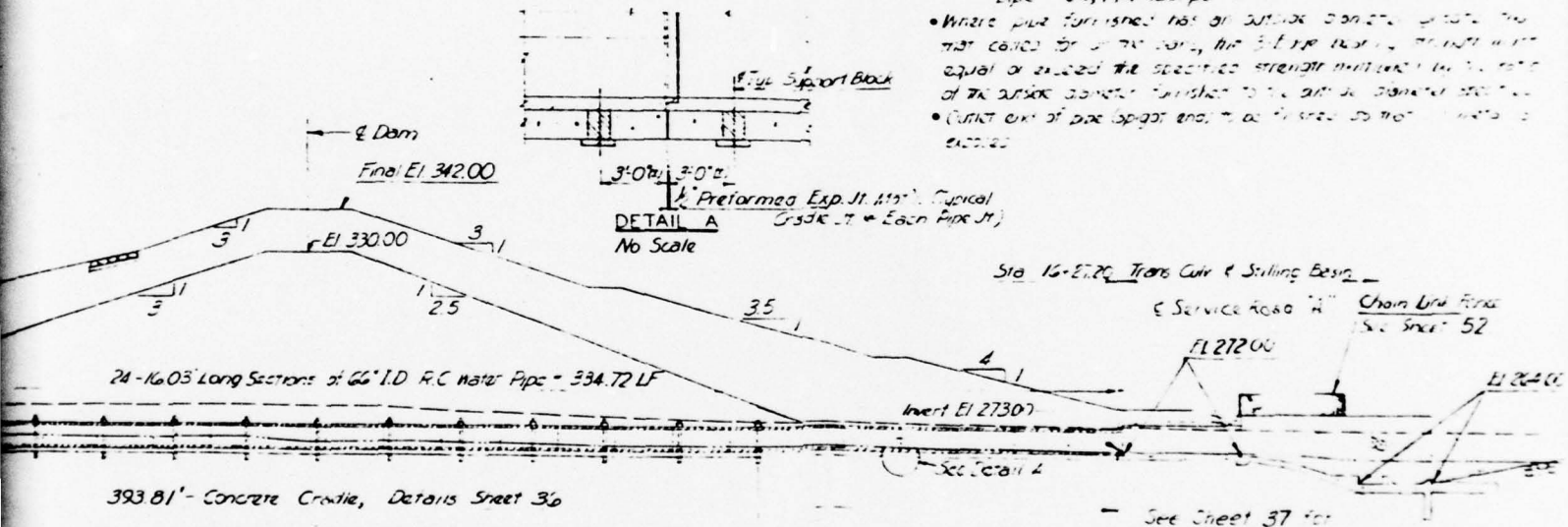


PLAN - PRINCIPAL SPILLWAY

66" I.D. REINFORCED CONCRETE PRESSURE PIPE
STEEL CYLINDER TYPE, SPEC. 541 (AWWA C-301)

334.81' - Straight Sections
1 - Spigot Ring Wall Fitting - See details, Sheet 36.
Pressure Head = 59'
1000 = 112,723 lbs per ft of pipe
Min. 5-Edge Bearing Strength for 1000 Load Factor
Pipe = 24,774 lbs per lin ft

- Where pipe furnished has an outside diameter greater than that called for in the plans, the 5-E bearing strength shall be equal or exceed the specified strength multiplied by the ratio of the outside diameter furnished to the outside diameter specified.
- Cutout one of pipe spigot end, as directed so that [illegible] exposed.



PROFILE ALONG ℄ PRINCIPAL SPILLWAY

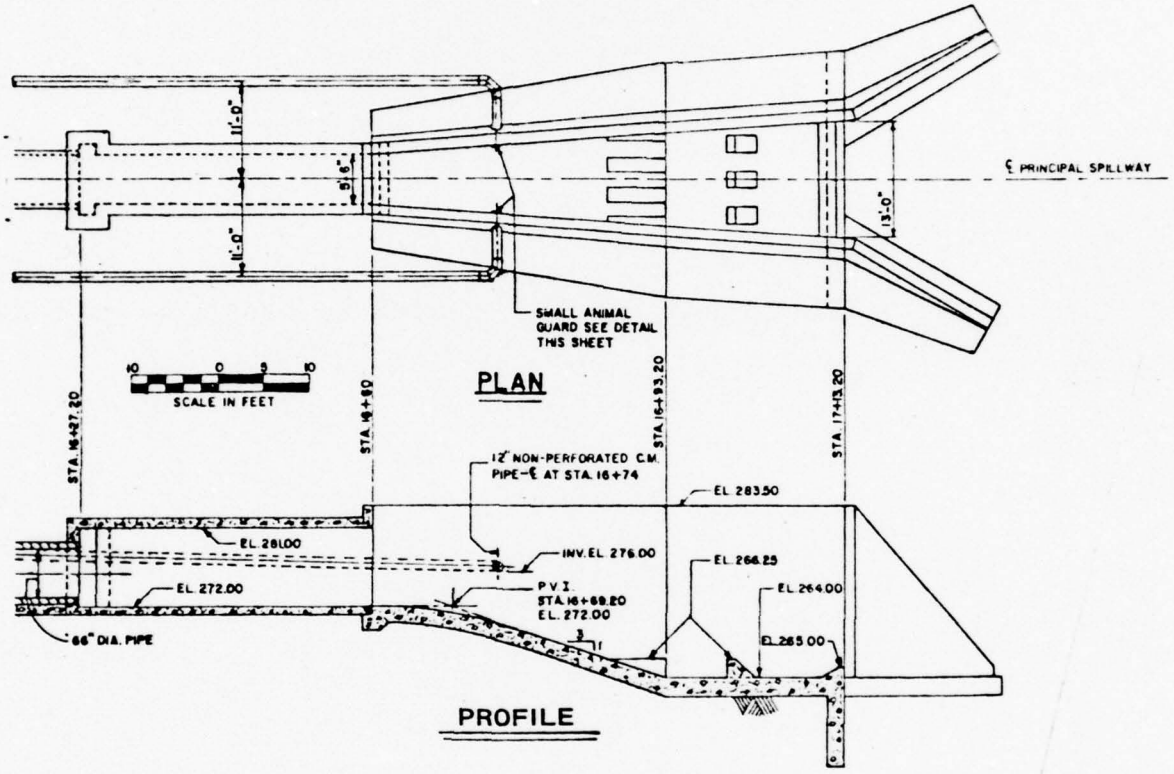
Scale: 0 25 50 Ft

PLAN & PROFILE OF PRINCIPAL SPILLWAY
PEACE VALLEY DAM

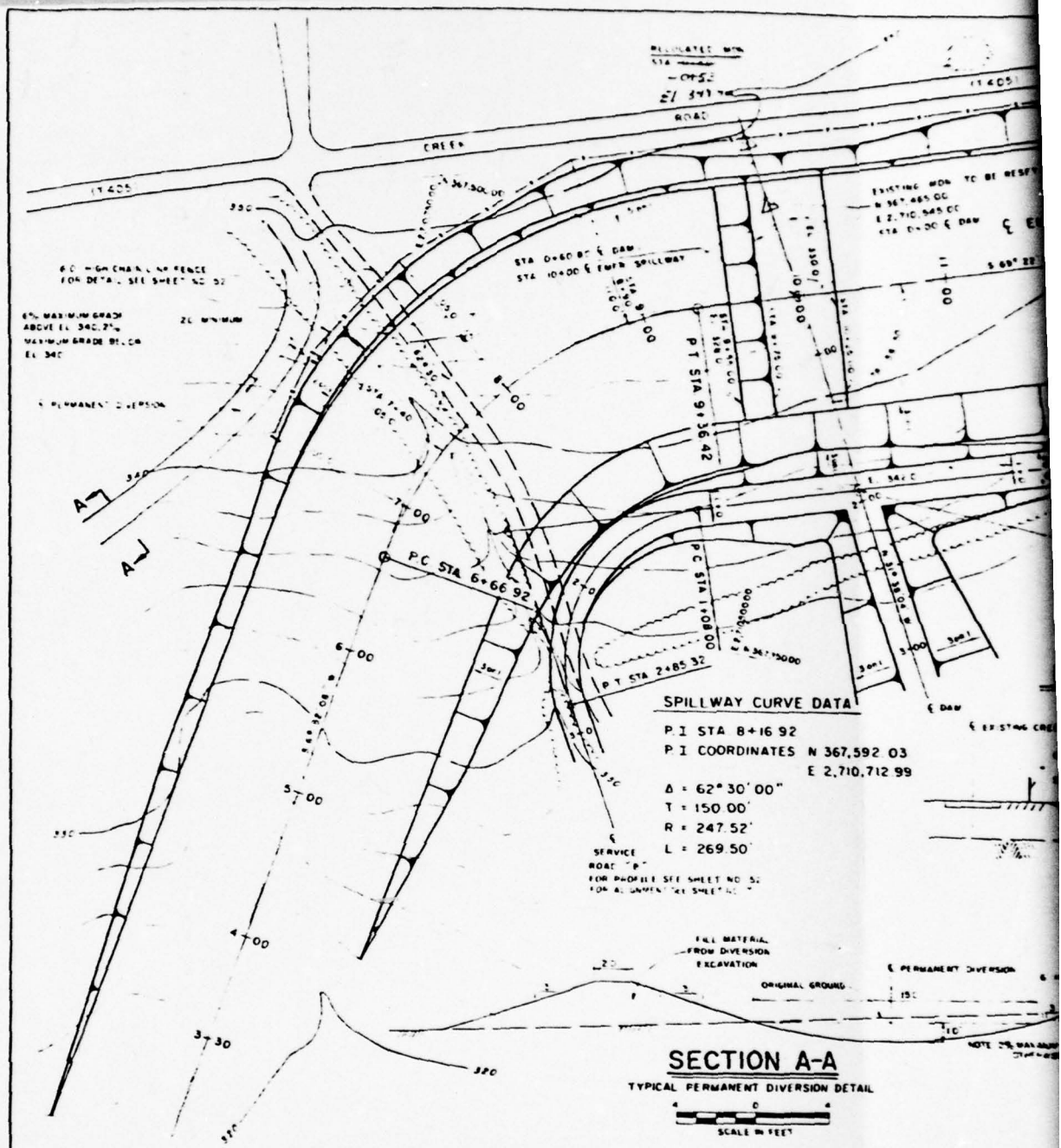
NAT. ID NO. PA.00790 BUCKS COUNTY

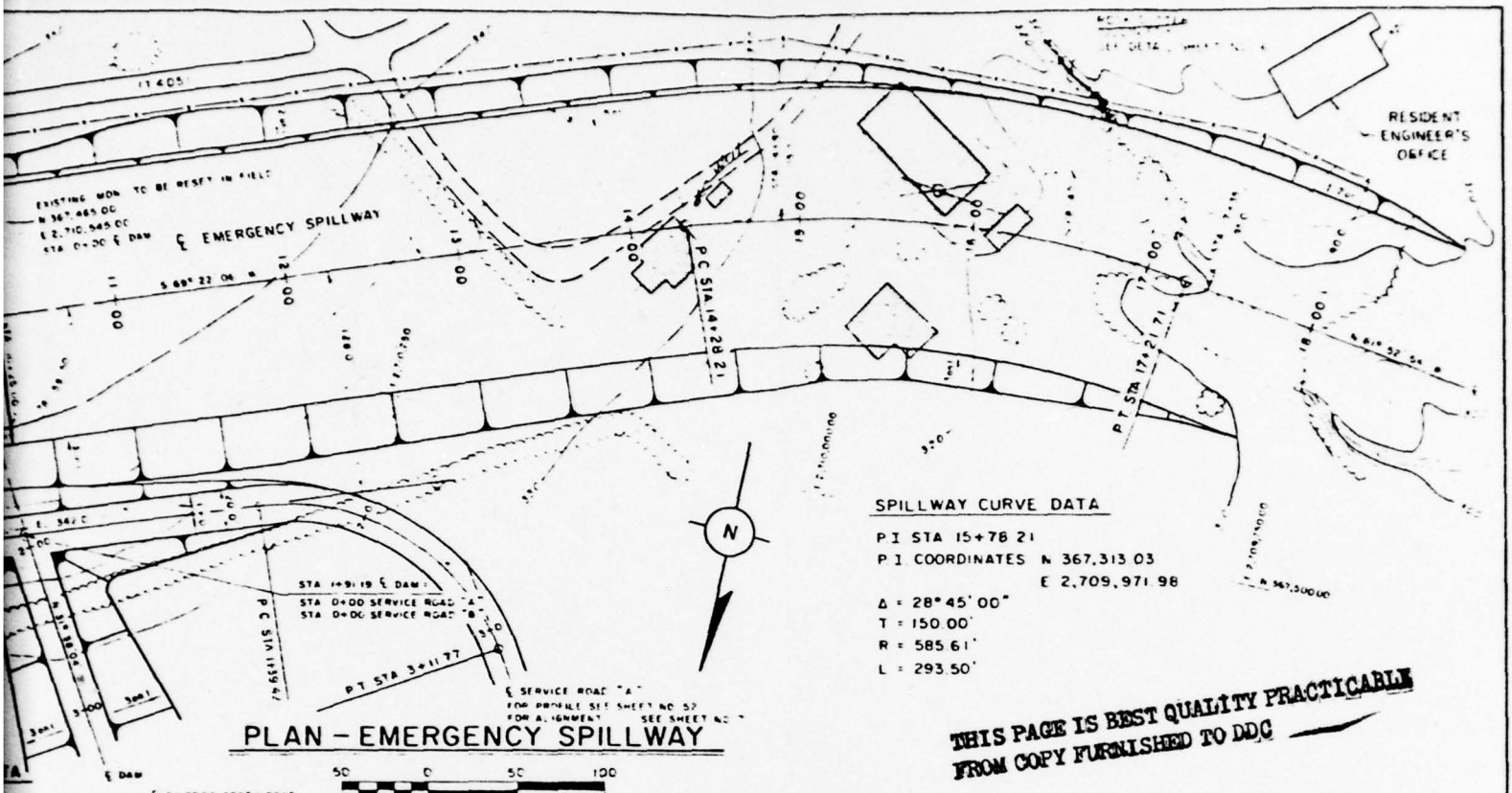
DATA OBTAINED FROM U.S. DEPT. OF AGRICULTURE, SOIL CONSERVATION SERVICE, DRAWING NO.PA-617-P, SHEET 13 OF 67

PLATE 5



PLAN AND PROFILE OF PRINCIPAL STILLING BASIN PEACE VALLEY DAM		
NAT. ID NO. PA.00790		BUCKS COUNTY
DATA OBTAINED FROM U.S. DEPT. OF AGRICULTURE, SOIL CONSERVATION SERVICE, DRAWING NO.PA-617-P , SHEET 12 OF 67		
		PLATE 6





PLAN – EMERGENCY SPILLWAY

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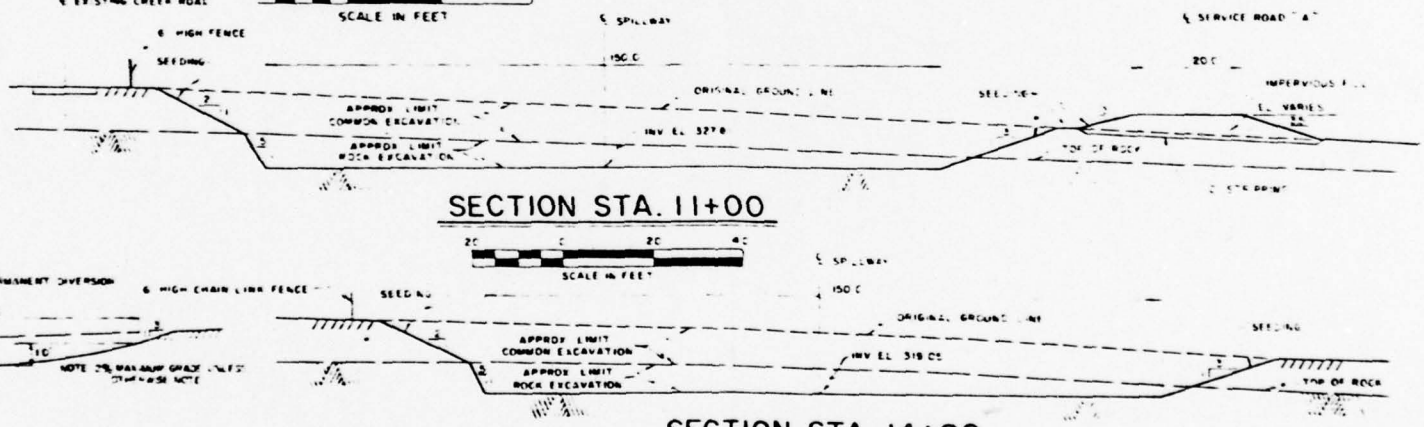
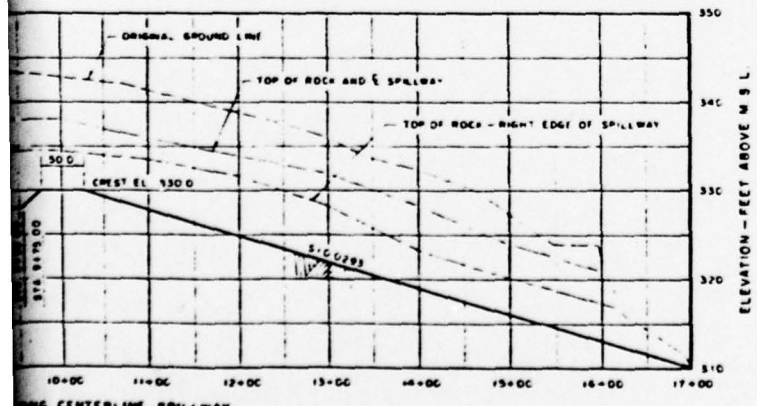
FROM COPY FURNISHED TO DDC



SECTION STA. 11+00

SECTION STA. 14+00



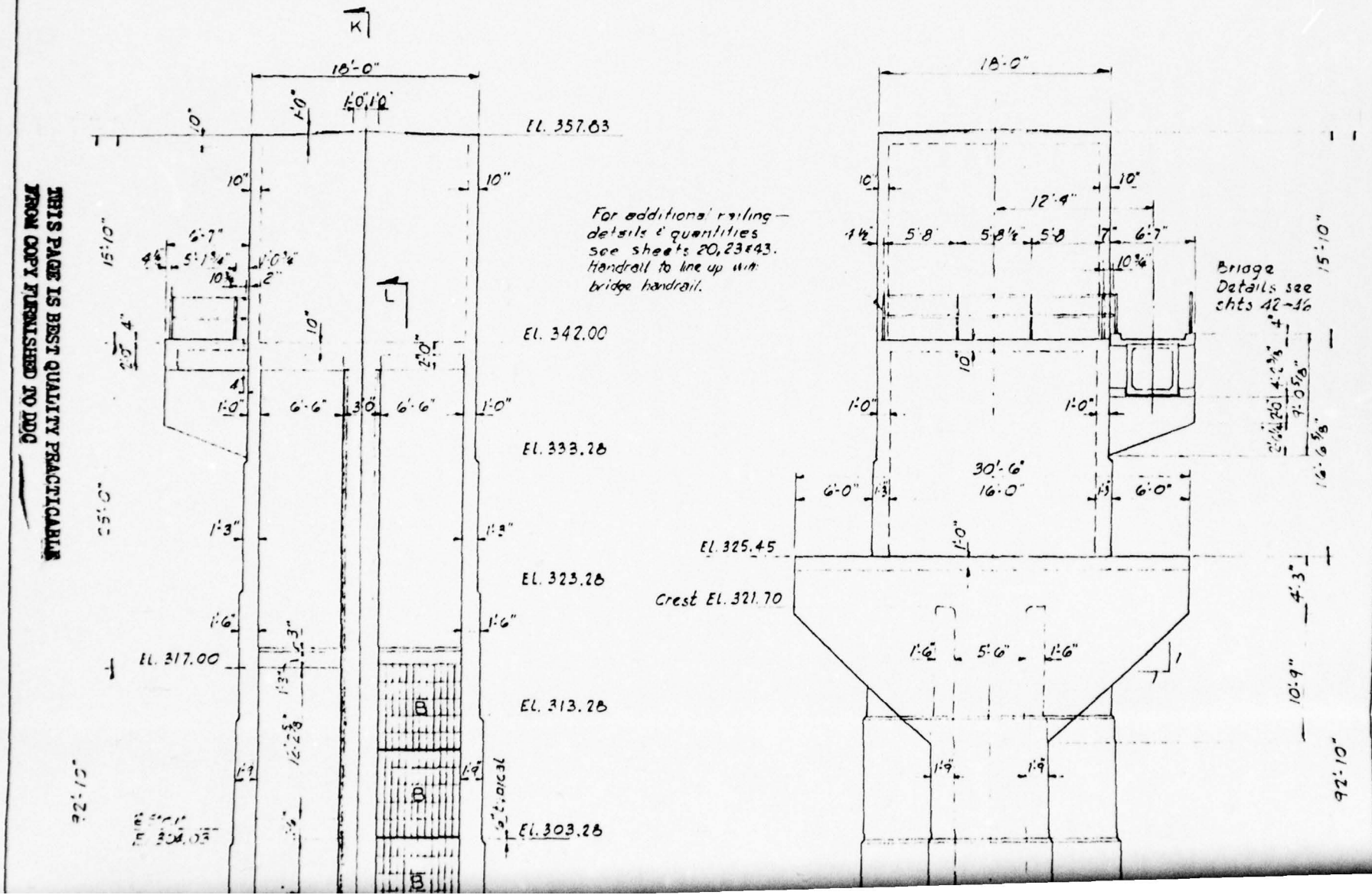
ERGENCY SPILLWAY

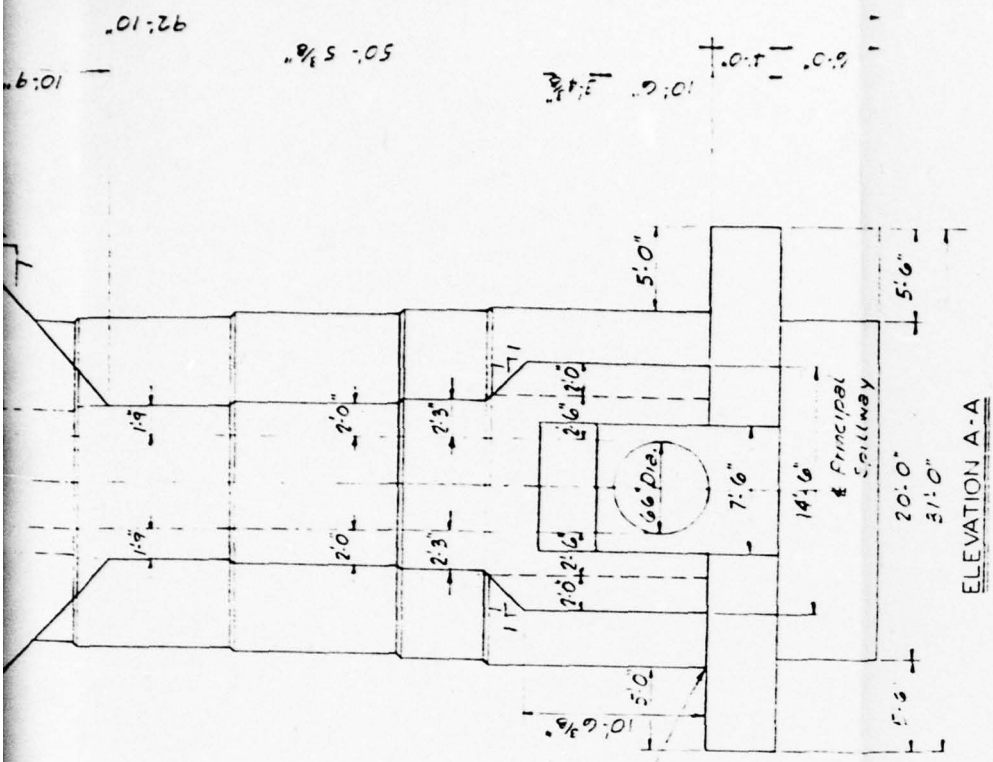
PLAN & PROFILE OF EMERGENCY SPILLWAY
PEACE VALLEY DAM

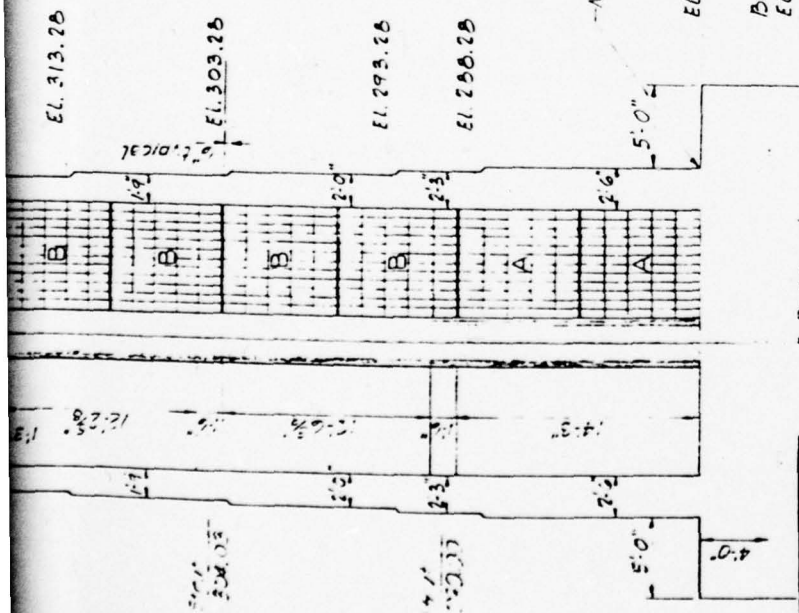
NAT. ID NO. PA.00790 BUCKS COUNTY

DATA OBTAINED FROM U.S. DEPT. OF AGRICULTURE, SOIL CONSERVATION SERVICE, DRAWING NO.PA-617-P , SHEET 10 OF 67

PLATE 7







Scale: 0 1 2 3 6 Ft
Except where noted

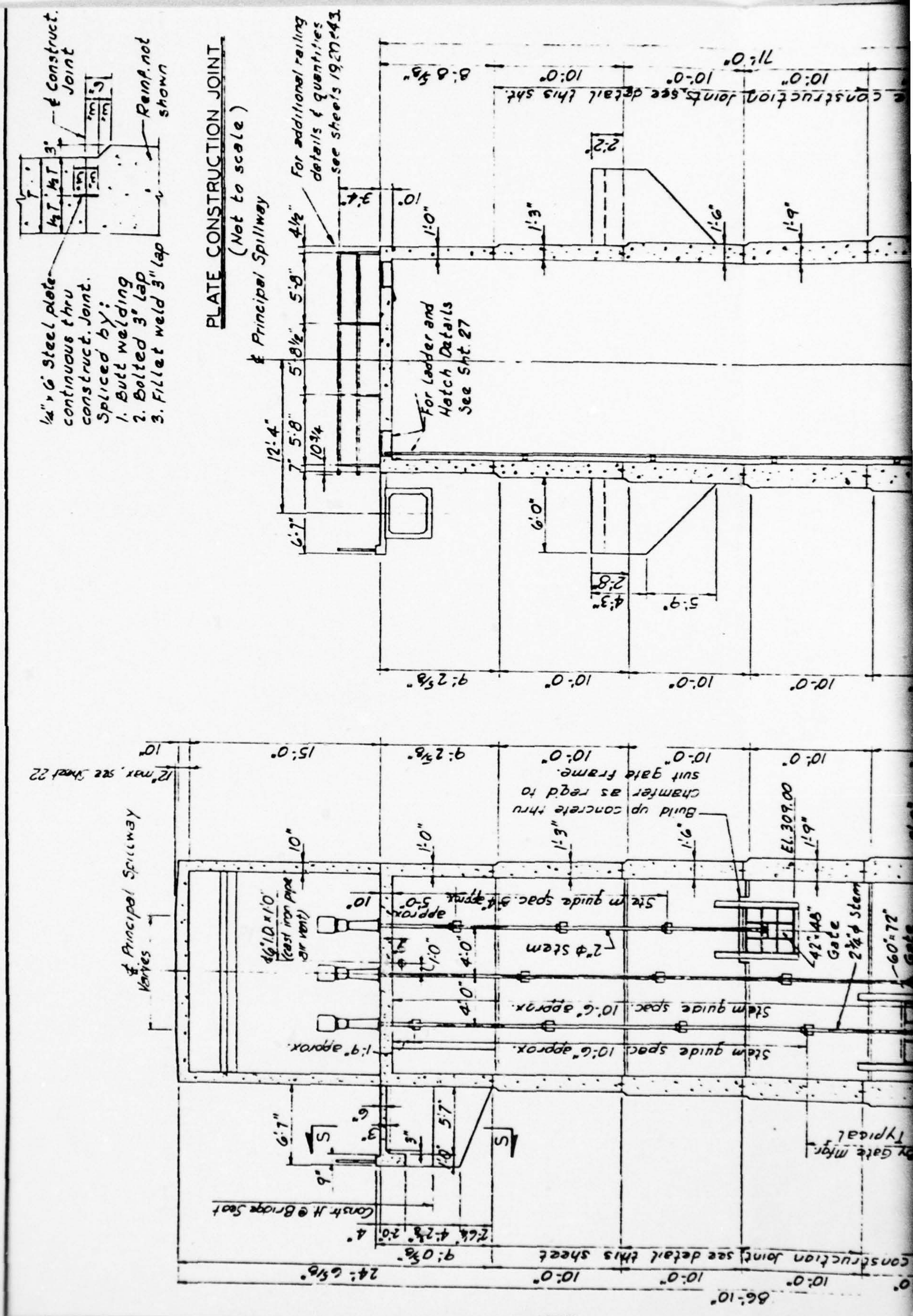
INTAKE STRUCTURE SECTIONS

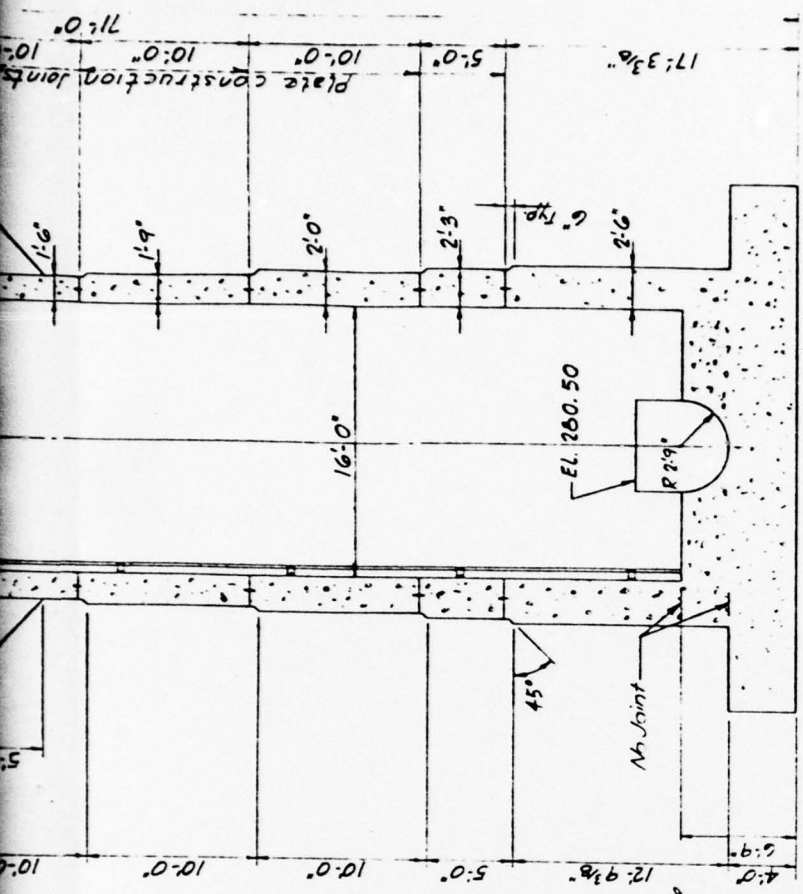
PEACE VALLEY DAM

NAT. ID NO. PA.00790 BUCKS COUNTY

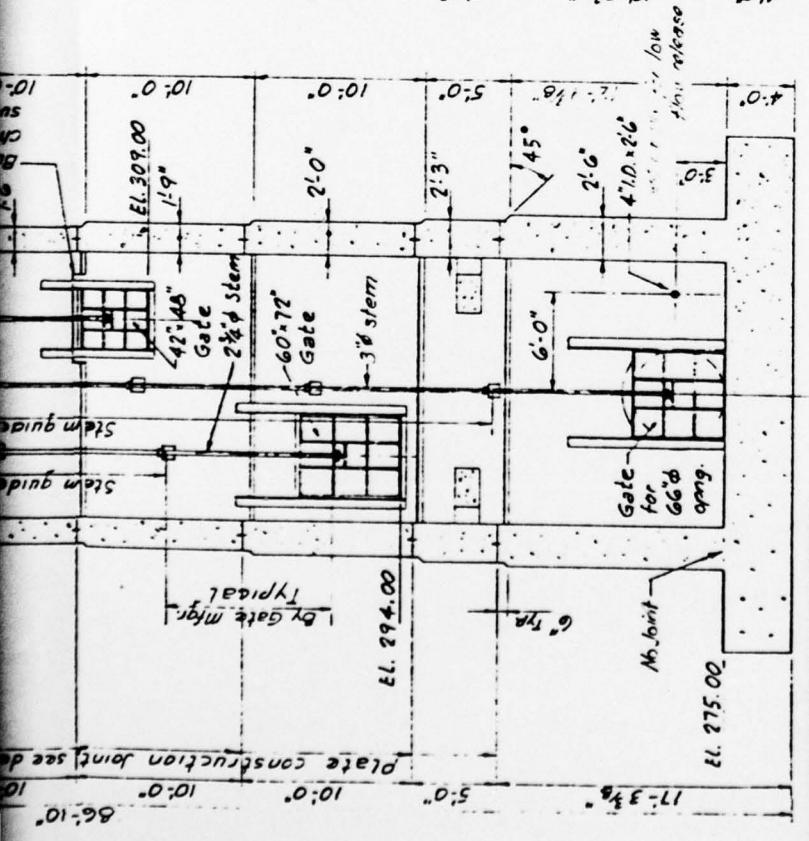
DATA OBTAINED FROM U.S. DEPT. OF AGRICULTURE, SOIL CONSERVATION SERVICE, DRAWING NO.PA-617-P , SHEET 19 OF 67

PLATE 8

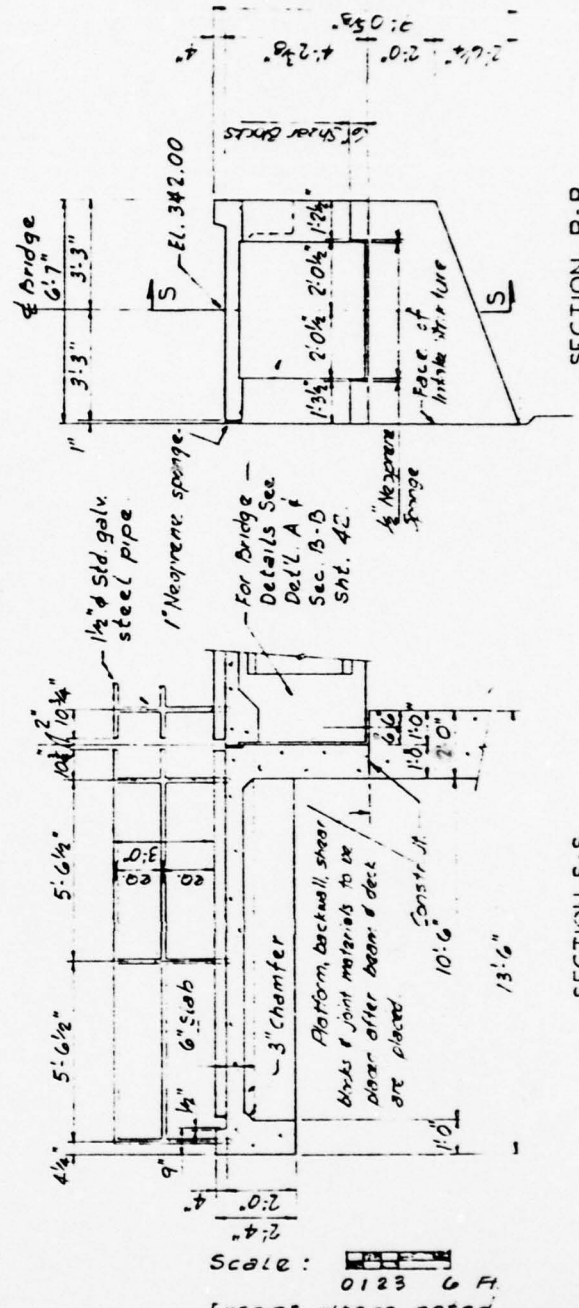




SECTION F-F



SECTION E-E



Except where noted

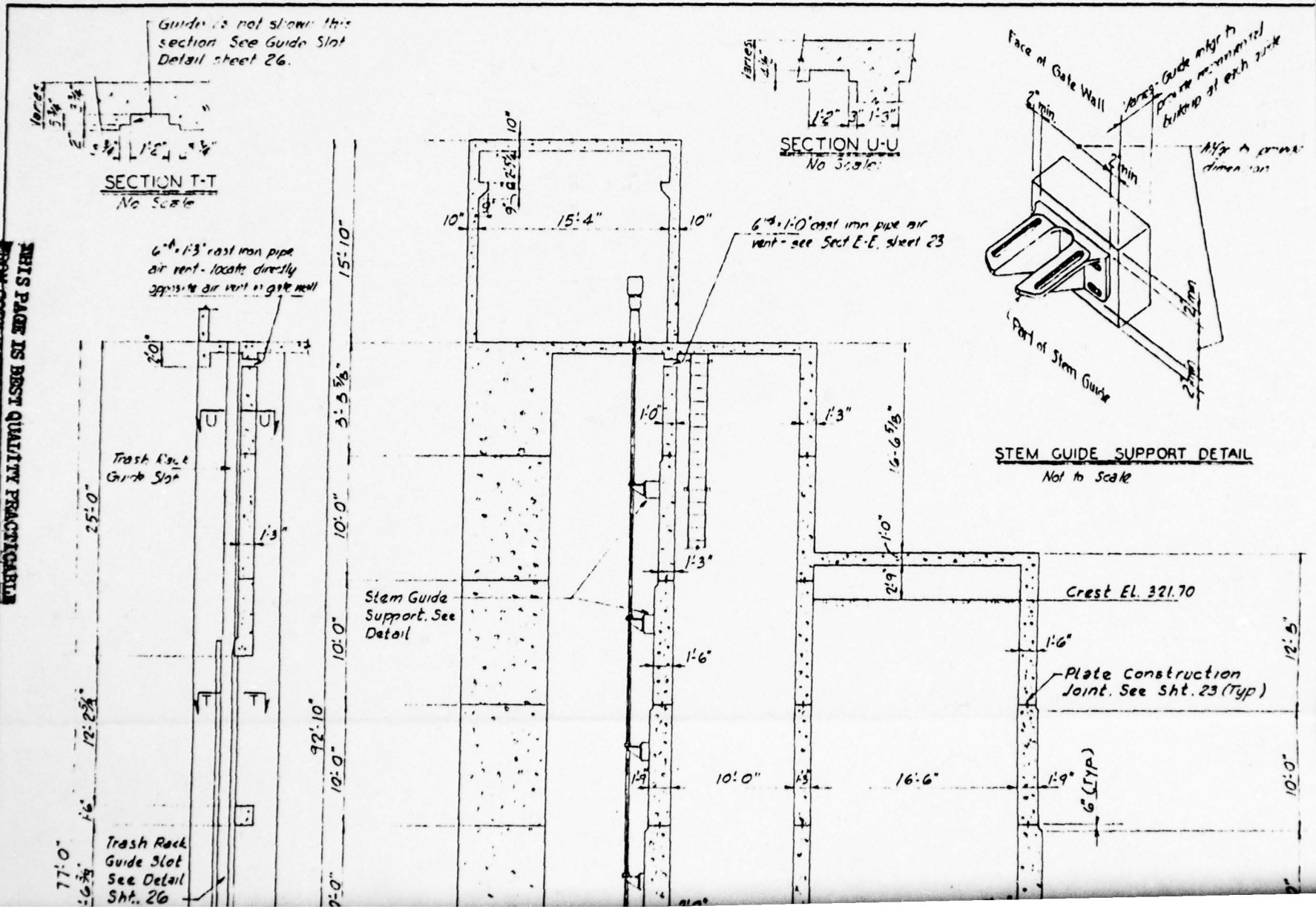
INTAKE STRUCTURE SECTIONS

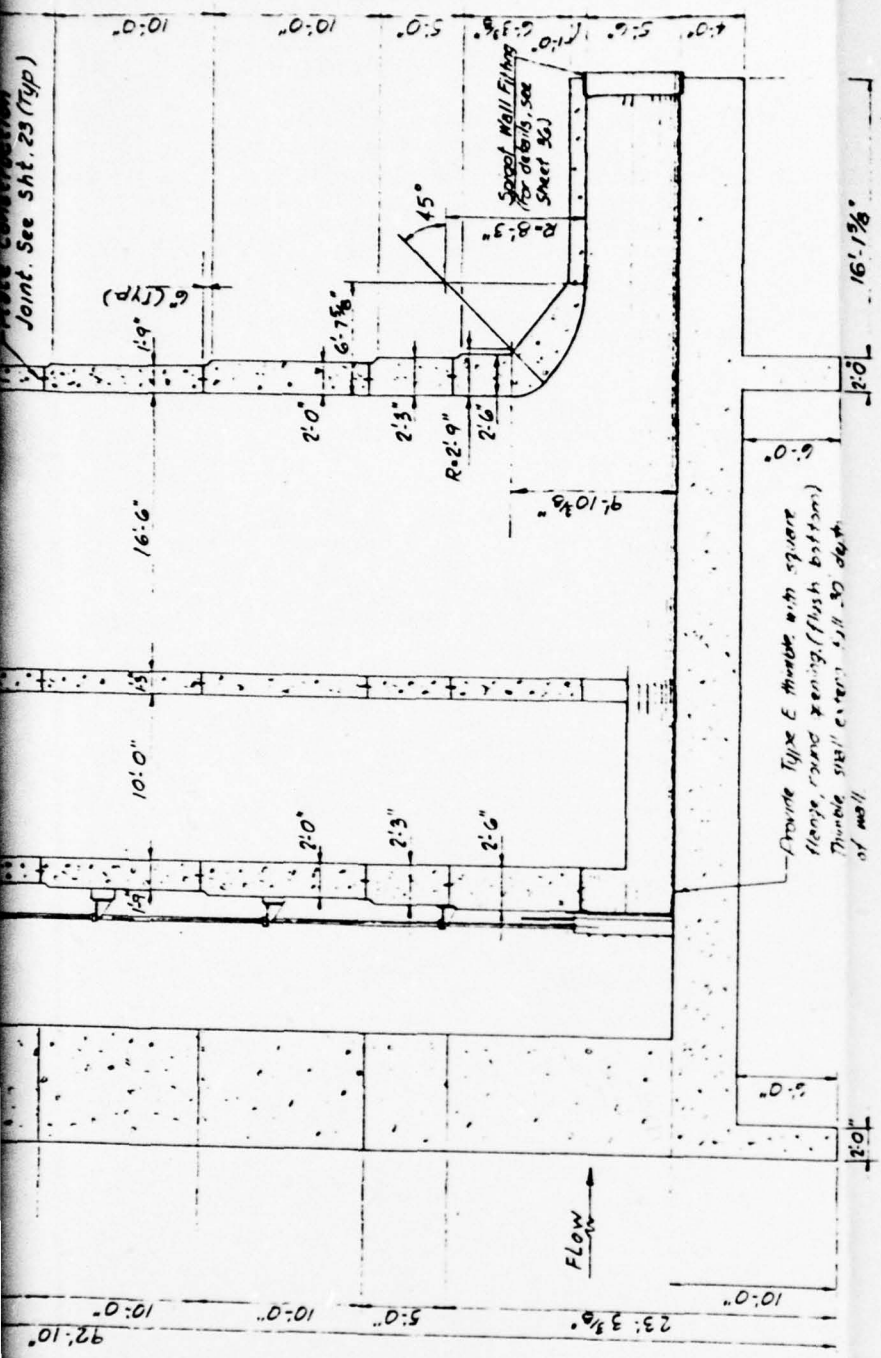
PEACE VALLEY DAM

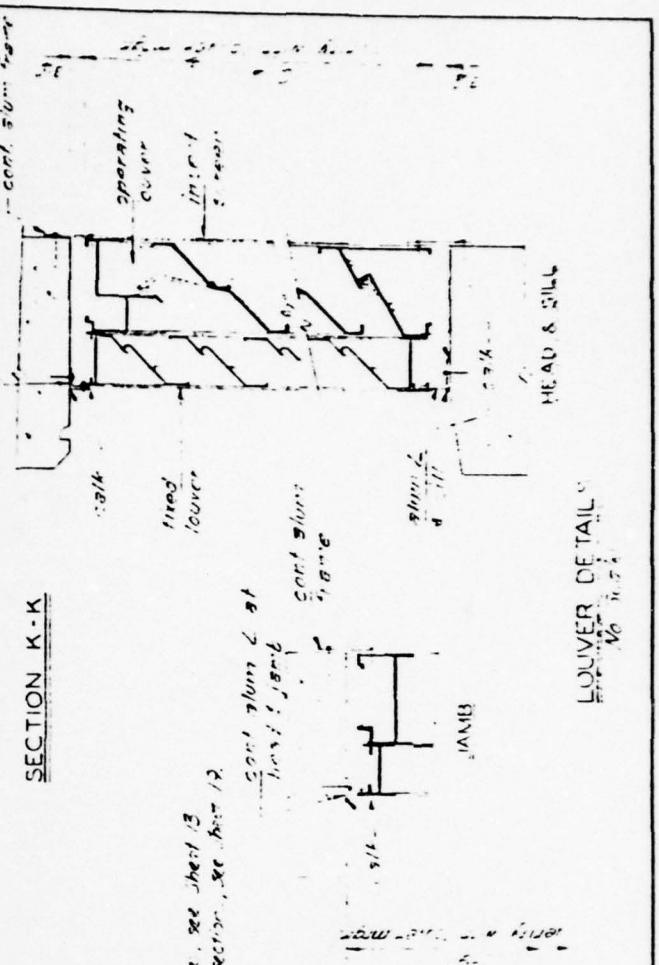
NAT. ID NO. PA.00790 BUCKS COUNTY

DATA OBTAINED FROM U.S. DEPT. OF AGRICULTURE, SOIL CONSERVATION SERVICE, DRAWING NO.PA-617-P , SHEET 23 OF 67

PLATE 9







SECTION K-K

NOTES

- For General Note, see Sheet 13
- For location of section, see Sheet 13

Scale: 1/8" = 1'-0"
Except where noted

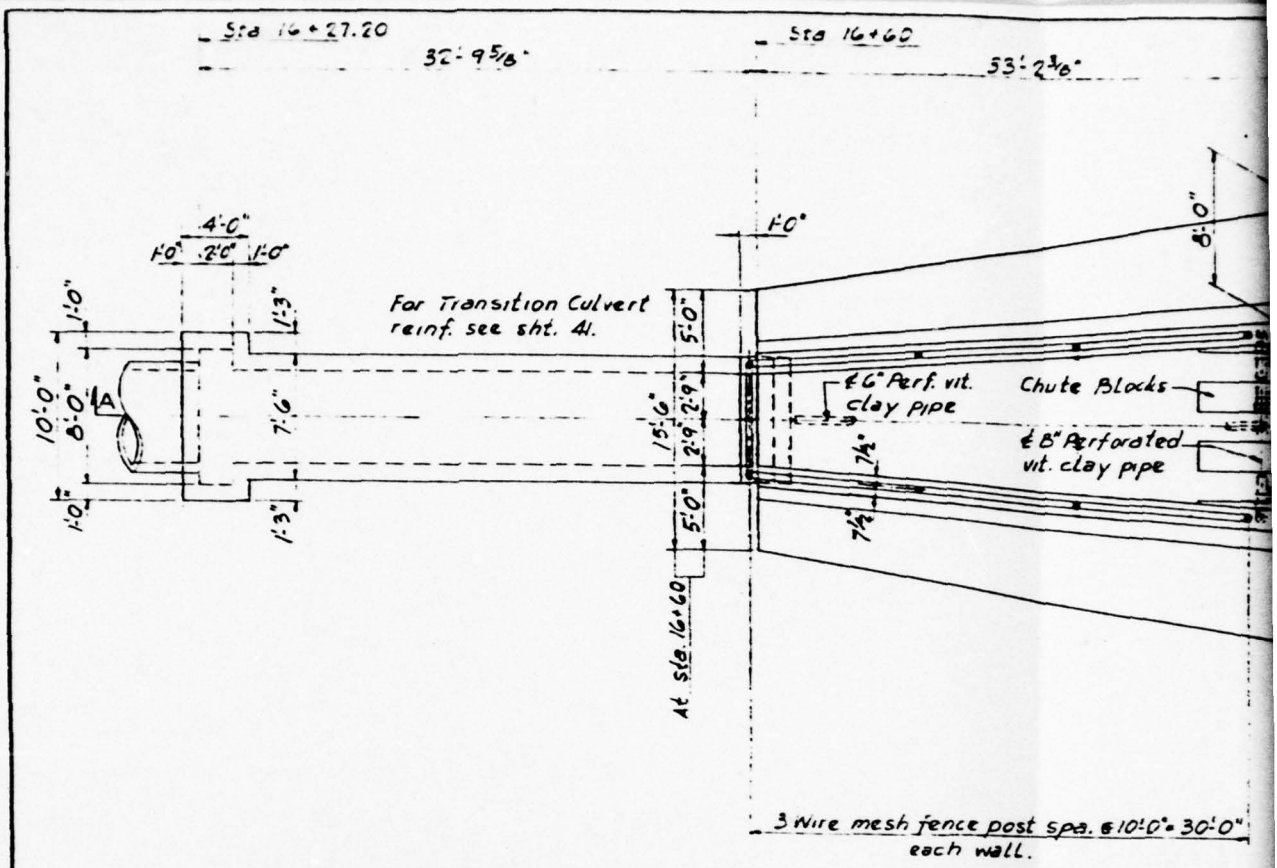
INTAKE STRUCTURE SECTIONS

PEACE VALLEY DAM

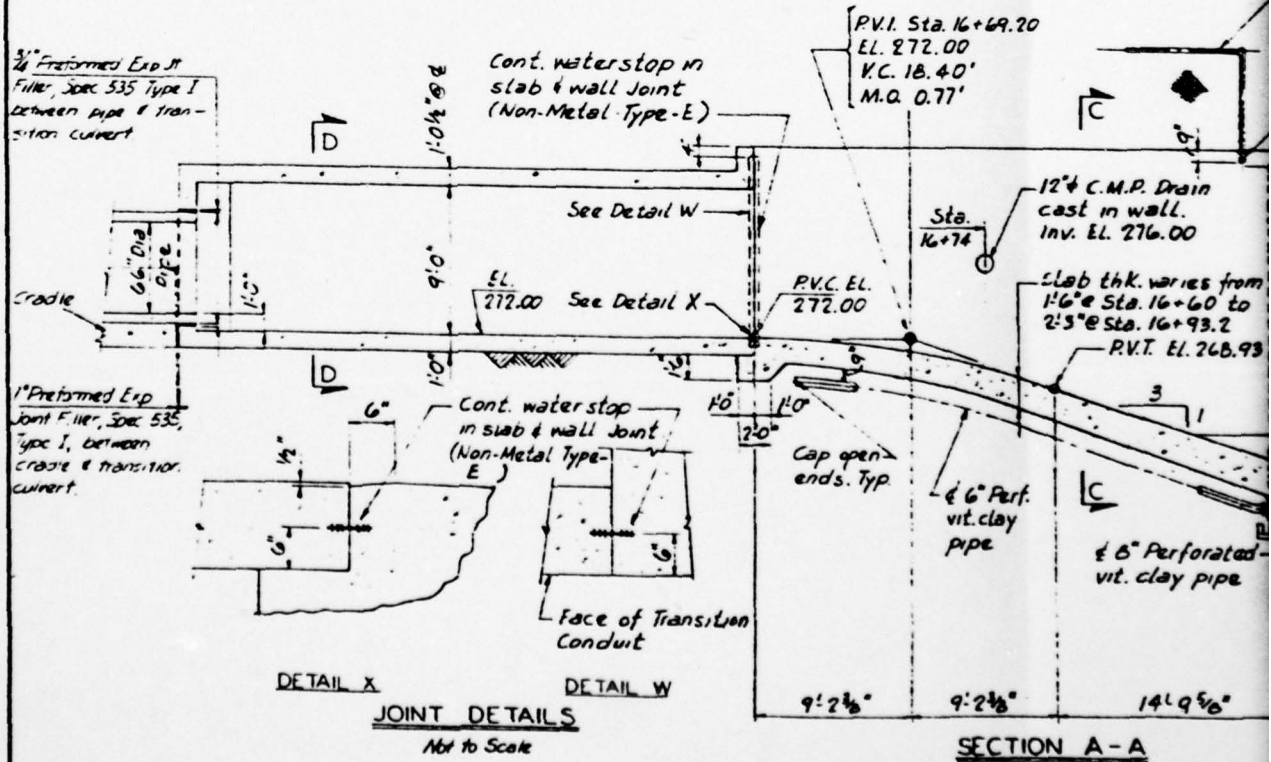
NAT. ID NO. PA.00790 BUCKS COUNTY

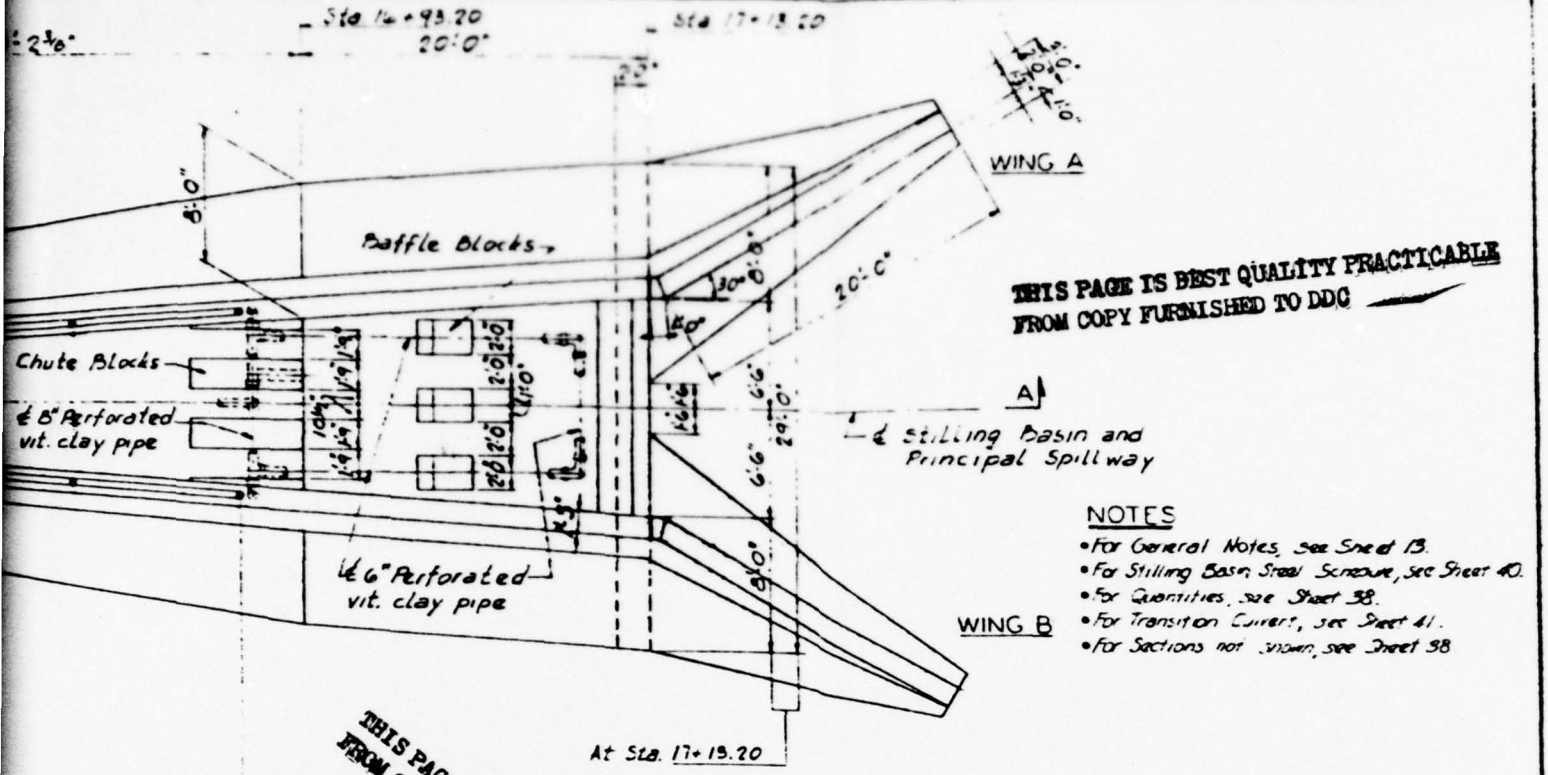
DATA OBTAINED FROM U.S. DEPT. OF AGRICULTURE, SOIL CONSERVATION SERVICE, DRAWING NO.PA-617-P , SHEET 25 OF 67

PLATE 10



STILLING BASIN PLA





NOTES

- For General Notes, see Sheet 13.
- For Stilling Basin Steel Schedule, see Sheet 40.
- For Quantities, see Sheet 38.
- For Transition Curves, see Sheet 41.
- For Sections not shown, see Sheet 38

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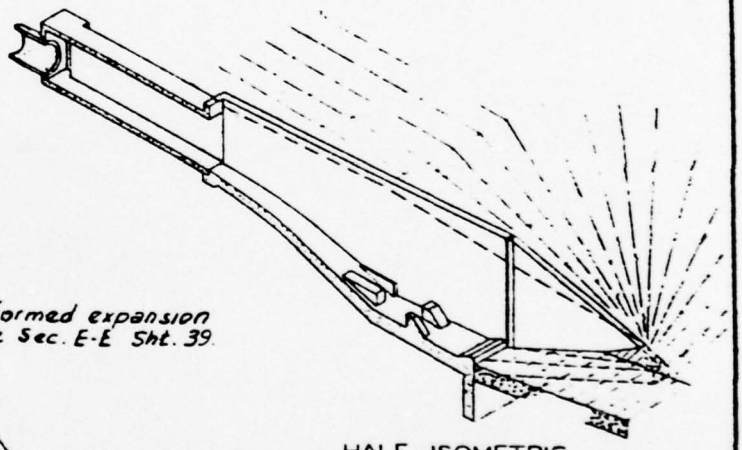
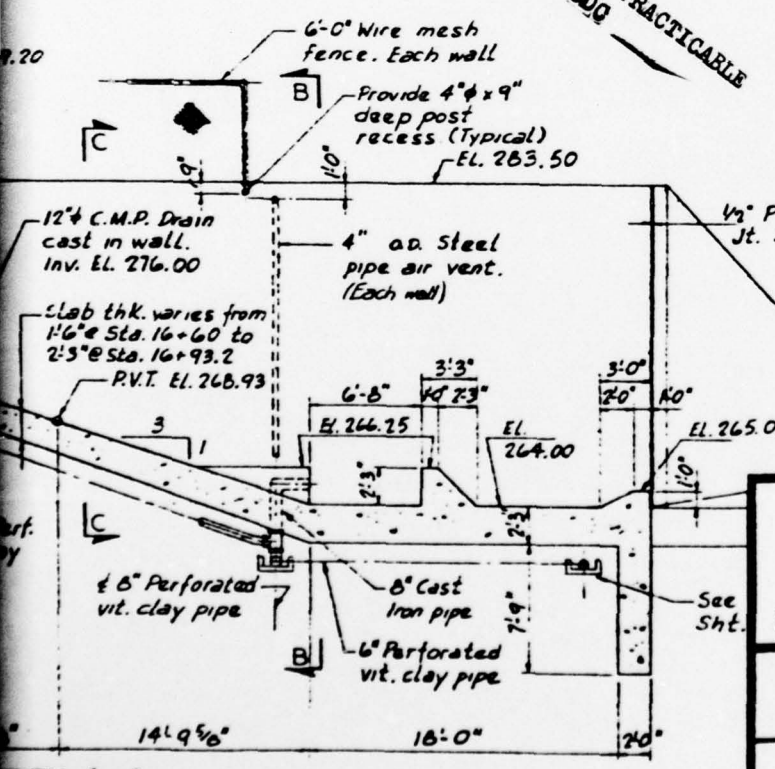
TILLING BASIN PLAN



HALF ISOMETRIC
Not to Scale

Scale: 1" = 6 Ft
Except Where Noted



TION A-A

PLAN OF STILLING BASIN
PEACE VALLEY DAM

NAT. ID NO. PA.00790 BUCKS COUNTY

DATA OBTAINED FROM U.S. DEPT. OF AGRICULTURE, SOIL CONSERVATION SERVICE, DRAWING NO.PA-617-P , SHEET 37 OF 67

PLATE 11

2

DH 13, ELEV. 29?. 12, 11+00, Centerline
Logged by: D. T. Harroun & R. Coulin
Drilling Equipment: S & H C-60

Hole From	Depth To	Description of Materials	Unif. Soil Class Symb.	STANDARD PENETRATION Type Bit Used	Blows Per 6"	No.	Type	SAMPLES From Ft.	To Ft.	% Rec.
0.0	0.5	Dark brown top soil.		SpT	2-6-10	1	Jar	0.0	1.5	
				"	16-19-20	2	"	1.5	3.0	
0.5	3.5	Yellow silty clay with weathered shale fragments, medium plastic, 10-15% sand, 10-15% weathered shale fragments.	CL	"	27-20-30	3	"	3.0	3.5	
				NXM			Red	3.5	4.5	100
				"			"	4.5	7.5	67
				"			"	7.5	10.0	100
				"			"	10.0	13.5	86
3.5	11.0	Argillite, gray, calcareous weathered light gray and brown. Broken into small angular pieces and lengths averaging 6".		"			"	13.5	16.0	100
				"			"	16.0	17.5	100
				"			"	17.5	21.0	92
				"			"	21.0	26.0	100
				"			"	26.0	31.8	100
11.0	17.0	Argillite, dark gray, broken into small pieces mostly along bedding surfaces.		"			"	31.8	35.5	100
				"			"	35.5	43.5	100
				"			"	43.5	50.0	100
				"			"	50.0	55.0	100
17.0	43.0	Argillite, gray, calcareous and light gray, argillaceous limestone. Upper 1' badly broken into small pieces. Calcite filled, high angle fractures throughout but core nevertheless good with pieces up to 2' thick.		"			"	55.0	58.0	100
				"			"	58.0	59.5	100
				"			"	59.5	61.0	100
				"			"	61.0	68.0	100
				"			"	68.0	70.5	100
				"			"	70.5	73.0	100
43.0	46.0	Argillite, dark gray with middle 1' section containing interbedded light gray limy seams. Badly broken in lower 6".								
46.0	61.0	Argillite, gray, calcareous with some light gray laminations. Numerous high angle fractures from 48.0'-54.0'. Core broken into small angular pieces from 57.8'-61.0'; core generally good.								
61.0	70.5	Argillite, dark gray with some light gray laminae. Badly broken into small angular pieces from 70.0'-70.5'. Recovery good.								
70.5	73.0	Argillite, gray, calcareous in pieces 8" thick.								

Permeability Test: 3.0'-3.5', k_h = 11.75 Ft./Day

Flow Tests: 3.5'-73', k_h = 1.05 Ft./Day
20'-25', k_h = 2.66 Ft./Day
25'-73', k_h = 0.80 Ft./Day

Depth to groundwater: 0 Hrs. 8/26/68 - 9.5'
24 Hrs. 8/27/68 - 9.6'

DH 14, ELEV. 307.64, 19+00, Centerline
Logged by: D. T. Harroun & R. Coulin
Drilling Equipment: S & H C-60

Hole From	Depth To	Description of Materials	Unif. Soil Class Symb.	STANDARD PENETRATION Type Bit Used	Blows Per 6"	No.	Type	SAMPLES From Ft.	To Ft.	% Rec.
0.0	0.7	Silty clay top soil.		SpT	2-9-6	1	Jar	0.0	1.5	
0.7	2.5	Yellow-gray mottled clay with weathered shale fragments, medium plastic, 10-15% sand, 10-15% weathered shale fragments.	CL	"	4-42-49	2	"	1.5	3.0	
				"	12-53-65	3	"	3.0	4.5	
				"	38-52-56	4	"	4.5	6.0	
				"	19-75	5	"	6.0	7.0	
				NXM			Red	7.0	9.0	90
				"			"	9.0	11.5	100
2.5	7.0	Light brown weathered shale with silty clay seams, medium plastic, 15% sand, 70% weathered shale.	GC	"			"	11.5	15.5	100
				"			"	15.5	18.5	100
				"			"	18.5	23.0	100
				"			"	23.0	26.0	100
				"			"	26.0	31.0	100
				"			"	31.0	35.0	100
				"			"	35.0	40.0	100
7.0	40.0	Argillite, gray to light gray, argillaceous limestone. Entire core is essentially similar with very little weathering at top. Pieces alternating from 6" to 1' thick with some fracturing in the argillite zones producing pieces 1" to 4" thick. Calcite filling from 29.0'-29.5'. Core generally good.								

Permeability Test: 3.0'-4.5', k_h=0 Ft./Day
4.5'-6.0', k_h=0 Ft./Day
6.0'-7.0', k_h=0 Ft./Day

DH 14, Continued

Flow Tests: 7'-12', 10'-15', 15'-20', 15'-60', 20'-25', 25'-60', 30'-35', 35'-60'. Couldn't see took bottom

Depth to groundwater: 9 Hrs. 24 Hrs.

DH 15, ELEV. 315.77, 21+00, Centerline
Logged by: D. T. Harroun & R. Coulin
Drilling Equipment: S & H C-60

Hole From	Depth To	Description of Materials	Unif. Soil Class Symb.
0.0	0.8	Silty clay top soil.	
0.8	1.9	Yellow silty clay with weathered shale fragments, medium plastic, 10-15% sand, 10-15% weathered shale fragments.	CL
1.9	6.0	Yellow silty clay with weathered shale fragments, medium plastic, 15% sand, 70% shale fragments.	GC
6.0	11.5	Argillite, dark gray occurring in 1/2"-1" thick but weathered brown surfaces and internally.	
11.5	40.0	Argillite, dark gray to gray. Broken angular fragments at 15.0'-15.6' Lower 4' also broken but pieces 2" Remainder of core solid with only	

Permeability Test: 3.0'-4.5', 4.5'-6.0',

Flow Tests: 23'-28', 23'-60', 28'-60', Unable to see 10.0'-15.0'

Depth to groundwater: 0 Hrs. 24 Hrs.

DH 16, ELEV. 326.69, 23+00, Centerline
Logged by: D. T. Harroun & R. Coulin
Drilling Equipment: S & H P-35

Hole From	Depth To	Description of Materials	Unif. Soil Class Symb.
0.0	1.0	Silty clay top soil.	
1.0	2.0	Yellow silty clay with weathered shale fragments, Medium plastic, 10%-15% sand, 10%-15% weathered shale fragments.	CL
2.0	4.0	Weathered shale and clay, medium plastic, 15% sand, 70% broken shale.	GC
4.0	5.7	Weathered and broken shale.	
5.7	10.5	Argillite, dark gray with light gray zones, deeply weathered to brown brown, in pieces 1" thick.	
10.5	18.0	Argillite, gray to light gray showing deformation. Lower 6' contains dark gray argillite. Pieces 1" to	
18.0	26.0	Argillite dark gray with some thin bands in upper 2'. Pieces 1" to 6" separations only.	
26.0	32.5	Argillite, gray to light gray, highly pieces 4" to 2' showing penetrating and horizontal separation	
32.5	40.0	Argillite, dark gray with thin laminae calcareous material. Pieces 3" to	

Continued

Flow Tests
7'-12', k= 2.16 Ft./Day
10'-15', k= 0.83 Ft./Day
15'-20', k= 0.87 Ft./Day
15'-60', k= 1.16 Ft./Day
20'-25', k= 5.18 Ft./Day
25'-40', k= 0.56 Ft./Day
30'-35', k= 1.19 Ft./Day
35'-60', k= 0.31 Ft./Day
Couldn't seal off top packers from 25.0' to 30.0' - took bottom test from 25.0' to 40.0'

Depth to groundwater: 0 Hrs. 8/27/68 - 6.1'
24 Hrs. 8/28/68 - 6.1'

ELEV. 315.77, 21+00. Centerline
by D. T. Harroun & R. Combs
Equipment: S & H C-60

Depth To	Description of Materials	Unif. Soil Class Symb.	STANDARD PENETRATION Type Bit Used	Blows Per 6"	No.	Type	SAMPLES From Ft.	To Ft.	% Rec.
0.8	Silty clay top soil.		SpT	2-3-7	1	Jar	0.0	1.5	
1.9	Yellow silty clay with weathered shale fragments, medium plastic, 10-15% sand, 10-15% weathered shale fragments.	CL	"	12-16-15	2	"	1.5	3.0	
			"	13-44-66	3	"	3.0	4.5	
			"	28-23-80	4	"	4.5	6.0	
			NXM			Rod	6.9	8.0	85
			"			"	8.0	11.0	100
			"			"	11.0	15.5	100
6.0	Yellow silty clay with weathered shale fragments, medium plastic, 15% sand, 70% shale fragments.	GC	"			"	15.5	23.5	100
			"			"	23.5	28.5	100
			"			"	28.5	35.0	100
			"			"	35.0	40.0	100
41.5	Argillite, dark gray occurring in bedding plates 1/2"-1" thick but weathered brown along surfaces and internally.								
60.0	Argillite, dark gray to gray. Broken into small angular fragments at 15.0'-18.5' and 21.0'-22.0'. Lower 4' also broken but pieces 2"-3" thick. Remainder of core solid with only bedding separations.								

Permeability Test: 3.0'-4.5', k= 0 Ft./Day
4.5'-6.0', k= 0 Ft./Day

Flow Tests: 23'-28', k= 0.90 Ft./Day
23'-60', k= 0.33 Ft./Day
28'-60', k= 0.24 Ft./Day
Double to seat packers from: 15.0'-20.0'; 17.0'-23.0', 10.0'-15.0'; 11.0'-16.0'; 8.0'-13.0'

Depth to groundwater: 0 Hrs. 8/29/68 - 6.0'
24 Hrs. 8/30/68 - 6.0'

ELEV. 326.69, 23+00. Centerline
by: D. T. Harroun & R. Combs
Equipment: S & H P-35

Depth To	Description of Materials	Unif. Soil Class Symb.	STANDARD PENETRATION Type Bit Used	Blows Per 6"	No.	Type	SAMPLES From Ft.	To Ft.	% Rec.
1.0	Silty clay top soil.		SpT	2-5-11	1	Jar	0.0	1.5	
2.0	Yellow silty clay with weathered shale fragments, Medium plastic, 10%-15% sand, 10%-15% weathered shale fragments.	CL	"	14-22-30	2	"	1.5	3.0	
			"	30-26-18	3	"	3.0	4.5	
			"	14-19-90	4	"	4.5	5.7	
			NXM			Rod	5.7	8.0	68
			"			"	8.0	10.0	100
			"			"	10.0	10.9	100
4.0	Weathered shale and clay, medium plastic, 15% sand, 70% broken shale.	GC	"			"	10.9	17.0	98
			"			"	17.0	24.0	100
			"			"	24.0	31.5	100
35.7	Weathered and broken shale.		"			"	31.5	36.0	100
			"			"	36.0	40.0	100
38.5	Argillite, dark gray with light gray, calcareous zones. Deeply weathered to brown and light brown, in pieces 1" thick.								
38.0	Argillite, gray to light gray showing penecontemporaneous deformation. Lower 6' contains thin bands 1/2"-2" of dark gray argillite. Pieces 1" to 5" in good core.								
36.0	Argillite dark gray with some thin light gray calcareous bands in upper 2'. Pieces 1" to 4" with bedding separations only.								
32.5	Argillite, gray to light gray, highly calcareous. In pieces 4" to 2' showing penecontemporaneous deformation and horizontal separation only.								
40.0	Argillite, dark gray with thin laminae of light gray calcareous material. Pieces 3" to 2' thick.								

DH 16, Continued

Permeability Test: 1.0'-4.5', k= .01 Ft./Day
4.5'-5.7', k= .01 Ft./Day

Flow Tests: 6'-60', k= 1.06 Ft./Day
15'-60', k= 0.93 Ft./Day
20'-25', k= 2.94 Ft./Day
25'-40', k= 0.36 Ft./Day
Unable to test, water coming over casing: 15.0'-20.0', 10.0'-15.0'; 5.0'-10.0'.

Depth to groundwater: 0 Hrs. 8/27/68 - 10.9
24 Hrs. 8/28/68 - Caved at 8.1'

DH 17, ELEV. 339.87, 25+00 Centerline
Logged by: D. T. Harroun & R. Combs
Drilling Equipment: S & H P-35

Hole From	Depth To	Description of Materials	Unif. Soil Class Symb.	STANDARD PENETRATION Type Bit Used	Blows Per 6"	No.	Type	SAMPLES From Ft.	To Ft.	% Rec.
0.0	1.0	Silty clay top soil.		SpT	3-8-18	1	Jar	0.0	1.5	
1.0	4.0	Yellow silty clay with weathered shale fragments, medium plastic, 10%-15% sand, 10%-15% shale fragments.	CL	"	29-28-26	2	"	1.5	3.0	
				"	18-26-40	3	"	3.0	4.5	
				"	64	4	"	4.5	5.0	
				"	50-50	5	"	7.5	8.2	
				NXM			Rod	8.2	9.2	100
				"			"	9.2	13.7	98
4.0	8.2	Weathered shale and silty clay, medium plastic, 15% sand, 70% broken shale.	GC	"			"	13.7	15.3	62
				"			"	15.3	22.0	100
				"			"	22.0	28.4	100
8.2	10.0	Argillite, deeply weathered to light brown in pieces 1/2"-1".		"			"	28.4	34.5	100
				"			"	34.5	40.0	100
10.0	15.3	Argillite, gray and light gray, calcareous. Pieces 2" to 6" with weathering along bedding separations.								
15.3	27.0	Argillite, dark gray with thin, light gray calcareous bands. Pieces 1" to 6" with bedding separations.								
27.0	40.0	Argillite, dark gray interbedded with thin bands of light gray, calcareous material showing penecontemporaneous deformation. Lower 4' predominantly dark gray argillite. Good core, pieces 3" to 3' thick.								

Permeability Test: 3.0'-4.5', k= .28 Ft./Day
4.5'-5.0', k= .02 Ft./Day
5.0'-7.5', k= .48 Ft./Day
7.5'-8.2', k= .007 Ft./Day

Flow Tests: 15'-20', k= 0.24 Ft./Day
20'-25', k= 0.87 Ft./Day
30'-35', k= 0.14 Ft./Day
35'-40', k= 0.07 Ft./Day

Depth to groundwater: 0 Hrs. 8/23/68 - 10.5'
7:30 A.M. 8/26/68 - 11.3'

DH 18, ELEV. 350.33, 27+00. Centerline
Logged by: D. T. Harroun & R. Combs
Drilling Equipment: S & H P-35

Hole From	Depth To	Description of Materials	Unif. Soil Class Symb.	STANDARD PENETRATION Type Bit Used	Blows Per 6"	No.	Type	SAMPLES From Ft.	To Ft.	% Rec.
0.0	1.0	Silty clay top soil.		SpT	1-5-14	1	Jar	0.0	1.5	
1.0	3.0	Yellow silty clay with weathered shale fragments, medium plastic, 10% to 15% sand, 10% to 15% shale fragments.	CL	"	25-32-32	2	"	1.5	3.0	
				"	48-61-50	3	"	3.0	4.5	
				"	28-41-70	4	"	4.5	6.0	
				"	89	5	"	6.0	6.2	
				NXM			Rod	6.2	12.0	95
				"			"	12.0	18.9	100
3.0	6.2	Weathered shale with clay, medium plastic, 70% shale fragments, 10% sand.	GC	"			"	18.9	26.7	100
				"			"	26.7	34.1	100
				"			"	34.1	41.7	100
6.2	16.0	Argillite, dark gray, laminated in part with light gray, calcareous material.		"			"	41.7	49.7	100
				"			"	49.7	55.5	100
				"			"	55.5	59.8	100
				"			"	59.8	67.4	100

TYPICAL LOGS OF TEST HOLES

PEACE VALLEY DAM

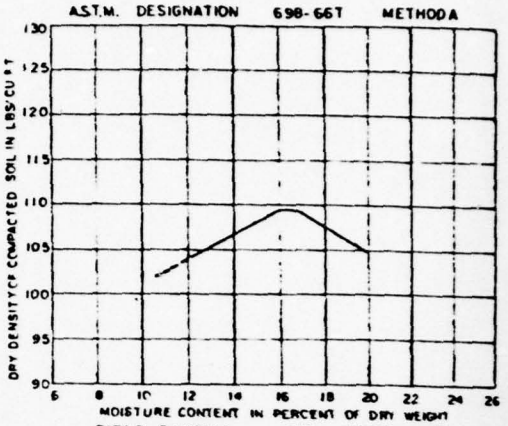
NAT. ID NO. PA.00790 BUCKS COUNTY

DATA OBTAINED FROM U.S. DEPT. OF AGRICULTURE, SOIL CONSERVATION SERVICE, DRAWING NO.PA-617-P , SHEET 57 OF 67

PLATE 12

2

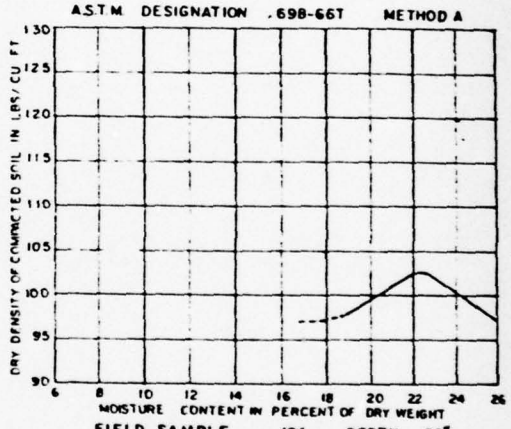
COMPACTION CURVE



FIELD SAMPLE 118 DEPTH 4'

LABORATORY CLASSIFICATION CL

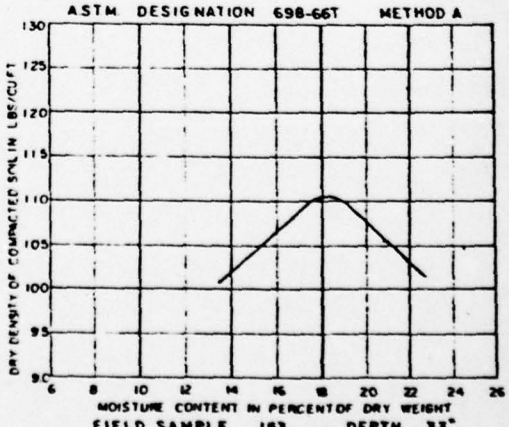
COMPACTION CURVE



FIELD SAMPLE 184 DEPTH 22'

LABORATORY CLASSIFICATION CL

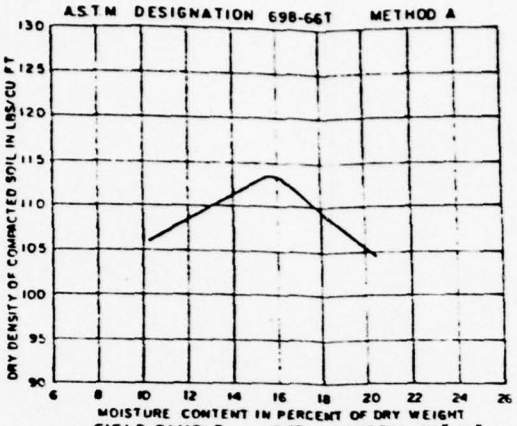
COMPACTION CURVE



FIELD SAMPLE 153 DEPTH 33'

LABORATORY CLASSIFICATION CL

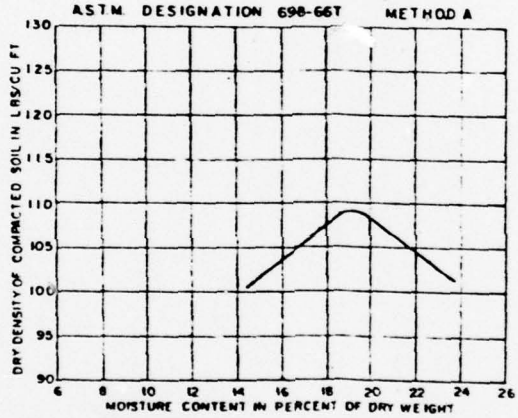
COMPACTION CURVE



FIELD SAMPLE 205 DEPTH 30"-50"

LABORATORY CLASSIFICATION GC

COMPACTION CURVE



FIELD SAMPLE 110 DEPTH 71"

LABORATORY CLASSIFICATION GC

TYPICAL SOIL COMPACTION TEST DATA

PEACE VALLEY DAM

NAT. ID NO. PA.00790 BUCKS COUNTY

DATA OBTAINED FROM U.S. DEPT. OF AGRICULTURE, SOIL CONSERVATION SERVICE, DRAWING NO.PA-617-P , SHEET 67 OF 67

PLATE 13

APPENDIX

E

APPENDIX

F

SITE GEOLOGY
PEACE VALLEY DAM

The Peace Valley Dam is located in the Triassic Lowland section of the Piedmont Physiographic Province. The bedrock in the dam area consists of the black and gray argillites and shales of the Triassic Lockatong formation. In the vicinty of the dam the Lockatong formation is bounded on the southeast by the arkosic sandstones and shales of the Triassic Stockton formation. Both formations are intruded by diabase dikes to the south and east of the dam. Bedding generally strikes to the northeast and dips gently to the northwest at 5° to 20° (Willard, et. al., 1959). Jointing is well developed and closely spaced, generally with a northeast strike and approximately vertical dip (Willard, et. al., 1959; Van Houten, 1969).

The Danborough fault, an eight mile long normal fault has been mapped (Willard, et. al. 1959), as striking along the axis of the reservoir (perpendicular to the dam). Although, as shown on Plate F-1, the fault has not been mapped under the dam (terminating approximately 2000 feet east of the structure); this mapping does not preclude the possibility that the fault may extend beneath the dam (Willard, et. al., 1959). Although the fault trace is not exposed at the surface, mineralized friction breccias have been noted at several places along its length and may be prsent along the fault and along the associated joints near the dam.

Pleistocene deposits are reported to be limited in the dam site area, consisting mainly of thin periglacial materials that cover sections of the stream valley at the higher elevations of this region (Willard, et. al., 1959).

Downstream seepage could be a potential problem if the fault and fracture system and associated breccias extend beneath the dam, and if the fault and fracture system are zones of groundwater transport.

References:

1. *Willard, B., Freedman, J., McLaughlin, D.B., Ryan, D.J., Wherry, E.T., Peltier, L.C., and Gault, H.R., 1959, Geological and Mineral Resources of Buckes County, Pennsylvania, Pa. Geol. Survey, 4th Series, Bull. W-4, 312 p.*

2. *Willard, B., McLaughlin, Watson, E.H., and others, 1950, Geologic Map of Bucks County Pennsylvania, Pa. Geol. Survey, 4th Series, Bull. C-9, Plate 2.*

3. *Van Houten, F.B., 1969, Late Triassic Group, North Central New Jersey and adjacent Pennsylvania and New York, in Subitzky, S. (Ed.), Geology of Selected Areas in New Jersey and Eastern Pennsylvania, pp. 314-347.*

AD-A064 005 WOODWARD-CLYDE CONSULTANTS PLYMOUTH MEETING PA F/G 13/2
NATIONAL DAM INSPECTION PROGRAM. PEACE VALLEY DAM (ID PA-00790)--ETC(U)
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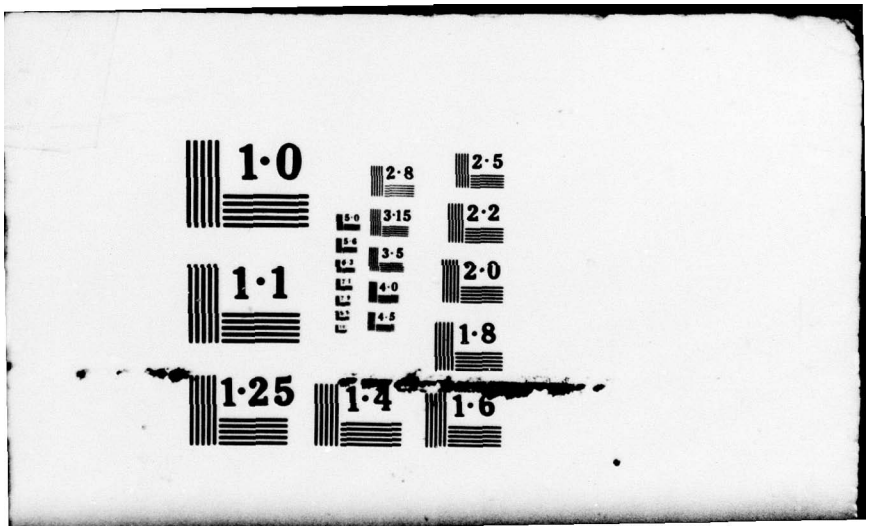
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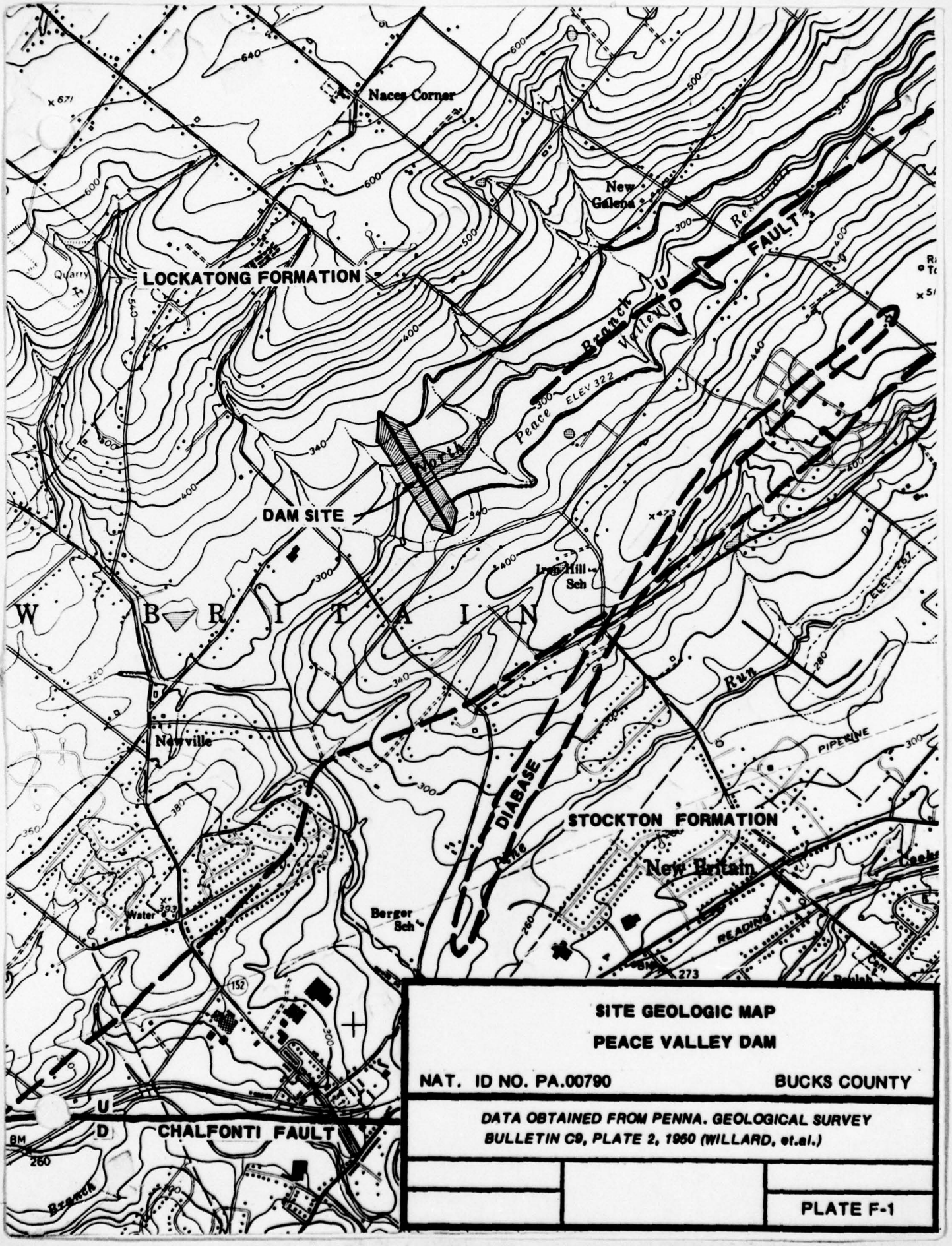

SITE GEOLOGIC MAP

PEACE VALLEY DAM

NAT. ID NO. PA.00790 **BUCKS COUNTY**

DATA OBTAINED FROM PENNA. GEOLOGICAL SURVEY BULLETIN C9, PLATE 2, 1960 (WILLARD, et.al.)

PLATE F-1