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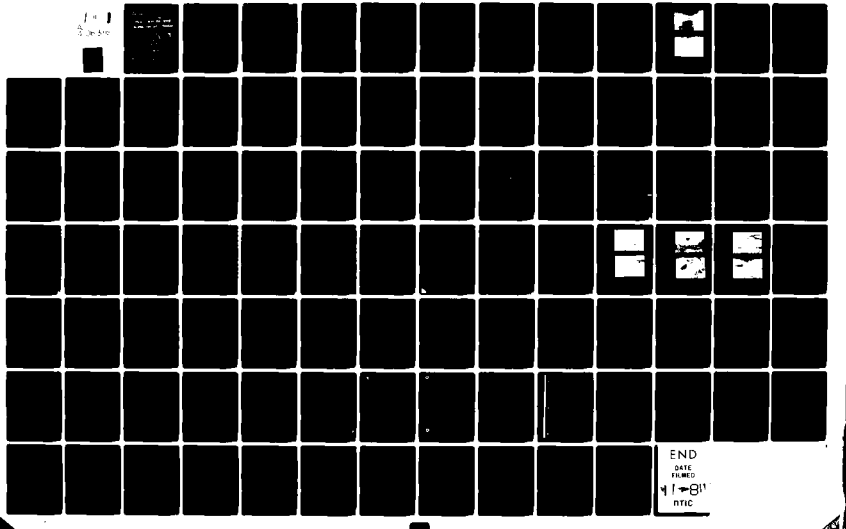

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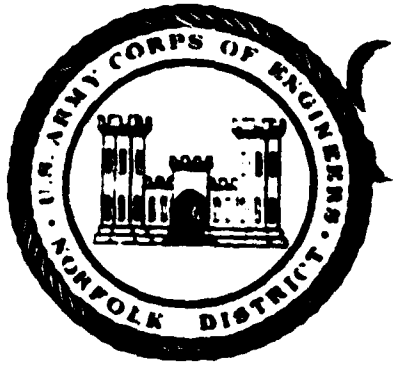
ROANOKE RIVER BASIN

Name Of Dam: LEATHERWOOD CREEK NO. 3

Location: HENRY COUNTY, VIRGINIA

Inventory Number: VA. NO. 00904

PHASE I INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM



PREPARED FOR

NORFOLK DISTRICT CORPS OF ENGINEERS
803 FRONT STREET
NORFOLK, VIRGINIA 23510

BY

SCHNABEL ENGINEERING ASSOCIATES, P.C./
J. K. TIDGENS AND ASSOCIATES, INC.

JUNE 1981

ROANOKE RIVER BASIN

NAME OF DAM: LEATHERWOOD CREEK NO. 3
LOCATION: HENRY COUNTY, VIRGINIA
INVENTORY NUMBER: VA. NO. 08904

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20. Abstract

Pursuant to Public Law 92-367, Phase I Inspection Reports are prepared under guidance contained in the recommended guidelines for safety inspection of dams, published by the Office of Chief of Engineers, Washington, D. C. 20314. The purpose of a Phase I Inspection is to identify expeditiously those dams which may pose hazards to human life or property. The assessment of the general conditions of the dam is based upon available data and visual inspection. Detailed investigation and analyses involving topographic mapping, subsurface investigations, testing, and detailed computational evaluations are beyond the scope of a Phase I investigation; however, the investigation is intended to identify any need for such studies.

Based upon the field conditions at the time of the field inspection and all available engineering data, the Phase I report addresses the hydraulic, hydrologic, geologic, geotechnic, and structural aspects of the dam. The engineering techniques employed give a reasonably accurate assessment of the conditions of the dam. It should be realized that certain engineering aspects cannot be fully analyzed during a Phase I inspection. Assessment and remedial measures in the report include the requirements of additional indepth study when necessary.

Phase I reports include project information of the dam appurtenances, all existing engineering data, operational procedures, hydraulic/hydrologic data of the watershed, dam stability, visual inspection report and an assessment including required remedial measures.

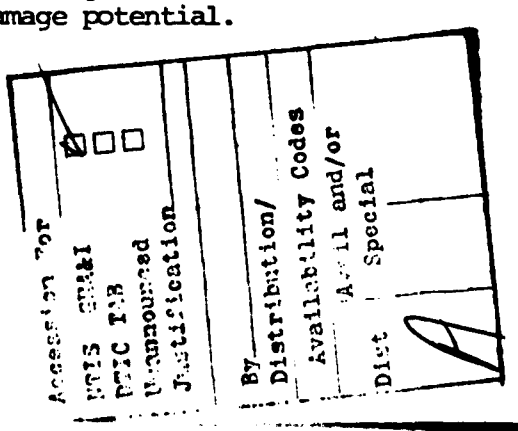
PREFACE

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

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

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

Phase I inspections are not intended to provide detailed hydrologic and hydraulic analyses. In accordance with the established Guidelines, the Spillway Test flood is based on the estimated "Probable Maximum Flood" for the region (greatest reasonably possible storm runoff), or fractions thereof. Because of the magnitude and rarity of such a storm event, a finding that a spillway will not pass the test flood should not be interpreted as necessarily posing a highly inadequate condition. The test flood provides a measure of relative spillway capacity and serves as an aid in determining the need for more detailed hydrologic and hydraulic studies, considering the size of the dam, its general condition and the downstream damage potential.



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PHASE I REPORT
NATIONAL DAM SAFETY PROGRAM

BRIEF ASSESSMENT OF DAM

Name of Dam:	Leatherwood Creek No. 3 Dam
State:	Virginia
Location:	Henry County
USGS Quad Sheet:	Martinsville East
Coordinates:	Lat 36° 44.4' Long 79° 46.3'
Stream:	West Fork, Leatherwood Creek
Date of Inspection:	June 30, 1981

Leatherwood Dam No. 3 is a zoned earthfill structure about 407 ft long and 41.2 ft high. The principal spillway consists of a reinforced concrete riser and a 42 inch diameter concrete outlet pipe which extends through the structure. An earth emergency spillway is located at the left abutment with a 200 ft wide bottom and 3 H:1V side slopes. The structure is classified intermediate in size and is assigned a significant hazard classification. The dam is located on the West Fork of Leatherwood Creek approximately 1.5 miles west of Leatherwood, Virginia. The dam is used for irrigation, flood control and recreational purposes, and is owned and maintained by Mr. Charley M. Finney.

Based on criteria established by the Department of the Army, Office of the Chief of Engineers (OCE), the appropriate Spillway Design Flood (SDF) is the ½ PMF. The spillways will pass 30 percent of the Probable Maximum Flood (PMF) or 60 percent of the SDF without overtopping the dam. During the SDF, the dam will be overtopped for three hours up to a maximum of 1.7 feet and reach a maximum velocity of 5.7 fps. Flows overtopping the dam during the SDF are not considered

detrimental to the embankment with respect to erosion. The spillway is judged inadequate, but not seriously inadequate.

The visual inspection did not reveal any problems which would require immediate attention. A summary of the design stability analyses for the upstream slope under drawdown conditions were reviewed and found to be acceptable. The downstream slope meets requirements recommended by the U. S. Bureau of Reclamation, however, the embankment crest is 6 ft narrower than recommended.

It is recommended that the owner implement an emergency action plan to warn the downstream dwellings of any dangers which may be imminent.

The following routine maintenance and observation functions should be initiated within the next twelve months:

The grass and weeds on the dam embankment and in the emergency spillway should be cut at least once a year and preferably twice a year. Maintenance is recommended in the early summer and fall. Existing trees on the dam should be cut to the ground and removed. Logs laying on the embankment should also be removed.

The eroded area along the left side of the emergency spillway approach channel should be backfilled, compacted and reseeded. Debris should be removed from the trash rack and the top of the riser. A staff gage should be installed to monitor water levels.

SCHNABEL ENGINEERING ASSOCIATES, P.C./
J. K. TIMMONS & ASSOCIATES, INC.

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Commonwealth of Virginia

Submitted by:

Original signed by:
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Acting Chief, Design Branch

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Colonel, Corps of Engineers
Commander and District Engineer

Recommended by:

Original signed by
JACK G. STARR

Jack G. Starr, P.E.
Chief, Engineering Division

Date: SEP 23 1981

Leatherwood Dam No. 3 - Lake

Dam

Overview Photographs

SECTION 1 - PROJECT INFORMATION

1.1 General:

1.1.1 Authority: Public Law 92-367, 8 August 1972, authorized the Secretary of the Army, through the Corps of Engineers, to initiate a national program of safety inspection of dams throughout the United States. The Norfolk District has been assigned the responsibility of supervising the inspection of dams in the Commonwealth of Virginia.

1.1.2 Purpose of Inspection: The purpose is to conduct a Phase I inspection according to the Recommended Guidelines for Safety Inspection of Dams (see Reference 1, Appendix VI). The main responsibility is to expeditiously identify those dams which may be a potential hazard to human life or property.

1.2 Project Description:

1.2.1 Dam and Appurtenances: Leatherwood Creek No. 3 Dam is a zoned earthfill structure approximately 407 ft long and 41.2 ft high.* The crest of the dam is 12 ft wide, and side slopes are approximately 2.5 horizontal to 1 vertical (2.5H:1V) on the upstream and downstream slopes of the dam. A 10 ft wide berm occurs between elevation 745.3 and 746.3 msl on the upstream slope. The upstream slope is 3H:1V below the berm. The crest of the dam is at elevation 772.2 msl. "As built" drawings show the presence of a core trench which extends to "firm bedrock" and a seepage drain beneath the downstream slope. There is no slope protection on the upstream face of the dam.

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*Height is measured from the top of the dam to the downstream toe at the centerline of the stream.

The principal spillway consists of a reinforced concrete riser inlet. The riser has an internal opening of 9 ft by 3.5 ft, and is approximately 27 ft high. The riser has a low level orifice (3.5 ft by 1.25 ft) at an invert elevation of 744.8 msl and two overflow weirs at elevation 755.3 msl. A 36 inch diameter slide gate in the riser at an invert elevation of 733.3 msl is available to drain the lake. The outlet pipe is a 42 inch diameter concrete pipe which outlets at an elevation of 731 msl into a Bradley Perterka impact basin. (See Plate 5, Appendix I.)

The emergency spillway (EMS) consists of a vegetated earthen channel spillway located at the left abutment, having a crest elevation of 766.6 msl. The EMS has a bottom width of 200 ft at the control section and 3H:1V side slopes, and is in a cut section. (See Plate 2, Appendix I.)

1.2.2 Location: Leatherwood Dam No. 3 is located on the west fork of Leatherwood Creek, 1.5 miles west of Leatherwood, Virginia. (See Plate 1, Appendix I.)

1.2.3 Size Classification: The dam is classified as an intermediate size structure based on its height and maximum lake storage potential as defined in Reference 1, Appendix VI.

1.2.4 Hazard Classification: The dam is located in a rural area; however, based upon the proximity of inhabited dwellings located 1.5 miles downstream, and several dwellings 5 miles downstream, the dam is assigned a "significant" hazard classification. The hazard

classification used to categorize a dam is a function of location only and has nothing to do with its stability or probability of failure.

1.2.5 Ownership: The dam is owned and maintained by Mr. Charley M. Finney of Martinsville, Virginia.

1.2.6 Purpose: Recreation and flood control.

1.2.7 Design and Construction History: The dam was designed and constructed under the supervision of the United States Department of Agriculture (USDA), Soil Conservation Service (SCS). The structure was constructed by Larramore Construction Company and completed in 1964.

1.2.8 Normal Operational Procedures: The principal spillway is ungated, therefore, water rising above the low level orifice and overflow weirs of the riser outlet is automatically discharged downstream. Normal pool is maintained at elevation 745 msl just above the invert of the low level orifice in the riser. Flood discharges which cannot be absorbed by storage and the riser, flow through the emergency spillway at pool elevations above 766.6 msl. The 36 inch diameter gate at elevation 732.3 msl is manually operated, and is available to lower the lake elevation below normal pool for maintenance purposes.

1.3 Pertinent Data:

1.3.1 Drainage Area: The drainage area is 9.84 square miles.

1.3.2 Discharge at Dam Site: According to the owner, the maximum known flood at the dam site occurred in April 1977 when an estimated pool elevation of 760 msl was observed. This corresponds to an approximate discharge of 226 CFS.

Principal Spillway Discharge:

Pool Elevation at Crest of Dam (elev 772.2) 272 CFS

Emergency Spillway Discharge:

Pool Elevation at Crest of Dam (elev 772.2) 7500 CFS

1.3.3 Dam and Reservoir Data: See Table 1.1, below:

Table 1.1 - DAM AND RESERVOIR DATA

	Reservoir				
			Storage		
	Elevation feet msl	Area Acres	Volume Acre Feet	Watershed Inches	Length Miles
Crest of Dam	772.2	135	2400	4.6	2.0
Emergency Spillway Crest	766.6	110.5	1695	3.2	1.8
Low Level Orifice Crest	744.8	34	180	.3	.9
Streambed at Downstream Toe of Dam	731.0	-	-	-	-

SECTION 2 - ENGINEERING DATA

2.1 Design: The dam was designed and constructed under the direction of the USDA, Soil Conservation Service (SCS). "As built" drawings and design data are available in the office of the State Conservationist, U. S. Soil Conservation Service, Federal Building, Room 9201, 5th and Marshall Streets, Richmond, Virginia 23240.

A subsurface investigation was conducted at the site by the SCS during the initial design stages. The investigation consisted of excavating 47 test pits. Subsurface profiles and a report of the investigation with foundation recommendations were prepared based upon geologic field reconnaissance, test pit data and laboratory testing. A copy of the design report is included as Appendix IV. Test pit locations, subsurface profiles and test pit logs are presented on Plates 2, 3 and 6 of Appendix I, respectively.

The dam is a zoned, compacted earthfill embankment. The earthfill requirements shown on Plate No. 4, Appendix I, specify that MH materials be placed in Section No.1, i.e. the core of the dam. Soil classification is by the Unified Soil Classification System, ASTM D-2487. The upstream slope, crest and downstream slope (Section No. 2) were to be constructed with SM materials. Select borrow areas for each section of the embankment were specified. "As built" embankment slopes for the structure are illustrated on Plate 4 of Appendix I.

Plate No. 3, Appendix I indicates the dam is founded on overburden and includes a cutoff trench which extends through alluvial and residual soils to "firm rock." The cutoff also extends to the same materials in both abutments. No field permeability tests were taken during the subsurface investigation, however permeability rates of 0.1 ft/day to 10 ft/day were assumed for the foundation soil materials based on similarities with Leatherwood Creek No. 2-A dam site. According to the geotechnical memorandum, Appendix V, "The alluvial sands below 3 to 4 feet were described as 'unstable' with a 'fairly stable' residual sand noted between these and rock. This foundation may be weaker and more compressible than that tested from Site 5."

Although a cutoff or core was specified, a seepage drain was included beneath the downstream slope. The design report stated that the trench drain at "c/b = 0.6" be constructed to control the phreatic line and relieve pressures from seepage through the partially weathered rock. The drain consists of a 4 ft wide trench which includes 6 inch diameter bituminous coated, perforated corrugated metal pipe enclosed in a granular envelope. Design details are included in the back of Appendix V, while "as built" details are shown on Plate 4 of Appendix I.

The principal spillway was designed as a drop inlet structure consisting of a reinforced concrete riser, a 42 inch conduit and Perterka Impact at the outlet end of the conduit. The emergency spillway (EMS) is designed to accommodate a 50 year flood without the pool elevation exceeding the EMS.

The emergency spillway (EMS) consists of a vegetated earthen channel spillway located at the left abutment, having a crest elevation of 766.6 msl. The EMS has a bottom width of 200 ft at the control section and 3H:1V side slopes, and is in a cut section. (See Plates 2 and 3, Appendix I.)

The design report and supplementary data provided by the SCS includes detailed laboratory test data describing the physical properties of the materials used to construct the embankment. Shear parameters used in design of the embankment were determined by consolidated undrained triaxial compression tests as follows:

SECTION	SOIL	SHEAR STRENGTH PARAMETERS	
		Angle of Internal Friction	Cohesion
Embankment	MH	$\emptyset_{cu} = 19^{o}$	c = 800 psf
	SM	$\emptyset_{cu} = 30.5^{o}$	c = 300 psf

Embankment stability was checked by the Swedish Circle Method Analysis and a factor of safety of 1.95 was calculated for full drawdown on the upstream slope (2.5H:1V with berm). A method of "slices" analysis was also performed for a drawdown condition on the upstream slope. The minimum factor of safety calculated was 1.56.

2.2 Construction: The construction records were not furnished by the SCS office in Richmond, but they are available from the SCS office in Washington, D.C.

2.3 Evaluation: "As built" drawings are generally representative of the structure. Field measurements indicate that the embankment crest is 3 ft narrower than shown on the "as built" drawings. Hydrologic and hydraulic calculations were available for evaluation. There is sufficient information to evaluate foundation conditions and embankment stability.

SECTION 3 - VISUAL INSPECTION

3.1 Findings: At the time of inspection, the dam appeared to be in good condition. Field observations are outlined in Appendix III.

3.1.1 General: An inspection was made on June 30, 1981 and the weather was cloudy with a temperature of 80°F. The pool and tailwater levels at the time of inspection were 745 and 731 msl, respectively, which corresponds to normal pool and tailwater elevations. Ground conditions were dry at the time of the inspection. Maintenance inspections are performed jointly by SCS and the Blue Ridge Soil and Water Conservation District on an annual basis. Inspection reports are available in the Soil and Water Conservation District office in Collinsville, Virginia.

3.1.2 Dam and Spillway: The embankment slopes and crest were heavily vegetated with tall grass and briers making observation difficult. Scattered small trees less than 1/4 inch in diameter were also present. A few scattered logs exist on the upstream slope as a result of previous high water, extending to a level equal to the top of the intake structure.

No sloughing or erosion was noted on the embankment, however, very dense vegetation restricted visual observation. The only observed erosion was in the approach channel of the emergency spillway. Along the left upstream edge of the left abutment-emergency spillway contact is a deeply eroded area 7 ft$^{+}_{-}$ deep, 15 ft$^{+}_{-}$ long and 5 ft$^{+}_{-}$ wide. It is filled with weeds and residual soils are exposed.

The downstream toe of the embankment was dry and no seepage was encountered. Two 6-inch CMP toe drains were encountered, one on the left and one on the right side of the plunge pool. No flow was observed, as the plunge pool level was slightly above the toe drain inverts.

The riser structure and outlet pipe showed no signs of deterioration and were functioning properly at the time of inspection. Debris was

present in the low level intake trash rack and logs were present on top of the riser. According to the owner, the slide gate has not been operated since it was installed. The impact basin and outlet channel indicated no signs of deterioration. The emergency spillway was well vegetated except for the previously described minor erosion in the approach channel.

3.1.3 Reservoir Area: The reservoir area was free of debris and the perimeter was wooded. The reservoir is located in a valley with gentle side slopes. Water was clear and sedimentation was not observed.

3.1.4 Downstream Area: The downstream channel is 15 ft wide and is located in a valley with steep side slopes. This valley is heavily wooded except for an area 50 ft either side of the channel which is a meadow. Approximately 1.5 miles downstream, there is a dwelling about 15 ft above the stream channel. Approximately 5 miles downstream, there are several dwellings about 10 ft above the stream channel and several commercial facilities 15 ft above the channel.

3.1.5 Instrumentation: No instrumentation (monuments, observation wells, piezometers, etc.) was encountered for the structure. There is no staff gage.

3.2 Evaluation:

3.2.1 Dam and Spillway: Overall, the dam was in good condition at the time of the inspection. There is an annual inspection and maintenance program for this structure. Maintenance of the dam at the time of the inspection appeared to be inadequate. The embankment, including its crest

and slopes should be mowed at least once a year, but more preferably twice a year. The presence of trees on the embankment, particularly those at pool level on the upstream slope, may promote the development of deep rooted vegetation and this type growth can encourage piping within an embankment. All trees growing on the embankment should be cut to the ground and removed from the embankment. Logs laying on the embankment should also be removed.

The erosion observed in the emergency spillway should be corrected. It is recommended that the eroded area be properly backfilled, compacted, and the surface reseeded to prevent further erosion.

The outlet pipe and intake structures are in good structural condition. The condition of the operating appurtenances could not be determined. Debris should be removed from the trash rack and the top of the riser. A staff gage should be installed to monitor water levels.

3.2.2 Downstream Area: A breach in the Leatherwood Creek No. 3 Dam during extreme flooding would possibly create a hazard to the downstream dwellings.

SECTION 4 - OPERATIONAL PROCEDURES

4.1 Procedures: The normal storage pool is elevation 745 msl or 0.2 ft above the crest of the principal spillway low flow inlet. The lake provides an irrigation supply, flood control and recreation. Water automatically passes through the principal spillway as the water level in the reservoir rises above the low level crest. Water will also pass automatically through the overflow crest when the water level in the reservoir exceeds elevation 755.3 msl and automatically through the emergency spillway when the pool level exceeds elevation 766.6 msl. A 36 inch slide gate valve at the low point in the riser structure is provided to drawdown the reservoir below normal pool.

4.2 Maintenance of Dam and Appurtenances: Maintenance is the responsibility of the owner and the Blue Ridge Soil and Water Conservation District. Maintenance is accomplished by a joint annual inspection by SCS and Soil and Water Conservation District personnel. Maintenance deficiencies are noted and recommended remedial measures are made to the owner. If the owner fails to comply with these recommendations, maintenance is then performed by the Blue Ridge Soil and Water Conservation District.

4.3 Warning System: At the present time, there is no warning system or evacuation plan for the dam. The dam is monitored by SCS personnel during periods of heavy precipitation and runoff.

4.4 Evaluation: The dam and appurtenances are in good operating condition, but maintenance of the dam appeared to be inadequate. An emergency operation and warning plan should be developed. It is recommended that a formal emergency procedure be prepared and furnished to all operating personnel. This should include:

a. How to operate the dam during an emergency.

b. Who to notify, including public officials, in case evacuation from the downstream area is necessary.

SECTION 5 - HYDRAULICS/HYDROLOGIC DATA

5.1 Design: Leatherwood Dam No. 3 was designed by the Soil Conservation Service (SCS) as a multi-purpose dam, and hydrologic and hydraulic data is available, and stage-storage and stage-discharge data were used in the evaluation. This structure is a Class "A" dam according to the SCS classification method.

5.2 Hydrologic Records: There are no records available.

5.3 Flood Experience: According to Mr. Charley M. Finney, an estimated maximum pool elevation of 760 msl occurred in April 1977. This corresponds to a peak flow of approximately 276 CFS.

5.4 Flood Potentials: In accordance with the established guidelines, the Spillway Design Flood (SDF) is based on the estimated "Probable Maximum Flood" for the region (flood discharges that may be expected from the most severe combination of critical meteorologic and hydrologic conditions that are reasonably possible in the region), or fractions thereof. The Probable Maximum Flood (PMF) and ½ PMF hydrographs were developed by the HEC-1 DB Computer Program(Reference 4,Appendix VI). Precipitation amounts for the flood hydrograph of the PMF were taken from the U.S. Weather Bureau Information (References 5 and 6, Appendix VI). Appropriate adjustments for basin size and shape were accounted for. These hydrographs were routed through the reservoir to determine maximum pool elevations.

5.5 Reservoir Regulations: For routing purposes, the pool at the beginning of flood was assumed to be at elevation 745 msl. Reservoir stage-storage data and stage-discharge data were utilized from the existing design report. Floods were routed through the reservoir using the principal spillway discharge up to a pool storage elevation of 766.6 msl and a combined principal and emergency discharges for pool elevations above 766.6 msl. Pool elevations above 772.2 msl were routed over the non-overflow section of the dam.

5.6 Overtopping Potential: The predicted rise of the reservoir pool and other pertinent data were determined by routing the flood hydrographs through the reservoir as previously described. The results for the flood conditions (½ PMF and PMF) are shown in the following Table 5.1:

TABLE 5.1 - RESERVOIR PERFORMANCE

		Hydrograph	
	Normal Flow	½ PMF	PMF
Peak Flow, CFS			
Inflow	10	19,408	38,817
Outflow	10	18,578	37,132
Maximum Pool Elevation Ft, msl	745	773.9	776.4
Non-Overflow Section (Elev 772.2 msl)			
Depth of Flow, Ft	-	1.7	4.2
Duration, Hours	-	3.0	5.0
Velocity, fps*	-	5.7	8.9
Tailwater Elevation Ft, msl	731	747.8	753

*Critical velocity

5.7 Reservoir Emptying Potential: A 36 inch diameter gate at an elevation 732.3 msl is capable of draining the reservoir through the outlet pipe. Assuming that the lake is at normal pool elevation (745 msl) and there is 10 cfs inflow, it would take approximately 1.5 days to lower the reservoir to elevation 733.8 msl. This is equivalent to an approximate drawdown rate of 7.5 ft/day based on the hydraulic height measured from normal pool to the invert of the drawdown pipe divided by the time to dewater the reservoir.

5.8 Evaluation: The U. S. Army, Corps of Engineers' guidelines indicate the appropriate Spillway Design Flood (SDF) for an intermediate size, significant hazard dam is the ½ PMF to PMF. Because of the risk involved, the ½ PMF has been selected as the SDF. The spillway will pass 30 percent of the PMF without overtopping the crest of the dam (60 percent of the SDF). During the SDF, the dam will be overtopped for three hours up to maximum of 1.7 feet and reach a maximum velocity of 5.7 fps.

Hydrologic data used in the evaluation pertains to present day conditions with no consideration given to future development.

SECTION 6 - DAM STABILITY

6.1 Foundation and Abutments: The dam is located along the western edge of the Piedmont Physiographic Province of Virginia. The site is underlain by the Leatherwood Granite, which is typically a coarse grained to porphyritic granite and is approximately 1020 million years old. Detailed geologic maps of the area do not indicate the presence of any faults in the site vicinity. Site geology is presented in more detail in the Design Geologic Report, which is included as Appendix IV.

The subsurface investigation indicated that along the centerline of the dam, the site was underlain by shallow alluvial and residual soils over weathered bedrock. The bedrock surface was somewhat irregular along the principal spillway. Bedrock was encountered from 3 to 5 ft on the right abutment and 1 to 5 ft on the left abutment. Test pits showed the emergency spillway cut to be free of rock except at Station 4+20 on the centerline.

The alluvial sands below 3 to 4 ft were described as "unstable with a fairly stable residual sand noted between these and rock." It was recommended in design that areas of low density silt or sand under the fill with density less than 77.0 pcf should be removed and replaced with compacted fill. It was stated in the design report (Appendix V) that "this foundation may be weaker and more compressible than that tested from Site 5."

The potential for seepage through the foundation was recognized, and a cutoff or core was included in the design. Moderate permeabilities were anticipated for the overburden soils and the designer expected some seepage through all weathered bedrock. The "as built" drawings show the presence of a drainage trench under the downstream portion of the embankment to collect any seepage which may occur.

6.2 Embankment:

6.2.1 Materials: "As built" drawings indicate the dam is a zoned structure. Section No. 1 of the dam, consisting of the cutoff and interior core, was constructed with soils classifying as MH. Section No. 2 (the upstream slope, the downstream slope and crest) was constructed with SM materials. All specified materials were excavated from select borrow areas. Fill materials in both sections were to be compacted to 95% of maximum dry density in accordance with ASTM Standard D-698 (Standard Proctor). Compacted densities and shear strength values for the embankment materials are summarized on page 2 of Appendix V. Specifications for maximum lift thickness and maximum rock sizes were not observed in the design data provided.

No one-dimensional consolidation test was performed, however, the SCS soil mechanics laboratory estimated from the consolidation phase of the shear tests that approximately 5% settlement might be expected in the base of the fill. It was recommended that a 1.25 ft overfill be provided to compensate for residual settlement in the fill and foundation.

6.2.2 Subdrains and Seepage: In attempt to control seepage, a cutoff was constructed to bedrock below the more permeable alluvial soils in the floodplain and extending into the abutments. Details are shown on Plate 3 of Appendix I. An internal drainage system was also constructed, consisting of a drainage trench beneath the downstream portion of the embankment to collect any seepage which may occur. Drainage pipes were provided for transmitting the collected water to the plunge pool. During the field inspection it could not be determined if the drains were functioning properly because their inverts were below the discharge pool level. In attempt to prevent piping around the principal spillway pipe, 7 anti-seep collars were included as shown on Plate 5 of Appendix I.

6.2.3 Stability: A stability analysis was performed for the upstream slope at this structure and the report describing the engineering design data used is included in Appendix V. These data were reviewed along with the stability analysis and were found to be acceptable. The minimum factor of safety calculated for the upstream slope for the drawn down condition is 1.56 as given in Appendix V. Reference 1, Appendix VI, recommends a factor of safety of 1.2. A stability analysis was not performed for the downstream slope.

The dam is 41.2 ft high and has a crest width of 12 ft. The upstream slope is 2.5H:1V with a 10 ft wide berm at pool level between elevations 780.5 and 781.5 msl. The upstream slope then continues at a 3H:1V slope below normal pool. The downstream slope is 2.5H:1V. The dam can be subjected to a sudden drawdown since the lake level can be drawn down at a rate of 7.5 ft/day. This exceeds the critical rate of 0.5 ft per day for earth dams. According to the guidelines presented in Design of Small Dams,

U. S. Department of the Interior, Bureau of Reclamation for small homogeneous dams, with stable foundation, subjected to a drawdown and with an embankment of SM to MH materials, the recommended downstream slopes range from 2H:1V to 2.5H:1V. (A homogeneous dam was considered for this evaluation because Section No. 2 materials are not as coarse as those described as shell material in the Design of Small Dams.) The recommended crest width is 18 ft. Based upon these general guidelines, the downstream slope is adequate, although, the embankment crest is 6 ft narrower than recommended.

6.2.4 Seismic Stability: The dam is located in Seismic Zone 2. Therefore, according to the Recommended Guidelines for Safety Inspection of Dams, the dam is considered to have no hazard from earthquakes provided static stability conditions are satisfactory and conventional safety margins exist.

6.3 Evaluation: Based upon the visual inspection and the design report, the foundation is considered sound. The factor of safety for the upstream slope during the drawdown condition meets the U. S. Army, Corps of Engineers guidelines. Although a stability analysis was not performed for the downstream slope, the "as built" slope meets the requirements recommended by the U. S. Bureau of Reclamation. Overtopping is not considered detrimental to the dam with respect to erosion because of the shallow depth and short duration of flood. Also the critical velocity is slightly less than 6 fps, the assumed effective eroding velocity for a vegetated earth embankment. The embankment crest is 6 ft narrower than recommended by the U. S. Bureau of Reclamation, however, based upon the

performance history of the structure and the short overtopping duration, the narrow width is not considered a problem.

Since no undue settlement, cracking or sloughing was noted at the time of inspection, it appears that the embankment is adequate for maximum control storage with water at elevation 745 msl.

SECTION 7 - ASSESSMENT/REMEDIAL MEASURES

7.1 Dam Assessment: Sufficient engineering data is available for assessing the dam. The visual inspection revealed no findings that proved the dam to be unsound. There is an annual inspection and maintenance program for this structure, but there is no emergency operation and warning plan. Overall, the dam was in good condition at the time of inspection. U. S. Army, Corps of Engineers guidelines indicate the appropriate Spillway Design Flood (SDF) for this dam is the ½ PMF. The spillway will pass 30 percent of the PMF (60 percent of the SDF) without overtopping the crest of the dam. During the SDF, the dam will be overtopped for three hours up to a maximum of 1.7 feet and reach a maximum velocity of 5.7 fps. Flows overtopping the dam at a maximum velocity of 5.7 fps during the SDF are not considered detrimental to the embankment with respect to erosion. The spillway is judged inadequate, but not seriously inadequate. Field measurements indicate the embankment crest is 3 ft narrower than shown on the "as built" drawings. Review of available stability data indicates the structure is stable as designed.

7.2 Recommended Remedial Measures:

7.2.1 Emergency Operation and Warning Plan: It is recommended that a formal emergency procedure be prepared, prominently displayed, and furnished to all operating personnel. This should include:

1) How to operate the dam during an emergency.
2) Who to notify, including public officials, in case evacuation from the downstream area is necessary.

7.3 Required Maintenance: The inspection revealed the following maintenance items that should be scheduled by the owner during a regular maintenance period within the next 12 months.

a) The grass and weeds on the dam embankment and in the emergency spillway should be cut at least once a year and preferably twice a year. Maintenance is recommended in the early summer and fall.

b) Existing trees on the dam should be cut to the ground and removed from the embankment. Logs laying on the embankment should also be removed.

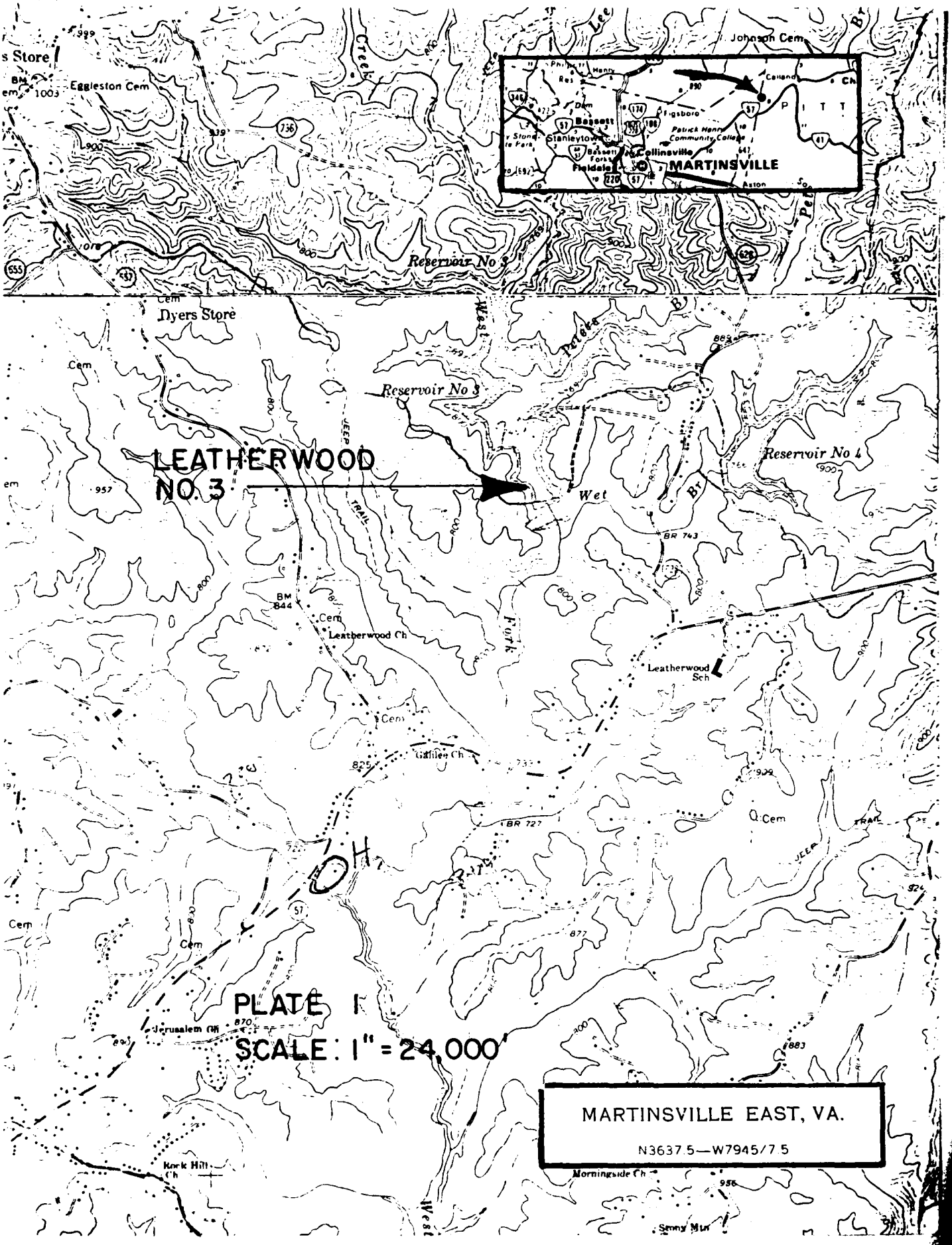
c) The eroded area along the left side of the emergency spillway approach channel should be backfilled, compacted and reseeded.

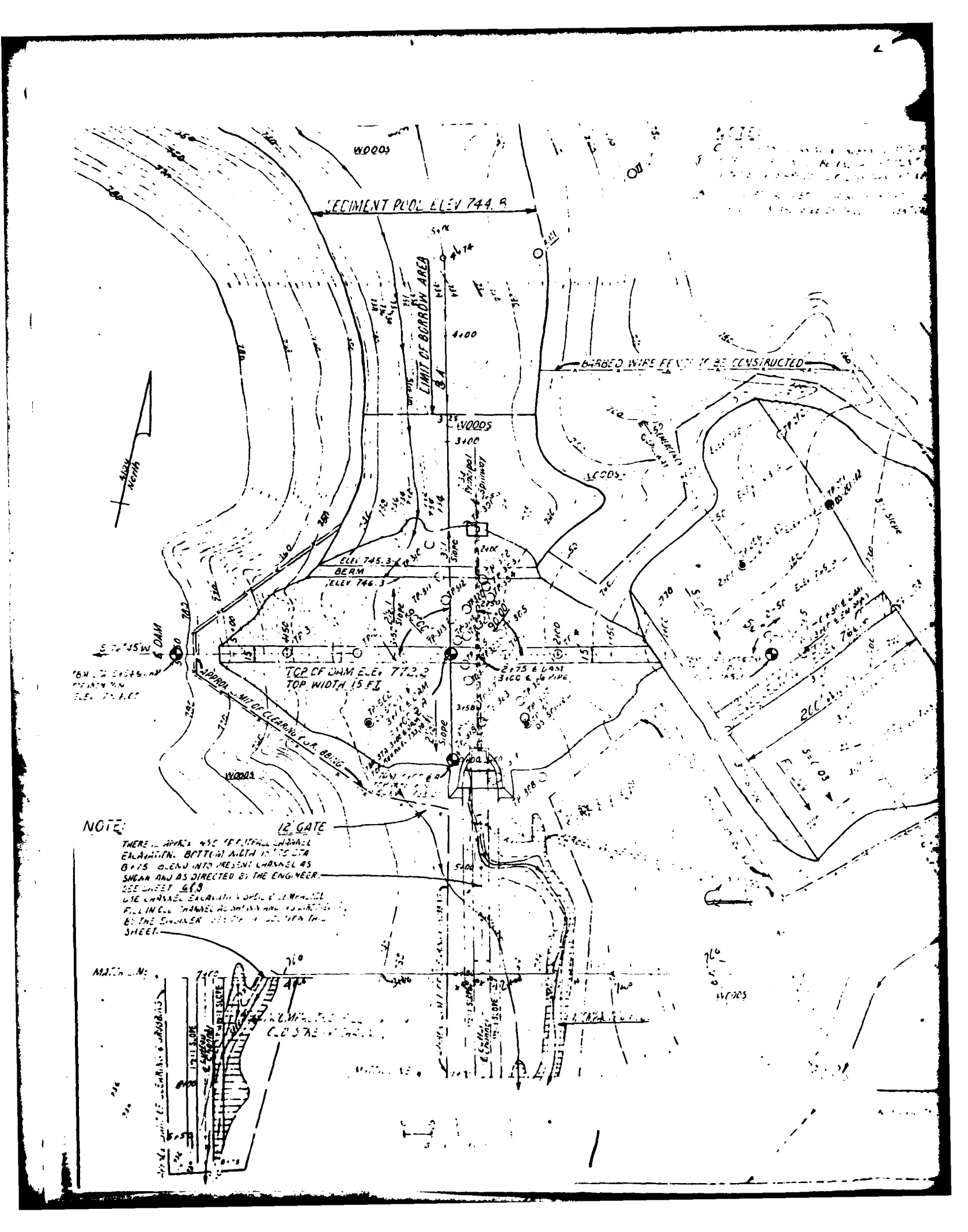
d) Debris should be removed from the trash rack and the top of the riser.

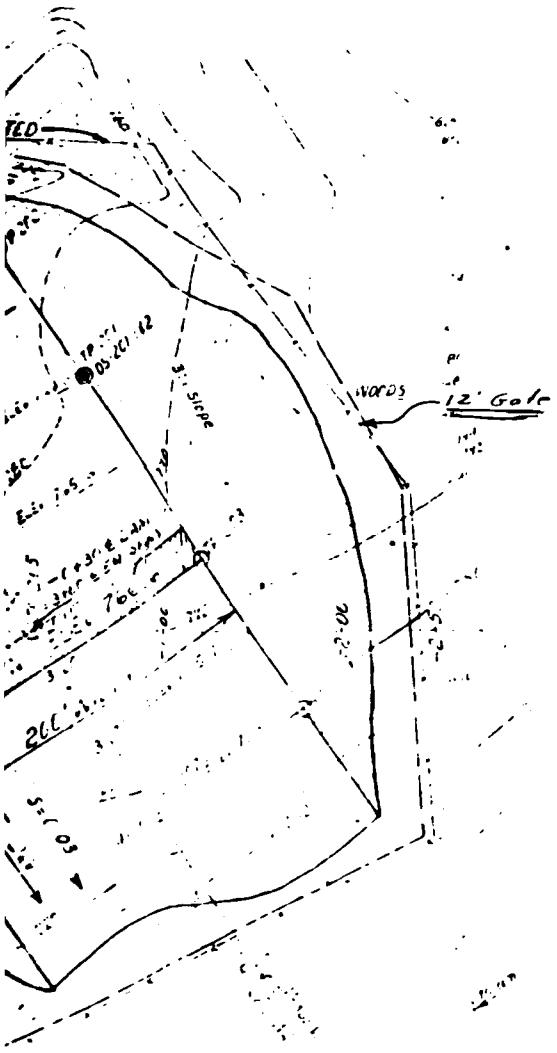
e) A staff gage should be installed to monitor water levels.

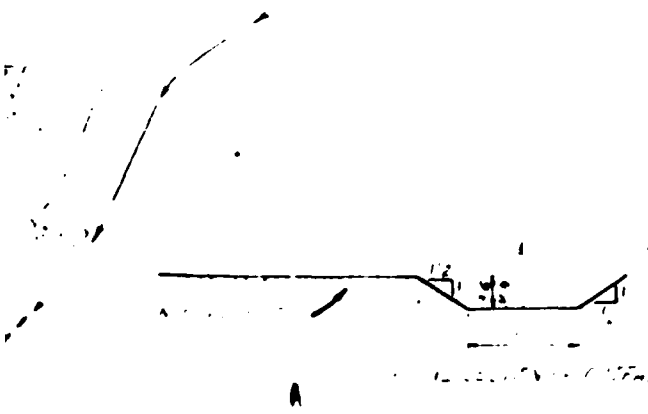
APPENDIX I

MAPS AND DRAWINGS


Eggleston Cem
Johnson Cem
Reservoir No 2
Dyers Store
Reservoir No 3
Reservoir No 4
LEATHERWOOD
NO. 3
Leatherwood Ch
Leatherwood Sch
Galilee Ch
Jerusalem Ch
Kirk Hill Ch
Morningside Ch
MARTINSVILLE
PLATE I
SCALE: 1" = 24,000'
MARTINSVILLE EAST, VA.
N3637.5—W7945/7.5


WOODS
SEDIMENT POOL ELEV 744.9
LIMIT OF BORROW AREA
BARBED WIRE FENCE TO BE CONSTRUCTED
WOODS
WOODS
ELEV 745.3
BERM
ELEV 746.3
TOP OF DAM ELEV 772.3
TOP WIDTH 15 FT
ADDRA LIMIT OF CLEARING & GR. BRUSH
WOODS
12' GATE
NOTE:
THERE IS APPROX 450' OF TRAPEZOIDAL CHANNEL EXCAVATION. BOTTOM WIDTH IS 75' DIA B+15 BLEND INTO PRESENT CHANNEL AS SHOWN AND AS DIRECTED BY THE ENGINEER. SEE SHEET 6 & 8
USE CHANNEL EXCAVATION SPOIL FOR EMBANKMENT FILL IN CUT CHANNEL AS SHOWN AND AS DIRECTED BY THE ENGINEER. SEE PLAN AND PROFILE THIS SHEET.
MATCH LINE
266'
WOODS
SEC 05

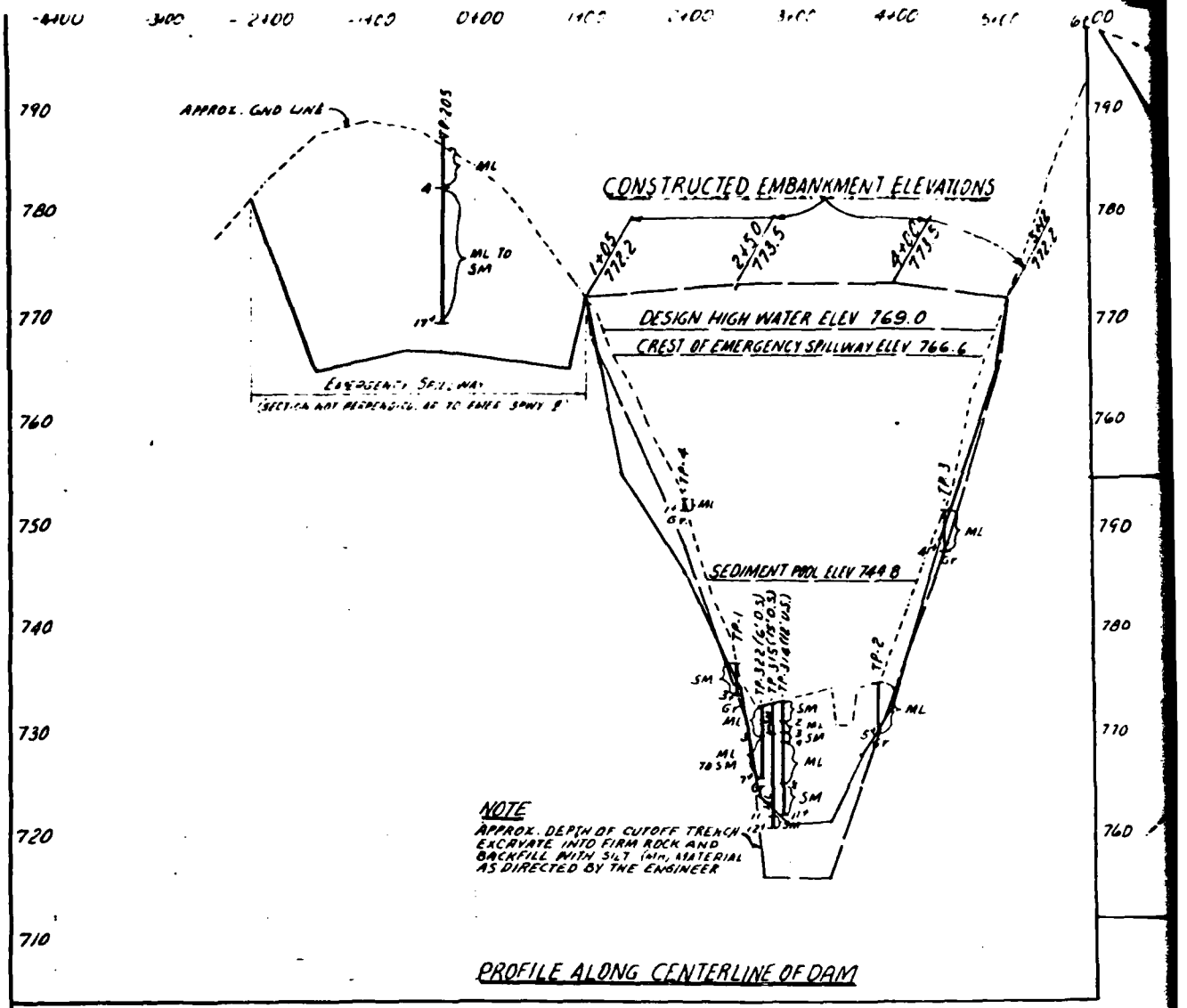


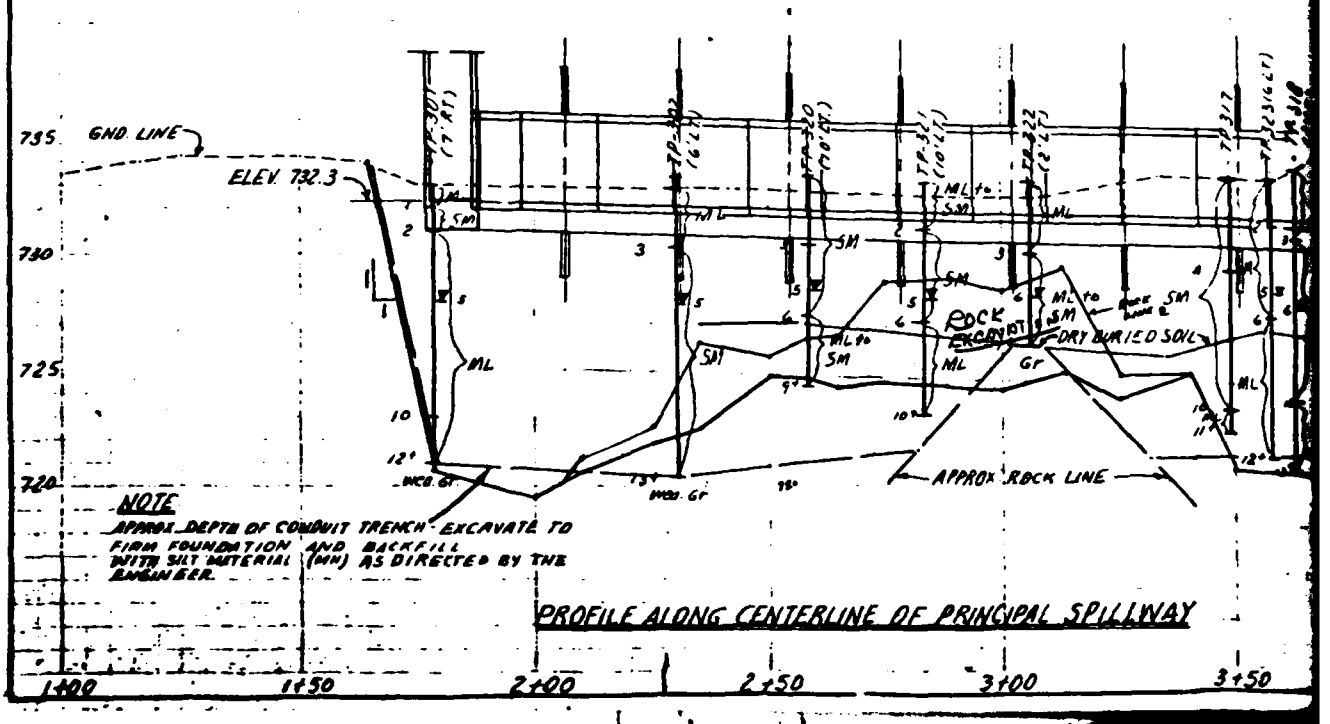


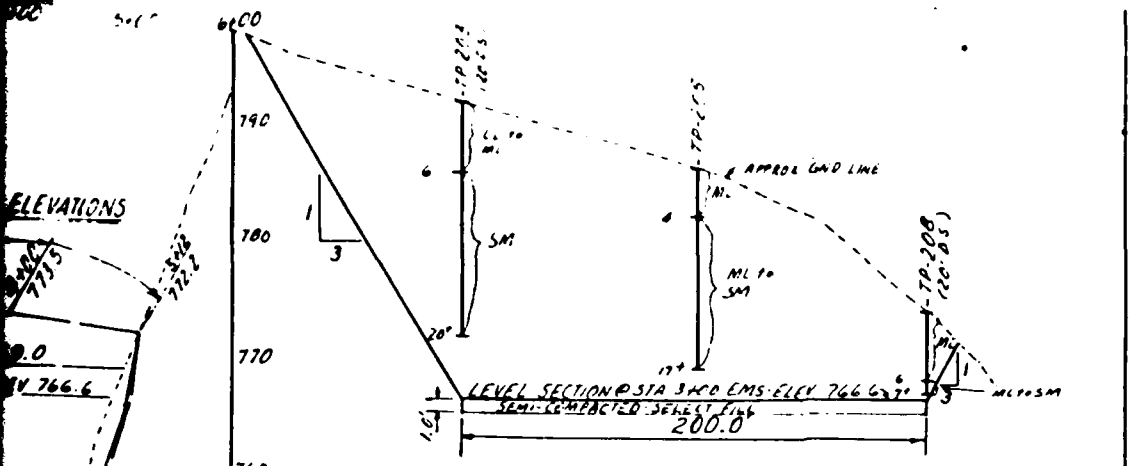
"AS BUILT"

U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

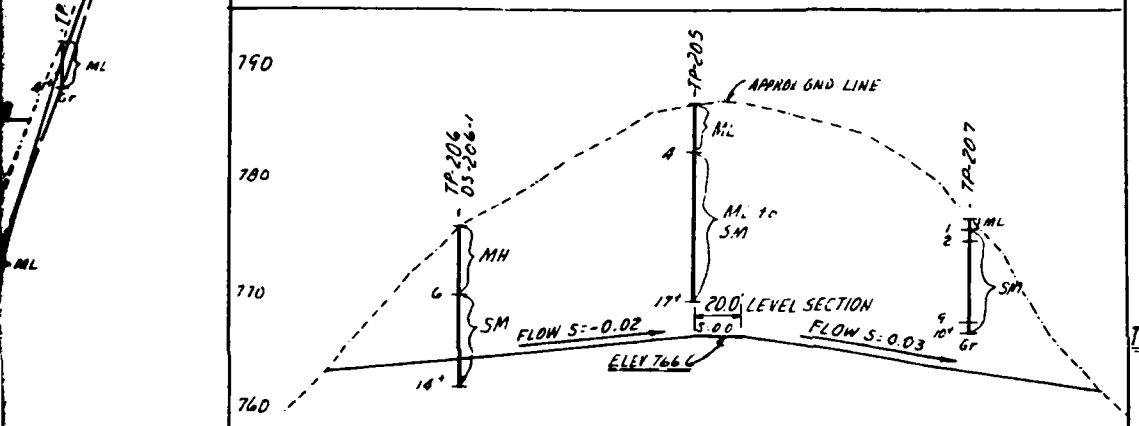
PLATE 2


CONSTRUCTED EMBANKMENT ELEVATIONS
DESIGN HIGH WATER ELEV 769.0
CREST OF EMERGENCY SPILLWAY ELEV 766.6
SEDIMENT POOL ELEV 749.8
APPROX. GND LINE
EMERGENCY SPILLWAY
NOTE
APPROX. DEPTH OF CUTOFF TRENCH EXCAVATE INTO FIRM ROCK AND BACKFILL WITH SILT (ML) MATERIAL AS DIRECTED BY THE ENGINEER
PROFILE ALONG CENTERLINE OF DAM

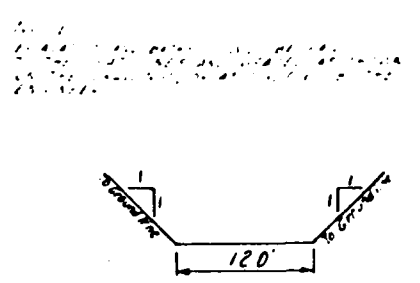

GND. LINE
ELEV. 732.3
ROCK EXCAVATION
DRY BURIED SOIL
APPROX. ROCK LINE
NOTE
APPROX. DEPTH OF CONDUIT TRENCH EXCAVATE TO FIRM FOUNDATION AND BACKFILL WITH SILT MATERIAL (ML) AS DIRECTED BY THE ENGINEER.
PROFILE ALONG CENTERLINE OF PRINCIPAL SPILLWAY



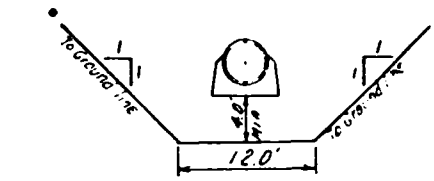
TYPICAL EXCAVATION SECTION OF EMERGENCY SPWY.



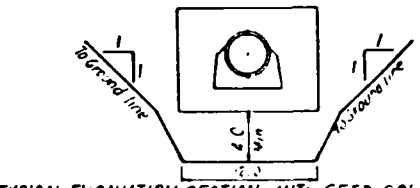
PROFILE ALONG CENTERLINE OF EMERGENCY SPILLWAY



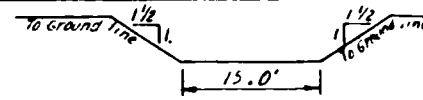
TYPICAL EXCAVATION SECTION-CUTOFF TRENCH



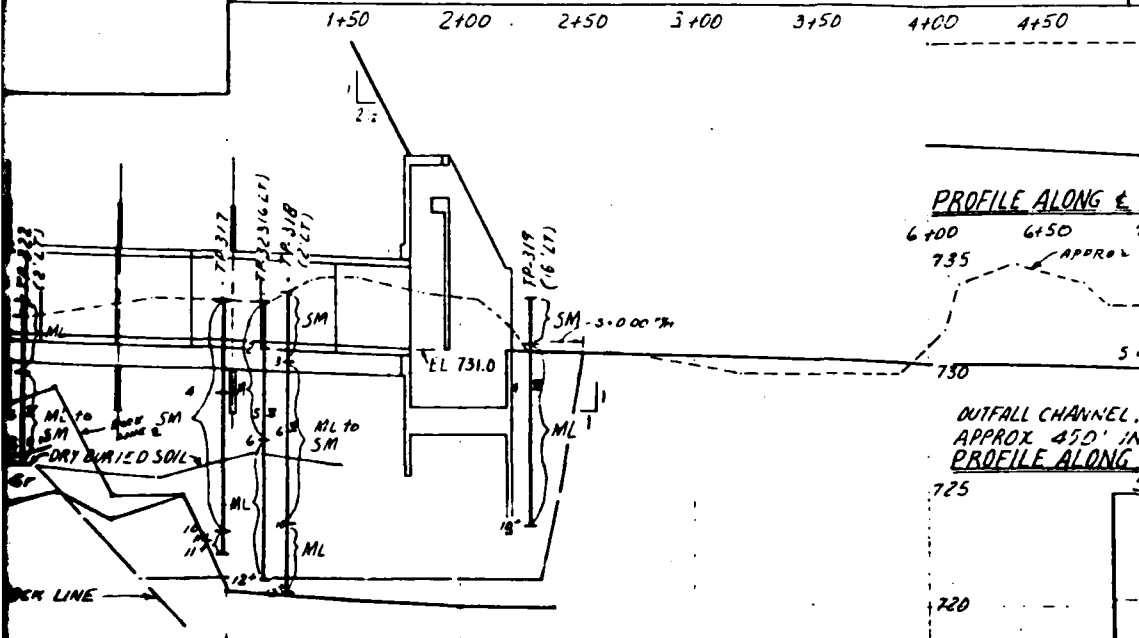
TYPICAL EXCAVATION SECTION-CONDUIT TRENCH

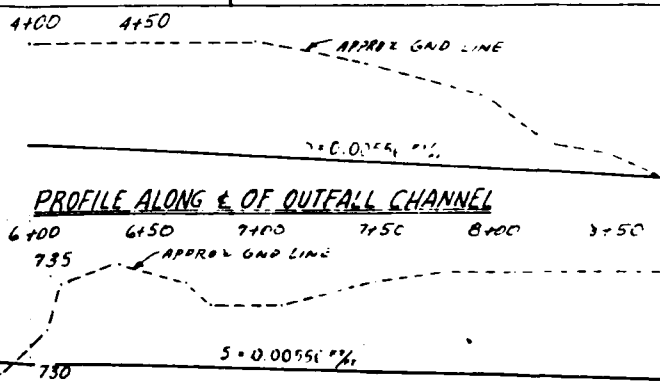


TYPICAL EXCAVATION SECTION-ANTI-SEEP COLLARS



TYPICAL EXCAVATION SECTION-OUTFALL CHANNEL





PROFILE ALONG ℄ OF OUTFALL CHANNEL

OUTFALL CHANNEL, 12' BOTTOM WIDTH 1½:1 SIDE SLOPES
APPROX 450' IN LENGTH

PROFILE ALONG ℄ OF OUTFALL CHANNEL

"AS BUILT"

DAM NO. 3 PETERS BRANCH
LEATHERWOOD CREEK WATERSHED
HENRY COUNTY, VIRGINIA
PROFILES AND TYPICAL EXCAVATION SECTIONS

U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

N.W. WILSON 9-63
L.S. COFFMAN 9-63
S.E. Romine 9-63

PLATE 3

6/13 VA-483-P

NOTES

1. THE FLEXIBLE DRAIN PIPE, PERFORATED [illegible] BE 6" DIA. ANNULAR OR SPIRAL 16 GAUGE [illegible] MANUFACTURED CORRUGATED METAL PIPE WITH STD COUPLING BANDS.

2. [illegible] SHALL BE LAID WITH 3/8" DIA. PERFORATIONS DOWN.

[illegible] PERFORATED 6" DIA. PIPE IN EACH SIDE OF [illegible] BASIN

FILTER MATERIAL

16.0'

90° ELBOW

5.5'

[illegible] SEE SECTION THRU WALL

SMALL ANIMAL LOADS DETAIL, SHEET 11

[illegible] BASIN AND [illegible] SPILLWAY

90° ELBOW

5.5'

[illegible] SEE SECTION THRU WALL

4.0'

PLAN VIEW

[illegible] SLOPE

ELEV. 753.0

INVERT ELEV 751.3

APPROX. STRIPPED GROUND LINE

4.0

0 MIN.

SECTION ALONG CENTER LINE

SEE PAGE [illegible] FOR DETAILS

[illegible] FEET

SCALE

[illegible] SECTION

ELEV. 745.3

ELEV. 746.3

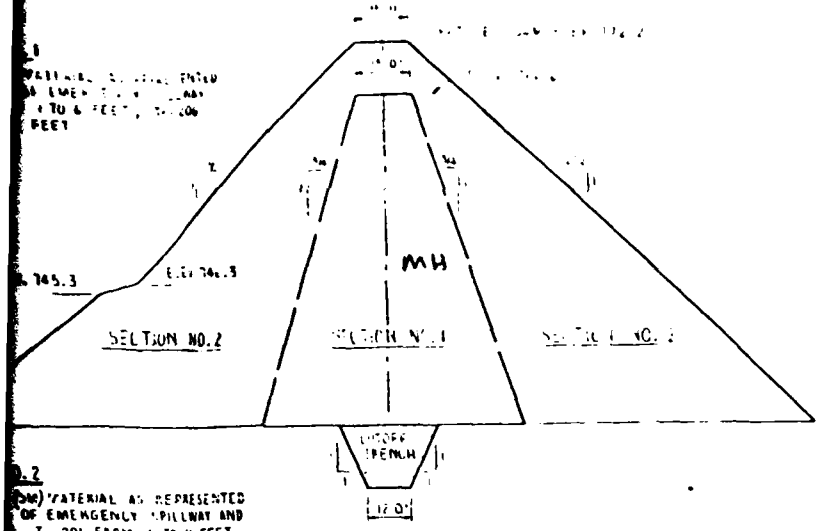
SECTION NO. 2

SECTION NO. 2

[illegible] MATERIAL AS REPRESENTED BY THE LOGS OF EMERGENCY SPILLWAY AND BORROW AREA [illegible] 201 FROM 0 TO 16 FEET, TP 150 FROM 0 TO 6 FEET, TP 102 FROM 0 TO 13 FEET, TP 206 FROM [illegible] TO 4 FEET

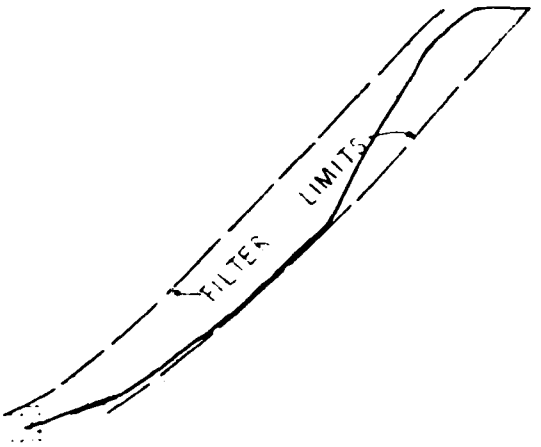
[illegible] SPILLWAY

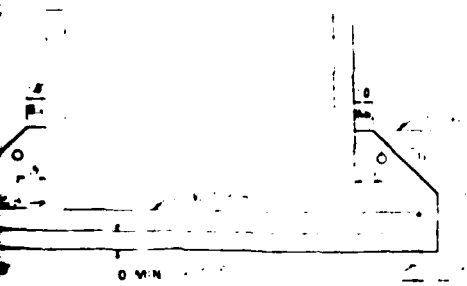
0 MIN.



TYPICAL SECTION OF COMPACTED DAM

NOT TO SCALE





"AS BUILT"

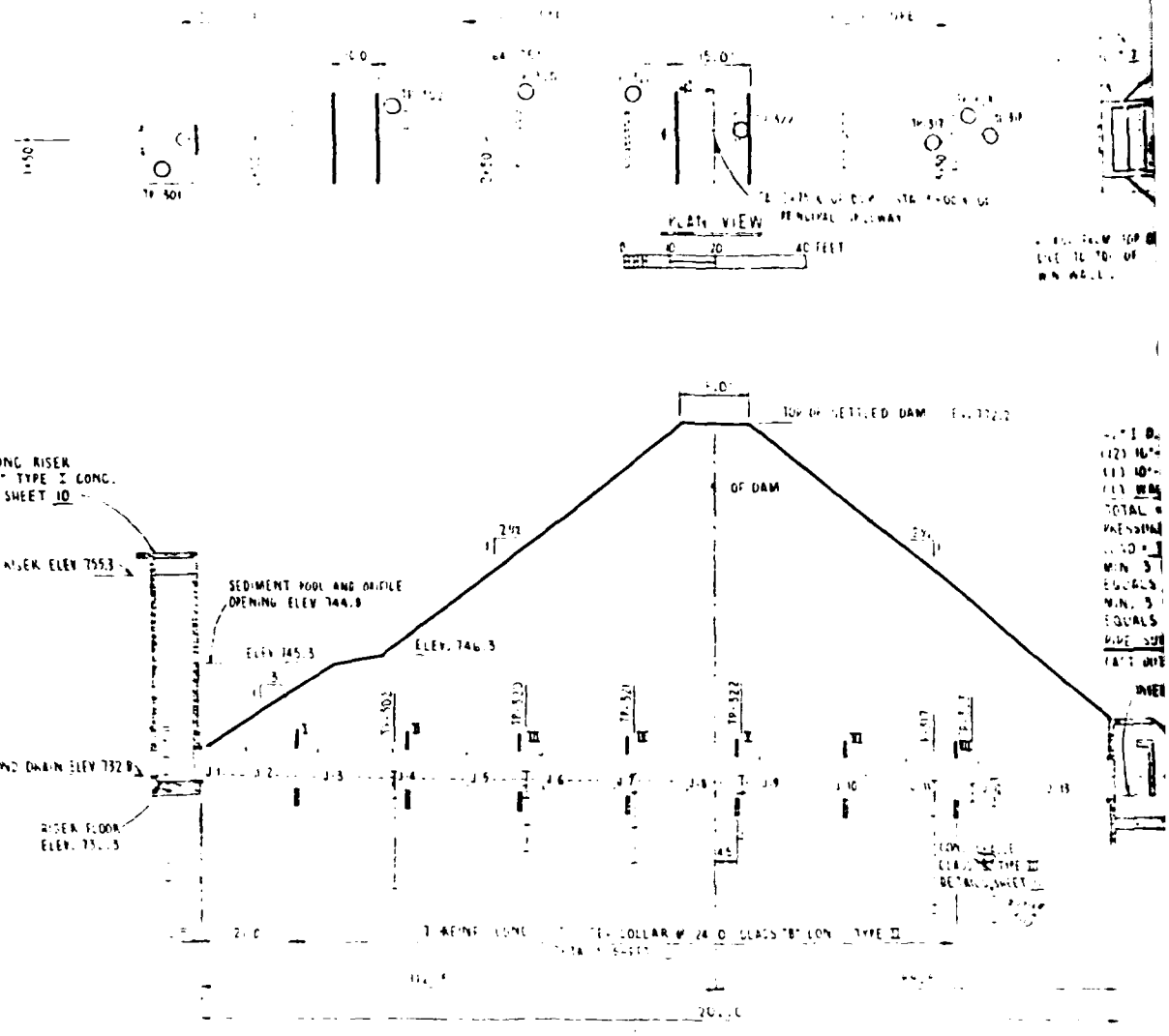
DAM NO 3 PETERS BRANCH
LEATHERWOOD CREEK WATERSHED
HENRY COUNTY, VIRGINIA
SEEPAGE DRAIN DETAIL

U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

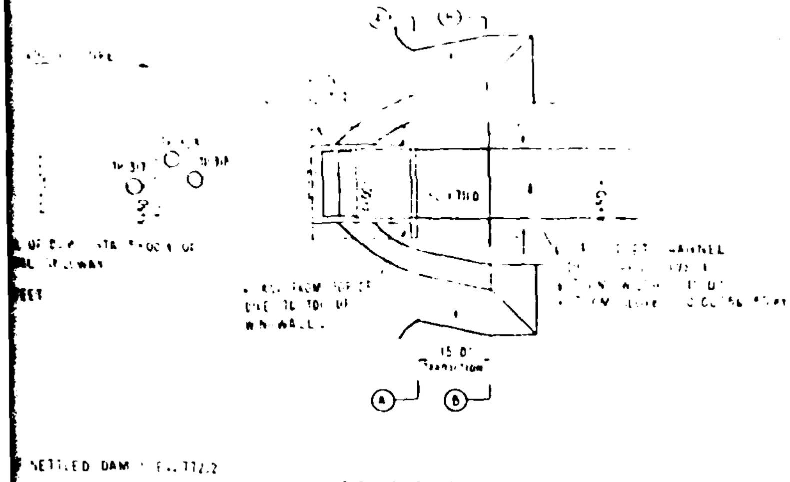
W.H. Lucas Jr 12/65

PLATE 4

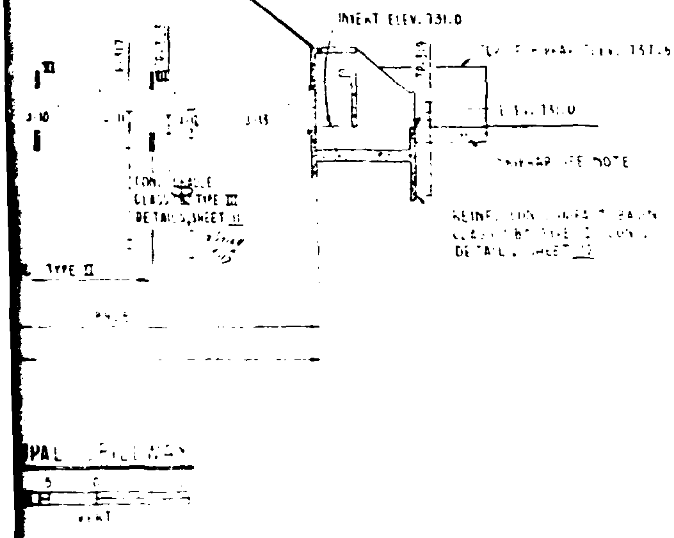
VA-4E


PLAN VIEW
0 10 20 40 FEET
REINF. CONC. RISER
CLASS "B" TYPE I CONC.
SEDIMENT POOL AND ORIFICE
OPENING ELEV 744.8
ELEV. 745.3
ELEV. 746.3
OF DAM
RISER FLOOR
ELEV. 735.3
PROFILE ALONG ℄ OF PRINCIPAL SPILLWAY
HORIZ
VERT
SCALE IN FEET
ELEV. 737.5
5.0'
ELEV. 737.5
ELEV. 731.0

SECTION A-A



4" I.D. REINF. CONC. WATER PIPE
(12) 16'-0" SECTION.
(1) 10'-0" SECTION
(1) WALL PIECE FOR 15" WALL
TOTAL = 203.58'
PRESSURE HEAD = 36'
LOAD = 30,000 LBS. PER LIN FT BASED ON O.D OF 4'-6"
MIN. 3 EDGE BEARING STRENGTH FOR 0.001" CRACK (PRE-STRESSED PIPE)
EQUALS 9600 LBS. PER LIN FT
MIN. 3 EDGE BEARING STRENGTH FOR 0.01" CRACK (NON PRESTRESSED PIPE)
EQUALS 12,800 LBS PER LIN FT
PIPE SUPPLIERS NOTE:
CAST OUTSIDE OF SPIGOT JOINT RING WITH [illegible] ON ONE 16'-0" SECTION

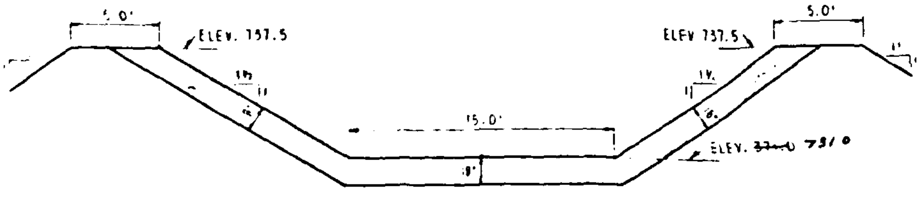


JOINT	DISTANCE FROM RISER WALL	INVERT ELEV. OF 42" PIPE	PIPE
J-1	0.00	[illegible]	[illegible]
[illegible]	[illegible]	[illegible].4	
[illegible]	[illegible]	[illegible].13	
J-4	4[illegible].33	731.0[illegible]	
[illegible]	[illegible].33	731.[illegible]	
[illegible]	74.33	73[illegible].8[illegible]	
J-7	90.33	731.72	
J-8	106.33	731.67	
[illegible]	122.33	731.5[illegible]	
J-10	138.33	731.4	
[illegible]	[illegible]	731.33	
J-12	[illegible].33	[illegible]	
J-13	186.33	731.10	
[illegible]	[illegible].33	731.00	

[illegible] AND DO NOT [illegible]

COLLAR	DISTANCE FROM RISER WALL	INVERT ELEV. OF 42" DIA PIPE
I	2[illegible].33	732.16
II	45.33	732.01
III	69.33	731.[illegible]
IV	[illegible].33	731.70
V	117.33	731.5[illegible]
VI	141.33	731.39
VII	165.33	731.24

NOTE:
RIPRAP SHALL BE WELL GRADED FROM A MIN. OF 6" TO A MAX. OF 18". IT SHALL BE PLACED WITH THE LONGEST DIMENSIONS PERPENDICULAR TO LINE OF FLOW.



SECTION B-B

"AS BUILT"

DAM NO 3 PETERS BRANCH
LEATHERWOOD CREEK WATERSHED
HENRY COUNTY, VIRGINIA
PLAN-PROFILE OF PRINCIPAL SPILLWAY
U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

L. S. COFFMAN 9-63
W. H. MORGAN 11-63
S. C. R[illegible]

PLATE 5
VA-483-P
8
13

TEST PITS (Borrow E)

TP _, STA. 2/50 C/L Dam, Elev. 736.9'

0.0 3.0 Sand, silty, yellowish-red, blocky, micaceous, Cecil soil, dry hole (SM)
3/ Granite

TP 2, STA. 3/85 C/L Dam, Elev. 734.6'

0.0 5.0 Silt, clayey, red, slightly micaceous, blocky Braddock soil, dry hole (ML)
5/ Granite

TP 3, STA. 4/50 C/L Dam, Elev. 751.3'

0.0 4.0 Silt, clayey, yellowish-red, micaceous, moist, blocky, Cecil soil - dry hole (ML)
4/ Granite

TP 4, STA. 3/00 C/L Dam, Elev. 752.5'

0.0 1.0 Silt, clayey, greyish-brown, moist, friable, (ML)
1/ Granite

TP 101, STA. 90' Rt. 4/71 B/L A, Elev. 743.92'

0.0 2.0 Silt, clayey, yellowish-red, blocky, moist, Cecil soil *(ML)
2.0 5/ Silt, sandy, yellowish-red with salt and pepper coloring, loose, moist *(ML)
5.0 6.0 Sand, silty, brownish-gray, moist, loose, ang., feldspar grains - dry hole *(SM)
6/ Granite

DS 101-1 1.0 - 6.0'

TP 102, STA. 70' Rt. 3/00 B/L A, Elev. 739.7'

0.0 7.0 Silt, clayey, brownish-red, moist, blocky, Thurmont soil *(ML)
7.0 13.0 Sand, silty, salt and pepper coloring, moist, loose, water at 13 feet *(SM)

DS 102-1 1.0 - 6.0'

TP 103, STA. 50' Rt. 3/00 B/L A, Elev. 745.0'

0.0 4.0 Silt, clayey, yellowish-red, slightly micaceous, blocky, moist, Cecil soil - dry hole (ML)
4/ Granite

TP 104, STA. 30' Rt. 2/60 B/L A, Elev. 737.9'

0.0 3.0 Silt, clayey, brownish-red, blocky, moist, impermeable, Cecil soil (ML)
3.0 5.0 Sand, silty, salt and pepper coloring, dry, weathered granite (SM)
5/ Granite

TP 105, STA. 30' Rt. 15/75 B/L A, Elev. 745.3'

0.0 3.0 Silt, clayey, reddish-brown, blocky, moist, Thurmont soil (ML)
3.0 8.0 Sand, silty, yellowish-brown, moist, angular granite fragments - dry hole (SM)
8/ Granite

TP 106, STA. 190 Rt. 15/73 B/L A, Elev. 751.8'

0.0 5.0 Silt, clayey, dark red to brownish-red, blocky, moist, Thurmont soil (ML)
5.0 10.0 Silt, clayey, olive-gray with yellowish-red mottles, wet with a spring present - water at 5' (ML)

TP 107, STA. 190' Rt., 17/15 B/L A, Elev. 742.5'

0.0 4.0 Silt, clayey, yellowish-red, blocky, impermeable, moist, Cecil soil (ML)
4.0 6.0 Sand, silty, yellowish-brown, moist, loose (SM to ML)
6.0 7.0 Sand, silty, salt and pepper coloring, grains of angular feldspar - dry hole (SM)
7/ Granite

TP 108, STA. 120 Rt. 17/90 B/L A, Elev. 743.6'

0.0 4.0 Silt, clayey, yellowish-red, blocky, impermeable, moist, Cecil soil (ML)
4.0 12/ Silt, sandy, brownish-yellow, loose, moist on top, wet at bottom - water at 10' (ML)

TP 109, STA. 30' Rt. 19/65 B/L A, Elev. 742.7'

0.0 2.0 Silt, clayey, yellowish-red, blocky, impermeable, moist, Cecil soil (ML)
2.0 5.0 Sand, silty, yellowish-red, with salt and pepper coloring, loose - dry hole (SM)
5/ Granite

TP 110, STA. [illegible]' Rt. 5/20 B/L A, Elev. 773.59'

0.0 4.0 Silt, clayey, red, blocky, slightly micaceous, moist, impermeable, Cecil soil (ML)
4.0 5.0 Sand, silty, salt and pepper coloring - dry hole (SM)
5/ Granite

TP 111, STA. [illegible]' Rt. 7/05 B/L A, Elev. 776.7'

0.0 3.0 Silt, clayey, yellowish-red, slightly micaceous, blocky, moist, impermeable, Cecil soil - dry hole (ML)
3/ Granite

TP 201, STA. 100' Lt. 2/00 C/L EE, Elev. 783.75'

0.0 6.0 Clay, silty, red, blocky, impermeable, moist, Lloyd soil (CL to ML)
6.0 16/ Silt, sandy, yellowish-red, loose, micaceous, weathered white aplite stringers - dry hole (ML)

DE 201-1 1.0 6.0'
DS 201-2 6.0 16'

TP 202, STA. 100' Lt. 1/25 C/L ES, Elev. 777.02'

0.0 4.0 Clay, silty, red, blocky, impermeable, moist, Lloyd soil (CL to ML)
4.0 13/ Silt, clayey, yellowish-red, loose moist, micaceous - dry hole (ML)

TP 203, STA. 100' Lt. 3/20 C/L ES, Elev. 793.33'

0.0 6.0 Clay, silty, red, blocky, impermeable, moist, Lloyd soil (CL to ML)
6.0 20/ Sand, silty, grayish-brown, loose, moist, micaceous, angular feldspar grains - dry hole (SM)

TP 204, STA. 130' Lt. 1/20 C/L ES, Elev. 778.05'

0.0 3.0 Clay, silty, red, blocky, impermeable, moist, Lloyd soil (CL to ML)
3.0 7.0 Silt, sandy, yellowish-red, loose, moist, micaceous (ML)
7.0 12/ Silt, sandy, yellowish-red, loose, moist, micaceous, angular feldspar grains - dry hole (ML)

TP 205, STA. 3/00 C/L ES, Elev. 787.59'

0.0 1.0 Silt, clayey, yellowish-red, blocky, moist, Cecil soil (ML)
1.0 17/ Silt, sandy, grayish-brown, micaceous, moist, loose - dry hole (ML to SM)

TP 206, STA. 2/00 C/L ES, Elev. 776.11'

0.0 6.0 Silt, clayey, yellowish-red, slightly micaceous, blocky, moist, Cecil soil (ML)*
6.0 11/ Silt, sandy, yellowish-brown, loose, moist, angular weathered feldspar grains - dry hole (ML to SM)*

DS 206-1 1.0 6.0'
DS 206-2 6.0 - 11.0'

TP 207, STA. 1/20 C/L ES, Elev. 777.55'

0.0 1.0 Silt, clayey, yellowish-red, blocky, moist, impermeable, Cecil soil (ML)
1.0 2.0 Sand, silty, yellowish-red, blocky, micaceous, moist (SM)
2.0 9.0 Sand, silty, gray salt and pepper colored, loose, moist, micaceous, angular feldspar grains (SM)
9.0 10.0 Gray weathered granite - dry (SM)
10/ Granite

TP 208, STA. 160' Rt. 3/20 [illegible], Elev. [illegible]'

0.0 [illegible] Silt, clayey, yellowish-red, blocky, moist, Cecil soil (ML)
6.0 7/ Silt, sandy, brownish-gray, micaceous, loose, moist - dry hole (ML to SM)

TP 301, [illegible] Elev. 73[illegible]

0.0 1.0 Silt, clayey, brownish-red, moist, micaceous, friable, blocky, Congaree soil (ML)
1.0 2.0 Sand, silty, brownish-red, moist, micaceous, friable (SM)
2.0 10.0 Silt, sandy, dark gray, wet, water at 5' (SM to ML)
10.0 12.0 Silt, clayey, reddish-yellow, friable, micaceous, residual soil with weathered rock fragments (ML)
12/ Weathered granite

TP 302, Elev. 722.0'

0.0 3.0 Silt, sandy, clayey, reddish-brown, moist, friable, Congaree soil (ML)
3.0 13.0 Sandy, silty, brownish-gray, wet, loose, water at 5' (SM)
13/ Weathered granite

TP 303, Elev. 733.9'

0.0 3.0 Silt, sandy, clayey, reddish-brown, moist, friable, Congaree soil (ML)
3.0 9.0 Sandy, silty, mottled yellowish-red and gray, wet, water at 5' (SM)
9/ Granite

TP 304, Elev. 735.0'

0.0 1.0 Silt, sandy, clayey, reddish-brown, blocky, moist, Congaree soil (ML)
1.0 7.0 Silt, sandy, clayey, yellowish-red, wet, loose, water at 5' (ML)
7/ Granite

TP 305, Elev. 736.0'

0.0 2.0 Sand, clayey, yellowish-red, blocky, moist, Cecil soil (SM)
2/ Granite

TP 3[illegible] [illegible]

0.0 [illegible] Silt, clayey, brownish-red, moist, Cecil soil
[illegible] 5.0 [illegible], silty, gray, wet
5/ Granite

TP 307

0.0 6.0 Silt, clayey, brownish-red, friable, micaceous, Congaree soil at 6'
6.0 11.0 Sand, silty, mottled gray, loose, wet, rotten granite
11/ Granite

TP 308

0.0 3.0 Sand, silty, brownish-red, moist, friable, Congaree soil
3.0 8.0 Silt, sandy, dark gray, wet, water at 5'
8.0 10/ Silt, clayey, brownish-red

TP 309

0.0 1.0 Silt, clayey, brownish-red, friable, Congaree soil.
1.0 5.0 Sand silty, brownish-red, friable. Water at 4'
5.0 10/ Sand, silty, dark gray,

TP 311

0.0 4.0 Sand, silty, reddish-brown, Congaree soil
4.0 10/ Sand, silty, dark gray, Water at 5'

TP 312

0.0 3.0 Sand, silty, brownish-red, Congaree soil.
3.0 11/ Sand, silty, dark gray,

TP 313

0.0 3.0 Sand, silty, brownish-red, Congaree soil.
3.0 12/ Sand, silty, dark gray,

TP 314

0.0 2.0 Sand, silty, yellowish-red, friable, Congaree soil.
2.0 3.0 Sand, silty, dark gray,
3.0 4.0 Sand, silty, reddish-brown,
4.0 8.0 Silt, sandy, dark gray, Water at 5'
8.0 11/ Sand, silty, dark gray,

TP 315

0.0 3.0 Sand, silty, yellowish-red, friable, micaceous, Congaree soil
3.0 11/ Sand, silty, dark gray, water at 5'
11.0 12/ Sand, silty, dark gray,

TP 316

0.0 3.0 Silt, sandy, red to reddish-brown, friable, micaceous, Congaree soil
3.0 11/ Silt, sandy, dark gray,

TP 317

0.0 4.0 Sand, silty, reddish-brown, friable, Congaree soil
4.0 10.0 Sand, silty, dark gray,
10.0 11/ Silt, sandy, brownish-red, wet

TP 318

0.0 3.0 Sand, silty, reddish-brown, micaceous, Congaree soil
3.0 10.0 Silt, sandy, dark gray, water at 6'
10.0 11/ Silt, sandy, reddish-brown, moist

TP 319

0.0 2.0 Sand, silty, brownish-red, micaceous, friable, Congaree soil
2.0 10/ Silt, sandy, dark gray, water at 4'

TP 320

0.0 3.0 Sand, silty, brownish-red, Congaree soil
3.0 6.0 Sand, silty, dark gray, water at 5'
6.0 9/ Silt, sandy, brownish-red, residual soil, fairly firm

TP 321

0.0 2.0 Silt, sandy, brownish-red, micaceous, Congaree soil
2.0 6.0 Sand, silty, dark gray, water at 5'
6.0 10/ Silt, sandy, brown, micaceous, fairly firm

TP 306 [illegible] Elev. 732.9'

0.0 4.0 Silt, clayey, brownish-red, blocky, moist, Cecil soil (ML)
4.0 5.0 Sand, silty, gray, weathered granite (SM)
5/ Granite

TP 307

0.0 6.0 Silt, clayey, brownish-red, moist to wet, friable, micaceous, Congaree soil, water at 6' (ML)
6.0 11.0 Sand, silty, mottled, yellowish-red and grey, loose, wet, cobbles weathered granite (SP to ML)
11/ Granite

TP 308 [illegible]

0.0 3.0 Sand, silty, brownish-red, micaceous, moist, friable, Congaree soil, water at 3' (SM)
3.0 9.0 Silt, sandy, dark gray, fine mica, wet, hole caves (ML)
9.0 10/ Silt, clayey, brownish-red, wet, some mica (ML)

TP 310

0.0 1.0 Silt clayey, brownish-red, moist, blocky, friable, Congaree soil. (ML)
1.0 5.0 Sand silty, brownish-red, moist to wet, friable. Water at 4' (SM)
5.0 10/ Sand, silty, dark gray, wet. Hole caves. (SM)

TP 311 [illegible]

0.0 4.0 Sand, silty, reddish-brown, moist, friable Congaree soil (SM)
4.0 10/ Sand, silty, dark gray, wet Water at 5'. (SM)

TP 312 [illegible]

0.0 3.0 Sand, silty, brownish-red, moist, friable, Congaree soil. (SM)
3.0 11/ Sand, silty, dark gray, wet. Water at 4'. (SM)

TP 313 [illegible]

0.0 3.0 Sand, silty, brownish-red, moist, friable, Congaree soil. ( )
3.0 12/ Sand, silty, dark gray, wet. Water at 5' ( )

TP 314

0.0 2.0 Sand, silty, yellowish-[illegible] friable. Congaree soil. (SM)
2.0 3.0 Sand, silty, dark gray, wet (SM)
3.0 4.0 Sand, silty, reddish-brown, wet, micaceous (SM)
4.0 9.0 Silt, sandy, dark gray, micaceous, [illegible] water at 5' ( )
9.0 11/ Sand, silty, dark gray, wet, micaceous. ( )

TP 315

0.0 3.0 Sand, silty, yellowish-red, moist, friable, micaceous, Congaree soil ( )
3.0 11/ Silt, sandy, dark gray, wet, water at [illegible] (ML)
11.0 12/ [illegible], silty, [illegible], wet. ( )

TP 316

0.0 3.0 Silt, sandy, reddish-brown, moist, friable, micaceous, Congaree soil (ML)
3.0 11/ Silt, sandy, dark gray, wet, [illegible] (ML to SM)

TP 317

0.0 4.0 Sand, silt, reddish-brown, moist, friable, Congaree soil (SM)
4.0 10.0 Sand, silty, dark gray, wet (SM)
10.0 11/ Silt, sandy, reddish-brown, micaceous, moist (ML)

TP 318

0.0 3.0 Sand, silty, reddish-brown, moist, friable, micaceous, Congaree soil (SM)
3.0 10.0 Silt, sandy, dark gray, wet, water at 6' (ML to SM)
10.0 13/ Silt, sandy, reddish-brown, micaceous, moist (ML)

TP 319

0.0 2.0 Sand, silty, brownish-red, moist, some mica, friable, Congaree soil (SM)
2.0 13/ Silt, sandy, dark gray, wet, micaceous, water at 4' (ML)

TP 320

0.0 3.0 Sand, silty, brownish-red, wet, friable, Congaree soil (SM)
3.0 6.0 Sand, silty, dark gray, wet, micaceous, water at 5' (SM)
6.0 9/ Silt, sandy, brownish-red, moist, residual soil, fairly firm (ML to SM)

TP 321

0.0 2.0 Silt, sandy, brownish-red, wet, micaceous, Congaree soil (ML to SM)
2.0 6.0 Sand, silty, dark gray, wet, micaceous, water at 5' (SM)
6.0 16/ Silt, sandy, brownish-red, moist, residual, fairly firm (ML)

TP 322

0.0 3.0 Silt, sandy, brownish-red, moist, friable, Congaree soil (ML)
3.0 7.0 Silt, sandy, brownish-red with lenses of dark gray, wet - water at 6' (ML to SM)
7/ Granite

TP 323

0.0 2.0 Sand, silt, brownish-red, micaceous, moist, friable, Congaree soil (SM)
2.0 6.0 Sand, silt, dark gray, micaceous, wet, water at 5' (SM)
6.0 12/ Silt, sandy, brownish-red, moist, micaceous, fairly firm, residual soil (ML)

TP 501 Elev. 731.9'

0.0 6.0 Silt, clayey, brownish-red, moist to wet, micaceous, friable, Congaree soil, water at 6' *(ML)
6.0 11.0 Sand, silty, mottled yellowish-red and gray, loose, wet, cobbles weathered granite *(SM)
11/ Granite

US 501-1 1.0 - 6.0
US 501-2 6.0 - 11.0

TP 502 STA. 65' Lt. 3/75 C/L Dam, Elev. 732.9

0.0 1.0 Silt, clayey, brownish-red, micaceous, moist, friable, Braddock soil (ML)
1.0 5.0 Silt, clayey, red, blocky, moist - dry hole *(ML)
5/ Granite

US 502-1 1.0 5.0

LEGEND

TEST HOLE NUMBERING SYSTEM

[illegible]	1 - 99
[illegible]	101 - 199
[illegible]	201 - 299
Centerline of outlet structure	301 - 399
[illegible]	401 - 499
[illegible]	501 - [illegible]

UNIFIED SOIL CLASSIFICATION SYSTEM SYMBOLS

ML [illegible] low to medium plasticity; silty, sandy, or [illegible] silty clays.
ML Silts, silty, [illegible] fine sands; [illegible] silts.
SM Silty sands; sand-silt mixtures

SAMPLES

US Undisturbed
DS Disturbed

All soil [illegible] descriptions and classifications were [illegible] visual examination [illegible] 1963.

ROCK SYMBOLS

[illegible] GRANITE

*UNIFIED SOIL CLASSIFICATION SYMBOLS BY LABORATORY AND FIELD ARE AS FOLLOWS

TESTPIT	DEPTH		CLASSIFICATION	
	FROM	TO	FIELD	LAB
TP 101	1	6	ML TO SM	SM
TP 102	[illegible]	13	ML TO SM	SM
TP 201	[illegible]	6	[illegible]	[illegible]
TP 201	6	16	ML	SM
TP 206	[illegible]	[illegible]	ML	[illegible]
TP 206	6	14	ML TO SM	SM
TP 501	1	6	ML	-
TP 501	6	[illegible]	SM	
TP 502	[illegible]	5	ML	-

2

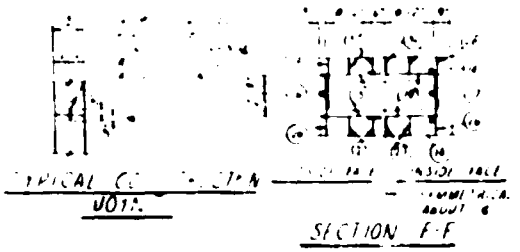
47

"AS BUILT"

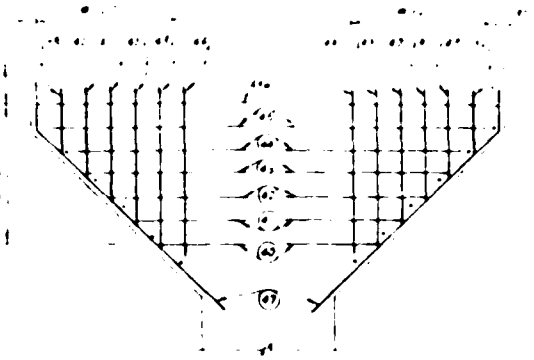
DAM NO 3 PETERS BRANCH
LEATHERWOOD CREEK WATERSHED
[illegible]
LOGS OF TEST HOLES
U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

PLATE 6

[illegible] A 483



SECTION F-F

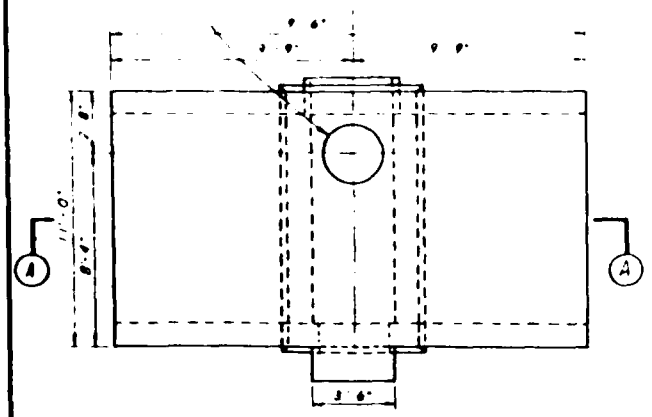


ANTI VORTEX SUPPORT

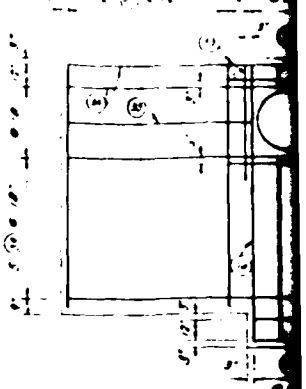
30" DIA [illegible] ASSEMBLY
[illegible] CO
CATALOG [illegible]
MODEL [illegible]

SLUICE GATE NOTES

1. [illegible] SLUICE GATE
   [illegible] OR APPROVED EQUAL
2. FLAT FRAME
3. "T" TYPE WALL THIMBLE 15" LONG
4. SEATING HEAD = 25 FEET
5. UNSEATING HEAD = 0
6. OPERATING HEAD 28 FEET
7. RISING STEM, THREADED PORTION BRONZE
8. STEM STEM GUIDES & LIFTING [illegible] SIZED AND SPACED ACCORDING TO MANUFACTURERS RECOMMENDATIONS

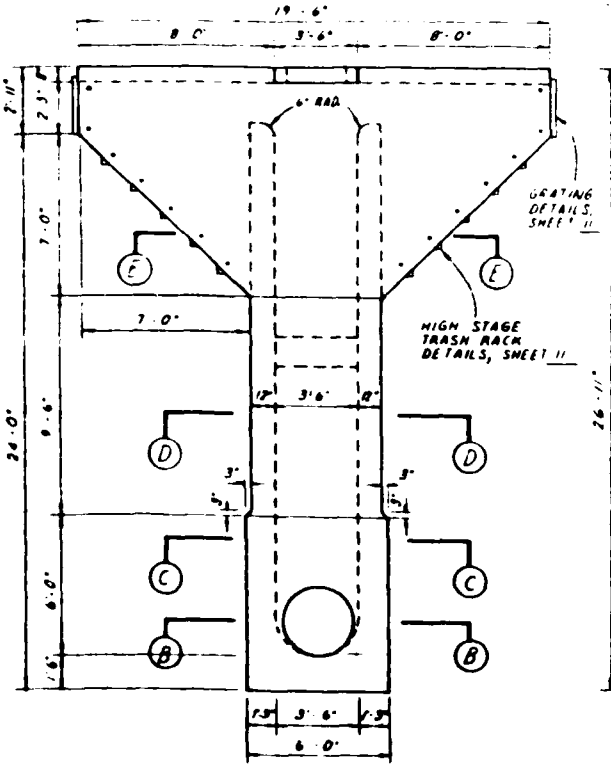


PLAN

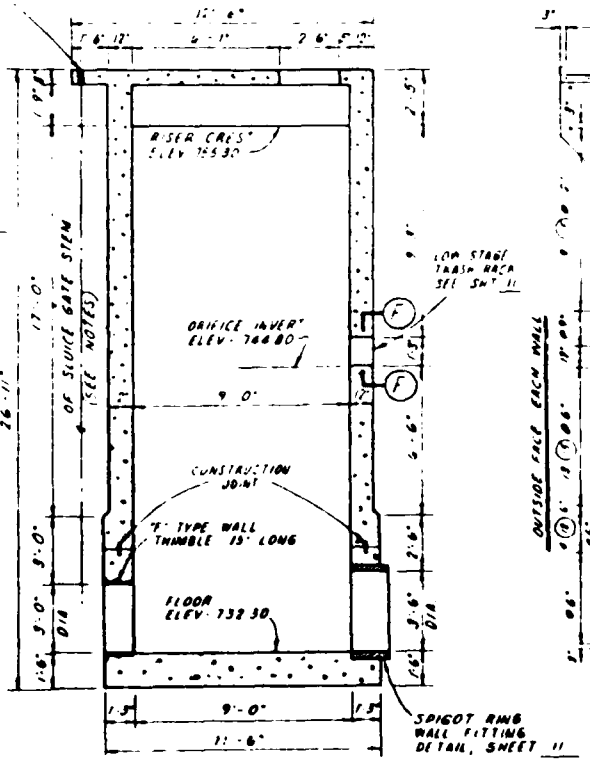


TOP

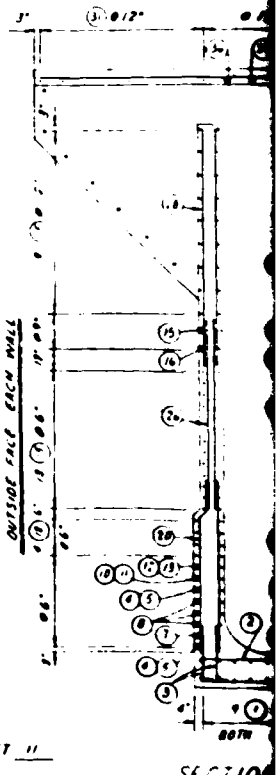
DIDE SLEEVE FOR SLUICE GATE SIZED AND LOCATED ACCORDING TO MANUFACTURERS RECOMMENDATIONS.



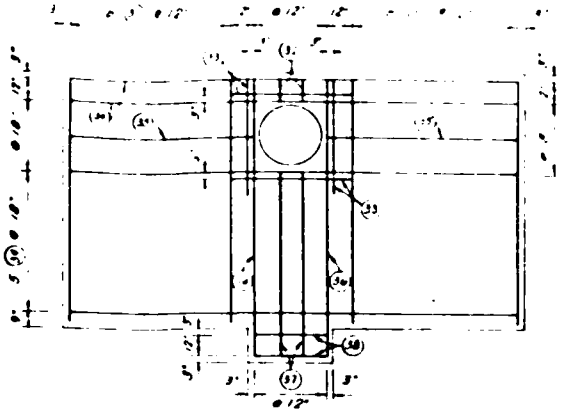
UPSTREAM ELEVATION



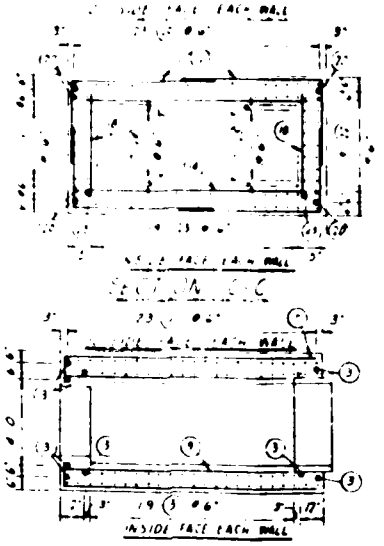
SECTION ALONG CENTERLINE



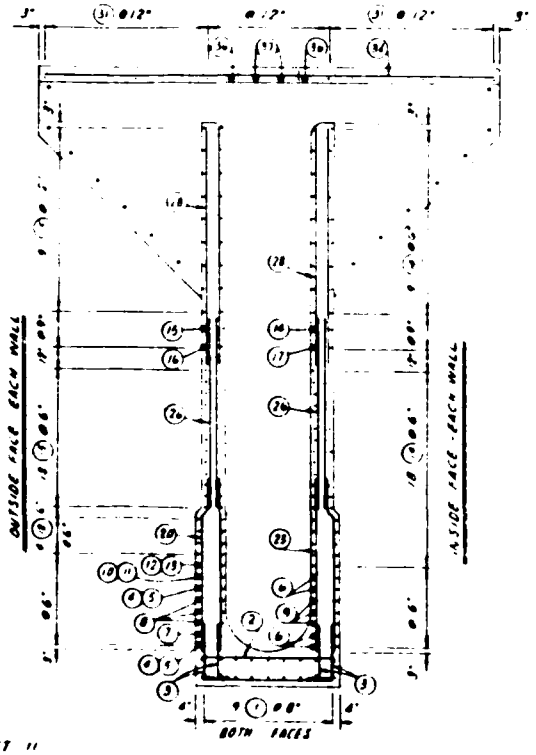
SECTIO



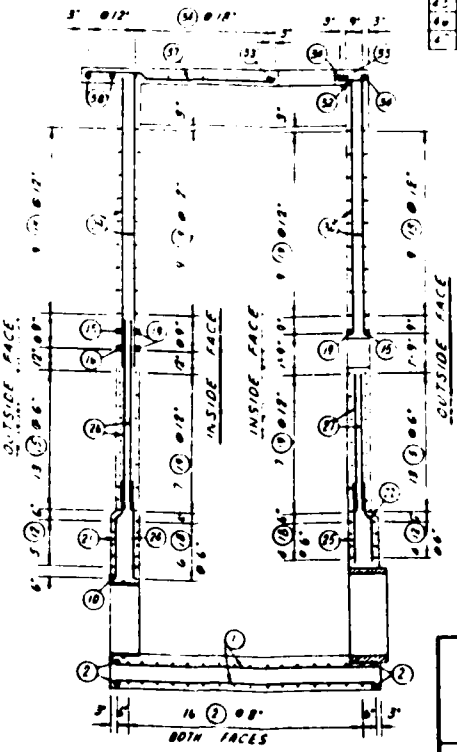
TOP SLAB



SECTION B-B

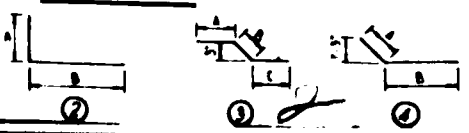


SECTION A-A



SECTION ON CENTERLINE

BAR TYPES



QUANTITY SUMMARY

REINF STEEL

NO 4 BARS

NO 5 BARS

NO 8 BARS

TOTAL

CONCRETE

CLASS "B" TYPE I

CU YDS

GENERAL NOTES

1. ALL CONCRETE SHALL BE CLASS
2. PORTLAND CEMENT TYPE IA OR TYPE I WITH AIR ENTRAINING ADMIXTURE SHALL BE USED
3. ALL REINF STEEL TO BE LAPPED A MIN OF 35 BAR DIA
4. ALL REINF STEEL PLACED IN CONCRETE POURED AGAINST THE GROUND SHALL HAVE A MIN OF 3" CLEAR COVER WHERE FORMS ARE USED BARS SHALL HAVE A MIN OF 2" CLEAR COVER
5. ALL EXPOSED EDGES OF CONCRETE TO HAVE A 3/4" CHAMFER UNLESS OTHERWISED NOTED

0 1 2 3 4 5 6 FEET
SCALE

DAM NO 3 PETERS BRANCH
LEATHERWOOD CREEK WATERSHED
HENRY COUNTY, VIRGINIA
RISER DETAILS

U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

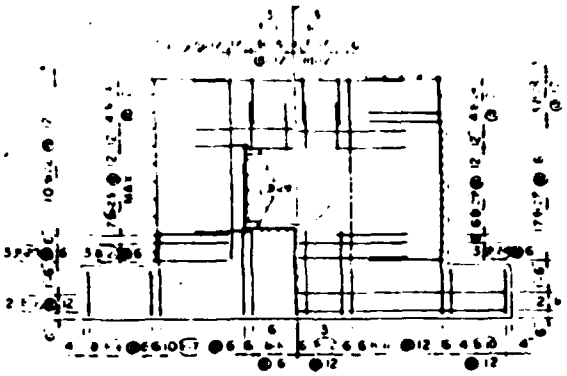
C B FORD

AS BUILT

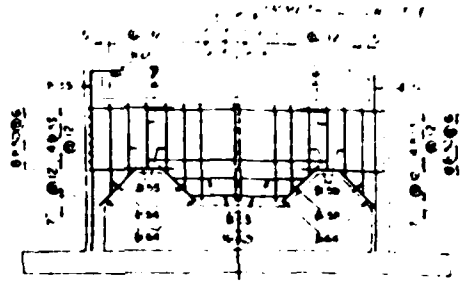
B.J. Simmons 12/69

No. 10 of 13

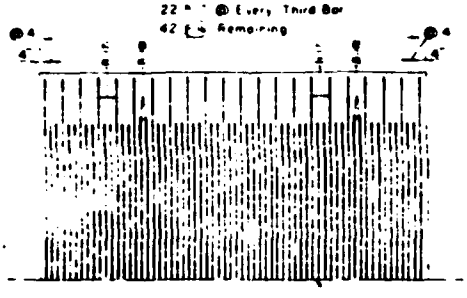
VA-483-R



DOWNSTREAM FACE SECTION D-D UPSTREAM FACE

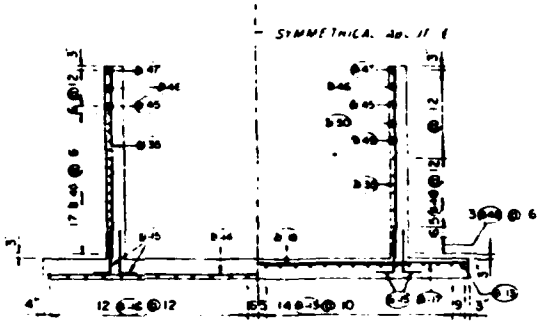


DOWNSTREAM FACE SECTION THRU BAFFLE UPSTREAM FACE

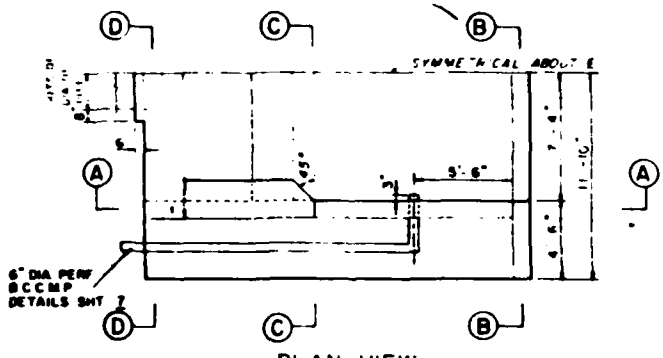


SYMMETRICAL ABOUT ℄

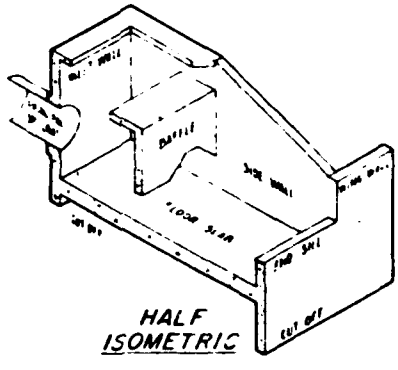
PLAN OF FLOOR SLAB TOP FACE



OUTSIDE & BOTTOM FACES SECTION C-C INSIDE & TOP FACES

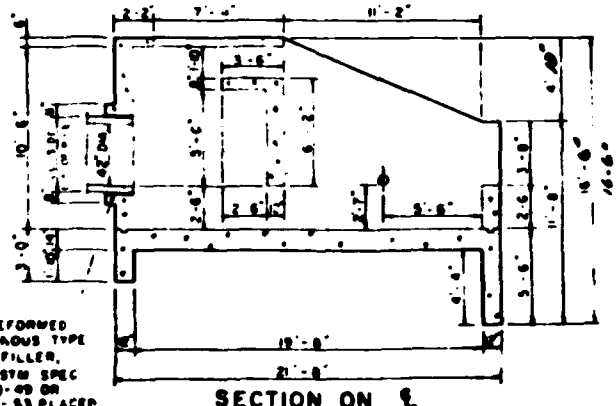


PLAN VIEW



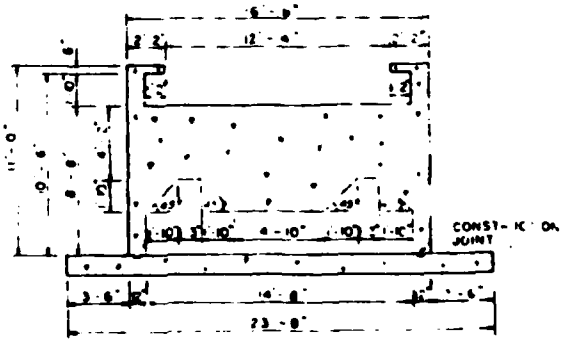
HALF ISOMETRIC

CONSTRUCTION JOINT



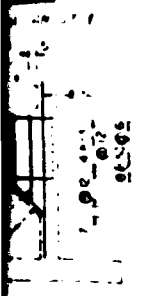
SECTION ON ℄

"½" PREFORMED BITUMINOUS TYPE JOINT FILLER, PER ASTM SPEC D-545-49 OR D-994-53 PLACED BETWEEN PIPE AND CONCRETE

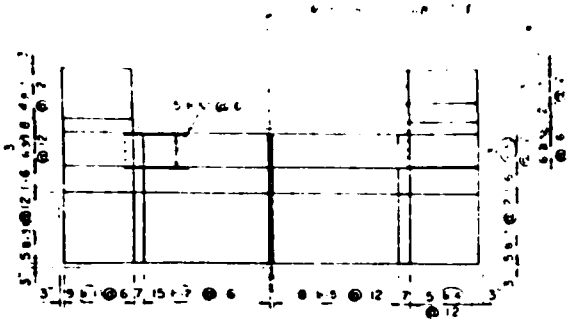


SECTION THRU BAFFLE

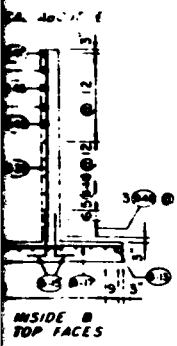
MAX ALLOWABLE DISCHARGE = 250 CFS	INSIDE DIA OF PIPE 60" MAX 42" MIN



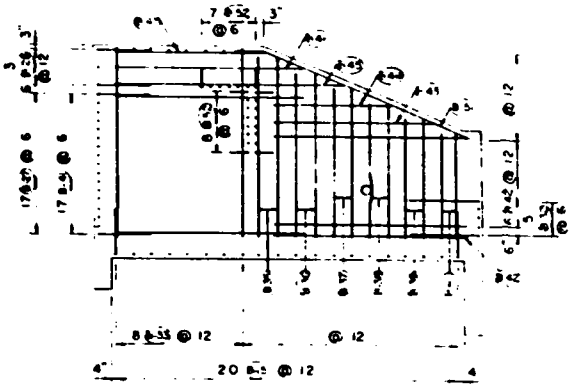
FLE UPSTREAM FACE



DOWNSTREAM FACE SECTION B-B UPSTREAM FACE



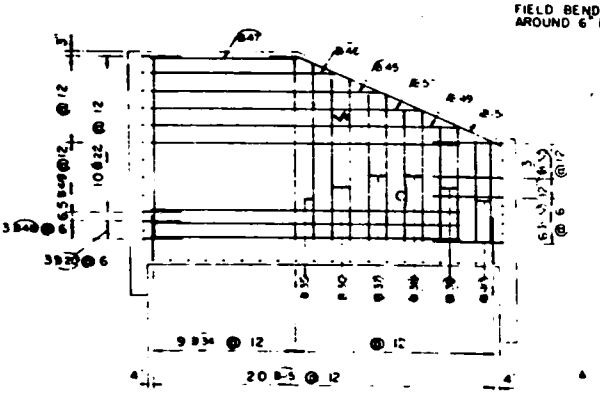
INSIDE & TOP FACES



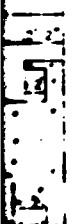
SECTION A-A OUTSIDE FACE

CONSTRUCTION JOINT

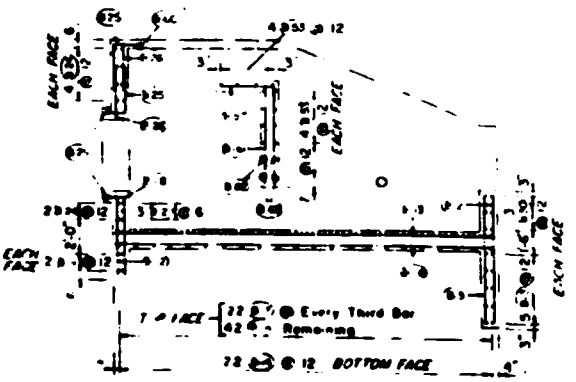
NOTE
FIELD BEND REINF BARS AROUND 6" DIA BOLT



SECTION A-A INSIDE FACE



CONSTRUCTION JOINT



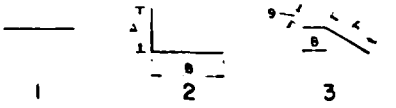
SECTION ALONG ℄

FLE

INSIDE DIA 3'-1" PL
60" MAX 42" MIN

STEEL SCHEDULE

	LOCATION									
1		6	7	7-4						
2		24	7	7-4						
3		10	5	23-3						
4		10	5	11-3						
B 5		10	5	7-6						
6		16	6	2-6						
7		20	6	4-9						
8		11	6	5-9	2	4-9	1-0			
9		4	5	23-3						
B-10		8	5	4-9						
11		12	5	14-6	2	13-6	1-0			
12		6	5	4-9						
13	FLOOR SLAB	30	7	21-3						
14		22	5	23-3						
B-15		80	5	3-7	2	2-7	1-0			
16		24	5	21-3						
17		22	7	23-3						
18		42	7	17-0						
19	INLET WALL	10	5	10-6						
B 20		6	6	6-3	2	4-0	2-3			
21		3	6	11-6						
22		20	5	6-3	2	4-0	2-3			
23		14	5	4-0	2	3-0	1-0			
24		11	5	11-6						
B-25		12	6	3-9	2	2-9	1-0			
26		12	5	2-9						
27		34	7	7-0	2	4-0	3-0			
28		6	5	7-0	2	4-0	3-0			
29		20	5	4-0						
B-30	WING WALLS	6	6	23-3						
31		8	6	4-0						
32		28	5	7-6	2	4-0	3-6			
33	SIDE WALLS	16	5	12-3	2	10-6	1-3			
34		18	5	10-6						
B-35		6	5	10-3						
36		5	5	9-6						
37		8	5	8-6						
38		8	5	7-9						
39		8	5	6-9						
B-40		6	5	6-0						
41		34	5	10-6						
42		14	5	10-9						
43		2	5	9-0						
44		2	5	6-6						
B-45		4	5	3-0						
46		4	5	7-6						
47		4	5	8-3						
48		16	5	17-3						
49		2	5	17-9						
B 50		2	5	5-6						
51		4	5	4-0	3	2-6				
52	BAFFLE	46	5	5-9	2	4-9				
53			5	9-9						
54		4	5	6-[illegible]	2	[illegible]	[illegible]			
B-55		4	5	8-6	2	4-3	3-0			
56		5	5	6-9	2	3-9	3-0			
57		5	5	8-9	2	5-9	3-0			
58		4	5	5-0						
59		4	5	4-0						
B-60		2	5	3-9						
61		2	5	5-9						
62		2	5	7-3						
63		2	5	5-6						
64		6	5	3-0						
B-65	OVERHANG	2	5	7-6						
66			5	15-3						



1 2 3

BAR TYPES

"AS BUILT"

QUANTITIES (THIS SHEET NO. 7)

REINFORCING STEEL
NO 5 BARS [illegible] LIN FT 5575.8 LBS
NO 6 BARS 486 [illegible] FT 731.1 LBS
NO 7 BARS 2921 [illegible] FT 9152.9 LBS

CONCRETE
CLASS "B" TYPE I 96.09 CU YDS

SCALE 0 1 2 3 4 5 6 7 FEET

DAM NO.3 PETERS BRANCH
LEATHERWOOD CREEK WATERSHED
HENRY COUNTY, VIRGINIA
IMPACT BASIN DETAILS

U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

[illegible] M NIROLICH
[illegible] K MORGAN

PLATE 8

Wm Lanning Jr 12/69 19

VA-483-P

APPENDIX II

PHOTOGRAPHS

Photograph No. 1 - Upstream Slope

Photograph No. 2 - Downstream Slope

Photograph No. 3 - Intake Structure
(Note Debris in Low Flow Orifice)

Photograph No. 4 - Outlet Structure

Photograph No. 5 - Emergency Spillway

Photograph No. 6 - Downstream Channel

APPENDIX III

FIELD OBSERVATIONS

Check List
Visual Inspection
Phase I

Name Dam Leatherwood No. 3 County Henry State Virginia Coordinates Lat 36° - 44.4' Long 79° - 46.3'

Date(s) Inspection June 30, 1981 Weather Cloudy Temperature 80°F

Pool Elevation at Time of Inspection 745 msl Tailwater at Time of Inspection 731 msl

Inspection Personnel:

Schnabel Engineering Associates, P.C.
James J. Seli
Stephen G. Werner
Raymond A. DeStephen, P.E.*

J. K. Timmons & Associates
Robert G. Roop, P.E.
Steve Oddi

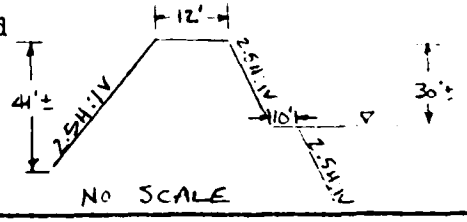
Recorders
Stephen G. Werner
Steve Oddi

State Water Control Board
Leon Musselwhite

Owner
Charley M. Finney

* Not present during this inspection, but visited site on August 17, 1981

EMBANKMENT

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SURFACE CRACKS	The slopes, crest and abutment contacts were inspected and no cracks were noted. The embankment was heavily vegetated with tall grass and briers making observation difficult. Ground conditions were dry at the time of the inspection.	The vegetation should be controlled.
UNUSUAL MOVEMENT OR CRACKING AT OR BEYOND THE TOE	No unusual movements were noted on the dam or beyond the downstream toe.	-
SLOUGHING OR EROSION OF EMBANKMENT AND ABUTMENT SLOPES	No erosion was noted on the embankment slopes or along the abutment-embankment contacts.	The dense vegetative cover could conceal erosion.
VERTICAL AND HORIZONTAL ALINEMENT OF THE CREST	The vertical and horizontal alignment of the dam appeared to be good. Note adjacent field measurements.	
RIPRAP FAILURES	There was no riprap on the upstream slope. Granite blocks or boulders 1 - 3 ft± in length line the plunge pool This riprap appeared to be functioning properly and was in good condition.	-

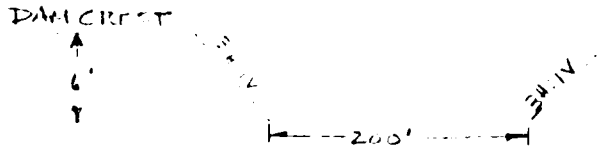
EMBANKMENT

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
JUNCTION OF EMBANKMENT AND ABUTMENT, SPILLWAY AND DAM	Both ends of the embankment tie in properly with the abutments. The right abutment is rather densely vegetated with trees and grass. Residual granite is exposed in the right abutment - light brown silt, trace fine sand with fine to coarse feldspar fragments, dry (ML). Appears to be the same material of which the dam is constructed. The grassed emergency spillway occupies the left abutment-embankment contact.	-
ANY NOTICEABLE SEEPAGE	No seepage was encountered. The downstream toe is dry.	-
DRAINS	Two 6-inch cmp toe drains occur on either side of the plunge pool. Small reinforcing bars cover the ends. No flow observed; plunge pool level was slightly above toe drain inverts.	-
MATERIALS	The embankment soils are dry. Appears to be silt, trace fine to medium sand, with mica, dry - brown (ML). In natural moisture condition it still appears to be ML.	-
VEGETATION	Tall grass and briers (blackberry bushes) occur on the embankment, particularly the downstream slope. Scattered small trees less than 1/4 inch diameter are also present. Few scattered logs present on the upstream slope as a result of previous high water. These logs extend as high as the top of the intake structure.	Needs maintenance

PRINCIPAL SPILLWAY

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS AND RECOMMENDATIONS
CONTROL SECTIONS	Concrete riser type structure with trash rock, low level orifice inlet and high level weir inlet (rectangular). The top of the intake structure is 13 ft above pool level.	Debris in lower orifice and on top of the structure.
APPROACH CHANNEL	-	-
DISCHARGE CHANNEL	36 inch reinforced concrete energy dissipater. Riprap lines the plunge pool below the energy dissipater.	No signs of structural deterioration. Riprap is intack.
BRIDGE AND PIERS	-	-
EMERGENCY GATE	-	-
GATES AND OPERATION	Drain gate attached to the top of the operating spillway. Not locked but not readily accessible.	Never operated according to owner.

EMERGENCY SPILLWAY

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONTROL SECTIONS		Well vegetated
APPROACH CHANNEL	The left upstream edge of the left abutment emergency spillway contact is deeply eroded. It is 7 ft± deep, 15 ft long, 5 ft± wide and filled with growing weeds. Residual granite with quartz veins is exposed. The soil is basically fine to coarse silty sand with mica, dry - brown (SM). This area is approximately 15 ft above pool level.	Should be corrected.
DISCHARGE CHANNEL	-	-
BRIDGE AND PIERS	-	-
MISCELLANEOUS	-	-

INSTRUMENTATION

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATION
MONUMENTATION/SURVEYS	None	-
OBSERVATION WELLS	None	-
WEIRS	None	-
PIEZOMETERS	None	-
STAFFGAGES	None	Should be installed
OTHER	-	-

RESERVOIR

VISUAL EXAMINATION	OBSERVATIONS	REMARKS AND RECOMMENDATIONS
SLOPES	Densely wooded, moderate slopes (5H:1V±) bound the reservoir. No erosion was noted. A granite boulder occurs above pool level along the left side of the reservoir. The reservoir area was free of debris.	-
SEDIMENTATION	No apparent sedimentation. The water was clear.	-

DOWNSTREAM CHANNEL

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONDITION (OBSTRUCTIONS, DEBRIS, ETC.)	15 ft± wide channel, 8 ft± high. Heavily lined with trees n = 0.07, 50 ft open flood plain, n = 0.05 on either side. Sides are wooded with heavy underbrush.	n = 0.07 LOB n = 0.05 C n = 0.1 ROB
SLOPES	Side slopes (3H:1V) are wooded and include heavy underbrush.	n = 0.1
APPROXIMATE NO. OF HOMES AND POPULATION	Approximately 1.5 miles downstream there is a dwelling 15 ft± above the stream channel. Approximately 5 miles downstream there are several dwellings about 10 ft above the stream channel and several commercial facilities 15 ft above the channel.	Possible flooding could occur to the downstream dwellings.

CHECK LIST

ENGINEERING DATA

DESIGN, CONSTRUCTION, OPERATION

ITEM		REMARKS
REGIONAL VICINITY MAP	Martinsville East 7½ minute topographic map (U.S.G.S.)	-
DESIGN/CONSTRUCTION HISTORY	Designed by USDA, SCS. Constructed by Larramore Construction Co. and completed in 1965.	-
PLAN OF DAM	See Appendix I	-
TYPICAL SECTIONS OF DAM	See Appendix I	-
OUTLETS - PLAN DETAILS CONSTRAINTS DISCHARGE RATINGS	See Appendix I	-
SPILLWAY- PLAN SECTION DETAILS	See Appendix I	-
OPERATING EQUIPMENT - PLAN DETAILS	See Appendix I	-

ITEM		REMARKS
MONITORING SYSTEMS	None	-
RAINFALL/RESERVOIR HIGHPOOL RECORDS	None	-
GEOLOGY REPORTS	See Appendix IV and Reference 3, Appendix VI	-
BORROW SOURCES	See Appendix I	-
MATERIALS INVESTIGATIONS BORING RECORDS LABORATORY-FIELD TEST DATA	See Appendix I	-
HYDROLOGIC/HYDRAULIC DATA	Design data available at USDA, SCS office in Richmond, Virginia	-

ITEM		REMARKS
DESIGN REPORTS	Summary included as Appendix IV. Complete Design Report available at USDA, SCS office in Richmond, Virginia	-
DESIGN COMPUTATIONS HYDROLOGY & HYDRAULICS DAM STABILITY SEEPAGE STUDIES	Available at USDA, SCS office in Richmond, Virginia	-
POST CONSTRUCTION ENGINEERING STUDIES RECORDS, SURVEYS	As built drawings included in Appendix I	-
MODIFICATIONS	None	-
PRIOR ACCIDENTS OR FAILURE OF DAM DESCRIPTION REPORTS	None	-
MAINTENANCE OPERATION RECORDS	None	-

APPENDIX IV

DESIGN REPORT

DESIGN REPORT

LEATHERWOOD CREEK WATERSHED
DAM NO. 3
HENRY COUNTY, VIRGINIA

This floodwater retarding dam is located on Peters Branch of Leatherwood Creek approximately 1-1/4 miles northwest of Leatherwood, Virginia. Sheet 4 of this report, together with the Martinsville, Virginia-North Carolina 15 minute quadrangle published by the U.S. Geological Survey, may be used to locate the structure.

The design of this dam is in accordance with criteria established by the Soil Conservation Service, U.S. Department of Agriculture. It is a class (a) structure as defined in Washington Engineering Memorandum SCS-27.

This is one of five flood retention structures designed to reduce flooding in the Leatherwood valley. It will retard a 50-year frequency storm without discharge occurring in the emergency spillway. This retention capacity is equivalent to 2.86 inches of runoff from a 1,250 acre watershed area.

The structure consists of a compacted earth fill with cutoff to bedrock under the centerline of the dam. A drainage trench is included under the downstream portion of the embankment to collect any seepage which may occur.

The drop inlet principal spillway consists of a reinforced concrete riser, together with a 42-inch diameter conduit of reinforced concrete water pipe and a Bradley Perterka impact basin to dissipate energy at the outlet end of the conduit.

The emergency spillway is designed as an earth cut into silty sands in the left abutment.

A typical cross section of the earth fill and a summary of pertinent design information is given on sheet 5 of this report.

The results of hydraulic and hydrologic determinations are given in the following table:

REFERENCE:	U.S. DEPARTMENT OF AGRICULTURE SOIL CONSERVATION SERVICE UPPER DARBY, PENNSYLVANIA ENGINEERING & WATERSHED PLANNING UNIT	DRAWING NO. VA-483-R SHEET 1 OF 5 DATE 12-16-63

DESIGN REPORT

Factor Which Determines Stage	Surface Area Acres	Runoff in Inches	Peak Inflow c.f.s.	Peak Outflow c.f.s.	Elev. of Maximum Stage	Storage in Ac.-Ft.	Element of Structure Determined by Maximum Stage
50-year sediment accumulation	34	0.34	-	-	744.8	180[1]	Crest of orifice
50- year frequency storm moisture condition II	110.5	3.22	-	252	766.6	1695[2]	Crest of emergency spillway
0.6 x6-hour point rainfall moisture condition II	122.5	3.37	5480	2170	769.0	1770	Design high water
1.0 x6-hour point rainfall moisture condition II	135	4.17	10,060	8120	772.2	2190	Top of dam

[1] Does not include 13 acre-feet of sediment allocated to flood pool.

[2] Emergency spillway crest determined by utilizing TR-10

The time to empty 100 percent of the flood storage is 9.1days.

Copies of the geology and soil mechanics laboratory reports used in the design of this structure are attached.

The following publications were used in the design of this dam:

National Engineering Handbook No. 5, Hydraulics
National Engineering Handbook No. 4, Hydrology
National Engineering Handbook No. 6, Structural Design
Engineering Division Technical Releases Nos. 2, 5 and 10

REFERENCE:	U.S. DEPARTMENT OF AGRICULTURE SOIL CONSERVATION SERVICE ENGINEERING & WATERSHED PLANNING UNIT DREXEL PARK, DARBY, PENNSYLVANIA	DRAWING NO. VA-483 SHEET 2 OF 5 DATE 12-16-63

DESIGN REPORT

Copies of these publications may be obtained from Mr. Tom F. McGourin, State Conservationist, USDA, Soil Conservation Service, Richmond, Virginia.

Concurred:

Gerald E. Oman
Design Engineer

R. C. Barnes, Jr.
State Conservation Engineer

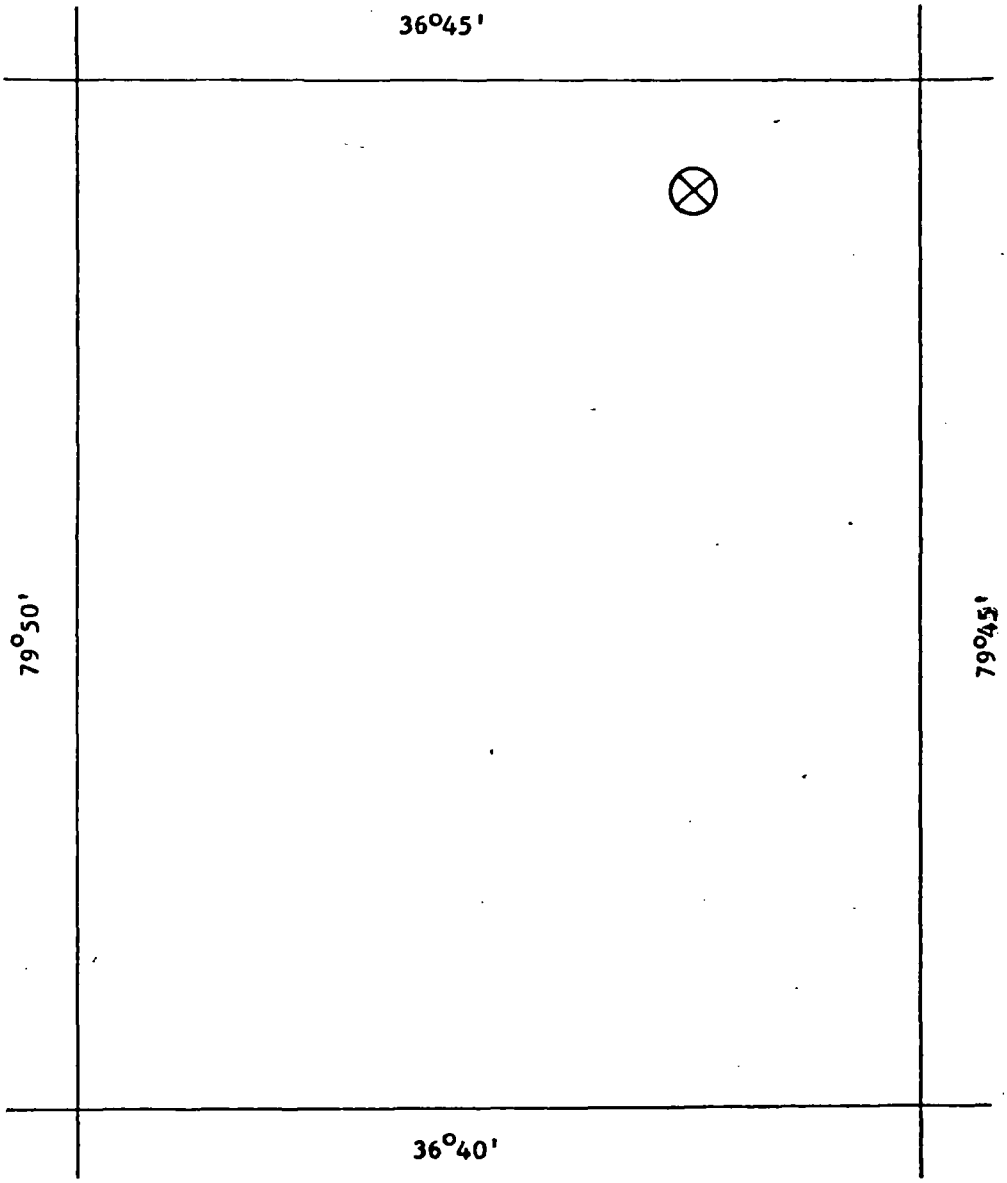
Vincent McKeever
Hydrologist

Robert F. Fonner
Geologist

REFERENCE:	U.S. DEPARTMENT OF AGRICULTURE SOIL CONSERVATION SERVICE ENGINEERING & WATERSHED PLANNING UNIT UPPER DARBY, PENNSYLVANIA	DRAWING NO. VA-483 SHEET 3 OF 5 DATE 12-16-63

DESIGN REPORT

LEATHERWOOD CREEK WATERSHED PROTECTION PROJECT
SITE NO. 3, PETERS BRANCH
VA-483-R
HENRY COUNTY, VIRGINIA



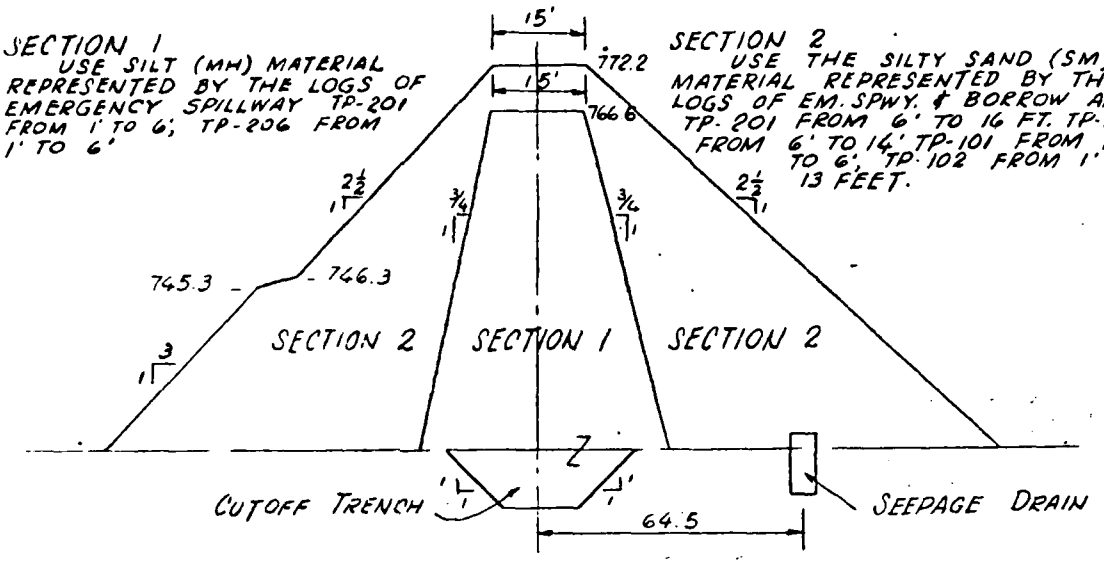
REFERENCE:
MARTINSVILLE, VA-NC
15' QUAD
1947

U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

DRAWING NO.
VA-483-R
SHEET 4 OF 5
DATE 5-23-63

DESIGN REPORT

Summary Sheet



Typical X-Section

I.	Watershed data		
	A. Structure class	(a)	
	B. Drainage area	6,300	Ac.
	C. Time of concentration - T_c	5.4	Hrs.
	D. Hydrologic curve number - CN		
	1. Moisture condition II	72	
	2. Moisture condition III	88.5	
II.	Principal spillway		
	A. Conduit		
	1. Size (I.D.)	42	In.
	2. Length	202	Ft.
	B. Riser		
	1. Size	3.5x9.0	Ft.
	2. Height	23	Ft.
	C. Weir length	18.0	Ft.
	D. Orifice size	1.25x3.5	in.
	E. Pond drain size	36	in.
III.	Emergency spillway		
	A. Width	200	Ft.
	B. Side slopes	3:1 3½ IV	
	C. Length of level section	20	Ft.
	D. Exit slope	0.03	Ft/Ft.
	E. Maximum velocity at control section (D.H.W.)	6.75	Ft/Sec.
	F. Duration of flow (D.H.W.) through emergency spillway	11.69	Hrs.
	G. Frequency of use	2.0%	

REFERENCE:

U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
ENGINEERING & WATERSHED PLANNING UNIT
UPPER DARBY, PENNSYLVANIA

DRAWING NO. VA-483

SHEET 5 OF 5

DATE 12-16-63

UNITED STATES DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

10-69

DETAILED GEOLOGIC INVESTIGATION OF DAM SITES

GENERAL

State VIRGINIA County HENRY - - ¼ - - ¼ Sec - T - R - ; Watershed Leatherwood Creek

Subwatershed Peters Branch Fund class FP-08 (FP 2 WP 1 etc.) Site number 3 Site group I Structure class a

Investigated by MACK, T., Geologist (Signature and title) Equipment used Case backhoe (Type size, make model etc.) Date 5/63

SITE DATA

Drainage area size 9.64 sq. mi. 6298 acres Type of structure Earth Fill Purpose Flood Prevention

Direction of valley trend downstream SE Maximum height of fill 39.8 feet. Length of fill 411 feet.

Estimated volume of compacted fill required 37,250 cubic yards

STORAGE ALLOCATION

	Volume (ac. ft.)	Surface Area (acres)	Depth at Dam (feet)
Sediment	193	39.0	10.0
Floodwater	2100	126.0	34.5

SURFACE GEOLOGY AND PHYSIOGRAPHY

Physiographic description Piedmont Province Topography rolling Attitude of beds Dip none Strike none

Steepness of abutments Left 26 percent Right 29 percent Width of floodplain at centerline of dam 125 feet

General geology of site: The site is underlain by the Leatherwood granite formation, which is of probable Paleozoic age. At this locality, the formation ranges from a granite to a syenite. Quartz, which is an essential mineral in granite, ranges from 3 to 16 percent. In the syenite, plagioclase feldspar becomes an important mineral. It occurs up to 25 percent of the volume of rocks. This high plagioclase syenite is on the higher elevations of the left abutment. The Lloyd soil that is on the left side of the emergency spillway is formed from this more basic syenite.

The content of black biotite mica ranges from 15 to 40 per cent. This is a high biotite content for a granite syenite. In many places it gives a black color to the rock. Muscovite mica is present in minor amounts.

Peter's Branch flows through a narrow valley at the dam site. Recent stream alluvium fills the narrow flood plain. The stream flows in a stream channel that ranges from 2 to 3½ feet below the flood plain. The stream is slowly degrading. Traces of former meanders are at the dam site and upstream. The stream and its tributaries flow in a strongly entrenched dendritic pattern. Traces of former pene-

VA-483G

plaination are still observable in that the tops of all hill crests are generally at the same elevation. The topography has reached early maturity.

Centerline of the Dam

Both abutments are underlain by syenite that has a high content of black biotite mica. The depth of the rockline ranges from 3 to 5 feet on the right abutment. On the left abutment it ranges from 1 to 5 feet. The syenite appears unjointed from surface observation.

The flood plain is underlain by recent stream alluvium. The upper 3 to 4 feet of this is moist silty to sandy Congaree soil. Below this is a wet reduced gray layer of silt and sand which ranges from 4 to 8 feet in thickness.

Below this reduced alluvial layer is a light yellowish red silty material that is a buried residual soil. It is not wet. Rock fragments and mica flakes are present. In comparison to the sandy wet alluvial material, this latter material appears fairly stable. It was observed from several test pits that this dryer layer is underlain by weathered rock.

Emergency Spillway

The emergency spillway is located in the left abutment. Test pits showed the spillway cut to be free of rock, except at station 4+20 on the centerline. Here the rockline occurs two feet above grade.

Two soil types are present in the emergency spillway. The four test pits on the left side showed Lloyd soil to be present. This soil has a tight clayey B horizon and a loose micaceous C horizon. The centerline and the right side have Cecil soil that also has a clayey B horizon and a loose micaceous C horizon. For construction purposes, the B horizons of these two soils are similar. Also the two C horizons are extremely similar. The B horizons of these are considered to be better construction material than the C horizons. If there is need for additional borrow, the left slope of the emergency spillway can be benched.

Borrow Area

Two borrow areas were investigated. One is below the waterline on the left side of the stream. The other is above the waterline on the same side of the stream. The borrow area below the waterline is narrow, averaging only 50 feet in width. It consists of residual Cecil soil and colluvial Thurmont soil. The average useable depth of these soils is approximately 5 feet. The part of this borrow area more than 800 feet from the centerline of the dam is inaccessible to the extent that it is almost unuseable. It is bordered on the stream side by a swamp and on the hill side by a fairly steep slope.

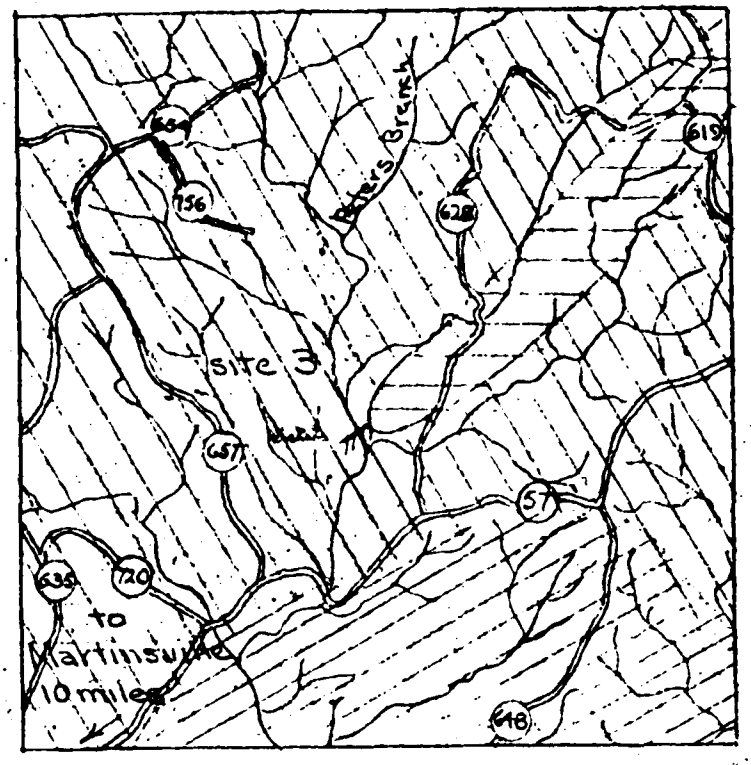
The second borrow area is above the waterline. It is largely composed of shallow Cecil soil that averages 4 feet in depth. This area is accessible to the dam site.

Principal Spillway

Three possible conduit trenches were investigated. Pipe trench A intersects the centerline of the dam at station 2+50. Under the riser, weathered rock was found at 12 feet. It was not encountered under the outlet. A large spine of firm granite was in this trench. It lies within 1 to 5 feet of the ground surface for 50 feet on both sides of the dam centerline. To cut this spine down to a depth of 2 feet below the cradle would require the removal of at least 520 cubic yards of granite. In this pipe trench the area under the riser and outlet will have to be excavated and backfilled to a depth of 7 feet.

Pipe trench B intersects the centerline of the dam at station 2+92. It parallels pipe trench A at a distance of 40 feet. No rock was encountered in this trench. From the riser to 40 feet left of the dam centerline, no firm soil was encountered even to a depth of 11 feet below ground level. A fairly firm buried residual soil occurs for approximately 25 feet along this pipe trench in this area left of the centerline of the dam. The riser and the outlet of this pipe trench will be on unstable alluvial material.

A third pipe trench was investigated. It is 25 feet right of pipe trench A. In this pipe trench the granite spine was encountered at 7 feet below ground level. The buried soil was encountered in test pits at a depth of 6 to 7 feet for 50 feet on either side of the centerline of the dam.



Scale 0 ½ 1 2 3

Leatherwood granite and syenite with pegmatites and migmatites

Leatherwood granite with orthogneissoid structure (boundary diffuse)

Leatherwood syenite with plagioclase feldspar

GEOLOGIC MAP OF THE AREA SURROUNDING SITE NO. 3
LEATHERWOOD CREEK W/S, HENRY COUNTY, VIRGINIA

VA-483G

4 OF 5

UNITED STATES DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SOIL SAMPLE LIST
SOIL AND FOUNDATION INVESTIGATIONS

Location Henry County, Virginia Owner _____

Watershed Leatherwood Creek Sub-watershed Peters Branch Site No. 3

Submitted by Mack, T Date June 19 63

Sent by Truck (carrier) Government B/L No. _____

Lab. No.	Field Sample No.	Sample Description		Depth		Type of Sample	
		Location	Grid or Station	From	To	Undist.	Dist.
		LARGE					
	101-1	Borrow Area	90' Rt. 4+74 ℄ A	1	6		x
	102-1	Ditto	70' Rt. 7+00 ℄	1	13		x
	201-1	Emergency Spillway	100'Lt. 2+00 ℄ E. Spillway	1	6		x
	201-2	"	Ditto	6	16		x
	206-1	"	2+00 ℄ E.Spillway	1	6		x
	206-2	"	Ditto	6	14		x
		SMALL					
	501-1	Toe Drain	3+68 ℄ Pipe A	1	6		x
	501-2	"	Ditto	6	11		x
	502-1	"	65'Lt.3+75 ℄ Dam	1	5		x

Original to Soils Laboratory
Copy to E and WP Unit
Distribute other copies as directed by State Conservationist

VA-4636

Sheet 5 of 5 Sheets

APPENDIX V

STABILITY DATA

OPTIONAL FORM NO. 10
5010-104

UNITED STATES GOVERNMENT

Memorandum

TO : R. C. Barnes, State Conservation Engineer, SCS, Richmond, Virginia

DATE: August 28, 1963

FROM : Rey S. Decker, Head, Soil Mechanics Laboratory, SCS, Lincoln, Nebraska

SUBJECT: Virginia WP-08, Leatherwood Creek, Site No. 3

ATTACHMENTS

1. Form SCS-354, Soil Mechanics Laboratory Data, 2 sheets.
2. Form SCS-355, Triaxial Shear Test Data, 2 sheets.
3. Form SCS-352, Compaction and Penetration Resistance Report, 6 sheets.
4. Form SCS-357, Summary - Slope Stability Analysis, 1 sheet.
5. Form SCS-372, Recommended Use of Excavated Material, 1 sheet.
6. Geologic Plans and Profiles.

INTERPRETATION AND DISCUSSION OF DATA

FOUNDATION MATERIALS

A. Classification and Description: The site is on slightly weathered granite. It was investigated by backhoe test pits only, and the depth to rock is not defined if over 10 feet to 12 feet.

Logs indicate the materials may class about the same as on Site 2-A, ranging from SM to CL and MH.

B. Consistency, Strength and Compressibility: The alluvial sands below 3 feet to 4 feet were described as "unstable" with a "fairly stable" residual sand noted between these and rock.

This foundation may be weaker and more compressible than that tested from Site 5.

C. Permeability: Permeability of both soils and bedrock is assumed to be low as on Site 2-A.

EMBANKMENT MATERIALS

A. Classification: Soil classes of these samples are SM and MH. The MH on this site is finer and the SM is intermediate in clay size and compacted density to those previously shear tested. The surface 3 feet to 4 feet may be more plastic than the composites indicated on this site also.

B. Compacted Dry Densities: Standard compaction tests yielded maximum dry densities of 90.0 p.c.f. to 93.5 p.c.f. for MH and 98.0 p.c.f. to 105.0 p.c.f. for SM.

C. Permeability: Rates for compacted MH should be very low. Those for compacted SM will largely vary inversely to density.

D. Shear Strength: The fine MH and the most well graded SM were tested at 95% of Standard density. The specimens were saturated, and consolidated, undrained triaxial tests were performed. Shear parameters were interpreted as $\phi = 19°$, c = 800 p.s.f. for the MH and $\phi = 30.5°$, c = 300 p.s.f. for the SM. These values are recommended for design.

E. Consolidation: The consolidation phase of the shear tests indicate about 5% settlement may be expected in the base of the fill.

STABILITY ANALYSIS

A 41.4-foot dam with 10 feet of foundation no weaker than the embankment was assumed. Failure arcs were tried in the 2 1/2:1 over 3:1 upstream slope with a 10-foot berm. They showed such high safety factors under full drawdown that no other trials were made. See the summary on Form SCS-357.

RECOMMENDATIONS

A. Site Preparations: Areas of low-density silt or sand under the fill with less density than 77.0 p.c.f. should be removed and replaced with compacted fill.

B. Cutoff: A cutoff or core is indicated. Unless it can bottom on firm rock at least up to the sediment pool elevation, a foundation drain will be required. Backfill with the most plastic material available.

C. Principal Spillway: All three locations investigated have objectionable features. A slightly skewed location near ℄ Station 3+75 appears to offer better foundation conditions even though the alignment may not be so desirable. It is suggested this be considered.

D. Drainage: No measures are needed if the cutoff is bottomed on firm rock. Otherwise a foundation trench drain at c/b = 0.6 is needed.

3 -- R. C. Barnes -- 8/28/63
Rey S. Decker
Subj: Virginia WP-08, Leatherwood Creek, Site No. 3

E. Embankment Design: The following are recommended:

1. Selectively place the MH in the backfill and center section and the SM in both shells. The low-density SM should go into the downstream base.

2. Place all materials at 95% of Standard (B-2) density. See Form SCS-372 for minimum densities and allowable moisture ranges.

3. Make embankment slopes 2 1/2:1 over 3:1 upstream with the slope change and a 10-foot berm at elevation 745.3; and 2 1/2:1 downstream.

4. Provide overfill of 1.25 foot to compensate for residual settlement in the fill and foundation.

Prepared by:

Roland B. Phillips

Attachments

cc: R. C. Barnes (3)
H. M. Kautz, Upper Darby, Pa. (2)
G. W. Grubb, Upper Darby, Pa.

[illegible]

FORM SCS-357
10-58

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SOIL MECHANICS LABORATORY

SUMMARY - SLOPE STABILITY ANALYSIS

State [illegible] Project [illegible]

Date 8-6-6? Analysis Made By G.M.G. Checked By [illegible]

Method of Analysis SWEDISH CIRCLE

Location of Material			Emb. / 95?+5?? / ML		Emb. / 95?+5?? / SM					
Sample No.			64?85		64?8?					
γ_d				9?.7		97.3				
γ_m				109.5		116.0				
γ_s				115.5		121.0				
γ_b				53.0		58.5				
Condition	Opt.	Sat.	Opt.	Sat.	Opt.	Sat.	Opt.	Sat.	Opt.	Sat.
ϕ				19.0°		30.5°				
Tan ϕ				0.3[illegible]		0.5[illegible]				
K										
C				[illegible]		300				

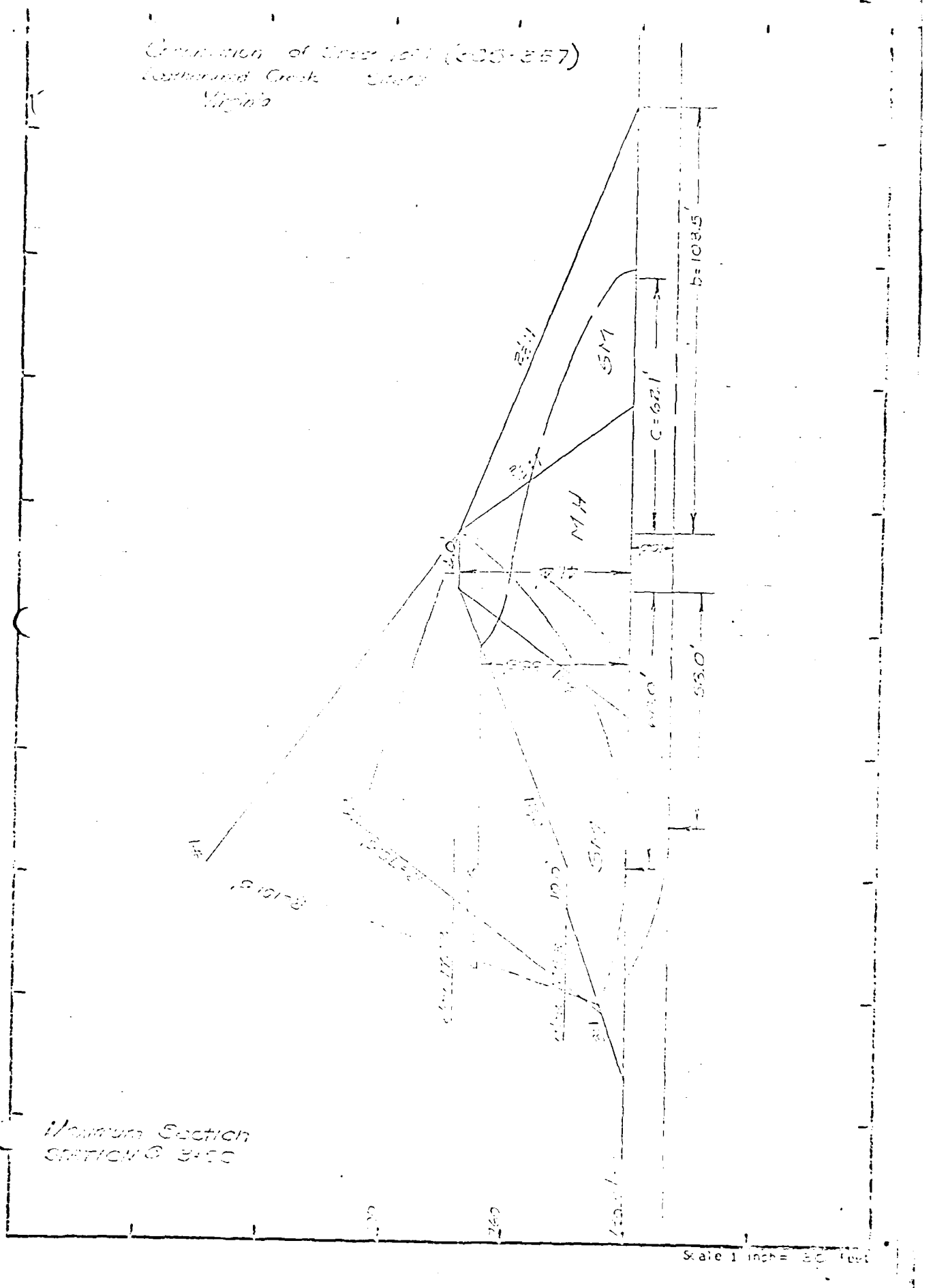
UPSTREAM SLOPE*

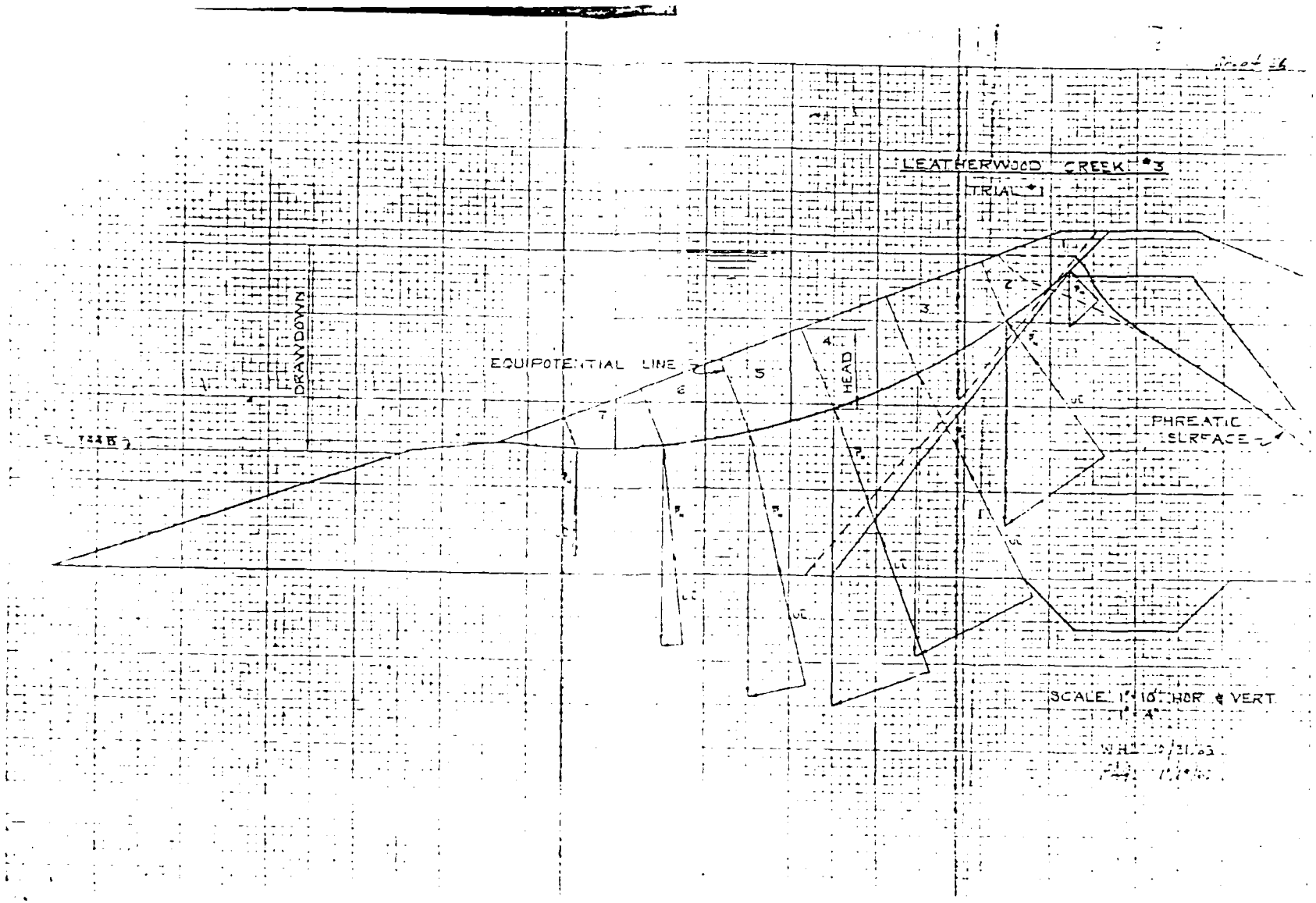
Trial	Slope	Conditions	Fs
1	[illegible]	Full drawdown [illegible]	
		[illegible]	
		[illegible]	[illegible]
2	[illegible]	Full drawdown [illegible]	
		[illegible]	
		[illegible]	
		[illegible]	[illegible]
		* [illegible]	

DOWNSTREAM SLOPE

Trial	Slope	Conditions	Fs

To be used to report to field offices data used for slope stability analyses and the results of the analyses.
The right side of the form will be used for a sketch of the embankment on which the analyses have been made.


b=103.5'
c=62.1'
2:1
5:1
4:1
40'
55.0'
Maximum Section
SECTION @ 3+00
Scale 1 inch = 30 feet


LEATHERWOOD CREEK #3
TRIAL #1
DRAWDOWN
EQUIPOTENTIAL LINE
HEAD
PHREATIC SURFACE
SCALE 1" = 10' HOR & VERT

COMPUTATION SHEET
SCS-522 REV 5-58

STATE Virginia PROJECT Leatherwood Creek Site 2
BY WHL DATE 10/31/63 CHECKED BY [illegible] DATE 11/1/63 JOB NO VA-422
SUBJECT Stability Analysis SHEET 27 OF

SOIL CONSERVATION SERVICE

$\phi = 30°$ $\tan\phi = 0.577$ $C = 0.28$ K/ft²

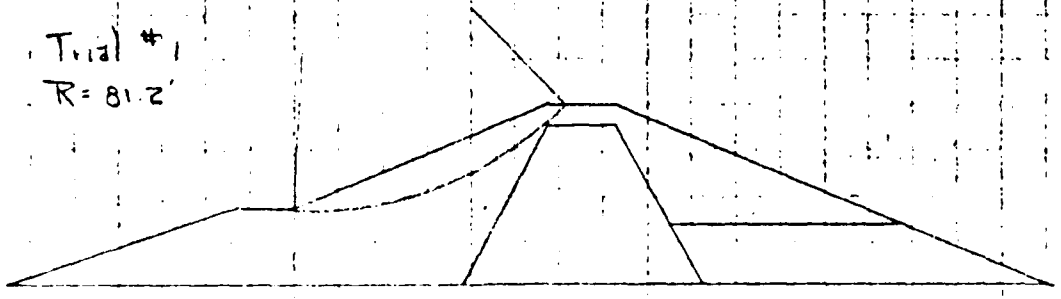
$\gamma_m = 118.7$ #/ft³ $\gamma_{SAT} = 125.8$ #/ft³ u = hydrostatic press. = head x 0.0624

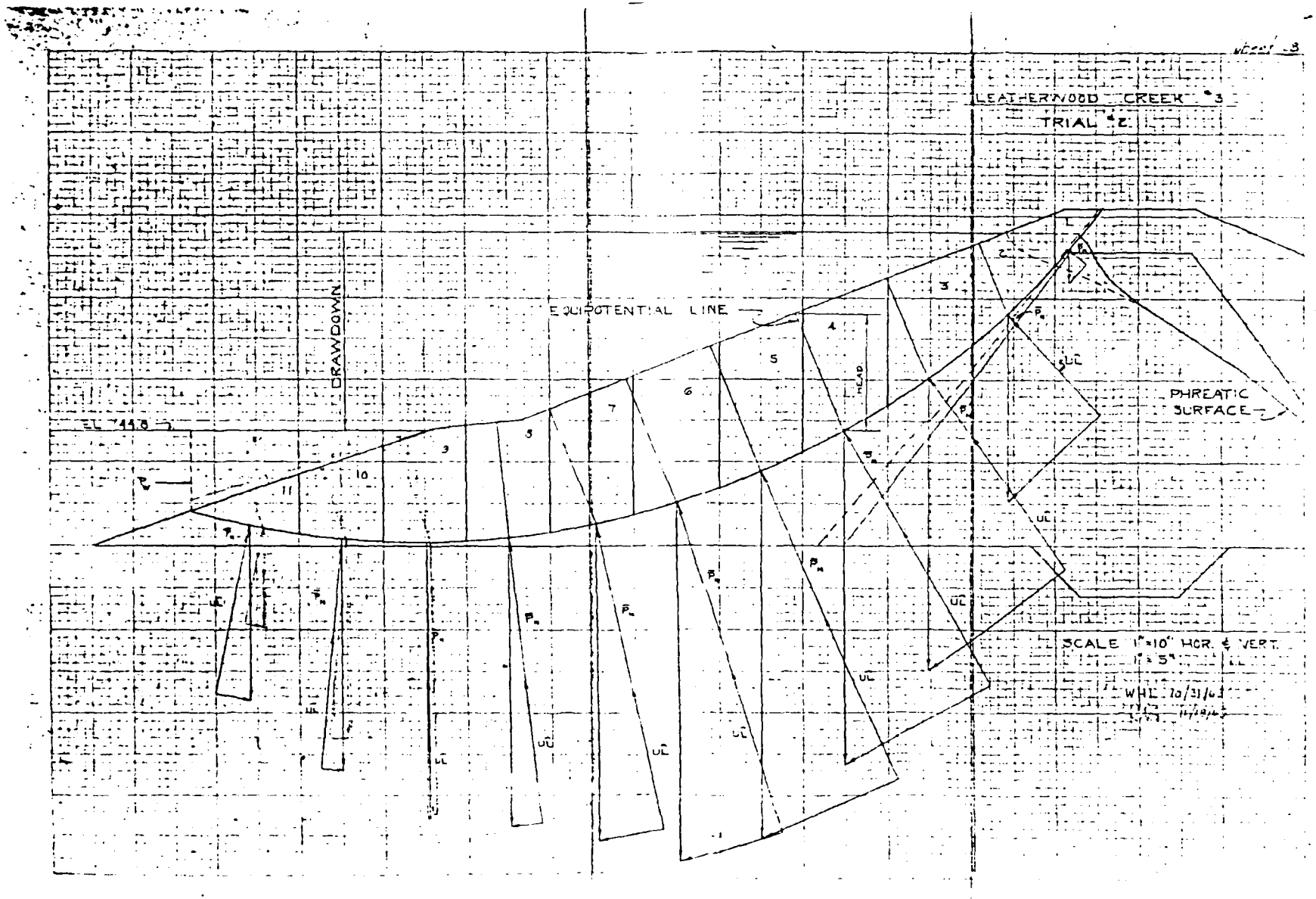
Rad. = 81.2' $\bar{P}_N = P_N - UL$

slice	Area		total wgt.	$\bar{L}$	U	P_N	Tang. Forces		$U\bar{L}$	$\bar{P}_N$	$\bar{P}_N \tan\phi$	$C\bar{L}$
	ft²		Kips	ft.	K/ft²	Kips	Driving	Resist.	Kips	Kips	Kips	Kips
1	22.8	m	2.71	9.7	0	1.96	1.85K		0	1.96	1.13	2.72
2	19.2	m	9.68	12.8	0.44	7.80	5.72		5.63	2.17	1.25	3.58
	58.8	s										
3	104.5	s	13.15	11.5	0.57	11.7	6.1		6.56	5.14	2.97	3.22
4	109.5	s	13.78	11.0	0.59	12.96	4.75		6.49	6.47	3.73	3.08
5	97.5	s	12.27	10.4	0.54	11.95	2.74		5.62	6.33	3.65	2.91
6	74.0	s	9.31	10.3	0.41	9.3	1.0		4.22	5.08	2.93	2.88
7	40.3	s	5.07	13.4	0.22	5.05		0.09K	2.95	2.10	1.21	3.75
							22.16K	0.09K			16.87K	22.14K

Driving Force = 22.16K

Resisting Force = 0.09 + 16.87 + 22.14 = 39.10 $FS = \frac{39.10}{22.16} = 1.76$ Trial #1




LEATHERWOOD CREEK
TRIAL "E"
EQUIPOTENTIAL LINE
DRAWDOWN
EL 1118
PHREATIC SURFACE
HEAD
SCALE 1"=10' HOR. & VERT.
WHL 10/31/63

COMPUTATION SHEET
SCS-522 REV 5-58

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
GPO 1958 O-470988

STATE Virginia | PROJECT Leatherwood Creek Site 13
BY WHL | DATE 11/1/63 | CHECKED BY [illegible] | DATE 11/18/63 | JOB NO. VA-483
SUBJECT Stability Analysis | SHEET 2 OF 2

Trial # 2 Rad. = 102.4'

slice	Area ft²		tot. wt. Kips	$\bar{L}$ ft.	U K/ft²	P_N Kips	Tang. Forces Driving	Resist.	$U\bar{L}$ Kips	$\bar{P}_N$ Kips	$P_N \tan\phi$ Kips	$C\bar{L}$ Kips
1	16.8	m	1.99	9.3	0	1.3	1.48		0	1.3	0.75	2.60
2	22.4	m	2.66	14.2	0	2.0	7.74		0	0.49	0.28	3.98
	68.9	s	8.67		0.55	4.30			7.81			
3	139.5	s	17.55	12.6	0.77	14.1	10.35		9.70	4.40	2.54	3.53
4	164.5	s	20.69	11.7	0.90	17.4	9.95		10.53	6.87	3.96	3.28
5	175	s	22.02	11.2	0.95	20.1	8.8		10.64	9.46	5.46	3.14
6	172.5	s	21.70	10.8	0.94	20.7	6.52		10.15	10.55	6.09	3.02
7	153	s	19.25	10.5	0.85	18.9	4.0		8.93	9.97	5.75	2.94
8	139.1	s	17.50	10.2	0.86	17.3	1.8		8.77	8.53	4.92	2.84
9	130	s	16.35	10.0	0.84	16.63	0.1		8.40	8.23	4.75	2.80
	4.5	w	0.28									
10	94	s	11.83	10.0	0.81	13.85		1.30	8.10	5.75	3.32	2.80
	34	w	2.12									
11	44.8	s	5.89	13.5	0.72	10.25		2.10	9.72	0.53	0.31	3.78
	7.3	w	4.56									
							50.74ᵏ	3.40ᵏ			38.13ᵏ	34.73ᵏ

$P_w = \frac{1}{2}(0.624)(9.6)^2 = 2.88^k$ @ 2/3 of 95.5'

$2.88(95.5) = P_w'(102.4)$ $P_w' = 2.69^k$ acting on arc

Driving force = 50.74ᵏ

Resisting force = 3.4 + 38.13 + 34.73 + 2.69 = 78.95ᵏ

$FS = \frac{78.95}{50.74} = 1.56$

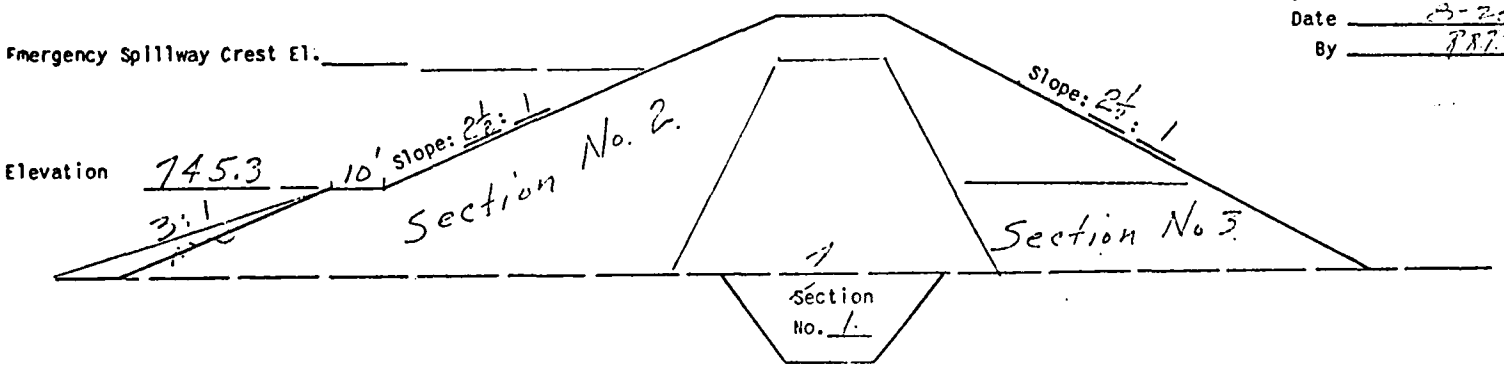
SCS-377
(3/59)

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

RECOMMENDED USE OF EXCAVATED MATERIAL

☐ Formal Zoning Plan ☒ Selective Placement Plan

State Virginia
Project [illegible]
Date 3-25-64
By [illegible]



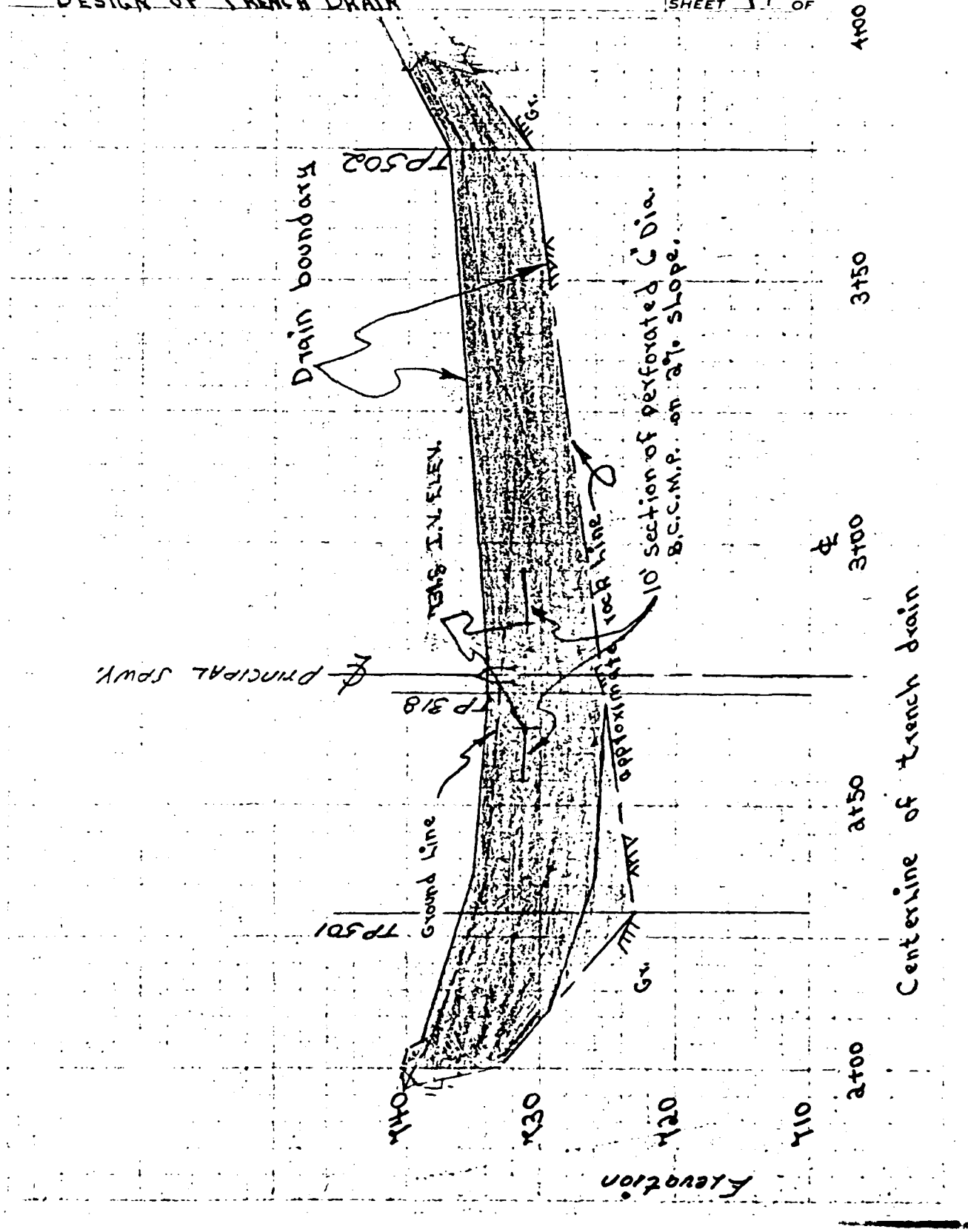
TYPICAL EMBANKMENT SECTION

Embankment Section		Source of Fill Material			Lab. Sample No.	Lab Test (Standard)		Lab. Curve No.	Compaction Requirements Class of Fill [illegible]		
Sec. No.	Description	Location	Ave. Depth From	Ave. Depth To		Max. Den.	Optm. Moist.		Minimum Density Lbs. per Cu.Ft.	Moisture Range Percent From	Moisture Range Percent To
1.	Backfill and cover	E. Spillway - TP# 201.1	1	6	64 W 83	90.6	30.0	17	[illegible]	28	35
		" " - TP# 206.1	1	6	64 W 85	93.5	26.0	30	99	25	29
2.	Upstream shell	E. Spillway - TP# 201.2	6	16	64 W 84	109.0	21.0	2	99	[illegible]	[illegible]
		Borrow - " 101.1	1	6	64 W 87	105.5	19.0	5	100	17	22
		" " 102.1	1	13	64 W 88	102.0	20.5	6	97	19	23
3.	Downstream base	E. Spillway - TP# 206.2	6	10	64 W 86	98	23.5	4	93	20	25

COMPUTATION SHEET
SCS-523 REV 5-58

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

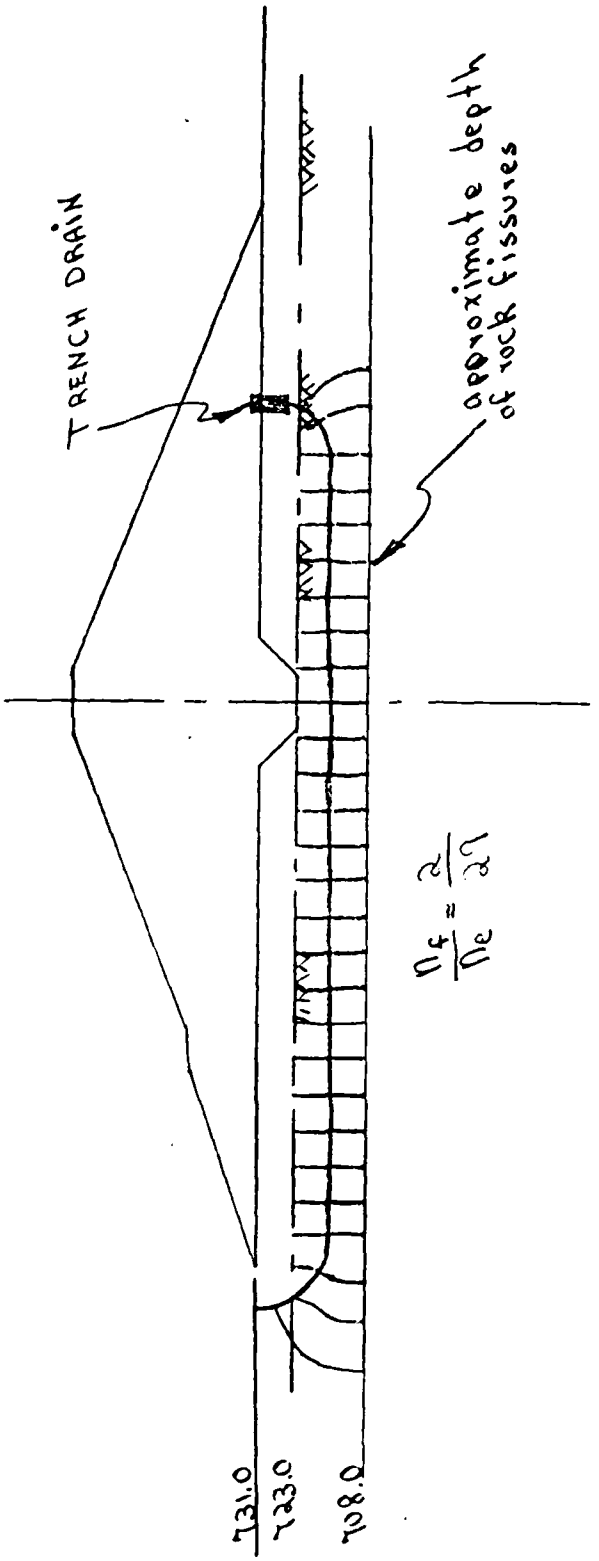
STATE Virginia | PROJECT Heatherwood Creek Site 3
BY [illegible] | DATE 12-18-63 | CHECKED BY SCR | DATE 12/23/63 | JOB NO VA-483
SUBJECT Design of Trench Drain | SHEET 19 OF



SCS 523 REV 5 58

U S DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

STATE VIRGINIA PROJECT Leatherwood Creek Site 3
BY [illegible] DATE 12-18-63 CHECKED BY [illegible] DATE [illegible] JOB NO VA-483
SUBJECT Design of Trench Drain SHEET 20 OF



$\frac{n_f}{n_e} = \frac{2}{20}$

$i = \frac{h}{L} = \frac{736.6 - 731.0}{220} = \frac{35.6}{220} = 0.162$ ft/ft

K = 1.5 ft/day for fissured rock (an average)
A = 15 ft²

$Q = KiA$

$Q = 1.5 \times 0.162 \times 15 = 3.64$ ft³/day/ft of dam

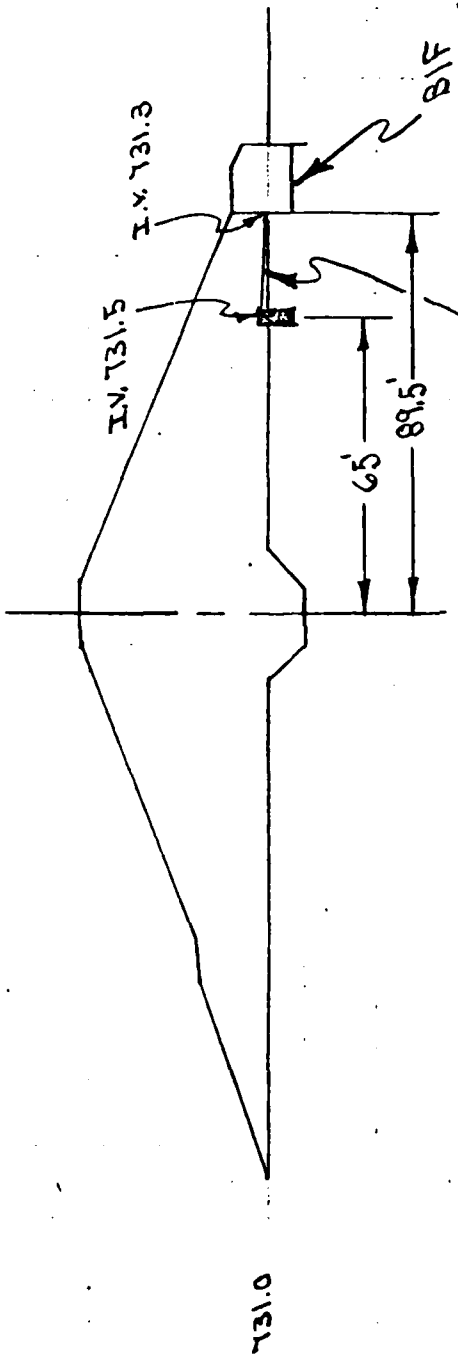
$Q = K h \frac{n_f}{n_e} = 1.5 \times 35.6 \times \frac{2}{20} = 3.70$ ft³/day/ft of dam

1" = 40'

SCS 523 REV 5 58

U S DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

STATE VIRGINIA | PROJECT Leatherwood Creek Site 3
BY [illegible] DATE 12-19-63 | CHECKED BY SCM DATE 12/23/63 | JOB NO VA-483
SUBJECT Design of Trench Drain | SHEET 21 OF



24'-6" Non-perforated 6" Dia. B.C.M.P. connecting Trench drain with B/F Drain @ apx 8.16% slope

Each 10' section of pipe in drain, drains 100' of Trench drain.
Q Through pipe = 370 ft³/day.

$$\frac{370\ ft^3/day}{86,400\ sec/day} = 0.00428\ cfs$$

capacity needed.

COMPUTATION SHEET
SCS-523 REV 5-58

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

GPO 1958 O - 617661

STATE Virginia | PROJECT Leatherwood Creek Site 3
BY [illegible] DATE 12-19-63 | CHECKED BY SCP DATE 12/23/63 | JOB NO VA-483
SUBJECT Design of Trench Drain | SHEET 22 OF

Capacity of 6" Dia. B.C.C.M.P. Flowing half Full.

$Q = \frac{1.486}{n} a R^{2/3} S^{1/2}$ $n = 0.025$ Table 76 Pg 7-20 King

$a = \frac{\pi Y^2}{2}$ $p = \frac{2\pi Y}{2}$ $R = \frac{a}{p} = \frac{Y}{2}$ $S = 2\%$

$$Q = \frac{1.486}{n}\left(\frac{\pi Y^2}{2}\right)\left(\frac{Y}{2}\right)^{2/3}\left(S\right)^{\frac{1}{2}}$$

$$Q = \frac{1.486}{0.025}\left(\frac{3.14159 \times (0.25)^2}{2}\right)\left(\frac{0.25}{2}\right)^{2/3}\left(0.02\right)^{\frac{1}{2}} = \underline{0.207 \text{ cfs}}$$

$Q_{available} = \underline{0.207 \text{ cfs}}$

Form 223- 353a

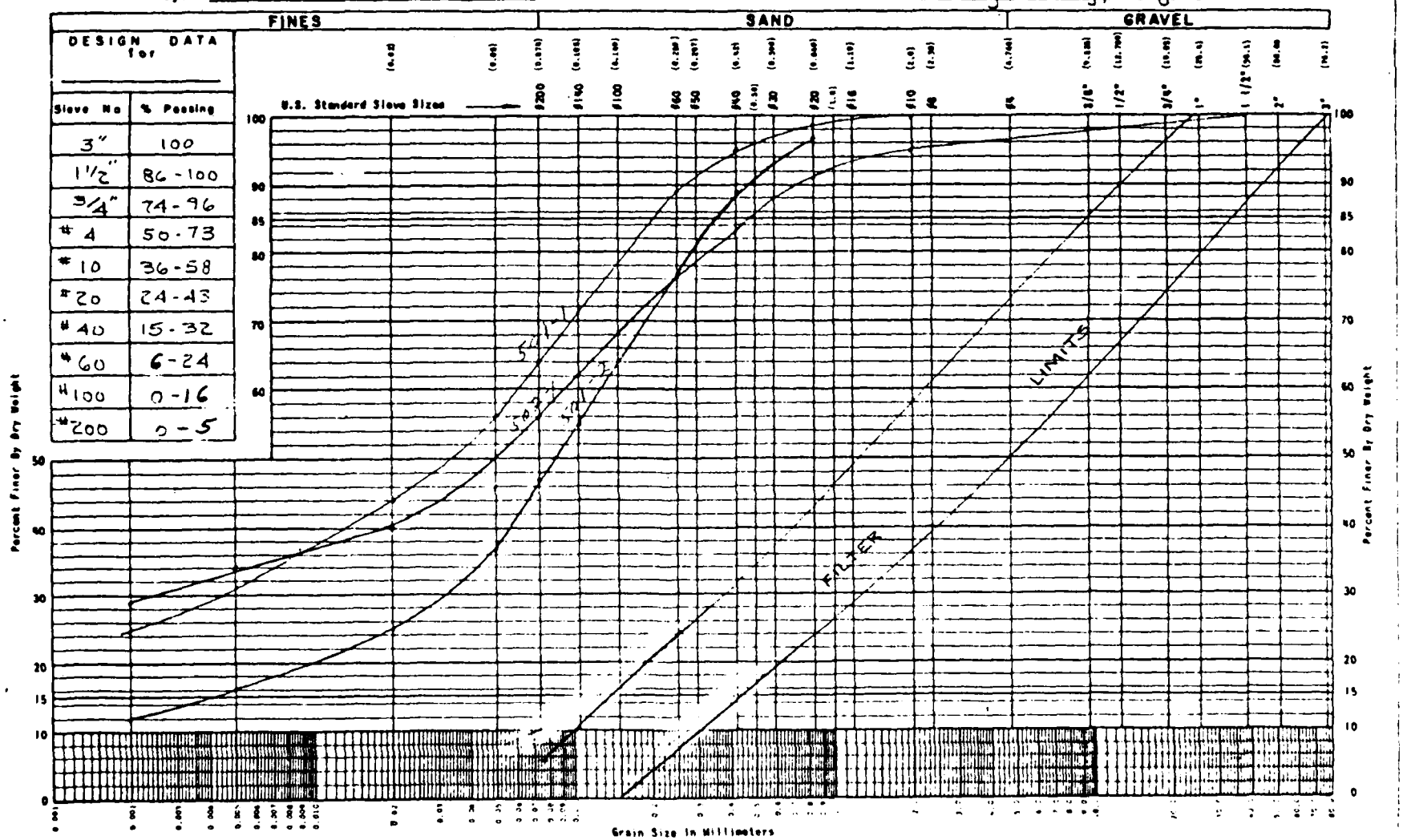
U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

WHL 11/12/63 SCR 12/10/6

GRAIN SIZE DISTRIBUTION GRAPH

Project Leatherwood Creek Site 3 Location Henry County, Virginia VA-483

DESIGN DATA for _____	
Sieve No	% Passing
3"	100
1 1/2"	86 - 100
3/4"	74 - 96
# 4	50 - 73
# 10	36 - 58
# 20	24 - 43
# 40	15 - 32
# 60	6 - 24
# 100	0 - 16
# 200	0 - 5

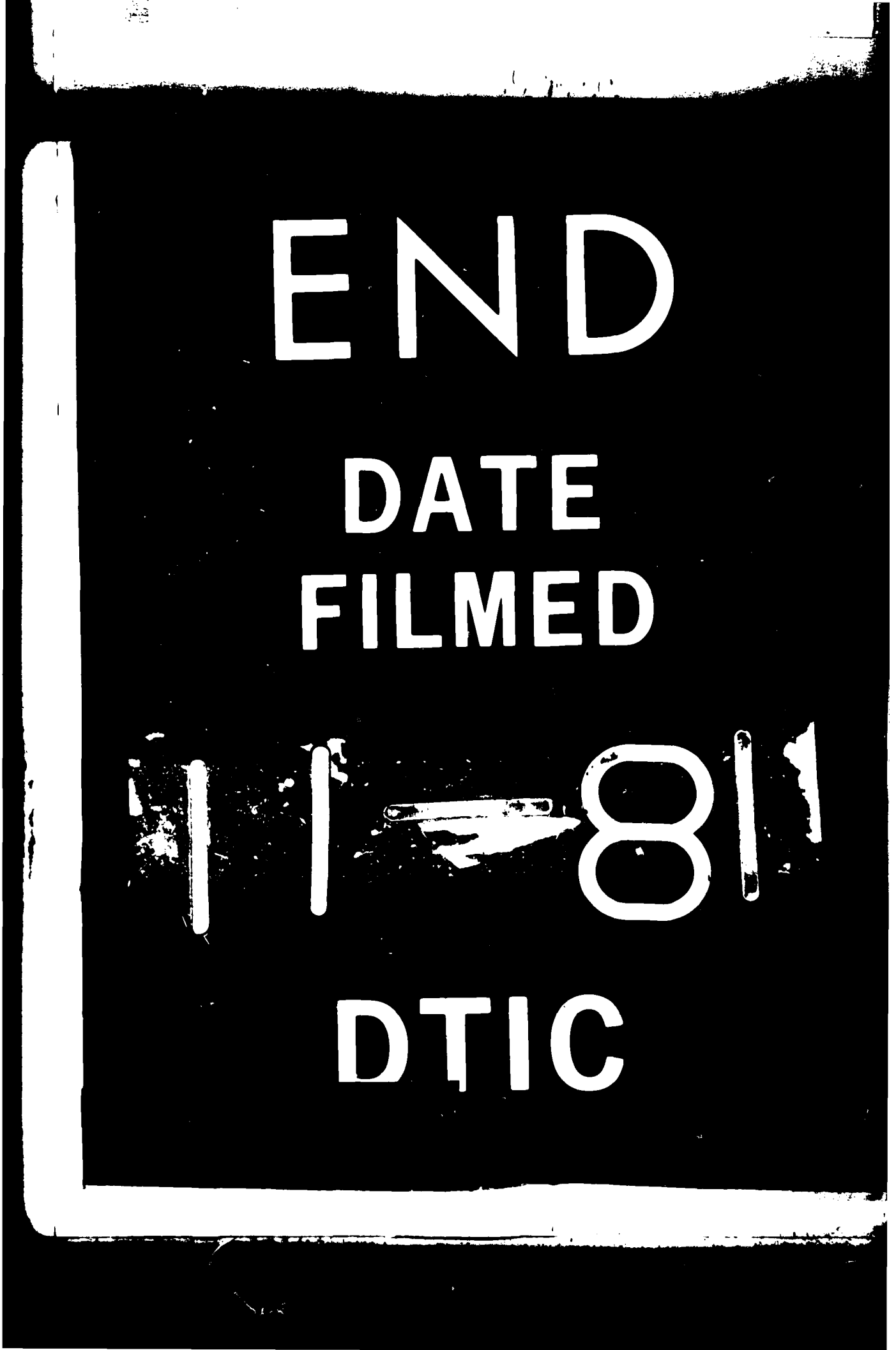


Sheet No 23 of ___

GPO 921843

APPENDIX VI - REFERENCES

1. Recommended Guidelines for Safety Inspection of Dams, Department of Army, Office of the Chief of Engineers, 46 pp.
2. Design of Small Dams, U. S. Department of Interior, Bureau of Reclamation, 1974, 816 pp.
3. Geology of the Snow Creek, Martinsville East, Price and Spray Quadrangles, Virginia by J. F. Conley and W. S. Henika, Virginia Division of Mineral Resources Reports of Investigations 33, 71 pp.
4. HEC-1 Dam Break Version, Flood Hydrograph Package, Users Manual for Dam Safety Investigations, the Hydrologic Engineering Center, U. S. Army Corps of Engineers, September, 1978.
5. Hydrometerological Report No. 33, U. S. Department of Commerce, Weather Bureau, U. S. Department of Army, Corps of Engineers, Washington, D. C., April, 1956.
6. Technical Paper No. 40, U. S. Department of Commerce, Weather Bureau, Washington, D. C., May, 1961.


END
DATE
FILMED
8
DTIC