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NATIONAL DAM SAFETY PROGRAM. MOUNTAIN RUN DAM NUMBER 8A (VA-047--ETC(U)
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RAPPAHANNOCK RIVER BASIN

(1)

AD A063624

Name Of Dam: MOUNTAIN RUN DAM NO. 8A
Location: CULPEPER COUNTY, VIRGINIA
Inventory Number: VA 04701

LEVEL II

PHASE I INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM

(12) 56p.

(10) Michael Baker, III

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(9) Final rept.,

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

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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 investigation 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 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.

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 and 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.

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MOUNTAIN RUN NO. 8A

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 inspections 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 VII). 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: Mountain Run Dam No. 8A is an earth-fill structure about 570 feet long and 34 feet high. The top of the dam is 14 feet wide and is at elevation 465.0 feet m.s.l. Side slopes are 2.5 horizontal to 1 vertical (2.5:1) on the downstream side and 3:1 on the upstream side.

The principal spillway consists of a 24-inch diameter reinforced concrete pipe, running through the dam at a low level. This pipe is served by a drop-inlet structure (riser) located in a low elevation of the reservoir just upstream from the heel of the embankment. The crest of the riser is at elevation 445.0. The principal spillway rests on solid rock.

The emergency spillway is a vegetated earth side-channel spillway located off the west end of the dam. It has a bottom width of about 125 feet with a crest at elevation 459.5 and side slopes of 3:1. The emergency spillway is cut into silty clay, weathered mica schist and weathered granite.

A 24-inch round slide headgate with the bottom at the floor of the riser (elevation 435) is located on the upstream side of the riser, thus permitting withdrawal of water from the bottom of the reservoir.

1.2.2 Location: Mountain Run Dam No. 8A is located on Mountain Run about six miles west northwest of Culpeper, Va. The reservoir formed by the dam is known locally as Caynor Lake.

1.2.3 Size Classification: The dam is classified as an "intermediate" size structure because of its maximum storage potential of 1870 acre-feet.

1.2.4 Hazard Classification: The dam is located in an urban area and is therefore given a high hazard classification in accordance with guidelines contained in Section 2.1.2 of Reference 1, Appendix VII. The hazard classification used to categorize dams is a function of location only and has nothing to do with its stability or probability of failure.

1.2.5 Ownership: Dr. Elliot Morris
4000 Cathedral Avenue
Washington, D. C. 20016

1.2.6 Purpose: Flood Control.

1.2.7 Design and Construction History: The dam was designed and constructed under the supervision of the U.S. Soil Conservation Service. Construction was completed in 1959.

1.2.8 Normal Operational Procedures: Operation of the project is automatic. The principal spillway is ungated, therefore water rising above the crest of the drop inlet is automatically passed downstream. Similarly water is automatically passed through the emergency spillway in the event of an extreme flood which fills the flood storage space.

1.3 Pertinent Data:

1.3.1 Drainage Areas: The dam controls a drainage area of 5.0 square miles.

1.3.2 Discharge at Dam Site:

Maximum flood at dam site not known.

Principal Spillway:
Pool level at emergency spillway crest . . . . 66 c.f.s.

Emergency Spillway:
Pool level at top of dam . . . . . 4,400 c.f.s.

1.3.3 Dam and Reservoir Data: Pertinent data on the dam and reservoir are shown in the following table:

Table 1.1 DAM AND RESERVOIR DATA

Item	Elevation feet m.s.l.	Reservoir Capacity Area acres	Reservoir Capacity Acre feet	Reservoir Capacity Watershed inches	Length miles
Top of dam	465.0	171	1870	7.0	-
Maximum pool, design surcharge	462.8	152	1520	5.7	1.6
Emergency spillway crest	459.5	124	1063	4.0	-
Principal Spillway crest (a)	445.0	22	73	0.3	0.4
Streambed at centerline of dam	431±	0	0	0	0

(a) Top of conservation pool and bottom of flood control pool.

SECTION 2 - ENGINEERING DATA

2.1 Design: The dam was designed and constructed under the direction of the U.S. Soil Conservation Service. As-built drawings and complete design data are available in the office of the State Conservationist, U.S. Soil Conservation Service, P.O. Box 10026, (Federal Building, Room 9201) Richmond, Va. 23240.

A geologic (foundation) investigation was conducted at the site by the SCS during the initial design stages. The investigation consisted of excavating and examining 18 test pits along the proposed dam alignment, principal and emergency spillways and borrows areas. The test pits were excavated with an industrial tractor to a depth of 11 feet or refusal on rock. Geologic logs, profiles, and a report of investigation with foundation recommendations were prepared based on the test pit excavations. The profiles are shown on Plate III, Appendix I, and the geologic report is inclosed as Appendix IV.

The embankment structure consists of a compacted earth dam. The design recommendations according to Appendix VI indicated that ML and MH materials be used in the center section and that SM material be used in the outer sections of the embankment. The ML and MH material should be placed at 100% and the SM material be placed at 95 to 97.5% of the maximum dry density established by the standard practice compaction test. Information on the typical section of the fill placement was not available.

As the embankment is built on bedrock, the seepage along the bedrock surface is controlled by a core trench which has a base width of 14 feet (see Plate III, Appendix I) and extends one foot into granite or 3 to 10 feet into the weathered schist with the actual depth determined as the trench was excavated.

To control the phreatic surface and to collect seepages, a drainage system is located under the downstream portion of the dam. The drainage system consists of a trench approximately 3 feet wide by a minimum of 4 feet deep filled with graded filter material and a 6-inch perforated pipe. An intercepting drain consisting of a trench and a pipe (size not specified) connects the seepage drain and runs parallel to the principal spillway to the plunge pool. Five anti-seep collars were built around the principal spillway under the upstream and center portion of the dam to control the problem of piping.

The emergency spillway located at the right abutment is formed by a cut into materials consisting of sandy silt, silty clay, and weathered mica schist.

Referring to Appendix VI, eight soil samples were tested for soil classification. Samples obtained from the emergency spillway cut area were classified as ML, MH and SM materials. Samples obtained from the floodplain were classified as SM and ML materials. Almost the entire amount of fill required for constructing the embankment was excavated from the spillway area. The maximum dry density of the ML and SM materials ranged from 93.5 to 99.5 pcf. Consolidated undrained tests were conducted on a MH and a ML material. Results of triaxial test performed on sample compacted at optimum water content and on sample compacted at 100% saturated water content for each material were as follows:

Type of Soils	Compaction Water Content %	Maximum dry density pcf	Angle of int. friction Degree	Cohesion psf
MH	26 (sat.)	98	31	0
MH	19 (opt.)	97	31	288
ML	30 (sat.)	96	30	288
ML	17 (opt.)	96	30	1370

The stability of the embankment slopes was checked with the Swedish circle method of analysis (given in Appendix VI). The factor of safety is 1.40 for the upstream slope with drawdown from El. 459.5 (emergency spillway crest) and 1.96 for the downstream slope with a drain at c/b = 0.5. The stability calculations were not available. For additional information on slope stability analysis, see Section 6 and Appendix V. The foundation for embankment is bedrock and no design information on settlement analysis for the embankment was available.

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 Operation: There is no known operation and instrumentation procedure.

2.4 Evaluation: See Evaluation given in Section 6.3.

SECTION 3 - VISUAL INSPECTION

3.1 Findings: Field observation are outlined in Appendix III. There is excessive growth of vegetation on the embankment, abutments, in the immdiate downstream area, and riprap protecting discharge channel. Several animal burrows were noted in the embankment. Wet spots, supporting lush growth, were noted within the immediate downstream area. A small hole was also noted in a nearby downstream area. This may be a depression. Colloidal sediment was evident in foundation drain pipes. The dam has no staff gages or instrumentation. The access walkway to the riser was damaged. Manual controls were not available to operate intake valves in the riser.

3.2 Evaluation: Overall the dam was in fair condition at the time of inspection. However, some minor remedial measures are required. Excessive growth encourages the development of deep rooted vegetation. This type of growth can encourage piping within the embankment and undermine riprap protection. Excessive growth at the toe and downstream areas, the wet spots and the depression are indications of seepage; although no direct correlation could be made with any of the above mentioned factors. Annual SCS inspections have revealed that wet spots have been problem since 1962. The geology report in Appendix IV indicates that there is a spring in the downstream area. The spring may be the sole source for the wet spots. However, the above findings are indicative that more specific measures should be taken to closely monitor the structure.

SECTION 4 - OPERATIONAL PROCEDURES

4.1 Procedures: Operation of the project is automatic. The 24-inch diameter principal spillway is ungated, therefore water rising above the crest of the drop inlet is automatically passed downstream. This in turn automatically maintains the pool level at or near elevation 445 ft. m.s.l. most of the time. Water is automatically passed through the ungated emergency spillway in the event of an extreme flood which fills the flood storage space.

4.2 Maintenance: Maintenance of the project consists mainly of fertilizing, liming, and mowing the embankment and spillway; seeding and mulching bare areas; painting the trash racks; and repairing gullies that might occur.

4.3 Inspection: The project is inspected annually to insure proper maintenance. The inspection of the dam is conducted as part of the Annual Inspection of the works of improvement in the Mountain Run Watershed. The inspection team consists of representatives from the Town of Culpeper, the U. S. Soil Conservation Service, the Virginia Soil and Water Conservation Commission, the Culpeper Soil and Water Conservation District and the Mountain Run Watershed Association.

4.4 Warning System: At the present time, there is no warning system or evacuation plan in operation.

SECTION 5 - HYDRAULIC/HYDROLOGIC DESIGN

5.1 Design: The elevation of the crest (445.0 feet m.s.l.) of the drop inlet to the principal spillway was established at an elevation which would provide the conservation storage needed for sediment deposit. The capacity (66 c.f.s. with reservoir level at crest of emergency spillway) of the principal spillway was established by consideration of a number of factors including (1) the capability of evacuating the flood storage space within a reasonable time (± 10 days), (2) not passing damaging flows downstream, and (3) the capability of the reservoir to store flood waters. The crest (elevation 459.5) of the emergency spillway was established at the maximum elevation reached in routing the principal spillway hydrograph which resulted from the 100-year rainstorm. The elevation of the top of the dam (elevation 465.0) was established by the maximum elevation reached in passing the emergency spillway hydrograph (elevation 462.8) plus an allowance of 2.2 feet for wave action. This procedure was used before the elevation of the top of the dam is determined by routing the freeboard hydrograph.

The design of the dam was based on a low SCS Standard design criteria, consequently it is not capable of passing the Probable Maximum Flood (PMF) without overtopping the dam. The size of the emergency spillway and freeboard hydrographs (when used) vary with the hazard classification, being relatively smaller for dams having a low hazard classification and larger for dams having a high hazard classification.

5.2 Hydrologic Records: None

5.3 Flood Experience: Flooding during Hurricane Agnes in Culpeper in June 1972 was reduced somewhat by this dam.

5.4 Flood Potential: Design features of the dam were established by routing various hydrographs as noted in paragraph 5.1.

5.5 Reservoir Regulation: Pertinent dam and reservoir data are shown in Table 1.1.

Regulation of flow from the reservoir is automatic. Water rising above the crest of the drop inlet flows into this inlet and through the dam in the 24-inch concrete conduit. Water also flows past the dam over the ungated emergency spillway in the event water in the reservoir rises over the crest of the spillway.

Outlet discharge capacity, reservoir area and storage capacity data, and hydrograph and routing determinations were obtained from reports and computations furnished by the Soil Conservation Service (SCS). The routing of the emergency spillway hydrograph began with the reservoir level at the crest of the principal spillway.

5.6 Overtopping Potential: The probable rise in the reservoir and other pertinent information on reservoir performance in various hydrographs is shown in the following table:

Table 5.1 RESERVOIR PERFORMANCE

Item	Normal	Hydrograph		
		Principal Spillway (a)	Emergency Spillway	Free-Board (b)
Peak flow, c.f.s.				
Inflow	5	2,180	4,440	12,400
Outflow	5	66	2,050	11,100
Peak elev., ft. msl	445	459.5	462.8	467.1
Emergency Spillway				
Depth of flow, ft.	-	0	3.3	7.6
Avg. velocity, f.p.s.(c)	-	0	4.6	4.8
Non-overflow section				
Depth of flow, ft.	-	-	-	2.1
Avg. velocity, f.p.s.(c)	-	-	-	3.4

(a) 100-year flood.

(b) Probable maximum flood by COE standards.

(c) Maximum velocity at crest about 150 to 200% of the average velocity.

5.7 Reservoir Emptying Potential: The 24-inch gated opening on the upstream side of the riser at a low level will permit withdrawal of about 66 c.f.s. with the reservoir level at the principal spillway crest and essentially dewater the reservoir in less than two day.

5.8 Evaluation: Hydrologic and hydraulic determinations prepared by the SCS as a basis for design of the project appear reasonable. The PMF would overtop the dam by 2.1 feet. The emergency spillway will pass a flood greater than 1/2 of the PMF without overtopping the dam. The spillway is considered to be inadequate but not seriously inadequate. Possible breaching of the dam was considered in the design of Dam No. 50 which is located downstream.

SECTION 6 - DAM STABILITY

6.1 Foundation: Mountain Run Dam #8A is founded on alluvial and residual soils overlying metamorphic bedrock. A 14-foot wide (base) cutoff or core trench keys the earth embankment into fairly competent bedrock. A seepage drain, 3 feet wide, runs approximately 350 feet along the length of the dam 29 feet downstream of the centerline. The drain system is founded on weathered bedrock and varies in thickness according to local foundation conditions. "As-built" drawings of the seepage drain and cutoff trench are shown on Plates II and III, respectively, in Appendix I. A geologic report of the dam site is inclosed in Appendix IV. The remainder of this section deals with describing the geologic location of the dam site and the foundation conditions.

The dam site is located within the Piedmont Plateau Physiographic Province of Virginia which is underlain by predominately igneous and metamorphic rocks of Precambian to Cambian age. A narrow band of much younger sedimentary rocks comprising the Triassic Basin trends northeast-southwest through much of the Piedmont. A section of the basin cuts through the Culpeper area. The contact between the sedimentary rocks of the basin and the older metamorphic rocks to the west is a border thrust fault that intersects the City of Culpeper. Subsequent thrust and transverse faulting which occurred along the border area after the basin's formation has greatly complicated the local geology.

The dam site is located approximately three miles west of the basin contact and is underlain by Cambrian Age metamorphic rocks of the Lynchburg Formation. At the dam site, the Lynchburg Formation is composed of mica schist and granite gneiss. The mica schist comprises the right abutment and right portion of the channel section. The steeper left abutment and remaining portion of the channel section is composed of the granite gneiss. Residual soils ranging from 2 to 4 feet and 1 to 2 feet overlie the bedrock on the right and left abutments respectively. Alluvial soils ranging from 6 to 15 feet overlie the bedrock along the channel section.

The structural relationship between the mica schist and granite gneiss was not determined from the limited foundation investigation. The bedding/or schistosity of the rocks was not mapped and no prominent joint system was noted, however, numerous small clay filled joints were observed, especially within the mica schist. No verification of the foliation or jointing was made during the Corps' visual inspection since no outcrops exist at the site.

The condition of the foundation bedrock varies from fairly competent to badly weathered as indicated on the test pit logs and described in the geologic report. The mica schist bedrock comprising the right abutment is fairly soft and friable to the depth of exploration. The schist under the channel section is harder and less weathered. The granite gneiss comprising the steeper left abutment is much harder and more competent. Since field permeability and consistency tests were not performed on the foundation materials, an accurate determination of the foundation condition is not possible. A small spring is located on the downstream side of the left abutment approximately 100' from the crest. The spring existed before the dam placement and did not develope as a result. During the Corp's visual inspection, the spring was located and checked. At that time, clean water was flowing from the spring at approximately 10 gpm.

Based on the dam profile on Plate III, Appendix I, the cutoff trench and seepage drain were placed into weathered bedrock. In the geology report, it was recommended that the trench be placed 1 foot into firm gneiss on the left abutment and 3 to 10 feet into the weathered schist. The actual placement depth of cutoff trench and seepage drain are not exactly known, however. The notes listed on the profile, Plate III, and the seepage drain detail, Plate II, indicate that field decisions were made pertaining to the exact thicknesses and grade depths of both the seepage drain and cutoff trench. Construction reports were not available to check these figures or determine the foundation materials and their conditions. It is assumed that the trench was placed into competent, impermeable bedrock and that the seepage drain was founded on impermeable materials and extended to intercept any water bearing statum as indicated in the notes.

Since the construction reports were not available for review, a proper determination of the foundation conditions under the cutoff trench and seepage drain is not possible.

6.2 Embankment: Referring to Plate V, Appendix I, the upstream slope is 1 vertical to 3 horizontal from the crest of dam to El. 447.0 where it flattens to 1 vertical to 10 horizontal forming a berm for a vertical distance of 2 feet. The slope continues at 1 vertical to 3 horizontal to natural ground. The 20-foot berm is necessary for providing the necessary factor of safety for stability as well as for protecting the upstream shoreline from erosion during the normal pool operation. The downstream slope is 1 vertical to 2½ horizontal from crest to toe of dam. Although not specified in the "as-built" drawing submitted by SCS, it appeared that the major portion of the dam is constructed with MH and ML materials compacted to 100% of maximum dry density. Some SM materials form the downstream slope.

Referring to Plate II, Appendix I, the seepage drain is located at 29 feet from the centerline of dam. The location of drain in the "as-built" condition provides a c/b ratio of less than 0.5.

6.3 Evaluation:

6.3.1 Foundation: Most dam foundations are evaluated on the basis of potential settlement, sliding and seepage. Excessive settlement of the dam is not a problem because the foundation is composed of fairly competent, weathered bedrock and dense alluvium and settlement was not noted along the dam alignment during the visual inspection. Sliding within the foundation bedrock is not usually a problem under small, earth dams. In addition, there are no adversely oriented weak planes within the foundation rock that would act as a potential sliding plane. The potential for seepage does exist within the foundation since part of the dam is founded on alluvium. The cutoff trench and seepage drain were supposedly placed below the alluvium into weathered bedrock to cutoff and control all seepage. Whether seepage will take place under the cutoff trench and seepage drain cannot be judged because the foundation materials and their conditions under the trench and drain are not known. It is assumed that all possible seepage zones encountered during the trench excavation were adequately treated. At the time of the inspection the flow from the toe drain was less than 1 cfm and no wet areas, developed since construction, were noted downstream.

Due to the geologic location of the dam site, faulting in the foundation rocks should have been anticipated and more thoroughly investigated. Because prominent jointing, fault zones, and open foliation planes in the foundation rocks were not encountered within the test pits does not conclude their non-existance. A more detailed investigation utilizing deep core borings may have encountered all of them. The existing cutoff trench and seepage drain appear to be effective during normal pool conditions as evidenced in the visual inspection. However, should upstream-downstream striking open joints, fault zones or open zones along foliation exist within the foundation bedrock below the trench, high (flood) water conditions could induce uncontrolled seepage through them. The toe drain and downstream area should be closely monitored during high water conditions to determine unsafe seepage.

6.3.2 Embankment: The embankment slopes meet the requirement recommended by the U. S. Bureau of Reclamation for small zoned earthfill dams on stable foundation. Since no undue settlement, crack or seepage was noted at the time of inspection, it appears that the embankment is adequate for normal pool operation with water level at El. 445.

The stability analysis for pool level at emergency spillway crest, El. 459.5 is based on the saturated MH material, which is a representative material for the major portion of the dam. The factor of safety of the upstream slope for the drawdown condition is 1.40 as given in Appendix VI. Reference 1, Appendix VII recommends a factor of safety of 1.2. The factor of safety for the downstream slope with drain at c/b=0.5 is 1.96. If the drain is located in the less pervious MH materal, the factor of safety for the downstream slope will be less than 1.96, since the steady seepage pressure will be greater than the design condition with drain at c/b=0.5. Reference 1, Appendix VII recommends a factor of Safety of 1.5. As the embankment was built on rock, the stability of slopes must also be checked with a sliding block method of analysis.

SECTION 7 ASSESSMENT/REMEDIAL MEASURES

7.1 Dam Assessment: Reference 1, Appendix VII, recommends a Spillway Design Flood equivalent to the PMF. Since the PMF tops the crest of the dam, the emergency spillway is considered inadequate. However, the spillway capacity is not considered seriously inadequate, because it can pass more than one-half the PMF.

Based on the visual inspection and review of existing records, there is no apparent problem that would require immediate action for the normal pool conditions. The actual embankment structure appears to be similar to the "as-built" drawings. Without the construction records, the stability of the embankment under designed loading conditions cannot be assessed although the embankment slopes meet the requirement recommended by the U.S. Bureau of Reclamation for small zoned earthfill dams on stable foundation (Reference 2, Appendix VII).

7.2 Remedial Measures: There is no immediate need for remedial measures. However the following actions are suggested and should be initiated within 12 months. These measures are suggested for monitoring and maintenance purposes only.

7.2.1 The grasses on the faces of embankment should be maintained in such a condition that will facilitate the annual inspection.

7.2.2 Remove woody vegetation in downstream discharge channel riprap to eliminate deep rooted growth.

7.2.3 Backfill animal burrows located in the emergency spillway, embankment and abutments.

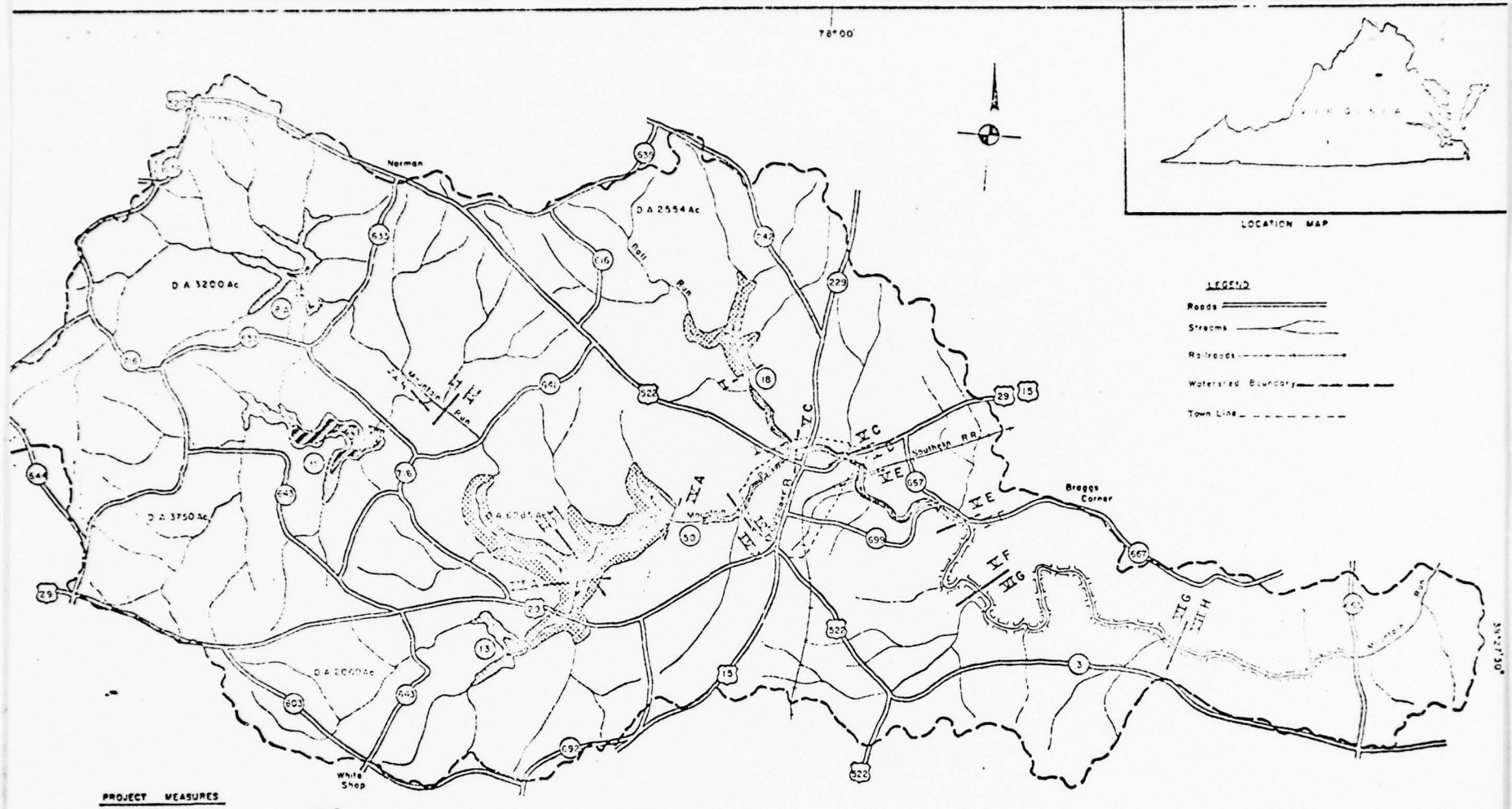
7.2.4 Either repair or remove damaged access to the riser.

7.2.5 The crest of the dam should be closed to vehicular traffic and the bare spots should be reseeded. In the event that the traffic cannot be successfully controlled, the crest must be paved to protect against erosion.

7.2.6 Record the pool elevation and flow rate of the seepage drain whenever the pool level rises 7 ft. or more above the normal pool elevation. Staff gage or other equivalent method should be placed to indicate the pool level.

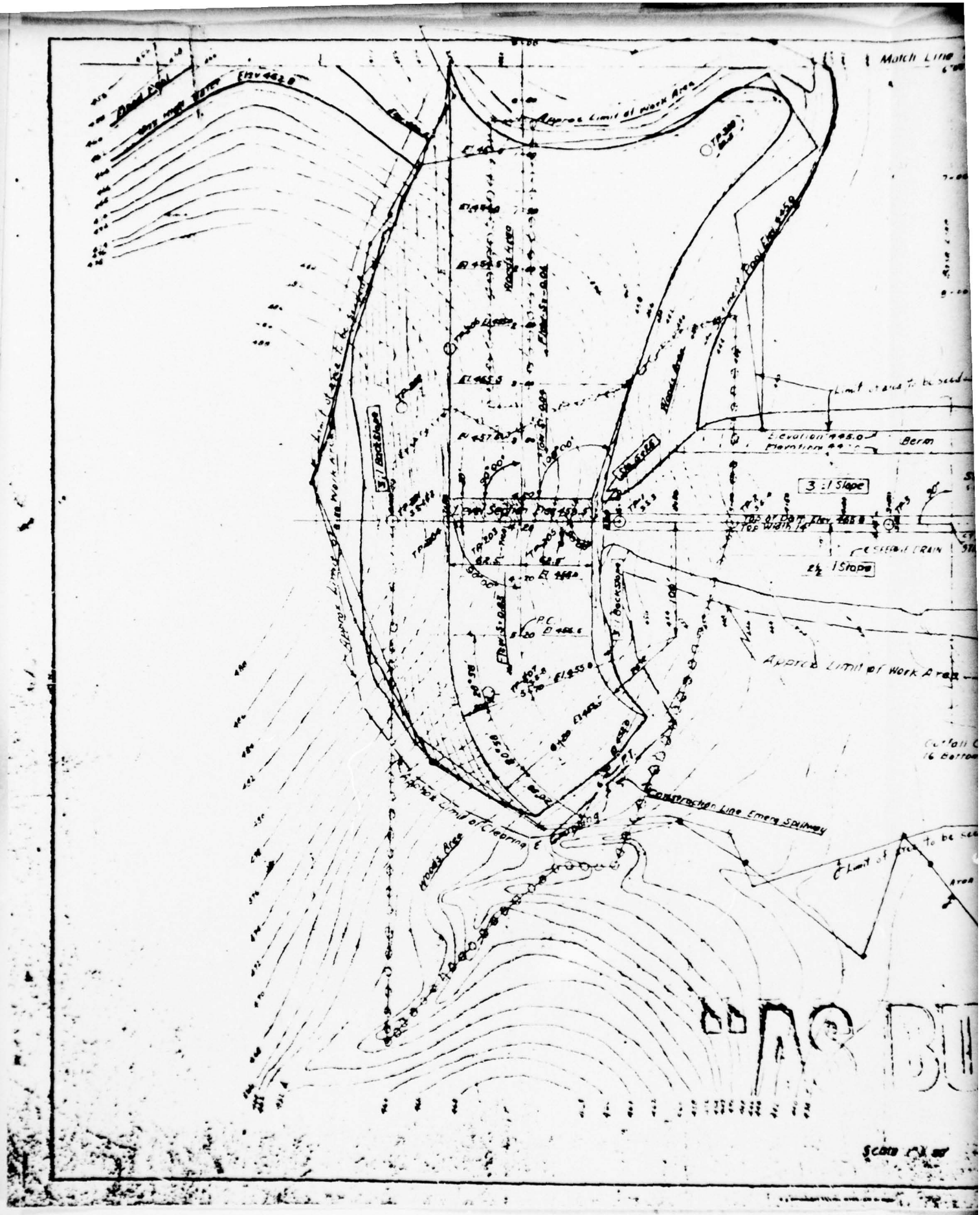
APPENDIX I

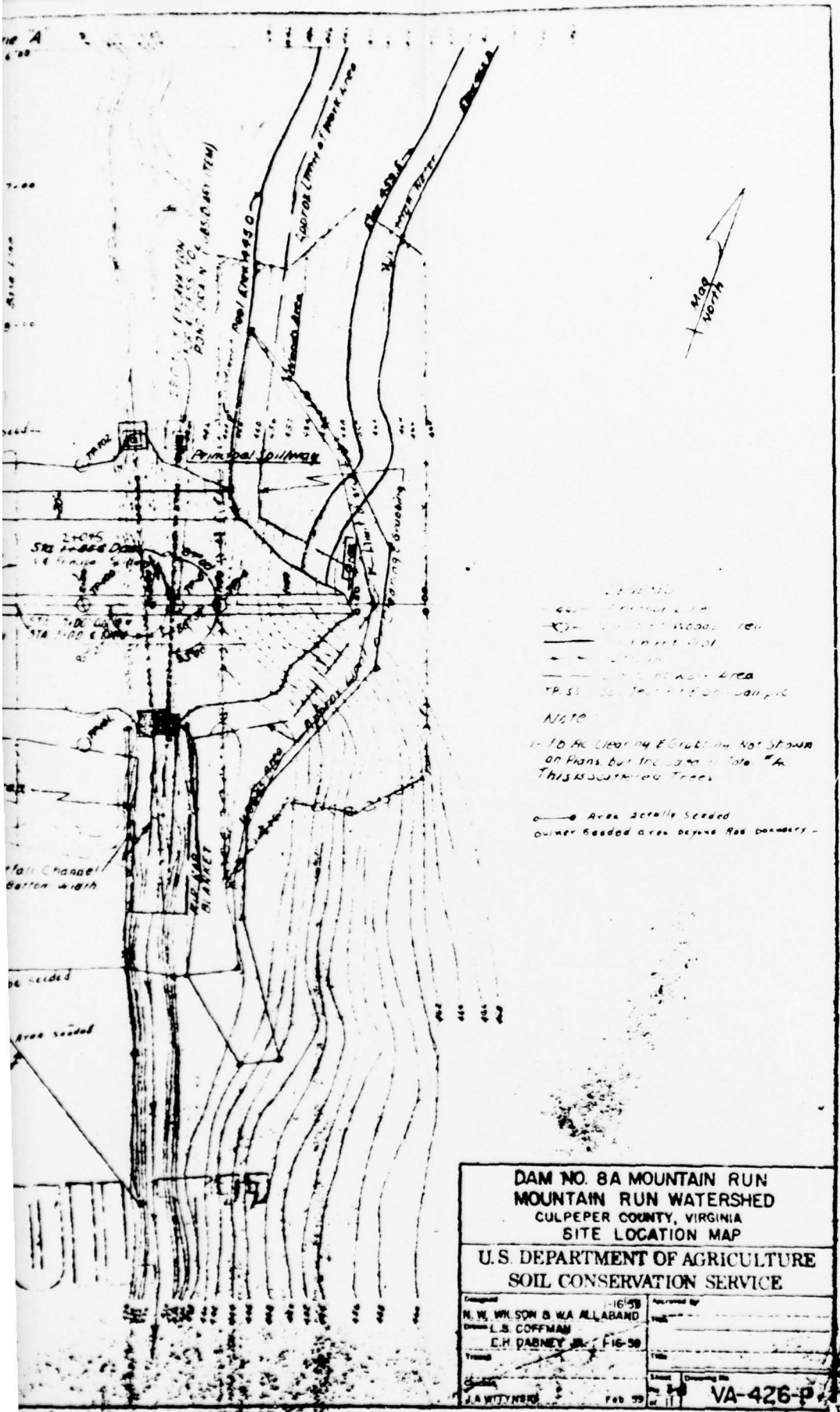
MAPS AND DRAWINGS



PROJECT MAP
MOUNTAIN RUN WATERSHED
CULPEPER COUNTY, VIRGINIA
U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

NOV. 1961


Approx Limit of Work Area
Mulch Line
Limit of area to be seeded
Elevation 465.0
Berm
3:1 Slope
Top of Dam Elev 465.0
Top Width 14'
2½ 1 Slope
Approx Limit of Work Area
Approx Limit of Clearing
Construction Line Emerg Spillway
Limit of area to be seeded
Woods Area
SCALE



DAM NO. 8A MOUNTAIN RUN
MOUNTAIN RUN WATERSHED
CULPEPER COUNTY, VIRGINIA
SITE LOCATION MAP

U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

Designed 1-16-59
N. W. WILSON & W.A. ALLABAND
Drawn L.S. COFFMAN
C.H. DABNEY JR. F-16-59
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Checked
J.A. WITTY NSRS Feb 59
Approved by
Date
Title
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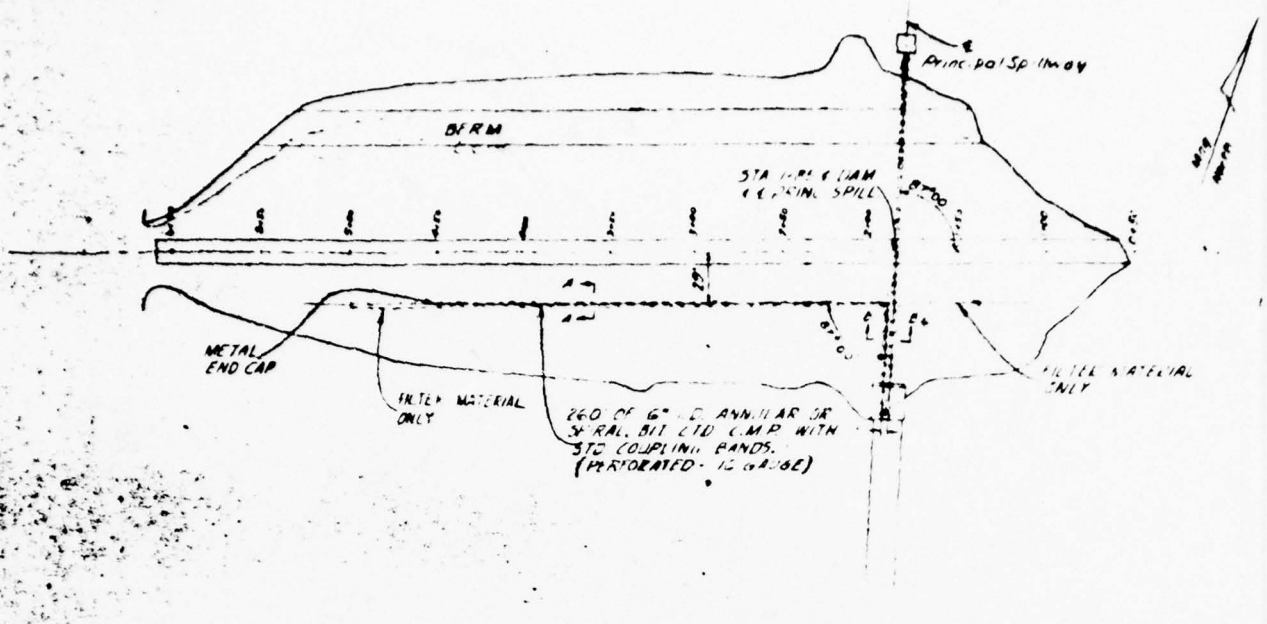
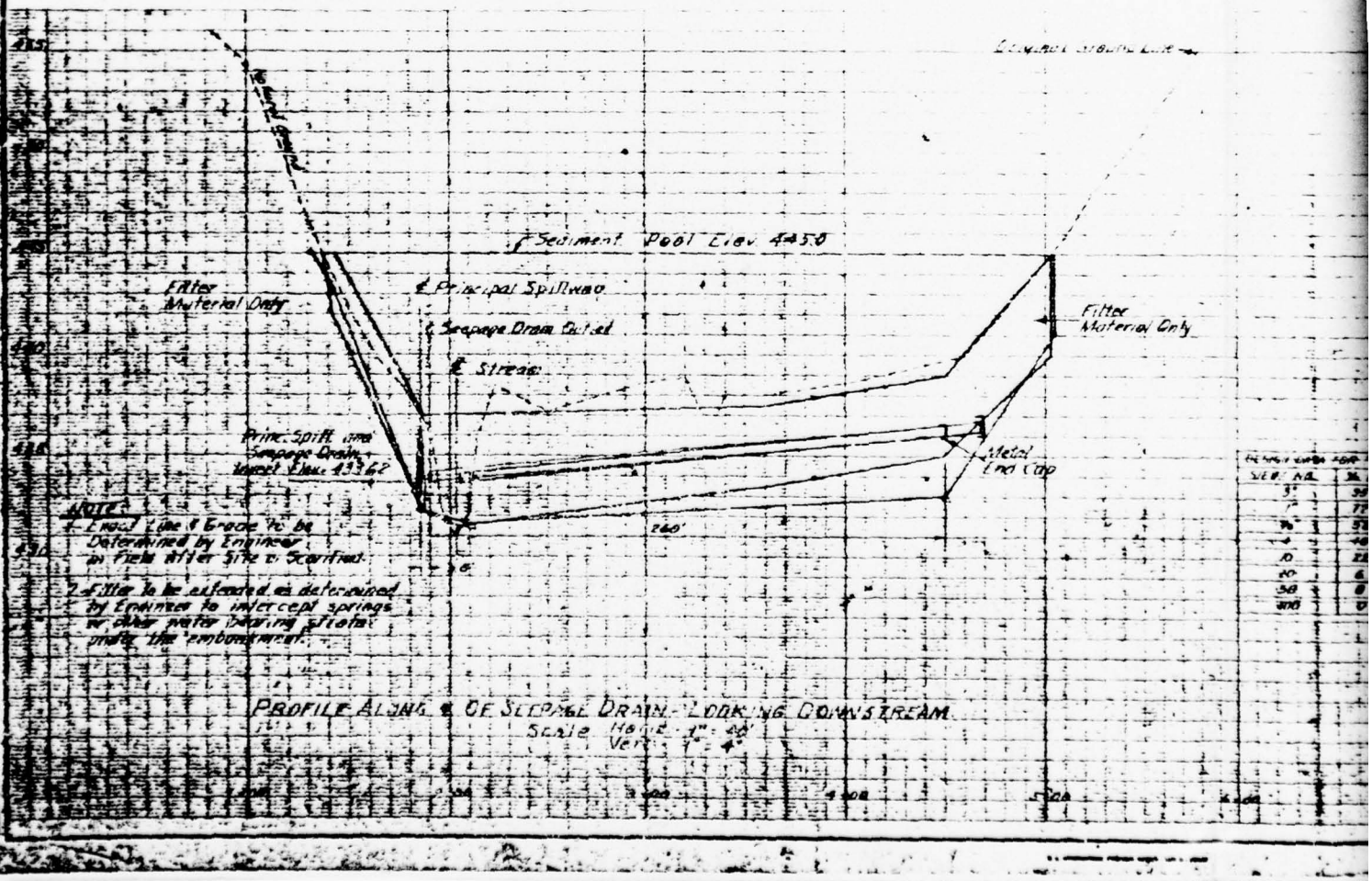
Drawing No. VA-426-P
Sheet No. 11

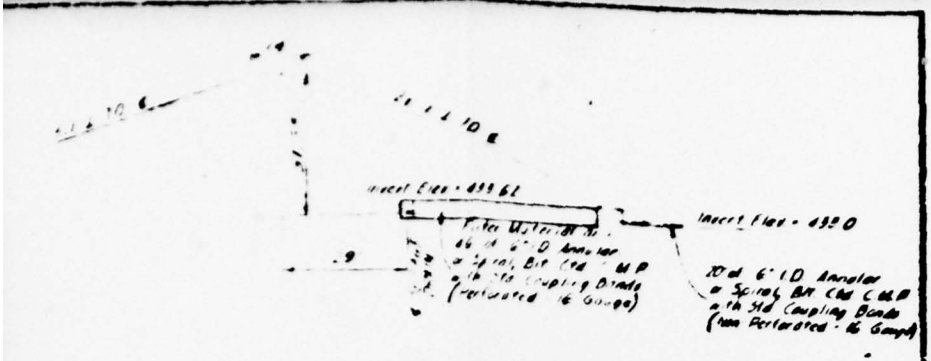
PLATE I



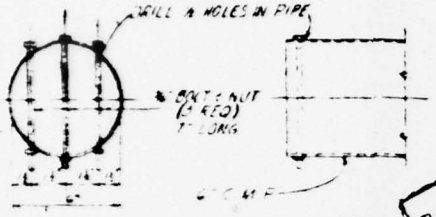
PLAN VIEW OF SEEPAGE DRAIN
Scale 1" = 50'



PROFILE ALONG ℄ OF SEEPAGE DRAIN - LOOKING DOWNSTREAM
Scale Horiz. 1" = 40'
Vert. 1" = 4'

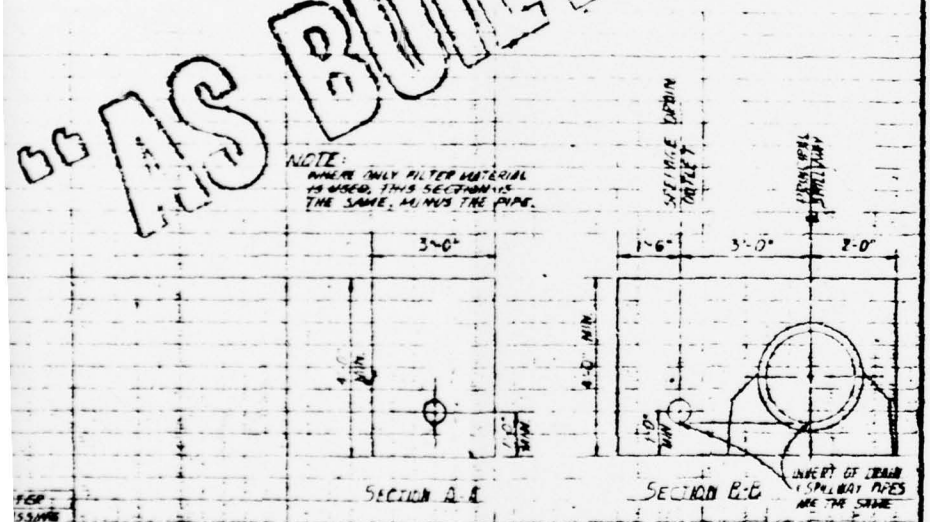


CTION THRU OUTLET PIPE OF SEEPAGE DRAIN



DETAIL OF SMALL ANIMAL GUARD
NOT TO SCALE

"AS BUILT"



TYPICAL SECTION OF SEEPAGE DRAIN
SCALE 1"=2'

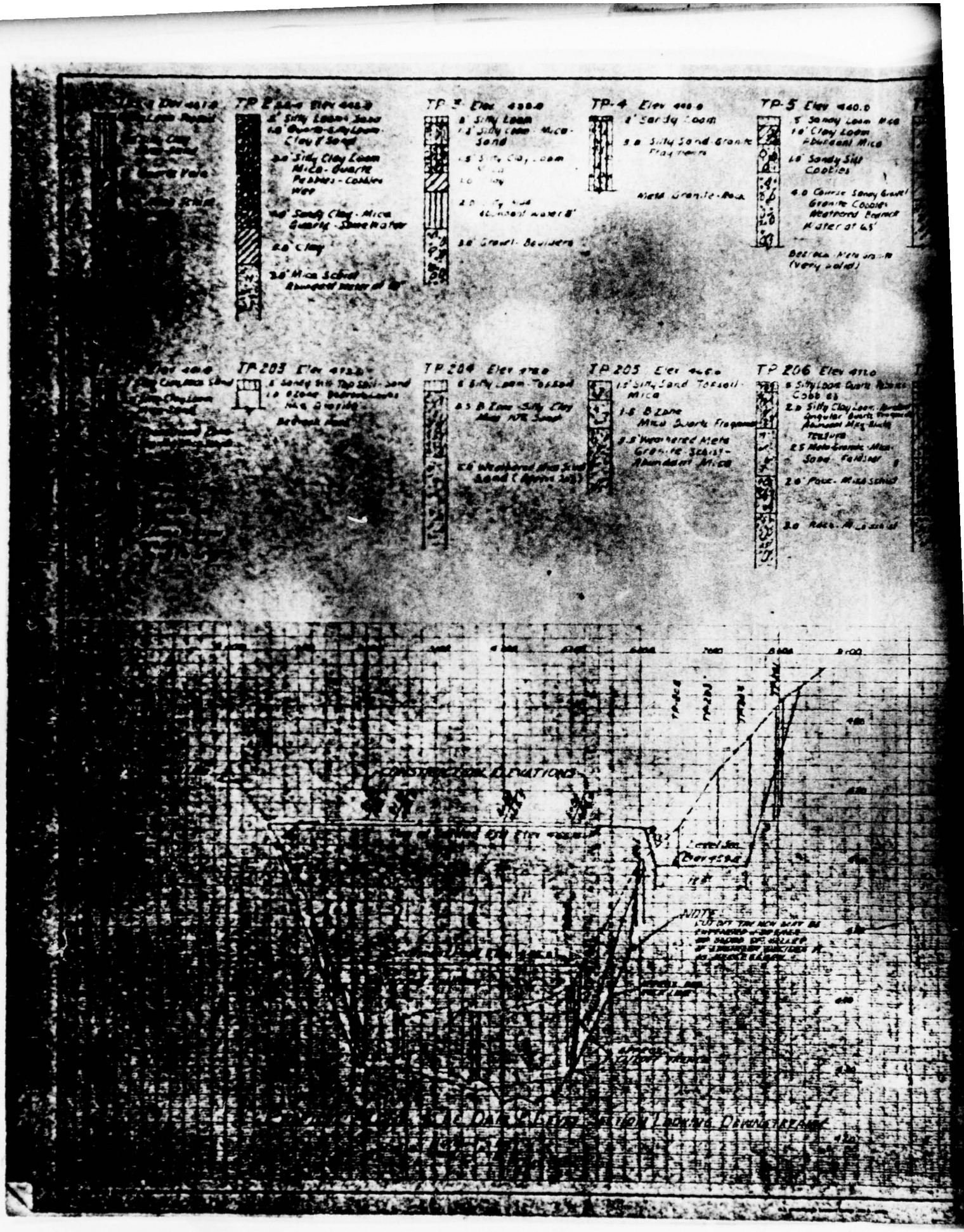
DAM NO. 8A MOUNTAIN RUN
MOUNTAIN RUN WATERSHED
CULPEPER COUNTY, VIRGINIA
DETAILS OF SEEPAGE DRAIN

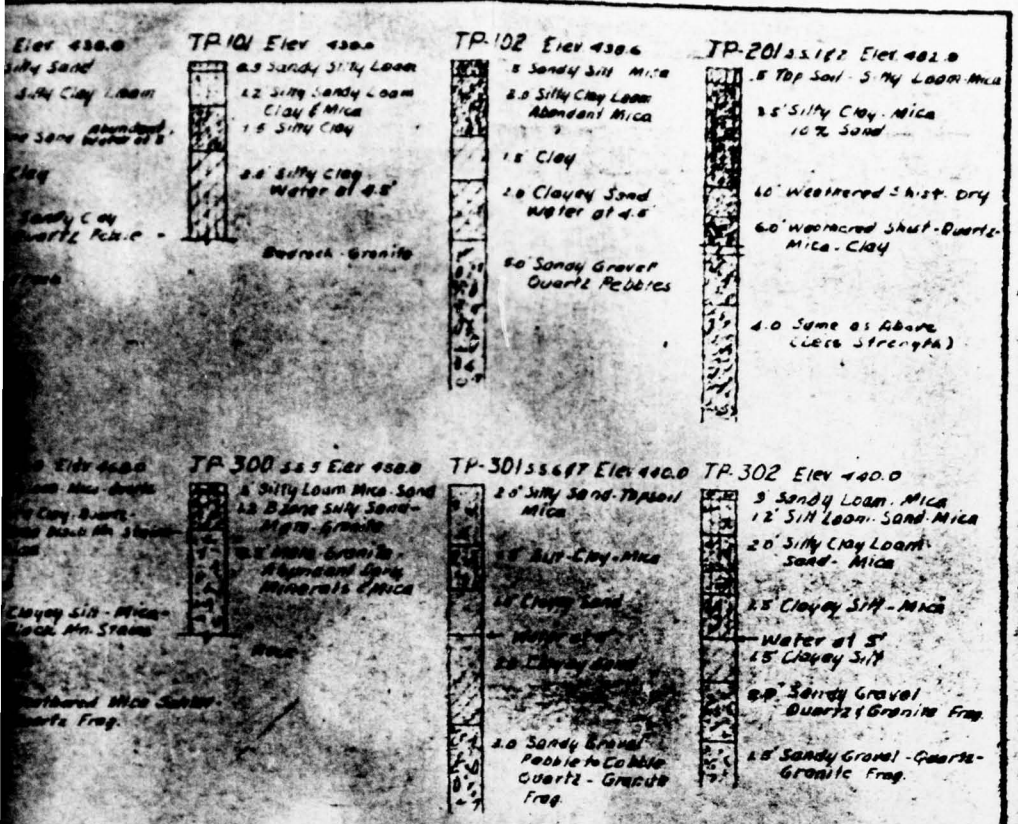
U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

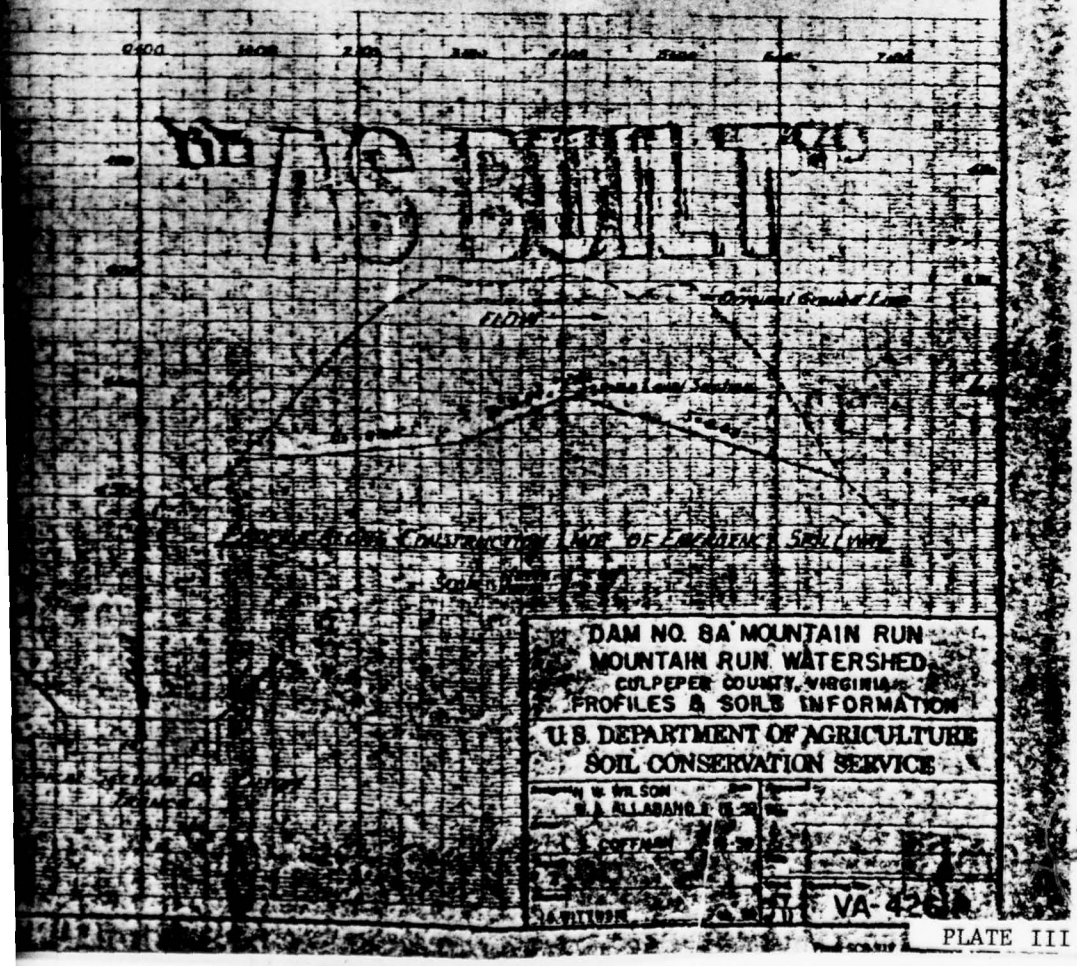
Designed	N. W. WILSON W. A. ALLABAND	1-16-59	Approved by
Drawn	L. S. COFFMAN	1-16-59	Title
Traced			Title
Checked	A. B. WITYNSKI	Feb. 59	Sheet No. 9 of 11 sheets; Drawing No. VA-426-P

Form SCS-31 (November 1956)

PLATE II


TP 2 Elev 440.0
2' Silty Loam Sand
4.0 Quartz Silty Loam Clay & Sand
2.0 Silty Clay Loam Mica-Quartz Pebbles - Cobbles Wet
4.0' Sandy Clay - Mica Quartz - Some Water
2.0 Clay
2.0' Mica Schist
TP 3 Elev 439.0
8' Silty Loam
1.5' Silty Clay Loam Mica-Sand
2.0 Clay
36' Gravel - Boulders
TP-4 Elev 440.0
2' Sandy Loam
3.0 Silty Sand Granite Fragments
Mica Granite - Rock
TP-5 Elev 440.0
5' Sandy Loam Mica
10' Clay Loam Abundant Mica
4.0 Sandy Silt Cobbles
4.0 Coarse Sandy Gravel Granite Cobbles Bedrock Bottom Water at 6.5'
Bedrock Mica Granite (Very Solid)
TP 203 Elev 412.0
5 Sandy Silt Top Soil - Sand
1.0 Stone Fragments Mica Gravels
Bedrock Mica
TP 204 Elev 410.0
6 Silty Loam - Topsoil
8.5 B Zone Silty Clay Many Mica Sand
2.5 Weathered Mica Schist Sand (Approx 30%)
TP 205 Elev 410.0
1.5' Silty Sand Topsoil - Mica
1.5 B Zone Mica Quartz Fragments
3.5' Weathered Mica Granite - Schist - Abundant Mica
TP 206 Elev 411.0
5 Silty Loam Quartz Pebbles Cobbles
2.0 Silty Clay Loam Angular Quartz Fragments Abundant Mica Rock Texture
2.5 Mica Granite Mica Sand Feldspar
2.0' Rock - Mica Schist
CONSTRUCTION DEVIATIONS
NOTE
Looking Downstream

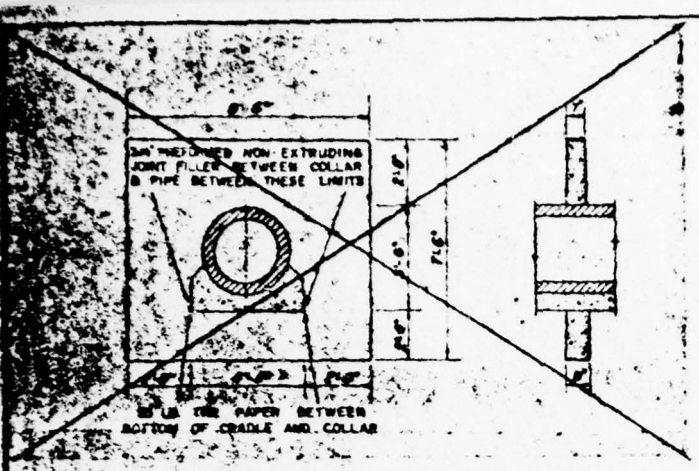


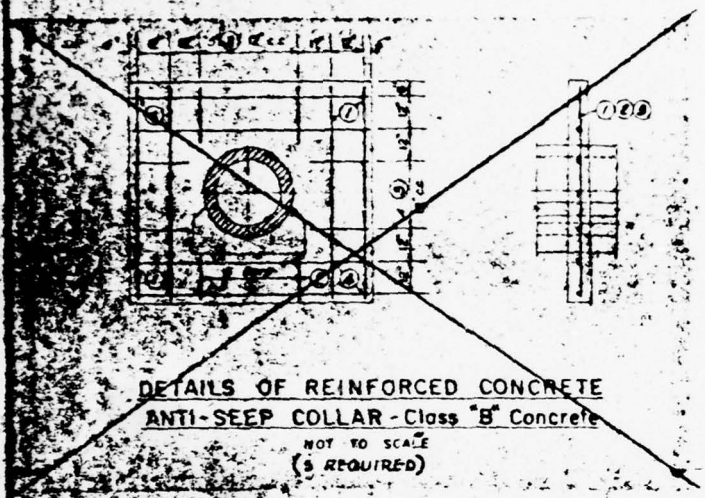


DAM NO. 8A MOUNTAIN RUN
MOUNTAIN RUN WATERSHED
CULPEPER COUNTY, VIRGINIA
PROFILES & SOILS INFORMATION
U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

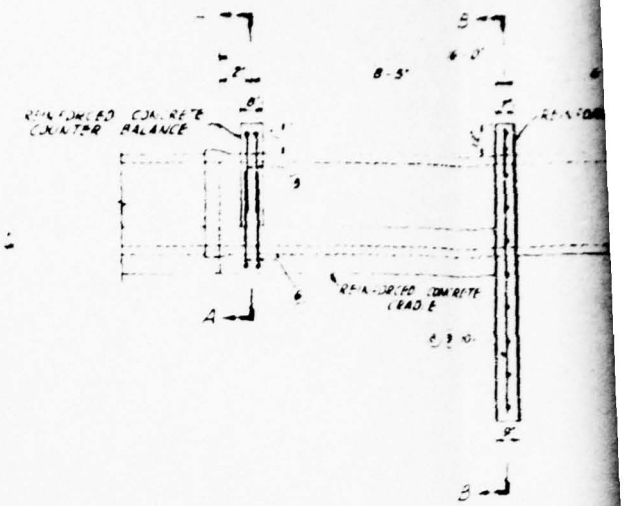
VA-428

PLATE III

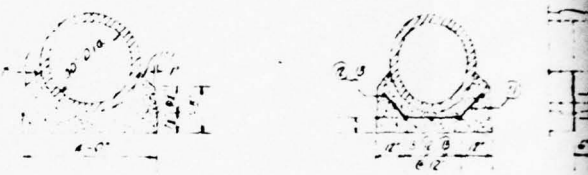




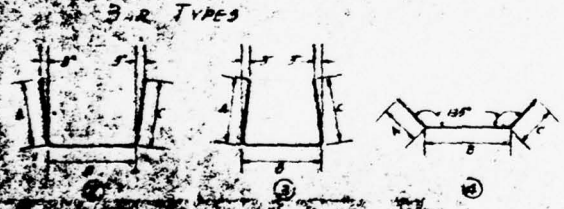
DETAILS OF REINFORCED CONCRETE
ANTI-SEEP COLLAR - Class "B" Concrete
NOT TO SCALE
(5 REQUIRED)



DETAILS OF REINFOR



DETAILS OF



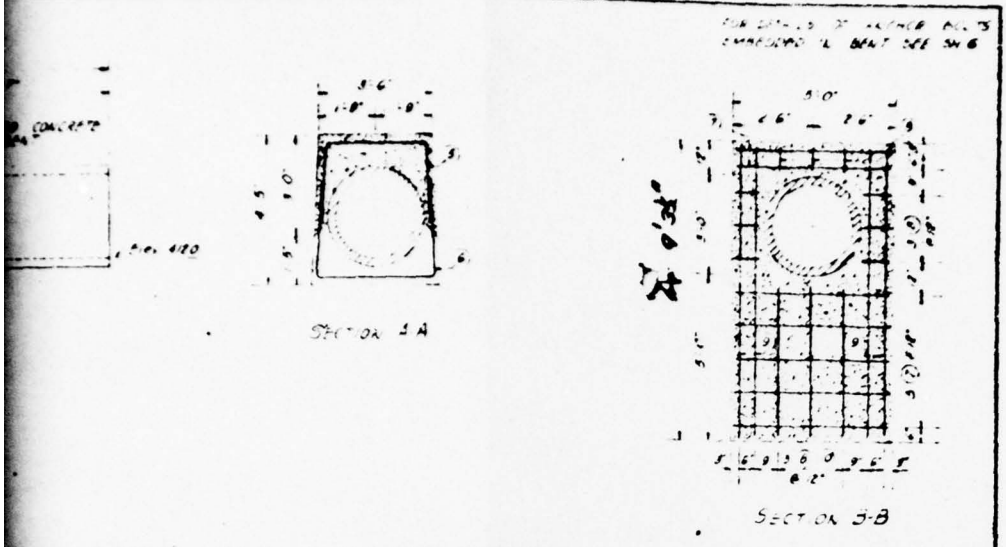
STEEL SCHEDULE

MARK	LOCATION	QUAN.	SIZE	LENGTH	TYPE	A	B	C	TOTAL FT	STEEL	CONC.
	Chamber Bottom								15.83		
									18.17		0.13 C.Y.
	Beam								91.50		
									6.75		
									54.00		
									13.50		0.94 C.Y.
	Cradle								604.00		
									930.00		

TOTAL WT. OF BARS IN THIS GROUP [illegible] LBS.

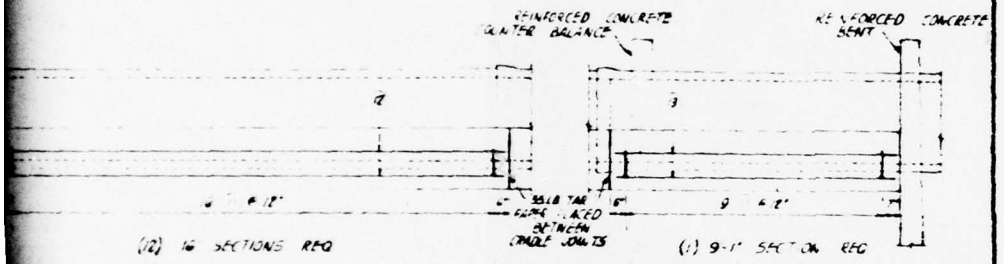
TOTAL CONCRETE IN THIS GROUP Class "B" [illegible] Cu. Yds.

"AS BU



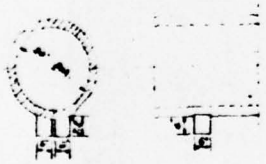
CED CONCRETE BENT & COUNTER BALANCE - Class 'B' Concrete

Scale 3/8" = 1'-0"



REINFORCED CONCRETE CRADLE - Class 'B' Concrete

Scale 3/8" = 1'-0"



CONCRETE SUPPORT BLOCK

LT"

B-A

DAM NO. 3 MOUNTAIN RUN
MOUNTAIN RUN WATERSHED
CULPEPER COUNTY, VIRGINIA
MISC. STEEL DETAILS

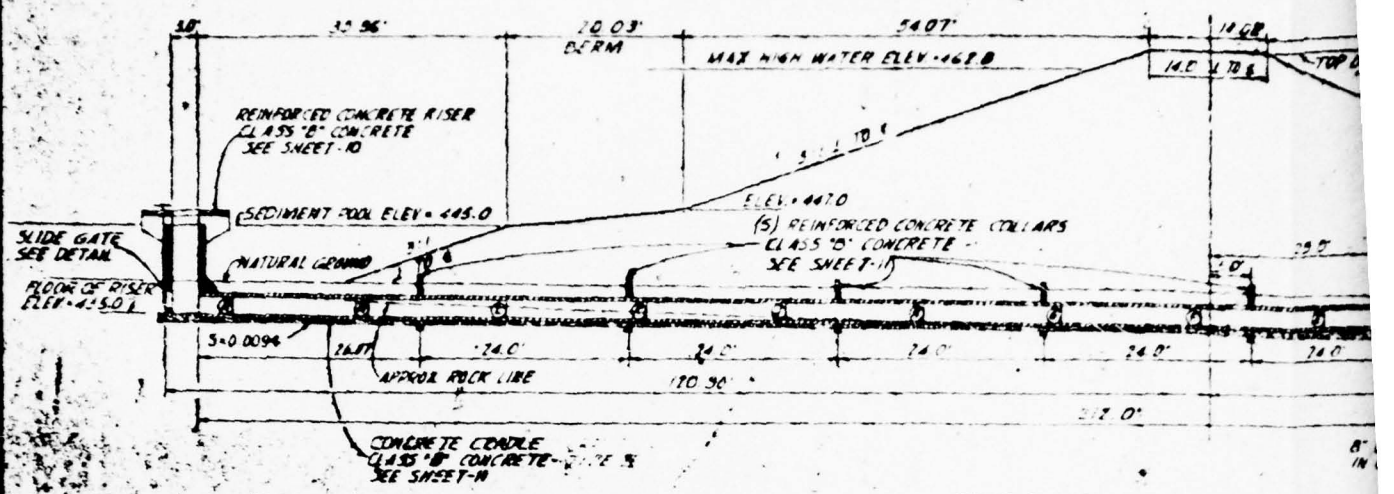
U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

J. RISZDORFER 8-58
B. J. GERMANA 8-58
J. RISZDORFER 8-58

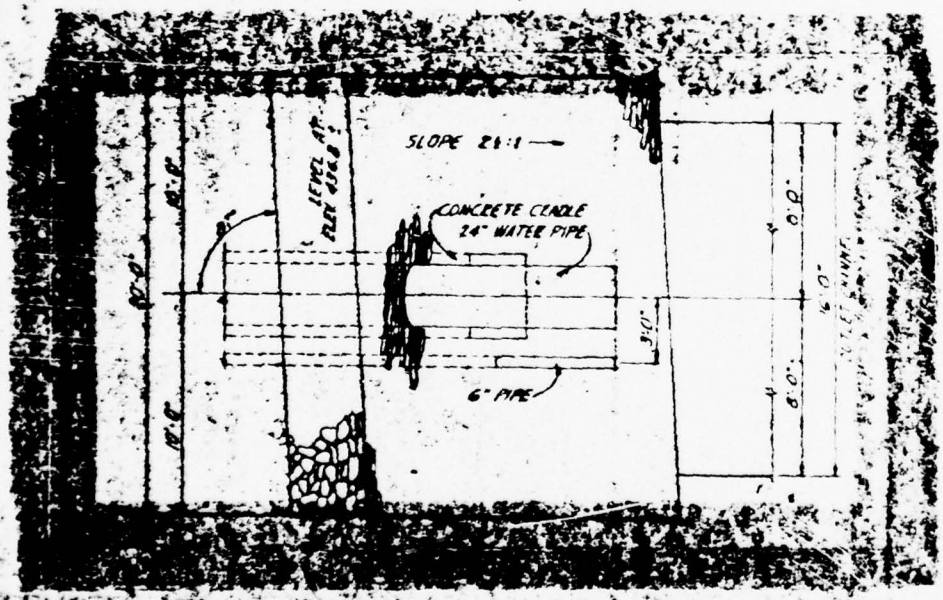
VA-425-D

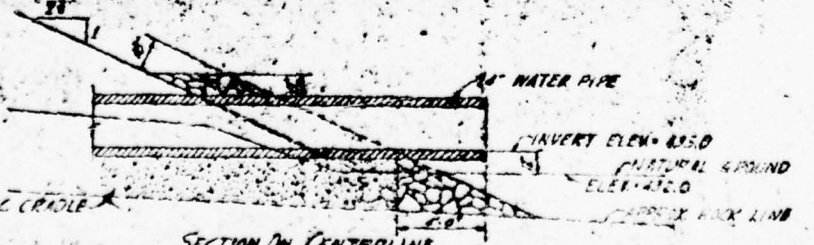
2

PLATE IV



PROFILE ALONG ℄ OF PRINCIPAL SPILLWAY
81' WIDTH @ DAM AT STA 1+95
SCALE 1" = 100'





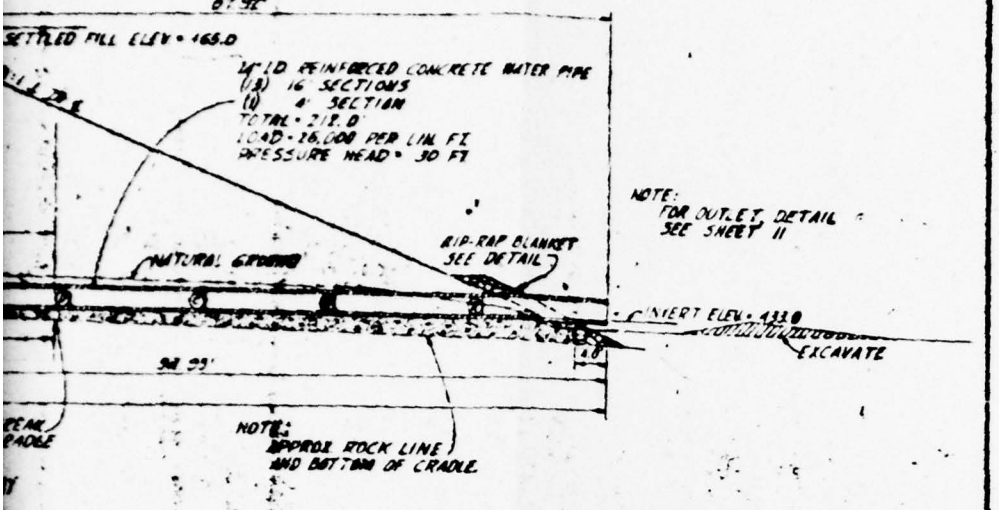
SECTION ON CENTERLINE

DETAILS OF RIP-RAP BLANKET
SCALE: 1" = 1'-0"

TYPICAL SE

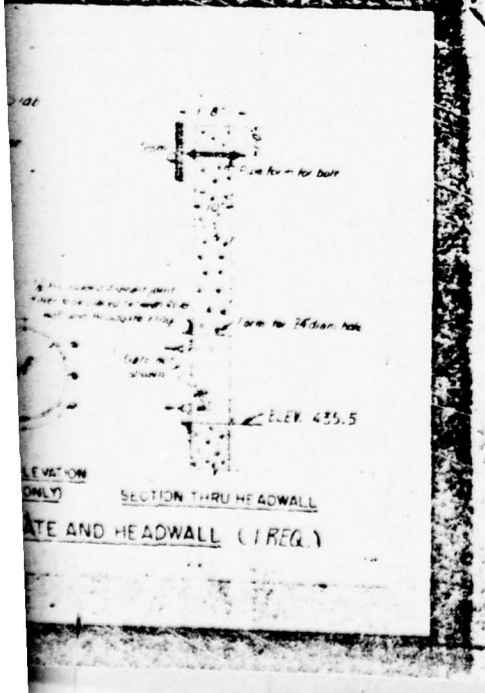
NOTE:
SLIDE GATE
OPERATING HEAD = 10 FEET.

DETAIL OF SL



POINT	DISTANCE FROM DISCHARGE END OF 24" PIPE IN FEET	INVERT ELEV OF 24" PIPE
OUTLET	0	433.00
A	16	433.13
B	32	433.30
C	48	433.45
D	64	433.60
E	80	433.73
F	96	433.91
G	112	434.06
H	128	434.21
J	144	434.36
K	160	434.51
L	176	434.66
M	192	434.81
N	208	434.96
RISER	212	435.00

NOTE: ABOVE DIMENSIONS OF LENGTH OF PIPE ARE BASED ON NOMINAL LENGTHS AND DO NOT INCLUDE COUPLER.



DAM NO. 8A MOUNTAIN RUN
MOUNTAIN RUN WATERSHED
CULPEPER COUNTY, VIRGINIA
PROFILE ALONG ℄ PRINCIPAL SPILLWAY
U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

Designed D SCHORR	Date 2-59	Approved by	
Drawn M NIKOUCH	2-59	Title	
Traced		Title	
Submitted J A D TYNSKI	Feb. 59	Sheet No. 9 of 11	Drawing No. VA-426-P

PLATE V

APPENDIX II

PHOTOGRAPHS

CREST OF DAM

UPSTREAM SLOPE

DOWNSTREAM SLOPE OF EMBANKMENT LOOKING WEST

IMMEDIATE DOWNSTREAM AREA

DROP-INLET AND RESERVOIR

DISCHARGE SPILLWAY CONDUIT

APPENDIX III

FIELD OBSERVATIONS

Name of Dam: Mountain Run Dam No. 8A
County: Culpeper State: Virginia
Coordinates: Lat. 38°29'42" Long. 78°04'40"
Date of Inspection: 8 June 1978
Weather: Overcast - Temperature: 75°F
Pool Elevation at Time of Inspection: 445' m.s.l.
Tailwater at Time of Inspection: 431' m.s.l.

Inspection Personnel:

State Water Control Board
H. Wigglesworth

Corps of Engineers
W. Barker
L. Jones
D. Pezza (Recorder)
J. Robinson

1. Embankment:

1.1 Surface Cracks: The slopes, crest, and abutment contacts were inspected. The slopes, toe, and downstream left abutment contact were covered with 3 to 4 feet of light vegetation, making observations difficult. The vegetation was predominately grass with some other types of growth including fungus, oak, maple and fur trees. The rest of the embankment was trimmed to 3 or 4 inches. Soil conditions were very moist due to damp weather conditions. No cracks were noted on the dam.

1.2 Unusual Movement: No unusual movement was noted on the dam. Again vegetation inhibited observations.

1.3 Sloughing or Erosion: No sloughing was noted. Erosion was limited to randomly located animal borrows 6 to 8 inches in diameter. Four holes were found, two on each slope of the dam. High vegetation inhibited observations.

1.4 Alignment: The vertical and horizontal alignment of the dam did not deviate from the as built drawings. The crest of the dam serves as a gravel access road.

1.5 Riprap: The only riprap on the dam was in the discharge channel. Refer to section 2.3 for comments.

1.6 Junctions: Conditions appeared good. The downstream left abutment contact was difficult to observe due to high vegetation. A small depression approximately 3 feet in diameter and 1 foot deep was noted in the downstream area. It is located about 20 feet downstream of the toe and 100 feet left of the right abutment emergency spillway dike. The cause of the depression was undetermined. No wet spots were in the immediate area. However, wet spots were noted in the low lying downstream area as noted in Section 1.7.

1.7 Seepage: Several wet spots were noted in a general area located right of the outlet channel within a low lying downstream area extending from the toe to about 100 feet downstream. Vegetative growth in the downstream slope became much thicker towards the toe. The low lying area supported lush swamp like growth. The terrain was rather soft. No other wet spots, erosion or boiling was noted at abutments, in embankments, or aong conduits. However, the wet conditions coupled with the unusual heavy growth of vegetation on the lower downstream slope indicates seepage. No direct correlation could be made with the depression which was dry.

1.8 Drains: The structure has a toe foundation drain. A 6 inch corrugated metal discharge pipe, serving the drain, was located just right of the spillway conduit at approximately the same invert elevation. The pipe was flowing less than one-sixth full and the water was clear. A rust colored colloidal sediment was noted in the bottom of the pipe.

1.9 Instrumentation: There were no instrumentation or staff gages for the entire dam.

2. Water Works:

2.1 Intake Structure: Access to the riser was damaged; therefore, the inlet was observed from the heel of the dam. The structure is concrete and showed no visible signs of deterioration. A vertical shaft, without manual controls for regulation of intake values, extended above the riser. The regulating works were not operated during the inspection. The riser had no trash racks or emergency gates. No debris was lodged in the inlet nor was there any in the immediate area. Pool elevation was slightly higher than the drop inlet.

2.2 Outlet Works: A 24 inch ungated concrete conduit serves as the spillway running from the riser through the dam. The discharge and extended 4 to 5 feet beyond the toe of the dam. It appeared in good condition and was running about one-sixth full.

2.3 Outlet Channel: A discharge channel extends from the tow to approximately 50 feet downstream. The area behind and around the conduit is protected from eddy currents with diabased riprap. The riprap ixtends the full length of the outlet channel protecting the slopes and base of the channel. The riprap has settled in certain areas, and heavy vegetation has grown up through the rocks. The tailwater was approximately 2 feet below the conduit invert. Channel depths were as deep as 3.5 feet near the mouth of the conduit.

3. Emergency Spillway: The spillway is cut into existing terrain. The channel is in good condition and has excellent vegetative cover trimmed to 3 or 4 inches. Several animal borrows were located in the approach channel. A gravel access road leading to the crest of the dam cut across the downstream channel. The left dike was trimmed and appeared in good condition. The right cut slope was in excellent condition and was covered with 3 to 4 feet of light vegetation.

4. Reservoir: The area surrounding the upstream reservoir consists of gentle terrain covered with pasture land, planted fields and heavy vegetation. A cottage sits on the left abutment overlooking the reservoir. New construction was noted, but not identified on the right side of the reservoir. No obvservations of sediment could be made. The water was turbid but free from debris.

5. Downstream Channel: The channel immediately beyond the outlet channel had near verticle slopes up to 10 feet in height. The channel is shallower further downstream. The slopes did not show recent erosion and they were covered with heavy vegetation. The terrain above the channel was flat. No structures are in the apparent flood plain up to Route 633. The channel was not checked beyond this point.

6. Instrumentation: There was no instrumentation or staff gages.

APPENDIX IV - GEOLOGY REPORT

MOUNTAIN RUN WATERSHED
SITE 8A CULPEPER
CULPEPER COUNTY, VIRGINIA

GEOLOGIC REPORT NO. VA-426-G
Prepared by L. A. Gorman
Geologist, SCS
Richmond, Virginia

L A Gorman

Robert A Bennett
Geologist in Charge
Upper Chesapeake Area

INTRODUCTION

General

STATE - Virginia; COUNTY - Culpeper
WATERSHED - Mountain Run
LOCATION - Six miles west northwest of Culpeper, Virginia
EXPLORED BY - L. A. Gorman
EQUIPMENT USED - Davis Backhoe mounted on a Massey-Harris Industrial Tractor owned by the Madison Equipment Co. of Madison, Virginia

SITE DATA (Approximate)
DRAINAGE AREA - 5 sq. mi. - 3,200 acres
TYPE OF STRUCTURE - Earthen Fill
PURPOSE - Flood Prevention; HEIGHT - 29.5'
VOLUME OF FILL REQUIRED - 34,925 cu. yds.
LOCATION OF EMERGENCY SPILLWAY - Right (West) abutment
SURFACE AREA OF NORMAL POOL - 21.5 acres

Site No. 8A, Mountain Run Watershed, is located approximately six miles west northwest of Culpeper, Virginia on Mountain Run. The stream originates in the western part of Culpeper County and flows generally east emptying into the Rappahannock River. The site is being considered for a flood prevention dam about 600 feet long and 29.5 feet high, with the emergency spillway located on the west abutment.

The geologic investigation was made during the week of September 1, 1958 with the following SCS personnel participating: W. F. Lucas, Jr., Engineer; L. B. Herretty, Work Unit Conservationist; Roland Byrd, Student Trainee; and L. A. Gorman, Geologist.

The pits were opened with a Davis Backhoe mounted on a heavy duty Massey-Harris industrial tractor which was able to dig to depths of approximately 11 feet.

TOPOGRAPHY

Mountain Run Watershed lies in the Piedmont province in the north-central part of the state. The environs of Site 8A are made up of rolling hills and narrow stream valleys. Most of the slopes are less than 20 percent, although the east abutment is about 22 percent.

REFERENCES:	U. S. DEPARTMENT OF AGRICULTURE SOIL CONSERVATION SERVICE	DRAWING NO. VA-426-G SHEET 1 OF 14 DATE 12-16-58

GEOLOGY REPORT

PHYSIOGRAPHY AND GEOLOGY

The Mountain Run Watershed lies entirely within the northern Piedmont Plateau physiographic province. The valley floor is generally flat with gently sloping valley walls. The east abutment has a slope of about 22 percent due to resistant metamorphosed granite outcrops. The drainage pattern is dendritic.

The dam site is located in an area of Cambrian metamorphic rocks several miles west of the border of Triassic sediments and intrusives.

The bedrock at the site consists of granite gneiss under the east abutment and under part of the stream valley but between the proposed principal spillway and TP-2, the rock type changes to a mica schist. This rock type is also present in the west abutment. No prominent joint system was observed and the joints that are present appear to be either closed or filled with soil or clay.

Only one small spring was found about 100 feet from the centerline in the east abutment. This spring is located beyond the forward toe of the dam and no difficulty is anticipated.

EXCAVATION OF DAM

Along the centerline, 10 test pits were dug and soil samples representative of the material encountered were taken. These samples have been submitted to the laboratory for analysis at Lincoln, Nebraska.

The west abutment consisted of the following: Test pits Nos. 1, 2, 203, 205. Rock was encountered in all of these pits at depths varying from 1.5 feet in T.P. 203 to 11 feet in T.P. 2. The overburden material in these pits were similar so the log of T.P. 1 will be used as representative.

0.0 - 0.5	Silty loam, brownish red topsoil, some mica.
0.5 - 3.0	Silty clay, Red, abundant mica, some sand (10%)
3.0 - 3.5	Quartz vein
3.5 - 9.0	Mica schist, weathered, grayish-brown

Across the valley floor, test pits (Nos. 2, 3, and 100) showed the material to be:

0.0 - 0.3	Silty loam, grayish brown
0.3 - 1.5	Silty loam, brown, some mica sparse very fine sand (10%)
1.5 - 3.0	Silty clay loam, brown, abundant mica

REFERENCE:	U.S. DEPARTMENT OF AGRICULTURE SOIL CONSERVATION SERVICE	DRAWING NO. VA-426-G SHEET 2 OF 14 DATE 12-16-58

3.0 - 4.0 Clay, mottled gray brown
4.0 - 6.0 Soft silt, blue gray, water at 5 feet
6.0 - 9.0 Stream gravel, well rounded, some large 2' boulders. Hole caved, core trench should go below this zone.

The east abutment is made up of a granite gneiss with abundant blue quartz with practically no overburden present. Actually the rock is probably a granodiorite.

Conclusions:

The foundation appears to be very adequate and no settlement difficulties should be expected. Some seepage should be anticipated along the top of the bedrock, but this can probably be controlled by a good core. The rock type differs in the two abutments, and the contact between them should be investigated when the core trench is excavated. The core trench should extend at least into the unweathered bedrock along the centerline. A good core should seal most of the seepage under the dam, and any other seepage could be controlled by foundation drain.

SPILLWAYS

The principal spillway is tentatively planned on the west side of the stream test pits 100, 101, and 102 were dug along the proposed spillway route.

In T. P. 100 and 101, hard bedrock was encountered at 7 and 6 feet respectively. In T. P. 102, no bedrock was encountered at 11 feet, but it probably could be expected within a few feet. The log of T. P. 100 will be sufficient to show the material encountered.

T. P. 100 0.0' - 0.3' Brownish gray silty sand
0.3 - 2.5 Light brown silty clay, abundant mica
2.5 - 3.0 Fine well rounded stream sand abundant water at 3'
3.0 - 4.5 Brownish gray clay
4.5 - 7.0 Gray sandy gravel, quartz pebbles
7.0 - Bedrock weathered granite

It appears from T. P. 5 that it would be advantageous to make this the location of the principal spillway. Bedrock was encountered at 6.5 feet, and it appears to be uniform. With the spillway location here, the outlet could be into the stream channel.

The emergency spillway will be located on the west abutment. The material to be excavated is shown in T. P. 201, 202, 203, 204, 205, 206,

REFERENCE:	U.S. DEPARTMENT OF AGRICULTURE SOIL CONSERVATION SERVICE	DRAWING NO. VA-426-G SHEET 3 OF 14 DATE 12-16-58

and 207. Some rock excavation is expected, because in the lower side of the spillway in T. P. 203, weathered granite was found at 1.5'. A cut of about six feet will be necessary at this point so about 1,000 cu. yds. of rock excavation may be expected. It may be that the rock will be weathered enough to be removed by a ripper, but this can not be verified until construction begins.

The log of T. P. 201 is representative of the material to be excavated.

T. P. 201	0.0' - 0.5'	Silty loam topsoil, brown, some mica
	0.5 - 4.0	Silty clay, red, some mica dry, well-drained, sand 10%
	4.0 - 5.0	Weathered schist, reddish gray, dry, well drained
	5.0 -11.0	Weathered schist, some quartz, abundant mica, well-drained, some gray to buff clay seams
	11.0 -15.0	Same as above but softer.

BORROW AREAS

Approximately 32,000 cu. yds. of borrow is required for the dam. The material excavated from the emergency spillway will be used for fill. The total material excavated from this spillway should make excellent fill, and should account for almost the entire amount needed.

The material on the flood plain and around the edge of the pool area appears to be good borrow material as evidenced by T. P. 300, 301, 302. The remainder of the borrow needed can be obtained from this source.

T. P. 301	0.0' - 2.0'	Light brown silty sand topsoil, some mica.
	2.0 - 3.5	Light brown silt, some clay
	3.5 - 5.0	Gray to brown clayey sand, some water at 5'
	5.0 - 8.0	Blue gray clayey sand, log at 7 feet, probably old soil zone.
	8.0 -11.0	Sandy gravel quartz pebbles to cobbles, subangular to rounded, some granite fragments.

CONCLUSIONS

The conclusions are the results of the geologic investigations to date.

1. Adequate borrow material is available.
2. Bedrock was encountered in all centerline and spillway holes. Where the rock was weathered, the hole was dug to firm rock or to the depth limit of the backhoe.

REFERENCE:	U.S. DEPARTMENT OF AGRICULTURE SOIL CONSERVATION SERVICE	DRAWING NO. VA-426-G SHEET 4 OF 17 DATE 12-16-58

3. The emergency spillway will have to be carefully treated to prevent erosion, because the weathered schist erodes easily.

4. The dam will be set on bedrock so a core trench should be excavated and an impermeable core placed, to prevent seepage along the bedrock surface. The core trench should be cut to firm rock, probably in the granite one foot will be deep enough, but in the weathered schist from 3 to 10 feet may be necessary.

   The geologist should probably be present when the core trench is excavated.

5. Seepage through the dam and foundation should be expected. Adequate drainage should be installed to control this seepage.

6. A small spring is located on the downstream side of the east abutment, so the location of the dam should not be moved downstream; at present the proposed structure will be upstream from the spring.

7. Approximately 1,000 cu. yds. of rock excavation may be necessary in the emergency spillway. The rock may be weathered enough to be removed by ordinary excavating methods.

8. The relocation of the principal spillway should be considered. The present proposed location is not a bad one, but if it were moved to the location of T.P. 5, the foundation would be better, and the outlet could be into the stream channel.

   As an aid to correlating the results of the tests with the location of the test pits that were sampled, the following tables may be used.

REFERENCE:	U.S. DEPARTMENT OF AGRICULTURE SOIL CONSERVATION SERVICE	DRAWING NO. VA-426-G SHEET 5 OF 14 DATE 12-16-58

SOIL SAMPLE LIST
SOIL AND FOUNDATION INVESTIGATIONS

Location [illegible] Owner [illegible]

Watershed [illegible] Sub-watershed [illegible] State [illegible]

Submitted by [illegible] Requested by [illegible] Date [illegible]

Sent by [illegible] Government B/L No.
(carrier)

Lab. No.	Field Sample No.	Sample Description		Depth		Type of Sample	
		Location	Grid or Station	From	To	Undist.	Dist.
	1	[illegible]	[illegible]	Surf	1		X
	2	" "	[illegible]	1	25		X
	3	[illegible]	[illegible]	3	5		X
	4	"	[illegible]	2	5		X
	5	[illegible]	[illegible]	2	5		X
	6	" "	[illegible]	2	5		X
	7	" "	[illegible]	2	5		X
	8	[illegible]	[illegible]	2	5		X

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

VA-426-G

Sheet 6 of 14 Sheets

APPENDIX V - STABILITY ANALYSIS SUMMARY

Referring to Appendix VI, the conditions used for stability analysis and the results were as follows:

Height of Dam: 34 feet
Width of crest: 14 feet
Elevation of crest: El. 465.0
Downstream slope: 1 vert. on 2½ horiz. to toe
Upstream slope: 1 vert. on 3 horiz. to El. 447.0
1 vert. on 10 horiz. to El. 445.0
1 vert. on 3 horiz. to El. 430.0
Elevation of base of embankment: El. 430.0
Elevation of base of foundation: El. 430.0
Elevation of emergency spillway crest: El. 459.5
Seepage drain at c/b = 0.5
Dry unit weight: 97.0 pcf
Wet unit weight (partially saturated): 115.5 pcf
Saturated unit weight: 120.0 pcf
Submerged unit weight: 57.5 pcf
Angle of internal friction for saturated condition: 31.0°
Angle of internal friction for partially saturated condition: 31.0°
Cohesion for saturated condition: 0 psf
Loading condition: Pool level at emergency spillway crest.
Minimum factor of safety for upstream slope under full drawdown: 1.40
Minimum factor of safety for downstram slope with drain at c/b = 0.5: 1.96

APPENDIX VI - DESIGN REPORT

MOUNTAIN RUN WATERSHED
Site 6A
Culpeper, Virginia

Site 6A, Mountain Run Watershed, is located approximately six miles west northwest of Culpeper, Virginia, on Mountain Run. The stream originates in the western part of Culpeper County and flows generally east emptying into the Rappahannock River.

The geographic location of this site may be found on the Gordonsville 15' Quadrangle, published by the U. S. Geological Survey, by scaling [illegible]" east (longitude 7[illegible]° [illegible]' [illegible]" west) and [illegible]" north (latitude 38° [illegible]' [illegible]" north) from the intersection of latitude 38° [illegible]' [illegible]" north and longitude 78° [illegible]' [illegible]" west. Sheet 3 of this report is a transparent overlay that can be used to locate the proposed dam. By placing this overlay on the appropriate latitude and longitude lines on the Gordonsville Quadrangle, the location of the proposed dam may be found.

The purpose of this detention reservoir is to reduce flood flow in and around the town of Culpeper and other points along the stream. It is designed as a class "A" structure.

The dam has a watershed of [illegible] acres. It is to be constructed of compacted earth with a foundation of granite gneiss and mica schist. The principal spillway will consist of a reinforced concrete drop inlet, 3' x 3' inside dimensions, and a reinforced concrete water pipe, 24" inside diameter. It is to rest on bedrock.

An emergency spillway will also be provided which is to be cut into silty clay, weathered mica schist and weathered granite. This material will be stable under the maximum design velocity.

The elevation of the sediment pool is based on the assumption that sediment will accrue in the reservoir area at the rate of 75 acre-feet in 50 years.

This assumption caused the level of the sediment pool, which is the crest of the riser, to be set at an elevation of 44[illegible]. This elevation is 9.5' above the invert elevation of the 24" inside diameter headgate of the pond drain. A seepage drain consisting of perforated pipe and graded filter is included to prevent piping and stabilize the downstream slopes of the embankment.

The flood routing procedure used in the design is described in Engineering Handbook, Section 5, Hydraulics, U. S. Department of Agriculture, Soil Conservation Service.

This flood routing procedure was used to determine the maximum stages shown in the following table:

REFERENCE	U. S. DEPARTMENT OF AGRICULTURE SOIL CONSERVATION SERVICE	DRAWING NO. VA-4[illegible]-R SHEET 1 OF 3 DATE 3-3-5[illegible]

DESIGN REPORT

Factor Which Determines Stage	Drainage Area Acres	Runoff in Inches	Peak Inflow CFS	Peak Out-Flow CFS	Elevation Maximum Stage	Storage Ac.-Ft.	Remarks Crest of Weir / Top of Dam
50 year sediment deposit	21.5	-	-	-	449.6	15	Crest of Weir
100 year frequency storm	143.7	3.66	2177	65	453.5	390	Crest of emergency spillway
1x6 hour rainfall, moisture condition II	152.3	7.41	4437	2.5	456.6	1450	Maximum high water

The emergency spillway will flow for a maximum of 34.4 hours for the 1x6 hour rainfall. To empty the reservoir from the crest of the emergency spillway to the crest of the weir will not exceed 3.5 days.

A wave freeboard of 3.2 feet was selected. This freeboard was added to the distance from the crest of the 1x6 hour point rainfall and moisture condition II, to determine the top of the dam elevation 459.8.

The reinforced concrete design procedure was based on Engineering Handbook, Section 4, Structural Design, U. S. Department of Agriculture, Soil Conservation Service. The data used were for Class "A" concrete as described in this publication.

The inflow hydrographs for the 100 year storm and the 1x6 hour point rainfall, moisture condition II, are constructed by the method described in Section 3.21 of the Hydrology Guide.

A copy of the Geology Report (VA-426-G) is attached.

Copies of Sections 5 and 6 of the Engineering Handbook and Section 3.21 of the Hydrology Guide may be obtained from Mr. Frank C. Edminster, State Conservationist, USDA, SCS, Richmond, Virginia.

A. Lewis Wall acting
Glenn W. Grubb
Design and Construction Engineer

Concurred:

Vincent McKeever
Vincent McKeever

Robert F. Fonner
Robert F. Fonner
Geologist

REFERENCE	U S DEPARTMENT OF AGRICULTURE SOIL CONSERVATION SERVICE	DRAWING NO VA-426-G SHEET 2 OF 3 DATE 3-3-59

MOUNTAIN RUN FLOOD PREVENTION PROJECT
MOUNTAIN RUN WATERSHED
SITE NUMBER 8A
CULPEPER COUNTY, VIRGINIA

78 10'

78 00'

38 30'

38 30'

38 20'

38 20'

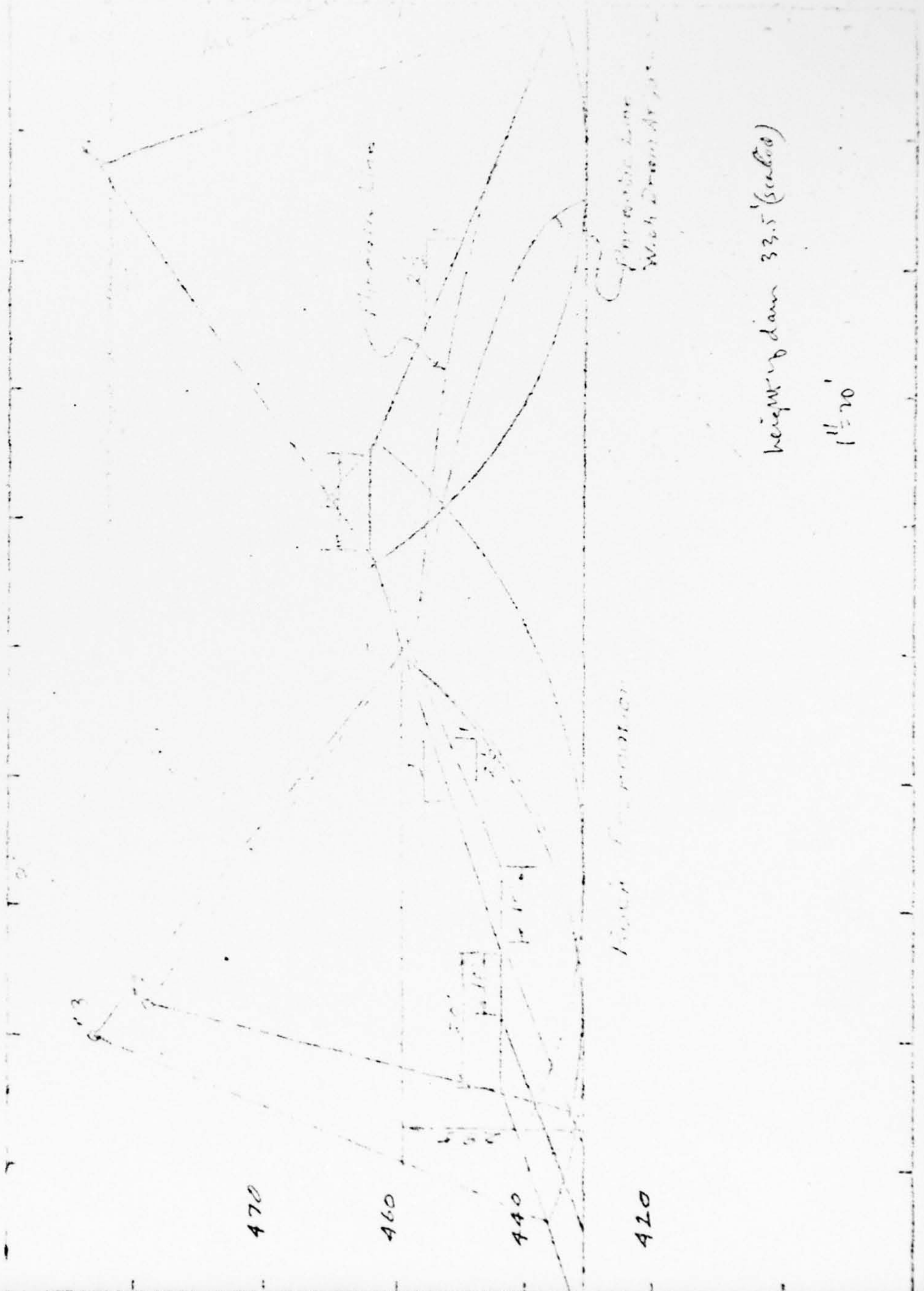
78 10'

78 00'

GORDONSVILLE 30' QUAD VIRGINIA	U.S. DEPARTMENT OF AGRICULTURE SOIL CONSERVATION SERVICE	VA - 426 - R SHEET 3 3 DATE SEPTEMBER 58

	59W1689		59W1692			
	97.0		94.9			
	115.5		115.5			
	120.0		122.5			
	57.5		60.0			
	31°	31°	30°	30°		
	0.601	0.601	0.577	0.577		
	288	0	1370	288		

2	2½:1	Full Drawdown 10' Berm, Sat. Emb. #59W1689	1.00
3A	3:1	Full Drawdown 10' Berm, Sat. Emb. #59W1689	1.18
3B	3:1	Full Drawdown 20' Berm, Sat. Emb. #59W 1689	1.40
4	3:1	Full Drawdown 10' Berm, Sat. & Moist. Emb. #59W1689	1.45
1A	2½:1	No Drain, Moist & Sat. Emb. # 59W1689	1.24
1B	2½:1	With Drain at 4/B = 0.5, Mst & Sat. Emb. # 59 W 1689	1.96



REFERENCE

U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
ASHEVILLE DISTRICT

DRAWING NUMBER
VA-426-G
SHEET 8 OF 14 SHEETS

APPENDIX VII - REFERENCES

1. Recommended Guidelines for Safety Inspection of Dams, Dept. of Army, Office of the Chief of Engineers.

2. Design of Small Dams, U. S. Department of Interior, Bureau of Reclamation.