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NATIONAL DAM SAFETY PROGRAM. JOHNS CREEK NUMBER 3 (INVENTORY NU--ETC(U)
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JAMES RIVER BASIN

Name of Dam: Johns Creek No. 3
Location: Craig County, State of Virginia
Inventory Number: VA 04503

LEVEL II

PHASE I INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM

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PREPARED FOR

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

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AUGUST 1979

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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.

PREFACE

This report is prepared under guidance contained in the Recommended Guidelines for Safety Inspection of Dams, for Phase I Investigations. Copies of these guidelines may be obtained from the Office of the Chief of Engineers, Washington, D.C. 20314. The purpose of a Phase I investigation is to 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 continued care and inspection can there be any chance that unsafe conditions be detected.

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

PHASE I INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM

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PHASE I INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM

Name of Dam: Johns Creek No. 3
State: Virginia
County: Craig
USGS 7.5 Minute Quadrangle: Waiteville, VA-W.VA
Stream: Mudlick Branch of Johns Creek Watershed
Dates of Inspection: 10 and 11 May 1979

BRIEF ASSESSMENT OF DAM

Johns Creek No. 3 Dam is a zoned, earthfill dam approximately 400 feet long and 50 feet high. The dam, located approximately 18 miles southwest of New Castle, Virginia, is used for flood control. Johns Creek No. 3 Dam is an "intermediate" size - "significant" hazard structure as defined by the Recommended Guidelines for Safety Inspection of Dams. Visual inspection and office analyses indicate no deficiencies requiring emergency attention.

Using the Corps of Engineers' screening criteria for initial review of spillway adequacy, the 1/2 Probable Maximum Flood (1/2 PMF) was selected as the spillway design flood (SDF). The SDF was routed through the reservoir and found to overtop the dam by a maximum depth of 1.7 feet with an average critical velocity of 3.5 f.p.s. Total duration of dam overtopping would be approximately 2 hours. The spillway is capable of passing only 20 percent of the PMF and is therefore adjudged as inadequate.

The dam and appurtenant structures were found to be in generally good overall condition. No conditions indicating embankment instability were detected during the field inspection and office analyses. Although the safety factors determined during design are greater than those required for minimum accepted stability, they cannot be considered to represent that of the as-built embankment.

It is recommended that the following repair items be accomplished as part of the annual maintenance program: repair the spalling and cracks in the concrete riser, repair rodent holes, remove small trees and brush from the dam, provide erosion protection on the left abutment, and install a staff gage in the reservoir.

MICHAEL BAKER, JR., INC.

Michael Baker, III, P.E.
Chairman of the Board and
Chief Executive Officer

COMMONWEALTH OF VIRGINIA
MICHAEL
BAKER III
NO. 3176
CERTIFIED PROFESSIONAL ENGINEER

SUBMITTED: Original signed by JAMES A. WALSH

James A. Walsh
Chief, Design Branch

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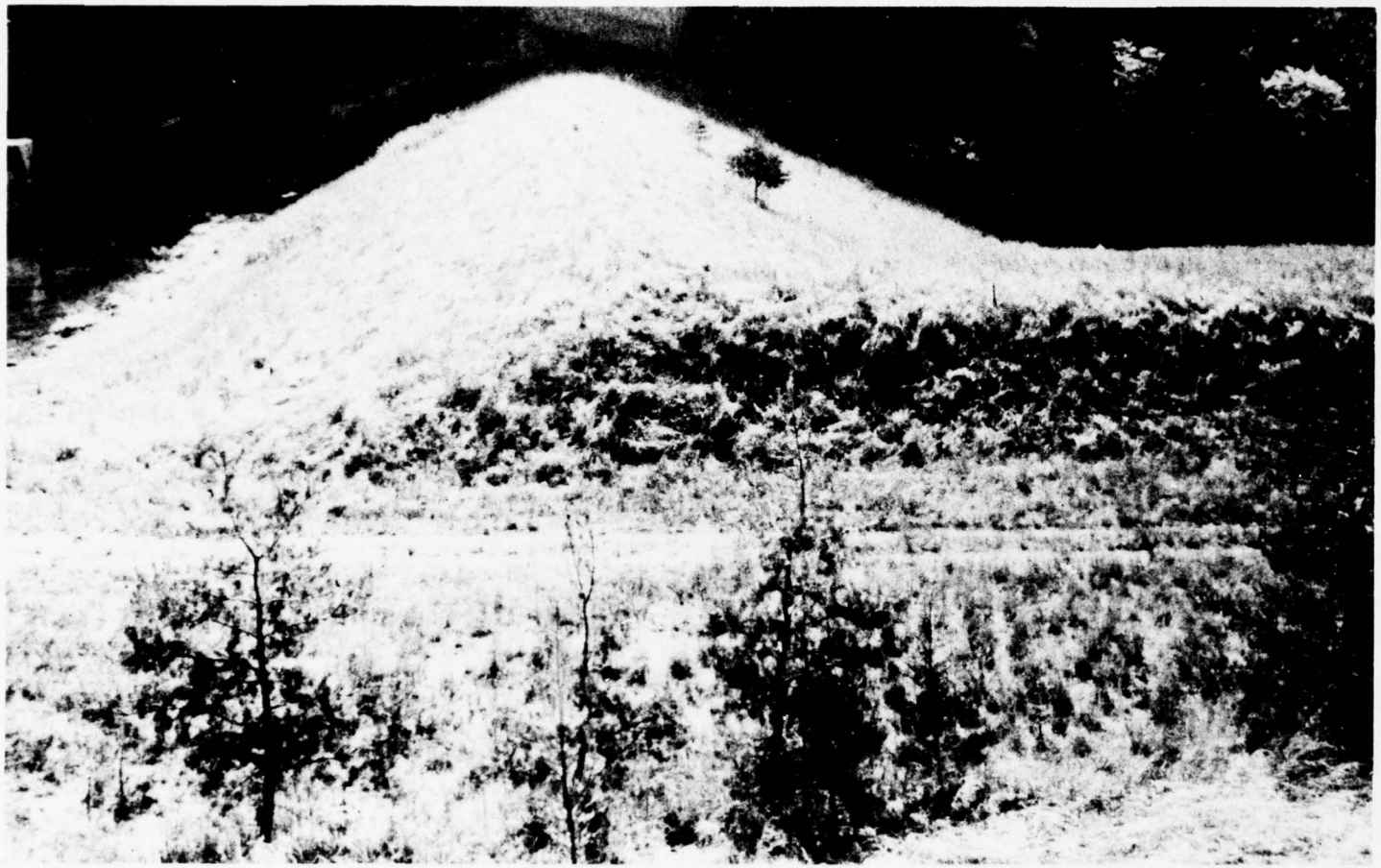
for Jack G. Starr
Chief, Engineering

APPROVED: Original signed by: Douglas L. Haller

Douglas L. Haller
Colonel, Corps of Engineers
District Engineer

Date: AUG 24 1979



OVERALL VIEW OF DAM

PHASE I INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM
NAME OF DAM: JOHNS CREEK No. 3 ID# VA 04503

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. The main responsibility is to expeditiously identify those dams which may be a potential hazard to human life or property.

1.2 Description of Project

1.2.1 Description of Dam and Appurtenances: Johns Creek No. 3 Dam is a zoned, earthfill dam approximately 50 feet high[1] and 400 feet long. The dam was constructed with side slopes of 2.5:1 (horizontal to vertical) on both the upstream and downstream slopes. A 10 foot berm was provided on the upstream face at elevation 1855.0 feet above Mean Sea Level (M.S.L.) near the normal pool elevation of 1854.3 feet M.S.L. Below this berm, the slope of the face was constructed at a 3:1 slope. Seepage control is provided by an impervious core, a cut-off trench, and toe drains. No collector pipes are used in the toe drains; instead, the drains are constructed of free draining material and have outlets into the stilling basin.

The principal spillway is a drop-inlet structure consisting of a reinforced concrete riser, a 24 inch diameter reinforced concrete outlet pipe, and a natural, unlined stilling basin approximately 10 feet wide and 40 feet long.

[1]Measured from downstream embankment toe to the embankment crest.

The 75 foot wide, vegetated, earth channel emergency spillway is located outside the right[2] abutment of the dam. The approach channel slope is approximately 2 percent to the 30 foot long level control section. The discharge slope of the emergency spillway is approximately 4 percent.

Normal pool is controlled by one 8 inch by 12 inch secondary level orifice-inlet located on the right side of the outlet riser. An 8 inch cast-iron pipe is also provided along the left side of the riser for cold water release. The invert of the secondary level orifice-inlet is at elevation 1854.8 feet M.S.L. and the invert for the cold water release is at elevation 1854.47 feet M.S.L. The riser is also fitted with a 24 inch pond drain with an invert elevation of 1838.00 feet M.S.L. The flow through the pond drain is controlled by a manually operated sluice gate with the control located atop the riser. The plan and typical sections of the dam are shown on Plates 3 and 4.

1.2.2 Location: Johns Creek No. 3 Dam is located on the Mudlick Branch of the Johns Creek watershed approximately 18 miles southwest of New Castle, Craig County, Virginia. A Location Plan is included with this report.

1.2.3 Size Classification: The maximum height of the dam is 50 feet and the reservoir storage capacity to the top of dam (elevation 1881.9 feet M.S.L.) is 275 acre-feet. Therefore, the dam is in the "intermediate" size category as defined by the Recommended Guidelines for Safety Inspection of Dams.

1.2.4 Hazard Classification: The dam is located in a rural area where failure may damage some farmland and a few homes; however, loss of life is not considered probable. Several farm buildings are located approximately 1 mile downstream of the dam. In the event of a failure of the dam, loss of livestock and damage to farmland are likely. Therefore, this dam is considered in the "significant" hazard category as defined by the Recommended

[2]Facing downstream.

Guidelines for Safety Inspection of Dams. 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: The dam is owned by Mr. Elridge Huffman, Box 341, New Castle, Virginia 24127.

1.2.6 Purpose of Dam: The dam is used for flood control.

1.2.7 Design and Construction History: The existing facility was designed by the U.S. Department of Agriculture, Soil Conservation Service (SCS), and R. Stuart Royer and Associates, Consulting Engineers, Richmond, Virginia. The dam, completed in 1968, was built by Laughon and Johnson, Inc.

1.2.8 Normal Operational Procedures: The reservoir is maintained at a normal pool elevation of 1854.8 feet M.S.L. No formal operating procedures are followed for the dam. For a more detailed operating assessment, see paragraph 4.1.

1.3 Pertinent Data

1.3.1 Drainage Area: The drainage area of Johns Creek No. 3 Dam is 1.84 square miles.

1.3.2 Discharge at Dam Site: The maximum discharge at the dam site is unknown.

Principal Spillway:
Pool level at top of dam . . 77 c.f.s.

Emergency Spillway:
Pool level at top of dam . . 2343 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 AREA

Item	Elevation feet M.S.L.	Reservoir Area acres	Reservoir Capacity Acre-feet	Reservoir Capacity Watershed inches	Length feet
Top of dam	1881.9	20.3	275	2.80	2300
Emergency spillway crest	1876.1	14.2	194	1.98	1800
Principal spillway crest	1872.0	12.9	139	1.42	1500
Secondary level orifice invert (normal pool)	1854.8	3.9	22	0.22	420
Streambed at downstream toe of dam	1832±	-	-	-	-

SECTION 2 - ENGINEERING DATA

2.1 Design: Although the site was investigated and the embankment designed by the SCS, only incomplete and very limited portions of the field investigation and stability analyses reports were available for review by Michael Baker, Jr., Inc.

The test pit logs and the interpretations and conclusions to the geologic report (Appendix VII) indicate that the embankment foundation consists of black fissle shale overlain by 0.6 to 7.3 feet of firm clay, silt, sand, and gravel (CL, ML-CL, SM, and GM soils).

According to test pit logs included with the as-built drawings, material available from borrow sources was mainly fine sandy silt (ML) with a lesser amount of silty sand (SM). Most of the material from the emergency spillway excavation was shale, overlain by a mantle of sandy silt (ML) approximately 5 feet thick.

Typical sections of the as-built embankment given in Plates 3 and 4 show that the zoned embankment was constructed in 3 sections. Section 1, the center core section and cut-off trench backfill, consists of ML soils. The second section, which is the upstream and downstream section, was constructed of CL-ML or ML soils. Section 3, the downstream toe, was built of SM, silty sand.

The only stability analysis summary provided (see Appendix VI) was for a homogenous embankment of ML soils, using shear strength parameters from two laboratory tests; the analysis did not consider the effects of foundation soils on stability. The minimum safety factors of 1.66 and 1.77 calculated for the upstream and downstream slopes respectively, using $c = 425$ p.s.f. and $\phi = 29°$, are above the minimum acceptable safety factor. Using $c = 550$ p.s.f. and $\phi = 24.5°$, the minimum safety factor for the upstream slope is 1.75, with 1.83 for the downstream slope. The geometry of the analyzed section is similar to that given on the as-built drawings. Saturated shear valves were used for a full drawdown condition for the upstream slope. Although the safety factors are adequate, they cannot be considered to represent that of the present embankment due to the unknown effects of foundation soils on stability.

2.2 Construction: The dam, constructed by Laughon and Johnson, Inc., was completed in 1968. Construction

records were not available for this inspection; however, as-built drawings were reviewed and were subsequently verified in the field. Construction reports are on file in Washington, District of Columbia.

2.3 Operation: There are no formal operating procedures for this dam. The previous maximum discharge at the dam site is unknown. No operational records are available nor are there any records of operating equipment checks.

2.4 Evaluation

2.4.1 Design: The as-built drawings and Design Report were adequate to assess all aspects of design except for slope stability as previously noted. The hydrologic and hydraulic data provided was adequate for design review, although portions of the Design Report were incomplete. The assessments made in this report are based on this design data along with field observations.

The design of the dam is similar to other SCS dams of this type, typically with 2.5:1/3:1 upstream slopes and 2.5:1 downstream slopes, with 10 foot wide berms on the upstream side of the embankment. This type of SCS dam is generally not subject to significant heads for long periods of time, thus contributing to stability.

2.4.2 Construction: No construction records were available for review. The as-built drawings do not indicate any changes or modifications were made during the construction of the dam.

2.4.3 Operation: Annual operation and maintenance inspection reports were available for review (see Appendix V).

SECTION 3 - VISUAL INSPECTION

3.1 Findings

3.1.1 General: The field inspection of the dam was made on 10 and 11 May 1979. The reservoir was at normal pool elevation and ground conditions were dry. Although the embankment, emergency spillway, and reservoir were generally in good condition, significant cracking and spalling was discovered in the concrete riser. The upstream portion of the left abutment adjacent to the embankment is undergoing some erosion. Details of deficiencies are given in the visual inspection check list (Appendix III) and a Field Sketch of conditions at the time of inspection (Plate 1). The following are brief summaries of conditions in the various sections of the dam site.

3.1.2 Dam: No obvious signs of embankment instability were noted. The alignment and slopes approximate the as-built drawings. There was some clear seepage (±0.5 g.p.m.) noted at the right of the outlet pipe, but it was probably coming from the rock toe drain. The small wet area to the left of the outlet pipe (near the abutment) does not indicate a potential stability problem, as its source may be a spring.

The vegetative cover (Sericea) on the dam is well developed and only a few small scattered trees (less than 2 inches in diameter) and patches of briars were found on the embankment. The edge of the embankment at normal pool is lined with low willows (3 to 4 feet high). There is a zone of erosion along the upstream left abutment which is causing some undercutting of the root mantle resulting in a shallow overhang. Immediately upstream is an accumulation of shale talus which extends into the reservoir near the riser (see Photo 2). One rodent hole was observed on the upstream face. The emergency spillway slopes appear stable; however, shale talus is also accumulating along the toe of the right cut slope as the result of weathering of the poorly vegetated shale cut.

3.1.3 Appurtenant Structures: Significant cracking and spalling (see Photo 3) was found on the riser at the normal pool waterline. This cracking and spalling is apparently the result of freeze-thaw conditions along with the possibility of weak concrete. The cracks do not extend through the wall of the riser and are not considered to threaten the stability of the riser at their present condition. However, they should be repaired with an epoxy concrete to prevent further deterioration. Except for the condition of the riser, no serious deficiencies were found in any of the appurtenant structures.

3.1.4 Reservoir Area: The reservoir slopes appear stable. The left upstream area is relatively steep with a well developed tree cover. To the right, the borrow area is rather flat with some shale exposures.

3.1.5 Downstream Channel: No riprap was provided in the downstream channel or stilling basin. However, there is no significant erosion and the slopes are stable; shale bedrock is exposed in the bottom of the channel near the outlet pipe. The slope of the disposal area for excess excavation to the right of the channel is steep, but no slumps were noted. At the time of inspection, the channel was unobstructed and the outlet pipe was in good condition. However, there are several small trees (approximately 2 inches in diameter) adjacent to the outlet pipe.

3.2 Evaluation: The cracks in the riser noted on the visual inspection check list should be cleaned and repaired. The trees on the embankment, at the edge of the water, and beside the outlet pipe should be removed. The eroded area on the left abutment should be seeded, after grading, to remove the root mantle overhang. Although the rodent holes are not considered detrimental to the safety of the dam, the burrows should be excavated and backfilled as part of normal maintenance operations.

SECTION 4 - OPERATIONAL PROCEDURES

4.1 Procedures: There are no formal operating procedures for Johns Creek No. 3 Dam. The reservoir level is maintained at the normal pool elevation of 1854.8 feet M.S.L. by means of the secondary level orifice-inlet located on the right side of the concrete riser.

During periods of heavy inflow, the excess water is diverted around the dam by means of the emergency spillway. To protect the downstream toe from erosion caused by flow through the emergency channel, a berm was constructed between the embankment and spillway. This berm, approximately 150 feet long, directs flow through the emergency channel to a point below the dam, where it enters the downstream channel.

4.2 Maintenance of Dam: The Natural Bridge Soil and Water Conservation District personnel along with local SCS representatives perform an annual inspection of the dam. The Natural Bridge Soil and Water Conservation District provides for operation and maintenance of the dam.

4.3 Maintenance of Operating Facilities: Maintenance of the operating equipment is provided by the Natural Bridge Soil and Water Conservation District.

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

4.5 Evaluation: Maintenance of the dam is considered adequate.

SECTION 5 - HYDRAULIC/HYDROLOGIC DATA

5.1 Design: Normal pool (elevation 1854.8 feet M.S.L.) is maintained by an 8 by 12 inch secondary level orifice-inlet on the right side of the concrete riser. The orifice invert was established at the elevation sufficient to store the 50-year sediment accumulation. The riser crest elevation (1872.0 feet M.S.L.) was established at an elevation capable of storing additional runoff above normal pool. The capacity (72 c.f.s. with the reservoir level at the emergency spillway crest) 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 (less than 10 days).

2) Not passing damaging floods downstream.

3) The capability of the reservoir to store the floodwaters.

The elevation of the top of dam (1881.9 feet M.S.L.) was established by use of the freeboard hydrograph. The freeboard hydrograph was developed for a class "b" structure. No other design data was available for review.

5.2 Hydrologic Records: No rainfall of stream flow records were available at the dam site.

5.3 Flood Experience: No exact high water marks were available. However, it is apparent from the trash line along the face of the dam that water in the reservoir has reached an elevation of at least 1872.0 feet M.S.L. in the past.

5.4 Flood Potential: The Probable Maximum Flood (PMF) and 1/2 Probable Maximum Flood (1/2 PMF) were developed and routed through the reservoir by use of the HEC-1 DB computer program (Reference 9, Appendix VIII) and appropriate unit hydrograph, precipitation and storage-outflow data. Clark's T_c and R coefficients for the local drainage areas were estimated from basin characteristics. The rainfall applied to develop the unit hydrograph was obtained from the U.S. Weather Bureau's publication (References 5 and 16, Appendix VIII). The inflow hydrograph for the PMF was developed by the Corps of Engineers using a rainfall of 33.3 inches producing a runoff of 31.3 inches. Losses were estimated

at an initial loss of 1.0 inch and a constant loss thereafter of 0.05 inch per hour.

5.5 Reservoir Regulation: Pertinent dam and reservoir data are shown in Table 1.1, paragraph 1.3.3.

Regulation of flow from the reservoir is automatic. Normal flows are maintained by the secondary level orifice-inlet in the riser with a crest elevation of 1854.8 feet M.S.L. Water entering the secondary level orifice-inlet flows through the dam in a 24 inch diameter reinforced concrete conduit. Water also flows past the dam through the ungated, vegetated, emergency spillway in the event water in the reservoir rises above an elevation of 1876.1 feet M.S.L.

Outlet discharge capacity, and reservoir area and storage capacity were taken from the SCS Design Report. Hydrograph data and routing computations for PMF and 1/2 PMF were computed as part of this report. The flood routings were begun with the reservoir level at normal pool.

5.6 Overtopping Potential: The probable rise of the reservoir and other pertinent information on reservoir performance are shown in the following table:

TABLE 5.1 RESERVOIR PERFORMANCE

Item	Normal	Hydrographs 1/2 PMF	Hydrographs PMF(a)
Peak flow, c.f.s.			
Inflow	2	6,750	13,500
Outflow	2	6,600	13,300
Peak elev., ft. M.S.L.	1854.8	1883.6	1885.6
Emergency spillway(b) (elev. 1876.1 feet M.S.L.)			
Depth of flow, ft.	-	5.0	6.3
Average velocity, f.p.s.	-	12.7	14.3
Duration of flow, hrs.	-	11.2	14.2
Non-overflow section (elev. 1881.9 ft. M.S.L.)			
Depth of flow, ft.	-	1.7	3.7
Average velocity, f.p.s.	-	3.5	5.1
Total duration of overtopping, hrs.	-	2.0	3.7
Tailwater elev., ft. M.S.L.	1833.9(c)	-	-

(a) The PMF is an estimate of flood discharges that may be expected from the most severe combination of critical meteorologic and hydrologic conditions that are reasonably possible in a region.
(b) Depth and velocity estimates were based on critical depth at control section.
(c) Tailwater at time of inspection.

5.7 Reservoir Emptying Potential: A 24 inch sluice gate on the upstream face of the riser is available to dewater the reservoir. The time for the reservoir level to decrease from the emergency spillway crest (elevation 1876.1 feet M.S.L.) to the riser crest (elevation 1872.0 feet M.S.L.) is approximately 8 hours. From this level, it would take approximately 8 days to return to the secondary level orifice invert (elevation 1854.8 feet M.S.L.). The reservoir drawdowns, as determined by the SCS, were computed neglecting inflow.

5.8 Evaluation: Johns Creek No. 3 Dam is an "intermediate" size-"significant" hazard dam requiring evaluation for a spillway design flood (SDF) equal to the 1/2 PMF. The 1/2 PMF was routed through the reservoir and found to overtop the dam by a maximum depth of approximately 1.7 feet with an average critical velocity of 3.5 f.p.s. Total duration of dam overtopping would be approximately 2 hours. The spillway is capable of passing only 20 percent of the PMF.

Conclusions pertain to present day conditions and the effect of future development on the hydrology has not been considered.

SECTION 6 - DAM STABILITY

6.1 Foundation and Abutments: Foundation conditions at the site of this dam were obtained from test pit and auger boring data as shown on the as-built drawings and from a limited amount of laboratory data.

Bedrock beneath the dam consists of black fissile Devonian shale which lies beneath a thin cover of clay, silt, sand, and gravel (CL, ML-CL, SM and GM soils, respectively) between 0.6 and 7.3 feet thick. The as-built cross sections show that the dam was constructed on these foundation soils, except for the cut-off trench and the area between Station 5+50 and 6+00 which was apparently undercut to bedrock for virtually the full embankment width. Shale is exposed in the emergency spillway, in the borrow area of the reservoir, along the abutment slopes, and in the stilling basin. Shale from excavation of the emergency spillway has been wasted on the right downstream side of the embankment between the emergency spillway and the downstream channel. The shale was apparently wasted because it was not required for construction of the embankment.

6.2 Stability Analysis

6.2.1 Visual Observations: No evidence of embankment slope instability, such as bulging or cracking, was noted during the field inspection. A small amount of seepage appeared to be coming from the left abutment on the downstream side. A small wet area was found at the toe adjacent to the left downstream embankment; the moisture is possibly coming from the abutment. Clear seepage is occurring to the right of the outlet pipe just above the stilling basin and appears to be drainage (approximately 0.5 g.p.m.) from the toe drain.

6.2.2 Design Data: The SCS recommended use of excavated material in their report shows a selective placement plan with an upstream slope design of 3:1 from the bottom of the embankment to elevation 1855.0 feet M.S.L.; at elevation 1855.0 feet M.S.L., a 10 foot wide berm was recommended; above elevation 1855.0 feet M.S.L., the slope shown was 2.5:1. The downstream slope was a uniform 2.5:1. A cut-off trench to bedrock was constructed beneath the core of the embankment and a toe drain provided. The SCS analyzed

the dam for stability at its maximum cross-section using $\phi = 29.0°$ and $c = 425$ p.s.f. for the embankment. The minimum safety factors were 1.66 for the upstream slope and 1.77 for the downstream slope. A similar analysis was made using $\phi = 24.5°$ and $c = 550$ p.s.f. The resulting minimum safety factors were 1.75 and 1.83 for the upstream and downstream slopes, respectively. Both analyses were made using the Swedish Circle Method, assuming a full drawdown condition for the upstream slope; both soils were classified as silts (ML). No information was available on seepage conditions used for the downstream slope.

Although the slope stability cases were described, drawings of the stability circles were not available from the SCS. The typical section of the compacted dam, on the as-built drawings, shows an embankment with the same slope configuration and zoning. The slope stability table describes an analysis for a homogeneous dam.

6.2.3 Operating Records: The available SCS operation and maintenance inspection reports from January 1975 to the present do not show any evidence of past stability problems. These reports are presented in Appendix V.

6.2.4 Post-Construction Changes: There have been no known changes made to the dam or its appurtenant structures since construction was completed.

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

6.3 Evaluation: Although the final design and construction included zoning of the embankment, the dam was analyzed as a homogeneous structure. However, although stability analysis data is incomplete, it appears that the dam is stable based on historic records and the field inspection. In addition, the disposal of shale from excavation adjacent to the downstream slope probably increases stability of the downstream slope by serving as a buttress.

The berm separating the crest and emergency spillway appears to be made of the same material as the embankment. Although no stability analyses were made of the berm, there is no evidence of instability. No erosion protection is provided along the slopes of the diversion dike other than the vegetative cover. Riprap protection of the dike along the emergency spillway would prevent erosion during high flows.

SECTION 7 - ASSESSMENT/REMEDIAL MEASURES

7.1 Dam Assessment: The dam and appurtenant structures are generally in good overall condition. No deficiencies were discovered during the field inspection and office analysis which would indicate the need for emergency attention. Riprap on the slope of the berm on the left side of the emergency spillway would prevent erosion during high flows.

Using the Corps of Engineers' screening criteria for initial review of spillway adequacy, the 1/2 PMF was selected as the SDF for the "intermediate" size-"significant" hazard classification of Johns Creek No. 3 Dam. It has been determined that the dam would be overtopped by the SDF by a maximum depth of 1.5 feet with an average critical velocity of 3.5 f.p.s. and would remain above the top of dam for 2 hours. The spillway is capable of passing only 20 percent of the PMF and is therefore adjudged as inadequate.

The spalling and cracking in the concrete riser at normal pool level is not considered to seriously threaten the stability of the structure. However, further deterioration will occur if this condition is not corrected.

The other recommended remedial measures are not considered urgent and therefore may be accomplished as part of the annual maintenance and inspection program.

7.2 Recommended Remedial Measures: It is recommended that the spalling and cracking on the riser be repaired with an epoxy concrete as part of general maintenance. Although the repairs are not considered urgent, they should be completed within a year to prevent more serious deterioration.

The following repair items should be completed as part of general maintenance of the dam:

1) Excavate, fill, and compact the rodent holes.

2) Remove the small trees, briars, and willows on the embankments.

3) Grade and seed the erosion area on the left abutment.

4) Install a staff gage to monitor reservoir levels above normal pool.

APPENDIX I

PLATES

CONTENTS

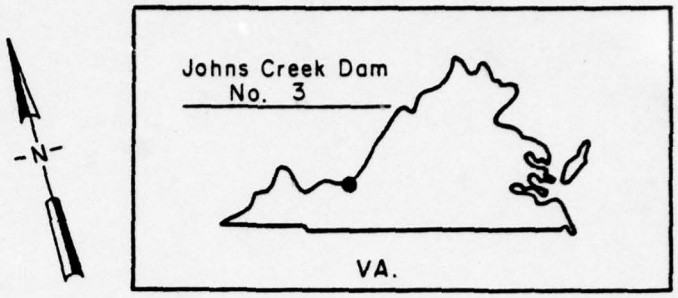
Location Plan

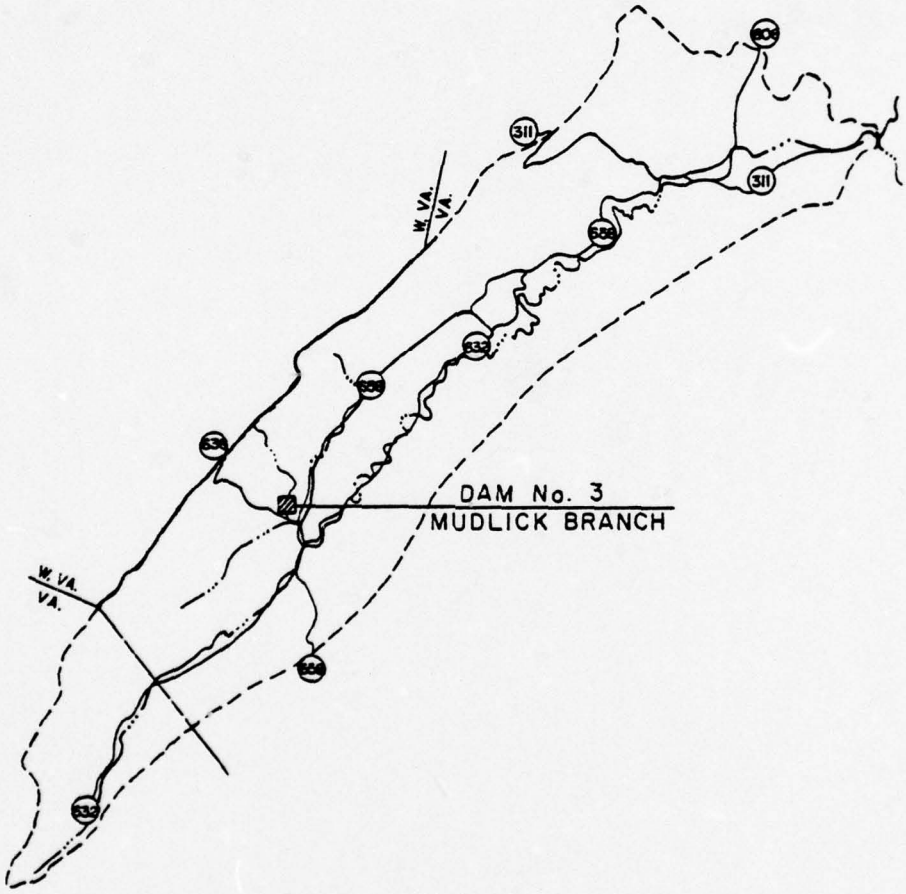
Plate 1: Field Sketch

Plate 2: Site Location Map

Plate 3: Profiles - Spillways, Typical Sections and Centerline Sections

Plate 4: Plan and Profile of Principal Spillway



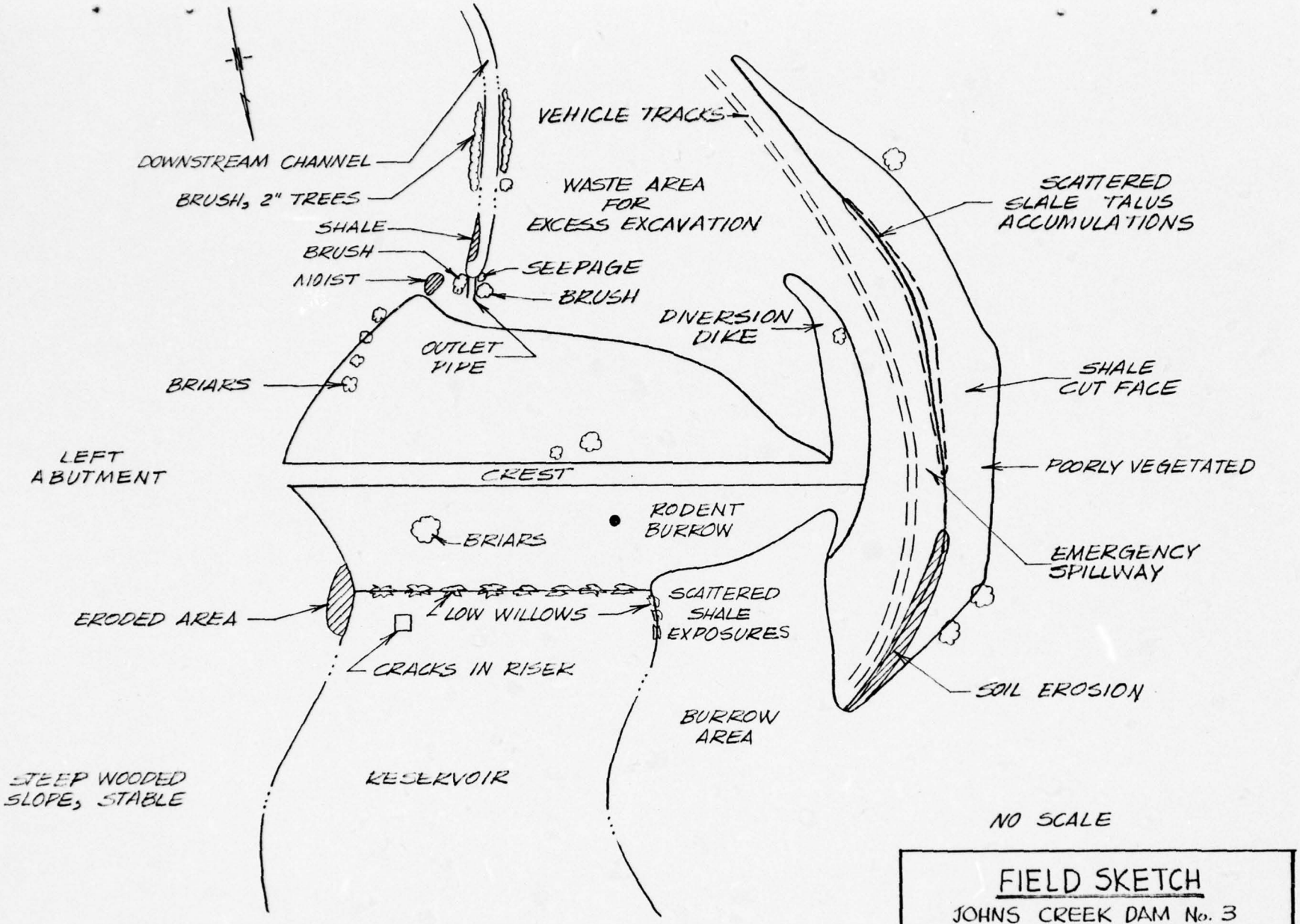


0 1 2 3 4 Miles

SCALE

LOCATION PLAN

JOHNS CREEK DAM No. 3



FIELD SKETCH

JOHNS CREEK DAM No. 3
MICHAEL BAKER, JR., INC.
10, 11 MAY 1979
PLATE 1

EMERGENCY SPILLWAY CREST 1876.10
TP-130
TP-131
TP-101
TP-107
TP-135
TP-103
TP-104
TP-105
TP-108
TP-109
BORROW AREA "A"
BORROW AREA "B"
LIMITS OF CONSTRUCTION
SEE SHEET 4 FOR GENERAL NOTES & LEGEND.
B.M. - ELEV. 1872.80
SCS BRASS MARKER IN CONCRETE AT STA 1+535 ℄ DAM

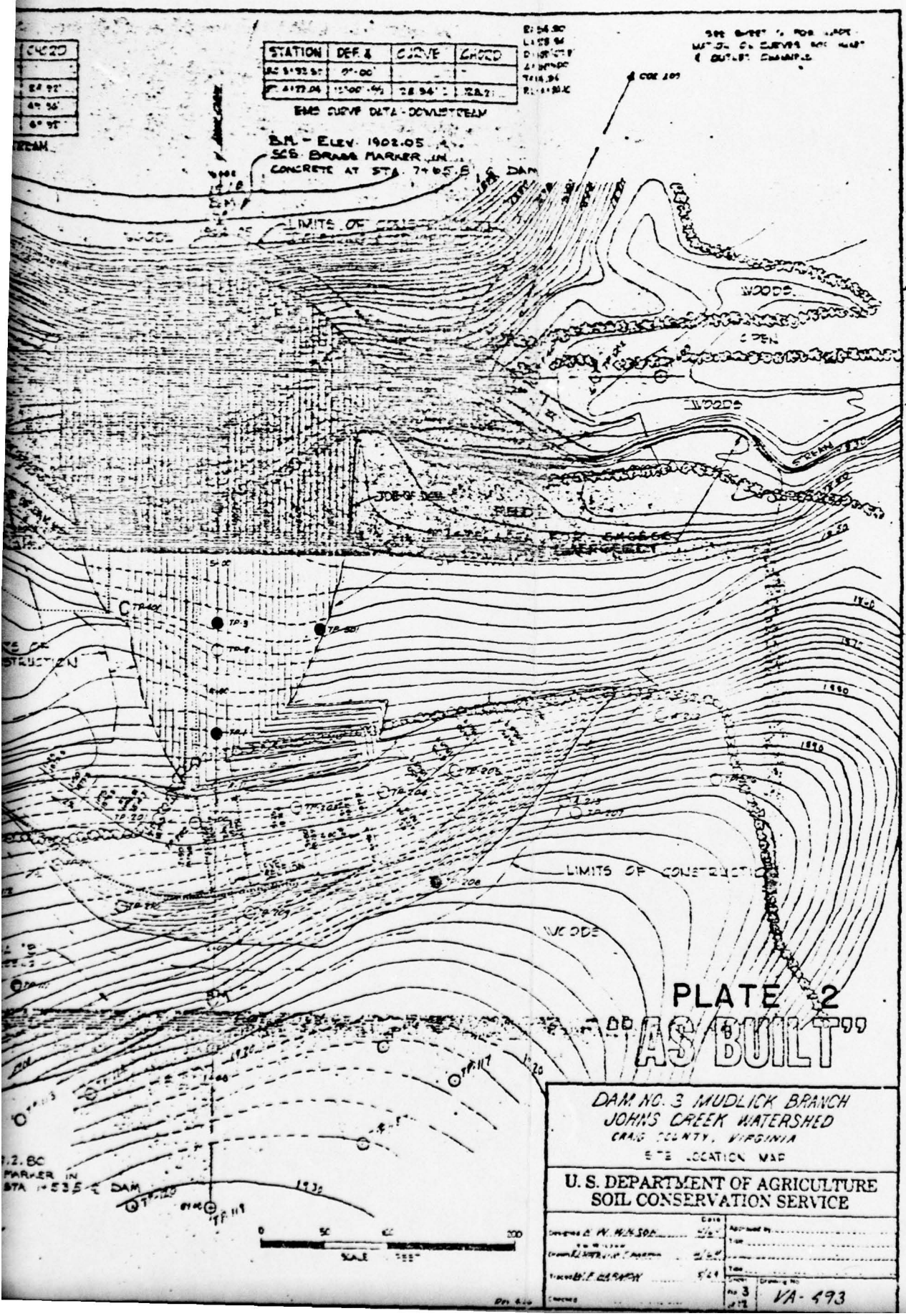


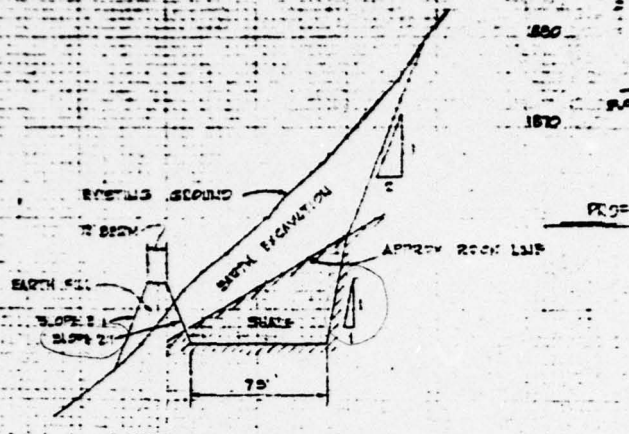
PLATE 2

"AS BUILT"

DAM NO. 3 MUDLICK BRANCH
JOHNS CREEK WATERSHED
CRAIG COUNTY, VIRGINIA
SITE LOCATION MAP

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

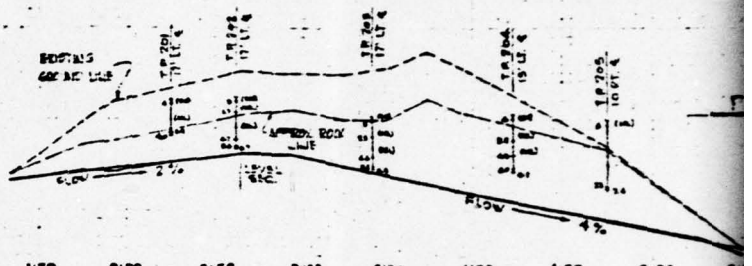
VA-493



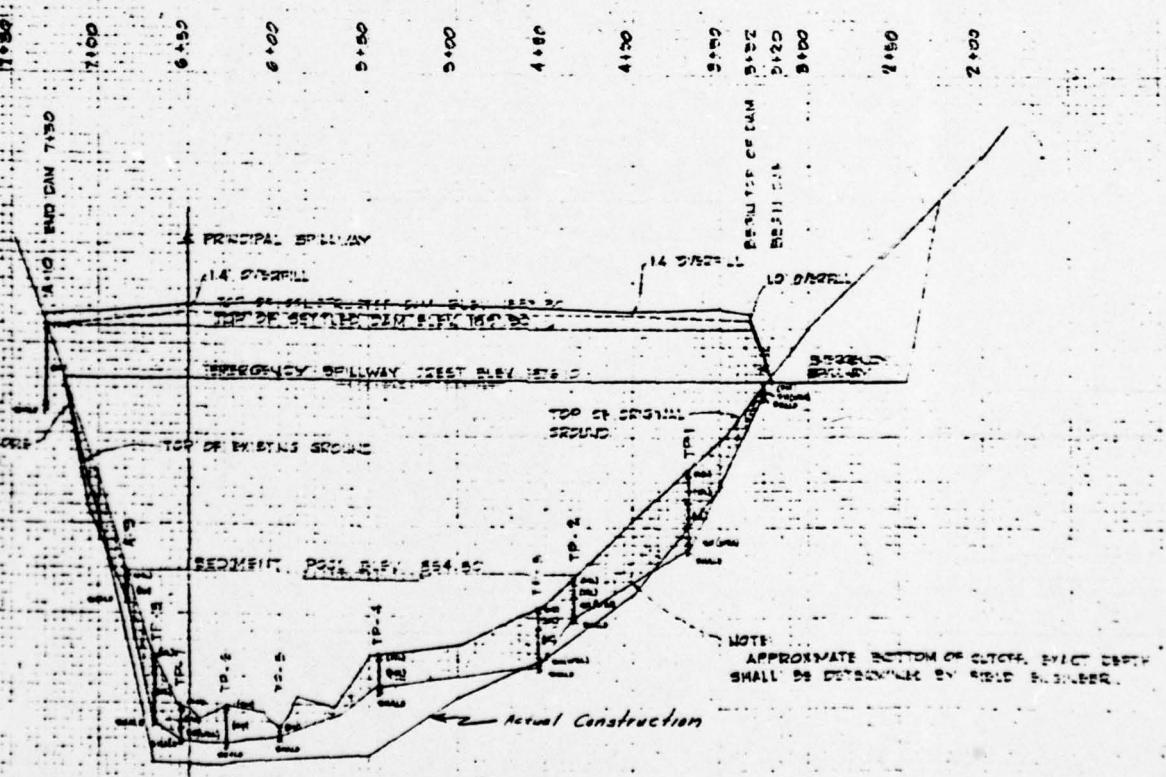
NOTE
ALL SLOPES ABOVE SHALE LINE SHALL BE 2:1 OR FLATTER.

TYPICAL SECTION THROUGH EMERGENCY SPILLWAY

PROFILE ALONG INSIDE EDGE OF EMERGENCY SPILLWAY



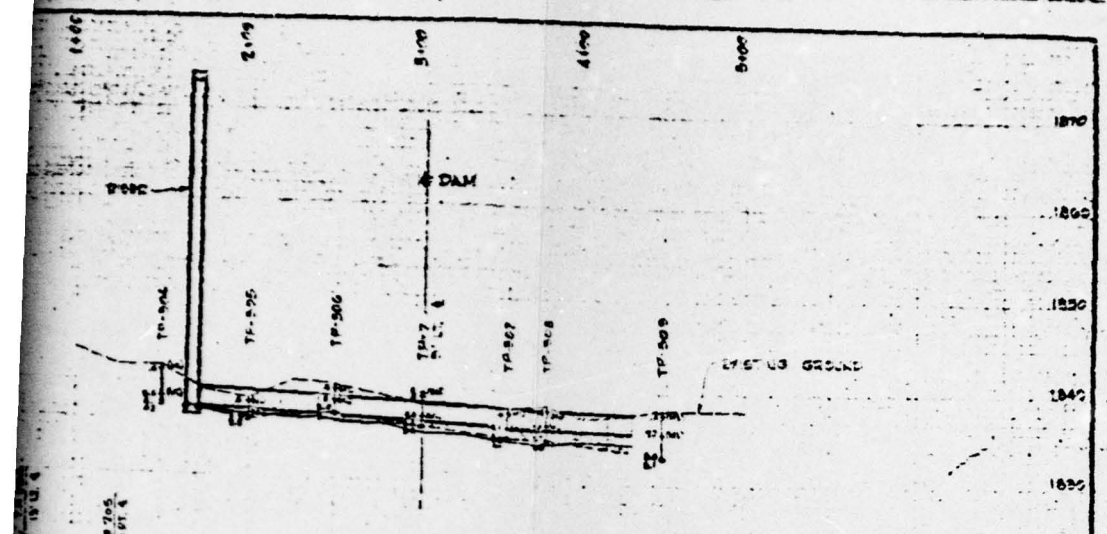
PROFILE ALONG CENTERLINE OF EMERGENCY SPILLWAY

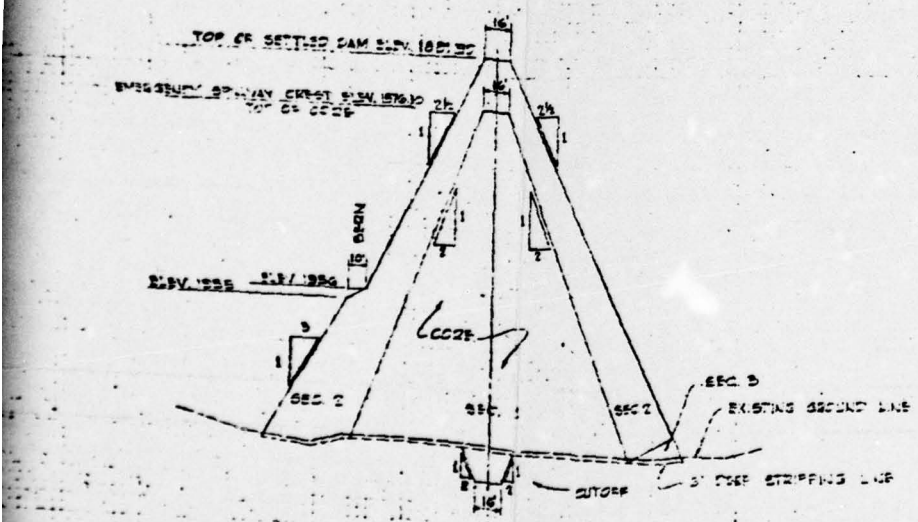


NOTE
APPROXIMATE BOTTOM OF CUTOFF. EXACT DEPTH SHALL BE DETERMINED BY FIELD ENGINEER.

PROFILE THROUGH CENTERLINE OF DAM

LOOKING DOWNSTREAM





TYPICAL SECTION OF COMPACTED DAM

PLATE 3

"AS BUILT"

R. STUART ROYER & ASSOCIATES
CONSULTING ENGINEERS
RICHMOND, VIRGINIA

PROJECT NO. 6503

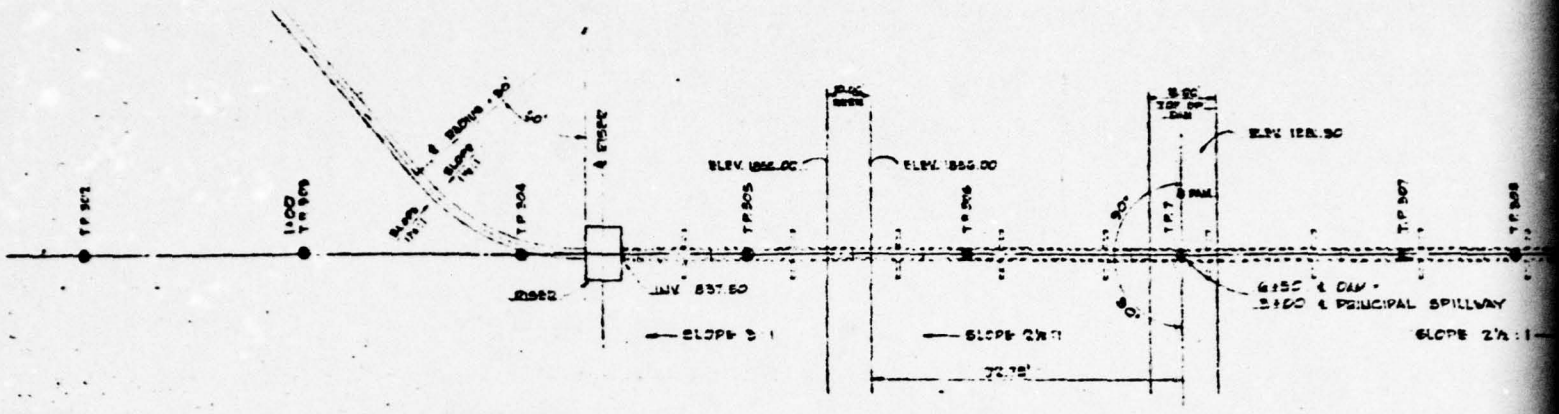
DAM NO. 3 MUDLICK BRANCH
JOHNS CREEK WATERSHED
CRAIG COUNTY, VIRGINIA

PROFILES - SPILLWAYS, TYP. SECT. & ℄ SECT.

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

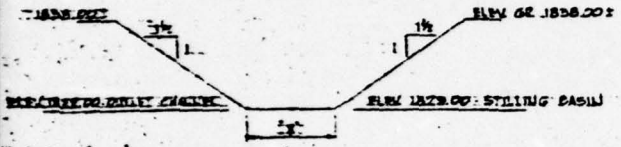
	Date
Designed J. A. LIMERICK	5/65
Drawn K. L. BURTON	5/65
Traced K. L. BURTON	5/65

Sheet No. 5 — VA-493



PLAN

HORIZONTAL SCALE IN FEET



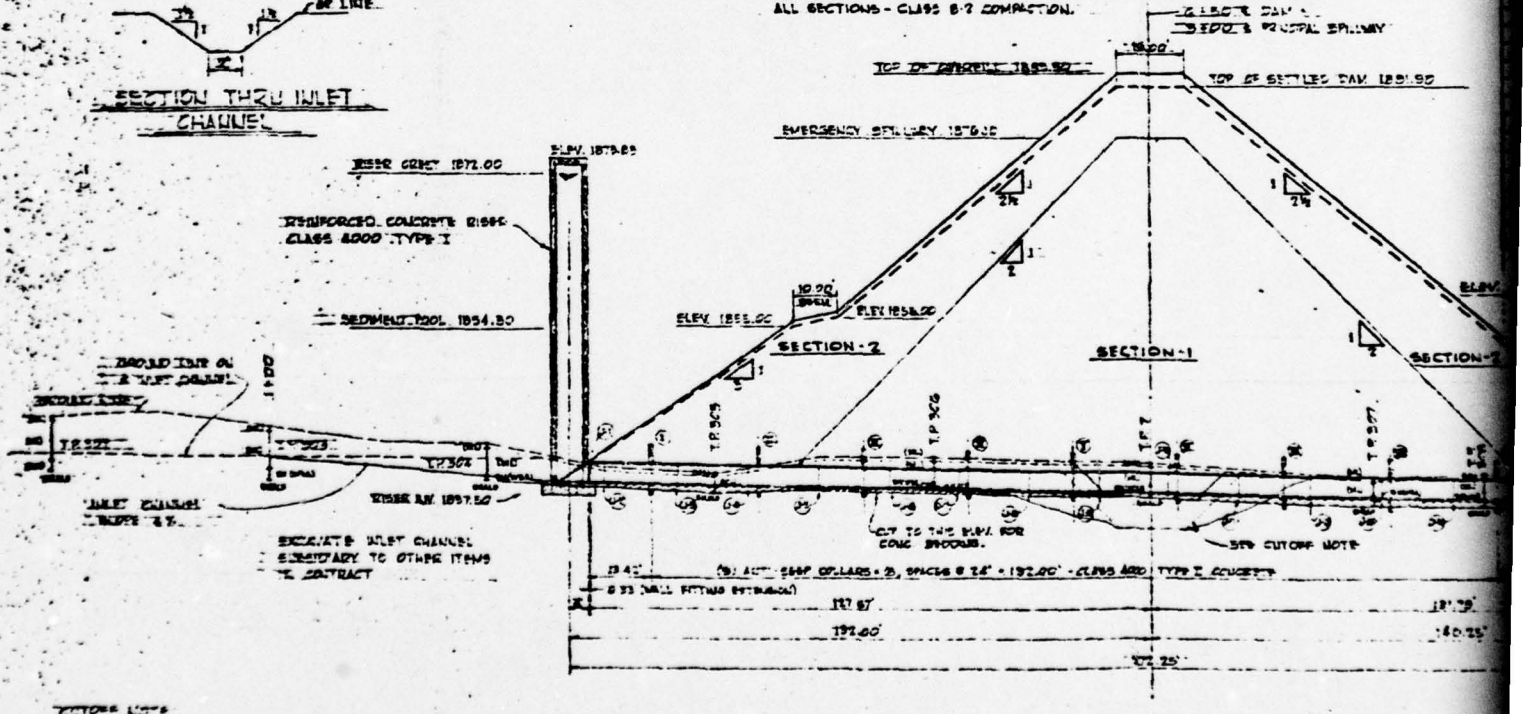
"Y" 6' FOR STILLING BASIN
"X" 10' FOR OUTLET CHANNEL

SECTION THRU STILLING BASIN & OUTLET CHANNEL

SECTION THRU INLET CHANNEL

	TEST PIT	AV. DEPTH	BORROW AREA
SECTION 1	102	5'	"A"
"	111	3.1'	"A"
"	137	10'	"D"
"	142	8'	"B"
SECTION 2	110	2.2'	"B"
"	142	8'	"B"
SECTION 3	121	8.4'	"C"

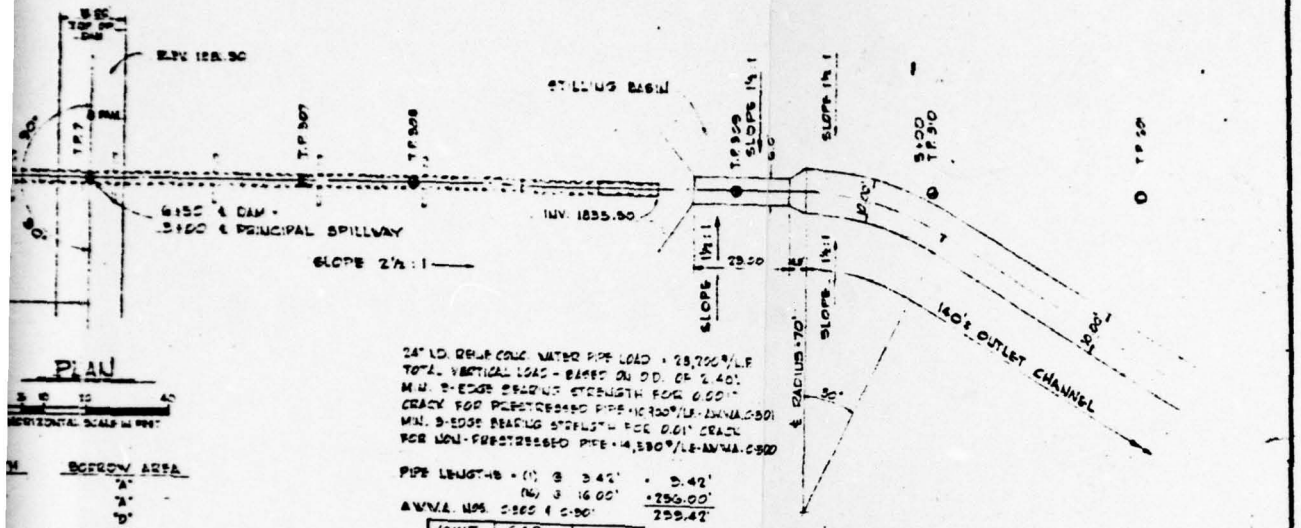
SHALE FROM EMERGENCY SPILLWAY EXCAVATION MAY BE WASTED ADJACENT TO DOWNSTREAM TOE DAM OR IN EMERGENCY SPILLWAY BERM.
ALL SECTIONS - CLASS B-2 COMPACTION.



SECTION THRU CENTERLINE OF PRINCIPAL SPILL

HORIZONTAL SCALE IN FEET

VERTICAL SCALE IN FEET



PLAN

HORIZONTAL SCALE IN FEET

24" I.D. REINF. CONC. WATER PIPE LOAD = 28,700#/L.F.
TOTAL VERTICAL LOAD - BASED ON O.D. OF 2.40'
MIN. 3-EDGE BEARING STRENGTH FOR 0.01" CRACK FOR PRESTRESSED PIPE = 10,300#/L.F. - AWWA C-301
MIN. 3-EDGE BEARING STRENGTH FOR 0.01" CRACK FOR NON-PRESTRESSED PIPE = 14,350#/L.F. - AWWA C-302

PIPE LENGTHS = (1) @ 3.42' = 0.42'
(16) @ 16.00' = 256.00'
AWWA NOS. C-302 & C-301 = 256.42'

JOINT	GAP
J-1	¼"
J-2	¼"
J-3	¼"
J-4	¼"
J-5	⅛"
J-6	¼"
J-7	¼"
J-8	⅛"
J-9	¼"
J-10	¼"
J-11	⅛"
J-12	¼"
J-13	¼"
J-14	¼"
J-15	¼"
J-16	¼"
J-17	¼"

JOINT	DIST. FROM RISER WALL FITTING	INVERT ELEV. OF 24" DIA. PIPE	SLOPE	JOINT	DIST. FROM RISER WALL FITTING	INVERT ELEV. OF 24" DIA. PIPE	SLOPE
J-1	0	1857.50	.0077	J-10	151.42	1836.49	.0077
J-2	3.67	1857.47	"	J-11	141.42	1856.96	"
J-3	19.42	1857.35	"	J-12	165.42	1856.74	"
J-4	35.42	1857.23	"	J-13	179.42	1856.12	"
J-5	51.42	1857.10	"	J-14	195.42	1838.99	"
J-6	67.42	1856.98	"	J-15	211.42	1839.87	"
J-7	83.42	1856.86	"	J-16	227.42	1835.75	"
J-8	99.42	1836.73	"	J-17	243.42	1835.62	"
J-9	115.42	1856.61	"	ANTI-SEEP COLLARS	259.42	1835.50	"
I	13.42	1857.40	.0077	VII	133.42	1839.47	.0077
II	37.42	1857.21	"	VIII	157.42	1836.28	"
III	61.42	1857.03	"	IX	181.42	1836.10	"
IV	85.42	1836.84	"	X	205.42	1836.91	"
V	109.42	1836.66	"				

NOTE: ABOVE FIGURES FOR DIST. FROM RISER WALL FITTING TO JOINT ARE BASED ON NOMINAL 16' LENGTHS AND DO NOT INCLUDE SPEEP CAST OUTSIDE OF SPIGOT JOINT RING WITH CONCRETE ON DUE SECTION.

EXCAVATION MAY BE WASTED IN EMERGENCY SPILLWAY BERM.

BORROW AREA
"A"
"A"
"D"
"E"
"B"
"B"
"C"

TOP OF SETTLED DAM 1859.90

ELEV. 1858.70 MIN.

SECTION-1

SECTION-2

SECTION-3

STR CUTOFF NOTE

TYPE E CONCRETE

140'± OUTLET CHANNEL

CENTERLINE OF PRINCIPAL SPILLWAY

VERTICAL SCALE IN FEET

PLATE 4

DAM NO. 3

R. STUART ROYER & ASSOCIATES
CONSULTING ENGINEERS
RICHMOND, VIRGINIA

PROJECT NO. 6803

DAM NO. 3 MUDLICK BRANCH
JOHNS CREEK WATERSHED
CRAIG COUNTY, VIRGINIA
PLAN & PROFILE OF PRINCIPAL SPILLWAY

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

Designed J.A. LIVELY 5/69
Drawn K.L. BURTON 5/69
Traced K.L. BURTON 5/69
Approved by
Title
Sheet No. 6
Drawing No. VA.-493

2

APPENDIX II

PHOTOGRAPHS

CONTENTS

Photo 1: Upstream Embankment and Riser with Lift Pedestal and Stem for Reservoir Drain

Photo 2: Reservoir, Riser, and Erosion on Left Abutment

Photo 3: Close-up View of Riser Showing Deterioration of Concrete at Water Level

Photo 4: Outlet Pipe and Stilling Basin

Photo 5: Upstream View of Emergency Spillway and Right Abutment

Photo 6: View of Downstream Channel Area

Note: Photographs were taken on 10 and 11 May 1979.

JOHNS CREEK No. 3 DAM

PHOTO 1. Upstream Embankment and Riser with Lift Pedestal and Stem for Reservoir Drain

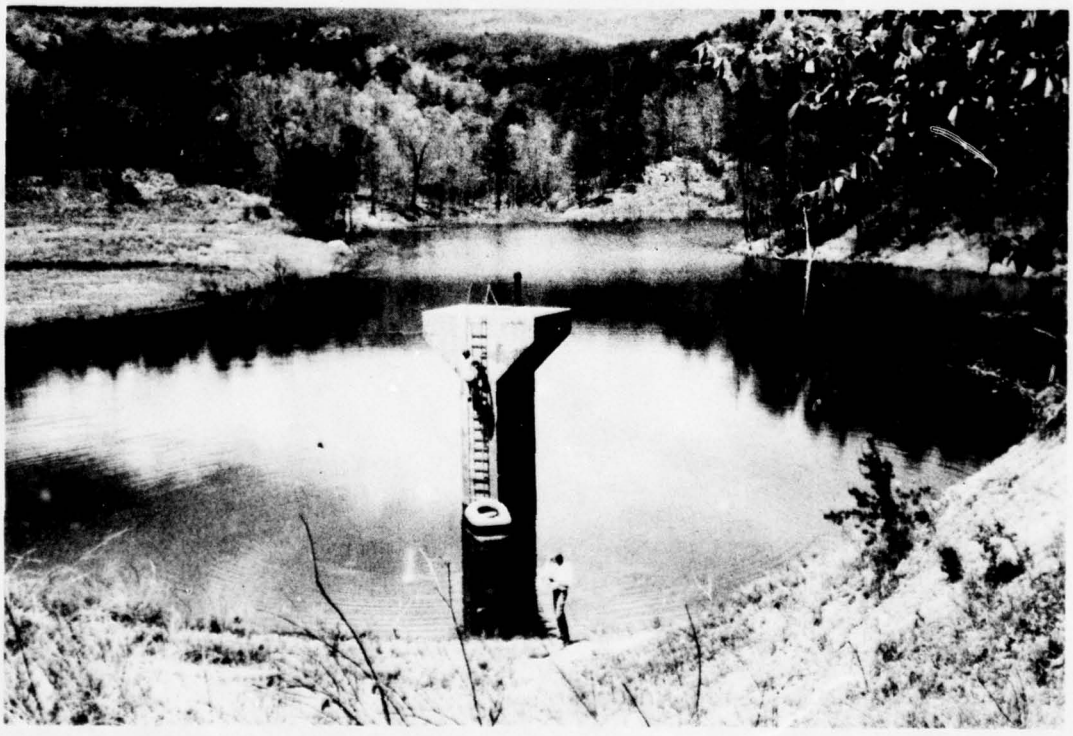


PHOTO 2. Reservoir, Riser and Erosion on Left Abutment

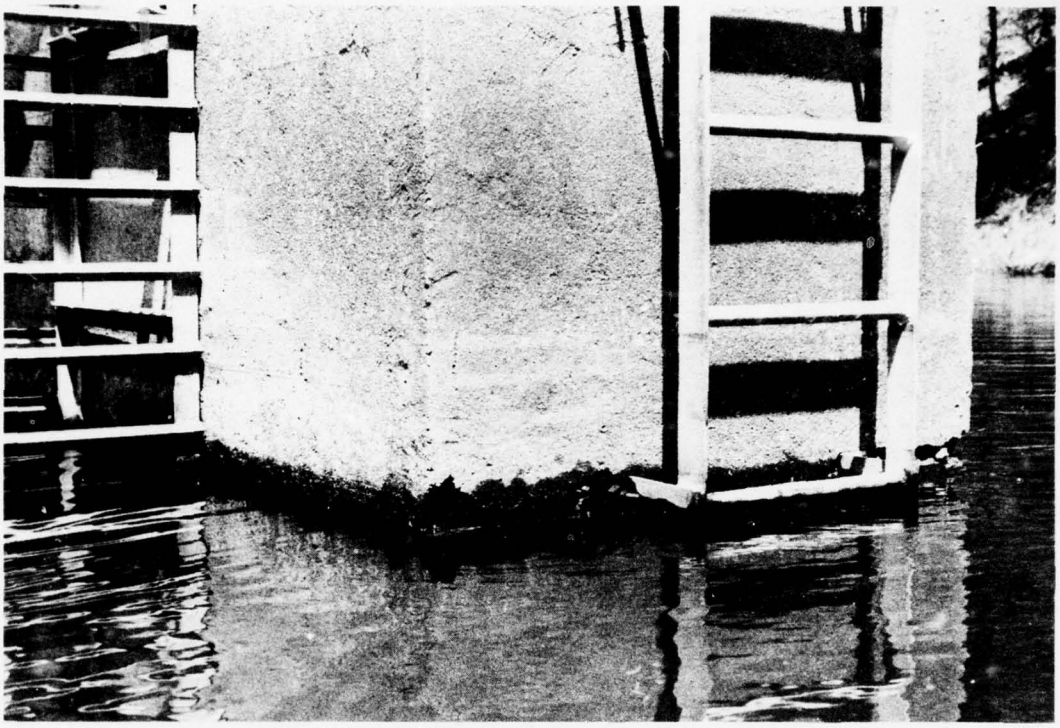


PHOTO 3. Close-up View of Riser Showing Deterioration of Concrete at Water Level

PHOTO 4. Outlet Pipe and Stilling Basin

PHOTO 5. Upstream View of Emergency Spillway and Right Abutment

PHOTO 6. View of Downstream Channel Area

APPENDIX III

CHECK LIST - VISUAL INSPECTION

Check List
Visual Inspection
Phase 1

Name of Dam Johns Creek No. 3 County Craig State Virginia Coordinates Lat. 3726.2
Long. 8023.1

Dates of Inspection 10 May 1979
11 May 1979 Weather Clear, Hot
Ptly Cldy, Warm Temperature High 80's F.
70's F.

Pool Elevation at Time of Inspection 1855.0 ft. M.S.L. Tailwater at Time of Inspection 1833.9 ft. M.S.L.

Inspection Personnel:

Michael Baker, Jr., Inc.:
T. W. Smith
D. Johns
B. M. Camlin

Virginia Water Control Board:
Hugh Gildea

B. M. Camlin Recorder

EMBANKMENT

Name of Dam: JOHNS CREEK No. 3

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SURFACE CRACKS	None observed	
UNUSUAL MOVEMENT OR CRACKING AT OR BEYOND THE TOE	None observed	
SLOUGHING OR EROSION OF EMBANKMENT AND ABUTMENT SLOPES	Erosion was observed on the left abutment between the embankment and a position on the abutment in-line with the riser. Erosion resulted in a 3 ft.± overhang above a root mantle.	
VERTICAL AND HORIZONTAL ALIGNMENT OF THE CREST	Vertical and horizontal alignments of the crest coincide with the as-built drawings.	
RIPRAP FAILURES	Embankment does not contain any riprap.	

EMBANKMENT

Name of Dam: JOHNS CREEK No. 3

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
VEGETATION	A few small trees were observed on the upstream and downstream embankment faces. Low willows are growing at the edge of water on the upstream side. Sericea growth is well developed and provides adequate protection.	Trees should be removed.
RODENT HOLES	One rodent hole is located on the upstream face about 6-8 in. above the trash line.	The rodent hole should be excavated, backfilled and compacted.
JUNCTION OF EMBANKMENT AND ABUTMENT, SPILLWAY AND DAM	Erosion occurring on the left upstream abutment has not extended into the embankment.	
ANY NOTICEABLE SEEPAGE	Clear drainage from the area to the right of the outlet pipe is estimated at 0.5± g.p.m. This may not be seepage but may instead be drainage from the rock toe.	
	A small, wet area was observed near the toe on the left side at the abutment.	The source of this water may be a spring in the hillside.
STAFF GAGE AND RECORDER	None observed	Staff gage should be installed to monitor reservoir levels above normal pool.
DRAINS	Refer to "ANY NOTICEABLE SEEPAGE" paragraph on this page.	

OUTLET WORKS

Name of Dam: JOHNS CREEK No. 3

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CRACKING AND SPALLING OF CONCRETE SURFACES IN OUTLET CONDUIT	No severe cracking or spalling was observed. No cracks were observed in the support for the outlet pipe.	
INTAKE STRUCTURE	Several cracks were noted on the corners of the riser at the water level. These cracks do not extend through the concrete and do not appear to threaten the stability of the riser at this time.	These cracks should be repaired to prevent further deterioration during freezing conditions.
OUTLET STRUCTURE	The outlet pipe consists of 24 in. diameter R.C.P. emptying into a natural stilling pool.	
OUTLET CHANNEL	The outlet channel is well defined but some small trees and brush are located on the banks of the channel.	Small trees and brush are not considered a serious restriction to flows.
EMERGENCY GATE	The reservoir may be drained by a 24 in. diameter slide gate located on the upstream side of riser.	

UNGATED SPILLWAY

Name of Dam: JOHNS CREEK No. 3

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONTROL SECTION	The control section is 75 ft. wide and 30 ft. long with a crest elevation of 1876.1 ft. M.S.L.	
APPROACH CHANNEL	The approach channel has a 2% adverse slope. Vegetation was adequate, although vehicle tracks were evident the length of the spillway.	
DISCHARGE CHANNEL	The discharge channel has a 4% slope.	
BRIDGE AND PIERS	Not Applicable	

INSTRUMENTATION

Name of Dam: JOHNS CREEK No. 3

VISUAL EXAMINATION	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
MONUMENTATION/SURVEYS	Bench marks noted on the as-built drawings were not located in the field.	
OBSERVATION WELLS	None observed	
WEIRS	None observed	
PIEZOMETERS	None observed	
OTHER		

RESERVOIR

Name of Dam: JOHNS CREEK No. 3

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SLOPES	Slopes upstream from the left abutment and borrow area are relatively flat, stable and well vegetated. Weathered shale is exposed in portions of the borrow area. Slopes upstream on the right are steep, with a well developed tree cover. No unstable areas were observed except for erosion on the left abutment as previously noted.	
SEDIMENTATION	No serious sedimentation was noted during field inspection that would inhibit proper operation of the dam and reservoir.	

DOWNSTREAM CHANNEL

Name of Dam: JOHNS CREEK No. 3

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONDITION (OBSTRUCTIONS, DEBRIS, ETC.)	Some small trees and brush are located on the downstream channel slopes but are not considered to seriously obstruct flows from the dam.	
SLOPES	The channel slope downstream of the dam is about 1%. The banks of the channel average about 10 ft. high immediately downstream of the dam.	
APPROXIMATE NO. OF HOMES AND POPULATION	No inhabited houses were observed within the first mile downstream of the dam. Several houses located beyond the first mile are generally at high enough elevations to not be seriously affected by high water.	

APPENDIX IV

CHECK LIST - ENGINEERING DATA

CHECK LIST
ENGINEERING DATA
DESIGN, CONSTRUCTION, OPERATION

Name of Dam: JOHNS CREEK No. 3

ITEM	REMARKS
PLAN OF DAM	The Plan of Dam is shown on the as-built drawings and is included in this report as Plate 2.
REGIONAL VICINITY MAP	The vicinity map is presented in this report as the Location Plan.
CONSTRUCTION HISTORY	The contractor and completion date were obtained from the COE. The dam was constructed by Laughon and Johnson, Inc. in 1968.
TYPICAL SECTIONS OF DAM	Typical sections are included in the as-built drawings and are presented in this report as Plates 3 and 4.
HYDROLOGIC/HYDRAULIC DATA	Hydrologic and hydraulic calculations were available.
OUTLETS - PLAN and DETAILS	Shown in the as-built drawings.
- CONSTRAINTS and DISCHARGE RATINGS	Contained in the hydrologic/hydraulic calculations.
RAINFALL/RESERVOIR RECORDS	No rainfall or reservoir records are available at the dam.

Name of Dam: JOHNS CREEK No. 3

ITEM	REMARKS
DESIGN REPORTS	Design Reports were obtained from the SCS.
GEOLOGY REPORTS	Data on detailed geologic investigations are contained in the Design Report and included in Appendix VII. This information is incomplete because only the pages given in Appendix VII, namely, the Interpretations and Conclusions to Detailed Geologic Investigation of Dam Sites, were provided for review.
DESIGN COMPUTATIONS HYDROLOGY & HYDRAULICS	Hydrology and hydraulic calculations were available for this inspection report.
DAM STABILITY SEEPAGE STUDIES	Stability analyses were available for this inspection report and are included in Appendix VI. Because the written text normally accompanying the stability analysis summaries was not provided, this information is incomplete. In addition, Sheet 2 of the stability analysis summary was not available.
MATERIALS INVESTIGATIONS BORING RECORDS LABORATORY FIELD	Test pit and boring records, resistivity data compaction curves and results of laboratory analyses were printed in the as-built drawings and/or in the Detailed Geologic Report.
POST-CONSTRUCTION SURVEYS OF DAM	No known post-construction surveys were found.
BORROW SOURCES	Borrow sources in the reservoir area are shown on the as-built drawings.

Name of Dam: JOHNS CREEK No. 3*

ITEM	REMARKS
MONITORING SYSTEMS	No monitoring systems have been provided.
MODIFICATIONS	Data obtained during the inspection agrees closely with the as-built drawings, indicating that no major modifications were made.
HIGH POOL RECORDS	None available
POST-CONSTRUCTION ENGINEERING STUDIES AND REPORTS	None available
PRIOR ACCIDENTS OR FAILURE OF DAM DESCRIPTION REPORTS	No prior accidents or failure of the dam have been noted.
MAINTENANCE OPERATION RECORDS	Annual inspections are conducted by the Natural Bridge Soil and Water Conservation District. Copies of the reports are included in Appendix V.

Name of Dam: JOHNS CREEK No. 3

ITEM	REMARKS
SPILLWAY PLAN, SECTIONS and DETAILS	Information contained in the as-built drawings.
OPERATING EQUIPMENT PLANS & DETAILS	Information contained in the as-built drawings.

APPENDIX V

OPERATION AND MAINTENANCE INSPECTION REPORTS

COMMONWEALTH OF VIRGINIA

NATURAL BRIDGE SOIL AND WATER CONSERVATION DISTRICT

May 25, 1979

Route 1, Box 274
Daleville, VA 24083

Thomas W. Smith
Michael Baker, Jr. Inc.
Engineers and Surveyors
4301 Dutch Ridge Road
Box 280
Beaver, Pennsylvania 15009

Dear Mr. Smith:

Enclosed are copies of the last five(5) years operation and maintenance inspection reports of the dams on Johns Creek Watershed. These are the reports you requested by letter dated May 17, 1979.

We would like to receive a copy of your inspection report for our information and files.

Sincerely,

Jack W. Bostic (eas)

Jack W. Bostic, Chairman

Enclosures

w/s

P. O. Box 56
Pincastle, Va. 24090

June 9, 1978

David M. Grimsood
State Conservationist
Soil Conservation Service
P. O. Box 10026
Richmond, Va. 23240

Subject: NBSWCD Annual O&M Report (1978) Johns Creek Watershed

Dear Mr. Grimsood,

District Director J. Francis Ross and myself along with D. A. Towler, District Conservationist made the annual operation and maintenance inspection of the Johns Creek Watershed project on June 6, 1978.

All structures (Nos. 1,2,3 and 4) were found to be in a safe and satisfactory operating condition. The water levels were at their normal levels. The concrete risers and principal spillways along with the metal trash racks and ladders were found to be in good condition.

The vegetative cover on all dams was in good condition, Dam No. 3 was being grazed and at present the grazing was at an acceptable level.

Considerable debris has accumulated along the face of Dam #2 and needs to be removed.

The repair work has been completed by the district to the gully in the emcess road leading to the Emergency Spillway on Dam #2 (this item mentioned in the 1977 O&M report).

Conservation plans have been developed during the present calendar year to cover Dams #2 and 3. These conservation plans with the land user will be used as the basis for normal maintenance of these areas.

P. B. Hughston
Chairman, Natural Bridge SWCD

D. A. Towler
District Conservationist

cc: J. M. Betts w/enclosures

UNITED STATES DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

Rt. 1 Box 274
Daleville, Va. 24083

SUBJECT: W/S - Johns Creek Watershed
Annual Operation and Maintenance Inspection

DATE: June 2, 1977

TO: J. M. Betts
Area Conservationist
Harrisonburg, Va.

This is a report of subject inspection of Dams 1, 2, 3 and 4 made jointly by the Natural Bridge SWCD Director Francis Ross and SCS District Conservationist D. A. Towler on May 24, 1977.

In general all four dams were found to be in very good condition. A small amount of debris was found deposited along the high water lines from a heavy rain in early spring. This debris is lightly scattered and no problems are anticipated.

The low stage orifice on Dam #2 has a small amount of debris in the opening. The present lessor of the lake will be contacted by the NBSWCD to remove this obstruction. The access road to the EWS on Dam #2 is eroding beside the stone that the NBSWCD used in 1976 to fill a similar small gully. The NBSWCD will contact a contractor to discuss arrangements on repairing this gully.

Francis Ross
Natural Bridge SWCD Director

D. A. Towler
SCS District Conservationist

Water Resource Committee Mbr.
D. Tuler

COMMONWEALTH OF VIRGINIA

NATURAL BRIDGE SOIL AND WATER CONSERVATION DISTRICT
P. O. BOX 56, FINCASTLE, VIRGINIA 24090

June 23, 1976

David N. Grimwood
State Conservationist
Soil Conservation Service
P. O. Box 10026
Richmond, Virginia 23240

SUBJECT: NBSWCD Annual O & M Inspection Report 1976, Johns Creek *Watershed Project*

Dear Mr. Grimwood:

District Director J. F. Ross and myself, accompanied by Huey Kelly and W. B. Garrett (local SCS technicians) made the NBSWCD annual inspection of the completed portion (floodwater retarding structures Nos. 1, 2, 3, and 4) of the Johns Creek Watershed Project June 11.

All structures appeared to be safe and operating satisfactorily.

Specific Findings:

Dam #1 - Overall appearance - good; vegetative cover - 98% sericea (ungrazed and unmowed); fertilizing needed in part of emergency spillway to rejuvinate thin area; berm and portion of dam adjacent to normal pool level mostly bare, needs to be established in a water tolerant cover such as Reed' Canary grass -; riser openings clear; small amount of debris on face of dam, small trees adjacent to loose rock gutters at end of dam need removing.

Dam #2 - Overall appearance - good. Vegetative cover same as #1, (the Natural Bridge District had repaired the gully mentioned in it's 1975 O & M report); there was some debris around 1st stage riser intake and considerably more on face of dam and south bank of the permanent pool. Bare car tracks evidenced too much travel through the emergency spillway; (the district has initiated steps to control this).

Dam #3 - Overall appearance - good; vegetative cover same as #1.

Dam #4 - Overall appearance - good; vegetative cover same as for #1. Change in 1st stage opening made by SCS last fall appears to have corrected the too slow draw down problem.

No major flooding conditions took place in the watershed during the past year.

The NBSWCD expresses appreciation to the USDA - SCS for work performed as needed to correct the 1st stage opening of riser at the No. 4 dam.

Sincerely,

P. D. Hughston

P. D. Hughston
Chairman, NBSWCD District

December 16, 1975

David N. Grimwood
State Conservationist
Soil Conservation Service
P. O. Box 10026
Richmond, Va. 23240

SUBJECT: NBSWCD Annual O&M Report (1975) Johns Creek Watershed

Dear Mr. Grimwood:

District Director J. F. Ross and myself made the NBSWCD annual inspection of the completed portion (floodwater retarding structures Nos. 1,2,3 and 4) of the John Creek Watershed Project on August 19, 1975.

All structures were found to be in substantially safe and satisfactory operating condition with the following exceptions:

Structure No. 4 - Due to the relatively small size of the first stage opening in the riser, moderately wet periods result in waters standing over much of the "designed" temporary storage area too long and no vegetative cover could be maintained on these lands. This condition also lowered the flash flood storage potential considerably. (District Conservationist Dwight Towler, USDA, SCS informed our directors in November that the SCS had completed work on the riser designed to correct this situation.)

Structure No. 2 - An active gully 1 to 2 feet in depth 200+ feet long was cutting into the steep access area leading from the emergency spillway. While not presently affecting the structures operation, if left unstabilized this gully could develop into a serious source of erosion and sediment.

The District is currently considering alternatives for correcting this problem but no final decision has been made to date.

The protection given by these dams during the past years intensive rains on Johns Creek was appreciatively noted by many people living in that valley.

Yours very truly,

P. D. Hughston

P. D. Hughston
Chairman Board of Directors

UNITED STATES DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE - P. O. Box 47, Fincastle, Va. 24090

SUBJECT WS - Johns Creek Watershed
Annual Maintenance Inspection

DATE Jan. 10, 1975

TO Wm. D. Richardson
Area Conservationist
Soil Conservation Service
Route 1, Box 274
Daleville, Virginia 24083

This is a report of the annual maintenance inspection on Johns Creek Watershed Dams 1, 2, 3, and 4. This inspection was made jointly by Natural Bridge SWCD Director Jack Larkins, SCS District Conservationist D. A. Towler, and SCS Technician W. B. Garrett on January 9, 1975.

In general all four dams were found to be in very good condition. Some erosion is occuring on the area below the EMS on Site #2 which was damaged and subsequently repaired following the May 28, 1973 storm.

No progress has been made in obtaining a contractor to make the planned alterations to the low stage orifice on Dam #4.

Jack Larkins
Natural Bridge SWCD Director

D. A. Towler
SCS District Conservationist

APPENDIX VI

STABILITY ANALYSES

Form SCS-357
12-58

U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SOIL MECHANICS LABORATORY

SUMMARY - SLOPE STABILITY ANALYSIS

State _____ Project _____

Date 11-15-60 Analysis Made By _____ Checked By _____

Method of Analysis Swedish Circle
(Fan Shaped)

Location of Material					Emb Sta 25+00 to 30 M L		Emb Sta 25+00 to 30 M L			
Sample No.					65W746		65W577			
γ_o					94.3		94.4			
γ_m					116.5		119.0			
γ_s					182.0		184.0			
γ_D					59.5		61.5			
Condition	Opt.	Sat.	Opt.	Sat.	Opt.	Sat.	Opt.	Sat.	Opt.	Sat.
ϕ						24.5°		23.0°		
Tan ϕ						.4556		.4245		
K										
C						550		425		

UPSTREAM SLOPE			
Trial	Slope	Conditions	Fs
2	2½:1 3:1	Full draw down - 10 berms el 1455.0 Arc cut from opp shldr thru emb 65W746 (24.5°-550) only - Sat shear values only	1.75
2A	2½:1 3:1	Same as #2 except emb 65W577 (23°-425)	1.66

DOWNSTREAM SLOPE			
Trial	Slope	Conditions	Fs
1	2½:1	No drain - No berm - Arc cut from opp shldr thru emb 65W746 (24.5°-425) only - Sat shear values only	1.43
1A	2½:1	Same as #1 except emb 65W577 (23°-425)	1.77

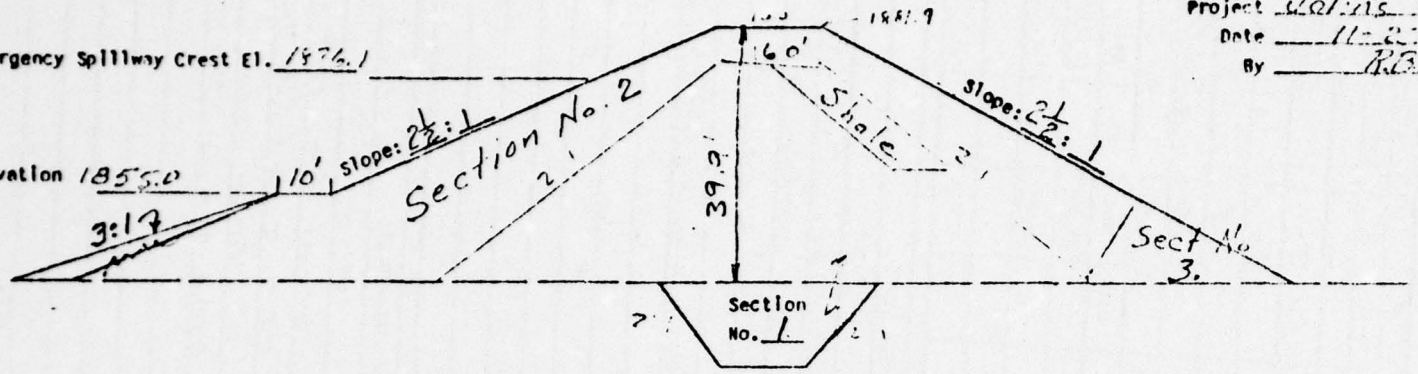
SCS-377
(3/59)

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

RECOMMENDED USE OF EXCAVATED MATERIAL

☐ Formal Zoning Plan ☒ Selective Placement Plan

State Virginia
Project Zolins Creek 3
Date 11-62
By RBP



VI-2

TYPICAL EMBANKMENT SECTION

Embankment Section		Source of Fill Material			Lab. Sample No.	Lab Test		Lab. Curve No.	Compaction Requirements Class of Fill	
Sec. No.	Description	Location	Ave. Depth From	Ave. Depth To		Standard Max. Den.	Standard Optm. Mois%.		Minimum Density lbs. per Cu.Ft.	Moisture Range Percent From / To
1.	Backfill and center section	Borrow 'A' (102.1)	1	8	65W MC 744	101.5	20.4	1	98	2 / 2
		" 'A' (111.1)	2	14	65W MC 746	100.0	23.0	3	96	2 / 2
2.	Outside section	Borrow 'A' (110.1)	1	3	65W MC 745	107.0	15.5	2	101.5	0 / 2
		Borrow 'E' (142.1)	1	13	65W MC 748	107.0	15.5	2	101.5	0 / 2
3.	Downstream toe	Borrow 'C' (121.1)	1	5	65W 747	115.5	14.5	4	* 103.5	1 / 2

* Correction needed for gravel.

APPENDIX VII

GEOLOGIC REPORT

Form SCS-376
Sheet 4 of 5
For In-Service Use Only

USDA SCS

10-58

DETAILED GEOLOGIC INVESTIGATION OF DAM SITES

State Virginia County Grain Watershed Johns Creek Subwatershed Muddy Branch

Site number 3 Site group I Structure class b Investigated by [illegible] Date 8/61
(signature and title)

INTERPRETATIONS AND CONCLUSIONS

1. The shale rock present under the foundation of the dam has little, if any, water present in it below a depth of 8 feet. The shale that occurs between backhoe refusal and the bottom of the vadose zone as recorded by the resistivitor is considered to be impermeable to the passage of water. The water present in this vadose region of the shale is small. It is assumed that ionization of the water present causes the effect recorded on the conductance in this zone. This should be considered in the depth to which the cut-off trench should be excavated.

2. The residual and colluvial soils present in the foundation appear firm. This conclusion can be justified by the high penetration resistance recorded with the pocket penetrometer and the moderately high densities taken with equipment described above. The alluvial soil present under the foundation is shallow.

3. The residual and colluvial soils present are very slowly permeable as shown by permeability tests conducted. The k value ranges from .161 to .402 cubic feet/square foot/day.

4. Shale underlies the proposed pipe location at depths that range from 3.0 to 5.5 below the ground surface. The relief of the shale here is small. It is approximately two feet.

5. Shale will have to be excavated from the emergency spillway. Indications of the possibility of ripping this shale can be obtained from the seismic velocities taken and the included Caterpiller Rippability Chart.

6. Consideration should be given to the necessity of the installation of a seepage drain.

7. Suggested placement of borrow material and material from the emergency spillway has been tentatively outlined in the soils correlation table. Sufficient material for construction of the dam is available.

8. Topsoil is suggested to be stockpiled and used for top-dressing the dam and areas in the emergency spillway.

(To Accompany Soil [illegible] Report on Soils [illegible] Dam)

Johns Creek Site No. 3 Va. [illegible] Mack, T. 8/64

Representative Sample for Lab.			Representative Area				Purpose of Test Suggested Use	Test Result (Quality Co. Ver.)	Remarks
Hole No.	Depth From - To	Unif. Class.	Hole No.	Depth From - To	Unif. Class.	Location			
208-1	1.9-3.7	Shale	208	1.9-3.7*	Shale	Spillway	downstream slopes	5,000	Shale
			201	3.9-4.0*					
			202	4.7-5.7*					
			203	4.6-5.9*					
			204	4.5-6.1*					
			205	0.4-7.4*					
			206	1.2-3.2*					
			207	5.3-6.1*					
			209	11.4-11.6*					
			210	12.9-13.0*					
			211	3.1-3.2*					
			212	1.1-2.2*					
			213	1.2-2.1*					

SCS ENF Unit
Upper Darby, Pa.
[illegible]

APPENDIX VIII

GENERAL REFERENCES

GENERAL REFERENCES

1. Bureau of Reclamation, U.S. Department of the Interior, Design of Small Dams, A Water Resources Technical Publication, Revised Reprint, 1977.

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4. Commonwealth of Virginia, "Geologic Map of Virginia," Department of Construction and Economic Development, and Division of Mineral Resources, 1963.

5. HR 33, "Seasonal Variations of Probable Maximum Precipitation, East of the 105th Meridian for Areas 10 to 1000 Square Miles and Durations of 6 to 48 Hours," (1956).

6. King, Horace Williams and Brater, Ernest F., Handbook of Hydraulics, Fifth Edition, McGraw - Hill Book Company, New York, 1963.

7. Soil Conservation Service, "National Engineering Handbook - Section 4, Hydrology," U.S. Department of Agriculture, 1964.

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9. U.S. Army, Hydrologic Engineering Center, "Flood Hydrograph Package (HEC-1), Dam Safety Investigations, Users Manual," Corps of Engineers, Davis, California, September 1978.

10. U.S. Army, Hydrologic Engineering Center, "HEC-2 Water Surface Profiles, Users Manual," Corps of Engineers, Davis, California, October 1973.

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16. U.S. Department of Commerce, "Technical Paper No. 40, Rainfall Frequency Atlas of the United States for Durations from 30 Minutes to 24 Hours and Return Periods from 1 to 100 Years," Weather Bureau, Washington, D.C., May 1961.