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NATIONAL DAM INSPECTION PROGRAM. LITTLE YOUGHIOGHENY RIVER SITE--ETC(U)

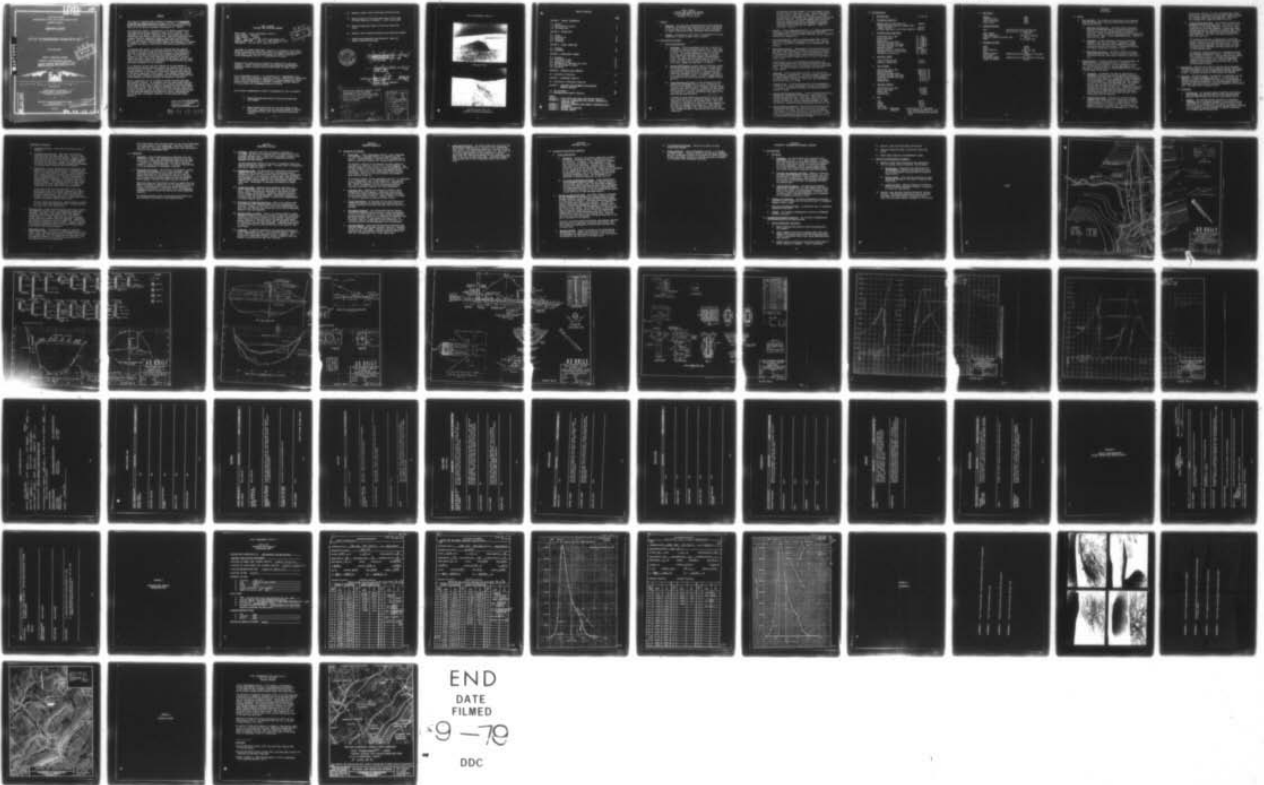
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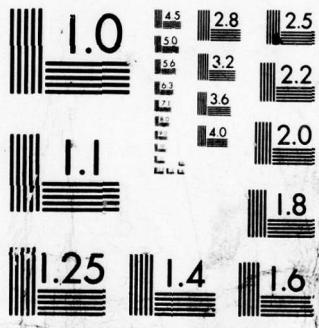
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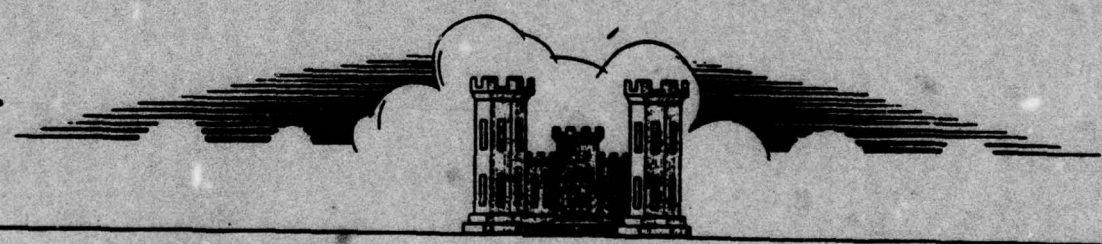
LITTLE YOUGHIOGHENY RIVER SITE NO. 7

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PHASE I INSPECTION REPORT

NATIONAL DAM INSPECTION PROGRAM
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Contract # *DAW31-79-C-0038*
PREPARED FOR

DEPARTMENT OF THE ARMY
BALTIMORE DISTRICT, CORPS OF ENGINEERS
BALTIMORE, MARYLAND 21203

BY

ACKENHEIL & ASSOCIATES, BALTIMORE, MD, INC.
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PREFACE

This report is prepared under guidance contained in the Recommended Guidelines for Safety Inspection of Dams, for Phase 1 investigations. Copies of these guidelines may be obtained from the Department of the Army, Office of Chief of Engineers, Washington, D.C. 20314.

The purpose of a Phase 1 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 visual observations and review of available data. Detailed investigation and analyses involving topographic mapping, subsurface investigations, material testing, and detailed computational evaluations are beyond the scope of a Phase 1 investigation; however, the inspection is intended to identify any need for such studies which should be performed by the owner.

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

Phase 1 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" (PMF) for the region (greatest reasonably possible storm runoff), or fractions thereof. The spillway design flood provides a measure of relative spillway capacity and serves as an aid in determining the need for more detailed hydrologic and hydraulic studies, considering the size of the dam, its general condition, and the downstream damage potential.

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PHASE 1 REPORT
NATIONAL DAM INSPECTION PROGRAM

NAME OF DAM: Little Youghiogheny Site No. 7
STATE LOCATED: Maryland
COUNTY LOCATED: Garrett
STREAM: Main branch of the Little Youghiogheny River
DATES OF INSPECTION: April 11, 1979, and May 24, 1979
COORDINATES: Lat. 39° 25.4', Long. 79° 18.3'



ASSESSMENT OF GENERAL CONDITIONS: Based on the evaluation of available design information and visual observations of conditions as they existed on the dates of the field reconnaissances, the general condition of Little Youghiogheny Site No. 7 is considered to be good.

Seepage outlet drain pipes are subject to inundation by plunge pool tailwater. Should the outlet drains become submerged, the downstream embankment phreatic surface could rise and result in reduced slope stability.

Little Youghiogheny Site No. 7 is classified as an "intermediate" size, "high" hazard dam according to guideline criteria. Based on Soil Conservation Service hydrological/hydraulic computations, spillway capacity was found adequate to pass 100 percent of the PMF. Therefore, spillway capacity is in accordance with recommended guideline criteria.

The following recommendations should be implemented as soon as possible:

- 1) Remove deposited bank material obstructing downstream exit channel.
- 2) Remove damaged end section of the south seepage outlet drain pipe. Replace with new pipe end section, or install a perforated plastic pipe inside remaining outlet pipe sections.

- 3) Develop a formal flood surveillance and warning plan.
- 4) Remove rusted nut from end of gate valve control stem to permit engaging of handwheel. Install stem guides.
- 5) Excavate plunge pool banks to 2H:1V and riprap with stone.
- 6) Develop a more thorough maintenance and inspection program.
- 7) Remove woody vegetation from embankment slopes and backfill animal burrow holes.



10 James D. Hainley 15 June '79
 James D. Hainley, P.E. Date
 Maryland Registration No. 5284
 Vice President

Timothy E. Debes 15 June '79
 Timothy E. Debes Date
 Project Engineer

APPROVED BY: James W. Peck 16 July '79
 JAMES W. PECK Date
 Colonel, Corps of Engineers
 District Engineer

6 National Dam Inspection Program. Little
 Youghiogheny River Site Number 7
 (NDI-ID-MD-32), Ohio River Basin, Main
 Branch of the Little Youghiogheny River,
 Garrett County, Maryland. Phase I
 Inspection Report,

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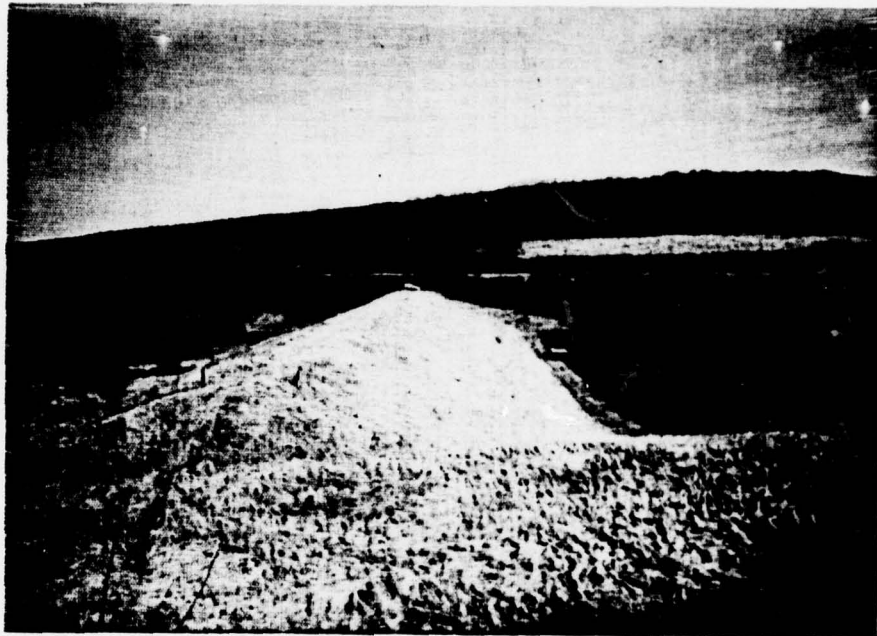
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LITTLE YOUGHIOGHENY SITE NO. 7



Overview of Dam



Overview of Dam Crest and
Emergency Spillway in Background

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PHASE 1 REPORT
NATIONAL DAM INSPECTION PROGRAM
LITTLE YOUGHIOGHENY SITE NO. 7
NATIONAL I.D. NO. MD 32

1.1 General

- a. Authority. The study was performed pursuant to the authority granted by The National Dam Inspection Act, Public Law 92-367, to the Secretary of the Army, through the Corps of Engineers, to conduct inspections of dams throughout the United States.
- b. Purpose. The purpose of this study is to determine if the dam constitutes a hazard to human life or property.

1.2 Description of Project

a. Dam and Appurtenances

- 1) Embankment. Little Youghiogheny Site No. 7 consists of an earthfill embankment approximately 700 ft. long, with a maximum toe to crest height of 45 ft. and a crest width of 16 ft. The upstream embankment slope is inclined 4H:1V between the embankment toe and berm located at normal pool level, and 3H:1V between the berm and dam crest. The downstream embankment slope is inclined 2.5H:1V, and has a 10 ft. wide berm located 25 ft. below top of dam. (Refer to Plate Nos. 1, 4, and 5.)
- 2) Seepage Drain System. Seepage control provisions consist of a filter trench collector system and a blanket drain and corrugated metal pipe outlet system. Filter trench extensions are located about 90 ft. upstream from the downstream embankment toe and are extended a maximum of 14 ft. below original ground. Collected seepage water is discharged into the outlet plunge pool. (Refer to Plate No. 4.)
- 3) Flood Discharge Facilities. Flood discharge facilities consist of a principal spillway riser, located 325 ft. from the north abutment, and an emergency spillway channel located on the south abutment. Principal spillway intake works include a 14 in. dia. reservoir drain inlet pipe, a low stage 1x2 ft. orifice, and two (2) high stage 7.5 ft. wide concrete overflow weirs.

Principal spillway outlet works consist of a 14 in. gate valve, and a 30 in. dia. reinforced concrete outlet pipe connected to the base of the spillway riser. The 14 in. gate valve is operated by a control stem and handwheel and provides for drawdown of the reservoir. Water entering the principal spillway riser flows vertically down the riser through the 240 ft. long outlet pipe into an unlined plunge pool.

The emergency spillway channel is cut into natural earth and has a 20 ft. wide control crest. The spillway channel is curved, 90 ft. wide, and is about 325 ft. in length. Spillway flow is discharged into a stream channel paralleling the dam centerline. This stream channel joins the plunge pool exit channel about 100 ft. downstream of the dam. Upstream and downstream spillway channels are vegetated with grass and are underlain by sandstone. (Refer to Plate Nos. 1 and 3.)

- b. Location. Little Youghiogheny Site No. 7 is located approximately 1 mile east of Deer Park on the main branch of the Little Youghiogheny River in Garrett County, Maryland. (Refer to Regional Location Plan, Appendix E.)
- c. Size Classification. Based on a maximum dam height of 45 ft. and a top of dam reservoir storage of 1,155 ac. ft., the dam facility is accordingly classified in the "intermediate" size category.
- d. Hazard Classification. Approximately 1 mile downstream of the dam, about eight (8) homes located in Deer Park are situated adjacent to the stream channel. These residences will likely be inundated by large spillway flows and are expected to be subject to substantial damage and loss of life in the event of a dam failure.

Approximately 5 and 8 miles downstream respectively, the Little Youghiogheny River flows through the towns of Loch Lynn Heights and Oakland, prior to discharging into the Youghiogheny River. The dam is therefore accordingly classified as a "high" hazard.

- e. Ownership. Little Youghiogheny Site No. 7 is owned by the Nestlé Company, Incorporated. The Nestlé Company, Incorporated is legally responsible for the operation and maintenance of the dam facility. Contact Dr. John Lyons, 100 Bloomingdale Road, White Plains, NY 10605.
- f. Purpose of Dam. The primary purpose of Little Youghiogheny Site No. 7 is to reduce downstream flooding of Deer Park, Loch Lynn Heights, and Oakland, Maryland, by providing temporary storage of runoff.
- g. Design and Construction History. The Soil Conservation Service, Engineering and Watershed Planning Unit, Upper Darby, PA, designed the dam facility in June 1959. Construction was started September 28, 1959, under the direction of the Soil Conservation Service, and was completed September 16, 1960. The George F. Hazelwood Company constructed the dam facility.
- h. Normal Operating Procedure. The dam facility operates as an uncontrolled structure. Reservoir pool level is normally maintained at El. 2,485, the level of the uncontrolled low stage intake orifice of the principal spillway riser. Flood flows are discharged through the principal spillway riser or in combination with the emergency spillway.

1.3 Pertinent Data

a.	<u>Drainage Area</u>	2.3 sq. mi.
b.	<u>Discharge at Dam Site</u>	
	Maximum known flood at dam site	Unknown
	Ungated spillway capacity at design high water elevation	630 cfs
	Spillway capacity at top of dam elevation	7,560 cfs
c.	<u>Elevation (feet above MSL)</u>	
	Constructed top of dam	E1. 2,516
	Design high water	E1. 2,509.5
	Normal pool	E1. 2,485.0
	Emergency spillway crest	E1. 2,507.5
	Principal spillway high stage	E1. 2,489.0
	Principal spillway low stage	E1. 2,485.0
	Maximum tailwater	Unknown
	Upstream invert of outlet pipe	E1. 2,474.5
	Downstream invert of outlet pipe	E1. 2,471.0
	Streambed at centerline	E1. 2,473.0
d.	<u>Reservoir Length</u>	
	Length of maximum pool	0.9 mi.
	Length of normal pool	0.35 mi.
e.	<u>Total Storage</u>	
	Constructed top of dam	1,155.0 ac. ft.
	Design high water	690.0 ac. ft.
	Emergency spillway crest	565.0 ac. ft.
	Principal spillway high stage	90.0 ac. ft.
	Principal spillway low stage	31.0 ac. ft.
	Normal pool	31.0 ac. ft.
	Sediment pool	31 ac. ft.
f.	<u>Reservoir Surface</u>	
	Constructed top of dam	85 acres
	Design high water	62 acres
	Normal pool	6 acres
	Sediment pool	6 acres
g.	<u>Dam</u>	
	Type	Earth
	Length	700 ft.
	Height	45 ft.
	Top width	16 ft.
	Side slopes - Downstream	2.5H:1V with 10 ft. wide berm
	Upstream	4H:1V between toe and 10 ft. wide berm, 3H:1V between berm and dam crest

g. Dam (cont.)

Zoning	None
Impervious core	None
Cutoff provisions	None
Grout curtain	None

h. Regulating Outlet

Type	Concrete drop inlet structure and 30 in. dia. R. C. outlet pipe
Riser height	18.5 ft.
Riser dimensions	2.5x7.5 ft. (inside)
Length of connecting outlet pipe	240 ft.
Gates	14 in. gate valve

i. Emergency Spillway

Type	Earth
Width	90 ft.
Crest elevation	2,507.5 ft. MSL
Gate	None
Upstream channel	Vegetated earth with negative 1.5% slope
Crest width	20 ft.
Downstream channel	Vegetated earth with a positive 2.5% slope
Length of channel	325 ft.

SECTION 2
DESIGN DATA

2.1 Design

- a. Data Available: The following available data can be obtained from the Maryland Water Resources Administration and the Soil Conservation Service.
- 1) Hydrology and Hydraulics. Available design information consists of inflow hydrographs, discharge rating curves, flood routing results, and hydrological calculation summaries. Design information obtained from Soil Conservation Service design report, Little Youghiogheny River, Site No. 7, dated June 16, 1959.
 - 2) Embankment. Design information includes construction drawings, slope stability summary, geologist's report, laboratory soil test data, and a summary of estimated construction quantities and costs. Information obtained from report identified in Section 2.1-a(1).
 - 3) Appurtenant Structures. Available information includes design drawings and some structural design calculations. Information obtained from report identified in Section 2.1-a(1).
- b. Design Features. Principal features of the dam embankment and appurtenances are illustrated on Plates 1 through 6. A description of project features is also discussed in Section 1.2, "Description of Project". Dam and appurtenances are designed in accordance with Soil Conservation Service, structure classification "C" criteria.
- 1) Embankment. As designed, the dam was constructed as a homogeneous earthfill structure by selective placement of available borrow materials. According to design documents, silty and clayey sands were predominately used to construct the dam embankments. Sandstone gravel was used, however, to construct the downstream embankment toe. All earthfill material was reportedly obtained from borrow sources located within or near the dam site. Foundation preparation consisted of stripping original ground cover until contact was made with an underlying stiff gravelly clay layer. Cutoff provisions were not considered necessary by Soil Conservation Service designers.
 - 2) Seepage Drain System. According to as-built drawings, seepage filter trench drains are constructed of graded sand and gravel soil materials. Trench drain width and height dimensions vary from a minimum of 3x3 ft. to a maximum of 3x14 ft., respectively. Collected seepage water is diverted through the embankment by a 9 ft. wide

blanket drain and two 6 in. dia. corrugated metal outlet drain pipes. The blanket drain and outlet pipes discharge the collected water into the plunge pool. Details of this seepage drain system are shown on Plate 4.

- 3) Flood Discharge Facilities. The principal spillway riser operates as a drop inlet structure. The riser is 18 ft. in height, has an inside dimension of 2.5x7.5 ft. and is constructed of reinforced concrete. Low and high stage spillway openings are respectively protected with a steel reinforcement bar and angle iron cage, and galvanized pipe crosspieces. The anti-vortex device consists of a cantilever roof slab.

The concrete outlet pipe is supported by a continuous concrete cradle, and is constructed with five (5) equally spaced, reinforced concrete anti-seep collars. At the location of the plunge pool, the outlet pipe and cradle are supported by a concrete pile bent and two (2) cast in-place concrete piles.

The emergency spillway consists of a trapezoidal natural earth channel excavated to bedrock. Spillway side slopes have inclinations of 2H:1V. The upstream spillway channel is inclined on a negative 1.5% slope, the downstream channel a positive 2.5% slope. Maximum channel flow velocities are estimated to reach 5.4 ft./sec. at the spillway control section.

2.2 Construction. Based on the review of available design documents and field observations, it may be concluded the dam was constructed in general accordance with the intended design drawings and specifications. No unusual construction difficulties were reported.

2.3 Operation. The Nestlé Company, Incorporated is responsible for the operation of Little Youghiogheny Site No. 7. The principal and emergency spillways are uncontrolled structures. No performance or operation records are maintained. The only operational feature is a mechanical gate valve used to regulate the drawdown of the reservoir pool. This gate valve is normally closed.

2.4 Evaluation

- a. Availability. All available design information and drawings were obtained from the Dam Safety Division, Maryland Water Resources Administration and the Soil Conservation Service.
- b. Adequacy. The available design information is reasonably documented and is considered adequate to evaluate the dam and appurtenances in accordance with the scope of a Phase 1 study. Based on a review of this data, the dam and appurtenant structures are considered to have been designed in general conformance with accepted engineering practice.

- c. Validity. Based on the available data, there is no observable evidence or reason to question the validity of the design information and drawings.

SECTION 3
VISUAL OBSERVATIONS

3.1 Findings

a. General. The on-site reconnaissance of Little Youghiogheny Site No. 7 consisted of:

- 1) Visual observations of the earth embankment, abutment, and spillway structures.
- 2) Visual observation of exposed sections of the concrete principal spillway riser, slide gate mechanisms, outlet pipe, reservoir, and plunge pool.
- 3) Visual observations of discernible hazardous conditions or safety deficiencies.
- 4) Evaluation of the downstream hazard potential.

Visual surveys were performed during periods when reservoir and tailwater were at normal pool levels.

A visual observation check list and field sketch are given in Appendix A. Specific observations are illustrated in photographs of Appendix D.

In general, visual observations indicated the dam was reasonably maintained and in good condition at the present time.

The following conditions were observed on the dates of the field reconnaissances.

b. Embankment

- 1) Embankment Surface. Embankment slopes are vegetated with a dense grass cover. A few animal burrow holes were observed about mid-slope on the downstream embankment, and near the south abutment junction. Telephone poles are located on the downstream berm about mid-dam length, and on the south spillway channel side slope. Motorbike and foot traffic has worn a narrow path across the full length of the dam crest and downstream spillway channel. Some woody vegetation was observed near the principal spillway riser at the upstream embankment shoreline.
- 2) Wet Zone. Standing water was observed on the downstream berm about mid-dam length. This berm is located 7.0 ft. above normal pool level and is graded to collect surface drainage. No seepage condition is associated with this wet zone.

c. Appurtenant Structures

- 1) Emergency Spillway. Significant deficiencies were not observed.
- 2) Principal Spillway Riser. Wood debris was partially obstructing the low stage trash rack. The 14 in. gate valve was exercised and found operable. However, a pipe wrench had to be used in place of the intended handwheel to rotate the stem shaft. A steel nut rusted tight to the end of the stem shaft prohibits engaging the handwheel. Stem guides were missing and should be replaced.
- 3) Outlet Works. Erosion and deposition of plunge pool bank material is occurring and has formed a vegetated earth mound in the downstream exit channel. Visual observations and a review of as-built drawings indicate the erosion has cut approximately 6 ft. of natural bank material on each side of the plunge pool. The deposition of this eroded material is estimated to be blocking about 75% of the exit channel. This blockage appears to have raised plunge pool tailwater approximately 0.5 ft. above the intended design level under normal pool conditions.

On the date of the field reconnaissance review, the outlet drain pipes were observed inundated by tailwater. The exposed bottom of the south outlet toe drain was observed rusted through. This outlet toe drain was reportedly accidentally damaged by Soil Conservation Service inspection personnel about two weeks later.

Hairline cracks were observed on exposed concrete surfaces of the principal spillway outlet pipe. A black cold tar has been used to seal these cracks.

- d. Reservoir Area. Visual observations and a map review indicate the immediate reservoir area is predominately covered with woodlands. Reservoir slopes appear stable, but reservoir shorelines show evidence of bank erosion. This erosion extends about 5 ft.± above normal pool level and is evident around the entire reservoir shoreline perimeter. Reportedly, the reservoir frequently rises up to about 5 ft. above normal pool level during seasonal heavy rainfall. However, there was no discernible evidence found of significant siltation which might affect flood storage capacity.
- e. Downstream Channel. The downstream channel is typically cobble lined, stable, and narrow in width (approximately 4 ft.). Channel banks show some erosion and are partially covered with grass, woody shrub, and tree vegetation. As previously noted, the downstream channel is partially blocked (about 75%) at the downstream lip of the plunge pool.

The stream channel joins the west branch of the Little Youghiogheny River approximately 1 mile downstream. From this confluence near Deer Park, the Little Youghiogheny River flows approximately 8 miles to the Youghiogheny River.

3.2 Evaluation

- a. Embankment. Observed deficiencies are generally minor and superficial in scope. The standing water observed on the downstream berm is attributed to surface drainage since the berm is located 7 ft. above normal pool level and is purposely graded to collect surface drainage. In general, the condition of the dam embankment is considered to be good.
- b. Appurtenant Structures. The principal and emergency spillway structures are considered to be in good condition. Wood debris obstructing the low stage trash rack will require removal. The steel nut, rusted tight to the end of the gate valve control stem, should be removed so that the handwheel may be engaged. Missing stem guides should be replaced.

Deposited plunge pool bank material should be removed from the downstream channel to reduce the risk of inundating outlet toe drains. Should the outlet toe drains become obstructed or inundated by tailwater, a significant rise in the downstream embankment phreatic surface may develop and reduce embankment stability.

The observed hairline cracks on the outlet pipe surfaces are not considered significant as they presently exist.

SECTION 4
OPERATIONAL FEATURES

- 4.1 Procedure. Reservoir pool level is normally maintained at El. 2,485, the level of the uncontrolled low stage orifice of the principal spillway riser. Flood flows are primarily passed by the principal spillway overflow weirs or in combination with the emergency spillway channel.

The only operational feature of the dam is a mechanical gate valve used to draw down the reservoir pool. The gate valve is infrequently used and is normally closed.

- 4.2 Maintenance of Dam. The dam facility is maintained by the Nestlé Company with the assistance of the Soil Conservation Service. According to local Soil Conservation Service officials, maintenance usually consists of cutting grass, removing small trees and brush from embankment slopes, repairing worn foot paths and eroded gullies, removing trash from dam premises, and clearing debris from the trash racks. Maintenance is reportedly performed on an annual basis.

- 4.3 Inspection of Dam. Operation and maintenance inspections are usually performed by the Soil Conservation Service, on an annual basis. These inspections are performed at the request of the Nestlé Company, Incorporated. Inspections generally consist of visually examining the dam embankment, appurtenant structures, reservoir area, and outlet channel, and providing recommendations for needed remedial repairs.

- 4.4 Maintenance of Operating Facilities. There is no record of how often the gate valve operating mechanisms are maintained and exercised. However, at the time of the field reconnaissance, the gate valve was operable, but exposed gate valve control mechanisms appeared rusted and ungreased.

- 4.5 Warning Systems in Effect. There is no warning system or formal emergency procedure to alert or evacuate, as necessary, downstream residents in the event or threat of a dam failure. Gravel access roads leading to the dam site may not be passable under severe weather conditions. The main access road is considered likely to be inundated by spillway flood discharge. Alternate routes should be used to gain access to the dam facility in the event of high flood flows.

- 4.6 Evaluation. In general, maintenance and inspection procedures at Little Youghiogeny Site No. 7 are considered adequate. However, a formal flood surveillance and warning plan is needed for the protection of downstream residents located in Oakland, Loch Lynn Heights, and particularly, Deer Park, Maryland.

SECTION 5
HYDROLOGY/HYDRAULICS

5.1 Evaluation of Features

- a. Design Data. Little Youghiogheny Site No. 7 has a watershed of 1,472 acres, vegetated primarily by woodland and open pasture. The dam impounds a reservoir with a surface area of about 6.3 acres and a normal pool storage volume of 31 ac. ft.

The hydraulic capacity of the emergency spillway channel is reported to be 7,560 cfs, with 6.5 ft. of wave freeboard. The spillway channel is sized to pass a flood corresponding to 27 in. of direct rainfall in 6 hours without overtopping the dam embankment. According to Soil Conservation Service routing calculations, the 27 in. of direct rainfall will produce a peak inflow of 12,520 cfs.

As previously stated, Little Youghiogheny Site No. 7 is classified as an "intermediate" size, "high" hazard dam. The required spillway design flood for the dam facility is therefore the PMF. (Refer to Appendix C for Soil Conservation Service hydrology calculation summaries and flood hydrographs.)

- b. Experience Data. Records are not kept of reservoir level elevations or rainfall amounts. Reportedly, the principal spillway high stage overflow weirs are frequently activated during seasonal heavy rainfalls. However, there is no report or record of emergency spillway activation to date.
- c. Visual Observations. On the dates of the visual surveys, no evidence was observed of conditions that would prevent the emergency spillway or principal spillway riser to function as designed.
- d. Overtopping Potential. Soil Conservation Service routing calculations indicate the dam can pass a flood corresponding to 27 in. of direct rainfall in 6 hours without overtopping. Hydrometeorological Report No. 33 indicates the adjusted 6 hour PMF direct rainfall for the subject site area is 21.5 in. Therefore, based on a comparison of this information, it is considered unlikely the dam embankment will be overtopped.
- e. Spillway Adequacy. Based upon the previously developed data, reservoir storage and spillway hydraulic capacity is adequate to pass the full PMF (100%). Therefore, the dam and spillway facilities are in accordance with the required criteria set forth for "intermediate" size, "high" hazard dams.

- f. Downstream Conditions. The outlet plunge pool discharges into the original stream channel of the main Little Youghiogeny River branch. The downstream channel has a gradient of about 0.8% and a natural channel width of about 4 ft. Deer Park, MD is located approximately one mile downstream of the dam. About eight (8) inhabited residences will be inundated in Deer Park in the event of high flood flows. Substantial damage to property and loss of life is expected should a dam failure occur.

SECTION 6
STRUCTURAL STABILITY

6.1 Evaluation of Structural Stability

a. Visual Observations

- 1) Embankment. Surficial deficiencies identified in Section 3.1 are not considered to have a significant effect on dam stability. In general, visual observations indicate the structural performance of the embankment is good under normal pool conditions. However, there is concern the outlet toe drains may become obstructed or inundated by full discharge of the outlet pipe. Obstruction or inundation of the seepage outlet pipes will reduce their efficiency and possibly cause a rise in the phreatic surface of the downstream embankment slope. The development of this condition is considered hazardous to dam stability.
- 2) Principal and Emergency Spillways. Visual observations of the emergency spillway channel and exposed sections of the principal spillway riser, did not reveal evidence of distress that would significantly affect their performance. The eroded motorbike path and partially obstructed trash rack described in Section 3, are not considered detrimental to the stability of these dam appurtenances.

- b. Design and Construction Data. Available information indicates the dam embankment was analyzed for steady seepage and rapid drawdown conditions using the modified Swedish Circle Method of slope stability analysis. Saturated consolidated undrained shear strengths were used in this analysis. The stability analysis considered a homogeneous earthfill structure with a phreatic surface sloping from the emergency spillway crest to the filter trench drains. The minimum factor of safety against shear failure was reported to be 1.77 for the steady-state seepage stability of the downstream slope and 1.26 for the rapid draw down condition of the upstream slope. Based on this data and visual observations, the static stability of the dam is considered to be adequate.

Review of structural design calculations and drawings indicates that there are no significant structural deficiencies that would affect the performance of the principal spillway riser or outlet pipe.

- c. Operating Records. Operating records are not maintained at the dam facility. However, the structural stability of the dam embankment and appurtenant structures is not considered to be affected by the operation of the gate valve.

- d. Post-Construction Changes. There are no reports of post-construction changes.
- e. Seismic Stability. Little Youghiogheny Site No. 7 is located in Seismic Zone 1. Therefore, based on the previously developed data and recommended criteria for evaluation of seismic stability of dams, the seismic stability of the dam structure is presumed to be adequate under earthquake conditions.

SECTION 7
ASSESSMENT, RECOMMENDATIONS/REMEDIAL MEASURES

7.1 Dam Assessment

a. Evaluation

1) Embankment. The visual observations indicate Little Youghiogheny Site No. 7 is in good condition. At normal pool level there was no discernible evidence of conditions that would significantly affect the overall performance of the dam embankment. However, as previously noted, full outlet pipe discharge may inundate seepage outlet drain pipes, and create a hazardous stability condition.

2) Principal and Emergency Spillways. Based on a review of available design documents, as-built drawings, and visual observations of conditions as they existed on the dates of the field reconnaissances, the structural performance and condition of the principal and emergency spillways are assessed good.

3) Flood Discharge Capacity. The hydrological/hydraulic computations reviewed in this study indicate the dam can pass the PMF (100%), the required spillway design flood, without overtopping the dam embankment. Therefore, the spillway system is considered adequate and in accordance with recommended guideline criteria.

b. Adequacy of Information. The design information and drawings available for this review were of sufficient detail to adequately conduct a Phase 1 study.

c. Necessity for Additional Data. No additional data is considered required at this time.

d. Urgency. The following recommendations should be implemented as soon as possible.

7.2 Recommendations/Remedial Measures. The following recommendations are presented based on the data obtained.

a. Dam and Appurtenant Structures

1) Remove deposited bank material obstructing downstream exit channel.

2) Remove damaged end section of seepage outlet drain pipe. Replace with new pipe end section and connecting band or install a perforated plastic pipe inside remaining outlet pipe sections.

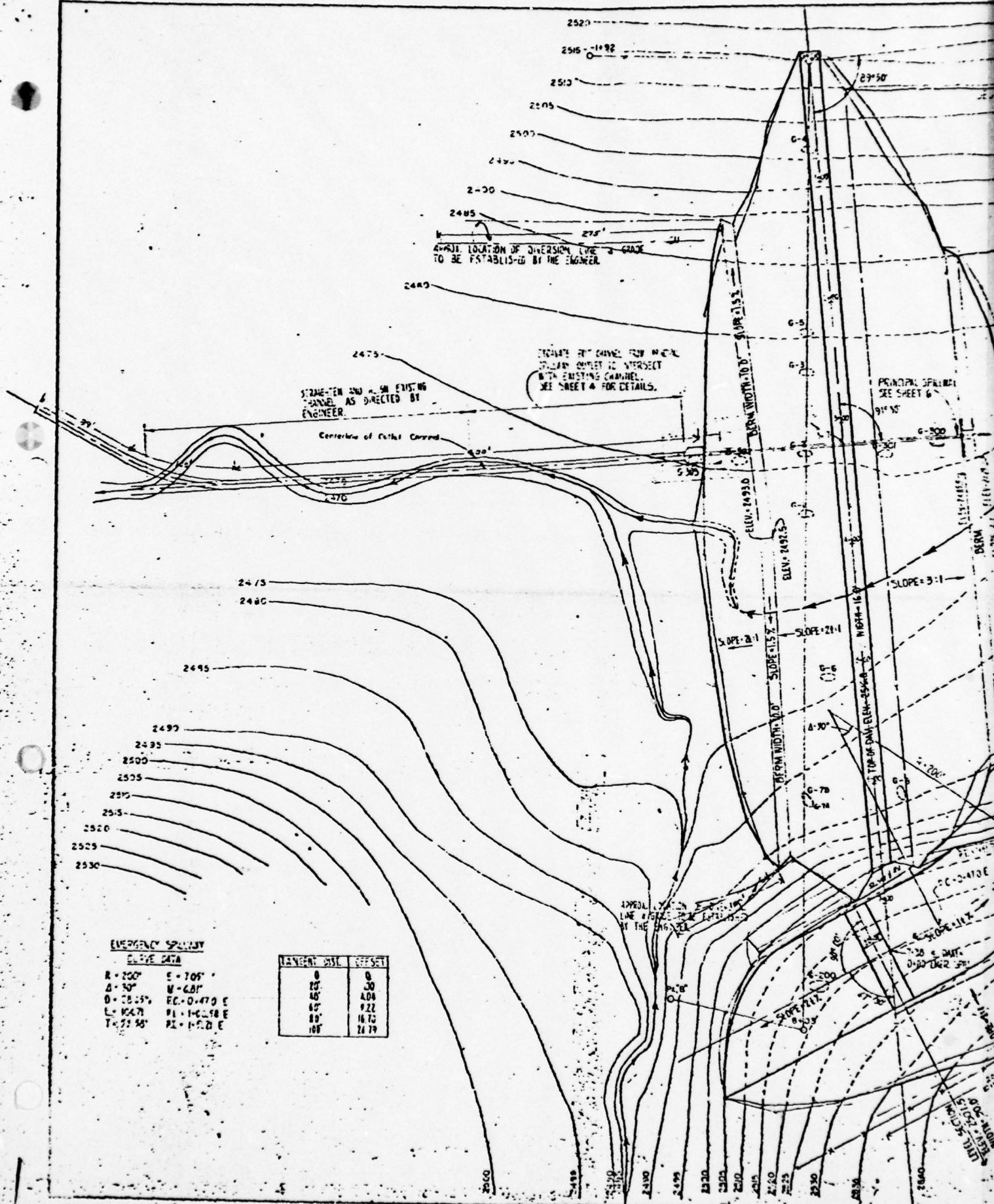
3) Remove rusted nut from end of gate valve control stem to permit engaging of handwheel. Install stem guides.

- 4) Backfill, tamp, and resod animal burrow holes.
- 5) Excavate plunge pool banks to 2H:1V and riprap with stone.
- 6) Remove woody vegetation from embankment slopes.

b. Operation and Maintenance Procedures

- 1) Develop a formal flood surveillance and warning plan. Plan to include, but not limited to, the following:
 - a) Surveillance. Around-the-clock surveillance of dam embankments, reservoir and plunge pool levels, and spillway channels during periods of unusually heavy rainfall.
 - b) Warning System. Formal warning procedures to alert downstream residents in the event of expected high flood flows.
 - c) Evacuation Plans. Adequate emergency contingency plans to evacuate downstream residents in the event or threat of a dam failure.
- 2) Develop a more thorough inspection program at the dam facility. Maintenance program should include frequent maintenance and exercising of the reservoir drain gate valve and prompt remedial treatment of deficiencies.

PLATES



APPROXIMATE LOCATION OF DIVERSION LINE & GRADE TO BE ESTABLISHED BY THE ENGINEER.

LOCATE THE CHANNEL FOR NEW DRAINAGE DITCH TO INTERSECT WITH EXISTING CHANNEL. SEE SHEET 4 FOR DETAILS.

STRENGTHEN AND WIDEN EXISTING CHANNEL AS DIRECTED BY ENGINEER.

PRINCIPAL SPRING SEE SHEET 6

EMERGENCY SPILLWAY
SLOPE DATA

R = 200' E = 705'
 Δ = 50' M = 6.81'
 O = 38.5% FC = 0.470 E
 L = 104.7' PI = 146.18 E
 T = 22.50' PS = 14.21 E

CHANNEL WIDENING	DISCHARGE	OFFSET
0'	0	0
20'	30	0.30
40'	100	1.00
60'	225	3.00
80'	400	6.00
100'	600	9.00

LEVEL SECTION
 ELEV. 2500
 WIDTH 100'-00"

239

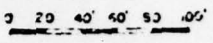
WATER ELEV. 2509.5

SEDIMENT POOL ELEV. 2485.0

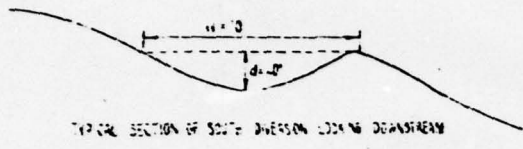
LEGEND

Traverse	.....	0210
Control	.....	2510
Stream
High Water Elev.
Sediment Pool Elev.
Prop. Line	6-575
Prop. Bar

SCALE



NORTH



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FROM COPY FURNISHED TO DDC**

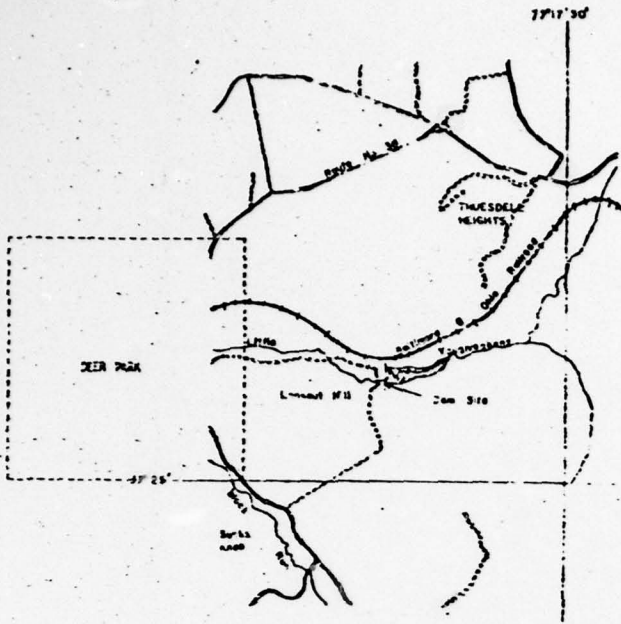
AS BUILT

LITTLE YOUGHIOGHENY WATERSHED
GARRETT COUNTY, MARYLAND
RESERVOIR NO. 7
PLAN VIEW - DAM SITE

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

Designer D. Shanklin	Date Apr 53	Area
Checker F. Dorsey	.....	.....
..... F. Dorsey	.....	.....
..... J. Cotton	.....	.....

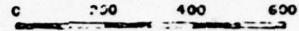
PLATE NO. I



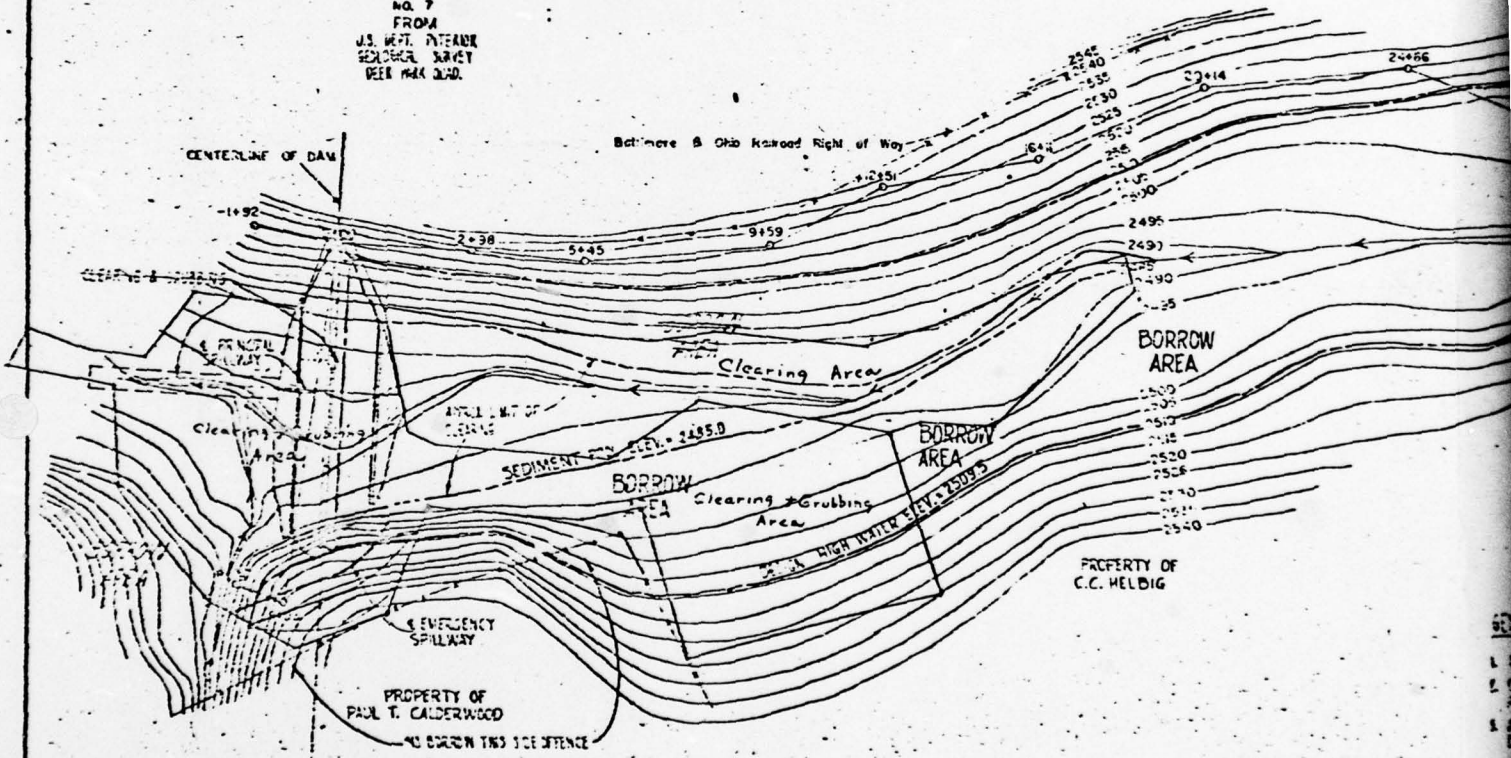
LEGEND

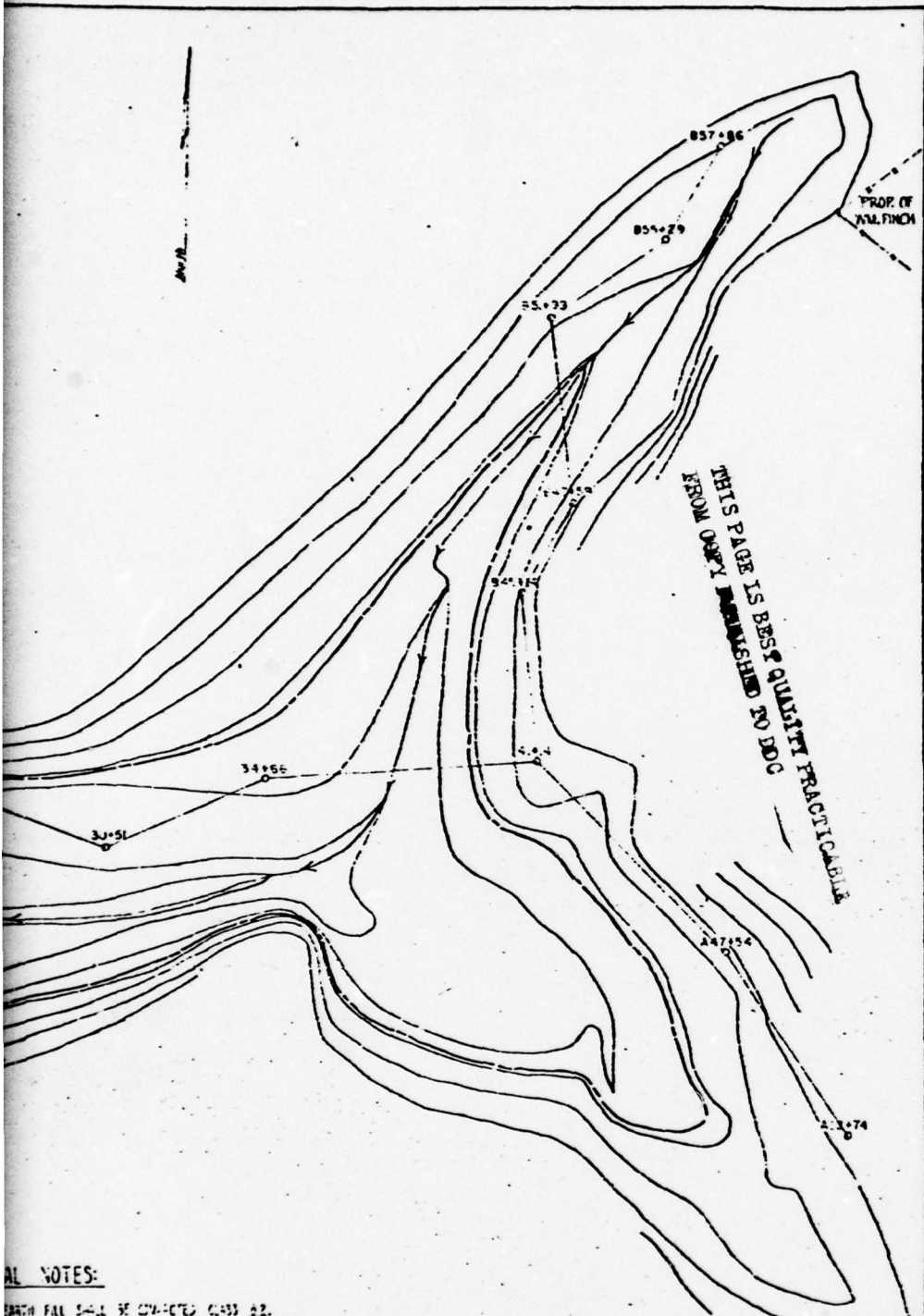
- Transverse Line ----- 2+98
- Contour Lines ----- 25' Elev.
- Stream -----
- Design sign water elev. -----
- Sediment Pool Elev. -----
- Property Lines -----

SCALE



LOCATION SKETCH FOR LITTLE VERMILION SITE
 NO. 7
 FROM
 U.S. REPT. INTERIOR
 GEOLOGICAL SURVEY
 DEER PARK Q.U.D.





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FROM COPY X

GENERAL NOTES:
 GRADE SHALL BE CONFORMED CLASS 22.
 SHALL BE PLACED IN 18 IN. SPACING WITH CHANNEL.
 EMERGENCY SPACING AND LIFTING DEAS (APPROX. 2 ACRES) (Actual 18.1 Ac)
 INDICATED SPACING AREAS ARE TENTATIVE. ACTUAL LOCATION
 SHALL BE FIELD BY ENGINEER.
 SHALL BE PLACED IN THE STEPPING
 SHALL BE PLACED ON THE EMERGENCY SPACING.
 SHALL BE PLACED ON THE DISTURBED AREAS INSIDE THE
 SHALL BE DIRECTED BY THE ENGINEER.
 SHALL BE CONSIDERED TO BE COMMON.

AS BUILT

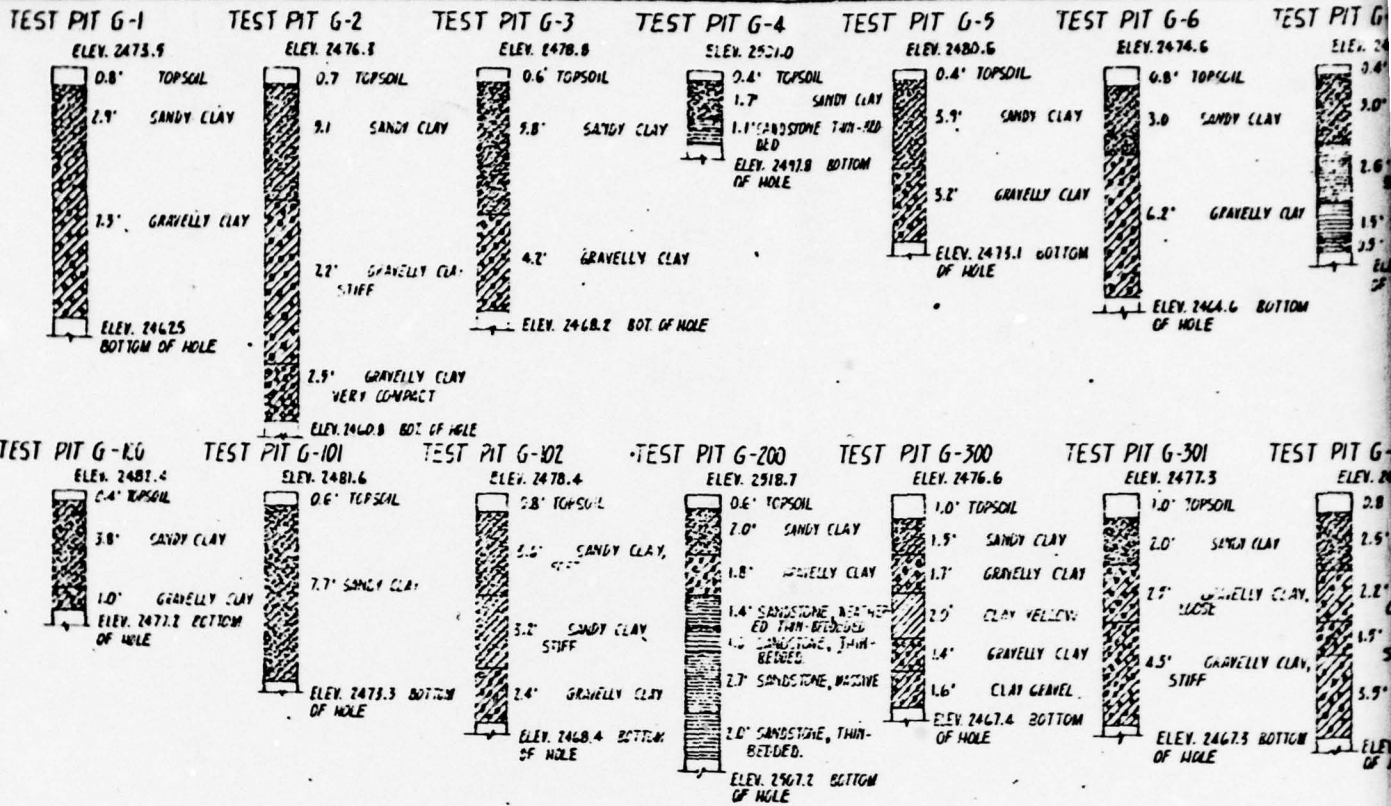
LITTLE YOUGHIOGHENY WATERSHED
 GARRETT COUNTY, MARYLAND
 RESERVOIR NO. 7
 PLAN VIEW - RESERVOIR

U.S. DEPARTMENT OF AGRICULTURE
 SOIL CONSERVATION SERVICE

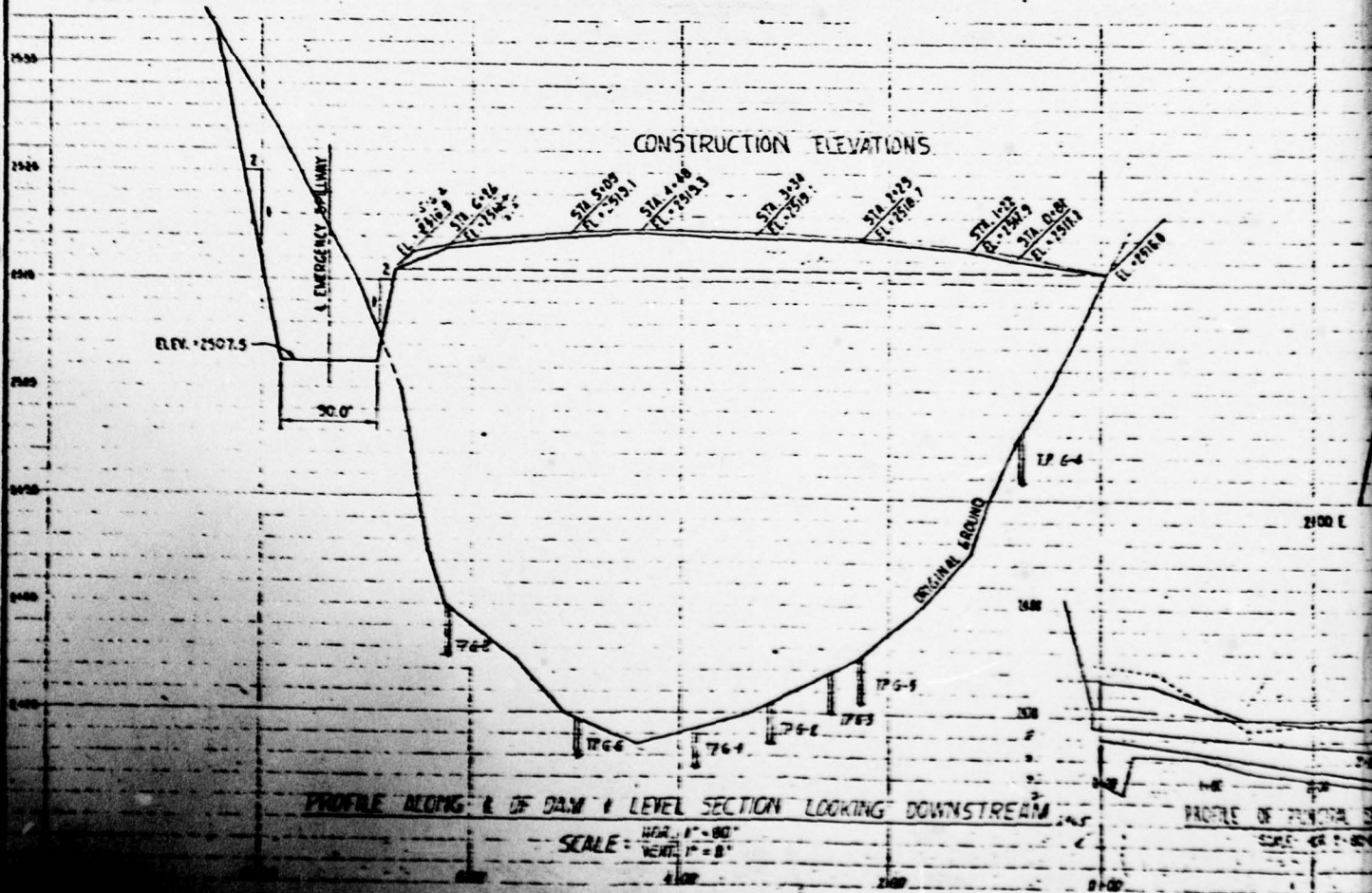
Drawn by D. Shorlin	Date Apr 77	Checked by F. Dorsey	Scale 1" = 400'
Checked by F. Dorsey	Project No. 111-1-1-1	Sheet No. 2	Sheet Total 2
Approved by J. Cotton	Project Name RESERVOIR NO. 7	Project No. 111-1-1-1	Sheet No. 2

PLATE NO. 2

NO. - 4039



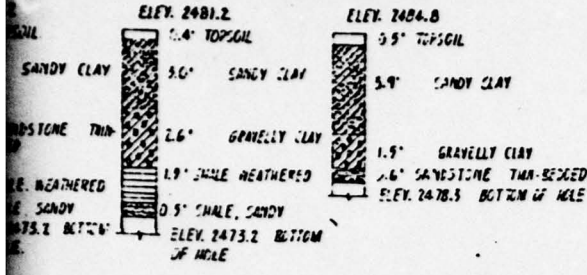
DATE OF SOIL INVESTIGATION - 29 OCT 50



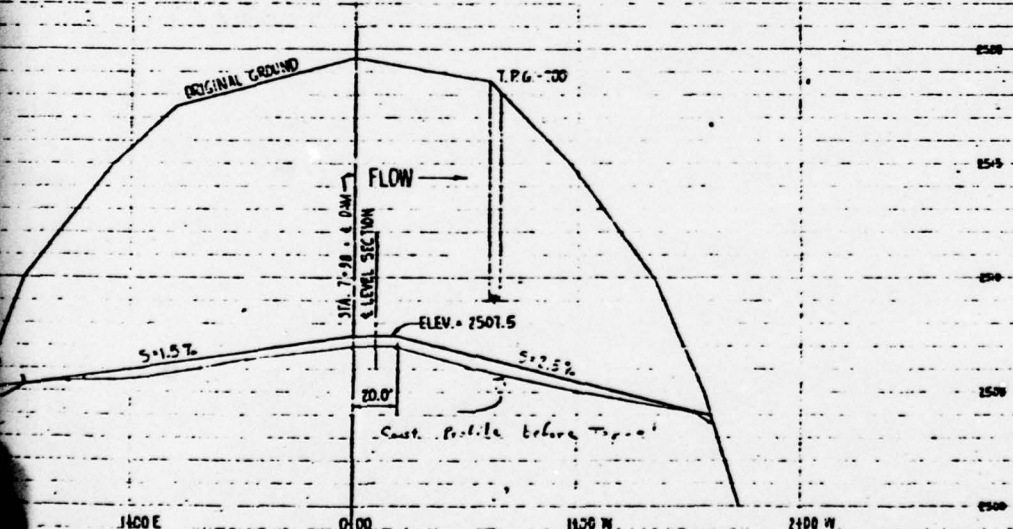
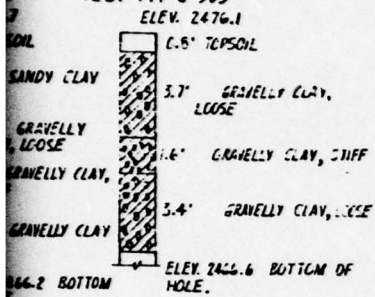
TEST PIT G-7b

TEST PIT G-8

LEGEND



TEST PIT G-303



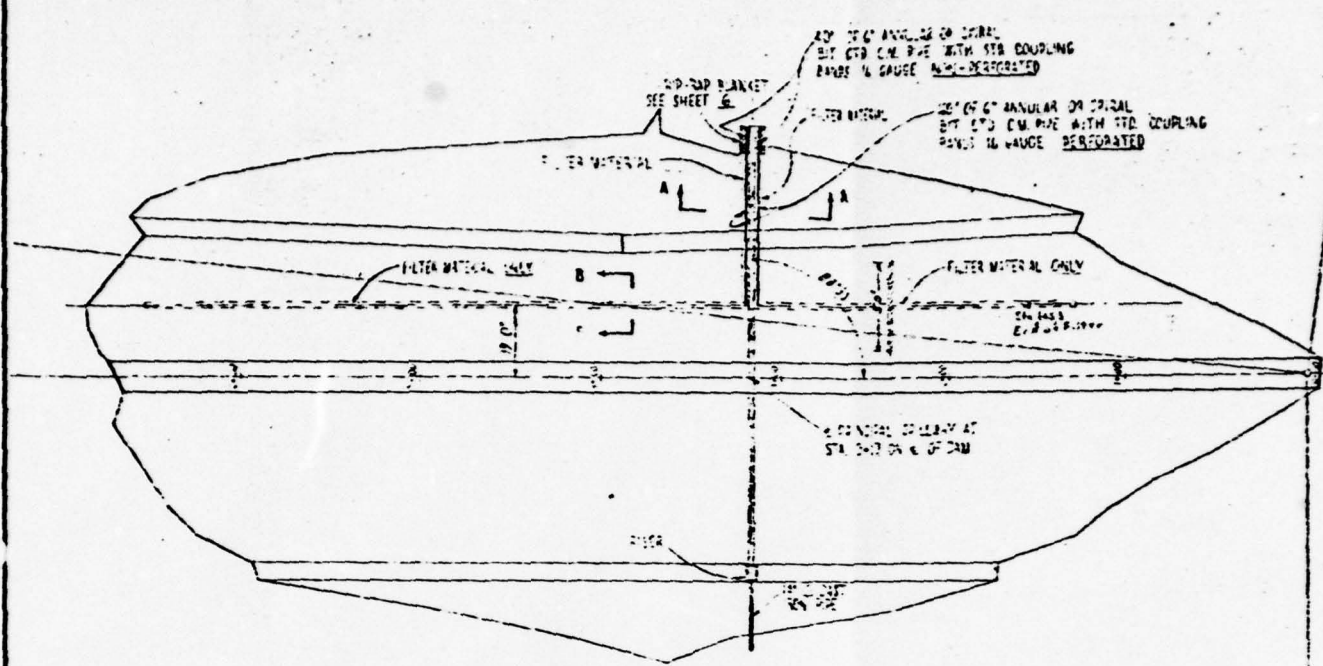
PROFILE ALONG & OF EMERGENCY SPILLWAY
SCALE: 1" = 40.0' HOR.
1" = 4.0' VERT.

AS BUILT

LITTLE YOUGHIOGHENY WATERSHED GARRETT COUNTY, MARYLAND RESERVOIR NO. 7 SOIL INFORMATION & PROFILE THRU EMERGENCY SPILLWAY		
U. S. DEPARTMENT OF AGRICULTURE SOIL CONSERVATION SERVICE		
Designed by D. SHANNON	Date 3-59	Approved by Title
Drawn by W. H. WORGAN	Date 3-59	Checked by Title
Checked by J. A. TAYLOR	Date Apr 59	Drawing No. MD. - 403P

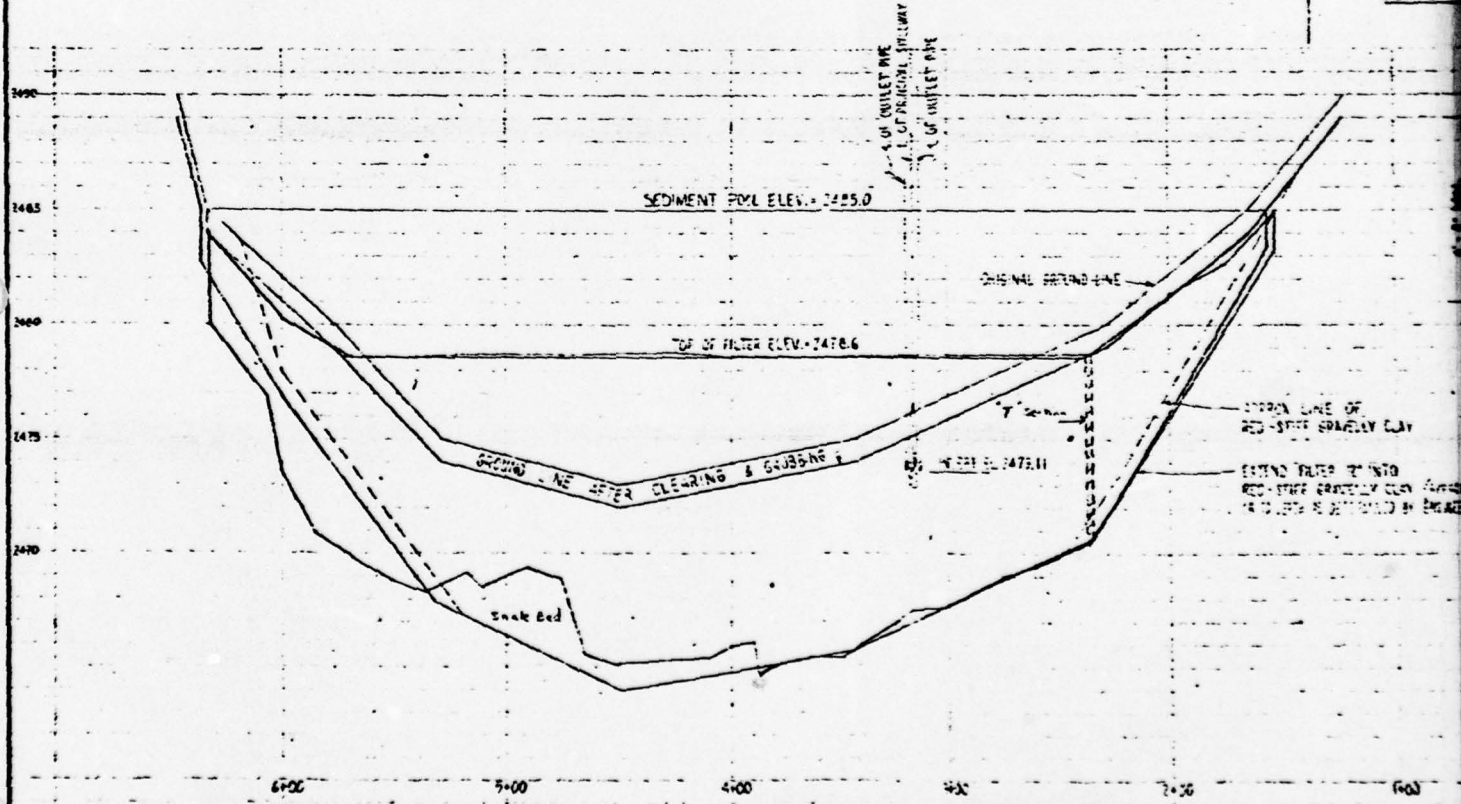
PLATE NO. 3

NOTE:
ELEV.
IN FEET



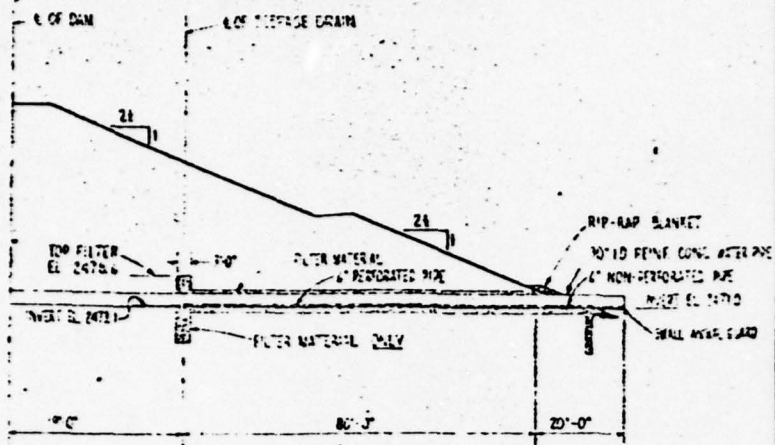
PLAN VIEW OF SEEPAGE DRAIN
SCALE 1" = 50'

DETAIL OF

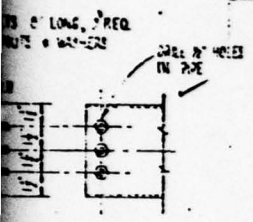


PROFILE ALONG CENTERLINE OF SEEPAGE DRAIN LOOKING DOWNSTREAM
SCALE VERT. 1" = 10'

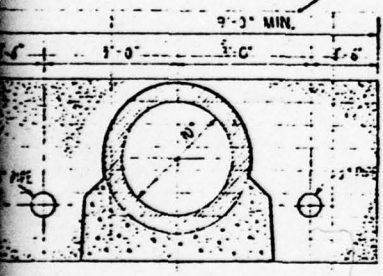
SECTION OF SEEPAGE DRAIN
DESIGNED BY ENGINEER IN FIELD



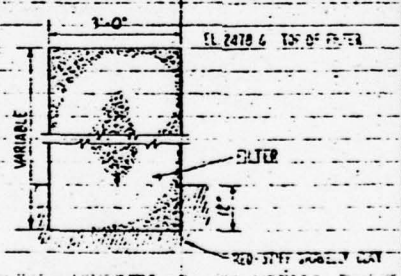
SECTION THRU OUTLET PIPE OF SEEPAGE DRAIN
SCALE 1" = 20'



SMALL ANNUAL GUARD - 2 REQ.
SCALE 2" = 1'-0"



SECTION A-A
SCALE 1/2" = 1'-0"



SECTION B-B
SCALE 1/2" = 1'-0"

FILTER MATERIAL TABLE

SEIVE NO.	% PASSING
1/2"	100
1/4"	85-100
1/8"	65-85
NO. 4	50-70
NO. 20	12-40
NO. 30	10-30
NO. 40	5-20
NO. 200	< 5

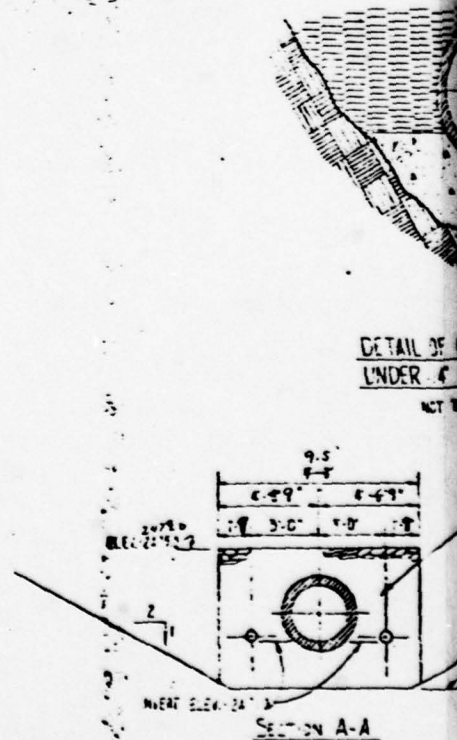
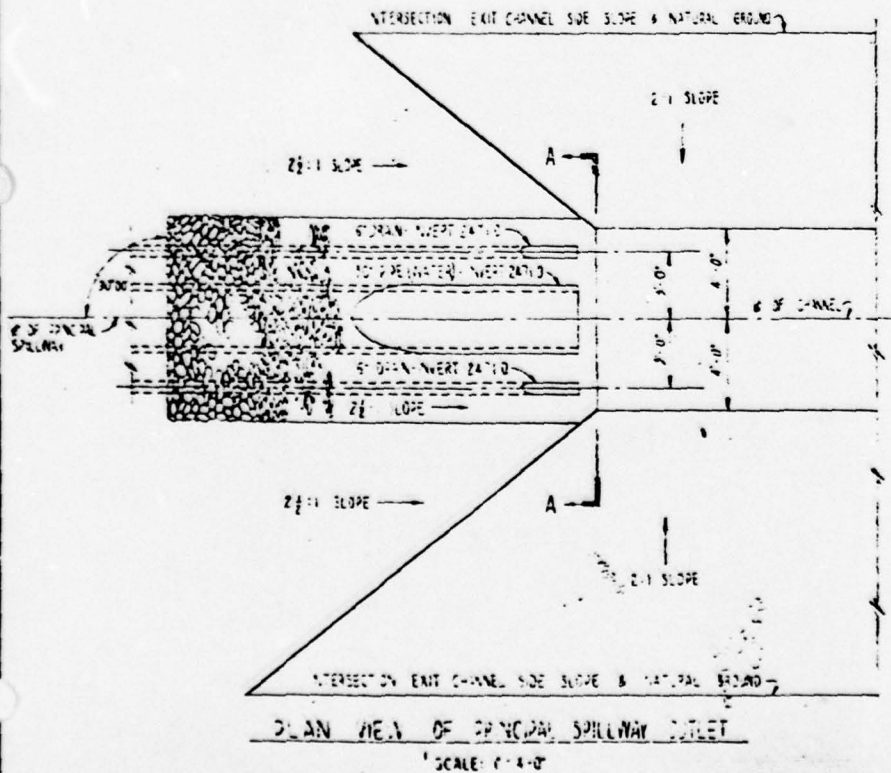
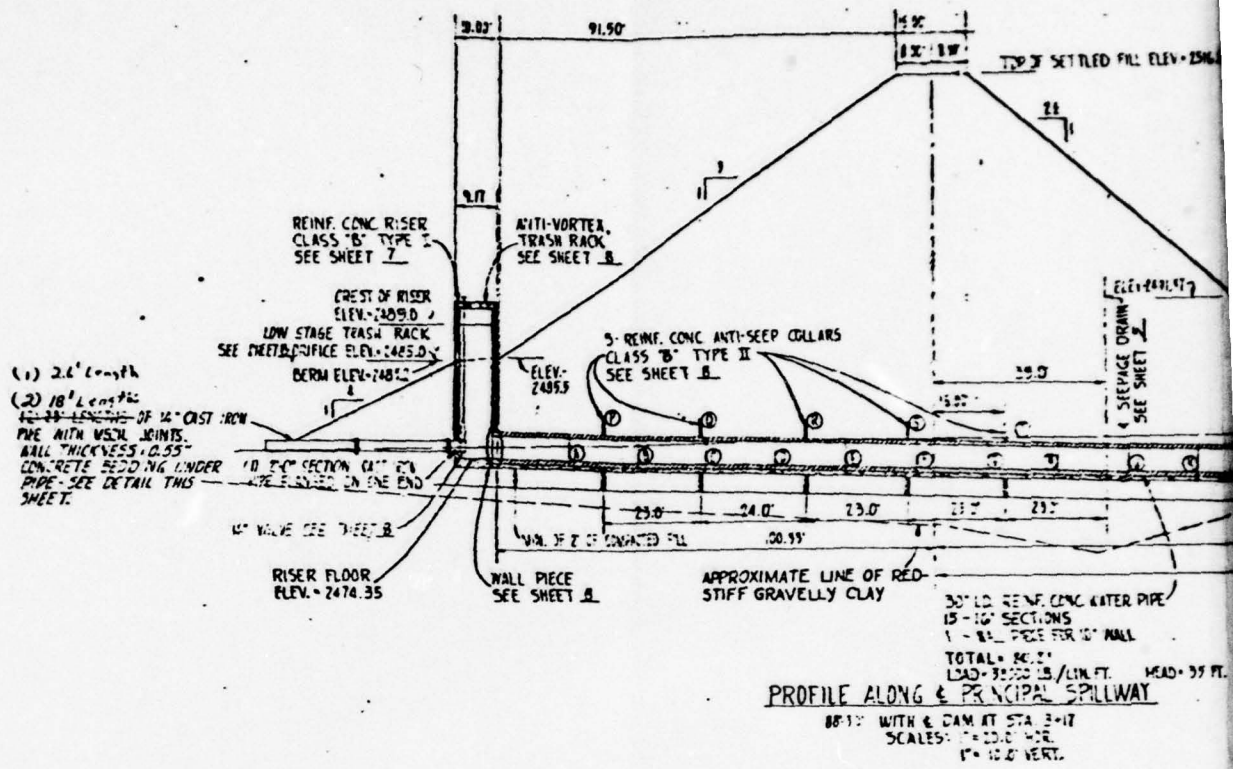
AS BUILT

LITTLE YOUGHIOGHENY WATERSHED
GARRETT COUNTY, MARYLAND
RESERVOIR NO. 7
DETAILS OF SEEPAGE DRAIN
U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

Designed by D. SCHORR	Date 3-59	Approved by
Drawn by H. BROWNING	Date 3-59	Field
Checked by J. A. WITNYSKI	Date Apr 59	Sheet No. 3 of 5

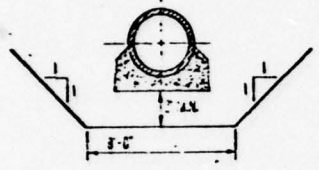
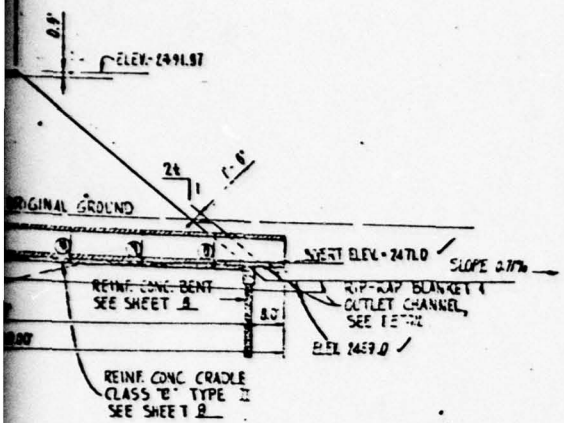
Drawing No. MD-403-P

PLATE NO. 4

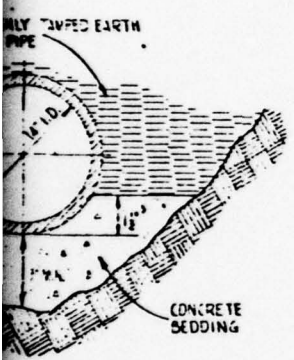


POINT	DISTANCE FROM DISCHARGE END OF 30" PIPE (FEET)	INVERT ELEV. OF 30" PIPE WITH TAMBER	SLOPE
RISER	240.33	2474.35	
A	224.0	2474.27	0.0008
B	208.0	2474.27	0.0008
C	192.0	2474.27	0.0008
D	176.0	2474.27	0.0008
E	160.0	2474.11	0.0008
F	144.0	2474.01	0.0008
G	128.0	2473.280	0.0025
H	112.0	2473.42	0.0025
J	96.0	2473.59	0.0025
K	80.0	2473.67	0.0025
L	64.0	2472.52	0.0025
M	48.0	2471.99	0.0025
N	32.0	2471.59	0.0025
O	16.0	2471.22	0.0025
PIPE OUTLET	0	2471.00	0.0025
P	217.0	2474.32	
Q	194.0	2474.29	
R	170.0	2474.17	
S	147.0	2474.03	
T	124.0	2473.69	

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



TYPICAL SECTION OF PRINCIPAL SPILLWAY TRENCH



THIS PAGE IS BEST QUALITY REPRODUCTION FROM THE ORIGINAL DRAWING BY SCS.

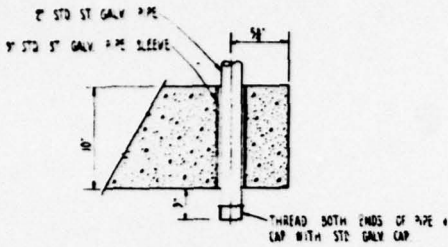
AS BUILT

LITTLE YOUGHIOGHENY WATERSHED
GARRETT COUNTY, MARYLAND
RESERVOIR NO. 7
PROFILE ALONG & OF PRINCIPAL SPILLWAY
U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

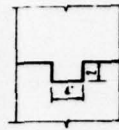
Designed by D. SCHORR	Date 3-59	Approved by W. MORGAN	Date 3-59
Checked by J. B. TYNSKI	Date 4-59	Scale 1" = 6'	Sheet No. B

MD-403 P

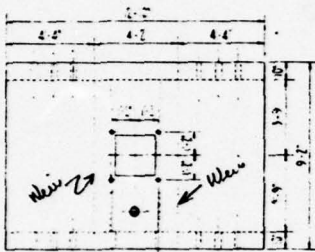
PLATE NO. 5



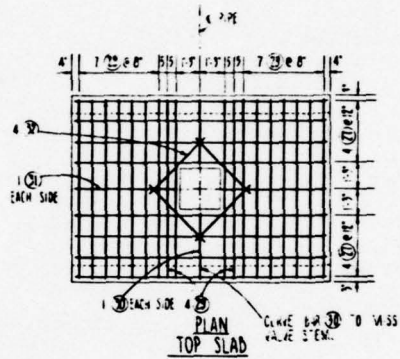
- (1) 3'-0" LENGTHS OF 2" STD ST GALV PIPE REQ.
- (2) STD GALV CAPS REQ.
- (3) 3" LENGTHS OF 3" STD ST GALV PIPE SLEEVE REQ.



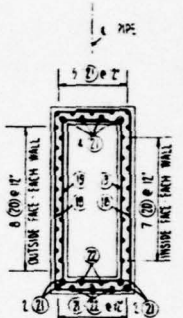
TYPICAL CONSTRUCTION JOINT



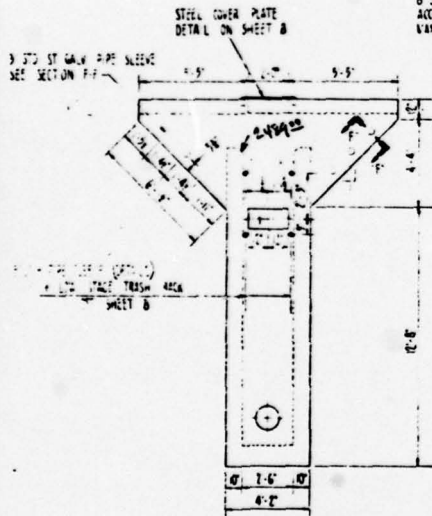
PLAN



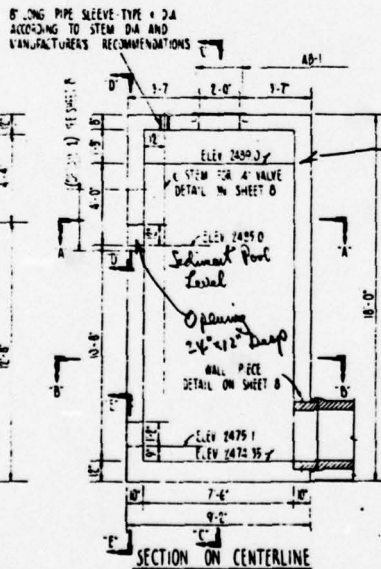
PLAN TOP SLAB



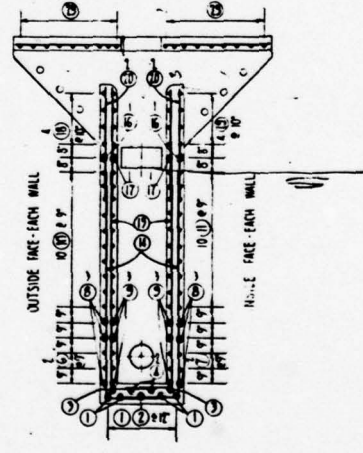
SECTION A-A



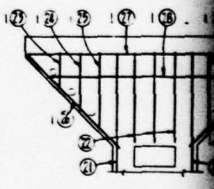
UPSTREAM WALL ELEVATION



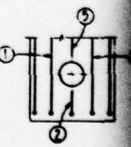
SECTION ON CENTERLINE



SECTION C-C



SECTION D-D



SECTION E-E

DETAIL OF REINFORCED CONCRETE RISER

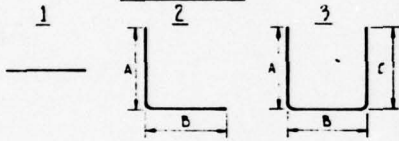
SCALE 1/4" = 1'

STEEL SCHEDULE

MARK	LOCATION	QUANTITY	SIZE	LENGTH	TYPE	A	B	C	TOTAL FT
1	2 ND FLOOR	4	5	10-0	2	11-3	8-9		80.00
2		1	5	18-1	2	1-4	8-9		10.00
3		2	5	8-2	2	0-8	7-6		36.33
4		2	5	8-2	2	0-9	7-6		36.33
5		2	4	6-5	1				24.75
6	WALLS	4	6	9-10	2	8-9	1-1		59.33
7		4	6	8-2	2	7-6	2-8		32.67
8		4	6	11-7	2	8-9	1-0		69.30
9		6	6	9-11	2	7-6	2-5		59.50
10		20	6	14-5	3	7-10	8-9	7-10	288.33
11		20	6	12-9	3	2-5	7-11	2-5	255.00
12		2	5	12-9	2	11-3	1-0		24.50
13		7	5	7-6	1				52.50
14		16	5	14-1	2	11-3	2-0		225.33
15		14	5	15-1	2	0-8	2-5		185.17
16		2	5	12-1	3	7-8	8-9	0-8	24.17
17		1	5	0-2	2	1-3	1-1		20.33
18		8	5	2-1	3	2-8	8-9	7-8	84.67
19		8	5	2-5	3	2-9	7-11	2-5	99.33
20		30	4	5-5	1				157.50
21		15	4	7-0	1				91.82
22		4	4	3-5	1				21.25
23		6	4	4-9	1				34.00
24		8	4	2-9	1				26.00
25		6	4	3-9	1				30.00
26		8	4	6-6	1				52.00
27		12	4	12-6	1				150.00
28		4	4	10-6	1				42.00
29		18	3	8-9	1				157.50
30		2	5	5-3	1				6.50
31		2	4	5-0	1				10.00
32		4	4	4-0	1				16.00

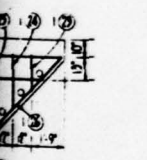
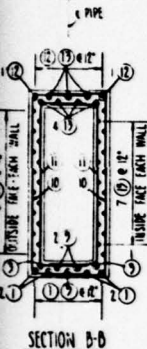
TOTAL NO 4 BARS = 629.78 LIN. FT. = 404.6 LBS.
 TOTAL NO 5 BARS = 245.26 LIN. FT. = 1111.9 LBS.
 TOTAL NO 6 BARS = 744.19 LIN. FT. = 800 LBS.

BAR TYPES



GENERAL NOTES

1. ALL REINFORCING STEEL TO BE LAPPED 90 DIA.
2. ALL REINFORCING STEEL SHOULD HAVE A MIN. 1" OF CLEAR CONCRETE COVER EXCEPT WHERE CONCRETE IS POURED AGAINST THE GROUND, THIS STEEL SHOULD HAVE A 3" MIN. OF CLEAR CONCRETE.
3. PORTLAND CEMENT TYPE IA SHALL BE USED OR TYPE I WITH AN AIR-ENTRAINING ADJUSTURE.
4. TOTAL CONCRETE CLASS B - TYPE I = 14.2 CU. YDS.



NOTE: STEEL SHOWN IN SECTION B-B IS THE SAME IN EACH WALL AND EACH FACE.

LITTLE YOUGHIOGHENY WATERSHED
 GARRETT COUNTY, MARYLAND
 RESERVOIR NO. 7
 RISER DETAILS

U. S. DEPARTMENT OF AGRICULTURE
 SOIL CONSERVATION SERVICE

Designed by D. SCHMIDT	Date 5-59	Approved by Title
Drawn by B. GERMANN	Date 5-59	Title
Traced		
Checked J.A. WITYNSKI	Apr 59	Sheet No. 7 of 8 Drawing No. MD-403 P

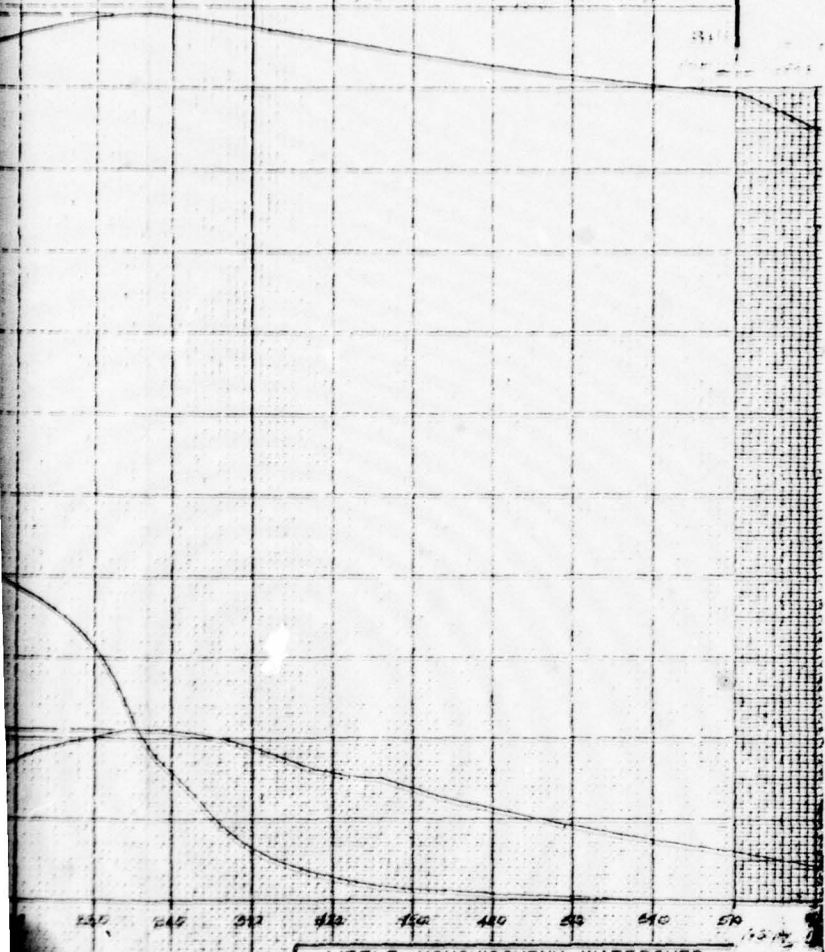
Form SCS-313 (November 1955)

PLATE NO. 6

2

HYDROLOGIC DATA
 IN CLASS 7C
 AREA 2 30 50 MI
 CONCENTRATION 0 99 MI
 6 OF
 EY SPILLWAY FLOW 1 00 HRS
 6.00

$T_{total} = \frac{100}{337} = 0.297$
 $T_{channel} = \frac{100}{337} = 0.297$
 $T_{reservoir} = \frac{100}{337} = 0.297$
 $T_{total} = 0.297 + 0.297 + 0.297 = 0.891$



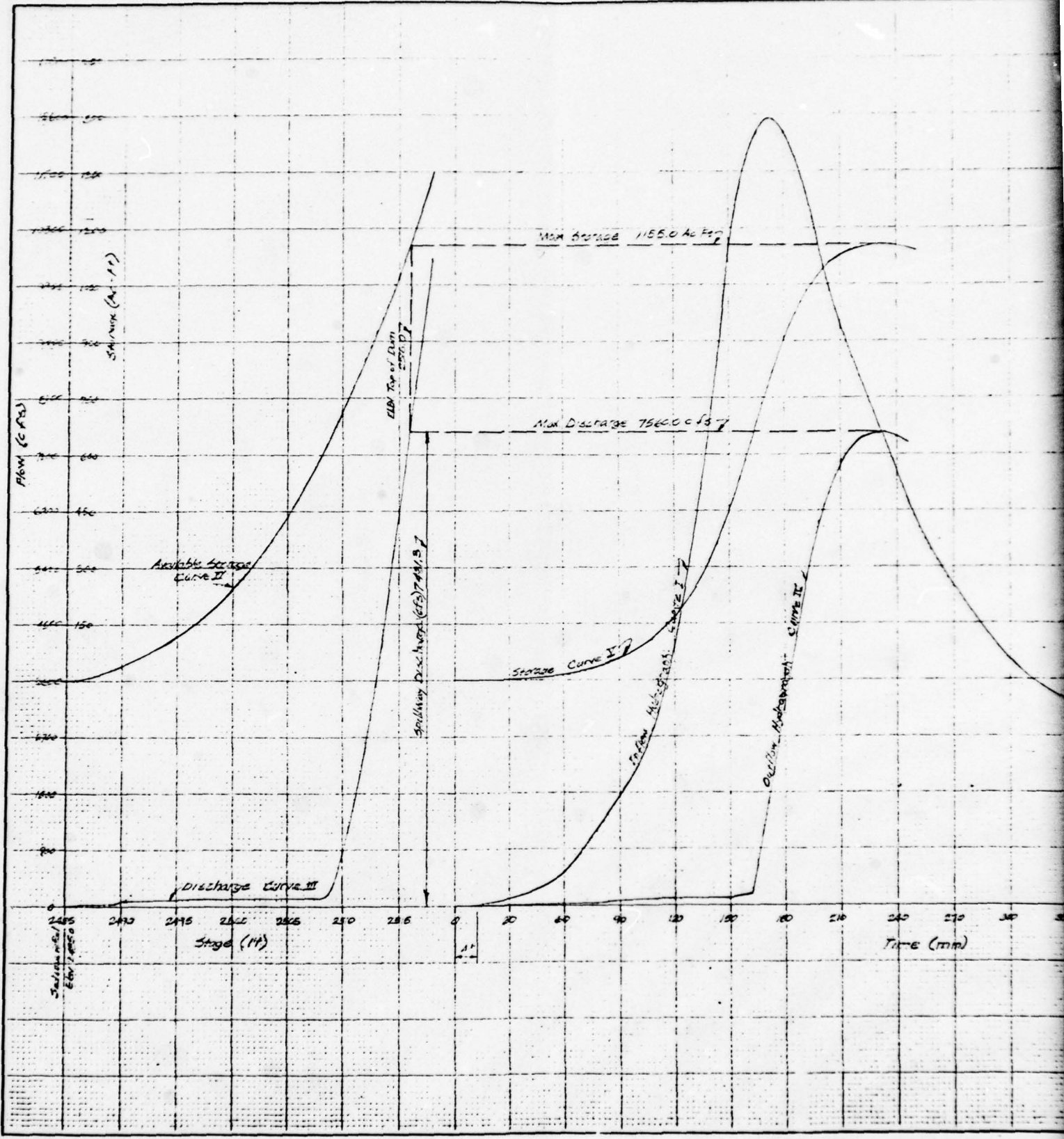
LITTLE YOUGHIOGHENY WATERSHED
 GARRETT COUNTY, MARYLAND
 RESERVOIR NO. 7
 EMERGENCY SPILLWAY HYDROGRAPH
 6 HR PT RAINFALL - MOISTURE CONDITION II

U.S. DEPARTMENT OF AGRICULTURE
 SOIL CONSERVATION SERVICE

Designed D. Stankin - L. Beck	Date Feb 59	Approved by Title
Drawn L. Beck	Date Feb 59	Title
Checked D. E. Hoff	Date Feb 59	Sheet No. 1 of 3
		Drawing No. MD - 403H

PLATE NO. 7

2

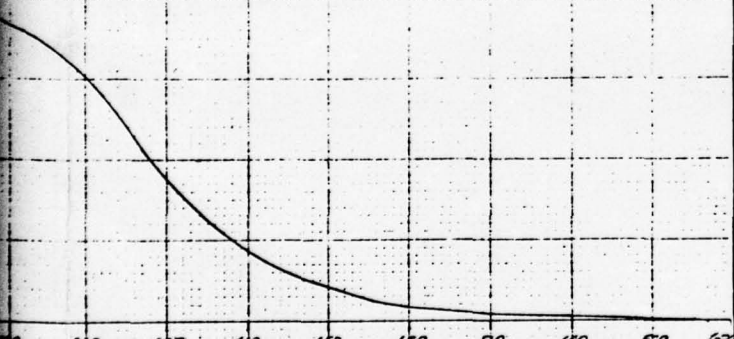


1

HYDROLOGIC DATA

STRUCTURE CLASS ----- "C"
 DRAINAGE AREA ----- 2 5 50 MI.
 RUNOFF ----- 21 0 IN.
 TIME OF CONCENTRATION ----- 1 11 HRS.
 RAINFALL ----- 2.7 IN.

Handwritten notes:
 Time of concentration = 1.11 hrs.
 Runoff = 21.0 in.
 Rainfall = 2.7 in.



LITTLE YOUGHIOGHENY WATERSHED
 GARRETT COUNTY, MARYLAND
 RESERVOIR NO. 7
 FREEBOARD HYDROGRAPH
 2 5 x 6 HR PT RAINFALL - MOISTURE CONDITION II
 U. S. DEPARTMENT OF AGRICULTURE
 SOIL CONSERVATION SERVICE

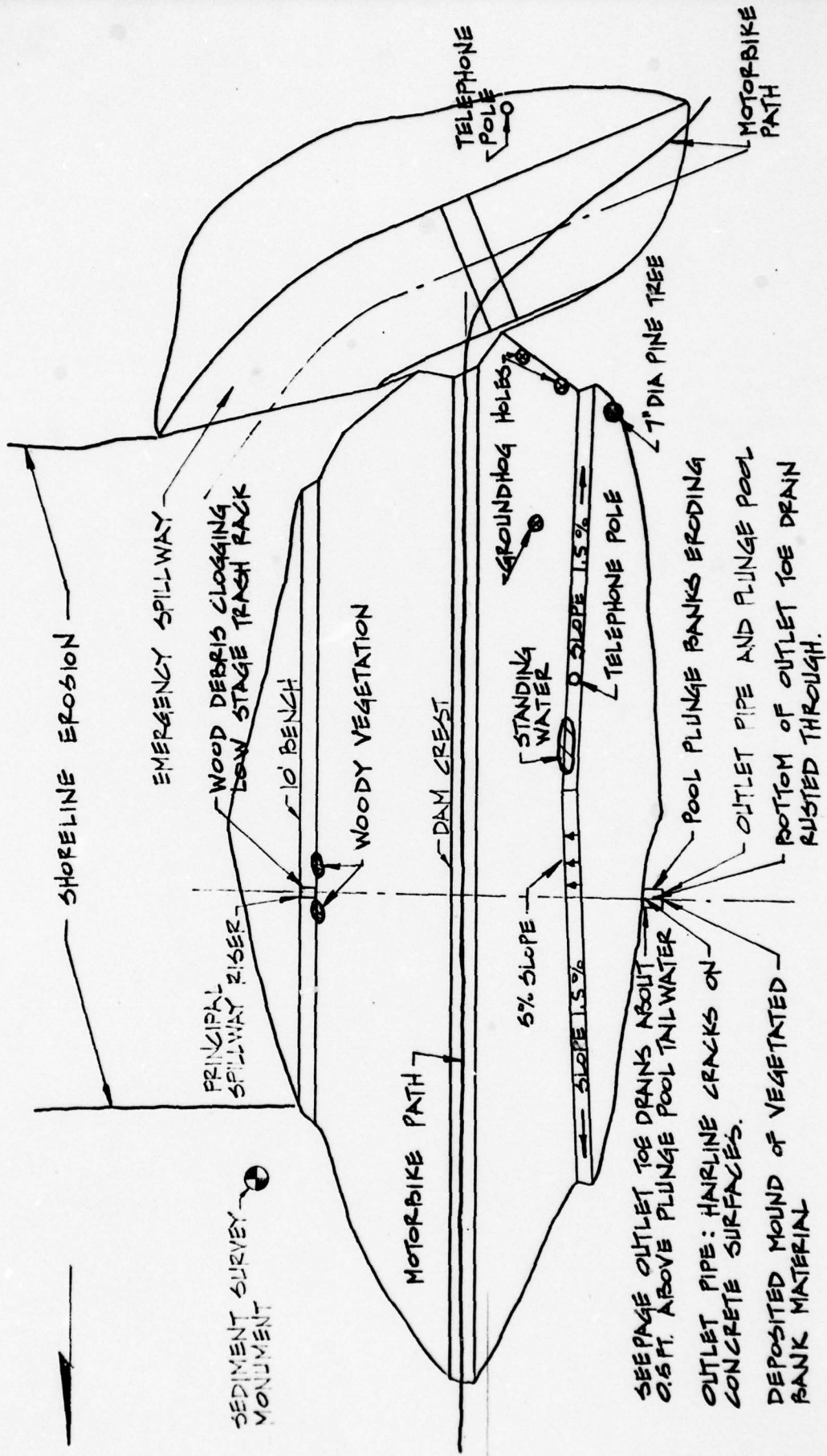
Design	Date	Approved by
D. Shanklin - L. Beck	Feb. 59	
Drawn	Date	Title
L. Beck	Feb. 59	
Checked	Date	Sheet
D. Schorr	Feb. 59	MD - 403H

Form SCS-315 (November, 1955)

PLATE NO. 8

Handwritten number: 2

APPENDIX A
FIELD SKETCH AND VISUAL OBSERVATIONS CHECKLIST



FIELD SKETCH
LITTLE YOLGHI GHEHY SITE #7

VISUAL OBSERVATIONS CHECKLIST

Name Dam Little Youghiogheny County Garrett State Maryland National ID # MD 32
Site No. 7

Type of Dam Earthfill Hazard Category Class I, High hazard

Date(s) Inspection 4/11/79 Weather Clear, cold Temperature 50°F

Inspection Review Date 4/24/79 (Ackenheil & Associates personnel only.)

Pool Elevation at Time of Inspection 2,485* M.S.L. Tailwater at Time of Inspection Normal M.S.L.

*Pool at riser orifice elevation.

Inspection Personnel:

Ackenheil & Associates

Timothy Debes
James Hainley
Michael McCarthy

Water Resources Administration

Jeffrey Smith
Thomas Moynahan

Soil Conservation Service

Bill DeBarry
Walt Payte

Recorder Timothy Debes

CONCRETE/MASONRY DAMS

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

EMBANKMENT

VISUAL EXAMINATION OF OBSERVATIONS REMARKS OR RECOMMENDATIONS*

SURFACE CRACKS

None observed.

UNUSUAL MOVEMENT OR
CRACKING AT OR BEYOND
THE TOE

None observed.

SLOUGHING OR EROSION OF
EMBANKMENT AND ABUTMENT
SLOPES

Motorbike path observed on dam crest and downstream spillway channel.
A few groundhog holes observed near south abutment junction. No evidence
of sloughing was discernible.

VERTICAL AND HORIZONTAL
ALIGNMENT OF THE CREST

No vertical or horizontal misalignment noted.

RIPRAP FAILURES

N/A

*REFER TO REPORT SECTIONS 3 AND 7

EMBANKMENT

<u>VISUAL EXAMINATION OF</u>	<u>OBSERVATIONS</u>	<u>REMARKS OR RECOMMENDATIONS</u>
SETTLEMENT	None evident.	
JUNCTION OF EMBANKMENT AND ABUTMENT, SPILLWAY AND DAM	Embankment, abutment and spillway junctions heavily vegetated with grass. Only minor rill erosion evident.	
ANY NOTICEABLE SEEPAGE	None observed. However, some standing water was noted on the downstream berm, about mid-dam length.	
STAFF GAGE AND RECORDER	None.	
DRAINS	Both seepage toe drains discharging clear water at an estimated rate of 0.5 gpm. Protective bituminous pipe coatings deteriorated. Small animal guard screens partially missing. Bottom of one seepage toe drain rusted through.	

OUTLET WORKS
(Pond Drain)

<u>VISUAL EXAMINATION OF</u>	<u>OBSERVATIONS</u>	<u>REMARKS OR RECOMMENDATIONS</u>
------------------------------	---------------------	-----------------------------------

CRACKING AND SPALLING OF CONCRETE SURFACES IN OUTLET CONDUIT	Hairline cracks evident on concrete surfaces. A black cold tar has been applied to seal cracks. Concrete surface cracks reportedly developed 5 to 6 years after construction of dam.	
--	--	--

INTAKE STRUCTURE	Wood debris partially obstructing low stage trash rack. Gate exercised and found operable. A pipe wrench had to be used in place of the intended hand wheel, due to a steel nut rusted tight to the end of the stem shaft. Riser intake structure appeared in good condition.	
------------------	---	--

OUTLET STRUCTURE	N/A	
------------------	-----	--

OUTLET CHANNEL	Plunge pool banks eroding. Eroded bank material has formed an earth mound at inlet of downstream channel. Inlet obstruction raises tailwater approximately 0.5 ft., to within 0.5 ft. of seepage toe drain inverts under normal conditions.	
----------------	---	--

EMERGENCY GATE	N/A	
----------------	-----	--

UNGATED SPILLWAY

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONCRETE WEIR	N/A	
APPROACH CHANNEL	Spillway approach channel cut into natural earth. Channel bottom and side slopes are vegetated with grass, and appear stable. No flow obstructions evident.	
DISCHARGE CHANNEL	Motorbike path worn across channel bottom. Channel side slopes stable. Spillway discharges into treeline and natural stream channel paralleling dam centerline.	
BRIDGE AND PIERS	None	

GATED SPILLWAY

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

INSTRUMENTATION

VISUAL EXAMINATION OF OBSERVATIONS REMARKS OR RECOMMENDATIONS

MONUMENTATION/SURVEYS

Sediment survey monuments located near north abutment shoreline and 0.2 miles upstream, along reservoir banks.

OBSERVATION WELLS

None

WEIRS

None

PIEZOMETERS

None

OTHER

N/A

RESERVOIR

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SLOPES	Reservoir slopes covered primarily by woodland and some open pasture. Reservoir shoreline erosion extends about 5 ft. above normal pool, and is evident around entire pool perimeter. Reportedly, pool levels frequently fluctuate during seasonal rainfall periods.	
SEDIMENTATION	No significant evidence of sedimentation visible. Reservoir water and outlet pipe discharge observed clear. Soil Conservation Service officials indicate results of sediment surveys conducted at dam facility show accumulated sediment storage much less than anticipated.	

DOWNSTREAM CHANNEL

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONDITION (OBSTRUCTIONS, DEBRIS, ETC.)	Deposited bank material partially blocking channel inlet at lip of plunge pool. Inlet obstruction raises plunge pool tailwater to within 0.5 ft. of seepage drain pipe inverts under normal conditions.	
SLOPES	Channel side slopes vegetated with grass, woody brush, and trees.	
APPROXIMATE NO. OF HOMES AND POPULATION	About eight (8) homes, located in Deer Park, will be inundated by high flood flows. These homes will be subject to substantial damage and loss of life in the event of a dam failure.	

APPENDIX B
CHECKLIST ENGINEERING DATA
DESIGN, CONSTRUCTION, OPERATION PHASE I

CHECK LIST
ENGINEERING DATA
DESIGN, CONSTRUCTION, OPERATION
PHASE 1

Little Youghiogeny
Site No. 7

NAME OF DAM

ID # MD 32

ITEM

REMARKS

AS-BUILT DRAWINGS

As-built drawings available from Soil Conservation Service.
See plates 1 through 5.

REGIONAL VICINITY MAP

See Appendix E. U.S.G.S. 7.5 minute quadrangle map
showing dam site location.

CONSTRUCTION HISTORY

Dam designed by U. S. Department of Agriculture, Soil Conservation Service
in 1959. Construction was started September 28, 1959, and completed September 16, 1960.

TYPICAL SECTIONS OF DAM

See Plates 1, 4, and 5 for details of dam embankment.

OUTLETS - PLAN

DETAILS

CONSTRAINTS

DISCHARGE RATINGS Available in design report.

See plates 4 and 5 for details of principal spillway riser and outlet pipe.

RAINFALL/RESERVOIR RECORDS

Not available.

ITEM	REMARKS
DESIGN REPORTS	<p>Little Youghiogheny River Watershed, Site No. 7, design report prepared by Soil Conservation Service, June 1959.</p>
GEOLOGY REPORTS	<p>Brief geology report included in Soil Conservation Service design report. Report prepared by Robert F. Fonner, and Stephen J. Maddock, January 9, 1959.</p>
DESIGN COMPUTATIONS HYDROLOGY & HYDRAULICS DAM STABILITY SEEPAGE STUDIES	<p>Hydrology and hydraulic design calculations and static slope stability results are presented in the Soil Conservation Service design report.</p>
MATERIALS INVESTIGATIONS BORING RECORDS LABORATORY FIELD	<p>Included in design and geology reports. See plate 3 for test pit logs.</p>
POST-CONSTRUCTION SURVEYS OF DAM	<p>Post-construction surveys are being conducted of accumulated sediment pool storage by the Soil Conservation Service.</p>
BORROW SOURCES	<p>Borrow source locations are shown on as-built drawings. All sources were located within dam site and reservoir limits.</p>

ITEM	REMARKS
MONITORING SYSTEMS	None.
MODIFICATIONS	None reported.
HIGH POOL RECORDS	None recorded.
POST CONSTRUCTION ENGINEERING STUDIES AND REPORTS	None reported.
PRIOR ACCIDENTS OR FAILURE OF DAM DESCRIPTION REPORTS	None reported.
MAINTENANCE OPERATION RECORDS	Annual maintenance and operation inspection reports available from the Soil Conservation Service District Office in Oakland, MD

ITEM	REMARKS
SPILLWAY PLAN	See plates 1 and 3 for details. Spillway design calculations included in design report.
SECTIONS	
DETAILS	
OPERATING EQUIPMENT PLANS & DETAILS	None available.
SPECIFICATIONS	None available.
MISCELLANEOUS	<ol style="list-style-type: none"> 1) Water obstruction permit dated September 15, 1959. 2) Annual Maintenance and Inspection reports, 1977 and 1978, prepared by Soil Conservation Service.

APPENDIX C

**HYDROLOGIC AND HYDRUALIC
ENGINEERING DATA**

LITTLE YOUGHIOGHENY SITE NO. 7

CHECK LIST
HYDROLOGIC AND HYDRAULIC
ENGINEERING DATA

DRAINAGE AREA CHARACTERISTICS: 80% woodland, 15% open pasture,
remainder crop and urban development.

ELEVATION TOP NORMAL POOL (STORAGE CAPACITY): 2,485 ft. (31 ac.-ft.)

ELEVATION TOP FLOOD CONTROL POOL (STORAGE CAPACITY): 2,516 ft. (1,155 ac.-ft.)

ELEVATION MAXIMUM DESIGN POOL: 2,509.5 ft. (690 ac.-ft.)

ELEVATION TOP DAM: 2,516 ft.

EMERGENCY SPILLWAY

- a. Elevation 2,507.5 ft.
- b. Type Trapezoidal open channel
- c. Width 90 ft.
- d. Length 325 ft.
- e. Location Spillover South abutment
- f. Number and Type of Gates None

OUTLET WORKS

- a. Type Concrete drop inlet riser and 30 in. dia. R.C. pipe.
- b. Location 350 ft. from south abutment and spillway.
- c. Entrance Inverts Low stage orifice El. 2,485, high stage weirs, El. 2,489
- d. Exit Inverts Outlet pipe El. 2,471±
- e. Emergency Drawdown Facilities Hand operated 14 in. gate valve housed in principal spillway riser.

HYDROMETEOROLOGICAL GAGES

- a. Type None
- b. Location N/A
- c. Records None

MAXIMUM NON-DAMAGING DISCHARGE Unknown

PREP. # 13 Feb. '59

HYDROGRAPH COMPUTATION

100 Yr. Frequency

WATERSHED OR PROJECT Little Yak MD-403-H STATE Maryland

STRUCTURE SITE OR SUBAREA Site #7

DR. AREA 2.30 SQ. MI. T. 1.11 HR. RUNOFF CONDITION NO. II

RUNOFF CURVE NO. 72 STORM DISTRIB. CURVE B HYDROGRAPH FAMILY NO. 3

STORM DURATION 6 HR. RAINFALL: POINT IN. AREAL 4.74 IN.

Q 2.00 IN. COMPUTED T. 0.78 HR. T. 4.30 HR.

(T₀ + T_p): COMPUTED 5.51 ; USED 6.00 . REVISED T. 0.72 .

Q_p = $\frac{484 A}{REV. T_p} = \frac{1546.1}{0.72} = 2147.3$ CFS. Q₀ = 3092.2 CFS.

(COLUMN) = (1/T_p) REV. T_p (COLUMN) = (484/A) Q_p
 Refer to Pg. 3.21-50 Hyd. Sec. 4A - Supp. A for $\frac{1}{T_p} \& \frac{Q_p}{A}$

LINE NO.	(1/T _p) REV. T _p	(484/A) Q _p	LINE NO.	(1/T _p) REV. T _p	(484/A) Q _p	LINE NO.	(1/T _p) REV. T _p	(484/A) Q _p
	HOURS	CFS		HOURS	CFS		HOURS	CFS
1	0.0	0.0	21	6.05	30.9	41		
2	0.30	6.2	22	6.35	15.5	42	CHECK:	
3	0.60	64.9	23	6.65	9.3	43	ΔT = 0.302	
4	0.91	426.7	24	6.96	6.2	44	ΣQ = 9963.1	
5	1.21	989.5	25	7.26	3.1	45	Q = ΔT ΣQ	
6	1.51	1206.0	26	7.56	0.0	46	Q = (645)A	
7	1.81	1122.5	27	7.86	0.0	47	Q = (0.302)(9763.1)	
8	2.12	971.0	28			48	Q = (645)(2.3)	
9	2.42	834.9	29			49	Q = 2.03A	
10	2.72	717.4	30			50		
11	3.02	615.3	31			51	• ERROR = -1.5%	
12	3.33	538.0	32			52	OK	
13	3.63	479.3	33			53		
14	3.93	445.3	34			54		
15	4.23	423.6	35			55		
16	4.54	392.7	36			56		
17	4.84	312.3	37			57		
18	5.14	194.8	38			58		
19	5.44	102.0	39			59		
20	5.75	55.7	40			60		

HYDROGRAPH COMPUTATION

Prep. # 13 Feb 59

6 Hr. Pt. Rainfall Design Hydrograph

WATERSHED OR PROJECT Little Yak MD-403-H STATE Maryland

STRUCTURE SITE OR SUBAREA Site #7

DR. AREA 2.30 SQ. MI. T_c 1.11 HR. RUNOFF CONDITION NO. II

RUNOFF CURVE NO. 72 STORM DISTRIB. CURVE B HYDROGRAPH FAMILY NO. 2

STORM DURATION 6 HR. RAINFALL: POINT 10.8 IN. AREAL 10.04 IN.

Q 6.53 IN. COMPUTED T_p 0.78 HR. T_0 5.01 HR.

$(T_0 + T_p)$: COMPUTED 6.42 ; USED 6.0 REVISED T_p 0.84

$Q_p = \frac{484 A}{REV. T_p} = \frac{1325.2}{0.84} = 1577.6$ CFS. $Q_{0.78} = 8653.6$ CFS.

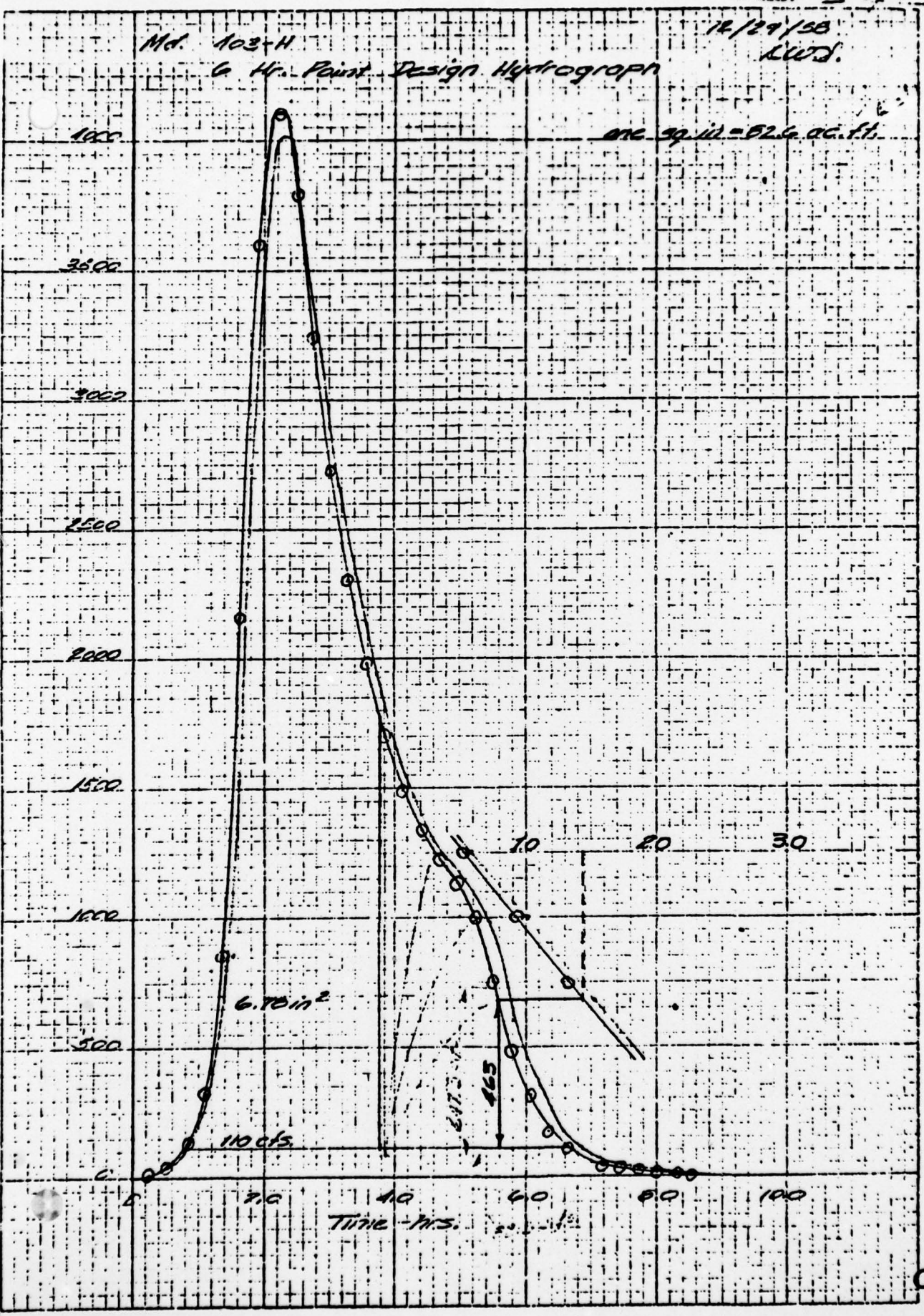
(C COLUMN) = $(1/T_p)$ REV. T. (C COLUMN) = $(1/c/10)$ Q_p
Refer to Pg. 3.21-47 Hyd. Sec. 24-Supp. A for $1/10$ & $1/10$

LINE NO.	1 HOUR	Q CFS	LINE NO.	1 HOUR	Q CFS	LINE NO.	1 HOUR	Q CFS
1	0.0	0.0	21	5.71	735.6	41	Check	
2	0.29	8.7	22	6.00	475.9	42	$\Delta t = 0.285$	
3	0.57	43.3	23	6.28	302.9	43	$\Sigma Q = 34493.6$	
4	0.86	129.8	24	6.57	173.1	44	$Q = \frac{Q_p \times \Delta t}{645}$	
5	1.14	320.2	25	6.85	103.8	45	$645 A$	
6	1.43	848.1	26	7.14	69.2	46	$Q = \frac{(0.285)(34493.6)}{(645)(2.5)}$	
7	1.71	2111.5	27	7.43	43.3	47		
8	2.00	3522.0	28	7.71	34.6	48		
9	2.28	4015.3	29	8.00	26.0	49	$Q = 6.63$ in.	
10	2.57	3712.4	30	8.28	17.3	50		
11	2.86	3175.9	31	8.57	8.7	51	ERROR = -1.52	
12	3.14	2674.0	32	8.85	0.0	52		
13	3.43	2258.6	33			53		
14	3.71	1938.4	34			54		
15	4.00	1670.1	35			55		
16	4.28	1452.5	36			56		
17	4.57	1315.3	37			57		
18	4.86	1202.9	38			58		
19	5.14	1116.3	39			59		
20	5.43	977.9	40			60		

Md. 103-H
6 Hr. Point Design Hydrograph

12/29/58
LWS.

one sq. ft. = 52.6 cc. ft.



HYDROGRAPH COMPUTATION
2.5 x 6 Hr. Point Design Hydrograph

WATERSHED OR PROJECT Little Yak Md. 403-H STATE Maryland

STRUCTURE SITE OR SUBAREA Site No. 7

DR. AREA 2.3 SQ. MI. T_c 1.11 HR. RUNOFF CONDITION NO. II

RUNOFF CURVE NO. 72 STORM DISTRIB. CURVE B HYDROGRAPH FAMILY NO. 1

STORM DURATION 6 HR. RAINFALL: POINT 27.0 IN. AREAL 25.11 IN.

Q 21.0 IN. COMPUTED T_p 0.777 HR. T_p 5.57 HR.

$(T_p + T_c)$: COMPUTED 7.17 : USED 6 REVISED T_p 0.928

$Q_p = \frac{484 A}{REV. T_p} = \frac{1199.6}{0.928} = 1292$ CFS. $Q_{90} = 25,192$ CFS.

$(COLUMN) = (1/T_p) REV. T_p$ $(COLUMN) = (4c/A) Q_p$

LINE NO.	t HOURS	q CFS	LINE NO.	t HOURS	q CFS	LINE NO.	t HOURS	q CFS
1	0	0	21	8.17	126	41	$\Delta t = 0.392$	
2	0.41	76	22	8.57	76	42	$\Sigma q = 77668$	
3	0.82	327	23	8.98	50	43		
4	1.22	1033	24	9.39	25	44	$Q = \frac{\Delta t \Sigma q}{645A}$	
5	1.63	2116	25	9.80	0	45		
6	2.04	4434	26			46	$Q = 20.5$ in.	
7	2.45	9724	27			47		
8	2.86	12520	28			48		
9	3.27	10833	29			49		
10	3.67	8439	30			50		
11	4.08	6500	31			51		
12	4.49	5089	32			52		
13	4.90	4132	33			53		
14	5.31	3502	34			54		
15	5.72	3124	35			55		
16	6.12	2519	36			56		
17	6.53	1512	37			57		
18	6.94	891	38			58		
19	7.35	453	39			59		
20	7.76	227	40			60		

1/d. 403-H
2.5 x 6 7/8 Point Design Hydrograph

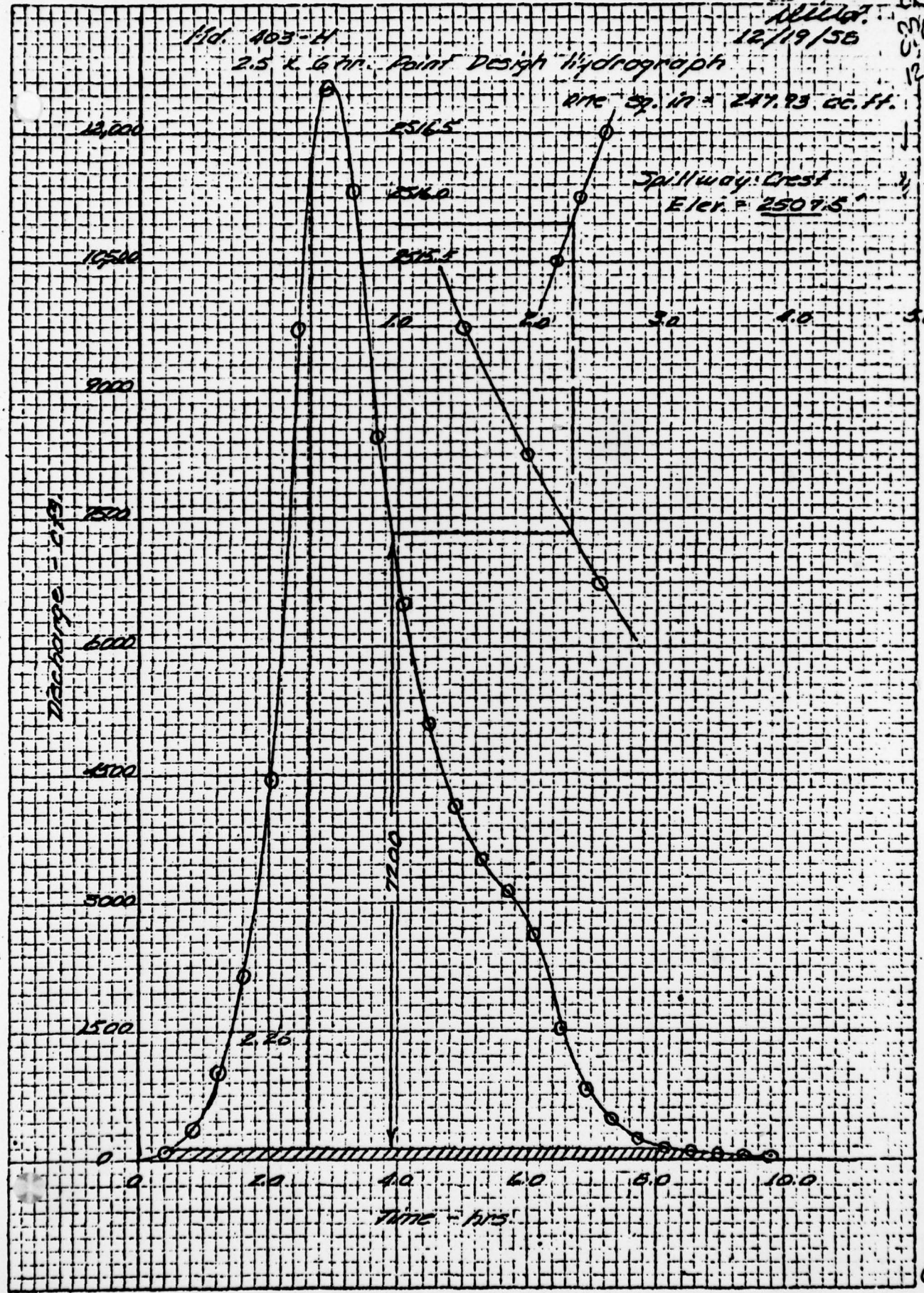
12/19/58

OK
12/29/58

Area sq. in = 247.93 cc. ft.

Spillway Crest
Elev. = 2507.5'

Discharge - cfs



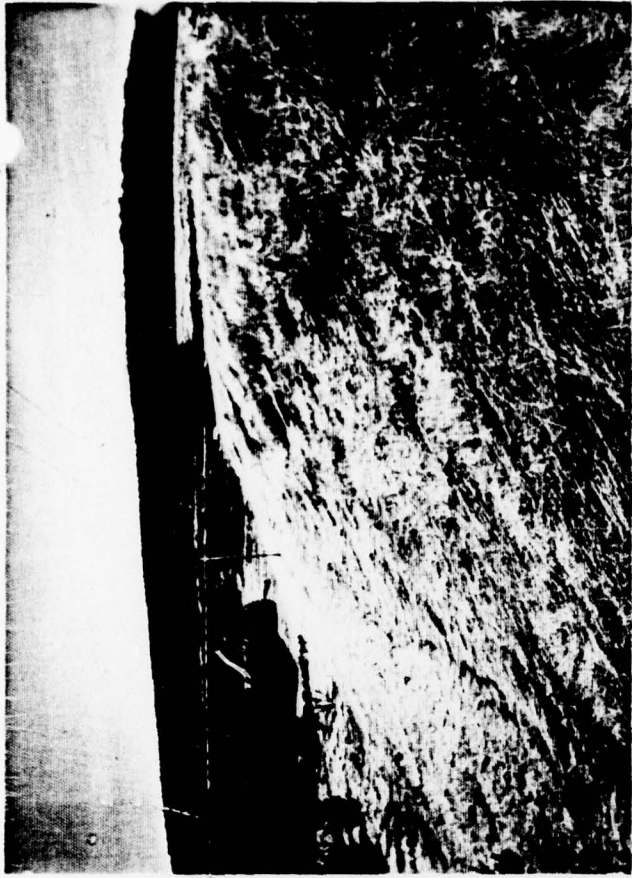
APPENDIX D
PHOTOGRAPHS

PHOTOGRAPH 1 View of upstream embankment slope and emergency spillway inlet in background.

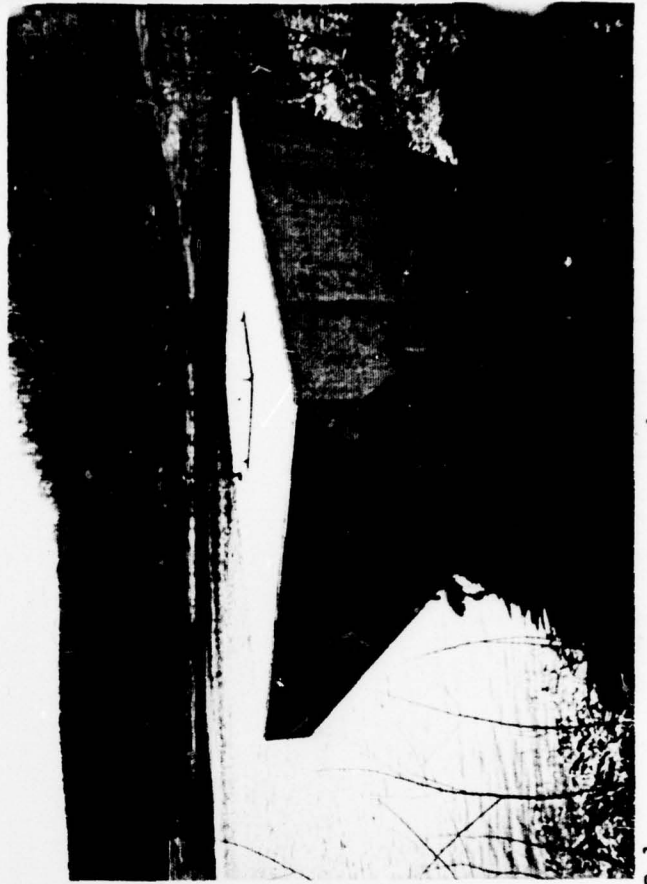
PHOTOGRAPH 2 View of downstream embankment slope.

PHOTOGRAPH 3 Overview of principal spillway riser and reservoir.

PHOTOGRAPH 4 Close up view of principal spillway riser.



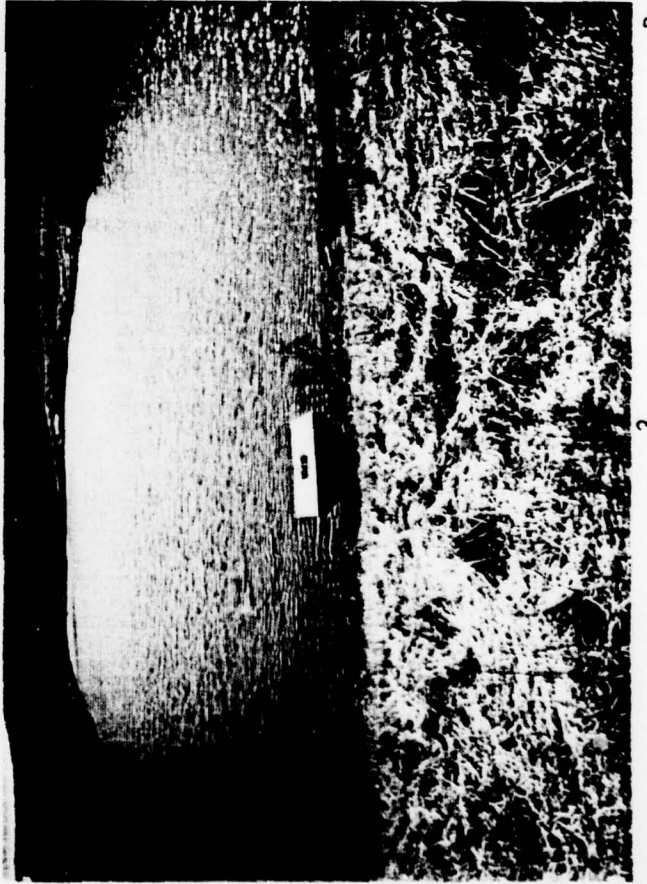
2



4



1



3

PHOTOGRAPH 5 Overview of downstream emergency spillway channel.

PHOTOGRAPH 6 Overview of plunge pool, bank erosion, and deposited earth mound in stream channel.

PHOTOGRAPH 7 View of seepage toe drains and outlet discharge pipe..

PHOTOGRAPH 8 View of homes located adjacent to downstream channel.



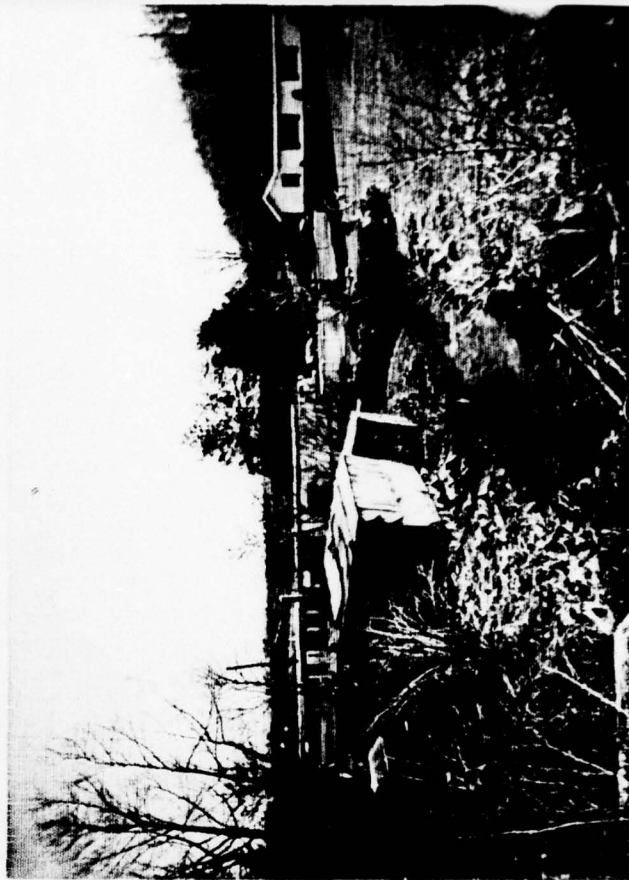
5



6

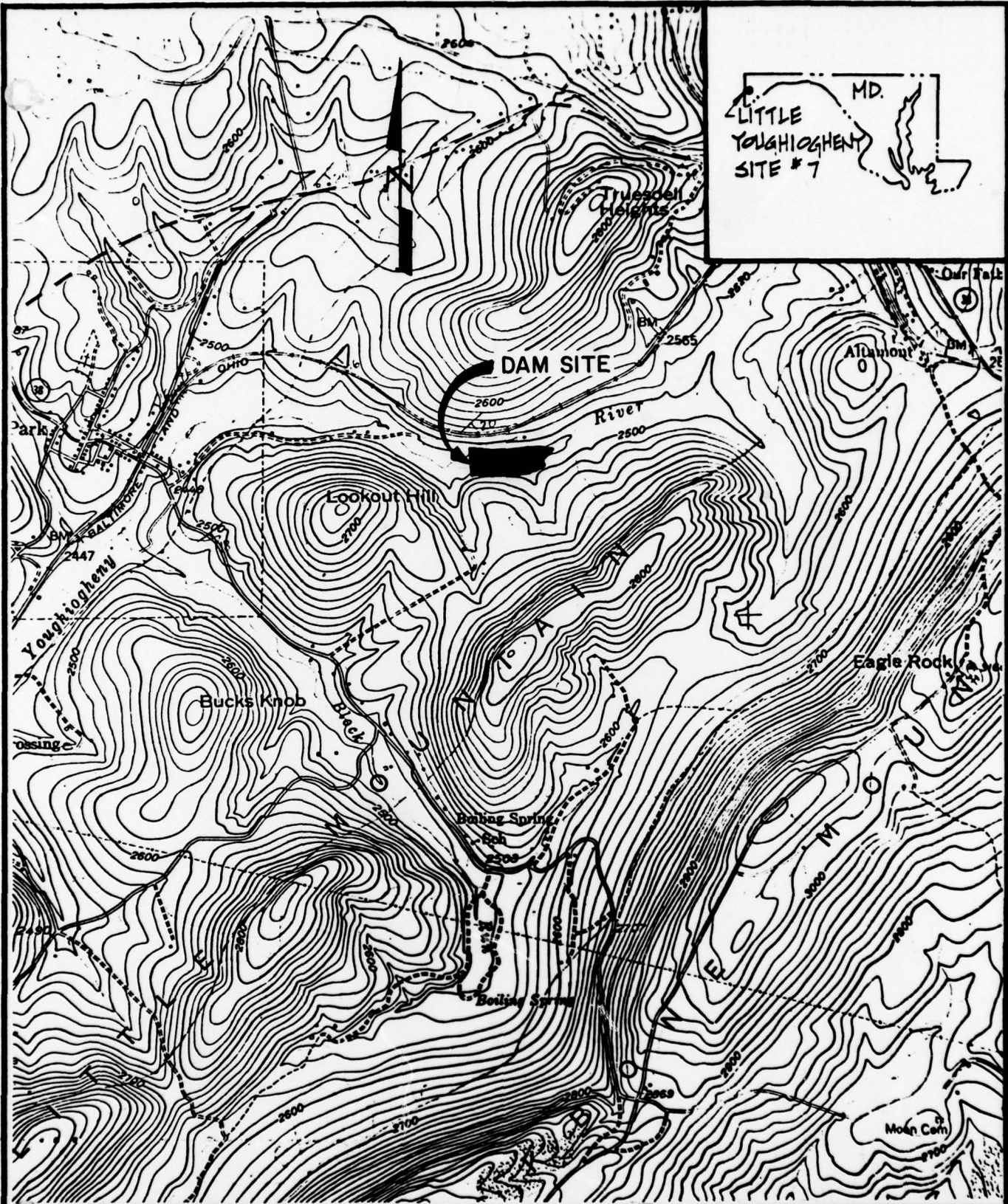


7



8

APPENDIX E
REGIONAL LOCATION PLAN



DATE: MAY 30, 1979

SCALE: 1:24000

DR: JLM CK: TED

DWG. NO. E1

NATIONAL DAM INSPECTION PROGRAM

ACKENHEIL & ASSOCIATES
CONSULTING ENGINEERS
BALTIMORE, MD.

LOCATION PLAN
OF LITTLE
YOUGHIOGHENY
SITE # 7

APPENDIX F
REGIONAL GEOLOGY

LITTLE YOUGHIOGHENY RIVER DAM SITE NO. 7
NDI I.D. NO. MD 32
REGIONAL GEOLOGY

Little Youghiogheny Site No. 7 is situated in the Allegheny Plateau Physiographic Province. The predominant macrostructure of the region is the northeast trending Deer Park Anticline which extends through eastern Garrett County into Pennsylvania.

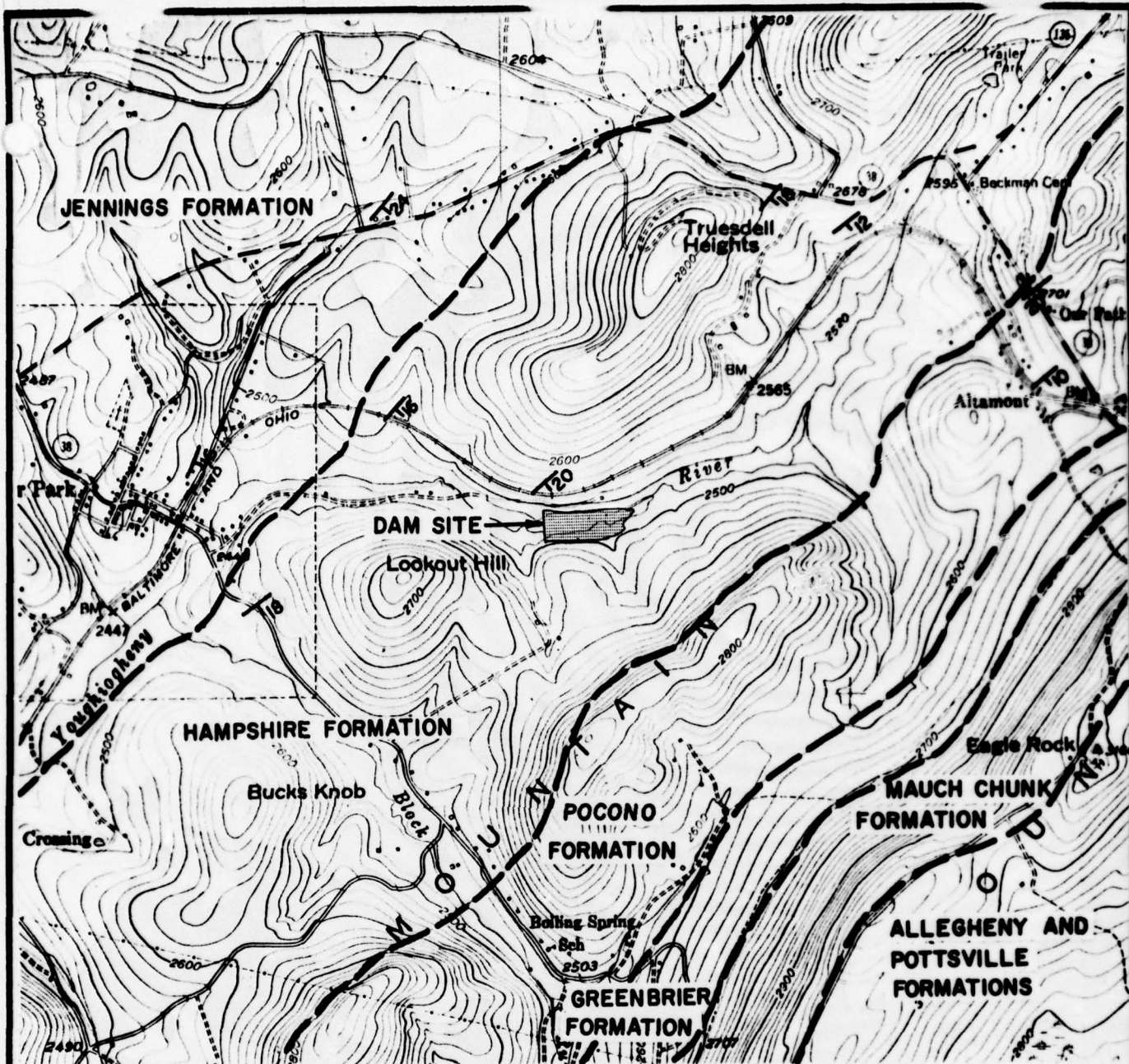
The dam site is located on the eastern flank of the Deer Park Anticline within the Hampshire Formation and is located approximately 0.45 miles west of the Pocono Formation contact and 0.55 miles east of the Jennings Formation contact. Interbedded marine shales, sandstones, and siltstones predominately comprise the Jennings Formation. The Pocono Formation consists of strongly cross-bedded sandstone interbedded with siltstones and shales. Upper Devonian Hampshire Formation bedrock consists of non-marine sandstone alternating with thick beds of red shale, and occasionally thin beds of green shale. This formation is exposed in a belt 1-2 miles wide, on the eastern and western flanks of the Deer Park Anticline.

Bedding at the dam site strikes approximately N 40° E and dips approximately 20° SE. The bedding strikes the axis of the dam at approximately a 35° angle.

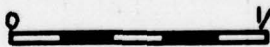
No joints or faults were reported in Maddock's 1959 Geology report of the site, although sandstone beds immediately beneath the soil mantle are badly fractured. Moderate seepage was reportedly observed emanating from the soft sandy clay layers of the valley floor, as evidenced in test pit excavations.

References

- Maryland Geological Survey, 1953, reprinted 1965, Geologic Map of Garrett County.
- Maryland Geological Survey, revised 1961, reprinted 1966, Bulletin 19, Geography and Geology of Maryland.
- Maddock, Stephen J., 1959, Geology Report of Little Youghiogheny River Watershed Reservoir No. 7.



DEER PARK QUADRANGLE, GARRETT COUNTY, MARYLAND

SCALE:  1/2 MILE 1: 24000

CONTOUR INTERVAL 20 FT. DATUM IS MEAN SEA LEVEL

——— FORMATIONAL CONTACT

 STRIKE AND DIP

DATA OBTAINED FROM MARYLAND GEOLOGICAL SURVEY'S GEOLOGIC MAP OF GARRETT COUNTY, 1953 REPRINTED 1965

DATE: MAY 30, 1979	NATIONAL DAM INSPECTION PROGRAM	SITE GEOLOGY OF LITTLE YOUGHIOGHENY SITE #7
SCALE: AS SHOWN		
DR: JLM CK: TED	ACKENHEIL & ASSOCIATES CONSULTING ENGINEERS BALTIMORE, MD.	
DWG. NO. F2		