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NATIONAL DAM INSPECTION PROGRAM. WYE MILLS DAM, (NDI-NUMBER-MD---ETC(U)
MAY 79

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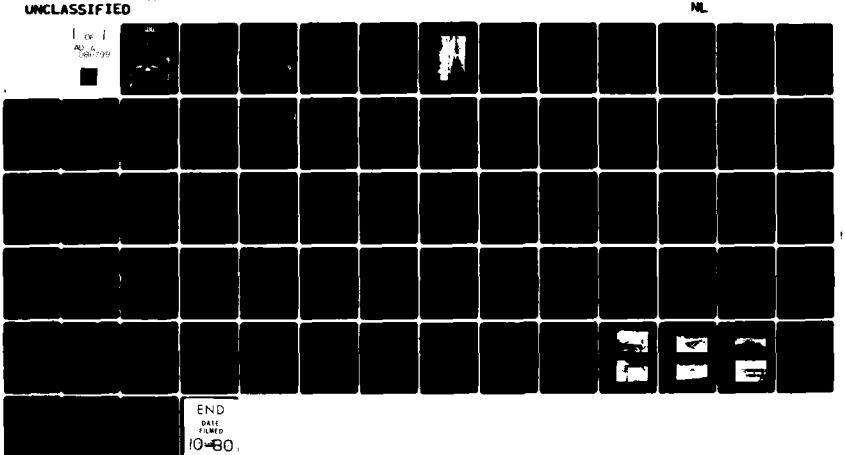

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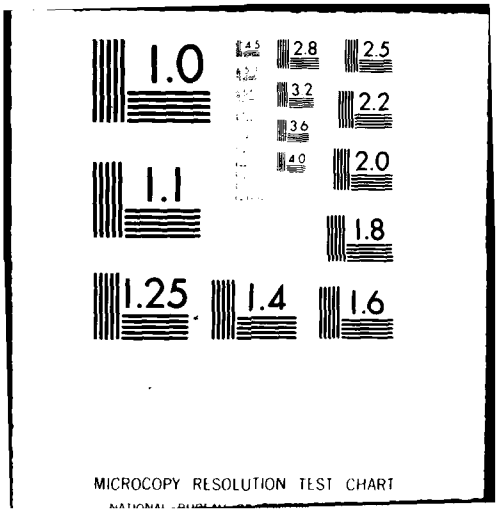
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LEVEL II

AD A088269

UPPER CHESAPEAKE BAY BASIN

WYE EAST RIVER, QUEEN ANNES COUNTY

MARYLAND

WYE MILLS DAM

NDI NO. MD00029

PHASE 1 INSPECTION REPORT

NATIONAL DAM INSPECTION PROGRAM

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

Prepared By: Maryland Water Resources Administration

MAY 1979

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UPPER CHESAPEAKE BAY BASIN

WYE MILLS DAM,
QUEEN ANNES COUNTY, MARYLAND
(NDI-MD-MD - 00029)

PHASE I INSPECTION REPORT,
~~NATIONAL~~ DAM ~~SAFETY PROGRAM~~

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

Prepared by: WATER RESOURCES ADMINISTRATION
Department of Natural Resources
Tawes Building
Annapolis, Maryland 21401

Date: May 1979

memo of understanding between State of Md. and Corps.

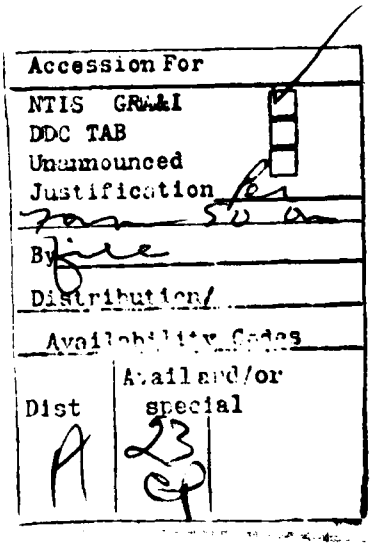
PREFACE

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

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

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

Phase I Inspections are not intended to provide detailed hydrologic and hydraulic analyses. In accordance with the established guidelines, the spillway design flood is based on the estimated "Probable Maximum Flood" 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.



PHASE I INSPECTION REPORT

NATIONAL DAM INSPECTION PROGRAM

NAME OF DAM: Wye Mills Dam
STATE: Maryland
COUNTY: Queen Annes
STREAM: Wye East River
DATE OF INSPECTION: March 26, 1979

ASSESSMENT: Based on the evaluation of the conditions as they existed on the date of the inspection and as revealed by visual observations, the condition of Wye Mills Dam is assessed to be good.

The spillway capacity (95 per cent PMF) is classified as inadequate because it will not pass the recommended spillway design flood of full Probable Maximum Flood (PMF) according to the recommended criteria. However, it is believed that the dam will safely pass PMF without endangering life and property and, therefore, additional detailed hydrologic studies are not warranted.

Operation and maintenance procedures are unwritten and should be documented. A formal warning system should be implemented to alert downstream areas the event of emergencies.

SUBMITTED BY: WATER RESOURCES ADMINISTRATION
DAM SAFETY DIVISION

Date

APPROVED BY:

24 June 1979
Date

G. K. WITHERS
Colonel, Corps of Engineers
District Engineer

Wye Mills Dam MD 00029

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APPENDICES

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM
WYE MILLS DAM
NDI NO. MD 00029

SECTION I
PROJECT INFORMATION

1.1 General

a. Authority. The inspection 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 inspection is to determine if the dam constitutes a hazard to human life or property.

1.2 Description of Project

a. Dam and Appurtenances. The Wye Mills Dam consists of an earth fill embankment with a timber sheet core approximately 26 feet high and 832 feet long. Twin concrete box culverts 12 feet by 13 feet connect to a "U-shaped" concrete ogee spillway 107 feet long near the right abutment of the dam. Downstream the twin box culverts discharge to a 197 foot long channel 14 feet wide which carries flow under MD Route 404. The upstream and downstream dam embankment slopes rise at a rate of 3H:1V with a top width of 10 feet. The upstream face of the embankment consists of concrete slab protection from 10.87 feet above MSL to 20.5 feet above MSL, 1.5 feet below the top of the dam. The ogee type spillway has a crest elevation of 14.29 feet or 7.71 feet below the top of the dam, which is at elevation 22.00. The foundation base extends approximately 4 feet below MSL.

b. Location. The Wye Mills Dam is located on the Wye East River dividing Talbot and Queen Annes Counties in the town of Wye Mills, Maryland. The structure is less than .25 miles from tidal influences of the Wye East River.

c. Size Classification. The maximum height of the dam is 24 feet. The reservoir volume to the top of the dam at elevation 22.00 is 1224 acre-feet. Therefore, the dam is in the "intermediate" size category.

d. Hazard Classification. Loss of life and property would likely result from a failure of the dam. Also loss of State Road #404 would likely result. Based on the above, the dam is classified in the high hazard category.

e. Ownership. The Wye Mills Dam is owned by the State of Maryland, Department of Natural Resources, Annapolis, Maryland 21401.

f. Purpose of Dam. The primary purpose of the dam is to provide a reservoir for recreation. The Old Wye Mill is put into operation annually during the summer months.

g. Design and Construction History. The present structure is located at the site of old mill dams dating back to the late 1600's. In 1953, the State of Maryland acquired the dam and lake. A breaching occurred, probably as a result of Hurricane Connie in 1955. As a result, the Maryland Game and Inland Fish Commission and their consultant, Mr. Thomas F. Comber, designed a new dam at the same location with construction beginning on October 21, 1957. Construction was completed by the William Dunn Construtction Company on May 16, 1958.

h. Normal Operating Procedures. No formal operating procedures exist

1.3 Pertinent Data

a. Drainage Area The Wye Mills Reservoir has a drainage area of 10.21 square miles.

b. Discharge at Dam Site The maximum discharge at the dam site through the ungated spillway at elevation 14.29 is 4930 cubic feet/sec. The maximum flood at the dam site is unknown.

c. Elevation (feet above mean sea level)

Top of dam -	22.00
Spillway Crest -	14.29
Normal Tailwater -	4.0
Streambed at centerline of dam -	2.0

d. Reservoir

Length of maximum pool -	1.5 miles
Length of recreation pool -	0.95 miles

e. Storage (acre-feet)

Normal pool -	302 acre ft. at elevation 14.2
Top of dam -	1224 acre ft. at 22.00

f. Reservoir Surface (acres)

Top of dam -	168.8 acres
Normal pool -	61.5 acres

g. Dam

Type -	Earthfill
Length (feet) -	832
Height (feet) -	24
Top width (feet) -	10
Side Slopes -	
Upstream and Downstream:	3H:IV
Impervious core - Wakefield sheeting top elevation -	17.0
Cutoff - Sheeting extends to elevation -	7.5

h. Diversion and Regulating Tunnel - None

i. Spillway

Type -	Concrete ogee, U-Shaped
Length of weir (feet) -	107
Crest elevation (feet M.S.L.) -	14.29
Gates -	None

Downstream channel - Ogee connected to a twin 13 x 12 foot high 90 foot long reinforced concrete box culvert which discharges to an excavated channel, 197 feet long.

j. Regulating Outlets - Two 24" Armco Slide Gates, Model 20-10C Style B stems; one located in ogee (drain), invert elevation 2.0; one located near the left side of the dam, upstream face (mill headrace), invert elevation 11.5.

SECTION 2
ENGINEERING DATA

2.1 Design:

a. Data Available. The present Wye Mills Dam was designed during 1956 and constructed in 1957. This structure encompassed an earlier earthen embankment and impoundment which supplied a mill race for the historic Wye Mill dating to the middle 17th century. In all probability, engineering data was never generated for the earlier dam and none was found during the data review for this report.

Design plans including limited subsurface data, structural computations, specifications, special provisions, and a final report were prepared for the present dam configuration. The plans are presented in Appendix "C", and the remaining data is available in the files of the Maryland Department of Natural Resources, Water Resources Administration. The only hydrologic and hydraulic information consists of the design high water of 2.8 feet above spillway crest used in the structural calculations.

b. Design Features.

1. Embankment - The construction drawings indicate the embankment to consist of rolled earth fill with 3H:IV upstream and downstream slope configurations. The project specifications require the fill material to be A-1, (clean sand), A-2 (sand and fines), and/or A-3 (sand) classified in accordance with Maryland State Roads Commission Specifications. The embankment was to be placed in lifts not exceeding 6 inches in compacted thickness, rolled with a 1000 pound minimum sheeps foot roller for at least 6 passes, and compacted to a dry density not less than 105 pounds per cubic foot as determined by A.A.S.H.O. Method of Test T-99.

A treated timber sheetpile cutoff wall, designated as Wakefield Sheeting, was to be provided along the centerline of the dam from the left to right abutments. According to the subsurface explorations and the design drawings, the core wall was to extend from design high water at el. 17 to levels corresponding to a clay layer between el. +2.5 and el. -7.5. The dam embankment was to be constructed to el. 17 before the sheet piles were driven. The final tip elevations were to be determined in the field during construction by the Engineer.

Slope protection consisting of concrete panels, six inches in thickness, was to be placed on the upstream face of the embankment. The protection was shown to extend from el. 20.5 to approximately el. 11. The contractor was given the option of installing either 30-inch square precast blocks or 36-inch square cast-in-place blocks. The bases of the concrete blocks at el. 11 bear against tongue and groove sheetpiling, 8 feet in length, driven along a narrow bench on the upstream embankment.

2. Appurtenant Structures - The overflow spillway consists of a "U" shaped reinforced concrete ogee weir located at the right side of the dam with the crest level designed to be at el. 14.29. The bottom of the base slab was not specified on the drawings, but the designers intention was to support the structure on stiff clay. The final foundation level was to be determined during construction by the engineer.

A drain opening, 24 inches in diameter and fitted with an Armco slide gate on the upstream side, was to be provided through the right side of the spillway with invert at el. +2.0.

Flow over the spillway is carried through the embankment by a reinforced concrete twin cell box culvert, each cell measuring 12 feet high by 13 feet wide with wall thicknesses of 1.2 feet. The embankment at the outfall of the box culvert is retained by reinforced concrete walls, 14 feet in maximum height, with a wall thickness of 1.2 feet. Foundation levels for the box culvert and retaining walls were to be determined by the Engineer during construction. All masonry joints were designed to be waterproofed with copper flashing and/or membrane waterproofing on the inundated/backfill side and all construction joints are shown on the drawings to be keyed within the spillway, box culvert, and retaining wall structures.

An inlet structure was provided on the left side of the embankment to supply an existing concrete raceway for the Wye Mill. This structure consists of a 24 inch extra strength reinforced concrete pipe which is positioned on the upstream embankment slope with an inlet invert at +11.5, extends through the embankment at a 1.75% grade, and outfalls at a concrete headwall at the raceway. The inlet is encased in a concrete headwall and is provided with an Armco slide gate to regulate flow to the mill. Openings in the Wakefield sheeting cut-off wall for the 24-inch pipe and around the perimeter of the box culvert are provided with copper water stops and bituminous waterproofing.

c. Design Data

1. Hydrology and Hydraulics - The only data available consists of the design high water level of 2.8 feet above spillway crest found in the structural computations.

2. Embankment - Data for embankment design is limited to that which appears on the construction drawings and contract documents. Subsurface data consisting of seventeen auger probes and three drive tests were obtained for the project, but no geotechnical interpretation of the data relative to foundations, seepage potential, slope stability, or availability of suitable embankment materials was found during the data review. The drive tests were performed by driving a three-quarter inch pipe, 20 feet in length with a 12 pound maul through the embankment when the fill had reached el. 17. The numbers of blows per foot were recorded and were apparently used as an indication of the penetration resistance for the Wakefield sheeting core wall.

3. Appurtenant Structures - Structural analyses for the overflow spillway, the box culvert, and the retaining wall were available in the DNR files. The anaylsis of the spillway was concerned primarily with resistance to uplift and computation of internal stresses through various sections of the base slab for reinforcing steel proportioning. A summary of the results of these computations appears on SHEET 4 of the contract drawings and were derived with the following assumptions:

1. The weir and slab structure was analyzed as a unit for resistance to uplift.

2. Structural dead loads were computed for concrete with a density of 150 pounds per cubic foot.

3. Full uplift of 955 pounds per square foot acted upon the base.

4. Case I considers a total horizontal water (design high water) and silt load of 383 kips and a vertical dead, water and silt load of 2,085 kips.

5. Case II considers a total horizontal water (normal pool), silt and ice load of 579 kips and the same vertical load as Case I.

Case II was considered by the designer to be the critical loading condition and reinforcing steel design was based upon this assumption. Moments for reinforcing steel content in the base slab, as contained in the design computations, were apparently computed utilizing an uplift pressure distribution of 100 per cent hydrostatic pressure (normal pool) at the heel and zero at the toe. The sections through the base which were analyzed were located at the toe of the ogee weir and at the centerline of the weir-slab structure.

The box culvert was designed for the dead load of structure based upon a concrete unit weight of 150 pounds per cubic foot, earth pressure computed from an equivalent fluid load of 35 pounds per cubic foot, and live load from an H-20-44 truck. Hydrostatic pressure was not considered in the design. The retaining walls on either side of the box culvert outfall were designed for an earth pressure derived from an equivalent fluid loading of 35 pounds per cubic foot and hydrostatic pressure for seven feet of groundwater behind the wall. All reinforced concrete design for the spillway, box culvert and retaining walls was based upon the working stress method with steel strength equal to 18 ksi and concrete strength of 3000 psi (Class A concrete). All materials were assumed to conform to Maryland State Roads Specifications.

2.2 Construction. The construction data available consist of the contract drawings and specifications, special provisions and final report. The final report is very general in nature and addresses primarily the final financial status of the project. Brief references infer that the contractor was William Dunn of Denton, Maryland, the project was completed on May 16, 1958, the consulting engineer was Thomas F. Comber, and the inspection services were provided by the Maryland Game and Inland Fish Commission and the Engineering Branch of the Federal Aid Division of the U.S. Fish and Wildlife Service. Periodic construction reports, material quality control tests, and other information which may have been pertinent to construction were not found. With the exception of foundation levels for the appurtenant structures and cut off wall which were to be determined in the field, the contract drawings appear to accurately depict the completed project.

2.3 Operation. Formal operating records have not been maintained. The only known operational procedures at the dam are seasonal use of the inlet valve for the mill raceway.

2.4 Evaluation:

a. Availability. Construction drawings, contract specifications and special provisions, structural computations for appurtenant structures, and a final report constitute the design information. This information is available in the files of the State of Maryland Department of Natural Resources.

b. Adequacy.

1. Hydrology and Hydraulics - The only reference to hydrologic and hydraulic design data is the design highwater of 2.8 feet above the spillway crest which by itself is not considered adequate to access spillway adequacy. Refer to Section 5, Hydrology and Hydraulics and Appendix D for complete discussion.

2. Embankment - The construction documents and design data address the embankment configuration only. Although subsurface data was obtained, no interpretation of the data relative to soil strengths, foundation capacities, slope stability or seepage potential was performed. The provision for a treated timber core wall extending to impervious clay might ordinarily lessen the need for a detailed seepage analysis, but the as-built tip elevations of the timber sheet piles are not available. The only references to the density of the completed embankment are the results of the "drive test" which are highly variable and non-standard methods of test.

3. Appurtenant Structures - The construction drawings and specifications appear to adequately address the structural detailing for the reinforced concrete spillway, box culvert, and retaining walls. Some elements of the design procedure considered standard for dam analysis are not present in the design computations for this project. Sliding along the foundation and overturning of the ogee spillway are not directly addressed.

The resultant of forces for the weir-slab unit is shown on the plans to fall within the middle third of the slab area precluding overturning of the spillway as a unit. However, the resultant falls outside the limits of the ogee section and tension appears to exist at the heel of weir at the joint with the slab. Although apparent vertical tension reinforcing steel has been provided between the slab and weir at the heel, no stress analysis or steel content design was available for review. The ogee section was not analysed for uplift and sliding along this joint nor along a joint 6.7 feet above the top of slab. The structure was also not evaluated for an empty condition.

With the exception that hydrostatic loading was not included in the box culvert design, the structural computations for the culvert and retaining walls appear complete and in accordance with accepted engineering practice. The earth loading for these structures apparently utilized active pressure theory with a soil unit weight of 120 pounds per cubic foot and ϕ equal to 33 degrees, values well suited to the compacted sand backfill specified in the contract documents.

c. Operating Records. There are no formal operating records for review.

d. Post Construction Changes. The downstream channel, subsequent to completion of the dam in 1958, was lined along the banks with treated timber sheetpiling from the end of the retaining walls at the culvert outlet of the dam to the culvert for Maryland Route 404, approximately 180 feet downstream. No drawings, specifications or design analyses were available for this feature.

e. Seismic Stability. The dam is located within Seismic Zone 1 and static stability with normal safety factors should be sufficient to withstand minor earthquake induced dynamic forces. No calculations or studies have been made to confirm this opinion.

SECTION 3
VISUAL INSPECTION

3.1 Findings

a. General. The dam and its appurtenant structures were found to be in good overall condition at the time of the inspection, March 26, 1979. The complete visual inspection check list is presented in Appendix A.

b. Dam.

1. There is no cracking, sloughing or other appreciable movement in the embankment.

2. The vertical alignment is good with no evidence of settlement.

3. Erosion exists on the downstream face, right of the overflow spillway, and has been aggravated by foot traffic. Sparse vegetation exists on the embankment crest in the vicinity of the spillway.

4. The concrete overflow spillway and twin concrete box culvert are in excellent condition with no cracks, spalling or movement noted. Expansion joint material at the top of both downstream wingwalls of the box is missing.

5. Upstream concrete slope protection is in excellent condition.

6. A wet area exists downstream of the toe, left of the discharge area.

c. Appurtenant Structure.

1. The staff gauge on the left side of the spillway backwall is dislodged.

2. Concrete slope protection panels behind the timber sheet piling on the right side of the discharge channel have been undermined and have collapsed.

3. The 24" drain gate in the overflow spillway was inaccessible, no steam could be located, and operating personnel stated that divers were last used in 1966 to lower the pool.

4. The 24" gate which operates the mill race appears to be well maintained and is operated regularly.

d. Reservoir Area. The reservoir slopes are steep to moderate sloping and are well vegetated and wooded. Sedimentation was evident at the upper end of the pool as viewed from U.S. Route 50.

e. Downstream Channel. The outlet channel and stream channel is free of debris to the tidal influence. The overbank areas showed heavy deposits of sand and woody debris from recent flooding. In the event of a dam failure, a few homes, offices of the owner and a general store/post office may be inundated. The Maryland Route 404 bridge would also be inundated. The potential for loss of more than a few lives exists. Therefore, a hazard category of "high" appears appropriate for this dam.

3.2 Evaluation.

a. Dam.

1. With the exception of the inoperable drain gate, the dam and spillway appear in excellent condition.

2. While a wet area exists downstream of the toe, left of the discharge channel, it is believed to be as a result of poor surface drainage.

3. Collapse of the concrete panels adjacent to the timber sheet piling on the right side of the discharge channel appears to have resulted from flood flows returning to the channel from the overbank area. No adverse effect on the dam is envisioned due to a distance from the toe to the damaged area of approximately 180 feet.

SECTION 4
OPERATIONAL PROCEDURES

4.1 Procedure. The purpose of this State owned dam is to provide for recreational fishing. The normal pool is at elevation 14.3 and is controlled by the overflow spillway crest. The Inland Fisheries Division of the Maryland Wildlife Administration (Department of Natural Resources) has the responsibility for operation and maintenance of the structure. Students of the Chesapeake College operate the mill on behalf of the Society for the Preservation of Maryland Antiquities. Controlled discharges may be made by operation of the headrace gate (elevation 11.5). The drain gate (elevation 2.0) is presently thought to be inoperable.

4.2 Maintenance of the Dam. No specific maintenance program has been established. Present level of general maintenance appears adequate, with the exception of the inoperable drain valve.

4.3 Maintenance of Operating Facilities. The slide gate for the mill headrace is operated regularly during the summer months and periodically the remainder of the year. The drain gate is the only other operating feature of the dam and has not been exercised since 1966. The owner claims that operation of this gate would be desirable for winter pool drawdown for fishery conservation. Drain gate operation is also desirable for inspection and repair of the overflow spillway, concrete box culvert and discharge channel.

4.4 Warning System. There is no formal warning system in effect although field offices for the owner are at the dam. Additionally, during periods of heavy rainfall, the Maryland State Highway Administration assigns an observer to check and close, if necessary, the Route 404 bridge downstream.

4.5 Evaluation. The general operational procedures are satisfactory except that no formal warning system is in effect and maintenance procedures are unwritten.

SECTION 5
HYDRAULICS AND HYDROLOGY

5.1 Evaluation of Features

a. Design Data. The Wye Mills Dam has a watershed area of 10.21 square miles and impounds a reservoir with a surface area of approximately 60 acres. The overflow spillway is located near the right abutment and can safely discharge 4930 cfs. No hydrologic or hydraulic design data were available for the preparation of this report.

b. Experience Data. As previously stated, the Wye Mills Dam is classified as an intermediate size dam in the high hazard category. Under the recommended criteria for evaluating emergency spillway discharge capacity, such structures are required to pass the Probable Maximum Flood (PMF). The maximum flood at the dam site is unknown.

The PMF inflow hydrograph for the reservoir was determined utilizing the Dam Safey Version of the HEC-I computer program developed by the Hydrologic Engineering Center of the Corps of Engineers. The peak of the PMF inflow hydrograph is 6139 cfs. The input data and results of the program are presented in Appendix D.

c. Visual Observations. On the date of the inspection, no conditions were observed that would indicate that the spillway of the dam could not operate satisfactorily in the event of a flood.

d. Overtopping Potential. Various percentages of the PMF inflow hydrograph were routed through the reservoir to determine the percentage of PMF inflow that the dam can pass without significantly overtopping the embankment and causing breaching of the dam. The analyses indicate that the spillway can pass 95 percent of the PMF without overtopping. Full PMF would overtop the embankment by a maximum of 0.30 foot for a total duration of overtopping of 4.50 hours. It is believed that this overtopping would cause some erosion on the embankment; however, total failure is considered unlikely.

e. Spillway Adequacy. Since the spillway cannot pass PMF without overtopping, the spillway is judged to be inadequate.

SECTION 6
STRUCTURAL STABILITY

6.1 Evaluation of Structural Stability:

a. Visual Observations. No visible signs of appreciable movements, distress, or deterioration were detected in the earthen embankment or appurtenant structures. Minor ponded water was noted at the toe of the slope near the center of the dam, but this condition is judged to be the result of poor surface drainage. No indications of active seepage through the embankment were found. A portion of the treated timber sheeting which lines the banks of the downstream channel had been undermined and was partially collapsed. This condition however, does not affect the stability of the dam.

b. Design and Construction Data:

1. Embankment - Stability problems within the earthen embankment of Wye Mills Dam are considered unlikely due to the specification for compacted granular fill material placed at a 3 horizontal to 1 vertical slope configuration. The timber sheeting core wall, as designed, should adequately control seepage. Although documented foundation treatment and levels were not available for review, the good visual alignment of the crest and slopes suggests that competent foundation levels were attained. The geology report presented in Appendix F, indicates that competent materials for foundations and termination of sheet pile cut off walls were available within the anticipated construction levels of the project. Although accurate assessment of embankment performance is not possible for the slight overtopping condition during PMF, total failure is considered unlikely due to the presence of the embedded sheet pile cut off wall and an extremely high tailwater condition.

2. Appurtenant Structures - Although some deficiencies were noted in the design computations, the good detailing on the plans and the excellent performance of the reinforced concrete elements suggest that structures competent to withstand normal operating loads were achieved. Although final foundation levels are unknown, the lack of any visible differential movement and cracking indicates that competent bearing material was reached during construction. The stability of the spillway during PMF loading is considered adequate due to a severe tailwater condition by which the weir will be completely submerged with equal water pressure on both upstream and downstream sides.

c. Operating Procedures. Detailed operating procedures were unavailable for review and factors which might affect stability could therefore not be assessed.

d. Post Construction Changes. There exists no known changes or alterations to the facility which might adversely affect the stability of the dam (Ref. Section 2.4.d.).

e. Seismic Stability. Wye Mills Dam is located within seismic zone 1 and seismic stability is judged to be adequate based upon observed static stability. No computations have been made to confirm static stability.

SECTION 7
ASSESSMENT, REMEDIAL MEASURES AND RECOMMENDATIONS

7.1 Dam Assessment:

a. Safety. Based upon visual inspection and review of design and construction data, the Wye Mills Dam appears to be in good condition. Preliminary hydrologic and hydraulic analyses indicate the overflow spillway is capable of passing 95 per cent of PMF before the dam is overtopped. Since the dam is not anticipated to fail completely nor significantly increase loss of life or property damage in the event of overtopping by PMF, the spillway is judged to be inadequate, but not seriously inadequate.

b. Adequacy of Information. The available information consists of construction drawings including limited subsurface explorations, structural computations, specifications, special provisions, and a final report. This data is generally adequate to assess the project.

c. Urgency. Although immediate action is not required at this time, the recommendations of this section should be implemented as soon as possible.

d. Necessity for Additional Studies. Although the spillway is inadequate to pass PMF without overtopping, the overtopping is not considered of sufficient magnitude or duration to cause failure of the dam and additional studies are not necessary at this time.

7.2 Remedial Measures and Recommendations:

a. Structures and Appurtenances.

1. Inspect and repair the 24 inch drain in the overflow spillway as necessary.

2. Repair and stabilize the timber sheet pile lining of the downstream channel.

3. Re-vegetate foot paths on downstream face of embankment near box culvert and attempt to construct barriers or designated pathways removed from the embankment slopes.

4. Replace expansion joint material in concrete structures as necessary.

5. Replace staff gauge on spillway.

b. Operation and Maintenance Procedures.

1. Document operating procedures in writing.

2. A warning system should be developed to warn downstream residences of large spillway discharges, during periods of heavy rainfall or runoff or failure of the dam.

APPENDIX A

CHECK LIST - VISUAL INSPECTION, SITE SKETCH, PHASE I

Check List
Visual Inspection
Phase I

Name of Dam Wye Mills County Queen Annes State Maryland ID# MD. 00029

Type of Dam RE, Earth Hazard Category I

Date(s) of Inspection March 26, 1979 Weather Clear Temperature 45°F

Pool Elevation at Time of Inspection 14.3 M.S.L. Tailwater 4.1 M.S.L.

Inspection Personnel:

Jeff Smith

Douglas Moore

Tom Moynahan

Douglas Moore ,Recorder

EMBANKMENT

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SURFACE CRACKS	NONE	
UNUSUAL MOVEMENT OR CRACKING AT OR BEYOND THE TOE	NONE	
SLOUGHING OR EROSION OF EMBANKMENT AND ABUTMENT SLOPES	Erosion (caused by foot traffic) vegetation	Rt. side of spillway Sparce in vicinity of spillway crest
VERTICAL AND HORIZONTAL ALIGNMENT OF THE CREST	Good	
RIPRAP FAILURES	No rip rap upstream, concrete slope protection, good.	

EMBANKMENT

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
JUNCTION OF EMBANKMENT AND ABUTMENT, SPILLWAY AND DAM	No erosion or movement noted.	
ANY NOTICEABLE SEEPAGE	Wet area beyond downstream toe leftside discharge channel result of poor surface drainage.	
STAFF GAGE AND RECORDER	Staff guage on left side spillway backwall dislodged	
DRAINS	No drains noted	

OUTLET WORKS

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CRACKING AND SPALLING OF CONCRETE SURFACES IN OUTLET CONDUIT		
INTAKE STRUCTURE		
OUTLET STRUCTURE	Twin box culvert carrying flow through embankment in good condition no cracks or movement noted expansion joint material at top of both downstream wingwalls is missing.	
OUTLET CHANNEL	Clear, right side concrete slope protection panels undermined and collapsed in vicinity of Rte. 404 bridge, bank erosion left side	Right side timber sheetpiling in good condition
EMERGENCY GATE	24" drain gate in operable, stem missing	

UNGATED SPILLWAY

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONCRETE WEIR	No spalling, good condition	
APPROACH CHANNEL		
DISCHARGE CHANNEL	See outlet channel, previous sheet	
BRIDGE AND PIERS		

INSTRUMENTATION

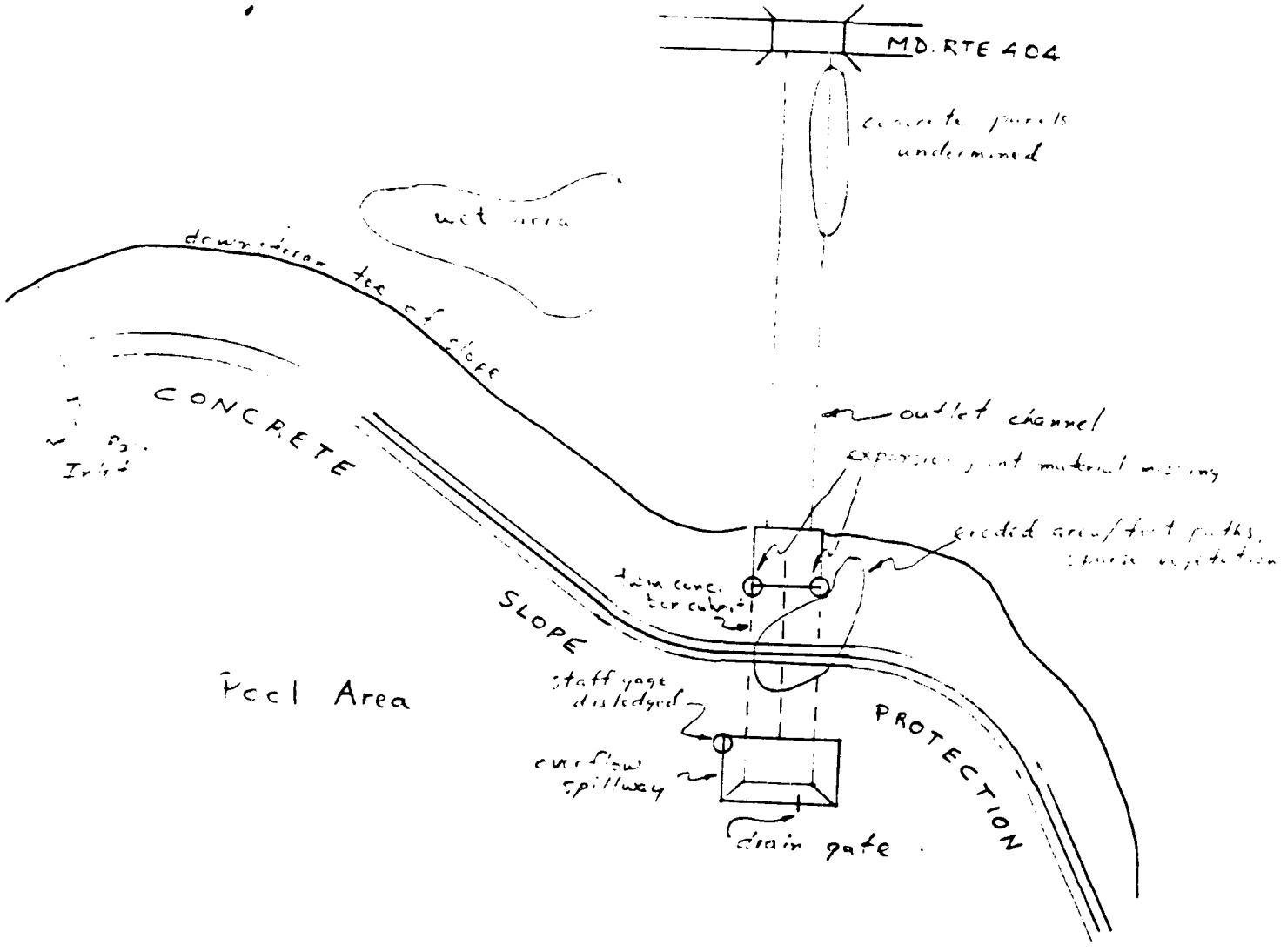
VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
MONUMENTATION/SURVEYS		
OBSERVATION WELLS	NONE	Domestic water supply well #QA-73-0715 located in embankment near left abutment
WEIRS	NONE	
PIEZOMETERS	NONE	
OTHER	Two State of Maryland Official Survey marks location at in take structure to Mill Race on concrete slope protection, and middle of spillway backwall.	

RESERVOIR

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SLOPES	Steep, heavily wooded slopes	
SEDIMENTATION	Some noted at upper end of pool as viewed from U.S. Rte. 50	

DOWNSTREAM CHANNEL

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONDITION (OBSTRUCTIONS, DEBRIS, ETC.)	Clear, much debris in overbank area	
SLOPES	Stable	
APPROXIMATE NO. OF HOMES AND POPULATION	Several, general store/post office Talbot County side	



WYE MILLS
SITE SKETCH

APPENDIX B

CHECK LIST - HYDROLOGIC AND HYDRAULIC ENGINEERING DATA

PHASE I

DAM NAME: ..ve Mills
ID # MD ..028

CHECK LIST
HYDROLOGIC AND HYDRAULIC
ENGINEERING DATA

DRAINAGE AREA CHARACTERISTICS: Sandy and silt loams, mild slopes, crop and woodland

ELEVATION TOP OF NORMAL POOL(STORAGE CAPACITY): 14.3 (302 Ac-ft)

ELEVATION TOP OF FLOOD CONTROL POOL(STORAGE CAPACITY):

ELEVATION MAXIMUM DESIGN POOL: 17.1 (571 Ac-ft)

ELEVATION TOP OF DAM: 22.0 (1224 Ac-ft)

CRESTS

a. Elevation 14.3
b. Type U - shaped ogee near right abutment
c. Width 29 ft. x 49 ft. x 29 ft.
d. Length
e. Location Spillover discharges through embankment via Twin 13x12 ft
f. Number and Type of Gates NONE high box culvert

OUTLET WORKS:

a. Type Normal discharges over ogee sections; appropriations to mill vi
b. Location 24" slide gate, left side of dam, at
c. Entrance Inverts inv. elevation 11.15
d. Exit Inverts
e. Emergency Drawdown Facilities 24" slide gate inv. 2.0 located in ogee section

HYDROMETEOROLOGICAL GAGES:

a. Type NONE
b. Location
c. Records

MAXIMUM NON-DAMAGING DISCHARGES: 4930 cfs, non-overtopping discharge
discharges exceeding approximately
1000 cfs damage 200 ft. outlet channel

ITEM	REMARKS
SPILLWAY PLAN	
SECTIONS	Design plans available
DETAILS	
OPERATING EQUIPMENT PLANS & DETAILS	2 ARMCO 24" slide gates Model 20-10C, Style B stem 1 for drawdown 1 for mill operation

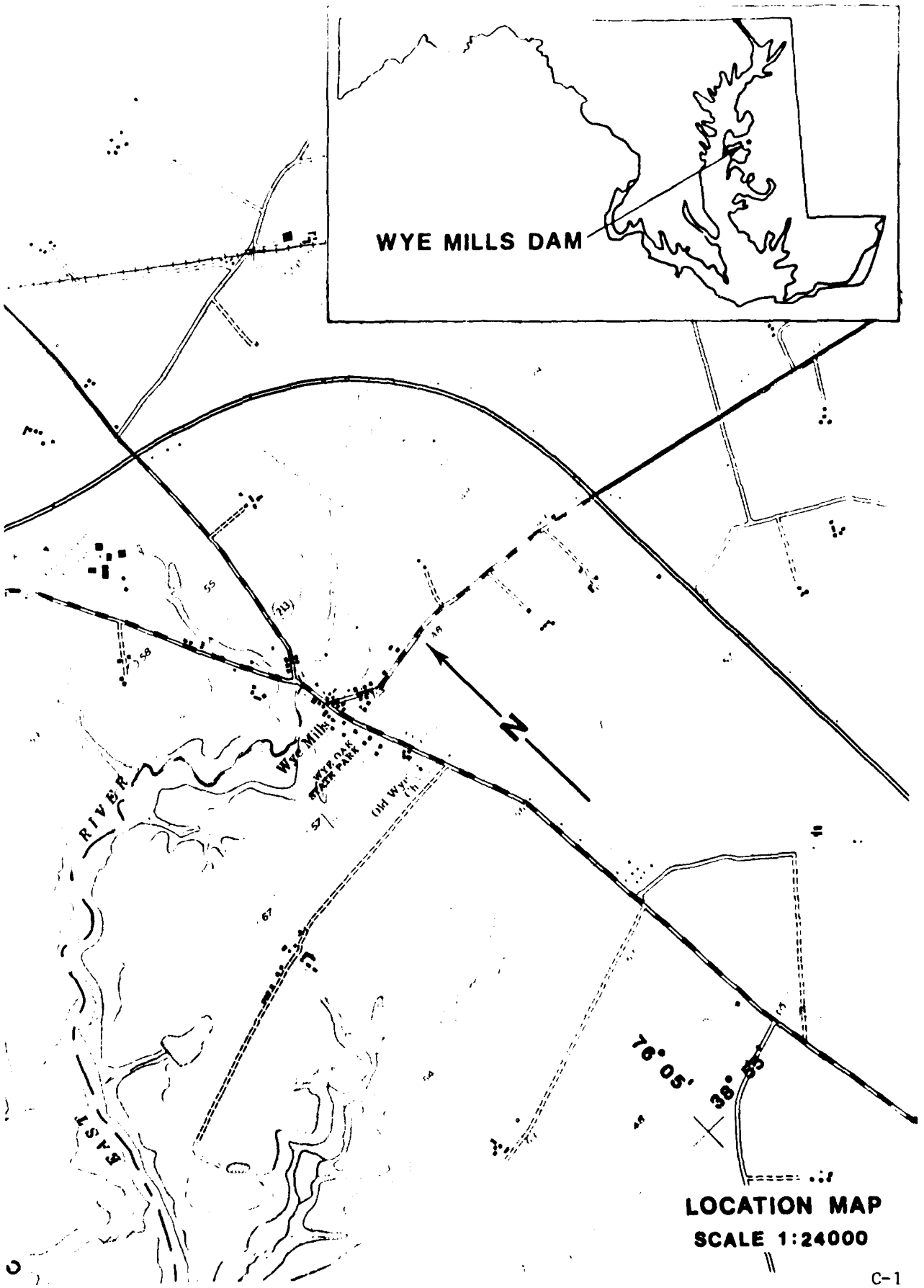
ITEM	REMARKS
MONITORING SYSTEMS	NONE
MODIFICATION	NONE
HIGH POOL RECORDS	Not recorded, staff gage attached to spillway damaged
POST CONSTRUCTION ENGINEERING STUDIES & REPORTS	Final construction summary dated June 30, 1958 construction photographs
PRIOR ACCIDENTS OR FAILURE OF DAM DESCRIPTION REPORTS	Photographs showing repair to discharge channel sheet pile after storm of 8-4-67
MAINTENANCE OPERATION RECORDS	NONE

ITEM	REMARKS
DESIGN REPORTS	For spillway and box culvert only
GEOLOGY	NONE
DESIGN COMPUTATIONS	
HYDROLOGY & HYDRAULICS	NONE
DAM STABILITY	
SEEPAGE STUDIES	
MATERIALS INVESTIGATIONS	
BORING RECORDS	Test pit information on plans
LABORATORY	
FIELD	
POST CONSTRUCTION SURVEY OF DAM	NONE
BORROW SOURCES	No record available

ITEM	REMARKS
AS BUILT DRAWINGS	NONE
REGIONAL VICINITY MAP	Available
CONSTRUCTION HISTORY	Final report dated June 30, 1958
TYPICAL SECTIONS OF DAM	Design plans available
OUTLETS - PLANS	Design plans avialable
- DETAILS	
-CONSTRAINTS	
- DISCHARGE RATINGS	Not available - design head, 2.8 ft., evident in stability computations
RAINFALL/RESERVOIR RECORDS	local staff gage damaged - no records, nearest raingage in Denton nearest streamgage 2 miles from dam #4925 on Sallie Harris Creek, trib-to Wye East River

APPENDIX C

LOCATION MAP & PLANS



LOCATION MAP

SCALE 1:24000

GENERAL NOTES:

Specifications: State Roads Commission Specifications titled "Specifications for Materials, Highways, Bridges and Incidental Structures" dated March, 1955, with Supplementary Special Provisions for Material and Construction; "A.A.S.H.O. Standard Specifications for Highway Bridges" dated 1953 for design; and "General Requirements and Regulations Relating to the Submission of Applications and the Design of Dams and Other Waterway Obstructions of Water Resources Commission of Maryland" dated 1955 for design, materials and construction.

Culvert Loading: H20-44

Concrete: See Special Provisions

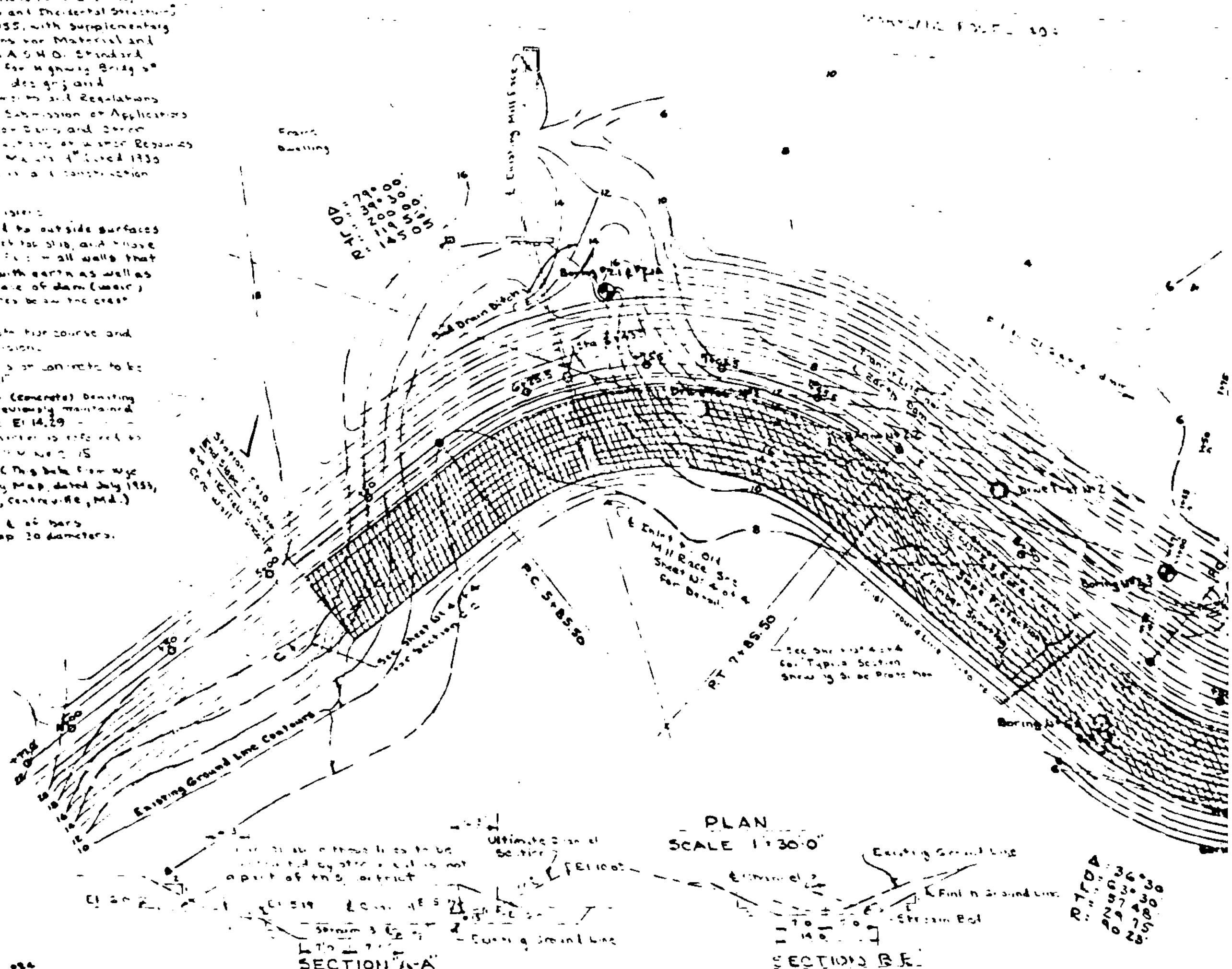
Dampproofing: Shall be applied to outside surfaces of sub-walls ... and those portions of rear faces of all walls that are in contact with earth as well as the upstream face of dam (weir) to a point 6 inches below the crest.

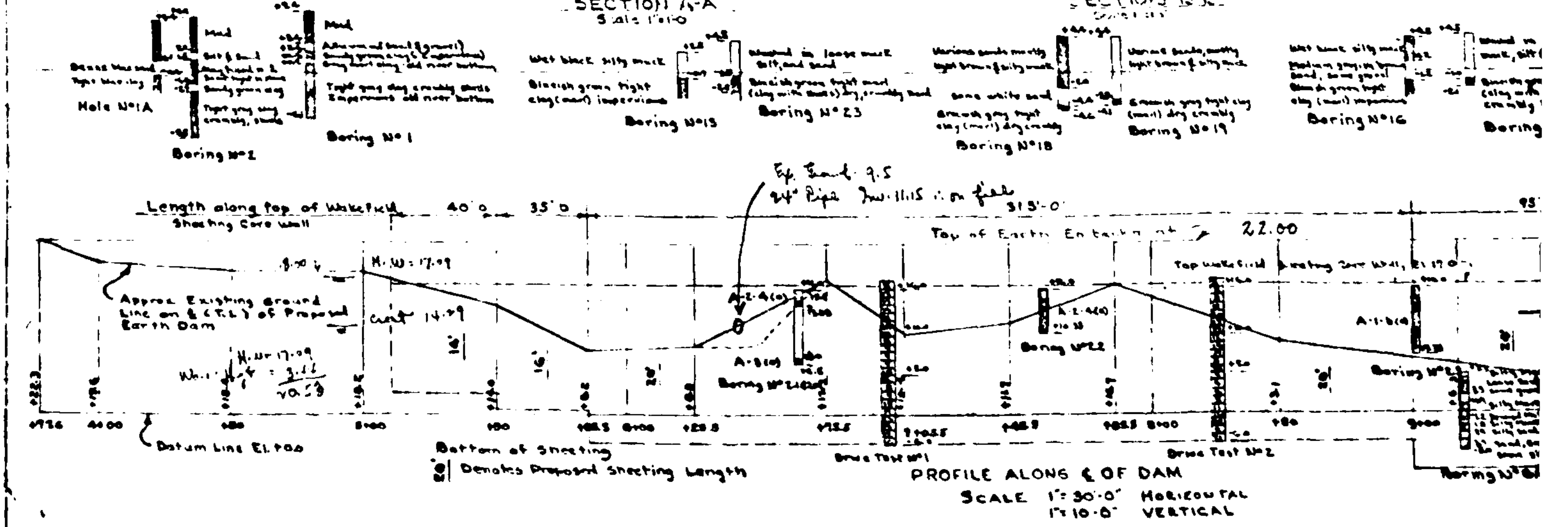
Membrane Waterproofing: Omit mortar protection course and See Special Provisions.

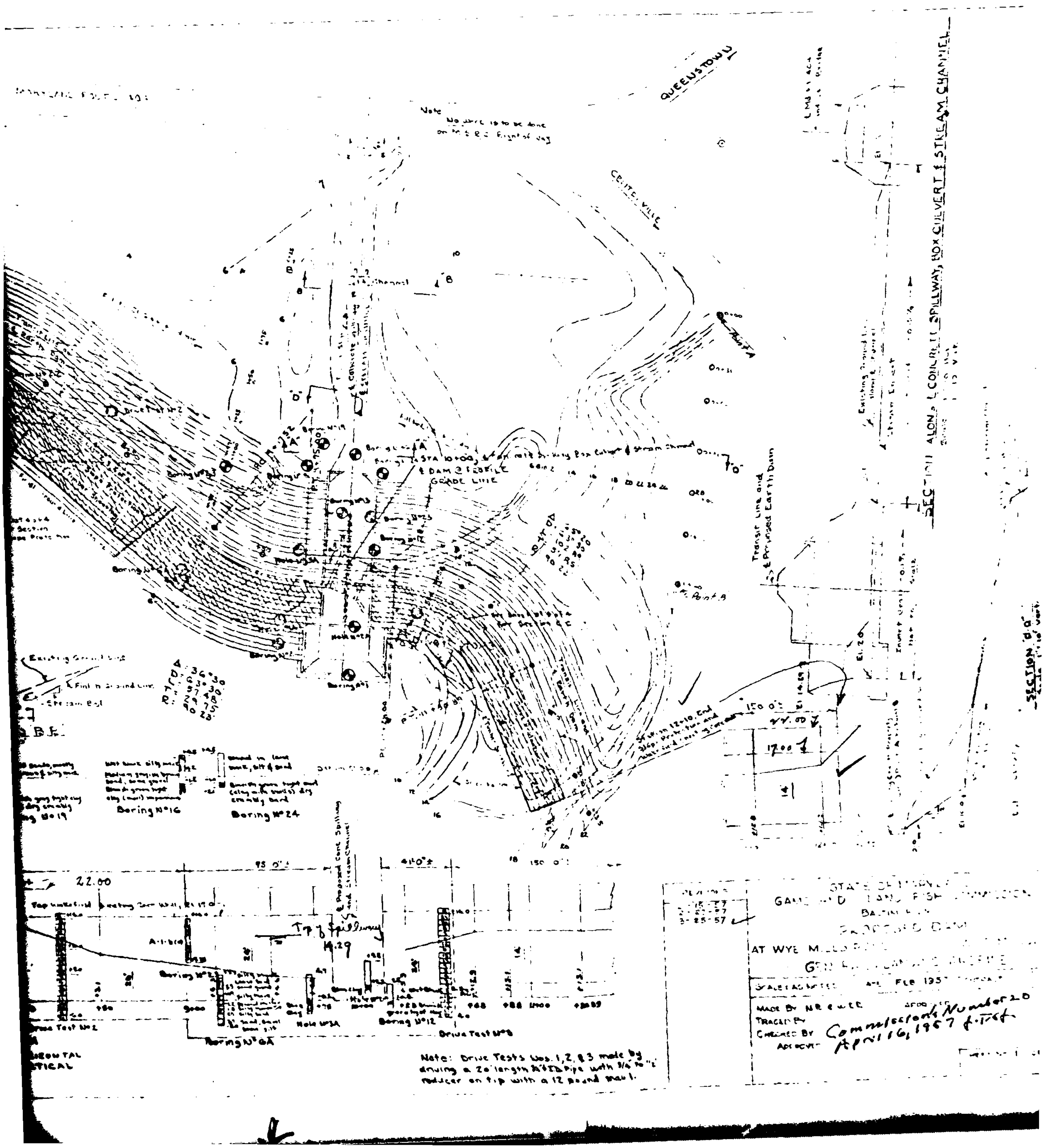
Chamfer: All exposed edges of concrete to be chamfered 1" x 1".

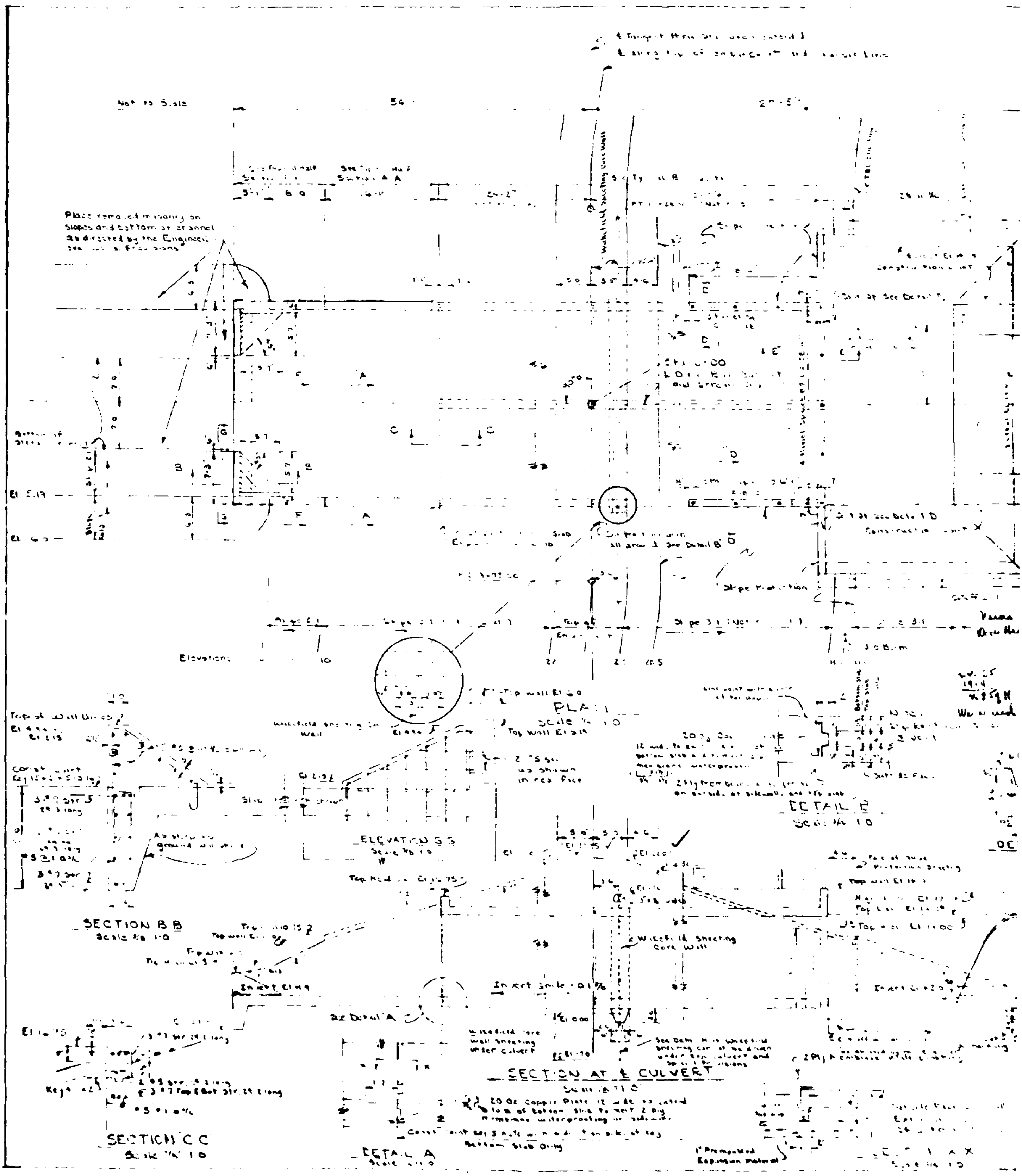
Bench Mark: Elevation Marker (Concrete) Denoting High Water as previously maintained by W. H. ... El. 14.29 (Above elevation marker is referred to U.S.C.&G.S. Survey ... Elevation 57.83) (This data from Wye Mills Mill Property Map, dated July 1953, by W. B. Bartlett, Centreville, Md.)

Reinforcing Steel: Dimensions are to ℄ of bars. Spliced bars to lap 20 diameters.

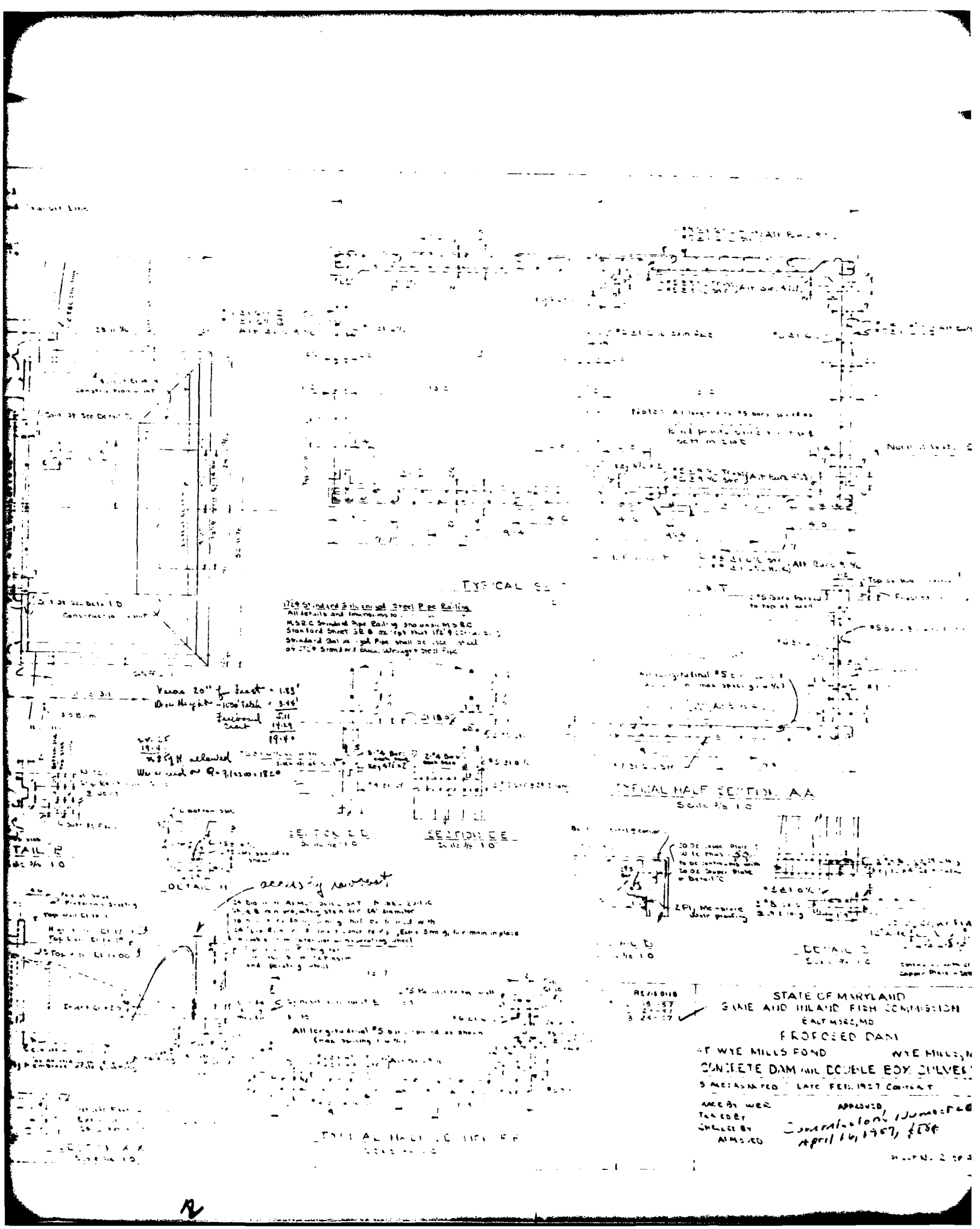


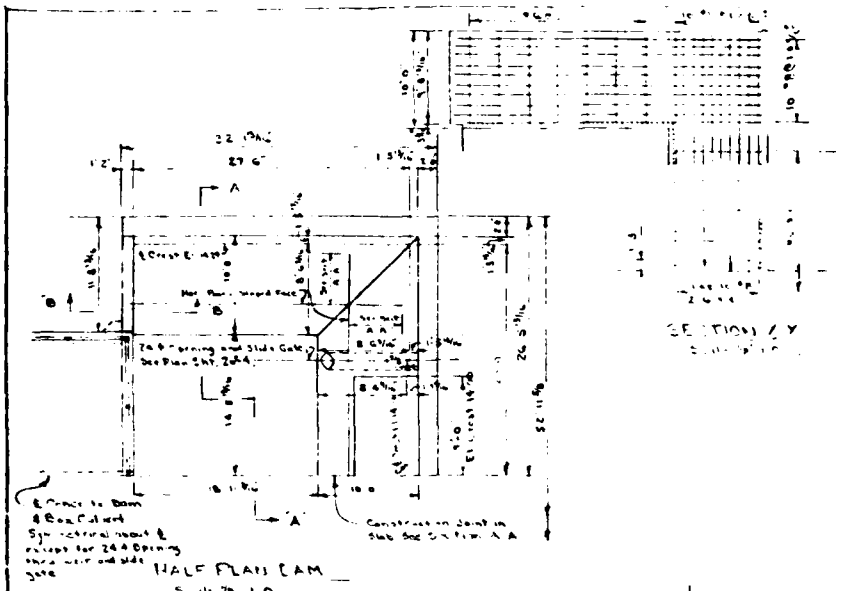



QUEENSTOWN
CENTREVILLE
Note: No work is to be done on the R.R. Right of Way
SECTION ALONG ℄ CONCRETE SPILLWAY, BOX CULVERT ℄ STREAM CHANNEL
SECTION "D-D"
Transit Line and ℄ Proposed Earth Dam
STA 10+00, ℄ DAM ℄ PROFILE
GRADE LINE
Drive Test No 2
Boring No 16
Boring No 24
Boring No 19
Boring No 12
Boring No 6A
Hole No 3A
Drive Test No 3
Existing Ground Line
Finish Ground Line
Stream Bed
A: 36°30
D: 63°30
R: 97.48
T: 24.75
L: 90.23
22.00
95 0"
41'0"
150 0"
Top of Spillway 14.29
Note: Drive Tests Nos. 1, 2, & 3 made by driving a 20' length 3/4" Pipe with 3/4" to 1/2" reducer on tip with a 12 pound maul.
2-15-57
2-21-57
3-25-57
STATE OF MARYLAND
GAME AND INLAND FISH COMMISSION
PROPOSED DAM
AT WYE MILLS
FEB 1957
MADE BY N.R.C.W.E.E.
TRACED BY
CHECKED BY
APPROVED
Commissioner's Number 20
April 16, 1957 J.T.C.

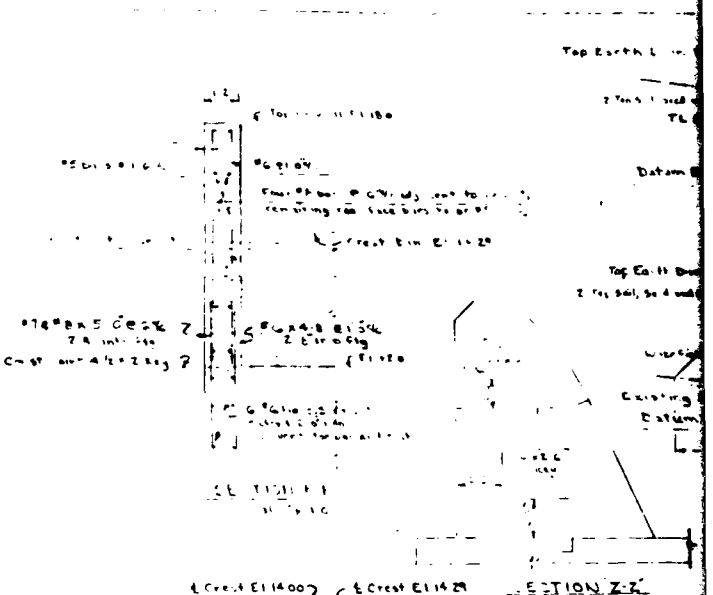


Not to Scale
Place removed masonry on slopes and bottom of channel as directed by the Engineer
Elevations
Slope Protection
PLAN
SECTION B-B
Scale ⅛" = 1'-0"
ELEVATION S-S
DETAIL B
Wakefield Sheeting Core Wall
Invert Slope - 0.1%
SECTION AT ℄ CULVERT
SECTION C-C
DETAIL A
1" Premoulded Expansion Material

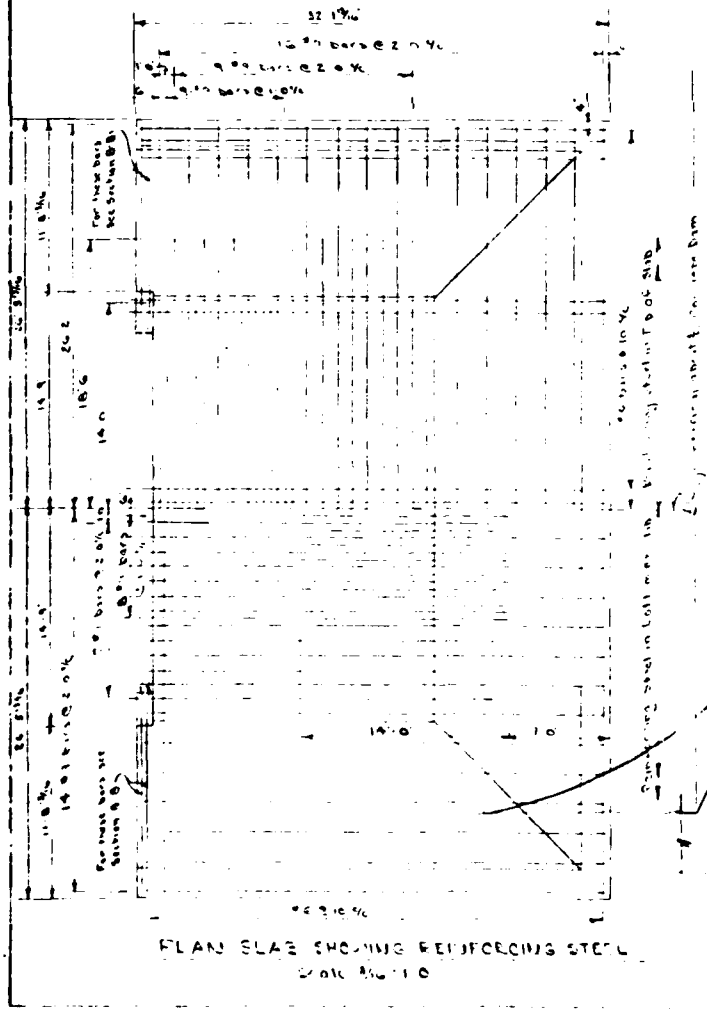

TYPICAL SECTION
TYPICAL HALF SECTION A-A
SECTION C-C
SECTION E-E
DETAIL 1
DETAIL 2
TYPICAL HALF SECTION F-F
TAILRACE
STATE OF MARYLAND
GAME AND INLAND FISH COMMISSION
EASTON, MD
PROPOSED DAM
AT WYE MILLS POND
WYE MILLS, MD
CONCRETE DAM with DOUBLE BOX CULVERT
SURVEYED
DRAWN BY
TRACED BY
CHECKED BY
APPROVED
April 16, 1957



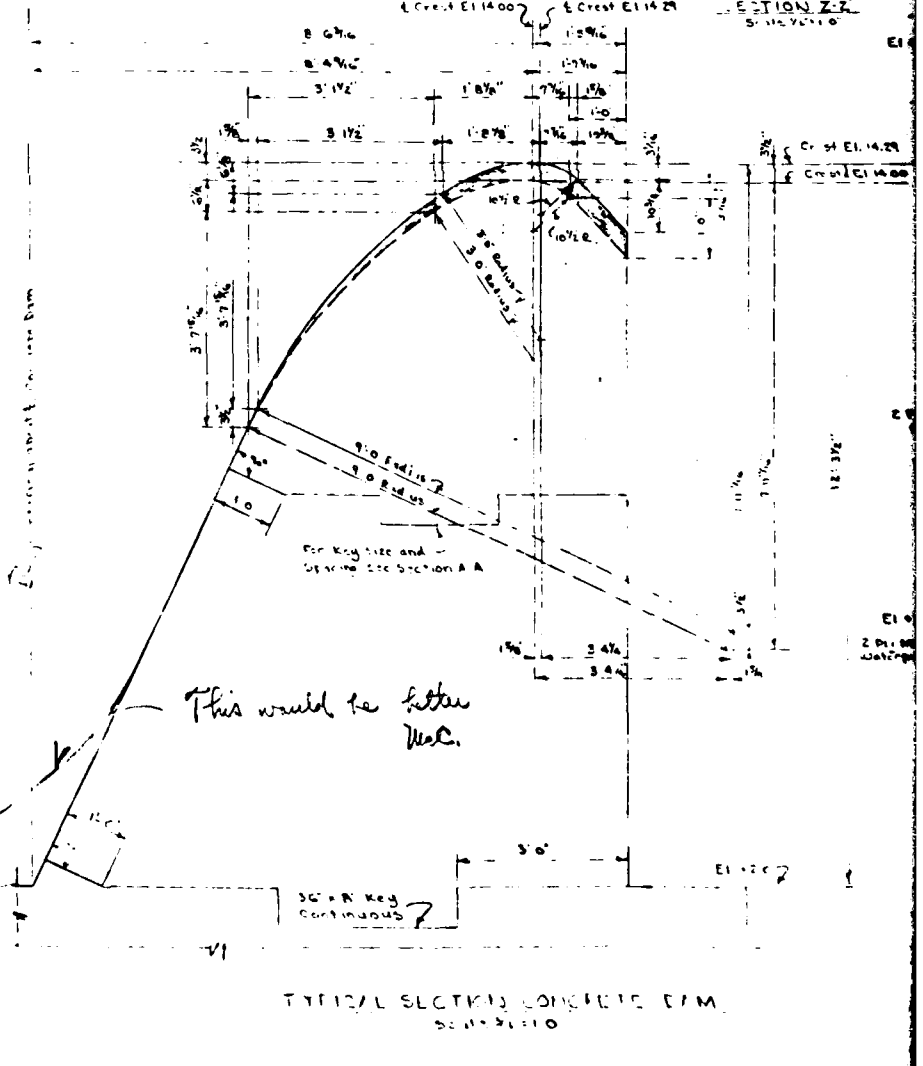
HALF PLAN [illegible]



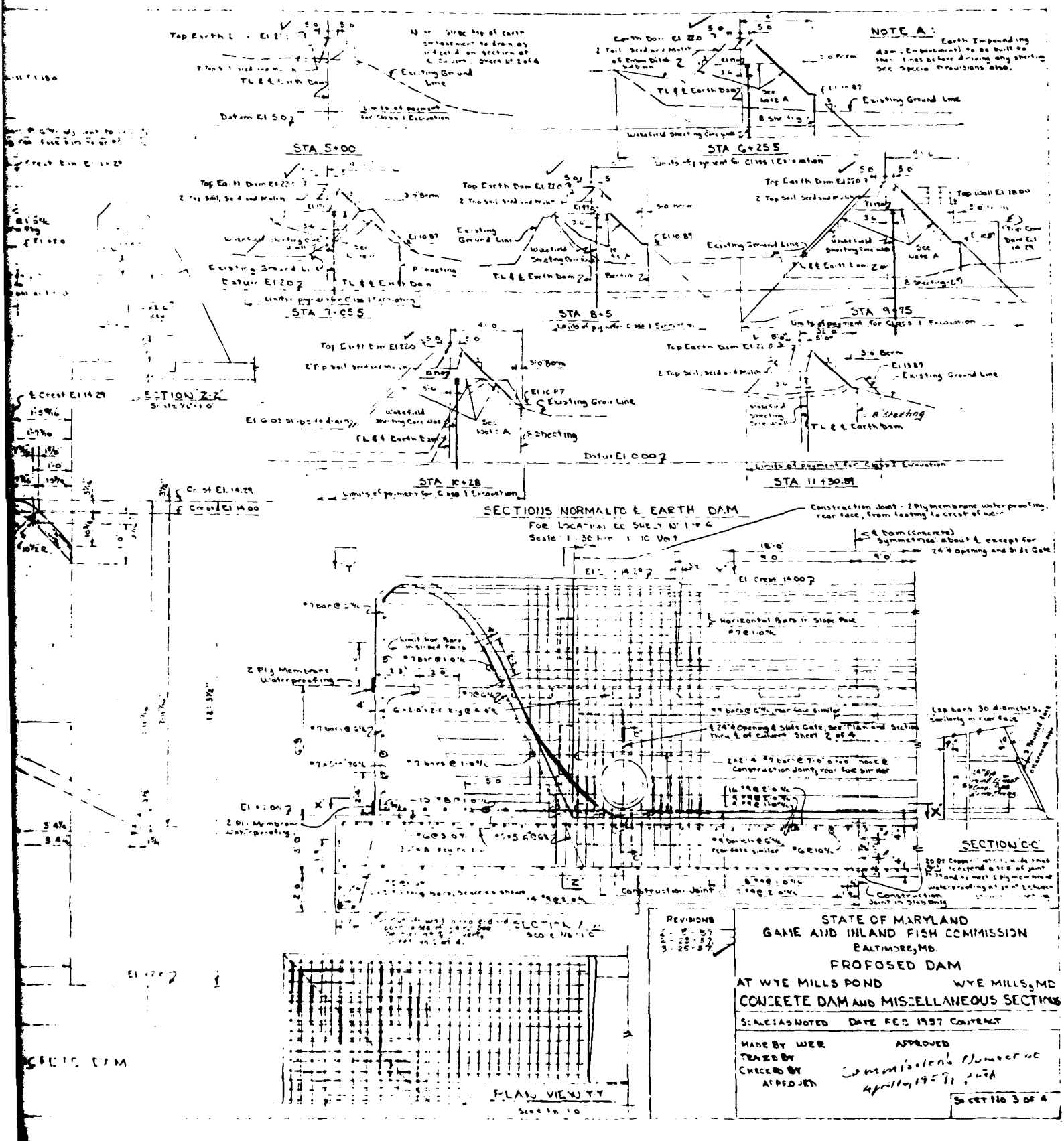
SECTION Z-Z

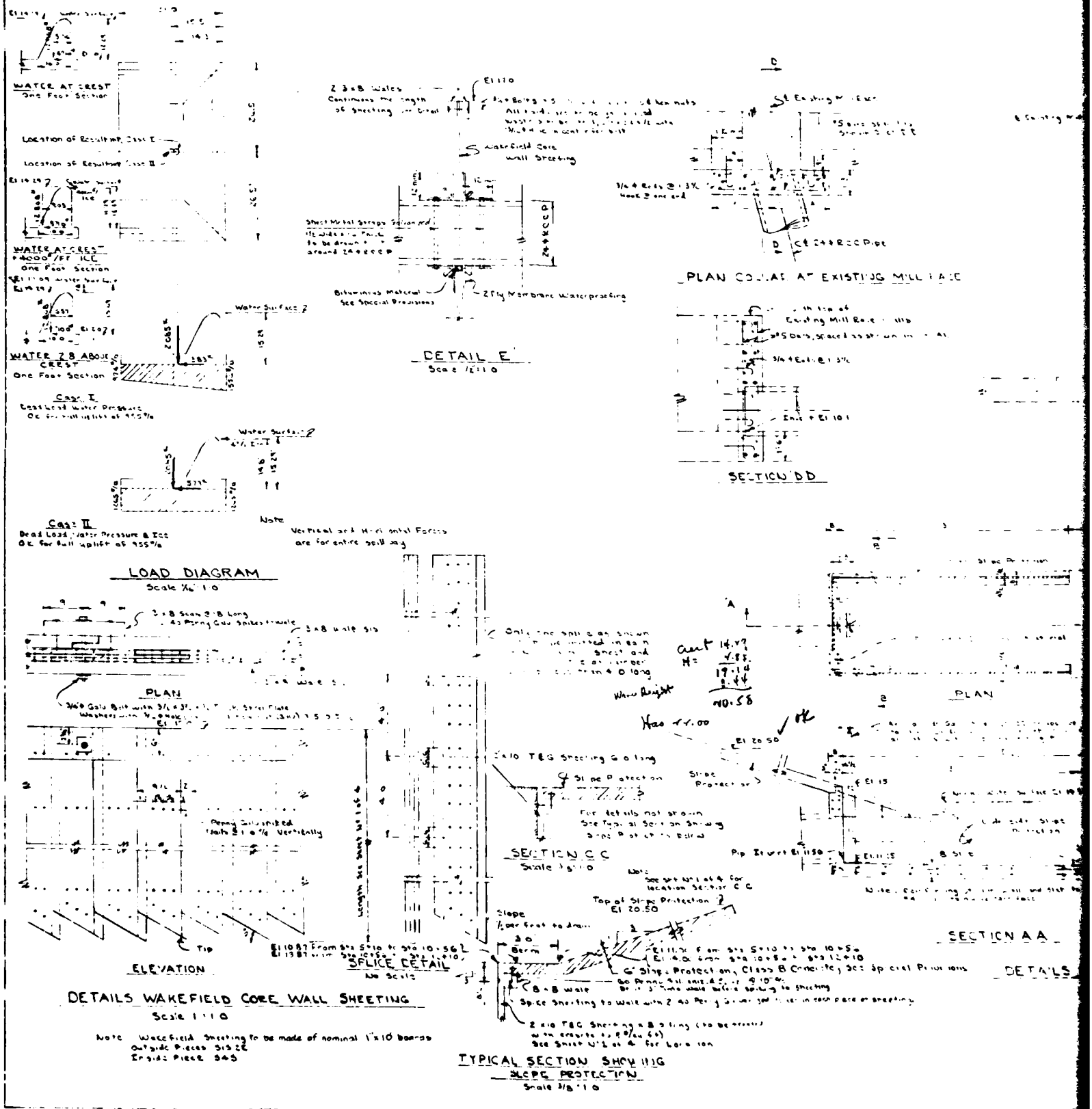


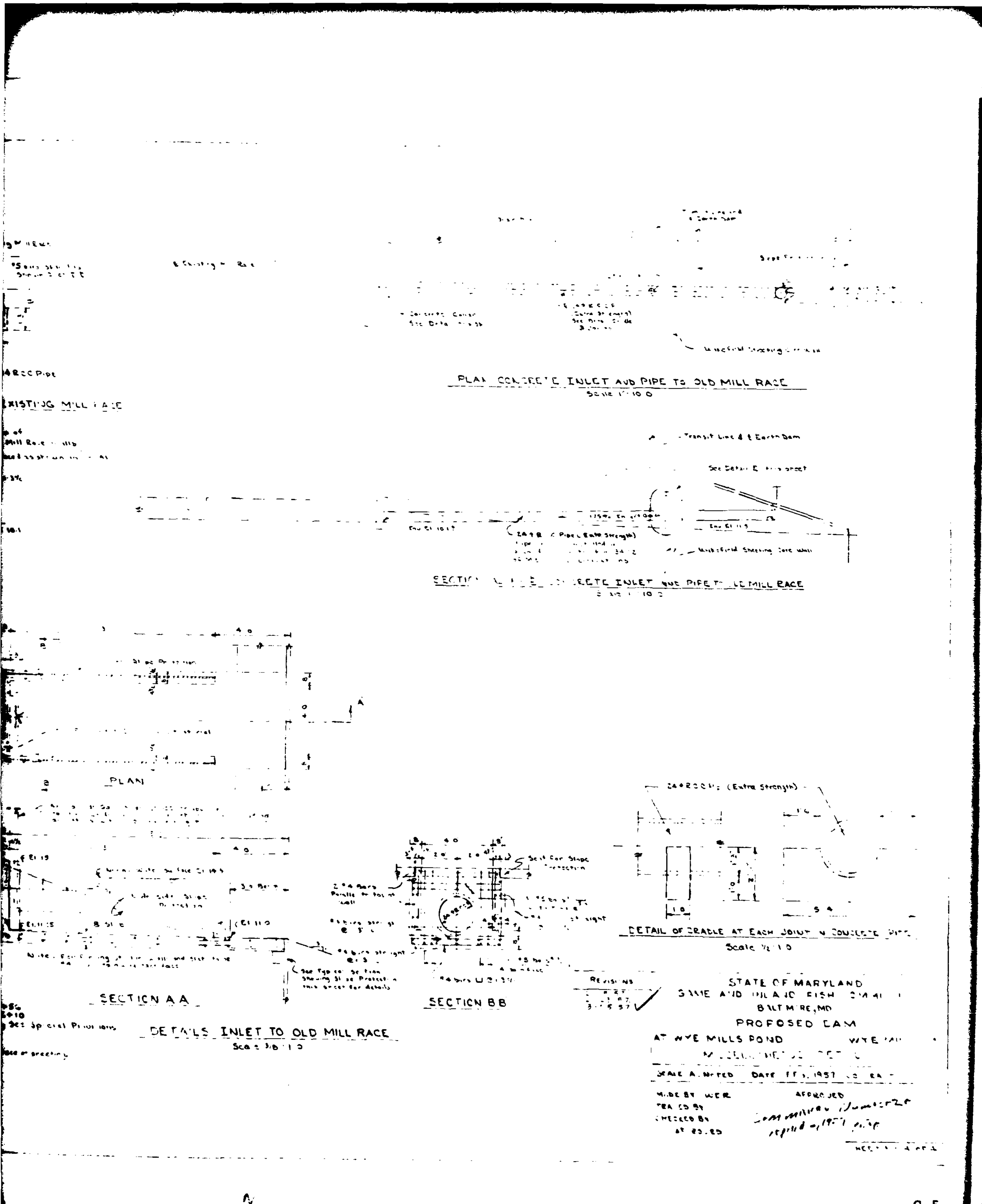
PLAN SLAB SHOWING REINFORCING STEEL



TYPICAL SECTION CONCRETE DAM


NOTE A:
STA 5+00
STA 6+25 S
STA 7+65 S
STA 8+5
STA 9+75
STA 10+28
STA 11+30.89
SECTIONS NORMAL TO ℄ EARTH DAM
SECTION Z-Z
SECTION C-C
PLAN VIEW YY
REVISIONS
STATE OF MARYLAND
GAME AND INLAND FISH COMMISSION
BALTIMORE, MD.
PROPOSED DAM
AT WYE MILLS POND WYE MILLS, MD
CONCRETE DAM AND MISCELLANEOUS SECTIONS
SCALE: AS NOTED DATE FEB 1957 CONTRACT
MADE BY WER
TRACED BY
CHECKED BY
APPROVED
APPROVED
Commissioner's Number 46
April 4, 1957
SHEET No 3 OF 4


WATER AT CREST
One Foot Section
Location of Resultant Case I
Location of Resultant Case II
WATER AT CREST
+4000 #/FT ICE
One Foot Section
WATER 2 8 ABOVE CREST
One Foot Section
Case I
Case II
Dead Load Water Pressure & Ice
DETAIL E
Scale 1/2" = 1'-0"
Waterfield Core Wall Sheeting
Bituminous Material See Special Provisions
2 Ply Membrane Waterproofing
PLAN COLLAR AT EXISTING MILL RACE
SECTION DD
LOAD DIAGRAM
Scale 1/16" = 1'-0"
PLAN
ELEVATION
SPLICE DETAIL
No Scale
DETAILS WAKEFIELD CORE WALL SHEETING
Scale 1" = 1'-0"
Note Wakefield Sheeting to be made of nominal 1"x10" boards
Outside Pieces S15 22
Inside Piece S49
TYPICAL SECTION SHOWING SLOPE PROTECTION
Scale 3/8" = 1'-0"
SECTION C C
Scale 3/8" = 1'-0"
SECTION A A
PLAN
DETAILS


EXISTING MILL RACE
PLAN CONCRETE INLET AND PIPE TO OLD MILL RACE
Transit Line & E Earth Dam
PLAN
SECTION AA
SECTION BB
DETAILS INLET TO OLD MILL RACE
24" R.C.C. Pipe (Extra Strength)
DETAIL OF CRADLE AT EACH JOINT
Scale ½" = 1'-0
Revisions
STATE OF MARYLAND
BALTIMORE, MD
PROPOSED DAM
AT WYE MILLS POND
DATE
MADE BY W.E.R.
TRACED BY
CHECKED BY
APPROVED

APPENDIX D

ANALYSES

Wye Mills J.O. Smith

Stage - Storage - Surface Area

normal depth : spillway crest 14.29
apron invert @ spillway 2.00
12.29 FT

Surface Area @ crest = 61.5 Ac.

Normal Storage = $0.4 A_d = 0.4 \times 61.5 \times 12.29 = 302$ Ac-Ft

Area measurements from Quad sheet 1:24000

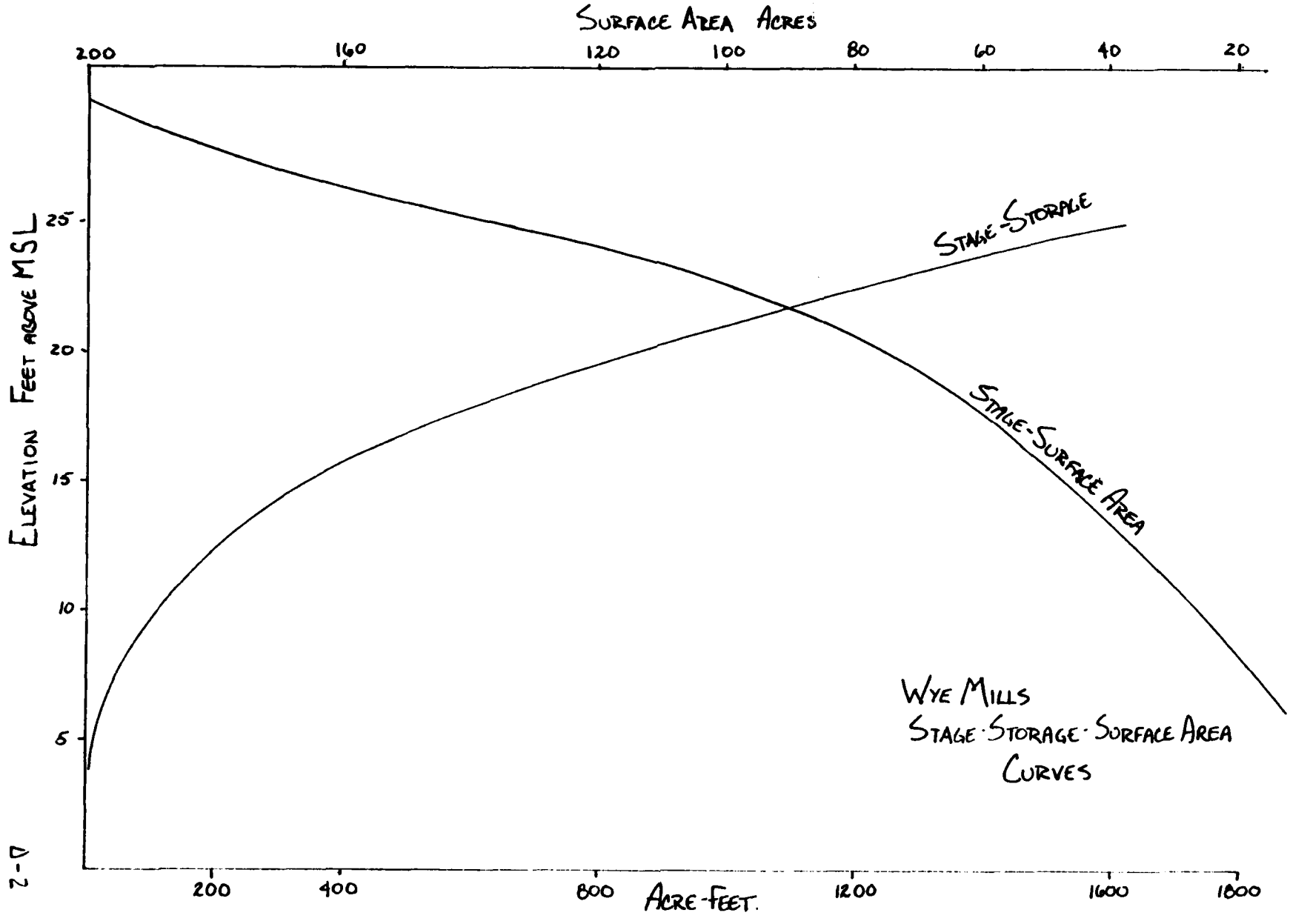
	Elev.	Area, in²	Area, Ac.	Avg. Area	Δ Vol.	Cum. Vol.
	2.0	0	0	–	0	0
	14.29	0.67	61.5	–	302	302
interpolated O.H.W.	17.1		98			571
	20.0	1.50	138	99.75	569	871
interpolated top of dam	22.0		168.8			1224
	25.0	2.34	215	176.5	882	1753

↑ ## E, ## S CARDS ↑

T CARD - Rainfall losses - use 1" initial, 0.05" uniform loss in inches/hour per Balto. Corps

P CARD - from Hydromet 53, PMP Index rain fall = 24.5 in.

	R_6	R_{12}	R_{24}
, Zone 6 →	112%	123%	131%



WYE MILLS
STAGE · STORAGE · SURFACE AREA
CURVES

Snyders UH Coefficients

From Balto. District Curves, Zone 37

$C_t = 4.07$

$C_p = 0.35$

$t_p = C_t (\not{\epsilon} L_{CA})^{0.3}$

from Quad sheet, $L = 5.30$ miles

$L_{CA} = 2.17$ miles

$t_p = 4.07[5.3 \times 2.17]^{0.3} = 8.47$

$C_p = 0.35$

} W CARD

Rating Curve for Twin 13x12 FT. high box culvert

Used to modify discharge values obtained from only considering ogee crest as control

Using Bureau of Public Rds Chart #1, 90° wingwalls

invert elev. 2.0 MSL, B = 26 FT, D = 12 FT

Q	Q/B	HW/D	HW	Stage
0			0	2.0
1000	38	0.5	6	8.0
2000	77	0.8	9.6	11.6
3000	115	1.05	12.6	14.6
4000	154	1.3	15.6	17.6
5000	192	1.7	20.4	22.4
6000	230	2.0	24	26.0

↑ assumes inlet control →

The above calculations assume inlet control governs. To check the possibility that outlet control governs, the following downstream controls/conditions must be known:

1. tidal hydraulics
2. geometry & roughness downstream of Rte 404
3. geometry of Rte 404 and its bridge
4. geometry & roughness between Rte 404 and Wye Mills Dam.

Since determination of the above parameters is beyond the scope of a Phase I study, outlet control has been assessed for a discharge close to PMF, assuming that the culvert is flowing full and using a Bureau of Public Roads outlet control nomograph:

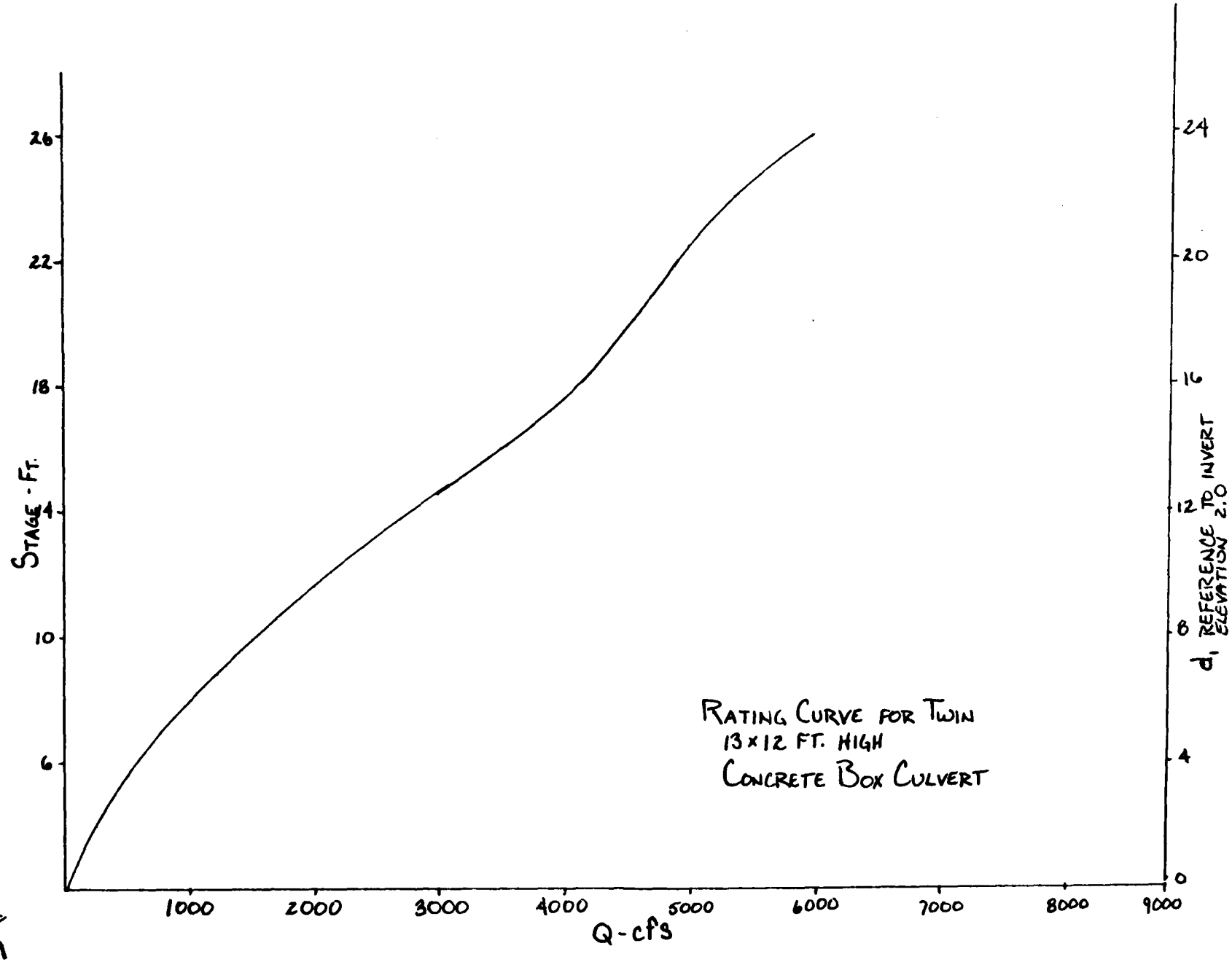
$Q = 6000 = 3000$ cfs/barrel
Area of culvert = 12x13 = 156 ft^2
Square edged entrance, $K_e = 0.5$

$L = 90$ ft, $S_o = 0/001$ ft/ft
h_o = assumed TW on culvert = 12 ft

HW, headwater depth = $H + h_o - LS_o$

at 3000 cfs/barrel, H = 9 ft from nomograph
$HW = 9 + 12 - 90(.001)$
$= 21 - 0,09 = 20.9$ vs 24 from inlet control

∴ at 6000 cfs, with the 12 ft TW assumption, inlet control governs and the previous calculations are considered valid for this Phase I study.



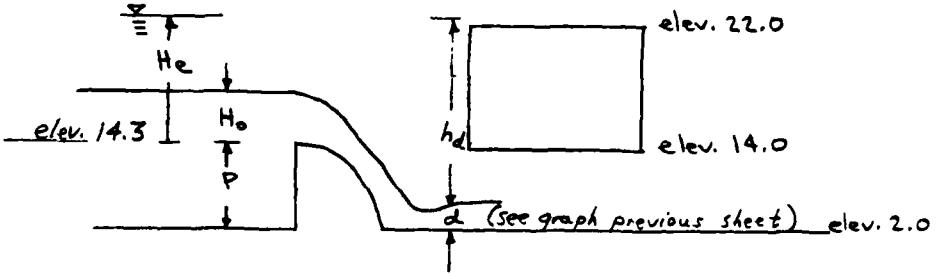
RATING CURVE FOR TWIN
13 x 12 FT. HIGH
CONCRETE BOX CULVERT

S-1

Rating Curve

Combination of ogee spillway & culvert flow

using fig 249, 250, 252 from Design of Small Dams



H_o = design head = 2.8 FT

He = head under consideration

@ pool elev. 14.3, $H_o = 2.8$, $H_e = 0$, $d = 0$, $h_d = 12.3$, $P = 12.3$

$Q = 0$ cfs

@ pool elev. 15.0, $H_o = 2.8$, $H_e = 0.7$, $P = 12.3$

$\frac{P}{H_o} = 4.4 \quad \therefore C_o = 3.95$ fig 249

$\frac{H_e}{H_o} = 0.25 \quad \therefore C/C_o = 0.87$ fig 250

$\therefore C = 0.87(3.95) = 3.44$

$Q = CLH_e^{3/2} = 3.44 \times 100 \times 0.7^{3/2} = 201$ cfs

from graph, sheet A-5 @ 231 cfs, $d = 2.0$, $h_d = 11.0$

$\frac{h_d + d}{He} = 18.6$

$\frac{h_d}{He} = 15.7$

} no reduction in C fig 252

Use $Q = 201$ cfs

@ pool elev. 16.0 , $H_o = 2.8$, $H_e = 1.7$, $P = 12.3$, $C_o = 3.95$

$\frac{He}{Ho} = 0.61 \quad \therefore C/C_o = 0.94$

$\therefore C = 0.94(3.95) = 3.71$

$Q = CLH_e^{3/2} = 3.71 \times 100 \times 1.7^{3/2} = 822$ cfs

from graph, sheet D-5, $d = 5.0$, $h_d = 9.0$ @ 822 cfs

$\frac{h_d + d}{He} = 8.23$

$\frac{h_d}{He} = 5.29$

} no reduction in C from fig. 252

Use Q = 822 cfs

@ pool elev. 17.0 , $H_o = 2.8$, $H_e = 2.7$, $P = 12.3$, $C_o = 3.95$

$\frac{He}{Ho} = 0.96 \quad \therefore C/C_o = 0.995$

$\therefore C = 0.995(3.95) = 3.93$

$Q = CLH_e^{3/2} = 3.93 \times 100 \times 2.7^{3/2} = 1744$

from graph, sheet D-5, @ 1744 cfs, $d = 9.1$, $h_d = 5.9$

$\frac{h_d + d}{He} = 5.55$

$\frac{h_d}{He} = 2.18$

} no reduction in C from fig. 252

Use Q = 1744 cfs

@ pool elev. 18.0 , $H_o = 2.8$, $H_e = 3.7$, $P = 12.3$, $C_o = 3.95$

$\frac{He}{Ho} = 1.32 \quad \therefore C/C_o = 1.04$

$\therefore C = 1.04(3.95) = 4.11$

$Q = CLH_e^{3/2} = 4.11 \times 100 \times 3.7^{3/2} = 2925$

from graph, sheet D-5, @ 2925 cfs, $d = 14.3$, $h_d = 1.7$

$\frac{h_d + d}{He} = 4.32$

$\frac{h_d}{He} = 0.46$

} 3% reduction in C from fig. 252

new C = old C × 97% = 4.11 × 0.97 = 3.99

$Q = 3.99 \times 100 \times 3.7^{3/2} =$ 2840 cfs use

@ pool elev. 19.0 , $H_o = 2.8$, $H_e = 4.7$, $P = 12.3$, $C_o = 3.95$

$\frac{H_e}{H_o} = 1.68$ $\therefore C/C_o = 1.07$

$\therefore C = 1.07 (3.95) = 4.23$

$Q = C L H_e^{3/2} = 4.23 \times 100 \times 4.7^{3/2} = 4310$ cfs

from graph, sheet D-5, @ 4310 cfs, $d = 17$, $h_d = 0$

$\therefore$ stage at which ogee is completely submerged and beginning at which culvert flow governs.

$\frac{h_d + d}{H_e} = 3.62$

$\frac{h_d}{H_e} = 0$

} 100% decrease in C $\therefore$ culvert flow governs

$\therefore$ At stages ≥ 19.0, flow is controlled by culvert and outflow figures can be read from graph, sheet D-5

@ 19.0, $Q = 4280$ cfs
@ 20.0, $Q = 4540$ cfs
@ 22.0, $Q = 4930$ cfs

Summary	Stage, FT MSL	Discharge, cfs
	14.29	0
	15	201
	16	822
	17	1744
	18	2840
	19	4280
	20	4540
	22	4930
	← Y4, Y5 CARDS	→

```
1**********
'FLOOD HYDROGRAPH PACKAGE (HEC-1)
'DAM SAFETY VERSION     JULY 1978
   LAST MODIFICATION  26 FEB 88
 **********
     1                 A1       SNYDER UNIT HYDROGRAPH,FLOOD ROUTING,AND DAM OVERTOPPING ANALYSIS
     2                 A2       WYE MILLS DAM,QUEEN ANNES COUNTY,MARYLAND  MILL'S MODIFIED
     3                 A3       FOR VARIOUS PERCENTAGES OF PMF
     4                 B    100        1       30        0        0        0        0        -4        0
     5                 B1     5
     6                 J      1        9        1
     7                 J1   .91      .92      .93      .94      .95      .96      .97      .98     1.00
     8                 K      0        1                                                    1
     9                 K1       CALCULATION F PMF RATIOS TO WYE MILLS DAM                                1
    10                 M      1        1    10.21                10.21
    11                 P              24.5      112      123      131
    12                 T                                                      1      .05
    13                 W   8.47     0.35
    14                 X   -1.0    -0.05      2.0
    15                 K      1        2                                      1
    16                 K1       ROUTED FLOWS THROUGH WYE MILLS LAKE  NO BREACH
    17                 Y                                  1        1
    18                 Y1     1                                                302       -1
    19                 Y4 14.29       15       16       17       18       19       20       22
    20                 Y5     0      201      822     1744     2840     4280     4540     4930
    21                 $S     0      302      871     1753
    22                 $E     2    14.29       20       25
    23                 $$ 14.29
    24                 $D  22.0      3.1      1.5      832
    25                 K     99
```

SNYDER UNIT HYDROGRAPH\FLOOD ROUTING\AND DAM OVERTOPPING ANALYSES
WYE MILLS DAM\QUEEN ANNES COUNTY\MARYLAND NLDI#: MD00020
FOR VARIOUS PERCENTAGES OF PMF

JOB SPECIFICATION

NQ	NHR	NMIN	IDAY	IHR	IMIN	METRC	IPLT	IPPT	NSTAN
100	1	30	0	0	0	0	0	-4	0
			JOPER	HYT	LROPT	TRACE			
			5	0	0	0			

MULTI-PLAN ANALYSES TO BE PERFORMED
NPLAN= 1 NRTIO= 9 LRTIO= 1

RTIOS= .91 .92 .93 .94 .95 .96 .97 .98 1.00

****

SUB-AREA RUNOFF COMPUTATION

CALCULATION OF PMF RATIOS TO WYE MILLS DAM

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPPT	INAME	ISTAGE	IAUTO
1	0	0	0	0	0	1	0	0

HYDROGRAPH DATA

IHYDG	IUHG	TAPER	SNAP	TRSDA	TRSPC	RATIO	ISTAQ	ISAME	LOCAL
1	1	10.21	0.00	10.21	0.00	0.000	0	1	0

PRECIP DATA

SPFE	PMS	R6	R12	R24	R48	R72	R96
0.00	24.50	112.00	123.00	131.00	0.00	0.00	0.00

TRSPC COMPUTED BY THE PROGRAM IS .801

LOSS DATA

LROPT	STRKR	DLTKR	RTIOL	ERAIN	STRTQ	RTIOK	STRTL	CNSTL	ALSMX	RTIMP
0	0.00	0.00	1.00	0.00	0.00	1.00	1.00	.05	0.00	0.00

UNIT HYDROGRAPH DATA
TP= 8.47 CP= .35 NTA= 0

RECESSION DATA
STRTQ= -1.00 QRCSN= -.05 RTIOR= 2.00

UNIT HYDROGRAPH 71 END-OF-PERIOD ORDINATES, LAG= 8.46 HOURS, CP= .35 VOL= 1.00

18.	66.	135.	205.	255.	272.	259.	240.	222.	205.
190.	175.	162.	150.	139.	128.	118.	110.	101.	94.
87.	80.	74.	68.	63.	58.	54.	50.	46.	43.
40.	37.	34.	31.	29.	27.	25.	23.	21.	20.
18.	17.	15.	14.	13.	12.	11.	10.	10.	9.
8.	8.	7.	7.	6.	6.	5.	5.	4.	4.
4.	3.	3.	3.	3.	3.	2.	2.	2.	2.
2.									

0 END-OF-PERIOD FLOW

MO.DA	HRMN	PERIOD	RAIN	EXCS	LOSS	COMP Q	MO.DA	HRMN	PERIOD	RAIN	EXCS	LOSS	COMP Q
									SUM	25.70	23.93	1.77	105519.
										(653.)	(608.)	(45.)	(2987.97)

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HYDROGRAPH ROUTING

ROUTED FLOWS THROUGH WYE MILLS LAKE NO BREACH

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
2	1	0	0	0	0	1	0	0

ROUTING DATA

QLOSS	CLOSS	AVG	IRES	ISAME	IOPT	IPMP	LSTR
0.0	0.000	0.00	1	1	0	0	0

NSTPS	NSTDL	LAG	AMSKK	X	TSK	STORA	ISPRAT
1	0	0	0.000	0.000	0.000	302.	-1

STAGE	14.29	15.00	16.00	17.00	18.00	19.00	20.00	22.00
FLOW	0.00	201.00	822.00	1744.00	2840.00	4280.00	4540.00	4930.00
CAPACITY=	0.	302.	871.	1753.				
ELEVATION=	2.	14.	20.	25.				

CREL	SPWID	COOW	EXPW	ECEUL	COOL	CAREA	EXPL
14.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0

DAM DATA

TOPEL	COOD	EXPD	DAMWID
22.0	3.1	1.5	832.

PEAK OUTFLOW IS 4814. AT TIME 27.00 HOURS

PEAK OUTFLOW IS 4841. AT TIME 27.00 HOURS

PEAK OUTFLOW IS 4869. AT TIME 27.00 HOURS

PEAK OUTFLOW IS 4897. AT TIME 27.00 HOURS

PEAK OUTFLOW IS 4925. AT TIME 27.00 HOURS

PEAK OUTFLOW IS 5019. AT TIME 27.00 HOURS

PEAK OUTFLOW IS 5158. AT TIME 27.00 HOURS

PEAK OUTFLOW IS 5255. AT TIME 27.00 HOURS

PEAK OUTFLOW IS 5408. AT TIME 27.00 HOURS

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PEAK FLOW AND STORAGE (END OF PERIOD) SUMMARY FOR MULTIPLE PLAN-RATIO ECONOMIC COMPUTATIONS
FLOWS IN CUBIC FEET PER SECOND (CUBIC METERS PER SECOND)
AREA IN SQUARE MILES (SQUARE KILOMETERS)

OPERATION	STATION	AREA	PLAN	RATIOS APPLIED TO FLOWS RATIO 1 .91	RATIO 2 .92	RATIO 3 .93	RATIO 4 .94	RATIO 5 .95	RATIO 6 .96	RATIO 7 .97	RATIO 8 .98	RATIO 9 1.00
HYDROGRAPH AT	1	10.21	1	5586.	5648.	5709.	5770.	5832.	5893.	5955.	6016.	6139.
	(	26.44)	(	158.18)(	159.92)(	161.66)(	163.40)(	165.14)(	166.87)(	168.61)(	170.35)(	173.83)
ROUTED TO	2	10.21	1	4814.	4841.	4869.	4897.	4925.	5019.	5158.	5255.	5408.
	(	26.44)	(	136.30)(	137.09)(	137.88)(	138.66)(	139.45)(	142.13)(	146.05)(	148.81)(	153.13)

1 SUMMARY OF DAM SAFETY ANALYSIS

PLAN 1 .....

	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
ELEVATION	14.29	14.29	22.00
STORAGE	302.	302.	1224.
OUTFLOW	0.	0.	4930.

RATIO OF PMF	MAXIMUM RESERVOIR W.S.ELEV	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
.91	21.40	0.00	1118.	4814.	0.00	27.00	0.00
.92	21.55	0.00	1144.	4841.	0.00	27.00	0.00
.93	21.69	0.00	1169.	4869.	0.00	27.00	0.00
.94	21.83	0.00	1194.	4897.	0.00	27.00	0.00
.95	21.97	0.00	1219.	4925.	0.00	27.00	0.00
.96	22.09	.09	1240.	5019.	1.50	27.00	0.00
.97	22.18	.18	1255.	5158.	4.50	27.00	0.00
.98	22.23	.23	1264.	5255.	4.50	27.00	0.00
1.00	22.30	.30	1276.	5408.	4.50	27.00	0.00

1**********
FLOOD HYDROGRAPH PACKAGE (HEC-1)
DAM SAFETY VERSION JULY 1978
LAST MODIFICATION 26 FEB 79
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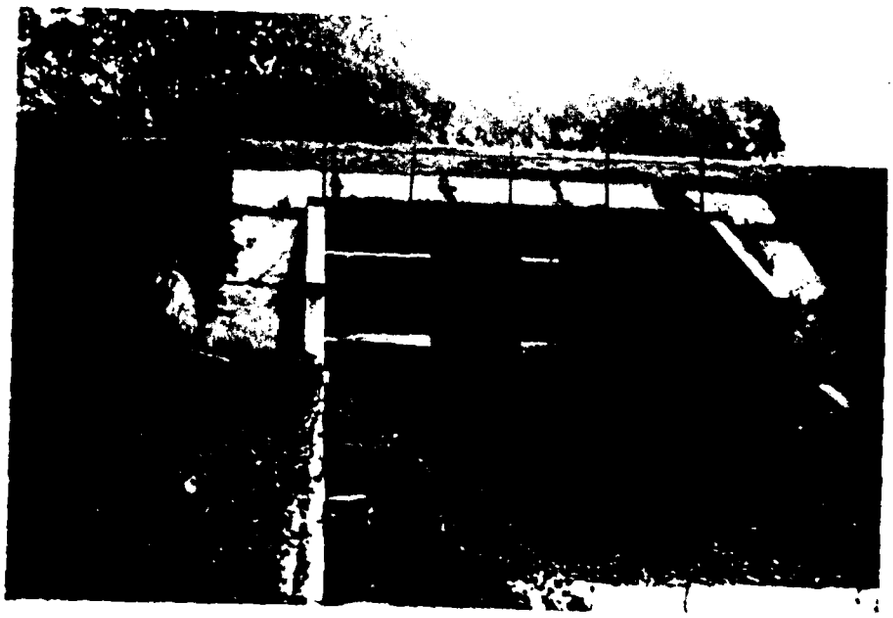
APPENDIX E

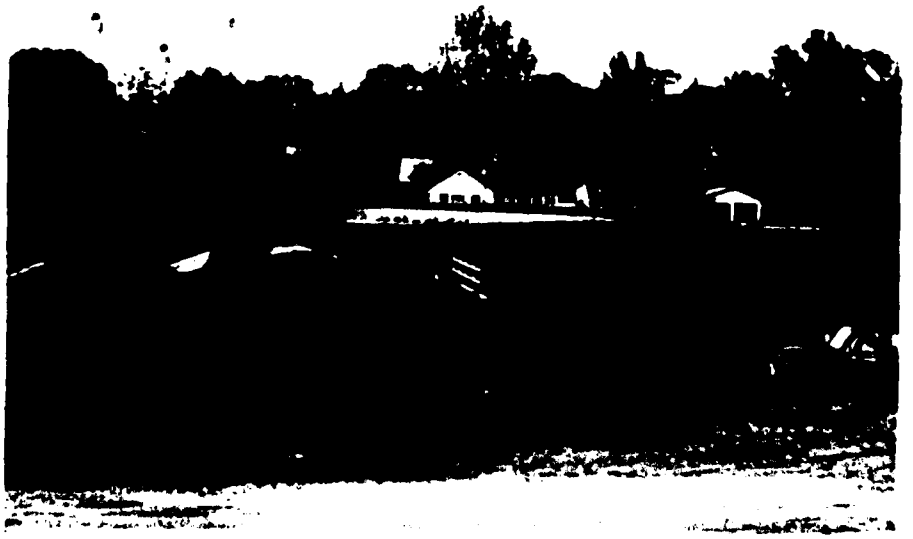
PHOTOGRAPHS

OVERFLOW SPILLWAY



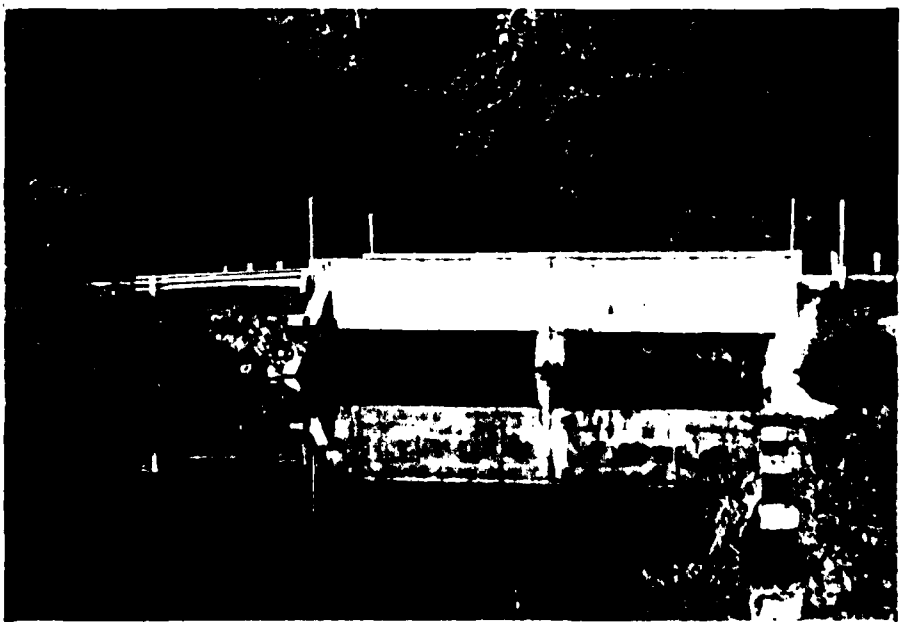
OVERFLOW SPILLWAY
BOX CULVERT

UPSTREAM FACE
FROM LEFT ABUTMENT



DOWNSTREAM FACE
FROM RIGHT ABUTMENT

DOWNSTREAM CHANNEL FROM
MD. RTE. 404 BRIDGE



MD. RTE. 404 BRIDGE

APPENDIX F

GEOLOGY REPORT

GEOLOGY REPORT
WYE MILLS DAM
QUEEN ANNES COUNTY, MARYLAND

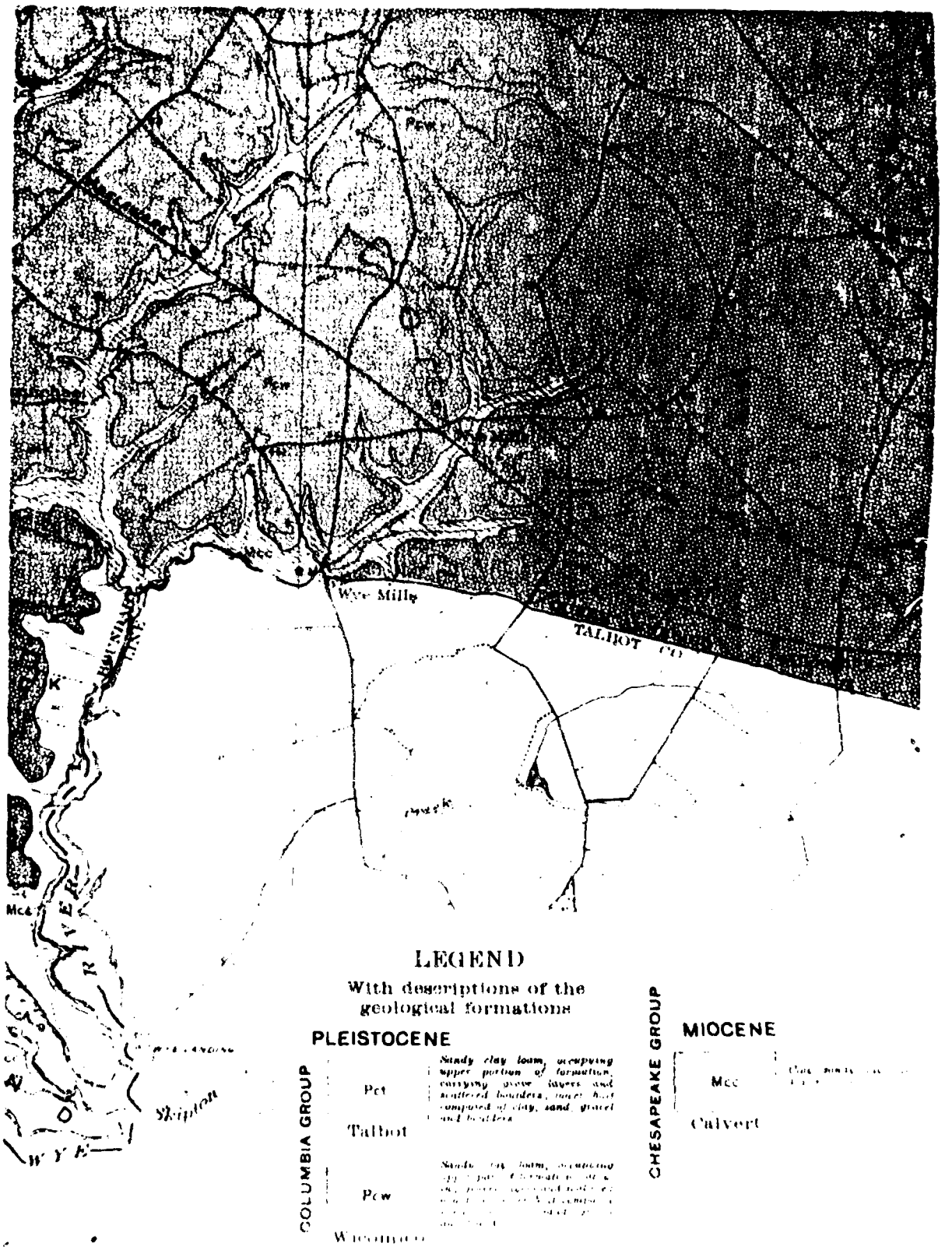
Wye Mills Dam is situated within the general physiographic region known as the Atlantic Coastal Plain characterized by deep unconsolidated sediments overlying crystaline bedrock. The depth of sediments reaches 2500 feet in the vicinity of Wye Mills. At the dam site, the sediments outcropping at the surface are of the Calvert Formation of Miocene Age within the Chesapeake group and consist of clay, sandy clay, sand, marl, and diatomaceous earth. The Calvert Formation is of marine origin and in Queen Annes County is exposed primarily in stream valleys where overlying pleistocene deposits have been removed through erosion.

Subsurface data obtained for the design of the dam typically penetrated "tight blue to gray clay and marls" of the Calvert Formation between elevations +2 and -5. Due to the eroded overlying sediments, these clays are stiff, overconsolidated, relatively impervious and should provide competent foundation material within reasonable depths. Sheetpile cut off walls embedded in these clays should prove effective in controlling seepage through the dam. Although the subsurface explorations only penetrated the clay layer a few feet and did not define its thickness, recent well logs in this formation in the area immediately adjacent to the dam indicate the "hard clay" stratum to range in thickness between eighteen and forty-five feet. Granular borrow material conforming to the project specifications should have been readily available in the region surrounding the dam site above the stream valley in the pleistocene deposits.

Although the dam is located in seismic zone 1 and earthquakes are anticipated to be relatively rare, a slight earth movement with its epicenter at Wilmington Delaware occurred in February, 1973. The seismic activity reached VI on the Modified Mercali scale at its epicenter, but the magnitude at the dam site is unknown. No detrimental effects were reported at the dam after the tremor.

QUEEN ANNE'S COUNTY GEOLOGICAL MAP

Scale 1:250,000



REFERENCES

1. Maryland Geological Survey, Queen Annes County, 1926.

2. Department of Geology, Mines, and Water Resources, The Water Resources of Cecil, Kent, and Queen Annes Counties, Bulletin 21, 1958.