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ACKENHEIL AND ASSOCIATES INC BALTIMORE MD
NATIONAL DAM INSPECTION PROGRAM. PINEY RUN DAM (NDI-ID NUMBER M--ETC(U)
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PREPARED FOR
DEPARTMENT OF THE ARMY
WATERWAYS DIVISION
WASHINGTON, D.C.

REPORT NO. 101
PROJECT NO. 101
DATE 10/1/80

BY
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CHESAPEAKE BAY BASIN
PINEY RUN
CARROLL COUNTY

MARYLAND

LEVEL 10

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PINEY RUN DAM (NDI-ID Number 101)

PHASE 1 INSPECTION REPORT

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PREFACE

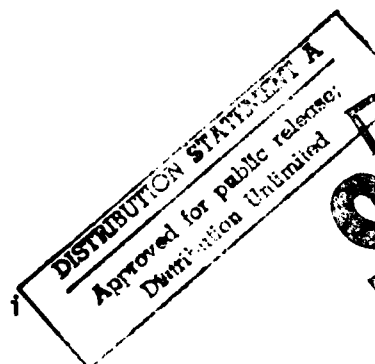
This report is prepared under guidance contained in the Recommended Guidelines for Safety Inspection of Dams, for Phase 1 investigations. Copies of these guidelines may be obtained from the Department of the Army, Office of Chief of Engineers, Washington, D.C. 20314.

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.



PHASE 1 INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

SYNOPSIS OF ASSESSMENT AND RECOMMENDATIONS

NAME OF DAM:	Piney Run Dam
STATE LOCATED:	Maryland
COUNTY LOCATED:	Carroll
STREAM:	Piney Run
DATES OF INSPECTIONS:	May 15, 1980 and July 31, 1980
COORDINATES:	Lat. 76° 58.1', Long. 39° 22.6'

ASSESSMENT

Piney Run Dam is classified as an "intermediate" size, "high" hazard dam in accordance with U. S. Army Corps of Engineers dam safety criteria.

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 Piney Run Dam is considered to be good. The presence of surface erosion and shallow depressions on embankment crest, slopes, right abutment and spillway channel are considered minor deficiencies in need of maintenance. Also, the removal of tree growth and woody shrubs from the upstream embankment-spillway abutment, and installation of anchor bolts to secure the principal spillway access ladder is recommended.

The cause, origin and significance of the red-brown staining observed in the downstream channel could not be conclusively established by visual observation. It is believed this condition may represent a potential hazard to the dam. Therefore, the dam owner should make an investigation to ascertain the cause, origin and significance of the staining to dam and appurtenant stability.

Guideline criteria recommends a PMF spillway design flood for "intermediate" size, "high" hazard dams. Review of available design information indicates the emergency spillway can pass the PMF without overtopping the dam crest. Therefore, spillway discharge capacity is assessed adequate and in accordance with recommended guideline criteria.

RECOMMENDATIONS

The following recommendations should be implemented as soon as possible:

1. Develop and institute a flood surveillance, warning, and evacuation plan.
2. Investigate cause, origin and significance of red-brown staining observed in the downstream channel.
3. Repair, mulch and seed surface erosion and depressions on embankment crest, slopes, right abutment, and spillway channel.

4. Develop methods of reducing the quantity of debris that frequently collects on, and obstructs the principal spillway entrance structure and trash rack.
5. Remove tree and woody shrub growth located along embankment-spillway abutment, downstream embankment slope, and exit channel side slopes.
6. Develop a more thorough maintenance program to regularly remove collected debris and sediment from the principal spillway entrance structure.



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PINEY RUN DAM



Overview of Dam

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PHASE 1 REPORT
NATIONAL DAM INSPECTION PROGRAM
PINEY RUN DAM
NDI ID. NO. MD 139

SECTION 1
PROJECT INFORMATION

1.1 GENERAL

- A. AUTHORITY: This 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: Piney Run Dam was constructed as a zoned earthfill structure. The dam embankment consists of an impervious clay core extending from dam foundation to crest, and upstream and downstream embankment shells. Piney Run Dam has a maximum toe to crest height of 73 ft., a crest width of 22 ft., and is 624 ft. long. Upstream and downstream embankments slope 3H:1V. A seven (7) ft. wide rock riprap berm and an 18 ft. wide rock and earth berm are located on the upstream slope at about 12.5 ft. and 38.5 ft. below the dam crest, respectively. Refer to Plate Nos. 1, 2, 3, 6, and 7.
2. Seepage Control Provisions: A cutoff trench is located at the centerline of the dam embankment. The cutoff trench bottom was excavated to bedrock and extends along the dam foundation and abutments up to about 17 ft. below the dam crest. Refer to Plate No. 4.

Cement grout was injected into foundation bedrock below the cutoff trench to form a curtain for the purpose of reducing seepage flow. The grout curtain is located at dam centerline and extends a maximum of 68 ft. below the cutoff trench. Refer to Plate No. 5.

Embankment seepage water is collected by chimney and filter trench drains, and is diverted out of the embankment by a toe drain and corrugated metal pipe outlet system. The chimney drain is located downstream of the clay core and extends between abutments and up from the cutoff trench to 16.5 ft. below dam crest. Filter trench drains are located about 150 ft. upstream from the downstream

embankment toe and are excavated to a maximum of 13 ft. below original ground. As shown on Plate No. 8, the outlet toe drain and pipes exit the downstream embankment toe at the location of the impact stilling basin.

3. Hydraulic Discharge Facilities: Hydraulic discharge facilities include a principal spillway riser, reservoir drain, water supply intake and outlet structure, and an emergency spillway channel.

Principal spillway intake works consist of a 57 ft. high drop inlet riser with two 11 ft. long overflow weir crest openings. A 128 ft. long 24 in. dia. reinforced concrete pipe with inlet is connected to the base of the principal spillway riser and serves as the reservoir drain. Principal spillway outlet works include a hand operated slide gate housed in the riser and a 304 ft. long, 36 in. dia. reinforced concrete outlet pipe with impact stilling basin. Refer to Plate Nos. 2, 6, 9, 10, 11, 12, and 13.

The emergency spillway channel is excavated to rock and is located at the right abutment. Spillway channels are 250 ft. wide, have vegetated 2.5H:1V side slopes, and a level crest section length of 30 ft. The overall length of the spillway channels and control crest is about 682 ft. Refer to Plate Nos. 1, 2, 3, and 4.

A water supply intake structure is located at the earth-rock berm on the upstream slope at El. 502, adjacent to dam centerline Station 7+50. The intake structure is constructed of reinforced concrete and is 38 ft. in height. A 24 in. dia. concrete pipe supported by a continuous concrete cradle is connected to the base of the intake structure and will serve as the outlet when the riser is put into service. Refer to Plate No. 7.

- B. LOCATION: Piney Run Dam is located in Carroll County, Maryland approximately 1 mile northwest of Sykesville. The dam was constructed across Piney Run, a southward flowing tributary of the Patapsco River.
- C. SIZE CLASSIFICATION: The dam has a maximum (top of dam) storage capacity of 8,842 ac.-ft. and a toe to crest height of 73 ft. Based on maximum storage capacity and dam height, the dam is classified as an "intermediate" size structure.
- D. HAZARD CLASSIFICATION: Piney Run Dam is classified as a "high" hazard structure. In the event of dam failure approximately eight (8) inhabited structures located within a 5.5 mile downstream channel reach would be subject to substantial damage and loss of life. Additional property damage would be expected to occur to state and county roads and bridges.

- E. OWNERSHIP: Piney Run Dam is owned and under the authority of the Carroll County Commissioners. As a park facility, its operation and maintenance are the responsibility of the Carroll County Park Commission. All correspondence concerning maintenance and operation procedures should be directed to Richard Soisson, Park Manager, Piney Run Park, 30 Martz Road, Sykesville, MD 21784, phone number (301) 795-3274.
- F. PURPOSE OF DAM: The dam was constructed as a multi-purpose facility to provide flood control, water supply, and recreation.
- G. DESIGN AND CONSTRUCTION HISTORY: The dam was designed by Rummel, Klepper and Kahl Consulting Engineers, Baltimore, Maryland, with the assistance of the Soil Conservation Service in 1971 and 1972. Piney Run Dam was constructed by Dewey Jordan Inc. Construction of the dam was started June 26, 1973 and completed November 21, 1974.
- H. NORMAL OPERATING PROCEDURE: Piney Run Dam normally operates as an uncontrolled structure with the reservoir drain slide gate closed. Normal pool elevation is maintained at El. 524, the level of the uncontrolled weir crest openings of the principal spillway riser.

1.3 PERTINENT DATA

- A. DRAINAGE AREA 10.4 sq. mi.
- B. DISCHARGE AT DAM FACILITY
 - Maximum discharge at dam facility Unknown
 - Maximum ungated spillway channel capacity 19,520 cfs
- C. ELEVATION (FEET ABOVE MSL)
 - Constructed top of dam El. 540.5
 - Spillway channel weir crest El. 532.0
 - Normal pool El. 524.0
 - Maximum tailwater Unknown
 - Invert of reservoir drain inlet El. 469.5+
 - Invert of reservoir drain outlet El. 468.2+
 - Streambed at dam centerline El. 467.5
 - Downstream toe of dam El. 467.5+
- D. RESERVOIR LENGTH
 - Length of maximum pool 1.95 mi.
 - Length of normal pool 1.80 mi.
- E. STORAGE CAPACITY
 - Constructed top of dam 8842 ac.-ft.
 - Spillway channel crest 7400 ac.-ft.
 - Normal pool 6036 ac.-ft.
 - Sediment pool 339 ac.-ft.

F. RESERVOIR SURFACE

Constructed top of dam	384 acres
Spillway crest	340 acres
Normal pool	298 acres
Sediment pool	Unknown

G. DAM EMBANKMENT

Type	Zoned earthfill
Length	624 ft.
Height	73 ft.
Crest width	22 ft.
Side slopes	3H:1V
Impervious core	Yes
Core cutoff trench	Yes
Grout curtain	Yes

H. EMERGENCY SPILLWAY CHANNEL

Type	Vegetated earth
Cross section	Trapezoidal
Width	250 ft.
Crest elevation	532 ft.
Gate	None
Length of channel	682 ft.
Side slopes	2.5H:1V

I. REGULATING OUTLET

Type	Concrete drop inlet riser and 36 in. dia. R. C. outlet pipe
Riser Height	57 ft.
Riser Dimensions	3x9 ft. interior dimension
Length of connecting outlet pipe	304 ft.
Gate	Slide gate located in principal spillway riser

SECTION 2 ENGINEERING DATA

2.1 DESIGN

A. DATA AVAILABLE: The following available data may be obtained from the Maryland Water Resources Administration.

1. Hydrology and Hydraulics: Design calculations, stage-storage curves, discharge rating curves, and summaries of flood hydrograph results were obtained from Work Plan for the Piney Run Watershed prepared by Soil Conservation Service, and Piney Run Watershed Design Report, prepared by Rummel, Klepper & Kahl.
2. Embankment: Design information includes construction drawings, filter and chimney drain design calculations, geologic investigation summary, soil laboratory tests, settlement, piping, and stability analyses, and construction quantity estimates. This information was obtained from the documents identified above.
3. Appurtenant Structures: Available information includes calculations for sizing of water supply intake ports and pipe conduits, slide gate design, sizing and structural design of riser structures, design of rate control vault, and construction drawings. This information was obtained from Piney Run Watershed Design Report.

B. DESIGN FEATURES: Dam and appurtenances were designed in accordance with Soil Conservation Service, structural classification "C" (high hazard) criteria. Illustrations of principal design features are shown on Plate Nos. 1 through 14.

1. Embankment: The embankment core consists predominantly of compacted silty clay (CL) and clayey silt (ML), with some clayey and silty sand (SC-SM). The core extends from 5 ft. below dam crest to dam foundation, and is continuous with the cutoff trench. Embankment core has a base width of about 23 ft. and the upstream side tapers on a 2V:1H slope towards the dam centerline.

Upstream and downstream embankment shells are constructed predominantly of silty sand (SM), with some silty clay (CL) and gravel (GM). Earthfill for core and shell construction was obtained from on-site borrow sources and emergency spillway excavation. Foundation preparation for placement of fill involved clearing and grubbing all foundation surfaces.

2. Seepage Drain Systems: According to construction drawings, the cutoff trench has a base width varying between 20 and 35 ft. and excavated side slopes of 1H:1V. The cutoff

trench is extended to grouted rock and is backfilled with compacted silty clay (CL) and clayey silt (ML) borrow. Fractured and fissured bedrock trench bottoms were treated with a dental cement grout.

A chimney drain is located against the downstream side of the embankment core. This drain measures 4 ft. wide and extends from 16.5 ft. below the dam crest to the cutoff trench.

Cement grout was used to inject a curtain in the quartzite and schist foundation bedrock. The curtain is located at dam centerline and extends a maximum of 68 ft. below the cutoff trench, and 750 ft. between abutments. Grout lines were drilled and grouted by the split spacing method, using three stage grouting procedures.

Seepage filter trench drains and outlet drain consist of a 1 ft. thick blanket of sand installed around a gravel core section of varying dimension. Filter trench drains connect into the outlet drain about 185 ft. downstream of dam centerline. The outlet drain was constructed around the 36 in. dia. R.C. outlet pipe. Filter trench drain width and height dimensions vary from about 2 x 10 ft. to 4 x 13 ft. About 275 ft. of 8 in. dia. perforated corrugated metal pipe was installed in the top sections of the filter trench drain and outlet toe drain to facilitate the drainage of seepage water. The outlet filter drain has a base width of 16 ft., 1H:1V side slopes, and a top width of 9 ft.

3. Flood Discharge Facilities: Details of the principal and emergency spillways, outlet works and water supply structure are shown on Plate Nos. 2, 4, 6, 7, 9, 10, 11, 12, 13, and 14.

The principal spillway riser operates as an uncontrolled drop inlet structure. The riser is constructed of reinforced concrete and measures 57 ft. in height and 3 x 9 ft. in interior dimension. Riser weir crest openings are protected by trash racks comprised of 9 ft. 10 in. long angle iron cross members. A 24 in. dia. reinforced concrete pipe connects the reservoir drain inlet to the base of the spillway riser and is regulated by a 24 in. slide gate housed in the spillway riser. A handwheel is used to operate the gate.

Principal spillway outlet consists of a 36 in. dia. reinforced concrete pipe, constructed with nine (9) anti-seep collars spaced at intervals of 18 ft. The pipe is supported by a continuous concrete cradle through the dam embankment.

The outlet pipe end section is supported and connected to the reinforced concrete inlet wall of the impact stilling basin. Outlet pipe flow is discharged into the basin baffle block, through the basin outlets, and into Piney Run.

The emergency spillway is a natural earth channel excavated to rock at the right abutment. Channel shape is trapezoidal, with a bottom width of 250 ft. and side slope inclinations of 2.5H:1V. Upstream spillway channel is approximately 302 ft. long on a negative 2 percent slope. The downstream channel is approximately 350 ft. long on a positive 2.5 percent slope.

- 2.2 CONSTRUCTION: Based on review of available design documents and field observations, it may be concluded the dam and appurtenances were constructed in general accordance with the intended design drawings.
- 2.3 OPERATION: According to Waterway Obstruction Permit Number C1-71-Ob-1, the Commissioners of Carroll County are responsible for the operation of Piney Run Dam.

The principal and emergency spillways are uncontrolled structures, and no performance or operation records are maintained. The only operational feature of these facilities is a mechanical slide gate used to regulate the reservoir drain. The water supply intake structure has eight (8) intake ports controlled by slide gates. This structure is not in use at the present time. A proposed downstream water supply pipeline has not yet been constructed.

2.4 EVALUATION

- A. AVAILABILITY: Available design information and drawings were obtained from the Dam Safety Division, Maryland Water Resources Administration.
- B. ADEQUACY: The construction drawings and design data provided are reasonably documented and are considered adequate to evaluate the dam and appurtenant structures 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: At this time there is no apparent evidence or reason to question the validity of the available design information and drawings.

SECTION 3 VISUAL INSPECTION

3.1 FINDINGS

A. GENERAL: The on-site reconnaissance of Piney Run Dam consisted of:

1. Visual observation of the earth embankment, abutments, and spillway channel.
2. Visual observation of exposed portions of the reservoir drain pipe, principal and water supply intake risers, and impact stilling basin.
3. Visual search for hazardous conditions and safety deficiencies.
4. Stadia survey of relative elevations along the embankment crest centerline, spillway and across embankment slopes.
5. Evaluation of the downstream hazard potential.

Visual surveys were performed during periods when reservoir and tailwater were at normal pool levels. An observation check list and field sketch are given in Appendix A. Specific observations are illustrated in photographs of Appendix C.

B. EMBANKMENT

1. Embankment Surface: Embankment and abutment slopes had a dense grass covering and appeared stable. The upstream embankment slope had a layer of rock riprap extending from normal pool level to about 13 ft. below dam crest. Shallow depressions and tire ruts were located on the dam crest and extended the full embankment length. Tire ruts were also worn into the embankment-spillway abutment. Shallow rill erosion was observed on the downstream slope at the right abutment junction. Field survey measurements indicate the upstream and downstream embankment slopes are inclined 3H:1V. Tree and woody shrub growth were observed on the upstream embankment-spillway junction.
2. Wet Zones: Wet zones with ponded water were observed at the downstream embankment toe and approximately 175 ft. and 200 ft. below the dam. The zones were small in surface area and had no discernible discharge. These zones are located in a topographic low and appear subject to surface drainage. Field reconnaissance on July 31, 1980 indicated these previously observed wet zones to be relatively dry.

C. APPURTENANT STRUCTURES

1. Principal Spillway Riser: Exposed exterior surfaces of the riser were observed in good condition with no discernible evidence of spalling or cracking. Trash rack angle iron cross members also appeared in good condition. Anchor bolts, which secure the top 6 ft. section of the access ladder to the interior riser wall, were missing. The reservoir drain slide gate was exercised and found in good operating condition.
2. Outlet Works: The impact stilling basin appeared in good structural condition. There was no discernible evidence of spalling or cracking on exposed concrete surfaces. Seepage outlet drains, exiting from each side wall of the impact basin, had no discernible discharge. The protective screen fence, located on top the right impact stilling basin side wall, is damaged.

Stilling basin side walls, rock riprap placed on exit channel stream banks and the downstream channel bottom, all showed evidence of a distinct red-brown staining. This staining extended up stilling basin side walls and channel banks to the "high water mark." Staining was not evident at the toe drain outlets, nor was it evident on riprap placed on the upstream slope, or on exposed riser surfaces.

3. Emergency Spillway: Spillway channel bottom and side slopes had a dense grass covering and appeared stable. Shallow tire ruts were observed to extend up both spillway side slopes at the dam centerline. Field survey measurements indicate side slopes approximate a 2.5H:1V inclination. The downstream spillway channel exits directly into a natural wooded area about 375 ft. from the dam centerline.

- D. RESERVOIR AREA: Visual observations and map review indicate that the immediate reservoir drainage area has gentle to moderate inclined shoreline and slopes. Watershed cover complex consists predominantly of cropland, pasture, and forest. Reservoir slopes and shoreline appeared stable, exhibiting no significant evidence of erosion or slope instability. Sediment is reportedly transported into the reservoir from upstream cultivated land during periods of rainfall.

- E. DOWNSTREAM CHANNEL: The immediate downstream channel reach is cobble lined and has stable side slopes. There were no observed conditions in the downstream channel that might cause flow obstruction and present hazard to the dam.

Downstream from the dam, Piney Run meanders approximately 5.5 miles in a southeast direction before it forms a confluence with the Patapsco River. Approximately eight (8) inhabited structures are located within this estimated downstream flood plain between the dam and river.

3.2 EVALUATION

A. EMBANKMENT

1. Embankment Surface: The observed deficiencies, consisting of tire ruts, shallow depressions, tree and woody shrub growth, and surface erosion, are surficial in scope and are not considered significant relative to the overall stability of the dam. However, these deficiencies should be repaired or corrected as soon as possible. In general, the embankment slopes are adequately maintained and appear in good condition. The dam crest is assessed in fair condition.
2. Wet Zones: The previously observed wet zones, located at and below the downstream embankment toe, are situated in a topographic low, and are believed attributable to surface drainage. Since no active seepage was visually associated with these zones and since the zones have subsequently become dry, the zones are not considered to represent a significant hazard to the dam. However, as a precautionary measure, the areas where wet zones were observed should be periodically monitored by the Park Manager to note any change in conditions and ascertain the cause of the intermittent ponded water.

- B. APPURTENANT STRUCTURES: Surface erosion along emergency spillway side slopes at dam centerline should be backfilled, mulched, and seeded. Tree and woody shrub growth at the upstream embankment-spillway abutment will require removal. Anchor bolts should be replaced to secure the principal spillway access ladder to the riser wall. The protective screen fence located on top of the right impact stilling basin side wall needs repair.

In general, principal and water supply intake risers, impact stilling basin and emergency spillway channel appear to be in good condition.

The cause and origin of the red-brown staining observed in the downstream channel and its significance to dam or appurtenant stability, could not be conclusively established by visual observation. Since toe drain pipe outlets were dry, this staining may indicate that iron enriched seepage water may be entering the outlet pipe through joints. Such a condition would present a significant hazard to the dam. It is suggested the reservoir be lowered several feet to allow observation of the outlet pipe to determine if seepage water is entering the pipe and precipitating the red-brown staining. Also, water quality tests should be performed to estimate pH content and acidity, and an assessment made to evaluate the effect on concrete structures.

SECTION 4 OPERATIONAL FEATURES

- 4.1 PROCEDURE: Normal operating procedure does not require a dam tender. The reservoir is normally maintained at the level of the uncontrolled riser weir crest openings. The operational features of the dam include a reservoir drain slide gate and water supply intake ports regulated by slide gates. The reservoir drain slide gate is normally kept closed. The water supply intake riser is not in use at this time, hence the slide gates are normally closed. Reservoir drain and water supply slide gates are reportedly exercised annually.
- 4.2 MAINTENANCE OF DAM: The dam embankment and appurtenant structures are maintained by the Carroll County Park Commission. Maintenance normally consists of removing trash and debris, mowing the emergency spillway channel, applying seed and fertilizer, and repairing eroded surfaces.
- 4.3 INSPECTION OF DAM: Formal inspections are made annually each November by park personnel and the Soil Conservation Service. Inspections generally consist of visually examining the dam embankment, appurtenant structures, reservoir area, outlet channel, and providing repair recommendations. In addition, the Park Manager normally inspects and operates the reservoir drain and water supply slide gates about twice each year.
- 4.4 MAINTENANCE OF OPERATING FACILITIES: The hand operated mechanical slide gates housed in the principal and water supply intake risers are maintained infrequently. Flow metering devices, located at the downstream embankment toe, near the impact stilling basin are not in use and are infrequently maintained.
- 4.5 WARNING SYSTEM: There is no formal warning system or emergency procedure to alert or evacuate downstream inhabitants in the event or threat of a dam failure. However, the Park Manager reports the dam is monitored during periods of heavy rainfall and civil defense authorities would be contacted in case of an emergency or in the event the emergency spillway becomes activated.
- 4.6 EVALUATION: Inspection procedures for the dam embankment and appurtenances are considered adequate. However, a more thorough maintenance program is recommended for the slide gates and operating mechanisms. Also, a formal flood surveillance, warning and evacuation plan is needed for the protection of downstream inhabitants.

SECTION 5
HYDROLOGY/HYDRAULICS

5.1 EVALUATION OF FEATURES

- A. DESIGN DATA: Piney Run Dam has a watershed drainage area of approximately 6,678 acres and topographic relief ranging from El. 469 to El. 790. Watershed cover complex consists predominantly of cropland, pasture, and forest, with little rural development. The dam impounds a 298 acre lake with an estimated normal pool storage volume of 6,036 ac.-ft.

Hydrologic analyses were based on Soil Conservation Service structure classification "C" criteria (high hazard).

Fifty year sediment accumulation of 339 ac.-ft. and beneficial storage of 5,697 ac.-ft. (for water supply and recreation) were used to set the riser crest openings at 16.5 ft. below the dam crest (El. 524).

Principal spillway weir crest openings were designed to pass the 6 hour, one percent probability storm without activating the emergency spillway.

The hydraulic capacity of the emergency spillway channel is reported to be 19,520 cfs when the reservoir pool is level with the dam crest (El. 540.5). Spillway capacity was designed to pass a flood corresponding to 23.2 inches of runoff in 6 hours without overtopping the dam embankment. Top of dam elevation was based on Soil Conservation Service freeboard hydrograph criteria.

As previously indicated, Piney Run Dam is classified as an "intermediate" size, "high" hazard dam. According to guideline criteria, the required spillway design flood for the dam facility is the PMF. Soil Conservation Service routing calculations reportedly indicate emergency spillway capacity is adequate to pass 100 percent PMF.

Soil Conservation Service hydrologic/hydraulic design methods are in accordance with accepted engineering practice.

- B. EXPERIENCE DATA: Records are not routinely kept of reservoir level elevations or rainfall amounts. However, during Hurricane Eloise (September 22-26, 1975), 14 inches of rainfall reportedly caused the lake to rise to El. 532.1, level with the emergency spillway crest. Also, Tropical Storm David reportedly raised the lake about one foot above normal pool level.

C. VISUAL OBSERVATIONS: On the dates of the field reconnaissances, no evidence of serious deficiencies were observed that would prevent the emergency spillway or principal spillway riser from functioning as designed.

D. OVERTOPPING POTENTIAL: Army Corps of Engineers dam safety criteria recommends the Probable Maximum Flood (PMF) for "intermediate" size, "high" hazard dams. Hydrometeorological Report No. 33 indicates the adjusted 6 hour PMF direct rainfall for the subject site area is 21.5 inches. (Refer to Appendix D.)

Soil Conservation Service design summary indicates dam and emergency spillway are sized to pass a flood corresponding to 26.8 inches of direct rainfall (23.17 inches runoff) in 6 hours without overtopping the dam crest.

Based on this data, it is considered unlikely the dam embankment will be overtopped.

E. EMERGENCY SPILLWAY ADEQUACY: The data previously developed, indicates that reservoir storage and spillway hydraulic capacity is adequate to pass 100 percent of the PMF. The dam and spillway are therefore considered adequate and in accordance with recommended criteria.

F. DOWNSTREAM CONDITIONS: Downstream of the dam, Piney Run empties into the south branch of the Patapsco River just north of Marriottsville. In this 5.5 mile channel reach, about eight (8) inhabited structures will be subject to damage and loss of life in the event of a dam failure.

The downstream channel has a natural gradient of approximately 0.7 percent and a width varying from 6 to 40 feet. Channel banks have dense grass and tree cover and in general appeared stable.

SECTION 6 STRUCTURAL STABILITY

6.1 EVALUATION OF STRUCTURAL STABILITY

A. VISUAL OBSERVATIONS

1. Embankment: Surficial embankment deficiencies and wet zones identified in Sections 3.1-B1 and B2 are not considered to have a significant affect on dam stability. However, as a precautionary measure, the areas where wet zones were previously observed should be periodically monitored by the Park Manager to note any change in condition and ascertain the cause of the intermittent ponded water.

In general, the structural condition of the dam embankment is assessed as good at the present time.

2. Appurtenant Structures: Visual observations of the principal spillway, water supply intake, emergency spillway, and impact stilling basin structures did not reveal evidence of structural distress that would significantly affect hydraulic performance or dam stability at this time.

B. DESIGN AND CONSTRUCTION DATA

1. Subsurface Exploration: The geological and subsurface investigation of the dam site and borrow areas included twenty-four (24) power auger holes, fifteen (15) test pits, and five (5) bucket auger holes. Refer to Plate No. 2 for locations.

In general, geologic investigation indicated the predominant presence of residual soils, composed mostly of silts and clays of low plasticity. These soils ranged from five (5) to six (6) feet deep, covering highly weathered mica schist ranging in thickness from ten (10) to forty (40) feet.

2. Laboratory Testing: Classification, compacted dry density, and shear strength tests were performed on selected samples of foundation and proposed borrow soils. Soil samples were obtained by split-spoon and Shelby tube samplers and from test pit excavations.

Results of classification tests indicate SM, ML, CL, and GM soils are predominant at the dam site. Standard proctor test on SM-SC soil yielded a maximum dry density of 113.3 pcf and an optimum moisture content of 15.5 percent. Soils of this type were used in the construction of embankment shells.

Consolidated undrained triaxial tests were performed to estimate the shear strength of compacted borrow soils.

Test results from six (6) triaxial tests indicated total stress friction angle and cohesion values to range from 22° to 29° and 430 psf to 1,320 psf, respectively. An unconsolidated undrained triaxial shear test of dam foundation soil yielded a friction angle value of zero and a cohesion intercept of 1,010 psf.

3. Slope Stability Analysis: Slope stability of upstream and downstream embankment slopes was evaluated using the Swedish Circular Arc Method. The analyses considered a 70 ft. high zoned earthfill embankment with 3H:1V side slopes, overlying bedrock. The lowest factor of safety against shear failure was reported to be 2.06 for a steady-state seepage condition of the downstream slope, and 1.65 for normal pool condition of the upstream slope. The steady-state phreatic surface used in the above analysis sloped from normal pool level to the downstream embankment toe. Earthquake and rapid drawdown conditions were not considered.
4. Seepage Analysis: Analyses were made of embankment and foundation soils to estimate expected seepage flows under normal pool conditions. Calculations indicate expected seepage losses of about 12,000 cfd and 6,000 cfd through the dam foundation and embankment, respectively.

Adequacy of chimney and filter trench drains was evaluated using flow nets and the Darcy flow equation. Drain dimensions were sized to provide 2.5 times the expected seepage flow capacity.

5. Stability Against Piping: Embankment soils were evaluated for stability against piping using filter criteria from Navdocks DM-7 and the Soil Conservation Service. The study indicated the embankment core soils are stable against piping into embankment shell soils.
6. Observation Wells: A total of thirteen (13) observation wells are installed in the left abutment, dam embankment and emergency spillway channel. The purpose of the wells is to monitor the effectiveness of the cutoff trench and grout curtain, and to monitor ground water conditions in the left abutment. Observation wells are extended into bedrock and have been periodically monitored since the reservoir was initially filled.

In general, observation wells show expected long term steady-state water elevations. However, observation well #7, located upstream of the cutoff trench and grout curtain, is showing a slow rise in static water level.

- C. OPERATING RECORDS: Operating records are not routinely 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 reservoir drain or water supply intake slide gates.

- D. POST-CONSTRUCTION CHANGES: In 1978, a leak developed in the water supply pipe located near the flow meter vault. Leaking pipe sections were removed and replaced with new pipe.
- E. SEISMIC STABILITY: Based on available static slope stability data, visual observations, and the past performance history of the dam, the static stability of the embankment slopes is considered to be adequate.

According to guideline criteria, Piney Run Dam is located in a Seismic Zone 1 area (low seismic probability). Based upon this low seismic probability, available slope stability data and the recommended criteria for evaluating the seismic stability of dams, the seismic stability of the embankment is presumed to be adequate under these earthquake conditions.

SECTION 7
ASSESSMENT AND RECOMMENDATIONS

7.1 DAM ASSESSMENT

A. EVALUATION

1. Embankment: The observed deficiencies presented in Section 3.2A are surficial in scope and are not considered to represent significant hazard to dam stability. However, repairs or corrections should be made as necessary. Periodic observation of areas where wet zones were observed is advised to ascertain cause of ponded water. In general, visual observations indicate the dam slopes are adequately maintained and in good condition. The dam crest is considered to be in fair condition.
2. Appurtenant Structures: Tree and woody shrub growth at the upstream embankment-spillway abutment will require removal. Eroded tire ruts on emergency-spillway side slopes are in need of repair. Also, anchor bolts are needed to properly secure the top 6 ft. section of the principal spillway access ladder to the riser wall. The protective screen fence, located on top the right impact stilling basin side wall, also needs repair.

In general, the condition of the emergency spillway and appurtenances is assessed as good.

The cause and significance of the red-brown staining observed in the downstream channel could not be conclusively established by visual observation. Additional studies are recommended (refer to Section 3.2-B), which can be performed by the dam owner, to evaluate the cause, origin and significance of the staining.

3. Overtopping Potential: Army Corps of Engineers dam safety criteria recommends a PMF spillway design flood for "intermediate" size, "high" hazard dams. Hydrologic/hydraulic routing calculations reportedly indicate the dam can pass the PMF (100 percent) without overtopping the dam embankment.
 4. Spillway Adequacy: Based on the above data, emergency spillway capacity is assessed adequate and in accordance with recommended guideline criteria.
- B. ADEQUACY OF INFORMATION: The design drawings and reports available for this review were of sufficient detail to adequately conduct a Phase 1 study.
- C. NECESSITY FOR FURTHER INVESTIGATION: The dam owner should investigate the cause, origin and significance of the red-brown staining observed in the downstream channel. (Refer to Section 3.2-B.)

- D. URGENCY: Although there is no urgency in instituting the remedial measures recommended below, these measures should be accomplished as soon as possible.

7.2. RECOMMENDATIONS: The following recommendations are presented based on the data obtained:

A. DAM AND APPURTENANT STRUCTURES

1. Investigate cause, origin and significance of the red-brown staining observed in the downstream channel.
2. Repair, mulch and seed surface erosion and depressions on embankment crest, slopes, right abutment and spillway channel.
3. Remove tree and woody shrub growth from upstream embankment-spillway abutment.
4. Install anchor bolts and secure principal spillway access ladder to riser wall.
5. Repair the protective screen fence located on top the right impact stilling basin side wall.

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 emergency spillway channel discharge 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. Periodically observe areas where wet zones were encountered, as a precautionary measure. Note any change in conditions and ascertain cause of intermittent ponded water.

APPENDIX A
VISUAL OBSERVATIONS CHECK LIST AND FIELD SKETCH

VISUAL OBSERVATION CHECK LIST

Name Dam Piney Run County Carroll State Maryland National ID # MD 139
 Type of Dam Earthfill Hazard Category Class I - High hazard
 Date(s) Inspection 5/15/80 Weather Clear Temperature 65°
 Inspection Review Date 7/31/80
 Pool Elevation at Time of Inspection 525.1* Tailwater at Time of Inspection Normal M.S.L.

Inspection Personnel: ACKENHEIL & ASSOCIATES

Paul D'Amato
 Timothy Debes
 Richardson Gabel
 James Hainley

CARROLL CO. REPRESENTATIVE

Richard Soisson, Park Manager

Recorder Paul D'Amato

*Pool at riser weir crest elevation.

EMBANKMENT

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS*
SURFACE CRACKS	None observed. Embankment crest and slopes have a dense grass covering.	
UNUSUAL MOVEMENT OR CRACKING AT OR BEYOND THE TOE	None observed.	
SLOUGHING OR EROSION OF EMBANKMENT AND ABUTMENT SLOPES	Shallow rill erosion observed on downstream embankment slope near right abutment.	
VERTICAL AND HORIZONTAL ALIGNMENT OF THE CREST	No significant vertical or horizontal misalignment observed.	
RIPRAP FAILURES	None observed. Riprap protection observed in good condition.	

*REFER TO REPORT SECTIONS 3 AND 7

EMBANKMENT

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SETTLEMENT	Small shallow depressions observed in dam crest.	Depressions believed attributed to vehicular traffic across dam crest.
JUNCTION OF EMBANKMENT AND ABUTMENT, SPILLWAY AND DAM	Large trees located at the upstream dam-spillway abutment.	
ANY NOTICEABLE SEEPAGE	Wet zone located at toe of dam, approximately 80 ft. southwest of the left dam abutment. Zone observed to have a surface area of about 50 sq. ft. Two other wet zones were observed about 175 ft. and 200 ft. below the dam towards the left abutment side.	
STAFF GAGE AND RECORDER	None.	
DRAINS	Seepage drains outlet from side walls of impact stilling basin. Drains appeared in good condition with no observable flow.	

OUTLET WORKS

(Pond Drain)

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CRACKING AND SPALLING OF CONCRETE SURFACES IN OUTLET CONDUIT	Concrete pipe outlet observed in good condition. No cracking or spalling of interior surfaces was observed.	
INTAKE STRUCTURE	Principal and water supply intake structures partially submerged. Exposed concrete surfaces appeared in good condition with no cracking or spalling evident. Slide gate of principal spillway riser was exercised and found operable.	
OUTLET STRUCTURE	Concrete impact stilling basin observed in good condition.	
OUTLET CHANNEL	Outlet stream channel is cobble lined with vegetated banks. Channel observed free of debris and flow obstructions. However, a distinct red-brown staining of riprap and water discoloration were evident.	
EMERGENCY GATE	Not applicable.	

UNGATED SPILLWAY

VISUAL EXAMINATION OF		OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONCRETE WEIR		Not applicable.	
APPROACH CHANNEL		Approach channel has a dense grass covering, was recently mowed, and was observed free of debris and flow obstructions.	
DISCHARGE CHANNEL		Discharge channel bottom and side slopes vegetated with grass. Channel exits into a natural wooded area. Vehicular tire erosion evident on both spillway side slopes at dam centerline.	
BRIDGE AND PIERS		None.	

GATED SPILLWAY

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONCRETE SILL	Not applicable.	
APPROACH CHANNEL	Not applicable.	
DISCHARGE CHANNEL	Not applicable.	
BRIDGE AND PIERS	Not applicable.	
GATES AND OPERATION EQUIPMENT	Not applicable.	

INSTRUMENTATION

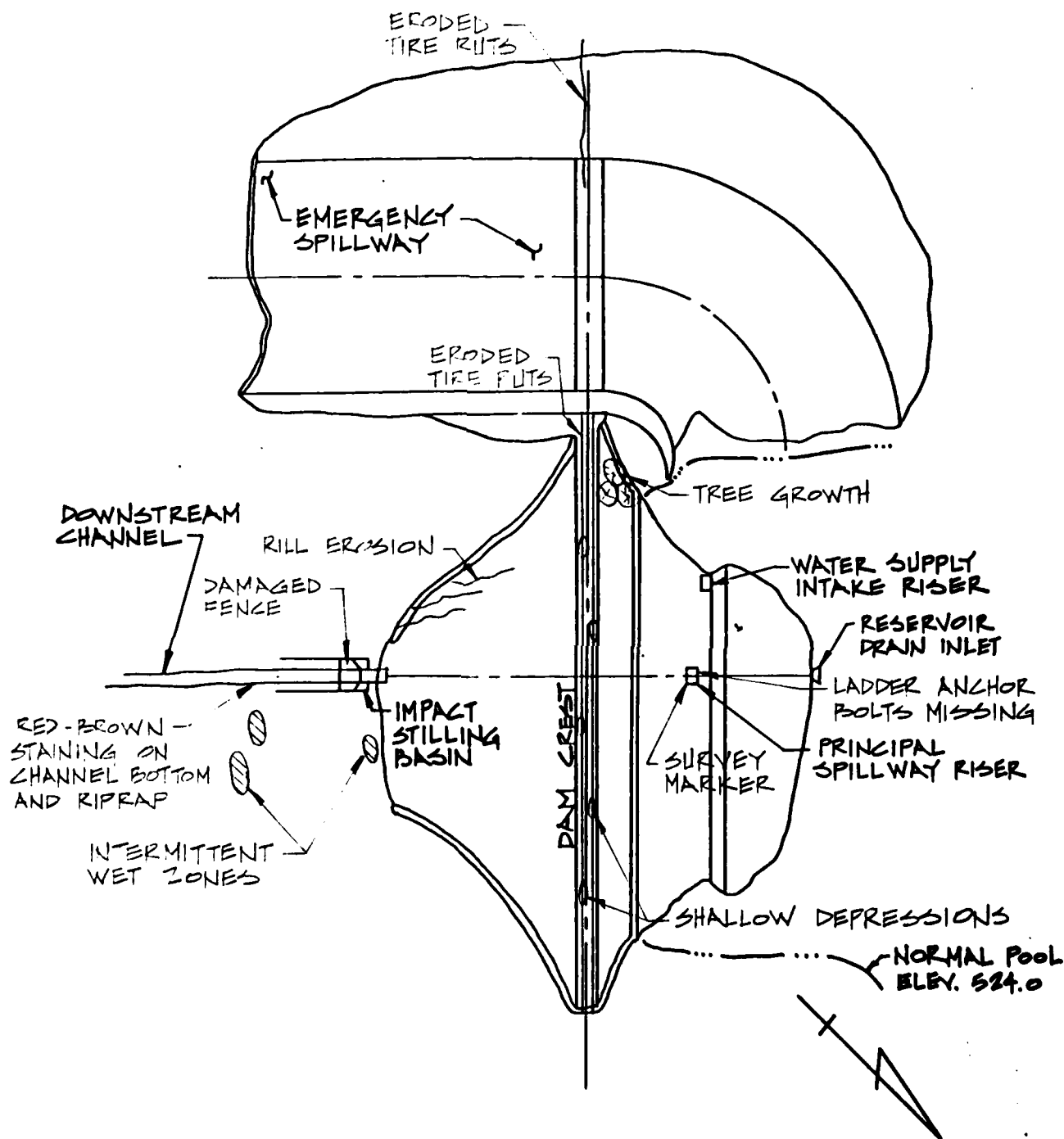
<u>VISUAL EXAMINATION OF</u>	<u>OBSERVATIONS</u>	<u>REMARKS OR RECOMMENDATIONS</u>
MONUMENTATION/SURVEYS	Survey marker located on top of intake riser (El. 526.16).	
OBSERVATION WELLS	A total of thirteen (13) observation wells are located on upstream and downstream embankment slopes, spillway channel, and left abutment.	
WEIRS	None.	
PIEZOMETERS	None.	
OTHER	Water supply pipe flow meter and vault located on right side of impact stilling basin.	

RESERVOIR,

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SLOPES	Reservoir slopes have gentle to moderate inclinations, are well vegetated, and appear stable. No evidence of landslides, embankment sloughing, or significant shoreline erosion was observed.	
SEDIMENTATION	Reservoir and spillway discharge water observed clear. A small quantity of sediment is reportedly transported into the reservoir from upstream cultivated lands during heavy rainfall.	

DOWNSTREAM CHANNEL

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONDITION (OBSTRUCTIONS, DEBRIS, ETC.)	No debris or flow obstructions observed.	
SLOPES	Channel side slopes are stable and vegetated with grass and trees.	
APPROXIMATE NO. OF HOMES AND POPULATION	Approximately eight (8) inhabited structures are located in the downstream flood plain between the dam site and the Patapsco River confluence.	



DATE: AUG. 8, 1980

SCALE: NONE

DR: JLM CK: TED

DWG. NO. A-10

NATIONAL DAM INSPECTION PROGRAM

ACKENHEIL & ASSOCIATES
CONSULTING ENGINEERS
BALTIMORE, MD.

PINEY RUN DAM
FIELD SKETCH

ELEV (FT.)

580

540

500

A

A

DAM CRE
1" = 80'

ELEV. (FT.)

540

22'

1 1/2

2 1

510

500

480

TYPICAL SECTION A-A THRU
1" = 20'

NOTE:

ASSUMED DATUM ELEV. 540.5
TOP OF DAM @ SECTION A-A

1

EMERGENCY SPILLWAY

2.5

250'

2.5

CREST PROFILE

THRU DAM

DATE: AUG 8, 1980
SCALE: AS SHOWN
DR: JLM CK: ARG
DWG. NO. A-11

NATIONAL DAM INSPECTION PROGRAM

ACKENHEIL & ASSOCIATES
CONSULTING ENGINEERS
BALTIMORE, MD.

PINEY RUN
DAM

APPENDIX B
CHECK LIST
ENGINEERING DATA
DESIGN, CONSTRUCTION, OPERATION
PHASE 1

CHECK LIST
ENGINEERING DATA
DESIGN, CONSTRUCTION, OPERATION
PHASE 1

NAME OF DAM Piney Run Dam
ID # MD 139

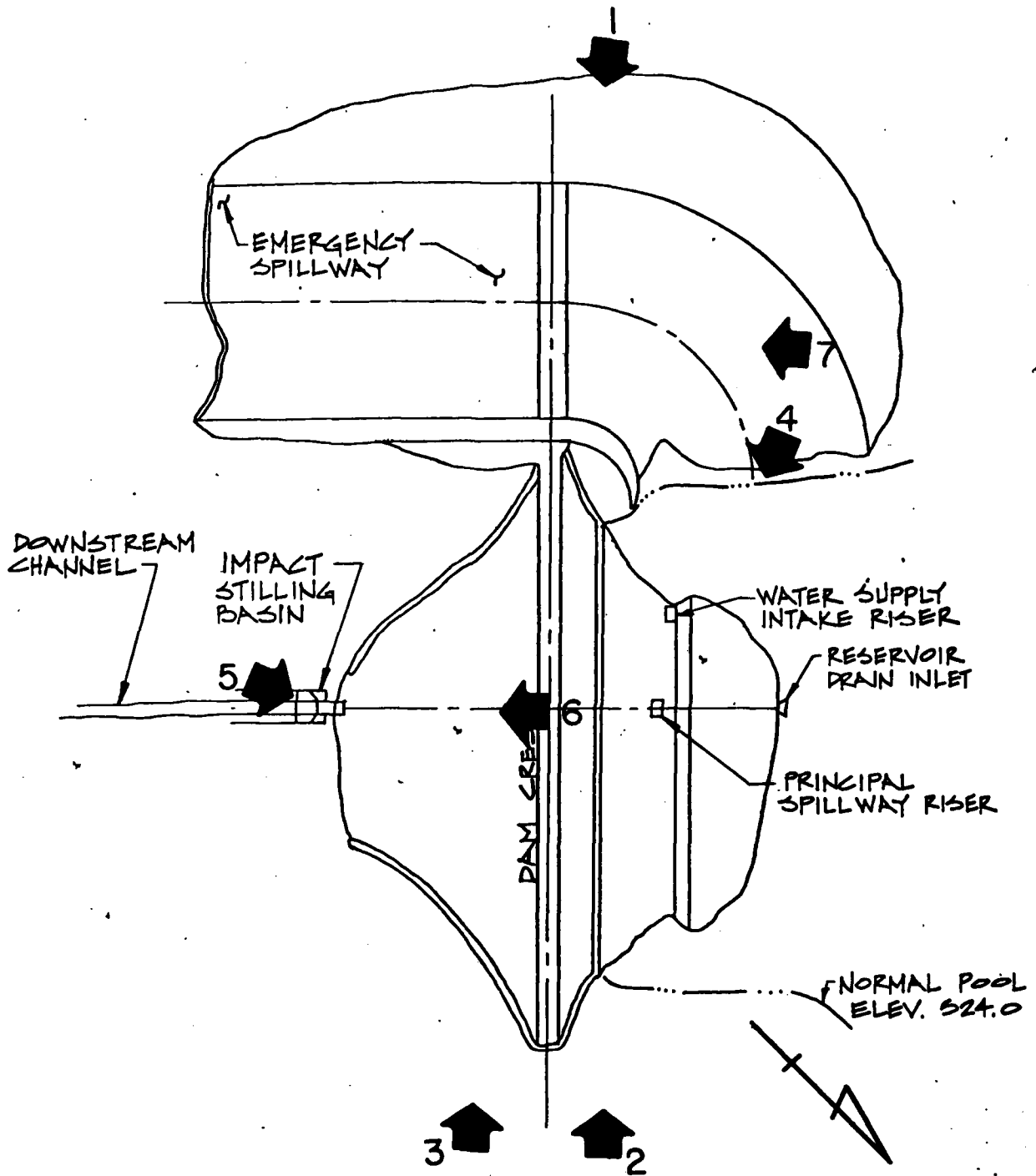
ITEM	REMARKS
AS-BUILT DRAWINGS	No as-built drawings were available. Design drawings were provided by the Maryland Water Resources Administration, Dam Safety Division, Annapolis, Maryland. (See Plate Nos. 1 through 16.)
REGIONAL VICINITY MAP	See Appendix E, U.S.G.S. 7.5 minute quadrangle map showing dam site location.
CONSTRUCTION HISTORY	Design drawings and report prepared by Rummel, Klepper and Kahl Consulting Engineers. Construction of dam began June 26, 1973 and was completed November 21, 1974.
TYPICAL SECTIONS OF DAM	See Plate Nos. 2, 3, 4, 6, 7, and 8.
OUTLETS - PLAN DETAILS CONSTRAINTS DISCHARGE RATINGS	See Plate Nos. 2 and 3. See Plate Nos. 6, 7, and 8. None None available.
RAINFALL/RESERVOIR RECORDS	None available.

ITEM	REMARKS
DESIGN REPORTS	Work Plan for the Piney Run Watershed prepared by Soil Conservation Service, and <u>Piney Run Watershed Design Report</u> , prepared by Rummel, Klepper and Kahl. Reports may be obtained from Maryland Water Resources Administration.
GEOLOGY REPORTS	Brief summary of site geology contained in <u>Piney Run Watershed Design Report</u> .
DESIGN COMPUTATIONS HYDROLOGY & HYDRAULICS DAM STABILITY SEEPAGE STUDIES	Summary of flood hydrograph and routing calculations, and dam stability and seepage studies included in design reports identified above.
MATERIALS INVESTIGATIONS BORING RECORDS LABORATORY FIELD	See Plate No. 2. Results of physical and engineering property soil tests conducted on foundation and borrow soils are included in the above identified design report.
POST-CONSTRUCTION SURVEYS OF DAM	None reported.
BORROW SOURCES	Soil for embankment construction obtained from emergency spillway excavation and borrow pits located within reservoir site area.

ITEM	REMARKS
MONITORING SYSTEMS	A total of thirteen (13) observation wells are installed in the dam embankment, left abutment and spillway channel. (See Plate Nos. 15 and 16 for observation well locations.)
MODIFICATIONS	None reported.
HIGH POOL RECORDS	Hurricane Eloise rose lake level to El. 532.1. Tropical Storm David rose lake level to approximately El. 525.
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 inspections performed by park and Soil Conservation Service personnel. Inspection records available from Maryland Water Resources Administration and the Soil Conservation Service.

ITEM	REMARKS
SPILLWAY PLAN	See Plate Nos. 1, 2, 3, and 4 for details of emergency spillway channel and control section construction.
SECTIONS	
DETAILS	
OPERATING EQUIPMENT PLANS & DETAILS	None available.
SPECIFICATIONS	None available.
MISCELLANEOUS	1) Waterway obstruction Permit C1-71-0b-1 dated April 15, 1971. 2) Proceedings of Public Hearing held on January 26, 1971. 3) Miscellaneous correspondence and inspection reports. 4) Slides of dam and appurtenant construction. 5) Maryland Inventory of Dams checklist.

APPENDIX C
PHOTOGRAPHS



PHOTOGRAPH
KEY MAP

DA 2 AUG. 8, 1980

SCALE: NONE

DR: JLM CK: TED

DWG. NO. C-1

NATIONAL DAM INSPECTION PROGRAM

ACKENHEIL & ASSOCIATES
CONSULTING ENGINEERS
BALTIMORE, MD.

PINEY RUN
DAM SITE

PHOTOGRAPH 1

Overview of dam crest, upstream embankment slope, and embankment-spillway abutment looking east.

PHOTOGRAPH 2

Overview of upstream embankment slope and riprap protection, and emergency spillway approach channel.

PHOTOGRAPH 3

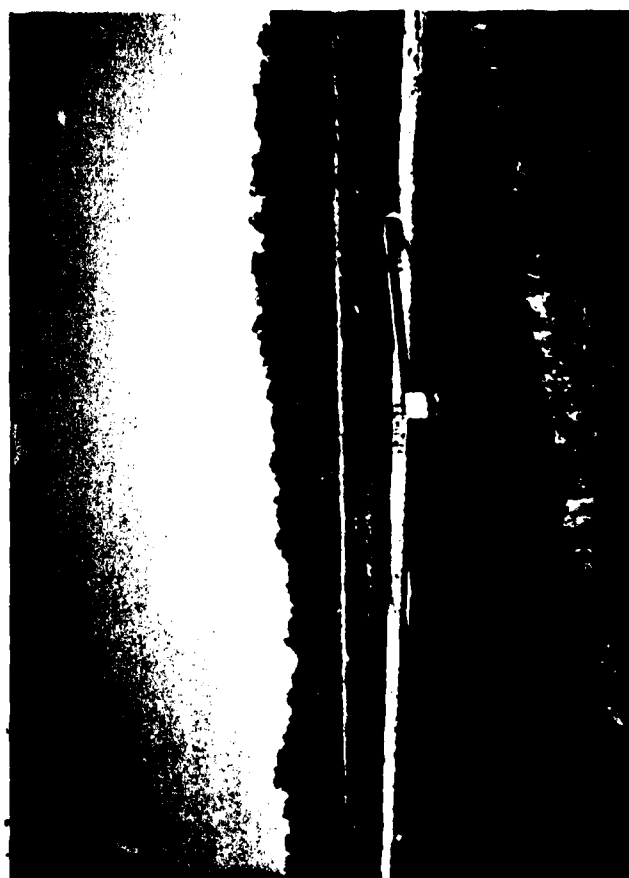
View of downstream embankment slope and surface erosion on emergency spillway side slope.

PHOTOGRAPH 4

View of principal spillway and water supply intake risers.



2



4



1



3

PHOTOGRAPH 5

Close-up view of impact stilling basin. Note red-brown staining on basin walls and riprap.

PHOTOGRAPH 6

Overview of downstream exit channel. Note red-brown staining of channel bottom.

PHOTOGRAPH 7

View of emergency spillway channel.

PHOTOGRAPH 8

Downstream hazard.



5



6



7



8

APPENDIX D

HYDROLOGIC AND HYDRAULIC
ENGINEERING DATA

HYDROLOGIC AND HYDRAULIC
ENGINEERING DATA

DRAINAGE AREA CHARACTERISTICS: Watershed cover complex consists predomi-
nantly of cropland, pasture, and forest, with little rural development.

ELEVATION TOP NORMAL POOL (STORAGE CAPACITY): 524.0 ft. (6036 ac.-ft.)

ELEVATION TOP FLOOD CONTROL POOL (STORAGE CAPACITY): 540.5 ft. (8842 ac.-ft.)

ELEVATION MAXIMUM DESIGN POOL: 540.5 ft.

ELEVATION TOP DAM: 540.5 ft.

EMERGENCY SPILLWAY

- a. Elevation Control crest at El. 532.0
- b. Type Vegetated earth channel, trapezoidal in shape
- c. Width 250 ft.
- d. Length 682 ft.
- e. Location Right abutment
- f. Number and Type of Gates None

OUTLET WORKS

- a. Type 36 in. dia. R.C. pipe
- b. Location _____
- c. Entrance Invert El. 469.5 ±
- d. Exit Invert El. 468.2 ±
- e. Emergency Drawdown Facilities Hand operated 24 in. dia. slide
gate housed in principal spillway riser.

HYDROMETEOROLOGICAL GAGES

- a. Type None
- b. Location None
- c. Records None

MAXIMUM NON-DAMAGING DISCHARGE Unknown

PINEY RUN DAM
HYDROLOGY REVIEW

Determine rainfall amount for PMF spillway design flood.

A. PMF rainfall for Carroll County, Maryland

Approximately, 23.9 in./24 hr.

Rainfall obtained from Hydrometeorological Report No. 33.
Based on 200 sq. mi. watershed.

B. Adjust rainfall for 6 hr. duration

Watershed area = 10.73 sq. mi.

Dam site located in Zone 6, therefore

$$23.9 \text{ in./24 hr.} \times 112\% = 26.8 \text{ in./6 hr.}$$

Adjustment factor obtained from Depth-Area-Duration Relationships, Hydrometeorological Report No. 33.

C. Adjust rainfall for drainage area.

Reduction factor = 0.8 (for watershed areas 10 sq. mi. or less)

Therefore, adjusted PMF rainfall =

$$0.8 \times 26.8 \text{ in./6 hr.} = 21.44 \text{ in./6 hr.}$$

Say, 21.5 in./6 hr.

HYDROLOGICAL DATA SHEET FROM
PINEY RUN WATERSHED WORK PLAN

ITEM	UNIT	TOTAL
Class of Structure		C
Drainage Area	Sq. Mi.	10.43
Curve No. (1 Day) (AMCII)		75
Tc	Hrs.	3.5
Elevation Top of Dam	Ft. MSL	540.5
Elevation Crest of Emergency Spillway	Ft. MSL	532.0
Elevation Crest of Single Stage	Ft. MSL	524.0
Maximum Height of Dam	Ft.	73
Volume of Fill	Cu. Yds.	180,000
Total Capacity	Ac. Ft.	8,842
Sediment Submerged	Ac. Ft.	303
Sediment Aerated	Ac. Ft.	36
Beneficial Use (W.S. & Rec.)	Ac. Ft.	5,697
Water Supply	Ac. Ft.	3,357
Recreation	Ac. Ft.	2,340
Retarding	Ac. Ft.	2,806
Surface Area		
Sediment Pool	Acres	55
Beneficial Pool (W.S. & Rec.)	Acres	298
Water Supply	Acres	298
Recreation	Acres	146
Retarding Pool	Acres	384
Principal Spillway		
Rainfall Volume (Areal) 1 Day	Inches	7.2
Rainfall Volume (Areal) 10 Day	Inches	12.0
Runoff Vol. (10 Day)	Inches	6.26
Capacity Single Stage (Max.)	cfs.	209
Frequency Operation - Emer. Spillway	% Chance	1
Size of Conduit	Dim.	36"Ø
Emergency Spillway		
Rainfall Vol. (ESH) (Areal)	Inches	10.8
Runoff Vol. (ESH)	Inches	7.63
Type	Vegetated	
Bottom Width	Ft.	250
Velocity of Flow (Ve)	Ft./Sec.	6.0
Slope of Exit Channel	Ft./Ft.	.025
Maximum Water Surface Elevation	Ft. MSL	534.0
Freeboard		
Rainfall Vol. (FH) (Areal)	Inches	26.8
Runoff Vol. (FH)	Inches	23.17
Maximum Water Surface Elevation	Ft. MSL	540.5
Capacity Equivalents		
Sediment Volume	Inches	0.60
Retarding Volume	Inches	5.05

February, 1968

BY Sy DATE 8/26
CHKD. By DATE _____

SUBJECT Check at
H. Riddick's Cade

SHEET NO. _____ OF _____
JOB NO. 87A-SI-32

Drainage Area 10.43 sq mi

$$10.43 \text{ sq mi} \times 640 \frac{\text{ac}}{\text{sq mi}} = 6675.20 \text{ acres}$$

① Storm	② Rainfall inch	③ Runoff inch	④ = $\frac{③ \times 6675.2}{12}$ Runoff Vol ac-ft	⑤ = ④ + (6000 ac-ft @ El. 524) Total Storage Volume w/o outflow ac-ft	⑥ Water level Stage ft
1yr-6hr	2.0	.40	222.5	6223	524.5
2yr-6hr	2.5	.65	361.6	6362	525
5yr-6hr	3.0	.95	528.4	6528	525.7
10yr-6hr	3.5	1.30	723.1	6723	526.2
25yr-6hr	4.0	1.66	923.4	6923	527
50yr-6hr	4.8	2.30	1279.4	7279	528
100yr-6hr	5.3	2.70	1501.9	7502	528.8
PMPs (500yr-6hr)	26.5	22.3	12404.7	18,405	overflow
x 100yr-6hr	13.7	11.23	6245	12,245	540 540.5

Computer Curve
obtained by
using SCS
Stage-Storage
Computations
6/21/67

RUMMEL, KLEPPER & KAHL
DESIGN CALCULATION SUMMARY SHEET

BY DATE 10/12/11 SUBJECT Exhibit 100 Year
CHKD. BY DATE

SHEET NO. OF
JOB NO. 222-51-3

Basis for top of structure

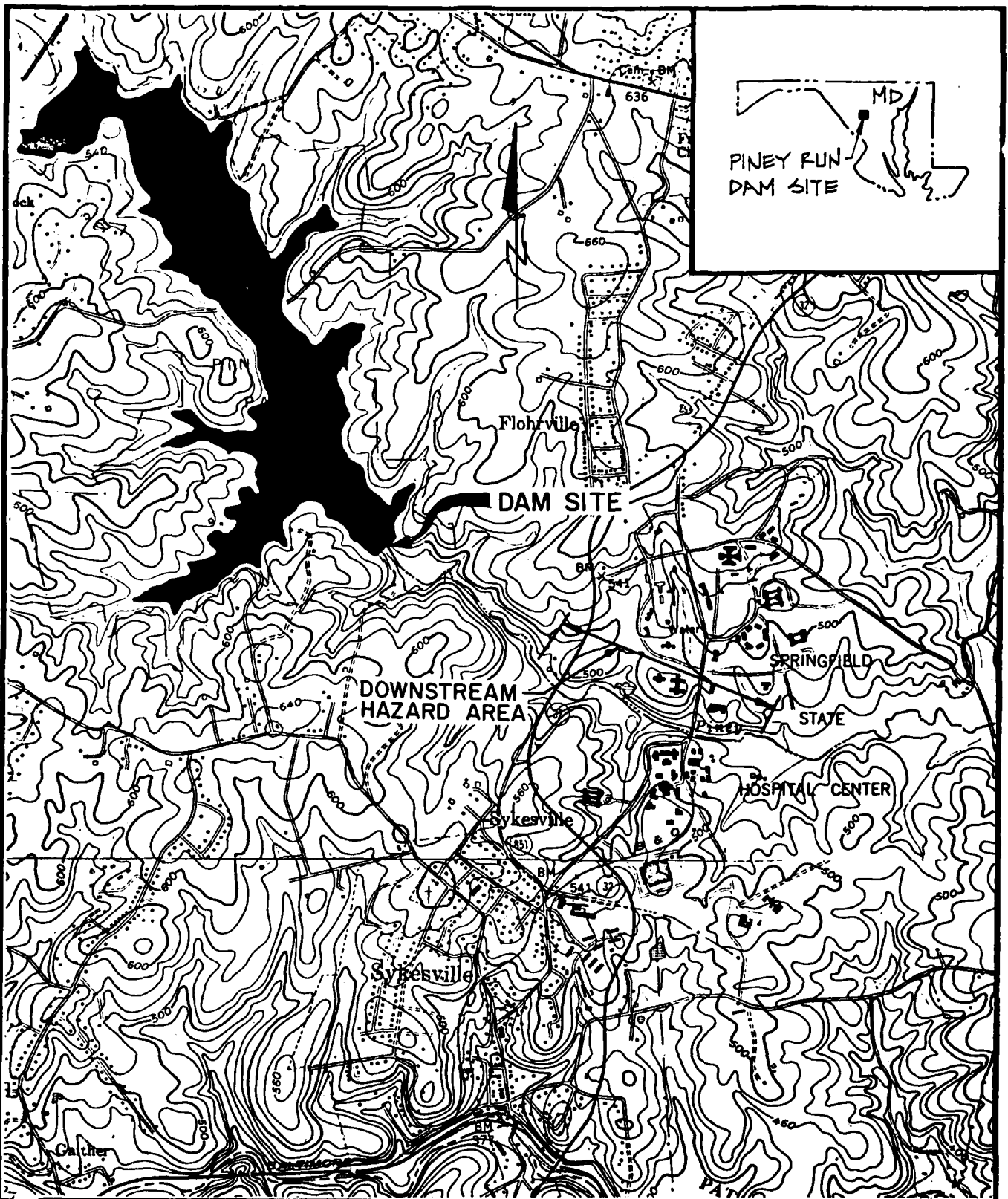
(1) Neglecting outflow during 50yr x 6hr storm
max'm water level stage will be estimated
at 528.0 ft.

* (2) Add 2 ft freeboard, bringing top of
intake structure to 530 ft.

(3) 100 yr x 6 hr storm would produce estimate
water stage of 528.8 ft. Therefore
structure would not be inundated by
this storm.

RUMMEL, KLEPPER & KAHL
DESIGN DATA

APPENDIX E
LOCATION PLAN AND PLATES



DATE: AUG. 8, 1980

SCALE: 1:24000

DR: JLM CK: TED

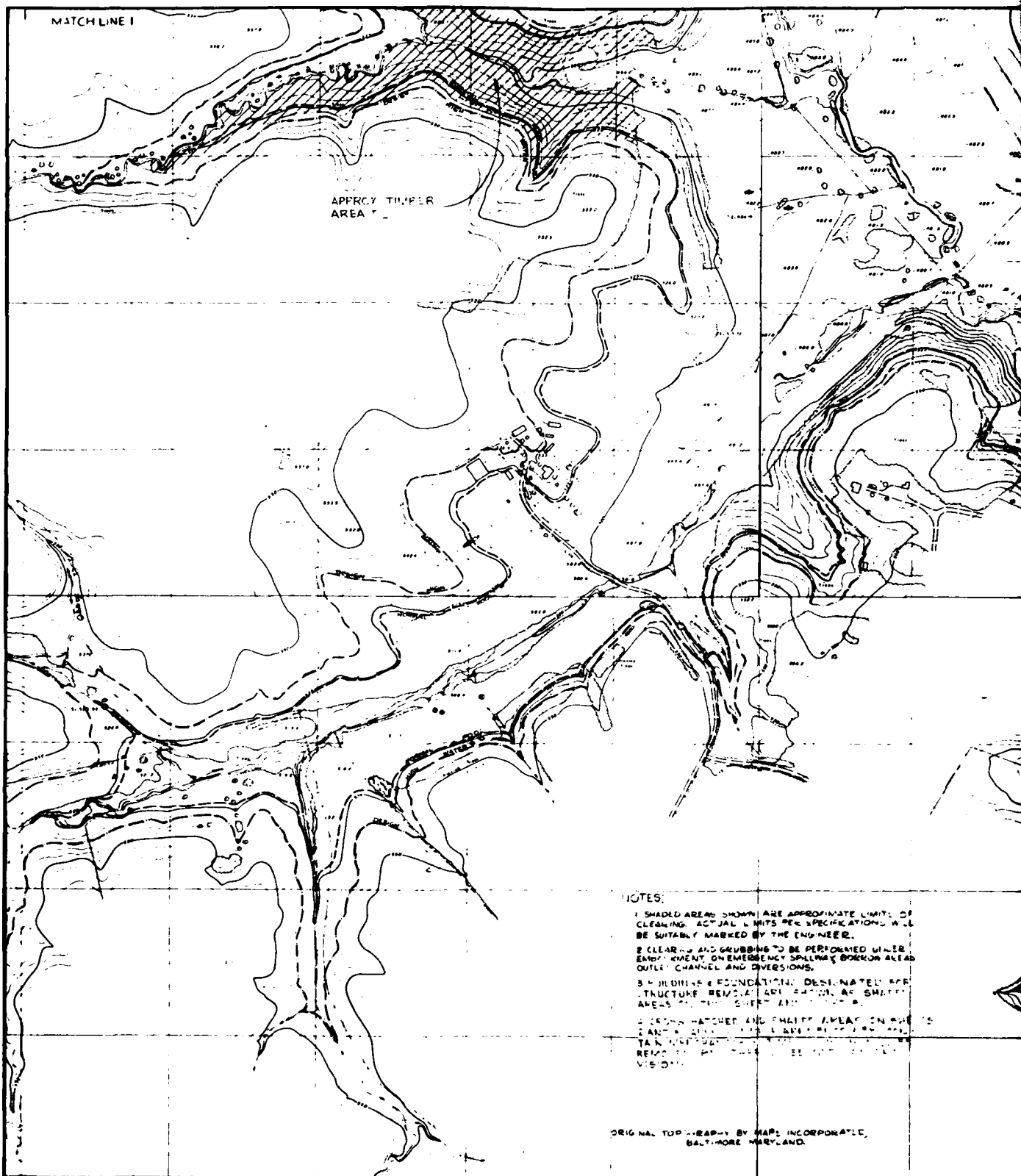
DWG. NO. E-1

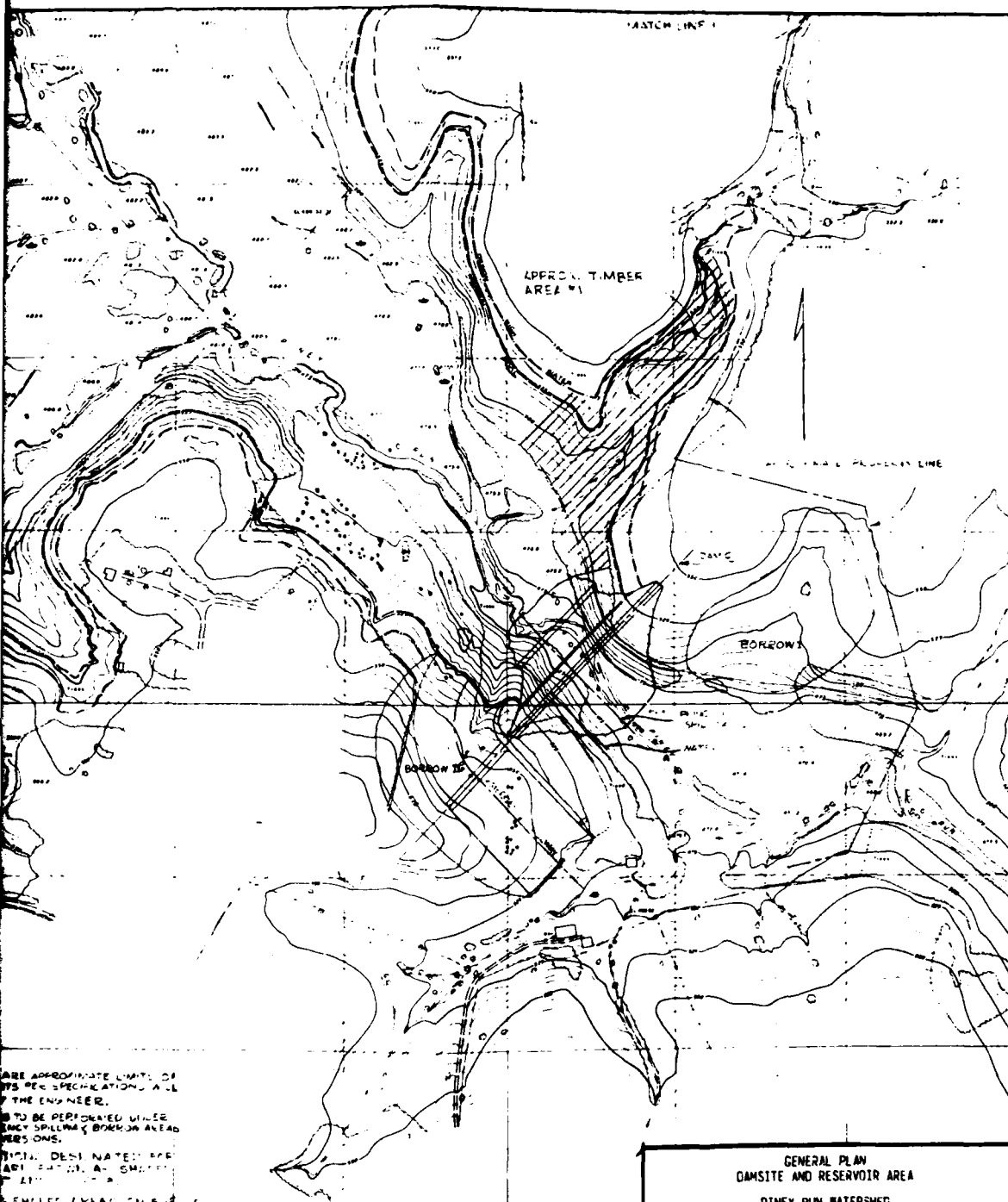
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CONSULTING ENGINEERS
BALTIMORE, MD.

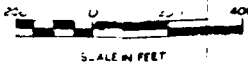
LOCATION PLAN

OF PINEY RUN
DAM SITE





ARE APPROXIMATE LIMITS OF
SPECS PER SPECIFICATIONS AND
THE ENGINEER.
TO BE PERFORMED UNDER
SPILLWAY BORROW AREA
BERS ONS.
DESIGNATED ARE
ARE SHOWN
SHOWN
SHOWN

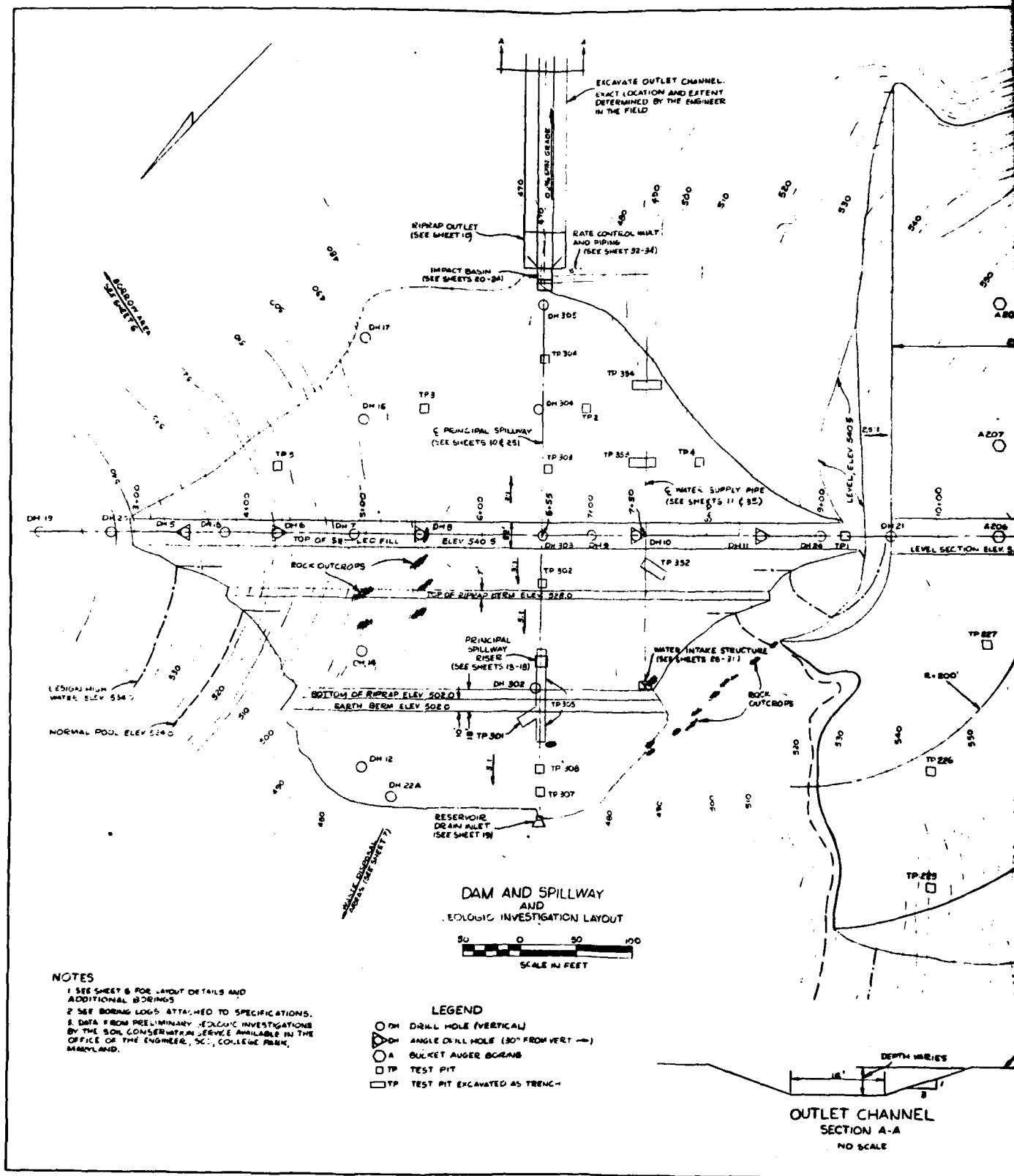


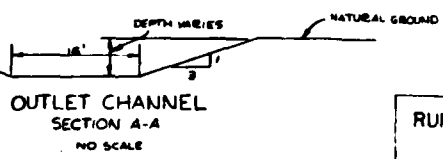
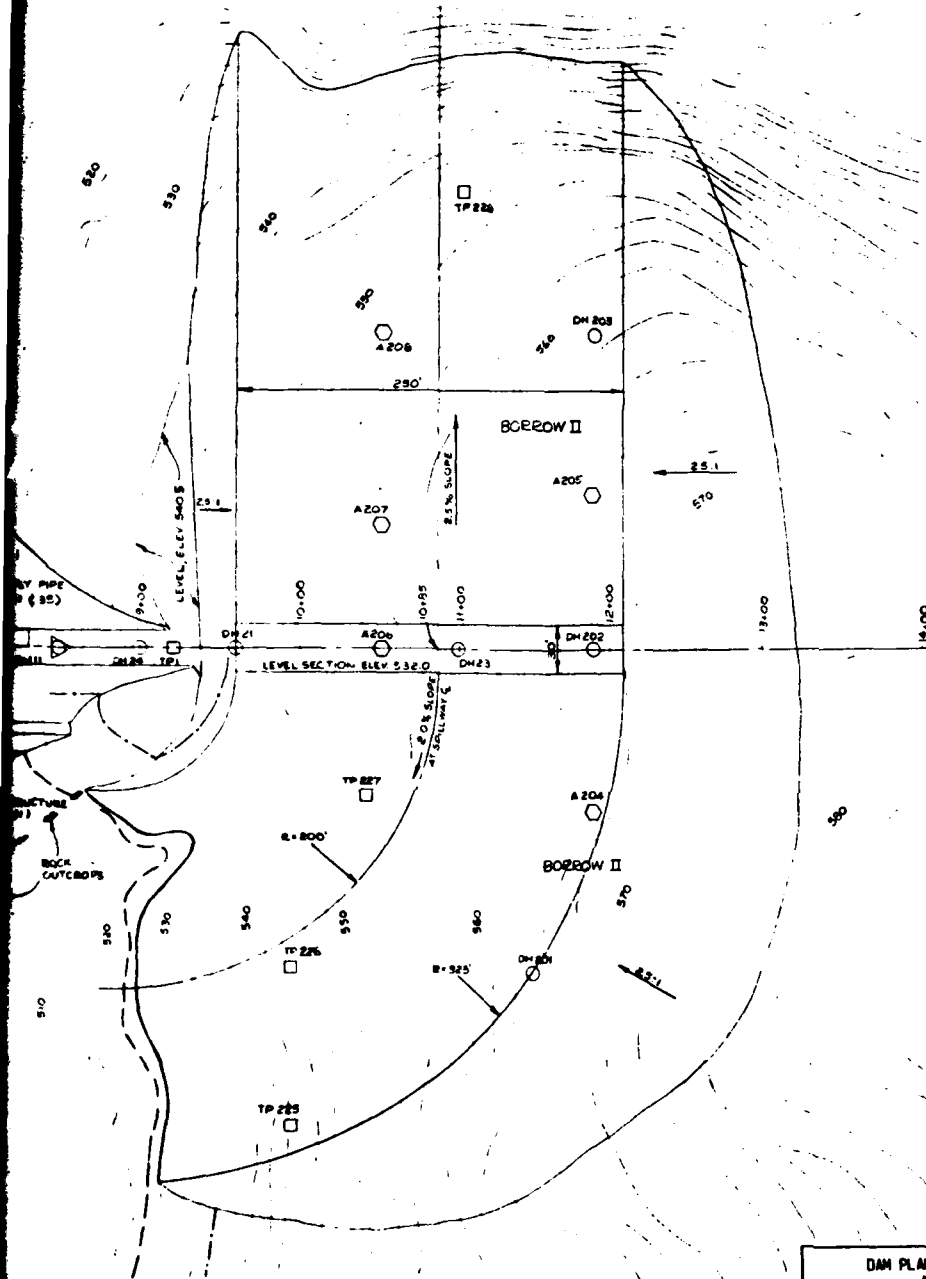
RUMMEL, KLEPPER & KAHL
CONSULTING ENGINEERS
BALTIMORE, MARYLAND

GENERAL PLAN DAMSITE AND RESERVOIR AREA PINEY RUN WATERSHED CARROLL COUNTY, MARYLAND	
U. S. DEPARTMENT OF AGRICULTURE SOIL CONSERVATION SERVICE	
Designed by: <u> </u>	Date: <u> </u>
Drawn by: <u> </u>	Approved by: <u> </u>
Traced by: <u> </u>	Title: <u> </u>
Checked by: <u> </u>	Sheet No. <u>2</u> of <u>55</u>
Drawing No. <u>SCS-MD-483-P</u>	

PLATE NO. I

2

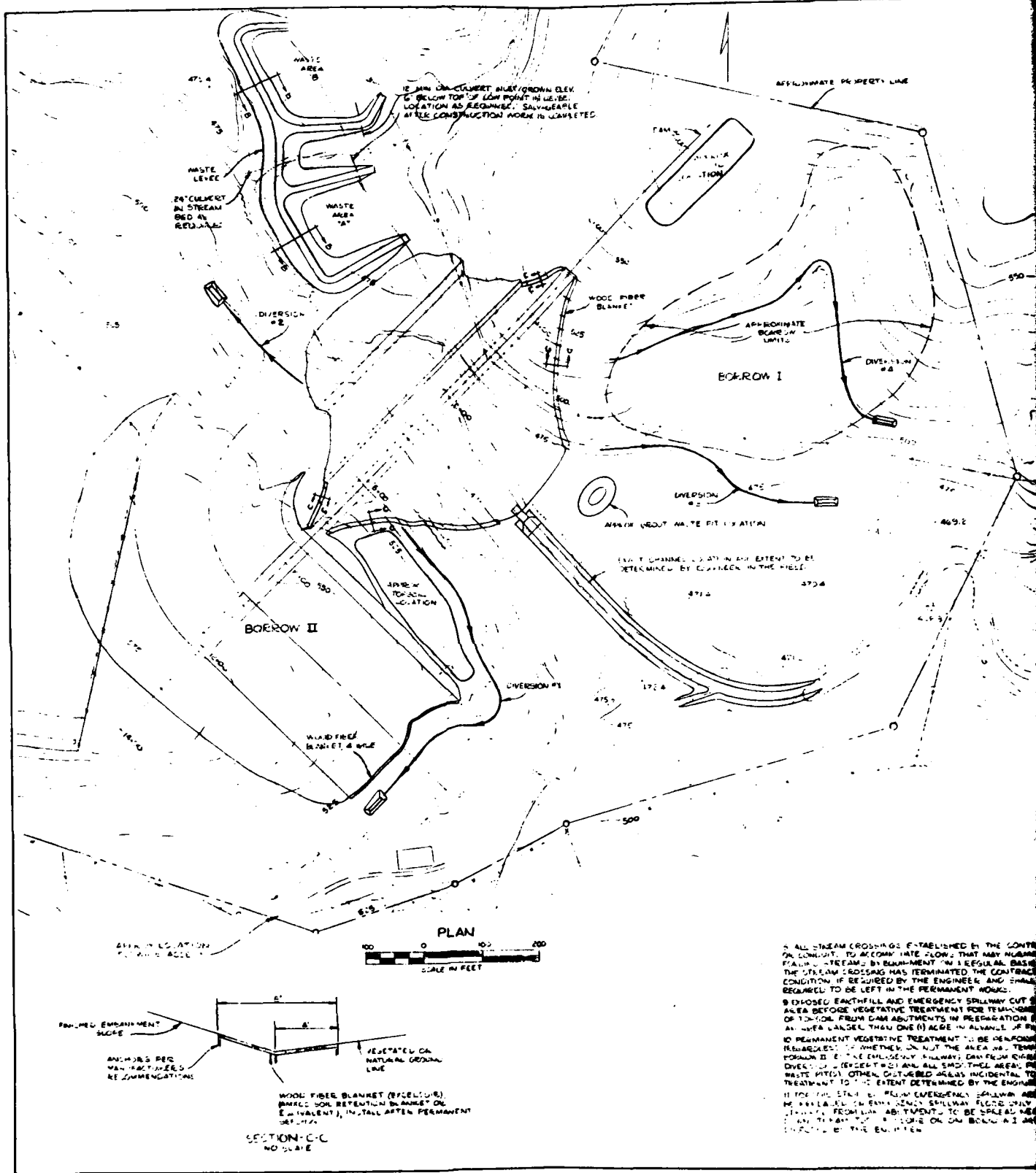


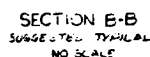
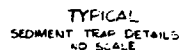
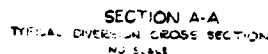


RUMMEL, KLEPPER & KAHL
CONSULTING ENGINEERS
BALTIMORE, MARYLAND

DAM PLAN, GEOLOGIC INVESTIGATION LAYOUT AND OUTLET CHANNEL DETAILS	
PINEY RUN WATERSHED CARROLL COUNTY, MARYLAND	
U. S. DEPARTMENT OF AGRICULTURE SOIL CONSERVATION SERVICE	
Designed H.R.	Date
Drawn C.A.H.	Approved by
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2 PLATE NO. 2



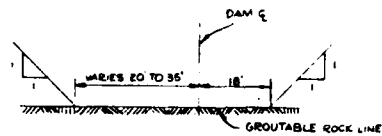
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	No. 7	SCS-MD-483-P
	of 25	

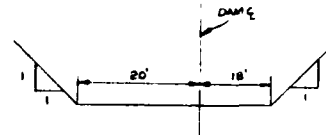
RUMMEL, KLEPPER & KAHL
CONSULTING ENGINEERS
BALTIMORE, MARYLAND

PLATE NO. 3

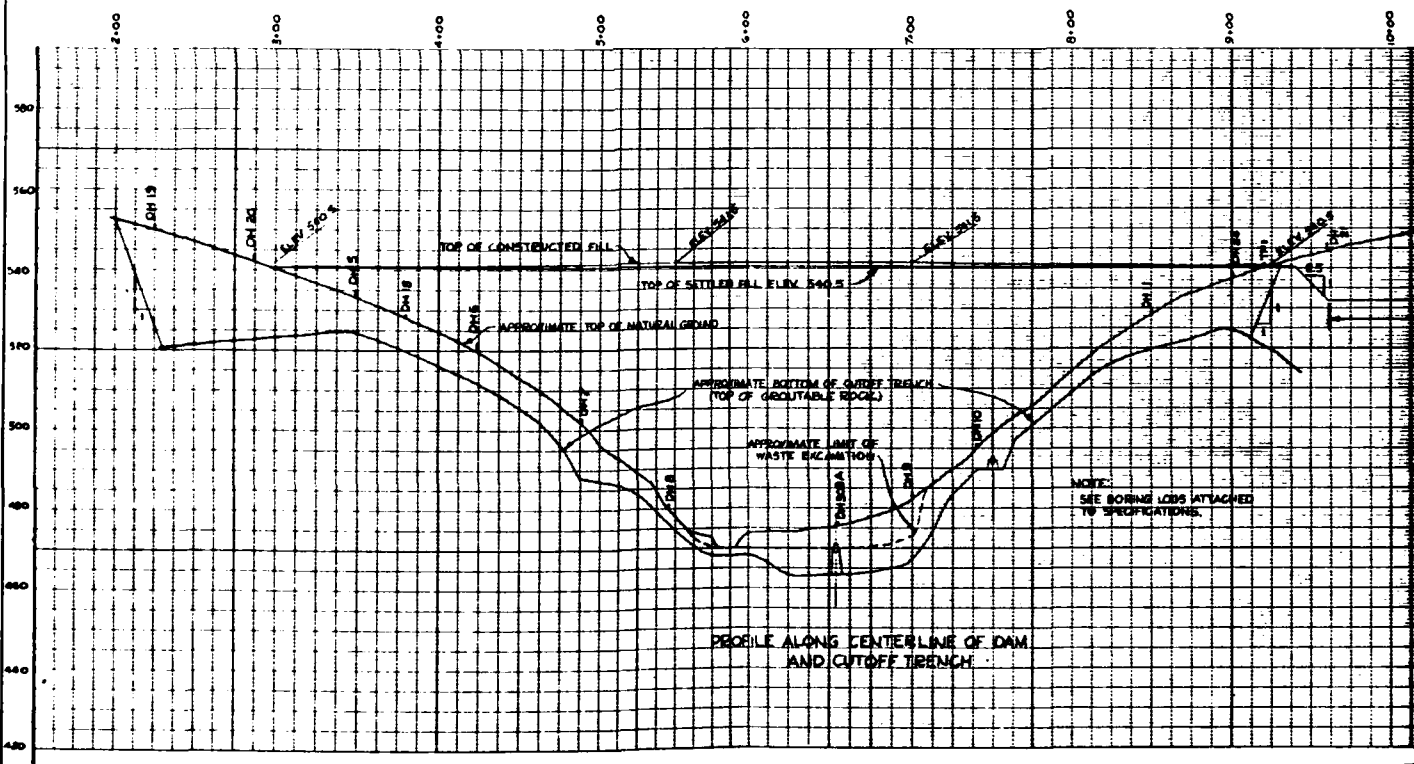
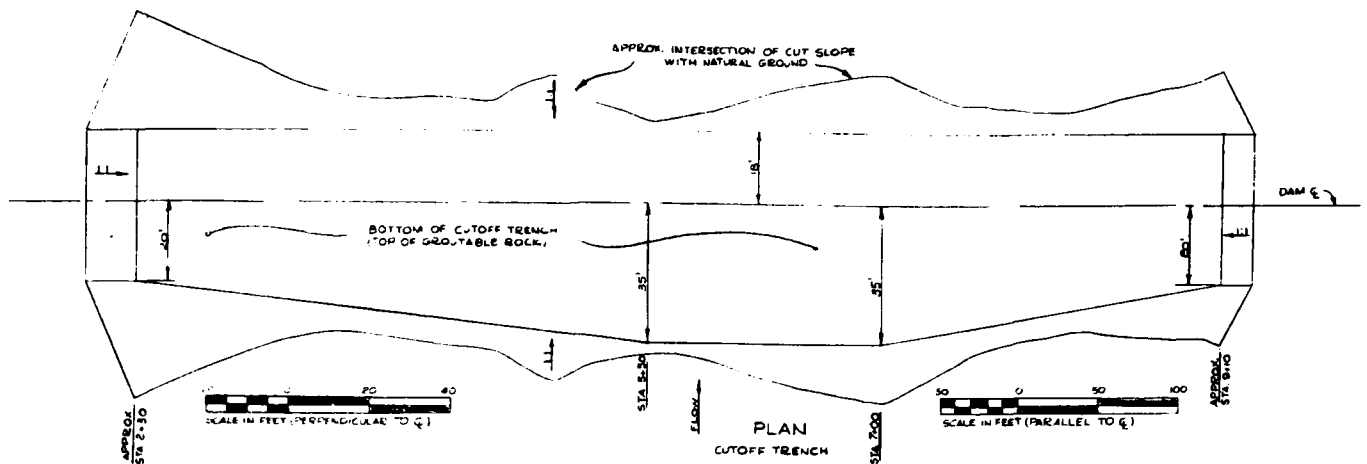
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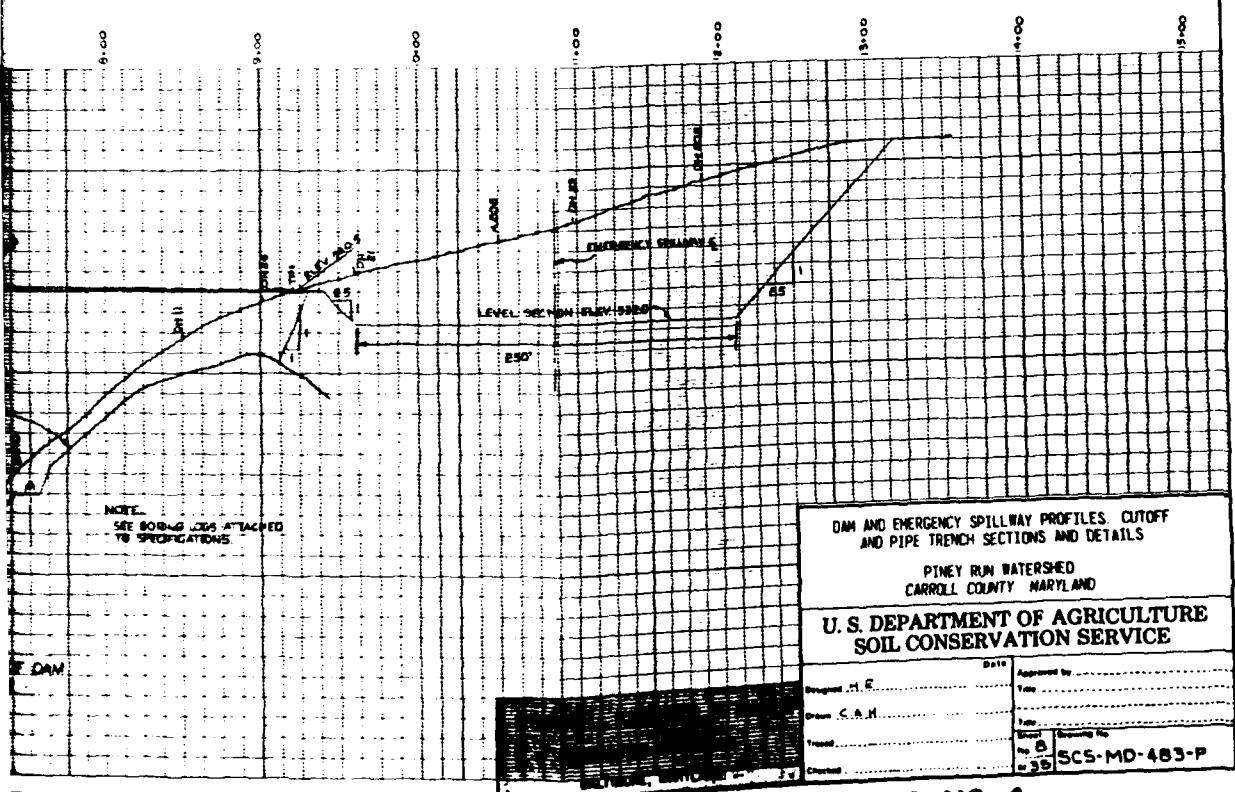
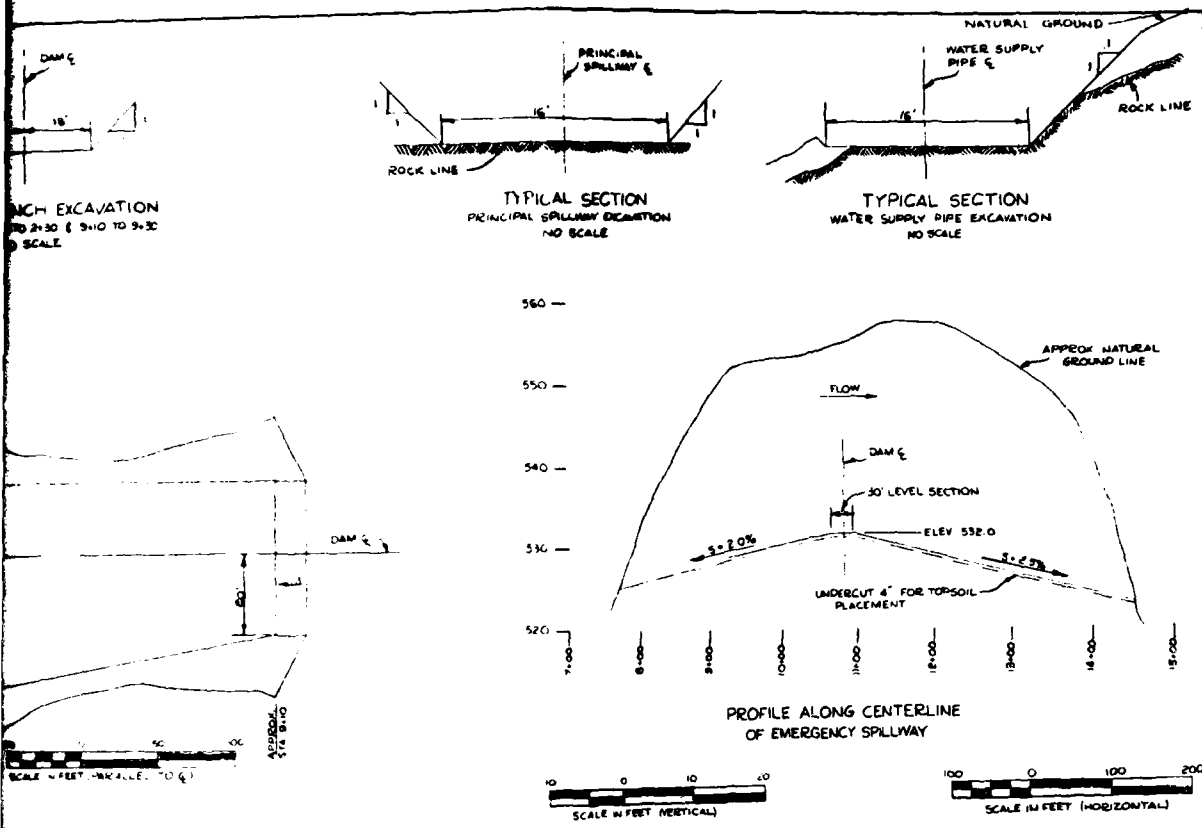


CUTOFF TRENCH EXCAVATION
APPROX STA 2+30 TO STA 9+10
NO SCALE



CUTOFF TRENCH EXCAVATION
APPROX STA 2+00 TO 2+30 & 9+10 TO 9+30
NO SCALE





DAM AND EMERGENCY SPILLWAY PROFILES, CUTOFF AND PIPE TRENCH SECTIONS AND DETAILS

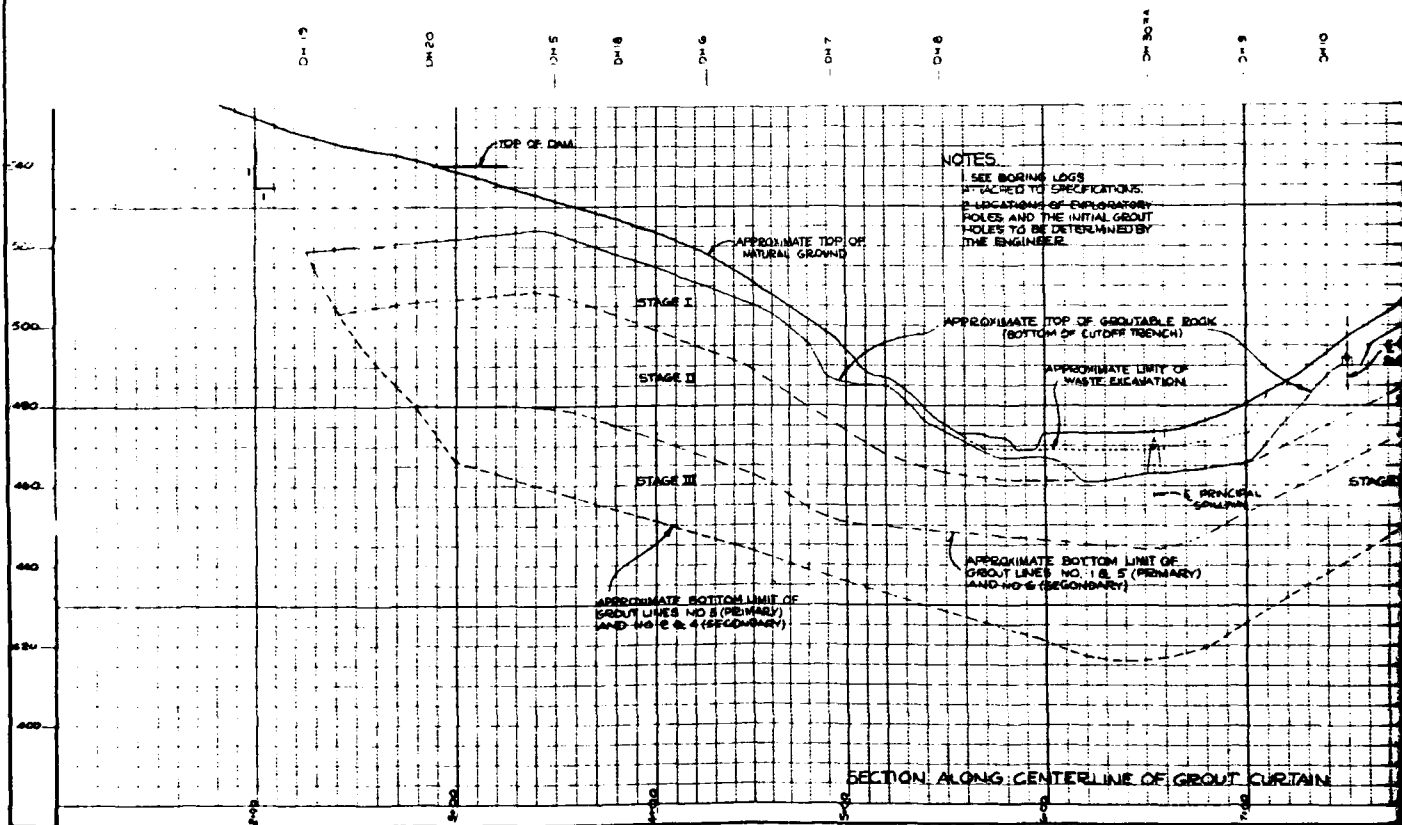
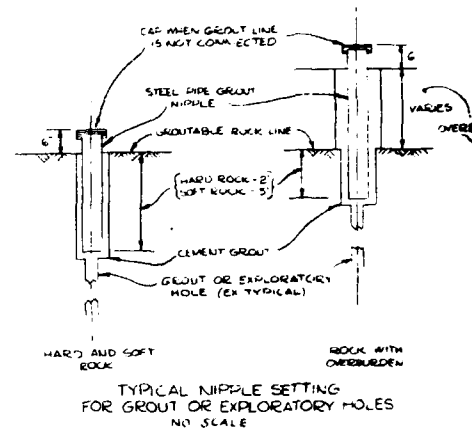
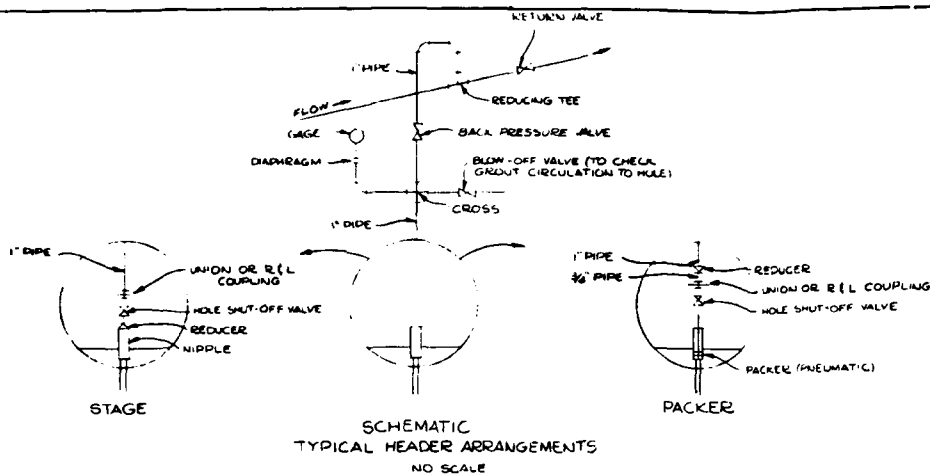
PINEY RUN WATERSHED
CARROLL COUNTY MARYLAND

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

Designed: H. E.	Date:	Approved by:
Drawn: C. A. H.	Title:	
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PLATE NO. 4

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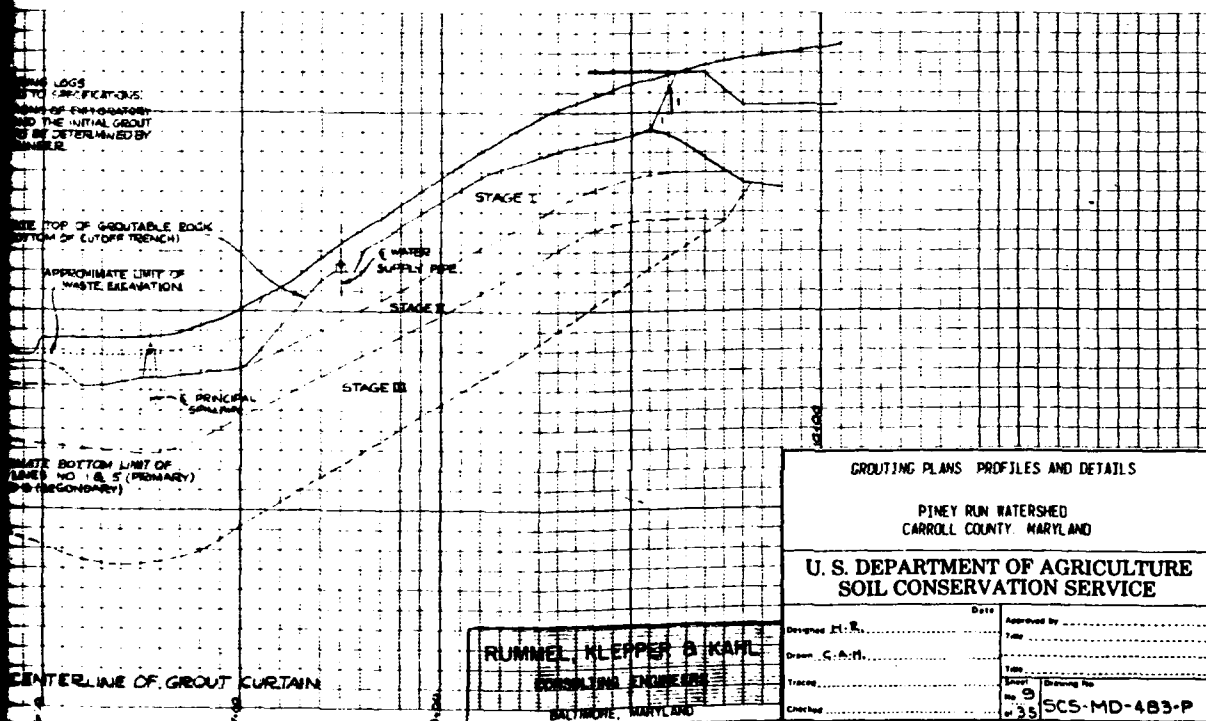
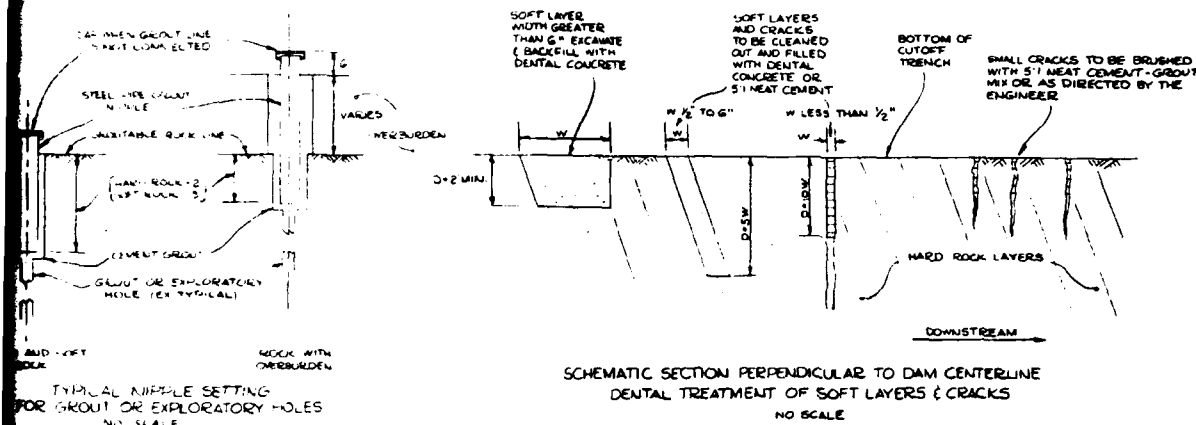
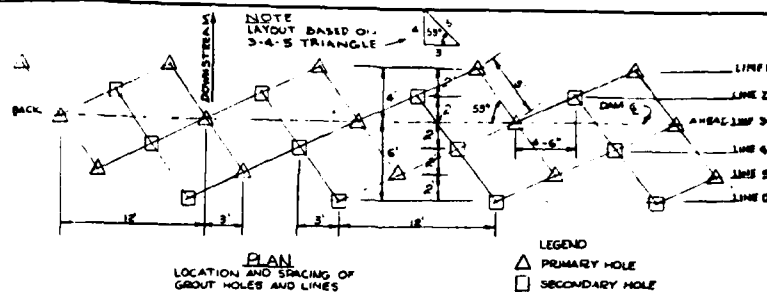
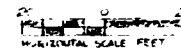
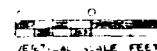
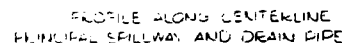


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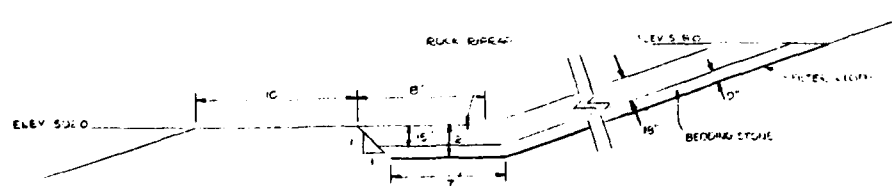
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4 MAXIMUM
5 LOW 9
6 MINIMUM
7 108-70
8 7-108
(MIN-DE
9 A-108
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12 W-108
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PIPE SIZE	W. S. 4.0110
6	00
5	70 - 00
4	30 - 40
3	10 - 30
2	0 - 5

NOTE: PLACEMENT OF MATERIALS PER
SPECIFICATIONS
SHOULD BE CONSIDERED TO STONE
VE STRIPS AND TO PAVING
PAVING STRIPS PER GRADATIONS IN PLAN



TYPICAL SECTION
RIPRAP SLOPE PROTECTION
1. SCALE

ROOF

WALL

LEVEL ACCESS TO

WALL BATH

REINFORCING WITH TOP OF EACH WALL

NOTE: REINFORCING SHALL BE 1/2" DIA. STEEL BARS SPACED AT 12" O.C. MINIMUM. SEE DETAIL FOR REINFORCING.

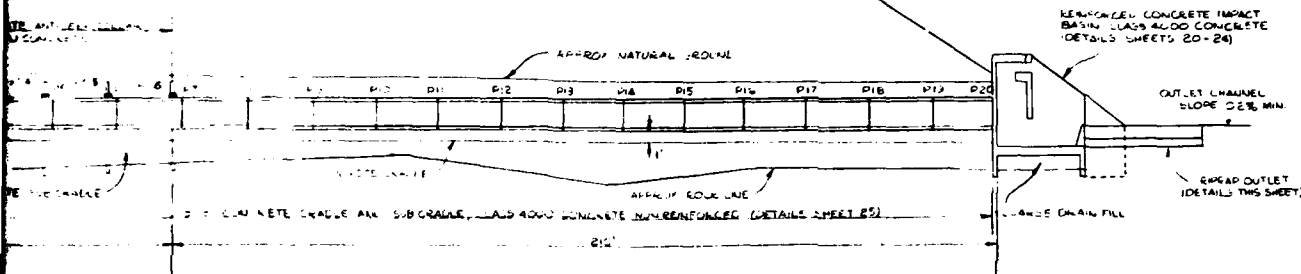
NOTE
RE: KIMBERLY, ROLLING
STONE AND PAPER CLOTH
EQUAL TO THAT USED FOR
EMERGENCY SLOPE

STATION	DISTANCE FROM UPPER STATION (FT)	Pipe Invert Elev. (ft)
PC	14.00	468.85
PCC	20.00	468.87
PCB	42.00	468.81
PCL	64.00	468.77
PCT	78.00	468.73
PCT	84.00	468.60
PCT	100.00	468.53
PCT	120.00	468.48
PCT	140.00	468.44

JOINT	DISTANCE FROM UPPER STATION (FT)	Pipe Invert Elevation (ft)	SLOPE FT/FT
P1	00.00	468.85	
P2	16.00	468.86	
P3	32.00	468.84	
P4	48.00	468.80	
P5	64.00	468.76	
P6	80.00	468.72	
P7	96.00	468.66	
P8	112.00	468.64	
P9	128.00	468.60	
P10	144.00	468.56	
P11	160.00	468.52	.0085
P12	176.00	468.48	
P13	192.00	468.44	
P14	208.00	468.40	
P15	224.00	468.36	
P16	240.00	468.32	
P17	256.00	468.28	
P18	272.00	468.24	
P19	288.00	468.20	
P20	304.00	468.16	
P21	320.00	468.12	
P22	336.00	468.08	
P23	352.00	468.04	
P24	368.00	468.00	.005
P25	384.00	467.96	
P26	400.00	467.92	

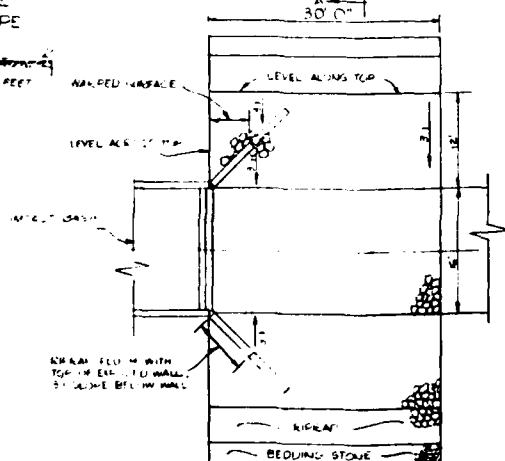
PRINCIPAL SPILLWAY CONDUIT - SPEC 418

1. 30" DIA. REINFORCED CONCRETE WATER PIPE
2. ONE SPIRANT WALL FOR 9 WALL - DETAIL SHEET 28
3. TOTAL LENGTH 304.00 FEET
4. MAXIMUM ALLOWABLE HEAD-ING, MINIMUM PRESSURE HEAD - C
5. MIN. 125 BOLL PER LIN FT BASED ON 2" OF 28
6. MINIMUM TENSILE STRENGTH FOR 0.005 CRACK
7. MINIMUM TENSILE STRENGTH FOR 0.005 CRACK
8. MINIMUM TENSILE STRENGTH FOR 0.005 CRACK
9. MINIMUM TENSILE STRENGTH FOR 0.005 CRACK
10. MINIMUM TENSILE STRENGTH FOR 0.005 CRACK
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28. MINIMUM TENSILE STRENGTH FOR 0.005 CRACK
29. MINIMUM TENSILE STRENGTH FOR 0.005 CRACK
30. MINIMUM TENSILE STRENGTH FOR 0.005 CRACK



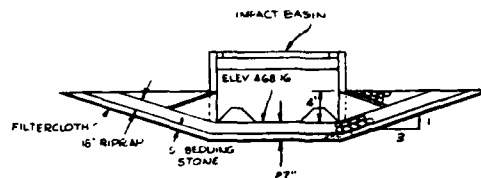
PROFILE ALONG CENTERLINE
OF SPILLWAY AND DRAIN PIPE

SCALE, FEET
HORIZONTAL SCALE, FEET



NOTE
REINFORCEMENT
DETAILS FOR
CONCRETE
STRUCTURE

PLAN
NO SCALE



SECTIONAL-ELEVATION
A-A

RIPPRAP OUTLET DETAILS
NO SCALE

PRINCIPAL SPILLWAY PROFILE
RIPPRAP SLOPE PROTECTION AND OUTLET DETAILS

PINEY RUN WATERSHED
CARROLL COUNTY, MARYLAND

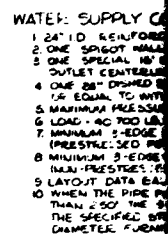
U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

RUMMEL, KLEPPER & KAHL
CONSULTING ENGINEERS
Baltimore, Maryland

Project No. 10
Client C.A.M.
Traced
Date 10-1-55
Approved By
Title
Sheet
Drawing No.
No. 10
SCS-MD-483-P

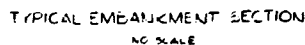
PLATE NO. 6

2



EXTRUCTION DETAILS

- 1. EARTH FILL - SECTION I
 - A THIS SECTION SHALL CONSIST OF MATERIALS OBTAINED FROM BORROW AREAS OR SELECTED FROM EXISTING MATERIALS. II WHEN THEY ARE MANUALLY PLACED BY THE ENGINEER.
 - B THE FILLING SHALL BE PLACED IN 15" AND WATER CARRYING TRENCHES. EARTH ALSO IN SELECTED SECTIONS; AND WILL BE ROCK FILLED USING WATER RETAINING IN SELECTED FROM BORROW AREAS. MAXIMUM SIDE OF ROCK FRAGMENT MAY BE LOCATED IN FILLING IS FURNISHED WITH CONSTRUCTION BEING PERFORMED BY HAND OR MANUALLY DIRECTED POWER TAMPERS.
- 2. EARTH FILL - SECTION II
 - A THIS SECTION SHALL CONSIST OF MATERIALS OBTAINED FROM BORROW AREAS (EMERGENCY SPILLWAY).
- 3. EARTH FILL - SECTIONS I & II
 - A COMPACTION SHALL BE CLASS A. THE FILL SHALL BE COMPACTED TO LESS THAN 95% OF MAXIMUM DENSITY OBTAINED BY COMPACTION TESTS. THE FILL MATERIALS PERFORMED IN ACCORDANCE WITH ASTM DESIGNATION OF 95% MOISTURE CONTENT. THE FILL SHALL BE PLACED IN 15" SHALL BE PLACED IN 15" AND WATER CARRYING TRENCHES. EARTH ALSO IN SELECTED SECTIONS; AND WILL BE ROCK FILLED USING WATER RETAINING IN SELECTED FROM BORROW AREAS. MAXIMUM SIDE OF ROCK FRAGMENT MAY BE LOCATED IN FILLING IS FURNISHED WITH CONSTRUCTION BEING PERFORMED BY HAND OR MANUALLY DIRECTED POWER TAMPERS.
 - B MAXIMUM THICKNESS OF FILL MATERIAL LAYERS BEFORE COMPACTION SHALL BE 3 INCHES MAXIMUM SIDE OF ROCK FRAGMENT; THAT MAY BE INCORPORATED IN THE FILL IS 6 IN. MAX.

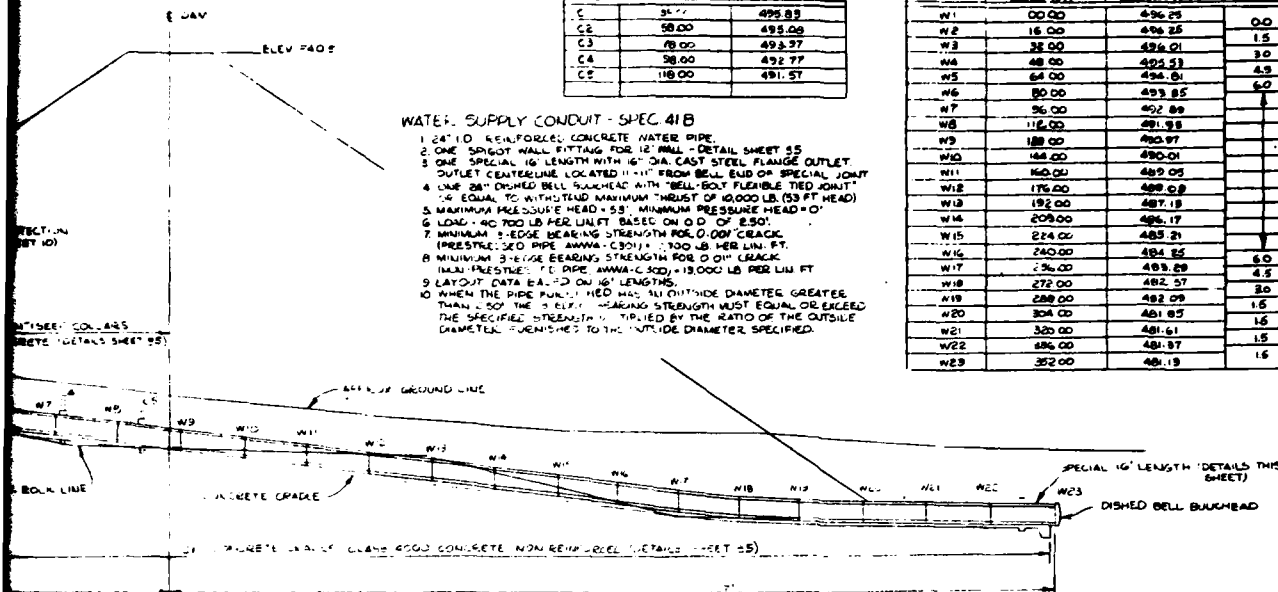


JOINT	DISTANCE FROM MANHOLE (FT)	PIPE INVERT ELEV. (FT)
C	34.77	495.82
C2	58.00	495.08
C3	78.00	493.97
C4	98.00	492.77
C5	118.00	491.57

JOINT	DISTANCE FROM MANHOLE (FT)	PIPE INVERT ELEV. (FT)	SLOPE (IN/100)
W1	00.00	496.25	0.0
W2	16.00	496.25	1.5
W3	32.00	496.01	3.0
W4	48.00	495.53	4.5
W5	64.00	494.81	6.0
W6	80.00	493.85	
W7	96.00	492.89	
W8	112.00	491.93	
W9	128.00	490.97	
W10	144.00	490.01	
W11	160.00	489.05	
W12	176.00	488.09	
W13	192.00	487.13	
W14	208.00	486.17	
W15	224.00	485.21	
W16	240.00	484.25	6.0
W17	256.00	483.29	4.5
W18	272.00	482.33	3.0
W19	288.00	481.37	1.5
W20	304.00	481.41	1.5
W21	320.00	481.45	1.5
W22	336.00	481.49	1.5
W23	352.00	481.53	1.5

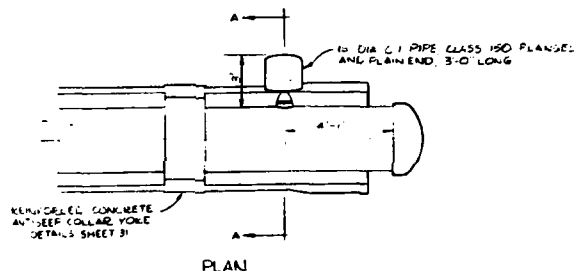
WATER SUPPLY CONDUIT - SPEC. 41B

1. 24" I.D. REINFORCED CONCRETE WATER PIPE
2. ONE SPIGOT WALL FITTING FOR 12" I.D. - DETAIL SHEET 55
3. ONE SPECIAL 16' LENGTH WITH 16" DIA. CAST STEEL FLANGE OUTLET
4. ONE 36" DISHED BELL BULKHEAD WITH "BELL-BOLT" FLEXIBLE TIED JOINT
5. EQUAL TO WITHSTAND MINIMUM THRUST OF 10,000 LB. (53 FT HEAD)
6. MAXIMUM PRESSURE HEAD = 55' MINIMUM PRESSURE HEAD = 0'
7. LONG - 40,700 LB PER LIN. FT. BASED ON O.D. OF 25.0"
8. MINIMUM 3-EDGE BEARING STRENGTH FOR 0.01" CRACK (PRESTRESSED PIPE AMWA-C301) = 1,700 LB PER LIN. FT.
9. MINIMUM 3-EDGE BEARING STRENGTH FOR 0.01" CRACK (UNPRESTRESSED PIPE AMWA-C302) = 13,000 LB PER LIN. FT.
10. LAYOUT DATA BASED ON 45' LENGTHS
11. WHEN THE PIPE BULKHEAD HAS AN OUTSIDE DIAMETER GREATER THAN 2.50' THE 3-EDGE BEARING STRENGTH MUST EQUAL OR EXCEED THE SPECIFIED STRENGTH MULTIPLIED BY THE RATIO OF THE OUTSIDE DIAMETER DIVIDED BY THE INSIDE DIAMETER SPECIFIED.

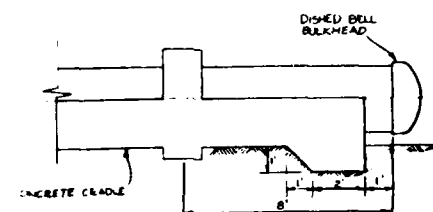


PROFILE ALONG CENTERLINE OF WATER SUPPLY PIPE

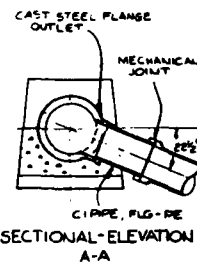
SCALE: 1" = 20' HORIZONTAL
1" = 10' VERTICAL



PLAN



ELEVATION



SECTIONAL-ELEVATION A-A

1. EARTH-FILL SECTION I

- A. THIS SECTION SHALL CONSIST OF MATERIAL OBTAINED FROM BORROW PITS AND SELECTED BY THE ENGINEER. (IF AVAILABLE, HIGHWAY MATERIAL SHALL BE USED.)
- B. THE FILL SHALL BE PLACED IN LAYERS NOT EXCEEDING 12" IN THICKNESS. EACH LAYER SHALL BE COMPACTED TO A MINIMUM OF 95% OF THE MAXIMUM DRY DENSITY OF THE FILL MATERIAL AS DETERMINED BY THE STANDARD PROCTOR TEST. THE FILL SHALL BE MOISTENED TO THE MOISTURE CONTENT OF THE FILL MATERIAL AS DETERMINED BY THE STANDARD PROCTOR TEST. THE FILL SHALL BE MOISTENED TO THE MOISTURE CONTENT OF THE FILL MATERIAL AS DETERMINED BY THE STANDARD PROCTOR TEST.

2. EARTH-FILL SECTION II

- A. THIS SECTION SHALL CONSIST OF MATERIAL OBTAINED FROM BORROW PITS (EMERGENCY SUPPLY ONLY).

3. EARTH-FILL SECTIONS I & II

- A. COMPACTED SHALL BE CLASS A. THE FILL SHALL BE COMPACTED TO A MINIMUM OF 95% OF THE MAXIMUM DRY DENSITY OF THE FILL MATERIAL AS DETERMINED BY THE STANDARD PROCTOR TEST. THE FILL SHALL BE MOISTENED TO THE MOISTURE CONTENT OF THE FILL MATERIAL AS DETERMINED BY THE STANDARD PROCTOR TEST. THE FILL SHALL BE MOISTENED TO THE MOISTURE CONTENT OF THE FILL MATERIAL AS DETERMINED BY THE STANDARD PROCTOR TEST.
- B. MAXIMUM THICKNESS OF FILL MATERIAL LAYERS BEFORE COMPACTION SHALL BE 12" INCHES. MAXIMUM SIZE OF ROCK FRAGMENTS SHALL BE 6" INCHES. ROCK FRAGMENTS SHALL BE INCORPORATED IN THE FILL TO BE 12" INCHES.

CAST STEEL FLANGE OUTLET AND DISHED BELL BULKHEAD DETAILS

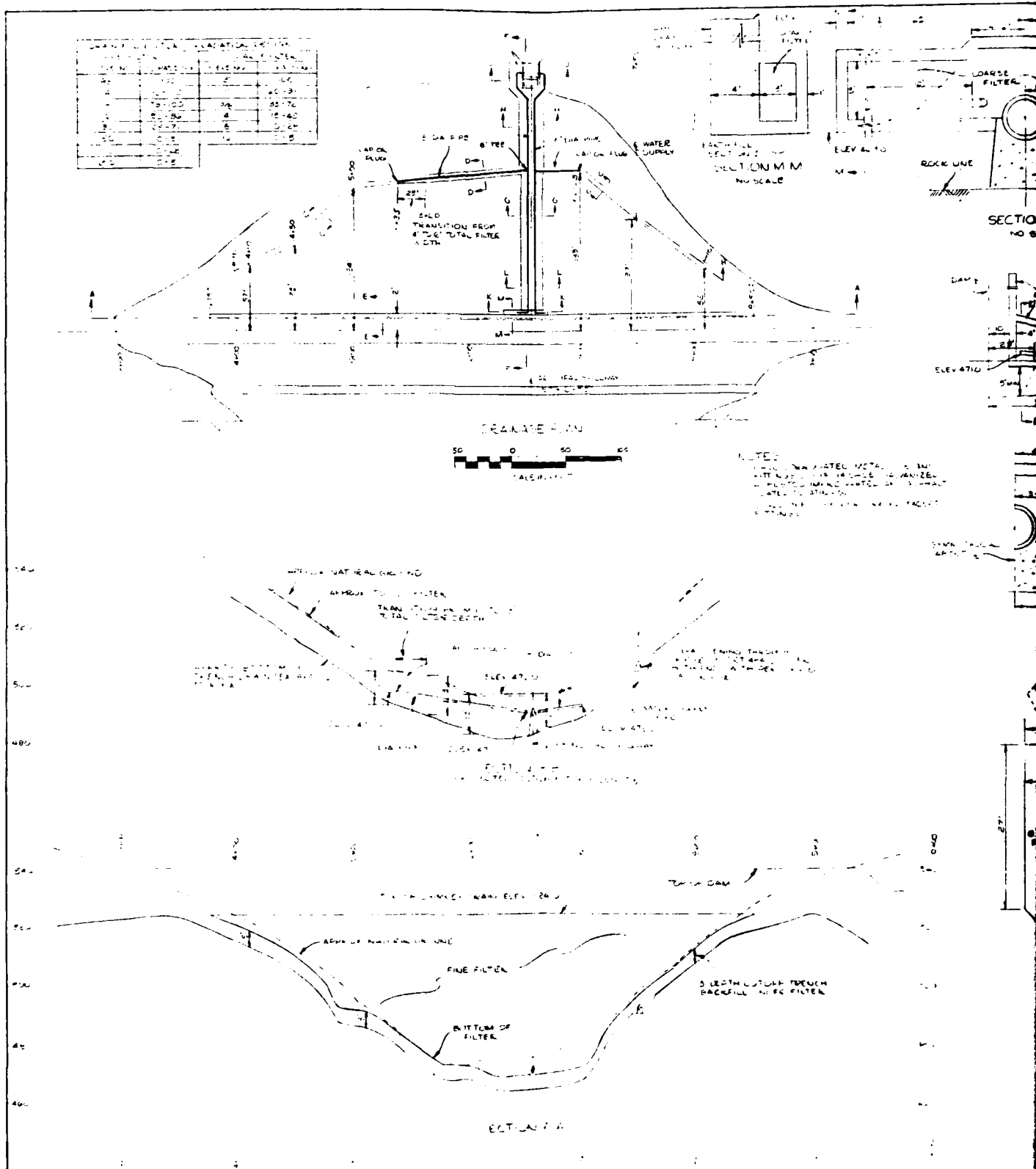
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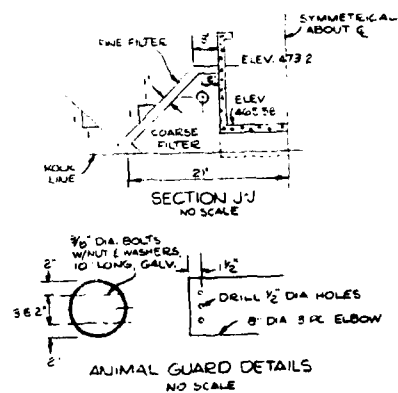
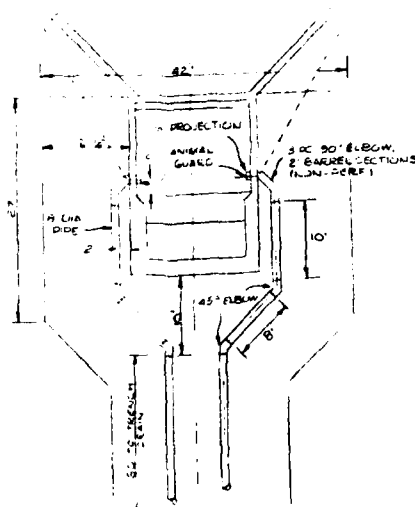
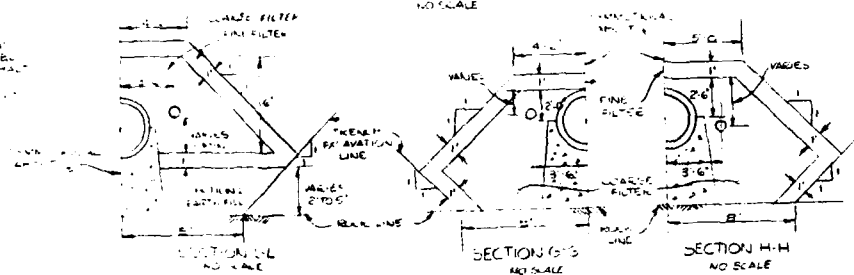
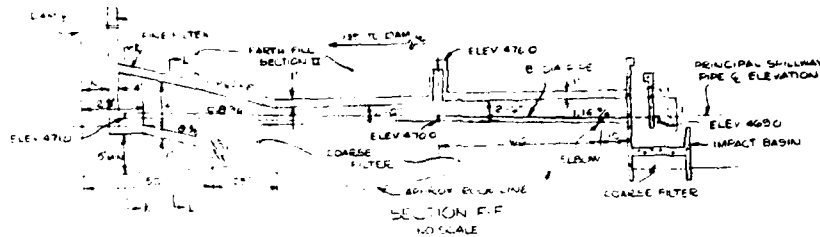
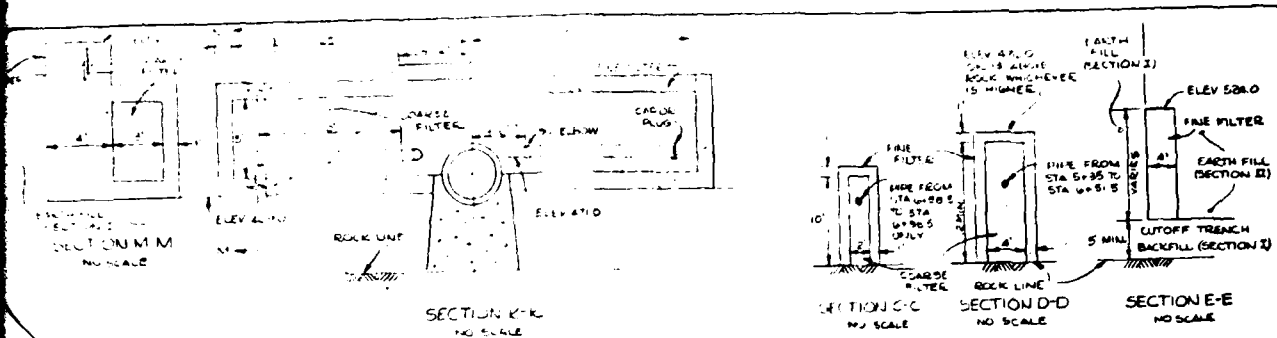
WATER SUPPLY PIPE PROFILE AND EMBANKMENT CROSS SECTION	
PINEY RUN WATERSHED CARROLL COUNTY, MARYLAND	
U. S. DEPARTMENT OF AGRICULTURE SOIL CONSERVATION SERVICE	
Designed: H.R.	Date: _____
Drawn: C.A.H.	Trig: _____
Typed: _____	Sheet: _____
Checked: _____	Drawing No: 5C5-MD-485-P

RUMMEL, KLEPPER & KAHL
CONSULTING ENGINEERS
BALTIMORE, MARYLAND

PLATE NO. 7

2





PLAN OF DRAIN OUTLET
NO SCALE

RUMMEL, KLEPPER & KAHL
CONSULTING ENGINEERS
100 W. W. MAIN AVE.

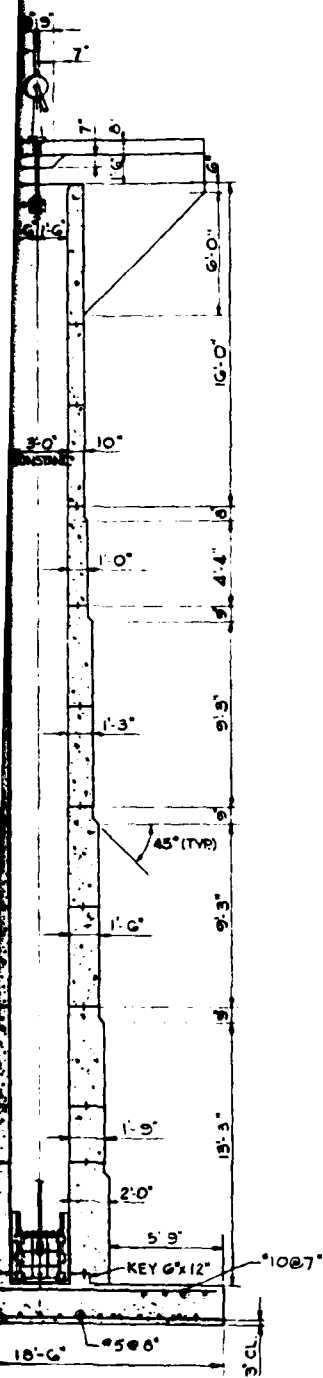
DRAINAGE
LAYOUT AND DETAILS
PINEY RUN WATERSHED
CARROLL COUNTY, MARYLAND

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

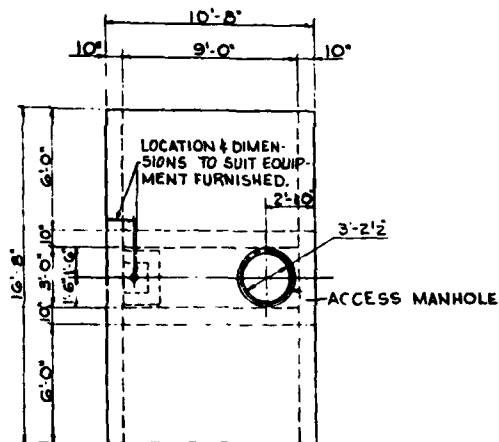
DATE	APPROVED BY
12/23	SCS-MD-483-P

PLATE NO. 8

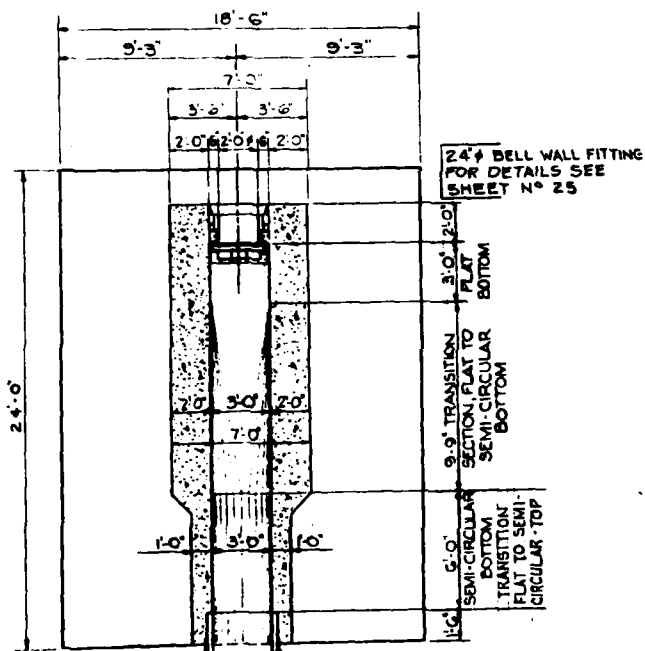
2



SECTION A-A



TOP PLAN



SECTION C-C

0 5 10
SCALE IN FEET

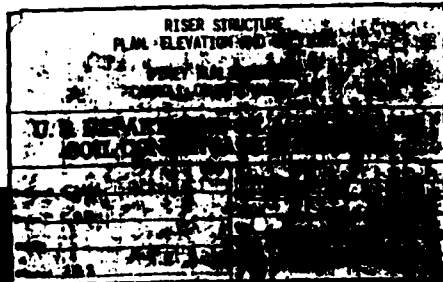
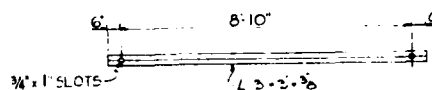
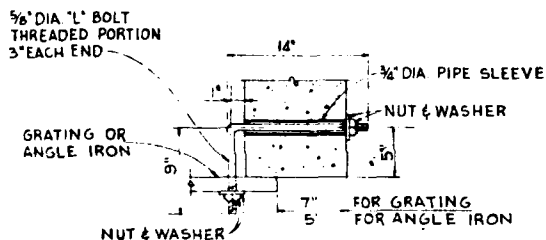
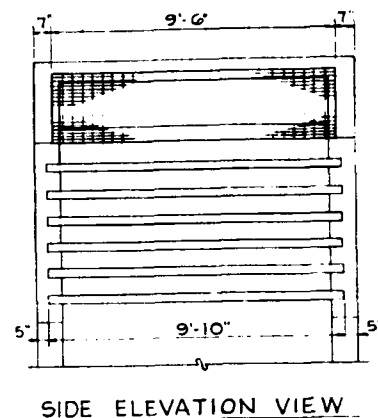


PLATE NO. 9

2



"L" BOLT DETAIL
NOT TO SCALE

ANGLE IRON DETAIL
NOT TO SCALE

TRASH RACK DETAILS

BILL OF MATERIAL				
LOCATION	ITEM	SIZE	LENGTH	QUANTITY
TRASH	ANGLE IRON	3" x 5 3/8"	9'-10"	12
RACK &	1" BOLT w/TYPE 2 NUTS & WASHERS	5/8" DIA.	9" x 14"	32
TOP OF	GALV. PIPE SLEEVE	3/4" DIA.	10"	32
RISE	GRATING #	Ø	27 1/2 x 36"	2

* BORDEN TYPE W/B OR EQUIVALENT

NOTE: BEARING BARS OF GRATING ARE PARALLEL TO LONGITUDINAL AXIS.
ENTIRE TRASH RACK AND TOP GRATE TO BE GALVANIZED IN ACCORDANCE WITH SPEC. 119.
MATERIAL IN TRASH RACK SHALL CONFORM TO SPEC. 117.

1/4"x6" STEEL PLATE,
CONTINUOUS THRU CONSTR. JT.
SPICES SHALL BE EITHER:
1 BUTT WELDED
2. LAPPED 3" AND BOLTED
3. LAPPED 3" AND FILLET WELDED

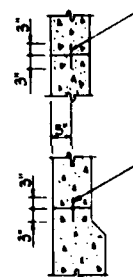
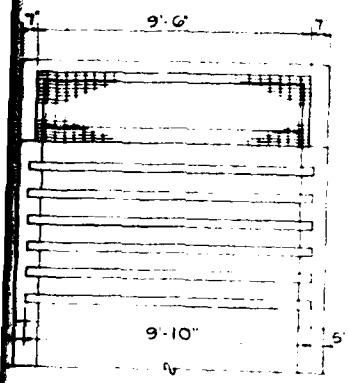
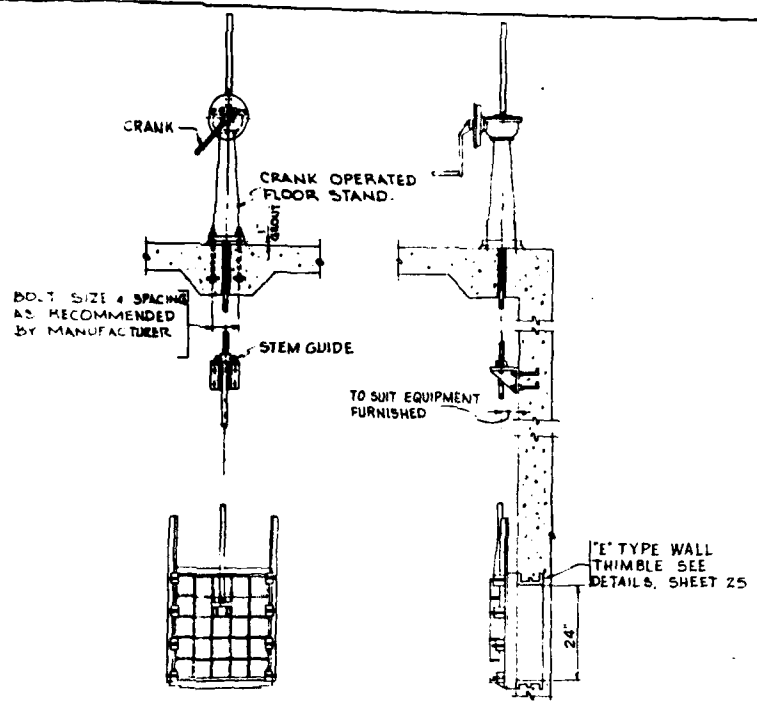


PLATE
CONSTR. JOINT



SIDE ELEVATION VIEW



ELEVATION VIEW

SECTION VIEW

TYPICAL SLIDE GATE DETAIL
NOT TO SCALE

8'-10"
L 3-3-36

IRON DETAIL
NOT TO SCALE

1/4"x6" STEEL PLATE,
CONTINUOUS THRU CONSTR. JT.
SPICES SHALL BE EITHER:
1 BUTT WELDED
2 LAPPED 3" AND BOLTED
3 LAPPED 3" AND FILLET WELDED

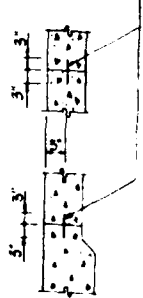
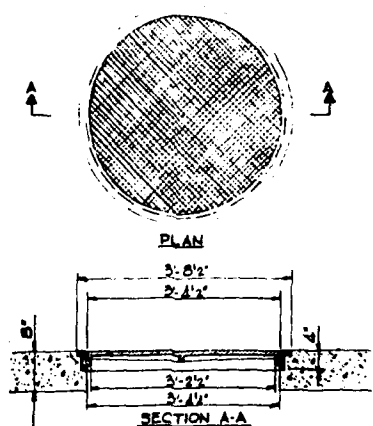


PLATE
CONSTR. JOINT



PLAN

SECTION A-A

MANHOLE FRAME DETAIL
NO SCALE

RISER STRUCTURE TRASH RACK AND SLIDE GATE DETAILS	
PTNEY RUN WATERSHED CARROLL COUNTY, MARYLAND	
U. S. DEPARTMENT OF AGRICULTURE SOIL CONSERVATION SERVICE	
Designed by JEF	Date
Drawn by JQS	Checked by
Scale 1/8" = 1'-0"	Drawing No. SCS-MD-488-P

RUMMEL, KLEPPER & KAHL
CONSULTING ENGINEERS
BALTIMORE, MARYLAND

PLATE NO. 10

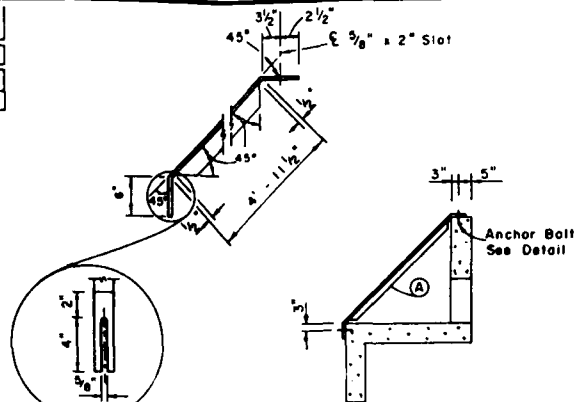
2

RESERVOIR DRAIN TRASH RACK BILL OF MATERIALS

Item	Size	Length	Quan.
Angle (A)	1 1/2" x 1 1/2" x 1/4"	5' - 11 1/2"	2
Anchor Bolt	1/2" Dia	2" x 8"	4

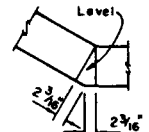
CONSTRUCTION DETAILS

- Material in reservoir drain trash rack shall conform to Spec 581 for structural steel.
- Trash rack to be galvanized in accordance with Spec 582.

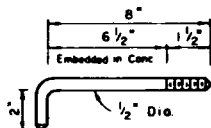


ISOMETRIC

TRASH RACK

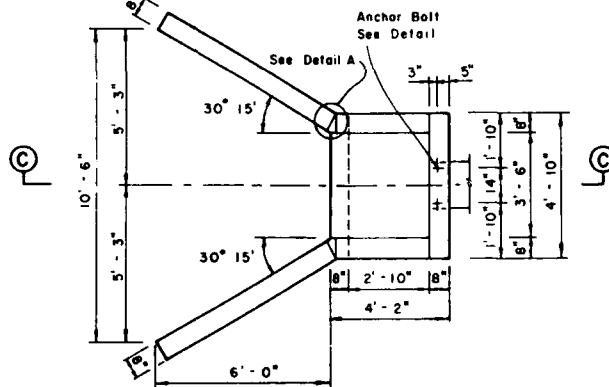


DETAIL A

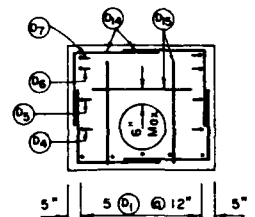


ANCHOR BOLT

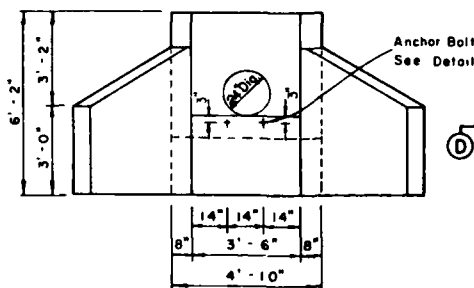
ASTM A 276, 1/2" dia., Class 302 or 303, 2" Type 2 nuts and washers.



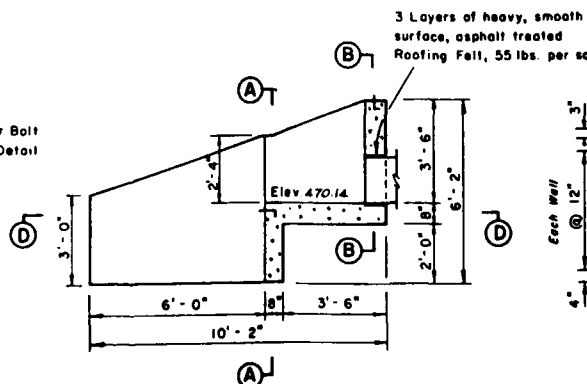
PLAN



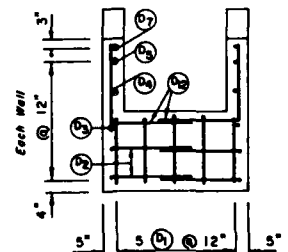
SECTION BB



UPSTREAM ELEVATION



SECTION ALONG CENTERLINE



SECTION A-A

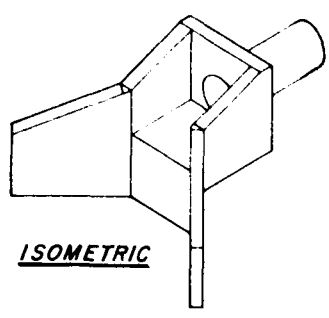
REINF. CONCRETE RESERVOIR DRAIN INLET (CLASS 4000 CONC.)

E 3/8" x 2" Sto

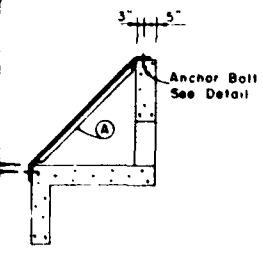
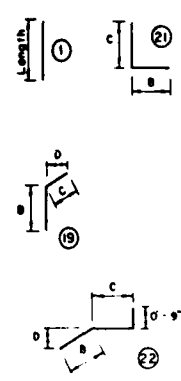
BAR TYPES

RESERVOIR DRAIN STEEL SCHEDULE

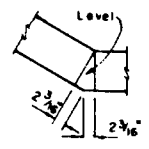
Mark	Quan.	Size	Length	Type	B	C	D	Total Length
D-1	5	4	5'-9"	21	2'-2"	3'-7"		28 75'
D-2	4	4	9'-5"	19	6'-8"	2'-9"	2'-4"	37 67'
D-3	2	4	8'-0"	19	6'-8"	1'-4"	0'-8"	16 00'
D-4	2	4	9'-4"	22	4'-9"	3'-10"	1'-11"	18 67'
D-5	2	4	5'-10"	22	1'-3"	3'-10"	0'-6"	11 67'
D-6	2	4	2'-11"	21	2'-2"	0'-9"		5 83'
D-7	2	4	11'-11"	22	7'-2"	4'-0"	3'-7"	23 83'
D-8	4	4	2'-9"	1				11 00'
D-9	4	4	3'-3"	1				13 00'
D-10	4	4	3'-9"	1				15 00'
D-11	2	4	4'-6"	1				9 00'
D-12	4	4	5'-5"	21	2'-9"	2'-8"		21 67'
D-13	4	4	6'-0"	21	2'-9"	3'-3"		24 00'
D-14	4	4	5'-0"	21	2'-9"	2'-3"		20 00'
D-15	3	4	3'-6"	1				10 50'



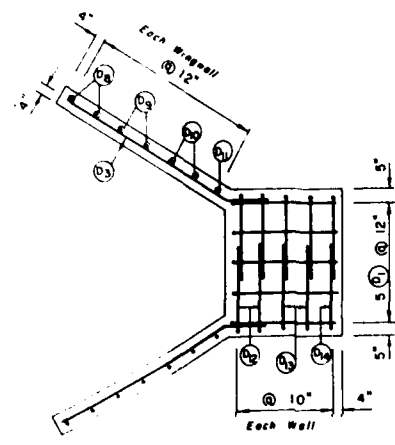
ISOMETRIC



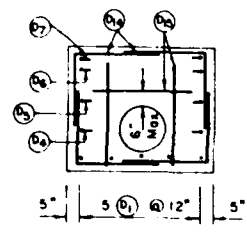
DETAIL A



DETAIL A

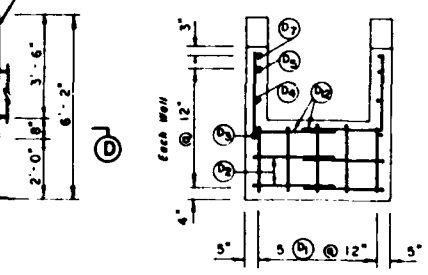


SECTION DD

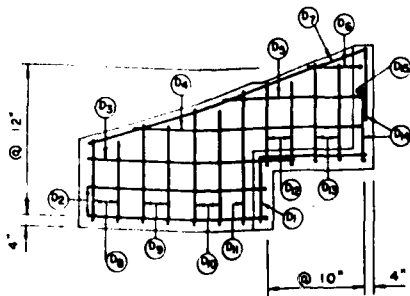


SECTION BB

3 Layers of heavy, smooth surface, asphalt treated Roofing Felt, 55 lbs per sq



SECTION AA



SECTION CC

QUANTITIES (This Sheet Only)

STEEL

No 4 Bar 266 6 = 178 Lbs.

CONCRETE

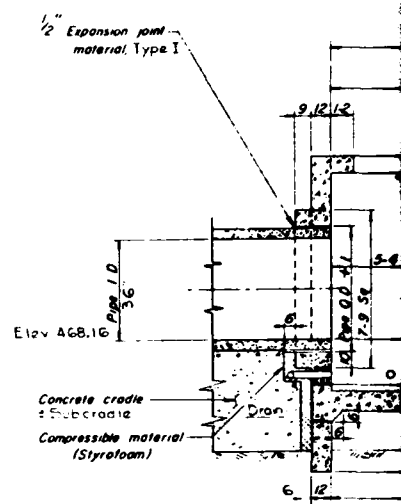
Class 4000 3.0 Cu Yds Reinforced

RESERVOIR DRAIN INLET

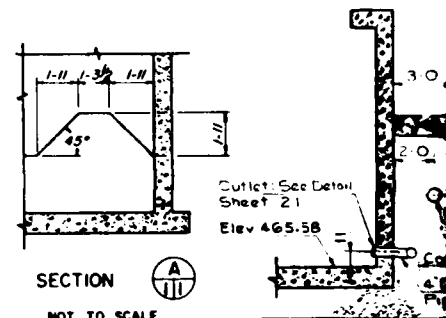
CS 4000 CONC

PINEY RUN WATERSHED CARROLL COUNTY, MARYLAND	
RESERVOIR DRAIN INLET DETAILS	
U. S. DEPARTMENT OF AGRICULTURE SOIL CONSERVATION SERVICE	
Designed	Date
Drawn H. T. Browning	Approved By
Traced R. L. Allen	Title
Checked	Scale
	Sheet No. 9 of 9
	Project No. SCS-MD-483-P

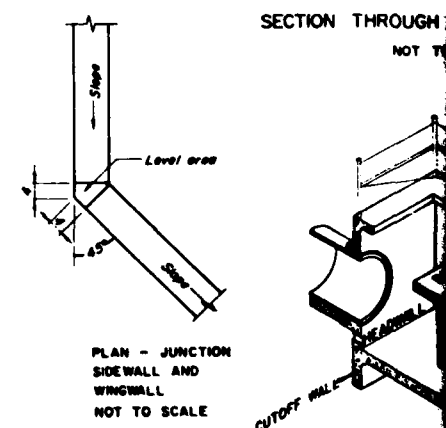
2



SECTION



SECTION 
NOT TO SCALE

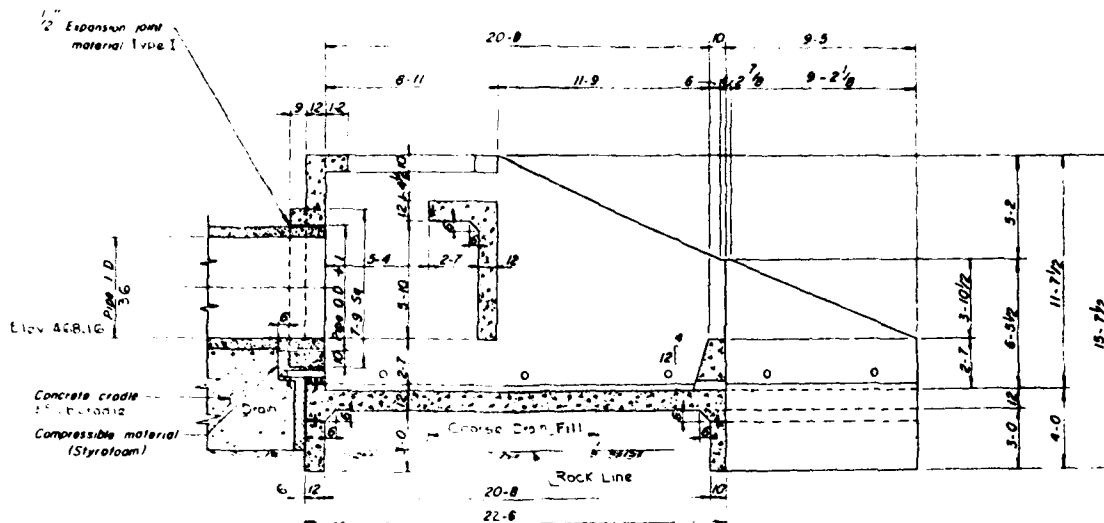


PLAN - JUNCTION
SIDEWALL AND
WINGWALL
NOT TO SCALE

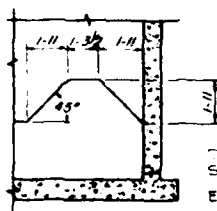
CARL RONDE
Consulting Engineer
634 Ridgeway Rd Lake Oswego, Ore

1 0 5 10
SCALE IN FEET
EXCEPT AS NOTED

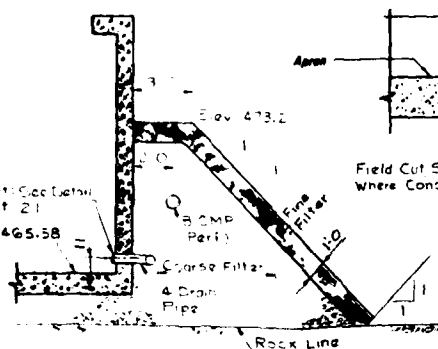
RUMMEL, KLEPPER & KAHL
CONSULTING ENGINEERS
BALTIMORE, MARYLAND



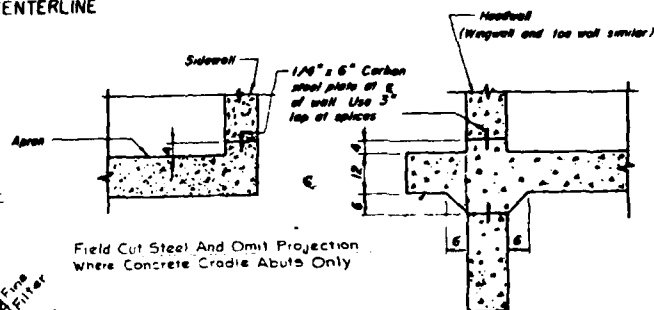
SECTION ON CENTERLINE



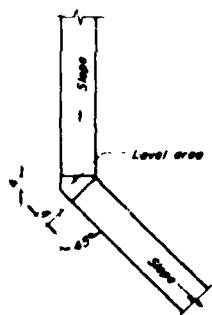
SECTION
NOT TO SCALE



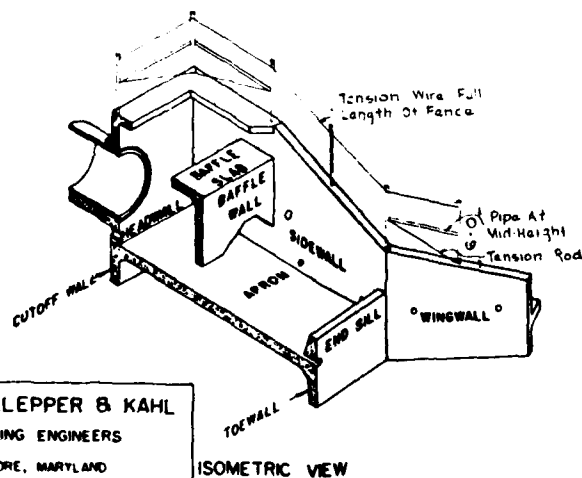
SECTION THROUGH DRAIN & FILTER
NOT TO SCALE



CONSTRUCTION JOINT DETAILS
NOT TO SCALE



PLAN - JUNCTION
SIDEWALL AND
WINGWALL
NOT TO SCALE



ISOMETRIC VIEW

QUANTITIES

Formwork (Contact area)	2500	Sq Ft
Reinforced Concrete (See Sheet 21)		Cu Yds
Reinforcing Steel		Lbs
Drainage		
4" Perforated drain pipe	100	Lm Ft
Annual screen detail, sheet 2 of 3	13	00
Drain pipe 90° ell	2	00
Drain pipe 45° ell	2	00
Drain Fill, Coarse And Fine Filter	As Req'd	

Drain Fill, Coarse And Fine Filter As Req'd

Joints 1/4\"/>

IMPACT BASIN DETAILS
PINEY RUN WATERSHED
CARROLL COUNTY MARYLAND

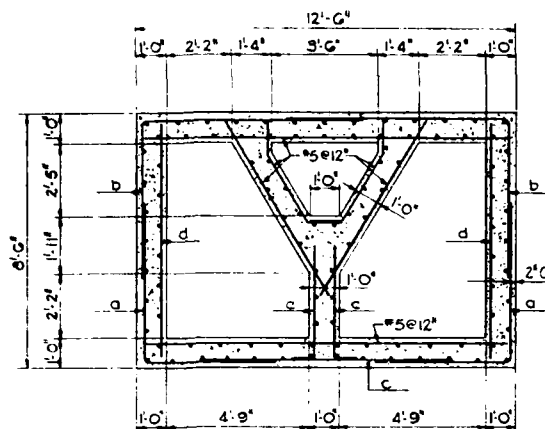
U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

Drawn by	Date	Approved by
Checked	11/11/61	SCS-MD-483-P

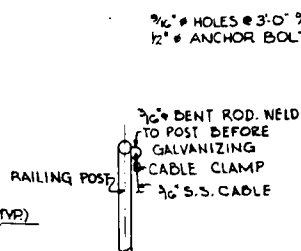
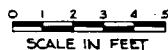
PLATE NO. 12

Form SCS-310 November 1956

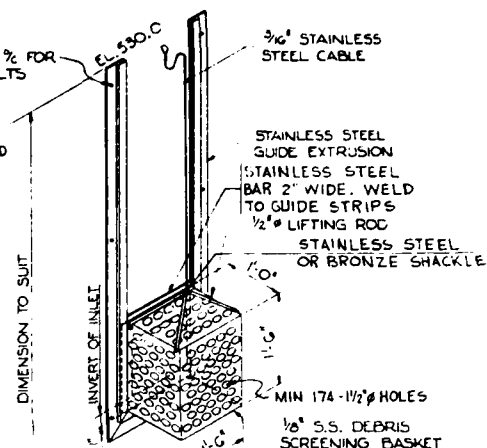
2



TYPICAL SECTION - INTAKE STRUCTURE



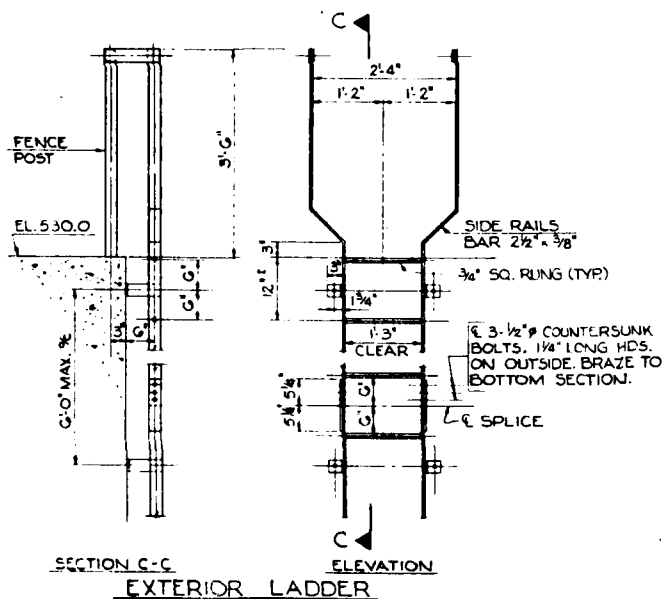
CABLE ATTACHMENT
DETAIL
NO SCALE



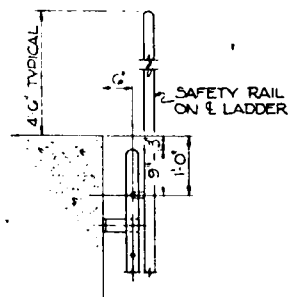
WATER INTAKE SCREEN
NO SCALE

REINFORCING BAR SCHEDULE									
VERTICAL REINFORCING				HORIZONTAL REINFORCING					
SECTION	SIDE WALL	END WALL	INTERIOR WALL	a	b	c	d	e	
FROM EL. 495.00 TO EL. 501.17	#6	#6	#5	#6 @ 11"	#6 @ 11"	#5 @ 11"	#6 @ 11"	#6 @ 11"	
FROM EL. 501.17 TO EL. 507.17	#7	#5	#5	#5 @ 11"	#5 @ 11"	#5 @ 11"	#6 @ 11"	#5 @ 11"	
FROM EL. 507.17 TO EL. 512.17	#6	#5	#5	#5 @ 12"	#5 @ 12"	#5 @ 12"	#6 @ 12"	#5 @ 12"	
FROM EL. 512.17 TO EL. 530.00	#5	#5	#5	#5 @ 12"	#5 @ 12"	#5 @ 12"	#6 @ 12"	#5 @ 12"	

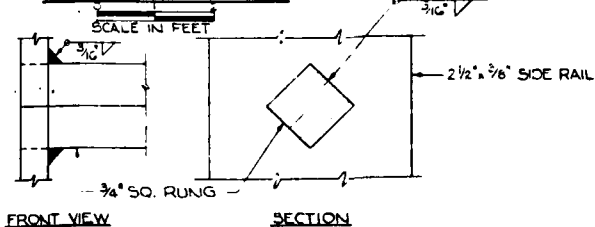
BARS SPACED AS SHOWN IN SECTION



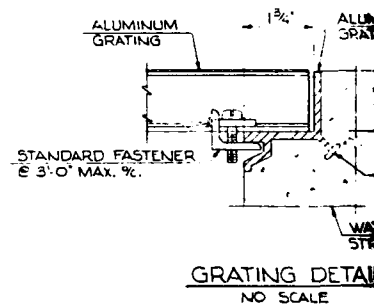
SECTION C-C
ELEVATION
EXTERIOR LADDER



INTERIOR LADDER

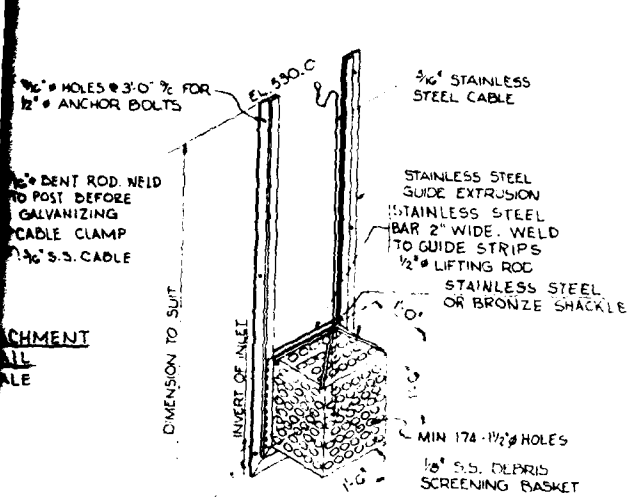


FRONT VIEW
SECTION
RUNG DETAIL
FULL SIZE

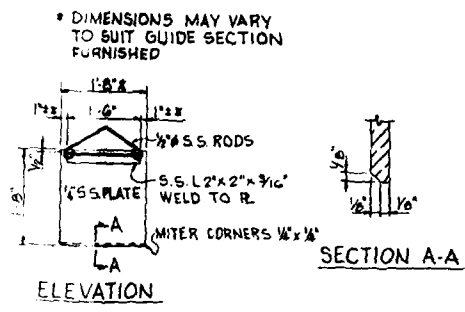


GRATING DETAIL
NO SCALE

LADDER DETAILS

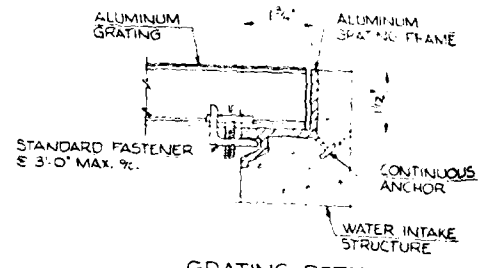


WATER INTAKE SCREEN
NO SCALE

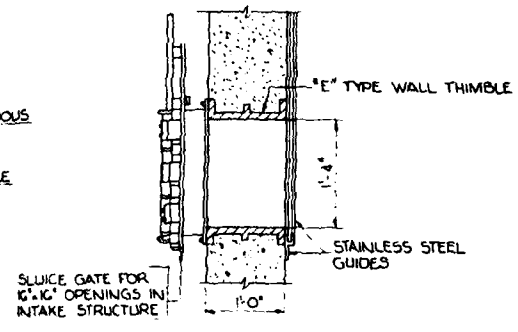


STOP PLATE
3-REQUIRED
NO SCALE

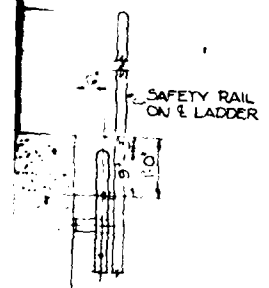
REINFORCING			
e	d	c	
#11"	#6@11"	#6@11"	
#11"	#6@11"	#6@11"	
#12"	#6@12"	#6@12"	
#12"	#6@12"	#6@12"	



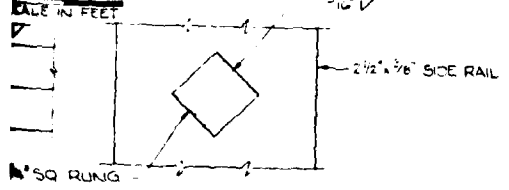
GRATING DETAIL
NO SCALE



SLUICE GATE AND THIMBLE DETAIL
NO SCALE

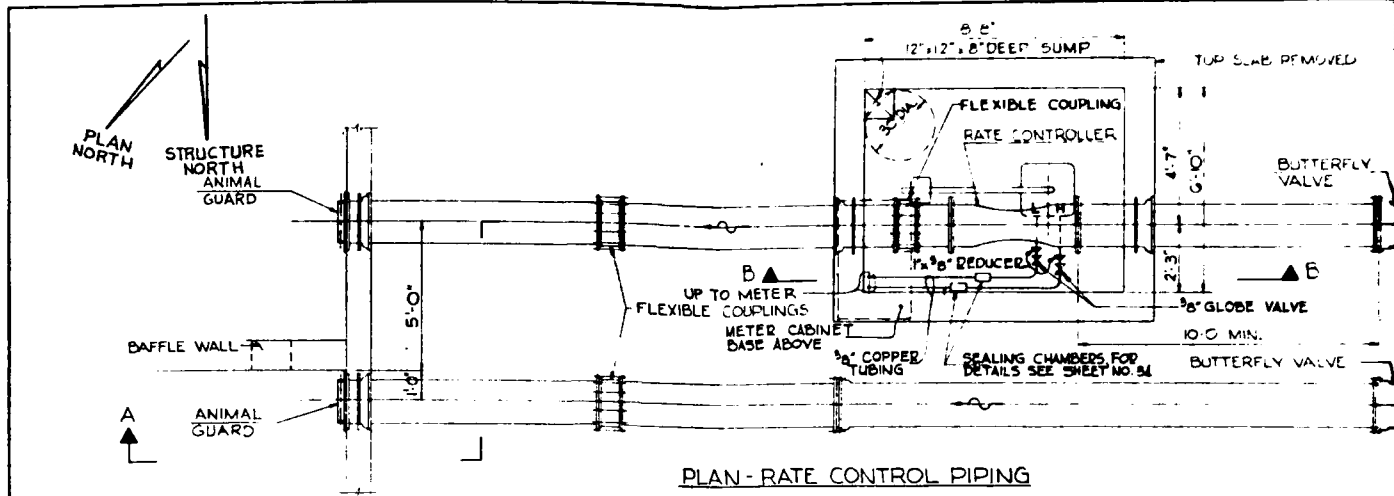


SAFETY RAIL

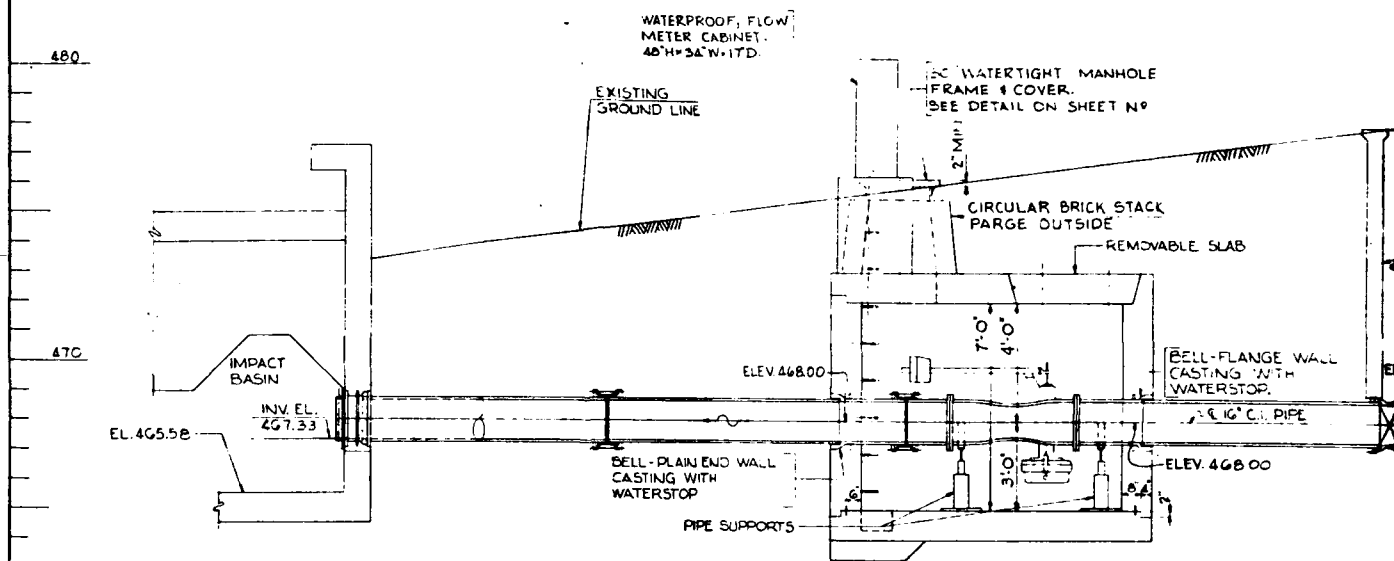


RUNG DETAIL
FULL SIZE

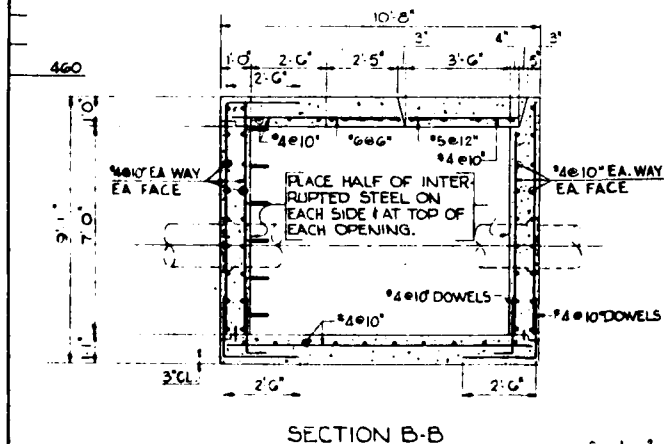
WATER INTAKE ACCESSORIES			
PINEY RUN WATERSHED CARROLL COUNTY, MARYLAND			
U. S. DEPARTMENT OF AGRICULTURE SOIL CONSERVATION SERVICE			
Designed by S. Y.	Date	Approved by	
Drawn by C. E. P.			
Trained by J. G. S.			
Sheet No. 51	Drawing No. 35	SCS-MD-483-P	



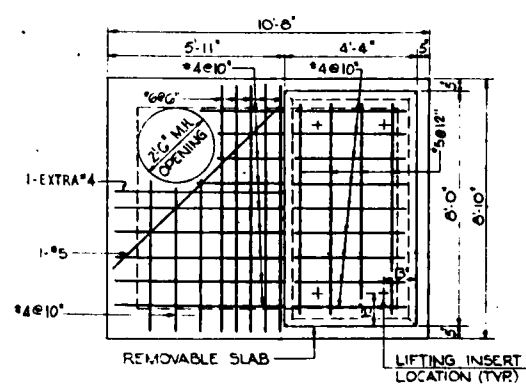
PLAN - RATE CONTROL PIPING



PROFILE - ALONG SECTION A-A

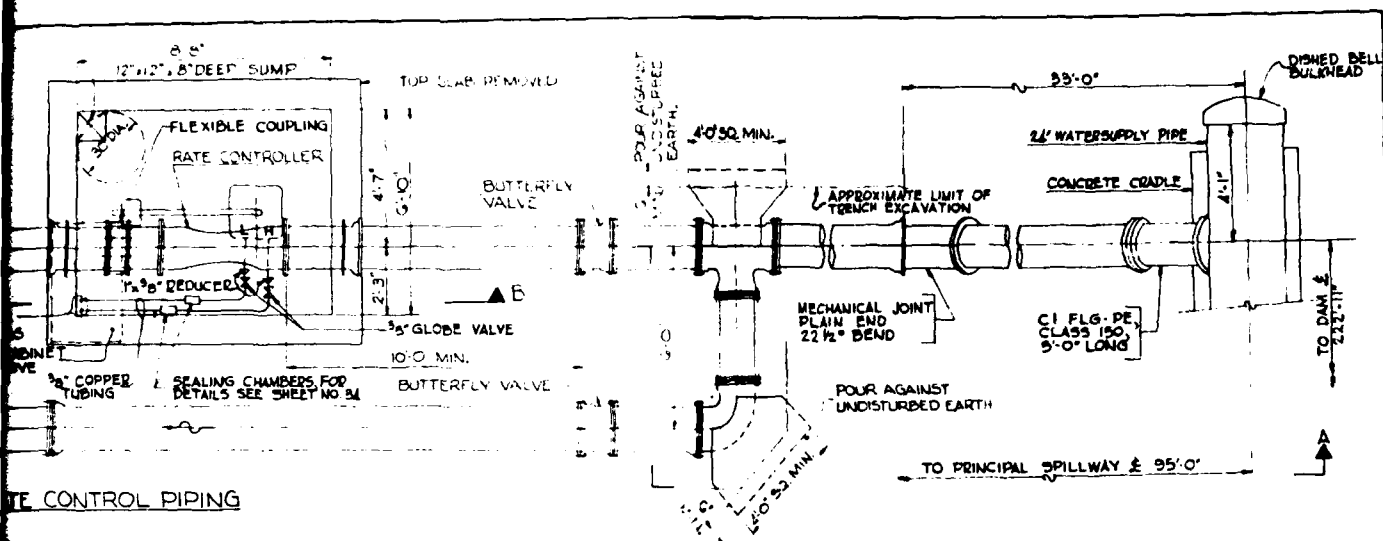


SECTION B-B

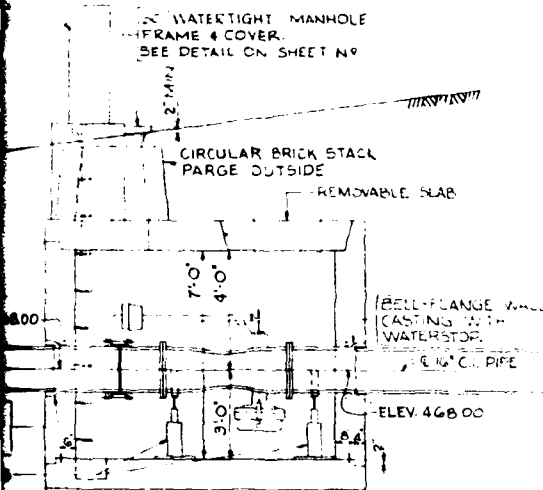


PLAN - TOP SLAB

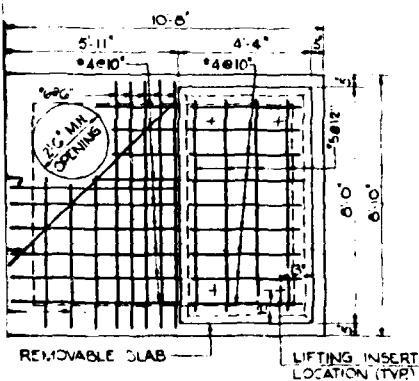
SCALE IN FEET
EXCEPT AS OTHERWISE NOTED



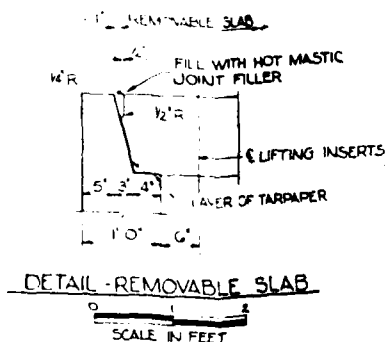
RATE CONTROL PIPING



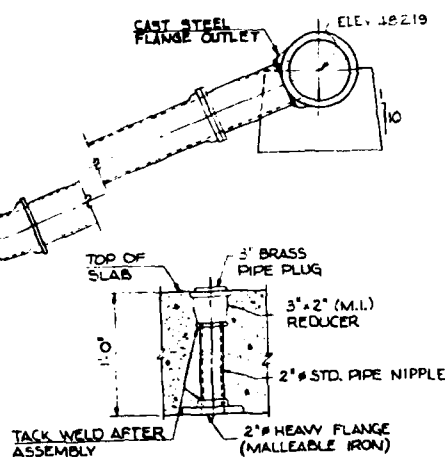
- ALONG SECTION A-A



PLAN-TOP SLAB



DETAIL-REMOVABLE SLAB



NOTE: PIPE & FITTINGS TO BE THREADED & GALVANIZED.

LIFTING INSERT

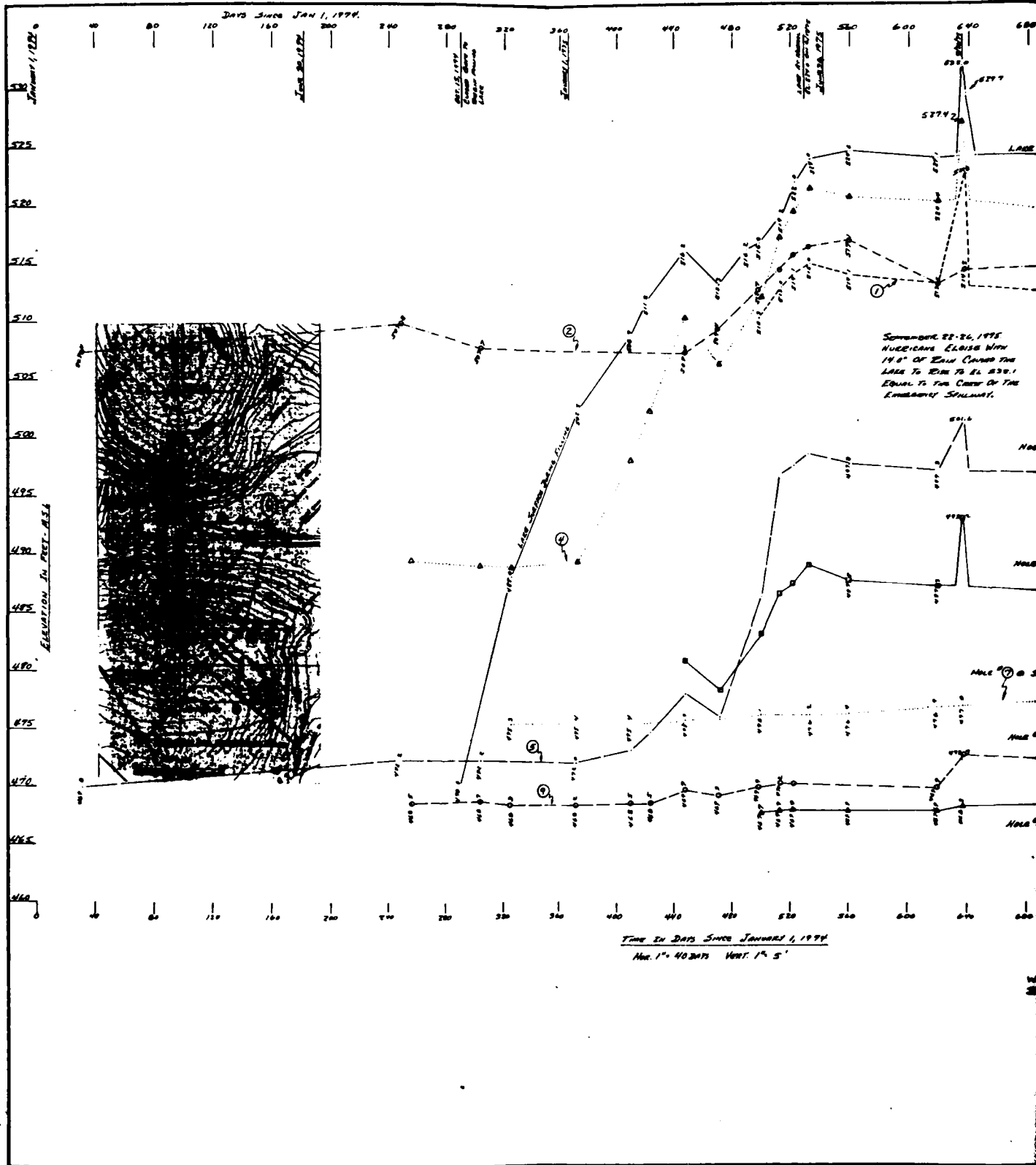
SCALE IN FEET

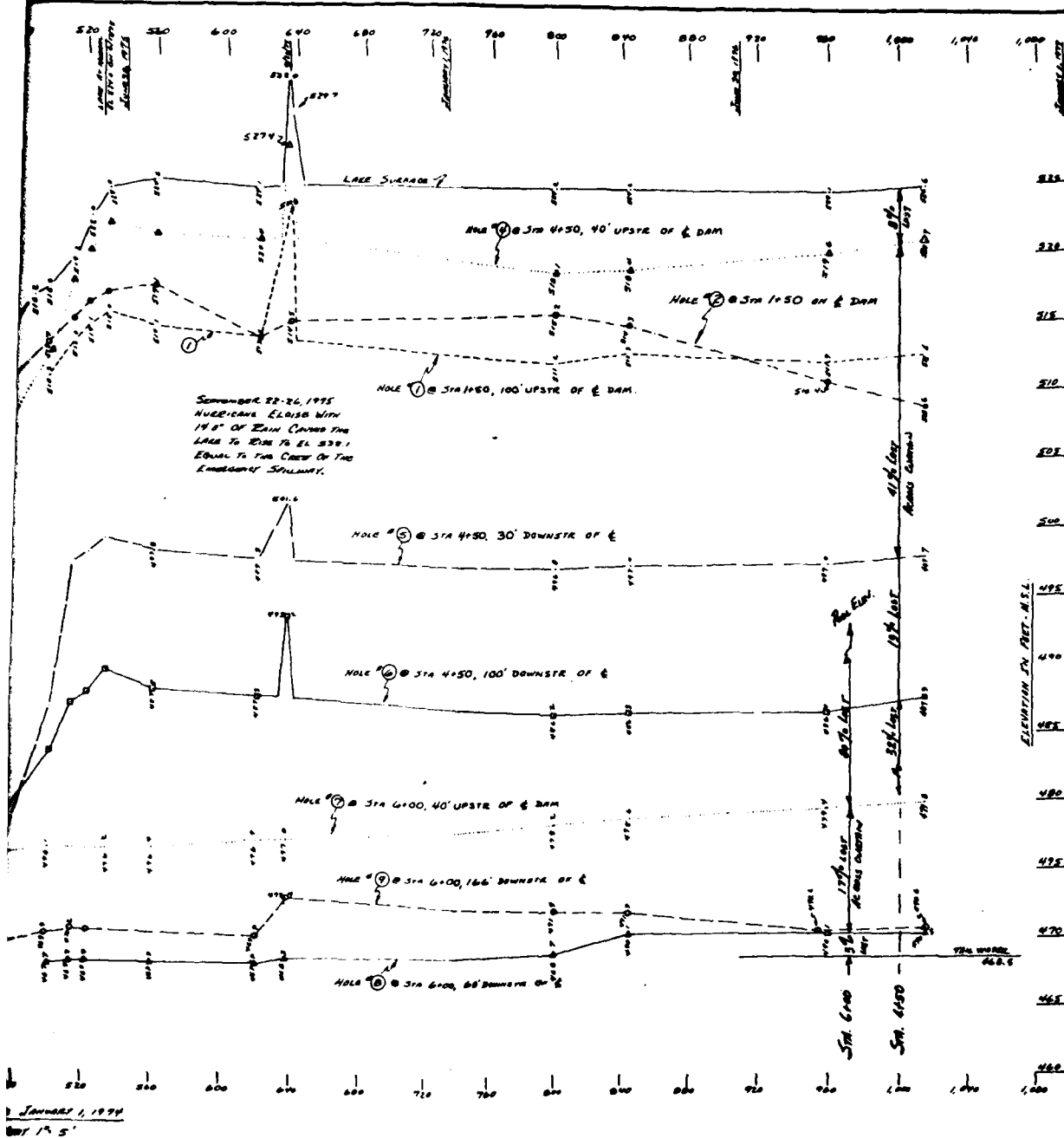
RATE CONTROL PIPING AND VAULT	
PINEY RUN WATERSHED CARROLL COUNTY, MARYLAND	
U. S. DEPARTMENT OF AGRICULTURE SOIL CONSERVATION SERVICE	
Designed by J. G. S.	Approved by _____
Drawn by C. E. D.	Title _____
Checked by C. H. M.	Sheet no. 30 of 35
	Drawing no. SCS-MD-453-P

RUMMEL, KLEPPER & KAHL
CONSULTING ENGINEERS
BALTIMORE, MARYLAND

PLATE NO. 14

2



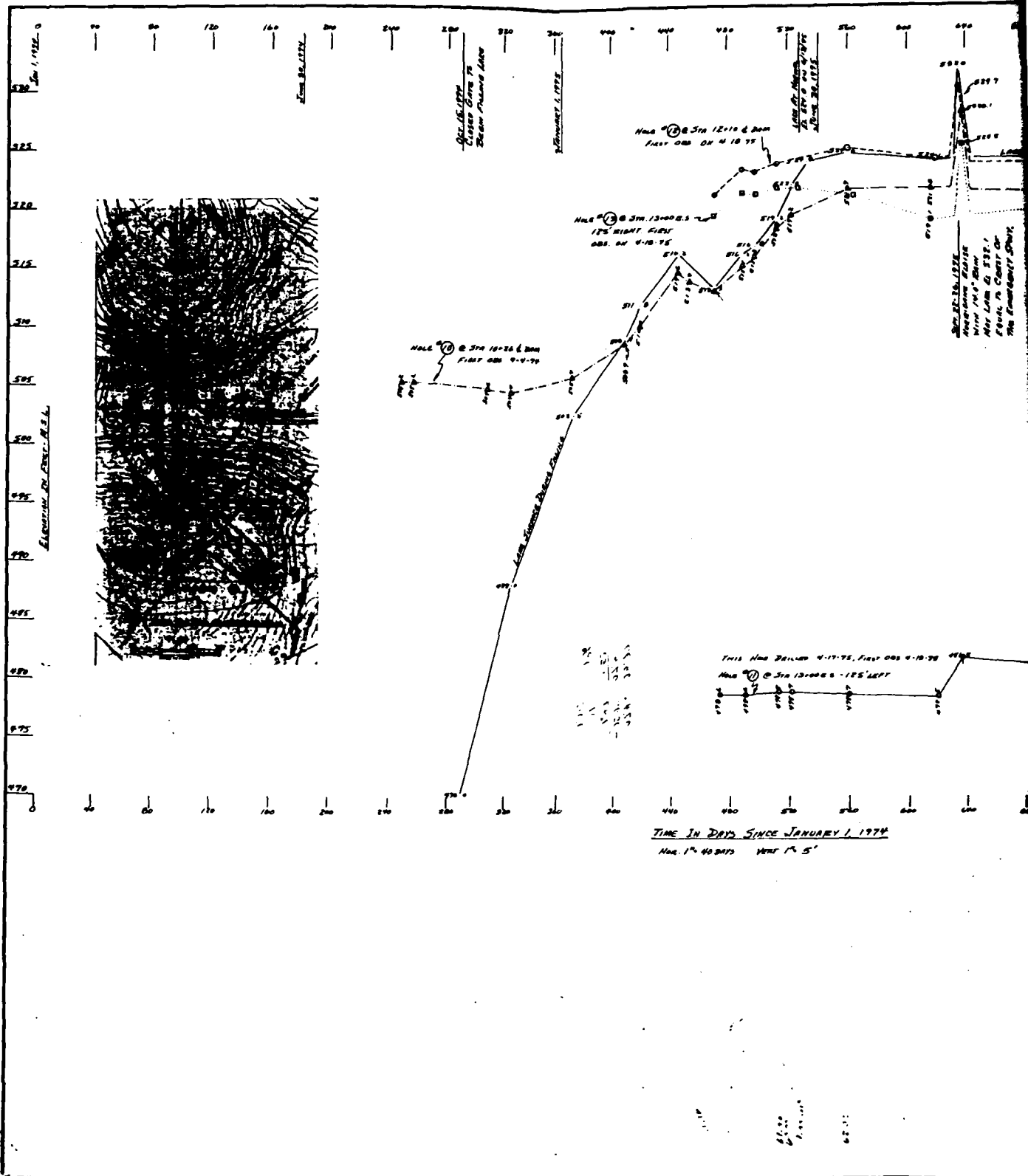


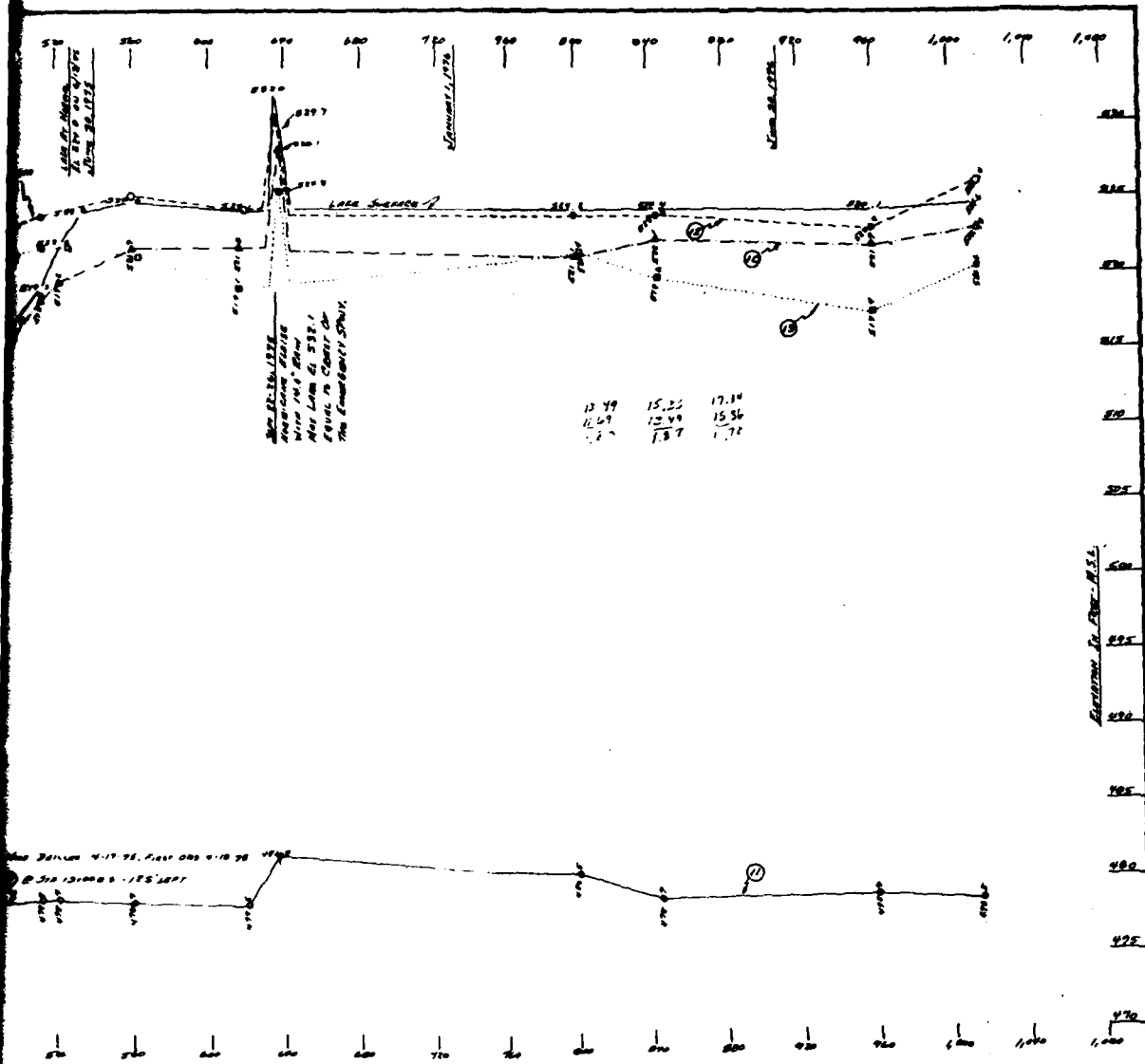
NOTE
WATER IN SYSTEM CHANNEL BEHIND DAM
BEHIND AT EL 460 5' C.F.

PIKET RUN DAM SITE NO. 1, SWEETVILLE, MARYLAND	
STATIC WATER ELEVATIONS VERSUS TIME IN DATE	
OBSERVATION HOLE NO. 1, 2, 4, 5, 6, 7, 8, 9 AND LAKE SURFACE	
U.S. DEPARTMENT OF AGRICULTURE SOIL CONSERVATION SERVICE	
Designed by R. J. McNamee	Approved by
Drawn by R. J. McNamee	Checked by
Traced by	Field No.
Checked by	Scale
SCS-MD-483-P	

2
PLATE NO. 15

SCS-ENG-312-B Rev. 7-69





DATE JANUARY 1, 1974
 NEW 1.5'

Note: Notes to Station Diagram Below
 Station at El. 460.0000

PROJECT AND SITE NO.		STATIONING
STATIC WATER ELEVATION		TIME IN DAY
FOR OBSERVATION		NO. 1, 2, 3, 4, 5, 6, 7, 8, 9, 10 AND 11
U. S. DEPARTMENT OF AGRICULTURE SOIL CONSERVATION SERVICE		
Engineer	Date	
Drawn	Title	
Checked	Scale	
SCS-NO. 400-P		

PLATE NO. 16

2

APPENDIX F
REGIONAL GEOLOGY

PINEY RUN DAM
NDI ID NO. MD 139
GEOLOGY

REGIONAL GEOLOGY

Piney Run Dam is located approximately one mile north of Sykesville, Maryland in the Piedmont Province. Crystalline schists comprise the predominant rock formations found within the dam site area. These rock formations have a closely folded structure and trend approximately N 35° E.

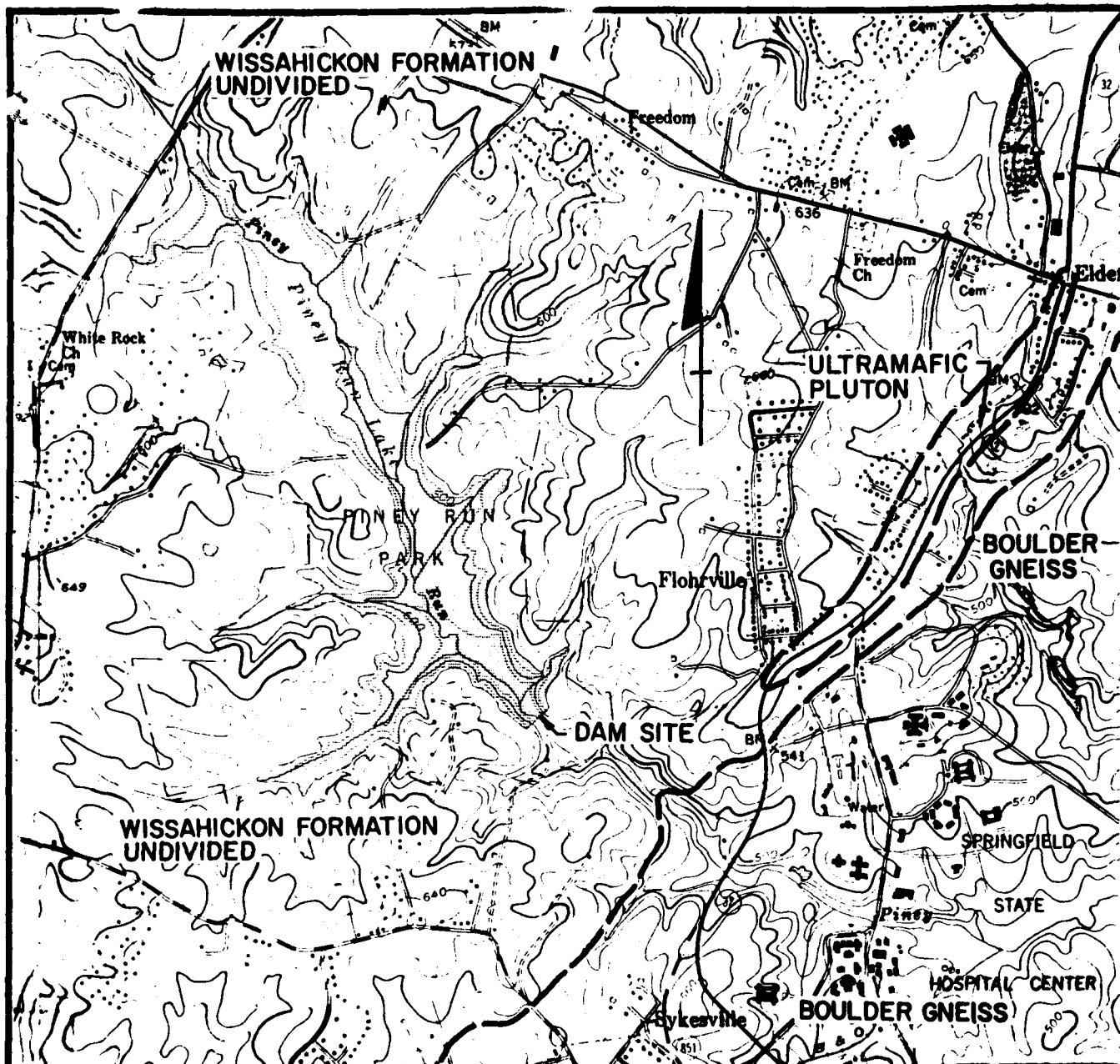
SITE GEOLOGY

The Peach Bottom syncline fold axis is located approximately one mile northwest of the dam. The Upper Pelitic Schist, a metamorphic facies of the Wissahickon Formation, is believed to underlie the dam. This formation is of Late Precambrian Age.

Previous geologic investigations indicated that residual soils, composed predominantly of clays and silts of low plasticity, overlie the Pelitic Schist. These soils were found to range from 5 to 6 ft. deep. The highly weathered mica schist ranged in thickness from 10 to 40 ft.

References

The Physical Features of Carroll County and Frederick County, State of Maryland, Board of Natural Resources, Baltimore, Maryland, 1946.



FINKSBURG QUADRANGLE CARROLL COUNTY, MARYLAND

SCALE: 0  1/2 MILE 1:24000

CONTOUR INTERVAL 20FT. DATUM IS MEAN SEA LEVEL

--- INFERRED FORMATION CONTACTS

DATA OBTAINED FROM MARYLAND GEOLOGICAL SURVEY'S GEOLOGIC MAP OF CARROLL COUNTY, 1928

DATE: AUG. 8, 1980		NATIONAL DAM INSPECTION PROGRAM	SITE GEOLOGY OF PINEY RUN LAKE DAM
SCALE: AS SHOWN			
DR: JLM	CK: GRG	ACKENHEIL & ASSOCIATES CONSULTING ENGINEERS BALTIMORE, MD.	
DWG. NO. F-2			

**DAT
FILM**

2-