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NATIONAL DAM INSPECTION PROGRAM. LATROBE RESERVOIR NDI NUMBER P--ETC(U)

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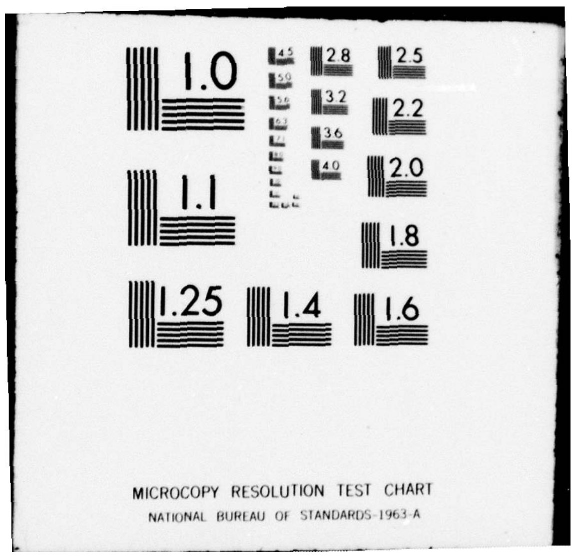
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LEVEL II

1

NW

OHIO RIVER BASIN
TROUT RUN, WESTMORELAND COUNTY
PENNSYLVANIA

LATROBE RESERVOIR
NDI [illegible] Pa. – 479 .

number

Ohio River Basin. Trout Run, Westermoreland County, Pennsylvania.

PHASE I INSPECTION REPORT,
6 NATIONAL DAM INSPECTION PROGRAM.

10 Bernard M. Mihalcin

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PREPARED FOR

DEPARTMENT OF THE ARMY
Baltimore District, Corps of Engineers
Baltimore, Maryland [illegible]

15 DACW31-78-C-0052

PREPARED BY

GAI CONSULTANTS, INC.
[illegible] ROAD
MONROEVILLE, PENNSYLVANIA [illegible]

LEVEL II

(1)

# PHASE I REPORT
## National Dam Inspecton Program

Latrobe Reservoir

Pennsylvania

Westmoreland County

Trout Run

16 May 1978 (visual inspection)

Inspection Team - GAI Consultants, Inc.
570 Beatty Road
Monroeville, Pennsylvania 15146

Based on a visual inspection, past performance, and available engineering data, the dam and its appurtenances appear to be in very good condition. The structure was rebuilt in 1958 when the embankment was modified to increase the available storage. The initial embankment, which was constructed in 1920 now forms part of the upstream portion of the dam.

The project is capable of passing the PMF (recommended spillway design flood) without overtopping.

Runoff had become impounded on a bench at the midpoint of the structure because of poor drainage. It is recommended that the owner be required to provide positive drainage from all points on the bench so as to prevent the ponding of water on the downstream face.

It is also recommended that a formal warning system be developed in order to provide for the safe evacuation of downstream inhabitants, should the need arise.

The dam should also be inspected on a yearly basis by qualified personnel to ensure that conditions at the facility do not deteriorate.



Contract DACW31-78-C-0052

GAI Consultants, Inc.

Bernard M. Mihalcin

Bernard M. Mihalcin

COMMONWEALTH OF PENNSYLVANIA
REGISTERED
PROFESSIONAL
BERNARD M. MIHALCIN
ENGINEER
20371-E

Date: July 7, 1978

Approved:

G K Withers

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

Date: 20 Jul 78

**Overview Photograph of Latrobe Reservoir Taken from the Right Abutment.**

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TABLE OF CONTENTS

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM
LATROBE RESERVOIR
NDI# PA-479, PENNDER# 65-66

# SECTION 1
# GENERAL INFORMATION

ABSTRACT

## 1.0 Authority.

The Dam Inspection Act, Public Law 92-367 authorized the Secretary of the Army, through the Corps of Engineers, to initiate a program of inspection of dams throughout the United States.

## ~~1.1~~ Purpose.

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

ABSTRACT

## 1.2 Description of Project.

a. Dam and Appurtenances. Latrobe Reservoir Dam (Trout Run Dam, as it is locally known), is an earthen embankment approximately 775 feet in length with a maximum height of 86 feet. A concrete chute spillway is located along the left end of the embankment. The spillway is a gravity type structure with an ogee-shaped crest and channel length of approximately 400 feet. A single 24-inch cast iron supply line constitutes the outlet works. It originates and is gated at the reservoir tower and runs under the embankment exiting to the right of the downstream channel. At a point approximately 250 feet downstream a 24-inch blow-off is connected to the supply line. No walkway has been provided, thus the reservoir tower and equipment therein are accessible only by boat.

b. Location. Latrobe Reservoir is located approximately 4 miles southeast of Latrobe, Westmoreland County, Pennsylvania. The reservoir dam is situated at the southern end of the reservoir approximately 5,000 feet from the confluence of Trout Run and Coalpit Run, near the intersection of U. S. Routes 30 and 259. The dam, reservoir, and watershed are contained within the Derry and Wilpen 7.5 minute quadrangles. The coordinates of the dam are N40° 16' 28", W79°, 16' 17".

c. Size Classification. Intermediate (86 feet high, 3,650 acre-feet storage capacity at spillway crest).

d. Hazard Classification. High (see Section 3.1.c).

e. Ownership. Municipal Authority of the Borough of Latrobe.

f. Purpose of Dam. The dam serves as a storage reservoir for the water supply system of the Borough of Latrobe. Recreational use is prohibited.

g. Historical Data. The original facility was designed and constructed by J. G. White Engineering Corporation of New York, New York, and completed in 1920. Designed to serve as a storage reservoir for the water supply system of the Borough of Latrobe, it has been owned and operated since construction by the Municipal Authority of the Borough of Latrobe. The original dam was an earth embankment 51 feet high, 580 feet long, with a reservoir capacity of 360 million gallons and it was equipped with a concrete spillway having a capacity of 2,900 cfs.

Inspection reports compiled every two years by the Pennsylvania Water Commission indicated a plethora of minor problems at the original facility between 1920 and 1958.

As early as May 1920, seepage was detected at several locations along the downstream slope confirming the fears of inspecting engineers and causing much concern to the local citizenry. Although the Pennsylvania Water Commission was convinced at this time that the structure was unsafe, there was disagreement as to the nature of the leakage.

Nevertheless, in December 1920, it was recommended that the structure be strengthened by superimposing a drained earthfill upon the downstream part of the dam. Repairs were instituted the following year. Additional repairs to the spillway were made during the following years.

The firm of Gannett, Fleming, Corddry, and Carpenter, Inc., of Harrisburg, Pennsylvania, was retained in 1958 to prepare plans for upgrading the facility. Included in their design were an extensive grouting program; a plan to increase the dam height by 35 feet to elevation 1256; demolishing, removing, and replacing the old spillway; and modifying the control tower. Construction ensued and the old Latrobe Reservoir Dam currently forms the upstream toe of the "new" structure (see Figure 3 in Appendix E).

PennDER inspection reports compiled for the present facility in 1966 and again in 1971 indicate that the structure was in a good condition.

1.3 Pertinent Data.

a. Drainage Area. 5.66 square miles.

b. Discharge at Dam Site. According to Ed McClellam, Trout Run Dam superintendent for the past 30 years, discharge records are not kept at this facility. However, he recalls that the highest level, achieved during his years as superintendent, was approximately 3 feet at the spillway crest in June 1972.

The capacity of the outlet works at maximum pool level (elevation 1256) are as follows:

24-inch cast iron outlet pipe - 75 cfs.

Spillway - 8,400 cfs.

c. Elevation (feet above mean sea level).

Top of Dam - 1256.

Maximum Pool Design Surcharge - Not known.

Maximum Pool of Record - 1243 (verbal).

Normal Pool (spillway crest) - 1240.

Upstream Portal Invert Outlet Conduit - 1169.

Downstream Portal Invert Outlet Conduit - 1168.

Streambed at Center Line of Dam - 1168.

Maximum Tailwater - Not known.

d. Reservoir.

Length of Maximum Pool ≈ 1.3 miles (elevation 1256).

Length of Normal Pool - 1.2 miles (elevation 1240).

e. Storage (acre-feet).

Spillway Crest - 3650.

Top of Dam - 6250.

Design Surcharge - Not known.

f. Reservoir Surface (acres).

Top of Dam ≈ 160.

Maximum Pool - Maximum design pool not known.

Spillway Crest ≈ 125.

g. Dam.

Type - Rolled earthfill.

Length - 600 feet.

Height - 86 feet maximum.

Top Width - 20 feet.

Side Slopes - Lower Downstream 3H:1V
Upper Downstream 2.5H:1V
Upstream 2.5H:1V

Zoning - Compacted impervious selected mixture of clay, sand, and gravel increasing in permeability toward outer slopes, with riprap on upstream face, and rock toe downstream. A sand and gravel filter blanket is provided within and beneath the embankment (see Figure 3).

Impervious Core - Not applicable.

Cutoff - A cutoff trench located at the downstream toe of the original embankment was carried an average depth of 15 feet below the toe for the entire length of the dam and into both abutments.

Grout Curtain - A grouting program was carried out as part of the latest construction in 1958. Grout holes (approximately 60 feet deep) were drilled along the embankment centerline and extend approximately 60 feet beyond the embankment--abutment contacts. The best record available on the grout program is contained in the construction progress reports that were compiled every two weeks during construction in 1959 by Gannett, Fleming, Corddry, and Carpenter, Inc.

h. Outlet Conduit.

Type - 24-inch cast iron supply pipe serving the Borough of Latrobe has its inlet at reservoir intake tower. Approximately 250 feet downstream, the pipe is connected to a valved 24-inch cast iron blow-off.

Closure - Sluice gates are controlled in the gate house.

Access - Intake tower accessible only by boat; inlet submerged.

Regulating Facilities - Can be regulated in the gate house and at gate valve 250 feet downstream.

i. Spillway.

Type - Concrete channel with ogee-crested weir.

Weir Length - 35 feet.

Channel Length ≈ 400 feet.

Crest Elevation - 1240.

Upstream Channel - Curved natural rockbed channel approximately 100 feet in length.

Downstream Channel - Approximate 15 percent slope at top that steepens as it reaches a stilling basin which is 42 feet wide, 60 feet long, and 6.5 feet deep.

j. Regulating Outlets. None in spillway. Low flow can be controlled through blow-off line.

## SECTION 2
## ENGINEERING DATA

2.1 Design.

a. Design Data Availability and Sources.

1. Hydrology and Hydraulics. No design reports are available.

2. Embankment. A copy of the specifications used during the 1958 reconstruction of the structure and the design drawings are available from both the owner and PennDER files.

3. Appurtenant Structures. Same as 2 (above).

b. Design Features.

1. Embankment. Available contract documents and historical data indicate that the present Latrobe Reservoir Embankment was constructed of rolled earthfill. The original embankment which was constructed in 1920 was incorporated into the current structure and currently functions as a part of the upstream portion of the dam (see Figure 3). Contract documents indicate that a cutoff trench was excavated to rock and that a concrete cutoff wall and grout curtain were constructed beneath the present structure.

The upstream face of the dam is at a slope of 2.5H to 1V and is faced with 9 inches of gravel covered by a well graded durable sandstone riprap. The downstream face of the structure lies at a slope of 3H to 1V and is mantled with crown vetch. Near the midpoint of the downstream face, a 10-foot wide berm was constructed to direct flow into lined diversion ditches on the embankment-natural slope interface. The dam is provided with a rock toe which drains a sand and gravel filter blanket contained within and beneath the embankment.

2. Appurtenant Structures.

a) Spillway. The primary discharge is a reinforced concrete ogee spillway located adjacent to the left abutment (see Photographs 2 and 6).

The ogee spillway foundation is keyed into rock on the left abutment and is shown on the attached Figure 4.

b) 24-Inch Supply Pipe. A 24-inch cast iron supply pipe, encased in concrete within the new structure, passes beneath the dam to a point a few hundred feet downstream. A valve box is located at this point which serves to utilize the supply line as a blow-off pipe enabling the water authority to discharge water into the downstream drainage system (see Photograph 5).

c) Gate House. The original gate house was modified in 1958 in order to raise the structure and permit the drawing of water through four gates located at different elevations within the reservoir. The gates discharge water directly into the 24-inch supply line. Details of the modifications of the gate house are shown on Figure 5.

## 2.2 Construction Records.

Progress reports are available for both the original and the modified embankments. The latter reports were issued to PennDER and document the progress made on a monthly basis. These data are available in PennDER files.

## 2.3 Operational Records.

No operational records are available.

## 2.4 Other Investigations.

Several State inspection reports are available from PennDER files, however, the majority document problems and conditions at the original structure. Two post construction reports concerning the new structure are available from PennDER files and are dated 1964 and 1971.

## 2.5 Evaluation.

The information available is considered sufficient to make an accurate assessment of the structure.

## SECTION 3
## VISUAL INSPECTION

3.1 Observations.

a. General. The general appearance of the structure and the related appurtenances suggests that the dam was well engineered, is well maintained, and is in satisfactory condition.

b. Embankment. The upstream slope of the dam is mantled with a well graded, durable, sandstone which was apparently dumped in place. The downstream dam slope is thickly vegetated (crown vetch) and is provided with a system of concrete and/or stone-lined diversion ditches which discharge at the rock toe. No indications of seepage through the embankment slope were observed during the field investigation. There were no indications of lush vegetation on the downstream face nor did we note any flora which is selective for damp or swampy environs. Some water was noted seeping through the rock outcrop just above the bench level on the right abutment which discharges some flow into the diversion ditch. It is possible that the flow is not related to impoundment levels as other springs were noted through similar rock strata above the impoundment level on the left abutment.

c. Appurtenant Structures.

1. Spillway. The spillway, spillway abutments, discharge channel, and plunge pool all appeared to be in excellent condition, except for some minor temperature and/or shrinkage cracking.

2. Gate House, Valves, and Supply Line. Access to the gate house is by boat, which was not available during our inspection, consequently, we were not able to assess condition of the mechanical systems within the gate house. According to a representative of the Water Authority the system is in good working order. The downstream gate valve which regulates flow from the supply line to a 24-inch blow-off line was observed (see Photograph 5). The valve is located in a concrete pit approximately 250 feet downstream of the dam. The valve was greased and appeared in good order.

3. Reservoir Area. The slopes adjoining the reservoir were moderate to steep and densely wooded. No signs of slope distress were observed with the exception of a portion of a road fill on the northeast side of the reservoir (see Photograph 7). A portion of the raised

and/or relocated county road in this area has slumped into the reservoir. However, since the total slumped volume of fill at this point is small, this condition is not considered to be serious.

4. Downstream Channel. The area immediately downstream of the dam is characterized as a broad (≈600 feet wide) thinly vegetated valley containing Trout Run. The stream passes beneath a two-lane bridge approximately 4,000 feet downstream of the dam before emptying into Coalpit Run a first order tributary of Loyalhanna Creek.

3.2 Evaluation.

As shown on the Regional Vicinity Map (Appendix G) approximately six (6) homes located along Trout Run just downstream of the dam would be inundated if the dam were to fail. Consequently, the hazard classification is high.

## SECTION 4
## OPERATIONAL PROCEDURES

### 4.1 Normal Operational Procedure.

According to water company personnel, there are no established operational procedures at the facility. Excess inflow passes over the spillway and discharges into the Trout Run channel. The only other outlet serving the structure is a 24-inch supply line which is used to convey water to the Borough of Latrobe. This outlet can be readily regulated to pass water through a 24-inch blow-off pipe directly into the Trout Run channel.

### 4.2 Maintenance of Dam.

The dam crest is periodically mowed by water company personnel. The downstream slope is covered with crown vetch and is reportedly cleared of brush yearly.

### 4.3 Maintenance of Operating Facilities.

The water company superintendent stated that the valves are lubricated yearly and that the blow-off is opened every few years to insure that it is operating properly.

### 4.4 Warning Systems.

There are no formal warning systems in effect.

### 4.5 Evaluation.

The overall appearance of the structure suggests that it is well maintained.

## SECTION 5
## HYDROLOGIC/HYDRAULIC EVALUATION

### 5.1 Design Data.

No hydrologic or hydraulic design data was available. This information was reportedly destroyed while in storage at Harrisburg, Pennsylvania, during the flood of June 1972.

### 5.2 Experience Data.

No data pertinent to spillway evaluation are available from past performance.

### 5.3 Visual Observations

The dam and its appurtenances appeared to be in very satisfactory condition.

### 5.4 Overtopping Potential and Spillway Adequacy.

The ratio "PMF Peak Flow/Drainage Area" was determined from an empirical curve supplied by the Corps of Engineers, Baltimore District. The curve used was the Ohio River Basin Curve (see calculations in Appendix C). Based on this curve and a drainage area of 5.66 square miles, Peak PMF Q/A = 1,680 cfs/sq. mi., and Peak PMF Q = 9,509 cfs. The size category is "intermediate" and the hazard rating "high". Consequently, the SDF is the PMF ("Recommended Guidelines for the Inspection of Dam").

Calculations were performed to evaluate the overtopping potential using spillway and blow-off line capacities during the PMF.

Based on this curve, the inflow volume calculated for the design storm is equal to 16,112 acre-feet. This corresponds to an overconservative estimate of runoff and, as a consequence, an inflow volume based on 26 inches of runoff, that is 7,849 acre-feet, was used in subsequent calculations.

The spillway has a maximum discharge capacity equivalent to 8,400 cfs. This coupled with the maximum discharge capacity of the outlet works (≃75 cfs) yields a total maximum discharge capacity approximately equal to 8,475 cfs. A comparison of peak inflow to the maximum discharge shows that some storage volume is required.

Based on normal pool elevation 1240 and top of dam elevation 1256, the available storage is found to be 2,240 acre-feet which is greater than the volume of storage required of 863 acre-feet. Consequently, the embankment would not be overtopped during the PMF and the spillway capacity is considered adequate (see Appendix C).

## SECTION 6
## EVALUATION OF STRUCTURAL INTEGRITY

### 6.1 Visual Observations.

a. Embankment. Based on visual observations, the embankment appeared to be in excellent condition. Aside from a small amount of runoff, which was ponded on a bench at the downstream embankment midpoint, the drainage system seemed to be in good order.

b. Appurtenant Structures. Based on the visual inspection, the spillway structure appeared to be in excellent condition.

### 6.2 Design and Construction Techniques.

a. Embankment. Specifications and construction drawings indicate the the embankment is well engineered. Favorable embankment slopes, a substantial grouting program, a layered blanket drain, rock toe, and lined diversion ditches suggest adequate stability and safety features.

b. Appurtenant Structures. Specifications and construction drawings also indicate well designed outlet and discharge facilities. The spillway is keyed into rock, anchored, drained and of adequate capacity. The outlet pipe is encased in concrete through the new embankment and can be controlled from the upstream end.

### 6.3 Past Performance.

No formal records of past performance were available. The Agnes flood of 1972 which was reportedly passed with a 3-foot spillway level did no apparent damage.

### 6.4 Seismic Stability.

The dam is located in Seismic Zone No. 1 and is thus subject to minor earthquake induced forces. Since the embankment is broad-based, well drained, and constructed of residual soils it is believed that the static stability is sufficient to withstand minor earthquake induced dynamic forces. However, no calculations or investigations, etc., were performed to confirm this belief.

## SECTION 7
## ASSESSMENT AND RECOMMENDATIONS FOR REMEDIAL MEASURES

### 7.1 Dam Assessment.

a. Safety. The visual inspection and operational history of the dam since its reconstruction in 1958 indicate that the structure is in very good condition. Review of available engineering data indicate that the structure and its appurtenances were designed and constructed in accordance with accepted engineering practice. The only deficiency noted at the time of inspection was that runoff had become impounded on the downstream face of the dam because of poor drainage on the bench located about midway between the toe and dam crest. A design deficiency (in retrospect) is the lack of instrumentation (settlement monitors, piezometers, etc.) that would have been prudent during the time of initial fillup.

The hydraulic and hydrologic procedures adopted for our analysis indicate that the spillway will pass and/or contain the PMF.

b. Adequacy of Information. Although most of the files pertaining to the design of this dam were lost during the flood of June 1972, contract specifications and drawings were available for review. These are considered sufficient to make a reasonable assessment of the adequacy of the facility.

c. Urgency. It is suggested that the remedial measures listed below be implemented as soon as practical.

d. Necessity for Additional Investigations. Because of the good overall appearance of the structure, additional investigations are not deemed necessary at this time.

### 7.2 Recommendations/Remedial Measures.

a. It is recommended that remedial measures be implemented to provide positive drainage on the bench so as to prevent runoff from accumulating on the downstream dam face.

b. It is recommended that a formal warning system be implemented to protect the inhabitants residing on the floodplain immediately downstream of the dam.

c. It is recommended that the dam be inspected on a yearly basis to check for changed conditions.

## APPENDIX A

## CHECK LIST - ENGINEERING DATA

CHECK LIST
ENGINEERING DATA
DESIGN, CONSTRUCTION, OPERATION
PHASE I

NAME OF DAM Latrobe Reservoir - Locally known as "Trout Run Reservoi
ID # PA-479

ITEM | REMARKS | SHEET 1

**AS-BUILT DRAWINGS**
Available from owner as well as PennDER files - These drawings only cover the reconstruction which took place in 1958.

**REGIONAL VICINITY MAP**
See Section F of the report.

**CONSTRUCTION HISTORY**
A partial history is available from PennDER - photographs were supplied by both the owner and PennDER.

**TYPICAL SECTIONS OF DAM**
Drawing 6 - General Plan
Drawing 7 - Typical Sections and Details

**OUTLETS - PLAN** Drawing 11 - Tower and Conduit Details, Supply Line Blow-off.

**- DETAILS** Drawing 11 - Conduit Location Profile; 24-inch Blow-off detail; Miscellaneous Details.

**- DISCHARGE RATINGS** None

**RAINFALL/RESERVOIR RECORDS**
Rainfall records from 1956 to present along with reservoir levels from 1909 to present are available at Latrobe Reservoir pump house.

DESIGN REPORTS

Not available.

Note: Many of the reports and much of the data for this project were destroyed by the flood of June 1972, while in storage at Harrisburg, Pennsylvania, according to Gannett, Fleming, Corddry, and Carpenter, Inc.

GEOLOGY REPORTS

Not available.

DESIGN COMPUTATIONS
HYDROLOGY & HYDRAULICS
DAM STABILITY
SEEPAGE STUDIES

Not available.

MATERIALS INVESTIGATIONS
BORING RECORDS
LABORATORY
FIELD

Drawings 3, 4, and 5 - Foundation Exploration Logs I, II, III.

POST-CONSTRUCTION SURVEYS OF DAM

None.

BORROW SOURCES

Drawing 2 - Location Plan.

**MONITORING SYSTEMS**

No formal system, manager inspects yearly.

**MODIFICATIONS**

Not since 1958.

**HIGH POOL RECORDS**

Daily records available, but maximum not known.

**POST CONSTRUCTION ENGINEERING STUDIES AND REPORTS**

None.

**PRIOR ACCIDENTS OR FAILURE OF DAM DESCRIPTION REPORTS**

None according to available records.

**MAINTENANCE OPERATION RECORDS**

Formal records not available. Periodic maintenance is carried out. Scuba investigation 5 years ago revealed no siltation against screen intakes. Yearly clearing and grubbing of vegetation on the embankment is maintained.

| ITEM | REMARKS | ID # 479 | SHEET 4 |
|---|---|---|---|
| SPILLWAY PLAN | Drawing 6 - General Plan | | |
| SECTIONS | Drawing 12 - Spillway Chute, Stilling Basin. | | |
| DETAILS | Drawing 13 - Approach and Wall Details.<br>Drawing 14 - Stilling Basin Details.<br>Drawing 15 - Wall Details.<br>Drawing 16 - Wall Details. | | |
| OPERATING EQUIPMENT PLANS & DETAILS | | | |
| | Drawings 9, 10, and 11 - Tower and Conduit Details.<br>Manufacturer's Shop Drawings - Not available. | | |

NDI# PA-479

CHECK LIST ID # PennDER# 65-66

HYDROLOGIC AND HYDRAULIC

ENGINEERING DATA

DRAINAGE AREA CHARACTERISTICS: 5.66 square miles.

ELEVATION TOP NORMAL POOL (STORAGE CAPACITY): 1240.

ELEVATION TOP FLOOD CONTROL POOL (STORAGE CAPACITY): 1256.

ELEVATION MAXIMUM DESIGN POOL: Not known.

ELEVATION TOP DAM: 1256.

SPILLWAY DATA:

a. Crest Elevation 1240.

b. Type Concrete ogee.

c. Weir Length 35

d. Channel Length ≃400 feet.

e. Location Spillover Left abutment.

f. Number and Type of Gates None.

OUTLET WORKS:

a. Type One 24-inch supply pipe with 24-inch blow-off.

b. Location see below.

c. Entrance Inverts elevation 1169 - Located beneath tower.

d. Exit Inverts elevation 1168 - Located approx. 250 feet downstream.

e. Emergency Draindown Facilities 24-inch blow-off.

HYDROMETEOROLOGICAL GAGES:

a. Type Raingage, staff gage.

b. Location Latrobe Pump Station, Latrobe Reservoir Tower.

c. Records Rainfall post 1956; water level post 1090; located at pump house.

MAXIMUM NON-DAMAGING DISCHARGE: Not known.

# APPENDIX B

# CHECK LIST - VISUAL INSPECTION

CHECK LIST
VISUAL INSPECTION
PHASE 1

DAM NAME Latrobe Reservoir COUNTY Westmoreland STATE Pa. ID # Pa-479

TYPE OF DAM Earthfill w/Rock Toe HAZARD CATEGORY High

DATE(S) INSPECTION 16 May 78 WEATHER Overcast TEMPERATURE $50^{\circ}$-$60^{\circ}$

POOL ELEVATION AT TIME OF INSPECTION 1240.5 M.S.L. TAILWATER AT TIME OF INSPECTION 1167.5 M.S.L.

INSPECTION PERSONNEL:

| GAI | Owner's Representatives | |
|---|---|---|
| B. Mihalcin | Ed. McCallen - entire visit | Tom Gray (chemist) - brief visi |
| J. P. Nairn | J. Durco (Mgr.) - brief visit | |
| K. H. Khilji | D. Johnson (operations) - " | |
| D. Bonk | | |

K. H. Khilji RECORDER

EMBANKMENT ID# Pa-479 Sheet 1

| VISUAL EXAMINATION OF | OBSERVATIONS | REMARKS OR RECOMMENDATIONS |
|---|---|---|
| SURFACE CRACKS | None observed. | |
| UNUSUAL MOVEMENT OR CRACKING AT OR BEYOND THE TOE | None observed. | |
| SLOUGHING OR EROSION OF EMBANKMENT AND ABUTMENT SLOPES | Minor rockfall at downstream right abutment - no problem. | |
| VERTICAL AND HORIZONTAL ALIGNMENT OF THE CREST | Smooth -- No unusual settlement. | |
| RIPRAP FAILURES | None observed.<br>Well-graded, durable riprap; 2 to 3 ft. maximum particle size. | |

| VISUAL EXAMINATION OF | OBSERVATIONS | REMARKS OR RECOMMENDATIONS |
|---|---|---|
| | | |
| **JUNCTION OF EMBANKMENT AND ABUTMENT, SPILLWAY AND DAM** | Minor rockfall on downstream slope of right abutment. Otherwise, in excellent condition | |
| **ANY NOTICEABLE SEEPAGE** | Seepage visible through natural slope at right abutment below bench level. 5 to 10 gpm flow -- could be from existing spring. | |
| **STAFF GAGE AND RECORDER** | Staff gage on gate house tower leg. Not legible. | |
| **DRAINS** | Minor accumulation of water on bench -- bench too flat.<br>Paved slope drains - OK.<br>Toe drain (Rock toe) - functioning OK. | |

| VISUAL EXAMINATION OF | OBSERVATIONS | REMARKS OR RECOMMENDATIONS |
|---|---|---|

**CRACKING AND SPALLING OF CONCRETE SURFACES IN OUTLET CONDUIT**

Not applicable - outlet through cast iron blow-off pipe.

**INTAKE STRUCTURE**

Gate House (Control Tower) visible but not accessible by foot. Needs minor maintenance, possibly bridge for quick access.

**OUTLET STRUCTURE**

24-inch blow-off line, valve box, and outlet end in good condition. Owner operated valve in 1977 to verify operability.

**OUTLET CHANNEL**

Blow-off valve discharges into stream. No problem.

**EMERGENCY GATE**

Inaccessible to inspection crew.

UNGATED SPILLWAY ID # Pa-479 SHEET 4

| VISUAL EXAMINATION OF | OBSERVATIONS | REMARKS OR RECOMMENDATIONS |
|---|---|---|

**CONCRETE WEIR**

Excellent condition. Minor spalling at 2 construction joints along base. Owner to patch this year.

**APPROACH CHANNEL**

No problems.

**DISCHARGE CHANNEL**

Stilling basin & downstream area in good to excellent condition.

**BRIDGE AND PIERS**

None.

INSTRUMENTATION ID # Pa-479 SHEET 5

| VISUAL EXAMINATION | OBSERVATIONS | REMARKS OR RECOMMENDATIONS |
|---|---|---|
| **MONUMENTATION/SURVEYS** None observed. | | |
| **OBSERVATION WELLS** None. | | |
| **WEIRS** No weirs on discharge or drainage facilities. | | |
| **PIEZOMETERS** None. | | |
| **OTHERS** | | |

RESERVOIR ID # Pa-479 SHEET 6

| VISUAL EXAMINATION OF | OBSERVATIONS | REMARKS OR RECOMMENDATIONS |
|---|---|---|
| SLOPES | Gentle to moderate. Mostly wooded around reservoir. Steep (1:1) slope on relocated road embankment(probably rockfill from adjacent cut). Small slide on road embankment. | |
| SEDIMENTATION | Minor. | |

DOWNSTREAM CHANNEL ID # Pa-479 SHEET 7

VISUAL EXAMINATION OF | OBSERVATIONS | REMARKS OR RECOMMENDATIONS

CONDITION
(OBSTRUCTIONS,
DEBRIS, ETC.)

Natural channel with thick vegetation.

SLOPES

Gentle downstream slope. With moderate to steep side slopes.

APPROXIMATE NO.
OF HOMES AND
POPULATION

Few homes - all indicated on U.S.G.S. 7.5 minute map; Derry and Wilpen quadrangles.
Photo revised 1973.

# APPENDIX C

# HYDRAULICS AND HYDROLOGY

SUBJECT DAM SAFETY INSPECTION – LATROBE RESERVOIR.

KHK DATE 5/17/78 PROJ. NO. 78-501-479

CHKD. BY DLB DATE 5-22-78 SHEET NO. 1 OF 11

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Environmental Specialists

# LATROBE RESERVOIR NDS & PA 479

DERRY QUADRANGLE
WILPEN QUADRANGLE
} 7.5 MINUTE USGS MAP



## DAM STATISTICS

MAXIMUM HEIGHT OF DAM = 86 FT.

DRAINAGE AREA (PLANIMETERED) = 5.50 SQ. MILES U.S.G.S MAP.

DRAINAGE AREA (FROM REF 2) = 5.66 SQ. MILES

STORAGE CAPACITY @ NORMAL POOL = 3650 ACRE – FEET (REF 2.)

## SIZE CLASSIFICATION.

DAM SIZE = INTERMEDIATE. (SEE TABLE 1 REF. 1)
$\geq 40 < 100$ FT

## SPILLWAY DESIGN FLOW (SDF)

HAZARD RATING = HIGH
POSSIBLE LOSS OF LIFE IS GREATER THAN 3

REFRENCES:
1: "RECOMMENDED GUIDELINES FOR SAFETY INSPECTION OF DAMS" BY DEPT. OF ARMY – OFFICE OF CHIEF ENGINEER – APPENDIX D.

2: LOCATION & DRAINAGE AREA, RESERVOIR MAP DRAWING No 2788 SHEET 2 BY GANNETT FLEMING CORDDRY & CARPENTER INC 6/12/1958

SUBJECT DAM SAFETY INSPECTION - LATROBE RESERVOIR

BY KHK DATE 5/17/78 PROJ. NO. 78-501-479

CHKD. BY DLB DATE 5-22-78 SHEET NO. 2 OF 11

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REQUIRED SDF = PMF

(SEE TABLE 3, REF 1)

USE PMF FOR SDF

DRAINAGE AREA = 5.66 SQ. MILES (SHEET 1)

PMF (PEAK FLOW)/AREA = 1680 (SHEET 10 OF 11)

PMF = 1680 x 5.66 = 9509 CFS.

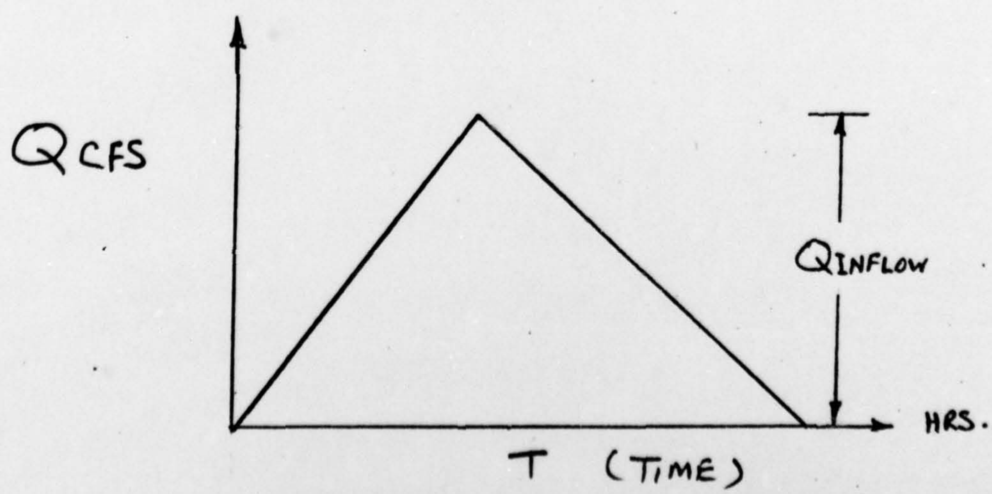
SDF = 9509 CFS.



## DEVELOP INFLOW HYDROGRAPH

MAXIMUM INFLOW = 9509 C.F.S

TOTAL TIME OF FLOW = 41 HRS. (FROM SHEET 11 OF 11)



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VOLUME OF INFLOW HYDROGRAPH

$V = 1/2\,(Q_{I\,MAX})(\text{TIME})$

$= 1/2\,(9509\text{ CFS})(41\text{ HRS})(3600\text{ SEC/HR})(1\text{ ACRE}/43{,}560\text{ FT}^2)$

$= 16{,}110$ ACRE-FEET

DETERMINE THE AVERAGE RAINFALL IN INCHES REQUIRED TO PRODUCE THE VOLUME ABOVE

$\dfrac{(16{,}110\text{ AC-FT})}{(5.66\text{ SQ.MI.})}(1\text{ SQ.MI.}/640\text{ ACRES})(12\text{ IN/FT}) = 53.4$ INCHES

VOLUMES PRODUCED BY RAINFALLS IN EXCESS OF 26 INCHES ARE TO BE RECALCULATED USING 26 INCHES AS AN UPPER BOUND

$(26\text{ INCHES})(5.66\text{ SQ.MI.})(640\text{ ACRES/SQ.MI.})(1\text{ FT}/12\text{ IN}) = 7849$ AC-FT

VOLUME OF INFLOW (RECALCULATED) = 7849 AC-FT

NOTE: $Q_{I\,MAX}$ REMAINS CONSTANT
STORM DURATION DECREASES IN ACCORDANCE WITH THE DECREASE IN INFLOW VOLUME

STORM DURATION $= (7849\text{ AC-FT})(2)(43{,}560\text{ FT}^2/\text{AC})/(3600\text{ SEC/HR})(9509\text{ CFS}) =$

$= 20$ HRS

SUBJECT DAM SAFETY INSPECTION - LATROBE RESERVOIR

BY KHK DATE 5/17/78 PROJ. NO. 78-501-479

CHKD. BY DLB DATE 5-22-78 SHEET NO. 4 OF 11

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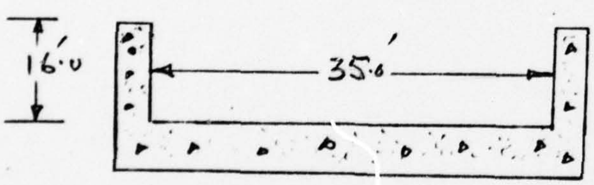
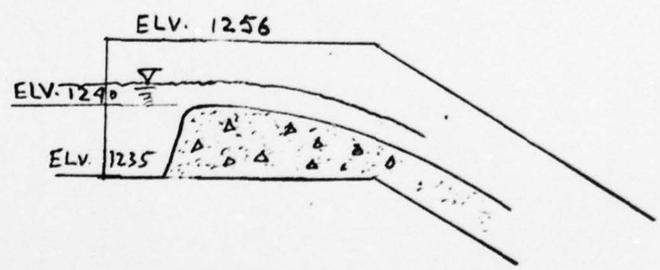
## SPILLWAY CAPACITY




SPILLWAY CREST ELEVATION = 1240 FT. SEE SHEET 12 OF REF 2

HEAD ABOVE SPILLWAY CREST = 16 FT " " "

$$Q = C L H_t^{3/2} \quad \text{---- (EQ. 21-121, REF 3)}$$

$H_t$ = 16 FT (NEGLECTING VELOCITY HEAD) = $H_D$

L = 35. FT

REF 3: "STANDARD HAND BOOK FOR CIVIL ENGINEERS" By MERRITT.

SUBJECT DAM SAFETY INSPECTION LATROBE RESERVOIR

BY KHK DATE 5/17/78 PROJ. NO. 78-501-479

CHKD. BY DLB DATE 5-22-78 SHEET NO. 5 OF 11

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FROM FIG. 21-67 REF. 3

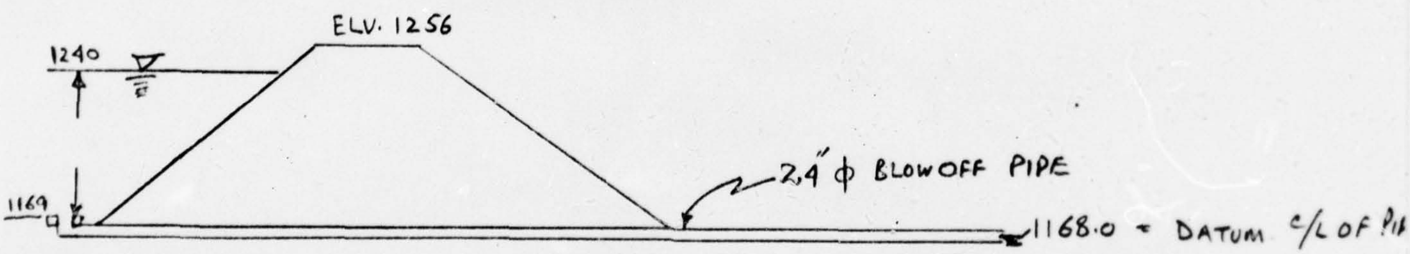
$$P/H_D = \frac{5}{16} = .3125$$



$$\therefore C = 3.75$$

$$Q = 3.75 \times 35 \times (16)^{3/2} = 8400 \text{ CFS}$$

CONSIDER DISCHARGE THROUGH 24" BLOW OFF PIPE




INVERT ELEVATION 1167.0 (DRAWING H-4499-1 By J.G. WHITE ENGINEERING CORPORATION)

LENGTH OF PIPE = 765 FT (DRAWING 2788 SHEET 11 REF 2)

HEAD OVER INVERT = 1240 − 1167 = 73 FT.

USE BERNOULLI'S EQUATION.

$$z_1 + \frac{P_1}{w} + \frac{V_1^2}{2g} = Z_2 + \frac{P_2}{w} + \frac{V_2^2}{2g} + h_f \quad \text{---- EQ 21-12 REF 3}$$

Where

$Z_1$ = HEIGHT OF INLET ABOVE DATUM = 0

$Z_2$ = HEIGH OF OUTLET " " = 0

$P_1/w$ = PRESSURE HEAD AT INLET = 72.0 FT.

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$P_2/w$ = PRESSURE HEAD AT OUTLET = 0

$V_1$ = VELOCITY AT INLET = 0

$V_2$ = VELOCITY AT OUTLET. = ? SOLVE FOR.

$h_f$ = HEAD LOSSES DUE TO FRICTION

$$h_f = \frac{LV^2}{2gD}$$ DARCY - WEISBACH FORMULA EQ - 21-30 REF 3

WHERE L = LENGTH OF PIPE = 765 FT (SHEET 5)
V = VELOCITY = SOLVE FOR
D = DIAMETER OF PIPE = 2.0 FT
$g$ = 32.2 FT/SEC$^2$

$f$ = .017 FOR $\epsilon$ = .00085 (CAST IRON PIPE) : TABLE 21-3 REF 3

$\epsilon/D$ = .00042

RAYNOLDS NUMBER = $3.5 \times 10^7$

ENTRANCE LOSSES $= h_e = K_E \dfrac{V^2}{2g}$ EQ. (21-42) REF 3

$K_E$ = COEFFICIENT OF ENTRANCE LOSSES
= .50 TABLE 21-7 REF 3

SOLVE BERNOULLI'S EQUATION.

$$0 + 72 + 0 = 0 + 0 + \frac{V_2^2}{2(32.2)} + \frac{.017(765)V_2^2}{2(32.2)(2)} + \frac{.50\,V_2^2}{2(32.2)}$$

SUBJECT DAM SAFETY INSPECTION - LATROBE RESERVOIR

BY KHK DATE 5/18/78 PROJ. NO. 78-501-479

CHKD. BY DLB DATE 5-22-78 SHEET NO. 7 OF 11

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$$72 = 0.016 V_2^2 + 0.101 V_2^2 + .008 V_2^2$$

$$V = 24.0 \text{ FT/SEC.}$$

$$Q = \frac{\pi}{4}(D)^2 \times V = 75.40 \text{ CFS.}$$

MAXIMUM DISCHARGE THROUGH SPILLWAY = 8400 CFS

MAXIMUM DISCHARGE " PIPE = 75. CFS.

TOTAL OUTFLOW = 8475 CFS

NOTE: IT IS ASSUMED THE BLOW-OFF WILL BE OPENED PRIOR TO WHEN MAXIMUM SPILLWAY DISCHARGE OCCURS AND WILL REMAIN OPENED DURING THE ENTIRE DISCHARGE PERIOD

MAXIMUM INFLOW (9509 CFS) > MAXIMUM OUTFLOW (8475 CFS)

SUBJECT Dam Safety Inspection
Latrobe Reservoir

BY DLB DATE 5-26-78 PROJ. NO. 78-501-479

CHKD. BY JPN DATE 5-26-78 SHEET NO. 8 OF 11

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Consider inflow relative to both outflow and storage

Using short cut method as recommended by NAD

$$P = \frac{\text{Maximum Total Discharge}}{\text{PMF Peak Inflow}} = \frac{8475}{9509} \quad \begin{matrix}\text{(Sheet 7)}\\ \text{(Sheet 2)}\end{matrix}$$

$P = 0.89$



$$(1-P) = \frac{\text{Required Reservoir Storage}}{\text{Volume of Inflow Hydrograph}} = 0.11$$

Volume of Inflow Hydrograph = 7849 Ac-Ft (Sheet 3)

$\therefore$ (16112 Ac-Ft)(0.11) = 863 Acre-Ft

Required Reservoir Storage = 863 Acre-Ft

Compute Storage Available

* Reservoir Surface Area at El 1240 ≃ 120 acres
* Reservoir Surface Area at El 1252 ≃ 160 acres

*Notes: Areas have been planimetered from Drwg #2 by Gannett, Fleming, Cordory & Carpenter

SUBJECT Dam Safety Inspection
Latrobe Reservoir

BY DLB DATE 5-26-78 PROJ. NO. 78-501-479

CHKD. BY JPN DATE 5-26-78 SHEET NO. 9 OF 11

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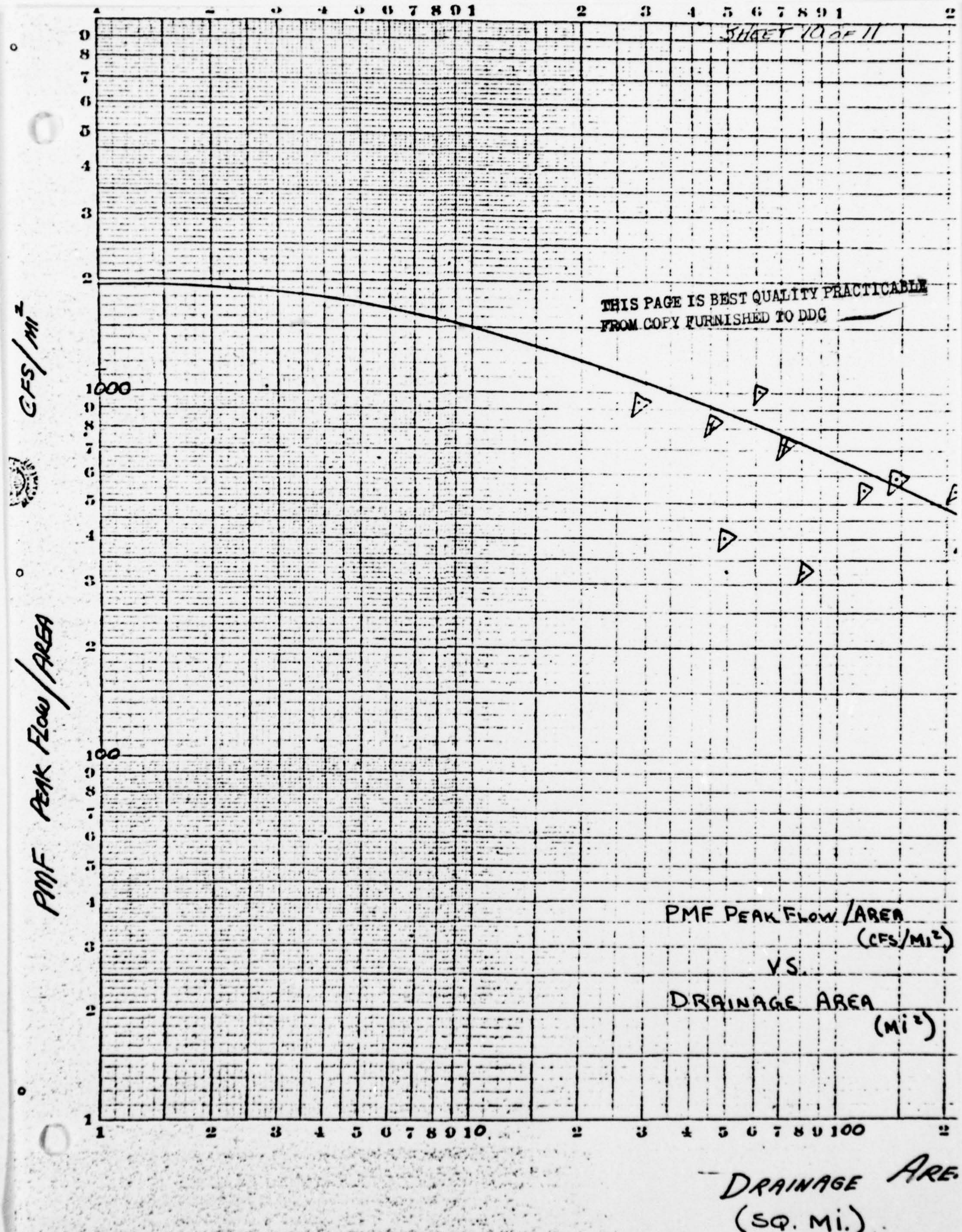
AVAILABLE FREEBOARD (1256 - 1240) = 16 FT

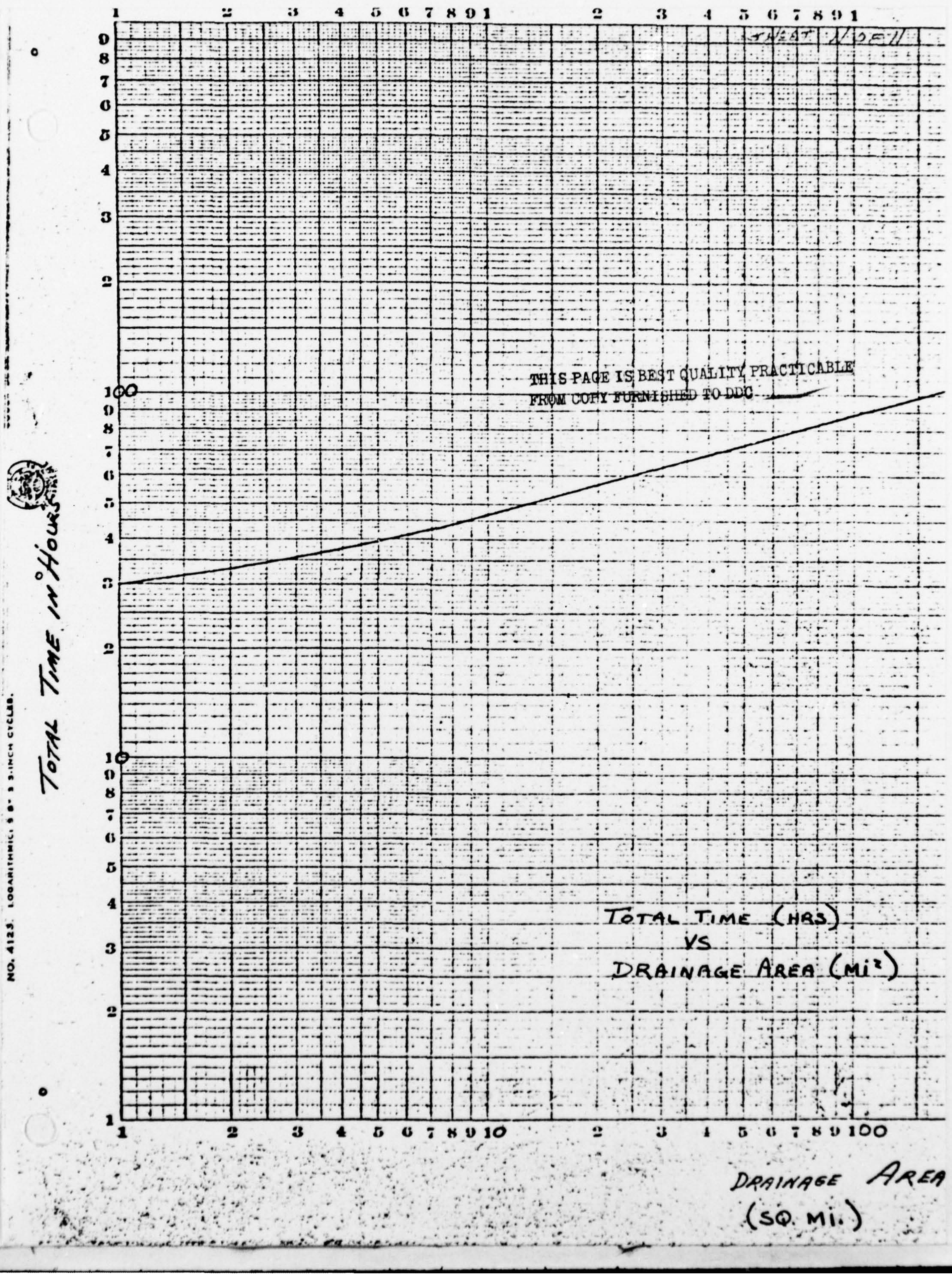
$$\text{STORAGE AVAILABLE} \simeq \left[\frac{(160+120)\text{ ACRES}}{2}\right](16\text{ FT}) = 2240\text{ AC-FT}$$

STORAGE AVAILABLE > STORAGE REQUIRED

2240 AC-FT > 863 AC-FT

CONCLUSION: LATROBE RESERVOIR WILL BE ABLE TO CONTAIN AND OR PASS THE PMF PEAK INFLOW WITHOUT OVERTOPPING


PMF PEAK FLOW/AREA CFS/MI²
1000
100
PMF PEAK FLOW/AREA (CFS/MI²) VS. DRAINAGE AREA (MI²)
1
2
3
4
5
6
7
8
9
10
100
DRAINAGE AREA (SQ. MI.)



SHEET 11 OF 11
TOTAL TIME IN HOURS
TOTAL TIME (HRS)
VS
DRAINAGE AREA (MI²)
DRAINAGE AREA
(SQ. MI.)
100
10
1
NO. 4123. LOGARITHMIC, 3 × 2 3-INCH CYCLES.

APPENDIX D

PHOTOGRAPHS

| | |
|---|---|
| PHOTOGRAPH 1 | View looking across the crest of the Latrobe Reservoir embankment taken from the right abutment. The spillway is located in the background. A field team member is shown near the center of the embankment as scale. |
| PHOTOGRAPH 2 | View taken from a few hundred feet downstream of the Latrobe Reservoir embankment showing the spillway on the right and the rock toe near the center of the photograph. |
| PHOTOGRAPH 3 | View looking downstream from the crest of the Latrobe Reservoir embankment. |
| PHOTOGRAPH 4 | View of the upstream face of the Latrobe Reservoir embankment. The gate house can be seen near the right center of the photograph. |


1


2


3


4

| | |
|---|---|
| PHOTOGRAPH 5 | View of the valve on the 24-inch blow-off pipe located approximately 250 feet downstream of the center of the embankment. |
| PHOTOGRAPH 6 | View of the spillway at the Latrobe Reservoir. Note the riprap in the channel just downstream of the spillway. |
| PHOTOGRAPH 7 | View of the upstream portion of the Latrobe Reservoir near the northeast end. A portion of a road passing around the reservoir has slumped into the reservoir as shown on the photograph. Roadway is not pictured. |
| PHOTOGRAPH 8 | View of a two-lane bridge located approximately one-half mile downstream of the embankment. It represents the first restriction downstream. |

5

6

7

8

# APPENDIX E

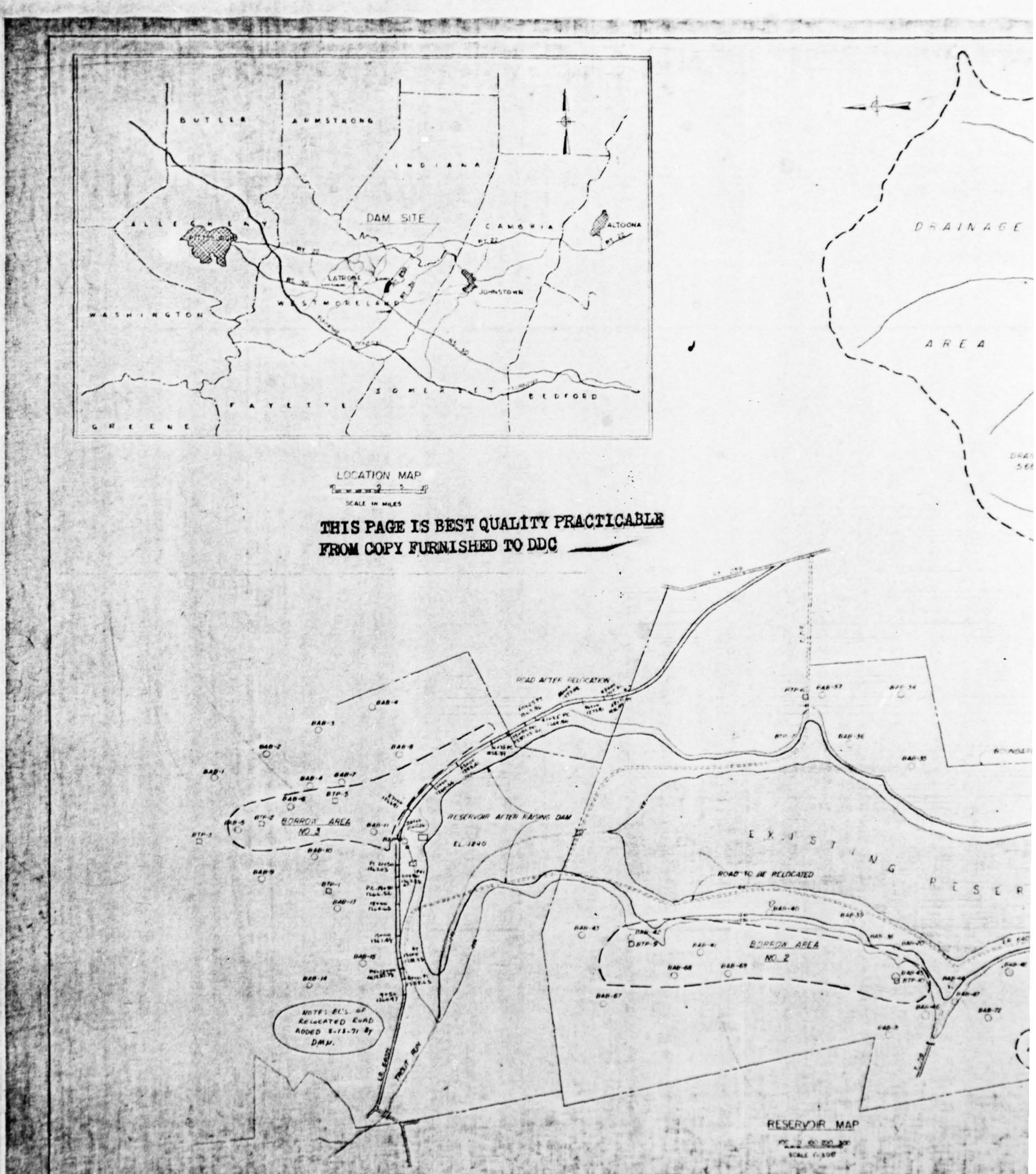
# GEOLOGY

The Latrobe Reservoir Dam is located approximately midway between the Chestnut Ridge Anticline and Ligonier Syncline in the Pennsylvanian age sedimentary rocks of the Conemaugh Formation. The unit is best characterized as a cyclic sequence of shales, siltstones, and sandstones containing a few limestone beds and coal seams. These strata dip to the southwest at about 5° in the area of the Latrobe Reservoir.

# APPENDIX F

# FIGURES

APPENDIX F - FIGURES


BUTLER
ARMSTRONG
INDIANA
DAM SITE
ALLEGHENY
CAMBRIA
ALTOONA
LATROBE
WESTMORELAND
JOHNSTOWN
WASHINGTON
SOMERSET
BEDFORD
FAYETTE
GREENE
LOCATION MAP
SCALE IN MILES
DRAINAGE
AREA
ROAD AFTER RELOCATION
BORROW AREA NO. 3
RESERVOIR AFTER RAISING DAM
EL. 1840
EXISTING RESER
ROAD TO BE RELOCATED
BORROW AREA NO. 2
TROUT RUN
NOTE: EC'S. OF RELOCATED ROAD ADDED 9-13-71 BY DMH.
RESERVOIR MAP

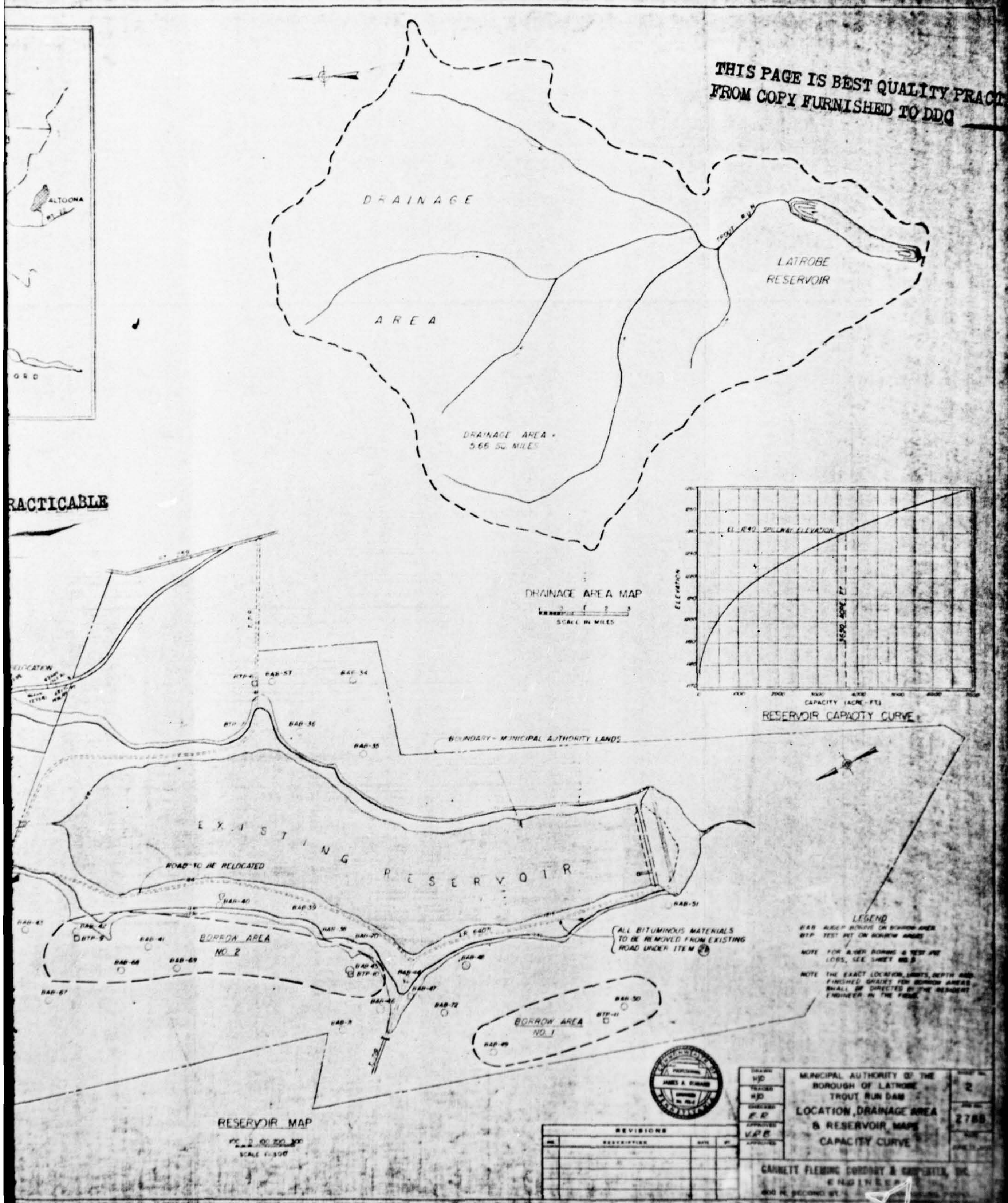

ALTOONA
DRAINAGE
AREA
TROUT RUN
LATROBE
RESERVOIR
DRAINAGE AREA = 5.65 SQ. MILES
DRAINAGE AREA MAP
SCALE IN MILES
ELEVATION
SPILLWAY ELEVATION
CAPACITY (ACRE-FT.)
RESERVOIR CAPACITY CURVE
BOUNDARY - MUNICIPAL AUTHORITY LANDS
EXISTING
RESERVOIR
ROAD TO BE RELOCATED
BORROW AREA
NO. 2
BORROW AREA
NO. 1
ALL BITUMINOUS MATERIALS
TO BE REMOVED FROM EXISTING
ROAD UNDER ITEM
LEGEND
RESERVOIR MAP
REVISIONS
MUNICIPAL AUTHORITY OF THE
BOROUGH OF LATROBE
TROUT RUN DAM
LOCATION, DRAINAGE AREA
& RESERVOIR MAPS
CAPACITY CURVE
ENGINEERS



FIGURE 1

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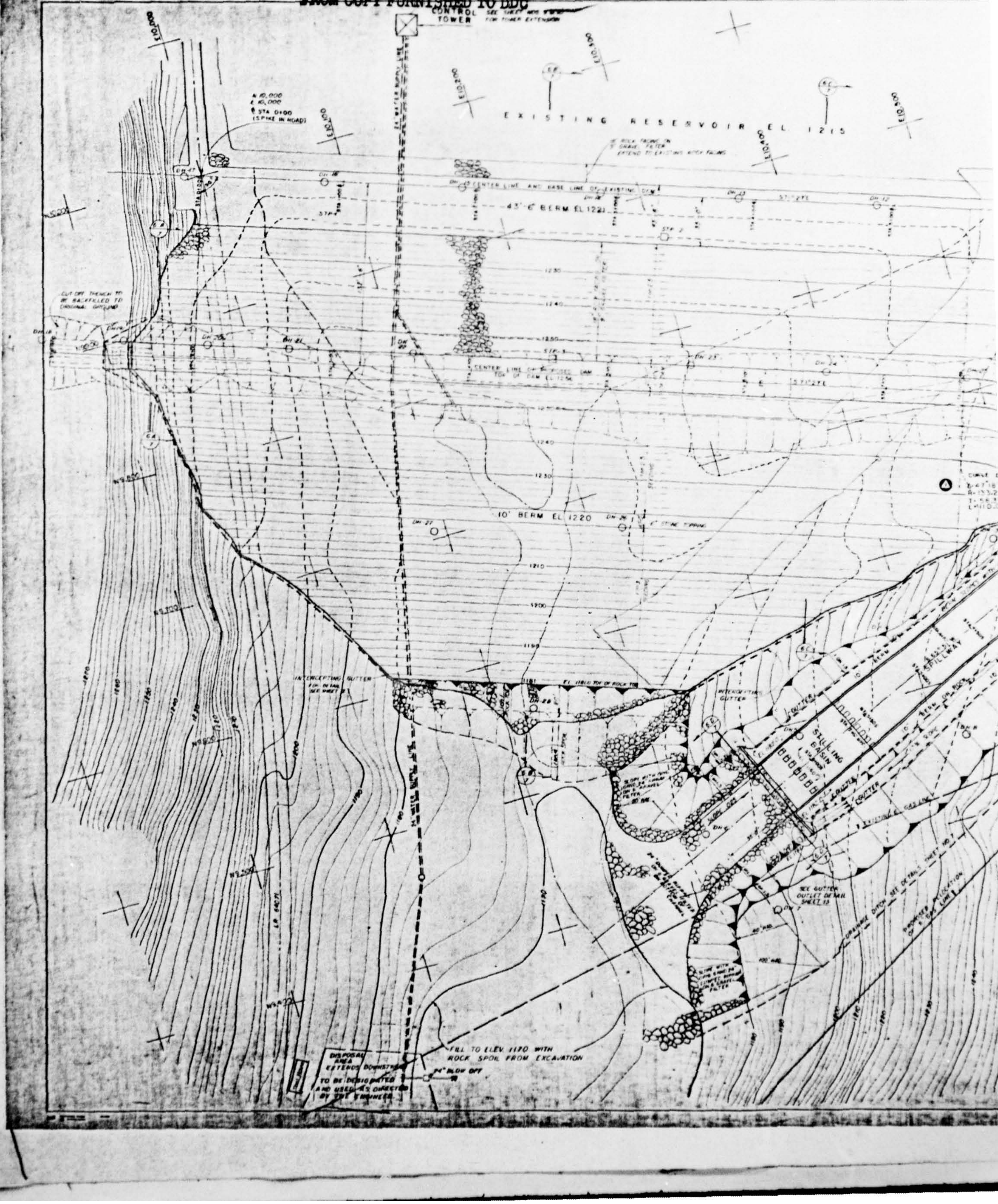

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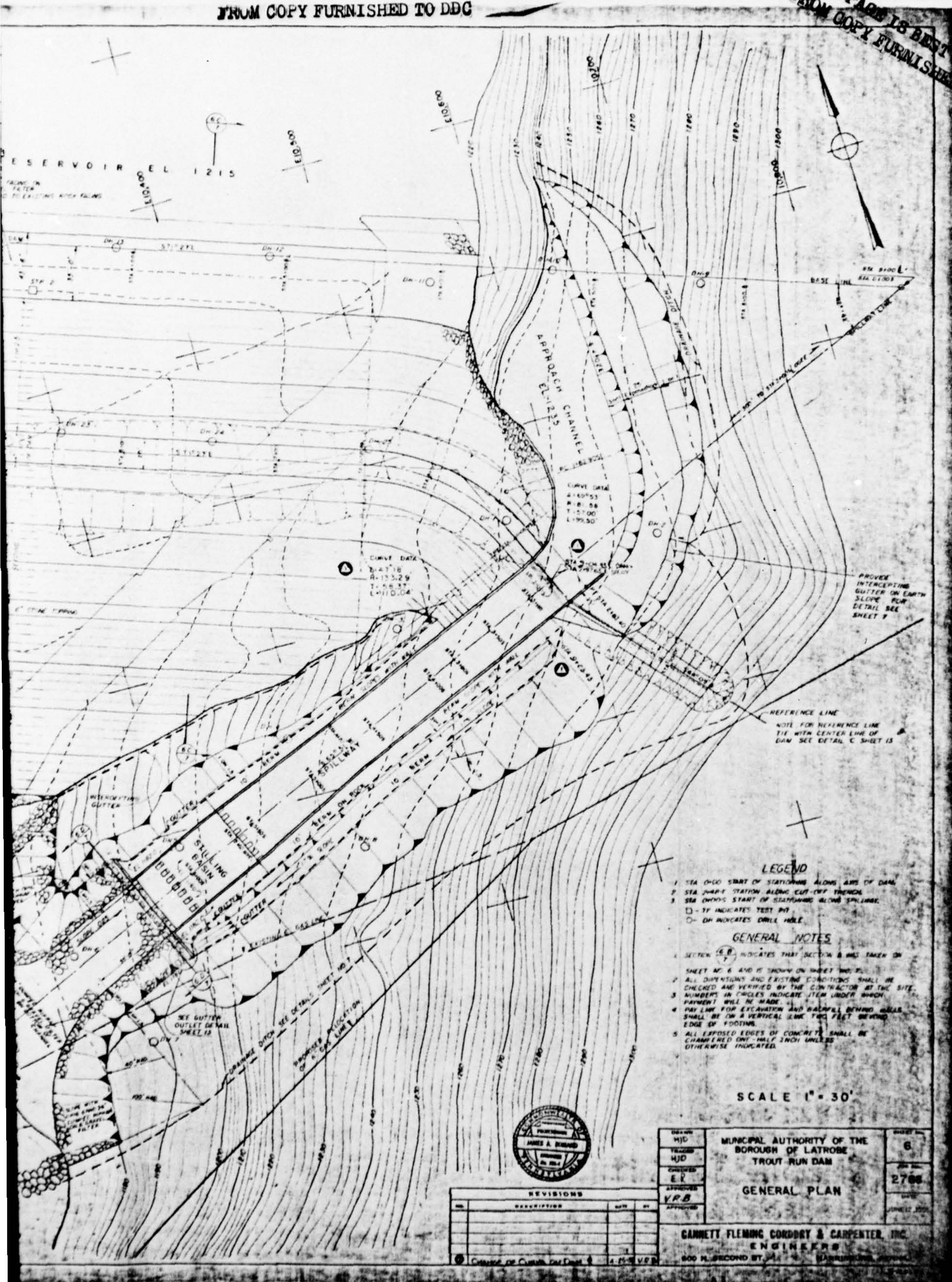


FIGURE 2

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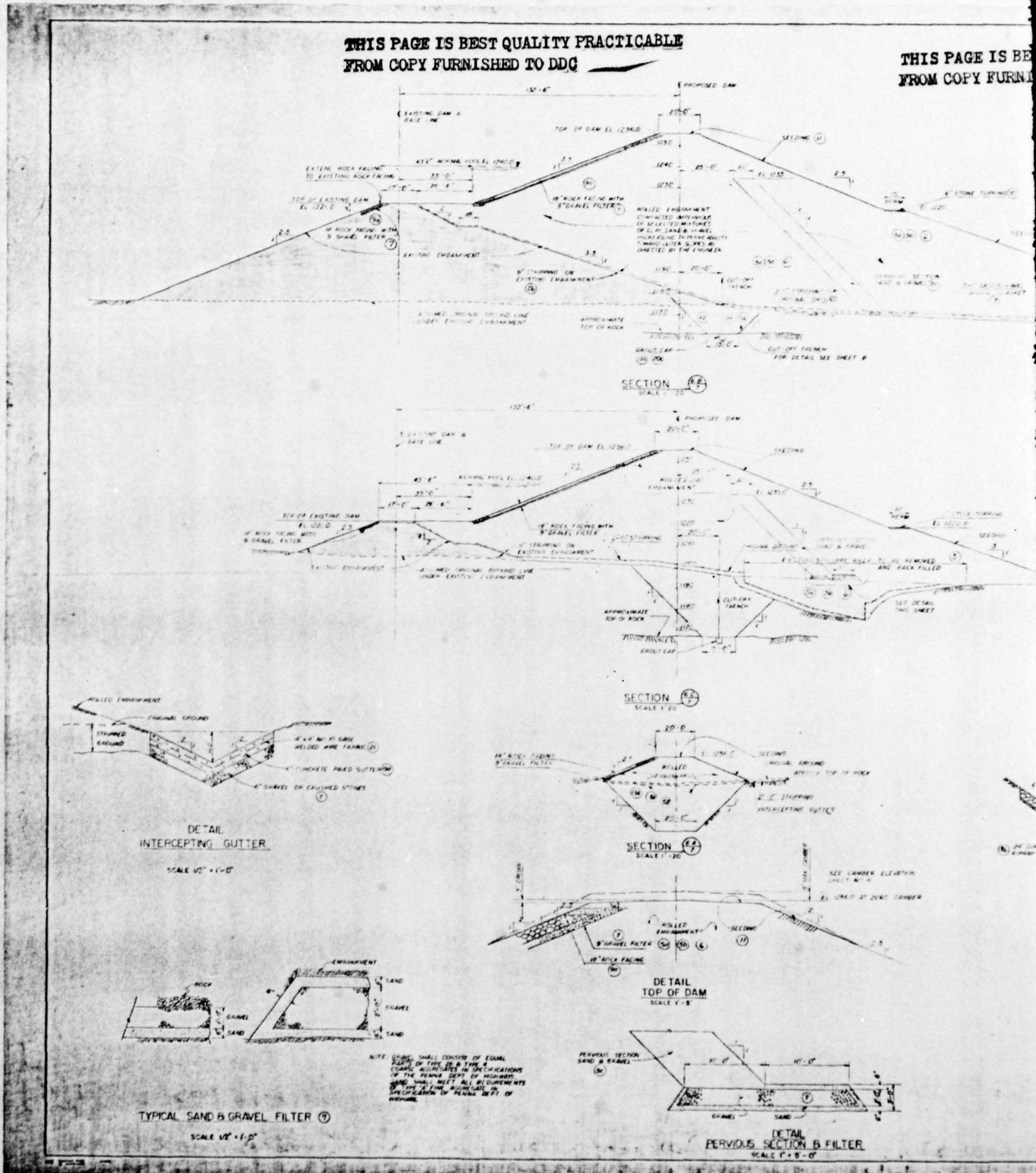

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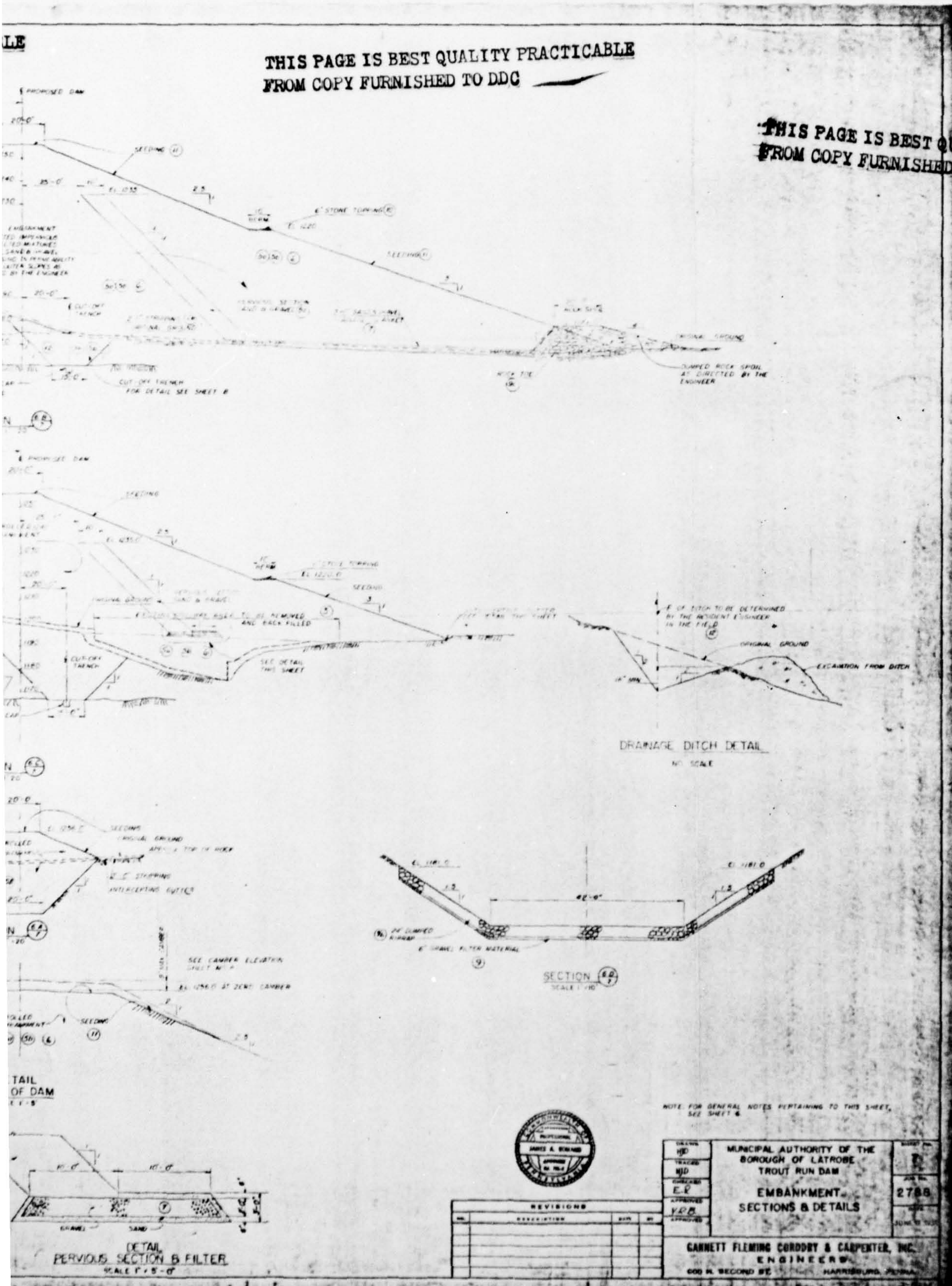


FIGURE 3

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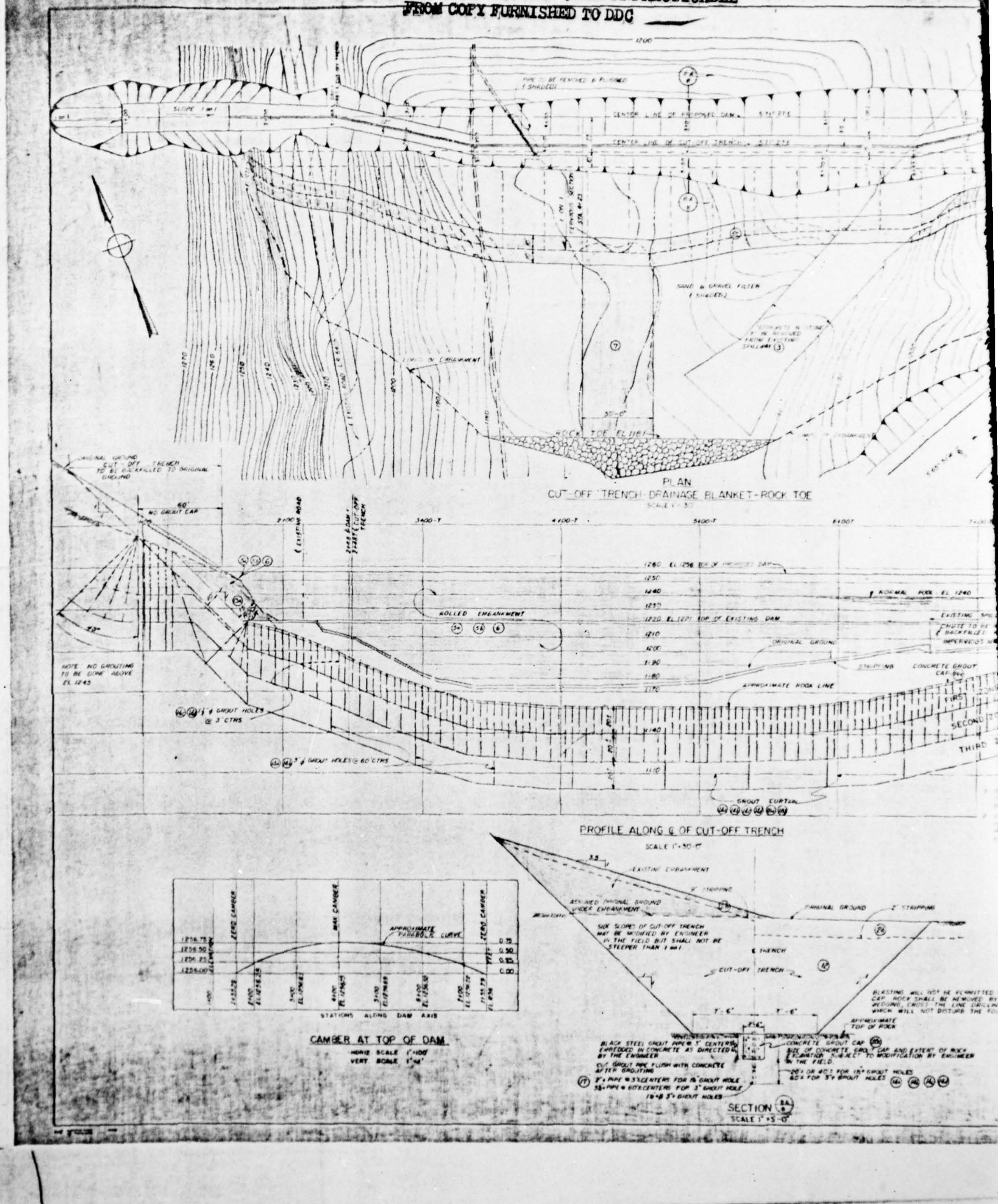


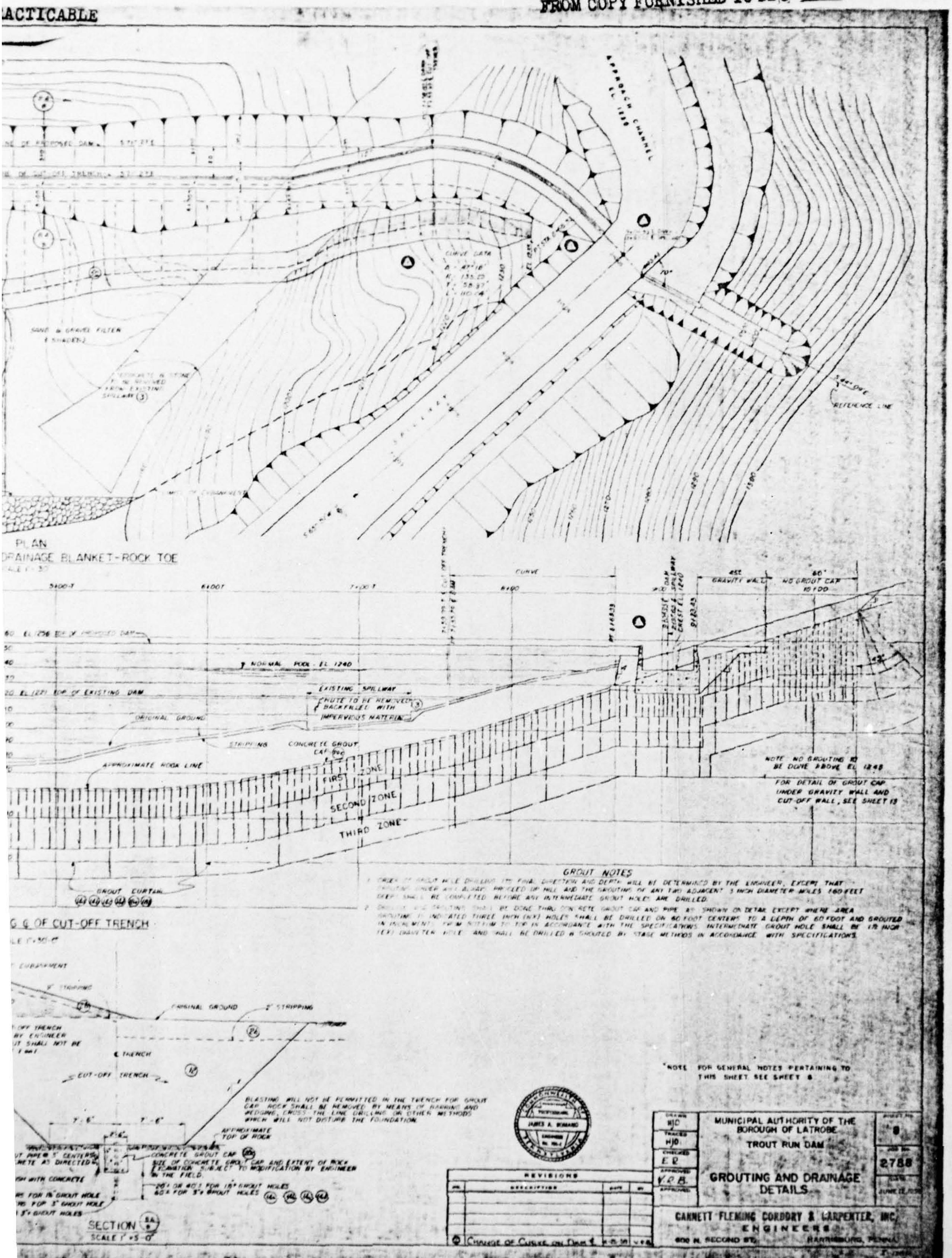
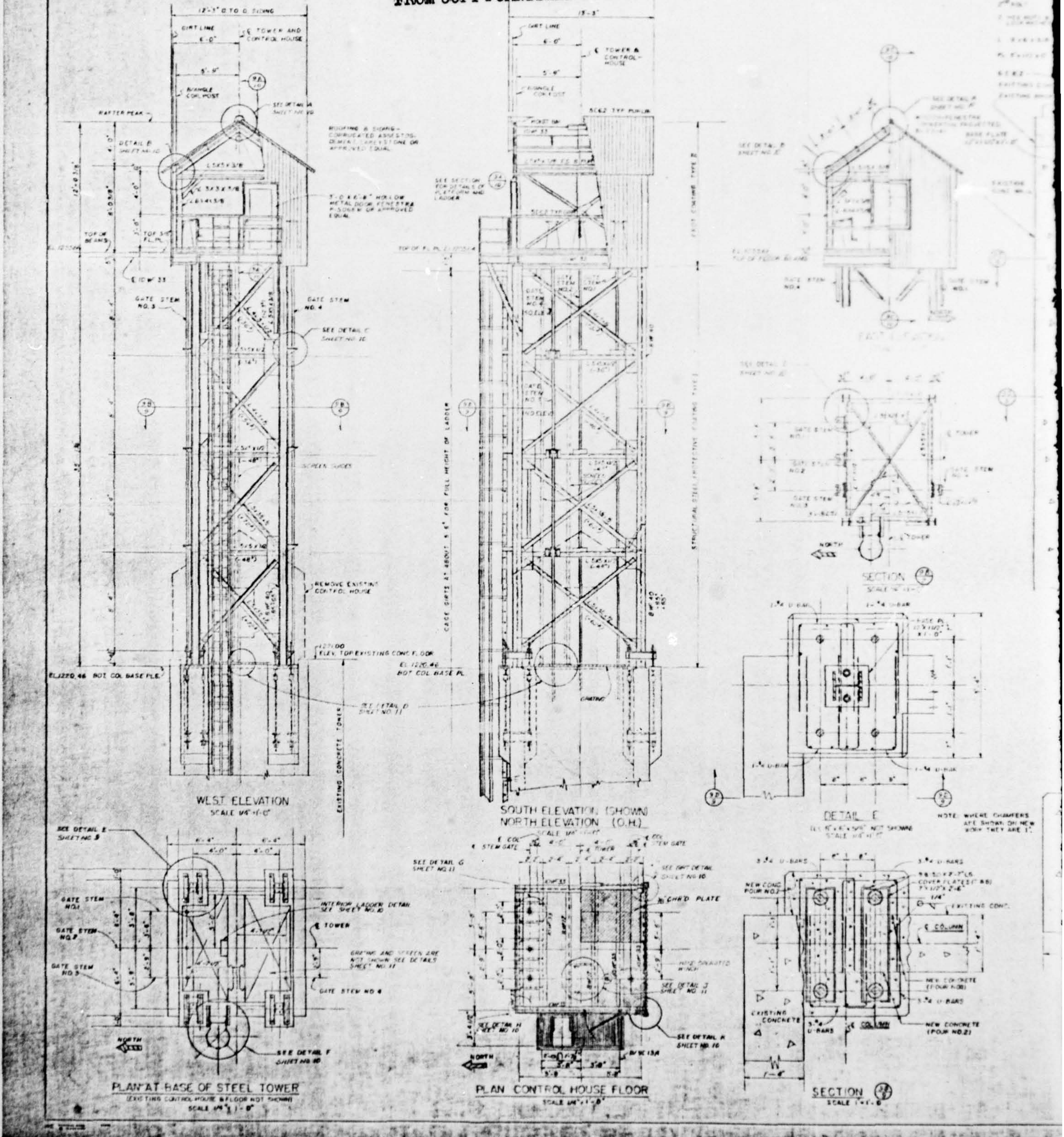

APPROACH CHANNEL
PLAN
DRAINAGE BLANKET-ROCK TOE
CURVE
GRAVITY WALL
NO GROUT CAP
NORMAL POOL EL 1240
EXISTING SPILLWAY
ORIGINAL GROUND
STRIPPING
CONCRETE GROUT CAP
APPROXIMATE ROCK LINE
FIRST ZONE
SECOND ZONE
THIRD ZONE
NOTE NO GROUTING TO BE DONE ABOVE EL 1248
FOR DETAIL OF GROUT CAP UNDER GRAVITY WALL AND CUT-OFF WALL, SEE SHEET 13
GROUT NOTES
GROUT CURTAIN
CUT-OFF TRENCH
NOTE FOR GENERAL NOTES PERTAINING TO THIS SHEET SEE SHEET 8
SECTION
SCALE 1" = 5'-0"
REVISIONS
MUNICIPAL AUTHORITY OF THE BOROUGH OF LATROBE
TROUT RUN DAM
GROUTING AND DRAINAGE DETAILS
2788
GANNETT FLEMING CORDDRY & CARPENTER, INC.
ENGINEERS

FIGURE 4


WEST ELEVATION
SOUTH ELEVATION (SHOWN)
NORTH ELEVATION (O.H.)
SECTION
DETAIL E
SECTION
PLAN AT BASE OF STEEL TOWER
(EXISTING CONTROL HOUSE & FLOOR NOT SHOWN)
PLAN CONTROL HOUSE FLOOR
REMOVE EXISTING CONTROL HOUSE
EXISTING CONCRETE TOWER
EXISTING CONCRETE
NEW CONCRETE (POUR NO.2)

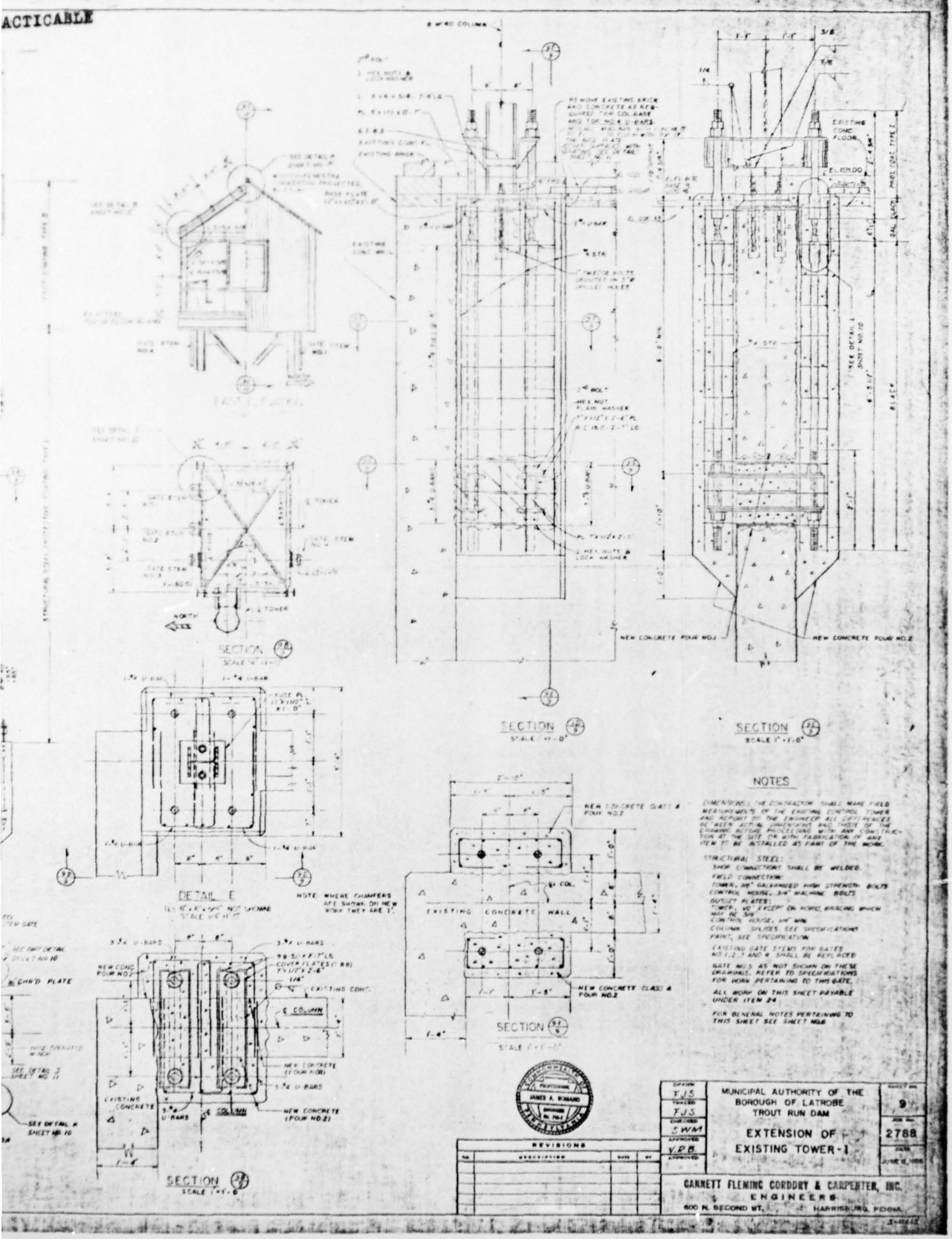
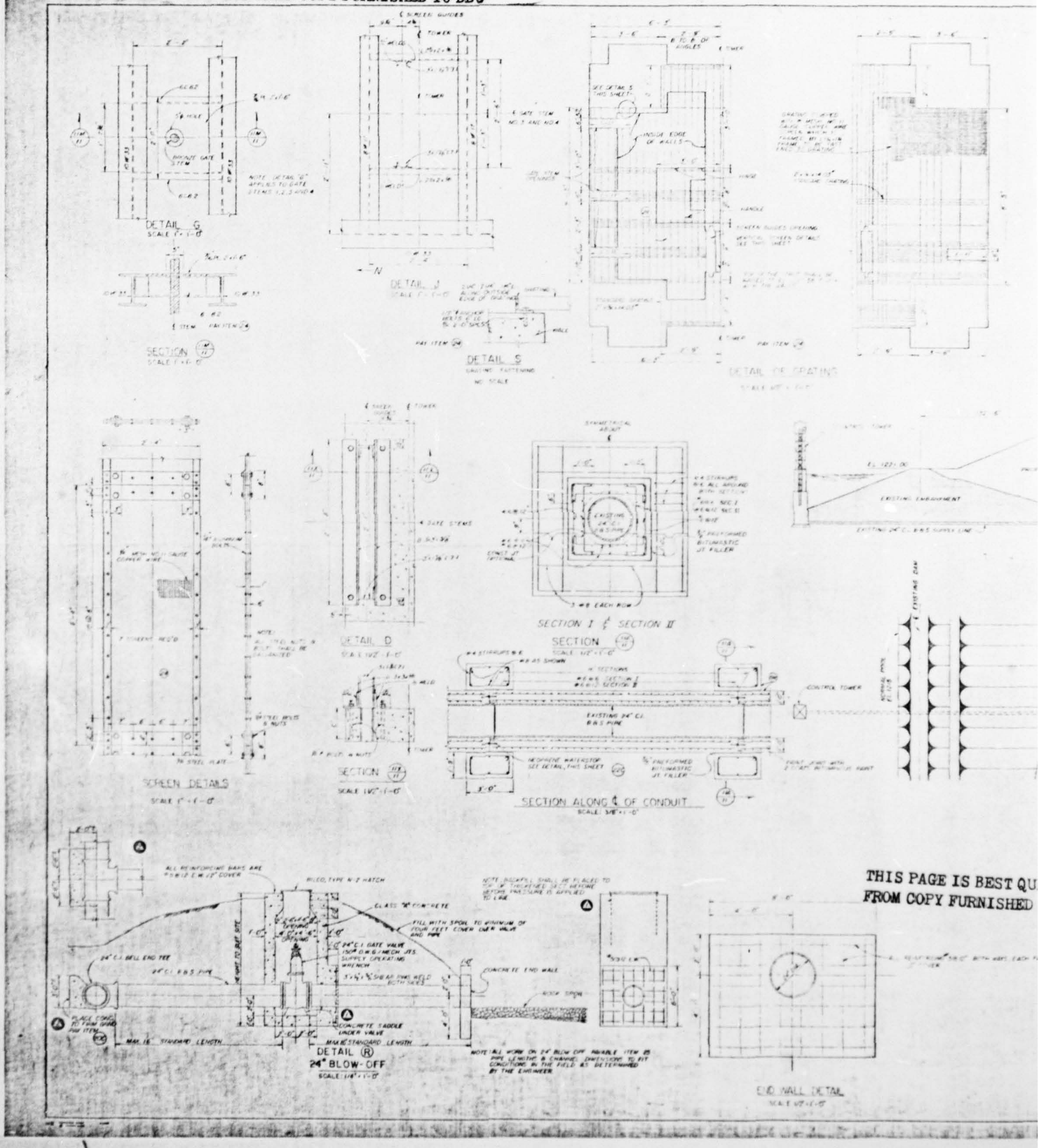

ACTICABLE
SECTION
SCALE 1" = 1'-0"
SECTION
SCALE 1" = 1'-0"
NOTES
DIMENSIONS: THE CONTRACTOR SHALL MAKE FIELD MEASUREMENTS OF THE EXISTING CONTROL TOWER AND REPORT TO THE ENGINEER ALL DIFFERENCES BETWEEN ACTUAL DIMENSIONS AND THOSE OF THE DRAWING BEFORE PROCEEDING WITH ANY CONSTRUCTION AT THE SITE OR WITH FABRICATION OF ANY ITEM TO BE INSTALLED AS PART OF THE WORK.
STRUCTURAL STEEL:
SHOP CONNECTIONS SHALL BE WELDED.
FIELD CONNECTION:
TOWER, 7/8" GALVANIZED HIGH STRENGTH BOLTS
CONTROL HOUSE, 3/4" MACHINE BOLTS
GUSSET PLATES:
TOWER, 1/2" EXCEPT ON HORIZ. BRACING WHICH MAY BE 3/8"
CONTROL HOUSE, 1/4" MIN.
COLUMN SPLICES SEE SPECIFICATIONS
PAINT, SEE SPECIFICATION
EXISTING GATE STEMS FOR GATES NO 1, 2, 3 AND 4 SHALL BE REPLACED
GATE NO 5 AS NOT SHOWN ON THESE DRAWINGS. REFER TO SPECIFICATIONS FOR WORK PERTAINING TO THIS GATE.
ALL WORK ON THIS SHEET PAYABLE UNDER ITEM 24
FOR GENERAL NOTES PERTAINING TO THIS SHEET SEE SHEET NO.6
EXISTING CONCRETE WALL
NEW CONCRETE POUR NO.1
NEW CONCRETE POUR NO.2
SECTION
DETAIL E
SECTION
REVISIONS
DRAWN FJS
TRACED FJS
CHECKED SWM
APPROVED V.P.B.
MUNICIPAL AUTHORITY OF THE
BOROUGH OF LATROBE
TROUT RUN DAM
EXTENSION OF
EXISTING TOWER-1
SHEET NO. 9
JOB NO. 2788
GANNETT FLEMING CORDDRY & CARPENTER, INC.
ENGINEERS
600 N. SECOND ST. HARRISBURG, PENNA.

FIGURE 5

2


DETAIL G
SCALE 1" = 1'-0"
SECTION
DETAIL J
DETAIL S
NO SCALE
DETAIL OF GRATING
EXISTING EMBANKMENT
CONTROL TOWER
SCREEN DETAILS
SCALE 1" = 1'-0"
DETAIL D
SCALE 1 1/2" = 1'-0"
SECTION I ¢ SECTION II
SECTION
SECTION ALONG ¢ OF CONDUIT
DETAIL R
24" BLOW-OFF
SCALE 1/4" = 1'-0"
CONCRETE END WALL
CONCRETE SADDLE UNDER VALVE
END WALL DETAIL

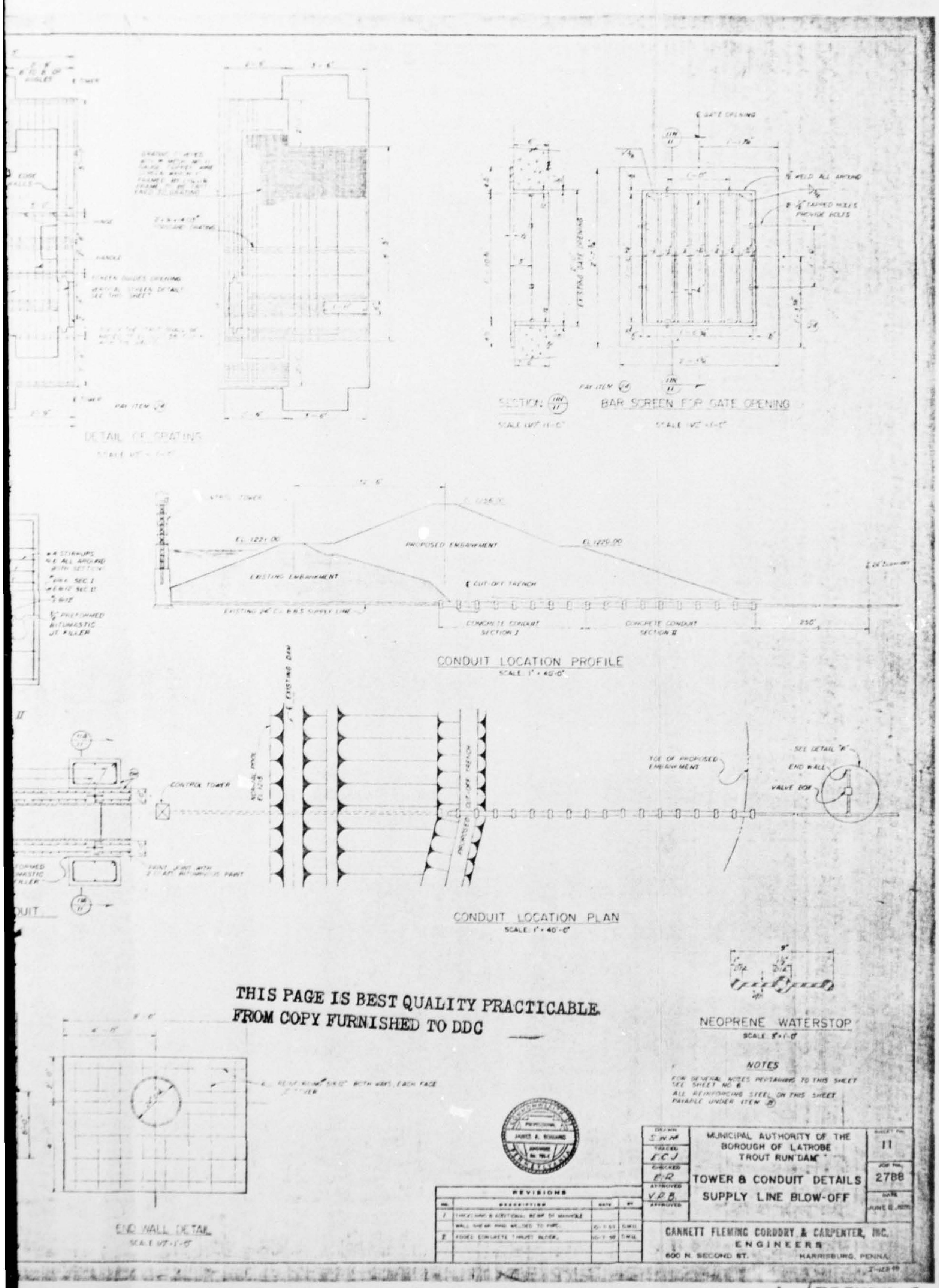
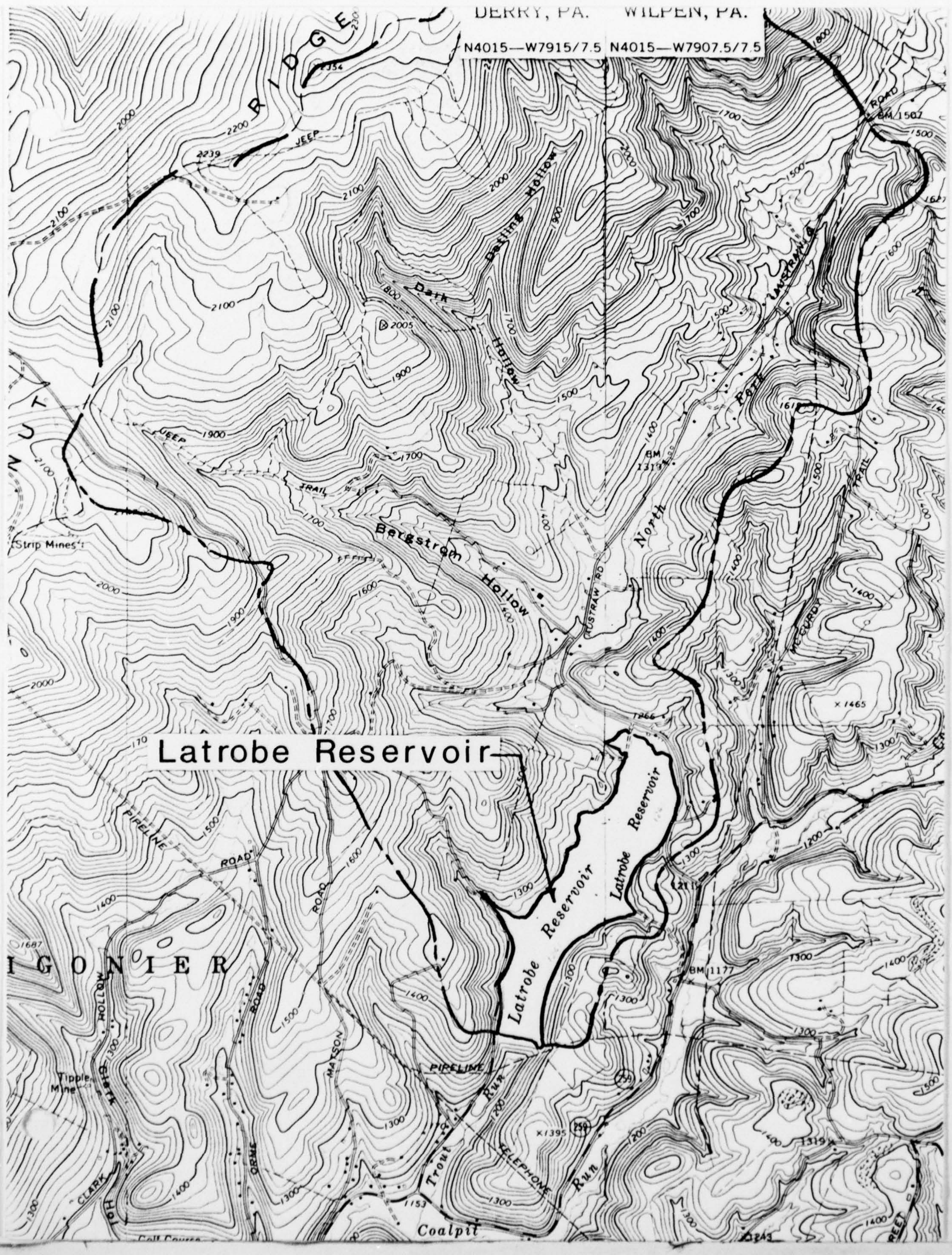

DETAIL OF GRATING
SECTION
BAR SCREEN FOR GATE OPENING
CONDUIT LOCATION PROFILE
SCALE: 1" = 40'-0"
PROPOSED EMBANKMENT
EXISTING EMBANKMENT
CUT-OFF TRENCH
CONCRETE CONDUIT SECTION I
CONCRETE CONDUIT SECTION II
CONDUIT LOCATION PLAN
SCALE: 1" = 40'-0"
CONTROL TOWER
TOE OF PROPOSED EMBANKMENT
END WALL
VALVE BOX
NEOPRENE WATERSTOP
NOTES
END WALL DETAIL
REVISIONS
MUNICIPAL AUTHORITY OF THE BOROUGH OF LATROBE
TROUT RUN DAM
TOWER & CONDUIT DETAILS
SUPPLY LINE BLOW-OFF
11
2788
GANNETT FLEMING CORDDRY & CARPENTER, INC.
ENGINEERS
600 N. SECOND ST. HARRISBURG, PENNA.



FIGURE 6

APPENDIX G

REGIONAL VICINITY MAP


DERRY, PA.
WILPEN, PA.
N4015—W7915/7.5
N4015—W7907.5/7.5
Latrobe Reservoir
RIDGE
NUT
IGONIER
Darling Hollow
Dark Hollow
Bergstrom Hollow
North Fork
Latrobe Reservoir
Latrobe Reservoir
Latrobe Reservoir
Strip Mines
Tipple Mine
PIPELINE
ROAD
PIPELINE
TELEPHONE
Trout Run
Run
Coalpit
Clark Hollow
JEEP
TRAIL
MATSON
McCURDY
BM 1507
BM 1177