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NATIONAL DAM INSPECTION PROGRAM. MILL RUN DAM (NDI ID 533), SUS--ETC(U)
SEP 78 DACW31-78-C-0049
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SUSQUEHANNA RIVER BASIN
MILL RUN, BLAIR COUNTY

PENNSYLVANIA

National Dam Inspection Program. Mill Run Dam (NDI ID 533), Susquehanna River Basin, Mill Run, Blair County, Pennsylvania. Phase I Inspection Report.

MILL RUN DAM

NDI I.D. NO: 533

(11) Sep 78

(12) 79 p.

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

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Contract No. (15) DACW31-78-C-0049

PREPARED FOR

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

BY

D'APPOLONIA CONSULTING ENGINEERS
10 DUFF ROAD
PITTSBURGH, PA. 15235

SEPTEMBER 1978

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PHASE I REPORT
NATIONAL DAM INSPECTION PROGRAM

NAME OF DAM: Mill Run Dam
STATE LOCATED: Pennsylvania
COUNTY LOCATED: Blair
STREAM: Mill Run, a tributary of the Beaverdam Branch of the Juniata River
DATE OF INSPECTION: July 10 and 18, 1978

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

It is recommended that seepage from the sand drains be monitored and recorded. The steep rock cut along the spillway should be frequently observed and necessary remedial measures taken to prevent rock slides that may partially block the spillway channel.

Because sudden release of water in the event of a failure of the Fabridam spillway gates may cause property damage downstream and because of the unique nature of these gates, this appurtenance should be frequently inspected by personnel experienced in design, construction, maintenance, and operation of such equipment.

It is also recommended that the owner develop a formal warning system to alert the downstream residents in the event of emergencies.

The spillway capacity is classified to be adequate.

Lawrence D. Andersen, P.E.
Vice President

23 Sep 78

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

MILL RUN DAM
NDI I.D. NO. 533
JULY 10, 1978

Upstream Face

Downstream Face

DEPARTMENT OF THE ARMY
BALTIMORE DISTRICT, CORPS OF ENGINEERS
P.O. BOX 1715
BALTIMORE, MARYLAND 21203

NABEN-R

SEP 26 1978

Honorable Milton J. Shapp
Governor of Pennsylvania
Harrisburg, Pennsylvania 17120

Dear Governor Shapp:

In accordance with President Carter's directive under Public Law 92-367 (National Dam Inspection Program), the Baltimore District, Corps of Engineers, is continuing to carryout Phase I inspections of non-Federal dams in Pennsylvania. Inspection reports have been completed for the following four dams:

a. Tipton Dam - NDI No. PA 523

b. Mill Run Dam - NDI No. PA 533

c. Tyrone Reservoir No. 1 - NDI No. PA 536

d. Tyrone Reservoir No. 2 - NDI No. PA 535

One copy of each final report is inclosed.

Two copies of each report are being furnished to Dr. Maurice K. Goddard's office, Pennsylvania Department of Environmental Resources (PennDER), for distribution to respective dam owners.

In my letter of 13 September 1978, I alerted you to the unsafe condition of Tyrone Reservoir No. 2 dam. In addition to the unsafe condition of Tyrone Reservoir No. 2 dam, Tyrone Reservoir No. 1, because of its seriously inadequate spillway, is now considered unsafe. The Office of the Chief of Engineers has recently provided a clarification that dams with seriously inadequate spillways are now to be assessed as unsafe, non-emergency, until more detailed studies prove otherwise, or corrective measures are taken.

SEP 26 1978

The classification of "unsafe" applied to a dam because of a seriously inadequate spillway is not meant to connote the same degree of emergency that would be associated with an "unsafe" classification applied for a structural deficiency. It does mean, however, that based on an initial screening and preliminary computations, there appears to be a serious deficiency in spillway capacity so that if a severe storm were to occur, overtopping and failure of the dam could take place, significantly increasing the hazard to loss of life downstream from the dam.

As a result of this determination, it is recommended that the following measures be taken by the owner of Tyrone Reservoir No. 1 dam:

a. Within one month from the date of this letter, engage the services of a registered professional engineer to more accurately determine the spillway adequacy by performing a detailed hydrologic and hydraulic analysis and to recommend any remedial measures required to increase the spillway's capacity.

b. Within 18 months from the date of this letter, all remedial measures deemed appropriate by the owner's consultant and concurred in by the Commonwealth should be completed.

c. Immediately develop a detailed emergency operation plan and downstream warning system for use during periods of unusually heavy rainfall.

We are currently developing a listing for those dams which were found to have seriously inadequate spillways earlier in our program but were not declared unsafe. Under the new guidelines, these dams will now be placed in the unsafe category. This list will be forwarded within one week.

Under the provisions of the Freedom of Information Act, these inspection reports will be subject to release by this office, upon request, after 22 October 1978.

Each report has received thorough consideration by a Board of Review consisting of senior engineers and staff members from this office, and a designated representative from PennDER. The recommendations of each report have received concurrence by the Board.

NABEN-R
Honorable Milton J. Shapp

SEP 26 1978

An important facet of the ongoing program for inspection of non-Federal dams will be the implementation of the recommendations made in the reports. Emphasis is placed on the Commonwealth providing the impetus for the fulfillment of the recommendations and keeping the Baltimore District informed of the proposed actions to be taken.

Additional copies of the reports will be made available to you upon request.

Sincerely yours,

4 Incl
As stated

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

Copy furnished: w/incl
Honorable Maurice K. Goddard

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PHASE I
NATIONAL DAM INSPECTION PROGRAM
MILL RUN DAM
NDI I.D. NO. 533
DER I.D. NO. 7-82

SECTION 1
PROJECT INFORMATION

ABSTRACT

1.1 General

a. Authority. The inspection was performed pursuant to the authority granted by The National Dam Inspection Act, Public Law 92-367, to the Secretary of the Army, through the Corps of Engineers, to conduct inspections of dams throughout the United States.

b. Purpose. The purpose of this inspection is to determine if the dam constitutes a hazard to human life or property.

ABSTRACT

1.2 Description of Project

a. Dam and Appurtenances. The dam consists of an earth embankment approximately 1200 feet long, with a maximum height of 100 feet from the downstream toe and a crest width of 20 feet. The combined primary and emergency spillway is located on the left abutment (looking downstream). As designed, flow through the spillway is controlled by an ogee weir located at a level 13 feet below the dam crest. The spillway is spanned by a bridge with a pier at the center of the weir and leaving a 10-foot clear opening between the bottom of the bridge and crest level. Presently, the ogee weir is equipped with inflatable gates, which permit raising the control elevation of the spillway by four feet, leaving a freeboard of nine feet to the crest of the dam. The spillway chute is a rectangular channel with concrete sides and bottom which discharges into a plunge pool at the toe level of the dam. The outlet works for the dam consist of an intake tower, a 42-inch-diameter combined supply line and outlet pipe, and meter house and blow-off valve chamber at the downstream toe of the dam. The intake tower is located along the left shore of the lake about 350 feet upstream from the spillway. The 42-inch pipe leads from the intake through the embankment to the valve chamber at the toe of the dam. The pipe is encased in reinforced concrete through the embankment. Flow through this pipe is normally controlled by valves located at the valve chamber downstream of the dam. Flow into this pipe can also be controlled by closing the sluice gates at the intake tower. This pipe constitutes the emergency drawdown facility for the dam. The dam impounds 2700 acre-feet of water when the spillway gates are inflated.

b. Location. Mill Run Dam is located on Mill Run about two miles upstream from the city limits of Altoona in Logan Township, Blair County, Pennsylvania (Plate 1).

Downstream from the dam, Mill Run flows through a narrow valley. About one mile from the dam, it is confined to a channel about 40 feet wide formed by the dike of the offstream Allegheny Reservoir on one side and the natural valley wall on the other side. Further downstream, Mill Run goes through residential areas, flows under the Penn-Central Railroad embankment, and enters the city limits of Altoona. It is estimated that the failure of Mill Run Dam would also result in failure of the Allegheny Reservoir downstream and combined discharge would cause large loss of life and property damage.

c. Size Classification. Large (based on 100-foot height).

d. Hazard Classification. High.

e. Ownership: City of Altoona (address: Mr. William L. Cochran, Director, Water, Parks and Public Property, City of Altoona, Altoona, Pennsylvania 16601).

f. Purpose of Dam. Water supply.

g. Design and Construction History. The dam was designed by Gwin Engineers, Inc., of Altoona and Albright and Friel, Inc., of Philadelphia, Pennsylvania in 1955. The dam was constructed by Sanctis Construction Company, Inc., of Pittsburgh, Pennsylvania and New Enterprise Stone and Lime Company, Inc., of New Enterprise, Pennsylvania. The dam was completed in 1957.

h. Normal Operating Procedure. The intended normal operating procedure for the dam is to maintain the lake level at the crest level of the inflatable gates (Elevation 1506), which would leave nine feet of freeboard to the top of the dam. However, city water authority personnel reported that usually supply water takeoff exceeds inflow and the pool is maintained below the spillway crest level.

1.3 Pertinent Data

a. Drainage Area (square miles) - 4.3

b. Discharge at Dam Site (cfs)

Maximum known flood at dam site - 300
Warm water outlet at pool elevation - N/A
Diversion tunnel low pool outlet at pool elevation - N/A
Diversion tunnel outlet at pool elevation - N/A

Gated spillway capacity at pool elevation - N/A
Gated spillway capacity at maximum pool elevation - 11,400 (gates deflated)
Ungated spillway at maximum pool elevation - N/A
Total spillway capacity at maximum pool elevation - 11,400 (gates deflated)

c. Elevation (USGS Datum) (feet)

Top of dam - 1515
Maximum pool-design surcharge - N/A
Full flood control pool - N/A
Recreation pool (normal) - 1502
Spillway crest - 1502 (1506 with spillway gates inflated)
Upstream portal invert diversion tunnel - 1424
Downstream portal invert diversion tunnel - 1420±
Streambed at center line of dam - 1419±
Maximum tailwater - Unknown

d. Reservoir (feet)

Length of maximum pool - 3200
Length of recreation pool (normal) - 2800
Length of flood control pool - N/A

e. Storage (acre-feet)

Recreation pool (normal) - 2700 at Elevation 1502
Flood control pool - N/A
Design surcharge - N/A
Top of dam - 3320 at Elevation 1515

f. Reservoir Surface (acres)

Top of dam - 53
Maximum pool - N/A
Flood control pool - N/A
Recreation pool (normal) - 42
Spillway crest - 42

g. Dam

Type - Earth
Length - 1200 feet
Height - 100 feet
Top width - 20 feet
Side slopes - 2H:1V, 3H:1V, upstream; 2H:1V, 3H:1V, downstream
Zoning - Yes
Impervious core - Yes
Grout curtain - Yes

h. Diversion and Regulating Tunnel

Type - 42-inch cast-iron pipe
Length - 900± feet
Closure - Gate valve downstream end and sluice gates at intake tower
Access - Valve chamber and intake tower
Regulating facilities - N/A

i. Spillway

Type - Ogee weir
Length - 77.5 feet (clear length of crest)
Crest elevation - 1502
Gates - Inflatable Fabridam
Upstream channel - Lake
Downstream channel - Rectangular concrete channel (variable width)

SECTION 2
ENGINEERING DATA

2.1 Design

a. Data Available

(1) Hydrology and Hydraulics. A state inspection report entitled, Report Upon the Application of Altoona City Water Authority and City of Altoona, dated July 6, 1955, summarizes the hydrologic and hydraulic data for the project. The report states the criteria used for the design of the spillway.

(2) Embankment. Available information includes design drawings, boring logs, and reports of Pittsburgh Testing Laboratory on the classification and strength tests for foundation and embankment materials.

(3) Appurtenant Structures. Available information consists of design drawings.

b. Design Features

(1) Embankment

(a) As designed, the dam is a zoned embankment consisting of compacted impervious fill with a large rock-fill section forming the downstream slope (Plates 2 and 3). The impervious section extends into a cutoff trench excavated into the foundation rock at the center line of the dam.

A longitudinal sand drain is located near the downstream limit of the impervious zone. This sand drain is connected to two transverse sand drains which discharge into a rock-fill toe trench at the toe of the dam.

(b) The embankment was designed to have two to one (horizontal to vertical) slopes on both the downstream and upstream slopes from the crest to Elevation 1502 and three to one slopes below this elevation on both faces.

(c) The foundation of the dam was grouted. Plate 3 shows the as-built grout hole spacing and grout takes.

(d) The subsurface investigation conducted for the dam consisted of 18 borings. Plate 4 shows the boring locations. Boring logs are illustrated in Plate 5. Typical subsurface profile consists of silty clay to a depth of up to 50 feet on the right abutment, diminishing to about 8 feet at the valley floor. The soil is underlain by alternating layers of sandstone and shale. The left abutment consists of alternating layers of sandstone and shale.

(e) Soil testing for the design consisted of classification, direct and triaxial shear, and consolidation tests.

c. Appurtenant Structures. The appurtenances of the dam consist of the combined primary and emergency spillway and the outlet works. The spillway crest is equipped with inflatable fabric dams which were installed to increase the storage capacity of the reservoir. The combined primary and emergency spillway for the dam is located on the left abutment (Plate 6). Plate 7 illustrates the typical cross section of the ogee weir and profile of the spillway chute. The transverse cross section of the spillway control section is shown in Plate 8.

The inflatable fabric dams across the spillway were designed by N. M. Imberson and Associates, Inc., of Burbank, California, and were installed in 1968. These dams were designed to be inflated either by water or air. However, city personnel reported that only the air system has been used in the past. Controls for the gates are located in a control house on the right side of the spillway.

Design reports indicate that when the fabric dams are under automatic operation, they start to deflate when the water level over the bags reaches 6 inches and completely deflate when the water depth over the bags reaches 3 feet. The bags may also be deflated manually.

The outlet works for the dam consist of an intake tower, a 42-inch cast-iron combined blow-off and supply line, and valve chamber and meter house located at the toe of the dam. Plate 9 illustrates the profile of the outlet pipe and the details of the intake tower. The flow through this pipe is normally controlled by the valves located at the valve chamber and the meter house. However, when required, the pipe can be drained by closing the sluice gates at the intake tower. Plate 10 illustrates the valve chamber and meter house piping.

d. Design Data

(1) Hydrology and Hydraulics. The 1955 state report indicates that the maximum discharge capacity of the spillway was calculated to be 10,270 cubic feet per second (cfs), controlled by a 10-foot, 3-inch clearance between the spillway crest and the overhead bridge, leaving two feet, 7 inches of freeboard to the top of the dam. It is further stated that the spillway would pass the required design discharge of 3655 cfs (850 cfs per square mile) with a freeboard of 7.8 feet.

(2) Embankment. The embankment design was based on the subsurface investigation and the laboratory tests conducted by Pittsburgh Testing Laboratory. Review of laboratory test results indicate that the strength parameters for the embankment material obtained from direct shear tests ranged between zero and 0.49 tons per square foot for cohesion and 14 to 45 degrees for internal friction angle. Average values were about 0.10 ton per square foot for cohesion and 24 degrees for internal friction angle. The factor of safety against slope stability was reported to be 1.5.

(3) Appurtenant Structures. There are no design data available for the appurtenant structures.

2.2 Construction. Construction drawings and specifications prepared by the design engineers were available for review. To the extent that can be determined, the construction of the dam was apparently conducted in accordance with the plans and specifications. No reference was found to indicate that any unusual problems were encountered during construction of the dam.

2.3 Operation. As reported by water authority personnel, there are no formal operating procedures for the dam. It is understood that when there is sufficient inflow to fill the reservoir, the spillway gates are inflated to increase the storage capacity of the dam. These gates are controlled from a control house adjacent to the spillway.

The 42-inch combined outlet and supply line is normally controlled by the valves downstream. Flow into this pipe can also be controlled by the intake tower sluice gates.

2.4 Other Investigations. Available records include periodic state inspection records. A report entitled, Report of Fabridam Slippage at Mill Run Reservoir, Altoona, Pennsylvania, June 7, 1968, prepared by Gwin Engineers, Inc., describes the partial failure of a Fabridam. on June 7, 1968.

2.5 Evaluation

a. Availability. Available data were provided by PennDER.

b. Adequacy

(1) Hydrology and Hydraulics. The reported results of the hydrology and hydraulic analysis indicate that the design followed the criteria set forth by the Commonwealth of Pennsylvania, Department of Forests and Waters, applicable at the time of the design.

(2) Embankment. Review of the geotechnical aspects of the design indicates that the design generally followed the accepted practices for subsurface investigation and laboratory testing applicable at the time of the design.

The design incorporated such basic components as zoning of the embankment, cutoff trench, foundation grouting, and internal drainage system. However, there is no filter zone between the downstream rock shell and the impervious core. Internal drainage is provided by a longitudinal sand drain at the downstream toe of the impervious zone and by the downstream rock zone.

(3) Appurtenant Structures. Review of the design drawings indicates that as designed there are no significant design deficiencies that should affect the overall performance of the appurtenant structures.

c. Operating Records. Daily pool level and precipitation records are maintained by the damtender. The damtender, who has been at the site since the completion of the dam, reported that to his best knowledge maximum flow over the spillway was about six inches. Records indicate that during Tropical Storm Agnes in July 1972, the pool was below spillway crest.

d. Post-Construction Changes. In 1968, inflatable Fabridams were installed across the spillway to increase the storage capacity of the reservoir from 2700 acre-feet to about 3000 acre-feet. The Fabridams were repaired following a partial failure of one section on June 7, 1968. The damtender reported that Mill Creek flowed over its banks at several locations through Altoona due to the flow which resulted from the Fabridam failure.

In 1958, drainage pipes were installed along the toe of the dam to collect the seepage flow from the sand filters and discharge it to the blow-off pipe discharge channel (Plate 11). A flow-measuring device was installed in the blow-off pipe discharge channel to monitor the seepage through the dam. Available records indicate that average seepage flow has been about 200 gallons per minute.

e. Seismic Stability. The dam is located in Seismic Zone 1 and static stability of the dam is considered to be adequate. Therefore, based on the recommended criteria for evaluation of seismic stability of dams, the structure is assumed to present no hazard from earthquakes.

SECTION 3
VISUAL INSPECTION

3.1 Findings

a. General. The on-site inspection of Mill Run Dam consisted of:

1. Visual inspection of the embankment, abutments, and embankment toe.

2. Visual examination of the spillway and its components, the downstream end of the outlet pipe, and other appurtenant features.

3. Observation of factors affecting the runoff potential of the drainage basin.

4. Evaluation of downstream area hazard potential.

The specific observations are illustrated in Plate 12 and in the photographs in Appendix C.

b. Embankment. The general inspection of the embankment consisted of searching for indications of structural distress, such as cracks, subsidence, bulging, wet areas, seeps and boils, and observing general maintenance conditions, vegetative cover, erosion, and other surficial features.

1. Except for one seepage area which discharges into the spillway discharge channel immediately downstream of the plunge pool, all seepage observed at the site is collected by a drainage system discharging into the blow-off pipe channel. Flow from the blow-off pipe discharge channel was determined to be 150 gallons per minute on the date of inspection from a measurement taken at an existing rectangular flow weir.

   Flow into the spillway discharge channel was estimated to be 10 to 15 gallons per minute. All the observed seepages were found to be clear.

2. High crown vetch precluded the inspection of the downstream slope of the dam for surficial signs of distress, such as cracks or wet areas.

c. Appurtenant Structures. The spillway structures, spillway crests, channels, and plunge pools were examined for deterioration or other signs of distress and obstructions that would limit flow.

In general, the structures were found to be in good condition. However, a steep rock cut along the spillway approach channel and discharge chute is considered to pose a potential for partial blockage of these channels in the event of a significant rock slide. Boulders in the approach channel and spillway chute demonstrate this potential.

The operation of the Fabridam spillway gates was explained by the dam tender and demonstrated (pool was below spillway level on the date of inspection). It is reported that although the Fabridams can be inflated either by air or water, only air is being used.

d. Reservoir Area. A map review indicates that the watershed is predominantly covered with woodlands.

The shorelines are not considered to be susceptible to massive landslides which would affect the storage volume of the reservoir or cause overtopping of the dam by displaced water.

e. Downstream Channel. Mill Run downstream from the dam flows adjacent to the dikes of offstream Allegheny Reservoir about one mile southwest. Further downstream, it flows through residential areas and enters the city limits of Altoona immediately downstream of the Penn-Central Railroad underpass. Through Altoona the stream is confined to a 25- to 30-foot-wide rectangular channel spanned by numerous bridges. The stream joins the Beaverdam Branch of the Little Juniata River about one mile south of Altoona.

3.2 Evaluation. In general, the condition of the dam is considered to be good. The quantity of seepage from the dam (165 gpm) on the date of inspection was found to be within the limits of reported past seepage flow. Seepage was clear and no signs of internal erosion were found. A remote seepage monitoring device installed on the access to the discharge channel was found to be nonfunctional. The water authority personnel reported that seepage flows are not being recorded.

The inflatable gates were inflated by the authority personnel and were found to be functional. The maintenance condition of the control equipment for the gates is considered to be satisfactory. However, because a sudden release of water in the event of a failure of the spillway gates may cause property damage downstream by overflowing the channel on a residental area of Altoona and considering the unique nature of the Fabridam spillway gates, it is considered advisable that these facilities be periodically inspected by engineers experienced in design and installation of such equipment.

SECTION 4
OPERATIONAL FEATURES

4.1 Procedure. The city personnel reported that there are no formal operating procedures for the dam. When there is sufficient inflow to the reservoir to raise the lake level to the spillway crest elevation, the Fabridams are inflated to increase the storage capacity.

Two operational features of the dam which may affect safety are the drainpipe valve, if it is required to lower the reservoir, and the Fabridam spillway gates, in the event of large floods.

4.2 Maintenance of the Dam. The general condition of the dam is considered to be satisfactory. However, it is considered necessary to resume monitoring seepage flows from the sand drains to determine that the rate of flow is not increasing with time.

4.3 Maintenance of Operating Facilities. The maintenance condition of the operating facilities is considered to be satisfactory. The drainpipe valve for the lake was operated and observed to be functional. The control equipment for the Fabridams was observed and found to be in satisfactory condition.

4.4 Warning System. No formal warning system exists for the dam. The damtender resides about one-half mile downstream from the dam on the access road to the site. Telephone communication facilities are available at the site.

4.5 Evaluation. The dam is satisfactorily maintained. However, it is considered advisable that seepage flow measurement be resumed to document that the rate of seepage through the dam is not increasing. In view of the unique nature of the spillway Fabridams, it is considered advisable that these facilities be periodically inspected by personnel experienced in design, construction, operation and maintenance of such facilities.

SECTION 5
HYDRAULICS AND HYDROLOGY

5.1 Evaluation of Features

a. Design Data. Mill Run Dam has a watershed area of 4.3 square miles and impounds a reservoir with a surface area of 42 acres. The combined primary and emergency spillway is located on the left abutment and is equipped with inflatable gates. When the Fabridam gates are deflated, the spillway has a discharge capacity of 11,400 cfs with no freeboard.

b. Experience Data. As previously stated, Mill Run Dam is classified as a "large" dam in the "high" hazard category. Under the recommended criteria for evaluating emergency spillway discharge capacity, such impoundments are required to pass the PMF.

The adequacy of the spillway was analyzed based on the simplified procedure developed by the Baltimore District, Corps of Engineers (Appendix D). Based on this analysis procedure, it was determined that the PMF inflow hydrograph will have a peak of 12,900 cfs and a total volume of 6000 acre-feet. These values are greater than the maximum spillway discharge capacity of 11,400 cfs and 620 acre-feet surcharge storage volume of the dam, respectively. Further analysis, according to the procedure, indicates that the spillway can pass a maximum flow of 97 percent PMF without overtopping when the spillway gates are fully deflated and 63 percent PMF if the gates fail to deflate.

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

d. Overtopping Potential. As stated above, the spillway can pass 97 percent PMF without overtopping.

e. Spillway Adequacy. The spillway can essentially pass PMF, therefore, it is classified as adequate. However, the Fabridam spillway gates should be frequently inspected to insure adequate performance.

SECTION 6
STRUCTURAL STABILITY

6.1 Evaluation of Structural Stability

a. Visual Observations

(1) Embankment. As discussed in Section 3, the field observations did not reveal any signs of distress that would significantly affect the short-term stability of the dam and no unsatisfactory conditions were reported in the past.

(2) Appurtenant Structures. Structural performance of the appurtenant structures is considered to be satisfactory.

b. Design and Construction Data

(1) Embankment. The dam was designed based on the evaluation of subsurface conditions and results of laboratory tests. The reported factor of safety against slope failure is 1.5. The design incorporated such basic components as cutoff trench, grout curtain, internal drainage system, and zoning of the embankment.

(2) Appurtenant Structures. Review of the design drawings indicates that there are no apparent structural deficiencies that would significantly affect the performance of appurtenant structures.

c. Operating Records. The structural stability of the dam is not considered to be affected by the operational features of the dam.

d. Post-Construction Changes. There have been no reported modifications to the original design that would affect the structural stability of the structure other than installation of spillway gates.

SECTION 7
ASSESSMENT AND RECOMMENDATIONS/REMEDIAL MEASURES

7.1 Dam Assessment

a. Assessment. The visual observations and review of available information indicate that the Mill Run Dam is in good condition. However, it is considered advisable to resume monitoring and recording seepage through the sand drains. It appears that the dam was constructed with reasonable care and the design generally followed the currently accepted engineering practices.

The capacity of the spillway was found to be "adequate."

b. Adequacy of Information. The available information in conjunction with visual observations and the previous experience of the inspectors are considered to be sufficient to make a reasonable assessment of the condition of the dam.

c. Urgency. The following recommendations should be considered as soon as practicable or on a continued basis.

d. Necessity for Further Investigation. The condition of the dam is not considered to require further investigation at this time.

7.2 Recommendations/Remedial Measures

1. It is recommended that seepage from the sand drains be monitored and recorded.

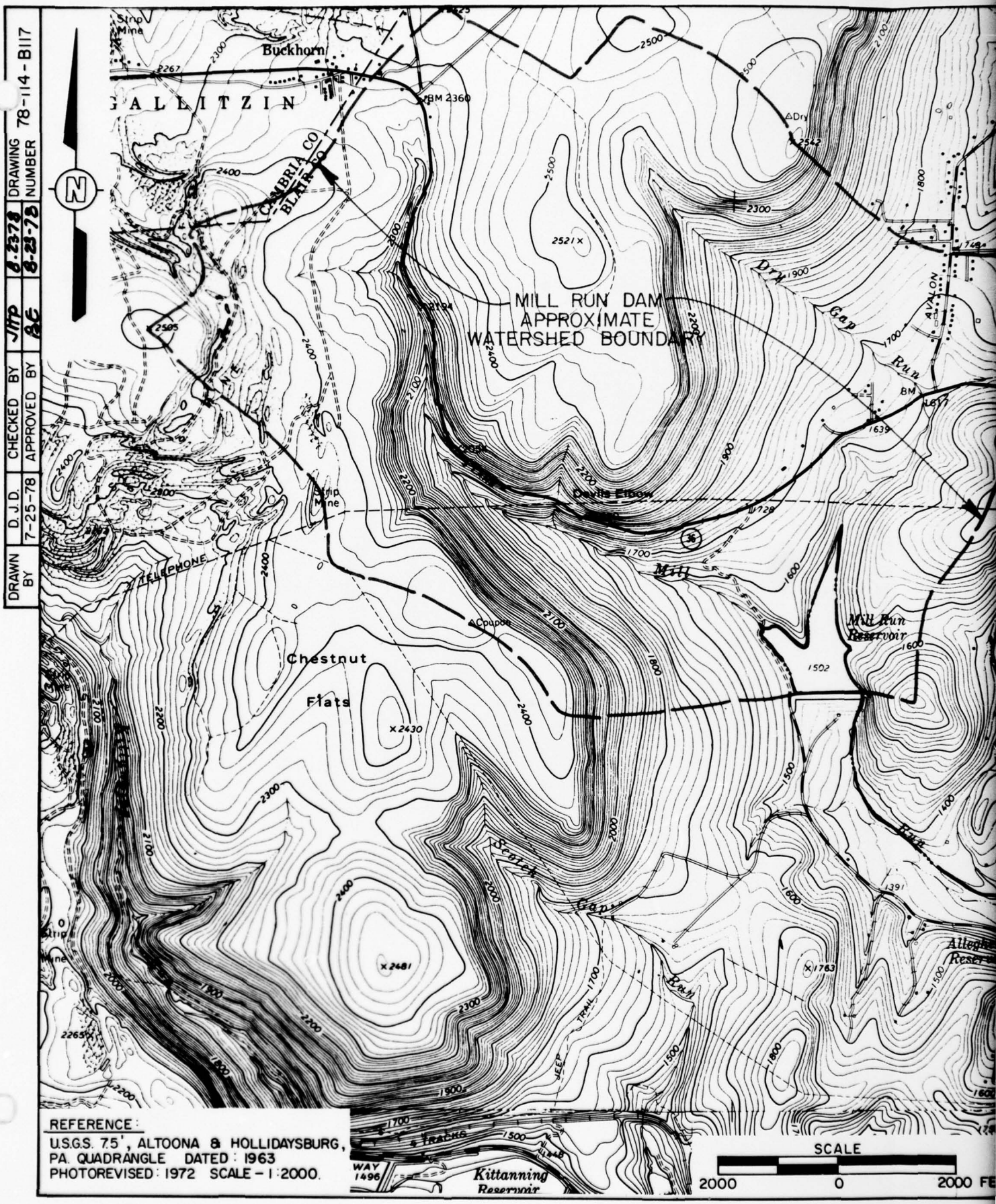
2. The steep rock cut along the spillway channel should be frequently observed and necessary remedial measures taken to prevent rock slides that may partially block the spillway channel.

3. Due to the unique nature of the Fabridam spillway gates and since a sudden release of water in the event of their failure may cause property damage downstream by overflowing the channel in a residential area of Altoona, this appurtenance should be frequently inspected by personnel experienced in design, construction, maintenance, and operation of such equipment.

4. It is recommended that the owner provide around-the-clock surveillance during periods of unusually heavy runoff and develop a formal warning system to alert the downstream residents in the event of emergencies.

5. It is recommended that the owner be advised that the dam and appurtenant structures be inspected regularly and properly maintained.

PLATES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D.J.D.
7-25-78
CHECKED BY
APPROVED BY
DRAWING NUMBER 78-114-B117
Strip Mine
Buckhorn
GALLITZIN
CAMBRIA CO
BLAIR CO
BM 2360
MILL RUN DAM
APPROXIMATE
WATERSHED BOUNDARY
Devils Elbow
Mill Run Reservoir
Chestnut Flats
Scotch Gap Run
Dry Gap Run
AVALON
TELEPHONE
JEEP TRAIL
TRACKS
WAY 1496
Kittanning Reservoir
REFERENCE:
U.S.G.S. 7.5', ALTOONA & HOLLIDAYSBURG, PA. QUADRANGLE DATED: 1963
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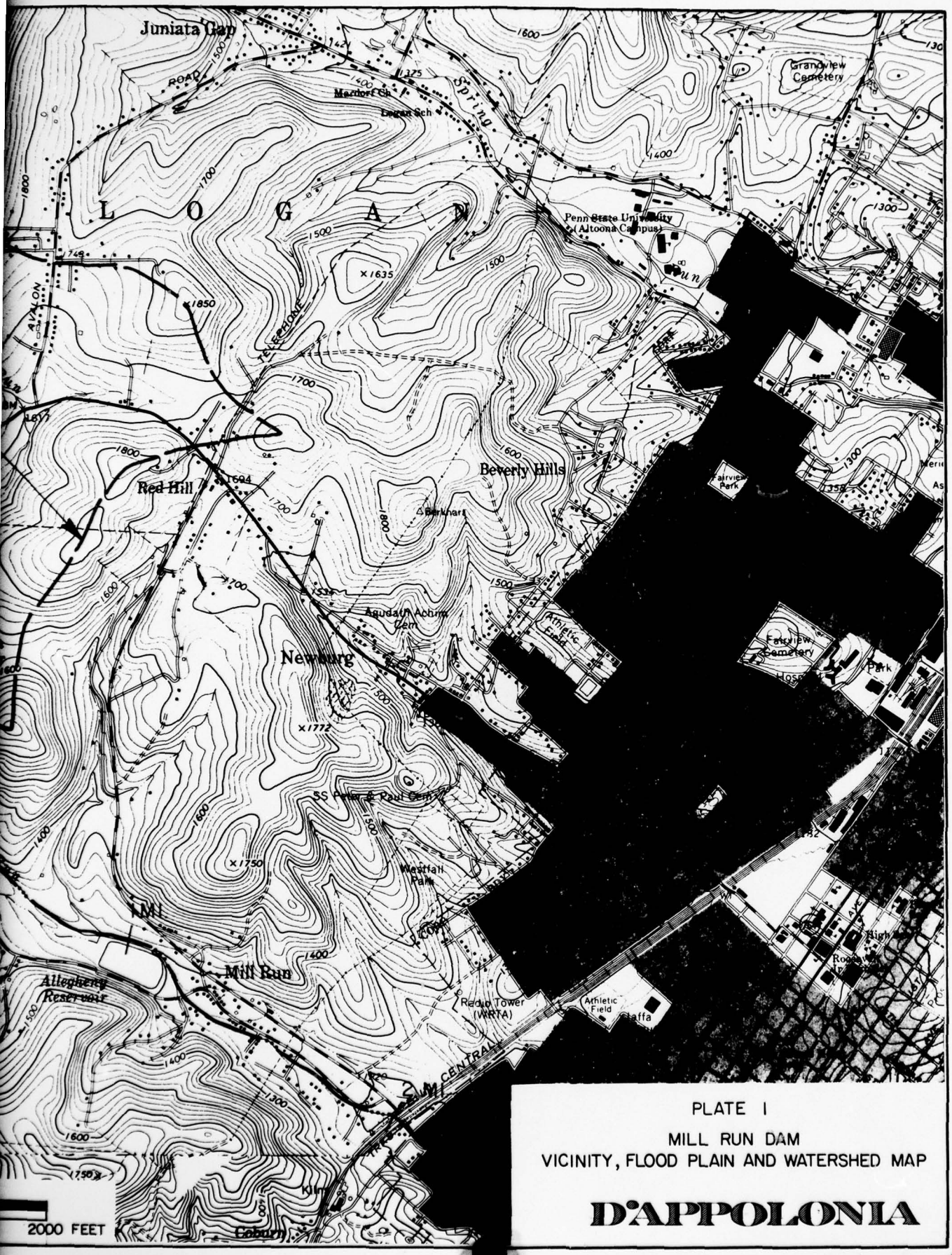


PLATE I

MILL RUN DAM
VICINITY, FLOOD PLAIN AND WATERSHED MAP

D'APPOLONIA

DRAWN BY	D.J.D.	CHECKED BY	JHP	8-23-78	DRAWING NUMBER	78-114-B75
	7-21-78	APPROVED BY	BC	8-23-78		

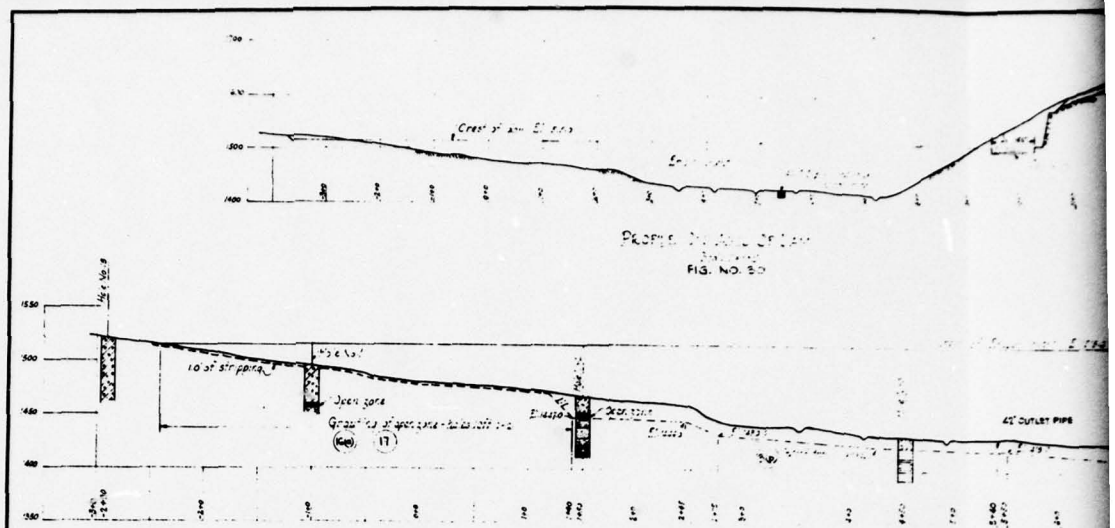


FIG. NO. 30

FIG. NO. 31

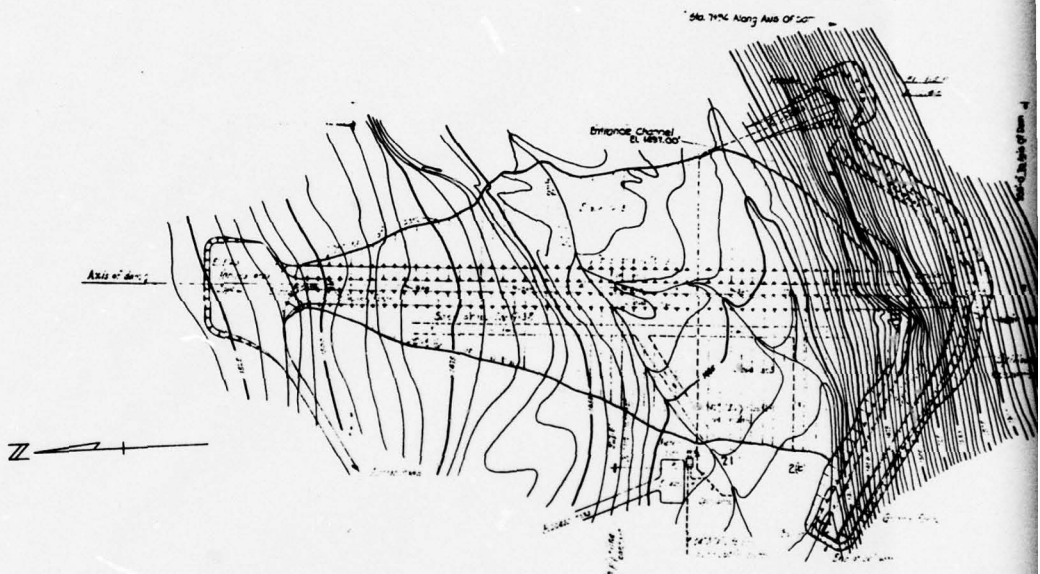
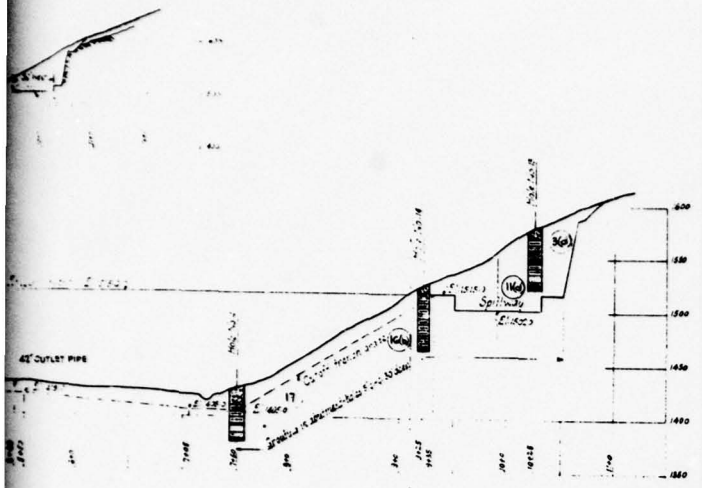
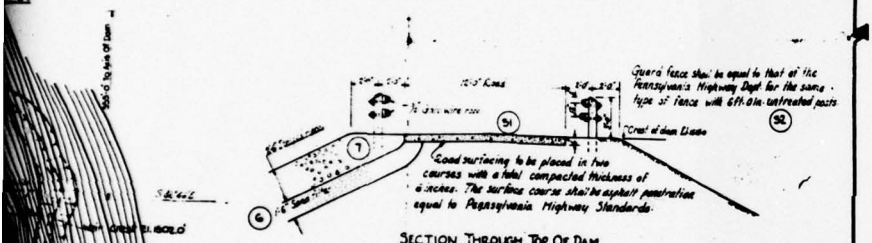
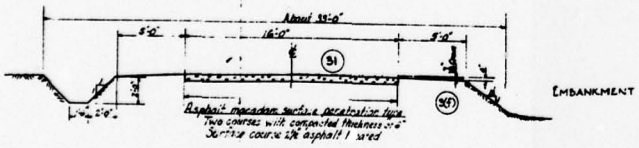


FIG. NO. 32





SECTION THROUGH TOP OF DAM
Scale 1"=4'-0"
FIG. NO. 54



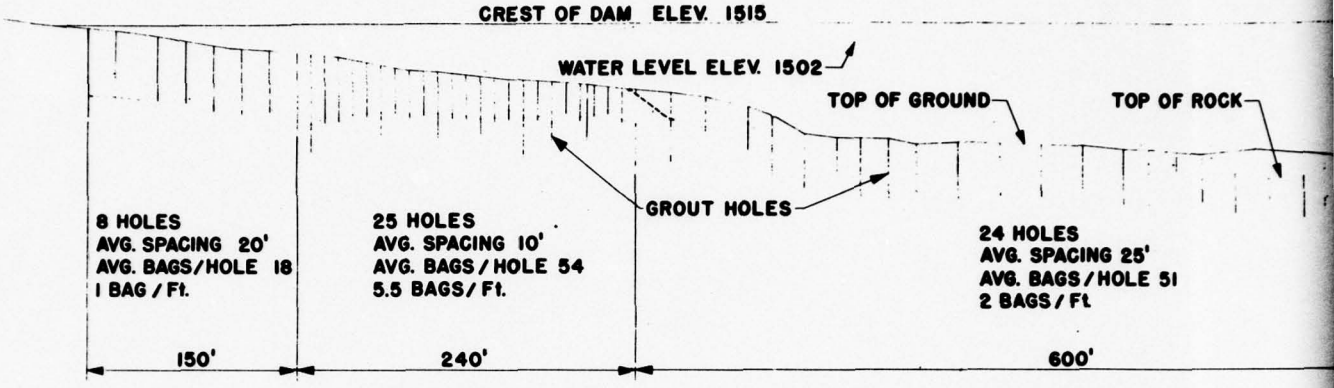
SECTION OF ACCESS ROAD
FIG. NO. 56
Scale 1"=4'-0"

CONTRACT No. 19	ALTOONA CITY AUTHORITY ALTOONA, PENNSYLVANIA WATER SYSTEM IMPROVEMENTS PLAN & DETAILS OF DAM MILL RUN RESERVOIR LEWIS L. GWIN ALBRIGHT & FREEL, INC. CONSULTING ENGINEERS SCALE AS NOTED DESIGNED BY RWS DRAWN BY RMS TRACED BY SML APPROVED DATE MAY 27, 1955 PLAN NO. 54035-6

PLATE 2

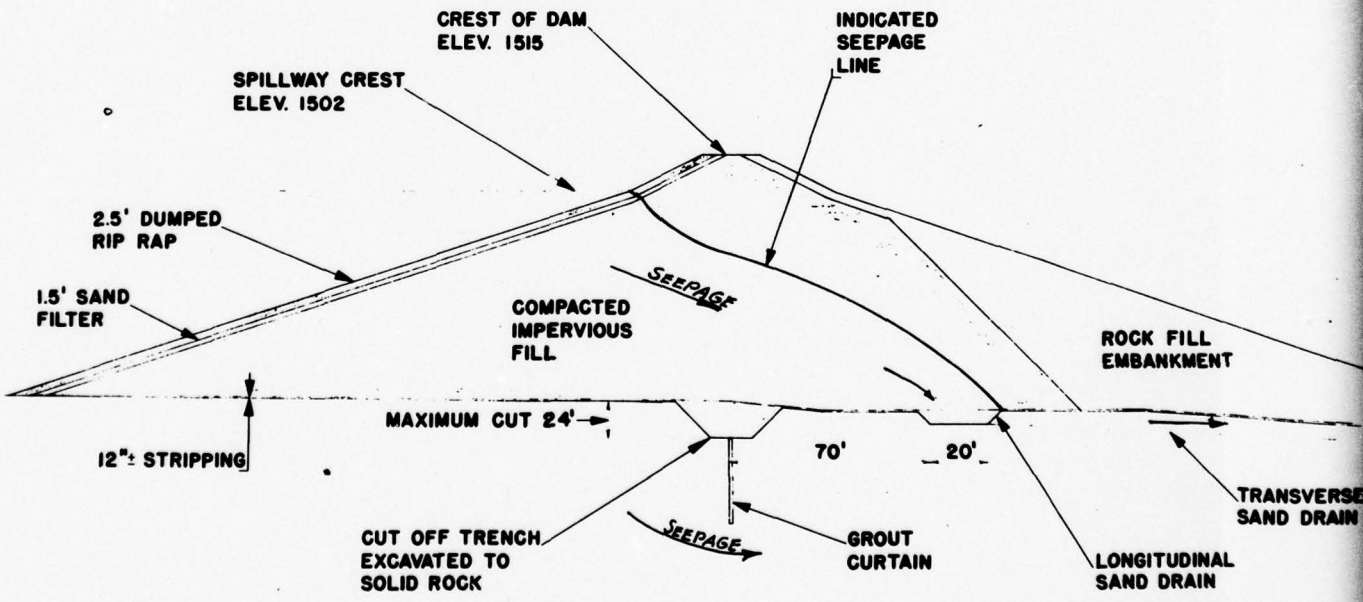
D'APPOLONIA

DRAWN BY	DJD	CHECKED BY	JMP	8-23-78	DRAWING NUMBER 78-114-B74
	7-21-78	APPROVED BY	BC	8-23-78	

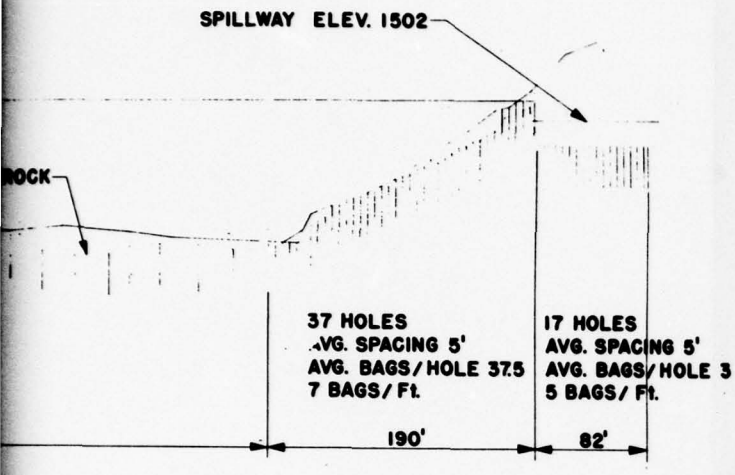


LONGITUDINAL SECTION OF DAM

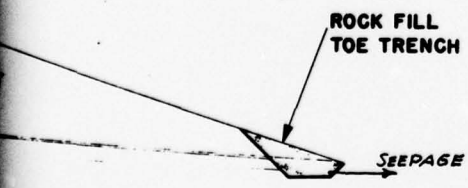
SCALE: 1" = 40'



AS BUILT CROSS SECTION "A-A"



AM



TRANSVERSE
SAND DRAIN

MILL RUN DAM
ALTOONA, PA.

SECTIONS THRU DAM
SHOWING
TYPICAL CONSTRUCTION & GROUTING

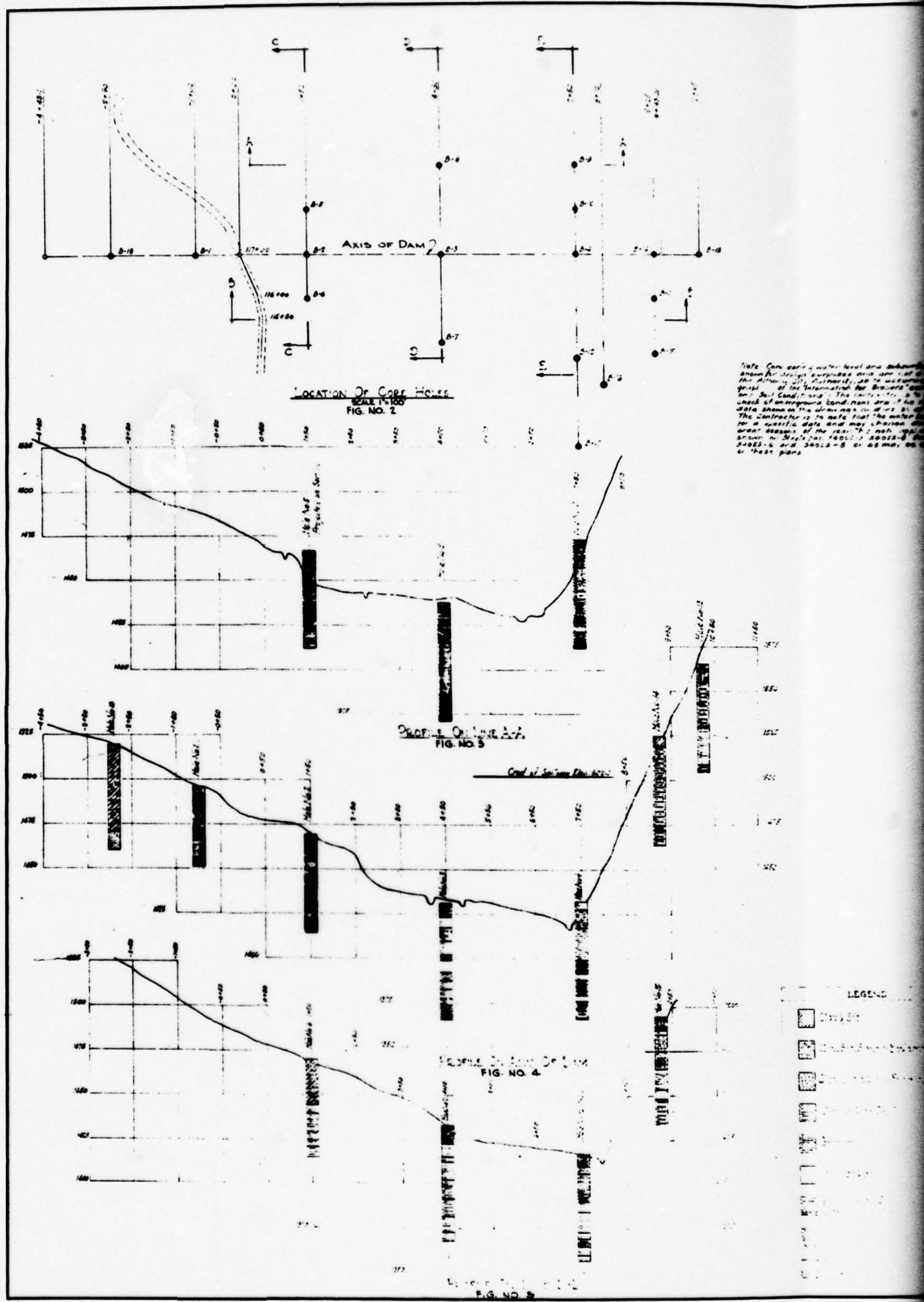
ALBRIGHT & FRIEL INC.
CONSULTING ENGINEERS
PHILADELPHIA, PENNA.

OCTOBER 13, 1958

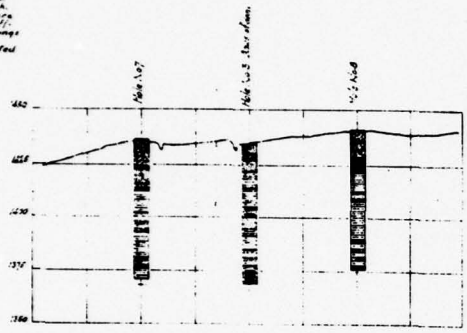
PLATE 3

D'APPOLONIA

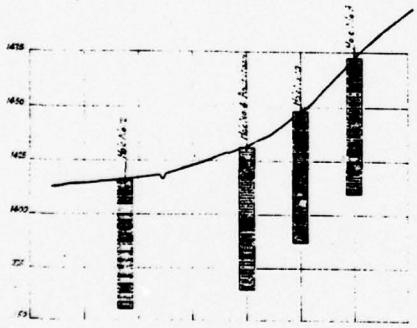
DRAWN BY	D.J.D.	CHECKED BY	JHP	8-23-78	DRAWING NUMBER	78-114-B80
	7-21-78	APPROVED BY	GE	8-23-78		



PROFILE ON LINE C-C
FIG. NO. 6



PROFILE ON LINE D-D
FIG. NO. 7



PROFILE ON LINE E-E
FIG. NO. 8

LEGEND

ALTOONA CITY AUTHORITY ALTOONA, PENNSYLVANIA	
CONTRACT No. 19	WATER SYSTEM IMPROVEMENTS
	LOCATION OF CORE BORINGS AND GEOLOGICAL SECTIONS MILL RUN RESERVOIR
	LEWIS L. GWIN ALBRIGHT & FRIEL, INC. CONSULTING ENGINEERS
SCALE AS NOTED	DRAWN BY S M L; TRACED BY; DESIGNED BY R M E; APPROVED; DATE MAY 27, 1955
	54055 - 3

PLATE 4

D'APPOLONIA

DRAWN BY	D.J.D.	CHECKED BY	JHP	8-23-78	DRAWING NUMBER	78-114-B81
	7-21-78	APPROVED BY	AE	8-25-78		

FIG. NO. 9

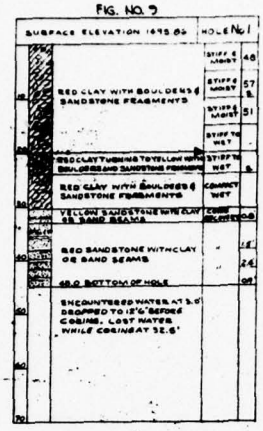


FIG. NO. 10

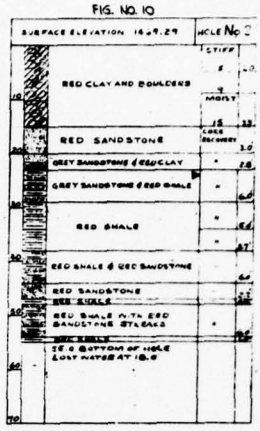


FIG. NO. 11

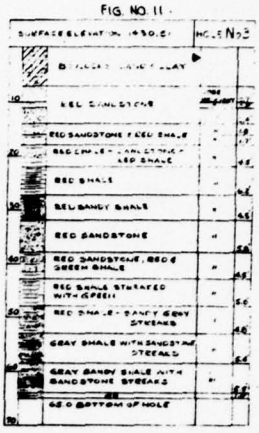


FIG. NO 12

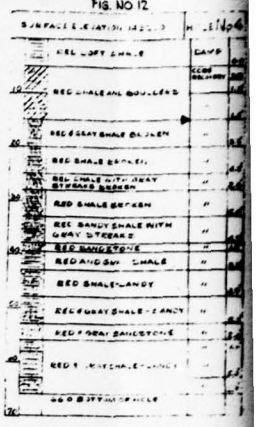


FIG. NO. 16

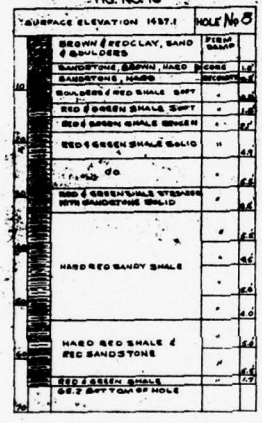


FIG. NO. 17

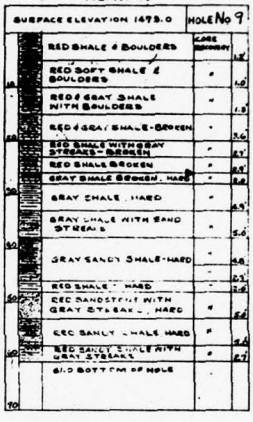


FIG. NO. 18

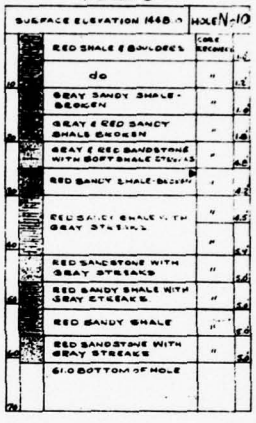


FIG. NO 19

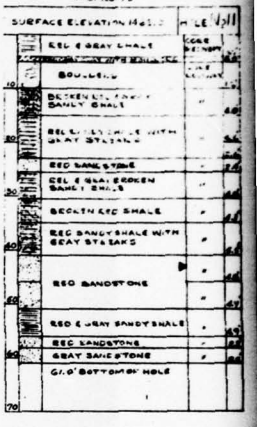


FIG. NO. 23

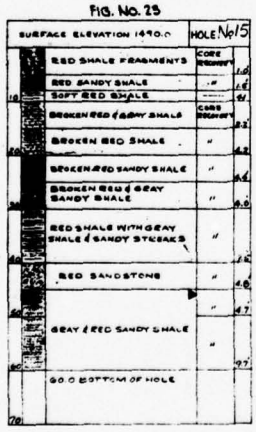


FIG. NO. 24

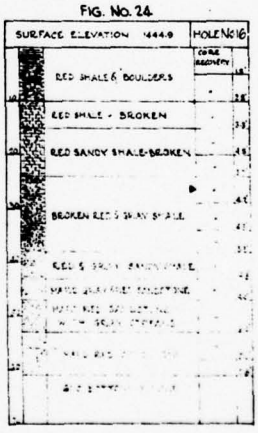


FIG. NO. 25

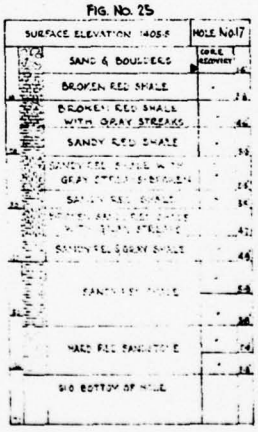
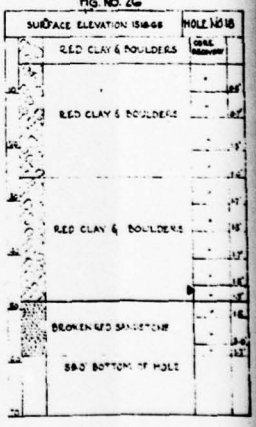


FIG. NO. 26



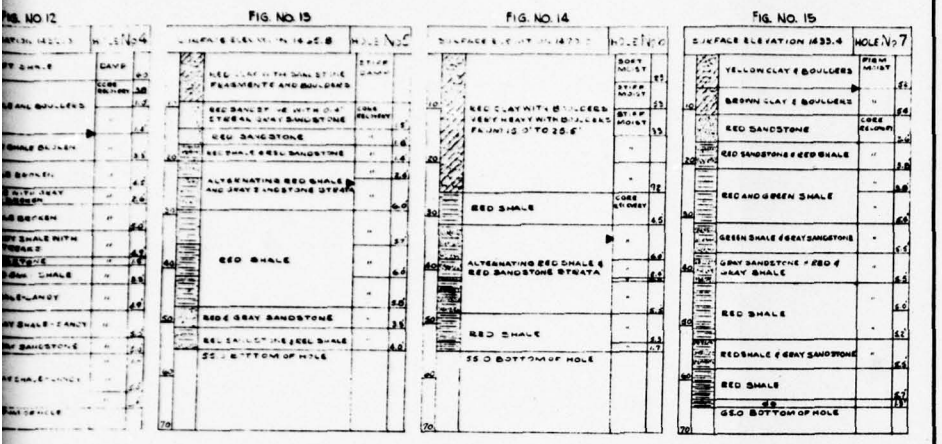


FIG. NO. 12

FIG. NO. 13

FIG. NO. 14

FIG. NO. 15

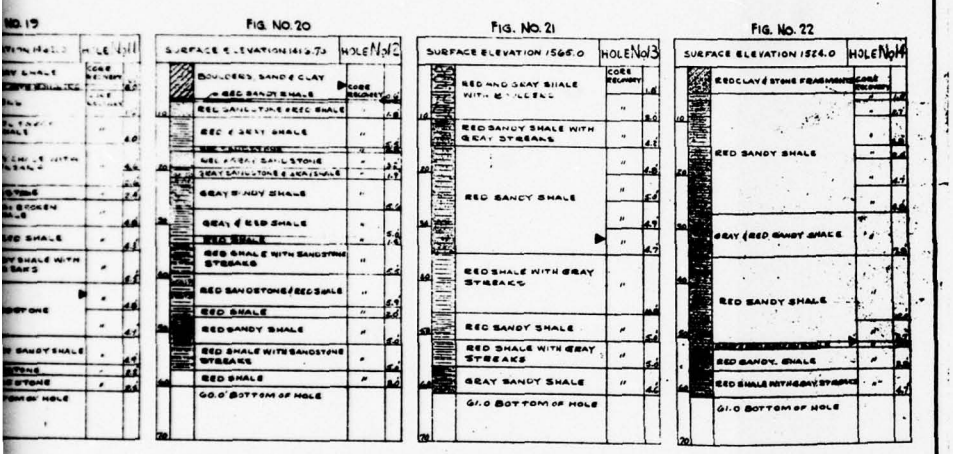


FIG. NO. 19

FIG. NO. 20

FIG. NO. 21

FIG. NO. 22

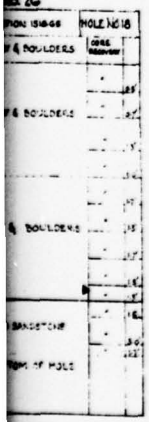


FIG. NO. 26

CONTRACT No. 19

ALTOONA CITY AUTHORITY
ALTOONA, PENNSYLVANIA
WATER SYSTEM IMPROVEMENTS
LOGS OF CORE BORINGS
MILL RUN RESERVOIR

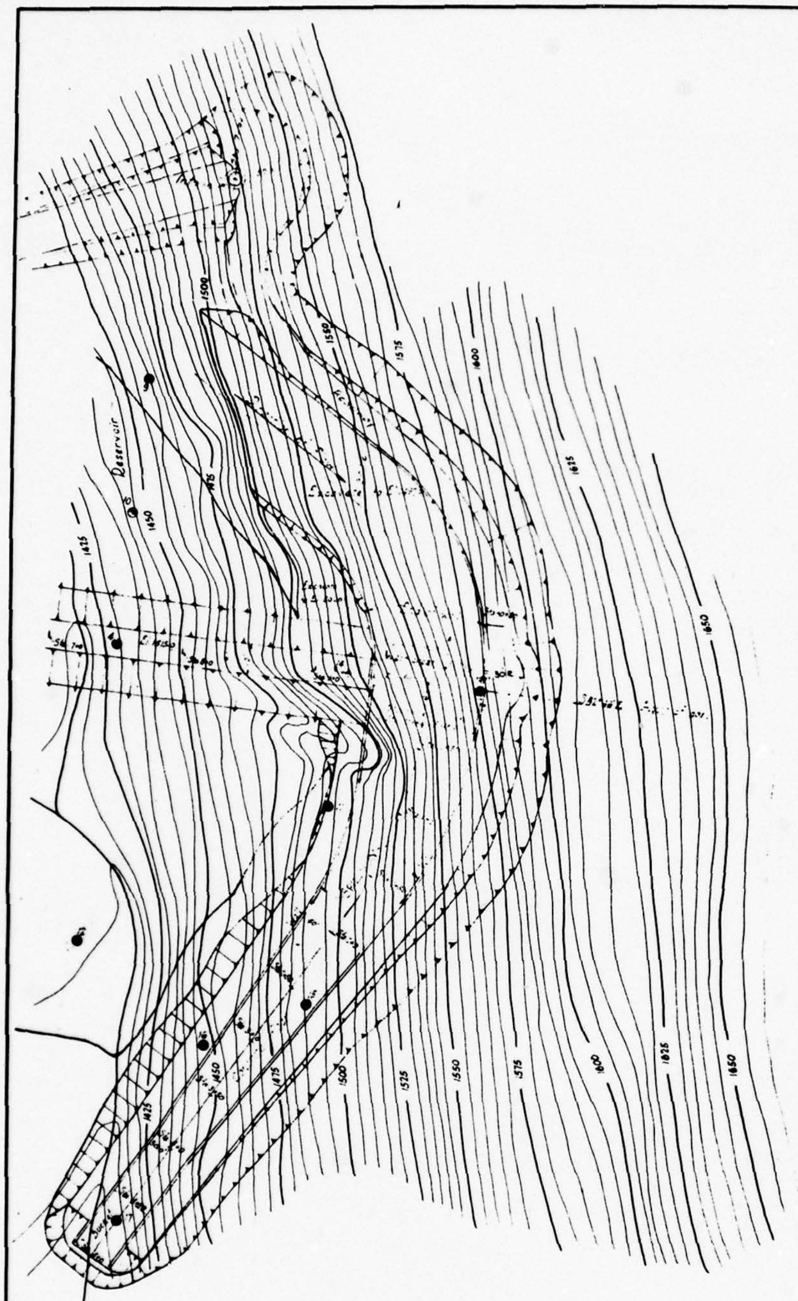
LEWIS L. GWIN
ALBRIGHT & FRIEL, INC.
CONSULTING ENGINEERS

DESIGNED BY S.B.L. DRAWN BY R.M.B. TRACED BY
APPROVED Francis P. Friel Lewis L. Gwin
DATE MAY 27, 1955
PLAN NUMBER 54055-4

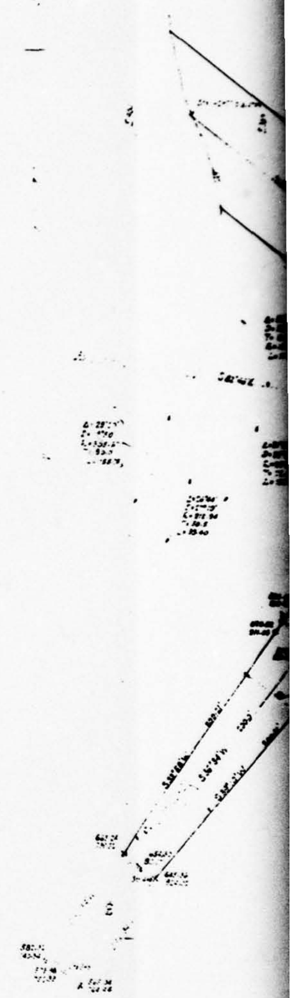
PLATE 5

D'APPOLONIA

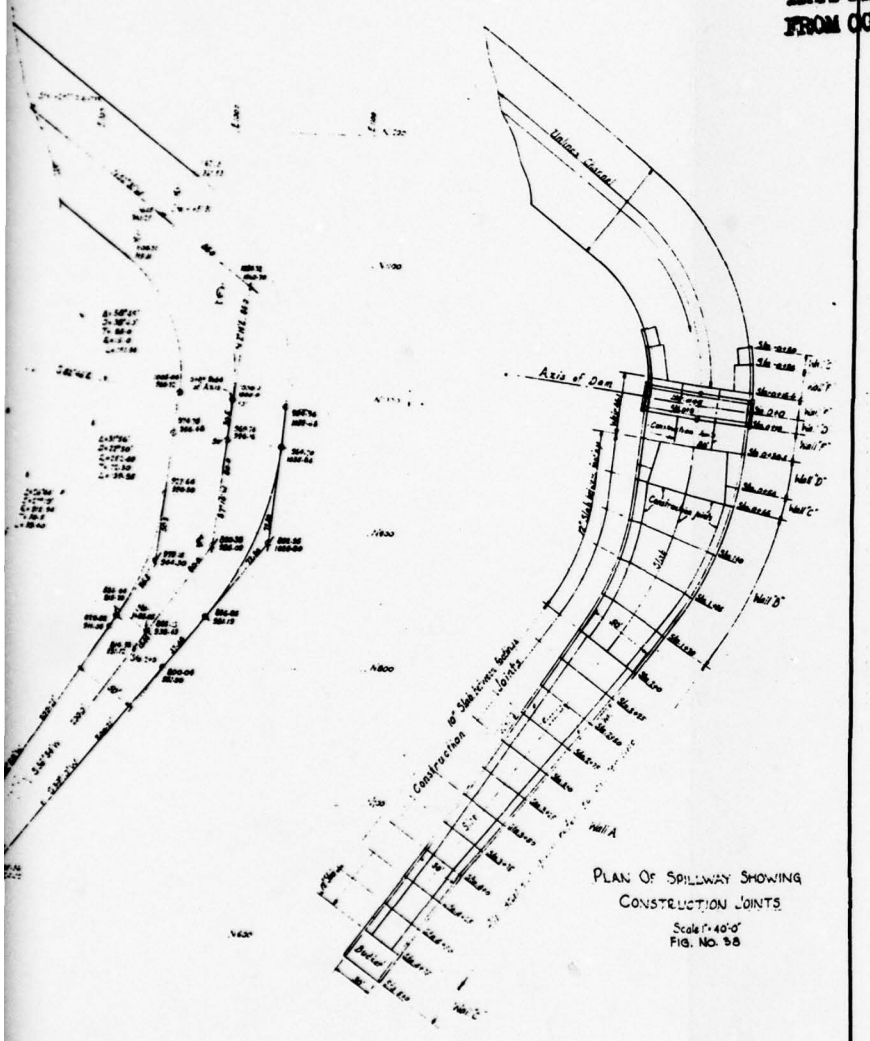
DRAWN BY	D. J. D.	CHECKED BY	JHP	8-23-78	DRAWING NUMBER	78-114-B76
	7-21-78	APPROVED BY	[illegible]	8-23-78		



General Plan Of Spillway
And
Spillway Excavation
Fig. No. 36



Layout Plan Of S
Fig. No. 37



PLAN OF SPILLWAY SHOWING
CONSTRUCTION JOINTS
Scale 1"=40'-0"
FIG. No. 58

PLAN OF SPILLWAY
FIG. No. 57

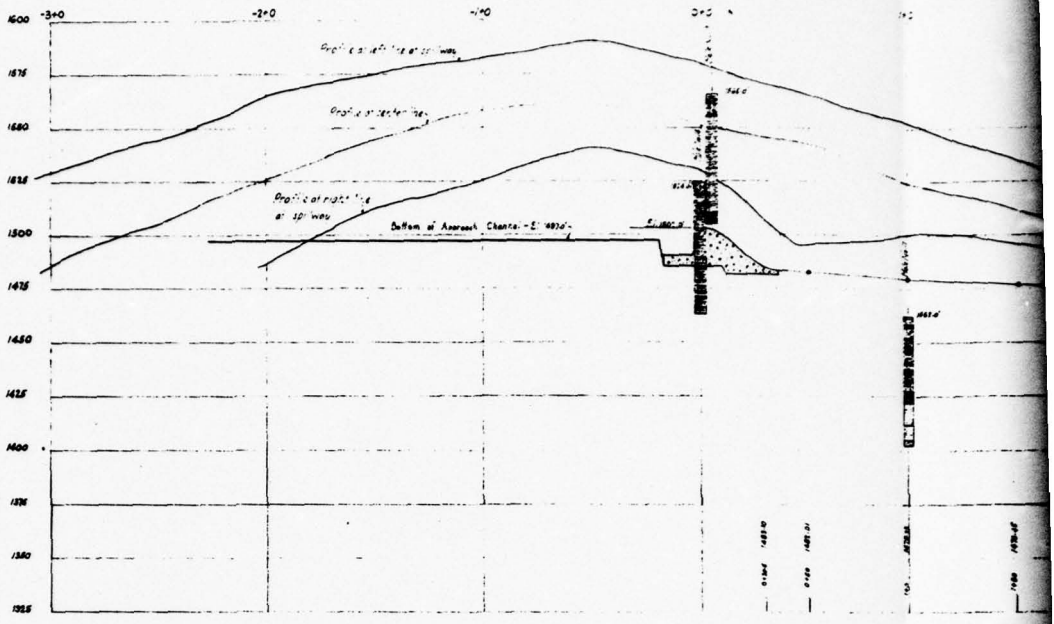
CONTRACT No. 19

ALTOONA CITY AUTHORITY	
ALTOONA, PENNSYLVANIA	
SCALE AS NOTED	WATER SYSTEM IMPROVEMENTS
REVISIONS	PLAN OF SPILLWAY & LAYOUT DETAILS MILL RUN RESERVOIR
	LEWIS L. GWIN ALBRIGHT & FRIEL, INC. CONSULTING ENGINEERS
DRAWN BY RMS / CHECKED BY RMS / TRACED BY SML	APPROVED DATE MAY 27, 1955
	PLAN NUMBER 54055-7

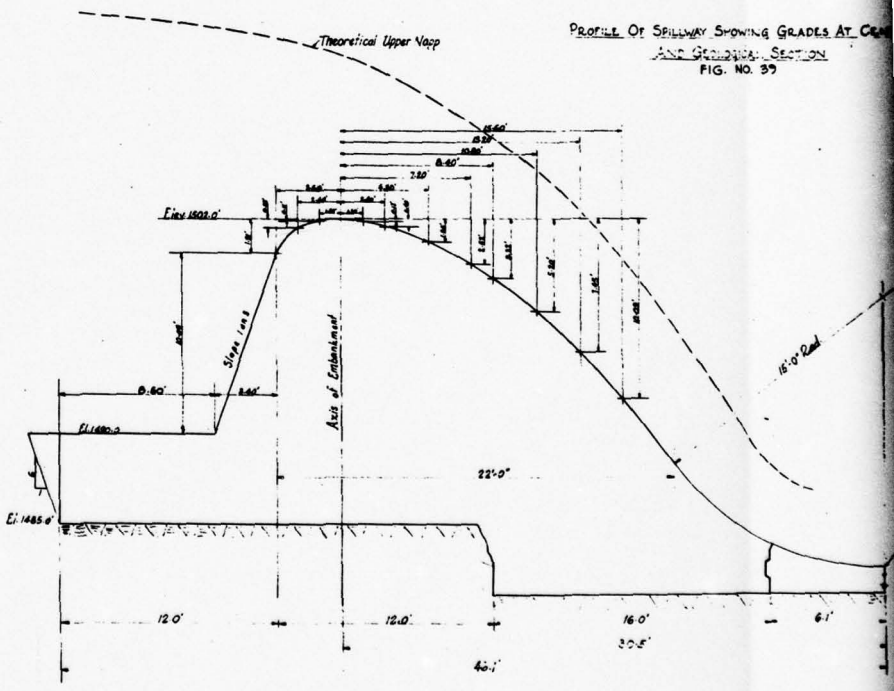
PLATE 6

D'APPOLONIA

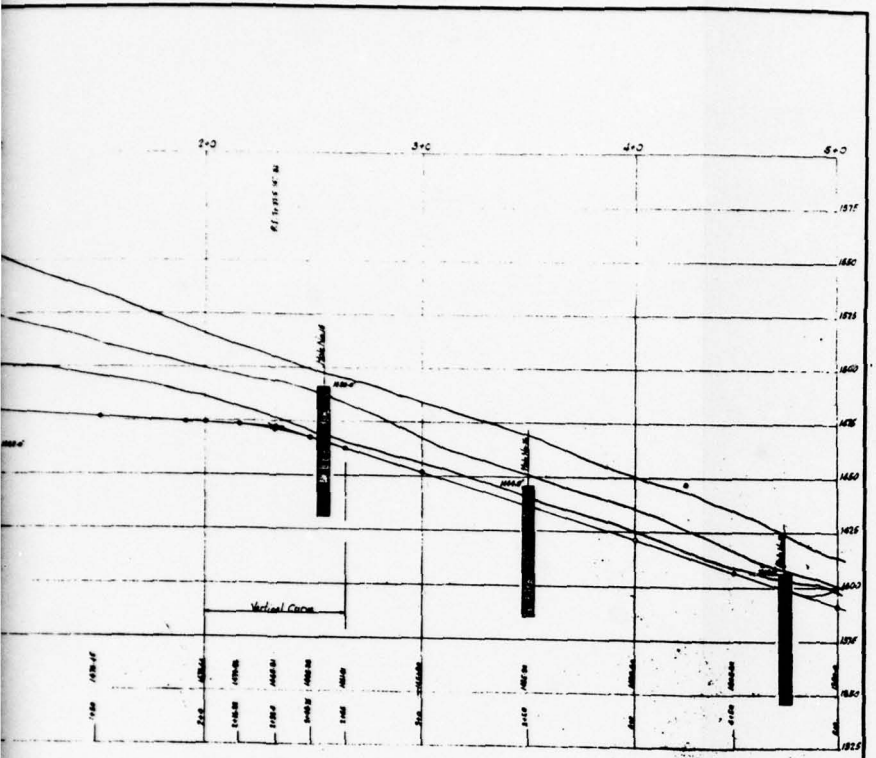
DRAWN BY	D.J.D.	CHECKED BY	JHP	8-23-78	DRAWING NUMBER 78-114-B72
	7-21-78	APPROVED BY	BE	8-23-78	



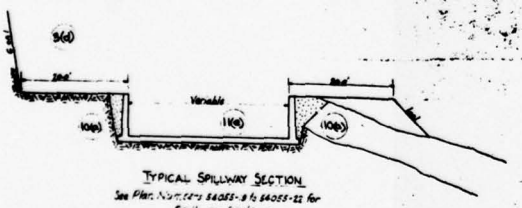
PROFILE OF SPILLWAY SHOWING GRADES AT CREST AND GEOLOGICAL SECTION
FIG. NO. 39



GENERAL DIMENSIONS OF SPILLWAY WEIR
Scale 1" = 5'-0"
FIG. NO. 40



GRADES AT CENTER LINE
SECTION



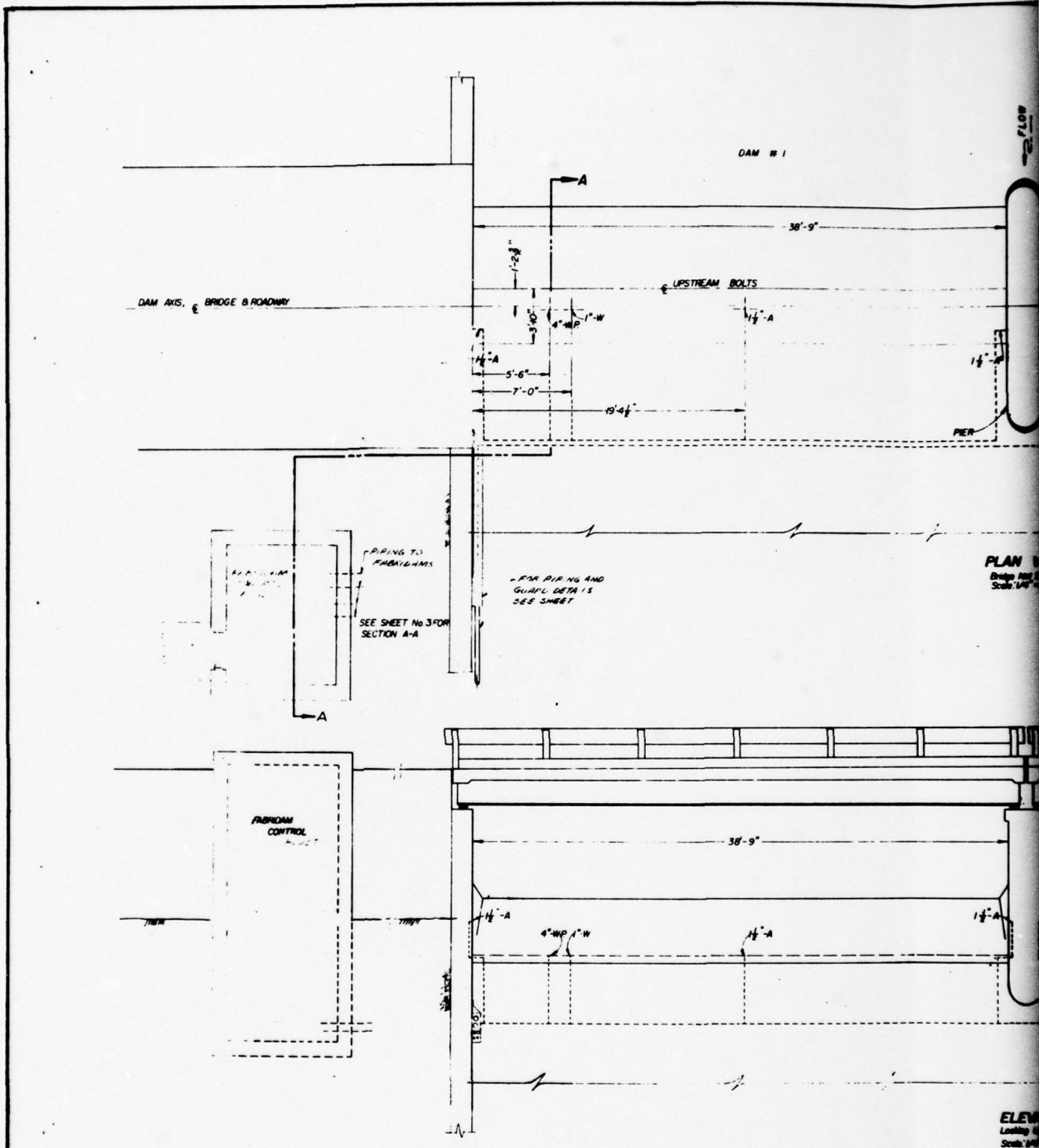
TYPICAL SPILLWAY SECTION
See Plan Numbers 54055-9 & 54055-22 for Spillway Sections
FIG. NO. 61

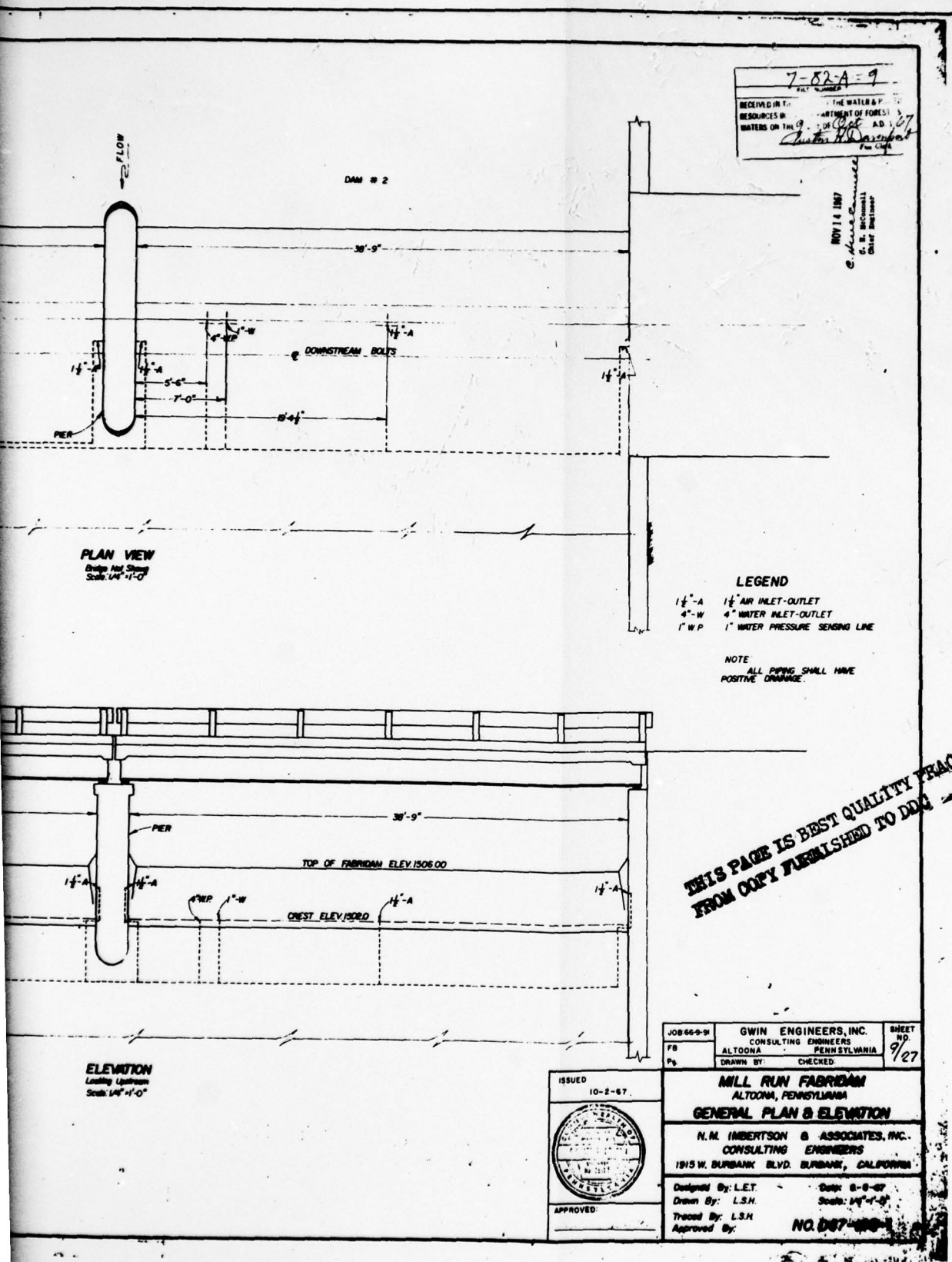
ALTOONA CITY AUTHORITY ALTOONA, PENNSYLVANIA	
SCALE AS NOTED	WATER SYSTEM IMPROVEMENTS
	GEOLOGICAL SECTIONS OF SPILLWAY AND WIER DETAILS MILL RUN RESERVOIR
	LEWIS L. GWIN ALBRIGHT & FRIEL, INC. CONSULTING ENGINEERS
DRAWN BY R.W.S. / TRACED BY S.M.L. / CHECKED BY R.W.S.	DATE MAY 27, 1955
CONTRACT No. 19	PLAN NUMBER 54055-8

PLATE 7

D'APPOLONIA

DRAWN BY	D.J.D	CHECKED BY	JHP	8-25-78	DRAWING NUMBER	78-114-B73
	7-21-78	APPROVED BY	BE	8-29-78		





7-82-A-9

FILE NUMBER

RECEIVED IN THE WATER & P... RESOURCES BUREAU OF FORESTS & WATERS ON THIS 9 DAY OF Oct A.D. 1967

Clinton H. Davenport
Fire Chief

NOV 14 1967
C. R. McConnell
Chief Engineer

ISSUED
10-2-67

APPROVED:

JOB 66-9-91	GWIN ENGINEERS, INC. CONSULTING ENGINEERS ALTOONA PENNSYLVANIA	SHEET NO. 9/27
FB		
Ps	DRAWN BY: CHECKED:	

MILL RUN FABRIDAM
ALTOONA, PENNSYLVANIA
GENERAL PLAN & ELEVATION

N. M. IMBERTSON & ASSOCIATES, INC.
CONSULTING ENGINEERS
1915 W. BURBANK BLVD. BURBANK, CALIFORNIA

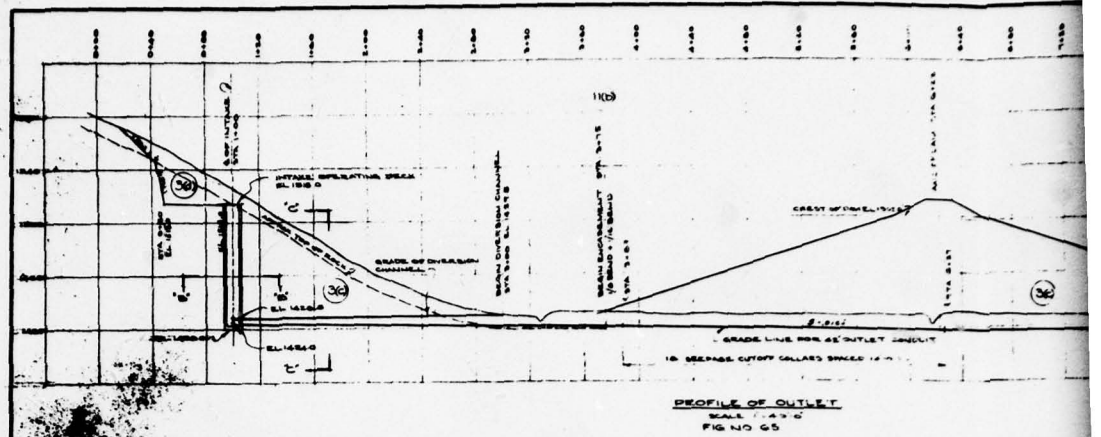
Designed By: L.E.T. Date: 8-8-67
Drawn By: L.S.H. Scale: 1/4"=1'-0"
Traced By: L.S.H
Approved By: NO. D67-[illegible]

PLATE 8

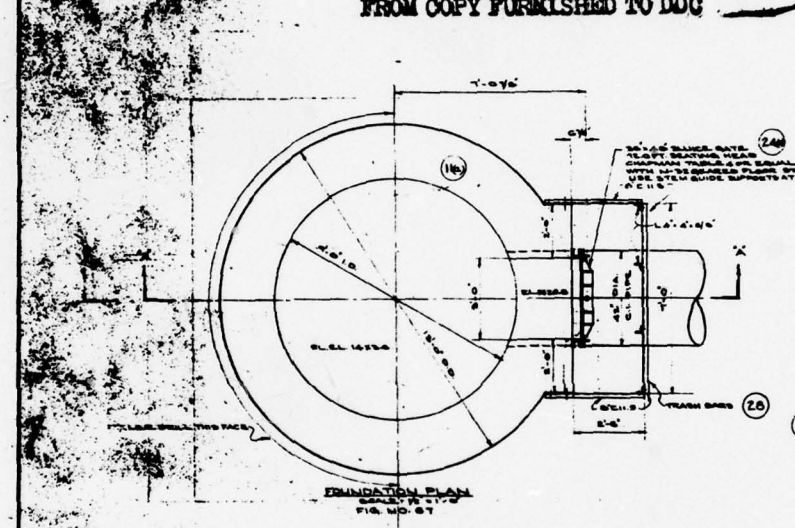
D'APPOLONIA

2

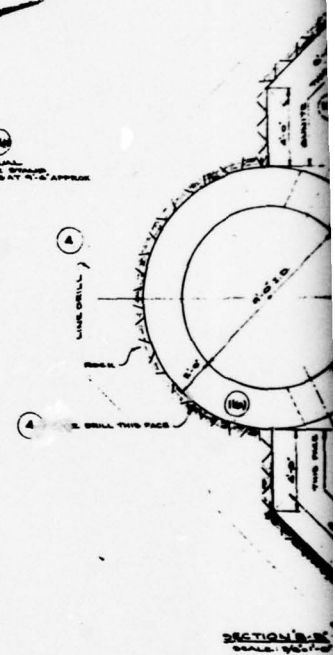
DRAWN BY	D.J.D.	CHECKED BY	JMP	8-29-78	DRAWING NUMBER	78-114-B78
	7-21-78	APPROVED BY	AE	8-29-78		

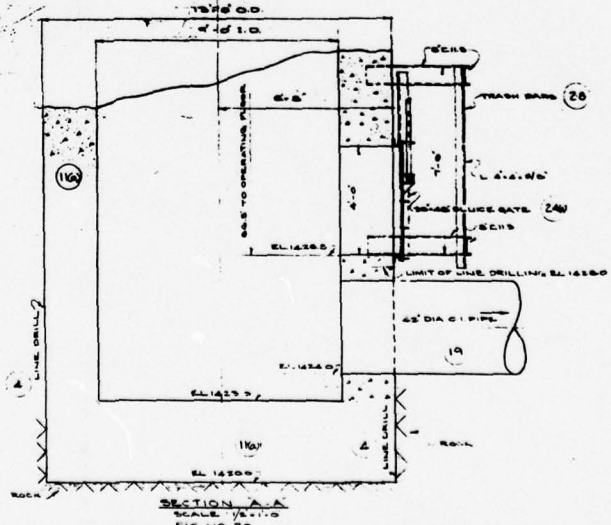


PROFILE OF OUTLET
SCALE 1"=4'-0"
FIG NO 65

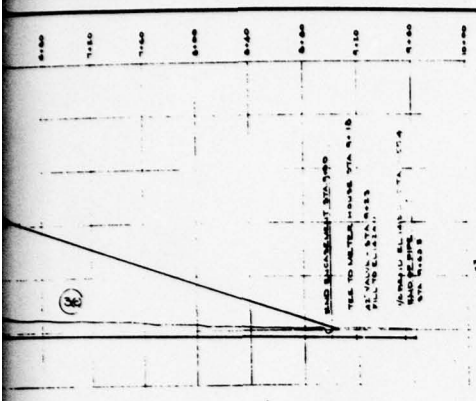


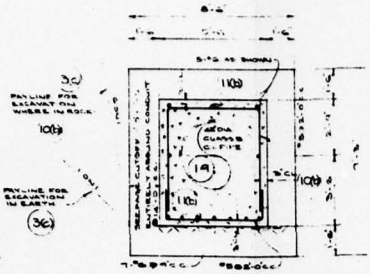
FOUNDATION PLAN
SCALE 1"=1'-0"
FIG NO. 67



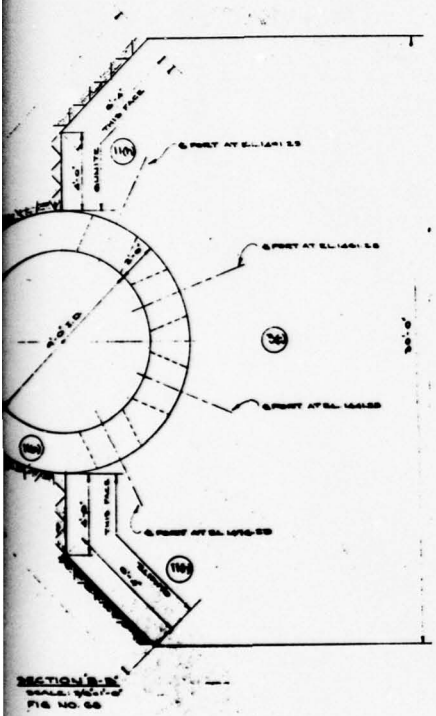


SECTION A-A
SCALE 1/2"=1'-0"
FIG NO 70

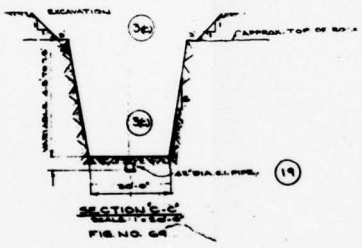




DETAIL OF PIPE ENCASEMENT
SCALE 3/8"=1'-0"
FIG. NO. 66



SECTION "B-B"
SCALE 1/4"=1'-0"
FIG. NO. 65



SECTION "C-C"
SCALE 1/4"=1'-0"
FIG. NO. 64

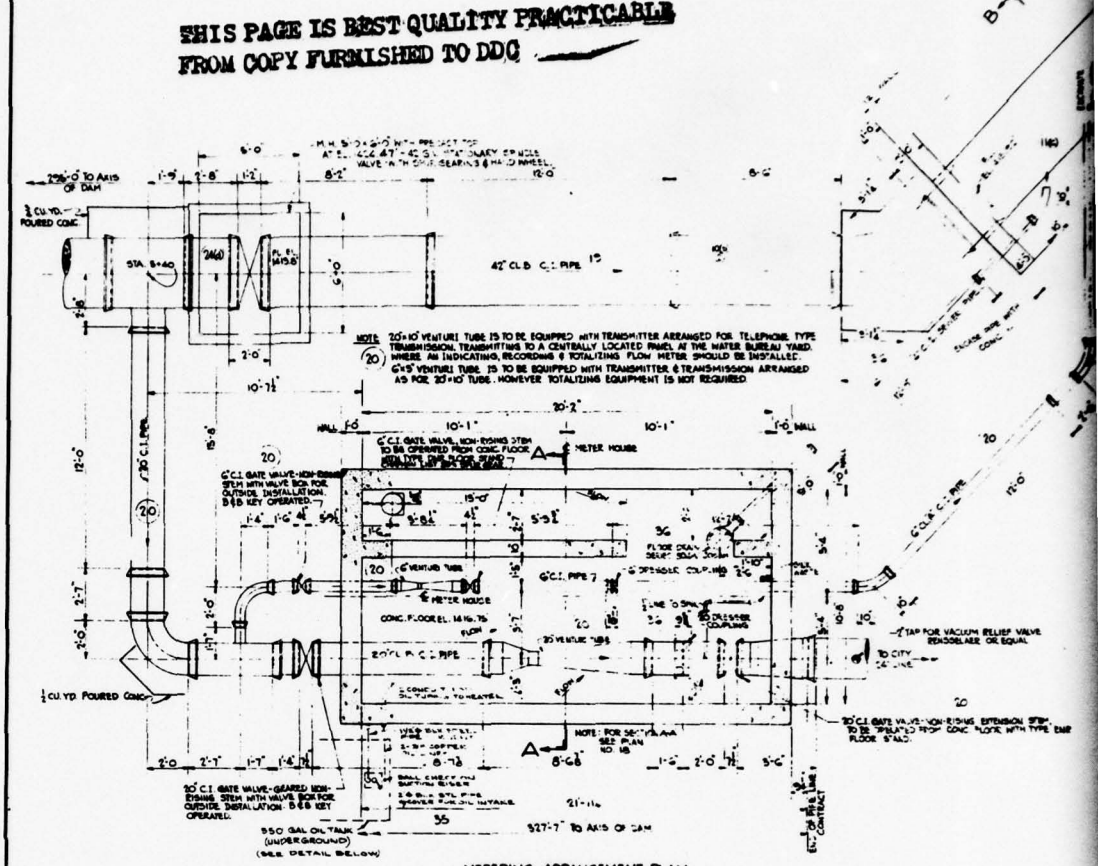
NOTE:
NUMBERS IN CIRCLES INDICATE THE ITEM NUMBER UNDER WHICH PAYMENT WILL BE MADE.

	ALTOONA CITY AUTHORITY ALTOONA, PENNSYLVANIA
SCALE AS NOTED	WATER SYSTEM IMPROVEMENTS
CONTRACT No. 19	PLAN, PROFILE & SECTIONS OF INTAKE MILL RUN RESERVOIR
	LEWIS L. GWIN ALBRIGHT & FREEL, INC. CONSULTING ENGINEERS
DESIGNED L.J.V. CHECKED L.J.V.	DRAWING MAY 27, 1966
	54095 - 12

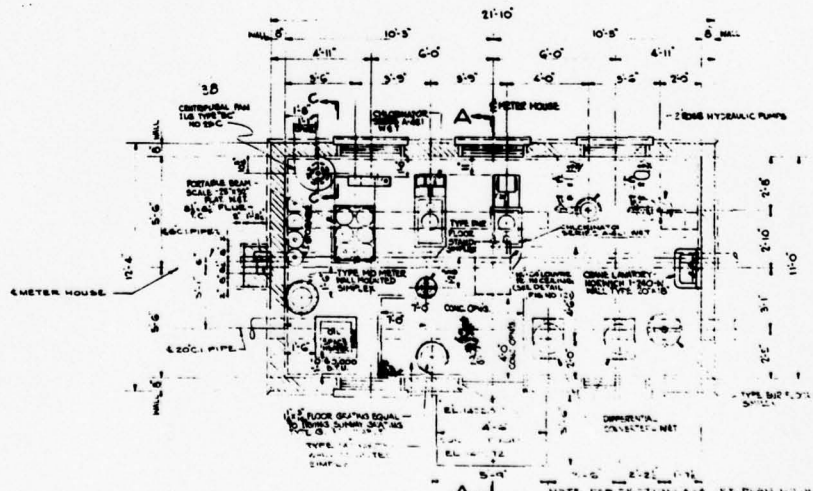
PLATE 9

D'APPOLONIA

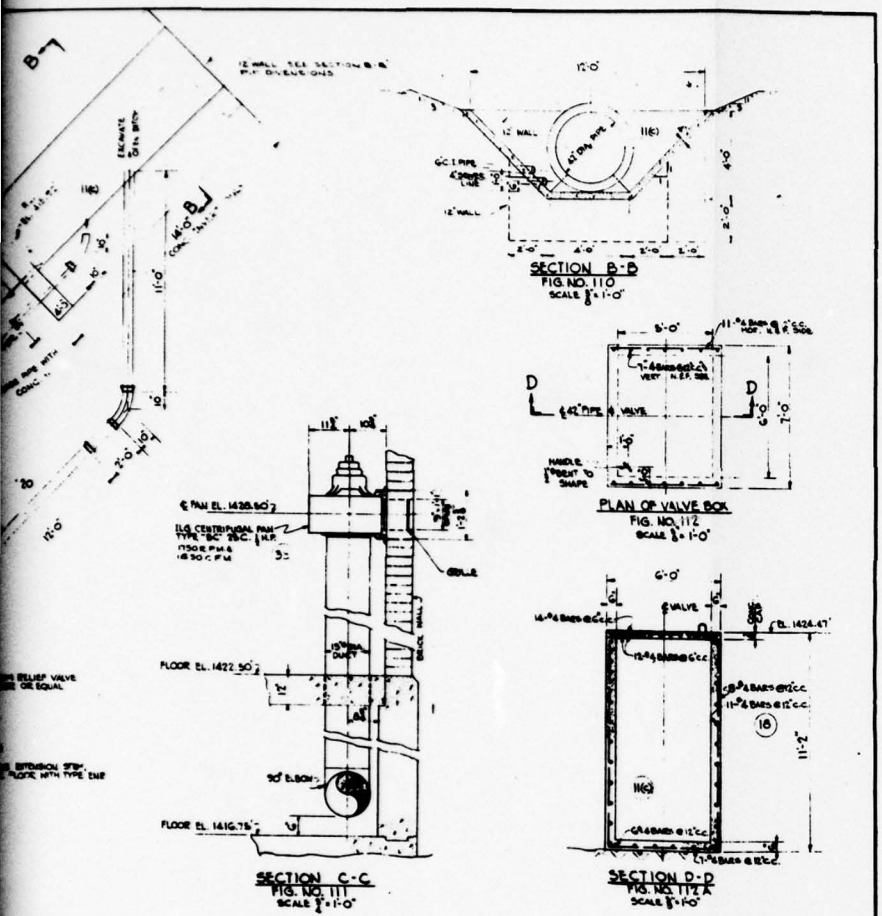
DRAWN BY	D.J.D.	CHECKED BY	JAP	8-23-78	DRAWING NUMBER	78-114-B79
	7-21-78	APPROVED BY	DE	8-29-78		



METERING ARRANGEMENT PLAN
FIG. NO. 108
SCALE 1/4"=1'-0"



ARRANGEMENT PLAN OF CHLORINATION EQUIPMENT
FIG. NO. 23
SCALE 3/8"=1'-0"



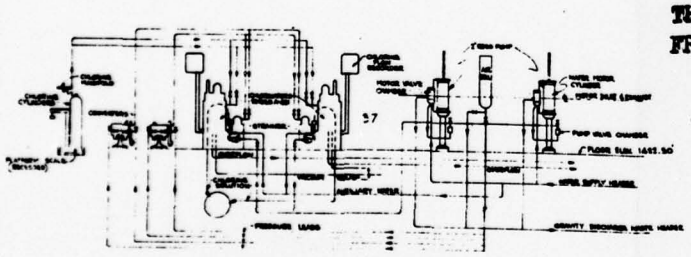
SECTION B-B
FIG. NO. 110
SCALE 1/2" = 1'-0"

PLAN OF VALVE BOX
FIG. NO. 112
SCALE 1/2" = 1'-0"

SECTION C-C
FIG. NO. 111
SCALE 1/2" = 1'-0"

SECTION D-D
FIG. NO. 112-A
SCALE 1/2" = 1'-0"

THIS PAGE IS BEST QUALITY PRACTICABLE
FROM COPY FURNISHED TO DDC



SCHEMATIC DIAGRAM OF CHLORINATION EQUIPMENT
FIG. NO. 113

NOTE:
NUMBERS IN CIRCLES INDICATE THE ITEM NUMBER UNDER WHICH PAYMENT WILL BE MADE.

ALTOONA CITY AUTHORITY
ALTOONA, PENNSYLVANIA

WATER SYSTEM IMPROVEMENTS

METER HOUSE PIPING & CHLORINATION
MILL RUN RESERVOIR

CONTRACT No. 19

LEWIS L. GWIN
ALBRIGHT & FRIEL, INC.
CONSULTING ENGINEERS

APPROVED: Francis J. Friel
DATE: MAY 27 1955

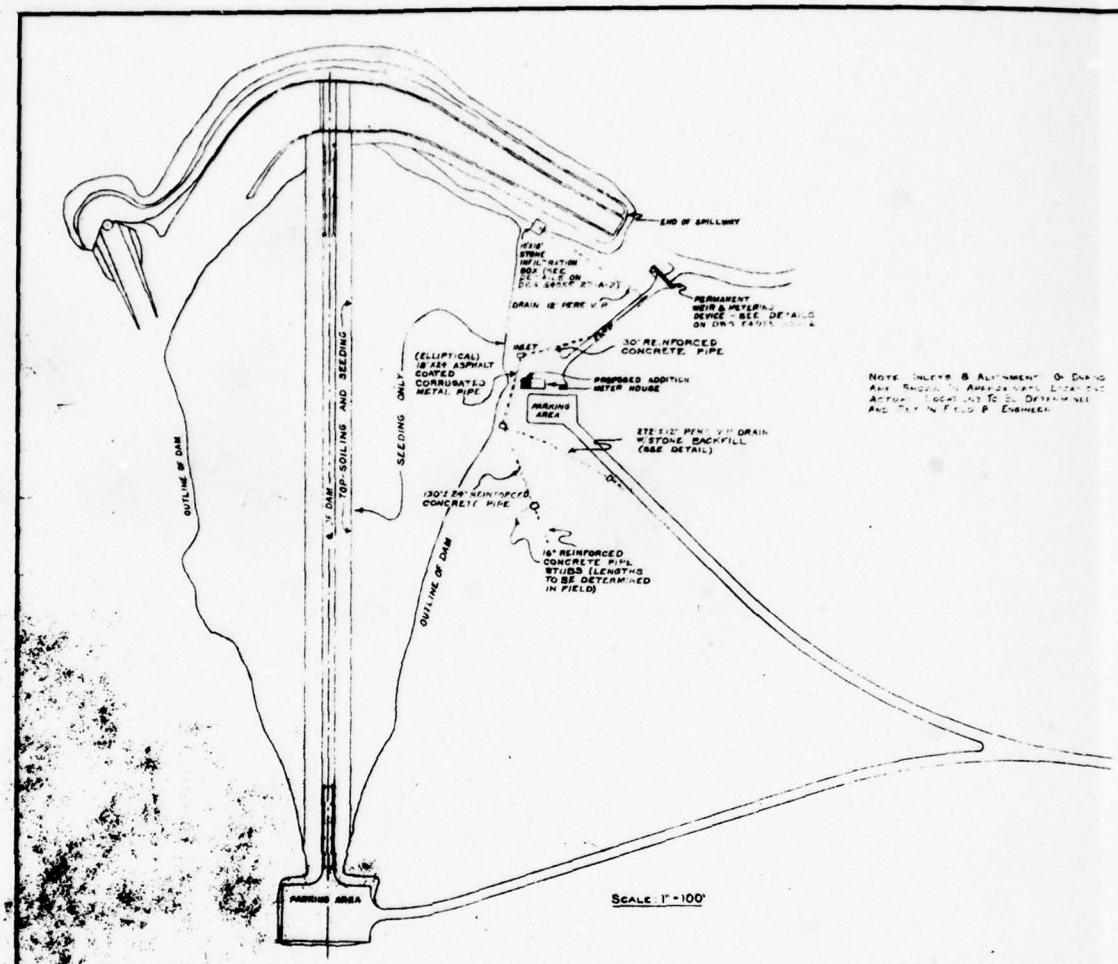
34055-17

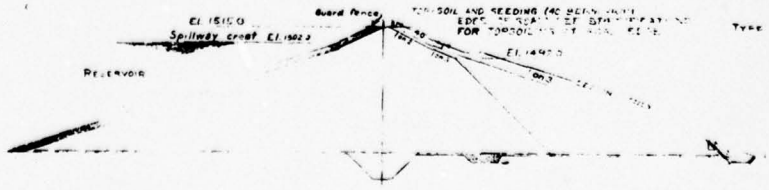
PLATE 10

D'APPOLONIA

2

DRAWN BY	D.J.D.	CHECKED BY	JHP	8-23-78	DRAWING
	7-21-78	APPROVED BY	RE	8-23-78	NUMBER 78-114-B77

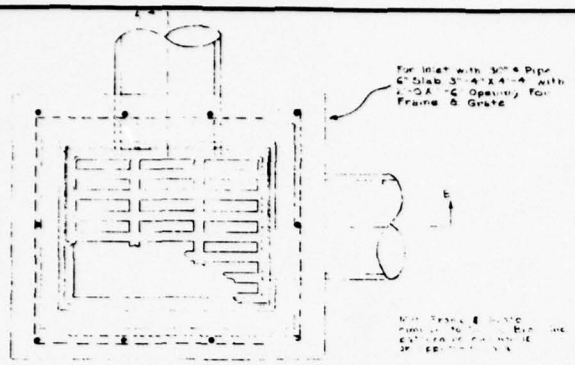




TYPICAL CROSS SECTION OF DAM

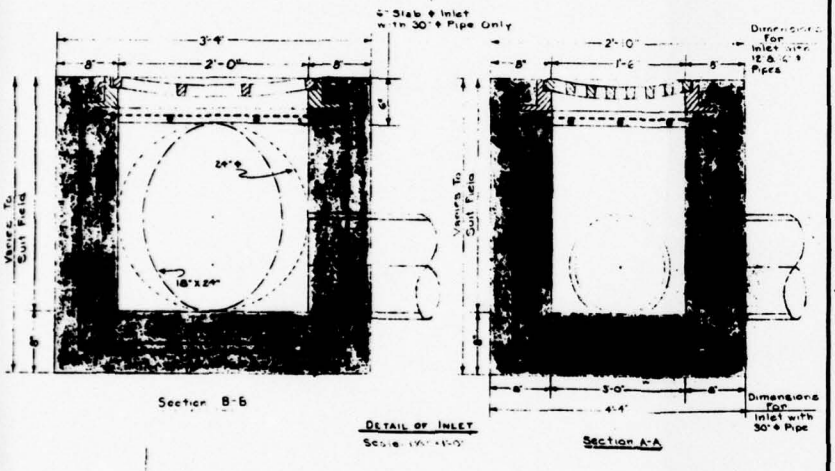
SCALE: 1" = 50'

Scale



PLAN

Reinforcing Steel No. 5 Spacing As Shown Splay Around Pipes

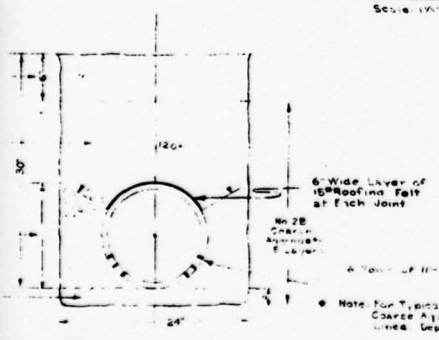


Section B-B

DETAIL OF INLET

Scale 1/4"=1'-0"

Section A-A



* Note For Typical Backfill of other Size Pipe Lines Coarse Aggregate to be 6 Each Side of Pipe unless Depth to Suit Field Conditions

TYPICAL BACKFILL FOR 12" PERFORATED VITRIFIED CLAY PIPE LINES

Scale 1/2"=1'-0"

CONTRACT No. 27 & 28

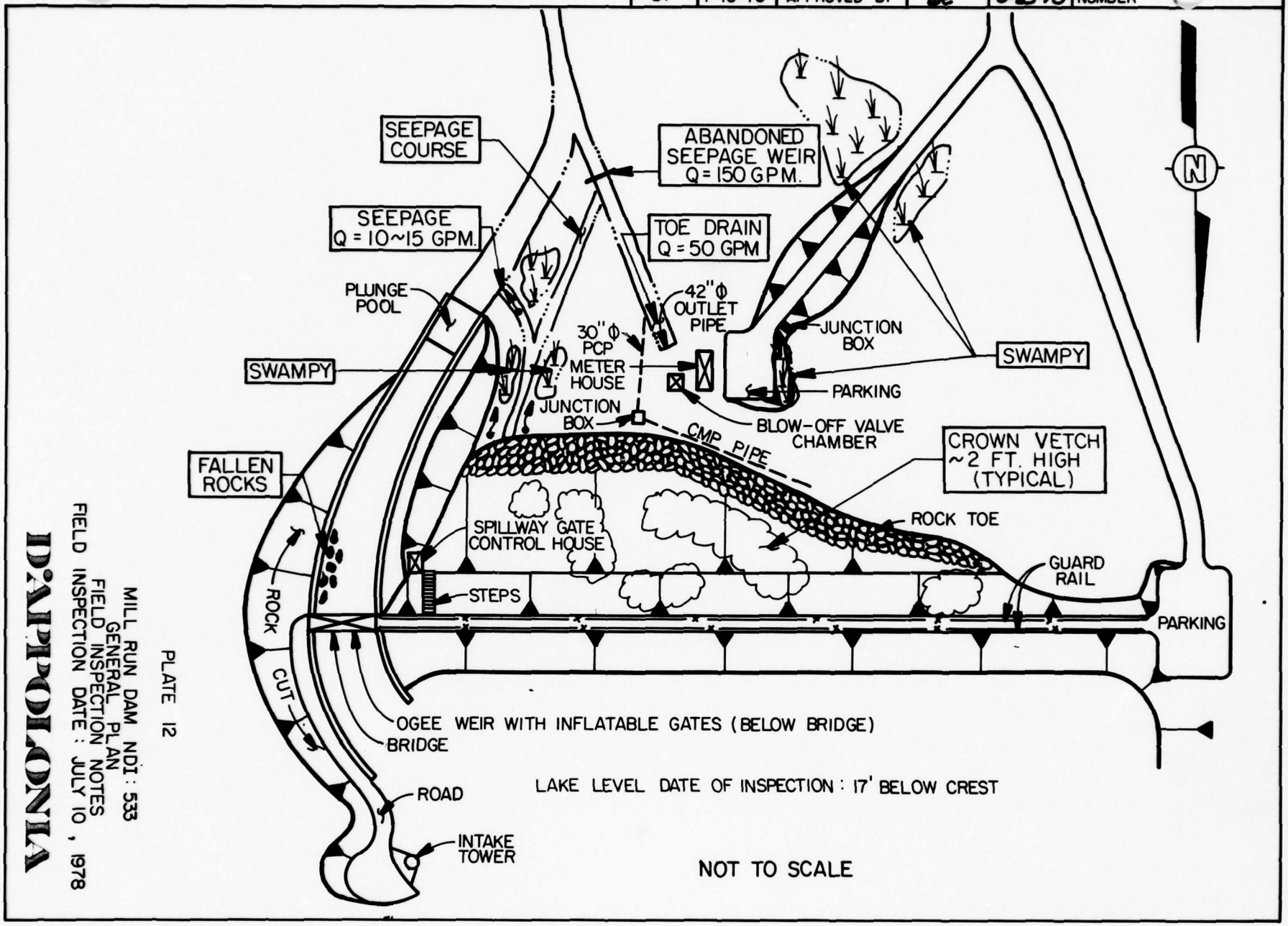
REGISTERED PROFESSIONAL ENGINEER

ALTOONA CITY AUTHORITY ALTOONA, PENNSYLVANIA		
SCALE AS NOTED	MILL RUN RESERVOIR TOPSOILING & SEEDING DOWNSTREAM SLOPE & SEEPAGE COLLECTION FACILITIES	
REVISIONS A 9-9-59	ALBRIGHT & FRIEL INC. LEWIS L. GWIN CONSULTING ENGINEERS	
DRAWN BY T.H.	CHECKED BY FVV	DATE MAY 29, 1959
TRACED BY T.H.		PLAN NUMBER 54058-28A-1

PLATE 11

D'APPOLONIA

DRAWN BY	D.J.D.	CHECKED BY	JMP	8-23-78	DRAWING NUMBER	78[illegible]4-A20
	7-18-78	APPROVED BY	BE	8-23-78		



LAKE LEVEL DATE OF INSPECTION : 17' BELOW CREST

NOT TO SCALE

PLATE 12

MILL RUN DAM NDI : 533
GENERAL PLAN
FIELD INSPECTION NOTES
FIELD INSPECTION DATE : JULY 10 , 1978

D'APPOLONIA

APPENDIX A

CHECKLIST
VISUAL INSPECTION
PHASE I

CHECKLIST
VISUAL INSPECTION
PHASE I

NAME OF DAM MILL RUN DAM COUNTY BLAIR STATE PA ID# NDI: 533
DER: 7-82

TYPE OF DAM EARTHFILL. HAZARD CATEGORY HIGH.

DATE(S) INSPECTION JULY 10, 1978 WEATHER SUNNY TEMPERATURE 80's

POOL ELEVATION AT TIME OF INSPECTION 1498 M.S.L. TAILWATER AT TIME OF INSPECTION 1415 ± M.S.L.

INSPECTION PERSONNEL:

BILGIN EREL	REVIEW INSPECTION BY: (JULY 18, 1978)	ELIO D'APPOLONIA
WAH-TAK CHAN		L.D. ANDERSEN
		JAMES POELLOT

BILGIN EREL RECORDER

VISUAL INSPECTION
PHASE I
EMBANKMENT

NAME OF DAM MILL RUN DAM
ID# NDI: 533 DER: 7-82

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SURFACE CRACKS	NONE	
UNUSUAL MOVEMENT OR CRACKING AT OR BEYOND THE TOE	NONE	
SLOUGHING OR EROSION OF EMBANKMENT AND ABUTMENT SLOPES	NONE	
VERTICAL AND HORIZONTAL ALIGNMENT OF THE CREST	NO PERCEIVABLE MISALIGNMENT.	
RIPRAP FAILURES	NONE	

VISUAL INSPECTION
PHASE I
EMBANKMENT

NAME OF DAM MILL RUN DAM

ID# NDI :533 DER : 7-82

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
JUNCTION OF EMBANKMENT AND ABUTMENT, SPILLWAY AND DAM	NO SIGNS OF DISTRESS.	
ANY NOTICEABLE SEEPAGE	SEEPAGE FROM SAND DRAINS. (TOTAL SEEPAGE ≈ 165 GPM)	
STAFF GAGE AND RECORDER	NONE	
DRAINS	A DRAINAGE SYSTEM COLLECTS THE SEEPAGE FROM THE SAND DRAINS AND DISCHARGES INTO THE OUTLET PIPE DISCHARGE CHANNEL	

VISUAL INSPECTION
PHASE I
CONCRETE/MASONRY DAMS

NAME OF DAM MILL RUN DAM
ID# NDI 533 CER 7-82

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
ANY NOTICEABLE SEEPAGE	EARTH FILL DAM ∴ N/A.	
STRUCTURE TO ABUTMENT/EMBANKMENT JUNCTIONS	N/A	
DRAINS	N/A	
WATER PASSAGES	N/A	
FOUNDATION	N/A.	

VISUAL INSPECTION
PHASE I
CONCRETE/MASONRY DAMS

NAME OF DAM MILL RUN DAM
ID# NDI: 523 DER: 7-82

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SURFACE CRACKS CONCRETE SURFACES	EARTH FILL DAM N/A.	
STRUCTURAL CRACKING	N/A.	
VERTICAL AND HORIZONTAL ALIGNMENT	N/A.	
MONOLITH JOINTS	N/A.	
CONSTRUCTION JOINTS STAFF GAGE OF RECORDER:	N/A.	

VISUAL INSPECTION
PHASE I
OUTLET WORKS

NAME OF DAM MILL RUN DAM
ID# NDI: 533 DER 7-82

VISUAL EXAMINATION OF .	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CRACKING AND SPALLING OF CONCRETE SURFACES IN OUTLET CONDUIT	42-INCH CAST IRON PIPE. ONLY DOWNSTREAM END IS VISIBLE.	
INTAKE STRUCTURE	AN INTAKE TOWER ON THE LEFT SHORE OF THE LAKE UPSTREAM FROM THE SPILLWAY	
OUTLET STRUCTURE	OUTLET PIPE WOULD DISCHARGE OVER A CONCRETE APRON INTO THE DISCHARGE CHANNEL	
OUTLET CHANNEL	RIPRAPPED EARTH CHANNEL.	
EMERGENCY GATE	OUTLET PIPE VALVE WAS OPERATED BY THE CITY PERSONNEL OBSERVED TO BE FUNCTIONAL.	

VISUAL INSPECTION
PHASE I
UNGATED SPILLWAY

NAME OF DAM Mill Run Dam
ID# NDI: 523 DEC 7-82

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONCRETE WEIR	THERE IS ONE SPILLWAY AND IT IS GATED N/A.	
APPROACH CHANNEL	N/A.	
DISCHARGE CHANNEL	N/A.	
BRIDGE AND PIERS	N/A	

VISUAL INSPECTION
PHASE I
GATED SPILLWAY

NAME OF DAM MILL POND DAM
ID# NDI: 532 OER. 7-82

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONCRETE SILL	GOOD CONDITION	
APPROACH CHANNEL	SOME ROCKS IN THE APPROACH CHANNEL, WHICH FELL FROM THE ADJACENT ROCK CUT. NOT AN OBSTRUCTION AT THIS TIME	STEEP ROCK CUT ADJACENT TO THE SPILLWAY SHOULD BE OBSERVED PERIODICALLY AND REMEDIAL MEASURES TAKEN TO PREVENT A ROCK SLIDE.
DISCHARGE CHANNEL	CONCRETE CHANNEL: GOOD CONDITION (SOME ROCKS IN THE CHANNEL WHICH FELL FROM THE ADJACENT ROCK CUT)	
BRIDGE PIERS	ONE BRIDGE PIER. 2½-FT WIDE CLEAR OPENING: 77½ FT WIDE 10'-3" HIGH.	
GATES AND OPERATION EQUIPMENT	INFLATABLE FABRIDAMS. DEFLATED DATE OF INSPECTION. INFLATION OF THE GATES OBSERVED.	SUDDEN FAILURE OF THESE GATES COULD CAUSE DAMAGE DOWNSTREAM. THEREFORE GATE SHOULD BE FREQUENTLY INSPECTED BY PERSONNEL EXPERIENCED IN MAINTENANCE AND OPERATION OF SUCH EQUIPMENT.

VISUAL INSPECTION
PHASE I
INSTRUMENTATION

NAME OF DAM MILL RUN DAM
ID# NJ 533 DER 7-82

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
MONUMENTATION/SURVEYS	NONE FOUND	
OBSERVATION WELLS	NONE	
WEIRS	ONE FLOW WEIR ON OUTLET PIPE DISCHARGE CHANNEL. REMOTE RECORDING EQUIPMENT NON-FUNCTIONAL	IT IS REPORTED THAT FLOW READINGS ARE NOT BEING TAKEN.
PIEZOMETERS	NONE	
OTHER	NONE	

VISUAL INSPECTION
PHASE I
RESERVOIR

NAME OF DAM MILL RUN DAM
ID# NDI: 533 DER 7-82

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SLOPES	WOODED.	
SEDIMENTATION	UNKNOWN.	

VISUAL INSPECTION
PHASE I
DOWNSTREAM CHANNEL

NAME OF DAM MILL RUN DAM
ID# NDI 533 DEP 7-82

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONDITION (OBSTRUCTIONS, DEBRIS, ETC.)	STREAM FLOWS ADJACENT TO AN OFF-STREAM RESERVOIR. DOWNSTREAM FROM PENN-CENTRAL UNDER PASS THE STREAM IS CONFINED TO A 25 FT WIDE CHANNEL SPANNED WITH NUMEROUS	BRIDGES.
SLOPES	N/A.	
APPROXIMATE NUMBER OF HOMES AND POPULATION	STREAM FLOW THROUGH CITY OF ALTOONA. HOMES ≈ 400 POPULATION: 1000 ~ 2000 (ROUGH ESTIMATE)	

APPENDIX B

CHECKLIST
ENGINEERING DATA, DESIGN,
CONSTRUCTION, OPERATION
PHASE I

CHECKLIST
ENGINEERING DATA
DESIGN, CONSTRUCTION, OPERATION
PHASE I

NAME OF DAM MILL RUN DAM
ID# NOI : 533 OER : 7-82

ITEM	REMARKS
AS-BUILT DRAWINGS	AVAILABLE IN STATE FILES.
REGIONAL VICINITY MAP	SEE PLATE 1
CONSTRUCTION HISTORY	DAM WAS DESIGNED BY GWIN ENG. INC. OF ALTOONA AND ALBRIGHT AN FRIEL ENG. INC OF PHILEDELPHIA IN 1955. CONSTRUCTION COMPLETED IN 1957
TYPICAL SECTIONS OF DAM	SEE PLATES 2 & 3
OUTLETS - PLAN - DETAILS - CONSTRAINTS - DISCHARGE RATINGS	SEE PLATES 3 THROUGH 10

CHECKLIST
ENGINEERING DATA
DESIGN, CONSTRUCTION, OPERATION
PHASE I

NAME OF DAM Mill Run Dam
ID# NDI: 533 DER: 7-82

ITEM	REMARKS
RAINFALL/RESERVOIR RECORDS	MAINTAINED BY DAM TENDER.
DESIGN REPORTS	NOT AVAILABLE (OWNER & DESIGNER CONTACTED)
GEOLOGY REPORTS	NOT AVAILABLE (OWNER & DESIGNER CONTACTED)
DESIGN COMPUTATIONS HYDROLOGY & HYDRAULICS DAM STABILITY SEEPAGE STUDIES	RESULT REPORTED IN A STATE REPORT DATED JULY 6, 1955.
MATERIALS INVESTIGATIONS BORING RECORDS LABORATORY FIELD	BORING LOGS IN DESIGN DRAWING. LABORATORY TESTS WERE CONDUCTED BY PITTSBURGH TESTING LABORATORY

CHECKLIST
ENGINEERING DATA
DESIGN, CONSTRUCTION, OPERATION
PHASE I

NAME OF DAM MILL RUN DAM
ID# NDI : 533 LHD:7-82

ITEM	REMARKS
POST CONSTRUCTION SURVEYS OF DAM	NONE REPORTED.
BORROW SOURCES	LAKE AREA.
MONITORING SYSTEMS	NONE
MODIFICATIONS	NONE REPORTED.
HIGH POOL RECORDS	~ 6-INCHES OVER THE SPILLWAY. (RECORDS MAINTAINED BY THE OWNER)

CHECKLIST
ENGINEERING DATA
DESIGN, CONSTRUCTION, OPERATION
PHASE I

NAME OF DAM MILL RUN DAM
ID# NOI 533 DER 7-8C

ITEM	REMARKS
POST CONSTRUCTION ENGINEERING STUDIES AND REPORTS	NONE FOUND, OTHER THAN RELATED TO PARTIAL FAILURE OF THE FABRIDAMS.
PRIOR ACCIDENTS OR FAILURE OF DAM DESCRIPTION REPORTS	ONE SIDE OF THE FABRIDAMS PARTIALLY FAILED ON JUNE 7 1968 CAUSING THE MILL CREEK TO OVER FLOW ITS BANKS AT SOME LOCATIONS THROUGH ALTOONA.
MAINTENANCE OPERATION RECORDS	MAINTAINED BY THE OWNER.
SPILLWAY PLAN SECTIONS DETAILS	SEE PLATE 6
OPERATING EQUIPMENT PLANS AND DETAILS	SEE PLATE 10

NAME OF DAM MILL RUN DAM

ID# NDI 533 DER 7-82

CHECKLIST
HYDROLOGIC AND HYDRAULIC
ENGINEERING DATA

DRAINAGE AREA CHARACTERISTICS: WOODED, 4.3 SQ. MILES

ELEVATION; TOP NORMAL POOL AND STORAGE CAPACITY: 2700 AC-FT @ EL 1502

ELEVATION; TOP FLOOD CONTROL POOL AND STORAGE CAPACITY: SAME AS ABOVE

ELEVATION; MAXIMUM DESIGN POOL: EL. 1506 (TOP OF GATES)

ELEVATION; TOP DAM: EL 1515

CREST: (SPILLWAY)

a. Elevation CONCRETE CREST: 1502 GATE CREST: 1506

b. Type CONCRETE OGEE, INFLATABLE GATES.

c. Width 77'-6" (CLEAR WIDTH)

d. Length N/A.

e. Location Spillover DAM CREST.

f. Number and Type of Gates 2 - INFLATABLE FABRIDAMS

OUTLET WORKS:

a. Type 42-INCH C.I PIPE

b. Location MIDDLE OF DAM

c. Entrance Inverts EL 1424

d. Exit Inverts EL 1420 ±

e. Emergency Draindown Facilities 42-INCH PIPE

HYDROMETEOROLOGICAL GAGES:

a. Type RAIN GAGE

b. Location DAM TENDERS RESIDENCE - ½ MILE DOWNSTREAM

c. Records MAINTAINED BY THE OWNER

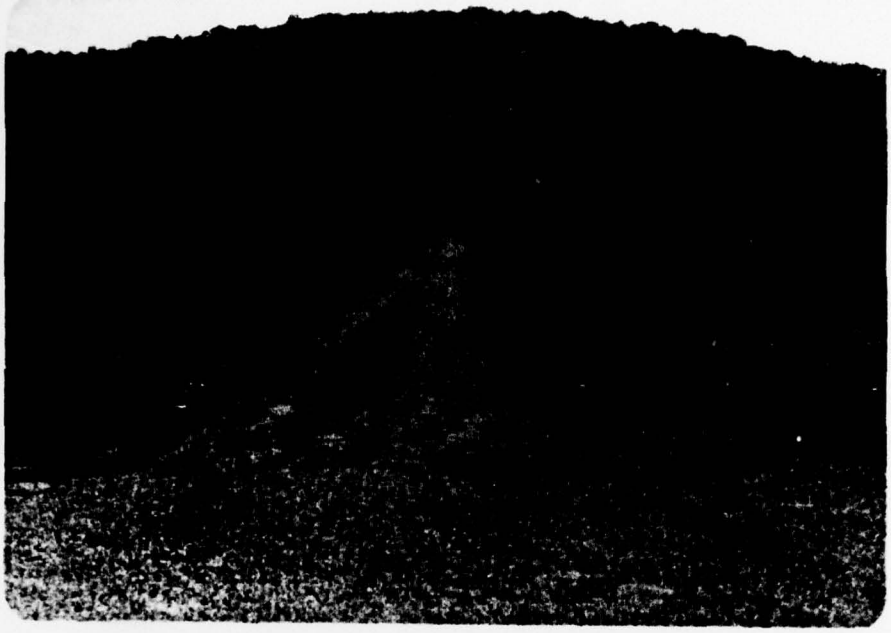
MAXIMUM NONDAMAGING DISCHARGE: ~ 2500 CFS - DOWNSTREAM CHANNEL CAPACITY.

APPENDIX C

PHOTOGRAPHS

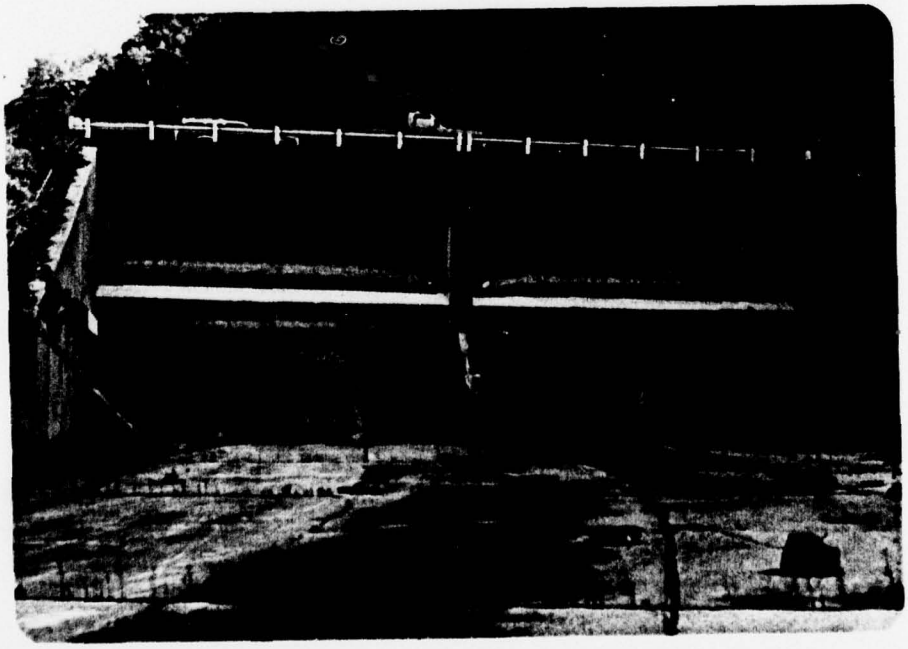
LIST OF PHOTOGRAPHS
MILL RUN DAM
NDI I.D. NO. 533
JULY 10, 1978

PHOTOGRAPH NO.	DESCRIPTION
1	Crest (looking east).
2	Spillway crest (note inflatable spillway gates).
3	Spillway discharge channel (note fallen rocks from rock cut).
4	Spillway discharge channel and plunge pool.
5	Intake tower.
6	Intake tower gate controls.
7	Lake blow-off pipe.
8	Seepage weir.
9	Penn-Central Railroad embankment.
10	Typical stream channel through Altoona.



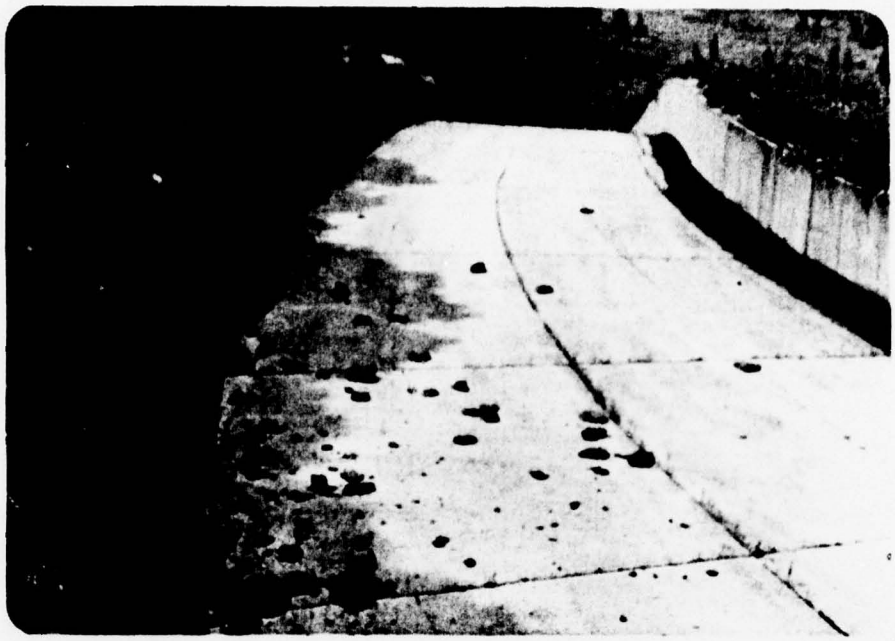
Photograph No. 1

Crest (looking east).



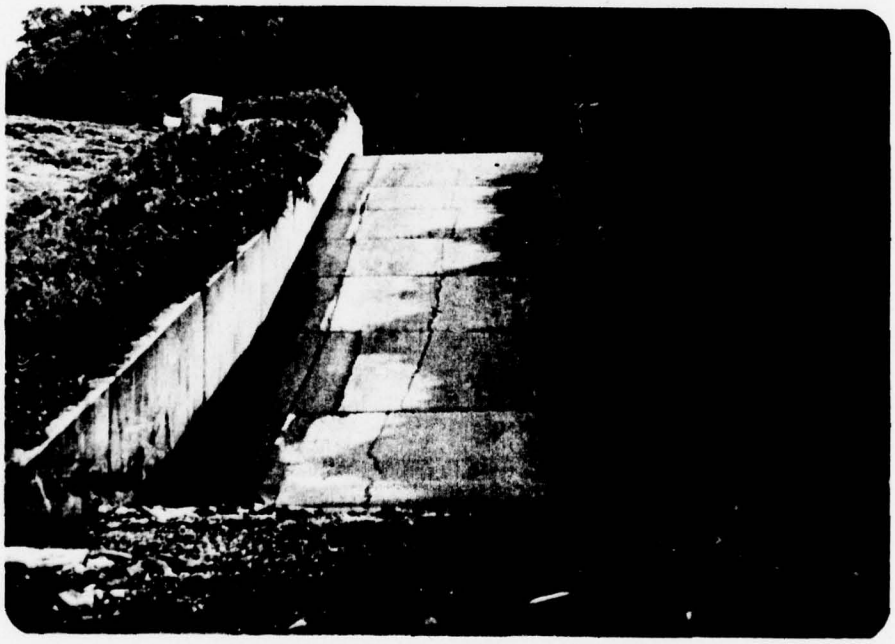
Photograph No. 2

Spillway crest (note inflatable spillway gates).



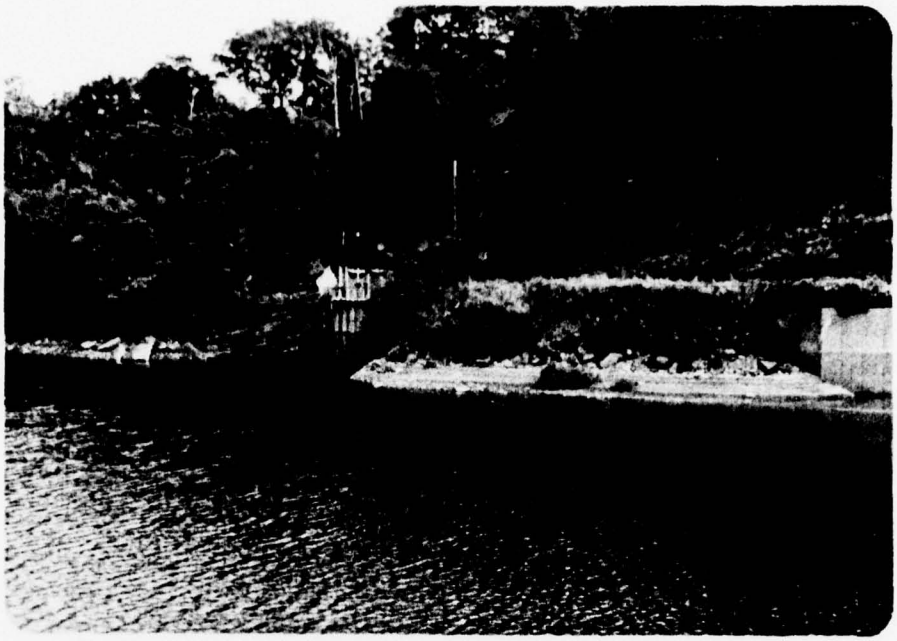
Photograph No. 3

Spillway discharge channel (note fallen rocks from rock cut).



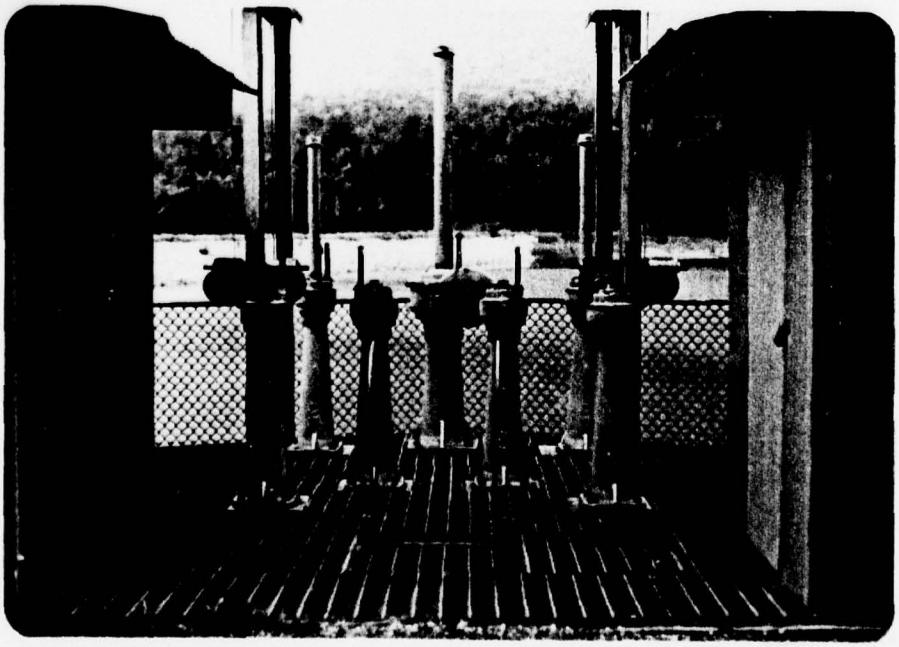
Photograph No. 4

Spillway discharge channel and plunge pool.



Photograph No. 5

Intake tower.



Photograph No. 6

Intake tower gate controls.

Photograph No. 7

Lake blow-off pipe.

Photograph No. 8

Seepage weir.

Photograph No. 9

Penn-Central Railroad embankment (2 miles downstream; stream flows through middle arch).

Photograph No. 10

Typical stream channel through Altoona.

APPENDIX D
CALCULATIONS

D'APPOLONIA
CONSULTING ENGINEERS, INC

By WTC Date 7-14-78 Subject MILL RUN DAM Sheet No. 1 of 3
Chkd. By BE Date 8-24-78 HYDROLOGY & HYDRAULIC Proj. No. 78-114-10

HYDROLOGY AND HYDRAULIC

DAM MILL RUN DAM

WATERSHED AREA $A = 4.3$ SQ. MILES

INFLOW HYDROGRAPH : BASIN SUSQUEHANNA REGION #1 BASIN
MILL RUN

PEAK INFLOW $q = 3000 \frac{cfs}{sq.mi.}$ (FROM CHARTS PROVIDED BY BALTIMORE DIST. COE)

$Q = q \cdot A = 12900$ cfs

TOTAL TIME = 24 hours

VOLUME OF INFLOW

$V_i = \frac{1}{2}(12900)(24 \times 3600)\left(\frac{1}{43560}\right)$

$= 12793$ Ac·ft

which is EQUAL TO 55.8" RUNOFF > 26"

REVISE TIME TO t_{26} FOR 26" TOTAL RUNOFF

$V_i = \frac{26}{12} \times 4.3 \times 640 = 5963$ ac·ft

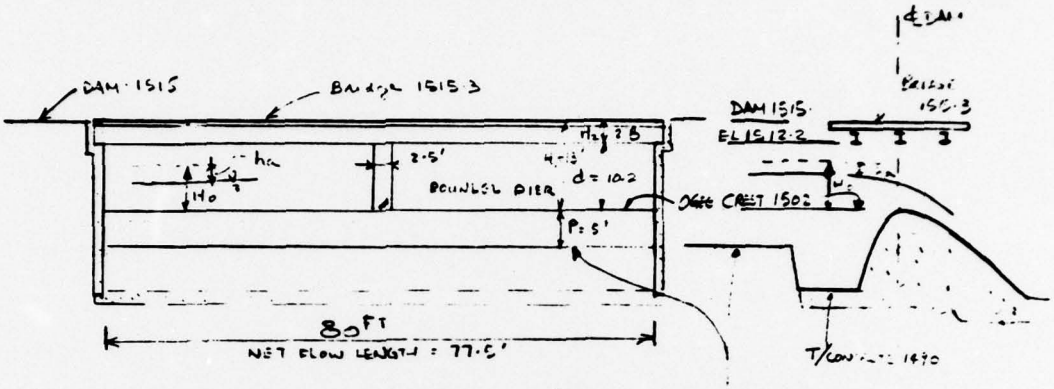
$t_{60} = \frac{5963 \times 43560}{\frac{1}{2}(12900)(3600)} = 11.2$ hours

RESERVOIR SURCHARGE = 616 ACRE-FT / 13 ft
= 426 acre-ft / 9 ft

SPILLWAY
TYPE OGEE SPILLWAY W/ FABRIC DAM
LENGTH 80 FT LESS 2.5' PIER = 77.5 FT
OGEE CREST EL 1502
FABRIC DAM CREST (When Full) EL 1506

D'APPOLONIA
CONSULTING ENGINEERS, INC

By WTC Date 7-14-78 Subject MILL RUN DAM Sheet No. 2 of 3
Chkd. By BE Date 8-24-78 HYDROLOGY & HYDRAULIC Proj. No. 78-114-10



BOTTOM OF APPROACH CHANNEL
EL 1497

DUE TO THE OBSTACLE OF Bridge, THE SPILLWAY CAPACITY HAS REDUCED BY THE CLEAR OPENNING OF 10.2' x 77.5'

REFERENCE DESIGN OF SMALL DAM 2nd EDITION 1973, P 378 to 382

$$V_a = \frac{Q}{B(H_o - h_a + P)}$$

P = 5

H_o (Reservoir W.L above El 1502) FT	$\frac{P}{H_o}$	C_o	$Q = C_o L H_o^{1.5}$ cfs	V_a fps	$h_a = \frac{V_a^2}{2g}$ ft	$H_o - h_a$ ft	
9	0.556	3.82	7993	7.6	0.90	8.1	
10	0.5	3.80	9313	8.4	1.09	8.9	
11	0.455	3.78	10688	9.0	1.28	9.7	
11.5	0.435	3.77	11394	9.4	1.38	10.1	
12	0.42	3.76	12113	9.8	1.48	10.5	> 10.2
13	0.385	3.74	13585	10.4	1.68	11.3	> 10.2

THE Bridge will not be an obstacle to spillway discharge up to Reservoir EL (1502 + 11.5) = 1513.5 or Q = 11400 ± cfs

THE DISCHARGE CAPACITY ABOVE EL 1513.5 WILL BE CONTROL BY THE Bridge openning and it is calculated as follows

D'APPOLONIA
CONSULTING ENGINEERS, INC

P.386 Fig 257 of Ref

$H_1 = H_0 = 13'$ $\quad d = 10.2'$ $\quad H_2 = H_1 - d = 2.8'$

$\frac{d}{H_1} = \frac{10.2}{13} = 0.785$

COEF OF DISCHARGE FOR ORIFICE FLOW = C = 0.6372

$Q = \frac{2}{3}\sqrt{2g}\, C\, L\, (H_1^{1.5} - H_2^{1.5})$

$= \frac{2}{3}\sqrt{644}\,(0.6372)(77.5)\,(13^{1.5} - 2.8^{1.5})$

$= 11146 \text{ cfs} \approx 11400 \text{ cfs}$

FOR ALL practical purpose use $\boxed{Q_{max} = 11400 \text{ cfs}}$

PERCENT OF PMF WITHOUT OVERTOPPING

$= \left(\frac{11200}{12900} + \frac{616}{5963}\right) 100\% \text{ PMF}$

$= 97\% \text{ PMF} \approx 100\% \text{ PMF}$

FOR ALL PRACTICAL PURPOSE, THE DAM & SPILLWAY IS ADEQUATE FOR PMF STORM DESIGN if the FABRIC DAM WERE DOWN @ THE BEGINING OF STORM

HOWEVER if the FABRIC DAM DID NOT DEFLATED IN TIME OVERTOPPING OF DAM IS POSSIBLE.

APPENDIX E
REGIONAL GEOLOGY

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The Mill Run Reservoir is located at the northwest edge of the folded belt of the Appalachian Mountain System. The dam is located on strata of the Lower Catskill Formation (Devonian Age). The rock strata consist of thin-bedded highly fractured reddish-brown silty claystones with some interbedded green-gray shales and sandstones. The strata dip moderately to the northwest and the fracture systems in general trend northwest and north-south. Since the more easily weathered rock types predominate in the slopes, in general they are relatively gentle. Sandstone probably predominates in the area of the east abutment and minor rock slides could be expected due to the claystones weathering below sandstone layers.