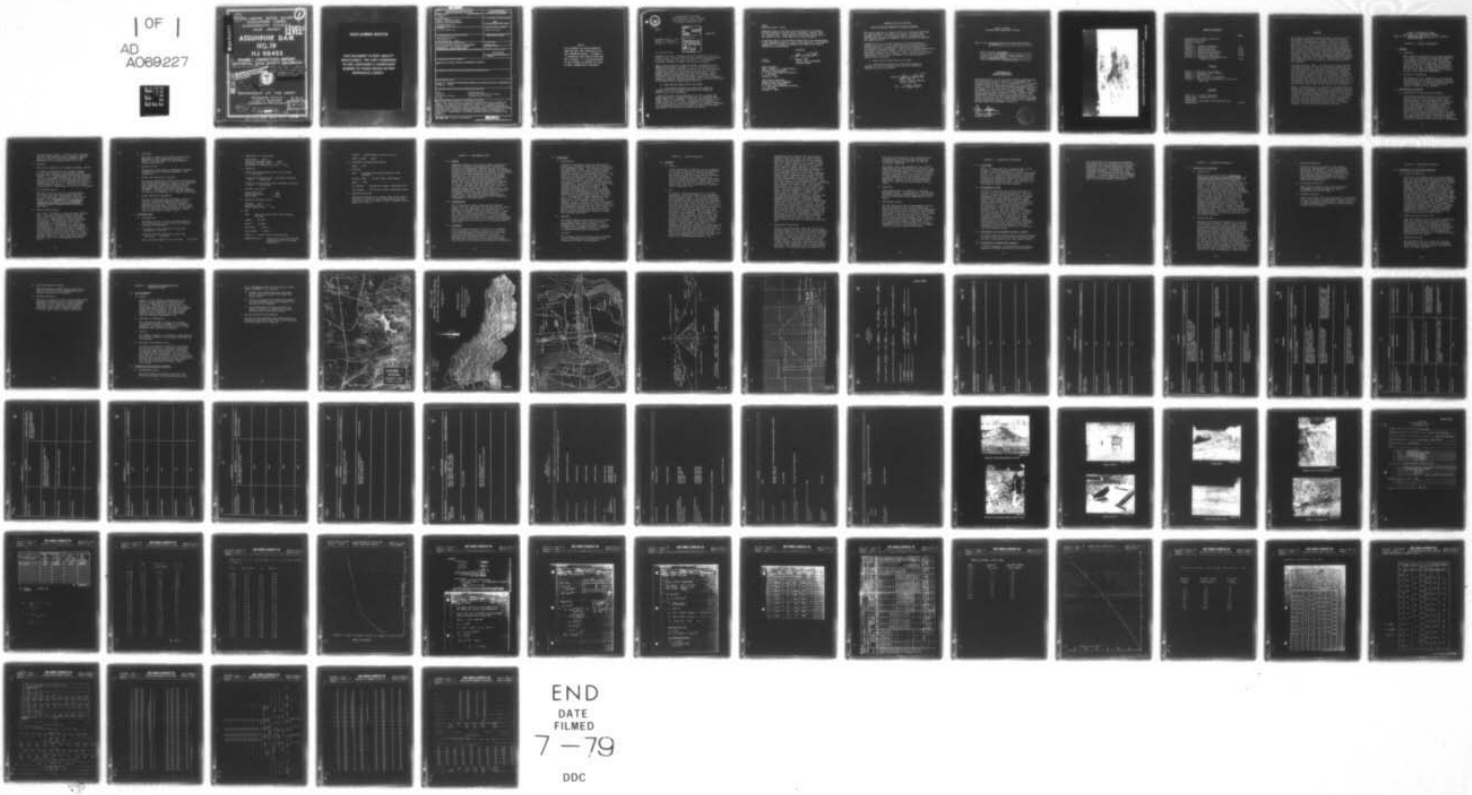
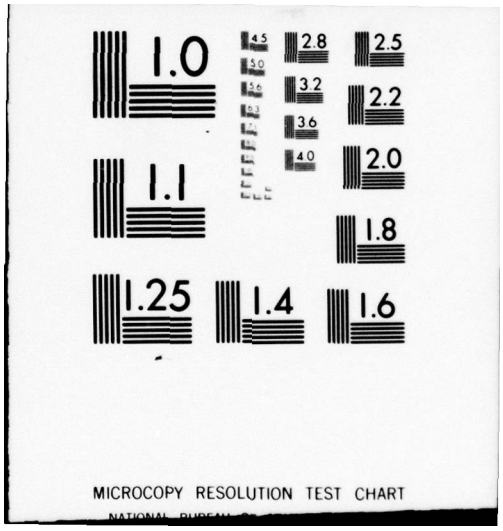
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DELAWARE RIVER BASIN
ASSUNPINK CREEK
MONMOUTH COUNTY
NEW JERSEY

LEVEL III

# ASSUNPINK DAM NO.19 NJ 00453

## PHASE 1 INSPECTION REPORT NATIONAL DAM SAFETY PROGRAM.

Assunpink Dam, Number 19. (NJ00453). Delaware River Basin. Assunpink Creek, Monmouth County, New Jersey. Phase 1 Inspection Report.

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(10) F. Keith /Jolls

DEPARTMENT OF THE ARMY
Philadelphia District
Corps of Engineers
Philadelphia, Pennsylvania

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| 4. TITLE (and Subtitle)<br>Phase I Inspection Report<br>National Dam Safety Program<br>Assunpink Dam No 19<br>Monmouth County, N.J. | | 5. TYPE OF REPORT & PERIOD COVERED<br>FINAL<br>6. PERFORMING ORG. REPORT NUMBER |
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19. KEY WORDS (Continue on reverse side if necessary and identify by block number)

Dams
Spillway
Structural Analysis
Safety
Visual Inspection
National Dam Inspection Act Report
Assunpink Dam No. 19, N.J.

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

This report cites results of a technical investigation as to the dam's adequacy. The inspection and evaluation of the dam is as prescribed by the National Dam Inspection Act, Public Law 92-367. The technical investigation includes visual inspection, review of available design and construction records, and preliminary structural and hydraulic and hydrologic calculations, as applicable. An assessment of the dam's general condition is included in the report.

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7 MAY 1979

Honorable Brendan T. Byrne
Governor of New Jersey
Trenton, New Jersey 08621

Dear Governor Byrne:

Inclosed is the Phase I Inspection Report for Assunpink Dam No. 19 in Monmouth County, New Jersey which has been prepared under authorization of the Dam Inspection Act, Public Law 92-367. A brief assessment of the dam's condition is given in the front of the report.

Based on visual inspection, available records, calculations and past operational performance, Assunpink Dam No. 19, initially listed as a high hazard potential structure but reduced to a low hazard potential structure as a result of this inspection, is judged to be in good overall condition and the spillway is considered adequate. The low hazard potential classification means that in the event of failure of the dam, no loss of life and only minimal economic loss is expected. However, to assure the continued functioning of the dam and its impoundment, the following remedial actions could be undertaken:

a. Repair and seed eroded areas on all slopes.

b. Place additional barriers at access points around the perimeter of the dam to prevent erosion caused by unauthorized vehicular use of the dam surfaces.

A copy of the report is being furnished to Mr. Dirk C. Hofman, New Jersey Department of Environmental Protection, the designated State Office contact for this program. Within five days of the date of this letter, a copy will also be sent to Congressman Frank Thompson, Jr. of the Fourth District. Under the provisions of the Freedom of Information Act, the inspection report will be subject to release by this office, upon request, five days after the date of this letter.

NAPEN-D
Honorable Brendan T. Byrne

Additional copies of this report may be obtained from the National Technical Information Services (NTIS), Springfield, Virginia 22161 at a resonable cost. Please allow four to six weeks from the date of this letter for NTIS to have copies of the report available.

An important aspect of the Dam Safety Program will be the implementation of the recomendations made as a result of the inspection. We accordingly request that we be advised of proposed action taken by the State to implement our recommendations.

Sincerely,

JAMES G. TON
Colonel, Corps of Engineers
District Engineer

1 Incl
As stated

Copies furnished:
Dirk C. Hofman, P.E., Deputy Director
Division of Water Resources
N. J. Dept of Environmental Protection
P. O. Box CN029
Trenton, NJ 08625

John O'Dowd, Acting Chief
Bureau of Flood Plain Management
Division of Water Resources
N. J. Dept. of Environmental Protection
P. O. Box CN029
Trenton, NJ 08625

ASSUNPINK DAM NO. 19 (NJ00453)

CORPS OF ENGINEERS ASSESSMENT OF GENERAL CONDITIONS

This dam was inspected on 4 January 1979 by Louis Berger and Associates, Inc. under contract to the State of New Jersey. The state, under agreement with the U. S. Army Engineer District, Philadelphia, had this inspection performed in accordance with the National Dam Inspection Act, Public Law 92-367.

Assunpink Dam No. 19, initially listed as a high hazard potential structure but reduced to a low hazard potential structure as a result of this inspection, is judged to be in good overall condition and the spillway is considered adequate. The low hazard potential classification means that in the event of failure of the dam, no loss of life and only minimal economic loss is expected. However, to assure the continued functioning of the dam and its impoundment, the following remedial actions could be undertaken:

a. Repair and seed eroded areas on all slopes.

b. Place additional barriers at access points around the perimeter of the dam to prevent erosion caused by unauthorized vehicular use of the dam surfaces.

APPROVED: James G. Ton

JAMES G. TON
Colonel, Corps of Engineers
District Engineer

DATE: 7 May 1979

PHASE I REPORT
NATIONAL DAM INSPECTION PROGRAM

Name of Dam Assunpink Dam No. 19 Fed ID# NJ 00453
NJ ID# 594

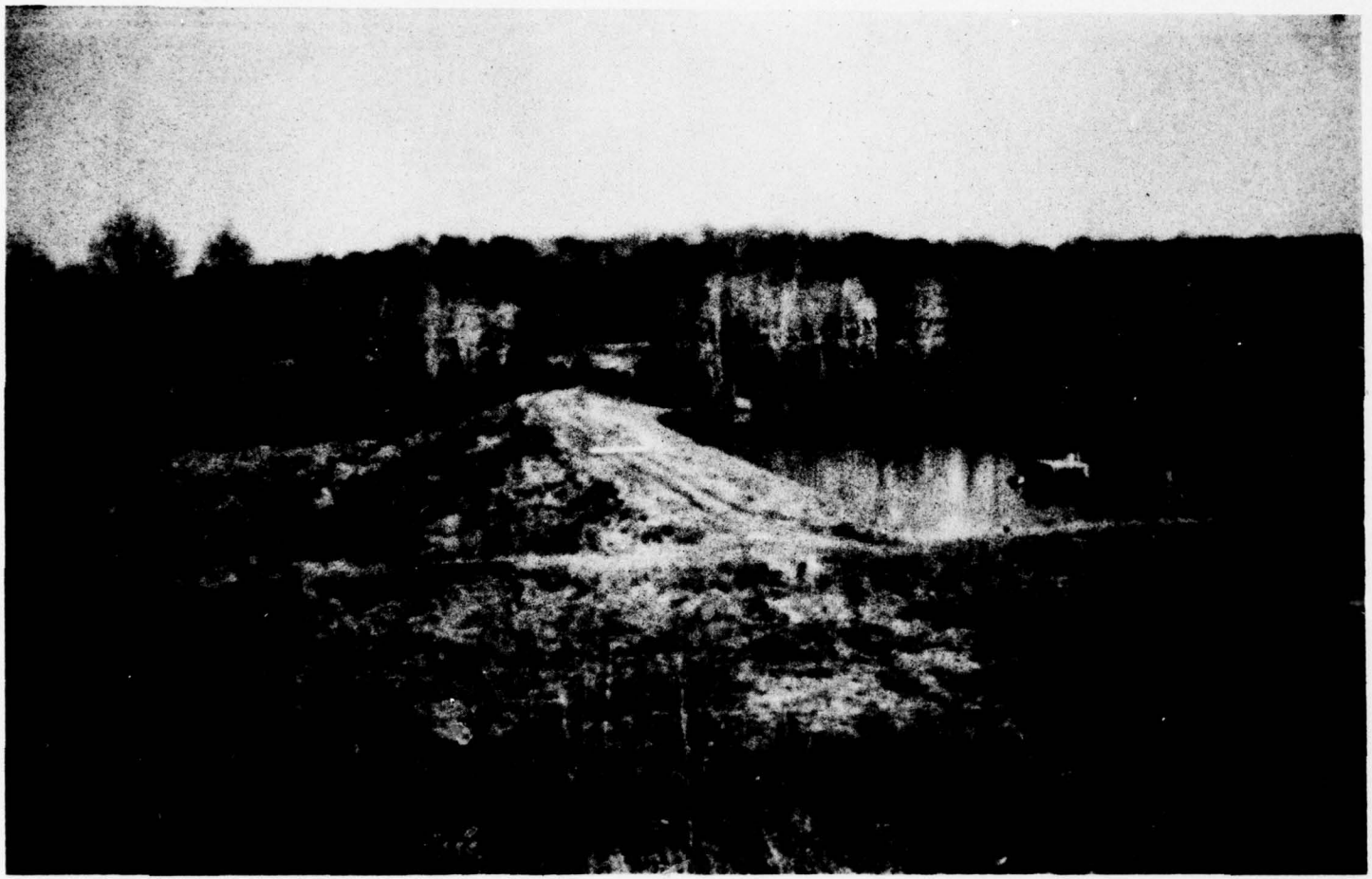
State Located New Jersey
County Located Monmouth
Coordinates Lat. 4012.3 - Long. 7429.5
Stream Assunpink Creek
Date of Inspection 4 January 1979

## ASSESSMENT OF GENERAL CONDITIONS

Assunpink Dam No. 19 is in a good overall condition and has sufficient spillway capacity to accommodate the 100-year design flood. It is recommended that its hazard classification be downgraded to low as it is situated within an official Fish and Wildlife Management Area and overtopping or collapse would not appreciably increase the danger of loss of life or property damage. No detrimental findings were uncovered to merit further study. Recommended remedial actions to be undertaken in the future as part of the State maintenance program include repair and seeding of the eroded areas of all slopes and placing additional vehicular barriers at the accessible points around the perimeter of the dam.

F. Keith Jolls P.E.
Project Manager





OVERVIEW OF ASSUNPINK CREEK WATERSHED DAM SITE #19

DECEMBER, 1978

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# PREFACE

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

In reviewing this report, it should be realized that the reported condition of the dam is based on observations of field conditions at the time of inspection along with data available to the inspection team. It is important to note that the condition of a dam depends on numerous and constantly changing internal and external conditions, and is evolutionary in nature. It would be incorrect to assume that the present condition of the dam will continue to represent the condition of the dam at some point in the future. Only through continued care and inspection can there be any chance that unsafe conditions be detected.

Phase I inspections are not intended to provide detailed hydrologic and hydraulic analyses. In accordance with the established Guidelines, the Spillway Test flood is based on the estimated "Probable Maximum Flood" for the region (greatest reasonably possible storm runoff), or fractions thereof. The test flood provides a measure of relative spillway capacity and serves as an aide in determining the need for more detailed hydrologic and hydraulic studies, considering the size of the dam, its general condition and the downstream damage potential.

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM
NAME OF DAM: ASSUNPINK DAM SITE NO. 19 FED #NJ00453
AND NJ ID #594

## SECTION 1 - PROJECT INFORMATION

### 1.1 GENERAL

a. Authority

This report is authorized by the Dam Inspection Act, Public Law 92-367, and has been prepared in accordance with Contract FPM-36 between Louis Berger & Associates, Inc. and the State of New Jersey and its Department of Environmental Protection, Divison of Water Resources. The State, in turn, is under agreement with the U.S. Army Corps of Engineers, Philadelphia to have this inspection performed.

b. Purpose of Inspection

The purpose of this inspection is to evaluate the structural and hydraulic condition of the Assunpink Dam No. 19 and appurtenant structures, and to determine if the dam constitutes a hazard to human life or property.

### 1.2 DESCRIPTION OF PROJECT

a. Description of Dam and Appurtenances

The dam at Assunpink Site No. 19 (a/k/a Stone Tavern Lake) is a two zone, 715 foot long earthen structure with an impermeable core and cutoff key. The dam crest is at elevation 164.9 and creates a multi-purpose reservoir on an unnamed branch of Assunpink Creek within the officially designated State Fish and Wildlife Area. The upstream face is protected by riprap between elevations 147 and 159.5. The principal discharge outlet consists of a drop inlet structure containing a two-stage reinforced concrete riser, a 30-inch diameter reinforced concrete outlet pipe, and a reinforced

concrete impact basin. A 75-foot wide trapezoidal auxiliary spillway with a negative approach slope is located at the left abutment. The embankment has a maximum height of 36 feet.

b. Location

The dam is located on an unnamed tributary (which

is south of and parallel to the main stream) in the upper reaches of the Assunpink Creek drainage area in Upper Freehold Township, Monmouth County. It is approximately one and three-tenths of a mile southwest of Roosevelt and two and four-tenths miles west of the intersection of county highways 571 and 574 and is located about 2½ miles above Assunpink Dam No. 4. The dam is roughly 6 miles east of Interchange 7A on the N.J. Turnpike.

c. Size Classification

The dam at Site No. 19 has a maximum height of 36 feet and a maximum storage capacity of 1,160 acre-feet. Accordingly, this dam is placed in the intermediate size category as defined by the criteria in the Recommended Guidelines for Safety Inspection of Dams (storage capacity between 1,000 and 50,000 acre-feet).

d. Hazard Classification

This dam is located in a fish and game wildlife area. The only structure between this dam and another larger flood control structure (Site No. 4) downstream is a small secondary road bridge. The downstream flood plain is uninhabited and accordingly, this dam is recommended to be downgraded to a low hazard classification. If this dam should collapse and completely discharge its total storage of 1,160 acre-feet into the reservoir at Dam No. 4, little effect would be felt as Dam No. 4 has a storage capacity of over 3,000 acre-feet above spillway crest and a large auxiliary spillway. Further, there is no development below Dam No. 4.

e. Ownership

This dam is owned by the State of New Jersey, Department of Environmental Protection, Division of Fish, Game, and Shellfisheries, Trenton, New Jersey.

f. Purpose of Dam

The purpose of the dam is floodwater retention, sediment storage, wildlife management, and recreation.

g. Design and Construction History

The dam was designed in 1967 by the United States Soil Conservation Service as part of the Assunpink Creek Watershed floodwater retention program and constructed under the authority of the Watershed Protection and Flood Prevention Act (PL 566). Construction of the dam was completed in 1971 by C.C. Anselman Inc., General Contractors.

h. Normal Operating Procedures

The dam is maintained by personnel of the N.J. Division of Fish and Game but there are no routine, day-to-day, operational procedures performed at this dam. The water level in the lake is regulated during the year at the direction of the Bureau of Fisheries with changes occuring only once or twice a year.

## 1.3 PERTINENT DATA

a. Drainage Area

Assunpink Site No. 19 has a drainage area of 1.77 square miles which consists of woodland, cropland and meadowland.

b. Principal spillway capacity at dam crest elevation - 120 cfs

Auxiliary spillway capacity at dam crest elevation - 1,450 cfs

Total spillway capacity at top of dam - 1,570 cfs

c. Elevations (ft. above MSL)

Top of dam - 164.9
Principal spillway crest - 156.5
Auxiliary spillway crest - 160.9
Streambed at centerline of dam - 129±

d. Reservoir

Length of maximum design pool (top of dam) - 5,020 feet

Length of recreation pool ( principal spillway crest) - 4,400 feet

Length of flood control pool (auxiliary spillway crest) - 4,670 feet

e. Storage (acre-feet)

| | | |
|---|---|---|
| Recreation pool | - | 490 |
| Flood control pool | - | 805 |
| Top of dam | - | 1,160± |

f. Reservoir Surface (acres)

Top dam - 112.5
Recreation pool - 56
Flood control pool - 86.5

g. Dam

Type - Earth with drop inlet and auxiliary spillway

Length - 715 feet

Height - 36 feet

Top Width - 15 feet

Side Slopes - 2.5H:1V

Zoning - 2 zones (see attached plans)

Impervious Core - Clayey and silty sand (SC-SM) compacted to 95% of maximum dry density.

Cutoff - Keyed section at base of core.

Grout curtain - None

h. Diversion and Regulating Tunnel

Type - None

i. Spillway

Type - Auxiliary channel excavated at left abutment.

Channel width - 75 feet (3H:1V sideslopes)

Gates - None

U/S Channel - Negatively sloped, vegetated inlet

D/S Channel - Positively sloped, vegetated outlet

j. Regulating Outlets

Principal spillway is a 2 stage, drop inlet structure with a 30-inch diameter reinforced concrete outlet pipe and a low water 12"x12" drawdown outlet. Crest El. = 156.5.

## SECTION 2 - ENGINEERING DATA

### 2.1 DESIGN

Complete details of the initial design report and work plan, hydraulic determinations, structural analyses and subsurface information were available at the Soil Conservation Service offices (in Somerset) together with as-built plans and records of the various corrective measures undertaken since the initial construction. All design was done in accordance with SCS criteria and was discussed with engineering personnel of their staff who explained in detail the various design and operational features of the dam, particularly the hydraulics of the spillways. The main spillway drop inlet structure is a two-stage deep-well concrete riser of a standard design developed by the Saint Anthony Falls Hydraulic Laboratory. The impact basin is also of a standard design developed by the Bureau of Reclamation. This type of energy dissipator is rather widely used and functions almost completely independent of tailwater head.

### 2.2 CONSTRUCTION

The construction closely followed the contract plans. The SCS supervised the construction on lands acquired by the Department of Conservation and Economic Development with Green Acres funds. There have been no major structural modifications since the initial construction except in 1977 when additional subsurface drainfill was installed immediately above and along the sides of the impact basin headwall. Stone riprap was also placed on the upstream face at this time.

### 2.3 OPERATION

As the principal purpose of the dam is to reduce urban flooding in Trenton as well as to establish a wildlife management and recreational area, the multi-purpose operation appears to function properly under the aegis of the Division of Fish and Game who regulate the water level seasonally. (See Section 4 for additional operational information).

## 2.4 EVALUATION

a. Availability

Sufficient engineering data was obtained to assess the structural stability with regard to the embankment zones. The foundation stability was delineated in the various soils reports prepared by the SCS (which analyzed all geotechnical aspects in considerable detail). The soils at the dam consist of Coastal Plains sediments of glauconitic Navesink sands underlaid by Mount Laurel - Wenonah sands. All overlying organic alluvium was stripped before construction. The stability of the slopes were checked by the Swedish circle method and provided adequate factors of safety. Some concern was expressed at the time of design regarding the permeability of the clean sand beneath the right abutment and the structural behavior of the considerable amount (20,000 ± c.y.) of glauconitic sands employed at this site. The SCS soils report states that its behavior as a construction material was unknown in 1967. However, their tests revealed adequate compacted densities, shear strengths and permeability rates and the glauconitic sand was ultimately employed in the core. Shell material was selected from the Red Bank Sand which overlaid the Navesink Formation above the auxiliary spillway.

b. Adequacy

The field inspection and review of the available design plans reveal that the dam is structurally sound and well-built. It is believed that the data available is adequate to render this assessment without recourse to gathering additional information.

c. Validity

The validity of the engineering data available is not challenged and is accepted without recourse to further investigations.

## SECTION 3 - VISUAL INSPECTION

### 3.1 FINDINGS

a. General

Visual inspection of Dam No. 19 was conducted on January 4, 1979 with engineering personnel of the SCS and Division of Fish and Game. The overall condition of the dam was reviewed with its designers who pointed out the localized problem areas and remedial measures that have been undertaken. Water level in the lake at the time of the inspection was at normal pool elevation 156.5 and the tailwater was at elevation 130.7.

b. Dam

In general, the dam appeared to be in good condition. Some light growth was observed on the embankment slopes. The riprap protection of the upstream face of the dam was uniformly distributed and well aligned with the exception of a two foot wide swath directly opposite the principal spillway intake structure. At this location the riprap has been displaced laterally to the sides as well as downslope into the reservoir. This displacement is reportedly the result of vandalism. The embankment is a slightly curved structure lying between two naturally higher abutment zones on each side of the river channel. The dam has numerous prominent vehicular tracks along the crest dispite the existence of a transverse steel barrier. These tracks (the results of unauthorized vehicles) extend in a southwesterly direction across the auxiliary spillway and up the left abutment; deep erosion gullies have been cut on the left wall of the spillway. There are several rodent burrows near the right end of the embankment and partially frozen cracks in the embankment surface. The

examination also revealed the existence of numerous small (8" deep x 12" long) surface cracks on the downstream face of the embankment which were located 6 to 10 feet up from the toe. These could be the result of frost action (several small capillary "ice flowers were noted) or animal burrows. Slightly below the toe seepage was observed emanating at the extremes of the cleared zone. The flow continues along the toe to the discharge channel where, combined with seepage from the filter drain around the impact basin, it has caused considerable erosion and sloughing of the right bank of the discharge channel. This area has previously been backfilled and stabilized with riprap and crushed stone. The eroded area extends to a point a few feet above and behind the right wingwall of the outlet structure. Similar seepage and erosion was noted behind the left wingwall. Seepage issuing from around the impact basin has a high iron precipitate content which is staining the concrete and silting the discharge channel immediately downstream. Discharge from toe drains located at the end of the wingwalls also contained a high percentage of iron. The heavy rust-colored precipitate is probably derived from the iron oxide binder frequently found in the Red Bank sands, which were utilized in the shell material for the embankment and are also found in the nearby left abutment. Higher up the slope of the left embankment seepage was noted emanating from a point about 65 feet downstream from the crest of the dam. The site of this clear flow is roughly at elevation 139.

c. Appurtenant Structures

The main spillway riser tower and outfall are located roughly 135 feet from the left abutment. The upper portion of the 33-foot high reinforced concrete riser and the impact basin are in good condition. There are clear trash racks at each opening and the stem-operated gate is in good working order. Although the location of the intake structure (60 feet offshore) precluded a close visual inspection, the concrete, grates, and trash racks appeared to be in satisfactory condition. It was noted that the wheel to the

gate stem was missing but the representative of the Bureau of Fish and Game advised the inspection team that the wheel is removed to prevent vandalism.

The impact basin also appeared to be in good condition and was functioning as designed. Some light efflorescence was noted where the conduit emerges from the headwall. The grass covered auxiliary spillway is 75 feet wide and appeared in good condition with the exception of the erosion gullies and vehicle tracks previously described. Similar to the main embankment, most of the side slopes have adequate ground cover.

d. Reservoir

Stone Tavern Lake is located in a sparsely developed region. The reservoir is surrounded by gently sloping, wooded banks to the east and west and cultivated fields immediately to the south.

e. Downstream Channel

The area below the dam is undeveloped with the terrain flattening out near the downstream confluence with the main stream of the Assunpink Creek. The flood plain consists of open fields and wooded stands and is all within the wildlife reservation. The natural channel is quite narrow and relatively shallow. The left side of the flood plain rises somewhat more abruptly than the gradual slopes to the right. The only channel restriction between the dam and Assunpink Site No. 4 downstream is the lightly-travelled Cooleys Corner Road bridge.

## SECTION 4 - OPERATIONAL PROCEDURES

### 4.1 PROCEDURES

Dam No. 19 functions as an integral part of the Assunpink Creek Watershed flood control system, as well as providing a wildlife and recreational area. Operational procedures are governed by the N.J. Division of Fish and Game, Bureau of Fisheries who prescribe changes in the lake level periodically during the year. The regulation is performed by field personnel of the N.J.D.F. & G. who manually adjust the gate opening.

### 4.2 MAINTENANCE OF DAM

The dam is maintained by personnel of the N.J. Division of Fish and Game whose field office is located a short distance downstream. They are responsible for all aspects of the dam's upkeep and safety including grounds keeping, riprap repair, inlet structure operation and repair, impact basin maintenance and routine patrolling and inspection. A recurring problem appears to be the use of unauthorized vehicles on the dam embankment. They have created deep erodable ruts in the shell material covering both the dam and auxiliary spillway. A barrier has been erected across the crest of the dam to prevent passage, but appears to be only minimally effective. The barrier has been vandalized in the past and replaced. Minor defects such as this are corrected as required, but problems of a more serious nature involving structural aspects are referred to the Soil Conservation Service for additional investigation and remedial action.

### 4.3 DESCRIPTION OF ANY WARNING SYSTEM IN EFFECT

No formal warning system exists although personnel of the Division of Fish and Game regularly patrol the dam in conjunction with their other duties.

### 4.4 EVALUATION OF OPERATIONAL ADEQUACY

A formal inspection is performed by engineering personnel of NJDFG and SCS on an annual basis.

The operational and maintenance procedures are considered to be adequate and efficiently performed. The design inherently provides flood control (and dam protection) without attendant personnel. Consequently, the only operations required are limited to those necessary for recreational and environmental purposes. A warning system is not considered essential since the downstream area is also part of the same wildlife reservation.

## SECTION 5 - HYDRAULIC/HYDROLOGIC

### 5.1 EVALUATION OF FEATURES

a. Design Data

Based on the criteria in the Recommended Guidelines for Safety Inspection of Dams, the 100-year frequency event was selected as the design storm by the inspecting engineer. Precipitation data was obtained from Technical Paper 40 and NOAA Technical Memorandum NWS Hydro - 35. Storage data and time of concentration were obtained from the Soil Conservation Service design calculations and reviewed in the context of the above inspection criteria. Inflow to the reservoir for the selected 100-year storm was computed utilizing the HEC-1 computer program. This gave a peak inflow to the reservoir of 1,850 cfs. Routing this through the controlled-release reservoir reduced the peak to 140 cfs. The combined spillways have a maximum discharge capacity of approximately 1,570 cfs before overtopping occurs and can therefore accommodate the design flood. The depth of overflow in the auxiliary spillway is less than one foot for the design discharge.

b. Experience Data

The dam was originally designed for a 100-year frequency storm using a time of concentration of 2.5 hours. In the original design, annual flood peak discharges were obtained from USGS records for 1924-58 from gaging data in Trenton and detailed hydraulic analyses, including infiltration studies, were exhaustively performed by the SCS to quantify final design values against the economical apportionment of the dam. The crest elevation was established by routing the proportionate freeboard hydrographs of the 100-year flow (3,650 cfs) at Trenton. The auxiliary spillway height was established so that no design flow (according to SCS procedures) ever reaches the spillway crest; the auxiliary spillway is truly an emergency, safety feature.

c. Visual Observations

With the water at low stage at the time of inspection, approximately 3 cfs was flowing out of the 30" outfall. Visual observations confirmed all the aspects and assumptions of the original design, although it is felt that the subsurface seepage losses through the underlying foundation material are somewhat higher than anticipated.

d. Overtopping Potential

There are no records of the dam having been overtopped and the spillways can easily accommodate the design flood.

e. Drawdown Potential

Using the 12"x12" sluice gate opening at the bottom of the riser tower it would take slightly less than 12 days to dewater the reservoir. There is only a slight possibility that there would be tailwater at the time of drawdown.

## SECTION 6 - STRUCTURAL STABILITY

### 6.1 EVALUATION OF STRUCTURAL STABILITY

a. Visual Observations

In view of the relative age of the dam embankment, the well-designed and supervised construction and the continuous maintenance, the dam at Assunpink Site No. 19 is deemed to be in a good overall condition. The upper zones of the recently placed riprap protection show little evidence of subgrade subsidence and the main embankment crest and adjoining cut slopes along the auxiliary spillway are at true design grade and are marred only by vehicular rutting. The inspection team noted the continual maintenance problem of backslope erosion and apparent seepage at the downstream toe. The toe drains in the vicinity of the impact basin appear to be under a continuous, but modest, head. In summary, nothing was visually noted to create or worsen a hazardous condition that cannot be readily maintained or corrected. The only drainage element not visible for inspection was the lower portions of the intake riser.

b. Design and Construction Data

From the review of the soils report recommendations and contract plans for the initial construction, the design appears to be well-engineered, reflect a conservative approach and employs conventional analytical techniques. Based upon the condition of the dam and the hazard classification, it is believed that additional design studies are unnecessary under the purview of PL 92-367.

c. Operating Records

The performance of this structure has been satisfactory since its completion, although certain normal remedial repairs and modifications have been required.

d. Post Construction Changes

There have been no major modifications since the 1977 addition of the riprap protective blanket and the filter drainfill.

e. Seismic Stability

The dam is located in Zone 1 and has negligible potential vulnerability to seismic loadings. Experience of the inspection team indicates that dams in this zone will have adequate stability under dynamic loading conditions if stable under static loading conditions.

## SECTION 7 - ASSESSMENTS/RECOMMENDATIONS/ REMEDIAL ACTIONS

### 7.1 DAM ASSESSMENT

a. Safety

Subject to the inherent limitations of the Phase I visual inspection, Assunpink Dam No. 19 is judged to be in a good overall condition. Overtopping of the dam is a very remote possibility and no seriously detrimental conditions were observed. The dam is recommended to be reclassified in a low hazard category due to location within the State Fish and Wildlife Management area.

b. Adequacy of Information

The information made available by the Soil Conservation Service is deemed to be adequate regarding the analyses and evaluation of safe operation and structural stability.

c. Urgency

No immediate urgency is attached to implementing any further studies or the remedial measures set forth below.

d. Necessity for Further Study

In view of the overall condition of this dam and the fact that it is continually monitored by trained engineering personnel, additional inspections under the purview of P.L. 92-367 are deemed to be unnecessary. The Division of Fish and Game, in conjunction with SCS engineers, maintain an internal system of annual inspections and emergency action plans which basically reflect the requirements mandated under P.L. 92-367.

### 7.2 RECOMMENDATIONS/REMEDIAL MEASURES

a. Recommended Action

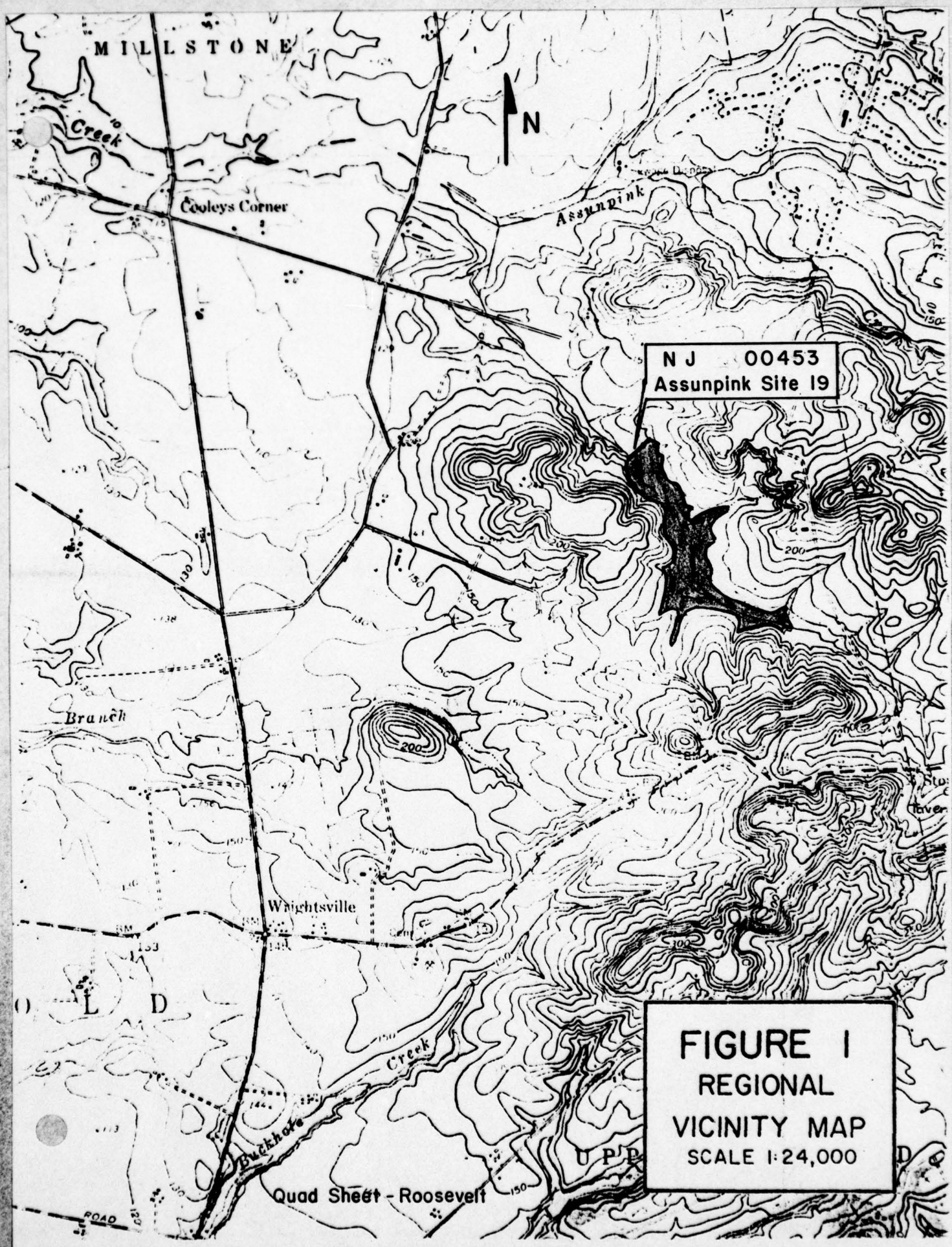
Under the current Assunpink Creek Fish and Wildlife Management Area maintenance program,

it is recommended that the following be taken under advisement in the future:

- Regrade the eroded backslopes and sides of the auxiliary channel and reseed the barren areas.
- Continue to monitor the backslope seepage and the subgrade drains which appear to be susceptible to clogging.
- Place additional vehicular barriers at various locations to inhibit the illegal vehicular use on the dam surfaces.

b. O&M Maintenance and Procedures

In view of the assessment contained herein, no additional procedures other than those presently in effect appear to be required.


MILLSTONE
Creek
Cooleys Corner
N
Assunpink
NJ 00453
Assunpink Site 19
Branch
Wrightsville
Creek
Buckhole
Quad Sheet - Roosevelt
FIGURE 1
REGIONAL
VICINITY MAP
SCALE 1:24,000

# PROJECT MAP
## ASSUNPINK CREEK WATERSHED
### MERCER AND MONMOUTH COUNTIES, NEW JERSEY

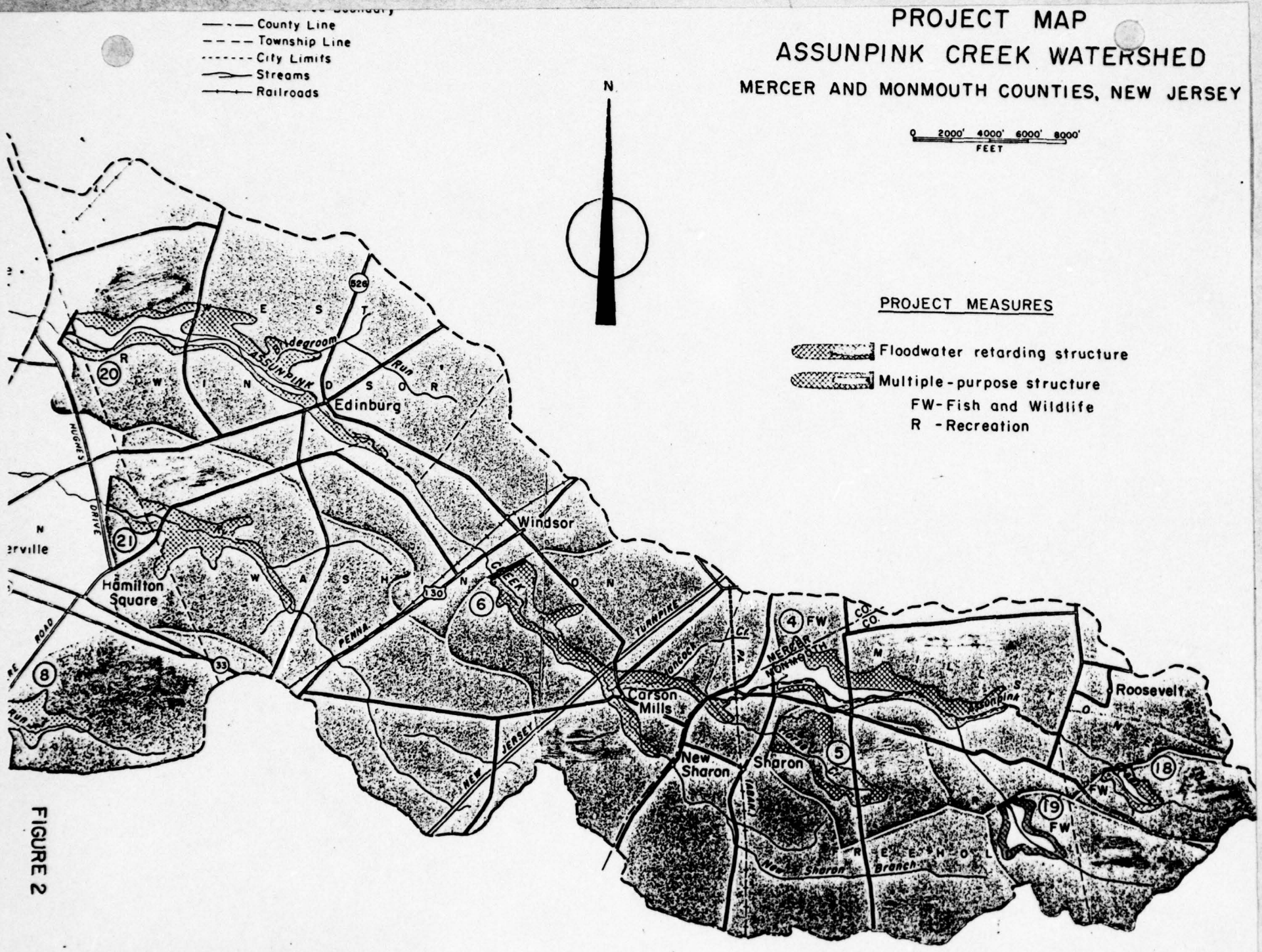



FIGURE 2

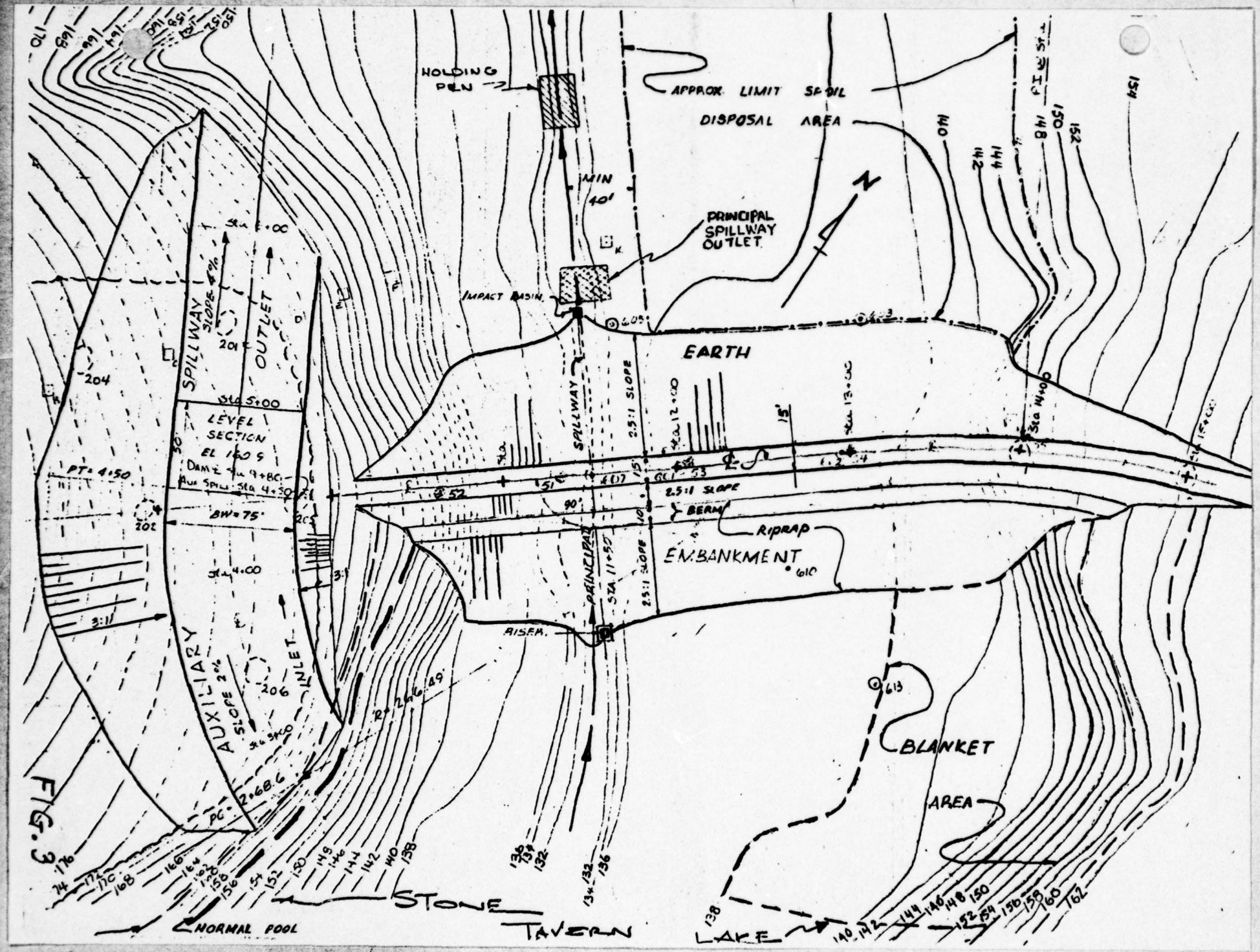
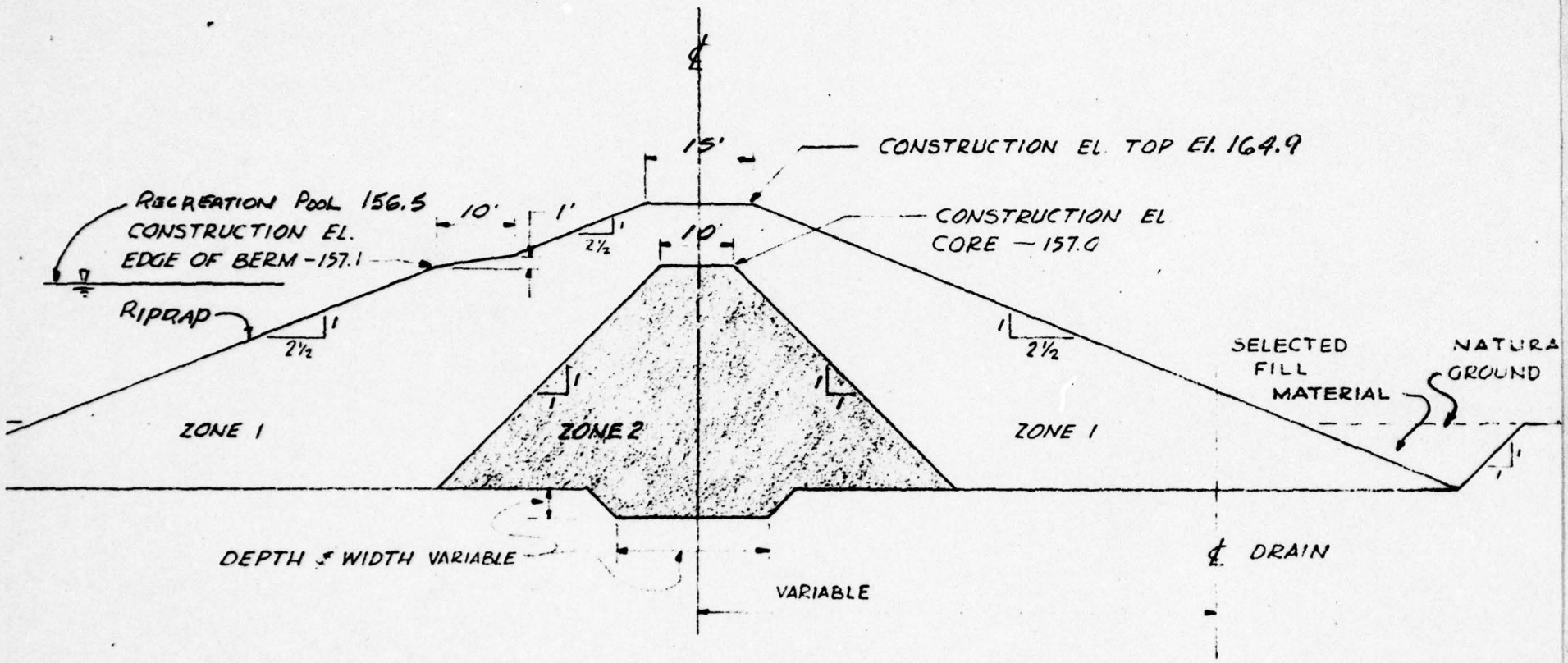

HOLDING POND
APPROX. LIMIT SPOIL DISPOSAL AREA
MIN 40'
PRINCIPAL SPILLWAY OUTLET
IMPACT BASIN
EARTH
SPILLWAY
2.5:1 SLOPE
BERM
Riprap
EMBANKMENT
PRINCIPAL SPILLWAY
RISER
OUTLET
SPILLWAY SLOPE 4%
LEVEL SECTION EL 160.5
DAM Sta 9+80
Aux Spillway Sta 4+50
BW=75'
AUXILIARY SPILLWAY
SLOPE 2%
INLET
PC
R=2686.49'
BLANKET AREA
STONE TAVERN
NORMAL POOL
LAKE

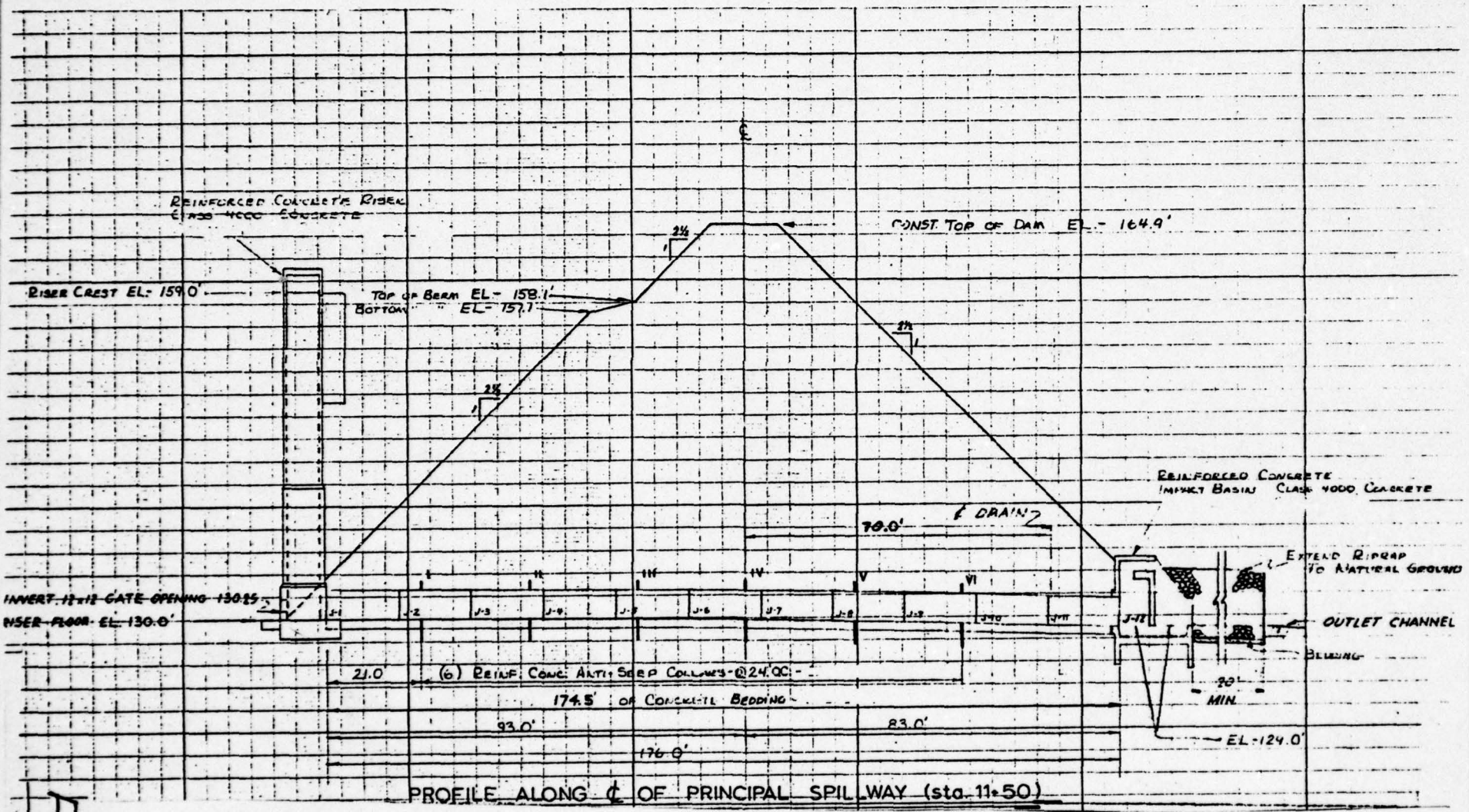
FIG. 3




# TYPICAL SECTION OF EMBANKMENT

NO SCALE

FIG. 4




PROFILE ALONG ℄ OF PRINCIPAL SPILLWAY (sta. 11+50)

11/6

Check List
Visual Inspection
Phase 1

Name Dam Assunpink Site #19 County Monmouth State New Jersey Coordinators NJDEP

Date(s) Inspection 1/4,18/79 Weather Sunny Temperature 15°F

Pool Elevation at Time of Inspection 156.5 M.S.L. Tailwater at Time of Inspection 130.7 M.S.L.

Inspection Personnel:

T. Chapter F. Schmidt (NJDFG) K. Jolls

E. Simone L. Holt (SCS)

L. Baines

L. Baines Recorder

Dam No. 00453

CONCRETE/MASONRY DAMS

| VISUAL EXAMINATION OF | OBSERVATIONS | REMARKS OR RECOMMENDATIONS |
|---|---|---|
| SEE PAGE ON LEAKAGE | N/A | |
| STRUCTURE TO ABUTMENT/EMBANKMENT JUNCTIONS | N/A | |
| DRAINS | N/A | |
| WATER PASSAGES | N/A | |
| FOUNDATION | N/A | |

## CONCRETE/MASONRY DAMS

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

## EMBANKMENT

| VISUAL EXAMINATION OF | OBSERVATIONS | REMARKS OR RECOMMENDATIONS |
|---|---|---|
| SURFACE CRACKS | Minor surface cracks (approximately 12" long) on backslope of right embankment. The crack, approximately 8" deep, may be due to frost heave or animal borrows. Several animal borrows were observed. | |
| UNUSUAL MOVEMENT OR CRACKING AT OR BEYOND THE TOE | None observed. | |
| SLOUGHING OR EROSION OF EMBANKMENT AND ABUTMENT SLOPES | Sloughing behind wingwalls of outlet structure and adjoining channel banks. It has been backfilled and stabilized with riprap.<br><br>(see photo) | Right wall of auxiliary spillway deeply rutted and eroded by tire tracks. |
| VERTICAL AND HORIZONTAL ALINEMENT OF THE CREST | Crest rutted with tire tracks despite steel barrier in center of dam crest. | |
| RIPRAP FAILURES | Riprap displaced from narrow swath directly above 30" outlet pipe. Attributed to vandalism on reservoir side of embankment. | |

## EMBANKMENT

| VISUAL EXAMINATION OF | OBSERVATIONS | REMARKS OR RECOMMENDATIONS |
|---|---|---|
| | Trees growing along toe of right embankment for about 50' to abutment. | See photographs. |
| JUNCTION OF EMBANKMENT AND ABUTMENT, SPILLWAY AND DAM | Embankment abutments natural terrain on right and auxiliary channel on left. Both sides satisfactory. Tire tracks cross right wall of auxiliary spillway near embankment crest. | |
| ANY NOTICEABLE SEEPAGE | Minor seepage along toe of right embankment beginning at abutment and running along the toe to the outlet structure. (see photo) | Additional seepage about 65' from crest of left embankment. Approximate elevation 139 M.S.L. Pool elevation approximately 156 M.S.L. "Ice flowers" common along embankment. |
| STAFF GAGE AND RECORDER | None | |
| DRAINS | Toe drains discharging from end of wingwalls of outlet. Heavy precipitate noted here as well as "French drain" around structure. | (See photographs). |

## OUTLET WORKS

| VISUAL EXAMINATION OF | OBSERVATIONS | REMARKS OR RECOMMENDATIONS |
|---|---|---|
| CRACKING AND SPALLING OF CONCRETE SURFACES IN OUTLET CONDUIT | None observed | Structure in new condition. |
| INTAKE STRUCTURE | Drop inlet with box riser; gate stem operated. Grating and trash rack on all sides. | All in good condition. |
| OUTLET STRUCTURE | Reinforced concrete impact basin in front of discharge pipe. | Erosion and sloughing behind wingwalls replaced with riprap. Concrete in good condition. Heavy iron precipitate noted. |
| OUTLET CHANNEL | Narrow natural channel in wide valley. Heavy tree growths. Some bank sloughing near outlet structure. | Sloughing already backfilled with riprap. |
| EMERGENCY GATE | None | |

## UNGATED SPILLWAY

| VISUAL EXAMINATION OF | OBSERVATIONS | REMARKS OR RECOMMENDATIONS |
|---|---|---|
| CONCRETE WEIR | None | Auxiliary spillway consists of wide grassy channel abutting left embankment. |
| APPROACH CHANNEL | Negatively sloped approach, grassy surface. Erosion on both walls of channels. Approximately 3:1 sideslopes. | |
| DISCHARGE CHANNEL | Positively sloped, vegetated and wooded. | |
| BRIDGE AND PIERS | None | |
| | | |

GATED SPILLWAY

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

INSTRUMENTATION

| VISUAL EXAMINATION | OBSERVATIONS | REMARKS OR RECOMMENDATIONS |
|---|---|---|
| MONUMENTATION/SURVEYS | TBM2: Railroad spike in 14" ø oak tree in downstream channel. El. 135.48. | Others are available. |
| OBSERVATION WELLS | None | |
| WEIRS | None | |
| PIEZOMETERS | None | |
| OTHER | None | |

## RESERVOIR

| VISUAL EXAMINATION OF | OBSERVATIONS | REMARKS OR RECOMMENDATIONS |
|---|---|---|
| SLOPES | Wooded to cultivated. Gently sloping on east, steeper on west. | |
| SEDIMENTATION | None observed. Design provided for dead area on floor of lake to accommodate sedimentation. | See design reports. |

## DOWNSTREAM CHANNEL

| VISUAL EXAMINATION OF | OBSERVATIONS | REMARKS OR RECOMMENDATIONS |
|---|---|---|
| CONDITION (OBSTRUCTIONS, DEBRIS, ETC.) | Gently sloping, wooded area. Wide valley, narrow channel. Many swampy, lowlying marshy areas along channel. | |
| SLOPES | Gentle and wooded. | |
| APPROXIMATE NO. OF HOMES AND POPULATION | None in floodplain between this dam and Site #4 downstream. Part of state wildlife refuge (uninhabited). | |

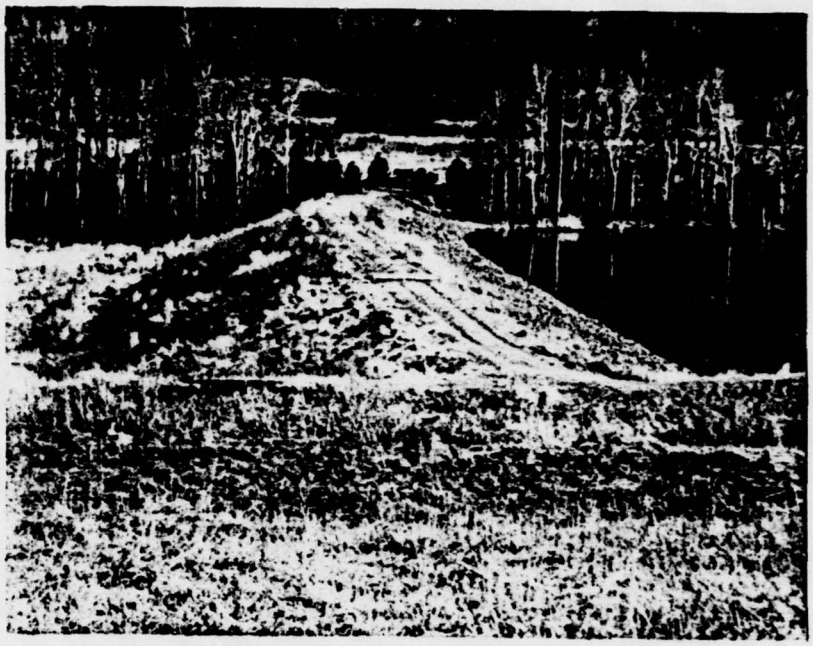
CHECK LIST
ENGINEERING DATA
DESIGN, CONSTRUCTION, OPERATION

| ITEM | REMARKS |
|---|---|
| PLAN OF DAM | Available from SCS (1370 Hamilton Street, Somerset, N.J.) |
| REGIONAL VICINITY MAP | Available from SCS or USGS Quad. |
| CONSTRUCTION HISTORY | Available from SCS |
| TYPICAL SECTIONS OF DAM | Available from SCS |
| HYDROLOGIC/HYDRAULIC DATA | Available from SCS |
| OUTLETS - PLAN | Available from SCS |
| - DETAILS | Available from SCS |
| -CONSTRAINTS | Available from SCS |
| -DISCHARGE RATINGS | Available from SCS |
| RAINFALL/RESERVOIR RECORDS | None kept |

| ITEM | REMARKS |
|---|---|
| DESIGN REPORTS | Available from SCS |
| GEOLOGY REPORTS | Available from SCS |
| DESIGN COMPUTATIONS | Available from SCS |
| HYDROLOGY & HYDRAULICS | Available from SCS |
| DAM STABILITY | Not available |
| SEEPAGE STUDIES | Available |
| MATERIALS INVESTIGATIONS | Available from SCS |
| BORING RECORDS | Available from SCS |
| LABORATORY | Available from SCS |
| FIELD | Available from SCS |
| POST-CONSTRUCTION SURVEYS OF DAM | None performed |
| BORROW SOURCES | Indicated on available plans |

| ITEM | REMARKS |
|---|---|
| MONITORING SYSTEMS | None |
| MODIFICATIONS | Reports, plans, etc. of modifications and repairs performed in 1976/1977 available from SCS. |
| HIGH POOL RECORDS | Not recorded |
| POST CONSTRUCTION ENGINEERING STUDIES AND REPORTS | Available from SCS as noted above. |
| PRIOR ACCIDENTS OR FAILURE OF DAM DESCRIPTION REPORTS | None |
| MAINTENANCE OPERATION RECORDS | None kept |

| ITEM | REMARKS |
|---|---|
| SPILLWAY PLAN<br>SECTIONS<br>DETAILS | Plans, sections and details for principal and auxiliary spillways available from SCS. |
| OPERATING EQUIPMENT PLANS & DETAILS | Available from SCS. |



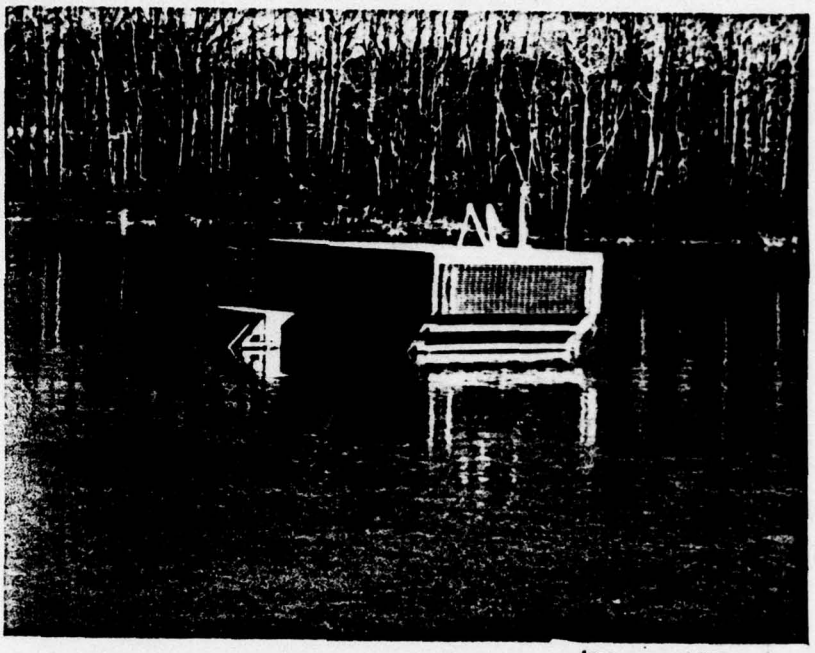
January, 1979

Assunpink Creek Watershed Dam Site #19



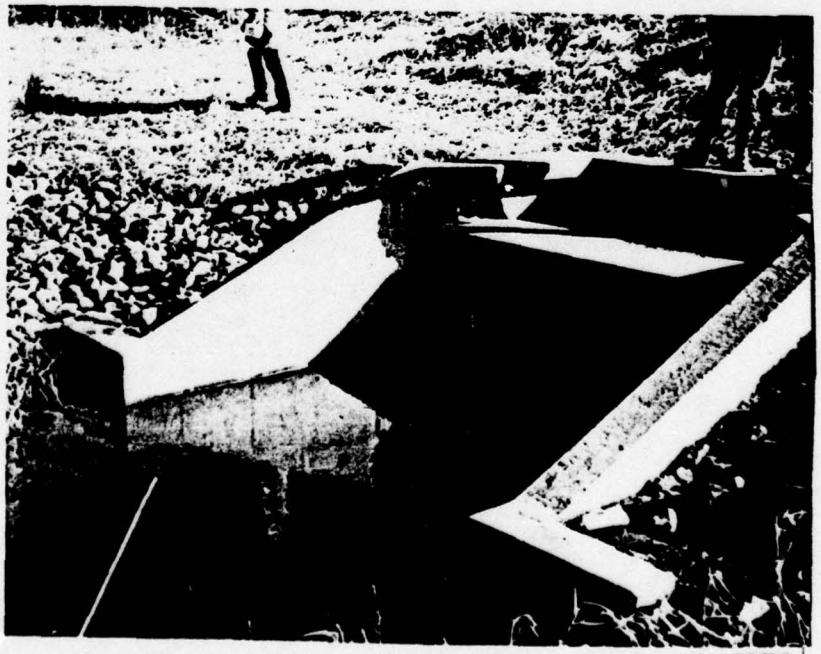
January, 1979

Displaced riprap directly opposite intake structure



January, 1979

Intake structure



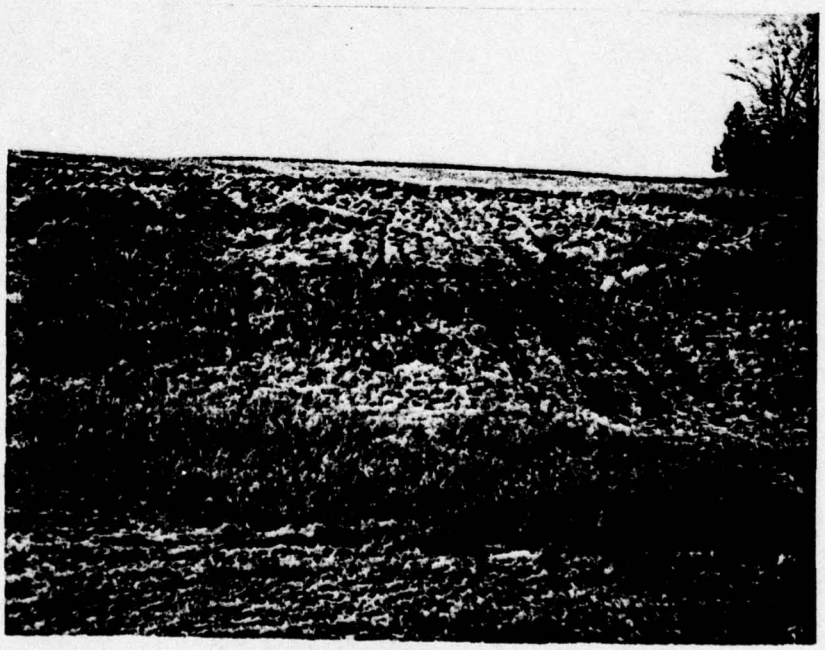
January, 1979

Outlet structure



January, 1979

Looking West



January, 1979

Erosion and vehicle tracks



January, 1979

Seepage at toe of right embankment



January, 1979

Repair of sloughed area

Dam No. 00453

CHECK LIST
HYDROLOGIC AND HYDRAULIC DATA
ENGINEERING DATA

DRAINAGE AREA CHARACTERISTICS: 1.77 sq. miles

ELEVATION TOP NORMAL POOL (STORAGE CAPACITY): 156.5 ( 490 acre-feet)

ELEVATION TOP FLOOD CONTROL POOL (STORAGE CAPACITY): 160.9 (805 acre-feet)

ELEVATION MAXIMUM DESIGN POOL: + 161.1 M.S.L. (SSC records)

ELEVATION TOP DAM: + 164.9 M.S.L.

CREST:

a. Elevation + 160.9 M.S.L.
b. Type Auxiliary spillway channel
c. Width 75 feet wide channel
d. Length 670 foot long channel
e. Location Spillover Left abutment
f. Number and Type of Gates None

OUTLET WORKS: Principal spillway (crest El. 156.5)

a. Type 2 stage drop inlet with 30" diameter reinforced concrete pipe.
b. Location 135 feet from left abutment
c. Entrance inverts + 130± M.S.L.
d. Exit inverts + 129 M.S.L.
e. Emergency draindown facilities Gate at invert El. 130.25 M.S.L.

HYDROMETEOROLOGICAL GAGES: None

a. Type
b. Location
c. Records

MAXIMUM NON-DAMAGING DISCHARGE: 1570 CFS

BY D J M DATE 1-77

CHKD. BY _____ DATE _____

SUBJECT _____

# LOUIS BERGER & ASSOCIATES INC.

ASSONPINK SCS #19 DAM INSPECTION

SHEET NO. A1 OF _____

PROJECT C227

Tc as calculated by SCS

| Time of Concentration -- Tc | | | | |
|---|---|---|---|---|
| (1) Description of Course of Runoff Water | (2) Slope of Course (%) | (3) Length (l) of Course (ft) | (4) Velocity of Runoff Water (v) (ft/sec) | (5) Time (sec) (3) ÷ (4) |
| OVERLAND - CROPLAND | 2.4 | 4000 | 1.0 | 4000 |
| CHANNEL | 0.6 | 9700 | 2.0 | 4850 |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | Sum | 8850 |

$Tc = \frac{8850}{3600} = 2.46$ hrs.

$Tp = \frac{0.25}{2} + 0.6 \times 2.46$

$= 1.60$ hours

$Qp = \frac{484 \times .77 \times 1}{1.60}$

$= 535$ cfs

BY D.J.M DATE 1-79
CHKD. BY _____ DATE _____
SUBJECT _____

**LOUIS BERGER & ASSOCIATES INC.**

ASSONPINK SITE # 19 DAM INSPECTION

SHEET NO. A2 OF.
PROJECT C227

| T | T/Tp | Dimensionless Ordinate (DO) | Qp × D.O |
|---|---|---|---|
| 0.25 | 0.16 | 0.05 | 27 |
| 0.50 | 0.31 | 0.17 | 91 |
| 0.75 | 0.47 | 0.38 | 203 |
| 1.00 | 0.63 | 0.65 | 348 |
| 1.25 | 0.78 | 0.86 | 460 |
| 1.50 | 0.94 | 0.95 | 524 |
| 1.75 | 1.09 | 0.98 | 524 |
| 2.00 | 1.25 | 0.88 | 471 |
| 2.25 | 1.41 | 0.74 | 396 |
| 2.50 | 1.56 | 0.60 | 321 |
| 2.75 | 1.72 | 0.47 | 251 |
| 3.00 | 1.88 | 0.38 | 203 |
| 3.25 | 2.03 | 0.30 | 161 |
| 3.50 | 2.19 | 0.24 | 128 |
| 3.75 | 2.34 | 0.198 | 106 |
| 4.00 | 2.50 | 0.155 | 83 |
| 4.25 | 2.66 | 0.120 | 64 |
| 4.50 | 2.81 | 0.096 | 51 |
| 4.75 | 2.97 | 0.078 | 42 |
| 5.00 | 3.13 | 0.064 | 34 |
| 5.25 | 3.28 | 0.053 | 28 |
| 5.50 | 3.44 | 0.040 | 21 |
| 5.75 | 3.59 | 0.032 | 17 |
| 6.00 | 3.75 | 0.027 | 14 |

Σ 4568

BY D.J.M. DATE 1-79 **LOUIS BERGER & ASSOCIATES INC.** SHEET NO. A3 OF.
CHKD. BY DATE PROJECT 5227
SUBJECT

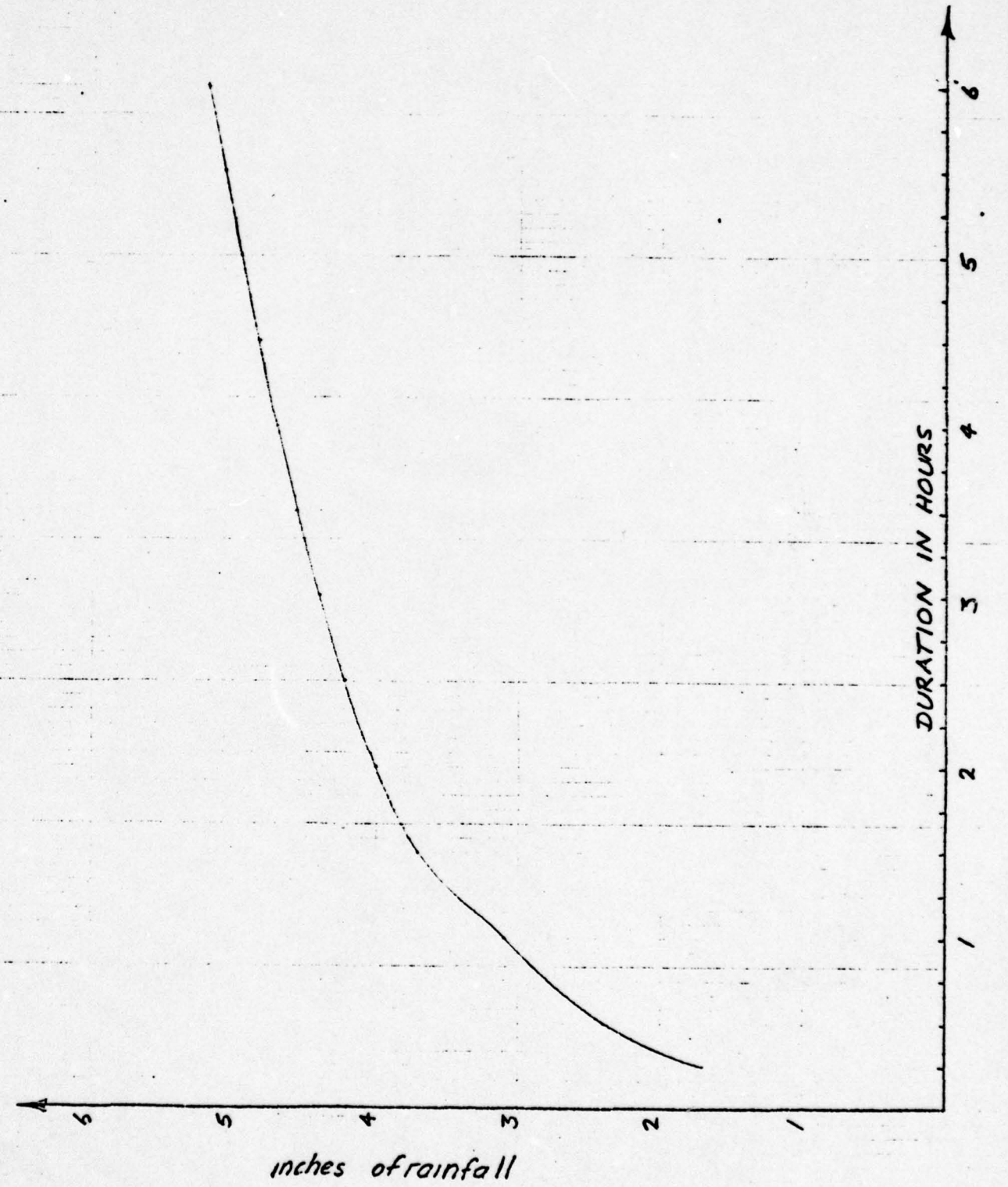
PRECIPITATION DATA FROM T.P 40 (See depth duration curve overleaf) & HMR 33

| Time | Precipitation | Δ | Rearrange |
|---|---|---|---|
| 0.25 | 1.7 | 1.7 | 0.06 |
| 0.50 | 2.4 | 0.7 | 0.06 |
| 0.75 | 2.8 | 0.4 | 0.06 |
| 1.00 | 3.1 | 0.3 | 0.06 |
| 1.25 | 3.5 | 0.4 | 0.07 |
| 1.50 | 3.7 | 0.2 | 0.07 |
| 1.75 | 3.86 | 0 16 | 0.08 |
| 2.00 | 4.00 | 0.14 | 0.09 |
| 2 25 | 4 11 | 0.11 | 0.09 |
| 2.50 | 4 22 | 0 11 | 0.09 |
| 2.75 | 4 31 | 0.09 | 0.11 |
| 3.00 | 4 40 | 0 09 | 0.11 |
| 3.25 | 4 49 | 0.09 | 0.30 |
| 3 50 | 4.57 | 0 08 | 0.70 |
| 3 75 | 4 64 | 0 07 | 1.70 |
| 4 00 | 4.71 | 0.07 | 0.40 |
| 4.25 | 4.78 | 0 07 | 0.40 |
| 4 50 | 4 84 | 0.06 | 0.20 |
| 4.75 | 4.90 | 0.06 | 0.16 |
| 5 00 | 4.96 | 0.06 | 0.14 |
| 5.25 | 5.02 | 0 06 | 0.07 |
| 5.50 | 5.08 | 0 06 | 0.06 |
| 5.75 | 5.14 | 0.06 | 0.06 |
| 6 00 | 5.20 | 0.06 | 0.06 |

BY D.J.M DATE 1-79
CHKD. BY DATE

SUBJECT T.P. 40 & H.M.R. 35
DEPTH DURATION CURVE

SHEET NO. A-4 OF
JOB NO. C227



BY D J M DATE 1-79 **LOUIS BERGER & ASSOCIATES INC.** SHEET NO. A5 OF.

CHKD. BY DATE PROJECT C227

SUBJECT SCS SPILLWAY DISCHARGE CALCULATIONS

**Hydraulic:**

pipe dia. 30"
An = 4.91 ft.$^2$
r = .012
kr = 1
kp = .00786
Lp = 140'

$$cp = \frac{Ap\ 2g}{1+kr+kplp}$$

$$= \frac{64.4}{1+1+1.4}$$

$$= 21.36$$

$$Q = 21.36 \times h^{\frac{1}{2}}$$

Width of auxiliary spillway = 75 feet
At elevation 162.57, pipe flow is 114 cfs
and auxiliary spillway is 364 cfs
Total flow is 478 cfs

Check velocity:
Auxiliary spillway crest elevation 160.9

A = 75 x 1.67 + 1.67$^2$ x 3 de = 162.57-160.9 = 1.67 feet
= 133.33 ft.$^2$

$$v = \frac{364}{133.33} = 2.74 \text{ feet per second}$$

Hydrograph developed by SCS for principal spillway, indicates that peak of the flood will be reduced considerably by temporary storage above the spillway crest.

STATE New Jersey PROJECT Raritan Pipe - Suite 19
BY Montrum DATE 12-67 CHECKED BY DATE JOB NO. NJ-08-2010-19
SUBJECT Re-design Of Orifice SHEET ___ OF ___

Low-stage orifice is to be lowered 6' due to addition of Wildlife Water Control Device.

Orifice size must be reduced to give approximately the same discharge at the increased head.

Q max. = 12 CFS (WORK PLAN)

$Q = Cu\,(2gh)^{1/2}$

h = 159.0 - 149.9 = 9.1 Ft. use 9'

$12 = .6\ a\ (8.025)(9)^{1/2}$
$12 = 14.4\ a$
$a = 0.833$

use 12" x 10" ORIFICE

1' wide x 10" Deep

BY D.J.L DATE 1-79 **LOUIS BERGER & ASSOCIATES INC.** SHEET NO. A6 OF

CHKD. BY DATE PROJECT C227

SUBJECT SCS SPILLWAY DISCHARGE CALCULATIONS

STATE N.J. PROJECT Agawam - Sec 19

BY C.Kalkstein DATE 8/13/66 CHECKED BY D.J.L.O DATE 9.3.66 JOB NO. NJ CO-20-0-18.1F

SUBJECT Riser Crest Weir & Conduit Flow SHEET ___ OF ___




Weir Flow

$Q = CLH^{3/2}$

$= 3.1(15)H^{3/2}$

$Q = 46.5\,H^{3/2}$

Conduit Flow

$Q = C_p h_p^{1/2}$

$C_p = A_p \sqrt{\frac{2g}{1 + k_r + k_p l_p}}$

$= 4.91 \sqrt{\frac{64.4}{1 + 1 + 1.4}}$

$= 4.91 \sqrt{18.9}$

$= 4.91 (4.35)$

$= 21.36$

$Q_{conduit} = 21.36\,h_p^{1/2}$

2.5' ID Conc. Pipe

$A_p = 4.91$ ft²

$\eta = 0.012$

$k_r = 1$

$k_p = .00786$

$l_p = 180'$

BY D.J.H. DATE 1-79 **LOUIS BERGER & ASSOCIATES INC.** SHEET NO. 17 OF.

CHKD. BY DATE PROJECT 6727

SUBJECT SCS SPILLWAY DISCHARGE CALCULATIONS

STATE N.J. PROJECT ASSUNPINK - SITE 19

BY Montana DATE 8/8/66 CHECKED BY V.A. LOYD DATE 8-66 SUBJECT N.J. 08-2019-19

SUBJECT ORIFICE SIZE - LOW STAGE SHEET OF

$Q_{max}$ = 12 CFS ✓ (WORK PLAN)

High Stage 159.0

Low Stage 156.5

2.5 ✓

$Q = Ca(2gh)^{1/2}$

$12 = .6\,a\,(8.025)(12.5)^{1/2}$ ✓

$a = \frac{12}{.6(158)(8.025)}$ ✓

$a = 1.58\ ft^2$ ✓

$W = \frac{3}{4}\Phi = \frac{3}{4}(30) = 22.5\ IN = 1.875\ ft$ ✓

$H = 1.58 \div 1.875 = 0.84\ ft = 10\ IN.$ ✓

$a = 1.875\,(.84) = 1.58$ OK/ ✓

Low Stage Weir Flow

$Q = CLH^{3/2}$

$Q = 3.1\,(1.875)(H^{3/2}) = 5.81\,H^{3/2}$

Low Stage Orifice Flow:

$Q = Ca(2gh)^{1/2}$

$= 0.6\,(1.58)(8.025)\,h^{1/2}$

$= 7.61\,h^{1/2}$

BY D.J.M DATE 1-79

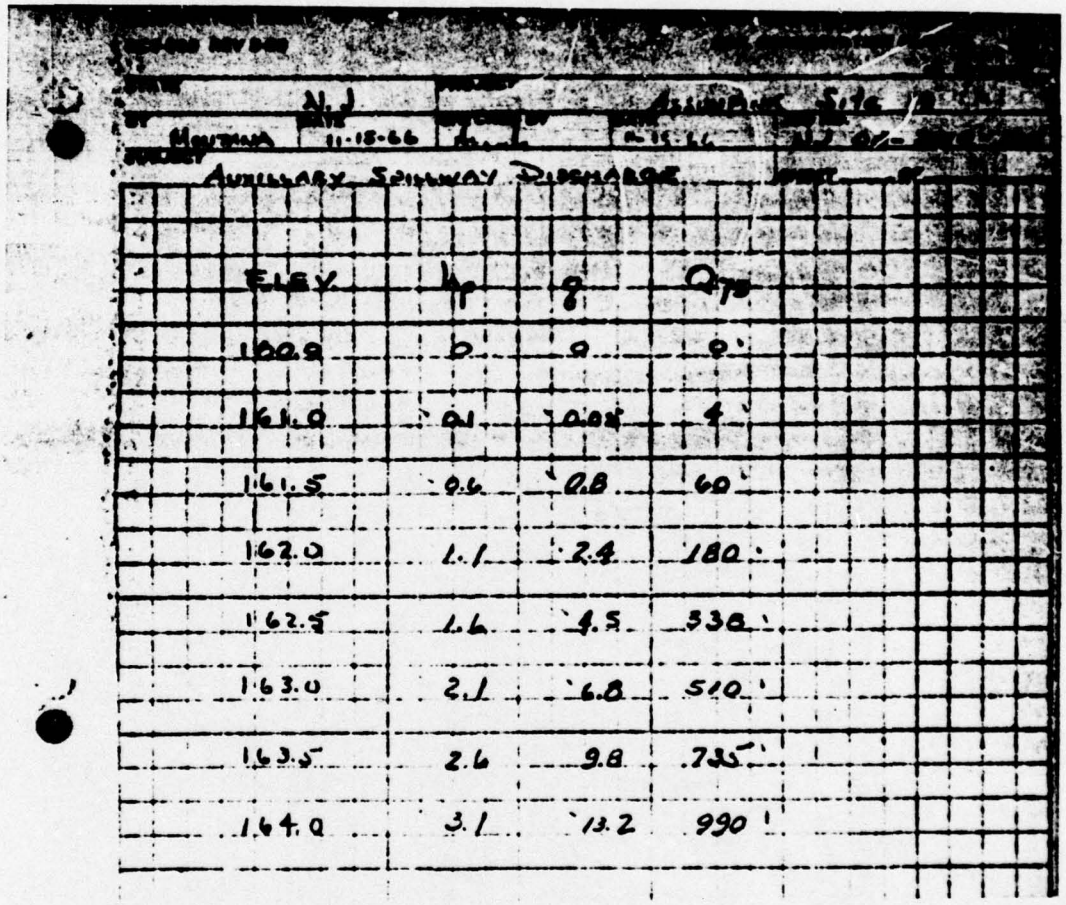
CHKD. BY _____ DATE _____

SUBJECT SCS SPILLWAY DISCHARGE CALCULATIONS

# LOUIS BERGER & ASSOCIATES INC.

SHEET NO. A8 OF _____

PROJECT _____



D.J.M 11-15-66

Auxiliary Spillway Discharge

| Elev. | $h_p$ | $q$ | $Q_{ps}$ |
|---|---|---|---|
| 160.9 | 0 | 0 | 0 |
| 161.0 | 0.1 | 0.08 | 4 |
| 161.5 | 0.6 | 0.8 | 60 |
| 162.0 | 1.1 | 2.4 | 180 |
| 162.5 | 1.6 | 4.5 | 330 |
| 163.0 | 2.1 | 6.8 | 510 |
| 163.5 | 2.6 | 9.8 | 735 |
| 164.0 | 3.1 | 13.2 | 990 |

SCS DAY 5-69
Vendor Corporation

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

Subject: Discharge Curve — N.J. 6

Assumed Elev. 19 — Morris District

BY D.J.M. DATE 1-79 — LOUIS BERGER & ASSOCIATES INC.

CHKD. BY _____ DATE _____ — Assumed Elev. 19 Dam Crest

SUBJECT Spillway Discharge Capacity as computed by SCS — PROJECT 5247

SHEET NO. A9 OF

| ELEV | LOW STAGE WEIR $Q = 5.81 H^{3/2}$ $H_e$ | $H_e^{3/2}$ | $Q_{we}$ | LOW STAGE ORIFICE $Q = 7.61 H^{1/2}$ $h_o$ | $h_o^{1/2}$ | $Q_{oe}$ | RISER CREST WEIR $Q = 4.85 H^{3/2}$ $H_R$ | $H_R^{3/2}$ | $Q_{wr}$ | RISER CREST CONDUIT $Q = 21.36 H_p^{1/2}$ $h_p$ | $h_p^{1/2}$ | 30"Φ $Q_{pe}$ | $Q_{or}$ | $Q_{em}$ | TOTAL $Q_o$ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | $H_R$ | | | | | | | | | | | | | | |
| | Ft | Ft | CFS | Ft | Ft | CFS | Ft | Ft | CFS | Ft | Ft | CFS | CFS | CFS | CFS |
| 156.5 | 0 | 0 | 0 | | | | | | | | | | 0 | | 0 |
| 156.75 | 0.25 | .1250 | 0.73 | | | | | | | | | | 0.7 | | 0.7 |
| 157.00 | 0.50 | .3536 | 2.05 | | | | | | | | | | 2.1 | | 2.1 |
| 157.25 | 0.75 | .6495 | 3.77 | | | | | | | | | | 3.8 | | 3.8 |
| 157.33 | 0.83 | .7562 | 4.39 | | | | | | | | | | 4.4 | | 4.4 |
| 157.50 | 1.00 | 1.000 | 5.81 | .58 | .762 | 5.80 | | | | | | | 5.8 | | 5.8 |
| 158.00 | | | | 1.08 | 1.04 | 7.91 | | | | | | | 7.9 | | 7.9 |
| 158.50 | | | | 1.58 | 1.26 | 9.59 | | | | | | | 9.6 | | 9.6 |
| 159.00 | | | | 2.08 | 1.44 | 10.96 | 0 | 0 | 0 | 25.0 | 5.00 | 106.80 | 11.0 | | 11.0 |
| 159.50 | | | | 2.58 | 1.61 | 12.25 | .5 | .3536 | 16.44 | 25.5 | 5.05 | 107.87 | 28.7 | | 28.7 |
| 160.00 | | | | 3.08 | 1.75 | 13.32 | 1.0 | 1.000 | 46.50 | 26.0 | 5.10 | 108.94 | 59.8 | | 59.8 |
| 160.50 | | | | 3.58 | 1.89 | 14.38 | 1.5 | 1.837 | 85.42 | 26.5 | 5.15 | 110.00 | 99.8 | | 110.0* |
| 161.00 | | | | 4.08 | 2.02 | 15.37 | 2.0 | 2.828 | 131.50 | 27.0 | 5.20 | 111.07 | 146.9 | 4 | 115.1 |
| 161.50 | | | | 4.58 | 2.14 | 16.29 | 2.5 | 3.953 | 183.89 | 27.5 | 5.24 | 111.93 | | 60 | 171.9 |
| 162.00 | | | | 5.08 | 2.25 | 17.12 | 3.0 | 5.196 | 241.61 | 28.0 | 5.29 | 112.99 | | 130 | 243.0 |
| 162.50 | | | | | | | 3.5 | 6.548 | 304.48 | 28.5 | 5.34 | 114.06 | | 338 | 452.0 |
| 163.00 | | | | | | | 4.0 | 8.000 | 372.00 | 29.0 | 5.39 | 115.13 | | 510 | 625.1 |
| 163.50 | | | | | | | | | | 29.5 | 5.43 | 115.98 | | 736 | 851.0 |
| 164.00 | | | | | | | | | | 30.0 | 5.48 | 117.05 | | 990 | 1107.0 |
| 164.90 | | | | | | | | | | 30.9 | 5.56 | 118.76 | | 1451 | 1569.8 |

Note: Water in Tailrace is such that it was determined to lower the Low Stage Weir 1.83 ft. at Storage between High & Low Stage. The Low Stage Weir is set at Elev. 155.17 ft. Future changes in Tailrace may require re-setting of Weir.

K.B.

BY. D.J.M. DATE 1-79

CHKD. BY. DATE

SUBJECT

**LOUIS BERGER & ASSOCIATES INC.**

ASSOCIATE SITE #19 DAM INSPECTION

SHEET NO. A10 OF.

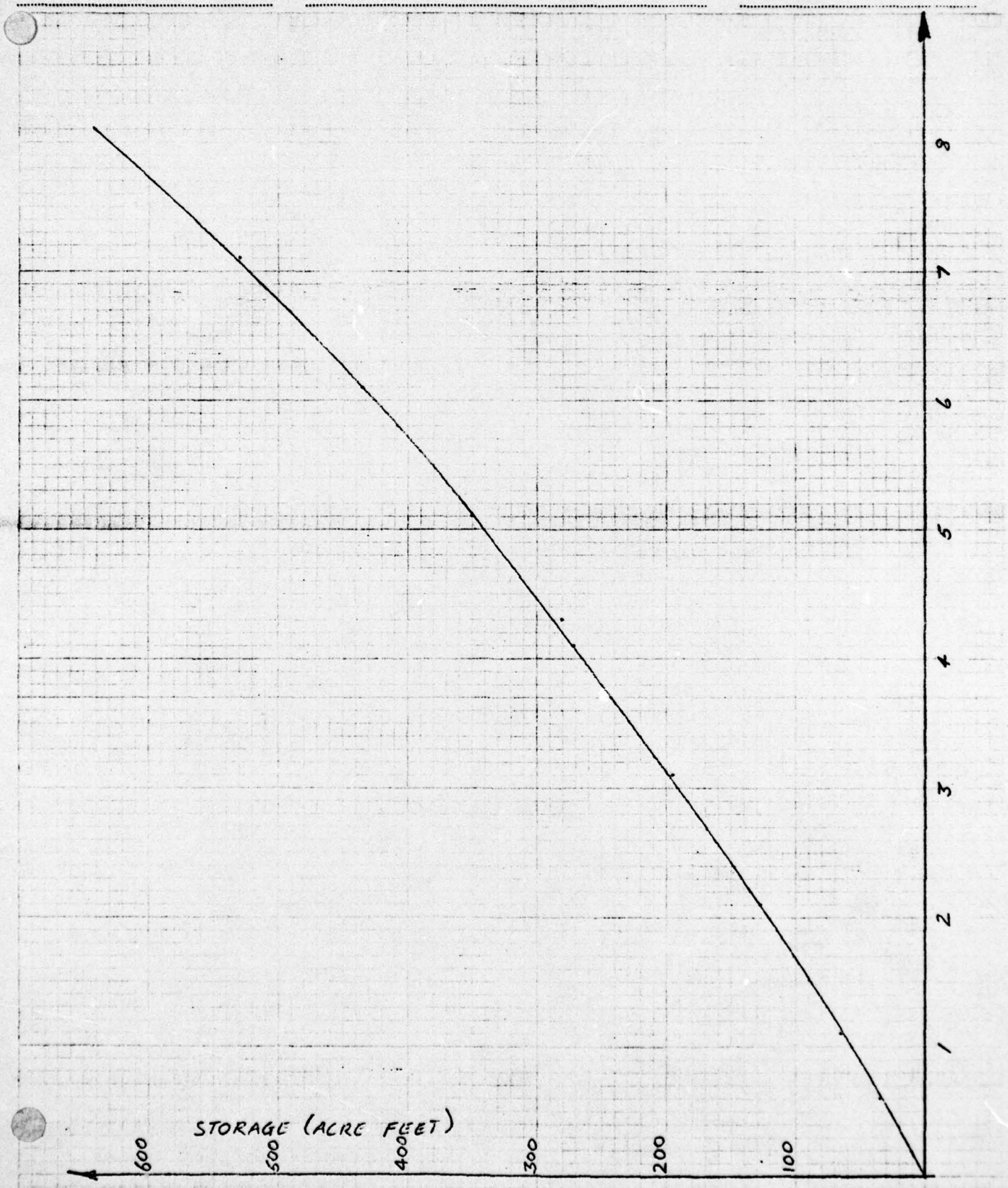
PROJECT C227

## STAGE / STORAGE FROM SCS

| ELEV M.S.L | STORAGE (ACRE FEET) | SURCHARGE STORAGE (ACRE FEET) |
|---|---|---|
| 155.9 | 455 | 0 |
| 156.5 | 490 | 35 |
| 157.0 | 520 | 65 |
| 159.0 | 582 | 127 |
| 159.0 | 650 | 195 |
| 160.0 | 726 | 271 |
| 160.2 | 735 | 280 |
| 161.0 | 805 | 350 |
| 162.0 | 890 | 435 |
| 163.0 | 985 | 530 |
| 164.0 | 1097 | 642 |

BY D. J. M. DATE 1-79 SUBJECT STAGE STORAGE CURVE SHEET NO. All OF

CHKD. BY DATE JOB NO. C227



BY D.J.M. DATE 1-79
CHKD. BY _____ DATE _____
SUBJECT _____

**LOUIS BERGER & ASSOCIATES INC.**

ASSUNPINK SITE # 19 DAM INSPECTION

SHEET NO. A12 OF _____
PROJECT C-227

Summary of storage and discharge data for HEC-1 input

| Elevation (feet) | SURCHARGE STORAGE (ACRE FEET) | DISCHARGE (cfs) |
|---|---|---|
| | 0 | 0 |
| 157 | 65 | 2 |
| 158 | 127 | 8 |
| 159 | 195 | 11 |
| 160 | 271 | 60 |
| 161 | 350 | 115 |
| 162 | 435 | 243 |
| 163 | 530 | 625 |
| 164 | 642 | 1107 |

BY. D J M DATE 1-79

CHKD. BY_____DATE_____

SUBJECT_____

# LOUIS BERGER & ASSOCIATES INC.

ASSUNPINK SITE #19 DAM INSPECTION

SHEET NO. A13 OF_____

PROJECT_____

DRAWDOWN CALCULATIONS BY SCS

SOIL CONSERVATION SERVICE

TIME TO EMPTY RESERVOIR ASSUNPINK SITE 19

MONMOUTH CO.

NJ-08-3810-19

11-15-66

CL EWN

| (1) ELEV FT. | (2) TOTAL STORAGE Ac. FT | (3) DIFF. STORAGE Ac FT | (4) DISCHARGE ACTUAL CFS | (5) DISCHARGE AVERAGE CFS | (6) AVERAGE DISCHARGE 1 DAY (5) Ac FT/day | (7) Time (3)÷(6) DAYS | (8) ACCUM. DRAWDOWN TIME DAYS | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | | |
| | | | | | | | | |
| 160.9 | 315 | | 111 | | | | 0 | |
| | | 45 | | 110.5 | 219.2 | 0.21 | | |
| 160.5 | 270 | | 110 | | | | 0.21 | |
| | | 35 | | 85 | 168.6 | 0.21 | | |
| 160.0 | 235 | | 60 | | | | 0.42 | |
| | | 35 | | 44.5 | 88 | 0.4 | | |
| 159.5 | 200 | | 29 | | | | 0.82 | |
| | | 40 | | 20 | 39.7 | 1.01 | | |
| 159.0 | 160 | | 11 | | | | 1.83 | |
| | | 38 | | 11.5 | 22.8 | 1.67 | | |
| 158.5 | 122 | | 10 | | | | 3.50 | |
| | | 32 | | 9 | 17.8 | 1.8 | | |
| 158.0 | 90 | | 8 | | | | 5.30 | |
| | | 30 | | 7 | 13.9 | 2.2 | | |
| 157.5 | 60 | | 6 | | | | 7.50 | |
| | | 30 | | 4 | 7.9 | 3.8 | | |
| 157.0 | 30 | | 2 | | | | 11.30 | |
| | | 30 | | 1 | 1.9 | 15.8 | | |
| 156.5 | 0 | | 0 | | | | 27.10 | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |

U.S. GOVERNMENT PRINTING OFFICE

BY L.B DATE FEB '79 **LOUIS BERGER & ASSOCIATES INC.** SHEET NO. A-14 OF

CHKD. BY DATE ASSUNPINK SITE #19 DAM INSPECTION PROJECT 6-227

SUBJECT DRAWDOWN COMPUTATIONS

| ELEV FT. | TOTAL STORAGE ACRE-FT | DIFF. STORAGE ACRE-FT | DISCHARGE ACTUAL CFS | DISCHARGE AVG. CFS | AVERAGE DISCHARGE ACRE FT/DAY | DRAWDOWN TIME DAYS |
|---|---|---|---|---|---|---|
| 155.9 | 455 | | 24.4 | | | |
| | | 95 | | 24 | 47.6 | 2.0 |
| 154 | 360 | | 23.5 | | | |
| | | 80 | | 22.7 | 45.02 | 1.78 |
| 152 | 280 | | 21.8 | | | |
| | | 75 | | 21.6 | 42.84 | 1.75 |
| 150 | 205 | | 21.4 | | | |
| | | 55 | | 20.9 | 41.45 | 1.33 |
| 148 | 150 | | 20.3 | | | |
| | | 45 | | 19.7 | 39.07 | 1.15 |
| 146 | 105 | | 19.1 | | | |
| | | 40 | | 18.5 | 36.7 | 1.09 |
| 144 | 65 | | 17.9 | | | |
| | | 30 | | 17.2 | 34.12 | .88 |
| 142 | 35 | | 16.5 | | | |
| | | 16 | | 15.8 | 31.34 | .51 |
| 140 | 19 | | 15.0 | | | |
| | | 9 | | 14.2 | 28.17 | .32 |
| 138 | 10 | | 13.4 | | | |
| | | 6 | | 12.5 | 24.79 | .24 |
| 136 | 4 | | 11.5 | | | |
| | | 2 | | 10.4 | 20.63 | .10 |
| 134 | 2 | | 9.3 | | | |
| | | 1 | | 7.9 | 15.67 | .06 |
| 132 | 1 | | 6.4 | | | |
| | | 1 | | 3.2 | 6.35 | .16 |
| 130.25 | 0 | | 0 | | | |

$Q = CA\sqrt{2gH}$

$= .6(1)\sqrt{64.4H}$

$= 4.8150\,H^{1/2}$

$\Sigma$ 11.37 DAYS SAY 12 days.

BY. DJM DATE

CHKD. BY DATE

SUBJECT

# LOUIS BERGER & ASSOCIATES INC.

ASSUNPINK CREEK SITE 19

SHEET NO. A-15 OF

PROJECT C-227

```
A   ASSUNPINK SITE#18,19,4 DAM INSPECTIONS NORTH GROUP
A   BY D.J.MULLIGAN
A   FEBRUARY 1979
B    150      0      15                                                    3
1.     3
K      0      2                                                    1
1   INFLOW TO SITE 19 DAM
M      0     -1    1.77       0    1.77
O     24
1   0.06   0.06   0.06   0.06   0.07   0.07   0.08   0.09   0.09   0.09
1   0.11   0.11   0.30   0.70   1.70   0.40   0.40   0.20   0.16   0.14
1   0.07   0.06   0.06   0.06
T                                                   0.5    0.1
U     24
1     27     91    203    348    460    524    524    471    396    321
1    251    203    161    128    106     83     64     51     42     34
1     28     21     17     14
X      0      0      1
K      1                                                    1
1   ROUTING THROUGH 19
Y                                  1
1      1
2      0     65    127    195    271    350    435    530    642
3      0      2      8     11     60    115    243    625   1107
```

**********  **********  **********  **********  **********

SUB-AREA RUNOFF COMPUTATION

INFLOW TO SITE 19 DAM

| ISTAQ | ICOMP | IECON | ITAPE | JPLT | JPRT | INAME |
|---|---|---|---|---|---|---|
| 2 | 0 | 0 | 0 | 0 | 0 | 1 |

HYDROGRAPH DATA

| IHYDG | IUHG | TAREA | SNAP | TRSDA | TRSPC | RATIO | ISNOW | ISAME | LOCAL |
|---|---|---|---|---|---|---|---|---|---|
| 0 | -1 | 1.77 | 0.0 | 1.77 | 0.0 | 0.0 | 0 | 0 | 0 |

PRECIP DATA

| NP | STORM | DAJ | DAK |
|---|---|---|---|
| 24 | 0.0 | 0.0 | 0.0 |

PRECIP PATTERN

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 0.06 | 0.06 | 0.06 | 0.06 | 0.07 | 0.07 | 0.08 | 0.09 | 0.09 | 0.09 |
| 0.11 | 0.11 | 0.30 | 0.70 | 1.70 | 0.40 | 0.40 | 0.20 | 0.16 | 0.14 |
| 0.07 | 0.06 | 0.06 | 0.06 | | | | | | |

LOSS DATA

| STRKR | DLTKR | RTIOL | ERAIN | STRKS | RTIOK | STRTL | CNSTL | ALSMX | RTIMP |
|---|---|---|---|---|---|---|---|---|---|
| 0.0 | 0.0 | 1.00 | 0.0 | 0.0 | 1.00 | 0.50 | 0.10 | 0.0 | 0.0 |

GIVEN UNIT GRAPH, NUHGC= 24

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 27. | 91. | 203. | 348. | 460. | 524. | 524. | 471. | 396. | 321. |
| 251. | 203. | 161. | 128. | 106. | 83. | 64. | 51. | 42. | 34. |
| 28. | 21. | 17. | 14. | | | | | | |

UNIT GRAPH TOTALS 4568. CFS OR 1.00 INCHES OVER THE AREA

RECESSION DATA

STRTQ= 0.0 QRCSN= 0.0 RTIOR= 1.00

END-OF-PERIOD FLOW

| TIME | RAIN | EXCS | COMP Q |
|---|---|---|---|
| 1 | 0.06 | 0.00 | 0. |
| 2 | 0.06 | 0.00 | 0. |

BY DJM DATE

CHKD. BY DATE

SUBJECT

# LOUIS BERGER & ASSOCIATES INC.

ASSUN PINK CREEK SITE #19

SHEET NO. A16 OF

PROJECT C-227

| | | | |
|---|---|---|---|
| 3 | 0.06 | 0.00 | 0. |
| 4 | 0.06 | 0.00 | 0. |
| 5 | 0.07 | 0.00 | 0. |
| 6 | 0.07 | 0.00 | 0. |
| 7 | 0.08 | 0.00 | 0. |
| 8 | 0.09 | 0.04 | 1. |
| 9 | 0.09 | 0.06 | 5. |
| 10 | 0.09 | 0.06 | 15. |
| 11 | 0.11 | 0.08 | 34. |
| 12 | 0.11 | 0.08 | 62. |
| 13 | 0.30 | 0.27 | 104. |
| 14 | 0.70 | 0.67 | 173. |
| 15 | 1.70 | 1.67 | 316. |
| 16 | 0.40 | 0.37 | 558. |
| 17 | 0.40 | 0.37 | 903. |
| 18 | 0.20 | 0.18 | 1293. |
| 19 | 0.16 | 0.13 | 1613. |
| 20 | 0.14 | 0.11 | 1811. |
| 21 | 0.07 | 0.05 | 1850. |
| 22 | 0.06 | 0.04 | 1755. |
| 23 | 0.06 | 0.04 | 1573. |
| 24 | 0.06 | 0.04 | 1369. |
| 25 | 0.0 | 0.0 | 1158. |
| 26 | 0.0 | 0.0 | 976. |
| 27 | 0.0 | 0.0 | 809. |
| 28 | 0.0 | 0.0 | 668. |
| 29 | 0.0 | 0.0 | 550. |
| 30 | 0.0 | 0.0 | 442. |
| 31 | 0.0 | 0.0 | 353. |
| 32 | 0.0 | 0.0 | 282. |
| 33 | 0.0 | 0.0 | 226. |
| 34 | 0.0 | 0.0 | 181. |
| 35 | 0.0 | 0.0 | 145. |
| 36 | 0.0 | 0.0 | 113. |
| 37 | 0.0 | 0.0 | 88. |
| 38 | 0.0 | 0.0 | 63. |
| 39 | 0.0 | 0.0 | 32. |
| 40 | 0.0 | 0.0 | 21. |
| 41 | 0.0 | 0.0 | 13. |
| 42 | 0.0 | 0.0 | 8. |
| 43 | 0.0 | 0.0 | 5. |
| 44 | 0.0 | 0.0 | 3. |
| 45 | 0.0 | 0.0 | 2. |
| 46 | 0.0 | 0.0 | 1. |
| 47 | 0.0 | 0.0 | 0. |
| 48 | 0.0 | 0.0 | 0. |
| 49 | 0.0 | 0.0 | 0. |
| 50 | 0.0 | 0.0 | 0. |
| 51 | 0.0 | 0.0 | 0. |
| 52 | 0.0 | 0.0 | 0. |
| 53 | 0.0 | 0.0 | 0. |
| 54 | 0.0 | 0.0 | 0. |
| 55 | 0.0 | 0.0 | 0. |
| 56 | 0.0 | 0.0 | 0. |
| 57 | 0.0 | 0.0 | 0. |
| 58 | 0.0 | 0.0 | 0. |
| 59 | 0.0 | 0.0 | 0. |
| 60 | 0.0 | 0.0 | 0. |
| 61 | 0.0 | 0.0 | 0. |
| 62 | 0.0 | 0.0 | 0. |
| 63 | 0.0 | 0.0 | 0. |
| 64 | 0.0 | 0.0 | 0. |
| 65 | 0.0 | 0.0 | 0. |
| 66 | 0.0 | 0.0 | 0. |
| 67 | 0.0 | 0.0 | 0. |
| 68 | 0.0 | 0.0 | 0. |
| 69 | 0.0 | 0.0 | 0. |
| 70 | 0.0 | 0.0 | 0. |
| 71 | 0.0 | 0.0 | 0. |
| 72 | 0.0 | 0.0 | 0. |
| 73 | 0.0 | 0.0 | 0. |
| 74 | 0.0 | 0.0 | 0. |
| 75 | 0.0 | 0.0 | 0. |
| 76 | 0.0 | 0.0 | 0. |
| 77 | 0.0 | 0.0 | 0. |
| 78 | 0.0 | 0.0 | 0. |
| 79 | 0.0 | 0.0 | 0. |
| 80 | 0.0 | 0.0 | 0. |
| 81 | 0.0 | 0.0 | 0. |
| 82 | 0.0 | 0.0 | 0. |
| 83 | 0.0 | 0.0 | 0. |
| 84 | 0.0 | 0.0 | 0. |
| 85 | 0.0 | 0.0 | 0. |
| 86 | 0.0 | 0.0 | 0. |
| 87 | 0.0 | 0.0 | 0. |
| 88 | 0.0 | 0.0 | 0. |
| 89 | 0.0 | 0.0 | 0. |
| 90 | 0.0 | 0.0 | 0. |
| 91 | 0.0 | 0.0 | 0. |
| 92 | 0.0 | 0.0 | 0. |
| 93 | 0.0 | 0.0 | 0. |
| 94 | 0.0 | 0.0 | 0. |
| 95 | 0.0 | 0.0 | 0. |
| 96 | 0.0 | 0.0 | 0. |
| 97 | 0.0 | 0.0 | 0. |
| 98 | 0.0 | 0.0 | 0. |
| 99 | 0.0 | 0.0 | 0. |
| 100 | 0.0 | 0.0 | 0. |
| 101 | 0.0 | 0.0 | 0. |
| 102 | 0.0 | 0.0 | 0. |
| 103 | 0.0 | 0.0 | 0. |
| 104 | 0.0 | 0.0 | 0. |
| 105 | 0.0 | 0.0 | 0. |
| 106 | 0.0 | 0.0 | 0. |
| 107 | 0.0 | 0.0 | 0. |
| 108 | 0.0 | 0.0 | 0. |
| 109 | 0.0 | 0.0 | 0. |
| 110 | 0.0 | 0.0 | 0. |
| 111 | 0.0 | 0.0 | 0. |
| 112 | 0.0 | 0.0 | 0. |
| 113 | 0.0 | 0.0 | 0. |
| 114 | 0.0 | 0.0 | 0. |
| 115 | 0.0 | 0.0 | 0. |
| 116 | 0.0 | 0.0 | 0. |
| 117 | 0.0 | 0.0 | 0. |
| 118 | 0.0 | 0.0 | 0. |
| 119 | 0.0 | 0.0 | 0. |
| 120 | 0.0 | 0.0 | 0. |
| 121 | 0.0 | 0.0 | 0. |
| 122 | 0.0 | 0.0 | 0. |
| 123 | 0.0 | 0.0 | 0. |
| 124 | 0.0 | 0.0 | 0. |

| | | | |
|---|---|---|---|
| 125 | 0.0 | 0.0 | 0. |
| 126 | 0.0 | 0.0 | 0. |
| 127 | 0.0 | 0.0 | 0. |
| 128 | 0.0 | 0.0 | 0. |
| 129 | 0.0 | 0.0 | 0. |
| 130 | 0.0 | 0.0 | 0. |
| 131 | 0.0 | 0.0 | 0. |
| 132 | 0.0 | 0.0 | 0. |
| 133 | 0.0 | 0.0 | 0. |
| 134 | 0.0 | 0.0 | 0. |
| 135 | 0.0 | 0.0 | 0. |
| 136 | 0.0 | 0.0 | 0. |
| 137 | 0.0 | 0.0 | 0. |
| 138 | 0.0 | 0.0 | 0. |
| 139 | 0.0 | 0.0 | 0. |
| 140 | 0.0 | 0.0 | 0. |
| 141 | 0.0 | 0.0 | 0. |
| 142 | 0.0 | 0.0 | 0. |
| 143 | 0.0 | 0.0 | 0. |
| 144 | 0.0 | 0.0 | 0. |
| 145 | 0.0 | 0.0 | 0. |
| 146 | 0.0 | 0.0 | 0. |
| 147 | 0.0 | 0.0 | 0. |
| 148 | 0.0 | 0.0 | 0. |
| 149 | 0.0 | 0.0 | 0. |
| 150 | 0.0 | 0.0 | 0. |
| SUM | 5.20 | 4.26 | 19579. |

| | PEAK | 6-HOUR | 24-HOUR | 72-HOUR | TOTAL VOLUME |
|---|---|---|---|---|---|
| CFS | 1850. | 801. | 204. | 151. | 19579. |
| INCHES | | 4.21 | 4.29 | 4.29 | 4.29 |
| AC-FT | | 397. | 405. | 405. | 405. |

## HYDROGRAPH ROUTING

ROUTING THROUGH 19

| ISTAQ | ICOMP | IECON | ITAPE | JPLT | JPRT | INAME |
|---|---|---|---|---|---|---|
| 0 | 1 | 0 | 0 | 0 | 0 | 1 |

ROUTING DATA

| GLOSS | CLOSS | AVG | IRES | ISAME |
|---|---|---|---|---|
| 0.0 | 0.0 | 0.0 | 1 | 0 |

| NSTPS | NSTDL | LAG | AMSKK | X | TSK | STORA |
|---|---|---|---|---|---|---|
| 1 | 0 | 0 | 0.0 | 0.0 | 0.0 | 0. |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| STORAGE= | 0. | 65. | 127. | 195. | 271. | 350. | 435. | 530. | 642. | 0. |
| OUTFLOW= | 0. | 2. | 8. | 11. | 60. | 115. | 243. | 625. | 1107. | 0. |

| TIME | EOP STOR | AVG IN | EOP OUT |
|---|---|---|---|
| 1 | 0. | 0. | 0. |
| 2 | 0. | 0. | 0. |
| 3 | 0. | 0. | 0. |
| 4 | 0. | 0. | 0. |
| 5 | 0. | 0. | 0. |
| 6 | 0. | 0. | 0. |
| 7 | 0. | 0. | 0. |

BY DJM DATE

CHKD. BY DATE

SUBJECT

# LOUIS BERGER & ASSOCIATES INC.

ASSUNPINK CREEK SITE #19

SHEET NO. A18 OF

PROJECT C-227

| | | | |
|---|---|---|---|
| 8 | 0. | 0. | 0. |
| 9 | 0. | 3. | 0. |
| 10 | 0. | 10. | 0. |
| 11 | 1. | 24. | 0. |
| 12 | 2. | 48. | 0. |
| 13 | 3. | 83. | 0. |
| 14 | 6. | 138. | 0. |
| 15 | 11. | 245. | 0. |
| 16 | 20. | 437. | 1. |
| 17 | 35. | 730. | 1. |
| 18 | 58. | 1098. | 2. |
| 19 | 88. | 1453. | 4. |
| 20 | 123. | 1712. | 8. |
| 21 | 161. | 1831. | 9. |
| 22 | 198. | 1802. | 13. |
| 23 | 232. | 1666. | 35. |
| 24 | 261. | 1474. | 54. |
| 25 | 286. | 1264. | 71. |
| 26 | 307. | 1067. | 85. |
| 27 | 323. | 892. | 96. |
| 28 | 336. | 739. | 106. |
| 29 | 347. | 609. | 113. |
| 30 | 355. | 496. | 122. |
| 31 | 360. | 397. | 130. |
| 32 | 364. | 317. | 136. |
| 33 | 366. | 254. | 140. |
| 34 | 368. | 204. | 142. |
| 35 | 368. | 163. | 142. |
| 36 | 368. | 129. | 142. |
| 37 | 367. | 100. | 141. |
| 38 | 366. | 75. | 139. |
| 39 | 364. | 47. | 136. |
| 40 | 362. | 27. | 132. |
| 41 | 359. | 17. | 129. |
| 42 | 357. | 11. | 125. |
| 43 | 354. | 7. | 122. |
| 44 | 352. | 4. | 118. |
| 45 | 350. | 2. | 115. |
| 46 | 347. | 1. | 113. |
| 47 | 345. | 1. | 112. |
| 48 | 343. | 0. | 110. |
| 49 | 341. | 0. | 108. |
| 50 | 338. | 0. | 107. |
| 51 | 336. | 0. | 105. |
| 52 | 334. | 0. | 104. |
| 53 | 332. | 0. | 102. |
| 54 | 330. | 0. | 101. |
| 55 | 328. | 0. | 99. |
| 56 | 326. | 0. | 98. |
| 57 | 324. | 0. | 97. |
| 58 | 322. | 0. | 95. |
| 59 | 320. | 0. | 94. |
| 60 | 318. | 0. | 93. |
| 61 | 316. | 0. | 91. |
| 62 | 314. | 0. | 90. |
| 63 | 312. | 0. | 89. |
| 64 | 310. | 0. | 87. |
| 65 | 309. | 0. | 86. |
| 66 | 307. | 0. | 85. |
| 67 | 305. | 0. | 84. |
| 68 | 303. | 0. | 82. |
| 69 | 302. | 0. | 81. |
| 70 | 300. | 0. | 80. |
| 71 | 298. | 0. | 79. |
| 72 | 297. | 0. | 78. |
| 73 | 295. | 0. | 77. |
| 74 | 293. | 0. | 76. |
| 75 | 292. | 0. | 75. |
| 76 | 290. | 0. | 74. |
| 77 | 289. | 0. | 72. |
| 78 | 287. | 0. | 71. |
| 79 | 286. | 0. | 70. |
| 80 | 285. | 0. | 69. |
| 81 | 283. | 0. | 68. |
| 82 | 282. | 0. | 67. |
| 83 | 280. | 0. | 66. |
| 84 | 279. | 0. | 66. |
| 85 | 278. | 0. | 65. |
| 86 | 276. | 0. | 64. |
| 87 | 275. | 0. | 63. |
| 88 | 274. | 0. | 62. |
| 89 | 272. | 0. | 61. |
| 90 | 271. | 0. | 60. |
| 91 | 270. | 0. | 59. |
| 92 | 269. | 0. | 59. |
| 93 | 268. | 0. | 58. |
| 94 | 266. | 0. | 57. |
| 95 | 265. | 0. | 56. |
| 96 | 264. | 0. | 55. |
| 97 | 263. | 0. | 55. |
| 98 | 262. | 0. | 54. |
| 99 | 261. | 0. | 53. |
| 100 | 260. | 0. | 53. |
| 101 | 258. | 0. | 52. |
| 102 | 257. | 0. | 51. |
| 103 | 256. | 0. | 51. |
| 104 | 255. | 0. | 50. |
| 105 | 254. | 0. | 49. |
| 106 | 253. | 0. | 49. |
| 107 | 252. | 0. | 48. |
| 108 | 251. | 0. | 47. |
| 109 | 250. | 0. | 47. |
| 110 | 249. | 0. | 46. |
| 111 | 248. | 0. | 45. |
| 112 | 247. | 0. | 45. |
| 113 | 247. | 0. | 44. |
| 114 | 246. | 0. | 44. |
| 115 | 245. | 0. | 43. |
| 116 | 244. | 0. | 43. |
| 117 | 243. | 0. | 42. |
| 118 | 242. | 0. | 41. |
| 119 | 241. | 0. | 41. |
| 120 | 240. | 0. | 40. |
| 121 | 240. | 0. | 40. |
| 122 | 239. | 0. | 39. |
| 123 | 238. | 0. | 39. |
| 124 | 237. | 0. | 38. |
| 125 | 236. | 0. | 38. |
| 126 | 236. | 0. | 37. |
| 127 | 235. | 0. | 37. |
| 128 | 234. | 0. | 36. |
| 129 | 233. | 0. | 36. |

BY DJM DATE

CHKD. BY DATE

SUBJECT

# LOUIS BERGER & ASSOCIATES INC.

ASSUNPINK CREEK SITE #19

SHEET NO. A19 OF

PROJECT C-227

| | | | |
|---|---|---|---|
| 130 | 233. | 0. | 35. |
| 131 | 232. | 0. | 35. |
| 132 | 231. | 0. | 34. |
| 133 | 231. | 0. | 34. |
| 134 | 230. | 0. | 33. |
| 135 | 229. | 0. | 33. |
| 136 | 228. | 0. | 33. |
| 137 | 228. | 0. | 32. |
| 138 | 227. | 0. | 32. |
| 139 | 226. | 0. | 31. |
| 140 | 226. | 0. | 31. |
| 141 | 225. | 0. | 30. |
| 142 | 225. | 0. | 30. |
| 143 | 224. | 0. | 30. |
| 144 | 223. | 0. | 29. |
| 145 | 223. | 0. | 29. |
| 146 | 222. | 0. | 29. |
| 147 | 222. | 0. | 28. |
| 148 | 221. | 0. | 28. |
| 149 | 220. | 0. | 27. |
| 150 | 220. | 0. | 27. |
| SUM | | | 8951. |

| | PEAK | 6-HOUR | 24-HOUR | 72-HOUR | TOTAL VOLUME |
|---|---|---|---|---|---|
| CFS | 142. | 124. | 82. | 60. | 8951. |
| INCHES | | 0.65 | 1.72 | 1.96 | 1.96 |
| AC-FT | | 62. | 162. | 185. | 185. |

********** ********** ********** ********** **********

COMBINE HYDROGRAPHS

COMBINE HYDROGRAPHS FOR SITES 18&19

| ISTAQ | ICOMP | IECON | ITAPE | JPLT | JPRT | INAME |
|---|---|---|---|---|---|---|
| 0 | 2 | 0 | 0 | 0 | 0 | 1 |

SUM OF 2 HYDROGRAPHS AT 0

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. | 0. |
| 0. | 0. | 1. | 1. | 2. | 3. | 6. | 9. | 13. | 43. |
| 73. | 137. | 203. | 252. | 291. | 322. | 336. | 345. | 343. | 340. |
| 336. | 331. | 324. | 315. | 306. | 296. | 285. | 275. | 263. | 252. |
| 241. | 231. | 221. | 211. | 202. | 195. | 189. | 182. | 176. | 171. |
| 165. | 161. | 158. | 156. | 153. | 151. | 146. | 146. | 144. | 141. |
| 139. | 137. | 135. | 133. | 131. | 129. | 127. | 125. | 123. | 121. |
| 119. | 117. | 115. | 113. | 111. | 110. | 108. | 106. | 105. | 103. |
| 101. | 100. | 98. | 97. | 95. | 94. | 92. | 91. | 89. | 88. |
| 87. | 85. | 84. | 83. | 82. | 80. | 79. | 78. | 77. | 76. |
| 75. | 73. | 72. | 71. | 70. | 69. | 68. | 67. | 66. | 65. |
| 64. | 63. | 62. | 61. | 61. | 60. | 59. | 58. | 57. | 56. |
| 55. | 55. | 54. | 53. | 52. | 51. | 51. | 50. | 49. | 48. |
| 48. | 47. | 46. | 46. | 45. | 44. | 44. | 43. | 42. | 42. |
| 41. | 41. | 40. | 39. | 39. | 38. | 38. | 37. | 37. | 36. |

| | PEAK | 6-HOUR | 24-HOUR | 72-HOUR | TOTAL VOLUME |
|---|---|---|---|---|---|
| CFS | 345. | 280. | 150. | 107. | 16057. |
| INCHES | | 0.87 | 1.87 | 2.09 | 2.09 |
| AC-FT | | 139. | 298. | 332. | 332. |