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OSWEGO RIVER BASIN

PUNCH BOWL DAM

SCHUYLER COUNTY, NEW YORK
INVENTORY NO. N.Y. 1345

NEW YORK

REPORT DOCUMENTATION PAGE		READ INSTRUCTIONS BEFORE COMPLETING FORM
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Punch Bowl Dam

Oswego River Basin
Schuyler County

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

This report provides information and details on the physical condition of the dam as of the inspection date. Information and analysis are based on visual inspection of the dam by the performing organization.

Based on the evaluation of the existing conditions, the condition of the Punch Bowl Dam is considered to be good. The examination of documents and the visual observations did not reveal conditions which constitute a hazard to human life or property.

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The spillway capacity was evaluated according to the recommended procedure and the dam was found to pass 100 percent of the Probable Maximum Flood (PMF) without significantly affecting the stability of the dam. Therefore, the spillway capacity is rated as adequate.

PREFACE

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

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

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

Phase I inspections are not intended to provide detailed hydrologic
and hydraulic analyses. In accordance with the established Guidelines,
the spillway design flood is based on the estimated "Probable Maximum
Flood" for the region (greatest reasonably possible storm runoff), or
fractions thereof. Because of the magnitude and rarity of such a storm
event, a finding that a spillway will not pass the test flood should not
be interpreted as necessarily posing a highly inadequate condition. 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 condi-
tion and the downstream damage potential.

PHASE I INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM
PUNCH BOWL DAM
N.Y. 1343
DEC I.D. NO. 60C-4405
OSWEGO RIVER BASIN
SCHUYLER COUNTY, NEW YORK

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*Not included due to lack of pertinent data.

PHASE I INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM

Name of Dam: Punch Bowl Dam
                                      N.Y. 1343

State Located: New York

County Located: Schuyler

Stream: Glen Creek (a tributary of Seneca
                                      Lake)

Date of Inspection: June 25, 1981 and July 15, 1981

ASSESSMENT

    Based on the evaluation of the existing conditions, the condition
of the Punch Bowl Dam is considered to be good. The examination of
documents and the visual observations did not reveal conditions which
constitute a hazard to human life or property.

    The spillway capacity was evaluated according to the recommended
procedure and the dam was found to pass 100 percent of the Probable
Maximum Flood (PMF) without significantly affecting the stability of the
dam. Therefore, the spillway capacity is rated as adequate.

    The following recommendations should be implemented within 12 months
from the final issuance date of this report:

    1. An all-weather access route to the dam should be
       provided to permit inspection of the dam and the
       implementation of action in the event of an emergency
       during severe weather conditions.

    2. Means should be developed to drain the reservoir in
       the event of an emergency.

    3. An emergency action plan should be developed, including
       a formal warning system to alert the downstream residents
       in the event of an emergency.

    4. The dam and appurtenant structures should be inspected
       regularly and necessary maintenance should be performed.

Lawrence D. Andersen, P.E.
Vice President
D'Appolonia Consulting Engineers, Inc.
Pittsburgh, Pennsylvania

Approved by:

Col. W. M. Smith, Jr.
New York District Engineer

Date: 14 Sep 81

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PUNCH BOWL DAM
N.Y. 1343
DEC I.D. 60C-4405
JUNE 25, 1981

OVERVIEW

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PHASE I INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM
PUNCH BOWL DAM
N.Y. 1343
DEC I.D. NO. 60C-4405
OSWEGO RIVER BASIN
SCHUYLER COUNTY, NEW YORK

SECTION 1: PROJECT INFORMATION

1.1 GENERAL

a. Authority
The Phase I Inspection reported herein was authorized by the
Department of the Army, New York District, Corps of Engineers,
to fulfill the requirements of the National Dam Inspection Act,
Public Law 92-367.

b. Purpose of Inspection
The inspection was to evaluate the existing conditions of the
subject dam to identify deficiencies and hazardous conditions,
determine if they constitute hazards to life and property, and
recommend remedial measures where necessary.

1.2 DESCRIPTION OF PROJECT

a. Dam and Appurtenances
The Punch Bowl Dam is a concrete arch dam with a maximum height of
38 feet from the downstream toe. The dam spans a narrow gorge
approximately 100 feet wide. No design and construction information
is available. According to the approximate field measurements,
the crest length of the arch is approximately 110 feet and the
thickness of the arch at the crest level is about 5 feet. The dam
appears to be a single curvature arch. Based on field measurements,
the radius of curvature is about 70 feet.

A 35-foot-wide, 2-foot-deep low section, located at the center of
the arch, constitutes the normal flow spillway. A gated opening
through the dam, located approximately 30 feet below the dam near
the right abutment, is the low level outlet facility of the struc-
ture. According to state park personnel, the low level outlet
sluice gate has not been operated since the completion of the
dam.

b. Location
The dam is located in Watkins Glen State Park on Glen Creek about
two miles upstream from its mouth at Seneca Lake in Dix Township,
Schuyler County, New York. Plate 1 illustrates the location of the
dam.

c. Size Classification

The dam is classified as a small dam based on its 38-foot height and a maximum storage capacity of 190 acre-feet.

d. Hazard Classification

The dam is classified to be in the high hazard category. Downstream from the dam, Glen Creek flows through a narrow gorge in Watkins Glen State Park, and then through commercial and residential areas within the town of Watkins Glen. Finally, Glen Creek discharges into Barge Canal at the south end of Seneca Lake about two miles downstream from the dam. In Watkins Glen, the stream flows through a 50- to 60-foot-wide, 10- to 15-foot-deep channel. Based on visual observations, it is estimated that failure of the dam could cause loss of more than a few lives and appreciable property damage in both the Watkins Glen State Park and the town of Watkins Glen.

e. Ownership

The dam is owned and operated by the New York State Department of Parks and Recreation. (Address: Mr. Robert DeNardo, Park Superintendent, Watkins Glen State Park, P.O. Box 304, Watkins Glen, New York 14891, 607-535-4511).

f. Purpose of Dam

According to the Park Superintendent, the dam was designed and constructed for the purpose of controlling sediment runoff into Watkins Glen State Park.

g. Design and Construction History

No references were found to document the design and construction history of the dam. According to state files, construction of the dam was completed in 1936.

h. Normal Operating Procedure

The reservoir is normally maintained at the spillway crest level of the dam.

1.3 PERTINENT DATA

Elevations referred to in this and subsequent sections of the report were obtained from field measurements assuming the spillway crest to be at Elevation 915 (USGS Datum) which is shown as the pool level of the reservoir on the Beaver Dam 7.5-minute USGS quadrangle.

a. Drainage Area (sq. mi.)   21.5

b. Discharge at Dam (cfs)
   Spillway at top of nonoverflow section   310

c. Elevation (USGS Datum) (feet)
   Top of dam (overflow section)   915
   Top of dam (nonoverflow section)   917

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d. Reservoir (acres)

    Surface area at top of overflow section   12.9± [1]

    Surface area at top of nonoverflow section   13.6±

e. Storage Capacity (acre-feet)

    Top of dam (overflow section)   160 [2]

    Top of dam (nonoverflow section)   190

f. Dam

Type	Concrete arch
Length	110 feet
Height	38 feet
Top width	5± feet
Side slopes	Downstream: Vertical
	Upstream: Vertical
Cutoff	Unknown
Grout curtain	No

g. Primary Spillway

Type	Concrete overflow section
Length	35 feet
Crest elevation	915 feet

h. Reservoir Drain

Type	Gated opening through dam (size unknown)
Length	Not applicable
Access	Not accessible
Regulatory Facility	Manually operated hoist mechanism

---

[1]Planimetered from USGS 7.5-minute Beaver Dam quadrangle. Original reservoir area was reported to be 16 acres. Reservoir is now significantly silted.

[2]Design storage capacity.

SECTION 2: ENGINEERING DATA

2.1 DATA AVAILABLE

Available information was obtained from the New York State Department of Environmental Conservation, Dam Safety Division files. The only information available in the files was a field inspection checklist dated June 8, 1980. The State Parks and Recreation Department Offices in Albany and the Finger Lakes field office were contacted in an effort to obtain additional information. However, both offices reported that no design or construction information was available for the dam. An internal correspondence provided by the State Park Superintendent, dated July 6, 1972, and prepared by Mr. J. W. Miller, Senior Park Engineer, was found to include some information on the pertinent dimensions of the dam.

2.2 GEOLOGY

The Punch Bowl Dam is located in the glaciated Allegheny Plateau section of the Appalachian Plateau Province. This region is characterized as a maturely dissected plateau with the topographic features modified by continental glaciation. The modification consists of rounding off of the high areas and deposition of glacial till in the valleys.

The dam site is located near the axis of a northeast trending anticline (trending approximately north 70 degrees east). The folding is gentle with the maximum dip of the limbs of one to two degrees. The dip of the strata is affected locally by the folding; however, regionally, the rock strata dip south to southwest at approximately 100 to 150 feet per mile. The most prominent fracture orientations in the region have a strike of north 25 degrees west. Less prominent fractures strike north 75 degrees west and north 10 degrees east. Also, there is a north-trending normal fault approximately one mile west of the dam.

The rock strata in the area consist of unconsolidated Pleistocene glacial till (Wisconsin Drift) underlain by strata of the Sonyea Group (Upper Devonian Age). The glacial till consists of a mixture of clay and silt with varying quantities of gravel. The glacial till is relatively thin on hilltops and slopes and thicker in the valleys. The bedrock consists of a thick sequence of interbedded gray calcareous shale, gray and greenish-gray siltstone and silty shale, brown, gray, and dark gray shale, and black fissile shale.

2.3 SUBSURFACE INVESTIGATION

No reference was found relative to a subsurface investigation.

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2.4 EMBANKMENT AND APPURTENANT STRUCTURES

As noted before, very limited information is available concerning the design and construction of the dam. Sketches in Plate 2 illustrate the plan view and typical cross section of the dam as derived from the available information. The 1972 correspondence indicates that the radius of curvature of the dam is about 70 feet. The thickness of the arch wall is reported to be five feet at crest level and seven feet at the bottom of the dam. It is also reported that the dam was keyed into the abutments in the range of 8 to 25 feet and into the foundation by about 6 feet. It is reported that steel reinforcement was provided on both faces of the dam.

2.5 CONSTRUCTION RECORDS

No construction records are available. Visual observations indicate that no postconstruction changes were instituted.

2.6 OPERATING RECORDS

No operating records are maintained.

2.7 EVALUATION OF DATA

The available information is very limited. However, in conjunction with visual observation, the available data are considered to be adequate for Phase I inspection purposes.

SECTION 3: VISUAL INSPECTIONS

3.1 FINDINGS

a. General
Visual inspections of the dam were conducted on June 25 and July 15, 1981. On both dates, the pool level was approximately at the crest level of the overflow section.

b. Dam
No identifiable signs of distress or misalignment were observed. No seepage was observed at the junction of the dam and the abutments. The base of the dam is submerged by the spillway plunge pool; therefore, it could not be inspected for signs of seepage. The concrete comprising the main structure was found to be in good condition. Some sections of the stone veneer on the crest of the dam and the concrete in the vicinity of the low level outlet were found to be deteriorating.

c. Spillway
A 35-foot-wide and approximately 2-foot-deep low overflow section on the crest of the dam constitutes the spillway of the dam. The overflow section was found to be in good condition; no significant concrete erosion was noted.

d. Reservoir Drain
A gated opening through the dam, located approximately 30 feet below the dam crest near the right abutment, constitutes the low level outlet for the facility. The sluice gate and hoist are located on the downstream side of the dam. The outlet is not accessible for inspection. According to the park superintendent, the outlet has not been operated since the completion of the dam.

e. Downstream Channel
The stream channel downstream from the dam is a deep gorge. The channel appears to be stable within the vicinity of the dam.

f. Reservoir
It appears that the reservoir is silted to within several feet of the spillway overflow crest. The original reservoir surface area is reported to have been 16 acres. Visual observations indicate that the present reservoir area is in the range of 13 acres.

3.2 EVALUATION

The dam was found to be structurally in good condition. However, the sluice gate and its hoisting equipment appear to be corroded and are reported to be nonfunctional. Minor concrete deterioration was also observed.

SECTION 4: OPERATION AND MAINTENANCE PROCEDURES

4.1 PROCEDURES

The reservoir is normally maintained at the spillway crest level with excess inflow discharging over the spillway. The dam has no formal operating procedure.

4.2 MAINTENANCE OF THE DAM

The dam is maintained by state park personnel. The low level outlet gate was found to be corroded and requires reconditioning. Further, the outlet is not accessible for thorough inspection or for maintenance.

4.3 WARNING SYSTEM IN EFFECT

There is no formal warning system in effect. It is reported by state park personnel that the dam is inspected following major storms. It was found that the dam is accessible by a foot path only which may not be passable during severe weather conditions.

4.4 EVALUATION

The maintenance condition of the low level outlet operating facilities is considered to be poor. These facilities should be maintained to prevent further corrosion. Access to the dam should also be improved to permit inspection of the dam and implementation of emergency action, if necessary, during severe weather conditions.

SECTION 5: HYDRAULIC/HYDROLOGY

5.1 DRAINAGE AREA CHARACTERISTICS

The Punch Bowl Dam drains an area of 21.5 square miles. The
basin is comprised of woodlands, farmlands, and pasturelands.
Two dams are located upstream from the Punch Bowl Dam on Glen
Creek.

5.2 ANALYSIS CRITERIA

As previously stated, the Punch Bowl Dam is classified as a small
dam in the high hazard category. Under the recommended criteria
for evaluating spillway discharge capacity, such impoundments
are required to pass one-half to full PMF.

The PMF inflow hydrograph for the reservoir was determined using
the Dam Safety Version of the HEC-1 computer program developed by
the Hydrologic Engineering Center of the U.S. Army Corps of Engi-
neers. The data used for the computer input are presented in
Appendix D.

5.3 SPILLWAY CAPACITY

The 35-foot-wide, 2-foot-deep low section along the crest of the
dam constitutes the primary spillway. The capacity of the primary
spillway is calculated to be 310 cfs. During inflow conditions in
excess of the capacity of the primary spillway, the entire crest of
the dam can function as an emergency spillway.

5.4 RESERVOIR CAPACITY

The original storage capacity of the dam is reported to be 160 acre-
feet but the reservoir has significantly silted. The present
surcharge storage capacity is estimated to be in the range of 20 to
30 acre-feet.

5.5 FLOODS OF RECORD

None available.

5.6 OVERTOPPING POTENTIAL

The PMF inflow hydrograph, determined according to the recommended
procedure, was found to have a peak flow of 28,500 cfs. The capacity
of the low overflow section of the dam (310 cfs) corresponds to one
percent of the PMF. The 50 percent PMF peak flow is 14,200 cfs.
The PMF and 50 percent PMF inflow hydrographs were routed through
the reservoir and it was found that the crest of the dam would be
overtopped by 11.4 feet during the 50 percent PMF and by 18.5 feet
during the full PMF.

5.7 EVALUATION

The results of a preliminary stability analysis, which is discussed in Section 6, indicate that the dam will likely be stable during the passage of full PMF; therefore, the spillway capacity is considered to be adequate according to the recommended criteria.

SECTION 6: STRUCTURAL STABILITY

6.1 EVALUATION OF STRUCTURAL STABILITY

a. Visual Observations
As discussed in Section 3, the field observations did not reveal
any signs of distress that would adversely affect the stability of
the dam at this time.

b. Design and Construction Data
As previously noted, very limited design information is available
to aid in the assessment of the structural stability of the dam.
No design drawings or calculations are available.

c. Stability Analysis
A preliminary stability analysis was conducted to determine the
order of magnitude of the stresses in the arch during the passage of
the full PMF. The stability analysis is included in Appendix G. A
representative unity height of the dam was analyzed as an arch with
pinned supports. In view of the lack of any quantitative design
information, such as type and strength of the concrete and strength
of the abutment rocks, a more detailed analysis could not be con-
ducted. The results of this approximate analysis indicate that the
maximum arch compressive stress is in the range of 300 psi, which is
likely to be within the allowable strength of the abutment rock and
the concrete used to construct the dam. Based on visual observations,
the stability of the dam under normal pool conditions is considered
to be adequate.

d. Postconstruction Changes
No postconstruction changes were reported.

e. Seismic Stability
The dam is located in Seismic Zone 1. Based on the recommended
criteria for evaluation of the seismic stability of dams, the
structure is presumed to present no hazard from earthquakes.

SECTION 7: ASSESSMENT/RECOMMENDATIONS

7.1 ASSESSMENT

a. Safety
Visual observations indicate that the Punch Bowl Dam is structurally in good condition. No conditions were observed that would adversely affect the stability of the structure at this time. The dam was found to pass the required spillway design flood without signifi-cantly affecting its stability. Therefore, the spillway capacity of the dam is classified to be adequate.

The operating equipment of the low level outlet was found to be in poor condition and requires maintenance. It was reported by State Park personnel that the low level outlet facility is nonfunctional. Because the reservoir has significantly silted, the low level outlet facility cannot be used to drain the reservoir. Therefore, other means of draining the reservoir should be devised to drawdown the lake in the event of an emergency condition.

Another condition noted was that the dam is accessible by a foot path only, which may not be passable under severe weather conditions. Therefore, access to the dam should be provided to permit inspection of the dam and implementation of emergency action during severe weather conditions, if necessary.

b. Adequacy of Information
Available information, in conjunction with visual observations, is considered to be sufficient to make a Phase I evaluation.

c. Need for Additional Investigations
No additional investigation is considered to be required at this time.

d. Urgency
The following recommendations should be implemented within 12 months from the final issuance date of this report.

7.2 RECOMMENDATIONS

1. An all-weather access route to the dam should be provided to permit inspection of the dam and the implementation of action in the event of an emergency during severe weather conditions.

2. Means should be developed to drain the reservoir in the event of an emergency.

3. An emergency action plan should be developed, including a formal warning system to alert the downstream residents in the event of an emergency.

4. The dam and appurtenant structures should be inspected regularly and necessary maintenance should be performed.

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APPENDIX A

PHOTOGRAPHS
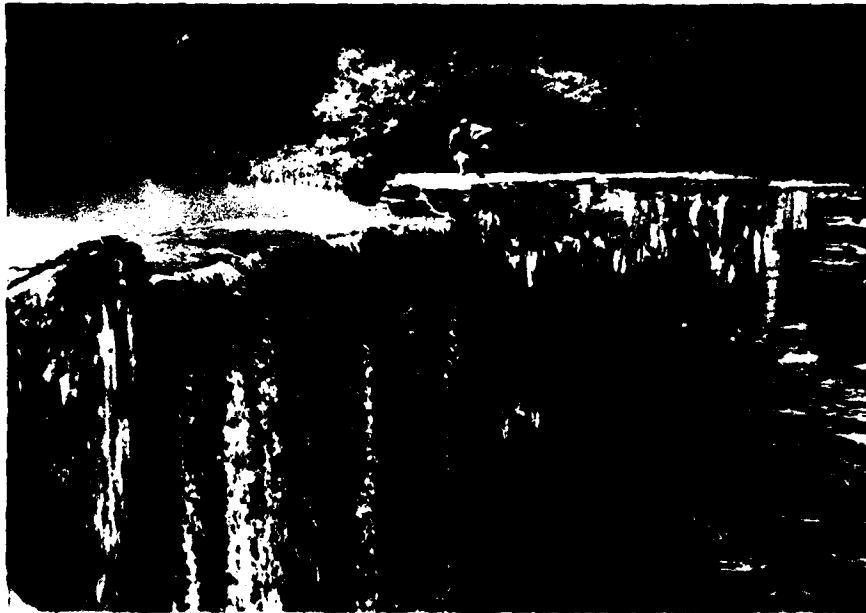
PHOTOGRAPH NO. 1
Dam Crest (looking north)

PHOTOGRAPH NO. 2
Left Abutment

PHOTOGRAPH NO. 3
Right Abutment

PHOTOGRAPH NO. 4
Low Level Outlet Sluice Gate

PHOTOGRAPH NO. 5
Watkins Glen State Park
(1.0 mile downstream)

PHOTOGRAPH NO. 6
City of Watkins Glen
(1.5 miles downstream)

APPENDIX B

VISUAL INSPECTION CHECKLIST

VISUAL INSPECTION CHECKLIST

1) <u>Basic Data</u>

    a. General

        Name of Dam   Punch Bowl Dam

        Fed. I.D. #   N.Y. 1343   DEC Dam No.   60C-4405

        River Basin   Oswego River Basin

        Location: Watkins Glen State Park, one mile south of Watkins

                 Glen in Schulyer County

        Stream Name   Glen Creek

        Tributary of   Seneca Lake

        Latitude (N)   42° 22.4'   Longitude (W)   76° 53.9'

        Type of Dam   Concrete arch

        Hazard Category   High

        Date(s) of Inspection   June 25, 1981 and July 15, 1981

        Weather Conditions   Sunny, Temp. 75 degrees

        Reservoir Level at Time of Inspection   El. 915 $\pm$

    b. Inspection Personnel   Lawrence Andersen, P.E.; James Poellot,

        P.E.; Bilgin Erel, P.E.; and Michael Bort

    c. *Persons Contacted (Including Address & Phone No.)*

        Mr. Robert DeNardo, Park Superintendent, Watkins Glen State

        Park, P.O. Box 304, Watkins Glen, New York   14891,

        607-535-4511

d. History:

Date Constructed __1936__ Date(s) Reconstructed ___N/A___

Designer __Unknown__

Constructed by ___Unknown___

Owner __New York State Department of Parks and Recreation__

2) Embankment

a. Characteristics

(1) Embankment Material ___Concrete___

(2) Cutoff Type ___N/A___

(3) Impervious Core ___N/A___

(4) Internal Drainage System ___N/A___

(5) Miscellaneous ___--___

b. Crest

(1) Vertical Alignment __Good__

(2) Horizontal Alignment ___Good___

(3) Surface Cracks ___None___

(4) Miscellaneous ___--___

c. Upstream Slope

(1) Slope (Estimate) ___Vertical___

(2) Undesirable Growth or Debris, Animal Burrows __N/A__

(3) Sloughing, Subsidence or Depressions ___N/A___

      (4) Slope Protection   N/A

      (5) Surface Cracks or Movement at Toe   None

d. Downstream Slope

      (1) Slope (Estimate)   Vertical

      (2) Undesirable Growth or Debris, Animal Burrows   N/A

      (3) Sloughing, Subsidence or Depressions   N/A

      (4) Surface Cracks or Movement at Toe   None

      (5) Seepage   None visible.

      (6) External Drainage System (Ditches, Trenches, Blanket)

          None

      (7) Condition Around Outlet Structure   N/A

      (8) Seepage Beyond Toe   None

e. Abutments – Embankment Contact

      No problems observed.

(1) Erosion at Contact   N/A

(2) Seepage Along Contact   None

3) Drainage System

    The dam has no internal drainage system.

4) Instrumentation (Monumentation/Surveys, Observation Wells, Weirs, Piezometers, etc.)

                  None

5) <u>Reservoir</u>

    a. Slopes   Moderate slopes, no problems observed.

    b. Sedimentation   Silted to within five to six feet of the
       spillway crest.

    c. Unusual Conditions Which Affect Dam   None observed.

6) <u>Area Downstream of Dam</u>

    a. Downstream Hazard (No. of Homes, Highways, etc.) Glen Creek
       flows through a narrow gorge in Watkins Glen State Park; then,
       approximately one mile farther downstream, it flows through
       commercial and residential areas of the town of Watkins Glen.

    b. Seepage, Unusual Growth   None

    c. Evidence of Movement Beyond Toe of Dam   None

    d. Condition of Downstream Channel   Good

7) <u>Spillway(s) (Including Discharge Conveyance Channel)</u>

    a. General   Service Spillway: A low overflow section of the
                dam constitutes the spillway.

    b. Condition of Service Spillway   Good

c. Condition of Auxiliary Spillway _____N/A_____

_____

_____

d. Condition of Discharge Conveyance Channel ___N/A_____

_____

_____

_____

8) **Reservoir Drain/Outlet**

Type: Pipe _____ Conduit _____ Other Opening through dam

Material: Concrete _____ Metal _____ Other __Unknown__

_____

Size: __Unknown_____ Length _____

Invert Elevations: Entrance __Unknown__ Exit ____Unknown_____

Physical Condition (Describe): __Not observable._____

Material: _____--_____

Joints: _____--_____ Alignment _____--_____

Structural Integrity: _____--_____

_____

Hydraulic Capability: _____--_____

_____

Means of Control: Gate __X__ Valve _____ Uncontrolled _____

Operation: Operable _____ Inoperable __X__ Other _____

Present Condition (Describe): __The reservoir drain is_____

reported to be inoperable._____

9) <u>Structural</u>

    a. Concrete Surfaces   <u>The dam appears to generally be in</u>
       <u>good condition with some spalling near the right abutment</u>
       <u>and near the low level outlet gate.</u>

    b. Structural Cracking   <u>None observed.</u>

    c. Movement - Horizontal & Vertical Alignment (Settlement)
       <u>None observed.</u>

    d. Junctions with Abutments or Embankment. _____
       <u>No problems observed.</u>

    e. Drains - Foundation, Joint, Face _____
       <u>No problems observed.</u>

    f. Water Passages, Conduits, Sluices _____
       <u>N/A</u>

    g. Seepage or Leakage _____ <u>None observed.</u>

h. Joints - Construction, etc. ___No problems observed.___

i. Foundation ___Not visible.___

j. Abutments ___N/A___

k. Control Gates ___Reported to be inoperable.___

l. Approach & Outlet Channels ___Good___

m. Energy Dissipators (Plunge Pool, etc.) ___None___

n. Intake Structures ___N/A___

o. Stability ___N/A___

p. Miscellaneous ___---___

10) <u>Appurtenant Structures</u> (Power House, Lock, Gatehouse, Other)

    a. Description and Condition _____ None _____

        _____

        _____

        _____

        _____

        _____

        _____

        _____

        _____

        _____

        _____

        _____

APPENDIX C

ENGINEERING DATA CHECKLIST

APPENDIX C
ENGINEERING DATA CHECKLIST
NAME OF DAM: PUNCH BOWL DAM

AREA-CAPACITY DATA:

		Elevation (feet)	Surface Area (acres)	Storage Capacity (acre-feet)
1)	Top of Dam	917.0	13.6	190.0
2)	Design High Water (Max. Design Pool)	N/A	N/A	N/A
3)	Auxiliary Spillway Crest	N/A	N/A	N/A
4)	Service Spillway Crest	915.0	13.9	(design value) 160.0
5)	Crest of Orifice (Normal Pool)	N/A	N/A	N/A

DISCHARGES

		Discharge (cfs)
1)	Average Daily	50⁺
2)	Auxiliary Spillway at Maximum High Water[1]	28,490
3)	Auxiliary Spillway at Design High Water	N/A
4)	Principal Spillway at Auxiliary Spillway Crest Elevation	310
5)	Low Level Outlet	N/A
6)	Total of All Facilities at Maximum High Water[1]	28,490
7)	Maximum Known Flood	Unknown
8)	At Time of Inspection	50⁺

---

[1]Maximum high water is assumed to equal the full PMF. The dam
is capable of passing the full PMF.

DAM: _____ Punch Bowl Dam _____

CREST ELEVATION: _____ 917.0 _____

   Type: __Concrete arch_____

   Width: ___5 feet_____ Length: _____110 feet_____

Spillover: __Low overflow section of the dam._____

Location: __Center of the dam._____

            _____

SPILLWAY:

SERVICE		AUXILIARY (Entire dam crest)
915.0	Elevation	917
Overflow section	Type	Dam crest
35-foot	Width	5 feet
	Type of Control	
Uncontrolled	Uncontrolled	N/A
	Controlled	
N/A	Type (Flashboards; Gate)	N/A
N/A	Number	N/A
N/A	Size/Length	N/A
Concrete	Invert Material	N/A
N/A	Anticipated Length of Operating Service	N/A
N/A	Chute Length	N/A
5 to 6 feet	Height Between Spillway Crest and Approach Channel Invert (Weir Flow)	7 to 8 feet

Hydrometerological Gages:

Type: _____None_____

Location: N/A _____

Records:

Date - N/A _____

Max. Reading - N/A _____

FLOODWATER CONTROL SYSTEM:

Warning System: __None_____

_____

Method of Controlled Releases (Mechanisms):

_____None_____

_____

DRAINAGE AREA: _____ 21.5 square miles _____

DRAINAGE BASIN RUNOFF CHARACTERISTICS:

Land Use - Type: _____ Woodlands, farmlands, and pasturelands _____

Terrain - Relief: _____ Moderate to steep slopes _____

Surface - Soil: _____ Low permeability _____

Runoff Potential (existing or planned extensive alterations to existing surface or subsurface conditions)

Moderate to high runoff potential due to moderate to

steep slopes and low infiltration rate.

_____

Potential Sedimentation Problem Areas (natural or man-made; present or future)

Punch Bowl Dam was designed and constructed to act as a

sediment collection basin and is presently silted into

within five to six feet of its spillway crest. Thus, there

is an erosion problem within the watershed, the problem

most likely associated with the farmland areas.

Potential Backwater Problem Areas for Levels at Maximum Storage Capacity Including Surcharge Storage:

None observed.

_____

Dikes - Floodwalls (overflow and nonoverflow) - Low Reaches Along the Reservoir Perimeter:

Location: None _____

Elevation: _____

Reservoir:

Length at Maximum Pool: 2,400± feet _____

Length of Shoreline at Normal Pool: _____ 3,700± feet ____

APPENDIX D

HYDROLOGY AND HYDRAULIC ANALYSES

NAME OF DAM:___ Punch Bowl Dam (NY DEC 60C-4405)

PROBABLE MAXIMUM PRECIPITATION (PMP) = __21.5_ INCHES/24 HOURS[1]

STATION	1	2	3	4	5
Station Description	Punch Bowl Lake	Punch Bowl Dam	°		
Drainage Area (square miles)	21.5	—			
Cumulative Drainage Area (square miles)	21.5	21.5			
Adjustment of PMF for Drainage Area (%)					
6 Hours	111	—			
12 Hours	123	—			
24 Hours	132	—			
48 Hours	142	—			
72 Hours	—	—			
Snyder Hydrograph Parameters					
C_p/C_t [2]	0.60/2.0	—			
L (miles) [3]	8.0	—			
L_{ca} (miles) [3]	3.5	—			
$t_p = C_t(L \cdot L_{ca})^{0.3}$ (hours)	5.3	—			
Spillway Data					
Crest Length (ft)	—	35.0			
Freeboard (ft)	—	2.0			
Discharge Coefficient	—	3.1			
Exponent	—	1.5			

[1] Hydrometeorological Report 33 (Figure 1), U.S. Army, Corps of Engineers, 1956.

[2] Snyder's Coefficients.

[3] L = Length of longest water course from outlet to basin divide.
L_{ca} = Length of water course from outlet to point opposite the centroid of drainage area.

```
***********************
FLOOD HYDROGRAPH PACKAGE (HEC-1)
DAM SAFETY VERSION    JULY 1978
LAST MODIFICATION   01 APR 80
***********************

1   AT   SNYDER UNIT HYDROGRAPH, SPILLWAY AND DAM OVERTOPPING ANALYSES
2   A2   PUNCH BOWL DAM (NY 60C-44D5)SCHUYLER COUNTY,N.Y. PROJECT NO. 8U-718-(R
3   A3   FOR 5%,10%,20%,30%,40%,50%,7(%,80%,AND 1UC% PROBABLE MAXIMUM FLOOC(PMF)   =
4   B    300   0   30   0   0   0   0   -4
5   B1   5
6   J    1
7   J1   0.05   0.10   0.20   0.30   0.40   0.50   0.70   0.80   1.00
8   K    0                                     1
9   K1   1              CALC. OF SNYDER INFLOW HYDROGRAPH TO PUNCH BOWL DAM, (N.Y. 60C-44C5)
10  M    1    21.5   21.5   21.5
11  P         111    123    132    142
12  T                            1.0    0.05
13  W    5.30   0.60
14  X    -1.5   -0.05   2.0
15  K1   2                                              1
16  K1        ROUTING FLOW THROUGH PUNCH BOWL DAM, (AY 60C-44D))
17  Y    1
18  Y1   1                            -915.0
19  SA   0.0    12.9   14.7   20.2   22.0
20  SE   877.0  915.0  920.0  930.0  940.0
21  SS   915.0  35.0   3.1    1.5
22  SD   917.0  3.1    1.5    75.0                                        0.0319
23  K    99
```

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

OPERATION	STATION	AREA	PLAN	RATIOS APPLIED TO FLOWS								
				RATIO 1 .05	RATIO 2 .10	RATIO 3 .20	RATIO 4 .30	RATIO 5 .40	RATIO 6 .50	RATIO 7 .70	RATIO 8 .90	RATIO 9 1.00
HYDROGRAPH AT	1	21.50 (55.68)	1	1424. (40.33)	2849. (80.67)	5698. (161.34)	854. (242.01)	11395. (322.67)	14244. (403.34)	19942. (564.68)	2279. (645.35)	2648. (805.69)
ROUTED TO	2	21.50 (55.68)	1	1423. (40.31)	2848. (80.65)	5657. (161.33)	8543. (242.00)	11395. (322.67)	14244. (403.35)	19941. (564.66)	2278. (645.42)	2648. (805.62)

SUMMARY OF DAM SAFETY ANALYSIS

PLAN 1 ....

	ELEVATION	STORAGE	OUTFLOW
INITIAL VALUE	915.00	163.	0.
SPILLWAY CREST	915.00	163.	0.
TOP OF DAM	917.00	190.	507.

RATIO OF PMF	MAXIMUM RESERVOIR W.S.ELEV	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
.05	918.87	1.87	216.	1423.	15.00	45.00	0.00
.10	920.43	3.43	239.	2848.	20.50	45.00	0.00
.20	922.87	5.87	277.	5697.	27.00	45.00	0.00
.30	924.90	7.90	311.	8546.	31.50	45.00	0.00
.40	926.72	9.72	345.	11395.	37.50	45.00	0.00
.50	928.38	11.38	374.	14244.	41.50	45.00	0.00
.70	931.42	14.42	435.	19941.	52.00	45.00	0.00
.80	932.82	15.82	464.	22789.	55.00	45.00	0.00
1.00	935.46	18.46	519.	28486.	55.00	45.00	0.00

OVERTOPPING ANALYSIS SUMMARY
PAGE D4 OF 4

APPENDIX E

PLATES

N

AP
WAT
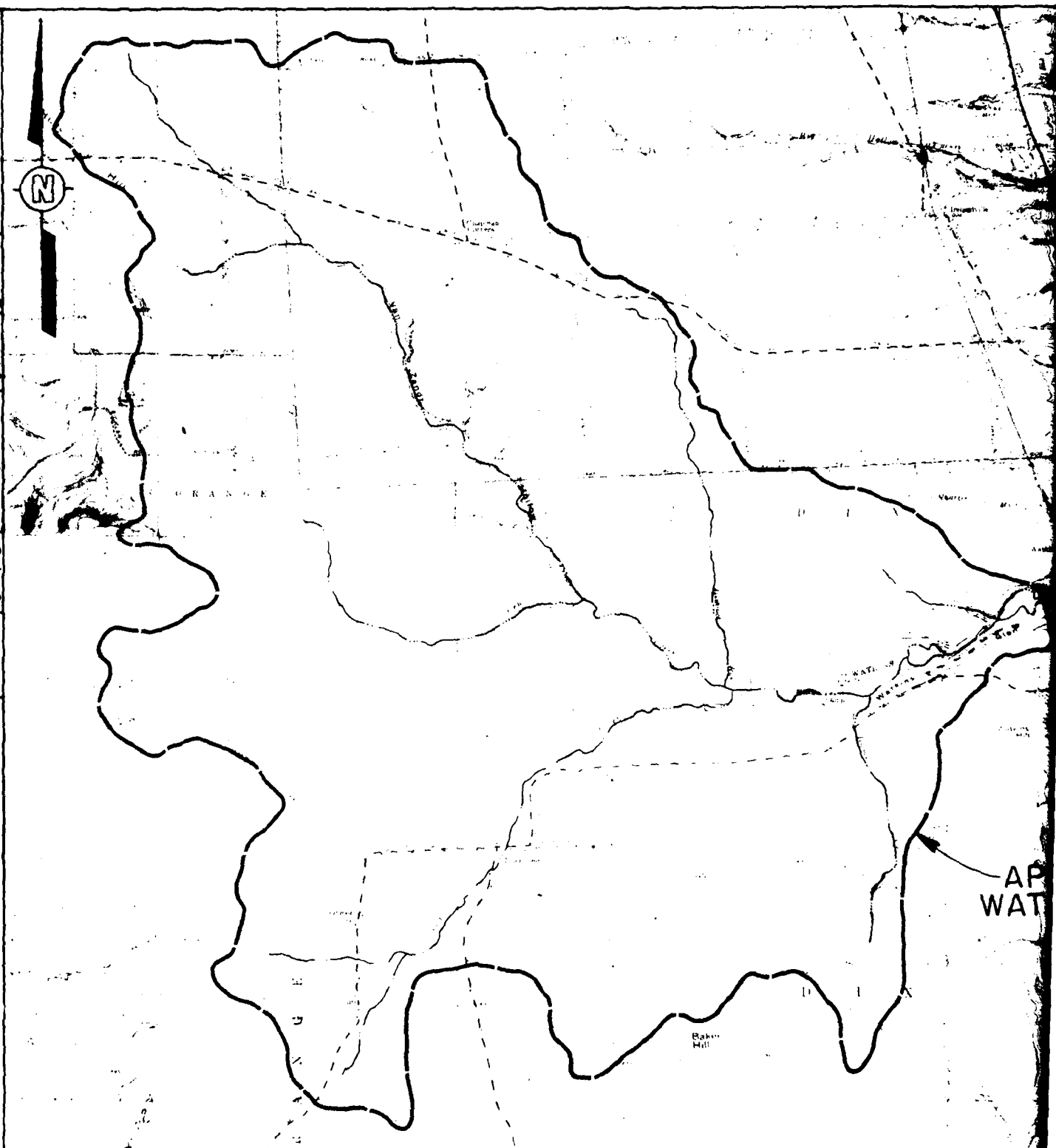
REFERENCE:

1. 7.5 MIN. U.S.G.S. READING CENTER, N.Y. QUADRANGLE
   DATED : 1950 , PHOTOREVISED :1978, SCALE 1:24000

2. 7.5 MIN. U.S.G.S. BEAVER DAMS, N.Y. QUADRANGLE
   DATED : 1953 , SCALE 1:24000

3. 7.5 MIN. U.S.G.S. BURDETT, N.Y. QUADRANGLE
   DATED : 1950 , SCALE 1:24000

4. 7.5 MIN. U.S.G.S. MONTOUR FALLS, N.Y. QUADRANGLE
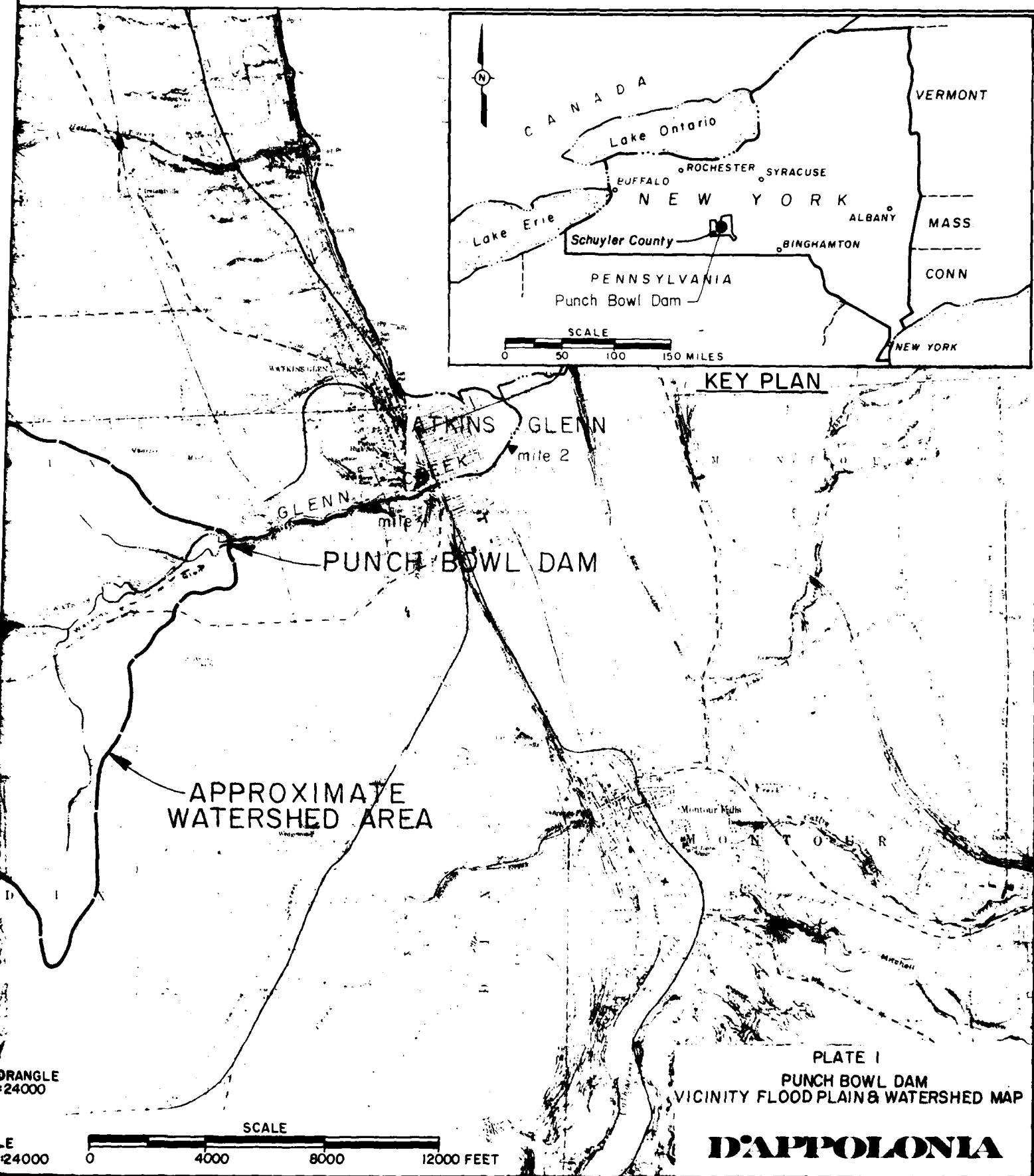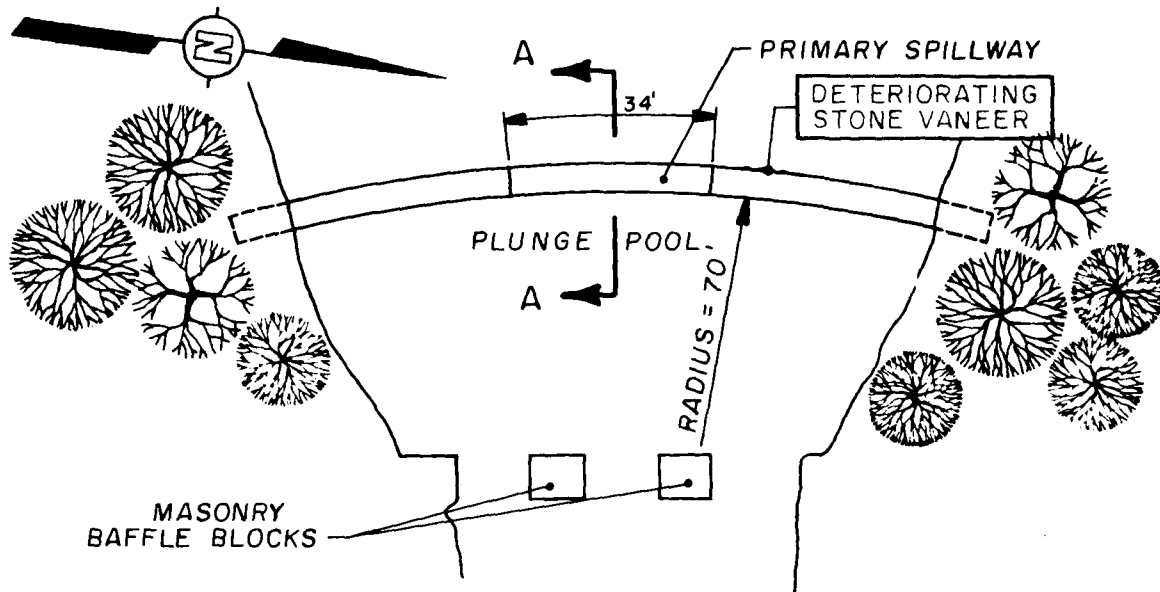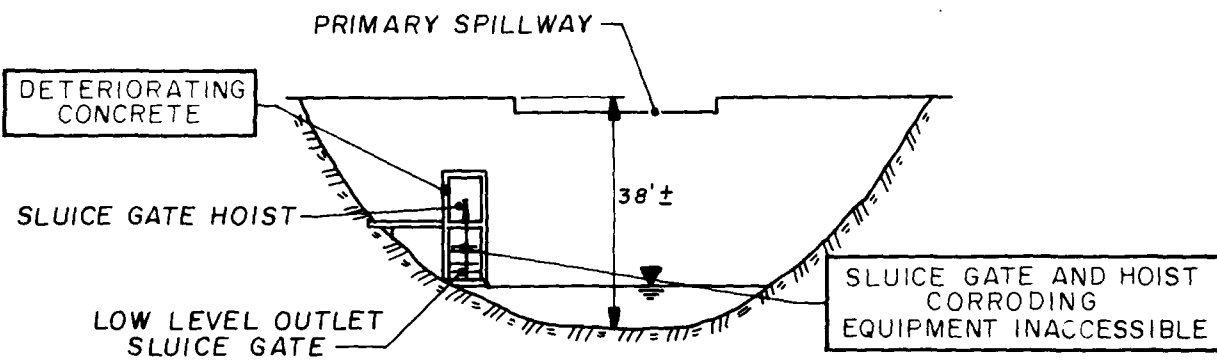   DATED :1950 , PHOTOREVISED :1978,SCALE 1:24000

5. 7.5 MIN. U.S.G.S. WAYNE, N.Y. QUADRANGLE
   DATED 1953   SCALE 1:24000

6. 7.5 MIN. U.S.G.S. BRADFORD, N.Y. QUADRANGLE
   DATED :1953, PHOTOREVISED :1978,SCALE 1:24000

0   400

19 1293 HERCULENE. A&B SMITH CO . PGH . PA LT1530-1079

KEY PLAN

CANADA

Lake Ontario

VERMONT

ROCHESTER ○ SYRACUSE

BUFFALO

N E W   Y O R K

ALBANY

MASS

Lake Erie

Schuyler County

BINGHAMTON

CONN

PENNSYLVANIA

Punch Bowl Dam

NEW YORK

SCALE

0   50   100   150 MILES

WATKINS GLENN

mile 2

GLENN   EEK

mile

PUNCH BOWL DAM

APPROXIMATE
WATERSHED AREA

Montour Falls

M O N T O U R

Mitchell
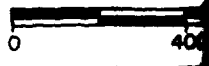
PLATE 1
PUNCH BOWL DAM
VICINITY FLOOD PLAIN & WATERSHED MAP

D'APPOLONIA

DRANGLE
24000

24000

SCALE

0   4000   8000   12000 FEET

PRIMARY SPILLWAY

DETERIORATING STONE VANEER

34'

PLUNGE POOL

RADIUS = 70'

MASONRY BAFFLE BLOCKS

A — A

PLAN

PRIMARY SPILLWAY

DETERIORATING CONCRETE

SLUICE GATE HOIST

LOW LEVEL OUTLET SLUICE GATE

38' ±

SLUICE GATE AND HOIST CORRODING EQUIPMENT INACCESSIBLE

ELEVATION

5'

5' ±

PROBABLE SILT LEVEL

7'
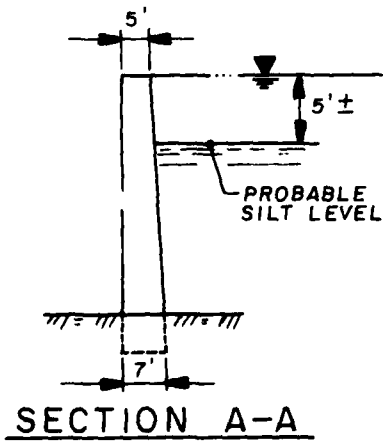
SECTION A-A

NOTE:
POOL LEVEL AT DATE OF INSPECTION : PRIMARY SPILLWAY CREST.

PLATE 2

PUNCH BOWL DAM
GENERAL PLAN
FIELD INSPECTION NOTES
FIELD INSPECTION DATE: JUNE 25, 1981

D'APPOLONIA

NOT TO SCALE

APPENDIX F

GEOLOGY MAP

Tyrone Power Company Dam

Punch Bowl Dam

Newtown-Hoffman Watershed Project
Floodwater Retarding Dam Site-1

Newtown-Hoffman Watershed Project
Floodwater Retarding Dam Site-18

SCALE

| 0 | 2 | 4 | 6 | 8 | 10 miles |
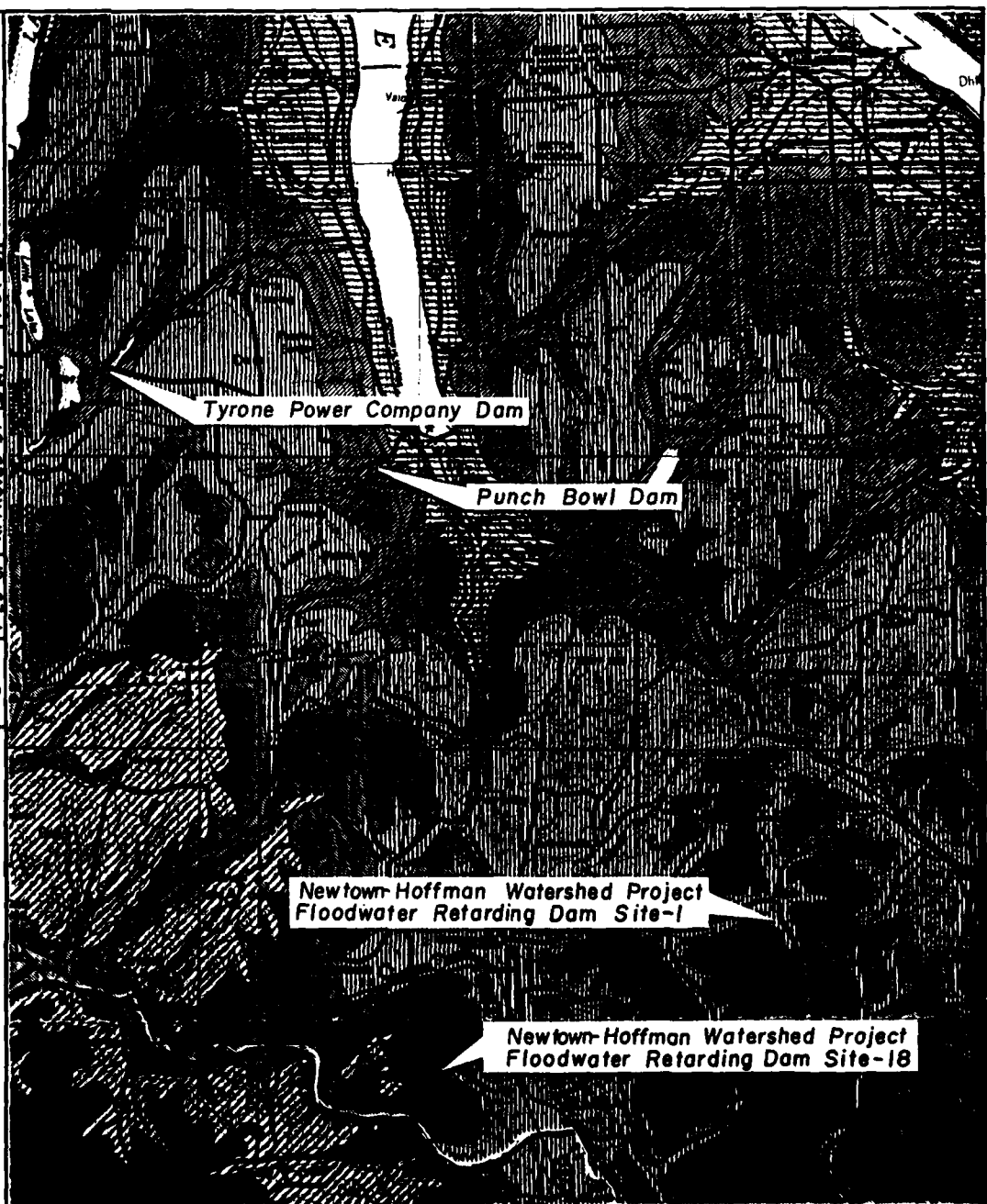
GEOLOGY MAP

REFERENCE :
GEOLOGIC MAP OF NEW YORK, FINGER LAKES SHEET
DATED: 1970, SCALE 1 : 250,000

D'APPOLONIA

LEGEND

CANADAWAY GROUP
800-1200 ft. (240-370 m)

Dcw Machias Formation—shale, siltstone, Rushford Sand stone; Caneadea, Canisteo, and Hume Shales, Canaseraga Sandstone, South Wales and Dunkirk Shales in Pennsylvania, Towanda Formation—shale, sand stone.

JAVA GROUP
300-700 ft. (90-210 m.)

Dj Wiscoy Formation—sandstone, shale, Hanover and Pipe Creek Shales

WEST FALLS GROUP
1100-1600 ft. (340-490 m.)
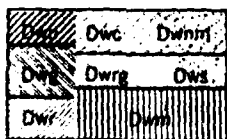
Dwn Nunda Formation—sandstone, shale

Dwc West Hill and Gardeau Formations—shale, siltstone; Roricks Glen Shale; upper Beers Hill Shale; Grimes Siltstone.

Dwl lower Beers Hill Shale; Dunn Hill, Millport, and Moreland Shales.

Dwc Nunda Formation—sandstone, shale; West Hill Formation—shale, siltstone; Corning Shale

Dwnm "New Milford" Formation—sandstone, shale

Dwg Gardeau Formation—shale, siltstone, Roricks Glen Shale.

Dw Slide Mountain Formation—sandstone, shale, conglomerate.

Dwm Beers Hill Shale; Grimes Siltstone, Dunn Hill, Millport, and Moreland Shales
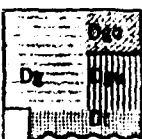
SONYEA GROUP
200-1000 ft. (60-300 m.)
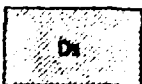
Ds In west: Cashaqua and Middlesex Shales
In east: Rye Point Shale; Rock Stream ("Enfield") Siltstone; Pulteney, Sawmill Creek, Johns Creek, and Montour Shales.

GENESEE GROUP AND TULLY LIMESTONE
200-1000 ft. (60-300 m.)

Dg West River Shale; Genundewa Limestone; Penn Yan and Geneseo Shales; all except Geneseo replaced eastwardly by Ithaca Formation—shale, siltstone and Sherburne Siltstone

Dgo Oneonta Formation—shale, sandstone

Dgu Unadilla Formation—shale, siltstone

Dt Tully Limestone.

LOCKPORT GROUP
80-175 ft. (25-55 m.)

Sl Oak Orchard and Penfield Dolostones, both replaced eastwardly by Sconondoa Formation—limestone, dolostone.
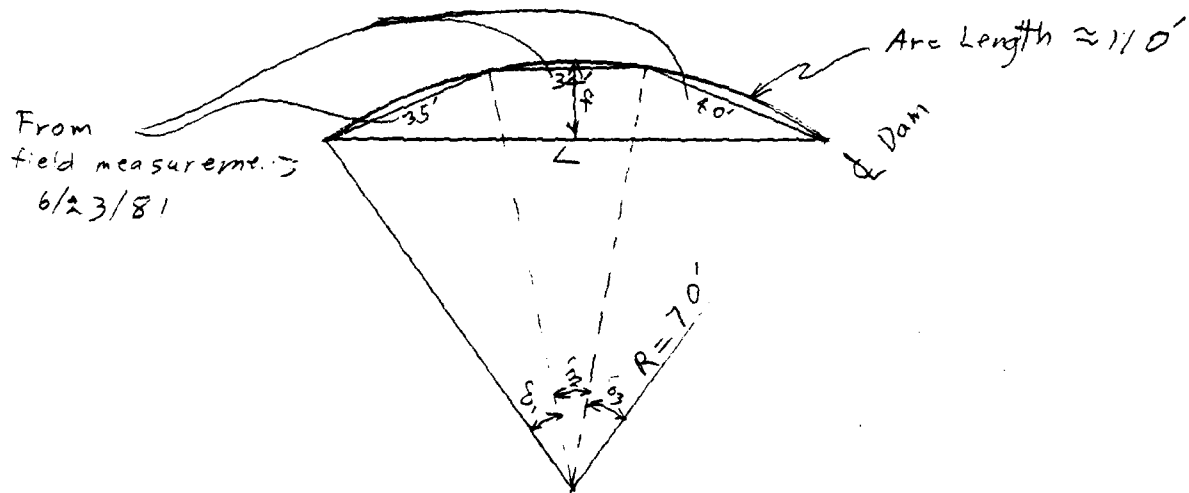
GEOLOGY MAP LEGEND

APPENDIX G

STABILITY ANALYSES

D'APPOLONIA
CONSULTING ENGINEERS, INC.

By _Ja.E._ Date _7/28/81_ Subject __Punch Bowl Dam__ Sheet No. _1_ of _7_

Chkd. By _____ Date _08-05-81_ __STABILITY CALCULATIONS__ Proj. No. _80-778_

Geometric data on this arch dam is shown below in plan.

From field measurements 6/23/81

This data was obtained from a copy of an internal memorandum from J.W. Miller, Sr Park Engineer, N.Y. State Parks & Recreation Dept., 7/6/72.

Compute Angles

$$\delta_1 = 2 \left\{ \sin^{-1} \left(\frac{17.5}{70.0} \right) \right\} = (14.48) 2 = 28.96°$$

$$\delta_2 = 2 \left\{ \sin^{-1} \left(\frac{17.0}{70.0} \right) \right\} = (14.06) 2 = 28.11°$$

$$\delta_3 = 2 \left\{ \sin^{-1} \left(\frac{20}{70} \right) \right\} = (16.60) 2 = 33.20°$$

$$\Delta = \Sigma \delta = 90.27°$$

$$\text{Arc Length} = 2\pi \frac{90.27}{360} (70.0) = 110.28'$$

$$L = 2 R \sin \left(\frac{90.27}{2} \right)° = 2(70)(0.700) = 99.23'$$

$$\to f = R - R \cos \left(\frac{90.27}{2} \right)° = 70(1 - 0.705) = 20.02'$$

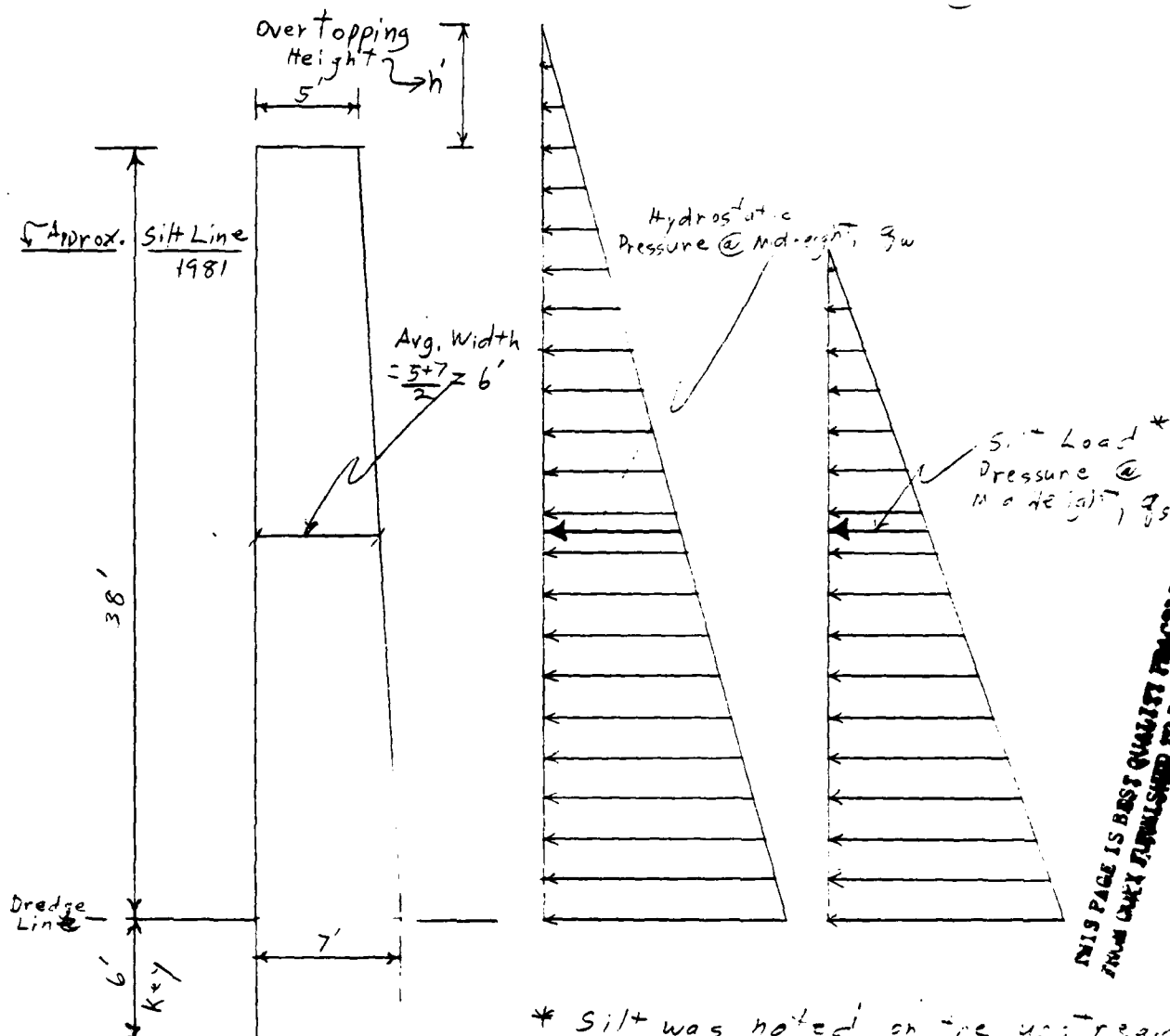$$\text{Arch Angle } \phi = \frac{1}{2}\Delta = \frac{90.27}{2} = \underline{\underline{45.14°}}$$

D'APPOLONIA
CONSULTING ENGINEERS, INC.

By _JA.E._ Date _7/28/81_ Subject _Punch Bowl Dam_ Sheet No. _2_ of _7_
Chkd. By_____Date_08-05-81_ _STABILITY CALCULATIONS_ Proj. No. _80-778_

Typical Cross-Section of Dam & Loading

Overtopping
Height ⟶ h'
5'

≈ Approx. Silt Line
1981

Avg. Width
$= \frac{5+7}{2} = 6'$

Hydrostatic
Pressure @ Mid-height, q_w

Silt Load *
Pressure @
Mid height, q_s

38'

Dredge
Line

6' Key

7'

* Silt was noted on the upstream
face of the dam approximately 5' or
6' below the crest. Assume that
the silt is 5' below the dam
crest, (Per Conversation with J.E.
7/28/8.)

Typical values of unit weight of loose silt are
90-100 pcf (J.E. Bowles, Physical & Geotechnical Properties
of Soils, McGraw-Hill, p.154), ... 37 ...

D'APPOLONIA
CONSULTING ENGINEERS, INC.

By __A.E.__ Date __7/27/81__ Subject __Punch Bowl Dam__ Sheet No. __3__ of __7__

Chkd. By __ __ Date __08-05-81__ __STABILITY CALCULATIONS__ Proj. No. __80-778__

Consider a 1 ft. thick section at the mid height of the dam. (Ignore Poisson's effect, axial & shear deformations)
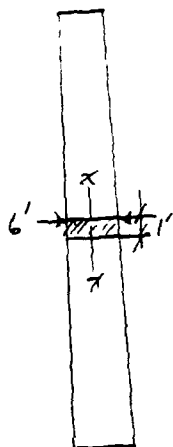
Slice Area $= (6 \times 12)(1 \times 12) = 864 \ \text{in}^2$

$$I_{x-x} = \frac{bd^3}{12} = \frac{(12)(72)^3}{12} = (72)^3 = 373,248 \ \text{in}^4$$

$R = 70' = 840''$

$V = q\frac{L}{2}$
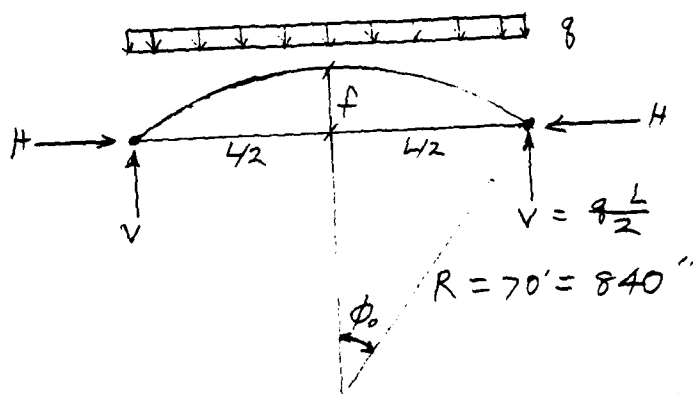
Assume that the structure may be analyzed as a two-hinged circular arch

$$H = \frac{\int M_x' \, y \, \frac{ds}{EI} - \int P_s' \, \frac{dz}{EA}}{\int y^2 \, \frac{ds}{EI} - \int \left(\frac{dx}{ds}\right) \frac{dx}{EA}} \qquad (Eq. \ 6\text{-}5.1, \ Ref. \ 1)$$

where

$$\int M_x' \, y \, \frac{ds}{EI} = \frac{q \, R^4}{EI} \left\{ \frac{2}{3} \sin^3 \phi_0 - \phi_0 \cos \phi_0 \sin^2 \phi_0 + \frac{1}{2} \phi_0 \cos \phi_0 \right.$$
$$\left. - \frac{1}{2} \sin \phi_0 \cos^2 \phi_0 \right\} \quad (Ref. \ 1, \ p.17)$$

$$\int P_s' \, \frac{dz}{EA} = \frac{2 q R^2}{3EA} \left\{ \sin^3 \phi_0 \right\} \quad (Ref. \ 1, \ p.177)$$

Ref. 1. Willems, N. and W. M. Lucas, Jr., _Structural Analysis For Engineers_, McGraw-Hill, 1978.

D'APPOLONIA
CONSULTING ENGINEERS, INC.

By _J.A.E._ Date _7/29/81_ Subject _Punch Bowl Dam_   Sheet No. _4'_ of _7_

Chkd. By _PH_ Date _08·05·81_ _STABILITY CALCULATIONS_   Proj. No. _80-778_

$$\int y^2 \frac{ds}{EI} = \frac{R^3}{EI}\left\{\phi_0 + 2\phi_0 \cos^2\phi_0 - 3\sin\phi_0 \cos\phi_0\right\}$$

$$\int \left(\frac{dx}{ds}\right)\frac{dx}{EA} = \frac{R}{EA}\left\{\phi_0 + \sin\phi_0 \cos\phi_0\right\}$$

we have $\phi_0 = 45.14° = 0.788$ rad.

$R = 840''$

$I = 373,248 \text{ in}^4$

$A = 864 \text{ in}^2$

The modulus of elasticity, E, will divide out of the equation for H.

Then

$$\int M_s' y \frac{ds}{I} = \frac{g(840)^4}{373248}\left\{\tfrac{2}{3}(0.356) - 0.788(0.354) + 0.278 - 0.176\right\}$$

$$= \frac{(840)^4}{373248}\left\{0.060\right\}g = 79676 \cdot g$$

$$\int P_s' \frac{dz}{A} = \frac{2g(840)^2}{3(864)}\left\{(0.709)^3\right\} = 194 \cdot g$$

$$\int y^2 \frac{ds}{I} = \frac{(840)^3}{373248}\left\{0.072\right\} = 114.60$$

$$\int \left(\frac{dx}{ds}\right)\frac{dx}{A} = \frac{840}{864}\left\{0.788 + (0.709)(0.705)\right\} = 1.25$$

$$\Rightarrow H = \frac{79676 \cdot g - 194 \cdot g}{114.60 - 1.25} = \underline{\underline{701.3\ g}}$$

From the attached summary of the HEC-1 computer program run for this dam, overtopping depth @ 100% PMF = 18.43' ≈ 18.5' = h'

D'APPOLONIA
CONSULTING ENGINEERS, INC.

By _M.E._ Date _7/30/81_ Subject _Punch Bowl Dam_   Sheet No. _5_ of _7_

Chkd. By___ Date _08-05-81_ _STABILITY CALCULATIONS_   Proj. No. _80-778_

Assuming that $k_o = 1.0$ for the silt loading, the horizontal pressure at the midheight of the dam can be computed.

$$P = q_w + q_s = (18.5 + 10) 62.4 + (14.0) 37.6$$
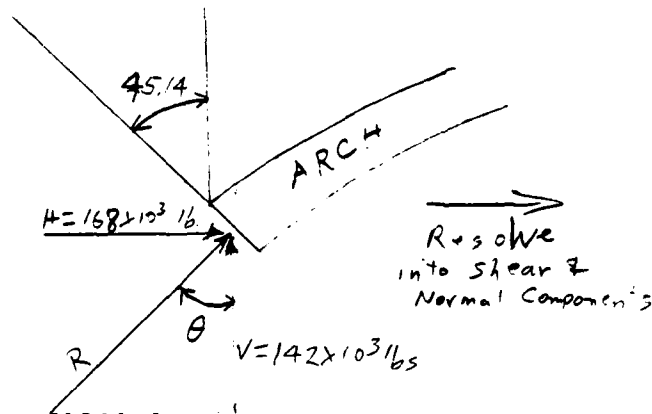$$(@ 100\% \ PMF)$$
$$= 2340 + 526.4 = 2866.4 \ psf$$

Avg. Loading Per Inch, Arc Length $= \dfrac{2866.4}{12} \approx 239 \ ^{lb}/_{in}$

$$\rightarrow H = 701.3 (239) = 167,594 \ lbs.$$

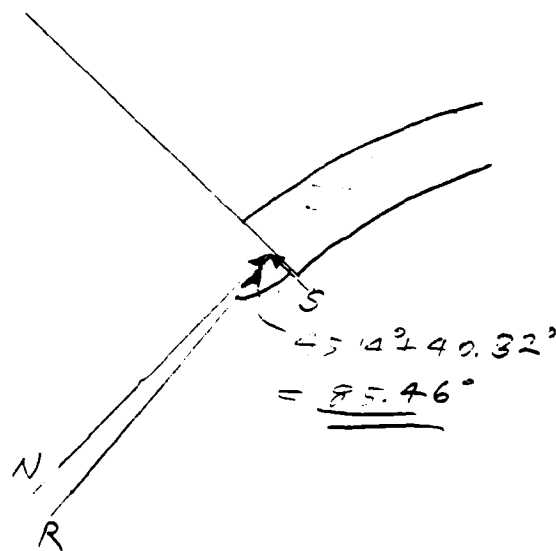$$V = \dfrac{qL}{2} = \dfrac{(2866.4)(99.23)}{2} = 142216 \ lbs.$$

Resultant $\quad R = (H^2 + V^2)^{1/2} = 219802 \ lbs$

$$\theta = Sin^{-1} \left(\dfrac{142216}{219802} \right) = 40.32°$$

R + S oWe into Shear & Normal Components

45.14

ARCH

$H = 168 \times 10^3 \ lb$

θ

$V = 142 \times 10^3 \ lbs$

R

S

$45 + 40.32° = 85.46°$

$$S = R \cos(85.46°) = 17409 \ lb.$$
$$N = R \sin(85.46°) = 219112 \ lb.$$

D'APPOLONIA
CONSULTING ENGINEERS, INC.

By _J.A.E._ Date _7·30·81_ Subject _Punch Bowl Dam_   Sheet No. _6_ of _7_

Chkd. By _____ Date _08·05·81_ _STABILITY CALCULATIONS_   Proj. No. _80-778_

Stresses on faces of abutments

$$Shear = S/A = (17409/864) = 20.6 \, psi.$$

$$Compression = N/A = (219112/864) = 253.6 \, psi.$$

Observations at the site indicate that abutment rock is composed of calcareous and/or silty shales, primarily, with some siltstone also reported.

According to ETL 1110-2-184, the lowest strength parameters for shales listed are for the Degonia Shale. These parameters will be used in this calculation.

$$\phi = 28°, \quad S = 40 \, psi$$

Factor of safety — Abutment Sliding

$$Shear \; Strength = (\Sigma V) \tan\phi + S(Area)$$

$$= N \tan 28° + (40.0)(864.0)$$

$$= 219112(0.53) + 34560 = 151064 \; psi.$$

$$F = Shear \; Strength / Shear = 151064 / 17409$$

$$= 8.68 > 4 \longrightarrow O.K.$$

253 psi Compression is Gt. S, inspection even if Poisson's effects are multiplied by 2 or 3.

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By _J.A.E._ Date _7/30/81_ Subject _Punch Bowl Dam_
Chkd. By _PMF_ Date _08·05·81_ STABILITY CALCULATIONS

Sheet No. _7_ of _7_
Proj. No. _80-7·8_

CHECK MID SPAN STRESS AT MID HEIGHT

Moment @ Midspan $= M = V\left[\frac{L}{2}\right] - \left(q\frac{L}{2}\right)\frac{L}{4} - H[f]$

we have $V = \frac{qL}{2}$ $\Rightarrow$ $M = \frac{qL^2}{4} - \frac{qL^2}{8} - H[f]$

$\Rightarrow$ $M = \frac{qL^2}{8} - H[f]$, $\ell = 20.62'$, $L = 99.23'$, $q = 239$

$\Rightarrow$ $M = \frac{(239)(99.23 \times 12)^2}{8} - (167594)(20.62 \times 12)$

$= 42.36 \times 10^6 - 41.47 \times 10^6$

$= 8.9 \times 10^5$ in-lb.

$\sigma = \frac{H}{A} \pm \frac{M}{S}$, $S = \frac{bd^2}{6} = \frac{12(72)^2}{6} = 10368$

$= \frac{167594}{864} \pm \frac{8.9 \times 10^5}{10368} = \{194. \pm 86\}$ psi.

Tensile stress $= 0$ Max. Compressive Stress $= \underline{280\ psi}$

Allowable compressive stress assuming a concrete strength of 3000 psi, $= f'_c$

$\sigma_a = 0.45 f'_c = \underline{350\ psi.}$

Stresses are O.K.

APPENDIX I

REFERENCES

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