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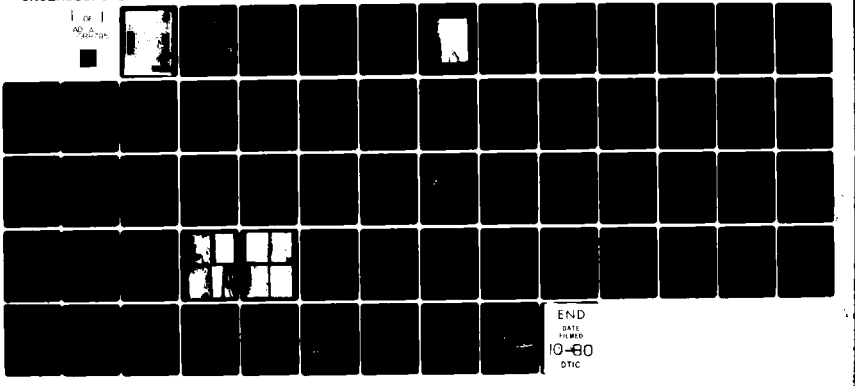

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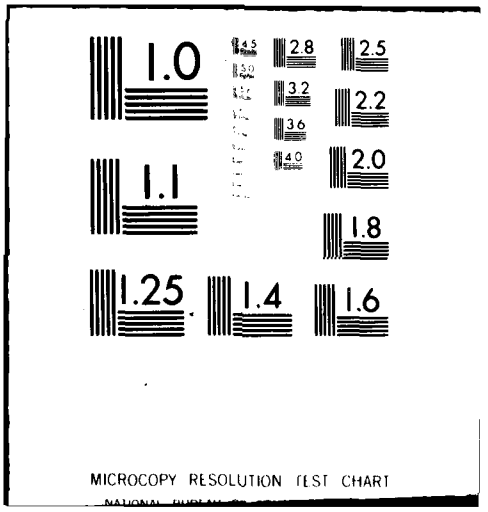
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DELAWARE RIVER BASIN,
DRAKES CREEK, CARBON COUNTY,

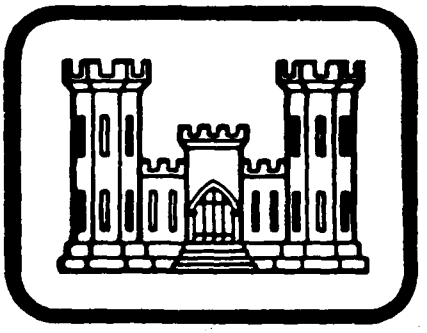
PENNSYLVANIA

Y.M.C.A. DAM

(NDS ID NO. PA-873,
DER ID NO. 13-100)

PLEASANT VALLEY WEST PROPERTY OWNERS ASSOCIATION

PHASE I INSPECTION REPORT
~~NATIONAL DAM~~ INSPECTION PROGRAM



Prepared By

L. ROBERT KIMBALL & ASSOCIATES
CONSULTING ENGINEERS & ARCHITECTS
EBENSBURG, PENNSYLVANIA
15931

FOR

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

JULY, 1980

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 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. 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 inspections 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. The spillway design flood provides a measure of relative spillway capacity and serves as an aid in detemining 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 REPORT
NATIONAL DAM INSPECTION REPORT

NAME OF DAM	YMCA Dam
STATE LOCATED	Pennsylvania
COUNTY LOCATED	Carbon
STREAM	Drakes Creek
DATE OF INSPECTION	April 8, 1980

ASSESSMENT

The assessment of YMCA Dam is based upon visual observations made at the time of inspection, review of available records and data, hydraulic and hydrologic computations and past operational performance. The inspection and review of data of the YMCA Dam did not reveal any problems which require emergency action. The dam appears to be in fair condition. The seepage which was noted along the toe of dam should be monitored and evaluated by a professional engineer knowledgeable in earth dams. The evaluation should be implemented immediately.

YMCA Dam is a significant hazard-intermediate size dam. The spillway design flood (SDF) for a dam of this size and classification is the 1/2 PMF to PMF. Based on the existing potential for loss of life and property damage, the spillway design flood has been selected as the 1/2 PMF (probable maximum flood). The spillway and reservoir are capable of controlling approximately 81% of the PMF. Based on criteria established by the Corps of Engineers, the spillway is termed adequate.

The following recommendations and remedial measures should be instituted immediately.

1. The fence which spans the spillway crest should be removed. The purpose of the fence is unclear. Restricting spillway discharges is a safety hazard and some alternate solution should be developed to serve whatever purpose the fence fulfilled.

2. The seepage and wet areas located on the downstream slope and at the toe of the embankment should be monitored for turbidity and quantity at regular intervals and during periods of heavy precipitation. The seepage observed at the right abutment and along the toe of the downstream slope near the right abutment should be channeled into a collection drainage channel. The discharge from the spring located at the right abutment should be diverted away from the toe of the dam in order that

any seepage from the dam along the toe could be observed. The monitoring program and the monitoring readings should be evaluated by a registered professional engineer experienced in dam design and construction. Measures to control seepage should be implemented as required.

3. Provide erosion protection on the downstream slope adjacent to the right spillway wingwall. Erosion protection should be provided on the upstream slope adjacent to the spillway approach wingwalls.

4. Some means of positive upstream closure of the drainline should be developed.

5. Deterioration of the grouted riprap section should be evaluated by a registered professional engineer knowledgeable in dam design and construction and should be repaired as deemed necessary by the investigation.

6. The reservoir drain should be operated and lubricated on a regular basis.

7. A warning system should be developed to warn any downstream residents or property owners of large spillway discharges or imminent failure of the dam. This should be accomplished prior to future development below the dam.

8. A safety program should be implemented with inspections at regular intervals by qualified personnel.

L. ROBERT KIMBALL & ASSOCIATES
CONSULTING ENGINEERS AND ARCHITECTS

Date

R. Jeffrey Kimball, P.E.

APPROVED BY:

15 August 80
Date

JAMES W. PECK
Colonel, Corps of Engineers
District Engineer

Overview of Y.M.C.A. Dam

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PHASE I
NATIONAL DAM INSPECTION PROGRAM
YMCA DAM
NDI. I.D. NO. PA 873
DER I.D. NO. 13-100

SECTION 1
PROJECT INFORMATION

1.1 General.

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

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

1.2 Description of Project.

a. Dam and Appurtenances. YMCA Dam is an earthfill dam, 42 feet high and 608 feet long. The crest width is 9 feet. The upstream slope is 2.5H:1V and grass covered. The downstream slope was measured to be 2H:1V and grass covered.

The reservoir drain consists of a 24 inch corrugated metal pipe with a concrete endwall located 270 feet from the left abutment. The spillway consists of a 42 foot long ogee section, 150 feet from the left abutment. The spillway is blocked by a chain linked fence. Reinforced concrete retaining walls are provided along both sides of the spillway channel. The floor of the channel is a reinforced concrete slab for a distance of approximately 60 feet. The exit channel is trapezoidal for its remaining distance to the streambed. The channel is protected with grouted riprap (36 inches thick) for the initial 90 feet. The remaining portion of the exit channel (550 feet in length) to the original streambed is protected with 18 inch thick dumped riprap. Reinforced concrete cutoff walls were extended into the embankment on both sides of the spillway. Gravel drains exist behind the channel walls and also under the channel slab.

The embankment is a zoned earthfill. An impervious clay material was used as the core section along the embankment centerline. A cutoff trench is provided to a depth of 10 feet. The bottom width of the trench is 8 feet. The upstream zone consists of sandy clay material found in borrow areas near the site. The downstream zone is a random fill.

b. Location. The dam is located on Drakes Creek, Carbon County, Pennsylvania. YMCA Dam can be located on the Christmans, U.S.G.S. 7.5 minute quadrangle.

c. Size Classification. YMCA Dam is an intermediate size structure (42 feet high, 280 ac-ft.).

d. Hazard Classification. The hazard classification for YMCA Dam has been determined to be significant. Downstream conditions at the time of the inspection did not indicate that loss of more than a few lives is probable should the structure fail. Future development downstream of the dam is probable and it is evident that plans are in progress to sell lots immediately below the dam.

e. Ownership. YMCA Dam is owned by the Pleasant Valley West Property Owner's Association. Correspondence should be addressed to:

Pleasant Valley West Property Owner's Association
Christmans, Pennsylvania
(717) 325-4695

f. Purpose of Dam. YMCA Dam is used for recreation.

g. Design and Construction History. Construction of the YMCA dam was completed in late 1967. Very little information is available on the actual construction of the dam. According to information located in the Pennsylvania DER files the dam was constructed by the Operating Engineers Local under a federally financed manpower retaining program for the Greater Philadelphia YMCA Council. The construction superintendent was Mr. Thomas Barrett. The design engineer was Mr. Theodore K. Rothermund of Penn-Jersey Engineering Company, Portland, Pennsylvania. There is some mention in the Pennsylvania DER files relative to field density testing being made at the site under the direction of the Penn-Jersey Engineering Company. Compression tests of the concrete used in the spillway structure was performed by Allentown Testing Laboratories Inc., Bethlehem, Pennsylvania.

h. Normal Operating Procedures. The owner of the dam did not accompany the inspection team on the inspection of the dam. Neither the owner nor a representative of the owner was available for interview for the purposes of this inspection. It appears that no operations are conducted at the dam. The reservoir drainline appeared to be partially opened and an estimated 100 gpm was discharging from the 24 inch diameter CMP.

1.3 Pertinent Data.

a. Drainage Area. 1.49 square miles (U.S.G.S. 7.5 minute quadrangle)

b. Discharge at Dam Site (cfs).

Maximum known flood at dam site	Unknown
Drainline capacity at normal pool	Unknown
Spillway capacity at top of dam	1075
Additional spillway capacity at left abutment	986
Combined discharge capacity	2061

c. Elevation (U.S.G.S. Datum) (feet). - Based on assumed principal spillway crest elevation 1535.0. Estimated from U.S.G.S. 7.5 minute quadrangle.

Top of dam - considered low point	1539.0
Top of dam - design height	Unknown
Maximum pool - design surcharge	Unknown
Normal pool	1535.0
Spillway crest	1535.0
Additional spillway capacity (left abutment) crest	1535.6
Upstream invert - 24" drainline	Unknown
Downstream invert - 24" drainline	1499.3
Maximum tailwater	None
Toe of dam	1497.4

d. Reservoir (feet).

Length of maximum pool	2200 feet
Length of normal pool	1800 feet

e. Storage (acre-feet).

Normal pool	215
Top of dam	280

f. Reservoir Surface (acres).

Top of dam	28
Normal pool	19
Spillway crest	19

g. Dam.

Type	Earthfill
Length	608 feet
Height	42 feet
Top width	9 feet
Side slopes - upstream	2.5H:1V
- downstream	2H:1V

Zoning	Yes
Impervious core	Center section
Cutoff	Clay core
Grout curtain	Unknown

h. Reservoir Drain.

Type	24" Corrugated metal pipe
Length	Unknown
Closure	24" gate valve
Access	Man-hole on embankment crest
Regulating facilities	24" gate valve

i. Spillway.

Type	Concrete ogee
Length	42 feet
Crest elevation (estimate)	1535.0
Upstream channel	Lake
Downstream channel	Reinforced concrete slab for a distance of approximately 60'

SECTION 2
ENGINEERING DATA

2.1 Design. Review of information in the files of the Commonwealth of Pennsylvania, Department of Environmental Resources revealed that some correspondence and permit information were available for review. No construction plans or structural details were available for review. Information in the Pennsylvania DER files point to the fact that core borings were made but this information was not available in the file nor could it be obtained from the owner.

2.2 Construction. Very little information is available on construction of the dam. At least one inspection report prepared by PennDER in 1967 questions the construction procedures utilized. The report makes mention of large size material (rocks) being incorporated into the embankment fill. Several test result reports relative to the compressive strength of the concrete utilized in construction of the spillway and field density tests of the embankment material are available in the Pennsylvania DER files.

2.3 Operation. No operating records are known to exist.

2.4 Evaluation.

a. Availability. Engineering data were provided by Pennsylvania DER, Bureau of Dams and Waterway Management. The owner was not available for interview in regard to operation and maintenance of the dam.

b. Adequacy. No design data was available for review for the purposes of this report. Minimal information was available for review concerning the construction of the dam. The Phase I Report is based on visual inspection and hydrologic and hydraulic analyses. Sufficient information exists to complete a Phase I Report.

SECTION 3
VISUAL INSPECTION

3.1 Findings.

a. General. The onsite inspection of YMCA Dam was conducted by personnel of L. Robert Kimball and Associates on April 8, 1980. The inspection consisted of:

1. Visual inspection of the retaining structure, abutments and toe.
2. Examination of the spillway facilities, exposed portion of any outlet works and other appurtenant works.
3. Observations affecting the runoff potential of the drainage basin.
4. Evaluation of the downstream area hazard potential.

b. Dam. The dam appears to be in fair condition. From a brief survey conducted during the inspection, it was noted that the main embankment crest to the right of the spillway is generally even. The embankment crest to the left of the spillway in the area of the left abutment was lower in elevation. The crest of the dam as well as the upstream and downstream slopes were grass covered. The crest width was measured to be 9 feet. The upstream slope was measured to be 2.5H:1V and the downstream slope was 2H:1V. Erosion was noted on the downstream slope adjacent to the right spillway wingwall. The potential for erosion exists along the upstream slopes adjacent to both spillway wingwalls.

Seepage was observed in several areas along the downstream toe of the dam and in the area of the drainline discharge structure at the toe of the dam. Flow along the right abutment appeared to be originating from a spring located at the right above the dam. Flow along the toe from this area was measured to be approximately 43 to 45 gallons per minute (See page A-12). Another seepage measurement point was made in the area to the left of the drainline discharge structure. Flow in this area was measured to be approximately 2 gallons per minute. Information obtained in past Pennsylvania DER inspection report memos indicate that seepage was observed during construction of the dam. The location of this seepage was not pinpointed and therefore no determination as to a history of seepage can be made. Comments in the inspection report memo's made during 1967 and 1968 indicate that seepage was evident and only one report mentions the location of the seepage. A 1968 memo indicates that flow was coming from one of the weep holes in the retaining wall on the abutment of the spillway structure. The water was

noted as being clear with no fines and it appears that in the judgement of the inspector that the source of the flow was from groundwater.

c. Appurtenant Structures. The water level at the time of inspection was estimated to be at elevation 1535.0. The spillway appeared to be in good condition and there was no evidence of deterioration of the concrete. The spillway discharge channel immediately below the spillway structure consisted of slush grouted riprap. The discharge channel appeared to be in good condition, although some flow was noted to be discharging from underneath the grouted riprap section. This condition, if allowed to continue could lead to the possible deterioration of portins of the grouted riprap section. A chain link fence which spans the spillway tends to reduce the discharge potential of the spillway.

The drainline for the reservoir consists of a 24 inch corrugated metal pipe. A concrete structure is present at the discharge end of the pipe. The reservoir drain discharge channel eventually joins the natural stream below the dam. Some discharge from the pipe was noted during the inspection and the discharge was estimated to be approximately 100 gpm. A manhole exists on the embankment crest which serves as an entrance to the drainline controls.

A depressed area to the left of the spillway located at the left abutment was observed during the inspection and it was concluded by the inspecting engineers that the area had the potential to provide additional spillway capacity for the dam. It was determined that discharges from this area would flow along a roadway which provides access to the dam.

d. Reservoir Area. The watershed is covered mostly with timberland. The reservoir slopes are gentle to moderate and do not appear to be susceptible to massive landslides which would affect the storage volume of the reservoir or cause overtopping of the dam by displacing water.

e. Downstream Channel. The downstream channel of the YMCA Dam (Drakes Creek) eventually joins the Lehigh River approximately 2 miles downstream. Drakes Creek is relatively narrow for its entire length to the Lehigh River.

3.2 Evaluation. In general, the embankment, spillway structure and outlet works appear to be in fair condition.

SECTION 4
OPERATIONAL PROCEDURES

4.1 Procedures. Water level is maintained at the spillway crest at elevation 1535.0. The owner of the dam was not available for an interview, therefore the operational proceedures for this dam are unknown.

4.2 Maintenance of the Dam. No planned maintenance schedule for the dam is known to exist.

4.3 Maintenance of Operating Facilities. The operating procedures for this dam are unknown. The condition of the facilities is considered fair.

4.4 Warning System in Effect. There is no known warning system in effect to warn any downstream residents or property owners of large spillway discharges or imminent failure of the dam. At the time of inspection there were no downstream residents although it is obvious that plans are to develop the downstream area below the dam.

4.5 Evaluation. The condition of the operating facilities is unknown. There is no known warning system in effect to warn downstream residents.

SECTION 5
HYDRAULICS AND HYDROLOGY

5.1 Evaluation of Features.

a. Design Data. The Pennsylvania DER files contained only a mention of the hydrologic and hydraulic design considerations used in the design of these facilities. The SCS method was mentioned as being used to determine the hydraulic and hydrologic characteristics of the dam and watershed. Information in the file suggests that a designed span width of 45 feet was considered for the spillway crest as well as 5 feet of freeboard.

b. Experience Data. No rainfall, runoff or reservoir level data were available. The spillway reportedly has functioned adequately in the past.

c. Visual Observations. The spillway appeared to be in good condition. A depressed area was observed at left abutment and this area was considered as being capable of providing additional spillway capacity for the dam. Flow across the left abutment would discharge along the roadway which provides access to the dam and would ultimately discharge flow beyond the toe of dam.

d. Overtopping Potential. Overtopping potential was investigated through the development of the probable maximum flood (PMF) for the watershed and the subsequent routing of the PMF and fractions of the PMF through the reservoir and spillway.

The Corps of Engineers, Baltimore District, has directed that the HEC-1 Dam Safety Version systemized computer program be utilized. The program was prepared by the Hydrologic Engineering Center (HEC), U.S. Army Corps of Engineers, Davis, California, July, 1978. The major methodologies or key input data for this program are discussed briefly in Appendix D.

5.2 Evaluation Assumptions. To enable us to complete the hydraulic and hydrologic analysis for this structure, it was necessary to make the following assumptions.

1. Pool elevation prior to the storm was at the spillway crest elevation 1535.0.

2. Additional discharge capacity exists at the left abutment and flow through this area was considered safe to an elevation of 1539.0 feet. Discharges above an elevation of 1539.0 feet were considered as sufficient to cause erosion at the left spillway wingwall and therefore provide potential for failure of the structure due to overtopping.

3. The top of dam was considered to be at elevation 1539.0 feet.

4. The fence which spans the spillway crest was considered as sufficient to reduce the normal coefficient of discharge of the structure to a value of 3.2. However, no consideration was made of the reduced cross sectional area due to the fence.

5.3 Summary of Overtopping Analysis. Complete summary sheets for the computer output are presented in Appendix D.

Peak inflow (PMF)	2684 cfs
Spillway capacity	1075 cfs
Additional spillway capacity (left abutment)	986 cfs
Combined discharge capacity	2061 cfs

a. Spillway Adequacy Rating. The Spillway Design Flood (SDF) for this dam is the 1/2 PMF to PMF storm. The SDF is based on the hazard and size classification of the dam. Based on the hazard potential for this dam the spillway design flood (SDF) was selected as the 1/2 PMF. Based on the following definition provided by the Corps of Engineers, the spillway is rated as adequate as a result of our hydrologic analysis.

> Adequate - All significant hazard dams which pass the spillway design flood (1/2 PMF).

The spillway and reservoir are capable of controlling the 1/2 PMF storm without overtopping the dam. However, the additional spillway capacity at the left abutment provides approximately 48% of the discharge potential for the dam.

The fence in the spillway will reduce the actual spillway capacity determined from this analysis.

5.4 Summary of Dam Breach Analysis. As the subject dam can satisfactorily pass the 1/2 PMF without failure (based on analysis) it was not necessary to perform the dam breach analysis and downstream routing of the flood wave.

SECTION 6
STRUCTURAL STABILITY

6.1 Evaluation of Structural Stability.

a. Visual Observations. Minor erosion on the downstream embankment slope adjacent to the right wingwall was observed during the inspection. The potential for erosion exists on the upstream embankment adjacent to both wingwalls which provide the approach to the spillway. Discharge from the spillway shows a potential for erosion of the grouted riprap section which provides the outlet channel for spillway discharges. Flow under the grouted riprap could lead to potential deterioration of the discharge channel and the effectiveness of grouted riprap. Two flow areas were noted during the inspection. One flow area was observed to exist along the toe and originating from a spring on the right abutment and flowing along the right abutment embankment contact. It was not possible during the inspection to determine whether the seepage along the toe from the right abutment contact was seepage through the dam or discharge originating from a spring located at the right abutment. Past information available in the Pennsylvania DER files suggest that seepage was noted during construction of the dam. No signs of instability were noted during the inspection. However, long term stability is questionable due to observed seepage noted during the inspection. A second area was noted beyond the toe of the dam adjacent to the drainline discharge structure.

b. Design and Construction Data. Minimal design and construction data exists in the Pennsylvania DER files. Stability analyses, although recommended by DER to the owner of the dam prior to and during construction, were not completed. No stability analyses were conducted for this dam.

c. Operating Records. No operating records are known to exist.

d. Post Construction Changes. No post construction changes are known to have occurred since the structure was built in 1968.

e. Seismic Stability. The dam is located in seismic zone 1. No seismic stability analyses has been performed. Normally, it can be considered that if a dam in this zone is stable under static loading conditions, it can be assumed safe for any expected earthquake loading. The dam appears to be statically stable and it is assumed that this dam is stable for any expected earthquake loadings.

SECTION 7
ASSESSMENT AND RECOMMENDATIONS/REMEDIAL MEASURES

7.1 Dam Assessment.

a. Safety. The dam appears to be in fair condition. No signs of immediate instability were observed during the inspection. Minor erosion is occurring near the right spillway wingwall on the downstream slope. The potential for erosion exists at the spillway approach adjacent to both wingwalls. Seepage noted during the inspection was observed in several locations. Flow from the right abutment was measured to be approximately 43 to 45 gallons per minute. The origination of the flow could not be determined due to the fact that a spring exists on the right abutment and contributes significantly to the measured flow along the toe. A seepage area was located adjacent to the 24 inch discharge structure located at the toe of the dam. Seepage in this area was noted to be approximately 2 gallons per minute. The visual observations, review of available data, hydraulic and hydrologic calculations indicate that the YMCA dam's spillway is adequate.

b. Adequacy of Information. Sufficient information is available to complete a Phase I Report.

c. Urgency. The recommendations suggested below should be implemented immediately.

d. Necessity for Further Investigation. In order to accomplish some of the recommendations/remedial measures outlined below, further investigations will be required.

7.2 Recommendations/Remedial Measures.

1. The fence which spans the spillway crest should be removed. The purpose of the fence is unclear. Restricting spillway discharges is a safety hazard and some alternate solution should be developed to serve whatever purpose the fence fulfilled.

2. The seepage and wet areas located on the downstream slope and at the toe of the embankment should be monitored for turbidity and quantity at regular intervals and during periods of heavy precipitation. The seepage observed at the right abutment and along the toe of the downstream slope near the right abutment should be channeled into a collection drainage channel. The discharge from the spring located at the right abutment should be diverted away from the toe of the dam in order that

any seepage from the dam along the toe could be observed. The monitoring program and the monitoring readings should be evaluated by a registered professional engineer experienced in dam design and construction. Measures to control seepage should be implemented as required.

3. Provide erosion protection on the downstream slope adjacent to the right spillway wingwall. Erosion protection should be provided on the upstream slope adjacent to the spillway approach wingwalls.

4. Some means of positive upstream closure of the drainline should be developed.

5. Deterioration of the grouted riprap section should be evaluated by a registered professional engineer knowledgeable in dam design and construction and should be repaired as deemed necessary by the investigation.

6. The reservoir drain should be operated and lubricated on a regular basis.

7. A warning system should be developed to warn any downstream residents or property owners of large spillway discharges or imminent failure of the dam. This should be accomplished prior to future development below the dam.

8. A safety program should be implemented with inspections at regular intervals by qualified personnel.

APPENDIX A
CHECKLIST, VISUAL INSPECTION, PHASE I

CHECK LIST
VISUAL INSPECTION
PHASE I

NAME OF DAM YMCA Dam COUNTY Carbon STATE Pennsylvania ID# PA 873

TYPE OF DAM Earthfill HAZARD CATEGORY Significant

DATE(s) INSPECTION April 8, 1980 WEATHER Clear and cool TEMPERATURE Mid 50's

POOL ELEVATION AT TIME OF INSPECTION 1535.0 M.S.L. TAILWATER AT TIME OF INSPECTION None M.S.L.

INSPECTION PERSONNEL:

R. Jeffrey Kimball, P.E. - L. Robert Kimball and Associates

James T. Hockensmith - L. Robert Kimball and Associates

O.T. McConnell - L. Robert Kimball and Associates

Brian Maguire - Pennsylvania Department of Environmental Resources

~~Denny Diekey - Pennsylvania Department of Environmental Resources~~

James T. Hockensmith
RECORDER

EMBANKMENT

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SURFACE CRACKS	None.	
UNUSUAL MOVEMENT OR CRACKING AT OR BEYOND THE TOE	None.	
SLOUGHING OR EROSION OF EMBANKMENT AND ABUTMENT SLOPES	Minor erosion on downstream slope adjacent to spillway wingwall.	
VERTICAL AND HORIZONTAL ALIGNMENT OF THE CREST	No observed efficiencies. Low spot on the crest near the left abutment. Top of dam elevation 1539.0 feet.	
RIPRAP FAILURES	No riprap on upstream slope adjacent to the spillway approach wingwalls.	

EMBANKMENT

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
VEGETATION	Crest of dam, upstream and downstream slopes grass covered.	
JUNCTION OF EMBANKMENT AND ABUTMENT, SPILLWAY AND DAM	Appears to be good with the exception of potential erosion adjacent to spillway wingwalls on upstream slope. Erosion exists on the downstream slope adjacent to the right spillway wingwall.	
ANY NOTICEABLE SEEPAGE	Seepage observed along the downstream toe near the right abutment contact and adjacent to the spillway drainline discharge structure.	
STAFF GAUGE AND RECORDER	None.	
DRAINS	None.	

CONCRETE/MASONRY DAMS

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
ANY NOTICEABLE SEEPAGE	Not applicable.	
STRUCTURE TO ABUTMENT/EMBANKMENT JUNCTIONS	Not applicable.	
DRAINS	Not applicable.	
WATER PASSAGES	Not applicable.	
FOUNDATION	Not applicable.	

CONCRETE/MASONRY DAMS

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SURFACE CRACKS CONCRETE SURFACES	Not applicable.	
STRUCTURAL CRACKING	Not applicable.	
VERTICAL AND HORIZONTAL ALIGNMENT	Not applicable.	
MONOLITH JOINTS	Not applicable.	
CONSTRUCTION JOINTS	Not applicable.	
STAFF GAUGE OR RECORDER	Not applicable.	

OUTLET WORKS

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CRACKING AND SPALLING OF CONCRETE SURFACES IN OUTLET CONDUIT	None observed.	
INTAKE STRUCTURE	Not applicable.	
OUTLET STRUCTURE	24 inch corrugated metal pipe. Discharges directly at the toe of dam. Discharge structure in good condition.	
OUTLET CHANNEL	Discharges to natural stream.	
EMERGENCY GATE	Not operated during inspection - unobserved.	

UNGATED SPILLWAY

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONCRETE WEIR	Concrete structure, ogee shaped weir. Appears to be in good condition. A fence which spans the spillway crest should be removed.	
APPROACH CHANNEL	Lake. No obstructions noted during time of inspection.	
DISCHARGE CHANNEL	Trapezoidal shaped, protected by slush grouted riprap for a distance of approximately 60 feet. Open cut channel to the natural stream. Possible undercutting at the end of the slush grouted section.	
BRIDGE AND PIERS	None.	

GATED SPILLWAY

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

DOWNSTREAM CHANNEL

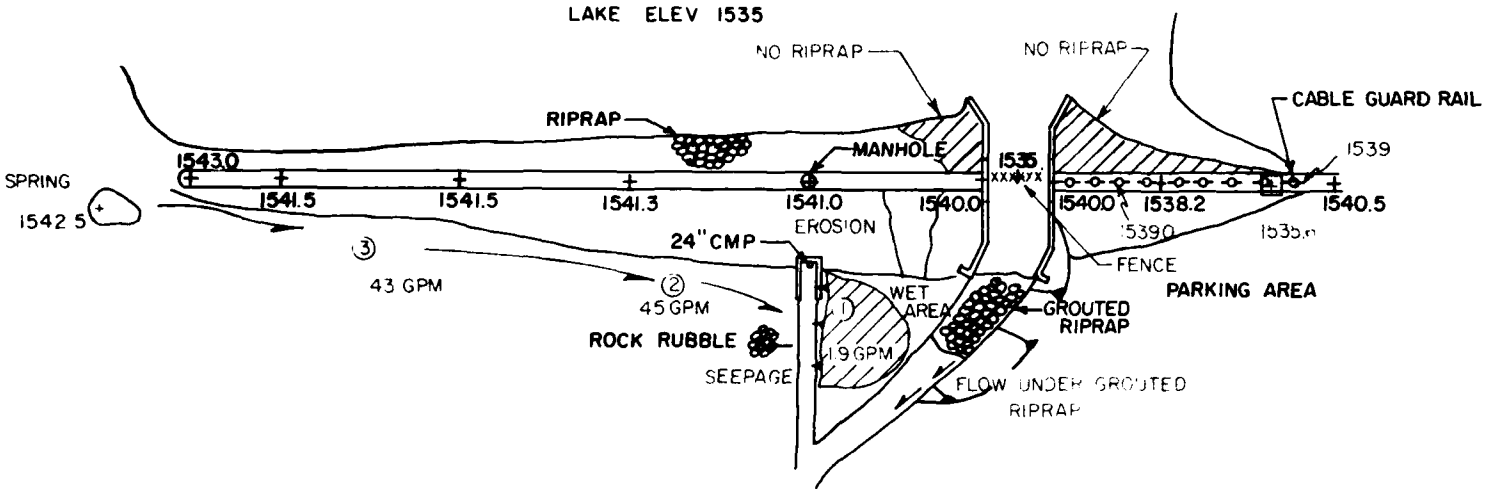
VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONDITION (OBSTRUCTIONS, DEBRIS, ETC.)	Drakes Creek is a narrow stream for its entire distance of approximately 2 miles until it joins the Lehigh River. No homes were observed to be located along the downstream channel. The potential for development of the downstream area is evident and should be closely monitored for the purpose of updating the hazard classification potential for this dam.	
SLOPES	Appear to be stable.	
APPROXIMATE NO. OF HOMES AND POPULATION	No homes were observed along the downstream channel. Potential development is probable and should be evaluated on a regular basis.	

RESERVOIR

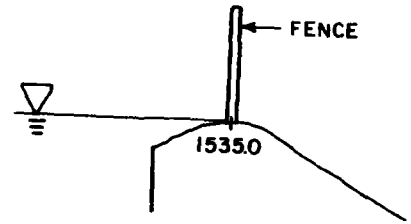
VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SLOPES	Gentle slopes. Appear to be stable.	
SEDIMENTATION	Unknown.	

INSTRUMENTATION

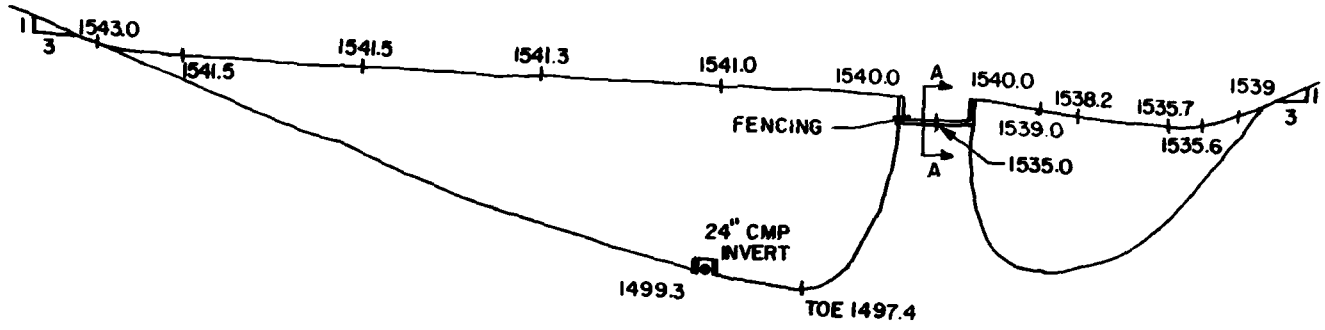
VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
MONUMENTATION/SURVEYS	None.	
OBSERVATION WELLS	None.	
WEIRS	None.	
PIEZOMETERS	None.	
OTHER	None.	



YMCA DAM
(Scale 1" = 100')



SPILLWAY CREST
SECTION A–A
(Not To Scale)



PROFILE
LOOKING UPSTREAM

Scale: Horiz. 1"=100'
Vert. 1"=40'

YMCA DAM

APPENDIX B
CHECKLIST, ENGINEERING DATA, DESIGN, CONSTRUCTION, OPERATION, PHASE I

CHECK LIST
ENGINEERING DATA
DESIGN, CONSTRUCTION, OPERATION
PHASE I

NAME OF DAM YMCA Dam

ID# PA 873

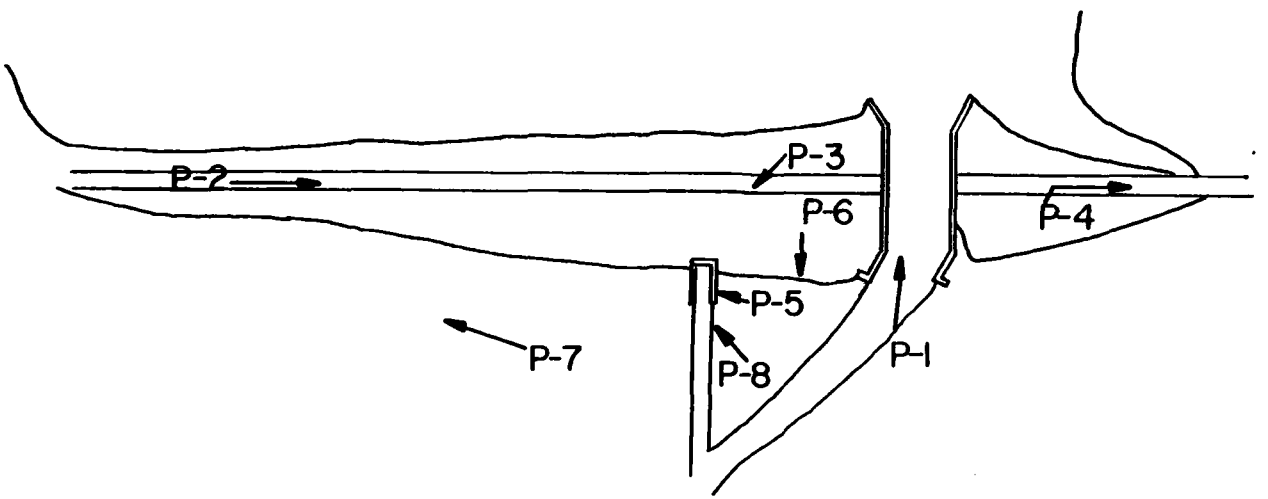
ITEM	REMARKS
AS-BUILT DRAWINGS	None.
REGIONAL VICINITY MAP	U.S.G.S. quadrangle.
CONSTRUCTION HISTORY	Minimal information in DER files.
TYPICAL SECTIONS OF DAM	None available for review.
OUTLETS - PLAN - DETAILS - CONSTRAINTS - DISCHARGE RATINGS RAINFALL/RESERVOIR RECORDS	None. None. None. None. None.

ITEM	REMARKS
DESIGN REPORTS	None.
GEOLOGY REPORTS	None.
DESIGN COMPUTATIONS HYDROLOGY & HYDRAULICS DAM STABILITY SEEPAGE STUDIES	None.
MATERIALS INVESTIGATIONS BORING RECORDS LABORATORY FIELD	DER files suggest that borings were completed prior to construction. Boring information not available for review. Field density test and concrete compression test results in DER files.
POST-CONSTRUCTION SURVEYS OF DAM	Unknown.
BORROW SOURCES	Unknown

ITEM	REMARKS
MONITORING SYSTEMS	None.
MODIFICATIONS	Unknown.
HIGH POOL RECORDS	Unknown.
POST CONSTRUCTION ENGINEERING STUDIES AND REPORTS	Unknown.
PRIOR ACCIDENTS OR FAILURE OF DAM DESCRIPTION REPORTS	Unknown.
MAINTENANCE OPERATION RECORDS	Unknown.

ITEM	REMARKS
SPILLWAY PLAN SECTIONS DETAILS	None available for review.
OPERATING EQUIPMENT PLANS & DETAILS	None available for review.

APPENDIX C
PHOTOGRAPHS



C-1

P- INDICATES PHOTO LOCATION

YMCA DAM
PHOTO INDEX

YMCA DAM

Photograph Descriptions

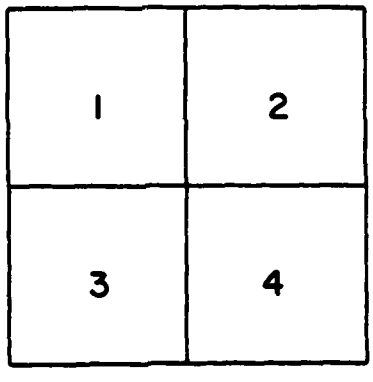
Sheet 1. Front

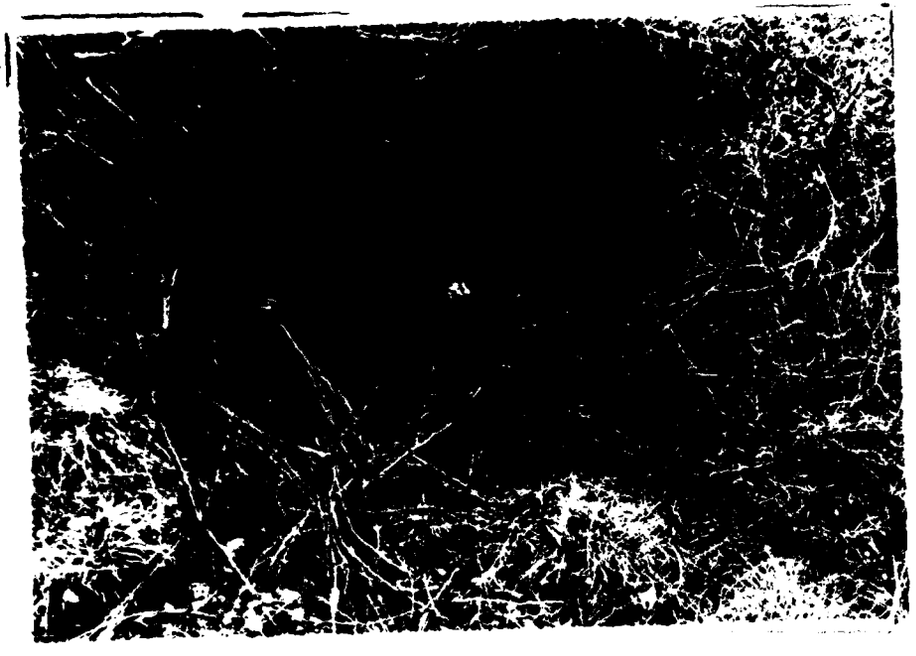
(1) Upper left - Spillway discharge structure with slush grouted riprap discharge channel in foreground.
(2) Upper right - View of upstream slope, crest of dam and left abutment.
(3) Lower left - Manhole cover for 24" gate valve.
(4) Lower right - View of upstream slope and area providing additional spillway capacity at the left abutment.

Sheet 1. Back

(5) Upper left - Downstream slope, 24" CMP discharge structure and seepage area in foreground.
(6) Upper right - Downstream view of discharge channel.
(7) Lower left - Downstream slope and right abutment.
(8) Lower right - Seepage area at toe adjacent to 24" CMP discharge structure.

TOP OF PAGE





APPENDIX D
HYDROLOGY AND HYDRAULICS

APPENDIX D
HYDROLOGY AND HYDRAULICS

Methodology. The dam overtopping and breach analyses were accomplished using the systemized computer program HEC-1 (Dam Safety Investigation), September, 1978, prepared by the Hydrologic Engineering Center, U.S. Army Corps of Engineers, Davis, California. A brief description of the methodology used in the analysis is presented below.

1. Precipitation. The Probable Maximum Precipitation (PMP) is derived and determined from regional charts prepared from past rainfall records including "Hydrometeorological Report No. 40" prepared by the U.S. Weather Bureau.

The index rainfall is reduced from 10% to 20% depending on watershed size by utilization of what is termed the HOP Brook adjustment factor. Distribution of the total rainfall is made by the computer program using distribution methods developed by the Corps.

2. Inflow Hydrograph. The hydrologic analysis used in development of the overtopping potential is based on applying a hypothetical storm to a unit hydrograph to obtain the inflow hydrograph for reservoir routing.

The unit hydrograph is developed using the Snyder method. This method requires calculation of several key parameters. The following list gives these parameters their definition and how they were obtained for these analysis.

Parameter	Definition	Where Obtained
Ct	Coefficient representing variations of watershed	From Corps of Engineers*
L	Length of main stream channel miles	From U.S.G.S. 7.5 minute topgraphic
Lca	Length on main stream to centroid of watershed	From U.S.G.S. 7.5 minute topographic
Cp	Peaking coefficient	From Corps of Engineers*
A	Watershed size	From U.S.G.S. 7.5 minute topographic

*Developed by the Corps of Engineers on a regional basis for Pennsylvania.

3. Routing. Reservoir routing is accomplished by using Modified Plus routing techniques where the flood hydrograph is routed through reservoir storage. Hydraulic capacities of the outlet works, spillways and the crest of the dam are used as outlet controls in the routing.

The hydraulic capacity of the outlet works can either be calculated and input or sufficient dimensions input and the program will calculate an elevation discharge relationship.

Storage in the pool area is defined by an area - elevation relationship from which the computer calculates storage. Surface areas are either planimetered from available mapping or U.S.G.S. 7.5 minute series topographic maps or taken from reasonably accurate design data.

4. Dam Overtopping. Using given percentages of the PMF the computer program will calculate the percentage of the PMF which can be controlled by the reservoir and spillway without the dam overtopping.

5. Dam Breach and Downstream Routing. The computer program is equipped to determine the increase in downstream flooding due to failure of the dam caused by overtopping. This is accomplished by routing both the pre-failure peak flow and the peak flow through the breach (calculated by the computer with given input assumptions) at a given point in time and determining the water depth in the downstream channel. Channel cross-sections taken from U.S.G.S. 7.5 minute topographic maps were used in the downstream flood wave routing. Pre and post failure water depths are calculated at locations where cross-sections are input.

HYDROLOGY AND HYDRAULICS ANALYSIS
DATA BASE

NAME OF DAM: YMCA Dam

PROBABLE MAXIMUM PRECIPITATION (PMP) = 22.0

STATION	1	2	3
Station Description	YMCA Dam		
Drainage Area (square miles)	1.49		
Cumulative Drainage Area (square miles)	1.49		
Adjustment of PMF for Drainage Area (%)(1)			
6 hours	111		
12 hours	123		
24 hours	133		
48 hours	142		
72 hours			
Snyder Hydrograph Parameters			
Zone (2)	2		
Cp (3)	0.45		
Ct (3)	2.10		
L (miles) (4)	1.70		
Lca (miles) (4)	0.89		
tp = Ct(LxLca) 0.3 hrs.	2.38		
Spillway Data			
Crest Length (ft)	42		
Freeboard (ft)	4.0		
Discharge Coefficient	3.2		
Exponent	1.5		

(1) Hydrometeorological Report 33 (Figure 1), U.S. Army Corps of Engineers, 1965.
(2) Hydrological zone defined by Corps of Engineers, Baltimore District, for determining Snyder's coefficients (C_p and C_t).
(3) Snyder's Coefficients.
(4) 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.

CHECK LIST
HYDROLOGIC AND HYDRAULIC
ENGINEERING DATA

DRAINAGE AREA CHARACTERISTICS: 1.49 mi^2 wooded gentle slopes

ELEVATION TOP NORMAL POOL (STORAGE CAPACITY): 215 ac-ft

ELEVATION TOP FLOOD CONTROL POOL (STORAGE CAPACITY): 280 ac-ft

ELEVATION MAXIMUM DESIGN POOL: Unknown

ELEVATION TOP DAM: 1539.0

SPILLWAY CREST:

a. Elevation 1535.0
b. Type Concrete ogee section
c. Width Crest length - 42 feet
d. Length Slush grouted riprap for approximately 60'
e. Location Spillover Near left abutment
f. Number and Type of Gates None

OUTLET WORKS:

a. Type 24" CMP
b. Location Through embankment - approximately Station 2+10
c. Entrance inverts Unknown
d. Exit inverts 1499.3
e. Emergency drawdown facilities 24" CMP

HYDROMETEOROLOGICAL GAUGES:

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

MAXIMUM NON-DAMAGING DISCHARGE: Unknown

L. ROBERT KIMBALL & ASSOCIATES
CONSULTING ENGINEERS & ARCHITECTS
EBENSBURG PENNSYLVANIA

DAM NAME YMCA
I.D. NUMBER 873
SHEET NO. 1 OF 4
BY CAB DATE 5-6-80

LOSS RATE AND BASE FLOW PARAMETERS

RECOMMENDED BY CORPS OF ENGINEERS
BALTIMORE DISTRICT

STRTL = 1 INCH

CNSTL = .05 IN/HR

STRTQ = 1.5 CFS/MI²

QRCSN = .05 (5% OF PEAK FLOW)

RTIOR = 2.0

ELEVATION - AREA - CAPACITY - RELATIONSHIPS

FROM U.S.G.S. 7.5 MIN QUAD., AND FIELD INSPECTION DATA.

SCALE 1" = 2000'

ELEV.	AREA SQ IN.	AREA (AC)	AVG. AREA (AC)	ΔH (FT)	Δ STORAGE (AC. FT)	TOTAL STORAGE (AC. FT)
1500	.003	.28				
			2.02	20	40.4	
1520	.041	3.76				40.4
			16.12	20	322.3	
1540	.31	28.47				362.7
			55.10	20	1102	
1560	.89	81.73				1464.7

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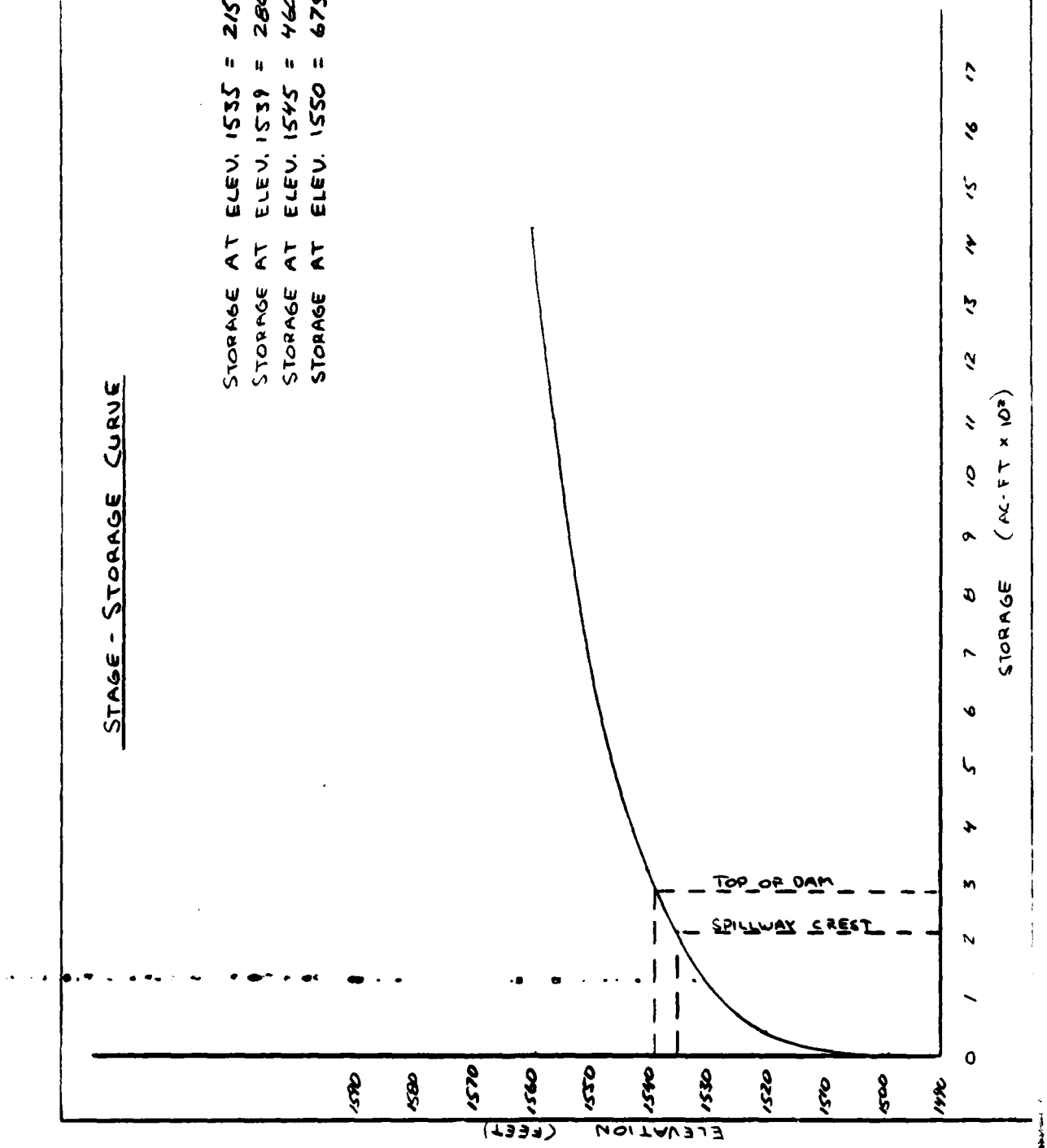
CONSULTING ENGINEERS & ARCHITECTS
EBENSBURG PENNSYLVANIA

DAM NAME YMCA DAM
I.D. NUMBER 873
SHEET NO. 2 OF 4
BY CAB DATE 5-6-80

STAGE - STORAGE CURVE

STORAGE AT ELEV. 1535 = 215 AC-FT
STORAGE AT ELEV. 1539 = 280 AC-FT
STORAGE AT ELEV. 1545 = 460 AC-FT
STORAGE AT ELEV. 1550 = 675 AC-FT



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CONSULTING ENGINEERS & ARCHITECTS
EBENSBURG PENNSYLVANIA

DAM NAME YMCA DAM
I.D. NUMBER 873
SHEET NO. 3 OF 4
BY CAB DATE 5-6-80

SPILLWAY CREST ELEV. = 1535
POND SURFACE AREA = 19.40 AC
INITIAL STORAGE = 215 AC-FT

$S	0	128	40	215	280	360
$E	1498	1500	1520	1535	1539	1540

460	675
1545	1550

OVERTOPPING PARAMETERS

*TOP OF DAM ELEV. = 1539
LENGTH OF DAM (EXCLUDING SPILLWAY) = 608'
COEFFICIENT OF DISCHARGE = 3.0

$L	20	50	80	120	155	303
$V	1535.7	1537	1538	1539	1540	1541

588	628	663	738
1542	1543	1544	1545

* ADDITIONAL SPILLWAY CAPACITY IS PROVIDED BY A LOW SPOT ON THE LEFT ABUTMENT. THIS ADDITIONAL CAPACITY WILL BE ACCOUNTED FOR IN THE $L, $V OPTIONS. OVERTOPPING WILL NOT BE CONSIDERED UNTIL ELEV. 1539.

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CONSULTING ENGINEERS & ARCHITECTS
EBENSBURG PENNSYLVANIA

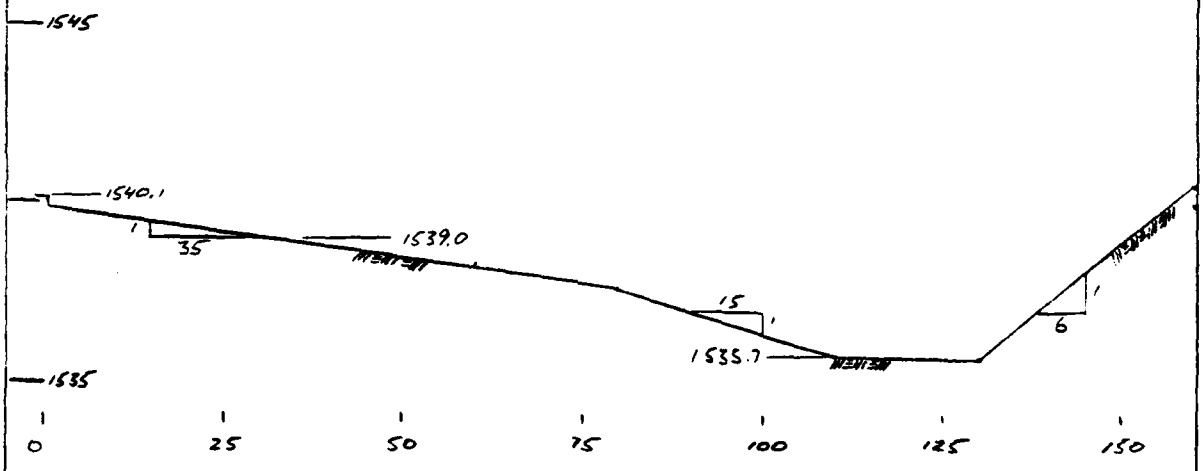
DAM NAME YMCA DAM
I.D. NUMBER 873
SHEET NO. 4 OF 4
BY CAB DATE 5-6-80

SPILLWAY RATING CURVE

DETERMINED BY HEC-1 COMPUTER PROGRAM

CREST ELEV. = 1535
LENGTH OF SPILLWAY = 42'
COEFFICIENT OF DISCHARGE = 3.2

PROFILE OF ADDITIONAL SPILLWAY CAPACITY



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**********
. FLOOD HYDROGRAPH PACKAGE (HEC-1)
DAM SAFETY VERSION     JULY 1978
  LAST MODIFICATION  26 FEB 79
**********
    1                 AI      ANALYSIS OF DAM OVERTOPPING USING RATIOS OF PMF
    2                 A2      HYDROLOGIC-HYDRAULIC ANALYSIS OF SAFETY OF THE YMCA DAM
    3                 A3      RATIOS OF PMF ROUTED THROUGH THE RESERVOIR (873)
    4                 B    288       0      10       0       0       0       0       0       0       0
    5                 B1     5
    6                 J      1       5       1
    7                 J1    .2      .3      .4      .5       1
    8                 K      0       1                                       1
    9                 K1      INFLOW TO RESERVOIR
   10                 M      1       1   1.449
   11                 P           22.0     111     123     133     142
   12                 T                                                   1     .05
   13                 W    2.38     .45
   14                 X    -1.5    -.05     2.0
   15                 K      1       2                                       1
   16                 K1      ROUTE THROUGH RESERVOIR
   17                 Y                                       1       1
   18                 Y1     1                                               -1535       0
   19                 SS     0     .28      40     215     280     360     460     675
   20                 SE  1498    1500    1520    1535    1539    1540    1545    1550
   21                 SS  1535      42     3.2     1.5
   22                 SD  1539     3.0     1.5     608
   23                 SL    20      50      80     120     155     303     588     628     663     738
   24                 SV1535.7    1537    1538    1539    1540    1541    1542    1543    1544    1545
   25                 K     99
```

```
**********  **********
FLOOD HYDROGRAPH PACKAGE (HEC-1)
DAM SAFETY VERSION     JULY 1978
  LAST MODIFICATION  26 FEB 79
**********

RUN  DATE= 80/05/08.
     TIME= 05.09.21.

                ANALYSIS OF DAM OVERTOPPING USING RATIOS OF PMF
                HYDROLOGIC-HYDRAULIC ANALYSIS OF SAFETY OF THE YMCA DAM
                RATIOS OF PMF ROUTED THROUGH THE RESERVOIR (873)

                                JOB SPECIFICATION
      NQ     NHR     NMIN     IDAY     IHR     IMIN    METRC     IPLT     IPRT    NSTAN
     288       0       10        0       0        0        0        0        0        0
                                JOPER      NWT    LROPT    TRACE
                                    5        0        0        0

                        MULTI-PLAN ANALYSES TO BE PERFORMED
                                    NPLAN= 1  NRTIO= 5  LRTIO= 1
          RTIOS=    .20      .30      .40      .50     1.00

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

                        SUB-AREA RUNOFF COMPUTATION

                INFLOW TO RESERVOIR

                ISTAQ    ICOMP    IECON    ITAPE     JPLT     JPRT    INAME   ISTAGE    IAUTO
                    1        0        0        0        0        0        1        0        0

                                HYDROGRAPH DATA
          IHYDG    IUHG   TAREA    SNAP   TRSDA   TRSPC   RATIO  ISNOW   ISAME   LOCAL
              1       1   1.49     0.00    1.49    0.00   0.000      0       0       0

                                PRECIP DATA
                SPFE     PMS      R6     R12     R24     R48     R72     R96
                0.00   22.00  111.00  123.00  133.00  142.00    0.00    0.00
TRSPC COMPUTED BY THE PROGRAM IS  .800

                                LOSS DATA
          LROPT   STRKR   DLTKR   RTIOL   ERAIN   STRKS   RTIOK   STRTL   CNSTL   ALSMX   RTIMP
              0    0.00    0.00    1.00    0.00    0.00    1.00    1.00     .05    0.00    0.00

                        UNIT HYDROGRAPH DATA
                    TP=  2.38    CP=  .45    NTA=  0

                        RECESSION DATA
                STRTQ=   -1.50    QRCSN=    -.05    RTIOR= 2.00
APPROXIMATE CLARK COEFFICIENTS FROM GIVEN SNYDER CP AND TP ARE TC=14.89 AND R=22.47 INTERVALS

     UNIT HYDROGRAPH100 END-OF-PERIOD ORDINATES, LAG=  2.40 HOURS, CP=  .45  VOL=  .98
          3.      12.      24.      39.      56.      74.      94.     114.     133.     150.
        164.     175.     183.     187.     187.     182.     174.     166.     159.     152.
```

145.	139.	133.	127.	122.	116.	111.	106.	102.	97.
93.	89.	85.	82.	78.	75.	71.	68.	65.	62.
60.	57.	55.	52.	50.	48.	46.	44.	42.	40.
38.	37.	35.	33.	32.	31.	29.	28.	27.	26.
25.	23.	22.	21.	21.	20.	19.	18.	17.	16.
16.	15.	14.	14.	13.	13.	12.	12.	11.	11.
10.	10.	9.	9.	8.	8.	8.	7.	7.	7.
6.	6.	6.	6.	5.	5.	5.	5.	5.	4.

HYDROGRAPH ROUTING

ROUTE THROUGH RESERVOIR

D-11

ISTAO	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
2	1	0	0	0	0	1	0	0

ROUTING DATA

QLOSS	CLOSS	AVG	IRES	ISAME	IOPT	IPMP	LSTR
0.0	0.000	0.00	1	1	0	0	0

NSTPS	NSTDL	LAG	AMSKK	X	TSK	STORA	ISPRAT
1	0	0	0.000	0.000	0.000	-1535.	0

CAPACITY=	0.	0.	40.	215.	280.	360.	460.	675.
ELEVATION=	1498.	1500.	1520.	1535.	1539.	1540.	1545.	1550.

CREL	SPWID	COQW	EXPW	ELEVL	COQL	CAREA	EXPL
1535.0	42.0	3.2	1.5	0.0	0.0	0.0	0.0

DAM DATA

TOPEL	COQD	EXPD	DAMWID
1539.0	3.0	1.5	808.

CREST LENGTH AT OR BELOW ELEVATION	20.	50.	80.	120.	155.	303.	588.	628.	663.	738.
	1535.7	1537.0	1538.0	1539.0	1540.0	1541.0	1542.0	1543.0	1544.0	1545.0

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)

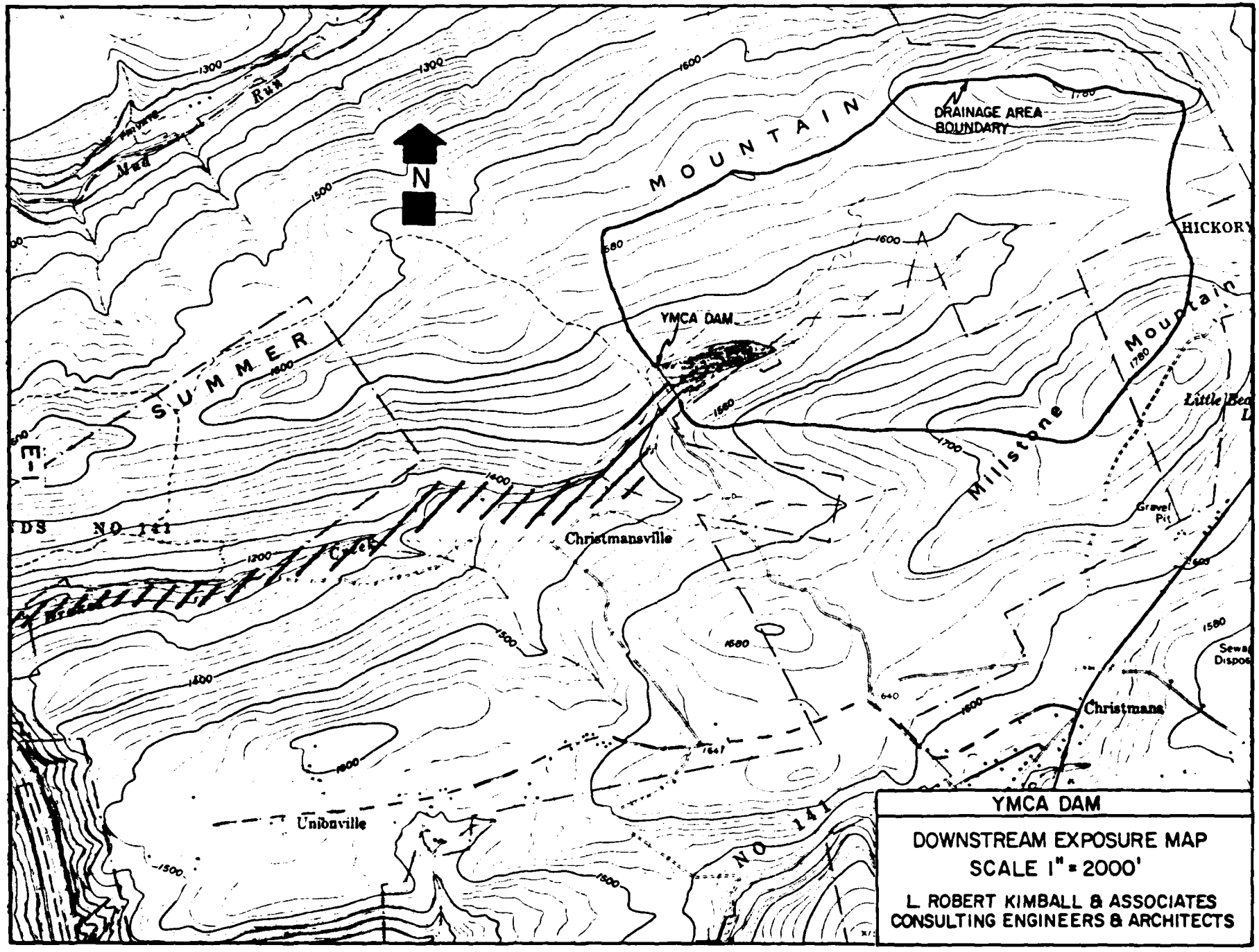
OPERATION	STATION	AREA	PLAN	RATIOS APPLIED TO FLOWS RATIO 1 .20	RATIO 2 .30	RATIO 3 .40	RATIO 4 .50	RATIO 5 1.00
HYDROGRAPH AT	1	1.49	1	537.	805.	1074.	1342.	2684.
		(3.86)		(15.20)	(22.80)	(30.40)	(38.00)	(76.00)
ROUTED TO	2	1.49	1	524.	793.	1062.	1329.	2554.
		(3.86)		(14.85)	(22.47)	(30.07)	(37.63)	(72.31)

SUMMARY OF DAM SAFETY ANALYSIS

PLAN 1		INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
	ELEVATION	1535.00	1535.00	1539.00
	STORAGE	215.	215.	280.
	OUTFLOW	0.	0.	2061.

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
.20	1537.00	0.00	248.	524.	0.00	42.50	0.00
.30	1537.49	0.00	255.	793.	0.00	42.50	0.00
.40	1537.89	0.00	262.	1062.	0.00	42.33	0.00
.50	1538.23	0.00	268.	1329.	0.00	42.33	0.00
1.00	1539.42	.42	314.	2554.	4.00	42.83	0.00

APPENDIX E
DRAWINGS

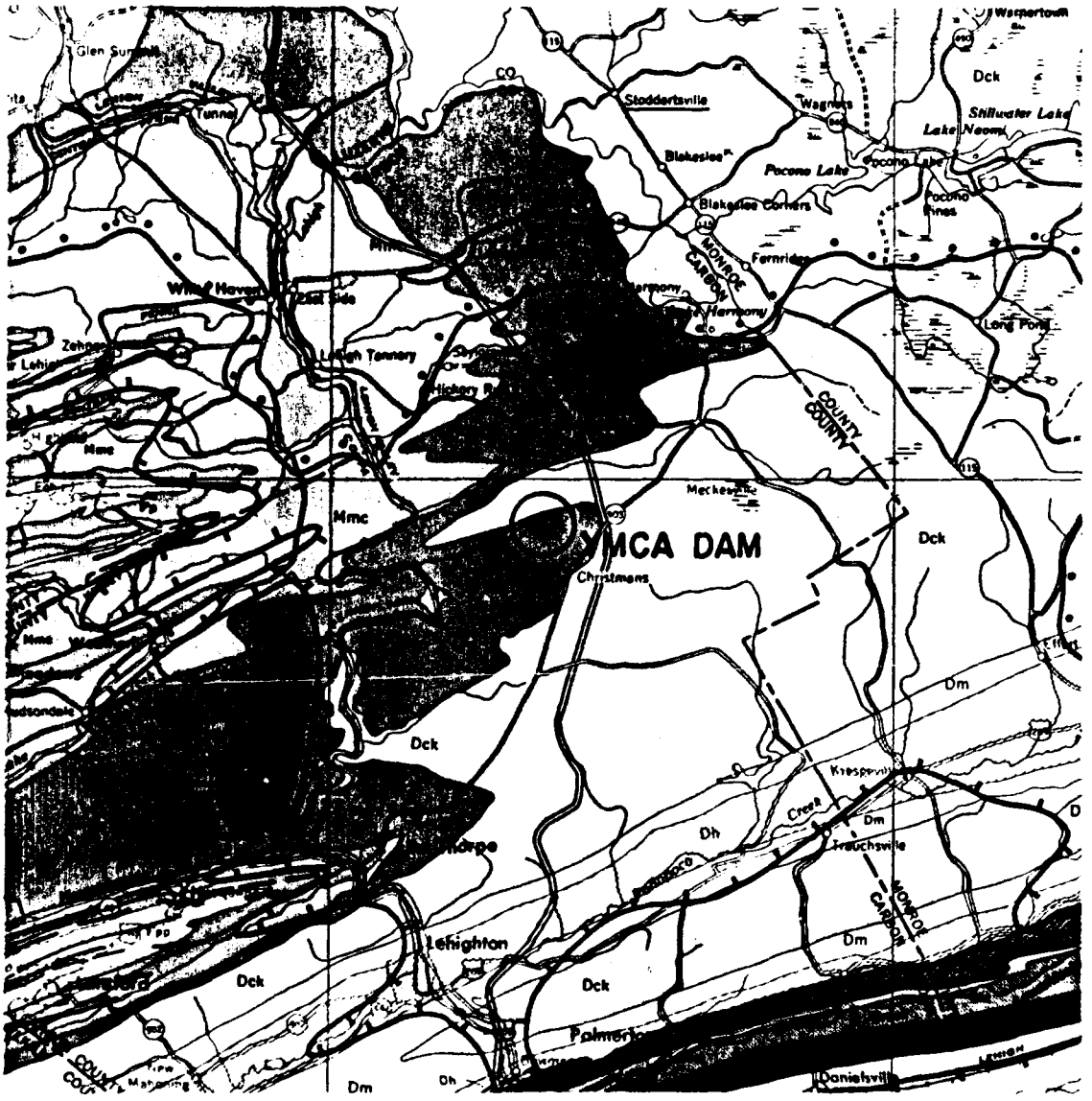

DRAINAGE AREA BOUNDARY
MOUNTAIN
N
YMCA DAM
SUMMER
HICKORY
Mountain
Millstone
Gravel Pit
Christmansville
Christmans
Unionville
NO 141
YMCA DAM
DOWNSTREAM EXPOSURE MAP
SCALE 1" = 2000'
L. ROBERT KIMBALL & ASSOCIATES
CONSULTING ENGINEERS & ARCHITECTS

APPENDIX F
GEOLOGY

General Geology

The YMCA Dam lies within the Poconos Plateau Section of the Appalachian Plateau Physiographic Province. This region is characterized by both broad and narrow anticlines and synclines. While drag folds and minor faulting may be common in the area, no major faulting is indicated in the vicinity of the dam.

The bedrock underlying the reservoir and dam is the Mississippian aged Pocono Group. This group consists mainly of fine to coarse grained sandstone with some conglomerate, siltstone, shale and coal. The moderate to thick bedding is normally well developed. The regular and steeply dipping to vertical joints are also well developed. The rocks of the Pocono group are very resistant to weathering and form an excellent foundation for heavy structures. The interstitial and secondary porosity give the rocks of this group a high effective porosity.



Geologic Map of The YMCA Dam Area

Pocono Group

Predominantly gray, hard, massive, cross-bedded conglomerate and sandstone with some shale; includes in the Appalachian Plateau Burgoon, Shenango, Cuyahoga, Cussewago, Corry, and Knapp Formations, includes part of "Chemung" of M. L. Fuller in Potter and Tioga counties

Scale: 1:250,000