**Phase I Inspection Report**

Camp Harriman Dam  
Hudson River Basin, Greene Co. New York  
Inventory No. N.Y. 552

**Authors**:  
Eugene O'Brien, P.E.  
D. W.  

**Performing Organization Name and Address**  
Tippetts-Abbett-McCarthy-Stratton  
345 Park Avenue  
New York, New York 10021

**Performing Organization Name and Address**  
Department of the Army  
26 Federal Plaza / New York District, CofE  
New York, New York 10007

**Program Element, Project, Task Area & Work Unit Numbers**  
12. Unnumbered  

**Report Date**  
26 October 1978

**Number of Pages**  
13

**DISTRIBUTION STATEMENT (of this Report)**  
Approved for public release; Distribution unlimited.

**DISTRIBUTION STATEMENT (of the abstract entered in block 20, if different from Report)**  
National Dam Safety Program, Camp Harriman Dam (Inventory Number 552), Hudson River Basin, East Kill, Schoharie Creek, Greene County, New York.

**Supplementary Notes**  
Phase I Inspection Report.

**Key Words** (Continue on reverse side if necessary and identify by block number)  
Dam Safety  
National Dam Safety Program  
Visual Inspection  
Hydrology, Structural Stability  
Greene County  
Camp Harriman Dam  
East Kill-Schoharie Creek

**Abstract** (Continue on reverse side if necessary and identify by block number)  
This report provides information and analysis on the physical condition of the dam as of the report date. Information and analysis are based on visual inspection of the dam by the performing organization.

Camp Harriman Dam was judged to be safe.
## Contents

<table>
<thead>
<tr>
<th>Section</th>
<th>Page No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>- ASSESSMENT</td>
<td>-</td>
</tr>
<tr>
<td>- OVERVIEW PHOTOGRAPH</td>
<td>-</td>
</tr>
<tr>
<td>1 PROJECT INFORMATION</td>
<td>1</td>
</tr>
<tr>
<td>1.1 GENERAL</td>
<td>1</td>
</tr>
<tr>
<td>a. Authority</td>
<td>1</td>
</tr>
<tr>
<td>b. Purpose of Inspection</td>
<td>1</td>
</tr>
<tr>
<td>1.2 DESCRIPTION OF PROJECT</td>
<td>1</td>
</tr>
<tr>
<td>a. Description of the Dam</td>
<td>1</td>
</tr>
<tr>
<td>b. Location</td>
<td>2</td>
</tr>
<tr>
<td>c. Size Classification</td>
<td>2</td>
</tr>
<tr>
<td>d. Hazard Classification</td>
<td>3</td>
</tr>
<tr>
<td>e. Ownership</td>
<td>3</td>
</tr>
<tr>
<td>f. Use of the Dam</td>
<td>3</td>
</tr>
<tr>
<td>g. Design and Construction History</td>
<td>3</td>
</tr>
<tr>
<td>h. Normal Operating Procedures</td>
<td>3</td>
</tr>
<tr>
<td>1.3 PERTINENT DATA</td>
<td>3</td>
</tr>
<tr>
<td>a. Drainage Area</td>
<td>3</td>
</tr>
<tr>
<td>b. Discharge at Dam Site</td>
<td>3</td>
</tr>
<tr>
<td>c. Elevation</td>
<td>4</td>
</tr>
<tr>
<td>d. Reservoir</td>
<td>4</td>
</tr>
<tr>
<td>e. Storage</td>
<td>4</td>
</tr>
<tr>
<td>f. Dam</td>
<td>4</td>
</tr>
<tr>
<td>g. Spillways</td>
<td>4</td>
</tr>
<tr>
<td>h. Regulating Outlets</td>
<td>5</td>
</tr>
<tr>
<td>2 ENGINEERING DATA</td>
<td>6</td>
</tr>
<tr>
<td>2.1 DESIGN</td>
<td>6</td>
</tr>
<tr>
<td>2.2 CONSTRUCTION RECORDS</td>
<td>6</td>
</tr>
<tr>
<td>Section</td>
<td>Title</td>
</tr>
<tr>
<td>---------</td>
<td>--------------------------------------------</td>
</tr>
<tr>
<td>2.3</td>
<td>POST CONSTRUCTION INFORMATION</td>
</tr>
<tr>
<td>2.4</td>
<td>OPERATION RECORDS</td>
</tr>
<tr>
<td>2.5</td>
<td>EVALUATION OF DATA</td>
</tr>
<tr>
<td>3</td>
<td>VISUAL INSPECTION</td>
</tr>
<tr>
<td>3.1</td>
<td>FINDINGS</td>
</tr>
<tr>
<td></td>
<td>a. General</td>
</tr>
<tr>
<td></td>
<td>b. Dam</td>
</tr>
<tr>
<td></td>
<td>c. Spillways</td>
</tr>
<tr>
<td></td>
<td>d. Regulating Gates</td>
</tr>
<tr>
<td></td>
<td>e. Abutments</td>
</tr>
<tr>
<td></td>
<td>f. Downstream Channel</td>
</tr>
<tr>
<td></td>
<td>g. Reservoir Area</td>
</tr>
<tr>
<td>3.2</td>
<td>EVALUATION OF OBSERVATIONS</td>
</tr>
<tr>
<td>4</td>
<td>OPERATION AND MAINTENANCE PROCEDURES</td>
</tr>
<tr>
<td>4.1</td>
<td>PROCEDURES</td>
</tr>
<tr>
<td>4.2</td>
<td>MAINTENANCE OF THE DAM</td>
</tr>
<tr>
<td>4.3</td>
<td>MAINTENANCE OF THE REGULATING FACILITIES</td>
</tr>
<tr>
<td>4.4</td>
<td>WARNING SYSTEMS IN EFFECT</td>
</tr>
<tr>
<td>4.5</td>
<td>EVALUATION</td>
</tr>
<tr>
<td>5</td>
<td>HYDROLOGIC/HYDRAULIC</td>
</tr>
<tr>
<td>5.1</td>
<td>DRAINAGE BASIN CHARACTERISTICS</td>
</tr>
<tr>
<td>5.2</td>
<td>SPILLWAY</td>
</tr>
<tr>
<td>5.3</td>
<td>RESERVOIR CAPACITY</td>
</tr>
<tr>
<td>5.4</td>
<td>FLOODS OF RECORD</td>
</tr>
<tr>
<td>5.5</td>
<td>OVERTOPPING POTENTIAL</td>
</tr>
<tr>
<td>5.6</td>
<td>EVALUATION OF HYDROLOGY/HYDRAULICS</td>
</tr>
</tbody>
</table>
6          STRUCTURAL STABILITY          14

6.1      EVALUATION OF STRUCTURAL STABILITY          14
a.     Visual Observations          14
b.     Design and Construction Data          14
c.     Operating Records          14
d.     Post Construction Changes          14
e.     Seismic Stability          14

7          ASSESSMENT/REMEDIAL MEASURES          15

7.1      DAM ASSESSMENT          15
a.     Safety          15
b.     Adequacy of Information          15
c.     Additional Investigations          15

7.2      REMEDIAL MEASURES          16

APPENDICES

A.     DRAWINGS

B.     PHOTOGRAPHS

C.     ENGINEERING DATA CHECKLIST

D.     VISUAL INSPECTION CHECKLIST

E.     HYDROLOGIC DATA AND COMPUTATIONS

F.     STABILITY ANALYSIS
PHASE I REPORT
NATIONAL DAM SAFETY PROGRAM

Name of Dam: CAMP HARRIMAN DAM (I.D. NO. 552)
State Located: NEW YORK
County Located: GREENE COUNTY
Stream: EAST KILL, SCHOHARIE CREEK
Date of Inspection: AUGUST 30, 1978

ASSESSMENT

Examination of the available documents and visual inspection of the Camp Harriman Dam and appurtenant structures did not reveal any conditions which are unsafe at the present time. There do exist, however, several conditions which, if allowed to deteriorate further, could adversely affect the safety of the dam; these are as follows:

- Erosion of the Main Spillway apron
- Deterioration and undermining of the Auxiliary Spillway
- Deterioration and cracking of the pavement atop the dam

The total combined spillway capacity at pool El 2100 is estimated to be 6030 cfs, assuming that the emergency relief channel remains clear of debris and heavy tree growth. The peak outflow discharge during the Probable Maximum Flood (PMF) and the Standard Project Flood (SPF) would be 20,550 cfs and 8430 cfs respectively. The dam would be overtopped by 1.55 ft during the PMF and 0.19 ft during the SPF. Performance of the dam and spillways was satisfactory during a recorded overtopping of 1.5 ft. It is considered that overtopping of 0.19 ft during the SPF would result in little or no damage to either the dam or spillways. The Camp Harriman Dam is therefore considered to be adequate to safely pass the Standard Project Flood.

No remedial measures are required at the present time. Certain measures are, however, recommended as follows:

- Repair and maintain pavement on the dam crest
- Repair the main spillway
- Fill cavities under the auxiliary spillway
- Maintain the emergency relief channel in a clear and operable condition for a full 100 ft width
- Remove brush and heavy vegetation from the dam
- Prepare O & M manual and develop inspection program.

Eugene O'Brien
New York No. 29823

Approved By:
Col. Clark H. Benn
New York District Engineer

Date: 20 OCTOBER 1979
PHASE I INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM
CAMP HARRIMAN DAM, INVENTORY NO. 552
HUDSON RIVER BASIN
GREENE 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 by letter dated 31 March 1978, in fulfillment of the requirements of the National Dam Inspection Act, Public Law 92-367, 8 August 1972.

b. Purpose of Inspection
   The purpose of this inspection and report is to investigate and evaluate the existing conditions of subject dam in order to: identify deficiencies and hazardous conditions; determine if they constitute hazards to human life or property; and notify the State of New York of these results along with recommendations for remedial measures where necessary.

1.2 DESCRIPTION OF PROJECT

a. Description of the Dam
   The Camp Harriman Dam consists of a non-overflow rock section, a centrally located main spillway and an auxiliary spillway located near one end of the dam. The length of the dam, including the main and auxiliary spillways, is approximately 640 feet. The upper 3 to 6 feet of the non-overflow section is, from the appearance of the front face, constructed of hand-placed dry masonry consisting of flat field stones; the lower portion of the downstream face is rock fill. The slope of hand-placed stone is about 4(V):1(H); the slope of the rock fill is about 1(V):1.5(H). The 4(V):1(H) upstream face of the rock section is apparently faced with concrete. Earth fill has been placed against the upstream face to the top of dam level, at approximately E1 2100. The crest of the rock section varies from 8 to 13 feet in width and is paved with 6 inches of unreinforced concrete.

   The southernmost 50 feet of the dam consists of an apparent cutoff wall which extends from the auxiliary spillway into the left abutment.
The main spillway, which is located near the center of the dam, was originally constructed of dry hand-placed field stone masonry which was "parged" (plastered) with mortar. The downstream face is stepped, having an average slope of approximately 1:1; the upstream slope of the rock section has a slope of about 4(V):1(H). The width of the crest, at El 2097.1, is approximately 11 feet; the crest length is 30 feet and the length of the steps is 34.5 feet. The main spillway has a parged, dry field stone masonry training wall at each side and a 20.8 foot x 34.5 foot mortar apron, which was originally paved with flagstones, at its downstream end. Extensive repairs were made to the main spillway during 1965. These repairs consisted of grouting some areas and guniting the faces of the crest, steps and training walls. A timber walkway spans the main spillway.

The auxiliary spillway, which is located at the left end of the dam, is a broad (12 foot) crested 49 foot long parged stone weir with a slight downstream slope. The crest is about 0.5 to 0.6 feet higher than that of the main spillway.

An emergency spillway has been provided recently by excavating and clearing a 100-foot wide relief channel at a natural low point in the topography approximately 500 feet southeast of the southerly (left) end of the dam. The elevation of this cleared emergency relief channel is now about the same as that of the main spillway.

Flow from the reservoir is regulated at the main spillway by two gates. A 12-inch horizontally mounted sluice gate is located at the downstream end of a conduit which passes through the spillway near its left side at invert El 2086.8; the sluice gate is connected to a gate stand at the top of the left training wall. Another 12-inch sluice is located at the upstream end of a corrugated metal pipe which passes through the spillway near its right side at El 2072.3; this gate is operated from a gate stand at the upstream end of the spillway. It is reported that the intake line for the lower gate is a 24-inch diameter clay pipe, which extends approximately 34 feet upstream of the dam and is partially covered with soil.

b. Location
The dam is located on the East Kill of the Schoharie Creek approximately 1.8 miles east and upstream of East Jewett, New York.

c. Size Classification
The maximum height of the dam is approximately 32 feet and the storage capacity at spillway crest level is 230 acre feet; therefore, it is considered to be a "small" size dam.
d. **Hazard Classification**
   The dam is considered to be in the "significant" hazard potential category.

e. **Ownership**
   The reservoir, which is sometimes referred to as Lake Capra, and the dam are owned by the Boys Club of New York which has its main offices at 287 E. Tenth Street, New York, New York 10009. Operation and maintenance are performed by the full time caretaker of Camp Harriman.

f. **Use of the Dam**
   The impoundment formed by the dam has been used as a recreation facility for Camp Harriman, a summer camp for children.

g. **Design and Construction History**
   It is reported that the dam was constructed circa 1912-1913 by a private owner named Colgate and modified after construction by addition of concrete facing upstream, earth fill and rock fill. The lake was substantially drained for several years during World War II. Around 1962 the dam and main spillway were repaired by refacing part of the dam's upstream face with 12 to 18 inches of concrete, sealing several leaks and placing earth fill against the upstream face. In 1964, pressure grouting was used to seal two areas of leakage in the downstream side of the spillway. Sometime after 1964 the spillway was resurfaced with gunite.

h. **Normal Operating Procedures**
   The pool is usually maintained at spillway crest level, except when an unusually large inflow is anticipated. In such cases the gates are opened and the pool lowered. The lower gate is usually cracked slightly open to provide some downstream flow. Both gates are "exercised" approximately every two months.

1.3 **PERTINENT DATA**

a. **Drainage Area**, square miles 4.58

b. **Discharge at Dam Site**, cfs
   - Maximum known flood at site (Aug. 10, 1976)*
     - Maximum regulating gate outlets 20±
     - Ungated Main Spillway, Pool El 2100** 410
     - Ungated Auxiliary Spillway, Pool El 2100 480
     - Emergency relief channel, Pool El 2100 6030
     - Total discharge capacity at Pool El 2100 6920
*Estimated, assuming that the emergency relief channel was not operating

**Top of Dam

c. **Elevation (USGS Datum)**
   - Top of Dam: 2100±
   - Crest, Main Spillway: 2097.1±
   - Crest, Auxiliary Spillway: 2097.6±
   - Crest, Emergency relief channel: 2097.1±
   - Stream bed at downstream toe of dam: 2072.0±

d. **Reservoir**
   - Length of pool, mi (El 2100±): 0.4
   - Surface area, acres, (El 2100±): 51.2
   - Length of shoreline, mi (El 2100±): 1.4

e. **Storage**, acre-feet
   - Top of spillway crest: 230.2
   - Top of dam: 444.2

f. **Dam**
   Type: Dry masonry and rockfill with earth fill on upstream face
   - Length: 640± ft
   - Height: 28± ft above foundation
   - Crest width: 13 ft
   - Impervious zone: 12" to 18" concrete facing on upstream side of dry masonry (full extent of facing is not known)
   - Grout curtain: none

g. **Spillways**
   Main Spillway
   Type: Parged and gunited dry masonry, broad-crested ungated weir with stepped downstream slope
   - Length: 30 ft
   - Crest Elevation: 2097.1±
   - Downstream Channel: East Kill, Schoharie Creek

   Auxiliary Spillway
   Type: Parged dry masonry broad-crested ungated weir
   - Length: 49 ft
   - Crest Elevation: 2097.6±
   - Downstream Channel: Short channel, lined with dumped stone, to East Kill
Emergency Relief Channel
Type: Excavated "swale" in low portion of flat ridge between reservoir and East Kill
Crest Length: 100± ft
Crest Elevation: 2097.1±
Downstream Channel: 0.3-mile long channel cleared of brush, nearly uniform slope of 0.02 from spillway crest to East Kill

h. Regulating Outlets
12-inch sluice gate at downstream end of spillway at Invert El 2086.8
12-inch sluice gate at upstream end of spillway at Invert El 2072.3
SECTION 2 - ENGINEERING DATA

2.1 DESIGN

It is reported that the dam was constructed circa 1912-1913. No computations, drawings or other plans relative to the design are available; it is reported that none were made.

2.2 CONSTRUCTION RECORDS

No construction records are available.

2.3 POST CONSTRUCTION INFORMATION

There are no records of the project prior to 1964. A report prepared by Ackerman, Knox, Haywood and Pakan, dated November 1964 includes some historical information, the findings of an inspection, an evaluation of the condition of the dam and spillways and recommendations for rehabilitation. Two drawings (Drawings No. 2806-01 and 2803-03) of the same date, also prepared by Ackerman, et.al., present plans and elevations of the dam and spillway based on a 1964 survey.

A 1965 application to the State of New York Department of Public Works for a permit to reconstruct the dam indicates that borings were made; logs of the borings were not available.

2.4 OPERATION RECORDS

There are no written records of either gate operation or maintenance; there are no written maintenance records for the dam. The caretaker reported that gates were greased approximately annually and exercised bi-monthly in recent years.

2.5 EVALUATION OF DATA

The available data were obtained from the Boys Club, New York Office, the caretaker and from Haywood and Pakan Associates and, in conjunction with the visual inspection, are considered to be adequate for this Phase I inspection.
SECTION 3 - VISUAL INSPECTION

3.1 FINDINGS

a. General
A visual inspection of the Camp Harriman Dam was made on Wednesday, August 30, 1976. At the time of the inspection the reservoir level was at the level of the main spillway crest, El 2097.1+.

b. Dam
There are minor irregularities in the alignment of the dam; these appear to represent as-built conditions rather than post construction movements. The vertical alignment is uniform at El 2100 except for the reach between the dogleg in the northern portion and the main spillway; in this area, the 1964 survey indicates that the dam may have settled 0.01 to 0.02 feet. The pavement on the dry masonry crest has many longitudinal and transverse cracks open as much as 3/4 inch. There is a longitudinal 2.5-inch depression or "swale" in the crest located approximately 120 feet north of the main spillway at the dogleg.

The exposed nearly vertical downstream face of dry masonry appeared to be in good condition with no visible signs of distress or movement. The rockfill also appeared to be in good condition except for a few areas where stones had been either toppled or dislocated due to overtopping of the dam.

The existence of a nearly vertical 12-to 18-inch thick concrete facing on the upstream side of the dry masonry could be determined from visual inspection of the pavement for most of the dam length. The vertical extent of the concrete wall, however, could not be ascertained from the visual inspection. The condition of the earth fill which had been placed against the upstream face of the masonry section was good; although the earth fill slopes are not protected, there has not been visible damage as a result of wave action.

The upstream face of the dam is generally covered with grass and some brush; the downstream slopes of the rockfill have some grass and brush cover and, occasionally, some trees growing on them.

There are no visible signs of seepage emerging from either the downstream slopes or toe of the dam.
c. **Spillways**

(1) **Main Spillway** - The visible portions of the main spillways gunited surface were in good condition. Except for some fine cracks near the bottom of the training walls, there were no signs of distress. There is a visible inward bulge on the north training wall; this bulge apparently existing prior to guniting in 1965.

There has been substantial erosion of the apron. The flagstones have been carried away (possibly after having been loosened by freeze-thaw cycles) and some of the underlying concrete fill has also been eroded. A small amount of soil adjacent to the south (outside) face of the south training wall has been eroded, apparently as a result of overtopping.

(2) **Auxiliary Spillway** - The auxiliary spillway has not been resurfaced with gunite; the surface of the parged field stone crest and side walls are cracked and deteriorating. There is a protrusion near the center of the spillway crest which appears to be the remnant of an old bridge pier. At the southern half of the spillway, there exists a separation of as much as 2 inches between the upstream vertical wall and the downstream portion of the spillway crest. Stone in the stream bed below the weir has been eroded such that there are some cavities under the 4-foot high weir and also under the side walls. Some small seepage was audible (not visible) near the left side of the spillway toe.

(3) **Emergency Relief Channel** - The channel consists of a dozed and cleared flat strip about 100 feet wide.

d. **Regulating Gates**

Both sluice gates were reported to be operational. The visible gate at invert El 2086.8 was shut and leaking; this condition is the result of the sealing adjustment. The gate appeared to be in good condition and well maintained. The lower sluice gate, which could not be inspected, was cracked slightly open.

e. **Abutments**

There were no signs of seepage or other unusual conditions at the abutments. There were no signs of erosion or other adverse effects which might result from overtopping of the dam at the abutments.

f. **Downstream Channel**

The channels downstream of the main and auxiliary spillways contained some trees and brush; however, their present condition would not impede flood flows. The downstream channel of the emergency relief swale contained high grass and shrubs and would probably not be efficient in discharging low flood flows.
g. Reservoir Area

In the vicinity of the dam and spillways there were no evidences of sloughing, potentially unstable slopes or other unusual conditions which would adversely affect the dam.

3.2 EVALUATION OF OBSERVATIONS

Visual observations made during the course of the inspection did not indicate serious problems which would adversely affect the safety of the dam and require either immediate investigation or immediate remedial action.

a. The cracked condition of and depressions in the pavement do not represent an unsafe condition at the present time; however, the pavement holds together and prevents erosion of the dry masonry top stones during overtopping. Therefore, the pavement should be either repaired or covered with an additional course of pavement and the depressions filled.

b. The growth of trees and heavy brush on the dam is considered to be undesirable.

c. Erosion of the main spillway apron is considered to be an undesirable condition; additional erosion of the apron could cause undermining of the spillway toe and/or training walls.

d. The observed conditions at the auxiliary spillway (i.e. surface deterioration and undermining caused by scour) are considered to be undesirable.
SECTION 4 - OPERATION AND MAINTENANCE PROCEDURES

4.1 PROCEDURES

The water level behind the dam is usually kept at spillway crest level. If a major storm is anticipated, the Camp Harriman caretaker will open the gates to lower the reservoir level by as much as 5 or 6 feet. At other times the lower gate is cracked slightly open to provide some water downstream.

4.2 MAINTENANCE OF THE DAM

There is no operation and maintenance manual for the project and no record of maintenance to the dam.

4.3 MAINTENANCE OF THE REGULATING FACILITIES

It is reported that the gates are exercised bi-monthly and maintained at approximately yearly intervals.

4.4 WARNING SYSTEMS IN EFFECT

There is no warning system in effect.

4.5 EVALUATION

The maintenance of the Camp Harriman Dam is considered less than adequate in the following areas:

a. Control of brush and trees on portions of the dam.

b. Maintenance and repair of such project features as:
   - the crest pavement
   - Main Spillway apron
   - Auxiliary Spillway

c. Absence of an operation and maintenance manual
5.1 DRAINAGE BASIN CHARACTERISTICS

Camp Harriman Dam is located on the East Kill in the Town of Jewett, Greene County, N.Y. just upstream from Colgate Lake. The drainage basin has a triangular shape and is almost entirely wooded. The drainage pattern with respect to the dam location is such that all runoff would arrive at the lake almost simultaneously, thus causing a high peak inflow, even though the dense vegetal cover would cause some losses and flow retardation. It is expected, however, that flow retardation would be counterbalanced by flow acceleration resulting from the steep slopes encountered in the basin. There is an approximate 1760 ft drop in about one mile distance to the north of the lake (Blackhead Peak) and a 1320-foot drop in about 1.2 mile distance to the east (Stoppel Point). The drainage basin has an area of 4.58 square miles of which 51.2 acres are occupied by the lake.

5.2 SPILLWAY

Discharge capacity is available by means of outflow through the Main and Auxiliary Spillways and through the Emergency Relief Channel. Dimensions and elevations of these structures are given in paragraph 1.3g. It is estimated that the discharge capacities are 410 and 480 cfs for Main and Auxiliary spillways, respectively, and 6030 cfs for the relief channel, when the lake level is equal to that of the top of the dam. The computed discharge capacities of the 12 inch diameter low level outlets, with lake level at El 2097.1 are about 9 cfs for the upper and 12 cfs for the lower conduit.

5.3 RESERVOIR CAPACITY

The normal reservoir capacity corresponding to spillway crest El 2097.1 is 230.2 acre feet, or 75 million gallons. The computed surcharge storage between spillway crest elevation and top of dam (El 2100) is 151 acre feet. This amount of surcharge storage is equivalent less than one inch of runoff over the entire basin.

5.4 FLOODS OF RECORD

The nearest U.S. Geological Survey complete stream gaging station is No. 3500 located on the Schoharie Creek near Prattsville. "Pipe Gages", to record flood flows only, are located on a number of tributaries, one on the East Kill at East Jewett and one on the Batavia Kill near Windham. The records indicate the following flood flows in 1955 and 1960 for these last
two points.

**East Jewett Station on the East Kill**
Drainage Area = 35 Square Miles
1955 flood = 10,000 cfs = 285 cfs/sq mi
1960 flood = 8,100 cfs = 230 cfs/sq mi

**Windham Station on the Batavia Kill**
Drainage Area = 4 Square Miles
1955 flood = 1,700 cfs = 430 cfs/sq mi
1960 flood = 1,690 cfs = 436 cfs/sq mi

It was reported that the dam had been overtopped several times prior to 1964; however, there are no records of such overtopping.

It was also reported that the dam was overtopped by 1.5 feet on August 10, 1976. The reservoir had been lowered by 5 or 6 feet in anticipation of the storm. At that time the emergency relief channel had not been cleared and bulldozed to El 2100.

5.5 **OVERTOPPING POTENTIAL**

The overtopping potential was evaluated for both the Probable Maximum Flood (PMF) and the Standard Project Flood (SPF).

The Probable Maximum 6 hour rainfall for the Camp Harriman area was determined as 23.5 inches, and based on EC 1110-2-27 was reduced 20 percent to 18.8 inches. The distribution of the rainfall was based on data in a publication of the World Meteorological Organization.

Based on the Soil Conservation Service curve number method the rainfall excess was determined as 16.54 inches. Because of the physical features of the basin, with four streams flowing into the lake, the basin was divided into 4 sub-basins. Triangular unit hydrographs were developed for each sub-basin and subsequently used to compute their respective PMF runoff hydrographs. The flood hydrograph was formed by adding the PMF runoff hydrographs from each sub-basin to the runoff resulting from the rainfall directly on the lake area, and resulted in a flood inflow peak of 20,660 cfs.

The potential of the water overtopping the dam was investigated on the basis of the available surcharge storage and spillway discharge capacities to meet a potential emergency inflow. It was assumed that the lake level at the start of the flood inflow would be at (El 2097.1 (spillway crest).
The PMF would cause the level of the lake to rise to a maximum elevation of 2101.55, 1.55 feet above the top of the dam. The peak outflow discharge would be 20,550 cfs or about 3 times the outflow capacity. The Standard Project Flood, usually taken as one half PMF, would produce a maximum lake level elevation of 2100.19 and a peak discharge of 8430 cfs, 1.2 times the combined spillway capacity.

The low level conduits were assumed inoperable during the floods.

5.6 EVALUATION OF HYDROLOGY/HYDRAULICS

Based on the assumption that the emergency relief channel remains clear of debris, vegetation and heavy tree growth, the dam would be overtopped by approximately 0.2 ft during the Standard Project Flood and about 1.55 ft during the Probable Maximum Flood. The dam safely withstood 1.5 ft overtopping during 1976, at which time the emergency relief channel had not been cleared.

REFERENCES:


SECTION 6 - STRUCTURAL STABILITY

6.1 EVALUATION OF STRUCTURAL STABILITY

a. Visual Observations
   Visual inspection did not indicate conditions which would adversely affect the stability of either the dam or the main and auxiliary spillways at the present time. However, certain conditions, if allowed to deteriorate further, could adversely affect structural stability at some later date; these are as follows:
   - Erosion of Main Spillway Apron
   - Deterioration and undermining of Auxiliary Spillway
   - Deterioration and cracking of the dam crest pavement

b. Design and Construction Data
   There exist no design computations or other data regarding the structural stability of the dam.

   On the basis of the performance experience of the dam and the auxiliary spillway under flood flows which have overtopped the dam, both structures are considered to be stable. On the basis of stability analyses performed during the course of this investigation, as well as performance experience, the structural stability of the Main Spillway is also considered to be adequate.

c. Operating Records
   There are no operating records.

d. Post Construction Changes
   No records of post construction changes were available for this investigation; however, it is reported that the following repairs were made:
   - Addition of concrete facing on upstream side of dry masonry section.
   - Placement of earth fill upstream of masonry section.
   - Sealing by pressure grouting of several leaks at the main spillway.
   - Resurfacing of the main spillway using gunite.
   - Rehabilitation of the gates.

e. Seismic Stability
   The dam is located in Seismic Zone No. 1; therefore, no seismic analyses are warranted.
SECTION 7 - ASSESSMENT/REMEDIAL MEASURES

7.1 DAM ASSESSMENT

a. Safety
Examination of the available documents and visual inspection of the Camp Harriman Dam and appurtenant structures did not reveal any conditions which are unsafe at the present time. There do exist, however, several conditions which, if allowed to deteriorate further, could adversely affect the safety of the dam; these are as follows:

- Erosion of the Main Spillway apron.
- Deterioration and undermining of the Auxiliary Spillway.
- Deterioration and cracking of the pavement atop the dam.

The total combined spillway capacity at pool El 2100 is estimated to be 6030 cfs, assuming that the emergency relief channel remains clear of debris and heavy tree growth. The peak outflow discharge during the Probable Maximum Flood (PMF) and the Standard Project Flood (SPF) would be 20550 cfs and 8430 cfs respectively. The dam would be overtopped by 1.55 ft during the PMF and by 0.19 ft during the SPF. Performance of the dam and spillways were satisfactory during a recorded overtopping of 1.5 ft. It is considered that overtopping of 0.19 ft during the SPF would result in little or no damage to either the dam or spillways. The Camp Harriman Dam is therefore considered to be adequate to safely pass the Standard Project Flood.

b. Adequacy of Information
The information available were not adequate to fully determine the nature of dam section and the full extent of the upstream concrete facing on the masonry section. Although leakage was reported to have occurred, efforts have been made to seal it and there were no evidence of seepage at the time of the inspection. The available data, in conjunction with the findings of the visual inspection, are adequate for performance of this investigation. Inadequacies with regard to operation and maintenance data are as follows:

1. Up-to-date record drawings of the project.
2. Operating and maintenance manuals.
3. Records of water levels inspection and operation.

c. Additional Investigations
Additional investigations to assess the safety of the dam do not appear necessary.
7.2 REMEDIAL MEASURES

No remedial measures are required at the present time.

Certain measures are, however, recommended as follows:

a. The cracked pavement atop the spillway crest should be repaired or covered by an additional course of pavement and the depressions filled with concrete.

b. The apron of the main spillway should be repaired.

c. Cavities under the auxiliary spillway should be filled and the toe of the spillway protected by additional stone riprap.

d. The emergency relief channel should be maintained in a clear and operable condition for a full 100 ft width at all times.

e. Heavy brush, shrubs and young saplings should be removed from all locations on the dam. Large conifers, but not deciduous hardwoods, should be removed. The remaining trees should be inventoried and their condition monitored. If a tree dies, the area around the tree should be monitored for seepage.

f. An operation and maintenance manual should be prepared and a program of periodic inspections developed.
APPENDIX A

DRAWINGS
SECTION B
--- Limits of Reputed Septic Field

- Septic M.H. F.L. 2085.0
- Septic M.H. El. 2085.6
N

DAM FACE GENERALLY GOOD

100'   50

FACE BATTER
1:5'

SPILLWAY GATE
365 W. 3.4' HIGH (V. Propl)
EL. Top 2190.2 Bot 2186.8

2096.5

5.7

+LOWEST EXPOSED
100' OF DAM
SIDE WALLS OF SPILLWAY
PARGED FIELDSTONE, BADLY
DETERIORATED
NORTH CURTAIN WALL

SECTION - NORT
PLAN of MAIN SPILLWAY

SCALE 1" = 5'0"

CONCRETE APRON BADLY ERODED
SPILLWAY SCALE

BY ACKERMAN & HAYWARD, P.A.
CONSULTING ENGINEERS
POUGHKEEPSIE, N.Y.
NOVEMBER 1964
PILLWAY SECTIONS
SCALE 1" = 5'0"
DRY STONE WALL
20' LONG 1.5 THICK
CAMP
BOYS CLUB
EAST KI
HUNTER
GREENE C

SCALE 1" = 5'0"
HARRIMAN
of New York
on
MILL CREEK
TOWNSHIP
COUNTY, N.Y.

DRAWN: R.H
19 NO 2806-03
2. Downstream face of dam, looking south toward the Main Spillway

3. Crest of dam, looking north from the Main Spillway
4. Cracked concrete paving on the dam crest

5. Longitudinal depression in crest of dam near dog-leg, looking north
6. Gate operating stand for high level sluice gate, looking northerly

7. North training wall, low level gate outlet and downstream face of Main Spillway
8. Bulge in north training wall at Main Spillway, looking east
9. High level horizontally mounted sluice gate, Main Spillway
10. View of Auxiliary Spillway showing crest, north wall and toe

11. Erosion cavity under toe of Auxiliary Spillway
12. Separation of upstream concrete wall and parged stone crest of Auxiliary Spillway, looking south
ENGINEERING DATA CHECKLIST

APPENDIX C
<table>
<thead>
<tr>
<th>ITEM</th>
<th>REMARKS</th>
</tr>
</thead>
<tbody>
<tr>
<td>DESIGN REPORTS</td>
<td>None available</td>
</tr>
<tr>
<td>GEOLOGY REPORTS</td>
<td>None available</td>
</tr>
<tr>
<td>DESIGN COMPUTATIONS</td>
<td>None available</td>
</tr>
<tr>
<td>HYDROLOGY &amp; HYDRAULICS</td>
<td>Not available</td>
</tr>
<tr>
<td>DAM STABILITY</td>
<td>None</td>
</tr>
<tr>
<td>SEEPAGE STUDIES</td>
<td>None</td>
</tr>
<tr>
<td>MATERIALS INVESTIGATIONS</td>
<td>None</td>
</tr>
<tr>
<td>BORING RECORDS</td>
<td>Not available</td>
</tr>
<tr>
<td>LABORATORY</td>
<td>None</td>
</tr>
<tr>
<td>FIELD</td>
<td>None</td>
</tr>
</tbody>
</table>

**POST-CONSTRUCTION SURVEYS OF DAM**

- **Knox Hayward Park**
- **Dwg No 2806-01**
- **Dwg No 2806-03**

*Surveys by Ackerman, dated Nov 1964*

- **Plan and Sections of Dam**
- **Plan and Sections, Main Spillway**

**BORROW SOURCES**

- **None**
# CHECKLIST
**ENGINEERING DATA**
**DESIGN, CONSTRUCTION, OPERATION**
**PHASE I**

<table>
<thead>
<tr>
<th>ITEM</th>
<th>REMARKS</th>
</tr>
</thead>
<tbody>
<tr>
<td>NAME OF DAM</td>
<td>Comp Harriman</td>
</tr>
<tr>
<td>ID #</td>
<td>552</td>
</tr>
<tr>
<td>AS-BUILT DRAWINGS</td>
<td>None available</td>
</tr>
<tr>
<td>REGIONAL VICINITY MAP</td>
<td>USGS</td>
</tr>
<tr>
<td>CONSTRUCTION HISTORY</td>
<td>From report by: Ackerman-Knox</td>
</tr>
<tr>
<td></td>
<td>Hayward &amp; Pakan, November 1964</td>
</tr>
<tr>
<td>TYPICAL SECTIONS OF DAM</td>
<td>None available</td>
</tr>
<tr>
<td>OUTLETS-PLAN</td>
<td>Survey of dam Nov. 1964 by</td>
</tr>
<tr>
<td></td>
<td>Hayward and Pakan (Spillway)</td>
</tr>
<tr>
<td>-DETAILS</td>
<td></td>
</tr>
<tr>
<td>-CONSTRAINTS</td>
<td>None</td>
</tr>
<tr>
<td>-DISCHARGE RATINGS</td>
<td>None available</td>
</tr>
<tr>
<td>RAINFALL/RESERVOIR RECORDS</td>
<td>None available at site</td>
</tr>
<tr>
<td>ITEM</td>
<td>REMARKS</td>
</tr>
<tr>
<td>-------------------------------</td>
<td>----------------------------------------------</td>
</tr>
<tr>
<td>MONITORING SYSTEMS</td>
<td>None</td>
</tr>
<tr>
<td>MODIFICATIONS</td>
<td>1964: Spillway gated, gates replaced, fill placed U/S of dam</td>
</tr>
<tr>
<td>HIGH POOL RECORDS</td>
<td>Aug 10 1976</td>
</tr>
</tbody>
</table>

POST CONSTRUCTION ENGINEERING

STUDIES AND REPORTS Report by Ackerman-Knox-Hayward and Rock, 54 Market St, Poughkeepsie N.Y. "CAMP HARRIMAN DAM, BOYS CLUB OF N.Y.", dated December 1964

PRIOR ACCIDENTS OR FAILURE OF DAM

DESCRIPTION None

REPORTS Photos of overtopping in 1976

MAINTENANCE

OPERATION

RECORDS None available
<table>
<thead>
<tr>
<th>ITEM</th>
<th>REMARKS</th>
</tr>
</thead>
<tbody>
<tr>
<td>SPILLWAY PLAN</td>
<td>1964 Survey by Haywood &amp; Pearson</td>
</tr>
<tr>
<td>SECTIONS</td>
<td></td>
</tr>
<tr>
<td>DETAILS</td>
<td></td>
</tr>
<tr>
<td>OPERATING EQUIPMENT</td>
<td>No data</td>
</tr>
<tr>
<td>PLANS &amp; DETAILS</td>
<td></td>
</tr>
</tbody>
</table>
VISUAL INSPECTION CHECKLIST

1. Basic Data
   a. General
      Name of Dam: Camp Harriman Hazard Category: High
      County: Greene ID#: 552
      Stream Name: East Kill Tributary of Schonharie Creek
      Location: Greene County Nearest Town (P.O.): Vewett
      Longitude: W 74°06'40" Latitude: N 42°14'00"
      Date of Inspection: 06/06/78 Weather: Partly Cloudy Temperature: 75°
   b. Inspection Personnel:
      A. Lange, Water Resources Structural Engineer
      A. Dolcimascolo, Geotechnical Engineer
   c. Persons Contacted: Steve Canfield, Caretaker
   d. History:
      Date Constructed: Area: 1912-1913
      Present Owner: Boys Club of New York
      Designed by: Unknown
      Constructed by: Unknown
      Recent History: Put out of service during WWII
      Renovated in 1965

2. Technical Data
   Type of Dam: Embankment and Dam Failure Drainage Area: 4.58 sq mi Acre
   Height: 28.5 ft Length: 640 ft
   Upstream Slope: ? Downstream Slope: Avg: 1.0(h): 1.5(v)
   Crest Width: Varies Freeboard at Spillway Crest: 2.9 ft
   10'-018'
Low Level Control: (Type and Size) 12" sluice gate at invert E1 2086.8
Valve Condition Good; operable
Main Emergency Spillway Type (Material) Parred stone Width 30
Side Slopes Stepped overflow
Height (Crest to Top) 2.9 ft
Exit Slope
Exit Length 20.8 ft Apron
Ponded Surface Area ___________ Acres
Capacity (Normal Level) ___________ Acre Feet
Capacity Emergency Spillway Level ___________ Acre Feet

3. Embankment Hand placed field stone and rock fill O/S section with O/S earth fill
a. Crest Raved crest - 6" thick conc. paving
(1) Vertical Alignment Not uniform apparent as result of settlement of stones. Longitudinal 2" swale in crest 120' right of main spillway.
(2) Horizontal Alignment Irregular - probably as constructed
(3) Longitudinal Surface Cracks Longitudinal cracks in pavement open as much as 3/4" apparently not recent
(4) Transverse Surface Cracks Some small transverse cracks
(5) General Condition of Surface General condition of surface paving varies from good to poor, especially where cracks occur.
(6) Miscellaneous

________________________
________________________
________________________
________________________
(2) Sloughing, Subsidence, or Depressions; Abnormal Bulges or Non-Uniformity
None visible except for a few local areas where loosely dumped stones were overturned or moved as a result of overtopping

(3) Surface Cracks on Face of Slope Not applicable

(4) Surface Cracks or Evidence of Heaving at Embankment Toe
None visible

(5) Wet of Saturated Areas or Other Evidence of Seepage on Face of Slope; Evidence of "Piping" or "Boils"
None visible

(6) Fill Contact with Outlet Structure generally good condition except near right end of Main Spillway where very small pocketed as a result of overtopping

(7) Condition of Grass Slope Protection Not applicable

d. Abutments

(1) Erosion of Contact of Embankment with Abutment from Surface Water Runoff, Upstream or Downstream
None visible

(2) Springs or Indications of Seepage Along Contact of Embankment with the Abutments
None visible
b. Upstream Slope Earth fill which was placed
against stone dam.

(1) Undesirable Growth or Debris Brush and high
grass

(2) Sloughing, Subsidence, or Depressions None visible
except for some erosion near
main spillway

(3) Slope Protection None

(a) Condition of Riprap — Not applicable

(b) Durability of Individual Stones — Not applicable

(c) Adequacy of Slope Protection Against Waves and Runoff
Slopes apparently not affected by waves,
and are in relatively good condition

(d) Gradation of Slope Protection – Localized Areas of Fine Material
Not applicable

(4) Surface Cracks Not applicable

c. Downstream Slope Hand placed stone, lower part is
rock fill.

(1) Undesirable Growth or Debris

Trees and brush growing from
rock fill section
(7) Stability of Tailrace Channel Sideslopes *adequate*

(8) Condition of Tailrace Channel Riprap, Channel is lined with stone, apparently adequate

(9) Adequacy of Slope Protection Against Waves, Currents and Surface Runoff

(10) Miscellaneous

f. Drainage System *None*

(11) Condition of Relief Wells, Drains and Appurtenances *None*

(2) Unusual Increase or Decrease in Discharge from Relief Wells *None*

4. Instrumentation

   (1) Monumentation/Surveys *None*
(3) Springs or Indications of Seepage in Areas a Short Distance Downstream of Embankment - Abutment Tie-in

None visible

---
e. Area Downstream of Embankment, Including Tailrace Channel

---

(1) Localized Subsidence, Depressions, Sinkholes, Etc.

None visible

---

(2) Evidence of "Piping" or "Boils"

None visible

---

(3) Unusual Presence of Lush Growth, such as Swamp Grass, etc.

None

---

(4) Unusual Muddy Water in Downstream Channel

None visible

---

(5) Sloughing or Erosion

None visible

---

(6) Surface Cracks or Evidence of Heaving Beyond Embankment, Toe

None visible

---
(2) Observation Wells None

(3) Weirs None

(4) Piezometers None

(Other)

5. Reservoir

a. Slopes Flat slopes in reservoir are apparently stable; no signs of sloughing or soil distress.
b. Sedimentation  Not apparent

6. Spillways  Three spillways: Main, Auxiliary and Emergency (Swale).
   a. Principal Spillway: Inlet Condition ____________________________
      Pipe Condition ____________________________
      General Remarks (include information such as recently repaired, potential for debris accumulation, special items of note, etc.)
      Paraged Fieldstone stepped spillway with
      Paraged Fieldstone training walls. Original wall surfacing not visible; 1965 resurfacing in good condition. Erosion of apron
   b. Auxiliary Spillway: General Condition 49 ft wide; crest 0.5 ft lower than Main Spillway. Paraged Fieldstone (original) 12' long sill slightly "gee"
      Tree Growth ____________________________
      Erosion  Erosion under toe of aux. spillway - 2 ft deep
      Other Observations  Some seepage
      not under auxiliary spillway - not visible - hard.
8. Downstream Channel

a. Condition (obstructions, debris, etc.) Narrow rock line; main channel, lined with trees

b. Slopes Relatively flat near dam

c. Approximate No. Homes and Population General structures near E. Hewitt, and road bridge

d. General Colgate Lake (formerly dam) is located 0.3 mi D/S of Dam. Colgate Dam is located 0.6 mi D/S of Camp Harrison Dam. Colgate Lake dam had no repairs, and lake was drawn down at time of inspection. Reservoir concrete dams Mar 1973

TEAM CAPTAIN
STRUCTURAL INSPECTION CHECKLIST
PHASE I DAM INSPECTION

1. Concrete Surfaces
   Concrete surfaces main spillway generally in good condition.

2. Structural Cracking
   None visible except for a few minor hairline cracks - apparently not related to structural distress.

3. Movement - Horizontal and Vertical Alignment
   "Bulging" or "curved" appearance of main spillway, rectifying wall. Concrete surface is not cracked.

4. Junctions with Abutments or Embankments
   Generally good except for some erosion at left training wall. Apparently result of over-topping.

5. Drains - Foundation, Joint, Face
   None

6. Water Passages, Conduits, Sluices
   No severe erosion near conduits.

7. Seepage or Leakage
   See above.

8. Monolith Joints - Construction Joints
   Not applicable.

9. Foundation
   Reportedly founded in glacial till (Hampton Clay).
10. Abutments

11. Control Gates Two gates: A 12" gate valve at
    invert El 2072.3; a 12" sluice gate at El
    2076.8.

12. Approach and Outlet Channels 20.8 fl long apron
    originally parged and covered w/ flagstones.
    Flagstones erected. Some surface erosion.

13. Stilling Basin Concrete

14. Intake Structure

15. Settlement

16. Stability
   a. Overturning
   b. Sliding
   c. Seismic

17. Instrumentation
   a. Alignment NO
   b. Uplift
   c. Seismic

18. Miscellaneous
HYDROLOGIC DATA AND COMPUTATIONS

APPENDIX E
**TAMS**

**Job No.** 1997-15  
**Project** CAMP HARRIS MINI DAM  
**Subject** UNIT HYDROGRAPH COMPUTATIONS  
**Date** 3/19/79  
**By** WR  
**Ch'k. by**

---

**THIS DRAINAGE BASIN LOCATED IN SOUTHERN N.Y.**

**WITH A PROBABLE MAXIMUM RAINFALL FOR 6 HRS. OF 23.51 IN.**

**DRAINAGE BASIN:**

<table>
<thead>
<tr>
<th>AREA</th>
<th>AREA (mi²)</th>
<th>L (mi)</th>
<th>AH (ft)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1.096</td>
<td>2.045</td>
<td>1755</td>
</tr>
<tr>
<td>2</td>
<td>2.733</td>
<td>2.331</td>
<td>1303</td>
</tr>
<tr>
<td>3</td>
<td>0.372</td>
<td>0.948</td>
<td>1003</td>
</tr>
<tr>
<td>4</td>
<td>0.301</td>
<td>0.834</td>
<td>933</td>
</tr>
<tr>
<td>LAKE</td>
<td>0.083</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

1" = 2000' = 0.379 mi.

**AREA # 1 UNIT HYDROGRAPH**

\[
T_c = \left( \frac{1.923}{H} \right)^3 \frac{0.385}{A} \\
L = 2.045 \text{ mi.} \\
H = 1755' \\
A = 1.096 \text{ mi}^2 \\
T_c = 0.334 \text{ hrs.} = 20 \text{ min.} \\
0.6T_c = 0.20 \text{ - } L_t
\]

Use \( t = 5.0 \text{ min.} \) or \( 0.0833 \text{ hrs} \)

\[
T_p = 0.5 + 0.6T_c = 0.242 \text{ hrs.} = 15 \text{ min.} \\
Q_p = \frac{4844.4}{T_p} = 2190 \\
T_b = 2.67T_p = 0.65 \text{ hrs.} = 39
\]
AREA #2

\[ T_c = \left[ \frac{11.2(2.33)}{1303} \right] \frac{0.385}{1303} \]

\[ T_c = 0.436 \text{ hrs.} = 26\text{min} \]

\[ C = 0.6T_c = 0.26 \]

Use \( D = 0.0833 \) hrs. = 5 min.

\[ T_p = 0.5T_c + 0.6L = 0.302 \]

\[ Q_p = \frac{184A}{T_p} = \frac{184(2.733)}{0.302} = 4380 \text{ cfs} \]

\[ T_o = 2.67(T_p) = 0.806 \text{ hrs.} = 48\text{min} \]

AREA #3

\[ T_c = \left[ \frac{11.9(0.248)}{1003} \right] \frac{0.385}{1003} \]

\[ T_c = 0.11 \text{ hrs.} = 6.6\text{min} \]

\[ C = 0.6T_c = 0.6 \]

Use \( D = 0.0833 \) hrs. or 5 min.

\[ T_p = 0.5T_c + 0.6L = 0.442 \]

\[ Q_p = \frac{184A}{T_p} = \frac{184(0.372)}{0.442} = 1260 \text{ cfs} \]

\[ T_o = 2.67(T_p) = 0.38 \text{ hrs.} \]

---

THIS PAGE IS BEAST QUALITY PRACTICABLE
FROM COPY FURNISHED TO DOG
TAMS

Job No. 1487-15

Project CAMP HARRIMAN DAM

Subject UNIT HYDROGRAPH COMPUTATION

AND HYDROGRAPHS

Date 9/19/78

By [Signature]

Ch’k. by [Signature]

\[ A = \frac{[112(0.824)]^3}{933} \]
\[ T_c = 0.157 \text{ hrs} = 9 \text{ min.} \]
\[ L = 0.834 \text{ mi} \]
\[ H = 933' \]
\[ A = 0.361 \text{ mi}^2 \]

\[ Q_p = \frac{984A}{T_c} = 1120 \text{ cfs} \]

\[ T_o = 2.67 \text{ (ft)} \]

\[ T_o = 0.35 \text{ hr} = 21 \text{ min.} \]
**TAMS**

**Job No.** 1487-15  
**Project** Inspection Camp Harriman Dam  
**Subject**  
---

**Sheet 4 of**  
**Date** Sep 00  
**By**  
**Ch’k. by**  

---

**Main Spillway**  
Length: 30.0'  
Width: 11 feet  
Max head: 30'  

**Auxiliary**  
Length: 49.0'  
Width: 12.4'  
Max head: 24'  

**Closure spillway**  
Act as broad crest weir.

\[ Q = CLH^{1/3} \]

<table>
<thead>
<tr>
<th>Elev</th>
<th>Main Spillway</th>
<th>Q</th>
<th></th>
<th>Auxilary Spillway</th>
<th>C</th>
<th>Q</th>
</tr>
</thead>
<tbody>
<tr>
<td>2097</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>262</td>
<td>32</td>
<td>0</td>
</tr>
<tr>
<td>2097.6</td>
<td>0.6</td>
<td>2.70</td>
<td>38</td>
<td>0.4</td>
<td>262</td>
<td>32</td>
</tr>
<tr>
<td>2098</td>
<td>1.0</td>
<td>2.68</td>
<td>80</td>
<td>1.4</td>
<td>266</td>
<td>116</td>
</tr>
<tr>
<td>2099</td>
<td>2.0</td>
<td>2.60</td>
<td>224</td>
<td>2.4</td>
<td>264</td>
<td>481</td>
</tr>
<tr>
<td>2100</td>
<td>3.0</td>
<td>2.00</td>
<td>412</td>
<td>3.4</td>
<td>240</td>
<td>811</td>
</tr>
<tr>
<td>2101</td>
<td>4.0</td>
<td>2.40</td>
<td>634</td>
<td>4.4</td>
<td>200</td>
<td>1124</td>
</tr>
<tr>
<td>2102</td>
<td>5.0</td>
<td>2.60</td>
<td>885</td>
<td>uu</td>
<td>200</td>
<td>uu</td>
</tr>
</tbody>
</table>

**Flow over Dam**

**Leaky dam area**  
700 m x 30 m = 51,000 m²  
Average width of 30 m  

<table>
<thead>
<tr>
<th>Elev</th>
<th>Flow</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>2100</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2101</td>
<td>1</td>
<td></td>
<td></td>
<td>1500</td>
</tr>
<tr>
<td>2102</td>
<td>2</td>
<td></td>
<td></td>
<td>4187</td>
</tr>
</tbody>
</table>

---

*This page is best quality practice.*

*From copy furnished to DQ.*
**TAMS**

**Job No.** 1487-15  
**Project** Inspection Camp Harriman Dam  
**Subject** Flow Area Emergency Spillway

---

![Diagram](image)

### Formulas

\[
A = (b + 15d) \frac{d}{2}  \\
\rho = 6 + 2d \sqrt{3.25}  \\
\eta = \frac{A}{\rho}  \\
S_k = 0.1414  \\
V = \frac{1.486 \eta^{0.5} S_k^2}{n}  \\
Q = AV
\]

<table>
<thead>
<tr>
<th>E1</th>
<th>d</th>
<th>A</th>
<th>( \rho )</th>
<th>( \eta )</th>
<th>( n^\frac{1}{4} )</th>
<th>V</th>
<th>( \frac{n}{A_{x V}} )</th>
<th>Q</th>
</tr>
</thead>
<tbody>
<tr>
<td>2097.1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>0.65</td>
<td>3.9</td>
<td>210</td>
<td>0</td>
</tr>
<tr>
<td>2097.6</td>
<td>0.5</td>
<td>58.75</td>
<td>101.8</td>
<td>0.53</td>
<td>0.65</td>
<td>3.9</td>
<td>210</td>
<td>0</td>
</tr>
<tr>
<td>2098</td>
<td>1</td>
<td>102.15</td>
<td>103.2</td>
<td>0.99</td>
<td>0.99</td>
<td>5.9</td>
<td>67</td>
<td>359</td>
</tr>
<tr>
<td>2099</td>
<td>1.9</td>
<td>246.15</td>
<td>106.9</td>
<td>2.28</td>
<td>1.73</td>
<td>10.4</td>
<td>553</td>
<td>0</td>
</tr>
<tr>
<td>2100</td>
<td>2.9</td>
<td>416.15</td>
<td>110.5</td>
<td>3.77</td>
<td>2.42</td>
<td>14.5</td>
<td>130</td>
<td>11500</td>
</tr>
<tr>
<td>2101</td>
<td>3.9</td>
<td>618.15</td>
<td>114.8</td>
<td>5.42</td>
<td>3.09</td>
<td>18.6</td>
<td>11500</td>
<td>0</td>
</tr>
<tr>
<td>2102</td>
<td>4.9</td>
<td>850.15</td>
<td>117.6</td>
<td>7.23</td>
<td>3.74</td>
<td>22.5</td>
<td>130</td>
<td>11500</td>
</tr>
</tbody>
</table>

---

*This page is best quality practicable from copy furnished to DDC.*
TAMS

Job No. 1481-15
Project HARRIMAN CUMP DAM
Subject

Sheet 6 of ____________
Date 9/10/78
By ____________
Ch’k. by ____________

$0.005 = 1 m^2

2100' Contour = 0.083 m^2

(assumed lake contour) = 53.12 Acres

2180' Contour = 2.02

1.01 = 0.146 m^2 = 93.44 Acres

Length of lake

1" = 2000'

1" = 0.379 mi

1.15" = 0.436 mi.

Perimeter of lake

3.27" = 1.24 mi.

@ F.E. 2007 = 46.5 Acres

This page is the best quality practicable
From copy furnished to D, R, Q
### Elevation vs Storage Computations

<table>
<thead>
<tr>
<th>Elev (ft)</th>
<th>Area (Acre)</th>
<th>Volume (McF)</th>
<th>Surcharge (A.M.)</th>
<th>Storage (A.M.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2097'</td>
<td>4.15</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>2098'</td>
<td>49.5</td>
<td>48.5</td>
<td>48.5</td>
<td></td>
</tr>
<tr>
<td>2100'</td>
<td>53.1</td>
<td>102.6</td>
<td>151.1</td>
<td></td>
</tr>
<tr>
<td>2102'</td>
<td>57.0</td>
<td>111.1</td>
<td>262.2</td>
<td></td>
</tr>
<tr>
<td>2104'</td>
<td>61.0</td>
<td>118.0</td>
<td>380.2</td>
<td></td>
</tr>
<tr>
<td>2106'</td>
<td>65.0</td>
<td>126.0</td>
<td>506.2</td>
<td></td>
</tr>
<tr>
<td>2108'</td>
<td>69.5</td>
<td>134.5</td>
<td>640.7</td>
<td></td>
</tr>
<tr>
<td>2110'</td>
<td>73.5</td>
<td>143.0</td>
<td>783.7</td>
<td></td>
</tr>
<tr>
<td>2112'</td>
<td>77.5</td>
<td>151.0</td>
<td>934.7</td>
<td></td>
</tr>
<tr>
<td>2114'</td>
<td>82.0</td>
<td>159.5</td>
<td>1094.2</td>
<td></td>
</tr>
<tr>
<td>2116'</td>
<td>85.5</td>
<td>167.5</td>
<td>1261.7</td>
<td></td>
</tr>
<tr>
<td>2118'</td>
<td>89.5</td>
<td>175.0</td>
<td>1436.7</td>
<td></td>
</tr>
<tr>
<td>2120'</td>
<td>93.4</td>
<td>182.9</td>
<td>1619.6</td>
<td></td>
</tr>
</tbody>
</table>
Job No. 487-15
Project HARRIMAN CAMP DAM
Subject

Sheet 2 of __
Date 9/19/78
By __
Ch’k. by __

EL. vs. STORAGE

---

ELEVATION (FT)  
SOWAGE STORAGE (CFT)
Hydrologic Soil Group C/D  AMC II
Forest - Hydrologic Condition class Good  CN 65
CN for AMC III  83.

\[
S = \frac{1000}{CN} - 10 = 2.05
\]

\[
Q = \frac{(P - 0.25)^2}{P + 0.85} = \frac{(P - 0.41)^2}{P + 1.64}
\]

Location of Dam:  N 42° 14'  W 74° 10'

Probable Maximum 6 Hour Rainfall for 10 square miles
23.5 inches

Reduced 20% = 18.8 inches

EC 1110 - 2-27 Aug 66

This page is best quality practicable from copy furnished to DDQ
### TAMS

**Job No.** 1487-15  
**Project** Inspection Camp Harriman Dam  
**Date**  
**By**  
**Ch'k. by**  

---

<table>
<thead>
<tr>
<th>El.</th>
<th>( Q_1 )</th>
<th>( Q_2 )</th>
<th>( Q_3 )</th>
<th>( Q_4 )</th>
<th><strong>Total</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>2097.1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>2097.6</td>
<td>38</td>
<td>0</td>
<td>210</td>
<td>248</td>
<td></td>
</tr>
<tr>
<td>2098</td>
<td>80</td>
<td>32</td>
<td>607</td>
<td>719</td>
<td></td>
</tr>
<tr>
<td>2099</td>
<td>224</td>
<td>210</td>
<td>2539</td>
<td>2779</td>
<td></td>
</tr>
<tr>
<td>2100</td>
<td>412</td>
<td>481</td>
<td>6030</td>
<td>6923</td>
<td></td>
</tr>
<tr>
<td>2101</td>
<td>634</td>
<td>871</td>
<td>11500</td>
<td>14,509</td>
<td></td>
</tr>
<tr>
<td>2102</td>
<td>885</td>
<td>1194</td>
<td>19100</td>
<td>25,339</td>
<td></td>
</tr>
</tbody>
</table>

- \( Q_1 \): Main Spillway
- \( Q_2 \): Auxiliary Spillway
- \( Q_3 \): Emergency Spillway
- \( Q_4 \): Flow over dam

---

*This page is best quality practicable from copy furnished to DoG*
TAMS

Job No. 1987-15

Project CHAMP MACKMAN LAKE DAM

Subject DETERMINE DISCHARGE

---

TWO DISCHARGE CONDUITS @ DAM

(CREST 2097.1

1st PIPE @ 2086.8 which is M.3' below crest ΔH = 10.3'

2nd PIPE @ 2072.3  "  24.8'  "  ΔH = 24.8'

Assume uniform slopes of .001

Manning's

Q = 1.49 AR^4/3

1st PIPE

Q = 1.49(1.785)(3.97)(.479)

.024

Q = 9.3 c.f.s.

2nd PIPE

Q = 1.49(1.785)(3.97)(.643)

.024

Q = 12.4 c.f.s.

---

Check Figure 3-10 p. 567 SMALL DAMS...

\[ H_T = \sqrt{\frac{2.5204 (11 K_e)}{D^2} + \frac{66.18}{D^{10/3}}} \left( \frac{Q}{10} \right)^2 \]

K_e = 1.1 Bohn

n = .024 Bohn

1st DAM 12.8 H. = H_T

2nd DAM 29.0 H. = H_T

---

THIS PAGE IS BEST QUALITY PRACTICABLE

FROM COPY FURNISHED TO DOG
### Table: Water Level Data

<table>
<thead>
<tr>
<th>Time (h)</th>
<th>Elevation</th>
<th>Storage</th>
<th>Outflow</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.00</td>
<td>99.46</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>1.01</td>
<td>99.55</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>2.02</td>
<td>99.64</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>3.03</td>
<td>99.73</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>4.04</td>
<td>99.82</td>
<td>0.00</td>
<td>0.00</td>
</tr>
</tbody>
</table>

**Notes:**
- This page is best quality from copy published to end.
- The data represents water levels and related measurements over time.
- Storage and outflow values remain constant at 0.00 for the duration displayed.
- The table format is designed for easy reading and analysis of water management data.
<table>
<thead>
<tr>
<th>TIME (HRS)</th>
<th>INFLOW (CFS)</th>
<th>OUTFLOW (CFS)</th>
<th>STORAGE (ACFT)</th>
<th>ELEVATION (FT.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>6.26</td>
<td>1219.98</td>
<td>2634.32</td>
<td>92.1456</td>
<td>98.84</td>
</tr>
<tr>
<td>6.30</td>
<td>972.63</td>
<td>2457.02</td>
<td>87.1938</td>
<td>98.75</td>
</tr>
<tr>
<td>6.34</td>
<td>733.87</td>
<td>2196.43</td>
<td>82.1671</td>
<td>98.68</td>
</tr>
<tr>
<td>6.38</td>
<td>555.09</td>
<td>1977.51</td>
<td>77.1785</td>
<td>98.54</td>
</tr>
<tr>
<td>6.42</td>
<td>386.42</td>
<td>1764.62</td>
<td>72.3273</td>
<td>98.44</td>
</tr>
<tr>
<td>6.46</td>
<td>266.22</td>
<td>1561.41</td>
<td>67.6965</td>
<td>98.37</td>
</tr>
<tr>
<td>6.51</td>
<td>160.93</td>
<td>1370.97</td>
<td>63.3570</td>
<td>98.28</td>
</tr>
<tr>
<td>6.55</td>
<td>97.77</td>
<td>1195.55</td>
<td>59.3594</td>
<td>98.21</td>
</tr>
</tbody>
</table>

MAX. VALUES 20637.55 20531.33 101.55
MIN. VALUES 0.00 0.00 97.10
STABILITY ANALYSIS

APPENDIX F
TAMS

Job No. 1487-15
Project Phase I Inspection - NYS Dams
Subject Camp Harriman Dam
Cross Section of Main Spillway

Sheet 2 of
Date 9-26-78
By
Ch’k. by

---

Aug 10, 1976
Crest El 2097
Top of Dam El 2000

= 150 lbf/ft

Glacial till (hard pan)
<table>
<thead>
<tr>
<th>V</th>
<th>H</th>
<th>Arm</th>
<th>M &amp; Xr</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spillway</td>
<td>97.39</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- \( \frac{1}{2}(0.0625)(26.5)^2 = 21.95 \) \( \text{kips} \)
- \( \frac{1}{2}(6)(4)(26.5)^2 = 8.43 \) \( \text{kips} \)
- \( 0.0625(26.5)h = 1.66h \) \( \text{kips} \)
- \( 2.0625(h^2) = 0.03125h^2 \) \( \text{kips} \)

\[ R_V = \frac{107.13 - 31.88 - 1.58h + 0.03125h^2}{R_H} \]

\( X_R = \frac{2257.63 - 813.82 - 37.07h + 0.03125h^2}{R_V} \)

- Assumption A
  - \( 97.39 \)
  - \( 75.25 \)
- Assumption B
  - \( 73.25 \)
  - \( 69.10 \)

\( X_R = \) location of resultant reaction, measured from toe
**TAMS**

Job No. 1487-15  
Project: Camp Harriman Dam - Main Spillway  
Subject:  

**Date:** 9-26-78  
By:  
Ch’k. by:  

---

**EVALUATION OF SHEAR STRESSES**

<table>
<thead>
<tr>
<th>h</th>
<th>Avg Stress Ksf</th>
<th>Assumption H/V</th>
<th>Assumption “A”</th>
<th>Assumption “B”</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0.79</td>
<td>0.280</td>
<td>0.403</td>
<td></td>
</tr>
<tr>
<td>1.5</td>
<td></td>
<td>0.312</td>
<td>0.448</td>
<td></td>
</tr>
<tr>
<td>3.0</td>
<td>Varies</td>
<td>0.340</td>
<td>0.491</td>
<td></td>
</tr>
<tr>
<td>4.5</td>
<td></td>
<td>0.367</td>
<td>0.534</td>
<td></td>
</tr>
<tr>
<td>6.0</td>
<td></td>
<td>0.392</td>
<td>0.576</td>
<td></td>
</tr>
<tr>
<td>10.0</td>
<td>1.189</td>
<td>0.453</td>
<td>0.679</td>
<td></td>
</tr>
</tbody>
</table>
TYPICAL SECTION THROUGH DAM

Approx. Scale 1" = 10'

CAMP HARRIMAN DAM

TIPPETT-ABBETT-McCARTHY-STRAWTON
ENGINEERS AND ARCHITECTS
NEW YORK

Phase 1 Inspection

Typical Section Through Dam

By: ARD    Date: 9-78

Right of Main Spillway

Left of Main Spillway

Hand placed Fieldstone

Rock Fill

Earth Fill

6" concrete pavement (unreinforced)

10" concrete wall