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<th>1. REPORT NUMBER</th>
<th>2. GOVT ACCESSION NO</th>
<th>3. RECIPIENT'S CATALOG NUMBER</th>
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<td>CT 00495</td>
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**4. TITLE (and Subtitle)**
Cold Spring Reservoir Dam

**NATIONAL PROGRAM FOR INSPECTION OF NON-FEDERAL DAMS**

**5. TYPE OF REPORT & PERIOD COVERED**
INSPECTION REPORT

**6. PERFORMING ORG. REPORT NUMBER**

**7. AUTHOR(s)**
U.S. ARMY CORPS OF ENGINEERS
NEW ENGLAND DIVISION

**9. PERFORMING ORGANIZATION NAME AND ADDRESS**

**11. CONTROLLING OFFICE NAME AND ADDRESS**
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NEW ENGLAND DIVISION, WEDEN
424 TRAPELO ROAD, WALTHAM, MA. 02254

**12. REPORT DATE**
May 1981

**13. NUMBER OF PAGES**
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**14. MONITORING AGENCY NAME & ADDRESS (if different from Controlling Office)**

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**18. SUPPLEMENTARY NOTES**
Cover program reads: Phase I Inspection Report, National Dam Inspection Program; however, the official title of the program is: National Program for Inspection of Non-Federal Dams; use cover date for date of report.

**19. KEY WORDS (Continue on reverse side if necessary and identify by block number)**
DAMS, INSPECTION, DAM SAFETY,
Connecticut River Basin
Bloomfield, Connecticut

**20. ABSTRACT (Continue on reverse side if necessary and identify by block number)**
Cold Spring Reservoir Dam consists of an earth embankment, approximately 1,040 ft. long, with a top width of 12 ft. and a maximum height of 20 ft. Based on visual inspection and review of available plans and reports, Cold Spring Reservoir Dam is judged to be in fair condition. The dam is classified as 'Intermediate' in size with 'High' hazard potential. A test flood equal to the PMF was selected.
Honorable William A. O'Neill
Governor of the State of Connecticut
State Capitol
Hartford, Connecticut 06115

Dear Governor O'Neill:

Inclosed is a copy of the Blue Hills Dam (CT-00496) Phase I Inspection Report, prepared under the National Program for Inspection of Non-Federal Dams. This report is based upon a visual inspection, a review of the past performance and a brief hydrological study of the dam. I approve the report and support the findings and recommendations described in Section 7 and ask that you keep me informed of the actions taken to implement them. This follow-up action is vitally important part.

Copies of this report have been forwarded to the Department of Environmental Protection, and to the owner, State of Connecticut, Department of Environmental Protection. Copies will be available to the public in thirty days.

I wish to thank you and the Department of Environmental Protection for your cooperation in this program.

Sincerely,

C. E. Edgar, III
Colonel, Corps of Engineers
Commander and Division Engineer
COLD SPRING RESERVOIR DAM
CT 00495

CONNECTICUT RIVER BASIN
BLOOMFIELD, CONNECTICUT

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

IDENTIFICATION NO: CT-00495

NAME OF DAM: Cold Spring Reservoir Dam

TOWN: Bloomfield

COUNTY AND STATE: Hartford County, Connecticut

STREAM: Northerly Branch of Tumbledown Brook

DATE OF INSPECTION: December 16, 1980

BRIEF ASSESSMENT

Cold Spring Reservoir Dam consists of an earth embankment, approximately 1,040 ft. long, with a top width of 12 ft. and a maximum height of 20 ft. In addition, there is a 140 ft. long dike, 2.5 ft. high, with an 8 ft. top width.

The two outlets for the dam are the principal spillway and emergency spillway. The principal spillway is a drop inlet structure consisting of a two stage reinforced concrete intake riser discharging through a 36" reinforced concrete pipe under the dam embankment. The emergency spillway is a trapezoidal grassed channel, 125 ft. wide at the control section with its crest 4.5 ft. below the top of the dam.

Based on visual inspection and review of available plans and reports, Cold Spring Reservoir Dam is judged to be in fair condition. Some features found existing that could affect the stability of dam are erosion of the dam embankment and the potential foundation and embankment stability problem resulting from the existing soil conditions.

The dam is a flood control project and, therefore, the reservoir is dry except during periods of heavy rainfall. With the reservoir dry, the inspection could not reveal seepage conditions.
It is recommended that the owner arrange for a qualified registered engineer to do the following within a one year of receipt of this report:

Inspect the dam during the time that water is impounded in the reservoir with particular attention to locating any possible seepage;

Reappraise the stability of the dam embankment and foundation using the "As-Built" configuration and giving consideration to existing seepage and soil characteristics.

It is recommended that the owner repair the wheel ruts, low spots, and minor erosion gullies on the crest and slopes of the dam and dike embankments within one year of this report. Other remedial measures contained in Section 7 should also be carried out within a period of one year.

Based on the Corps of Engineers' Recommended Guidelines for Safety Inspection of Dams, the dam is classified as 'Intermediate' in size with 'High' hazard potential. A test flood equal to the probable maximum flood (PMF) was selected, in accordance with the Corps of Engineers' Guidelines. The calculated test flood inflow of 2,620 cfs results in a routed outflow of 2,140 cfs. The spillway capacity is 3,720 cfs with the water level at the top of the dam. The spillway is capable of passing 174% of the routed test flood outflow without overtopping the dam. The storage capacity to the top of the dam is 1,760 ac-ft. and up to the test flood level is 1,530 ac-ft. As the dam is a 'High' hazard potential and a potential breach may result in excessive economic loss and more than a few lives may be endangered, an emergency operation plan
should be prepared and implemented if and when necessary. An operation and maintenance manual to take care of normal routine procedures should be prepared.

GOODKIND & O'DEA, INC.
AND
SINGHAL ASSOCIATES
(J.V.)

Ramesh P. Singhal, PH.D., P.E.
(Singhal Associates)

Lawrence J. Buckley, P.E.
(Goodkind & O'Dea, Inc.)
This Phase I Inspection Report on Cold Spring Reservoir Dam (CT-00495) has been reviewed by the undersigned Review Board members. In our opinion, the reported findings, conclusions, and recommendations are consistent with the Recommended Guidelines for Safety Inspection of Dams, and with good engineering judgement and practice, and is hereby submitted for approval.

CARNEY M. TERZIAN
CARNEY M. TERZIAN, MEMBER
Design Branch
Engineering Division

JOSEPH W. FINEGAN, JR., MEMBER
Water Control Branch
Engineering Division

ARAMAST MAHTESIAN, CHAIRMAN
Geotechnical Engineering Branch
Engineering Division

APPROVAL RECOMMENDED:

JOE B. FRYAR
Chief, Engineering Division
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 continued care and inspection can there be any chance that unsafe conditions be detected.

Phase I Inspections are not intended to provide detailed hydrologic and hydraulic analyses. In accordance with the established Guidelines, the Spillway Test Flood is based on the estimated "Probable Maximum Flood" for the region (greatest reasonably possible storm runoff), or fractions thereof. Because of the magnitude and rarity of such a storm event, a finding that a spillway will not pass the test flood should not be interpreted as necessarily posing a highly inadequate condition. The test flood provides a measure of relative spillway capacity and serves as an aide in determining the need for more detailed hydrologic and hydraulic studies, considering the size of the dam, its general condition and the downstream damage potential.

The Phase I Investigation does not include an assessment of the need for fences, gates, no-trespassing signs, repairs to existing fences and railings and other items which may be needed to minimize trespass and provide greater security for the facility and safety of the public. An evaluation of the project for compliance with OSHA rules and regulations is also excluded.
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- Hazard Classification
- Ownership
- Operator
- Purpose of Dam
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NOTE:
OVERVIEW PHOTO TAKEN DECEMBER 20, 1990.

COLD SPRING RESERVOIR DAM
BLOOMFIELD, CONNECTICUT

OVERVIEW PHOTO OF DAM

GOODKIND & O'DEA INC.

SINGHAL ASSOCIATES LTD.

ENGINEERS

U.S. ARMY ENGINEER DIV. NEW ENGLAND CORPS OF ENGINEERS

WALTHAM, MASS.

NATIONAL PROGRAM OF INSPECTION OF NON-FED. DAMS
1.1 General

a. Authority

Public Law 92-367, August 8, 1972, authorized the Secretary of the Army, through the Corps of Engineers, to initiate a National Program of Dam Inspection throughout the United States. The New England Division of the Corps of Engineers has been assigned the responsibility of supervising the inspection of dams within the New England Region. Goodkind & O'Dea Inc., Hamden, Conn. and Singhal Associates, Orange, Connecticut (Joint Venture) have been retained by the New England Division to inspect and report on selected dams in the State of Connecticut. Authorization and notice to proceed were issued to Goodkind & O'Dea Inc. and Singhal Associates (J.V.) under a letter of December 9, 1980 from Colonel William E. Hodgson, Jr., Corps of Engineers. Contract No. DACW 33-81-C-0022 dated December 9, 1980 has been assigned by the Corps of Engineers for this work.

b. Purpose of Inspection

The purposes of the program are to:

1. Perform technical inspection and evaluation of non-federal dams to identify conditions requiring correction in a timely manner by non-federal interest.

2. Encourage and prepare the States to quickly initiate effective dam inspection programs for non-federal dams.
3. To update, verify and complete the National Inventory of Dams.

1.2 Description of Project

a. Location

The Cold Spring Reservoir Dam is situated on the north-
erly branch of Tumbledown Brook, which flows into the North
Branch of the Park River, approximately 5 miles downstream
from the dam. The location is approximately 1.7 miles south-
west of Bloomfield Town Hall and 0.3 miles north of the inter-
section of Burr Road and Simsbury Road (State Route 185). The
geographic location of the site may be found on the Avon Quad-
rangle Map, with coordinates of latitude N41° 49.2' and longi-
tude W72° 46'.

b. Description of Dam and Appurtenant Structures

Cold Spring Reservoir is impounded by a dam and a small
dike. The dam consists of a grass covered earth embankment
approximately 1,040 ft. long with a top width of 12 ft. and
upstream and downstream slopes varying from 3 horizontal to 1
vertical to approximately 4 horizontal to 1 vertical. The top
of the dam is at an elevation of 210.5' Metropolitan District
Commission Datum (MDC Datum) - (2.08' higher than NGVD), with
a maximum height of 20 ft. A gravel seepage underdrain system
which includes a 12" perforated pipe with two outlets is situ-
ated on the downstream slope of the dam embankment. In addition,
there is a 10 ft. wide, 2 ft. thick rock fill drainage system
under two sections of the downstream dam embankment as noted
on the general dam plan in Appendix B. Rock fill drain outlets,
10 ft. wide and 2 ft. thick and extending 5 ft. beyond the toe of dam, are located at 50 ft. intervals.

Prior to the dam construction, sub-soil investigations had revealed the existence of peat and organic materials up to depths of as much as 35 ft. below existing ground. The unsuitable foundation material was removed and replaced with granular fill. The excavated peat and organic material was placed on the upstream and downstream slopes and toes of the dam embankment as shown on Sheet B-2 in Appendix B. An impermeable blanket, approximately 3 ft. thick, extends from the impermeable dam core to an upstream distance of at least 12 ft. beyond the granular fill line.

The dike, which is shown on the Location Plan (Sheet 2), is a grass covered, earth embankment approximately 140 ft. long with a top width of 8 ft. and upstream and downstream slopes of 2 horizontal to 1 vertical. The top of the dike is at an elevation of 210.5' MDC Datum with a maximum height of only 2.5 ft.

The principal spillway is a drop inlet structure, consisting of a two stage reinforced concrete intake riser discharging through a 36" reinforced concrete pipe running under the dam embankment. The 129 ft. long pipe discharges into the downstream channel which is rip-rapped a distance of 50 ft. beyond the outlet. The low level inlet of the intake riser is at elevation of 192.5' MDC Datum whereas the high level overflow weirs are at an elevation of 196.0' MDC Datum. Trash racks are located at both the high level and low level inlets.
Situated at the low level inlet of the intake riser is a 24" diameter steel sliding sluice gate. The gate mechanism is manual and consists of a gate stem and handle.

The emergency spillway at the dam is a 125 ft. wide grassed trapezoidal channel. At the control section of the spillway the crest elevation is 206.0' MDC Datum, which is 4.5' below the dam crest elevation.

C. **Size Classification: 'Intermediate'**

According to the Corps of Engineers' Recommended Guidelines for Safety Inspection of Dams, a dam is classified 'Intermediate' if either its height lies between 40 ft. and 100 ft. or the storage is between 1,000 ac. ft. and 50,000 ac. ft. The Cold Spring Dam has a maximum height of only 20 ft. but the maximum storage to the top of dam is 1,760 ac. ft. As such, it is classified as 'Intermediate' in size.

d. **Hazard Classification: "High"**

Based on the Corps of Engineers' Recommended Guidelines for Safety Inspection of Dams, the hazard classification for Cold Spring Reservoir Dam is 'High'. A dam failure analysis indicates that a breach of the dam would result in a downstream flood flow of 55,700 cfs causing an 18 ft. high wave of water to travel down in the brook and along its overbanks on both sides. Continuation of the valley flood routing shows that even at the 4th cross-section, 2,800 ft. down, the excessive flow and wave height are as high as 36,000 cfs and 11 ft. respectively above the bottom of the brook.

The depths of flow in the brook in the vicinity of 20 downstream houses considered (the last one being approximately 3,000
5 ft. from the dam) range as below:

<table>
<thead>
<tr>
<th></th>
<th>Pre-failure depth</th>
<th>Post-failure depth</th>
</tr>
</thead>
<tbody>
<tr>
<td>First 4 houses:</td>
<td>5.5 ft.</td>
<td>17.0 ft.</td>
</tr>
<tr>
<td>Next 3 houses:</td>
<td>2.5 ft.</td>
<td>13.0 ft.</td>
</tr>
<tr>
<td>Next 2 houses:</td>
<td>3.0 ft.</td>
<td>10.5 ft.</td>
</tr>
<tr>
<td>Next 11 houses:</td>
<td>4.0 ft.</td>
<td>11.0 ft.</td>
</tr>
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Four of these homes are subject to partial flooding in their yards, below the first floor elevation, under test flood condition. In case of a dam failure these houses, along with the other 16, will be flooded to a depth ranging from 1 ft. to 7 ft. above their first floor elevation.

The dam failure would result in flooding of a large number of houses, public buildings and several important roads including State Routes #185 and #218. There will be excessive economic loss and more than few lives may be lost.

e. Ownership

The Cold Spring Dam and the Reservoir are owned by:

The State of Connecticut
Department of Environmental Protection
State Office Building
165 Capitol Avenue
Hartford, Ct. 06115
Telephone: (203) 566-7245/7244

f. Operator

Mr. Victor Galgowski
Superintendent, Dam Maintenance
D.E.P. (Water Resources Unit)
165 Capitol Avenue
Hartford, Ct. 06115
Telephone: (203) 566-7245/7244
g. **Purpose of Dam**

The primary purpose of the dam and reservoir is for flood control. Originally the Cold Spring Dam reservoir area was also to be utilized for a wildlife preserve under the supervision of the State of Connecticut Department of Environmental Protection. The low level inlet of the principal spillway intake riser was built with a manually control sluice gate which could regulate the reservoir pool level. Depending on the season, the water level would be raised or lowered accordingly, to avail the needs of the wildlife. This plan was never actually implemented and, therefore, the sluice gate has always remained open.

h. **Design and Construction History**

The dam and appurtenant structures were designed in the year 1960 by Anderson-Nichols, Consulting Engineers, Boston/Hartford, under the direction of the U.S. Department of Agriculture, Soil Conservation Service. Due to field conditions, certain design changes were made of which the most significant extended the limits of lateral excavation on the downstream side of the dam. Trapped organic material was discovered under the uncompacted granular fill through soil borings taken during the time of construction. The partially built dam embankment, part of granular fill, and the trapped organic material was removed and the limits of downstream lateral excavation increased. Additional excavation of organic material resulted, which was replaced with the uncompacted granular fill prior to the completion of the dam.
construction in 1968. The other minor modifications are included in the "As-Built" drawings which are available from the Soil Conservation in Storrs, Connecticut as is the design report.

i. Normal Operational Procedures

Cold Spring Reservoir is normally dry with no permanent pool. The normal operation and maintenance is limited to cutting grass and brush from the slopes of the dam and cleaning the trash racks at the principal spillway intake riser.

1.3 Pertinent Data

a. Drainage Area

The drainage area consists of 1.94 square miles of gently sloping terrain. There are some steep slopes in the vicinity of Little Philip Mountain and Penwood State Park. Ground elevations range from a low of 190 feet to a high of 700 feet above MSL. Most of the area is open and inhabited with several town roads and State Route 178 and 185 passing through it.

b. Discharge at Damsite

There are two spillway facilities at the damsite. The principal spillway consists of a 129 ft. long reinforced concrete pipe under the dam embankment with a two stage reinforced intake riser on the upstream side and a rip-rapped channel on the downstream side. A sliding sluice gate is located at the low level inlet of the riser. The emergency spillway is a trapezoidal grassed channel 125 ft. wide at the control section and situated at the east end of the dam.
1. Outlet works (conduits) size: 1-36" RCP
   Low level inlet invert elevation: 192.5
   High level weir inlet elevation: 196.0
   Discharge capacity at test flood: 133.0 cfs
   Elevation: 209.0

2. Maximum known flood at damsite: N/A

3. Ungated spillway capacity at top of dam: 3,720 cfs
   Elevation: 210.5

4. Ungated spillway capacity at test flood elevation: 2,140 cfs
   Elevation: 209.0

5. Gated spillway capacity at normal pool elevation: N/A
   Elevation:

6. Gated spillway capacity at test flood elevation: N/A

7. Total spillway capacity at test flood elevation: 2,140 cfs
   Elevation: 209.0

8. Total project discharge at top of dam: 3,720 cfs
   Elevation: 210.5

9. Total project discharge at test flood elevation: 2,140 cfs
   Elevation: 209.0

c. Elevation - Feet above MDC Datum (2.08 ft. higher than the NGVD)

1. Streambed at toe of dam: 190.5 (Invert of downstream channel)

2. Bottom of cutoff: Varies: Applies only to a small length of dam

3. Maximum tailwater: N/A

4. Normal pool: N/A

5. Full flood control pool: 206.0

6. Spillway crest 206.0 (Emergency)
   196.0 (Principal)
7. Design surcharge—original design: 208.5
8. Top of dam: 210.5
9. Test flood surcharge: 209.0
d. Reservoir - Length in Feet
   1. Normal pool: N/A
   2. Flood control pool: 8,000 ft.
   3. Spillway crest pool:
      Emergency spillway 8,000 ft.
      Principal spillway 3,700 ft.
          (high level weir inlet)
   4. Top of dam: 8,850 ft.
   5. Test flood pool: 8,800 ft.
e. Storage - Acre-feet
   1. Normal pool: N/A
   2. Flood control pool: 1,100 ac-ft.
   3. Spillway crest pool:
      Emergency spillway 1,100 ac-ft.
      Principal spillway 240 ac-ft.
          (high level weir inlet)
   4. Top of dam: 1,760 ac-ft.
   5. Test flood pool: 1,530 ac-ft.
f. Reservoir Surface - Acres
   1. Normal pool: N/A
   2. Flood control pool: 137 acres
   3. Spillway pool:
      Emergency spillway 137 acres
      Principal spillway 60 acres
          (high level weir inlet)
   4. Top of dam: 168 acres
   5. Test flood pool: 158 acres
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<thead>
<tr>
<th></th>
<th>Dam</th>
<th>Dike</th>
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<tr>
<td>1. Type:</td>
<td>Earth Embankment</td>
<td>Earth Embankment</td>
</tr>
<tr>
<td>2. Length:</td>
<td>1,040 ft.</td>
<td>140 ft.</td>
</tr>
<tr>
<td>3. Height:</td>
<td>20 ft.</td>
<td>2.5 ft.</td>
</tr>
<tr>
<td>4. Top width:</td>
<td>12.0 ft.</td>
<td>8 ft.</td>
</tr>
<tr>
<td>5. Side slopes</td>
<td>Varies from 3 hor. to 1 vert. to 4 hor. to 1 vert. for U/S and D/S slopes (See general dam plan)</td>
<td>2 hor. to 1 vert. slopes for U/S and D/S slopes</td>
</tr>
<tr>
<td>6. Zoning:</td>
<td>Core: compacted impervious fill</td>
<td>Entire section is compacted random fill.</td>
</tr>
<tr>
<td></td>
<td>Outer shell: Peat &amp; organic silt (U/S and D/S) Foundation: Uncompacted granular fill</td>
<td></td>
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<tr>
<td>7. Impervious core:</td>
<td>Compacted impervious fill</td>
<td>N/A</td>
</tr>
<tr>
<td>8. Cutoff:</td>
<td>A 10' wide and a minimal 3' deep cut-off trench under small part of dam</td>
<td>None</td>
</tr>
<tr>
<td>9. Grout Curtain:</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>10. Other:</td>
<td>Gravel seepage under-drain system with a 12&quot; perforated pipe under most of dam length. 10 ft. wide, 2 ft. thick rock fill drain under two sections of dam</td>
<td>N/A</td>
</tr>
</tbody>
</table>

**h. Diversion and Regulating Tunnel**

N/A
### Spillway

#### Principal Spillway

1. **Type:** Drop inlet structure consisting of a two stage reinforced concrete intake riser w/36" reinforced concrete pipe

2. **Length of Crest:** 18 ft. (High level inlet weirs) 125 ft. (at control section)

3. **Crest Elevation (MDC Datum):**
   - W/flashboards: N/A N/A
   - WO/flashboards: 196.0' (High level inlet weirs) 206.0'

4. **Gates:** 24" sliding sluice gate at low level inlet

5. **Upstream Channel:** Relocated brook

6. **Downstream Channel:** Relocated brook with 50 ft. length rip-rapped at outlet

7. **General:** N/A N/A

#### Emergency Spillway

The only regulated outlet is the low level inlet of the two stage intake riser of the principal spillway. A 24" diameter, manually controlled, steel sluice gate regulates the low level inlet flow into the 36" reinforced concrete pipe.

1. **Invert (Low level inlet):** 192.5'

2. **Size:** 36" RCP

3. **Description:** 129 ft. long 36" RCP

4. **Control mechanism:** 24" manually controlled steel sluice gate at low level inlet of intake riser

5. **Other:** 1-11 N/A
2.1 Design Data
A comprehensive design report prepared in 1960 and entitled "North Branch Park River Watershed Protection Project, Design Report, Site No. 9, Bloomfield, CT", is available. The design report includes hydrologic and hydraulic data and computations, soil borings, soil laboratory test data, dam stability analysis and seepage analysis. Additional dam stability analysis were performed during the time of construction and are included in the design drawings.

2.2 Construction Data
"As-Built" drawings entitled "North Branch Park River Watershed Protection Project, Floodwater Retarding Structure, Site No. 9, Cold Spring Dam" are available. During construction certain design changes were made as a result of field conditions. Details of the contract modifications are included in the "As-Built" drawings. Of these modifications the one pertaining to the stability of the dam embankment included an increased amount of peat removal and granular fill replacement. Soil borings taken during construction revealed trapped organic material under the granular fill on the downstream side of the dam. The partially constructed dam embankment and part of the granular fill, along with trapped organic material, were removed and clean materials were replaced. In the reconstruction, the downstream limit of peat removal and granular material replacement was extended. A 1.5 horizontal to 1.0 vertical slope was projected from the dam crest to the lower
limits of organic deposit instead of the original design 1:1 slope. Also, a 1:1 slope was projected from this lower intersection point to the existing ground, thereby greatly increasing the extent of granular fill required under the downstream dam embankment. A rock fill drain was placed under the downstream embankment slope in the two areas where trapped organic material was found (See general dam plan and typical dam section in Appendix B).

2.3 Operational Data

Normally a pool does not exist and water level readings are not taken at any specified intervals. According to the owner, water levels have never risen to the level of the emergency spillway crest. No formal operation records are known to exist.

2.4 Evaluation of Data

a. Availability

Available existing data was provided by the State of Connecticut Department of Environmental Protection who are the owners and the U.S. Soil Conservation Service who designed and constructed the project. Location of the available data is given in Appendix B.

b. Adequacy

The engineering data available when coupled with the visual inspection were generally adequate to perform a Phase I assessment of the dam; however, additional information concerning the present condition of dam including seepage characteristics and stability analysis is required.

c. Validity

A comparison of record data and visual observations revealed no significant discrepancies in the record data.
3.1 Findings

a. General

The formal field inspection took place December 16, and 22, 1980 by engineers from Goodkind & O'Dea, Inc. and Singhal Associates. Detailed checklists, which are given in Appendix A, were utilized for the inspection of the dam, dike, and spillways. Photographs showing the dam features and problem areas were also taken during the inspection and are included in Appendix C along with the photo location plan.

The general condition of the project is fair with some areas requiring further studies, or maintenance work and/or monitoring. At the time of the inspection, the reservoir was dry.

b. Dam

The dam is a grass covered, earthfill embankment with a gravel underdrain system on the downstream side. No sign of lateral movement or misalignment was observed as shown by Photos 1 and 2. Two low spots, each approximately 5 ft. by 8 ft. and 6" deep, were noted and are indicated on the general dam plan in Appendix B. Minor erosion down the embankment slopes was associated with these low spots, which is also shown on the general dam plan. The dam embankment was covered by a well developed growth of grass with minor vehicular rutting along the crest.
No evidence of any embankment or downstream seepage was noted; however the reservoir was dry at the time of the inspection. The two 12" seepage drain outlets were clean and dry, with one animal guard bar missing from the western outlet.

c. **Appurtenant Structures**

**Principal Spillway**

Consisting of a two stage reinforced concrete intake riser and a 36" reinforced concrete pipe, the principal spillway allows the normal flow of the brook and the impounded storm-water runoff to pass through the dam embankment. The concrete intake riser was in good condition with no sign of cracking or spalling. Located at the low level inlet was a sliding steel sluice gate which was open and presently inoperable. As shown in Photo 4, the gate stem was bent and the gate handle was missing from the sluice gate works. The upstream channel was clean of debris with some minor weed growth along the edges (Photo 3).

Minor exterior spalling of concrete was noted at the outlet end of the 36" reinforced concrete pipe. The pipe was over half full of water due to the flat downstream profile, preventing full interior inspection (See Photo 5). The rip-rapped area beyond the outlet pipe was clean and appeared stable.

**Emergency Spillway**

Located at the east end of the dam, the grass lined spillway was generally in good condition. The grass lining appeared stable with evidence of moderate vehicular trespassing.
on the channel floor and cut slope as shown by the wheel tracks in Photo 7.

Dike

The dike is a low grass covered earthfill embankment located at the northeast corner of the reservoir, and appears to be used as a farm road (See sheet 2, Location Plan, for dike location). Severe vehicular rutting and very minor slope erosion was observed respectively, along the crest and slopes of the dike embankment. The upstream and downstream slopes and toes were moderately covered with brush and small trees as shown in Photo 8.

d. Reservoir Area

The reservoir which was dry at the time of the inspection, is primarily a flat, swampy lowland containing several non-inhabitable structures with a State road and several residential homes bordering it.

e. Downstream Channel

The channel downstream from the principal spillway was generally clean with some very minor brush growth along the slopes (Photo 6). The downstream profile is very flat and may be causing some backwater in the principal spillway pipe.

3.2 Evaluation

The general condition of Cold Spring Dam is good based upon the visual inspection. The following features could influence the future condition and/or stability of the structure.

a. Continued vehicular traffic along the dam and
emergency spillway could lead to erosion problems.

b. Further erosion of the dam and dike embankment may result in decreased structural stability.

The dam is a flood control project and, therefore, the reservoir is dry except in periods of heavy rainfall. With the reservoir dry, the inspection could not reveal seepage conditions. Thus, this inspection cannot in any way evaluate the seepage conditions that may exist when water is impounded in the reservoir.
4.1 Operational Procedures

a. General

There are no operational procedures such as dam surveillance or reservoir level readings at this time. The emergency spillway was designed to be uncontrolled and, therefore, does not have any operational procedures. The principal spillway does have a slide gate at the intake riser, but the gate is presently inoperable and remains open year-round.

b. Description of any Warning System in Effect

There are no warning systems in effect.

4.2 Maintenance Procedures

a. General

The State of Connecticut is responsible for the maintenance of Cold Spring Reservoir Dam. The State mows the dam embankment and emergency spillway biennially, whereas the upstream and downstream channels are generally cleaned and cleared of debris and brush annually.

Representatives from the State of Connecticut Department of Environmental Protection and the U.S. Soil Conservation Service inspect the dam annually. A copy of the latest inspection report is included in Appendix B.

b. Operating Facilities

The State of Connecticut is responsible for construction, operation and structural repair of the flood control works.
4.3 Evaluation

The operational and maintenance procedures are generally satisfactory but there are areas requiring improvement. A formal operational and maintenance procedure with continuing records and a formal emergency downstream warning plan should be developed by the State of Connecticut Department of Environmental Protection. A list of recommended procedures for the operation and maintenance of the dam is listed in Section 7.
5.1 General

Cold Spring Reservoir was created along with three other reservoirs in the Bloomfield, Connecticut area in the 1960's to reduce flooding in the watershed area of the North Branch of the Park River. Detailed designs were prepared by Anderson-Nichols Consulting Engineers, Boston/Hartford under the direction of U.S. Department of Agriculture, Soil Conservation Service.

The Reservoir has a contributory watershed area of 1.94 square miles which is gently sloping except over small portions where the slope is steep. Most of this area is developed, having a good number of town and state roads, houses and other buildings spread over it.

There is the two stage reinforced concrete intake riser with the 36" reinforced concrete pipe acting as the principal spillway and the 125 ft. wide grassed trapezoidal channel, serving as the emergency spillway. The combined spillway capacity is 3,720 cfs with the reservoir pool level to the crest of the dam. The spillway capacity at the test flood elevation 209.0' MDC Datum is 2,140 cfs. The crest elevation of the dam is 210.5' MDC Datum which is 4.5 ft. higher than the emergency spillway crest elevation of 206.0' MDC Datum.

5.2 Design Data

Detailed plans, the as-built drawings and the original design report prepared by Anderson-Nichols, Consulting Engineers, are available at the Soil Conservation Service office in Storrs, Connecticut. Necessary design data is contained in these documents. Some changes had to be made in the design due to actual field
conditions encountered at the time of construction. Details of contract modification will be found in the additional drawing sheets attached to the original package. The design test flood inflow for Cold Spring Reservoir Dam was 6,700 cfs and the routed outflow was 2,110 cfs. The design high water elevation in the reservoir was set at 208.5' MDC Datum giving a freeboard of 2.0'.

5.3 **Experience Data**

There are no known records of reservoir levels during the times that water has been impounded at Cold Spring Reservoir Dam.

5.4 **Test Flood Analysis**

Based on the dam failure analysis, the dam is classified as being 'High' hazard potential in accordance with Table 2 on page D-9 of the Corps of Engineers' *Recommended Guidelines for Safety Inspection of Dams*. The test flood should be equal to the probable maximum flood (PMF) which was accordingly adopted for analysis.

An inflow peak rate of runoff was calculated for 1.94 square miles of watershed area. The terrain was judged to lie between the 'flat & coastal' and 'rolling' category. A multiplying factor of 1,350 cfs per square mile, lying between those for the two categories but closer to the 'flat and coastal' was selected. The test flood came out to be

\[
\text{Test Flood} = \text{PMF} = 1,350 \times 1.94 = 2,620 \text{ cfs}
\]

A triangular hydrograph was constructed using the methodology given in the "Hydrology, Section 4, SCS National Engineering Handbook". The peak inflow rate of 2,620 cfs and a total runoff of 19.0 inches for the PMF were used to construct the inflow hydrograph.
The flood was then routed through the reservoir, assuming an initial elevation of 206.0 ft. MDC Datum, which was at the crest of the emergency spillway control section.

The test flood produced a maximum outflow discharge of 2,140 cfs which is considerably below the maximum spillway capacity of 3,720 cfs, which is 174% of the former. The peak test flood elevation of 209.0 ft. MDC Datum results in a 1.5 ft. freeboard to the top of the dam.

5.5 Dam Failure Analysis

A dam failure analysis was made using the guidelines provided by the Corps of Engineers. Failure of the dam was assumed with the water level at the test flood pool elevation of 209.0 ft. MDC Datum and a prefailure routed outflow of 2,140 cfs. Assuming a breach size of 18.5 ft. high and 420 ft. wide (40% of dam length), the peak release rate into the downstream valley would be 55,700 cfs. The height of the flood wave came out to be approximately 18 ft. at the first cross-section (Sta. 7+60). Four cross-sections were analyzed, the last one being 2,800 ft. downstream from the dam. Flood-routing computations were done taking into consideration the available valley storage. The resulting flood elevations and the values of the routed flood flows are shown in Appendix D. At the last cross-section, (Sta. 28+0), the flow reduces to 36,000 cfs, and the wave height to 11 ft. which still have considerable potential of causing substantial flooding of properties further down from Overbrook Farm Road.

The depths of flow in the brook in the vicinity of 20 downstream houses considered (the last one being approximately 3,000
ft. from the dam), range as below.

<table>
<thead>
<tr>
<th>Prefailure Depth</th>
<th>Post-Failure Depth</th>
</tr>
</thead>
<tbody>
<tr>
<td>First 4 houses:</td>
<td>5.5 ft.</td>
</tr>
<tr>
<td>Next 3 houses</td>
<td>2.5 ft.</td>
</tr>
<tr>
<td>Next 2 houses</td>
<td>3.0 ft.</td>
</tr>
<tr>
<td>Next 11 houses</td>
<td>4.0 ft.</td>
</tr>
</tbody>
</table>

Four of these homes are subject to partial flooding in their yards below the first floor elevation under test flood conditions. In case of a dam failure these houses, along with the other 16, will be flooded to a depth ranging from 1 ft. to 7 ft. above their first floor elevation.

A large number of roads, houses and buildings will be flooded as a result of dam breach. The economic loss may be excessive and more than few lives may be lost. As such, the dam is classified as 'High' hazard potential.

Dam breach computations are included in Appendix D.
6.1 Visual Observations

The visual inspection revealed no apparent structural stability problems; however an area of concern was noted. Minor erosion has developed on the upstream and downstream slopes of the dam embankment as a result of its concentration and runoff from two minor low spots on the crest of the dam. The concentration of drainage is the result of vehicular rutting along the crest of the dam.

The reservoir was dry at the time of the inspection; therefore, any seepage that may exist when water is impounded in the reservoir could not be observed.

6.2 Design and Construction Data

Prior to construction, subsurface explorations revealed the existence of peat and organic materials down to depths of 35 ft. below the existing ground at the proposed dam site. The organic material was removed and replaced by a granular fill with excavation lateral limits determined by the intersection of a 1:1 slopes projected from the dam crest to the bottom of the organic deposits. Extension of a vertical line from this point of intersection to the existing ground defined the upstream and downstream limits of excavation; however, as noted in Section 2, the downstream lateral limit was modified during construction by projecting a 1.5:1 slope to the bottom of organic material and then extending a 1:1 slope back to the existing ground. The downstream extension of the granular fill...
limits improved the foundation conditions under the dam embankment.

The excavated organic material was placed on the slopes of the impervious dam core where it provides additional counterweight to counteract lateral yielding of foundation soils. Original stability analysis were based on using the granular fill limits as defined by the design 1:1 slope from the dam crest and not the "As-Built" 1.5:1 slope. Therefore the dam stability may be increased by the additional granular fill placed in the downstream foundation; however, since the stability analyses were not based on the "As-Built" conditions, additional studies should be undertaken to confirm the stability of the dam embankment and foundation giving consideration to existing seepage and soil characteristics.

6.3 Post Construction Changes

The available data does not indicate any post construction changes.

6.4 Seismic Stability

The dam is located in Seismic Zone 1 and in accordance with Corps of Engineers' guidelines does not warrant further seismic analysis at this time.
7.1 Project Assessment  

a. Condition  

Based upon the visual inspection of the site, review of available data and past performance, the project appears to be in fair condition. There was no evidence of structural instability; however, a conclusive evaluation of the existing embankment and foundation conditions could not be made without appropriate dam stability analysis. Any structural instability that may occur due to seepage when the reservoir contains floodwater was not evaluated due to the dry condition of the reservoir.

Based upon "Preliminary Guidance for Estimating Maximum Probable Discharge" dated March, 1978, peak inflow to the reservoir is 2,620 cfs; peak outflow is 2,140 cfs with the water level 1.5 ft. below the dam crest. Based upon our hydraulic computations, the spillway capacity with the pool level to the top of dam is 3,720 cfs, which is equivalent to approximately 174% of the routed test flood outflow.

b. Adequacy of Information  

The information available is adequate for a Phase I limited assessment of the condition and stability of the project.

c. Urgency  

It is recommended that the measures presented in Section 7.2 and 7.3 be implemented within one year of the owner's receipt of this report.
7.2 **Recommendations**

It is recommended that the owner employ a qualified registered engineer to:

1. Inspect the dam during the time that water is impounded in the reservoir with particular attention to locating any possible seepage.

2. Reappraise the stability of the dam embankment and foundation using the "As Built" configuration and giving consideration to existing seepage and soil characteristics.

The owner should implement the recommendations of the engineer.

7.3 **Remedial Measures**

a. **Operation and Maintenance Procedures**

The following measures should be undertaken within the time period indicated in Section 7.1.c, and continued on a regular basis.

1. Surveillance should be provided by the owner during periods of unusually heavy precipitation and high discharge. The owner should develop and implement a downstream warning system to be used in case of emergencies at the dam or dike.

2. A formal program of operation and maintenance procedures should be instituted and fully documented to provide accurate records for future reference.

3. A comprehensive program of inspection by a registered
professional engineer qualified in dam inspection should be instituted on a biennial basis.

4. Remove all brush and small trees from the slopes and within 10 ft. of the upstream heel and downstream toe of the dike embankment.

5. On the emergency spillway fill in vehicular scars, reestablish sod and vegetation.

6. Replace animal guard bar at the western seepage drain outlet.

7. Fill in ruts, minor erosion gullies and low spots in the dam and dike embankments, reestablish sod and vegetation.

7.4 Alternatives

This study has identified no practical alternatives to the above recommendations.
APPENDIX A

INSPECTION CHECKLIST
VISUAL INSPECTION CHECK LIST
PARTY ORGANIZATION

PROJECT Cold Spring Dam
DATE 12/16/80
TIME Morning
WEATHER Cold-Clear 20's
W.S. ELEV. U.S. D.N.S.

PARTY:
1. Ed Henderson (EH)
2. Wesley J. Wolf (WW)
3. Gerald F. Buckley (GB)
4. ________________________
5. ________________________

DISCIPLINE:
1. Geotechnical
2. Hydraulics
3. Soils & Structures

PROJECT FEATURE
1. Dam Embankment (Earth Fill) EH, WW, GB
2. Principal Spillway - Intake Riser EH, WW, GB
3. Principal Spillway - Outlet EH, WW, GB
4. Emergency Spillway EH, WW, GB
5. Dike Embankment (Earth Fill) EH, WW, GB
6. ________________________
7. ________________________
8. ________________________
9. ________________________
10. ________________________

INSPECTED BY
PERIODIC INSPECTION CHECK LIST

PROJECT Cold Spring Dam
PROJECT FEATURE Earthfill Dam
DISCIPLINE
DATE 12/16/80
NAME E.H. WW. GR

<table>
<thead>
<tr>
<th>AREA ELEVATED</th>
<th>CONDITIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td>DAM EMBANKMENT</td>
<td>210.5' MOC Datum</td>
</tr>
<tr>
<td>Crest Elevation</td>
<td>No Pool - Dry Dam</td>
</tr>
<tr>
<td>Current Pool Elevation</td>
<td>Unknown</td>
</tr>
<tr>
<td>Maximum Impoundment to Date</td>
<td>None Observed</td>
</tr>
<tr>
<td>Surface Cracks</td>
<td>N/A</td>
</tr>
<tr>
<td>Pavement Conditions</td>
<td>Low Spot - 300' from West End. Might be settlement</td>
</tr>
<tr>
<td>Movement or settlement of crest</td>
<td>None Observed</td>
</tr>
<tr>
<td>Lateral movement</td>
<td>Small Low Spot</td>
</tr>
<tr>
<td>Vertical alignment</td>
<td>Looks Good</td>
</tr>
<tr>
<td>Horizontal alignment</td>
<td>Good</td>
</tr>
<tr>
<td>Conditions at abutment &amp; at Concrete Structures</td>
<td>None Observed</td>
</tr>
<tr>
<td>Indications of Movement of Structural Items on Slopes</td>
<td>Minor</td>
</tr>
<tr>
<td>Trespassing on Slopes</td>
<td>N/A</td>
</tr>
<tr>
<td>Sloughing or Erosion of Slopes or Abutments</td>
<td>None Observed</td>
</tr>
<tr>
<td>Rock Slope Protection-Riprap Failures</td>
<td>None Observed (Dry Dam)</td>
</tr>
<tr>
<td>Unusual Movement or Cracking at or Near Toes</td>
<td>None Observed (Dry Dam)</td>
</tr>
<tr>
<td>Unusual Embankment or Downstream Seepage</td>
<td>N/A</td>
</tr>
<tr>
<td>Piping or Boils</td>
<td>None Observed</td>
</tr>
<tr>
<td>Foundation Drainage Features</td>
<td>N/A</td>
</tr>
<tr>
<td>Toe Drains</td>
<td>N/A</td>
</tr>
<tr>
<td>Instrumentation System</td>
<td>N/A</td>
</tr>
</tbody>
</table>
PERIODIC INSPECTION CHECK LIST

PROJECT Cold Spring Dam DATE 12/16/80
PROJECT FEATURE Intake, Riser & Channel NAME EH, WW, GB
DISCIPLINE ______________________ NAME ______________________

<table>
<thead>
<tr>
<th>AREA EVALUATED</th>
<th>CONDITION</th>
</tr>
</thead>
<tbody>
<tr>
<td>OUTLET WORKS - INTAKE CHANNEL AND INTAKE STRUCTURE</td>
<td></td>
</tr>
<tr>
<td>a. Approach Channel</td>
<td></td>
</tr>
<tr>
<td>Slope Conditions</td>
<td></td>
</tr>
<tr>
<td>Bottom Conditions</td>
<td></td>
</tr>
<tr>
<td>Rock Slides or Falls</td>
<td></td>
</tr>
<tr>
<td>Log Boom</td>
<td></td>
</tr>
<tr>
<td>Debris</td>
<td></td>
</tr>
<tr>
<td>Condition of concrete lining</td>
<td>Excavated Channel</td>
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<td></td>
<td>Good</td>
</tr>
<tr>
<td></td>
<td>Good - Few Weeds</td>
</tr>
<tr>
<td></td>
<td>None</td>
</tr>
<tr>
<td></td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td>Clean</td>
</tr>
<tr>
<td></td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td>Concrete Riser For Pipe</td>
</tr>
<tr>
<td></td>
<td>Good</td>
</tr>
<tr>
<td></td>
<td>Clean</td>
</tr>
<tr>
<td>b. Intake Structure</td>
<td></td>
</tr>
<tr>
<td>Condition of Concrete</td>
<td></td>
</tr>
<tr>
<td>Step Logs and Slots</td>
<td></td>
</tr>
</tbody>
</table>

A-3
PERIODIC INSPECTION CHECK LIST

PROJECT: Cold Spring Dam  DATE: 12/16/20
PROJECT FEATURE: Outlet Channel  NAME: EH, WW, GB
DISCIPLINE: 

<table>
<thead>
<tr>
<th>AREA EVALUATED</th>
<th>CONDITIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td>OUTLET WORKS - OUTLET STRUCTURE AND OUTLET CHANNEL</td>
<td>No Outlet Structure: Flow Discharges From Pipe Onto Rip-Rap</td>
</tr>
<tr>
<td>General Condition of Concrete</td>
<td></td>
</tr>
<tr>
<td>Rust or Staining</td>
<td></td>
</tr>
<tr>
<td>Spalling</td>
<td></td>
</tr>
<tr>
<td>Erosion or Cavitation</td>
<td></td>
</tr>
<tr>
<td>Visible Reinforcing</td>
<td></td>
</tr>
<tr>
<td>Any Seepage or Efflorescence</td>
<td></td>
</tr>
<tr>
<td>Condition at Joints</td>
<td></td>
</tr>
<tr>
<td>Drain Holes</td>
<td></td>
</tr>
<tr>
<td>Channel</td>
<td></td>
</tr>
<tr>
<td>Loose Rock or Trees Overhanging Channel</td>
<td></td>
</tr>
<tr>
<td>Condition of Discharge Channel</td>
<td></td>
</tr>
<tr>
<td>Excavated Channel - Rip-Rapped</td>
<td></td>
</tr>
<tr>
<td>None</td>
<td></td>
</tr>
<tr>
<td>Minor Earthen Obstructions &amp; Brush In Channel</td>
<td></td>
</tr>
</tbody>
</table>
## PERIODIC INSPECTION CHECK LIST

### PROJECT
- **Cold Spring Dam**

### DATE
- **12/16/80**

### PROJECT FEATURE
- **Emergency Spillway**

### DISCIPLINE
- **E.H., W.W., G.B.**

### NAME
- **E.H., W.W., G.B.**

### AREA EVALUATED | CONDITION
---|---
**OUTLET WORKS - SPILLWAY WEIR, APPROACH AND DISCHARGE CHANNELS** | 
| a. Approach Channel (Before Crest) | 
| General Condition | Good - Scars From Vehicles  
| Loose rock overhanging channel | None  
| Trees Overhanging Channel | None  
| Floor of Approach Channel | Good  
| b. Weir and trailing walls | 
| General Condition of Concrete | - N/A  
| Rust or Staining |  
| Spalling |  
| Any Visible Reinforcing |  
| Any Seepage or Efflorescence |  
| Drain Holes |  
| c. Discharge Channel (After Crest) | 
| General Condition | Good - Scars From Vehicles  
| Loose Rock Overhanging Channel | None  
| Trees Overhanging Channel | None  
| Floor of Channel | Good  
| Other Obstructions | None  

*Note: Emergency Spillway is Grass Covered Earth*
PERIODIC INSPECTION CHECK LIST

PROJECT Cold Spring Dam  
PROJECT FEATURE Earthfill Dike  
DATE 12/16/80  
NAME EH, WW, GB

<table>
<thead>
<tr>
<th>AREA EVALUATED</th>
<th>CONDITION</th>
</tr>
</thead>
<tbody>
<tr>
<td>DIKE EMBANKMENT (Very Minor DiKe)</td>
<td>Used as Farm Road</td>
</tr>
<tr>
<td>Crest Elevation</td>
<td>210.5 ft MDC Datum</td>
</tr>
<tr>
<td>Current Pool Elevation</td>
<td>No Pool - Dry Dam</td>
</tr>
<tr>
<td>Maximum Impoundment to Date</td>
<td>Unknown</td>
</tr>
<tr>
<td>Surface Cracks</td>
<td>None Observed (Very Rutted)</td>
</tr>
<tr>
<td>Pavement Conditions</td>
<td>N/A</td>
</tr>
<tr>
<td>Movement or settlement of crest</td>
<td>None Observed (Vehicle Rut)</td>
</tr>
<tr>
<td>Lateral movement</td>
<td>None Observed</td>
</tr>
<tr>
<td>Vertical alignment</td>
<td>Looks Good</td>
</tr>
<tr>
<td>Horizontal alignment</td>
<td>Looks Good</td>
</tr>
<tr>
<td>Conditions at abutment &amp; at Concrete Structures</td>
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<td>Indications of Movement of Structural Items on Slopes</td>
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<tr>
<td>Trespassing on Slopes</td>
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<td>Sloughing or Erosion of Slopes or Abutments</td>
<td>Very Minor</td>
</tr>
<tr>
<td>Rock Slope Protection-Riprap Failures</td>
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<tr>
<td>Unusual Movement or Cracking at or Near Toes</td>
<td>None Observed</td>
</tr>
<tr>
<td>Unusual Embankment or Downstream Seepage</td>
<td>None Observed (Dry Dam)</td>
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<tr>
<td>Piping or Boils</td>
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<td>Foundation Drainage Features</td>
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<td>Toe Drains</td>
<td>N/A</td>
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<td>Instrumentation System</td>
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# Engineering Data Checklist

<table>
<thead>
<tr>
<th>Item</th>
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<td>Location Map</td>
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<td>U.S. Soil Conservation Service, Storrs, CT</td>
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<td>Hydrologic &amp; Hydraulic Data</td>
<td>Available in Design Report</td>
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<td>Soil Borings</td>
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<td>Available in Design Report</td>
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<td>Geology Reports</td>
<td>Available in Design Report</td>
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<tr>
<td>Construction History</td>
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<td>Operation Records</td>
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<td>Inspection History</td>
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<td>State of Connecticut Department of Environmental Protection</td>
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<td>Available</td>
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<td>Design Computations</td>
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<td>Hydrologic &amp; Hydraulic</td>
<td>Available in Design Report</td>
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<td>Dam Stability</td>
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<tr>
<td>Seepage Analysis</td>
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B-1
DESIGN REPORT

NORTH BRANCH PARK RIVER
WATERSHED PROTECTION PROJECT
RETARDING STRUCTURE - SITE NO.9
COLD SPRING DAM
BLOOMFIELD, CONNECTICUT

The site of this proposed floodwater retarding structure is located approximately 1.7 miles southwest of Bloomfield Town Hall and 0.3 miles north of the intersection of Burr Road and Simsbury Road (State Route 185). The dam is situated on the northerly branch of Tumbledown Brook, a tributary of Wash Brook.

The geographic location of this site may be found on the Metropolitan District Geodetic and Topographical Survey Sheet 126, published by the Commission on Regional Planning, Hartford County, Connecticut, by scaling 3.2 inches north (latitude 41° 49' 11.3" north) and 10.7 inches west (longitude 72° 45' 57.9" west) from the lower right-hand corner of the sheet. Sheet 5 of this report is an overlay which, when placed on the appropriate latitude and longitude of the Metropolitan District Geodetic and Topographical Survey Sheet 126, will locate the proposed dam.

This dam, designed as a Class "C" structure, has a watershed of 1,240 acres. The foundation material of the central section of the dam presently consists of peat and organic silt, which is unsuitable. A suitable foundation of granular fill will be provided by a combination of excavation and displacement of the peat and organic silt. The dam will then be constructed of compacted impervious fill. The principal spillway will be a single stage drop inlet spillway with a reinforced concrete pipe 36 inches in diameter and a reinforced concrete riser, 3 ft. x 9 ft inside dimensions. It will rest on a foundation of silty sand.

An emergency spillway with a base width of 125 feet and crest elevation at 206.0 ft. (MDD) will also be provided. The maximum velocity at the control section will be 6.72 feet per second for the design flood. The frequency of use will not exceed a one percent chance.
A rectangular low flow orifice, 1 ft. x 3 ft., will be provided in the face of the riser to pass base flow of the stream and maintain a "dry" sediment pool. The invert elevation of the low flow orifice is set at 192.5 ft. (MDD) on the assumption that the accumulation of sediment will be negligible in the vicinity of the principal spillway. The crest of the riser is set at elevation 196.0 ft. (MDD). The riser was used to provide a simple means of vortex control and to facilitate the construction of an adequate trash rack.

The drawdown time was computed to be 10.28 days from the crest of the emergency spillway to the crest of the riser.

This is to be a dry reservoir (no permanent pool) but a drainage blanket with a toe drain is provided.

The flood routing procedure used in the design is described in Engineering Handbook, Section 5, Hydraulics, U. S. Department of Agriculture, Soil Conservation Service.

The flood routing procedure was used to determine the maximum stages shown in the table on the following page.
<table>
<thead>
<tr>
<th>Factor Which Determines Stage</th>
<th>Surface Area Acres</th>
<th>Runoff in Inches</th>
<th>Peak Inflow CFS</th>
<th>Elev. of Maximum Stage Ft. 1/</th>
<th>Storage Ac. Ft.</th>
<th>Element of Structure Determined by Maximum Stage</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Invert of Low Flow Orifice</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Crest of Riser</td>
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<tr>
<td>Project Storm (Prin. Spwy. Design)</td>
<td>60</td>
<td>---</td>
<td>---</td>
<td>196.0</td>
<td>---</td>
<td>Crest of Emergency Spillway</td>
</tr>
<tr>
<td>1.75 x 6 hr. point rainfall, moisture condition III (Emer. Spwy. Design)</td>
<td>137</td>
<td>12.00</td>
<td>2480</td>
<td>206.0</td>
<td>1096</td>
<td>Design Highwater</td>
</tr>
<tr>
<td>2.5 x 6 hr. point rainfall, moisture condition II (Freeboard Design)</td>
<td>154</td>
<td>15.84</td>
<td>5050</td>
<td>208.5</td>
<td>1460</td>
<td>Top of Dam</td>
</tr>
<tr>
<td></td>
<td>159</td>
<td>19.80</td>
<td>6700</td>
<td>209.2</td>
<td>1570</td>
<td></td>
</tr>
<tr>
<td></td>
<td>169</td>
<td>---</td>
<td>---</td>
<td>210.5</td>
<td>1775</td>
<td></td>
</tr>
</tbody>
</table>

1/ Referenced to Metropolitan District Datum

2/ Determined on the basis of State criteria requiring a minimum freeboard of two feet above design highwater elevation.
Hazard Classification

The dam site is located about 6 ÷ 7 miles upstream from the business center of Hartford, Connecticut. The area 4 in. x 100 x 500 feet of the flood protection by the reservoir is well developed and includes a complex of residential, commercial, and industrial properties.

These conditions, under Soil Conservation Service class definitions, place the structure as

Class C.
Basic Data For Hydrographs

1. Soil-Cover Complex Numbers:
   
   a. For Principal Spillway Hydrograph, Moisture Condition II, Curve Number 86

   b. For Emergency Spillway Design Hydrograph, Soil Cons. Service criteria permit use -- Moisture Condition III with Curve No. 86. However, a letter from the Connecticut Water Resources Commission, dated April 30, 1959, to John J. Mazzochi specifies that in determining this hydrograph the rate of retention or total precipitation loss may not exceed 0.25 inches per hour. In order to satisfy this specification the Curve No. is raised to 88.

   c. For Emergency Spillway Freeboard Hydrograph, Moisture Condition II, Curve No. 68

2. Time = Concentration
   
   Channel Flow Reach 1: distance 2000 ft, slope 7%
   Velocity 7.0 fps
   \[ \text{Time} = \frac{2000}{7} = 286 \text{ sec} \]

   Channel Flow Reach 2: distance 6000 ft, slope 5\% 0.008
   \[ \sqrt{s} = 0.07 \]
   Velocity = 4.7 fps
   \[ \text{Time} = \frac{6000}{4.7} = 1220 \text{ sec} \]

   Channel Flow Reach 3: distance 6000 ft, slope 0.0002
   \[ \sqrt{s} = 0.014 \]
   Velocity = 0.75 fps
   \[ \text{Time} = \frac{6000}{0.75} = 8000 \text{ sec} \]

   Total Time = 9500 sec = 2.63 hrs.
Basic Data for Hydrographs—Continued

3. Storm Rainfall and Duration

a. Principal Spillway Hydrograph
   Point rainfall = 14.74 in.
   Areal rainfall = 13.78 in.
   Duration = 19 hr.

b. Emergency Spillway Design Hydrograph
   Duration = 6 hr.
   6 hr. point rainfall from SCS-NEH 4 Sup.A, Fig. 3.21, 14.6 in.
   Areal rainfall = 0.935 x 14.6 = 13.34 in.

C. Emergency Spillway Freeboard Hydrograph
   Duration = 6 hr.
   6 hr. point rainfall (same same as above), 10.6 in.
   Areal rainfall = 0.935 x 10.6 = 24.78 in.

Sediment Storage Computation

Basis—Rate of accumulation in reservoir 0.1 ton per acre per year

Dr. Area = 1.94 sq. mi. = 1240 acres

50 yr. acc. = 0.1 x 1240 x 50 = 6240 tons

Dry unit weight = 90 lb per cu. ft.

50 yr. acc. Volume = \( \frac{6240 \times 2000}{90 \times 43.56} = 3.16 \) ac. ft.

B-7
PERFORMANCE DATA
- NORTH BRANCH PINE RIVER WATERSHED

Graphs showing:
- Pool elevation in feet vs. reservoir capacity % full
- Reservoir capacity vs. % full
- Pal spillway discharge vs. per second
- Emergency spillway discharge vs. discharge in cubic feet per second

PERTINENT DATA
- Top of Dam: EL 210.5
- Design High Water: EL 202.5
- Crest Emergency Spillway: EL 206.5
- Crest Principal Spillway: EL 196.0
- Invert Flow Orifice: EL 192.5
- Drainage Area Controlled: 194.50 mi²
- "Of Runoff = 101.46 Acre-Feet"

All Elevations Refer to Metropolitan District Datum

Constructed by:
- State of Connecticut
- Department of Agriculture & Natural Resources
- Joseph N. Gill, Commissioner

In Association With The:
- U.S. Department of Agriculture
- Soil Conservation Service
- Public Law 566 Funds

Designed by:
- Anderson - Nichols
- Consulting Engineers

Status:
- Under Construction

Anderson - Nichols Associates, February 1967
## Project: Bloomfield - Coldspring Reservoir  
**Date:** August 7, 1979

**Inspection Party:**  
A. Horwarth, Soil Conservation Service; and A. Roberts,  
V. Galgowski, Department of Environmental Protection

<table>
<thead>
<tr>
<th>Item</th>
<th>Condition</th>
<th>Maintenance or Repairs Required</th>
<th>Date Completed</th>
</tr>
</thead>
<tbody>
<tr>
<td>I. Embankments</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>A. Vegetation</td>
<td>S</td>
<td>Mow grass</td>
<td></td>
</tr>
<tr>
<td>B. Rip rap</td>
<td>S</td>
<td></td>
<td></td>
</tr>
<tr>
<td>C. Drains</td>
<td>S</td>
<td></td>
<td></td>
</tr>
<tr>
<td>II. Principal Spillway</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>A. Trash rack</td>
<td>S</td>
<td></td>
<td></td>
</tr>
<tr>
<td>B. Gates</td>
<td>S</td>
<td></td>
<td></td>
</tr>
<tr>
<td>C. Stilling Basin</td>
<td>S</td>
<td></td>
<td></td>
</tr>
<tr>
<td>D. Conduit</td>
<td>S</td>
<td></td>
<td></td>
</tr>
<tr>
<td>III. Emergency Spillway</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>A. Vegetation</td>
<td>S</td>
<td>Mow grass</td>
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</tr>
<tr>
<td>B. Obstructions</td>
<td>U</td>
<td></td>
<td></td>
</tr>
<tr>
<td>IV. Outlet Channels</td>
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<td></td>
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<tr>
<td>A. Slope protection</td>
<td>S</td>
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<td></td>
</tr>
<tr>
<td>B. Abatis</td>
<td>S</td>
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<td>V. Reservoir Area</td>
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<td>A. Weirs</td>
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<td>B. Stop logs</td>
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<td>VI. Miscellaneous</td>
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</tr>
<tr>
<td>A. Access road</td>
<td>S</td>
<td></td>
<td></td>
</tr>
<tr>
<td>B. Fences</td>
<td>S</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Remarks:** Unauthorized fill dumped in emergency spillway should be removed.  
Eventually, cattail growth in channel in vicinity of the intake structure will have to be removed in order to prevent plugging of conduit.

**Inspected By:** Victor F. Galgowski  
**Title:** Supt. of Dam Maintenance

* S = Satisfactory  
U = Unsatisfactory  
N/A = Not applicable
BIBLIOGRAPHY


PLAN OF DIKE

NOTE:
See Location Plan (Sheet-2) for Location of Dike

TYPICAL SECT
ELEV. Z10.5 APPROX.
ROCK FILL DRAIN UNDER TWO SECTIONS OF DAM (SEE GENERAL PLAN)
GRAVEL MATERIAL REMOVED AND REPLACED INCOMPACTED GRANULAR FILL

ALL SECTION OF DAM

IMPACTED RANDOM FILL

SECTION OF DIKE

NOTE:
ALL ELEVATIONS REFERENCED TO METROPOLITAN DISTRICT DATUM.

REFERENCE:
DESIGN DRAWINGS SUPPLIED BY U.S. SOIL CONSERVATION SERVICE MANSFIELD, CONN.
NOTE:
ALL ELEVATIONS REFERENCED TO METROPOLITAN DISTRICT DATUM.

REFERENCE:
DESIGN DRAWINGS SUPPLIED BY U.S. SOIL CONSERVATION SERVICE MANSFIELD, CONN.
**FD-2**

<table>
<thead>
<tr>
<th>Layer</th>
<th>Description</th>
</tr>
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<tbody>
<tr>
<td>0.0</td>
<td>Soft, black, organic: SILT &amp; PEAT OH-PT.</td>
</tr>
<tr>
<td>2.0</td>
<td>Very soft, red-brown, fibrous PEAT. Pt.</td>
</tr>
<tr>
<td>7.0</td>
<td>Very soft, yellow-brown PEAT. Pt.</td>
</tr>
<tr>
<td>12.0</td>
<td>Very soft, yellow-gray organic SILT. (Resembles Diatomaceous Earth). OH.</td>
</tr>
<tr>
<td>16.6</td>
<td>Medium dense, red-brown sandy GRAVEL. Little silt. GM.</td>
</tr>
<tr>
<td>21.5</td>
<td>Medium dense to dense red-brown, gravelly, sandy SILT - non-plastic (Glacial till). ML.</td>
</tr>
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</table>

**FD-7**

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<th>Layer</th>
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<td>Brown, sandy TOPSOIL. SM.</td>
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<tr>
<td>1.0</td>
<td>Loose, red-brown gravelly silty fine SAND - SM.</td>
</tr>
<tr>
<td>3.0</td>
<td>Dense to very dense, red-brown, silty gravelly SAND. Matrix very slightly plastic (Glacial till). SM.</td>
</tr>
<tr>
<td>13.0</td>
<td>Very dense, greenish-gray, gravelly, silty SAND - few cobbles (Weathered Basalt). SM.</td>
</tr>
<tr>
<td>21.5</td>
<td></td>
</tr>
</tbody>
</table>
ELEVATION

A

Soft, brown to black
PEAT with shells.

Pt

0.0
d:3

Soft, grey, silty
PEAT with shells.

Pt

1.0

So:1.0

Gray-brown:organic
SILT, little peat.
(Resembles Diatomaceous
Earth)

O H

Inorganic silt
content increases
with depth.

27.5

Very stiff, red Brown
Inorganic SILT, very
slightly plastic ML

31.5

NOTES:

1) ALL ELEVATIONS REFERENCED TO METROPOLITAN
   DISTRICT DATUM.

2) SEE SHEET B-1 "GENERAL PLAN" FOR LOCATION
   OF BORINGS.

3) SEE DESIGN DRAWINGS FOR ADDITIONAL
   BORINGS.

REFERENCE:

DESIGN DRAWINGS SUPPLIED BY U.S. SOIL
CONSERVATION SERVICE MANSFIELD, CONN.
APPENDIX C

DETAIL PHOTOGRAPHS
NOTE:
SEE PLAN OF DIKE
(SHEET B-2) FOR
LOCATION OF
PHOTOGRAPH

REFERENCE:
DESIGN DRAWINGS SUPPLIED BY
U.S. SOIL CONSERVATION SERVICE
MANSFIELD, CONN.

COLD SPRING RESERVOIR DAM
BLOOMFIELD, CONNECTICUT
PHOTO 1 - View looking east along top of dam embankment.

PHOTO 2 - View looking west along top of dam embankment
PHOTO 3 - Upstream Channel.

PHOTO 4 - Intake Riser - Slide Gate open. Gate stem bent and gate handle missing.
PHOTO 5 - Principal Spillway Outlet Pipe

PHOTO 6 - Downstream Channel. Note minor channel obstructions.
PHOTO 7 - View looking at inlet end of emergency spillway. Note vehicle use.

PHOTO 8 - View looking south along minor dike.
APPENDIX D

HYDROLOGIC AND HYDRAULIC COMPUTATIONS
TEST FLOOD FLOWS
AND HAZARD CLASSIFICATION

DRAINAGE AREA = 1.94 Sq. Miles

The drainage area can be considered as lying between the ‘flat & coastal’ and ‘rolling’ categories. Assuming a factor of $\frac{950 + \frac{1}{2} (2150 - 950)}{3} = 1350$
from the Corps of Engineers chart,

$$PMF = 1350 \times 1.94$$

= 2620 C.F.S.

SIZE & HAZARD CLASSIFICATION

MAX. HEIGHT OF THE DAM = 20.0'

MAX. IMPOUNDMENT UPTO TOP OF DAM = 1740 AC.FT.

Although the height of the dam is <25 ft., the storage exceeds 1000 AC.FT. Hence,

The size of the dam = ‘Intermediate’

The hazard potential is ‘High’ due to the existence on the downstream side of several important roads including state routes #185 and 218 and a large number of houses and other buildings. Many of these will be flooded in the event of dam failure. There may be ‘more than few’ loss of lives.

As per Table 3 page D-11 of the recommended guidelines for safety inspection of dams, the recommended design flood = PMF = 2620 C.F.S.
SPILLWAY CAPACITY

The spillway consists of the following:

1. 36" RCP (Pipe Inv. 192.5, Weir Inv. 196.0)
2. Emergency spillway 125 ft. at the control section with crest elev. 206.0

The capacities of the spillways at various elevations are tabulated below:

<table>
<thead>
<tr>
<th>ELEV.</th>
<th>PRINCIPAL SPILLWAY</th>
<th>EMERGENCY SPILLWAY Q=3.0 L/Hr</th>
<th>TOTAL</th>
</tr>
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<td>196-0</td>
<td>0.0</td>
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</tr>
<tr>
<td>197-0</td>
<td>60.0</td>
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<tr>
<td>199-0</td>
<td>76.0</td>
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<td>200-0</td>
<td>83.0</td>
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<td>0.0</td>
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<td>118.0</td>
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<td>207-0</td>
<td>123.0</td>
<td>375.0</td>
<td>498.0</td>
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<td>128.0</td>
<td>1061.0</td>
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<td>3580.0</td>
<td>3720.0</td>
</tr>
</tbody>
</table>
SINGHAL ASSOCIATES
CONSULTING ENGINEERS
(CIVIL, HYDRAULICS, SANITARY)

827 MAPLEDALE ROAD, ORANGE, CT 06477
TEL: (203) 795-6562

Job: COLD SPRING DAM
Sheet Number: D-3
Date: 12-22-1980
By: R. S. G. H.

SPILLWAY CAPACITY CURVE

HEIGHT ABOVE WEIR CREST (ELEV 196.0) OF PRINCIPAL SPILLWAY

0  4  8  12  16  20

500  1000  1500  2000  2500  3000  3500  4000

TOTAL SPILLWAY CAPACITY - CFS

500  1000  1500  2000  2500  3000  3500  4000

SPILLWAY CAPACITY - CFS
## Water Surface Areas and Surcharge Storages

<table>
<thead>
<tr>
<th>Reservoir Water Elevation</th>
<th>Height Above Emergency Spillway Crest (ft)</th>
<th>Water Surface Area (Acres)</th>
<th>Surcharge Storage Capacity (Ac-ft)</th>
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</thead>
<tbody>
<tr>
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<td>660.0</td>
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</table>
RESERVOIR SURFACE AREA AND SURCHARGE STORAGE CURVES

WATER SURFACE AREA (ACRES)

140
144
150
156
160
164
170
174
180

SURCHARGE STORAGE (AC. FT.) ABOVE EMERGENCY SPILLWAY CREST (ELEV. 200.0)

0
100
200
300
400
500
600

HEIGHT ABOVE EMERGENCY SPILLWAY CREST (FT.)

0
1
2
3
4

Mapledale Road, Orange, CT 06477
Tel: (203) 795-6652

SINGHAL ASSOCIATES
CONSULTING ENGINEERS
(CIVIL, HYDRAULICS, SANITARY)

827 MAPLEDALE ROAD, ORANGE, CT 06477
TEL: (203) 795-6652

Job: COLD SPRING DAM
Sheet Number: D-5
Date: 12-7-81
By: K. S. / H.
INFLOW FLOOD HYDROGRAPH

TEST FLOOD = 2620 C.F.S. (P.M.F.)
DRAINAGE AREA = 1.94 SQ. MILES.

AS PER 'HYDROLOGY SECTION 4, S.C.S. NATIONAL ENGINEERING HANDBOOK':

\[ q_p = \frac{484 \cdot A \cdot Q}{T_p} \]

AND \[ T_b = 2.67 \cdot T_p \]

WHERE \[ T_b \] = TIME BASE OF HYDROGRAPH IN HOURS
\[ T_p \] = TIME IN HOURS FROM START OF RISE OF HYDROGRAPH TO ATTAINMENT OF PEAK
\[ q_p \] = PEAK RATE OF RUNOFF IN C.F.S.
\[ A \] = DRAINAGE AREA IN SQ. MILES
\[ Q \] = TOTAL VOLUME OF RUNOFF IN INCHES

SUBSTITUTING THE KNOWN VALUES OF \( A, Q \) AND \( q_p \):

\[ 2620 = \frac{484 \times 1.94 \times 19}{T_p} \]

FROM WHICH \[ T_p = 6.8 \] HOURS

AND \[ T_b = 2.67 \times 6.8 \]
\[ = 18.2 \] HOURS

THE TRIANGULAR HYDROGRAPH HAS BEEN DRAWN ACCORDINGLY ON THE NEXT PAGE.
<table>
<thead>
<tr>
<th>TIME (HRS)</th>
<th>INTERVAL ΔT (HRS)</th>
<th>AVERAGE INFLOW RATE (CF/SEC)</th>
<th>AVERAGE INFLOW (AC-FT.)</th>
<th>TRIAL RESERVOIR ELEV. AT END OF ΔT</th>
<th>TRAIL RESERVOIR ELEV. AT END OF ΔT</th>
<th>OUTFLOW RATE (CF/S)</th>
<th>AVERAGE INFLOW DURING ΔT (AC-FT)</th>
<th>AVERAGE STORAGE AS ΔT (AC-FT.)</th>
<th>INCREMENTAL STORAGE AS ΔT (AC-FT.)</th>
<th>TOTAL STORAGE (AC-FT.)</th>
<th>RESERVOIR ELEV END OF ΔT</th>
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<td>9</td>
<td>9</td>
<td>9</td>
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<td>167</td>
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**Notes:**
- MAX INFLOW = 209.05 CF/SEC
- MIN INFLOW = 143.14 CF/SEC
- MAX ELEV = 208.65 FT
- MIN ELEV = 143.14 FT
<table>
<thead>
<tr>
<th>TIME</th>
<th>INTERVAL AT (HRS)</th>
<th>AVERAGE INFLOW RATE (FT/SEC.)</th>
<th>AVERAGE INFLOW (AC. FT.)</th>
<th>TRIAL RESERVOIR ELEVATION AT END OF ΔT. (FT)</th>
<th>OUTFLOW RATE (CFS)</th>
<th>AVERAGE OUTFLOW DURING ΔT (AC. FT.)</th>
<th>INCREMENTAL STORAGE AS (AC. FT.)</th>
<th>TOTAL STORAGE (AC. FT.)</th>
<th>RESERVOIR ELEVATION END OF ΔT. (FT)</th>
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<tbody>
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<td>90</td>
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<td>850</td>
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<td>591</td>
<td>692</td>
<td>-35</td>
<td>154</td>
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</table>
INFLOW HYDROGRAPH

IN \( q_{\text{max}} = 2,620 \text{ CFS} \)

OUTFLOW HYDROGRAPH

OUT \( q_{\text{max}} = 2,143 \text{ CFS} \)

FLOW - CFS

3,200

2,400

1,600

900

0

TIME - HOURS

0

4

8

12

16

20

07%

INFLOW & OUTFLOW HYDROGRAPHS
DAM FAILURE ANALYSIS

As per Corps of Engineers' Guidelines

\[ Q_p = \frac{8}{27} \times W_b \times \frac{1}{3} x \frac{1}{6} \times \frac{1}{3} \]

Where \( Q_p \) = Dam breach peak failure outflow in cfs.

\( W_b \) = Breach width = 40% of dam length at mid-height

\( y_o \) = Height of stream bed to pool level at failure (209.9 ft)

Substituting the values of \( y_o \) and \( W_b \) as 209.9 ft and (0.4 x 1046 = 418.6 ft):

\[ Q_p = \frac{8}{27} \times 416 \times \sqrt[3]{22} \times 18^2 \]

\[ = 58,700 \text{ cfs} \]
<table>
<thead>
<tr>
<th>ELEV  (FT)</th>
<th>D  (FT)</th>
<th>P_w (FT)</th>
<th>A  (SF)</th>
<th>R+ A/P_w (FT)</th>
<th>S  (FT/FT)</th>
<th>V  (FT/SEC)</th>
<th>Q  (CES)</th>
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<td>1.5</td>
<td>70</td>
<td>140</td>
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<td>1.65</td>
<td>230</td>
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<tr>
<td>199.0</td>
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<td>820</td>
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<td>2.67</td>
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<td>255</td>
<td>1740</td>
<td>6.90</td>
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<td>3.77</td>
<td>6435</td>
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<td>25580</td>
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<td>9140</td>
<td>9.83</td>
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<td>4.77</td>
<td>43600</td>
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<td>1010</td>
<td>13100</td>
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<td>216.0</td>
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<td>6.44</td>
<td>92590</td>
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</tbody>
</table>

![Graph](attachment://graph.png)

**Graph Description:**
- **X-axis:** Depth of Flow (FT)
- **Y-axis:** Area (1000 S.F.)
- ** xlabel:** Area (1000 S.F.)
- **ylabel:** Depth of Flow (FT)
- **Q:** Q = 1000 CES
- **Graph Title:** X-SECTION #1 - STA 7+60
### X-SECTION #2 (STA 1140)

<table>
<thead>
<tr>
<th>ELEV (FT)</th>
<th>D (FT)</th>
<th>Pw (FT)</th>
<th>A (S.F)</th>
<th>R = A/Pw (FT/FT)</th>
<th>S (FT/SEC)</th>
<th>V = (1.466 R^0.6) (FT/SEC)</th>
<th>Q (CFS)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1950</td>
<td>2.0</td>
<td>550</td>
<td>640</td>
<td>1.16</td>
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<td></td>
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<tr>
<td>200.0</td>
<td>7.0</td>
<td>815</td>
<td>4280</td>
<td>5.25</td>
<td>1.15</td>
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<td>736</td>
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<tr>
<td>205.0</td>
<td>12.0</td>
<td>940</td>
<td>8440</td>
<td>9.19</td>
<td>3.14</td>
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<td>13440</td>
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<tr>
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<td>13440</td>
<td>12.97</td>
<td>4.39</td>
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- **A** - 1000 S.F
- **Q** - 1000 CFS
- **Depth of Flow** (FT)
- **Depth of Flow** (24)
- **Q** - 1000 CFS
- **A** - 1000 S.F
<table>
<thead>
<tr>
<th>ELEV. (FT)</th>
<th>D (FT)</th>
<th>Pw (FT)</th>
<th>A (SF)</th>
<th>R/F</th>
<th>S (FT/FT)</th>
<th>V (2.5' sec)</th>
<th>Q (CF/s)</th>
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<td>560</td>
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<td>1.0</td>
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### X-SECTION #4 (STA. 28+0)

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<th>Pw (FT)</th>
<th>A (SF)</th>
<th>R (FT/FT)</th>
<th>S (FT/SEC)</th>
<th>V (SF/SEC)</th>
<th>Q (CFS)</th>
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<td>0.0006</td>
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<td>5.84</td>
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</tbody>
</table>

---

### Depth of Flow (FT)

- 0  | 4  | 8  | 12  | 16  | 20  |
- 0  | 4  | 8  | 12  | 16  | 20  |
- 0  | 4  | 8  | 12  | 16  | 20  |
- 0  | 4  | 8  | 12  | 16  | 20  |
- 0  | 4  | 8  | 12  | 16  | 20  |

---

### G - 1000 CFS

A - 1000 S.F.
DAM FAILURE FLOOD ROUTING

X-SECTION #1 (STA. 7+60)

FOR $Q_p = 55,700$ CFS.

$H_1 = 18.6'$ AND $A_1 = 10657 \text{ SF}$

REACH LENGTH $= 760'$

STORAGE $= 10657 \times 760 / 43560 = 186 \text{ AC. FT}$

$Q_p2 = Q_p \left( 1 - \frac{186}{1530} \right) = 55700 \times 0.878 = 48900 \text{ CFS}$

$H_2 = 17.2'$ AND $A_2 = 9805 \text{ SF}$

STORAGE $= 9805 \times 760 / 43560 = 171 \text{ AC. FT}$

AVG. STORAGE $= \frac{1}{2} (171 + 186) = 178.5 \text{ AC. FT}$

$Q_p3 = Q_p \left( 1 - \frac{178.5}{1530} \right) = 55700 \times 0.883 = 49200 \text{ CFS}$

$H_3 = 17.2'$

Routed Flow $= 49700 \text{ CFS}$.

Post-Failure Flood Elevation $= 193.5 + 17.2 = 210.7$ (SAY 211.0)

Pre-Failure Flow $= 2140 \text{ CFS}$.

Flow Depth $= 5.5'$

AND Flood Elevation $= 193.5 + 5.5 = 199.0$

Rise in Flood Stage $= 211.0 - 199.0$

$= 12.0'$

NUMBER OF HOUSES FLOODED:

Before Failure $= 0$

After Failure $= 4$
DAM FAILURE FLOOD ROUTING

Y-SECTION #2 (STA. 1140)

FOR \( Q_1 \): 49,200 CFS

\( Q_1 = H_1 \) = 13.4' AND \( A_1 = 10,050 \) SF

REACH LENGTH = 340'

STORAGE = \( \frac{100,500 \times 340}{43560} \) = 78 AC FT.

\( Q_2 = Q_1 \left( \frac{1 - 78}{1530} \right) = 49200 \times 0.949 = 46700 \) CFS

\( H_2 = 13.1' \) AND \( A_2 = 9730 \) SF

STORAGE = \( \frac{9730 \times 340}{43560} \) = 74 AC FT.

AVG. STORAGE = \( \frac{1}{2} \left( 74 + 78 \right) = 77 \) AC FT.

\( Q_3 = Q_2 \left( \frac{1 - 77}{1530} \right) = 49200 \times 0.949 = 46700 \) CFS

\( H_3 = 13.1' \)

ROUTED FLOW IS = 46700 CFS

POST FAILURE FLOOD ELEVATION = 193.0 + 13.1

= 206.1

PRE-FAILURE FLOW = 2140

FLOW DEPTH = 2.6'

AND FLOOD ELEVATION = 193.0 + 2.6

= 195.6

RISE IN FLOOD STAGE = 206.1 - 195.6

= 10.5'

NUMBER OF HOUSES FLOODED:

BEFORE FAILURE = 2

AFTER FAILURE = 7
FOR $Q_p = 46700$ CFS,

$H_1 = 11.37'$ AND $A_1 = 10230$ SF.

REACH LENGTH = 900 FT.

STORAGE VOLUME = $10230 \times 900 / 13560 = 711$ AC-FT.

$Q_{p2} = Q_p \left(1 - \frac{211}{1530}\right) = 46700 \times 0.862 = 40250$ CFS

$H_2 = 10.55'$ AND $A_2 = 9280$ SF.

STORAGE = $9280 \times 900 / 13560 = 192$ AC-FT.

AVG. STORAGE = $\frac{1}{2} (192 + 211) = 202$ AC-FT.

$Q_{p3} = Q_p \left(1 - \frac{202}{1530}\right) = 46700 \times 0.868 = 40500$ CFS.

AND $H_3 = 10.6'$

ROUTED FLOW = 40500 CFS.

POST. FAILURE FLOOD ELEVATION = $191.5 + 10.6$

= 202.0' (+)

PRE. FAILURE FLOW = 2140 CFS

FLOW DEPTH = 3.0'

AND FLOOD ELEVATION = $191.5 + 3.0$

= 194.5

RISE IN FLOOD STAGE = 202.0 - 194.5 = 7.5'

NUMBER OF HOUSES FLOODED:

BEFORE FAILURE = 3

AFTER FAILURE = 9
FOR \( Q_1 = 40,500 \) CFS
\[ H_1 = 11.93 \text{'} \quad \text{AND} \quad A_1 = 9340 \text{ SF} \]
Reach Length = 800'
Storage = \( 9340 \times 800/43,560 = 172 \text{ AC. FT.} \)
\[ Q_2 = Q_1 \left( 1 - \frac{172}{1530} \right) = 40,500 \times 0.988 = 39,900 \text{ CFS} \]
\[ H_2 = 11.3 \text{'} \quad \text{AND} \quad A_2 = 8605 \text{ SF} \]
Storage = \( 8605 \times 800/43,560 = 158 \text{ AC. FT.} \)
Avg. Storage = \( \frac{1}{2} \left( 158 + 172 \right) = 165 \text{ AC. FT} \)
\[ Q_3 = Q_1 \left( 1 - \frac{165}{1530} \right) = 40,500 \times 0.892 = 36,000 \text{ CFS} \]
\[ \text{AND} \quad H_3 = 11.3 \text{'} \]
Routed Flow = 36,000 CFS
Post-Failure Flood Elevation = 191.0 + 11.3 = 202.3
SAY 202.5 ±

Pre-Failure Flow = 2140 CFS
Flow Depth = 4.0'
AND Flood Elevation = 191.0 + 4.0 = 195.0

Rise in Flood Stage = 202.5 - 195.0
\[ = 7.5 \text{'} \]

Number of Houses Flooded:
Before Failure = 4
After Failure = 20
APPENDIX E

INFORMATION AS CONTAINED IN

THE NATIONAL INVENTORY OF DAMS
### INVENTORY OF DAMS IN THE UNITED STATES

<table>
<thead>
<tr>
<th>STATE IDENTITY NUMBER</th>
<th>STATE</th>
<th>COUNTY</th>
<th>NAME</th>
<th>LATITUDE (NORTH)</th>
<th>LONGITUDE (WEST)</th>
<th>REPORT DATE DAY</th>
<th>REPORT DATE MO</th>
<th>REPORT DATE YR</th>
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<tbody>
<tr>
<td>CT 094</td>
<td>CT</td>
<td>007</td>
<td>COLD SPRING RESERVOIR DAM</td>
<td>41°49'30&quot;</td>
<td>72°46'0&quot;</td>
<td>0</td>
<td>0</td>
<td>0</td>
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#### POPULAR NAME
- COLD SPRING RESERVOIR

#### REGION
- 01

#### RIVER OR STREAM
- NORTH BRANCH TUMBLEDOWNT]

#### CITY-TOWN-VILLAGE
- BROOK BLOOMFIELD

#### DIST DOWN FED R PRIV/FED $C8 A VER/DATE
- NED N N N N B

#### TYPE OF DAM
- RC

#### YEAR COMPLETED
- 1968

#### PURPOSES
- C

#### HYDRO PROJECT DATA
- Hyrc

#### IMPOUNDING CAPACITIES
- ACH = 138

#### REMARKS

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<tr>
<th>DUSE</th>
<th>SPILLWAY</th>
<th>MAXIMUM DISCHARGE (F.F.)</th>
<th>VOLUME OF DAM (CY)</th>
<th>POWER CAPACITY</th>
<th>NAVIGATION LOCKS</th>
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<tr>
<td>1</td>
<td>1000</td>
<td>125</td>
<td>3720</td>
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#### OWNER
- STATE OF CT FED

#### ENGINEERING BY
- USDA SCS

#### CONSTRUCTION BY
- UNKNOWN

#### REGULATORY AGENCY
- DESIGN

#### CONSTRUCTION
- NONE

#### OPERATION
- NONE

#### MAINTENANCE
- NONE

#### INSPECTION BY
- GROUNDING < OPERA INC

#### INSPECTION DATE
- 10/09/84

#### AUTHORITY FOR INSPECTION
- PL92-367

#### REMARKS

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