



1.0



1.1



1.25



1.5



1.4



2.5



2.2



2.0



1.8



1.6

2.8

3.15

3.6

4.0

4.5

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**CHICOPEE RIVER BASIN
LUDLOW, MASSACHUSETTS**

**LUDLOW DAM
MA00547
AND
CHERRY VALLEY DAM
MA00548**

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



**DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION, CORPS OF ENGINEERS
WALTHAM, MASS.**

AUGUST 1978

UNCLASSIFIED

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19. KEY WORDS (Continue on reverse side if necessary and identify by block number) DAMS, INSPECTION, DAM SAFETY, Chicopee River Basin Ludlow, Massachusetts Broad Brooks		
20. ABSTRACT (Continue on reverse side if necessary and identify by block number) Both dams are of the earthfill type with a vertical spilling wall along their centerlines. Ludlow Dam is about 440 ft. long and 27 ft. high. The other is about 1400 ft. long and 38 ft. high. Both are in good condition. Since the dams could be possibly overtopped should a full PMF occur, additional investigation by a qualified consultant should be conducted in order for the dams to be able to pass a full PMF without overtopping.		

LUDLOW & CHERRY VALLEY DAMS

MA 000547 & MA 000548

CHICOPEE RIVER BASIN
LUDLOW, MASSACHUSETTS

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

NATIONAL DAM INSPECTION PROGRAM
PHASE I INSPECTION REPORT

Identification No.: Mass. #547, #548
Name of Dam: Ludlow & Cherry Valley Dams
Town: Ludlow
County and State: Hampden County, Massachusetts
Stream: Higher, Axe Factory, Roaring & Broad Brooks
Date of Inspection: 16 December 1977, 8 June 1978

Ludlow and Cherry Valley Dams confine the waters of Springfield Reservoir. Both dams, which were built in approximately 1877, are of the earth fill type with a vertical spiling wall along their centerlines. Ludlow dam on the southern side of the reservoir, has an approximate maximum height above the downstream toe of about 27 feet, has a 40-foot top width, and is approximately 440 feet long. Ludlow Dam has no spillway. Cherry Valley Dam on the easterly side of the reservoir, is about 38 feet high, has a 25 foot top width and is approximately 1400 feet long. The spillway is located at the southern end of the dam and has a net length of about 56 feet.

Ludlow and Cherry Valley Dams, which impound Springfield Reservoir, are in good condition. Based upon visual inspections, the reservoir dams are maintained in good operating condition with a continual maintenance program.

The Phase I analysis indicates that the Cherry Valley spillway has a capacity equal to 53 percent of the estimated "maximum probable" discharge which is approximately equivalent to the Standard Project Flood.

In the event of sudden failure of the Cherry Valley Dike, it was estimated that the impact area could extend about 2.5 miles downstream, with a flood wave in the order of 15 feet in depth, and possibly effecting about 30 residences, and several bridges. If the failure occurred at

the Ludlow Dam, it was estimated that the impact area could extend about 3 miles downstream, with a flood wave estimated between 5 to 10 feet in depth, that could possibly affect about 25 residences, 2 schools and 4 road bridges.

Since the dams could be possibly overtopped should a full PMF occur, additional investigation by a qualified consultant should be conducted in order for the dams to be able to pass a full PMF without overtopping. However, because of the relatively large spillway capacity, the small depth of overtopping, and the apparent good condition, this investigation is recommended as low priority.

The owner however, should within two to four years, ensure the operation of the sluice gate structure and make repairs, if needed, for it to be fully operable. Also, operation and maintenance procedures as mentioned in Section 7.3.b. should be implemented.

Gregory T. Buteau
GREGORY T. BUTEAU, P. E.
Massachusetts Registration #27567

This Phase I Inspection Report on Ludlow Dam and Cherry Valley Dam 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 judgment and practice, and is hereby submitted for approval.

Charles G. Tiersch

CHARLES G. TIERSCH, Chairman
Chief, Foundation and Materials Branch
Engineering Division

Fred J. Ravens, Jr.

FRED J. RAVENS, Jr., Member
Chief, Design Branch
Engineering Division

Saul Cooper

SAUL COOPER, Member
Chief, Water Control Branch
Engineering Division

APPROVAL RECOMMENDED:

Joe B. Fryar

JOE B. FRYAR
Chief, Engineering Division

PREFACE

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

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

It is important to note that the condition of a dam depends on numerous and constantly changing internal and external conditions, and is evolutionary in nature. It would be incorrect to assume that the present condition of the dam will continue to represent the condition of the dam at some point in the future. Only through 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.

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APPENDIX	A	Visual Inspection List
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APPENDIX	C	Photographs
APPENDIX	D	Hydrologic/Hydraulic Computations
APPENDIX	E	Inventory Forms



Photograph #1

Cherry Valley Dam & Spillway



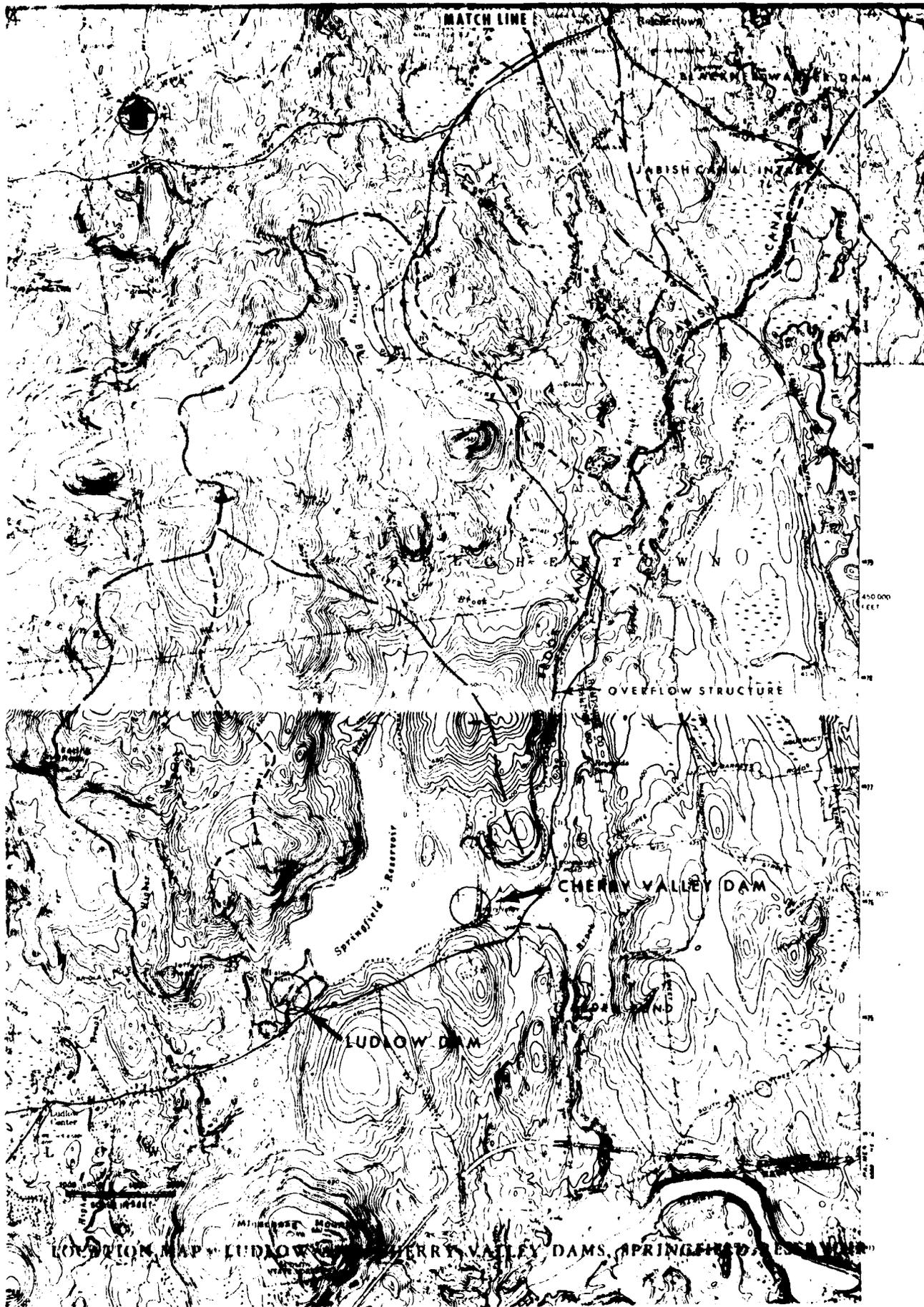
Photograph #2

Ludlow Dam
Upstream View of Right Abutment



Photograph #3

Ludlow Dam - Downstream
View on Southerly Side
of Route 21





LOCATION MAP LUDLOW AND GIBBY VALLEY DAMS, SPRINGFIELD RESERVOIR
MATCH LINE

PHASE I INSPECTION REPORT
LUDLOW & CHERRY VALLEY DAMS
MA 000547 & MA 000548

SECTION 1: PROJECT INFORMATION

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.

b. Purpose.

(1) Perform technical inspection and evaluation of non-Federal dams to identify conditions which threaten the public safety and thus permit correction in a timely manner by non-Federal interests.

(2) Encourage and assist the states to initiate quickly effective dam safety programs for non-Federal dams.

(3) To update, verify and complete the National Inventory of Dams.

1.2 Description of Project.

a. Location. The Springfield Reservoir, which is impounded by the Cherry Valley and Ludlow Dams, is located approximately 2 miles north of the intersection of Broad Brook and the Chicopee River in the Chicopee River's Basin. The reservoir is shown on U.S.G.S. Quadrangle, Ludlow, Mass., in Hampden County, and is approximately 5 miles northeast of Ludlow, Mass.

b. Description of Dam and Appurtenances. Two dams confine the waters of Springfield Reservoir. Ludlow Dam is located at the southern side of the reservoir and Cherry Valley Dam is located along the easterly side of the reservoir. Both dams are of the earth filled type with a vertical spiling wall along their centerlines. An overall view of the entire project is shown on the location map.

Ludlow Dam. This is the main downstream dam in a series of three dams on the southern edge of the reservoir. The other two dams upstream of Ludlow Dam, separate the reservoir from the Settling Basin and the Settling Basin from the Filter Basin as shown on an old drawing in Appendix B. Ludlow Dam has an approximate maximum height above the downstream toe of about 27 feet, has a 40-foot top width, and is approximately 440 feet long.

The distribution system for this water supply reservoir consists of 24 inch and 36 inch diameter mains.

The controls for the 24 inch main are located in a gate house on the top upstream side of the dam. The controls for the 36 inch main are located about 150 feet downstream of the gate house on the dam embankment. No spillway exists at the Ludlow Dam.

Cherry Valley Dam. This dam on the easterly side of the reservoir is about 38 feet high, has a 25 foot top width and is approximately 1400 feet long. The spillway is located at the southern end of the dam and has a net length of about 56 feet.

No other outlets exist for the Cherry Valley Dam, however a repair project for the dam in 1939 resulted in the upstream grouting of a 20 inch drain pipe located perpendicular to the centerline of the dam at the dam's lowest point. Also, the repair project in 1939 resulted in the removal and plugging of a 54 inch wrought iron pipe on the downstream side of the dam which was parallel to the longitudinal axis.

c. Size Classification. With dam heights of 27 feet (Ludlow) and 38 feet (Cherry Valley) and with storage at the top of dams at approximately 8,300 acre feet, the category classification is INTERMEDIATE.

d. Hazard Classification

Ludlow Dam. Along the flow path of Higher Brook downstream of Ludlow Dam are several single family residences on Miller Street and on Route 21. Two schools (Veterans Park School and a high school) are located near High Brook about two and one half miles downstream of the dam.

Cherry Valley Dam. Three quarters of a mile downstream of the dam and spillway is located Alden Pond, a recreation pool. About a dozen single family units are located near the water surface around the perimeter of this pond.

Based upon the above potential loss of life and economic loss, the dams are in the HIGH HAZARD category.

e. Ownership. The dam is owned by the City of Springfield, Board of Water Commissioners.

f. Operator. Mr. Edward Golden is the full-time superintendent at Ludlow Reservoir employed by the Board of Water Commissioners. The office phone number at the project is 413-583-3909.

g. Purpose. The purpose of the reservoir is for domestic water supply for the Town of Ludlow. Previously, the reservoir was a source of water supply to the City of Springfield.

h. Design and Construction History. The only design data available consists of plan views and centerline profiles of the dams as enclosed in Appendix B. Original drawings for the dams are dated for the year 1877.

The spillway at Cherry Valley Dam was enlarged to its present width in 1910. Sluffing at the downstream slope of Cherry Valley Dam between the old streambed and right abutment occurred during the September 1938 flood.

This reach, extending from the spillway to the left bank of the old brook bed was repaired and strengthened by adding a gravel berm on the downstream slope and flattening the slope from a 1 on 2 to a 1 on 2.5. No problems with slope stability have been noted since the 1938 event. Also, the 20 inch diameter iron drain pipe extending through the lowest part of the dam was grouted and the 54 inch diameter iron pipe laid through the downstream slope parallel to the centerline of the dam was plugged and removed as part of the 1939 repair.

1. Normal Operational Procedures. The Springfield Reservoir is normally maintained at a pool elevation of 373.6 feet msl, using 20 inches of flashboards atop the 45-foot concrete ogee spillway, and 6-foot stop logs on top of the two 2'4" wide vertical sluice gates at the Cherry Valley Dam. Invert at the sluice gates is approximately 355 msl. The sluice gate has not been operated for many years and the ability to raise the sluice gates to lower the pool is questionable.

At the base of Ludlow Dam, 24 inch and 36 inch diameter pipes are controlled by hand valves which regulates the gravity flow estimated at 1.5 MGD into the water supply system.

There is no regulation for flood control purposes at this project.

1.3 Pertinent Data.

a. Drainage Area. The drainage area at the dam is 10.8 square miles of which 6.5 square miles is directed into the reservoir via a 2.5 mile long Broad Brook Canal. Also, the flow from an additional 11.2 square mile Jabish Brook is drained into the reservoir from April through October via the Jabish Canal and the Broad Brook Canal. The Jabish Brook flow is controlled by two 3 x 3 foot gates at the head of Jabish Canal intake. From approximately October to April flow from the Jabish Brook flows over the Blackner-Walker Dam.

b. Discharge at Dam Site. There are no discharge records available for the project. The largest known floods in this area of Massachusetts occurred in March 1936, September 1938 and August 1955. A flood plain study conducted for the Chicopee River basin indicates that the September 1938 event was the worst of record. Review of U.S. Geological Survey records of streams in the area indicate that Springfield Reservoir probably experienced an inflow of about 110 cubic feet per second per square mile of drainage area.

Excess flows are generally passed over the 56-foot long overflow and spillway section at the southerly end of the 1,400 foot Cherry Valley Dam. A spillway and sluice rating curve are shown in Appendix D. With a pool elevation 379 feet msl, the total spillway capacity is about 3,300 cfs.

c. Elevation (feet above MSL)*

	<u>Ludlow Dam</u>	<u>Cherry Valley Dam</u>
1. Top Dam	379.0 [±]	379.0 [±] - 380.0 [±]
2. Maximum pool-design surcharge	unknown	unknown
3. Full flood control pool	none	none
4. Recreation pool	none	none
5. Spillway crest (gated)	none	none
6. Upstream portal invert diversion tunnel	none	none
7. Streambed at centerline of dam	359.0 [±]	339.0 [±]
8. Maximum tailwater	n.a.	n.a.
9. Spillway Crest	n.a.	3/1.9
10. Spillway Crest with flashboards	n.a.	3/3.6
11. Water Supply Intake		
24-inch diameter pipe.	350.0 [±]	n.a.
36-inch diameter pipe.	351.0 [±]	n.a.

* Some drawings in Appendix B use a City Base datum that is 27.11 feet higher than the mean sea level datum.

	<u>Ludlow Dam</u>	<u>Cherry Valley Dam</u>
d. <u>Reservoir</u>		
1. Length of maximum pool	1.5 miles \pm	1.1 miles \pm
2. Length of recreation pool	n.a.	n.a.
3. Length of flood control pool	n.a.	n.a.
e. <u>Storage (acre-feet)</u>		
1. Recreation pool	none	none
2. Flood control pool	none	none
3. Design surcharge	unknown	unknown
4. Top of dam	8,300 approx.	8,300 approx.
5. Spillway Crest - Elevation 371.9	5,500 approx.	5,500 approx.
6. Spillway Crest with flashboards Elevation 373.6	6,150 approx.	6,150 approx.
f. <u>Reservoir Surface (acres)</u>		
1. Top dam Elevation 379.	455 approx.	455 approx.
2. Maximum pool	370 approx.	370 approx.
3. Flood-control pool	n.a.	n.a.
4. Spillway Crest	370 approx.	370 approx.
5. Spillway Crest with flashboards	390 approx.	390 approx.

g. Dam

1. Widlow Dam

- a. Type - Earth fill w/vertical stone masonry spiling wall
- b. Length - 440 \pm
- c. Height (above streambed at downstream toe) 27 \pm
- d. Top width - 40 ft.
- e. Side Slopes - U/S 1 on 2
D/S 1 on 2 and 1 on 8
- f. Zoning - unknown
- g. Impervious Core - unknown
- h. Cutoff - stone masonry spiling wall
- i. Grout curtain - unknown

2. Cherry Valley Dam

- a. Type - Earth fill w/vertical stone masonry spiling wall
- b. Length - 1400 \pm
- c. Height (above streambed at downstream toe) 38 \pm ft.
- d. Top width - 25 ft.
- e. Side slopes U/S 1 on 2
D/S 1 on 2.5 H $>$ 20 \pm ft.
D/S 1 on 2 H \leq 20 \pm ft.
- f. Zoning - Unknown
- g. Impervious Core - Unknown
- h. Cut-off Stone masonry spiling wall
- i. Grout Curtain - unknown

h. Spillway. The spillway section consists of a 45-foot concrete ogee weir at elevation 371.9 feet msl, two 2' 4" wide sluice gate sections with invert at elevation 355 feet msl and closed with stop logs from about elevation 362.5 to elevation 373.9 feet msl, and a 7-foot wide masonry overflow structure at 373.9 feet msl. The flashboards for the 45-foot concrete ogee weir provide pool control to elevation 373.6 feet msl. For purposes of this report the net spillway length was considered 56 feet and an assumed C coefficient of 3.2 was used in estimating the stage-capacity relation for the spillway.

The upstream approach channel is in good condition and flares from a 58-foot width at the spillway to over 75 feet about 50 feet upstream. The downstream channel falls abruptly in rock cut from elevation 374 at the crest to elevation 350 in the waste channel. The stilling basin consists of a rock cut in ledge outcrop. The spillway was modified and enlarged to its present dimensions just after the September 1938 flood.

i. Regulating Outlets. As previously discussed the 20" pipe at the valley of Cherry Valley was plugged in 1939 and the sluice gates at the same dam have not been operated in many years. The condition and the ability to operate these sluice gates is questionable.

SECTION 2: ENGINEERING DATA

2.1 Design. Design data available for the embankments consists of plan view original ground surveys and centerline profiles showing elevation of the top of dam, original ground, general excavation line, and base of masonry spiling wall. The plan views show only the embankment footprint with the toe of slope line. There are no cross sections of the original dams to show material zoning or type of materials used. There is no data available on seepage and stability analyses or adopted design values for the foundations or embankments. A drawing in Appendix B shows the plan and sections for the enlargement of the spillway at Cherry Valley Dam in 1910. Also, in Appendix B another drawing shows the area of sluff on the downstream slope of Cherry Valley Dam with the plan and cross-sections of the repairs made after the 1938 flood. This repair added a gravel berm, blind drains, and weep pipes to stabilize the slope.

2.2 Construction. There are no construction records other than the plans described above and the inspection report after the 1939 repairs to the Board of County Commissioners dated March 3, 1939 by James L. Tighe in Appendix B.

2.3 Evaluation.

a. Availability. There is not sufficient data available for stability or seepage analyses. For a rational analysis boring information is required for the embankment and foundations soils in order to assign realistic values of shear strength, unit weights, void ratios and permeability of the embankment and foundation soils.

b. Adequacy. There is no foundation boring data available. There is no embankment materials data available.

SECTION 3: VISUAL INSPECTION

3.1 Findings.

a. General: The overall project appeared well maintained. The state has inspected the project periodically. Copies of past inspection reports are found in Appendix B. Deficiencies that have been noted by the state in the past have apparently been corrected in a proper and efficient manner. However, it appears that operation of the sluice gates at the Cherry Valley Dam is questionable.

b. Ludlow Dam. There was no evidence of problems with Ludlow Dam or the two upstream dams that separate the filter and settling pools. A minor amount of seepage with soft ground was noted between the dam and the highway located approximately 300 feet below the dam. Water was found bubbling up near a culvert passing under Route 21, downstream of the dam. Further investigation by the superintendent and others revealed the source to be an old catch basin for the drainage layout of old Rte. 21, that had not been plugged with reconstruction of the road. There was no evidence of problems with the two upstream dams that separate the filter and settling pools.

Cherry Valley Dam. There is no evidence of instability of the dam at the present time. Slumping of the downstream slope between the right abutment and the old streambed occurred in September 1938. This area was repaired and the embankment strengthened from the right abutment to the left bank of the old stream by the addition of a 10 foot gravel berm on a 1 on 2.5 slope. Where the height of dam exceeds 25 feet in this reach, and additional 10 feet wide berm with a 1 on 1.5 slope extends to

the embankment toe. Some seepage was noted emerging from the toe of the dam in the old streambed area. Seepage water was running clear with no indication of fines migrating. Numerous woodchuck den burrows were noted on the downstream slope of the dam. Reservoir water was about 6 feet below the dam crest.

A shallow surface drainage ditch parallel to and downstream of the toe of the dam extends along the left valley wall to the brook channel.

A 6-inch clay pipe running from the direction of the toe of dam discharges into the ditch. The pipe was discharging a stream about 1-inch in diameter. A small boil was noted in the drainage ditch just downstream of the 6-inch pipe.

c. Appurtenant Structures.

1. No apparent problems were observed in the spillway area at Cherry Valley Dam. The spillway approach and discharge channels were free of obstruction.

2. The outlet controls and drawdown consists of two 2'-4" x 6'-3" sluice gates located at the spillway for Cherry Valley Dam. The gates as indicated by the drawing in Appendix B are manually operated by rack and pinion controls. The invert of the sluiceways are 19 feet below the spillway crest or at approximately Elev. 355 msl. The rack and pinion gate controls are rusted and the timber gate stems are deteriorated. It does not appear that the gates have been operated for some considerable time.

d. Reservoir Area. The reservoir along the perimeter of the dam was well maintained. All small trees and brush are cleared some distance above the waterline.

c. Downstream Channel. There is no outlet channel downstream of the dam. A water course exists that leads local drainage to the Higher Brook drainage system. In the event of a breach in the Ludlow Dam the water would flow over Route 21 through an undeveloped area to Miller Street bridge. It would then continue through a swamp area to another street bridge near two schools. These schools are about 2.5 miles downstream of the dam and could conceivably experience some inundation in the event of a breach in the main dam. This flood prone area was not inspected.

The main outlet channel exists downstream of the spillway and sluice gate at Cherry Valley Dam. Downstream of the spillway a channel with about a 15 foot bottom width, 2 on 1 side slopes, and a depth of about 8 feet, leads the discharge of the spillway to Route 21 bridge. At Route 21 two 3 x 3 foot box conduits carry flows under the roadway through an undeveloped area into Alden Pond. This pond is used for recreation and about a dozen winterized houses line the banks of the pond. Broad Brook continues from the pond to the Chicopee River through mostly undeveloped areas.

f. Canals. Supplemental water supply is fed into the Springfield Reservoir through two canals, the Jabish-Broad Brook Canal and the Higher Brook Canal. These canals follow hillside contours and were constructed by hillside cut using the excavated channel material to build a low side retaining dike.

The Broad Brook Canal Dike is about 10-12 ft. wide at the top with side slopes approximately 1 on 1. The height of the dike varies with steepness

of the hillside slope to a maximum height of about 15 feet. Two houses facing State Route 21, north of intersection of the state road with Bondsville Road, are situated right at the toe of the 15 foot high dike.

Water in the canal is flowing about 2.5 to 3.0 feet below the top of the dike. At high pool stage, the canal will overtop before the main dams.

Approximately 7000 feet upstream of the reservoir on Broad Brook Canal, an overflow structure is located. This structure is experiencing leakage and seepage on its left (north) side.

3.2 Evaluation. The overall project appeared well maintained and in good condition. The appurtenant structures appeared in good condition and the embankments appeared stable and maintained free from trees and brush. The amount of seepage from the toe at Cherry Valley Dam did not appear excessive. The rodent holes found on the downstream slope of Cherry Valley Dam does not appear serious but should be continued to be filled regularly. The canals should be monitored in times of heavy rains, particularly in those areas where the dike is closely located near houses.

SECTION 4: OPERATIONAL PROCEDURES

4.1 Procedures. This project is operated primarily for domestic water supply. The system is maintained full except during necessary drawdown for water supply. Normal and excessive flows are passed over the spillway and through a 5-foot wide by 8-foot high opening in Broad Brook Canal dike. The invert elevation of this opening is approximately one foot higher than the spillway flashboards or about 374 feet msl. This diversion directs flow to the lower Broad Brook drainage system outside the reservoir area.

From April through October the water from an additional 11.2 square mile Jabish Brook flows in to the reservoir by way of the Jabish-Broad Brook Canal. Generally, during winter, the Jabish Canal intake is closed and the flow completely passes over the Blackner-Walker Dam towards Alden Pond.

4.2 Maintenance of Dam and Dike. All periodic maintenance is performed under the direction of the dam superintendent for the Board of Water Commissioners in Springfield.

4.3 Maintenance of Operating Facilities. The dam and associated structures are well maintained. As noted previously, operation of the Cherry Valley sluice gates is questionable.

4.4 Warning System. During periods of high flow the dam superintendent patrols the structures periodically.

4.5 Evaluation. Although the reservoir system is well maintained, the ability to drawdown the reservoir by operation of the Cherry Valley sluice gates should be ensured.

SECTION 5: HYDRAULIC/HYDROLOGIC

5.1 Evaluation of Features.

a. Design Data. There is no known design data available.

b. Experienced Data. Historical hydrologic data consists of daily reservoir pool elevations and precipitation at Ludlow Dam. The maximum known pool elevation occurred in September 1938. During this event a portion of Broad Brook Canal dike was overtopped and high flows from the upper 6.5 square mile watershed were diverted to a sparsely developed area of Broad Brook. Also, sluffing of a downstream section of the Cherry Valley Dam occurred at this time.

As a result of the 1955 storm, repairs were made to the Jabish-Broad Brook Canal Dike.

c. Visual Observation. All operating components (the dams, the dike and spillway) appeared in good condition at time of inspection. With the exception of the questionable operation of the sluice gates, no obstructions were noted.

d. Overtopping Potential. Based on a New England Regional Guide Curve for Probable Maximum Flood, a peak of 8,200 cfs or 1,900 cfs/square mile was selected for the 4.3 square mile lower basin area. In addition 1,000 cfs is estimated as the maximum contribution from the 6.5 square mile upper basin via Broad Brook Canal. The PMF inflow for the Springfield Reservoir is therefore estimated to be about 9,200 cfs. In designing the spillway at the two Corps of Engineers' Barre Falls and Conant Brook Dams, in the Chicopee River basin, the PMF's were computed to be 1,200 and 1,500 cfs/square mile, respectively. Due to the size classification of the project (INTERMEDIATE), and the hazard potential (HIGH), according to the 1977 Guidelines, the full PMF was selected as the spillway design test

flood (SDF). It was estimated that based on size of the pool relative to size of watershed, the reduction in inflow to outflow by surcharge storage would be about 3,000 cfs. The resulting peak outflow would then be 6,200 cfs and the water surface at the reservoir would be about 380 feet msl, or about 1 foot over the top of the dams. This would represent about 500 cfs flow over the main dam to Higher Brook and 5,700 cfs flow over the Cherry Valley dike and spillway to Broad Brook.

e. Dam Failure Analysis.

1. Cherry Valley Dike. A superficial dam failure analysis was made of Cherry Valley Dam assuming the reservoir filled to top of dam, a 40 percent dam breach width, and a breach depth equal to the height of dam above streambed. It was further assumed that downstream road bridges would fail and not significantly modify or magnify the resulting dam failure discharge.

The peak dam failure outflow was estimated at about 60,000 cfs producing a 15 to 20 foot flood wave downstream. This flood wave would extend downstream for a distance of about 2 miles to the junction of Broad Brook with the Chicopee River. Within this reach it was estimated that about 30 residential structures and 3 road bridges would be seriously affected.

2. Ludlow Dam. A minimal dam failure analysis was also made at Ludlow Dam, utilizing similar assumptions that were used in paragraph (e 1).

The peak dam failure outflow was estimated at about 33,000 cfs, producing a 5 to 10 foot flood wave downstream. This flood wave would extend for a distance of about 3 miles along the path of Higher Brook. Within this reach it is estimated that about 25 residential structures, 2 schools and 4 road bridges would be impacted.

SECTION 6: STRUCTURAL STABILITY

6.1 Evaluation of Structural Stability.

a. Visual Observations. From a visual inspection both dams appeared stable under the conditions observed at the time of inspection. Seepage did not appear to be excessive. The rodent dens on the downstream slope of Cherry Valley Dam did not appear to present a serious problem but should be filled and rodents discouraged from future burrowing. Since both dams are earthfill dams, they will not withstand sustained periods of overtopping without serious erosion problems and possibly a complete failure. However, the stone masonry spiling wall that extends within 2 feet of the dam crest would help to retard the erosion process below the wall.

b. Design and Construction Data. The design data available shows only the overall dimensions of the dams, the original ground, and footing elevation of the spiling wall. There is no foundation exploration data available for stability and seepage analyses. There is no construction data available except for the downstream berm added in 1938.

c. Operating Records. Slumping of the downstream on Cherry Valley Dam slope indicates there probably was a seepage or saturation problem near the right abutment. In this area the dam ranged from about 27 to 38 feet high. In this area gravel berms were added. These berms would tend to prevent the emergence of seepage on the slope and increase the seepage path. They also increase the safety factor of stability of the downstream slope. In the reach where no modification has been made to the original 1 on 2 slope, the maximum height of the dam is about 21 feet.

d. Post Construction Changes. No problems or repairs were found to have occurred with the Ludlow Dam. In 1910 the spillway was enlarged, but is still not capable of handling the PMF. The gravel berm added in 1938 appears to have solved the downstream slump problem.

e. Seismic Stability. This dam is located in seismic probability zone 2. Under Corps of Engineer's guidelines, seismic stability does not have to be investigated for dams in Zone 2.

SECTION 7: ASSESSMENT, RECOMMENDATION & REMEDIAL MEASURES

7.1 Dam Assessment.

a. Condition. Ludlow and Cherry Valley Dams, which are located at the Springfield Reservoir, have been in operation for over 100 years and have experienced three known floods for the years 1936, 1938, and 1955.

Based upon visual inspections, the reservoir dams are maintained in good operating condition with an on-going maintenance program.

The flood events cited above produced flows of 600 (1936), 1,200 (1938) and 1,000 (1955) cfs. The September 1938 flood produced some problems of overtopping at the canal dike and sluffing on the downstream side of Cherry Valley. These problems were corrected and when the reservoir system was exposed to the 1955 flood of approximately 1000 cfs, no known problems were encountered on the Cherry Valley Dam. However, some areas of the Jabish-Broad Brook canal were overtopped and repaired as a result of the 1955 event.

Based on a cursory phase I analysis of both dams at the Springfield Reservoir, it was determined that the existing spillway has a capacity of about 3,300 cfs, equal to 53 percent of the estimated "maximum probable flood" discharge, which is approximately equivalent to the Standard Project Flood. The spillway has sufficient capacity to discharge one-half the maximum probable flood which is equivalent to the Standard Project Flood.

In the event of sudden failure of the Cherry Valley Dike, it was estimated that the impact area could extend about 2.5 miles downstream, with a flood wave in the order of 15 feet in depth, and possibly effecting about 30 residences, and several bridges. If the failure occurred at the

Ludlow Dam, it was estimated that the impact area could extend about 3 miles downstream, with a flood wave estimated between 5 to 10 feet in depth, that could possibly affect about 25 residences, 2 schools and 4 road bridges.

b. Adequacy of Information. The information available is such that the assessment of the dams is based primarily on visual inspection and the past operational performance of the structure.

c. Urgency. It is recommended that additional investigations be given a low priority at this time because of the relatively large spillway capacity, the small depth of overtopping and the apparent good condition of the project. It is further recommended that suggestions in Section 7.2 be implemented.

7.2 Recommendations.

a. Additional engineering investigations should be conducted by a qualified consultant, in order for the dams to be able to pass the full PMF.

b. The owner should have the operation of the sluice gate structure investigated by a qualified consultant and repairs made, if needed, within two to four years to make the structure operational.

7.3 Remedial Measures.

a. Alternatives. None.

b. Operation and Maintenance Procedures.

The following items are suggested to be accomplished by the owner within two to four years as a result of the Phase I analysis for the Springfield Reservoir system:

1. Repair of the Broad Brook canal dike in the vicinity of the overflow structure to eliminate excessive seepage as noted in Section 3.1.f.

2. A formal operational procedure should be developed in the event of an emergency, which should include a formal warning system and evacuation plan. This procedure should include a plan of surveillance particularly during periods of unusually heavy rains, since the dams are upstream of populated areas. The area surveyed should include homes near the canal dike particularly the area cited in Section 3.1.f.

APPENDIX A

APPENDIX E-2
VISUAL INSPECTION CHECK LIST
PARTY ORGANIZATION

PROJECT Springfield Reservoir, Ludlow and
Cherry Valley Dams

DATE: 12/16/77 & 6/8/78

TIME Approx. 9:30 A.M.-3:00 P.M.

WEATHER 12/16/77 Clear, Cold, 3-6"
snow on ground, approx.
30° ± F; 6/8/78 Thunder-
showers, approx. 70°F.

PARTY:

- | | |
|--|--|
| 1. <u>J. Aiken - NED, F&M Br.**</u> | 6. <u>A. MacCallum, Mass. DEOE *</u> |
| 2. <u>G. Buteau - NED, Civil Eng.**</u> | 7. <u>H. Shumway, Mass. DPW, Dist #2 *</u> |
| 3. <u>M. Michielutti - NED, WCB *</u> | 8. <u>J. Iagallo, Mass. DEOE***</u> |
| 4. <u>F. Broderick - City of Sfld, Water Dep**</u> | 9. <u>W. Blanchard, Mass. DPW, Dist #2 *</u> |
| 5. <u>E. Golden - Supt. for Sfld Reservoir</u> | 10. _____ |

PROJECT FEATURE	INSPECTED BY	REMARKS
1. <u>Ludlow Dam</u>	<u>J. Aiken</u>	} Features #1,2,3,4 on 12/16/77
2. <u>Cherry Valley Dam</u>	<u>G. Buteau</u>	
3. <u>Overflow Structure - Broad Crook Canal</u>	<u>M. Michielutti</u>	
4. <u>Jabish Canal Intake</u>		
5. <u>Broad Brook Canal</u>	<u>Aiken, Buteau</u>	} Features #1,2,3,5 on 6/8/78
6. _____		
7. _____		
8. _____		
9. _____		
10. _____		

* Attended inspection on 12/16/77
** Attended inspections on both 12/16/77 and 6/8/78
*** Attended inspection on 6/8/78

PERIODIC INSPECTION CHECK LIST

PROJECT Springfield Reservoir

DATE 12 Dec. 1977, 8 June 1978

PROJECT FEATURE Ludlow Dam Embankment

NAME Inspection Team

DISCIPLINE _____

NAME _____

AREA EVALUATED	CONDITIONS
<u>DAM EMBANKMENT</u> - Ludlow Dam	
Crest Elevation	379 ±
Current Pool Elevation	373 ± on 12/16/77
Maximum Impoundment to Date	Unknown
Surface Cracks	None Observed
Pavement Condition	No Pavement
Movement or Settlement of Crest	None Observed
Lateral Movement	None Observed
Vertical Alignment	Appears good
Horizontal Alignment	Appears Good
Condition at Abutment and at Concrete Structures	Good
Indications of Movement of Structural Items on Slopes	None Observed
Trespassing on Slopes	None Observed
Sloughing or Erosion of Slopes or Abutments	None Observed
Rock Slope Protection - Riprap Failures	None Observed
Unusual Movement or Cracking at or near Toes	None Observed
Unusual Embankment or downstream Seepage	Ground at valley at toe of D/S slope and toe of north side of Rte 21 road embankment, wet & soggy.
Piping or Boils	Water boiling up through grate of abandoned catch basin on north side of Route 21.
Foundation Drainage Features	
Toe Drains	Unknown
Instrumentation System	None

PERIODIC INSPECTION CHECK LIST

PROJECT Springfield Reservoir

DATE 16 Dec.'77, 8 Jun '78

PROJECT FEATURE Cherry Valley Dam

NAME Inspection Team

DISCIPLINE _____

NAME _____

AREA EVALUATED	CONDITION
<u>DAM EMBANKMENT</u> - Cherry Valley Dam	
Crest Elevation	El. 379.5 - 380.0 ± msl
Current Pool Elevation	El. 373 ± on 12/16/78
Maximum Impoundment to Date	Unknown
Surface Cracks	None Observed
Pavement Condition	Poor-Deteriorated surface treatment
Movement or Settlement of Crest	None Observed
Lateral Movement	None Observed
Vertical Alignment	Good
Horizontal Alignment	Good
Condition at Abutment and at Concrete Structures	Good
Indications of Movement of Structural Items on Slopes	None Observed
Trespassing on Slopes	Burrow holes (woodchucks) on D/S slopes
Sloughing or Erosion of Slopes or Abutments	None observed
Rock Slope Protection - Riprap Failures	No failures observed
Unusual Movement or Cracking at or near Toes	None Observed
Unusual Embankment or Downstream Seepage	Some seepage at D/S toe at old streambed reported in past inspection reports.
Piping or Boils	Small boil beyond 6 inch drain pipe.
Foundation Drainage Features	Unknown - see Dwg for 1939 Repairs
Toe Drains	One 6 inch drain pipe observed
Instrumentation System	None

PERIODIC INSPECTION CHECK LIST

PROJECT Springfield Reservoir

DATE 12/16/77 & 6/8/78

PROJECT FEATURE Gate House - Ludlow Dam

NAME Inspection Team

DISCIPLINE _____

NAME _____

AREA EVALUATED	CONDITION
- CONTROL TOWER	
a. Concrete and Structural	Masonry - good condition
General Condition	Masonry - good condition
Condition of Joints	Good
Spalling	N/A
Visible Reinforcing	N/A
Rusting or Staining of Concrete	N/A
Any Seepage or Efflorescence	N/A
Joint Alignment	N/A
Unusual Seepage or Leaks in Gate Chamber	None Observed
Cracks	None observed
Rusting or Corrosion of Steel	None Observed
b. Mechanical and Electrical	Not applicable.
Air Vents	A mechanical system operates to pump water from Settling Basin to Filter Beds above the location of Ludlow Dam.
Float Wells	
Crane Hoist	
Elevator	
Hydraulic System	
Service Gates	
Emergency Gates	
Lightning Protection System	
Emergency Power System	
Warning and Lighting System in Gate Chamber	

PERIODIC INSPECTION CHECK LIST

PROJECT Springfield Reservoir

DATE 12/16/78 & 6/8/78

PROJECT FEATURE _____

NAME Inspection Team

DISCIPLINE _____

NAME _____

AREA EVALUATED	CONDITION
<p><u>OUTLET WORKS - TRANSITION AND CONDUIT</u></p> <p>General Condition of Concrete</p> <p>Rust or Staining on Concrete</p> <p>Spalling</p> <p>Erosion or Cavitation</p> <p>Cracking</p> <p>Alignment of Monoliths</p> <p>Alignment of Joints</p> <p>Numbering of Monoliths</p> <p>Other:</p> <p>Overflow Structure - Broad Brook Canal</p> <p>Broad Brook Canal</p> <p>Jabish Canal - Intake gates</p>	<p>N/A</p> <p>Leakage noted on north side of structure</p> <p>Side slope varies. Some areas on the canal from the reservoir to Rte 21 have a steep side slope (1 on 1 or less) whose toe abuts residential properties. In these areas cited, the height of the dike from the toe is approximately 15-20 ± feet. These areas should be observed in times of heavy rains.</p> <p>Appeared well maintained.</p>

PERIODIC INSPECTION CHECK LIST

PROJECT Springfield Reservoir

DATE 12/16/78 & 6/8/78

PROJECT FEATURE Emergency Spillway at
Cherry Valley Dam

NAME Inspection Team

DISCIPLINE _____

NAME _____

AREA EVALUATED	CONDITION
<p><u>OUTLET WORKS - OUTLET STRUCTURE AND OUTLET CHANNEL</u> - None, other than sluice gates at Cherry Valley Emergency Spillway.</p> <p>General Condition of Channel</p> <p>Rust or Staining</p> <p>Spalling</p> <p>Erosion or Cavitation</p> <p>Visible Reinforcing</p> <p>Any Seepage or Efflorescence</p> <p>Condition at Joints</p> <p>Drain holes</p> <p>Channel</p> <p>Loose Rock or Trees Overhanging Channel</p> <p>Condition of Discharge Channel</p>	<p>N/A</p>

PERIODIC INSPECTION CHECK LIST

PROJECT Springfield Reservoir

DATE 12/16/78 & 6/8/78

PROJECT FEATURE Cherry Valley Dam

NAME Inspection Team

DISCIPLINE _____

NAME _____

AREA EVALUATED	CONDITION
<p><u>OUTLET WORKS - SPILLWAY WEIR, APPROACH AND DISCHARGE CHANNELS</u></p>	
<p>a. Approach Channel</p>	
<p>General Condition</p>	<p>Good to excellent - clear of debris and trees.</p>
<p>Loose Rock Overhanging Channel</p>	<p>None observed</p>
<p>Trees Overhanging Channel</p>	<p>None observed</p>
<p>Floor of Approach Channel</p>	<p>Not observed - under water.</p>
<p>b. Weir and Training Walls</p>	
<p>General Condition of Concrete</p>	<p>Good--Fair with flashboards in top of weir (12/16/77) & 6" of water flowing over crest on 6/8/78.</p>
<p>Rust or Staining</p>	<p>None Observed</p>
<p>Spalling</p>	<p>None Observed</p>
<p>Any Visible Reinforcing</p>	<p>None Observed</p>
<p>Any Seepage or Efflorescence</p>	<p>None Observed</p>
<p>Drain Holes</p>	<p>None Observed</p>
<p>c. Discharge Channel</p>	
<p>General Condition</p>	<p>Clear of trees and debris</p>
<p>Loose Rock Overhanging Channel</p>	<p>None observed</p>
<p>Trees Overhanging Channel</p>	<p>None Observed</p>
<p>Floor of Channel</p>	<p>Good Condition</p>
<p>Other Obstructions</p>	<p>None observed</p>

note

PERIODIC INSPECTION CHECK LIST

Springfield Reservoir

DATE 16 Dec. '77, 8 Jun '78

OBJECT FEATURE Cherry Valley Dam

NAME: Inspection Team

DISCIPLINE

NAME:

AREA EVALUATED	CONDITION
<u>DAM EMBANKMENT</u> - Cherry Valley Dam	
Crest Elevation	El. 379.5 - 380.0 ± msl
Current Pool Elevation	El. 373 ± on 12/16/78
Maximum Impoundment to Date	Unknown
Surface Cracks	None Observed
Pavement Condition	Poor-Deteriorated surface treatment
Movement or Settlement of Crest	None Observed
Lateral Movement	None Observed
Vertical Alignment	Good
Horizontal Alignment	Good
Condition at Abutment and at Concrete Structures	Good
Indications of Movement of Structural Items on Slopes	None Observed
Trespassing on Slopes	Burrow holes(woodchucks) on D/S slopes
Sloughing or Erosion of Slopes or Abutments	None observed
Rock Slope Protection - Riprap Failures	No failures observed
Unusual Movement or Cracking at or near Toes	None Observed
Unusual Embankment or Downstream Seepage	Some seepage at D/S toe at old streambed reported in past inspection reports.
Piping or Boils	Small boil beyond 6 inch drain pipe.
Foundation Drainage Features	Unknown - see Dwg for 1939 Repairs
Toe Drains	One 6 inch drain pipe observed
Instrumentation System	None

PERIODIC INSPECTION CHECK LIST

Kingfield Reservoir

DATE 12 Dec. 1977, 8 June 1978

FEATURE Ludlow Dam Embankment

NAME Inspection Team

LINE

NAME

AREA EVALUATED	CONDITIONS
DAM EMBANKMENT - Ludlow Dam	
Crest Elevation	379 ±
Current Pool Elevation	373 ± on 12/16/77
Maximum Impoundment to Date	Unknown
Surface Cracks	None Observed
Pavement Condition	No Pavement
Movement or Settlement of Crest	None Observed
Lateral Movement	None Observed
Vertical Alignment	Appears good
Horizontal Alignment	Appears Good
Condition at Abutment and at Concrete Structures	Good
Indications of Movement of Structural Items on Slopes	None Observed
Trespassing on Slopes	None Observed
Sloughing or Erosion of Slopes or Abutments	None Observed
Rock Slope Protection - Riprap Failures	None Observed
Unusual Movement or Cracking at or near Toes	None Observed
Unusual Embankment or Downstream Seepage	Water boiling up through grate on abandoned catch basin on north side of Route 21. Ground at Valley at toe of D/S slope and toe of north side of Route 21 road embankment, wet and soggy.
Piping or Boils	-
Foundation Drainage Features	-
Toe Drains	Unknown
Instrumentation System	None

APPENDIX B

The Commonwealth of Massachusetts

EXECUTIVE OFFICE OF ENVIRONMENTAL AFFAIRS
DEPARTMENT OF ENVIRONMENTAL QUALITY ENGR.
DIVISION OF WATERWAYS

Board of Water Commissioners
City of Springfield
Court Street
Springfield, Ma.

100 Nashua Street, Boston 02111

March 7, 1977

Re: Inspection Dam #2-7-161-6
Springfield Water Works
Ludlow Reservoir
Ludlow, Ma.

Dear Sir:

On April 30, 1976, an Engineer from the Massachusetts Department of Public Works made a visual inspection of the above dam. Our records indicate the owner to be Board of Water Commissioners-Springfield. If this information is incorrect will you please notify this office.

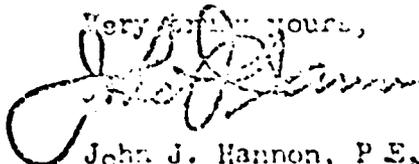
The inspection was made in accordance with the provisions of Chapter 253 of the Massachusetts General Laws as amended (Dams Safety Act). Chapter 705 of the Acts of 1975 transferred the jurisdiction of the so-called "Dams Safety Program" to the Commissioner of the Department of Environmental Quality Engineering.

The results of the inspection indicate that this dam is safe; however, the following conditions were noted that require attention:

The structure appears to be in good order.

We call these conditions to your attention before they become serious and more expensive to correct. With any correspondence please include the number of the Dam as indicated above.

Very truly yours,



John J. Hannon, P.E.
Chief Engineer

cc: Francis J. Hoe
Russell Sacks
etc

INSPECTION REPORT - DAMS AND RESERVOIRS

LOCATION:

City/Town Ludlow, County Hampden, Dam No. 2-7-161-6

Name of Dam Springfield Water Works - Ludlow Reservoir - Higher Brook Dam
Mass. Sect.

Topo Sheet No. 15A, Coordinates: N 438,500, E 347,200

Date

Inspected by: Harold T. Shumway, On April 30, 1976 Last Inspection 2-27-74

OWNER/S: As of April 30, 1976

per: Assessors _____, Reg. of Deeds _____, Prev. Insp. X, Per. Contact X

City of Springfield Attn.: Mr. Brodrick, Supervising Engineer
1 Board of Water Comm., City Hall, Court Street, Springfield, Mass.
Name St. & No. City/Town State Tel. No.

2. _____
Name St. & No. City/Town State Tel. No.

3. _____
Name St. & No. City/Town State Tel. No.

CARETAKER: (if any) e.g. superintendent, plant manager, appointed by
absentee owner, appointed by multi owners.

Mr. Edward Golden
Supt. Ludlow Reservoir, 1149 Center Street, Ludlow, Mass.
Name St. & No. City/Town State Tel. No.

DATA:

No. of Pictures Taken None, Sketches See description of Dam.
Plans, Where At Water Dept. office - File No. 08-7 dated 1907 and
others.

DEGREE OF HAZARD: (if dam should fail completely)*

- 1. Minor _____
- 2. Moderate _____
- 3. Severe _____
- 4. Disastrous X

Abnormal high water would flood both Ludlow High School and an
Comments: Elementary school. 2.2 billion gallons plus capacity of basins
upper and lower - which hold another 31 million gallons.

*This rating may change as land use changes (future development).

6) OUTLETS: OUTLET CONTROLS AND DRAWDOWN

In center of southwesterly or downstream basin -
 No. 1 Location and Type: Granite stone gatehouse and intake well for a 36" and a 24" main.

Controls yes, TYPE: Gate valves and slide gates.

Automatic . Manual X. Operative Yes X, No .

Additional gates downstream. Plus blow-off. Also gates on up-
 Comments: stream sluiceway etc., leading into basins from Reservoir and filters

No. 2 Location and Type: 150' + south of gatehouse - gate well.

Controls yes, Type: Gate valve for 36" main.

Automatic . Manual X. Operative Yes X, No .

Comments: All controls in good working order per Mr. Golden, Supt. of Ludlow Reservoir

No. 3 Location and Type:

Controls , Type:

Automatic . Manual . Operative Yes , No .

Comments:

Drawdown present Yes X, No . Operative Yes X, No .

Comments: See Ludlow Reservoir Overflow Spillway No. 2-7-161-6A.

7) DAM UPSTREAM FACE: Slope 2:1, Depth Water at Dam 12' to 15'

Material: Turf X. Brush & Trees . Rock fill . Masonry . Wood

Other Rock paved slope.

Condition: 1. Good X. 3. Major Repairs

2. Minor Repairs . 4. Urgent Repairs

Comments: This is for southwesterly embankment of southwesterly basin. Top of embankment 40' wide with roadway along top. Other embankments also well maintained and appear safe.

8) DAM DOWNSTREAM FACE: Slope 8:1 variable

Material: Turf X. Brush & Trees . Rock Fill . Masonry . Wood

Other

Condition: 1. Good X. 3. Major Repairs

2. Minor Repairs . 4. Urgent Repairs

Comments: See comments under Item #7 above. On 2 northerly embankments

9. EMERGENCY SPILLWAY: Available yes . Needed _____.

Height Above Normal Water: 4' to 5' Ft.

Width 100 ± Ft. Height 2 Ft. Material Earth _____.

Condition: 1. Good X _____.

3. Major Repairs _____.

2. Minor Repairs _____.

4. Urgent Repairs _____.

Comments: See also Cherry Valley Dam No. 2-7-161-6A.

10. WATER LEVEL AT TIME OF INSPECTION: 8 Ft. Above _____ . Below X _____.

Top Dam X _____ F.L. Principal Spillway _____.

Other _____.

Normal Freeboard 4' to 8' Ft. varies with demand for water.

11. SUMMARY OF DEFICIENCIES NOTED:

Growth (Trees and Brush) on Embankment None found _____.

Animal Burrows and Washouts None found _____.

Damage to Slopes or Top of Dam None found _____.

Cracked or Damaged Masonry None found _____.

Evidence of Seepage None found _____.

Evidence of Piping None found _____.

Leaks None found _____.

Erosion None found _____.

Trash and/or Debris Impeding Flow None found _____.

Clogged or Blocked Spillway None found _____.

Other None found _____.

OVERALL CONDITION:

1. Safe X
2. Minor repairs needed _____
3. Conditionally safe - major repairs needed _____
4. Unsafe _____
5. Reservoir impoundment no longer exists (explain)
Recommend removal from inspection list _____

REMARKS AND RECOMMENDATIONS: (Fully Explain)

The embankment slopes separating the main reservoir from the upper basin, the embankment between the upper and lower basins, and the southerly embankment at the lower end of the Lower basin, which is the main dam embankment, are all in good condition and appear safe. The stone paving appears stable, and the earthen slopes are well turfed and mowed over.

All gate controls, while old, are well maintained and in working order.

This entire installation appears to be well maintained and in a satisfactory condition.

See also Dam Inspection Report for Cherry Valley Dam No. 2-7-161-6A.

HTS/bk

INSPECTION REPORT DAMS AND RESERVOIRS

LOCATION:

City/Town Ludlow County Hampden Dam No. 2-7-161-6

Name of Dam Springfield Water Works, Ludlow Reservoir Dam

Mass. Sect.

Topo Sheet No. 15A Coordinates: N 438,500, E 347,200

Inspected by: R. C. Salls, P.E., On Feb. 27, 1974. Date Last Inspection Aug. 1970.

OWNER/S: As of 1972

per: Assessors X, Reg. of Deeds _____, Prev. Insp. _____, Per. Contact X

1. City of Springfield Attn: Mr. Brodrick, Supervising Engineer
Board of Water Commissioners, City Hall Court Street Springfield, Mass.

Name St. & No. City/Town State Tel. No.

2. Name St. & No. City/Town State Tel. No.

3. Name St. & No. City/Town State Tel. No.

CARETAKER: (if any) e.g. superintendent, plant manager, appointed by
 absentee owner, appointed by multi owners.

Mr. Edward Golden
Supt. Ludlow Reservoir 1149 Center Street Ludlow, Mass.

Name St. & No. City/Town State Tel. No.

4. DATA: See Files at Water Dept. Office
 No. of Pictures Taken None Sketches See description of Dam.
 Plans, Where at Water Dept. Office - File No. 08-7 Dated 1907 and others

5. DEGREE OF HAZARD: (if dam should fail completely)*
 1. Minor _____ 3. Severe _____
 2. Moderate _____ 4. Disastrous X

Comments: Abnormal high water would flood Ludlow High School and a Grammar School being
built adjacent both are built on filled ground where Pond used to be.
 *This rating may change as land use changes (future development).

5. OUTLETS: OUTLET CONTROLS AND DRAWDOWN

No. 1 Location and Type: In center of southwesterly or downstream basin - Granite stone gatehouse and intake well for a 36" & a 24" main.
 Controls Yes, TYPE: Gate valve and slide gates

Automatic . Manual X. Operative Yes X, No .

Comments: Additional gates downstream. Plus blow off
Also gates on upstream sluiceway etc. leading into basin from Reservoir

No. 2 Location and Type: and filters.

Controls , Type:

Automatic . Manual . Operative Yes , No .

Comments:

No. 3 Location and Type:

Controls , Type:

Automatic . Manual . Operative Yes , No .

Comments:

Drawdown present Yes X, No . Operative Yes X, No .

Comments: See Ludlow Reservoir Overflow Spillway

6. DAM UPSTREAM FACE: Slope 2:1, Depth Water at Dam 12 - 15'

Material: Turf . Brush & Trees . Rock fill . Masonry . Wood .

Other Rock cover on slope

Condition: 1. Good X. 3. Major Repairs .

2. Minor Repairs . 4. Urgent Repairs .

Comments: This is for southwesterly embankment of southwesterly basin top of embankment 40' Wide with Roadway

DAM DOWNSTREAM FACE: Slope Roughly 8:1

Material: Turf X. Brush & Trees . Rock Fill . Masonry . Wood .

Other

Condition: 1. Good X. 3. Major Repairs .

2. Minor Repairs . 4. Urgent Repairs .

(9) EMERGENCY SPILLWAY: Available Yes. Needed No.

Height Above Normal Water 4 to 5 Ft.

Width 100± Ft. Height 2 Ft. Material Earth.

Condition: 1. Good X. 3. Major Repairs _____.

2. Minor Repairs _____. 4. Urgent Repairs _____.

Comments: See also Cherry Valley Dam No. 2-7-161-6A

(10) WATER LEVEL AT TIME OF INSPECTION: 8 Ft. Above _____. Below X.

Top Dam X F.L. Principal Spillway _____.

Other _____.

Normal Freeboard 4 to 8 Ft. Varies with demand for water

(11) SUMMARY OF DEFICIENCIES NOTED:

Growth (Trees and Brush) on Embankment None.

Animal Burrows and Washouts None found.

Damage to Slopes or Top of Dam None seen.

Cracked or Damaged Masonry None.

Evidence of Seepage None observed.

Evidence of Piping None observed.

Leaks None observed.

Erosion None observed.

Trash and/or Debris Impeding Flow None.

Clogged or Blocked Spillway None.

Other _____.

12.

OVERALL CONDITION:

1. safe X
2. Minor repairs needed _____
3. Conditionally safe - major repairs needed _____
4. Unsafe _____
5. Reservoir impoundment no longer exists (explain)
Recommend removal from inspection list _____

13.

REMARKS AND RECOMMENDATIONS: (Fully Explain)

This is the dam and intake works for the Ludlow Reservoir of the Springfield Water Works which blocks off the flow of Higher Brook and closes off the low area on the southwesterly corner of the reservoir. Here also, incorporated into this dam are the storage basins for the water which has passed through the sand filters and the intake well and gatehouse for the water mains leading to the distributors system.

The various embankments making up the basins and the dam, while very old, are in satisfactory condition. The rock cover on all waterside slopes was generally in good shape with an even surface and few displaced stones. All turfed areas were mowed and otherwise well taken care of. The gatehouse and other masonry work was in good shape. The valves in the gatehouse were very old and the operating hand stand was of a type which we had not seen before and which was apparently manufactured around 1900 or earlier. These valves are all in operating condition and are backed up by stop logs on the gate well and additional gates and controls on the outlet water mains and by gates and controls on the upstream basins.

This entire installation appeared to be well maintained and in satisfactory condition.

KCS/Js/rt

DESCRIPTION OF DAM

DISTRICT 2

Submitted by R. G. Salls, P.E. Dam No. 2-7-161-6

Date February 27, 1974 ~~City~~/Town Ludlow

Name of Dam Springfield Water Works Ludlow Reservoir Dam

See also Ludlow Reservoir Overflow Spillway "Cherry Valley Dam" No. 2-7-161-6A

1. Location: Topo Sheet No. 15A ~~Ass. Rect.~~ Coordinates N 438,500 E 347,200

Provide $8\frac{1}{2}$ " x 11" in clear copy of topo map with location of Dam clearly indicated.

About 100 to 600' northerly of Center Street "Route 21" (Belchertown Road)

about $2\frac{1}{4}$ miles easterly from Ludlow Center

2. Year built around 1877 Year/s of subsequent repairs UNK

Purpose of Dam: Water Supply Recreational _____
Flood Control _____ Irrigation _____ Other _____

4. Drainage Area: 10.8 sq. ~~mi.~~ See Note Below acres.
Type: City, Bus. & Ind. _____ Dense Res. _____ Suburban _____ Rural, Farm 10
Wood & Scrub Land 90% Slope: Steep 35% Med. 35% Slight 30%

In addition water is fed into Reservoir from Jabish Brook Watershed ($9\frac{1}{2}$ Sq. Miles Area)

5. through Jabish - Broad Brook Canal.
Normal Ponding Area: 39 $\frac{1}{2}$ Acres; Ave. Depth 12 - 15'
Impoundment: 193 gals.; 592.5 acre ft.
Silted in: Yes No _____ Approx. Amount Storage Area 10%

6. No. and type of dwellings located adjacent to pond or reservoir Supt's. home only
i.e. summer homes etc. Some residences over look Reservoir.

Dimensions of Dam: Length 400' Max. Height 18' to 25'

Freeboard 4 to 8' Varies

Spillways: Upstream Face 2:1 Slope Cover

Embankment

Earth X Conc. Masonry _____ Stone Masonry _____
Timber _____ Rockfill _____ Other _____

8A.

Dam Type: Gravity X Straight X Curved, Arched _____ Other _____
Overflow _____ Non-overflow _____

Series of settling basins - See Note Below

9.

A. Description of present land usage downstream of dam:

85 % rural; 15 % urban

B. Is there a storage area or flood plain downstream of dam which could accommodate the impoundment in the event of a complete dam failure? Yes X No _____

C. Character Downstream Valley: Narrow _____ Wide X Developed Partly
Rural 85% Urban 15%

10.

Risk to life and property in event of complete failure.

No. of people 20 - 30 If flood reached school during session

No. of homes 4 - 5

No. of businesses None

No. of industries None Type _____

No. utilities 4 Type Quabbin Chicopee Aqueduct

Springfield Water Mains

Railroads None Electric and Telephone Lines

Other dams Harris Pond Dam #2-7-161-9 Small Ponds at Ludlow Gun Club and around Ludlow High School Complex.

Other Ludlow High School and a Grammar School being constructed adjacent Route 21 and after Townways.

11.

Attach Sketch of dam to this form showing section and plan on 8 $\frac{1}{2}$ " x 11" sheet

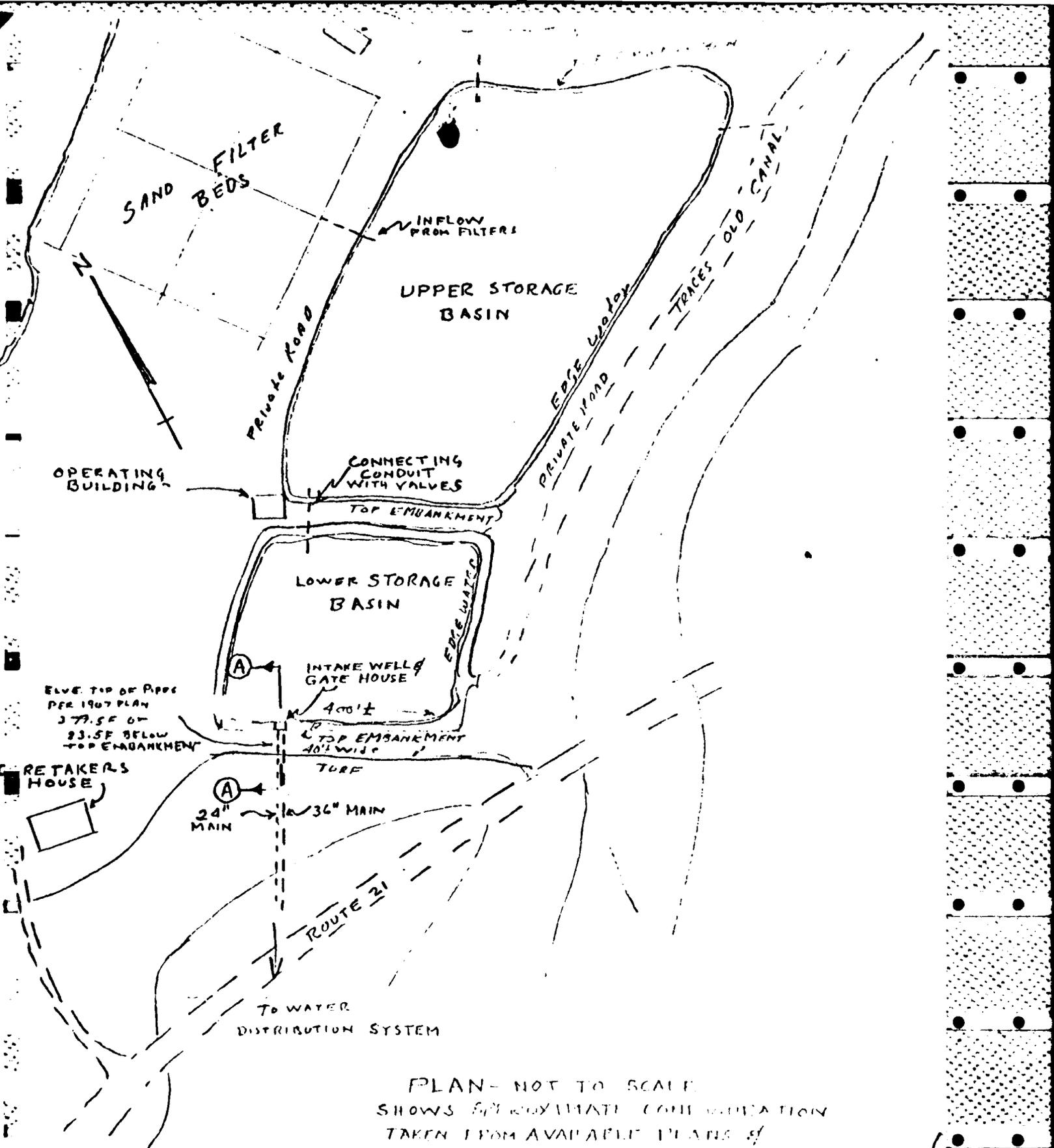
RCS/vk/rt

Attachments

Locus Plan

Sketches

Note: Tops of embankment here are higher than the embankment of the Cherry Valley Dam #2-7-161-6A.



OPERATING BUILDING

SAND FILTER BEDS

UPPER STORAGE BASIN

CONNECTING CONDUIT WITH VALVES

LOWER STORAGE BASIN

INTAKE WELLS GATE HOUSE

400'±
TOP EMBANKMENT 40' WIDE

RETAKERS HOUSE

24" MAIN

36" MAIN

ROUTE 21

To WATER DISTRIBUTION SYSTEM

PLAN - NOT TO SCALE
SHOWS APPROXIMATE CONFIGURATION
TAKEN FROM AVAILABLE PLANS &
FIELD OBSERVATIONS

Handwritten signature
Feb

DAM NO 2-7-1496

CSU PROJECT

High Hill

RESENOIR

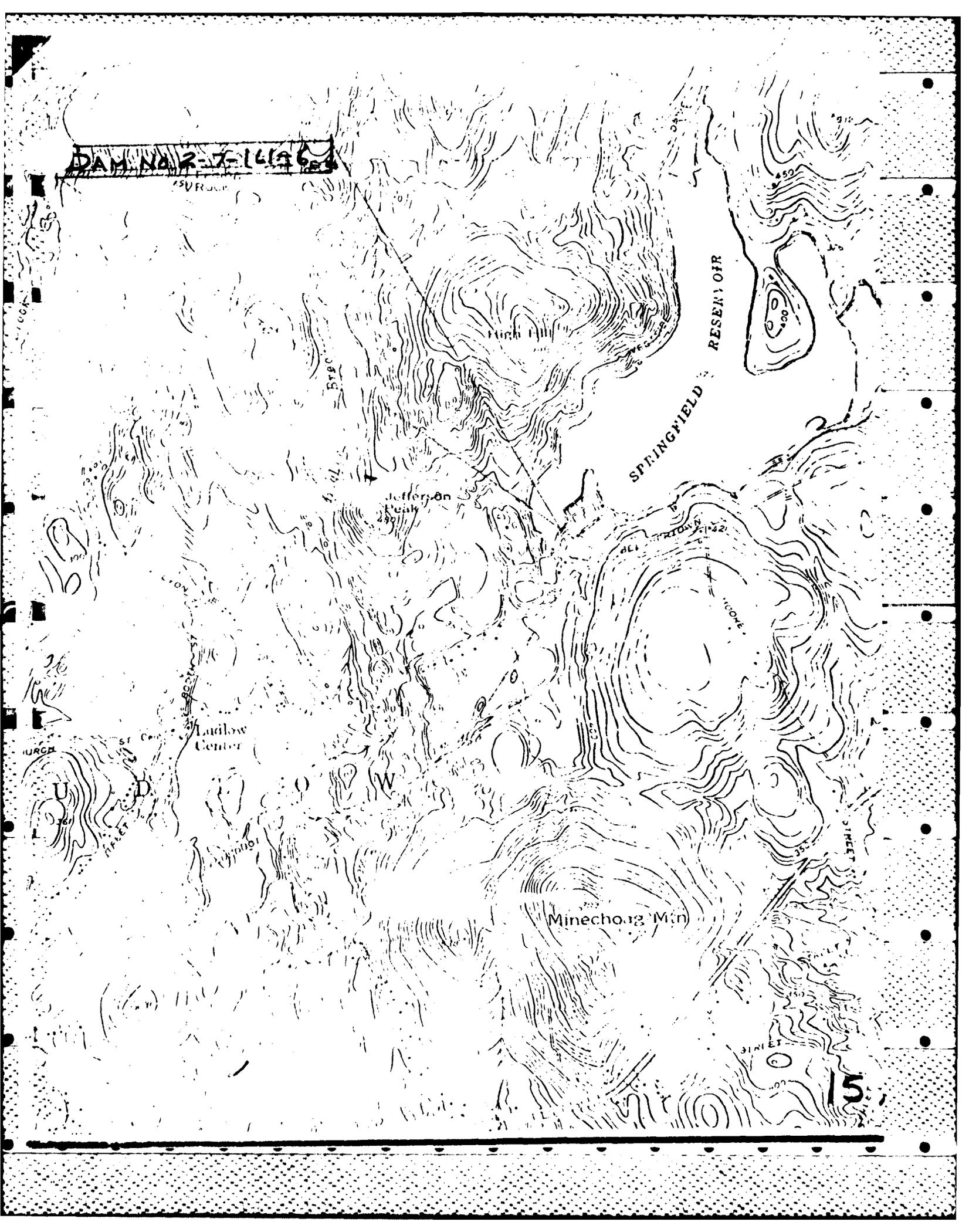
SPRINGFIELD

Jefferson Peak

Ludlow Center

Minechong Mtn

15



April 2, 1974

Board of Water Commissioners
City Hall
Court Street
Springfield, Massachusetts

RE: Inspection - Dam #2-7-161-6A
Ludlow
Ludlow Reservoir Overflow Spillway
(Cherry Valley Dam)

Gentlemen:

On February 27, 1974, an engineer from the Massachusetts Department of Public Works inspected the above dam, owned by the City of Springfield.

The inspection was made in accordance with Chapter 253 of the Massachusetts General Laws, as amended by Chapter 595 of the Acts of 1970 (Dam Safety Act).

The results of the inspection indicate that this dam is safe; however, the following conditions were noted that require attention:

1. New brush is sprouting from the old root system from previous cuttings and at places along the lower downstream slope. At the downstream toe heavy patches of brush remain. The removal of the brush growth is recommended.
2. Seepage, apparently of long standing, was occurring along the downstream toe. This should be closely watched for any change of condition and then appropriate action should be taken.

It is noted that in the past, damage has occurred through acts of vandalism, a problem shared by many owners of dams. Protective fencing should be considered before more serious damage may occur.

We call these conditions to your attention now, before they become serious and more expensive to correct.

Very truly yours,

JIS

INSPECTION REPORT - DAMS AND RESERVOIRS

1. LOCATION:

City/Town Ludlow County Hampden Dam No. 2-7-161-6A

Name of Dam Ludlow Reservoir Overflow Spillway ("Cherry Valley Dam")

Mass. Sect.

Topo Sheet No. 15A Coordinates: N 440,800, E 352,000

Inspected by: R. C. Salls, P.E., On Feb. 27, 1974 Date August 1970
Last Inspection

See Also Ludlow Reservoir Dam No. 2-7-161-6

2. OWNER/S: As of 1972

per: Assessors X, Reg. of Deeds _____, Prev. Insp. _____, Per. Contact X

City of Springfield Attn. Mr. Brodrick, Supervising Engineer
1. Board of Water Commissioners, City Hall, Court Street, Springfield, Mass.
Name St. & No. City/Town State Tel. No.

2. Name St. & No. City/Town State Tel. No.

3. Name St. & No. City/Town State Tel. No.

3. CARETAKER: (if any) e.g. superintendent, plant manager, appointed by
absentee owner, appointed by multi owners.

Mr. Edward Golden, Supt. Ludlow Reservoir, 1149 Center St., Ludlow, Mass.
Name St. & No. City/Town State Tel. No.

4. DATA: See Files in Water Dept.

No. of Pictures Taken Office, Sketches See description of Dam
Plans, Where See Plans in Water Dept. Office - File No. 02-8
dated 1877, 03-8 dated 1877, 09-7 dated 1910, & 18-9 dated 1938

5. DEGREE OF HAZARD: (if dam should fail completely)*

- 1. Minor _____
- 2. Moderate X _____
- 3. Severe _____
- 4. Disastrous _____

Comments: With increased building around and below Alden Pond degree of hazard
would be severe.

*This rating may change as land use changes (future development).

6. OUTLETS: OUTLET CONTROLS AND DRAWDOWN

No. 1 Location and Type: At west end of dam masonry dropwall spillway 52' effective width, E. 16' high, drops 10-12' then by chute to Broad Brook for Total fall 32'

Controls Yes, TYPE: Provision for flashboards,

Automatic _____ Manual X Operative Yes X, No _____

Comments: _____

No. 2 Location and Type: In dropwall - 4' Wide - sluiceway undetermined height say 10 to 12'

Controls Yes, Type: Slide gates with stop log on top section

Automatic _____ Manual X Operative Yes X, No _____

Comments: Operates per Water Department Personnel

No. 3 Location and Type: _____

Controls _____, Type: _____

Automatic _____ Manual _____ Operative Yes _____, No _____

Comments: _____

Drawdown present Yes X, No _____ Operative Yes X, No _____

Comments: See Item 2 Above

7. DAM UPSTREAM FACE: Slope 2:1, Depth Water at Dam 31' - _____

Material: Turf _____ Brush & Trees _____ Rock fill X Masonry _____ Wood _____

Other Stone on upstream slope

Condition: 1. Good _____ 3. Major Repairs _____

2. Minor Repairs X 4. Urgent Repairs _____

Comments: Portion visible general good condition. Brush cut previously is beginning to grow again on slopes & top.

DAM DOWNSTREAM FACE: Slope 2½:1

Material: Turf _____ Brush & Trees X Rock Fill X Masonry _____ Wood _____

Other Rock cover on slope. Toe fill of rock. Some brush

Condition: 1. Good _____ 3. Major Repairs _____

2. Minor Repairs X 4. Urgent Repairs _____

Comments: Some seepage along toe apparently normal condition most of slope had been cleared of brush a year or so ago but along bottom of slope and in toe area

9. EMERGENCY SPILLWAY: Available Yes. Needed No.

Height Above Normal Water 4 - 5 Ft.

Width _____ Ft. Height _____ Ft. Material _____.

Condition: 1. Good X. 3. Major Repairs _____.

2. Minor Repairs _____. 4. Urgent Repairs _____.

Comments: High water would back up Broad Brook Canal and overflow into branch
Broad Brook about 500' from Reservoir.

10. WATER LEVEL AT TIME OF INSPECTION: 6 Ft. Above _____. Below _____.

Top Dam X _____ F.L. Principal Spillway _____.

Other _____.

Normal Freeboard 5 Ft.

11. SUMMARY OF DEFICIENCIES NOTED:

Growth (Trees and Brush) on Embankment See Items 7 & 8.

Animal Burrows and Washouts None found.

Damage to Slopes or Top of Dam None.

Cracked or Damaged Masonry No significant damage noted.

Evidence of Seepage Seepage along the toe apparently a long standing and normal condition.

Evidence of Piping None found.

Leaks None found.

Erosion Minor, winter damage being repaired at time of inspection.

Trash and/or Debris Impeding Flow None.

Clogged or Blocked Spillway None.

Other _____.

2. OVERALL CONDITION:

1. Safe _____.
2. Minor repairs needed X _____.
3. Conditionally safe - major repairs needed _____.
4. Unsafe _____.
5. Reservoir impoundment no longer exists (explain)
Recommend removal from inspection list _____.

13. REMARKS AND RECOMMENDATIONS: (Fully Explain)

This is an old earth embankment dam first built around 1877 which received extensive repairs and remodeling in 1910 and after the 1938 flood. It now is only an auxiliary water source for the Springfield Water Department.

The embankment portion of the dam has generally good grade and alignment. Much of the brush on the slopes which the County Engineer commented on in his 1970 Inspection Report has been cut but new brush is sprouting from the old root systems and at some places along the lower downstream slope and toe quite heavy patches of brush remain. Because of the rock surface the establishment of a mowable turf on these slopes would be expensive and difficult.

Seepage was occurring along the toe and just beyond and from the presence of bull rushes and similar growth this is apparently a normal and long standing condition. No area of concentrated flow was found.

The masonry overflow spillway appeared to be in satisfactory condition. Water was flowing over the flashboards on the crest. The gate structure appeared to be in fair condition although the wooden access platform allowing access to the gate operating mechanism was somewhat dilapidated. Water Department Personnel informed us that the gate was in operating condition.

Access to this installation is relatively easy yet the area is secluded. Damage has occurred here in the past and it is possible that more serious and dangerous acts of vandalism could result in a blockage of the spillway causing an overtopping if undetected.

Submitted by R. C. Salls, P.E. Dam No. 2-7-161-6ADate February 27, 1974 ~~City~~/Town LudlowName of Dam Ludlow Reservoir
Overflow spillway (Cherry Valley Dam)

See also Ludlow Reservoir Dam No. 2-7-161-6

1. Location: Topo Sheet No. 15A Mass. Rect. Coordinates N 440,800 E 352,000Provide $8\frac{1}{2}$ " x 11" in clear copy of topo map with location of Dam clearly indicated.8 - 900' north of Route 21, Center Street near intersection of Alden Street
access via private dirt road 2500' west of Alden Street.2. Year built around 1877 Spillway enlarged 1910
Year/s of subsequent repairs Repairs 19383. Purpose of Dam: Water Supply X Recreational _____
Flood Control _____ Irrigation _____ Other _____4. Drainage Area: 10.8 See Note Below sq. mi. _____ acres.
Type: City, Bus. & Ind. _____ Dense Res. _____ Suburban _____ Rural, Farm 15%
Wood & Scrub Land 85% Slope: Steep 20% Med. 60% Slight 20%In addition - Water is fed into pond from Jabish Brook Watershed - ($9\frac{1}{2}$ Sq. Miles in area) through Jabish - Broad Brook Canal.5. Normal Ponding Area: 39 $\frac{1}{2}$ Acres; Ave. Depth 12 to 15 feet
Impoundment: 193 Million gals.; 592.5 acre ft.
Silted in: Yes X No _____ Approx. Amount Storage Area 10%6. No. and type of dwellings located adjacent to pond or reservoir _____
i.e. summer homes etc. Supt. home only - Some residences overlook
reservoir7. Dimensions of Dam: Length 1400' Max. Height 31' \pm
Freeboard 7' \pm
Slopes: Upstream Face 2:1
Downstream Face 2 $\frac{1}{2}$ to 1 with 10' wide berms
Width across top 25'

3.

Classification of Dam by Material:

Earth X Conc. Masonry _____ Stone Masonry _____
Timber _____ Rockfill _____ Other _____

8A.

Masonry Spillway and Corewall
Dam Type: Gravity X Straight X Curved, Arched _____ Other _____
Overflow _____ Non-overflow _____

9.

A. Description of present land usage downstream of dam:

100 % rural; _____ % urban

B. Is there a storage area or flood plain downstream of dam which could accommodate the impoundment in the event of a complete dam failure? Yes _____ No X

C. Character Downstream Valley: Narrow _____ Wide X Developed Partially
Rural 100% Urban _____

10.

Risk to life and property in event of complete failure.

No. of people 3 - 4

No. of homes 3 - 4 around Alden Pond

No. of businesses None

No. of industries None Type _____

No. of utilities 3 Type Water - Electric and Telephone Lines

Railroads None

Other dams Alden Pond Dam No. 2-161-4

Other Route 21 - Bridge over Broad Brook

11.

Attach Sketch of dam to this form showing section and plan on 8 1/2" x 11" sheet.

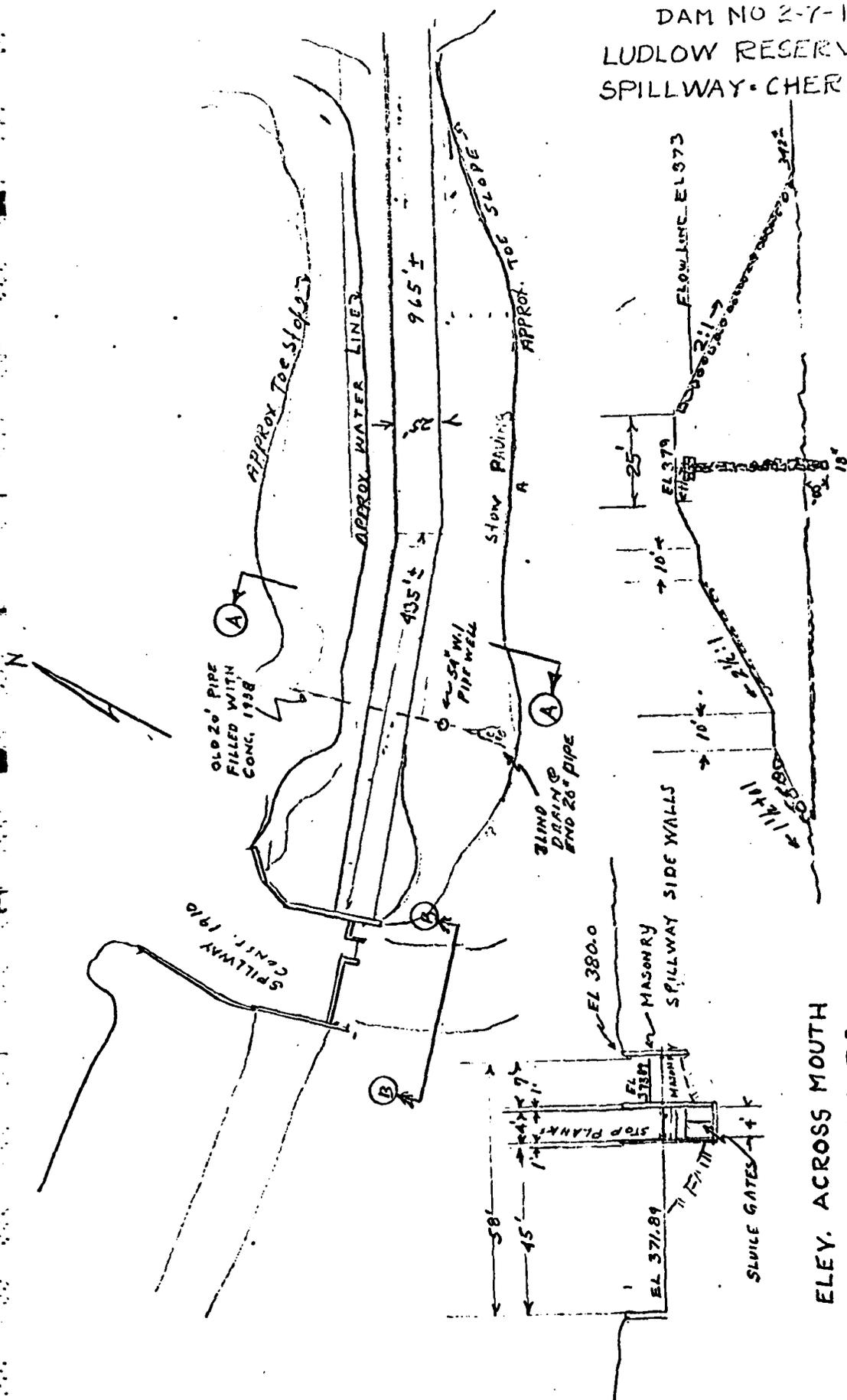
RCS/vk/rt

Attachments

Locus Plan

Sketches

DAM NO 2-7-161 6A
 LUDLOW RESERVOIR OVERFLOW
 SPILLWAY - CHERRY VALLEY DAM



TYPICAL SECTION "AA"

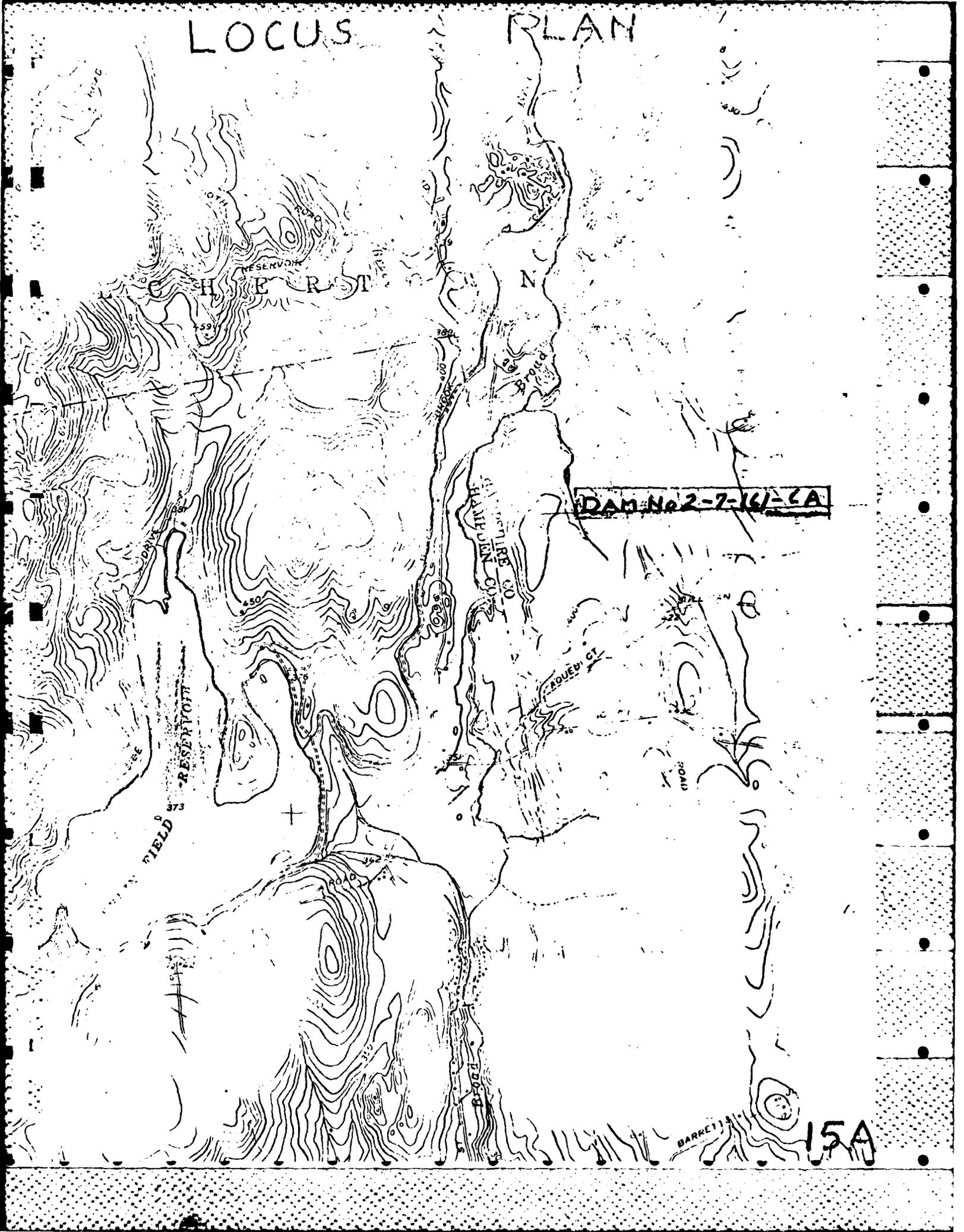
ELEV. ACROSS MOUTH
 SPILLWAY BB

NOTE: ELEVATIONS SHOWN FROM 1938 PLANS
 APPARENTLY SEA LEVEL ELEVATIONS

INFO FROM
 PLANS ON FILE
 SPLD WATER D
 FILE NO: 02-8 (18)
 " : 03-8 (18)
 " : 09-7 (19)
 " : 8-7 (19)

LOCUS

PLAN



DAM No 2-7-16-CA

15A

c/ file

INSPECTION REPORT - DAMS AND RESERVOIRS

LOCATION:

City/Town Ludlow County Hampden Dam No. 2-7-161-6

Name of Dam Springfield Water Works, Ludlow Reservoir Dam

Mass. Rect.

Topo Sheet No. 15A Coordinates: N 438,500 , E 347,200

Inspected by: R. C. Salls, P.E. , On Feb. 27, 1974 , Date Aug. 1970 Last Inspection

2. OWNER/S: As of 1972

per: Assessors X , Reg. of Deeds _____ , Prev. Insp. _____ , Per. Contact X .

City of Springfield Attn: Mr. Brodrick, Supervising Engineer
 1. Board of Water Commissioners, City Hall Court Street Springfield, Mass.
 Name St. & No. City/Town State Tel. No.

2. _____
 Name St. & No. City/Town State Tel. No.

_____ Name St. & No. City/Town State Tel. No.

3. CARETAKER: (if any) e.g. superintendent, plant manager, appointed by absentee owner, appointed by multi owners.

Mr. Edward Golden
 Supt. Ludlow Reservoir 1149 Center Street Ludlow, Mass.
 Name St. & No. City/Town State Tel. No.

4. DATA: See Files at Water Dept. Office

No. of Pictures Taken None , Sketches See description of Dam.
 Plans, Where at Water Dept. Office - File No. 08-7 Dated 1907 and others

5. DEGREE OF HAZARD: (if dam should fail completely)*

- | | |
|-------------------|------------------------------|
| 1. Minor _____ | 3. Severe _____ |
| 2. Moderate _____ | 4. Disastrous <u>X</u> _____ |

Comments: Abnormal high water would flood Ludlow High School and a Grammar School being built adjacent both are built on filled ground where Pond used to be.

*This rating may change as land use changes (future development).

ETS: OUTLET CONTROLS AND DRAWDOWN

No. 1 Location and Type: In center of southwesterly or downstream basin - Granite stone gatehouse and intake well for a 36" & a 24" main.

Controls Yes, TYPE: Gate valve and slide gates

Automatic . Manual X. Operative Yes , No .

Comments: Additional gates downstream. Plus blow off

Also gates on upstream sluiceway etc. leading into basin from Reservoir

No. 2 Location and Type: and filters.

Controls , Type:

Automatic . Manual . Operative Yes , No .

Comments:

No. 3 Location and Type:

Controls , Type:

Automatic . Manual . Operative Yes , No .

Comments:

Drawdown present Yes X, No . Operative Yes X, No .

Comments: See Ludlow Reservoir Overflow Spillway

7. DAM UPSTREAM FACE: Slope 2:1, Depth Water at Dam 12 - 15'

Material: Turf . Brush & Trees . Rock fill . Masonry . Wood .

Other Rock cover on slope

Condition: 1. Good X. 3. Major Repairs .

2. Minor Repairs . 4. Urgent Repairs .

Comments: This is for southwesterly embankment of southwesterly basin top of

embankment 40' Wide with Roadway

8. DAM DOWNSTREAM FACE: Slope Roughly 8:1

Material: Turf X. Brush & Trees . Rock Fill . Masonry . Wood .

Other

Condition: 1. Good X. 3. Major Repairs .

2. Minor repairs . 4. Urgent Repairs .

EMERGENCY SPILLWAY: Available Yes . Needed No .Height Above Normal Water 4 to 5 Ft.Width 100± Ft. Height 2 Ft. Material Earth .Condition: 1. Good X . 3. Major Repairs _____ .

2. Minor Repairs _____ . 4. Urgent Repairs _____ .

Comments: See also Cherry Valley Dam No. 2-7-161-6A

(10.)

WATER LEVEL AT TIME OF INSPECTION: 8 Ft. Above _____ . Below X .Top Dam X F.L. Principal Spillway _____ .

Other _____ .

Normal Freeboard 4 to 8 Ft. Varies with demand for water

SUMMARY OF DEFICIENCIES NOTED:

Growth (Trees and Brush) on Embankment None .Animal Burrows and Washouts None found .Damage to Slopes or Top of Dam None seen .Cracked or Damaged Masonry None .Evidence of Seepage None observed .Evidence of Piping None observed .Leaks None observed .Erosion None observed .Trash and/or Debris Impeding Flow None .Clogged or Blocked Spillway None .

Other _____ .

12.

OVERALL CONDITION:

1. Safe X
2. Minor repairs needed _____
3. Conditionally safe - major repairs needed _____
4. Unsafe _____
5. Reservoir impoundment no longer exists (explain)
Recommend removal from inspection list _____

13.

REMARKS AND RECOMMENDATIONS: (Fully Explain)

This is the dam and intake works for the Ludlow Reservoir of the Springfield Water Works which blocks off the flow of Higher Brook and closes off the low area on the southwesterly corner of the reservoir. Here also, incorporated into this dam are the storage basins for the water which has passed through the sand filters and the intake well and gatehouse for the water mains leading to the distributors system.

The various embankments making up the basins and the dam, while very old, are in satisfactory condition. The rock cover on all waterside slopes was generally in good shape with an even surface and few displaced stones. All turfed areas were mowed and otherwise well taken care of. The gatehouse and other masonry work was in good shape. The valves in the gatehouse were very old and the operating hand stand was of a type which we had not seen before and which was apparently manufactured around 1900 or earlier. These valves are all in operating condition and are backed up by stop logs on the gate well and additional gates and controls on the outlet water mains and by gates and controls on the upstream basins.

This entire installation appeared to be well maintained and in satisfactory condition.

RCS/js/rt

DESCRIPTION OF DAM

DISTRICT 2Submitted by R. C. Salls, P.E.Dam No. 2-7-161-6Date February 27, 1974City/Town LudlowName of Dam Springfield Water Works Ludlow Reservoir Dam

See also Ludlow Reservoir Overflow Spillway "Cherry Valley Dam" No. 2-7-161-6A

1. Location: Topo Sheet No. 15A Mass. Rect. Coordinates N 438,500 E 347,200

Provide $8\frac{1}{2}$ " x 11" in clear copy of topo map with location of Dam clearly indicated.

About 100 to 600' northerly of Center Street "Route 21" (Belchertown Road)

about $2\frac{1}{4}$ miles easterly from Ludlow Center

2. Year built around 1877 Year/s of subsequent repairs UNK

3. Purpose of Dam: Water Supply Recreational _____
Flood Control _____ Irrigation _____ Other _____

4. Drainage Area: 10.8 sq. mi. See Note Below acres.
Type: City, Bus. & Ind. _____ Dense Res. _____ Suburban _____ Rural, Farm 100%
Wood & Scrub Land 90% Slope: Steep 35% Med. 35% Slight 30%

In addition Water is fed into Reservoir from Jabish Brook Watershed ($9\frac{1}{2}$ Sq. Miles Area)

5. through Jabish - Broad Brook Canal.

Normal Ponding Area: 39 $\frac{1}{2}$ Acres; Ave. Depth 12 - 15'

Impoundment: 193 gals.; 592.5 acre ft.

Silted in: Yes No _____ Approx. Amount Storage Area 10%

6. No. and type of dwellings located adjacent to pond or reservoir Supt's. home only
i.e. summer homes etc. Some residences overlook Reservoir.

7. Dimensions of Dam: Length 400' Max. Height 18' to 25' \pm

Freeboard 4 to 8' Varies

Slopes: Upstream Face 2:1 Stone Cover

Downstream Face roughly as on lower Embankment

8.

Earth Conc. Masonry _____ Stone Masonry _____
Timber _____ Rockfill _____ Other _____

8A.

Dam Type: Gravity Straight Curved, Arched _____ Other _____
Overflow _____ Non-overflow _____

Series of settling basins - See Note Below

9.

A. Description of present land usage downstream of dam:

85 % rural; 15 % urban

B. Is there a storage area or flood plain downstream of dam which could accommodate the impoundment in the event of a complete dam failure? Yes No _____

C. Character Downstream Valley: Narrow _____ Wide Developed Part _____
Rural 85% Urban 15%

10.

Risk to life and property in event of complete failure.

No. of people 20 - 30 If flood reached school during session

No. of homes 4 - 5

No. of businesses None

No. of industries None Type _____

No. of utilities 4 Type Quabbin Chicopee Aqueduct

Springfield Water Mains
Electric and Telephone Lines

Railroads None

Other dam Harris Pond Dam #2-7-161-9 Small Ponds at Ludlow Gun Club and around Ludlow High School Complex.

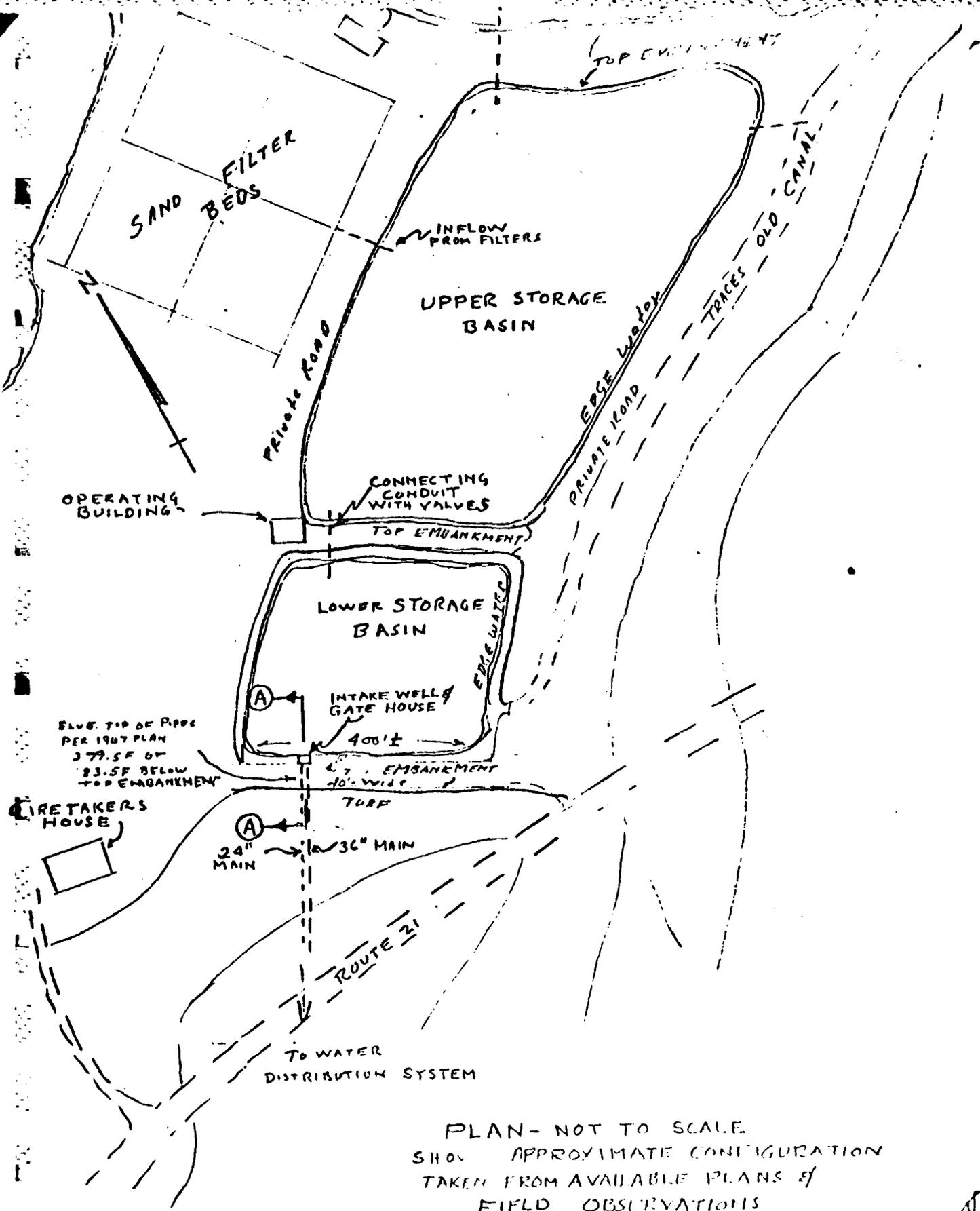
Other Ludlow High School and a Grammar School being constructed adjacent Route 21 and after Townways.

11.

Attach Sketch of dam on this form showing section and plan on 8 1/2" x 11" sheet

RCS/vk/rt
Attachments
Locus Plan
Sketches

Note: Tops of embankment here are higher than the embankment of the Cherry Valley Dam #2-7-161-6A.



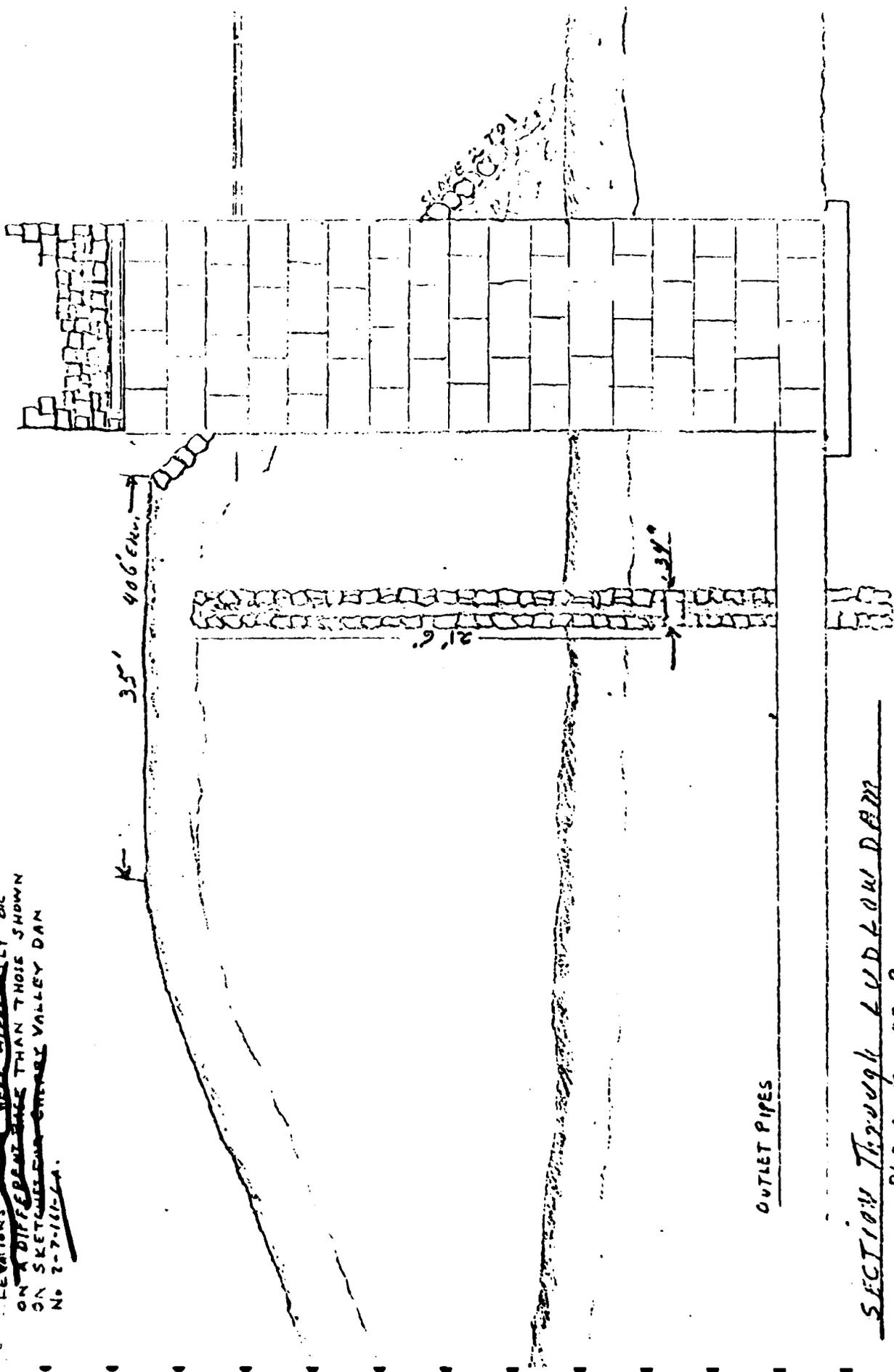
ELVE. TOP OF PIPE
PER 1907 PLAN
379.56 ±
83.56 BELOW
TOP EMBANKMENT

PLAN - NOT TO SCALE
SHOW APPROXIMATE CONFIGURATION
TAKEN FROM AVAILABLE PLANS &
FIELD OBSERVATIONS

Handwritten initials and a checkmark.

X SECTION AA

ELEVATIONS SHOWN HERE APPARENTLY OR
ON A DIFFERENT SCALE THAN THOSE SHOWN
ON SKETCH OF THE CHERRY VALLEY DAM
NO. 2-7-11-1-A.



OUTLET PIPES

SECTION THROUGH LUDLOW DAM

PLAN No. 02-8

HORIZONTAL SCALE 12 FEET TO AN INCH

VERTICAL

6 " " " " " "

Copied from
Spring for H. W. W. S.
Plans. 2-6

Commonwealth of Massachusetts

County of Hampden

Springfield, Mass.

Office of the
County Commissioners
52 State Street

William F. Stapleton

~~Richard J. Stroh~~

Floyd R. Fradet

Stephen A. Moynahan,
Chairman

August 19, 1970

Springfield Water Works
City Hall
Springfield, Massachusetts

Gentlemen:

In accordance with the provisions of Chapter 253, Section 45, et seq. of the General Laws, Tercentenary Edition, relative to the inspection, condition and safety of the dams in Hampden County, you are hereby advised that your dam located off of Route 21 in Ludlow and forming Ludlow Reservoir has been recently inspected by our engineer, and your attention is called to the following conditions noted and the recommendations made by him.

"The embankment of this dam is in need of maintenance and attention. All of the brush growth on the embankment should be cut down. Brush growth on the sloping surface toward the reservoir as well as on the downstream toe area of the dam is becoming very thick. In fact, brush was so thick in certain areas of the embankment that a proper inspection of the dam could not be made. The dam embankment should be maintained properly and a good turf cover developed on all surfaces of the embankment.

Normal seepage was noted at the toe area, particularly in the deep section at the old brook location.

Spillway concrete and stone masonry was o.k. Some erosion was observed but the erosion is not bad. Normal flashboards were on the crest and water level was about one-half way up on the flashboards. The stone masonry of the gate structure was o.k. and some leakage, as observed previously, was taking place thru the joints of the stone masonry. This was not dangerous as existing.

The spillway chute and channel downstream of the spillway proper were observed to be in good condition.

In the opinion of the undersigned, the dam is safe; however, it should be better maintained, particularly as to the removal of brush growth and development of a good turf cover on the embankment. "

The recommendations of the County Hydraulic Engineer should be followed and the dam should be properly maintained.

Any further information concerning this matter which you may desire will be furnished upon request.

Very truly yours,

BOARD OF COUNTY COMMISSIONERS

GEORGE H. McDONNELL
PHILIP W. SHERIDAN
EDWARD J. BAYON

TIGHE & BOND CONSULTING ENGINEERS

CIVIL, SANITARY AND ELECTRICAL ENGINEERING
INVESTIGATIONS, REPORTS, PLANS AND SPECIFICATIONS
SUPERVISION OF CONSTRUCTION AND OPERATION

BOWERS AND PEQUOT STREETS
HOLYOKE, MASSACHUSETTS
TEL. JEFFERSON 3-3991

CD Ludlow
August 18, 1970

The Honorable the Board of County Commissioners
52 State Street
Springfield, Massachusetts

Gentlemen:

All of the dams located within the Town of Ludlow have been inspected at least once during the year 1970. The following is a report on the general condition noted at each of the dams in Ludlow.

A. Ludlow Mfg. Associates Dam (Red Bridge-now Western Mass. Elec.)

The earth embankment was noted to be in reasonably good condition. Brush growth is beginning to develop again, particularly on the downstream slope, and, if the brush is not removed by the time of the next inspection, the owner should be advised to cut all brush growth and to develop a good turf cover over the entire embankment.

The erosion on the downstream slope of the embankment at the spillway left abutment wall was no worse than observed in previous years. The erosion is the result of foot traffic. A protective fence has been constructed parallel to the left abutment wall and the eroded area is parallel to and just adjacent to the fence. The surface of the slope of the embankment on the water side is satisfactory. The settled stone paving shows no further evidence of any movement.

The toe area was in good condition. The toe was dry. The rock fill portion of the toe was o. k.

The stone masonry of the spillway was noted to be in good condition. The joints of the stone masonry were satisfactory. The abutment masonry was o. k.

being taken from the pond with a plastic hose. This, together with seepage thru the stone masonry section of the spillway may be the reason for the amount of water in storage being so low. It would appear that the owner has attempted to control seepage thru the dry stone masonry section of the dam by placing gravel on the upstream face.

The spillway was observed to be in satisfactory condition. The dam embankment itself is rather dilapidated but is serviceable. The toe area was observed to be dry and the brook bed immediately downstream from the spillway was also dry.

The small stone filled side spillways along the left shore of the pond area were in satisfactory and functional condition.

Though the dam is somewhat dilapidated and receives little attention or maintenance, it is the opinion of the undersigned that it is safe.

F. Springfield Water Works Dam

The embankment of this dam is in need of maintenance and attention. All of the brush growth on the embankment should be cut down. Brush growth on the sloping surface toward the reservoir as well as on the downstream toe area of the dam is becoming very thick. In fact, brush was so thick in certain areas of the embankment that a proper inspection of the dam could not be made. The dam embankment should be maintained properly and a good turf cover developed on all surfaces of the embankment.

Normal seepage was noted at the toe area, particularly in the deep section at the old brook location.

Spillway concrete and stone masonry was o.k. Some erosion was observed but the erosion is not bad. Normal flashboards were on the crest and water level was about one-half way up on the flashboards. The stone masonry of the gate structure was o.k. and some leakage, as observed previously, was taking place thru the joints of the stone masonry. This was not dangerous as existing.

The spillway chute and channel downstream of the spillway proper were observed to be in good condition.

In the opinion of the undersigned, the dam is safe; however, it should be better maintained, particularly as to the removal of brush growth and development of a good turf cover on the embankment.

JAMES L. TIGHE

CONSULTING ENGINEER

CALEDONIAN BUILDING, 189 HIGH STREET

HOLYOKE, MASS.

TELEPHONE 790

MEMBER AM. INST. OF CONSULTING ENGINEERS, INC.

MEMBER
SOC. C. E.
E. GREAT BRITAIN
ST. OF CANADA

MEMBER
BOSTON SOC. C. E.
ENG. SOC. WEST. MASS.
AM. & N. E. W. W. ASSOC'S

WATER SUPPLY
SEWERAGE
SEWAGE DISPOSAL
ANALYSIS OF WATER

WATER POWER INVESTIGATIONS
AND DEVELOPMENT
DAMS AND POWER INSTALLATIONS
ESTIMATES AND APPRAISALS

December 29, 1925.

The Honorable The Board of County Commissioners of Hampden County,
Springfield, Massachusetts.

George S. Cook, Chairman.

Dear Sir:

According to your instructions, I have made an inspection of all the dams in the county relative to their condition and safety upon which I submit the following report.

The total number of dams inspected was 295, of which 206 back up water or form ponds, as the remaining 89, none of which are now in use, have openings through them and do not retard the natural stream flow.

While these latter structures after inspection might not be further considered, nevertheless, it was thought advisable to record them in this report in order that they will be known and can be disregarded in any inspections that may have to be made in the future. For the same reason it was thought advisable to record the ponds found without dams, that is, the natural ponds, so called.

Throughout the report it may be stated that not only is the name of the town given, but also the established local or place name, if any, where each dam is located. It may also be stated that the name of the stream upon which each dam is located, is that given on the state topographical map and, where there is no name given on the map, the local name is given that the stream is known by.

Where a dam is built across a stream which is the boundary line of two towns with a part of the dam in each town, the dam is classified as belonging to the town in which the plant attached is located. For instance, the Ludlow Manufacturing Associates dam, which is built across the Chicopee River with a part in Ludlow and a part in Wilbraham, is classified as located in the town of Ludlow, because the plant or establishment attached thereto is located in the town of Ludlow. On the other hand, the Collins Manufacturing Company dam, which is also built across the Chicopee River with a part in Ludlow and a part in Wilbraham, is classified as being located in the town of Wilbraham, because the plant attached thereto is located in the town of Wilbraham.

In the arrangement of the report the towns have been placed in alphabetical order and the dams in each are listed and described thereunder except in the case of the Chicopee and Westfield Rivers where the dams on each, while listed in the towns in which they are located, are described under Chicopee and West Springfield respectively.

Where the length and height of a dam is given, it means, unless otherwise stated, its maximum length as measured along the top and the maximum height to the top above the natural stream-bed, or in the case of a spillway dam proper to the crest of the spillway.

In the following table, the number of dams in each town classified as described above, are given, likewise the natural ponds in each town.

TABLE.

NAME OF TOWN	DAMS FORMING PONDS	DAMS NO LONGER FORMING PONDS.	NATURAL PONDS NOT RAISED BY DAMS
Agawam	6	2	0
Blandford	6	9	2
Brimfield	7	4	1
Chester	5	6	1
Chicopee	21	2	0
East Longmeadow	0	1	0
Granville	6	15	2
Hampden	11	4	0
Holland	2	5	2
Holyoke	12	2	0
Longmeadow	2	0	0
Ludlow	8	0	7
Monson	33	5	2
Montgomery	4	3	1
Palmer	14	5	3
Russell	7	0	0
Southwick	4	5	2
Springfield	19	1	10
Holland	5	4	2
Sales	9	4	0
Westfield	9	9	3
West Springfield	14	0	0
Wilbraham	2	3	2
Total	206	89	40

The pond formed by the structure is about one and one-half acres and is a shallow body of water. To the structure is attached a sawmill which was operated until three or four years ago, when the mill was abandoned. The dam, apparently, is also abandoned. It is in fair condition, however, but should it fail for want of repairs in the future, because of the very small shallow pond behind it, no material damage, it seems, would be done by the released water.

It is advisable, however, in case the dam is no longer going to be used, that a free passage way for the water be made through it, and pond drawn down.

ALDEN BROTHERS DAM.-- Broad Brook rises one and one-half miles south of Belchertown Center, flows southerly through Belchertown to Ludlow and through Ludlow into the Chicopee River into which it empties about fifteen hundred feet west of the Belchertown-Ludlow boundary line. It is six miles in length, and has a total drainage area of eleven and one-half square miles.

About a mile from its mouth and two and one-half miles east of Ludlow Center, at a point where the drainage area contributory is ten and three-quarters miles, is a dam belonging to Alden Brothers, Ludlow, Mass. This is an earthen embankment faced downstream with dry stone masonry one hundred and sixty feet in length and eleven feet in height. The spillway is forty-eight feet in length and located at the west end.

It is built of dry stone masonry and carries three feet of flashboards. These flashboards are removed in the Spring and in time of high water by the owner. The pond is eight acres in area and a sawmill and cidemill are connected, both of which are being still operated. The dam is in fair condition. It was built in 1864, and is in the hands of the same family ever since.

ANTHONY KOWALZIK DAM.-- Upstream about one and one-quarter miles from the Alden Brothers dam, last described, at a point in the brook where the drainage area contributory is five and three-quarters square miles, is a dam belonging to Anthony Kowalzik, Alden Street, R. F. D., Ludlow, Mass.

It is a dry stone masonry spillway structure backed with earth. The spillway was raised two feet from its original height by the laying of a concrete wall sixteen inches in width. The total height of the spillway is seven and one-half feet and the embankment is only a foot higher.

Inasmuch as the crest of the spillway is in poor condition, and the spillway is leaking, it is recommended that repairs be made thereon and that the top of the embankment be raised at least to three feet above the crest of the spillway. To this dam was attached a horse-radish factory which moved to Indian Orchard about three years ago. The factory has not been put to any use ever since. The area of the pond formed is about four acres and is a shallow body of water.

CITY OF SPRINGFIELD WATER WORKS DAM.-- Ludlow Reservoir is located in the north-east corner of the town of Ludlow about one-half mile upstream on the main tributary of Broad Brook. The reservoir has a surface area of four hundred and forty-eight acres and a total drainage area contributory including Jabish Brook, of twenty-one square miles.

The dam which forms the reservoir, is an earthen embankment thirteen hundred feet more or less, in length and 40 feet in height with its overflow at the south end. The dam and overflow are in good condition, and under the constant inspection of the engineering department of the Springfield Water Works.

REPORT OF ENGINEER

March 3, 1939

The Hon. The Board of County Commissioners
Hampden County, Court House
Springfield, Mass.

Charles W. Bray, Chairman,

Dear Sir:

In accordance with your instructions, I have examined the Plans and specifications filed with the County by the City of Springfield Water Department, showing the repairs which were made at the Cherry Valley Dam after the flood of September last, and report as follows:

The Cherry Valley Dam is located on a tributary of Higher Brook in the Town of Ludlow, and forms the Ludlow Reservoir, which is one of the sources of the Springfield water supply. The Ludlow Reservoir covers about 450 acres, and has a total drainage area contributory, including Jabish Brook, which is diverted into the reservoir by a long canal, of twenty-one square miles.

The dam, which was built in 1874, is an eartham embankment about thirteen hundred feet in length, forty feet in maximum height, and twenty-five feet in width on top, with slopes of 1 on 2 both upstream and downstream. The entire upstream slope was paved with rubble stone, and the top and downstream slope loamed and grassed. Through the center of the dam there is a core wall of rubble stone masonry laid in mortar, 18 inches in thickness, extending from the foundations up to within about three feet of the top of the dam, and a fifty-four inch diameter iron pipe conduit is laid through the downstream slope parallel with the length of the dam, to connect the ends of the Broad Brook feeder canal at each end of the dam. There is also a twenty inch diameter iron drain pipe extending through the lowest part of the dam near its center.

The spillway attached is a masonry structure 34 feet in length, located in the solid ledge rock at the South end of the dam.

In the hurricane-flood of September last it appears that the vicinity of Ludlow received a greater rainfall than any other part of Hampden County. According to the rain guage maintained by the Springfield Water Department at the Ludlow Reservoir, a total of 12.69 inches of rain fell in the five day period from Sept. 17th-21st, inclusive.

The resulting high flood flow produced by this storm did not cause any direct damage at the Ludlow Reservoir to the dam, since the overflow or spillway was of ample capacity. During the storm, however, a slump or slide occurred in the surface of the downstream embankment, at a point some 200 feet northerly from the spillway. This slide probably resulted from the saturation of the embankment material by the continual rain falling directly upon it, and being considered serious enough to demand immediate attention, the work of repairing the damage done was begun at once.

The repair work was inspected during its progress, and as shown by the plan and specifications filed, it consisted of strengthening the whole dam by the placing of a heavy gravel fill on the downstream slope extending from the toe of the structure up to within 6 feet of its top. This new gravel fill has been placed so as to make a flatter downstream slope, that is, a slope of 1 on 2-1/2 instead of the original slope of 1 on 2. It is provided with two berms ten feet in width, one near the toe of the dam and the other near its top, and the entire surface of the new slope has been covered with stone rip-rap.

Along the downstream toe and under the new gravel fill, stone and pipe drains have been laid for the purpose of draining the embankment and lowering the ground water level.

In addition to the new construction on the downstream slope, the freeboard of height above the spillway level, has been increased by the placing of a one foot layer of earthfill on the top of the dam for its entire length. The 20 inch and 54 inch iron pipes which are laid in the embankment, since they are no longer to be used, have been permanently sealed up with concrete.

Inasmuch as the work done upon the dam, as shown by the plan and specifications filed, has been inspected during its progress and after its completion, and since the work has been properly done and has added materially to the strength of the structure, I would recommend that the plan and specifications be approved.

Respectfully submitted,

James L. Tighe

FINAL DECREE

COMMONWEALTH OF MASSACHUSETTS

Hampden, ss: County Commissioners' Meeting March 22, 1939

In the matter of the petition of the City of Springfield, Mass., Board of Water Commissioners, for approval of plan of the re-built section of the Cherry Valley Dam at Ludlow Reservoir.

Petition, plan and specifications of the repair work were filed February 8, 1939.

This matter arose as the result of damage caused by the hurricane-flood of September 1938 when a slide occurred in the surface of the downstream embankment of the aforesaid dam. The damage was so extensive as to make imperative immediate reparation in order to properly protect the lives and safety of the public and to adequately safeguard private property in the vicinity.

Accordingly, as an emergency measure, the work of repairing the damage began at once and progressed in accordance with the above mentioned plan and specifications under the direction of the County's Engineer, Mr. James L. Tighe, to whom the matter was referred by the County Commissioners.

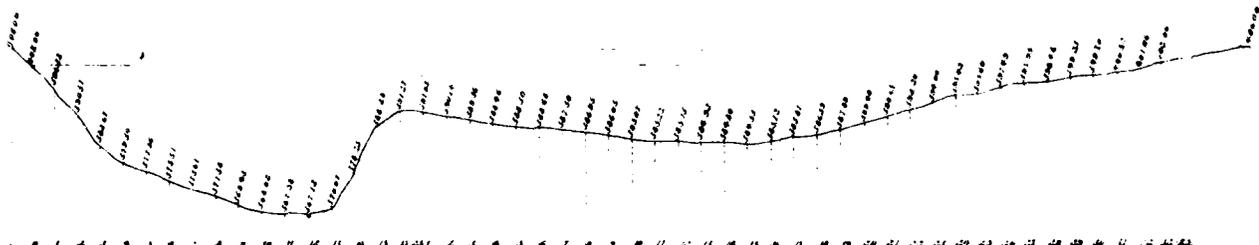
The County Commissioners having inspected the work and the Engineer having made a final report in writing to the Board of County Commissioners dated March 3, 1939 which is on file with this case, and it appearing that said plan and specifications have been faithfully adhered to, it is ordered that same be approved, accepted and recorded.

Charles W. Bray
Thos. J. Costello
Edward J. Stapleton

outside of the old fill. All fill which could be removed was taken from the site and the gravel cut back into the unaffected portion of the dam and thoroughly joined to the old work. All passages for water beneath the dam, including the drain pipe, were thoroughly grouted and filled with concrete, as were, also, the interstices between the rocks which surrounded this pipe as far as they could be reached. The top of the dam was given a one-foot layer of fill in order to restore or increase its height above the flow line. Over 10,000 cubic yards of new material were used in the reconstruction.

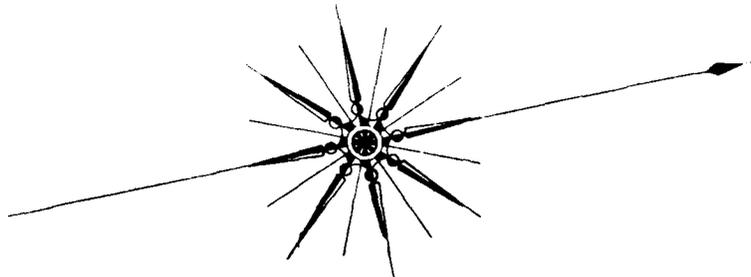
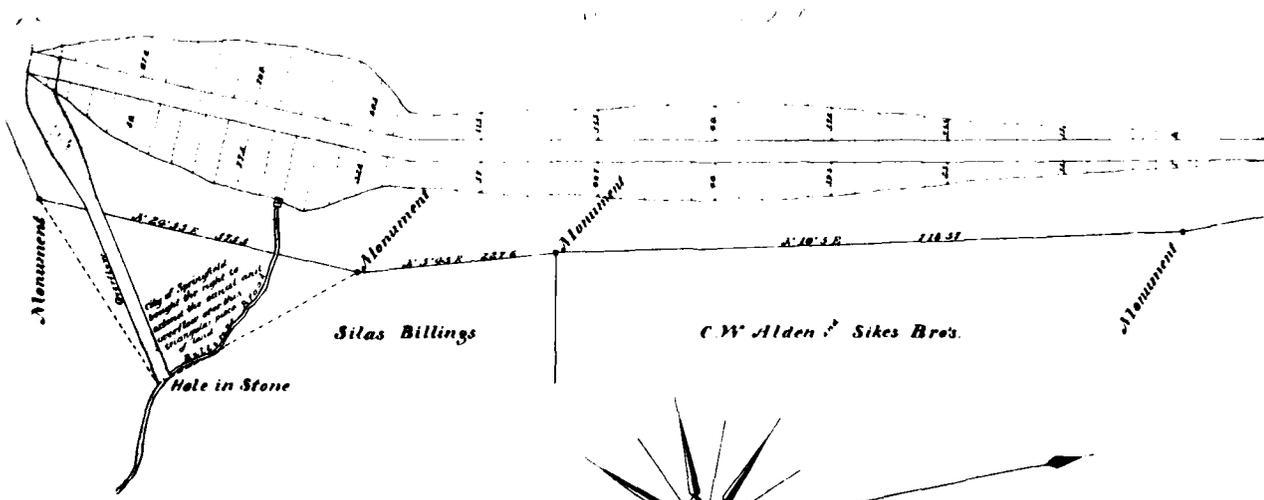
HAMPDEN COUNTY
APPROVED
Mar. 22, 1939
Charles W. Bray
Thos. J. Costello
Edward J. Stapleton
County Commissioners

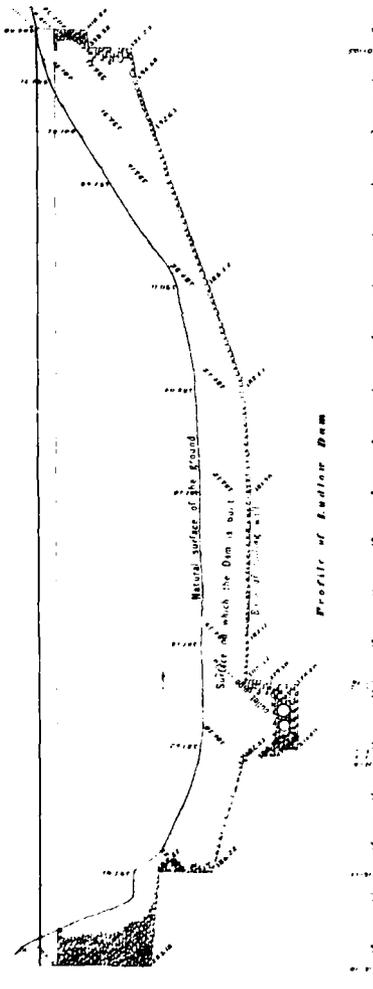
February 7, 1939.



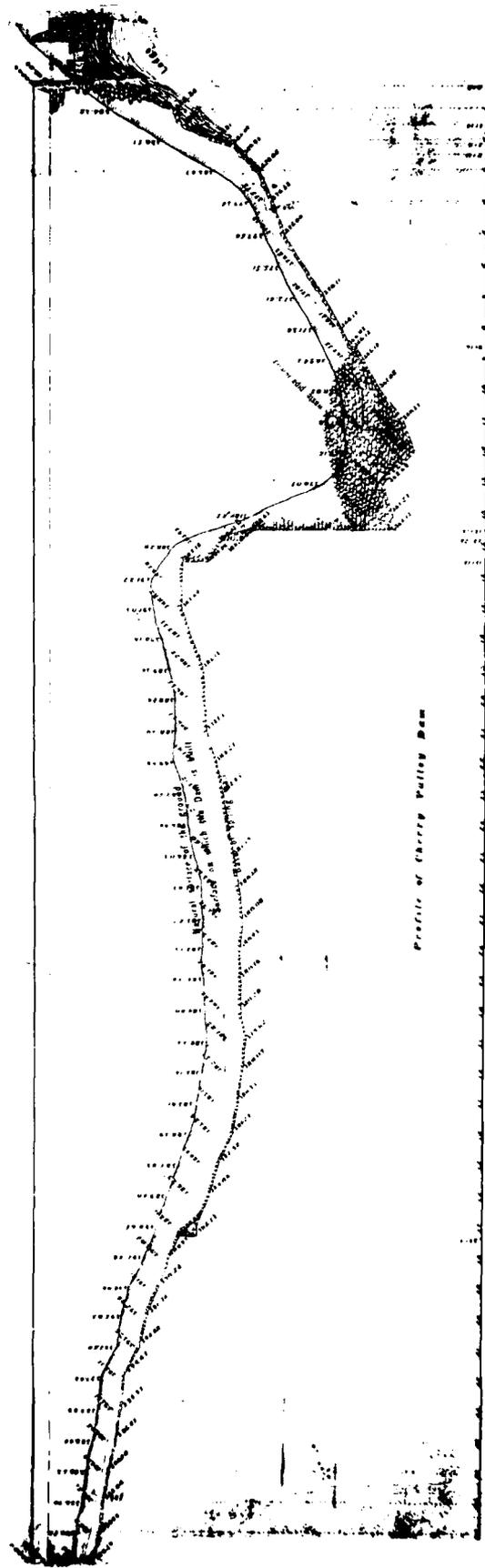
Plan and Profile
of the
CHERRY VALLEY DAM

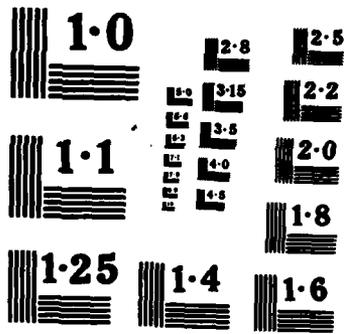
End low
Scale 80 Feet to an Inch





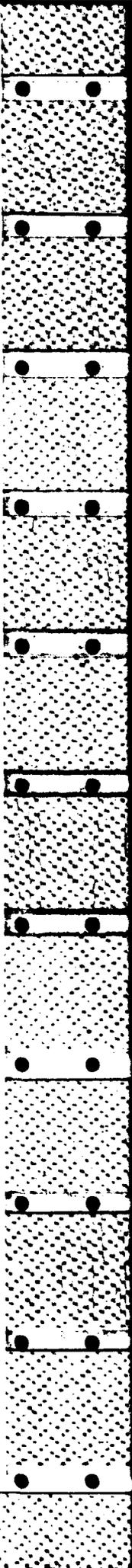
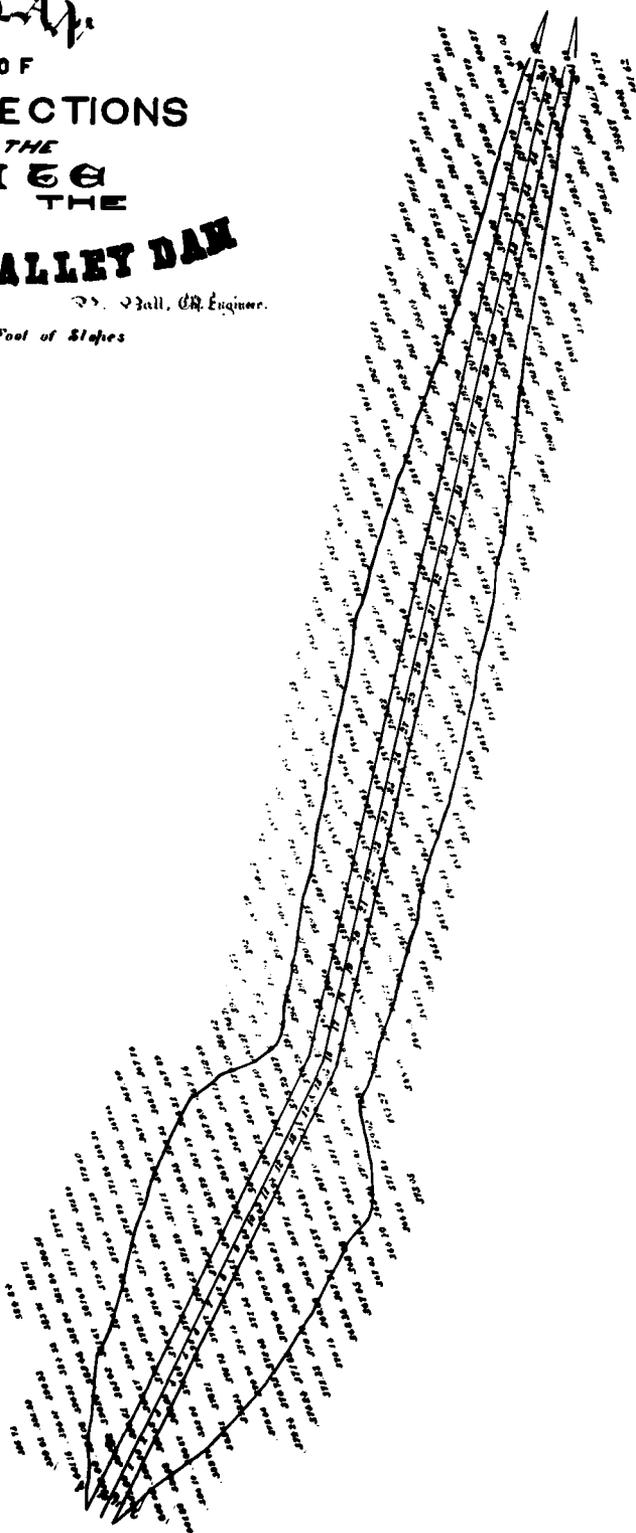
EXPLANATION
 The figures entered at the intersection
 of the several stations with the graphic
 lines, are the respective heights of
 these points above City Base.





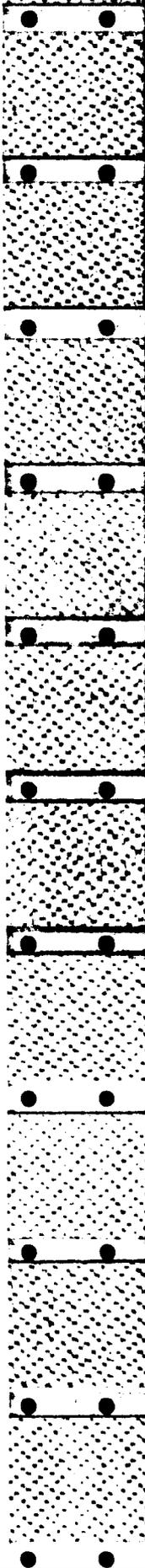
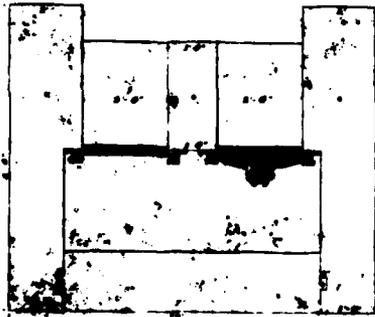
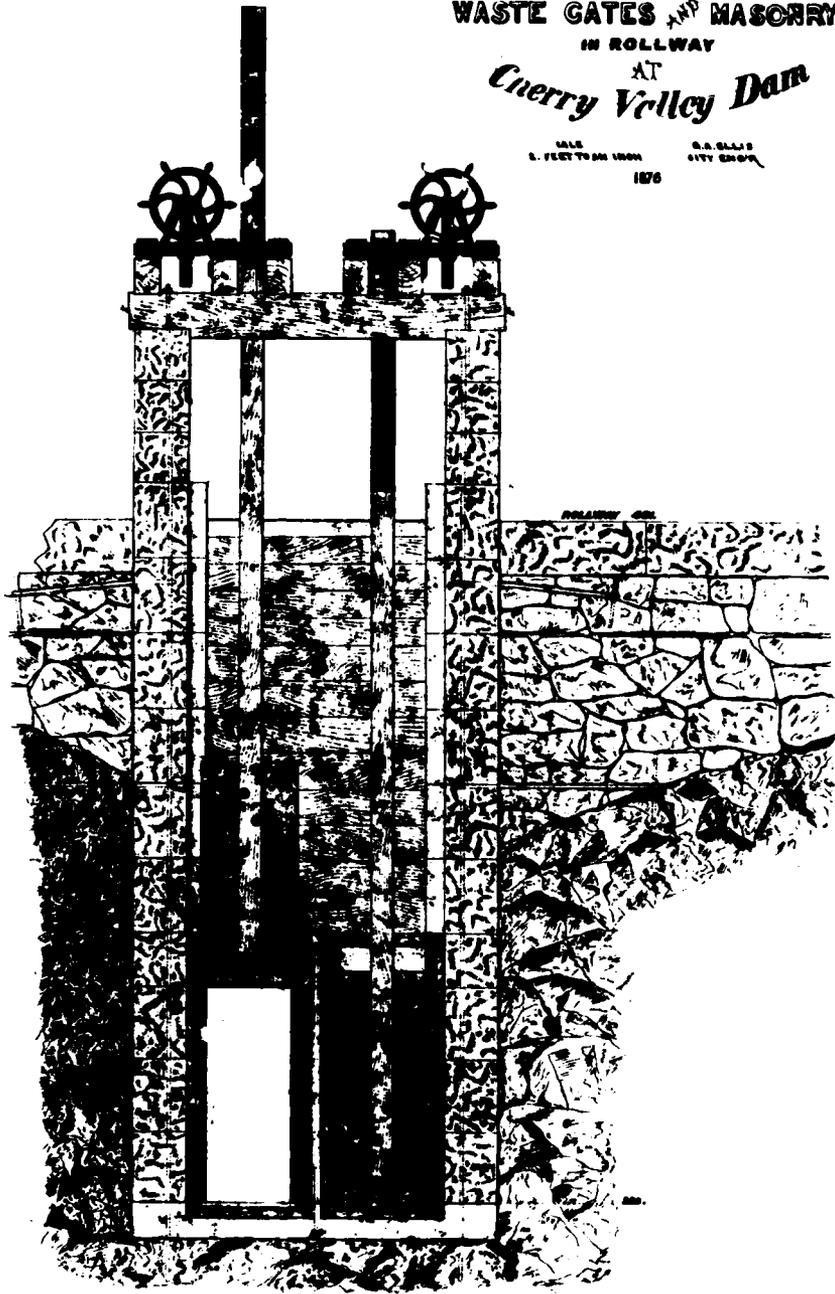
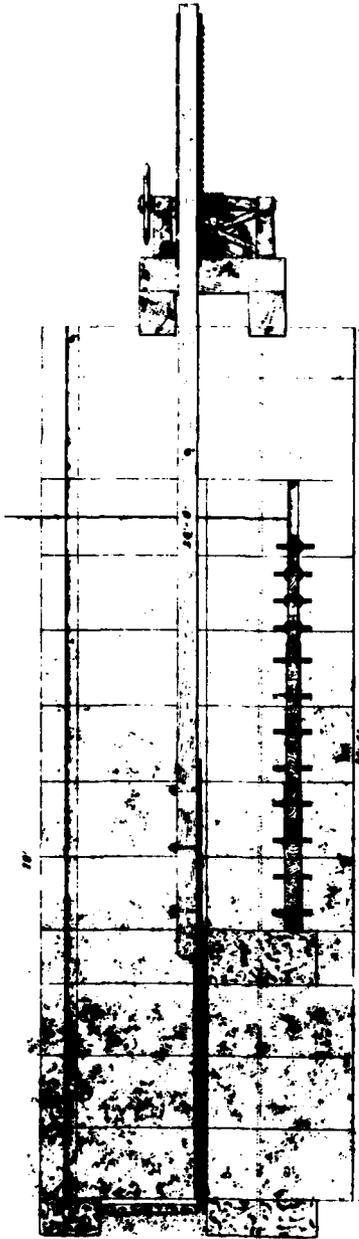

 OF
CROSS SECTIONS
 ON THE
SIDE
 OF THE
CHERRY VALLEY DAM

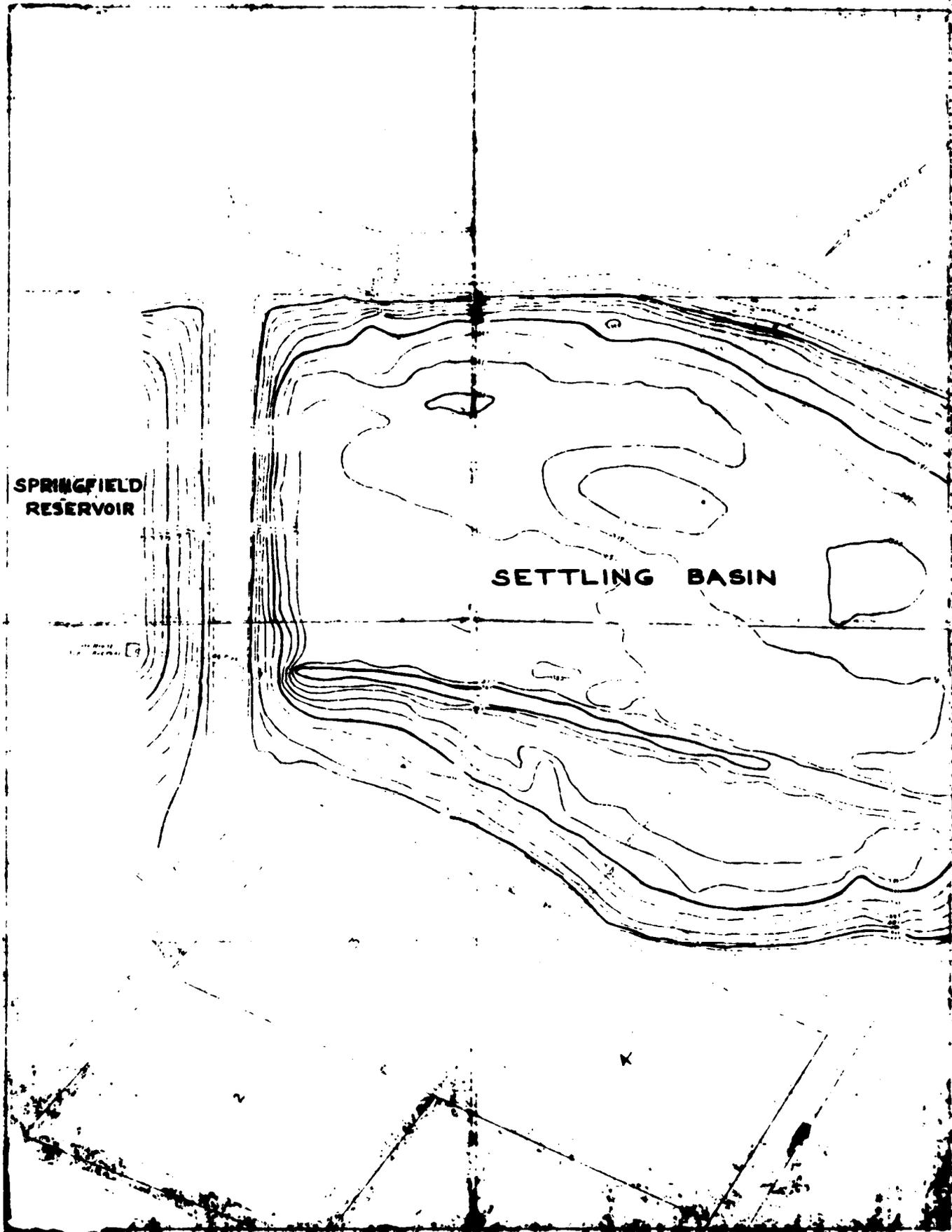
Scale as far as an inch: D. S. Hall, C.E. Engineer.
1 B 80 Feet of Slopes



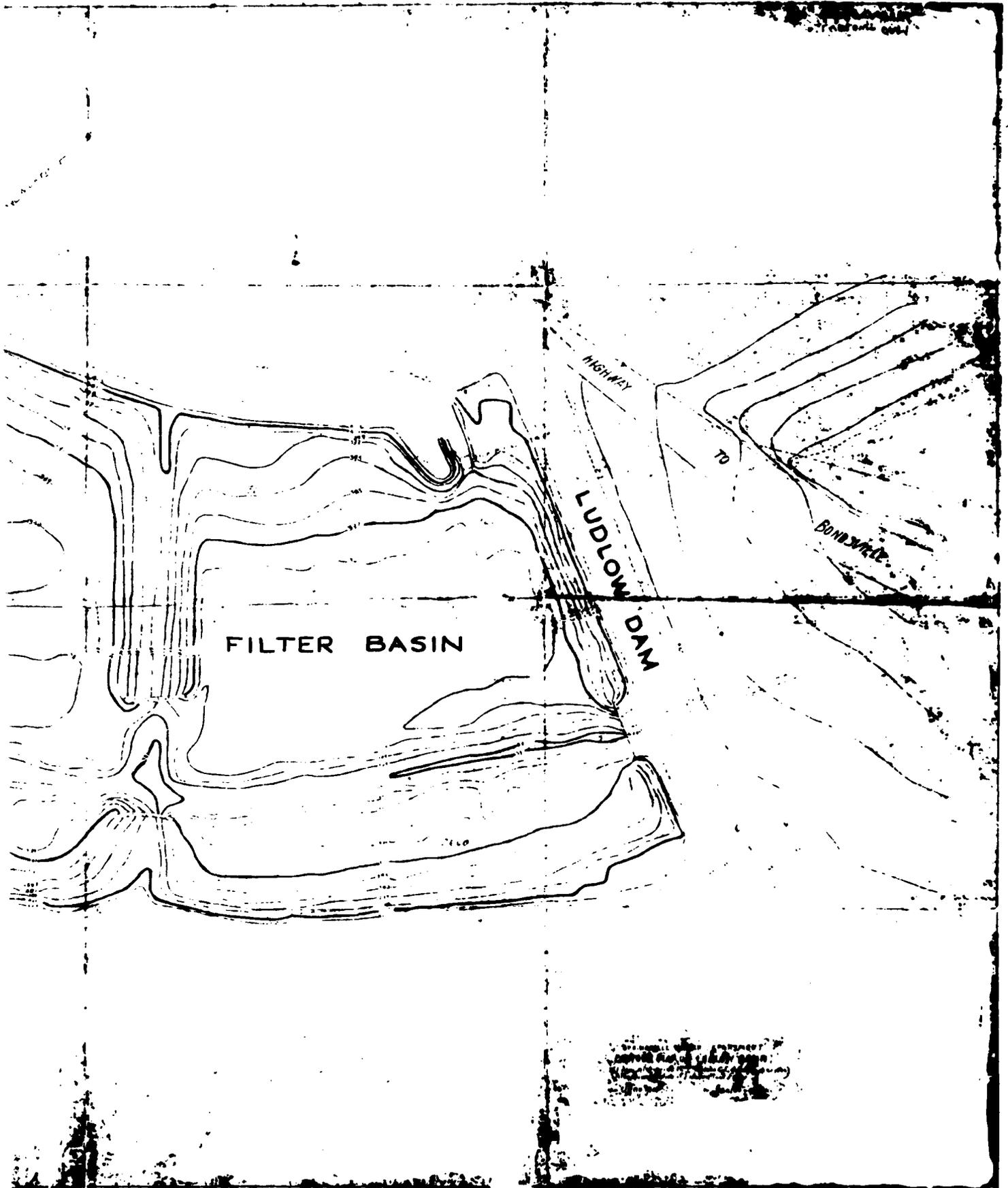
Plan and Elevation
OF
WASTE GATES AND MASONRY
IN ROLLWAY
AT
Cherry Valley Dam

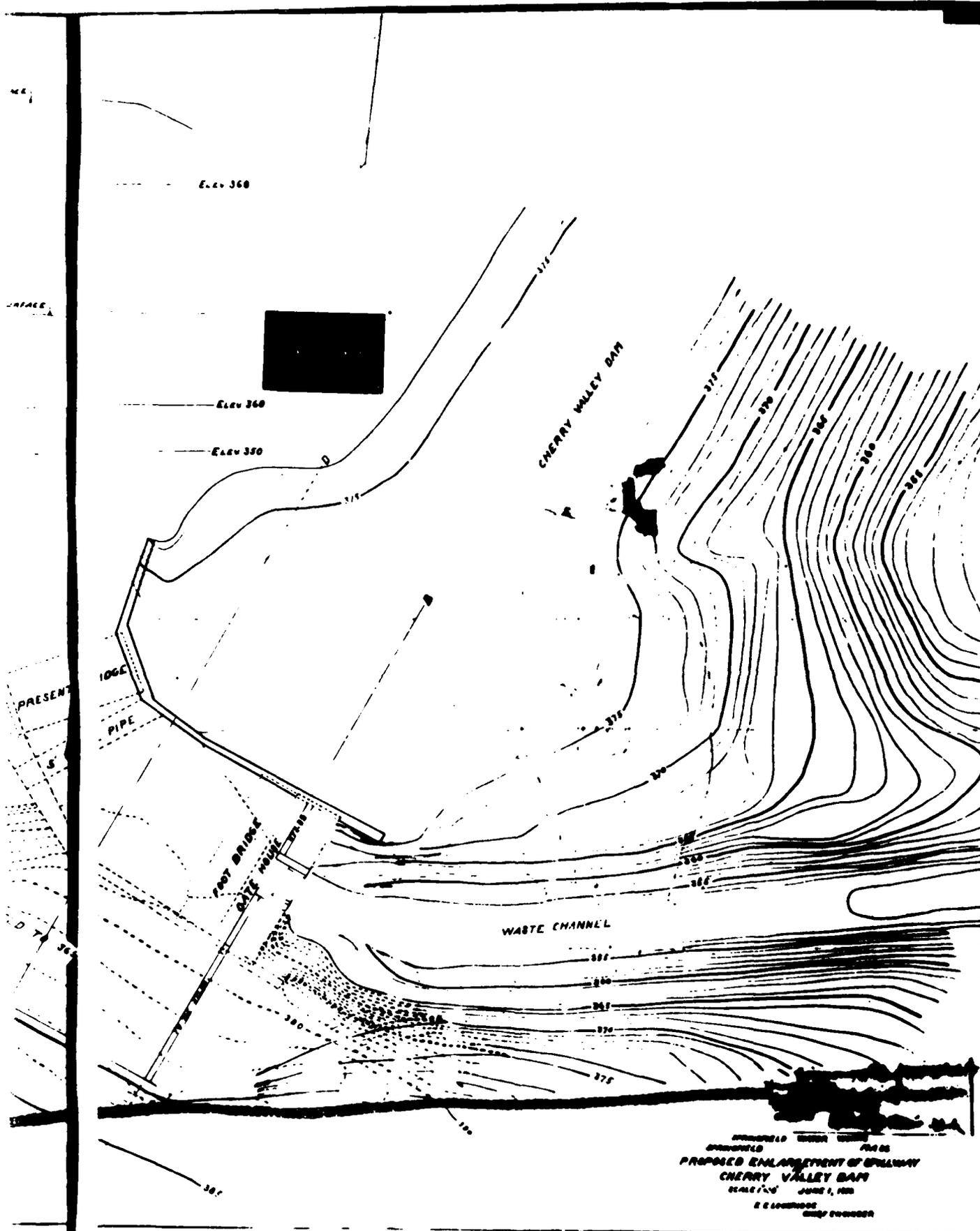
SCALE
1/4" = 1 FOOT TO THE INCH
1876





1072

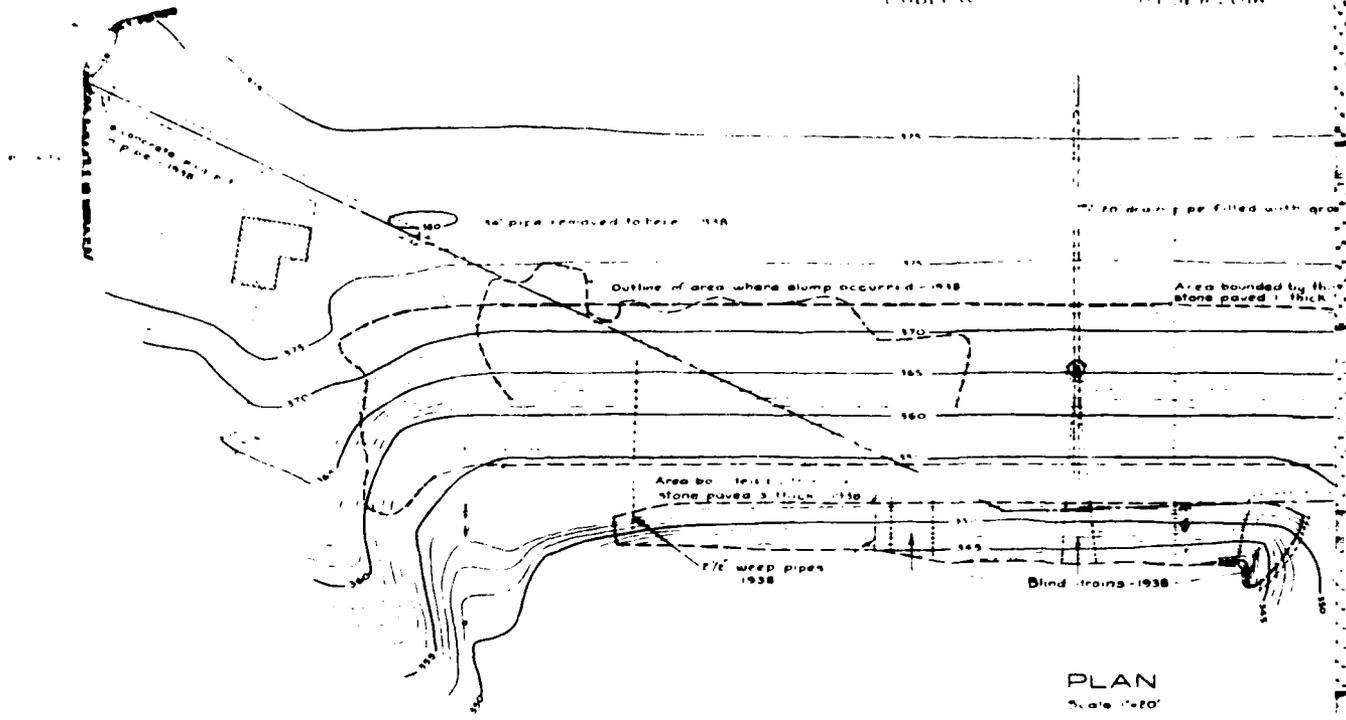




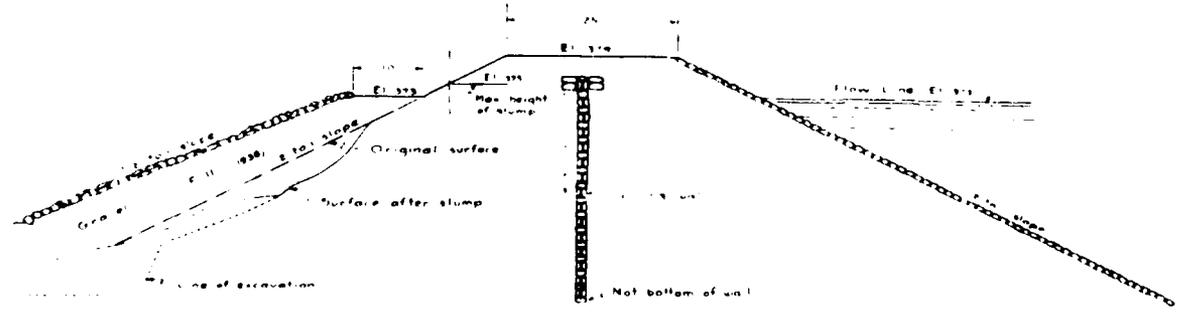
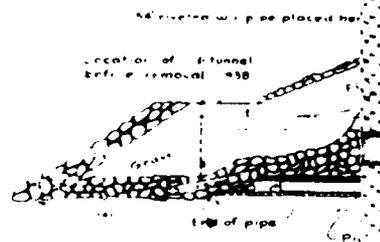
PROPOSED ENLARGEMENT OF SPILLWAY
 CHERRY VALLEY DAM
 SCALE 1" = 100' JUNE 1, 1930
 E. E. LEONARD
 CIVIL ENGINEER

FOOTING

PIPER

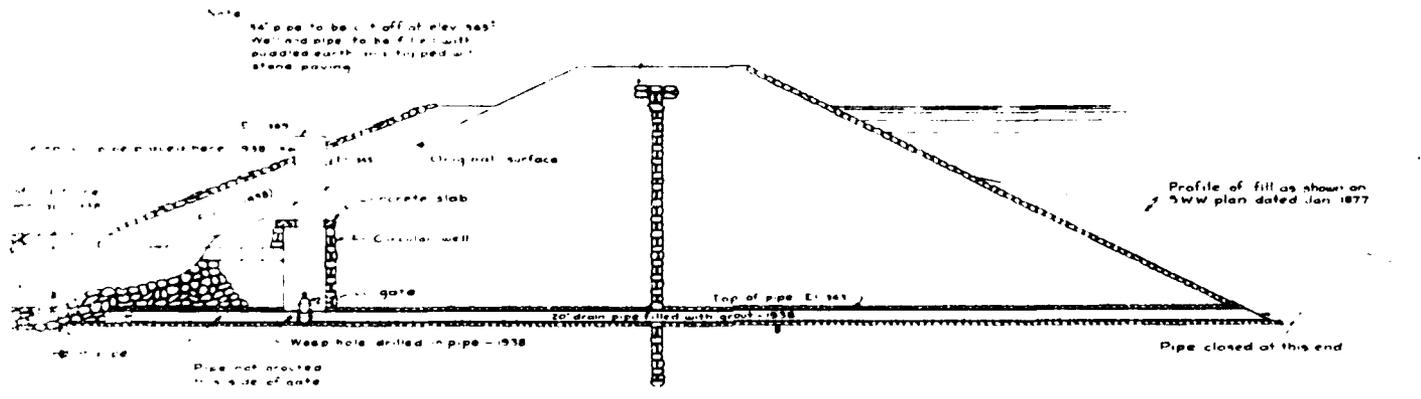
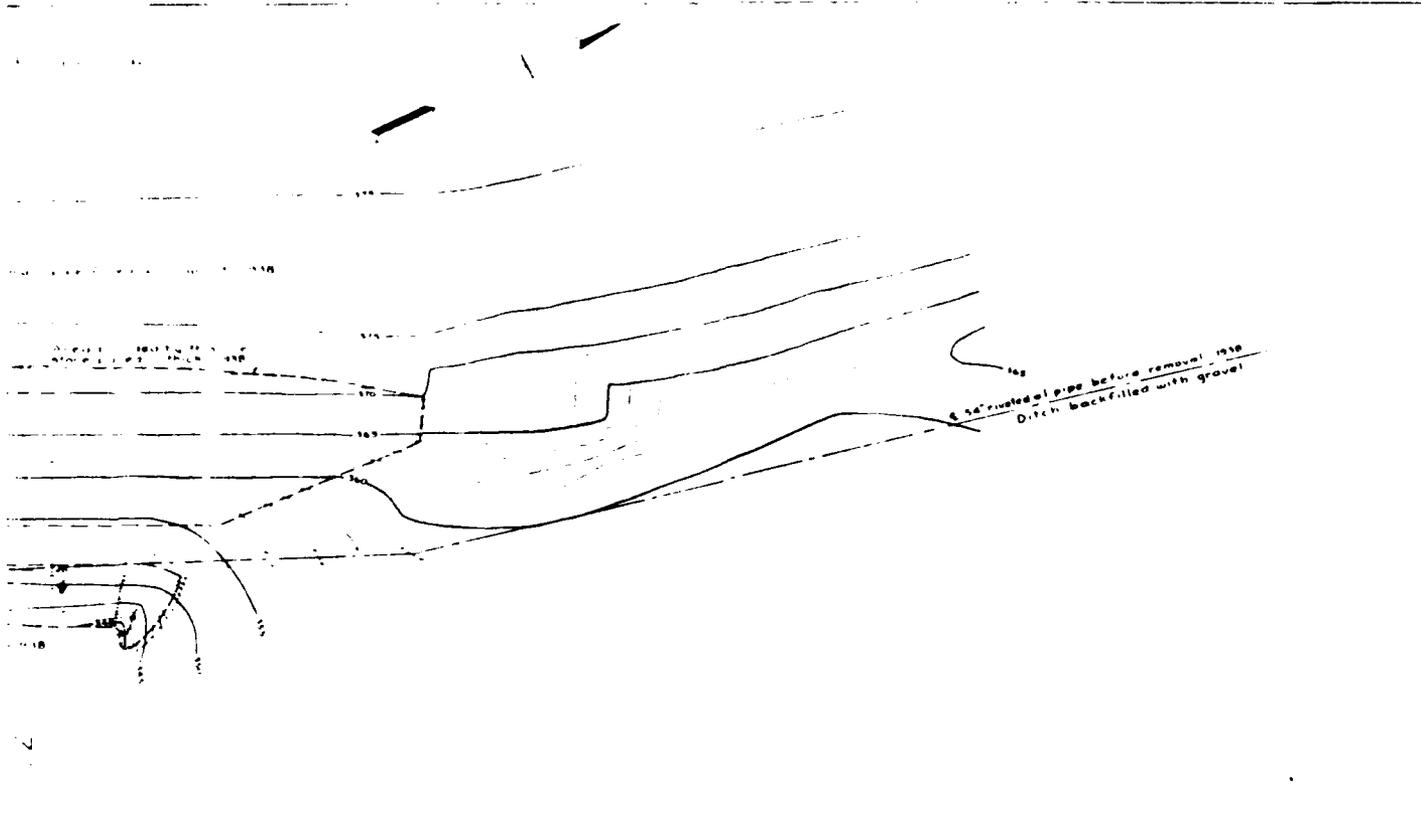


PLAN
Scale 1:20



TYPICAL SECTION
Scale 1:20

192



SECTION THRU DRAIN
Scale 1"=10'

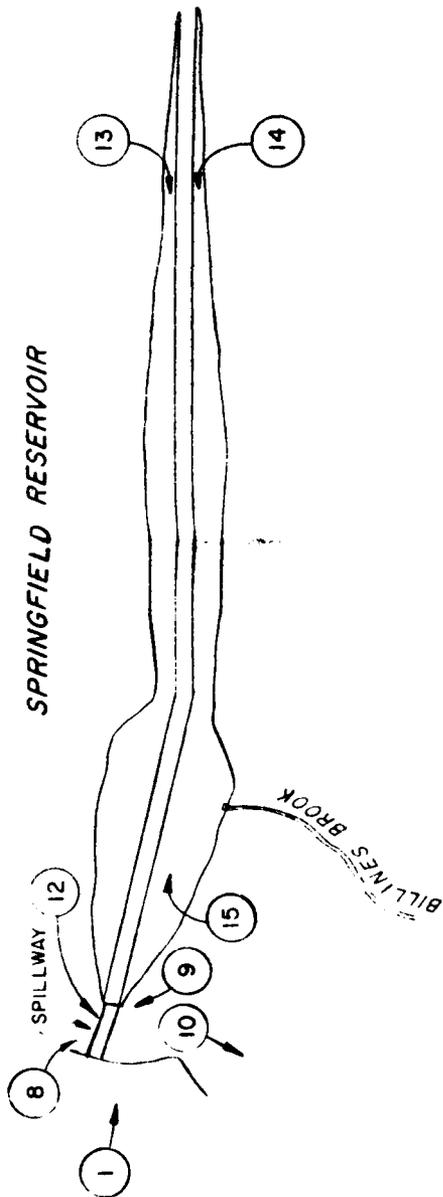
Commonwealth of Massachusetts
Members,
Filed February 8, 1939
Attest Ervin S. [Signature]
Clerk

Approved:
March 22, 1939
[Signature]
Edward J. [Signature]
County Commissioner

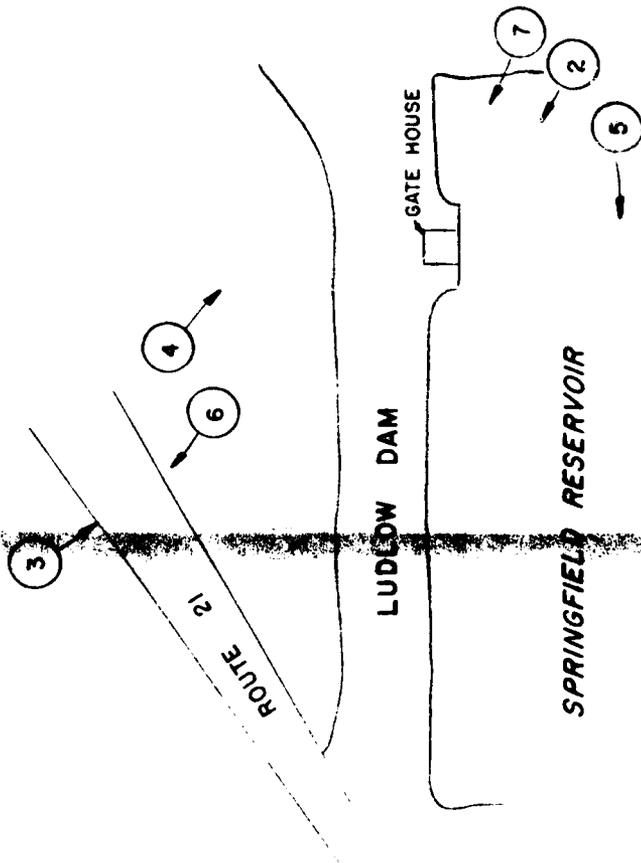
LUDLOW RESERVOIR WATER SUPPLY
SPRINGFIELD, MASS.
PLAN SHOWING REPAIRS
TO
CHERRY VALLEY DAM
AFTER
SEPTEMBER FLOOD 1938

SCALE AS SHOWN JANUARY 1939

APPENDIX C



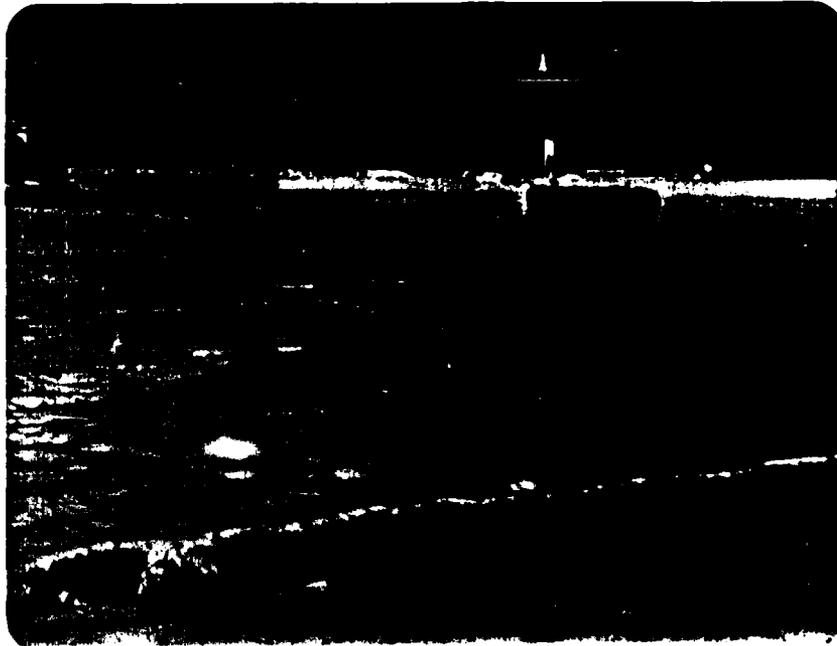
CHERRY VALLEY DAM



NOTE:

PHOTOGRAPHS 11, 16, 17 & 18 ARE NOT SHOWN SINCE THEY ARE OUTSIDE LIMITS OF MAP

SPRINGFIELD RESERVOIR PHOTOGRAPH INDEX MAP



Photograph #4

Downstream View at Toe of
Slope for Ludlow Dam



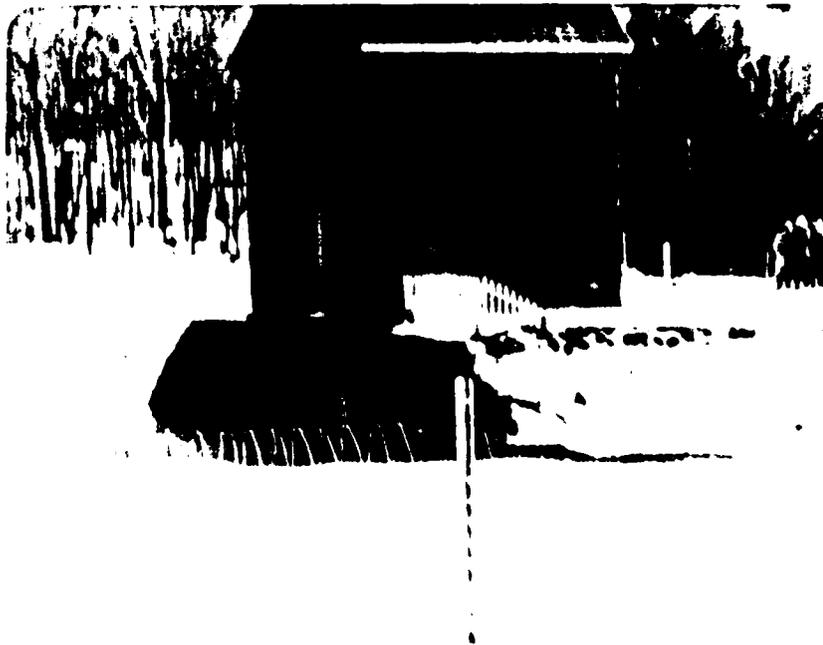
Photograph #5

Dams Upstream of Ludlow Dam
Separating Filter & Settling Basins



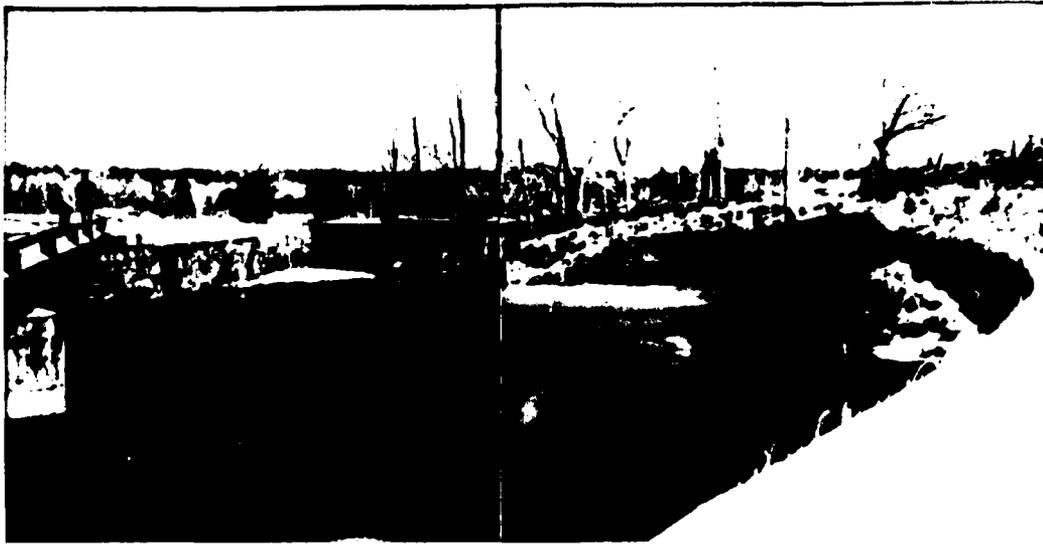
Photograph #6

Location of Leakage at Abandoned
Catch Basin - Downstream of Ludlow
Dam on North Side of Route 21



Photograph #7

Gate House at Ludlow Dam
Upstream View



Photograph #8

Spillway and Approach Channel
at Cherry Valley Dam



Photograph #9

Downstream View of Spillway
at Cherry Valley Dam



Photograph #10

Outlet Channel beyond Emergency
Spillway at Cherry Valley Dam



Photograph #11

Overflow Structure on
Broad Brook Canal - Easterly View



Photograph #12

Controls for Sluice Gates
at Cherry Valley Dam



Photograph #13

Upstream View of Cherry
Valley Dam - Right Abutment



Photograph #14

Downstream View of Cherry
Valley Dam - Left Abutment



Photograph #15

Downstream View of Cherry
Valley Dam - Right Abutment



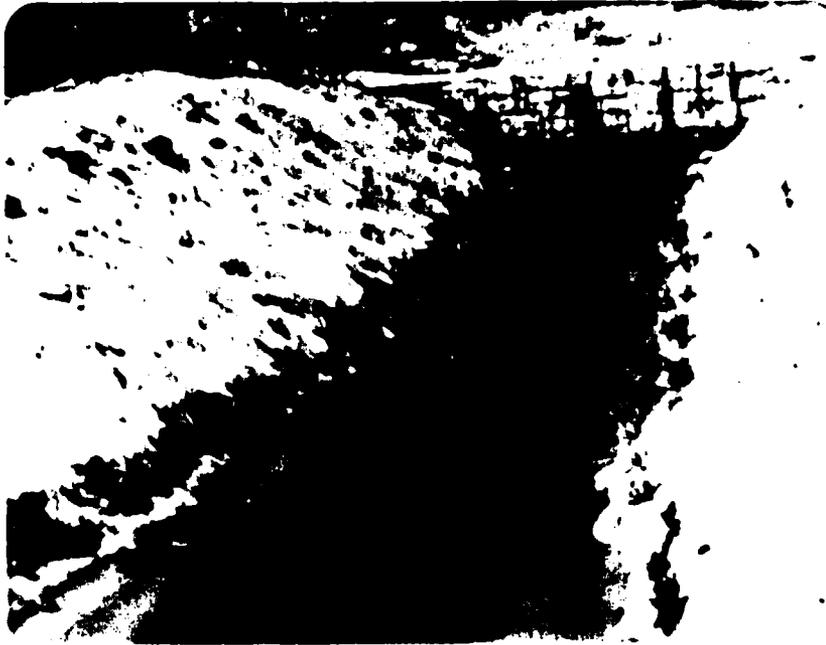
Photograph #16

Blackner Walker Dam Located
in Area of Jabish Canal Intake



Photograph #17

Blackner Walker Dam Facing Upstream
Crest Length is Approximately 100 feet



Photograph 18

Downstream View of Jabish
Canal Intake

APPENDIX D

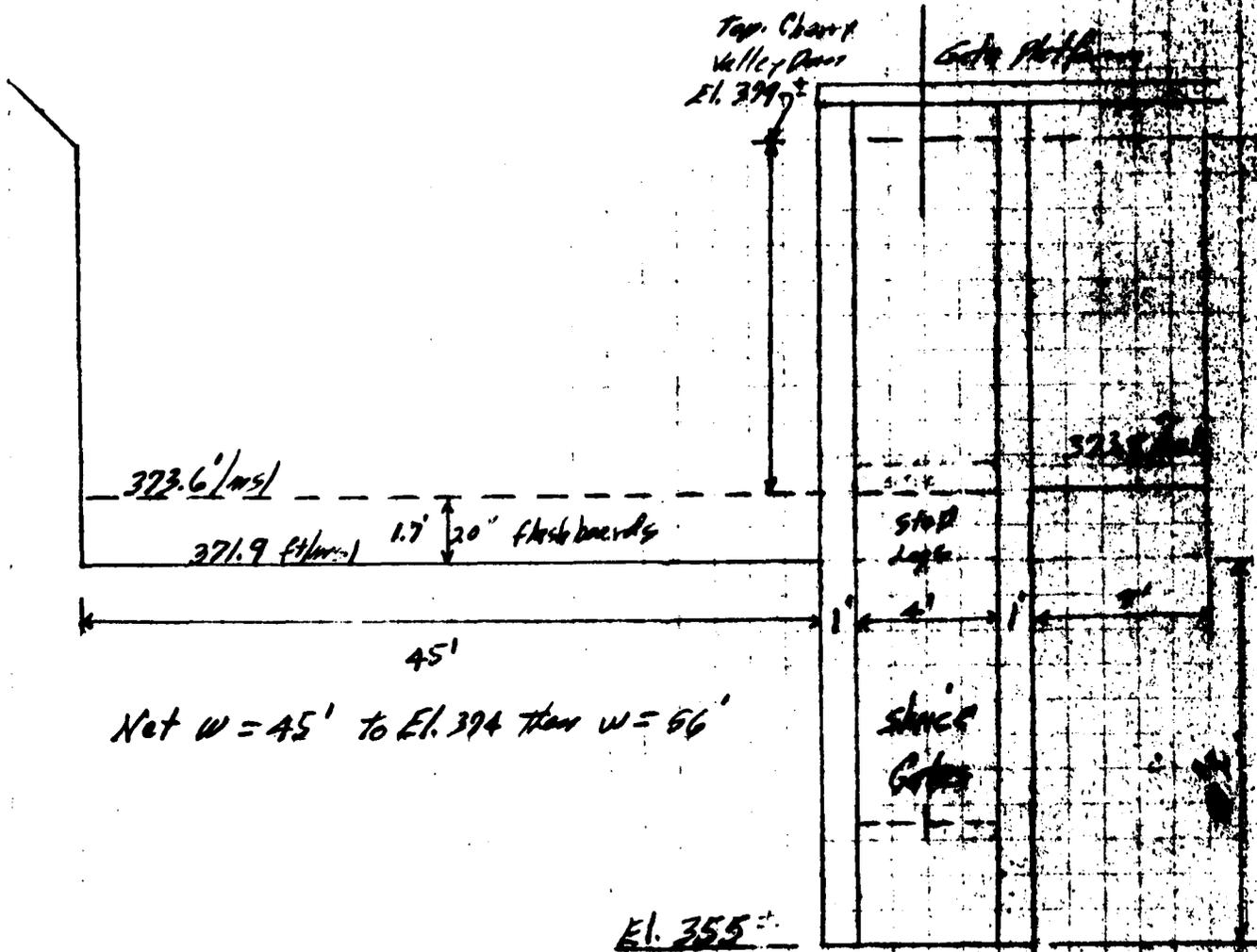
27 Sept 49

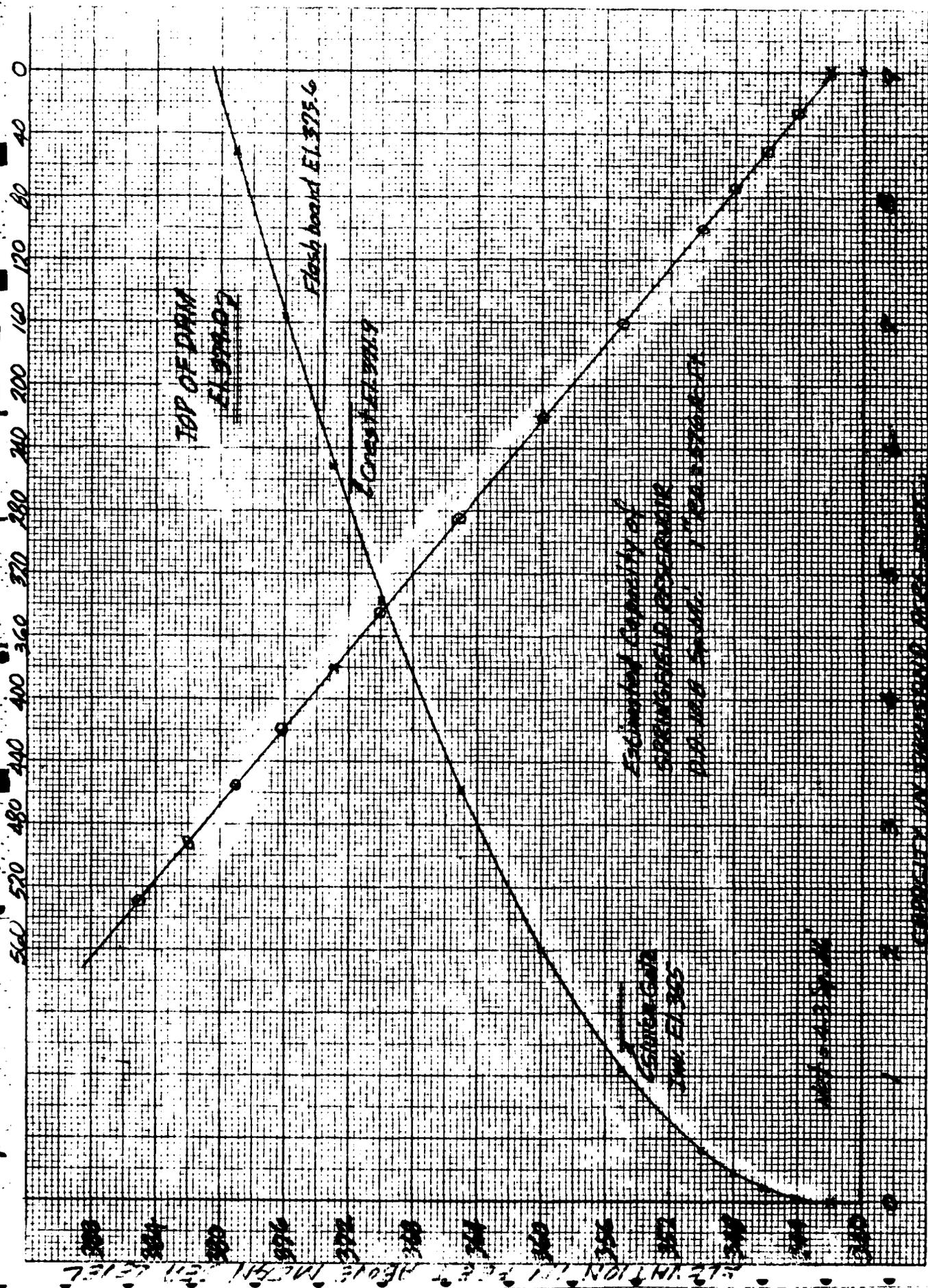
CORPS OF ENGINEERS, U. S. ARMY

SUBJECT *Dam Inspection Springville Reservoir*

COMPUTATION *Spillway data - Cherry Valley Dam 2-7-161 GA (547)*

COMPUTED BY _____ CHECKED BY _____ DATE *12/19/72*





ELEVATION IN FEET ABOVE MEAN SEA LEVEL

DEPTH IN FEET BELOW MEAN SEA LEVEL

TOP OF DAM

Flash board EL. 375.6

CONCRETE WALL

ESTIMATED CAPACITY OF
SPRINGFIELD RESERVOIR

ESTIMATED CAPACITY OF
SPRINGFIELD RESERVOIR

SUBJECT Dam Inspection

COMPUTATION Estimated Area-Capacity Springfield Reservoir

COMPUTED BY _____

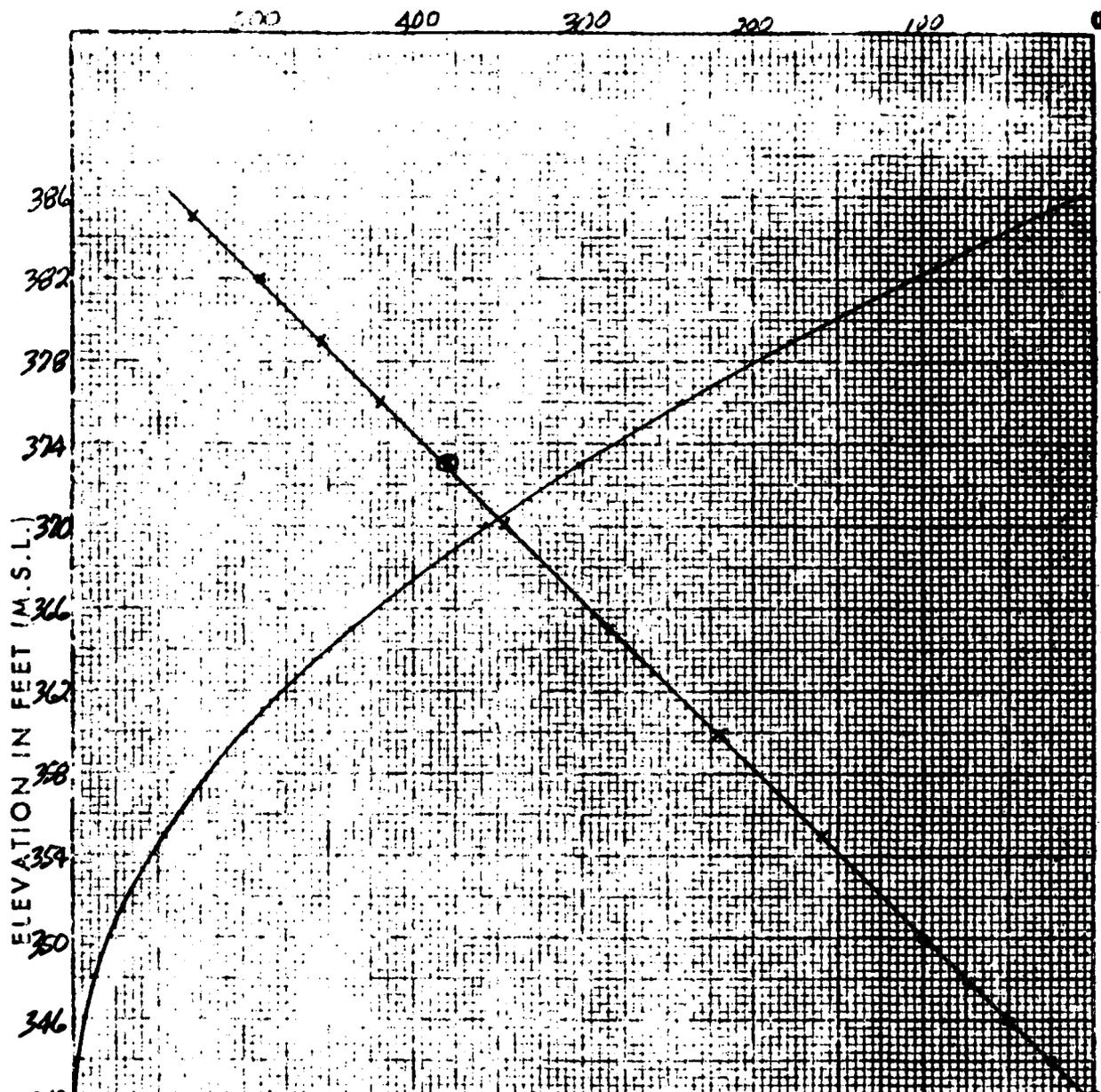
CHECKED BY _____

DATE 1/3/77

<u>EI.</u> <u>ft/ft</u>	<u>Δ</u> <u>ft.</u>	<u>Est.</u> <u>Area</u> <u>Acres</u>	<u>Avr.</u> <u>Area</u>	<u>Area</u> <u>Cap. cit.</u>	<u>± Area</u> <u>Capacity</u> <u>Ac/</u>
342		0			0
	2		13	26	
344		26			26
	2		38	76	
346		50			102
	2		63	126	
348		75			228
	2		88	176	
350		100			404
	5		130	650	
355		160			1054
	5		190	950	
360		220			2004
	5		253	1265	
365		285			3269
	5		316	1580	
370		346			4849
	3		363	1089	
373		* 380			5938
	3		400	1200	
376		420			7138
	3		438	1314	
379		455			8452
	3		473	1419	
382		490			9871
	3		510	1530	
385		530			11401

* Perimeter of w/s area + straight-line area from 240 thru 300 to EI. 385

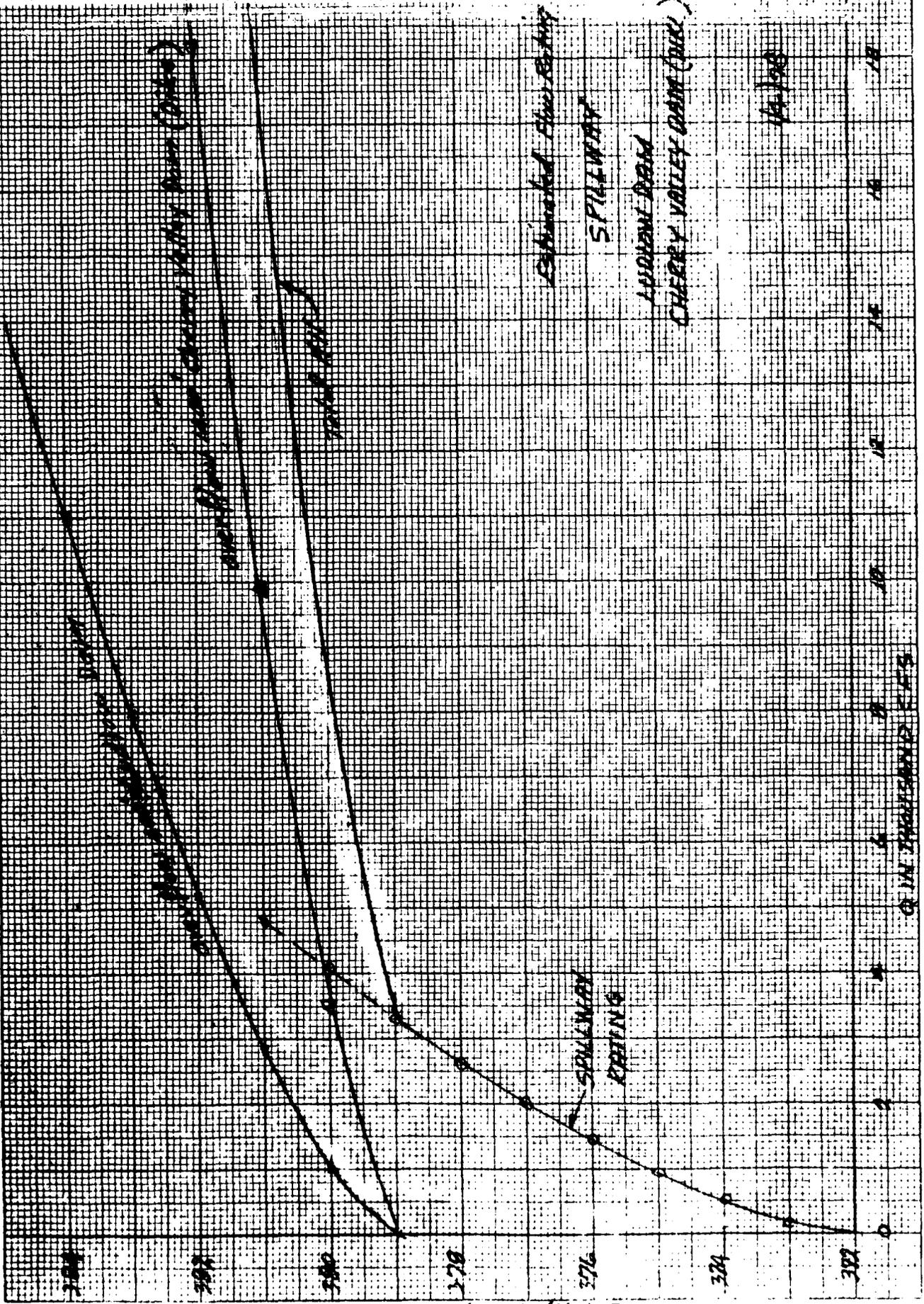
AREA OF RESERVOIR IN HUNDRED ACRES



CHICOPEE RIVER BASIN
AREA AND CAPACITY CURVES
SPRINGFIELD RESERVOIR
 RIVER MILE _____
 DRAINAGE AREA = 4.3 AND 10.8 SQ. MI.
 RIVER, _____
 U.S. Army Engineer Division, New England
 Waltham, Mass. DATE: _____

CAPACITY IN THOUSAND ACRE-FEET

(1" OF RUN-OFF = _____ ACRE-FEET)



12 11 10 9 8 7 6 5 4 3 2 1

ft
days

Estimated Flow Rating
Spillway Rating
Reservoir Dam
Cherry Valley Dam (Peak)

ft

SUBJECT

Henry Valley, D. 1122

COMPUTATION

Spillway & Dam, Dike Overflow Area

COMPUTED BY

CHECKED BY

DATE

1/4/78

EI.	Spillway <u>Q</u>	ovs. flow <u>Q</u> L=1400 ft. (Dike)	Dike Total	overflow <u>Q</u> L=400' Dam	Total All outflow	Brook Brook overflow EVA
372	0		0			
373	144		144			30
374	506		506			80
375	931		931			140
376	1430		1430			210
377	2000		2000			300
378	2600		2600		2600	390
Top → 379	3300	—	3300	—	3300	500
380	4055	3500	7560	1000	8560	600
381	4800	9900	14700	2800	17500	
382	5500	18200	23700	5200	28900	
383	6200	28000	31000	8000	39000	

South Dam $L = 400'$ @ El. 378.9

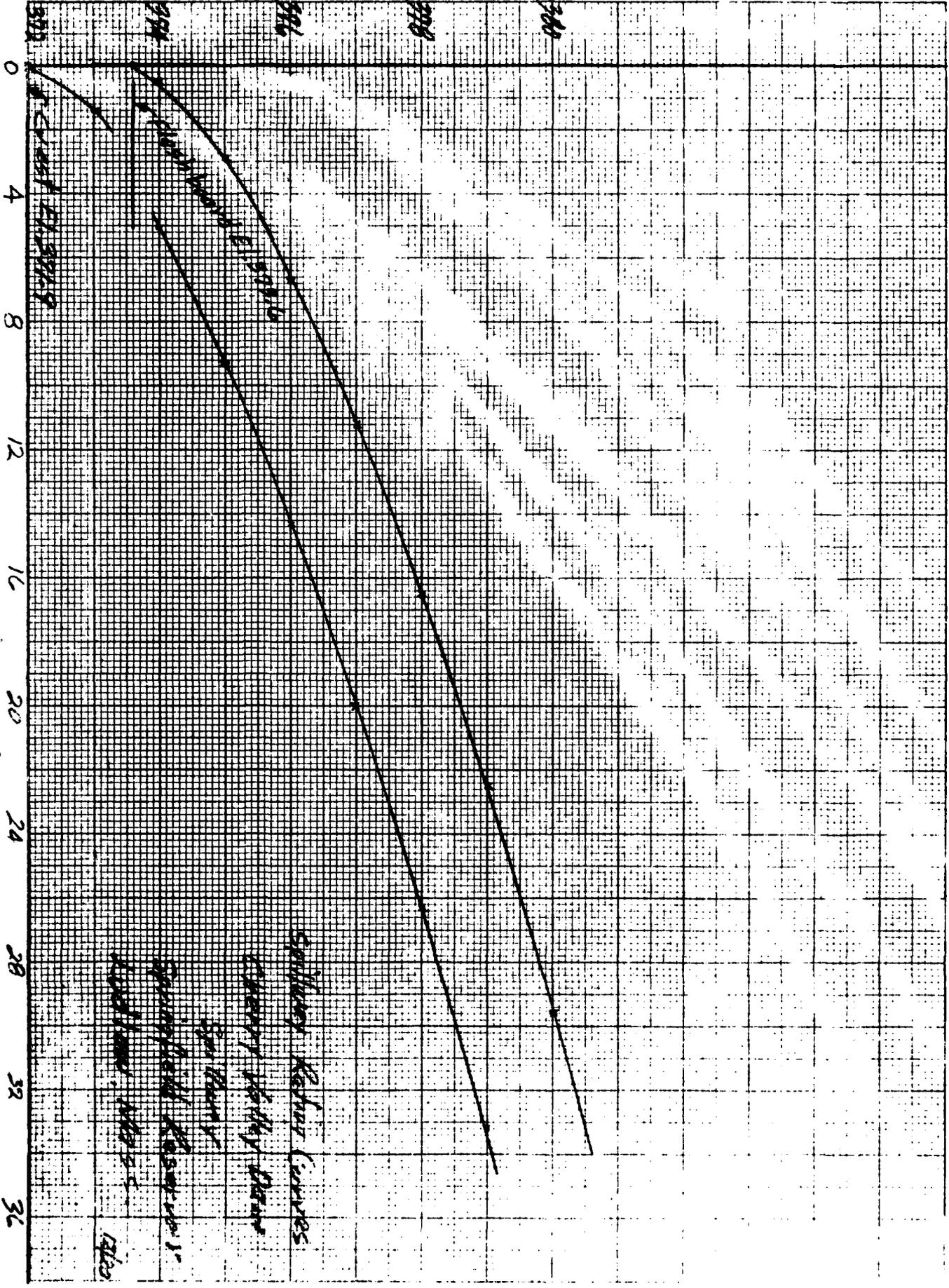
at 379

Cherry Valley Dam $L = 1400'$ @ El. 379.0

Total overflow $L = 1800'$, $C = 2.5$, $Q = CLH^{3/2}$

El.	H.	$H^{3/2}$	$\frac{L=1400}{CL}$	overflow $Q =$	$\frac{L=400}{CL}$	overflow Q
379	0	0	3500	-	1000	-
380	1	1	"	3500	"	1000
381	2	2.828	"	9800	"	2800
382	3	5.196	"	18200	"	5200
383	4	8.0	"	28000	"	8000
384	5	11.18	"	39000	"	11000
385	6	14.70	"	51500	"	14700

EL. IN FEET M.S.L.



DISTANCE IN FEET

1923

SPRINGHEAD RESERVOIR
 COUNTRY VILLAGE DAM
 SPRINGHEAD RESERVOIR
 COUNTRY VILLAGE DAM

SUBJECT SE 22117 1/2" 1/2" 1/2"

COMPUTATION Spillway Cut w/ Flap boards to El. 373.6 (20")

COMPUTED BY _____ CHECKED BY _____ DATE 12/23/77

from top of Flapboard

$$Q = C L H^{3/2} \quad Q$$

$$C = 3.2$$

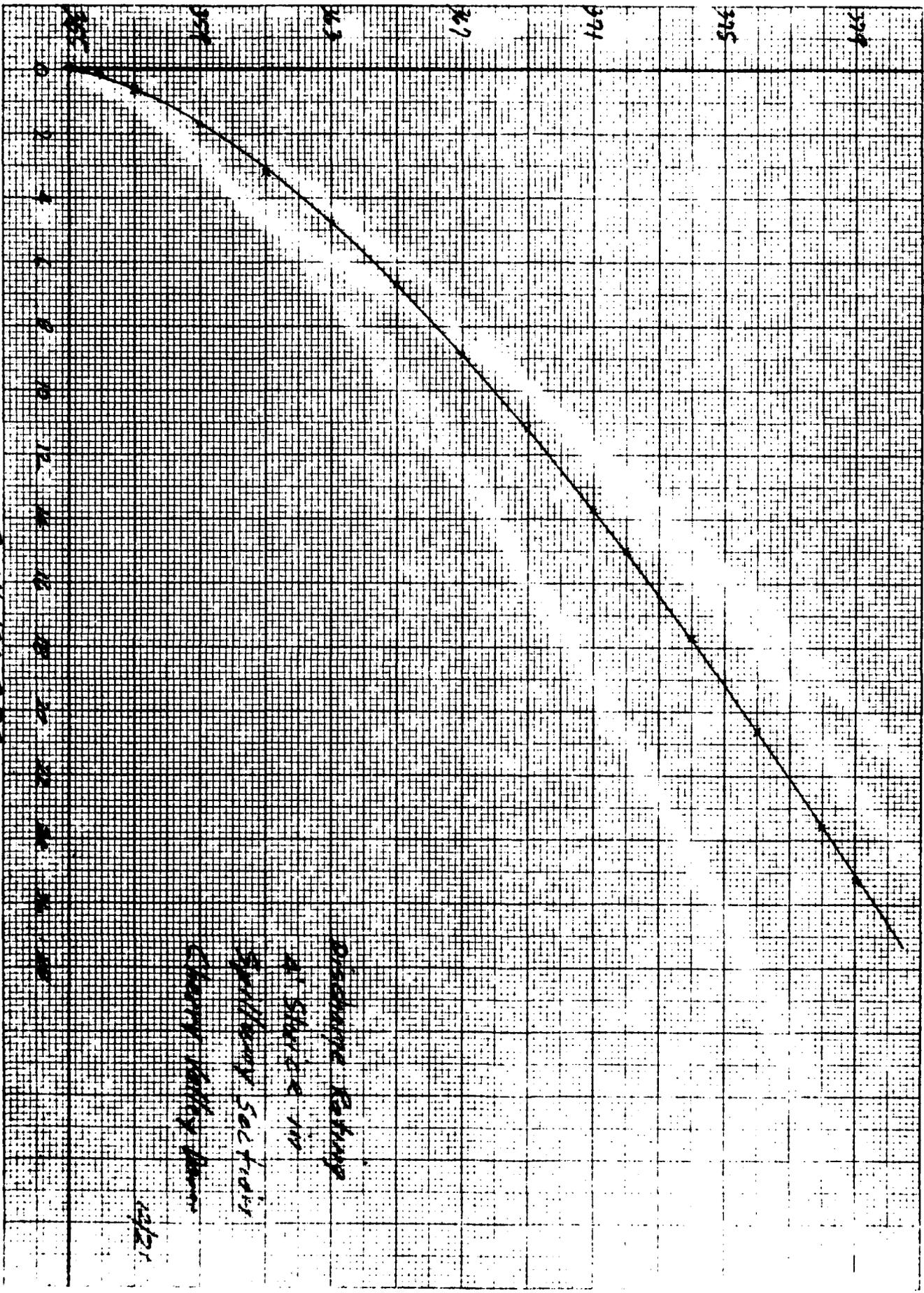
EL.	H	$H^{3/2}$	L	$LH^{3/2}$	Q
373.6	0	-	45	-	-
374	.4	.2530	56	14	46
375	1.4	1.6565	"	93	297
376	2.4	3.718	"	208	666
377	3.4	6.269	"	351	1123
378	4.4	9.230	"	517	1654
379	5.4	12.55	"	703	2250
380	6.4	16.5	"	924	2956

from Crest El. 371.9

EL.	H	$H^{3/2}$	L	$LH^{3/2}$	Q
371.9	-	-	45	-	-
372	0	-	"	-	-
373	1	1	"	45	144
374	2	2.828	56	158	506
375	3	5.196	"	291	931
376	4	8.00	"	448	1434
377	5	11.18	"	626	2003
378	6	14.70	"	823	2634
379	7	18.52	"	1037	3318
380	8	22.63	"	1267	4055
381	9	27.0	"	1512	4838

EI. IN FT. M.S.L.

8 IN 100 F.T.S.



OBSERVING STATION
 8. 500 P.E. 110
 WILLIAMS SALT PITS
 COLUMBIA COUNTY, MISSOURI
 1921

SUBJECT *Self-cleaning of Sluice gates*

COMPUTATION *of sludge on gate of Berry Valley Dam*

COMPUTED BY

CHECKED BY

DATE

12/21/77

$Q = \frac{2}{3} \sqrt{2g} L H^{3/2}, L=4'$

<u>El.</u>	<u>H</u>	<u>H^{3/2}</u>	<u>$\frac{2}{3} \sqrt{2g}$</u>	<u>$\frac{2}{3} \sqrt{2g} H^{3/2}$</u>	<u>Q</u>
355	0	-	5.35	0	0
356	1	1	"	5	20
357	2	2.828	"	15	60
359	4	8.00	"	43	170
361	6	14.70	"	79	320
363	8	22.63	"	121	480
365	10	31.62	"	169	670
367	12	41.57	"	222	890
369	14	52.38	"	280.3	1120
371	16	64.00	"	342.4	1370
372	17	70.09	"	375.0	1500
374	19	82.82	"	443.1	1770
376	21	96.23	"	514.9	2060
378	23	110.3	"	590.1	2360
379	24	117.6	"	629.2	2520

Invert El. of Sluice taken from plan June 1 1916?

APPENDIX E

INVENTORY OF DAMS IN THE UNITED STATES

STATE	DIVISION	COUNTY	CONTRACT	NAME	LATITUDE (NORTH)	LONGITUDE (WEST)	REPORT DATE
MA	580 NED	MA 013 02		CHERRY VALLEY DAM	4212.4	7224.9	12 JUL 78

POPULAR NAME	NAME OF IMPONDMENT	
CHERRY VALLEY DAM	SPRINGFIELD RESERVOIR	
REGION/BASIN	RIVER OR STREAM	
01 08 BILLINGS BRUOK	LUDLUM	
NEAREST DOWNSTREAM CITY-TOWN-VILLAGE	DIST FROM DAM (MI.)	POPULATION
		3 17580

TYPE OF DAM	YEAR COMPLETED	PURPOSES	STORAGE CAPACITY (ACR)	HYDRAULIC HEAD (FT)	IMPOUNDING CAPACITIES (ACR)	DIST OWN	FED R	PRV/FED	SCS A	VER/DATE
REPG	1877	S	47	38	8300	N	N	N	N	31 JUL 78

REMARKS

DIS HAS	SPILLWAY LENGTH (FT)	TYPE	WIDTH (FT)	MAXIMUM DISCHARGE (CFS)	VOLUME OF DAM (CY)	INSTALLED	POWER CAPACITY (MW)	PROPOSED	NO.	NAVIGATION LOCKS
1	11450	U	56	3300						

OWNER	CONSTRUCTION BY
CITY OF SPRINGFIELD	ENGINEERING 8Y

REGULATORY AGENCY			
DESIGN	CONSTRUCTION	OPERATION	MAINTENANCE

INSPECTION BY	AUTHORITY FOR INSPECTION
NED	30UCT76 PL 92-367

REMARKS

END

FILMED

6-85

DTIC