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NATIONAL DAM SAFETY PROGRAM. COLLIERSVILLE DAM (NY 685), SUSQUE--ETC(U)
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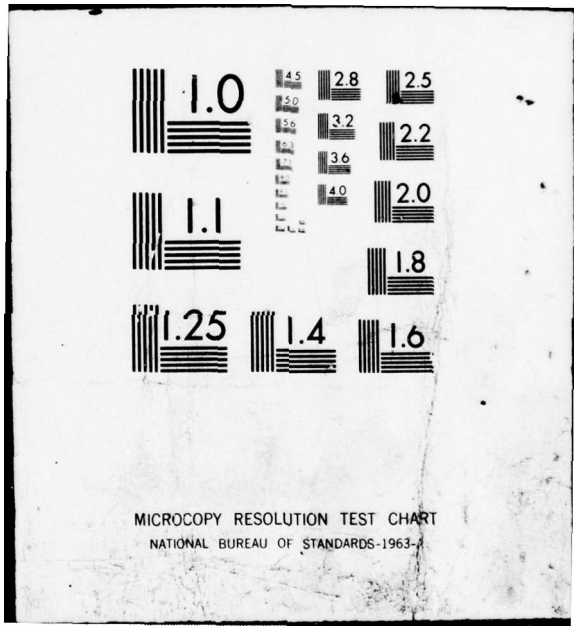
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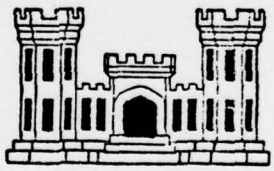
LEVEL II

SUSQUEHANNA RIVER BASIN

COLLIERSVILLE DAM

OTSEGO COUNTY, NEW YORK
INVENTORY NO. 685

PHASE I INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM



NEW YORK DISTRICT CORPS OF ENGINEERS

JULY 26, 1978

DEPARTMENT OF THE ARMY
U. S. ARMY ENGINEER DISTRICT, NEW YORK
26 FEDERAL PLAZA
NEW YORK, NEW YORK 10007

NANEN-F

2 OCT 1978

Honorable Hugh L. Carey
Governor of New York
Albany, New York 12224

Dear Governor Carey:

The purpose of this letter is to inform you of a clarification of the guidelines used by this office in assessing dams under the National Program of Inspection of Dams.

Office of the Chief of Engineers has recently provided a clarification that dams with seriously inadequate spillways are to be assessed as unsafe, non-emergency, until more detailed studies prove otherwise or corrective measures are completed.

The following dams in your state have previously been assessed as having seriously inadequate spillways, with capability to pass safely only the percentage of the probable maximum flood as noted in each report. They are now to be assessed as unsafe:

I.D. NO.	NAME OF DAM
N.Y. 59	Lower Warwick Reservoir Dam
N.Y. 4	Salisbury Mills Dam
N.Y. 45	Amawalk Dam
N.Y. 418	Jamesville Dam
N.Y. 685	Colliersville Dam
N.Y. 6	Delta Dam
N.Y. 421	Oneida City Dam
N.Y. 39	Croton Falls Dam
N.Y. 509	Chadwick Dam (Plattenkill)
N.Y. 66	Boyds Corner Dam
N.Y. 397	Cranberry Lake Dam
N.Y. 708	Seneca Falls Dam
N.Y. 332	Lake Sebago Dam
N.Y. 338	Indian Brook Dam
N.Y. 33	Lower(S) Wiccopee Dam (Lower Hudson W.S. for Peekskill)

NANEN-F
Honorable Hugh L. Carey

I.D. NO.	NAME OF DAM
N.Y. 49	Pocantico Dam
N.Y. 445	Attica Dam
N.Y. 658	Cork Center Dam
N.Y. 153	Jackson Creek Dam
N.Y. 172	Lake Algonquin Dam
N.Y. 318	Sixth Lake Dam
N.Y. 13	Butlet Storage Dam
N.Y. 90	Putnam Lake (Bog Brook Dam)
N.Y. 166	Pecks Lake Dam
N.Y. 674	Bradford Dam
N.Y. 75	Sturgeon Pool Dam
N.Y. 414	Skaneateles Dam
N.Y. 155	Indian Lake Dam
N.Y. 472	Newton Falls Dam
N.Y. 362	Buckhorn Lake Dam

The classification of "unsafe" applied to a dam because of a seriously inadequate spillway is not meant to connote the same degree of emergency as would be associated with an "unsafe" classification applied for a structural deficiency. It does mean, however, that based on an initial screening, and preliminary computations, there appears to be a serious deficiency in spillway capacity so that if a severe storm were to occur, overtopping and failure of the dam would take place, significantly increasing the hazard to loss of life downstream from the dam.

Consequently, it is advisable to implement the recommendations previously furnished in the reports for the above-mentioned dams as soon as practicable.

It is requested that owners of these dams be furnished a copy of this letter and that copies be permanently appended to all reports previously furnished to you.

Sincerely yours,

CLARK H. BENN
Colonel, Corps of Engineers
District Engineer

(1)

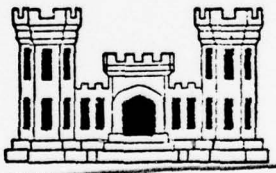
SUSQUEHANNA RIVER BASIN

COLLIERSVILLE DAM

OTSEGO COUNTY, NEW YORK
INVENTORY NO. 685

(6) **PHASE I INSPECTION REPORT**
NATIONAL DAM SAFETY PROGRAM.

Colliersville Dam (NY685), Susquehanna River Basin, Otsego County, New York. PhaseI Inspection Report,



(10) Eugene/ O'Brien

(15) DACW51-78-C-0024

Prepared by: TIPPETTS-ABBETT-McCARTHY-STRATTON, New York

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NEW YORK DISTRICT CORPS OF ENGINEERS

(11) 26 JULY ~~28~~ 1978

SUSQUEHANNA RIVER BASIN
COLLIERSVILLE DAM
INVENTORY NO. 685
PHASE I INSPECTION REPORT

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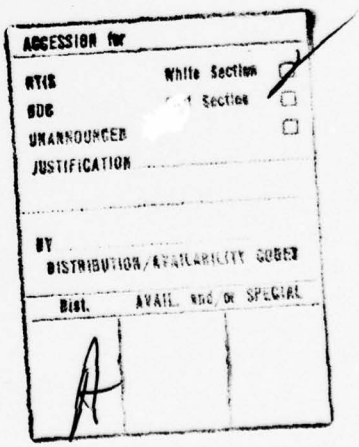


PHASE I REPORT
NATIONAL DAM SAFETY PROGRAM

Name of Dam	COLLIERSVILLE DAM (I.D. NO. 685)
State Located:	NEW YORK STATE
County Located:	OTSEGO COUNTY
Stream:	SUSQUEHANNA RIVER
Date of Inspection:	JUNE 12, 13 AND JULY 19, 1978

ASSESSMENT

Examination of the available documents and visual inspection of the Colliersville Dam and appurtenant structures did not reveal any conditions which are structurally unsafe at the present time. There exist, however, conditions of distress and deterioration which may, if the conditions worsen, have the potential for developing into hazardous conditions. These conditions should be monitored on a regular basis.

The total discharge capacity of the spillway, without overtopping the abutment sections of the dam, is 11,200 cfs, assuming the headgates are permanently closed. This is appreciably less than the Probable Maximum Flood of 59,100 cfs and the Standard Project Flood of 29,500 cfs, both as determined using a unit-hydrograph for the total area. The project discharge capacity is therefore seriously inadequate relative to either of the design floods.

It could not be determined on the basis of the available information, and also the visual inspection, that the left abutment walls extended into sound rock at the east end of the dam. Therefore, an evaluation as to whether failure of the walls, caused by overtopping and subsequent erosion around the east end, would occur during the Standard Project Flood.

Additional investigations are recommended to more reliably determine the potential for overtopping and, if overtopping were indeed possible under the Standard Project Flood, the amount of overtopping and the effect on stability of the east abutment of the dam.

The additional investigations should be initiated immediately and be performed in accordance with the requirements of the appropriate sections of Chapter 4, RECOMMENDED GUIDELINES FOR SAFETY INSPECTION OF DAMS. The investigations should include, but not necessarily be limited to the following:

- More precise evaluation of the Standard Project Flood, and the potential for overtopping, by considering lake drainage areas separately and routing component floods through the lake storages, and also valley storage in the main river channel.

- Investigate by trenching or boring the actual as-built extent of the east abutment walls.

- Determine by trenching or boring whether the walls abut into sound non-erodable rock, or the length of the walls and the nature of the overburden and embankment fill are such to preclude erosion if the dam were to be overtopped.

The additional investigations should be initiated immediately and completed as soon as possible. During the period of the investigation, programs for anticipating major floods and warning downstream residents of a potential flood hazard shortly be instituted and maintained.

No remedial measures are recommended at the present time. However, remedial measures may be necessitated as a result of the above investigations.

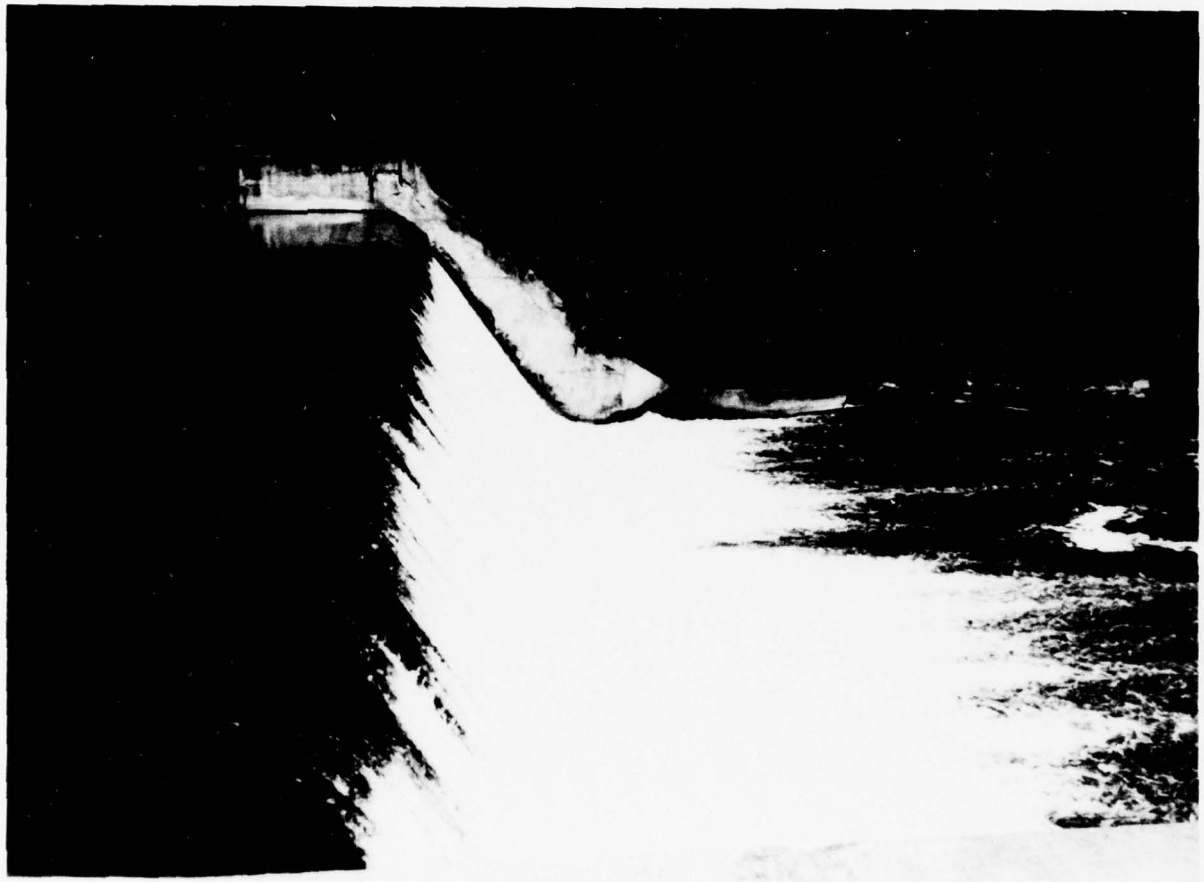
Eugene O'Brien

Eugene O'Brien, P.E.
New York No. 29823

Approved By: Clark H. Benn

Col. Clark H. Benn
New York District Engineer

Date: 28 July 58



GENERAL OVERVIEW OF DAM

PHASE I INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM
COLLIERSVILLE DAM INVENTORY NO: 685
SUSQUEHANNA RIVER BASIN
OTSEGO COUNTY, NEW YORK

SECTION 1 - PROJECT INFORMATION

1.1 GENERAL

a. Authority

The Phase I Inspection reported herein was authorized by the DEPARTMENT OF THE ARMY, NEW YORK DISTRICT, CORPS OF ENGINEERS by letter dated 31 March 1978, in fulfillment of the requirements of the National Dam Inspection Act, Public Law 92-367, 8 August 1972.

b. Purpose of Inspection

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

1.2 DESCRIPTION OF THE PROJECT

a. Description of the Dam and Appurtenant Structure

The Colliersville Dam was constructed as a component of the Colliersville Hydroelectric Project. The major structural features of the project, include a 200-feet long overflow dam flanked on the left side by an abutment, which is U-shaped in plan, and on the right side by an approximately 50-feet long gate structure. Downstream of the gates are a 550-feet long concrete flume headrace, a 105-feet long tailrace channel, a powerhouse, and a transformer house. Goodyear Lake, the pool formed by the dam is approximately 2 miles long and has a surface area of 520 acres.

The dam is a reinforced concrete ungated overflow buttress dam of the Ambursen type with flat upstream and downstream face slabs. The base width of the dam, including an upstream anchor wall and a toe wall, is approximately 70 feet and the maximum structure height is 36 feet. The upstream face slab is 9 inches thick and has a slope of approximately 1.5 (V) on 1 (H). The buttresses supporting the slabs are spaced 10 feet center to center; the crest length of the structure is 200 feet.

The U-shaped left abutment of the dam is a reinforced concrete structure consisting of a vertical wall transverse to the dam axis which connects

upstream and downstream vertical walls which parallel the dam axis. The transverse wall, which is 4-feet wide at the top and approximately 5-feet wide at the base, extends 15.0 and 26.5 feet upstream and downstream of the axis respectively. According to available drawings the upstream wall is 3-feet wide at the top, 5-feet wide at the base and extends 70 feet east of the transverse wall to the east bank of the river. The downstream wall is 2-feet wide at the top, 5-feet wide at the base and extends 40 feet east of the transverse wall. Both the upstream and downstream walls are backfilled on both sides. The maximum structural height of the upstream and transverse walls is approximately 42 feet from the foundation to the coping which is 6 feet above the crest of the dam. The maximum structural height of the downstream wall designed was approximately 25 feet. Observations during the field inspection indicate that the removal of concrete during later repair work may have reduced the height by an unknown amount.

The right abutment consists of a transverse vertical concrete wall similar to that at left abutment, which forms part of the head gate structure and extends downstream to join the wall of the concrete flume headrace.

The head gate structure comprises four openings formed by the right abutment of the dam, the right wall of the concrete flume and 3 intermediate reinforced concrete piers approximately 18 inches thick. Each opening is equipped with a steel gate 10'-6 1/4" wide by 9'-0" high. A reinforced concrete slab connecting the piers and walls forming the gate openings provides a working platform above the gates. A common structural steel hoisting frame is provided for gate operation. The power generating facilities at this dam have not been used since March 1969, and the gates now remain in a permanently closed position with three 5-inch wide by 7-inch high wooden stoplogs above each gate.

The 12-feet deep concrete flume which originally served as the headrace increases in width from approximately 50 feet at the head gate structure to 100 feet at the powerhouse.

The powerhouse is a 33.5-feet wide, 103.0-feet long, 22-feet high reinforced concrete building which, during its period of operation, was equipped with four horizontal shaft double inlet turbines. Power generating equipment has been removed from the powerhouse and it is now used for storage of materials.

The transformer house, a 34-feet wide by 43-feet long reinforced concrete building southwest of the powerhouse, also has been stripped of its original equipment. It now serves as a field office for the staff of a substation which is located south of the powerhouse structure.

b. Location

The dam is located on the North branch of the Susquehanna River, one mile north of Colliersville, Town of Milford, Otsego County, New York and 15 miles south of Otsego Lake, the source of the North Branch of the Susquehanna River.

c. Size Classification

The dam is less than 40-feet high and the usable storage volume is less than 50,000 acre feet. Therefore, it is considered to be an "intermediate" size dam.

d. Hazard Classification

The dam is in the "high" hazard potential category. The town of Colliersville, which is approximately one mile downstream, would be subject to extensive damage and possible loss of life if the dam should fail.

e. Ownership

Colliersville Dam is owned and maintained by the New York State Electric and Gas Corporation, which obtained ownership from Southern New York Power and Railway Corporation by a deed dated September 5, 1923.

f. Use of Dam

A dam has existed as this site from the early 19th century. The present dam and its appurtenant structures, which were placed in operation in 1908, were designed to provide a source of power for the 65-mile trolley line of the Oneonta and Mohawk Valley Railroad Company and to furnish power and light to the adjoining towns and villages. The dam has had several owners since its inception. The present owner, New York State Electric and Gas Corporation, (NYSEG) used the dam for power generation until 1969. Thereafter, all power generating equipment was removed. Today the sole purpose of the dam is to maintain the level of Goodyear Lake, the pool formed by the dam, for recreational purposes.

g. Design and Construction History

The Colliersville Hydroelectric Plant was designed by the Stevens-Hewitt Engineering Company. The designers, acting as contractors, commenced construction in June 1906. The firm of William Barclay Parsons was appointed by the owners as engineers to supervise the completion of the work and testing of the machinery. The work was completed under the direction of Mr. P. S. Tainter representing the Stevens-Hewitt Engineering Co. and the tests were conducted by Mr. H. M. Brinckerhoff, mechanical and electrical associate of Mr. Parsons. The plant was placed in operation in 1908.

Subsequent construction work included replacement of the concrete flume after failure over a portion of its length, gunite repair of the dam slabs

and the walls and foundations of the concrete flumes, placement of fill downstream of the south wall of the U-shaped left abutment to protect against movement, removal of the ice spillway at the end of the headrace, and removal of power-generating equipment from the powerhouse and related equipment from the transformer house.

h. Normal Operating Procedure

Since the headrace and powerhouse are no longer in use, the four head gates at the entrance to the headrace are maintained in a permanently closed position. Three 5-inch wide by 7-inch high stop logs are also kept in place.

i. Regulating Outlets

The four head gates at the intake of the headrace, which are the only gates at the dam, have their inverts near the headrace canal floor at El 1144.14. Stoplogs can be added above the gates in the gate slots. The gates have 1/4 inch thick upstream skin plates and are vertical lift type with three lifting and "dogging" points at the top. An elevated hoist beam is provided above the gates with lifting eyes for attaching hand hoists and "dogging" connections.

1.3 PERTINENT DATA

a. Drainage Areas (Sq. miles)	351
b. Discharge at Dam Site, cfs	
Maximum known at site (March 19, 1936)	8740
Maximum regulating gates; assume gates permantly closed	0
Ungated spillway at Maximum pool, El.1156.22	11200
Total discharge capacity at maximum pool	11200
c. Elevation (ft. above MSL)	
Top of Dam	1156.22
Crest of Spillway	1150.22
Canal at Head gates	1144.14
Streambed at centerline of dam	1118±
d. Reservoir (miles)	
Length of recreation pool	2
e. Storage (acre-feet)	
Recreation pool. El 1150.22	7800
Top of dam, El. 1156.22	10300
f. Reservoir Surface (acres)	
Top of dam	520

g. Dam

Type: Ambursen reinforced concrete flat slab and buttress
Length: Total =320± feet
50 feet gated canal, 200 feet dam, 70± feet left abutment
Height: 36 feet, maximum
Side Slope: Upstream 1.0(V) on 1.0(H)
Downstream 1.5(V) on 1.0(H)
Grout Curtain: None

h. Spillway

Type: Downstream face Ambursen of dam
Length of weir: 200 feet
Crest El. 1150.22
Gates: Ungated

i. Regulating Outlets

There are no low level outlets. Due to removal of equipment from the powerhouse water cannot be passed through the headrace; the headgates are kept permanently in the closed position.

SECTION 2 - ENGINEERING DATA

2.1 DESIGN

The detailed design of the dam was done by the Stevens-Hewitt Engineering Company in 1906. Information on the design details is available from Stevens-Hewitt drawings, construction photographs and correspondence in the NYSEG files. A list of the Stevens-Hewitt drawings reviewed is given in the Appendix. Information also is available from a technical article entitled "The Colliersville Hydro-Electric Plant" published in the Engineering News Record, Vol. 57, No. 10, dated March 7, 1908. None of the original design computations are available.

The available information indicates that the dam and appurtenant structures, in general, were founded on "solid shale" after excavation... "through successive layers of shale and clay...". The dam foundation is reported to be "... about 6 feet below the original bed of the river...". A brief analysis of the stability of the dam against sliding and overturning was made by NYSEG on December 4, 1975. The results of this analysis show the structure to be safe with water acting over a base to crest height of 32 feet. It should be noted that the dam successfully withstood the maximum flood, which occurred on March 19, 1936, with water flowing an estimated depth of 4.6 feet over the crest of the dam.

2.2 CONSTRUCTION RECORDS

The sources of information on the construction of the Colliersville Hydroelectric Project comprise a series of photographs in the files of the NYSEG and the Engineering News Record article referenced in Paragraph 2.1. Subsequent repair work by NYSEG such as the grouting of leaks through the slabs and joints of the Ambursen dam, gunite repairs to the spillways and head gate repairs are also documented with photographs. Detailed records of both the original construction and subsequent repairs are not available.

2.3 OPERATION RECORDS

There is no operation and maintenance manual for this project. Operation records were maintained up to March 1969 when operations at the powerhouse were terminated. Operation data are available in the following reports:

a. Inspection Reports for the Colliers Hydro Power Plant from 1955 to 1966 including comments on gates and turbine operation and maintenance.

b. "Water Level, Colliers Plant 1950-1968", and

c. "Summation of Generation, Colliers 1964-1969"

Currently, an "inspector" visits the site every six to eight weeks to check the structure and make observations.

2.4 EVALUATION OF DATA

The data provided by the New York State Electric and Gas Corporation consisted primarily of copies of the design drawings; reference data and drawings which were part of the Colliers Hydro Licensing Application of March 31, 1964; internal inspection reports for the years 1955, 1957, 1960, 1964 and 1966; a 1977 inspection report by an independent consultant; correspondence with the Ambursen Engineering Corporation and an outside consultant pertaining to the problem of cracking in the tops of the buttress; records of pool elevation; and photographic records. As-built drawings and project specifications were not available.

The available data reviewed combined with data obtained during the visual inspection are considered adequate for a Phase I inspection and evaluation of safety of the Ambursen Dam and gate structures; however, discrepencies between design drawings for and visual observations of the left abutment wall preclude adequate evaluation of the wall stability if the dam were to be overtopped.

SECTION 3 - VISUAL INSPECTION

3.1 FINDINGS

a. General

Visual inspections of Colliersville Dam were made on June 12, June 13 and July 20, 1978. On June 12, the reservoir level was approximately 6 inches above the crest; on June 13, after one inch of rain had fallen during the night, the reservoir level had risen to approximately El. 1151±.

b. Ambursen Dam/Spillway

Inspection of the exterior and interior of the Ambursen dam/spillway revealed cracking of the buttresses and face slabs and evidence of concrete deterioration. Areas of past and current leakage were in evidence in the interior of the structure. Water flows down the upstream face slabs and the buttresses at many locations and; minerals deposited by flowing water fill cracks and cover large areas of the surface of the concrete. Stalactities hang from overhead. However, the quantity of water entering the dam is relatively small and the level of water within the dam remains low due to the presence of 1 ft by 1 ft drainage openings through the bottom of the dam at the toe. On June 13, 1978, seepage was observed to be significantly higher than on the first day, even through the estimated increase in head caused by the overnight rain was only about 0.3 ft.

All buttresses have cracks in a generally horizontal direction slightly below the top of the catwalk openings. The cracks vary in width rarely exceeding 3/8 inch at the catwalk opening and decreasing in width as the crack approaches the upstream and downstream faces. A few cracks have additional spalling at the surface near the opening making them appear even larger. It is reported that the cracks developed shortly after the dam was placed in operation. Metal plates, 3 inches wide by 24 inches high, were installed in 1952 on the downstream side of the walkway opening to monitor the horizontal and vertical movement of the cracks. The plates are anchored in the concrete below the crack and free at the top. It is reported that, based on observations made by the NYSEG field engineer during his many regular inspections in the last ten years, there has been no discernible movement.

Cracks and concrete deterioration also are visible on the interior faces of the spillway slab and on the abutment walls. In Bay 20, for example, where the wall of the left abutment transverse to the dam axis is exposed, there is a zone of deterioration in which the aggregate is exposed. This is believed to be caused by frost action since this is an exterior wall. In addition, a crack was observed at the intersection of the upstream slab and the crest in this bay. Similar cracks were observed in Bays Nos. 4, 8, 12, 18 and 19. Some of these exhibit spalled edges and exposed reinforcing bars.

Concrete cracking and deterioration are also evident from the exterior of the dam/spillway, even though water was flowing over the crest. Surface spalling of the channel side of the west abutment wall also was observed. It is reported that the gunite, which was applied to the exterior of the slabs of the Ambursen dam, was deteriorating; this could not be verified since water was flowing over the crest at the time of the inspection.

There is evidence of leakage in almost all bays. The wooden walkway between the buttresses was wet throughout and a buildup of mineral deposits was encountered at several locations. A flow of water was observed at the deteriorated portion of the left abutment wall mentioned above and another small stream of water was observed passing through the upstream face slab in Bay 9. Flow in this bay increased significantly when the head on the dam increased due to the rain previously mentioned. The cracks in Bays 4, 8, 12, 18 and 19, which are referred to above, show seepage in the form of dampness. Seepage also was observed to occur at the juncture of the upstream face slab and the buttress in some bays.

Mineral deposition coats buttresses, upstream and downstream face slabs, and the bottom of the crest pour.

Seepage is also occuring at the left abutment of the dam. This is believed to be due to water passing around the abutment rather than through it. This abutment is U-shaped in plan and water apparently becomes trapped between the walls parallel to the axis. Exposed horizontal reinforcing bars which may have tied the downstream abutment wall to the transverse wall indicate that the downstream wall may have been lowered. The current top of this wall seems to serve as a dam and water was observed to flow over the top of the concrete. A seep estimated at 2 gpm was observed 4.5 ft from the eastern face of the transverse wall. An 8-inch drain in the fill downstream from the low wall was not functioning. It was not possible to ascertain whether this was due to a blockage of the pipe or to flow of the water through the fill.

Seepage also was observed in the hillside about 150 feet downstream from the dam. The slope in this area was wet and covered with typical wet area vegetation.

There appears to be a discrepancy between the length of the upstream left abutment wall as shown on the available drawings and as observed in the field. The drawing indicates that the wall is 70-feet long. Field inspection, using a pick and shovel to probe for the east end of the wall as it disappears into the abutment, indicates the wall is at least 75-feet long; the location of the east end of the wall, and therefore its length, could not be ascertained using hand probing methods.

Exposed horizontal bars protruding from the transverse wall, at the location where the downstream left abutment wall meets the dam indicates that the downstream wall was lowered. For the most part, the downstream wall which is covered by fill, could not be seen.

There is some question as to whether either wall abuts directly into sound rock; examination of the east bank of the river at and near the dam indicate that rock may not be close to ground surface.

The west abutment also has an entrance into the dam. New grating over the entrance had recently been installed. The downstream channel face of the west wing wall was not in good condition with some spalling of the surface and some exposed aggregate.

c. Head Gate Structure

At the time of the inspection the head gates were in the down position. Three 5-inch wide by 7-inch high stop logs were atop each gate and the upper stop log above each gate was wedged tight at the ends. It is understood that the head gates have been closed since the powerhouse operations were terminated in 1969. The 1955 NYSEG inspection report noted that the original timber stop logs at the intake had been replaced (probably just prior to 1955) by the present steel gates. It was noted in the 1957 report that the head gates had closed satisfactorily. The water level at the time of this inspection was 4 feet below the top of the stop logs. Leakage past the gates had resulted in the ponding of water up to 8 inches deep in the headrace flume immediately downstream of the gates.

The inspection indicated bottom leakage on the left side of Gate No. 2, the second from the west. Significant leakage also was observed around the Gate No. 4 guide immediately adjacent to the dam and about 3.5 feet above the floor of the flume. There is a large area of spalled concrete adjacent to the leak. From this spalled area, a bulge in the wall which ranges from 6 to 12 inches in width extends horizontally for several feet.

All gates and the hoist frame over the gates showed signs of rust. In addition, the segment of the hoist frame over Gate No. 3 was bent down about 2 inches in the middle.

The west wall of Gate Bay No. 4 had a crack 3-feet long on its downstream face about 4 1/2 feet from the floor which also continued around the downstream end. There is some spalling of the concrete on the faces of the piers of Gate Bays Nos. 2 and 3. In Gate Bay No. 1, the west wall, adjacent to the road, has some relatively long irregular cracks near the top. There is also a bulging of the upper wall a few feet downstream of the gate.

d. Concrete Headrace Flume

In general the condition of the headrace flume is poor. There is evidence of extensive gunite repairs to the concrete flume which was reconstructed following the collapse of the original flume. The gunite itself can now be observed to be cracked and pulling away from the concrete wall as much as 12 to 18 inches at several locations. At one location, where a highway culvert discharges water down to the flume, it appears that freezing and thawing of water in an initial crack in the gunite forced the gunite farther away from the wall to which it was applied. This condition was noted in a previous inspection report. The downstream wall of the flume near the powerhouse also shows signs of deterioration in the form of cracks, bulging and spalling of the concrete wall. In addition the buttresses stiffening the downstream wall exhibit signs of deterioration in the form of spalled surfaces, surface cracks and some areas with exposed aggregate. The ice spillway at the downstream end of the flume has been removed and the opening in the wall has been closed.

Inspection of the underside of the flume revealed that, in general, it is in satisfactory condition although there are some minor cracks and locally spalled areas. However, the concrete for at least half of the columns and footings which support the flume show signs of deterioration and spalling which have exposed reinforcing rods. The 1955, 1957 and 1960 inspection reports of NYSEG indicate that the footings and columns were restored to their original condition. They apparently have not been repaired since 1961.

Some of the drains which carry water from the west side of the flume to be discharged downslope on the east side were functioning at the time of the inspection; many of the elbows at the base of the risers on these drains are broken.

e. Powerhouse

The powerhouse is no longer used for generating power. The turbine chamber gates and generating equipment are either in disrepair or have been removed.

f. Downstream Channel

Discharge over the dam flows into the channel of the Susquehanna River. There is no downstream apron beyond the structure. The stream bed is full of rocks and stones of all sizes. On the west side are huge chunks of concrete, remnants of the portion of the old flume which failed. Further downstream the channel narrows as it approaches and passes the former powerhouse structure.

g. Reservoir Area

In the vicinity of the dam, there was no evidence of sloughing, potentially unstable slopes or other unusual conditions which would adversely affect the dam.

3.2 EVALUATION OF OBSERVATIONS

Very little if any change has been reported in the condition of the cracked buttress wall. They have been inspected and monitored closely since 1951. The Inspection Reports and the Consulting Engineers concluded that the cracks do not affect the stability or safety of the structure and that for the immediate future no repair or correction of this condition would be necessary. This conclusion appears to be reasonable.

Since the canal is no longer used, footings and columns under the canal need not be repaired at the present time; however, they should be inspected at least annually. If the footings and piers continue to spall and disintergrate the need for repairs, replacements or other types of rehabilitation should be investigated.

The structural soundness of the head gates and their supporting structures should be inspected at least once every four months.

On the basis of the visual observations it cannot be ascertained that the upstream and downstream walls extending from the Ambursen dam to the east bank actually abut, at their east end, into sound rock; the lengths of as-built walls, which apparently differ from the design length, could not be determined.

SECTION 4 - OPERATIONAL AND MAINTENANCE PROCEDURES

4.1 PROCEDURES

The head gates at the intake to the headrace channel have remained closed since the power plant ceased operation in 1969. There is no regulation of the reservoir level.

4.2 MAINTENANCE OF DAM

There is no operation and maintenance manual for the project. There are no formally established maintenance procedures for the dam. A Field Engineer inspects the dam at 6 to 8 week intervals. Repairs to the concrete structures for spalling and deteriorating surfaces, exposed rebars and leakage are made according to their need.

4.3 MAINTENANCE OF OPERATING FACILITIES

There is little evidence of recent maintenance of the headrace canal. The canal is empty and the gates and power machinery at the powerhouse have been either removed or abandoned.

It was reported that the dam and appurtenances are inspected periodidally at 6 to 8 week intervals.

New steel deck grating had been installed in place of the previous wooden planks at the left abutment entrance to the dam. This grating entrance is kept locked.

4.4 DESCRIPTION OF WARNING SYSTEM IN EFFECT

There is no warning system currently in effect.

SECTION 5 - COLLIERSVILLE DAM HYDRAULIC/HYDROLOGIC

5.1 DRAINAGE AREA CHARACTERISTICS

The drainage area of the Susquehanna River upstream of the Colliersville Dam totals 349 square miles. Two large lakes in the headwaters, Otsego Lake and Canadarago Lake with drainage areas of 93 sq. mi. and 65 sq. mi., respectively, probably provide substantial storage within the basin, which in turn may be expected to modify peak flood runoff, thus causing net effective drainage area in most floods to be only about 191 sq. mi. The river flows in a meandering course through a flat valley, which has a potential for valley storage in major floods. The longitudinal slope is only about 2 feet per mile.

5.2 SPILLWAY CAPACITY

The spillway is 200 feet long and shaped to conform to the overall jet. The maximum head possible, between the crest of the spillway (El. 1150.2) and the top of the dam, is 6 feet. The head-discharge relationship was computed assuming that the weir coefficient varied from 3.1 at one foot head to 3.8 at five feet of head, and above. The computed capacity at maximum head is 11,200 cfs. The spillway rating curve is shown on Figure 1.

5.3 RESERVOIR CAPACITY

According to the U.S. Geological Survey map, the surface area of Goodyear Lake is 366 acres at El. 1150.2. It is estimated that the surface area of the lake at the top of the dam (El. 1156.2) is 484 acres, indicating a surcharge storage of about 2500 acre-feet, equivalent to only 0.13 inch of runoff. No data on the total capacity of the lake were available.

5.4 FLOODS OF RECORD

A U.S.G.S. gaging station, located one quarter mile downstream from the dam, was operated from June 1924 to September 1968, inclusive. The annual flood peaks are shown on Table 2 and the frequency curve of peak discharges is shown on Figure 2. The mean annual flood is 4639 cfs, and the 100-year flood is estimated to be 10,000 cfs. The greatest flow measured at a USGS gaging station was 8740 cfs in March 19, 1936.

5.5 DESIGN FLOODS

The unique hydrologic characteristics of the Susquehanna River above Colliersville Dam indicate that it will have a low flood potential, and, therefore, estimates of the Probable Maximum Flood and the Standard Project Flood based on generalized relations considering the total drainage area alone will

lead to excessive values. To obtain a more reliable estimate of the PMF peak discharge, a PMP design storm for an area of 349 sq. mi. in the Upper Susquehanna Basin was derived from a study prepared by the U.S. Weather Bureau,[1] and the rainfall excess from this storm was applied to a unit hydrograph for the total drainage area previously derived in a study for the Susquehanna River Basin.[2] The computed peak discharge for the PMF was 59,100 cfs. From this discharge the peak of the Standard Project Flood is estimated to be approximately 29,500 cfs or 3.38 times the maximum flood of record and 2.63 times the computed spillway capacity of 11,200 cfs.

5.6 OVERTOPPING POTENTIAL

The estimated peak discharge of 29,500 cfs for the Standard Project Flood is considered to be an adequate standard for evaluating the safety of the dam. It is not necessary to route the entire flood hydrograph through the reservoir as the surcharge storage is negligible. The design peak flow is 2.63 times the capacity of the spillway to the top of the abutments. If it is assumed that the abutment sections could safely take overflow, it is estimated that flow over the abutments would be approximately 2 to 4 feet deep under the design flood.

5.7 EVALUATION

In view of the fact that the abutments will be overtopped by 2 to 4 feet, under the estimated Standard Project Flood, it is considered that the spillway capacity is seriously inadequate from a hydraulic and hydrologic viewpoint.

However, it is believed that the Standard Project Flood based on a unit-hydrograph for the total area, including the lakes, is very conservative, and that a more precise estimate could be made by considering the drainage areas of the lakes separately and routing component floods through the lake storages and also considering valley storage in the main river channel.

---

[1] Probable Maximum Precipitation, Susquehanna Drainage Above Harrisburg, Pa., Hydrometeorological Report No. 4, Figs. 1 and 2, May 1965.

[2] Susquehanna River Basin Study; Susquehanna River Basin Coordinating Committee, Appendix D, Hydrology, Table 33, p. D-IV-116, June 1970.

SECTION 6 - STRUCTURAL STABILITY

6.1 EVALUATION OF STRUCTURAL STABILITY

a. Visual Observations

Visual observations did indicate some existing conditions of distress and deterioration, which could adversely affect the structural stability of the dam if they were allowed to become worse. However, the cracked buttresses in the dam and the deteriorating reinforced concrete footings and piers supporting the flume are conditions which have existed with little if any discernible change in the past few years. These conditions should be monitored closely during the regular inspections.

The buttress cracks at the walkway openings are a potential hazard but they have remained in their present condition for many years. They originally occurred about 1909, shortly after the dam was built. In 1909 water was not spilling over the dam and the downstream spillway slab (apron) acquired a temperature greater than 100°F while the buttress and upstream slab was at 70°F or less. The differential temperature of over 30°F between the apron and the buttress caused the apron to expand upwards relative to the buttress lifting the upper part of the buttress and causing the cracks at the walkway opening. Displacement of particles have kept the cracks from closing upon reversal of the temperature forces.

Contributing factors may have been omission of non-bonding asphalt compound at the tops of the buttresses and the omission of additional reinforcement around the walkway opening.

Ambursen dams built later did add coal tar mastic to separate slabs and buttresses and placed additional reinforcement around the walkway openings. Consulting engineers, involved with this problem, have agreed that these cracks would not have occurred because of loadings of the dam with water or ice pressure only.

At present, the top of the buttress and the downstream spillway slab are subjected to very little stress and there is little chance of excessive temperature stress again affecting the "walkway" cracks because water has always been flowing over the dam since the concrete flume was closed.

The piers and footings under the canal are not in good condition but their deterioration has been gradual. If the deterioration is unchecked and repairs are not made over the next several years then the structural adequacy of the channel and head gate supports may be endangered.

Monitoring the dam, the channel and the head gates at frequent intervals is advisable to prevent potentially hazardous conditions from arising without the opportunity to initiate remedial measures.

b. Design and Construction Data

The original design computations for structural stability of the dam are no longer available. The results of an analysis of the dam made by a NYSEG staff member and dated December 4, 1975 indicate that the resultant falls within the middle third of the base and the safety factor for sliding is acceptable.

c. Operating Records

Operating records were kept up to 1969 when the hydro plant stopped generating power. The water level gage is no longer operable. No major operational problems which would affect the stability of the dam or canal were reported in recent years.

d. Post Construction Changes

There have been structural changes and repairs to the concrete canal since it was opened in 1908. A number of inspection reports have reported and requested repairs to the dam and canal. Records and/or drawings of construction changes and repairs are not available.

Flash boards were originally used on the crest of the dam but they are no longer available. A portion of the original reinforced concrete headrace flume failed, was redesigned and rebuilt. No drawings or design computations are available but photographs are available of the original and existing structures.

SECTION 7 - ASSESSMENT/REMEDIAL MEASURES

7.1 DAM ASSESSMENT

a. Safety

Examination of the available documents and visual inspection of the Colliersville Dam and appurtenant structures did not reveal any conditions which are structurally unsafe at the present time. There exist, however, conditions of distress and deterioration which may, if the conditions worsen, have the potential for developing into hazardous conditions. These conditions should be monitored on a regular basis.

The total discharge capacity of the spillway, without overtopping the abutment sections of the dam, is 11,200 cfs, assuming the head gates are permanently closed. This is appreciably less than the Probable Maximum Flood of 59,100 cfs and the Standard Project Flood of 29,500 cfs, both as determined using a unit-hydrograph for the total area. The project discharge capacity is therefore seriously inadequate relative to either of the design floods.

If failure of the dam and its abutments were not to occur as a result of overtopping, the spillway inadequacy would be of little concern since the entire structure could overflow for the short duration of such a major flood. However, it could not be determined on the basis of the available information, and also the visual inspection, that the left abutment walls extended into sound rock at the east end of the dam. In fact, the actual length of walls and the distance to which they penetrated the abutment could not be ascertained. Therefore an evaluation as to whether failure of the walls, caused by overtopping and subsequent erosion around the east end, would occur during the Standard Project Flood.

b. Adequacy of Information

Information on the Ambursen dam and gate structures are adequate for the Phase I inspection. Information regarding the as-built dimensions of the east abutment walls, and whether they extend to rock, is inadequate to evaluate erosion, undermining and potential for instability if the dam were to be overtopped.

c. Additional Investigations

Additional recommendations are recommended to more reliably determine the potential for overtopping and, if overtopping were indeed possible under the Standard Project Flood, the amount of overtopping and the effect on the east abutment of the dam.

The additional investigations should be initiated immediately and be performed in accordance with the requirements of the appropriate sections of

Chapter 4, RECOMMENDED GUIDELINES FOR SAFETY INSPECTION OF DAMS.

The investigations should include, but not necessarily be limited to the following:

- More precise evaluation of the Standard Project Flood, and the potential for overtopping, by considering lake drainage areas separately and routing component floods through the lake storages, and also valley storage in the main river channel.

- Investigate by trenching or boring the actual as-built extent of the east abutment walls.

- Determine by trenching or boring whether the walls abut into sound non-erodable rock, or the length of the walls and the nature of the overburden and embankment fill are such to preclude erosion if the dam were to be overtopped.

d. Urgency

The additional investigations should be initiated immediately and completed as soon as possible. During the period of the investigation, programs for anticipation and surveillance of major floods and for warning downstream residents of a potential flood hazard should be instituted and maintained.

e. Remedial Measures

No remedial measures are recommended at the present time. However, remedial measures may be necessitated as a result of the above investigations.

Certain measures, however, are recommended as follows:

a. Continue monitoring of the cracks in the buttresses of the Ambursen dam particularly during periods of high flow over the dam.

b. Periodic inspection of project features such as:
   - deteriorating flume piers and footings
   - gates and gate supports
   - structural components of the Ambursen dam

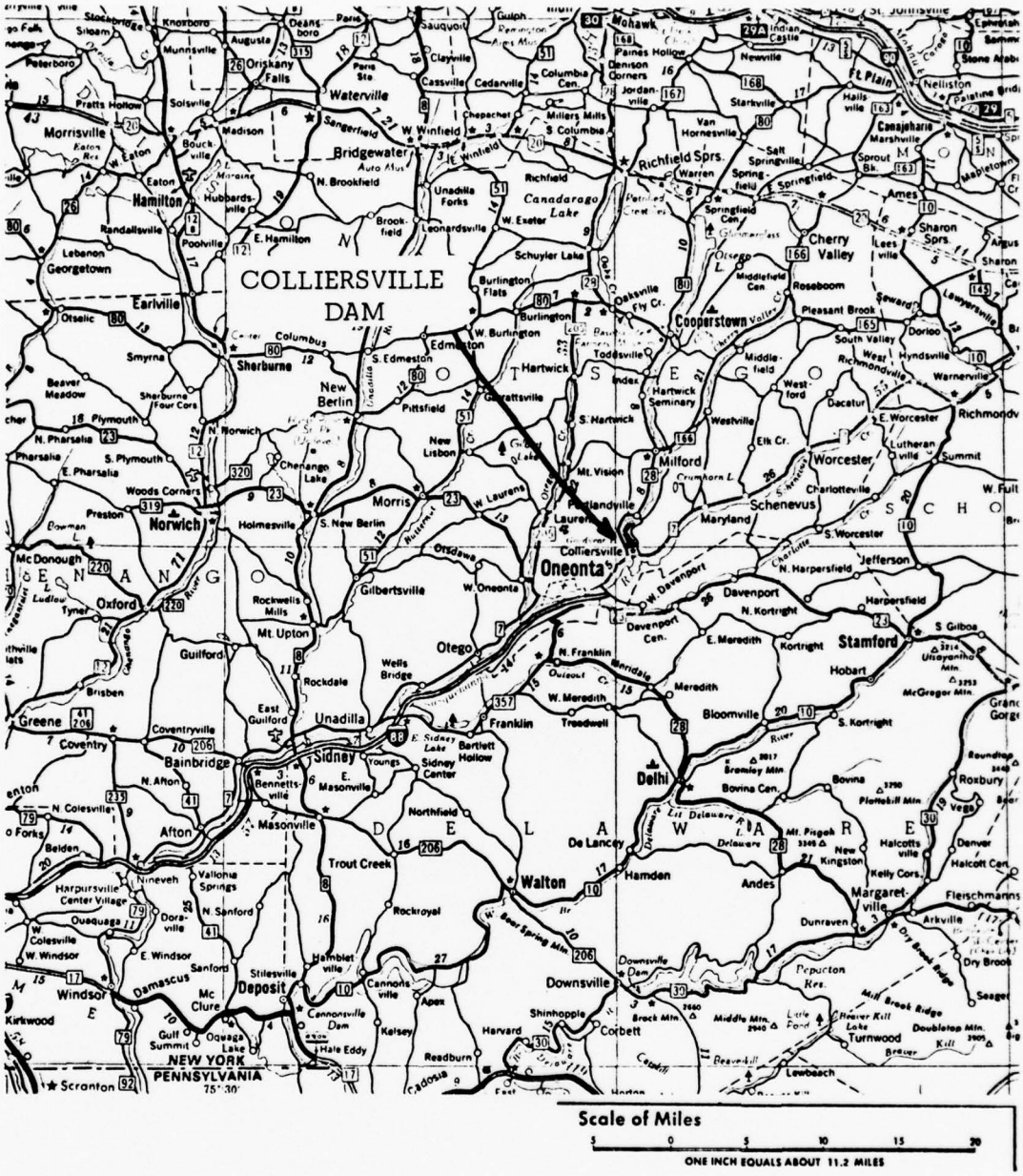
c. Inspect the upstream face of the gates during the next year.

d. Repair and paint the hoist frame above the head gates.

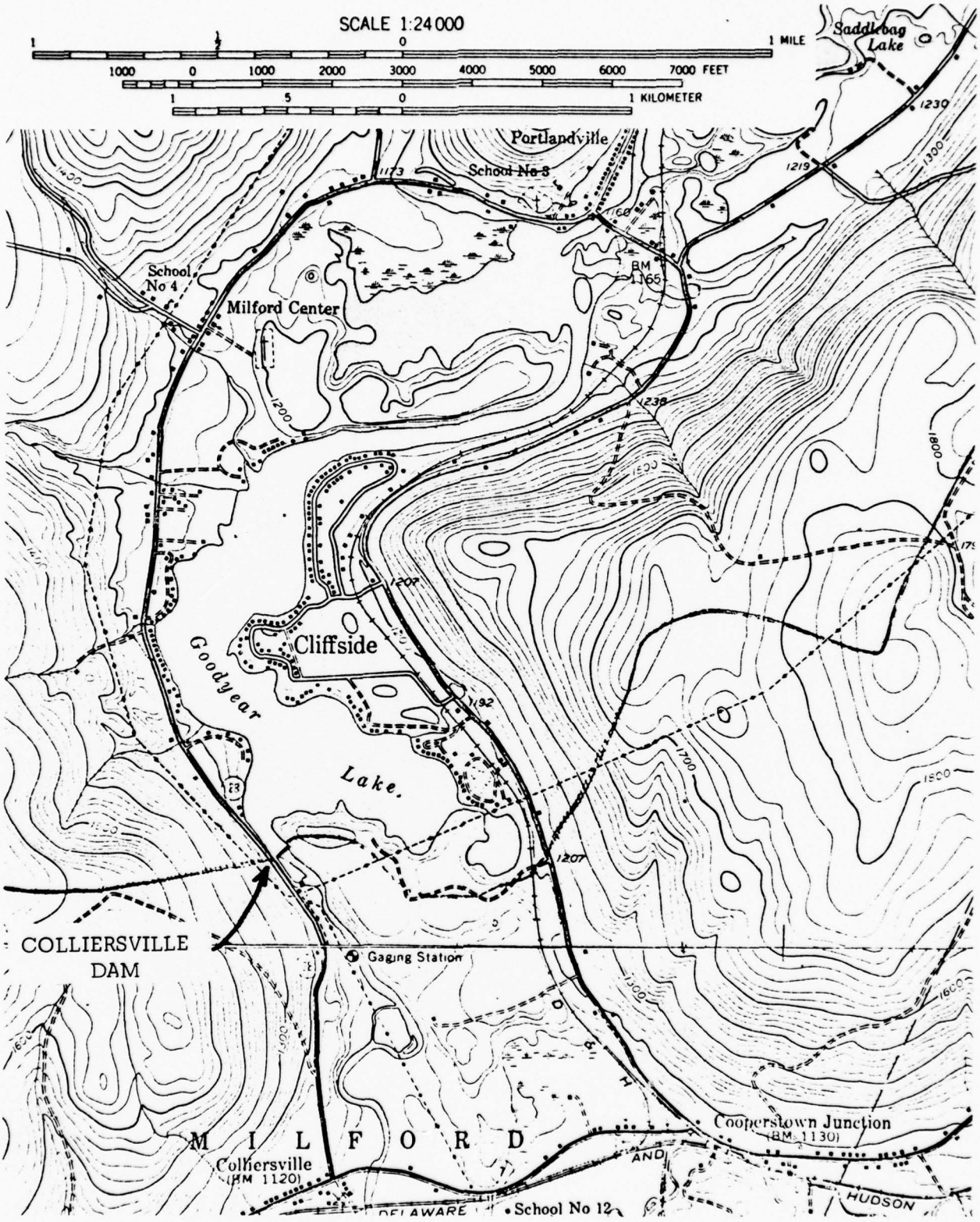
e. Prepare Operation, Maintenance and Inspection Manuals for the project.

DRAWINGS

APPENDIX A



VICINITY MAP
COLLIERSVILLE DAM



TOPOGRAPHIC MAP
COLLIERSVILLE DAM

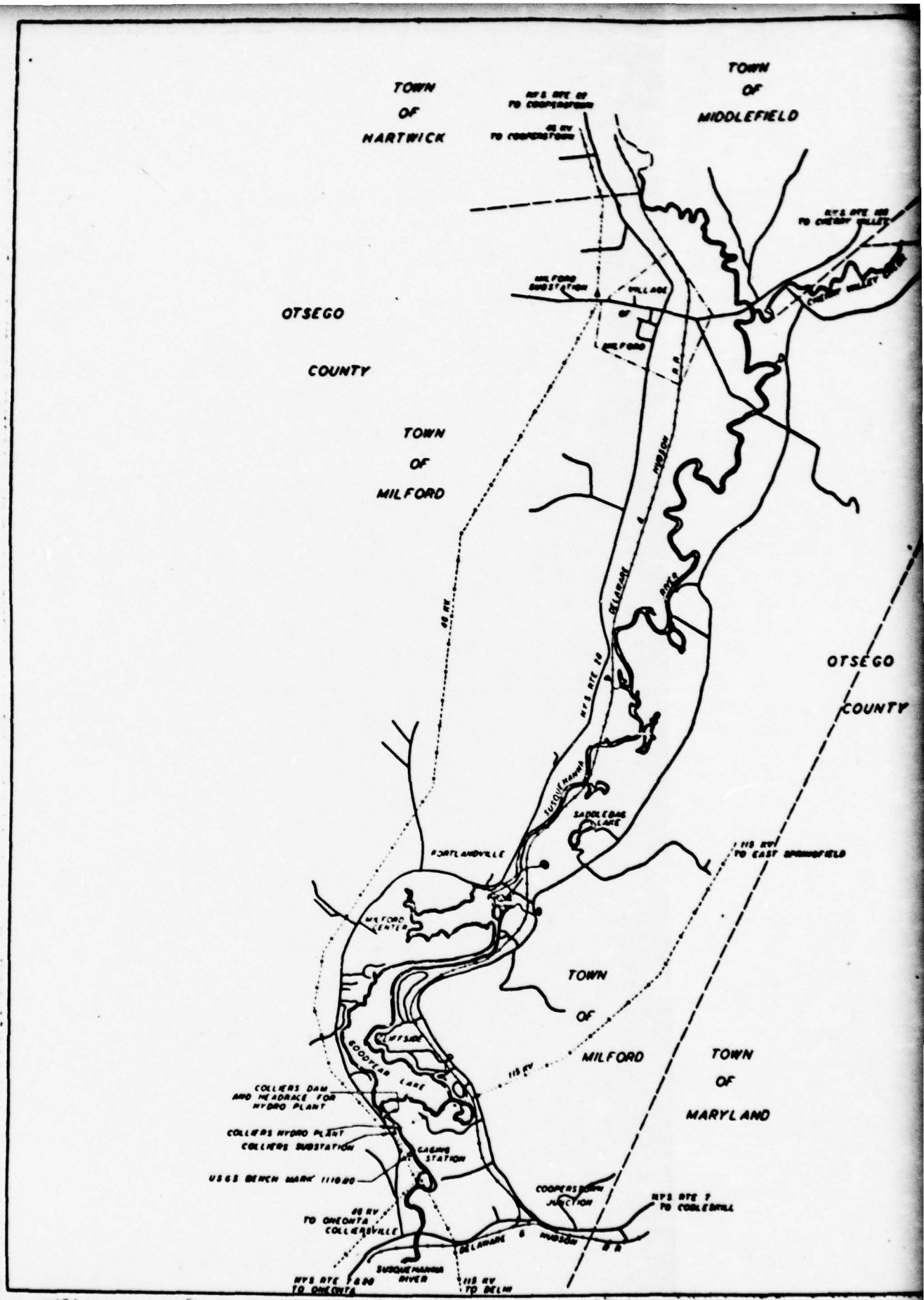
COLLIERS HYDRO PROJECT

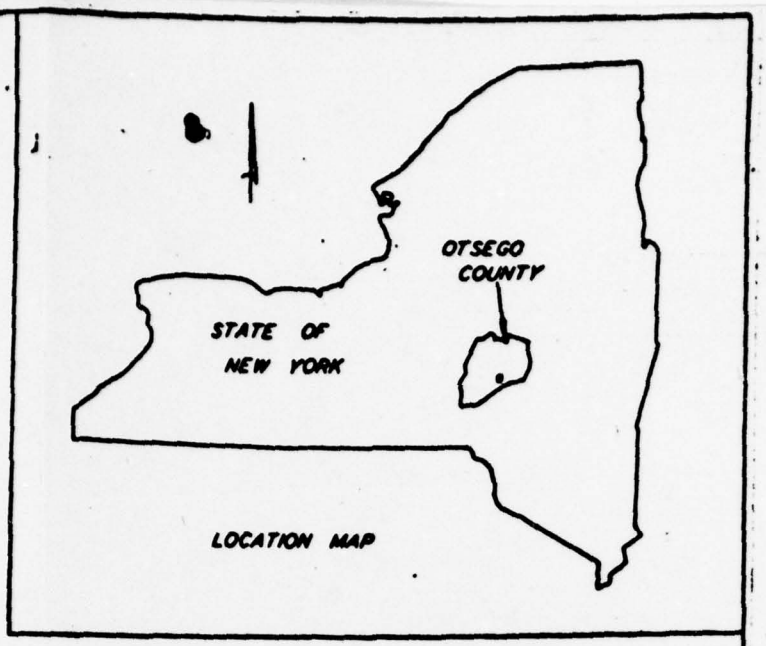
OWNER: NEW YORK STATE ELECTRIC & GAS COMPANY

LIST OF DRAWINGS

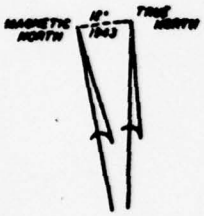
B	6216		PROPOSED CHANGE IN CANAL WALL ELEVATION AND SECTION	JULY 9, 1907
B	6218	*	CONTOUR AT DAM	AUGUST 24, 1906
B	6219	*	PLAN OF WING WALL AT EASTEND OF COLLIERS DAM	AUGUST 23, 1907
D	6220	*	CONCRETE STEEL GRAVITY DAM ELEVATION AND SECTIONS	JUNE 15, 1907
B	6341		SECTION OF ICE SPILLWAY-SOUTH WALL OF CANAL	AUGUST 23, 1907
D	2285	*	GENERAL LOCATION MAP	
D	2286		EXISTING COLLIERS DEVELOPMENT	SHEET I
D	2287		DITTO (APPLICATION FOR LICENSE)	SHEET 2
D	2288		DITTO (APPLICATION FOR LICENSE)	SHEET 3
D	2289		DITTO (APPLICATION FOR LICENSE)	SHEET 4
D	2290	*	PLAN, ELEVATIONS AND SECTIONS OF DAM & POWERHOUSE	SHEET 1
D	2291	*	SECTIONS AND ELEVATIONS - DAM, INTAKE AND CANAL	SHEET 2

* Drawings included in the Appendix


TOWN OF HARTWICK
TOWN OF MIDDLEFIELD
OTSEGO COUNTY
TOWN OF MILFORD
OTSEGO COUNTY
TOWN OF MILFORD
TOWN OF MARYLAND
MILFORD SUBSTATION
VILLAGE OF MILFORD
SUSQUEHANNA RIVER
SADDLEBAG LAKE
PORTLANDVILLE
MILFORD CENTER
GOODYEAR LAKE
COLLIERS DAM AND HEADRACE FOR HYDRO PLANT
COLLIERS HYDRO PLANT
COLLIERS SUBSTATION
GAGING STATION
USGS BENCH MARK 111080
COOPERSTOWN JUNCTION
DELAWARE & HUDSON R R
NYS RTE 7 TO COBLESKILL
46 KV TO ONEONTA COLLIERSVILLE
NYS RTE 7 TO ONEONTA
115 KV TO DELHI
115 KV TO EAST SPRINGFIELD
46 KV TO COOPERSTOWN
NYS RTE 28 TO COOPERSTOWN
NYS RTE 166 TO CHERRY VALLEY
46 KV
NYS RTE 10
115 KV



TOWN
OF
WESTFORD



LEGEND

- SUBSTATION
- TRANSMISSION LINE
- RAILROADS
- ROADS & STREETS
- TOWN LINE
- VILLAGE LINE

THIS DRAWING IS A PART OF THE APPLICATION FOR LICENSE MADE BY THE UNDERSIGNED THIS 31ST DAY OF MARCH, 1980.
NEW YORK STATE ELECTRIC & GAS CORPORATION
BY _____
TITLE VICE-PRESIDENT

NEW YORK STATE ELECTRIC & GAS CORPORATION
ITHACA, N.Y.

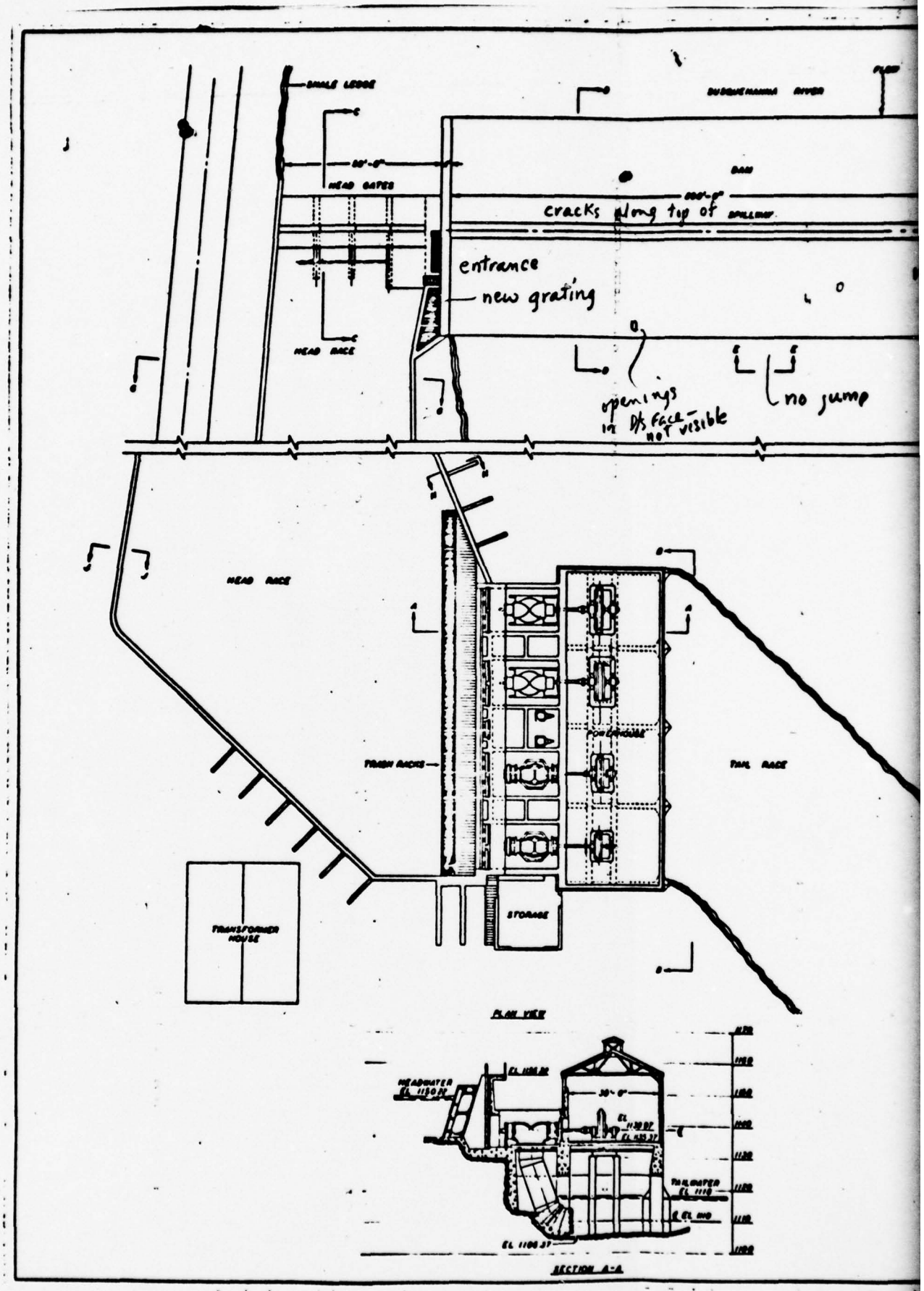
COLLIERS HYDRO PROJECT
GENERAL LOCATION MAP

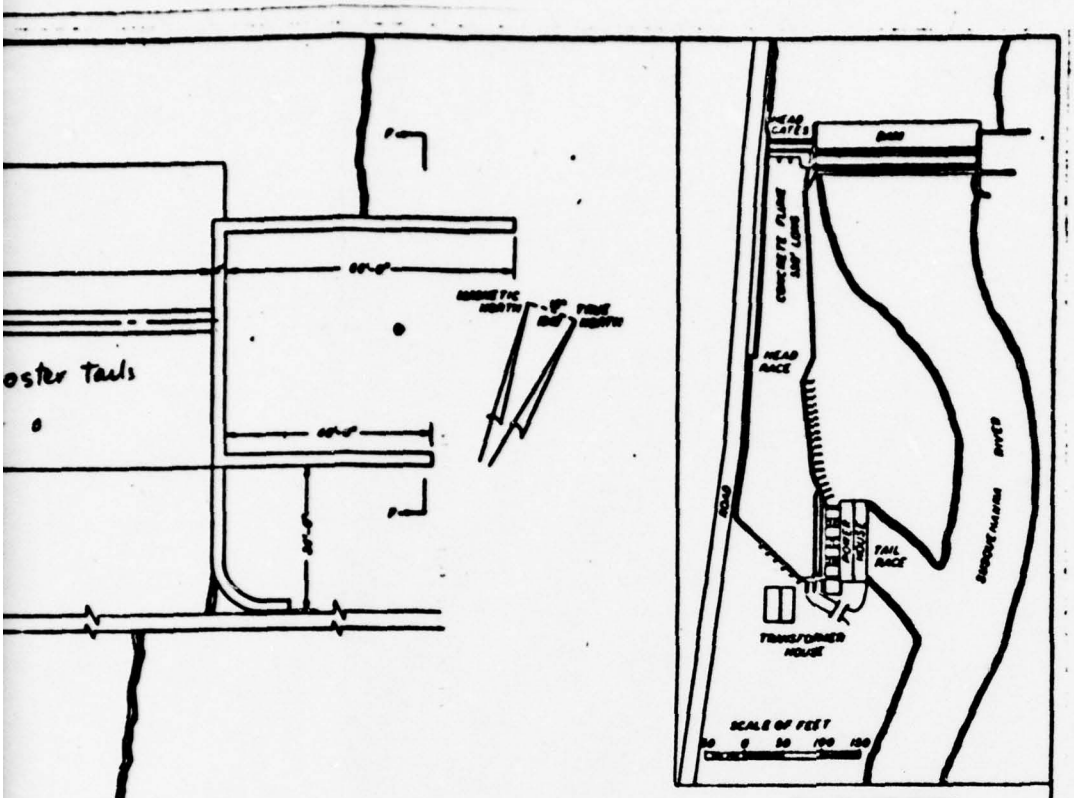
EXHIBIT J

SCALE - 1" = 2000'
2000 0 2000 4000 6000 8000 10000

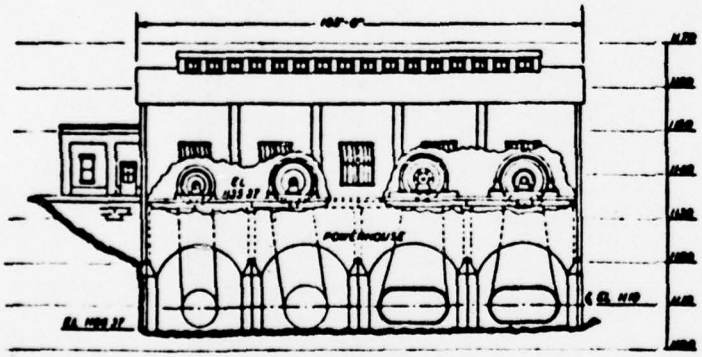
D2285

1
J


SHALE LEDGE
SUSQUEHANNA RIVER
50'-0"
HEAD GATES
DAM
200'-0"
cracks along top of SPILLWAY
entrance
new grating
HEAD RACE
openings in D/S face - not visible
no jump
HEAD RACE
TRASH RACKS
POWERHOUSE
TAIL RACE
TRANSFORMER HOUSE
STORAGE
PLAN VIEW
HEADWATER EL. 1150.00
EL. 1134.00
30'-0"
EL. 1119.00
EL. 1105.37
TAILWATER EL. 1110
EL. EL. 1110
EL. 1106.37
SECTION A-A



PLAN OF DEVELOPMENT



ELEVATION A-A

NEW YORK STATE ELECTRIC & GAS CORPORATION
ITHACA, N.Y.

COLLIERS HYDRO PROJECT
EXISTING COLLIERS DEVELOPMENT
PLAN, ELEVATIONS AND SECTIONS OF DAM AND POWERHOUSE

EXHIBIT L SCALE - 1" = 10' SHEET 1

0 10 20 30 40 50

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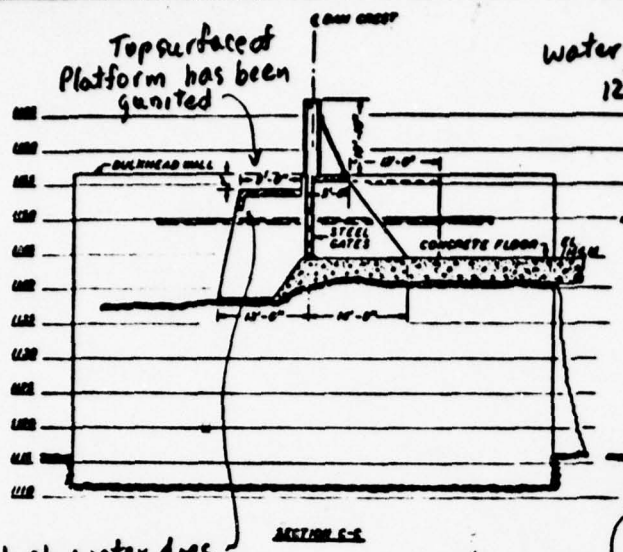
NEW YORK STATE ELECTRIC & GAS CORPORATION
BY _____
TITLE VICE-PRESIDENT

D2290

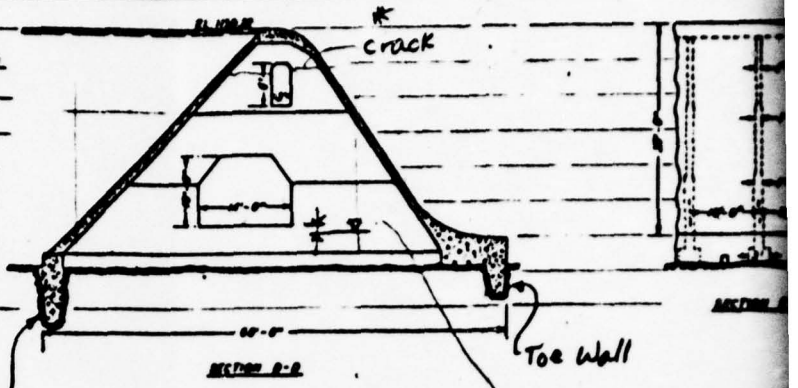
Top surface of Platform has been gunited

water surface 5" over crest 6/12/78
12"-18" Spring flows



SECTION C-C

high water does contact bottom of u/s lip - some erosion has resulted

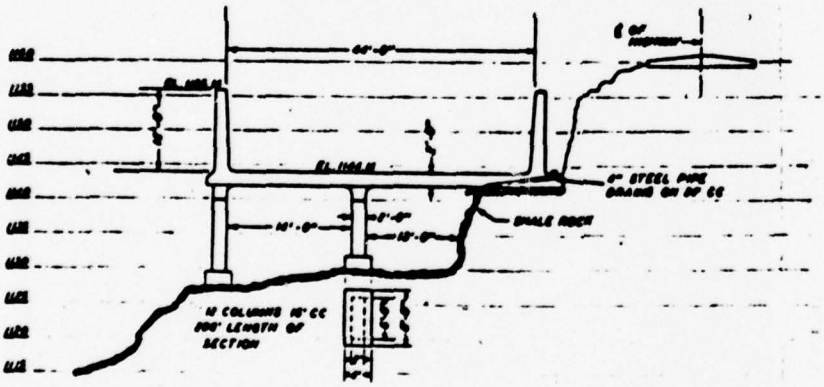


SECTION A-A

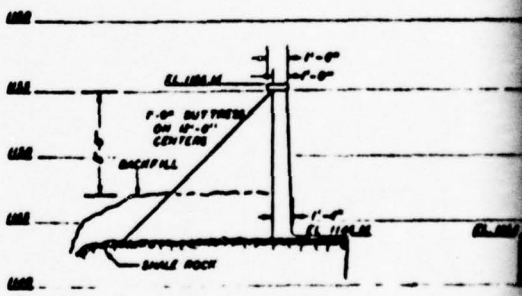
Anchor Wall

* gages monitor up and down motion of cracks since March 28, 1952

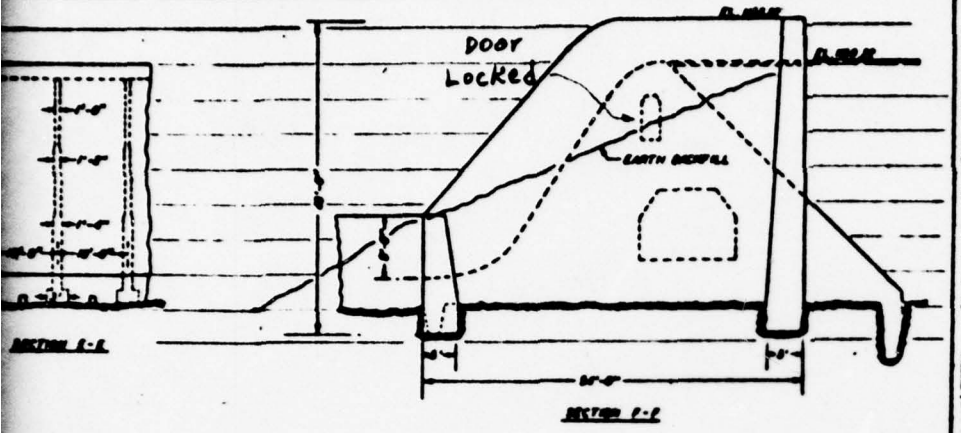
Interior water usually below



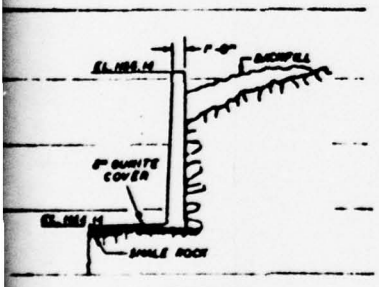
SECTION B-B



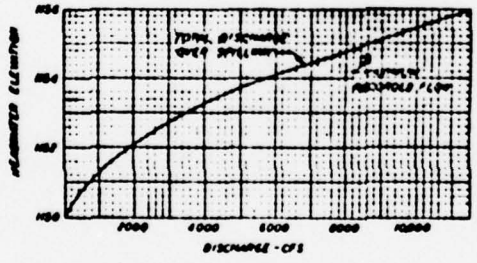
SECTION D-D



water
below opening



SECTION A-A
(SCALE $\frac{3}{16}$" = 1'-0")



FLOOD DISCHARGE CAPACITY

NEW YORK STATE ELECTRIC & GAS CORPORATION
ITHACA, N.Y.
COLLIERS HYDRO PROJECT
EXISTING COLLIERS DEVELOPMENT
SECTIONS AND ELEVATIONS - DAM, INTAKE AND CANAL
EXHIBIT L SHEET 8
SCALE - 1" = 10'

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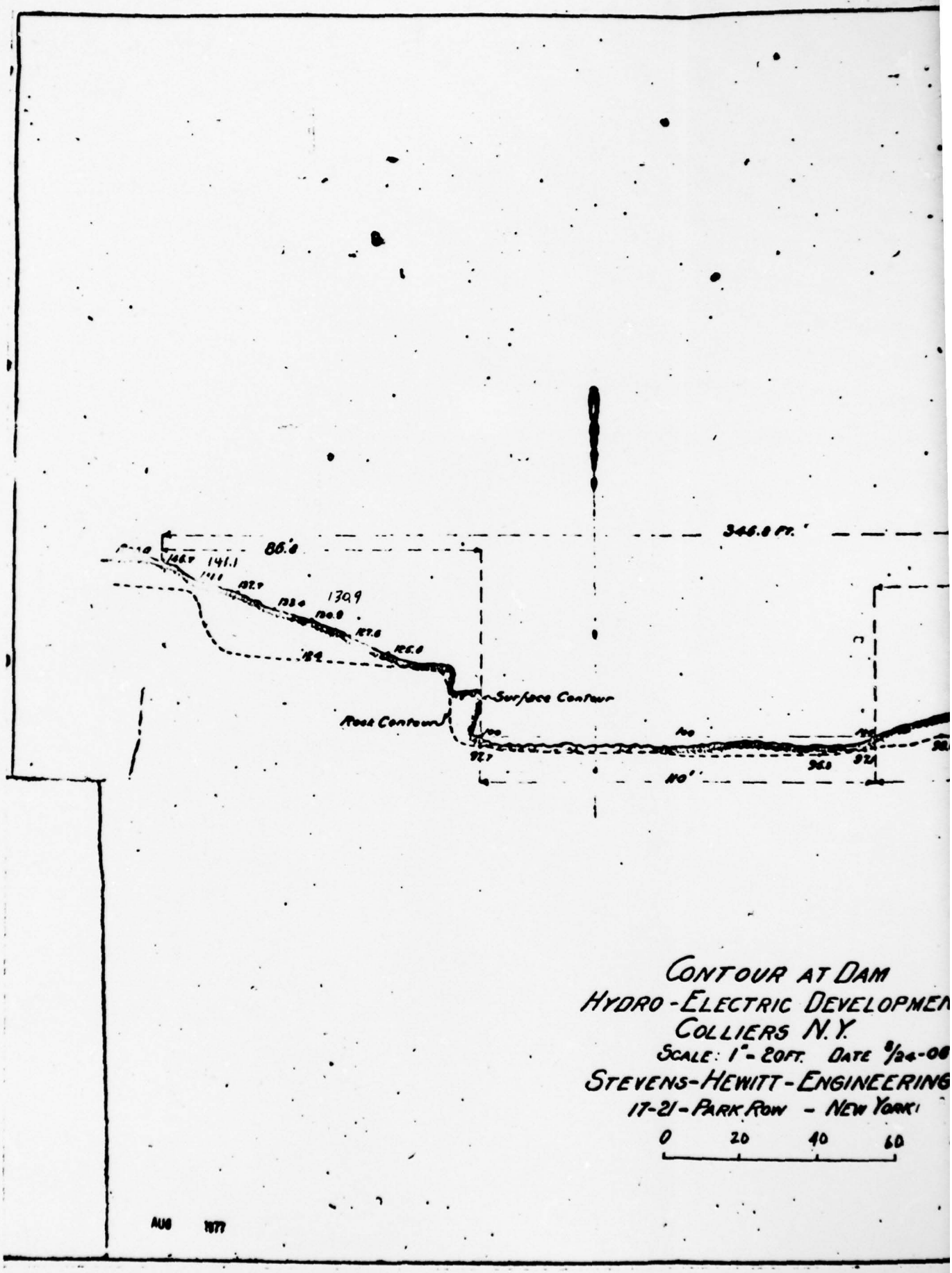
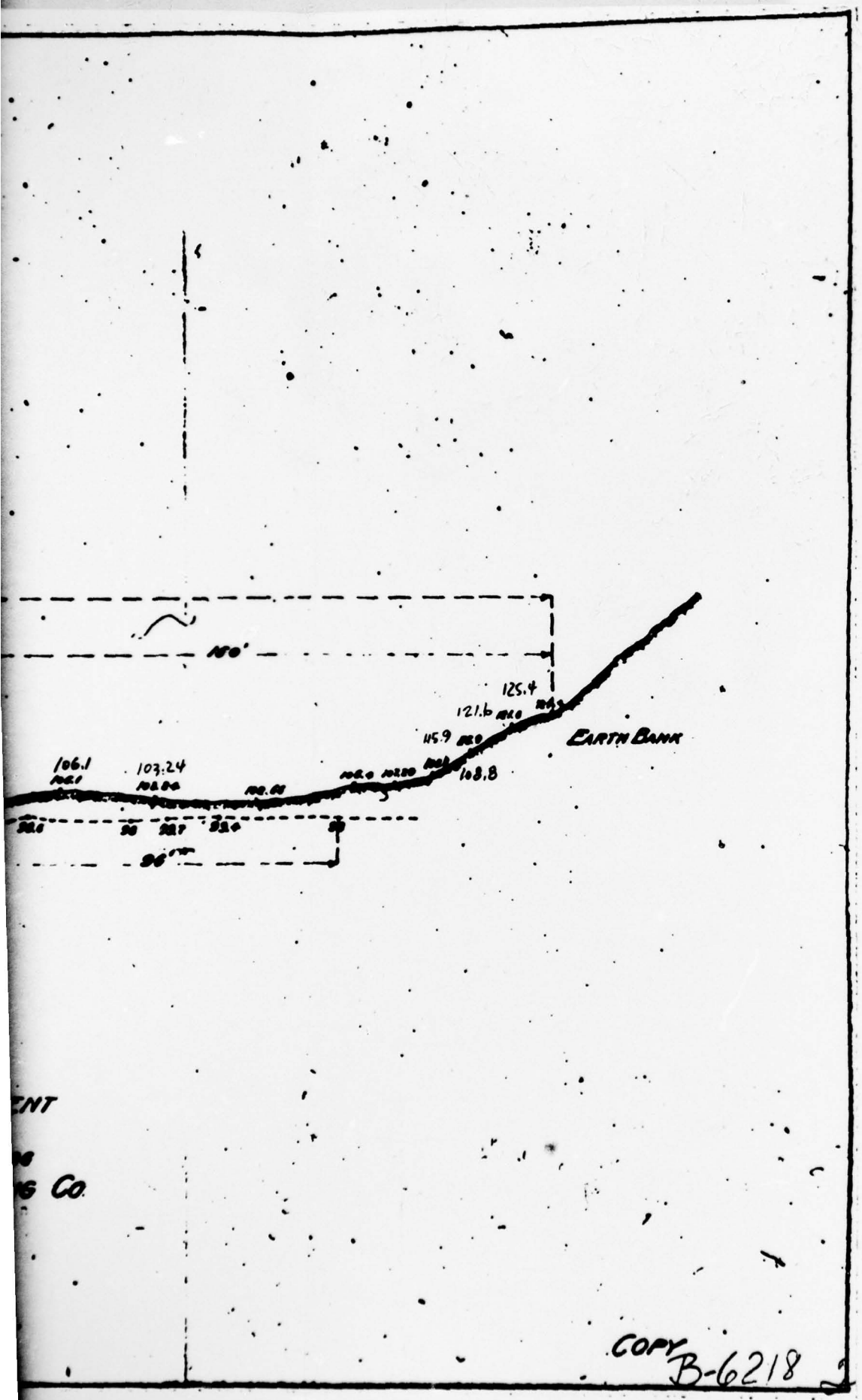
NEW YORK STATE ELECTRIC & GAS CORPORATION
BY R. W. Westcott
TITLE VICE-PRESIDENT

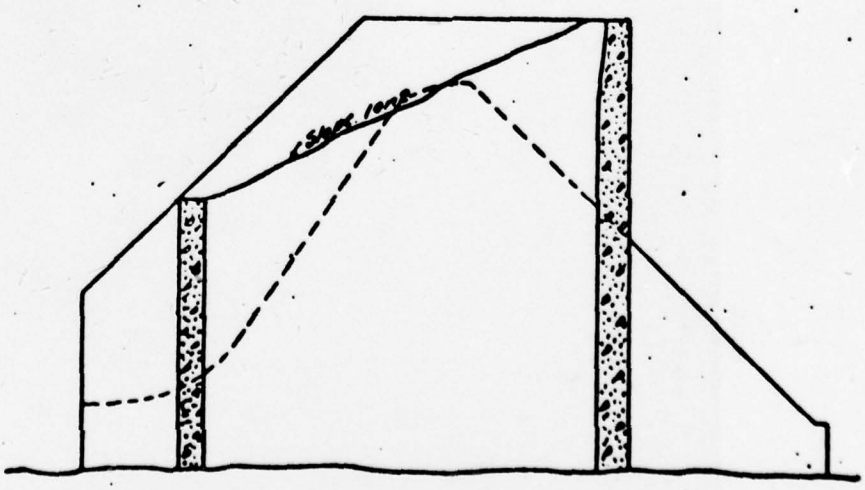
D2291



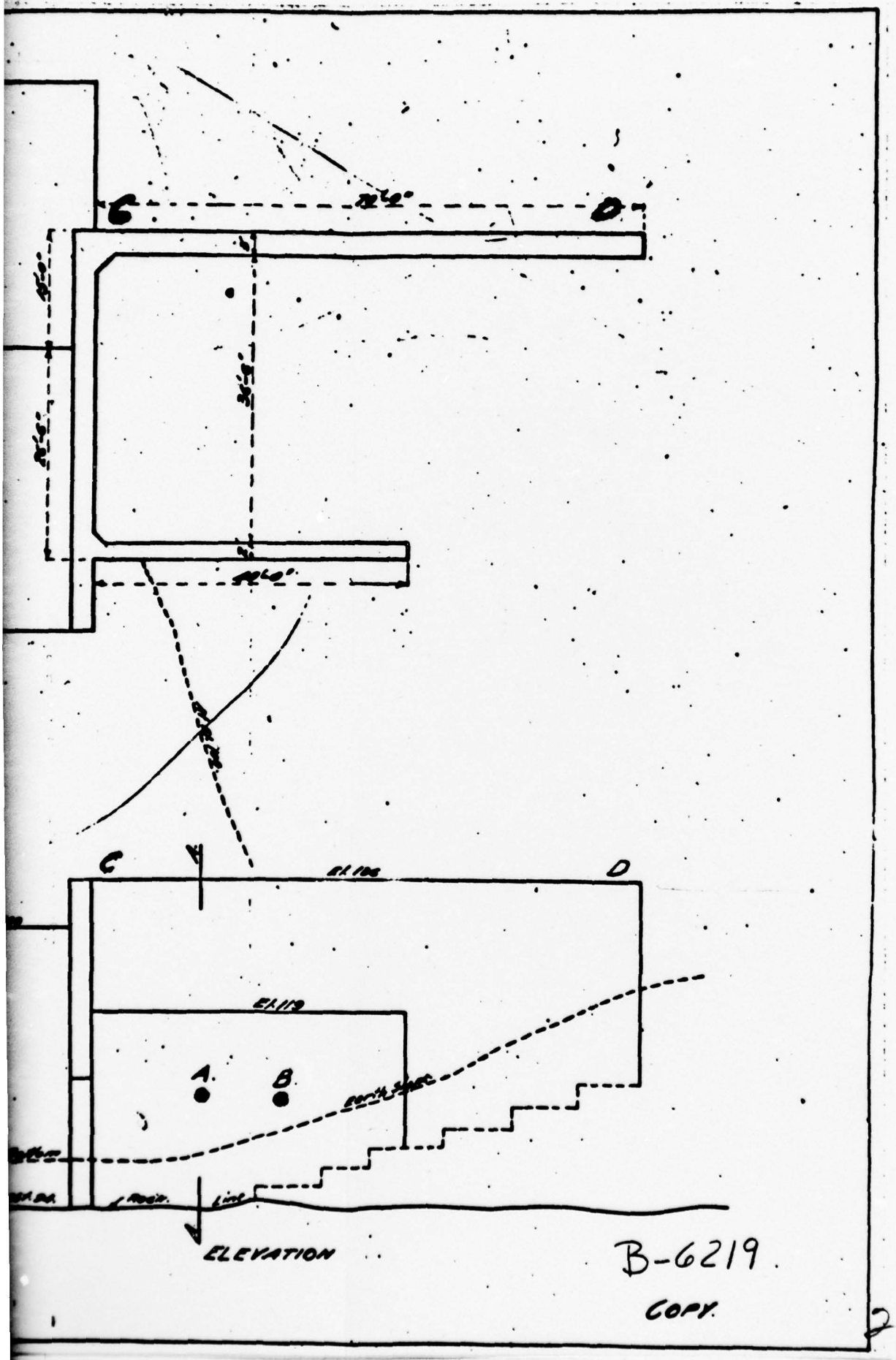
CONTOUR AT DAM
HYDRO-ELECTRIC DEVELOPMEN
COLLIERS N.Y.
SCALE: 1" - 20FT. DATE 8/24-00
STEVENS-HEWITT-ENGINEERING
17-21-PARK ROW - NEW YORK


125.4
121.6
115.9
EARTH BANK
106.1
107.24
108.8
96'
ENT
G CO.
COPY B-6218

PLAN OF WING WALL
AT
EAST END OF COLLIERS DAM
Scale 1" = 10ft.
0 10 20 30

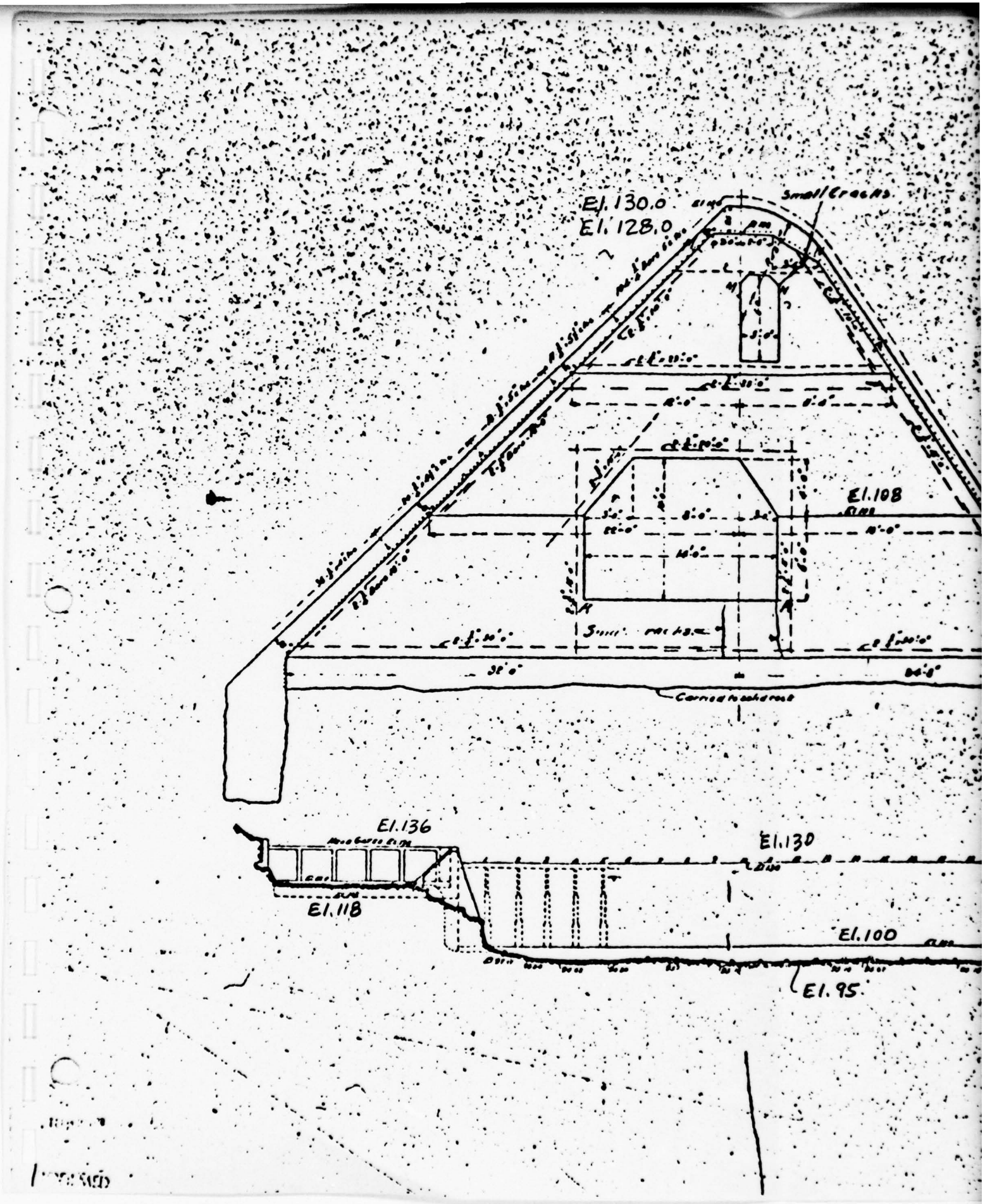


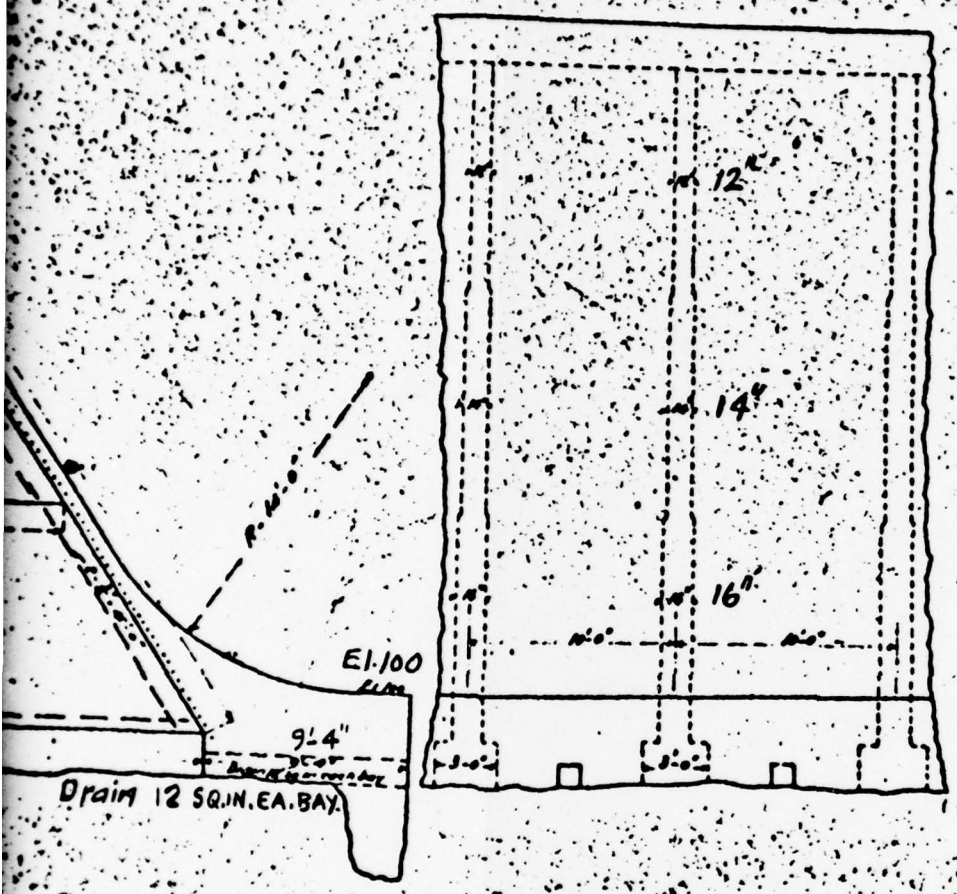
SECTION A-A.

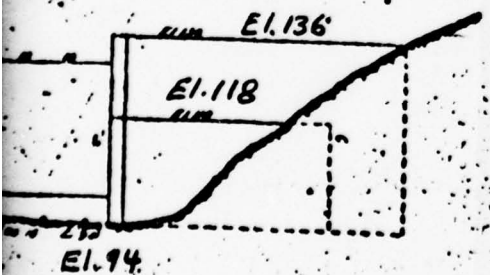


B-6219

COPY


El. 130.0
El. 128.0
Small Cracks
El. 108
El. 136
El. 118
El. 130
El. 100
El. 95





El. 130 = El. 1150.2

CONCRETE STEEL GRAVITY DAM

COLLIERS DEVELOPMENT

COLLIERS N.Y.

SCALE 1/8 · 1/4 · 1FT. DATE · 6/28 · 07

STEVENS-HEWITT-ENGINEERING CO.

17-21-PARK ROW - NEW YORK

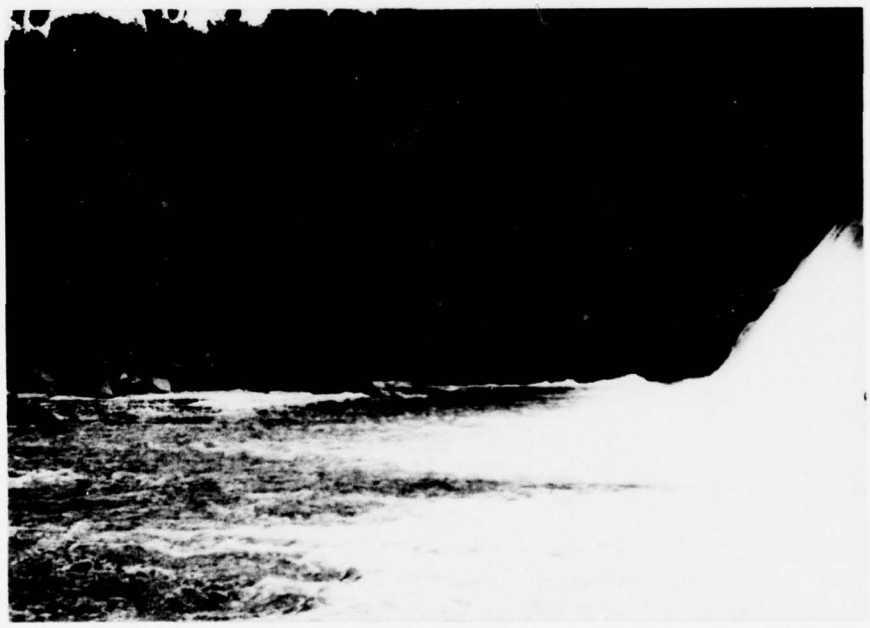
0 4 8 12 16

D-6220

COPY.

PHOTOGRAPHS

APPENDIX B

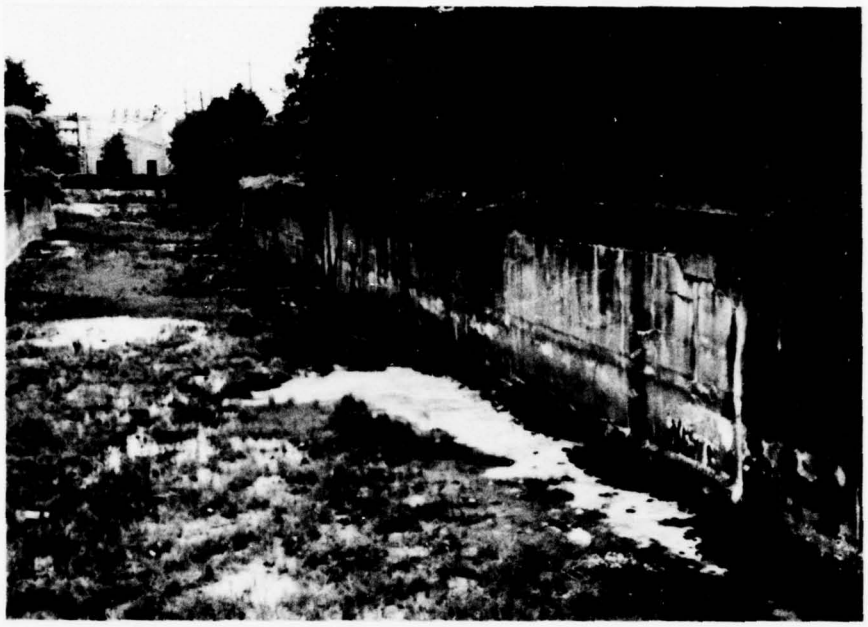


VIEW OF RIGHT ABUTMENT AND HEAD RACE EXTERIOR
SHOWING SUPPORTING COLUMNS

DOWNSTREAM VIEW OF HEAD GATE STRUCTURE
ADJACENT TO RIGHT ABUTMENT

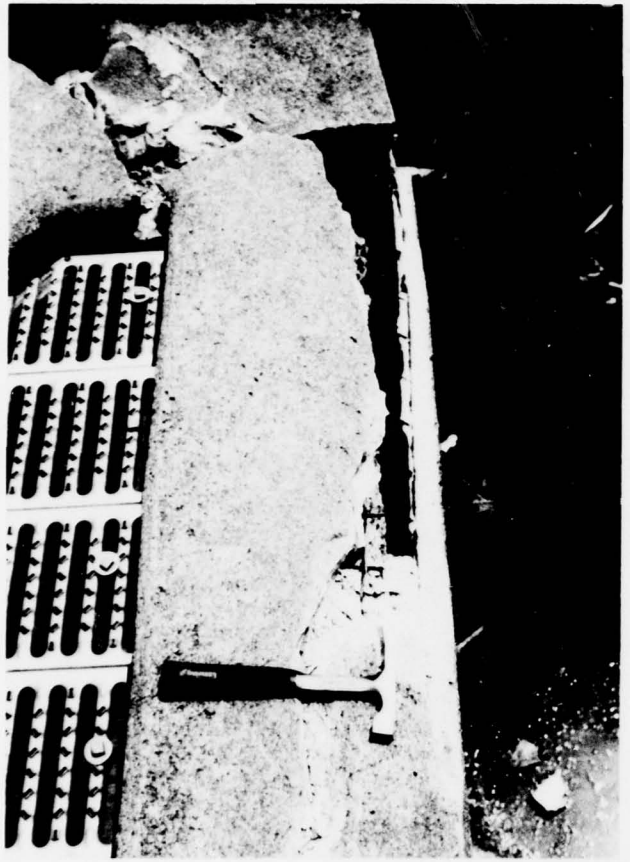
DOWNSTREAM VIEW OF HEAD GATE NO. 1

DOWNSTREAM VIEW OF NO. 4 GATE SLOT AREA
SHOWING DAMAGED WALL ADJACENT TO ABUTMENT



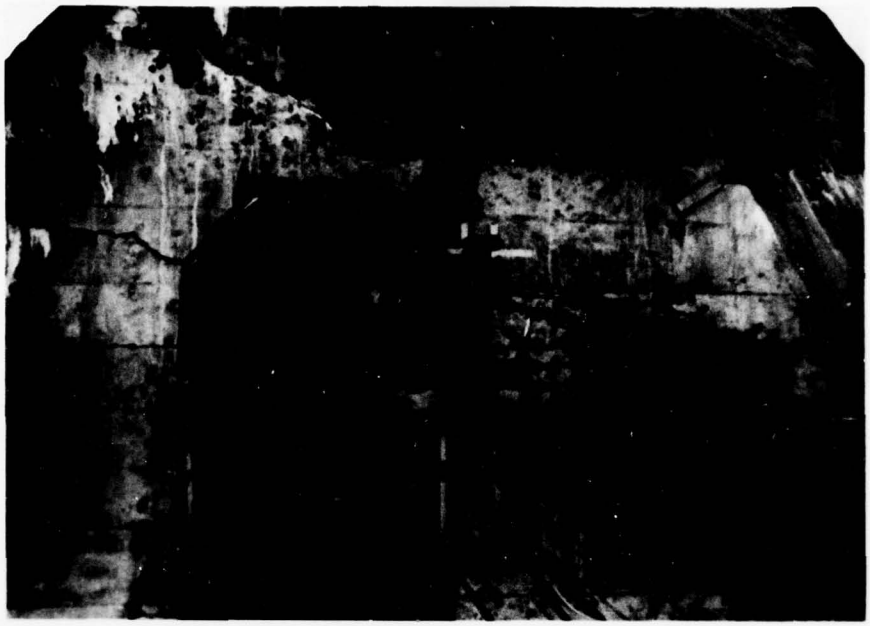
HEAD RACE VIEWED FROM HEAD GATE PLATFORM,
SHOWING IRREGULARITIES IN RIGHT WALL

RIGHT WALL OF HEAD RACE
SHOWING SEPARATION OF GUNITE SURFACING FROM ORIGINAL WALL



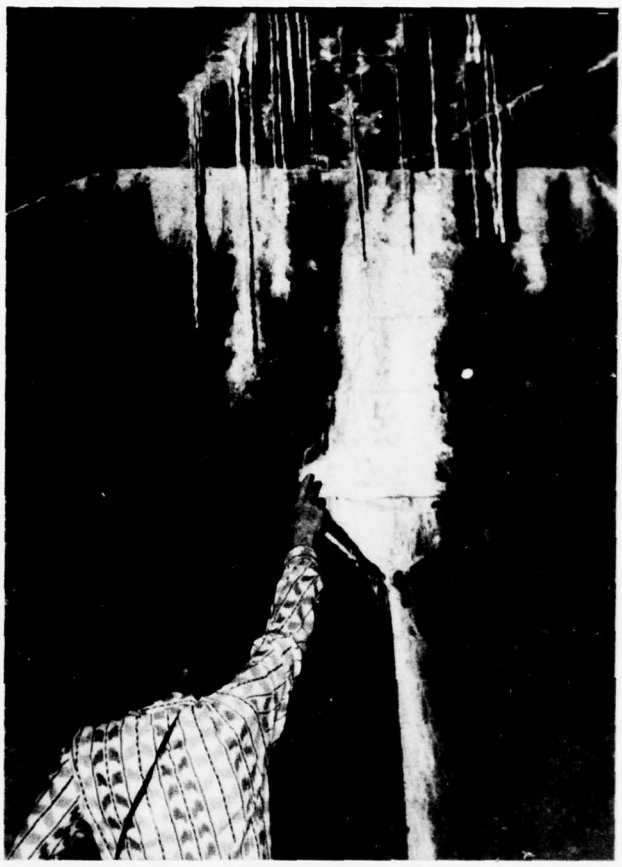
CRACK AND SEPARATION OF GUNITE SURFACE AT JUNCTION OF RIGHT END OF DAM AND LEFT WALL OF HEAD RACE

WALKWAY THROUGH BUTTRESSES BEFORE CONSTRUCTION OF CREST SLAB



OPENING IN BUTTRESSES,
SHOWING CRACKS AND MONITORING GAGE PLATE

CRACK AT INTERSECTION OF DOWNSTREAM
FACE AND CREST SLABS



WALKWAY OPENING IN BUTTRESS,
SHOWING STALACTITES AND WALL DEPOSITS

Colliers Plant 10-7-66
Deteriorated Ledge at
Canal intake.

SEEPAGE AND DISCOLORATION AT LEDGE
UNDER UPSTREAM END OF HEAD RACE

COLLIERS

VIEW FROM ROADWAY SHOWING RAISED HEAD GATES AND RESERVOIR LEVEL JUST BELOW CREST

VIEW OF HEAD RACE VIEWED FROM DOWNSTREAM END

DOWNSTREAM FACE OF DAM, RIGHTSIDE, SHOWING DAMAGED SURFACE

6/14/62

SUPPORT COLUMNS UNDER HEAD RACE (6/14/62)

ENGINEERING DATA CHECKLIST

APPENDIX C

CHECKLIST
ENGINEERING DATA
DESIGN, CONSTRUCTION, OPERATION
PHASE I

NAME OF DAM COLLIERSVILLE

ID # 685

ITEM	REMARKS
AS-BUILT DRAWINGS	NONE AVAILABLE. SEE APPENDIX FOR LIST OF STEVENS-HEWITT ENG. CO. DESIGN DRAWINGS AND DRAWINGS FURNISHED WITH MARCH 31, 1964 LICENSE APPLICATION.
REGIONAL VICINITY MAP	USGS DWG. D 2285 EXHIBIT J - LICENSE APPLICATION
CONSTRUCTION HISTORY	DESCRIBED IN ENGINEERING NEWS RECORD ARTICLE VOL. 57 No. 10 p. 256, 257, 258 (MARCH 7, 1908) SEE APPENDIX FOR LIST OF PHOTOGRAPHS TAKEN DURING CONSTRUCTION.
TYPICAL SECTIONS OF DAM	SEE DWGS. D6220, D2290, D2291 AND ENGINEERING NEWS RECORD ARTICLE
OUTLETS-PLAN	SEE DWGS. D2290 & D2291
-DETAILS	AS ABOVE
-CONSTRAINTS	NONE CITED
-DISCHARGE RATINGS	NONE AVAILABLE
RAINFALL/RESERVOIR RECORDS	FROM REPORTS AND STUDIES SEE SECTION 5 HYDRAULIC/HYDROLOGIC

ITEM	REMARKS
DESIGN REPORTS	NONE AVAILABLE
GEOLOGY REPORTS	NONE AVAILABLE
DESIGN COMPUTATIONS	NONE AVAILABLE
HYDROLOGY & HYDRAULICS	NONE AVAILABLE
DAM STABILITY	4 PAGE CALCULATION FOR SLIDING AND OVERTURNING BY N.Y.S.E.G. DATED 12/4/75
SEEPAGE STUDIES	NONE AVAILABLE
MATERIALS INVESTIGATIONS	NONE AVAILABLE
BORING RECORDS	NONE AVAILABLE
LABORATORY	NONE AVAILABLE
FIELD	NONE AVAILABLE
POST-CONSTRUCTION SURVEYS OF DAM	NONE AVAILABLE
BORROW SOURCES	INFORMATION NOT AVAILABLE

ITEM	REMARKS
MONITORING SYSTEMS	NONE AVAILABLE TODAY. WATER LEVEL GAUGE FROM EAST ABUTMENT TO POWERHOUSE WAS DISCONTINUED AFTER 1969
MODIFICATIONS	THE HEADRACE FLUME WAS REDESIGNED AFTER A PORTION OF IT FAILED. THE WEST SIDE OF THE FLUME IS NOW SUPPORTED DIRECTLY ON SHALE BEDROCK. THE CENTER AND EASTERN PORTIONS ARE SUPPORTED BY TWO ROWS OF REINFORCED CONCRETE PIERS FOUNDED ON SPREAD FOOTINGS
HIGH POOL RECORDS	DATA SHEET: WATER LEVEL COLLIERS PLANT 1950-1968 (MAXIMUM AND MINIMUM LEVELS)
POST CONSTRUCTION ENGINEERING STUDIES AND REPORTS	NONE AVAILABLE INSPECTION REPORTS 1955, 1957, 1960, 1964, 1966 REPORT - GOODYEAR LAKE SOIL CONSERVATION SERVICE JAN. 1975 VISUAL INSPECTION REPORT BY CHAS. T. MAIN OF N.Y. INC. JAN. 1977
PRIOR ACCIDENTS OR FAILURE OF DAM DESCRIPTION	1) THE BUTTRESSES CRACKED AT THE CATWALK OPENINGS (ABOUT 1909) AFTER THE RESERVOIR LEVEL REACHED THE CREST AND THE DOWNSTREAM FACE WAS DRY AND EXPOSED TO THE SUN WITH AMBIENT TEMPERATURE ABOUT 100°F. 2) A PORTION OF THE HEADRACE FLUME FAILED AFTER THE FIRST FLOOD.
REPORTS	CRACKED BUTTRESSES ARE DISCUSSED IN (1) AMBURSEN ENG. CORP. LETTERS OF JUNE 18, JUNE 22 AND SEPT. 18 1951. AND (2) THE INSPECTION REPORT BY WILLIAM P. CREAGER DATED APRIL 5, 1951
MAINTENANCE OPERATION RECORDS	NO OPERATIONS AND MAINTENANCE MANUAL IS AVAILABLE. INSPECTIONS OF THE DAM ARE MADE EVERY 6 TO 8 WEEKS.

POWER GENERATION AT THE HYDRO PLANT WAS TERMINATED IN 1969
MAINTENANCE AND REPAIRS MADE AS DEEMED NECESSARY

ITEM	REMARKS
SPILLWAY PLAN	DWGS. D6220 AND D2290
SECTIONS	DWGS D6220, D2290, D2291
DETAILS	NONE
OPERATING EQUIPMENT	THE HYDRO PLANT NO LONGER GENERATES POWER. THE HEAD GATES ARE IN DOWN POSITION WITH EACH SURMOUNTED BY THREE 6-INCH WIDE BY 7-INCH HIGH STOP LOGS. THE GATES HAVE NOT BEEN RAISED IN THE PAST 8 YEARS.
PLANS & DETAILS	DWGS. D2290, D2291

VISUAL INSPECTION CHECKLIST

APPENDIX D

VISUAL INSPECTION CHECKLIST

1. Basic Data

a. General

Name of Dam COLLIERSVILLE Hazard Category HIGH

County OTSEGO ID# 685

Stream Name NORTH BRANCH OF SUSQUEHANNA RIVER Tributary of

Location OTSEGO County Nearest Town (P.O.) COLLIERSVILLE

Longitude 74°59'36" Latitude 42°30'15" Other Directions ON EAST SIDE OF NEW YORK STATE ROUTE 28, APPROXIMATELY ONE MILE NORTH OF THE INTERSECTION OF ROUTES 28 AND 7

Date of Insp 6-12-78 6-13-78 Weather SUNNY CLOUDY Temperature 80°F 60°F

b. Inspection Personnel H.B. LEVENTHAL STRUCTURAL ENGINEER
J.S. BURDICK MECHANICAL ENGINEER } TAMS
P. ZACCHEO GEOTECHNICAL ENGINEER }

c. Persons Contacted MR. R. ONDREYKO BY TELEPHONE 6/8/78
MR. D.F. WHITTAKER SUPERVISOR OF ENGINEERING MECHANICAL ENGINEERING DEPT. LETTER 5/26/78

d. History: Date Constructed 1906 - 1908

Present Owner NEW YORK STATE ELECTRIC AND GAS CORP.

Designed by STEVENS-HEWITT ENGINEERING Co.

Constructed by STEVENS-HEWITT ENGINEERING Co.

Recent History THE POWERHOUSE AND HEADRACE HAVE NOT BEEN USED SINCE 1969

2. Technical Data AMBURSEN REINFORCED CONCRETE

Type of Dam FLATSLAB AND BUTTRESS Drainage Area 349 SQ. MI.

Height 36 FEET Length 200

Upstream Slope 1 ON 1 Downstream Slope 1.5(V) ON 1.0(H) SCALED

Crest Width 4.5 FT. Freeboard at Spillway Crest WATER FLOWING OVER CREST

Low Level Control: (Type and Size) NONE

Valve Condition

~~Emergency~~ Spillway Type (Material) REINFORCED CONCRETE Width 200 FT.

Side Slopes VERTICAL

Height (Crest to Top) 6 FEET

Exit Slope

Exit Length

Ponded Surface Area Acres

Capacity (Normal Level) Acre Feet

Capacity Emergency Spillway Level Acre Feet

3. Embankment

NOT APPLICABLE

a. Crest

(1) Vertical Alignment

(2) Horizontal Alignment

(3) Longitudinal Surface Cracks

(4) Transverse Surface Cracks

(5) General Condition of Surface

(6) Miscellaneous

b. Upstream Slope NOT APPLICABLE

(1) Undesirable Growth or Debris

(2) Sloughing, Subsidence, or Depressions

(3) Slope Protection

(a) Condition of Riprap

(b) Durability of Individual Stones

(c) Adequacy of Slope Protection Against Waves and Runoff

(d) Gradation of Slope Protection - Localized Areas of Fine Material

(4) Surface Cracks

c. Downstream Slope

(1) Undesirable Growth or Debris

(2) Sloughing, Subsidence, or Depressions; Abnormal Bulges or Non-Uniformity

NOT APPLICABLE

(3) Surface Cracks on Face of Slope

(4) Surface Cracks or Evidence of Heaving at Embankment Toe

(5) Wet of Saturated Areas or Other Evidence of Seepage on Face of Slope; Evidence of "Piping" or "Boils"

(6) Fill Contact with Outlet Structure

(7) Condition of Grass Slope Protection

d. Abutments

(1) Erosion of Contact of Embankment with Abutment from Surface Water Runoff, Upstream or Downstream

(2) Springs or Indications of Seepage Along Contact of Embankment with the Abutments

(3) Springs or Indications of Seepage in Areas a Short Distance Downstream of Embankment - Abutment Tie-in

NOT APPLICABLE

e. Area Downstream of Embankment, Including Tailrace Channel

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

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

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

(4) Unusual Muddy Water in Downstream Channel

(5) Sloughing or Erosion

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

(7) Stability of Tailrace Channel Sideslopes NOT APPLICABLE

(8) Condition of Tailrace Channel Riprap

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

(10) Miscellaneous

f. Drainage System

(1) Condition of Relief Wells, Drains and Appurtenances

(2) Unusual Increase or Decrease in Discharge from Relief Wells

4. Instrumentation

NONE

(1) Monumentation/Surveys NONE

(2) Observation Wells NONE

(3) Weirs NONE

(4) Piezometers NONE

(Other)

5. Reservoir

a. Slopes PORTIONS OF RESERVOIR SLOPES VISIBLE FROM THE DAM SHOW NO SIGNS OF DISTRESS, INSTABILITY OR OTHER ADVERSE CONDITIONS

b. Sedimentation NOT VISIBLE.

SEE GOODYEAR LAKE SOIL CONSERVATION SERVICE REPORT JAN. 1975 FOR RECENT SURVEY DATA.

6. Spillways

SPILLWAY OVER AMBURSEN DAM

a. ~~Principal Spillway Inlet Condition~~ 200 FEET LONG

~~Pipe Condition~~ DOWNSTREAM FACE OF DAM IS CONCRETE SLAB

General Remarks (include information such as recently repaired, potential for debris accumulation, special items of note, etc.)

PHOTOGRAPHS SHOW AREAS OF THE DOWNSTREAM FACE REPAIRED WITH GUNITE. DURING THE INSPECTION WATER WAS PASSING OVER THE DAM BUT SOME CRACKS WERE OBSERVED IN THE DOWNSTREAM SLAB. THERE WERE SOME MINOR LEAKS INTO

~~b. Emergency Spillway General Condition~~ THE DAM FROM CRACKS AND AT JOINTS BETWEEN THE SLAB AND BUTTRESS.

Tree Growth

Erosion

Other Observations

7. Structural (if required) See Attached Appendix

8. Downstream Channel

SUSQUEHANNA RIVER NARROWS AS IT APPROACHES AND PASSES THE FORMER POWERHOUSE.

a. Condition (obstructions, debris, etc.) THERE IS NO DOWNSTREAM APRON BEYOND THE DAM.

THE STREAM BED IS FULL OF ROCKS AND STONES OF ALL SIZES. NOT FAR FROM THE HEADRACE ARE HUGE CHUNKS OF CONCRETE - REMNANTS OF THE ORIGINAL HEADRACE STRUCTURE.

b. Slopes

c. Approximate No. Homes and Population THE TOWN OF COLLIERSVILLE WITH HOMES AND SOME PEOPLE DOWNSTREAM WOULD BE AFFECTED IF THE DAM IS BREACHED

d. General

HAROLD B. LEVENTHAL
TEAM CAPTAIN

STRUCTURAL INSPECTION CHECKLIST

PHASE I DAM INSPECTION

WATER FLOWING OVER CREST AND DOWNSTREAM FACE

1. Concrete Surfaces WAS RELATIVELY SMOOTH INDICATING VERY FEW, IF ANY, IRREGULARITIES. PREVIOUS GUNITE REPAIRS, PROBABLY IN THE 1960's, WERE STILL GOOD.

2. Structural Cracking THERE WERE SOME MINOR CRACKS VISIBLE ON THE EXTERIOR FACE OF THE CREST AND DOWNSTREAM SLAB. ALL BUTTRESSES HAVE CRACKS SLIGHTLY BELOW TOP OF CATWALK OPENINGS. THERE ARE ALSO SOME MINOR CRACKS AT THE INTERSECTION OF THE INTERIOR UPSTREAM SLOPE AND THE CURVED CREST.

3. Movement - Horizontal and Vertical Alignment: NO NOTICEABLE MOVEMENT

4. Junctions with Abutments or Embankments THE DOWNSTREAM CHANNEL FACE OF THE WEST WINGWALL WAS NOT IN GOOD CONDITION WITH SOME SPALLING OF THE SURFACE AND SOME EXPOSED AGGREGATE.

5. Drains - Foundation, Joint, Face THE TOE DRAINS WERE NOT VISIBLE DUE TO THE PRESENCE OF WATER IN THE BAYS AND FLOWING OVER THE DOWNSTREAM FACE.

6. Water Passages, Conduits, Sluices THE REBUILT FLUME IS NO LONGER USED TO TRANSMIT WATER TO THE POWER HOUSE. A NUMBER OF COLUMNS AND FOOTINGS SUPPORTING THE CANAL ARE IN BAD CONDITION.- CONCRETE SURFACES ARE SPALLING AND DETERIORATING AND REINFORCING BARS ARE EXPOSED.

7. Seepage or Leakage THERE WAS AN OBSERVABLE SEEP ON DOWNSTREAM FACE OF EAST ABUTMENT. ABOUT 150 FEET FURTHER DOWNSTREAM THERE WAS SOME SEEPAGE FROM THE HILLSIDE. THERE WAS SOME WETNESS AND MINOR LEAKS INSIDE THE DAM.

8. Monolith Joints - Construction Joints RELATIVELY GOOD CONDITION. SOME BAYS HAVE MINOR LEAKS OR SHOW WETNESS AT THE INTERSECTION OF THE UPSTREAM SLAB (INTERIOR FACE) AND TOP OF FOOTING

9. Foundation EXCAVATED THROUGH SUCCESSIVE THIN LAYERS OF SHALE AND CLAY TO A FOOTING IN SOLID SHALE ABOUT 6 FEET BELOW THE ORIGINAL BED OF THE RIVER.

BROKEN ELBOWS WERE EXPOSED IN THE EXPOSED DRAINS BENEATH THE FLUME WHICH CARRY WATER FROM BEHIND THE WEST WALL OF THE FLUME TO THE RIVER SIDE OF THE FLUME FOR DISCHARGE INTO THE RIVER.

10. Abutments THERE IS SOME SPALLING AND DETERIORATION OF CONCRETE SURFACES OF WEST ABUTMENT. GUNITE REPAIRS HAD BEEN MADE TO THE CONCRETE SURFACES OF EAST ABUTMENT.

11. Control Gates HEAD GATES ARE IN DOWN POSITION. WATER FLOWS OVER THE DAM. HEAD RACE CHANNEL IS NO LONGER USED.

12. Approach and Outlet Channels APPROACH CHANNEL - UNDERSIDE OF LAKE. OUTLET CHANNEL NARROWS AS IT APPROACHES THE POWERHOUSE. ROCKS, STONES AND HUGE CHUNKS OF CONCRETE ARE IN OUTLET CHANNEL.

13. Stilling Basin NONE - NO CONCRETE APRON DOWNSTREAM

14. Intake Structure NONE

15. Settlement NO OBSERVABLE SETTLEMENT

16. Stability

a. Overturning CALCULATIONS NOT REQUIRED FOR PHASE I

b. Sliding " " " " "

c. Seismic NOT REQUIRED - SEISMIC ZONE NO. 1

17. Instrumentation NONE

a. Alignment

b. Uplift

c. Seismic NOT REQUIRED - SEISMIC ZONE NO. 1

18. Miscellaneous

HYDROLOGIC DATA & COMPUTATIONS

APPENDIX E

TAMS

Job No. 1487-08
Project DAM INSPECTION
Subject COLLIERSVILLE DAM
PMF CALCULATION USING UH + OTHER DATA FROM STUDY ON SUSQUEHANA RIVER BASIN

Sheet 1 of 1
Date JULY 5, 1978
By M. GONZALEZ-G.
Ch'k. by

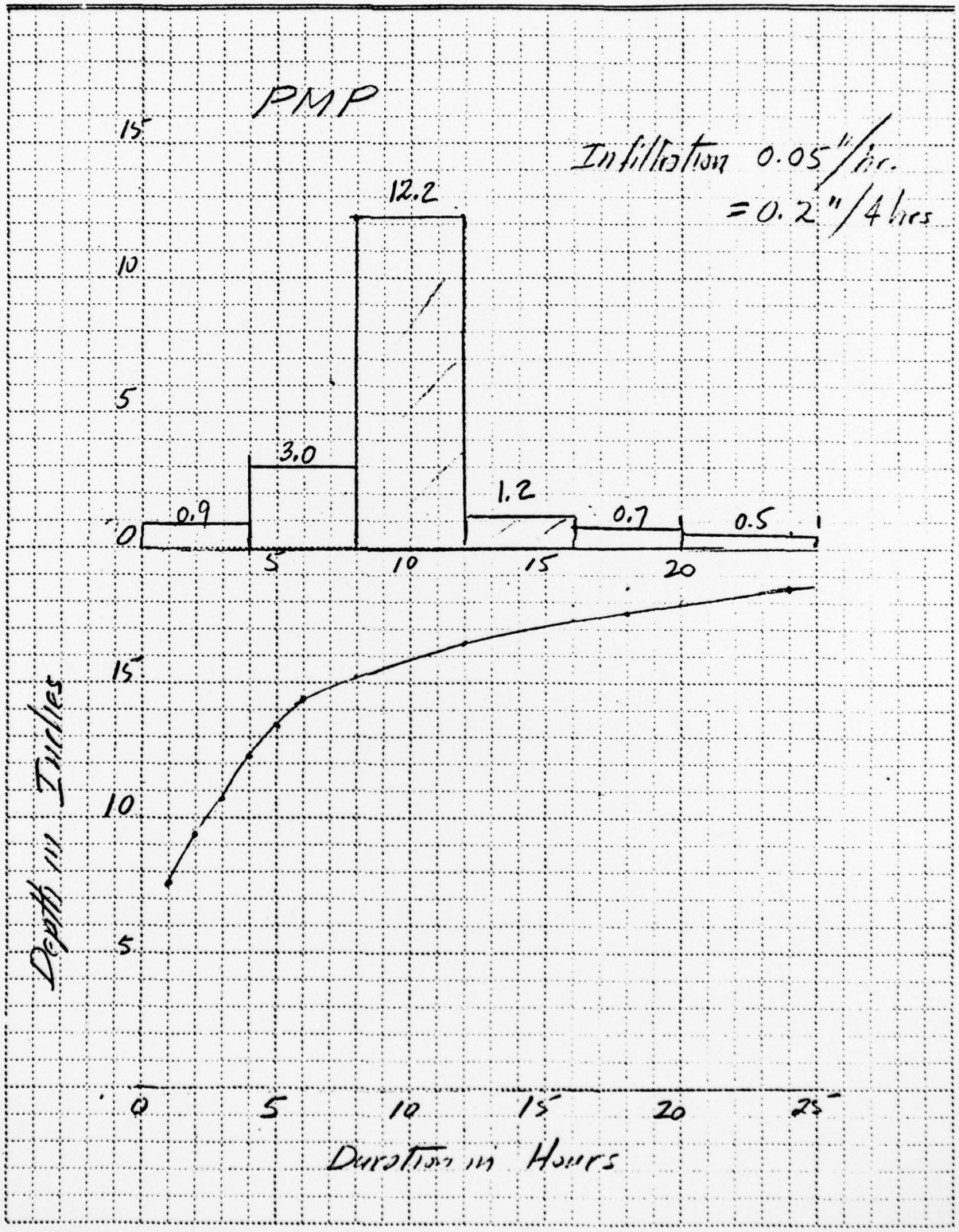
TIME IN HOURS	4HR UH IN SEC.FT.	RAINFALL EXCESS IN INCHES PER. 4 HRS.	0.7"	2.8"	12.0"	1.0"	0.5"	0.3"	TOTAL
0	0								
4	171	0.7	0						
8	644	2.8	120	0					120
12	1314	12.0	451	479	0				930
16	2081	1.0	920	1803	2052	0			4775
20	2787	0.5	1457	3679	7728	171	0		13035
24	3286	0.3	1951	5827	15768	644	86	0	24276
26	3510		2300	7804	24972	1314	322	51	36763
28	3402		2457	9201	33444	2081	657	193	48033
32	3131		2581	9828	39432	2787	1040	394	55862
36	2882		2192	9526	42120	3286	1394	624	59142
40	2653		2017	8767	40824	3510	1642	836	57597
44	2442		1857	8070	37572	3402	1755	986	53642
48	2248		1709	7428	34584	3131	1701	1053	49606
52	2069		1574		31836	2882	1566	1021	
56	1904					2653	1441	939	
60	1753						1327	865	
	1614							796	
	1485								
	1367								
	1259								

Job No. 1487-08 TIPPETTS-ABBETT-McCARTHY-STRATTON ENGINEERS AND ARCHITECTS NEW YORK Sheet ___ of ___

Project Dam Inspection, Collierville Dam Date _____

Subject _____ By _____

_____ Chk. by _____



TAMS

Job No. 1487-08 Sheet 1 of _____

Project DAM INSPECTION, COLLIERSVILLE, N.Y. Date 6/26/78

Subject FLOODS OF RECORD By HGG.

Ch'k. by _____

#	DATE	DISCHARGE (cfs)	#	DATE	DISCHARGE (cfs)
1.	MAR. 19, 1936	8740	21.	FEB. 26, 1961	4700
2.	APR. 5, 1960	7870	22.	MAR. 15, 1927	4580
3.	MAR. 22, 1948	6980	23.	MAR. 12, 1955	4250
4.	APR. 1, 1962	6950	24.	MAR. 24, 1968	4140
5.	APR. 9, 1940	6470	25.	FEB. 12, 1925	4070
6.	SEPT. 22, 1938	6300	26.	FEB. 18, 1954	3880
7.	MAR. 6, 1964	6210	27.	APR. 1, 1951	3860
8.	MAR. 16, 1929	6070	28.	JAN. 25, 1953	3840
9.	JAN. 23, 1959	5900	29.	APR. 10, 1926	3860
10.	APR. 6, 1956	5850	30.	JAN. 26, 1937	3790
11.	APR. 7. 1958	5720	31.	DEC. 31, 1941	3680
12.	JAN. 10, 1935	5630	32.	DEC. 31, 1949	3590
13.	MAR. 28, 1963	5610			
14.	MAR. 18, 1943	5450	33.	MAR. 27, 1928	3460
15.	APR. 5, 1950	5370	34.	MAR. 18, 1945	3460
			35.	APR. 12, 1931	3330
16.	MAR. 18, 1944	5160	36.	MAR. , 1934	3280
			37.	APR. 3, 1952	3260
17.	MAR. 8, 1946	5140	38.	OCT. 8, 1933	3250
			39.	APR. 11, 1932	3080
18.	APR. 7, 1947	5100	40.	MAR. 25, 1966	3050
			41.	APR. 13, 1965	2540
19.	MAR. 18, 1942	4990	42.	JAN 15, 1930	2420
			43.	APR. 3, 1967	2390
20.	FEB. 21, 1939	4710	44.	JAN. 24, 1957	2130

TAMS

Job No. 1487-08 Sheet 1 of 3

Project DAM INSPECTION Date 6/26/78

Subject COLLIERSVILLE, N.Y. By M.G.G.

FLOODS OF RECORD Ch'k. by

DATE	Q	M	$T_R = \frac{N+1}{M}$	$\frac{1}{T_R}$	$(1-\frac{1}{T_R})100$	
MAR. 19, 1936	8740	1	45.000	0.022	97.8	
APR. 5, 1960	7870	2	22.500	~~0.444~~ 0.044	95.6	
MAR 22, 1948	6980	3	15.000	0.067	93.3	
APR 1, 1962	6950	4	11.250	~~0.88~~ 0.089	91.1	
APR. 9, 1940	6470	5	9.000	0.111	88.9	
SEPT. 22, 1938	6300	6	7.500	0.133	86.7	
MAR. 6, 1964	6210	7	6.429	0.156	84.4	
MAR. 16, 1929	6070	8	5.625	0.178	82.2	
JAN. 23, 1959	5900	9	5.000	0.200	80.0	
APR 6, 1956	5850	10	4.500	0.222	77.8	
APR 7, 1958	5720	11	4.091	0.244	75.6	
JAN. 10, 1935	5630	12	3.750	0.267	73.3	
MAR 28, 1963	5610	13	3.462	0.289	~~73.3~~ 71.1	
✓ MAR 18, 1943	5450	14	3.214	0.311	68.9	
APR. 5, 1950	5370	15	3.000	0.333	66.7	
MAR 18, 1949	5160	16	2.813	0.356	64.4	
MAR 8, 1946	5140	17	2.647	0.378	62.2	
APR 7, 1947	5100	18	2.500	0.400	60.0	
MAR. 18, 1942	4990	19	2.368	0.422	57.8	
FEB. 21, 1939	4710	20	2.250	0.444	55.6	

TAMS

Job No. 1487-08 Sheet 2 of 3
Project DAM INSPECTION Date 6/26/78
Subject COLLIERSVILLE, N.Y. By M.G.G.
FLOODS OF RECORD Ch'k. by

DATE	Q	M	$T_R = \frac{N+1}{M}$	$\frac{1}{T_R}$	$(1-\frac{1}{T_R})100$	
FEB. 26, 1961	4700	21	2.143	0.467	53.3	
MAR. 15, 1927	4580	22	2.046	0.489	51.1	
MAR. 12, 1955	4250	23	1.957	0.511	48.9	
MAR. 24, 1968	4140	24	1.875	0.533	46.7	
FEB. 12, 1925	4070	25	1.800	0.556	44.4	
FEB. 18, 1954	3880	26	1.730	0.578	42.2	
APR. 1, 1951	3860	27	1.667	0.599	40.1	
~~JAN. 25, 1953~~	~~3840~~					
APR. 10, 1926	3860	28	1.607	0.622	37.8	
JAN. 25, 1953	3840	29	1.552	0.644	35.6	
JAN 26, 1937	3790	30	1.500	0.667	33.3	
DEC. 31, 1941	3680	31	1.452	0.689	31.1	
DEC 31, 1941	3590	32	1.406	0.711	28.9	
MAR, 27, 1928	3460	33	1.364	0.733	26.7	
MAR. 18, 1945	3460	34	1.324	0.755	24.5	
APR. 12, 1931	3350	35	1.286	0.778	22.2	
MAR. , 1934	3280	36	1.250	0.800	20.0	
APR. 3, 1952	3260	37	1.216	0.822	17.8	
OCT. 8, 1933	3250	38	1.184	0.845	15.5	
APR. 11, 1932	3080	39	1.154	0.867	13.3	

TAMS

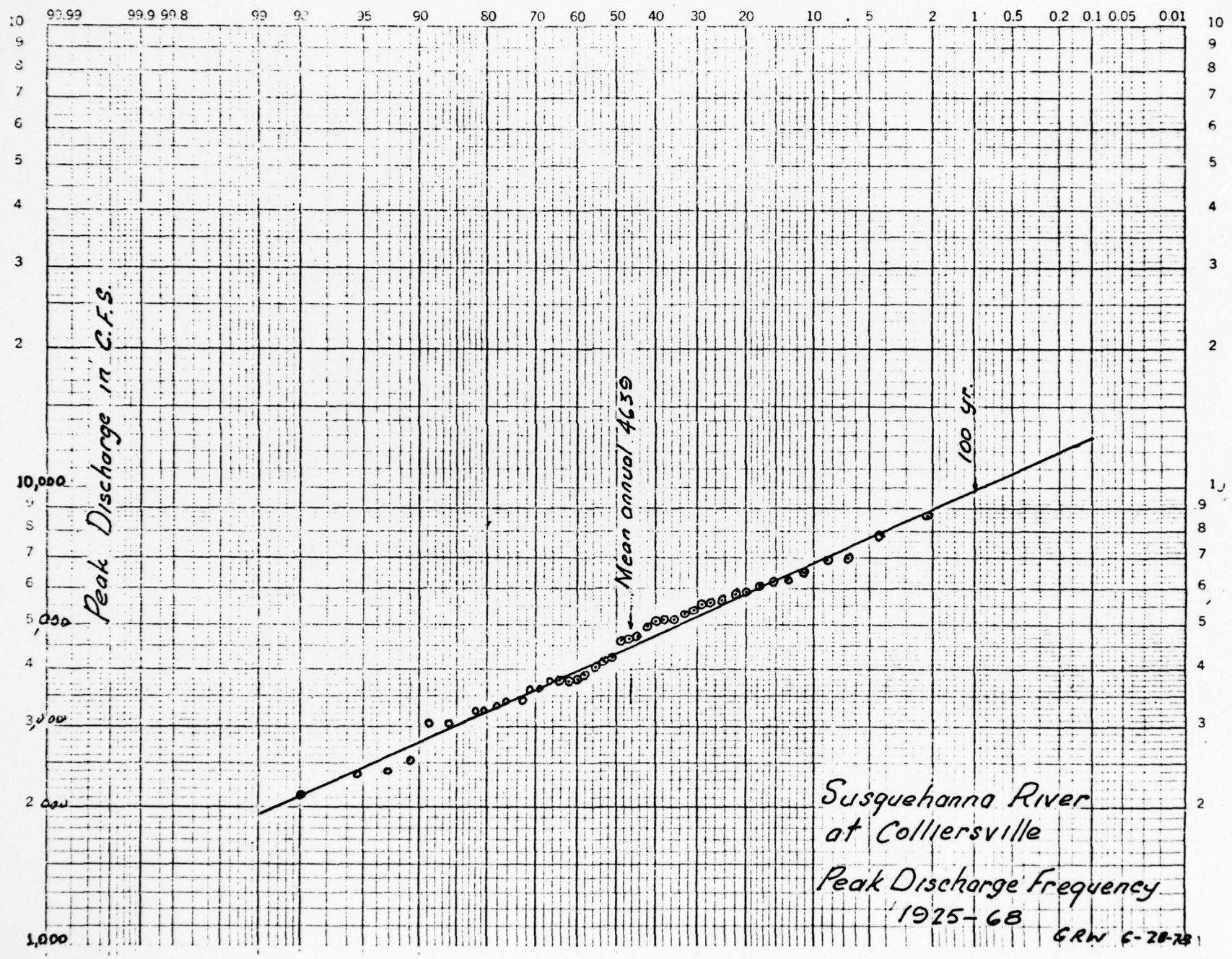
Job No. 1487-08 Sheet 3 of 3

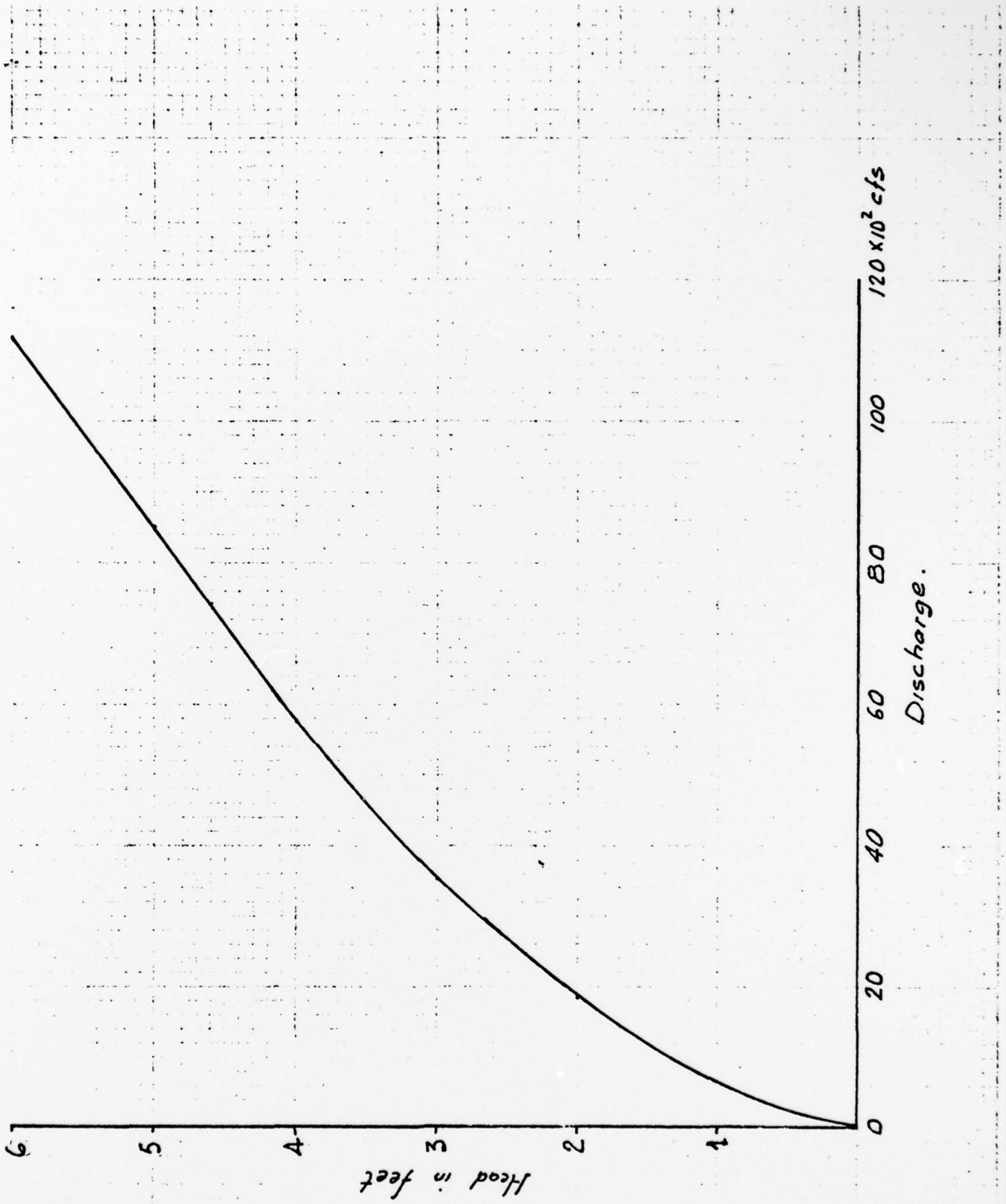
Project DAM INSPECTION Date 6/26/78

Subject COLLIERSVILLE, N.Y. By M. G-G

FLOODS OF RECORD Ch'k. by

DATE	Q	M	$T_R = \frac{N+1}{M}$	$\frac{1}{T_R}$	$(1-\frac{1}{T_R})100$
MAR. 25, 1966	3050	40	1.125	0.889	11.1
APR. 13, 1965	2540	41	1.098	0.911	8.9
JAN. 15, 1950	2420	42	1.071	0.934	6.6
APR. 3, 1967	2390	43	1.047	0.955	4.5
JAN 24, 1957	2130	44	1.023	0.978	2.2


99.99 99.9 99.8 99 95 90 80 70 60 50 40 30 20 10 5 2 1 0.5 0.2 0.1 0.05 0.01
Peak Discharge in C.F.S.
10,000
5,000
3,000
2,000
1,000
Mean annual 4639
100 yr.
Susquehanna River
at Colliersville
Peak Discharge Frequency
1925-68
GRW 6-28-78



Colliersville Dam			
Job No. 1487-08	Spillway Rating Curve	D.L.C	Jun 27. 78

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REPORT DOCUMENTATION PAGE

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19. KEY WORDS *(Continue on reverse side if necessary and identify by block number)*

Dam Safety
National Dam Safety Program
Visual Inspection
Hydrology, Structural Stability
Otsego County
Colliersville Dam
Susquehanna River

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

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

Colliersville Dam was judged to be unsafe-non-emergency due to a seriously inadequate spillway. Hydrologic analysis and soil boring were recommended.

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