OSWEGO RIVER BASIN
LOCK 24 - ERIE CANAL
ONONDAGA COUNTY, NEW YORK
INVENTORY NO. N.Y. 792

PHASE I INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM.

Lock 24 - Erie Canal (Inventory Number NY-792), Oswego River Basin, Onondaga County, New York.

Phase I Inspection Report

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Prepared for
DEPARTMENT OF THE ARMY
NEW YORK DISTRICT, CORPS OF ENGINEERS
NEW YORK, NEW YORK

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THIS DOCUMENT IS BEST QUALITY PRACTICABLE. THE COPY FURNISHED TO DTIC CONTAINED A SIGNIFICANT NUMBER OF PAGES WHICH DO NOT REPRODUCE LEGIBLY.
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.

The examination of documents and the visual inspections of the Lock 24 dam did not reveal conditions which constitute an immediate hazard to human life or property. However, the
The dam has some deficiencies which require further investigation and remedial action.

The spillway cannot pass the peak outflow from one-half the PMF. For this storm and lesser storm events, a high tailwater condition resulting in flooding of downstream areas would occur. Therefore, overtopping would not significantly increase the hazard to loss of life downstream from that which would exist just before such overtopping and the spillway is assessed as inadequate.

Stability analyses based on available information indicate that the stability of the dam is inadequate for all loading conditions. Additional stability analyses, taking into account measured characteristics of the dam/bodrock interaction, should be completed within six (6) months of the date of notification of the owner. Based upon the results of these investigations, appropriate remedial measures deemed necessary to insure the safety and integrity of the dam and appurtenant structures should be undertaken and completed during the first construction season following completion of the stability analyses.

During periods of unusually heavy precipitation and high runoff occurring over the watershed, continuous surveillance should be provided both at the dam and in the downstream areas to warn of high floodwater conditions. Such surveillance procedures and other measures deemed necessary should be developed documented and placed in readiness for future use as part of a detailed emergency operation-action plan. A warning system should also be developed and implemented; to be used in the event of dam failure.

In addition, the dam has a number of problem areas which, if left uncorrected, have the potential for the development of hazardous conditions and must be corrected within one year. These areas are:

1. Determine the responsibility for the maintenance of the powerhouse, boat yard, and Mercer mill, and correct the deficiencies noted.

2. Correct concrete deterioration on the dam crest and in the general lock area.
PREFACE

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

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

It is important to note that the condition of a dam depends on numerous and constantly changing internal and external conditions, and is evolutionary in nature. It would be incorrect to assume that the present condition of the dam will continue to represent the condition of the dam at some point in the future. Only through frequent inspections can unsafe conditions be detected and only through continued care and maintenance can these conditions be prevented or corrected.

Phase I inspections are not intended to provide detailed hydrologic and hydraulic analyses. In accordance with the established Guidelines, the Spillway 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.
PHASE I INSPECTION REPORT  
NATIONAL DAM SAFETY PROGRAM  
LOCK 24 ERIE CANAL  
I.D. NO. NY-792  
ONONDAGA COUNTY, NEW YORK

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</tbody>
</table>
ASSESSMENT

The examination of documents and the visual inspections of the Lock 24 dam did not reveal conditions which constitute an immediate hazard to human life or property. However, the dam has some deficiencies which require further investigation and remedial action.

The spillway cannot pass the peak outflow from one-half the PMF. For this storm and lesser storm events, a high tailwater condition resulting in flooding of downstream areas would occur. Therefore, overtopping would not significantly increase the hazard to loss of life downstream from that which would exist just before such overtopping and the spillway is assessed as inadequate.

Stability analyses based on available information indicate that the stability of the dam is inadequate for all loading conditions. Additional stability analyses, taking into account measured characteristics of the dam/bedrock interaction, should be completed within six (6) months of the date of notification of the owner. Based upon the results of these investigations,
appropriate remedial measures deemed necessary to insure the safety and integrity of the dam and appurtenant structures should be undertaken and completed during the first construction season following completion of the stability analyses.

During periods of unusually heavy precipitation and high runoff occurring over the watershed, continuous surveillance should be provided both at the dam and in the downstream areas to warn of high floodwater conditions. Such surveillance procedures and other measures deemed necessary should be developed, documented and placed in readiness for future use as part of a detailed emergency operation-action plan. A warning system should also be developed and implemented; to be used in the event of dam failure.

In addition, the dam has a number of problem areas which, if left uncorrected, have the potential for the development of hazardous conditions and must be corrected within one year. These areas are:

1. Determine the responsibility for the maintenance of the powerhouse, boat yard, and Mercer mill, and correct the deficiencies noted.

2. Correct concrete deterioration on the dam crest and in the general lock area.

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APPROVED BY
Colonel W. M. Smith, Jr.
New York District Engineer
Panoramic View of
BALDWINSVILLE DAM
(Lock 24)
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, to fulfill the requirements of the National Dam Inspection Act, Public Law 92-367.

b. Purpose of Inspection

This inspection was conducted to evaluate the existing conditions of the dam, to identify deficiencies and hazardous conditions, to determine if they constitute hazards to human life and property, and to recommend remedial measures where necessary.

1.2 DESCRIPTION OF PROJECT

a. Description of the Dam and Appurtenant Structures

The Lock 24 dam is a masonry gravity overflow dam approximately 325 feet in length. It rises approximately 16 feet above its rock foundation to the fixed crest.

Flow is partially controlled by a tainter gate located at the north end (or left side) of the dam. This gate is approximately 50 feet wide.

North of the dam tainter gate, a small hydroelectric powerhouse is maintained by Niagara Mohawk Power Corporation. Flow into the powerhouse is controlled by another tainter gate approximately 50 feet in width.
The south abutment of the dam is a masonry wall of the Baldwinsville Boat Yard.

The lock which is associated with this dam is located to the south of a narrow island, approximately 200 feet south of the south dam abutment. This lock is approximately 350 feet long and 44 feet wide.

On the island are two structures which in the past have utilized the head developed by the dam for power. These are the Baldwinsville Boat Yard and the Mercer mill. These structures receive water from a forebay, or intake channel, which varies in width from approximately 120 feet to approximately 30 feet. Neither structure is utilizing the head at the present time. At the boat yard, upstream water is retained by gates with flashboards. At the time of inspection, the Mercer mill was inaccessible.

b. Location

The dam is located on the Seneca River, in the Village of Baldwinsville, New York.

c. Size Classification

The dam has a head of approximately 10 feet, and a storage volume of approximately 34,100 acre-feet. Therefore, the dam is classified as an intermediate size dam.

d. Hazard Classification

The dam is classified "high" hazard because of downstream residences and the potential impact on navigation.

e. Ownership

The Lock 24 dam is owned by the New York State Department of Transportation, Waterways Maintenance Subdivision. The controlling office is located in Syracuse, New York.
Their address is as follows:

New York State Department of Transportation
Region 3
Canal Maintenance
State Office Building
333 East Washington Street
Syracuse, New York

Mr. Leo Burns
315-473-8194

f. Purpose of the Dam

The primary purpose of the dam is to provide navigable upstream waters. The impounded waters behind the dam provide a storage pool for gravity inflow to the lock. A secondary purpose of the dam is to provide hydroelectric power.

g. Design and Construction History

The present dam is believed to have been constructed about 1893. Plans for the lock, tainter gate, and a concrete cap on the dam crest are dated 1908. Plans for a new tainter gate are dated 1963 and it is reported that this was accomplished at about this time.

h. Normal Operational Procedures

The water level behind the dam is maintained at or slightly above elevation 374.0 (BCD-Barge Canal Datum) (The dam crest elevation). Gauge readings upstream and downstream of the lock are recorded daily.

1.3 PERTINENT DATA

a. Drainage Area (square miles) 3266+

b. Elevations (Barge Canal Datum)

<table>
<thead>
<tr>
<th>Top of Dam (Lock Walls)</th>
<th>379.0</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dam Overflow Crest</td>
<td>374.0</td>
</tr>
<tr>
<td>Design Pool</td>
<td>374.0</td>
</tr>
<tr>
<td>Maximum Recorded Pool</td>
<td>378.8</td>
</tr>
<tr>
<td>Tainter Gate Crest</td>
<td>366.0</td>
</tr>
<tr>
<td>Streambed at Dam Centerline</td>
<td>358+</td>
</tr>
<tr>
<td>Maximum Recorded Tailwater</td>
<td>372.5</td>
</tr>
<tr>
<td>Minimum Recorded Tailwater</td>
<td>363+</td>
</tr>
</tbody>
</table>
c. Storage (acre-feet)
Design Pool 34,100+

d. Dam
Type Masonry
Length 325 feet
Height 16+ feet
Top Width 5-6 feet
Foundation Rock

e. Gate
Type One Taintor Gate
Width 50 feet
Crest Elevation 366.0

f. Lock
Size Approximately 350' long and 44' wide

g. Other Appurtenant Structures
1. Niagara Mohawk Power Corporation powerhouse with 50' wide taintor gate
2. Baldwinsville Boat Yard
3. Mercer Mill
SECTION 2: ENGINEERING DATA

2.1 GEOTECHNICAL DATA

a. Geology

Lock 24 is located within the Village of Baldwinsville, New York in the Erie-Ontario Lowlands physiographic province.

This channel is a major glacial drainageway and, as a result, the Seneca River valley proper is filled with stratified sand and gravel outwash from the melting continental ice sheet. The surrounding terrain consists of the Iroquoian Lake plain with associated lacustrine deposits; ground moraine (glacial till) underlies these materials in most areas and forms knolls and drumlins which are free of lacustrine sediments by virtue of the fact that they were of sufficient elevation to have formed "islands" during the proglacial phase. All glacial deposits in the area reflect the most recent, or Wisconsinan, stage of the Pleistocene.

Underlying this glacial drift are Upper Silurian age mudstones of the Vernon Formation (Salina Group) and dolostones of the older Lockport Group. The Vernon is known to be gypsiferous while the Lockport Dolomite is characteristically vuggy. All rock units in the area are flat-lying over short distances, although a gentle southward dip may be discerned; all strata are non faulted and the region is considered seismically stable. However, according to Figure 1 of the Guidelines promulgated by the Corps of Engineers, this is in an area of Zone 2 seismic probability.

b. Subsurface Investigations

No records of subsurface investigations were available. Based upon the available plans and the site characteristics, it appears that the structure is founded on rock.
2.2 DESIGN/CONSTRUCTION RECORDS

No records were available for the original masonry dam. Plans dated 1908 and identified as contract 45 show the dam, lock, tainter gate, and appurtenant structures as they presently exist. Plans for a new tainter gate are dated 1963. Selected drawings are included in Appendix E.

2.3 OPERATION RECORDS

This site has an attendant on a year-round basis. Upstream and downstream water elevation readings are recorded daily throughout the year. The dam tainter gate and the Niagara Mohawk Power Corporation tainter gate are regulated to ensure that the upstream water surface does not drop below elevation 374.0 (BCD) (the dam crest).

2.4 EVALUATION OF DATA

The data presented in this report was obtained during the site inspections and from the files of the New York State Department of Transportation. The information is considered adequate for Phase I inspection purposes.
SECTION 3: VISUAL INSPECTION

3.1 FINDINGS

a. General

Visual inspections of the dam and appurtenant structures were conducted on June 11, 1980 and on June 26, 1980. The weather was generally fair. The upstream water surface elevation was 374.4 (BCD) during the first inspection. For the second inspection, the upstream water surface elevation was drawn down to just below 374.0 (BCD) (the dam crest), so that the dam crest and downstream face could be inspected. This was accomplished by entering the River below the dam in a small boat. The photographs in Appendix A depict the conditions described below.

b. Dam

The original masonry portion of the dam appeared to be in satisfactory condition. Concrete deterioration was noted along the cap that comprises the dam crest.

c. Dam Tainter Gate

The dam tainter gate was operable and appeared to be in satisfactory condition.

d. Lock

The lock in general is in satisfactory condition. Some areas of concrete deterioration were noted.

e. Powerhouse and Appurtenant Structures

Concrete deterioration was noted in the general area of the powerhouse and its appurtenant structures.

f. Baldwinsville Boat Yard and Mercer Mill

Significant concrete deterioration was noted in the area of the gates at the Baldwinsville Boat Yard. Also,
flashboards appeared to be old and were observed to be leaking.

At the time of inspection, the Mercer mill was inaccessible.

g. Upstream and Downstream Channels

The conditions of the river and its banks upstream and downstream of the dam appeared to be satisfactory.

3.2 EVALUATION OF OBSERVATIONS

The following deficiencies were noted:
1. Concrete deterioration along the dam crest.
2. Concrete deterioration in the lock area.
3. Concrete deterioration in the powerhouse intake, gate area, and the tailrace.
4. Concrete deterioration in the gate area at the Baldwinsville Boat Yard.
5. Old and leaking flashboards at the Baldwinsville Boat Yard.
SECTION 4: OPERATION AND MAINTENANCE PROCEDURES

4.1 PROCEDURE

Normal practice is to not allow the upstream water surface to drop below elevation 374.0 (BCD) (the dam crest). Flow is regulated primarily by the dam tainter gate. At very low flows, both the dam tainter gate and the Niagara Mohawk Power Corporation cainter gate must be closed.

4.2 MAINTENANCE OF DAM AND APPURTEANNT STRUCTURES

The dam and appurtenant structures (lock and tainter gate) are maintained by the New York State Department of Transportation. The dam tender reported that the current maintenance is on an as-needed basis. Increased maintenance is required to correct concrete deterioration on the dam crest and in the general lock area.

4.3 MAINTENANCE OF OTHER APPURTEANNT STRUCTURES

The maintenance of the other appurtenant or adjunct structures (powerhouse, boat yard and Mercer mill) appears to rest with their respective owners. No documents were found which define this responsibility. Yet there are cases such as deteriorating concrete and leaking flashboards which, if left to continue unchecked, could lead to failure and concomitant loss of control of the pool level.

4.4 WARNING SYSTEM IN EFFECT

No apparent warning system is present.

4.5 EVALUATION

Operation and Maintenance of the dam tainter gate are satisfactory. Additional maintenance is required to correct concrete deterioration on the dam crest, in the
general lock area, in the powerhouse area, and at the Baldwinsville Boat Yard. In addition, old and leaking flashboards at the Baldwinsville Boat Yard should be replaced. Maintenance procedures at the Mercer mill should be reviewed.

A detailed emergency warning system should be developed.
SECTION 5: HYDROLOGIC/HYDRAULIC

5.1 DRAINAGE AREA CHARACTERISTICS

The Oswego River Basin in which the dam and the lock are located is in Central New York State and has a drainage area of approximately 5100 square miles at its mouth. The drainage area of the watershed at the dam is about 3266 square miles. The river system upstream of the dam includes six Finger Lakes, Cross Lake, the Barge Canal, and outlets from the lakes to the canal. The Seneca River and 16 other principal waterways drain the watershed above the dam. The Seneca River flows from Seneca Lake generally northeastward nearly 61 miles to its confluence with the Oneida River approximately 12 miles downstream of the dam. Canals within the watershed include a reach of the Erie Canal, the Seneca Canal, and the Seneca-Cayuga Canal. All of the lakes in the watershed have regulated outlets.

A major part of the Finger Lakes area is a region of rolling hills separated by deeply eroded, steep-sided valleys of moderate width. Major valleys extend generally north-south, and most are largely occupied by the Finger Lakes. This region slopes generally northward from an elevation of approximately 2000 feet near the watershed boundary to an elevation of approximately 1000 feet near the northern ends of the Finger Lakes.

5.2 ANALYSIS CRITERIA

The hydrologic analysis of this dam was performed using the Corps of Engineers HEC-1 computer program, Dam Safety Version. The spillway design flood selected for analysis was the PMF in accordance with the Recommended Guidelines of the U.S. Army Corps of Engineers.
The basic input for this study was taken from an HEC-1 model developed by the New York State Department of Environmental Conservation with assistance from the U.S. Army Corps of Engineers, Buffalo District. The model was calibrated by the D.E.C. to the observed floods of Hurricane Agnes, June 20-26, 1972. The subbasin designation, 6-hour unit hydrographs, routing methods, and loss rates for the model (those used for Hurricane Agnes) were all adopted.

The Probable Maximum Flood (PMF) was developed assuming the uniform distribution of the Probable Maximum Precipitation (PMP) over the watershed above the dam. A PMP of 21.5 inches was obtained from Hydrometeorological Report Number 51 for a 24 hour duration and a 200 square mile area.

The flood routing at the dam was performed by the modified Puls method. It was assumed that the gates in the forebay and the lock are closed during the flood.

**SPILLWAY CAPACITY**

The dam has a 352 feet long ungated spillway structure and a 50 feet long spillway with a tainter gate. The crest elevation of the ungated spillway is 374 and the elevation of the tainter gate sill is 366. The discharge over the dam crest was computed assuming that the discharge coefficient varies with head. The values of discharge coefficient ranged from 3.38 to 3.83. The primary spillway was analysed assuming the gate is fully opened. The discharge over the spillway was computed as weir flow for flood elevations up to 379 and as orifice flow above elevation 379. The elevation of the top of the walls on both ends of the dam is 379 and, at all stages exceeding this elevation, there will be overflow from the channel. Therefore, the discharge at both ends of the dam above elevation 379 was also computed by approximating cross sections from the plans and the U.S.G.S. quadrangle for Baldwinsville.
The spillways do not have sufficient capacity for discharging the peak outflow from either the Probable Maximum Flood (PMF) or one-half the PMF. For the PMF, the peak inflow is 111,438 cfs and the peak outflow is 109,132 cfs. For one-half the PMF, the peak inflow is 41,606 cfs and the peak outflow is 41,033 cfs. The computed spillway capacity for a water surface elevation at the top of the dam (wall at both ends) is 23,274 cfs.

5.4 RESERVOIR CAPACITY

The reservoir at normal pool impounded by this dam lies primarily within the limits of the existing channel of the Seneca River, extending approximately 10 miles, and Cross Lake. The total storage capacity of this dam up to elevation 379 is approximately 34,100 acre-feet.

5.5 FLOODS OF RECORD

The maximum known flood in the watershed occurred on June 28, 1972 as a result of Hurricane Agnes. The discharge of 17,200 cfs was recorded at the U.S.G.S. gaging station 04237500 located about 400 feet downstream of the dam. The maximum high water occurred at this same time and was recorded at the dam as 378.8, while the maximum tailwater was 372.5.

5.6 OVERTOPPING POTENTIAL

The hydrologic analysis indicates that the dam does not have sufficient spillway capacity to pass the PMF or one-half the PMF. The dam would be overtopped by 12.95 feet and 7.45 feet during the PMF and one-half PMF, respectively.
5.7 EVALUATION

The spillway will not pass the calculated peak outflow from one-half the PMF. For this storm and less severe storm events, however, a high tailwater condition resulting in flooding of downstream areas would occur. Therefore, the additional overtopping would not significantly increase the hazard to loss of life downstream from that which would exist just before such overtopping.

The spillway is assessed as inadequate.
SECTION 6: STRUCTURAL STABILITY

6.1 EVALUATION OF STRUCTURAL STABILITY

a. Visual Observations

No visible evidence of structural instability of the dam was noted. The horizontal and vertical alignments, abutments, joints, and tainter gate all appeared to be satisfactory. The concrete deterioration noted in the visual inspection does not affect structural stability at this time.

b. Design and Construction Data

The subsurface and structural information used in the stability analyses was obtained from the contract drawings included in Appendix E. This information did not include specific properties of the supporting bedrock, precise details of dam embedment, or design details.

c. Data Review and Stability Evaluation

The stability analyses performed used the cross-section information provided on the contract drawings, plus certain simplifying assumptions regarding the dam and its foundation characteristics. The dam was considered a solid gravity section seated on, but not embedded in, bedrock.

The conditions analysed, and the resulting factors of safety, are summarized in the table which follows.

The analyses indicate less than desirable factors of safety for all loading conditions, and failure for most loading conditions. However, further inspections and analyses are required to verify or modify the assumptions made in the stability analyses. The most critical assumptions appear to be those involving the dam/bedrock interface and the actual uplift pressures.
## SUMMARY OF STABILITY ANALYSES

<table>
<thead>
<tr>
<th>CASE</th>
<th>LOADING CONDITIONS</th>
<th>FACTOR OF SAFETY</th>
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<td>Full Uplift</td>
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<tr>
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</tr>
<tr>
<td></td>
<td>Ice</td>
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<td></td>
<td>Seismic (Zone 2)</td>
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<td></td>
<td>X</td>
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<td>.52</td>
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</table>

**NOTE:** FULL UPLIFT CONDITIONS NOT ANALYZED FOR 1/2 PMF AND PMF BECAUSE 1/2 UPLIFT CONDITIONS INDICATED FAILURE.
d. Seismic Stability

The dam is situated in seismic Zone 2. Therefore, seismic stability analyses were performed based on the Zanger hydrodynamic pressure distribution, which is similar to the Westergaard distribution recommended by the Corps of Engineers Guidelines. The analyses were performed under normal pool, one-half PMF, and full PMF. The results are tabulated in the accompanying table. Although undesirable factors of safety are indicated, further inspections and analyses are required to refine the assumptions made in the stability analyses.
SECTION 7: ASSESSMENT/RECOMMENDATIONS

7.1 ASSESSMENT

a. Safety

The Phase I inspection of the Lock 24 dam did not reveal conditions which constitute an immediate hazard to human life or property. However, additional maintenance is required to correct concrete deterioration on the dam crest and in the general lock area. Also, the responsibility for maintenance of the other appurtenant structures (powerhouse, boat yard, and Mercer mill) should be investigated, because failure of these structures could create problems similar to those caused by loss of the dam itself.

The spillway does not have sufficient discharge capacity for passing one-half the PMF and is considered to be inadequate. For one-half the PMF and lesser storm events, a high tailwater condition resulting in flooding of downstream areas would occur. Therefore, the additional overtopping would not significantly increase the hazard to loss of life downstream from that which would exist just before such overtopping.

The stability analyses, which were based upon assumed parameters, indicate less than adequate factors of safety for all loading conditions and actual failure under severe loadings.

During periods of unusually heavy precipitation and high runoff occurring over the watershed, continuous surveillance should be provided both at the dam and in the downstream areas to warn of high floodwater conditions. Such surveillance procedures and other measures deemed necessary should be developed, documented and placed in readiness for future use as part of a detailed emergency operation-action plan. A warning system should also be developed and implemented; to be used in the event of dam failure.
b. Adequacy of Information

The information available for the preparation of this report was adequate for the purposes of a Phase I investigation. However, additional site specific data will be required for subsequent studies.

c. Necessity for Additional Investigations

Additional investigations are necessary regarding the stability of the dam. Such investigations should be based on actual measurements of embedment, dam/bedrock friction and uplift.

d. Urgency

The stability investigations required should be completed within six (6) months of the date of notification of the owner. Based upon the results of these investigations, appropriate remedial measures deemed necessary to insure the safety and integrity of the dam and appurtenant structures should be undertaken and completed during the first construction season following completion of the stability analyses.

The urgency of other remedial measures is discussed in the following section.

7.2 RECOMMENDED MEASURES

a) The following actions should be undertaken:

1. Develop and implement a detailed emergency operation-action plan and warning system.

2. Determine the responsibility for the maintenance of the powerhouse, boat yard, and Mercer mill.

3. Correct concrete deterioration on the dam crest and in the general lock area.

4. Correct deficiencies noted for the other appurtenant structures.

5. Take any remedial actions that may be dictated by the stability analyses.
b) The urgency of the actions listed above is as follows:

- Items 1 and 2 should be completed within 90 days after notification of the owner.
- Items 3 and 4 should be completed within 12 months after notification of the owner.
- Item 5 should be completed within the first construction season following completion of the stability analyses.
Upstream staff gauge
NOTE: Concrete deterioration

Lock 24, facing downstream

Approach to Lock 24, Facing downstream
Concrete deterioration on south exterior corner of Dam Crest.
APPENDIX B

VISUAL INSPECTION CHECKLIST
VISUAL INSPECTION CHECKLIST

1) Basic Data
   a. General

   Name of Dam  Lock 24 Erie Canal
   I.D. # 728-230 DEC. Dam No. 792
   River Basin  Seneca River
   Location: Town Lyons County  Chautauqua
              U.S.G.S. Quadrangle  Lockport
   Stream Name  Seneca River
   Tributary of  Owasco River
   Latitude (N)  43° 9'  Longitude (W)  76° 20'
   Type of Dam  Masonry
   Hazard Category  High
   Date(s) of Inspection  6/11/80, 6/24/80
   Weather Conditions  Fair - Partly Cloudy
   Reservoir Level at Time of Inspection  777.4
   Tailwater Level at Time of Inspection  367.9

   b. Inspection Personnel  Rick Hoist (TA)

   c. Persons Contacted (Including Address & Phone No.)
      Leo Biny, NYS DOT (515-422-8191)

   d. History:
      Date Constructed  Approx. 1873
      Date(s) Reconstructed  1903
      New Date  1963/7?
      Designer  Unknown
      Constructed by  Unknown
      Owner  Present, NYS DOT

   e. Seismic Zone  2
VISUAL INSPECTION CHECKLIST

2) Embankment
   a. Characteristics
      1) Embankment Material
      
      2) Cutoff Type  **None**
      
      3) Impervious Core  **None**
      
      4) Internal Drainage System  **None**
      
      5) Miscellaneous
      
   b. Crest
      1) Vertical Alignment  **Good**
      
      2) Horizontal Alignment  **Good**
      
      3) Surface Cracks  **Deterioration of Concrete**
      
      4) Miscellaneous
      
   c. Upstream Slope
      1) Slope (Estimate) (V:H)  **N. A.**
      
      2) Undesirable Growth or Debris, Animal Burrows  **N. A.**
      
      3) Sloughing, Subsidence or Depressions  **N. A.**
THOMSEN ASSOCIATES
CONSULTING GEOTECHNICAL ENGINEERS & GEOLOGISTS

VISUAL INSPECTION CHECKLIST

4) Slope Protection  

5) Surface Cracks or Movement at Toe  UNOBSERVABLE

d. Downstream Slope
1) Slope (Estimate - V:H)  

2) Undesirable Growth or Debris, Animal Burrows  

3) Sloughing, Subsidence or Depressions  

4) Surface Cracks or Movement at Toe  UNOBSERVABLE

5) Seepage  UNOBSERVABLE

6) External Drainage System (Ditches, Trenches; Blanket)  NONE

7) Condition Around Outlet Structure  GENERALLY GOOD

8) Seepage Beyond Toe  UNOBSERVABLE

e. Abutments-Embankment Contact
VISUAL INSPECTION CHECKLIST

1) Erosion at Contact
   ____

2) Seepage Along Contract
   ____

3) Drainage System
   a. Description of System
      N.A.
   b. Condition of System
      N.A.
   c. Discharge from Drainage System
      N.A.

4) Instrumentation (Monumentation/Surveys, Observation Wells, Weirs, Piezometers, Etc.)
   _STAFF GAUGES_ - 1 Upstream, 1 Downstream
   USGS Maintains 2 Discharge Gauges
      Downstream of Dam
Visual Inspection Checklist

5) Reservoir
   a. Slopes General Good
   
   b. Sedimentation Inadequate
   
   c. Unusual Conditions Which Affect Dam None Noted

6) Area Downstream of Dam
   a. Downstream Hazard (No. of Homes, Highways, etc.) Several Homes
   
   b. Seepage, Unusual Growth None 00-00
   
   c. Evidence of Movement Beyond Toe of Dam None 00-00
   
   d. Condition of Downstream Channel Generally Good

7) Spillway(s) (Including Discharge Conveyance Channel)
   
   a. General
   
   
   b. Condition of Service Spillway Generally Good
### VISUAL INSPECTION CHECKLIST

c. Condition of Auxiliary Spillway

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d. Condition of Discharge Conveyance Channel

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8) Reservoir Drain/Outlet

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<th>Conduit</th>
<th>Other</th>
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<td>11' x 11'</td>
<td>Length</td>
<td>50'</td>
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<td>760.0</td>
<td>Exit</td>
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<td></td>
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<td></td>
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<tr>
<td>Structural Integrity:</td>
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<td></td>
<td></td>
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<tr>
<td>Hydraulic Capability:</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Means of Control: Gate</td>
<td>X</td>
<td>Valve</td>
<td>Uncontrolled</td>
</tr>
<tr>
<td>Operation: Operable</td>
<td>X</td>
<td>Inoperable</td>
<td>Other</td>
</tr>
<tr>
<td>Present Condition (Describe):</td>
<td></td>
<td></td>
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9) **Structural**
   a. Concrete Surfaces
   b. Structural Cracking
   c. Movement - Horizontal & Vertical Alignment (Settlement)
   d. Junctions with Abutments or Embankments
   e. Drains - Foundation, Joint, Face
   f. Water Passages, Conduits, Sluices
   g. Seepage or Leakage
<p>| | |</p>
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<tr>
<td><strong>h. Joints - Construction, etc.</strong></td>
<td><strong>Accept Good</strong></td>
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<tr>
<td><strong>i. Foundation</strong></td>
<td><strong>Unobservable</strong></td>
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<tr>
<td><strong>j. Abutments</strong></td>
<td><strong>Generally Good</strong></td>
</tr>
<tr>
<td><strong>k. Control Gates</strong></td>
<td><strong>Generally Good</strong></td>
</tr>
<tr>
<td><strong>l. Approach &amp; Outlet Channels</strong></td>
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<tr>
<td><strong>m. Energy Dissipators (Plunge Pool, etc.)</strong></td>
<td><strong>N/A</strong></td>
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<tr>
<td><strong>n. Intake Structures</strong></td>
<td><strong>(Gates) Generally Good</strong></td>
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<tr>
<td><strong>o. Stability</strong></td>
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<tr>
<td><strong>p. Miscellaneous</strong></td>
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APPENDIX C

HYDROLOGIC/HYDRAULIC ENGINEERING
DATA AND COMPUTATIONS
**Stage-Discharge Computations (Ungated Spillway)**

- **Normal Flow:** 374
- **Crest Elevation:** 374
- **Spillway Shape:** Similar to the one shown on Fig. 1-7 (King & Breakey)
- **All Elevations are based on Barge Canal Datum.**

<table>
<thead>
<tr>
<th>ELEV.</th>
<th>H</th>
<th>H^{3/2}</th>
<th>C</th>
<th>L</th>
<th>Discharge</th>
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<td>374</td>
<td>0</td>
<td>0</td>
<td>3.52</td>
<td>0</td>
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<tr>
<td>375</td>
<td>1</td>
<td>1</td>
<td>3.38</td>
<td>3.52</td>
<td>11.90</td>
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<td>376</td>
<td>2</td>
<td>2.83</td>
<td>3.51</td>
<td>3.52</td>
<td>34.96</td>
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<td>5.20</td>
<td>3.58</td>
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<td>65.53</td>
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<td>3.68</td>
<td>3.52</td>
<td>10.363</td>
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<td>63.172</td>
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### Stage-Discharge Computations (Graded Spillway)

#### Assumptions:
1. Gate is fully open (bottom of gate at el. 379)
2. Neglect Approach Velocity
3. Normal Pool Elev. 374.0
4. Elevation of top of sill = 366.0
5. Length of spillway = 50'

Discharge \( Q = 2\sqrt{g \cdot L \cdot (H_1^{3/2} - H_2^{3/2})} \) (Eq. used for elw. above el. 379)

Discharge \( Q = C \cdot L \cdot H_1^{3/2} \) (Eq. used for flood elw. below 279)

<table>
<thead>
<tr>
<th>Elev.</th>
<th>( H_1 )</th>
<th>( d )</th>
<th>( C )</th>
<th>( H_2 )</th>
<th>( H_1^{3/2} )</th>
<th>( H_2^{3/2} )</th>
<th>( H_1^{3/2} - H_2^{3/2} )</th>
<th>Discharge</th>
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**NOTE:** Bureau Publication "Design of Small Dams - Fig. 257" was used to compute coefficient of discharge 'C' for orifice flow.
## Stage-Discharge Computations in Overbanks

### Subarea-1

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<th>A</th>
<th>P</th>
<th>Q</th>
<th>R</th>
<th>R²</th>
<th>G</th>
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<td>.5</td>
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<td>387</td>
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### Subarea-4

<table>
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<tr>
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<th>24.7</th>
<th>275</th>
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<td>60</td>
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<td>1.84</td>
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<td>387</td>
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<td>735</td>
<td>210</td>
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<td>2.50</td>
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</table>

**Note:** See attached cross section.
# Stage-Discharge Tabulation

<table>
<thead>
<tr>
<th>ELEV. (FEET)</th>
<th>PRIMARY SPILLWAY (C.F.S.)</th>
<th>AUXILIARY SPILLWAY (C.F.S.)</th>
<th>SUBAREA DISCHARGE IN C.F.S.</th>
<th>TOTAL DISCHARGE (C.F.S.)</th>
<th>REMARKS</th>
</tr>
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<tr>
<td>374</td>
<td>374</td>
<td>0</td>
<td></td>
<td>3,960</td>
<td>Normal Pool Elev.</td>
</tr>
<tr>
<td>375</td>
<td>4725</td>
<td>1190</td>
<td></td>
<td>5,915</td>
<td>-374.0 (Barge)</td>
</tr>
<tr>
<td>376</td>
<td>5533</td>
<td>3496</td>
<td></td>
<td>9,029</td>
<td>U.S.G.S. =</td>
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<tr>
<td>377</td>
<td>6384</td>
<td>6553</td>
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<td>12,137</td>
<td>B.C.D-1.04</td>
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<tr>
<td>378</td>
<td>7275</td>
<td>10,363</td>
<td></td>
<td>17,638</td>
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<tr>
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<td>15,072</td>
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<td>23,274</td>
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<tr>
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<td>8796</td>
<td>19,817</td>
<td>10</td>
<td>221 110 249 98 0</td>
<td>29,351</td>
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<tr>
<td>381</td>
<td>10,066</td>
<td>20,509</td>
<td>230</td>
<td>1381 690 1866 1425 400</td>
<td>46,207</td>
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<tr>
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<td>1631</td>
<td>4383 2191 5921 5201 458</td>
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<td>383</td>
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<td>3590</td>
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Note: Stage-Discharge curve was plotted to interpolate other values for HEC-1 input. Curve is checked.
### Stage-Storage Tabulation

<table>
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<tr>
<th>U.S.G.S. Datum</th>
<th>B.C.D.</th>
<th>Cross Lake Storage in Acre-FT.</th>
<th>Total Storage (Acre-FT.)</th>
<th>Remarks</th>
</tr>
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<tr>
<td>(Cross Lake Elevation)</td>
<td>Elevation at Dam</td>
<td>Elevation at Dam</td>
<td></td>
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<tr>
<td>373</td>
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<td>374</td>
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<td>0</td>
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<tr>
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<td></td>
<td>Stage storage data</td>
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<tr>
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<td>374</td>
<td>375</td>
<td>5,000</td>
<td>6,500</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>U.P.E. elevation 379</td>
</tr>
<tr>
<td>377</td>
<td>375</td>
<td>376</td>
<td>10,500</td>
<td>13,650</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Storage obtained from N.Y. State B.E.C.</td>
</tr>
<tr>
<td>379</td>
<td>376</td>
<td>377</td>
<td>16,400</td>
<td>21,320</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Storage above elev. 379</td>
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<tr>
<td>380</td>
<td>376.5</td>
<td>377.5</td>
<td>19,400</td>
<td>25,720</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Storage estimated by estimating surface area adjacent to cross lake from U.S.G.S. quadrangle Jordan, Lysander, and Cato</td>
</tr>
<tr>
<td>382</td>
<td>378</td>
<td>379</td>
<td>26,200</td>
<td>34,100</td>
</tr>
<tr>
<td>385</td>
<td>390</td>
<td>391</td>
<td>37,500</td>
<td>48,750</td>
</tr>
<tr>
<td>390</td>
<td>394</td>
<td>395</td>
<td>58,750</td>
<td>76,375</td>
</tr>
<tr>
<td>395</td>
<td>386</td>
<td>397</td>
<td>82,690</td>
<td>107,500</td>
</tr>
</tbody>
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Note: Stage-storage curve was plotted to interpolate other values. For HEC-1 input, curve is attached.
Stage-Discharge Curve
Baldwinsville Dam
Lock 24
Barge Canal Datum
<table>
<thead>
<tr>
<th>Area Code</th>
<th>Area Description</th>
<th>Drainage Area (sq.mi.)</th>
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</thead>
<tbody>
<tr>
<td>A1</td>
<td>Canandaigua Lake</td>
<td>184</td>
</tr>
<tr>
<td>A2</td>
<td>Flint Creek at Mouth</td>
<td>102</td>
</tr>
<tr>
<td>A3</td>
<td>Canandaigua Outlet @ B.C. Confluence</td>
<td>155</td>
</tr>
<tr>
<td>B1</td>
<td>Keuka Lake</td>
<td>183</td>
</tr>
<tr>
<td>B2</td>
<td>Seneca Lake</td>
<td>524</td>
</tr>
<tr>
<td>B3</td>
<td>Cayuga Lake</td>
<td>782</td>
</tr>
<tr>
<td>B4</td>
<td>Seneca Lake Outlet to Lock 4</td>
<td>39</td>
</tr>
<tr>
<td>B5</td>
<td>Seneca Lake Outlet from Lock 4 to Mud Lock</td>
<td>36</td>
</tr>
<tr>
<td>C1</td>
<td>Owasco Lake</td>
<td>201</td>
</tr>
<tr>
<td>C2</td>
<td>Skaneateles Lake</td>
<td>74</td>
</tr>
<tr>
<td>C3</td>
<td>Otisco Lake</td>
<td>42.7</td>
</tr>
<tr>
<td>C4</td>
<td>Onondaga Reservoir</td>
<td>67.7</td>
</tr>
<tr>
<td>C5</td>
<td>Onondaga Lake</td>
<td>102.3</td>
</tr>
<tr>
<td>C6</td>
<td>Owasco Outlet @ B.C. Confluence</td>
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</tr>
<tr>
<td>C7</td>
<td>Skaneateles Creek @ B.C. Confluence</td>
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<td>C8</td>
<td>Ninemile Creek @ Mouth</td>
<td>72.3</td>
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<tr>
<td>D1</td>
<td>Chittenango Creek @ Mouth</td>
<td>288</td>
</tr>
<tr>
<td>D2</td>
<td>Canaseraga Creek @ Mouth</td>
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<tr>
<td>D3</td>
<td>Oneida Creek @ Mouth</td>
<td>144</td>
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<tr>
<td>D4</td>
<td>Fish Creek and Wood Creek</td>
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</tr>
<tr>
<td>D5</td>
<td>Local Inflow to Oneida Lake</td>
<td>269</td>
</tr>
<tr>
<td>D6</td>
<td>Local Inflow to Oneida River above Lock 23</td>
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</tr>
<tr>
<td>D7</td>
<td>Oneida River from Lock 25 to Three Rivers</td>
<td>110</td>
</tr>
<tr>
<td>E1</td>
<td>Ganargua Creek @ Lock 29</td>
<td>147</td>
</tr>
<tr>
<td>E2</td>
<td>Ganargua Creek @ Lock 27</td>
<td>118</td>
</tr>
<tr>
<td>E3</td>
<td>Local Inflow to B.C. Lock 29 to Lock 27</td>
<td>51</td>
</tr>
<tr>
<td>E4</td>
<td>Local Inflow to B.C. Lock 27 to Lock 26</td>
<td>89</td>
</tr>
<tr>
<td>E5</td>
<td>Local Inflow to B.C. Lock 26 to Lock 25</td>
<td>18</td>
</tr>
<tr>
<td>E6</td>
<td>Local Inflow to B.C. Lock 25 to Owasco Outlet</td>
<td>191</td>
</tr>
<tr>
<td>E7</td>
<td>Local Inflow to B.C. Owasco to Skaneateles Outlet</td>
<td>98</td>
</tr>
<tr>
<td>E8</td>
<td>Local Inflow to B.C. Skaneateles to Lock 24</td>
<td>98</td>
</tr>
<tr>
<td>E9</td>
<td>Local Inflow to B.C. Lock 24 to Three Rivers</td>
<td>37</td>
</tr>
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</table>
# Table A-6

**Modelling Parameters**

<table>
<thead>
<tr>
<th>Subbasin</th>
<th>QRSCH*</th>
<th>RTOR**</th>
<th>Start Q CFS</th>
<th>Losses Initial</th>
<th>Constant in 1 hr</th>
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</thead>
<tbody>
<tr>
<td>A-1 - Canandaigua Lake</td>
<td>1000</td>
<td>1.6</td>
<td>300</td>
<td>1.25</td>
<td>0.03</td>
</tr>
<tr>
<td>A-2 - Flint Creek</td>
<td>2000</td>
<td>1.6</td>
<td>90</td>
<td>0.50</td>
<td>0.06</td>
</tr>
<tr>
<td>A-3 - Canandaigua Outlet</td>
<td>200</td>
<td>1.6</td>
<td>150</td>
<td>0.60</td>
<td>0.06</td>
</tr>
<tr>
<td>B-1 - Keuka Lake</td>
<td>800</td>
<td>1.6</td>
<td>100</td>
<td>1.50</td>
<td>0.03</td>
</tr>
<tr>
<td>B-2 - Seneca Lake</td>
<td>2800</td>
<td>1.6</td>
<td>500</td>
<td>1.50</td>
<td>0.03</td>
</tr>
<tr>
<td>B-3 - Cayuga Lake</td>
<td>1700</td>
<td>1.6</td>
<td>1000</td>
<td>0.5</td>
<td>0.03</td>
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<tr>
<td>B-4 - Seneca Lake Outlet to Lock CS-4</td>
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<td>1.6</td>
<td>92</td>
<td>0.50</td>
<td>0.05</td>
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<td>B-5 - Seneca Lake Outlet to CS-4 to CS-1</td>
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<td>92</td>
<td>0.50</td>
<td>0.05</td>
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<tr>
<td>C-1 - Owasco Lake</td>
<td>1000</td>
<td>1.6</td>
<td>450</td>
<td>0.75</td>
<td>0.05</td>
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<tr>
<td>C-2 - Skaneateles Lake</td>
<td>500</td>
<td>1.6</td>
<td>250</td>
<td>0.75</td>
<td>0.05</td>
</tr>
<tr>
<td>C-3 - Otisco Lake</td>
<td>300</td>
<td>1.6</td>
<td>90</td>
<td>0.75</td>
<td>0.05</td>
</tr>
<tr>
<td>C-4 - Onondaga Reservoir</td>
<td>302</td>
<td>1.6</td>
<td>250</td>
<td>1.5</td>
<td>0.06</td>
</tr>
<tr>
<td>C-5 - Onondaga Lake</td>
<td>500</td>
<td>1.6</td>
<td>250</td>
<td>1.25</td>
<td>0.06</td>
</tr>
<tr>
<td>C-6 - Owasco Lake Outlet</td>
<td>200</td>
<td>1.6</td>
<td>90</td>
<td>0.50</td>
<td>0.06</td>
</tr>
<tr>
<td>C-7 - Skaneateles Creek</td>
<td>200</td>
<td>1.6</td>
<td>90</td>
<td>0.50</td>
<td>0.06</td>
</tr>
<tr>
<td>C-8 - Nine Mile Creek</td>
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<td>250</td>
<td>1.00</td>
<td>0.06</td>
</tr>
<tr>
<td>D-1 - Chittenango Creek</td>
<td>2160</td>
<td>1.6</td>
<td>600</td>
<td>0.25</td>
<td>0.06</td>
</tr>
<tr>
<td>D-2 - Canaseraga Creek</td>
<td>800</td>
<td>1.6</td>
<td>260</td>
<td>0.25</td>
<td>0.06</td>
</tr>
<tr>
<td>D-3 - Oneida Creek</td>
<td>1080</td>
<td>2.00</td>
<td>320</td>
<td>0.25</td>
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</tr>
<tr>
<td>D-4 - Fish Creek</td>
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<td>1.6</td>
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<td>0.06</td>
</tr>
<tr>
<td>D-5 - Area Local to Oneida Lake</td>
<td>2000</td>
<td>1.6</td>
<td>340</td>
<td>0.25</td>
<td>0.06</td>
</tr>
<tr>
<td>D-6 - Oneida River above Lock E-23</td>
<td>210</td>
<td>1.6</td>
<td>70</td>
<td>0.5</td>
<td>0.06</td>
</tr>
<tr>
<td>D-7 - Oneida River Lock E-23 to Three Rivers</td>
<td>300</td>
<td>1.6</td>
<td>200</td>
<td>0.5</td>
<td>0.06</td>
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<tr>
<td>E-1 - Canargua Creek Vic. Lock E-29</td>
<td>550</td>
<td>1.6</td>
<td>160</td>
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<td>0.05</td>
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<td>E-2 - Canargua Creek Lock E-27</td>
<td>470</td>
<td>1.6</td>
<td>120</td>
<td>0.5</td>
<td>0.05</td>
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<tr>
<td>E-3 - Area Local to Barge Canal Lock E-29 to E-27</td>
<td>200</td>
<td>1.6</td>
<td>100</td>
<td>0.5</td>
<td>0.05</td>
</tr>
<tr>
<td>E-4 - Area Local to Barge Canal E-27 to E-26</td>
<td>360</td>
<td>1.6</td>
<td>100</td>
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<td>0.06</td>
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<tr>
<td>E-5 - Area Local to Barge Canal E-26 to E-28</td>
<td>100</td>
<td>1.6</td>
<td>90</td>
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<td>0.06</td>
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<tr>
<td>E-6 - Area Local to Barge Canal E-28 to Owasco Outlet</td>
<td>400</td>
<td>1.6</td>
<td>140</td>
<td>0.5</td>
<td>0.06</td>
</tr>
<tr>
<td>E-7 - Area Local to Barge Canal Owasco Outlet to Seneca Outlet</td>
<td>400</td>
<td>1.6</td>
<td>140</td>
<td>0.5</td>
<td>0.06</td>
</tr>
<tr>
<td>E-8 - Area Local to Barge Canal, Seneca Outlet to Lock E-24</td>
<td>400</td>
<td>1.6</td>
<td>120</td>
<td>0.5</td>
<td>0.06</td>
</tr>
<tr>
<td>E-9 - Area Local to Barge Canal Lock E-24 to Three Rivers</td>
<td>150</td>
<td>1.6</td>
<td>100</td>
<td>0.5</td>
<td>0.06</td>
</tr>
</tbody>
</table>

*Flow in cfs below which base flow recession occurs.

**Ratio of recession flow to that flow occurring 10 time intervals later.
| K1 | 11 CANOAQUIGUA LAKES INFL WS (SUB_AREA A1) | K1 | 12 CANOAQUIGUA LAKE Q1 FLOW USING MODIFIED FOLS WQTHO |
|---|---|---|
| 6200 | 9 | 11 12200 120 11900 11700 10900 10dU0 10700 10100 |
| 6400 | P | 0 41.5 39 33 01 72 |
| 6500 | T | 0 0 0 0 0 0 1.25 0.03 |
| 6600 | U | 0 0 |
| 6700 | U1 | 8500 3183 JUDE 15U/ 091 110 145 30 |
| 6900 | X | 300 1000 1.0 |
| 6900 | K | 1 4 0 0 0 1 |
| 7000 | K1 | 12 CANOAQUIGUA LAKE Q1 FLOW USING MODIFIED FOLS WQTHO |
| 7100 | Y | 0 0 0 1 1 |
| 7200 | Y1 | 1 0 0 0 0 0 51000 |
| 7300 | Y2 | 10700 21300 31900 42500 53100 63700 74300 84900 95500 106100 |
| 7400 | Y2212s00 | 319000 |
| 7500 | Y3 | 50 50 50 50 280 500 1000 1500 2250 3000 |
| 7600 | Y3 | 08000 200300 |
| 7700 | K | 1 5 0 0 0 0 1 |
| 7900 | K1 | 13 KUVEJUQFlW 12 Flow 1 GREN CHEEK NORTH |
| 7900 | Y | 0 0 0 1 |
| 8000 | F1 | 0 14 5 |
| 8100 | K | 0 5 0 0 0 0 1 |
| 8200 | K1 | 14 FLINT CK INFLW A-2 |
| 8300 | M | 0 0 0 0 0 0 1 |
| 8400 | P | 0 21.5 39 53 01 72 |
| 8500 | T | 0 0 0 0 0 0 0 0 0 0.5 0.0b |
| 8600 | U | 2e |
| 8700 | U1 | 38 344 900 1200 1367 116b 900 801 00 349 |
| 8800 | U1 | 455 377 411 239 215 17p 147 104 101 94 |
| 8900 | U1 | 67 57 47 39 35 34 |
| 9000 | X | 90 2000 1.0 |
| 9100 | K | 2 5 0 0 0 0 1 |
| 9200 | K1 | 15 COMBINE KUVEJUQ CANOAQUIGUA Q1 FLOWS AND FLINT CK INFLWS |
| 9300 | M | 0 0 0 0 0 0 1 |
| 9400 | K1 | 16 KUVEJUQ 1G LUCK 2|
| 9500 | Y | 0 0 0 0 1 |
| 9600 | Y1 | 0 7 3 |
| 9700 | K | 0 50 0 0 0 0 1 |
| 9800 | K1 | 17 Q1VEJUQ LOCAL FLOW A-3 |
| 9900 | M | 0 0 0 0 0 0 1 |
| 10000 | P | 0 21.5 39 53 01 72 |
| 10100 | T | 0 0 0 0 0 0 0 0 0 0.6 0.0b |
| 10200 | U | 22 |
| 10300 | U1 | 338 900 114d 17b 2408 20u1 1921 1413 1038 |
| 10400 | U1 | 703 502 412 309 223 164 120 90 95 49 |
| 10500 | U1 | 35 34 |
| 10600 | X | 150 260 1.0 |
| 10700 | X | 2 50 0 0 0 0 1 |
| 10800 | K1 | 18 COMBINE LOCAL FLOW A-3 611H FLOWS AT LUCK 27 |
| 10900 | K | 1 0 0 0 0 0 1 |
| 11000 | K1 | 19 KUVEJUQ 1G LUCK 2 |
| 11100 | Y | 0 0 0 0 1 |
| 11200 | Y | 0 0 0 0 1 |
| 11300 | K | 2 0 0 0 0 0 1 |
| 11400 | K1 | 20 Q1VEJUQ 1G AT (Q1VEJUQ FLOW + E-1, E-2, E-3) |
| 11500 | K | 0 0 0 0 0 0 1 |
| 11600 | K1 | 21 Q1VEJUQ FLOWS AT LUCK 27 15 TUNE 8 |
| 11700 | Y | 0 0 0 0 1 |
| 11800 | Y | 0 0 0 0 1 |
| 11900 | K | 0 7 0 0 0 0 1 |
| 12000 | K1 | 22 LOCAL INFLW 27 15 LUCK 2b (E-4) |
| 12100 | M | 1 -1 6y 0 3236 0 0 0 1 |
| 12200 | P | 0 21.5 39 53 01 72 |
| 12300 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.5 | 0.00 |
| 12400 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| 12500 | U1 | 0.07 | 1.076 | 1.941 | 11.4 | 50 | 111 | 572 | 43 | 301 | 104 |
| 12600 | U1 | 0.03 | 1.031 | 1.934 | 11.39 | 50 | 110 | 57 | 45 | 39 | 29 |
| 12700 | U1 | 0.13 | 2.133 | 2.133 | 12 | 57 | 45 | 39 | 29 | 1 |
| 12800 | X | 1340 | 340 | 1.0 | 1 |
| 12900 | K | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| 13000 | K1 | 23 ROUTE FLUWS AT LOCK 20 IN NODE 8 |
| 13100 | Y | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| 13200 | Y1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| 13300 | K | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| 13400 | K1 | 24 CUMULATIVE ROUTED AND LOCAL FLUWS AT NODE 8 |
| 13500 | K | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| 13600 | K1 | 25 ROUTE FLUWS AT NODE 8 IN NODE 10 |
| 13700 | Y | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| 13800 | Y1 | 0 | 5 | 2 | 5 | 2 | 5 | 2 | 5 | 2 | 5 |
| 13900 | K | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| 14000 | K1 | 26 LOCAL FLUWS BETWEEN LOCK 20 AND LOCK 25 (K-2) |
| 14100 | M | 1 | -1 | 18 | 0 | 323b | 0 | 0 | 0 | 0 | 1 |
| 14200 | P | 0 | 21.3 | 39 | 53 | 61 | 72 | 87 | 113 | 90 | 38 |
| 14300 | T | 0 | 0 | 0 | 0 | 0 | 0 | 0.5 | 0.00 | 0 | 0 |
| 14400 | U | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| 14500 | U1 | 171 | 304 | 313 | 240 | 193 | 152 | 119 | 93 | 75 | 58 |
| 14600 | U1 | 45 | 35 | 28 | 22 | 17 | 13 | 11 | 8 | 6 | 5 |
| 14700 | U1 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 |
| 14800 | X | 90 | 90 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 |
| 14900 | K | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 15000 | K1 | 27 ROUTE INFLUENCE AT NODE 10 |
| 15100 | Y | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 15200 | Y1 | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 15300 | K | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 15400 | K1 | 28 CUMULATIVE ROUTED FLUWS AT NODE 10 |
| 15500 | K | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 15600 | K1 | 29 ROUTE FLUWS AT NODE 10 IN NODE 15 |
| 15700 | Y | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| 15800 | Y1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| 15900 | K | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 16000 | K1 | 30 LOCAL INFLUENCE AT NODE 20 INTO KEUKA LAKE |
| 16100 | M | 1 | -1 | 183 | 0 | 323b | 0 | 0 | 0 | 0 | 1 |
| 16200 | P | 0 | 21.3 | 39 | 53 | 61 | 72 | 87 | 113 | 90 | 38 |
| 16300 | T | 0 | 0 | 0 | 0 | 0 | 0 | 0.5 | 0.03 | 0 | 0 |
| 16400 | U | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 16500 | U1 | 14181 | 3342 | 1273 | 483 | 183 | 0 | 0 | 0 | 0 | 0 |
| 16600 | X | 100 | 800 | 1.6 | 1.6 | 1.6 | 1.6 | 1.6 | 1.6 | 1.6 | 1.6 |
| 16700 | K | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 16800 | K1 | 11 KEUKA LAKE OUTFLOW OF MODIFIED FLOWS |
| 16900 | Y | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 17000 | Y1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 14700 |
| 17100 | Y | 1207000 | 129500 | 141000 | 155500 | 172000 | 175000 | 191000 | 204000 | 217000 | 32550 |
| 17200 | Y1 | 120 | 320 | 435 | 530 | 575 | 670 | 890 | 1130 | 1470 | 12600 |
| 17300 | K | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 17400 | K1 | 32 ROUTE KEUKA LAKE OUTFLOW 10 12 |
| 17500 | Y | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| 17600 | Y1 | 0 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| 17700 | K | 0 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 |
| 17800 | K1 | 33 BDIRECT LAKE INFLUENCES B2-E |
| 17900 | M | 1 | -1 | 244 | 0 | 323b | 0 | 0 | 0 | 0 | 1 |
| 18000 | P | 0 | 21.3 | 39 | 53 | 61 | 72 | 87 | 113 | 90 | 38 |
| 18100 | T | 0 | 0 | 0 | 0 | 0 | 0 | 0.5 | 0.03 | 0 | 0 |
| 18200 | U | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 |
| 18300 | U1 | 2695 | 10831 | 6059 | 4332 | 2132 | 1706 | 1072 | 422 | 286 | 0 | 0 |

McFarland Johnson Engineers, Inc.
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McFARLAND - JOHNSON ENGINEERS, INC.
PREVIEW OF SEQUENCE OF STREAM NETWORK CALCULATIONS

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FLOOD HYDROGRAPH PACKAGE (HFC-1)
DAM SAFETY VERSION
JULY 1976
LAST MODIFICATION 20 FEB 79

ANALYSIS OF DAM OVERTIPPING USING RATIOS OF PMF
HYDROLOGIC-HYDRAULIC ANALYSIS OF SAFETY OF LOCK 24 DAM
RATIOS OF PMF ROUTED THROUGH THE RESERVOIR

TIME OF EXECUTION 27-AUG-80 08:13:58

ANALYSIS OF DAM OVERTIPPING USING RATIOS OF PMF

JOB SPECIFICATION

MULTI-PLAN ANALYSES TO BE PERFORMED
NPLAN= 1 NRILU= 6 LRTIL= 1
RTIUS= 0.20 0.40 0.50 0.60 0.80 1.00

SUB-AREA RUNOFF COMPUTATION

1 LARGE CANAL LOCK 30 AT MACEDON (SUB AREA A1)

HYDROGRAPH DATA

-1 0 100.00 0.00 3236.00 0.00 0.000 0 1 0

SUB-AREA RUNOFF COMPUTATION

HYDROGRAPH ROUTING

2 LARGE CANAL LOCK 29 PALMYRA (ROUTED FLOWS FROM LOCK 30)

SUB-AREA RUNOFF COMPUTATION
3. GANAKGUA CREEK LOCAL INFLOWS TO LOCK 29 (SUB-AREA B-1)

ISTAO  ICOMP  IECUN  ITAPE  JPLT  JPRT  INAME  ISIAGE  IAUTO
2  0  0  0  0  0  1  0  0

HYDROGRAPH DATA
MYIN  IUNG  IAKCA  SNAP  IRSUG  TRSE  RATIO  Imdn  ISAME  LOCAL
1  -1  147.00  0.00  3250.00  0.00  0.000  0  1  0  

PRECIP DATA
SPFE  PMH  R0  R12  R24  R48  R72  R96
0.00  21.50  39.00  53.00  61.00  12.00  0.00  0.00

IRSPC COMPUTED BY THE PROGRAM IS 0.924

LOSS DATA
LATPI  SIRKH  ULTRK  RTUL  ERAM  SIRKS  HIOK  SIRIL  CNSIL  ALSM  RTMP
0  0.00  0.00  1.00  0.00  0.00  1.00  0.50  0.05  0.00  0.00

RECESSION DATA
JRTJ=  140.00  0.00  0.00  0.00
MO. DA  HR. MN  PERIOD  RAIN  EXCS  LOSS

SUM  14.37  12.12  2.24

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

CUMULATE HYDROGRAPHS

4 COMBINED ROUTED AND LOCAL FLOWS AT LOCK 29

ISTAO  ICOMP  IECUN  ITAPE  JPLT  JPRT  INAME  ISIAGE  IAUTO
2  2  0  0  0  0  0  1  0  0

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

HYDROGRAPH ROUTING

5 ROUTED HYDROGRAPH TO LOCK 29 AT LYONS

ISTAO  ICOMP  IECUN  ITAPE  JPLT  JPRT  INAME  ISIAGE  IAUTO
6  1  0  0  0  0  1  0  0  0

ROUTING DATA
GPOOL  CPOOL  AVG  IRES  ISAME  IOPI  IPMP  LSTR
0.0  0.000  0.000  0  1  0  0  0

NSIPS  NSIDL  LAG  AMSRCA  X  KSRK  ISRK  ISPHTM
0  8  3  0.000  0.000  0.000  0.000  0.00

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

McFARLAND-JOHNSON ENGINEERS, INC.
SUB-AREA RUNOFF COMPUTATION

LOWER GANARAGUA LOCAL INFLOWS VICINITY OF LOCK 27 (SUB-AREA E-2)

ISTAQ ILCMP ICOW ITAPE JPLT JPRT INAME ISTAGE IAUTO
0 0 0 0 0 1 0 0

HYDROGRAPH DATA
INHG IAREA SNAP IROSA TRSPC RATIO ISNOW ISAME LOCAL
1 -1 118.00 0.00 3230.00 0.00 0.00 0 1 0

PRECIP DATA
SPFN PMS R6 R12 R24 R48 R72 R96
0.00 21.50 39.00 53.00 61.00 72.00 0.00 0.00

LOSS DATA
LRUP EIRK SITIK ERAIN SIKRS RTIKK SIKIL CNSIL ALSMX RTIMP
0 0.00 0.00 1.00 0.00 0.00 0.50 0.05 0.00 0.00

RECESSION DATA
SIRIK= 120.00  QKSN= 470.00  RTIKK= 1.60  

END-OF-PERIOD FLOW
MD.1A HR.MN PERIOD RAIN EXCS LOSS COMP Q

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

COMBINE HYDROGRAPHS

7 COMBINED AND LOCAL FLOWS AT LOCK 27

ISTAQ ILCMP ICOW ITAPE JPLT JPRT INAME ISTAGE IAUTO
6 2 0 0 0 0 1 0 0

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

SUB-AREA RUNOFF COMPUTATION

8 LOCAL FLOW E-3 (AREA LOCAL TO BARGE CANAL E-29 TO E-27)

ISTAQ ILCMP ICOW ITAPE JPLT JPRT INAME ISTAGE IAUTO
3 0 0 0 0 0 1 0 0

HYDROGRAPH DATA
INHG IAREA SNAP IROSA TRSPC RATIO ISNOW ISAME LOCAL
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PRECIP DATA
SPFN PMS R6 R12 R24 R48 R72 R96
0.00 21.50 39.00 53.00 61.00 72.00 0.00 0.00

TRSPC COMPUTED BY THE PROGRAM IS 0.928

MCFARLAND-JOHNSON ENGINEERS, INC.
LJSS DATA
LROFI SIMAR BLINK RIIUD ERAIN STKks RIIJK STRIL CNSIL ALSMk RTMP
0 0.00 0.00 1.00 0.00 0.00 0.00 0.50 0.05 0.00 0.00

RECESSION DATA
STRIJ= 100.00 WCKSN= 200.00 RIIUR= 1.00

END-OF-PERIOD FLOW
MJDA HH.MM PERIOD RAIN EXCS LOSS COMP 0 MJDA HH.MM PERIOD RAIN EXCS LOSS COMP 0

SUM 14.37 12.12 2.24 68228.
( 365 )( 308 )( 57 )( 1932.00 )

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

HYDROGRAPH ROUTING
9 ROUTED FLOW E=3 10 LYONS (JODE 6)
ISIAQ ICOMP IECN ITAPE JPLT JPRT INAME ISTAGL IAUTO
6 1 0 0 0 0 1000 1 0 0

ROUTING DATA
LOSS CLASS AVG IRES ISAME IUPF IPMP LSIN
0.0 0.000 0.000 0.000 0.000 0.000 0.000

ISIPS NSIUL LAC AMSKK L LSK STOA ISPHAL
0 5 2 0.000 0.000 0.000 0.000 0.000

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

COMBINE HYDROGRAPHS
10 COMBINE FLOWS AT HUWE 6
ISIAQ ICOMP IECN ITAPE JPLT JPRT INAME ISTAGL IAUTO
0 2 0 0 0 0 0 0 0 0

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

SUB-AREA RUNOFF COMPUTATION
11 CANANDAIGUA LAKE INFLO
ISIAQ ICOMP IECN ITAPE JPLT JPRT INAME ISTAGE IAUTO
4 0 0 0 0 0 0 1 0 0

HYDROGRAPH DATA
INHG IUHG TANEA SNAP TRSBA TKPC RAIFIC ISNOw ISAME LOCAL
1 1 1.0000 0.00 3236.00 0.00 0.000 0.000 0.00 0.00 0.00 0.00

PRECIP DATA
SPC# PRC KI2 R24 R48 R72 R96
0.00 21.50 39.00 53.00 61.00 72.00 0.00 0.00

INPREC COMPUTED BY THE PROGRAN IS 0.928

MCFARLAND-JOHNSON ENGINEERS, INC.
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### Recession Data

- $S_{i+1} = S_i + Q_{r,i}$
- $Q_{r,i} = 1000.00$
- $R_100 = 1.60$

### End-of-Period Flow

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<th>EXCS</th>
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#### Hydrograph Routing

**12 Canandaigua Lake Outflow Using Modified Puls Method**

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**Storage**

| 10700.00 | 21300.00 | 31900.00 | 42500.00 | 53100.00 | 63700.00 | 74300.00 | 84920.00 | 95200.00 | 106100.00 |

**Outflow**

| 50.00 | 50.00 | 50.00 | 50.00 | 240.00 | 600.00 | 1000.00 | 1560.00 | 2250.00 | 3000.00 |

---

#### Hydrograph Routing

**13 Routed Outflow to Flint Creek Mouth**

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#### Sub-Area Runoff Computation

McFarland & Johnson Engineers, Inc.
14 FLUENT CREEK INFLOW A-Z

HYDROGRAPH DATA

INFLOW 140C 14PC 14PE JPL1 JPL2 INAKE ISIAU LAUTO
1 -1 102.00 0.00 3230.00 0.00 0.00 0.00 0

PREDICTION DATA

 شهر پنداخ M12 F24 M48 M72 R90
0.00 51.50 39.00 53.00 61.00 72.00 0.00 0.00

INSPC COMPUTER IN THE PROGRAM 10 0.576

LOSS DATA

LOSS DATA

LOSS DATA

RICE = 1.5

END PERIOD INPUT

MOJO NAME PERIOD RAIN LACS LOSU COMP Q MOJO NAME PERIOD RAIN LACS LOSU COMP Q

SUM 14.37 11.01 2.66 144965
( -0.5)( -0.6)( -0.5)( -1.04)95)

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

COMBINE HYDROGRAPHS

15 COMBINE ROUTED CARRAMUIDDA JUINLUMS AND FLUTE CR INFLOWS

ISIAU 0 0 1 0 0 0 0 0

16 ROUTED IN Buck 27

HYDROGRAPH ROUTING

ISIAU 0 0 0 0 0 0 0 0

HYDROGRAPH ROUTING

MOJO NAME PERIOD RAIN LACS LOSU COMP Q MOJO NAME PERIOD RAIN LACS LOSU COMP Q

SUM 14.37 11.01 2.66 144965
( -0.5)( -0.6)( -0.5)( -1.04)95)
17 JUNE LOCAL FLOW A-3

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**STREAMS COMPUTED BY THE PROGRAM IS 0.926**

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END-OF-PERIOD FLOW: NO DA HR, MN PERIOD RAIN EXCS LOSS CUMP Q

SUM 14.37 11.76 2.59 199856. (365)(299)(60) (5551.91)

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

**COMBINE HYDROGRAPHS**

18 COMBINE LOCAL FLOW A-3 #11 FLOW AT LOC 27

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**HYDROGRAPH ROUTING**

19 ROUTE OUTLET 10 CANAL

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MCFARLAND-JOHNSON ENGINEERS, INC.
COMAINE HYDROGRAPHS

20 COMAINE FLUX AI 0(UNIHT FLUX + E=1, E=2, E=3)

1STAG ICOMP IECON ITAPE JPLT JPHT INAME ISTATE IAUTO
0 -2 0 0 0 1 0 0

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

HYDROGRAPH ROUTING

21 ROUTE FLUXES AT LOCK 27 TO NODE 8

1STAG ICOMP IECON ITAPE JPLT JPHT INAME ISTATE IAUTO
8 1 0 0 0 0 1 0 0

ROUTING DATA
GROSS CLOSS AVG INES ISAMIE IROW IPMP LSIR
0.0 0.000 0.000 0 1 0 0 0

NSIPS NSIDL LAG AMSKK X ISA SIDOA RSPKAR
0 0 0 0 0 0 0 0

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

SUB-AREA RUNOFF COMPUTATION

22 LOCAL INFLOW LOCK 27 TO LOCK 26 (E=)

1STAG ICOMP IECON ITAPE JPLT JPHT INAME ISTATE IAUTO
7 0 0 0 0 1 0 0 0

HYDROGRAPH DATA
INIDG IUNG ITAREA SNIP IMSDA TKSPC RACID ISNOW ISAME LOCAL
1 -1 69.00 0.00 3236.00 0.00 0.000 0 1 0

PACCIP DATA
SPCE PKS PK4 R12 R24 R48 R72 R96
0.00 21.50 39.00 53.00 61.00 72.00 0.00 0.00

INSPC COMPUTED BY THE PROGRAM IS 0.926

LOSS DATA
LRUP1 SIRAH DLHRA MINL RAIN SIRKS RTIKR SIRIL CINTL ALSMK RTIMP
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RECESSION DATA
STRF= 100.00 QKCH= 360.00 RTLO= 1.60

END OF PERIOD FLUX

MO.04 HR.MN PERIOD RAIN EXCS LOSS CUMP Q

MO.04 HR.MN PERIOD RAIN EXCS LOSS CUMP Q

SUM 14.37 11.81 2.56 116859.

( 165.)( 300.)( 65.)( 3309.00)

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

MCFARLANF - JOHNSON ENGINEERS, INC.
**HYDROGRAPH ROUTING**

23 ROUTE FLOWS AT NODE 16 TO NODE 8

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**NSIPS NSIDL LAG AMSSK X TSK STOKA ISPRAT**

|    | 0 | 2 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |

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

**Combine Hydrographs**

24 COMBINE ROUTED AND LOCAL FLOWS AT NODE 8

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**HYDROGRAPH ROUTING**

25 ROUTE FLOWS AT NODE 8 TO NODE 10

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**ROUTING DATA**

| JUSSS | CLASS | AVG | IRG | ISAME | IOPT | IPMP | LSST |    |
|-------|-------|-----|-----|-------|------|------|------|    |
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**NSIPS NSIDL LAG AMSSK X TSK STOKA ISPRAT**

|    | 0 | 5 | 2 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |

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**Sub-Area Runoff Computation**

26 LOCAL FLOWS BETWEEN LOCK 26 AND LOCK 25 (E-S)

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TMSEC COMPUTED BY THE PROGRAM IS 0.920

McFarland-Johnson Engineers, Inc.
**LOSS DATA**

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**END-OF-PERIOD FLOW**

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HYDROGRAPH ROUTING

27 ROUTE INFLOW E=5 10 NODE 10

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<th>ITAPE</th>
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COMBINE HYDROGRAPHS

28 COMBINE ROUTED FLOW WITH FLOW AT NODE 10

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HYDROGRAPH ROUTING

29 ROUTE FLOWS AT NODE 10 TO NODE 15

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**ROUTING DATA**

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<th>LAG</th>
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<th>I</th>
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McFARLAND - JOHNSON ENGINEERS, INC.
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******* ******* ******* ******* ******* *******

SUB-AREA RUNOFF COMPUTATION

JO LOCAL INFLOWS: 1 KEUKA LAKE

<table>
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<th>ICOMP</th>
<th>IECON</th>
<th>ITAPE</th>
<th>JPFL</th>
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<th>ICHSA</th>
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IRSPC COMPUTED BY THE PROGRAM IS 2.978

LOSS DATA

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END-OF-PERIOD FLOW

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<th>RAIN</th>
<th>EXCS</th>
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SUM: 14.37 11.91 2.46 249.33

(305)(302)(52)(3989.33)

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

HYDROGRAPH ROUTING

31 KEUKA LAKE INFLOW: 1 MODIFIED PULS

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<th>IECON</th>
<th>ITAPE</th>
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NSPS | NATUR | LAG | ANSKK | TSK | SIGA | ISPRAT |
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OUTFLOWS: 120.00 320.00 445.00 530.00 575.00 670.00 890.00 1130.00 1470.00

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

HYDROGRAPH ROUTING

32 KEUKA LAKE INFLOWS: 10 12

MCFARLAND - JOHNSON ENGINEERS, INC.
*********  *********  *********  *********

**SUB-AREA RUNOFF COMPUTATION**

**30 LOCAL INFLOW B-1 INTO KEUKA LAKE**

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**HYDROGRAPH ROUTING**

**31 KEUKA LAKE OUTFLOW */ MODIFIED PULS**

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<th>ISAPE</th>
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**ASIP| NDUT| LAG | ANSSK| X | TSK | SIORA | ISPHAT |
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**HYDROGRAPH ROUTING**

**32 ROUTE KEUKA LAKE OUTFLOWS 10 12**

McFARLAND-JOHNSON ENGINEERS, INC.
IABW ICOW IECA IAPL JPLT JPKI INAME ISTAGE IAUTO
12 1 0 0 0 1 0 0

ROUING DATA
LOSS AVG IRES ISAME IOPP LPMH USIR
0.00 0.000 0.00 0 1 0 0 0

SNOFF Sheets LAND ANSKE X ISK SIOKA ISPHRAI
0 2 5.000 5.000 0.000 0.000

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

SUB-AREA RUNOFF COMPUTATION

33 SENECALake INFLOWS B-2

IABW ICOW IECA IAPL JPLT JPKI INAME ISTAGE IAUTO
12 0 0 0 0 1 0 0

HYDROGRAPH DATA
IMLW IMLG TMLG SWAP TRESDA TRSPC RATIO ISNOW ISAMX LOCAL
1 -1 524.00 0.00 3236.00 0.00 0.000 0 1 0

PRECIP DATA
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IMSPC COMPUTED BY THE PROGRAM IS 0.926

LOSS DATA
LHQP SIRK ULYK KITKD ERAIN SIRK SIRK CNSIL ALSMA RIMP
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RECESSION DATA
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END-OF-PERIOD FLOWS
MODA HRMN PERIOD RAIN EXCS LOSS CUMP 0 MODA HRMN PERIOD RAIN EXCS LOSS CUMP 0

SUM 14.37 12.75 1.62 758979.
(365)(324)(41)(21491.89)

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

COMBINE HYDROGRAPHS

34 COMBING LOCAL FLOWS B-2 AND ROUTED KEUKA LAKE OUTLET FLOWS

IABW ICOW IECA IAPL JPLT JPKI INAME ISTAGE IAUTO
12 2 0 0 0 0 1 0 0 0

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

HYDROGRAPH ROUTING

MCFARLAND-JOHNSON ENGINEERS, INC.
35 SENECA LAKE OUTFLOWS - MODIFIED PULS METHOD

ISTAU ICOMP ICEN ITAPE JPLT JPHT INAME ISTAGE IAUTO
12 1 0 0 0 0 1 0 0

ROUTING DATA
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STORAGE
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800000.00 1200000.00

OUTFLOW
700.00 700.00
700.00 700.00 700.00 700.00 700.00 1000.00 3000.00 3000.00
15000.00 77000.00

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

HYDROGRAPH ROUTING
36 SENECA LAKE OUTFLOWS ROUTED TO 13

ISTAU ICOMP ICEN ITAPE JPLT JPHT INAME ISTAGE IAUTO
13 1 0 0 0 0 1 0 0

ROUTING DATA
GCLASS CLASS AVG IRES ISAME IJPL IPMP LSTK
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#SIPS NSIPS LAG AMSKK X ISK SIGMA ISPMAI
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******* ********** ******* ********** **********

SUB-AREA RUNOFF COMPUTATION
37 LOCAL INFLOW b=4

ISTAU ICOMP ICEN ITAPE JPLT JPHT INAME ISTAGE IAUTO
13 0 0 0 0 0 1 0 0

HYDROGRAPH DATA
INHYD INCH TALEA SNAP INSDA TRSPC RAIND ISNOW ISAME LOCAL
1 6 39.00 0.00 0.00 0.00 0.00 0 1 0

PRECIP DATA
SPRC PRC K6 R12 R24 R48 R72 R96
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TRSPC COMPUTED BY THE PROGRAM IS 0.020

LOSS DATA
LKPIT SRKRI DLKIR KIRIL ERAIN STRKIS RIKIK SIRIL CNTST ALEMA RTIMP
0 0.00 0.00 1.00 0.00 0.00 1.00 0.50 0.50 0.05 0.00

RECESSION DATA
SIRW= 92.00 QRCM= 200.00 RLIMK= 1.60

MCFARLAND-JOHNSON ENGINEERS, INC.
END-JF-PERIOD FLOU
MOJA PERIOD RAIN EXCS LOSS COMP Q 43.00 HR. PERIOD RAIN EXCS LOSS COMP Q
SUM 14.37 14.12 2.24 541.30
( 36.0( 30.5( 57.0( 1532.79)

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

COMBINE HYDROGRAPH
3d COMBINE ROUTED SENeca LAKE OUTFLOW AND LOCAL FLOW B=4
ISTAJ ICUMP IECUN IIAPE JPLT JPR1 INSTAE ISTATE IAUTO
13 2 0 0 0 1 0 0

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

HYDROGRAPH ROUTING
3y ROUTE HYDROGRAPH TO 14 (CAYUGA LAKE INFLOW)
ISTAJ ICUMP IECUN IIAPE JPLT JPR1 INSTAE ISTATE IAUTO
14 1 0 0 0 1 0 0

ROUTING DATA
EXCS AVG IMES ISAME IOP1 IPMP LSTR
0.00 0.00 0.00 0.00 0.00 0.00 0.00
ICUMP ICUMP LAG AMSK X ISK SIURA ISPKAI
0 0 2 0.000 0.000 0.000 0.000

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

SUB-AREA RUNOFF COMPUTATION
4a LOCAL INFLOW B-S
ISTAJ ICUMP IECUN IIAPE JPLT JPR1 INSTAE ISTATE IAUTO
14 0 0 0 0 1 0 0

HYDROGRAPH DATA
INYUG LUNG TAREA SMAP TSHA TSHP RATIO ISMOD ISAME LOCAL
1 -1 30.00 0.00 0.00 0.00 0.00 0.00 1 0

PRECIP DATA
SPF 99 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00
K12 21.50 39.00 53.00 51.00 72.00 0.00 0.00 0.00
K72 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00
K96 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00

LOSS DATA
LMUPI SIIAR BIIKR KIIUL GRAIN SIRKS RIIJK SIMK CNSTL ALSMK RIIIP
0 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00

RECESSION DATA
SIMK= 92.00 JRC= 200.00 McFarland-Johnson Engineers, Inc.
<table>
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<th>IECOM</th>
<th>ITAPE</th>
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**HYDROGRAPH ROUTING**

**44 CAYUGA LAKE OUTFLOWS - MODIFIED PULS**

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**HYDROGRAPH ROUTING**

**45 ROUTE CAYUGA LAKE OUTFLOWS TO NODE 15**

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<th>IECOM</th>
<th>ITAPE</th>
<th>JPLT</th>
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**COMBINE HYDROGRAPHS**

**46 COMBINE ROUTED FLOW WITH FLOW AT NODE 15**

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<th>IECOM</th>
<th>ITAPE</th>
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</tr>
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</table>

**HYDROGRAPH ROUTING**

**47 ROUTE FLOWS TO NODE 16**

McFarland-Johnson Engineers, Inc.
I#I

A I,

I#I

CjaFAMP

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STUhRA

ISPtKAI

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3

0.000 0.000

0.000 0.000

0.00

0 0 0 0 0 0 0 0 0

SUB-AREA RUNOFF COMPUTATION

48 LOCAL FLOW E-0

I#I

ICOM P IEC AS NITAPE JPR T JPR T INAME ISIAGE IAUTO

16 1 0 0 0 1 0 0

ROUGING DATA

ILOSS CLCS SS AVG IRC S ISAS ME LPR T IPR MP LSILH

0.0 0.000 0.00 0 1 0 0 0 0

ASIPS N#IDL LA2 AMSAK A ISK STUHA ISIPRAI

0 8 3 0.000 0.000 0.000 0.000 0 0

***********

***********

***********

HYDROGRAPH DATA

IHYOG IUNG TARCA SHAP THSDA INSPC RATIO ISHA ISAME LOCAL

1 -1 191.00 0.00 3236.00 0.00 0.00 0 1 0

PRECI P DATA

SPCE PHS R0 R12 R24 RH K72 R9b

0.00 21.90 39.00 53.00 61.00 72.00 0.00 0.00

RSIP COMPUTED BY THE PROGRAM IS 0.944

LOSS DATA

LKDRT STRAM DLTKH MTOL ERAIN SINKS RIIUK STRIL CNSIL ALSM X RIIMP

0 0.00 0.00 1.00 0.00 0.00 1.00 0.50 0.05 0.00 0.00

RECESSION DATA

SIR1= 140.00

JHCSH= 400.00

RI10K= 1.60

SUM-OF-PERIOD FLU M

MJ. DA HR.MN PERIOD RAIN EXCS LOSS COMP W MJ. DA HR. MN PERIOD RAIN EXCS LOSS COMP W

SUM 14.37 11.81 2.50 242yd5

(365) (300) (65) (6777.74)

***********

***********

***********

HYDROGRAPH ROUTING

49 ROUTE LOCAL FLOW E-0 TO NODE 16

I#I

ICOM P IEC AS NITAPE JPR T JPR T INAME ISIAGE IAUTO

16 1 0 0 0 1 0 0

RJUI1NG DATA

ILOSS CLCS SS AVG IRC S ISAS ME LPR T IPR MP LSILH

0.0 0.000 0.00 0 1 0 0 0 0

ASIPS N#IDL LA2 AMSAK A ISK STUHA ISIPRAI

0 2 0 0.000 0.000 0.000 0.000 0.000 0 0

McFARLAND-JOHNSON ENGINEERS, INC.
**********  **********  **********  **********  **********
COM BINE HYDROGRAPHS
50 COM BINE Routed FLOW w/ FLOW AT NOUDE 1B
ISTAQ  ICOMP  IECON  ITAPE  JPLT  JPRT  INAME  ISIAIE  IAUTO
18  2  0  0  0  0  1  0  0
**********  **********  **********  **********  **********
SUB-AREA RUNOFF COMPUTATION
51 HEAU UASCU INFLOW C=1
ISTAQ  ICOMP  IECON  ITAPE  JPLT  JPRT  INAME  ISIAIE  IAUTO
17  0  0  0  0  1  0  0
**********  **********  **********  **********  **********
HYDROGRAPH DATA
IHUG  IUHG  IAREA  SHAP  TRSOA  TRSPC  RATIO  IShou  ISIAIE  LOCAL
1  -1  201.00  0.00  329.00  0.00  0.000  0  1  0
**********  **********  **********  **********  **********
PRECIP DATA
SPC=  PHS  MW  R12  R24  R34  R64  R74  R96
0.00  0.00  0.00  1.60  59.00  61.00  72.00  0.00  0.00
TRSPC COMPUTED BY THE PROGRAM IS 0.946
**********  **********  **********  **********  **********
LJSS DATA
LWQPT  STRH  BLNK  KLUD  EKARE  SIKRE  R12Q  SII14  CWS14  A1WEX  R1IMP
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RECESSION DATA
SW=  450.00  1694=  1000.00  R11=  1.60
**********  **********  **********  **********  **********
END-OF-PERIOD FLOW
U  MO. DA  HR. MA  PERIOD  RAIN  EXCS  LOSS  CJMP Q
MO. DA  HR. MA  PERIOD  RAIN  EXCS  LOSS  CJMP Q
*******  **********  **********  **********  **********
HYDROGRAPH RUNOFF
52 UASCU LAKE INFLOWS - MODIFIED PULS METHOD
ISTAQ  ICOMP  IECON  ITAPE  JPLT  JPRT  INAME  ISIAIE  IAUTO
17  1  0  0  0  0  1  0  0
**********  **********  **********  **********  **********
QUSSS  CUSSS  AVG  IRES  ISAME  I0PI  IPMQ  LS1K
0.0  0.000  0.00  1  1  0  0  0
**********  **********  **********  **********  **********
MCFARLAND JONSON ENGINEERS, INC.
**HYDROGRAPH ROUTING**

53 ROUTE JAMES CANYON OUTLET FLOWS

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<th>ITAPE</th>
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<th>INAME</th>
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<th>IAUTO</th>
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**ROUTING DATA**

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**NSIPS**

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**COMBINE HYDROGRAPHS**

54 COMBINE FLOWS WITH FLOWS AT NODE 18

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<th>ISTAT</th>
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<th>ITAPE</th>
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<th>JPRT</th>
<th>INAME</th>
<th>ISTATE</th>
<th>IAUTO</th>
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**SUB-AREA RUNOFF COMPUTATION**

55 READ LOCAL FLOW C-6

<table>
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**HYDROGRAPH DATA**

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<th>LMG</th>
<th>TAREA</th>
<th>LOGS</th>
<th>IRSA</th>
<th>TRSPC</th>
<th>RATIO</th>
<th>ISNRM</th>
<th>ISMME</th>
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**PRECIP DATA**

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TRSPC COMPUTED BY THE PROGRAM IS 0.928

**LOSS DATA**

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<th>R1UL</th>
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<th>STAKS</th>
<th>RILOK</th>
<th>SIRIL</th>
<th>CMTIL</th>
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McFARLAND-JOHNSON ENGINEERS, INC
END-JF-PERIOD FLOW

SUM 14.37 11.81 2.56 20796
(30.5)(300)(65)(755.49)

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

COMBINE HYDROGRAPHS

56 COMBINE LOCAL FLOW C=0 WITH FLOW AT NODE 18

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

HYDROGRAPH ROUTING

57 ROUTE FLOW AT T=10 NODE 21

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

SUB-AREA RUNOFF COMPUTATION

58 LOCAL INFLOW 2-7

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

HIDROGRAPH DATA

IMHDJ IUNG TANKA SNAP THSLA THSPC RATIO ISHDW ISAME LOCAL
1 -1 98.00 0.00 323.00 0.00 0.00 0

PRECIIP DATA

SPF LN R0 R12 R24 R48 R72 R96
0.00 21.50 39.00 51.00 61.00 72.00 0.00 0.00

LOSS DATA

LIJPT SIATR ULIAK KILUL EMAI STARKS RTIOK STIRL CABLE ALSMA RTIMP
0 0.00 0.00 1.00 0.00 1.00 0.50 0.05 0.00 0.00

RECESSION DATA

McFARLAND-JOHNSON ENGINEERS, INC.
**HYDROGRAPH ROUTING**

59 ROUTE LOCAL FLOW IU NODE 21

**COMBINE HYDROGRAPHS**

**SUB-AREA RUNOFF COMPUTATION**

**LOSS DATA**

McFARLAND - JOHNSON ENGINEERS, INC.
HcESSION DATA
SIR= 250.00  JRCS= 500.00  KI0K= 1.00

END-UE-PERIOD RAIN
MD, DA HR, MN PERIOD RAIN EXCS LOSS COMP
0

Sun 14.37 11.97 2.39 10.460.1
(365.)(304.) (81.) (2967.63)

********** ********** ********** ********** ********** **********
HYDROGRAPH ROUTING

02 SKANEATELES LAKE OUTFLOWS
IST 1 COMP 1 ECON ITAPE JPLT JPKT INAME ISIAOE IAUTO
20 1 0 0 0 1 0 0
ROUTING DATA
QLOSS CLSS CLSS AVG IRE ISAME IPT IIPM LSTK
0.0 0.000 0.000 1 1 0 0 0
NSIPS NSIP CIU LAG AMSK X TSK STOKA ISPRAI
1 0 0 0 0 0 0 0 0 0
STORAGE 0.00 17321.00 34750.00 52164.00 10438.00 20973.00 243492.00
OUTFLOWS 0.00 331.00 747.00 1595.00 6403.00 13313.00 17359.00

********** ********** ********** ********** ********** **********
HYDROGRAPH ROUTING

03 ROUTE SKANEATELES LAKE OUTFLOWS TO NODE 21
IST 1 COMP 1 ECON ITAPE JPLT JPKT INAME ISIAOE IAUTO
21 1 0 0 0 1 0 0
ROUTING DATA
QLOSS CLSS CLSS AVG IRE ISAME IPT IIPM LSTK
0.0 0.000 0.000 1 1 0 0 0
NSIPS NSIP CIU LAG AMSK X TSK STOKA ISPRAI
0 6 2 0.000 0.000 0.000 0 0

********** ********** ********** ********** ********** **********
COMBINE HYDROGRAPHS

04 COMBINE ROUTED LAKE OUTFLOW WITH FLOW AT NODE 21
IST 1 COMP 1 ECON ITAPE JPLT JPKT INAME ISIAOE IAUTO
21 2 0 0 0 1 0 0

McFARLAND-JOHNSON ENGINEERS, INC.
### Local Runoff Computation

**Local Flows C-7**

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<th>ICOMP</th>
<th>ICONC</th>
<th>ITAPE</th>
<th>JPLT</th>
<th>JPRI</th>
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**Hydrograph Data**

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<th>IMSPC</th>
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**Precipitation Data**

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**Loss Data**

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**Recession Data**

| SIRIC = 90.00 | QRCN = 200.00 | R10K = 1.60 |

**End-JF-Period Flows**

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<th>RAIN</th>
<th>EXCS</th>
<th>LOSS</th>
<th>COMP Q</th>
<th>AJDA</th>
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<th>PERIOD</th>
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<th>EXCS</th>
<th>LOSS</th>
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SUB-AREA RUNOFF COMPUTATION

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HYDROGRAPH DATA

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INSPC COMPUTED BY THE PROGRAM IS 0.969

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SUM 14.37 11.01 2.56 130265.
(365)(360)(65)(3686.89)

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COMBINE HYDROGRAPHS

09 COMBINE RUNOFF FLOW AND LOCAL FLOW AT NODE 22

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HYDROGRAPH ROUTING

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McFarland-Johnson Engineers, Inc.
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| (491.48) | | | (102.50) | (453.13) | (301.41) | (453.09) | (401.25) | (762.82) |
| 2 COMBINED | 50 | 491.00 | 1 | 7901. | 15670. | 19696. | 23797. | 32719. | 42051. |
| (1142.14) | | | (221.72) | (413.90) | (594.71) | (673.88) | (679.33) | (1190.75) |
| RRISED IU | 0 | 491.00 | 1 | 7901. | 15670. | 19696. | 23797. | 32719. | 42051. |
| (1142.14) | | | (221.72) | (413.90) | (594.71) | (673.88) | (679.33) | (1190.75) |
| 2 COMBINED | 0 | 657.00 | 1 | 14675. | 29264. | 36582. | 44180. | 59960. | 76022. |
| (2219.62) | | | (415.11) | (826.87) | (1039.84) | (1251.02) | (1698.89) | (2152.70) |
| RRISED IU | 8 | 657.00 | 1 | 12657. | 25130. | 31434. | 38065. | 52001. | 66109. |
| (2219.62) | | | (458.26) | (711.76) | (901.11) | (1077.67) | (1472.50) | (1872.01) |
| HYDROGRAPH AI | 7 | 89.00 | 1 | 5332. | 7053. | 8829. | 10595. | 14126. | 17568. |
| (230.51) | | | (100.00) | (200.00) | (250.00) | (300.00) | (400.00) | (500.01) |
| RRISED IU | 6 | 89.00 | 1 | 3307. | 6051. | 9921. | 13229. | 16536. | |
| (240.51) | | | (93.55) | (187.10) | (234.12) | (280.99) | (374.59) | (460.24) |
| 2 COMBINED | 8 | 946.00 | 1 | 13228. | 26400. | 33000. | 39859. | 54239. | 66908. |
| (2450.12) | | | (375.70) | (747.74) | (934.02) | (1128.09) | (1539.59) | (1951.24) |
| RRISED IU | 10 | 946.00 | 1 | 14730. | 25347. | 31084. | 36281. | 52220. | 66372. |
| (2450.12) | | | (300.08) | (717.76) | (897.20) | (1084.01) | (1474.71) | (1875.46) |
| HYDROGRAPH AI | 9 | 14.00 | 1 | 801. | 1305. | 1707. | 2046. | 2731. | 3413. |
| (40.02) | | | (19.33) | (38.60) | (48.33) | (57.59) | (77.34) | (96.66) |
| RRISED IU | 10 | 16.00 | 1 | 876. | 1351. | 1839. | 2027. | 2708. | 3379. |
| (40.02) | | | (19.13) | (38.27) | (47.41) | (57.40) | (76.54) | (95.57) |
| 2 COMBINED | 10 | 930.00 | 1 | 14810. | 25524. | 31918. | 36562. | 52520. | 66747. |
| (2495.73) | | | (363.30) | (723.05) | (901.81) | (1091.94) | (1487.29) | (1896.06) |
| RRISED IU | 15 | 930.00 | 1 | 12404. | 24687. | 30880. | 37296. | 50821. | 64014. |
| (2495.73) | | | (351.25) | (693.05) | (873.86) | (1058.16) | (1439.15) | (1829.67) |
| HYDROGRAPH AI | 11 | 183.00 | 1 | 32665. | 47331. | 59104. | 70997. | 94663. | 118448. |
| (473.97) | | | (670.14) | (1340.27) | (1675.34) | (2010.41) | (2480.35) | (3350.69) |
| RRISED IU | 11 | 143.00 | 1 | 564. | 872. | 1078. | 1346. | 12921. | 24665. |
| (473.97) | | | (15.96) | (24.70) | (30.51) | (38.12) | (48.04) | (681.45) |
| RRISED IU | 12 | 163.00 | 1 | 563. | 865. | 1068. | 1328. | 6994. | 14452. |
| (473.97) | | | (15.94) | (24.49) | (30.23) | (37.01) | (39.04) | (409.24) |
| HYDROGRAPH AI | 12 | 524.00 | 1 | 40102. | 96203. | 120254. | 144305. | 192407. | 240569. |
| (1357.15) | | | (1352.09) | (2724.16) | (3405.22) | (4080.27) | (5456.44) | (6816.44) |
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| (1631.12) | | | (1370.12) | (2738.53) | (3419.81) | (4101.44) | (5684.44) | (6627.02) |
| RRISED IU | 12 | 707.00 | 1 | 700. | 2711. | 3000. | 5220. | 14284. | 24751. |
| (1631.12) | | | (19.82) | (70.76) | (84.95) | (147.82) | (244.48) | (672.55) |
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APPENDIX D

STRUCTURAL STABILITY ANALYSIS
LOCKE 24
Stability Analysis

1. Determine Weight of Masonry Dam
   \[ W_d = (\text{Area})(150 \text{pcf}) = (204 \text{ sf})(150 \text{pcf}) = 30,600 \text{ lbs/lin ft} = 30.6 \text{ Kips/lin ft.} \]

2. Determine Water Force for Following Conditions
   A. Upstream
      1. Normal Pool  Elevation 374.0
      2. 1/2 PMF      Elevation 381.45
      3. PMF          Elevation 386.95
B. Downstream

1. Low Tailwater  
   Elev. 363.0

2. High Tailwater of Record  
   Elev. 372.5

A₁. Upstream Normal Pool

\[ P_{\text{Upn}} = \frac{1}{2} \chi V A^2 \]
\[ = \frac{1}{2} (62.4) (16.8)^2 \]
\[ = 8806 \text{ lbs/lin ft} \]
\[ = 8.31 \text{ kips/lin ft} \]

Resultant Acts 5.6' Above Base

A₂. Upstream ½ PMF

\[ P_{\frac{1}{2}\text{PMF}} = \frac{1}{2} (62.4) (24.25)^2 - \frac{1}{2} (62.4) (745)^2 \]
\[ = 18348 - 1732 \]
\[ = 16,616 \text{ lbs/lin ft} \]
\[ = 16.62 \text{ kips/lin ft} \]

Location of Resultant

\[ \bar{y} = [16.3)(745)\frac{1}{2}(16.3)(16.8)] = (8.4)(16.8)(745) + (5.6)\frac{1}{2}(16.8)(16.8), \]
\[ \bar{y} = 125.16 + 141.12 = 1051.14 + 790.27 \]
\[ \bar{y} = 2656.28 = 1841.61 \]
\[ \bar{y} = 6.92' \text{ Above Base} \]
Stability Analysis

A3 Upstream Full PMF

\[ P_{UPMF} = \left( \frac{1}{2} \right) (62.4)(29.75)^2 - \left( \frac{1}{2} \right) (62.4)(12.95)^2 \]

= 2.7614 - 523.2
= 223.82 lbs./lin. ft.
= 22.38 kips/lin ft.

Location of Resultant

\[ y = \frac{[16.8](12.95) \cdot \frac{1}{2}(16.8)(16.8) - (84)(16.8)(12.95) - (5.4)(\frac{1}{2})(16.8)(16.8)}{(217.50 + 14.12) - 1827.50 + 790.77} \]

= 358.68

\[ \text{Resultant acts } 7.30' \text{ above base} \]

B1 Downstream Low Tailwater

\[ P_{DLT} = \frac{1}{2} (62.4)(4.20)^2 \]

= 119.9 lbs./lin. ft.
= 1.20 kips/lin ft.

\[ \text{Resultant acts } 2.07' \text{ above base} \]

B2 Downstream High Tailwater

\[ P_{DHT} = \frac{1}{2} (62.4)(15.7)^2 \]

= 7690.1 lbs./lin. ft.
= 7.69 kips/lin ft.

\[ \text{Resultant acts } 5.23' \text{ above base} \]
(3) Determine Ice Load

\[ P_{\text{max}} = \frac{(5000 \text{ psi})(2' \text{ deep})}{1000} = 10 \text{ kips/lin ft.} \]

Resultant Acts 15.8' Above Base

(4) Determine Upstream Siltation Force

Assume Siltation to Elev. 346.0 (Gate Crest)

\[ P_s = \frac{1}{2} (85 \text{ psf})(346.0 - 357.2)^2 \]
\[ = 3291.2 \text{ lbs/lin ft.} = 3.29 \text{ kips/lin ft.} \]

Resultant Acts 2.93' Above Base

(5) Determine Hydrodynamic Pressure, Force, and Moment:

\[ P_e = c \lambda \gamma_w \sqrt{2gh} \]

for \( z/k = 1 \) \( c = 0.73 \)

for zone 2 \( \lambda = 0.05 \)

\[ P_e = \frac{(0.73)(0.05)(62.4)(16.8)}{1000} = 0.0383 \text{ Ksf/lin ft.} \]

(for Normal Flow)
Locke 24
Stability Analysis

\[ V_c = 0.726 \times P_e \times \frac{Z}{(1.8)} \]
\[ = 0.726 \times 0.0383 \times (1.8) \]
\[ = 0.47 \text{ kips/lin. ft.} \]
(for Normal Pool)

\[ M_c = 0.299 \times P_e \times Z^2 \]
\[ = 0.299 \times 0.0383 \times (1.8)^2 \]
\[ = 3.23 \text{ kip-ft/lin. ft.} \]
(for Normal Pool)

For 1/2 PMF:

\[ P_e = \frac{(0.73)(0.05)(62.4)(24.25)}{1000} = 0.0552 \text{ ksf/lin. ft.} \]

\[ V_c = 0.726 \times 0.0552 \times (24.25) = 0.97 \text{ kips/lin. ft.} \]

\[ M_c = 0.299 \times 0.0552 \times (24.25)^2 = 9.71 \text{ kip-ft/lin. ft.} \]

For Full PMF:

\[ P_e = \frac{(0.73)(0.05)(62.4)(29.75)}{1000} = 0.0678 \text{ ksf/lin. ft.} \]

\[ V_c = 0.726 \times 0.0678 \times (29.75) = 1.40 \text{ kips/lin. ft.} \]

\[ M_c = 0.299 \times 0.0678 \times (29.75)^2 = 17.94 \text{ kip-ft/lin. ft.} \]
Determine Inertia Force Due to Seismic

\[ P_c = \lambda W_c \]
\[ = (0.05)(30.6) \]
\[ = 1.53 \text{ kips/lin.ft.} \]

Resultant Acts Through Centroid, 0.1 Above Base

Determine Full and \( \frac{1}{2} \) Uplift Pressures at Normal Pool, \( \frac{1}{2} \) PMF, and Full PMF

At Normal Pool:

\[ P_{u, \text{Full}} = \frac{(62.4)(21.2)(365 - 356.8)+\frac{1}{2}(62.4)(21.2)}{[374 - 357.2 - (365 - 356.8)]} \]
\[ = 10847 + 5688 \]
\[ = 16535 \text{ lbs/lin.ft.} \]
\[ = 6.54 \text{ kips/lin.ft.} \]
\[ \bar{x} (10847 + 5688) + (10.6)(10847) + (14.1)(5688) \]
\[ \bar{x} 16535 = 195179 \]
\[ \bar{x} = 11.8 \text{ From Toe} \]

At \( \frac{1}{2} \) PMF:

\[ P_{u, \text{Full}} = \frac{(62.4)(21.2)(372.5 - 356.8)+\frac{1}{2}(62.4)(21.2)}{[24.25 - (372.5 - 356.8)]} \]
\[ = 20769 + 5655 \]
\[ = 26424 \text{ lbs/lin.ft.} \]
\[ = 26.4 \text{ kips/lin.ft.} \]
Stability Analysis

\[ P_{M/2} = 13.21 \text{ Kips/lin ft.} \]

\[ \times \left( \frac{20769 \cdot 5.55}{10.6} \right) \left( 20769 \cdot 14.1 \right) \left( 5.55 \right) \]

\[ \times 2429 \cdot 299887 \]

\[ \bar{x} = 11.35 \text{' From Toe} \]

At Full PMF:

\[ P_{W_{\text{Full}}} = 20769 + \frac{1}{2}(62.4)(21.2)(29.75 - 15.7) \]

\[ = 20769 + 9293 \]

\[ = 30062 \text{ lbs/lin ft} \]

\[ = 30.06 \text{ Kips/lin ft} \]

\[ P_{M/2} = 15.03 \text{ Kips/lin ft.} \]

\[ \times \left( \frac{20769 + 9293}{10.6} \right) \left( 20769 \cdot 14.1 \right) \left( 9293 \right) \]

\[ \bar{x} 30062 = 351183 \]

\[ \bar{x} = 11.68 \text{' From Toe} \]
# Stability Analysis

## Force and Moment

<table>
<thead>
<tr>
<th>Loading</th>
<th>Force (Kips)</th>
<th>Moment Arm (Ft)</th>
<th>Moment About Toe (Kip-Ft)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weight of Dam Wc</td>
<td>30.6</td>
<td>13.7</td>
<td>+419.22</td>
</tr>
<tr>
<td>Water Forces</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Downstream</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Low PDLT</td>
<td>1.20</td>
<td>2.07</td>
<td>+2.48</td>
</tr>
<tr>
<td>High PDLT</td>
<td>7.69</td>
<td>5.23</td>
<td>+10.22</td>
</tr>
<tr>
<td>Upstream</td>
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<td></td>
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</tr>
<tr>
<td>Normal PUM</td>
<td>8.81</td>
<td>-5.6</td>
<td>-49.54</td>
</tr>
<tr>
<td>½ PMF PUM</td>
<td>16.62</td>
<td>-6.92</td>
<td>-115.01</td>
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<tr>
<td>PMF PUM</td>
<td>22.38</td>
<td>-7.30</td>
<td>-163.37</td>
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<tr>
<td>Ice PIMM</td>
<td>10.0</td>
<td>-15.8</td>
<td>-158.00</td>
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<tr>
<td>Silt Ps</td>
<td>3.29</td>
<td>-2.93</td>
<td>-9.64</td>
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<td>Hydrodynamic Loading ((\frac{V}{c})Mc)</td>
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<tr>
<td>Normal</td>
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<td>-6.87</td>
<td>-3.23</td>
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<td>½ PMF</td>
<td>97</td>
<td>-10.01</td>
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<td>PMF</td>
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<td>Seismic Inertia Force Ps</td>
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<td>Hydrostatic Uplift ((P_{uw}))</td>
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<tr>
<td>Normal Pool</td>
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<tr>
<td>Full Uplift</td>
<td>16.54</td>
<td>-11.8</td>
<td>-195.17</td>
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<tr>
<td>½ Uplift</td>
<td>8.27</td>
<td>-11.8</td>
<td>-97.59</td>
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<tr>
<td>½ PMF</td>
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<tr>
<td>Full Uplift</td>
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<td>-299.87</td>
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<tr>
<td>½ Uplift</td>
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<td>-11.35</td>
<td>-149.93</td>
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<tr>
<td>PMF</td>
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<td></td>
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</tr>
<tr>
<td>Full Uplift</td>
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<td>-351.10</td>
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<tr>
<td>½ Uplift</td>
<td>15.03</td>
<td>-11.68</td>
<td>-175.65</td>
</tr>
</tbody>
</table>
STABILITY CALCULATIONS

1. Normal Pool, 1/2 Uplift, No Ice, No Seismic

A. OVERTURNING STABILITY

Resisting Moments: \(419.22 \times 2.48 = 421.7\)

Overturning Moments: \(-49.34 - 9.64 - 97.59 = 156.57\)

\(\text{FS} = \frac{421.7}{156.57} = 2.69\) (with respect to overturning)

\(\frac{X}{Y} = 421.7 - 156.57 = 11.87\)

\(\text{e} \times \frac{Y}{X} = \frac{21.2}{2} - 11.87 = -1.27\)

\(\text{B} \times \frac{21.6}{16} = 3.35 > 1.27\) (Resultant within Middle 1/3)

B. SLIDING STABILITY

\(\text{F.S.} = \frac{(W_c - P_u) \tan \phi}{2 \times F_{\text{horizontal}}}\)

\(30.6 - 8.27 \tan 35^\circ = \frac{(22.33)(.70)}{1.20 - 8.81 - 3.29} = 10.9\)

\(1.43\)

2. Normal Pool, Full Uplift, No Ice, No Seismic

A. OVERTURNING

Resisting Moments: \(419.22 \times 2.48 = 421.7\)

Overturning Moments: \(-49.34 - 9.64 - 195.17 \times 254.15\)

\(\text{FS} = \frac{421.7}{254.15} = 1.66\)
Locke 24
Stability Analysis

\[
\bar{F} = \frac{421.7 \cdot 254.15}{30.6 \cdot 16.54} = 11.92
\]

\[
e = 10.6 - 11.92 = 1.32 < 3.53 \text{ (Resultant within Middle 1/3)}
\]

**B SLIDING**

\[
FS = \frac{(30.6 - 16.54)(1.70)}{1.20 - 8.81 - 3.29} = 0.90
\]

(3) Normal Pool, 1/2 PMF, Ice, No Seismic

**A OVERTURNING**

Resisting Moments: \(419.22 + 2.48 = 421.7\)

Overturing Moments: \(-49.34 - 158.0 - 9.64 - 195.17 = 314.57\)

\[
FS = \frac{421.7}{314.57} = 1.34
\]

\[
\bar{F} = \frac{421.7 - 314.57}{30.6 - 8.27} = 4.80
\]

\[
e = 10.6 - 4.80 = 5.8 > 3.53 \text{ (Resultant outside Middle 1/3)}
\]

**B SLIDING**

\[
FS = \frac{(30.6 - 8.27)(1.70)}{1.20 - 8.81 - 3.29} = 0.75
\]

(4) Normal Pool, Full Uplift, Ice, No Seismic

**A OVERTURNING**

Resisting Moments: \(419.22 + 2.48 = 421.7\)

Overturing Moments: \(-49.34 - 158.0 - 9.64 - 195.17 = 412.15\)
Locke Z4
Stability Analysis

\[ F.S. = \frac{421.7 - 102}{412.15} \]

\[ x = \frac{421.7 - 412.15}{30.6 - 16.54} = .68 \]

\[ e = 106 - 6.8 = 9.92 > 3.53 \text{ (Resultant outside Middle 1/3)} \]

B. SLIDING

\[ F.S. = \frac{(30.6 - 16.54)(.70)}{1.20 - 8.81 - 10.0 - 3.29} = .47 \]

Normal Pool, 1/2 Uplift, Ice, Seismic

A. OVERTURNING

Resisting Moments = 419.22 + 248 = 421.7


\[ F.S. = \frac{421.7}{527.13} = 1.29 \]

\[ x = \frac{421.7 - 527.13}{30.6 - 8.27} = 4.24 \]

\[ e = 10.6 - 4.24 = 6.36 > 3.53 \text{ (Resultant outside Middle 1/3)} \]

B. SLIDING

\[ F.S. = \frac{(30.6 - 8.27)(.70)}{1.20 - 8.81 - 10.0 - 3.29 - .47 - 1.53} = .68 \]
Normal Pool, Full Uplift, Ice, Seismic

A. OVERTURNING

Resisting Moments = 419.22 + 40.22 = 459.44

Overturning Moments = -115.01 - 9.64 - 149.93 = 274.58

F.S. = 459.44 = 1.67
274.58

\( \sigma = \frac{459.44 - 274.58}{30.6 - 13.21} = 10.63 \)

\( e = 10.6 - 10.63 = -0.03 < 3.53 \) (Resultant Middle/3)

B. SLIDING

\( F.S. = \frac{(30.6 - 16.54)(.70)}{1.20 - 8.81 - 10.0 - 3.29 - .47 - 1.53} = .43 \)

\( \frac{1}{2} \) PMF, \( \frac{1}{2} \) Uplift, No Ice, No Seismic

A. OVERTURNING

Resisting Moments = 419.22 + 40.22 = 459.44

Overturning Moments = -115.01 - 9.64 - 149.93 = 274.58

F.S. = 459.44 = 1.67
274.58

\( \sigma = \frac{459.44 - 274.58}{30.6 - 13.21} = 10.63 \)

\( e = 10.6 - 10.63 = -0.03 < 3.53 \) (Resultant Middle/3)
LOCKE 24
Stability Analysis

B. SLIDING

\[ F.S. = \frac{(30.6 - 13.2)(1.70)}{7.69 - 16.02 - 3.29} = 1.0 \]

8) \( \frac{1}{2} \) PMF, \( \frac{1}{2} \) Uplift, No Ice, Seismic

A. OVERTURNING

Resisting Moments: 419.22, 40.22, 459.44

Overturning Moments: -115.01, -9.64, -9.71, -9.33, -141.93

\[ = 293.62 \]

\[ F.S. = \frac{459.44}{293.62} = 1.56 \]

\[ \bar{x} = \frac{459.44 - 293.62}{30.6 - 13.21} = 9.54 \]

\[ e = 10.6 - 9.54 = 1.06 < 3.53 \text{ (Resultant Middle \( \frac{1}{3} \))} \]

B. SLIDING

\[ F.S. = \frac{(30.6 - 13.2)(1.70)}{7.69 - 16.02 - 3.29 - 97.153} = 8.3 \]

9) PMF, \( \frac{1}{2} \) Uplift, No Ice, No Seismic

A. OVERTURNING

Resisting Moments: 419.22, 40.22, 459.44

Overturning Moments: -163.37, -9.64, -175.55 = 348.56

\[ F.S. = \frac{459.44}{348.56} = 1.32 \]

\[ \bar{x} = \frac{459.44 - 348.56}{30.6 - 150.3} = 7.12 \]
THOMSEN ASSOCIATES — CONSULTANTS IN SOILS & FOUNDATION ENGINEERING

Locke 24
Stability Analysis

\[ e = 10.6 \cdot 7.12 = 348 < 3.53 \text{ (Resultant Middle/3)} \]

B. SLIDING

\[
F.S. = \frac{(30.6 - 15.03)(.70)}{7.69 \cdot 22.38 - 3.29} = .61
\]

(6) PMF, \( 1/2 \) Uplift, No Ice, Seismic

A. OVERTURNING

Resisting Moments = 419.22 \cdot 40.22 \cdot 459.44
Overturning Moments = -163.37 \cdot 9.64 \cdot 17.94 \cdot 9.33 = -175.55
\[ = 375.83 \]

\[
F.S. = \frac{459.44}{375.83} = 1.22
\]

\[
X = \frac{(459.44 \cdot 375.83)(.70)}{30.6 - 15.03} = 5.37
\]

\[ e = 10.6 - 5.37 = 5.23 > 3.53 \text{ (Resultant outside Middle/3)} \]

B. SLIDING

\[
F.S. = \frac{(30.6 - 15.03)(.70)}{7.69 \cdot 22.38 - 3.29 - 1.46 - 1.53} = .52
\]
TOPOGRAPHIC MAP
LOCK 24 ERIE CANAL
I.D. NO. N.Y. 792
Contract No. 45.

Erie Canal  
Section 6

For the construction of a dam in the Oneida River at Caughdenoy and of Lock No. 24 and appertaining structures at Baldwinville

CROSS SECTIONS OF LOWER APPROACH TO LOCK NO. 24, STA. 3920.00 TO STA. 3926.00

Scale: 20 feet to the inch

Examined and approved
S. G. Mackey
V.S. Deputy State Engineer
Nov. 27, 1887
Contract No. 45.
Erie Canal  Section 6.
For the construction of a dam in the Oneida River at Oaughdenoy and of Lock No. 24 and appertaining structures at Baldwinsville
DETAILED LOCATION PLAN OF UPPER APPROACH TO LOCK NO. 24
Scale: 50 feet to the-inch

Examined and approved
Examiner and auditor

Examined and approved

[Signature]
Dec. 22, 1837

[Signature]
Jan. 22
CONTRACT M 63-5
FOR
RECONSTRUCTION OF TAINTOR GATE
BALDWINSVILLE DAM
BALDWINSVILLE
ONONDAGA COUNTY
NEW YORK
SCALES AS INDICATED
SHEETS 1 TO 5

The provisions of the Public Works
Specifications of January 2, 1962 shall
apply to this contract.

Approved Sept 6, 1963

M. A. Bragg
Deputy Chief Engineer

Approved Aug 30, 1963

G. W. Hathaway
Asst. Deputy Chief Engineer (Design)
REQUIRED

**NOTE**

Columns, need to be offset downstream from needs cut to arrive 0'-6" better on shell along remains. Sections used are DP1 or DP2, 28'-0" long.

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**SECTION A-A**

Field on submerged pipe in B/CCnt 42, plans, and final estimate.

Sedimentary