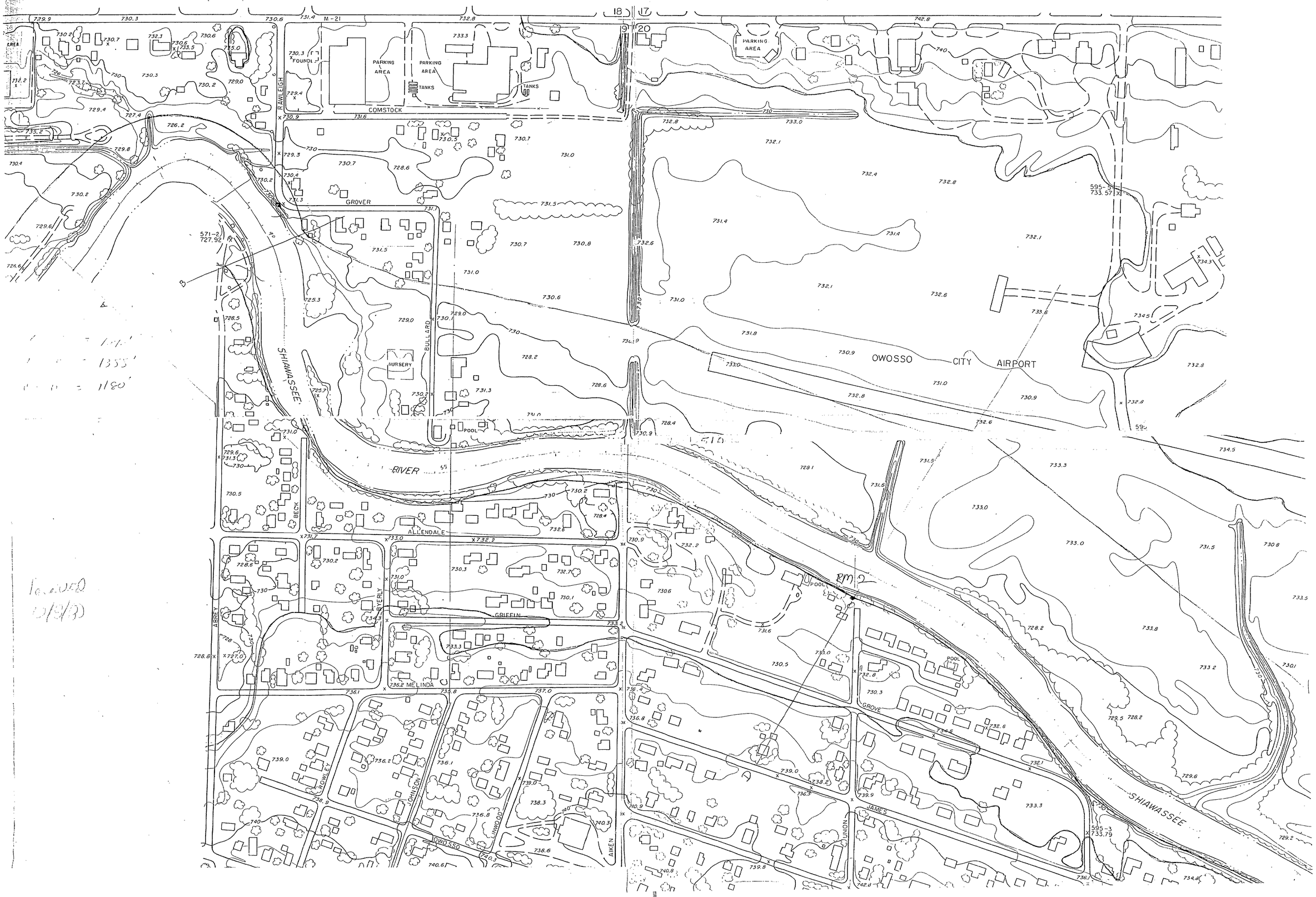
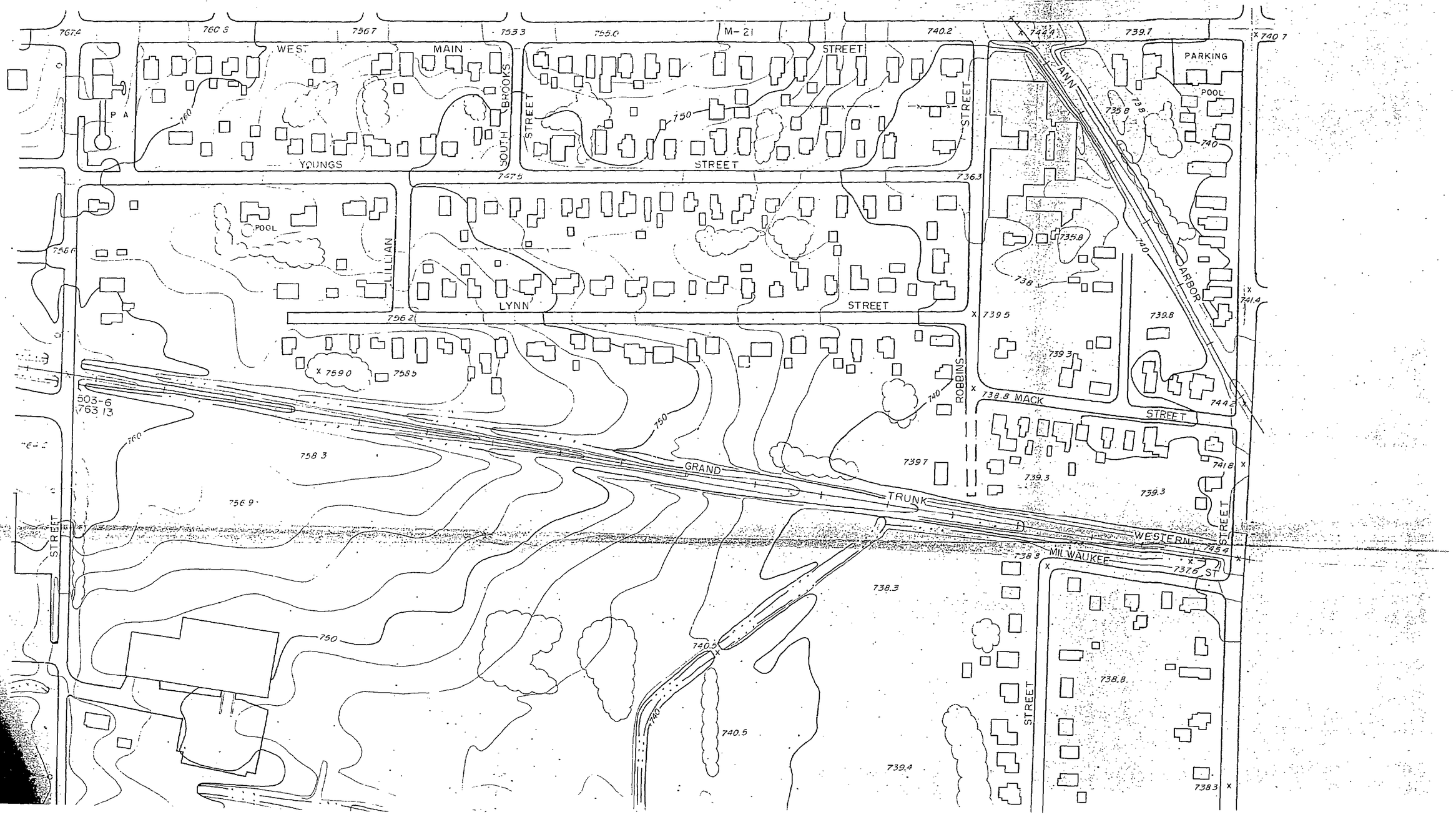
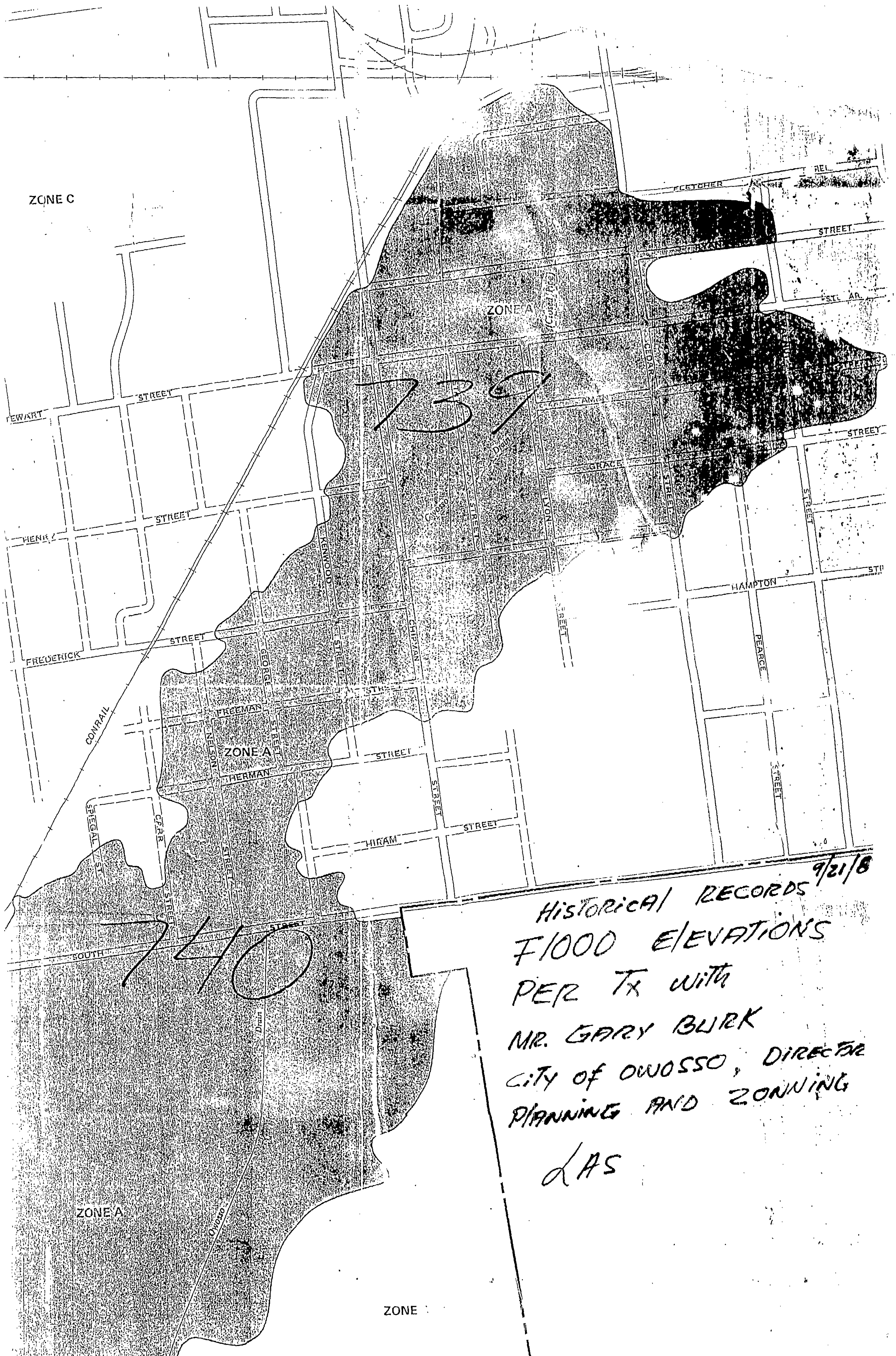

M-21
COMSTOCK
RALEIGH
GROVER
BULLARD
NURSERY
POOL
PARKING AREA
TANKS
FOUNDL
OWOSSO CITY AIRPORT
SHIAWASSEE RIVER
BECK
ALLENDALE
ABREY
RIVERLY
GRIFFIN
MELINDA
ROWLEY
JOHNSON
OWOSSO
LINWOOD
AIKEN
UNION
JAMES
GROVE
SHIAWASSEE
571-2
727.92
595-5
733.57
595-3
733.79
1355'
1180'

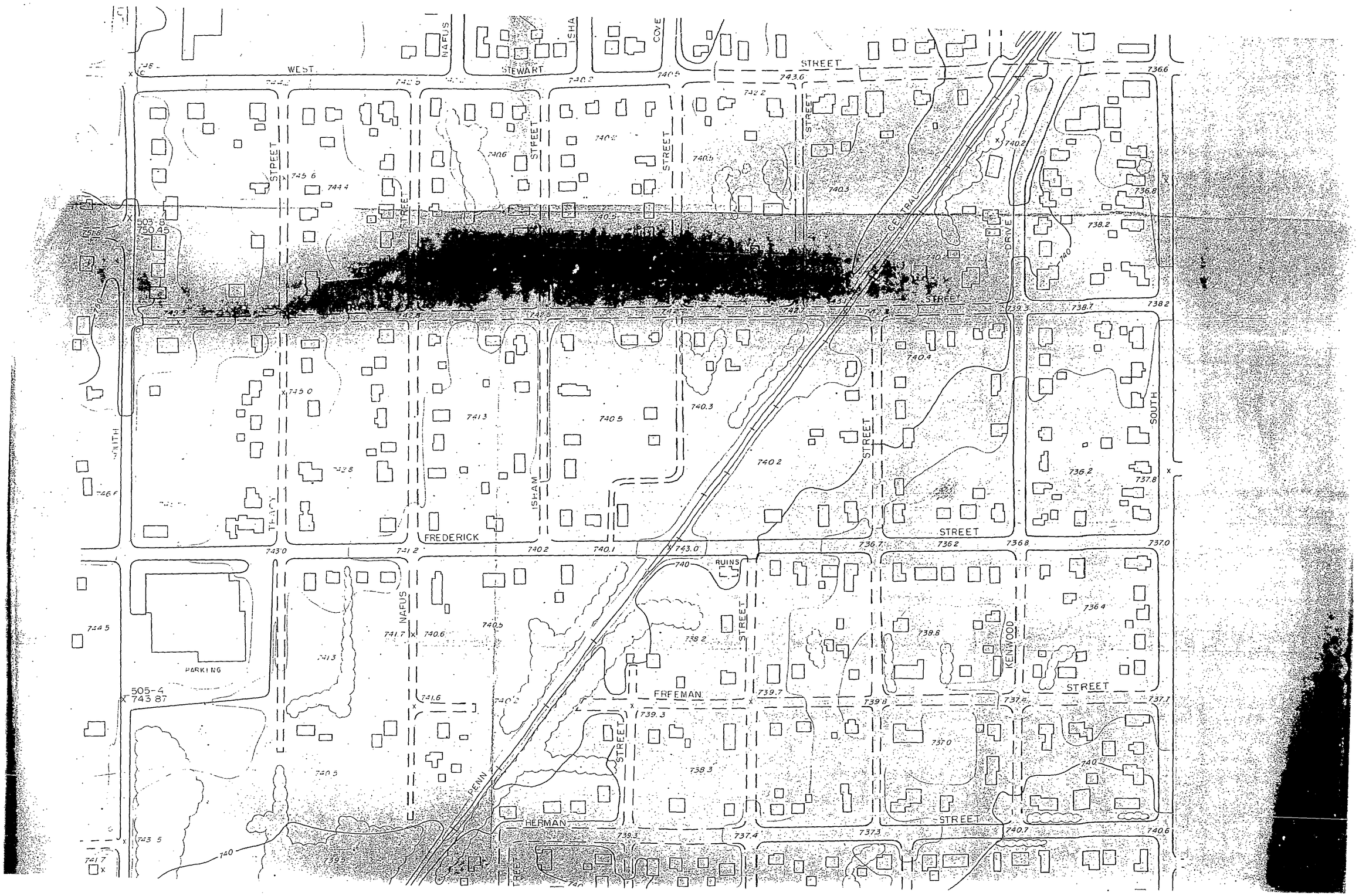
Received 10/8/80

Received 10/8/80

GENESEE
CASS
52
ISSEE
STREET
STREET
STREET
STEWART
STREET
STREET
STREET
FLETCHER
HAMPTON
PEARCE
STREET
STREET
STREET
STREET
STREET
STEWART
HENRY
FREDERICK
CONRAIL
CORPORATE
LIMITS

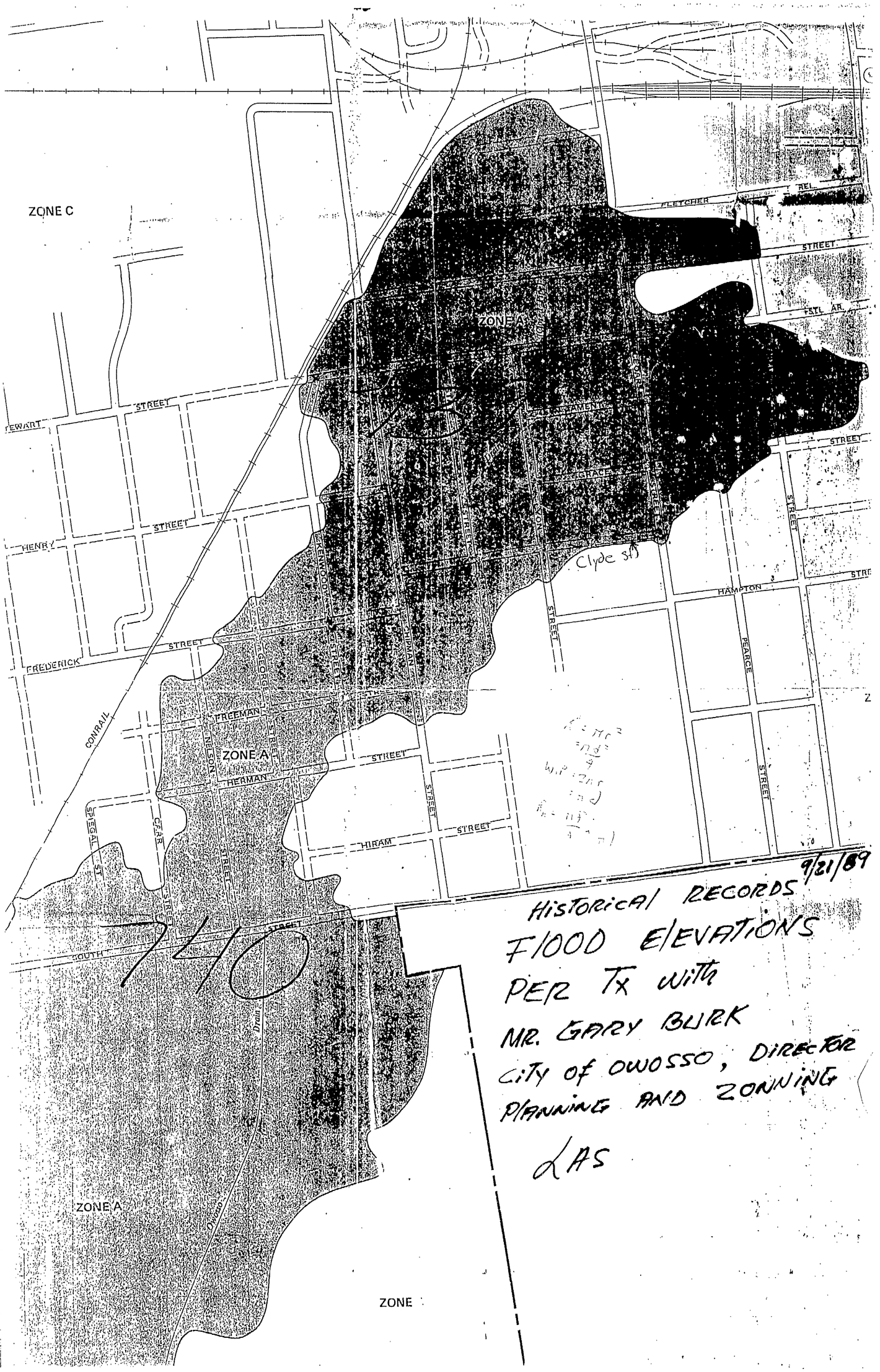

WEST
MAIN
STREET
YOUNGS
SOUTH
BROOKS
STREET
STREET
STREET
PARKING
POOL
POOL
LILLIAN
LYNN
STREET
ST. ANN
ARBOR
ROBBINS
MACK
STREET
GRAND
TRUNK
WESTERN
MILWAUKEE
ST
STREET
STREET
STREET
M-21
503-6
763 13

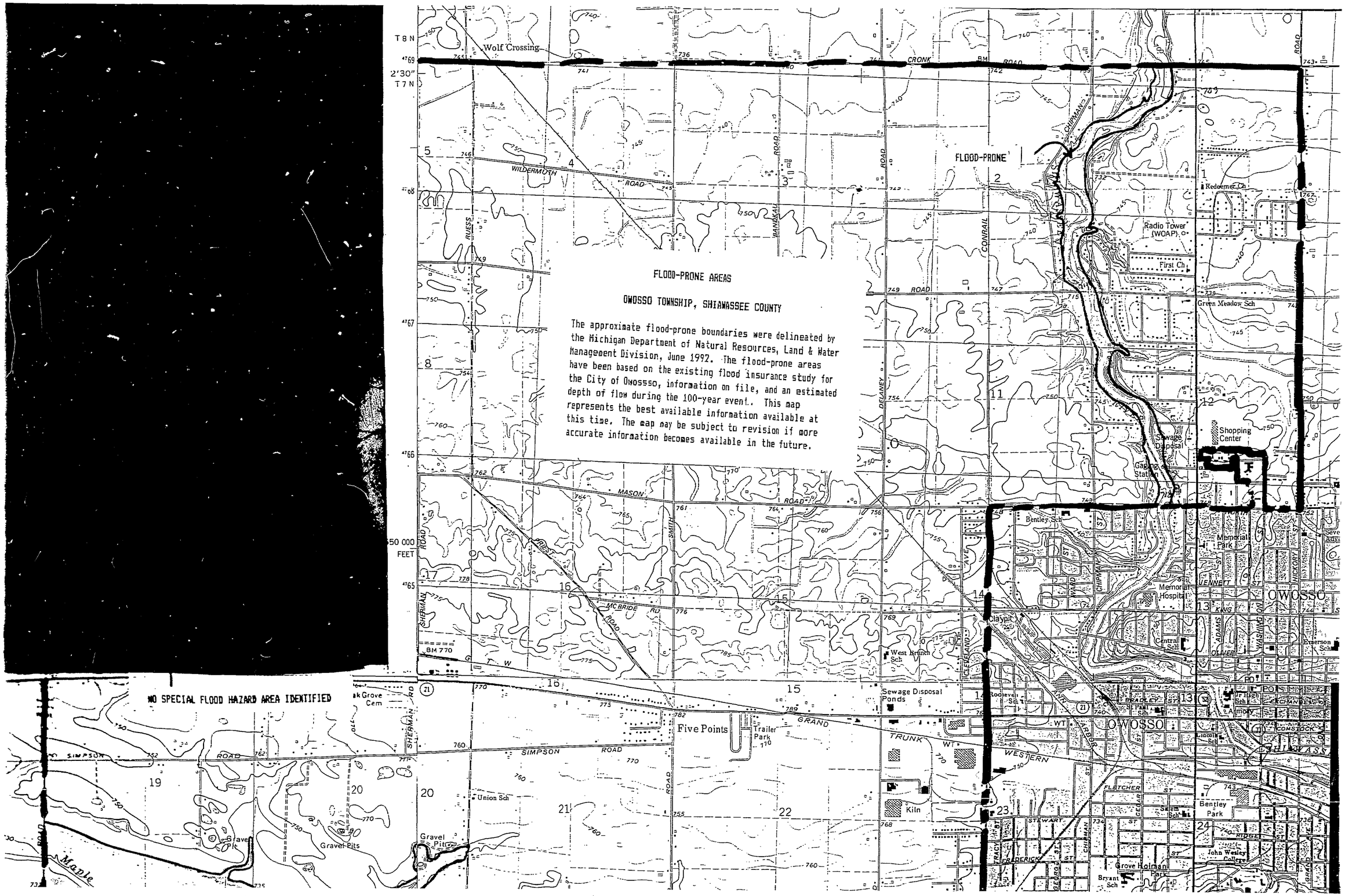

ZONE C
ZONE A
739
740
CONRAIL
FLETCHER
STREET
STL. AR.
CEDAR
GRACE
LYON
CHIPMAN
KENWOOD
GEORGE
FREEMAN
NELSON
HERMAN
CARR
SPIEGAL ST.
SOUTH
HIRAM
HAMPTON
PEARCE
FREDERICK
HENRY
STEWART
Owosso Drain
ZONE
Historical Records 9/21/8
F1000 Elevations
Per Tx with
Mr. Gary Burk
City of Owosso, Director
Planning and Zonning
LAS

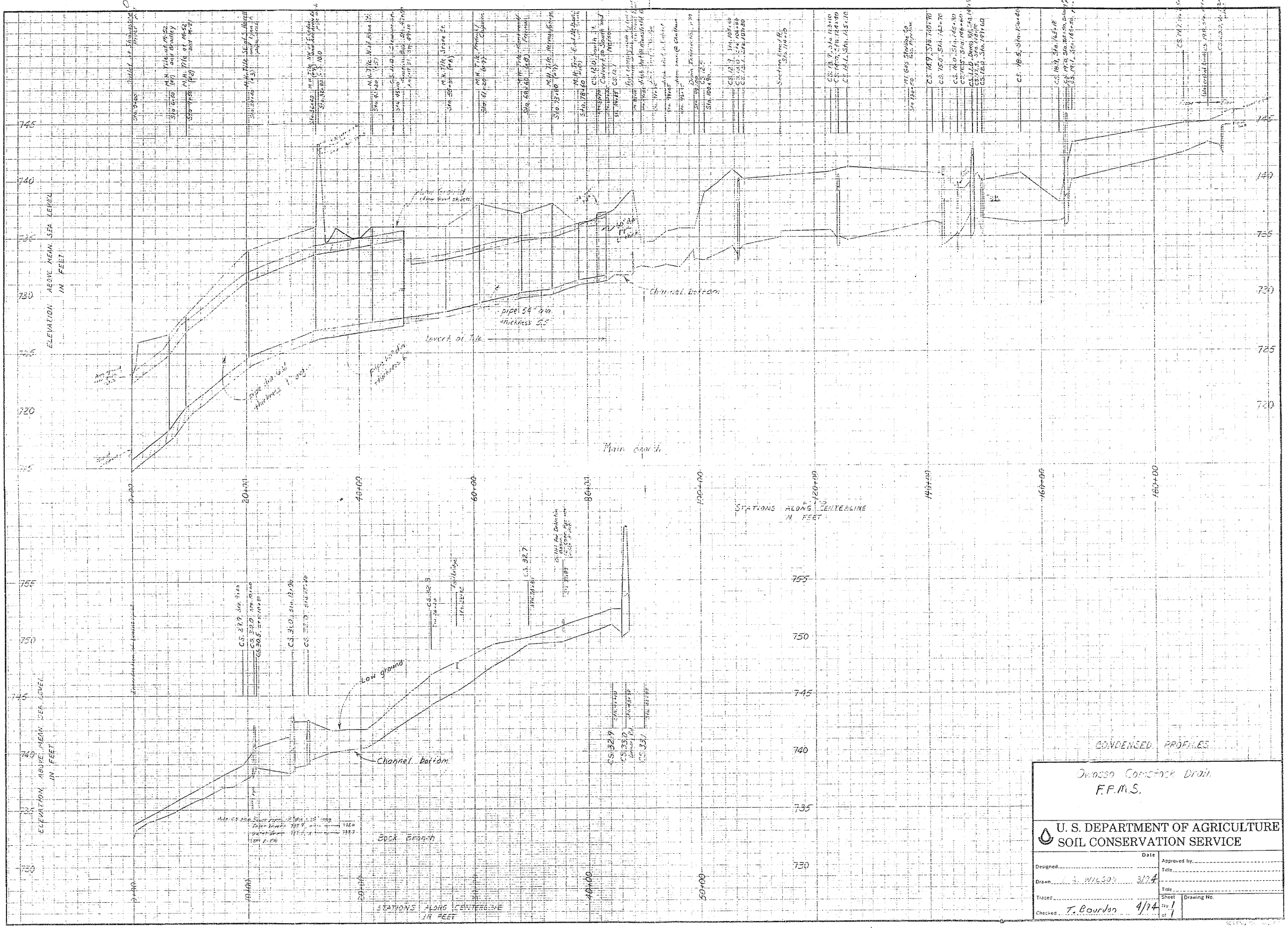

WEST
STEWART
NAFUS
ISHA
COVE
STREET
STREET
STREET
STREET
STREET
STREET
STREET
STREET
STREET
STREET
STREET
STREET
STREET
STREET
CENTRAL
DRIVE
SOUTH
SMITH
TRACY
ISHAM
FREDERICK
NAFUS
RUINS
KENWOOD
FREEMAN
HERMAN
PENN
PARKING
503-8
750.45
505-4
743.87

HERMAN
STREET
STREET
STREET
HIRAM
STREET
SPIEGAL
CARR
Drive
740
CORPORATE
LIMITS

SHIAWASSEE
RIVER
ANN ARBOR
RAILROAD
BEEHLER
STREET
UNION ST
RIVER
STREET
Owosso Drain
(Closed Pipe)
CHIPMAN
LANSING
CEDAR
BRADLEY
STREET
Dam
WATER
STREET
MAIN
STREET
RM2
CLINTON
ST
SHIAWASSEE
SHIAWASSEE
GENESEE
STREET
CASS
STREET
52
CORPORATE
LIMITS
FLETCHER
STREET
RYAN
STREET
STREET
STEWART
STREET
STEWART
STATE
CEDAR
WALNUT
AMENT
STREET


ZONE C
ZONE A
ZONE A
ZONE A
ZONE A
ZONE
FLETCHER
STREET
STEWART
STREET
HENRY
STREET
FREDERICK
STREET
HAMPTON
STREET
PEARCE
STREET
FREEMAN
STREET
HERMAN
STREET
HIRAM
STREET
SOUTH
STREET
CONRAIL
Clyde st
9/21/89
HISTORICAL RECORDS
F1000 ELEVATIONS
PER TX with
MR. GARY BURK
CITY OF OWOSSO, DIRECTOR
PLANNING AND ZONING
LAS

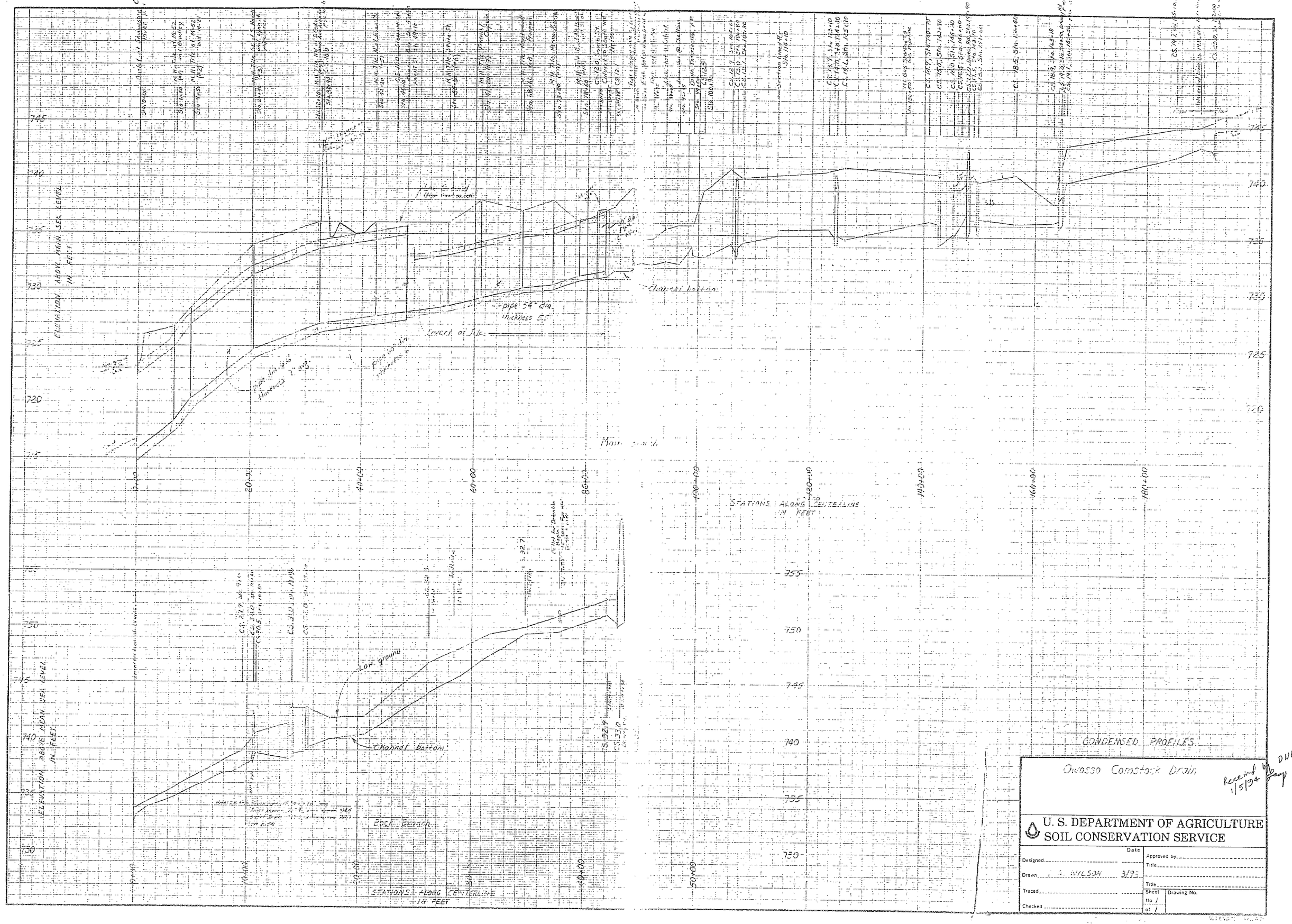

FLOOD-PRONE AREAS
OWOSSO TOWNSHIP, SHIAWASSEE COUNTY
The approximate flood-prone boundaries were delineated by the Michigan Department of Natural Resources, Land & Water Management Division, June 1992. The flood-prone areas have been based on the existing flood insurance study for the City of Owossso, information on file, and an estimated depth of flow during the 100-year event. This map represents the best available information available at this time. The map may be subject to revision if more accurate information becomes available in the future.
NO SPECIAL FLOOD HAZARD AREA IDENTIFIED
FLOOD-PRONE
Wolf Crossing
T8N
T7N
2'30"
50 000 FEET
CRONK ROAD
WILDERMUTH ROAD
MASON ROAD
MCBRIDE RD
SIMPSON ROAD
GRAND TRUNK WESTERN
Five Points
Trailer Park
Sewage Disposal Ponds
Kiln
Claypit
Gravel Pit
Gravel Pits
Union Sch
West Branch Sch
Bentley Sch
Memorial Park
Memorial Hospital
OWOSSO
Redeemer Ch
Radio Tower (WOAP)
First Ch
Green Meadow Sch
Shopping Center
Sewage Disposal
Gas Station
Bentley Park
John Wesley College
Grove Holman Park
Bryant Sch
Maple

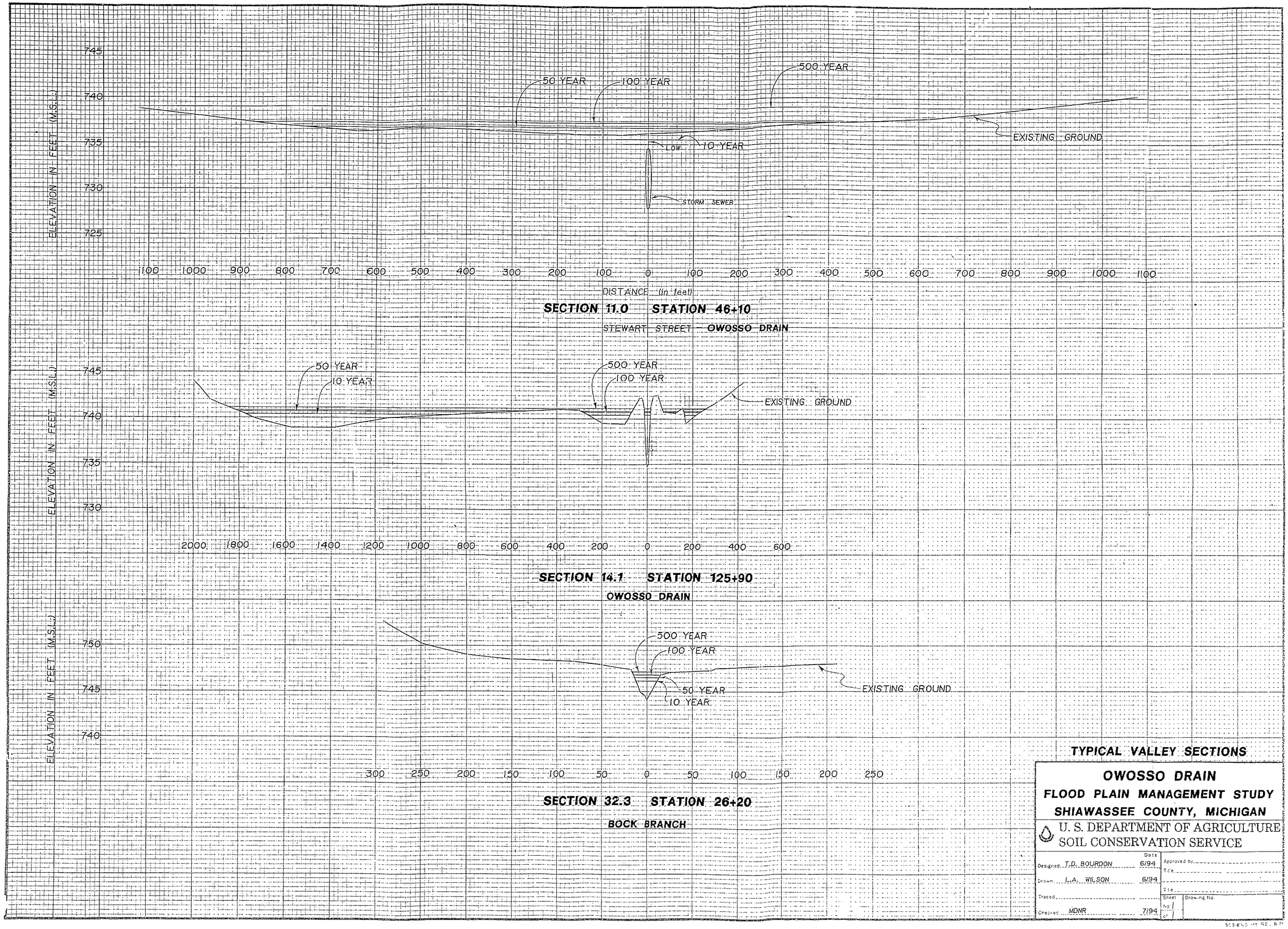


Owosso Comstock Drain
F.P.M.S.

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

	Date		
Designed		Approved by	
Drawn	L. WILSON 3/74	Title	
Traced		Title	
Checked	T. Bourdon 4/74	Sheet No. 1 of 1	Drawing No.


ELEVATION ABOVE MEAN SEA LEVEL IN FEET
STATIONS ALONG CENTERLINE IN FEET
Channel bottom
Pipe 54" Dia.
Thickness 5/8"
Invert of Tile
Low ground
Channel Bottom
Main South
CONDENSED PROFILES
Owosso Comstock Drain
Received 1/5/94 DNR
U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
Designed
Drawn L. WILSON 3/93
Traced
Checked
Date
Approved by
Title
Sheet No. 1 of 1
Drawing No.



TYPICAL VALLEY SECTIONS

OWOSSO DRAIN

FLOOD PLAIN MANAGEMENT STUDY

SHIAWASSEE COUNTY, MICHIGAN

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

Designed T.D. BOURDON	Date 6/94	Approved by	
Drawn L.A. WILSON	6/94	Title	
Traced		Sheet no. of	Drawing No.
Checked MDNR	7/94		

SCS-ENG-115 RE. 8-74

FLOOD PLAIN MANAGEMENT STUDY

OWOSSO DRAIN

SHIAWASSEE COUNTY, MICHIGAN

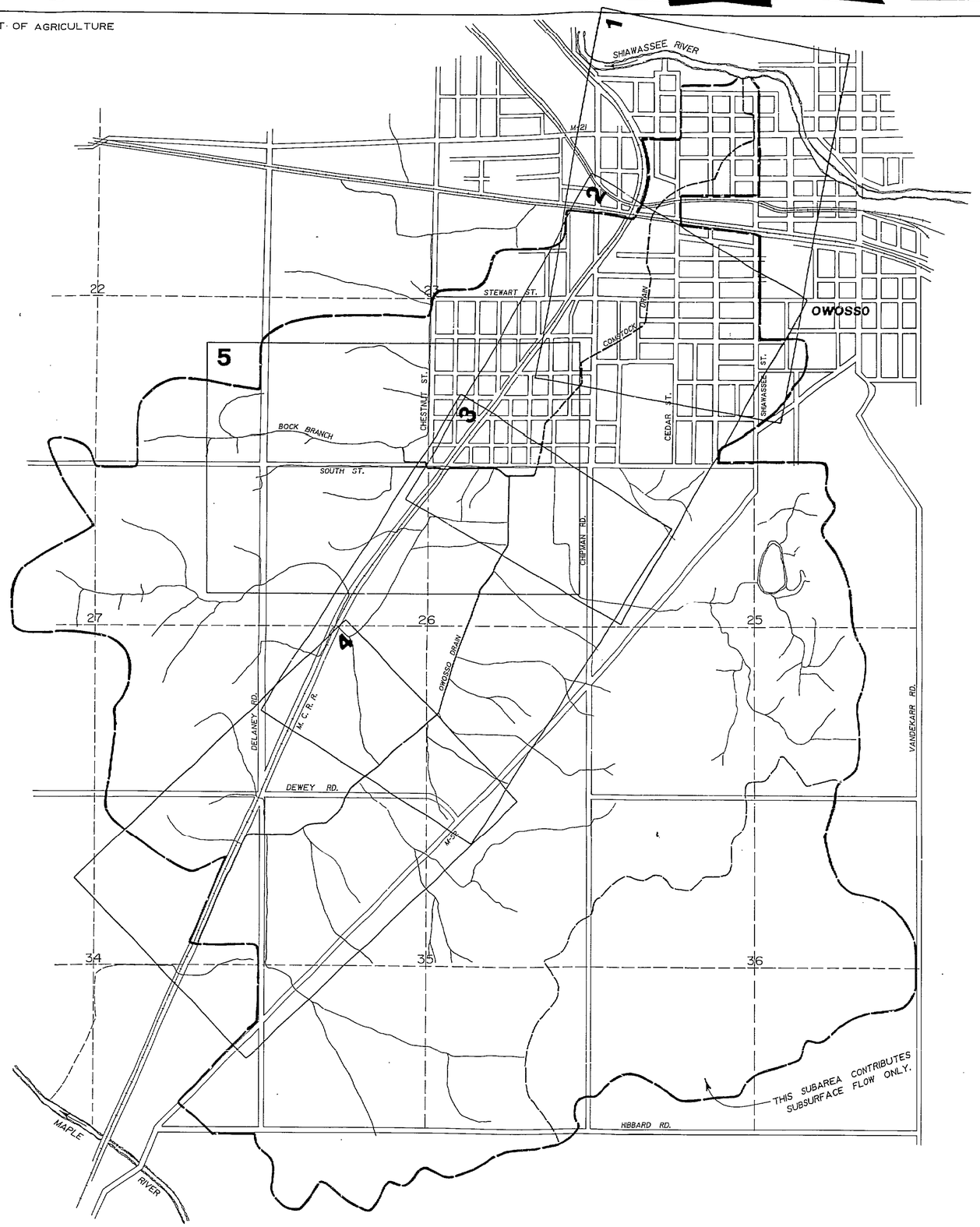
CONTENTS

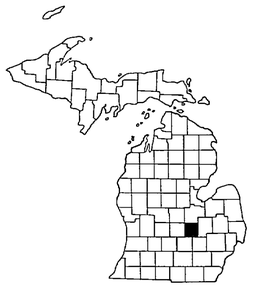
1. INDEX – FLOOD HAZARD AREA MAPS – 1 SHEET
2. FLOOD HAZARD AREA MAPS – 5 SHEETS
3. HIGH WATER PROFILES – 5 SHEETS
4. BENCH MARK LOCATION MAP – 1 SHEET
5. TYPICAL VALLEY SECTIONS – 1 SHEET

RECEIVED
JUL 07 1994
Natural Resources
Land & Water Management

U.S. DEPARTMENT OF AGRICULTURE

SOIL CONSERVATION SERVICE





VICINITY MAP

LEGEND

- Road
- Storm Sewer
- Open Drain
- Railroad
- Watershed Boundary
- Narrow Stream
- Subarea Boundary
- Sheet Coverage (2)

FIGURE 2

PHOTO SHEET INDEX MAP

Owosso and Comstock Drainage District

FLOOD PLAIN MANAGEMENT STUDY

SHIAWASSEE COUNTY, MICHIGAN

1000 500 0 1000 2000

Approximate Scale - Feet

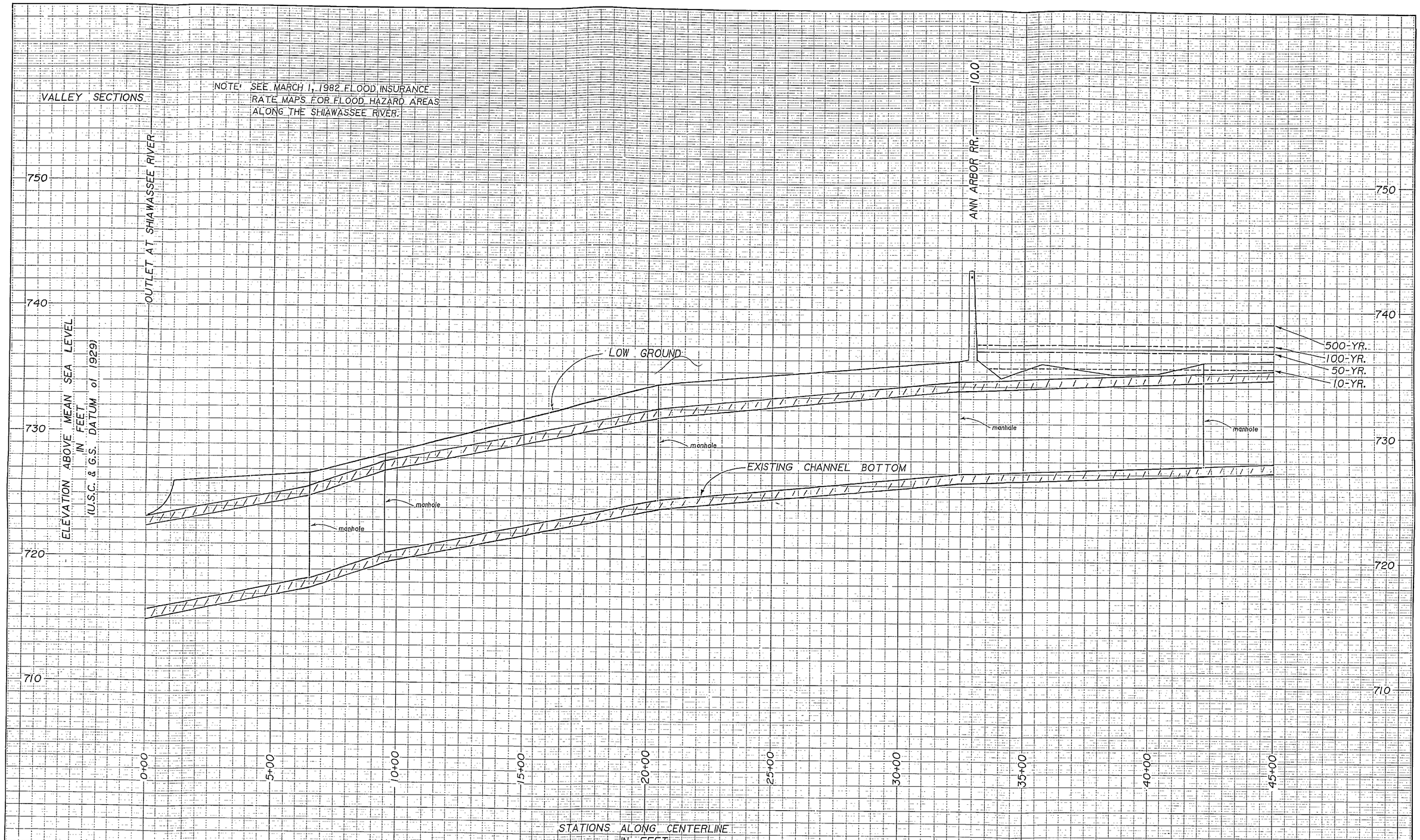
500 0 500

Approximate Scale - Meters

BASE COMPILED FROM DEPARTMENT OF ENGINEERING, OWOSSO, MICHIGAN, OWOSSO AND COMSTOCK DRAINAGE DISTRICT MAP.

VALLEY SECTIONS

NOTE: SEE MARCH 1, 1982 FLOOD INSURANCE RATE MAPS FOR FLOOD HAZARD AREAS ALONG THE SHIAWASSEE RIVER.

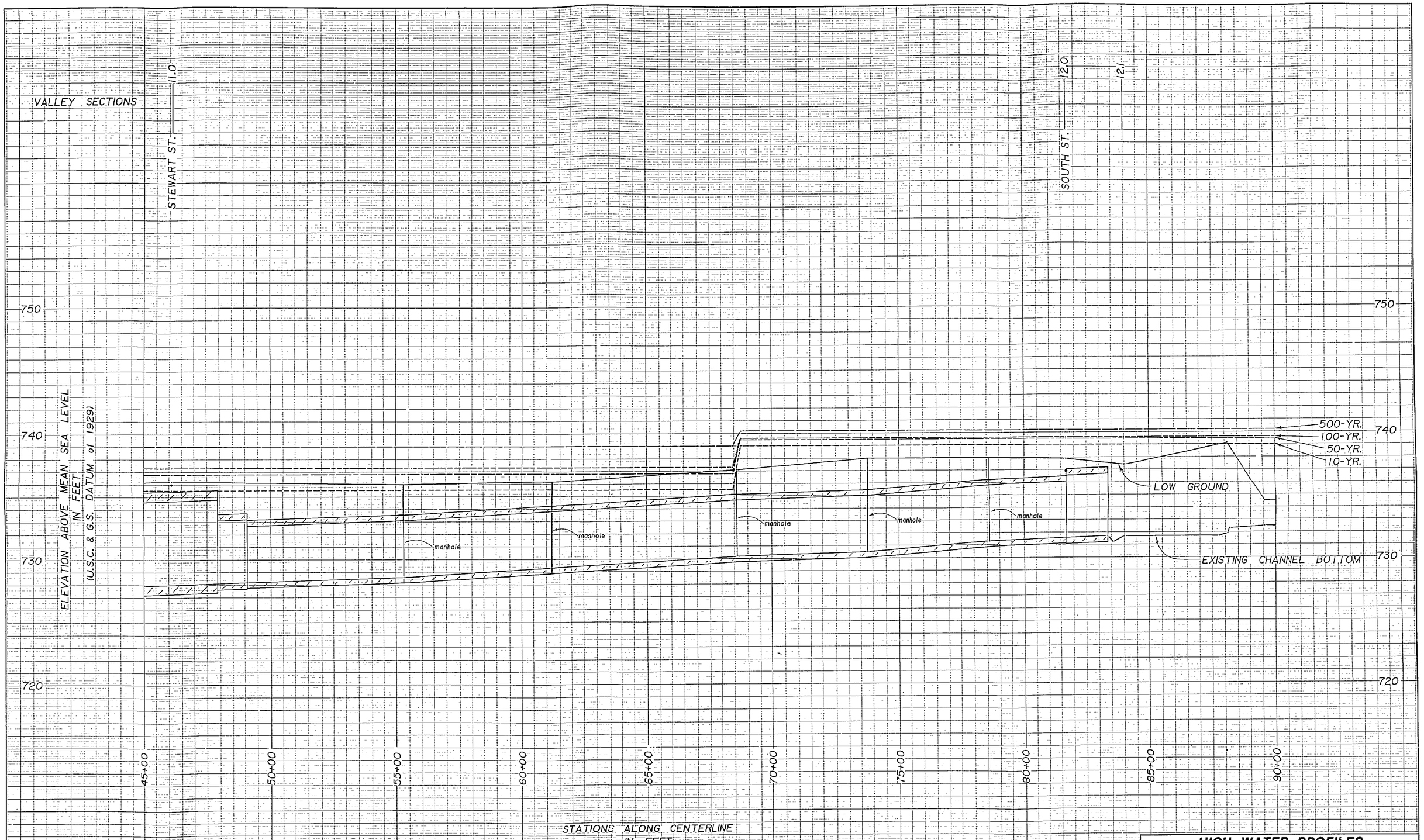


NOTE:
Additional field measured cross-sections may be needed to verify the water surface profile between the cross-sections used in this report. When the difference in the elevation of the channel bottom between cross-sections exceeds 2/3 the depth of flood flows, variations in the channel bottom can cause significant changes in the flood profiles.

HIGH WATER PROFILES
OWOSSO DRAIN
FLOOD PLAIN MANAGEMENT STUDY
SHIAWASSEE COUNTY, MICHIGAN

U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

Designed T.D. BOURDON	Date 6/94	Approved By	Title
Drawn L.A. WILSON	6/94		Title
Traced			
Checked MDNR	7/94	Sheet No. 1 of 5	Drawing No.



NOTE:
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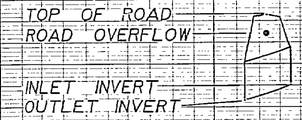

HIGH WATER PROFILES
OWOSSO DRAIN
FLOOD PLAIN MANAGEMENT STUDY
SHIAWASSEE COUNTY, MICHIGAN

U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

Designed T.D. BOURDON	Date 6/94	Approved By	Title
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Traced			
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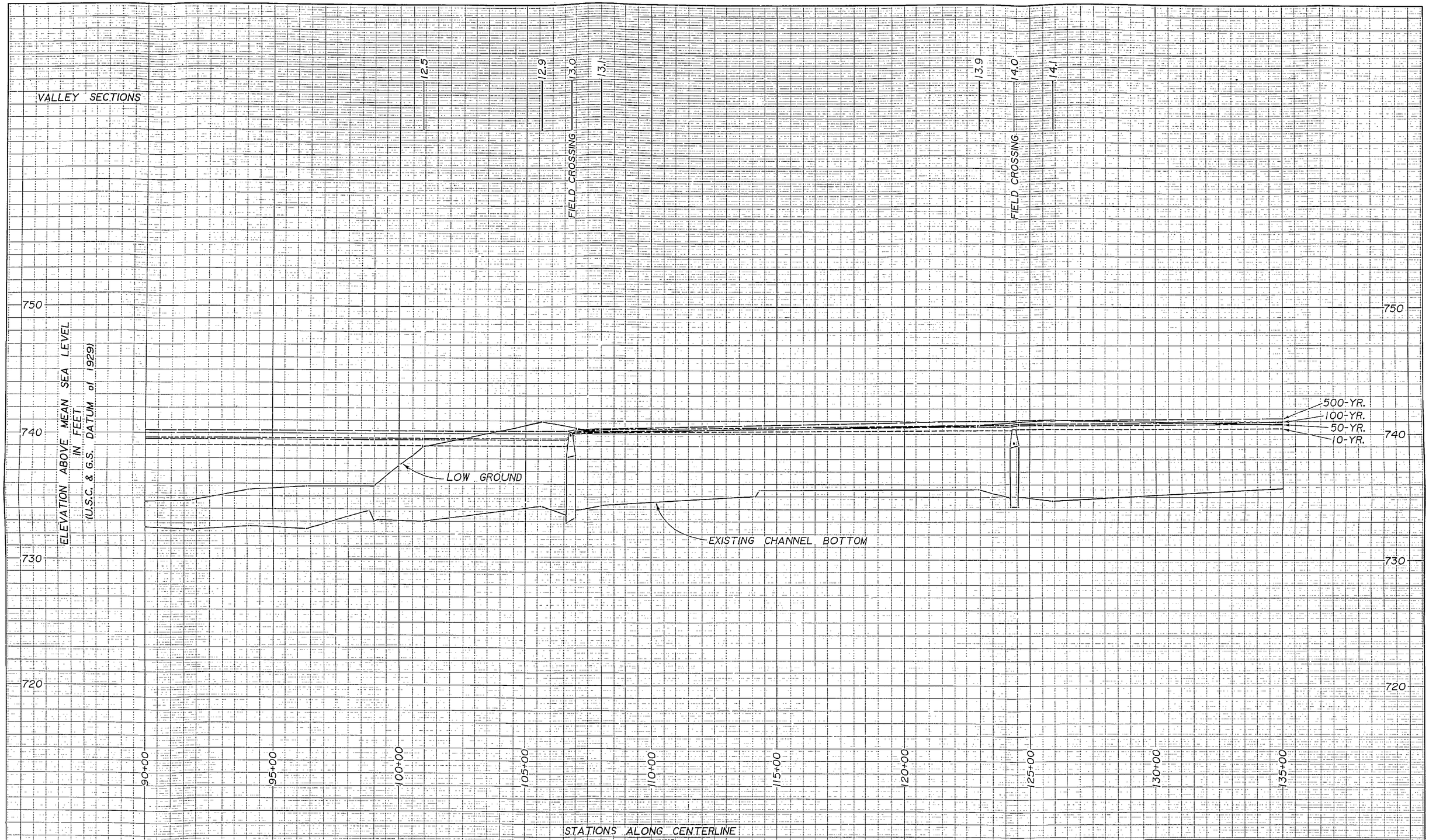

NOTE:
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HIGH WATER PROFILES
OWOSSO DRAIN
FLOOD PLAIN MANAGEMENT STUDY
SHIAWASSEE COUNTY, MICHIGAN

U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

Designed T.D. BOURDON	Date 6/94	Approved By	
Drawn L.A. WILSON	6/94	Title	
Traced		Title	
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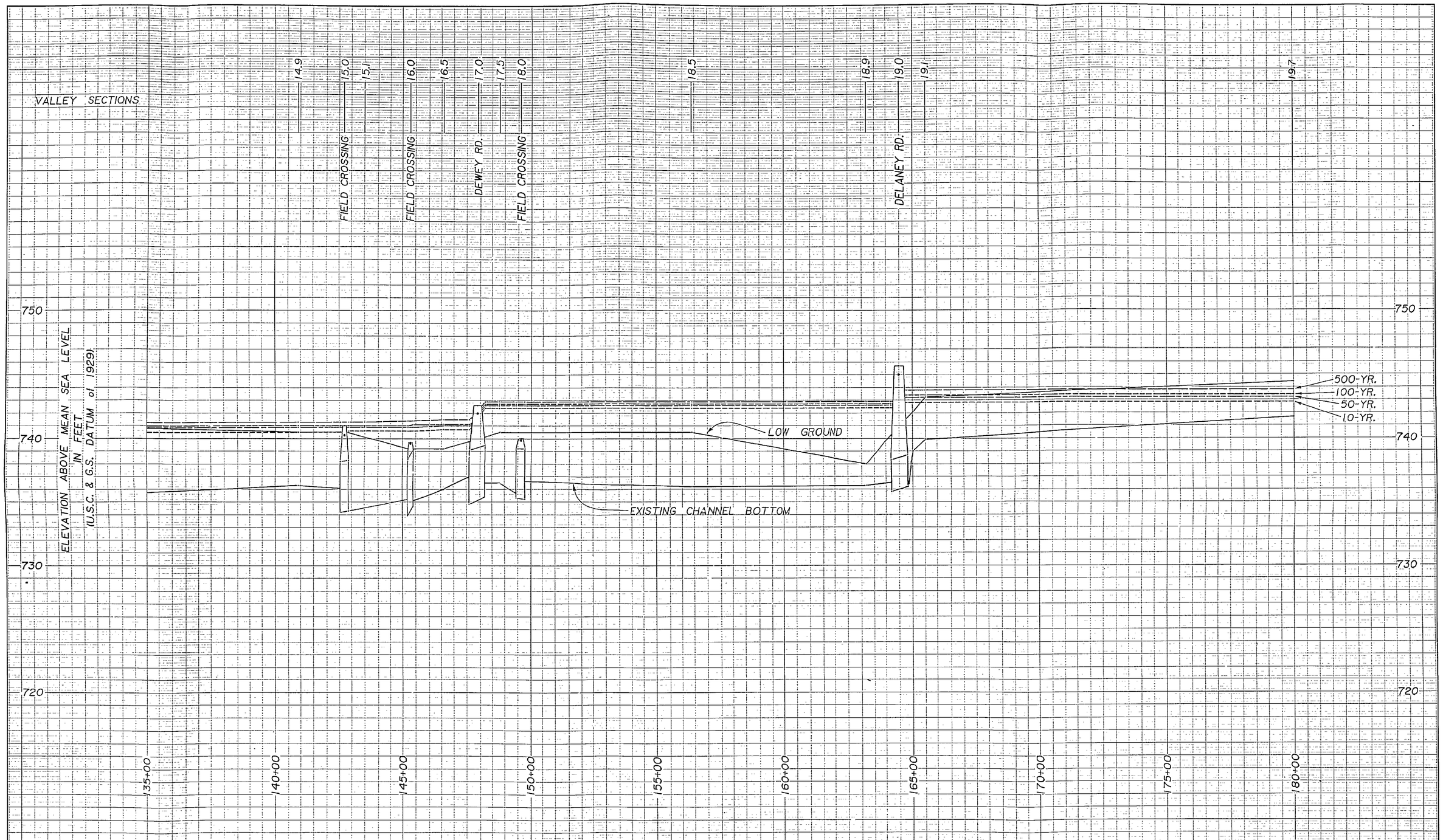

NOTE:
Additional field measured cross-sections may be needed to verify the water surface profile between the cross-sections used in this report. When the difference in the elevation of the channel bottom between cross-sections exceeds 2/3 the depth of flood flows, variations in the channel bottom can cause significant changes in the flood profiles.

HIGH WATER PROFILES
OWOSSO DRAIN
FLOOD PLAIN MANAGEMENT STUDY
SHIAWASSEE COUNTY, MICHIGAN

U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

Designed T.D. BOURDON	Date 6/94	Approved By	Title
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Traced			
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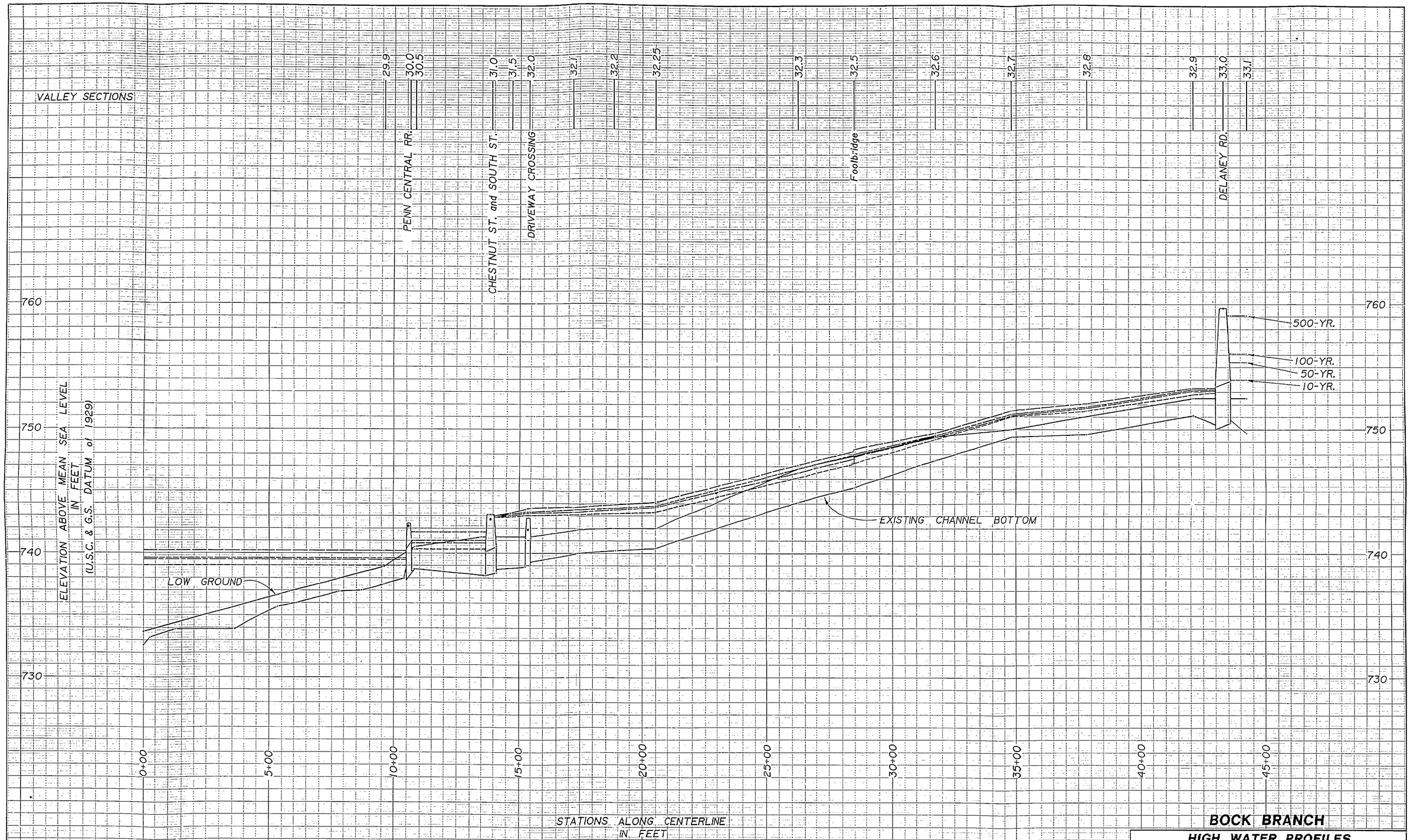


NOTE:
Additional field measured cross-sections may be needed to verify the water surface profile between the cross-sections used in this report. When the difference in the elevation of the channel bottom between cross-sections exceeds 2/3 the depth of flood flows, variations in the channel bottom can cause significant changes in the flood profiles.

BOCK BRANCH

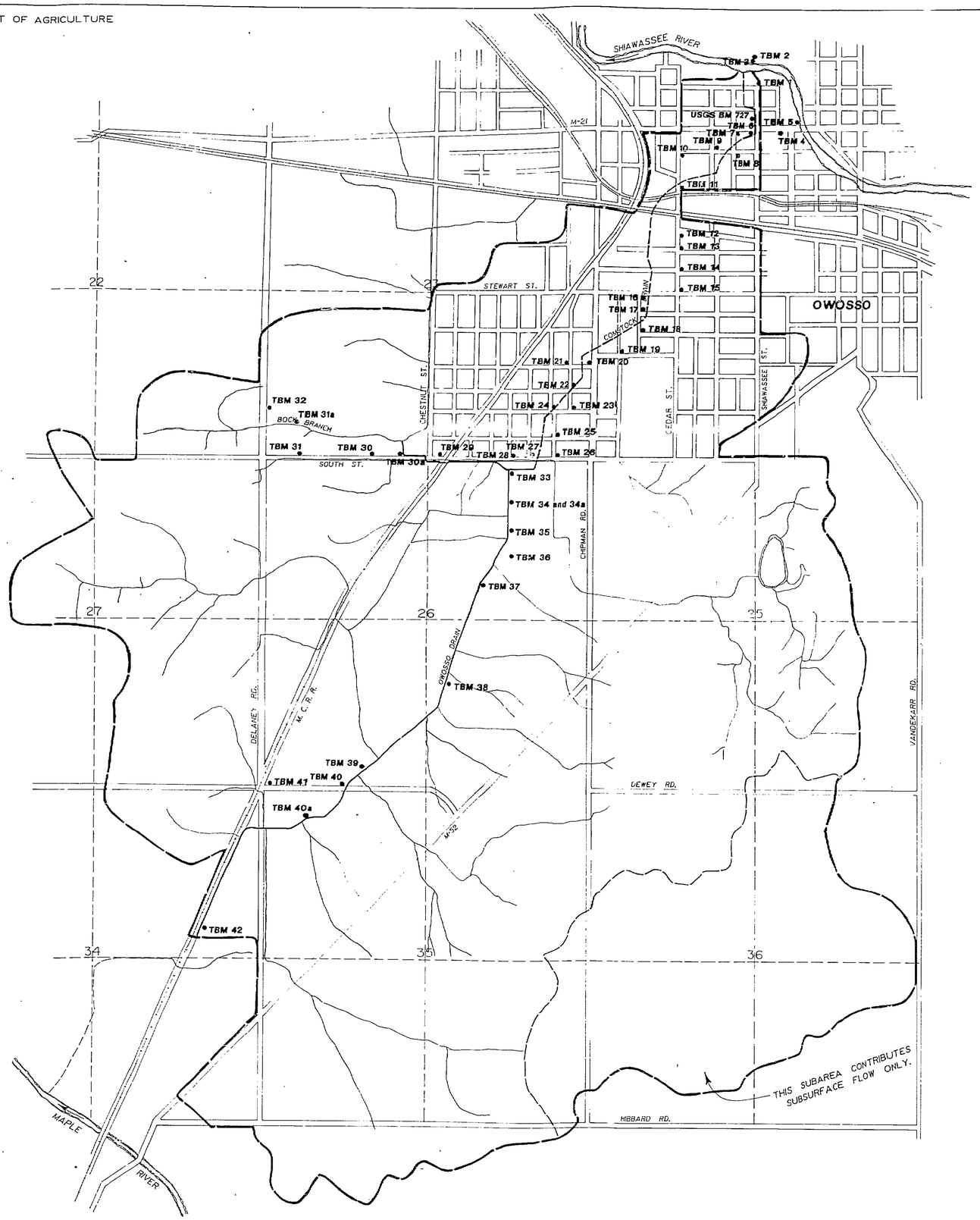
HIGH WATER PROFILES
OWOSSO DRAIN
FLOOD PLAIN MANAGEMENT STUDY
SHIAWASSEE COUNTY, MICHIGAN

U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

Designed T.D. BOURDON	Date 6/94	Approved By	
Drawn L.A. WILSON	6/94	Title	
Traced		Title	
Checked MDNR	7/94	Sheet No. 5 of 5	Drawing No.

U.S. DEPARTMENT OF AGRICULTURE

SOIL CONSERVATION SERVICE



VICINITY MAP

LEGEND

- Road
- Storm Sewer
- Open Drain
- Railroad
- Watershed Boundary
- Narrow Stream
- Subarea Boundary
- Bench Mark • TBM 24

FIGURE 3

BENCH MARK LOCATION MAP

Owosso and Comstock Drainage District

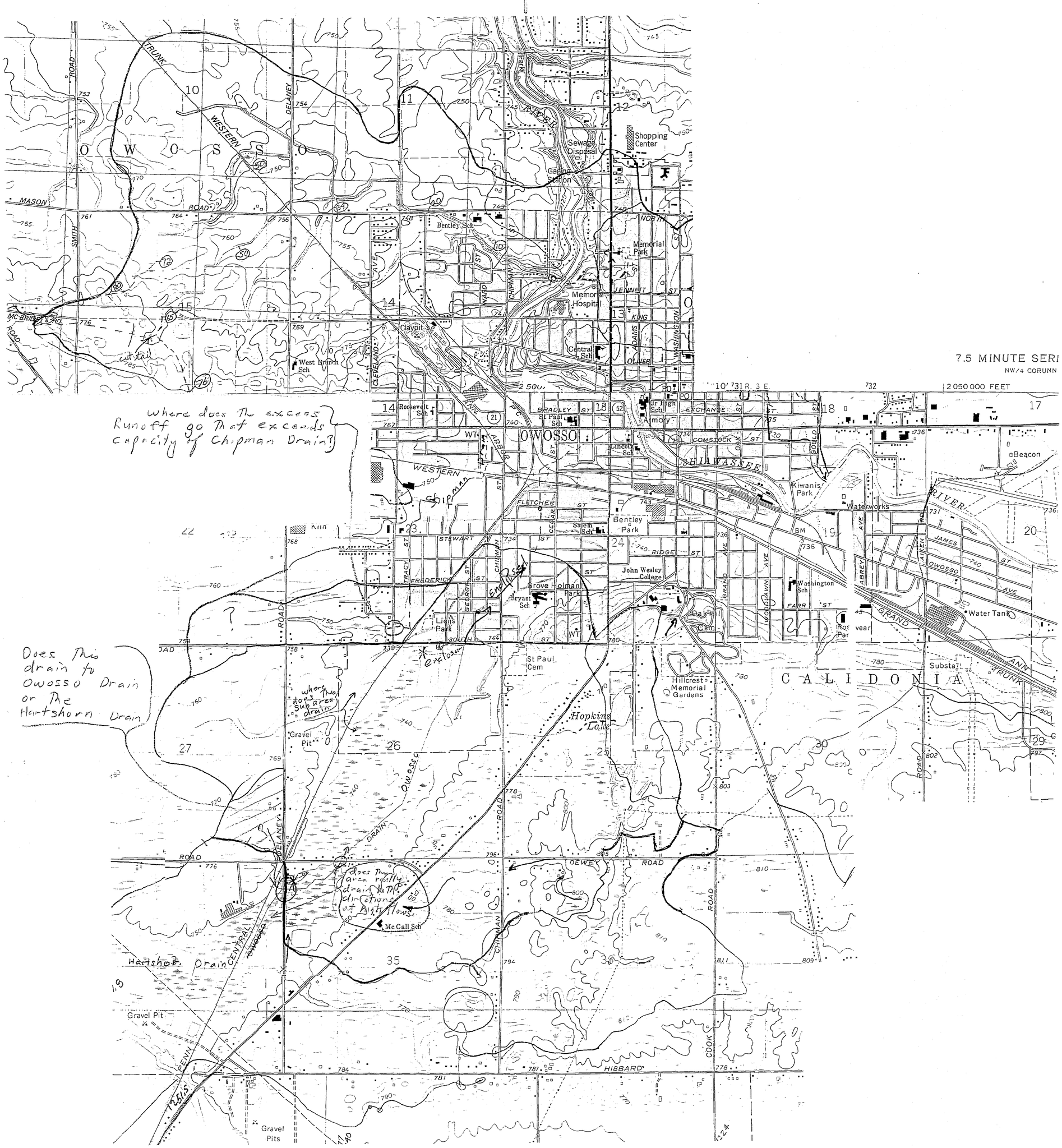
FLOOD PLAIN MANAGEMENT STUDY

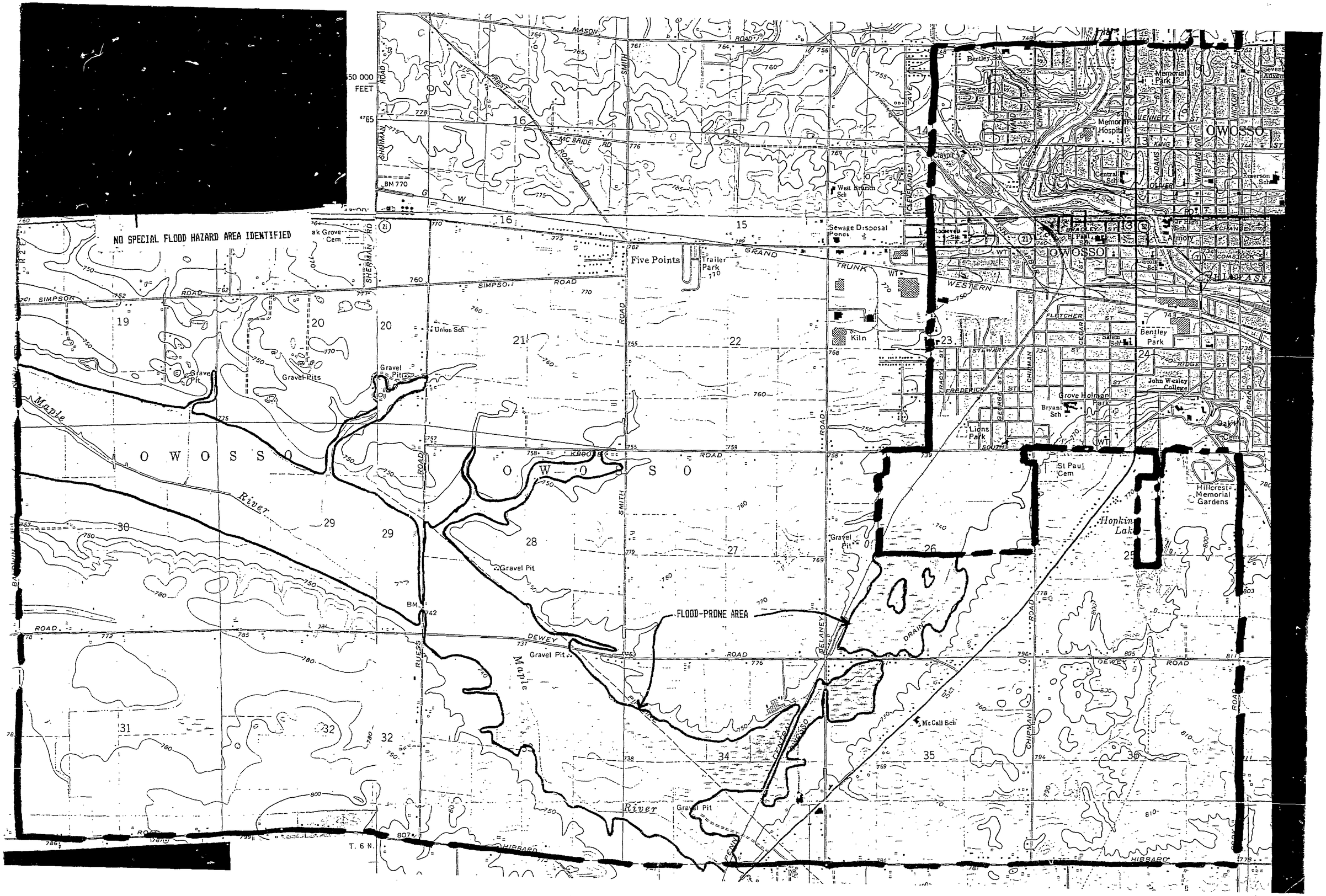
SHIAWASSEE COUNTY, MICHIGAN

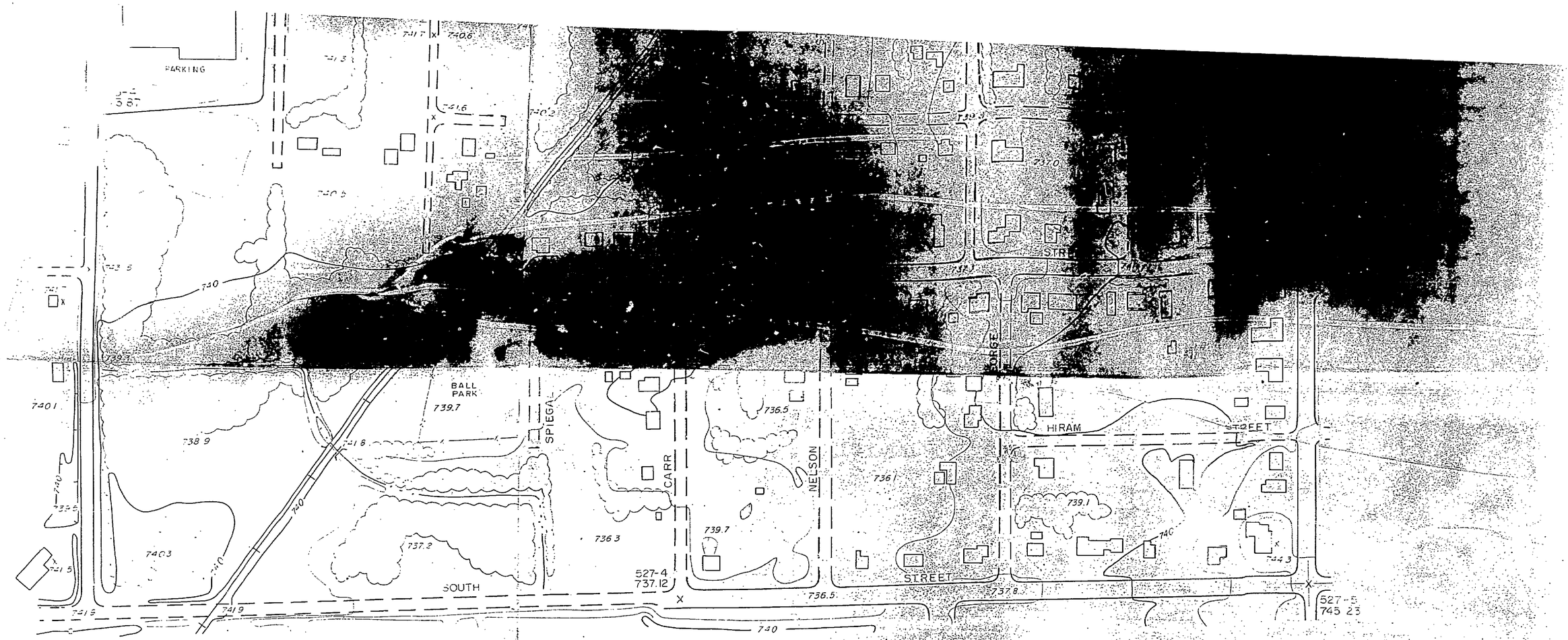
1000 500 0 1000 2000
Approximate Scale - Feet

500 0 500
Approximate Scale - Meters

BASE COMPILED FROM DEPARTMENT OF ENGINEERING, OWOSSO, MICHIGAN, OWOSSO AND COMSTOCK DRAINAGE DISTRICT MAP.


7.5 MINUTE SERI
NW/4 CORUNN
OWOSSO
CALEDONIA
TRUNK
WESTERN
DELANEY
MASON ROAD
SMITH
MC BRIDE RD
Sewage Disposal
Shopping Center
Gasing Station
Bentley Sch
Memorial Park
Memorial Hospital
Claypit
West Branch Sch
Central Sch
Roosevelt Sch
Jr High Sch
Armory
St Paul Sch
Lincoln Sch
Kiwanis Park
Waterworks
Beacon
Bentley Park
Salem Sch
John Wesley College
Grove Holman Park
Bryant Sch
Lions Park
Washington Sch
Oakhill Cem
Water Tank
Substa
St Paul Cem
Hillcrest Memorial Gardens
Hopkins Lake
Gravel Pit
Mc Call Sch
Gravel Pits
Kiln
Hartshorn Drain
CENTRAL
OWOSSO
DRAIN
DEWEY ROAD
HIBBARD
COOK
PENN
CHIPMAN
GRAND
ANN
TRUNK
SHIAWASSEE
RIVER
Does this drain to Owosso Drain or the Hartshorn Drain
where does the excess Runoff go that exceeds capacity of Chipman Drain?
where does sub area drain
does this area really drain in the directions at this house.
Enclosure


NO SPECIAL FLOOD HAZARD AREA IDENTIFIED
FLOOD-PRONE AREA
OWOSSO
Maple River
Five Points
Trailer Park
Sewage Disposal Ponds
Kiln
Gravel Pits
Gravel Pit
Union Sch
West Kromen Sch
Bentley Sch
Memorial Park
Memorial Hospital
Claypit
Central Sch
Emerson Sch
Roosevelt Sch
St Paul Sch
Armory
Lincoln Sch
Salem Sch
Bentley Park
John Wesley College
Grove Holman Park
Bryant Sch
Lions Park
St Paul Cem
Hillcrest Memorial Gardens
Hopkins Lake
McCall Sch
Oak Grove Cem
GRAND TRUNK WESTERN
SIMPSON ROAD
MASON ROAD
MC BRIDE RD
KROUSE ROAD
DEWEY ROAD
HIBBARD ROAD
SHERMAN RD
SMITH ROAD
RUESS ROAD
DELANEY ROAD
CHIPMAN ROAD
CLEVELAND AVE
BRADLEY ST
FLETCHER ST
FREDERICK ST
GEORGE ST
CEDAR ST
WARD ST
RIDGE ST
COMSTOCK
HICKORY
ADAMS
WASHINGTON
OLIVER
KING
BENNETT
CENTRAL
PENN
DRAIN
T. 6 N.
550 000 FEET
4765



N

200 400 600

CONTOUR INTERVAL 2'

SHEET INDEX

14	13	18
23	24	19

OWOSSO TWP. CALEDONIA TWP.

TOPOGRAPHIC MAP

CITY OF OWOSSO, MICHIGAN

E 1/4 SEC. 23, OWOSSO TWP.,

SHIAWASSEE COUNTY, MICHIGAN

DATE OF PHOTOGRAPHY JANUARY 1973 DATE OF MAPPING APRIL 1974

COMPILED BY PHOTOGRAMMETRIC METHODS

BY

ABRAMS AERIAL SURVEY CORPORATION

LANSING, MICHIGAN

LEGEND

- 100 YEAR FLOOD HAZARD
- 500 YEAR FLOOD HAZARD
- VALLEY SECTION LOCATION
- STREAM CHANNEL
- 0+00 CHANNEL STATION

NOTE:
LIMITS OF FLOODING SHOWN MAY VARY FROM ACTUAL LOCATIONS ON THE GROUND AND DUE TO INHERENT AERIAL PHOTOGRAPHIC DISPLACEMENT, THE PHOTOGRAPHIC IMAGE MAY VARY FROM TRUE GROUND LOCATION.

SCALE 0 400 800 FEET
0 100 200 METERS
APPROXIMATE

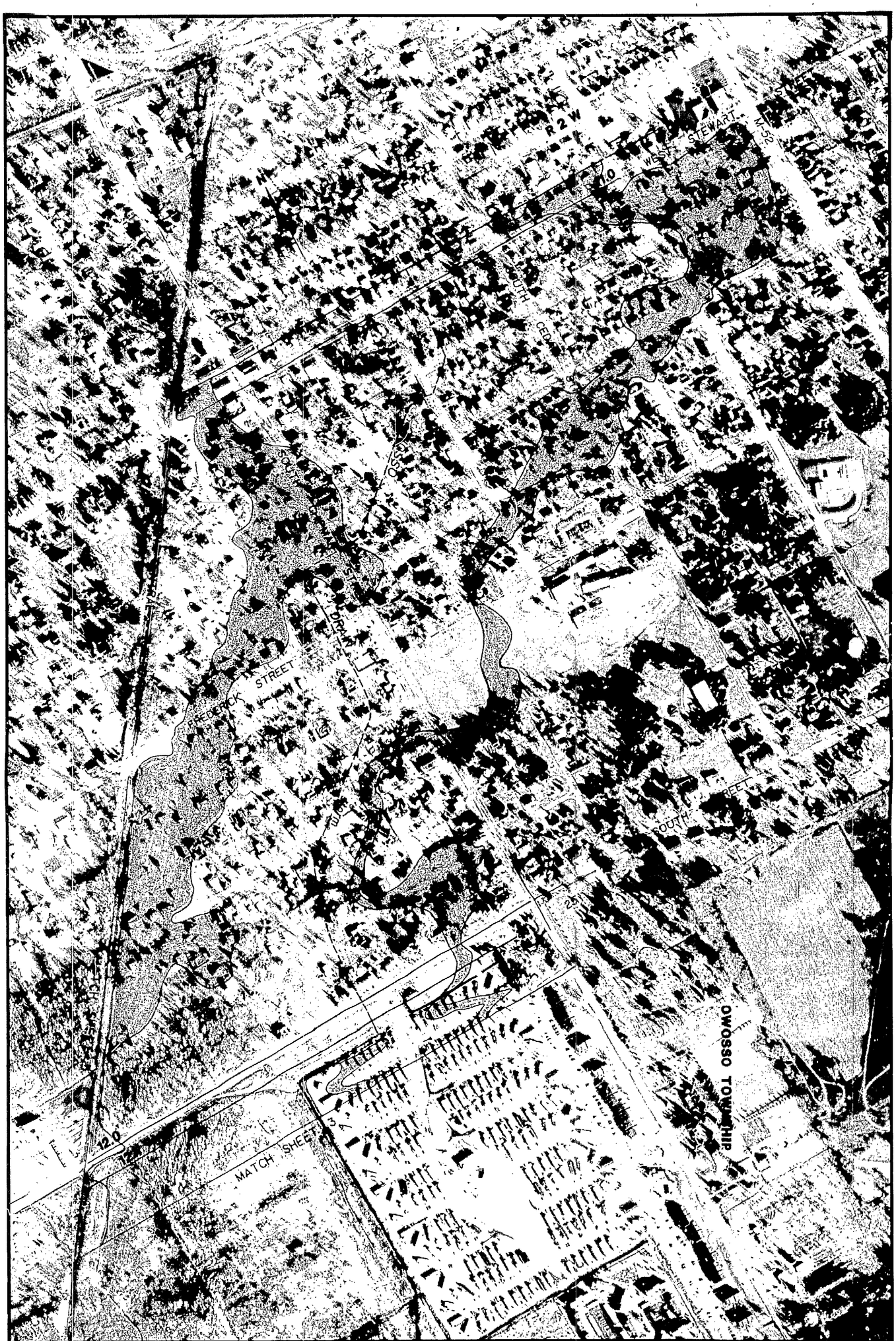
1991 PHOTOGRAPHY FROM NORTHERN AERIAL SURVEY INC.

U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

OWOSSO DRAIN
FLOOD PLAIN MANAGEMENT STUDY

SHIAWASSEE COUNTY, MICHIGAN

SHEET 1 OF 5



LEGEND

- 100 YEAR FLOOD HAZARD
- 500 YEAR FLOOD HAZARD
- VALLEY SECTION LOCATION
- STREAM CHANNEL
- 0+00 CHANNEL STATION

NOTE:
LIMITS OF FLOODING SHOWN MAY VARY FROM ACTUAL LOCATIONS ON THE GROUND AND DUE TO INHERENT AERIAL PHOTOGRAPHIC DISPLACEMENT, THE PHOTOGRAPHIC IMAGE MAY VARY FROM TRUE GROUND LOCATION.

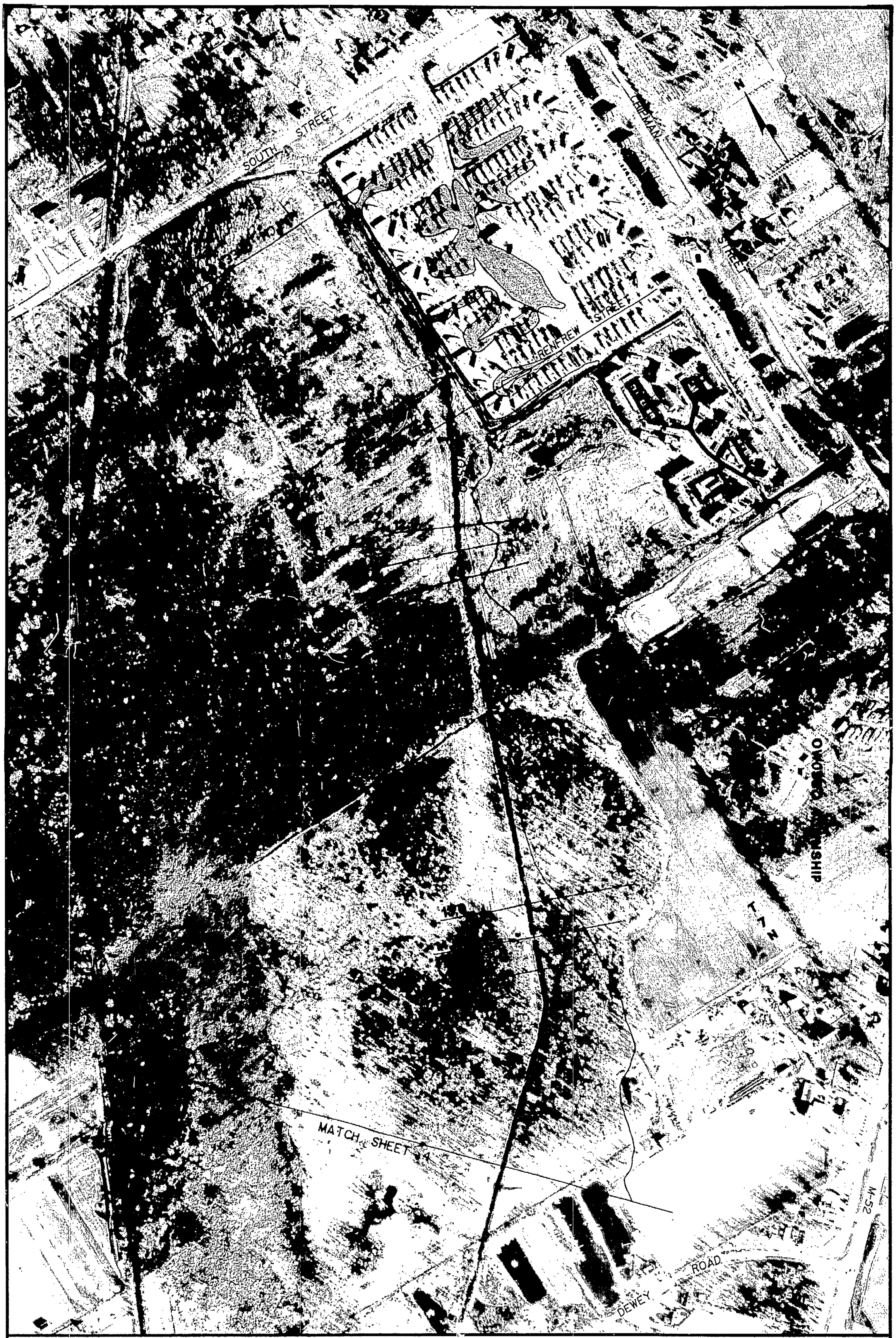
SCALE 0 400 800 FEET
0 100 200 METERS
APPROXIMATE

1991 PHOTOGRAPHY FROM NORTHERN AERIAL SURVEY INC.

SHEET 2 OF 5

U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

OWOSSO DRAIN
FLOOD PLAIN MANAGEMENT STUDY
SHIAWASSEE COUNTY, MICHIGAN



LEGEND

- 100 YEAR FLOOD HAZARD
- 500 YEAR FLOOD HAZARD
- VALLEY SECTION LOCATION
- STREAM CHANNEL
- 0+00 CHANNEL STATION

NOTE:
LIMITS OF FLOODING SHOWN MAY VARY FROM ACTUAL LOCATIONS ON THE GROUND AND DUE TO INHERENT AERIAL PHOTOGRAPHIC DISPLACEMENT, THE PHOTOGRAPHIC IMAGE MAY VARY FROM TRUE GROUND LOCATION.

SCALE 0 400 800 FEET
0 100 200 METERS
APPROXIMATE

1991 PHOTOGRAPHY FROM NORTHERN AERIAL SURVEY INC.

U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

OWOSSO DRAIN
FLOOD PLAIN MANAGEMENT STUDY
SHIAWASSEE COUNTY, MICHIGAN

LEGEND

- 100 YEAR FLOOD HAZARD
- 500 YEAR FLOOD HAZARD
- VALLEY SECTION LOCATION
- STREAM CHANNEL
- 0+00 CHANNEL STATION

NOTE:
LIMITS OF FLOODING SHOWN MAY VARY FROM ACTUAL LOCATIONS ON THE GROUND AND DUE TO INHERENT AERIAL PHOTOGRAPHIC DISPLACEMENT, THE PHOTOGRAPHIC IMAGE MAY VARY FROM TRUE GROUND LOCATION.

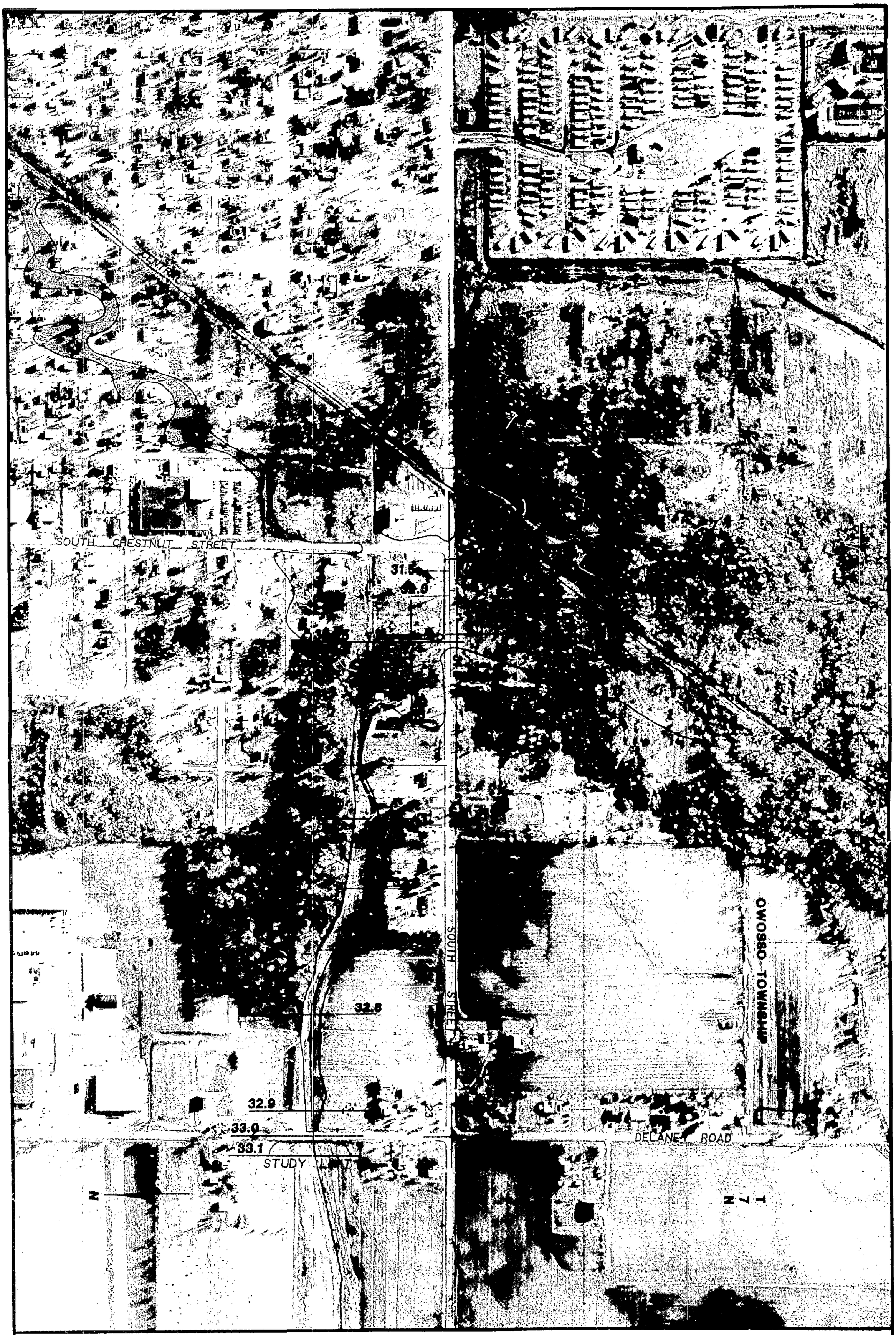
SCALE 0 400 800 FEET
0 100 200 METERS
APPROXIMATE

1991 PHOTOGRAPHY FROM NORTHERN AERIAL SURVEY INC.

U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

OWOSSO DRAIN
FLOOD PLAIN MANAGEMENT STUDY
SHIAWASSEE COUNTY, MICHIGAN

SHEET 4 OF 5



LEGEND

100 YEAR FLOOD HAZARD

500 YEAR FLOOD HAZARD

VALLEY SECTION LOCATION

STREAM CHANNEL

0+00 CHANNEL STATION

NOTE:
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0 100 200 METERS
APPROXIMATE

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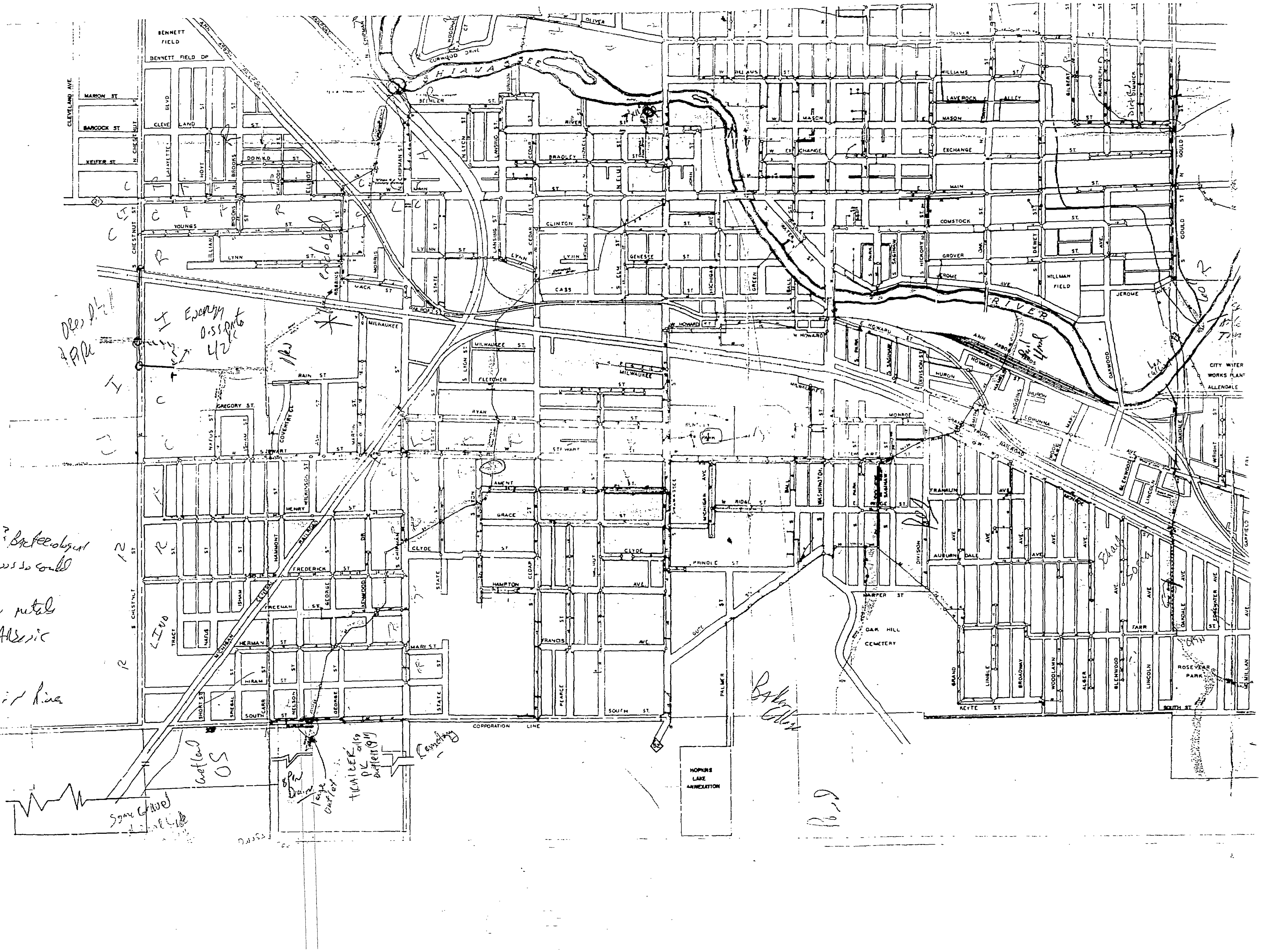
SHIAWASSEE COUNTY, MICHIGAN

SHEET 5 OF 5

Dry Weather

WWTP

WTP



Discharges ? Bacteriological analysis ... could ... dry weather
(Any wettable metals Arsenic
?
? levels in River

GRAND
TRUNK
WESTERN
MILWAUKEE
ST
MACK
STREET
ROBBINS
STREET
STREET
CHESTNUT
STREET
WEST
STEWART
GREGORY
ST
NAFUS
STREET
ISHAM
ST
COVENTRY
COURT
RAIN
STREET
STREET
MARTIN
STREET
CHIPMAN
503-6
763 13
503-7
757 64

00BREAK00

1) COUNTY: SHIAWASSEE

2) STUDY NAME: CALEDONIA TWP

3) WATERCOURSE: SHIAWASSEE RIVER

4) DOCUMENT TYPE: REPORT

00BREAK00

78

HYDRAULIC ANALYSIS REPORT

SHIAWASSEE RIVER AT CALEDONIA TOWNSHIP
SHIAWASSEE COUNTY, MICHIGAN

Prepared by

COMMONWEALTH ASSOCIATES INC.
209 EAST WASHINGTON AVENUE
JACKSON, MICHIGAN 49201

August, 1980

Introduction

Hydraulic calculations were performed for the Shiawassee River from Owosso City to Corunna corporate boundaries in Caledonia Township. Field cross section data were surveyed by Commonwealth Associates in January, 1979. The flood flows for 10-, 50-, 100-, and 500-year recurrence intervals were approved by Michigan DNR. A 2-foot contour map, mapped by Abrams Aerial Survey Corporation in 1969, was used for the study. The results were transferred to an enlarged U.S.G.S. topographic map. This study was performed by Commonwealth Associates Inc., Jackson, Michigan, and the Project Manager was V. Danushkodi, P.E.

Method Analysis

The HEC-2 computer program was utilized in the entire hydraulic analysis.

Variables and Coefficients

Manning's Roughness Coefficients

For channel	0.030-0.031
For overbanks	0.050-0.080

Coefficients for floodway

Contraction	0.10
Expansion	0.30

Coefficients for Bridges

None

Ratios

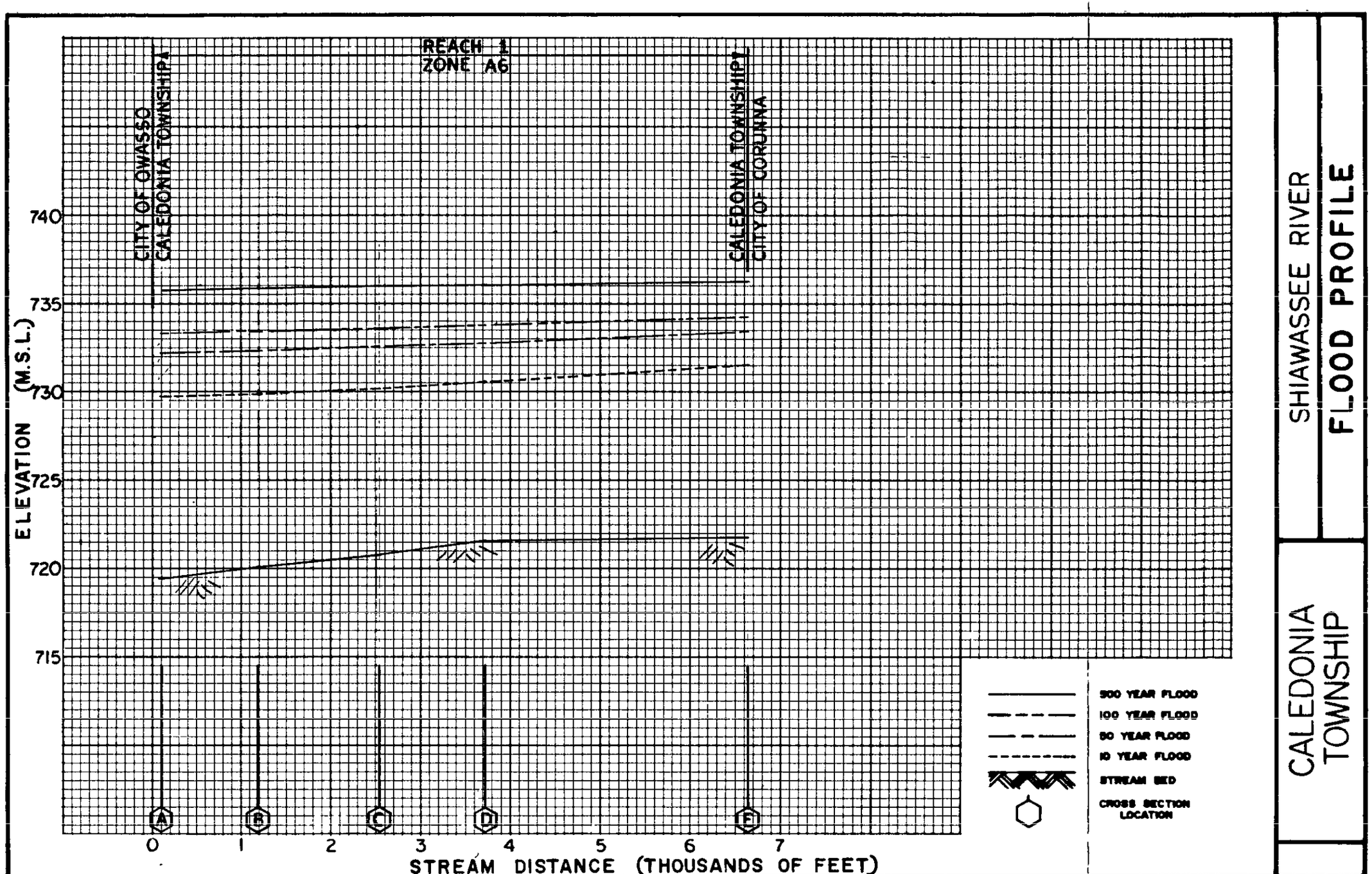
Contraction	1:1
Expansion	1:4

High-Water Marks

None

Starting Conditions

Flood levels determined for the FIS of Owosso by Gove Associates were used to start hydraulic calculations.


REACH 1
ZONE A6
CITY OF OWASSO
CALEDONIA TOWNSHIP
CALEDONIA TOWNSHIP
CITY OF CORUNNA
ELEVATION (M.S.L.)
740
735
730
725
720
715
A
B
C
D
F
0
1
2
3
4
5
6
7
STREAM DISTANCE (THOUSANDS OF FEET)
500 YEAR FLOOD
100 YEAR FLOOD
50 YEAR FLOOD
10 YEAR FLOOD
STREAM BED
CROSS SECTION LOCATION
SHIAWASSEE RIVER
FLOOD PROFILE
CALEDONIA TOWNSHIP

Special Problems

Gove Associates extended their hydraulic analysis by using the cross sections 249350, 250350, 3 and 4 obtained for the present study. The results shown in this report are basically the same as those of Gove Associates. However, minor corrections were made to their model to match the computer printout with the floodway map. Also, it was necessary to continue the hydraulics by one more section up to Corunna corporate boundary line.

References

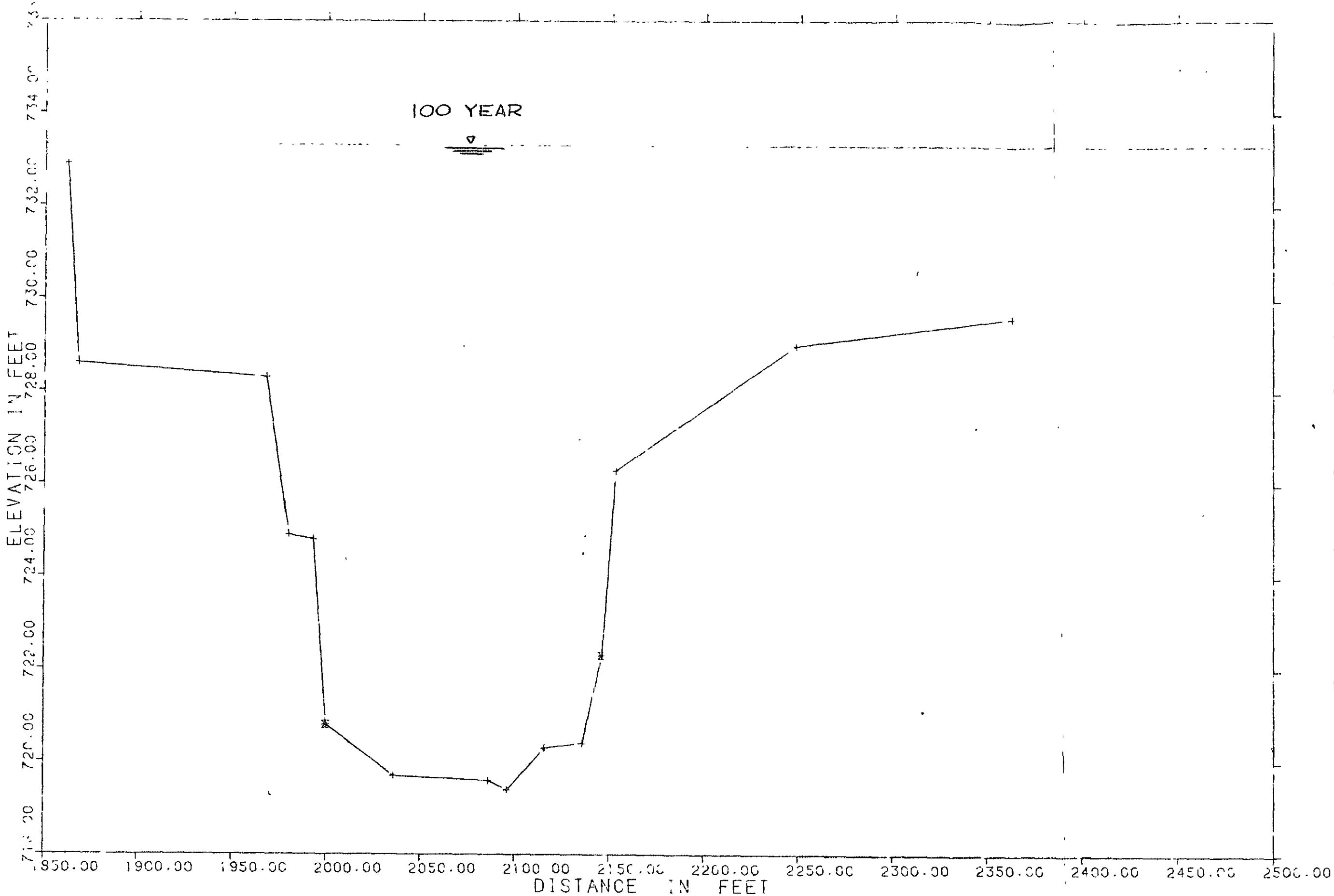
None

Cross Section Reference

SECNO	ID in Profile	Description
249350	A	Surveyed valley section
250350	B	Gove Associates section
3	C	Surveyed valley section
4	D	Surveyed valley section
5	E	Surveyed valley section

Bridge Notes and Sketches

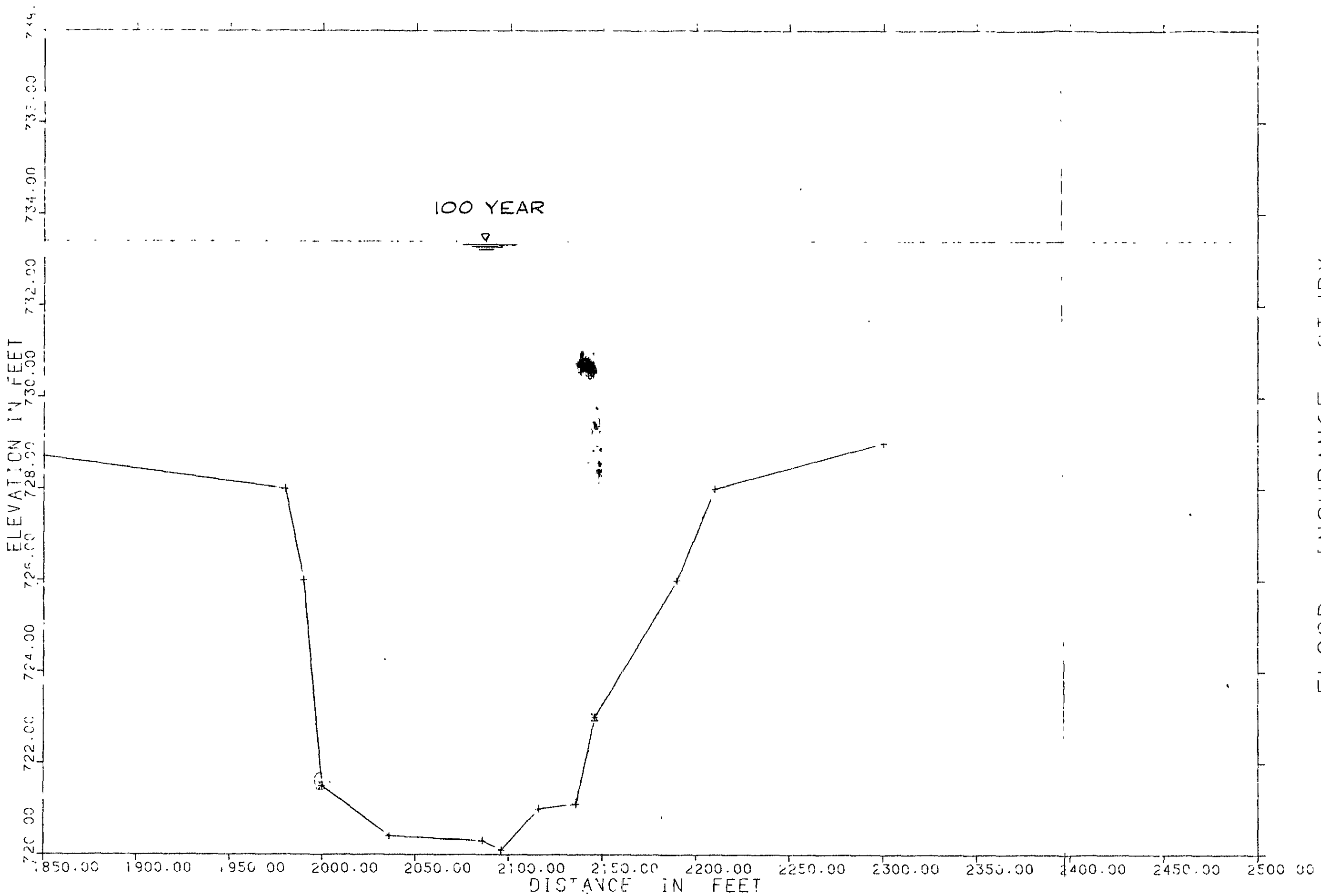
None



SECTION NO. 249349.999

FLOOD INSURANCE STUDY

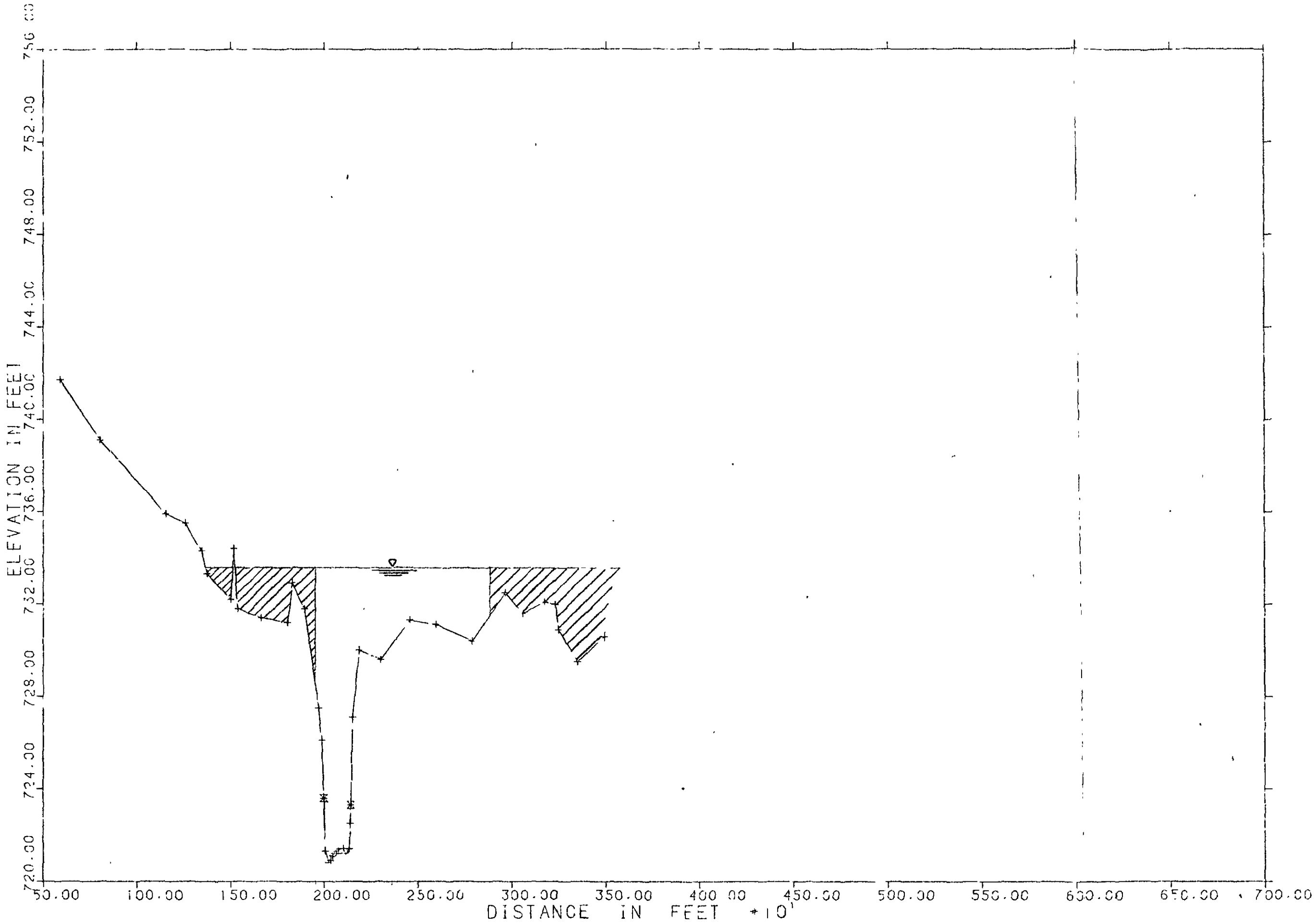
SHIAWASSEE RIVER, CALEDONIA



SECTION NO. 250349.999

FLOOD INSURANCE STUDY

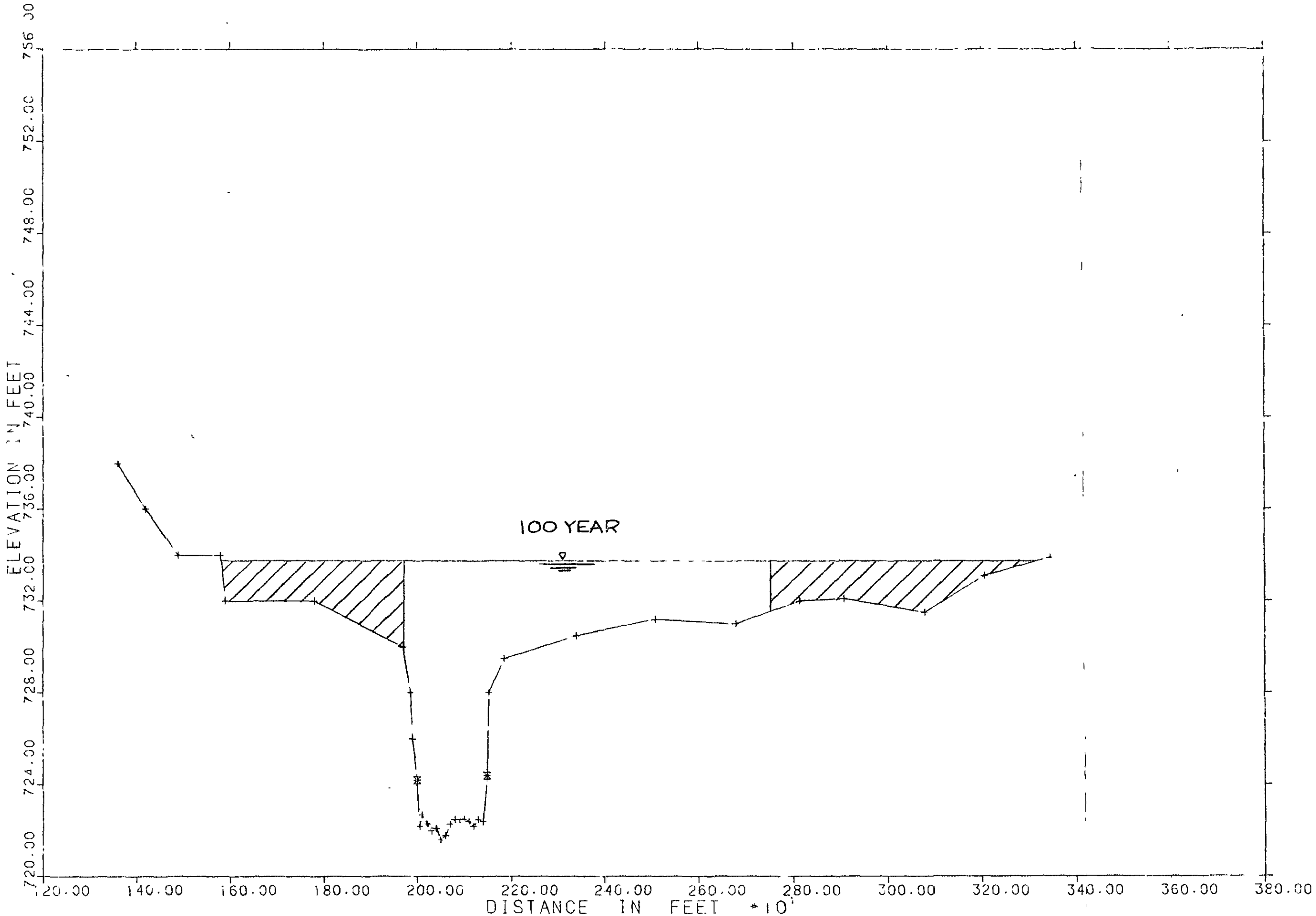
SHIAWASSEE RIVER, CALEDONIA



SECTION NO. 3.000

FLOOD INSURANCE STUDY

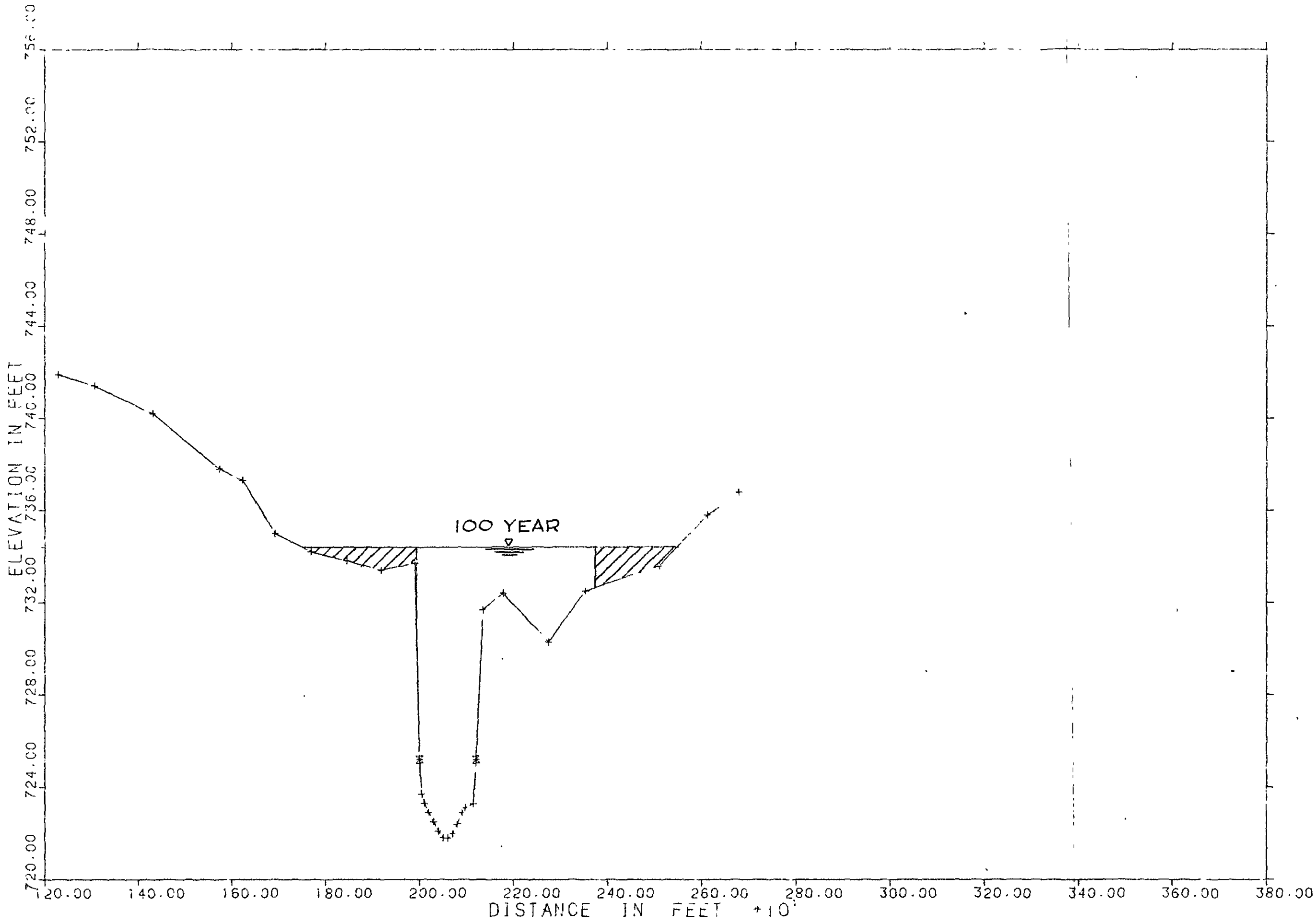
SHIAWASSEE RIVER, CALEDONIA



SECTION NO. 4.000

FLOOD INSURANCE STUDY

SHIAWASSEE RIVER, CALEDONIA



SECTION NO. 5.000

FLOOD INSURANCE STUDY

SHIAWASSEE RIVER, CALEDONIA

RECEIVED
SEP 1 8 1980
WATER MANAGEMENT

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*****************************************************
  HEC2 RELEASE DATED NOV 76 UPDATED APRI 1980
  ERROR CORR -  01,02,03,04
  MODIFICATION -  50,51,52,53,54
*****************************************************

C
T1      CALEDONIA  TOWNSHIP  SHIAWASSEE COUNTY
T2      100 YEAR FLOOD PROFILE STARTING WSEL PROVIDED BY GOVE ASSOCIATES
T3      SHIAWASSEE RIVER

J1  ICHECK     INQ       NINV      IDIR      STRT      METRIC    HVINS     Q         WSEL      FQ
     -1.        4.        0.        0.  0.000000      0.00       0.0       0.   733.300    0.000
J2  NPROF      IPLOT     PRFVS     XSECV     XSECH     FN        ALLDC     IBW       CHNIM     ITRACE
     1.000     0.000    -1.000     0.000     0.000     0.000     0.000     0.000     0.000    15.000
J3  VARIABLE CODES FOR SUMMARY PRINTOUT
    38.000     1.000    53.000    21.000    22.000    54.000     4.000    39.000   150.000   200.000

QT      6.000  4610.000  6450.000  7250.000  9130.000  7250.000  7250.000     0.000     0.000     0.000
NC       .050      .050      .031      .100      .300     0.000     0.000     0.000     0.000     0.000

        SURVEYED VALLEY SECTION A

X1 249350.000    15.000  2000.000  2146.000     0.000     0.000     0.000     0.000     0.000     0.000
GR     732.900  1862.000   728.600  1868.000   728.300  1968.000   724.900  1980.000   724.800  1993.000
GR     720.800  2000.000   719.700  2036.000   719.600  2086.000   719.400  2096.000   720.300  2116.000
GR     720.400  2136.000   722.300  2146.000   726.300  2153.000   729.000  2248.000   729.600  2362.000
NC        .060      .060      .030     0.000     0.000     0.000     0.000     0.000     0.000     0.000

        MADE UP VALLEY SECTION B

X1 250350.000    13.000  2000.000  2146.000   600.000  1090.000  1090.000     0.000     0.000     0.000
GR     728.700  1850.000   728.000  1980.000   726.000  1990.000   721.500  2000.000   720.400  2036.000
GR     720.300  2086.000   720.100  2096.000   721.000  2116.000   721.100  2136.000   723.000  2146.000
GR     726.000  2190.000   728.000  2210.000   729.000  2300.000     0.000     0.000     0.000     0.000
NC        .080      .070      .030     0.000     0.000     0.000     0.000     0.000     0.000     0.000
ET       0.000     0.000     0.000     0.000     0.000     9.100     0.000     0.000  1955.000  2885.000

        SURVEYED VALLEY SECTION C
```

X1	3.000	44.000	2000.000	2144.000	1355.000	1355.000	1355.000	0.000	0.000	0.000
GR	741.700	588.000	739.100	806.000	735.900	1155.000	735.500	1258.000	734.300	1345.000
GR	733.300	1373.000	732.200	1501.000	734.400	1516.000	731.800	1536.000	731.400	1662.000
GR	731.200	1804.000	732.900	1828.000	731.800	1894.000	727.500	1972.000	726.100	1989.000
GR	723.600	2000.000	721.300	2007.000	720.800	2025.000	720.900	2035.000	721.100	2045.000
GR	721.200	2055.000	721.300	2065.000	721.300	2075.000	721.400	2085.000	721.200	2095.000
GR	721.400	2105.000	721.100	2115.000	721.200	2125.000	721.400	2135.000	722.500	2140.000
GR	723.300	2144.000	727.100	2152.000	730.000	2187.000	729.600	2304.000	731.300	2459.000
GR	731.100	2596.000	730.400	2791.000	732.500	2965.000	731.600	3059.000	732.100	3175.000
GR	732.000	3231.000	730.900	3248.000	729.500	3350.000	730.600	3490.000	0.000	0.000
ET	0.000	0.000	0.000	0.000	0.000	9.100	0.000	0.000	1970.000	2750.000

SURVEYED VALLEY SECTION D

X1	4.000	37.000	2000.000	2149.000	1650.000	1650.000	1650.000	0.000	0.000	0.000
GR	738.000	1360.000	736.000	1420.000	734.000	1490.000	734.000	1580.000	732.000	1590.000
GR	732.000	1780.000	730.000	1970.000	728.000	1985.000	726.000	1990.000	726.000	1990.000
GR	724.200	2000.000	722.200	2005.000	722.700	2010.000	722.300	2020.000	722.000	2030.000
GR	722.100	2040.000	721.600	2050.000	721.800	2060.000	722.300	2070.000	722.500	2080.000
GR	722.500	2090.000	722.500	2100.000	722.400	2110.000	722.200	2120.000	722.500	2130.000
GR	722.400	2140.000	724.400	2149.000	728.000	2152.000	729.500	2185.000	730.500	2339.000
GR	731.200	2507.000	731.000	2679.000	732.000	2813.000	732.100	2907.000	731.500	3079.000
GR	733.100	3205.000	733.900	3345.000	0.000	0.000	0.000	0.000	0.000	0.000
QT	6.000	4570.000	6410.000	7200.000	9070.000	7200.000	7200.000	0.000	0.000	0.000
NC	.070	.070	.030	0.000	0.000	0.000	0.000	0.000	0.000	0.000
ET	0.000	0.000	0.000	0.000	0.000	1.400	0.000	0.000	0.000	0.000

SURVEYED VALLEY SECTION E

X1	5.000	31.000	2000.000	2120.000	2910.000	2910.000	2910.000	0.000	0.000	0.000
GR	741.900	1229.000	741.400	1307.000	740.200	1432.000	737.800	1574.000	737.300	1624.000
GR	735.000	1693.000	734.200	1770.000	733.800	1846.000	733.400	1919.000	733.700	1991.000
GR	725.200	2000.000	723.700	2005.000	723.300	2010.000	722.900	2020.000	722.500	2030.000
GR	722.100	2040.000	721.800	2050.000	721.800	2060.000	722.000	2070.000	722.400	2080.000
GR	722.900	2090.000	723.100	2097.000	723.300	2114.000	725.200	2120.000	731.700	2135.000
GR	732.400	2178.000	730.300	2275.000	732.500	2353.000	733.600	2510.000	735.800	2613.000
GR	736.800	2680.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
EJ	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

```
   SECNO     DEPTH     CWSEL     CRIWS     WSELK     EG        HV        HL        OLOSS    BANK ELEV
   Q         QLOB      GCH       QROB      ALOB      ACH       AROB      VOL       TWA    LEFT/RIGHT
   TIME      VLOB      VCH       VROB      XNL       XNCH      XNR       WTN       ELMIN       SSTA
   SLOPE     XLOBL     XLCH      XLOBR     ITRIAL    IDC       ICONT     CORAR     TOPWID      ENDST

*PROF 1

CCHV=     .100 CEHV=     .300
*SECNO 249350.000
3280 CROSS SECTION 249350.00 EXTENDED      3.70 FEET

        SURVEYED VALLEY SECTION A

249350.00     13.90    733.30      0.00    733.30    733.40       .10      0.00      0.00    720.80
     7250.      777.     5506.      967.      764.     1938.     1056.        0.        0.    722.30
      0.00      1.02      2.84       .92      .050      .031      .050     0.000    719.40   1862.00
   .000112        0.        0.        0.         0         0         0      0.00    500.00   2362.00

FLOW DISTRIBUTION FOR SECNO= 249350.00          CWSEL=    733.30

STA=     1862.     1868.     1968.     1980.     1993.     2000.     2146.     2153.     2248.     2362.
  PER Q=      .1       6.0       1.2       2.0       1.4      75.9       1.1       7.4       4.9
   AREA=    15.3     485.0      80.4     109.8      73.5    1937.8      63.0     536.7     456.0
    VEL=      .5        .9       1.1       1.3       1.4       2.8       1.2       1.0        .8

*SECNO 250350.000
3280 CROSS SECTION 250350.00 EXTENDED      4.70 FEET

        MADE UP VALLEY SECTION B

250350.00     13.31    733.41      0.00      0.00    733.53       .11       .12       .00    721.50
     7250.      703.     5611.      936.      818.     1851.      961.       84.       10.    723.00
       .11       .86      3.03       .97      .060      .030      .060      .031    720.10   1850.00
   .000127      600.     1090.     1090.         0         0         0      0.00    450.00   2300.00

FLOW DISTRIBUTION FOR SECNO= 250350.00          CWSEL=    733.41

STA=     1850.     1980.     1990.     2000.     2146.     2190.     2210.     2300.
  PER Q=      7.3       .8       1.6      77.4       6.5       1.7       4.7
   AREA=   657.0      64.0      96.5    1850.8     391.8     128.1     441.3
    VEL=      .8        .9       1.2       3.0       1.2       1.0        .8

*SECNO 3.000

3265 DIVIDED FLOW
```

```
  SECNO     DEPTH     CWSEL     CRIWS     WSELK     EG        HV        HL        OLOSS    BANK ELEV
  Q         QLOB      QCH       QROB      ALOB      ACH       AROB      VOL       TWA    LEFT/RIGHT
  TIME      VLOB      VCH       VROB      XNL       XNCH      XNR       WTN       ELMIN       SSTA
  SLOPE     XLOBL     XLCH      XLOBR     ITRIAL    IDC       ICONT     CORAR     TOPWID      ENDST

3280 CROSS SECTION      3.00 EXTENDED      3.01 FEET
       SURVEYED VALLEY SECTION C

    3.00     12.81    733.61      0.00      0.00    733.69       .08       .16       .00    723.60
   7250.       556.     4927.     1767.     1353.     1770.     3763.      247.       50.    723.30
     .30       .41      2.78       .47      .080      .030      .070      .031    720.80   1364.36
 .000112     1355.     1355.     1355.         2         0         0      0.00   2114.16   3490.00

FLOW DISTRIBUTION FOR SECNO=      3.00          CWSEL=    733.61

STA=     1364.     1828.     1989.     2000.     2144.     2304.     2459.     2791.     3175.     3490.
  PER Q=     3.1       3.5       1.1      68.0       5.8       3.3       5.3       3.5       6.5
   AREA=   748.9     507.6      96.3    1770.2     689.9     489.6     887.4     726.1     969.9
    VEL=      .3        .5        .8       2.8        .6        .5        .4        .3        .5

*SECNO 4.000
       SURVEYED VALLEY SECTION D

    4.00     12.20    733.80      0.00      0.00    733.91       .11       .21       .01    724.20
   7250.       519.     5286.     1445.     1077.     1706.     2790.      483.      123.    724.40
     .49       .48      3.10       .52      .080      .030      .070      .030    721.60   1580.97
 .000153     1650.     1650.     1650.         0         0         0      0.00   1747.52   3328.49

FLOW DISTRIBUTION FOR SECNO=      4.00          CWSEL=    733.80

STA=     1581.     1970.     2000.     2149.     2339.     2507.     2679.     3079.     3328.
  PER Q=     5.0       2.2      72.9       7.2       3.7       3.3       4.8       1.0
   AREA=   884.3     193.2    1705.7     775.7     496.5     465.4     819.0     233.3
    VEL=      .4        .8       3.1        .7        .5        .5        .4        .3

*SECNO 5.000
       SURVEYED VALLEY SECTION E

    5.00     12.50    734.30      0.00      0.00    734.61       .30       .63       .06    725.20
   7200.        77.     6452.      671.      173.     1390.      906.      752.      208.    725.20
     .68       .44      4.64       .74      .070      .030      .070      .030    721.80   1759.94
 .000337     2910.     2910.     2910.         2         0         0      0.00    783.04   2542.98
```

```
   SECNO     DEPTH     CWSEL     CRIWS     WSELK     EG        HV        HL        OLOSS    BANK ELEV
   Q         QLOB      QCH       QROB      ALOB      ACH       AROB      VOL       TWA    LEFT/RIGHT
   TIME      VLOB      VCH       VROB      XNL       XNCH      XNR       WTN       ELMIN       SSTA
   SLOPE     XLOBL     XLCH      XLOBR     ITRIAL    IDC       ICONT     CORAR     TOPWID      ENDST

FLOW DISTRIBUTION FOR SECNO=      5.00          CWSEL=    734.30

STA=     1760.     1846.     1919.     1991.     2000.     2120.     2135.     2178.     2275.     2353.     2510.     2543.
  PER Q=      .1        .2        .2        .5      89.6       1.5        .9       3.2       2.5       1.2        .0
   AREA=    23.7      51.4      54.3      43.7    1389.9      87.8      96.9     286.6     226.6     197.0      11.6
    VEL=      .2        .3        .3        .9       4.6       1.2        .7        .8        .8        .5        .2
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*****************************************************
  HEC2 RELEASE DATED NOV 76 UPDATED APRI 1980
  ERROR CORR -  01,02,03,04
  MODIFICATION -  50,51,52,53,54
*****************************************************
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T1 CALEDONIA TOWNSHIP SHIAWASSEE COUNTY
T2 100 YEAR PROFILE -- FLOODWAY
T3 SHIAWASSEE RIVER

J1	ICHECK	INQ	NINV	IDIR	STRT	METRIC	HVINS	Q	WSEL	FQ
	-10.	6.	0.	0.	0.000000	0.00	0.0	0.	733.300	0.000
J2	NPRCF	IPLOT	PRFVS	XSECV	XSECH	FN	ALLDC	IBW	CHNIM	ITRACE
	15.000	0.000	-10.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

```
   SECNO     DEPTH     CWSEL     CRIWS     WSELK     EG        HV        HL        OLOSS    BANK ELEV
   Q         QLOB      QCH       QROB      ALOB      ACH       AROB      VOL       TWA    LEFT/RIGHT
   TIME      VLOB      VCH       VROB      XNL       XNCH      XNR       WTN       ELMIN       SSTA
   SLOPE     XLOBL     XLCH      XLOBR     ITRIAL    IDC       ICONT     CORAR     TOPWID      ENDST

*PROF 2

CCHV=    .100 CEHV=    .300
*SECNO 249350.000
3280 CROSS SECTION 249350.00 EXTENDED      3.70 FEET

        SURVEYED VALLEY SECTION A

249350.00    13.90   733.30     0.00   733.30   733.40      .10      0.00      0.00   720.80
    7250.      777.    5506.     967.     764.    1938.    1056.       0.        0.   722.30
     0.00     1.02     2.84      .92     .050     .031     .050     0.000   719.40  1862.00
  .000112       0.       0.       0.        0        0        0      0.00   500.00  2362.00

*SECNO 250350.000
3280 CROSS SECTION 250350.00 EXTENDED      4.70 FEET

        MADE UP VALLEY SECTION B

250350.00    13.31   733.41     0.00     0.00   733.53      .11       .12       .00   721.50
    7250.      703.    5611.     936.     818.    1851.     961.       84.       10.   723.00
      .11      .86     3.03      .97     .060     .030     .060      .031   720.10  1850.00
  .000127     600.    1090.    1090.        0        0        0      0.00   450.00  2300.00

*SECNO 3.000
3280 CROSS SECTION      3.00 EXTENDED      2.98 FEET

3470 ENCROACHMENT STATIONS=    1955.0    2885.0  TYPE=     1  TARGET=     930.000
        SURVEYED VALLEY SECTION C

     3.00    12.79   733.59     0.00   733.61   733.72      .13       .19       .00   723.60
    7250.      243.    5695.    1312.     307.    1767.    2296.      208.       32.   723.30
      .25      .79     3.22      .57     .080     .030     .070      .031   720.80  1955.00
  .000151    1355.    1355.    1355.        1        0        0      0.00   930.00  2885.00

*SECNO 4.000

3470 ENCROACHMENT STATIONS=    1970.0    2750.0  TYPE=     1  TARGET=     780.000
        SURVEYED VALLEY SECTION D
```

```
  SECNO     DEPTH     CWSEL     CRIWS     WSELK     EG        HV        HL        OLOSS    BANK ELEV
  G         QLOB      QCH       QROB      ALOB      ACH       AROB      VOL       TWA    LEFT/RIGHT
  TIME      VLOB      VCH       VROB      XNL       XNCH      XNR       WTN       ELMIN       SSTA
  SLOPE     XLOBL     XLCH      XLOBR     ITRIAL    IDC       ICONT     CORAR     TOPWID      ENDST

    4.00     12.25    733.85      0.00    733.80    734.00       .15       .27       .01    724.20
   7250.      167.     5835.     1248.      195.     1712.     1945.      364.      64.     724.40
     .41       .86      3.41       .64      .080      .030      .070      .030    721.60   1970.00
 .000184     1650.     1650.     1650.         2         0         0      0.00    780.00   2750.00

*SECNO 5.000
 2800 NAT Q1=    3920.74  WSEL=     734.30  ENC Q1=    3920.74  WSEL=     734.40  RATIO=  0.0000
 NAT Q1=    4002.  RATIOS LOB,CH,ROB=    .0121    .8905    .0974  WSEL=     734.40

3470 ENCROACHMENT STATIONS=     1997.7     2382.6  TYPE=      4  TARGET=         .020
        SURVEYED VALLEY SECTION E

    5.00     12.64    734.44      0.00    734.30    734.75       .31       .70       .05    725.20
   7200.       11.     6539.      650.       19.     1406.      785.      566.     103.     725.20
     .60       .58      4.65       .83      .070      .030      .070      .030    721.80   1997.69
 .000333     2910.     2910.     2910.         2         0         0      0.00    384.94   2382.63
```

```
*************************************************
  HEC2 RELEASE DATED NOV 76 UPDATED APRI 1980
  ERROR CORR -  01,02,03,04
  MODIFICATION -  50,51,52,53,54
*************************************************
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NOTE- ASTERISK (*) AT LEFT OF CROSS-SECTION NUMBER INDICATES MESSAGE IN SUMMARY OF ERRORS LIST

SHIAWASSEE RIVER

SUMMARY PRINTOUT

SECNO	CWSEL	SSTA	STCHL	STCHR	ENDST	TOPWID	XLCH
249350.000	733.30	1862.00	2000.00	2146.00	2362.00	500.00	0.00
249350.000	733.30	1862.00	2000.00	2146.00	2362.00	500.00	0.00
250350.000	733.41	1850.00	2000.00	2146.00	2300.00	450.00	1090.00
250350.000	733.41	1850.00	2000.00	2146.00	2300.00	450.00	1090.00
3.000	733.61	1364.36	2000.00	2144.00	3490.00	2114.16	1355.00
3.000	733.59	1955.00	2000.00	2144.00	2885.00	930.00	1355.00
4.000	733.80	1580.97	2000.00	2149.00	3328.49	1747.52	1650.00
4.000	733.85	1970.00	2000.00	2149.00	2750.00	780.00	1650.00
5.000	734.30	1759.94	2000.00	2120.00	2542.98	783.04	2910.00
5.000	734.44	1997.69	2000.00	2120.00	2382.63	384.94	2910.00

SHIAWASSEE RIVER

SUMMARY PRINTOUT TABLE 150

SECNO	XLCH	ELTRD	ELLC	ELMIN	Q	CWSEL	CRIWS	EG	10K*S	VCH	AREA	.01K
249350.000	0.00	0.00	0.00	719.40	7250.00	733.30	0.00	733.40	1.12	2.84	3757.60	6850.15
249350.000	0.00	0.00	0.00	719.40	7250.00	733.30	0.00	733.40	1.12	2.84	3757.60	6850.15
250350.000	1090.00	0.00	0.00	720.10	7250.00	733.41	0.00	733.53	1.27	3.03	3629.51	6434.21
250350.000	1090.00	0.00	0.00	720.10	7250.00	733.41	0.00	733.53	1.27	3.03	3629.51	6434.21
3.000	1355.00	0.00	0.00	720.80	7250.00	733.61	0.00	733.69	1.12	2.78	6885.99	6854.36
3.000	1355.00	0.00	0.00	720.80	7250.00	733.59	0.00	733.72	1.51	3.22	4369.51	5909.44
4.000	1650.00	0.00	0.00	721.60	7250.00	733.80	0.00	733.91	1.53	3.10	5573.04	5868.76
4.000	1650.00	0.00	0.00	721.60	7250.00	733.85	0.00	734.00	1.84	3.41	3852.26	5351.36
5.000	2910.00	0.00	0.00	721.80	7200.00	734.30	0.00	734.61	3.37	4.64	2469.49	3920.74
5.000	2910.00	0.00	0.00	721.80	7200.00	734.44	0.00	734.75	3.33	4.65	2209.84	3945.41

SHIAWASSEE RIVER

SUMMARY PRINTOUT TABLE 150

SECNO	Q	CWSEL	DIFWSP	DIFWSX	DIFKWS	TOPWID	XLCH
249350.000	7250.00	733.30	0.00	0.00	0.00	500.00	0.00
249350.000	7250.00	733.30	0.00	0.00	0.00	500.00	0.00
250350.000	7250.00	733.41	0.00	.11	0.00	450.00	1090.00
250350.000	7250.00	733.41	0.00	.11	0.00	450.00	1090.00
3.000	7250.00	733.61	0.00	.20	0.00	2114.16	1355.00
3.000	7250.00	733.59	-.02	.18	-.02	930.00	1355.00
4.000	7250.00	733.80	0.00	.20	0.00	1747.52	1650.00
4.000	7250.00	733.85	.05	.26	.05	780.00	1650.00
5.000	7200.00	734.30	0.00	.50	0.00	783.04	2910.00
5.000	7200.00	734.44	.14	.59	.14	384.94	2910.00

FLOODWAY DATA, SHIAWASSEE RIVER
PROFILE NO. 2

STATION	FLOODWAY WIDTH	FLOODWAY SECTION AREA	FLOODWAY MEAN VELOCITY	WATER SURFACE ELEVATION WITH FLOODWAY	WATER SURFACE ELEVATION WITHOUT FLOODWAY	DIFFERENCE
249350.000	500.	3758.	1.9	733.3	733.3	0.0
250350.000	450.	3630.	2.0	733.4	733.4	0.0
3.000	930.	4370.	1.7	733.6	733.6	0.0
4.000	780.	3852.	1.9	733.8	733.8	0.0
5.000	385.	2210.	3.3	734.4	734.3	.1

```
*****************************************************
  HEC2 RELEASE DATED NOV 76 UPDATED APRI 1980
  ERROR CORR -  01,02,03,04
  MODIFICATION -  50,51,52,53,54
*****************************************************
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NOTE- ASTERISK (*) AT LEFT OF CROSS-SECTION NUMBER INDICATES MESSAGE IN SUMMARY OF ERRORS LIST

SHIAWASSEE RIVER

SUMMARY PRINTOUT

SECNO	CWSEL	SSTA	STCHL	STCHR	ENDST	TOPWID	XLCH
249350.000	729.69	1866.48	2000.00	2146.00	2362.00	495.52	0.00
249350.000	732.20	1862.98	2000.00	2146.00	2362.00	499.02	0.00
249350.000	733.30	1862.00	2000.00	2146.00	2362.00	500.00	0.00
249350.000	735.74	1862.00	2000.00	2146.00	2362.00	500.00	0.00
250350.000	729.89	1850.00	2000.00	2146.00	2300.00	450.00	1090.00
250350.000	732.34	1850.00	2000.00	2146.00	2300.00	450.00	1090.00
250350.000	733.41	1850.00	2000.00	2146.00	2300.00	450.00	1090.00
250350.000	735.82	1850.00	2000.00	2146.00	2300.00	450.00	1090.00
3.000	730.17	1923.70	2000.00	2144.00	3434.37	564.31	1355.00
3.000	732.54	1462.32	2000.00	2144.00	3490.00	1973.33	1355.00
3.000	733.61	1364.36	2000.00	2144.00	3490.00	2114.16	1355.00
3.000	735.99	1145.09	2000.00	2144.00	3490.00	2344.91	1355.00
4.000	730.64	1909.21	2000.00	2149.00	2372.58	463.37	1650.00
4.000	732.82	1585.88	2000.00	2149.00	3183.24	1597.36	1650.00
4.000	733.80	1580.97	2000.00	2149.00	3328.49	1747.52	1650.00
4.000	736.09	1417.41	2000.00	2149.00	3345.00	1927.59	1650.00
5.000	731.61	1993.21	2000.00	2120.00	2321.62	248.95	2910.00
5.000	733.50	1901.25	2000.00	2120.00	2495.34	545.22	2910.00
5.000	734.30	1759.94	2000.00	2120.00	2542.98	783.04	2910.00
5.000	736.33	1653.00	2000.00	2120.00	2648.74	995.75	2910.00

SHIAWASSEE RIVER

SUMMARY PRINTOUT TABLE 150

SECNO	XLCH	ELTRD	ELLC	ELMIN	Q	CWSEL	CRIWS	EG	10K*S	VCH	AREA	.01K
249350.000	0.00	0.00	0.00	719.40	4610.00	729.69	0.00	729.82	1.88	2.98	1959.79	3362.28
249350.000	0.00	0.00	0.00	719.40	6450.00	732.20	0.00	732.31	1.31	2.90	3207.94	5633.21
249350.000	0.00	0.00	0.00	719.40	7250.00	733.30	0.00	733.40	1.12	2.84	3757.60	6850.15
249350.000	0.00	0.00	0.00	719.40	9130.00	735.74	0.00	735.83	.84	2.75	4977.60	9965.43
250350.000	1090.00	0.00	0.00	720.10	4610.00	729.89	0.00	730.02	1.98	3.05	2050.24	3277.54
250350.000	1090.00	0.00	0.00	720.10	6450.00	732.34	0.00	732.45	1.45	3.05	3145.80	5355.12
250350.000	1090.00	0.00	0.00	720.10	7250.00	733.41	0.00	733.53	1.27	3.03	3629.51	6434.21
250350.000	1090.00	0.00	0.00	720.10	9130.00	735.82	0.00	735.93	.99	3.01	4715.80	9176.91
3.000	1355.00	0.00	0.00	720.80	4610.00	730.17	0.00	730.35	2.69	3.46	1651.04	2812.98
3.000	1355.00	0.00	0.00	720.80	6450.00	732.54	0.00	732.66	1.62	3.15	4666.28	5072.60
3.000	1355.00	0.00	0.00	720.80	7250.00	733.61	0.00	733.69	1.12	2.78	6885.99	6854.36
3.000	1355.00	0.00	0.00	720.80	9130.00	735.99	0.00	736.03	.55	2.20	12109.93	12311.93
4.000	1650.00	0.00	0.00	721.60	4610.00	730.64	0.00	730.84	3.18	3.61	1528.22	2583.67
4.000	1650.00	0.00	0.00	721.60	6450.00	732.82	0.00	732.97	2.07	3.40	3940.13	4481.51
4.000	1650.00	0.00	0.00	721.60	7250.00	733.80	0.00	733.91	1.53	3.10	5573.04	5868.76
4.000	1650.00	0.00	0.00	721.60	9130.00	736.09	0.00	736.14	.78	2.50	9861.74	10323.02
5.000	2910.00	0.00	0.00	721.80	4570.00	731.61	0.00	731.89	3.94	4.21	1206.97	2301.83
5.000	2910.00	0.00	0.00	721.80	6410.00	733.50	0.00	733.81	3.70	4.63	1912.26	3332.39
5.000	2910.00	0.00	0.00	721.80	7200.00	734.30	0.00	734.61	3.37	4.64	2469.49	3920.74
5.000	2910.00	0.00	0.00	721.80	9070.00	736.33	0.00	736.56	2.33	4.30	4296.69	5939.89

SHIAWASSEE RIVER

SUMMARY PRINTOUT TABLE 150

SECNO	G	CWSEL	DIFWSP	DIFWSX	DIFKWS	TOPWID	XLCH
249350.000	4610.00	729.69	0.00	0.00	0.00	495.52	0.00
249350.000	6450.00	732.20	2.51	0.00	0.00	499.02	0.00
249350.000	7250.00	733.30	1.10	0.00	0.00	500.00	0.00
249350.000	9130.00	735.74	2.44	0.00	0.00	500.00	0.00
250350.000	4610.00	729.89	0.00	.20	0.00	450.00	1090.00
250350.000	6450.00	732.34	2.44	.14	0.00	450.00	1090.00
250350.000	7250.00	733.41	1.08	.11	0.00	450.00	1090.00
250350.000	9130.00	735.82	2.41	.08	0.00	450.00	1090.00
3.000	4610.00	730.17	0.00	.28	0.00	564.31	1355.00
3.000	6450.00	732.54	2.37	.21	0.00	1973.33	1355.00
3.000	7250.00	733.61	1.07	.20	0.00	2114.16	1355.00
3.000	9130.00	735.99	2.38	.17	0.00	2344.91	1355.00
4.000	4610.00	730.64	0.00	.47	0.00	463.37	1650.00
4.000	6450.00	732.82	2.18	.28	0.00	1597.36	1650.00
4.000	7250.00	733.80	.98	.20	0.00	1747.52	1650.00
4.000	9130.00	736.09	2.28	.10	0.00	1927.59	1650.00
5.000	4570.00	731.61	0.00	.97	0.00	248.95	2910.00
5.000	6410.00	733.50	1.88	.67	0.00	545.22	2910.00
5.000	7200.00	734.30	.81	.50	0.00	783.04	2910.00
5.000	9070.00	736.33	2.03	.25	0.00	995.75	2910.00

FLOOD INSURANCE ZONE DATA FOR SHIAWASSEE RIVER

FLOOD HAZARD FACTOR FOR ENTIRE REACH USING SECTIONS

SECTION NUMBER	CUMULATIVE DISTANCE	ELEVATION DIFFERENCE BETWEEN BASE FLOOD AND 10	2	0.2
249350.000	0.	-3.61	-1.10	2.44
250350.000	1090.	-3.52	-1.08	2.41
3.000	2445.	-3.44	-1.07	2.38
4.000	4095.	-3.16	-.98	2.28
5.000	7005.	-2.69	-.81	2.03
WEIGHTED AVG FOR REACH		-3.22	-.99	2.29

FHF FOR THE REACH = 030 WITH 100.0 PERCENT OF THE REACH WITHIN 1.0 FEET
ZONE FOR THE REACH = A 6

00BREAK00

1) COUNTY: SHIAWASSEE

2) STUDY NAME: CITY OF CORUNNA

3) WATERCOURSE: SHIAWASSEE RIVER UNNAMED DR

4) DOCUMENT TYPE: REPORT

00BREAK00

JUN 8 1984

Planning Division - SS

Mr. Brian Krosik
Chief, Risk Studies Division
Risk Assessment Office
Federal Insurance Administration
Federal Emergency Management Agency
Washington, D.C. 20472

Dear Mr. Krosik:

Submitted for your review and consideration are revisions for the draft flood insurance study for the City of Corunna, Shiawassee County, Michigan. This study was previously submitted to your agency on March 29, 1984.

Revisions for inclusion in the report are:

Pages 2 & 5	(Enclosure 1)
Table 2 & 3	(Enclosure 2)
Profile N/A of Dam	(Enclosure 3)
FPMS & FIRM Worksheet	(Enclosure 4)
Map of Floodplain	(Enclosure 5)

If questions arise regarding the enclosed data, please contact Mr. Joseph Wantelista at (313) 226-6773 or Mr. Rocky Hills at (313) 226-6[illegible].

Sincerely,

C. Ardisoff, P.E.
Chief, Planning Division

Enclosures

Copy furnished: (w/o Enclosure 5)

HQDA (DAEN-CWP-F)/ATTN: Mr. J. Peterson
HQDEL-FP/ATTN: Mr. S. Tamulionis

✓GLH&H BR (Tech Support)
FPMS (Wantelista)
SS/US Br

FACSIMILE HEADER SHEET

(ER 105-1-5)

[illegible]	[illegible] SYMBOL	TELEPHONE NO.	RELEASER'S SIGNATURE			
	OFFICE SYMBOL	TELEPHONE NO.	PAGES	PRECEDENCE	DTG	

ENG FORM 4680 1 FEB 70

MAZANEC 3537132

FIS Corunna - Stoplog elevations at Dam

Use L ≅ 120 ft - Assume crest at 735'
P ≅ 9 ft

Frequency	upstream elevation	downstream elevation	head diff
-	738	735	3 ft
50	739	736.6	2.4
100	739.3	737.3	2.0
500	740	738.5'	1.5'

Freq	d	He	d/He	Hd+d/He
10	9	3	1	4
50	10.6	4	.6	3.25'
100	11.3	4.3	.47	3.1
500	13.5'	5'	.3	3.0

Freq	% load	
1	0 %	
50	1 %	
100	2 %	
500	5 %	

for use with chart 122-1

Assume all losses are minor ignore

Freq	Yield Hc in chart 111-4	
10	3	3.95
50	2.25	3.[illegible]
100	2.1	3.95
500	1.8	3.95

Freq	Q: (from report)		H needed
10	1100	=	3.7 3.9 3
50	620	=	4.1 4.9
100	2050	=	4.45 ok 6.3 4
500	8870	=	5.2 ok 6.2 (

50	1 %
100	2 %
500	5 %

Assume all losses are minor losses

Freq	% Wdg Re in short min	C
10	3	3.95
50	2.25	[illegible]
100	2.1	3.95
500	1.8	3.95

Freq	Q: (from report)		H needed	
10	7000	—	3.7 3.9	3
50	6200	—	4.1 4.9	4
100	7050	—	4.45 ok 6.3	4.[illegible]
500	0800	—	5.2 ok 6.2	[illegible]

C: 3.95 [illegible]

TELEPHONE CONVERSATION RECORD

If this form is used as a document agency is The Adjutant General's Office.

DATE: 6 Apr 84

SUBJECT OR CONVERSATION: [illegible] Corona, NM

INCOMING CALL		
PERSON CALLING	ADDRESS	PHONE NUMBER AND EXTENSION
PERSON CALLED	OFFICE	PHONE NUMBER AND EXTENSION

OUTGOING CALL		
PERSON CALLING: Marcone	OFFICE: NCERD-W	PHONE NUMBER AND EXTENSION: [illegible]
PERSON CALLED: Pa[illegible] Miller	ADDRESS: NCERD-N	PHONE NUMBER AND EXTENSION: 226 [illegible]

SUMMARY OF CONVERSATION:

The call was initiated in order to get clarification regard. the development of water surface elevations immediately upstream of a dam located in the subject area. On 23 March 84 based on a previous call regarding this issue it was determined that the dam was actually into the backwater model and allowed to calculated profiles across the structure. On 5 Apr I the undersigned computed hydraulic heads needed for passing the adopted flows using WES criteria. Two sets of weir coefficients were adopted. The results are summarized below and the computations are attached as enclosure 1.

STARTING ELEVATIONS ARE [illegible]

DISCHARGE	C=3.0	C=3.95	DRAFT REPORT
10	5.7 ft	5.7 ft	5 ft
50	4.9 ft	4.1 ft	4 ft
100	5.3	4.5 ft	4.5 ft
500	6.3	6.2 ft	5 ft

DA FORM 1 APR 64 701

[illegible] 1 [illegible] 25 TO WHICH WILL BE USED.

[illegible] 1003

TELEPHONE OR VERBAL CONVERSATION RECORD

For use of this form, see AR 340-15; the proponent agency is The Adjutant General's Office.

DATE

SUBJECT OF CONVERSATION

INCOMING CALL		
PERSON CALLING	ADDRESS	PHONE NUMBER AND EXTENSION
PERSON CALLED	OFFICE	PHONE NUMBER AND EXTENSION
OUTGOING CALL		
PERSON CALLING	OFFICE	PHONE NUMBER AND EXTENSION
PERSON	ADDRESS	PHONE NUMBER AND EXTENSION

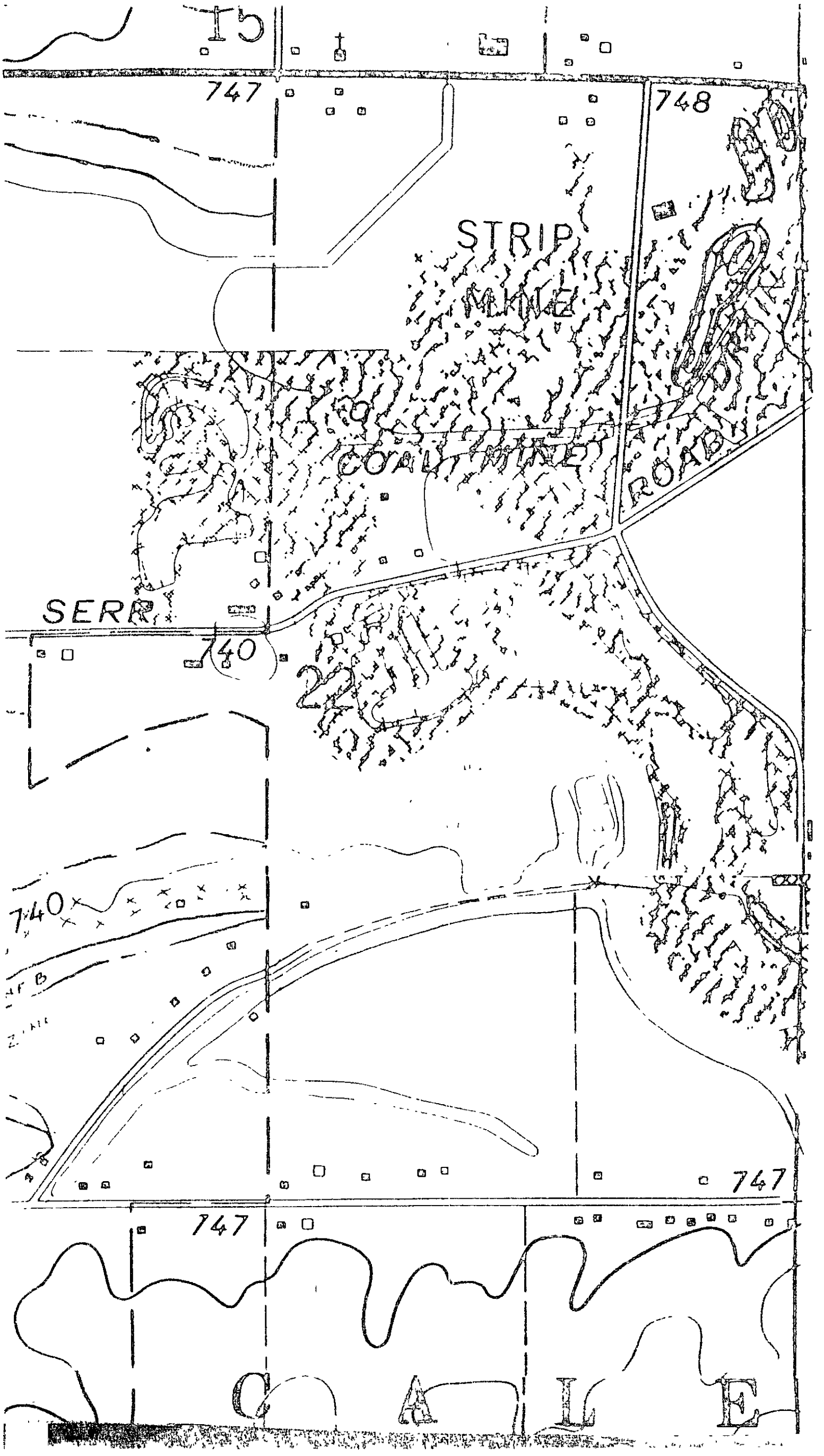
SUMMARY OF CONVERSATION

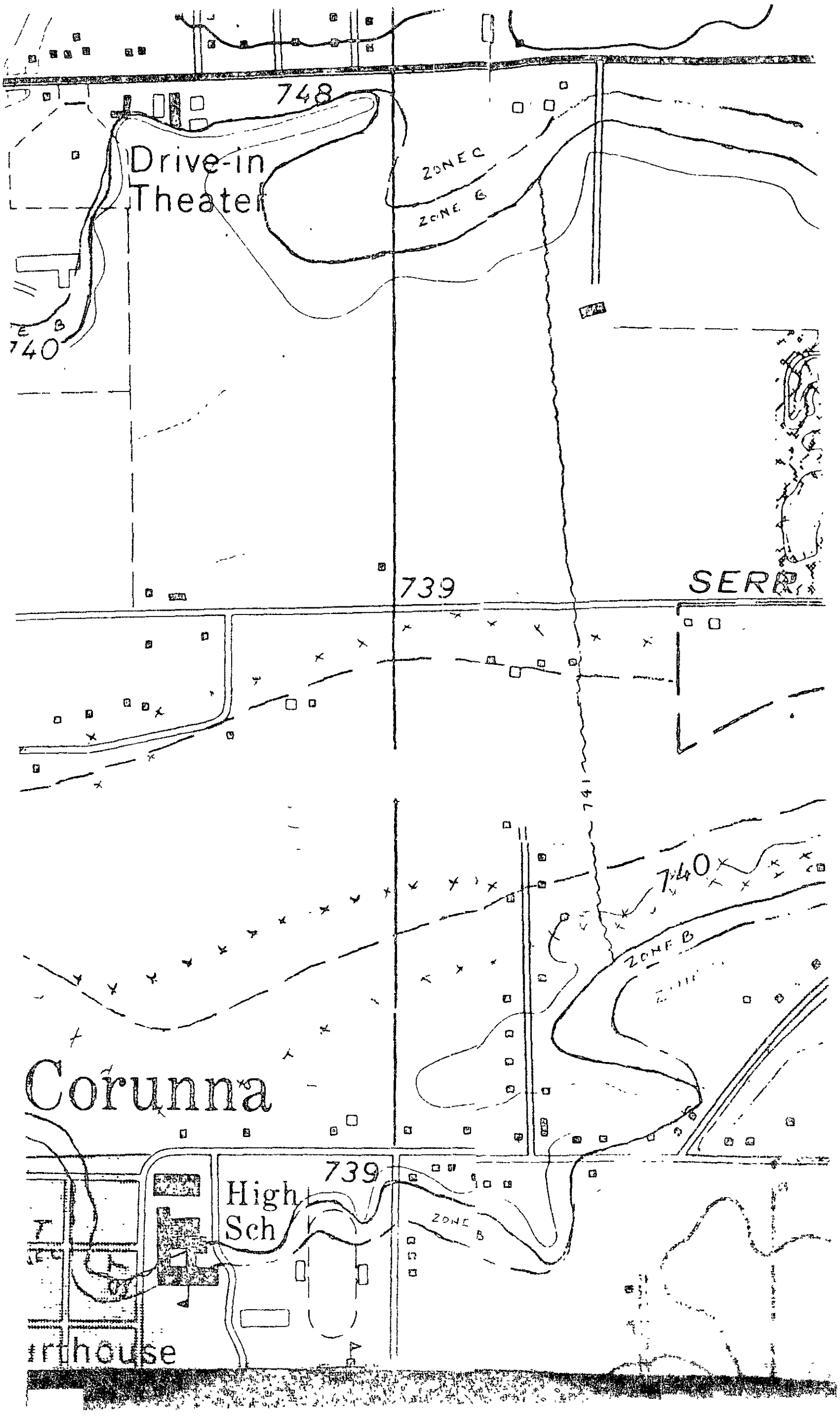
The lower "C" coefficient represents a less efficient bridge structure the higher "C" coefficient represents a more efficient bridge structure.

Based on the above the following was decided.

DA FORM 1 APR 66 751

PREVIOUS EDITIONS OF 1 FEB 60 WHICH WILL BE USED.


747
748
STRIP
MINE
COAL MINE
ROAD
SERR
740
740
747
747
C A L E


748
Drive-in
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ZONE B
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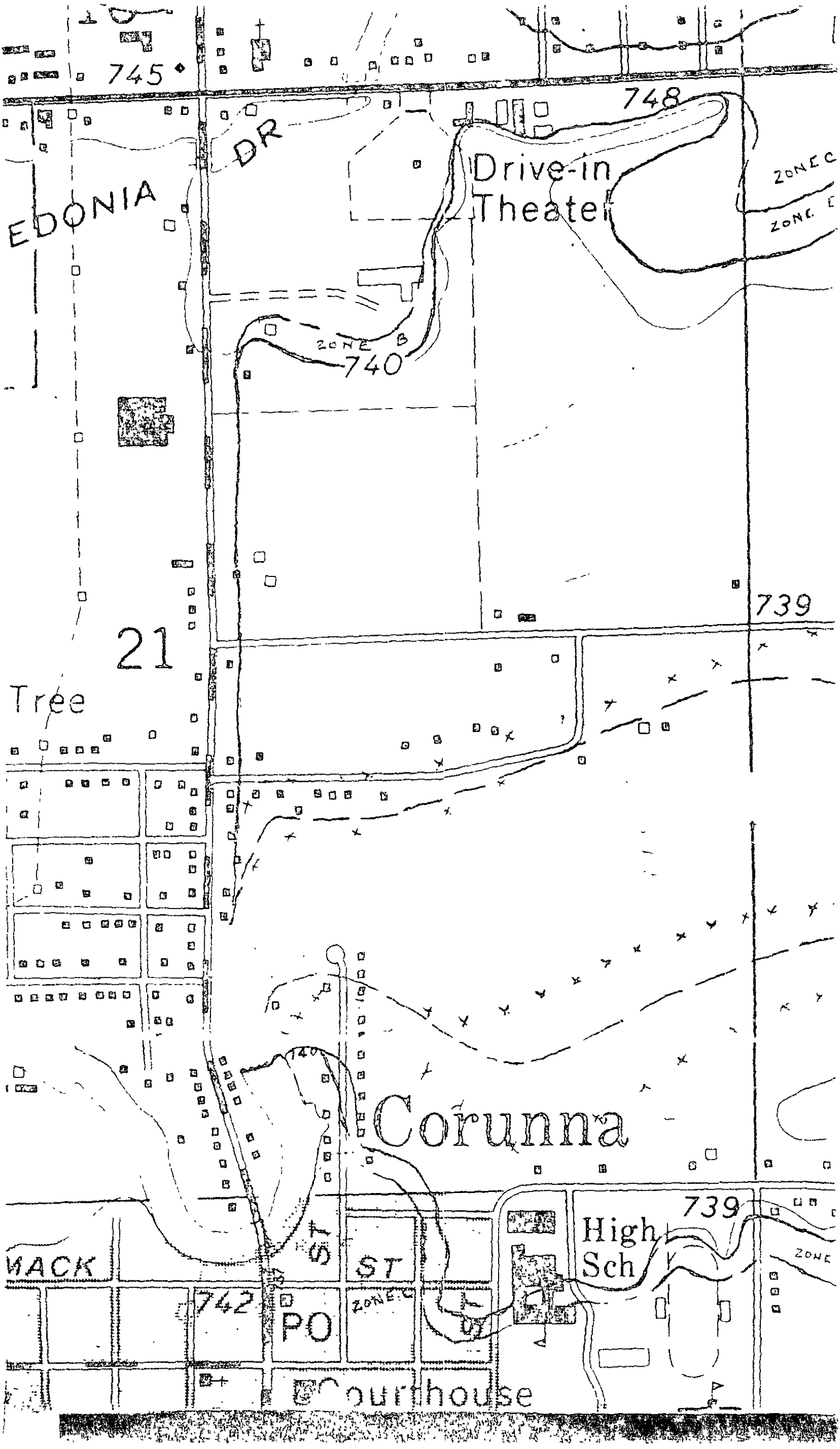
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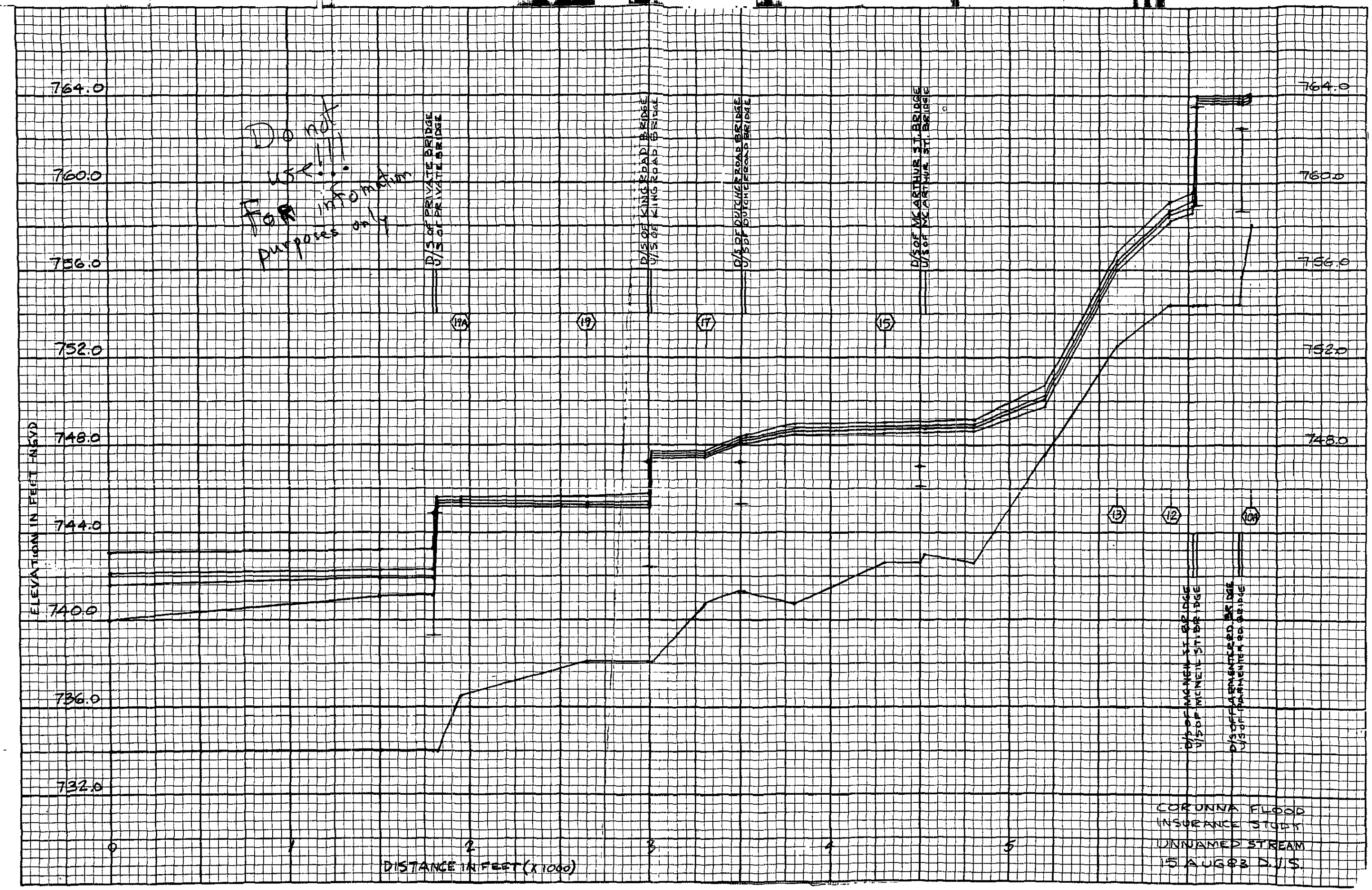

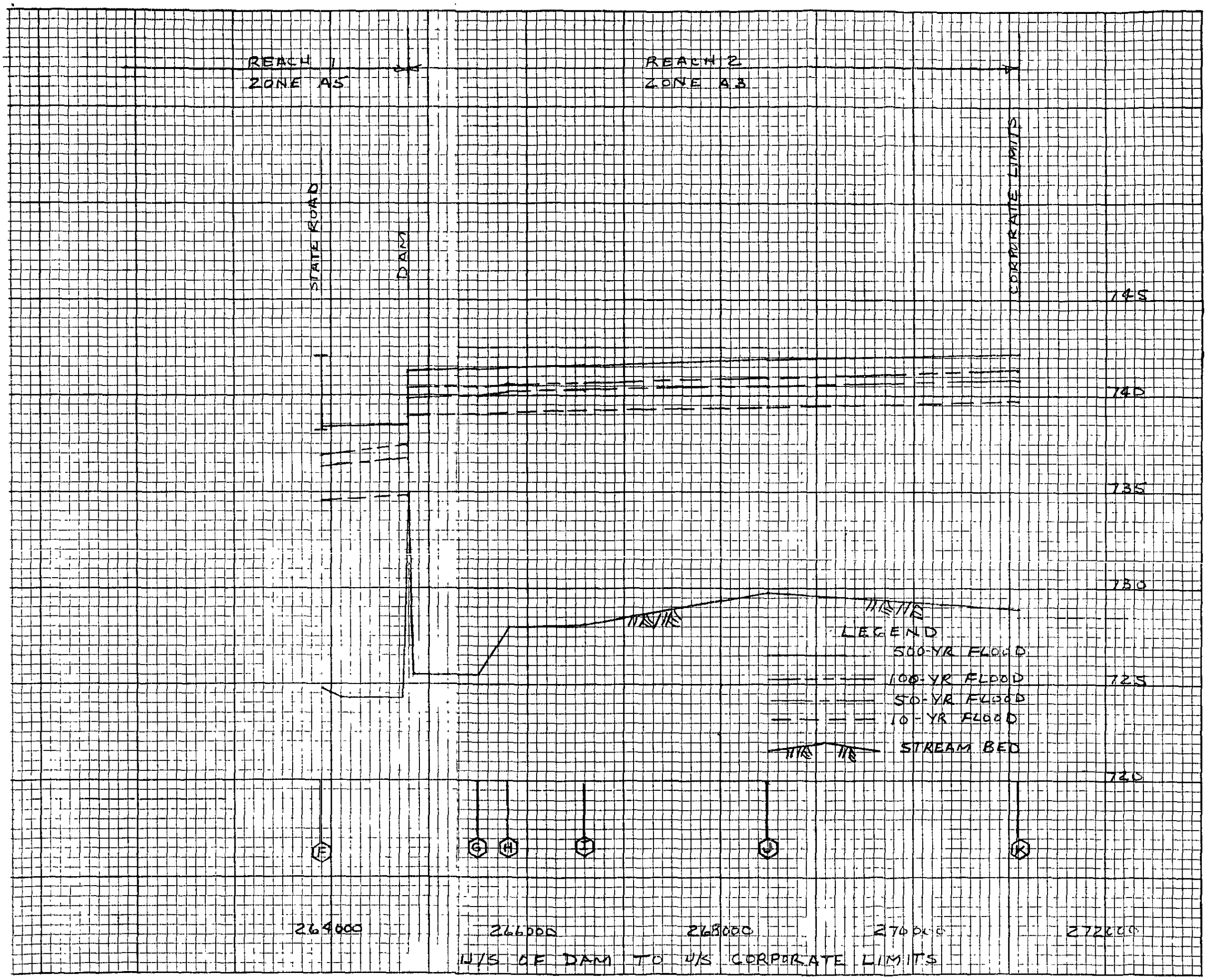
REACH 1
ZONE A5
REACH 2
ZONE A3
STATE ROAD
DAM
CORPORATE LIMITS
745
740
735
730
725
720
LEGEND
500-YR FLOOD
100-YR FLOOD
50-YR FLOOD
10-YR FLOOD
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264000
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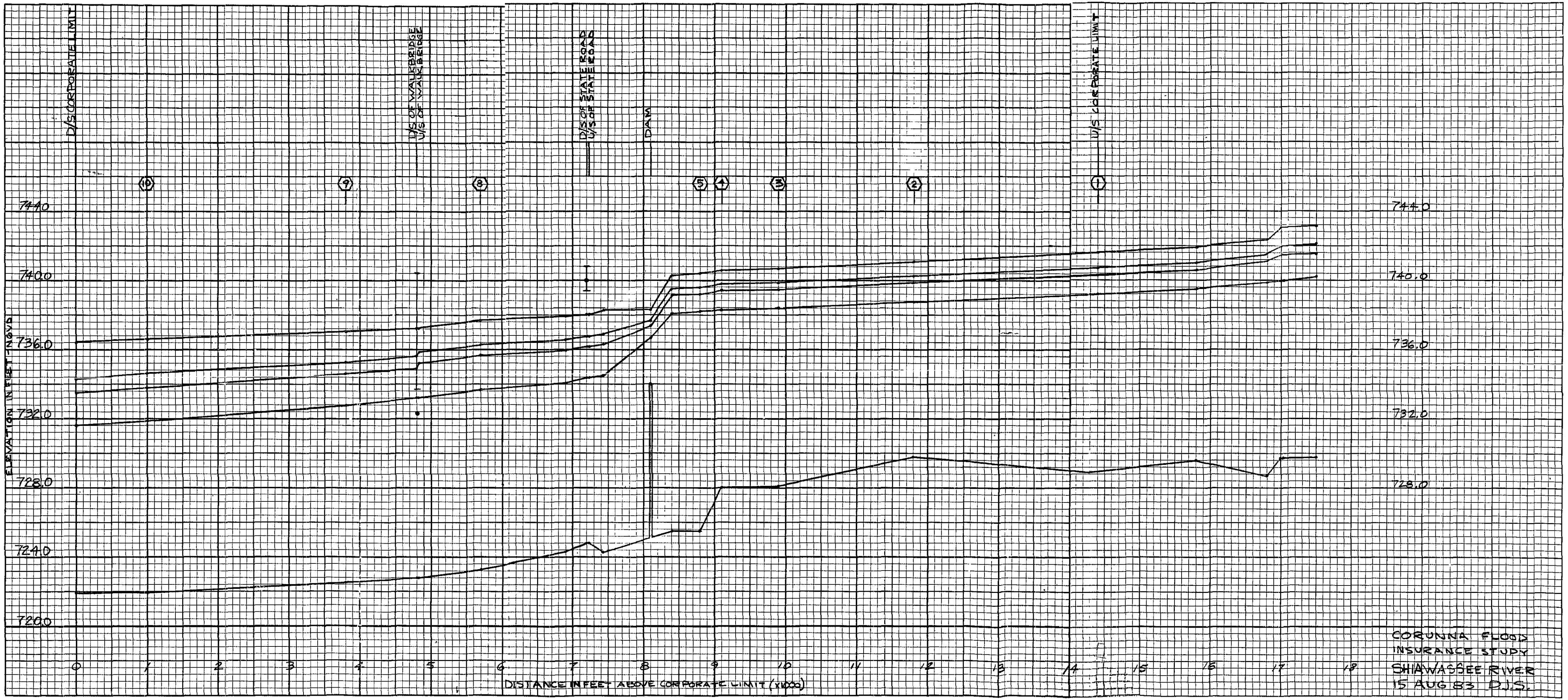
U/S OF DAM TO U/S CORPORATE LIMITS

R 14 MAY 1984



GRAPH-PAPER GRAPHIC CONTROLS CORPORATION Buffalo New York Printed in U.S.A.
SQUARE 10 X 10 TO THE INCH A3-2007-GB
K&E 10 X 10 TO THE INCH • 7 X 10 INCHES KEUFFEL & ESSER CO. MADE IN U.S.A.
46 0780

Do Not use elevations

Stream has been studied
by approximate methods

22 AUG 83 10:46:17

FILE: D7CSELZO*CORTR13

CORUNNA FIS

JOB: HEC22

UNNAMED STREAM

W/200 TABLE

THIS RUN EXECUTED 22 AUG 83 10:34:15

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**********************************************
HEC2 RELEASE DATED NOV 76 UPDATED MARC 1982
ERROR CORR - 31,32,33,34,35
MODIFICATION - 50,51,52,53,54,55
**********************************************
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C
T1          CITY OF COPUNNA FLOOD INSURANCE STUDY
T2          100 YEAR FLOOD FREQUENCY
T3          UNNAMED STREAM WITHOUT ENCROACHMENTS

J1  ICHECK    INQ      NINV     IDIR      STRT    METRIC    HVINS       Q      WSEL       FQ
        0.      2.       0.       0.  0.000000      0.00      0.0       0.   742.100    0.000

J2  NPROF    IPLOT    PRFVS    XSECV    XSECH      FN    ALLDC     IBW    CHNIM   ITRACE
    1.000    0.000   -1.000    0.000    0.000   0.000    0.000   0.000    0.000    0.000

J3  VARIABLE CODES FOR SUMMARY PRINTOUT
  150.000  200.000    0.000    0.000    0.000   0.000    0.000   0.000    0.000    0.000

NC      0.100    0.100    0.040    0.100    0.300    0.000    0.000    0.000    0.000    0.000
QT   2.000   360.000  360.000    0.000    0.000    0.000    0.000    0.000    0.000    0.000
ET      0.000    0.000    1.400    0.000    0.000    0.000    0.000    0.000    0.000    0.000
        CROSS SECTION 21
X1      0.000   15.000  249.000  280.000    0.000    0.000    0.000    0.000    0.000    0.000
GR    743.000    0.000  743.100   48.000  743.500   96.000  743.800  123.000  742.800  213.000
GR    743.300  239.000  744.300  249.000  733.900  272.000  740.300  288.000  741.400  308.000
GR    741.300  335.000  740.600  360.000  740.300  395.000  739.500  437.000  747.000 1400.000

NC      0.000    0.000    0.000    0.300    0.500    0.000    0.000    0.000    0.000    0.000
X1   1500.000    0.000    0.000    0.000 1500.000 1500.000 1500.000    0.000    0.000    0.000

NC      0.000    0.000    0.020    0.000    0.000    0.000    0.000    0.000    0.000    0.000
        DOWNSTREAM OF PRIVATE BRIDGE
X1   1799.000    0.000    0.000    0.000  299.000  299.000  299.000    0.000    0.000    0.000
X3     10.000    0.000    0.000    0.000    0.000    0.000    0.000  740.000  740.000    0.000

SB      0.000    1.600    2.600  220.000    3.100    0.000   12.600    0.000  735.300  735.300
ET      0.000    0.000    4.110  249.000 1400.000    0.000    0.000    0.000    0.000    0.000
        UPSTREAM OF PRIVATE BRIDGE
X1   1321.000    0.000    0.000    0.000   22.000   22.000   22.000    0.000    0.000    0.000
X2      0.000    0.000    1.000  739.300  744.900    0.000    0.000    0.000    0.000    0.000
X3     10.000    0.000    0.000    0.000    0.000    0.000    0.000  744.900  744.900    0.000
```

NC	0.000	0.000	0.040	0.000	0.000	0.000	0.000	0.000	0.000	0.000
ET	0.000	0.000	1.400	0.000	0.000	0.000	0.000	0.000	0.000	0.000
CROSS SECTION 19A										
X1	1950.000	24.000	175.000	227.000	129.000	129.000	129.000	0.000	0.000	0.000
GR	745.300	0.000	744.300	21.000	744.400	45.000	744.100	65.000	744.100	92.000
GR	744.000	111.000	743.[illegible]	122.000	746.400	136.000	751.400	147.000	748.500	156.000
GR	747.000	163.000	744.300	168.000	744.100	175.000	737.500	185.000	736.500	190.000
GR	737.000	195.000	743.600	200.000	743.100	227.000	743.200	260.000	743.300	278.000
GR	743.300	301.000	744.000	325.000	743.300	325.000	750.000	1575.000	0.000	0.000
CROSS SECTION 19										
X1	2650.000	20.000	195.000	235.000	700.000	700.000	700.000	0.000	0.000	0.000
GR	741.000	0.000	740.800	25.000	740.800	85.000	739.900	110.000	740.000	122.000
GR	742.000	124.000	742.400	159.000	742.000	149.000	741.100	151.000	742.100	173.000
GR	747.400	1[illegible]	747.500	195.000	739.100	215.000	739.200	225.000	742.100	235.000
GR	742.100	254.000	743.000	275.000	741.600	295.000	742.100	317.000	750.000	1017.000
NC	0.000	0.000	0.020	0.000	0.500	0.000	0.000	0.000	0.000	0.000
DOWNSTREAM OF KING ROAD BRIDGE										
X1	2999.000	0.000	0.000	0.000	349.000	349.000	349.000	0.000	0.000	0.000
X3	10.000	0.000	0.000	0.000	0.000	0.000	0.000	741.000	741.000	0.000
SB	0.000	1.600	2.600	400.000	3.200	0.000	13.200	0.000	738.300	738.300
ET	0.000	0.000	4.110	1.000	1000.000	0.000	0.000	0.000	0.000	0.000
UPSTREAM OF KING ROAD BRIDGE										
X1	3021.000	0.000	0.000	0.000	22.000	22.000	22.000	0.000	0.000	0.000
X2	0.000	0.000	1.000	742.400	747.200	0.000	0.000	0.000	0.000	0.000
X3	10.000	0.000	0.000	0.000	0.000	0.000	0.000	747.200	747.200	0.000
NC	0.000	0.000	0.040	0.000	0.000	0.000	0.000	0.000	0.000	0.000
ET	0.000	0.000	1.400	0.000	0.000	0.000	0.000	0.000	0.000	0.000
CROSS SECTION 17										
X1	3300.000	28.000	201.000	22[illegible].000	279.000	279.000	279.000	0.000	0.000	0.000
GR	745.200	0.000	745.100	20.000	744.700	40.000	744.800	61.000	744.700	89.000
GR	744.700	105.000	745.200	130.000	745.500	155.000	745.300	157.000	746.500	161.000
GR	747.400	170.000	747.900	181.000	747.600	195.000	747.100	201.000	741.500	211.000
GR	740.700	213.000	741.400	221.000	746.300	228.000	746.900	252.000	747.000	270.000
GR	747.200	291.000	747.300	315.000	747.200	339.000	747.500	362.000	748.200	383.000
GR	748.200	405.000	750.000	415.000	760.000	1615.000	0.000	0.000	0.000	0.000
DOWNSTREAM OF DUTCHER ROAD BRIDGE										
X1	3499.000	21.000	199.000	202.000	199.000	199.000	199.000	0.000	0.000	0.000
X3	10.000	0.000	0.000	0.000	0.000	0.000	0.000	745.000	745.000	0.000
GR	743.700	0.000	743.500	25.000	748.400	50.000	748.300	100.000	747.600	150.000
GR	747.500	175.000	747.400	197.000	743.300	198.000	741.900	198.500	741.300	199.500
GR	741.300	200.500	741.900	201.500	743.300	202.000	747.400	203.000	747.300	225.000
GR	747.200	250.000	747.400	300.000	747.700	350.000	747.800	375.000	747.800	400.000
GR	750.000	500.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
BT	11.000	0.000	748.700	0.000	198.000	747.400	743.300	198.500	747.400	744.700
BT	199.500	747.400	745.200	200.500	747.400	745.200	201.500	747.400	744.700	202.000
BT	747.400	743.300	203.000	747.400	0.000	250.000	747.200	0.000	400.000	747.800
BT	0.000	500.000	750.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

SB	0.000	1.600	2.600	400.000	3.200	0.000	13.200	0.000	741.200	741.200
ET	0.000	0.000	4.110	1.000	600.000	0.000	0.000	0.000	0.000	0.000
UPSTREAM OF DUTCHER ROAD BRIDGE										
X1	3521.000	0.000	0.000	10.000	22.000	22.000	22.000	0.000	0.000	0.000
X2	0.000	0.000	1.000	745.300	747.200	0.000	0.000	0.000	0.000	0.000
X3	10.000	0.000	0.000	0.000	0.000	0.000	0.000	747.200	747.200	0.000
ET	0.000	0.000	1.400	0.000	0.000	0.000	0.000	0.000	0.000	0.000
X1	3800.000	26.000	201.000	227.000	279.000	279.000	279.000	0.000	0.000	0.000
GR	745.200	0.000	745.100	20.000	744.700	40.000	744.800	61.000	744.700	89.000
GR	744.700	105.000	745.200	133.000	745.500	155.000	745.300	157.000	746.500	161.000
GR	747.400	170.000	747.000	181.000	747.600	193.000	747.100	201.000	741.500	211.000
GR	740.700	216.000	741.400	221.000	746.300	223.000	746.900	252.000	747.000	270.000
GR	747.200	291.000	747.300	315.000	747.200	339.000	747.500	362.000	748.200	383.000
GR	740.200	405.000	750.000	415.000	760.000	1615.000	0.000	0.000	0.000	0.000
CROSS SECTION 15										
X1	4300.000	24.000	1[illegible].000	204.000	500.000	500.000	500.000	0.000	0.000	0.000
GR	746.400	0.000	746.000	22.000	746.600	47.000	746.700	62.000	746.700	88.000
GR	747.000	110.000	746.700	130.000	747.700	145.000	753.100	162.000	749.100	170.000
GR	746.300	190.000	743.100	188.000	742.600	195.000	742.800	200.000	746.600	206.000
GR	746.600	230.000	746.400	255.000	746.600	280.000	746.700	305.000	746.500	330.000
GR	746.500	355.000	746.700	370.000	750.000	500.000	760.000	1300.000	0.000	0.000
DOWNSTREAM OF MC ARTHUR STREET BRIDGE										
X1	4499.000	0.000	0.000	0.000	199.000	199.000	199.000	0.000	0.000	0.000
X3	10.000	0.000	0.000	0.000	0.000	0.000	0.000	746.500	746.500	0.000
SB	0.000	1.600	2.600	400.000	2.400	0.000	7.500	0.000	743.000	743.000
ET	0.000	0.000	4.110	100.000	500.000	0.000	0.000	0.000	0.000	0.000
UPSTREAM OF MC ARTHUR STREET BRIDGE										
X1	4521.000	25.000	19[illegible].500	204.500	22.000	22.000	22.000	0.000	0.000	0.000
X2	0.000	0.000	1.000	743.100	747.200	0.000	0.000	0.000	0.000	0.000
X3	10.000	0.000	0.000	0.000	0.000	0.000	0.000	747.000	747.000	0.000
GR	750.000	0.000	749.500	25.000	749.600	50.000	749.400	75.000	749.000	100.000
GR	748.600	125.000	748.400	150.000	748.000	175.000	747.600	197.500	744.500	198.500
GR	743.300	199.000	747.000	199.500	743.000	200.500	743.300	201.000	744.500	201.500
GR	747.500	202.500	747.400	225.000	747.100	250.000	747.000	275.000	747.000	350.000
GR	747.200	400.000	750.000	500.000	760.000	1200.000	0.000	0.000	0.000	0.000
BT	15.000	0.000	750.000	0.000	197.500	747.600	0.000	199.500	747.600	744.500
BT	199.000	747.600	745.700	199.500	747.600	746.000	200.500	747.600	746.000	201.000
BT	747.600	745.000	201.000	747.600	744.500	202.500	747.600	0.000	225.000	747.300
BT	0.000	275.000	747.000	0.000	350.000	747.000	0.000	400.000	747.200	0.000
BT	500.000	750.000	0.000	1200.000	760.000	0.000	0.000	0.000	0.000	0.000
NC	0.000	0.000	0.040	0.000	0.000	0.000	0.000	0.000	0.000	0.000
ET	0.000	0.000	1.400	0.000	0.000	0.000	0.000	0.000	0.000	0.000
X1	4300.000	24.000	1[illegible].000	204.000	279.000	279.000	279.000	0.000	0.000	0.000
GR	746.400	0.000	746.000	22.000	746.600	47.000	746.700	62.000	746.700	88.000
GR	747.000	110.000	746.700	130.000	747.700	145.000	753.100	162.000	749.100	170.000
GR	746.300	190.000	743.100	188.000	742.600	195.000	742.300	200.000	746.600	206.000
GR	746.600	230.000	746.400	255.000	746.600	280.000	746.700	305.000	746.500	330.000
GR	746.500	355.000	746.700	370.000	750.000	500.000	760.000	1300.000	0.000	0.000

X1	5200.000	10.000	175.000	210.000	400.000	400.000	400.000	0.000	0.000	0.000
GR	751.000	0.000	752.700	130.000	757.000	175.000	749.500	191.000	747.500	200.000
GR	748.000	207.000	752.500	217.000	752.100	355.000	754.000	450.000	760.000	1300.000
CROSS SECTION 1.										
X1	5600.000	17.000	170.000	220.000	400.000	400.000	400.000	0.000	0.000	0.000
GR	755.700	0.000	756.300	25.000	755.700	49.000	756.100	70.000	756.500	95.000
GR	756.700	115.000	757.000	140.000	758.400	165.000	760.900	190.000	754.900	205.000
GR	752.900	210.000	752.700	215.000	756.900	225.000	758.400	249.000	758.100	295.000
GR	757.500	375.000	760.000	450.000	0.000	0.000	0.000	0.000	0.000	0.000
CROSS SECTION 12										
X1	5900.000	23.000	190.000	220.000	300.000	300.000	300.000	0.000	0.000	0.000
GR	759.900	0.000	759.100	17.000	758.900	45.000	759.700	65.000	758.900	90.000
GR	756.900	115.000	757.700	140.000	759.500	165.000	762.100	175.000	761.100	190.000
GR	755.100	205.000	754.400	209.000	755.700	210.000	759.400	220.000	759.400	243.000
GR	759.600	267.000	759.400	295.000	759.900	319.000	758.500	344.000	758.900	367.000
GR	755.000	392.000	760.000	400.000	770.000	1000.000	0.000	0.000	0.000	0.000
NC	0.000	0.000	0.000	0.000	0.500	0.000	0.000	0.000	0.000	0.000
DOWNSTREAM OF NORTH VEIL STREET BRIDGE										
X1	6030.000	0.000	0.000	0.000	130.000	130.000	130.000	0.000	0.000	0.000
SB	0.000	1.500	2.600	400.000	2.300	0.000	10.200	0.000	755.400	755.400
ET	0.000	0.000	4.110	1.000	700.000	0.000	0.000	0.000	0.000	0.000
UPSTREAM OF NORTH VEIL STREET BRIDGE										
X1	6052.000	0.000	0.000	0.000	22.000	22.000	22.000	0.000	0.000	0.000
X2	0.000	0.000	1.000	759.000	763.500	0.000	0.000	0.000	0.000	0.000
X3	10.000	0.000	0.000	0.000	0.000	0.000	0.000	763.500	763.500	0.000
NC	0.000	0.000	0.040	0.000	0.000	0.000	0.000	0.000	0.000	0.000
ET	0.000	0.000	1.400	0.000	0.000	0.000	0.000	0.000	0.000	0.000
X1	6100.000	0.000	0.000	0.000	48.000	48.000	48.000	0.000	0.000	0.000
DOWNSTREAM OF PARMENTER ROAD BRIDGE										
X1	6230.000	0.000	0.000	0.000	130.000	180.000	180.000	0.000	0.000	0.000
X3	10.000	0.000	0.000	0.000	0.000	0.000	0.000	759.000	759.000	0.000
SB	0.000	1.600	2.600	400.000	2.400	0.000	7.500	0.000	755.400	755.400
ET	0.000	0.000	4.110	1.000	325.000	0.000	0.000	0.000	0.000	0.000
UPSTREAM OF PARMENTER ROAD BRIDGE										
X1	6300.000	21.000	170.400	191.600	20.000	20.000	20.000	0.000	0.000	0.000
X2	0.000	0.000	1.000	758.700	762.300	0.000	0.000	0.000	0.000	0.000
X3	10.000	0.000	0.000	0.000	0.000	0.000	0.000	762.500	762.500	0.000
GR	763.200	0.000	762.500	40.000	762.500	90.000	762.500	112.000	762.800	187.400
GR	757.200	193.400	756.100	189.000	755.700	189.500	755.700	190.500	756.100	191.200
GR	757.200	191.600	757.200	192.600	762.900	215.000	763.000	240.000	763.100	265.000
GR	763.300	290.000	763.600	335.000	763.900	340.000	764.200	362.000	764.700	389.000
GR	770.000	800.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
BT	16.000	0.000	763.200	0.000	40.000	762.500	0.000	112.000	762.500	0.000
BT	187.400	762.800	0.000	188.400	762.800	757.200	188.300	762.800	758.200	189.500
BT	762.800	758.600	191.500	762.800	758.600	191.200	762.800	758.200	191.600	758.200
BT	757.200	192.600	762.900	0.000	240.000	763.300	0.000	290.000	763.300	0.000

BT	340.000	745.600	0.000	359.000	764.700	0.000	800.000	770.000	0.000	0.000
NC	0.000	0.000	0.040	0.000	0.000	0.000	0.000	0.000	0.000	0.000
ET	0.000	0.000	1.400	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	CROSS SECTION 103									
X1	6360.000	15.000	173.000	602.000	60.000	60.000	60.000	0.000	0.000	0.000
GR	761.400	0.000	731.400	62.000	759.700	120.000	760.700	147.000	761.300	178.000
GR	757.200	142.000	757.100	157.000	757.200	190.000	761.300	202.000	760.800	205.000
GR	761.400	255.000	763.000	355.000	763.700	312.000	763.600	340.000	763.700	372.000
EJ	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

```
SECNO     DEPTH     CWSEL     CRIWS     WSELK     EG        HV        HL        CLOSS     BANK ELEV
Q         QLOB      QCH       QROB      ALOB      ACH       AROB      VOL       TWA       LEFT/RIGHT
TIME      VLOB      VCH       VROB      XML       XNCH      XNR       WTN       ELMIN     SSTA
SLOPE     XLOBL     XLCH      XLOBR     TRIAL     IDC       ICONT     CORAR     TOPWID    ENDST

*PROF 1

CCHV=   0.100 CEHV=   0.300
*SECNO 0.000
        CROSS SECTION 21
      0.00      0.20    742.10      0.00    742.10    742.11      0.01      0.00      0.00    744.30
      360.        0.      197.      153.        0.      152.      654.        0.        0.    740.30
      0.00      0.00      1.25      0.25     0.100     0.040     0.100     0.000    733.90    253.08
  0.000189        0.        0.        0.         0         0         0      0.00    517.76    770.84

CCHV=   0.300 CEHV=   0.500
*SECNO 1500.000
   1500.00      0.42    742.32      0.00      0.00    742.33      0.01      0.22      0.00    744.30
      360.        0.      154.      176.        0.      145.      775.       30.       13.    740.30
      0.61      0.00      1.11      0.23     0.100     0.040     0.100     0.000    733.90    252.56
  0.000120     150.0     150.0     150.0         2         0         0      0.00    546.99    799.55

*SECNO 1799.000
        DOWNSTREAM OF PRIVATE BRIDGE
   1799.00      0.44    742.34      0.00      0.00    742.36      0.02      0.02      0.01    744.30
      360.        0.      243.      117.        0.      146.      734.       37.       22.    740.30
      0.39      0.00      1.45      0.15     0.100     0.020     0.100     0.000    733.90    252.52
  0.000055     299.      299.      299.         2         0         0      0.00    549.33    801.85

SPECIAL BRIDGE

SB   XK        XKOR      COEF      BDLEN     BWC       BWP       BAREA     SS        ELCHU     ELCHD
     0.00      1.65      2.60    220.00      3.10      0.00     12.60      0.00    735.30    735.30

*SECNO 1821.000
3280 CROSS SECTION  1821.00 EXTENDED     2.45 FEET

PRESSURE AND WEIR FLOW

EGPRS     EGLWC     HB        QWEIR     QPR       BAREA     TRAPEZOID AREA    ELLC      ELTRD
762.62    746.71      0.00      220.      140.       13.        12.      739.70    744.90

        UPSTREAM OF PRIVATE BRIDGE
```

Do not use Elevations

```
   SECNO     DEPTH     CNSTL     CRINS     WSELK     FS        HV        HL        OLOSS    BANK ELEV
   Q         WLOB      QCH       QROP      ALOB      ACH       AROP      VOL       TWA    LEFT/RIGHT
   TIME      VLOB      VCH       VROP      XNL       XNCH      XNR       WTH       ELMIN     SSTA
   SLOPE     XLOB L    XLCH      XLOBR     ITRIAL    IDC       ICONT     CORAR     TOPWID    ENDST

 1021.00     11.55    745.43      0.00      0.00    745.43      0.00      3.06      0.00    744.30
    360.       25.       142.      192.      332.      295.     2952.       38.       23.    740.30
    0.72      0.05      0.50      0.24     0.100     0.020     0.100     0.000    733.90      0.00
0.000034       22.       22.       22.         0         0         7      0.00   1198.25   1198.25

*SECNO 1950.000

3265 DIVIDED FLOW

        CROSS SECTION 19A
 1950.00      0.93    745.42      0.00      0.00    745.43      0.01      0.00      0.00    744.10
    360.       27.       220.      136.      144.      259.      739.       45.       25.    743.10
    0.73      0.14      0.45      0.14     0.100     0.040     0.100     0.000    736.50      7.75
0.000036      129.      129.      129.         0         0         0      0.00    713.79    756.65

*SECNO 2650.000

3265 DIVIDED FLOW

3280 CROSS SECTION   2550.00 EXTENDED      4.45 FEET

        CROSS SECTION 19
 2550.00      7.34    745.46      0.00      0.00    745.46      0.00      0.03      0.00    747.50
    360.      159.       99.      103.      759.      193.      795.       69.       36.    742.10
    1.49      0.20       .54      0.19     0.100     0.040     0.100     0.000    738.10      0.00
0.000026      700.      700.      700.         0         0         0      0.00    595.71    613.85

CCHV=   0.300 CEHV=   0.300
*SECNO 2999.000

3265 DIVIDED FLOW

3280 CROSS SECTION   2999.00 EXTENDED      4.47 FEET

        DOWNSTREAM OF KING ROAD BRIDGE
 2999.00      7.57    745.47      0.20      0.00    745.47      0.00      0.01      0.00    747.50
    360.      125.       154.       81.      792.      194.      792.       83.       41.    742.10
    1.72      0.16      0.54      0.19     0.100     0.020     0.100     0.000    738.10      0.00
0.000016      549.      549.      549.         1         1         0      0.00    597.52    615.67
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   SECNO     DEPTH     CS E     CROWS     VELOC     VS        HV        HL        OLOSS    BANK ELEV
   W         CLOB      CCH      ARCO      ALO.      ACH       ARCB      VCL       TWA    LEFT/RIGHT
   TIME      VLOB      VCH      VROB      XNL       XNCH      XNR       WTN       ELMIN       SSTA
   SLOPE     XLOBL     XLCH     XLOBR     ITRIAL    IDC       ICONT     CORAR     TOPWID      ENDST

SPECIAL BRIDGE

SB  XK        XKOR      COEQ      RDLEN     SNC       SWP       BAREA     SS        ELCHU     ELCHD
    0.00      1.60      2.30      470.00    3.20      0.00      13.20     0.00      738.30    738.30

*SECNO 3021.000
3230 CROSS SECTION   3021.00 EXTENDED      6.58 FEET

PRESSURE AND WEIR FLOW

 EGPRS     EGLWC     HZ        OWEIR     DPR       DAREA     TRAPEZOID     ELLC      ELTRD
                                                             AREA
 763.94    745.72    0.00      240.      122.      13.       13.           742.40    747.20

          UPSTREAM OF KING ROAD BRIDGE
 3021.00   9.47      747.57    0.00      0.00      747.50    0.00      2.11      0.00      747.50
    360.     116.      128.      117.      1101.     244.      1790.     84.       41.       742.10
   1.74      0.10      0.49      0.07      0.100     0.020     0.100     0.000     738.10    0.00
0.000004     22.       22.       22.       0         0         7         0.00      802.23    802.23

*SECNO 3300.000

3263 DIVIDED FLOW

3280 CROSS SECTION   3300.00 EXTENDED      2.32 FEET

          CROSS SECTION 17
 3300.00   6.87      747.57    0.00      0.00      747.59    0.02      0.00      0.01      747.10
    360.     175.      175.      10.       427.      124.      66.       96.       45.       746.30
   1.35      1.41      1.41      0.16      0.100     0.040     0.100     0.020     740.70    0.00
0.000219    279.      279.      279.      0         0         0         0.00      344.87    364.33

*SECNO 3499.000
3685 20 TRIALS ATTEMPTED WSEL/CWSEL
3693 PROBABLE MINIMUM SPECIFIC ENERGY
3720 CRITICAL DEPTH ASSUMED
          DOWNSTREAM OF DUTCHER ROAD BRIDGE
 3499.00   6.97      743.27    743.27    0.00      748.53    0.31      0.12      0.15      743.30
    360.     44.       100.      144.      67.       26.       158.      92.       46.       743.30
   1.65      0.72      5.46      0.83      0.100     0.040     0.100     0.000     741.30    65.28
0.004584    199.      199.      199.      20        5         0         0.00      376.42    442.70
```

Do not use elevations

SECNO	DEPTH	CWSEL	CTIWS	WSELK	EG	HV	HL	OLOSS	BANK ELEV
Q	QLOB	QCH	QROB	ALOB	ACH	AROB	VOL	TWA	LEFT/RIGHT
TIME	VLOB	VCH	VROB	XNL	XNCH	XNR	WTN	ELMIN	SSTA
SLOPE	XLOBL	XLCH	XLOBR	ITRIAL	IDC	ICONT	CORAR	TOPWID	ENDST

SPECIAL BRIDGE

SB	XK	XKOR	CCFQ	BOLEN	BWC	BWP	BAREA	SS	ELCHU	ELCHD
	0.00	1.60	2.60	400.00	3.20	0.00	13.20	0.00	741.20	741.20

*SECNO 3521.000
6870 D.S. ENERGY OF 748.58 HIGHER THAN COMPUTED ENERGY OF 748.31
PRESSURE AND WEIR FLOW

EGPRS	EGLWC	H3	QWEIR	QPR	BAREA	TRAPEZOID AREA	ELLC	ELTRD
766.75	748.48	0.00	341.	17.	13.	13.	745.30	747.20

UPSTREAM OF DUTCHER ROAD BRIDGE

3521.00	7.01	748.31	0.00	0.00	748.58	0.27	0.00	0.00	743.30
360.	51.	161.	148.	72.	26.	178.	98.	47.	743.30
1.85	0.70	6.16	0.83	0.100	0.040	0.100	0.000	741.30	61.23
0.004122	22.	22.	22.	0	0	3	0.00	385.15	446.38

*SECNO 3800.000
3280 CROSS SECTION 3800.00 EXTENDED 3.51 FEET

3800.00	8.01	748.71	0.00	0.00	748.72	0.01	0.06	0.08	747.10
360.	181.	139.	40.	650.	154.	247.	103.	49.	746.30
2.00	0.28	0.90	0.16	0.100	0.040	0.100	0.000	740.70	0.00
0.000067	279.	279.	279.	2	0	0	0.00	407.81	407.81

*SECNO 4300.000

3265 DIVIDED FLOW

3280 CROSS SECTION 4300.00 EXTENDED 2.35 FEET

CROSS SECTION 15

4300.00	6.16	748.76	0.00	0.00	748.77	0.01	0.05	0.00	748.30
360.	83.	144.	133.	290.	120.	453.	114.	54.	746.60
2.21	0.29	1.20	0.29	0.100	0.040	0.100	0.000	742.60	0.00
0.000154	500.	500.	500.	2	0	0	0.00	428.66	454.67

SECNO	DEPTH	CWSEL	CRIWS	WSELK	EG	HV	HL	OLOSS	BANK ELEV
Q	QLOB	QCH	QROB	ALOB	ACH	AROB	VOL	TWA	LEFT/RIGHT
TIME	VLOB	VCH	VROB	XNL	XNCH	XNR	WTN	ELMIN	SSTA
SLOPE	XLOBL	XLCH	XLOBR	ITRIAL	IDC	ICONT	CORAR	TOPWID	ENDST

*SECNO 4499.000

3265 DIVIDED FLOW

3280 CROSS SECTION 4499.00 EXTENDED 2.38 FEET

DOWNSTREAM OF MC ARTHUR STREET BRIDGE

4499.00	5.19	748.79	0.00	0.00	748.80	0.01	0.03	0.00	748.30
360.	33.	143.	133.	294.	121.	464.	118.	56.	746.60
2.30	0.28	1.18	0.29	0.100	0.040	0.100	0.000	742.60	0.00
0.000149	199.	199.	199.	0	0	0	0.00	429.96	455.58

SPECIAL BRIDGE

SS	XR	XKOR	CDFQ	BDLEN	BWC	BWP	BAREA	SS	ELCHU	ELCHD
	0.00	1.60	2.60	400.00	2.40	0.00	7.50	0.00	743.00	743.00

*SECNO 4521.000
PRESSURE AND WEIR FLOW

EGPRS	EGLWC	H3	QWEIR	QPR	BAREA	TRAPEZOID AREA	ELLC	ELTRD
806.03	749.20	0.00	351.	9.	8.	7.	746.10	747.00

UPSTREAM OF MC ARTHUR STREET BRIDGE

4521.00	5.79	748.79	0.00	0.00	748.82	0.03	0.02	0.00	744.50
360.	21.	52.	287.	48.	16.	381.	118.	56.	744.50
2.31	0.44	3.16	0.75	0.100	0.040	0.100	0.000	743.00	113.12
0.001405	22.	22.	22.	2	0	8	0.00	343.67	456.79

*SECNO 4800.000

3265 DIVIDED FLOW

3280 CROSS SECTION 4800.00 EXTENDED 2.50 FEET

4800.00	6.30	748.90	0.00	0.00	748.91	0.01	0.08	0.01	748.30
360.	35.	139.	136.	313.	124.	495.	122.	59.	746.60
2.43	0.27	1.12	0.28	0.100	0.040	0.100	0.000	742.60	0.00
0.000128	279.	279.	279.	2	0	0	0.00	436.37	460.06

Don't use Elevations

```
   SECNO     DEPTH     CWSEL     CRIWS     WSELK     EG        HV        HL        GLOSS     BANK ELEV
   Q         QLOB      QCH       QROB      ALOB      ACH       AROB      VOL       TWA     LEFT/RIGHT
   TIME      VLOB      VCH       VROB      XNL       XNCH      XNR       WTN       ELMIN       SSTA
   SLOPE     XLOBL     XLCH      XLOBR     ITRIAL    IDC       ICONT     CORAR     TOPWID      ENDST

*SECNO 5200.000

3301 HV CHANGED MORE THAN HVINS

3685 20 TRIALS ATTEMPTED WSEL/CWSEL
3693 PROBABLE MINIMUM SPECIFIC ENERGY
3720 CRITICAL DEPTH ASSUMED
  5200.00     2.73    750.28    750.28      0.00    751.29      1.01      0.18      0.50    757.00
     360.       0.      360.       0.        0.       45.        0.       127.       61.    752.50
     2.45     0.00      0.06      0.00     0.100     0.040     0.100     0.000    747.50    187.65
 0.020183     400.      400.      400.        20        14         0      0.00     22.39    210.04

*SECNO 5600.000

3265 DIVIDED FLOW

3280 CROSS SECTION   5600.00 EXTENDED      0.75 FEET

3301 HV CHANGED MORE THAN HVINS

          CROSS SECTION 13
  5600.00     3.94    756.44    756.36      0.00    756.93      0.49      5.48      0.16    760.80
     360.       67.      293.       0.        37.       47.        0.       128.       61.    758.90
     2.47     1.19      6.13      0.00     0.100     0.040     0.100     0.000    752.50      0.00
 0.009911     400.      400.      400.         8        11         0      0.00    111.60    221.04

*SECNO 5900.000

3265 DIVIDED FLOW

          CROSS SECTION 12
  5900.00     4.36    758.76      0.00      0.00    759.20      0.44      2.26      0.31    761.10
     360.       0.      359.       1.        1.       67.        4.       128.       62.    759.40
     2.49     0.09      5.32      0.29     0.100     0.040     0.100     0.000    754.40     59.46
 0.005900     300.      300.      300.         3         0         0      0.00     76.96    358.68

CCHV=   0.300 CEHV=   0.300
*SECNO 6030.000
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SECNO     DEPTH     CWSEL     CRIWS     WSELK     EG        HV        HL        OLOSS     BANK ELEV
Q         QLOB      QCH       QROB      ALOB      ACH       AROB      VOL       TWA     LEFT/RIGHT
TIME      VLOB      VCH       VROB      XNL       XNCH      XNR       WTN       ELMIN       SSTA
SLOPE     XLOOL     XLCH      XLOBR     ITRIAL    IDC       ICONT     CORAR     TOPWID      ENDST

3265 DIVIDED FLOW

          DOWNSTREAM OF MC NEIL STREET BRIDGE
  6050.00      4.81    759.21      0.00      0.00    759.48      0.27      0.23      0.05    761.10
     360.       10.       340.       9.       48.       79.       36.      129.       62.    759.40
     2.49      0.22      4.30      0.25     0.100     0.020     0.100     0.000    754.40     16.36
 0.000062      130.      130.      130.         3         0         0      0.00    262.05    394.74

SPECIAL BRIDGE

SB  XK        XKOR      COFQ      RDLEN     BWC       BWP       FAREA     SS        ELCHU     ELCHD
     0.00      1.60      2.60     400.00      2.80      0.00     10.20      0.00    755.40    755.40

*SECNO 6052.000
3280 CROSS SECTION   6052.00 EXTENDED      3.96 FEET

PRESSURE AND WEIR FLOW

EGPRS     EGLWC     H3        QWEIR     QPR       BAREA     TRAPEZOID                ELLC      ELTRD
                                                                AREA
  790.16    760.39      0.00      221.      139.       10.       10.    759.00    763.50

          UPSTREAM OF MC NEIL STREET BRIDGE
  6052.00      9.45    763.85      0.00      0.00    763.86      0.00      4.37      0.00    761.10
     360.       94.       146.     120.      874.      215.     1296.      129.       63.    759.40
     2.51      0.11      0.68      0.09     0.100     0.020     0.100     0.000    754.40      0.00
 0.000007       22.       22.       22.         0         0         3      0.00    631.36    631.36

*SECNO 6100.000
3280 CROSS SECTION   6100.00 EXTENDED      3.97 FEET

  6100.00      9.46    763.86      0.00      0.00    763.86      0.00      0.00      0.00    761.10
     360.      118.       92.     150.      375.      216.     1300.      132.       63.    759.40
     2.58      0.13      0.43      0.12     0.100     0.040     0.100     0.000    754.40      0.00
 0.000011       48.       48.       48.         1         0         0      0.00    631.90    631.90

*SECNO 6280.000
```

Do not use elevations

SECNO	DEPTH	CWSEL	CRIWS	WSELK	EG	HV	HL	OLOSS	BANK ELEV
Q	QLOB	QCH	QROB	ALOB	ACH	AROB	VOL	TWA	LEFT/RIGHT
TIME	VLOB	VCH	VROB	XNL	XNCH	XNR	WTN	ELMIN	SSTA
SLOPE	XLOBL	XLCH	XLOBR	ITRIAL	IDC	ICONT	CORAR	TOPWID	ENDST

3280 CROSS SECTION 6230.00 EXTENDED 3.96 FEET

DOWNSTREAM OF PARMENTER ROAD BRIDGE

6280.00	9.46	763.86	0.00	0.00	763.86	0.00	0.00	0.00	761.10
360.	118.	92.	150.	874.	215.	1297.	142.	66.	759.40
2.63	0.14	0.43	0.12	0.100	0.040	0.100	0.000	754.40	0.00
0.000011	130.	180.	180.	0	0	0	0.00	631.47	631.47

SPECIAL BRIDGE

SB	XK	XKOR	COFQ	ROLEN	BWC	BWP	BAREA	SS	ELCHU	ELCHD
	0.00	1.60	2.60	400.00	2.40	0.00	7.50	0.00	755.40	755.40

*SECNO 6300.000
3280 CROSS SECTION 6300.00 EXTENDED 0.64 FEET

PRESSURE AND WEIR FLOW

EGPRS	EGLWC	H3	QWEIR	QPR	BAREA	TRAPEZOID AREA	ELLC	ELTRD
821.10	764.86	0.00	349.	9.	8.	8.	758.70	762.50

UPSTREAM OF PARMENTER ROAD BRIDGE

6300.00	8.14	763.84	0.00	0.00	763.90	0.06	0.04	0.00	757.20
360.	129.	91.	140.	229.	25.	164.	142.	66.	757.20
2.63	0.56	3.66	0.85	0.100	0.040	0.100	0.000	755.70	0.00
0.001119	20.	20.	20.	2	0	8	0.00	336.82	336.82

*SECNO 6360.000
3280 CROSS SECTION 6360.00 EXTENDED 2.53 FEET

CROSS SECTION 10A

6360.00	6.83	763.93	0.00	0.00	763.93	0.00	0.02	0.02	761.30
360.	0.	0.	360.	0.	0.	866.	143.	67.	811.40
2.87	0.00	0.00	0.42	0.100	0.040	0.100	0.000	757.10	0.00
0.000135	60.	60.	60.	2	0	0	0.00	372.00	372.00

```
EEEEEE    EEEEEE    DDDDD    OOOO    L      AAAA    N   N   SSSS    K  K    IIIII
E         E         D   D  O    C  L      A    A  NN  N  S        K K        I
E         E         D   D  O    C  L      A    A  N N N   SSSS    K K        I
EEEE      EEEE      D   D  O    C  L      AAAAAA  N  N N       S  KKK        I
E         E         D   D  O    C  L      A    A  N   NN  S    S  K K        I
EEEEEE    EEEEEE    DDDDD    OOOO    LLLLLL A    A  N   N   SSSS    K  K    IIIII
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EE DOLANSKI 11 JUN 84 16:12:28

TERMINAL:203

PRINTED IN U.S.A.

THIS RUN EXECUTED 10 APR 84 9:24:31

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**********************************************
  HECZ RELEASE DATED NOV 76 UPDATED MARC 1982
  ERROR CORR -  01,02,03,04,05
  MODIFICATION -  50,51,52,53,54,55
**********************************************

C
T1              CITY OF CORUNNA FLOOD INSURANCE STUDY
T2              10 YEAR FLOOD FREQUENCY
T3              SHIAWASSEE RIVER

J1  ICHECK    INQ       NINV      IDIF      STRT      METRIC    HVINS     Q         WSEL      EQ
        0.        2.        0.        0.  0.000000     0.00      0.0       0.    731.600     0.000
J2  NPROF     IPLOT     PRFVS     XSECV     XSECH     FN        ALLDC     IBW       CHNIM     ITRACE
    1.000     0.000    -1.000     0.000     0.000     0.000     0.000     0.000     0.000     0.000
J3  VARIABLE CODES FOR SUMMARY PRINTOUT
  150.000   201.000     0.000     0.000     0.000     0.000     0.000     0.000     0.000     0.000

NC      0.030     0.080     0.030     0.100     0.300     0.000     0.000     0.000     0.000     0.000
ST      4.000  4440.000  6270.000  7050.000  8870.000     0.000     0.000     0.000     0.000     0.000
        DOWNSTREAM CORPORATE LIMIT
X1      0.000    31.000   445.000   592.000     0.000     0.000     0.000     0.000     0.000     0.000
GR    739.000     0.000   734.800   230.000   735.000   256.000   735.300   285.000   734.800   310.000
GR    734.300   360.000   733.800   370.000   733.500   397.000   734.200   433.000   734.200   445.000
GR    733.200   448.000   724.700   450.000   723.400   460.000   722.700   470.000   722.500   480.000
GR    721.900   491.000   722.300   500.000   722.300   510.000   722.700   520.000   723.100   570.000
GR    723.500   580.000   724.900   586.000   729.800   592.000   729.900   603.000   727.800   637.000
GR    729.700   645.000   729.700   700.000   728.500   730.000   728.500   751.000   732.500   772.000
GR    736.000  1842.000     0.000     0.000     0.000     0.000     0.000     0.000     0.000     0.000

        CROSS SECTIION-10
X1   1300.000     0.000     0.000     0.000  1000.000  1000.000  1000.000     0.000     0.000     0.000

NC      0.000     0.000     0.000     0.300     0.500     0.000     0.000     0.000     0.000     0.000
        CROSS SECTION-9
X1   3300.000    26.000   232.000   400.000  2000.000  2000.000  2600.000     0.000     0.000     0.000
GR    743.700     0.000   743.500    25.000   743.000    50.000   742.600    77.000   742.000   102.000
GR    741.400   127.000   740.800   152.000   740.000   177.000   739.200   200.000   739.400   232.000
GR    726.700   251.000   724.100   261.000   722.500   281.000   723.000   321.000   723.600   330.000
GR    723.700   340.000   725.400   350.000   726.000   360.000   732.000   400.000   731.700   432.000
GR    732.300   457.000   731.200   482.000   731.200   507.000   731.500   532.000   731.800   558.000
GR    739.000  2000.000     0.000     0.000     0.000     0.000     0.000     0.000     0.000     0.000
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NC      0.000     0.000     0.000     0.300     0.500     0.000     0.000     0.000     0.000     0.000
        DOWNSTREAM OF WALKBRIDGE
X1   4300.000    20.000   594.000   714.000  1000.000  1000.000  1000.000     0.000     0.000     0.000
GR    740.000     0.000   732.200   500.000   731.600   520.000   731.000   594.000   727.800   600.000
GR    724.000   626.000   723.600   646.000   723.400   649.000   723.200   652.000   722.800   656.000
GR    723.300   666.000   723.300   676.000   724.000   686.000   726.600   705.000   733.500   709.000
GR    735.300   714.000   736.000   736.000   735.400   762.000   735.800   805.000   739.000  1900.000

SB      1.150     1.600     2.600     0.000    86.500     3.000   920.000     1.000   722.800   722.800
        UPSTREAM OF WALKBRIDGE
X1   4310.000     0.00      1.000     0.000    10.000    10.000    10.000     0.000     0.000     0.000
X2      0.000     0.000     1.000   733.700   732.300     0.000     0.000     0.000     0.000     0.000
BT     15.000     0.000   740.000     0.000   500.000   732.200     0.000   520.000   732.200     0.000
BT    600.000   737.300     0.000   600.000   740.300   733.700   649.000   740.300   733.700   649.000
BT    740.300   723.400   652.000   740.300   723.200   652.000   740.300   733.700   705.000   740.300
BT    733.700   705.000   737.300   726.600   736.000   736.000     0.000   762.000   735.400     0.000
BT    805.000   735.800     0.000  1900.000   739.000     0.000     0.000     0.000     0.000     0.000

NC      0.000     0.000     0.000     0.100     0.300     0.000     0.000     0.000     0.000     0.000
        CROSS SECTION-B
X1   5200.000    36.000   300.000   992.000   890.000   890.000   890.000     0.000     0.000     0.000
GR    740.000     0.000   730.800   591.000   732.200   612.000   733.400   635.000   732.700   658.000
GR    732.100   682.000   732.600   705.000   732.100   732.000   732.300   755.000   732.500   787.000
GR    732.500   807.000   731.900   807.000   727.400   814.000   726.200   823.000   726.400   834.000
GR    730.100   866.000   729.500   887.000   727.200   892.000   725.200   902.000   724.500   912.000
GR    723.500   922.000   723.300   932.000   723.400   942.000   723.600   952.000   724.100   962.000
GR    724.900   972.000   726.200   982.000   727.000   994.000   730.500   990.000   731.400   992.000
GR    733.800  1040.000   734.200  1064.000   735.600  1089.000   736.400  1106.000   737.400  1135.000
GR    739.000  2290.000     0.000     0.000     0.000     0.000     0.000     0.000     0.000     0.000

NC      0.000     0.000     0.000     0.300     0.500     0.000     0.000     0.000     0.000     0.000
X1   6900.000    26.000   102.000   247.000  1200.000  1200.000  1200.000     0.000     0.000     0.000
GR    741.100     0.000   740.800    15.000   741.200    30.000   741.300    47.000   740.700    71.000
GR    740.000    93.000   739.100   102.000   732.600   114.000   731.900   123.000   727.600   132.000
GR    726.100   142.000   725.000   152.000   725.000   162.000   724.800   172.000   724.800   182.000
GR    724.300   202.000   724.700   212.000   727.200   220.000   730.200   232.000   733.900   247.000
GR    733.300   272.000   733.300   297.000   733.000   317.000   733.500   347.000   735.100   378.000
GR    740.000   500.000     0.000     0.000     0.000     0.000     0.000     0.000     0.000     0.000

NC      0.000     0.000     0.000     0.300     0.500     0.000     0.000     0.000     0.000     0.000
        DOWNSTREAM OF STATE ROAD
X1   7200.000    23.000   100.000   268.000   300.000   300.000   300.000     0.000     0.000     0.000
GR    742.200     0.000   742.200    99.000   737.100   100.000   734.900   109.000   728.000   128.000
GR    726.600   148.000   726.900   156.000   726.000   160.000   725.300   168.000   725.200   178.000
GR    725.500   188.000   724.800   198.000   725.400   207.000   725.200   211.000   725.300   215.000
GR    725.400   218.000   726.200   228.000   728.000   235.000   729.700   245.000   733.700   255.000
GR    735.100   268.000   740.700   269.000   740.000   377.000     0.000     0.000     0.000     0.000
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SB      0.900     1.600     2.600     0.000   100.000     8.000  1700.000     2.600   725.000   725.000
        UPSTREAM OF STATE ROAD
X1   7230.000     0.000     0.000     0.000    30.000    30.000    30.000     0.000     0.000     0.000
X2      0.000     0.000     1.000   739.400   740.000     0.000     0.000     0.000     0.000     0.000
BT     14.000     0.000   742.700     0.000   100.000   742.000     0.000   100.000   745.000   739.400
BT    156.000   744.600   739.000   156.000   744.600   726.900   160.000   744.600   726.000   160.000
BT    744.600   739.000   211.000   744.200   738.600   211.000   744.200   725.200   215.000   744.200
BT    725.300   215.000   744.200   738.600   268.000   743.900   738.200   268.000   740.800     0.000
BT    377.000   740.000     0.000     0.000     0.000     0.000     0.000     0.000     0.000     0.000

X1   7430.000    26.000   102.000   247.000   200.000   200.000   200.000     0.000     0.000     0.000
GR    741.100     0.000   740.800    15.000   741.200    30.000   741.300    47.000   740.700    71.000
GR    740.000    93.000   739.100   102.000   732.600   114.000   731.900   123.000   727.600   132.000
GR    726.100   142.000   725.000   152.000   725.000   162.000   724.800   172.000   724.800   182.000
GR    724.300   202.000   724.700   212.000   727.200   220.000   730.200   232.000   733.900   247.000
GR    735.600   272.000   733.000   297.000   733.000   317.000   733.500   347.000   735.100   378.000
GR    739.000   502.000     0.000     0.000     0.000     0.000     0.000     0.000     0.000     0.000

X1   8050.000     0.000     0.000     0.000   620.000   620.000   620.000     0.000     0.000     0.000

NC      0.000     0.000     0.015     0.000     0.000     0.000     0.000     0.000     0.000     0.000
X1   8100.000     5.000     0.000   215.000    50.000    50.000    50.000     0.000     0.000     0.000
GR    738.900     0.000   734.000    25.000   734.000   190.000   738.700   215.000   740.000   290.000

NC      0.000     0.000     0.030     0.100     0.300     0.000     0.000     0.000     0.000     0.000
        DAM
X1   8150.000    18.000   380.000   553.000    50.000    50.000    50.000     0.000     0.000     0.000
X5      4.000   738.900   739.900   740.300   741.200     0.000     0.000     0.000     0.000     0.000
GR    740.000     0.000   736.100   250.000   736.100   290.000   735.500   336.000   736.300   380.000
GR    731.000   410.000   729.900   431.000   728.900   441.000   728.300   451.000   725.800   471.000
GR    725.500   481.000   725.700   501.000   727.000   521.000   733.500   531.000   733.500   541.000
GR    735.500   543.000   740.000   553.000   740.900   569.000     0.000     0.000     0.000     0.000

X1   8400.000     0.000     0.000     0.000   250.000   250.000   250.000     0.000     0.000     0.000

        CROSS SECTION-5
X1   8300.000     0.000     0.000     0.000   400.000   400.000   400.000     0.000     0.000     0.000

        CROSS SECTION-4
X1   9100.000    37.000   265.000   515.000   300.000   300.000   300.000     0.000     0.000     0.000
GR    739.900     0.000   736.600    35.000   736.600    55.000   736.800    79.000   736.700   103.000
GR    736.800   125.000   736.700   147.000   736.500   172.000   736.700   195.000   736.800   217.000
GR    736.700   240.000   736.500   265.000   735.100   268.000   733.300   278.000   729.700   297.000
GR    728.600   307.000   728.000   317.000   728.100   327.000   729.200   347.000   729.200   357.000
GR    729.700   367.000   730.200   407.000   731.500   447.000   731.600   457.000   731.400   467.000
GR    732.000   437.000   732.700   497.000   734.200   507.000   735.500   515.000   735.600   545.000
GR    735.800   572.000   736.000   600.000   735.500   655.000   736.000   680.000   735.100   724.000
GR    738.000   743.000   739.750  1015.000     0.000     0.000     0.000     0.000     0.000     0.000
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CROSS SECTION-3

X1	9900.000	19.000	1160.000	1405.000	800.000	800.000	800.000	0.000	0.000	0.000
GR	740.000	0.000	737.100	1100.000	736.200	1140.000	736.600	1160.000	735.500	1170.000
GR	733.900	1200.000	733.500	1230.000	729.800	1260.000	729.300	1270.000	728.100	1310.000
GR	726.400	1320.000	728.200	1340.000	728.500	1360.000	728.500	1370.000	729.800	1380.000
GR	733.300	1390.000	735.500	1400.000	736.800	1405.000	739.000	1905.000	0.000	0.000

CROSS SECTION-2

X1	11800.000	21.000	800.000	998.000	1800.000	1800.000	1800.000	0.000	0.000	0.000
GR	740.000	0.000	737.300	690.000	737.400	725.000	738.000	795.000	737.900	800.000
GR	735.500	802.000	730.900	820.000	729.800	830.000	730.000	850.000	730.500	910.000
GR	729.900	920.000	729.800	930.000	730.400	940.000	730.300	950.000	730.900	960.000
GR	732.600	970.000	733.600	980.000	734.400	990.000	735.600	998.000	736.000	1038.000
GR	739.000	1700.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

UPSTREAM OF CORPORATE LIMITS / CROSS SECTION-1/

X1	14400.000	26.000	800.000	990.000	2600.000	2600.000	2600.000	0.000	0.000	0.000
GR	740.000	0.000	737.000	700.000	736.200	740.000	737.500	800.000	734.200	802.000
GR	731.000	810.000	729.700	820.000	729.800	830.000	729.500	840.000	729.400	850.000
GR	729.300	860.000	729.300	870.000	729.200	880.000	729.600	890.000	729.000	900.000
GR	728.900	910.000	728.000	920.000	729.300	930.000	731.400	940.000	731.900	960.000
GR	732.400	970.000	733.600	980.000	733.700	987.000	738.300	990.000	740.700	1090.000
GR	742.700	1130.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

X1	15800.000	19.000	413.000	563.000	1400.000	1400.000	1400.000	0.000	0.000	0.000
GR	740.000	0.000	737.700	300.000	738.400	393.000	738.400	413.000	733.500	423.000
GR	733.000	433.000	732.800	443.000	732.500	453.000	732.200	463.000	732.000	473.000
GR	731.300	483.000	729.600	503.000	729.800	513.000	729.800	523.000	731.000	533.000
GR	735.600	560.000	740.300	563.000	742.000	573.000	742.000	581.000	0.000	0.000
NC	0.000	0.000	0.000	0.300	0.500	0.000	0.000	0.000	0.000	0.000
X1	16800.000	17.000	44.000	165.000	1000.000	1000.000	1000.000	0.000	0.000	0.000
GR	748.700	1.000	740.700	21.000	740.300	44.000	735.700	46.000	733.000	55.000
GR	731.200	65.000	729.700	85.000	728.800	95.000	728.700	115.000	729.500	125.000
GR	730.700	135.000	731.300	145.000	731.400	155.000	739.300	165.000	740.700	177.000
GR	753.500	195.000	754.800	206.000	0.000	0.000	0.000	0.000	0.000	0.000
NC	0.000	0.000	0.015	0.000	0.000	0.000	0.000	0.000	0.000	0.000

DOWNSTREAM OF DAM/BRIDGE

X1	17000.000	25.000	195.000	456.000	200.000	200.000	200.000	0.000	0.000	0.000
X2	0.000	0.000	0.000	740.900	735.200	0.000	0.000	0.000	0.000	0.000
GR	743.100	0.000	743.000	25.000	743.400	50.000	743.500	75.000	743.400	100.000
GR	743.500	125.000	743.600	150.000	743.000	175.000	742.300	195.000	742.000	199.000
GR	729.700	200.000	729.700	215.000	740.700	216.000	735.700	270.000	735.700	348.000
GR	735.700	431.000	736.900	456.000	737.700	481.000	738.200	506.000	739.200	531.000
GR	739.500	556.000	739.800	581.000	740.400	606.000	741.000	631.000	742.100	656.000
BT	15.000	0.000	743.100	743.100	25.000	743.000	743.000	50.000	743.400	743.400
BT	150.000	743.600	743.600	199.000	742.000	742.000	200.000	741.900	741.100	215.000
BT	740.700	740.700	216.000	740.700	740.700	270.000	735.700	735.700	431.000	735.700
BT	735.700	506.000	738.200	738.200	531.000	739.200	739.200	581.000	739.800	739.800
BT	631.000	741.000	741.000	656.000	742.100	742.100	0.000	0.000	0.000	0.000

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UPSTREAM OF DAM/BRIDGE ALSO CONFLU. OF UNNAMED STREAM

X1	17013.000	0.000	0.000	0.000	13.000	13.000	13.000	0.000	0.000	0.000
X2	0.000	0.000	0.000	0.000	0.000	0.000	1.000	0.000	0.000	0.000
NC	0.000	0.000	0.030	0.000	0.000	0.000	0.000	0.000	0.000	0.000
X1	17500.000	18.000	36.000	181.000	487.000	487.000	487.000	0.000	0.000	0.000
GR	741.000	0.000	740.600	30.000	739.700	36.000	732.200	46.000	731.000	56.000
GR	730.800	66.000	730.500	76.000	730.500	86.000	730.400	96.000	729.700	106.000
GR	730.600	126.000	731.700	136.000	733.900	146.000	734.300	156.000	734.100	166.000
GR	737.400	181.000	737.700	190.000	741.000	200.000	0.000	0.000	0.000	0.000
EJ	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

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THIS RUN EXECUTED 10 APR 84 9:26:08

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HEC2 RELEASE DATED NOV 76 UPDATED MARC 1982
ERROR CORR - 01,02,03,04,05
MODIFICATION - 5,51,52,53,54,55
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T1                CITY OF CORUNNA FLOOD INSURANCE STUDY
T2            100 YEAR FREQUENCY FLOOD
T3            SHIAWASSEE RIVER

J1  ICHECK    INO       NINV      IDIR      STRT      METRIC    HVINS     Q         WSEL      FQ
       0.       4.       0.        0.   0.000000      0.00      0.0       0.    734.300    0.000
J2  NPROF     IPLOT     PRFVS     XSECV     XSECH     FN        ALLDC     IBW       CHNIM     ITRACE
     3.000    0.000    -1.000     0.000     0.000     0.000     0.000     0.000     0.000     0.000
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   SECNO     DEPTH     CWSEL     CRIWS     WSELK     FG        HV        HL        OLOSS    BANK ELEV
   3         QLOB      QCH       QROB      ALOB      ACH       AROB      VOL       TWA    LEFT/RIGHT
   TIME      VLOB      VCH       VROB      XNL       XNCH      XNR       WTN       ELMIN       SSTA
   SLOPE     XLOBL     XLCH      XLOBR     ITRIAL    IDC       ICONT     CORAR     TOPWID      ENDST

APROF 3

CCHV=   0.100 CEHV=   0.300
*SECNO 0.000
        DOWNSTREAM CORPORATE LIMIT
     0.00     12.60    734.30      0.00    734.30    734.50      0.20      0.00      0.00    734.20
    7050.       8.      6121.      921.       42.     1608.     1385.        0.        0.    729.80
     0.00      0.18      3.81      0.67     0.080     0.030     0.080     0.000    721.90    345.00
 0.000263        0.        0.        0.         0         0         0      0.00    982.29   1322.29

*SECNO 1000.000
        CROSS SECTIION-10
  1000.00     12.67    734.57      0.00      0.00    734.75      0.18      0.25      0.00    734.20
    7050.      16.      6036.      997.       72.     1646.     1587.        73.       24.    729.80
     0.09      0.22      3.67      0.63     0.080     0.030     0.080     0.000    721.80    324.21
 0.000237    1000.     1000.     1000.         0         0         0      0.00   1078.54   1402.75

CCHV=   0.300 CEHV=    .500
*SECNO 3800.000
        CROSS SECTION-9
  3800.00     12.77    735.27      0.00      0.00    735.47      0.20      0.71      0.01    739.40
    7150.       0.      6052.      928.        0.     1572.     1780.       255.       75.    732.00
     0.31      0.00      3.85      0.56     0.080     0.030     0.080     0.000    722.50    238.18
 0.000300    2000.     2800.     2000.         2         0         0      0.00   1015.13   1253.28

CCHV=   0.300 CEHV=   0.500
*SECNO 4800.000

3265 DIVIDED FLOW

        DOWNSTREAM OF WALKBRIDGE
  4800.00     12.77    735.57      0.00      0.00    735.95      0.38      0.39      0.09    731.00
    7050.      642.      6408.       0.       753.     1236.        2.       316.       91.    735.80
     0.36      0.85      5.18      0.08     0.080     0.030     0.080     0.000    722.00    284.13
 0.000518    1000.     1000.     1000.         2         0         0      0.00    454.64    780.02
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   SECNO     DEPTH     CWSEL     CRIWS     WSELK     EG        HV        HL        OLOSS     BANK ELEV
   Q         QLOB      QCH       QROB      ALOB      ACH       AROB      VOL       TWA     LEFT/RIGHT
   TIME      VLOB      VCH       VROB      XNL       XNCH      XNR       WTN       ELMIN       SSTA
   SLOPE     XLOBL     XLCH      XLOBR     ITRIAL    IDC       ICONT     CORAR     TOPWID      ENDST

SPECIAL BRIDGE

SB  XK        XKOR      CCEB      RDLEN     BWC       BWP       BAREA     SS        ELCHU     ELCHD
     1.15      1.60      2.60      0.00     86.00      3.00    920.00      1.00    722.80    722.80
*SECNO 4510.000
3265 DIVIDED FLOW
PRESSURE AND WEIR FLOW

 EGPRS     EGLWC     H3        QWEIR     QPR       BAREA     TRAPEZOID     ELLC      ELTRD
                                                             AREA
   736.17    735.88    0.02      2525.     4515.     320.      1024.     733.70    732.30

          UPSTREAM OF WALKBRIDGE
  4510.00     13.01    735.81      0.00      0.00    736.17      0.35      0.22      0.00    731.00
     7050.      698.     6351.        2.      831.     1265.       13.      317.       92.    735.80
      0.37      0.84      5.02      0.14     0.080     0.030     0.080     0.000    722.80    268.39
  0.000473       10.       10.       10.         2         0         2      0.00    512.48    809.51

CCHV=   0.100 CEHV=   0.300
*SECNO 5700.000
          CROSS SECTION-8
  5700.00     13.02    736.32      0.00      0.00    736.45      0.13      0.26      0.02    732.50
     7050.     1041.     5859.      150.     1799.     1866.      275.      379.      106.    731.40
      0.46      0.58      3.14      0.55     0.080     0.030     0.080     0.000    723.30    236.35
  0.000198      890.      890.      890.         2         0         0      0.00    867.96   1104.31

CCHV=   0.300 CEHV=   0.500
*SECNO 6900.000
  6900.00     12.27    736.57      0.00      0.00    736.97      0.40      0.38      0.13    739.10
     7050.        0.     6663.      387.        0.     1280.      420.      456.      122.    733.90
      0.52      0.00      5.20      0.92     0.080     0.030     0.080     0.000    724.30    106.67
  0.000597      1200.     1200.     1200.         2         0         0      0.00    307.91    414.58

CCHV=   0.300 CEHV=   0.500
*SECNO 7200.000
          DOWNSTREAM OF STATE ROAD
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SECNO     DEPTH     CWSEL     CRIWS     WSELK     EG        HV        HL        CLOSS     BANK ELEV
Q         QLOB      QCH       QROB      ALOB      ACH       AROB      VOL       TWA       LEFT/RIGHT
TIME      VLOB      VCH       VROB      XNL       XNCH      XNR       WTN       ELMIN     SSTA
SLOPE     XLOBL     XLCH      XLCRB     ITRIAL    IDC       ICONT     CORAR     TOPWID    ENDST

7200.00   11.97     736.77    0.00      0.00      737.15    0.38      0.18      0.01      737.10
7050.     0.        7050.     0.        0.        1423.     0.        467.      123.      735.10
0.54      0.00      4.96      0.13      0.080     0.030     0.080     0.000     724.80    101.36
0.000587  300.      300.      300.      2         0         0         0.00      166.94    268.30

SPECIAL BRIDGE

SE   XK     XKOB     CCEQ     BDLEN    BWC      OWP      BAREA    SS       ELGHU    ELCHD
     0.90   1.60     2.60     0.00     100.00   8.00     1700.00  2.60     725.00   725.00

*SECNO 7230.000
CLASS A LOW FLOW

3420 BRIDGE W.S.=   736.72 BRIDGE VELOCITY=   4.91   CALCULATED CHANNEL AREA=   1436.

ESPRS     EGLWC     H3        QWEIR     QLOW      BAREA     TRAPEZOID AREA    ELLC      ELTRD
0.00      737.17    0.03      0.        7050.     1700.     1864.             739.40    740.00

          UPSTREAM OF STATE ROAD
7230.00   11.99     736.79    0.00      0.00      737.17    0.38      0.02      0.00      737.10
7050.     0.        7050.     0.        0.        1427.     0.        468.      124.      735.10
0.54      0.00      4.94      0.13      0.080     0.030     0.080     0.000     724.80    101.25
0.000501  30.       30.       30.       0         0         0         0.00      167.05    268.30

*SECNO 7430.000
7430.00   12.63     736.93    0.00      0.00      737.29    0.36      0.11      0.01      739.10
7050.     0.        6607.     443.      0.        1330.     492.      476.      125.      733.90
0.55      0.00      4.97      0.90      0.080     0.030     0.080     0.000     724.30    106.02
0.000521  200.      200.      200.      1         0         0         0.00      329.85    435.87

*SECNO 8050.000
8050.00   12.98     737.28    0.00      0.00      737.60    0.33      0.30      0.01      739.10
7050.     0.        6553.     497.      0.        1379.     560.      502.      130.      733.90
0.59      0.00      4.75      0.89      0.080     0.030     0.080     0.000     724.30    105.38
0.000457  620.      620.      620.      0         0         0         0.00      341.66    447.04

*SECNO 8100.000
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   SECNO      DEPTH      CWSEL      CRIWS      WSELK      EG         HV         HL         OLOSS     BANK ELEV
   Q          QLOB       QCH        QROB       ALOB       ACH        AROB       VOL        TWA     LEFT/RIGHT
   TIME       VLOB       VCH        VROB       XNL        XNCH       XNR        WTN        ELMIN      SSTA
   SLOPE      XLOBL      XLCH       XLOBR      ITRIAL     IDC        ICONT      CORAR      TOPWID     ENDST

 3301 HV CHANGED MORE THAN HVINS

 3685 20 TRIALS ATTEMPTED WSEL,CWSEL
 3693 PROBABLE MINIMUM SPECIFIC ENERGY
 3720 CRITICAL DEPTH ASSUMED
   8100.00      3.68     737.68     737.68       0.00     739.36       1.68       0.04       0.67     738.90
    7050.         0.      7050.         0.         0.       679.         0.       504.       130.     738.70
      0.59      0.00      10.39       0.00      0.080      0.015      0.080      0.000     734.00       6.20
  0.002216        50.        50.        50.        20         14          0       0.00     203.39     209.60

 CCHV=    0.100 CEHV=    0.300
 *SECNO 8150.000
  WATER EL=X5 CARD=    740.300
 3280 CROSS SECTION    8150.00 EXTENDED       0.30 FEET

             DAM
   8150.00     14.80     740.30       0.00       0.00     740.47       0.17       0.02       0.15     736.30
     7050.      670.      6380.         0.      1131.      1852.         1.       506.       130.     740.00
      0.60      0.59       3.44       0.08      0.080      0.030      0.080      0.000     725.50       0.00
  0.000210        50.        50.        50.         0          0          0       0.00     558.33     558.33

 *SECNO 8400.000
 3280 CROSS SECTION    8400.00 EXTENDED       0.36 FEET

   8400.00     14.85     740.35       0.00       0.00     740.52       0.16       0.05       0.00     736.30
     7050.      682.      6368.         0.      1152.      1862.         1.       523.       133.     740.00
      0.62      0.59       3.42       0.08      0.080      0.030      0.080      0.000     725.50       0.00
  0.000206       250.       250.       250.         2          0          0       0.00     559.32     559.32

 *SECNO 8800.000
 3280 CROSS SECTION    8800.00 EXTENDED       0.44 FEET

             CROSS SECTION-5
   8800.00     14.94     740.44       0.00       0.00     740.60       0.16       0.08       0.00     736.30
     7050.      700.      6349.         0.      1134.      1876.         2.       551.       139.     740.00
      0.66      0.59       3.38       0.10      0.080      0.030      0.080      0.000     725.50       0.00
  0.000200       400.       400.       400.         0          0          0       0.00     560.79     560.79
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    SECNO     DEPTH     CWSEL     CRIWS     WSELK     EG        HV        HL        OLOSS   BANK ELEV
    Q         QLOB      QCH       QROB      ALOB      ACH       AROB      VCL       TWA     LEFT/RIGHT
    TIME      VLOB      VCH       VROB      XNL       XNCH      XNR       WTN       ELMIN       SSTA
    SLOPE     XLOBL     XLCH      XLOBR     ITRIAL    IDC       ICONT     CORAR     TOPWID      ENDST

 *SECNO 9100.000
 3280 CROSS SECTION   9100.00 EXTENDED      0.83 FEET

          CROSS SECTION-4
   9100.00     12.58    740.58      0.00      0.00    740.65      0.07      0.04      0.01    736.50
      7050.      463.     5844.      744.      978.     2449.     1562.      579.      144.    735.50
       0.70      0.47      2.39      0.48     0.080     0.030     0.080     0.000    728.00      0.00
   0.000111      300.      300.      300.         2         0         0      0.00   1015.00   1015.00

 *SECNO 9900.000
 3280 CROSS SECTION   9900.00 EXTENDED      1.67 FEET

          CROSS SECTION-5
   9900.00     12.57    740.67      0.00      0.00    740.75      0.07      0.09      0.00    736.80
      7050.      905.     5594.      552.     2581.     2326.     1387.      682.      171.    736.80
       0.81      0.35      2.40      0.40     0.080     0.030     0.080     0.000    728.10      0.00
   0.000118      800.      800.      800.         2         0         0      0.00   1905.00   1905.00

 *SECNO 11300.000
 3280 CROSS SECTION  11800.00 EXTENDED      1.90 FEET

          CROSS SECTION-2
  11800.00     11.11    740.91      0.00      0.00    740.99      0.08      0.24      0.00    737.90
      7050.      753.     5063.     1233.     1917.     1931.     2456.      957.      249.    735.60
       1.07      0.39      2.62      0.50     0.080     0.030     0.080     0.000    729.80      0.00
   0.000136     1900.     1900.     1900.         1         0         0      0.00   1700.00   1700.00

 *SECNO 14400.000
 3280 CROSS SECTION  14400.00 EXTENDED      1.25 FEET

          UPSTREAM OF CORPORATE LIMITS / CROSS SECTION-1/
  14400.00     12.36    741.26      0.00      0.00    741.36      0.11      0.37      0.01    737.50
      7050.     1124.     5868.       57.     2375.     2045.      178.     1283.      333.    738.30
       1.36      0.47      2.87      0.32     0.080     0.030     0.080     0.000    728.90      0.00
   0.000147     2600.     2600.     2600.         1         0         0      0.00   1100.99   1100.99

 *SECNO 15800.000
 3280 CROSS SECTION  15800.00 EXTENDED      1.46 FEET
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    SECNO      DEPTH     CWSEL     CRIWS     WSELK     EG        HV        HL        OLOSS    BANK ELEV
    Q          WLOB      QCH       QROB      ALOB      ACH       AROB      VOL       TWA    LEFT/RIGHT
    TIME       VLOB      VCH       VROB      XNL       XNCH      XNR       WTN       ELMIN      SSTA
    SLOPE      XLOBL     XLCH      XLOBR     IIRIAL    IDC       ICONT     CORAR     TOPWID     ENDST

 15800.00      11.87    741.47      0.00      0.00    741.74      0.27      0.33      0.05    738.40
    7050.       894.     6155.        1.     1163.     1390.        4.     1398.      360.    740.30
     1.46       0.77      4.43      0.26     0.080     0.030     0.080     0.000    729.60      0.00
 0.000426      1400.     1400.     1400.         1         0         0      0.00    569.84    569.84

CCHV=    0.300 CEHV=    1.500
*SECNO 16800.000
 16800.00      13.15    741.85      0.00      0.00    742.30      0.44      0.47      0.09    740.30
    7050.        17.     7019.       14.       33.     1313.       23.     1443.      368.    739.30
     1.51       0.51      5.35      0.62     0.080     0.030     0.080     0.000    728.70     17.97
 0.000520      1000.     1000.     1000.         2         0         0      0.00    160.65    178.62

*SECNO 17000.000
3280 CROSS SECTION  17000.00 EXTENDED      0.27 FEET

3370 NORMAL BRIDGE,NRD=  0 MIN ELTRD=  735.70 MAX ELLC=  740.90

          DOWNSTREAM OF DAM/BRIDGE
 17000.00      12.67    742.37      0.00      0.00    742.44      0.07      0.03      0.11    742.30
    7050.         0.     6531.      519.        0.     2990.     1502.     1456.      370.    736.90
     1.54       0.00      2.19      0.35     0.080     0.015     0.080     0.000    729.70    192.90
 0.000085       200.      200.      200.         2         0         0   2243.91    463.10    656.00

*SECNO 17013.000
3280 CROSS SECTION  17013.00 EXTENDED      0.18 FEET

          UPSTREAM OF DAM/BRIDGE ALSO CONFLU. OF UNNAMED STREAM
 17013.00      12.58    742.28      0.00      0.00    742.54      0.25      0.00      0.09    742.30
    7050.         0.     6738.      312.        0.     1633.      574.     1457.      370.    736.90
     1.54       0.00      4.13      0.54     0.080     0.015     0.080     0.000    729.70    195.23
 0.000167        13.       13.       13.         2         0         0      0.00    460.77    656.00

*SECNO 17500.000
3230 CROSS SECTION  17500.00 EXTENDED      2.35 FEET

 17500.00      12.66    742.36      0.00      0.00    742.70      0.34      0.12      0.04    739.70
    7050.        44.     6938.       68.       75.     1479.       73.     1478.      374.    737.40
     1.57       0.59      4.69      0.93     0.080     0.030     0.080     0.000    729.70      0.00
 0.000416       487.      487.      487.         1         0         0      0.00    200.00    200.00
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THIS RUN EXECUTED 10 APR 84 9:27:07

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  HEC2 RELEASE DATED NOV 76 UPDATED MARC 1982
  ERROR CORR - 01,02,03,04,05
  MODIFICATION - 50,51,52,53,54,55
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T1                CITY OF CORUNNA FLOOD INSURANCE STUDY
T2            500 YEAR FREQUENCY FLOOD
T3            SHIAWASSEE RIVER
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J1	ICHECK	INQ	NINV	IDIR	STRT	METRIC	HVINS	Q	WSEL	FQ
	0.	5.	0.	0.	0.000000	0.00	0.0	0.	736.400	0.000

J2	NPROF	IPLOT	PRFVS	XSECV	XSECH	FN	ALLDC	IBW	CHNIM	ITRACE
	15.000	0.000	-1.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

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    SECNO     DEPTH     CWSEL     CRIWS     WSELK     EG        HV        HL        OLOSS   BANK ELEV
    Q         QLOB      QCH       QROB      ALOB      ACH       AROB      VOL       TWA   LEFT/RIGHT
    TIME      VLOB      VCH       VROB      XNL       XNCH      XNR       WTN       ELMIN       SSTA
    SLOPE     XLOBL     XLCH      XLOBR     ITRIAL    IDC       ICONT     CORAR     TOPWID      ENDST

*PROF 4

CCHV=   0.100 CEHV=   0.300
*SECNO 0.000
3280 CROSS SECTION       0.00 EXTENDED       0.40 FEET

          DOWNSTREAM CORPORATE LIMIT
      0.00     14.50    736.40      0.00    736.40    736.54      0.14      0.00      0.00    734.20
     8870.      186.     6618.     2166.      498.     1917.     3568.        0.        0.    729.80
      0.00      0.37      3.45      0.58     0.080     0.030     0.080     0.000    721.90    142.38
  0.000171        0.        0.        0         0         0         0      0.00   1699.62   1842.00

*SECNO 1000.000
3280 CROSS SECTION    1000.00 EXTENDED       0.57 FEET

          CROSS SECTION-10
   1000.00     14.68    736.58      0.00      0.00    736.71      0.13      0.16      0.00    734.20
     8870.      207.     6509.     2154.      550.     1942.     3782.      141.        39.    729.80
      0.11      0.38      3.35      0.57     0.080     0.030     0.080     0.000    721.90    133.00
  0.000159     1000.     1000.     1000.         0         0         0      0.00   1709.00   1842.00

CCHV=   0.300 CEHV=   0.500
*SECNO 3800.000
          CROSS SECTION-9
   3800.00     14.54    737.04      0.00      0.00    737.20      0.15      0.48      0.01    739.40
     8870.        0.     6722.     2148.        0.     1861.     3604.      445.       113.    732.00
      0.36      0.00      3.61      0.60     0.080     0.030     1.080     0.000    722.50    235.53
  0.000217     2000.     2800.     2000.         2         0         0      0.00   1372.26   1607.79

CCHV=   0.300 CEHV=   0.500
*SECNO 4800.000
          DOWNSTREAM OF WALKBRIDGE
   4800.00     14.44    737.24      0.00      0.00    737.59      0.35      0.30      0.10    731.00
     8870.     1251.     7441.      178.     1356.     1435.      489.      545.       141.    735.80
      0.42      0.92      5.18      0.36     0.080     0.030     0.080     0.000    722.80    177.61
  0.000427     1000.     1000.     1000.         0         0         0      0.00   1116.47   1294.08
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SECNO     DEPTH     CWSEL     CRIWS     WSELK     EG        HV        HL        OLOSS     BANK ELEV
Q         QLOB      QCH       QBOR      ALOB      ACH       AROB      VOL       TWA       LEFT/RIGHT
TIME      VLOB      VCH       VROB      XNL       XNCH      XNR       WTN       ELMIN     SSTA
SLOPE     XLOBL     XLCH      XLOBR     ITRIAL    IDC       ICONT     CORAR     TOPWID    ENDST


SPECIAL BRIDGE

SB  XK        XKOR      CCEO      BDLEN     BWC       BWP       BAREA     SS        ELCHU     ELCHD
    1.15      1.60      2.60      0.00      86.00     3.00      920.00    1.00      722.80    722.80
*SECNO 4810.000
6870 D.S. ENERGY OF 737.59 HIGHER THAN COMPUTED ENERGY OF 737.58
PRESSURE AND WEIR FLOW

EGPRS     EGLWC     H3        QWEIR     QPR       BAREA     TRAPEZOID AREA  ELLC      ELTRD
737.58    737.46    0.01      5405.     3418.     920.      1024.             733.70    732.30


          UPSTREAM OF WALKERIDGE
4810.00   14.44     737.24    0.00      0.00      737.59    0.35      0.00      0.00      731.00
8870.     1254.     7435.     181.      1361.     1437.     495.      546.      142.      735.80
0.42      0.92      5.18      0.37      0.080     0.030     0.080     0.000     722.80    176.86
0.000425  10.       10.       10.       2         0         2         0.00      1121.21   1298.07


CCHV=  0.100 CEHV=  0.300
*SECNO 5700.000
          CROSS SECTION-8
5700.00   14.42     737.72    0.00      0.00      737.84    0.13      0.23      0.02      732.50
8870.     1700.     6896.     234.      2649.     2134.     494.      634.      165.      731.40
0.51      0.64      3.23      0.58      0.080     0.030     0.080     0.000     723.30    146.64
0.000175  890.      890.      890.      2         0         0         0.00      1217.35   1363.99


CCHV=  0.300 CEHV=  0.500
*SECNO 6900.000
6900.00   13.61     737.91    0.00      0.00      738.35    0.44      0.35      0.16      739.10
8870.     0.        8135.     735.      0.        1471.     668.      736.      187.      733.90
0.58      0.00      5.53      1.10      0.080     0.030     0.080     0.000     724.30    104.19
0.000576  1200.     1200.     1200.     2         0         0         0.00      343.81    443.00


CCHV=  0.300 CEHV=  0.500
*SECNO 7200.000
          DOWNSTREAM OF STATE ROAD
7200.00   13.23     733.08    0.00      0.00      738.53    0.45      0.17      0.01      737.10
8870.     0.        8870.     0.        0.        1642.     1.        749.      189.      735.10
0.59      0.00      5.40      0.18      0.080     0.030     0.080     0.000     724.81    99.81
0.000582  300.      300.      300.      2         0         0         0.00      168.72    268.53
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   SECNO     DEPTH     CWSEL     CRIWS     WSELK     EG        HV        HL        OLOSS    BANK ELEV
   Q         OLOB      CCH       CROS      ALOB      ACH       AROS      VOL       TWA    LEFT/RIGHT
   TIME      VLOB      VCH       VROS      XNL       XNCH      XNR       WTN       ELMIN       SSTA
   SLOPE     XLOBL     XLCH      XLOBR     ITRIAL    IDC       ICONT     CORAR     TOPWID      ENDST

SPECIAL BRIDGE

SB  XK        XKCR      CCEQ      RDLEN     BWC       BWP       BAREA     SS        ELCHU     ELCHD
    0.90      1.60      2.60      0.00      100.00    8.00      1720.00   2.60      725.00    725.00
*SECNO 7230.000
CLASS A LOW FLOW

3421 BRIDGE W.S.=    738.02 BRIDGE VELOCITY=,     5.41    CALCULATED CHANNEL AREA=,    1639.

 EGPRS     EGLWC     H3        QWEIR     QLOW      BAREA     TRAPEZOID     ELLC      ELTRD
                                                                AREA
    0.00   738.56    0.03      0.        8870.     1700.     1864.         739.40    740.00

        UPSTREAM OF STATE ROAD
 7230.00   13.31   738.11    0.00      0.00    738.56    0.45      0.03      0.00    737.10
   8870.      0.     3870.      0.        0.     1648.      1.      750.     189.     735.10
    0.59    0.00     5.38     0.18     0.080    0.030    0.080    0.000    724.80     99.80
0.000576    30.      30.      30.        0        0        0     0.00    168.74    268.54

*SECNO 7430.000
 7430.00   13.99   738.29    0.00      0.00    738.68    0.39      0.11      0.02    739.10
   8870.      0.     8048.    822.       0.     1525.    780.     759.     190.     733.90
    0.61    0.00     5.28     1.05     0.080    0.030    0.080    0.000    724.30    103.50
0.000504   200.     200.     200.        2        0        0     0.00    375.90    479.40

*SECNO 8050.000
 8050.00   14.33   732.63    0.00      0.00    738.99    0.36      0.29      0.01    739.10
   8370.      0.     7984.    836.       0.     1573.    860.     793.     196.     733.90
    0.64    0.00     5.08     1.03     0.080    0.030    0.080    0.000    724.30    102.88
0.000450    620.     620.     620.        0        0        0     0.00    387.15    490.03

*SECNO 8100.000

3301 HV CHANGED MORE THAN HVINS

3685 20 TRIALS ATTEMPTED WSEL,CWSEL
3693 PROBABLE MINIMUM SPECIFIC ENERGY
3720 CRITICAL DEPTH ASSUMED
 8100.00    4.26   738.26   738.26      0.00    740.13    1.92      0.04      0.78    738.90
   8870.      0.     8870.      0.        0.      797.      0.     795.     196.     738.70
    0.64    0.00    11.13     0.00     0.080    0.015    0.080    0.000    734.00      3.28
0.002136     50.      50.      50.       20       17        0     0.00    209.36    212.64
```

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   SECNO     DEPTH     CWSEL     CRIWS     WSELK     EG        HV        HL        OLOSS    BANK ELEV
   Q         QLOB      QCH       QROB      ALOB      ACH       AROB      VOL       TWA      LEFT/RIGHT
   TIME      VLOB      VCH       VROB      XNL       XNCH      XNR       WTN       ELMIN       SSTA
   SLOPE     XLOBL     XLCH      XLOBR     ITRIAL    IDC       ICONT     COBAR     TOPWID      ENDST

CCHV=   0.100 CEHV=   0.300
*SECNO 8150.000
 WATER EL=X5 CARD=   741.200
3230 CROSS SECTION   8150.00 EXTENDED      1.20 FEET

          DAM
  8150.00     15.70     741.20      0.00      0.00    741.41      0.21      0.03      0.17    736.30
   8870.      1082.     7785.       3.      1473.     2008.       12.       797.      196.     740.00
    0.65      0.73      3.88      0.23      0.080     0.030     0.080     0.000    725.50      0.00
   0.239      50.       50.       50.         0         0         0      0.00     569.00    569.00

*SECNO 8400.000
3230 CROSS SECTION   8400.00 EXTENDED      1.26 FEET

  8400.00     15.76     741.26      0.00      0.00    741.47      0.20      0.06      0.00    736.30
   8870.      1098.     7769.       3.      1497.     2019.       13.       817.      200.     740.00
    0.67      0.73      3.85      0.24      0.080     0.030     0.080     0.000    725.50      0.00
0.000234      250.      250.      250.         2         0         0      0.00     569.00    569.00

*SECNO 8800.000
3230 CROSS SECTION   8800.00 EXTENDED      1.36 FEET

          CROSS SECTION-5
  8800.00     15.86     741.36      0.00      0.00    741.56      0.20      0.09      0.00    736.30
   8870.      1122.     7745.       4.      1533.     2035.       15.       850.      205.     740.00
    0.70      0.73      3.80      0.26      0.080     0.030     0.080     0.000    725.50      0.00
0.000227      400.      400.      400.         0         0         0      0.00     569.00    569.00

*SECNO 9100.000
3230 CROSS SECTION   9100.00 EXTENDED      1.78 FEET

          CROSS SECTION-4
  9100.00     13.53     741.53      0.00      0.00    741.62      0.09      0.05      0.01    736.50
   8870.      696.      7139.     1135.      1230.     2687.     2038.       883.      210.     735.50
    0.74      0.57      2.62      0.56      0.080     0.030     0.080     0.000    728.00      0.00
0.000119      300.      300.      300.         2         0         0      0.00    1015.00   1015.00

*SECNO 9900.000
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   SECNO     DEPTH     CWSEL     CRIWS     WSELK     EG        HV        HL        OLOSS    BANK ELEV
   W         QLOB      QCH       QRCB      ALOB      ACH       ARCB      VOL       TWA    LEFT/RIGHT
   TIME      VLOB      VCH       VRCB      XNL       XNCH      XNR       WTN       ELMIN       SSTA
   SLOPE     XLOBL     XLCH      XLOBR     TIRIAL    IDC       ICONT     CORAR     TOPWID      ENDST

3280 CROSS SECTION   9900.00 EXTENDED      2.64 FEET

         CROSS SECTION-3
 9900.00     13.54    741.64      0.00      0.00    741.71      0.07      0.09      0.00    736.80
    8870.     1590.     6398.      882.     3702.     2563.     1870.     1012.      237.    736.80
     0.85      0.43      2.50      0.47     0.080     0.030     0.080     0.000    728.10      0.00
0.000112      800.      800.      800.         2         0         0      0.00   1905.00   1905.00

*SECNO 11800.000
3280 CROSS SECTION  11800.00 EXTENDED      2.86 FEET

         CROSS SECTION-2
11800.00     12.06    741.86      0.00      0.00    741.94      0.08      0.23      0.00    737.90
    8870.     1231.     5789.     1800.     2683.     2121.     3128.     1363.      316.    735.60
     1.12      0.48      2.73      0.58     0.080     0.030     0.080     0.000    728.80      0.00
0.000130     1900.     1900.     1900.         0         0         0      0.00   1700.00   1700.00

*SECNO 14400.000
3280 CROSS SECTION  14400.00 EXTENDED      2.20 FEET

         UPSTREAM OF CORPORATE LIMITS / CROSS SECTION-1/
14400.00     13.30    742.20      0.00      0.00    742.32      0.12      0.37      0.01    737.50
    8870.     1817.     6928.      125.     3138.     2226.      293.     1768.      400.    738.30
     1.40      0.58      3.11      0.43     0.080     0.030     0.080     0.000    728.90      0.00
0.000154     2600.     2600.     2600.         2         0         0      0.00   1120.07   1120.07

*SECNO 15800.000
3280 CROSS SECTION  15800.00 EXTENDED      2.41 FEET

15800.00     12.82    742.42      0.00      0.00    742.72      0.30      0.34      0.06    738.40
    8870.     1473.     7391.        6.     1553.     1532.       16.     1909.      427.    740.30
     1.50      0.95      4.82      0.40     0.080     0.030     0.080     0.000    729.60      0.00
0.000445     1400.     1400.     1400.         1         0         0      0.00    581.00    581.00

CCHV=   0.300 CEHV=   0.500
*SECNO 16800.000
16800.00     14.10    742.80      0.00      0.00    743.38      0.58      0.52      0.14    740.30
    8870.       45.     8793.       32.       59.     1427.       37.     1962.      436.    739.30
     1.54      0.77      6.16      0.87     0.080     0.030     0.080     0.000    728.70     15.50
0.000619     1000.     1000.     1000.         2         0         0      0.00    164.45    179.95
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    SECNO     DEPTH     CWSEL     CRIWS     WSELK     EG        HV        HL        OLOSS     BANK ELEV
    N         QLOB      QCH       QROB      ALOB      ACH       AROB      VOL       TWA     LEFT/RIGHT
    TIME      VLOB      VCH       VROB      XNL       XNCH      XNR       WTN       ELMIN       SSTA
    SLOPE     XLOBL     XLCH      XLOBR     ITRIAL    IDC       ICONT     CORAR     TOPWID      ENDST

 *SECNO 17000.000

 3265 DIVIDED FLOW

 3280 CROSS SECTION  17000.00 EXTENDED      1.39 FEET

 3370 NORMAL BRIDGE,NBD=  0 MIN ELTRD=  735.70 MAX ELLC=  740.90

          DOWNSTREAM OF DAM/BRIDGE
  17000.00     13.78    743.48      0.00      0.00    743.57      0.09      0.04      0.15    742.30
     8870.        5.     8173.      692.       42.     3279.     1724.     1977.      438.    736.90
      1.57      0.11      2.49      0.40     0.080     0.015     0.080     0.000    729.70      0.00
  0.000098      200.      200.      200.         2         0         0   2243.91    611.64    656.00

 *SECNO 17013.000

 3265 DIVIDED FLOW

 3280 CROSS SECTION  17013.00 EXTENDED      1.29 FEET

          UPSTREAM OF DAM/BRIDGE ALSO CONFLU. OF UNNAMED STREAM
  17013.00     13.59    743.39      0.00      0.00    743.67      0.28      0.00      0.10    742.30
     8870.        4.     8384.      482.       31.     1921.      795.     1978.      438.    736.90
      1.57      0.14      4.36      0.61     0.080     0.015     0.080     0.000    729.70      0.00
  0.000151       13.       13.       13.         2         0         0      0.00    546.29    656.00

 *SECNO 17500.000
 3280 CROSS SECTION  17500.00 EXTENDED      3.44 FEET

  17500.00     13.73    743.43      0.00      0.00    743.86      0.43      0.12      0.07    739.70
     8670.       93.     8673.      105.      114.     1636.       94.     2006.      442.    737.40
      1.59      0.81      5.30      1.11     0.080     0.030     0.080     0.000    729.70      0.00
  0.000466      487.      487.      487.         1         0         0      0.00    200.00    200.00
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THIS RUN EXECUTED 10 APR 84 9:28:50

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**********************************************************
  HEC2 RELEASE DATED NOV 76 UPDATED MAR 1982
  ERROR CORR -  01,02,03,04,05
  MODIFICATION -  50,51,52,53,54,55
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NOTE- ASTERISK (*) AT LEFT OF CROSS-SECTION NUMBER INDICATES MESSAGE IN SUMMARY OF ERRORS LIST

SHIAWASSEE RIVER

SUMMARY PRINTOUT TABLE 150

SECNO	XLCH	ELTRD	ELLC	ELMIN	Q	CWSEL	CRIWS	EG	10K*S	VCH	AREA	.01K
0.000	0.00	0.00	0.00	721.90	4440.00	731.60	0.00	731.78	3.01	3.45	1622.88	2558.41
0.000	0.00	0.00	0.00	721.90	6270.00	733.50	0.00	733.70	2.82	3.78	2389.04	3736.95
0.000	0.00	0.00	0.00	721.90	7050.00	734.30	0.00	734.50	2.63	3.81	3034.76	4345.32
0.000	0.00	0.00	0.00	721.90	8870.00	736.40	0.00	736.54	1.71	3.45	5931.80	6775.68
1000.000	1000.00	0.00	0.00	721.90	4440.00	731.90	0.00	732.06	2.65	3.31	1719.16	2729.33
1000.000	1000.00	0.00	0.00	721.90	6270.00	733.79	0.00	733.97	2.54	3.64	2584.38	3936.66
1000.000	1000.00	0.00	0.00	721.90	7050.00	734.57	0.00	734.75	2.37	3.67	3305.97	4584.27
1000.000	1000.00	0.00	0.00	721.90	8870.00	736.58	0.00	736.71	1.59	3.35	6273.84	7041.00
3800.000	2800.00	0.00	0.00	722.50	4440.00	732.76	0.00	732.97	3.99	3.71	1440.71	2224.17
3800.000	2800.00	0.00	0.00	722.50	6270.00	734.56	0.00	734.77	3.32	3.87	2677.73	3442.15
3800.000	2800.00	0.00	0.00	722.50	7050.00	735.27	0.00	735.47	3.00	3.85	3351.88	4068.26
3800.000	2800.00	0.00	0.00	722.50	8870.00	737.04	0.00	737.20	2.17	3.61	5464.82	6027.27
4800.000	1000.00	0.00	0.00	722.80	4440.00	733.17	0.00	733.48	5.26	4.53	1149.08	1935.62
4800.000	1000.00	0.00	0.00	722.80	6270.00	734.89	0.00	735.26	5.27	5.05	1712.61	2730.31
4800.000	1000.00	0.00	0.00	722.80	7050.00	735.57	0.00	735.95	5.18	5.18	1990.58	3098.60
4800.000	1000.00	0.00	0.00	722.80	8870.00	737.24	0.00	737.59	4.27	5.18	3279.80	4294.87
4810.000	10.00	732.30	733.70	722.80	4440.00	733.17	0.00	733.48	5.26	4.53	1149.31	1935.97
4810.000	10.00	732.30	733.70	722.80	6270.00	735.18	0.00	735.52	4.72	4.85	1829.15	2886.66
4810.000	10.00	732.30	733.70	722.80	7050.00	735.81	0.00	736.17	4.73	5.02	2108.81	3241.85
4810.000	10.00	732.30	733.70	722.80	8870.00	737.24	0.00	737.59	4.25	5.18	3292.84	4305.11
5700.000	890.00	0.00	0.00	723.30	4440.00	733.70	0.00	733.84	2.92	3.09	1956.79	2600.19
5700.000	890.00	0.00	0.00	723.30	6270.00	735.68	0.00	735.81	2.10	3.09	3404.84	4328.90
5700.000	890.00	0.00	0.00	723.30	7050.00	736.32	0.00	736.45	1.98	3.14	3940.22	5004.19
5700.000	890.00	0.00	0.00	723.30	8870.00	737.72	0.00	737.84	1.75	3.23	5277.29	6700.75
6900.000	1200.00	0.00	0.00	724.30	4440.00	734.11	0.00	734.45	6.93	4.68	1022.92	1686.59
6900.000	1200.00	0.00	0.00	724.30	6270.00	735.96	0.00	736.33	6.04	5.03	1517.75	2551.92
6900.000	1200.00	0.00	0.00	724.30	7050.00	736.57	0.00	736.97	5.97	5.20	1700.87	2884.36
6900.000	1200.00	0.00	0.00	724.30	8870.00	737.91	0.00	738.35	5.76	5.53	2138.28	3695.39

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	SECNO	XLCH	ELTRD	ELLC	ELMIN	Q	CWSEL	CRIWS	EG	10K*S	VCH	AREA	.01K
	7200.000	300.00	0.00	0.00	724.80	4440.00	734.37	0.00	734.66	5.83	4.28	1037.63	1838.61
	7200.000	300.00	0.00	0.00	724.80	6270.00	736.17	0.00	736.52	5.78	4.74	1324.12	2607.16
	7200.000	300.00	0.00	0.00	724.80	7050.00	736.77	0.00	737.15	5.87	4.96	1423.01	2910.11
	7200.000	300.00	0.00	0.00	724.80	8870.00	738.08	0.00	738.53	5.82	5.40	1643.28	3676.67
	7230.000	30.00	740.00	739.40	724.80	4440.00	734.39	0.00	734.68	5.79	4.27	1040.63	1845.50
	7230.000	30.00	740.00	739.40	724.80	6270.00	736.20	0.00	736.54	5.73	4.72	1328.03	2618.95
	7230.000	30.00	740.00	739.40	724.80	7050.00	736.79	0.00	737.17	5.81	4.94	1427.39	2923.78
	7230.000	30.00	740.00	739.40	724.80	8870.00	738.11	0.00	738.56	5.76	5.38	1648.61	3696.46
	7430.000	200.00	0.00	0.00	724.30	4440.00	734.50	0.00	734.80	5.73	4.40	1122.48	1854.47
	7430.000	200.00	0.00	0.00	724.30	6270.00	736.31	0.00	736.65	5.23	4.79	1627.23	2741.57
	7430.000	200.00	0.00	0.00	724.30	7050.00	736.93	0.00	737.29	5.21	4.97	1822.04	3087.74
	7430.000	200.00	0.00	0.00	724.30	8870.00	738.29	0.00	738.68	5.04	5.28	2305.06	3952.53
	8050.000	620.00	0.00	0.00	724.30	4440.00	734.87	0.00	735.13	4.86	4.17	1214.70	2013.32
	8050.000	620.00	0.00	0.00	724.30	6270.00	736.66	0.00	736.97	4.57	4.57	1735.49	2933.78
	8050.000	620.00	0.00	0.00	724.30	7050.00	737.28	0.00	737.60	4.57	4.75	1939.96	3297.99
	8050.000	620.00	0.00	0.00	724.30	8870.00	738.63	0.00	738.99	4.50	5.08	2432.69	4182.70
*	8100.000	50.00	0.00	0.00	734.00	4440.00	736.73	736.73	738.01	24.45	9.08	489.21	898.01
*	8100.000	50.00	0.00	0.00	734.00	6270.00	737.41	737.41	738.98	22.75	10.05	623.94	1314.42
*	8100.000	50.00	0.00	0.00	734.00	7050.00	737.68	737.68	739.36	22.16	10.39	678.62	1497.73
*	8100.000	50.00	0.00	0.00	734.00	8870.00	738.26	738.26	740.18	21.36	11.13	796.75	1919.13
*	8150.000	50.00	0.00	0.00	725.50	4440.00	738.90	0.00	739.00	1.42	2.60	2249.48	3729.14
*	8150.000	50.00	0.00	0.00	725.50	6270.00	739.90	0.00	740.05	1.94	3.23	2762.68	4503.58
*	8150.000	50.00	0.00	0.00	725.50	7050.00	741.30	0.00	740.47	2.10	3.44	2984.35	4859.25
*	8150.000	50.00	0.00	0.00	725.50	8870.00	741.20	0.00	741.41	2.39	3.88	3493.25	5731.57
	8400.000	250.00	0.00	0.00	725.50	4440.00	738.94	0.00	739.03	1.40	2.59	2267.06	3755.78
	8400.000	250.00	0.00	0.00	725.50	6270.00	739.95	0.00	740.10	1.90	3.20	2790.37	4545.26
	8400.000	250.00	0.00	0.00	725.50	7050.00	740.35	0.00	740.52	2.06	3.42	3015.22	4910.48
	8400.000	250.00	0.00	0.00	725.50	8870.00	741.26	0.00	741.47	2.34	3.85	3529.26	5795.88
	8800.000	400.00	0.00	0.00	725.50	4440.00	738.99	0.00	739.09	1.37	2.57	2294.24	3796.92
	8800.000	400.00	0.00	0.00	725.50	6270.00	740.03	0.00	740.17	1.85	3.17	2832.67	4610.65
	8800.000	400.00	0.00	0.00	725.50	7050.00	740.44	0.00	740.60	2.00	3.38	3061.73	4988.09
	8800.000	400.00	0.00	0.00	725.50	8870.00	741.36	0.00	741.56	2.27	3.80	3583.02	5892.57
	9100.000	300.00	0.00	0.00	728.00	4440.00	739.08	0.00	739.13	0.89	1.91	3501.86	4709.03
	9100.000	300.00	0.00	0.00	728.00	6270.00	740.15	0.00	740.22	1.07	2.27	4555.29	6074.68
	9100.000	300.00	0.00	0.00	728.00	7050.00	740.58	0.00	740.65	1.11	2.39	4988.36	6680.46
	9100.000	300.00	0.00	0.00	728.00	8870.00	741.53	0.00	741.62	1.19	2.62	5954.54	8143.90
	9900.000	800.00	0.00	0.00	728.10	4440.00	739.15	0.00	739.21	1.12	2.09	3540.41	4192.88
	9900.000	800.00	0.00	0.00	728.10	6270.00	740.24	0.00	740.31	1.20	2.35	5469.16	5730.60
	9900.000	800.00	0.00	0.00	728.10	7050.00	740.67	0.00	740.75	1.18	2.40	6293.95	6486.79
	9900.000	800.00	0.00	0.00	728.10	8870.00	741.64	0.00	741.71	1.12	2.50	8134.70	8386.41

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SECNO	XLCH	ELTRD	ELLC	ELMIN	Q	CWSEL	CRIWS	EG	10K*S	VCH	AREA	.01K
11800.000	1900.00	0.00	0.00	729.80	4440.00	739.37	0.00	739.45	1.34	2.32	3757.95	3836.08
11800.000	1900.00	0.00	0.00	729.80	6270.00	740.48	0.00	740.56	1.37	2.55	5587.77	5354.72
11800.000	1900.00	0.00	0.00	729.80	7050.00	740.91	0.00	740.99	1.36	2.62	6303.77	6038.56
11800.000	1900.00	0.00	0.00	729.80	8870.00	741.86	0.00	741.94	1.30	2.73	7931.93	7767.79
14400.000	2600.00	0.00	0.00	728.90	4440.00	739.70	0.00	739.78	1.20	2.34	2931.19	4046.59
14400.000	2600.00	0.00	0.00	728.90	6270.00	740.83	0.00	740.93	1.41	2.74	4126.18	5278.70
14400.000	2600.00	0.00	0.00	728.90	7050.00	741.26	0.00	741.36	1.47	2.87	4597.39	5822.49
14400.000	2600.00	0.00	0.00	728.90	8870.00	742.20	0.00	742.32	1.54	3.11	5656.83	7148.49
15800.000	1400.00	0.00	0.00	729.60	4440.00	739.89	0.00	740.09	3.71	3.66	1664.26	2304.03
15800.000	1400.00	0.00	0.00	729.60	6270.00	741.04	0.00	741.29	4.14	4.23	2309.35	3080.44
15800.000	1400.00	0.00	0.00	729.60	7050.00	741.47	0.00	741.74	4.26	4.43	2556.77	3414.96
15800.000	1400.00	0.00	0.00	729.60	8870.00	742.42	0.00	742.72	4.45	4.82	3101.05	4206.90
16800.000	1000.00	0.00	0.00	728.70	4440.00	740.23	0.00	740.48	3.57	3.98	1119.88	2349.49
16800.000	1000.00	0.00	0.00	728.70	6270.00	741.41	0.00	741.79	4.74	4.97	1298.26	2878.84
16800.000	1000.00	0.00	0.00	728.70	7050.00	741.85	0.00	742.30	5.20	5.35	1368.72	3090.38
16800.000	1000.00	0.00	0.00	728.70	8870.00	742.80	0.00	743.38	6.19	6.16	1521.87	3565.86
17000.000	200.00	735.70	740.90	729.70	4440.00	740.31	0.00	740.54	2.29	3.86	1343.59	2932.38
17000.000	200.00	735.70	740.90	729.70	6270.00	741.86	0.00	741.92	0.78	2.04	4258.80	7106.64
17000.000	200.00	735.70	740.90	729.70	7050.00	742.37	0.00	742.44	0.85	2.18	4492.58	7650.71
17000.000	200.00	735.70	740.90	729.70	8870.00	743.48	0.00	743.57	0.98	2.49	5044.58	8954.68
17013.000	13.00	0.00	0.00	729.70	4440.00	740.32	0.00	740.54	2.27	3.85	1348.55	2945.31
17013.000	13.00	0.00	0.00	729.70	6270.00	741.77	0.00	742.01	1.74	4.02	1974.79	4757.19
17013.000	13.00	0.00	0.00	729.70	7050.00	742.28	0.00	742.54	1.67	4.13	2206.79	5451.14
17013.000	13.00	0.00	0.00	729.70	8870.00	743.39	0.00	743.67	1.51	4.36	2746.59	7223.49
17500.000	487.00	0.00	0.00	729.70	4440.00	740.47	0.00	740.68	3.34	3.66	1251.25	2428.28
17500.000	487.00	0.00	0.00	729.70	6270.00	741.87	0.00	742.16	3.91	4.39	1529.50	3168.97
17500.000	487.00	0.00	0.00	729.70	7050.00	742.36	0.00	742.70	4.18	4.69	1626.64	3447.84
17500.000	487.00	0.00	0.00	729.70	8870.00	743.43	0.00	743.86	4.66	5.30	1843.91	4107.92

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SHIAWASSEE RIVER

SUMMARY PRINTOUT TABLE 150

SECNO	Q	CWSEL	DIFWSP	DIFWSX	DIFKWS	TOPWID	XLCH
0.000	4440.00	731.60	0.00	0.00	0.00	318.90	0.00
0.000	6270.00	733.50	1.90	0.00	0.00	630.61	0.00
0.000	7050.00	734.30	0.80	0.00	0.00	882.29	0.00
0.000	8870.00	736.40	2.10	0.00	0.00	1699.62	0.00
1000.000	4440.00	731.90	0.00	0.30	0.00	320.55	1000.00
1000.000	6270.00	733.79	1.89	0.29	0.00	757.32	1000.00
1000.000	7050.00	734.57	0.78	0.27	0.00	1078.54	1000.00
1000.000	8870.00	736.58	2.01	0.18	0.00	1709.00	1000.00
3800.000	4440.00	732.76	0.00	0.85	0.00	509.10	2800.00
3800.000	6270.00	734.56	1.79	0.77	0.00	870.85	2800.00
3800.000	7050.00	735.27	0.71	0.70	0.00	1015.10	2800.00
3800.000	8870.00	737.04	1.77	0.47	0.00	1372.26	2800.00
4800.000	4440.00	733.17	0.00	0.40	0.00	270.91	1000.00
4800.000	6270.00	734.89	1.72	0.33	0.00	384.44	1000.00
4800.000	7050.00	735.57	0.68	0.30	0.00	454.64	1000.00
4800.000	8870.00	737.24	1.67	0.21	0.00	1116.47	1000.00
4810.000	4440.00	733.17	0.00	0.00	0.00	270.96	10.00
4810.000	6270.00	735.18	2.02	0.29	0.00	404.03	10.00
4810.000	7050.00	735.81	0.63	0.25	0.00	512.48	10.00
4810.000	8870.00	737.24	1.43	0.00	0.00	1121.21	10.00
5700.000	4440.00	733.70	0.00	0.53	0.00	633.12	890.00
5700.000	6270.00	735.68	1.99	0.50	0.00	813.52	890.00
5700.000	7050.00	736.32	0.64	0.51	0.00	867.96	890.00
5700.000	8870.00	737.72	1.40	0.48	0.00	1217.35	890.00
6900.000	4440.00	734.11	0.00	0.42	0.00	247.70	1200.00
6900.000	6270.00	735.96	1.84	0.27	0.00	291.57	1200.00
6900.000	7050.00	736.57	0.61	0.25	0.00	307.91	1200.00
6900.000	8870.00	737.91	1.34	0.19	0.00	343.81	1200.00
7200.000	4440.00	734.37	0.00	0.26	0.00	150.81	300.00
7200.000	6270.00	736.17	1.80	0.21	0.00	164.39	300.00
7200.000	7050.00	736.77	0.60	0.20	0.00	166.94	300.00
7200.000	8870.00	738.08	1.31	0.17	0.00	168.72	300.00
7230.000	4440.00	734.39	0.00	0.02	0.00	151.04	30.00
7230.000	6270.00	736.20	1.80	0.02	0.00	164.50	30.00
7230.000	7050.00	736.79	1.60	0.03	0.00	167.15	30.00
7230.000	8870.00	738.11	1.31	0.03	0.00	168.74	30.00

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	SECNO	Q	CWSEL	DIFWSP	DIFWSX	DIFKWS	TOPWID	XLCH
	7430.000	4440.00	734.50	0.00	0.11	0.00	256.09	200.00
	7430.000	6270.00	736.31	1.81	0.12	0.00	309.34	200.00
	7430.000	7050.00	736.93	0.62	0.13	0.00	329.85	200.00
	7430.000	8870.00	738.29	1.36	0.18	0.00	375.90	200.00
	8050.000	4440.00	734.87	0.00	0.37	0.00	263.62	620.00
	8050.000	6270.00	736.66	1.79	0.34	0.00	320.90	620.00
	8050.000	7050.00	737.28	0.62	0.35	0.00	341.66	620.00
	8050.000	8870.00	738.63	1.35	0.34	0.00	387.15	620.00
*	8100.000	4440.00	736.73	0.00	1.86	0.00	193.45	50.00
*	8100.000	6270.00	737.41	0.68	0.75	0.00	201.57	50.00
*	8100.000	7050.00	737.68	0.27	0.41	0.00	203.39	50.00
*	8100.000	8870.00	738.26	0.57	-0.37	0.00	209.36	50.00
*	8150.000	4440.00	738.90	0.00	2.17	0.00	480.04	50.00
*	8150.000	6270.00	739.90	1.00	2.49	0.00	546.37	50.00
*	8150.000	7050.00	740.30	0.40	2.62	0.00	558.33	50.00
*	8150.000	8870.00	741.20	0.90	2.94	0.00	569.00	50.00
	8400.000	4440.00	738.94	0.00	0.04	0.00	482.47	250.00
	8400.000	6270.00	739.95	1.01	0.05	0.00	543.72	250.00
	8400.000	7050.00	740.35	0.40	0.05	0.00	559.32	250.00
	8400.000	8870.00	741.26	0.91	0.06	0.00	569.00	250.00
	8800.000	4440.00	738.99	0.00	0.06	0.00	486.19	400.00
	8800.000	6270.00	740.03	1.04	0.08	0.00	553.48	400.00
	8800.000	7050.00	740.44	0.41	0.09	0.00	560.79	400.00
	8800.000	8870.00	741.36	0.92	0.10	0.00	569.00	400.00
	9100.000	4440.00	739.08	0.00	0.08	0.00	901.66	300.00
	9100.000	6270.00	740.15	1.08	0.12	0.00	1015.00	300.00
	9100.000	7050.00	740.58	0.43	0.14	0.00	1015.00	300.00
	9100.000	8870.00	741.53	0.95	0.17	0.00	1015.00	300.00
	9900.000	4440.00	739.15	0.00	0.07	0.00	1585.55	800.00
	9900.000	6270.00	740.24	1.09	0.09	0.00	1905.00	300.00
	9900.000	7050.00	740.67	0.43	0.09	0.00	1905.00	800.00
	9900.000	8870.00	741.64	0.97	0.11	0.00	1905.00	800.00
	11800.000	4440.00	739.37	0.00	0.23	0.00	1540.12	1900.00
	11800.000	6270.00	740.48	1.11	0.24	0.00	1700.00	1900.00
	11800.000	7050.00	740.91	0.43	0.24	0.00	1700.00	1900.00
	11800.000	8870.00	741.86	0.95	0.22	0.00	1700.00	1900.00
	14400.000	4440.00	739.70	0.00	0.32	0.00	976.76	2600.00
	14400.000	6270.00	740.83	1.13	0.35	0.00	1092.40	2600.00
	14400.000	7050.00	741.26	0.43	0.35	0.00	1100.99	2600.00
	14400.000	8870.00	742.20	0.95	0.34	0.00	1120.07	2600.00

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SECNO	Q	CWSEL	DIFWSP	DIFWSX	DIFKWS	TOPWID	XLCH
15800.000	4440.00	739.89	0.00	0.19	0.00	547.54	1400.00
15800.000	6270.00	741.06	1.15	0.21	0.00	567.28	1400.00
15800.000	7050.00	741.47	0.44	0.21	0.00	569.84	1400.00
15800.000	8870.00	742.42	0.94	0.21	0.00	581.00	1400.00
16800.000	4440.00	740.23	0.00	0.34	0.00	128.94	1000.00
16800.000	6270.00	741.41	1.18	0.38	0.00	158.87	1000.00
16800.000	7050.00	741.85	0.44	0.38	0.00	160.65	1000.00
16800.000	8870.00	742.80	0.94	0.38	0.00	164.45	1000.00
17000.000	4440.00	740.31	0.00	0.08	0.00	398.48	200.00
17000.000	6270.00	741.86	1.55	0.45	0.00	451.60	200.00
17000.000	7050.00	742.37	0.51	0.52	0.00	463.10	200.00
17000.000	8870.00	743.48	1.11	0.68	0.00	611.64	200.00
17013.000	4440.00	740.32	0.00	0.00	0.00	399.14	13.00
17013.000	6270.00	741.77	1.46	-0.09	0.00	449.57	13.00
17013.000	7050.00	742.28	0.51	-0.09	0.00	460.77	13.00
17013.000	8870.00	743.39	1.10	-0.09	0.00	546.29	13.00
17500.000	4440.00	740.47	0.00	0.16	0.00	191.17	487.00
17500.000	6270.00	741.87	1.40	0.09	0.00	200.00	487.00
17500.000	7050.00	742.36	0.50	0.08	0.00	200.00	487.00
17500.000	8870.00	743.43	1.07	0.05	0.00	200.00	487.00

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SUMMARY OF ERRORS AND SPECIAL NOTES

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CAUTION  SECNO= 8100.000  PROFILE= 1  CRITICAL DEPTH ASSUMED
CAUTION  SECNO= 8100.000  PROFILE= 1  PROBABLE MINIMUM SPECIFIC ENERGY
CAUTION  SECNO= 8100.000  PROFILE= 1  20 TRIALS ATTEMPTED TO BALANCE WSEL
CAUTION  SECNO= 8100.000  PROFILE= 2  CRITICAL DEPTH ASSUMED
CAUTION  SECNO= 8100.000  PROFILE= 2  PROBABLE MINIMUM SPECIFIC ENERGY
CAUTION  SECNO= 8100.000  PROFILE= 2  20 TRIALS ATTEMPTED TO BALANCE WSEL
CAUTION  SECNO= 8100.000  PROFILE= 3  CRITICAL DEPTH ASSUMED
CAUTION  SECNO= 8100.000  PROFILE= 3  PROBABLE MINIMUM SPECIFIC ENERGY
CAUTION  SECNO= 8100.000  PROFILE= 3  20 TRIALS ATTEMPTED TO BALANCE WSEL
CAUTION  SECNO= 8100.000  PROFILE= 4  CRITICAL DEPTH ASSUMED
CAUTION  SECNO= 8100.000  PROFILE= 4  PROBABLE MINIMUM SPECIFIC ENERGY
CAUTION  SECNO= 8100.000  PROFILE= 4  20 TRIALS ATTEMPTED TO BALANCE WSEL

NOTE     SECNO= 8150.000  PROFILE= 1  WSEL BASED ON X5 CARD
NOTE     SECNO= 8150.000  PROFILE= 2  WSEL BASED ON X5 CARD
NOTE     SECNO= 8150.000  PROFILE= 3  WSEL BASED ON X5 CARD
NOTE     SECNO= 8150.000  PROFILE= 4  WSEL BASED ON X5 CARD
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FLOOD INSURANCE ZONE DATA FOR SHIAWASSEE RIVER

FLOOD HAZARD FACTOR FOR ENTIRE REACH USING SECTIONS

SECTION NUMBER	CUMULATIVE DISTANCE	ELEVATION DIFFERENCE BETWEEN BASE FLOOD AND 10	2	0.2
0.000	0.	-2.70	-0.80	2.10
1000.000	1000.	-2.67	-0.73	2.01
3800.000	3800.	-2.51	-0.71	1.77
4800.000	4800.	-2.40	-0.68	1.67
4810.000	4810.	-2.64	-0.63	1.43
5700.000	5700.	-2.62	-0.64	1.40
6900.000	6900.	-2.45	-0.61	1.34
7200.000	7200.	-2.40	-0.60	1.31
7230.000	7230.	-2.40	-0.60	1.31
7430.000	7430.	-2.43	-0.62	1.36
8050.000	8050.	-2.41	-0.62	1.35
8100.000	8100.	-0.95	-0.27	0.57
8150.000	8150.	-1.40	-0.40	0.90
8400.000	8400.	-1.42	-0.40	0.91
8800.000	8800.	-1.45	-0.41	0.92
9100.000	9100.	-1.50	-0.43	0.95
9900.000	9900.	-1.53	-0.43	0.97
11800.000	11800.	-1.54	-0.43	0.95
14400.000	14400.	-1.56	-0.43	0.95
15800.000	15800.	-1.58	-0.44	0.94
16800.000	16800.	-1.62	-0.44	0.94
17000.000	17000.	-2.06	-0.51	1.11
17013.000	17013.	-1.97	-0.51	1.10
17500.000	17500.	-1.89	-0.50	1.07
WEIGHTED AVG FOR REACH		-2.02	-0.55	1.29

FHF FOR THE REACH = 020 WITH 100.0 PERCENT OF THE REACH WITHIN 1.0 FEET
ZONE FOR THE REACH = A 4

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*****************************************************
*  WATER SURFACE PROFILES                           *
*  VERSION OF NOVEMBER 1975                         *
*  UPDATED MARCH 1982                               *
*                                                   *
*  RUN DATE   7 NOV 83 TIME    8:40:05              *
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*************************************
*  U.S. ARMY CORPS OF ENGINEERS     *
*  THE HYDROLOGIC ENGINEERING CENTER *
*  609 SECOND STREET, SUITE D       *
*  DAVIS, CALIFORNIA 95616          *
*  (916) 440-2105 (FTS) 448-2105    *
*************************************
```

```
X     X  XXXXXXX   XXXXX              XXXXX
X     X  X         X     X            X     X
X     X  X         X                  X
XXXXXXX  XXXX      X          XXXXX   XXXXX
X     X  X         X                  X
X     X  X         X     X            X
X     X  XXXXXXX   XXXXX              XXXXXXX
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CORUNNA FLOOD INSURANCE STUDY

SHIAWASSEE RIVER

REVISED HEC-2 OUTPUT FOR ENCROACHMENT (FLOODWAY) RUN

Note: Do <u>not</u> use elevations u/s of dam

THIS RUN EXECUTED 7 NOV 83 8:40:08

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**************************************************
HEC2 RELEASE DATED NOV 76 UPDATED MARC 1982
ERROR CORR - 01,02,03,04,05
MODIFICATION - 50,51,52,53,54,55
**************************************************
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C
T1              CITY OF CORUNNA FLOOD INSURANCE STUDY
T2              100 YEAR FLOOD FREQUENCY
T3              SHIAWASSEE RIVER WITHOUT ENCROACHMENTS

J1  ICHECK    INQ       NINV      IDIR      STRT      METRIC    HVINS     Q         WSEL      FQ
       0.        2.        0.        0.  0.000000     0.00       0.0       0.   734.300    0.000

J2  NPROF     IPLOT     PRFVS     XSECV     XSECH     FN        ALLDC     IBW       CHNIM     ITRACE
    1.000     0.000    -1.000     0.000     0.000     0.000     0.000     0.000     0.000     0.000

J3  VARIABLE CODES FOR SUMMARY PRINTOUT
  150.000   200.000     0.000     0.000     0.000     0.000     0.000     0.000     0.000     0.000

NC    0.080     0.080     0.030     0.100     0.300     0.000     0.000     0.000     0.000     0.000
QT    2.000  7050.000  7050.000     0.000     0.000     0.000     0.000     0.000     0.000     0.000
ET    0.000     0.000     1.400     0.000     0.000     0.000     0.000     0.000     0.000     0.000
          DOWNSTREAM CORPORATE LIMIT
X1    0.000    31.000   445.000   592.000     0.000     0.000     0.000     0.000     0.000     0.000
GR  739.000     0.000   734.800   230.000   735.000   256.000   735.300   285.000   734.800   310.000
GR  734.300   340.000   733.800   370.000   733.500   397.000   734.200   433.000   734.200   445.000
GR  733.200   448.000   724.700   450.000   723.400   460.000   722.700   470.000   722.500   480.000
GR  721.900   490.000   722.300   500.000   722.300   510.000   722.700   520.000   723.100   570.000
GR  723.500   580.000   724.900   586.000   729.800   592.000   729.900   603.000   727.800   637.000
GR  729.700   645.000   729.700   700.000   728.500   730.000   728.500   751.000   732.500   772.000
GR  736.000  1842.000     0.000     0.000     0.000     0.000     0.000     0.000     0.000     0.000

          CROSS SECTION-10
X1  1000.000     0.000     0.000     0.000  1000.000  1000.000  1000.000     0.000     0.000     0.000

NC    0.000     0.000     0.000     0.300     0.500     0.000     0.000     0.000     0.000     0.000
          CROSS SECTION-9
X1  3800.000    26.000   232.000   400.000  2000.000  2000.000  2800.000     0.000     0.000     0.000
GR  743.700     0.000   743.500    25.000   743.000    50.000   742.600    77.000   742.000   102.000
GR  741.400   127.000   740.800   152.000   740.000   177.000   739.200   200.000   739.400   232.000
GR  726.700   251.000   724.100   261.000   722.500   281.000   723.000   321.000   723.600   330.000
GR  723.700   340.000   725.400   350.000   726.000   360.000   732.000   400.000   731.700   432.000
GR  732.300   457.000   731.200   482.000   731.200   507.000   731.500   532.000   731.800   558.000
GR  739.000  2000.000     0.000     0.000     0.000     0.000     0.000     0.000     0.000     0.000
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NC	0.000	0.000	0.000	0.300	0.500	0.000	0.000	0.000	0.000	0.000
	DOWNSTREAM OF WALKBRIDGE									
X1	4800.000	20.000	594.000	714.000	1000.000	1000.000	1000.000	0.000	0.000	0.000
GR	740.000	0.000	732.200	500.000	731.600	520.000	731.000	594.000	727.800	600.000
GR	724.000	626.000	723.600	646.000	723.400	649.000	723.200	652.000	722.800	656.000
GR	723.300	666.000	723.300	676.000	724.000	686.000	726.600	705.000	733.500	709.000
GR	735.800	714.000	736.000	736.000	735.400	762.000	735.800	805.000	739.000	1900.000
SB	1.150	1.600	2.600	0.000	86.000	3.000	920.000	1.000	722.800	722.800
ET	0.000	0.000	4.110	300.000	850.000	0.000	0.000	0.000	0.000	0.000
	UPSTREAM OF WALKERIDGE									
X1	4810.000	0.000	0.000	0.000	10.000	10.000	10.000	0.000	0.000	0.000
X2	0.000	0.000	1.000	733.700	732.300	0.000	0.000	0.000	0.000	0.000
BT	15.000	0.000	740.000	0.000	500.000	732.200	0.000	520.000	732.200	0.000
BT	600.000	737.300	0.000	600.000	740.300	733.700	649.000	740.300	733.700	649.000
BT	740.300	723.400	652.000	740.300	723.200	652.000	740.300	733.700	705.000	740.300
BT	733.700	705.000	737.300	726.600	736.000	736.000	0.000	762.000	735.400	0.000
BT	805.000	735.800	0.000	1900.000	739.000	0.000	0.000	0.000	0.000	0.000
NC	0.000	0.000	0.000	0.100	0.300	0.000	0.000	0.000	0.000	0.000
ET	0.000	0.000	1.400	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	CROSS SECTION-8									
X1	5700.000	36.000	800.000	992.000	890.000	890.000	890.000	0.000	0.000	0.000
GR	740.000	0.000	730.800	591.000	732.200	612.000	733.400	635.000	732.700	658.000
GR	732.100	682.000	732.600	705.000	732.100	732.000	732.300	755.000	732.500	787.000
GR	732.500	800.000	730.900	807.000	727.400	814.000	726.200	823.000	726.400	834.000
GR	730.100	866.000	729.500	387.000	727.200	892.000	725.200	902.000	724.500	912.000
GR	723.500	922.000	723.300	932.000	723.400	942.000	723.600	952.000	724.100	962.000
GR	724.900	972.000	726.200	982.000	727.000	984.000	730.500	990.000	731.400	992.000
GR	733.800	1040.000	734.200	1064.000	735.600	1089.000	736.400	1106.000	737.400	1135.000
GR	739.000	2290.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
NC	0.000	0.000	0.000	0.300	0.500	0.000	0.000	0.000	0.000	0.000
X1	6900.000	26.000	102.000	247.000	1200.000	1200.000	1200.000	0.000	0.000	0.000
GR	741.100	0.000	740.800	15.000	741.200	30.000	741.300	47.000	740.700	71.000
GR	740.000	93.000	739.100	102.000	732.600	114.000	731.900	123.000	727.600	132.000
GR	726.100	142.000	725.000	152.000	725.000	162.000	724.800	172.000	724.800	182.000
GR	724.300	202.000	724.700	212.000	727.200	220.000	730.200	232.000	733.900	247.000
GR	733.600	272.000	733.000	297.000	733.000	317.000	733.500	347.000	735.100	378.000
GR	740.000	500.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
NC	0.000	0.000	0.000	0.300	0.500	0.000	0.000	0.000	0.000	0.000
ET	0.000	0.000	4.110	100.000	268.000	0.000	0.000	0.000	0.000	0.000
	DOWNSTREAM OF STATE ROAD									
X1	7200.000	23.000	100.000	268.000	300.000	300.000	300.000	0.000	0.000	0.000
GR	742.700	0.000	742.200	99.000	737.100	100.000	734.900	109.000	728.000	128.000
GR	726.600	148.000	726.900	156.000	726.000	160.000	725.300	168.000	725.200	178.000
GR	725.500	188.000	724.800	198.000	725.400	207.000	725.200	211.000	725.300	215.000
GR	725.400	218.000	726.200	228.000	728.000	235.000	729.700	245.000	733.700	255.000
GR	735.100	268.000	740.700	269.000	740.000	377.000	0.000	0.000	0.000	0.000

SB	0.900	1.600	2.600	0.000	100.000	8.000	1700.000	2.600	725.000	725.000
ET	0.000	0.000	4.110	100.000	268.000	0.000	0.000	0.000	0.000	0.000
	UPSTREAM OF STATE ROAD									
X1	7230.000	0.000	0.000	0.000	30.000	30.000	30.000	0.000	0.000	0.000
X2	0.000	0.000	1.000	739.400	740.000	0.000	0.000	0.000	0.000	0.000
BT	14.000	0.000	742.700	0.000	100.000	742.000	0.000	100.000	745.000	739.400
BT	156.000	744.600	739.000	156.000	744.600	726.900	160.000	744.600	726.000	160.000
BT	744.600	739.000	211.000	744.200	738.600	211.000	744.200	725.200	215.000	744.200
BT	725.300	215.000	744.200	738.600	268.000	743.900	738.200	268.000	740.800	0.000
BT	377.000	740.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
ET	0.000	0.000	1.400	0.000	0.000	0.000	0.000	0.000	0.000	0.000
X1	7430.000	26.000	102.000	247.000	200.000	200.000	200.000	0.000	0.000	0.000
GR	741.100	0.000	740.800	15.000	741.200	30.000	741.300	47.000	740.700	71.000
GR	740.000	93.000	739.100	102.000	732.600	114.000	731.900	123.000	727.600	132.000
GR	726.100	142.000	725.000	152.000	725.000	162.000	724.800	172.000	724.800	182.000
GR	724.300	202.000	724.700	212.000	727.200	220.000	730.200	232.000	733.900	247.000
GR	733.600	272.000	733.000	297.000	733.000	317.000	733.500	347.000	735.100	378.000
GR	739.000	502.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
X1	8050.000	0.000	0.000	0.000	620.000	620.000	620.000	0.000	0.000	0.000
NC	0.000	0.000	0.015	0.000	0.000	0.000	0.000	0.000	0.000	0.000
ET	0.000	0.000	4.110	1.000	215.000	0.000	0.000	0.000	0.000	0.000
	DAM									
X1	8100.000	5.000	0.000	215.000	50.000	50.000	50.000	0.000	0.000	0.000
GR	738.900	0.000	734.000	25.000	734.000	190.000	738.700	215.000	740.000	290.000
NC	0.000	0.000	0.030	0.100	0.300	0.000	0.000	0.000	0.000	0.000
ET	0.000	0.000	1.400	0.000	0.000	0.000	0.000	0.000	0.000	0.000
X1	8150.000	18.000	380.000	553.000	50.000	50.000	50.000	0.000	0.000	0.000
GR	740.000	0.000	736.100	250.000	736.100	290.000	735.500	336.000	736.300	380.000
GR	731.000	410.000	729.900	431.000	728.900	441.000	728.300	451.000	725.800	471.000
GR	725.500	481.000	725.700	501.000	727.000	521.000	730.500	531.000	733.500	541.000
GR	735.500	543.000	740.000	553.000	740.900	569.000	0.000	0.000	0.000	0.000
X1	8400.000	0.000	0.000	0.000	250.000	250.000	250.000	0.000	0.000	0.000
	CROSS SECTION-5									
X1	8800.000	0.000	0.000	0.000	400.000	400.000	400.000	0.000	0.000	0.000
	CROSS SECTION-4									
X1	9100.000	37.000	265.000	515.000	300.000	300.000	300.000	0.000	0.000	0.000
GR	739.900	0.000	736.600	35.000	736.600	55.000	736.800	79.000	736.700	103.000
GR	736.800	125.000	736.700	147.000	736.500	172.000	736.700	195.000	736.800	217.000
GR	736.700	240.000	736.500	265.000	735.100	268.000	733.300	278.000	729.700	297.000
GR	728.600	307.000	728.000	317.000	728.100	327.000	729.200	347.000	729.200	357.000
GR	729.700	367.000	730.200	407.000	731.500	447.000	731.600	457.000	731.400	467.000
GR	732.000	487.000	732.700	497.000	734.200	507.000	735.500	515.000	735.600	545.000
GR	735.800	572.000	736.000	600.000	735.500	655.000	736.000	680.000	735.100	724.000
GR	738.000	743.000	739.750	1015.000	0.000	0.000	0.000	0.000	0.000	0.000

CROSS SECTION-3

X1	9900.000	19.000	1160.000	1405.000	800.000	800.000	800.000	0.000	0.000	0.000
GR	740.000	0.000	737.100	1100.000	736.200	1140.000	736.800	1160.000	735.500	1170.000
GR	733.900	1200.000	733.500	1230.000	729.800	1260.000	729.300	1270.000	728.100	1310.000
GR	728.400	1320.000	728.200	1340.000	728.500	1360.000	728.500	1370.000	729.800	1380.000
GR	733.300	1390.000	735.500	1400.000	736.800	1405.000	739.000	1905.000	0.000	0.000

CROSS SECTION-2

X1	11800.000	21.000	800.000	996.000	1900.000	1900.000	1900.000	0.000	0.000	0.000
GR	740.000	0.000	737.300	690.000	737.400	725.000	738.000	795.000	737.900	800.000
GR	735.500	802.000	730.900	820.000	729.800	830.000	730.000	850.000	730.500	910.000
GR	729.900	920.000	729.800	930.000	730.400	940.000	730.300	950.000	730.900	960.000
GR	732.600	970.000	733.600	980.000	734.400	990.000	735.600	998.000	736.000	1038.000
GR	739.000	1700.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

UPSTREAM OF CORPORATE LIMITS / CROSS SECTION-1/

X1	14400.000	26.000	800.000	990.000	2600.000	2600.000	2600.000	0.000	0.000	0.000
GR	740.000	0.000	737.000	700.000	736.200	740.000	737.500	800.000	734.200	802.000
GR	731.000	810.000	729.700	820.000	729.800	830.000	729.500	840.000	729.400	850.000
GR	729.300	860.000	729.300	870.000	729.200	880.000	729.600	890.000	729.000	900.000
GR	728.900	910.000	729.000	920.000	729.300	930.000	731.400	940.000	731.900	960.000
GR	732.400	970.000	733.600	980.000	733.700	987.000	738.300	990.000	740.700	1090.000
GR	742.700	1130.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

X1	15800.000	19.000	413.000	563.000	1400.000	1400.000	1400.000	0.000	0.000	0.000
GR	740.000	0.000	737.700	300.000	738.400	393.000	738.400	413.000	733.500	423.000
GR	733.000	433.000	732.800	443.000	732.500	453.000	732.200	463.000	732.000	473.000
GR	731.300	483.000	729.600	503.000	729.800	513.000	729.800	523.000	731.000	533.000
GR	735.600	560.000	740.300	563.000	742.000	573.000	742.000	581.000	0.000	0.000

NC	0.000	0.000	0.000	0.300	0.500	0.000	0.000	0.000	0.000	0.000
X1	16800.000	17.000	44.000	165.000	1000.000	1000.000	1000.000	0.000	0.000	0.000
GR	748.700	0.000	740.700	21.000	740.300	44.000	735.700	46.000	733.000	55.000
GR	731.200	65.000	729.700	85.000	728.800	95.000	728.700	115.000	729.500	125.000
GR	730.700	135.000	731.300	145.000	731.400	155.000	739.300	165.000	740.700	177.000
GR	753.500	195.000	754.800	206.000	0.000	0.000	0.000	0.000	0.000	0.000

NC	0.000	0.000	0.015	0.000	0.000	0.000	0.000	0.000	0.000	0.000

DOWNSTREAM OF DAM/BRIDGE

X1	17000.000	25.000	195.000	456.000	200.000	200.000	200.000	0.000	0.000	0.000
X2	0.000	0.000	0.000	740.900	735.700	0.000	0.000	0.000	0.000	0.000
GR	743.100	0.000	743.000	25.000	743.400	50.000	743.500	75.000	743.400	100.000
GR	743.500	125.000	743.600	150.000	743.000	175.000	742.300	195.000	742.000	199.000
GR	729.700	200.000	729.700	215.000	740.700	216.000	735.700	270.000	735.700	348.000
GR	735.700	431.000	736.900	456.000	737.700	481.000	738.200	506.000	739.200	531.000
GR	739.500	556.000	739.800	581.000	740.400	606.000	741.000	631.000	742.100	656.000
BT	15.000	0.000	743.100	743.100	25.000	743.000	743.000	50.000	743.400	743.400
BT	150.000	743.600	743.600	199.000	742.000	742.000	200.000	741.900	741.100	215.000
BT	740.700	740.700	216.000	740.700	740.700	270.000	735.700	735.700	431.000	735.700
BT	735.700	506.000	738.200	738.200	531.000	739.200	739.200	581.000	739.800	739.800
BT	631.000	741.000	741.000	656.000	742.100	742.100	0.000	0.000	0.000	0.000

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ET      0.000      0.000      4.110    200.000    531.000      0.000      0.000      0.000      0.000      0.000
        UPSTREAM OF DAM/BRIDGE ALSO CONFLU. OF UNNAMED STREAM
X1  17013.000      0.000      0.000      0.000     13.000     13.000     13.000      0.000      0.000      0.000
X2      0.000      0.000      0.000      0.000      0.000      0.000      1.000      0.000      0.000      0.000

NC      0.000      0.000      0.030      0.000      0.000      0.000      0.000      0.000      0.000      0.000
ET      0.000      0.000      1.400      0.000      0.000      0.000      0.000      0.000      0.000      0.000
X1  17500.000     18.000     36.000    181.000    487.000    487.000    487.000      0.000      0.000      0.000
GR    740.000      0.000    740.600     30.000    739.700     36.000    732.200     46.000    731.000     56.000
GR    730.800     66.000    730.500     76.000    730.500     86.000    730.400     96.000    729.700    106.000
GR    730.600    126.000    731.700    136.000    733.900    146.000    734.300    156.000    734.100    166.000
GR    737.400    181.000    737.700    190.000    741.000    200.000      0.000      0.000      0.000      0.000
EJ      0.000      0.000      0.000      0.000      0.000      0.000      0.000      0.000      0.000      0.000
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   SECNO      DEPTH      CWSEL      CRIWS      WSELK      EG         HV         HL         OLOSS    BANK ELEV
   Q          QLOB       QCH        QROB       ALOB       ACH        AROB       VOL        TWA    LEFT/RIGHT
   TIME       VLOB       VCH        VROB       XNL        XNCH       XNR        WTN        ELMIN       SSTA
   SLOPE      XLOBL      XLCH       XLOBR      ITRIAL     IDC        ICONT      CORAR      TOPWID      ENDST

*PROF 1

CCHV=   0.100 CEHV=   0.300
*SECNO 0.000
          DOWNSTREAM CORPORATE LIMIT
      0.00      12.40     734.30       0.00     734.30     734.50       0.20       0.00       0.00     734.20
    - 7050.        8.       6121.       921.       42.      1608.      1385.         0.         0.     729.80
      0.00       0.18       3.81       0.67      0.080      0.030      0.080      0.000     721.90     340.00
  0.000263         0.         0.         0.          0          0          0       0.00     982.29    1322.29

*SECNO 1000.000
          CROSS SECTIION-10
   1000.00      12.67     734.57       0.00       0.00     734.75       0.18       0.25       0.00     734.20
     7050.        16.       6036.       997.        72.      1646.      1587.        73.        24.     729.80
      0.09       0.22       3.67       0.53      0.080      0.030      0.080      0.000     721.90     324.21
  0.000237      1000.      1000.      1000.          0          0          0       0.00    1078.54    1402.75

CCHV=   0.300 CEHV=   0.500
*SECNO 3800.000
          CROSS SECTION-9
   3800.00      12.77     735.27       0.00       0.00     735.47       0.20       0.71       0.01     739.40
     7050.         0.       6052.       998.         0.      1572.      1780.       255.        75.     732.00
      0.31       0.00       3.85       0.56      0.080      0.030      0.080      0.000     722.50     238.18
  0.000300      2000.      2800.      2000.          2          0          0       0.00    1015.10    1253.28

CCHV=   0.300 CEHV=   0.500
*SECNO 4800.000

3265 DIVIDED FLOW

          DOWNSTREAM OF WALKBRIDGE
   4800.00      12.77     735.57       0.00       0.00     735.95       0.38       0.39       0.09     731.00
     7050.       642.       6408.         0.       753.      1236.         2.       316.        91.     735.80
      0.36       0.85       5.18       0.08      0.080      0.030      0.080      0.000     722.80     284.13
  0.000518      1000.      1000.      1000.          2          0          0       0.00     454.64     780.02
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SECNO	DEPTH	CWSEL	CRIWS	WSELK	EG	HV	HL	OLOSS	BANK ELEV
Q	QLOB	QCH	QROB	ALOB	ACH	AROB	VOL	TWA	LEFT/RIGHT
TIME	VLOB	VCH	VROB	XNL	XNCH	XNR	WTN	ELMIN	SSTA
SLOPE	XLOBL	XLCH	XLOPR	ITRIAL	IDC	ICONT	CORAR	TOPWID	ENDST

SPECIAL BRIDGE

SB	XK	XKOR	COFQ	RDLEN	BWC	BWP	BAREA	SS	ELCHU	ELCHD
	1.15	1.60	2.60	0.00	86.00	3.00	920.00	1.00	722.80	722.80

*SECNO 4810.000

3265 DIVIDED FLOW

PRESSURE AND WEIR FLOW

EGPRS	EGLWC	H3	QWEIR	QPR	BAREA	TRAPEZOID AREA	ELLC	ELTRD
736.17	735.88	0.02	2525.	4515.	920.	1024.	733.70	732.30

UPSTREAM OF WALKBRIDGE

4810.00	13.01	735.81	0.00	0.00	736.17	0.35	0.22	0.00	731.00
7050.	698.	6351.	2.	831.	1265.	13.	317.	92.	735.80
0.37	0.84	5.02	0.14	0.080	0.030	0.080	0.000	722.80	268.39
0.000473	10.	10.	10.	2	0	2	0.00	512.48	809.51

CCHV= 0.100 CEHV= 0.300
*SECNO 5700.000
CROSS SECTION-8

5700.00	13.02	736.32	0.00	0.00	736.45	0.13	0.26	0.02	732.50
7050.	1041.	5859.	150.	1799.	1866.	275.	379.	106.	731.40
0.46	0.58	3.14	0.55	0.080	0.030	0.080	0.000	723.30	236.35
0.000198	890.	890.	890.	2	0	0	0.00	867.96	1104.31

CCHV= 0.300 CEHV= 0.500
*SECNO 6900.000

6900.00	12.27	736.57	0.00	0.00	736.97	0.40	0.38	0.13	739.10
7050.	0.	6663.	387.	0.	1280.	420.	456.	122.	733.90
0.52	0.00	5.20	0.92	0.080	0.030	0.080	0.000	724.30	106.67
0.000597	1200.	1200.	1200.	2	0	0	0.00	307.91	414.58

CCHV= 0.300 CEHV= 0.500
*SECNO 7200.000
DOWNSTREAM OF STATE ROAD

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 SECNO      DEPTH      CWSEL      CRIWS      WSELK      EG         HV         HL         OLOSS      BANK ELEV
 Q          QLOB       QCH        QROB       ALOB       ACH        AROB       VOL        TWA     LEFT/RIGHT
 TIME       VLOB       VCH        VROB       XNL        XNCH       XNR        WTN        ELMIN       SSTA
 SLOPE      XLOBL      XLCH       XLOBR      ITRIAL     IDC        ICONT      CORAR      TOPWID      ENDST

 7200.00    11.97      736.77     0.00       0.00       737.15     0.38       0.18       0.01       737.10
   7050.     0.        7050.      0.         0.         1423.      0.         467.       123.       735.10
    0.54     0.00       4.96      0.13       0.080      0.030      0.080      0.000      724.80     101.36
0.000587     300.       300.      300.        2          0          0         0.00       166.94     268.30

SPECIAL BRIDGE

SB  XK       XKOR       COFQ       RDLEN      BWC        BWP        BAREA      SS         ELCHU      ELCHD
     0.90     1.60       2.60      0.00       100.00      8.00      1700.00    2.60       725.00     725.00

*SECNO 7230.000
CLASS A LOW FLOW

3420 BRIDGE W.S.=     736.72 BRIDGE VELOCITY=,      4.91      CALCULATED CHANNEL AREA=,      1436.

 EGPRS      EGLWC      H3         QWEIR      QLOW       BAREA      TRAPEZOID  ELLC       ELTRD
                                                                     AREA
     0.00   737.17      0.03       0.         7050.      1700.      1864.      739.40     740.00

          UPSTREAM OF STATE ROAD
 7230.00    11.99      736.79     0.00       0.00       737.17     0.38       0.02       0.00       737.10
   7050.     0.        7050.      0.         0.         1427.      0.         468.       124.       735.10
    0.54     0.00       4.94      0.13       0.080      0.030      0.080      0.000      724.80     101.25
0.000581      30.        30.       30.        0          0          0         0.00       167.05     268.30

*SECNO 7430.000
 7430.00    12.63      736.93     0.00       0.00       737.29     0.36       0.11       0.01       739.10
   7050.     0.        6607.      443.       0.         1330.      492.       476.       125.       733.90
    0.55     0.00       4.97      0.90       0.080      0.030      0.080      0.000      724.30     106.02
0.000521     200.       200.      200.        1          0          0         0.00       329.85     435.87

*SECNO 8050.000
 8050.00    12.98      737.28     0.00       0.00       737.60     0.33       0.30       0.01       739.10
   7050.     0.        6553.      497.       0.         1379.      560.       502.       130.       733.90
    0.59     0.00       4.75      0.89       0.080      0.030      0.080      0.000      724.30     105.38
0.000457     620.       620.      620.        0          0          0         0.00       341.66     447.04

*SECNO 8100.000
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SECNO     DEPTH     CWSEL     CRIWS     WSELK     EG        HV        HL        OLOSS     BANK ELEV
Q         QLOB      QCH       QROB      ALOB      ACH       AROB      VOL       TWA     LEFT/RIGHT
TIME      VLOB      VCH       VROB      XNL       XNCH      XNR       WTN       ELMIN       SSTA
SLOPE     XLOBL     XLCH      XLOBR     ITRIAL    IDC       ICONT     CORAR     TOPWID      ENDST

3301 HV CHANGED MORE THAN HVINS

3685 20 TRIALS ATTEMPTED WSEL,CWSEL
3693 PROBABLE MINIMUM SPECIFIC ENERGY
3720 CRITICAL DEPTH ASSUMED
        DAM
  8100.00      3.68    737.68    737.68      0.00    739.36      1.68      0.04      0.67    738.90
    7050.        0.     7050.        0.        0.     679.        0.      504.      130.    738.70
     0.59      0.00     10.39      0.00     0.080     0.015     0.080     0.000    734.00      6.20
 0.002216       50.       50.       50.        20        14         0      0.00    203.39    209.60

CCHV=   0.100 CEHV=   0.300
*SECNO 8150.000

3301 HV CHANGED MORE THAN HVINS

  8150.00     13.82    739.32      0.00      0.00    739.54      0.22      0.03      0.15    736.30
    7050.      470.     6580.        0.      772.     1683.        0.      506.      130.    740.00
     0.60      0.61      3.91      0.00     0.080     0.030     0.080     0.000    725.50     43.86
 0.000305       50.       50.       50.         3         0         0      0.00    507.61    551.48

*SECNO 8400.000
  8400.00     13.90    739.40      0.00      0.00    739.61      0.22      0.07      0.00    736.30
    7050.      486.     6564.        0.      800.     1697.        0.      520.      133.    740.00
     0.62      0.61      3.87      0.00     0.080     0.030     0.080     0.000    725.50     38.67
 0.000295      250.      250.      250.         2         0         0      0.00    512.99    551.66

*SECNO 8800.000
        CROSS SECTION-5
  8800.00     14.02    739.52      0.00      0.00    739.73      0.21      0.12      0.00    736.30
    7050.      509.     6541.        0.      841.     1717.        0.      543.      138.    740.00
     0.65      0.60      3.81      0.00     0.080     0.030     0.080     0.000    725.50     30.99
 0.000282      400.      400.      400.         0         0         0      0.00    520.93    551.93

*SECNO 9100.000
        CROSS SECTION-4
  9100.00     11.70    739.70      0.00      0.00    739.80      0.10      0.06      0.01    736.50
    7050.      363.     6101.      586.      745.     2230.     1124.      566.      143.    735.50
     0.68      0.49      2.74      0.52     0.080     0.030     0.080     0.000    728.00      2.09
 0.000166      300.      300.      300.         2         0         0      0.00   1005.64   1007.72
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SECNO      DEPTH      CWSEL      CRIWS      WSELK      EG         HV         HL         OLOSS      BANK ELEV
Q          QLOB       QCH        QROB       ALOB       ACH        AROB       VOL        TWA     LEFT/RIGHT
TIME       VLOB       VCH        VROB       XNL        XNCH       XNR        WTN        ELMIN       SSTA
SLOPE      XLOBL      XLCH       XLOBR      ITRIAL     IDC        ICONT      CORAR      TOPWID      ENDST

*SECNO 9900.000
3280 CROSS SECTION   9900.00 EXTENDED      0.84 FEET

          CROSS SECTION-3
 9900.00     11.74    739.84       0.00       0.00    739.95       0.11       0.14       0.00    736.80
    7050.      560.     6104.       387.      1616.     2122.       969.       647.       169.    736.80
     0.77      0.35      2.88       0.40      0.080     0.030      0.080      0.000     728.10     61.39
0.000191      800.      800.       800.          2         0          0       0.00    1843.61   1905.00

*SECNO 11800.000
3280 CROSS SECTION  11800.00 EXTENDED      1.21 FEET

          CROSS SECTION-2
11800.00     10.41    740.21       0.00       0.00    740.32       0.11       0.37       0.00    737.90
    7050.      529.     5472.      1049.      1365.     1795.      1972.       862.       247.    735.60
     0.98      0.39      3.05       0.53      0.080     0.030      0.080      0.000     729.80      0.00
0.000203     1900.     1900.      1900.          2         0          0       0.00    1700.00   1700.00

*SECNO 14400.000
3280 CROSS SECTION  14400.00 EXTENDED      0.71 FEET

          UPSTREAM OF CORPORATE LIMITS / CROSS SECTION-1/
14400.00     11.81    740.71       0.00       0.00    740.84       0.13       0.51       0.01    737.50
    7050.      922.     6093.        35.      1947.     1943.       121.      1134.       330.    738.30
     1.24      0.47      3.14       0.29      0.080     0.030      0.080      0.000     728.90      0.00
0.000187     2600.     2600.      2600.          1         0          0       0.00    1090.29   1090.29

*SECNO 15800.000
3280 CROSS SECTION  15800.00 EXTENDED      0.98 FEET

15800.00     11.39    740.99       0.00       0.00    741.31       0.32       0.41       0.06    738.40
    7050.      735.     6314.         0.       963.     1317.         1.      1235.       357.    740.30
     1.33      0.76      4.79       0.21      0.080     0.030      0.080      0.000     729.60      0.00
0.000537     1400.     1400.      1400.          0         0          0       0.00     566.99    566.99

CCHV=   0.300 CEHV=   0.500
*SECNO 16800.000
16300.00     12.77    741.47       0.00       0.00    741.95       0.48       0.56       0.08    740.30
    7050.       10.     7030.        10.        23.     1266.        18.      1277.       365.    739.30
     1.38      0.43      5.55       0.57      0.080     0.030      0.080      0.000     728.70     18.98
0.000588     1000.     1000.      1000.          2         0          0       0.00     159.11    178.08
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SECNO      DEPTH      CWSEL      CRIWS      WSELK      EG         HV         HL         OLOSS      BANK ELEV
Q          QLOB       QCH        QROB       ALOB       ACH        AROB       VOL        TWA     LEFT/RIGHT
TIME       VLOB       VCH        VROB       XNL        XNCH       XNR        WTN        ELMIN        SSTA
SLOPE      XLOBL      XLCH       XLOBR      ITRIAL     IDC        ICONT      CORAR      TOPWID       ENDST

*SECNO 17000.000

3370 NORMAL BRIDGE,NPD=  0 MIN ELTRD=  735.70 MAX ELLC=  740.90

          DOWNSTREAM OF DAM/BRIDGE
 17000.00     12.33     742.03      0.00       0.00     742.11       0.07       0.04       0.12     742.30
    7050.        0.       6543.      507.         0.     2922.      1435.      1290.       366.     736.90
     1.41      0.00       2.25      0.35      0.080      0.015      0.080      0.000     729.70     198.54
 0.000093      200.       200.      200.          2          0          0    2243.91     455.97     654.51

*SECNO 17013.000
          UPSTREAM OF DAM/BRIDGE ALSO CONFLU. OF UNNAMED STREAM
 17013.00     12.23     741.93      0.00       0.00     742.22       0.29       0.00       0.11     742.30
    7050.        0.       6767.      283.         0.     1541.       504.      1291.       366.     736.90
     1.41      0.00       4.39      0.56      0.080      0.015      0.080      0.000     729.70     199.01
 0.000201       13.        13.        13.          2          0          0       0.00     453.11     652.12

*SECNO 17500.000
3280 CROSS SECTION  17500.00 EXTENDED      2.04 FEET

 17500.00     12.34     742.04      0.00       0.00     742.40       0.36       0.14       0.04     739.70
    7050.       36.       6951.       63.         63.     1432.       67.       1311.       370.     737.40
     1.44      0.56       4.85      0.94      0.080      0.030      0.080      0.000     729.70       0.00
 0.000467      487.       487.      487.          2          0          0       0.00     200.00     200.00
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THIS RUN EXECUTED 7 NOV 83 8:40:47

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*************************************************
  HEC2 RELEASE DATED NOV 76 UPDATED MARC 1982
  ERROR CORR -  C1,02,03,04,05
  MODIFICATION -  50,51,52,53,54,55
*************************************************

T1                  CITY OF CORUNNA FLOOD INSURANCE STUDY
T2              100 YEAR FREQUENCY FLOOD
T3              SHIAWASSEE RIVER WITH ENCROACHMENTS

J1  ICHECK     INQ       NINV      IDIR      STRT      METRIC    HVINS     Q         WSEL      FQ
       0.       3.        0.        0.  0.000000      0.00       0.0       0.   734.300    0.000

J2  NPROF      IPLOT     PRFVS     XSECV     XSECH     FN        ALLDC     IBW       CHNIM     ITRACE
     15.000    0.000    -1.000     0.000     0.000     0.000     0.000     0.000     0.000     0.000
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SECNO     DEPTH     CWSEL     CRIWS     WSELK     EG        HV        HL        OLOSS     BANK ELEV
Q         QLOB      QCH       QROB      ALOB      ACH       AROB      VOL       TWA     LEFT/RIGHT
TIME      VLOB      VCH       VROB      XNL       XNCH      XNR       WTN       ELMIN       SSTA
SLOPE     XLOBL     XLCH      XLOBR     ITRIAL    IDC       ICONT     CORAR     TOPWID      ENDST

*PROF 2

CCHV=   0.100 CEHV=   0.300
*SECNO 0.000
 2800 NAT Q1=   4345.32  WSEL=    734.30  ENC Q1=   4345.32  WSEL=    734.40  RATIO=  0.0000
 NAT Q1=   4434.  RATIOS LOB,CH,ROB=  0.0015  0.8633  0.1347  WSEL=    734.40

3470 ENCROACHMENT STATIONS=     445.0     806.9  TYPE=     4  TARGET=       0.020
          DOWNSTREAM CORPORATE LIMIT
     0.00     12.40   734.30     0.00   734.30   734.51     0.21     0.00     0.00   734.20
   7050.        0.    6228.      822.      0.     1608.     950.      0.       0.     729.80
     0.00      0.00     3.87     0.87    0.080    0.030    0.080    0.000   721.90   445.00
 0.000273       0.       0.       0.        0        0        0     0.00   361.87   806.87

*SECNO 1000.000
 2800 NAT Q1=   4584.27  WSEL=    734.57  ENC Q1=   4584.27  WSEL=    734.67  RATIO=  0.0000
 NAT Q1=   4683.  RATIOS LOB,CH,ROB=  0.0028  0.8512  0.1460  WSEL=    734.67

3470 ENCROACHMENT STATIONS=     445.0     870.3  TYPE=     4  TARGET=       0.021
          CROSS SECTIION-10
  1000.00     12.68   734.58     0.00   734.57   734.77     0.19     0.26     0.00   734.20
   7050.        0.    6141.      909.      0.     1649.    1128.     61.       9.     729.80
     0.08      0.00     3.73     0.81    0.030    0.030    0.080    0.000   721.90   445.00
 0.000245     1000.    1000.    1000.        2        0        0     0.00   425.33   870.33

CCHV=   0.300 CEHV=   0.500
*SECNO 3800.000
 2800 NAT Q1=   4068.26  WSEL=    735.27  ENC Q1=   4068.26  WSEL=    735.37  RATIO=  0.0000
 NAT Q1=   4163.  RATIOS LOB,CH,ROB=  0.0000  0.8527  0.1473  WSEL=    735.37

3470 ENCROACHMENT STATIONS=     232.0     733.3  TYPE=     4  TARGET=       0.023
          CROSS SECTION-9
  3800.00     12.81   735.31     0.00   735.27   735.51     0.21     0.74     0.01   739.40
   7050.        0.    6160.      890.      0.     1577.    1242.    219.      34.     732.00
     0.30      0.00     3.91     0.72    0.080    0.030    0.080    0.000   722.50   238.12
 0.000306     2000.    2800.    2000.        2        0        0     0.00   545.15   783.28

CCHV=   0.300 CEHV=   0.500
*SECNO 4800.000
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SECNO     DEPTH     CWSEL     CRIWS     WSELK     EG        HV        HL        OLOSS     BANK ELEV
Q         QLOB      QCH       QROB      ALOB      ACH       AROB      VOL       TWA    LEFT/RIGHT
TIME      VLOB      VCH       VROB      XNL       XNCH      XNR       WTN       ELMIN        SSTA
SLOPE     XLOBL     XLCH      XLOBR     ITRIAL    IDC       ICONT     CORAR     TOPWID       ENDST

2800 NAT Q1=   3098.60  WSEL=    735.57  ENC Q1=   3098.60  WSEL=    735.67  RATIO=  0.0000
NAT Q1=   3156.  RATIOS LOB,CH,ROB=  0.0943  0.9056  0.0001  WSEL=    735.67

3265 DIVIDED FLOW

3470 ENCROACHMENT STATIONS=     461.2     753.5  TYPE=     4  TARGET=      C.018
        DOWNSTREAM OF WALKBRIDGE
  4800.00     12.81    735.61      0.00    735.57    736.00      0.40      0.40      0.09    731.00
    7050.       540.     6510.        0.      513.     1241.        0.      272.       43.    735.80
      0.35      1.05      5.25      0.00     0.080     0.030     0.080     0.000    722.80    461.24
  0.000528     1000.     1000.     1000.         2         0         0      0.00    252.92    753.58


SPECIAL BRIDGE

SB  XK        XKOR      COFQ      RDLEN     BWC       BWP       BAREA     SS        ELCHU     ELCHD
     1.15      1.60      2.60      0.00     86.00      3.00    920.00      1.00    722.80    722.80

*SECNO 4810.000
     3700.   BRIDGE STENCL=    300.00    STENCR=    850.00

3265 DIVIDED FLOW

PRESSURE AND WEIR FLOW

EGPRS     EGLWC     H3        QWEIR     QPR       BAREA     TRAPEZOID     ELLC      ELTRD
                                                            AREA
  736.19    735.91     0.02     2604.     4463.      920.     1024.     733.70    732.30


3470 ENCROACHMENT STATIONS=     300.0     850.0  TYPE=     1  TARGET=     550.000
        UPSTREAM OF WALKBRIDGE
  4810.00     13.04    735.84      0.00    735.81    736.19      0.35      0.19      0.00    731.00
    7050.       721.     6327.        2.      832.     1269.       15.      272.       43.    735.80
      0.35      0.87      4.99      0.15     0.080     0.030     0.080     0.000    722.80    300.00
  0.000465      10.       10.       10.         2         0         3      0.00    497.03    820.67


CCHV=   C.100 CEHV=   0.300
*SECNO 5700.000
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 SECNO     DEPTH     CWSEL     CRIWS     WSELK     EG        HV        HL        OLOSS   BANK ELEV
 Q         QLOB      QCH       QROB      ALOB      ACH       AROB      VOL       TWA   LEFT/RIGHT
 TIME      VLOB      VCH       VROB      XNL       XNCH      XNR       WTN       ELMIN       SSTA
 SLOPE     XLOBL     XLCH      XLOBR     ITRIAL    IDC       ICONT     CORAR     TOPWID      ENDST

2800 NAT Q1=   5004.19  WSEL=    736.32  ENC Q1=   5004.19  WSEL=    736.42  RATIO=  0.0000
NAT Q1=   5116.  RATIOS LOB,CH,ROB=  0.1510  0.8270  0.0220  WSEL=    736.42

3470 ENCROACHMENT STATIONS=     447.2    1021.6  TYPE=     4  TARGET=       0.022
          CROSS SECTION-8
  5700.00    13.04   736.34     C.00   736.32   736.48     0.14     0.26     0.02   732.50
     7050.     998.    5972.      8C.    1460.    187C.     124.     329.      54.   731.40
      0.44     0.68     3.19     C.64    0.080    0.030    0.080    0.000   723.30   447.16
 0.000205     890.     890.     890.        2        0        0     0.00   574.42  1021.58

CCHV=   0.300 CEHV=   0.500
*SECNO 6900.000
 2800 NAT Q1=   2834.36  WSEL=    736.57  ENC Q1=   2884.36  WSEL=    736.67  RATIO=  0.0000
 NAT Q1=   2941.  PATIOS LOB,CH,ROB=  0.0000  0.9430  0.0570  WSEL=    736.67

3470 ENCROACHMENT STATIONS=     102.0     328.8  TYPE=     4  TARGET=       0.019
  6900.00    12.30   736.60     0.00   736.57   737.C1     0.42     0.39     0.14   739.10
     7050.       0.    6786.     264.       0.    1284.     267.     398.      65.   733.90
      0.51     0.00     5.28     0.99    0.08C    0.030    0.080    0.000   724.30   106.62
 0.000614    1200.    1200.    1200.        2        0        0     0.00   222.20   328.83

CCHV=   0.300 CEHV=   0.50C
*SECNO 7200.000

3470 ENCROACHMENT STATIONS=     100.0     268.0  TYPE=     1  TARGET=     168.000
          DOWNSTREAM OF STATE ROAD
  7200.00    12.03   736.83     0.CO   736.77   737.21     0.38     0.18     0.01   737.10
     7050.       0.    7050.       0.       0.    1433.       0.     408.      67. 100000.00
      0.52     0.00     4.92     0.00    0.080    0.030    0.080    0.000   724.80   101.11
 0.000582     300.     300.     300.        2        0        0     0.00   166.89   268.00

SPECIAL BRIDGE

SB  XK        XKOR      COFQ      PDLEN     BWC       BWP       BAREA     SS        ELCHU     ELCHD
     0.90      1.60      2.60      0.00    100.00      8.00   1700.00     2.60    725.00    725.00

*SECNO 7230.000
     3700.   BRIDGE STENCL=    100.00    STENCR=    268.00
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 SECNO     DEPTH     CWSEL     CRIWS     WSELK     EG        HV        HL        CLOSS   BANK ELEV
 Q         QLOB      QCH       QROB      ALOB      ACH       AROB      VOL       TWA   LEFT/RIGHT
 TIME      VLOB      VCH       VROB      XNL       XNCH      XNR       WTN       ELMIN       SSTA
 SLOPE     XLOBL     XLCH      XLOBR     ITRIAL    IDC       ICONT     CORAR     TOPWID      ENDST

CLASS A LOW FLOW

3420 BRIDGE W.S.=     736.78 BRIDGE VELOCITY=,      4.88      CALCULATED CHANNEL AREA=,      1445.

 EGPRS     EGLWC     H3        QWEIR     QLOW      BAREA     TRAPEZOID     ELLC      ELTRD
                                                             AREA
     0.00    737.23      0.03        0.     7050.     1700.     1864.     739.40    740.00


3470 ENCROACHMENT STATIONS=     100.0     268.0  TYPE=     1  TARGET=     168.000
          UPSTREAM OF STATE ROAD
  7230.00     12.05    736.85      0.00    736.79    737.23      0.37      0.02      0.00    737.10
    7050.        0.     7050.        0.        0.     1437.        0.      409.       67. 100000.00
     0.53      0.00      4.91      0.00     0.080     0.030     0.080     0.000    724.80    101.00
 0.000577       30.       30.       30.         0         0         0      0.00    167.00    268.00


*SECNO 7430.000
 2800 NAT Q1=    3087.74  WSEL=     736.93  ENC Q1=    3087.74  WSEL=     737.03  RATIO=  0.0000
 NAT Q1=    3152.  RATIOS LOB,CH,ROB=  0.0000  0.9348  0.0652  WSEL=     737.03

3470 ENCROACHMENT STATIONS=     102.0     334.9  TYPE=     4  TARGET=       0.021
  7430.00     12.66    736.96      0.00    736.93    737.34      0.38      0.11      0.00    739.10
    7050.        0.     6733.      317.        0.     1336.      319.      416.       68.    733.90
     0.54      0.00      5.04      0.99     0.080     0.030     0.080     0.000    724.30    105.95
 0.000534      200.      200.      200.         0         0         0      0.00    228.98    334.92


*SECNO 8050.000
 2800 NAT Q1=    3297.99  WSEL=     737.28  ENC Q1=    3297.99  WSEL=     737.38  RATIO=  0.0000
 NAT Q1=    3362.  RATIOS LOB,CH,ROB=  0.0000  0.9272  0.0728  WSEL=     737.38

3470 ENCROACHMENT STATIONS=     102.0     344.4  TYPE=     4  TARGET=       0.019
  8050.00     13.02    737.32      0.00    737.28    737.66      0.34      0.31      0.01    739.10
    7050.        0.     6567.      383.        0.     1386.      388.      441.       71.    733.90
     0.57      0.00      4.81      0.99     0.080     0.030     0.080     0.000    724.30    105.28
 0.000466      620.      620.      620.         2         0         0      0.00    239.08    344.36


*SECNO 8100.000
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SECNO     DEPTH     CWSEL     CRIWS     WSELK     EG        HV        HL        OLOSS     BANK ELEV
Q         QLOB      QCH       QROB      ALOB      ACH       AROB      VOL       TWA     LEFT/RIGHT
TIME      VLOB      VCH       VROB      XNL       XNCH      XNR       WTN       ELMIN       SSTA
SLOPE     XLOBL     XLCH      XLOBR     ITRIAL    IDC       ICONT     CORAR     TOPWID      ENDST


3301 HV CHANGED MORE THAN HVINS

3685 20 TRIALS ATTEMPTED WSEL,CWSEL
3693 PROBABLE MINIMUM SPECIFIC ENERGY
3720 CRITICAL DEPTH ASSUMED

3470 ENCROACHMENT STATIONS=        1.0      215.0  TYPE=      1  TARGET=      214.000
        DAM
  8100.00      3.68    737.68    737.68    737.68    739.36      1.68      0.04      0.67100000.00
    7050.        0.     7050.        0.        0.      678.        0.      442.       71. 100000.00
     0.58      0.00     10.39      0.00     0.080     0.015     0.080     0.000    734.00      6.21
 0.002217       50.       50.       50.        20        14         0      0.00    203.39    209.59


CCHV=   0.100 CEHV=   0.300
*SECNO 8150.000
 2800 NAT Q1=    4039.53  WSEL=     739.32  ENC Q1=    4039.53  WSEL=     739.42  RATIO=  0.0000
 NAT Q1=    4117.   RATIOS LOB,CH,ROB=  0.0694  0.9306  0.0000  WSEL=     739.42

3301 HV CHANGED MORE THAN HVINS


3470 ENCROACHMENT STATIONS=      238.0      553.0  TYPE=      4  TARGET=        0.019
  8150.00     13.80    739.30      0.00    739.32    739.54      0.24      0.03      0.14    736.30
    7050.      350.     6700.        0.      476.     1680.        0.      444.       72.    740.00
     0.58      0.73      3.99      0.00     0.080     0.030     0.080     0.000    725.50    237.96
 0.000317       50.       50.       50.         3         0         0      0.00    313.49    551.45


*SECNO 8400.000
 2800 NAT Q1=    4101.99  WSEL=     739.40  ENC Q1=    4101.99  WSEL=     739.50  RATIO=  0.0000
 NAT Q1=    4130.   RATIOS LOB,CH,ROB=  0.0716  0.9284  0.0000  WSEL=     739.50

3470 ENCROACHMENT STATIONS=      233.7      553.0  TYPE=      4  TARGET=        0.019
  8400.00     13.89    739.39      0.00    739.40    739.62      0.23      0.08      0.00    736.30
    7050.      366.     6684.        0.      500.     1693.        0.      456.       73.    740.00
     0.60      0.73      3.95      0.00     0.080     0.030     0.080     0.000    725.50    233.71
 0.000308      250.      250.      250.         0         0         0      0.00    317.91    551.62


*SECNO 8800.000
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 SECNO     DEPTH     CWSEL     CRIWS     WSELK     EG        HV        HL        OLOSS     BANK ELEV
 Q         QLOB      QCH       QROB      ALOB      ACH       AROB      VOL       TWA     LEFT/RIGHT
 TIME      VLOB      VCH       VROB      XNL       XNCH      XNR       WTN       ELMIN       SSTA
 SLOPE     XLOBL     XLCH      XLOBR     ITRIAL    IDC       ICONT     CORAR     TOPWID      ENDST

2800 NAT Q1=   4195.31  WSEL=    739.52  ENC Q1=   4195.31  WSEL=    739.62  RATIO=  0.0000
NAT Q1=   4277.  RATIOS LOB,CH,ROB=  0.0750  0.9250  0.0000  WSEL=    739.62

3470 ENCROACHMENT STATIONS=     230.3     553.0  TYPE=     4  TARGET=       0.019
         CROSS SECTION-5
 8800.00    14.02   739.52     0.00   739.52   739.74     0.22     0.12     0.00   736.30
    7050.     388.    6662.      0.     530.    1716.       0.     477.      76.   740.00
     0.63     0.73     3.88     0.00   0.080    0.030    0.080    0.000   725.50   230.26
0.000294     400.     400.     400.        1        0        0     0.00   321.65   551.91

*SECNO 9100.000
2800 NAT Q1=   5473.12  WSEL=    739.70  ENC Q1=   5473.12  WSEL=    739.80  RATIO=  0.0000
NAT Q1=   5603.  RATIOS LOB,CH,ROB=  0.0532  0.8612  0.0855  WSEL=    739.80

3470 ENCROACHMENT STATIONS=      74.6     726.8  TYPE=     4  TARGET=       0.023
         CROSS SECTION-4
 9100.00    11.71   739.71     0.00   739.70   739.82     0.11     0.07     0.01   736.50
    7050.     291.    6236.     523.     574.    2231.     851.     497.      80.   735.50
     0.66     0.51     2.80     0.61   0.080    0.030    0.080    0.000   728.00    74.56
0.000173     300.     300.     300.        2        0        0     0.00   652.24   726.80

*SECNO 9900.000
2800 NAT Q1=   5098.33  WSEL=    739.84  ENC Q1=   5098.33  WSEL=    739.94  RATIO=  0.0000
NAT Q1=   5245.  RATIOS LOB,CH,ROB=  0.0842  0.8579  0.0579  WSEL=    739.94
3280 CROSS SECTION   9900.00 EXTENDED      0.85 FEET

3470 ENCROACHMENT STATIONS=     717.8    1663.9  TYPE=     4  TARGET=       0.028
         CROSS SECTION-3
 9900.00    11.75   739.85     0.00   739.84   739.97     0.12     0.15     0.00   736.80
    7050.     497.    6246.     307.    1053.    2124.     642.     566.      94.   736.80
     0.74     0.47     2.94     0.48   0.080    0.030    0.080    0.000   728.10   717.81
0.000199     800.     800.     800.        0        0        0     0.00   946.14  1663.95

*SECNO 11800.000
2800 NAT Q1=   4944.87  WSEL=    740.21  ENC Q1=   4944.87  WSEL=    740.31  RATIO=  0.0000
NAT Q1=   5095.  RATIOS LOB,CH,ROB=  0.0798  0.7672  0.1530  WSEL=    740.31
3280 CROSS SECTION  11800.00 EXTENDED      1.23 FEET
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   SECNO     DEPTH     CWSEL     CRIWS     WSELK     EG        HV        HL        OLOSS     BANK ELEV
   Q         QLOB      QCH       QROB      ALOB      ACH       AROB      VOL       TWA       LEFT/RIGHT
   TIME      VLOB      VCH       VROB      XNL       XNCH      XNR       WTN       ELMIN     SSTA
   SLOPE     XLOBL     XLCH      XLOBR     ITRIAL    IDC       ICONT     CORAR     TOPWID    ENDST


3470 ENCROACHMENT STATIONS=     422.5     1491.6  TYPE=     4  TARGET=       0.029
          CROSS SECTION-2
 11800.00     10.44    740.24      0.00    740.21    740.36      0.12      0.39      0.00    737.90
    7050.       461.     5610.     980.      933.     1798.     1629.      744.      138.     735.60
     0.95      0.49      3.12      0.60     0.080     0.030     0.080     0.000    729.80    422.48
 0.000212     1900.     1900.     1900.         1         0         0      0.00   1069.11   1491.59

*SECNO 14400.000
 2800 NAT Q1=    5150.63  WSEL=     740.71  ENC Q1=    5150.63  WSEL=     740.81  RATIO=  0.0000
 NAT Q1=    5261.  RATIOS LOB,CH,ROB=  0.1358  0.8587  0.0055  WSEL=     740.81
3280 CROSS SECTION  14400.00 EXTENDED      0.75 FEET

3470 ENCROACHMENT STATIONS=     314.3      990.0  TYPE=     4  TARGET=       0.021
         UPSTREAM OF CORPORATE LIMITS / CROSS SECTION-1/
 14400.00     11.85    740.75      0.00    740.71    740.89      0.14      0.53      0.01    737.50
    7050.       855.     6195.       0.      1526.     1949.       0.       978.      190.     738.30
     1.20      0.56      3.18      0.00     0.080     0.030     0.080     0.000    728.90    314.35
 0.000195     2600.     2600.     2600.         0         0         0      0.00    675.65    990.00

*SECNO 15800.000
 2800 NAT Q1=    3043.54  WSEL=     740.99  ENC Q1=    3043.54  WSEL=     741.09  RATIO=  0.0000
 NAT Q1=    3125.  RATIOS LOB,CH,ROB=  0.1095  0.8904  0.0001  WSEL=     741.09
3280 CROSS SECTION  15800.00 EXTENDED      1.04 FEET

3470 ENCROACHMENT STATIONS=     180.2      563.0  TYPE=     4  TARGET=       0.026
 15800.00     11.44    741.04      0.00    740.99    741.38      0.34      0.43      0.06    738.40
    7050.       597.     6453.       0.       677.     1327.       0.      1066.      207.     740.30
     1.29      0.88      4.86      0.00     0.080     0.030     0.080     0.000    729.60    180.18
 0.000550     1400.     1400.     1400.         2         0         0      0.00    382.82    563.00


CCHV=   0.300 CEHV=   0.500
*SECNO 16800.000
 2800 NAT Q1=    2906.54  WSEL=     741.47  ENC Q1=    2944.43  WSEL=     741.57  RATIO= -0.0130
 NAT Q1=    2954.  RATIOS LOB,CH,ROB=  0.0017  0.9967  0.0016  WSEL=     741.57

3470 ENCROACHMENT STATIONS=      44.0      165.0  TYPE=     4  TARGET=       0.003
 16800.00     12.85    741.55      0.00    741.47    742.02      0.47      0.57      0.07    740.30
    7050.        0.     7050.       0.        0.     1276.       0.      1104.      213.     739.30
     1.34      0.00      5.53      0.00     0.080     0.030     0.080     0.000    728.70     44.00
 0.000599     1000.     1000.     1000.         2         0         0      0.00    121.00    165.00
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 SECNO     DEPTH     CWSEL     CRIWS     WSELK     EG        HV        HL        OLOSS    BANK ELEV
 Q         QLOB      QCH       QROB      ALOB      ACH       AROB      VOL       TWA    LEFT/RIGHT
 TIME      VLOB      VCH       VROB      XNL       XNCH      XNR       WTN       ELMIN       SSTA
 SLOPE     XLOBL     XLCH      XLOBR     ITRIAL    IDC       ICONT     CORAR     TOPWID      ENDST

*SECNO 17000.000
 2800 NAT Q1=   7291.58  WSEL=    742.03  ENC Q1=   7291.58  WSEL=    742.13  RATIO=  0.0000
 NAT Q1=   7394.  RATIOS LOB,CH,ROB=  0.0000  0.9276  0.0724  WSEL=    742.13
3280 CROSS SECTION  17000.00 EXTENDED      0.01 FEET

3370 NORMAL BRIDGE,NRD=  0 MIN ELTRD=  735.70 MAX ELLC=  740.90

3470 ENCROACHMENT STATIONS=      195.0      609.3  TYPE=      4  TARGET=       0.014
          DOWNSTREAM OF DAM/BRIDGE
 17000.00     12.41    742.11      0.00    742.03    742.18      0.07      0.04      0.12    742.30
    7050.        0.     6586.      464.        0.     2921.     1293.     1116.      214.    736.90
     1.36      0.00      2.25      0.36     0.080     0.015     0.080     0.000    729.70    197.57
 0.000093      200.      200.      200.         2         0         0   2130.99    411.76    609.33

*SECNO 17013.000

3470 ENCROACHMENT STATIONS=      200.0      531.0  TYPE=      1  TARGET=     331.000
          UPSTREAM OF DAM/BRIDGE ALSO CONFLU. OF UNNAMED STREAM
 17013.00     12.30    742.00      0.00    741.93    742.29      0.29      0.00      0.11100000.00
    7050.        0.     6851.      199.        0.     1553.      301.     1117.      214.    736.90
     1.36      0.00      4.41      0.66     0.080     0.015     0.080     0.000    729.70    200.00
 0.000201       13.       13.       13.         2         0         0      0.00    331.00    531.00

*SECNO 17500.000
 2800 NAT Q1=   3263.71  WSEL=    742.04  ENC Q1=   3272.51  WSEL=    742.14  RATIO= -0.0027
 NAT Q1=   3321.  RATIOS LOB,CH,ROB=  0.0055  0.9854  0.0092  WSEL=    742.14
3280 CROSS SECTION  17500.00 EXTENDED      2.11 FEET

3470 ENCROACHMENT STATIONS=       36.0      181.0  TYPE=      4  TARGET=       0.015
 17500.00     12.41    742.11      0.00    742.04    742.48      0.37      0.15      0.04    739.70
    7050.        0.     7050.        0.        0.     1443.        0.     1136.      217.    737.40
     1.39      0.00      4.89      0.00     0.080     0.030     0.080     0.000    729.70     36.00
 0.000499      487.      487.      487.         2         0         0      0.00    145.00    181.00
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THIS RUN EXECUTED 7 NOV 83 8:41:19

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*************************************************
HEC2 RELEASE DATED NOV 76 UPDATED MARC 1982
ERROR CORR - 01,02,03,04,05
MODIFICATION - 50,51,52,53,54,55
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NOTE- ASTERISK (*) AT LEFT OF CROSS-SECTION NUMBER INDICATES MESSAGE IN SUMMARY OF ERRORS LIST

SHIAWASSEE RIVER

SUMMARY PRINTOUT TABLE 150

SECNO	XLCH	ELTRD	ELLC	ELMIN	Q	CWSEL	CRIWS	EG	10K*S	VCH	AREA	.01K
0.000	0.00	0.00	0.00	721.90	7050.00	734.30	0.00	734.50	2.63	3.81	3034.76	4345.32
0.000	0.00	0.00	0.00	721.90	7050.00	734.30	0.00	734.51	2.73	3.87	2557.83	4268.99
1000.000	1000.00	0.00	0.00	721.90	7050.00	734.57	0.00	734.75	2.37	3.67	3305.97	4584.27
1000.000	1000.00	0.00	0.00	721.90	7050.00	734.58	0.00	734.77	2.45	3.73	2776.48	4508.60
3800.000	2800.00	0.00	0.00	722.50	7050.00	735.27	0.00	735.47	3.00	3.85	3351.88	4068.26
3800.000	2800.00	0.00	0.00	722.50	7050.00	735.31	0.00	735.51	3.08	3.91	2819.17	4019.50
4800.000	1000.00	0.00	0.00	722.80	7050.00	735.57	0.00	735.95	5.18	5.18	1990.58	3098.60
4800.000	1000.00	0.00	0.00	722.80	7050.00	735.61	0.00	736.00	5.28	5.25	1753.93	3068.24
4810.000	10.00	732.30	733.70	722.80	7050.00	735.81	0.00	736.17	4.73	5.02	2108.81	3241.85
4810.000	10.00	732.30	733.70	722.80	7050.00	735.84	0.00	736.19	4.65	4.99	2116.96	3270.67
5700.000	890.00	0.00	0.00	723.30	7050.00	736.32	0.00	736.45	1.98	3.14	3940.22	5004.19
5700.000	890.00	0.00	0.00	723.30	7050.00	736.34	0.00	736.48	2.05	3.19	3454.77	4927.54
6900.000	1200.00	0.00	0.00	724.30	7050.00	736.57	0.00	736.97	5.97	5.20	1700.87	2884.36
6900.000	1200.00	0.00	0.00	724.30	7050.00	736.60	0.00	737.01	6.14	5.28	1550.96	2845.17
7200.000	300.00	0.00	0.00	724.80	7050.00	736.77	0.00	737.15	5.87	4.96	1423.01	2910.11
7200.000	300.00	0.00	0.00	724.80	7050.00	736.83	0.00	737.21	5.82	4.92	1432.86	2921.86
7230.000	30.00	740.00	739.40	724.80	7050.00	736.79	0.00	737.17	5.81	4.94	1427.39	2923.78
7230.000	30.00	740.00	739.40	724.80	7050.00	736.85	0.00	737.23	5.77	4.91	1437.13	2934.86
7430.000	200.00	0.00	0.00	724.30	7050.00	736.93	0.00	737.29	5.21	4.97	1822.04	3087.74
7430.000	200.00	0.00	0.00	724.30	7050.00	736.96	0.00	737.34	5.34	5.04	1655.30	3051.21
8050.000	620.00	0.00	0.00	724.30	7050.00	737.28	0.00	737.60	4.57	4.75	1939.96	3297.99
8050.000	620.00	0.00	0.00	724.30	7050.00	737.32	0.00	737.66	4.66	4.81	1774.69	3267.15

	SECNO	XLCH	ELTRD	ELLC	ELMIN	Q	CWSEL	CRIWS	EG	10K*S	VCH	AREA	.01K
*	8100.000	50.00	0.00	0.00	734.00	7050.00	737.68	737.68	739.36	22.16	10.39	678.62	1497.73
*	8100.000	50.00	0.00	0.00	734.00	7050.00	737.68	737.68	739.36	22.17	10.39	678.50	1497.32
	8150.000	50.00	0.00	0.00	725.50	7050.00	739.32	0.00	739.54	3.05	3.91	2454.77	4039.53
	8150.000	50.00	0.00	0.00	725.50	7050.00	739.30	0.00	739.54	3.17	3.99	2156.74	3958.53
	8400.000	250.00	0.00	0.00	725.50	7050.00	739.40	0.00	739.61	2.95	3.87	2496.16	4101.99
	8400.000	250.00	0.00	0.00	725.50	7050.00	739.39	0.00	739.62	3.08	3.95	2193.37	4016.65
	8800.000	400.00	0.00	0.00	725.50	7050.00	739.52	0.00	739.73	2.82	3.81	2558.04	4195.31
	8800.000	400.00	0.00	0.00	725.50	7050.00	739.52	0.00	739.74	2.94	3.88	2245.89	4114.45
	9100.000	300.00	0.00	0.00	728.00	7050.00	739.70	0.00	739.80	1.66	2.74	4099.06	5473.12
	9100.000	300.00	0.00	0.00	728.00	7050.00	739.71	0.00	739.82	1.73	2.80	3656.48	5358.39
	9900.000	800.00	0.00	0.00	728.10	7050.00	739.84	0.00	739.95	1.91	2.88	4706.92	5098.33
	9900.000	800.00	0.00	0.00	728.10	7050.00	739.85	0.00	739.97	1.99	2.94	3819.12	4992.43
	11800.000	1900.00	0.00	0.00	729.80	7050.00	740.21	0.00	740.32	2.03	3.05	5131.48	4944.87
	11800.000	1900.00	0.00	0.00	729.80	7050.00	740.24	0.00	740.36	2.12	3.12	4359.68	4838.60
	14400.000	2600.00	0.00	0.00	728.90	7050.00	740.71	0.00	740.84	1.87	3.14	4011.21	5150.63
	14400.000	2600.00	0.00	0.00	728.90	7050.00	740.75	0.00	740.89	1.95	3.18	3475.17	5050.86
	15800.000	1400.00	0.00	0.00	729.60	7050.00	740.99	0.00	741.31	5.37	4.79	2281.23	3043.54
	15800.000	1400.00	0.00	0.00	729.60	7050.00	741.04	0.00	741.38	5.50	4.86	2004.03	3005.51
	16800.000	1000.00	0.00	0.00	728.70	7050.00	741.47	0.00	741.95	5.88	5.55	1307.58	2906.54
	16800.000	1000.00	0.00	0.00	728.70	7050.00	741.55	0.00	742.02	5.99	5.53	1275.74	2881.44
	17000.000	200.00	735.70	740.90	729.70	7050.00	742.03	0.00	742.11	0.93	2.25	4336.70	7291.58
	17000.000	200.00	735.70	740.90	729.70	7050.00	742.11	0.00	742.18	0.93	2.25	4213.53	7314.94
	17013.000	13.00	0.00	0.00	729.70	7050.00	741.93	0.00	742.22	2.01	4.39	2044.90	4976.50
	17013.000	13.00	0.00	0.00	729.70	7050.00	742.00	0.00	742.29	2.01	4.41	1854.26	4978.02
	17500.000	487.00	0.00	0.00	729.70	7050.00	742.04	0.00	742.40	4.67	4.85	1562.91	3263.71
	17500.000	487.00	0.00	0.00	729.70	7050.00	742.11	0.00	742.48	4.99	4.89	1442.76	3156.97

SHIAWASSEE RIVER

SUMMARY PRINTOUT TABLE 150

	SECNO	Q	CWSEL	DIFWSP	DIFWSX	DIFKWS	TOPWID	XLCH
	0.000	7050.00	734.30	0.00	0.00	0.00	982.29	0.00
	0.000	7050.00	734.30	0.00	0.00	0.00	361.87	0.00
	1000.000	7050.00	734.57	0.00	0.27	0.00	1078.54	1000.00
	1000.000	7050.00	734.58	0.01	0.28	0.01	425.33	1000.00
	3800.000	7050.00	735.27	0.00	0.70	0.00	1015.10	2800.00
	3800.000	7050.00	735.31	0.03	0.73	0.03	545.15	2800.00
	4800.000	7050.00	735.57	0.00	0.30	0.00	454.64	1000.00
	4800.000	7050.00	735.61	0.04	0.30	0.04	252.92	1000.00
	4810.000	7050.00	735.81	0.00	0.25	0.00	512.48	10.00
	4810.000	7050.00	735.84	0.03	0.24	0.03	497.03	10.00
	5700.000	7050.00	736.32	0.00	0.51	0.00	867.96	890.00
	5700.000	7050.00	736.34	0.02	0.50	0.02	574.42	890.00
	6900.000	7050.00	736.57	0.00	0.25	0.00	307.91	1200.00
	6900.000	7050.00	736.60	0.03	0.25	0.03	222.20	1200.00
	7200.000	7050.00	736.77	0.00	0.20	0.00	166.94	300.00
	7200.000	7050.00	736.83	0.06	0.23	0.06	166.89	300.00
	7230.000	7050.00	736.79	0.00	0.03	0.00	167.05	30.00
	7230.000	7050.00	736.85	0.06	0.03	0.06	167.00	30.00
	7430.000	7050.00	736.93	0.00	0.13	0.00	329.85	200.00
	7430.000	7050.00	736.96	0.03	0.11	0.03	228.98	200.00
	8050.000	7050.00	737.28	0.00	0.35	0.00	341.66	620.00
	8050.000	7050.00	737.32	0.05	0.36	0.05	239.08	620.00
*	8100.000	7050.00	737.68	0.00	0.41	0.00	203.39	50.00
*	8100.000	7050.00	737.68	0.00	0.36	0.00	203.39	50.00
	8150.000	7050.00	739.32	0.00	1.63	0.00	507.61	50.00
	8150.000	7050.00	739.30	-0.01	1.62	-0.01	313.49	50.00
	8400.000	7050.00	739.40	0.00	0.08	0.00	512.99	250.00
	8400.000	7050.00	739.39	-0.01	0.08	-0.01	317.91	250.00
	8800.000	7050.00	739.52	0.00	0.12	0.00	520.93	400.00
	8800.000	7050.00	739.52	0.00	0.13	0.00	321.65	400.00
	9100.000	7050.00	739.70	0.00	0.18	0.00	1005.64	300.00
	9100.000	7050.00	739.71	0.00	0.19	0.00	652.24	300.00

SECNO	Q	CWSEL	DIFWSP	DIFWSX	DIFKWS	TOPWID	XLCH
9900.000	7050.00	739.84	0.00	0.14	0.00	1843.61	800.00
9900.000	7050.00	739.85	0.01	0.14	0.01	946.14	800.00
11800.000	7050.00	740.21	0.00	0.37	0.00	1700.00	1900.00
11800.000	7050.00	740.24	0.03	0.39	0.03	1069.11	1900.00
14400.000	7050.00	740.71	0.00	0.49	0.00	1090.29	2600.00
14400.000	7050.00	740.75	0.05	0.52	0.05	675.65	2600.00
15800.000	7050.00	740.99	0.00	0.28	0.00	566.99	1400.00
15800.000	7050.00	741.04	0.06	0.29	0.06	382.82	1400.00
16800.000	7050.00	741.47	0.00	0.48	0.00	159.11	1000.00
16800.000	7050.00	741.55	0.08	0.51	0.08	121.00	1000.00
17000.000	7050.00	742.03	0.00	0.56	0.00	455.97	200.00
17000.000	7050.00	742.11	0.07	0.56	0.07	411.76	200.00
17013.000	7050.00	741.93	0.00	-0.11	0.00	453.11	13.00
17013.000	7050.00	742.00	0.07	-0.11	0.07	331.00	13.00
17500.000	7050.00	742.04	0.00	0.11	0.00	200.00	487.00
17500.000	7050.00	742.11	0.07	0.11	0.07	145.00	487.00

SUMMARY OF ERRORS AND SPECIAL NOTES

```
CAUTION  SECNO= 8100.000  PROFILE= 1  CRITICAL DEPTH ASSUMED
CAUTION  SECNO= 8100.000  PROFILE= 1  PROBABLE MINIMUM SPECIFIC ENERGY
CAUTION  SECNO= 8100.000  PROFILE= 1  20 TRIALS ATTEMPTED TO BALANCE WSEL
CAUTION  SECNO= 8100.000  PROFILE= 2  CRITICAL DEPTH ASSUMED
CAUTION  SECNO= 8100.000  PROFILE= 2  PROBABLE MINIMUM SPECIFIC ENERGY
CAUTION  SECNO= 8100.000  PROFILE= 2  20 TRIALS ATTEMPTED TO BALANCE WSEL
```

FLOODWAY DATA, SHIAWASSEE RIVER
PROFILE NO. 2

STATION	FLOODWAY WIDTH	FLOODWAY SECTION AREA	FLOODWAY MEAN VELOCITY	WATER SURFACE ELEVATION WITH FLOODWAY	WATER SURFACE ELEVATION WITHOUT FLOODWAY	DIFFERENCE
0.000	362.	2558.	2.8	734.3	734.3	0.0
1000.000	425.	2776.	2.5	734.6	734.6	0.0
3800.000	545.	2819.	2.5	735.3	735.3	0.0
4800.000	292.	1754.	4.0	735.6	735.6	0.0
4810.000	521.	2117.	3.3	735.8	735.8	0.0
5700.000	574.	3455.	2.0	736.3	736.3	0.0
6900.000	222.	1551.	4.5	736.6	736.6	0.0
7200.000	167.	1433.	4.9	736.9	736.8	0.1
7230.000	167.	1437.	4.9	736.9	736.8	0.1
7430.000	229.	1655.	4.3	736.9	736.9	0.0
8050.000	239.	1775.	4.0	737.3	737.3	0.0
8100.000	203.	678.	10.4	737.7	737.7	0.0
8150.000	313.	2157.	3.3	739.3	739.3	0.0
8400.000	318.	2193.	3.2	739.4	739.4	0.0
8800.000	322.	2246.	3.1	739.5	739.5	0.0
9100.000	652.	3656.	1.9	739.7	739.7	0.0
9900.000	946.	3819.	1.8	739.8	739.8	0.0
11800.000	1069.	4360.	1.6	740.2	740.2	0.0
14400.000	676.	3475.	2.0	740.7	740.7	0.0
15800.000	383.	2004.	3.5	741.1	741.0	0.1
16800.000	121.	1276.	5.5	741.6	741.5	0.1
17000.000	412.	4214.	1.7	742.1	742.0	0.1
17013.000	331.	1854.	3.8	742.0	741.9	0.1
17500.000	145.	1443.	4.9	742.1	742.0	0.1

00BREAK00

1) COUNTY: SHIAWASSEE

2) STUDY NAME: FLOODPLAIN MANAGEMENT STUDY

3) WATERCOURSE: OWOSSO DRAIN

4) DOCUMENT TYPE: SCS

00BREAK00

U.S. DEPARTMENT OF ...
SOIL CONSERVATION ...

Michigan — Owosso Drain FPMS

T Bourdon 2-24-94

Stage-Discharge for Str #5 (above Freeman) — 1 / 9

Utilized Bruce Menerey's calculations for the capacity of the 54" RCP outlet pipe and WSP2 calculations for overland flow to prepare stage-discharge table to be used in TR20 Rch:

Elev	Discharge (54" RCP) 1/	Discharge (Overland) 2/	Discharge (Total)
731.8	0.	0.	0.
736.3	61.4	—	61.4
737.0	66.2	—	66.2
738.0	72.0	4.8	76.8
739.0	76.0	83.5	159.5
739.5	78.0	180.0	258.0
740.0	80.0	350.0	430.0

1/ From Menerey's Comps See sheet 3 of 9

2/ WSP2 Output (Filename = WSPFREE.OUT) see sheet 6 of 9

Fax Transmittal Cover Sheet

Michigan Department of Natural Resources
Land and Water Management Division

DNR

SEND TO: Tom Bourdon

FAX TELEPHONE NO.: 517-337-6905

ADDRESS: SCS

SENDER: Bruce Menerey
335-3181

NUMBER OF PAGES: 2
(including cover sheet)

DATE: 2/14/94

IF YOU DO NOT RECEIVE ALL THE PAGES, PLEASE CALL: 517-373-1170

Here is the rating curve that I developed for the outlet structure. I noted that this does not include inflow that may occur from the storm sewers between South Street & Ament Street. I will take a look at the info that we have & if necessary modify the rating curve.

2/8/94
BEM

South Street - Owosso Drain

Stage	Q_{54}	Q_{weir}	$Q^{*}_{inverts}$	Q_T^{**}	
731.8	0	–		0	
734.5	30	–		30	
735	40	–		40	
735.5	50	–		50	
736.1	60	0		60	
737.4	69	0		69	
737.5	70	15	~~87~~	85	
737.6	70	35	~~87~~	105	
737.7	71	~~62~~	57	128	
738	72		59	131	Same
739	76		63	139	
740	80		68	148	
741	85		73	158	
742.1	90		76	166	
743.5	100		79	179	

* Assumes enough catch basins to let water into system (~4 to 5 cfs/catch basin), the 27", 24", 12", 10", + 8" pipes

** Does not consider inflow from stormsewers between South Street + Ament Street ←

7-11-94
TOB

4 of 9

5

---------- LIST OF INPUT DATA WITH LIMITED EDITING----------

```
WSP2       10.
TIT        OWOSSOW DRAIN-FPMS, SHIAWASSEE COUNTY, MICHIGAN, 10-20-93
CO         THE PURPOSE OF THIS RUN IS TO DETERMINE STAGE-DISCHARGE
COMMENT    CURVE FOR STRUCTURE #3 LOCATED SOUTH OF FREEMAN STREET
COMMENT    TO BE USED IN TR 20 COMPUTER RUN
DISCHARGE  -1.      50.     100.    200.    350.    600.
STARTS     FREEMAN  .0005   .0005   .0005   .0005   .0005
OUTPUT     T
COMMENT    737.5 - 737.0 \ 1100 = .0005
REACH      FREEMAN  1.      0.      0.
SEGMENT    FREEMAN  1       N       -55.
NVALUE     .15
SEGMENT    FREEMAN  2       C       40.
NVALUE     .10
SEGMENT    FREEMAN  3       N       640.
NVALUE     .15
SECTION    FREEMAN
           -170.    739.5   -120.   739.0   -55.    738.
           0.       737.5   40.     738.0   80.     739.0
           150.     739.8   200.    739.    250.    738.
           300.     738.    530.    739.    640.    740.
           -190.    739.7   -500.   739.3   -690.   740.
ENDTABLE
```

----------MESSAGE - DATA POINTS ON SECTION FREEMA REORDERED BY PROGRAM ACCORDING TO X VALUES
DUPLICATE X POINTS NOT CHANGED----------

```
REACH      VAL3     1.      70.     70.
SEGMENT    VAL3     1       C       510.
N          .10
SECTION    VAL3
           -510.    740.    -445.   739.5   -444.   748.
           -420.    748.    -419.   739.4   -395.   739.4
           -394.    748.    -340.   748.    -339.   739.4
           -255.    739.3   -254.   748.    -225.   748.
           -224.    739.3   -180.   739.3   -140.   738.7
           -139.    748.    -110.   748.    -109.   738.5
           -70.     738.3   -69.    748.    -40.    748.
           -39.     738.    50.     738.    51.     748.
           85.      748.    86.     738.5   150.    738.5
           151.     748.    230.    748.    231.    738.
           300.     738.    301.    748.    380.    748.
           381.     738.    420.    738.    421.    748.
           460.     748.    461.    739.    510.    740.
ENDTABLE
REACH      HERMAN   1.      260.    260.
SEGMENT    HERMAN   1       N       -390.
NVALUE     .15
SEGMENT    HERMAN   2       C       0.
```


----------LIST OF INPUT DATA----------

```
NVALUE     .10
SEGMENT    HERMAN   3       N       230.
NVALUE     .15
SECTION    HERMAN
           -650.    740.    -620.   7[illegible]2   -590.   738.
           -320.    737.4   0.      737.[illegible]   [illegible]   738
           230.     740.
```

```
SEGMENT   VAL2     1        C        340.
NVALUE    .10
SECTION   VAL2
          -390.    748.     -389.    740.     -375.    739.8
          -374.    748.     -330.    748.     -329.    739.3
          -290.    738.9    -289.    748.     -265.    748.
          -265.    738.7    -235.    738.5    -234.    748.
          -190.    748.     -189.    738.1    -175.    738.
          -110.    738.     -109.    748.     -75.     748.
          -74.     738.     -45.     738.     -44.     748.
          -25.     748.     -24.     738.     0.       738.
          35.      738.     36.      748.     70.      748.
          71.      738.     120.     738.     121.     748.
          130.     748.     131.     738.     150.     738.
          165.     738.2    166.     748.     210.     748.
          211.     738.2    250.     738.5    251.     748.
          330.     748.     331.     739.8    340.     740.
ENDTABLE
REACH     VALLEY   1.       185.     185.
SEGMENT   VALLEY   1        N        -220.
NVALUE    .15
SEGMENT   VALLEY   2        C        0.
NVALUE    .10
SEGMENT   VALLEY   3        N        180.
NVALUE    .15
SECTION   VALLEY
          -330.    740.     -220.    738.     0.       737.3
          150.     738.     180.     740.
ENDTABLE
REACH     SOUTH    1.       500.     500.
SEGMENT   SOUTH    1        N        -88.
NVALUE    .15
S     T   SOUTH    2        C        86.
NVALUE    .10
SEGMENT   SOUTH    3        N        737.
NVALUE    .15
1    WSP2 XEQ 02/24/94     11:22:31     OWOSSOW DRAIN-FPMS, SHIAWASSEE COUNTY, MICHIGAN, 10-20-93     WS : ____        PAGE
          REV 11/01/90   VERSION 2.0                                                                    ALT:       2


----------------------------LIST OF INPUT DATA----------------------------
SECTION   SOUTH
          -1476.   742.3    -1335.   739.4    -1159.   738.5
          -982.    738.     -805.    738.1    -633.    738.2
          -459.    737.5    -318.    736.9    -144.    737.3
          -88.     737.2    0.       737.4    86.      737.9
          110.     737.9    245.     738.4    384.     738.9
          560.     740.6    737.     742.4
ENDTABLE
COMPUTE   FREEMAN  SOUTH    FREEMAN
----------------------------END OF DATA LISTING----------------------------
1                  COMPUTE  FREEMAN  SOUTH    FREEMAN


----------------------------STARTING DATA FROM GIVEN SLOPES----------------------------

1    WSP2 XEQ 02/24/94     11:22:31     OWOSSOW DRAIN-FPMS, SHIAWASSEE COUNTY, MICHIGAN, 10-20-93     WS : ____        PAGE
          REV 11/01/90   VERSION 2.0                                                                    ALT: ____        2


                    RATING TABLE FOR SECTION FREEMA       DA=      1.0 SQ MI    EXP COEF= .00    CONT COEF= .00
                    -------------------------------
```

```
                                        DAMAGE    CHANNEL                          FT     FT/FT       FT
        0     737.5       0.0       0.0
  LOW  GRND   738.0      23.8       4.8      .00       .00       .00                                  95.0
*****MESSAGE- ELEV BELOW FIRST PROFILE. FLOW INTERPOLATED LINEARLY FROM CHANNEL BOTTOM*****
  BANK FULL   738.0      23.8       4.8      .00       .00       .00                                  95.0
**  'ESSAGE- ELEV BELOW FIRST PROFILE. FLOW INTERPOLATED LINEARLY FROM CHANNEL BOTTOM*****
739     1     738.8     247.3      50.0 83.5 .00       .00       .00     50.00      737.9   .00048    436.9
739.5   2     739.1     432.5     100.0 180 .00       .00       .00    100.00      738.1   .00049    572.5
        3     739.6     786.8     200.0     .00       .00       .00    200.00      738.2   .00050   1053.7
        4     740.0    1300.6     350.0     .00       .00       .00    350.00      738.4   .00048   1240.9
        5     740.5    1894.2     600.0     .00       .00       .00    600.00      738.5   .00048   1330.0
WARNING**********PROFILE NO  4  EXCEEDS SURVEY DATA BY    .0 FT. COMPUTATION BASED ON VERTICAL EXTENSION OF END POINTS**********
WARNING**********PROFILE NO  5  EXCEEDS SURVEY DATA BY    .5 FT. COMPUTATION BASED ON VERTICAL EXTENSION OF END POINTS**********

*****WARNING - SECT. VAL3   KD VALUES REVERSED ON SEGMENT  1 AT ELEVATION    748.80  VALUE CHANGED TO EQUAL PREVIOUS VALUE *****
1    WSP2 XEQ 02/24/94     11:22:31     OWOSSOW DRAIN-FPMS, SHIAWASSEE COUNTY, MICHIGAN, 10-20-93     WS : ____        PAGE
        REV 11/01/90   VERSION 2.0                                                                    ALT: ____          4


                    RATING TABLE FOR SECTION VAL3          DA=      1.0 SQ MI    EXP COEF=  .00    CONT COEF=  .00
                    -----------------------------

        NO.     ELEV      AREA       Q    ------ACRES FLOODED-------    STARTING       CRIT   FRICTION    FLOW TOP
                  FT      SQ FT     CFS   FLOODPLAIN            TOTAL      CSM         ELEV    SLOPE       WIDTH
                                               DAMAGE    CHANNEL                         FT     FT/FT        FT

        0     738.0       0.0       0.0
        1     738.8     195.9      50.0      .00       .50       .50     50.00      738.1   .00056      308.1
        2     739.2     311.1     100.0      .00       .55       .55    100.00      738.2   .00055      341.0
        3     739.7     534.8     200.0      .00       .88       .88    200.00      738.3   .00068      545.3
  LOW  GRND   740.0     734.9     327.2      .00       .98       .98                                    608.5
      FULL    740.0     734.9     327.2      .00       .98       .98                                    608.5
        4     740.1     770.9     350.0      .00       .98       .98    350.00      738.5   .00072      608.6
        5     740.5    1049.3     600.0      .00       .98       .98    600.00      738.7   .00078      609.5
WARNING**********PROFILE NO  4  EXCEEDS SURVEY DATA BY    .1 FT. COMPUTATION BASED ON VERTICAL EXTENSION OF END POINTS**********
WARNING**********PROFILE NO  5  EXCEEDS SURVEY DATA BY    .5 FT. COMPUTATION BASED ON VERTICAL EXTENSION OF END POINTS**********
1    WSP2 XEQ 02/24/94     11:22:31     OWOSSOW DRAIN-FPMS, SHIAWASSEE COUNTY, MICHIGAN, 10-20-93     WS : ____        PAGE
        REV 11/01/90   VERSION 2.0                                                                    ALT: ____          5


                    RATING TABLE FOR SECTION HERMAN        DA=      1.0 SQ MI    EXP COEF=  .00    CONT COEF=  .00
                    -------------------------------

        NO.     ELEV      AREA       Q    ------ACRES FLOODED-------    STARTING       CRIT   FRICTION    FLOW TOP
                  FT      SQ FT     CFS   FLOODPLAIN            TOTAL      CSM         ELEV    SLOPE       WIDTH
                                               DAMAGE    CHANNEL                         FT     FT/FT        FT

        0     737.3       0.0       0.0
  LOW  GRND   737.3        .0        .0      .00       .00       .00                                     .0
*****MESSAGE- ELEV BELOW FIRST PROFILE. FLOW INTERPOLATED LINEARLY FROM CHANNEL BOTTOM*****
  BANK FULL   737.3        .0        .0      .00       .00       .00                                     .0
*****MESSAGE- ELEV BELOW FIRST PROFILE. FLOW INTERPOLATED LINEARLY FROM CHANNEL BOTTOM*****
        1     738.8     674.9      50.0      .00      2.33      3.85     50.00      737.4   .00002      645.8
        2     739.2     [illegible]  100.0      .00      2.33      4.45    100.00      737.5   .00004      745.7
        3     739.7    1317.5     200.0      .00      2.33      4.95    200.00      737.6   .00006      829.2
        4     740.1    1677.6     350.0      .00      2.33      5.19    350.00      737.7   .00009      869.1
        5     740.6    2090.3     600.0      .00      2.33      5.25    600.00      737.8   .00014      880.0
W.    [illegible]**********PROFILE NO  4  EXCEEDS SURVEY DATA BY    .1 FT. COMPUTATION BASED ON VERTICAL EXTENSION OF END POINTS**********
WARNING**********PROFILE NO  5  EXCEEDS SURVEY DATA BY    .6 FT. COMPUTATION BASED ON VERTICAL EXTENSION OF END POINTS**********

*****WARNING - SECT. VAL[illegible]  KD VALUES REVERSED ON SEGMENT  1 AT ELEVATION    749.00  VALUE CHANGED TO EQUAL PREVIOUS VALUE *****
1    WSP2 XEQ 02/24/94     11:22:31     OWOSSOW DRAIN-FPMS, SHIAWASSEE COUNTY, MICHIGAN, 10-20-93     WS : ____        PAGE
        REV 11/01/90   VERSION 2.0                                                                    ALT: ____
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RATING TABLE FOR SECTION VAL2 DA= 1.0 SQ MI EXP COEF= .00 CONT COEF= .00

NO.	ELEV FT	AREA SQ FT	Q CFS	ACRES FLOODED FLOODPLAIN DAMAGE	ACRES FLOODED FLOODPLAIN CHANNEL	ACRES FLOODED TOTAL	STARTING CSM	CRIT ELEV FT	FRICTION SLOPE FT/FT	FLOW TOP WIDTH FT
0	738.0	0.0	0.0							
1	738.8	235.6	50.0	.00	.56	.56	50.00	738.1	.00032	323.0
2	739.2	356.0	100.0	.00	.60	.60	100.00	738.2	.00037	349.8
3	739.7	533.6	200.0	.00	.63	.63	200.00	738.3	.00042	365.9
LOW GRND	740.0	644.0	303.6	.00	.66	.66				383.7
BANK FULL	740.0	644.0	303.6	.00	.66	.66				383.7
4	740.1	693.4	350.0	.00	.66	.66	350.00	738.4	.00058	384.0
5	740.6	880.4	600.0	.00	.66	.66	600.00	738.6	.00079	384.9

WARNING**********PROFILE NO 4 EXCEEDS SURVEY DATA BY .1 FT. COMPUTATION BASED ON VERTICAL EXTENSION OF END POINTS**********
WARNING**********PROFILE NO 5 EXCEEDS SURVEY DATA BY .6 FT. COMPUTATION BASED ON VERTICAL EXTENSION OF END POINTS**********

1 WSP2 XEQ 02/24/94 11:22:31 OWOSSOW DRAIN-FPMS, SHIAWASSEE COUNTY, MICHIGAN, 10-20-93 WS : ____ PAGE
REV 11/01/90 VERSION 2.0 ALT: ____ 7

RATING TABLE FOR SECTION VALLEY DA= 1.0 SQ MI EXP COEF= .00 CONT COEF= .00

NO.	ELEV FT	AREA SQ FT	Q CFS	ACRES FLOODED FLOODPLAIN DAMAGE	ACRES FLOODED FLOODPLAIN CHANNEL	ACRES FLOODED TOTAL	STARTING CSM	CRIT ELEV FT	FRICTION SLOPE FT/FT	FLOW TOP WIDTH FT
0	737.3	0.0	0.0							
LOW GRND	737.3	.0	.0	.00	.00	.00				.0
*****MESSAGE- ELEV BELOW FIRST PROFILE. FLOW INTERPOLATED LINEARLY FROM CHANNEL BOTTOM*****										
BANK FULL	737.3	.0	.0	.00	.00	.00				.0
*****MESSAGE- ELEV BELOW FIRST PROFILE. FLOW INTERPOLATED LINEARLY FROM CHANNEL BOTTOM*****										
1	738.9	471.5	50.0	.00	.93	1.83	50.00	737.6	.00006	429.8
2	739.2	635.0	100.0	.00	.93	1.94	100.00	737.7	.00009	455.7
3	739.7	874.6	200.0	.00	.93	2.07	200.00	737.8	.00014	487.9
4	740.2	1098.0	350.0	.00	.93	2.16	350.00	737.9	.00022	508.7
5	740.7	1358.2	600.0	.00	.93	2.17	600.00	738.1	.00032	510.0

WARNING**********PROFILE NO 4 EXCEEDS SURVEY DATA BY .2 FT. COMPUTATION BASED ON VERTICAL EXTENSION OF END POINTS**********
WARNING**********PROFILE NO 5 EXCEEDS SURVEY DATA BY .7 FT. COMPUTATION BASED ON VERTICAL EXTENSION OF END POINTS**********

1 WSP2 XEQ 02/24/94 11:22:31 OWOSSOW DRAIN-FPMS, SHIAWASSEE COUNTY, MICHIGAN, 10-20-93 WS : ____ PAGE
REV 11/01/90 VERSION 2.0 ALT: ____ 8

RATING TABLE FOR SECTION SOUTH DA= 1.0 SQ MI EXP COEF= .00 CONT COEF= .00

NO.	ELEV FT	AREA SQ FT	Q CFS	ACRES FLOODED FLOODPLAIN DAMAGE	ACRES FLOODED FLOODPLAIN CHANNEL	ACRES FLOODED TOTAL	STARTING CSM	CRIT ELEV FT	FRICTION SLOPE FT/FT	FLOW TOP WIDTH FT
0	736.9	0.0	0.0							
LOW GRND	736.9	.0	.0	.00	.00	.00				.0
*****MESSAGE- ELEV BELOW FIRST PROFILE. FLOW INTERPOLATED LINEARLY FROM CHANNEL BOTTOM*****										
BANK FULL	737.2	30.1	1.0	.00	.00	2.31				201.0
*****MESSAGE- ELEV BELOW FIRST PROFILE. FLOW INTERPOLATED LINEARLY FROM CHANNEL BOTTOM*****										
1	738.9	1586.5	50.0	.00	2.00	18.22	50.00	737.2	.00001	1587.6
2	739.2	2206.1	100.0	.00	2.00	19.63	100.00	737.2	.00001	1710.5
3	739.7	3100.6	200.0	.00	2.00	20.91	200.00	737.3	.00002	1822.0
4	740.2	3941.2	350.0	.00	2.00	21.70	350.00	737.4	.00003	1890.7
5	740.7	4943.6	600.0	.00	2.00	22.60	600.00	737.6	.00004	1968.5

1 WSP2 XEQ 02/24/94 11:22:31 OWOSSOW DRAIN-FPMS, SHIAWASSEE COUNTY, MICHIGAN, 10-20-93 WS : ____ PAGE
REV 11/01/90 VERSION 2.0 ALT: ____ 9

```
END
ENDJOB

*****************************NORMAL END OF JOB----------------------------

1   _P2 XEQ 02/24/94     11:22:31                                          WS : ____        PAGE
        REV 11/01/90   VERSION 2.0                                         ALT: ____          1

---------------------- LIST OF INPUT DATA WITH LIMITED EDITING----------------------
ENDRUN

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

                SCS  WSPC     VERSION 11/01/90
                       FILE SUMMARY

        INPUT    = A:WSPFREE.DAT
        OUTPUT   = C:WSPFREE2.OUT            DATED 02/24/94  11:22:31

                OPTIONAL FILES SAVED

        OPTION T = A:WSPFREE.WRT             DATED 02/24/94  11:22:31

*****************************************************************************
```

Michigan — Owosso Drain FPMS

T Bourdon 2-23-94

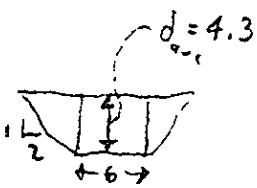
Stage - Storage for Structure ~~#2~~ 5 South of Freeman St. and 100 7-11-94

9 9

$$V = \frac{A_1 + A_2}{2} L$$

Area	Elevation		Volume	Cum Volume
	731.8 = 0		0	0
0	736.3		2.2 1/	2.2
		$\frac{0+4.5}{2}(737.0-736.3)$ =		
4.5	737.0		1.6	3.8
		$\frac{4.5+29.2}{2}(738.0-737.0)$ =		
15.7+13.5=29.2	738.0		16.9	20.7
		$\frac{29.2+54.3}{2}(739.0-738.0)$ =		
23.9+30.4=54.3	739.0		41.8	62.5
		$\frac{54.3+71.5}{2}(739.5-739.0)$ =		
30.0 2/ + 41.5=71.5	739.5		31.5	94.0
		$\frac{71.5+87.4}{2}(740-739.5)$ =		
35.0 2/ + 52.4=87.4	740.0		39.7	133.7

1/ Volume in channel 1500' long

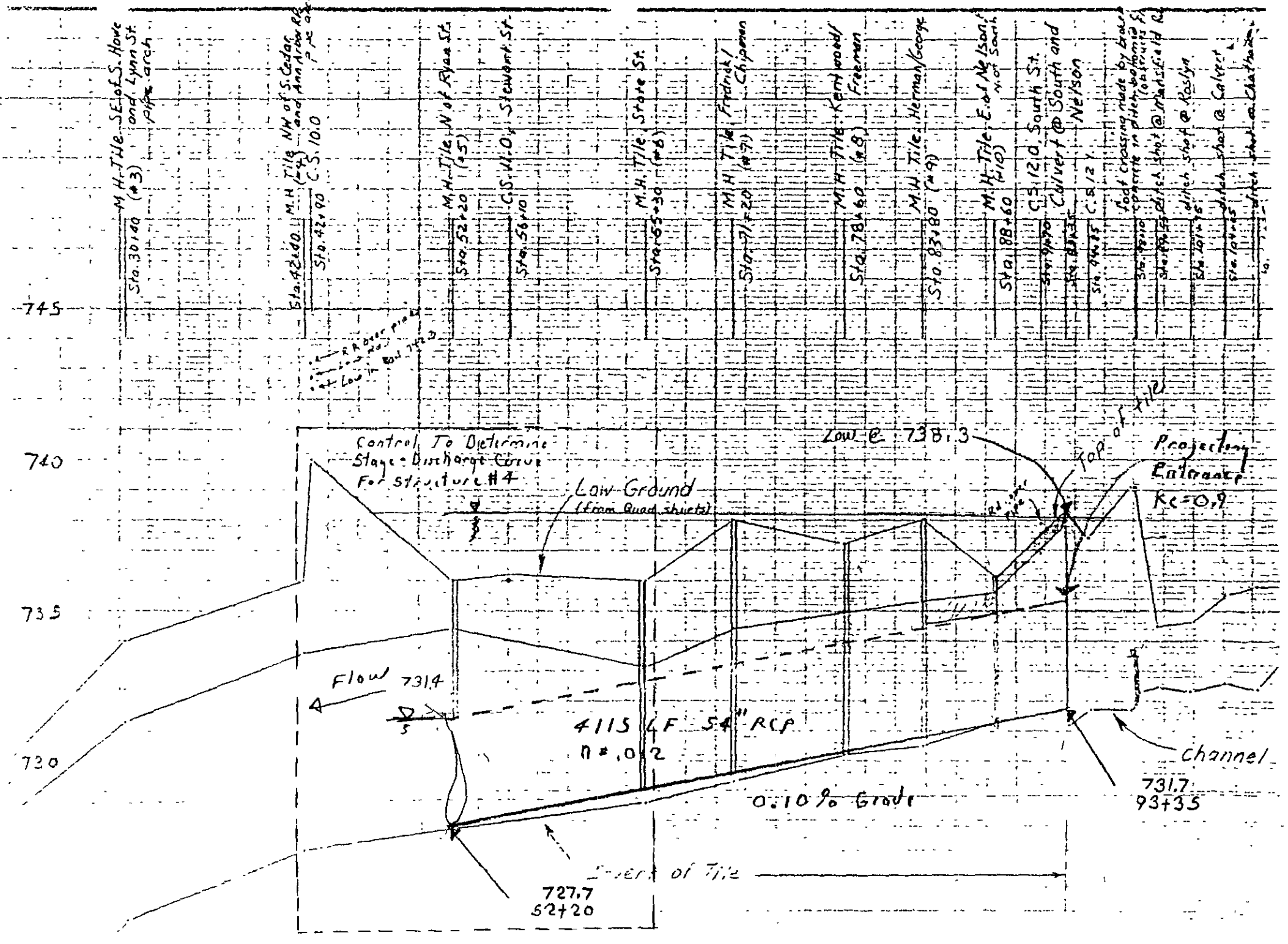


$$V = \frac{62.8+62.8}{2}(1500) / 43560$$

2/ Approximate - Estimated

V = 2.16 Use 2.2 Ac-Ft

Structure 6


745
740
735
730
Control To Determine Stage-Discharge Curve For Structure #4
Low Ground (from Quad sheets)
Low @ 738.3
Projecting Entrance Ke=0.9
Flow
731.4
4115 LF 54" RCP
n = .012
0.10% Grade
Channel
731.7
93+35
727.7
52+20
Event of Fill

Owosso Drain FPMS 1 of 8

Michigan 12-93
T Bourdon Structure ~~86~~ stage - discharge - storage Curves

Elevation ft	Discharge cfs 54" Pipe	27" Pipe	24" Pipe	12" Pipe	10" Pipe	8" Pipe	Total Discharge	Storage Ac Ft
728.4	0.						0.	0.
730.6	32.						32.	0.7
732.0	68.						68.	0.9
734.0	120.						120.	1.2
735.1	126.8	33.4	20.8	3.6	2.9	1.2	188.7	1.4
736.0	148.7	37.6	23.4	4.0	3.3	1.3	218.3	9.6
737.0	169.8	41.8	26.0	4.3	3.7	1.5	247.1	49.6
738.0	188.5	45.5	28.4	4.7	4.0	1.6	272.7	131.5
739.0	205.5	49.0	30.5	5.2	4.3	1.7	296.2	237.6

The Overland Flow Doesn't Occur until approx Elev 735.1 Therefore these pipes will receive flood waters from the south only at or above elev 735.1

interpolated

Storage Calculations

Area @ 735.1 = 0

Area @ 736.0 = 18.3 Ac

Area @ 737.0 = 61.7 Ac

Area @ 738.0 = 102.1

Area @ 739.0 = 110.0

* Volume in 54" Pipe = $\frac{15.89 \times 3725}{43560}$ = 1.4 Ac Ft

Elev	Vol	Cum Vol
735.1	1.4	1.4
736.0	$\frac{0+18.3}{2}(.9) = 8.2$	9.6
737.0	$\frac{18.3+61.7}{2}(1) = 40.0$	49.6
738.0	$\frac{61.7+102.1}{2}(1) = 81.9$	131.5
739.0	$\frac{102.1+110.0}{2}(1) = 106.1$	237.6

ummary)

US Department of Agriculture
Soil Conservation Service

DESIGN WORKSHEET
for
Culvert Evaluation

prepared for

OWOSSO DRAIN FPMS

in

SHIAWASSEE County, Michigan

Designer : TDB
Date : 12/10/93

Checker _____
Date _____

****

54 INCH OUTLET PIPE @ 51+40

'n' value = 0.013
Length = 230 ft.
Diameter = 54 in.
Projecting .. square edge
ke = 0.46

Capacity = 188.5 cfs. *

Outlet Controls

Elevation of headwater = 738.0
Elevation of inlet = 728.4
Elevation of tailwater = 732.7
Elevation of outlet = 728.2

54" Pipe

HW/D	Qout	
728.4	0	inlet control from nomographs
730.6 .5	32.0	
732.0 .8	68.0	
734.0 1.2	120.0	
735.1	126.8	outlet control
736.0	148.7	
737.0	169.8	
738.0	* 188.5	
739.0	205.5	

Add discharge [illegible] or [illegible] box below
As [illegible] depth of pipe 4' below ground [illegible]

US Department of Agriculture
Soil Conservation Service

DESIGN WORKSHEET
for
Pipe Flow Formula Solution

prepared for

OWOSSO DRAIN FPMS

in

SHIAWASSEE County, Michigan

Designer : TDB
Date : 12/10/93

Checker _____
Date _____

****

27 IN ENTERING @ STEWART ST. Entering trunk line from the West.

Mannings Coefficient (n)	0.013
Entrance Coefficient (Ke)	0.50
Diameter of pipe	27 inch.
1/ Head on pipe	3.4 feet.
Length of pipe	150 feet.

Pipe Capacity	33.4 cfs @ 735.1
Velocity in pipe	8.4 ft/sec
Friction Cofficient (Kp)	0.0106
Max allowable fall in pipe when outlet is not submerged	1.8 ft.

1/ 735.7 − 4 = 731.7

$$\begin{array}{r} 735.1 \\ -\ 731.7 \\ \hline 3.4 \end{array}$$

27" Pipe

@ 735.1	33.4 cfs
@ 736.0	37.6 cfs
@ 737.0	41.8 cfs
@ 738.0	45.5 cfs

US Department of Agriculture
Soil Conservation Service

DESIGN WORKSHEET
for
Pipe Flow Formula Solution

prepared for

OWOSSO DRAIN FPMS

in

SHIAWASSEE County, Michigan

Designer : TDB
Date : 12/10/93

Checker _____
Date _____

****

24 IN ENTERING @ AMENT ST. from east

Mannings Coefficient (n)	0.013
Entrance Coefficient (Ke)	0.50
Diameter of pipe	24 inch.
Head on pipe	4.3 feet.
Length of pipe	280 feet.
Pipe Capacity	23.4 cfs *
Velocity in pipe	7.5 ft/sec
Friction Cofficient (Kp)	0.0124
Max allowable fall in pipe when outlet is not submerged	3.0 ft.

24" Pipe

735.1	20.8
* 736.0	23.4
737.0	26.0
738.0	28.4
739.0	30.5

US Department of Agriculture
Soil Conservation Service

DESIGN WORKSHEET
for
Pipe Flow Formula Solution

prepared for

OWOSSO DRAIN FPMS

in

SHIAWASSEE County, Michigan

Designer : TDB
Date : 12/10/93

Checker _____
Date _____

****

12 IN @ RYAN ST entering from the east

Mannings Coefficient (n)	0.013
Entrance Coefficient (Ke)	0.50
Diameter of pipe	12 inch.
Head on pipe	4.4 feet.
Length of pipe	380 feet.

Pipe Capacity	3.6 cfs
Velocity in pipe	4.6 ft/sec
Friction Cofficient (Kp)	0.0313
Max allowable fall in pipe when outlet is not submerged	3.9 ft.

12" Pipe

735.1	3.6
736.0	4.0
737.0	4.3
738.0	4.7
739.0	5.2

6078

US Department of Agriculture
Soil Conservation Service

DESIGN WORKSHEET
for
Pipe Flow Formula Solution

prepared for

OWOSSO DRAIN FPMS

in

SHIAWASSEE County, Michigan

Designer : TDB
Date : 12/10/93

Checker _____
Date _____

****

10 IN ENTERING @ STEWART ST from east side

Mannings Coefficient (n)	0.013
Entrance Coefficient (Ke)	0.50
Diameter of pipe	10 inch.
Head on pipe	6.3 feet.
Length of pipe	150 feet.
Pipe Capacity	4.0 cfs
Velocity in pipe	7.4 ft/sec
Friction Cofficient (Kp)	0.0399
Max allowable fall in pipe when outlet is not submerged	5.0 ft.

10" Pipe

735.1	2.9
736.0	3.3
737.0	3.7
738.0	4.0
739.0	4.3"

" not stated

Note. sheet 8 of 8 is a contour map

US Department of Agriculture
Soil Conservation Service

DESIGN WORKSHEET
for
Pipe Flow Formula Solution

prepared for

OWOSSO DRAIN FPMS

in

SHIAWASSEE County, Michigan

Designer : TDB
Date : 12/10/93

Checker _____
Date _____

****

8 IN @ RYAN ST. entering from west

Mannings Coefficient (n)	0.013
Entrance Coefficient (ke)	0.50
Diameter of pipe	8 inch.
Head on pipe	7.3 feet.
Length of pipe	380 feet.
Pipe Capacity	1.6 cfs
Velocity in pipe	4.6 ft/sec
Friction Cofficient (kp)	0.0538
Max allowable fall in pipe when outlet is not submerged	6.8 ft.

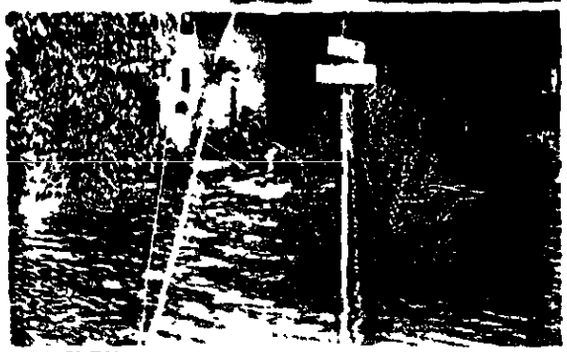
8 in Pipe

735.1	1.2
736.0	1.3
737.0	1.5
738.0	1.6
739.0	1.7 4

4 estimated

Shiawassee River level was at 10.05 and flood stage is seven feet. This photo was taken.

REMEMBER THE GRANDSTAND area of Corunna's McCurdy Park? This girl was surveying the situation early this morning. The water level was at approximately three feet.



CANOEING down Frederick Street in Owosso early today. (Argus-Press Photos)

ıter, Water, Everywhere

X
Writer
shutting lines ben
the past 24 hours
s of basements,
and forcing many

roaring, dreadful
-bright flashes of
ring rain totalled
nesday and 7 a.m.

sported at 10.14 at
he predicted nine
seven feet.

storm-related in-
endorcement and

All of the county's school districts were closed due to rainfall which has blocked many secondary roads and caused several problems at main trunk lines and major intersections everywhere in the county. Sheriff Jim LaJoye and Jim Jeffries, emergency services coordinator for the county, recommended the school closings early this morning.

"Just our whole county is flooded," says Myrna Kiger, a dispatcher for the sheriff's department in Corunna, adding, "all the fire departments; all the pumps that are available, everybody's out."

Workers at the Shiatown Hydroelectric Dam opened the last gate early today to release water expected by the Shiawassee River which had exceeded its seven-foot flood stage earlier.

Basement floodings are numbered in the hundreds throughout the county and many persons fled their homes as the rain continued relentlessly through the night.

Many, many social functions have been cancelled and will be rescheduled later

Nearly 5,000 persons suffered from power outages, says Mike McCloskey, district manager for Consumers Power Co.The outages lasted from one-half to three hours, McCloskey explains.

About 9 p.m. Wednesday some 2,565 persons in the Vernon, Bennington and Gaines roads area, including Woodlawn Trailer Park, Lennon, were without power for nearly three hours. Later, when a second huge rain began, the area along East Main Street in Owosso and southeast Corunna was without power for about 45 minutes. About 1,500 customers were affected, McCloskey notes.

He goes on to say there are several reports of isolated transformers damaged with at least three burned out and several instances of power line fuses being blown after being hit with lightning.

Crews were out all night working to restore power, McCloskey says, praising their efforts highly. He adds there hasn't been many reports of gas trouble, but lots and lots of reports of flooded basements.

McCloskey warns all homeowners who smell gas to call Consumers Power Co. immediately and to keep trying if the number is busy He urges those with flooded basements not to start electrical appliances in those basements until they have had a chance to dry out

"This is a serious situation," McCloskey notes and he urges extreme caution.

There have been several reports of persons evacuating their homes because of the intense storms And at least a few submerged automobiles have been investigated by sheriff's department deputies looking to see if anyone was trapped inside

At least two basements have collapsed under the strain of the rain and a couple of home have been heavily damaged after the walls caved in, it has been reported

The family of Ron DeVor, 1310 Frederick St Owosso, a particularly hard-hit area, was at home at 5 30 a m today when lightning apparently hit his citizen's band radio antenna knocking it down and dragging down an outside chimney wall with it Right after that the back basement wall collapsed due to the water pressure surrounding the house The entire structure slipped and is now slanted to the north, DeVor says.

Another basement collapse happened at 819 Ryan St., Owosso police report Also, a barn fire took place Wednesday night on Delaney Road and shortly after 9 a m today firemen went to 1722 Frederick Street to answer a fire call

Several employers in the Owosso area say higher than usual absenteeism has resulted today because employees can't get to work Spokesmen at Universal Electric, the county's largest employer (980 persons), say absenteeism is running at 14 percent, 12 percent above normal

Memorial Hospital spokesmen say workers are slowly trickling in, but many of them were delayed because of flooded streets and roads That situation is true at several other local plants and factories, spokesmen said.

Dick Good, division service manager at General Telephone, explains there is no widespread trouble with telephone service, but lots of scattered trouble mainly because of the lightning. Many persons will experience noisy circuits for some time because of wet cables, he adds.

The biggest problem right now, says Good, is circuit overloading with many persons calling each other to talk about the weather

He notes all installation activity by the phone company has been suspended for the next two to three days in order to make necessary repairs.

Owosso firemen worked most of the night turning off gas and electricity at several homes and evacuating persons from portions of Martin, State, Tangle and South Chipman streets.

They also answered fire calls resulting from lightning activity One was at 1229 N Shiawassee St. the Lee Kirkman residence and the other the Ricky Hampton home 1800 Henry St where lightning caused an electrical short tripping the breaker circuit

The long rains of September have set a modern-day record for this county, according to information provided by the U.S. Weather Station in Owosso. A total of 11.41 inches of rain fell in September, topping the previous high of 7 87 inches in 1941.

The driest September was 1979 when 0 01 inch of rain fell

Shiawassee County a average yearly rainfall is 30 inches That has already been exceeded this year with a total of 30 50 inches as of early today

Last year's total rainfall was 28 29 inches

The wettest year in recent times was 1973, according to a weather station spokesman. A total of 43 inches of rain came down that year

Finally, the deluge will no doubt severely damage crops in the county It was reported Tuesday the soy bean crop was in good shape, the jury was still out on corn and wheat and many acres of beans were lost That was before the latest 4 67 inches pummeled the fields

Longfellow said that " Into each life some rain must fall, some days must be dark and dreary Falling rain and continued darkness and dreariness is the outlook for today tonight and tomorrow, predicts the weatherman

Occasional rain is 100 percent likely today 70 percent tonight and 20 percent Friday Not until Saturday does the forecast call for sunshine and warmer weather

Information for this story was compiled by Argus-Press staff writers, Dick Campbell, Tom Bevans, Gary Webster, Dennis Klein, Jackie Hueckmann and Jerry Krust. It was written by Jo Peacock. Photographs were taken by Bevans Campbell and Krust.

Today's ood News

ion from Heart Damage

J. HANEY
ess Writer
Researchers have
ssolving medicine
the damage that
attacks, and they
could profoundly
are treat victims of
ter

vest promise," Dr.
of the new treat-
be reinforced by

w approach, which
d several medical
a dramatic as effect
heart disease as the
nary bypass surgery
ago.

spy, doctors are able
clots that block
that starve heart
attacks. When blood
heart muscle have-
ent apparent serious

the nation's leading
he American Heart
tion that they kill
year.

The latest study, conducted at Beth Israel Hospital and Harvard Medical School in Boston, was published in Thursday's issue of the New England Journal of Medicine.

The treatment, called intracoronary thrombolysis, was first used in West Germany three years ago. Doctors insert a catheter tube into the victim's leg, thread it through an artery to the heart and then release streptokinase, a medicine long used to dissolve clots.

In the Boston study, doctors performed the procedure on nine patients within an average of three hours after their heart attacks. The blocked arteries of all nine opened within 20 minutes.

Then the doctors gave the patients a radioactive material called thallium-201 This substance is absorbed by living heart muscle but not by tissue that has died.

The results showed that heart tissue that had been blocked by the clots was working normally in seven of the nine patients. Without the treatment, their heart tissue would have been in danger of dying because of lack of blood

Their study is the first to show that heart tissue survives after this treatment.

romise Keeps
igan Trains Running

Chuck
A couple of pictures
from the Owosso Paper
Bruce

ment Starts 'ear Today

The state constitution requires that Michigan have a balanced budget at the end of each fiscal year

A ten-minute squabble was resolved when House Democrats prevailed over Republican Gov William Milliken's plan to cut aid to Michigan State University by $600,000 less than the 3 percent slash to other public, four-year colleges.

The Democratic-controlled House gained leverage on Milliken and the Republicans by stalling action on the bill to dissolve the railroad fund until he withdrew the MSU proposal.

"Everyone else is taking reductions," said House Speaker Bobby Crim, D-Davison. "I can't justify that (MSU exemption)."

"The money is not as important as the principle," he said.

Milliken and Republican lawmakers maintained the exemption would help Michigan's economy by bolstering MSU's renowned agricultural research.

Milliken's order called for cuts of $6.6 million from school aid payments, $15 million from four-year universities, $3.6 million from community colleges and $27 million from revenue sharing.

The further MSU cut was added after university President Cecil Mackey agreed to keep agriculture experiment stations and cooperative extension programs "as intact as possible," Milliken aide Al Sandner said.

Water Puddle Is Scene of Accident

A water puddle near the intersection of Chipman and Mary Streets was the scene of a traffic accident in which one person had "A" (incapacitating) injuries at 10:20 p.m. Wednesday.

According to Owosso Police, a vehicle driven by Burton Eldred Clear of 115 1/2 Oak St., Durand, had driven through a water puddle which was covering Chipman Street and the vehicle stalled. A vehicle driven by Robert Joseph Miller Jr. of 1318 Calvert, then drove through the puddle, started to slide as its right side hit the Clear vehicle in the rear. A passenger in the Miller vehicle, Cindy Cole of 1200 Pembroke Dr., had "A" injuries and a passenger in the Clear vehicle, Dawn Button, also of Durand, had possible injuries.

BIRTHS

Babies were born to the following at Owosso Memorial Hospital on Wednesday:

GIRL TO: Mr. and Mrs. Victor Fuentes (Diana DeLong) 1973 N. Hickory St. BOYS TO: Mr. and Mrs. Richard Drahosz (Laurie Liddle) 2294 Rixiel Rd., Durand; Mr. and Mrs. Chester Borton (Mary Mazurek) 1430 Pearce St. and Mr. and Mrs. John Woolcock (Mary Mastelak) 13615 Fergus Rd., Chesaning.

Maternity visiting hours Monday through Sunday are 10 a.m. to noon, 2:30 to 4 p.m. and 6 to 8 p.m. Fathers may visit from 10 a.m. to 8 p.m.

A GIRL was born to Mr. and Mrs. Gordon Milnes of Allen Park Sept. 30. Mrs. Milnes is the former Charlotte Lyons of Owosso.

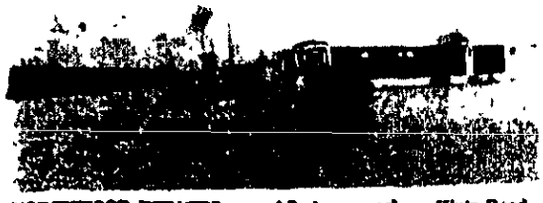
Hospital Admissions

The following were admitted to Owosso Memorial Hospital on Wednesday:

MEDICAL — Ronald Worthington, 707 Grand Ave. and Deborah Britton, 130 Alger Ave.

SURGICAL — Eric Numerich, 1916 Kilbourn Ave.; Grace Fluzell, 208 Second St., Elsie; Ray Spencer, 300 N. Shiawassee St.; Pauline Estep, 516 Spring St., Durand; Patricia King, 606 Martin St. and Joseph Gayski, 1671 W. Allen Rd., Henderson.

Visiting hours at the hospital are noon to 2 p.m. and 5 to 8 p.m. daily except



NORTHWOOD ESTATES, a mobile home park on Hintz Road, north of Owosso, was hard-hit by flood waters resulting from the 4.67 inches of rainfall since 7 p.m. Wednesday.

Heavy Rain Knocks Out Power; Floods Part of State

DETROIT (AP) — An overnight storm drenched southern Michigan with up to 8 inches of rain, snarling morning rush-hour traffic on Detroit freeways and cutting power to nearly 100,000 electric customers across the state.

The National Weather Service issued flash flood watches for 28 counties as police closed the Detroit freeway system for several hours early today. Some freeways remained closed during the morning rush-hour.

State troopers waded through some flooded Detroit highways and towed boats onto others to pluck dozens of motorists from car roofs. A four-foot high median wall on Interstate 94 was under water in Detroit, said state police Sgt. Thomas Steuback.

"I've been down here for 4½ years and I have not seen it this bad," he added.

Consumers Power Co. spokesman Tom Holliday said power to 82,000 customers in western Michigan was knocked out by the storm, most in Kent, Ottawa, Ionia, Allegan and Barry counties.

Detroit Edison Co. spokesman Martin Bufalini said 5,000 of the firm's 14,000 customers who lost power during the night still were without service at midday.

The Detroit area was soaked in 1.12 inches of rain between 2 a.m. and 5 a.m. The hardest hit town was Rockford in western Michigan, north of Grand Rapids, where 8 inches of rain fell overnight, the weather service said. The Rogue River, which runs through town, was approaching flood stage, said police officer John Porter.

In the suburb of Farmington Hills, seven feet of water flooded the Red Roof Inn and 60 guests were evacuated, said Jackie Green, a police dispatcher.

The Ionia County Sheriff's Department in western Michigan said at least four people were evacuated when two ponds sent water coursing through homes on the south side of Ionia.

Jim Holcomb, director of emergency services in Lansing, said emergency personnel were going door-to-door today, notifying families of the possibility of flooding. He said no one had been evacuated.

Schools were closed in Shiawassee County 80 miles northwest of Detroit because many secondary roads were washed out.

Workers at the Shiawassee Hydroelectric Dam opened all gates early today to release the backed-up Shiawassee River, which exceeded its seven-foot flood stage at Owosso, said sheriff's dispatcher Myrna Kiger.

Water, Food May Be Unsafe

In the wake of today's high water, Dr. John Lyons, Shiawassee County Medical Director, warns that water from wells in flooded areas should be considered unsafe and food in flooded basements should be carefully inspected, some discarded.

"Flooded" well water, he says, should not be used for drinking or cooking, brushing teeth, dishwashing or washing clothes unless boiled for two minutes or treated with chlorine. To treat with chlorine, add three or four drops of liquid chlorine bleach to each gallon of water, mix and let stand for 30 minutes before using.

Vegetables, such as potatoes, carrots, cabbage, onions and others, which came in contact with flood waters in basements should be discarded, he says. Canned goods should be thoroughly washed. Outsides of cans and jars should be washed with soap and hot water, using a brush around the covers and rubber rings. The cans and jars should then be immersed in chlorinated water for at least 15 minutes using the same chlorine strength as that for purifying water

Food stored in refrigerators where the power has been off for more than 24 hours or where flood waters came above the door opening should be thrown away

Food in a deep freeze should keep up to three days when the power is off, but when the temperature in the unit goes above 40 degrees the food should be discarded. He advises throwing away all frozen food when there is evidence flood waters got into the freezer compartment

If the basement is flooded, avoid flushing toilets or using other plumbing, Lyons recommends. When the water goes down, everything touched by flood water should be cleaned with warm or hot water and a chlorine solution, one-half cup of chlorine bleach to a gallon of water

Lyons warns residents to be particularly careful of electricity and gas in flooded areas. He suggests contacting Consumers Power for assistance, where necessary, for suggestions how best to avoid injury

Sewage systems are also a problem, Lyons says, and many are probably completely under water. If rural septic

Past Masters Brave Weather For Their Night

Despite the heavy rain, Past Masters' Night at the Owosso Masonic Lodge drew the largest attendance it has in years, with 30 visiting members also attending.

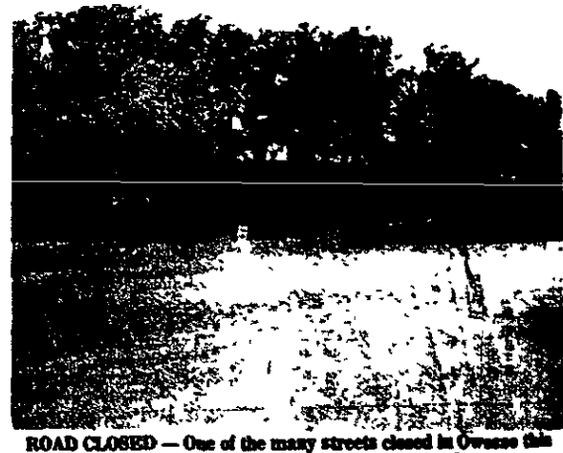
Worshipful Master Ward Coon presented 60-year memberships to seven of the nine eligible members, including: Carl Beamish and Floyd Serr of Corunna, F. Lawrence Coy, Marlow Hawkins, Floyd North and Carl Woodbury of Owosso, and Harold Wallace, now of Mt. Pleasant.

The other two members qualifying for 60-year certificates and pins are Keith Birdsell of Venice, Fla., and Charles Yager of St. Cloud, Fla.

Fifty-year membership awards were presented to Russell Jenkinson of Corunna and Herbert White of Owosso. John Krost of Owosso, who also qualified, was unable to attend.

Sixty-year membership honors were accorded by Coon to E. Duell Devereaux and Madison Gilbert of Owosso. Two others who are eligible but were able to attend include Berle Fisher of Fullerton, Calif. and Albert Gabriel. Oscar G

KEEP ON TRUCKIN' — Motorists in Owosso, like most placed throughout the county, found the going hazardous this morning. This was the scene on South Street, near Candlewick Court mobile home park, as residents plowed their way through the water to get to work. A number of cars stalled due to wet electrical systems. (Argus-Press Photo)



ROAD CLOSED — One of the many streets closed in Owosso this morning because of flooding was South Washington Street, near Oak Hill Cemetery.

COUNTY FAIR enthusiasts would have found the going tough this morning, as two feet of water occupied the main thoroughfare to the commercial buildings.

TO Charles Cerp

FROM Bruce Menerey

SUBJECT Owosso Drain

OUR JOB NO

DATE OF MEMO 2/8/94

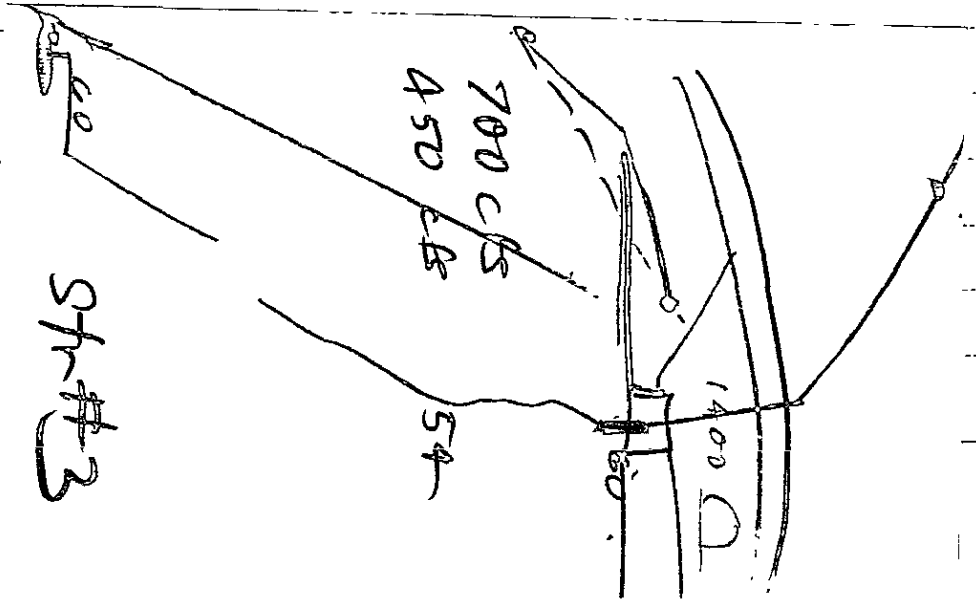
MESSAGE

Attached is a rating curve that I came up with. I assumed overland flow would begin to occur at elevation 737.4. Although, the amount of overland flow would be limited to the flow that would be able to enter back into the sewer system at the catch basins. The discharges may be slightly high, in that I did not include bend losses & junction losses for the 54" pipe.

SIGNED

SENDER – DO NOT WRITE BELOW THIS LINE

REPLY



ORIGINAL

SEN
REC

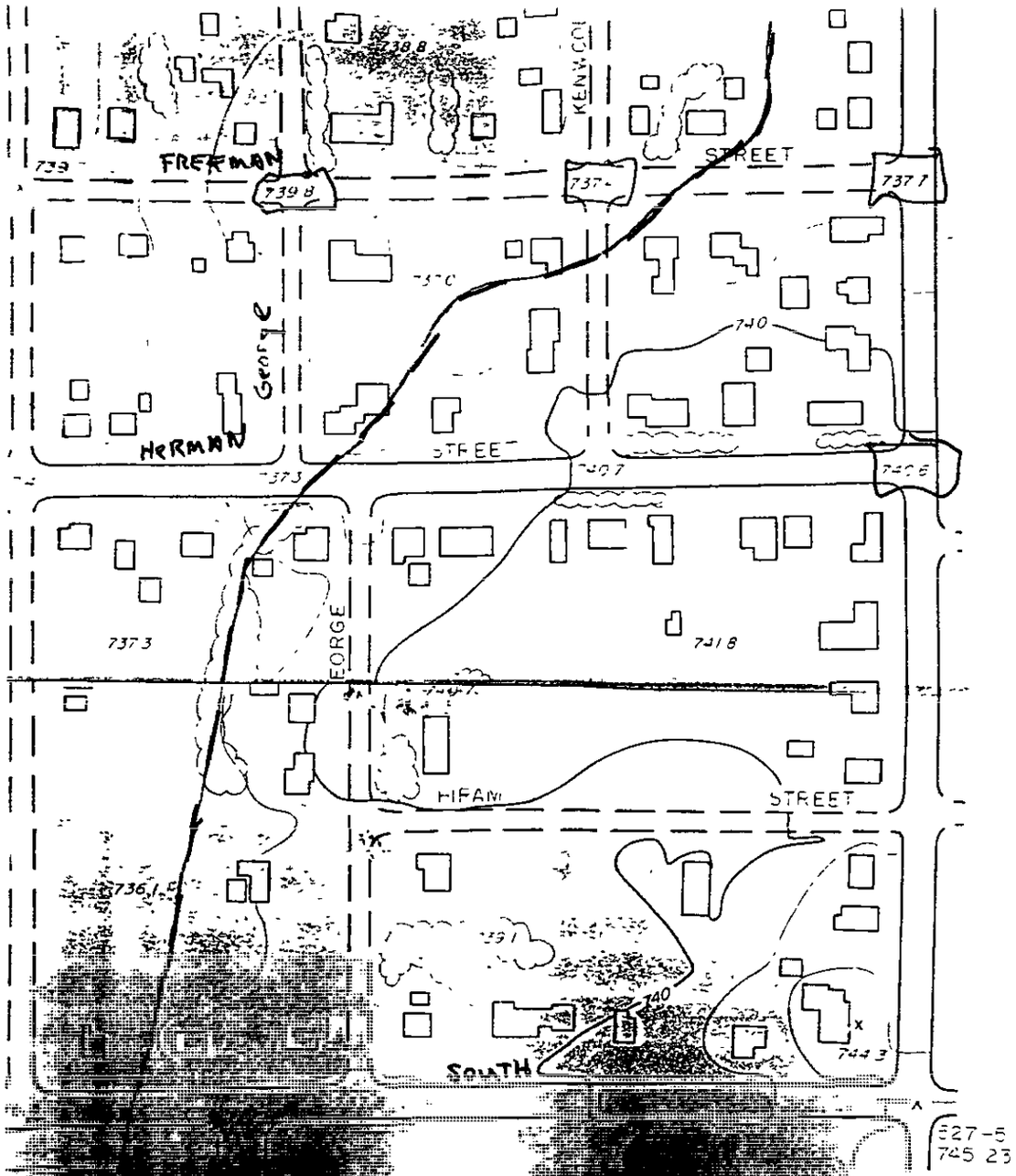
2/8/94
BEM

South Street - Owosso Drain

Stage	$Q_{54''}$	Q_{WEIR}	Q^*_{INLETS}	Q_T
731.8	0	–		0
734.5	30	–		30
735	40	–		40
735.5	50	–		50
736.1	60	0		60
737.4	69	0		69
737.5	70	15	~~81~~	85
737.6	70	35	~~81~~	105
737.7	71	~~62~~	57	128
738	72		59	131
739	76		63	139
740	80		68	148
741	85		73	158

* Assumes enough catch basins to let water into system (~4 to 5 cfs/catch basin), the 27", 24", 12", 10", + 8" pipes

Sta. 32+40
Sta. 32+90
C.S. 10 D
M.H. Tile
Sta. 42+20
Sta. 46+10
Sta. 49+10
M.H. Tile
Sta. 61+20
M.H. Tile
Sta. 68+80
M.H. Tile
Sta. 73+80
M.H. Tile
Sta. 78+60
C.S. 12 D
Sta. 84+25
C.S. 12
No Sewer
10" Bot
Fair Ground
(from Prof. sheets)
8" 12" 10" 9"
740
739
100
80
40
pipe 54" dia.
thickness 5.5"
Invert of Tile
pipe 60" dia.
thickness 6"
Main Drain



RAPHIC MAP

CITY O SSO, MICHIGAN

E 1/ OWOSSO TWP.,

SHI OUNTY, MICHIGAN

DATE OF P DATE OF MAPPING APRIL 197-

MMETRIC METHODS

ABR EY CORPORATIO

HIGAN

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+-----------------------------------+
|            S U M P O              |
|                                   |
|  Interactive Summary Printout     |
|  for MS/PC-DOS micro computers    |
|             May 1991              |
+-----------------------------------+
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NOTE - Asterisk (*) at left of profile number indicates message in summary of errors list

COMSTOCK DRAIN

Summary Printout

SECNO	B	CWSEL	EG	DEPTH	ELMIN	VCH	ELLC
49.10	30.00	729.88	730.37	1.68	728.20	5.60	732.70
49.10	50.00	730.41	731.06	2.21	728.20	6.49	732.70
49.10	70.00	730.84	731.66	2.64	728.20	7.27	732.70
49.10	90.00	731.24	732.22	3.04	728.20	7.93	732.70
49.10	150.00	732.00	733.73	3.80	728.20	10.57	732.70
49.20	30.00	730.02	730.42	1.81	728.21	5.11	732.71
49.20	50.00	730.56	731.13	2.35	728.21	6.01	732.71
49.20	70.00	731.00	731.73	2.79	728.21	6.82	732.71
49.20	90.00	731.41	732.29	3.20	728.21	7.50	732.71
49.20	150.00	732.37	733.87	4.16	728.21	9.84	732.71
49.30	30.00	730.11	730.46	1.89	728.22	4.77	732.72
49.30	50.00	730.66	731.17	2.44	728.22	5.71	732.72
49.30	70.00	731.13	731.78	2.91	728.22	6.48	732.72
49.30	90.00	731.53	732.34	3.31	728.22	7.23	732.72
49.30	150.00	732.52	733.96	4.30	728.22	9.63	732.72
49.40	30.00	730.14	730.49	1.91	728.23	4.72	732.73
49.40	50.00	730.70	731.20	2.47	728.23	5.66	732.73
49.40	70.00	731.17	731.81	2.94	728.23	6.44	732.73
49.40	90.00	731.61	732.39	3.38	728.23	7.09	732.73
49.40	150.00	732.62	734.02	4.39	728.23	9.53	732.73
50.40	30.00	730.44	730.70	2.11	728.33	4.14	732.83
50.40	50.00	731.06	731.44	2.73	728.33	4.99	732.83
50.40	70.00	731.60	732.10	3.27	728.33	5.70	732.83
50.40	90.00	732.10	732.73	3.77	728.33	6.38	732.83
50.40	150.00	733.36	734.75	5.03	728.33	9.45	732.83
55.30	30.00	731.14	731.32	2.44	728.70	3.45	733.20
55.30	50.00	731.91	732.18	3.21	728.70	4.15	733.20
55.30	70.00	732.67	733.02	3.97	728.70	4.75	733.20
55.30	90.00	733.60	734.10	4.90	728.70	5.67	733.20
55.30	150.00	737.12	738.50	8.42	728.70	9.45	733.20
61.20	30.00	731.68	731.86	2.48	729.20	3.37	733.70
61.20	50.00	732.58	732.82	3.38	729.20	3.93	733.70
61.20	70.00	733.58	733.89	4.38	729.20	4.45	733.70
61.20	90.00	735.20	735.70	6.00	729.20	5.67	733.70
61.20	150.00	741.56	742.95	12.36	729.20	9.45	733.70

@ Ament

State

Fredrick

	68.60	30.00	732.44	732.67	2.24	730.20	3.83	734.70	
	68.60	50.00	733.38	733.65	3.18	730.20	4.19	734.70	
*	68.60	70.00	734.66	734.96	4.46	730.20	4.42	734.70	Freeman
	68.60	90.00	737.24	737.74	7.04	730.20	5.67	734.70	
*	68.60	150.00	744.94	745.35	14.74	730.20	5.16	734.70	
	73.80	30.00	733.05	733.21	2.55	730.50	3.26	735.00	
	73.80	50.00	733.99	734.22	3.49	730.50	3.81	735.00	
	73.80	70.00	735.48	735.79	4.98	730.50	4.41	735.00	George/Herman
	73.80	90.00	738.68	739.18	8.18	730.50	5.67	735.00	
	73.80	150.00	745.70	746.03	15.20	730.50	4.62	735.00	
*	78.60	30.00	733.56	733.88	1.96	731.60	4.58	736.10	
	78.60	50.00	734.51	734.84	2.91	731.60	4.64	736.10	
	78.60	70.00	736.29	736.59	4.69	731.60	4.41	736.10	
	78.60	90.00	740.00	740.50	8.40	731.60	5.67	736.10	
	78.60	150.00	746.22	746.51	14.62	731.60	4.31	736.10	
	81.70	30.00	734.18	734.40	2.28	731.90	3.73	736.40	
	81.70	50.00	735.00	735.28	3.10	731.90	4.32	736.40	
	81.70	70.00	736.80	737.10	4.90	731.90	4.41	736.40	
	81.70	90.00	740.86	741.36	8.96	731.90	5.67	736.40	
	81.70	150.00	746.51	746.77	14.61	731.90	4.15	736.40	
	81.71	30.00	734.18	734.40	2.28	731.90	3.73	.00	
	81.71	50.00	735.00	735.29	3.10	731.90	4.27	.00	
*	81.71	70.00	736.96	737.14	5.06	731.90	3.41	.00	
*	81.71	90.00	741.41	741.48	9.51	731.90	2.22	.00	
*	81.71	150.00	746.74	746.83	14.84	731.90	2.32	.00	
*	83.35	30.00	734.53	734.54	2.73	731.80	.89	736.00	
*	83.35	50.00	735.46	735.42	3.66	731.80	1.04	736.00	uls South Street
*	83.35	70.00	737.50	737.51	5.70	731.80	.83	736.00	
*	83.35	90.00	742.11	742.11	10.31	731.80	.47	736.00	
*	83.35	150.00	746.83	746.83	15.03	731.80	.19	736.00	

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+-----------------------------+
|          S U M P O          |
|                             |
| Interactive Summary Printout |
| for MS/PC-DOS micro computers |
|          May 1991           |
+-----------------------------+
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NOTE - Asterisk (*) at left of profile number indicates message in summary of errors list

COMSTOCK DRAIN

Summary Printout

SECNO	Q	CWSEL	EG	DEPTH	ELMIN	VCH	ELLC
49.10	40.00	730.16	730.73	1.96	728.20	6.07	732.70
49.10	60.00	730.64	731.37	2.44	728.20	6.67	732.70
49.10	80.00	731.05	731.94	2.85	728.20	7.59	732.70
49.10	100.00	731.42	732.48	3.22	728.20	8.28	732.70
49.10	150.00	732.00	733.73	3.80	728.20	10.57	732.70
49.20	40.00	730.32	730.79	2.11	728.21	5.51	732.71
49.20	60.00	730.79	731.43	2.58	728.21	6.42	732.71
49.20	80.00	731.22	732.01	3.01	728.21	7.15	732.71
49.20	100.00	731.60	732.56	3.39	728.21	7.85	732.71
49.20	150.00	732.37	733.87	4.16	728.21	9.84	732.71
49.30	40.00	730.40	730.83	2.18	728.22	5.28	732.72
49.30	60.00	730.90	731.48	2.68	728.22	6.10	732.72
49.30	80.00	731.34	732.07	3.12	728.22	6.86	732.72
49.30	100.00	731.72	732.62	3.50	728.22	7.59	732.72
49.30	150.00	732.52	733.96	4.30	728.22	9.63	732.72
49.40	40.00	730.44	730.86	2.21	728.23	5.23	732.73
49.40	60.00	730.94	731.51	2.71	728.23	6.06	732.73
49.40	80.00	731.39	732.10	3.16	728.23	6.79	732.73
49.40	100.00	731.80	732.66	3.57	728.23	7.45	732.73
49.40	150.00	732.62	734.03	4.39	728.23	9.53	732.73
50.40	40.00	730.76	731.09	2.43	728.33	4.59	732.83
50.40	60.00	731.33	731.78	3.00	728.33	5.36	732.83
50.40	80.00	731.85	732.42	3.52	728.33	6.04	732.83
50.40	100.00	732.34	733.04	4.01	728.33	6.74	732.83
50.40	150.00	733.36	734.75	5.03	728.33	9.45	732.83
55.30	40.00	731.53	731.76	2.83	728.70	3.82	733.20
55.30	60.00	732.29	732.60	3.59	728.70	4.45	733.20
55.30	80.00	733.20	733.59	4.50	728.70	5.04	733.20
55.30	100.00	734.02	734.64	5.32	728.70	6.30	733.20
55.30	150.00	737.12	738.50	8.42	728.70	9.43	733.20
61.20	40.00	732.13	732.74	2.93	729.20	3.67	733.70
61.20	60.00	733.05	733.32	3.85	729.20	4.18	733.70
61.20	80.00	734.46	734.85	5.26	729.20	5.04	733.70
61.20	100.00	736.00	736.65	4.80	729.20	6.30	733.70
61.20	150.00	741.56	742.95	12.36	729.20	9.48	733.70

@ AMENT

State

Fredrick

	68.60	40.00	732.90	733.15	2.70	730.20	4.05	734.70	
	68.60	60.00	733.92	734.21	3.72	730.20	4.31	734.70	
	68.60	80.00	736.07	736.47	5.87	730.20	5.04	734.70	Freeman
	68.60	100.00	738.53	739.13	8.32	730.20	6.30	734.70	
	68.60	150.00	744.94	745.35	14.74	730.20	5.16	734.70	
	73.80	40.00	733.50	733.70	3.00	730.50	3.57	735.00	
	73.80	60.00	734.56	734.81	4.06	730.50	4.00	735.00	
	73.80	80.00	737.21	737.60	6.71	730.50	5.04	735.00	George/Herman
	73.80	100.00	740.29	740.90	9.79	730.50	6.30	735.00	
	73.80	150.00	745.70	746.03	15.20	730.50	4.62	735.00	
	78.60	40.00	734.01	734.35	2.41	731.60	4.65	736.10	
	78.60	60.00	735.10	735.42	3.50	731.60	4.54	736.10	
	78.60	80.00	738.25	738.65	6.65	731.60	5.04	736.10	
	78.60	100.00	741.92	742.54	10.32	731.60	6.30	736.10	
	78.60	150.00	746.22	746.51	14.62	731.60	4.31	736.10	
	81.70	40.00	734.56	734.83	2.66	731.90	4.11	736.40	
	81.70	60.00	735.54	735.84	3.64	731.90	4.39	736.40	
	81.70	80.00	738.93	739.32	7.03	731.90	5.04	736.40	
	81.70	100.00	743.06	743.42	11.16	731.90	4.85	736.40	
	81.70	150.00	746.51	746.77	14.61	731.90	4.15	736.40	
	81.71	40.00	734.57	734.83	2.67	731.90	4.10	.00	
	81.71	60.00	735.57	735.85	3.67	731.90	4.20	.00	
	81.71	80.00	739.31	739.41	7.41	731.90	2.57	.00	
	81.71	100.00	743.45	743.51	11.55	731.90	2.01	.00	
	81.71	150.00	746.74	746.83	14.84	731.90	2.32	.00	
	83.35	40.00	734.98	734.99	3.18	731.80	.99	736.00	
	83.35	60.00	736.05	736.06	4.25	731.80	1.04	736.00	u/s South Street
	83.35	80.00	740.02	740.03	8.22	731.80	.56	736.00	
	83.35	100.00	743.51	743.51	11.71	731.80	.32	736.00	
	83.35	150.00	746.83	746.83	15.03	731.80	.19	736.00	

at elev 636

$$Q = (6)(0.67)(1.04)(64.4)^{0.5} + (0.67)(1.04)[(64.4)(2)]^{0.5}(3)$$

$$= 33 + 23.7 = 57 \text{ cfs}$$

if we assume the normal 50% blockage

$$Q = (.5)(6)(.67)(1.04)(64.4)^{.5} + (.5)(3)(.67)(1.04)(128)^{.5}$$

$$= 8.68 + 11.35 = 20. \text{ cfs}$$

After adjusting the road elevation to reflect spot elevation at elev 636 and a 50% debris factor I estimate 20 cfs not the 37.6 noted for the 27" pipe

My spot check showed that only about 60% of the flow getting into the small lateral pipes outletting into the junction box really can get into the system.

Stewart St. West of 54" sewer
catch basins between Rapid Road and 54" pipe
11 inlets at 736
9 at 735
6 at 734

Most catch basin are sized for gutter flow and are not appropriate as ponded below at stage

Normal East Jordan Street Casting
Standard municipalities
catch Basin without curb inlet
has 150 sq inch opening (1.042 sq ft)
normal size is 18" x 24"

Capacity of a grate inlet operating as an orifice eq 18 Hydraulic Engr Circular #12 FHWA-TS 84-202 is

$$Q_i = C_o A (2gd)^{0.5}$$

where $C_o = 0.67$ Q = cfs
A = clear opening area of grate in ft^2
$g = 32.16\ ft/s^2$
d = depth of water

at Elev 736
9-6 inlets at 736 $d = 1$
6 inlets at 734 $d = 2$

Owosso Drain Review by Leap
Find normal depth for 54"ϕ pipe

Slope: $\frac{731.6 - 728.2}{3260} = \frac{3.4}{3260} = 0.00104$ ft/ft

or 1.3497 ft/1000 ft

$\sqrt{S} = 0.032295$

Flow Characteristics of Closed Conduit with Open-channel flow
Circular section 54"ϕ concrete pipe.
SCS (Tom) indicates pipe is old but in good condition clean bottom and suggest use of n = 0.013 Trowel finish. Because its old and may have been formed in place with gravel & dirt on bottom, I may have selected n = 0.015 or 0.017 rather than 0.013. A rough Trowel finish could be as high as 0.015

Suggest we use 0.015 in the absence of a report and an inspection of the pipes length.

Slope - area Method

See Chow Sec 6-9 page 146

$Q = K\sqrt{S}$ $\qquad$ $K =$ Avg K as a geometric mean of K_u and K_d

Q at normal depth is given by Manning as

$$Q = \frac{1.49}{n} A R^{2/3} \sqrt{S}$$

$$Q = A R^{2/3} \left(\sqrt{S}\right)\left(\frac{1.49}{n}\right)$$

$$= A R^{2/3} \left[(0.0323)\left(\frac{1.49}{0.015}\right)\right]$$

$$= \left(A R^{2/3}\right)(3.208)$$ Reg 222

See table for values

This has no inlet or outlet losses

Inlet losses = K_e = 1 vel head

max inlet loss when it starts to flow full is 0.24' → neg until pressure flow

flowing full @ Nomal depth

Max $V^2/2g$ is at Max vel @ .8D = 3.6 ft where $V^2/2g$ = 0.313'

The Secret of Analysis is to
Develope Rating Curve for 54" dia concrete pipe
flowing from
Enterance South St. 81+70
Exit Ament St. 49+10
32+60 = 3260' long

54"ϕ = 4.5' dia pipe

Normal depth inside 54" at South St.

731.7+ depth Elev	Depth	Area	w/p	R	$AR^{2/3}$	$\left(\sqrt{S}\right)\left(\frac{1.49}{n}\right)$ Reg 22	Q	$\frac{Q}{A}$ = V	$\frac{V^2}{2g}$	Eg
736.20	4.5	15.90	14.137	1.125	17.1988	3.2079	55.17	3.47	0.19	736.39
736.00	4.3	15.655	12.225	1.281	18.465135		59.2	3.784	0.22	736.22
735.7	4.0	14.938	11.07	1.349	18.2375		58.5	3.917	0.24	735.94
735.3	3.6	14.327	10.488	1.366	17.6383		56.6	3.949	0.24	735.54
735.2	3.5	13.273	9.719	1.366	16.3407		52.42	3.949	0.24	735.44
734.7	3.0	11.264	8.598	1.310	13.486		43.26	3.84	0.23	734.93
734.2	2.5	9.075	7.570	1.1989	10.2416		32.85	3.62	0.20	734.4
733.95	2.25	7.95	6.283	1.265	9.2988					
733.7	2.0	6.829	6.575	1.039	7.005		22.47	3.29	0.17	733.87
733.2	1.5	4.64	5.539	0.837	4.121					
732.7	1.0	2.632	4.418	0.596	1.864		5.98	2.27	0.08	732.78
732.5	.8	1.912	3.917	0.488	1.1851					
732.2	.5	0.966	3.059	0.316	0.448		1.44	1.49	0.03	732.23
732.0	.3	0.455	2.350	0.1937	0.1523					
731.7	.0									731.7

737.2 ≈ top of South St.

vel at 0.8 D = 3.6

bottom of channel

Neglect ~~6'-6"~~ ○ pipe enclosure and 60" pipes d/s of the 54"ϕ & 60" section u/s of it

Wed afternoon Tom indicate pipe size below the junction box was not 6-6' as noted on the profile but was a 6'-9" × 11'-0 arch design. The Red correction note the different size culvert.

It is clear from the table any flow over 60 cfs is pressure flow. Locate point where 60" pipe (5.0') starts going pressure flow. It is near A.ment St. $S = \frac{728.1 - 727}{4790 - 3240} =$

$S = 0.00071'/'$ $\sqrt{S} = 0.02664$

Elev	Depth	Area	W/P	R	$AR^{2/3}$	$\sqrt{S}\,\frac{1.49}{n}$ Reg 2	Q
728 ½ D +							
	5.0	19.63	15.708	1.250	22.779		73
	4.5	18.613	12.49	1.490	24.28		78
	4.0	16.839	11.071	1.521	22.27		71.4
731.6	3.5	14.681	9.912	1.481	19.076		61.2
731.1	3.0	12.30	8.861	1.388	15.306		49
	2.5	9.817	7.853				
	2.0	7.334	6.847				
	1.5	4.954	5.796				

When Q exceeds 160 cfs, we need to add the lower reach losses to the pressure flow loss from the lower 60" pipe upstream of the box

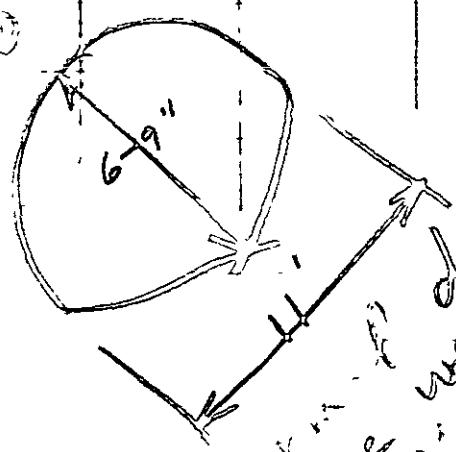
Locate Point (Discharge where) 78" ϕ pipe will start being pressure flow. D = 6.5'

S above rail Road = 0.00071 ft/ft

$\sqrt{S} = 0.02664$ $\left(\sqrt{S}\,\frac{1.49}{n}\right)$ = Reg 22 = 3.2079

Depth	Area	w/p	R	$AR^{2/3}$	Reg 22	Q	WS Elev 728.1 + D
6.5	33.183	20.42	1.625	45.865		147.13	734.6
6.0	32.009	16.767	1.909	49.259		158	734.1
5.5	29.945	15.181	1.973	47.10		151	733.6
5.2	28.459	14.39	1.978	44.839		144	733.3
5.0	27.39	13.906	1.9696	43.04		138	733.1
4.5	24.512	12.776	1.919	37.85		121	732.6
4.0	21.423	11.724	1.827	32.02		103	732.1
3.5	18.215	10.711	1.701	25.95		83	731.6
3.0	14.968	9.710	1.54	19.97		64	731.1
2.5	11.76	8.696	1.35	14.38		46	730.6

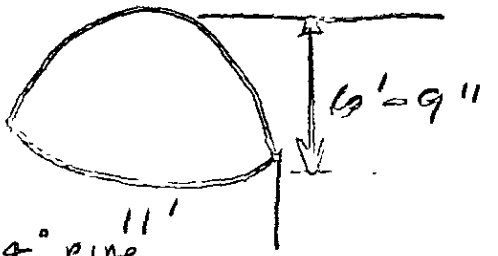
SCS recommend this to be a



Normal depths determined by using Manning's Curve using approximation for elliptical pipe. See Bruce's 59 S4 pipe input.

sheet 6

~~78" pipe~~
~~D = 6.5~~
~~A = 33.183~~
~~R = 1.625~~



60" pipe
D = 5.0
A = 19.63
R = 1.25

54" pipe
D = 4.5'
A = 15.9
R = 1.125'

$$L_1 = (V_1 - V_2)^2/2g$$

$$B_{L_1} = 0.67\ V^2/2g$$

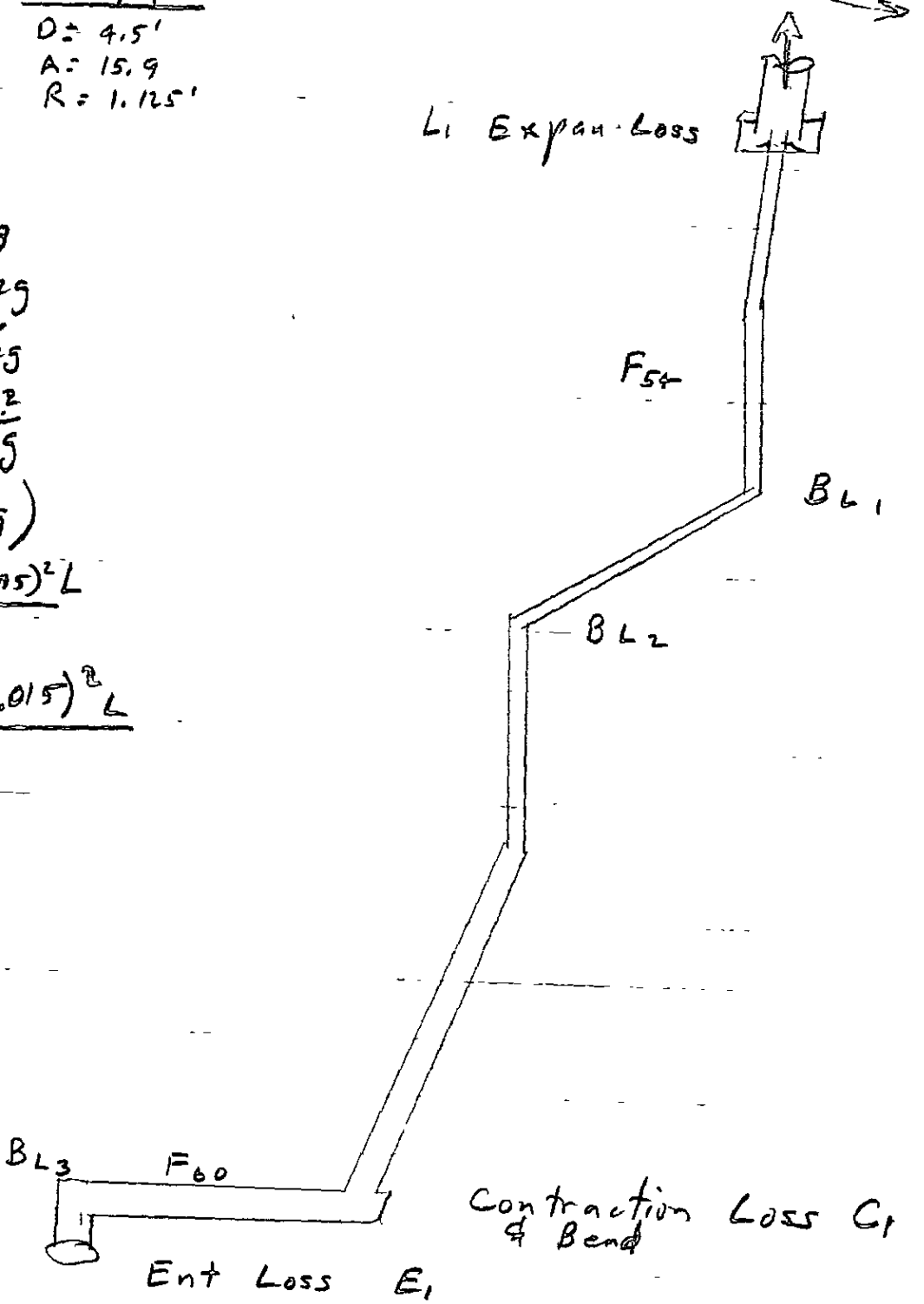
$$B_{L_2} = (0.6)(V^2/2g)$$

$$h_c = \left(\frac{1}{C} - 1\right)^2 \frac{V^2}{2g}$$

$$B_{L_3} = (.67)(V^2/2g)$$

$$f_{54''} = \frac{(29.16)(0.015)^2 L}{R_{54}^{1.33}}$$

$$f_{60''} = \frac{(29.16)(0.015)^2 L}{R_{60}}$$



Pressure loss for low flows 60 cfs to 80 cfs is located only in the upper reaches

$L_1 = (V_1 - V_2)^2/2g$

$B_{54} = (.6 + .67)\frac{V_{54}^2}{2g}$

$h_c = \left(\frac{1}{c} - 1\right)^2 V_{54}^2/2g$ where* $c = 0.582 + \frac{0.0418}{1.1 - 0.9} = 0.79$

$B_{60} = (.67)\, V_{60}^2/2g$

* King & Brater 6 Ed. page 6-22

$h_c = \left(\frac{1}{.79} - 1\right)^2 \frac{V^2}{2g} = 0.264\frac{V^2}{2g}$

$f_{54} = 18.288\frac{V_{54}^2}{2g}$

$f_{60} = 0.805\frac{V_{60}^2}{2g}$

$$\text{Loss} = \left[1.27 + 0.264 + 18.288\right]\frac{V_{54}^2}{2g} + (V_1 - V_2)^2/2g + \left[(0.67) + 0.805\right]\frac{V_{60}^2}{2g}$$

$$\text{Loss} = 19.822\frac{V_{54}^2}{2g} + 1.475\frac{V_{60}^2}{2g} + (V_1 - V_2)^2/2g$$

$Q_{60} =$ $V_{54} = \frac{60}{15.9} = 3.774$ $V_{60} = \frac{60}{19.63} = 3.057$

$V_{54} - V_{60} = 3.774 - 3.057 = 0.717$

$V_{54}^2/2g = 0.221$ $V_{60}^2/2g = 0.145$

$L_{60} = (19.822)(0.221) + (1.475)(0.145) + (0.717)^2/64.4$

0.008

$= 4.381 + 0.214 + 0.008 = 4.60$

for Q_{60} Headwater Elev

$731.6 + 4.60 = \cancel{736.2}$ 735.2

730.6

Q_{80}: $V_{54} = \frac{80}{15.9} = 5.03$ $\quad V_{60} = \frac{80}{19.63} = 4.075$

$V_{54}^2/2g = 0.393$ $\quad V_{60}^2/2g = 0.258$

$H_{Q=80} = (19.822)(.393) + (1.475)(0.258) + 0.014$

$= 7.79$

Q_{80} Headwater is

$728.1 + 5 + 7.79 = 740.89$

730.5
7.8
739.3

For flows between 85 & 150 cfs the 60" pipe near Ament St is also pressure (sheet 4) between 49+10 and 47+90 (120' of 60" pipe) The pressure Equation becomes the losses on page or sheet 7 + an expansion into the ~~78" pipe junction box~~ no details sta 47+90 + 120' of friction

$L_j = (V_{60} - V_{78})^2/2g$ $\quad f_{60} = \frac{(29.16)(0.015)^2(120)}{R_{60}}$

$f_{60} = 0.585 \frac{V_{60}^2}{2g}$

Pressure flow Junction Box Station 47+90 to South St. inlet.

$$\text{Loss} = 19.822\frac{V_{54}^2}{2g} + (V_{54} - V_{60})^2/2g + 2.06\frac{V_{60}^2}{2g} + (V_{60} - V_{78})^2/2g$$

for Q = 85 cfs

$V_{54} = \frac{85}{15.9} = 5.346$ $\quad V_{60} = \frac{85}{19.63} = 4.33$ $\quad V_{78} = \frac{85}{33.183} = 2.562$

$V_{54}^2/2g = 0.444$ $\quad V_{60}^2/2g = 0.291$ $\quad V_{78}^2/2g = 0.102$

$$\text{Loss } Q=85\text{cfs} = (19.822)(0.444) + (5.346-4.33)^2/2g + (2.06)(.291) + \frac{(4.33-2.56)^2}{2g}$$

$$= 8.801 + 0.016 + 0.60 + 0.049 = 9.466$$

Headwater Elev = ~~731.6~~ 731.2 (Sheet 5) + 9.466 = ~~741.07~~ 740.7

Q = 120 cfs

$V_{54} = \frac{120}{15.9} = 7.547$ $\quad V_{60} = \frac{120}{19.63} = 6.113$ $\quad V_{78} = \frac{120}{\cancel{33.183}\ 54.4} = \cancel{3.616}\ 2.206$

$V^2/2g = 0.884$ $\quad V^2/2g = 0.58$ $\quad V^2/2g = \cancel{0.203}\ 0.078$

$$\text{Loss } Q=120 = (19.822)(.884) + \frac{(7.547-6.113)^2}{2g} + (2.06)(.58) + \frac{(6.113-\cancel{3.640}\ 2.2)^2}{2g}$$

$$= 17.523 + 0.032 + 1.195 + \cancel{0.047}\ 0.2\text{[illegible]} = \cancel{18.847}\ 17\ \text{ft.}$$

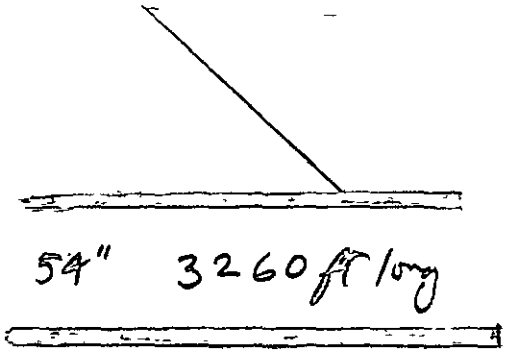
Elev of Headwater = ~~732.6~~ 731.8 (~~Sheet 5~~) + ~~18.847~~ 17 = ~~751.5~~ 748.8

This is 8.2 ft over the rail road

Q = 100

Check

Just looking at the 54" d/s of South and u/s of Rail Road & neglect other losses lets look at SCS's rating Curve at Structure #3



Friction and enterance loss only

$$\text{Head loss} = \left(.8 + \frac{(29.16)(0.015)^2\, 3260}{1.125^{1.33}}\right)\frac{V^2}{2g}$$

$$= \left(.8 + 18.288\right)\frac{V^2}{2g}$$

Even assuming TW at top of pipe at Junction box 733 The top value 739

7.4 head ND in 78" ϕ pipe 83 cfs = 731.6

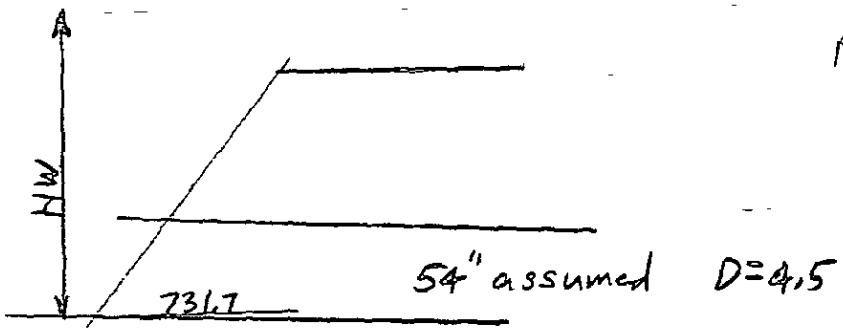
$$\sqrt{\left(\frac{7.4}{19.088}\right)(2g)} = V = 4.997 \text{ or } 5.0 \text{ ft}$$

54" pipe Area = 15.9 sq ft

$$Q = AV = (15.9)(5.0) = \underline{\underline{79 \text{ cfs}}}$$

use 80 cfs max

Evaluate inlet control
using Exhibit 14-7 SCS's field Manual
(NEH Notice 4-102 Aug 1972)
Tom indicate Grooved projecting

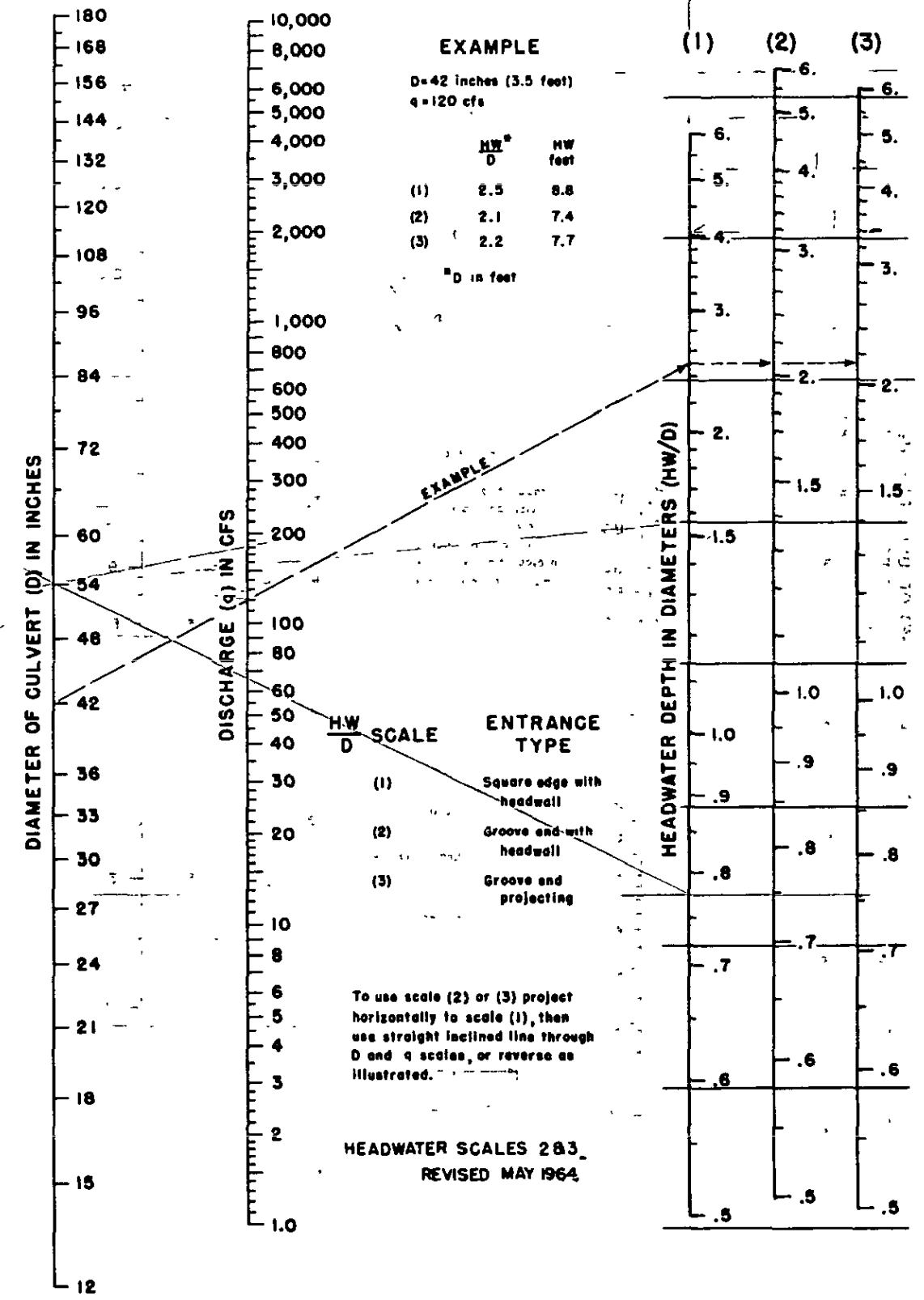


Rating Curve Q	Elev	Str #3 HW	
180	739	7.3	1.62
156	738	6.3	1.4
120	737	5.3	1.178
95	736	4.3	0.956
66	735.1	3.4	0.756
32	734	2.3	0.511

Bruce, I need you to check the SCS rating curve for Structure #3

Tom insist pressure flow is not the thing that controls the stages at South St. and that no water runs over land as "no body has seen evidence of flooded streets to the east.

Jeap



BUREAU OF PUBLIC ROADS JAN. 1963

Exhibit 14-7. Headwater depth for concrete pipe culverts with inlet control.

Try Q of 100 cfs

$V_{54} = \frac{100}{15.9} = 6.289$ $\quad V_{00} = \frac{100}{19.63} = 5.094$ $\quad V_{78} = \frac{100}{33.18} = 3.01$

$V^2/2g = 0.614$ $\quad V^2/2g = 0.403$ $\quad V^2/2g = 0.141$

$$\text{Loss}_{100} = (19.822)(.614) + \frac{(6.289 - 5.094)^2}{2g} + (2.06)(.403) + \frac{(5.094 - 3.01)^2}{2g}$$

$$= 12.171 + 0.022 + 0.83 + 0.067 = 13.09$$

Headwater elev $\quad$ 732.4 $\quad$ 744.5

$732.1 + 13.09 = \cancel{745.19}$

PERFORMANCE CURVE FOR CULVERT # 1 -- (10.00667 BY 6.833333) ROPE

DIS CHARGE FLOW (cfs)	HEAD-WATER ELEV. (ft)	INLET CONTROL DEPTH (ft)	OUTLET CONTROL DEPTH (ft)	FLOW TYPE F4	ANALYSIS ASSUMES NO OVERTOPPING NORMAL DEPTH (ft)	CRITICAL DEPTH (ft)	OUTLET VEL. (fps)	OUTLET DEPTH (ft)	TAILWATER VEL. (fps)	TAILWATER DEPTH (ft)
0	728.10	0.00	0.00	0-NF	0.00	0.00	0.00	0.00	0.00	0.00
30	729.88	1.42	1.78	2-M2c	1.58	1.01	5.19	1.01	3.80	0.89
60	730.64	2.06	2.54	2-M2c	2.27	1.50	6.00	1.50	4.65	1.07
90	731.24	2.56	3.14	2-M2c	2.83	1.85	6.74	1.85	5.38	1.39
120	731.77	2.99	3.67	2-M2c	3.32	2.16	7.30	2.16	5.94	1.68
150	732.25	3.38	4.15	2-M2c	3.79	2.41	7.82	2.43	6.41	1.95
180	732.69	3.78	4.57	2-M2c	4.25	2.70	8.22	2.70	6.81	2.20
210	733.13	4.15	5.03	2-M2c	4.71	2.92	8.66	2.92	7.16	2.44
240	733.48	4.51	5.39	2-M2c	5.23	3.14	9.04	3.14	7.47	2.68
270	733.95	4.86	5.85	2-M2c	5.97	3.35	9.36	3.35	7.75	2.90
300	735.09	5.18	7.09	6-FFn	6.83	3.54	5.08	6.83	8.01	3.12

INVERT ELEVATIONS-- Inlet - 728.10 ft Crest - 0.00 ft
Outlet - 727.00 ft Throat - 0.00 ft

PRESS: KEY TO RETURN

1 2 3 4 5-End 6 7 8 9 10

PERFORMANCE CURVE FOR CULVERT # 1 -- (10.00667 BY 6.833333) ROPE

DIS-CHARGE FLOW (cfs)	HEAD-WATER ELEV. (ft)	INLET CONTROL DEPTH (ft)	OUTLET CONTROL DEPTH (ft)	FLOW TYPE F4	ANALYSIS ASSUMES NO OVERTOPPING NORMAL DEPTH (ft)	CRITICAL DEPTH (ft)	OUTLET VEL. (fps)	OUTLET DEPTH (ft)	TAILWATER VEL. (fps)	TAILWATER DEPTH (ft)
0	728.10	0.00	0.00	0-NF	0.00	0.00	0.00	0.00	0.00	0.00
50	730.41	1.88	2.31	2-M2c	2.02	1.38	5.65	1.38	4.36	0.96
100	731.42	2.71	3.32	2-M2c	2.99	1.77	6.91	1.77	5.58	1.49
150	732.25	3.38	4.15	2-M2c	3.79	2.43	7.82	2.43	6.41	1.95
200	733.98	4.03	4.89	2-M2c	4.56	2.85	8.51	2.85	7.05	2.37
250	733.68	4.62	5.58	2-M2c	5.40	3.21	9.15	3.21	7.57	2.70
300	735.09	5.18	7.09	6-FFn	6.83	3.54	5.08	6.83	8.01	3.12
350	736.47	5.73	8.67	6-FFn	6.83	3.85	5.92	6.83	8.59	3.48
400	737.67	6.28	9.57	6-FFn	6.83	4.15	6.77	6.83	8.93	3.82
450	738.68	6.83	10.56	6-FFn	6.83	4.41	7.62	6.83	9.07	4.16
500	739.82	7.41	11.72	6-FFn	6.83	4.67	8.46	6.83	9.29	4.49

INVERT ELEVATIONS-- Inlet - 728.10 ft Crest - 0.00 ft
Outlet - 727.00 ft Throat - 0.00 ft

PRESS: KEY TO RETURN

1 2 3 4 5-End 6 7 8 9 10

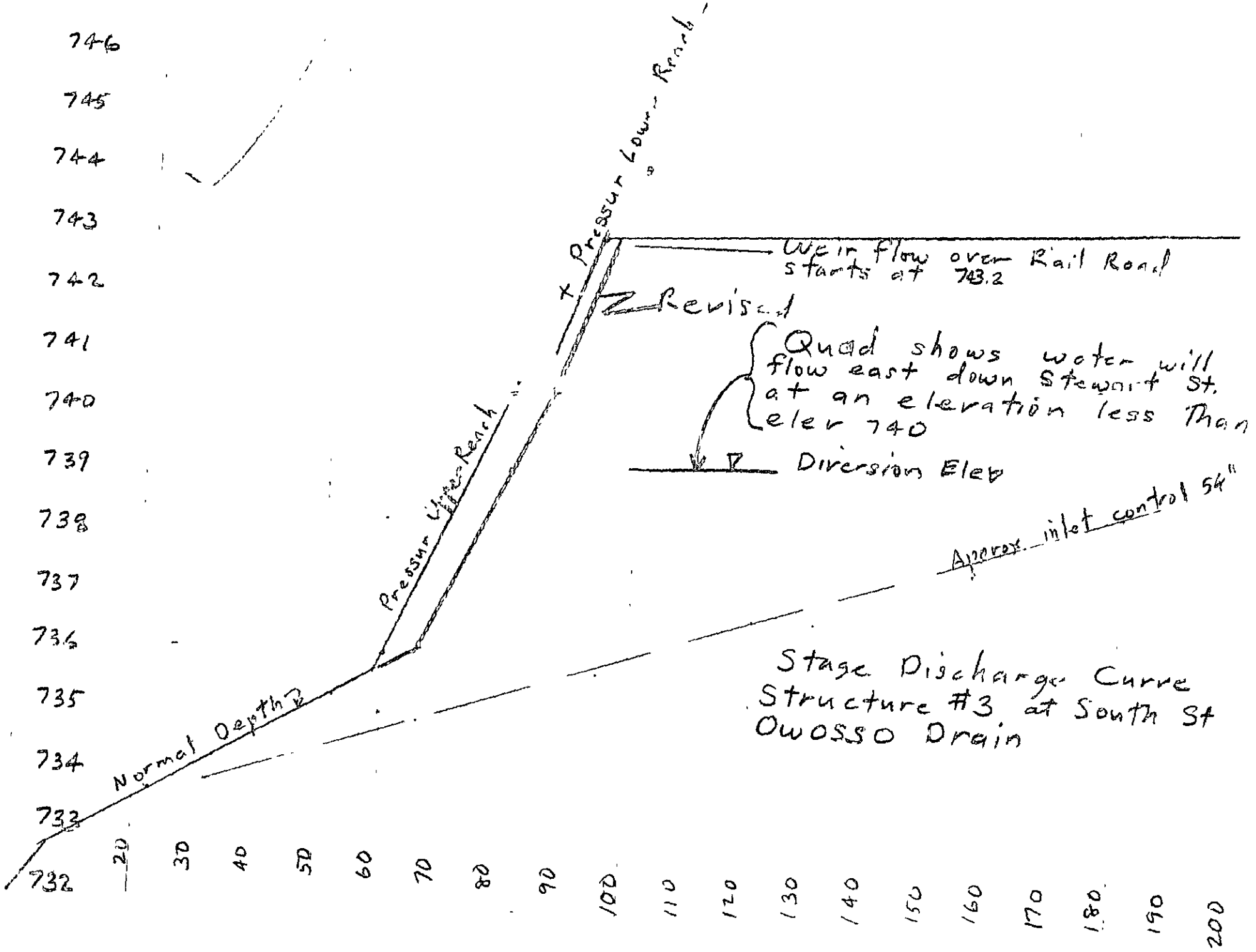
PERFORMANCE CURVE FOR CULVERT #1 - 1 (10.66667 [illegible] 833333) RCPE

IS-CHARGE FLOW (cfs)	HEAD-WATER ELEV (ft)	INLET CONTROL DEPTH (ft)	OUTLET CONTROL DEPTH (ft)	FLOW TYPE <F4>	ANALYSIS ASSUMES NO OVERTOPPING NORMAL DEPTH (ft)	CRITICAL DEPTH (ft)	OUTLET VEL. (fps)	OUTLET DEPTH (ft)	TAILWATER VEL. (fps)	TAILWATER DEPTH (ft)
0	728.10	0.00	0.00	0-NF	0.00	0.00	0.00	0.00	0.00	0.00
40	730.16	1.66	2.06	2-M2c	1.83	1.20	5.41	1.20	4.01	0.83
80	731.05	2.40	2.95	2-M2c	2.65	1.73	6.54	1.73	5.16	1.29
120	731.77	2.99	3.67	2-M2c	3.32	2.16	7.30	2.16	5.94	1.68
160	732.40	3.51	4.30	2-M2c	3.94	2.52	7.97	2.52	6.55	2.04
200	732.98	4.03	4.88	2-M2c	4.56	2.85	8.51	2.85	7.05	2.37
240	733.48	4.51	5.39	2-M2c	5.23	3.14	9.04	3.14	7.47	2.68
280	735.71	4.96	7.61	6-FFn	6.83	3.42	4.74	6.83	7.84	2.98
320	736.29	5.40	8.19	6-FFn	6.83	3.67	5.42	6.83	8.16	3.27
360	736.94	5.84	8.84	6-FFn	6.83	3.91	6.09	6.83	8.46	3.55
400	737.67	6.28	9.57	6-FFn	6.83	4.15	6.77	6.83	8.72	3.82

INVERT ELEVATIONS--> Inlet - 728.10 ft Crest - 0.00 ft
Outlet - 727.00 ft Throat - 0.00 ft

PRESS: <KEY> TO RETURN

1 2 3 4 5-End 6 7 8 9 10


746
745
744
743
742
741
740
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737
736
735
734
733
732
20
30
40
50
60
70
80
90
100
110
120
130
140
150
160
170
180
190
200
Pressur Lower Reach
Pressur Upper Reach
Normal Depth
Weir flow over Rail Road starts at 743.2
Revised
Quad shows water will flow east down Stewart St. at an elevation less than elev 740
Diversion Elev
Approx. inlet control 54"
Stage Discharge Curve
Structure #3 at South St
Owosso Drain

The size of the D/S Comstock Creek Drain Enclosure and the presence of the Stewart St. diversion overland flow path has only shifted slightly the discharge stage relationship about 8 cfs to the right. Note— Flows below elev 736 are still controled by the Normal depth flow within the 54" pipe.

The Difference between the rating curve Structure #3 is weather or not the difference of discharge 90 cfs at 734
138 cfs at 735.1
160 cfs at 736
180 cfs at 737
200 cfs at 738
218 cfs at 739 can cause flow over land divided or does island overland flow re enter the system at Stewart St. and the other storm system pipes, making this a creditable rating curve.

I say it can not!

Stewart is only a 27" pipe with 27 curb inlets
Ament and Frederick St. Storm sewers both 24" dia flowing into the flowing full 54"

Tom just transmitted this total flow summary sheets showing over 200 cfs in the 54"Φ pipe at elev 739 but he insist it is not pressure flow. At 739 the pipe will only take 80 cfs total

No way

Just because they note the flow is not pressure in the lower reach near the rail road not causing total submerge at the u/s limits of the junction box that this is 54"Φ pipe will not go pressure at slightly above its outlet in the box. The head needed to pass over 100 cfs is higher than the top of the rail road fill. I suggest that the val at elev 739 is much higher the rating curve at Structure #3

~~Pressure plate~~ junction box

Elevation Ft	Discharge Cfs 54" Pipe	27" Pipe	24" Pipe	12" Pipe	10"	8"	Total Q	Storage Ac-Ft
728.4	0.							0
730.6	32.						0	0.7
732.0	68.						68.	0.9
734.0	120.						120.	1.2
735.1	126.8	33.4	20.8	3.6	2.9	[illegible]	188.7	1.4
[illegible]	146.7	37.6	23.4	4.0	3.3	1.2	218.3	9.6
737.0	161.8	[illegible]	26.0	4.2	3.7	1.5	247.1	49.6
738.0	180	[illegible]	28.4	4.7	4.0	1.6	272.7	131.5
[illegible]	[illegible]	[illegible]	30.5	5.2	4.3	1.7	296.2	237.6

The Overland Flow Relief Ocean will approx Elev 735.1 Therefore the pipes will receive flood water from the south only at or above the 735.1

pressure head at much higher

Storage Calculations

	Elev	Vol	Cum Vol
	735.1	1.4	1.4
$\frac{0+18.3}{2}(1)=8.2$	736.0		9.6
$\frac{18.3+61.7}{2}(1)=40.0$	737.0		49.6
$\frac{61.7+102.1}{2}(1)=81.9$	738.0		131.5
$\frac{102.1+106.0}{2}(1)=106.1$	739.0		237.6

Area @ 735.0 = 0

Area @ 736.0 = 18.3 A

Area @ 737.0 = 61.7 A

Area @ 738.0 = 102.1

Area @ 739.0 = 106.0

Total Vol = [illegible] ÷ 37.23 = 1.4 Ac Ft

US Department of Agriculture
Soil Conservation Service

DESIGN NOTESHEET
for
Culvert Evaluation

prepared for

[illegible] TWP [illegible]

in

SHIAWASSEE County Michigan

Designer : [illegible]
Date : 12/19/93

Checker _____
Date _____

---

54 INCH OUTLET PIPE @ 0+40

'n' value = 0.012
Length = [illegible] ft.
Diameter = 54 in.
Projecting .. square edge
Ke = 0.50

Capacity = [illegible] cfs. *

Outlet Control

Elevation of headwater = [illegible]
Elevation of inlet [illegible]
Elevation of tailwater = [illegible]
Elevation of outlet = [illegible]

54" Pipe

Hw/D	Qout	
728.4	0	
730.6 .5	32.0	inlet control from nomographs
732.0 .8	68.0	
734.0 1.2	120.0	
735.1	126.8	outlet control
736.0	148.7	
737.0	169.8	
738.0	* 188.5	
739.0	205.5	

This analysis assumes water can get into the catch basins

US Department of Agriculture
Soil Conservation Service

DESIGN WORKSHEET
for
Pipe Flow Formula Solution

prepared for

[illegible]

in

SHIAWASSEE County, Michigan

Designer : [illegible]
Date : [illegible]

Checker _____
Date _____

[illegible] Entering trunk line from the West.

Roughness Coefficient (n)	[illegible]
Entrance Coefficient (Ke)	0.50
Diameter of pipe	27 inch.
1/ Head on pipe	3.4 feet
Length of pipe	150 feet.
Pipe Capacity	33.4 cfs @ 735.1
Velocity in pipe	8.4 ft/sec
Friction Coefficient (Kp)	[illegible]
HF allowable fall in pipe when inlet is not submerged	1.2 ft.

1/ 735.7 − 4 = 731.7

$$\begin{array}{r} 735.1 \\ -\ 731.7 \\ \hline 3.4 \end{array}$$

27" Pipe

@ 735.1	33.4 cfs
@ 736.0	37.6 cfs
@ 737.0	41.8 cfs
@ 738.0	45.5 cfs
@ [illegible]	49.0

US Department of Agriculture
Soil Conservation Service

DESIGN WORKSHEET
for
Pipe Flow Formula Solution

prepared for

[illegible]

in

SHIAWASSEE County, Michigan

Designer : TLB
Date : 1[illegible]/10/9[illegible]

Checked :
Date :

****

24 IN [illegible] ST. from east

Manning's Coefficient (n)	0.02[illegible]
Entrance Coefficient (Ke)	0.50
Diameter of pipe	24 inch
Head on pipe	[illegible] feet.
Length of pipe	380 feet.

Pipe Capacity	[illegible] cfs *
Velocity in pipe	[illegible] ft/sec

Friction Coefficient (Kp)	0.0124
Max allowable fall in pipe when outlet is not submerged	3.0 ft.

24" Pipe

735.1	20.8
* 736.0	23.4
737.0	26.0
738.0	28.4
739.0	30.5

US Department of Agriculture
Soil Conservation Service

DESIGN WORKSHEET
for
Pipe Flow Formula Solution

prepared for

[illegible]

in

SHIAWASSEE County, Michigan

Designer : [illegible] Checker _____
Date : 12/10/93 Date _____

****

12 IN @ RYAN CT entering from the east

Manning Coefficient (n)	0.013
Entrance Coefficient (Ke)	0.50
Diameter of pipe	12 inch.
Head on pipe	4.4 feet.
Length of pipe	300 feet.
Pipe Capacity	[illegible] cfs
Velocity in pipe	[illegible] ft/sec
Friction Coefficient (Kp)	0.0311
Max allowable fall in pipe when outlet is not submerged	3.7 ft.

12" Pipe

735.1	3.6
736.0	4.0
737.0	4.3
738.0	4.7
739.0	5.2 u

u estimated

Note: Sheet 8 of 8 is a Contour Map

US Department of Agriculture
Soil Conservation Service

DESIGN WORKSHEET
for
Pipe Flow Formula Solution

prepared for

[illegible]

in

[illegible] County, Michigan

Designed : [illegible] Checked : [illegible]
Date : 12/10/73 Date : [illegible]

[illegible]

[illegible] ANALYSIS. Entering from west

Manning's Coefficient (n)	0.013
Entrance Coefficient (Ce)	0.63
Diameter of pipe	8 inch.
Head on pipe	7.[illegible] feet.
Length of pipe	[illegible] feet.
Pipe Capacity	[illegible] cfs
Velocity in pipe	[illegible] ft/sec
Effect on different slope	[illegible]
Max allowable fall in pipe when outlet is not submerged	[illegible] ft.

8 in Pipe

735.1	1.2
736.0	1.3
737.0	1.5
738.0	1.6
739.0	1.74

Interpolated

U.S. DEPARTMENT OF AGRICULTURE, SOIL CONSERVATION SERVICE
1405 South Harrison Road, Room 101, East Lansing, Michigan 48823-5243
FAX NO. 517-337-6905

DATE: 2 2 94

TO: Chuck Culp
DNR

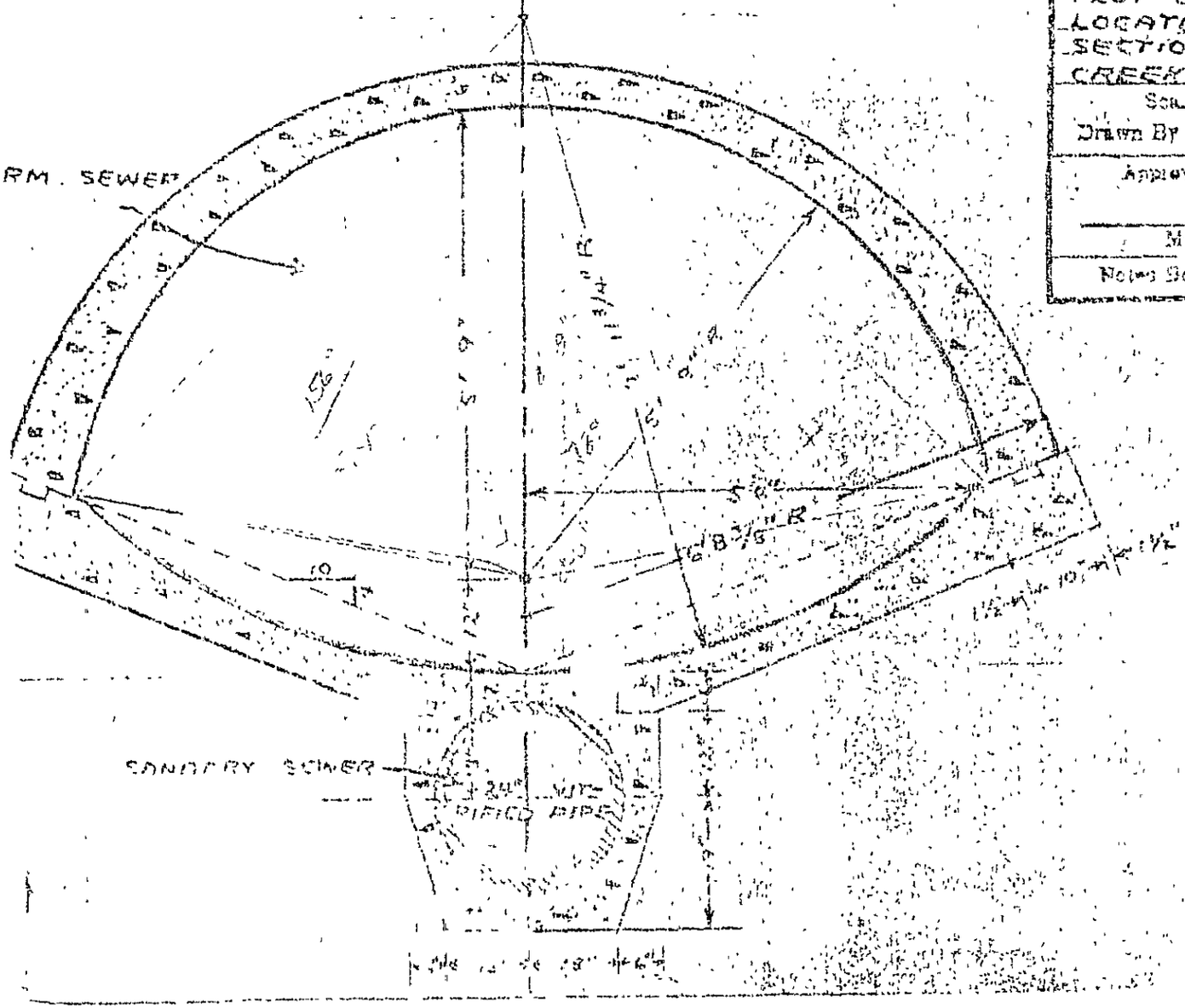
FROM: Tom Bourdon
SCS

NUMBER OF PAGES: Transmittal Sheet + 9 including this sheet

COMMENTS:

Received 2:15
Feb 3, 1994
Leep

TYPICAL CROSS-SECTION - TYPE "A"
CONSTRUCTION - COMSTOCK
CREEK DRAIN



DEPARTMENT OF ENGINEERING
OWOSSO, MICH.

PLOT OF Y.M.C.A PROPERTY & LOCATION & TYPICAL CROSS-SECTION OF PORTION OF COMSTOCK CREEK THRU SAID PROPERTY.

Scale: Horizontal 1" = Vertical 1" =

Drawn By J. QUINN Date 2/8/54

Approved By

Mayor City Engineer

Notes Book Page File

SCS indicates
Area = 54.4
we got 58.7
P = 29
Adj P
$\left(\frac{54.4}{58.7}\right)(29) = P = 26.89$
use 27 ft

46

Capital Consultants, Inc.
ENGINEERS
1027 LOUIS LAMBERT ROAD • LANSING MICHIGAN 48910-2706
TELEPHONE (517) 371-1221 • FAX (517) 371-2010

OWOSSO DRAIN — JOB NUMBER 89117-01
STUDY - COMSTOCK — SHEET NO. 2 OF
TRUNK DRAIN — COMP. BY SCN DATE 3/31
CHK'D. BY DATE

DETERMINE EQUIVALENT CIRCULAR

CIRCULAR AREA = $\frac{\pi D^2}{4}$

$54.43 \text{ FT}^2 = \frac{\pi D^2}{4}$ $\quad D = \sqrt{\frac{4(54.43)}{\pi}} = 8.32 \text{ FT}$

8.32 FT = 8'-4" = 100" CIRCULAR

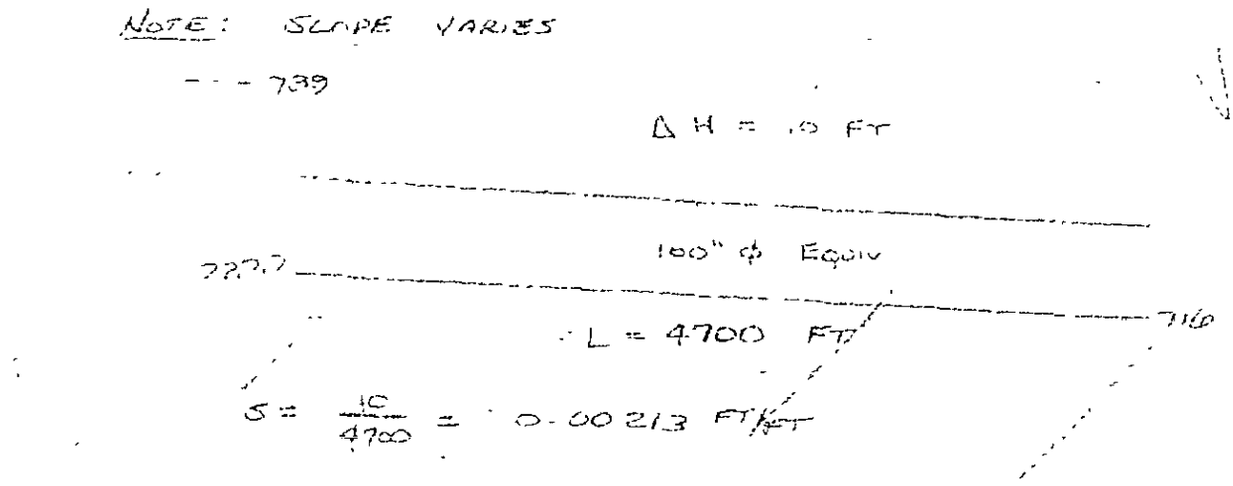
DETERMINE DISCHARGE FOR COMSTOCK TRUNK DRAIN

FREE DISCHARGE AT [redacted] 716 CFS

The upper reaches have a slope of 0.000171 ft/ft not 0.004 ft/ft which is the avg slope

PRESSURE DISCHARGE - 100 YR STORM

SHIAWASSEE RIVER ELEV = 729
I.E COMSTOCK TRUNK DRAIN AT RIVER = 716
STANDING WATER AT STEWART ST = 739
I.E. AT STEWART ST. 727.7
NOTE: SLOPE VARIES



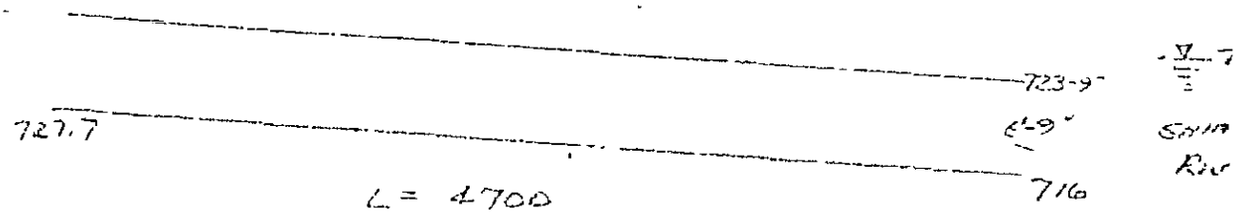
$S = \frac{10}{4700} = 0.00213 \text{ FT/FT}$

Capital Consultants, Inc.
ENGINEERS
3827 LAKE LANSING ROAD • LANSING, MICHIGAN 48912-3198
TELEPHONE (517) 321-1200 • FAX (517) 321-2013

OWOSSO DRAIN STUDY — JOB NUMBER 89117.0
COMSTOCK TRUNK — SHEET NO 1 OF
DRAIN — COMP. BY CSN DATE
CHK'D. BY DATE

PRESSURE DISCHARGE – 100 YEAR STORM

$\frac{V}{2}$ 739.0 @ STEWART STREET



$\Delta H = 739 - 725.6 = 13.4$ FT

ASSUME:

$f = 0.018$

$S = 13.4/4700 = 0.00285$ FT/FT

$d = 8.5$ ft (102")

$\Delta H = h_e + h_f + h_o$

WHERE: h_e = entrance loss $\quad h_e = K_e \frac{V^2}{2g} \quad K_e = 0.1$

h_f = friction loss

h_o = outlet loss $\quad h_o = K_o \frac{V^2}{2g} \quad K_o = 1.0$

$h_f = f \frac{l}{d} \frac{V^2}{2g}$ $\qquad A = 54.43$ FT^2

WANTED: $Q = ?$ $\qquad Q = VA \qquad V = Q/A$

$$\therefore \Delta H = K_e \frac{\left(\frac{Q^2}{A^2}\right)}{2g} - f \frac{l}{d} \frac{\left(\frac{Q^2}{A^2}\right)}{2g} + K_o \frac{\left(\frac{Q^2}{A^2}\right)}{2g}$$

$$13.4 = 0.1 \frac{\frac{Q^2}{(54.43)^2}}{2(32.2)} + 0.018 \frac{4700}{8.5} \frac{\frac{Q^2}{(54.43)^2}}{2(32.2)} + 1.0 \frac{\frac{Q^2}{(54.43)^2}}{2(32.2)}$$

$$862.96 = 0.1\left(\frac{Q^2}{2962.6}\right) - 9.953\left(\frac{Q^2}{2962.6}\right) + 1.0\left(\frac{Q^2}{2962.6}\right)$$

Consultants, Inc.
ENGINEERS
1527 LAKE LANSING ROAD • LANSING, MICHIGAN 48912-3748
TELEPHONE (517) 371-1200 • FAX (517) 371-2513

JOB NUMBER
STUDY - COMSTOCK SHEET NO 2 OF
TRUNK DRAIN COMP. BY SSH DATE
CHK'D. BY DATE

$$362.96\,(2962.6) = 0.1\,Q^2 + 9.953\,Q^2 + 1.0\,Q^2$$

$$2{,}556{,}605.3 = 11.053\,Q^2$$

$$231{,}304.2 = Q^2$$

$$480.94 = Q \qquad \underline{Q = 480.94 \text{ CFS}}$$

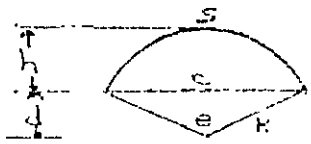
$$Q = V\,A \qquad 480.94 = V\,(54.43)$$

$$V = 8.836 \text{ FT/SEC}$$

Capital Consultants, Inc.
ENGINEERS
1627 LAKE LANSING ROAD • LANSING MICHIGAN 48912-3796
TELEPHONE (517) 371-1400 • FAX (517) 371-2910

OWOSSO DRAIN STUDY JOB NUMBER 89117.01
COMSTOCK TRUNK SHEET NO. 1 OF
DRAIN - CAPACITY COMP. BY SCN DATE 3/6
CHK'D. BY DATE

AREA = 1/2 (Rs - cd)



s = θR

MUST CALCULATE SEGMENT AREA FOR TOP HALF AND BOTTOM HALF OF COMSTOCK TRUNK DRAIN

BOTTOM HALF

R = 7' 11 3/4" = 7.98 FT
d = 5.9'
h = 2.08'
c = 11.0 FT
θ = 86° = 1.50098 RADIANS

s = 1.50098 (7.98 FT) = 11.98 FT

AREA = 1/2 (7.98 (11.98) - 11.0 (5.9)) = 15.35 FT²

TOP HALF

R = 5.75 FT
d = 1.08 FT
c = 11.0 FT
θ = 156° = 2.72271 RAD

s = 2.72271 (5.75) = 15.66

AREA = 1/2 (5.75 (15.66) - 11 (1.08)) = 39.08 FT²

TOTAL AREA = 15.35 FT² + 39.08 FT² = 54.43 FT²

U.S. DEPARTMENT OF AGRICULTURE, SOIL CONSERVATION SERVICE
1405 South Harrison Road, Room 101, East Lansing, Michigan 48823-5243
FAX NO. 517-337-6905

DATE: 2-2-94

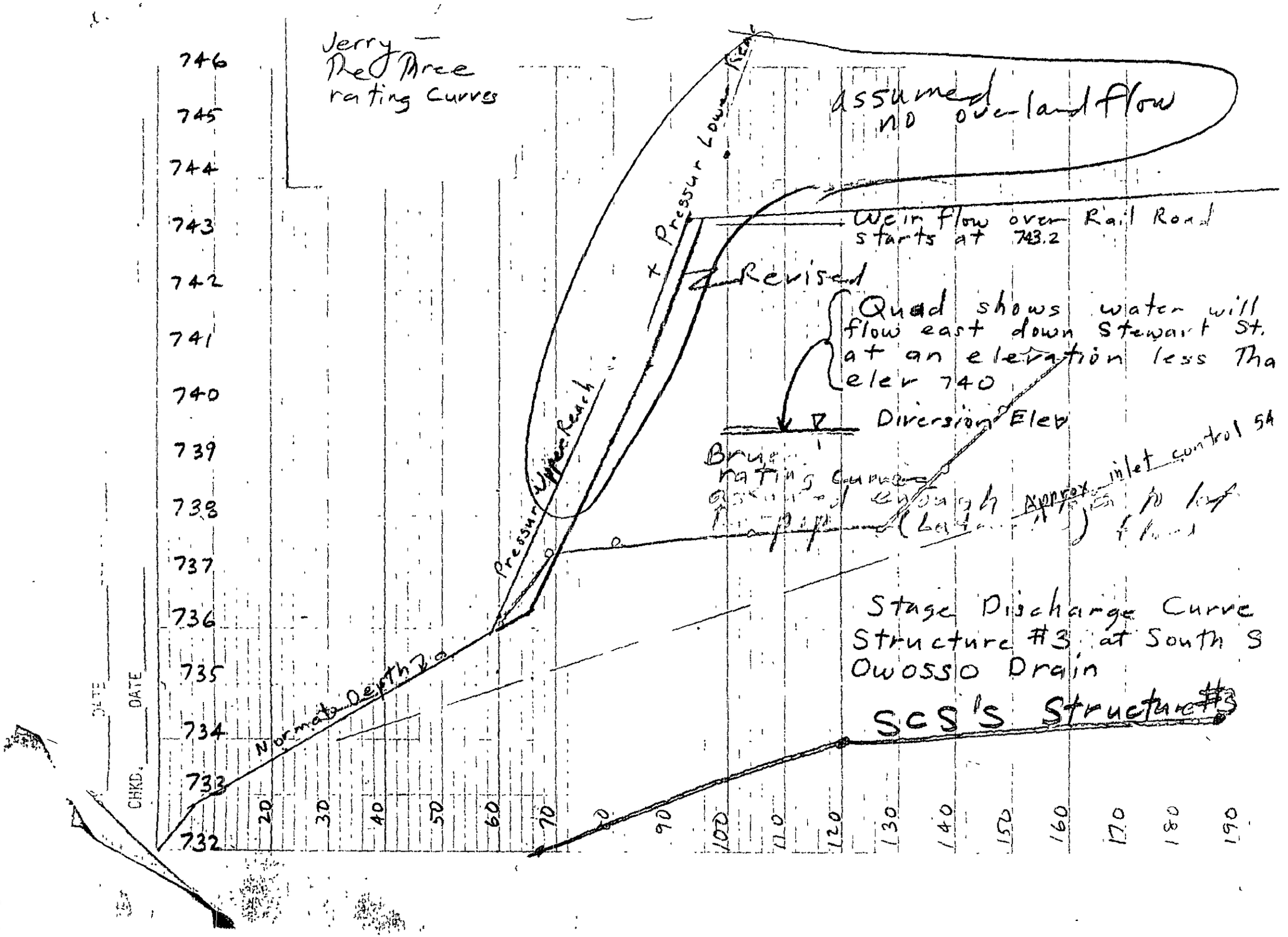
TO: Chuck Leep
DNR

FROM: Tom Bourdon
SCS

NUMBER OF PAGES: Transmittal Sheet + 6 including this cover sheet

COMMENTS: Attached are copies of TRUNK LINE from Shiawassee R to Junction Box along with calculations from Capital Consultants.

5943E


Jerry
Re Three
rating Curves
assumed
no overland flow
Weir flow over Rail Road
starts at 743.2
Revised
Quad shows water will
flow east down Stewart St.
at an elevation less Tha
elev 740
Diversion Elev
Pressur Lower Reach
Pressur Upper Reach
Normal Depth
Stage Discharge Curve
Structure #3 at South S
Owosso Drain
SCS's Structure #3
746
745
744
743
742
741
740
739
738
737
736
735
734
733
732
20
30
40
50
60
70
90
100
110
120
130
140
150
160
170
180
190
DATE
CHKD.

Elev	Discharge	Vol acre-ft
728.4	0.0	0.
730.6	32.	.7
732.	68.	.9
734.	120.	1.2
735.1	188.7	1.4
736.	218.3	9.6
737.	247.1	49.6
738.	272.7	131.5
739.	296.2	237.6

Pressure
60 cfs
80 cfs
85 cfs
weir flow at
120 cfs
Top of Rail

```
1 001      7 .58          71.0          1.14          1 1   1   1
1 002      6 .47          72.0          .97           1 1   1   1
```

Qs applied based off for 60" p

```
:**********80-80 LIST OF INPUT DATA (CONTINUED)*********************

4 003   7 6 3                                          1     1   1
1 004      7 .36          79.0          1.96          1 1   1   1
4 005   3 7 4                                          1     1   1
2    01 4   7 736.20                                   1 1 1 1   1
3 006   7   3 6300.                                    1     1   1
1 007      6 .52          72.0          1.62          1     1   1
4 009   3 6 5                                          1     1   1
```

2/8/94
BEM

Bruces Results

South Street - Owosso Drain

Stage	$Q_{54''}$	Q_{weir}	Q^*_{inlets}	Q_T
731.8	0	-		0
734.5	30	-		30
735	40	-		40
735.5	50	-		50
736.1	60	0		60
737.4	69	0		69
737.5	70	15	~~87~~	85
737.6	70	35	~~87~~	105
737.7	71	~~62~~	57	128
738	72		59	131
739	76		63	139
740	80		68	148
741	85		73	158

* Assumes enough catch basins to let water into system (~4 to 5 cfs/catch basin), the 27", 24", 12", 10", + 8" pipes

6 inlets at 734 d=2

CORPORATION

Wayne Koppa 952 Stewart
725 - 7645

Mrs Jack Speers 908 Fletcher
723 - 3412

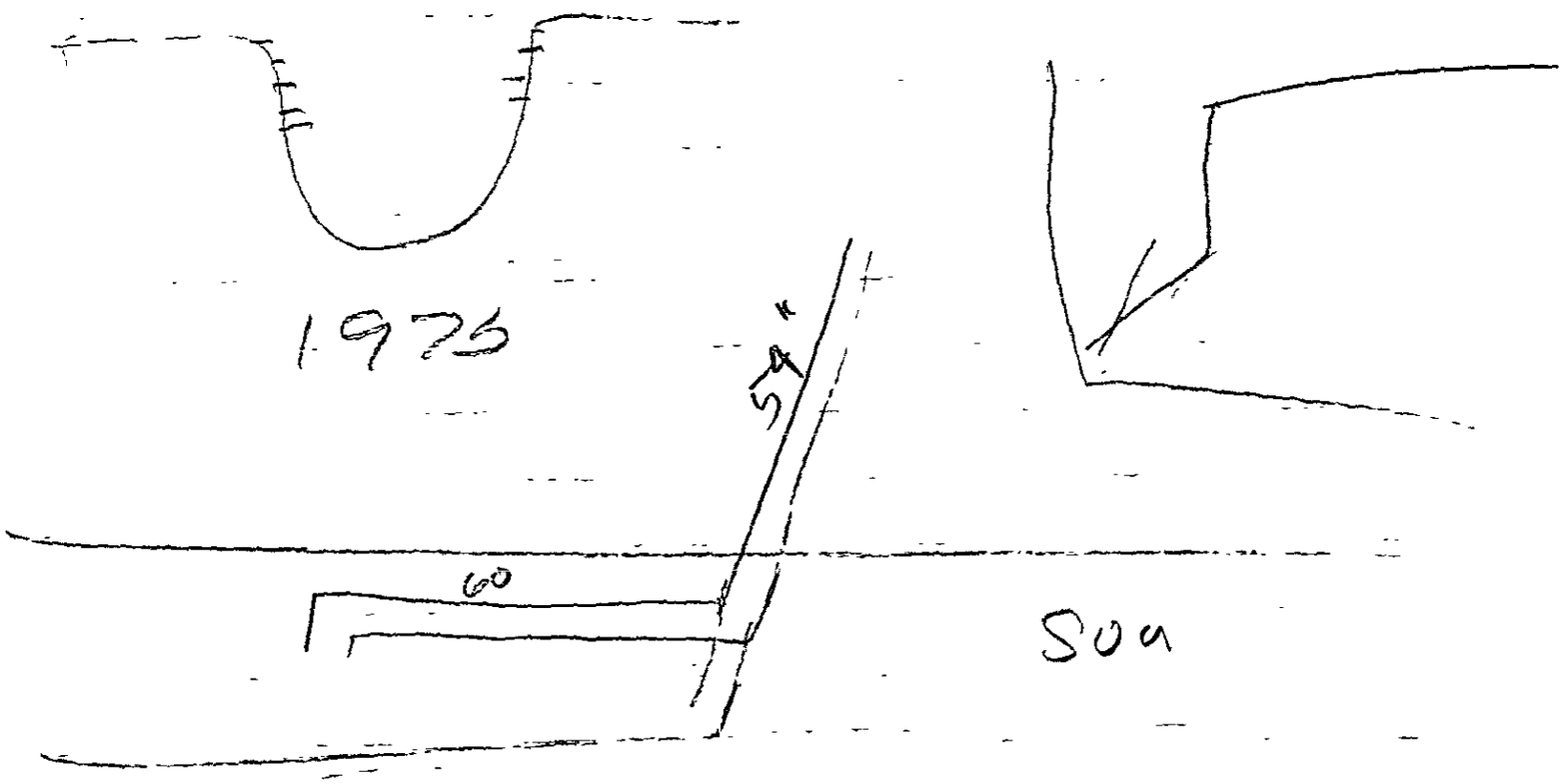
only time in 1981 that water actually inside house
basement about 1" below first Floor. Water was up only only up for 24 hr.

street back and runs in gutters but this reflect only snow melt from yards

1976
1975

54" ϕ North of South St.
in 1947 part of this reach
was open ditch

houses in brown area
81 ±



Citizens did not
feel water went down fast
enough and popped
man hole covers

---

inlets generally half plugg

Sept 19~~83~~-7 = 1986

10 - 11 & 12, 1986
did not get into garag
no water in sh~~ed~~ of 903 Fletch

Mr Jack Speers of 908 Fletcher
nuff home

Said water over road to near Lyons.

Chuck Emmins - 50 yr resident
Area flooded once in 1981

water flooded to 50' East
of S Lyons at Fletcher 916 Fletch

water behind house (green 505 Lyons

Not in flooded area but not interview

Flora Savage 723-5857
612 Grace St.

Paul ~~Kaster~~ Metzger
820 Lyons

See only top of furnace 1' below floor joi

1981 Fall

1980 or 1982 - March
(8 months) 1st block line below siding

743-2778

Wayne Koppa 1981
952 Stewart.

Richard Lischefski at floor joice
1308 Herman

Cora (Mother) 1312 Herman 6" above Garage floor

Res 31 years
(only once)
street flooded in 1982

U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

Michigan

T Bourdon 2-24-94

Owosso Drain FPMS

Stage-Discharge for Str #5 (above Freeman) 1 9

Utilized Bruce Menerey's calculations for the capacity of the 54" RCP outlet pipe and WSP2 calculations for overland flow to prepare stage-discharge table to be used in TR20 Rch:

Elev	Discharge (54" RCP) 1/	Discharge (Overland) 2/	Discharge (Total)
731.8	0	0	0
736.3	61.4	—	61.4
737.0	66.2	—	66.2
738.0	72.0	4.8	76.8
739.0	76.0	83.5	159.5
739.5	78.0	180.0	258.0
740.0	80.0	350.0	430.0

1/ From Menereys Comps See sheet 3 of 9

2/ WSP2 Output (Filename = WSPFREE.OUT) see sheet 6 of 9

Fax Transmittal Cover Sheet

Michigan Department of Natural Resources
Land and Water Management Division

DNR

SEND TO: Tom Bourdon

FAX TELEPHONE NO.: 517-337-6905

ADDRESS: SCS

SENDER: Bruce Menerey
335-3181

NUMBER OF PAGES: 2
(including cover sheet)

DATE: 2/14/94

IF YOU DO NOT RECEIVE ALL THE PAGES, PLEASE CALL: 517-373-1170

Here is the rating curve that I developed for the outlet structure. I noted that this does not include inflow that may occur from the storm sewers between South Street & Ament Street. I will take a look at the info that we have & if necessary modify the rating curve.

2/8/94
BEM

South Street - Owosso Drain

Stage	Q_{SA}	Q_{WEIR}	Q^{*}_{INLETS}	Q_T^{**}	
731.8	0	–		0	
734.5	30	–		30	
735	40	–		40	
735.5	50	–		50	
736.9	60	0		60	
737.4	69	0		69	
737.5	70	15	~~87~~	85	
737.6	70	35	~~87~~	105	
737.7	71	~~62~~	57	128	
738	72		59	131	Same
739	76		63	139	
740	80		68	148	
741	85		73	158	
742.1	90		76	166	
743.5	100		79	179	

* Assumes enough catch basins to let water into system (~4 to 5 cfs/catch basin), the 27", 24", 12", 10", & 8" pipes

** Does not consider inflow from stormsewers between South Street & Ament Street ←

7-11-94
TDB

4 of 9

5

```
---------------------- LIST OF INPUT DATA WITH LIMITED EDITING----------------------
WSP2      10.
TIT       OWOSSOW DRAIN-FPMS, SHIAWASSEE COUNTY, MICHIGAN, 10-20-93
CO MMENT  THE PURPOSE OF THIS RUN IS TO DETERMINE STAGE-DISCHARGE
COMMENT   CURVE FOR STRUCTURE #3 LOCATED SOUTH OF FREEMAN STREET
COMMENT   TO BE USED IN TR 20 COMPUTER RUN
DISCHARGE -1.       50.      100.      200.      350.      600.
STARTS    FREEMAN   .0005    .0005     .0005     .0005     .0005
OUTPUT    T
COMMENT   737.5 - 737.0 \ 1100 = .0005
REACH     FREEMAN   1.       0.        0.
SEGMENT   FREEMAN   1        N         -55.
NVALUE    .15
SEGMENT   FREEMAN   2        C         40.
NVALUE    .10
SEGMENT   FREEMAN   3        N         640.
NVALUE    .15
SECTION   FREEMAN
          -170.     739.5    -120.     739.0     -55.      738.
          0.        737.5    40.       738.0     80.       739.0
          150.      739.8    200.      739.      250.      738.
          300.      738.     530.      739.      640.      740.
          -190.     739.7    -500.     739.3     -690.     740.
ENDTABLE
--------------------MESSAGE - DATA POINTS ON SECTION FREEMA REORDERED BY PROGRAM ACCORDING TO X VALUES
                    DUPLICATE X POINTS NOT CHANGED--------------------
REACH     VAL3      1.       70.       70.
SEGMENT   VAL3      1        C         510.
N         .10
SECTION   VAL3
          -510.     740.     -445.     739.5     -444.     748.
          -420.     748.     -419.     739.4     -395.     739.4
          -394.     748.     -340.     748.      -339.     739.4
          -255.     739.3    -254.     748.      -225.     748.
          -224.     739.3    -180.     739.3     -140.     738.7
          -139.     748.     -110.     748.      -109.     738.5
          -70.      738.3    -69.      748.      -40.      748.
          -39.      738.     50.       738.      51.       748.
          85.       748.     86.       738.5     150.      738.5
          151.      748.     230.      748.      231.      738.
          300.      738.     301.      748.      380.      748.
          381.      738.     420.      738.      421.      748.
          460.      748.     461.      739.      510.      740.
ENDTABLE
REACH     HERMAN    1.       260.      260.
SEGMENT   HERMAN    1        N         -390.
NVALUE    .15
SEGMENT   HERMAN    2        C         0.
```



```
----------------------------LIST OF INPUT DATA----------------------------
NVALUE    .10
SEGMENT   HERMAN    3        N         230.
NVALUE    .15
SECTION   HERMAN
          -650.     740.     -620.     739.3     -390.     738.
          -320.     737.4    0.        737.3     30.       738.
          230.      740.
```

```
SEGMENT   VAL2     1        C        340.
NVALUE    .10
SECTION   VAL2
          -390.    748.     -389.    740.     -375.    739.8
          -374.    748.     -330.    748.     -329.    739.3
          -290.    738.9    -289.    748.     -265.    748.
          -265.    738.7    -235.    738.5    -234.    748.
          -190.    748.     -189.    738.1    -175.    738.
          -110.    738.     -109.    748.     -75.     748.
          -74.     738.     -45.     738.     -44.     748.
          -25.     748.     -24.     738.     0.       738.
          35.      738.     36.      748.     70.      748.
          71.      738.     120.     738.     121.     748.
          130.     748.     131.     738.     150.     738.
          165.     738.2    166.     748.     210.     748.
          211.     738.2    250.     738.5    251.     748.
          330.     748.     331.     739.8    340.     740.
ENDTABLE
REACH     VALLEY   1.       185.     185.
SEGMENT   VALLEY   1        N        -220.
NVALUE    .15
SEGMENT   VALLEY   2        C        0.
NVALUE    .10
SEGMENT   VALLEY   3        N        180.
NVALUE    .15
SECTION   VALLEY
          -330.    740.     -220.    738.     0.       737.3
          150.     738.     180.     740.
ENDTABLE
REACH     SOUTH    1.       500.     500.
SEGMENT   SOUTH    1        N        -88.
NVALUE    .15
SEGMENT   SOUTH    2        C        86.
NVALUE    .10
SEGMENT   SOUTH    3        N        737.
NVALUE    .15
1    WSP2 XEQ 02/24/94     11:22:31     OWOSSOW DRAIN-FPMS, SHIAWASSEE COUNTY, MICHIGAN, 10-20-93     WS : ____        PAGE
         REV 11/01/90   VERSION 2.0                                                                    ALT:      2


----------------------------LIST OF INPUT DATA----------------------------
SECTION   SOUTH
          -1476.   742.3    -1335.   739.4    -1159.   738.5
          -982.    738.     -805.    738.1    -633.    738.2
          -459.    737.5    -318.    736.9    -144.    737.3
          -88.     737.2    0.       737.4    86.      737.9
          110.     737.9    245.     738.4    384.     738.9
          560.     740.6    737.     742.4
ENDTABLE
COMPUTE   FREEMAN  SOUTH    FREEMAN
----------------------------END OF DATA LISTING----------------------------
1                  COMPUTE  FREEMAN  SOUTH    FREEMAN


----------------------------STARTING DATA FROM GIVEN SLOPES ----------------------------

1    WSP2 XEQ 02/24/94     11:22:31     OWOSSOW DRAIN-FPMS, SHIAWASSEE COUNTY, MICHIGAN, 10-20-93     WS : ____        PAGE
         REV 11/01/90   VERSION 2.0                                                                    ALT: ____         3


                    RATING TABLE FOR SECTION FREEMA       DA=      1.0 SQ MI    EXP COEF=  .00    CONT COEF=  .00
                    -------------------------------
```

				DAMAGE	CHANNEL			FT	FT/FT	FT
0	737.5	0.0	0.0							
LOW GRND	738.0	23.8	4.8	.00	.00	.00				95.0

*****MESSAGE- ELEV BELOW FIRST PROFILE. FLOW INTERPOLATED LINEARLY FROM CHANNEL BOTTOM*****

BANK FULL	738.0	23.8	4.8	.00	.00	.00				95.0

*****MESSAGE- ELEV BELOW FIRST PROFILE. FLOW INTERPOLATED LINEARLY FROM CHANNEL BOTTOM*****

739	1	738.8	247.3	50.0	83.5	.00	.00	.00	50.00	737.9	.00048	436.9
	2	739.1	432.5	100.0	180	.00	.00	.00	100.00	738.1	.00049	572.5
739.5	3	739.6	786.8	200.0		.00	.00	.00	200.00	738.2	.00050	1053.7
	4	740.0	1300.6	350.0		.00	.00	.00	350.00	738.4	.00048	1240.9
	5	740.5	1894.2	600.0		.00	.00	.00	600.00	738.5	.00048	1330.0

WARNING**********PROFILE NO 4 EXCEEDS SURVEY DATA BY .0 FT. COMPUTATION BASED ON VERTICAL EXTENSION OF END POINTS**********
WARNING**********PROFILE NO 5 EXCEEDS SURVEY DATA BY .5 FT. COMPUTATION BASED ON VERTICAL EXTENSION OF END POINTS**********

*****WARNING - SECT. VAL3 KD VALUES REVERSED ON SEGMENT 1 AT ELEVATION 748.80 VALUE CHANGED TO EQUAL PREVIOUS VALUE *****

RATING TABLE FOR SECTION VAL3 DA= 1.0 SQ MI EXP COEF= .00 CONT COEF= .00

NO.	ELEV FT	AREA SQ FT	Q CFS	ACRES FLOODED FLOODPLAIN DAMAGE	CHANNEL	TOTAL	STARTING CSM	CRIT ELEV FT	FRICTION SLOPE FT/FT	FLOW TOP WIDTH FT
0	738.0	0.0	0.0							
1	738.8	195.9	50.0	.00	.50	.50	50.00	738.1	.00056	308.1
2	739.2	311.1	100.0	.00	.55	.55	100.00	738.2	.00055	341.0
3	739.7	534.8	200.0	.00	.88	.88	200.00	738.3	.00068	545.3
LOW GRND	740.0	734.9	327.2	.00	.98	.98				608.5
FULL	740.0	734.9	327.2	.00	.98	.98				608.5
4	740.1	770.9	350.0	.00	.98	.98	350.00	738.5	.00072	608.6
5	740.5	1049.3	600.0	.00	.98	.98	600.00	738.7	.00078	609.5

WARNING**********PROFILE NO 4 EXCEEDS SURVEY DATA BY .1 FT. COMPUTATION BASED ON VERTICAL EXTENSION OF END POINTS**********
WARNING**********PROFILE NO 5 EXCEEDS SURVEY DATA BY .5 FT. COMPUTATION BASED ON VERTICAL EXTENSION OF END POINTS**********

RATING TABLE FOR SECTION HERMAN DA= 1.0 SQ MI EXP COEF= .00 CONT COEF= .00

NO.	ELEV FT	AREA SQ FT	Q CFS	ACRES FLOODED FLOODPLAIN DAMAGE	CHANNEL	TOTAL	STARTING CSM	CRIT ELEV FT	FRICTION SLOPE FT/FT	FLOW TOP WIDTH FT
0	737.3	0.0	0.0							
LOW GRND	737.3	.0	.0	.00	.00	.00				.0

*****MESSAGE- ELEV BELOW FIRST PROFILE. FLOW INTERPOLATED LINEARLY FROM CHANNEL BOTTOM*****

BANK FULL	737.3	.0	.0	.00	.00	.00				.0

*****MESSAGE- ELEV BELOW FIRST PROFILE. FLOW INTERPOLATED LINEARLY FROM CHANNEL BOTTOM*****

1	738.8	674.9	50.0	.00	2.33	3.85	50.00	737.4	.00002	645.8
2	739.2	9[illegible].3	100.0	.00	2.33	4.45	100.00	737.5	.00004	745.7
3	739.7	1317.5	200.0	.00	2.33	4.95	200.00	737.6	.00006	829.2
4	740.1	1677.6	350.0	.00	2.33	5.19	350.00	737.7	.00009	869.1
5	740.6	2090.3	600.0	.00	2.33	5.25	600.00	737.8	.00014	880.0

WARNING**********PROFILE NO 4 EXCEEDS SURVEY DATA BY .1 FT. COMPUTATION BASED ON VERTICAL EXTENSION OF END POINTS**********
WARNING**********PROFILE NO 5 EXCEEDS SURVEY DATA BY .6 FT. COMPUTATION BASED ON VERTICAL EXTENSION OF END POINTS**********

*****WARNING - SECT. VAL2 KD VALUES REVERSED ON SEGMENT 1 AT ELEVATION 749.00 VALUE CHANGED TO EQUAL PREVIOUS VALUE *****

RATING TABLE FOR SECTION VAL2 DA= 1.0 SQ MI EXP COEF= .00 CONT COEF= .00

NO.	ELEV FT	AREA SQ FT	Q CFS	------ACRES FLOODED------- FLOODPLAIN DAMAGE	CHANNEL	TOTAL	STARTING CSM	CRIT ELEV FT	FRICTION SLOPE FT/FT	FLOW TOP WIDTH FT
0	738.0	0.0	0.0							
1	738.8	235.6	50.0	.00	.56	.56	50.00	738.1	.00032	323.0
2	739.2	356.0	100.0	.00	.60	.60	100.00	738.2	.00037	349.8
3	739.7	533.6	200.0	.00	.63	.63	200.00	738.3	.00042	365.9
LOW GRND	740.0	644.0	303.6	.00	.66	.66				383.7
BANK FULL	740.0	644.0	303.6	.00	.66	.66				383.7
4	740.1	693.4	350.0	.00	.66	.66	350.00	738.4	.00058	384.0
5	740.6	880.4	600.0	.00	.66	.66	600.00	738.6	.00079	384.9

WARNING**********PROFILE NO 4 EXCEEDS SURVEY DATA BY .1 FT. COMPUTATION BASED ON VERTICAL EXTENSION OF END POINTS**********
WARNING**********PROFILE NO 5 EXCEEDS SURVEY DATA BY .6 FT. COMPUTATION BASED ON VERTICAL EXTENSION OF END POINTS**********

RATING TABLE FOR SECTION VALLEY DA= 1.0 SQ MI EXP COEF= .00 CONT COEF= .00

NO.	ELEV FT	AREA SQ FT	Q CFS	------ACRES FLOODED------- FLOODPLAIN DAMAGE	CHANNEL	TOTAL	STARTING CSM	CRIT ELEV FT	FRICTION SLOPE FT/FT	FLOW TOP WIDTH FT
0	737.3	0.0	0.0							
LOW GRND	737.3	.0	.0	.00	.00	.00				.0

*****MESSAGE- ELEV BELOW FIRST PROFILE. FLOW INTERPOLATED LINEARLY FROM CHANNEL BOTTOM*****

BANK FULL	737.3	.0	.0	.00	.00	.00				.0

*****MESSAGE- ELEV BELOW FIRST PROFILE. FLOW INTERPOLATED LINEARLY FROM CHANNEL BOTTOM*****

1	738.9	471.5	50.0	.00	.93	1.83	50.00	737.6	.00006	429.8
2	739.2	635.0	100.0	.00	.93	1.94	100.00	737.7	.00009	455.7
3	739.7	874.6	200.0	.00	.93	2.07	200.00	737.8	.00014	487.9
4	740.2	1098.0	350.0	.00	.93	2.16	350.00	737.9	.00022	508.7
5	740.7	1358.2	600.0	.00	.93	2.17	600.00	738.1	.00032	510.0

WARNING**********PROFILE NO 4 EXCEEDS SURVEY DATA BY .2 FT. COMPUTATION BASED ON VERTICAL EXTENSION OF END POINTS**********
WARNING**********PROFILE NO 5 EXCEEDS SURVEY DATA BY .7 FT. COMPUTATION BASED ON VERTICAL EXTENSION OF END POINTS**********

RATING TABLE FOR SECTION SOUTH DA= 1.0 SQ MI EXP COEF= .00 CONT COEF= .00

NO.	ELEV FT	AREA SQ FT	Q CFS	------ACRES FLOODED------- FLOODPLAIN DAMAGE	CHANNEL	TOTAL	STARTING CSM	CRIT ELEV FT	FRICTION SLOPE FT/FT	FLOW TOP WIDTH FT
0	736.9	0.0	0.0							
LOW GRND	736.9	.0	.0	.00	.00	.00				.0

*****MESSAGE- ELEV BELOW FIRST PROFILE. FLOW INTERPOLATED LINEARLY FROM CHANNEL BOTTOM*****

BANK FULL	737.2	30.1	1.0	.00	.00	2.31				201.0

*****MESSAGE- ELEV BELOW FIRST PROFILE. FLOW INTERPOLATED LINEARLY FROM CHANNEL BOTTOM*****

1	738.9	1586.5	50.0	.00	2.00	18.22	50.00	737.2	.00001	1587.6
2	739.2	2206.1	100.0	.00	2.00	19.63	100.00	737.2	.00001	1710.5
3	739.7	3100.6	200.0	.00	2.00	20.91	200.00	737.3	.00002	1822.0
4	740.2	3941.2	350.0	.00	2.00	21.70	350.00	737.4	.00003	1890.7
5	740.7	4943.6	600.0	.00	2.00	22.60	600.00	737.6	.00004	1968.5

```
END
ENDJOB
```

8 of 9

```
*****************************NORMAL END OF JOB-----------------------------

1   LP2 XEQ 02/24/94     11:22:31                                                    WS : ____        PAGE
        REV 11/01/90   VERSION 2.0                                                   ALT: ____          1


---------------------- LIST OF INPUT DATA WITH LIMITED EDITING----------------------
ENDRUN


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

                SCS  WSPC     VERSION 11/01/90
                       FILE SUMMARY

        INPUT    = A:WSPFREE.DAT
        OUTPUT   = C:WSPFREZ.OUT            DATED 02/24/94  11:22:31

                 OPTIONAL FILES SAVED

        OPTION T = A:WSPFREE.WRT            DATED 02/24/94  11:22:31

*****************************************************************************
```

Michigan — Owosso Drain FPMS

T Bourdon 2-23-94

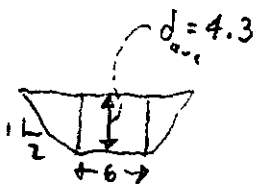
Stage - Storage for Structure #~~8~~ 5 South of Freeman St. and 100 7-11-94

9 9

$$V = \frac{A_1 + A_2}{2} L$$

Area	Elevation		Volume	Cum Volume
	731.8 = 0		0	0
0	736.3		2.2 1/	2.2
		$\frac{0+4.5}{2}(737.0-736.3)$ =		
4.5	737.0		1.6	3.8
		$\frac{4.5+29.2}{2}(738.0-737.0)$ =		
15.7+13.5=29.2	738.0		16.9	20.7
		$\frac{29.2+54.3}{2}(739.0-738.0)$ =		
23.9+30.4=54.3	739.0		41.8	62.5
		$\frac{54.3+71.5}{2}(739.5-739.0)$ =		
30.0 2/ + 41.5=71.5	739.5		31.5	94.0
		$\frac{71.5+87.4}{2}(740-739.5)$ =		
35.0 2/ + 52.4=87.4	740.0		39.7	133.7

1/ Volume in channel 1500' long

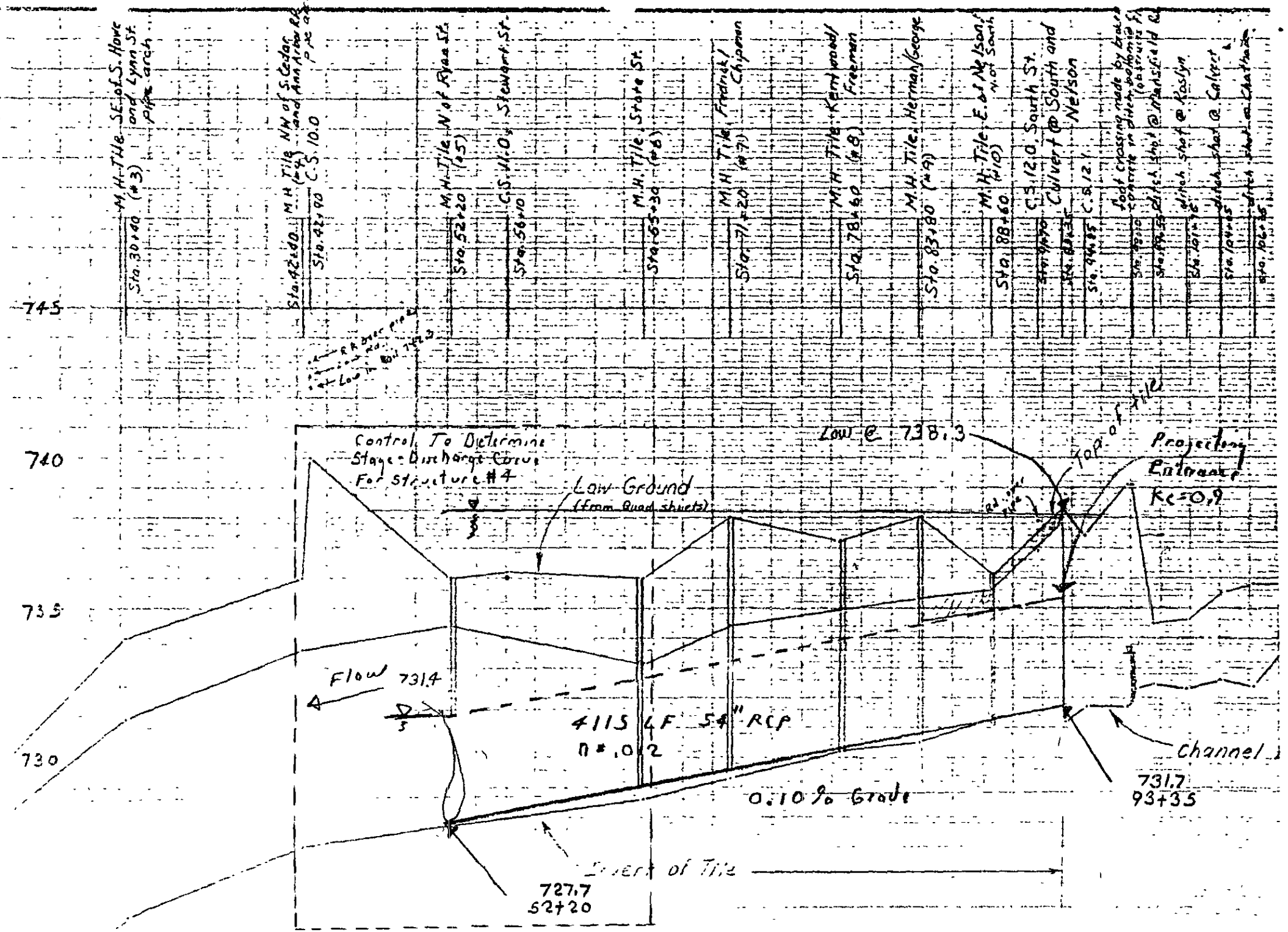


$$V = \frac{62.8+62.8}{2}(1500)/43560$$

2/ Approximate - Estimated

V = 2.16 Use 2.2 Ac-Ft

Structure 6


745
740
735
730
Control To Determine
Stage-Discharge Curve
For Structure #4
Low Ground
(from Quad sheets)
Low @ 738.3
Projecting
Entrance
Ke=0.9
Flow
731.4
4115 LF 54" RCP
n = .012
0.10% Grade
Channel
731.7
93+35
727.7
52+20
Sta. 30+40
Sta. 42+40
Sta. 52+20
Sta. 56+10
Sta. 65+30
Sta. 71+20
Sta. 78+60
Sta. 83+80
Sta. 88+60
Sta. 99+90
Sta. 104+85
Sta. 104+45

Owosso Drain FPMS 1 8

Michigan Bourdon 12-93

Structure #6 stage - discharge - storage Curves

Elevation ft	Discharge cfs 54" Pipe	27" Pipe	24" Pipe	12" Pipe	10" Pipe	8" Pipe	Total Discharge	Storage AcFt
728.4	0.						0.	0.
730.6	32.						32.	0.7
732.0	68.						68.	0.9
734.0	120.						120.	1.2
735.1	126.8	33.4	20.8	3.6	2.9	1.2	188.7	1.4
736.0	148.7	37.6	23.4	4.0	3.3	1.3	218.3	9.6
737.0	169.8	41.8	26.0	4.3	3.7	1.5	247.1	49.6
738.0	188.5	45.5	28.4	4.7	4.0	1.6	272.7	131.5
739.0	205.5	49.0	30.5	5.2	4.3	1.7	296.2	237.6

The Overland Flow Doesn't Occur until approx Elev 735.1 Therefore these pipes will receive flood waters from the south only at or above elev 735.1

interpolated

Storage Calculations

Area @ 735.1 = 0

Area @ 736.0 = 18.3 Ac

Area @ 737.0 = 61.7 Ac

Area @ 738.0 = 102.1

Area @ 739.0 = 110.0

* Volume in 54" Pipe = $\frac{15.89 \times 3725}{43560}$ = 1.4 Ac Ft

Elev	Vol	Cum Vol
735.1	1.4	1.4
736.0	$\frac{0+18.3}{2}(.9) = 8.2$	9.6
737.0	$\frac{18.3+61.7}{2}(1) = 46.0$	49.6
738.0	$\frac{61.7+102.1}{2}(1) = 81.9$	131.5
739.0	$\frac{102.1+110.0}{2}(1) = 106.1$	237.6

US Department of Agriculture
Soil Conservation Service

DESIGN WORKSHEET
for
Culvert Evaluation

prepared for

OWOSSO DRAIN FPMS

in

SHIAWASSEE County, Michigan

Designer : TDB
Date : 12/10/93

Checker _____
Date _____

****

54 INCH OUTLET PIPE @ 51+40

'n' value = 0.013
Length = 230 ft.
Diameter = 54 in.
Projecting .. square edge
ke = 0.46

Capacity * = 188.5 cfs.

Outlet Controls

Elevation of headwater = 738.0
Elevation of inlet = 728.4
Elevation of tailwater = 732.7
Elevation of outlet = 728.2

54" Pipe

HW	D	Qout	
728.4		0	inlet control from nomographs
730.6	.5	32.0	
732.0	.8	68.0	
734.0	1.2	120.0	
735.1		126.8	outlet control
736.0		148.7	
737.0		169.8	
738.0		* 188.5	
739.0		205.5	

Add discharge [illegible] of culvert box below
As [illegible] depth of pipe 4' below ground [illegible]

US Department of Agriculture
Soil Conservation Service

DESIGN WORKSHEET
for
Pipe Flow Formula Solution

prepared for

OWOSSO DRAIN FPMS

in

SHIAWASSEE County, Michigan

Designer : TDB
Date : 12/10/93

Checker _____
Date _____

****

27 IN ENTERING @ STEWART ST. Entering trunk Line from the West.

Mannings Coefficient (n)	0.013
Entrance Coefficient (Ke)	0.50
Diameter of pipe	27 inch.
1/ Head on pipe	3.4 feet.
Length of pipe	150 feet.

Pipe Capacity	33.4 cfs @ 735.1
Velocity in pipe	8.4 ft/sec
Friction Cofficient (Kp)	0.0106
Max allowable fall in pipe when outlet is not submerged	1.8 ft.

1/ 735.7 − 4 = 731.7

$$\begin{array}{r} 735.1 \\ -\ 731.7 \\ \hline 3.4 \end{array}$$

27" Pipe

@ 735.1 33.4 cfs
@ 736.0 37.6 cfs
@ 737.0 41.8 cfs
@ 738.0 45.5 cfs

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DESIGN WORKSHEET
for
Pipe Flow Formula Solution

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OWOSSO DRAIN FPMS

in

SHIAWASSEE County, Michigan

Designer : TDB
Date : 12/10/93

Checker _____
Date _____

****

24 IN ENTERING @ AMENT ST. from east

Mannings Coefficient (n)	0.013
Entrance Coefficient (Ke)	0.50
Diameter of pipe	24 inch.
Head on pipe	4.3 feet.
Length of pipe	280 feet.
Pipe Capacity	23.4 cfs*
Velocity in pipe	7.5 ft/sec
Friction Cofficient (Kp)	0.0124
Max allowable fall in pipe when outlet is not submerged	3.0 ft.

24" Pipe

735.1	20.8
* 736.0	23.4
737.0	26.0
738.0	28.4
739.0	30.5

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DESIGN WORKSHEET
for
Pipe Flow Formula Solution

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OWOSSO DRAIN FPMS

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SHIAWASSEE County, Michigan

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Checker _____
Date _____

****

12 IN @ RYAN ST entering from the east

Mannings Coefficient (n)	0.013
Entrance Coefficient (ke)	0.50
Diameter of pipe	12 inch.
Head on pipe	4.4 feet.
Length of pipe	380 feet.
Pipe Capacity	3.6 cfs
Velocity in pipe	4.6 ft/sec
Friction Cofficient (kp)	0.0313
Max allowable fall in pipe when outlet is not submerged	3.9 ft.

12" Pipe

735.1	3.6
736.0	4.0
737.0	4.3
738.0	4.7
739.0	5.2

OH-Ver 2.0

6 of 8

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Soil Conservation Service

DESIGN WORKSHEET
for
Pipe Flow Formula Solution

prepared for

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****

10 IN ENTERING @ STEWART ST from east side

Mannings Coefficient (n)	0.013
Entrance Coefficient (ke)	0.50
Diameter of pipe	10 inch.
Head on pipe	6.3 feet.
Length of pipe	150 feet.
Pipe Capacity	4.0 cfs
Velocity in pipe	7.4 ft/sec
Friction Cofficient (kp)	0.0399
Max allowable fall in pipe when outlet is not submerged	5.0 ft.

10" Pipe

735.1	2.9
736.0	3.3
737.0	3.7
738.0	4.0
739.0	4.3 U

U estimated

* Note: Sheet 8 of 8 is a Contour Map

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Soil Conservation Service

DESIGN WORKSHEET
for
Pipe Flow Formula Solution

prepared for

OWOSSO DRAIN FPMS

in

SHIAWASSEE County, Michigan

Designer : TDB
Date : 12/10/93

Checker _____
Date _____

****

8 IN @ RYAN ST. entering from west

Mannings Coefficient (n)	0.013
Entrance Coefficient (Ke)	0.50
Diameter of pipe	8 inch.
Head on pipe	7.3 feet.
Length of pipe	380 feet.
Pipe Capacity	1.6 cfs
Velocity in pipe	4.6 ft/sec
Friction Cofficient (Kp)	0.0538
Max allowable fall in pipe when outlet is not submerged	6.8 ft.

8 in Pipe

735.1	1.2
736.0	1.3
737.0	1.5
738.0	1.6
739.0	1.7 U

U extrapolated

FLOOD PLAIN MANAGEMENT STUDY

TECHNICAL REPORT

OWOSSO DRAIN

Shiawassee County, Michigan

CONTENTS

1. Investigations and Analyses
2. Table 1 - Flood Discharges
3. Table 2 - Flood Elevations
4. Bench Mark Descriptions
5. Glossary
6. Blue Line Attachments:
   - Index-Flood Hazard Area Maps
   - Flood Hazard Area Maps
   - High Water Profiles
   - Bench Mark Location Map
   - Typical Valley Sections

PREPARED BY:

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
EAST LANSING, MICHIGAN

June 1994

1

INVESTIGATIONS AND ANALYSIS

SURVEY PROCEDURES

Field surveys were made of bridges, roads, structures, channels and flood plains of the Owosso Drain and Bock Branch by the Soil Conservation Service (SCS) in October 1992 and completed in July 1993. Temporary bench marks, based on USC and GS mean sea level elevation data of 1929, were established using second order accuracy. Temporary bench marks are described in Part 4 of this Techincal Report. For Owosso Drain and Bock Branch 48 road bridges and valley cross-sections were surveyed. In addition, 2 foot contour maps were provided by the City of Owosso.

HYDROLOGY AND HYDRAULICS

Physical data were obtained from USGS topographic maps and soil survey maps, as well as on-site field inspections. The watershed boundary was determined from map studies and field checks. The watershed was divided into 16 sub-watershed areas for use in evaluating the runoff volumes. Drainage areas for the sub-watersheds were measured from USGS topographic maps. Times of concentration were calculated for the sub-watersheds using the Soil Conservation Service TR55 Computer Module and Manning's formula. Each sub-watershed was evaluated for land use, cover and soils. Runoff curve numbers were calculated using TR55 as described in Part 7 of the technical documentation book.

Channel flood routings to establish peak discharge-frequency relationships were made using the PC version of the SCS TR-20 Hydrology Computer Program dated September 1, 1983. The Modified Attenuation-Kinematic (Att-Kin) method of routing through stream channels is used by this program. This method is derived from inflow-outflow hydrograph relationships. The SCS WSP-2 computer program was used to obtain stage-discharge relationships. The TR-20 computer program uses these data and the Storage-Indication Method of evaluating the effect of the structures in reducing peak flood discharges. Elevation-storage relationships for the structures were obtained from USGS quadrangle maps and contour maps. Six natural storage areas were treated as structures in the TR-20 model. They have a significant impact on peak discharges and flood elevations. The TR-20 Flood Routing Schematic can be found in Part 12 of the techical support documentation. Table 1, in Part 2, lists discharges obtained from the flood routings and Table 2, in Part 3, lists flood elevations at sections located in the study area. According to information found on page 164, Water Resources Data, Mich. 1992, USGS Water Data Report MI-92-1, base flow is 0.64 cfs/sq. mi. Due to the small size of this watershed (4.68 sq. mi.) base flow was not considered.

The TR-20 model was used to reproduce elevations from the October 1, 1981 flood event and has been accepted as a basis of the hydrology and flood routing for the Owosso Drain and Bock Branch. Hourly rainfall information from the weather station at Owosso, Michigan was used to model the flood. The prediced flood elevation was within 0.2 foot of the observed elevation. The Antecedent Moisture Condition (AMC) for the time before the storm was determined from the rainfall data. The AMC is based upon the 5-day antecedent rainfall before the storm event. From the rainfall data, the AMC was AMC II.

Separate water surface profiles for Owosso Drain and Bock Branch were developed using the SCS WSP-2 computer program. This program uses the step method of computation to solve the Benoulli equation, and the Bureau of Public Roads bridge loss analysis. Flood discharges determined from flood routings were used in the water surface profile program to develop high water profiles along the channel. Manning's "n" values were determined from photographs and field investigations of the channel and flood plain.

A 24 inch RCP under the Penn Central Railroad located approximately 3,000 feet south of Dewey Road allows backwater from the Maple River to enter the Owosso Drain; however, according to interviews with local residents, backwaters from the Maple River have never topped the railroad. Since any backwater from the Maple River entering the Owosso Drain would occur several hours after the Owosso Drain peaks, the effects on flood elevations and peak discharges along the Owosso Drain would be minimal. It should also be noted that flood waters from the Owosso Drain will exit the Owosso Drain Watershed and enter the Maple River through the 24 inch RCP during major storm events. Again, due to the limited capacity of the 24 inch RCP the effects would be very minimal and were ignored in this analysis.

Normal bridge and channel flow conditions were assumed in the hydraulic computations. No consideration was made for openings blocked by ice or other debris. Channel and flood plain flow characteristics may change due to vegetative growth, sedimentation, scour, debris accumulation, filling and encroachment. Computations for this study considered only those features in the flood plain at the time of the field surveys. Future flood plain developments and modifications, as well as changes in the upstream drainage areas and land use and cover will require recomputation of water surface profiles.

Flood plain delineations were made on the photo maps. Computed water surface elevations at surveyed sections and bridges were used to identify flood plain limits. Between sections, topographic map interpretations and field inspections were used to delineate the flood boundary lines. Limits of flooding shown on the photo maps may vary from true ground location due to inherent photographic displacement. High water profile elevations and detailed field surveys should be used to determine the extent or depth of flooding at any specific site.

The limits of the 100-year and 500-year floods were too close to delineate, and the limits of the two flood plains are shown as the same line on the quadrangle sheet.

OK but where are the profiles HW vs profiles

2

TABLE 1 - FLOOD DISCHARGES

OWOSSO DRAIN

Location	TR-20 Sec.	From Sec.	To Sec.	Drainage Area Sq. Miles	Estimated Peak Discharges Cubic Feet Per Second 10-Yr	50-Yr	100-Yr	500 Yr
Into Struc. 1 1/	004	19.7	US19.0	0.23	90	152	181	258
Out of Struc. 1	Struc. 1			0.23	33	34	35	36
Into Struc. 2 2/	007	DS19.0	US17.0	1.41	270	460	549	789
Out of Struc. 2	Struc. 2			1.41	149	306	377	568
To Sta. 106+60	016	DS17.0	US13.0	3.02	200	335	405	600
Into Struc. 3 3/	011	---	---	0.44	115	160	195	305
Out of Struc. 3	Struc. 3			0.44	9	15	18	25
Into Struc. 5 5/	025	DS13.0	US11.5	3.85	300	520	630	935
Out of Struc. 5 5/	Struc. 5			3.85	145	230	270	425
Into Struc. 6 6/	029	DS11.5	US10.0	4.40	275	410	470	645
Out of Struc. 6	Struc. 6	DS10.0	9.0	4.40	205	230	250	290
At Shiawassee River	031			4.68	310	385	410	485

BOCK BRANCH

Delaney Road	019	33.1	32.9	0.13	40	65	75	105
DS Delaney Rd. to US South St.	022	32.8	US31.0	0.22	55	95	110	160
Into Struc. 4 4/	024	DS31.0	US30.0	0.39	105	170	205	290
Out of Struc. 4	007			0.39	23	30	33	41

1/ Natural detention area south of Dewey Road and west of Delaney Road
2/ Natural detention area south of Dewey Road
3/ Hopkins Lake
4/ Natural detention area southwest of the intersection of South Street and the Penn Central railroad tracks
5/ From D5 Farm Lane Crossing at station 106+60 to U5 Freeman Street
6/ From D5 Freeman Street to Penn Central Railroad

3

TABLE 2 - FLOOD ELEVATION AT SECTIONS 1/

OWOSSO DRAIN

Location	Section	Station	10-Year	50-Year	100-Year	500-Year
Penn Central 2/ Railroad	10.0 U	32+70	735.5	736.4	737.1	738.6
Stewart Street 2/	11.0	46+10	735.5	736.8	737.3	739.0
Freeman Street 2/	D	68+45	735.5	736.8	737.3	739.0
3/	U	68+75	738.8	739.3	739.5	740.0
South Street 3/	12.0	81+70	739.0	739.5	739.6	740.2
3/	12.1	84+85	739.0	739.5	739.6	740.2
3/	12.5	100+90	739.0	739.5	739.6	740.2
3/	12.9	105+60	739.0	739.5	739.6	740.2
Farm Lane	13.0 D	106+60	739.0	739.5	739.6	740.2
Crossing 3/	13.0 U	107+00	740.1	740.2	740.2	740.3
	13.1	108+00	740.1	740.2	740.3	740.4
	13.9	122+93	740.3	740.6	740.7	741.0
Farm Lane Crossing	14.0 D	124+23	740.3	440.6	740.7	741.0
	14.0 U	124+57	740.4	740.7	740.8	741.1
	14.1	125+90	740.4	740.7	740.8	741.1
	14.9	140+90	740.5	740.9	741.0	741.3
Farm Lane Crossing	15.0 D	142+53	740.5	740.9	741.0	741.3
	15.0 U	142+87	740.6	740.9	741.0	741.3
	15.1	143+50	740.6	740.9	741.0	741.4
Farm Lane Crossing	16.0 D	145+20	740.6	740.9	741.0	741.4
	16.0 U	145+40	740.6	740.9	741.1	741.4
	16.5	146+60	740.7	741.0	741.1	741.5
Dewey Road	17.0 DS	147+61	740.7	741.0	741.1	741.5
	17.0 US	148+19	742.3	742.6	742.7	742.8
	17.5	148+80	742.4	742.6	742.7	742.9
Farm Lane Crossing	18.0 DS	149+44	742.4	742.6	742.7	742.9
	18.5	156+40	742.4	742.6	742.7	742.9
	18.9	163+18	742.4	742.6	742.7	742.9
~~Dewey~~ Delaney Rd. 4/	19.0 DS	164+18	742.4	742.6	742.7	742.9
	19.0 US	164+82	742.7	743.2	743.4	743.8
	19.1	165+50	742.8	743.2	743.4	743.8
	19.7	185+20	742.8	743.2	743.4	743.8

1/ From WSP-2 Computer Output, Filename = OWOSOFWS.OUT
2/ From Structure 6, TR-20 Computer Output, Filename = TR200WOS.OUT
3/ From Structure 5, TR-20 Computer Output, Filename = TR200WOS.OUT
4/ From Structure 1, TR-20 Computer Output, Filename = TR200WOS.OUT

TABLE 2 - FLOOD ELEVATION AT SECTIONS 1/

BOCK BRANCH

Location		Section	Station	10-Year	50-Year	100-Year	500-Year
	2/	29.9	9+60	738.8	739.3	739.5	740.0
Penn Central Railroad	2/	30.0 D	10+50	738.8	739.3	739.5	740.0
	3/	30.0 U	10+70	740.3	740.8	741.0	741.6
	3/	30.5	10+80	740.3	740.8	741.0	741.6
South Street	3/	31.0 D	13+68	740.3	740.8	741.0	741.6
		31.0 U	14+12	742.9	742.9	743.0	743.0
		31.5	14+65	742.9	743.0	743.1	743.2
Drive		32.0 D	15+28	743.0	743.2	743.3	743.6
		32.0 U	15+52	743.0	743.2	743.3	743.6
		32.1	17+20	743.1	743.3	743.5	743.7
		32.2	18+80	743.2	743.5	743.6	743.9
		32.25	20+50	743.3	743.7	743.8	744.1
		32.3	26+20	746.1	746.5	746.8	747.1
Footbridge		32.5 D	28+42	747.2	747.6	747.9	748.7
		32.5 U	28+46	747.3	747.8	748.0	748.4
		32.6	31+70	749.2	749.4	749.5	749.7
		32.7	34+80	751.0	751.1	751.2	751.5
		32.8	37+80	751.5	751.7	751.8	752.1
		32.9	42+00	752.8	753.1	753.2	753.3
		33.0 D	$3+00	752.9	753.1	753.2	753.3
		33.0 U	43+60	754.0	755.4	756.1	759.1
		33.1	44+25	754.0	755.4	756.1	759.11

1/ From WSP-2 Computer Output Filename = BOCKWSP2.OUT
2/ From Structure 5, TR-20 Computer Output, Filename = TR200WOS.OUT
3/ From Structure 4, TR-20 Computer Output, Filename = TR200WOS.OUT

4

BENCH MARK DESCRIPTIONS *

OWOSSO DRAIN
SHIAWASSEE COUNTY, MICHIGAN

BM USGS 727

Southeast corner of SW 1/4 of Section 13, T7N, R2W - Located on northwest corner of the intersection of M-21 and M-52. Iron post with a bronze cap stamped "727", located one foot east of the northeast corner of the Public Library.

Elev. 726.88

TBM 1

Section 13, T7N, R2W - Top of northeast bonnet bolt of fire hydrant, located on northeast corner of the intersection of M-52 and Curwood Castle Road. Approximately 40 feet east of 1/4 section line of Section 13 and 730 feet north of centerline of M-21.

Elev. 725.64

TBM 2

Section 13, T7N, R2W - Top of northeast bonnet bolt of fire hydrant located between sidewalk and west side of M-52. Approximately 25 feet north of Mitchell Park entrance and west of Williams Road "T" intersection. Approximately 30 feet west of 1/4 section line of Section 13, and approximately 1150 feet north of centerline of M-21.

Elev. 735.81

TBM 3

Section 13, T7N, R2W - Northwest corner of headwall of 1.6 foot diameter concrete culvert on north bank of Shiawassee River. Approximately 25 feet west of northwest corner of M-52 bridge over Shiawassee River. Approximately 70 feet west of 1/4 section line and 1050 feet north of centerline of M-21.

Elev. 724.19

* Elevations based on USC & GS mean sea level datum of 1929.

TBM 4

Section 24, T7N, R2W - Top of northeast bonnet bolt of fire hydrant located on the south side of M-21. Located southeast of "T" intersection of M-21 and Johns Street. Approximately 350 feet east of 1/4 section line and approximately 40 feet south of centerline of M-21.

Elev. 730.70

TBM 5

Section 13, T7N, R2W - On the northwest corner of the M-21 bridge over Shiawassee River. Painted chiseled square in northeast corner of the top of the northwest abutment. Approximately 650 feet east of 1/4 section line and approximately 40 feet north of centerline of M-21.

Elev. 731.54

TBM 6

NE corner of NW 1/4 of Section 24, T7N, R2W - Top of northeast bolt on bonnet ring of fire hydrant located on the southwest corner of M-21 and M-52.

Elev. 731.05

TBM 7

NE 1/4 of NW 1/4 of Section 24, T7N, R2W - Top of northeast bolt of top bonnet ring of fire hydrant located on the southwest corner of M-21 and South Elm Street.

Elev. 734.79

TBM 8

NE 1/4 of NE 1/4 of NW 1/4 of Section 24, T7N, R2W - Top of northeast bolt of top bonnet ring of fire hydrant located on the southwest corner of the intersection of Clinton Street and South Elm Street.

Elev. 733.64

TBM 9

N 1/2 of NE 1/4 of NW 1/4 of Section 24, T7N, R2W - Top of northeast bolt of bonnet ring on fire hydrant located on the northeast corner of the intersection of Clinton Street and South Howell Street.

Elev. 735.86

TBM 10

NW 1/4 of NE 1/4 of NW 1/4 of Section 24, T7N, R2W - Top of northeast bolt of bonnet ring of fire hydrant located on the southeast corner of "T" intersection of South Cedar Street and Clinton Street.

Elev. 741.97

TBM 11

SW 1/4 of NE 1/4 of NW 1/4 of Section 24, T7N, R2W - Top of northeast bolt of top bonnet ring of fire hydrant located on the northeast corner of the "T" intersection of South Cedar Creet and Cass Street.

Elev. 739.38

TBM 12

NW corner of SE 1/4 of NW 1/4 of Section 24, T7N, R2W - Top of northeast bolt of top bonnet ring of fire hydrant located on the southeast corner of the intersection of South Cedar Street and City Yard Drive.

Elev. 741.83

TBM 13

West side of SE 1/4 of NW 1/4 of Section 24, T7N, R2W - Top of northeast bolt on top bonnet ring of fire hydrant located on the northeast corner of the intersection of South Cedar Street and Fletcher Street.

Elev. 742.45

TBM 14

West side of SE 1/4 of NW 1/4 of Section 24, T7N, R2W - Top of northeast bolt on top bonnet ring of fire hydrant located on the northeast corner of the intersection of South Cedar Street and Ryan/Thomas Street.

Elev. 739.62

TBM 15

SW corner of SE 1/4 of NW 1/4 of Section 24, T7N, R2W - Top of northeast bolt of top bonnet ring of fire hydrant located on the northeast corner of the intersection of South Cedar Street and West Stewart Street.

Elev. 738.96

TBM 16

NE 1/4 of NW 1/4 of SW 1/4 of Section 24, T7N, R2W - Top of northeast bolt on bonnet ring of fire hydrant located on the southeast corner of the "T" intersection of West Stewart Street and South Lyon Street.

Elev. 737.39

TBM 17

NE 1/4 of NW 1/4 of SW 1/4 of Section 24, T7N, R2W - Top of northeast bolt on bonnet ring of fire hydrant located on the northeast corner of the "T" intersection of South Lyon Street and Ament Street.

Elev. 738.22

TBM 18

NE 1/4 of NW 1/4 of SW 1/4 of Section 24, T7N, R2W - Top of northeast bolt on bonnet ring of fire hydrant located on the northeast corner of the "T" intersection of South Lyon Street and Grace Street.

Elev. 738.29

TBM 19

SW 1/4 of NW 1/4 of SW 1/4 of Section 24, T7N, R2W - Top of northeast bolt on top bonnet ring of fire hydrant located on the northeast corner of the intersection of Clyde Street and State Street.

Elev. 739.10

TBM 20

SE 1/4 of NE 1/4 of SE 1/4 of Section 23, T7N, R2W - Top of northeast bolt on bonnet ring of fire hydrant located on the northwest corner of the intersection of South Chipman Street and Frederick Street.

Elev. 740.23

TBM 21

SW 1/4 of SE 1/4 of NE 1/4 of SE 1/4 of Section 23, T7N, R2W - Top of northeast bolt on bonnet ring of fire hydrant located on the northwest corner of the intersection of Frederick Street and Kenwood Drive. Approximately 410 feet west and 1485 feet north of the southeast corner of Section 23.

Elev. 739.26

TBM 22

NW 1/4 of NE 1/4 of SE 1/4 of SE 1/4 of Section 23, T7N, R2W - Top of northeast bolt on bonnet ring of fire hydrant located on the northeast corner of the interaction of Kenwood Drive and Freeman Street. Approximately 340 feet west and 1090 feet north of the southwest corner of Section 23.

Elev. 739.61

TBM 23

SW 1/4 of NE 1/4 of SE 1/4 of SE 1/4 of Section 23, T7N, R2W - Top of northeast bolt on bonnet ring of fire hydrant located on the northeast corner of the "T" intersection of Kenwood Drive and Herman Street. Approximately 340 feet west and 770 feet north of southeast corner of Section 23.

Elev. 742.66

TBM 24

SE 1/4 of NW 1/4 of SE 1/4 of SE 1/4 of Section 23, T7N, R2W - Top of northeast bolt on bonnet ring of fire hydrant located on the northeast corner of the intersection of Herman Street and George Street. Approximately 710 feet west and 760 feet north of southeast corner of Section 23.

Elev. 739.48

TBM 25

NW 1/4 of SE 1/4 of SE 1/4 of SE 1/4 of Section 23, T7N, R2W - Top of northeast bolt on bonnet ring of fire hydrant located on the northeast corner of the "T" intersection of George Street and Hiram Street. Approximately 640 feet west and 335 feet north of the southeast corner of Section 23.

Elev. 742.21

TBM 26

SW 1/4 of SE 1/4 of SE 1/4 of SE 1/4 of Section 23, T7N, R2W - Top of northeast bolt of bonnet ring of fire hydrant located on the northeast corner of the "T" intersection of George Street and South Street. Approximately 625 feet east and 25 feet north of the southeast corner of Section 23.

Elev. 739.74

TBM 27

SE 1/4 of SW 1/4 of SE 1/4 of SE 1/4 of Section 23, T7N, R2W - Top of northeast bolt on bonnet ring of fire hydrant located on the northeast corner of the "T" intersection of South Street and Nelson Street. Approximately 1020 feet east and 30 feet north of the southeast corner of Section 23.

Elev. 739.60

TBM 28

SE 1/4 of SE 1/4 of SW 1/4 of SE 1/4 of Section 23, T7N, R2W - Top of northeast bolt on bonnet ring of fire hydrant on the northeast corner of the "T" intersection of South Street and Carr Street. Approximately 1335 feet east and 30 feet north of the southeast corner of Section 23.

Elev. 738.87

TBM 29

SW 1/4 of SW 1/4 of SW 1/4 of SE 1/4 of Section 23, T7N, R2W - SCS nail and disk in south side of post on the southwest corner of Bunker Storage Facility. Located approximately 20 feet north of north edge of South Street, and approximately 100 feet west of centerline of railroad track, at north edge of South Street.

Elev. 742.45

TBM 30

SE 1/4 of SW 1/4 of SE 1/4 of SW 1/4 of Section 23, T7N, R2W - SCS nail and disk on south side of power pole located approximately 16 feet north of north edge of South Street. Located approximately 1740 feet east and approximately 30 feet north of southwest corner of Section 23.

Elev. 745.61

TBM 30a

Section 23, T7N, R2W - SCS nail and disk in south side of power pole located approximately 410 feet west of South Chestnut Street and 30 feet north of the centerline of South Street.

Elev. 742.98

TBM 31

SE 1/4 of SW 1/4 of SW 1/4 of SW 1/4 of SW 1/4 of Section 23, T7N, R2W - SCS nail and disk on north side of power pole located approximately 16 feet north of north edge of South Street, approximately 600 feet east and 30 feet north of southwest corner of Section 23.

Elev. 754.65

TBM 31a

Section 23, T7N, R2W - Outlet invert of 12 inch diameter concrete pipe at south end of detention pond, approximately 550 feet east of Delaney Road on the north ditch bank of Bock Branch.

Elev. 750.46

TBM 32

SW 1/4 of NW 1/4 of SW 1/4 of SW 1/4 of Section 23, T7N, R2W - SCS nail and disk on west side of power pole located approximately 35 feet east of the centerline of Delaney Road. Approximately 780 feet north of South Street, and approximately 150 feet north of Bock Branch.

Elev. 757.37

TBM 33

West side of NE 1/4 of NE 1/4 of Section 26, T7N, R2W - Center of manhole cover of sanitary sewer located approximately 1320 feet west and 195 feet south of northeast corner of Section 26. Located approximately 12 feet east of Owosso Drain ditch bank and approximately 22 feet south of fenceline of ditch bank.

Elev. 741.79

TBM 34

West side of NE 1/4 of NE 1/4 of Section 26, T7N, R2W - Top of bolt on west side of flange of sanitary sewer cover, located approximately 24 feet northwest of trailer at 1410 Calvert Street, and approximately 16 feet east of Owosso Drain ditch bank. Located approximately 1320 feet west and 680 feet south of northeast corner of Section 26.

Elev. 740.45

TBM 34a

West side of NE 1/4 of NE 1/4 of Section 26, T7N, R2W - Center of sanitary sewer manhole cover 1860z located northwest of trailer at 1410 Calvert Street and approximately 20 feet east of Owosso Drain ditch bank.

Elev. 741.04

TBM 35

W 1/16 section line of NE 1/4 of NE 1/4 of Section 26, T7N, R2W - Center of manhole cover approximately 22 feet west of trailer at 1412 Pembroke Street, and approximately 20 feet east of Owosso Drain ditch bank. Located approximately 1320 feet east and 1140 feet south of northeast corner of Section 26.

Elev. 740.06

TBM 36

West section line of NW 1/4 of SE 1/4 of NE 1/4 of Section 26, T7N, R2W - Top of bolt on northeast side of flange of manhole cover located southwest of 1419 Renfrew Street. Located 1320 feet west and 1540 feet south of northeast corner of Section 26. Located approximately 20 feet east of ditch bank and 35 feet north of cyclone fence along ditch bank south of trailer park.

Elev. 742.55

TBM 37

North section line of SE 1/4 of SW 1/4 of SW 1/4 of NE 1/4 of Section 26, T7N, R2W - Top of east corner of lowest cross beam of structure on upstream end of CMP arch, 6.5 feet wide, 5.2 feet high; at lane crossing ditch. Located approximately 1770 feet west and approximately 1990 feet south of northeast corner of Section 26.

Elev. 737.31

TBM 38

SW 1/4 of NW 1/4 of SE 1/4 of Section 26, T7N, R2W - SCS nail and disk in the west side of a 36 inch diameter maple tree located approximately 90 feet northeast of CMP culvert at farm crossing, and 40 feet east of Owosso Drain ditch bank. Located approximately 2310 feet west and approximately 1690 feet north of southeast corner of Section 26.

Elev. 743.96

TBM 39

SW 1/4 of SE 1/4 of SW 1/4 of Section 26, T7N, R2W - SCS nail and disk in the south side of an 18 inch diameter poplar tree on the southwest edge of a pond, approximately 70 feet east of centerline of the culvert in the ditch crossing. Located approximately 1640 feet east and 350 feet north of the southwest corner of Section 26.

Elev. 741.67

TBM 40

Southeast corner of SW 1/4 of SW 1/4 of Section 26, T7N, R2W - SCS nail and disk in the east side of a 10 inch diameter tree on a property line west of the ditch at the culvert under Dewey Road and 29 feet north of the centerline of Dewey Road. Located approximately 1320 feet east of the southwest corner of Section 26.

Elev. 741.07

TBM 40a

Section 35, T7N, R2W - SCS nail and disk in southeast fence corner post, located approximately 440 feet south of Dewey Road and approximately 700 feet east of Delaney Road.

Elev. 741.39

TBM 41

Section 26, T7N, R2W - SCS nail and disk in south side of power pole located approximately 6 feet north of north side of Dewey Road and 125 feet east of centerline of Delaney Road.

Elev. 746.90

TBM 42

SW 1/4 of SE 1/4 of NE 1/4 of Section 34, T7N, R2W - SCS nail and disk in south side of 12 inch diameter maple tree, along old fenceline, approximately 50 feet east of railroad grade. Located approximately 450 feet north of property line (path intersection) along railroad grade, and approximately 2400 feet southwest of northeast corner of Section 34, along railroad grade.

Elev. 743.36

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GLOSSARY

BACKWATER--The resulting highwater surface upstream from a dam, bridge or other obstruction in a river channel or high stages in a receiving stream.

BRIDGE DECK--Elevation of road surface at the bridge.

BRIDGE LOW CLEARANCE--The lowest point of a bridge or other structure over or across a river, stream or water course that limits the opening through which water flows. This is referred to as "low steel" or "low chord". It often is higher than the low point of the roadway.

CHANNEL or WATER COURSE--An elongated depression either natural or man-made having a bed and well-defined banks varying in depth, width and length which gives direction to a current of water and is normally described as a creek, stream or riverbed.

CHANNEL BOTTOM--The lowest part of the stream channel (either in a constructed cross-section or a natural channel). Bottom elevations at a series of points along the length of a stream may be plotted and connected to provide a stream bottom profile.

CONFLUENCE--A flowing together or place of junction of two or more streams.

CROSS-SECTION or VALLEY SECTION--A graph showing the shape of the stream bed, banks and adjacent land on either side made by plotting elevations at measured distances along a line perpendicular to the flow of the stream.

DATUM--An assumed reference plane from which elevations and depths are measured such as from sea level.

HIGH WATER OR FLOOD PROFILE--A graph showing the relationship of water surface elevation location along the stream. While it is drawn to show surface elevations for the crest of a specific flood, it may be prepared for conditions at any other given time or stage.

ELEVATION-DISCHARGE RELATIONSHIP--The relationship between water surface elevation and rate of flow at a specified location for a range of flow rates.

FLOOD--A temporary overflow by a river, stream, ocean, lake or other body of land not normally covered by water. It does not include the ponding of surface water due to inadequate drainage such as within a development. It is characterized by damaging inundation, backwater effects of surcharging sewers and local drainage channels, and by unsanitary conditions within adjoining flooded habitated areas attributable to pollutants, debris and water table.

FLOOD CREST--The maximum stage or elevation reached by flood waters at a given location.

FLOOD FREQUENCY--A means of expressing the probability of flood occurrences as determined from a statistical analysis of representative stream flow or rainfall and runoff records. It is customary to estimate the frequency with which specific flood stages or discharges may be equaled or exceeded, rather than the frequency of an exact stage or discharge. Such estimates by strict definition are designated "exceedence frequence", but in practice the term "frequency" is used. The frequency of a particular stage or discharge is usually expressed as occurring once in a specified number of years.

10-YEAR FLOOD--A flood having a long-term average frequency of occurrence in the order of once in 10 years. It has a ten percent chance of being equaled or exceeded in any given year.

100-YEAR FLOOD--A flood having a long-term average frequency of occurrence in the order of once in 100 years. It has a one percent chance of being equaled or exceeded in any given year. This flood is comparable to the "Intermediate Regional Flood" used by the U.S. Army Corps of Engineers.

FLOOD PEAK--The maximum instantaneous discharge or volume of flow in cubic feet per second passing a given location. It usually occurs at or near the time of the flood crest.

FLOOD PLAIN--The relatively flat area or low lands covered by flood waters originating with either the adjoining channel of a water course such as a river or stream, or a body of standing water such as an ocean or lake.

FLOOD ROUTING--The process of determining progressively the timing and shape of a flood wave at successive points along a stream. This procedure is used to derive a downstream hydrograph from an upstream hydrograph. Local inflow and tributary hydrographs are considered.

FLOOD STAGE--The elevation at which overflow of the natural stream banks or body of water occurs.

FLOODWAY--The portion of the flood plain including the channel of the stream that is required for the conveyance of flood flow.

FLOODWAY FRINGE--The area of the flood plain lying outside the floodway which may be covered by flood waters originating from an adjoining river or stream.

HEAD LOSS--The effect of obstructions, such as narrow bridge openings, dams or buildings, that limit the area through which water must flow, raising the surface water upstream from the obstruction.

HEADWATER--The tributaries and upper reaches which are the sources of the stream.

HYDRAULICS--The science of the laws governing the motion of water and their practical applications.

HYDROGRAPH--A graph denoting the discharge or stage of flow over a period of time.

HYDROLOGY--The science dealing with the occurrence and movement of water upon and beneath the land areas of the earth.

INUNDATION--The flooding or overflow of an area with water.

LEFT BANK--The bank of the left side of a river, stream or water course, looking downstream.

LOW GROUND--The highest elevation at a specific stream channel cross-section at which the flow in the stream can be contained in the channel without overflowing into adjacent overbank areas.

MANNING'S "n"--A coefficient of channel and overbank roughness used in Manning's open channel flow formula, commonly called a retardance factor.

REACH LENGTH--A longitudinal length of stream channel selected for use in hydraulic or other computations.

RIGHT BANK--The bank on the right side of the river, stream or water course, looking downstream.

ROAD OVERFLOW--The lowest elevation on a road profile in the vicinity of where the road and stream cross. It is the first point on the roadway inundated if overtopping of the road occurs during a storm.

RUNOFF--That part of precipitation, as well as any other flow contributions, which appears in surface streams of either perennial or intermittent form.

TIME OF CONCENTRATION--Time required for water to flow from the most remote point of a watershed to the outlet or other point of reference.

WATERSHED--A drainage basin or area which collects runoff and transmits it, usually by means of streams and tributaries, to the outlet of the basin.

WATERSHED BOUNDARY--The divide separating one drainage basin from another.

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TECHNICAL SUPPORT DOCUMENTATION

FOR

FLOOD PLAIN MANAGEMENT STUDY

FOR

OWOSSO DRAIN
SHIAWASSEE COUNTY, MICHIGAN

PREPARED FOR

CITY OF OWOSSO
SHIAWASSEE COUNTY DRAIN COMMISSIONER
OWOSSO TOWNSHIP

IN COOPERATION WITH

MICHIGAN DEPARTMENT OF NATURAL RESOURCES

BY

UNITED STATES DEPARTMENT OF AGRICULTURE

ASSISTING THE

SHIAWASSEE COUNTY SOIL CONSERVATION DISTRICT

JUNE 1994

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14. Miscellaneous-Plan of Work & Floppy ✓

INVESTIGATIONS AND ANALYSIS

SURVEY PROCEDURES

Field surveys were made of bridges, roads, structures, channels and flood plains of the Owosso Drain and Bock Branch by the Soil Conservation Service (SCS) in October 1992 and completed in July 1993. Temporary bench marks, based on USC and GS mean sea level elevation data of 1929, were established using second order accuracy. Temporary bench marks are described in Part 4 of this Techincal Report. For Owosso Drain and Bock Branch 48 road bridges and valley cross-sections were surveyed. In addition, 2 foot contour maps were provided by the City of Owosso.

HYDROLOGY AND HYDRAULICS

Physical data were obtained from USGS topographic maps and soil survey maps, as well as on-site field inspections. The watershed boundary was determined from map studies and field checks. The watershed was divided into 16 sub-watershed areas for use in evaluating the runoff volumes. Drainage areas for the sub-watersheds were measured from USGS topographic maps. Times of concentration were calculated for the sub-watersheds using the Soil Conservation Service TR55 Computer Module and Manning's formula. Each sub-watershed was evaluated for land use, cover and soils. Runoff curve numbers were calculated using TR55 as described in Part 7 of the technical documentation book.

Channel flood routings to establish peak discharge-frequency relationships were made using the PC version of the SCS TR-20 Hydrology Computer Program dated September 1, 1983. The Modified Attenuation-Kinematic (Att-Kin) method of routing through stream channels is used by this program. This method is derived from inflow-outflow hydrograph relationships. The SCS WSP-2 computer program was used to obtain stage-discharge relationships. The TR-20 computer program uses these data and the Storage-Indication Method of evaluating the effect of the structures in reducing peak flood discharges. Elevation-storage relationships for the structures were obtained from USGS quadrangle maps and contour maps. Six natural storage areas were treated as structures in the TR-20 model. They have a significant impact on peak discharges and flood elevations. The TR-20 Flood Routing Schematic can be found in Part 12 of the techical support documentation. Table 1, in Part 2, lists discharges obtained from the flood routings and Table 2, in Part 3, lists flood elevations at sections located in the study area. According to information found on page 164, Water Resources Data, Mich. 1992, USGS Water Data Report MI-92-1, base flow is 0.64 cfs/sq. mi. Due to the small size of this watershed (4.68 sq. mi.) base flow was not considered.

The TR-20 model was used to reproduce elevations from the October 1, 1981 flood event and has been accepted as a basis of the hydrology and flood routing for the Owosso Drain and Bock Branch. Hourly rainfall information from the weather station at Owosso, Michigan was used to model the flood. The prediced flood elevation was within 0.2 foot of the observed elevation. The Antecedent Moisture Condition (AMC) for the time before the storm was determined from the rainfall data. The AMC is based upon the 5-day antecedent rainfall before the storm event. From the rainfall data, the AMC was AMC II.

Separate water surface profiles for Owosso Drain and Bock Branch were developed using the SCS WSP-2 computer program. This program uses the step method of computation to solve the Benoulli equation, and the Bureau of Public Roads bridge loss analysis. Flood discharges determined from flood routings were used in the water surface profile program to develop high water profiles along the channel. Manning's "n" values were determined from photographs and field investigations of the channel and flood plain.

A 24 inch RCP under the Penn Central Railroad located approximately 3,000 feet south of Dewey Road allows backwater from the Maple River to enter the Owosso Drain; however, according to interviews with local residents, backwaters from the Maple River have never topped the railroad. Since any backwater from the Maple River entering the Owosso Drain would occur several hours after the Owosso Drain peaks, the effects on flood elevations and peak discharges along the Owosso Drain would be minimal. It should also be noted that flood waters from the Owosso Drain will exit the Owosso Drain Watershed and enter the Maple River through the 24 inch RCP during major storm events. Again, due to the limited capacity of the 24 inch RCP the effects would be very minimal and were ignored in this analysis.

Normal bridge and channel flow conditions were assumed in the hydraulic computations. No consideration was made for openings blocked by ice or other debris. Channel and flood plain flow characteristics may change due to vegetative growth, sedimentation, scour, debris accumulation, filling and encroachment. Computations for this study considered only those features in the flood plain at the time of the field surveys. Future flood plain developments and modifications, as well as changes in the upstream drainage areas and land use and cover will require recomputation of water surface profiles.

Flood plain delineations were made on the photo maps. Computed water surface elevations at surveyed sections and bridges were used to identify flood plain limits. Between sections, topographic map interpretations and field inspections were used to delineate the flood boundary lines. Limits of flooding shown on the photo maps may vary from true ground location due to inherent photographic displacement. High water profile elevations and detailed field surveys should be used to determine the extent or depth of flooding at any specific site.

The limits of the 100-year and 500-year floods were too close to delineate, and the limits of the two flood plains are shown as the same line on the quadrangle sheet.

TABLE 1 - FlOOD DISCHARGES

OWOSSO DRAIN

Location	TR-20 Sec.	From Sec.	To Sec.	Drainage Area Sq. Miles	Estimated Peak Discharges Cubic Feet Per Second 10-Yr	50-Yr	100-Yr	500 Yr
Into Struc. 1 1/	004	19.7	US19.0	0.23	90	152	181	258
Out of Struc. 1	Struc. 1			0.23	33	34	35	36
Into Struc. 2 2/	007	DS19.0	US17.0	1.41	270	460	549	789
Out of Struc. 2	Struc. 2			1.41	149	306	377	568
To Sta. 106+60	016	DS17.0	US13.0	3.02	200	335	405	600
Into Struc. 3 3/	011	___	___	0.44	115	160	195	305
Out of Struc. 3	Struc. 3			0.44	9	15	18	25
Into Struc. 5 5/	025	DS13.0	US11.5	3.85	300	520	630	935
Out of Struc. 5 5/	Struc. 5			3.85	145	230	270	425
Into Struc. 6 6/	029	DS11.5	US10.0	4.40	275	410	470	645
Out of Struc. 6	Struc. 6	DS10.0	9.0	4.40	205	230	250	290
At Shiawassee River	031			4.68	310	385	410	485

BOCK BRANCH

Delaney Road	019	33.1	32.9	0.13	40	65	75	105
DS Delaney Rd. to US South St.	022	32.8	US31.0	0.22	55	95	110	160
Into Struc. 4 4/	024	DS31.0	US30.0	0.39	105	170	205	290
Out of Struc. 4	007			0.39	23	30	33	41

1/ Natural detention area south of Dewey Road and west of Delaney Road
2/ Natural detention area south of Dewey Road
3/ Hopkins Lake
4/ Natural detention area southwest of the intersection of South Street and the Penn Central railroad tracks
5/ From D5 Farm Lane Crossing at station 106+60 to U5 Freeman Street
6/ From D5 Freeman Street to Penn Central Railroad

TABLE 2 - FLOOD ELEVATION AT SECTIONS 1/

OWOSSO DRAIN

Location		Section	Station	10-Year	50-Year	100-Year	500-Year
Penn Central Railroad	2/	10.0 U	32+70	735.5	736.4	737.1	738.6
Stewart Street	2/	11.0	46+10	735.5	736.8	737.3	739.0
Freeman Street	2/	D	68+45	735.5	736.8	737.3	739.0
	3/	U	68+75	738.8	739.3	739.5	740.0
South Street	3/	12.0	81+70	739.0	739.5	739.6	740.2
	3/	12.1	84+85	739.0	739.5	739.6	740.2
	3/	12.5	100+90	739.0	739.5	739.6	740.2
	3/	12.9	105+60	739.0	739.5	739.6	740.2
Farm Lane		13.0 D	106+60	739.0	739.5	739.6	740.2
Crossing	3/	13.0 U	107+00	740.1	740.2	740.2	740.3
		13.1	108+00	740.1	740.2	740.3	740.4
		13.9	122+93	740.3	740.6	740.7	741.0
Farm Lane Crossing		14.0 D	124+23	740.3	440.6	740.7	741.0
		14.0 U	124+57	740.4	740.7	740.8	741.1
		14.1	125+90	740.4	740.7	740.8	741.1
		14.9	140+90	740.5	740.9	741.0	741.3
Farm Lane Crossing		15.0 D	142+53	740.5	740.9	741.0	741.3
		15.0 U	142+87	740.6	740.9	741.0	741.3
		15.1	143+50	740.6	740.9	741.0	741.4
Farm Lane Crossing		16.0 D	145+20	740.6	740.9	741.0	741.4
		16.0 U	145+40	740.6	740.9	741.1	741.4
		16.5	146+60	740.7	741.0	741.1	741.5
Dewey Road		17.0 DS	147+61	740.7	741.0	741.1	741.5
		17.0 US	148+19	742.3	742.6	742.7	742.8
		17.5	148+80	742.4	742.6	742.7	742.9
Farm Lane Crossing		18.0 DS	149+44	742.4	742.6	742.7	742.9
		18.5	156+40	742.4	742.6	742.7	742.9
		18.9	163+18	742.4	742.6	742.7	742.9
Dewey Rd.	4/	19.0 DS	164+18	742.4	742.6	742.7	742.9
		19.0 US	164+82	742.7	743.2	743.4	743.8
		19.1	165+50	742.8	743.2	743.4	743.8
		19.7	185+20	742.8	743.2	743.4	743.8

1/ From WSP-2 Computer Output, Filename = OWOSOFWS.OUT
2/ From Structure 6, TR-20 Computer Output, Filename = TR200WOS.OUT
3/ From Structure 5, TR-20 Computer Output, Filename = TR200WOS.OUT
4/ From Structure 1, TR-20 Computer Output, Filename = TR200WOS.OUT

TABLE 2 - FLOOD ELEVATION AT SECTIONS 1/

BOCK BRANCH

Location		Section	Station	10-Year	50-Year	100-Year	500-Year
	2/	29.9	9+60	738.8	739.3	739.5	740.0
Penn Central Railroad	2/	30.0 D	10+50	738.8	739.3	739.5	740.0
	3/	30.0 U	10+70	740.3	740.8	741.0	741.6
	3/	30.5	10+80	740.3	740.8	741.0	741.6
South Street	3/	31.0 D	13+68	740.3	740.8	741.0	741.6
		31.0 U	14+12	742.9	742.9	743.0	743.0
		31.5	14+65	742.9	743.0	743.1	743.2
Drive		32.0 D	15+28	743.0	743.2	743.3	743.6
		32.0 U	15+52	743.0	743.2	743.3	743.6
		32.1	17+20	743.1	743.3	743.5	743.7
		32.2	18+80	743.2	743.5	743.6	743.9
		32.25	20+50	743.3	743.7	743.8	744.1
		32.3	26+20	746.1	746.5	746.8	747.1
Footbridge		32.5 D	28+42	747.2	747.6	747.9	748.7
		32.5 U	28+46	747.3	747.8	748.0	748.4
		32.6	31+70	749.2	749.4	749.5	749.7
		32.7	34+80	751.0	751.1	751.2	751.5
		32.8	37+80	751.5	751.7	751.8	752.1
		32.9	42+00	752.8	753.1	753.2	753.3
		33.0 D	$3+00	752.9	753.1	753.2	753.3
		33.0 U	43+60	754.0	755.4	756.1	759.1
		33.1	44+25	754.0	755.4	756.1	759.11

1/ From WSP-2 Computer Output Filename = BOCKWSP2.OUT
2/ From Structure 5, TR-20 Computer Output, Filename = TR200WOS.OUT
3/ From Structure 4, TR-20 Computer Output, Filename = TR200WOS.OUT

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Main Branch

	C.S.	Station	Channel Bottom	Low Ground	Inlet Invert(us)	Outlet Invert(os)	Pipe Info.
p.25	Outlet @ Shiawassee River	0+00	716.6 sediment	723.2 @ sta. 0+08 (8' us.)		715.7 Outlet Invert 722.4 top of pipe (calc)	
							pipe dia. 6.6' thickness 9"
		0+70		724.0 (from contour map)			
		1+10		726.0 (from contour map)			
p.25	Tile #1 @ M-52 & Bradley	6+50		726.7 (from contour map)		718.3 invert 724.9 top of pipe	
p.26	Tile #2 @ M-52 and M-21	9+50		728.4 (from contour map)			
				Sta. 9+43 → 720.3 invert of pipe 726.9 top of pipe (calc)			
p.70	Tile #3 SE of Howell St.	20+40		734.0 (from contour map)		724.7 invert of pipe 731.3 top of pipe	
p.70	Tile #4 N. of Ann Arbor RR	32+40		736.0 (from contour map)		727.0 invert of pipe 733.6 top of pipe (calc)	6.6' dia. pipe arch
printout	10.0	32+90		742.3 Low in Rail		743.2 RR over pipe 742.7 Low Rd (@ Rd & RR)	

			Low Ground	
m. fr printout map	33+13		740.0	
	34+05		734.7	
	35+70		735.8	
	39+20		734.7	
	40+50		735.2	

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Main Branch 2

	CS.	Station	Channel Bottom	Low Ground	Inlet Invert (us)	Outlet Invert (ds)	Pipe Info.
p.72	Tile #5 @ Ryan/Kedor	42+20		736.0 (from contour map)	727.7 invert of pipe 734.4 top of pipe		pipe dia 6.6'
p.58	11.0 Stewart St	46+10		736.0 Low Rd. 736.2 ℄ over pipe			
	Junction Box	47+90					
	Ament St.	49+10		pipe 60" dia. 6" thickness			
p.71	Tile #6 @ State St.	55+30		736.0 (contour map)	728.6 Invert 733.1 Top (calc)		(pipe dia 54" 5.5" thick)
p.71	Tile #7 W. of Chipman	61+20		738.0 (contour map)	729.3 Invert 733.8 Top (calc)		(pipe dia 54")
p.71	Tile #8 @ Freeman	68+60		737.1 - Rd. @ curb p 71	730.2 Invert 734.7 Top (calc)		(pipe dia 54")
p.72	Tile #9 @ Herman & George	73+80		738.0 (contour map)	730.5 Invert 735.0 Top (calc)		(pipe dia 54")
p.72	Tile #10 E. of Nelson	78+60		736.1 (contour map)	731.3 Invert 735.8 Top (calc)		(pipe dia 54")
printout, p 29,30	12.0	81+70		736.9 Low Rd. 737.9 ℄ Rd. over pipe			
	Culvert inlet @ South & Nelson	83+35			731.7 Inlet Invert 736.7 Top of pipe (calc)		(60" dia. tile (concrete) 6" wall thickness of tile)

Bock Branch

	CS.	Station	Channel Bottom	Low Ground	Inlet Invert (US)	Outlet Invert (DS.)	Pipe Info.
ES 31.8 p 57	Outlet for Detention Basin (300' US. of CS 32.7)	Reach 2 37+80	749.6			750.5 Outlet Invert 760.5 Top of pipe	12" concrete pipe with 11" orifice @ inlet
p. 47	32.9	42+10	751.1	752.5			
p. 46, 47, 48	DS 33.0	43+00	750.4			750.0 Outlet Invert 753.4 DS Top of pipe	
	33.0 Delaney Rd.	43+30		759.7 759.7	Low in Rd. ℄ Rd. over pipe		3.5' dia. pipe 60' length
	US. 33.0	43+60	750.7		750.5 Inlet Invert 753.9 Top of pipe (US)		
p. 46	33.1 125' US of CS 33.0 outlet invert	44+25	749.7	752.5			

BOCK BRANCH

	CS.	Station	Channel Bottom	Low Ground	Inlet Invert (US)	Outlet Invert (DS)	Pipe Info.
p 52-54	DS 31.0	13+68	738.2			738.2	Outlet Invert
						740.1	DS. Top of pipe
	31.0 ℄ Chestnut and South St	13+90		742.7	~ow Rd. (p.53)		(24" dia. cmp
				743.1	℄ Rd. over pipe		44' long (p.54))
	US. 31.0	14+12			738.4	Inlet Invert	
					740.5	US. Top of pipe	
p.54,56	DS. 32.0	15+28	738.9			739.0	Outlet Invert
						741.0	DS. Top of pipe
p.56,54	32.0 N side Krouse Rd. (Driveway crossing)	15+40		741.9	Low Grnd.		
				742.8	℄ Rd over pipe		(24" dia. 24.5' long)
	US. 32.0	15+52	739.3		739.0	Inlet Invert	
					741.0	US Top of pipe	
p.55	surveyed pts.	17+40	740.0	741.9			
		18+80	740.2	742.0			
		20+50	740.4	742.0			
p.56	32.3	26+20	744.1	746.8			
p.56	footbridge	28+45	745.3			747.8	Top of bridge
						747.3	Low chord [illegible]
CS 32.6 ~.57	Reach 2 310' US. of CS. 32.7	31+70	747.5	749.4			
p.57	32.7	34+80	749.4	750.0			

BOCK BRANCH

	CS.	Station	Channel Bottom	Low Ground	Inlet Invert (US)	Outlet Invert (DS)	Pipe Info.
p. 48	190' DS. of CS 30.0	8+70	737.0				
p. 48	29.9	9+60	737.5	738.9			
p. 49	8' DS of CS 30.0	10+42	738.0				
p. 49	NORTH PIPE DS. 30.0	10+50	738.7			737.8 ✓ (calculated) 740.3 DS. Top of pipe	
	30.0	10+60		742.2 742.4	Low in Rail Rail over pipe		(2.5' dia. pipe 20 long)
	US. 30.0	10+70	738.4		✓ 738.4 Inlet Invert 740.9 US. Top of pipe		
p. 50	SOUTH PIPE (not shown on profile)						
	DS.		737.7			737.3 Outlet Invert 738.6 DS. Top of pipe	
	US		738.0		✓ 737.9 Inlet Invert 739.2 US. Top of pipe		(15" dia 25 long inlet - concrete outlet - CMP)
p. 50	30.5	10+80	738.7	740.5			
p. 50		13+50		741.3	? check this 741.3 on p. 50 (Carol added this pt.)		

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Main Branch

	CS.	Station	Channel Bottom	Low Ground	Inlet Invert (us.)	Outlet Invert (ds)	Pipe Info.
p.61, 64, 65	19.1	165+50	739.9	743.2 (p 65)			

BOCK BRANCH

	CS.	Station	Channel Bottom	Low Ground	Inlet Invert (us.)	Outlet Invert (ds)	Pipe Info.
p.68		0+00	732.6 see ④	733.7			
p.68		0+25	733.2				
p 68		1+25	733.9				
p.59		3+60	733.9				
p 59		5+30	735.7				
p.59	220' US. of culvert	5+80	735.9	736.9 (N. Bank) p 59			
p.40	450' DS of CS 30.0	6+10	736.0				
p 40	280' DS of CS 30.0	7+50	736.9				

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Main Branch

	CS	Station	Channel Bottom	Low Ground	Inlet Invert (US)	Outlet Invert (DS)	Pipe Info.
p.43	US. 17.0	148+19	736.5 sediment		735.4	Inlet Invert	Pipe 4.2' high @ US. end
					739.5	US. Top of pipe	
p 44	17.5 90' US ℄ Dewey Rd	148+80	736.5	740.5			
p.45	DS 18.0	149+44	735.7 sediment			735.3	Outlet Invert
						739.2	DS. Top of pipe
p.45	18.0 Ditch Crossing	149+60		739.9			(4' dia. pipe 32.5' long)
				740.0	℄ over pipe		
	US. 18.0	149+76	736.6 sediment		735.2	Inlet Invert	
					739.2	US. Top of pipe	
p 60	18.5	156+40	736.2	740.5			
p 63	18.9 (100' DS of CS 19.0 outlet @ sta 164+18	163+18	736.3	738.0			
p 61	DS. 19.0 (Bm 46)	164+18	736.5			735.8	Outlet Invert
						738.3	Top of pipe DS.
p.61,64	19.0 Delaney Rd	164+50		745.0	Low Rd		
				745.7	℄ Rd. over	pipe	30" x 64' CMP
p 61,64	US 19.0 (Sm 44)	164+82			736.2	Inlet Invert	
					738.7	Top of pipe US	
p 65	12' US CS.19.0 pipe inlet	164+94	738.0				
p 65	20' US. CS 19.0 pipe inlet	165+02	739.0	742.1			

Main Branch

	CS	Station	Channel Bottom	Low Ground	Inlet Invert(us)	Outlet Invert (ds)	Pipe Info.
p. 27	20' us inlet	83+55	731.2				
printout, p. 29, 30	12.1	84+85	731.7 p. 30	737.4			
p. 27	440' us. Culvert @ South & Nelson	87+75	731.7				
p. 68	foot crossing (broken) @ curve	88+10	732.3	733.7			see (3) on p. 68
p. 69	ditch shot @ Mansfield	89+55	732.5	734.5			
p. 69	@ Roslyn	91+75	732.3	734.6			
p. 69	@ Calvert	94+05	732.6	735.5			
p. 69	@ Chatham	96+35	732.4	735.8			
p 69	20' DS.	98+80	733.9				
	Drain Intersection	99+00	733.0	735.8			
	20' us.	99+20	733.1				
p. 31	12.5	100+90	733.0	738.9			
p	12.9 100' DS. CS 13 outlet station	105+60	734.2	740.9			

Main Branch

	CS	Station	Channel Bottom	Low Ground	Inlet Invert (us)	Outlet Invert (ds)	Pipe Info
p.32,33	DS. 13.0	106+60	733.5 sediment			732.9	Outlet Invert
						738.1	DS. Top of pipe
	13.0 ditch crossing	106+80		739.9	Low Rd.		5.2' high pipe
				740.1	℄ Rd. over pipe		6.5' wide pipe arch
							40' long
	US. 13.0	107+00	733.9 sediment		733.3	Inlet Invert	
					738.3	US. Top of pipe	
p.34	13.1	~~107+80~~ 108+00	734.3	740.1			
	Section Line /R	114+10	735.0				
		114+25	735.5				
p.35	13.9	~~123+10~~ 122+93	735.6	740.7			
p.36	DS 14.0	124+23	734.9 sediment			734.2	Outlet Invert
						738.9	DS. Top of Pipe
	14.0	124+40		739.3	Low Rd.		
				740.4	℄ over pipe		
	US. 14.0	124+57	735.0 sediment		734.2	Inlet Invert	4.8' high
					739.1	US. Top of pipe	6' wide
							34' long
p.37	14.1	125+90	734.7	741.1			
	Mich. Gas Storage Co. Gas Pipeline	136+50	(600' DS of 13-15)				

Main Branch

	CS	Station	Channel Bottom	Low Ground	Inlet Invert (US)	Outlet Invert (DS)	Pipe Info.
p.38	14.9	140+90	736.3 sediment	740.5			
p.39	DS. 15.0	142+53				734.2 Outlet Invert (calc)	
						736.1 Sediment	
						738.2 DS. Top of pipe	
	15.0	142+70		740.3 Low Rd.			
				741.0 ℄ Rd. over pipe			4' dia.
							34' long CMP
p.39	US. 15.0	142+87			734.3 Inlet Invert		
					738.3 US. Top of pipe		
p.40	DS. 16.0	145+20	735.2 sediment			733.9 (calc) Outlet Invert	(surveyed @ 733.6)
						738.4 DS. Top of pipe	
p.41	16.0 Ditch Crossing	145+30		739.6 Low Rd.			4.5' dia.
				739.7 ℄ Rd. over pipe			20' long
p.40	US. 16.0	145+40	735.1 sediment		734.6 (calc) Inlet Invert (surveyed @ 733.8)		
					739.1 Top of pipe, US.		
p.42	16.5	146+60	736.0	739.2			
p.43	DS. 17.0	147+61				734.8 Outlet Invert	pipe is 4.3' high.
						736.9 Sediment	
						739.1 DS Top of pipe	
p.43	17.0	147+90		742.0 Low Rd			58.5' long
				742.5 ℄ Rd. over pipe			5.5' wide
							1.5' corrugate.
							see p.43

TIME OF CONCENTRATION AND TRAVEL TIME Version 2.00

Project : OWOSSO DRAIN F.P.M.S. User: TDB Date: 10-01-93
County : SHIAWASSEE State: MI Checked: ____ Date: _____
Subtitle:

Subarea #1

Flow Type	2 year rain	Length (ft)	Slope (ft/ft)	Surface code	n	Area (sq/ft)	Wp (ft)	Velocity (ft/sec)	Time (hr)
Sheet	2.3	100	.1	e					0.101
Sheet		200	.005	e					0.584
Shallow Concent'd		1700	.005	u					0.414
Shallow Concent'd		4500	.0033	u					1.349

Time of Concentration = 2.45*
=====

--- Sheet Flow Surface Codes ---

A Smooth Surface
B Fallow (No Res.)
C Cultivated < 20 % Res.
D Cultivated > 20 % Res.
E Grass-Range, Short
F Grass, Dense
G Grass, Burmuda
H Woods, Light
I Woods, Dense
J Range, Natural

--- Shallow Concentrated --- Surface Codes ---

P Paved
U Unpaved

* - Generated for use by GRAPHIC method

TIME OF CONCENTRATION AND TRAVEL TIME Version 2.00

Project : OWOSSO DRAIN FPMS User: TDB Date: 05-04-94
County : SHIAWASSEE State: MI Checked: ____ Date: _____
Subtitle: ~~DETERMINE DISCHARGES FROM EAST SIDE~~ Subarea #3

Flow Type	2 year rain	Length (ft)	Slope (ft/ft)	Surface code	n	Area (sq.ft)	Wp (ft)	Velocity (ft/sec)	Time (hr)
Sheet	2.3	300	.067	E					0.286
Shallow Concent'd		700	.0043	U					0.184
Open Channel		1000						1.76	0.158

Time of Concentration = 0.63*

--- Sheet Flow Surface Codes ---

A Smooth Surface
B Fallow (No Res.)
C Cultivated 20 % Res.
D Cultivated 20 % Res.
E Grass-Range, Short
F Grass, Dense
G Grass, Bermuda
H Woods, Light
I Woods, Dense
J Range, Natural

--- Shallow Concentrated --- Surface Codes ---

P Paved
U Unpaved

* - Generated for use by GRAPHIC method

$$\frac{770-750}{300} = .067\%$$

$$\frac{750-747}{700} = .0043\%$$

$$\frac{747-740}{1000} = .007\%$$

From UD21, $V = 2.1\ S^{.5} = 1.76$ FPS

TIME OF CONCENTRATION AND TRAVEL TIME Version 2.00

Project : OWOSSO DRAIN FPMS User: TDB Date: 05-04-94
County : SHIAWASSEE State: MI Checked: ____ Date: _____
Subtitle: ~~DETERMINE DISCHARGES FROM WEST SIDE DA # 3~~
Subarea #4

Flow Type	2 year rain	Length (ft)	Slope (ft/ft)	Surface code	n	Area (sq/ft)	Wp (ft)	Velocity (ft/sec)	Time (hr)
Sheet	2.3	300	.03	C					0.294
Shallow Concent'd		1550	.01	U					0.267
Shallow Concent'd		850	.0019	U					0.135
								Time of Concentration =	0.70*

--- Sheet Flow Surface Codes ---

A Smooth Surface F Grass, Dense
B Fallow (No Res.) G Grass, Bermuda
C Cultivated (20 % Res.) H Woods, Light
D Cultivated (0 % Res.) I Woods, Dense
E Grass-Range, Short J Range, Natural

--- Shallow Concentrated Surface Codes ---

P Paved
U Unpaved

* - Generated for use by GRAPHIC method

TIME OF CONCENTRATION AND TRAVEL TIME Version 2.00

Project : OWOSSO DRAIN F.P.M.S. User: TDB Date: 09-20-93
County : SHIAWASSEE State: MI Checked: ____ Date: _____
Subtitle:

Subarea # - 2

Flow Type	2 year rain	Length (ft)	Slope (ft/ft)	Surface code	n	Area (sq/ft)	Wp (ft)	Velocity (ft/sec)	Time (hr)
Sheet	2.3	300	.0333	C					0.182
Shallow Concent'd		5100	.0084	U					0.958

Time of Concentration = 1.14* ✓
=====

Subarea # - 3

Flow Type	2 year rain	Length (ft)	Slope (ft/ft)	Surface code	n	Area (sq/ft)	Wp (ft)	Velocity (ft/sec)	Time (hr)
Sheet	2.3	300	.0143	C					0.255
Shallow Concent'd		400	.0143	U					0.058
Shallow Concent'd		2000	.0102	U					0.341
Open Channel		1600						1.4	0.317

VOID

Time of Concentration = 0.97* ✓
=====

Subarea # - ~~4~~ 5

Flow Type	2 year rain	Length (ft)	Slope (ft/ft)	Surface code	n	Area (sq/ft)	Wp (ft)	Velocity (ft/sec)	Time (hr)
Sheet	2.3	300	.0167	C					0.240
Shallow Concent'd		3000	.0033	U					0.899
Shallow Concent'd		3900	.0077	U					0.765
Open Channel		1100						5.7	0.054

Time of Concentration = 1.96* ✓
=====

Subarea # - ~~5~~ 6

Flow Type	2 year rain	Length (ft)	Slope (ft/ft)	Surface code	n	Area (sq/ft)	Wp (ft)	Velocity (ft/sec)	Time (hr)
Sheet	2.3	300	.0154	C					0.247
Shallow Concent'd		400	.0154	U					0.055
Shallow Concent'd		3800	.0160	U					0.517
Open Channel		2300						.8	0.799

Time of Concentration = 1.62* ✓
=====

TIME OF CONCENTRATION AND TRAVEL TIME Version 2.00

Project : OWOSSO DRAIN F.P.M.S. User: TDB Date: 09-20-93
County : SHIAWASSEE State: MI Checked: ____ Date: _____
Subtitle:

Subarea # - 7

Flow Type	2 year rain	Length (ft)	Slope (ft/ft)	Surface code	n	Area (sq/ft)	Wp (ft)	Velocity (ft/sec)	Time (hr)
Sheet	2.3	300	.0111	C					0.282
Shallow Concent'd		600	.0111	U					0.098
Shallow Concent'd		300	.0333	U					0.028
Open Channel		3100						1	0.861

Time of Concentration = 1.27*
=====

Subarea # - 8

Flow Type	2 year rain	Length (ft)	Slope (ft/ft)	Surface code	n	Area (sq/ft)	Wp (ft)	Velocity (ft/sec)	Time (hr)
Sheet	2.3	300	.0167	C					0.240
Shallow Concent'd		1000	.0169	U					0.132
Shallow Concent'd		3700	.0027	U					1.226
Open Channel		1900						5.2	0.101

Time of Concentration = 1.70*
=====

Subarea # - 9

Flow Type	2 year rain	Length (ft)	Slope (ft/ft)	Surface code	n	Area (sq/ft)	Wp (ft)	Velocity (ft/sec)	Time (hr)
Sheet	2.3	300	.024	E					0.431
Shallow Concent'd		400	.0074	U					0.080

Time of Concentration = 0.51*
=====

Subarea # - 10

Flow Type	2 year rain	Length (ft)	Slope (ft/ft)	Surface code	n	Area (sq/ft)	Wp (ft)	Velocity (ft/sec)	Time (hr)
Sheet	2.3	300	.0333	C					0.182
Shallow Concent'd		3400	.0147	U					0.483
Open Channel		1200						2	0.167

Time of Concentration = 0.83*
=====

Subarea # - 10

Flow Type	2 year rain	Length (ft)	Slope (ft/ft)	Surface code	n	Area (sq/ft)	Wp (ft)	Velocity (ft/sec)	Time (hr)
Sheet	2.3	300	.0050	C					0.388
Shallow Concent'd		1700	.0050	U					0.414
Shallow Concent'd		3300	.0052	U					0.907
Open Channel		2300						1.5	0.426

Time of Concentration = 2.14*
=====

Use 20 for TRSS Pr

TIME OF CONCENTRATION AND TRAVEL TIME Version 2.00

Project : OWOSSO DRAIN FPMS User: TDB Date: 04-19-94
County : SHIAWASSEE State: MI Checked: ____ Date: _____
Subtitle: BOCH BRANCH

Subarea #1 - 11 ~~10~~A

Flow Type	2 year rain	Length (ft)	Slope (ft/ft)	Surface code	n	Area (sq/ft)	Wp (ft)	Velocity (ft/sec)	Time (hr)
Sheet	2.3	300	.005	C					0.388
Shallow Concent'd		1700	.005	U					0.414
Shallow Concent'd		1700	.0051	U					0.406

Time of Concentration = 1.21*
=====

Subarea #2 - 12 ~~10~~B

Flow Type	2 year rain	Length (ft)	Slope (ft/ft)	Surface code	n	Area (sq/ft)	Wp (ft)	Velocity (ft/sec)	Time (hr)
Sheet	2.3	300	.0133	E					0.546
Shallow Concent'd		300	.0133	U					0.045

Time of Concentration = 0.59*
=====

Open Channel		4100						1.9	0.574

Travel Time = 0.57*
=====

Subarea #3 - 13 ~~10~~C

Flow Type	2 year rain	Length (ft)	Slope (ft/ft)	Surface code	n	Area (sq/ft)	Wp (ft)	Velocity (ft/sec)	Time (hr)
Sheet	2.3	300	.005	C					0.388
Shallow Concent'd		4000	.005	U					0.974

Time of Concentration = 1.36*
=====

--- Sheet Flow Surface Codes ---

A Smooth Surface
B Fallow (No Res.)
C Cultivated <20 % Res.
D Cultivated >20 % Res.
E Grass-Range, Short
F Grass, Dense
G Grass, Bermuda
H Woods, Light
I Woods, Dense
J Range, Natural

--- Shallow Concentrated --- Surface Codes ---

P Paved
U Unpaved

TIME OF CONCENTRATION AND TRAVEL TIME Version 2.00

Project : OWOSSO DRAIN F.P.M.S. User: TDB Date: 10-01-93
County : SHIAWASSEE State: MI Checked: ____ Date: _____
Subtitle: ~~SUBAREA # 12 ONLY~~

Subarea #15 ~~Subarea #12~~

Flow Type	2 year rain	Length (ft)	Slope (ft/ft)	Surface code	n	Area (sq/ft)	Wp (ft)	Velocity (ft/sec)	Time (hr)
Sheet	2.3	300	.033	e					0.380
Shallow Concent'd		1600	.0275	u					0.166
Shallow Concent'd		900	.0078	p					0.139
								Time of Concentration =	0.69*
									=====

Subarea ~~#2~~ ~~13~~ 14

Flow Type	2 year rain	Length (ft)	Slope (ft/ft)	Surface code	n	Area (sq/ft)	Wp (ft)	Velocity (ft/sec)	Time (hr)
Sheet	2.3	300	.0045	f					1.227
Shallow Concent'd		800	.0045	u					0.205
Shallow Concent'd		1000	.0125	u					0.154
Open Channel		1500						2	0.208
								Time of Concentration =	1.79*
									=====

Subarea ~~#2 - 13~~ #16

Flow Type	2 year rain	Length (ft)	Slope (ft/ft)	Surface code	n	Area (sq/ft)	Wp (ft)	Velocity (ft/sec)	Time (hr)
Sheet	2.3	300	.01	e					0.612
Shallow Concent'd		1300	.0054	p					0.242
Open Channel		6000						4	0.417
								Time of Concentration =	1.27*
									=====

--- Sheet Flow Surface Codes ---

A Smooth Surface
B Fallow (No Res.)
C Cultivated < 20 % Res.
D Cultivated > 20 % Res.
E Grass-Range, Short
F Grass, Dense
G Grass, Burmuda
H Woods, Light
I Woods, Dense
J Range, Natural

--- Shallow Concentrated --- Surface Codes ---

P Paved
U Unpaved

* - Generated for use by GRAPHIC method

Yellow for A Soils instead of Red

WATER FEATURES

Survey Area- CHIPPAWASSEE COUNTY, MICHIGAN

Map symbol and soil name		Hydrologic group	Flooding Freq	Flooding Duration	Flooding Months	High water table Depth (Ft)	High water table Kind	High water table Months
ah	ALCANDER	D	OCCA	LONG	NOV-MAY	1.0- 2.0	APPAR	NOV-MAY
Ba	BARR	B/D	NONE		-	-1- 1.0	APPAR	NOV-MAY
Bb	BARR, WARSAW	B/D	NONE		-	-1- 1.0	APPAR	NOV-MAY
Bc	BARRY	B/D	NONE		-	-1- 1.0	APPAR	NOV-MAY
BeA	BELDING	B	NONE		-	1.0- 2.0	APPAR	NOV-MAY
Bh	BERRIEN	B/D	NONE		-	-1- 1.0	PERCH	NOV-MAY
BmA	BOYER	B	NONE		-	6.0- 6.0		-
BmB	BOYER	B	NONE		-	6.0- 6.0		-
BmC	BOYER	B	NONE		-	6.0- 6.0		-
BmD	BOYER	B	NONE		-	6.0- 6.0		-
BmE	BOYER	B	NONE		-	6.0- 6.0		-
BoD	BOYER	B	NONE		-	6.0- 6.0		-
BrA	BOYER	B	NONE		-	6.0- 6.0		-
BrB	BOYER	B	NONE		-	6.0- 6.0		-
BrC	BOYER	B	NONE		-	6.0- 6.0		-
BrD	BOYER	B	NONE		-	6.0- 6.0		-
Bt	BRECKENRIDGE	B/D	NONE		-	-1- 1.0	APPAR	NOV-MAY
Bv	BREWER	B/D	NONE		-	-1- 1.0	APPAR	NOV-MAY
Bw	BRUNDISTON	B/D	NONE		-	-.- 1.	APPAR	DEC-MAY
Cg	CARLISLE	A/D	NONE		-	-.5- 1.0	APPAR	SEP-JUN
ChA	CELINA	B	NONE		-	2.5- 6.0	APPAR	DEC-APR
ChB	CELINA	B	NONE		-	2.5- 6.0	APPAR	DEC-APR
Cm	CERESCO	B	OCCA	BRIEF	MAR-MAY	1.0- 2.0	APPAR	SEP-MAY
Cn	COHOCTAH	B/D	OCCA	LONG	NOV-APR	0- 1.0	APPAR	SEP-MAY
Co	COLWOOD	B/D	NONE		-	-1- 1.0	APPAR	OCT-MAY
CpA	CONOVER	C	NONE		-	1.0- 2.0	APPAR	NOV-MAY
CpB	CONOVER	C	NONE		-	1.0- 2.0	APPAR	NOV-MAY
Ed	EDWARDS	B/D	NONE		-	-1- 1.0	APPAR	SEP-JUN
Em	EM	C	FREQ	BRIEF	OCT-JUN	1.5- 3.0	APPAR	JAN-APR
	LANDES	D	FREQ	BRIEF	JAN-JUN	4.0- 6.0	APPAR	MAR-MAY
	ALGANSEE	A	OCCA	BRIEF	MAR-JUN	2.0- 5.0	APPAR	DEC-MAY
FuB	FUX	D	NONE		-	0.0- 6.0		-
FuC	FOX	D	NONE		-	3.0- 6.0		-
FuD	FOX	D	NONE		-	6.0- 6.0		-
Gg	GILFORD	B/D	NONE		-	-.- 1.	APPAR	DEC-MAY
Gh	GILFORD	D/D	NONE		-	-.- 1.	APPAR	DEC-MAY
GmA	GLADWIN	B	NONE		-	1.0- 2.0	APPAR	NOV-MAY
Gn	GLENDORA	A/D	OCCA	LONG	JAN-DEC	0- 1.0	APPAR	NOV-JUN
Go	GRANDY	A/D	NONE		-	1- 1.0	APPAR	NOV-JUN
Gr	GRAVEL PIT		NONE		-	-		-
Hc	HOCKER	C	NONE		-	0.5- 1.5	PERCH	NOV-JUN
HkA	HOCKS	C	NONE		-	0.5- 1.5	PERCH	NOV-JUN
[illegible]	[illegible]	[illegible]	NONE			0.5- 1.5	APPAR	NOV-MAY
[illegible]	[illegible]	[illegible]	NONE			0.0- 6.0		-
[illegible]	[illegible]	[illegible]	NONE		-	[illegible]		-
[illegible]	[illegible]	B	NONE			[illegible]		-

Note: [illegible] D
H/D [illegible] D

WATER FEATURES

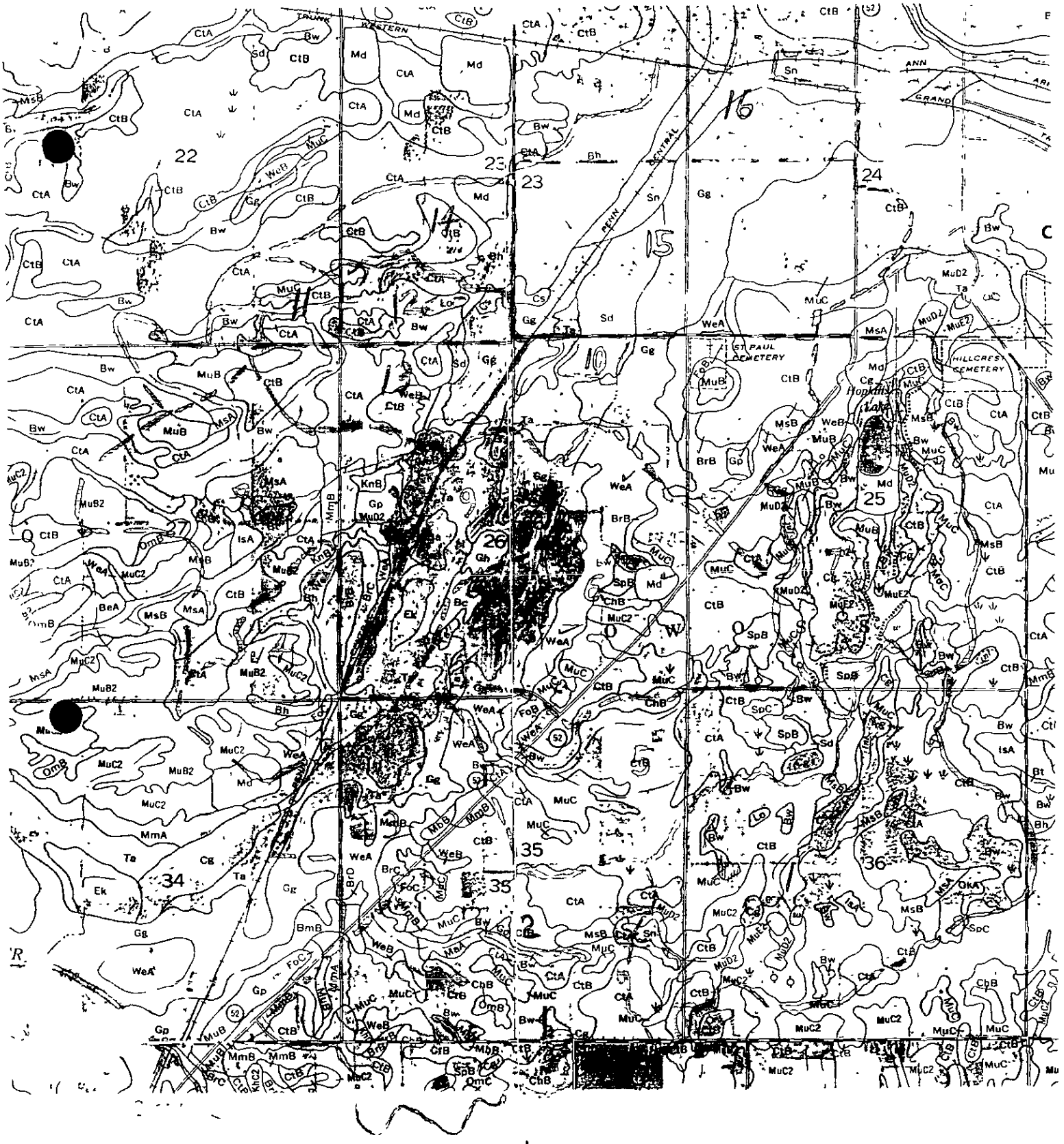
Survey Area- SHIAWASSEE COUNTY, MICHIGAN

Map symbol and soil name		Hydrologic group	Flooding Freq	Duration	Months	High water table Depth (Ft)	Kind	Months
HhCE	HENDALLVILLE	B	NONE		-	6.0- 6.0		-
HnA	HIBBIE	B	NONE		-	1.0- 2.0	APPAR	NOV-MAY
HnB	HIBBIE	B	NONE		-	1.0- 2.0	APPAR	NOV-MAY
LmB	LAPEER	B	NONE		-	6.0- 6.0		-
LmCE	LAPEER	B	NONE		-	6.0- 6.0		-
Ln	LENAWEE	B/D	NONE		-	-- 1.	APPAR	NOV-MAY
Lo	LINWOOD	A/D	NONE		-	-1- 1.0	APPAR	NOV-JUN
LsA	LOCHE	B	NONE		-	1.0- 2.0	APPAR	NOV-MAY
LsB	LOCHE	B	NONE		-	1.0- 2.0	APPAR	NOV-MAY
M	MISCELLANEOUS AREAS		NONE		-	-		-
MaA	MACOMB	B	NONE		-	0.5- 2.0	APPAR	NOV-MAY
MbB	MACOMB	B	NONE		-	0.5- 2.0	APPAR	NOV-MAY
Md	MADE LAND	B	NONE		-	-		-
MeA	MANCELONA	B	NONE		-	6.0- 6.0		-
MeB	MANCELONA	B	NONE		-	6.0- 6.0		-
MmA	MATHERTON	B	NONE		-	1.0- 2.0	APPAR	NOV-MAY
MmB	MATHERTON	B	NONE		-	1.0- 2.0	APPAR	NOV-MAY
MnA	MATHERTON	C	NONE		-	1.0- 3.0	APPAR	DEC-MAY
MnB	MATHERTON	C	NONE		-	1.0- 3.0	APPAR	DEC-MAY
MoB	MENOMINEE	B	NONE		-	6.0- 6.0		-
MoC	MENOMINEE	B	NONE		-	6.0- 6.0		-
MrA	METAMORA	B	NONE		-	1.0- 2.0	APPAR	NOV-MAY
MsA	METAMORA	B	NONE		-	1.0- 2.0	APPAR	NOV-MAY
MsB	METAMORA	B	NONE		-	1.0- 2.0	APPAR	NOV-MAY
MuB	MIAMI	B	NONE		-	6.0- 6.0		-
MuBE	MIAMI	B	NONE		-	6.0- 6.0		-
MuC	MIAMI	B	NONE		-	6.0- 6.0		-
MuCE	MIAMI	B	NONE		-	6.0- 6.0		-
MuDE	MIAMI	B	NONE		-	6.0- 6.0		-
MuEE	MIAMI	B	NONE		-	6.0- 6.0		-
MvDB	MIAMI	B	NONE		-	6.0- 6.0		-
Mw	MINE PITS		NONE		-	-		-
NyB	NEWAYGO	B	NONE		-	6.0- 6.0		-
OhA	OTTOKEE	A	NONE		-	2.0- 3.5	APPAR	JAN-APR
OmB	OWOSSO	B	NONE		-	6.0- 6.0		-
	MIAMI	B	NONE		-	6.0- 6.0		-
OmC	OWOSSO	B	NONE		-	6.0- 6.0		-
	MIAMI	B	NONE		-	6.0- 6.0		-
OmDE	OWOSSO	B	NONE		-	6.0- 6.0		-
	MIAMI	B	NONE		-	6.0- 6.0		-
PfB	PLAINFIELD VARIANT	A	NONE		-	6.0- 6.0		-
PfC	PLAINFIELD VARIANT	A	NONE		-	6.0- 6.0		-
RhA	RICHTER	C	NONE		-	0.5- 1.5	APPAR	FEB-APR
Sd	SEBEWA	B/D	NONE		-	-1- 1.0	APPAR	SEP-MAY
Sh	SHOALS	C	OCCA	BRIEF	OCT-JUN	0.5- 1.5	APPAR	JAN-APR
Su	SLOAN	B/D	OCCA	BRIEF	NOV-JUN	1- 1.0	APPAR	NOV-JUN

WATER FEATURES

Survey Area- SHIAWASSEE COUNTY, MICHIGAN

Map symbol and soil name		Hydrologic group	Flooding Freq	Flooding Duration	Flooding Months	High water table Depth (Ft)	High water table Kind	High water table Months
SpA	SPINKS	A	NONE		-	6.0- 6.0		-
SpB	SPINKS	A	NONE		-	6.0- 6.0		-
SpC	SPINKS	A	NONE		-	6.0- 6.0		-
SpD	SPINKS	A	NONE		-	6.0- 6.0		-
TsB	TUSCOLA	B	NONE		-	2.0- 3.5	APPAR	NOV-APR
Tw	TAWAS	A/D	NONE		-	-1- 1.0	APPAR	NOV-MAY
Wa	WALLPILL	C/D	FREQ	LONG	SEP-JUN	-.- 1.	APPAR	SEP-JUN
WeA	WASEPI	B	NONE		-	1.0- 2.0	APPAR	NOV-MAY
WeB	WASEPI	B	NONE		-	1.0- 2.0	APPAR	NOV-MAY

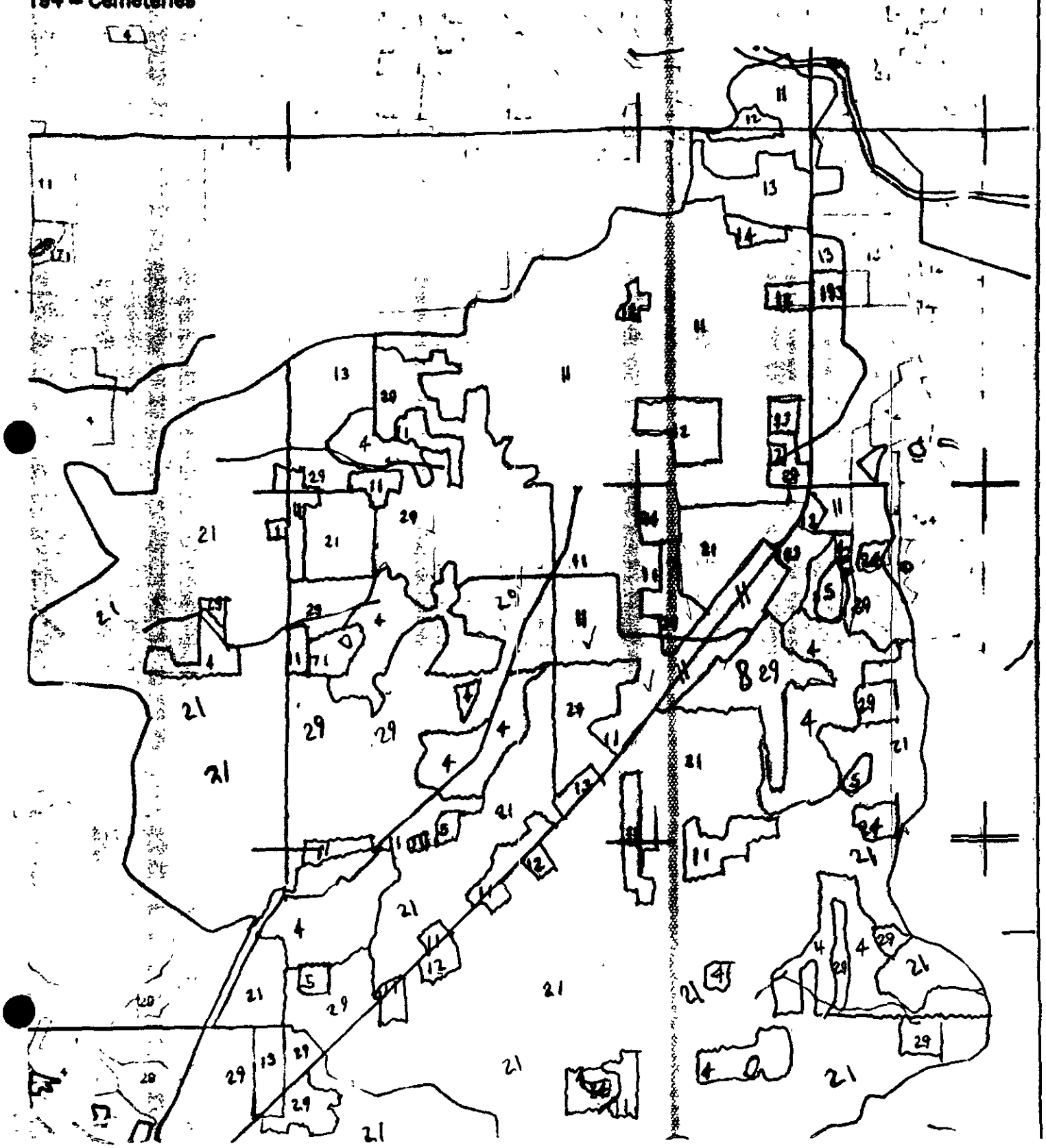


Scale 1:24,000

Owosso Drain Landuse
Shiawassee County, MI

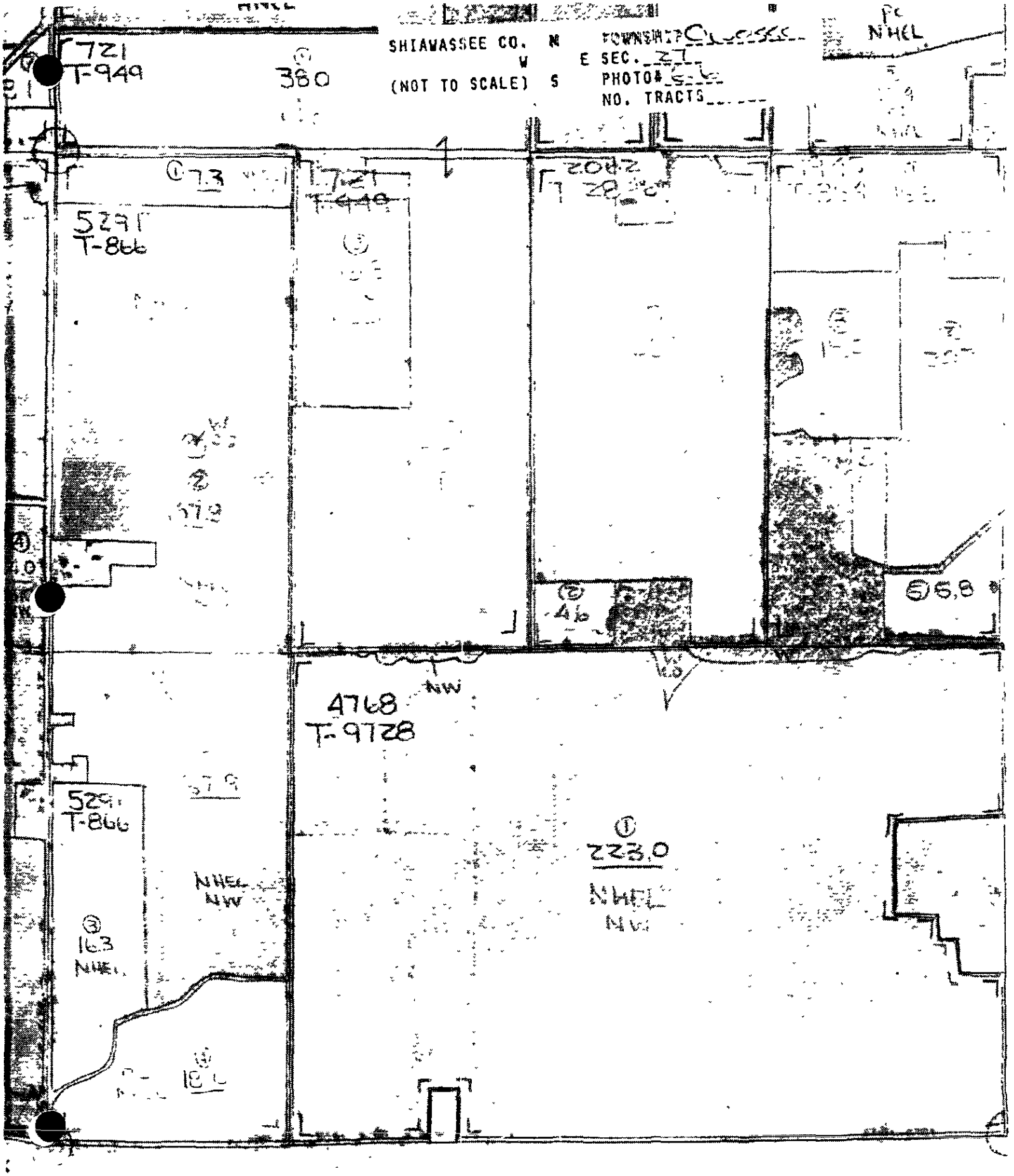
Scale = ~~1:20000~~ 1:24000

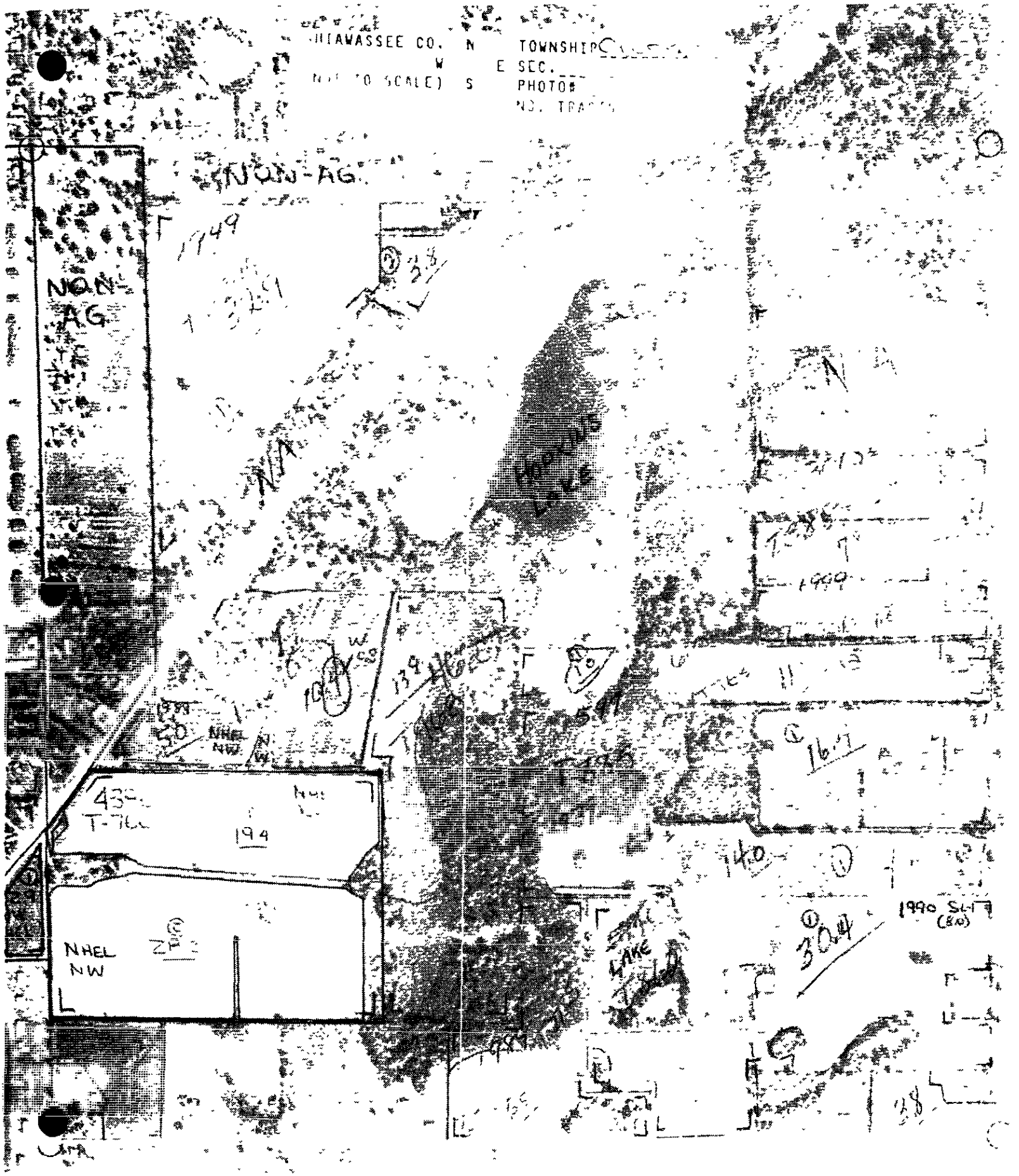
4 = Forested
5 = Water
11 = Residential
12 = Commercial
13 = Industrial
14 = Transportation, etc.
21 = Cropland
22 = Orchards, etc.
23 = Confined Feeding
24 = Permanent Pasture
29 = Other
171 = Open Pit
193 = Outdoor Recreation
194 = Cemeteries



B

SHIAWASSEE CO. N TOWNSHIP Owosso
W E SEC. 31
(NOT TO SCALE) S PHOTO# 6-7
NO. TRACTS


SHIAWASSEE CO.
(NOT TO SCALE)
N
W
E
S
TOWNSHIP
SEC. 27
PHOTO#
NO. TRACTS
7.21
T-949
380
7.3
5291
T-866
7.21
T-949
20.2
28
2
57.9
4.6
6.8
4768
T-9728
NW
529
T-866
57.9
223.0
NHEL
NW
NHEL
NW
16.3
NHEL
18.6
NHEL


HILLSDALE CO.
N
W
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S
TOWNSHIP
SEC.
PHOTO#
NO. TRACTS
NON-AG.
NON-AG
HORNUS LAKE
NHEL NW
NHEL NW
1990 SCS (80)

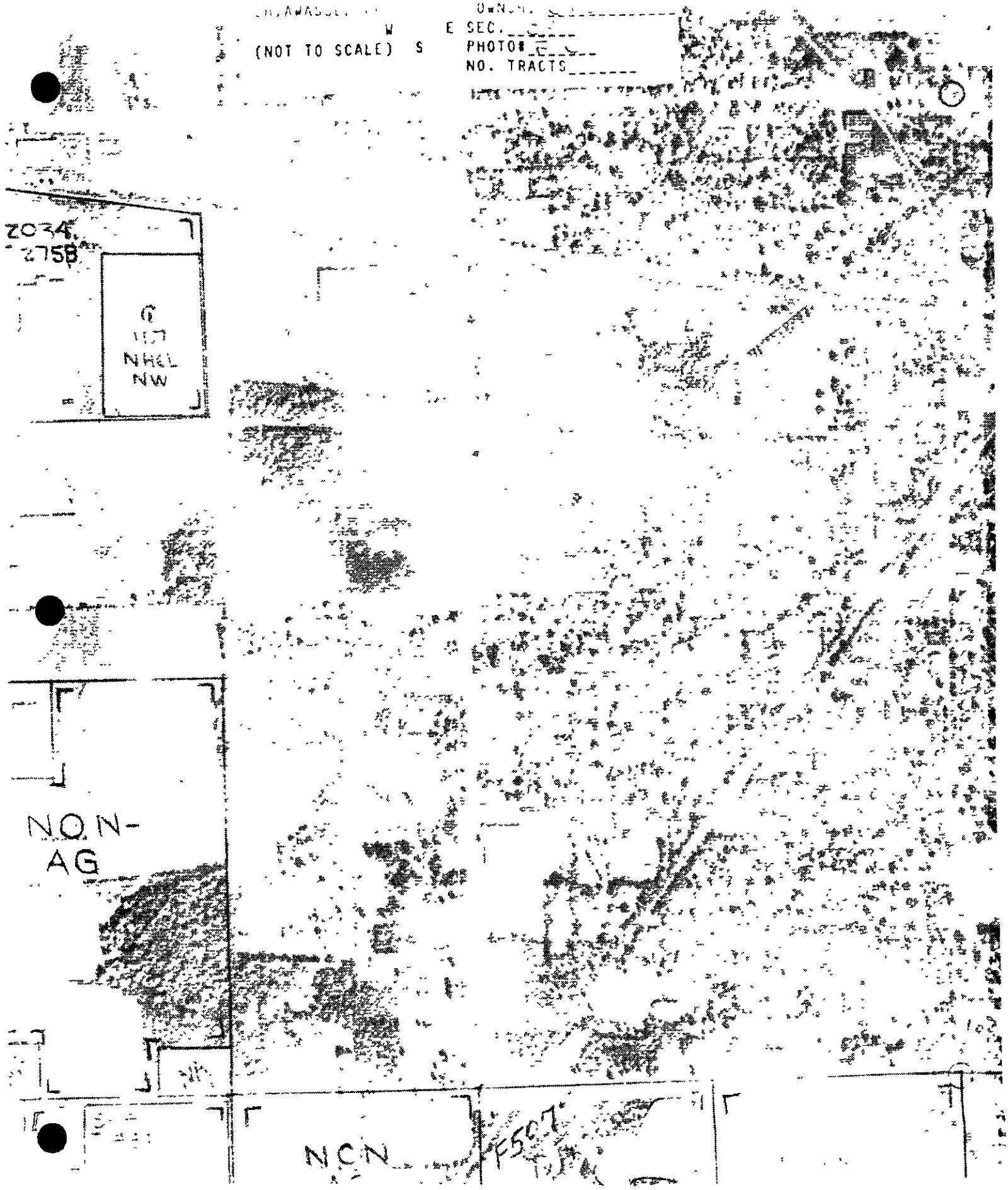
SHIAWASSEE CO. N TOWNSHIP Owosso

W E SEC. 24

(NOT TO SCALE) S PHOTO# [illegible]

NO. TRACTS _____

26-2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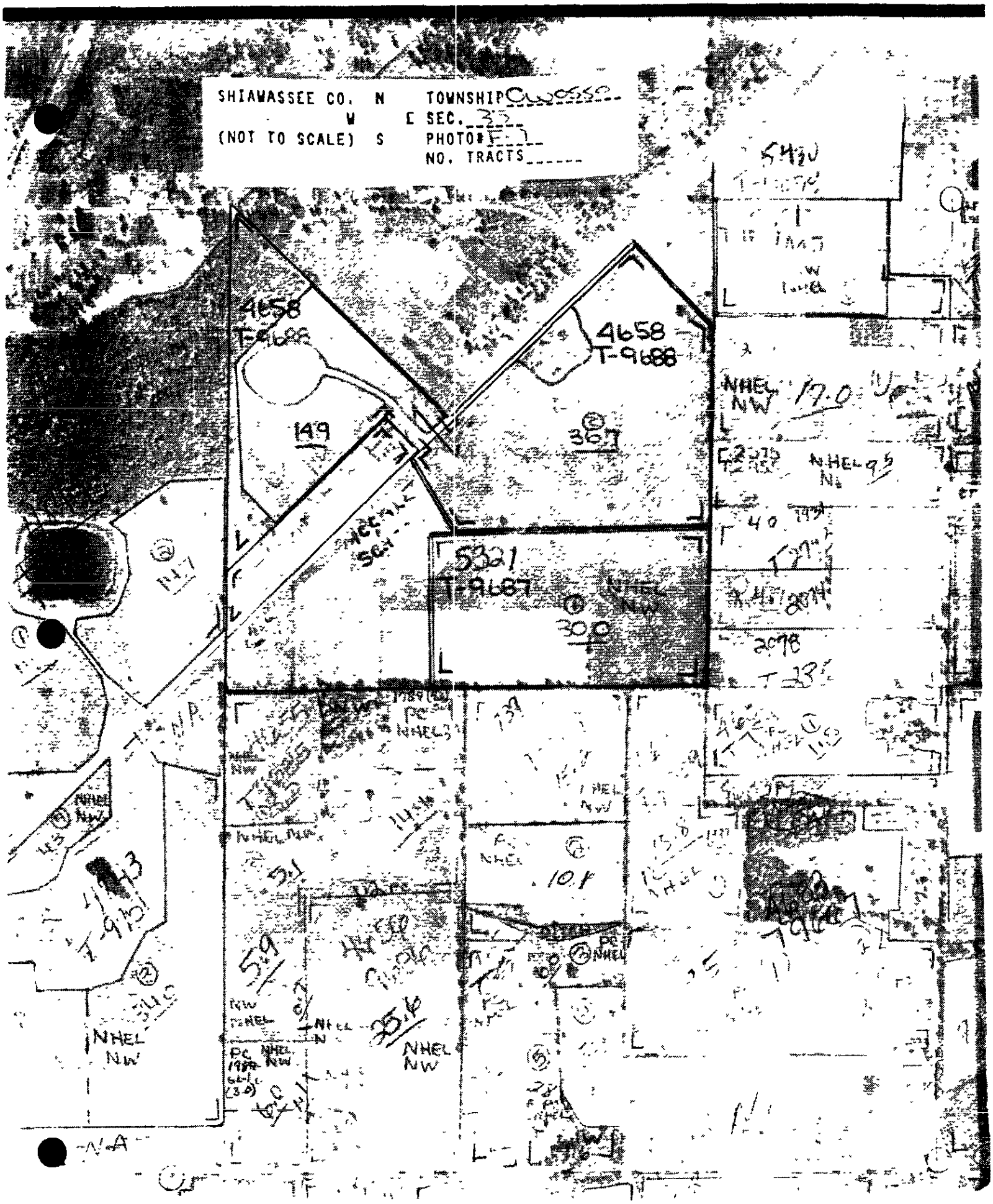

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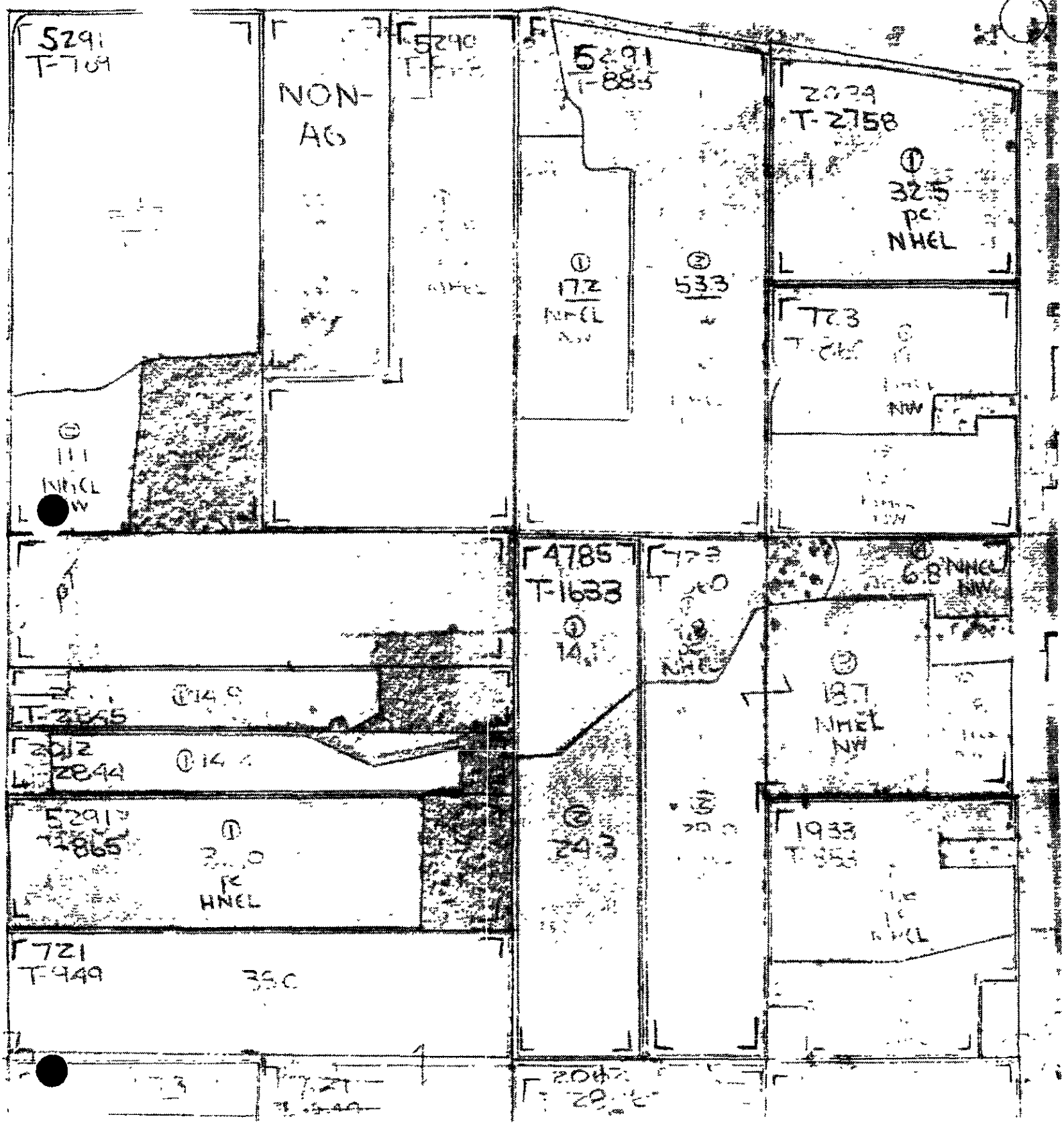

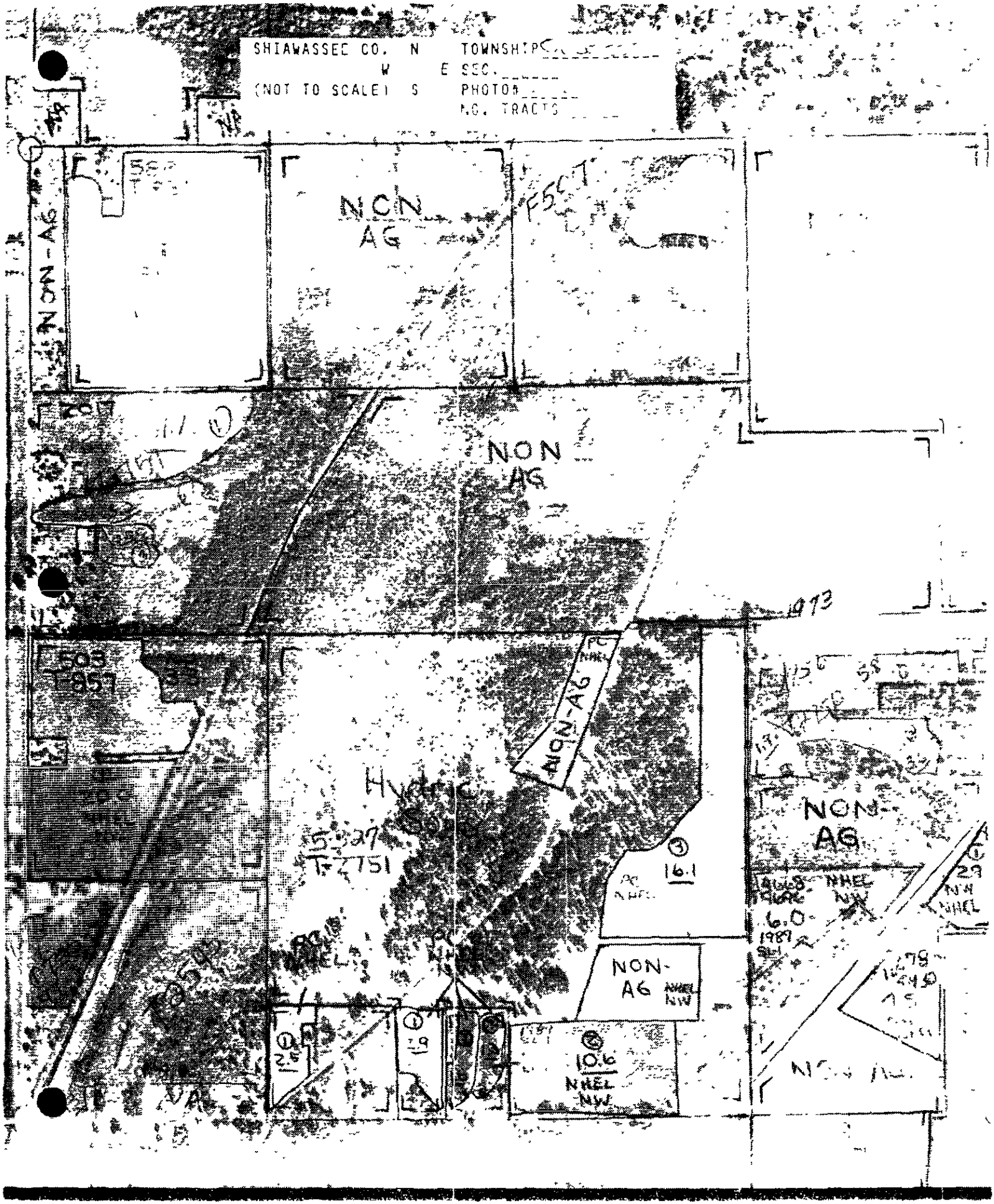
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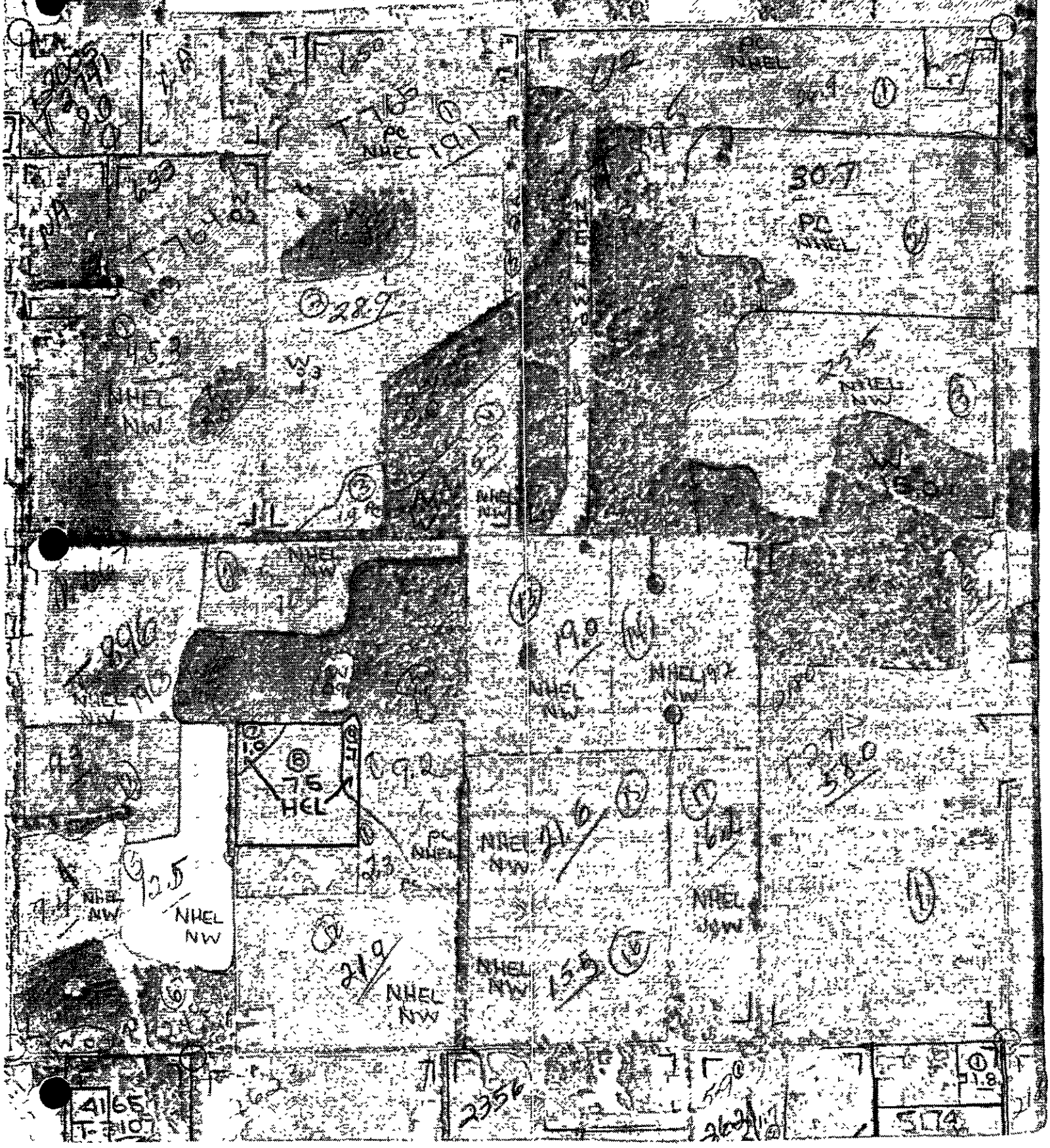


RUNOFF CURVE NUMBER COMPUTATION Version 2.00

Project : OWUSSO DRAIN F.P.M.S. User: TDS Date: 10-01-93
County : SHIAWASSEE State: MI Checked: ____ Date: _____
Subtitle:
Subarea : 1 ✓

COVER DESCRIPTION		Hydrologic Soil Group A	B	C	D
		Areas (Ac)			
FULLY DEVELOPED URBAN AREAS (Veg Estab.)					
Open space (Lawns, parks, etc.)					
Good condition; grass cover	75%	5(39)	5(61)	5(75)	5(100)
Streets and roads					
Paved; open ditches (including right of way)		-	1(100)	-	
CULTIVATED AGRICULTURAL LANDS					
Row crops	SR + Crop residue	good	2(64)	[illegible]	[illegible]
OTHER AGRICULTURAL LANDS					
Pasture, grassland or range		poor	-	[illegible]	- 1(50)
Woods		good		2(52)	2(75) 2(77)
Farmsteads		- --		2(74)	4(32)
1 Area (b, hydrologic Soil Group		/ ____	B	C	D

SUBAREA: 1 TOTAL DRAINAGE AREA 435 Acres RUNOFF CURVE NUMBER 75

RUNOFF CURVE NUMBER COMPUTATION

Project : OWOSSO DRAIN F.P.M.S. User: TDR Date: [illegible]
County : SHIAWASSEE State: M Checked: [illegible] Date: [illegible]
Subtitle:
Subarea : [illegible]

COVER DESCRIPTION			Hydrologic Soil Group A	B	C	D
				Acres (CN)		
FULLY DEVELOPED URBAN AREAS (Veg Estab.)						
Streets and roads						
Paved; open ditches (w/right-of-way)			-	3(89)		
Gravel (w/ right-of-way)			-	3(85)		-
Residential districts	Ave % impervious					
(by average lot size)						
1 acre	20		-	[illegible]	-	
CULTIVATED AGRICULTURAL LANDS						
Row crops	Straight row (SR)	good		67(78)	64(85)	
	SR + crop residue	good		33(75)	31(82)	-
OTHER AGRICULTURAL LANDS						
Brush - brush, weed, grass mix		good	4(30)	58(48)	50(65)	[illegible]
Woods		good		1(55)	2(70)	-
Total Area (by Hydrologic Soil Group)			4	105	106	-
			-	[illegible]	[illegible]	[illegible]

SUBAREA: [illegible] TOTAL DRAINAGE AREA: [illegible] Acres WEIGHTED CURVE NUMBER: [illegible]

Project : OWOSSO DRAIN [illegible] Date: [illegible]
County : SHIAWASSEE State: MI Checked: [illegible] Date: [illegible]
Subtitle: DETERMINE DISCHARGES FROM EAST SIDE DA [illegible]

COVER DESCRIPTION			Curve Number Group		
			Acres	[illegible]	
FULLY DEVELOPED URBAN AREAS (Veg Estab.)					
Impervious Areas					
Paved parking lots, roofs, driveways		-	[illegible]		
Streets and roads					
Paved; open ditches (including right-of-way)			[illegible]		
Urban Districts	avg % impervious				
Commercial & business	85%		[illegible]		[illegible]
Residential districts	avg % impervious				
(by average lot size)					
1 acre	20	-	[illegible]	[illegible]	[illegible]
CULTIVATED AGRICULTURAL LANDS					
Row crops	Straight row crops	good	[illegible]	[illegible]	-
	SR + crop residue	good	- [illegible]	[illegible]	
OTHER AGRICULTURAL LANDS					
Brush - brush, weeds, grass mix		good	[illegible]		
Woods		good	- [illegible]	-	[illegible]
Total Area [illegible]			[illegible]	[illegible]	[illegible]

[illegible] Wetlands

[illegible] CURVE NUMBER COMPUTATION [illegible] Version [illegible]

Project : [illegible] User: [illegible] Date: 05-04-94
County : SHIAWASSEE State: MI Checker: [illegible] Date: [illegible]
Subtitle: ~~[illegible]~~

Subarea #4

COVER [illegible]	Hydrologic Soil Group A	B	C	D
	Acres (CN)			
CULTIVATED AGRI [illegible]				
Row Crops [illegible]	[illegible]			-
[illegible] AGRI [illegible]				
[illegible]				[illegible]
Total Area [illegible]	[illegible]			[illegible]

[illegible] Calculated Area [illegible] [illegible] CURVE NUMBER [illegible]

[illegible] Concentration [illegible] method

RUNOFF CURVE NUMBER COMPUTATION Version 2.00

Project : OWOSSO DRAIN F.P.M.S. User: TDB Date: 09-10-93
County : SHIAWASSEE State: MI Checked: ____ Date: _____
Subbasin:
Subarea : X 5

CUVER DESCRIPTION		Hydrologic Soil Group A	B	C	D
		Acres (CN)			
FULLY DEVELOPED URBAN AREAS (Veg Estab.)					
Streets and roads					
Paved: open ditches (w/right-of-way)			4(89)	-	-
Gravel					
Commercial & business	Avg % Impervious 85	-	-	2(89)	-
Residential districts	Avg % Impervious				
1/8 acre or less	65	1(81)	10(88)	5(92)	-
CULTIVATED AGRICULTURAL LANDS					
Row crops	straight row (SR)	good	3(67)	44(78)	70(85)
	SR + crop residue	good	2(64)	22(75)	45(82)
OTHER AGRICULTURAL LANDS					
Pasture - lands, open, grass		good	-	-	6(69)
Woods		good	-	-	10(70)
Total Area (by Hydrologic Soil Group)		7 ====	80 ====	144 ====	

SUBAREA: 1 TOTAL DRAINAGE AREA: 231 Acres WEIGHTED CURVE NUMBER: 77

RUNOFF CURVE NUMBER COMPUTATION Version 2.00

Project : OWOSSO DRAIN F.P.M.S. User: TUB Date: 09-20-93
County : SHIAWASSEE State: MI Checked: ____ Date: _____
Subtitle:
Subarea : X 6

COVER DESCRIPTION			Hydrologic Soil Group A	B	C	D
			Acres (%)			
FULLY DEVELOPED URBAN AREAS (Veg Estab.)						
Impervious Areas						
Paved parking lots, roofs, driveways			-	-		3(98)
Streets and roads						
Paved; open ditches (w/right of way)			-	10(89)	-	-
Urban Districts	Avg % Impervy					
Industrial	72		-	4(68)	-	-
Residential districts (by average lot size)	Avg % Impervy					
1 acre	20		-	50(20)	-	-
CULTIVATED AGRICULTURAL LANDS						
Row crops Straight row SR		good	8(6)	38(28)	2.(20)	-
SR + Crop residue		good	-	20(75)	10.(25)	-
OTHER AGRICULTURAL LANDS						
Brush - brush, weed, grass mix		good	4(10)	22(40)	.(40)	49(78)
Woods		good		20(55)	-	40(77)
Total Area (by Hydrologic Soil Group)			1.	190	2	102

SUBAREA: 6 TOTAL DRAINAGE AREA: 13 Acres WEIGHTED CURVE NUMBER: 72

RUNOFF CURVE NUMBER COMPUTATION Version 2.00

Project : OWASSO DRAIN F.P.M.S. User: TDB Date: 09-20-93
County : SHIAWASSEE State: MI Checked: ____ Date: _____
Subtitle :
Subarea : X7

COVER DESCRIPTION		Hydrologic Soil Group A	B	C	D
			acres (CN)		
FULLY DEVELOPED URBAN AREAS (Veg Estab.)					
Open space (Lawns,parks etc.)					
Good condition, grass cover	75%	-	15(61)	-	-
Impervious Areas					
Paved parking lots, roofs, driveways		-	-	-	13(98)
Streets and roads					
Paved; open ditches (w/right-of-way		-	-	6(92)	-
Urban Districts	Avg % Impervy				
Commercial & business	85	-	4(92)	-	-
Residential districts	Avg % Impervy				
(by average lot size)					
1 acre	20	-	45(68)	-	-
CULTIVATED AGRICULTURAL LANDS					
Row crop Straight row (SR)	good	-	32(78)	6(88)	-
SR + Crop residue	good	-	16(75)	-	-
OTHER AGRICULTURAL LANDS					
Pasture, grassland or range	good	-	-	4(74)	(80)
Brush - brush, weed, grass mix	good	-	10(48)	21(65)	25(73)
Woods	good	-	10(60)	-	28(77)
Total Area (by Hydrologic Soil Group)		167 acres	57 acres	73 acres	

SUBAREA: X7 TOTAL DRAINAGE AREA: 297 Acres WEIGHTED CURVE NUMBER: 70

RUNOFF CURVE NUMBER COMPUTATION Version 2.00

Project : UWOSSU DRAIN F.P.M.S. User: TDD Date: 09-20-93
County : SHIAWASSEE State: MI Checked: ____ Date: _____
Subtitle:
Subarea : X8

COVER DESCRIPTION			Hydrologic Soil Group A	B	C	D
			Acres (CN)			
FULLY DEVELOPED URBAN AREAS (Veg Estab.)						
Streets and roads:						
Paved; open ditches (w/right-of-way)				4(87)	-	-
Residential districts	Avg % impervious					
by average lot size:						
1 acre	20		-	1(68)	-	-
CULTIVATED AGRICULTURAL LANDS						
Row crops	Straight row (SR)	good		0.1(73)	35(85)	-
	SR + Crop residue	good		30(75)	17(82)	-
OTHER AGRICULTURAL LANDS						
Brush	brush, weed, grass mix	good	-	2(48)	15(65)	3(73)
Woods		good		22(55)	-	15(77)
TOTAL Area (by Hydrologic Soil Group)			0.1	67	18	

SUBAREA: 1 TOTAL DRAINAGE AREA: 2.5 Acres WEIGHTED CURVE NUMBER: 73

RUNOFF CURVE NUMBER COMPUTATION Version 2.00

Project : OWOSSO DRAIN F.P.M.S. User: TDB Date: 09-10-93
County : SHIAWASSEE State: MI Checked: ____ Date: _____
Subtitle:
Subarea : X9

COVER DESCRIPTION		Hydrologic Soil Group A	B	C	D
			Acres (CN)		
FULLY DEVELOPED URBAN AREAS (Veg Estab.)					
Streets and roads					
Gravel (w/ right of-way)		-	1(85)	-	-
Residential districts (by average lot size)	Avg % Impervious				
1 acre	20	-	5(61)		
OTHER AGRICULTURAL LANDS					
Brush - brush, weed, grass mix	good	-	66(48)	-	30(73)
Woods	good	-	7(55)	-	20(77)
Total Area (by Hydrologic Soil Group)			71		50

SUBAREA: X TOTAL DRAINAGE AREA: 121 Acres WEIGHTED CURVE NUMBER: 61

RUNOFF CURVE NUMBER COMPUTATION Version 2.00

Project : ONOSSO DRAIN F.P.N.S. User: TDB Date: 09-20-93
County : SAGINAW State: MI Checked: ____ Date: _____
Subbasin:
Subarea : X10

COVER DESCRIPTION		Hydrologic Soil Group A	B	C	D
			Acres (CN)		
FULLY DEVELOPED URBAN AREAS (Veg Estab.)					
Open space (lawns,parks etc.)					
Good condition; grass cover	79%	-	11(61)	-	-
Streets and roads					
Paved; open ditches (w/right-of-way		-	3(89)	-	-
Urban Districts	Avg % Impervious				
Commercial & business	85		5(92)	-	-
Residential districts (by average lot size)	Avg % Impervious				
1/2 acre	30	-	100(72)	2(81)	-
CULTIVATED AGRICULTURAL LANDS					
Row crops Straight row (SR)	good		10(78)	22(85)	-
OTHER AGRICULTURAL LANDS					
Pasture - brush, weed, grass mix	good	-	3(49)	6(69)	21(79)
Woods	good	-	6(70)	-	-
Total Area (by hydrologic soil group)		170	30	34	

SUBAREA: X10 TOTAL DRAINAGE AREA: 234 Acres WEIGHTED CURVE NUMBER: 70

RUNOFF CURVE NUMBER COMPUTATION Version 2.00

Project : OWOSSO DRAIN F.P.M.S. User: TDB Date: 09-20-93
County : SHIAWASSEE State: MI Checked: ____ Date: _____
Subtitle:
Subarea : 10

COVER DESCRIPTION			Hydrologic Soil Group A	B	C	D
			Acres (%)			
FULLY DEVELOPED URBAN AREAS (Veg Estab.)						
Streets and roads						
Paved; open ditches (w/right-of-way)			-	5(67)	5(9[illegible])	-
Urban Districts	Avg % Impervious					
Industrial	[illegible]		-	[illegible](88)	[illegible](91)	-
Residential Districts (by average lot size)	Avg % Impervious					
1 acre	[illegible]0		[illegible]	[illegible](6[illegible])	12(79)	-
CULTIVATED AGRICULTURAL LANDS						
Row crops	Straight row (SR)	good	-	[illegible](78)	48(89)	-
	SR + crop residue	good	-	[illegible](65)	[illegible](82)	
OTHER AGRICULTURAL LANDS						
Brush - brush, weed, grass mix		good	-	6(18)	[illegible](60)	3[illegible](73)
Farmsteads		- -	-	7	[illegible](81)	
Total Area (by Hydrologic Soil Group)			3	75	133	32
			====	====	====	====

SUBAREA: 10 TOTAL DRAINAGE AREA: [illegible] Acres WEIGHTED CURVE NUMBER: 78

RUNOFF CURVE NUMBER COMPUTATION Version 1.00

Project : OWOSSO DRAIN FPMS User: JDB Date: 04-19-94
County : SHIAWASSEE State: MI Checked: ____ Date: _____
Subtitle: BOCK BRANCH
Subarea : ~~10A~~ 11

COVER DESCRIPTION		Hydrologic Soil Group A	B	C	D
			Acres (CN)		
FULLY DEVELOPED URBAN AREAS (Veg Estab.)					
Streets and roads					
Paved; open ditches (w/right-of-way)		-	1(89)	1(92)	-
CULTIVATED AGRICULTURAL LANDS					
Row crops: Straight row (SR)	good		15(78)	21(85)	-
SR + Crop residue	good	-	5(75)	18(82)	
OTHER AGRICULTURAL LANDS					
Brush - brush, weed, grass mix	good	-	6(48)	10(65)	3(73)
Farmstead	----	-	-	6(82)	-
Total Area (by Hydrologic Soil Group)		27	56	3	

SUBAREA: 10A TOTAL DRAINAGE AREA: 86 Acres WEIGHTED CURVE NUMBER: 77

RUNOFF CURVE NUMBER COMPUTATION Version 2.00

Project : OW0650 DRAIN PRMS User: TDB Date: 04-19-94
County : SHIAWASSEE State: MI Approved: _____ Date: _____
Subtitle: BOW BRANCH
Subarea : 10B 12

COVER DESCRIPTION		Hydrologic Soil Group A	B	C	D
			Acres (CN)		
FULLY DEVELOPED URBAN AREAS (Veg Estab.)					
Streets and roads					
Paved; open ditch (w/ right-of-way)		-	[illegible]	[illegible]	-
Urban Districts	Avg % Impervious				
Industrial	72		[illegible]	[illegible]	-
Residential Districts (by average lot size)	Avg % Impervious				
1 acre	20	[illegible]	[illegible]	[illegible]	-
OTHER AGRICULTURAL LANDS					
Brush - brush, weed, grass mix	good	-	-	[illegible]	[illegible]
Total Area by Hydrologic Soil Group		3 acres	7 acres	31 acres	19 acres

SUBAREA: 10B TOTAL DRAINAGE AREA: 50 acres WEIGHTED CURVE NUMBER: 75

RUNOFF CURVE NUMBER COMPUTATION Version 2.00

Project : OWOSSO DRAIN FPMS User: TDB Date: 01-19-91
County : SHIAWASSEE State: MI Checked: ____ Date: _____
Subtitle: BOCK BRANCH
Subarea : 10 X 13

COVER DESCRIPTION			Hydrologic Soil Group A	B	C	D
				Acres (CN)		
FULLY DEVELOPED URBAN AREAS (Veg Estab.						
Streets and roads						
Paved; open ditches (w/right-of-way)				2.0(98)	3.0(98)	
CULTIVATED AGRICULTURAL LANDS						
Row crops	Straight row (SR)	good		23.7(78)	1.0(85)	
	SR + Crop residue	good	-	14.0(76)	[illegible]	
OTHER AGRICULTURAL LANDS						
Brush - brush, weed, grass mix		good	-	-	10.0(70)	1.0(83)
Farmsteads		---	-	-	[illegible]	-
Total Area (by Hydrologic Soil Group)			49 acres	60 acres	14 acres	

SUBAREA: 10C TOTAL DRAINAGE AREA: 111 Acres WEIGHTED CURVE NUMBER: 79

RUNOFF CURVE NUMBER COMPUTATION Version 2.00

Project : OWOSSO DRAIN F.P.M.S. User: TDB Date: 10-01-93
County : SHIAWASSEE State: MI Checked: ____ Date: _____
Subtitle:
Subarea : ~~11~~ 14

COVER DESCRIPTION		Hydrologic Soil Group A	B	C	D
			Acres (CN)		
FULLY DEVELOPED URBAN AREAS (Veg Estab.)					
Open space (Lawns,parks etc.)					
Good condition; grass cover > 75%		-	1(61)	18(74)	3(80)
Streets and roads					
Paved; open ditches (w/right-of-way)		-	-	4(92)	-
Urban Districts	Avg % imperv				
Commercial & business	85	-	7(92)	-	-
Industrial	72	-	-	2(91)	-
Residential districts	Avg % imperv				
(by average lot size)					
1 acre	20	-	21(68)	-	-
OTHER AGRICULTURAL LANDS					
Brush - brush, weed, grass mix good		-	-	26(65)	-
Total Area (by Hydrologic Soil Group)			29	50	3
			====	====	====

SUBAREA: 11 TOTAL DRAINAGE AREA: 82 Acres WEIGHTED CURVE NUMBER: 72

RUNOFF CURVE NUMBER COMPUTATION Version 2.00

Project : OWOSSO DRAIN F.P.M.S. User: TDB Date: 10-01-93
County : SHIAWASSEE State: MI Checked: ____ Date: _____
Subtitle:
Subarea : ~~1~~ 15

COVER DESCRIPTION		Hydrologic Soil Group A	B	C	D
			Acres (CN)		
FULLY DEVELOPED URBAN AREAS (Veg Estab.)					
Open space (Lawns,parks etc.)					
Good condition; grass cover > 75%		-	16(61)	14(74)	10(80)
Streets and roads					
Paved; curbs and storm sewers		-	33(98)	2(98)	-
Urban Districts	Avg % imperv				
Commercial & business	85	-	5(92)	2(94)	-
Residential districts	Avg % imperv				
(by average lot size)					
1/4 acre	38	-	85(75)	35(83)	-
1/3 acre	30	-	84(72)	35(81)	-
Total Area (by Hydrologic Soil Group)			223	88	10
			====	====	====

SUBAREA: 12 TOTAL DRAINAGE AREA: 321 Acres WEIGHTED CURVE NUMBER: 78

RUNOFF CURVE NUMBER COMPUTATION Version 2.00

Project : OWOSSO DRAIN F.P.M.S. User: TDB Date: 10-01-93
County : SHIAWASSEE State: MI Checked: ____ Date: _____
Subtitle:
Subarea : 1~~2~~ 16

COVER DESCRIPTION		Hydrologic Soil Group A	B	C	D
			Acres (CN)		
FULLY DEVELOPED URBAN AREAS (Veg Estab.)					
Open space (Lawns,parks etc.)					
Fair condition; grass cover 50% to 75%		-	-	-	42(84)
Impervious Areas					
Paved parking lots, roofs, driveways		-	-	-	5(98)
Streets and roads					
Paved; curbs and storm sewers		-	15(98)	5(98)	-
Urban Districts	Avg % imperv				
Commercial & business	85	-	15(92)	-	-
Industrial	72	-	4(88)	-	-
Residential districts (by average lot size)	Avg % imperv				
1/4 acre	38	-	64(75)	30(83)	-
Total Area (by Hydrologic Soil Group)			98	35	47
			====	====	====

SUBAREA: 13 TOTAL DRAINAGE AREA: 180 Acres WEIGHTED CURVE NUMBER: 83

U.S. DEPARTMENT OF AGRICULTURE, SOIL CONSERVATION SERVICE
1405 South Harrison Road, Room 101, East Lansing, Michigan 48823-5243
FAX NO. 517-337-6905

DATE: 9-2-94

TO: Chuck Leep PE
MDNR Land and Water Mgt Div

FROM: Tom Bourdon PE
USDA - SCS E Lansing SO

NUMBER OF PAGES: Transmittal Sheet + 3 including this sheet

COMMENTS: Please add to section 9 of the Technical Support Documentation for the Owosso Drain FPMS.

Thanks

TDB

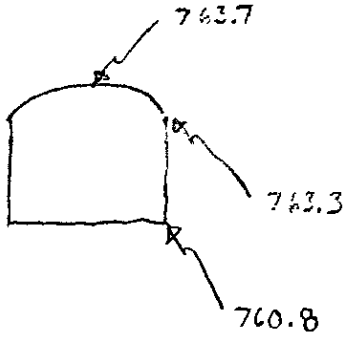
8945E

Michigan — Owosso Drain FPMS

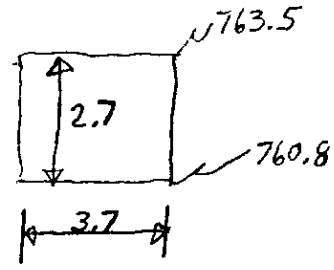
T. Bourdon 12-7-93

Rating Curve @ Outlet of Hopkins Lake (Sta 2) 1 2

3 TDB 7-11



⟹ assume con box



drawing (not to scale)
see survey notes dated 5-21-93 sheet 4a

From Chart 6 of Bureau of Public Roads Oct 1960

if D = 2.7 ; 0° extensions of sides ; Water Surface = 762.6'

then, $\frac{HW}{D} = \frac{762.6 - 760.8}{2.7} = \frac{1.8}{2.7} = 0.67$, $Q/B = 6.1$ cfs

and $Q = 6.1 \times 3.7 =$ 22.6 cfs

if water surface @ 764.0

then $\frac{HW}{D} = \frac{764.0 - 760.8}{2.7} = 1.19$, ; $Q/B = 14.1$ cfs

and $Q = 14.1 \times 3.7 =$ 52.2 cfs

if wsp @ 761.5, $\frac{HW}{D} = \frac{761.5 - 760.8}{2.7} = .26$, $Q/B = 1.9$ and $Q = 1.9 \times 3.7 =$ ~~7.0 cfs~~ 1/

stage	discharge	storage Ac ft
760.8	0.	0.
761.5	~~7.0~~ 1.3 1/	0.1
762.6	22.6	38.5
764.0	52.2	120.5

1/ Note: On 12-7-93 (Visited) the stage velocity in ditch ≤ 0.5 fps
water surface was at 761.5 and 761.5 − 760.8 = 0.7 ft
0.7 × 3.7 × 0.5 = (1.3 cfs) The difference due to open channel flow with high velocity

Structure 4

MI Owosso Drain FPMS - Back Br

TDB 4-93 JOB NO

Stage-discharge-stora W of RR Tracks Back Br SH 1 of 5

STRUCTURE 4

South - South St	North - South St
A @ 740 = 0.3 Ac	A @ 740 = 7.5
A @ 742 = 7.2 Ac	A @ 742 = 30.4
A @ 742.2 = 10.5 Ac	A @ 742.2 = 30.7
A @ 744.0 = 21.8	A @ 742.5 = 31.0
	A @ 742.56 = 31.5

stage = 737.9

	Vol	Cum
	0	0
V @ 740 = $\frac{0+7.2}{2}$ (740 - 737.9) =	0.3	0.3
V @ 742 = $\frac{0.3+7.2}{2}$ 2 =	7.5	7.8
V @ 742.2 = $\frac{7.2+10.5}{2}$ 0.2 =	1.8	9.60
* V @ 742.5 =		15.0
V @ 742.56 =		16.1
V @ 744.0 = $\frac{10.5+21.8}{2}$ 2 =	32.3	41.9

From BOCKWSP1.OUT, (see sheets 4 & 5 of 5)

if elev = 740.0, Q = 18.7 cfs

if elev = 742.0, Q = 46.8 cfs

if elev = 742.2, Q = 49.2

stage	discharge	South storage Vol.1	North Storage Vol.	Total storage Vol.1
737.9	0.	0		0.
740.0	18.7	0.3	+7.9	8.2
742.0	46.8	7.8	+46.5	54.3
742.2	49.2	9.6	+52.6 =	62.2
742.5	150.0	15.0	+61.9 =	76.9
742.56	250.0	16.1	+63.8 =	79.9

* By Interpolation

1/ Includes areas west of Penn Central RR both north & South of South street

File name = BOCKWSP1.OUT

2 of 5

---------- LIST OF INPUT DATA WITH LIMITED EDITING----------

```
WSP2      15.
T[illegible]      OWOSSO DRAIN-FPMS, SHIAWASSEE COUNTY, MICHIGAN
TITLE     EXISTING CONDITIONS, 04-20-94
COMMENT   THE OUTPUT FROM THIS RUN TO BE USED IN TR-20
COMMENT   COMPUTER RUN FILE NAME = BOCKTR20.DAT
DISCHARGE -1.       5.      10.     20.     30.     40.
DISCHARGE -1.      50.      60.     75.    100.    150.
DISCHARGE -1.     200.     250.    300.    350.    500.
STARTS    29.9    .00581   .00581  .00581  .00581  .00581
STARTS    29.9    .00581   .00581  .00581  .00581  .00581
STARTS    29.9    .00581   .00581  .00581  .00581  .00581
OUTPUT    T
EACH      29.9    1.       0.      0.
COMMENT   29.9 IS @ STA 9+00
SEGMENT   29.9    1        N       -23.
NVALUE    .07
SEGMENT   29.9    2        C       10.
NVALUE    .05
SEGMENT   29.9    3        N       1400.
NVALUE    .07
SECTION   29.9
          -70.    740.5    -48.    739.1   -39.    739.6
          -22.    739.2    -7.     738.9   -3.     738.1
          -2.     737.9    0.      737.5   2.      737.6
          3.      738.0    10.     739.7   23.     739.7
          55.     739.7    85.     739.0   300.    739.
          620.    737.3    960.    737.5   1400.   739.8
E[illegible]LE
ROAD      30.0    2.7      90.     90.
COMMENT   CS 30.0 IS RAILROAD CROSSING @ STA. 10+60
CULV1     30.0    1        22551
CULV2     2.5              20.     738.4   737.8
CULV1     30.0    1.       12311
CULV2     1.25             25.     737.9   737.3
SECTION   30.0
          -280.   742.3    -780.   742.4   -680.   742.4
          -575.   742.4    -470.   742.2   -400.   742.5
          -300.   742.7    -200.   742.5   -100.   742.5
          -42.    742.5    0.      742.4   145.    742.5
          230.    742.5    315.    742.6   395.    742.7
          480.    742.7    560.    742.9   650.    742.9
          735.    743.0    810.    743.1   890.    743.2
          990.    742.4
ENDTABLE
REACH     30.5    1.       10.     10.
```


----------LIST OF INPUT DATA----------

```
COMMENT   30.5 IS @ STA 10+80
SEGMENT   30.5    1        N       -5.
N[illegible]      .07
S[illegible]      30.5     2        C       10.
NVALUE    .05
SEGMENT   30.5     3        N       -50.
NVALUE    .07
SECTION   30.5
          [illegible]      742.2    -5      74      [illegible]
```

3 of 5

55.	741.1	100.	740.8	200.	741.1
250.	741.3	300.	740.5	450.	742.0

ENDTABLE

COMPUTE 29.9 30.5 29.9

----------END OF DATA LISTING----------

1 COMPUTE 29.9 30.5 29.9

----------STARTING DATA FROM GIVEN SLOPES----------

RATING TABLE FOR SECTION 29.9 DA= 1.0 SQ MI EXP COEF= .00 CONT COEF= .00

NO.	ELEV FT	AREA SQ FT	Q CFS	ACRES FLOODED FLOODPLAIN DAMAGE	ACRES FLOODED FLOODPLAIN CHANNEL	ACRES FLOODED TOTAL	STARTING CSM	CRIT ELEV FT	FRICTION SLOPE FT/FT	FLOW TOP WIDTH FT
0	737.3	0.0	0.0							
LOW GRND	737.3	.0	.0	.00	.00	.00				.0
*****MESSAGE- ELEV BELOW FIRST PROFILE. FLOW INTERPOLATED LINEARLY FROM CHANNEL BOTTOM*****										
1	737.5	38.3	5.0	.00	.00	.00	5.00	737.3	.00096	282.6
***** WARNING FLOW DEPTH LESS THAN 0.2 FT CHECK THIS PROFILE FOR POSSIBLE ERRORS IN WATER ELEV ***										
2	737.5	41.3	10.0	.00	.00	.00	10.00	737.3	.00294	413.1
***** WARNING FLOW DEPTH LESS THAN 0.2 FT CHECK THIS PROFILE FOR POSSIBLE ERRORS IN WATER ELEV ***										
3	737.5	53.4	20.0	.00	.00	.00	20.00	737.4	.00481	451.7
4	737.6	90.7	30.0	.00	.00	.00	30.00	737.4	.00427	421.6
5	737.6	96.6	40.0	.00	.00	.00	40.00	737.4	.00429	501.7
6	737.6	108.9	50.0	.00	.00	.00	50.00	737.4	.00448	519.1
7	737.7	118.9	60.0	.00	.00	.00	60.00	737.5	.00475	532.5
8	737.7	131.2	75.0	.00	.00	.00	75.00	737.5	.00521	548.9
9	737.7	153.4	100.0	.00	.00	.00	100.00	737.5	.00563	575.3
10	737.8	207.2	150.0	.00	.00	.00	150.00	737.5	.00530	633.5
11	737.9	248.9	200.0	.00	.00	.00	200.00	737.6	.00555	674.8
12	737.9	287.0	250.0	.00	.00	.00	250.00	737.6	.00569	708.5
13	738.0	329.5	300.0	.00	.00	.00	300.00	737.6	.00555	738.6
14	738.0	365.5	350.0	.00	.00	.00	350.00	737.7	.00557	764.1
15	738.2	408.7	500.0	.00	.00	.00	500.00	737.7	.00554	825.6

ROAD SECTION 30.0

NO.	HW FT	CFS	HL FT	TW FT	STARTING CSM	BRIDGE CFS	BRIDGE AREA SQ FT	CULVERT CFS	CULVERT AREA SQ FT	WEIR CFS	WEIR AREA SQ FT	WEIR TOP WIDTH FT
0	737.90	0.0	0.00	737.30	0.00	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1	738.59	5.0	1.33	737.56	5.00	.0	.0	5.0	1.7	.0	.0	.0
2	739.31	10.0	1.76	737.55	10.00	.0	.0	10.0	2.3	.0	.0	.0
3	740.10	20.0	2.51	737.59	20.00	.0	.0	20.0	4.8	.0	.0	.0
4	740.79	30.0	3.14	737.65	30.00	.0	.0	30.0	6.1	.0	.0	.0
5	741.42	40.0	3.71	737.69	40.00	.0	.0	40.0	6.1	0	.0	.0
6	741.97	50.0	4.24	737.73	50.00	.0	.0	43.7	6.1	1.5	1.8	51.5
7	742.53	60.0	4.62	737.75	60.00	.0	0	47.7	6.1	12.2	20.0	195.6
8	742.42	75.0	4.62	737.79	75.00	.0	.0	45.0	6.1	30.0	27.2	485.1
9	742.44	100.0	4.65	737.85	100.00	.0	.0	49.6	6.1	50.2	39.4	630.3
10	742.50	150.0	4.54	737.95	150.00	.0	.0	49.6	6.1	100.7	72.7	138.3
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	200.00	.0	0	[illegible]	[illegible]	151.5	[illegible]	352.7

740 18.7

742.2 46.8 49.2

13	742.57	300.0	4.43	738.16	300.00	.0	.0	49.8	6.1	250.2	184.1	1014.7
14	742.61	350.0	4.40	738.21	350.00	.0	.0	50.3	6.1	299.7	178.3	1075.9
15	742.68	500.0	4.32	738.36	500.00	.0	.0	50.7	6.1	449.3	250.6	1220.7

4 of 5

WARNING**********PROFILE NO 7 EXCEEDS SURVEY DATA BY .1 FT. COMPUTATION BASED ON VERTICAL EXTENSION OF END POINTS**********
WARNING**********PROFILE NO 8 EXCEEDS SURVEY DATA BY .1 FT. COMPUTATION BASED ON VERTICAL EXTENSION OF END POINTS**********
WARNING**********PROFILE NO 9 EXCEEDS SURVEY DATA BY .1 FT. COMPUTATION BASED ON VERTICAL EXTENSION OF END POINTS**********
WARNING**********PROFILE NO 10 EXCEEDS SURVEY DATA BY .2 FT. COMPUTATION BASED ON VERTICAL EXTENSION OF END POINTS**********
WARNING**********PROFILE NO 11 EXCEEDS SURVEY DATA BY .2 FT. COMPUTATION BASED ON VERTICAL EXTENSION OF END POINTS**********
WARNING**********PROFILE NO 12 EXCEEDS SURVEY DATA BY .3 FT. COMPUTATION BASED ON VERTICAL EXTENSION OF END POINTS**********
WARNING**********PROFILE NO 13 EXCEEDS SURVEY DATA BY .3 FT. COMPUTATION BASED ON VERTICAL EXTENSION OF END POINTS**********
WARNING**********PROFILE NO 14 EXCEEDS SURVEY DATA BY .3 FT. COMPUTATION BASED ON VERTICAL EXTENSION OF END POINTS**********
WARNING**********PROFILE NO 15 EXCEEDS SURVEY DATA BY .4 FT. COMPUTATION BASED ON VERTICAL EXTENSION OF END POINTS**********

MIN ROAD ELEVATION = 742.20 FT

OPENING NO.	NO. CULVERTS	CULV. CODE	HEIGHT OR DIAM	WIDTH	LENGTH	U/S INVERT	D/S INVERT	(N) COEFF
1	1	22551.	2.50		20.00	738.40	737.90	.012
2	1	12311.	1.25		25.00	737.90	737.30	.024

RATING TABLE FOR SECTION 20.5 DA= 1.0 SQ MI EXP COEF= .00 CONT COEF= .00

NO.	ELEV FT	AREA SQ FT	Q CFS	ACRES FLOODED FLOODPLAIN DAMAGE	CHANNEL	TOTAL	STARTING CSM	CRIT ELEV FT	FRICTION SLOPE FT/FT	FLOW TOP WIDTH FT
0	738.7	0.0	0.0							
1	739.3	2.3	5.0	.00	.02	.02	5.00	739.2	.02229	7.2
2	739.5	3.7	10.0	.00	.02	.02	10.00	739.4	.02431	8.5
LOW GRND	740.1	10.4	19.8	.00	.03	.03				13.2
BANK FULL	740.1	10.4	19.8	.00	.03	.03				13.2
3	740.1	10.5	20.0	.00	.03	.03	20.00	739.6	.00566	13.2
4	740.8	49.8	30.0	.00	.03	.35	30.00	739.8	.00120	150.8
5	741.4	212.2	40.0	.00	.03	.85	40.00	739.9	.00014	371.9
6	742.2	579.6	50.0	.00	.03	1.05	50.00	740.1	.00001	459.5
7	742.4	622.3	60.0	.00	.03	1.06	60.00	740.2	.00001	460.0
8	742.4	646.5	75.0	.00	.03	1.06	75.00	740.3	.00002	460.0
9	742.4	657.4	100.0	.00	.03	1.06	100.00	740.5	.00003	460.0
10	742.5	683.6	150.0	.00	.03	1.06	150.00	740.7	.00006	460.0
11	742.5	704.1	200.0	.00	.03	1.06	200.00	740.9	.00009	460.0
12	742.6	712.5	250.0	.00	.03	1.06	250.00	741.0	.00014	460.0
13	742.6	726.9	300.0	.00	.03	1.06	300.00	741.1	.00019	460.0
14	742.6	737.5	350.0	.00	.03	1.06	350.00	741.1	.00025	460.0
15	742.7	766.3	500.0	.00	.03	1.06	500.00	741.2	.00045	460.0

WARNING**********PROFILE NO 5 EXCEEDS SURVEY DATA BY .0 FT. COMPUTATION BASED ON VERTICAL EXTENSION OF END POINTS**********
WARNING**********PROFILE NO 6 EXCEEDS SURVEY DATA BY .9 FT. COMPUTATION BASED ON VERTICAL EXTENSION OF END POINTS**********
WARNING**********PROFILE NO 7 EXCEEDS SURVEY DATA BY 1.0 FT. COMPUTATION BASED ON VERTICAL EXTENSION OF END POINTS**********
WARNING**********PROFILE NO 8 EXCEEDS SURVEY DATA BY 1.0 FT. COMPUTATION BASED ON VERTICAL EXTENSION OF END POINTS**********
WARNING**********PROFILE NO 9 EXCEEDS SURVEY DATA BY 1.0 FT. COMPUTATION BASED ON VERTICAL EXTENSION OF END POINTS**********
WARNING**********PROFILE NO 10 EXCEEDS SURVEY DATA BY 1.1 FT. COMPUTATION BASED ON VERTICAL EXTENSION OF END POINTS**********
WARNING**********PROFILE NO 11 EXCEEDS SURVEY DATA BY 1.1 FT. COMPUTATION BASED ON VERTICAL EXTENSION OF END POINTS**********
WARNING**********PROFILE NO 12 EXCEEDS SURVEY DATA BY 1.2 FT. COMPUTATION BASED ON VERTICAL EXTENSION OF END POINTS**********
WARNING**********PROFILE NO 13 EXCEEDS SURVEY DATA BY 1.2 FT. COMPUTATION BASED ON VERTICAL EXTENSION OF END POINTS**********
WARNING**********PROFILE NO 14 EXCEEDS SURVEY DATA BY 1.2 FT. COMPUTATION BASED ON VERTICAL EXTENSION OF END POINTS**********
WARNING**********PROFILE NO 15 EXCEEDS SURVEY DATA BY 1.3 FT. COMPUTATION BASED ON VERTICAL EXTENSION OF END POINTS**********

END
ENDJOB

5 of 5

**********NORMAL END OF JOB----------

1 P2 XEQ 04/26/94 13:18:33 WS : ____ PAGE
REV 11/01/90 VERSION 2.0 ALT: ____ 1

---------- LIST OF INPUT DATA WITH LIMITED EDITING----------
***** END OF FILE - NO END RUN RECORD *****

****

SCS WSP1 VERSION 11/01/90
FILE SUMMARY

INPUT = A:200:WSP1.DAT
OUTPUT = C:DOC:WSP1.OUT DATED 04/26/94 13:18:33

OPTIONAL FILES SAVED

OPTION T = A:BOC:WSP1.WRT DATED 04/26/94 13:18:33

****

Structure 5

Michigan

Owosso Drain FPMS

T Bourdon 2-24-94

Stage-Discharge for Str #5 (above Freeman) 1 9

Utilized Bruce Menerey's calculations for the capacity of the 54" RCP outlet pipe and WSP2 calculations for overland flow to prepare stage-discharge table to be used in TR20 Rch:

Elev	Discharge (54" RCP) 1/	Discharge (Overland) 2/	Discharge (Total)
731.8	0.	0.	0.
736.3	61.4	—	61.4
737.0	66.2	—	66.2
738.0	72.0	4.8	76.8
739.0	76.0	83.5	159.5
739.5	78.0	180.0	258.0
740.0	80.0	350.0	430.0

1/ From Menerey's Comps See sheet 3 of 9

2/ WSP2 Output (Filename = WSPFREE.OUT) see sheet 6 of 9

Fax Transmittal Cover Sheet

Michigan Department of Natural Resources
Land and Water Management Division

DNR

SEND TO: Tom Bourdon

FAX TELEPHONE NO.: 517-337-6905

ADDRESS: SCS

SENDER: Bruce Menerey
335-3181

NUMBER OF PAGES: 2
(including cover sheet)

DATE: 2/14/94

IF YOU DO NOT RECEIVE ALL THE PAGES, PLEASE CALL: 517-373-1170

Here is the rating curve that I developed for the outlet structure. I noted that this does not include inflow that may occur from the storm sewers between South Street & Ament Street. I will take a look at the info that we have & if necessary modify the rating curve.

2/8/94
BEM

South Street - Owosso Drain

Stage	Q_{SA}	Q_{weir}	Q^{*}_{inlets}	Q_T^{**}	
731.8	0	–		0	
734.5	30	–		30	
735	40	–		40	
735.5	50	–		50	
736.1	60	0		60	
737.4	69	0		69	
737.5	70	15	~~87~~	85	
737.6	70	35	~~87~~	105	
737.7	71	~~62~~	57	128	
738	72		59	131	Same
739	76		63	139	
740	80		68	148	
741	85		73	158	
742.1	90		76	166	
743.5	100		79	179	

* Assumes enough catch basins to let water into system (~4 to 5 cfs/catch basin), the 27", 24", 12", 10", & 8" pipes

** Does not consider inflow from stormsewers between South Street & Ament Street ←

7-11-94
TOB

4 of 9

```
---------------------- LIST OF INPUT DATA WITH LIMITED EDITING----------------------
WSP2      10.
TITLE     OWOSSOW DRAIN-FPMS, SHIAWASSEE COUNTY, MICHIGAN, 10-20-93
COMMENT   THE PURPOSE OF THIS RUN IS TO DETERMINE STAGE-DISCHARGE
COMMENT   CURVE FOR STRUCTURE #5 LOCATED SOUTH OF FREEMAN STREET
COMMENT   TO BE USED IN TR 20 COMPUTER RUN
DISCHARGE -1.       50.      100.     200.     350.     600.
STARTS    FREEMAN   .0005    .0005    .0005    .0005    .0005
OUTPUT    T
COMMENT   737.5 - 737.0 \ 1100 = .0005
REACH     FREEMAN   1.       0.       0.
SEGMENT   FREEMAN   1        N        -55.
NVALUE    .15
SEGMENT   FREEMAN   2        C        40.
NVALUE    .10
SEGMENT   FREEMAN   3        N        640.
NVALUE    .15
SECTION   FREEMAN
          -170.     739.5    -120.    739.0    -55.     738.
          0.        737.5    40.      738.0    80.      739.0
          150.      739.8    200.     739.     250.     738.
          300.      738.     530.     739.     640.     740.
          -190.     739.7    -500.    739.3    -690.    740.
ENDTABLE
--------------------MESSAGE - DATA POINTS ON SECTION FREEMA REORDERED BY PROGRAM ACCORDING TO X VALUES
                    DUPLICATE X POINTS NOT CHANGED-------------------
REACH     VAL3      1.       70.      70.
SEGMENT   VAL3      1        C        510.
NVALUE    .10
SECTION   VAL3
          -510.     740.     -445.    739.5    -444.    748.
          -420.     748.     -419.    739.4    -395.    739.4
          -394.     748.     -340.    748.     -339.    739.4
          -255.     739.3    -254.    748.     -225.    748.
          -224.     739.3    -180.    739.3    -140.    738.7
          -139.     748.     -110.    748.     -109.    738.5
          -70.      738.3    -69.     748.     -40.     748.
          -39.      738.     50.      738.     51.      748.
          85.       748.     86.      738.5    150.     738.5
          151.      748.     230.     748.     231.     738.
          300.      738.     301.     748.     380.     748.
          381.      738.     420.     738.     421.     748.
          460.      748.     461.     739.     510.     740.
ENDTABLE
REACH     HERMAN    1.       260.     260.
SEGMENT   HERMAN    1        N        -390.
NVALUE    .15
SEGMENT   HERMAN    2        C        0.
```



```
----------------------------LIST OF INPUT DATA----------------------------
NVALUE    .10
SEGMENT   HERMAN    3        N        230.
NVALUE    .15
SECTION   HERMAN
          -650.     740.     -620.    739.3    -390.    738.
          -320.     737.4    0.       737.3    30.      738.
          230.      740.
```

```
SEGMENT   VAL2     1        C        340.
NVALUE    .10
SECTION   VAL2
          -390.    748.     -389.    740.     -375.    739.8
          -374.    748.     -330.    748.     -329.    739.3
          -290.    738.9    -289.    748.     -265.    748.
          -265.    738.7    -235.    738.5    -234.    748.
          -190.    748.     -189.    738.1    -175.    738.
          -110.    738.     -109.    748.     -75.     748.
          -74.     738.     -45.     738.     -44.     748.
          -25.     748.     -24.     738.     0.       738.
          35.      738.     36.      748.     70.      748.
          71.      738.     120.     738.     121.     748.
          130.     748.     131.     738.     150.     738.
          165.     738.2    166.     748.     210.     748.
          211.     738.2    250.     738.5    251.     748.
          330.     748.     331.     739.8    340.     740.
ENDTABLE
REACH     VALLEY   1.       185.     185.
SEGMENT   VALLEY   1        N        -220.
NVALUE    .15
SEGMENT   VALLEY   2        C        0.
NVALUE    .10
SEGMENT   VALLEY   3        N        180.
NVALUE    .15
SECTION   VALLEY
          -330.    740.     -220.    738.     0.       737.3
          150.     738.     180.     740.
ENDTABLE
REACH     SOUTH    1.       500.     500.
SEGMENT   SOUTH    1        N        -88.
NVALUE    .15
SEGMENT   SOUTH    2        C        86.
NVALUE    .10
SEGMENT   SOUTH    3        N        737.
NVALUE    .15
1    WSP2 XEQ 02/24/94    11:22:31    OWOSSOW DRAIN-FPMS, SHIAWASSEE COUNTY, MICHIGAN, 10-20-93    WS : ____        PAGE
         REV 11/01/90   VERSION 2.0                                                                  ALT:      2


----------------------------LIST OF INPUT DATA----------------------------
SECTION   SOUTH
          -1476.   742.3    -1335.   739.4    -1159.   738.5
          -982.    738.     -805.    738.1    -633.    738.2
          -459.    737.5    -318.    736.9    -144.    737.3
          -88.     737.2    0.       737.4    86.      737.9
          110.     737.9    245.     738.4    384.     738.9
          560.     740.6    737.     742.4
ENDTABLE
COMPUTE   FREEMAN  SOUTH    FREEMAN
----------------------------END OF DATA LISTING----------------------------
1                  COMPUTE  FREEMAN  SOUTH    FREEMAN


----------------------------STARTING DATA FROM GIVEN SLOPES----------------------------

1    WSP2 XEQ 02/24/94    11:22:31    OWOSSOW DRAIN-FPMS, SHIAWASSEE COUNTY, MICHIGAN, 10-20-93    WS : ____        PAGE
         REV 11/01/90   VERSION 2.0                                                                  ALT: ____         3


                    RATING TABLE FOR SECTION FREEMA       DA=      1.0 SQ MI    EXP COEF=  .00    CONT COEF=  .00
                    -------------------------------
```

```
                                        DAMAGE    CHANNEL                          FT     FT/FT       FT
        0     737.5       0.0       0.0
  LOW  GRND   738.0      23.8       4.8      .00       .00       .00                                  95.0
*****MESSAGE- ELEV BELOW FIRST PROFILE. FLOW INTERPOLATED LINEARLY FROM CHANNEL BOTTOM*****
  BANK FULL   738.0      23.8       4.8      .00       .00       .00                                  95.0
*****MESSAGE- ELEV BELOW FIRST PROFILE. FLOW INTERPOLATED LINEARLY FROM CHANNEL BOTTOM*****
        1     738.8     247.3      50.0      .00       .00       .00     50.00      737.9    .00048    436.9
        2     739.1     432.5     100.0      .00       .00       .00    100.00      738.1    .00049    572.5
        3     739.6     786.8     200.0      .00       .00       .00    200.00      738.2    .00050   1053.7
        4     740.0    1300.6     350.0      .00       .00       .00    350.00      738.4    .00048   1240.9
        5     740.5    1894.2     600.0      .00       .00       .00    600.00      738.5    .00048   1330.0
WARNING**********PROFILE NO  4  EXCEEDS SURVEY DATA BY    .0 FT. COMPUTATION BASED ON VERTICAL EXTENSION OF END POINTS**********
WARNING**********PROFILE NO  5  EXCEEDS SURVEY DATA BY    .5 FT. COMPUTATION BASED ON VERTICAL EXTENSION OF END POINTS**********

*****WARNING - SECT. VAL3   KD VALUES REVERSED ON SEGMENT  1 AT ELEVATION    748.80  VALUE CHANGED TO EQUAL PREVIOUS VALUE *****
1    WSP2 XEQ 02/24/94     11:22:31     OWOSSOW DRAIN-FPMS, SHIAWASSEE COUNTY, MICHIGAN, 10-20-93     WS : ____        PAGE
       REV 11/01/90   VERSION 2.0                                                                     ALT: ____          4


                    RATING TABLE FOR SECTION VAL3          DA=      1.0 SQ MI    EXP COEF=  .00    CONT COEF=  .00
                    -----------------------------

        NO.     ELEV      AREA       Q    ------ACRES FLOODED-------    STARTING       CRIT   FRICTION    FLOW TOP
                  FT     SQ FT     CFS   FLOODPLAIN            TOTAL      CSM          ELEV    SLOPE       WIDTH
                                              DAMAGE    CHANNEL                          FT     FT/FT        FT

        0     738.0       0.0       0.0
        1     738.8     195.9      50.0      .00       .50       .50     50.00      738.1    .00056     308.1
        2     739.2     311.1     100.0      .00       .55       .55    100.00      738.2    .00055     341.0
        3     739.7     534.8     200.0      .00       .88       .88    200.00      738.3    .00068     545.3
  LOW  GRND   740.0     734.9     327.2      .00       .98       .98                                    608.5
       FULL   740.0     734.9     327.2      .00       .98       .98                                    608.5
        4     740.1     770.9     350.0      .00       .98       .98    350.00      738.5    .00072     608.6
        5     740.5    1049.3     600.0      .00       .98       .98    600.00      738.7    .00078     609.5
WARNING**********PROFILE NO  4  EXCEEDS SURVEY DATA BY    .1 FT. COMPUTATION BASED ON VERTICAL EXTENSION OF END POINTS**********
WARNING**********PROFILE NO  5  EXCEEDS SURVEY DATA BY    .5 FT. COMPUTATION BASED ON VERTICAL EXTENSION OF END POINTS**********
1    WSP2 XEQ 02/24/94     11:22:31     OWOSSOW DRAIN-FPMS, SHIAWASSEE COUNTY, MICHIGAN, 10-20-93     WS : ____        PAGE
       REV 11/01/90   VERSION 2.0                                                                     ALT: ____          5


                    RATING TABLE FOR SECTION HERMAN        DA=      1.0 SQ MI    EXP COEF=  .00    CONT COEF=  .00
                    -----------------------------

        NO.     ELEV      AREA       Q    ------ACRES FLOODED-------    STARTING       CRIT   FRICTION    FLOW TOP
                  FT     SQ FT     CFS   FLOODPLAIN            TOTAL      CSM          ELEV    SLOPE       WIDTH
                                              DAMAGE    CHANNEL                          FT     FT/FT        FT

        0     737.3       0.0       0.0
  LOW  GRND   737.3        .0        .0      .00       .00       .00                                      .0
*****MESSAGE- ELEV BELOW FIRST PROFILE. FLOW INTERPOLATED LINEARLY FROM CHANNEL BOTTOM*****
  BANK FULL   737.3        .0        .0      .00       .00       .00                                      .0
*****MESSAGE- ELEV BELOW FIRST PROFILE. FLOW INTERPOLATED LINEARLY FROM CHANNEL BOTTOM*****
        1     738.8     674.9      50.0      .00      2.33      3.85     50.00      737.4    .00002     645.8
        2     739.2     922.3     100.0      .00      2.33      4.45    100.00      737.5    .00004     745.7
        3     739.7    1317.5     200.0      .00      2.33      4.95    200.00      737.6    .00006     829.2
        4     740.1    1677.6     350.0      .00      2.33      5.19    350.00      737.7    .00009     869.1
        5     740.6    2090.3     600.0      .00      2.33      5.26    600.00      737.8    .00014     880.0
WARNING**********PROFILE NO  4  EXCEEDS SURVEY DATA BY    .1 FT. COMPUTATION BASED ON VERTICAL EXTENSION OF END POINTS**********
WARNING**********PROFILE NO  5  EXCEEDS SURVEY DATA BY    .6 FT. COMPUTATION BASED ON VERTICAL EXTENSION OF END POINTS**********

*****WARNING - SECT. VAL2   KD VALUES REVERSED ON SEGMENT  1 AT ELEVATION    749.00  VALUE CHANGED TO EQUAL PREVIOUS VALUE *****
1    WSP2 XEQ 02/24/94     11:22:31     OWOSSOW DRAIN-FPMS, SHIAWASSEE COUNTY, MICHIGAN, 10-20-93     WS : ____        PAGE
       REV 11/01/90   VERSION 2.0                                                                     ALT: ____          6
```

RATING TABLE FOR SECTION VAL2 DA= 1.0 SQ MI EXP COEF= .00 CONT COEF= .00

NO.	ELEV FT	AREA SQ FT	Q CFS	ACRES FLOODED FLOODPLAIN DAMAGE	ACRES FLOODED FLOODPLAIN CHANNEL	ACRES FLOODED TOTAL	STARTING CSM	CRIT ELEV FT	FRICTION SLOPE FT/FT	FLOW TOP WIDTH FT
0	738.0	0.0	0.0							
1	738.8	235.6	50.0	.00	.56	.56	50.00	738.1	.00032	323.0
2	739.2	356.0	100.0	.00	.60	.60	100.00	738.2	.00037	349.8
3	739.7	533.6	200.0	.00	.63	.63	200.00	738.3	.00042	365.9
LOW GRND	740.0	644.0	303.6	.00	.66	.66				383.7
BANK FULL	740.0	644.0	303.6	.00	.66	.66				383.7
4	740.1	693.4	350.0	.00	.66	.66	350.00	738.4	.00058	384.0
5	740.6	880.4	600.0	.00	.66	.66	600.00	738.6	.00079	384.9

WARNING**********PROFILE NO 4 EXCEEDS SURVEY DATA BY .1 FT. COMPUTATION BASED ON VERTICAL EXTENSION OF END POINTS**********
WARNING**********PROFILE NO 5 EXCEEDS SURVEY DATA BY .6 FT. COMPUTATION BASED ON VERTICAL EXTENSION OF END POINTS**********

RATING TABLE FOR SECTION VALLEY DA= 1.0 SQ MI EXP COEF= .00 CONT COEF= .00

NO.	ELEV FT	AREA SQ FT	Q CFS	ACRES FLOODED FLOODPLAIN DAMAGE	ACRES FLOODED FLOODPLAIN CHANNEL	ACRES FLOODED TOTAL	STARTING CSM	CRIT ELEV FT	FRICTION SLOPE FT/FT	FLOW TOP WIDTH FT
0	737.3	0.0	0.0							
LOW GRND	737.3	.0	.0	.00	.00	.00				.0
*****MESSAGE- ELEV BELOW FIRST PROFILE. FLOW INTERPOLATED LINEARLY FROM CHANNEL BOTTOM*****										
BANK FULL	737.3	.0	.0	.00	.00	.00				.0
*****MESSAGE- ELEV BELOW FIRST PROFILE. FLOW INTERPOLATED LINEARLY FROM CHANNEL BOTTOM*****										
1	738.9	471.5	50.0	.00	.93	1.83	50.00	737.6	.00006	429.8
2	739.2	635.0	100.0	.00	.93	1.94	100.00	737.7	.00009	455.7
3	739.7	874.6	200.0	.00	.93	2.07	200.00	737.8	.00014	487.9
4	740.2	1098.0	350.0	.00	.93	2.16	350.00	737.9	.00022	508.7
5	740.7	1358.2	600.0	.00	.93	2.17	600.00	738.1	.00032	510.0

WARNING**********PROFILE NO 4 EXCEEDS SURVEY DATA BY .2 FT. COMPUTATION BASED ON VERTICAL EXTENSION OF END POINTS**********
WARNING**********PROFILE NO 5 EXCEEDS SURVEY DATA BY .7 FT. COMPUTATION BASED ON VERTICAL EXTENSION OF END POINTS**********

RATING TABLE FOR SECTION SOUTH DA= 1.0 SQ MI EXP COEF= .00 CONT COEF= .00

NO.	ELEV FT	AREA SQ FT	Q CFS	ACRES FLOODED FLOODPLAIN DAMAGE	ACRES FLOODED FLOODPLAIN CHANNEL	ACRES FLOODED TOTAL	STARTING CSM	CRIT ELEV FT	FRICTION SLOPE FT/FT	FLOW TOP WIDTH FT
0	736.9	0.0	0.0							
LOW GRND	736.9	.0	.0	.00	.00	.00				.0
*****MESSAGE- ELEV BELOW FIRST PROFILE. FLOW INTERPOLATED LINEARLY FROM CHANNEL BOTTOM*****										
BANK FULL	737.2	30.1	1.0	.00	.00	2.31				201.0
*****MESSAGE- ELEV BELOW FIRST PROFILE. FLOW INTERPOLATED LINEARLY FROM CHANNEL BOTTOM*****										
1	738.9	1586.5	50.0	.00	2.00	18.22	50.00	737.2	.00001	1587.6
2	739.2	2206.1	100.0	.00	2.00	19.63	100.00	737.2	.00001	1710.5
3	739.7	3100.6	200.0	.00	2.00	20.91	200.00	737.3	.00002	1822.0
4	740.2	3941.2	350.0	.00	2.00	21.70	350.00	737.4	.00003	1890.7
5	740.7	4943.6	600.0	.00	2.00	22.60	600.00	737.6	.00004	1968.5

```
END
ENDJOB

*****************************NORMAL END OF JOB----------------------------

1 (  PZ XEQ 02/24/94     11:22:31                                          WS : ___        PAGE
     REV 11/01/90   VERSION 2.0                                            ALT: ___          1

---------------------- LIST OF INPUT DATA WITH LIMITED EDITING----------------------
ENDRUN

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

                SCS  WSPZ     VERSION 11/01/90
                       FILE SUMMARY

        INPUT    = A:WSPFREE.DAT
        OUTPUT   = C:WSPFREZ.OUT            DATED 02/24/94  11:22:31

                 OPTIONAL FILES SAVED

        OPTION T = A:WSPFREE.WRT            DATED 02/24/94  11:22:31

 ***********************************************************************
```

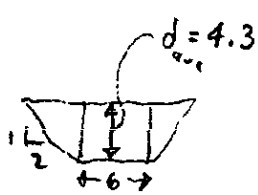
Michigan — Owosso Drain FPMS

T Bourdon 2-23-94 — Stage - Storage for Structure ~~#8~~ 5 South of Freeman St. and 10B 7-11-94 — 9 9

$$V = \frac{A_1 + A_2}{2} L$$

Area	Elevation		Volume	Cum Volume
	731.8 = 0		0	0
0	736.3		2.2 1/	2.2
		$\frac{0+4.5}{2}(737.0-736.3)$ =		
4.5	737.0		1.6	3.8
		$\frac{4.5+29.2}{2}(738.0-737.0)$ =		
15.7+13.5=29.2	738.0		16.9	20.7
		$\frac{29.2+54.3}{2}(739.0-738.0)$ =		
23.9+30.4=54.3	739.0		41.8	62.5
		$\frac{54.3+71.5}{2}(739.5-739.0)$ =		
30.0 2/ + 41.5=71.5	739.5		31.5	94.0
		$\frac{71.5+87.4}{2}(740-739.5)$ =		
35.0 2/ + 52.4=87.4	740.0		39.7	133.7

1/ Volume in channel 1500' long

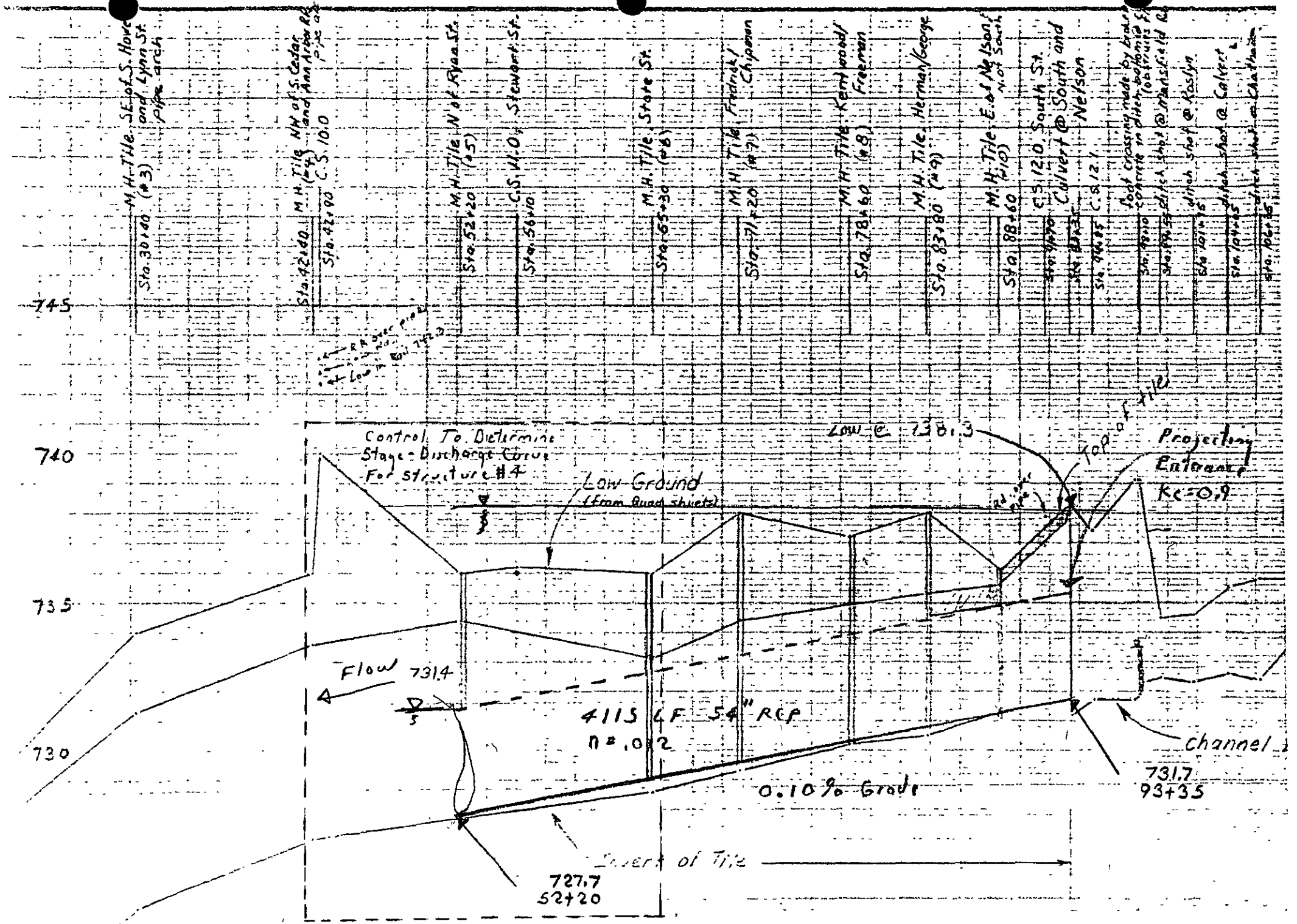


$$V = \frac{62.8+62.8}{2}(1500)/43560$$

2/ Approximate - Estimated

$V = 2.16$ Use 2.2 Ac-Ft

Structure 6


745
740
735
730
Control To Determine
Stage-Discharge Curve
For Structure #4
Low Ground
(From Quad sheets)
Low @ 138.3
Projecting
Entrance
Ke=0.9
Flow
731.4
4115 LF 54" RCP
n=.012
0.10% Grade
Channel
731.7
93+35
727.7
52+20
Invert of Tile
Sta. 30+40 (#3)
Sta. 42+40
Sta. 42+90
Sta. 52+20 (#5)
Sta. 56+10
Sta. 65+30 (#6)
Sta. 71+20 (#7)
Sta. 78+60 (#8)
Sta. 83+80 (#9)
Sta. 88+60 (#10)
Sta. 94+70
Sta. 94+85
Sta. 98+10
Sta. 101+16
Sta. 104+65
Sta. 109+55

U S DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

Owosso Drain FPMS 1 of 8

Michigan 12-93
Bourdon Structure #6 stage - discharge - storage Curves

Elevation Ft	Discharge cfs 54" Pipe	27" Pipe	24" Pipe	12" Pipe	10" Pipe	8" Pipe	Total Discharge	Storage AcFt
728.4	0.						0.	0.
730.6	32.						32.	0.7
732.0	68.						68.	0.9
734.0	120.						120.	1.2
735.1	126.8	33.4	20.8	3.6	2.9	1.2	188.7	1.4
736.0	148.7	37.6	23.4	4.0	3.3	1.3	218.3	9.6
737.0	169.8	41.8	26.0	4.3	3.7	1.5	247.1	49.6
738.0	188.5	45.5	28.4	4.7	4.0	1.6	272.7	131.5
739.0	205.5	49.0	30.5	5.2	4.3	1.7	296.2	237.6

interpolated

The Overland Flow Doesn't Occur untill approx Elev 735.1 Therefore these pipes will receive flood waters from the south only at or above elev 735.1

Storage Calculations

Area @ 735.1 = 0

Area @ 736.0 = 18.3 Ac

Area @ 737.0 = 61.7 Ac

Area @ 738.0 = 102.1

Area @ 739.0 = 110.0

* Volume in 54" Pipe = $\frac{15.89 \times 3725}{43560}$ = 1.4 Ac Ft

Elev	Vol	Sum Vol
735.1	1.4	1.4
736.0	$\frac{0+18.3}{2}(.9) = 8.2$	9.6
737.0	$\frac{18.3+61.7}{2}(1) = 46.0$	49.6
738.0	$\frac{61.7+102.1}{2}(1) = 81.9$	131.5
739.0	$\frac{102.1+110.0}{2}(1) = 106.1$	237.6

US Department of Agriculture
Soil Conservation Service

DESIGN WORKSHEET
for
Culvert Evaluation

prepared for

OWOSSO DRAIN FPMS

in

SHIAWASSEE County, Michigan

Designer : TDB
Date : 12/10/93

Checker _____
Date _____

****

54 INCH OUTLET PIPE @ 51+40

'n' value = 0.013
Length = 230 ft.
Diameter = 54 in.
Projecting .. square edge
ke = 0.46

Capacity * = 188.5 cfs.

Outlet Controls

Elevation of headwater = 738.0
Elevation of inlet = 728.4
Elevation of tailwater = 732.7
Elevation of outlet = 728.2

54" Pipe

HW	D	Qout	
728.4		0	inlet control from nomographs
730.6	.5	32.0	
732.0	.8	68.0	
734.0	1.2	120.0	
735.1		126.8	outlet control
736.0		148.7	
737.0		169.8	
738.0		* 188.5	
739.0		205.5	

Add discharge [illegible] or junction box below [illegible] pipe if below ground [illegible].

US Department of Agriculture
Soil Conservation Service

DESIGN WORKSHEET
for
Pipe Flow Formula Solution

prepared for

OWOSSO DRAIN FPMS

in

SHIAWASSEE County, Michigan

Designer : TDB
Date : 12/10/93

Checker _____
Date _____

****

27 IN ENTERING @ STEWART ST. Entering trunk Line from the West.

Mannings Coefficient (n)	0.013
Entrance Coefficient (Ke)	0.50
Diameter of pipe	27 inch.
1/ Head on pipe	3.4 feet.
Length of pipe	150 feet.

Pipe Capacity	33.4 cfs @ 735.1
Velocity in pipe	8.4 ft/sec
Friction Cofficient (Kp)	0.0106
Max allowable fall in pipe when outlet is not submerged	1.8 ft.

1/ 735.7 − 4 = 731.7

$$\begin{array}{r} 735.1 \\ -\ 731.7 \\ \hline 3.4 \end{array}$$

27" Pipe

@ 735.1 33.4 cfs
@ 736.0 37.6 cfs
@ 737.0 41.8 cfs
@ 738.0 45.5 cfs

US Department of Agriculture
Soil Conservation Service

DESIGN WORKSHEET
for
Pipe Flow Formula Solution

prepared for

OWOSSO DRAIN FPMS

in

SHIAWASSEE County, Michigan

Designer : TDB
Date : 12/10/93

Checker _____
Date _____

****

24 IN ENTERING @ AMENT ST. from east

Mannings Coefficient (n)	0.013
Entrance Coefficient (Ke)	0.50
Diameter of pipe	24 inch.
Head on pipe	4.3 feet.
Length of pipe	280 feet.
Pipe Capacity	23.4 cfs *
Velocity in pipe	7.5 ft/sec
Friction Cofficient (Kp)	0.0124
Max allowable fall in pipe when outlet is not submerged	3.0 ft.

24" Pipe

735.1	20.8
* 736.0	23.4
737.0	26.0
738.0	28.4
739.0	30.5

US Department of Agriculture
Soil Conservation Service

DESIGN WORKSHEET
for
Pipe Flow Formula Solution

prepared for

OWOSSO DRAIN FPMS

in

SHIAWASSEE County, Michigan

Designer : TDB
Date : 12/10/93

Checker _____
Date _____

****

12 IN @ RYAN ST entering from the east

Mannings Coefficient (n)	0.013
Entrance Coefficient (Ke)	0.50
Diameter of pipe	12 inch.
Head on pipe	4.4 feet.
Length of pipe	380 feet.
Pipe Capacity	3.6 cfs
Velocity in pipe	4.6 ft/sec
Friction Cofficient (Kp)	0.0313
Max allowable fall in pipe when outlet is not submerged	3.9 ft.

12" Pipe

735.1	3.6
736.0	4.0
737.0	4.3
738.0	4.7
739.0	5.2

US Department of Agriculture
Soil Conservation Service

DESIGN WORKSHEET
for
Pipe Flow Formula Solution

prepared for

OWOSSO DRAIN FPMS

in

SHIAWASSEE County, Michigan

Designer : TDB
Date : 12/10/93

Checker _____
Date _____

****

10 IN ENTERING @ STEWART ST from east side

Mannings Coefficient (n)	0.013
Entrance Coefficient (ke)	0.50
Diameter of pipe	10 inch.
Head on pipe	6.3 feet.
Length of pipe	150 feet.
Pipe Capacity	4.0 cfs
Velocity in pipe	7.4 ft/sec
Friction Cofficient (Kp)	0.0399
Max allowable fall in pipe when outlet is not submerged	5.0 ft.

10" Pipe

735.1	2.9
736.0	3.3
737.0	3.7
738.0	4.0
739.0	4.3 U

U estimated

* Note: Sheet 8 of 8 is a Contour Map

US Department of Agriculture
Soil Conservation Service

DESIGN WORK SHEET
for
Pipe Flow Formula Solution

prepared for

OWOSSO DRAIN FPMS

in

SHIAWASSEE County, Michigan

Designer : TDB
Date : 12/10/93

Checker _____
Date _____

****

8 IN @ RYAN ST. entering from west

Mannings Coefficient (n)	0.013
Entrance Coefficient (Ke)	0.50
Diameter of pipe	8 inch.
Head on pipe	7.3 feet.
Length of pipe	380 feet.
Pipe Capacity	1.6 cfs
Velocity in pipe	4.6 ft/sec
Friction Cofficient (f.p)	0.0538
Max allowable fall in pipe when outlet is not submerged	6.8 ft.

8 in Pipe

735.1	1.2
736.0	1.3
737.0	1.5
738.0	1.6
739.0	1.7 U

U estimated

For Information
7-12-94 TDB

U.S. DEPARTMENT OF AGRICULTURE, SOIL CONSERVATION SERVICE
1405 South Harrison Road, Room 101, East Lansing, Michigan 48823-5243
FAX NO. 517-337-6905

DATE: 2-2-94

TO: Chuck Leep
DNR

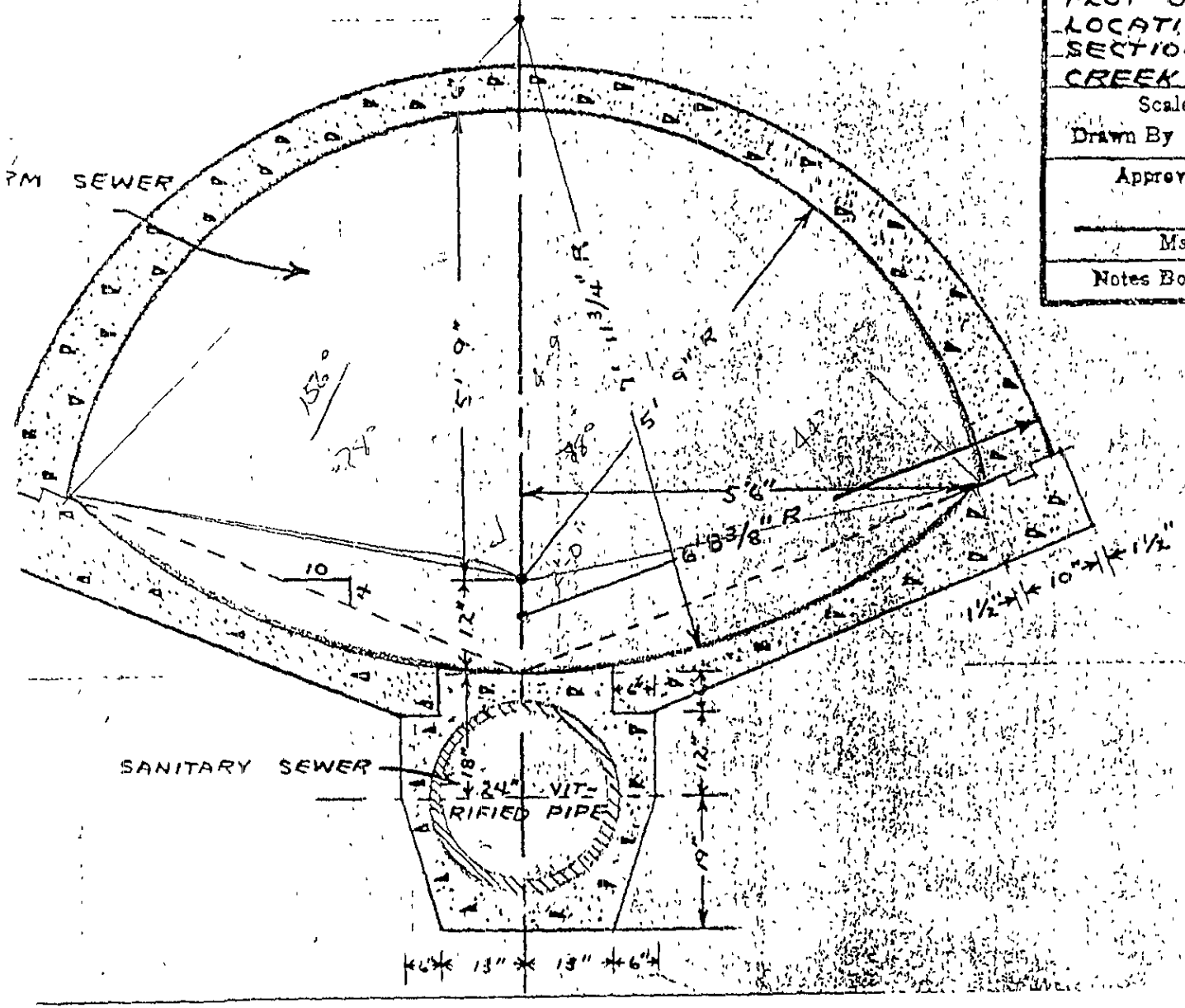
FROM: Tom Bourdon
SCS

NUMBER OF PAGES: Transmittal Sheet + 6 including this cover sheet

COMMENTS: Attached are copies of TRUNK LINE from Shiawassee R to Junction Box along with calculations from Capital Consultants.

8945E

TYPICAL CROSS-SECTION - TYPE "A"
CONSTRUCTION - COMSTOCK
CREEK DRAIN



DEPARTMENT OF ENGINEERING
OWOSSO, MICH.

PLOT OF Y.M.C.A PROPERTY & LOCATION & TYPICAL CROSS-SECTION OF PORTION OF COMSTOCK CREEK THRU SAID PROPERTY.

Scales: Horizontal 1"= Vertical 1"=

Drawn By J. QUINE Date 2/8/54

Approved By

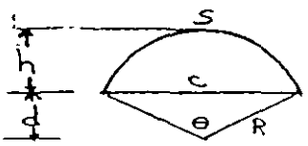
Mayor City Engineer

Notes Book Page File

46-

Capital Consultants, Inc.
ENGINEERS
1627 LAKE LANSING ROAD • LANSING, MICHIGAN 48912-3798
TELEPHONE (517) 371-1200 • FAX (517) 371-2013

OWOSSO DRAIN STUDY JOB NUMBER 89117.01
COMSTOCK TRUNK SHEET NO 1 OF
DRAIN - CAPACITY COMP. BY SCN DATE 3/
CHK'D. BY DATE



AREA = 1/2 (Rs - cd)

s = θR

MUST CALCULATE SEGMENT AREA FOR TOP HALF AND BOTTOM HALF OF COMSTOCK TRUNK DRAIN

BOTTOM HALF

R = 7'11 3/4" = 7.98 FT
d = 5.9'
h = 2.08'
c = 11.0 FT
θ = 86° = 1.50098 RADIANS

s = 1.50098 (7.98 FT) = 11.98 FT

AREA = 1/2 (7.98(11.98) - 11.0 (5.9)) = 15.35 FT²

TOP HALF

R = 5.75 FT
d = 1.08 FT
c = 11.0 FT
θ = 156° = 2.72271 RAD

s = 2.72271 (5.75) = 15.66

AREA = 1/2 (5.75 (15.66) - 11 (1.08)) = 39.08 FT²

TOTAL AREA = 15.35 FT² + 39.08 FT² = 54.43 FT²

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OWOSSO DRAIN
STUDY - COMSTOCK
TRUNK DRAIN

JOB NUMBER 89117.01
SHEET NO. 2 OF
COMP. BY SCN DATE 3/31
CHK'D. BY DATE

DETERMINE EQUIVALENT CIRCULAR

CIRCULAR AREA = $\frac{\pi D^2}{4}$

$54.43 \text{ FT}^2 = \frac{\pi D^2}{4}$ $\quad D = \sqrt{\frac{4(54.43)}{\pi}} = 8.32 \text{ FT}$

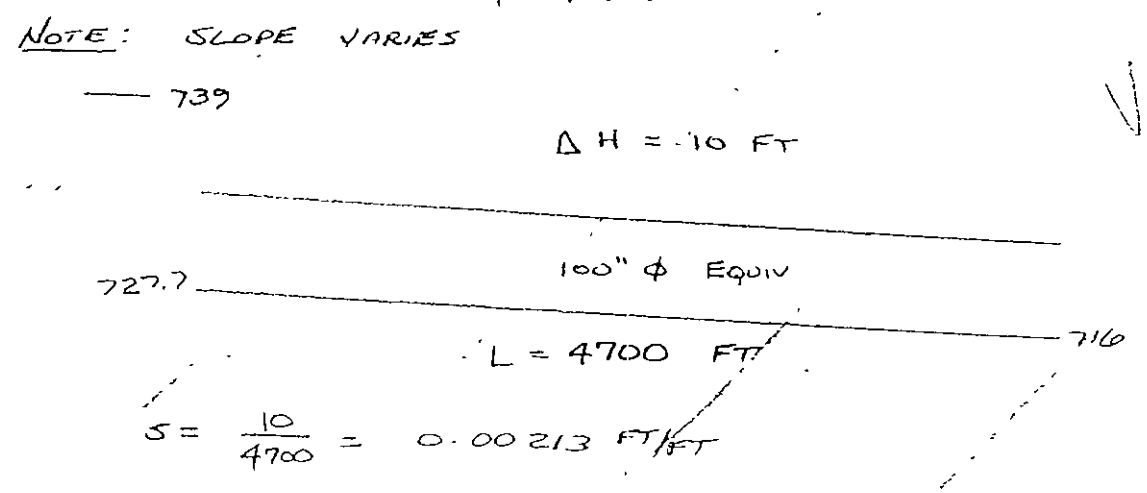
8.32 FT = 8'-4" = 100" CIRCULAR

DETERMINE DISCHARGE FOR COMSTOCK TRUNK DRAIN

FREE DISCHARGE AT 0.4% SLOPE (0.004 FT/FT) ≅ 700 CFS

PRESSURE DISCHARGE - 100 YR STORM

SHIAWASSE RIVER ELEV = 729
I.E COMSTOCK TRUNK DRAIN AT RIVER = 716
STANDING WATER AT STEWART ST = 739
I.E. AT STEWART ST. 727.7
NOTE: SLOPE VARIES



$S = \frac{10}{4700} = 0.00213 \text{ FT/FT}$

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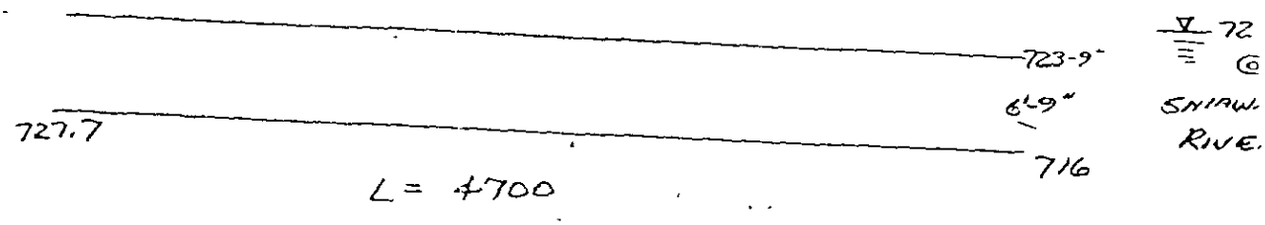
OWOSSO DRAIN STUDY — JOB NUMBER 89117.0
COMSTOCK TRUNK — SHEET NO. 1 OF
DRAIN — COMP. BY OEN DATE 4
CHK'D. BY DATE

PRESSURE DISCHARGE – 100 YEAR STORM

$\underline{\underline{V}}$ 739.0 @ STEWART STREET



ASSUME:

$\Delta H = 739 - 725.6 = 13.4$ FT

$f = 0.018$

~~$S = 13.4/4700 = 0.002851$ FT/FT~~ ~~$h_o = 0.011$~~

$d = 8.5$ ft (102")

$\Delta H = h_e + h_f + h_o$

WHERE: h_e = entrance loss $\quad h_e = K_e \frac{V^2}{2g} \quad K_e = 0.1$

h_f = friction loss

h_o = outlet loss $\quad h_o = K_o \frac{V^2}{2g} \quad K_o = 1.0$

$h_f = f \frac{l}{d} \frac{V^2}{2g}$ $\qquad A = 54.43$ FT^2

WANTED: $Q = ?$ $\qquad Q = VA \qquad V = Q/A$

$$\therefore \quad \Delta H = K_e \frac{\left(\frac{Q^2}{A^2}\right)}{2g} + f \frac{l}{d} \frac{\left(\frac{Q^2}{A^2}\right)}{2g} + K_o \frac{\left(\frac{Q^2}{A^2}\right)}{2g}$$

$$13.4 = 0.1 \frac{\frac{Q^2}{(54.43)^2}}{2(32.2)} + 0.018 \frac{4700}{8.5} \frac{\frac{Q^2}{(54.43)^2}}{2(32.2)} + 1.0 \frac{\frac{Q^2}{(54.43)^2}}{2(32.2)}$$

$$862.96 = 0.1\left(\frac{Q^2}{2962.6}\right) + 9.953\left(\frac{Q^2}{2962.6}\right) + 1.0 \frac{Q^2}{(2962.6)}$$

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JOB NUMBER
STUDY - COMSTOCK TRUNK DRAIN
SHEET NO. 2 OF
COMP. BY SCN DATE 4
CHK'D. BY DATE

$$862.96\,(2962.6) = 0.1\,Q^2 + 9.953\,Q^2 + 1.0\,Q^2$$

$$2{,}556{,}605.3 = 11.053\,Q^2$$

$$231{,}304.2 = Q^2$$

$$480.94 = Q \qquad Q = 480.94 \text{ CFS}$$

$$Q = V\,A \qquad 480.94 = V\cdot(54.43)$$

$$V = 8.836 \text{ FT/SEC}$$

Filename - OW050FW5.OUT

Final Run TDB, 6-27-94

```
---------------------- LIST OF INPUT DATA WITH LIMITED EDITING----------------------
WSP[redacted]   40.
T [redacted]    OW0550  DRAIN-FPMS, SHIAWASSEE COUNTY, MICHIGAN
TITLE     OW0550 DRAIN-EXISTING CONDITIONS, 06-27-94
COMMENT   2-YEAR, 10-YEAR, 50-YEAR, 100-YEAR, & 500-YEAR FLOODS
COMMENT   DISCHARGES FROM TR-20 COMPUTER RUN (filename = tr20ows.out)
COMMENT   XSECTION 16
DISCHARGE -1.       105.      200.      335.      405.      600.
STARTS    12.1      .0005     .0005     .0005     .0005     .0005
OUTPUT    T
REACH     12.1      1.        0.        0.
COMMENT   12.1 IS @ STA 84+85
SEGMENT   12.1      1         N         -6.
NVALUE    .07
SEGMENT   12.1      2         C         40.
NVALUE    .05
SEGMENT   12.1      3         N         770.
NVALUE    .07
SECTION   12.1
          -13.      739.8     -6.       733.2     0.        731.7
          6.        733.2     19.       737.5     40.       739.4
          105.      738.1     145.      737.5     146.      737.1
          164.      737.3     201.      739.6     260.      732.
          290.      738.      625.      740.      665.      740.
          770.      742.      -405.     738.      -465.     732.
          -665.     738.      -990.     736.      -1010.    736.
          -1210.    738.      -1490.    740.
EN[redacted]LE
-[redacted]----------MESSAGE - DATA POINTS ON SECTION 12.1  REORDERED BY PROGRAM ACCORDING TO X VALUES
                    DUPLICATE X POINTS NOT CHANGED--------------------
REACH     12.5      1.        1605.     1120.
COMMENT   12.5 IS @ STA 100+90
SEGMENT   12.5      1         N         -15.
NVALUE    .07
SEGMENT   12.5      2         C         20.
NVALUE    .05
SEGMENT   12.5      3         N         490.
NVALUE    .07
SECTION   12.5
          -200.     739.      -150.     738.7     -125.     739.8
          -105.     735.7     -85.      738.9     -65.      739.4
          -15.      738.9     -7.       734.8     0.        732.
          7.        734.5     20.       739.1     36.       740.3
          69.       740.6     80.       743.9     490.      742.
          -790.     738.      -1125.    739.      -1590.    740.
          -1655.    742.
ENDTABLE
--------------------MESSAGE - DATA POINTS ON SECTION 12.5  REORDERED BY PROGRAM ACCORDING TO X VALUES
                    DUPLICATE X POINTS NOT CHANGED--------------------
REACH     12.9      1.        470.      470.
```



```
[redacted]
-- ----------------------LIST OF INPUT DATA----------------------------
COMMENT   12.9 IS @ STA 105+00
SEGMENT   12.9      1         N         -23.
NVALUE    .07
SEGMENT   12.9      2         C         23.
```

```
NVALUE    .07
SECTION   12.9
          -200.    741.2    -100.    740.9    -50.     741.4
          -23.     740.9    -10.     735.3    -7.      735.
          0.       734.2    7.       734.9    10.      735.3
          26.      741.1    50.      742.     100.     742.1
          200.     742.     300.     742.9    -480.    740.
          -920.    740.     -1150.   738.     -1420.   740.
          -1570.   742.     -1715    744.
ENDTABLE
--------------------MESSAGE - DATA POINTS ON SECTION 12.9  REORDERED BY PROGRAM ACCORDING TO X VALUES
                    DUPLICATE X POINTS NOT CHANGED--------------------
ROAD      13.0     2.7      100.     100.
COMMENT   13.0 IS @ STA 106+80 FARM CROSSING
CULV1     13.0     1.       32111
CULV2     5.2      6.5      40.      733.3    732.9
SECTION   13.0
          -500.    740.     -400.    740.7    -300.    741.2
          -200.    740.4    -100.    740.5    -50.     740.5
          -23.     740.6    -5.      739.9    0.       740.1
          20.      740.6    50.      740.4    100.     741.
          200.     741.6    300.     743.5    -1430.   740.
          -1565.   742.     -1720.   744.
ENDTABLE
--------------------MESSAGE - DATA POINTS ON SECTION 13.0  REORDERED BY PROGRAM ACCORDING TO X VALUES
                    DUPLICATE X POINTS NOT CHANGED--------------------
REACH     13.1     1.       30.      80.
COMMENT   13.1 IS @ STA 107+80
SEGMENT   13.1     1        N        -22.
NVALUE    .07
SEGMENT   13.1     2        C        20.
NVALUE    .05
SEGMENT   13.1     3        N        300.
NVALUE    .07
SECTION   13.1
          -450.    740.6    -350.    740.9    -250.    740.9
          -150.    741.3    -50.     740.9    -22.     740.8
          -8.5     735.5    -4.      734.6    0.       735.
          4.       734.3    8.5      735.2    20.      740.1
          30.      740.7    50.      741.2    100.     740.7
          200.     742.2    300.     743.5    -1420.   740.
          -1530.   742.     -1770.   744.
ENDTABLE
1    WSP2 XEQ 06/27/94     14:25:46     OW0550  DRAIN-FPM5, SHIAWASSEE COUNTY, MICHIGAN          WS : ____        PAGE
          REV 11/01/90   VERSION 2.0    OW0550 DRAIN-EXISTING CONDITIONS, 06-27-94               ALT:       2


----------------------------LIST OF INPUT DATA----------------------------
--------------------MESSAGE - DATA POINTS ON SECTION 13.1  REORDERED BY PROGRAM ACCORDING TO X VALUES
                    DUPLICATE X POINTS NOT CHANGED--------------------
REACH     13.9     1.       1520.    1530.
COMMENT   13.9 IS @ STA 123-10
SEGMENT   13.9     1        N        -18.
NVALUE    .07
SEGMENT   13.9     2        C        20.
NVALUE    .05
SEGMENT   13.9     3        N        590.
NVALUE    .07
SECTION   13.9
          -[illegible]     741.[illegible]   -200.    741.3    -[illegible]     740.[illegible]
          -100.    740.7    -5[illegible]    741.2    -3[illegible]    741.3
          -[illegible]     741.7    -11.     737.2    -8.      73[illegible]
          -4       735.[illegible]   [illegible]      735.3    3.       735.3
          5.       [illegible]      11.      737.2    20.      741.6
          [illegible]
```

```
        300.      742.2     390.      744.      -1030.    740.
        -1280.    738.9     -1370.    738.9     -1500.    740.
        -1600.    740.      -1980.    742.      -1990.    744.
ENDTABLE
--------------------MESSAGE - DATA POINTS ON SECTION 13.9  REORDERED BY PROGRAM ACCORDING TO X VALUES
                   DUPLICATE X POINTS NOT CHANGED--------------------
ROAD      14.0      2.7       113.      113.
C[illegible]T     14.0 IS @ STA 124+40 FARM CROSSING
CULV1     14.0      1.        32111
CULV2     4.8       6.0       34.       734.24    734.19
SECTION   14.0
        -460.     740.7     -360.     741.4     -260.     740.7
        -160.     739.3     -58.      740.5     -42.      741.7
        -30.      740.7     -17.      740.7     0.        740.4
        20.       740.8     50.       741.3     95.       741.1
        101.      738.4     108.      738.4     113.      741.7
        200.      741.2     300.      741.2     400.      742.3
        510.      744.      -660.     740.4     -950.     740.
        -1280.    738.9     -1470.    738.9     -1700.    740.
        -1980.    742.      -1990.    744.
ENDTABLE
--------------------MESSAGE - DATA POINTS ON SECTION 14.0  REORDERED BY PROGRAM ACCORDING TO X VALUES
                   DUPLICATE X POINTS NOT CHANGED--------------------
REACH     14.1      1.        133.      133.
COMMENT   14.1 IS @ STA 125+90
SEGMENT   14.1      1         N         -39.
NVALUE    .07
SEGMENT   14.1      2         C         47.
NVALUE    .05
SEGMENT   14.1      3         N         425.
NVALUE    .07
SECTION   14.1
        -400.     741.      -300.     740.9     -200.     739.5
1 [illegible]P2 XEQ 06/27/94    14:25:46    OWOSSO  DRAIN-FPMS, SHIAWASSEE COUNTY, MICHIGAN          WS : ____        PAGE
        REV 11/01/90   VERSION 2.0    OWOSSO DRAIN-EXISTING CONDITIONS, 06-27-94                    ALT:      3


----------------------------LIST OF INPUT DATA----------------------------
        -100.     739.4     -39.      742.3     -29.      742.3
        -18.      741.1     -9.5      737.3     -6.       735.8
        -4.       735.      0.        734.7     3.        735.1
        8.        736.1     9.5       737.2     19.       741.5
        27.       742.5     47.       742.6     70.       740.7
        120.      740.6     150.      741.2     157.      740.7
        165.      739.5     190.      740.      310.      742.
        425.      744.      -1140.    740.      -1380.    738.9
        -1580.    738.9     -1740.    740.      -1930.    742.
        -2000.    744.
ENDTABLE
--------------------MESSAGE - DATA POINTS ON SECTION 14.1  REORDERED BY PROGRAM ACCORDING TO X VALUES
                   DUPLICATE X POINTS NOT CHANGED--------------------
REACH     14.9      1.        1500.     1500.
COMMENT   14.9 IS @ STA 140+90
SEGMENT   14.9      1         N         -16.
NVALUE    .07
SEGMENT   14.9      2         C         15.
NVALUE    .05
SEGMENT   14.9      3         N         690.
NV[illegible]     .07
SE[illegible]ON   14.9
        -465.     740.[illegible]     -380.     [illegible]     -225.     741.4
        -195.     743.1     -142.     739.4     -102.     [illegible]
        -75.      740.[illegible]     -26.      740.[illegible]     -11.      740.3
        -10.      737.2     -8.5      736.2     -6.5      736.3
        [illegible]       [illegible]       [illegible]       7.        736.2
```

```
        50.       740.6     100.      741.3     150.      741.7
        180.      740.      320.      740.      370.      742.
        570       742.      690.      744.      -600.     739.8
        -1350.    740.      -1430.    742.      -1480.    744.
ENDTABLE
--------------------MESSAGE - DATA POINTS ON SECTION 14.9  REORDERED BY PROGRAM ACCORDING TO X VALUES
                    DUPLICATE X POINTS NOT CHANGED--------------------
R[illegible]      15.0      2.7       163.      163.
COMMENT   15.0 IS @ STA 142+70 FARM CROSSING
CULV1     15.0      1.        12311
CULV2     4.0                 34.       724.2     734.71
SECTION   15.0
        -185.     742.6     -179.     741.6     -175.     739.4
        -50.      739.4     -47.      740.3     -33.      740.8
        -14.      741.      0.        741.      13.       741.1
        63.       741.6     113.      741.1     160.      740.7
        210.      740.8     320.      742.      480.      744.
        -580.     740.      -670.     740.      -1000.    739.7
        -1270.    740.      -1320.    742.      -1420.    744.
ENDTABLE
--------------------MESSAGE - DATA POINTS ON SECTION 15.0  REORDERED BY PROGRAM ACCORDING TO X VALUES
                    DUPLICATE X POINTS NOT CHANGED--------------------
REACH     15.1      1.        63.       63.
1    WSP2 XEQ 06/27/94     14:25:46     OWOSSO  DRAIN-FPMS, SHIAWASSEE COUNTY, MICHIGAN          AS : ____        PAGE
        REV 11/01/90   VERSION 2.0    OWOSSO DRAIN-EXISTING CONDITIONS, 06-27-94                 ALT:       4


----------------------------LIST OF INPUT DATA----------------------------
REACH2    14.9      -.1
COMMENT   15.1 IS @ STA 143+50
ROAD      16.0      2.7       170.      170.
COMMENT   16.0 IS @ STA 145+30 FARM CROSSING
C[illegible]      16.0      1.        12311
C[illegible]      4.5                 20.       733.80    732.56
SECTION   16.0
        -375.     740.6     -315.     740.5     -225.     739.9
        -85.      739.6     -40.      740.      -16.      739.7
        0.        739.7     12.       739.7     50.       740.8
        90.       742.3     400.      744.      -550.     740.
        -610.     740.      -1120.    740.      -1310.    742.
        -1350.    744.
ENDTABLE
--------------------MESSAGE - DATA POINTS ON SECTION 16.0  REORDERED BY PROGRAM ACCORDING TO X VALUES
                    DUPLICATE X POINTS NOT CHANGED--------------------
REACH     16.5      1.        1500.     1500.
COMMENT   16.5 IS @ STA 146+60
SEGMENT   16.5      1         N         -20.
NVALUE    .07
SEGMENT   16.5      2         C         18.5
NVALUE    .05
SEGMENT   16.5      3         N         630.
NVALUE    .07
SECTION   16.5
        -151.     739.3     -140.     739.9     -145.     739.6
        -130.     739.2     -50.      739.9     -30.      739.9
        -20.      739.5     -13.5     739.2     -10.5     736.9
        -7.       736.5     -4.       736.2     0.        736.
        4.        736.3     7.        736.4     10.5      737.4
        15.5      739.5     18.5      740.3     18.[illegible]      743.
        43.4      746.      48.5      74[illegible]     50.       740.7
        155.      742.6     258.      743.5     355.      744.5
        455.      742.      [illegible]       74[illegible]     [illegible]       745.4
        -200.     739.5     -400.     739.7     -700.     739.6
        -900.     739.      -1050.    74[illegible]     -1[illegible]7.     742.
        -1[illegible]50.    742
```

----------MESSAGE - DATA POINTS ON SECTION 16.5 REORDERED BY PROGRAM ACCORDING TO X VALUES
DUPLICATE X POINTS NOT CHANGED----------

COMPUTE 12.1 16.5 12.1

----------END OF DATA LISTING----------

1 COMPUTE 12.1 16.5 12.1

----------STARTING DATA FROM GIVEN SLOPES----------

RATING TABLE FOR SECTION 12.1 DA= 1.0 SQ MI EXP COEF= .00 CONT COEF= .00

NO.	ELEV FT	AREA SQ FT	Q CFS	ACRES FLOODED FLOODPLAIN DAMAGE	ACRES FLOODED CHANNEL	ACRES FLOODED TOTAL	STARTING CSM	CRIT ELEV FT	FRICTION SLOPE FT/FT	FLOW TOP WIDTH FT
0	731.7	0.0	0.0							
LOW GRND	733.2	9.0	6.7	.00	.00	.00				12.0
*****MESSAGE- ELEV BELOW FIRST PROFILE. FLOW INTERPOLATED LINEARLY FROM CHANNEL BOTTOM*****										
BANK FULL	733.2	9.0	6.7	.00	.00	.00				12.0
*****MESSAGE- ELEV BELOW FIRST PROFILE. FLOW INTERPOLATED LINEARLY FROM CHANNEL BOTTOM*****										
1	736.5	141.7	105.0	.00	.00	.00	105.00	733.8	.00049	187.3
2	737.2	332.2	200.0	.00	.00	.00	200.00	734.5	.00049	382.9
3	737.7	552.4	335.0	.00	.00	.00	335.00	735.2	.00050	548.0
4	737.9	700.8	405.0	.00	.00	.00	405.00	735.5	.00049	690.5
5	738.3	1102.3	600.0	.00	.00	.00	600.00	736.4	.00049	1050.2

Note Elevation, based on slope-area Start TR-20 Elev. more appropriate

RATING TABLE FOR SECTION 12.5 DA= 1.0 SQ MI EXP COEF= .00 CONT COEF= .00

NO.	ELEV FT	AREA SQ FT	Q CFS	ACRES FLOODED FLOODPLAIN DAMAGE	ACRES FLOODED CHANNEL	ACRES FLOODED TOTAL	STARTING CSM	CRIT ELEV FT	FRICTION SLOPE FT/FT	FLOW TOP WIDTH FT
0	733.0	0.0	0.0							
LOW GRND	735.7	29.1	34.5	.00	.71	.71				19.1
*****MESSAGE- ELEV BELOW FIRST PROFILE. FLOW INTERPOLATED LINEARLY FROM CHANNEL BOTTOM*****										
1	737.5	89.5	105.0	.00	1.02	1.22	105.00	735.0	.00062	47.5
2	738.4	322.9	200.0	.00	1.17	17.87	200.00	735.7	.00057	695.1
3	738.7	596.9	335.0	.00	1.23	24.93	335.00	736.4	.00059	969.5
4	738.8	744.6	405.0	.00	1.26	28.73	405.00	736.7	.00051	1117.5
BANK FULL	738.9	816.2	435.0	.00	1.27	30.42				1193.2
5	739.2	1170.7	600.0	.00	1.29	35.02	600.00	737.3	.00040	1362.2

RATING TABLE FOR SECTION 12.9 DA= 1.0 SQ MI EXP COEF= .00 CONT COEF= .00

NO.	ELEV FT	AREA SQ FT	Q CFS	ACRES FLOODED FLOODPLAIN DAMAGE	ACRES FLOODED CHANNEL	ACRES FLOODED TOTAL	STARTING CSM	CRIT ELEV FT	FRICTION SLOPE FT/FT	FLOW TOP WIDTH FT
0	734.2	0.0	0.0							
[illegible]	737.9	77.7	105.0	.00	.35	.35	105.00	735.7	.00058	32.6
[illegible]	739.2	[illegible]	200.0	[illegible]						[illegible]

3	739.1	301.4	335.0	.00	.45	3.46	335.00	736.7	.00105	320.6
4	739.3	357.4	405.0	.00	.44	3.99	405.00	737.0	.00113	370.1
5	739.7	582.5	600.0	.00	.46	7.17	600.00	737.6	.00129	664.3

NOTE: Used TR 20 Elev below Section 13.0

ROAD SECTION 13.0

NO.	HW FT	CFS	HL FT	TW FT	STARTING CSM	BRIDGE CFS	BRIDGE AREA SQ FT	CULVERT CFS	CULVERT AREA SQ FT	WEIR CFS	WEIR AREA SQ FT	WEIR TOP WIDTH FT
0	723.30	0.0	0.00	732.90	0.00	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1	738.48	105.0	.62	737.85	105.00	.0	.0	105.0	26.1	.0	.0	.0
2	740.05	200.0	1.30	738.76	200.00	.0	.0	146.9	26.1	53.1	50.7	949.0
3	740.16	335.0	.76	739.15	335.00	.0	.0	128.5	26.1	206.5	150.9	977.1
4	740.21	405.0	.65	739.33	405.00	.0	.0	115.5	26.1	289.5	202.2	991.5
5	740.31	600.0	.51	739.50	600.00	.0	.0	91.5	26.1	508.5	302.6	1019.1

MIN ROAD ELEVATION = 739.90 FT

OPENING NO.	NO. CULVERTS	CULV. CODE proj. pipe	HEIGHT OR DIAM	WIDTH	LENGTH	U/S INVERT	D/S INVERT	(N) COEFF
1	1	30111.	4.91	6.77	40.00	733.30	732.90	.021

RATING TABLE FOR SECTION 13.1 DA= 1.0 SQ MI EXP COEF= .00 CONT COEF= .00

NO.	ELEV FT	AREA SQ FT	Q CFS	ACRES FLOODED FLOODPLAIN DAMAGE	CHANNEL	TOTAL	STARTING CSM	CRIT ELEV FT	FRICTION SLOPE FT/FT	FLOW TOP WIDTH FT
0	734.3	0.0	0.0							
1	738.5	87.0	105.0	.00	.13	.13	105.00	735.0	.00047	32.4
LOW GRND	740.0	140.9	182.0	.00	.16	.16				39.7
2	740.1	153.5	200.0	.00	.17	.59	200.00	736.4	.00043	141.8
BANK FULL	740.1	161.7	247.3	.00	.17	.86				208.1
3	740.2	176.9	335.0	.00	.17	1.37	335.00	737.0	.00107	331.0
4	740.2	207.5	405.0	.00	.17	1.71	405.00	737.3	.00142	414.9
5	740.4	309.2	600.0	.00	.17	2.36	600.00	737.9	.00242	571.2

RATING TABLE FOR SECTION 13.9 DA= 1.0 SQ MI EXP COEF= .00 CONT COEF= .00

NO.	ELEV FT	AREA SQ FT	Q CFS	ACRES FLOODED FLOODPLAIN DAMAGE	CHANNEL	TOTAL	STARTING CSM	CRIT ELEV FT	FRICTION SLOPE FT/FT	FLOW TOP WIDTH FT
0	735.6	0.0	0.0							
GRND	738.0	61.3	26.6	.00	1.01	1.01				28.9
****MESSAGE- ELEV BELOW FIRST PROFILE, FLOW INTERPOLATED LINEARLY FROM CHANNEL BOTTOM****										
1	739.4	145.4	105.0	.00	1.08	9.24	105.00	737.5	.00045	126.1
2	740.0	241.3	200.0	.00	1.22	27.07	200.00	737.8	.00019	797.9
3	740.1	297.0	335.0	.00	1.26	33.07	335.00	738.1	.00018	958.6
BANK FULL	[illegible]	[illegible]	[illegible]	.00	[illegible]	[illegible]				[illegible]

5	741.0	1403.5	600.0	.00	1.29	45.20	600.00	739.1	.00031	1286.8

*****WARNING - SECT. 14.1 FD VALUES REVERSED ON SEGMENT 2 AT ELEVATION 742.60 VALUE CHANGED TO EQUAL PREVIOUS VALUE *****

ROAD SECTION 14.0

NO.	HW FT	CFS	HL FT	TW FT	STARTING CSM	BRIDGE CFS	BRIDGE AREA SQ FT	CULVERT CFS	CULVERT AREA SQ FT	WEIR CFS	WEIR AREA SQ FT	WEIR TOP WIDTH FT
0	734.24	0.0	0.00	734.12	0.00	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1	739.42	105.0	.02	739.38	105.00	.0	.0	18.0	22.1	87.0	176.1	481.9
2	740.35	200.0	.02	740.32	200.00	.0	.0	11.9	22.1	188.1	941.5	1232.9
3	740.64	335.0	.03	740.61	335.00	.0	.0	15.8	22.1	319.2	1345.9	1533.8
4	740.75	405.0	.03	740.72	405.00	.0	.0	17.7	22.1	387.3	1520.9	1630.4
5	741.06	600.0	.03	741.02	600.00	.0	.0	21.7	22.1	578.3	2036.1	1785.3

MIN ROAD ELEVATION = 738.40 FT

OPENING NO.	NO. CULVERTS	CULV. CODE	HEIGHT OR DIAM	WIDTH	LENGTH	U/S INVERT	D/S INVERT	(N) COEFF
1	1	20101.	4.58	6.08	44.00	734.24	734.12	.032

RATING TABLE FOR SECTION 14.1 DA= 1.0 SQ MI EXP COEF= .00 CONT COEF= .00

NO.	ELEV FT	AREA SQ FT	Q CFS	ACRES FLOODED FLOODPLAIN DAMAGE	ACRES FLOODED FLOODPLAIN CHANNEL	ACRES FLOODED TOTAL	STARTING CSM	CRIT ELEV FT	FRICTION SLOPE FT/FT	FLOW TOP WIDTH FT
0	734.7	0.0	0.0							
LOW GRND	732.9	69.0	28.3	.00	.15	.15				25.4
*****MESSAGE- ELEV BELOW FIRST PROFILE. FLOW INTERPOLATED LINEARLY FROM CHANNEL BOTTOM*****										
1	739.4	256.2	105.0	.00	.16	2.82	105.00	736.4	.00024	498.9
2	740.4	991.8	200.0	.00	.18	6.63	200.00	737.0	.00008	1174.7
3	740.7	1457.1	335.0	.00	.19	8.50	335.00	737.7	.00011	1505.0
4	740.8	1551.3	405.0	.00	.19	9.20	405.00	738.0	.00012	1629.9
5	741.1	2102.9	600.0	.00	.20	11.12	600.00	738.8	.00013	1969.0

RATING TABLE FOR SECTION 14.9 DA= 1.0 SQ MI EXP COEF= .00 CONT COEF= .00

NO.	ELEV FT	AREA SQ FT	Q CFS	ACRES FLOODED FLOODPLAIN DAMAGE	ACRES FLOODED FLOODPLAIN CHANNEL	ACRES FLOODED TOTAL	STARTING CSM	CRIT ELEV FT	FRICTION SLOPE FT/FT	FLOW TOP WIDTH FT
0	736.1	0.0	0.0							
GRND	739.4	27.1	3.5	.00	.03	.03				27.1
*****MESSAGE- ELEV BELOW FIRST PROFILE. FLOW INTERPOLATED LINEARLY FROM CHANNEL BOTTOM*****										
1	740.1	193.4	105.0	.00	1.00	30.96	105.00	737.4	.00025	999.1
BANK FULL	740.5	719.9	195.1	.00	1.06	41.41				[illegible]
2	740.5	914.1	200.0	.00	1.06	41.52	200.00	737.9	.00024	1217.7
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

5	741.5	1675.6	600.0	.00	1.07	55.45	600.00	739.4	.00015	1551.5	

ROAD SECTION 15.0

NO.	HW FT	CFS	HL FT	TW FT	STARTING CSM	BRIDGE CFS	BRIDGE AREA SQ FT	CULVERT CFS	CULVERT AREA SQ FT	WEIR CFS	WEIR AREA SQ FT	WEIR TOP WIDTH FT
0	734.20	0.0	0.00	734.71	0.00	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1	740.02	105.0	.03	740.00	105.00	.0	.0	9.3	12.6	95.7	193.9	824.3
2	740.56	200.0	.05	740.53	200.00	.0	.0	8.0	12.6	192.0	654.1	926.6
3	740.89	335.0	.03	740.96	335.00	.0	.0	10.7	12.6	324.3	984.6	1083.3
4	741.02	405.0	.02	740.99	405.00	.0	.0	11.9	12.6	393.1	1122.0	1157.4
5	741.34	600.0	.05	741.30	600.00	.0	.0	10.1	12.6	589.9	1525.9	1314.8

MIN ROAD ELEVATION = 739.40 FT

OPENING NO.	NO. CULVERTS	CULV. CODE	HEIGHT OR DIAM	WIDTH	LENGTH	U/S INVERT	D/S INVERT	(N) COEFF
1	1	12311.	4.00		34.00	734.20	734.71	.024

RATING TABLE FOR SECTION 15.1 DA= 1.0 SQ MI EXP COEF= .00 CONT COEF= .00

NO.	ELEV FT	AREA SQ FT	Q CFS	ACRES FLOODED FLOODPLAIN DAMAGE	ACRES FLOODED FLOODPLAIN CHANNEL	ACRES FLOODED TOTAL	STARTING CSM		CRIT ELEV FT	FRICTION SLOPE FT/FT	FLOW TOP WIDTH FT
0	734.2	0.0	0.0								
LOW GRND	737.3	67.2	19.9	.00	.14	.14					27.1
*****MESSAGE- ELEV BELOW FIRST PROFILE, FLOW INTERPOLATED LINEARLY FROM CHANNEL BOTTOM*****											
1	739.0	255.0	105.0	.00	.15	5.19	105.00		737.3	.00020	1009.2
BANK FULL	740.4	769.9	169.2	.00	.16	6.24					1202.6
2	740.5	979.0	200.0	.00	.16	6.76	200.00		737.9	.00009	1302.8
3	740.9	1462.5	335.0	.00	.16	7.47	335.00		738.4	.00010	1439.1
4	741.0	1545.7	405.0	.00	.16	7.71	405.00		738.6	.00011	1486.5
5	741.2	1727.7	600.0	.00	.16	8.36	600.00		739.2	.00010	1611.9

ROAD SECTION 16.0

NO.	HW FT	CFS	HL FT	TW FT	STARTING CSM	BRIDGE CFS	BRIDGE AREA SQ FT	CULVERT CFS	CULVERT AREA SQ FT	WEIR CFS	WEIR AREA SQ FT	WEIR TOP WIDTH FT
0	733.30	0.0	0.00	733.56	0.00	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1	740.02	105.0	.03	740.05	105.00	.0	.0	15.2	15.9	89.8	125.2	877.2
2	740.50	200.0	.02	740.57	200.00	.0	.0	9.4	15.9	190.6	661.1	1218.7
3	740.72	335.0	.02	740.97	335.00	.0	.0	12.7	15.9	323.1	1075.9	1262.2
4	741.06	405.0	.03	741.02	405.00	.0	.0	13.4	15.9	391.6	1222.8	1277.2
5	741.39	600.0	.02	741.35	600.00	.0	.0	16.9	15.7	583.1	1635.3	1316.9

MIN ROAD ELEVATION = 739.60 FT

OPENING NO.	NO. CULVERTS	CULV. CODE	HEIGHT OR DIAM	WIDTH	LENGTH	U/S INVERT	D/S INVERT	(N) COEFF
1	1	12311.	4.50		20.00	733.80	733.56	.024

RATING TABLE FOR SECTION 16.5 DA= 1.0 SQ MI EXP COEF= .00 CONT COEF= .00

NO.	ELEV FT	AREA SQ FT	Q CFS	ACRES FLOODED FLOODPLAIN DAMAGE	ACRES FLOODED FLOODPLAIN CHANNEL	ACRES FLOODED TOTAL	STARTING CSM	CRIT ELEV FT	FRICTION SLOPE FT/FT	FLOW TOP WIDTH FT
0	736.0	0.0	0.0							
LOW GRND	739.0	59.9	8.2	.00	1.06	1.06				27.5
*****MESSAGE- ELEV BELOW FIRST PROFILE. FLOW INTERPOLATED LINEARLY FROM CHANNEL BOTTOM*****										
DAM FULL	739.5	147.2	20.1	.00	1.36	14.28				372.4
*****MESSAGE- ELEV BELOW FIRST PROFILE. FLOW INTERPOLATED LINEARLY FROM CHANNEL BOTTOM*****										
1	740.2	768.8	105.0	.00	1.48	41.38	105.00	737.3	.00005	1079.2
2	740.7	1295.3	200.0	.00	1.48	42.63	200.00	737.8	.00004	1112.1
3	741.0	1705.3	335.0	.00	1.48	44.36	335.00	738.4	.00005	1157.1
4	741.1	1860.1	405.0	.00	1.48	45.01	405.00	738.7	.00005	1174.1
5	741.5	2249.3	600.0	.00	1.48	46.76	600.00	739.5	.00006	1219.7

---------- LIST OF INPUT DATA WITH LIMITED EDITING----------

END

END

**********NORMAL END OF JOB----------

---------- LIST OF INPUT DATA WITH LIMITED EDITING----------

ENDRUN

****

ECS WSPC VERSION 11/01/90
FILE SUMMARY

INPUT = a:owosofwe.dat
OUTPUT = c:owosofwe.out DATED 06/27/94 14:25:46

OPTIONAL FILES SAVED

OPTION T = a:owosofwe.WRT DATED 06/27/94 14:25:46

****

Filename = BOCKWSP2.OUT

Final Run TDB 6-28-9

---------- LIST OF INPUT DATA WITH LIMITED EDITING----------

```
WSPZ      30.
T[illegible]      CACESS DRAIN-FRYE, SHIAWASSEE COUNTY, MICHIGAN
TITLE     EXISTING CONDITIONS. 06-27-94
COMMENT   2-YR., 10-YR., 50-YR.,100-YR. & 500-YR. FLOODS
COMMENT   DISCHARGES FROM STRUCTURE A OF TRIBOWDS.OUT DATED 06-20-94
DISCHARGE -1.       15.       25.       30.       35.       40.
STARTS    29.9      .00581    .00581    .00581    .00581    .00581
TAIL      29.9      32.3
OUTPUT    1
REACH     29.9      1.        1.        0.
COMMENT   29.9 IS @ STA 9+00
SEGMENT   29.9      1         1         -23.
NVALUE    .07
SEGMENT   29.9      2         2         10.
NVALUE    .05
SEGMENT   29.9      3         4         1400.
NVALUE    .07
SECTION   29.9
          -70.      740.5     -48.      739.1     -39       739.1
          -21.      739.0     -7.       738.7     -3.       738.1
          -1.       737.9     0.        737.5     1.        737.6
          3.        738.0     19.       739.7     22.       739.7
          55.       739.7     85.       739.0     200.      738.
          600.      737.3     760.      737.5     1400.     737.8
ENDTABLE
FROM      30.0      1.7       70.       90.
[illegible]NT   CS 30.0 IS RAILROAD CROSSING @ STA. 10+60
C[illegible]      30.0      1         22551
CULVI     1.5                 20.       735.4     737.5
CULVI     30.0      1.        12211
CULVI     1.25                25.       737.9     737.3
SECTION   30.0
          -850.     742.3     -780.     742.4     -680.     742.4
          -575.     742.4     -470.     742.2     -450.     742.5
          300.      742.7     -200.     742.6     -100.     742.5
          -42.      742.5     9.        742.4     145.      742.5
          230.      742.5     315.      742.6     395.      742.7
          480.      742.7     560.      742.2     650.      742.9
          725.      743.0     810.      743.1     890.      743.3
          980.      743.4
ENDTABLE
REACH     30.5      1.        10.       10.
COMMENT   30.5 IS @ STA 10+60
SEGMENT   30.5      1         1         -5.
NVALUE    .07
```


---------- LIST OF INPUT DATA----------

```
SEGMENT   30.5      2         2         10.
NVALUE    .05
S[illegible]T   30.5      3         4         450.
N[illegible]E   .07
SECTION   30.5
          -20.      741.4     -5.       740.1     [illegible]       [illegible]
          0.        738.8     4.        739.2     10.       740.5
          35.       741.1     100.      742.2     [illegible]       741.[illegible]
          [illegible]       [illegible]       [illegible]       [illegible]       [illegible]       [illegible]
```

COMPUTE 29.9 30.0 29.9

----------END OF DATA LISTING----------

1 COMPUTE 29.9 30.5 29.9

----------STARTING DATA FROM GIVEN SLOPES----------

1 WSPZ XEQ 06/27/94 17:55:49 OWOSSO DRAIN-FPMS, SHIAWASSEE COUNTY, MICHIGAN WS : ____ PAGE
REV 11/01/90 VERS 04 1.0 EXISTING CONDITIONS, 06-27-94 ALT: ____ 2

RATING TABLE FOR SECTION 29.9 DA= 1.0 SQ MI EXP COEF= .00 CONT COEF= .00

NO.	ELEV FT	AREA SQ FT	Q CFS	ACRES FLOODED FLOODPLAIN DAMAGE	ACRES FLOODED FLOODPLAIN CHANNEL	ACRES FLOODED TOTAL	STARTING CSM	CRIT ELEV FT	FRICTION SLOPE FT/FT	FLOW TOP WIDTH FT
0	727.3	[illegible]	0.0							
LOW GRND	737.3	.0	.0	.00	.00	.00				.0
****MESSAGE- ELEV BELOW FIRST PROFILE. FLOW INTERPOLATED LINEARLY FROM CHANNEL BOTTOM****										
1	737.5	20.1	15.0	.00	.00	.00	15.00	737.3	.00570	430.9
***** WARNING FLOW DEPTH LESS THAN 0.1 FT CHECK THIS PROFILE FOR POSSIBLE ERRORS IN WATER ELEV ***										
2	737.[illegible]	70.7	25.0	.00	.00	.00	25.00	737.4	.00441	468.1
3	737.6	90.7	30.0	.00	.00	.00	30.00	737.4	.00427	481.6
4	737.[illegible]	[illegible]	35.0	.00	.00	.00	35.00	737.4	.00425	492.9
5	737.[illegible]	[illegible]	40.0	.00	.00	.00	40.00	737.4	.00429	502.7

1 WSPZ XEQ 06/27/94 17:55:49 OWOSSO DRAIN-FPMS, SHIAWASSEE COUNTY, MICHIGAN WS : ____ PAGE
REV 11/01/90 VERSION 1.0 EXISTING CONDITIONS. 06-27-94 ALT: ____ 3B

ROAD SECTION 30.0

NO.	HW FT	CFS	HL FT	TW FT	STARTING CSM	BRIDGE CFS	BRIDGE AREA SQ FT	CULVERT CFS	CULVERT AREA SQ FT	WEIR CFS	WEIR AREA SQ FT	WEIR TOP WIDTH FT
0	737.90	0.0	0.00	737.30	0.00	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1	738.75	15.0	1.21	737.54	15.00	.0	.0	15.0	4.0	.0	.0	.0
2	740.41	25.0	1.79	737.62	25.00	.0	.0	25.0	5.4	.0	.0	.0
3	740.78	30.0	3.14	737.65	30.00	.0	.0	30.0	6.1	.0	.0	.0
4	741.11	35.0	3.44	737.67	35.00	.0	.0	35.0	6.1	.0	.0	.0
5	741.42	40.0	3.73	737.69	40.00	.0	.0	40.0	6.1	.0	.0	.0

MIN ROAD ELEVATION = 741.20 FT

OPENING NO.	NO. CULVERTS	CULV. CODE	HEIGHT OR DIAM	WIDTH	LENGTH	U/S INVERT	D/S INVERT	(N) COEFF
1	1	CE31.	2.50		25.00	736.40	737.80	.012
2	1	CE11.	1.25		25.00	737.90	737.30	.024

1 WSPZ XEQ 06/27/94 17:55:49 OWOSSO DRAIN-FPMS, SHIAWASSEE COUNTY, MICHIGAN WS : ____ PAGE
REV 11/01/90 VERSION 1.0 EXISTING CONDITIONS, 06-27-94 ALT: ____ 4

RATING TABLE FOR SECTION 30.5 DA= 1.0 SQ MI EXP COEF= .00 CONT COEF= .00

NO.	ELEV FT	AREA SQ FT	Q CFS	ACRES FLOODED FLOODPLAIN DAMAGE	ACRES FLOODED FLOODPLAIN CHANNEL	ACRES FLOODED TOTAL	STARTING CSM	CRIT ELEV FT	FRICTION SLOPE FT/FT	FLOW TOP WIDTH FT

1	739.6	7.1	15.0	.00	.03	.03	15.00	739.5	.00978	11.0
LOW GRND	740.1	10.4	19.4	.00	.03	.03				13.2
BANK FULL	740.1	10.4	19.4	.00	.03	.03				13.2
2	740.4	14.8	25.0	.00	.03	.04	25.00	739.7	.00342	15.7
3	740.8	49.8	30.0	.00	.03	.35	30.00	739.8	.00120	150.8
4	741.1	90.9	35.0	.00	.03	.71	35.00	739.9	.00051	307.6
5	741.4	212.2	40.0	.00	.03	.85	40.00	739.9	.00014	371.8

A[illegible]S+********PROFILE NO 5 EXCEEDS SURVEY DATA BY .0 FT. (COMPUTATION BASED ON VERTICAL EXTENSION OF END POINTS*********

---------- LIST OF INPUT DATA WITH LIMITED EDITING----------

```
CHANGE    DISCHARGE
DISCHARGE -1.      30.      55.      95.      110.     160.
END
COMMENT   DISCHARGE FROM XSECTION 022 OF TRCOOWOS.OUT DATED 06-20-94
RO-2      31.0     2.7      288.     288.
COMMENT   CS 31.0 IS SOUTH STREET @ STA. 13+90
COLV1     31.0     1        12311
COLV2     2.0              44.      738.4    738.2
SECTION   31.0
          -1156.   744.2    -986.    744.5    -901.    744.3
          -686.    743.6    -664.    743.2    -566.    743.0
          -448.    742.8    -348.    742.7    -246.    742.9
          -156.    743.0    -56.     742.6    0.       743.1
          85.      743.3    170.     742.6    255.     743.7
          360.     744.1    440.     744.3    530.     744.4
ENDTABLE
REACH     31.5     1.       53.      53.
COMMENT   31.5 IS @ STA 14+65. THIS SECTION IS MANUFACTURED
SEGMENT   31.5     1.       N        20.
N[illegible]T     .05
S[illegible]ON    31.5
          -20.     742.8    -10.     742.8    -2.      738.7
          2.       738.7    10.      742.9    20.      743.5
ENDTABLE
ROAD      32.0     2.7      23.      62.
COMMENT   CS 32.0 IS A DRIVEWAY @ STA. 15+40
COLV1     32.0     1        12311
COLV2     2.0              24.5     739.0    739.0
SECTION   32.0
          -150.    741.9    -100.    741.9    -50.     742.7
          -20.     742.8    0.       742.8    13.      743.2
          27.      743.6
ENDTABLE
REACH     32.1     1.       168.     168.
REACH2    32.2     -4.1
COMMENT   32.1 IS @ STA 17+20
REACH     32.2     1.       160.     160.
REACH2    32.3     -3.9
COMMENT   32.2 IS @ STA 12+50
REACH     32.25    1.       170.     170.
REACH2    32.3     -3.7
COMMENT   32.25IS @ STA 20+50
REACH     32.3     1.       570.     570.
COMMENT   32.3 IS @ STA 26+20
SEGMENT   32.3     1        N        -18.
```


---------- LIST OF INPUT DATA----------

```
[illegible]UE     .07
[illegible]T      3[illegible]
```

```
SEGMENT   32.3     3        N        210.
NVALUE    .07
SECTION   32.3
          -290.    752.7    -250.    750.3    -200.    749.0
          -150.    748.5    -80.     748.3    -50.     747.9
          -18.     747.4    -8.      744.9    -2.6     744.5
          0.       744.1    2.6      744.5    15.      746.8
          25.      747.1    70.      747.3    75.      747.5
          125.     747.8    210.     748.0
ENDTABLE
ROAD      32.5     2.7      223.     223.
COMMENT   CS 32.5 IS A FOOTBRIDGE @ STA. 28+45
BPR       32.5     A        1.
GIRDER    747.6    747.3    0.       .8       2.7
          -18.     747.8    -17.9    747.3    15.      747.3
          15.1     747.8
ENDTABLE
COMMENT   CS 32.5 IS A MANUFACTURED CROSS SECTION USING A COMBINAT ON
COMMENT   OF FIELD SURVEYS AND CS 32.3(ADDED 1 FT. TO ALL SPOTS)
COMMENT   ALSO, SEE PAGE 56 OF SURVEY NOTES.
SECTION   32.5
          -290.    753.7    -250.    751.3    -200.    750.0
          -150.    749.5    -80.     749.3    -50.     748.9
          -18.4    747.8    -18.3    747.8    -18.     747.8
          -17.9    747.3    -8.      745.9    -2.6     745.3
          0.       745.3    2.6      745.3    15.      747.3
          15.1     747.8    15.2     747.8    15.3     747.8
          25.      748.1    70.      748.3    75.      748.5
          125.     748.3    210.     749.0
ENDTABLE
REACH     32.6     1.       323.     323.
REACH2    32.7     -1.8
COMMENT   32.6 IS @ STA 21+70
REACH     32.7     1.       310.     310.
COMMENT   32.7 IS @ STA 24+30
SEGMENT   32.7     1        N        -20.
NVALUE    .07
SEGMENT   32.7     2        C        20.
NVALUE    .05
SEGMENT   32.7     3        N        200.
NVALUE    .07
SECTION   32.7
```


----------LIST OF INPUT DATA----------

```
          -85.     752.4    -70.     751.5    -45.     750.6
          -20.     750.7    -10.     750.0    -5.      749.8
          -2.      749.7    0.       749.4    2.       749.7
          5.       750.2    20.      750.9    50.      751.0
          150.     752.5    200.     752.4
ENDTABLE
REACH     32.8     1.       300.     300.
COMMENT   32.8 IS @ STA 27+80
COMMENT   CS32.8 IS CD32.7 ADJUSTED BY -1.6 FEET
SEGMENT   32.8     1        N        -23.
NVALUE    .07
SEGMENT   32.8     2        C        40.
NVALUE    .05
SEGMENT   32.8     3        N        300.
NVALUE    .07
SECTION   32.8
          -290.    763.2    -250.    754.8    -225.    754.3
          -150.    754.3    -85.     [illegible]    [illegible]    754.5
```

2.5	749.5	15.	750.7	40.	751.3
90.	751.9	220.	754.1	300.	761.3

ENDTABLE

COMPUTE 30.5 32.8 30.5

----------END OF DATA LISTING----------

1 COMPUTE 30.5 32.8 30.5

----------STARTING DATA FROM CRITICAL DEPTH----------

RATING TABLE FOR SECTION 30.5 DA= 1.0 SQ MI EXP COEF= .00 CONT COEF= .00

NO.	ELEV FT	AREA SQ FT	Q CFS	ACRES FLOODED FLOODPLAIN DAMAGE	ACRES FLOODED FLOODPLAIN CHANNEL	ACRES FLOODED TOTAL	STARTING CSM	CRIT ELEV FT	FRICTION SLOPE FT/FT	FLOW TOP WIDTH FT
0	738.7	0.0	0.0							
1	739.8	6.6	30.0	.00	.00	.00	30.00	739.8	.04699	10.7
LOW GRND	740.1	10.4	52.8	.00	.00	.00				13.2
BANK FULL	740.1	10.4	52.8	.00	.00	.00				13.2
2	740.1	10.8	55.0	.00	.00	.00	55.00	740.1	.03996	13.4
3	740.5	17.5	95.0	.00	.00	.00	95.00	740.5	.03563	20.9
4	740.6	23.5	110.0	.00	.00	.01	110.00	740.6	.03647	45.4
5	740.7	43.9	160.0	.00	.00	.03	160.00	740.7	.04119	127.1

ROAD SECTION 31.0

NO.	HW FT	CFS	HL FT	TW FT	STARTING CSM	BRIDGE CFS	BRIDGE AREA SQ FT	CULVERT CFS	CULVERT AREA SQ FT	WEIR CFS	WEIR AREA SQ FT	WEIR TOP WIDTH FT
0	738.40	0.0	0.00	738.20	0.00	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1	742.81	30.0	2.46	740.35	30.00	.0	.0	19.4	3.1	10.6	12.3	220.2
2	742.88	55.0	2.18	740.70	55.00	.0	.0	19.0	3.1	36.0	31.7	339.6
3	742.95	95.0	1.86	741.10	95.00	.0	.0	17.0	3.1	78.0	60.7	464.2
4	742.97	110.0	1.72	741.19	110.00	.0	.0	17.5	3.1	92.5	68.2	491.3
5	743.03	160.0	1.58	741.44	160.00	.0	.0	15.6	3.1	144.4	100.2	565.8

MIN ROAD ELEVATION = 742.70 FT

OPENING NO.	NO. CULVERTS	CULV. CODE	HEIGHT OR DIAM	WIDTH	LENGTH	U/S INVERT	D/S INVERT	KN COEFF
1	1	12312.	2.00		44.00	738.40	738.20	.024

RATING TABLE FOR SECTION 31.5 DA= 1.0 SQ MI EXP COEF= .00 CONT COEF= .00

NO.	ELEV FT	AREA SQ FT	Q CFS	ACRES FLOODED FLOODPLAIN DAMAGE	ACRES FLOODED FLOODPLAIN CHANNEL	ACRES FLOODED TOTAL	STARTING CSM	CRIT ELEV FT	FRICTION SLOPE FT/FT	FLOW TOP WIDTH FT

```
        0     738.7       0.0       0.0
  LOW  GRND   738.7        .0        .0      .00       .00       .00                                        .0
*****MESSAGE- ELEV BELOW FIRST PROFILE. FLOW INTERPOLATED LINEARLY FROM CHANNEL BOTTOM*****
        1     742.8      50.6      30.0      .00       .00       .24     30.00       739.7   .00022      30.1
        2     742.9      52.7      55.0      .00       .00       .25     55.00       740.1   .00069      30.2
        3     743.0      57.5      95.0      .00       .00       .27     95.00       740.6   .00170      33.9
        4     743.1      58.8     110.0      .00       .00       .27    110.00       740.8   .00216      34.3
        5     743.2      64.3     160.0      .00       .00       .28    160.00       741.2   .00368      36.3
WARNING**********PROFILE NO  1  EXCEEDS SURVEY DATA BY    .0 FT. COMPUTATION BASED ON VERTICAL EXTENSION OF END POINTS**********
WARNING**********PROFILE NO  2  EXCEEDS SURVEY DATA BY    .1 FT. COMPUTATION BASED ON VERTICAL EXTENSION OF END POINTS**********
WARNING**********PROFILE NO  3  EXCEEDS SURVEY DATA BY    .2 FT. COMPUTATION BASED ON VERTICAL EXTENSION OF END POINTS**********
WARNING**********PROFILE NO  4  EXCEEDS SURVEY DATA BY    .3 FT. COMPUTATION BASED ON VERTICAL EXTENSION OF END POINTS**********
WARNING**********PROFILE NO  5  EXCEEDS SURVEY DATA BY    .4 FT. COMPUTATION BASED ON VERTICAL EXTENSION OF END POINTS**********
1    WSP2 XEQ 06/27/94     17:56:49     OWOSSO DRAIN-FPMS, SHIAWASSEE COUNTY, MICHIGAN              WS : ____        PAGE
        REV 11/01/90   VERSION 2.0    EXISTING CONDITIONS, 06-27-94                                ALT: ____         11B
```

ROAD SECTION 32.0

NO.	HW FT	CFS	HL FT	TW FT	STARTING CSM	BRIDGE CFS	BRIDGE AREA SQ FT	CULVERT CFS	CULVERT AREA SQ FT	WEIR CFS	WEIR AREA SQ FT	WEIR TOP WIDTH FT
0	739.00	0.0	0.00	739.00	0.00	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1	742.87	30.0	.03	742.83	30.00	.0	.0	1.9	3.1	28.1	31.4	15.7
2	743.00	55.0	.05	742.96	55.00	.0	.0	1.9	3.1	53.1	142.5	155.3
3	743.23	95.0	.06	743.16	95.00	.0	.0	2.2	3.1	92.9	125.1	161.1
4	743.30	110.0	.06	743.24	110.00	.0	.0	2.4	3.1	107.6	150.3	163.1
5	743.56	160.0	.08	743.48	160.00	.0	.0	2.4	3.1	157.6	195.6	175.1

```
WARNING**********PROFILE NO  1  EXCEEDS SURVEY DATA BY   1.0 FT. COMPUTATION BASED ON VERTICAL EXTENSION OF END POINTS**********
WARNING**********PROFILE NO  2  EXCEEDS SURVEY DATA BY   1.1 FT. COMPUTATION BASED ON VERTICAL EXTENSION OF END POINTS**********
WARNING**********PROFILE NO  3  EXCEEDS SURVEY DATA BY   1.3 FT. COMPUTATION BASED ON VERTICAL EXTENSION OF END POINTS**********
WARNING**********PROFILE NO  4  EXCEEDS SURVEY DATA BY   1.4 FT. COMPUTATION BASED ON VERTICAL EXTENSION OF END POINTS**********
WARNING**********PROFILE NO  5  EXCEEDS SURVEY DATA BY   1.7 FT. COMPUTATION BASED ON VERTICAL EXTENSION OF END POINTS**********
```

MIN ROAD ELEVATION = 741.90 FT

OPENING NO.	NO. CULVERTS	CULV. CODE	HEIGHT OR DIAM	WIDTH	LENGTH	U/S INVERT	D/S INVERT	(N) COEFF
1	1	12311.	2.00		24.50	739.00	739.00	.024

```
1    WSP2 XEQ 06/27/94     17:56:49     OWOSSO DRAIN-FPMS, SHIAWASSEE COUNTY, MICHIGAN              WS : ____        PAGE
        REV 11/01/90   VERSION 2.0    EXISTING CONDITIONS, 06-27-94                                ALT: ____         12
```

RATING TABLE FOR SECTION 32.1 DA= 1.0 SQ MI EXP COEF= .00 CONT COEF= .00

NO.	ELEV FT	AREA SQ FT	Q CFS	ACRES FLOODED FLOODPLAIN DAMAGE	ACRES FLOODED FLOODPLAIN CHANNEL	ACRES FLOODED TOTAL	STARTING CSM	CRIT ELEV FT	FRICTION SLOPE FT/FT	FLOW TOP WIDTH FT
0	740.0	0.0	0.0							
LOW GRND	742.7	45.9	26.2	.00	.16	.16				30.0

```
*****MESSAGE- ELEV BELOW FIRST PROFILE. FLOW INTERPOLATED LINEARLY FROM CHANNEL BOTTOM*****
BANK FULL     742.7      45.9      26.2      .00       .16       .16                                        30.0
*****MESSAGE- ELEV BELOW FIRST PROFILE. FLOW INTERPOLATED LINEARLY FROM CHANNEL BOTTOM*****
        1     742.9      52.1      30.0      .00       .17       .20     30.00       741.0   .00037      27.9
        2     743.1      64.4      55.0      .00       .17       .32     55.00       741.1   .00062      31.9
        3     743.4      87.1      95.0      .00       .17       .57     95.00       741.4   .00152      146.3
        4     743.4     100.8     110.0      .00       .17       .70    110.00       741.7   .00193      132.7
        5     743.7     144.5     160.0      .00       .17      1.14    160.00       742.1   .00312      125.7
```

RATING TABLE FOR SECTION 32.2 DA= 1.0 SQ MI EXP COEF= .00 CONT COEF= .00

NO.	ELEV FT	AREA SQ FT	Q CFS	ACRES FLOODED FLOODPLAIN DAMAGE	ACRES FLOODED FLOODPLAIN CHANNEL	ACRES FLOODED TOTAL	STARTING CSM	CRIT ELEV FT	FRICTION SLOPE FT/FT	FLOW TOP WIDTH FT
0	740.2	0.0	0.0							
LOW GRND	742.9	45.8	29.1	.00	.11	.11				30.6
*****MESSAGE- ELEV BELOW FIRST PROFILE. FLOW INTERPOLATED LINEARLY FROM CHANNEL BOTTOM*****										
BANK FULL	742.9	45.8	29.1	.00	.11	.11				30.6
*****MESSAGE- ELEV BELOW FIRST PROFILE. FLOW INTERPOLATED LINEARLY FROM CHANNEL BOTTOM*****										
1	742.9	47.2	30.0	.00	.11	.12	30.00	741.2	.00027	32.1
2	743.2	57.5	55.0	.00	.12	.18	55.00	741.5	.00057	47.9
3	743.5	80.1	95.0	.00	.12	.34	95.00	741.9	.00092	93.5
4	743.6	92.0	110.0	.00	.12	.45	110.00	741.9	.00094	123.6
5	743.9	143.6	160.0	.00	.12	.79	160.00	742.2	.00114	214.1

RATING TABLE FOR SECTION 32.25 DA= 1.0 SQ MI EXP COEF= .00 CONT COEF= .00

NO.	ELEV FT	AREA SQ FT	Q CFS	ACRES FLOODED FLOODPLAIN DAMAGE	ACRES FLOODED FLOODPLAIN CHANNEL	ACRES FLOODED TOTAL	STARTING CSM	CRIT ELEV FT	FRICTION SLOPE FT/FT	FLOW TOP WIDTH FT
0	740.4	0.0	0.0							
1	743.0	43.1	30.0	.00	.12	.12	30.00	741.4	.00034	29.7
GRND	743.1	45.8	37.3	.00	.12	.12				30.6
FULL	743.1	45.8	37.3	.00	.12	.12				30.6
2	743.3	52.5	55.0	.00	.12	.15	55.00	741.7	.00067	37.8
3	743.7	77.5	95.0	.00	.13	.35	95.00	742.0	.00096	59.4
4	743.8	93.9	110.0	.00	.13	.47	110.00	742.1	.00112	119.7
5	744.1	144.4	160.0	.00	.13	.84	160.00	742.4	.00112	215.6

RATING TABLE FOR SECTION 32.3 DA= 1.0 SQ MI EXP COEF= .00 CONT COEF= .00

NO.	ELEV FT	AREA SQ FT	Q CFS	ACRES FLOODED FLOODPLAIN DAMAGE	ACRES FLOODED FLOODPLAIN CHANNEL	ACRES FLOODED TOTAL	STARTING CSM	CRIT ELEV FT	FRICTION SLOPE FT/FT	FLOW TOP WIDTH FT
0	744.1	0.0	0.0							
1	745.6	16.2	30.0	.00	.25	.25	30.00	745.1	.00519	19.4
2	746.1	25.6	55.0	.00	.31	.31	55.00	745.4	.00427	24.0
3	746.5	36.3	95.0	.00	.36	.36	95.00	745.7	.00521	27.7
4	746.7	41.8	110.0	.00	.38	.38	110.00	745.8	.00504	29.3
LOW GRND	746.9	45.9	121.2	.00	.40	.40				30.2
BANK FULL	746.9	45.5	121.2	.00	.40	.40				30.2
5	747.1	59.9	160.0	.00	.42	.69	160.00	746.1	.00449	52.6

TABLE OF VALUES FOR BFR EQUATION

IF AN * SYMBOL APPEARS BESIDE A VARIABLE IN THIS TABLE,IT IS
EXTRAPOLATED FROM FIGURES 6 THRU 12 OF THE BFR MANUAL.

NO.	AREA	SLOPE	SIGMA	DRS	COEF	VEL FPS	ALPHA	ALPHA2	HP AC	AREA SQ FT	APPR SQ FT	DEPTH	DEPTH COEF

2	.72	.42	.00	.00	.00	.42	1.03	1.00	1.00	1.01	29.64	[illegible]	146.[illegible]	.00

3 ORIFICE FLOW FOR THIS PROFILE. COEF = .80
4 ORIFICE FLOW FOR THIS PROFILE. COEF = .80
5 ORIFICE FLOW FOR THIS PROFILE. COEF = .80

ROAD SECTION 32.5

NO.	HW FT	CFS	HL FT	TW FT	STARTING CSM	BRIDGE CFS	BRIDGE AREA SQ FT	CULVERT CFS	CULVERT AREA SQ FT	WEIR CFS	WEIR AREA SQ FT	WEIR TOP WIDTH FT
0	745.30	0.0	0.00	745.30	0.00	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1	746.76	30.0	.06	746.72	30.00	-----	22.0	-----	.0	-----	.0	.0
2	747.31	55.0	.10	747.21	55.00	55.0	35.9	.0	.0	.0	.0	0
3	747.90	95.0	.14	747.76	95.00	91.0	38.4	.0	.7	2.1	2.7	39.8
4	747.96	110.0	.18	747.78	110.00	102.3	38.9	.0	.0	2.7	2.3	43.0
5	748.36	160.0	.16	748.20	160.00	95.1	38.9	.0	.0	21.0	24.3	145.9

MIN ROAD ELEVATION = 747.80 FT

BRIDGE TYPE = BFR SIPDEF BOTTOM ELEVATION = 747.30 FT OPENING NO.= 1

RATING TABLE FOR SECTION 32.6 DA= 1.0 SQ MI EXP COEF= .00 CONT COEF= .00

NO.	ELEV FT	AREA SQ FT	Q CFS	ACRES FLOODED FLOODPLAIN DAMAGE	ACRES FLOODED FLOODPLAIN CHANNEL	ACRES FLOODED TOTAL	STARTING CSM	CRIT ELEV FT	FRICTION SLOPE FT/FT	FLOW TOP WIDTH FT
0	747.6	0.0	0.0							
LOW GRND	749.9	20.5	29.6	.00	.45	.45				30.0
*****MESSAGE- ELEV BELOW FIRST PROFILE. FLOW INTERPOLATED LINEARLY FROM CHANNEL BOTTOM*****										
BANK FULL	748.9	20.5	29.6	.00	.45	.45				30.0
*****MESSAGE- ELEV BELOW FIRST PROFILE. FLOW INTERPOLATED LINEARLY FROM CHANNEL BOTTOM*****										
1	748.9	20.8	30.0	.00	.45	.46	30.00	749.5	.00501	30.9
2	749.2	39.1	55.0	.00	.50	1.06	55.00	749.7	.00446	84.7
3	749.4	72.1	95.0	.00	.50	1.39	95.00	749.9	.00385	126.5
4	749.4	86.5	110.0	.00	.50	1.54	110.00	749.9	.00612	132.5
5	749.7	114.7	160.0	.00	.50	1.94	160.00	749.2	.00354	155.1

RATING TABLE FOR SECTION 32.7 DA= 1.0 SQ MI EXP COEF= .00 CONT COEF= .00

NO.	ELEV FT	AREA SQ FT	Q CFS	ACRES FLOODED FLOODPLAIN DAMAGE	ACRES FLOODED FLOODPLAIN CHANNEL	ACRES FLOODED TOTAL	STARTING CSM	CRIT ELEV FT	FRICTION SLOPE FT/FT	FLOW TOP WIDTH FT
0	749.4	[illegible]	0.0							
1	750.7	[illegible]	[illegible]	.00	.26	.26	30.00	750.2	.00526	35.5
LOW GRND	750.7	[illegible]	[illegible]	.00	.26	.26				36.7
BANK FULL	750.7	[illegible]	[illegible]	.00	.26	.26				36.7

4	751.2	81.4	140.0	.00	.28	.28	[illegible]	150.0	.00101	119.8
5	751.5	108.2	160.0	.00	.28	1.07	160.00	751.0	.00416	150.7

RATING TABLE FOR SECTION 32.6 DA= 1.0 SQ MI EXP COEF= .00 CONT COEF= .00

NO.	ELEV FT	AREA SQ FT	Q CFS	ACRES FLOODED FLOODPLAIN DAMAGE	ACRES FLOODED FLOODPLAIN CHANNEL	ACRES FLOODED TOTAL	STARTING CSM	CRIT ELEV FT	FRICTION SLOPE FT/FT	FLOW TOP WIDTH FT
0	749.5	0.0	0.0							
1	751.2	33.9	50.0	.00	.35	.35	3[illegible]	750.3	.00153	50.4
LOW GRND	751.2	38.2	55.0	.00	.39	.39				57.0
BANK FULL	751.2	38.2	55.0	.00	.39	.39				57.0
2	751.8	55.4	55.0	.00	.61	.54	55.00	750.5	.00148	79.0
3	751.8	65.6	95.0	.00	.42	.73	95.00	750.9	.00157	105.8
4	751.9	89.4	110.0	.00	.43	.75	110.00	751.2	.00187	109.1
5	752.1	112.0	160.0	.00	.43	.87	160.00	751.2	.00228	127.0

---------- LIST OF INPUT DATA WITH LIMITED EDITING----------

```
CHANGE    DISCHARGE
DISCHARGE -1.       20.       40.       65.       75.       105.
END
COMMENT   DISCHARGE FROM XSECTION 19 OF TRIOOWOS.OUT DATED 06-20-94
REACH     32.9      1.        430.      430.
COMMENT   32.9 IS @ STA 42+10
SEGMENT   32.9      1         N         -13.
N[illegible]      .07
SEGMENT   32.9      2         C         40.
NVALUE    .05
SEGMENT   32.9      3         N         300.
NVALUE    .07
SECTION   32.9
          -290.     754.8     -160.     763.4     -125.     755.9
          -195.     756.4     -95.      756.4     -50.      754.1
          -23.      753.6     -2.5      751.2     0.        751.1
          2.5       751.1     13.       752.5     40.       752.0
          90.       753.5     120.      755.7     300.      762.9
ENDTABLE
ROAD      32.0      2.7       60.       60.
COMMENT   CS 33.0 IS DELANEY RD.@ STA. 43+00
CULV1     33.0      1         12311
CULV2     3.5                 60.       750.5     750.0
SECTION   33.0
          -425.     765.2     -325.     762.2     -225.     761.5
          -125.     760.4     -75.      759.9     -25.      759.7
          0.        759.7     25.       759.7     75.       759.7
          125.      760.2     225.      761.2
ENDTABLE
REACH     33.1      1.        155.      155.
COMMENT   33.1 IS @ STA 44+55
SEGMENT   33.1      1         N         -25.
N[illegible]      .07
S[illegible]T     33.1      2         C         25.
N[illegible]      .05
SEGMENT   33.1      3         N         200.
N[illegible]      .07
SECTION   33.1
          -4[illegible]     76[illegible]     -325.     76[illegible]     -225.     76[illegible]
```

[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
0.	749.7	1.8	750.9	2.3	751.2
6.	752.5	25.	752.8	75.	752.9
125.	754.5	175.	756.6	200.	758.7

ENDTABLE

----------LIST OF INPUT DATA----------

COMPUTE 32.9 33.1 32.8

----------END OF DATA LISTING----------

1 COMPUTE 32.9 33.1 32.8

----------STARTING DATA FROM PREVIOUS COMPUTATIONS----------

RATING TABLE FOR SECTION 32.9 DA= 1.0 SQ MI EXP COEF= .200 CONT COEF= .05

NO.	ELEV FT	AREA SQ FT	Q CFS	ACRES FLOODED FLOODPLAIN DAMAGE	CHANNEL	TOTAL	STARTING CSA	CRIT ELEV FT	FRICTION SLOPE FT/FT	FLOW TOP WIDTH FT
0	751.1	1.0	0.0							
1	752.4	18.5	20.0	.00	.26	.26	20.00	751.7	.00219	26.6
2	752.8	31.2	40.0	.00	.46	.46	40.00	752.0	.00319	46.3
100 GRND	752.9	35.2	48.7	.00	.56	.56				57.0
FULL	752.9	38.2	48.9	.00	.56	.56				57.0
3	753.1	50.9	65.0	.00	.58	.74	65.00	752.2	.00247	74.7
4	753.1	50.0	75.0	.00	.58	.72	75.00	752.3	.00348	73.4
5	753.3	67.6	105.0	.00	.59	.89	105.00	752.5	.00349	89.8

*****WARNING - SECT. 33.1 ID VALUES REVERSED ON SEGMENT 2 AT ELEVATION 752.80 VALUE CHANGED TO EQUAL PREVIOUS VALUE *****

ROAD SECTION 33.0

NO.	HW FT	CFS	HL FT	TW FT	STARTING CSA	BRIDGE CFS	BRIDGE AREA SQ FT	CULVERT CFS	CULVERT AREA SQ FT	WEIR CFS	WEIR AREA SQ FT	WEIR TOP WIDTH FT
0	750.50	0.0	0.00	750.00	0.00	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1	752.90	20.0	.51	752.39	20.00	.0	.0	20.0	7.0	.0	.0	.0
2	754.00	40.0	1.22	752.79	40.00	.0	.0	40.0	9.5	.0	.0	.0
3	755.44	65.0	2.31	753.12	65.00	.0	.0	65.0	9.6	.0	.0	.0
4	756.11	75.0	2.99	753.12	75.00	.0	.0	75.0	9.6	.0	.0	.0
5	759.05	105.0	5.73	753.32	105.00	.0	.0	105.0	9.6	.0	.0	.0

MIN ROAD ELEVATION = 759.70 FT

OPENING NO.	NO. CULVERTS	CULV. CODE	HEIGHT OR DIAM	WIDTH	LENGTH	U/S INVERT	D/S INVERT	CN COEFF
1	1	[illegible]	2.5		60.00	750.50	750.00	.024

RATING TABLE FOR SECTION 23.1 DA= 1.0 SQ MI EXP COEF= .00 CONT COEF= .00

NO.	ELEV FT	AREA SQ FT	Q CFS	ACRES FLOODED FLOODPLAIN DAMAGE	ACRES FLOODED CHANNEL	ACRES FLOODED TOTAL	STARTING CSM	CRIT ELEV FT	FRICTION SLOPE FT/FT	FLOW TOP WIDTH FT
0	749.7	0.0	0.0							
LOW GRND	751.8	22.5	10.0	.00	.20	.20				41.5
*****MESSAGE- ELEV BELOW FIRST PROFILE. FLOW INTERPOLATED LINEARLY FROM CHANNEL BOTTOM*****										
BANK FULL	751.8	22.5	10.0	.00	.20	.20				41.5
*****MESSAGE- ELEV BELOW FIRST PROFILE. FLOW INTERPOLATED LINEARLY FROM CHANNEL BOTTOM*****										
1	753.0	44.9	20.0	.00	.25	.55	20.00	751.3	.00057	110.5
2	754.0	188.1	40.0	.00	.25	.90	40.00	751.8	.00006	182.2
3	755.4	535.7	65.0	.00	.25	1.45	65.00	752.2	.00001	294.0
4	756.1	747.3	75.0	.00	.25	1.64	75.00	752.4	.00001	352.2
5	759.1	1934.7	105.0	.00	.25	2.22	105.00	752.8	.00000	449.4

WARNING**********PROFILE NO 5 EXCEEDS SURVEY DATA BY .4 FT. COMPUTATION BASED ON VERTICAL EXTENSION OF END POINTS**********

WSPI XEQ 06/27/94 17:56:49 0.0550 DRAIN-FPME, SHIAWASSEE COUNTY, MICHIGAN WS : ____ PAGE
REV 11/01/90 VERSION 2.0 EXISTING CONDITIONS, 06-27-94 ALT: ____ 25

---------- LIST OF INPUT DATA WITH LIMITED EDITING----------

```
END
ENDJOB
```

**********NORMAL END OF JOB----------

WSPI XEQ 06/27/94 17:56:49 WS : ____ PAGE
REV 11/01/90 VERSION 2.0 ALT: ____ 1

---------- LIST OF INPUT DATA WITH LIMITED EDITING----------

```
ENDRUN
```

****

SCS WSPI VERSION 11/01/90
FILE SUMMARY

INPUT = A:BOOKWSPI.DAT
OUTPUT = C:BOOKWSPI.OUT DATED 06/27/94 17:56:49

OPTIONAL FILES SAVED

OPTION T = A:BOOKWSPI.WRT DATED 06/27/94 17:56:49

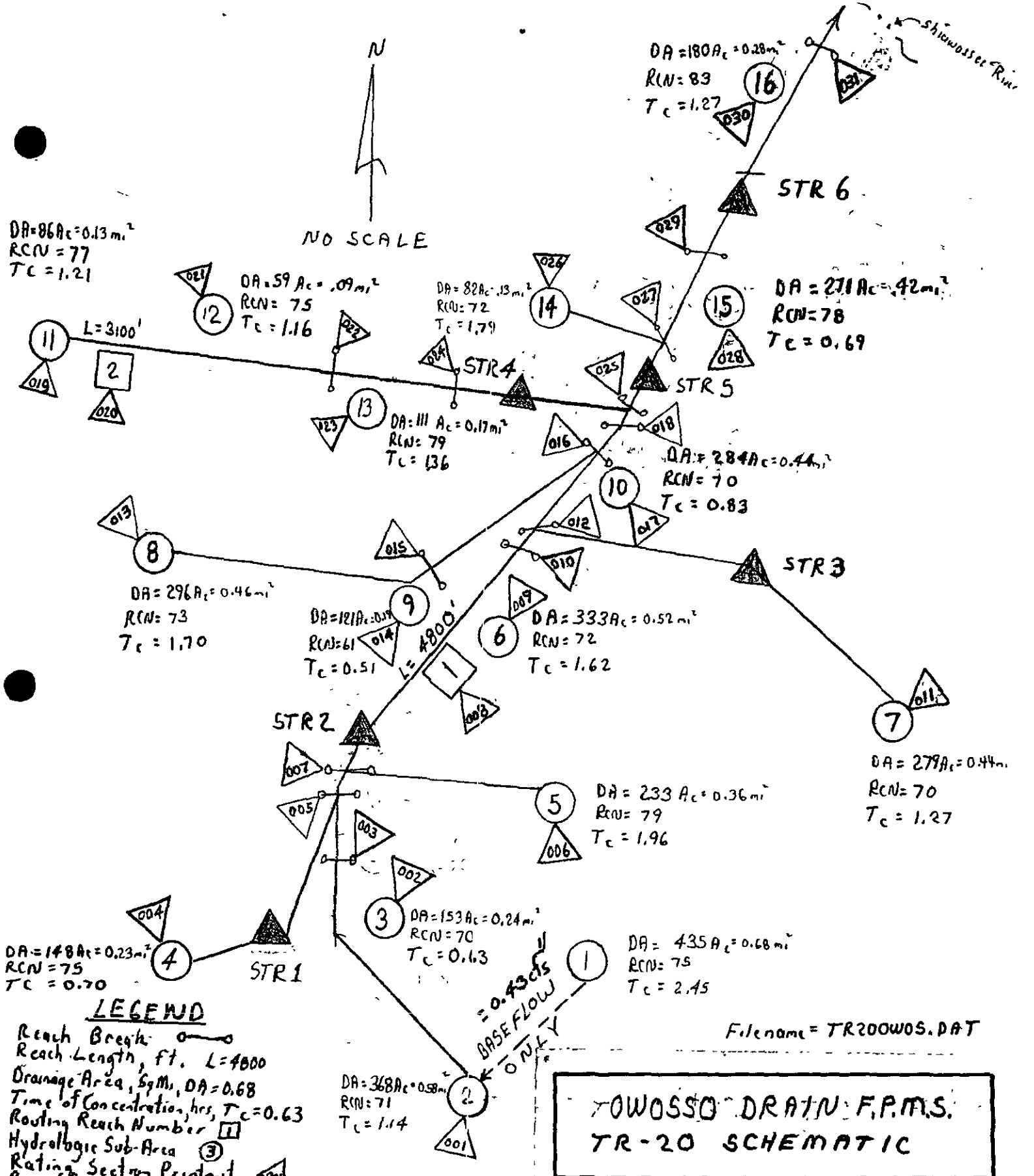
****

Filename = WSPOWOS0.WRT

```
1____    WSP2GENR12/27/9311:32:55
JOB TR-20                    FULLPRINT          SUMMARY
TITLE     OWOSSOW DRAIN-FPMS, SHIAWASSEE COUNTY, MICHIGAN
 2 XSECTN     6                 1.00      733.20      739.20      338.00____
 8                            338.00        0.0         0.0        0.0 12.1   1
 8                            731.70        .10         .53        .0012.1    2
 8                            733.95      32.00       36.33        .0012.1    3
 8                            736.90      65.00       90.25        .0012.1    4
 8                            737.20      71.00      115.83        .0012.1    5
 8                            737.90     121.00      360.77        .0012.1    6
 8                            738.10     172.00      604.37        .0012.1    7
 8                            738.60     375.00     1025.01        .0012.1    8
 8                            739.20     678.00     1700.02        .0012.1    9
 8                            739.90    1081.00     2438.11        .0012.1   10
 9 ENDTBL                                  Q          Area           AVE
 2 XSECTN     1                 1.00      740.00      742.87      739.50____
 8                            736.20        0.0         0.0        .0 17.5    1
 8                            736.48        .10         .90        .0017.5    2
 8                            739.16      32.00       94.21        .0017.5    3
 8                            740.65      65.00      159.75        .0017.5    4
 8                            740.85      71.00      172.52        .0017.5    5
 8                            742.24     121.00      293.47        .0017.5    6
 8                            742.42     172.00      354.26        .0017.5    7
 8                            742.62     375.00      492.67        .0017.5    8
 8                            742.87     678.00      701.26        .0017.5    9
 8                            743.07    1081.00     1059.65        .0017.5   10
 9 ENDTBL                                                           AVE
```

Input into TR20 for XSECTN 008

Note: This averages all the cross sections for the 4800 ft REACH north of Dewey Road.



Filename = TR200WOS.DAT

1/ Baseflow from page 164, Water Resources Data, March 1992 USGS Water Data Report MI-92-1

OWOSSO DRAIN F.P.M.S.
TR-20 SCHEMATIC

U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

Designed T.D.A.	Date 8-93	Approved by
Drawn		Title
Traced		Title
Checked		Sheet No. 1 of 1 — Drawing No.

SCS-ENG-21 Rev. 7-76

Michigan Owosso Drain FPMS
TOB
October 1, 1981 Flood

Between Sept 30 and Oct 1, 1981 approximately 4.79 in of rain fell in a 24 hour period. This approximates a 100 year 24 hour Rainfall of 4.85 inches. Also, Because 1.84 in. inches of rain fell between Sept 26 and 29. ACM was II. Predicted flood elevations for the 100 year flood were within 0.2 ft. of actual high water elevations observed during the Oct 1 1981 flood. It should be noted that landuse in this watershed is basically the same now as in 1981.

9-2-94

The Predicted WSP_{100} from the TR20 Model (See sec 13 of this book) for structure #6 is 737.34 ft
The elevations HWM observed for the Oct 1, 1981 flood is 737.45 at 908 Fletcher and 737.18 at 820 South Lyons. (See attached survey notes)
The predicted WSP_{100} from the TR20 Model for structure #5 is 739.63.
The elevation HWM observed for the Oct 1, 1981 flood is 739.46 at 1312 Herman st.
(see attached survey.

TDB

OWOSSO DRAIN FPMS

STA	BS+	HI	FS-	Elev
TBM #13	0.75	743.20		742.45
				0.75
				743.20
				5.25
				737.95
Top Concrete Porch			5.25	737.95
TBM #15	2.75	741.71		738.96
				2.75
				741.71
				4.37
				737.34
TP	4.36	741.70	4.37	737.34
				4.36
				741.70
HW Mark			4.52	737.18
TBM #24	3.77	743.25		739.48
			4.26	739.0

Cold 45° ; Wet

March 9, 1994
TDB ☐ π
Disk: ϕ

Determination of HWM Elevations - Oct 1, 1981 Flood

Predicted Str 6 100 yr Flood @ 737.34
Predicted Str 5 100 yr Flood @ 739.63

- 6" = 737.45

Mrs Jack Speers
908 Fletcher
517 723 3412
Located in Str 6 area

31' 6"
741.70
4.52
737.18

Metner
820 South Lyons
Located in Str 6 Area

5'4"
739.48
3.77
4.25
739.00

Add 5½" WL @ 739.46

1312 Hermon St
Located in Str 5 Area

Visited with residence and she said the water was 5½" deep from our sock

Michigan Owosso Drain FPMS
TOB
October 1, 1981 Flood

Between Sept 30 and Oct 1, 1981 approximately 4.79 in of rain fell in a 24 hour period. This approximates a 100 year 24 hour Rainfall of 4.85 inches. Also, because 1.84 in. inches of rain fell between Sept 26 and 29. ACM was II. Predicted flood elevations for the 100 year flood were within 0.2 ft. of actual high water elevations observed during the Oct 1 1981 flood. It should be noted that landuse in this watershed is basically the same now as in 1981.

DAILY PRECIPITATION (INCHES)

MICHIGAN
SEPTEMBER 1981

STATION	TOTAL	DAY OF MONTH 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
LOWELL 2 SE	6.13				T				.16						T	
LOWELL	5.47				.03				.16							
NILES	5.60			.01				.24						T	.92	
SOUTH HAVEN	4.56								.39							
SOUTH CENTRAL LOWER 09																
ALBION	3.87	T			.80	.03			.02						.02	
BATTLE CREEK	4.84		.62	.18	.04	T			.10					T	T	
BURLINGTON 3 E	4.63	T	T		.48				.15						.56	
CHARLOTTE	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
COLDWATER STATE SCHOOL	6.24	.14	.01	.82	.11			.17	.07					T	1.92	
DIMONDALE 1 WSW	4.98		.04	.02	.78	.17	.01		.08						.07	
EAST LANSING 4 S	5.13	T	T	T	1.18	.18	T	T							T	
EATON RAPIDS	4.91			.01	1.07	.21	.01		.10							
GRAND LEDGE	5.14	T	.44	.02	.25	.13			.24	.03						
HASTINGS	5.28		T		.05				.14							
HASTINGS 3 SE	3.80		.02	T	.06	.03			.11							
HILLSDALE	5.30	T	.09	.05	1.05	.18			.25						1.25	T
IONIA 1 WNW	5.24				.05	.04			.25							
JACKSON FAA AP	7.07	.13		1.26	1.34	T		.03							.06	
LANSING WSO AP //R	8.01	.32	.02	.26	.74	T		.11	T							
MUNITH 5 SW	5.10	.01	.05	.01	1.39	.06	.04	.01	.13						.17	
NOTTAWA 3 SE	4.22				.38		T		.24						.76	
OWOSSO WASTEWATER PL	6.74		T	T	1.08	1.08		T	.17	T						
SAINT JOHNS	5.88		.26	.03	1.00	.02			.33							
THREE RIVERS	5.15	.01	T		.32				.24						.57	
WHITE PIGEON 3 ENE	5.46		.42		.21				.26						.37	
WILLIAMSTON	5.38				1.00	.35			.12					.05		
SOUTHEAST LOWER 10																
ADRIAN 2 NNE	9.47	.19		4.74	.17	T	T	.13	.08					.09	1.09	
ALMONT	8.11	.63	.05	.01	3.97	.21	.04		.06	.01						.39
ANN ARBOR UNIV OF MICH	6.04	T	T	1.03	1.77	.09	T		.06	T					.18	
CHELSEA	6.74		.09	1.09	1.08	.38			.09						.79	
DEARBORN	4.83		.59	.08	1.10	.35			.05						.33	
DETROIT CITY AIRPORT //R	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
DETROIT METRO WSO AP	5.47	.07	.01	1.04	1.16	T		T	.05					.05	.17	
FLINT WSO AP	7.65	.13	.02	.94	1.55	.04	T	.08	.04					.02		T
FLINT 7 W	6.15	.27	.01		1.98	.59	T		.17	.04					.02	
GROSSE POINTE FARMS	4.03	T	.05	.03	1.01	.10			.03	.01					.90	
HOWELL WWTP	6.56		.78	.04	2.41	.38	.02		.10							
LAPEER	7.99	.63	.12	.03	3.72	.17			.17	.02					.08	.01
MILFORD GM PROVING GRN	12.51	.08	T	2.60	1.50	T		.04	.08					.04	T	
MONROE	5.56	.02	.02	.07	2.38	.01	.15								.20	
MORENCI	9.71	.10	.10	.04	5.18	.05	T		.27						T	
MT CLEMENS ANG BASE	7.38	.90	T	.44	.20	T		T	.13						T	
OXFORD	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
PONTIAC STATE HOSPITAL	4.80		.10	T	2.25	.30	T		.04	.02					T	
PORT HURON	6.88	.66	T	1.48	.99	T			.24							
WASHINGTON 2 NNW	6.52	.45	.09	1.36	.01	.05			.10					.17		
WILLIS 5 SSW	8.97	1.05	T	1.79	.60				.10					T		
YALE 1 NNE	5.89	.90	.02	.03	2.15	.28	.02		.13	.13					.51	
YPSILANTI EAST MICH U	7.06	.07	.01	1.04	2.15									.05	.28	

DAILY PRECIPITATION (CONT)

MICHIGAN
SEPTEMBER 1981

STATION	DAY OF MONTH 16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
LOWELL 2 SE	.08	1.33	.35	.01			.69			.04	1.00	1.64		T	.83	
LOWELL	.38	1.35	.38	.01			.46			.08	.48	1.30			.84	
NILES	.09	.22				.04			T	.11	3.15			.07	.75	
SOUTH HAVEN	.23	.23	.06				1.24		.02	.11	.72	.10		.09	1.37	
SOUTH CENTRAL LOWER 09																
ALBION	.07	.46	.30				1.15		T	.02	.04	.06		T	.90	
BATTLE CREEK	.15	.27	T	T			.73	.01		.08	.21	.94	.01	T	1.50	
BURLINGTON 3 E	.14	.09	.22				1.02			T	.06	.59		T	1.32	
CHARLOTTE	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
COLDWATER STATE SCHOOL	.36	.15				.57				.06	.41	.25		.05	1.15	
DIMONDALE 1 WSW	.18	.62	.17				1.08			.10	.41	.40		T	.85	
EAST LANSING 4 S	T	.56	.17				1.52			.03	.41	.42		.01	.65	
EATON RAPIDS	.15	.45	.27	.03			.60	.01	T	.02	.23	.86		.01	.88	
GRAND LEDGE		.49	.31				1.22			.03	.43	.77		.02	.76	
HASTINGS	.14	.46	.26			.01	.64		.01	.04	.66	1.66			1.21	
HASTINGS 3 SE	.07	.42	.24				.67			.04	.50	.67			.97	
HILLSDALE	.06	.19	.10				.42				.07	.27		.07	1.25	
IONIA 1 WNW	.07	1.13	.30				.68			.09	.87	1.10			.66	
JACKSON FAA AP	.48	.14				.96				.03	.34	.32		T	1.98	
LANSING WSO AP //A	.55	.20				1.17			T	.22	.99			T	3.43	
MUNITH 5 SW		.41	.14				1.08			.06	.04	.59		T	.91	
NOTTAWA 3 SE		.09	.19				.38				.15	1.13			.90	
OWOSSO WASTEWATER PL		1.13	.36				.90				.45	1.39		.05	.13	
SAINT JOHNS	.60	.85	.09			.02	.85				.63	1.14			.06	
THREE RIVERS		.04	.13				.46			.05	.12	.99	.01	.03	2.16	
WHITE PIGEON 3 ENE		.20	.11				.24				.15	.90			2.60	
WILLIAMSTON	.01	.69	.20				1.76				.28	.41			.51	
SOUTHEAST LOWER 10																
ADRIAN 2 NNE	.59	.10				.45				.04	.01	.29			1.50	
ALMONT		1.02	.22		.01	.03	1.12	.02			.11	.19		.02		
ANN ARBOR UNIV OF MICH	.10	.62	.08			.01	.86			.02	.11	.31		.03	.77	
CHELSEA		.53	.23				1.03				.03	.59			.81	
DEARBORN		.68	.20				.93				.05	.10			.37	
DETROIT CITY AIRPORT //A	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
DETROIT METRO WSO AP	.75	.19	.09			.90	T			.01	.04	.04	T	T	.90	
FLINT WSO AP	.53	.37	T	T		.88				.10	.46	.22	.01	.02	2.24	
FLINT 7 W		.86	.22			.03	.75				.35	.75	.03		.08	
GROSSE POINTE FARMS	.13	.42	.28			.09	.70			.05	.02	T	T		.21	
HOWELL WWTP		.62	.24				1.08				.08	.30			.51	
LAPEER	.34	.80	.02			.18	.81				.19	.55		.03	.12	
MILFORD GM PROVING GRN	.44	.39	.04			1.50	.12			.04	.04	.52	T	T	5.08	
MONROE		.61	.30				.76					.15			.89	
MORENCI		1.67	.09				.49				.02	.81		.05	.84	
MT CLEMENS ANG BASE	1.09	.24	.27	.13		.90	.06	T		.07	T	.05	T		2.90	
OXFORD	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
PONTIAC STATE HOSPITAL	T	.68	.15				1.04				.06	.16		T		
PORT HURON	.53	.56	.17	.01		.81	.02	.09		.10	.03	.13	T		.89	
WASHINGTON 2 NNW	1.19	.31			.11		.84	.01		.09		.11			1.80	
WILLIS 5 SSW	1.68	.44	.05			.80	.33			.01	.11			T	1.50	
YALE 1 NNE	.32	.66	.02			.43	.39			.02	.10	.26	.01		.02	
YPSILANTI EAST MICH U	.55	.28				.85	.03			.02	.21	.25	.34	.01	.92	

SEE REFERENCE NOTES FOLLOWING STATION INDEX

DAILY PRECIPITATION (INCHES)

MIC GAN
OCTOBE 981

STATION	TOTAL	DAY OF MONTH 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
KENT CITY 2 SW	7.80	5.17	.03		.03	.05	.36	.04								.51
LOWELL 2 SE	4.00	2.31	.05		T	.02	.35	.01								.36
LOWELL	3.91	2.50					.40									.45
NILES	1.92	.03	.23		T	.11	.04								.36	.02
SOUTH HAVEN	1.65	11	.14		T		.25								.23	.06
SOUTH CENTRAL LOWER 09																
ALBION	4.96	2.80	.04		T		T									.20
BATTLE CREEK	2.34	.54	.04	T	T		.03	.04							.10	.14
BURLINGTON 3 E	3.38	1.25			.03		.08									.16
CHARLOTTE	3.23	1.45	.03		T	.01	.23	.01								.16
COLDWATER STATE SCHOOL	2.05	.03			T	.06	T								.07	.01
DIMONDALE 1 WSW	3.56	1.97	.07		.02		.24	.01								.12
EAST LANSING 4 S	4.80	2.82	.02		T	T	.69	T								.14
EATON RAPIDS	3.62	1.55			.04		.28	T		T		T	T	T		.14
GRAND LEDGE	4.39	2.48	.06		T	.04	.29	.02								.20
HASTINGS	3.23	.90	.05		.03	.02	.40									.27
HASTINGS 3 SE	3.08	.99			.06		.24									.33
HILLSDALE	2.30	.64	.03		T	T	.11	T								.04
IONIA 1 WNW	7.13	5.12	.03				.48							.03		.39
JACKSON FAA AP	3.30	.28	T		T	T	.17								.53	T
LANSING WSO AP //R	1.28	.05	.01		T	.04	.20								.11	.02
MUNITH 5 SW	3.60	1.14	.04	.01		.01	.04	.02								.07
NOTTAWA 3 SE	2.31	.65					.14									.14
OWOSSO WASTEWATER PL	5.99	4.67	.05				.22	.03								.31
SAINT JOHNS	7.96	6.50	.04		T			T								.33
THREE RIVERS	2.28	.34	.04				.10	T								.18
WHITE PIGEON 3 ENE	1.76	.12	.05				.12									.14
WILLIAMSTON	2.21						.46	.02								.25
SOUTHEAST LOWER 10																
ADRIAN 2 NNE	2.62	.04			.03	.04	.08	T							.01	T
ALMONT	5.69	3.37	.02				.59	.01								
ANN ARBOR UNIV OF MICH	3.46	1.03	.03		.01		.05	T								.08
CHELSEA	3.38	1.51	.02				.06									.07
DEARBORN	5.85	2.64					.07	.12								
DETROIT CITY AIRPORT //R	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
DETROIT METRO WSO AP	3.92	.70	.03		T	T	.05								T	T
FLINT WSO AP	3.09	1.00	.02		T	T	.32								.21	.09
FLINT 7 W	5.80	3.90	.03				.18	.04								.31
GROSSE POINTE FARMS	8.54	4.30	.02		T		.42	T								T
HOWELL WWTP	5.43	3.87														
LAPEER	6.68	3.53		.05	T	.01	.41	.03	.01							.30
MILFORD GM PROVING GRN	4.56	1.70			T		.36								.12	T
MONROE	5.23	.70	.50				.21									
MORENCI	3.56	.02	T			.02	.25	.02								.02
MT CLEMENS ANG BASE	4.36	1.21	T		T		.12	T							.01	T
OXFORD	-	5.60	.70				.27	.11	T				.09			-
PONTIAC STATE HOSPITAL	6.90	4.75	.02				.15	.01								.02
PORT HURON	4.25	2.00	T		T		.35									.04
WASHINGTON 2 NNW	2.77	1.20	T		T		.11								.02	T
WILLIS 5 SSW	3.64	.50			.01		.10								.02	
YALE 1 NNE	5.13	2.65	.05				.34									.16
YPSILANTI EAST MICH U	3.39	1.01	T		T		T								.05	T

SEE REFERENCE NOTES FOLLOWING STATION INDEX

DAILY PRECIPITATION (CONT)

MICHIGAN
OCTOBER 1981

STATION	DAY OF MONTH 16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
KENT CITY 2 SW	.07		.81	.34	.02	T	.33	T	.04							
LOWELL 2 SE	.01		.50	.02			.37		T			T				
LOWELL	.04		.34	.04			.07	.04				.03				
NILES		.18	.89	T		.03	T	.03			T	T				
SOUTH HAVEN		.17	.30	.01		.14	.20	.04	T							
SOUTH CENTRAL																
LOWER 09																
ALBION			.43	.19	T	T	.60	.20				.50				
BATTLE CREEK		.15	.54	.10	.01	.46	T	.12				.07				
BURLINGTON 3 E		.16	.47	.27			.38	.06				.17	.35			
CHARLOTTE	.01		.42	.21	.01	.02	.44	.05	.04			.10	.04			
COLDWATER STATE SCHOOL		.19	.43	T		.40	.09	T			.02	.75				
DIMONDALE 1 WSW	.01		.33	.12		.03	.46	T	.04			.13	.01			
EAST LANSING 4 S			.47	.05		T	.36		.01			.11	.13			
EATON RAPIDS			.69	.15			.35	.01	.06			.14	.21			
GRAND LEDGE	.01		.51	.28	.01	.01	.42	.01				.05				
HASTINGS	.03		.47	.52		.03	.39	.09	.02			.01				
HASTINGS 3 SE	.02		.50	.37				.45	.04	.05		.03				
HILLSDALE	T		.29	.19			.20	.35	T			.27	.18			
IONIA 1 WNW			.40	.13			.55									
JACKSON FAA AP		.22	.35	T	T	.71	.18	.07			T	.79				
LANSING WSO AP //R		.10	.29	T		.37	T	T			T	.09				
MUNITH 5 SW	.01		.17	.13		T	.96	.13	.03			.24	.60			
NOTTAWA 3 SE	T		.55	.30			.15	T	T			.10	.28			
OWOSSO WASTEWATER PL	.01	T	.18	.06	.01	.01	.40				.03	.01	T			
SAINT JOHNS		.28	.45			.15	.21									
THREE RIVERS	.02		.95	.33			.25	T	.01			.02	.04			
WHITE PIGEON 3 ENE		.04	.49	.20			.23		.04			.09	.24			
WILLIAMSTON	.01		.60				.46					.15	.26			
SOUTHEAST LOWER 10																
ADRIAN 2 NNE		.03	.38	T		.17	.74	T			.07	1.01	.02			
ALMONT	.04			.20	.07	.01	.03	.40	.18			.04	.73			
ANN ARBOR UNIV OF MICH	T		.27	.05		.35	.48	.06	.01		.01	.98	.05			
CHELSEA			.12	.18			.53	.28				.38	.23			
DEARBORN			.42	.05		.05	.38	.63	T		.05	.42	1.02			
DETROIT CITY AIRPORT //R	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
DETROIT METRO WSO AP		.10	.41	T		.29	.74	.01			.11	1.48				
FLINT WSO AP		.10	.30			.41	.03	T			T	.61				
FLINT 7 W	.03		.33	.05		.02	.41	T				.16	.34			
GROSSE POINTE FARMS	T		.48	.07		.28	.60	.31			.09	1.77	.20			
HOWELL WWTP			.28		T	T	.53		.20			.18	.37			
LAPEER	.06	T	.31	.18			.23	.38	.07			1.08	.01		.02	
MILFORD GM PROVING GRN		.08	.24	T		.83	.28	.08			T	.87				
MONROE				.56			T	1.01	T		.10	1.10	1.05			
MORENCI	T		.64	.07			.06	.94	T		.04	.48	1.00			
MT CLEMENS ANG BASE		.12	.37	T		.73	.54	T			.01	1.25				
OXFORD												.17	2.11			
PONTIAC STATE HOSPITAL	.03		.25	.05		.04	.50	.22	T			.11	.75			
PORT HURON		.06	.28		T	.51	.41	.01			.07	.52				
WASHINGTON 2 NNW		.15	.07	T		.46	.20	.01				.55				
WILLIS 5 SSW		.05	.35			.18	.88	.04			.05	1.46				
YALE 1 NNE	.02		.25	.03		.40	.29		.02			.85	.07			
YPSILANTI EAST MICH U		.05	.15	.03		.40	.47	.04			.05	1.14				

SEE REFERENCE NOTES FOLLOWING STATION INDEX

Structure 1

```
*************************************
* HEC-2 WATER SURFACE PROFILES      *
*                                   *
* Version   4.6.2;  May 1991        *
*                                   *
* RUN DATE    03AUG94    TIME   09:00:58 *
*************************************
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*************************************
* U.S. ARMY CORPS OF ENGINEERS      *
* HYDROLOGIC ENGINEERING CENTER     *
* 609 SECOND STREET, SUITE D        *
* DAVIS, CALIFORNIA 95616-4687      *
*          (916) 756-1104           *
*************************************
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X     X  XXXXXXX   XXXXX            XXXXX
X     X  X       X     X          X     X
X     X  X       X                      X
XXXXXXX  XXXX    X         XXXXX   XXXXX
X     X  X       X                X
X     X  X       X     X          X
X     X  XXXXXXX   XXXXX           XXXXXXX
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1

03AUG94 09:00:58 PAGE 1

THIS RUN EXECUTED 03AUG94 09:00:58

```
***********************************
HEC-2 WATER SURFACE PROFILES

Version   4.6.2;  May 1991
***********************************
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```
T1      OWOSSO COMSTOCK DRAIN
T2      ENCLOSED PIPE
T3

J1  ICHECK    INQ      NINV     IDIR     STRT     METRIC   HVINS    Q        WSEL     FQ

                                        .00785                      100      720

J2  NPROF     IPLOT    PRFVS    XSECV    XSECH    FN       ALLDC    IBW      CHNIM    ITRACE

                        -1

J5  LPRNT    NUMSEC                 ********REQUESTED SECTION NUMBERS********

    -10      -10

NC     .015      .015      .015       .6        .8
X1                 9      94.4     105.6
BT      -7      94.4       740    718.05     95.02       740    719.63     97.13       740    721.73
BT             100       740     722.5    102.88       740    721.73    104.98       740    719.63
               105.6     740     718.5
GR     740      94.4    718.05      94.4    717.49     95.02    716.29     97.13    715.75       100
GR  716.29    102.88    717.49    104.98    718.05     105.6       740     105.6

X1     650                                   650       650       650                2.65
X2                                                                 1

X1     950                                   300       300       300                 1.9
```

```
X2                                                                  1

X1    2040                                  1090      1090      1090                  4.4
X2                                                                  1

X1    3240                                  1200      1200      1200                  2.3
                                                                    1

X1    4220                                   980       980       980                   .7
X2                                                                  1

X1    4790                                   570       570       570                   .4
X2                                                                  1
1
   03AUG94     09:00:58                                                                PAGE   2


X1    4795       11       100       105         5         5         5
BT      -9      100       740     730.6    100.19       740    731.56    100.73       740    732.37
BT            101.54       740      733.    102.5       740     733.1    103.46       740      733.
BT            104.27       740    732.37    104.81       740    731.56       105       740     730.6
GR     740      100     730.6       100    729.64    100.19    728.83    100.73     728.2    101.54
GR   728.2     102.5     728.1    103.46    728.83    104.27    729.64    104.81     730.6       105
GR     740      105

X1    4910                                   115       115       115                   .1
X2                                                                  1
1
   03AUG94     09:00:58                                                                PAGE   3


T2
T3

J1  ICHECK    INQ      NINV     IDIR      STRT     METRIC    HVINS     Q       WSEL      FQ

                                         .00785                        150       720

J2  NPROF     IPLOT    PRFVS    XSECV     XSECH     FN       ALLDC     IBW     CHNIM     ITRACE

     2                -1

1
   03AUG94     09:00:58                                                                PAGE   4


T1
T2
T3

J1  ICHECK    INQ      NINV     IDIR      STRT     METRIC    HVINS     Q       WSEL      FQ

                                         .00785                        200       720

J2  NPROF     IPLOT    PRFVS    XSECV     XSECH     FN       ALLDC     IBW     CHNIM     ITRACE

     3                -1

1
   03AUG94     09:00:58                                                                PAGE   5


T1
T2
```

13

J1	ICHECK	INQ	NINV	IDIR	STRT	METRIC	HVINS	Q	NSEL	FQ
					.00785			250	720	

J2	NPROF	IPLOT	PRFVS	XSECV	XSECH	FN	ALLDC	IBW	CHNIM	ITRACE
	4		-1							

1

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T1
T2
T3

J1	ICHECK	INQ	NINV	IDIR	STRT	METRIC	HVINS	Q	NSEL	FQ
					.00785			300	720	

J2	NPROF	IPLOT	PRFVS	XSECV	XSECH	FN	ALLDC	IBW	CHNIM	ITRACE
	5		-1							

1

03AUG94 09:00:58 PAGE 7

THIS RUN EXECUTED 03AUG94 09:01:00

HEC-2 WATER SURFACE PROFILES

Version 4.6.2; May 1991

NOTE- ASTERISK (*) AT LEFT OF CROSS-SECTION NUMBER INDICATES MESSAGE IN SUMMARY OF ERRORS LIST

SUMMARY PRINTOUT TABLE 150

	SECNO	XLCH	ELTRD	ELLC	ELMIN	Q	CWSEL	CRIWS	EG	10*KS	VCH	AREA	.01K
*	.000	.00	740.00	722.50	715.75	100.00	717.86	717.86	718.57	33.94	6.73	14.87	17.17
*	.000	.00	740.00	722.50	715.75	150.00	718.29	718.29	719.20	33.88	7.64	19.63	25.77
*	.000	.00	740.00	722.50	715.75	200.00	718.67	718.67	719.77	34.33	8.40	23.82	34.14
*	.000	.00	740.00	722.50	715.75	250.00	718.99	718.99	720.30	36.88	9.20	27.19	41.17
*	.000	.00	740.00	722.50	715.75	300.00	719.30	719.30	720.81	38.79	9.86	30.44	48.17
*	650.000	650.00	740.00	725.15	718.40	100.00	720.51	720.51	721.22	33.94	6.73	14.87	17.17
*	650.000	650.00	740.00	725.15	718.40	150.00	720.94	720.94	721.85	33.88	7.64	19.63	25.77
*	650.000	650.00	740.00	725.15	718.40	200.00	721.33	721.33	722.42	34.33	8.40	23.82	34.14
*	650.000	650.00	740.00	725.15	718.40	250.00	721.64	721.64	722.95	36.88	9.20	27.19	41.17
*	650.000	650.00	740.00	725.15	718.40	300.00	721.95	721.95	723.46	38.79	9.86	30.44	48.17
*	950.000	300.00	740.00	727.05	720.30	100.00	722.41	722.41	723.12	33.94	6.73	14.87	17.17

*	950.000	300.00	740.00	727.05	720.30	150.00	722.84	722.84	723.75	33.[illegible]	7.64	19.63	25.77
*	950.000	300.00	740.00	727.05	720.30	200.00	723.23	723.23	724.32	34.33	8.40	23.82	34.14
*	950.000	300.00	740.00	727.05	720.30	250.00	723.54	723.54	724.85	36.88	9.20	27.19	41.17
*	950.000	300.00	740.00	727.05	720.30	300.00	723.85	723.85	725.36	38.79	9.86	30.44	48.17
*	2040.000	1090.00	740.00	731.45	724.70	100.00	726.81	726.81	727.52	33.94	6.73	14.87	17.17
	2040.000	1090.00	740.00	731.45	724.70	150.00	727.24	727.24	728.15	33.88	7.64	19.63	25.77
	2040.000	1090.00	740.00	731.45	724.70	200.00	727.63	727.63	728.72	34.33	8.40	23.82	34.14
*	2040.000	1090.00	740.00	731.45	724.70	250.00	727.94	727.94	729.25	36.88	9.20	27.19	41.17
*	2040.000	1090.00	740.00	731.45	724.70	300.00	728.25	728.25	729.76	38.79	9.86	30.44	48.17
*	3240.000	1200.00	740.00	733.75	727.00	100.00	729.67	.00	730.02	12.23	4.75	21.07	28.39
*	3240.000	1200.00	740.00	733.75	727.00	150.00	730.29	.00	730.75	12.50	5.40	27.78	42.43
*	3240.000	1200.00	740.00	733.75	727.00	200.00	730.89	.00	731.43	12.89	5.90	33.87	55.71
*	3240.000	1200.00	740.00	733.75	727.00	250.00	731.57	.00	732.17	13.30	6.22	40.16	68.35
*	3240.000	1200.00	740.00	733.75	727.00	300.00	732.26	.00	732.93	14.42	6.58	45.60	79.01

1

	SECNO	XLCH	ELTRD	ELLC	ELMIN	Q	CWSEL	CRIWS	EG	10*KS	VCH	AREA	.01K
	4220.000	980.00	740.00	734.45	727.70	100.00	730.75	.00	731.00	7.31	3.97	25.20	36.99
	4220.000	980.00	740.00	734.45	727.70	150.00	731.46	.00	731.79	8.05	4.60	32.58	52.86
	4220.000	980.00	740.00	734.45	727.70	200.00	732.16	.00	732.56	9.03	5.11	39.17	66.55
	4220.000	980.00	740.00	734.45	727.70	250.00	732.91	.00	733.38	10.19	5.53	45.22	78.32
	4220.000	980.00	740.00	734.45	727.70	300.00	733.75	.00	734.29	11.97	5.93	50.63	86.70
	4790.000	570.00	740.00	734.85	728.10	100.00	731.17	.00	731.41	7.16	3.94	25.39	37.38
	4790.000	570.00	740.00	734.85	728.10	150.00	731.93	.00	732.25	7.62	4.51	33.25	54.35
	4790.000	570.00	740.00	734.85	728.10	200.00	732.69	.00	733.07	8.43	4.96	40.33	69.88
	4790.000	570.00	740.00	734.85	728.10	250.00	733.52	.00	733.96	9.52	5.35	46.71	81.02
	4790.000	570.00	740.00	734.85	728.10	300.00	734.50	.00	735.02	12.76	5.77	52.01	83.98
*	4795.000	5.00	740.00	733.10	728.10	100.00	731.00	730.94	732.13	50.62	8.55	11.70	14.05
*	4795.000	5.00	740.00	733.10	728.10	150.00	731.69	731.62	733.25	61.87	10.04	14.94	19.07
*	4795.000	5.00	740.00	733.10	728.10	200.00	732.38	732.14	734.36	76.54	11.30	17.70	22.86
*	4795.000	5.00	740.00	733.10	728.10	250.00	733.11	732.60	735.67	127.53	12.84	19.47	22.14
*	4795.000	5.00	740.00	733.10	728.10	300.00	733.88	732.82	737.57	183.65	15.41	19.47	22.14
*	4910.000	115.00	740.00	733.20	728.20	100.00	732.31	.00	732.85	20.64	5.87	17.04	22.01
	4910.000	115.00	740.00	733.20	728.20	150.00	733.33	.00	734.25	45.91	7.70	19.47	22.14
	4910.000	115.00	740.00	733.20	728.20	200.00	733.84	.00	735.48	81.62	10.27	19.47	22.14
	4910.000	115.00	740.00	733.20	728.20	250.00	734.57	732.62	737.13	127.53	12.84	19.47	22.14
	4910.000	115.00	740.00	733.20	728.20	300.00	735.99	732.92	739.68	183.65	15.41	19.47	22.14

1

SUMMARY PRINTOUT TABLE 150

	SECNO	Q	CWSEL	DIFWSP	DIFWSX	DIFKWS	TOPWID	XLCH
	.000	100.00	717.86	.00	.00	-2.14	10.79	.00
*	.000	150.00	718.29	.43	.00	-1.71	11.20	.00
*	.000	200.00	718.67	.38	.00	-1.33	11.20	.00
*	.000	250.00	718.99	.31	.00	-1.01	11.20	.00
*	.000	300.00	719.30	.31	.00	-.70	11.20	.00
*	650.000	100.00	720.51	.00	2.65	[illegible].00	10.79	650.00
*	650.000	150.00	720.94	.43	2.65	[illegible].00	11.20	650.00

*	650.000	200.00	721.33	.38	2.65	[illegible]	11.[illegible]	[illegible]
*	650.000	250.00	721.64	.31	2.65	.00	11.20	650.00
*	650.000	300.00	721.95	.31	2.65	.00	11.20	650.00
*	950.000	100.00	722.41	.00	1.90	.00	10.79	300.00
*	950.000	150.00	722.84	.43	1.90	.00	11.20	300.00
*	950.000	200.00	723.23	.38	1.90	.00	11.20	300.00
	950.000	250.00	723.54	.31	1.90	.00	11.20	300.00
*	950.000	300.00	723.85	.31	1.90	.00	11.20	300.00
*	2040.000	100.00	726.81	.00	4.40	.00	10.79	1090.00
*	2040.000	150.00	727.24	.43	4.40	.00	11.20	1090.00
*	2040.000	200.00	727.63	.38	4.40	.00	11.20	1090.00
*	2040.000	250.00	727.94	.31	4.40	.00	11.20	1090.00
*	2040.000	300.00	728.25	.31	4.40	.00	11.20	1090.00
*	3240.000	100.00	729.67	.00	2.86	.00	11.20	1200.00
*	3240.000	150.00	730.29	.62	3.05	.00	11.20	1200.00
*	3240.000	200.00	730.89	.60	3.26	.00	11.20	1200.00
*	3240.000	250.00	731.57	.68	3.63	.00	11.20	1200.00
*	3240.000	300.00	732.26	.69	4.01	.00	11.20	1200.00
	4220.000	100.00	730.75	.00	1.08	.00	11.20	980.00
	4220.000	150.00	731.46	.71	1.17	.00	11.20	980.00
	4220.000	200.00	732.16	.69	1.27	.00	11.20	980.00
	4220.000	250.00	732.91	.75	1.34	.00	11.20	980.00
	4220.000	300.00	733.75	.84	1.49	.00	11.20	980.00
	4790.000	100.00	731.17	.00	.42	.00	11.20	570.00
	4790.000	150.00	731.93	.76	.47	.00	11.20	570.00
	4790.000	200.00	732.69	.76	.53	.00	11.20	570.00
	4790.000	250.00	733.52	.83	.61	.00	11.20	570.00
	4790.000	300.00	734.50	.98	.75	.00	11.20	570.00
*	4795.000	100.00	731.00	.00	-.17	.00	5.00	5.00
*	4795.000	150.00	731.69	.69	-.24	.00	5.00	5.00
*	4795.000	200.00	732.38	.69	-.31	.00	5.00	5.00
*	4795.000	250.00	733.11	.73	-.41	.00	5.00	5.00
*	4795.000	300.00	733.88	.77	-.62	.00	5.00	5.00

1

	SECNO	Q	CWSEL	DIFWSP	DIFWSX	DIFWS	TOPWID	XLCH
*	4910.000	100.00	732.31	.00	1.31	.00	5.00	115.00
	4910.000	150.00	733.33	1.01	1.64	.00	5.00	115.00
	4910.000	200.00	733.84	.51	1.46	.00	5.00	115.00
	4910.000	250.00	734.57	.74	1.47	.00	5.00	115.00
	4910.000	300.00	735.99	1.42	2.11	.00	5.00	115.00

1

MMARY OF ERRORS AND SPECIAL NOTES

CAUTION SECNO= .000 PROFILE= 1 CRITICAL DEPTH ASSUMED
CAUTION SECNO= .000 PROFILE= 2 CRITICAL DEPTH ASSUMED
CAUTION SECNO= .000 PROFILE= 3 CRITICAL DEPTH ASSUMED
CAUTION SECNO= .000 PROFILE= 4 CRITICAL DEPTH ASSUMED
CAUTION SECNO= .000 PROFILE= 5 CRITICAL DEPTH ASSUMED

Pipe Diameter: 5feet

Pipe Invert: 728.1feet

Station	Top Chord	Bot Chord
0.00	730.600	730.600
0.19	731.557	729.643
0.73	732.368	728.832
1.54	732.910	728.290
2.50	733.100	728.100
3.46	732.910	728.290
4.27	732.368	728.832
4.81	731.557	729.643
5.00	730.600	730.600

Pipe Diameter: 4.5feet

Pipe Invert: 728.1feet

Station	Top Chord	Bot Chord
0.00	730.350	730.350
0.17	731.211	729.489
0.66	731.941	728.759
1.39	732.429	728.271
2.25	732.600	728.100
3.11	732.429	728.271
3.84	731.941	728.759
4.33	731.211	729.489
4.50	730.350	730.350

Michigan — Owosso Drain FPMS

T Bourdon 5-4-94

Stage-Discharge-Storage Str 1 (Above Delaney Rd) 1/ — 1 — 4

Storage Calculations Above Delaney Rd

CS 19.7 @ 185+20
CS 19.1 @ 164+82
L = 2038'

$$V = \frac{A_1 + A_2/2 \times L}{43560}$$

Stage (ft)	Discharge (cfs)	Cum Storage Ac-ft
736.2	0.	0.
742.2	32.0	0.64
743.0	33.6	5.77
743.5	34.7	13.80
744.0	36.7 2/	23.20

At elev 736.2, Area = 0

At elev 742.2, Area = 27.4

$$V = \frac{\frac{27.4+0}{2}(2038)}{43560} = 0.64$$

$$V = \frac{\frac{200.4+46.1}{2}(2038)}{43560} = 5.77$$

$$V = \frac{\frac{493.9+96}{2}(2038)}{43560} = 13.80$$

$$V = \frac{\frac{787.0+204.7}{2}(2038)}{43560} = 23.2$$

1/ FROM WSP2 OUTPUT (Filename = CWSPOUT0.OUT)

2/ Includes 1 cfs outflow below weir — see sheet 4 of 4

743.5	6[illegible]	678.0	.00	.70	7.03	679.00
744.0	659.0	1061.0	.00	.70	9.32	1081.00

05/04/9[illegible] 08:16:41 OWOSSOW DRAIN-PT 5 SHIAWASSEE COUNTY, MICHIGAN
1170.[illegible]90 VERSION 2.0 EXISTING CONDITIONS, 10-[illegible]

ROAD SECTION [illegible] Delaney Rd

m4 FT	CFS	HL FT	TW FT	STARTING CEM	BRIDGE CFS	BRIDGE AREA SQ FT	CULVERT CFS	C
73[illegible].00	0.0	0.00	735.80	0.00	0.0	0.0	0.0	
73[illegible].63	.1	.02	735.64	.10	.0	.0	.1	
742.[illegible]	32.0	1.64	739.57	32.00	.0	.0	32.0	
745.16	65.0	4.2[illegible]	740.87	65.00	.0	.0	38.1	
745.18	71.0	4.13	741.05	71.00	.0	.0	3[illegible]	
745.19	101.0	2.90	742.38	101.00	.0	.0	31.4	
7[illegible]	172.0	2.70	742.63	172.00	.0	.0	30.7	
7[illegible].03	375.0	1.40	743.13	375.00	.0	.0	29.2	
745.70	678.0	2.08	743.62	679.00	.0	.0	27.8	

743.0, Q = 33.6
743.5, Q = 34.7
744.0, Q = 35.7

C:\WEP2\WEP04030.OUT 909 14 Replace

3 of 4

RATING TABLE FOR SECTION [illegible]

NO.	ELEV FT	AREA SQ FT	Q CFS	WATER FLOODING FLOODPLAIN DAMAGE	CHANNEL	TOTAL
[illegible]	[illegible]	[illegible]	[illegible]			
LOW GRID	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
****MISSAGE-	ELEV BELOW	FIRST PROFILE	FLOW	UNDERMULATED	[illegible]	[illegible]
DAM FAIL	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
****MISSAGE-	ELEV BELOW	FIRST PROFILE	FLOW	UNDERMULATED	[illegible]	[illegible]
743.5	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
744.0	[illegible]	[illegible] 493.9	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible] 787.0	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
WARNING-**-*-***-PROFILE NO [illegible]						

[illegible] wapa\[illegible]

RATING TABLE [illegible]

NO.	ELEV FT	AREA SQ FT	Q CFS	WATER FLOODING FLOODPLAIN DAMAGE	CHANNEL	TOTAL
[illegible]	[illegible]	[illegible]	[illegible]			
743.5 → 744	[illegible]	[illegible] 96.0	[illegible]	[illegible]	[illegible]	[illegible]
LOW GRID	[illegible]	[illegible] 204.7	[illegible]	[illegible]	[illegible]	[illegible]
DAM FAIL	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
WARNING-**-*-***-PROFILE [illegible]						
[illegible]						

[illegible]

[illegible]

[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

Filename = Area3WSP.OUT

---------- LIST OF INPUT DATA WITH LIMITED EDITING----------

```
WSPZ      40.
TITLE     OWOSSOW DRAIN-FPMS, SHIAWASSEE COUNTY, MICHIGAN
1.        DISCHARGE OUTLETING TO THE WEST OF SUBAREA # 3, 5-4-94
DISCHARGE -1.       1.        3.        5.        7.        10.
DISCHARGE -1.       15.
STARTS    19.8      .001      .001      .001      .001      .001
STARTS    19.8      .001
OUTPUT    T
REACH     19.8      1.        0.        0.
COMMENT   19.8 IS @ STA. 189+40
SEGMENT   19.8      1         2         100.
NVALUE    .07
SECTION   19.8
         -36.1      745.9     -26.      745.9     -16.      745.0
         -20.       745.2     -16.      744.4     -10.      744.2
         -10.       744.9     -7.       745.0     -1.5      745.2
          0.        743.2     1.5       743.4     7.        745.1
          11.       745.1     16.       744.5     21.       744.7
          30.       745.2     50.       744.5     70.       744.6
          90.       744.6     100.      745.2
ENDTABLE
--------------------MESSAGE - DATA POINTS ON SECTION 19.8  REORDERED BY PROGRAM ACCORDING TO X VALUES
                    DUPLICATE X POINTS NOT CHANGED--------------------
COMPUTE   19.8      19.8      19.5
----------------------------END OF DATA LISTING----------------------------
1                   COMPUTE   19.5      19.6      19.8
```

----------STARTING DATA FROM GIVEN SLOPES----------

1 WSPZ XEQ 05/04/94 10:59:45 OWOSSOW DRAIN-FPMS, SHIAWASSEE COUNTY, MICHIGAN AS : ____ PAGE
REV 11/01/90 VERSION 2.0 DISCHARGE OUTLETING TO THE WEST OF SUBAREA # 3, 5-4-94 ALT: ____ 1

RATING TABLE FOR SECTION 19.8 DA= 1.0 SQ MI EXP COEF= .00 CONT COEF= .00

NO.	ELEV FT	AREA SQ FT	Q CFS	------AREA FLOODED------- FLOODPLAIN DAMAGE	CHANNEL	TOTAL	STARTING CEN	CRIT ELEV FT	FRICTION SLOPE FT/FT	FLOW TOP WIDTH FT
0	743.2	0.0	0.0							
1	744.0	2.8	1.0	.00	.00	.00	1.00	743.5	.00096	5.4
2	744.4	7.1	3.0	.00	.00	.00	3.00	743.6	.00075	17.7
3	744.6	11.7	5.0	.00	.00	.00	5.00	743.7	.00061	43.7
4	744.8	15.5	7.0	.00	.00	.00	7.00	743.8	.00057	70.0
5	744.9	21.7	10.0	.00	.00	.00	10.00	743.9	.00055	90.6
6	745.0	28.2	15.0	.00	.00	.00	15.00	744.1	.00053	91.6

1 WSPZ XEQ 05/04/94 10:58:45 OWOSSOW DRAIN-FPMS, SHIAWASSEE COUNTY, MICHIGAN AS : ____ PAGE
REV 11/01/90 VERSION 2.0 DISCHARGE OUTLETING TO THE WEST OF SUBAREA # 3, 5-4-94 ALT: ____ 2

---------- LIST OF INPUT DATA WITH LIMITED EDITING----------

```
BYL
SUBAREA
```

Structure 2

```
1____    WSPEGENR12/06/93 12:50:43   T.Bourdon                 WSP2 Output  Filename - WSPOWOS0.WR1
JOB TR-20                          FULLPRINT            SUMMARY
TITLE     OWOSSOW DRAIN-FPMS, SHIAWASSEE COUNTY, MICHIGAN
 2 XSECTN      6                     1.00       733.20       739.20       338.00____
 8                                 338.00         0.0          0.0          0.0 12.1    1
 8                                 731.70         .10          .53 ✓        .0012.1    2
 8                                 733.95        32.00        36.33 ✓       .0012.1    3
                                   736.90        65.00        90.25 ✓       .0012.1    4
 8                                 737.20        71.00       115.83 ✓       .0012.1    5
 8                                 737.90       121.00       360.77 ✓       .0012.1    6
 8                                 738.10       172.00       604.37 ✓       .0012.1    7
 8                                 738.60       375.00      1025.01 ✓       .0012.1    8
 8                                 739.20       678.00      1700.02 ✓       .0012.1    9
 8                                 739.80      1081.00      2438.11 ACCUM VOL Ac-Ft     .0012.1   10
 9 ENDTBL                          STAGE      DISCHARGE      AREA                        AVE
 2 XSECTN      1                     1.00       740.00       742.87          739.50____
 8                                 736.20         0.0          0.0    0.0 ✓  0.0 17.5    1
 8                                 736.48         .10          1.00   0.1 ✓  .0017.5    2
 8                                 739.16        32.00        84.61   7.1 ✓  .0017.5    3
 8                                 740.65        65.00       1/159.75 13.4 ✓ .0017.5    4
 8                                 740.85        71.00       172.52  14.5 ✓ .0017.5    5
 8                                 742.24       121.00       293.47  24.6 ✓ .0017.5    6
 8                                 742.42       172.00       354.25  29.7 ✓ .0017.5    7
 8                                 742.68       375.00       492.67  41.3 ✓ .0017.5    8
 8                                 742.87       678.00       701.26  58.8 ✓ .0017.5    9
 8                                 743.07      1081.00      1089.68  91.3   .0017.5   10
 9 ENDTBL                                                                             AVE
```

1/

sta 184+40
- sta 147+90
3650 ft between Dewey Rd & End of Job up near RR Tracks

$$\frac{3650\ ft \times 159.75\ ft^2}{43560\ ft^2/Ac} = 13.4\ Ac\text{-}Ft$$

Note: Use above output in TR-20 Run.

T.D.B.

Structure 3

Filename = TR200W05.DAT
Final Run TDB 6-27-2

```
*****************80-80 LIST OF INPUT DATA FOR TR-20 HYDROLOGY*****************

JOB -20                    FULLPRINT          SUMMARY   NOPLOTS
TITLE 001 OW0550 DRAIN - FPM5 - SHIAWASSEE CO.MI. 06-20-94
TITLE     EXISTING CONDITIONS-24 HOUR TYPE II STORM DISTRIBUTION
 4 DIMHYD              .14286
 8         0.0         .5          1.0         .8          .6
 8         .4          .2          0.0         0.0         0.0
 9 ENDTBL
 2 XSECTN  009         1.0         738.0
 8                     733.0       0.0         0.0
 8                     731.7       .1          .53
 8                     733.95      32.         36.33
 8                     736.9       65.         90.25
 8                     737.2       71.         115.83
 8                     737.9       121.        360.77
 8                     738.1       172.        604.37
 8                     738.6       375.        1025.01
 8                     739.2       678.        1700.02
 8                     739.8       1081.       2438.11
 9 ENDTBL                          Q, cfs      Area, ft²
 3 STRUCT      01
 8                0    736.2       0.0         0.
 8             745.1   742.2       32.0        .64         742.7   16
 8                     743.0       33.6        5.77        744.6   20
 8             745.1   743.5       34.7        13.80
 8                     744.0       36.7        23.2
 9 ENDTBL
 3 STRUCT      02
 8                     736.2       0.0         0.
 8                     736.42      .1          .1
 8                     739.16      32.         7.1
 8                     740.65      65.         13.4
 8             742 05  740.85      71.         14.5
 8                     742.24      121.        24.6
 8             742.5 200 742.42   172.        29.7
 8             742.7 335 742.68   375.        41.2
 8                     742.87      678.        58.8
 8                     743.07      1081.       91.3
 9 ENDTBL
 3 STRUCT      03
 8                     760.8       0.0         0.
 8                     761.5       1.3         .1
 8                     762.6       22.6        28.5
 8                     764.0       52.2        120.5
 9 ENDTBL
 3 STRUCT      04
 8                     737.9       0.0         0.
```

```
*****************80-80 LIST OF INPUT DATA CONTINUED*****************

 8                     740.0       18.7        5.2
 8                     742.2       46.3        54.3
 8                     742.26      69.2        [illegible]
 8                     742.5       150         75.7
 8                     742.96      250.        [illegible]
```

```
8                    731.8      0.0        0.
8                    736.3      61.4       2.2
8                    737.0      66.2       3.8
8                    738.0      76.8       20.7
8                    739.0      159.5      62.5
8                    739.5      258.       94.0
8                    740.       430.       133.7
[illegible]TBL
3 STRUCT     0c
8                    728.4      0.0        0.
8                    730.5      32.        .7
8                    732.       68.        .9
8                    734.       120.       1.2
8                    735.1      168.7      1.4
8                    736.       218.3      9.6
8                    737.       247.1      49.6
8                    738.       272.7      131.5
9 ENDTBL
6 RUNOFF 1 003       7 .58      71.0       1.14      1 1   1   1
6 RUNOFF 1 002       6 .24      70.0       .63       1 1   1   1
6 ADDHYD 4 002   7 6 3                               1     1   1
6 RUNOFF 1 004       7 .22      75.0       .70       1 1   1   1
6 RESVOR 2    01 7   1 736.20                        1 1 1 1   1
6 ADDHYD 4 005   1 3 4                               1     1   1
6 RUNOFF 1 006       7 .36      79.0       1.96      1 1   1   1
6 ADDHYD 4 007   4 7 5                               1     1   1
6 RESVOR 2    02 5   7 736.20                        1 1 1 1   1
6 REACH  3 008   7   3 4800.                         1     1   1
6 RUNOFF 1 009       6 .52      72.0       1.62      1     1   1
6 ADDHYD 4 010   2 6 5                               1     1   1
6 RUNOFF 1 011       6 .44      70.0       1.27      1 1   1   1
6 RESVOR 2    03 6   1 760.8                         1 1 1 1   1
6 [illegible]HYD 4 012   5 1 7                       1     1   1
6 [illegible]NOFF 1 013      6 .46      73.0       1.70      1 1   1   1
6 RUNOFF 1 014       5 .19      61.0       .51       1 1   1   1
6 ADDHYD 4 015   6 5 4                               1     1   1
6 ADDHYD 4 016   4 7 2                               1     1   1
6 RUNOFF 1 017       6 .44      70.6       .83       1 1   1   1
6 ADDHYD 4 018   2 6 1                               1     1   1
1
```

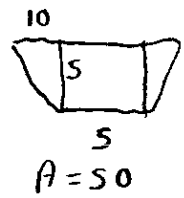
FOR 020

X & M Calculations for Back Br

```
**********************80-8( LIST OF INPUT DATA (CONTINUED)**********************
6 RUNOFF 1 019       7 .13      77.0       1.21      1 1   1   1
6 REACH  3 020   7   3 3100.    .71        1.31      1     1   1
6 RUNOFF 1 021       6 .09      75.0       1.16      1 1   1   1
6 ADDHYD 4 022   6 3 2                               1     1   1
6 RUNOFF 1 023       6 .17      79.0       1.36      1     1   1
6 ADDHYD 4 024   5 2 3                               1     1   1
6 RESVOR 2    04 3   6 737.9                         1 1 1 1   1
6 ADDHYD 4 025   5 1 5                               1     1   1
6 RESVOR 2    05 5   7 731.8                         1 1 1 1   1
6 RUNOFF 1 026       6 .13      72.0       1.79      1 1   1   1
6 ADDHYD 4 027   7 6 5                               1     1   1
6 RUNOFF 1 028       6 .42      79.0       .69       1 1   1   1
6 ADDHYD 4 029   5 6 7                               1 1   1   1
6 [illegible]OR 2    06 7   1 728.4                  1 1 1 1   1
6 [illegible]NOFF 1 030      5 .22      83.0       1.27      1 1   1   1
6 ADDHYD 4 031   [illegible] 7                       1 1   1   1
  ENDATA
7 LIST
7 INCFEA 5              120
```

From nomograph page H-9 of TR20,
if slope = .005 %,
n = .05
B = 5
X = 0.71

From nomograph page H-10 of TR20
if D/B = 1
Z = 2
AREA = 50
AND M = 1.31



```
 7 COMPUT 7 001   031   0.          4.89        1.          2 2  01  02
   ENDCMP 1
 7 COMPUT 7 001   031   0.          4.40        1.          2 2  01  03
   ENDCMP 1
 7 COMPUT 7 001   031   0.          3.37        1.          2 2  01  04
   ENDCMP 1
 7 COMPUT 7 001   031   0.          2.47        1.          2 2  01  05
   ENDCMP 1
   ENDJOB 2
0*****************************END OF 80-80 LIST*****************************
1
```

```
TR20 XEQ 06-21-94  17:52        OWOSSO DRAIN - FPMS - SHIAWASSEE CO.MI. 06-20-94                    JOB  1   PASS   1
     REV PC 09/83(.2)           EXISTING CONDITIONS-24 HOUR TYPE II STORM DISTRIBUTION                        PAGE   1
```

EXECUTIVE CONTROL OPERATION LIST RECORD ID

LISTING OF CURRENT DATA

```
        XSECTN NO.      DRAINAGE AREA
2 XSECTN     8              1.0000

                       ELEVATION   DISCHARGE    END AREA
8                        730.00        .00         .09
8                        731.70        .10         .53
8                        733.95      32.00       36.33
8                        736.90      65.00       90.25
8                        737.20      71.00      115.83
8                        737.90     121.00      360.77
8                        738.10     172.00      604.37
8                        738.50     375.00     1025.01
8                        739.20     678.00     1700.02
8                        739.80    1081.00     2438.11
9 ENDTBL

          STRUCT NO.    ELEVATION   DISCHARGE    STORAGE
3 STRUCT      1

8                        736.20        .00         .00
8                        742.20      32.00         .64
8                        743.00      33.60        5.77
8                        743.50      34.70       13.80
9                        744.00      36.70       23.20
9 ENDTBL

          STRUCT NO.    ELEVATION   DISCHARGE    STORAGE
3 STRUCT      2

8                        736.20        .00         .00
8                        736.48        .10         .10
9                        739.10      32.00        7.10
8                        740.05      65.00       13.40
8                        740.85      71.00       14.50
                         742.24     121.00       24.60
8                        742.42     172.00       29.70
```

```
8                        743.07     1061.00       91.30
1
```



```
9 ENDTBL

          STRUCT NO.     ELEVATION   DISCHARGE     STORAGE
3 STRUCT      3

8                        760.80         .00          .00
8                        761.50        1.30          .10
8                        762.60       22.60        38.50
8                        764.00       52.20       120.50
9 ENDTBL

          STRUCT NO.     ELEVATION   DISCHARGE     STORAGE
3 STRUCT      4

8                        737.90         .00          .00
8                        740.00       18.70         8.20
8                        742.00       46.80        54.30
8                        742.20       49.20        62.20
8                        742.50      150.00        76.90
8                        742.56      250.00        79.90
9 ENDTBL

          STRUCT NO.     ELEVATION   DISCHARGE     STORAGE
3 STRUCT      5

8                        731.80         .00          .00
8                        736.30       61.40         2.20
8                        737.00       66.20         3.80
8                        738.00       76.80        20.70
8                        739.00      159.50        62.50
8                        739.50      258.00        94.00
8                        740.00      430.00       133.70
9 ENDTBL

          STRUCT NO.     ELEVATION   DISCHARGE     STORAGE
3 STRUCT      6

8                        728.40         .00          .00
8                        730.60       32.00          .70
8                        732.00       68.00          .90
8                        734.00      120.00         1.20
8                        735.10      198.70         1.40
8                        736.00      218.30         9.60
8                        737.00      247.10        49.60
8                        738.00      272.70       131.50
9 ENDTBL
1
```

```
8                .0000       .5000      1.0000       .8000       .6000
8                .4000       .2000       .0000       .0000       .0000
9 ENDTBL

  COMPUTED PEAK RATE FACTOR =  368.76

    TABLE NO.       TIME INCREMENT
5 RAINFL 1                   .5000

8                .0000       .0080       .0170       .0260       .0350
8                .0450       .0550       .0650       .0760       .0870
8                .0990       .1120       .1260       .1400       .1560
8                .1740       .1940       .2190       .2540       .3030
8                .5150       .5830       .6240       .6550       .6820
8                .7060       .7280       .7480       .7660       .7830
8                .7990       .8150       .8300       .8440       .8570
8                .8700       .8820       .8930       .9050       .9160
8                .9260       .9360       .9460       .9560       .9650
8                .9740       .9830       .9920      1.0000      1.0000
9 ENDTBL

    TABLE NO.       TIME INCREMENT
5 RAINFL 2                   .2500

8                .0000       .0020       .0050       .0080       .0110
8                .0140       .0170       .0200       .0230       .0260
8                .0290       .0320       .0350       .0380       .0410
8                .0440       .0480       .0520       .0560       .0600
8                .0640       .0680       .0720       .0760       .0800
8                .0850       .0900       .0950       .1000       .1050
8                .1100       .1150       .1200       .1260       .1330
8                .1400       .1470       .1550       .1630       .1720
8                .1810       .1910       .2030       .2180       .2360
8                .2570       .2830       .3870       .6630       .7070
8                .7350       .7580       .7760       .7910       .8040
8                .8150       .8250       .8340       .8420       .8490
8                .8560       .8630       .8690       .8750       .8810
8                .8870       .8930       .8980       .9030       .9080
9                .9120       .9180       .9220       .9260       .9300
8                .9340       .9380       .9420       .9460       .9500
8                .9530       .9560       .9590       .9620       .9650
1
```



```
8                .9680       .9710       .9740       .9770       .9800
8                .9830       .9860       .9890       .9920       .9950
8                .9980      1.0000      1.0000      1.0000      1.0000
9 ENDTBL

    TABLE NO.       TIME INCREMENT
5 RAINFL 3                   .5000

5                .0000       .0100       .0220       .0320       .0520
5                .0670       .0930       .0990       .1160       .1350
8                .1560       .1790       .2040       .2320       .2680
5                .3107       .4250       .4900       .5200       .5590
8                .5770       .6010       .6210       .6443       .6140
                 [illegible]
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```
8                .8440       .8580       .8710       .8840       .8960
8                .9080       .9200       .9320       .9440       .9560
8                .9670       .9780       .9890      1.0000      1.0000
9 ENDTBL

    TABLE NO.       TIME INCREMENT
5 RAINFL 4                   .5000

8                .0000       .0040       .0080       .0120       .0160
8                .0200       .0250       .0300       .0350       .0400
8                .0450       .0500       .0550       .0600       .0650
8                .0700       .0750       .0810       .0870       .0930
8                .0990       .1050       .1110       .1180       .1250
8                .1320       .1400       .1480       .1560       .1650
8                .1740       .1840       .1950       .2070       .2200
8                .2360       .2550       .2770       .3030       .4090
8                .5150       .5490       .5830       .6050       .6240
8                .6400       .6550       .6690       .6820       .6940
8                .7050       .7160       .7270       .7380       .7480
8                .7580       .7670       .7760       .7840       .7920
8                .8000       .8080       .8160       .8230       .8300
8                .8370       .8440       .8510       .8580       .8640
8                .8700       .8760       .8820       .8880       .8940
8                .9000       .9060       .9110       .9160       .9210
8                .9260       .9310       .9360       .9410       .9460
8                .9510       .9560       .9610       .9660       .9710
8                .9760       .9800       .9840       .9880       .9920
8                .9960      1.0000      1.0000      1.0000      1.0000
9 ENDTBL
1
```



```
    TABLE NO.       TIME INCREMENT
5 RAINFL 5                   .5000

8                .0000       .0020       .0050       .0080       .0110
8                .0140       .0170       .0200       .0230       .0260
8                .0290       .0320       .0350       .0380       .0410
8                .0440       .0470       .0510       .0550       .0590
8                .0630       .0670       .0710       .0750       .0790
8                .0840       .0890       .0940       .0990       .1040
8                .1090       .1140       .1200       .1260       .1330
8                .1400       .1470       .1540       .1620       .1710
8                .1810       .1920       .2040       .2170       .2330
8                .2520       .2770       .3180       .6330       .6980
8                .7290       .7520       .7700       .7850       .7980
8                .8090       .8190       .8290       .8380       .8460
8                .8540       .8610       .8680       .8740       .8800
8                .8860       .8920       .8970       .9020       .9070
8                .9120       .9170       .9210       .9250       .9290
8                .9330       .9370       .9410       .9450       .9490
8                .9530       .9570       .9600       .9630       .9660
8                .9690       .9720       .9750       .9780       .9810
8                .9840       .9870       .9900       .9930       .9960
8                .9980      1.0000      1.0000      1.0000      1.0000
9 ENDTBL

    TABLE NO.       TIME INCREMENT
[illegible]
```

```
6                .0000       .0080       .0162       .0246       .0333
8                .0425       .0524       .0630       .0743       .0863
8                .0990       .1124       .1265       .1420       .1595
8                .1800       .2050       .2550       .3450       .4370
8                .5300       .6030       .6330       .6600       .6840
8                .7050       .7240       .7420       .7590       .7750
8                .7900       .8043       .8180       .8312       .8439
8                .8561       .8678       .8790       .8898       .9002
8                .9103       .9201       .9297       .9391       .9483
8                .9573       .9661       .9747       .9832       .9916
8               1.0000      1.0000      1.0000      1.0000      1.0000
9 ENDTBL
1
```

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TR20 XEQ 06-21-94  17:58      OWOSSO DRAIN - FPMS - SHIAWASSEE CO.MI. 06-20-94                    JOB  1   PAGE   1
     REV PC 09/83(.2)         EXISTING CONDITIONS-24 HOUR TYPE II STORM DISTRIBUTION                        PAGE   6
```

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0                    STANDARD CONTROL INSTRUCTIONS
```

```
6 RUNOFF 1   1       7        .5800     71.0000      1.14001 1 0 1 0 1
6 RUNOFF 1   2       6        .2400     70.0000       .63001 1 0 1 0 1
6 ADDHYD 4   3   7 6 3                                     1 0 0 1 0 1
6 RUNOFF 1   4       7        .2300     75.0000       .70001 1 0 1 0 1
6 RESVOR 2     1 7   1     736.2000                        1 1 1 1 0 1
6 ADDHYD 4   5   1 3 4                                     1 0 0 1 0 1
6 RUNOFF 1   6       7        .3600     79.0000      1.96001 1 0 1 0 1
6 ADDHYD 4   7   4 7 5                                     1 0 0 1 0 1
6 RESVOR 2     2 5   7     736.2000                        1 1 1 1 0 1
6 REACH  3   8   7   3    4800.0000       .0000       .00001 0 0 1 0 1
6 RUNOFF 1   9       6        .5200     72.0000      1.62001 0 0 1 0 1
6 ADDHYD 4  10   3 6 5                                     1 0 0 1 0 1
6 RUNOFF 1  11       6        .4400     70.0000      1.27001 1 0 1 0 1
6 RESVOR 2     3 6   1     760.8000                        1 1 1 1 0 1
6 ADDHYD 4  12   5 1 7                                     1 0 0 1 0 1
6 RUNOFF 1  13       6        .4600     73.0000      1.70001 1 0 1 0 1
6 RUNOFF 1  14       5        .1900     61.0000       .51001 1 0 1 0 1
6 ADDHYD 4  15   6 5 4                                     1 0 0 1 0 1
6 ADDHYD 4  16   4 7 2                                     1 0 0 1 0 1
6 RUNOFF 1  17       6        .4400     70.0000       .83001 1 0 1 0 1
6 ADDHYD 4  18   2 6 1                                     1 0 0 1 0 1
6 RUNOFF 1  19       7        .1300     77.0000      1.21001 1 0 1 0 1
6 REACH  3  20   7   3    3100.0000       .7100      1.31001 0 0 1 0 1
6 RUNOFF 1  21       6        .0900     75.0000      1.16001 1 0 1 0 1
6 ADDHYD 4  22   6 3 2                                     1 0 0 1 0 1
6 RUNOFF 1  23       6        .1700     79.0000      1.36001 0 0 1 0 1
6 ADDHYD 4  24   6 2 3                                     1 0 0 1 0 1
6 RESVOR 2     4 2   6     737.9000                        1 1 1 1 0 1
6 ADDHYD 4  25   6 1 5                                     1 0 0 1 0 1
6 RESVOR 2     5 5   7     731.8000                        1 1 1 1 0 1
6 RUNOFF 1  26       6        .1500     72.0000      1.79001 1 0 1 0 1
6 ADDHYD 4  27   7 6 5                                     1 0 0 1 0 1
6 RUNOFF 1  28       6        .4200     78.0000       .69001 1 0 1 0 1
6 ADDHYD 4  29   5 6 7                                     1 1 0 1 0 1
6 RESVOR 2     6 7   1     729.4000                        1 1 1 1 0 1
6 RUNOFF 1  30       6        .2800     [illegible]      1.27001 1 0 1 0 1
6 ADDHYD 4  31   1 6 7                                     1 1 0 1 0 1
  ENDATA
```

EXECUTIVE CONTROL OPERATION INCREM RECORD ID
+ MAIN TIME INCREMENT = .20 HOURS

EXECUTIVE CONTROL OPERATION COMPUT RECORD ID
+ FROM XSECTION 1
+ TO XSECTION 31
STARTING TIME = .00 RAIN DEPTH = 6.00 RAIN DURATION= 1.00 RAIN TABLE NO.= 2 ANT. MOIST. COND= 2
ALTERNATE NO.= 1 STORM NO.= 1 MAIN TIME INCREMENT = .20 HOURS

OPERATION RUNOFF CROSS SECTION 1
OUTPUT HYDROGRAPH= 7
AREA= .58 SQ MI INPUT RUNOFF CURVE= 71. TIME OF CONCENTRATION= 1.14 HOURS
INTERNAL HYDROGRAPH TIME INCREMENT= .1520 HOURS

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
12.65	400.64	(RUNOFF)
23.55	21.63	(RUNOFF)

TIME(HRS) FIRST HYDROGRAPH POINT = .00 HOURS TIME INCREMENT = .20 HOURS DRAINAGE AREA = .58 SQ.MI.

8.00	DISCHG	.00	.00	.00	.00	.02	.09	.27	.59	1.11	1.84
10.00	DISCHG	2.74	3.86	5.25	7.00	9.30	12.43	16.47	21.69	33.06	66.00
[illegible]	DISCHG	145.34	242.02	334.82	375.40	388.[illegible]2	367.09	339.43	306.68	269.85	230.42
[illegible]	DISCHG	188.96	147.24	110.44	88.19	78.[illegible]2	70.18	63.82	58.94	54.97	51.65
16.00	DISCHG	48.91	46.74	45.10	43.82	42.43	41.44	40.18	38.99	38.00	37.17
18.00	DISCHG	36.24	35.17	33.93	32.65	31.57	30.70	30.04	29.50	29.[illegible]7	28.70
20.00	DISCHG	28.17	27.48	26.59	25.58	24.48	23.90	23.23	22.57	22.21	21.88
22.00	DISCHG	21.65	21.53	21.52	21.54	21.56	21.57	21.59	21.61	21.62	21.57
24.00	DISCHG	21.24	20.13	18.15	15.50	12.48	9.75	7.34	5.28	3.58	2.20
26.00	DISCHG	1.15	.48	.12	.00						

RUNOFF VOLUME ABOVE BASEFLOW = 2.90 WATERSHED INCHES, 1086.99 CFS-HRS, 89.83 ACRE-FEET; BASEFLOW = .00 CFS

OPERATION RUNOFF CROSS SECTION 2
OUTPUT HYDROGRAPH= 6
AREA= .24 SQ MI INPUT RUNOFF CURVE= 70. TIME OF CONCENTRATION= .63 HOURS
INTERNAL HYDROGRAPH TIME INCREMENT= .0640 HOURS

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
12.37	240.75	(RUNOFF)
19.57	11.55	(RUNOFF)
23.52	6.83	(RUNOFF)

TIME(HRS) FIRST HYDROGRAPH POINT = .00 HOURS TIME INCREMENT = .20 HOURS DRAINAGE AREA = .24 SQ.MI.

8.00	DISCHG	.00	.00	.00	.00	.00	.01	.08	.26	.57	1.00
10.00	DISCHG	1.53	2.16	2.93	3.94	5.35	7.27	9.83	12.14	20.43	48.11
12.00	DISCHG	131.49	222.58	240.32	209.71	169.[illegible]1	123.77	32.59	55.35	46.02	40.01
[illegible]	DISCHG	35.26	31.58	28.67	26.16	23.93	22.12	20.89	19.95	19.04	18.21
[illegible].00	DISCHG	17.66	17.27	17.04	16.85	16.[illegible]3	15.75	15.17	14.73	14.44	14.26
19.00	DISCHG	13.37	13.22	12.59	12.10	11.76	11.57	11.53	11.54	11.55	11.52

1

20.00	DISCHG	11.18	10.49	9.84	9.34	8.99	8.79	8.74	8.74	8.75	8.76
22.00	DISCHG	8.77	8.77	8.78	8.79	8.80	8.80	8.81	8.82	8.83	8.79
24.00	DISCHG	8.40	7.16	5.21	3.27	1.79	.78	.20	.01		

RUNOFF VOLUME ABOVE BASEFLOW = 2.81 WATERSHED INCHES, 435.06 CFS-HRS, 35.95 ACRE-FEET; BASEFLOW = .00 CFS

OPERATION ADDHYD CROSS SECTION 3
INPUT HYDROGRAPHS= 7,6 OUTPUT HYDROGRAPH= 3

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
12.58	605.59	(NULL)
23.54	30.45	(NULL)

RUNOFF VOLUME ABOVE BASEFLOW = 2.88 WATERSHED INCHES, 1522.75 CFS-HRS, 125.78 ACRE-FEET; BASEFLOW = .00 CFS

OPERATION RUNOFF CROSS SECTION 4
OUTPUT HYDROGRAPH= 7
AREA= .23 SQ MI INPUT RUNOFF CURVE= 75. TIME OF CONCENTRATION= .70 HOURS
INTERNAL HYDROGRAPH TIME INCREMENT= .0933 HOURS

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
12.41	257.71	(RUNOFF)
19.55	11.96	(RUNOFF)
23.53	9.09	(RUNOFF)

TIME(HRS) FIRST HYDROGRAPH POINT = .00 HOURS TIME INCREMENT = .20 HOURS DRAINAGE AREA = .23 SQ.MI.

6.00	DISCHG	.00	.00	.00	.00	.00	.00	.00	.00	.00	.01
8.00	DISCHG	.07	.19	.39	.69	1.07	1.49	1.97	2.50	3.09	3.75
10.00	DISCHG	4.47	5.25	6.19	7.45	9.20	11.58	14.64	18.54	27.12	55.73
12.00	DISCHG	135.47	224.90	257.60	232.06	196.15	155.47	112.50	73.76	52.69	44.62
14.00	DISCHG	39.02	34.70	31.28	28.41	25.91	23.85	22.06	21.27	20.24	19.30
16.00	DISCHG	18.64	18.20	17.90	17.64	17.20	16.56	15.97	15.51	15.17	14.90
18.00	DISCHG	14.50	13.89	13.26	12.75	12.37	12.11	11.97	11.95	11.96	11.93
20.00	DISCHG	11.63	11.03	10.38	9.86	9.47	9.20	9.06	9.03	9.04	9.04
22.00	DISCHG	9.05	9.05	9.06	9.06	9.07	9.07	9.08	9.08	9.09	9.06
24.00	DISCHG	8.73	7.64	5.88	3.98	2.44	1.29	.51	.12	.00	

RUNOFF VOLUME ABOVE BASEFLOW = 3.29 WATERSHED INCHES, 487.70 CFS-HRS, 40.30 ACRE-FEET; BASEFLOW = .00 CFS

OPERATION RESVOR STRUCTURE 1
INPUT HYDROGRAPH= 7 OUTPUT HYDROGRAPH= 1
SURFACE ELEVATION= 736.20

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
14.15	35.96	743.81

TIME(HRS) FIRST HYDROGRAPH POINT = .00 HOURS TIME INCREMENT = .20 HOURS DRAINAGE AREA = .23 SQ.MI.

8.00	DISCHG	.03	.08	.20	.40	.68	1.03	1.44	1.90	2.43	3.01

1

8.00	ELEV	736.20	736.22	736.24	736.27	736.33	736.39	736.47	736.56	736.66	736.76
10.00	DISCHG	3.65	4.26	5.15	6.13	7.41	9.15	[illegible]	14.40	19.36	32.00
[illegible]	ELEV	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

12.00	ELEV	742.36	742.74	743.11	743.55	743.91	743.64	743.72	743.77	743.80	743.81
14.00	DISCHG	35.95	35.96	35.95	35.92	35.89	35.85	35.81	35.76	35.71	35.65
14.00	ELEV	743.81	743.81	743.81	743.81	743.80	743.79	743.78	743.77	743.75	743.74
16.00	DISCHG	35.59	35.53	35.47	35.41	35.35	35.28	35.21	35.15	35.08	35.01
16.00	ELEV	743.72	743.71	743.69	743.68	743.66	743.65	743.63	743.61	743.59	743.58
18.00	DISCHG	34.94	34.86	34.79	34.71	34.66	34.61	34.56	34.50	34.45	34.40
18.00	ELEV	743.56	743.54	743.52	743.50	743.48	743.46	743.43	743.41	743.39	743.36
[illegible]	DISCHG	34.35	34.30	34.25	34.19	34.14	34.08	34.02	33.97	33.91	33.85
20.00	ELEV	743.34	743.32	743.29	743.27	743.24	743.22	743.19	743.17	743.14	743.12
22.00	DISCHG	33.80	33.74	33.69	33.63	33.54	33.42	33.29	33.17	33.04	32.92
22.00	ELEV	743.09	743.06	743.04	743.01	742.97	742.91	742.85	742.78	742.72	742.66
24.00	DISCHG	32.80	32.67	32.54	32.39	32.24	32.09	23.85	10.09	4.22	1.75
24.00	ELEV	742.60	742.54	742.47	742.40	742.32	742.24	740.67	738.09	736.99	736.53
26.00	DISCHG	.73	.30	.13	.05	.02	.01	.00			
26.00	ELEV	736.34	736.26	736.22	736.21	736.20	736.20	736.20			

RUNOFF VOLUME ABOVE BASEFLOW = 3.29 WATERSHED INCHES, 488.32 CFS-HRS, 40.36 ACRE-FEET; BASEFLOW = .00 CFS

OPERATION ADDHYD CROSS SECTION 5
INPUT HYDROGRAPHS= 1,3 OUTPUT HYDROGRAPH= 4

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
12.58	239.87	(NULL)

RUNOFF VOLUME ABOVE BASEFLOW = 2.97 WATERSHED INCHES, 2010.37 CFS-HRS, 166.14 ACRE-FEET; BASEFLOW = .00 CFS

OPERATION RUNOFF CROSS SECTION 6
OUTPUT HYDROGRAPH= 7
AREA= .36 SQ MI INPUT RUNOFF CURVE= 79. TIME OF CONCENTRATION= 1.96 HOURS
INTERNAL HYDROGRAPH TIME INCREMENT= .1867 HOURS

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
13.27	211.90	(RUNOFF)

TIME(HRS) FIRST HYDROGRAPH POINT = .00 HOURS TIME INCREMENT = .20 HOURS DRAINAGE AREA = .36 SQ.MI.

6.00	DISCHG	.00	.00	.00	.00	.01	.04	.09	.16	.27	.42
8.00	DISCHG	.60	.83	1.11	1.45	1.85	2.31	2.84	3.45	4.13	4.89
10.00	DISCHG	5.72	6.64	7.69	8.91	10.47	12.15	14.34	17.22	22.34	33.96
12.00	DISCHG	57.85	96.30	115.99	146.18	175.75	200.69	211.09	209.51	204.00	196.67
14.00	DISCHG	187.98	178.16	167.47	156.07	144.09	131.67	119.93	105.94	92.79	79.60
16.00	DISCHG	66.67	54.69	45.85	41.02	38.06	35.77	33.88	32.29	30.93	29.73
18.00	DISCHG	28.66	27.70	26.91	26.99	25.19	24.41	23.69	23.05	22.49	21.99
20.00	DISCHG	21.48	20.95	20.41	19.86	19.29	18.71	18.16	17.66	17.21	16.82
22.00	DISCHG	16.48	16.19	15.94	15.72	15.52	15.36	15.21	15.10	15.01	14.92

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24.00	DISCHG	14.78	14.49	14.02	13.35	12.48	11.42	10.21	8.79	7.83	6.76
26.00	DISCHG	5.76	4.85	4.01	3.25	2.58	1.99	1.46	1.02	.66	.33
28.00	DISCHG	.13	.06	.01							

[illegible] VOLUME ABOVE BASEFLOW = 3.68 WATERSHED INCHES, 355.11 CFS-HRS, 70.67 ACRE-FEET; BASEFLOW = .00 CFS

OPERATION ADDHYD CROSS SECTION 7
INPUT HYDROGRAPHS= 4,7 OUTPUT HYDROGRAPH= 5

[illegible]

RUNOFF VOLUME ABOVE BASEFLOW = 3.15 WATERSHED INCHES, 2865.48 CFS-HRS, 236.80 ACRE-FEET; BASEFLOW = .00 CFS

OPERATION RESVOR STRUCTURE 2
INPUT HYDROGRAPH= 5 OUTPUT HYDROGRAPH= 7
SURFACE ELEVATION= 736.20

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
13.56	568.28	742.80

TIME(HRS) FIRST HYDROGRAPH POINT = .00 HOURS TIME INCREMENT = .20 HOURS DRAINAGE AREA = 1.41 SQ.MI.

6.00	DISCHG	.00	.00	.00	.00	.00	.00	.00	.00	.01	.01
6.00	ELEV	736.20	736.20	736.20	736.20	736.20	736.20	736.20	736.20	736.22	736.24
8.00	DISCHG	.02	.03	.05	.08	.15	.36	.62	.97	1.42	2.01
8.00	ELEV	736.26	736.29	736.34	736.41	736.48	736.50	736.52	736.55	736.59	736.64
10.00	DISCHG	2.75	3.66	4.78	6.13	7.81	9.91	12.87	15.96	20.67	29.16
10.00	ELEV	736.70	736.78	736.87	736.99	737.13	737.30	737.53	737.81	738.21	738.92
12.00	DISCHG	49.04	83.93	136.12	269.05	377.22	495.19	538.65	568.53	568.04	558.37
12.00	ELEV	739.93	741.21	742.29	742.54	742.69	742.75	742.78	742.80	742.80	742.79
14.00	DISCHG	537.64	505.33	473.13	435.50	400.42	367.93	338.04	310.74	285.67	262.46
14.00	ELEV	742.78	742.76	742.74	742.72	742.70	742.67	742.63	742.60	742.57	742.54
16.00	DISCHG	240.85	220.81	202.63	186.87	173.70	166.41	160.29	154.57	149.26	144.38
16.00	ELEV	742.51	742.48	742.46	742.44	742.42	742.40	742.38	742.36	742.34	742.32
18.00	DISCHG	139.89	135.68	131.69	127.89	124.29	120.96	119.35	117.77	116.22	114.72
18.00	ELEV	742.31	742.29	742.28	742.26	742.25	742.24	742.19	742.15	742.11	742.07
20.00	DISCHG	113.24	111.74	110.20	108.62	107.00	105.37	103.76	102.17	100.63	99.14
20.00	ELEV	742.02	741.98	741.94	741.90	741.85	741.81	741.76	741.72	741.67	741.63
22.00	DISCHG	97.72	96.36	95.09	93.88	92.75	91.69	90.70	89.76	88.88	88.06
22.00	ELEV	741.59	741.55	741.52	741.49	741.45	741.43	741.40	741.37	741.35	741.32
24.00	DISCHG	87.24	86.35	85.23	83.82	82.08	80.07	77.54	74.04	69.67	64.80
24.00	ELEV	741.30	741.28	741.25	741.21	741.16	741.10	741.03	740.93	740.81	740.64
[illegible]	DISCHG	60.19	55.74	51.53	47.57	43.86	40.41	37.20	34.22	31.52	29.27
[illegible]	ELEV	740.43	740.23	740.04	739.86	739.70	739.54	739.39	739.26	739.12	738.93
28.00	DISCHG	27.16	25.20	23.37	21.68	20.10	18.64	17.29	16.04	14.87	13.79
28.00	ELEV	738.75	738.59	738.44	738.29	738.16	738.04	737.92	737.82	737.72	737.63
30.00	DISCHG	12.79	11.86	11.00	10.20	9.46	8.78	8.14	7.55	7.00	6.49
30.00	ELEV	737.55	737.47	737.40	737.33	737.27	737.21	737.16	737.11	737.06	737.02

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32.00	DISCHG	6.02	5.58	5.18	4.80	4.45	4.12	3.83	3.55	3.29	3.06
32.00	ELEV	736.98	736.94	736.91	736.88	736.85	736.82	736.79	736.77	736.75	736.73
34.00	DISCHG	2.83	2.63	2.44	2.26	2.10	1.94	1.80	1.67	1.55	1.44
34.00	ELEV	736.71	736.69	736.68	736.66	736.65	736.63	736.62	736.61	736.60	736.59
36.00	DISCHG	1.33	1.24	1.15	1.06	.99	.91	.85	.79	.73	.68
36.00	ELEV	736.58	736.58	736.57	736.56	736.55	736.55	736.54	736.54	736.53	736.53
38.00	DISCHG	.63	.58	.54	.50	.46	.43	.40	.37	.34	.32
38.00	ELEV	736.52	736.52	736.52	736.51	736.51	736.51	736.51	736.50	736.50	736.50
40.00	DISCHG	.30	.27	.25	.24	.22	.20	.19	.17	.16	.15
40.00	ELEV	736.50	736.49	736.49	736.49	736.49	736.49	736.49	736.49	736.49	736.48
42.00	DISCHG	.14	.13	.12	.11	.10	.10	.10	.10	.09	.09
42.00	ELEV	736.48	736.48	736.48	736.48	736.48	736.48	736.47	736.47	736.46	736.46
[illegible]	DISCHG	.09	.09	.09	.09	.09	.09	.08	.08	.08	.08
[illegible]	ELEV	736.46	736.46	736.46	736.44	736.44	736.44	736.42	736.42	736.42	736.42
46.00	DISCHG	.08	.08	.07	.07	.07	.07	.07	.07	.07	.07
46.00	ELEV	736.42	736.41	736.41	736.41	736.40	736.40	736.40	736.39	736.39	736.39
48.00	DISCHG	.07	.06	.06	.06	.06	.06	.06	.06	.06	.06
48.00	ELEV	736.38	736.38	736.38	736.37	736.37	736.37	736.37	736.36	736.36	736.36
[illegible]	DISCHG	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

52.00	DISCHG	.05	.05	.05	.04	.04	.04	.04	.04	.04	.04
52.00	ELEV	736.33	736.33	736.33	736.33	736.32	736.32	736.32	736.32	736.32	736.31
54.00	DISCHG	.04	.04	.04	.04	.04	.04	.04	.04	.03	.03
54.00	ELEV	736.31	736.31	736.31	736.31	736.30	736.30	736.30	736.30	736.30	736.30
56.00	DISCHG	.03	.03	.03	.03	.03	.03	.03	.03	.03	.03
56.00	ELEV	736.29	736.29	736.29	736.29	736.29	736.29	736.29	736.28	736.28	736.28
58.00	DISCHG	.03	.03	.03	.03	.03	.03	.03	.03	.03	.02
[illegible]0	ELEV	736.28	736.28	736.28	736.28	736.28	736.27	736.27	736.27	736.27	736.27

RUNOFF VOLUME ABOVE BASEFLOW = 3.15 WATERSHED INCHES, 2865.61 CFS-HRS, 236.81 ACRE-FEET; BASEFLOW = .00 CFS

OPERATION REACH CROSS SECTION 8
INPUT HYDROGRAPH= 7 OUTPUT HYDROGRAPH= 3
LENGTH = 4800.00 FEET INPUT = RATING CURVE REPRESENTATIVE OF REACH
0 COEFFICIENTS USED IN ROUTING RELATED TO CROSS SECTION AREA, X= .21 M= 1.08
0 MODIFIED ATT-H IN ROUTING COEFFICIENT = .06 PEAK TRAVEL TIME = 2.50 HOURS

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
17.25	266.87	738.33

RUNOFF VOLUME ABOVE BASEFLOW = 3.15 WATERSHED INCHES, 2864.04 CFS-HRS, 236.68 ACRE-FEET; BASEFLOW = .00 CFS

OPERATION RUNOFF CROSS SECTION 9
OUTPUT HYDROGRAPH= 6
AREA= .52 SQ MI INPUT RUNOFF CURVE= 70. TIME OF CONCENTRATION= 1.62 HOURS
INTERNAL HYDROGRAPH TIME INCREMENT= .2160 HOURS
1

TR[illegible]EQ 06-21-94 17:58 OWOSSO DRAIN - FPMS - SHIAWASSEE CO.MI. 06-20-94 JOB 1 PASS 1
[illegible]REV PC 09/83(.2) EXISTING CONDITIONS-24 HOUR TYPE II STORM DISTRIBUTION PAGE 12

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
12.05	282.91	(RUNOFF)
23.54	19.65	(RUNOFF)

RUNOFF VOLUME ABOVE BASEFLOW = 3.00 WATERSHED INCHES, 1005.92 CFS-HRS, 83.13 ACRE-FEET; BASEFLOW = .00 CFS

OPERATION ADDHYD CROSS SECTION 10
INPUT HYDROGRAPHS= 3,6 OUTPUT HYDROGRAPH= 5

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
13.06	286.52	(NULL)
17.04	306.99	(NULL)

RUNOFF VOLUME ABOVE BASEFLOW = 3.11 WATERSHED INCHES, 3869.97 CFS-HRS, 319.81 ACRE-FEET; BASEFLOW = .00 CFS

OPERATION RUNOFF CROSS SECTION 11
OUTPUT HYDROGRAPH= 6
AREA= .44 SQ MI INPUT RUNOFF CURVE= 70. TIME OF CONCENTRATION= 1.27 HOURS
INTERNAL HYDROGRAPH TIME INCREMENT= .1693 HOURS

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
12.82	263.77	(RUNOFF)
23.55	16.14	(RUNOFF)

TIME,HRS FIRST HYDROGRAPH POINT = .00 HOURS TIME INCREMENT = .20 HOURS DRAINAGE AREA = .44 SQ.MI.
[illegible]

12.00	DISCHG	88.76	147.19	206.30	252.76	285.87	297.01	243.40	225.93	205.76	183.53
14.00	DISCHG	159.73	134.79	109.06	84.73	66.66	57.07	51.33	46.81	43.28	40.43
16.00	DISCHG	38.05	36.12	34.63	33.44	32.40	31.43	30.48	29.58	28.80	28.12
18.00	DISCHG	27.41	26.65	25.81	24.89	24.05	23.36	22.79	22.34	21.99	21.66
20.00	DISCHG	21.25	20.72	20.10	19.41	18.77	18.20	17.70	17.27	16.91	16.61
22.00	DISCHG	16.37	16.21	16.11	16.08	16.09	16.10	16.11	16.13	16.14	16.10
24.00	DISCHG	15.87	15.21	14.01	12.31	10.34	8.38	6.63	5.08	3.75	2.63
[illegible]	DISCHG	1.70	.99	.46	.15	.03					

RUNOFF VOLUME ABOVE BASEFLOW = 2.81 WATERSHED INCHES, 797.21 CFS-HRS, 65.88 ACRE-FEET; BASEFLOW = .00 CFS

OPERATION RESVOR STRUCTURE 3
INPUT HYDROGRAPH= 6 OUTPUT HYDROGRAPH= 1
SURFACE ELEVATION= 760.80

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
18.61	24.85	762.71

TIME(HRS) FIRST HYDROGRAPH POINT = .00 HOURS TIME INCREMENT = .20 HOURS DRAINAGE AREA = .44 SQ.MI.

8.00	DISCHG	.00	.00	.00	.00	.00	.00	.01	.02	.07	.16

8.00	ELEV	760.80	760.80	760.80	760.80	760.80	760.80	760.80	760.81	760.84	760.88
10.00	DISCHG	.30	.53	.85	1.30	1.93	1.37	1.43	1.52	1.66	1.92
10.00	ELEV	760.96	761.09	761.26	761.50	761.50	761.50	761.51	761.51	761.52	761.53
[illegible]	DISCHG	2.50	3.55	5.13	7.18	9.48	11.78	13.96	15.97	17.80	19.41
[illegible]	ELEV	761.56	761.62	761.70	761.80	761.92	762.04	762.15	762.26	762.35	762.44
14.00	DISCHG	20.80	21.95	22.77	23.21	23.53	23.75	23.94	24.09	24.21	24.31
14.00	ELEV	762.51	762.57	762.61	762.63	762.64	762.65	762.66	762.67	762.68	762.68
16.00	DISCHG	24.40	24.48	24.54	24.60	24.65	24.69	24.73	24.76	24.79	24.81
16.00	ELEV	762.69	762.69	762.69	762.69	762.70	762.70	762.70	762.70	762.70	762.70
18.00	DISCHG	24.83	24.84	24.85	24.85	24.85	24.84	24.83	24.82	24.80	24.79
18.00	ELEV	762.71	762.71	762.71	762.71	762.71	762.71	762.71	762.70	762.70	762.70
20.00	DISCHG	24.77	24.74	24.72	24.69	24.65	24.62	24.58	24.54	24.49	24.45
20.00	ELEV	762.70	762.70	762.70	762.70	762.70	762.70	762.69	762.69	762.69	762.69
22.00	DISCHG	24.40	24.35	24.30	24.25	24.20	24.16	24.11	24.06	24.01	23.97
22.00	ELEV	762.69	762.68	762.68	762.68	762.68	762.67	762.67	762.67	762.67	762.66
24.00	DISCHG	23.92	23.87	23.81	23.75	23.68	23.59	23.50	23.39	23.28	23.16
24.00	ELEV	762.66	762.66	762.66	762.65	762.65	762.65	762.64	762.64	762.63	762.63
26.00	DISCHG	23.03	22.90	22.77	22.64	22.45	22.25	22.05	21.84	21.65	21.45
26.00	ELEV	762.62	762.61	762.61	762.60	762.59	762.58	762.57	762.56	762.55	762.54
28.00	DISCHG	21.25	21.06	20.87	20.68	20.49	20.30	20.11	19.93	19.75	19.57
28.00	ELEV	762.53	762.52	762.51	762.50	762.49	762.48	762.47	762.46	762.45	762.44
30.00	DISCHG	19.39	19.21	19.04	18.86	18.69	18.52	18.35	18.18	18.02	17.85
30.00	ELEV	762.43	762.43	762.42	762.41	762.40	762.39	762.38	762.37	762.36	762.35
32.00	DISCHG	17.69	17.53	17.37	17.21	17.05	16.90	16.74	16.59	16.44	16.29
32.00	ELEV	762.35	762.34	762.33	762.32	762.31	762.31	762.30	762.29	762.28	762.27
34.00	DISCHG	16.14	15.99	15.85	15.70	15.56	15.42	15.28	15.14	15.00	14.86
34.00	ELEV	762.27	762.26	762.25	762.24	762.24	762.23	762.22	762.21	762.21	762.20
36.00	DISCHG	14.73	14.59	14.46	14.33	14.20	14.07	13.94	13.81	13.69	13.56
36.00	ELEV	762.19	762.19	762.18	762.17	762.17	762.16	762.15	762.15	762.14	762.13
[illegible]	DISCHG	13.44	13.31	13.19	13.07	12.95	12.84	12.72	12.60	12.49	12.37
[illegible]	ELEV	762.13	762.12	762.11	762.11	762.10	762.10	762.09	762.08	762.08	762.07
40.00	DISCHG	12.26	12.15	12.04	11.93	11.82	11.71	11.60	11.50	11.39	11.29
40.00	ELEV	762.07	762.06	762.05	762.05	762.04	762.04	762.03	762.03	762.02	762.02
42.00	DISCHG	11.19	11.08	10.98	10.88	10.78	10.68	10.59	10.49	10.39	10.30
[illegible]	ELEV	762.01	762.01	762.00	761.99	761.99	761.98	761.98	761.97	761.97	761.96
[illegible]	DISCHG	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

46.00	DISCHG	9.31	9.23	9.14	9.06	8.98	8.89	8.81	8.73	8.65	8.57
46.00	ELEV	761.91	761.91	761.91	761.90	761.90	761.89	761.89	761.88	761.88	761.88
48.00	DISCHG	8.50	8.42	8.34	8.27	8.19	8.12	8.04	7.97	7.90	7.82
48.00	ELEV	761.87	761.87	761.86	761.86	761.86	761.85	761.85	761.84	761.84	761.84
50.00	DISCHG	7.75	7.68	7.61	7.54	7.47	7.40	7.34	7.27	7.20	7.14
50.00	ELEV	761.83	761.83	761.83	761.82	761.82	761.82	761.81	761.81	761.80	761.80
52.00	DISCHG	7.07	7.01	6.94	6.88	6.82	6.76	6.69	6.63	6.57	6.51
[illegible]	ELEV	761.80	761.79	761.79	761.79	761.78	761.78	761.78	761.78	761.77	761.77
54.00	DISCHG	6.45	6.39	6.34	6.28	6.22	6.16	6.11	6.05	6.00	5.94
54.00	ELEV	761.77	761.76	761.76	761.76	761.75	761.75	761.75	761.75	761.74	761.74
56.00	DISCHG	5.89	5.83	5.78	5.73	5.68	5.62	5.57	5.52	5.47	5.42
56.00	ELEV	761.74	761.73	761.73	761.73	761.73	761.72	761.72	761.72	761.72	761.71

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58.00	DISCHG	5.37	5.32	5.27	5.23	5.18	5.13	5.08	5.04	4.99	4.95
58.00	ELEV	761.71	761.71	761.71	761.70	761.70	761.70	761.70	761.69	761.69	761.69

RUNOFF VOLUME ABOVE BASEFLOW = 2.52 WATERSHED INCHES, 716.54 CFS-HRS, 59.22 ACRE-FEET; BASEFLOW = .00 CFS

OPERATION ADDHYD CROSS SECTION 12
INPUT HYDROGRAPHS= 5,1 OUTPUT HYDROGRAPH= 7

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
13.08	299.09	(NULL)
17.05	331.69	(NULL)

[illegible]OFF VOLUME ABOVE BASEFLOW = 3.00 WATERSHED INCHES, 4586.51 CFS-HRS, 379.03 ACRE-FEET; BASEFLOW = .00 CFS

OPERATION RUNOFF CROSS SECTION 13
OUTPUT HYDROGRAPH= 6
AREA= .46 SQ MI INPUT RUNOFF CURVE= 73. TIME OF CONCENTRATION= 1.70 HOURS
INTERNAL HYDROGRAPH TIME INCREMENT= .1889 HOURS

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
13.09	249.90	(RUNOFF)

TIME(HRS) FIRST HYDROGRAPH POINT = .00 HOURS TIME INCREMENT = .20 HOURS DRAINAGE AREA = .46 SQ.MI.

8.00	DISCHG	.00	.00	.02	.06	.14	.28	.50	.81	1.23	1.76
10.00	DISCHG	2.40	3.17	4.10	5.25	6.69	8.54	10.93	14.14	20.07	36.21
12.00	DISCHG	67.77	107.29	148.73	190.68	229.44	247.68	247.17	240.28	230.77	219.10
14.00	DISCHG	205.78	191.13	175.44	158.89	141.65	123.93	105.90	87.80	70.71	58.25
16.00	DISCHG	51.70	47.65	44.44	41.86	39.75	37.99	36.48	35.15	33.95	32.90
18.00	DISCHG	31.94	31.03	30.15	29.25	28.33	27.47	26.72	26.05	25.47	24.94
20.00	DISCHG	24.39	23.82	23.22	22.53	21.88	21.18	20.59	20.05	19.60	19.22
22.00	DISCHG	18.88	18.59	18.32	18.10	17.92	17.78	17.69	17.63	17.62	17.60
24.00	DISCHG	17.47	17.04	16.29	15.23	13.86	12.25	10.57	9.01	7.57	6.25
26.00	DISCHG	5.06	4.00	3.06	2.25	1.56	1.00	.56	.26	.07	.00

RUNOFF VOLUME ABOVE BASEFLOW = 3.09 WATERSHED INCHES, 917.37 CFS-HRS, 75.81 ACRE-FEET; BASEFLOW = .00 CFS

[illegible]

OPERATION RUNOFF CROSS SECTION 14
OUTPUT HYDROGRAPH= 5
AREA= .19 SQ MI INPUT RUNOFF CURVE= 61. TIME OF CONCENTRATION= .51 HOURS
INTERNAL HYDROGRAPH TIME INCREMENT= .0680 HOURS

[illegible]

19.58	7.62	(RUNOFF)
23.55	5.88	(RUNOFF)

TIME(HRS) FIRST HYDROGRAPH POINT = .00 HOURS TIME INCREMENT = .20 HOURS DRAINAGE AREA = .19 SQ.MI.

10.00	DISCHG	.00	.00	.00	.00	.02	.26	.96	2.29	5.95	22.67

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12.00	DISCHG	82.36	145.70	141.70	114.64	82.11	50.80	35.66	30.22	26.35	23.22
14.00	DISCHG	20.78	18.87	17.28	15.87	14.57	13.56	12.97	12.54	11.99	11.52
16.00	DISCHG	11.20	11.02	10.98	10.94	10.55	10.03	9.65	9.42	9.33	9.31
18.00	DISCHG	8.99	8.44	8.00	7.72	7.58	7.57	7.59	7.60	7.62	7.60
20.00	DISCHG	7.26	6.69	6.24	5.94	5.80	5.76	5.79	5.80	5.81	5.81
22.00	DISCHG	5.82	5.83	5.84	5.84	5.85	5.86	5.87	5.88	5.88	5.86
24.00	DISCHG	5.50	4.38	2.73	1.39	.52	.10				

RUNOFF VOLUME ABOVE BASEFLOW = 2.01 WATERSHED INCHES, 246.34 CFS-HRS, 20.36 ACRE-FEET; BASEFLOW = .00 CFS

OPERATION ADDHYD CROSS SECTION 15
INPUT HYDROGRAPHS= 6,5 OUTPUT HYDROGRAPH= 4

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
12.76	310.89	(NULL)

RUNOFF VOLUME ABOVE BASEFLOW = 2.77 WATERSHED INCHES, 1163.71 CFS-HRS, 96.17 ACRE-FEET; BASEFLOW = .00 CFS

OPERATION ADDHYD CROSS SECTION 16
INPUT HYDROGRAPHS= 4,7 OUTPUT HYDROGRAPH= 2

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
12.95	596.40	(NULL)
16.70	381.09	(NULL)

RUNOFF VOLUME ABOVE BASEFLOW = 2.95 WATERSHED INCHES, 5750.22 CFS-HRS, 475.20 ACRE-FEET; BASEFLOW = .00 CFS

OPERATION RUNOFF CROSS SECTION 17
OUTPUT HYDROGRAPH= 6
AREA= .44 SQ MI INPUT RUNOFF CURVE= 70. TIME OF CONCENTRATION= .83 HOURS
INTERNAL HYDROGRAPH TIME INCREMENT= .1107 HOURS

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
12.49	370.44	(RUNOFF)
23.54	16.17	(RUNOFF)

TIME(HRS) FIRST HYDROGRAPH POINT = .00 HOURS TIME INCREMENT = .20 HOURS DRAINAGE AREA = .44 SQ.MI.

8.00	DISCHG	.00	.00	.00	.00	.00	.01	.09	.30	.70	1.30
10.00	DISCHG	2.08	3.04	4.24	5.81	7.94	10.81	14.60	19.54	29.92	64.99
12.00	DISCHG	161.80	279.99	362.61	355.11	321.71	256.26	232.80	181.17	123.95	91.96
14.00	DISCHG	75.20	65.94	58.64	53.07	48.23	44.22	41.12	38.78	36.77	34.94
16.00	DISCHG	33.53	32.57	31.93	31.41	30.65	29.64	28.67	27.99	27.25	26.71
[illegible]	DISCHG	25.97	25.00	23.96	23.10	22.41	21.57	21.48	21.25	21.16	21.12
[illegible]	DISCHG	20.13	19.95	19.75	18.07	17.45	16.79	16.32	16.14	16.04	16.05
[illegible]	DISCHG	16.06	16.07	16.09	16.10	16.[illegible]	16.12	16.14	16.15	16.17	16.12
24.00	DISCHG	15.69	14.24	11.77	5.79	2.[illegible]	1.95	1.27	1.07	.35	.04

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RUNOFF VOLUME ABOVE BASEFLOW = 2.81 WATERSHED INCHES, 796.93 CFS-HRS, 65.86 ACRE-FEET; BASEFLOW = .00 CFS

OPERATION ADDHYD CROSS SECTION 18
INPUT HYDROGRAPHS= 2,6 OUTPUT HYDROGRAPH= 1

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
12.76	912.01	(NULL)
16.62	412.33	(NULL)

RUNOFF VOLUME ABOVE BASEFLOW = 2.93 WATERSHED INCHES, 6547.14 CFS-HRS, 541.06 ACRE-FEET; BASEFLOW = .00 CFS

OPERATION RUNOFF CROSS SECTION 19
OUTPUT HYDROGRAPH= 7
AREA= .13 SQ MI INPUT RUNOFF CURVE= 77. TIME OF CONCENTRATION= 1.21 HOURS
INTERNAL HYDROGRAPH TIME INCREMENT= .1613 HOURS

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
12.73	103.17	(RUNOFF)
13.53	5.26	(RUNOFF)

TIME(HRS) FIRST HYDROGRAPH POINT = .00 HOURS TIME INCREMENT = .20 HOURS DRAINAGE AREA = .13 SQ.MI.

6.00	DISCHG	.00	.00	.00	.00	.00	.00	.00	.01	.04	.09
8.00	DISCHG	.15	.24	.36	.51	.69	.91	1.15	1.42	1.72	2.06
10.00	DISCHG	2.43	2.84	3.31	3.87	4.59	5.54	6.78	8.34	11.44	19.84
12.00	DISCHG	39.25	62.73	85.38	101.87	102.79	97.59	90.73	82.70	73.67	64.04
[illegible]	DISCHG	53.96	43.59	33.57	25.43	20.73	18.27	16.54	15.15	14.04	13.13
[illegible]	DISCHG	12.39	11.79	11.33	10.96	10.63	10.31	10.00	9.69	9.44	9.22
18.00	DISCHG	8.98	8.72	8.43	8.11	7.84	7.61	7.42	7.29	7.17	7.06
20.00	DISCHG	6.93	6.75	6.54	6.31	6.10	5.91	5.74	5.60	5.48	5.39
22.00	DISCHG	5.32	5.27	5.25	5.25	5.25	5.25	5.26	5.26	5.26	5.25
24.00	DISCHG	5.17	4.93	4.50	3.90	3.22	2.56	1.99	1.49	1.06	.70
26.00	DISCHG	.42	.22	.08	.02	.00					

RUNOFF VOLUME ABOVE BASEFLOW = 3.48 WATERSHED INCHES, 291.33 CFS-HRS, 24.16 ACRE-FEET; BASEFLOW = .00 CFS

OPERATION REACH CROSS SECTION 20
INPUT HYDROGRAPH= 7 OUTPUT HYDROGRAPH= 3
LENGTH = 3100.00 FEET INPUT = COEFFICIENTS RELATED TO CROSS SECTIONAL AREA, X= .71, M= 1.31
0 MODIFIED ATT-KIN ROUTING COEFFICIENT = .52 PEAK TRAVEL TIME = .40 HOURS

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
13.18	95.05	(NULL)
13.75	5.26	(NULL)

RUNOFF VOLUME ABOVE BASEFLOW = 3.48 WATERSHED INCHES, 291.33 CFS-HRS, 24.15 ACRE-FEET; BASEFLOW = .00 CFS
1

OPERATION RUNOFF CROSS SECTION 21

INTERNAL HYDROGRAPH TIME INCREMENT= .1547 HOURS

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
12.71	69.00	(RUNOFF)
23.54	3.55	(RUNOFF)

TIME(HRS) FIRST HYDROGRAPH POINT = .00 HOURS TIME INCREMENT = .20 HOURS DRAINAGE AREA = .09 SQ.MI.

[illegible]00	DISCHG	.01	.03	.07	.13	.22	.33	.46	.62	.80	1.00
10.00	DISCHG	1.23	1.49	1.79	2.15	2.61	3.22	4.02	5.04	7.02	12.81
12.00	DISCHG	26.12	42.67	58.30	68.43	68.58	64.80	59.79	54.02	47.66	40.80
14.00	DISCHG	33.64	26.42	19.76	15.41	13.25	11.85	10.77	9.91	9.22	8.65
16.00	DISCHG	8.18	7.80	7.52	7.30	7.09	6.89	6.68	6.48	6.31	6.16
18.00	DISCHG	6.01	5.83	5.63	5.41	5.23	5.08	4.97	4.88	4.81	4.74
20.00	DISCHG	4.65	4.53	4.39	4.23	4.08	3.95	3.84	3.75	3.67	3.61
22.00	DISCHG	3.57	3.55	3.54	3.54	3.54	3.55	3.55	3.55	3.55	3.54
24.00	DISCHG	3.49	3.31	3.00	2.57	2.09	1.64	1.25	.91	.63	.39
26.00	DISCHG	.22	.10	.03	.00						

RUNOFF VOLUME ABOVE BASEFLOW = 3.28 WATERSHED INCHES, 190.80 CFS-HRS, 15.77 ACRE-FEET; BASEFLOW = .00 CFS

OPERATION ADDHYD CROSS SECTION 22
INPUT HYDROGRAPHS= 6,3 OUTPUT HYDROGRAPH= 2

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
13.02	159.01	(NULL)
23.57	8.81	(NULL)

RUNOFF VOLUME ABOVE BASEFLOW = 3.40 WATERSHED INCHES, 483.06 CFS-HRS, 39.92 ACRE-FEET; BASEFLOW = .00 CFS

OPERATION RUNOFF CROSS SECTION 23
OUTPUT HYDROGRAPH= 6
AREA= .17 SQ MI INPUT RUNOFF CURVE= 79. TIME OF CONCENTRATION= 1.36 HOURS
INTERNAL HYDROGRAPH TIME INCREMENT= .1813 HOURS

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
12.84	131.49	(RUNOFF)
23.54	7.04	(RUNOFF)

RUNOFF VOLUME ABOVE BASEFLOW = 3.68 WATERSHED INCHES, 403.62 CFS-HRS, 33.36 ACRE-FEET; BASEFLOW = .00 CFS

OPERATION ADDHYD CROSS SECTION 24
INPUT HYDROGRAPHS= 6,2 OUTPUT HYDROGRAPH= 3

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PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
12.94	287.47	(NULL)
23.55	15.85	(NULL)

[illegible]FF VOLUME ABOVE BASEFLOW = 3.52 WATERSHED INCHES, 826.38 CFS-HRS, 73.27 ACRE-FEET; BASEFLOW = .00 CFS

OPERATION RESVOR STRUCTURE 4
INPUT HYDROGRAPH= 3 OUTPUT HYDROGRAPH= 6
SURFACE ELEVATION= 727.90

TIME(HRS) FIRST HYDROGRAPH POINT = .00 HOURS TIME INCREMENT = .20 HOURS DRAINAGE AREA = .39 SQ.MI.

5.00	DISCHG	.00	.00	.00	.00	.00	.00	.00	.01	.02	.03
6.00	ELEV	737.90	737.90	737.90	737.90	737.90	737.90	737.90	737.90	737.90	737.90
8.00	DISCHG	.04	.07	.10	.15	.21	.29	.39	.50	.65	.82
8.00	ELEV	737.91	737.91	737.91	737.92	737.92	737.93	737.94	737.95	737.97	737.99
10.00	DISCHG	1.03	1.27	1.54	1.86	2.23	2.67	3.19	3.82	4.68	5.91
10.00	ELEV	738.02	738.04	738.07	738.11	738.15	738.20	738.26	738.33	738.42	738.56
12.00	DISCHG	8.22	12.26	18.28	20.72	23.23	25.86	28.43	30.84	33.03	34.98
12.00	ELEV	738.82	739.29	739.95	740.14	740.32	740.51	740.69	740.86	741.02	741.16
14.00	DISCHG	36.64	38.02	39.11	39.91	40.46	40.81	41.04	41.17	41.25	41.29
14.00	ELEV	741.28	741.38	741.45	741.51	741.55	741.57	741.59	741.60	741.61	741.61
16.00	DISCHG	41.29	41.27	41.22	41.16	41.09	41.00	40.91	40.81	40.69	40.58
16.00	ELEV	741.61	741.61	741.60	741.60	741.59	741.59	741.58	741.57	741.57	741.56
18.00	DISCHG	40.45	40.32	40.18	40.04	39.83	39.72	39.56	39.39	39.22	39.04
18.00	ELEV	741.55	741.54	741.53	741.52	741.51	741.50	741.48	741.47	741.46	741.45
20.00	DISCHG	38.87	38.69	38.51	38.32	38.13	37.93	37.73	37.53	37.33	37.12
20.00	ELEV	741.44	741.42	741.41	741.40	741.39	741.37	741.35	741.34	741.33	741.31
22.00	DISCHG	36.91	36.71	36.50	36.29	36.09	35.88	35.68	35.48	35.29	35.09
22.00	ELEV	741.30	741.28	741.27	741.25	741.24	741.22	741.21	741.19	741.18	741.17
24.00	DISCHG	34.90	34.70	34.50	34.29	34.07	33.83	33.58	33.31	33.03	32.74
24.00	ELEV	741.15	741.14	741.12	741.11	741.09	741.08	741.06	741.04	741.02	741.00
26.00	DISCHG	32.44	32.13	31.82	31.51	31.19	30.88	30.57	30.27	29.96	29.66
26.00	ELEV	740.98	740.96	740.93	740.91	740.89	740.87	740.85	740.82	740.80	740.78
28.00	DISCHG	29.37	29.07	28.78	28.49	28.21	27.92	27.64	27.37	27.09	26.82
28.00	ELEV	740.76	740.74	740.72	740.70	740.68	740.66	740.64	740.62	740.60	740.58
30.00	DISCHG	26.55	26.29	26.02	25.76	25.50	25.25	24.99	24.74	24.50	24.25
30.00	ELEV	740.56	740.54	740.52	740.50	740.48	740.47	740.45	740.43	740.41	740.40
32.00	DISCHG	24.01	23.77	23.53	23.29	23.06	22.83	22.60	22.37	22.15	21.93
32.00	ELEV	740.38	740.36	740.34	740.33	740.31	740.29	740.28	740.26	740.25	740.23
34.00	DISCHG	21.71	21.49	21.27	21.06	20.85	20.64	20.43	20.23	20.03	19.82
34.00	ELEV	740.21	740.20	740.18	740.17	740.15	740.14	740.12	740.11	740.09	740.08
36.00	DISCHG	19.63	19.43	19.23	19.04	18.85	18.56	17.87	17.21	16.57	15.96
36.00	ELEV	740.07	740.05	740.04	740.02	740.01	739.98	739.91	739.83	739.76	739.69
38.00	DISCHG	15.37	14.80	14.25	13.73	13.22	12.73	12.26	11.81	11.37	10.95
38.00	ELEV	739.62	739.56	739.50	739.44	739.38	739.33	739.28	739.23	739.18	739.13

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40.00	DISCHG	10.54	10.15	9.78	9.42	9.07	8.73	8.41	8.10	7.80	7.51
40.00	ELEV	739.08	739.04	739.00	738.96	738.92	738.88	738.84	738.81	738.78	738.74
42.00	DISCHG	7.23	6.96	6.71	6.46	6.22	5.99	5.77	5.55	5.35	5.15
42.00	ELEV	738.71	738.68	738.65	738.63	738.60	738.57	738.55	738.52	738.50	738.48
44.00	DISCHG	4.96	4.78	4.60	4.43	4.27	4.11	3.96	3.81	3.67	3.53
44.00	ELEV	738.46	738.44	738.42	738.40	738.38	738.36	738.34	738.33	738.31	738.30
46.00	DISCHG	3.40	3.28	3.16	3.04	2.93	2.82	2.71	2.61	2.52	2.42
46.00	ELEV	738.28	738.27	738.25	738.24	738.23	738.22	738.20	738.19	738.18	738.17
48.00	DISCHG	2.33	2.25	2.16	2.08	2.01	1.93	1.86	1.79	1.73	1.66
48.00	ELEV	738.16	738.15	738.14	738.13	738.13	738.12	738.11	738.10	738.09	738.09
50.00	DISCHG	1.60	1.54	1.48	1.43	1.38	1.33	1.28	1.23	1.18	1.14
50.00	ELEV	738.08	738.07	738.07	738.06	738.06	738.05	738.04	738.04	738.03	738.03
52.00	DISCHG	1.10	1.06	1.02	.98	.94	.91	.88	.84	.81	.78
52.00	ELEV	738.02	738.02	738.01	738.01	738.01	738.00	738.00	737.99	737.99	737.99
54.00	DISCHG	.75	.73	.70	.67	.65	.62	.60	.58	.56	.54
54.00	ELEV	737.98	737.98	737.98	737.98	737.97	737.97	737.97	737.96	737.96	737.96
56.00	DISCHG	.52	.50	.48	.46	.44	.43	.41	.40	.38	.37
56.00	ELEV	737.96	737.96	737.95	737.95	737.95	737.95	737.95	737.94	737.94	737.94
58.00	DISCHG	.35	.34	.33	.32	.30	.29	.28	.27	.26	.25
58.00	ELEV	737.94	737.94	737.94	737.94	737.93	737.93	737.93	737.93	737.93	737.93

RUNOFF VOLUME ABOVE BASEFLOW = -3.02 WATERSHED INCHES, 668.38 CFS-HRS, 13.17 ACRE-FEET; BASEFLOW = .00 CFS

OPERATION ADDHYD CROSS SECTION 25
INPUT HYDROGRAPHS= 6,1 OUTPUT HYDROGRAPH= 5

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
12.77	934.74	(NULL)
16.61	453.49	(NULL)

RUNOFF VOLUME ABOVE BASEFLOW = 2.99 WATERSHED INCHES, 7432.50 CFS-HRS, 614.22 ACRE-FEET; BASEFLOW = .00 CFS

OPERATION RESVOR STRUCTURE 5
INPUT HYDROGRAPH= 5 OUTPUT HYDROGRAPH= 7
SURFACE ELEVATION= 731.80

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
18.03	425.22	739.99

TIME(HRS) FIRST HYDROGRAPH POINT = .00 HOURS TIME INCREMENT = .20 HOURS DRAINAGE AREA = 3.85 SQ.MI.

6.00	DISCHG	.00	.00	.00	.00	.00	.00	.00	.00	.01	.01
6.00	ELEV	731.80	731.80	731.80	731.80	731.80	731.80	731.80	731.80	731.80	731.80
8.00	DISCHG	.02	.03	.06	.10	.18	.32	.59	1.03	1.75	2.82
8.00	ELEV	731.80	731.80	731.80	731.81	731.81	731.82	731.84	731.88	731.93	732.01
10.00	DISCHG	4.30	6.25	8.72	11.86	15.76	20.66	27.06	35.58	48.87	63.75
10.00	ELEV	732.12	732.26	732.44	732.67	732.95	733.31	733.78	734.41	735.32	736.64
12.00	DISCHG	68.02	72.92	87.06	112.82	138.99	166.63	202.10	232.52	257.92	286.47
12.00	ELEV	737.17	737.62	738.12	739.44	738.75	739.04	739.22	739.37	739.50	739.59

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1 REQ 06-21-94 17:58 OWOSSO DRAIN - FPMS - SHIAWASSEE CO.MI. 06-20-94 JOB PASS 1
REV PC 09/83(.2) EXISTING CONDITIONS-24 HOUR TYPE II STORM DISTRIBUTION PAGE 20

14.00	DISCHG	309.66	328.95	345.25	359.06	370.69	380.31	388.05	394.04	398.54	402.05
14.00	ELEV	739.65	739.71	739.75	739.79	739.83	739.86	739.88	739.90	739.91	739.92
16.00	DISCHG	405.16	408.20	411.19	414.08	416.78	419.18	421.22	422.86	424.08	424.88
16.00	ELEV	739.93	739.94	739.95	739.95	739.96	739.97	739.97	739.98	739.99	739.99
18.00	DISCHG	425.21	425.03	424.32	422.10	421.43	419.34	416.90	414.15	411.14	407.91
18.00	ELEV	739.99	739.99	739.98	739.98	739.98	739.97	739.96	739.95	739.95	739.94
20.00	DISCHG	404.45	400.73	396.74	392.52	388.08	383.48	378.77	373.99	369.16	364.34
20.00	ELEV	739.93	739.91	739.90	739.89	739.88	739.86	739.85	739.84	739.82	739.81
22.00	DISCHG	359.52	354.73	349.99	345.29	340.65	336.08	331.59	327.17	322.85	318.62
22.00	ELEV	739.80	739.78	739.77	739.75	739.74	739.73	739.71	739.70	739.69	739.68
24.00	DISCHG	314.43	310.17	305.70	300.91	295.81	290.44	284.86	279.16	273.40	267.63
24.00	ELEV	739.66	739.65	739.64	739.62	739.61	739.59	739.58	739.56	739.54	739.53
26.00	DISCHG	261.91	256.73	252.68	248.56	244.47	240.43	236.41	232.41	228.45	224.52
26.00	ELEV	739.51	739.49	739.47	739.45	739.43	739.41	739.39	739.37	739.35	739.33
28.00	DISCHG	220.65	216.80	212.99	209.20	205.44	201.70	197.98	194.29	190.62	186.97
28.00	ELEV	739.31	739.29	739.27	739.25	739.23	739.21	739.20	739.18	739.16	739.14
30.00	DISCHG	183.35	179.75	176.19	172.65	169.15	165.68	162.25	159.09	156.94	154.78
30.00	ELEV	739.12	739.10	739.08	739.07	739.05	739.03	739.01	738.99	738.97	738.94
32.00	DISCHG	152.61	150.43	148.25	146.06	143.88	141.70	139.52	137.36	135.20	133.05
32.00	ELEV	738.92	738.89	738.86	738.84	738.81	738.78	738.76	738.73	738.71	738.68
34.00	DISCHG	130.91	128.79	126.68	124.59	122.51	120.46	118.42	116.41	114.42	112.45
[illegible]	ELEV	738.65	738.63	738.60	738.58	738.55	738.53	738.50	738.48	738.45	738.43
[illegible]	DISCHG	110.51	108.59	106.69	104.82	102.97	101.15	99.35	97.56	95.78	94.01
36.00	ELEV	738.41	738.38	738.36	738.34	738.32	738.29	738.27	738.25	738.23	738.21
38.00	DISCHG	92.26	90.53	88.81	87.12	85.44	83.78	82.14	81.53	79.94	77.36
38.00	ELEV	738.19	738.17	738.15	738.12	738.10	738.08	738.06	738.05	738.03	738.01
40.00	DISCHG	76.48	75.49	75.49	74.49	74.48	73.96	73.47	72.91	72.45	71.94
[illegible]	ELEV	737.97	[illegible]	[illegible]	[illegible]	[illegible]	737.72	[illegible]	[illegible]	[illegible]	[illegible]

42.00	ELEV	737.47	737.44	737.40	737.36	737.32	737.28	737.20	737.16	737.11	737.06
44.00	DISCHG	66.30	64.27	61.96	48.61	36.35	28.55	23.56	20.32	18.17	16.72
44.00	ELEV	737.01	736.72	736.38	735.36	734.46	733.89	733.53	733.29	733.13	733.03
46.00	DISCHG	15.71	14.97	14.41	13.96	13.59	13.26	12.97	12.70	12.45	12.22
46.00	ELEV	732.95	732.90	732.86	732.82	732.80	732.77	732.75	732.73	732.71	732.70
48.00	DISCHG	11.99	11.77	11.56	11.36	11.17	10.98	10.79	10.61	10.44	10.27
48.00	ELEV	732.68	732.66	732.65	732.63	732.62	732.60	732.59	732.58	732.57	732.55
50.00	DISCHG	10.11	9.95	9.79	9.64	9.50	9.35	9.21	9.06	8.94	8.82
50.00	ELEV	732.54	732.53	732.52	732.51	732.50	732.49	732.48	732.47	732.46	732.45
52.00	DISCHG	8.69	8.57	8.45	8.33	8.21	8.10	7.99	7.88	7.78	7.68
52.00	ELEV	732.44	732.43	732.42	732.41	732.40	732.39	732.39	732.38	732.37	732.36
54.00	DISCHG	7.58	7.48	7.38	7.29	7.20	7.11	7.02	6.93	6.85	6.76
54.00	ELEV	732.36	732.35	732.34	732.33	732.33	732.32	732.31	732.31	732.30	732.30
56.00	DISCHG	6.68	6.60	6.52	6.44	6.37	6.29	6.22	6.15	6.08	6.01
56.00	ELEV	732.29	732.28	732.28	732.27	732.27	732.26	732.26	732.25	732.25	732.24
58.00	DISCHG	5.94	5.87	5.81	5.74	5.68	5.62	5.55	5.49	5.43	5.37
58.00	ELEV	732.24	732.23	732.23	732.22	732.22	732.21	732.21	732.20	732.20	732.19

RUNOFF VOLUME ABOVE BASEFLOW = 2.99 WATERSHED INCHES, 7430.87 CFS-HRS, 614.09 ACRE-FEET, BASEFLOW = .00 CFS

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OPERATION RUNOFF CROSS SECTION 26
OUTPUT HYDROGRAPH= 6
AREA= .13 SQ MI INPUT RUNOFF CURVE= 72. TIME OF CONCENTRATION= 1.79 HOURS
INTERNAL HYDROGRAPH TIME INCREMENT= .1989 HOURS

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
13.20	65.12	(RUNOFF)

TIME(HRS) FIRST HYDROGRAPH POINT = .00 HOURS TIME INCREMENT = .20 HOURS DRAINAGE AREA = .13 SQ.MI.

8.00	DISCHG	.00	.00	.00	.00	.01	.03	.07	.12	.20	.31
10.00	DISCHG	.45	.63	.85	1.12	1.47	1.92	2.51	3.32	4.80	8.73
12.00	DISCHG	16.68	26.49	36.83	47.36	57.28	63.88	65.12	63.86	61.82	59.20
14.00	DISCHG	56.13	52.70	48.99	45.01	40.84	36.52	32.10	27.60	23.09	18.81
16.00	DISCHG	15.64	13.94	12.89	12.07	11.40	10.85	10.38	9.97	9.61	9.29
18.00	DISCHG	9.00	8.74	8.48	8.23	7.98	7.74	7.53	7.34	7.17	7.02
20.00	DISCHG	6.86	6.70	6.53	6.35	6.16	5.98	5.80	5.65	5.52	5.40
22.00	DISCHG	5.31	5.22	5.15	5.08	5.03	4.98	4.95	4.92	4.91	4.90
24.00	DISCHG	4.86	4.75	4.56	4.29	3.95	3.53	3.09	2.67	2.27	1.91
26.00	DISCHG	1.58	1.28	1.01	.78	.57	.40	.26	.15	.07	.02
28.00	DISCHG	.00									

RUNOFF VOLUME ABOVE BASEFLOW = 2.99 WATERSHED INCHES, 251.10 CFS-HRS, 20.75 ACRE-FEET; BASEFLOW = .00 CFS

OPERATION ADDHYD CROSS SECTION 27
INPUT HYDROGRAPHS= 7,6 OUTPUT HYDROGRAPH= 5

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
17.92	434.26	(NULL)

RUNOFF VOLUME ABOVE BASEFLOW = 2.99 WATERSHED INCHES, 7681.95 CFS-HRS, 634.84 ACRE-FEET, BASEFLOW = .00 CFS

OPERATION RUNOFF CROSS SECTION 28
OUTPUT HYDROGRAPH= 6
AREA= [illegible] SQ MI INPUT RUNOFF CURVE= 79 TIME OF CONCENTRATION= [illegible] HOURS

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
12.40	517.60	(RUNOFF)
19.54	22.72	(RUNOFF)
23.52	17.22	(RUNOFF)

TIME(HRS) FIRST HYDROGRAPH POINT = .00 HOURS TIME INCREMENT = .20 HOURS DRAINAGE AREA = .42 SQ.MI.

[illegible].00	DISCHG	.00	.00	.00	.00	.00	.05	.20	.47	.83	1.26
8.00	DISCHG	1.73	2.29	2.98	3.85	4.82	5.80	6.87	8.06	9.34	10.74
10.00	DISCHG	12.27	13.91	15.91	18.63	22.97	27.69	34.28	42.57	59.81	120.48
12.00	DISCHG	284.92	461.29	517.60	462.09	386.04	301.09	212.94	137.12	99.79	84.92
14.00	DISCHG	74.31	66.08	59.56	54.10	49.30	45.37	42.61	40.51	38.54	36.74

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TR20 XEQ 06-21-94 17:58 OWOSSO DRAIN - FRMS - SHIAWASSEE CO.MI. 06-20-94 JOB 1 PASS 1
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16.00	DISCHG	35.48	34.65	34.03	32.57	32.73	31.50	30.36	29.47	28.82	28.33
18.00	DISCHG	27.56	26.37	25.15	24.19	23.46	22.97	22.72	22.70	22.71	22.65
20.00	DISCHG	22.06	20.89	19.85	18.66	17.92	17.42	17.17	17.13	17.13	17.14
22.00	DISCHG	17.15	17.16	17.17	17.18	17.19	17.19	17.20	17.21	17.22	17.15
24.00	DISCHG	16.53	14.42	11.01	7.37	4.47	2.30	.88	.18	.00	

RUNOFF VOLUME ABOVE BASEFLOW = 3.58 WATERSHED INCHES, 970.50 CFS-HRS, 80.20 ACRE-FEET; BASEFLOW = .00 CFS

OPERATION ADDHYD CROSS SECTION 29
INPUT HYDROGRAPHS= 5,6 OUTPUT HYDROGRAPH= 7

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
12.46	646.23	(NULL)
15.20	462.76	(NULL)
17.69	462.54	(NULL)

TIME(HRS) FIRST HYDROGRAPH POINT = .00 HOURS TIME INCREMENT = .20 HOURS DRAINAGE AREA = 4.40 SQ.MI.

6.00	DISCHG	.00	.00	.00	.00	.00	.05	.20	.47	.83	1.27
8.00	DISCHG	1.75	2.32	3.04	3.95	5.01	6.16	7.52	9.21	11.29	13.87
10.00	DISCHG	17.02	20.78	25.48	31.61	39.70	50.27	63.85	81.46	113.48	192.96
12.00	DISCHG	369.62	560.70	641.49	622.27	582.41	531.60	480.16	433.50	419.51	430.59
14.00	DISCHG	440.10	447.73	453.79	458.17	460.83	462.20	462.76	462.15	460.17	457.60
16.00	DISCHG	456.28	456.79	458.17	459.72	460.91	461.53	461.96	462.30	462.52	462.51
18.00	DISCHG	461.78	460.14	457.96	455.52	452.87	450.05	447.15	444.19	441.03	437.58
20.00	DISCHG	433.37	428.31	422.92	417.53	412.16	406.88	401.74	396.76	391.81	386.88
22.00	DISCHG	381.98	377.12	372.30	367.55	362.86	358.26	353.74	349.31	344.98	340.66
24.00	DISCHG	336.81	329.34	321.27	312.57	304.22	296.27	288.83	282.01	275.67	269.54
26.00	DISCHG	263.49	258.01	253.66	249.34	245.06	240.83	236.66	232.56	228.52	224.55
28.00	DISCHG	220.65	216.80	212.99	209.20	205.44	201.70	197.98	194.29	190.62	186.97
30.00	DISCHG	183.35	179.75	176.19	172.65	169.13	165.68	162.25	159.09	155.94	154.75
32.00	DISCHG	152.61	150.43	149.25	146.06	143.88	141.70	139.52	137.36	135.20	133.05
34.00	DISCHG	130.91	128.79	126.68	124.59	122.51	120.46	118.42	116.41	114.42	112.45
36.00	DISCHG	110.51	108.59	106.69	104.82	102.97	101.15	99.35	97.56	95.79	94.01
38.00	DISCHG	92.26	90.53	88.81	87.12	85.44	83.78	82.14	80.53	78.94	77.36
40.00	DISCHG	76.48	75.99	75.49	74.99	74.48	73.98	73.47	72.96	72.45	71.94
42.00	DISCHG	71.42	70.91	70.40	69.88	69.37	68.85	68.34	67.83	67.32	66.81
44.00	DISCHG	66.30	64.27	61.96	48.61	36.15	28.55	23.56	20.32	18.17	16.72
[illegible]0	DISCHG	15.71	14.97	14.41	13.93	13.59	13.26	12.97	12.70	12.45	12.22
[illegible].00	DISCHG	11.99	11.77	11.56	11.36	11.17	10.92	10.79	10.61	10.44	10.27
50.00	DISCHG	10.11	9.95	9.79	9.64	9.50	9.35	9.21	9.05	8.94	8.82
52.00	DISCHG	8.69	8.57	8.45	8.33	8.21	8.10	7.99	7.88	7.78	7.68
54.00	DISCHG	7.58	7.48	7.38	7.29	7.20	7.11	7.02	6.93	6.85	6.76
56.00	DISCHG	6.68	6.60	6.52	6.44	6.37	6.29	6.22	6.15	6.08	6.01
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

RUNOFF VOLUME ABOVE BASEFLOW = 5.05 WATERSHED INCHES, 6602.47 C-S-HRS, 715.04 ACRE-FEET; BASEFLOW = .00 CFS

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OPERATION RESVOR STRUCTURE 6
INPUT HYDROGRAPH= 7 OUTPUT HYDROGRAPH= 1
SURFACE ELEVATION= 728.40

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
25.23	288.04	729.60
43.66	70.66	732.10
43.90	66.74	731.95

TIME(HRS) FIRST HYDROGRAPH POINT = .00 HOURS TIME INCREMENT = .20 HOURS DRAINAGE AREA = 4.40 SQ.MI.

6.00	DISCHG	.00	.00	.00	.00	.00	.01	.07	.22	.45	.78
6.00	ELEV	728.40	728.40	728.40	728.40	728.40	728.40	728.41	728.41	728.43	728.45
8.00	DISCHG	1.18	1.65	2.22	2.92	3.77	4.77	5.90	7.25	8.90	10.92
8.00	ELEV	728.48	728.51	728.55	728.60	728.65	728.73	728.81	728.90	729.01	729.15
10.00	DISCHG	13.40	16.42	20.10	24.73	30.72	46.27	59.18	75.19	101.43	173.28
10.00	ELEV	729.32	729.53	729.78	730.10	730.51	731.15	731.66	732.28	733.29	734.85
12.00	DISCHG	194.35	210.04	221.24	226.10	230.55	234.41	237.62	240.22	242.42	244.58
12.00	ELEV	735.27	735.75	736.10	736.27	736.43	736.56	736.67	736.76	736.84	736.91
14.00	DISCHG	246.84	248.00	249.05	250.11	251.19	252.28	253.36	254.44	255.50	256.55
14.00	ELEV	736.99	737.04	737.08	737.12	737.16	737.20	737.24	737.29	737.33	737.37
16.00	DISCHG	257.58	258.61	259.63	260.66	261.69	262.72	263.74	264.76	265.78	266.80
[illegible]	ELEV	737.41	737.45	737.49	737.53	737.57	737.61	737.65	737.69	737.73	737.77
[illegible]	DISCHG	267.80	268.80	269.78	270.74	271.69	272.61	273.52	274.41	275.27	276.12
18.00	ELEV	737.81	737.85	737.89	737.92	737.96	738.00	738.03	738.07	738.10	738.13
20.00	DISCHG	276.94	277.73	278.50	279.23	279.93	280.59	281.23	281.84	282.42	282.97
20.00	ELEV	738.17	738.20	738.23	738.25	738.28	738.31	738.33	738.36	738.38	738.40
22.00	DISCHG	283.49	283.99	284.46	284.90	285.31	285.70	286.06	286.40	286.71	287.00
22.00	ELEV	738.42	738.44	738.46	738.48	738.49	738.51	738.52	738.54	738.55	738.56
24.00	DISCHG	287.26	287.50	287.69	287.84	287.95	288.01	288.03	288.02	287.97	287.89
24.00	ELEV	738.57	738.59	738.59	738.59	738.60	738.60	738.60	738.60	738.60	738.59
26.00	DISCHG	287.78	287.65	287.48	287.30	287.09	286.86	286.61	286.35	286.06	285.75
26.00	ELEV	738.59	738.58	738.58	738.57	738.56	738.55	738.54	738.53	738.52	738.51
28.00	DISCHG	285.43	285.08	284.72	284.34	283.94	283.53	283.10	282.65	282.19	281.70
28.00	ELEV	738.50	738.48	738.47	738.45	738.44	738.42	738.41	738.39	738.37	738.35
30.00	DISCHG	281.21	280.69	280.16	279.62	279.06	278.48	277.89	277.29	276.67	276.05
30.00	ELEV	738.33	738.31	738.29	738.27	738.25	738.22	738.20	738.18	738.16	738.13
32.00	DISCHG	275.42	274.78	274.14	273.48	272.82	272.15	271.47	270.79	270.09	269.39
32.00	ELEV	738.11	738.08	738.06	738.03	738.00	737.98	737.95	737.93	737.90	737.87
34.00	DISCHG	268.68	267.97	267.25	266.52	265.78	265.04	264.29	263.53	262.77	262.00
34.00	ELEV	737.84	737.82	737.79	737.76	737.73	737.70	737.67	737.64	737.61	737.58
36.00	DISCHG	261.22	260.44	259.65	258.86	258.06	257.26	256.45	255.63	254.81	253.99
36.00	ELEV	737.55	737.52	737.49	737.46	737.43	737.40	737.37	737.33	737.30	737.27
38.00	DISCHG	253.16	252.33	251.49	250.65	249.80	248.95	248.09	247.23	245.42	243.45
38.00	ELEV	737.24	737.20	737.17	737.14	737.11	737.07	737.04	737.01	736.94	736.87
40.00	DISCHG	241.48	239.52	237.58	235.66	233.75	231.87	230.00	228.15	226.31	224.48
40.00	ELEV	736.80	736.74	736.67	736.60	736.54	736.47	736.41	736.34	736.28	736.21
42.00	DISCHG	222.68	220.88	219.11	213.62	205.27	197.39	189.92	55.90	69.83	66.55
[illegible]	ELEV	736.15	736.09	736.03	735.86	735.60	735.36	735.14	731.53	732.07	731.94

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44.00	DISCHG	66.55	65.03	62.74	53.83	40.26	31.51	28.52	24.91	21.80	19.42
44.00	ELEV	731.94	731.88	731.80	731.45	730.92	730.57	730.36	730.11	729.90	729.73
46.00	DISCHG	17.66	16.39	15.46	14.76	14.22	13.78	13.42	13.10	12.81	12.55
46.00	ELEV	729.61	729.53	729.46	729.41	729.38	729.35	729.32	729.30	729.28	729.26
48.00	DISCHG	12.31	12.07	11.85	11.64	11.43	11.24	11.04	10.86	10.68	10.50
48.00	ELEV	729.25	729.23	729.21	729.20	729.19	729.17	729.16	729.15	729.13	729.12
[illegible]0	DISCHG	10.33	10.17	10.00	9.85	9.70	9.55	9.40	9.26	9.12	8.99
50.00	ELEV	729.11	729.10	729.09	729.08	729.07	729.06	729.05	729.04	729.03	729.02
52.00	DISCHG	8.86	8.73	8.61	8.49	8.37	8.25	8.14	8.03	7.92	7.82
52.00	ELEV	729.01	729.00	728.99	728.98	728.98	728.97	728.96	728.95	728.94	728.94
54.00	DISCHG	7.71	7.61	7.51	7.42	7.32	7.23	7.14	7.05	6.96	6.88
54.00	ELEV	728.93	728.92	728.92	728.91	728.90	728.90	728.89	728.88	728.88	728.87
56.00	DISCHG	6.79	6.71	6.63	6.55	6.47	6.39	6.32	6.25	6.17	6.10
56.00	ELEV	728.87	728.86	728.86	728.85	728.84	728.84	728.83	728.83	728.82	728.82
58.00	DISCHG	6.03	5.96	5.90	5.83	5.76	5.70	5.64	5.58	5.51	5.45
58.00	ELEV	728.81	728.81	728.81	728.80	728.80	728.79	728.79	728.78	728.78	728.77

RUNOFF VOLUME ABOVE BASEFLOW = 3.05 WATERSHED INCHES, 8648.27 CFS-HRS, 714.69 ACRE-FEET; BASEFLOW = .00 CFS

OPERATION RUNOFF CROSS SECTION 30
OUTPUT HYDROGRAPH= 6
AREA= .28 SQ MI INPUT RUNOFF CURVE= 83. TIME OF CONCENTRATION= 1.27 HOURS
INTERNAL HYDROGRAPH TIME INCREMENT= .1693 HOURS

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
12.77	253.15	(RUNOFF)
23.52	12.06	(RUNOFF)

TIME(HRS) FIRST HYDROGRAPH POINT = .00 HOURS TIME INCREMENT = .20 HOURS DRAINAGE AREA = .28 SQ.MI.

4.00	DISCHG	.00	.00	.00	.00	.00	.00	.00	.00	.02	.05
[illegible]00	DISCHG	.12	.23	.40	.62	.89	1.21	1.55	1.92	2.30	2.70
[illegible]00	DISCHG	3.10	3.52	4.02	4.58	5.23	5.94	6.71	7.53	8.42	9.40
10.00	DISCHG	10.45	11.60	12.92	14.49	16.49	19.04	22.39	26.78	35.02	57.14
12.00	DISCHG	102.81	156.48	209.03	246.55	252.93	240.76	224.67	205.62	184.60	162.20
14.00	DISCHG	138.81	114.82	90.61	68.50	52.80	44.81	40.15	36.49	33.64	31.35
16.00	DISCHG	29.45	27.89	26.70	25.74	24.90	24.12	23.36	22.64	22.02	21.47
18.00	DISCHG	20.91	20.30	19.64	19.92	18.27	17.72	17.28	16.92	16.64	16.38
20.00	DISCHG	16.05	15.65	15.16	14.63	14.14	13.70	13.32	12.99	12.71	12.47
22.00	DISCHG	12.29	12.16	12.08	12.05	12.09	12.05	12.05	12.06	12.06	12.03
24.00	DISCHG	11.85	11.35	10.45	9.18	7.7	6.25	4.94	3.78	2.79	1.96
26.00	DISCHG	1.27	.73	.34	.11	.02					

RUNOFF VOLUME ABOVE BASEFLOW = 4.09 WATERSHED INCHES, 739.96 CFS-HRS, 61.15 ACRE-FEET; BASEFLOW = .00 CFS

OPERATION ADDHYD CROSS SECTION 31
INPUT HYDROGRAPHS= 1,6 OUTPUT HYDROGRAPH= 7

1

PEAK TIME HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
12.81	493.52	(NULL)
23.95	299.12	(NULL)
43.[illegible]	70.60	(NULL)
43.90	66.74	(NULL)

TIME(HRS) FIRST HYDROGRAPH POINT = [illegible] TIME INCREMENT = [illegible] DRAINAGE AREA = [illegible]

6.00	DISCHG	.12	.23	.40	.62	.89	1.22	1.63	2.14	2.76	3.48
8.00	DISCHG	4.28	5.18	6.24	7.50	9.00	10.70	12.61	14.78	17.31	20.32
10.00	DISCHG	23.85	28.02	33.02	39.22	47.21	65.31	81.56	101.97	136.45	230.41
12.00	DISCHG	297.16	366.52	430.27	472.65	483.48	475.17	462.29	445.83	427.02	406.78
14.00	DISCHG	385.65	362.82	339.66	318.61	303.99	297.09	293.51	290.93	289.14	287.90
16.00	DISCHG	287.03	286.50	286.33	286.40	286.59	286.83	287.10	287.40	287.80	288.27
18.00	DISCHG	288.71	289.10	289.42	289.66	289.96	290.34	290.80	291.33	291.92	292.50
[illegible]	DISCHG	292.99	293.38	293.66	293.86	294.07	294.30	294.55	294.83	295.12	295.44
22.00	DISCHG	295.78	296.15	296.54	296.94	297.36	297.75	298.11	298.45	298.77	299.03
24.00	DISCHG	299.11	298.85	298.14	297.02	295.66	294.26	292.98	291.80	290.77	289.85
26.00	DISCHG	289.05	288.38	287.82	287.41	287.11	286.86	286.61	286.35	286.06	285.75
28.00	DISCHG	285.43	285.08	284.72	284.34	283.94	283.53	283.10	282.65	282.19	281.70
30.00	DISCHG	281.21	280.69	280.16	279.62	279.05	278.48	277.89	277.29	276.67	276.05
32.00	DISCHG	275.42	274.78	274.14	273.48	272.82	272.15	271.47	270.79	270.09	269.39
34.00	DISCHG	268.68	267.97	267.25	266.52	265.73	265.04	264.29	263.53	262.77	262.00
36.00	DISCHG	261.22	260.44	259.65	258.86	258.05	257.26	256.45	255.63	254.81	253.99
38.00	DISCHG	253.16	252.33	251.49	250.65	249.80	248.95	248.09	247.23	245.42	243.45
40.00	DISCHG	241.48	239.52	237.58	235.66	233.76	231.87	230.00	228.15	226.31	224.48
42.00	DISCHG	222.68	220.88	219.11	213.62	205.27	197.39	189.92	55.90	69.83	66.55
44.00	DISCHG	66.55	65.03	62.74	53.83	40.26	31.51	28.52	24.91	21.80	19.42
46.00	DISCHG	17.66	16.39	15.46	14.76	14.22	13.78	13.42	13.10	12.81	12.55
48.00	DISCHG	12.31	12.07	11.85	11.64	11.43	11.24	11.04	10.86	10.68	10.50
50.00	DISCHG	10.33	10.17	10.00	9.85	9.70	9.55	9.40	9.26	9.12	8.99
52.00	DISCHG	8.86	8.73	8.61	8.49	8.37	8.25	8.14	8.03	7.92	7.82
54.00	DISCHG	7.71	7.61	7.51	7.42	7.32	7.23	7.14	7.05	6.96	6.88
56.00	DISCHG	6.79	6.71	6.63	6.55	6.47	6.39	6.32	6.25	6.17	6.10
58.00	DISCHG	6.03	5.96	5.90	5.83	5.76	5.70	5.64	5.58	5.51	5.45

RUNOFF VOLUME ABOVE BASEFLOW = 3.11 WATERSHED INCHES, 9388.23 CFS-HRS, 775.84 ACRE-FEET; BASEFLOW = .00 CFS

EXECUTIVE CONTROL OPERATION ENDCMP RECORD ID

\+ COMPUTATIONS COMPLETED FOR PASS 1

106-4R
Full input

1

TR20 XEQ 06-21-94 17:58 OWOSSO DRAIN - FPMS - SHIAWASSEE CO.MI. 06-20-94 JOB 1 PASS 2
REV PC 09/83(.2) EXISTING CONDITIONS-24 HOUR TYPE II STORM DISTRIBUTION PAGE 26

EXECUTIVE CONTROL OPERATION COMPUT RECORD ID

\+ FROM XSECTION 1

\+ TO XSECTION 31

STARTING TIME = .00 RAIN DEPTH = 4.85 RAIN DURATION= 1.00 RAIN TABLE NO.= 2 ANT. MOIST. COND= 2
ALTERNATE NO.= 1 STORM NO.= 2 MAIN TIME INCREMENT = .20 HOURS

50

OPERATION RUNOFF CROSS SECTION 1
OUTPUT HYDROGRAPH= 7
AREA= .58 SQ MI INPUT RUNOFF CURVE= 71. TIME OF CONCENTRATION= 1.14 HOURS
INTERNAL HYDROGRAPH TIME INCREMENT= .1500 HOURS

PEAK TIME(HRS)	PEAK DISCHARGE (CFS)	PEAK ELEVATION(FEET)
12.69	209.89	(RUNOFF)
23.56	16.18	(RUNOFF)

TIME(HRS) FIRST HYDROGRAPH POINT = .00 HOURS TIME INCREMENT = .20 HOURS DRAINAGE AREA = .58 SQ.MI.

8.00	DISCHG	.00	.00	.00	.00	.00	.00	.00	.00	.00	.01
10.00	DISCHG	.07	.23	[illegible]	[illegible]	2.14	3.64	5.74	8.64	15.39	[illegible]

16.00	DISCHG	36.05	34.48	33.29	32.37	31.01	30.65	29.74	28.87	28.15	27.55
18.00	DISCHG	26.88	26.09	25.18	24.24	23.45	22.81	22.33	21.94	21.62	21.36
20.00	DISCHG	20.97	20.46	19.81	19.06	18.40	17.82	17.33	16.91	16.58	16.33
22.00	DISCHG	16.17	16.08	16.08	16.09	16.11	16.13	16.14	16.16	16.18	16.14
24.00	DISCHG	15.90	15.07	13.59	11.61	9.35	7.30	5.50	3.95	2.68	1.65
26.00	DISCHG	.86	.36	.09	.00						

RUNOFF VOLUME ABOVE BASEFLOW = 2.01 WATERSHED INCHES, 751.41 CFS-HRS, 62.10 ACRE-FEET; BASEFLOW = .00 CFS

OPERATION RUNOFF CROSS SECTION 2
OUTPUT HYDROGRAPH= 6
AREA= .24 SQ MI INPUT RUNOFF CURVE= 70. TIME OF CONCENTRATION= .63 HOURS
INTERNAL HYDROGRAPH TIME INCREMENT= .0840 HOURS

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
12.39	161.74	(RUNOFF)
19.59	8.56	(RUNOFF)
23.54	6.58	(RUNOFF)

TIME(HRS) FIRST HYDROGRAPH POINT = .00 HOURS TIME INCREMENT = .20 HOURS DRAINAGE AREA = .24 SQ.MI.

10.00	DISCHG	.00	.06	.25	.63	1.29	2.28	3.71	5.65	10.00	27.27
12.00	DISCHG	82.98	146.71	161.69	142.78	117.12	88.04	58.86	39.93	33.32	29.04
14.00	DISCHG	25.64	23.00	20.91	19.10	17.49	16.19	15.29	14.63	13.97	13.37
16.00	DISCHG	12.97	12.70	12.53	12.40	12.10	11.60	11.18	10.87	10.66	10.53
18.00	DISCHG	10.26	9.77	9.31	8.95	8.70	8.57	8.53	8.55	8.56	8.54
20.00	DISCHG	8.29	7.78	7.30	6.93	6.68	6.53	6.49	6.50	6.50	6.51
22.00	DISCHG	6.52	6.53	6.53	6.54	6.55	6.55	6.56	6.57	6.57	6.55
24.00	DISCHG	6.26	5.34	3.88	2.44	1.34	.58	.15	.01		

1

RUNOFF VOLUME ABOVE BASEFLOW = 1.93 WATERSHED INCHES, 298.66 CFS-HRS, 24.68 ACRE-FEET; BASEFLOW = .00 CFS

OPERATION ADDHYD CROSS SECTION 3
INPUT HYDROGRAPHS= 7,6 OUTPUT HYDROGRAPH= 3

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
12.59	408.01	(NULL)
23.55	22.75	(NULL)

RUNOFF VOLUME ABOVE BASEFLOW = 1.98 WATERSHED INCHES, 1050.07 CFS-HRS, 86.78 ACRE-FEET; BASEFLOW = .00 CFS

OPERATION RUNOFF CROSS SECTION 4
OUTPUT HYDROGRAPH= 7
AREA= .23 SQ MI INPUT RUNOFF CURVE= 75. TIME OF CONCENTRATION= .70 HOURS
INTERNAL HYDROGRAPH TIME INCREMENT= .0933 HOURS

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
12.42	181.02	(RUNOFF)
19.57	9.07	(RUNOFF)
23.54	6.92	(RUNOFF)

TIME(HRS) FIRST HYDROGRAPH POINT = .00 HOURS TIME INCREMENT = .20 HOURS DRAINAGE AREA = .22 SQ.MI.

8.00	DISCHG	.00	.00	.00	.00	.01	.04	.15	.35	.63	[illegible]
10.00	DISCHG	1.43	1.93	2.53	3.31	4.39	5.85	7.77	10.28	15.85	34.39
[illegible]	DISCHG	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

16.00	DISCHG	14.04	13.71	13.49	13.30	12.98	12.50	12.06	11.72	11.46	11.27
18.00	DISCHG	10.97	10.51	10.04	9.66	9.37	9.17	9.07	9.06	9.07	9.05
20.00	DISCHG	8.82	8.37	7.88	7.49	7.19	6.99	6.88	6.86	6.87	6.87
22.00	DISCHG	6.88	6.88	6.89	6.89	6.90	6.91	6.91	6.92	6.92	6.90
24.00	DISCHG	6.65	5.82	4.48	3.03	1.86	.98	.39	.09	.00	

RUNOFF VOLUME ABOVE BASEFLOW = 2.33 WATERSHED INCHES, 345.96 CFS-HRS, 28.59 ACRE-FEET; BASEFLOW = .00 CFS

OPERATION RESVOR STRUCTURE 1
INPUT HYDROGRAPH= 7 OUTPUT HYDROGRAPH= 1
SURFACE ELEVATION= 736.20

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
13.77	34.50	743.41
23.63	6.92	737.50

TIME(HRS) FIRST HYDROGRAPH POINT = .00 HOURS TIME INCREMENT = .20 HOURS DRAINAGE AREA = .23 SQ.MI.

8.00	DISCHG	.00	.00	.00	.00	.00	.01	.06	.17	.36	.62
8.00	ELEV	736.20	736.20	736.20	736.20	736.20	736.20	736.21	736.23	736.27	736.32
10.00	DISCHG	.97	1.38	1.88	2.49	3.28	4.36	5.79	7.68	10.83	19.36
10.00	ELEV	736.38	736.46	736.55	736.67	736.82	737.02	737.29	737.64	738.23	739.83

12.00	DISCHG	32.11	32.58	33.28	33.77	34.04	34.25	34.39	34.47	34.49	34.50
12.00	ELEV	742.26	742.49	742.84	743.08	743.20	743.29	743.36	743.39	743.41	743.41
[illegible]	DISCHG	34.49	34.48	34.45	34.43	34.39	34.36	34.32	34.28	34.24	34.19
[illegible]	ELEV	743.41	743.40	743.39	743.38	743.36	743.34	743.33	743.31	743.29	743.27
16.00	DISCHG	34.15	34.10	34.06	34.01	33.96	33.91	33.87	33.82	33.77	33.71
16.00	ELEV	743.25	743.23	743.21	743.19	743.16	743.14	743.12	743.10	743.08	743.05
18.00	DISCHG	33.66	33.61	33.51	33.39	33.26	33.14	33.02	32.89	32.77	32.65
18.00	ELEV	743.03	743.01	742.95	742.89	742.83	742.77	742.71	742.65	742.58	742.52
20.00	DISCHG	32.53	32.40	32.28	32.15	32.02	20.14	12.42	9.17	7.82	7.27
20.00	ELEV	742.46	742.40	742.34	742.28	742.21	739.98	738.53	737.92	737.67	737.56
22.00	DISCHG	7.04	6.95	6.91	6.90	6.90	6.90	6.91	6.91	6.92	6.91
22.00	ELEV	737.52	737.50	737.50	737.49	737.49	737.49	737.49	737.50	737.50	737.50
24.00	DISCHG	6.83	6.48	5.70	4.56	3.33	2.21	1.32	.69	.31	.13
24.00	ELEV	737.48	737.42	737.27	737.06	736.82	736.61	736.45	736.33	736.26	736.22
26.00	DISCHG	.05	.02	.01	.00						
26.00	ELEV	736.21	736.20	736.20	736.20						

RUNOFF VOLUME ABOVE BASEFLOW = 2.33 WATERSHED INCHES, 345.81 CFS-HRS, 28.58 ACRE-FEET; BASEFLOW = .00 CFS

OPERATION ADDHYD CROSS SECTION 5
INPUT HYDROGRAPHS= 1,3 OUTPUT HYDROGRAPH= 4

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
12.60	441.78	(NULL)
23.56	24.67	(NULL)

RUNOFF VOLUME ABOVE BASEFLOW = 2.06 WATERSHED INCHES, 1395.88 CFS-HRS, 115.36 ACRE-FEET; BASEFLOW = .00 CFS

OPERATION RUNOFF CROSS SECTION 6
OUTPUT HYDROGRAPH= 7
AREA= .36 SQ MI INPUT RUNOFF CURVE= 79. TIME OF CONCENTRATION= 1.96 HOURS
INTERNAL HYDROGRAPH TIME INCREMENT= .167 HOURS

TIME(HRS) FIRST HYDROGRAPH POINT = .00 HOURS TIME INCREMENT = .20 HOURS DRAINAGE AREA = .36 SQ.MI.

6.00	DISCHG	.00	.00	.00	.00	.00	.00	.00	.00	.00	.01
8.00	DISCHG	.02	.05	.11	.20	.33	.50	.73	1.02	1.37	1.77
10.00	DISCHG	2.24	2.78	3.42	4.17	5.10	6.25	7.69	9.60	13.05	21.15
12.00	DISCHG	38.28	58.91	80.58	102.75	124.50	143.41	151.70	151.17	147.67	142.79
[illegible]	DISCHG	136.86	130.06	122.59	114.56	106.07	97.22	88.10	78.76	69.28	59.72
16.00	DISCHG	50.30	41.52	34.97	31.34	29.10	27.38	25.95	24.75	23.71	22.81
18.00	DISCHG	21.99	21.26	20.59	19.96	19.36	18.77	18.22	17.73	17.30	16.92
20.00	DISCHG	16.53	16.13	15.72	15.30	14.86	14.42	14.00	13.62	13.27	12.97
22.00	DISCHG	12.71	12.49	12.30	12.13	11.98	11.86	11.75	11.66	11.60	11.53
24.00	DISCHG	11.42	11.20	10.84	10.32	9.65	8.83	7.90	6.95	6.05	5.22
26.00	DISCHG	4.46	3.75	3.10	2.52	1.99	1.53	1.13	.79	.51	.29

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28.00	DISCHG	.14	.05	.01

RUNOFF VOLUME ABOVE BASEFLOW = 2.67 WATERSHED INCHES, 621.18 CFS-HRS, 51.33 ACRE-FEET; BASEFLOW = .00 CFS

OPERATION ADDHYD CROSS SECTION 7
INPUT HYDROGRAPHS= 4,7 OUTPUT HYDROGRAPH= 5

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
12.68	548.58	(NULL)

[illegible]OFF VOLUME ABOVE BASEFLOW = 2.22 WATERSHED INCHES, 2017.05 CFS-HRS, 166.69 ACRE-FEET; BASEFLOW = .00 CFS

OPERATION RESVOR STRUCTURE 2
INPUT HYDROGRAPH= 5 OUTPUT HYDROGRAPH= 7
SURFACE ELEVATION= 736.20

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
13.76	376.96	742.68

TIME(HRS) FIRST HYDROGRAPH POINT = .00 HOURS TIME INCREMENT = .20 HOURS DRAINAGE AREA = 1.41 SQ.MI.

8.00	DISCHG	.00	.00	.00	.00	.01	.02	.03	.04	.07	.10
8.00	ELEV	736.20	736.20	736.20	736.20	736.22	736.24	736.27	736.32	736.38	736.47
10.00	DISCHG	.29	.55	.90	1.36	2.00	2.88	4.10	5.78	8.30	13.26
10.00	ELEV	736.50	736.52	736.55	736.59	736.64	736.71	736.82	736.96	737.17	737.59
12.00	DISCHG	24.90	48.25	80.87	115.42	177.41	265.72	324.17	357.94	373.76	376.78
12.00	ELEV	738.56	739.89	741.12	742.08	742.43	742.54	742.61	742.66	742.68	742.68
14.00	DISCHG	369.91	355.28	335.15	312.44	290.05	269.10	249.59	231.45	214.52	198.62
14.00	ELEV	742.67	742.65	742.63	742.60	742.57	742.54	742.52	742.50	742.47	742.45
16.00	DISCHG	183.66	170.57	162.67	155.01	147.89	141.36	135.37	129.90	124.92	120.70
16.00	ELEV	742.43	742.41	742.39	742.36	742.33	742.31	742.29	742.27	742.25	742.23
18.00	DISCHG	118.58	116.47	114.36	112.26	110.16	108.11	106.11	104.18	102.34	100.57
18.00	ELEV	742.17	742.11	742.06	742.00	741.94	741.88	741.83	741.77	741.72	741.67
20.00	DISCHG	98.87	97.19	95.52	93.85	92.19	90.09	87.29	84.22	81.15	78.20
20.00	ELEV	741.62	741.58	741.53	741.49	741.44	741.38	741.30	741.22	741.13	741.05
[illegible]	DISCHG	75.42	72.81	70.22	67.86	65.59	63.57	61.72	60.04	58.49	57.04
[illegible]	ELEV	740.97	740.90	740.83	740.75	740.67	740.59	740.50	740.43	740.36	740.29
24.00	DISCHG	55.69	54.33	52.81	51.04	48.99	46.69	44.22	41.65	39.05	36.47
24.00	ELEV	740.23	740.17	740.10	740.02	739.93	739.82	739.71	739.60	739.48	739.36
26.00	DISCHG	33.96	31.59	29.57	27.65	25.79	24.04	22.39	20.84	19.37	17.99
[illegible]	ELEV	739.25	739.13	739.06	738.79	738.64	738.49	738.35	738.22	738.10	737.98
[illegible]	DISCHG	16.70	15.50	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	9.86	[illegible]	[illegible]

30.00	DISCHG	7.87	7.30	6.77	6.27	5.82	5.40	5.01	4.64	4.30	3.77
30.00	ELEV	737.13	737.08	737.04	737.00	736.96	736.92	736.89	736.86	736.83	736.81
32.00	DISCHG	3.70	3.43	3.18	2.95	2.74	2.54	2.36	2.18	2.03	1.88
32.00	ELEV	736.78	736.76	736.74	736.72	736.70	736.68	736.67	736.66	736.64	736.63
34.00	DISCHG	1.74	1.62	1.50	1.39	1.29	1.20	1.11	1.03	.95	.88
34.00	ELEV	736.62	736.61	736.60	736.59	736.58	736.57	736.56	736.56	736.55	736.55

36.00	DISCHG	.82	.76	.71	.65	.61	.56	.52	.48	.45	.42
36.00	ELEV	736.54	736.54	736.53	736.53	736.52	736.52	736.52	736.51	736.51	736.51
38.00	DISCHG	.39	.36	.33	.31	.29	.26	.25	.23	.21	.20
38.00	ELEV	736.50	736.50	736.50	736.50	736.50	736.49	736.49	736.49	736.49	736.49
40.00	DISCHG	.18	.17	.16	.14	.13	.12	.12	.11	.10	.10
40.00	ELEV	736.49	736.49	736.48	736.48	736.48	736.48	736.48	736.48	736.48	736.48
42.00	DISCHG	.10	.10	.09	.09	.09	.09	.09	.09	.08	.08
42.00	ELEV	736.47	736.47	736.46	736.46	736.45	736.45	736.45	736.44	736.44	736.43
44.00	DISCHG	.08	.08	.08	.08	.08	.08	.07	.07	.07	.07
44.00	ELEV	736.43	736.43	736.42	736.42	736.41	736.41	736.41	736.40	736.40	736.40
46.00	DISCHG	.07	.07	.07	.07	.06	.06	.06	.06	.06	.06
46.00	ELEV	736.39	736.39	736.39	736.38	736.38	736.38	736.38	736.37	736.37	736.37
48.00	DISCHG	.06	.06	.06	.06	.06	.05	.05	.05	.05	.05
48.00	ELEV	736.36	736.36	736.36	736.36	736.35	736.35	736.35	736.35	736.34	736.34
50.00	DISCHG	.05	.05	.05	.05	.05	.05	.05	.04	.04	.04
50.00	ELEV	736.34	736.34	736.34	736.33	736.33	736.33	736.33	736.32	736.32	736.32
52.00	DISCHG	.04	.04	.04	.04	.04	.04	.04	.04	.04	.04
52.00	ELEV	736.32	736.32	736.31	736.31	736.31	736.31	736.31	736.31	736.30	736.30
54.00	DISCHG	.04	.04	.03	.03	.03	.03	.03	.03	.03	.03
54.00	ELEV	736.30	736.30	736.30	736.30	736.29	736.29	736.29	736.29	736.29	736.29
56.00	DISCHG	.03	.03	.03	.03	.03	.03	.03	.03	.03	.03
56.00	ELEV	736.29	736.28	736.28	736.28	736.28	736.28	736.28	736.28	736.27	736.27
58.00	DISCHG	.03	.03	.02	.02	.02	.02	.02	.02	.02	.02
58.00	ELEV	736.27	736.27	736.27	736.27	736.27	736.27	736.27	736.26	736.26	736.26

RUNOFF VOLUME ABOVE BASEFLOW = 2.22 WATERSHED INCHES, 2017.19 CFS-HRS, 166.70 ACRE-FEET; BASEFLOW = .00 CFS

OPERATION REACH CROSS SECTION 8
INPUT HYDROGRAPH= 7 OUTPUT HYDROGRAPH= 3
LENGTH = 4800.00 FEET INPUT = RATING CURVE REPRESENTATIVE OF REACH
COEFFICIENTS USED IN ROUTING RELATED TO CROSS SECTION AREA, X= .24 M= 1.04
MODIFIED ATT-KIN ROUTING COEFFICIENT = .05 PEAK TRAVEL TIME = 4.26 HOURS

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
17.94	161.05	738.06

RUNOFF VOLUME ABOVE BASEFLOW = 2.22 WATERSHED INCHES, 2016.09 CFS-HRS, 166.61 ACRE-FEET; BASEFLOW = .00 CFS

OPERATION RUNOFF CROSS SECTION 9
OUTPUT HYDROGRAPH= 6
AREA= .52 SQ MI INPUT RUNOFF CURVE= 72. TIME OF CONCENTRATION= 1.62 HOURS
INTERNAL HYDROGRAPH TIME INCREMENT= .2160 HOURS

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
13.07	190.41	(RUNOFF)
23.57	14.76	(RUNOFF)

RUNOFF VOLUME ABOVE BASEFLOW = 2.09 WATERSHED INCHES, 700.04 CFS-HRS, 57.85 ACRE-FEET; BASEFLOW = .00 CFS

OPERATION ADDHYD CROSS SECTION 10
INPUT HYDROGRAPHS= 3,6 OUTPUT HYDROGRAPH= 5

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
13.07	193.29	(NULL)
17.58	188.11	(NULL)

RUNOFF VOLUME ABOVE BASEFLOW = 2.18 WATERSHED INCHES, 2716.13 CFS-HRS, 224.46 ACRE-FEET; BASEFLOW = .00 CFS

OPERATION RUNOFF CROSS SECTION 11
OUTPUT HYDROGRAPH= 6
AREA= .44 SQ MI INPUT RUNOFF CURVE= 70. TIME OF CONCENTRATION= 1.27 HOURS
INTERNAL HYDROGRAPH TIME INCREMENT= .1693 HOURS

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
12.84	177.46	(RUNOFF)
23.57	12.02	(RUNOFF)

TIME(HRS) FIRST HYDROGRAPH POINT = .00 HOURS TIME INCREMENT = .20 HOURS DRAINAGE AREA = .44 SQ.MI.

10.00	DISCHG	.00	.04	.15	.39	.86	1.59	2.73	4.59	6.55	21.53
12.00	DISCHG	53.21	92.67	133.49	166.50	177.14	172.74	164.76	153.97	141.16	126.80
14.00	DISCHG	111.20	94.68	77.45	60.88	48.33	41.53	37.42	34.18	31.64	29.59
16.00	DISCHG	27.88	26.48	25.41	24.56	23.81	23.12	22.43	21.78	21.22	20.73
18.00	DISCHG	20.22	19.67	19.05	18.38	17.71	17.27	16.85	16.53	16.28	16.04
20.00	DISCHG	15.74	15.35	14.90	14.39	13.92	13.50	13.14	12.82	12.55	12.33
22.00	DISCHG	12.16	12.04	11.98	11.96	11.96	11.98	11.99	12.00	12.02	11.99
24.00	DISCHG	11.82	11.33	10.44	9.17	7.70	6.25	4.94	3.72	2.80	1.96
26.00	DISCHG	1.27	.73	.34	.11	.02					

RUNOFF VOLUME ABOVE BASEFLOW = 1.93 WATERSHED INCHES, 547.29 CFS-HRS, 45.23 ACRE-FEET; BASEFLOW = .00 CFS

OPERATION RESVOR STRUCTURE 3
INPUT HYDROGRAPH= 6 OUTPUT HYDROGRAPH= 1
SURFACE ELEVATION= 760.80

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
18.76	17.91	762.36

TIME(HRS) FIRST HYDROGRAPH POINT = .00 HOURS TIME INCREMENT = .20 HOURS DRAINAGE AREA = .44 SQ.MI.

10.00	DISCHG	.00	.00	.02	.07	.18	.38	.73	1.30	1.35	1.47
10.00	ELEV	760.80	760.80	760.81	760.84	760.90	761.00	761.19	761.50	761.50	761.51
12.00	DISCHG	1.80	2.45	3.46	4.80	6.34	7.86	9.33	10.70	11.95	13.06
12.00	ELEV	761.53	761.56	761.61	761.68	761.76	761.84	761.91	761.99	762.05	762.11
14.00	DISCHG	14.03	14.94	15.49	15.93	16.33	16.59	16.80	16.98	17.12	17.24
14.00	ELEV	762.16	762.20	762.23	762.26	762.29	762.29	762.30	762.31	762.32	762.32
16.00	DISCHG	17.35	17.44	17.52	17.58	17.64	17.70	17.74	17.78	17.82	17.85
16.00	ELEV	762.33	762.33	762.34	762.34	762.34	762.35	762.35	762.35	762.35	762.35

1

18.00	ELEV	762.36	762.36	762.36	762.36	762.35	762.36	762.36	762.36	762.36	762.36
20.00	DISCHG	17.84	17.82	17.80	17.77	17.73	17.70	17.66	17.62	17.57	17.52
20.00	ELEV	762.35	762.35	762.35	762.35	762.35	762.35	762.34	762.34	762.34	762.34
22.00	DISCHG	17.48	17.43	17.38	17.33	17.23	17.23	17.18	17.13	17.09	17.04
22.00	ELEV	762.34	762.33	762.33	762.33	762.33	762.32	762.32	762.32	762.32	762.31
24.00	DISCHG	16.99	16.95	16.89	16.83	16.75	16.66	16.56	16.45	16.33	16.20
24.00	ELEV	762.31	762.31	762.31	762.30	762.30	762.29	762.29	762.28	762.28	762.27
[illegible]0	DISCHG	16.07	15.93	15.79	15.65	15.50	15.36	15.22	15.08	14.95	14.81
26.00	ELEV	762.26	762.26	762.25	762.24	762.23	762.23	762.22	762.21	762.20	762.20
28.00	DISCHG	14.67	14.54	14.41	14.28	14.15	14.02	13.89	13.76	13.64	13.51
28.00	ELEV	762.19	762.18	762.18	762.17	762.16	762.16	762.15	762.14	762.14	762.13
30.00	DISCHG	13.39	13.27	13.15	13.03	12.91	12.79	12.67	12.56	12.44	12.33
30.00	ELEV	762.12	762.12	762.11	762.11	762.10	762.09	762.09	762.08	762.08	762.07
32.00	DISCHG	12.22	12.10	11.99	11.88	11.78	11.67	11.56	11.46	11.35	11.25
32.00	ELEV	762.06	762.06	762.05	762.05	762.04	762.04	762.03	762.02	762.02	762.01
34.00	DISCHG	11.15	11.04	10.94	10.84	10.74	10.65	10.55	10.45	10.36	10.26
34.00	ELEV	762.01	762.00	762.00	761.99	761.99	761.98	761.98	761.97	761.97	761.96
36.00	DISCHG	10.17	10.08	9.98	9.89	9.80	9.71	9.63	9.54	9.45	9.36
36.00	ELEV	761.96	761.95	761.95	761.94	761.94	761.93	761.93	761.93	761.92	761.92
38.00	DISCHG	9.28	9.19	9.11	9.03	8.94	8.86	8.78	8.70	8.62	8.54
38.00	ELEV	761.91	761.91	761.90	761.90	761.89	761.89	761.89	761.88	761.88	761.87
40.00	DISCHG	8.47	8.39	8.31	8.24	8.16	8.09	8.01	7.94	7.87	7.80
40.00	ELEV	761.87	761.87	761.86	761.86	761.85	761.85	761.85	761.84	761.84	761.84
42.00	DISCHG	7.72	7.65	7.58	7.51	7.45	7.38	7.31	7.24	7.18	7.11
42.00	ELEV	761.83	761.83	761.82	761.82	761.82	761.81	761.81	761.81	761.80	761.80
44.00	DISCHG	7.05	6.98	6.92	6.86	6.79	6.73	6.67	6.61	6.55	6.49
44.00	ELEV	761.80	761.79	761.79	761.79	761.78	761.78	761.78	761.77	761.77	761.77
46.00	DISCHG	6.43	6.37	6.31	6.26	6.20	6.14	6.09	6.03	5.98	5.92
46.00	ELEV	761.76	761.76	761.76	761.76	761.75	761.75	761.75	761.74	761.74	761.74
48.00	DISCHG	5.87	5.81	5.76	5.71	5.66	5.60	5.55	5.50	5.45	5.40
48.00	ELEV	761.74	761.73	761.73	761.73	761.72	761.72	761.72	761.72	761.71	761.71
50.00	DISCHG	5.35	5.30	5.26	5.21	5.16	5.11	5.07	5.02	4.97	4.93
[illegible]00	ELEV	761.71	761.71	761.70	761.70	761.70	761.70	761.69	761.69	761.69	761.69
[illegible]00	DISCHG	4.88	4.84	4.80	4.75	4.71	4.66	4.62	4.58	4.54	4.50
52.00	ELEV	761.69	761.68	761.68	761.68	761.68	761.67	761.67	761.67	761.67	761.67
54.00	DISCHG	4.46	4.42	4.37	4.34	4.30	4.26	4.22	4.18	4.14	4.10
54.00	ELEV	761.66	761.66	761.66	761.66	761.65	761.65	761.65	761.65	761.65	761.64
56.00	DISCHG	4.07	4.03	3.99	3.96	3.92	3.88	3.85	3.81	3.78	3.74
56.00	ELEV	761.64	761.64	761.64	761.64	761.64	761.63	761.63	761.63	761.63	761.63
58.00	DISCHG	3.71	3.68	3.64	3.61	3.58	3.54	3.51	3.48	3.45	3.42
58.00	ELEV	761.62	761.62	761.62	761.62	761.62	761.62	761.61	761.61	761.61	761.61

RUNOFF VOLUME ABOVE BASEFLOW = 1.76 WATERSHED INCHES, 499.99 CFS-HRS, 41.32 ACRE-FEET; BASEFLOW = .00 CFS

OPERATION ADDHYD CROSS SECTION 12
INPUT HYDROGRAPHS= 5,1 OUTPUT HYDROGRAPH= 7

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PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
13.09	201.78	(NULL)
17.60	205.93	(NULL)

RUNOFF VOLUME ABOVE BASEFLOW = 2.10 WATERSHED INCHES, 3216.12 CFS-HRS, 265.78 ACRE-FEET; BASEFLOW = .00 CFS

OPERATION RUNOFF CROSS SECTION 13
[illegible]

INTERNAL HYDROGRAPH TIME INCREMENT= .1667 HOURS

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
13.13	170.19	(RUNOFF)

TIME(HRS) FIRST HYDROGRAPH POINT = .00 HOURS TIME INCREMENT = .20 HOURS DRAINAGE AREA = .46 SQ.MI.

8.00	DISCHG	.00	.00	.00	.00	.00	.00	.00	.01	.04	.12
[illegible]	DISCHG	.24	.45	.78	1.25	1.93	2.87	4.16	5.98	9.56	20.06
[illegible]	DISCHG	41.47	68.79	97.72	127.30	154.49	169.19	169.92	166.03	160.20	152.77
14.00	DISCHG	144.10	134.43	123.95	112.79	101.09	88.95	76.54	63.98	51.99	43.10
16.00	DISCHG	38.35	35.40	33.05	31.15	29.61	28.32	27.21	26.24	25.36	24.59
18.00	DISCHG	23.88	23.21	22.56	21.90	21.22	20.58	20.03	19.54	19.11	18.71
20.00	DISCHG	18.31	17.89	17.45	16.97	16.44	15.93	15.48	15.08	14.75	14.47
22.00	DISCHG	14.21	13.99	13.80	13.63	13.50	13.40	13.33	13.30	13.29	13.28
24.00	DISCHG	13.18	12.86	12.30	11.53	10.46	9.25	7.96	6.80	5.72	4.72
26.00	DISCHG	3.83	3.02	2.31	1.70	1.18	.75	.42	.19	.05	.00

RUNOFF VOLUME ABOVE BASEFLOW = 2.16 WATERSHED INCHES, 542.60 CFS-HRS, 53.10 ACRE-FEET; BASEFLOW = .00 CFS

OPERATION RUNOFF CROSS SECTION 14
OUTPUT HYDROGRAPH= 5
AREA= .19 SQ MI INPUT RUNOFF CURVE= 61. TIME OF CONCENTRATION= .51 HOURS
INTERNAL HYDROGRAPH TIME INCREMENT= .0680 HOURS

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
12.31	87.39	(RUNOFF)
19.60	5.36	(RUNOFF)
23.56	4.18	(RUNOFF)

TIME(HRS) FIRST HYDROGRAPH POINT = .00 HOURS TIME INCREMENT = .20 HOURS DRAINAGE AREA = .19 SQ.MI.

10.00	DISCHG	.00	.00	.00	.00	.00	.00	.00	.02	.81	8.28
[illegible]	DISCHG	43.76	85.08	85.86	71.46	52.85	33.80	24.07	20.51	17.94	15.87
[illegible]	DISCHG	14.23	12.96	11.88	10.93	10.05	9.37	8.98	8.69	8.32	8.00
16.00	DISCHG	7.79	7.67	7.65	7.62	7.36	7.00	6.74	6.58	6.53	6.52
18.00	DISCHG	6.30	5.92	5.62	5.42	5.34	5.32	5.34	5.35	5.36	5.35
20.00	DISCHG	5.12	4.72	4.40	4.19	4.07	4.08	4.09	4.10	4.10	4.11
22.00	DISCHG	4.12	4.13	4.13	4.14	4.15	4.15	4.16	4.17	4.18	4.16
24.00	DISCHG	3.91	3.11	1.94	.99	.37	.07				

1

RUNOFF VOLUME ABOVE BASEFLOW = 1.28 WATERSHED INCHES, 157.23 CFS-HRS, 12.99 ACRE-FEET; BASEFLOW = .00 CFS

OPERATION ADDHYD CROSS SECTION 15
INPUT HYDROGRAPHS= 6,5 OUTPUT HYDROGRAPH= 4

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
12.83	207.51	(NULL)

RUNOFF VOLUME ABOVE BASEFLOW = 1.91 WATERSHED INCHES, 799.83 CFS-HRS, 66.10 ACRE-FEET; BASEFLOW = .00 CFS

OPERATION ADDHYD CROSS SECTION 16
INPUT HYDROGRAPHS= 4,7 OUTPUT HYDROGRAPH= 2

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
[illegible]	[illegible]	(NULL)

RUNOFF VOLUME ABOVE BASEFLOW = 2.06 WATERSHED INCHES, 4015.95 CFS-HRS, 331.88 ACRE-FEET; BASEFLOW = .00 CFS

OPERATION RUNOFF CROSS SECTION 17
OUTPUT HYDROGRAPH= 6
AREA= .44 SQ MI INPUT RUNOFF CURVE= 70. TIME OF CONCENTRATION= .83 HOURS
INTERNAL HYDROGRAPH TIME INCREMENT= .1107 HOURS

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
12.49	247.64	(RUNOFF)
23.56	12.04	(RUNOFF)

TIME(HRS) FIRST HYDROGRAPH POINT = .00 HOURS TIME INCREMENT = .20 HOURS DRAINAGE AREA = .44 SQ.MI.

10.00	DISCHG	.01	.02	.29	.77	1.64	3.00	4.99	7.79	13.92	35.84
12.00	DISCHG	100.18	181.38	240.89	238.97	219.72	192.24	161.37	127.22	92.67	66.38
14.00	DISCHG	54.53	47.92	42.84	38.69	35.21	32.32	30.09	28.40	26.95	25.63
16.00	DISCHG	24.22	23.92	23.48	23.10	22.56	21.83	21.12	20.56	20.10	19.71
18.00	DISCHG	19.18	18.47	17.71	17.08	16.57	16.18	15.90	15.73	15.68	15.65
20.00	DISCHG	15.37	14.79	14.06	13.41	12.88	12.46	12.17	11.99	11.92	11.92
22.00	DISCHG	11.94	11.95	11.96	11.98	11.99	12.00	12.02	12.03	12.04	12.01
24.00	DISCHG	11.69	10.61	8.77	6.55	4.57	2.95	1.70	.80	.26	.03

RUNOFF VOLUME ABOVE BASEFLOW = 1.93 WATERSHED INCHES, 547.10 CFS-HRS, 45.21 ACRE-FEET; BASEFLOW = .00 CFS

OPERATION ADDHYD CROSS SECTION 18
INPUT HYDROGRAPHS= 2,6 OUTPUT HYDROGRAPH= 1

TR[illegible]EQ 06-21-94 17:58 OWOSSO DRAIN - FPMS - SHIAWASSEE CO.MI. 06-20-94 JOB 1 PASS 2
[illegible]EV PC 09/83(.2) EXISTING CONDITIONS-24 HOUR TYPE II STORM DISTRIBUTION PAGE 35

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
12.80	611.79	(NULL)
16.96	260.17	(NULL)

RUNOFF VOLUME ABOVE BASEFLOW = 2.04 WATERSHED INCHES, 4563.05 CFS-HRS, 377.09 ACRE-FEET; BASEFLOW = .00 CFS

OPERATION RUNOFF CROSS SECTION 19
OUTPUT HYDROGRAPH= 7
AREA= .13 SQ MI INPUT RUNOFF CURVE= 77. TIME OF CONCENTRATION= 1.21 HOURS
INTERNAL HYDROGRAPH TIME INCREMENT= .1613 HOURS

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
12.75	73.31	(RUNOFF)
23.54	4.04	(RUNOFF)

TIME(HRS) FIRST HYDROGRAPH POINT = .00 HOURS TIME INCREMENT = .20 HOURS DRAINAGE AREA = .13 SQ.MI.

8.00	DISCHG	.00	.00	.01	.02	.06	.12	.21	.33	.49	.66
10.00	DISCHG	.87	1.12	1.42	1.78	2.24	2.85	3.65	4.68	6.73	12.48
12.00	DISCHG	26.28	43.12	59.63	72.00	73.13	69.83	65.23	59.74	53.46	46.71
14.00	DISCHG	39.60	32.23	25.02	19.11	15.64	13.80	12.51	11.47	10.64	9.96
[illegible]	DISCHG	9.40	8.95	8.51	8.33	8.03	7.85	7.61	7.39	7.19	7.02
[illegible]	DISCHG	6.85	6.65	6.49	6.19	5.92	5.81	5.67	5.57	5.45	5.40
20.00	DISCHG	5.30	5.17	5.00	4.85	4.65	4.52	4.39	4.29	4.20	4.12
22.00	DISCHG	4.07	4.04	4.02	4.02	4.03	4.03	4.03	4.03	4.04	4.02
24.00	DISCHG	3.96	3.79	3.45	2.99	2.47	1.97	1.53	1.14	.81	.54
26.00	DISCHG	.32	.17	.07	.01	.00					

OPERATION REACH CROSS SECTION 20
INPUT HYDROGRAPH= 7 OUTPUT HYDROGRAPH= 3
LENGTH = 3100.00 FEET INPUT = COEFFICIENTS RELATED TO CROSS SECTIONAL AREA, X= .71, M= 1.31
0 MODIFIED ATT-KIN ROUTING COEFFICIENT = .49 PEAK TRAVEL TIME = .40 HOURS

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
13.23	67.60	(NULL)
23.77	4.03	(NULL)

RUNOFF VOLUME ABOVE BASEFLOW = 2.50 WATERSHED INCHES, 209.84 CFS-HRS, 17.34 ACRE-FEET; BASEFLOW = .00 CFS

OPERATION RUNOFF CROSS SECTION 21
OUTPUT HYDROGRAPH= 6
AREA= .09 SQ MI INPUT RUNOFF CURVE= 75. TIME OF CONCENTRATION= 1.16 HOURS
INTERNAL HYDROGRAPH TIME INCREMENT= .1547 HOURS

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
12.73	48.25	(RUNOFF)
22.58	2.70	(RUNOFF)

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TR20 XEQ 06-21-94 17:58 OWOSSO DRAIN - FPMS - SHIAWASSEE CO.MI. 06-20-94 JOB 1 PASS 2
REV PC 09/83(.2) EXISTING CONDITIONS-24 HOUR TYPE II STORM DISTRIBUTION PAGE 36

TIME(HRS) FIRST HYDROGRAPH POINT = .00 HOURS TIME INCREMENT = .20 HOURS DRAINAGE AREA = .09 SQ.MI.

8.00	DISCHG	.00	.00	.00	.00	.00	.01	.03	.06	.12	.20
10.00	DISCHG	.31	.44	.61	.83	1.10	1.48	1.98	2.62	3.89	7.79
12.00	DISCHG	17.06	28.77	40.05	47.62	48.10	45.71	42.41	38.52	34.18	29.44
14.00	DISCHG	24.45	19.38	14.64	11.49	9.91	8.87	8.07	7.44	6.92	6.50
16.00	DISCHG	6.15	5.87	5.66	5.50	5.34	5.19	5.04	4.89	4.76	4.66
18.00	DISCHG	4.54	4.41	4.26	4.10	3.96	3.85	3.76	3.70	3.64	3.59
20.00	DISCHG	3.52	3.44	3.33	3.21	3.10	3.00	2.91	2.84	2.79	2.74
22.00	DISCHG	2.71	2.70	2.69	2.69	2.70	2.70	2.70	2.70	2.70	2.70
24.00	DISCHG	2.65	2.52	2.28	1.96	1.59	1.25	.95	.69	.49	.30
26.00	DISCHG	.17	.07	.02	.00						

RUNOFF VOLUME ABOVE BASEFLOW = 2.33 WATERSHED INCHES, 135.35 CFS-HRS, 11.18 ACRE-FEET; BASEFLOW = .00 CFS

OPERATION ADDHYD CROSS SECTION 22
INPUT HYDROGRAPHS= 6,3 OUTPUT HYDROGRAPH= 2

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
13.06	111.40	(NULL)
22.59	6.73	(NULL)

RUNOFF VOLUME ABOVE BASEFLOW = 2.43 WATERSHED INCHES, 345.19 CFS-HRS, 28.53 ACRE-FEET; BASEFLOW = .00 CFS

OPERATION RUNOFF CROSS SECTION 23
OUTPUT HYDROGRAPH= 6
AREA= .17 SQ MI INPUT RUNOFF CURVE= 79. TIME OF CONCENTRATION= 1.36 HOURS
INTERNAL HYDROGRAPH TIME INCREMENT= .1812 HOURS

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
12.96	94.86	(RUNOFF)
23.55	5.44	(RUNOFF)

OPERATION ADDHYD CROSS SECTION 24
INPUT HYDROGRAPHS= 6,2 OUTPUT HYDROGRAPH= 3

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
12.97	203.80	(NULL)
23.57	12.17	(NULL)

RUNOFF VOLUME ABOVE BASEFLOW = 2.54 WATERSHED INCHES, 638.38 CFS-HRS, 52.76 ACRE-FEET; BASEFLOW = .00 CFS

OPERATION RESVOR STRUCTURE 4
INPUT HYDROGRAPH= 3 OUTPUT HYDROGRAPH= 6
SURFACE ELEVATION= 737.90

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PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
15.83	32.73	741.00

TIME(HRS) FIRST HYDROGRAPH POINT = .00 HOURS TIME INCREMENT = .20 HOURS DRAINAGE AREA = .39 SQ.MI.

8.00	DISCHG	.00	.00	.00	.01	.02	.03	.05	.09	.13	.19
8.00	ELEV	737.90	737.90	737.90	737.90	737.90	737.90	737.91	737.91	737.91	737.92
10.00	DISCHG	.26	.36	.48	.62	.81	1.04	1.32	1.69	2.17	2.96
10.00	ELEV	737.93	737.94	737.95	737.97	737.99	738.02	738.05	738.09	738.14	738.23
12.00	DISCHG	4.48	7.22	11.39	16.91	19.95	21.78	23.57	25.27	26.83	28.21
12.00	ELEV	738.40	738.71	739.18	739.80	740.09	740.22	740.35	740.47	740.58	740.68
14.00	DISCHG	29.40	30.40	31.18	31.76	32.15	32.42	32.57	32.67	32.71	32.73
14.00	ELEV	740.76	740.83	740.89	740.93	740.95	740.98	740.99	740.99	741.00	741.00
16.00	DISCHG	32.72	32.69	32.64	32.59	32.52	32.44	32.36	32.27	32.17	32.07
16.00	ELEV	741.00	741.00	740.99	740.99	740.98	740.98	740.97	740.97	740.96	740.95
18.00	DISCHG	31.96	31.85	31.74	31.62	31.49	31.36	31.22	31.08	30.94	30.80
18.00	ELEV	740.94	740.94	740.93	740.92	740.91	740.90	740.89	740.88	740.87	740.86
20.00	DISCHG	30.66	30.51	30.36	30.21	30.06	29.90	29.74	29.57	29.41	29.24
20.00	ELEV	740.85	740.84	740.83	740.82	740.81	740.80	740.79	740.77	740.76	740.75
22.00	DISCHG	29.08	28.91	28.74	28.58	28.41	28.25	28.09	27.93	27.77	27.62
22.00	ELEV	740.74	740.73	740.71	740.70	740.69	740.68	740.67	740.66	740.65	740.63
24.00	DISCHG	27.46	27.30	27.14	26.98	26.80	26.61	26.41	26.20	25.97	25.75
24.00	ELEV	740.62	740.61	740.60	740.59	740.58	740.56	740.55	740.53	740.52	740.50
26.00	DISCHG	25.51	25.27	25.02	24.78	24.53	24.29	24.05	23.81	23.57	23.33
26.00	ELEV	740.48	740.47	740.45	740.43	740.42	740.40	740.38	740.36	740.35	740.33
28.00	DISCHG	23.10	22.87	22.64	22.41	22.18	21.96	21.74	21.52	21.31	21.09
28.00	ELEV	740.31	740.30	740.28	740.26	740.25	740.23	740.22	740.20	740.19	740.17
30.00	DISCHG	20.88	20.67	20.47	20.26	20.06	19.86	19.66	19.46	19.27	19.07
30.00	ELEV	740.16	740.14	740.13	740.11	740.10	740.08	740.07	740.05	740.04	740.03
32.00	DISCHG	18.88	18.67	17.98	17.32	16.67	16.06	15.46	14.89	14.34	13.81
32.00	ELEV	740.01	740.00	739.92	739.84	739.77	739.70	739.64	739.57	739.51	739.45
34.00	DISCHG	13.30	12.81	12.33	11.88	11.44	11.01	10.61	10.21	9.84	9.47
34.00	ELEV	739.39	739.34	739.29	739.23	739.18	739.14	739.09	739.05	739.00	738.96
36.00	DISCHG	9.12	8.78	8.45	8.15	7.85	7.56	7.28	7.01	6.75	6.50
36.00	ELEV	738.92	738.89	738.85	738.81	738.78	738.75	738.72	738.69	738.66	738.63
38.00	DISCHG	6.26	6.03	5.80	5.59	5.38	5.18	4.99	4.81	4.63	4.46
38.00	ELEV	738.60	738.58	738.55	738.53	738.50	738.48	738.46	738.44	738.42	738.40
40.00	DISCHG	4.29	4.13	3.98	3.83	3.69	3.55	3.42	3.30	3.17	3.06
40.00	ELEV	738.38	738.36	738.35	738.33	738.31	738.30	738.28	738.27	738.26	738.24
42.00	DISCHG	2.94	2.84	2.73	2.63	2.53	2.44	2.35	2.26	2.18	2.10
42.00	ELEV	738.23	738.22	738.21	738.20	738.18	738.17	738.16	738.15	738.14	738.14
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

46.00	DISCHG	1.39	1.33	1.26	1.24	1.19	1.15	1.10	1.06	1.02	.99
46.00	ELEV	738.06	738.05	738.04	738.04	738.03	738.03	738.02	738.02	738.02	738.01
48.00	DISCHG	.95	.91	.88	.85	.82	.79	.76	.73	.70	.68
48.00	ELEV	738.01	738.00	738.00	738.00	737.99	737.99	737.99	737.98	737.98	737.98
50.00	DISCHG	.65	.63	.60	.58	.56	.54	.52	.50	.48	.46
50.00	ELEV	737.97	737.97	737.97	737.97	737.96	737.96	737.96	737.96	737.95	737.95

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52.00	DISCHG	.45	.43	.41	.40	.38	.37	.36	.34	.33	.32
52.00	ELEV	737.95	737.95	737.95	737.94	737.94	737.94	737.94	737.94	737.94	737.94
54.00	DISCHG	.31	.30	.28	.27	.26	.25	.24	.24	.23	.22
54.00	ELEV	737.93	737.93	737.93	737.93	737.93	737.93	737.93	737.93	737.93	737.92
56.00	DISCHG	.21	.20	.20	.19	.18	.17	.17	.16	.16	.15
56.00	ELEV	737.92	737.92	737.92	737.92	737.92	737.92	737.92	737.92	737.92	737.92
58.00	DISCHG	.14	.14	.13	.13	.12	.12	.12	.11	.11	.10
58.00	ELEV	737.92	737.92	737.92	737.91	737.91	737.91	737.91	737.91	737.91	737.91

RUNOFF VOLUME ABOVE BASEFLOW = 2.53 WATERSHED INCHES, 637.94 CFS-HRS, 52.72 ACRE-FEET; BASEFLOW = .00 CFS

OPERATION ADDHYD CROSS SECTION 25
INPUT HYDROGRAPHS= 6,1 OUTPUT HYDROGRAPH= 5

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
12.82	631.88	(NULL)
16.93	292.64	(NULL)

RUNOFF VOLUME ABOVE BASEFLOW = 2.09 WATERSHED INCHES, 5200.99 CFS-HRS, 429.81 ACRE-FEET; BASEFLOW = .00 CFS

OPERATION RESVOR STRUCTURE 5
INPUT HYDROGRAPH= 5 OUTPUT HYDROGRAPH= 7
SURFACE ELEVATION= 731.80

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
19.20	267.73	739.53

TIME(HRS) FIRST HYDROGRAPH POINT = .00 HOURS TIME INCREMENT = .20 HOURS DRAINAGE AREA = 3.85 SQ.MI.

8.00	DISCHG	.00	.00	.00	.00	.01	.01	.03	.04	.08	.15
8.00	ELEV	731.80	731.80	731.80	731.80	731.80	731.80	731.80	731.80	731.81	731.81
10.00	DISCHG	.28	.52	.95	1.70	2.94	4.87	7.77	11.98	18.93	36.40
10.00	ELEV	731.82	731.84	731.87	731.92	732.02	732.16	732.37	732.68	733.19	734.47
12.00	DISCHG	64.50	68.62	72.99	81.34	98.71	115.63	131.14	144.84	156.65	170.73
12.00	ELEV	736.75	737.23	737.64	738.05	738.26	738.47	738.66	738.82	738.97	739.06
14.00	DISCHG	184.00	195.34	205.03	213.27	220.27	226.12	230.93	234.77	237.79	240.26
14.00	ELEV	739.12	739.18	739.23	739.27	739.31	739.34	739.36	739.38	739.40	739.41
16.00	DISCHG	242.50	244.70	246.91	249.11	251.28	253.36	255.32	257.16	259.16	261.25
16.00	ELEV	739.42	739.43	739.44	739.46	739.47	739.48	739.49	739.50	739.50	739.51
18.00	DISCHG	263.06	264.57	265.77	266.66	267.18	267.62	267.73	267.63	267.35	266.87
18.00	ELEV	739.51	739.52	739.52	739.53	739.53	739.53	739.53	739.53	739.53	739.53
20.00	DISCHG	266.24	265.42	264.39	263.17	261.77	260.22	258.55	257.11	255.76	254.33
20.00	ELEV	739.52	739.52	739.52	739.52	739.51	739.51	739.50	739.50	739.49	739.48
22.00	DISCHG	252.86	251.34	249.77	248.17	246.53	244.86	243.17	241.45	239.70	237.93
22.00	ELEV	739.47	739.47	739.46	739.45	739.44	739.43	739.42	739.42	739.41	739.40
24.00	DISCHG	236.11	234.19	232.07	229.71	227.10	224.27	221.25	218.07	214.78	211.41
24.00	ELEV	739.39	739.38	739.37	739.36	739.34	739.33	739.31	739.30	739.28	739.26
26.00	DISCHG	207.99	204.53	201.06	197.57	194.08	190.61	187.15	183.72	180.32	176.96
26.00	ELEV	739.25	739.23	739.21	739.19	739.19	739.16	739.14	739.12	739.11	739.09

28.00	DISCHG	173.65	170.38	167.16	163.97	160.83	158.36	156.38	154.39	152.39	150.39
[illegible]	ELEV	739.07	739.06	739.04	739.02	739.01	738.99	738.96	738.94	738.91	738.89
[illegible]	DISCHG	148.37	146.35	144.33	142.31	140.28	138.26	136.23	134.22	132.20	130.20
30.00	ELEV	738.87	738.84	738.82	738.79	738.77	738.74	738.72	738.69	738.67	738.65
32.00	DISCHG	128.20	126.21	124.22	122.23	120.24	118.25	116.26	114.27	112.30	110.33
32.00	ELEV	738.62	738.60	738.57	738.55	738.53	738.50	738.48	738.45	738.43	738.41
34.00	DISCHG	108.37	106.42	104.48	102.56	100.65	98.76	96.89	95.04	93.20	91.39
34.00	ELEV	738.38	738.36	738.33	738.31	738.29	738.27	738.24	738.22	738.20	738.18
36.00	DISCHG	89.59	87.82	86.07	84.35	82.64	80.96	79.31	77.68	76.57	76.05
36.00	ELEV	738.15	738.13	738.11	738.09	738.07	738.05	738.03	738.01	737.98	737.93
38.00	DISCHG	75.54	75.02	74.50	73.98	73.45	72.93	72.40	71.87	71.35	70.82
38.00	ELEV	737.88	737.83	737.78	737.73	737.68	737.63	737.59	737.54	737.49	737.44
40.00	DISCHG	70.29	69.76	69.23	68.70	68.17	67.65	67.12	66.59	65.59	63.16
40.00	ELEV	737.39	737.34	737.29	737.24	737.19	737.14	737.09	737.04	736.91	736.56
42.00	DISCHG	56.99	41.10	31.03	24.61	20.47	17.76	15.95	14.71	13.82	13.16
42.00	ELEV	735.98	734.81	734.07	733.60	733.30	733.10	732.97	732.88	732.81	732.76
44.00	DISCHG	12.65	12.23	11.88	11.56	11.28	11.02	10.77	10.54	10.31	10.10
44.00	ELEV	732.73	732.70	732.67	732.65	732.63	732.61	732.59	732.57	732.56	732.54
46.00	DISCHG	9.89	9.70	9.50	9.32	9.14	8.97	8.80	8.64	8.48	8.32
46.00	ELEV	732.53	732.51	732.50	732.48	732.47	732.46	732.44	732.43	732.42	732.41
48.00	DISCHG	8.18	8.03	7.89	7.76	7.63	7.50	7.37	7.25	7.13	7.02
48.00	ELEV	732.40	732.39	732.38	732.37	732.36	732.35	732.34	732.33	732.32	732.31
50.00	DISCHG	6.91	6.80	6.70	6.59	6.49	6.40	6.30	6.21	6.12	6.03
50.00	ELEV	732.31	732.30	732.29	732.28	732.28	732.27	732.26	732.26	732.25	732.24
52.00	DISCHG	5.94	5.86	5.78	5.70	5.62	5.55	5.47	5.40	5.33	5.26
52.00	ELEV	732.24	732.23	732.22	732.22	732.21	732.21	732.20	732.20	732.19	732.19
[illegible]	DISCHG	5.19	5.12	5.06	4.99	4.93	4.87	4.81	4.75	4.69	4.63
[illegible]	ELEV	732.18	732.18	732.17	732.17	732.16	732.16	732.15	732.15	732.14	732.14
56.00	DISCHG	4.58	4.52	4.47	4.42	4.37	4.32	4.27	4.22	4.17	4.12
56.00	ELEV	732.14	732.13	732.13	732.12	732.12	732.12	732.11	732.11	732.11	732.10
58.00	DISCHG	4.08	4.03	3.99	3.94	3.90	3.86	3.81	3.77	3.73	3.69
58.00	ELEV	732.10	732.10	732.09	732.09	732.09	732.08	732.08	732.08	732.07	732.07

RUNOFF VOLUME ABOVE BASEFLOW = 2.09 WATERSHED INCHES, 5199.17 CFS-HRS, 429.66 ACRE-FEET; BASEFLOW = .00 CFS

OPERATION RUNOFF CROSS SECTION 26
OUTPUT HYDROGRAPH= 6
AREA= .13 SQ MI INPUT RUNOFF CURVE= 72. TIME OF CONCENTRATION= 1.79 HOURS
INTERNAL HYDROGRAPH TIME INCREMENT= .1989 HOURS

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
13.23	44.27	(RUNOFF)

TIME(HRS) FIRST HYDROGRAPH POINT = .00 HOURS TIME INCREMENT = .20 HOURS DRAINAGE AREA = .13 SQ.MI.

8.00	DISCHG	.00	.00	.00	.00	.00	.00	.00	.00	.00	.01
10.00	DISCHG	.03	.06	.12	.21	.34	.56	.85	1.28	2.15	4.66
12.00	DISCHG	9.98	16.68	23.82	31.17	38.27	43.07	44.25	43.64	42.45	40.84
14.00	DISCHG	38.89	36.67	34.24	31.61	28.82	25.91	22.91	19.83	16.73	13.76
16.00	DISCHG	11.52	10.29	9.53	8.93	8.46	8.04	7.70	7.40	7.14	6.91

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[illegible]

22.00	DISCHG	3.98	3.91	3.86	3.81	3.77	3.74	3.71	3.70	3.69	3.68
24.00	DISCHG	3.65	3.57	3.43	3.23	2.97	2.66	2.32	2.01	1.71	1.44
26.00	DISCHG	1.19	.96	.76	.58	.43	.30	.19	.11	.05	.02
28.00	DISCHG	.00									

RUNOFF VOLUME ABOVE BASEFLOW = 2.08 WATERSHED INCHES, 174.75 CFS-HRS, 14.44 ACRE-FEET; BASEFLOW = .00 CFS

OPERATION ADDHYD CROSS SECTION 27
INPUT HYDROGRAPHS= 7,6 OUTPUT HYDROGRAPH= 5

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
19.05	273.40	(NULL)

RUNOFF VOLUME ABOVE BASEFLOW = 2.09 WATERSHED INCHES, 5373.91 CFS-HRS, 444.10 ACRE-FEET; BASEFLOW = .00 CFS

OPERATION RUNOFF CROSS SECTION 28
OUTPUT HYDROGRAPH= 6
AREA= .42 SQ MI INPUT RUNOFF CURVE= 78. TIME OF CONCENTRATION= .69 HOURS
INTERNAL HYDROGRAPH TIME INCREMENT= .0920 HOURS

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
12.41	372.25	(RUNOFF)
19.55	17.44	(RUNOFF)
23.53	13.27	(RUNOFF)

TIME(HRS) FIRST HYDROGRAPH POINT = .00 HOURS TIME INCREMENT = .20 HOURS DRAINAGE AREA = .42 SQ.MI.

8.00	DISCHG	.01	.08	.26	.58	1.04	1.59	2.24	2.99	3.82	4.75
10.00	DISCHG	5.76	6.87	8.20	9.98	12.46	15.86	20.20	25.75	37.42	79.37
12.00	DISCHG	197.29	327.34	372.17	334.65	281.51	221.36	158.21	103.02	75.39	64.28
14.00	DISCHG	56.33	50.14	45.24	41.13	37.51	34.54	32.46	30.88	29.39	28.03
[illegible]	DISCHG	27.09	26.46	26.04	25.66	25.02	24.09	23.23	22.56	22.07	21.70
[illegible]	DISCHG	21.12	20.21	19.28	18.54	17.99	17.62	17.44	17.42	17.44	17.39
20.00	DISCHG	16.94	16.05	15.10	14.34	13.77	13.39	13.20	13.17	13.18	13.19
22.00	DISCHG	13.20	13.21	13.21	13.22	13.23	13.24	13.25	13.26	13.26	13.21
24.00	DISCHG	12.74	11.11	8.49	5.68	3.44	1.78	.68	.14	.00	

RUNOFF VOLUME ABOVE BASEFLOW = 2.59 WATERSHED INCHES, 700.93 CFS-HRS, 57.92 ACRE-FEET; BASEFLOW = .00 CFS

OPERATION ADDHYD CROSS SECTION 29
INPUT HYDROGRAPHS= 5,6 OUTPUT HYDROGRAPH= 7

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
12.44	470.89	(NULL)
14.89	286.66	(NULL)
18.46	291.37	(NULL)

1

TIME(HRS) FIRST HYDROGRAPH POINT = .00 HOURS TIME INCREMENT = .20 HOURS DRAINAGE AREA = 4.40 SQ.MI.

[illegible]	DISCHG	.01	.08	.26	.58	1.05	1.60	2.26	3.03	3.90	4.91
[illegible]	DISCHG	6.07	7.45	9.27	11.99	15.75	21.29	28.52	39.02	58.49	120.42
12.00	DISCHG	271.77	412.65	468.99	447.15	418.43	380.06	335.60	291.50	274.45	275.84
14.00	DISCHG	279.21	282.16	284.50	286.01	286.99	286.58	286.30	285.48	283.92	282.05
16.00	DISCHG	281.10	281.45	282.48	283.76	284.74	285.49	286.25	287.12	289.37	289.85
18.00	DISCHG	290.37	291.22	291.27	291.34	291.22	291.02	290.78	290.52	290.12	289.51
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

24.00	DISCHG	252.50	248.87	243.99	238.62	233.52	228.70	224.25	220.21	216.49	212.65
26.00	DISCHG	209.18	205.50	201.82	198.15	194.5	190.91	187.34	183.83	180.37	176.98
28.00	DISCHG	173.65	170.38	167.16	163.97	160.83	158.36	156.38	154.39	152.39	150.39
30.00	DISCHG	148.37	146.35	144.33	142.31	140.28	138.26	136.23	134.22	132.20	130.20
32.00	DISCHG	128.20	126.21	124.22	122.23	120.24	118.25	116.26	114.27	112.30	110.33
34.00	DISCHG	108.37	106.42	104.48	102.56	100.65	98.76	96.89	95.04	93.20	91.39
36.00	DISCHG	89.59	87.82	86.07	84.35	82.64	80.96	79.31	77.68	76.57	76.05
[illegible]	DISCHG	75.54	75.02	74.50	73.98	73.45	72.93	72.40	71.87	71.35	70.82
40.00	DISCHG	70.29	69.76	69.23	68.70	68.17	67.65	67.12	66.59	65.59	63.16
42.00	DISCHG	56.99	41.10	31.03	24.61	20.47	17.76	15.95	14.71	13.82	13.16
44.00	DISCHG	12.65	12.23	11.88	11.56	11.28	11.02	10.77	10.54	10.31	10.10
46.00	DISCHG	9.89	9.70	9.50	9.32	9.14	8.97	8.80	8.64	8.48	8.32
48.00	DISCHG	8.18	8.03	7.89	7.76	7.63	7.50	7.37	7.25	7.13	7.02
50.00	DISCHG	6.91	6.80	6.70	6.59	6.49	6.40	6.30	6.21	6.12	6.03
52.00	DISCHG	5.94	5.86	5.78	5.70	5.62	5.55	5.47	5.40	5.33	5.26
54.00	DISCHG	5.19	5.12	5.06	4.99	4.93	4.87	4.81	4.75	4.69	4.63
56.00	DISCHG	4.58	4.52	4.47	4.42	4.37	4.32	4.27	4.22	4.17	4.12
58.00	DISCHG	4.08	4.03	3.99	3.94	3.90	3.86	3.81	3.77	3.73	3.69

RUNOFF VOLUME ABOVE BASEFLOW = 2.14 WATERSHED INCHES, 6074.84 CFS-HRS, 502.02 ACRE-FEET; BASEFLOW = .00 CFS

OPERATION RESVOR STRUCTURE 6
INPUT HYDROGRAPH= 7 OUTPUT HYDROGRAPH= 1
SURFACE ELEVATION= 728.40

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
24.17	249.14	737.08
34.44	107.07	733.50

TIME(HRS) FIRST HYDROGRAPH POINT = .00 HOURS TIME INCREMENT = .20 HOURS DRAINAGE AREA = 4.40 SQ.MI.

8.00	DISCHG	.00	.02	.10	.28	.57	.99	1.50	2.13	2.86	3.71
[illegible]	ELEV	728.40	728.40	728.41	728.42	728.44	728.47	728.50	728.55	728.60	728.66
[illegible]	DISCHG	4.69	5.82	7.21	9.06	11.67	15.43	20.71	27.95	48.05	97.13
10.00	ELEV	728.72	728.80	728.90	729.02	729.20	729.46	729.82	730.32	731.22	733.12
12.00	DISCHG	190.62	199.40	213.39	220.19	222.71	224.80	226.36	227.38	228.03	228.59
12.00	ELEV	735.16	735.43	735.85	736.07	736.13	736.23	736.28	736.32	736.34	736.36
14.00	DISCHG	229.17	229.78	230.41	231.06	231.72	232.37	233.01	233.63	234.24	234.81
14.00	ELEV	736.38	736.40	736.42	736.44	736.47	736.49	736.51	736.53	736.55	736.57
16.00	DISCHG	235.37	235.91	236.45	237.01	237.56	238.13	238.69	239.26	239.83	240.42

1

16.00	ELEV	736.59	736.61	736.63	736.65	736.67	736.69	736.71	736.73	736.75	736.77
18.00	DISCHG	241.01	241.60	242.19	242.77	243.34	243.91	244.46	245.01	245.55	246.07
18.00	ELEV	736.79	736.81	736.83	736.85	736.87	736.89	736.91	736.93	736.95	736.96
20.00	DISCHG	246.58	247.06	247.28	247.47	247.64	247.80	247.95	248.09	248.23	248.35
20.00	ELEV	736.98	737.00	737.01	737.01	737.02	737.03	737.03	737.04	737.04	737.05
22.00	DISCHG	248.47	248.57	248.67	248.76	248.84	248.91	248.97	249.03	249.07	249.11
22.00	ELEV	737.05	737.06	737.06	737.06	737.07	737.07	737.07	737.08	737.08	737.08
24.00	DISCHG	249.13	249.14	249.12	249.08	249.02	248.92	248.81	248.67	248.51	248.34
24.00	ELEV	737.08	737.08	737.08	737.08	737.07	737.07	737.07	737.06	737.06	737.05
26.00	DISCHG	248.15	247.94	247.71	247.46	247.20	246.69	246.00	245.29	244.54	243.76
[illegible]	ELEV	737.04	737.03	737.02	737.01	737.00	736.99	736.96	736.94	736.91	736.88
[illegible]	DISCHG	242.95	242.11	241.25	240.35	239.43	238.48	237.52	236.55	235.57	234.57
28.00	ELEV	736.86	736.83	736.80	736.77	736.73	736.70	736.67	736.63	736.60	736.57
30.00	DISCHG	233.57	232.55	231.51	230.47	229.42	228.35	227.27	226.18	225.09	223.97
30.00	ELEV	736.53	736.49	736.46	736.42	736.39	736.35	736.31	736.27	736.24	736.20
32.00	DISCHG	222.85	221.72	220.58	219.43	218.13	212.40	206.88	201.59	196.46	191.53
[illegible]	ELEV	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

34.00	ELEV	734.31	733.15	733.47	733.34	733.23	733.21	733.14	733.08	732.99	732.92
36.00	DISCHG	90.22	88.44	86.68	84.95	83.24	81.55	79.88	78.24	76.92	76.20
36.00	ELEV	732.85	732.79	732.72	732.65	732.59	732.52	732.46	732.39	732.34	732.32
38.00	DISCHG	75.72	75.20	74.68	74.16	73.64	73.11	72.59	72.06	71.53	71.00
38.00	ELEV	732.30	732.28	732.26	732.24	732.22	732.20	732.18	732.16	732.14	732.12
40.00	DISCHG	70.47	69.94	69.42	68.89	68.36	67.83	67.30	66.77	65.96	64.07
40.00	ELEV	732.10	732.07	732.05	732.03	732.01	731.99	731.97	731.95	731.92	731.85
[illegible]	DISCHG	59.29	47.03	33.92	29.54	25.70	22.09	19.22	17.09	15.54	14.42
42.00	ELEV	731.66	731.18	730.67	730.43	730.17	729.92	729.72	729.57	729.47	729.39
44.00	DISCHG	13.59	12.96	12.46	12.06	11.71	11.40	11.12	10.87	10.62	10.40
44.00	ELEV	729.33	729.29	729.26	729.23	729.20	729.18	729.16	729.15	729.13	729.11
46.00	DISCHG	10.18	9.97	9.77	9.57	9.33	9.20	9.03	8.86	8.69	8.53
46.00	ELEV	729.10	729.09	729.07	729.06	729.05	729.03	729.02	729.01	729.00	728.99
48.00	DISCHG	8.38	8.23	8.08	7.94	7.80	7.67	7.54	7.42	7.29	7.18
48.00	ELEV	728.98	728.97	728.96	728.95	728.94	728.93	728.92	728.91	728.90	728.89
50.00	DISCHG	7.06	6.95	6.84	6.73	6.63	6.53	6.43	6.33	6.24	6.15
50.00	ELEV	728.89	728.88	728.87	728.86	728.85	728.85	728.84	728.84	728.83	728.82
52.00	DISCHG	6.06	5.97	5.89	5.81	5.73	5.65	5.57	5.50	5.42	5.35
52.00	ELEV	728.82	728.81	728.80	728.80	728.79	728.79	728.78	728.78	728.77	728.77
54.00	DISCHG	5.28	5.21	5.14	5.08	5.01	4.95	4.89	4.83	4.77	4.71
54.00	ELEV	728.76	728.76	728.75	728.75	728.74	728.74	728.74	728.73	728.73	728.72
56.00	DISCHG	4.65	4.60	4.54	4.49	4.44	4.33	4.23	4.28	4.23	4.19
56.00	ELEV	728.72	728.72	728.71	728.71	728.71	728.70	728.70	728.69	728.69	728.69
58.00	DISCHG	4.14	4.09	4.05	4.00	3.95	3.91	3.87	3.83	3.79	3.74
58.00	ELEV	728.68	728.68	728.68	728.68	728.67	728.67	728.67	728.66	728.66	728.66

RUNOFF VOLUME ABOVE BASEFLOW = 2.14 WATERSHED INCHES, 6072.83 CFS-HRS, 501.86 ACRE-FEET; BASEFLOW = .00 CFS

OPERATION RUNOFF CROSS SECTION 30
OUTPUT HYDROGRAPH= 6
AREA= .28 SQ MI INPUT RUNOFF CURVE= 83. TIME OF CONCENTRATION= 1.27 HOURS

1

INTERNAL HYDROGRAPH TIME INCREMENT= .1692 HOURS

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
12.78	187.96	(RUNOFF)
23.53	9.45	(RUNOFF)

TIME(HRS) FIRST HYDROGRAPH POINT = .00 HOURS TIME INCREMENT = .20 HOURS DRAINAGE AREA = .28 SQ.MI.

6.00	DISCHG	.00	.00	.00	.02	.05	.14	.25	.40	.58	.79
8.00	DISCHG	1.03	1.29	1.69	1.97	2.40	2.87	3.40	3.95	4.56	5.23
10.00	DISCHG	5.96	6.76	7.68	8.78	10.13	11.96	14.31	17.41	23.28	39.37
12.00	DISCHG	73.31	113.52	153.25	182.20	187.89	179.48	168.02	154.25	138.92	122.47
14.00	DISCHG	105.20	87.42	69.38	52.77	40.86	34.75	31.16	28.34	26.14	24.39
16.00	DISCHG	22.90	21.70	20.78	20.04	19.40	18.79	18.21	17.65	17.17	16.75
18.00	DISCHG	16.31	15.84	15.33	14.77	14.27	13.84	13.50	13.22	13.00	12.80
20.00	DISCHG	12.55	12.23	11.86	11.44	11.05	10.72	10.42	10.16	9.94	9.76
22.00	DISCHG	9.62	9.52	9.46	9.44	9.43	9.44	9.44	9.45	9.45	9.42
24.00	DISCHG	9.28	8.90	8.19	7.20	6.04	4.90	3.87	2.97	2.19	1.53
26.00	DISCHG	.99	.57	.27	.09	.02					

RUNOFF VOLUME ABOVE BASEFLOW = 3.04 WATERSHED INCHES, 549.57 CFS-HRS, 45.42 ACRE-FEET; BASEFLOW = .00 CFS

OPERATION ADDHYD CROSS SECTION 31
INPUT HYDROGRAPHS= 1,6 OUTPUT HYDROGRAPH= 7

12.81	410.63	(NULL)
20.20	259.29	(NULL)
23.71	258.54	(NULL)
34.44	107.07	(NULL)

TIME(HRS) FIRST HYDROGRAPH POINT = .00 HOURS TIME INCREMENT = .20 HOURS DRAINAGE AREA = 4.68 SQ.MI.

6.00	DISCHG	.00	.00	.00	.02	.06	.14	.25	.40	.58	.79
[illegible]	DISCHG	1.03	1.32	1.71	2.25	2.97	3.86	4.90	6.09	7.42	8.94
10.00	DISCHG	10.64	12.59	14.90	17.84	21.85	27.39	35.02	45.36	71.33	136.49
12.00	DISCHG	263.93	312.93	366.63	402.39	410.63	404.27	394.38	381.62	366.96	351.06
14.00	DISCHG	334.38	317.20	299.79	283.83	272.53	267.11	264.16	261.97	260.38	259.19
16.00	DISCHG	258.27	257.61	257.23	257.05	256.95	256.92	256.90	256.91	257.00	257.16
18.00	DISCHG	257.32	257.44	257.52	257.54	257.61	257.75	257.96	258.23	258.55	258.87
20.00	DISCHG	259.13	259.29	259.14	258.91	258.70	258.52	258.38	258.26	258.17	258.11
22.00	DISCHG	258.09	258.09	258.13	258.20	258.28	258.35	258.42	258.47	258.52	258.53
24.00	DISCHG	258.41	258.03	257.32	256.28	255.06	253.82	252.69	251.64	250.71	249.87
26.00	DISCHG	249.14	248.51	247.98	247.55	247.22	246.69	246.00	245.29	244.54	243.76
28.00	DISCHG	242.95	242.11	241.25	240.35	239.43	238.48	237.52	236.55	235.57	234.57
30.00	DISCHG	232.57	232.55	231.51	230.47	229.42	228.35	227.27	226.19	225.08	223.97
32.00	DISCHG	222.85	221.72	220.58	219.43	218.12	212.40	206.88	201.58	196.46	191.52
34.00	DISCHG	139.33	97.77	106.81	102.93	101.37	99.41	97.54	95.66	93.84	92.02
36.00	DISCHG	90.22	88.44	86.68	84.96	83.24	81.55	79.88	78.24	76.92	76.20
38.00	DISCHG	75.72	75.20	74.68	74.16	73.64	73.11	72.59	72.06	71.53	71.00

1

40.00	DISCHG	70.47	69.94	69.42	68.89	68.36	67.83	67.30	66.77	65.96	64.07
[illegible]	DISCHG	59.29	47.03	33.92	29.54	25.70	22.09	19.22	17.09	15.54	14.42
[illegible]	DISCHG	13.59	12.96	12.46	12.06	11.71	11.40	11.12	10.87	10.62	10.40
46.00	DISCHG	10.18	9.97	9.77	9.57	9.48	9.20	9.03	8.86	8.69	8.53
48.00	DISCHG	8.38	8.23	8.08	7.94	7.80	7.67	7.54	7.42	7.29	7.18
50.00	DISCHG	7.06	6.95	6.84	6.73	6.63	6.53	6.43	6.33	6.24	6.15
52.00	DISCHG	6.06	5.97	5.89	5.81	5.73	5.65	5.57	5.50	5.42	5.35
54.00	DISCHG	5.28	5.21	5.14	5.08	5.01	4.95	4.89	4.83	4.77	4.71
56.00	DISCHG	4.65	4.60	4.54	4.49	4.44	4.38	4.33	4.28	4.23	4.19
58.00	DISCHG	4.14	4.09	4.05	4.00	3.96	3.91	3.87	3.83	3.79	3.74

RUNOFF VOLUME ABOVE BASEFLOW = 2.19 WATERSHED INCHES, 6622.40 CFS-HRS, 547.28 ACRE-FEET; BASEFLOW = .00 CFS

EXECUTIVE CONTROL OPERATION ENDCMP RECORD ID
+ COMPUTATIONS COMPLETED FOR PASS 2

1

EXECUTIVE CONTROL OPERATION COMPLT RECORD ID
+ FROM XSECTION 1
+ TO XSECTION 31
STARTING TIME = .00 RAIN DEPTH = 4.40 RAIN DURATION= 1.00 RAIN TABLE NO.= 2 ANT. MOIST. COND= 2
ALTERNATE NO.= 1 STORM NO.= 3 MAIN TIME INCREMENT = .20 HOURS

OPERATION RUNOFF CROSS SECTION 1
OUTPUT HYDROGRAPH= 7
AREA= .58 SQ MI INPUT RUNOFF CURVE= 71. TIME OF CONCENTRATION= 1.14 HOURS
INTERNAL HYDROGRAPH TIME INCREMENT= .1510 HOURS

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
12.70	121.63	(RUNOFF)
23.57	14.06	(RUNOFF)

TIME(HRS) FIRST HYDROGRAPH POINT = .00 HOURS TIME INCREMENT = .10 HOURS DRAINAGE AREA = .58 SQ.MI.

10.00	DISCHG	.00	.00	.06	.23	.62	1.44	2.75	4.72	9.71	26.21
12.00	DISCHG	69.76	124.60	179.05	217.21	216.24	206.94	193.47	176.70	157.23	135.95
14.00	DISCHG	113.17	89.75	68.53	55.30	49.13	44.25	40.33	37.31	34.85	32.79
16.00	DISCHG	31.09	29.75	28.74	27.95	27.22	26.48	25.70	24.96	24.35	23.83
18.00	DISCHG	23.26	22.58	21.80	20.99	20.31	19.76	19.25	19.01	18.74	18.52
20.00	DISCHG	18.18	17.75	17.18	16.54	15.97	15.46	15.04	14.68	14.39	14.18
22.00	DISCHG	14.04	13.97	13.97	13.98	14.06	14.01	14.03	14.05	14.06	14.03
24.00	DISCHG	13.82	13.10	11.82	10.10	8.13	6.35	4.78	3.44	2.23	1.43
26.00	DISCHG	.75	.31	.08	.00						

RUNOFF VOLUME ABOVE BASEFLOW = 1.68 WATERSHED INCHES, 527.90 CFS-HRS, 51.39 ACRE-FEET; BASEFLOW = .00 CFS

OPERATION RUNOFF CROSS SECTION 2
OUTPUT HYDROGRAPH= 6
AREA= .24 SQ MI INPUT RUNOFF CURVE= 70. TIME OF CONCENTRATION= .63 HOURS
INTERNAL HYDROGRAPH TIME INCREMENT= .0840 HOURS

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
12.40	132.64	(RUNOFF)
19.60	7.40	(RUNOFF)
23.55	5.70	(RUNOFF)

T [illegible]RS) FIRST HYDROGRAPH POINT = .00 HOURS TIME INCREMENT = .10 HOURS DRAINAGE AREA = .24 SQ.MI.

10.00	DISCHG	.00	.00	.00	.06	.30	.84	1.77	3.17	6.45	19.97
12.00	DISCHG	65.49	118.92	132.64	117.93	97.41	73.85	49.85	34.05	28.47	24.84
14.00	DISCHG	21.95	19.71	17.93	16.39	15.02	13.91	13.14	12.58	12.02	11.50
16.00	DISCHG	11.17	10.94	10.80	10.69	10.43	10.01	9.65	9.38	9.20	9.09
18.00	DISCHG	8.86	8.44	8.04	7.74	7.52	7.41	7.38	7.39	7.40	7.39
20.00	DISCHG	7.17	6.73	6.32	6.00	5.73	5.65	5.62	5.63	5.63	5.64
22.00	DISCHG	5.65	5.65	5.66	5.67	5.63	5.68	5.69	5.70	5.70	5.68
24.00	DISCHG	5.43	4.63	3.37	2.11	1.15	.50	.13	.01		

RUNOFF VOLUME ABOVE BASEFLOW = 1.61 WATERSHED INCHES, 248.65 CFS-HRS, 20.55 ACRE-FEET; BASEFLOW = .00 CFS
1

OPERATION ADDHYD CROSS SECTION 3
INPUT HYDROGRAPHS= 7,6 OUTPUT HYDROGRAPH= 3

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
12.60	335.15	(NULL)
23.56	19.77	(NULL)

RUNOFF VOLUME ABOVE BASEFLOW = 1.66 WATERSHED INCHES, 876.55 CFS-HRS, 72.44 ACRE-FEET; BASEFLOW = .00 CFS

OPERATION ROUTE CROSS SECTION 4

AREA= .23 SQ MI INPUT RUNOFF CURVE= 75. TIME OF CONCENTRATION= .70 HOURS
INTERNAL HYDROGRAPH TIME INCREMENT= .0933 HOURS

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
12.43	152.19	(RUNOFF)
19.58	7.94	(RUNOFF)
23.54	6.08	(RUNOFF)

TIME(HRS) FIRST HYDROGRAPH POINT = .00 HOURS TIME INCREMENT = .20 HOURS DRAINAGE AREA = .23 SQ.MI.

8.00	DISCHG	.00	.00	.00	.00	.00	.00	.00	.02	.10	.27
10.00	DISCHG	.53	.87	1.32	1.92	2.75	3.89	5.40	7.41	11.88	27.53
12.00	DISCHG	74.29	129.32	151.89	138.63	118.64	95.39	70.28	47.02	33.97	28.88
14.00	DISCHG	25.31	22.55	20.37	18.53	16.9[illegible]	15.60	14.65	13.94	13.28	12.67
16.00	DISCHG	12.25	11.97	11.78	11.62	11.34	10.92	10.54	10.24	10.02	9.85
18.00	DISCHG	9.59	9.19	8.78	8.45	8.20	8.03	7.94	7.93	7.94	7.92
20.00	DISCHG	7.73	7.33	6.90	6.56	6.30	6.12	6.03	6.01	6.02	6.03
22.00	DISCHG	6.03	6.04	6.04	6.05	6.05	6.06	6.06	6.07	6.07	6.05
24.00	DISCHG	5.84	5.11	3.93	2.66	1.63	.86	.34	.08	.00	

RUNOFF VOLUME ABOVE BASEFLOW = 1.97 WATERSHED INCHES, 293.08 CFS-HRS, 24.22 ACRE-FEET; BASEFLOW = .00 CFS

OPERATION RESVOR STRUCTURE 1
INPUT HYDROGRAPH= 7 OUTPUT HYDROGRAPH= 1
SURFACE ELEVATION= 736.20

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
13.64	34.13	743.24
23.65	6.07	737.34

TIME(HRS) FIRST HYDROGRAPH POINT = .00 HOURS TIME INCREMENT = .20 HOURS DRAINAGE AREA = .23 SQ.MI.

8.00	DISCHG	.00	.00	.00	.00	.00	.00	.00	.01	.04	.12
8.00	ELEV	736.20	736.20	736.20	736.20	736.20	736.20	736.20	736.20	736.21	736.22
[illegible]	DISCHG	.29	.53	.86	1.30	1.91	2.73	3.85	5.34	7.86	14.78
10.00	ELEV	736.25	736.30	736.36	736.44	736.56	736.71	736.92	737.20	737.67	738.97
12.00	DISCHG	32.03	32.39	32.95	33.53	33.78	33.95	34.06	34.11	34.13	34.12
12.00	ELEV	742.22	742.40	742.67	742.96	743.08	743.16	743.21	743.23	743.24	743.24

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14.00	DISCHG	34.11	34.08	34.06	34.02	33.99	33.95	33.90	33.86	33.81	33.77
14.00	ELEV	743.23	743.22	743.21	743.19	743.18	743.16	743.14	743.12	743.10	743.08
16.00	DISCHG	33.72	33.67	33.62	33.53	33.42	33.30	33.19	33.07	32.95	32.83
16.00	ELEV	743.05	743.03	743.01	742.97	742.91	742.85	742.79	742.74	742.68	742.62
18.00	DISCHG	32.72	32.60	32.47	32.35	32.23	32.10	29.67	16.96	11.68	9.49
18.00	ELEV	742.56	742.50	742.44	742.38	742.31	742.25	741.76	739.38	738.39	737.98
20.00	DISCHG	8.52	7.94	7.46	7.03	6.68	6.41	6.21	6.10	6.05	6.04
20.00	ELEV	737.80	737.69	737.60	737.52	737.45	737.40	737.37	737.34	737.33	737.33
22.00	DISCHG	6.03	6.03	6.04	6.04	6.05	6.05	6.06	6.06	6.07	6.07
22.00	ELEV	737.33	737.33	737.33	737.33	737.33	737.33	737.34	737.34	737.34	737.34
24.00	DISCHG	6.00	5.69	5.01	4.01	2.72	1.94	1.16	.60	.27	.11
24.00	ELEV	737.32	737.27	737.14	736.95	736.75	736.56	736.42	736.31	736.25	736.22
26.00	DISCHG	.05	.02	.01	.00						
[illegible]	ELEV	736.21	736.20	736.20	736.20						

RUNOFF VOLUME ABOVE BASEFLOW = 1.97 WATERSHED INCHES, 292.69 CFS-HRS, 24.19 ACRE-FEET; BASEFLOW = .00 CFS

OPERATION ADDHYD CROSS SECTION 5
INPUT HYDROGRAPH= 1 OUTPUT HYDROGRAPH= 2

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
12.61	366.69	(NULL)
23.57	25.83	(NULL)

RUNOFF VOLUME ABOVE BASEFLOW = 1.73 WATERSHED INCHES, 1169.24 CFS-HRS, 96.63 ACRE-FEET; BASEFLOW = .00 CFS

OPERATION RUNOFF CROSS SECTION 6
OUTPUT HYDROGRAPH= 7
AREA= .36 SQ MI INPUT RUNOFF CURVE= 79. TIME OF CONCENTRATION= 1.96 HOURS
INTERNAL HYDROGRAPH TIME INCREMENT= .1667 HOURS

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
13.30	130.02	(RUNOFF)

TIME(HRS) FIRST HYDROGRAPH POINT = .00 HOURS TIME INCREMENT = .20 HOURS DRAINAGE AREA = .36 SQ.MI.

8.00	DISCHG	.00	.00	.01	.04	.08	.16	.27	.43	.64	.91
10.00	DISCHG	1.24	1.63	2.10	2.67	3.39	4.29	5.44	6.93	9.80	16.57
12.00	DISCHG	31.12	48.76	67.35	86.44	105.23	121.71	129.15	128.97	126.21	122.23
14.00	DISCHG	117.32	111.66	105.40	98.63	91.46	83.97	76.23	68.28	60.18	52.01
16.00	DISCHG	43.94	36.39	30.72	27.56	25.60	24.09	22.84	21.79	20.89	20.09
18.00	DISCHG	19.38	18.74	18.15	17.60	17.07	16.55	16.07	15.65	15.27	14.94
20.00	DISCHG	14.59	14.24	13.92	13.51	13.13	12.74	12.37	12.03	11.73	11.46
22.00	DISCHG	11.23	11.04	10.87	10.72	10.60	10.48	10.39	10.31	10.26	10.20
24.00	DISCHG	10.10	9.91	9.59	9.12	8.54	7.81	6.99	6.15	5.36	4.62
26.00	DISCHG	3.94	3.32	2.74	2.23	1.76	1.35	1.00	.70	.48	.26
28.00	DISCHG	.12	.04	.01							

RUNOFF VOLUME ABOVE BASEFLOW = 2.29 WATERSHED INCHES, 532.84 CFS-HRS, 44.03 ACRE-FEET; BASEFLOW = .00 CFS

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OPERATION ADDHYD CROSS SECTION 7
INPUT HYDROGRAPHS= 4,7 OUTPUT HYDROGRAPH= 5

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
12.69	459.64	(NULL)

RUNOFF VOLUME ABOVE BASEFLOW = 1.87 WATERSHED INCHES, 1702.07 CFS-HRS, 140.66 ACRE-FEET; BASEFLOW = .00 CFS

OPERATION RESVOR STRUCTURE 2
INPUT HYDROGRAPH= 5 OUTPUT HYDROGRAPH= 7
SURFACE ELEVATION= 736.20

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
13.89	305.59	742.59

TIME(HRS) FIRST HYDROGRAPH POINT = .00 HOURS TIME INCREMENT = .20 HOURS DRAINAGE AREA = 1.41 SQ.MI.

8.00	DISCHG	.00	.00	.00	.00	.00	.00	.01	.01	.02	.04
8.00	ELEV	736.20	736.20	736.20	736.20	736.20	736.20	736.22	736.24	736.26	736.30
[illegible]	DISCHG	.06	.08	.21	.46	.81	1.31	2.06	3.14	4.87	8.56
[illegible]	ELEV	736.36	736.44	736.49	736.51	736.54	736.55	736.64	736.74	736.88	737.19
12.00	DISCHG	17.76	36.16	63.72	93.40	122.43	171.62	224.50	273.84	295.60	304.69
12.00	ELEV	737.38	739.35	740.59	741.47	742.14	742.42	742.50	742.55	742.58	742.59
14.00	DISCHG	302.98	298.61	291.70	264.82	247.72	231.22	215.79	201.13	187.31	174.21
14.00	ELEV	742.59	742.58	742.56	742.54	742.52	742.50	742.49	742.46	742.44	742.42
16.00	DISCHG	5.92	[illegible]	[illegible]	147.96	136.11	[illegible]	[illegible]	[illegible]	7.69	[illegible]

16.00	DISCHG	112.70	110.39	108.11	105.87	103.67	101.53	99.38	96.73	93.54	90.25
18.00	ELEV	742.01	741.94	741.88	741.82	741.76	741.70	741.64	741.57	741.48	741.39
20.00	DISCHG	87.04	83.93	80.93	78.03	75.22	72.52	69.84	67.17	64.68	62.43
20.00	ELEV	741.30	741.21	741.13	741.05	740.97	740.89	740.81	740.72	740.64	740.53
22.00	DISCHG	60.33	58.38	56.57	54.90	53.37	51.95	50.64	49.44	48.33	47.31
22.00	ELEV	740.44	740.35	740.27	740.19	740.12	740.06	740.00	739.95	739.90	739.85
24.00	DISCHG	46.34	45.35	44.20	42.82	41.18	39.31	37.28	35.15	32.99	30.98
[illegible]	ELEV	739.81	739.76	739.71	739.65	739.57	739.49	739.40	739.30	739.20	739.07
[illegible]	DISCHG	29.13	27.32	25.57	23.90	22.31	20.80	19.38	18.03	16.77	15.58
26.00	ELEV	738.92	738.77	738.62	738.48	738.35	738.22	738.10	737.99	737.88	737.78
28.00	DISCHG	14.46	13.42	12.44	11.54	10.70	9.93	9.21	8.54	7.92	7.34
28.00	ELEV	737.69	737.60	737.52	737.44	737.37	737.31	737.24	737.19	737.14	737.09
30.00	DISCHG	6.81	6.32	5.86	5.43	5.04	4.67	4.33	4.02	3.73	3.46
30.00	ELEV	737.04	737.00	736.96	736.93	736.89	736.86	736.84	736.81	736.78	736.76
32.00	DISCHG	3.20	2.97	2.76	2.56	2.37	2.20	2.04	1.89	1.75	1.63
32.00	ELEV	736.74	736.72	736.70	736.69	736.67	736.66	736.64	736.63	736.62	736.61
34.00	DISCHG	1.51	1.40	1.30	1.20	1.12	1.03	.96	.89	.83	.77
34.00	ELEV	736.60	736.59	736.58	736.57	736.57	736.56	736.55	736.55	736.54	736.54
36.00	DISCHG	.71	.66	.61	.57	.53	.49	.45	.42	.39	.36
36.00	ELEV	736.53	736.53	736.52	736.52	736.52	736.51	736.51	736.51	736.50	736.50
38.00	DISCHG	.33	.31	.29	.27	.25	.23	.21	.20	.18	.17

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38.00	ELEV	736.50	736.50	736.50	736.49	736.49	736.49	736.49	736.49	736.49	736.49
40.00	DISCHG	.16	.15	.14	.13	.12	.11	.10	.10	.10	.10
40.00	ELEV	736.48	736.48	736.48	736.48	736.48	736.48	736.48	736.48	736.47	736.47
[illegible]	DISCHG	.09	.09	.09	.09	.09	.09	.08	.08	.08	.08
[illegible]	ELEV	736.46	736.46	736.45	736.45	736.45	736.44	736.44	736.43	736.43	736.43
44.00	DISCHG	.08	.08	.08	.08	.07	.07	.07	.07	.07	.07
44.00	ELEV	736.42	736.42	736.41	736.41	736.41	736.40	736.40	736.40	736.39	736.39
46.00	DISCHG	.07	.07	.07	.06	.06	.06	.06	.06	.06	.06
46.00	ELEV	736.39	736.39	736.38	736.38	736.38	736.37	736.37	736.37	736.36	736.36
48.00	DISCHG	.06	.06	.06	.05	.05	.05	.05	.05	.05	.05
48.00	ELEV	736.36	736.36	736.35	736.35	736.35	736.35	736.34	736.34	736.34	736.34
50.00	DISCHG	.05	.05	.05	.05	.05	.04	.04	.04	.04	.04
50.00	ELEV	736.34	736.33	736.33	736.33	736.33	736.32	736.32	736.32	736.32	736.32
52.00	DISCHG	.04	.04	.04	.04	.04	.04	.04	.04	.04	.04
52.00	ELEV	736.31	736.31	736.31	736.31	736.31	736.31	736.30	736.30	736.30	736.30
54.00	DISCHG	.03	.03	.03	.03	.03	.03	.03	.03	.03	.03
54.00	ELEV	736.30	736.30	736.29	736.29	736.29	736.29	736.29	736.29	736.29	736.28
56.00	DISCHG	.03	.03	.03	.03	.03	.03	.03	.03	.03	.03
56.00	ELEV	736.29	736.28	736.28	736.28	736.28	736.28	736.27	736.27	736.27	736.27
58.00	DISCHG	.02	.02	.02	.02	.02	.02	.02	.02	.02	.02
58.00	ELEV	736.27	736.27	736.27	736.27	736.27	736.26	736.26	736.26	736.26	736.26

RUNOFF VOLUME ABOVE BASEFLOW = 1.87 WATERSHED INCHES, 1702.08 CFS-HRS, 140.66 ACRE-FEET; BASEFLOW = .00 CFS

OPERATION REACH CROSS SECTION 8
INPUT HYDROGRAPH= 7 OUTPUT HYDROGRAPH= 3
LENGTH = 4800.00 FEET INPUT = RATING CURVE REPRESENTATIVE OF REACH
0 COEFFICIENTS USED IN ROUTING RELATED TO CROSS SECTION AREA, X= .30 M= 1.01
0 MODIFIED ATT-IN ROUTING COEFFICIENT = .05 PEAK TRAVEL TIME = 4.05 HOURS

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
17.86	137.41	737.96

RUNOFF VOLUME ABOVE BASEFLOW = 1.57 WATERSHED INCHES, 1701.50 CFS-HRS, 140.61 ACRE-FEET; BASEFLOW = .00 CFS

OPERATION RUNOFF CROSS SECTION 9
OUTPUT HYDROGRAPH= 6
AREA= .52 SQ MI INPUT RUNOFF CURVE= 72. TIME OF CONCENTRATION= 1.62 HOURS
INTERNAL HYDROGRAPH TIME INCREMENT= .2160 HOURS

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
13.08	158.92	(RUNOFF)
23.59	12.86	(RUNOFF)

RUNOFF VOLUME ABOVE BASEFLOW = 1.75 WATERSHED INCHES, 587.07 CFS-HRS, 48.52 ACRE-FEET; BASEFLOW = .00 CFS

OPERATION ADDHYD CROSS SECTION 10
INPUT HYDROGRAPHS= 3,6 OUTPUT HYDROGRAPH= 5

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PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
13.09	160.18	(NULL)
14.87	145.01	(NULL)
17.44	161.14	(NULL)

RUNOFF VOLUME ABOVE BASEFLOW = 1.84 WATERSHED INCHES, 2288.56 CFS-HRS, 189.13 ACRE-FEET; BASEFLOW = .00 CFS

OPERATION RUNOFF CROSS SECTION 11
OUTPUT HYDROGRAPH= 6
AREA= .44 SQ MI INPUT RUNOFF CURVE= 70. TIME OF CONCENTRATION= 1.27 HOURS
INTERNAL HYDROGRAPH TIME INCREMENT= .1693 HOURS

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
12.85	145.03	(RUNOFF)
23.58	10.42	(RUNOFF)

TIME(HRS) FIRST HYDROGRAPH POINT = .00 HOURS TIME INCREMENT = .20 HOURS DRAINAGE AREA = .44 SQ.MI.

10.00	DISCHG	.00	.00	.00	.05	.18	.49	1.13	2.27	5.08	15.16
12.00	DISCHG	40.83	73.21	107.05	134.98	144.59	141.64	135.66	127.26	117.12	105.61
14.00	DISCHG	93.02	79.58	65.49	51.80	41.31	35.58	32.09	29.33	27.17	25.42
16.00	DISCHG	23.96	22.78	21.87	21.14	20.51	19.91	19.33	18.78	18.30	17.88
18.00	DISCHG	17.44	16.97	16.45	15.87	15.35	14.92	14.56	14.29	14.07	13.87
20.00	DISCHG	13.61	13.28	12.89	12.45	12.05	11.69	11.37	11.10	10.87	10.68
22.00	DISCHG	10.54	10.43	10.38	10.36	10.37	10.38	10.39	10.41	10.42	10.40
24.00	DISCHG	10.25	9.83	9.05	7.96	6.68	5.42	4.29	3.28	2.43	1.70
26.00	DISCHG	1.10	.63	.30	.10	.02					

RUNOFF VOLUME ABOVE BASEFLOW = 1.60 WATERSHED INCHES, 455.64 CFS-HRS, 37.65 ACRE-FEET; BASEFLOW = .00 CFS

OPERATION RESVOR STRUCTURE 2
INPUT HYDROGRAPH= 6 OUTPUT HYDROGRAPH= 1
SURFACE ELEVATION= 760.80

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
18.97	15.00	761.21

TIME(HRS) FIRST HYDROGRAPH POINT = .00 HOURS TIME INCREMENT = .20 HOURS DRAINAGE AREA = .44 SQ.MI.

10.00	DISCHG	.00	.00	.00	.00	.02	.09	.23	.51	1.13	1.37
10.00	ELEV	760.80	760.80	760.80	760.80	760.81	760.85	760.92	761.06	761.41	761.50

14.00	DISCHG	11.61	12.29	12.84	13.25	13.55	13.79	13.97	14.12	14.25	14.36
14.00	ELEV	762.03	762.07	762.10	762.12	762.13	762.14	762.15	762.16	762.17	762.17
16.00	DISCHG	14.45	14.54	14.61	14.67	14.73	14.78	14.82	14.86	14.89	14.92
16.00	ELEV	762.18	762.18	762.19	762.19	762.19	762.20	762.20	762.20	762.20	762.20
18.00	DISCHG	14.95	14.97	14.98	14.99	15.00	15.00	15.00	14.99	14.99	14.98
18.00	ELEV	762.20	762.21	762.21	762.21	762.21	762.21	762.21	762.21	762.21	762.21
20.00	DISCHG	14.97	14.95	14.93	14.91	14.89	14.86	14.83	14.80	14.76	14.73

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20.00	ELEV	762.21	762.21	762.20	762.20	762.20	762.20	762.20	762.20	762.20	762.19
22.00	DISCHG	14.69	14.65	14.61	14.57	14.54	14.50	14.46	14.42	14.39	14.35
22.00	ELEV	762.19	762.19	762.19	762.19	762.18	762.18	762.18	762.18	762.18	762.17
24.00	DISCHG	14.31	14.27	14.23	14.18	14.12	14.04	13.96	13.87	13.76	13.66
24.00	ELEV	762.17	762.17	762.17	762.17	762.16	762.16	762.15	762.15	762.14	762.14
26.00	DISCHG	13.55	13.43	13.31	13.19	13.07	12.95	12.83	12.72	12.60	12.49
26.00	ELEV	762.13	762.13	762.12	762.11	762.11	762.10	762.10	762.09	762.09	762.08
28.00	DISCHG	12.37	12.26	12.15	12.04	11.93	11.82	11.71	11.60	11.50	11.39
28.00	ELEV	762.07	762.07	762.06	762.05	762.05	762.04	762.04	762.03	762.03	762.02
30.00	DISCHG	11.29	11.19	11.08	10.98	10.88	10.78	10.68	10.59	10.49	10.39
30.00	ELEV	762.02	762.01	762.01	762.00	761.99	761.99	761.98	761.98	761.97	761.97
32.00	DISCHG	10.30	10.21	10.11	10.02	9.93	9.84	9.75	9.66	9.57	9.48
32.00	ELEV	761.96	761.96	761.96	761.95	761.95	761.94	761.94	761.93	761.93	761.92
34.00	DISCHG	9.40	9.31	9.23	9.14	9.06	8.98	8.89	8.81	8.73	8.65
34.00	ELEV	761.92	761.91	761.91	761.91	761.90	761.90	761.89	761.89	761.88	761.88
36.00	DISCHG	8.57	8.50	8.42	8.34	8.27	8.19	8.12	8.04	7.97	7.90
36.00	ELEV	761.88	761.87	761.87	761.86	761.86	761.86	761.85	761.85	761.84	761.84
[illegible]00	DISCHG	7.82	7.75	7.68	7.61	7.54	7.47	7.40	7.34	7.27	7.20
[illegible]00	ELEV	761.84	761.83	761.83	761.83	761.82	761.82	761.82	761.81	761.81	761.80
40.00	DISCHG	7.14	7.07	7.01	6.94	6.88	6.82	6.76	6.69	6.63	6.57
40.00	ELEV	761.80	761.80	761.79	761.79	761.79	761.78	761.78	761.78	761.78	761.77
42.00	DISCHG	6.51	6.45	6.39	6.34	6.28	6.22	6.16	6.11	6.05	6.00
42.00	ELEV	761.77	761.77	761.76	761.76	761.76	761.75	761.75	761.75	761.75	761.74
44.00	DISCHG	5.94	5.89	5.83	5.78	5.73	5.68	5.62	5.57	5.52	5.47
44.00	ELEV	761.74	761.74	761.73	761.73	761.73	761.73	761.72	761.72	761.72	761.72
46.00	DISCHG	5.42	5.37	5.32	5.27	5.23	5.18	5.13	5.08	5.04	4.99
46.00	ELEV	761.71	761.71	761.71	761.71	761.70	761.70	761.70	761.70	761.69	761.69
48.00	DISCHG	4.95	4.90	4.86	4.81	4.77	4.72	4.68	4.64	4.60	4.55
48.00	ELEV	761.69	761.69	761.68	761.68	761.68	761.68	761.67	761.67	761.67	761.67
50.00	DISCHG	4.51	4.47	4.43	4.39	4.35	4.31	4.27	4.23	4.19	4.16
50.00	ELEV	761.67	761.66	761.66	761.66	761.66	761.66	761.65	761.65	761.65	761.65
52.00	DISCHG	4.12	4.08	4.04	4.01	3.97	3.93	3.90	3.86	3.83	3.79
52.00	ELEV	761.65	761.64	761.64	761.64	761.64	761.64	761.63	761.63	761.63	761.63
54.00	DISCHG	3.76	3.72	3.69	3.65	3.62	3.59	3.56	3.52	3.49	3.46
54.00	ELEV	761.63	761.63	761.62	761.62	761.62	761.62	761.62	761.61	761.61	761.61
56.00	DISCHG	3.43	3.40	3.37	3.33	3.30	3.27	3.24	3.21	3.19	3.16
56.00	ELEV	761.61	761.61	761.61	761.61	761.60	761.60	761.60	761.60	761.60	761.60
58.00	DISCHG	3.13	3.10	3.07	3.04	3.01	2.99	2.96	2.93	2.91	2.88
58.00	ELEV	761.59	761.59	761.59	761.59	761.59	761.59	761.59	761.58	761.58	761.58

RUNOFF VOLUME ABOVE BASEFLOW = 1.48 WATERSHED INCHES, 420.01 CFS-HRS, 34.71 ACRE-FEET; BASEFLOW = .00 CFS

G[illegible]ION ADDHYD CROSS SECTION [illegible]
INPUT H DROGRAPHS= 5,1 OUTPUT HYDROGRAPH= 7

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PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
13.17	166.14	(NULL)
14.94	158.71	(NULL)
17.46	176.01	(NULL)

RUNOFF VOLUME ABOVE BASEFLOW = 1.77 WATERSHED INCHES, 2708.57 CFS-HRS, 223.84 ACRE-FEET; BASEFLOW = .00 CFS

OPERATION RUNOFF CROSS SECTION 13
OUTPUT HYDROGRAPH= 6
AREA= .46 SQ MI INPUT RUNOFF CURVE= 73. TIME OF CONCENTRATION= 1.70 HOURS
INTERNAL HYDROGRAPH TIME INCREMENT= .1889 HOURS

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
13.16	141.25	(RUNOFF)

TIME(HRS) FIRST HYDROGRAPH POINT = .00 HOURS TIME INCREMENT = .20 HOURS DRAINAGE AREA = .46 SQ.MI.

10.00	DISCHG	.03	.08	.21	.43	.80	1.38	2.25	3.54	6.24	14.65
12.00	DISCHG	32.26	54.98	79.18	104.06	127.17	140.06	141.45	138.31	133.81	127.91
14.00	DISCHG	120.94	113.09	104.53	95.37	85.70	75.66	65.34	54.86	44.79	37.26
16.00	DISCHG	33.19	30.65	28.64	27.01	25.68	24.57	23.62	22.78	22.02	21.37
18.00	DISCHG	20.76	20.18	19.62	19.05	18.46	17.91	17.43	17.01	16.64	16.30
20.00	DISCHG	15.95	15.58	15.20	14.79	14.38	13.89	13.49	13.15	12.86	12.62
22.00	DISCHG	12.40	12.20	12.04	11.90	11.79	11.70	11.64	11.61	11.60	11.60
24.00	DISCHG	11.52	11.23	10.74	10.04	9.14	8.08	6.97	5.94	4.99	4.13
26.00	DISCHG	3.34	2.64	2.02	1.48	1.03	.66	.37	.17	.05	.00

RUNOFF VOLUME ABOVE BASEFLOW = 1.82 WATERSHED INCHES, 540.76 CFS-HRS, 44.69 ACRE-FEET; BASEFLOW = .00 CFS

OPERATION RUNOFF CROSS SECTION 14
OUTPUT HYDROGRAPH= 5
AREA= .19 SQ MI INPUT RUNOFF CURVE= 61. TIME OF CONCENTRATION= .51 HOURS
INTERNAL HYDROGRAPH TIME INCREMENT= .0680 HOURS

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
12.33	66.74	(RUNOFF)
19.62	4.51	(RUNOFF)
23.57	3.53	(RUNOFF)

TIME(HRS) FIRST HYDROGRAPH POINT = .00 HOURS TIME INCREMENT = .20 HOURS DRAINAGE AREA = .19 SQ.MI.

10.00	DISCHG	.00	.00	.00	.00	.00	.00	.00	.00	.19	4.43
12.00	DISCHG	30.87	64.01	66.07	55.95	42.22	27.55	19.78	16.90	14.82	13.13
14.00	DISCHG	11.79	10.75	9.87	9.09	8.37	7.80	7.48	7.25	6.94	6.68
16.00	DISCHG	6.51	6.41	6.40	6.38	6.16	5.86	5.65	5.52	5.47	5.47
18.00	DISCHG	5.29	4.97	4.72	4.55	4.48	4.48	4.49	4.50	4.51	4.50
20.00	DISCHG	4.31	3.97	3.71	3.52	3.45	3.44	3.45	3.46	3.46	3.47
22.00	DISCHG	3.48	3.48	3.49	3.50	3.50	3.51	3.52	3.52	3.53	3.52
24.00	DISCHG	3.30	2.63	1.64	.84	.31	.06				

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RUNOFF VOLUME ABOVE BASEFLOW = 1.02 WATERSHED INCHES, 125.79 CFS-HRS, 10.40 ACRE-FEET; BASEFLOW = .00 CFS

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
12.87	170.04	(NULL)
23.51	15.13	(NULL)

RUNOFF VOLUME ABOVE BASEFLOW = 1.59 WATERSHED INCHES, 666.55 CFS-HRS, 55.08 ACRE-FEET; BASEFLOW = .00 CFS

OPERATION ADDHYD CROSS SECTION 16
INPUT HYDROGRAPHS= 4,7 OUTPUT HYDROGRAPH= 2

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
13.03	333.20	(NULL)
16.72	205.95	(NULL)

RUNOFF VOLUME ABOVE BASEFLOW = 1.73 WATERSHED INCHES, 3375.12 CFS-HRS, 278.92 ACRE-FEET; BASEFLOW = .00 CFS

OPERATION RUNOFF CROSS SECTION 17
OUTPUT HYDROGRAPH= 6
AREA= .44 SQ MI INPUT RUNOFF CURVE= 70. TIME OF CONCENTRATION= .82 HOURS
INTERNAL HYDROGRAPH TIME INCREMENT= .1107 HOURS

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
12.50	202.46	(RUNOFF)
23.57	10.44	(RUNOFF)

TIME(HRS) FIRST HYDROGRAPH POINT = .00 HOURS TIME INCREMENT = .20 HOURS DRAINAGE AREA = .44 SQ.MI.

10.00	DISCHG	.00	.00	.00	.07	.35	1.02	2.22	4.11	8.62	25.74
12.00	DISCHG	78.10	145.51	196.17	196.07	180.45	159.47	134.65	106.92	78.52	56.62
14.00	DISCHG	46.62	41.02	36.70	33.18	30.21	27.75	25.85	24.41	23.18	22.05
16.00	DISCHG	21.19	20.60	20.22	19.91	19.44	18.82	18.22	17.73	17.34	17.01
[illegible]00	DISCHG	16.56	15.95	15.29	14.76	14.32	13.98	13.74	13.60	13.56	13.54
[illegible]00	DISCHG	13.30	12.80	12.16	11.61	11.15	10.79	10.54	10.38	10.32	10.33
22.00	DISCHG	10.34	10.36	10.37	10.38	10.39	10.41	10.42	10.43	10.44	10.42
24.00	DISCHG	10.14	9.21	7.61	5.68	3.96	2.56	1.47	.69	.22	.02

RUNOFF VOLUME ABOVE BASEFLOW = 1.60 WATERSHED INCHES, 455.49 CFS-HRS, 37.64 ACRE-FEET; BASEFLOW = .00 CFS

OPERATION ADDHYD CROSS SECTION 18
INPUT HYDROGRAPHS= 2,6 OUTPUT HYDROGRAPH= 1
1

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
12.83	502.73	(NULL)
16.58	225.77	(NULL)

RUNOFF VOLUME ABOVE BASEFLOW = 1.72 WATERSHED INCHES, 3830.61 CFS-HRS, 316.56 ACRE-FEET; BASEFLOW = .00 CFS

OPERATION RUNOFF CROSS SECTION 19
OUTPUT HYDROGRAPH= 7
AREA= .12 SQ MI INPUT RUNOFF CURVE= 77. TIME OF CONCENTRATION= 1.21 HOURS
INTERNAL HYDROGRAPH TIME INCREMENT= .1613 HOURS

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
[illegible]	[illegible]	[illegible]

TIME(HRS)		FIRST HYDROGRAPH POINT = .00 HOURS				TIME INCREMENT = .20 HOURS			DRAINAGE AREA =		.13 SQ.MI.
8.00	DISCHG	.00	.00	.00	.00	.00	.01	.04	.09	.17	.28
10.00	DISCHG	.42	.60	.82	1.09	1.45	1.93	2.57	3.40	5.06	9.83
12.00	DISCHG	21.47	35.82	49.98	60.73	61.96	59.30	55.54	50.99	45.75	40.08
14.00	DISCHG	34.08	27.85	21.72	16.65	13.66	12.06	10.94	10.04	9.32	8.72
16.00	DISCHG	8.23	7.84	7.54	7.30	7.09	6.88	6.68	6.48	6.31	6.17
[illegible]	DISCHG	6.01	5.84	5.65	5.44	5.26	5.10	4.98	4.89	4.82	4.75
20.00	DISCHG	4.66	4.54	4.40	4.25	4.10	3.98	3.87	3.77	3.69	3.63
22.00	DISCHG	3.59	3.56	3.54	3.54	3.55	3.55	3.55	3.55	3.56	3.55
24.00	DISCHG	3.49	3.34	3.04	2.64	2.18	1.74	1.35	1.01	.72	.48
26.00	DISCHG	.29	.15	.06	.01	.00					

RUNOFF VOLUME ABOVE BASEFLOW = 2.13 WATERSHED INCHES, 178.95 CFS-HRS, 14.79 ACRE-FEET; BASEFLOW = .00 CFS

OPERATION REACH CROSS SECTION 20
INPUT HYDROGRAPH= 7 OUTPUT HYDROGRAPH= 3
LENGTH = 3100.00 FEET INPUT = COEFFICIENTS RELATED TO CROSS SECTIONAL AREA, X= .71, M= 1.31
0 MODIFIED ATT-KIN ROUTING COEFFICIENT = .47 PEAK TRAVEL TIME = .40 HOURS

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
13.26	56.95	(NULL)
23.78	3.55	(NULL)

RUNOFF VOLUME ABOVE BASEFLOW = 2.13 WATERSHED INCHES, 178.90 CFS-HRS, 14.78 ACRE-FEET; BASEFLOW = .00 CFS

OPERATION RUNOFF CROSS SECTION 21
OUTPUT HYDROGRAPH= 6
AREA= .09 SQ MI INPUT RUNOFF CURVE= 75. TIME OF CONCENTRATION= 1.16 HOURS
INTERNAL HYDROGRAPH TIME INCREMENT= .1547 HOURS

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
12.75	40.48	(RUNOFF)
23.56	2.37	(RUNOFF)

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TIME(HRS)		FIRST HYDROGRAPH POINT = .00 HOURS				TIME INCREMENT = .20 HOURS			DRAINAGE AREA =		.09 SQ.MI.
8.00	DISCHG	.00	.00	.00	.00	.00	.00	.00	.00	.02	.05
10.00	DISCHG	.10	.17	.28	.43	.63	.91	1.29	1.79	2.81	6.00
12.00	DISCHG	13.76	23.64	33.25	39.82	40.40	38.52	35.84	32.65	29.06	25.11
14.00	DISCHG	20.94	16.67	12.66	9.97	8.61	7.71	7.03	6.47	6.03	5.67
16.00	DISCHG	5.36	5.12	4.94	4.80	4.66	4.53	4.40	4.27	4.16	4.07
18.00	DISCHG	3.97	3.85	3.72	3.58	3.46	3.37	3.29	3.24	3.19	3.15
20.00	DISCHG	3.09	3.01	2.92	2.81	2.71	2.63	2.55	2.49	2.44	2.40
22.00	DISCHG	2.38	2.36	2.36	2.36	2.36	2.37	2.37	2.37	2.37	2.37
24.00	DISCHG	2.23	2.21	2.00	1.72	1.40	1.10	.83	.61	.42	.26
26.00	DISCHG	.15	.07	.02	.00						

RUNOFF VOLUME ABOVE BASEFLOW = 1.97 WATERSHED INCHES, 114.66 CFS-HRS, 9.48 ACRE-FEET; BASEFLOW = .00 CFS

OPERATION ADDHYD CROSS SECTION 22
INPUT HYDROGRAPHS= 6,3 OUTPUT HYDROGRAPH= 2

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
[illegible]	[illegible]	[illegible]

RUNOFF VOLUME ABOVE BASEFLOW = 2.07 WATERSHED INCHES, 293.56 CFS-HRS, 24.26 ACRE-FEET; BASEFLOW = .00 CFS

OPERATION RUNOFF CROSS SECTION 23
OUTPUT HYDROGRAPH= 6
AREA= .17 SQ MI INPUT RUNOFF CURVE= 79. TIME OF CONCENTRATION= 1.36 HOURS
INTERNAL HYDROGRAPH TIME INCREMENT= .1813 HOURS

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
12.86	80.92	(RUNOFF)
23.56	4.81	(RUNOFF)

RUNOFF VOLUME ABOVE BASEFLOW = 2.29 WATERSHED INCHES, 251.50 CFS-HRS, 20.78 ACRE-FEET; BASEFLOW = .00 CFS

OPERATION ADDHYD CROSS SECTION 24
INPUT HYDROGRAPHS= 6,2 OUTPUT HYDROGRAPH= 3

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
12.99	172.29	(NULL)
23.58	10.74	(NULL)

RUNOFF VOLUME ABOVE BASEFLOW = 2.17 WATERSHED INCHES, 545.05 CFS-HRS, 45.04 ACRE-FEET; BASEFLOW = .00 CFS

OPERATION RESVOR STRUCTURE 4
INPUT HYDROGRAPH= 3 OUTPUT HYDROGRAPH= 6
SURFACE ELEVATION= 737.90

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T. REQ 06-21-94 17:58 OWOSSO DRAIN - FPMS - SHIAWASSEE CO.MI. 06-20-94 JOB 1 PASS 3
REV PC 09/83(.2) EXISTING CONDITIONS-24 HOUR TYPE II STORM DISTRIBUTION PAGE 56

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
15.76	29.53	740.77

TIME(HRS) FIRST HYDROGRAPH POINT = .00 HOURS TIME INCREMENT = .20 HOURS DRAINAGE AREA = .39 SQ.MI.

8.00	DISCHG	.00	.00	.00	.00	.00	.01	.01	.03	.05	.07
8.00	ELEV	737.90	737.90	737.90	737.90	737.90	737.90	737.90	737.90	737.91	737.91
10.00	DISCHG	.11	.16	.23	.32	.44	.60	.80	1.06	1.42	2.04
10.00	ELEV	737.91	737.92	737.93	737.94	737.95	737.97	737.99	738.02	738.06	738.13
12.00	DISCHG	3.27	5.53	9.00	13.63	18.79	20.31	21.82	23.24	24.55	25.72
12.00	ELEV	738.27	738.52	738.91	739.43	740.01	740.11	740.22	740.32	740.42	740.50
14.00	DISCHG	26.73	27.57	28.24	28.73	29.07	29.29	29.42	29.49	29.53	29.53
14.00	ELEV	740.57	740.63	740.65	740.71	740.74	740.75	740.76	740.77	740.77	740.77
16.00	DISCHG	29.52	29.48	29.44	29.38	29.31	29.24	29.15	29.07	28.98	28.88
16.00	ELEV	740.77	740.77	740.76	740.76	740.76	740.75	740.74	740.74	740.73	740.72
18.00	DISCHG	28.78	28.68	28.57	28.45	28.34	28.21	28.09	27.96	27.83	27.70
18.00	ELEV	740.72	740.71	740.70	740.69	740.69	740.68	740.67	740.66	740.65	740.64
20.00	DISCHG	27.57	27.43	27.30	27.16	27.02	26.87	26.72	26.58	26.43	26.27
20.00	ELEV	740.63	740.62	740.61	740.60	740.59	740.58	740.57	740.56	740.55	740.54
22.00	DISCHG	26.12	25.97	25.82	25.67	25.52	25.37	25.22	25.08	24.93	24.79
22.00	ELEV	740.53	740.52	740.51	740.50	740.49	740.47	740.46	740.45	740.44	740.43
[illegible]	DISCHG	24.65	24.51	24.36	24.21	24.05	23.88	23.70	23.51	23.31	23.10
[illegible]	ELEV	740.42	740.41	740.40	740.39	740.38	740.37	740.35	740.34	740.33	740.31
26.00	DISCHG	22.89	22.67	22.45	22.22	22.01	21.79	21.58	21.36	21.15	20.93
26.00	ELEV	740.30	740.28	740.27	740.25	740.24	740.22	740.20	740.19	740.17	740.16
28.00	DISCHG	20.72	20.52	20.31	20.11	19.91	19.71	19.51	19.31	19.12	[illegible]
28.00	ELEV	740.14	740.13	740.11	740.10	[illegible]	740.07	740.06	740.04	740.03	[illegible]

32.00	DISCHG	12.93	12.48	11.99	11.56	11.12	10.71	10.31	9.93	9.56	9.21
32.00	ELEV	739.35	739.30	739.25	739.20	739.15	739.10	739.06	739.02	738.97	738.93
34.00	DISCHG	8.87	8.54	8.22	7.92	7.63	7.34	7.07	6.81	6.56	6.32
34.00	ELEV	738.90	738.86	738.82	738.79	738.76	738.72	738.69	738.66	738.64	738.61
36.00	DISCHG	6.08	5.86	5.64	5.43	5.23	5.04	4.85	4.67	4.50	4.33
36.00	ELEV	738.58	738.56	738.53	738.51	738.49	738.47	738.44	738.42	738.41	738.39
38.00	DISCHG	4.17	4.02	3.87	3.73	3.59	3.46	3.33	3.20	3.09	2.97
[illegible]	ELEV	738.37	738.35	738.33	738.32	738.30	738.29	738.27	738.26	738.25	738.23
[illegible]	DISCHG	2.86	2.76	2.65	2.56	2.46	2.37	2.28	2.20	2.12	2.04
40.00	ELEV	738.22	738.21	738.20	738.19	738.18	738.17	738.16	738.15	738.14	738.13
42.00	DISCHG	1.96	1.89	1.82	1.75	1.69	1.63	1.57	1.51	1.45	1.40
42.00	ELEV	738.12	738.11	738.10	738.10	738.09	738.08	738.08	738.07	738.06	738.06
44.00	DISCHG	1.35	1.30	1.25	1.20	1.16	1.12	1.07	1.03	1.00	.96
44.00	ELEV	738.05	738.05	738.04	738.04	738.03	738.03	738.02	738.02	738.01	738.01
46.00	DISCHG	.92	.89	.86	.82	.79	.76	.74	.71	.68	.66
46.00	ELEV	738.00	738.00	738.00	737.99	737.99	737.99	737.98	737.98	737.98	737.97
48.00	DISCHG	.63	.61	.59	.57	.54	.52	.51	.49	.47	.45
48.00	ELEV	737.97	737.97	737.97	737.96	737.96	737.96	737.96	737.95	737.95	737.95
50.00	DISCHG	.43	.42	.40	.39	.37	.36	.35	.33	.32	.31
50.00	ELEV	737.95	737.95	737.95	737.94	737.94	737.94	737.94	737.94	737.94	737.93

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52.00	DISCHG	.30	.29	.28	.27	.26	.25	.24	.23	.22	.21
52.00	ELEV	737.93	737.93	737.93	737.93	737.93	737.93	737.93	737.93	737.92	737.92
54.00	DISCHG	.20	.20	.19	.18	.13	.17	.16	.16	.15	.15
54.00	ELEV	737.92	737.92	737.92	737.92	737.92	737.92	737.92	737.92	737.92	737.92
[illegible]	DISCHG	.14	.14	.13	.13	.12	.12	.11	.11	.10	.10
[illegible]	ELEV	737.92	737.92	737.91	737.91	737.91	737.91	737.91	737.91	737.91	737.91
58.00	DISCHG	.10	.09	.09	.09	.08	.08	.08	.07	.07	.07
58.00	ELEV	737.91	737.91	737.91	737.91	737.91	737.91	737.91	737.91	737.91	737.91

RUNOFF VOLUME ABOVE BASEFLOW = 2.16 WATERSHED INCHES, 544.63 CFS-HRS, 45.01 ACRE-FEET; BASEFLOW = .00 CFS

OPERATION ADDHYD CROSS SECTION 25
INPUT HYDROGRAPHS= 6,1 OUTPUT HYDROGRAPH= 5

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
12.85	522.12	(NULL)
16.56	255.16	(NULL)

RUNOFF VOLUME ABOVE BASEFLOW = 1.76 WATERSHED INCHES, 4375.29 CFS-HRS, 361.57 ACRE-FEET; BASEFLOW = .00 CFS

OPERATION RESVOR STRUCTURE 5
INPUT HYDROGRAPH= 5 OUTPUT HYDROGRAPH= 7
SURFACE ELEVATION= 731.80

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
19.49	227.42	739.34

TIME(HRS) FIRST HYDROGRAPH POINT = .00 HOURS TIME INCREMENT = .20 HOURS DRAINAGE AREA = 3.85 SQ.MI.

[illegible]	DISCHG	.00	.00	.00	.00	.00	.00	.01	.01	.02	.02
.00	ELEV	731.80	731.80	731.80	731.80	731.80	731.80	731.80	731.80	731.80	731.80
10.00	DISCHG	.06	.12	.23	.45	.91	1.75	3.32	5.34	14.57	22.50
10.00	ELEV	731.80	731.81	731.82	731.82	731.87	731.93	732.04	732.23	732.57	733.52
12.00	DISCHG	61.44	67.25	70.60	74.75	84.37	98.29	111.16	122.60	132.57	141.15
12.00	ELEV	[illegible]	737.10	737.42	737.81	738.09	738.22	738.42	738.55	738.67	738.72
[illegible]	DISCHG	[illegible]	[illegible]	[illegible]	76.94	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

16.00	DISCHG	204.08	206.63	209.05	211.37	213.56	215.61	217.49	219.21	220.79	222.21
16.00	ELEV	739.23	739.24	739.25	739.26	739.27	739.28	739.29	739.30	739.31	739.32
18.00	DISCHG	223.47	224.56	225.45	226.16	226.70	227.07	227.30	227.41	227.40	227.29
18.00	ELEV	739.32	739.33	739.33	739.34	739.34	739.34	739.34	739.34	739.34	739.34
20.00	DISCHG	227.06	226.71	226.22	225.60	224.84	223.97	223.00	221.93	220.78	219.56
20.00	ELEV	739.34	739.34	739.34	739.34	739.33	739.33	739.32	739.32	739.31	739.30
22.00	DISCHG	218.27	216.93	215.52	214.07	212.56	211.02	209.43	207.81	206.16	204.48
[illegible]00	ELEV	739.30	739.29	739.28	739.28	739.27	739.26	739.25	739.25	739.24	739.23
24.00	DISCHG	202.76	200.94	198.96	196.77	194.38	191.79	189.04	186.16	183.19	180.15
24.00	ELEV	739.22	739.21	739.20	739.19	739.18	739.16	739.15	739.14	739.12	739.10
26.00	DISCHG	177.08	173.98	170.86	167.74	164.62	161.52	158.81	156.85	154.87	152.88
26.00	ELEV	739.09	739.07	739.06	739.04	739.03	739.01	738.99	738.97	738.94	738.92

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28.00	DISCHG	150.89	148.89	146.89	144.90	142.90	140.90	138.90	136.91	134.92	132.93
28.00	ELEV	738.90	738.87	738.85	738.82	738.80	738.78	738.75	738.73	738.70	738.68
30.00	DISCHG	130.95	128.97	126.98	124.99	122.99	120.99	118.99	116.99	115.00	113.01
30.00	ELEV	738.65	738.63	738.61	738.58	738.56	738.53	738.51	738.49	738.46	738.44
32.00	DISCHG	111.03	109.06	107.10	105.15	103.21	101.29	99.38	97.50	95.63	93.77
32.00	ELEV	738.41	738.39	738.37	738.34	738.32	738.30	738.27	738.25	738.23	738.21
34.00	DISCHG	91.94	90.13	88.34	86.57	84.82	83.10	81.40	79.72	78.07	76.69
34.00	ELEV	738.18	738.16	738.14	738.12	738.10	738.08	738.06	738.04	738.02	737.99
36.00	DISCHG	76.17	75.65	75.13	74.60	74.08	73.55	73.02	72.48	71.95	71.42
36.00	ELEV	737.94	737.89	737.84	737.79	737.74	737.69	737.64	737.59	737.54	737.49
38.00	DISCHG	70.88	70.35	69.81	69.28	68.74	68.21	67.68	67.14	66.61	65.64
38.00	ELEV	737.44	737.39	737.34	737.29	737.24	737.19	737.14	737.09	737.04	736.92
[illegible]00	DISCHG	63.18	56.93	40.85	30.66	24.15	19.96	17.22	15.39	14.13	13.24
[illegible]00	ELEV	736.56	735.97	734.79	734.05	733.57	733.26	733.06	732.93	732.84	732.77
42.00	DISCHG	12.57	12.06	11.64	11.28	10.97	10.68	10.42	10.17	9.94	9.72
42.00	ELEV	732.72	732.68	732.65	732.63	732.60	732.58	732.56	732.55	732.53	732.51
44.00	DISCHG	9.51	9.31	9.11	8.92	8.74	8.56	8.39	8.23	8.07	7.92
44.00	ELEV	732.50	732.48	732.47	732.45	732.44	732.43	732.42	732.40	732.39	732.38
46.00	DISCHG	7.77	7.63	7.49	7.35	7.22	7.09	6.97	6.85	6.73	6.62
46.00	ELEV	732.37	732.36	732.35	732.34	732.33	732.32	732.31	732.30	732.29	732.29
48.00	DISCHG	6.51	6.40	6.30	6.20	6.10	6.01	5.91	5.82	5.74	5.65
48.00	ELEV	732.28	732.27	732.26	732.25	732.25	732.24	732.23	732.23	732.22	732.21
50.00	DISCHG	5.57	5.49	5.41	5.33	5.26	5.18	5.11	5.04	4.97	4.91
50.00	ELEV	732.21	732.20	732.20	732.19	732.19	732.18	732.17	732.17	732.16	732.16
52.00	DISCHG	4.84	4.78	4.71	4.65	4.59	4.53	4.48	4.42	4.37	4.31
52.00	ELEV	732.15	732.15	732.15	732.14	732.14	732.13	732.13	732.12	732.12	732.12
54.00	DISCHG	4.26	4.21	4.16	4.11	4.06	4.01	3.96	3.92	3.87	3.83
54.00	ELEV	732.11	732.11	732.10	732.10	732.10	732.09	732.09	732.09	732.08	732.08
56.00	DISCHG	3.78	3.74	3.70	3.66	3.62	3.58	3.54	3.50	3.46	3.42
56.00	ELEV	732.08	732.07	732.07	732.07	732.07	732.06	732.06	732.06	732.05	732.05
58.00	DISCHG	3.39	3.35	3.31	3.28	3.24	3.21	3.17	3.14	3.11	3.08
58.00	ELEV	732.05	732.05	732.04	732.04	732.04	732.04	732.03	732.03	732.03	732.02

RUNOFF VOLUME ABOVE BASEFLOW = 1.76 WATERSHED INCHES, 4373.82 CFS-HRS, 361.45 ACRE-FEET; BASEFLOW = .00 CFS

OPERATION RUNOFF CROSS SECTION 26
OUTPUT HYDROGRAPH= 6
AREA= .13 SQ MI INPUT RUNOFF CURVE= 72. TIME OF CONCENTRATION= 1.79 HOURS
INTERNAL HYDROGRAPH TIME INCREMENT= .1989 HOURS

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
13.25	36.57	(RUNOFF)

12.00	DISCHG	7.67	13.21	19.14	25.28	31.22	35.41	36.52	36.13	35.24	33.99
14.00	DISCHG	32.44	30.67	28.70	26.57	24.29	21.90	19.43	16.88	14.30	11.82
16.00	DISCHG	9.93	8.88	8.23	7.72	7.30	6.96	6.67	6.41	6.19	5.99
18.00	DISCHG	5.80	5.64	5.48	5.32	5.16	5.01	4.87	4.75	4.65	4.55

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20.00	DISCHG	4.45	4.35	4.24	4.13	4.01	3.89	3.78	3.68	3.59	3.52
22.00	DISCHG	3.46	3.41	3.36	3.32	3.23	3.26	3.23	3.22	3.21	3.21
24.00	DISCHG	3.18	3.11	2.99	2.81	2.59	2.32	2.03	1.75	1.49	1.25
26.00	DISCHG	1.04	.84	.66	.51	.33	.26	.17	.10	.05	.01
28.00	DISCHG	.00									

RUNOFF VOLUME ABOVE BASEFLOW = 1.75 WATERSHED INCHES, 146.54 CFS-HRS, 12.11 ACRE-FEET; BASEFLOW = .00 CFS

OPERATION ADDHYD CROSS SECTION 27
INPUT HYDROGRAPHS= 7,6 OUTPUT HYDROGRAPH= 5

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
19.27	232.18	(NULL)

RUNOFF VOLUME ABOVE BASEFLOW = 1.76 WATERSHED INCHES, 4520.36 CFS-HRS, 373.56 ACRE-FEET; BASEFLOW = .00 CFS

OPERATION RUNOFF CROSS SECTION 28
OUTPUT HYDROGRAPH= 6
AREA= .42 SQ MI INPUT RUNOFF CURVE= 78. TIME OF CONCENTRATION= .69 HOURS
INTERNAL HYDROGRAPH TIME INCREMENT= .0920 HOURS

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
12.41	317.01	(RUNOFF)
19.56	15.37	(RUNOFF)
23.53	11.72	(RUNOFF)

TIME(HRS) FIRST HYDROGRAPH POINT = .00 HOURS TIME INCREMENT = .20 HOURS DRAINAGE AREA = .42 SQ.MI.

8.00	DISCHG	.00	.00	.00	.04	.18	.44	.84	1.36	1.99	2.73
10.00	DISCHG	3.56	4.46	5.55	6.98	8.98	11.70	15.22	19.77	29.36	64.31
12.00	DISCHG	164.52	276.70	316.85	286.01	241.48	190.71	137.06	89.78	65.89	56.23
14.00	DISCHG	49.32	43.93	39.65	36.06	32.90	30.31	28.50	27.11	25.82	24.63
16.00	DISCHG	23.80	23.26	22.89	22.56	22.31	21.20	20.44	19.85	19.42	19.11
18.00	DISCHG	18.60	17.80	16.98	16.34	15.55	15.53	15.37	15.35	15.37	15.33
20.00	DISCHG	14.94	14.15	13.32	12.65	12.15	11.82	11.65	11.62	11.63	11.64
22.00	DISCHG	11.65	11.66	11.66	11.67	11.68	11.69	11.70	11.71	11.72	11.67
24.00	DISCHG	11.25	9.82	7.50	5.02	3.04	1.57	.60	.12	.00	

RUNOFF VOLUME ABOVE BASEFLOW = 2.21 WATERSHED INCHES, 599.42 CFS-HRS, 49.54 ACRE-FEET; BASEFLOW = .00 CFS

OPERATION ADDHYD CROSS SECTION 29
INPUT HYDROGRAPHS= 5,6 OUTPUT HYDROGRAPH= 7

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
12.42	408.09	(NULL)
18.22	247.99	(NULL)

TIME(HRS) FIRST HYDROGRAPH POINT = .00 HOURS TIME INCREMENT = .20 HOURS DRAINAGE AREA = 4.40 SQ.MI.

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8.00	DISCHG	.00	.00	.00	.04	.18	.44	.84	1.37	2.01	2.77
10.00	DISCHG	3.62	4.59	5.80	7.49	10.01	13.72	18.96	26.32	41.27	91.14
12.00	DISCHG	233.63	357.16	406.60	386.04	357.08	324.41	284.74	248.51	233.69	231.37
[illegible]	DISCHG	230.39	229.92	230.75	233.48	235.45	236.88	238.03	238.62	238.43	237.81
16.00	DISCHG	237.81	238.77	240.18	241.65	242.88	243.76	244.60	245.48	246.40	247.30
18.00	DISCHG	247.87	247.99	247.91	247.82	247.71	247.61	247.54	247.51	247.42	247.17
20.00	DISCHG	246.45	245.21	243.78	242.38	241.00	239.68	238.42	237.23	236.00	234.72
22.00	DISCHG	233.38	231.99	230.55	229.06	227.53	225.96	224.36	222.73	221.09	219.36
24.00	DISCHG	217.19	213.87	209.45	204.61	200.00	195.67	191.66	188.03	184.68	181.41
26.00	DISCHG	178.12	174.82	171.53	168.25	165.00	161.78	158.98	156.94	154.91	152.89
28.00	DISCHG	150.89	148.89	146.89	144.90	142.90	140.90	138.90	136.91	134.92	132.93
30.00	DISCHG	130.95	128.97	126.98	124.99	122.99	120.99	118.99	116.99	115.00	113.01
32.00	DISCHG	111.03	109.06	107.10	105.15	103.21	101.29	99.38	97.50	95.63	93.77
34.00	DISCHG	91.94	90.13	88.34	86.57	84.82	83.10	81.40	79.72	78.07	76.69
36.00	DISCHG	76.17	75.65	75.13	74.60	74.08	73.55	73.02	72.48	71.95	71.42
38.00	DISCHG	70.88	70.35	69.81	69.28	68.74	68.21	67.68	67.14	66.61	65.64
40.00	DISCHG	63.18	56.93	40.85	30.66	24.15	19.96	17.22	15.39	14.13	13.24
42.00	DISCHG	12.57	12.06	11.64	11.28	10.97	10.68	10.42	10.17	9.94	9.72
44.00	DISCHG	9.51	9.31	9.11	8.92	8.74	8.56	8.39	8.23	8.07	7.92
46.00	DISCHG	7.77	7.63	7.49	7.35	7.22	7.09	6.97	6.85	6.73	6.62
48.00	DISCHG	6.51	6.40	6.30	6.20	6.10	6.01	5.91	5.82	5.74	5.65
50.00	DISCHG	5.57	5.49	5.41	5.33	5.26	5.18	5.11	5.04	4.97	4.91
52.00	DISCHG	4.84	4.78	4.71	4.65	4.59	4.53	4.48	4.42	4.37	4.31
54.00	DISCHG	4.26	4.21	4.16	4.11	4.06	4.01	3.96	3.92	3.87	3.83
56.00	DISCHG	3.78	3.74	3.70	3.66	3.62	3.58	3.54	3.50	3.46	3.42
58.00	DISCHG	3.39	3.35	3.31	3.28	3.24	3.21	3.17	3.14	3.11	3.08

RUNOFF VOLUME ABOVE BASEFLOW = 1.80 WATERSHED INCHES, 5119.79 CFS-HRS, 423.10 ACRE-FEET; BASEFLOW = .00 CFS

OPERATION RESVOR STRUCTURE 6
INPUT HYDROGRAPH= 7 OUTPUT HYDROGRAPH= 1
SURFACE ELEVATION= 728.40

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
22.43	230.28	736.42
30.23	136.13	734.26
30.58	126.87	734.11

TIME(HRS) FIRST HYDROGRAPH POINT = .00 HOURS TIME INCREMENT = .20 HOURS DRAINAGE AREA = 4.40 SQ.MI.

8.00	DISCHG	.00	.00	.00	.01	.07	.20	.44	.81	1.29	1.89
8.00	ELEV	728.40	728.40	728.40	728.40	728.40	728.41	728.43	728.46	728.49	728.53
10.00	DISCHG	2.61	3.43	4.40	5.63	7.34	9.82	13.39	18.46	26.87	67.86
10.00	ELEV	728.58	728.64	728.70	728.79	728.90	729.08	729.32	729.67	730.25	731.99
12.00	DISCHG	188.92	195.09	205.91	216.94	219.85	221.28	222.27	222.79	223.01	223.12
12.00	ELEV	735.11	735.29	735.62	735.96	736.03	736.10	736.14	736.16	736.16	736.17
14.00	DISCHG	223.21	223.30	223.39	223.48	223.61	223.76	223.92	224.09	224.26	224.43
14.00	ELEV	736.17	736.17	736.18	736.18	736.19	736.19	736.20	736.20	736.21	736.21
16.00	DISCHG	224.59	224.75	224.92	225.11	225.31	225.53	225.75	225.98	226.21	226.46
16.00	ELEV	736.22	736.22	736.23	736.24	736.24	736.25	736.26	736.27	736.27	736.28

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18.00	DISCHG	226.71	227.06	227.21	227.45	227.69	227.93	228.16	228.39	228.61	228.84
18.00	ELEV	736.29	736.30	736.31	736.32	736.33	736.35	736.34	736.35	736.36	736.37
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

22.00	DISCHG	230.24	230.27	230.28	230.28	230.26	230.21	230.15	230.06	229.98	229.86
22.00	ELEV	736.41	736.42	736.42	736.42	736.42	736.41	736.41	736.41	736.41	736.40
24.00	DISCHG	229.73	229.56	229.35	229.08	228.77	228.40	227.99	227.54	227.05	226.53
24.00	ELEV	736.40	736.39	736.38	736.37	736.36	736.35	736.34	736.32	736.30	736.29
26.00	DISCHG	225.98	225.39	224.77	224.12	223.44	222.73	222.00	221.24	220.47	219.68
26.00	ELEV	736.27	736.25	736.22	736.20	736.18	736.15	736.13	736.10	736.08	736.05
28.00	DISCHG	218.88	217.12	213.11	209.22	205.43	201.75	198.17	194.68	191.27	169.57
[illegible]	ELEV	736.02	735.96	735.84	735.72	735.61	735.50	735.39	735.28	735.18	734.79
30.00	DISCHG	115.15	135.81	124.22	126.83	122.63	121.68	119.34	117.75	115.68	113.70
30.00	ELEV	733.81	734.25	734.07	734.11	734.04	734.03	733.97	733.91	733.83	733.76
32.00	DISCHG	111.72	109.74	107.78	105.83	103.89	101.96	100.05	98.15	96.28	94.42
32.00	ELEV	733.68	733.61	733.53	733.45	733.38	733.31	733.23	733.16	733.09	733.02
34.00	DISCHG	92.58	90.76	88.96	87.19	85.43	83.70	81.99	80.31	78.65	77.15
34.00	ELEV	732.95	732.88	732.81	732.74	732.67	732.60	732.54	732.47	732.41	732.35
36.00	DISCHG	76.30	75.84	75.31	74.79	74.26	73.73	73.20	72.67	72.14	71.60
36.00	ELEV	732.32	732.30	732.28	732.26	732.24	732.22	732.20	732.18	732.16	732.14
38.00	DISCHG	71.07	70.53	70.00	69.46	68.93	68.40	67.86	67.32	66.79	66.00
38.00	ELEV	732.12	732.10	732.08	732.06	732.04	732.02	731.99	731.97	731.95	731.92
40.00	DISCHG	64.10	59.26	46.86	33.57	29.34	25.35	21.64	18.72	16.55	14.98
40.00	ELEV	731.85	731.66	731.18	730.66	730.42	730.14	729.89	729.69	729.54	729.43
42.00	DISCHG	13.84	13.01	12.37	11.87	11.46	11.11	10.80	10.53	10.27	10.03
42.00	ELEV	729.35	729.29	729.25	729.22	729.19	729.16	729.14	729.12	729.11	729.09
44.00	DISCHG	9.80	9.59	9.38	9.18	8.99	8.80	8.63	8.45	8.29	8.13
44.00	ELEV	729.07	729.06	729.04	729.03	729.02	729.01	728.99	728.98	728.97	728.96
46.00	DISCHG	7.97	7.82	7.68	7.53	7.40	7.26	7.14	7.01	6.89	6.77
46.00	ELEV	728.95	728.94	728.93	728.92	728.91	728.90	728.89	728.88	728.87	728.87
48.00	DISCHG	6.66	6.55	6.44	6.34	6.23	6.14	6.04	5.95	5.86	5.77
48.00	ELEV	728.86	728.85	728.84	728.84	728.83	728.82	728.82	728.81	728.80	728.80
50.00	DISCHG	5.68	5.60	5.52	5.44	5.36	5.28	5.21	5.14	5.07	5.00
50.00	ELEV	728.79	728.78	728.78	728.77	728.77	728.76	728.76	728.75	728.75	728.74
52.00	DISCHG	4.93	4.86	4.80	4.74	4.67	4.61	4.55	4.50	4.44	4.38
52.00	ELEV	728.74	728.73	728.73	728.73	728.72	728.72	728.71	728.71	728.71	728.70
[illegible]	DISCHG	4.33	4.28	4.23	4.17	4.12	4.07	4.03	3.98	3.93	3.89
[illegible]	ELEV	728.70	728.69	728.69	728.69	728.68	728.68	728.68	728.67	728.67	728.67
56.00	DISCHG	3.84	3.80	3.76	3.71	3.67	3.63	3.59	3.55	3.51	3.47
56.00	ELEV	728.66	728.66	728.66	728.66	728.65	728.65	728.65	728.64	728.64	728.64
58.00	DISCHG	3.43	3.40	3.36	3.32	3.29	3.25	3.22	3.19	3.15	3.12
58.00	ELEV	728.64	728.63	728.63	728.63	728.63	728.62	728.62	728.62	728.62	728.61

RUNOFF VOLUME ABOVE BASEFLOW = 1.80 WATERSHED INCHES, 5119.72 CFS-HRS, 423.09 ACRE-FEET; BASEFLOW = .00 CFS

OPERATION RUNOFF CROSS SECTION 30
OUTPUT HYDROGRAPH= 6
AREA= .28 SQ MI INPUT RUNOFF CURVE= 83. TIME OF CONCENTRATION= 1.27 HOURS
INTERNAL HYDROGRAPH TIME INCREMENT= .1693 HOURS

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PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
12.79	160.63	(RUNOFF)
23.53	8.42	(RUNOFF)

[illegible] HRS) FIRST HYDROGRAPH POINT = .00 HOURS TIME INCREMENT = .20 HOURS DRAINAGE AREA = .28 SQ.MI.

[illegible]	DISCHG	.00	.00	.00	.00	.00	.02	.05	.10	.19	.31
2.00	DISCHG	.46	.64	.87	1.14	1.47	1.84	2.26	2.72	3.22	3.75
10.00	DISCHG	4.38	5.06	5.83	6.75	7.72	9.41	11.38	13.07	16.96	32.74
[illegible]	[illegible]	[illegible]	97.15	131.96	157.43	162.80	155.80	146.10	134.65	121.20	107.03

18.00	DISCHG	14.50	14.09	13.64	13.14	12.69	12.32	12.01	11.77	11.57	11.40
20.00	DISCHG	11.17	10.89	10.56	10.19	9.85	9.55	9.28	9.05	8.86	8.70
22.00	DISCHG	8.57	8.48	8.43	8.41	8.41	8.41	8.41	8.42	8.42	8.40
24.00	DISCHG	8.28	7.93	7.30	6.41	5.39	4.37	3.45	2.64	1.95	1.37
26.00	DISCHG	.89	.51	.24	.08	.0[illegible]					

RUNOFF VOLUME ABOVE BASEFLOW = 2.64 WATERSHED INCHES, 476.89 CFS-HRS, 39.41 ACRE-FEET; BASEFLOW = .00 CFS

OPERATION ADDHYD CROSS SECTION 31
INPUT HYDROGRAPHS= 1,6 OUTPUT HYDROGRAPH= 7

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
12.82	382.72	(NULL)
19.85	240.23	(NULL)
30.23	136.13	(NULL)
30.58	126.87	(NULL)

TIME(HRS) FIRST HYDROGRAPH POINT = .00 HOURS TIME INCREMENT = .20 HOURS DRAINAGE AREA = 4.68 SQ.MI.

6.00	DISCHG	.00	.00	.00	.00	.00	.02	.05	.10	.19	.31
8.00	DISCHG	.46	.64	.87	1.15	1.53	2.04	2.71	3.53	4.51	5.68
10.00	DISCHG	6.99	8.49	10.22	12.38	15.26	19.23	24.78	32.46	45.83	100.60
12.00	DISCHG	251.07	292.24	337.77	374.38	382.69	377.08	368.37	357.14	344.21	330.16
14.00	DISCHG	315.34	300.02	284.45	270.09	259.77	254.56	251.55	249.23	247.46	246.06
16.00	DISCHG	244.92	244.02	243.38	242.92	242.55	242.23	241.93	241.66	241.47	241.35
18.00	DISCHG	241.21	241.05	240.84	240.59	240.34	240.24	240.17	240.16	240.19	240.23
20.00	DISCHG	240.22	240.14	239.98	239.78	239.58	239.40	239.25	239.11	238.99	238.89
22.00	DISCHG	238.81	238.75	238.71	238.69	238.66	238.62	238.57	238.49	238.40	238.26
24.00	DISCHG	238.00	237.49	236.65	235.50	234.15	232.77	231.44	230.18	229.00	227.90
26.00	DISCHG	226.86	225.90	225.01	224.20	223.46	222.73	222.00	221.24	220.47	219.68
28.00	DISCHG	218.88	217.12	213.11	209.22	205.43	201.75	198.17	194.68	191.27	169.57
30.00	DISCHG	115.15	135.81	124.22	126.83	122.61	121.68	119.34	117.75	115.68	113.70
32.00	DISCHG	111.72	109.74	107.78	105.83	103.89	101.96	100.05	98.15	96.28	94.42
[illegible]	DISCHG	92.58	90.76	88.96	87.19	85.43	83.70	81.99	80.31	78.65	77.15
36.00	DISCHG	76.30	75.84	75.31	74.79	74.26	73.73	73.20	72.67	72.14	71.60
38.00	DISCHG	71.07	70.53	70.00	69.46	68.93	68.40	67.86	67.32	66.79	66.00
40.00	DISCHG	64.10	59.26	46.86	33.57	29.34	25.35	21.64	18.72	16.55	14.98

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42.00	DISCHG	13.84	13.01	12.37	11.87	11.46	11.11	10.80	10.53	10.27	10.03
44.00	DISCHG	9.80	9.59	9.38	9.18	8.97	8.80	8.63	8.45	8.29	8.13
46.00	DISCHG	7.97	7.82	7.68	7.53	7.40	7.26	7.14	7.01	6.89	6.77
48.00	DISCHG	6.66	6.55	6.44	6.34	6.24	6.14	6.04	5.95	5.86	5.77
50.00	DISCHG	5.68	5.60	5.52	5.44	5.36	5.28	5.21	5.14	5.07	5.00
52.00	DISCHG	4.93	4.86	4.80	4.74	4.67	4.61	4.55	4.50	4.44	4.38
54.00	DISCHG	4.33	4.28	4.23	4.17	4.12	4.07	4.03	3.98	3.93	3.89
56.00	DISCHG	3.84	3.80	3.76	3.71	3.67	3.63	3.59	3.55	3.51	3.47
58.00	DISCHG	3.43	3.40	3.36	3.32	3.29	3.25	3.22	3.19	3.15	3.12

RUNOFF VOLUME ABOVE BASEFLOW = 1.85 WATERSHED INCHES, 5596.62 CFS-HRS, 462.50 ACRE-FEET; BASEFLOW = .00 CFS

EXECUTIVE CONTROL OPERATION ENDCMP RECORD ID
+ COMPUTATIONS COMPLETED FOR PASS 3

EXECUTIVE CONTROL OPERATION COMPUT RECORD ID

+ FROM XSECTION 1
+ TO XSECTION 31

STARTING TIME = .00 RAIN DEPTH = 3.37 RAIN DURATION= 1.00 RAIN TABLE NO.= 2 ANT. MOIST. COND= 2
ALTERNATE NO.= 1 STORM NO.= 4 MAIN TIME INCREMENT = .20 HOURS

OPERATION RUNOFF CROSS SECTION 1
OUTPUT HYDROGRAPH= 7
AREA= .58 SQ MI INPUT RUNOFF CURVE= 71. TIME OF CONCENTRATION= 1.14 HOURS
INTERNAL HYDROGRAPH TIME INCREMENT= .1520 HOURS

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
12.76	118.70	(RUNOFF)
23.59	9.32	(RUNOFF)

TIME(HRS) FIRST HYDROGRAPH POINT = .00 HOURS TIME INCREMENT = .20 HOURS DRAINAGE AREA = .58 SQ.MI.

10.00	DISCHG	.00	.00	.00	.00	.00	.00	.02	.17	1.45	8.54
12.00	DISCHG	31.34	61.62	93.09	117.01	118.62	115.23	109.26	101.20	91.37	80.28
14.00	DISCHG	68.08	55.15	43.01	35.12	31.02	28.29	25.84	23.96	22.42	21.13
16.00	DISCHG	20.06	19.23	18.60	18.11	17.65	17.20	16.71	16.24	15.86	15.53
18.00	DISCHG	15.17	14.74	14.25	13.73	13.19	12.94	12.68	12.47	12.30	12.16
20.00	DISCHG	11.95	11.67	11.30	10.88	10.51	10.19	9.91	9.68	9.50	9.36
22.00	DISCHG	9.27	9.23	9.23	9.25	9.26	9.27	9.29	9.30	9.32	9.30
24.00	DISCHG	9.17	8.69	7.84	6.70	5.40	4.22	3.18	2.28	1.55	.95
26.00	DISCHG	.50	.21	.05	.00						

RUNOFF VOLUME ABOVE BASEFLOW = .98 WATERSHED INCHES, 368.27 CFS-HRS, 30.43 ACRE-FEET; BASEFLOW = .00 CFS

OPERATION RUNOFF CROSS SECTION 2
OUTPUT HYDROGRAPH= 6
AREA= .24 SQ MI INPUT RUNOFF CURVE= 70. TIME OF CONCENTRATION= .63 HOURS
INTERNAL HYDROGRAPH TIME INCREMENT= .0840 HOURS

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
12.43	71.64	(RUNOFF)
19.63	4.83	(RUNOFF)
23.56	3.75	(RUNOFF)

TIME(HRS) FIRST HYDROGRAPH POINT = .00 HOURS TIME INCREMENT = .20 HOURS DRAINAGE AREA = .24 SQ.MI.

10.00	DISCHG	.00	.00	.00	.00	.00	.00	.00	.05	.75	6.24
12.00	DISCHG	30.07	61.13	71.51	65.29	55.47	43.31	30.26	21.14	17.79	15.59
14.00	DISCHG	13.83	12.45	11.36	10.41	9.55	8.86	8.39	8.04	7.69	7.37
16.00	DISCHG	7.16	7.03	6.94	6.88	6.72	6.45	6.23	6.06	5.95	5.88
18.00	DISCHG	5.74	5.47	5.22	5.02	4.89	4.82	4.80	4.81	4.82	4.82
20.00	DISCHG	4.68	4.40	4.13	3.92	3.78	3.70	3.68	3.68	3.69	3.70
22.00	DISCHG	3.70	3.71	3.72	3.72	3.73	3.73	3.74	3.75	3.75	3.74
24.00	DISCHG	3.58	3.05	2.22	1.39	.76	.33	.09	.01		

RUNOFF VOLUME ABOVE BASEFLOW = .93 WATERSHED INCHES, 144.03 CFS-HRS, 11.90 ACRE-FEET; BASEFLOW = .00 CFS

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OPERATION ADDHYD CROSS SECTION 3
INPUT HYDROGRAPHS= 7,6 OUTPUT HYDROGRAPH= 3

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
12.64	182.73	(NULL)
23.58	13.07	(NULL)

RUNOFF VOLUME ABOVE BASEFLOW = .97 WATERSHED INCHES, 512.30 CFS-HRS, 42.34 ACRE-FEET; BASEFLOW = .00 CFS

OPERATION RUNOFF CROSS SECTION 4
OUTPUT HYDROGRAPH= 7
AREA= .23 SQ MI INPUT RUNOFF CURVE= 75. TIME OF CONCENTRATION= .70 HOURS
INTERNAL HYDROGRAPH TIME INCREMENT= .0933 HOURS

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
12.44	90.11	(RUNOFF)
19.60	5.39	(RUNOFF)
23.56	4.15	(RUNOFF)

TIME(HRS) FIRST HYDROGRAPH POINT = .00 HOURS TIME INCREMENT = .20 HOURS DRAINAGE AREA = .23 SQ.MI.

10.00	DISCHG	.00	.00	.00	.02	.03	.43	.98	1.86	4.02	12.32
12.00	DISCHG	39.69	73.84	89.62	83.16	72.27	59.12	44.49	30.45	22.28	19.02
14.00	DISCHG	16.72	14.94	13.52	12.32	11.37	10.40	9.78	9.32	8.89	8.49
16.00	DISCHG	8.21	8.03	7.91	7.81	7.63	7.35	7.10	6.91	6.76	6.65
18.00	DISCHG	6.48	6.21	5.94	5.72	5.55	5.44	5.38	5.38	5.39	5.38
20.00	DISCHG	5.25	4.98	4.69	4.46	4.29	4.17	4.11	4.10	4.10	4.11
22.00	DISCHG	4.11	4.12	4.12	4.13	4.13	4.14	4.14	4.15	4.15	4.14
24.00	DISCHG	3.99	3.50	2.69	1.82	1.12	.59	.22	.05	.00	

RUNOFF VOLUME ABOVE BASEFLOW = 1.21 WATERSHED INCHES, 179.89 CFS-HRS, 14.87 ACRE-FEET; BASEFLOW = .00 CFS

OPERATION RESVOR STRUCTURE 1
INPUT HYDROGRAPH= 7 OUTPUT HYDROGRAPH= 1
SURFACE ELEVATION= 736.20

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
13.38	33.13	742.76
23.70	4.15	736.99

TIME(HRS) FIRST HYDROGRAPH POINT = .00 HOURS TIME INCREMENT = .20 HOURS DRAINAGE AREA = .23 SQ.MI.

10.00	DISCHG	.00	.00	.00	.01	.05	.18	.49	1.03	2.15	5.67
10.00	ELEV	736.20	736.20	736.20	736.20	736.21	736.23	736.29	736.39	736.60	737.26
12.00	DISCHG	17.56	32.07	32.33	32.61	32.84	33.01	33.11	33.13	32.09	33.03
12.00	ELEV	739.49	742.24	742.36	742.50	742.62	742.70	742.75	742.76	742.75	742.71
14.00	DISCHG	32.95	32.86	32.77	32.67	32.56	32.45	32.33	32.21	32.10	29.15
14.00	ELEV	742.68	742.63	742.58	742.53	742.48	742.42	742.37	742.31	742.25	741.66
16.00	DISCHG	16.98	11.80	9.56	8.57	8.07	7.73	7.44	7.18	6.98	6.82

1

[illegible]	ELEV	739.29	738.41	737.99	737.81	737.71	737.65	737.59	737.55	737.51	737.48
[illegible]	DISCHG	6.67	6.48	6.25	6.00	5.79	5.62	5.50	5.43	5.40	5.39
18.00	ELEV	737.45	737.42	737.37	737.33	737.29	737.25	737.23	737.22	737.21	737.21
20.00	DISCHG	5.25	5.21	4.99	4.75	4.53	4.35	4.23	4.15	4.12	4.11
20.00	ELEV	737.20	737.18	737.14	737.09	737.05	737.02	736.99	736.98	736.97	736.97
22.00	DISCHG	4.11	4.12	4.12	4.12	4.13	4.13	4.14	4.14	4.15	4.15
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

24.00	ELEV	736.97	736.93	736.84	736.71	736.57	736.45	736.35	736.26	736.24	736.21
26.00	DISCHG	.03	.01	.01	.00						
26.00	ELEV	736.21	736.20	736.20	736.20						

RUNOFF VOLUME ABOVE BASEFLOW = 1.22 WATERSHED INCHES, 180.39 CFS-HRS, 14.91 ACRE-FEET; BASEFLOW = .00 CFS

OPERATION ADDHYD CROSS SECTION 5
INPUT HYDROGRAPHS= 1,3 OUTPUT HYDROGRAPH= 4

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
12.64	215.38	(NULL)
23.59	17.22	(NULL)

RUNOFF VOLUME ABOVE BASEFLOW = 1.02 WATERSHED INCHES, 692.70 CFS-HRS, 57.24 ACRE-FEET; BASEFLOW = .00 CFS

OPERATION RUNOFF CROSS SECTION 6
OUTPUT HYDROGRAPH= 7
AREA= .36 SQ MI INPUT RUNOFF CURVE= 79. TIME OF CONCENTRATION= 1.96 HOURS
INTERNAL HYDROGRAPH TIME INCREMENT= .1867 HOURS

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
13.35	80.43	(RUNOFF)

TIME(HRS) FIRST HYDROGRAPH POINT = .00 HOURS TIME INCREMENT = .20 HOURS DRAINAGE AREA = .36 SQ.MI.

8.00	DISCHG	.00	.00	.00	.00	.00	.00	.00	.00	.01	.02
10.00	DISCHG	.06	.12	.22	.39	.63	.98	1.48	2.20	3.64	7.51
12.00	DISCHG	16.38	27.40	39.15	51.35	63.54	74.52	79.91	80.38	79.13	77.04
14.00	DISCHG	74.33	71.09	67.42	63.40	59.08	54.53	49.78	44.87	39.83	34.71
16.00	DISCHG	29.60	24.76	21.07	18.96	17.64	16.62	15.76	15.07	14.46	13.92
18.00	DISCHG	13.44	13.00	12.60	12.22	11.86	11.51	11.18	10.89	10.63	10.41
[illegible]	DISCHG	10.17	9.93	9.69	9.43	9.17	8.90	8.64	8.41	8.20	8.02
[illegible]	DISCHG	7.86	7.73	7.61	7.51	7.42	7.35	7.28	7.23	7.19	7.16
24.00	DISCHG	7.09	6.95	6.73	6.41	6.09	5.49	4.91	4.32	3.76	3.25
26.00	DISCHG	2.77	2.33	1.93	1.57	1.24	.95	.70	.49	.32	.18
28.00	DISCHG	.09	.03	.01							

RUNOFF VOLUME ABOVE BASEFLOW = 1.47 WATERSHED INCHES, 340.63 CFS-HRS, 28.15 ACRE-FEET; BASEFLOW = .00 CFS

OPERATION ADDHYD CROSS SECTION 7
1

INPUT HYDROGRAPHS= 4,7 OUTPUT HYDROGRAPH= 5

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
12.80	270.38	(NULL)

RUNOFF VOLUME ABOVE BASEFLOW = 1.14 WATERSHED INCHES, 1033.32 CFS-HRS, 85.39 ACRE-FEET; BASEFLOW = .00 CFS

OPERATION RESVOR STRUCTURE 2
INPUT HYDROGRAPH= 5 OUTPUT HYDROGRAPH= 7
SURFACE ELEVATION= 735.20

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
14.50	148.61	742.34

10.00	DISCHG	.00	.00	.01	.01	.02	.05	.06	.11	.52	1.79
10.00	ELEV	736.20	736.20	736.21	736.23	736.25	736.29	736.36	736.48	736.52	736.62
12.00	DISCHG	6.13	15.76	29.80	47.86	66.20	82.51	96.40	108.02	117.50	128.89
12.00	ELEV	736.99	737.80	738.98	739.88	740.69	741.17	741.56	741.88	742.14	742.27
14.00	DISCHG	139.37	145.63	148.29	148.26	146.55	143.76	140.17	135.98	131.33	126.12
14.00	ELEV	742.30	742.33	742.34	742.34	742.33	742.32	742.31	742.29	742.28	742.26
16.00	DISCHG	120.25	116.17	111.72	107.21	102.81	98.59	94.54	90.67	86.99	83.51
[illegible]00	ELEV	742.22	742.11	741.98	741.86	741.73	741.62	741.50	741.40	741.29	741.20
16.00	DISCHG	80.22	77.08	74.09	71.22	68.44	65.41	62.93	60.43	58.18	56.09
18.00	ELEV	741.11	741.02	740.94	740.86	740.76	740.66	740.55	740.44	740.34	740.25
20.00	DISCHG	54.13	52.26	50.47	48.74	47.05	45.44	43.89	42.42	41.04	39.73
20.00	ELEV	740.16	740.08	739.99	739.92	739.84	739.77	739.70	739.63	739.57	739.51
22.00	DISCHG	38.52	37.38	36.33	35.36	34.47	33.64	32.88	32.18	31.59	31.07
22.00	ELEV	739.45	739.40	739.36	739.31	739.27	739.23	739.20	739.17	739.13	739.08
24.00	DISCHG	30.57	30.04	29.41	28.63	27.69	26.61	25.42	24.15	22.85	21.55
24.00	ELEV	739.04	738.99	738.94	738.88	738.80	738.71	738.61	738.50	738.39	738.28
26.00	DISCHG	20.26	19.00	17.79	16.63	15.52	14.47	13.48	12.55	11.67	10.84
26.00	ELEV	738.17	738.07	737.97	737.87	737.78	737.69	737.60	737.53	737.45	737.38
28.00	DISCHG	10.06	9.33	8.66	8.03	7.45	6.91	6.40	5.94	5.51	5.11
28.00	ELEV	737.32	737.26	737.20	737.15	737.10	737.05	737.01	736.97	736.93	736.90
30.00	DISCHG	4.74	4.39	4.08	3.78	3.50	3.25	3.01	2.80	2.59	2.40
30.00	ELEV	736.87	736.84	736.81	736.79	736.77	736.74	736.72	736.71	736.69	736.67
32.00	DISCHG	2.23	2.07	1.92	1.78	1.65	1.53	1.42	1.32	1.22	1.13
32.00	ELEV	736.66	736.65	736.63	736.62	736.61	736.60	736.59	736.58	736.57	736.57
34.00	DISCHG	1.05	.97	.90	.84	.78	.72	.67	.62	.57	.53
34.00	ELEV	736.56	736.55	736.55	736.54	736.54	736.53	736.53	736.52	736.52	736.52
36.00	DISCHG	.49	.46	.42	.39	.37	.34	.31	.29	.27	.25
36.00	ELEV	736.51	736.51	736.51	736.50	736.50	736.50	736.50	736.50	736.49	736.49
38.00	DISCHG	.23	.22	.20	.19	.17	.16	.15	.14	.13	.12
38.00	ELEV	736.49	736.49	736.49	736.49	736.49	736.48	736.48	736.48	736.48	736.48
40.00	DISCHG	.11	.10	.10	.10	.10	.09	.09	.09	.09	.09
40.00	ELEV	736.48	736.48	736.48	736.47	736.47	736.46	736.46	736.45	736.45	736.45
[illegible]00	DISCHG	.09	.09	.08	.08	.08	.08	.08	.08	.08	.07
[illegible]00	ELEV	736.44	736.44	736.43	736.43	736.43	736.42	736.42	736.42	736.41	736.41

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44.00	DISCHG	.07	.07	.07	.07	.07	.07	.07	.07	.06	.06
44.00	ELEV	736.41	736.40	736.40	736.40	736.39	736.39	736.39	736.38	736.38	736.38
46.00	DISCHG	.06	.06	.06	.06	.06	.06	.06	.06	.05	.05
46.00	ELEV	736.37	736.37	736.37	736.37	736.36	736.36	736.36	736.35	736.35	736.35
48.00	DISCHG	.05	.05	.05	.05	.05	.05	.05	.05	.05	.05
48.00	ELEV	736.35	736.35	736.34	736.34	736.34	736.34	736.33	736.33	736.33	736.33
50.00	DISCHG	.04	.04	.04	.04	.04	.04	.04	.04	.04	.04
50.00	ELEV	736.32	736.32	736.32	736.32	736.32	736.32	736.31	736.31	736.31	736.31
52.00	DISCHG	.04	.04	.04	.04	.04	.03	.03	.03	.03	.03
52.00	ELEV	736.31	736.30	736.30	736.30	736.30	736.30	736.30	736.29	736.29	736.29
54.00	DISCHG	.03	.03	.03	.03	.03	.03	.03	.03	.03	.03
54.00	ELEV	736.29	736.29	736.29	736.29	736.28	736.28	736.28	736.28	736.28	736.28
56.00	DISCHG	.03	.03	.03	.03	.03	.03	.02	.02	.02	.02
56.00	ELEV	736.28	736.27	736.27	736.27	736.27	736.27	736.27	736.27	736.27	736.27
58.00	DISCHG	.02	.02	.02	.02	.02	.02	.02	.02	.02	.02
58.00	ELEV	736.26	736.26	736.26	736.26	736.26	736.26	736.26	736.26	736.26	736.26

RUNOFF VOLUME ABOVE BASEFLOW = 1.13 WATERSHED INCHES, 1032.73 CFS-HRS, 85.34 ACRE-FEET; BASEFLOW = .00 CFS

OPERATION REACH CROSS SECTION 8
INPUT HYDROGRAPH= 7 OUTPUT HYDROGRAPH= 9
[illegible]

0 MODIFIED ATT-KIN ROUTING COEFFICIENT = .06 PEAK TRAVEL TIME = 3.04 HOURS

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
17.33	93.93	737.52

RUNOFF VOLUME ABOVE BASEFLOW = 1.13 WATERSHED INCHES, 1032.19 CFS-HRS, 85.30 ACRE-FEET; BASEFLOW = .00 CFS

OPERATION RUNOFF CROSS SECTION 9
OUTPUT HYDROGRAPH= 6
AREA= .52 SQ MI INPUT RUNOFF CURVE= 72. TIME OF CONCENTRATION= 1.62 HOURS
INTERNAL HYDROGRAPH TIME INCREMENT= .2160 HOURS

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
13.13	97.98	(RUNOFF)
23.65	8.58	(RUNOFF)

RUNOFF VOLUME ABOVE BASEFLOW = 1.04 WATERSHED INCHES, 348.46 CFS-HRS, 28.80 ACRE-FEET; BASEFLOW = .00 CFS

OPERATION ADDHYD CROSS SECTION 10
INPUT HYDROGRAPHS= 3,6 OUTPUT HYDROGRAPH= 5

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
14.57	116.26	(NULL)
16.85	110.95	(NULL)

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RUNOFF VOLUME ABOVE BASEFLOW = 1.11 WATERSHED INCHES, 1380.65 CFS-HRS, 114.10 ACRE-FEET; BASEFLOW = .00 CFS

OPERATION RUNOFF CROSS SECTION 11
OUTPUT HYDROGRAPH= 6
AREA= .44 SQ MI INPUT RUNOFF CURVE= 70. TIME OF CONCENTRATION= 1.27 HOURS
INTERNAL HYDROGRAPH TIME INCREMENT= .1693 HOURS

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
12.89	77.87	(RUNOFF)
23.60	6.84	(RUNOFF)

TIME(HRS) FIRST HYDROGRAPH POINT = .00 HOURS TIME INCREMENT = .20 HOURS DRAINAGE AREA = .44 SQ.MI.

10.00	DISCHG	.00	.00	.00	.00	.00	.00	.00	.05	.66	4.72
12.00	DISCHG	17.67	34.90	53.66	70.28	77.15	76.75	74.52	70.82	66.04	60.39
14.00	DISCHG	54.01	47.03	39.51	31.94	25.88	22.44	20.31	18.61	17.28	16.20
16.00	DISCHG	15.30	14.56	14.00	13.56	13.17	12.90	12.44	12.10	11.80	11.54
18.00	DISCHG	11.27	10.92	10.65	10.28	9.95	9.68	9.46	9.29	9.15	9.02
20.00	DISCHG	8.86	8.65	8.40	8.12	7.86	7.62	7.43	7.26	7.11	6.99
22.00	DISCHG	6.90	6.83	6.80	6.79	6.80	6.81	6.82	6.83	6.84	6.83
24.00	DISCHG	6.74	6.46	5.96	5.24	4.40	3.57	2.82	2.16	1.60	1.12
26.00	DISCHG	.73	.42	.20	.07	.01					

RUNOFF VOLUME ABOVE BASEFLOW = .92 WATERSHED INCHES, 263.94 CFS-HRS, 21.51 ACRE-FEET; BASEFLOW = .00 CFS

OPERATION RESVOR STRUCTURE 5
INPUT HYDROGRAPH= 5 OUTPUT HYDROGRAPH= 1
SURFACE ELEVATION= 700.00

19.60 6.95 761.90

\+ * * FIRST POINT OF FLAT PEAK

TIME(HRS) FIRST HYDROGRAPH POINT = .00 HOURS TIME INCREMENT = .20 HOURS DRAINAGE AREA = .44 SQ.MI.

10.00	DISCHG	.00	.00	.00	.00	.00	.00	.00	.01	.07	.58
10.00	ELEV	760.80	760.80	760.80	760.80	760.80	760.80	760.80	760.80	760.84	761.11
12.00	DISCHG	1.36	1.59	1.98	2.53	3.18	3.85	4.51	5.13	5.71	6.23
[illegible]00	ELEV	761.50	761.52	761.54	761.56	761.60	761.63	761.67	761.70	761.73	761.75
14.00	DISCHG	6.70	7.10	7.43	7.68	7.88	8.03	8.15	8.25	8.34	8.42
14.00	ELEV	761.78	761.80	761.82	761.83	761.84	761.85	761.85	761.86	761.86	761.87
16.00	DISCHG	8.48	8.54	8.59	8.64	8.68	8.72	8.76	8.79	8.82	8.85
16.00	ELEV	761.87	761.87	761.88	761.88	761.88	761.88	761.89	761.89	761.89	761.89
18.00	DISCHG	8.87	8.89	8.91	8.92	8.93	8.94	8.95	8.95	8.95	8.95
18.00	ELEV	761.89	761.89	761.89	761.89	761.89	761.89	761.89	761.90	761.90	761.90
20.00	DISCHG	8.95	8.95	8.95	8.94	8.93	8.92	8.91	8.90	8.88	8.86
20.00	ELEV	761.90	761.90	761.89	761.89	761.89	761.89	761.89	761.89	761.89	761.89
22.00	DISCHG	8.85	8.83	8.81	8.79	8.77	8.75	8.74	8.72	8.70	8.69
22.00	ELEV	761.89	761.89	761.89	761.89	761.89	761.89	761.88	761.88	761.88	761.88
24.00	DISCHG	8.67	8.65	8.63	8.60	8.56	8.52	8.47	8.42	8.36	8.30
24.00	ELEV	761.88	761.88	761.88	761.88	761.88	761.87	761.87	761.87	761.86	761.86

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26.00	DISCHG	8.23	8.16	8.09	8.01	7.94	7.87	7.80	7.73	7.66	7.59
26.00	ELEV	761.86	761.85	761.85	761.85	761.84	761.84	761.84	761.83	761.83	761.82
28.00	DISCHG	7.52	7.45	7.38	7.31	7.25	7.18	7.11	7.05	6.99	6.92
28.00	ELEV	761.82	761.82	761.81	761.81	761.81	761.80	761.80	761.80	761.79	761.79
[illegible]00	DISCHG	6.86	6.80	6.73	6.67	6.61	6.55	6.49	6.43	6.37	6.32
[illegible]00	ELEV	761.79	761.78	761.78	761.78	761.77	761.77	761.77	761.77	761.76	761.76
32.00	DISCHG	6.26	6.20	6.14	6.09	6.03	5.98	5.92	5.87	5.82	5.76
32.00	ELEV	761.76	761.75	761.75	761.75	761.74	761.74	761.74	761.74	761.73	761.73
34.00	DISCHG	5.71	5.66	5.61	5.55	5.50	5.45	5.40	5.35	5.31	5.26
34.00	ELEV	761.73	761.73	761.72	761.72	761.72	761.71	761.71	761.71	761.71	761.70
36.00	DISCHG	5.21	5.16	5.11	5.07	5.02	4.98	4.93	4.89	4.84	4.80
36.00	ELEV	761.70	761.70	761.70	761.69	761.69	761.69	761.69	761.69	761.68	761.68
38.00	DISCHG	4.75	4.71	4.67	4.62	4.58	4.54	4.50	4.46	4.42	4.38
38.00	ELEV	761.68	761.68	761.67	761.67	761.67	761.67	761.67	761.66	761.66	761.66
40.00	DISCHG	4.34	4.30	4.26	4.22	4.18	4.14	4.10	4.07	4.03	3.99
40.00	ELEV	761.66	761.65	761.65	761.65	761.65	761.65	761.64	761.64	761.64	761.64
42.00	DISCHG	3.96	3.92	3.88	3.85	3.81	3.78	3.74	3.71	3.68	3.64
42.00	ELEV	761.64	761.64	761.63	761.63	761.63	761.63	761.63	761.62	761.62	761.62
44.00	DISCHG	3.61	3.58	3.54	3.51	3.48	3.45	3.42	3.39	3.35	3.32
44.00	ELEV	761.62	761.62	761.62	761.61	761.61	761.61	761.61	761.61	761.61	761.60
46.00	DISCHG	3.29	3.26	3.23	3.20	3.18	3.15	3.12	3.09	3.06	3.03
46.00	ELEV	761.60	761.60	761.60	761.60	761.60	761.60	761.59	761.59	761.59	761.59
48.00	DISCHG	3.01	2.98	2.95	2.92	2.90	2.87	2.84	2.82	2.79	2.77
48.00	ELEV	761.59	761.59	761.59	761.58	761.58	761.58	761.58	761.58	761.58	761.58
50.00	DISCHG	2.74	2.72	2.69	2.67	2.64	2.62	2.60	2.57	2.55	2.52
50.00	ELEV	761.57	761.57	761.57	761.57	761.57	761.57	761.57	761.57	761.56	761.56
52.00	DISCHG	2.50	2.48	2.46	2.43	2.41	2.39	2.37	2.35	2.32	2.30
52.00	ELEV	761.56	761.56	761.56	761.56	761.56	761.56	761.56	761.55	761.55	761.55
54.00	DISCHG	2.28	2.26	2.24	2.22	2.20	2.18	2.16	2.14	2.12	2.10
54.00	ELEV	761.55	761.55	761.55	761.55	761.55	761.55	761.54	761.54	761.54	761.54
[illegible]00	DISCHG	2.08	2.06	2.04	2.03	2.01	1.99	1.97	1.95	1.94	1.92
[illegible]00	ELEV	761.54	761.54	761.54	761.54	761.54	761.54	761.53	761.53	761.53	761.53
58.00	DISCHG	1.90	1.88	1.87	1.85	1.83	1.81	1.80	1.78	1.77	1.75
58.00	ELEV	761.53	761.53	761.53	761.53	761.53	761.53	761.53	761.52	761.52	761.52

FUNCTP VOLUME ABOVE BASEFLOW = .49 WATERSHED INCHES, 250.94 CFS--HS, 20.90 ACRE-FEET; BASEFLOW = .00 CFS

OPERATION ADDHYD CROSS SECTION 12
INPUT HYDROGRAPHS= 5,1 OUTPUT HYDROGRAPH= 7

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
14.62	123.94	(NULL)
16.88	119.65	(NULL)

RUNOFF VOLUME ABOVE BASEFLOW = 1.07 WATERSHED INCHES, 1633.59 CFS-HRS, 135.00 ACRE-FEET; BASEFLOW = .00 CFS

OPERATION RUNOFF CROSS SECTION 13

TRCU XEQ 06-21-94 17:58 OWOSSO DRAIN - FPMS - SHIAWASSEE CO.MI. 06-20-94 JOB 1 PASS 4
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OUTPUT HYDROGRAPH= 6
AREA= .46 SQ MI INPUT RUNOFF CURVE= 73. TIME OF CONCENTRATION= 1.70 HOURS
INTERNAL HYDROGRAPH TIME INCREMENT= .1889 HOURS

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
13.23	80.30	(RUNOFF)

TIME(HRS) FIRST HYDROGRAPH POINT = .00 HOURS TIME INCREMENT = .20 HOURS DRAINAGE AREA = .46 SQ.MI.

10.00	DISCHG	.00	.00	.00	.00	.00	.03	.12	.37	1.25	5.22
12.00	DISCHG	14.69	27.49	41.41	56.02	70.12	78.71	80.27	79.40	77.47	74.66
14.00	DISCHG	71.16	67.09	62.54	57.58	52.26	46.62	40.76	34.73	28.81	24.22
16.00	DISCHG	21.67	20.06	18.78	17.74	16.89	16.19	15.58	15.04	14.55	14.13
18.00	DISCHG	13.74	13.37	13.01	12.64	12.26	11.90	11.59	11.32	11.08	10.86
20.00	DISCHG	10.64	10.40	10.15	9.88	9.58	9.28	9.03	8.80	8.61	8.45
[illegible]	DISCHG	8.31	8.18	8.08	7.99	7.91	7.86	7.82	7.80	7.80	7.80
24.00	DISCHG	7.75	7.56	7.23	6.76	6.16	5.44	4.70	4.00	3.37	2.78
26.00	DISCHG	2.25	1.78	1.36	1.00	.69	.44	.25	.11	.03	.00

RUNOFF VOLUME ABOVE BASEFLOW = 1.09 WATERSHED INCHES, 324.69 CFS-HRS, 26.83 ACRE-FEET; BASEFLOW = .00 CFS

OPERATION RUNOFF CROSS SECTION 14
OUTPUT HYDROGRAPH= 5
AREA= .19 SQ MI INPUT RUNOFF CURVE= 61. TIME OF CONCENTRATION= .51 HOURS
INTERNAL HYDROGRAPH TIME INCREMENT= .0680 HOURS

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
12.41	27.77	(RUNOFF)
23.59	2.12	(RUNOFF)

TIME(HRS) FIRST HYDROGRAPH POINT = .00 HOURS TIME INCREMENT = .20 HOURS DRAINAGE AREA = .19 SQ.MI.

10.00	DISCHG	.00	.00	.00	.00	.00	.00	.00	.00	.00	.39
12.00	DISCHG	9.22	24.57	27.76	25.01	20.36	14.45	10.73	9.27	8.20	7.31
14.00	DISCHG	6.61	6.05	5.58	5.15	4.76	4.45	4.28	4.16	3.99	3.85
16.00	DISCHG	3.76	3.71	3.71	3.70	3.58	3.42	3.30	3.23	3.21	3.21
18.00	DISCHG	3.11	2.92	2.78	2.68	2.64	2.64	2.65	2.66	2.67	2.67
20.00	DISCHG	2.56	2.36	2.21	2.19	2.06	2.05	2.06	2.06	2.07	2.07
22.00	DISCHG	2.03	2.09	2.09	2.10	2.10	2.11	2.11	2.12	2.12	2.12
24.00	DISCHG	1.99	1.59	.99	.50	.19	.04				

RUNOFF VOLUME ABOVE BASEFLOW = .52 WATERSHED INCHES, 63.36 CFS-HRS, 5.24 ACRE-FEET; BASEFLOW = .00 CFS

OPERATION ADDHYD CROSS SECTION 15
INPUT HYDROGRAPHS= 2,5 OUTPUT HYDROGRAPH= 4

13.01	93.17	(NULL)
23.58	9.93	(NULL)

RUNOFF VOLUME ABOVE BASEFLOW = .93 WATERSHED INCHES, 388.05 CFS-HRS, 32.07 ACRE-FEET; BASEFLOW = .00 CFS

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OPERATION ADDHYD CROSS SECTION 16
INPUT HYDROGRAPHS= 4,7 OUTPUT HYDROGRAPH= 2

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
13.58	200.66	(NULL)

RUNOFF VOLUME ABOVE BASEFLOW = 1.04 WATERSHED INCHES, 2021.64 CFS-HRS, 167.07 ACRE-FEET; BASEFLOW = .00 CFS

OPERATION RUNOFF CROSS SECTION 17
OUTPUT HYDROGRAPH= 6
AREA= .44 SQ MI INPUT RUNOFF CURVE= 70. TIME OF CONCENTRATION= .83 HOURS
INTERNAL HYDROGRAPH TIME INCREMENT= .1107 HOURS

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
12.56	106.09	(RUNOFF)
23.59	6.87	(RUNOFF)

TIME(HRS) FIRST HYDROGRAPH POINT = .00 HOURS TIME INCREMENT = .20 HOURS DRAINAGE AREA = .44 SQ.MI.

[illegible]	DISCHG	.00	.00	.00	.00	.00	.00	.00	.06	.96	7.80
12.00	DISCHG	34.59	72.13	103.03	105.92	99.62	89.75	77.46	63.12	47.73	35.19
14.00	DISCHG	29.21	25.81	23.17	21.00	19.17	17.64	16.46	15.57	14.81	14.11
16.00	DISCHG	13.57	13.21	12.99	12.80	12.61	12.13	11.75	11.45	11.21	11.00
18.00	DISCHG	10.72	10.33	9.92	9.56	9.30	9.09	8.94	8.85	8.83	8.82
20.00	DISCHG	8.67	8.35	7.94	7.58	7.28	7.05	6.89	6.79	6.76	6.77
22.00	DISCHG	6.78	6.79	6.80	6.81	6.82	6.83	6.85	6.86	6.87	6.85
24.00	DISCHG	6.67	6.06	5.01	3.74	2.61	1.68	.97	.46	.15	.02

RUNOFF VOLUME ABOVE BASEFLOW = .93 WATERSHED INCHES, 263.86 CFS-HRS, 21.81 ACRE-FEET; BASEFLOW = .00 CFS

OPERATION ADDHYD CROSS SECTION 18
INPUT HYDROGRAPHS= 2,6 OUTPUT HYDROGRAPH= 1

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
12.97	284.47	(NULL)

RUNOFF VOLUME ABOVE BASEFLOW = 1.02 WATERSHED INCHES, 2285.50 CFS-HRS, 188.87 ACRE-FEET; BASEFLOW = .00 CFS

OPERATION RUNOFF CROSS SECTION 19
OUTPUT HYDROGRAPH= 7
AREA= .13 SQ MI INPUT RUNOFF CURVE= 77. TIME OF CONCENTRATION= 1.21 HOURS
INTERNAL HYDROGRAPH TIME INCREMENT= .1613 HOURS

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
12.80	37.63	(RUNOFF)
23.37	2.46	(RUNOFF)

1

TIME(HRS) FIRST HYDROGRAPH POINT = .00 HOURS TIME INCREMENT = .20 HOURS DRAINAGE AREA = .13 SQ.MI.

10.00	DISCHG	.00	.01	.03	.08	.18	.35	.61	.98	1.81	4.46
[illegible]	DISCHG	11.44	20.29	29.23	36.36	37.63	36.36	34.35	31.81	28.78	25.45
14.00	DISCHG	21.87	18.10	14.32	11.12	9.19	8.14	7.40	6.79	6.31	5.92
16.00	DISCHG	5.59	5.33	5.14	4.98	4.83	4.70	4.56	4.43	4.32	4.22
18.00	DISCHG	4.12	4.00	3.87	3.73	3.61	3.51	3.43	3.36	3.32	3.27
20.00	DISCHG	3.21	3.13	3.03	2.93	2.83	2.74	2.67	2.60	2.55	2.51
22.00	DISCHG	2.48	2.46	2.45	2.45	2.45	2.46	2.46	2.46	2.46	2.46
24.00	DISCHG	2.42	2.31	2.11	1.83	1.51	1.20	.94	.70	.50	.33
26.00	DISCHG	.20	.10	.04	.01	.00					

RUNOFF VOLUME ABOVE BASEFLOW = 1.34 WATERSHED INCHES, 112.15 CFS-HRS, 9.27 ACRE-FEET; BASEFLOW = .00 CFS

OPERATION REACH CROSS SECTION 20
INPUT HYDROGRAPH= 7 OUTPUT HYDROGRAPH= 3
LENGTH = 3100.00 FEET INPUT = COEFFICIENTS RELATED TO CROSS SECTIONAL AREA, X= .71, M= 1.31
0 MODIFIED ATT-KIN ROUTING COEFFICIENT = .43 PEAK TRAVEL TIME = .60 HOURS

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
13.35	33.98	(NULL)
23.83	2.46	(NULL)

RUNOFF VOLUME ABOVE BASEFLOW = 1.34 WATERSHED INCHES, 112.11 CFS-HRS, 9.26 ACRE-FEET; BASEFLOW = .00 CFS

OPERATION RUNOFF CROSS SECTION 21
OUTPUT HYDROGRAPH= 6
AREA= .09 SQ MI INPUT RUNOFF CURVE= 75. TIME OF CONCENTRATION= 1.16 HOURS
INTERNAL HYDROGRAPH TIME INCREMENT= .1547 HOURS

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
12.79	23.82	(RUNOFF)
23.58	1.62	(RUNOFF)

TIME(HRS) FIRST HYDROGRAPH POINT = .00 HOURS TIME INCREMENT = .20 HOURS DRAINAGE AREA = .09 SQ.MI.

10.00	DISCHG	.00	.00	.00	.00	.02	.07	.18	.36	.79	2.47
12.00	DISCHG	6.95	12.85	18.79	23.11	23.82	22.97	21.60	19.88	17.88	15.62
14.00	DISCHG	13.20	10.68	8.26	6.57	5.70	5.12	4.67	4.31	4.02	3.78
16.00	DISCHG	3.59	3.43	3.31	3.22	3.13	3.05	2.96	2.87	2.80	2.74
18.00	DISCHG	2.68	2.60	2.51	2.42	2.34	2.28	2.23	2.19	2.16	2.13
20.00	DISCHG	2.09	2.04	1.98	1.91	1.84	1.79	1.74	1.70	1.66	1.64
22.00	DISCHG	1.62	1.61	1.61	1.61	1.61	1.61	1.62	1.62	1.62	1.62
24.00	DISCHG	1.59	1.51	1.37	1.18	.96	.75	.57	.42	.29	.18
26.00	DISCHG	.10	.04	.01	.00						

RUNOFF VOLUME ABOVE BASEFLOW = 1.21 WATERSHED INCHES, 70.38 CFS-HRS, 5.82 ACRE-FEET; BASEFLOW = .00 CFS

OPERATION ADDHYD CROSS SECTION 22
1

INPUT HYDROGRAPHS= 1,3 OUTPUT HYDROGRAPH= 2

13.17	55.26	(NULL)
23.66	4.08	(NULL)

RUNOFF VOLUME ABOVE BASEFLOW = 1.29 WATERSHED INCHES, 182.48 CFS-HRS, 15.08 ACRE-FEET; BASEFLOW = .00 CFS

OPERATION RUNOFF CROSS SECTION 23

OUTPUT HYDROGRAPH= 6

AREA= .17 SQ MI INPUT RUNOFF CURVE= 79. TIME OF CONCENTRATION= 1.36 HOURS

INTERNAL HYDROGRAPH TIME INCREMENT= .1813 HOURS

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
12.88	50.44	(RUNOFF)
23.59	3.38	(RUNOFF)

RUNOFF VOLUME ABOVE BASEFLOW = 1.47 WATERSHED INCHES, 160.77 CFS-HRS, 13.29 ACRE-FEET; BASEFLOW = .00 CFS

OPERATION ADDHYD CROSS SECTION 24

INPUT HYDROGRAPHS= 6,2 OUTPUT HYDROGRAPH= 3

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
13.05	104.25	(NULL)
23.61	7.46	(NULL)

RUNOFF VOLUME ABOVE BASEFLOW = 1.36 WATERSHED INCHES, 343.26 CFS-HRS, 28.37 ACRE-FEET; BASEFLOW = .00 CFS

OPERATION RESVOR STRUCTURE 4

INPUT HYDROGRAPH= 3 OUTPUT HYDROGRAPH= 6

SURFACE ELEVATION= 737.90

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
15.50	22.77	740.29

TIME(HRS) FIRST HYDROGRAPH POINT = .00 HOURS TIME INCREMENT = .20 HOURS DRAINAGE AREA = .39 SQ.MI.

10.00	DISCHG	.00	.01	.01	.02	.04	.07	.12	.19	.31	.57
10.00	ELEV	737.90	737.90	737.90	737.90	737.90	737.91	737.91	737.92	737.94	737.96
12.00	DISCHG	1.19	2.43	4.42	7.14	10.38	13.78	17.10	19.11	19.88	20.57
12.00	ELEV	738.03	738.17	738.40	738.70	739.07	739.45	739.82	740.03	740.08	740.13
14.00	DISCHG	21.17	21.67	22.07	22.36	22.56	22.67	22.74	22.76	22.76	22.74
14.00	ELEV	740.18	740.21	740.24	740.26	740.27	740.28	740.29	740.29	740.29	740.29
16.00	DISCHG	22.71	22.66	22.60	22.54	22.47	22.39	22.32	22.23	22.15	22.06
16.00	ELEV	740.29	740.28	740.28	740.27	740.27	740.26	740.26	740.25	740.25	740.24
18.00	DISCHG	21.97	21.88	21.78	21.68	21.58	21.47	21.37	21.26	21.15	21.04
18.00	ELEV	740.23	740.23	740.22	740.21	740.20	740.20	740.19	740.18	740.17	740.17
20.00	DISCHG	20.93	20.82	20.71	20.59	20.47	20.36	20.24	20.12	20.00	19.88
20.00	ELEV	740.16	740.15	740.14	740.13	740.13	740.12	740.11	740.10	740.09	740.08

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22.00	DISCHG	19.75	19.63	19.51	19.39	19.27	19.15	19.03	18.92	18.80	18.66
22.00	ELEV	740.07	740.07	740.06	740.05	740.04	740.03	740.02	740.02	740.01	740.00
[illegible]	DISCHG	13.24	17.84	17.44	17.03	16.61	16.18	15.73	15.27	14.80	14.32
[illegible]	ELEV	739.95	739.90	739.86	739.81	739.77	739.72	739.67	739.62	739.56	739.51
26.00	DISCHG	13.85	13.37	12.90	12.44	11.95	11.54	11.12	10.71	10.31	9.93
26.00	ELEV	739.45	739.40	739.35	739.30	739.25	739.20	739.15	739.10	739.06	739.02
28.00	DISCHG	9.36	9.21	8.87	8.54	8.22	7.92	7.63	7.35	7.07	6.81
28.00	ELEV	738.97	738.93	738.90	738.86	738.82	738.79	738.75	738.72	738.69	738.65
[illegible]	DISCHG	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

32.00	DISCHG	4.50	4.33	4.17	4.02	3.87	3.73	3.59	3.46	3.33	3.20
32.00	ELEV	738.41	738.39	738.37	738.35	738.33	738.32	738.30	738.29	738.27	738.26
34.00	DISCHG	3.09	2.97	2.86	2.76	2.65	2.56	2.46	2.37	2.28	2.20
34.00	ELEV	738.25	738.23	738.22	738.21	738.20	738.19	738.18	738.17	738.16	738.15
36.00	DISCHG	2.12	2.04	1.96	1.89	1.82	1.75	1.69	1.63	1.57	1.51
36.00	ELEV	738.14	738.13	738.12	738.11	738.10	738.10	738.09	738.08	738.08	738.07
38.00	DISCHG	1.45	1.40	1.35	1.30	1.25	1.20	1.16	1.12	1.07	1.03
[illegible]	ELEV	738.06	738.06	738.05	738.05	738.04	738.04	738.03	738.03	738.02	738.02
40.00	DISCHG	1.00	.96	.92	.89	.86	.82	.79	.77	.74	.71
40.00	ELEV	738.01	738.01	738.00	738.00	738.00	737.99	737.99	737.99	737.98	737.98
42.00	DISCHG	.68	.66	.63	.61	.59	.57	.54	.52	.51	.49
42.00	ELEV	737.98	737.97	737.97	737.97	737.97	737.96	737.96	737.96	737.96	737.95
44.00	DISCHG	.47	.45	.43	.42	.40	.39	.37	.36	.35	.33
44.00	ELEV	737.95	737.95	737.95	737.95	737.95	737.94	737.94	737.94	737.94	737.94
46.00	DISCHG	.32	.31	.30	.29	.28	.27	.26	.25	.24	.23
46.00	ELEV	737.94	737.93	737.93	737.93	737.93	737.93	737.93	737.93	737.93	737.93
48.00	DISCHG	.22	.21	.20	.20	.19	.18	.18	.17	.16	.16
48.00	ELEV	737.92	737.92	737.92	737.92	737.92	737.92	737.92	737.92	737.92	737.92
50.00	DISCHG	.15	.15	.14	.14	.13	.13	.12	.12	.11	.11
50.00	ELEV	737.92	737.92	737.92	737.92	737.91	737.91	737.91	737.91	737.91	737.91
52.00	DISCHG	.10	.10	.10	.09	.09	.09	.08	.08	.08	.07
52.00	ELEV	737.91	737.91	737.91	737.91	737.91	737.91	737.91	737.91	737.91	737.91
54.00	DISCHG	.07	.07	.07	.06	.06	.06	.06	.05	.05	.05
54.00	ELEV	737.91	737.91	737.91	737.91	737.91	737.91	737.91	737.91	737.91	737.91
56.00	DISCHG	.05	.05	.05	.04	.04	.04	.04	.04	.04	.03
56.00	ELEV	737.91	737.91	737.91	737.90	737.90	737.90	737.90	737.90	737.90	737.90
58.00	DISCHG	.03	.03	.03	.03	.03	.03	.03	.03	.02	.02
58.00	ELEV	737.90	737.90	737.90	737.90	737.90	737.90	737.90	737.90	737.90	737.90

RUNOFF VOLUME ABOVE BASEFLOW = 1.36 WATERSHED INCHES, 343.17 CFS-HRS, 28.36 ACRE-FEET; BASEFLOW = .00 CFS

OPERATION ADDHYD CROSS SECTION 25
[illegible] INPUT HYDROGRAPHS= 6,1 OUTPUT HYDROGRAPH= 5

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
13.02	298.22	(NULL)

RUNOFF VOLUME ABOVE BASEFLOW = 1.06 WATERSHED INCHES, 2628.67 CFS-HRS, 217.23 ACRE-FEET; BASEFLOW = .00 CFS
1

OPERATION RESVOR STRUCTURE 5
INPUT HYDROGRAPH= 5 OUTPUT HYDROGRAPH= 7
SURFACE ELEVATION= 731.80

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
19.91	144.12	739.81

TIME(HRS) FIRST HYDROGRAPH POINT = .00 HOURS TIME INCREMENT = .20 HOURS DRAINAGE AREA = 3.85 SQ.MI.

10.00	DISCHG	.00	.00	.00	.01	.02	.04	.10	.28	1.05	5.30
[illegible]	ELEV	731.80	731.80	731.80	731.80	731.80	731.80	731.81	731.82	731.88	732.19
[illegible]	DISCHG	21.96	58.64	66.51	68.37	70.32	72.82	75.12	76.39	84.72	90.42
12.00	ELEV	733.41	736.10	737.03	737.[illegible]	737.41	737.62	737.84	738.02	738.10	738.16
14.00	DISCHG	95.62	100.44	104.92	109.05	112.92	116.21	119.20	121.81	124.05	125.99
14.00	ELEV	738.23	738.29	738.34	738.39	738.44	738.48	738.51	738.54	738.57	738.59
16.00	DISCHG	127.75	129.39	130.94	132.41	133.80	135.11	136.23	137.46	138.51	139.49
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	738.73	[illegible]	[illegible]

18.00	ELEV	738.77	738.78	738.79	738.79	738.80	738.80	738.81	738.81	738.81	738.81
20.00	DISCHG	144.12	144.04	143.87	143.62	143.28	142.87	142.39	141.85	141.26	140.61
20.00	ELEV	738.81	738.81	738.81	738.81	738.80	738.80	738.79	738.79	738.78	738.77
22.00	DISCHG	139.92	139.18	138.41	137.60	136.77	135.90	135.01	134.10	133.17	132.22
22.00	ELEV	738.76	738.75	738.74	738.74	738.73	738.71	738.70	738.69	738.68	738.67
24.00	DISCHG	131.25	130.22	129.12	127.92	126.62	125.22	123.73	122.18	120.56	118.89
24.00	ELEV	738.66	738.65	738.63	738.62	738.60	738.59	738.57	738.55	738.53	738.51
[illegible]	DISCHG	117.19	115.45	113.69	111.90	110.09	108.27	106.44	104.61	102.78	100.96
[illegible]	ELEV	738.49	738.47	738.45	738.42	738.40	738.38	738.36	738.34	738.31	738.29
28.00	DISCHG	99.15	97.34	95.55	93.77	92.00	90.24	88.50	86.77	85.06	83.37
28.00	ELEV	738.27	738.25	738.23	738.21	738.18	738.16	738.14	738.12	738.10	738.08
30.00	DISCHG	81.69	80.03	78.39	76.79	76.27	75.76	75.23	74.71	74.18	73.64
30.00	ELEV	738.06	738.04	738.02	738.00	737.95	737.90	737.85	737.80	737.75	737.70
32.00	DISCHG	73.11	72.57	72.03	71.49	70.94	70.40	69.85	69.31	68.76	68.21
32.00	ELEV	737.65	737.60	737.55	737.50	737.45	737.40	737.34	737.29	737.24	737.19
34.00	DISCHG	67.67	67.12	66.57	65.40	62.83	54.17	38.55	28.65	22.31	18.22
34.00	ELEV	737.14	737.09	737.04	736.88	736.52	735.77	734.63	733.90	733.44	733.14
36.00	DISCHG	15.53	13.73	12.48	11.59	10.92	10.40	9.98	9.62	9.30	9.02
36.00	ELEV	732.94	732.81	732.71	732.65	732.60	732.56	732.53	732.50	732.48	732.46
38.00	DISCHG	8.75	8.51	8.28	8.06	7.85	7.66	7.47	7.28	7.11	6.94
38.00	ELEV	732.44	732.42	732.41	732.39	732.33	732.36	732.35	732.33	732.32	732.31
40.00	DISCHG	6.78	6.63	6.48	6.34	6.20	6.07	5.94	5.82	5.71	5.59
40.00	ELEV	732.30	732.29	732.27	732.26	732.25	732.24	732.24	732.23	732.22	732.21
42.00	DISCHG	5.49	5.38	5.28	5.18	5.09	5.00	4.91	4.83	4.75	4.67
42.00	ELEV	732.20	732.19	732.19	732.18	732.17	732.17	732.16	732.15	732.15	732.14
44.00	DISCHG	4.59	4.52	4.45	4.38	4.31	4.25	4.18	4.12	4.06	4.01
44.00	ELEV	732.14	732.13	732.13	732.12	732.12	732.11	732.11	732.10	732.10	732.09
46.00	DISCHG	3.95	3.89	3.84	3.79	3.74	3.69	3.64	3.59	3.54	3.50
46.00	ELEV	732.09	732.09	732.08	732.08	732.07	732.07	732.07	732.06	732.06	732.06
48.00	DISCHG	3.45	3.41	3.37	3.33	3.29	3.25	3.21	3.17	3.13	3.10
48.00	ELEV	732.05	732.05	732.05	732.04	732.04	732.04	732.04	732.03	732.03	732.03

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50.00	DISCHG	3.06	3.02	2.99	2.96	2.92	2.89	2.86	2.82	2.79	2.76
50.00	ELEV	732.02	732.02	732.02	732.02	732.01	732.01	732.01	732.01	732.00	732.00
52.00	DISCHG	2.73	2.70	2.67	2.65	2.62	2.59	2.56	2.53	2.51	2.48
52.00	ELEV	732.00	732.00	732.00	731.99	731.99	731.99	731.99	731.99	731.98	731.98
54.00	DISCHG	2.45	2.43	2.40	2.38	2.36	2.33	2.31	2.28	2.26	2.24
54.00	ELEV	731.98	731.98	731.98	731.97	731.97	731.97	731.97	731.97	731.97	731.96
56.00	DISCHG	2.22	2.19	2.17	2.15	2.13	2.11	2.09	2.06	2.04	2.02
56.00	ELEV	731.96	731.96	731.96	731.96	731.96	731.95	731.95	731.95	731.95	731.95
58.00	DISCHG	2.00	1.98	1.96	1.94	1.92	1.91	1.89	1.87	1.85	1.83
58.00	ELEV	731.95	731.95	731.94	731.94	731.94	731.94	731.94	731.94	731.94	731.93

RUNOFF VOLUME ABOVE BASEFLOW = 1.06 WATERSHED INCHES, 2628.67 CFS-HRS, 217.23 ACRE-FEET; BASEFLOW = .00 CFS

OPERATION RUNOFF CROSS SECTION 26
OUTPUT HYDROGRAPH= 6
AREA= .13 SQ MI INPUT RUNOFF CURVE= 72. TIME OF CONCENTRATION= 1.79 HOURS
INTERNAL HYDROGRAPH TIME INCREMENT= .1989 HOURS

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
13.30	20.45	(RUNOFF)

TIME(HRS) FIRST HYDROGRAPH POINT = .00 HOURS TIME INCREMENT = .20 HOURS DRAINAGE AREA = .13 SQ.MI.

10.00	DISCHG	.01	.00	.00	.00	.00	.00	.01	.06	.24	1.13
20.00	DISCHG	3.39	[illegible]	9.76	13.29	15.81	19.44	20.35	20.23	20.00	19.45

18.00	DISCHG	3.61	3.70	3.60	3.50	3.40	3.30	3.21	3.14	3.07	3.01
20.00	DISCHG	2.94	2.88	2.81	2.74	2.66	2.58	2.51	2.44	2.39	2.34
22.00	DISCHG	2.30	2.27	2.23	2.21	2.19	2.17	2.16	2.15	2.14	2.14
24.00	DISCHG	2.12	2.08	1.99	1.88	1.73	1.55	1.35	1.17	1.00	.84
26.00	DISCHG	.69	.56	.44	.34	.25	.18	.11	.06	.03	.01
28.00	DISCHG	.00									

RUNOFF VOLUME ABOVE BASEFLOW = 1.04 WATERSHED INCHES, 86.98 CFS-HRS, 7.19 ACRE-FEET; BASEFLOW = .00 CFS

OPERATION ADDHYD CROSS SECTION 27
INPUT HYDROGRAPHS= 7,6 OUTPUT HYDROGRAPH= 5

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
19.75	147.12	(NULL)

RUNOFF VOLUME ABOVE BASEFLOW = 1.06 WATERSHED INCHES, 2715.65 CFS-HRS, 224.42 ACRE-FEET; BASEFLOW = .00 CFS

OPERATION RUNOFF CROSS SECTION 28
OUTPUT HYDROGRAPH= 6
AREA= .42 SQ MI INPUT RUNOFF CURVE= 78. TIME OF CONCENTRATION= .69 HOURS
INTERNAL HYDROGRAPH TIME INCREMENT= .0920 HOURS

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PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
12.43	196.30	(RUNOFF)
19.58	10.66	(RUNOFF)
23.54	8.18	(RUNOFF)

TIME(HRS) FIRST HYDROGRAPH POINT = .00 HOURS TIME INCREMENT = .20 HOURS DRAINAGE AREA = .42 SQ.MI.

8.00	DISCHG	.00	.00	.00	.00	.00	.00	.00	.00	.00	.02
10.00	DISCHG	.10	.31	.69	1.29	2.11	3.53	5.33	7.75	12.97	32.94
12.00	DISCHG	94.48	166.86	195.89	179.17	153. 7	122.73	89.82	59.97	44.43	38.05
14.00	DISCHG	33.45	29.85	26.99	24.59	22.46	20.72	19.50	18.57	17.70	16.90
16.00	DISCHG	16.34	15.98	15.74	15.53	15. 6	14.61	14.10	13.70	13.41	13.20
18.00	DISCHG	12.85	12.31	11.75	11.31	10.98	10.76	10.65	10.65	10.66	10.64
20.00	DISCHG	10.37	9.83	9.25	8.79	8.45	8.22	8.10	8.09	8.09	8.10
22.00	DISCHG	8.11	8.12	8.13	8.14	8. 4	8.15	8.16	8.17	8.18	8.15
24.00	DISCHG	7.86	6.86	5.24	3.51	2. 3	1.10	.42	.08	.00	

RUNOFF VOLUME ABOVE BASEFLOW = 1.40 WATERSHED INCHES, 379.45 CFS-HRS, 31.36 ACRE-FEET; BASEFLOW = .00 CFS

OPERATION ADDHYD CROSS SECTION 29
INPUT HYDROGRAPHS= 5,6 OUTPUT HYDROGRAPH= 7

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
12.46	274.17	(NULL)
19.70	157.77	(NULL)

TIME(HRS) FIRST HYDROGRAPH POINT = .00 HOURS TIME INCREMENT = .20 HOURS DRAINAGE AREA = 4.40 SQ.MI.

[illegible]	DISCHG	.00	.00	.00	.00	.00	.00	.00	.00	.00	.02
10.00	DISCHG	.10	.31	.69	1.30	2.12	3.56	5.44	8.08	14.26	39.27
12.00	DISCHG	119.84	231.93	272.25	260.82	240.49	215.00	185.29	158.68	149.16	147.02
14.00	DISCHG	147.78	148.12	148.74	149.25	149.78	150.13	150.54	150.90	150.71	150.42
16.00	DISCHG	150.49	151.12	152.02	152.76	153.71	154.25	154.77	155.35	155.97	156.60
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

22.00	DISCHG	150.33	149.57	148.77	147.95	147.10	146.22	145.33	144.41	143.49	142.51
24.00	DISCHG	141.23	139.16	136.35	133.30	130.47	127.86	125.50	123.43	121.56	119.73
26.00	DISCHG	117.88	116.01	114.13	112.24	110.34	108.45	106.56	104.68	102.82	100.97
28.00	DISCHG	99.15	97.34	95.55	93.77	92.00	90.24	88.50	86.77	85.06	83.37
30.00	DISCHG	81.69	80.03	78.39	76.79	76.27	75.76	75.23	74.71	74.18	73.64
32.00	DISCHG	73.11	72.57	72.03	71.49	70.94	70.40	69.85	69.31	68.76	68.21
34.00	DISCHG	67.67	67.12	66.57	65.40	62.88	54.17	38.55	28.65	22.31	18.22
[illegible]	DISCHG	15.53	13.73	12.48	11.59	10.92	10.40	9.98	9.62	9.30	9.02
38.00	DISCHG	8.75	8.51	8.28	8.06	7.85	7.66	7.47	7.28	7.11	6.94
40.00	DISCHG	6.78	6.63	6.48	6.34	6.20	6.07	5.94	5.82	5.71	5.59
42.00	DISCHG	5.49	5.38	5.28	5.18	5.09	5.00	4.91	4.83	4.75	4.67
44.00	DISCHG	4.59	4.52	4.45	4.38	4.31	4.25	4.18	4.12	4.06	4.01
46.00	DISCHG	3.95	3.89	3.84	3.79	3.74	3.69	3.64	3.59	3.54	3.50
48.00	DISCHG	3.45	3.41	3.37	3.33	3.29	3.25	3.21	3.17	3.13	3.10

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50.00	DISCHG	3.06	3.02	2.99	2.96	2.92	2.89	2.86	2.82	2.79	2.76
52.00	DISCHG	2.73	2.70	2.67	2.65	2.62	2.59	2.56	2.53	2.51	2.48
54.00	DISCHG	2.45	2.43	2.40	2.38	2.36	2.33	2.31	2.28	2.26	2.24
56.00	DISCHG	2.22	2.19	2.17	2.15	2.13	2.11	2.09	2.06	2.04	2.02
58.00	DISCHG	2.00	1.98	1.96	1.94	1.92	1.91	1.89	1.87	1.85	1.83

RUNOFF VOLUME ABOVE BASEFLOW = 1.09 WATERSHED INCHES, 3095.10 CFS-HRS, 255.78 ACRE-FEET; BASEFLOW = .00 CFS

OPERATION RESVOR STRUCTURE 6
INPUT HYDROGRAPH= 7 OUTPUT HYDROGRAPH= 1
SURFACE ELEVATION= 728.40

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
13.09	202.31	735.51
19.71	157.79	734.61

TIME(HRS) FIRST HYDROGRAPH POINT = .00 HOURS TIME INCREMENT = .20 HOURS DRAINAGE AREA = 4.40 SQ.MI.

10.00	DISCHG	.03	.13	.33	.70	1.28	2.17	3.45	5.26	8.50	18.55
10.00	ELEV	728.40	728.41	728.42	728.45	728.49	728.55	728.64	728.76	728.98	729.67
12.00	DISCHG	75.56	189.64	193.25	197.49	200.37	202.15	202.03	200.29	197.60	194.76
12.00	ELEV	732.29	735.13	735.24	735.37	735.46	735.51	735.51	735.45	735.37	735.28
14.00	DISCHG	192.04	189.49	148.10	149.49	149.59	150.12	150.44	150.79	150.74	150.48
14.00	ELEV	735.20	735.12	734.45	734.47	734.47	734.48	734.49	734.49	734.49	734.49
16.00	DISCHG	150.44	150.98	151.85	152.79	153.59	154.17	154.68	155.25	155.86	156.49
16.00	ELEV	734.49	734.50	734.51	734.53	734.54	734.55	734.56	734.56	734.57	734.58
18.00	DISCHG	156.96	157.15	157.18	157.22	157.28	157.36	157.48	157.63	157.75	157.77
18.00	ELEV	734.59	734.59	734.60	734.60	734.60	734.60	734.60	734.60	734.60	734.60
20.00	DISCHG	157.51	156.88	156.07	155.28	154.52	153.79	153.12	152.49	151.85	151.17
20.00	ELEV	734.60	734.59	734.58	734.56	734.55	734.54	734.53	734.52	734.51	734.50
22.00	DISCHG	150.46	149.70	148.92	148.10	147.25	146.38	145.48	144.57	143.65	142.69
22.00	ELEV	734.49	734.48	734.46	734.45	734.44	734.42	734.41	734.39	734.38	734.36
24.00	DISCHG	141.48	139.58	136.88	133.85	130.95	128.31	125.90	123.78	121.88	120.05
24.00	ELEV	734.34	734.31	734.27	734.22	734.18	734.13	734.09	734.06	734.03	734.00
26.00	DISCHG	118.57	116.66	114.79	112.99	111.00	109.11	107.22	105.33	103.46	101.61
26.00	ELEV	733.95	733.87	733.80	733.73	733.65	733.59	733.51	733.44	733.36	733.29
[illegible]	DISCHG	99.78	97.97	96.18	94.39	92.62	90.86	89.11	87.38	85.66	83.96
[illegible]	ELEV	733.22	733.15	733.08	733.02	732.95	732.88	732.81	732.75	732.68	732.61
30.00	DISCHG	82.27	80.61	78.96	77.34	76.39	75.95	75.41	74.89	74.36	73.83
30.00	ELEV	732.55	732.48	732.42	732.36	732.32	732.31	732.29	732.27	732.24	732.22
32.00	DISCHG	73.29	72.76	72.22	71.67	71.13	70.59	70.04	69.50	68.95	68.40
[illegible]	ELEV	732.20	732.18	732.16	732.14	732.12	732.10	732.08	732.06	732.04	732.02
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

34.00	DISCHG	20.05	17.06	14.90	13.33	12.17	11.35	10.72	10.21	9.80	9.45
36.00	ELEV	729.78	729.57	729.42	729.32	729.24	729.18	729.14	729.10	729.07	729.05
38.00	DISCHG	9.14	8.86	8.60	8.37	8.14	7.93	7.73	7.53	7.35	7.17
38.00	ELEV	729.03	729.01	728.99	728.98	728.96	728.95	728.93	728.92	728.91	728.89
40.00	DISCHG	7.00	6.84	6.68	6.53	6.39	6.25	6.12	5.99	5.87	5.75
40.00	ELEV	728.88	728.87	728.86	728.85	728.84	728.83	728.82	728.81	728.80	728.80

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42.00	DISCHG	5.63	5.52	5.42	5.32	5.22	5.12	5.03	4.95	4.86	4.78
42.00	ELEV	728.79	728.79	728.77	728.77	728.76	728.75	728.75	728.74	728.73	728.73
44.00	DISCHG	4.70	4.62	4.55	4.47	4.40	4.34	4.27	4.21	4.14	4.08
44.00	ELEV	728.72	728.72	728.71	728.71	728.70	728.70	728.69	728.69	728.68	728.68
46.00	DISCHG	4.03	3.97	3.91	3.86	3.81	3.75	3.70	3.65	3.61	3.56
46.00	ELEV	728.68	728.67	728.67	728.67	728.66	728.66	728.65	728.65	728.65	728.64
48.00	DISCHG	3.51	3.47	3.43	3.39	3.34	3.30	3.26	3.22	3.18	3.14
48.00	ELEV	728.64	728.64	728.64	728.63	728.63	728.63	728.62	728.62	728.62	728.62
50.00	DISCHG	3.11	3.07	3.04	3.00	2.97	2.93	2.90	2.87	2.84	2.80
50.00	ELEV	728.61	728.61	728.61	728.61	728.60	728.60	728.60	728.60	728.59	728.59
52.00	DISCHG	2.77	2.74	2.71	2.68	2.66	2.63	2.60	2.57	2.54	2.52
52.00	ELEV	728.59	728.59	728.59	728.58	728.58	728.58	728.58	728.58	728.57	728.57
54.00	DISCHG	2.49	2.46	2.44	2.41	2.39	2.36	2.34	2.32	2.29	2.27
54.00	ELEV	728.57	728.57	728.57	728.57	728.56	728.56	728.56	728.56	728.56	728.56
56.00	DISCHG	2.25	2.22	2.20	2.18	2.16	2.14	2.11	2.09	2.07	2.05
56.00	ELEV	728.55	728.55	728.55	728.55	728.55	728.55	728.55	728.54	728.54	728.54
58.00	DISCHG	2.03	2.01	1.99	1.97	1.95	1.93	1.91	1.89	1.87	1.86
58.00	ELEV	728.54	728.54	728.54	728.54	728.53	728.53	728.53	728.53	728.53	728.53

RUNOFF VOLUME ABOVE BASEFLOW = 1.09 WATERSHED INCHES, 3097.72 CFS-HRS, 256.00 ACRE-FEET; BASEFLOW = .00 CFS

OPERATION RUNOFF CROSS SECTION 30
OUTPUT HYDROGRAPH= 6
AREA= .28 SQ MI INPUT RUNOFF CURVE= 83. TIME OF CONCENTRATION= 1.27 HOURS
INTERNAL HYDROGRAPH TIME INCREMENT= .1693 HOURS

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
12.81	106.86	(RUNOFF)
23.54	6.06	(RUNOFF)

TIME(HRS) FIRST HYDROGRAPH POINT = .00 HOURS TIME INCREMENT = .20 HOURS DRAINAGE AREA = .28 SQ.MI.

8.00	DISCHG	.00	.00	.01	.04	.10	.20	.34	.52	.74	1.01
10.00	DISCHG	1.33	1.70	2.13	2.66	3.34	4.21	5.37	6.92	9.93	18.61
12.00	DISCHG	37.88	61.16	84.57	102.39	106.86	102.89	97.02	89.70	81.36	72.26
14.00	DISCHG	62.59	52.53	42.21	32.55	25.46	21.74	19.54	17.80	16.44	15.35
16.00	DISCHG	14.44	13.69	13.12	12.67	12.27	11.90	11.53	11.19	10.89	10.63
18.00	DISCHG	10.36	10.07	9.76	9.40	9.08	8.81	8.60	8.42	8.29	8.16
20.00	DISCHG	8.01	7.81	7.57	7.31	7.07	6.85	6.66	6.50	6.36	6.25
22.00	DISCHG	6.16	6.09	6.06	6.04	6.05	6.05	6.05	6.06	6.06	6.05
24.00	DISCHG	5.96	5.71	5.26	4.62	3.88	3.15	2.49	1.90	1.41	.99
26.00	DISCHG	.64	.37	.17	.06	.01					

RUNOFF VOLUME ABOVE BASEFLOW = 1.75 WATERSHED INCHES, 316.45 CFS-HRS, 26.15 ACRE-FEET; BASEFLOW = .00 CFS

OPERATION ADDHYD CROSS SECTION 31
INPUT HYDROGRAPHS= 1,6 OUTPUT HYDROGRAPH= 7

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PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
12.85	307.76	(NULL)
18.03	167.32	(NULL)

TIME(HRS) FIRST HYDROGRAPH POINT = .00 HOURS TIME INCREMENT = .20 HOURS DRAINAGE AREA = 4.68 SQ.MI.

8.00	DISCHG	.00	.00	.01	.04	.10	.20	.34	.52	.74	1.01
10.00	DISCHG	1.36	1.82	2.46	3.36	4.63	6.38	8.82	12.19	18.44	37.16
12.00	DISCHG	113.45	250.79	277.82	299.88	307.43	305.04	299.06	289.99	278.96	267.02
14.00	DISCHG	254.64	242.02	190.31	182.04	175.05	171.87	169.97	168.58	167.18	165.83
16.00	DISCHG	164.88	164.67	164.98	165.46	165.86	166.06	166.21	166.43	166.75	167.12
18.00	DISCHG	167.32	167.21	166.92	166.62	166.36	166.18	166.08	166.05	166.04	165.93
20.00	DISCHG	165.52	164.69	163.64	162.59	161.58	160.64	159.78	158.99	158.21	157.42
22.00	DISCHG	156.61	155.80	154.97	154.14	153.29	152.43	151.54	150.63	149.71	148.73
24.00	DISCHG	147.43	145.29	142.14	138.46	134.83	131.46	128.39	125.68	123.28	121.04
26.00	DISCHG	119.21	117.03	114.96	112.96	111.01	109.11	107.22	105.33	103.46	101.61
28.00	DISCHG	99.78	97.97	96.18	94.39	92.62	90.86	89.11	87.38	85.66	83.96
30.00	DISCHG	82.27	80.61	78.96	77.34	76.39	75.95	75.41	74.89	74.36	73.83
32.00	DISCHG	73.29	72.76	72.22	71.67	71.13	70.59	70.04	69.50	68.95	68.40
34.00	DISCHG	67.85	67.30	66.76	65.84	63.81	57.49	44.18	31.78	28.33	23.90
36.00	DISCHG	20.05	17.08	14.90	13.33	12.19	11.35	10.72	10.21	9.80	9.45
38.00	DISCHG	9.14	8.86	8.60	8.37	8.14	7.93	7.73	7.53	7.35	7.17
40.00	DISCHG	7.00	6.84	6.68	6.53	6.39	6.25	6.12	5.99	5.87	5.75
42.00	DISCHG	5.63	5.52	5.42	5.32	5.22	5.12	5.03	4.95	4.86	4.78
44.00	DISCHG	4.70	4.62	4.55	4.47	4.40	4.34	4.27	4.21	4.14	4.08
46.00	DISCHG	4.03	3.97	3.91	3.86	3.81	3.75	3.70	3.65	3.61	3.56
48.00	DISCHG	3.51	3.47	3.43	3.38	3.34	3.30	3.26	3.22	3.18	3.14
50.00	DISCHG	3.11	3.07	3.04	3.00	2.97	2.93	2.90	2.87	2.84	2.80
[illegible]	DISCHG	2.77	2.74	2.71	2.68	2.66	2.63	2.60	2.57	2.54	2.52
[illegible]	DISCHG	2.49	2.46	2.44	2.41	2.39	2.36	2.34	2.32	2.29	2.27
56.00	DISCHG	2.25	2.22	2.20	2.18	2.16	2.14	2.11	2.09	2.07	2.05
58.00	DISCHG	2.03	2.01	1.99	1.97	1.95	1.93	1.91	1.89	1.87	1.86

RUNOFF VOLUME ABOVE BASEFLOW = 1.13 WATERSHED INCHES, 3414.17 CFS-HRS, 282.15 ACRE-FEET; BASEFLOW = .00 CFS

EXECUTIVE CONTROL OPERATION ENDCMP RECORD ID
+ COMPUTATIONS COMPLETED FOR PASS 4

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EXECUTIVE CONTROL OPERATION COMPUT RECORD ID
+ FROM XSECTION 1
+ TO XSECTION 31
STARTING TIME = .00 RAIN DEPTH = 2.47 RAIN DURATION= 1.00 RAIN TABLE NO.= 2 ANT. MOIST. COND= 2
ALTERNATE NO.= 1 STORM NO.= 5 MAIN TIME INCREMENT = .20 HOURS

OPERATION RUNOFF CROSS SECTION 1
OUTPUT HYDROGRAPH= 7
AREA= .58 SQ MI INPUT RUNOFF CURVE= 71. TIME OF CONCENTRATION= 1.14 HOURS
[illegible]

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
12.89	49.89	(RUNOFF)
23.63	5.40	(RUNOFF)

TIME(HRS) FIRST HYDROGRAPH POINT = .00 HOURS TIME INCREMENT = .20 HOURS DRAINAGE AREA = .58 SQ.MI.

10.00	DISCHG	.00	.00	.00	.00	.00	.00	.00	.00	.04	1.56
12.00	DISCHG	9.78	21.80	35.37	47.36	49.68	49.51	48.07	45.56	42.13	38.02
[illegible]	DISCHG	33.31	28.05	22.72	18.95	17.00	15.43	14.16	13.17	12.37	11.69
16.00	DISCHG	11.13	10.69	10.36	10.11	9.87	9.64	9.38	9.13	8.93	8.76
18.00	DISCHG	8.57	8.34	8.07	7.78	7.54	7.35	7.21	7.10	7.01	6.94
20.00	DISCHG	6.83	6.67	6.47	6.24	6.03	5.85	5.69	5.56	5.46	5.39
22.00	DISCHG	5.34	5.32	5.32	5.34	5.35	5.36	5.37	5.38	5.40	5.39
24.00	DISCHG	5.32	5.04	4.55	3.89	3.13	2.45	1.85	1.33	.90	.55
26.00	DISCHG	.29	.12	.03	.00						

RUNOFF VOLUME ABOVE BASEFLOW = .48 WATERSHED INCHES, 178.62 CFS-HRS, 14.76 ACRE-FEET; BASEFLOW = .00 CFS

OPERATION RUNOFF CROSS SECTION 2

OUTPUT HYDROGRAPH= 6

AREA= .24 SQ MI INPUT RUNOFF CURVE= 70. TIME OF CONCENTRATION= .63 HOURS

INTERNAL HYDROGRAPH TIME INCREMENT= .0840 HOURS

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
12.47	28.75	(RUNOFF)
23.59	2.15	(RUNOFF)

TIME(HRS) FIRST HYDROGRAPH POINT = .00 HOURS TIME INCREMENT = .20 HOURS DRAINAGE AREA = .24 SQ.MI.

10.00	DISCHG	.00	.00	.00	.00	.00	.00	.00	.00	.00	.70
12.00	DISCHG	8.65	21.95	28.30	27.14	24.17	20.08	15.02	10.95	9.33	8.24
14.00	DISCHG	7.25	6.65	6.10	5.61	5.16	4.80	4.56	4.38	4.20	4.04
16.00	DISCHG	3.93	3.86	3.82	3.80	3.72	3.58	3.46	3.37	3.31	3.28
[illegible]	DISCHG	3.29	3.06	2.92	2.82	2.74	2.71	2.70	2.71	2.72	2.72
[illegible]	DISCHG	2.64	2.48	2.30	2.22	2.14	2.10	2.09	2.09	2.10	2.10
22.00	DISCHG	2.11	2.11	2.12	2.12	2.13	2.13	2.14	2.14	2.15	2.14
24.00	DISCHG	2.05	1.75	1.27	.80	.44	.19	.05	.00		

RUNOFF VOLUME ABOVE BASEFLOW = .44 WATERSHED INCHES, 68.37 CFS-HRS, 5.65 ACRE-FEET; BASEFLOW = .00 CFS

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OPERATION ADDHYD CROSS SECTION 3

INPUT HYDROGRAPHS= 7,6 OUTPUT HYDROGRAPH= 3

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
12.69	75.62	(NULL)
23.61	7.54	(NULL)

RUNOFF VOLUME ABOVE BASEFLOW = .47 WATERSHED INCHES, 246.99 CFS-HRS, 20.41 ACRE-FEET; BASEFLOW = .00 CFS

OP[illegible]ION RUNOFF CROSS SECTION 4

OUTPUT HYDROGRAPH= 7

AREA= .22 SQ MI INPUT RUNOFF CURVE= 75. TIME OF CONCENTRATION= .70 HOURS

INTERNAL HYDROGRAPH TIME INCREMENT= .0933 HOURS

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)

TIME(HRS) FIRST HYDROGRAPH POINT = .00 HOURS TIME INCREMENT = .20 HOURS DRAINAGE AREA = .23 SQ.MI.

10.00	DISCHG	.00	.00	.00	.00	.00	.00	.00	.00	.25	2.85
12.00	DISCHG	15.13	32.55	42.21	40.43	36.17	30.56	23.88	16.99	12.70	10.91
14.00	DISCHG	9.64	8.65	7.85	7.17	6.53	6.09	5.74	5.47	5.23	5.00
16.00	DISCHG	4.85	4.75	4.69	4.63	4.53	4.37	4.23	4.11	4.03	3.97
[illegible]	DISCHG	3.87	3.72	3.56	3.43	3.33	3.27	3.24	3.23	3.24	3.24
[illegible]	DISCHG	3.16	3.00	2.83	2.69	2.59	2.52	2.48	2.48	2.48	2.49
22.00	DISCHG	2.49	2.50	2.50	2.51	2.51	2.52	2.52	2.52	2.53	2.52
24.00	DISCHG	2.43	2.13	1.64	1.11	.63	.36	.14	.03	.00	

RUNOFF VOLUME ABOVE BASEFLOW = .63 WATERSHED INCHES, 94.07 CFS-HRS, 7.77 ACRE-FEET; BASEFLOW = .00 CFS

OPERATION RESVOR STRUCTURE 1
INPUT HYDROGRAPH= 7 OUTPUT HYDROGRAPH= 1
SURFACE ELEVATION= 736.20

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
12.94	32.08	742.24
23.71	2.53	736.67

TIME(HRS) FIRST HYDROGRAPH POINT = .00 HOURS TIME INCREMENT = .20 HOURS DRAINAGE AREA = .23 SQ.MI.

10.00	DISCHG	.00	.00	.00	.00	.00	.00	.00	.00	.07	.94
10.00	ELEV	736.20	736.20	736.20	736.20	736.20	736.20	736.20	736.20	736.21	736.38
12.00	DISCHG	5.65	16.29	28.62	32.04	32.07	32.07	32.05	30.84	21.49	15.83
12.00	ELEV	737.26	739.25	741.57	742.22	742.23	742.24	742.22	741.98	740.23	739.17
14.00	DISCHG	12.58	10.57	9.21	8.22	7.43	6.79	6.28	5.88	5.57	5.31
14.00	ELEV	738.56	738.18	737.93	737.74	737.59	737.47	737.38	737.30	737.24	737.19
16.00	DISCHG	5.08	4.92	4.80	4.72	4.64	4.53	4.39	4.26	4.15	4.07
16.00	ELEV	737.15	737.12	737.10	737.08	737.07	737.05	737.02	737.00	736.98	736.96

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18.00	DISCHG	3.98	3.87	3.74	3.59	3.47	3.37	3.30	3.26	3.25	3.24
18.00	ELEV	736.95	736.93	736.90	736.87	736.85	736.83	736.82	736.81	736.81	736.81
20.00	DISCHG	3.22	3.14	3.01	2.87	2.74	2.63	2.56	2.51	2.49	2.49
20.00	ELEV	736.80	736.79	736.76	736.74	736.71	736.69	736.68	736.67	736.67	736.67
22.00	DISCHG	2.49	2.49	2.50	2.50	2.51	2.51	2.51	2.52	2.52	2.52
22.00	ELEV	736.67	736.67	736.67	736.67	736.67	736.67	736.67	736.67	736.67	736.67
24.00	DISCHG	2.50	2.37	2.09	1.67	1.22	.81	.48	.25	.11	.05
24.00	ELEV	736.67	736.64	736.59	736.51	736.43	736.35	736.29	736.25	736.22	736.21
26.00	DISCHG	.02	.01	.00							
26.00	ELEV	736.20	736.20	736.20							

RUNOFF VOLUME ABOVE BASEFLOW = .63 WATERSHED INCHES, 94.23 CFS-HRS, 7.79 ACRE-FEET; BASEFLOW = .00 CFS

OPERATION ADDHYD CROSS SECTION 5
INPUT HYDROGRAPHS= 1,3 OUTPUT HYDROGRAPH= 4

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
12.69	108.09	(NULL)
23.61	10.07	(NULL)

RUNOFF VOLUME ABOVE BASEFLOW = .50 WATERSHED INCHES, 341.22 CFS-HRS, 23.24 ACRE-FEET; BASEFLOW = .00 CFS

OPERATION [illegible] CROSS SECTION 6

INTERNAL HYDROGRAPH TIME INCREMENT= .1667 HOURS

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
13.45	42.34	(RUNOFF)

TIME(HRS) FIRST HYDROGRAPH POINT = .00 HOURS TIME INCREMENT = .20 HOURS DRAINAGE AREA = .36 SQ.MI.

10.00	DISCHG	.00	.00	.00	.00	.00	.02	.06	.18	.59	2.20
[illegible]	DISCHG	6.58	12.27	18.48	25.06	31.80	38.13	41.58	42.31	42.04	41.27
14.00	DISCHG	40.14	38.68	36.96	35.03	32.91	30.64	28.23	25.71	23.08	20.37
16.00	DISCHG	17.63	14.98	12.89	11.66	10.88	10.27	9.77	9.34	8.97	8.65
18.00	DISCHG	8.36	8.10	7.86	7.63	7.41	7.20	7.00	6.82	6.67	6.53
20.00	DISCHG	6.39	6.24	6.09	5.93	5.77	5.60	5.44	5.30	5.17	5.06
22.00	DISCHG	4.96	4.88	4.81	4.75	4.70	4.65	4.61	4.58	4.56	4.54
24.00	DISCHG	4.50	4.41	4.27	4.07	3.81	3.49	3.12	2.74	2.39	2.07
26.00	DISCHG	1.76	1.48	1.23	1.00	.79	.61	.45	.31	.20	.12
28.00	DISCHG	.05	.02	.00							

RUNOFF VOLUME ABOVE BASEFLOW = .82 WATERSHED INCHES, 189.97 CFS-HRS, 15.70 ACRE-FEET; BASEFLOW = .00 CFS

OPERATION ADDHYD CROSS SECTION 7
INPUT HYDROGRAPHS= 4,7 OUTPUT HYDROGRAPH= 5

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TR20 XEQ 06-21-94 17:58 OWOSSO DRAIN - FPMS - SHIAWASSEE CO.MI. 06-20-94 JOB 1 PASS 5
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PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
12.98	139.82	(NULL)

RUNOFF VOLUME ABOVE BASEFLOW = .58 WATERSHED INCHES, 531.19 CFS-HRS, 43.90 ACRE-FEET; BASEFLOW = .00 CFS

OPERATION RESVOR STRUCTURE 2
INPUT HYDROGRAPH= 5 OUTPUT HYDROGRAPH= 7
SURFACE ELEVATION= 736.20

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
14.60	68.45	740.77

TIME(HRS) FIRST HYDROGRAPH POINT = .00 HOURS TIME INCREMENT = .20 HOURS DRAINAGE AREA = 1.41 SQ.MI.

10.00	DISCHG	.00	.00	.00	.00	.00	.00	.00	.00	.01	.06
10.00	ELEV	736.20	736.20	736.20	736.20	736.20	736.20	736.20	736.20	736.23	736.37
12.00	DISCHG	1.23	4.87	11.17	19.15	27.54	36.13	44.60	51.95	57.79	62.06
12.00	ELEV	736.57	736.88	737.41	738.08	738.73	739.35	739.73	740.06	740.32	740.52
14.00	DISCHG	65.07	67.11	68.18	68.45	68.17	67.47	66.43	65.12	63.63	61.94
14.00	ELEV	740.65	740.72	740.76	740.77	740.75	740.73	740.70	740.65	740.59	740.51
16.00	DISCHG	60.09	58.10	56.03	53.96	51.94	50.00	48.14	46.34	44.63	43.01
16.00	ELEV	740.43	740.34	740.24	740.15	740.05	739.97	739.89	739.81	739.73	739.66
18.00	DISCHG	41.47	40.00	38.58	37.22	35.92	34.67	33.49	32.37	31.41	30.55
18.00	ELEV	739.59	739.52	739.46	739.40	739.34	739.28	739.23	739.18	739.11	739.04
20.00	DISCHG	29.73	28.94	28.16	27.39	26.63	25.89	25.17	24.48	23.82	23.19
20.00	ELEV	738.97	738.90	738.84	738.77	738.71	738.65	738.59	738.53	738.47	738.42
22.00	DISCHG	22.59	22.03	21.50	21.01	20.55	20.12	19.73	19.36	19.01	18.69
[illegible]	ELEV	738.37	738.32	738.28	738.24	738.20	738.16	738.13	738.10	738.07	738.04
[illegible]	DISCHG	18.39	18.07	17.69	17.22	16.67	16.02	15.32	14.56	13.76	13.00
24.00	ELEV	738.02	737.99	737.96	737.92	737.87	737.82	737.76	737.69	737.62	737.55
26.00	DISCHG	12.23	11.47	10.75	10.05	9.38	8.75	8.15	7.59	7.06	6.56
26.00	ELEV	737.50	737.44	737.37	737.32	737.26	737.21	737.16	737.11	737.06	737.02
28.00	DISCHG	[illegible]	[illegible]	5.24	4.86	4.51	4.19	3.89	3.57	3.33	3.09
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

30.00	ELEV	736.71	736.69	736.68	736.66	736.65	736.64	736.62	736.61	736.60	736.59
32.00	DISCHG	1.35	1.25	1.16	1.08	1.00	.93	.86	.80	.74	.68
32.00	ELEV	736.58	736.58	736.57	736.56	736.56	736.55	736.54	736.54	736.53	736.53
34.00	DISCHG	.64	.59	.55	.51	.47	.44	.40	.37	.35	.32
34.00	ELEV	736.52	736.52	736.52	736.51	736.51	736.51	736.51	736.50	736.50	736.50
36.00	DISCHG	.30	.28	.26	.24	.22	.21	.19	.18	.16	.15
36.00	ELEV	736.50	736.49	736.49	736.49	736.49	736.49	736.49	736.49	736.49	736.48
[illegible]00	DISCHG	.14	.13	.12	.11	.10	.10	.10	.10	.09	.09
38.00	ELEV	736.48	736.48	736.48	736.48	736.48	736.48	736.47	736.47	736.46	736.46
40.00	DISCHG	.09	.09	.09	.09	.09	.08	.08	.08	.08	.08
40.00	ELEV	736.46	736.45	736.45	736.44	736.44	736.44	736.43	736.43	736.42	736.42
42.00	DISCHG	.08	.08	.07	.07	.07	.07	.07	.07	.07	.07
42.00	ELEV	736.42	736.41	736.41	736.41	736.40	736.40	736.40	736.39	736.39	736.39
44.00	DISCHG	.07	.06	.06	.06	.06	.06	.06	.06	.06	.06

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44.00	ELEV	736.38	736.38	736.38	736.37	736.37	736.37	736.37	736.36	736.36	736.36
46.00	DISCHG	.06	.05	.05	.05	.05	.05	.05	.05	.05	.05
46.00	ELEV	736.36	736.35	736.35	736.35	736.35	736.34	736.34	736.34	736.34	736.33
48.00	DISCHG	.05	.05	.05	.04	.04	.04	.04	.04	.04	.04
48.00	ELEV	736.33	736.33	736.33	736.33	736.32	736.32	736.32	736.32	736.32	736.31
50.00	DISCHG	.04	.04	.04	.04	.04	.04	.04	.04	.04	.03
50.00	ELEV	736.31	736.31	736.31	736.31	736.30	736.30	736.30	736.30	736.30	736.30
52.00	DISCHG	.03	.03	.03	.03	.03	.03	.03	.03	.03	.03
52.00	ELEV	736.29	736.29	736.29	736.29	736.29	736.29	736.29	736.28	736.28	736.28
54.00	DISCHG	.03	.03	.03	.03	.03	.03	.03	.03	.03	.02
[illegible]00	ELEV	736.28	736.28	736.28	736.28	736.28	736.27	736.27	736.27	736.27	736.27
[illegible].00	DISCHG	.02	.02	.02	.02	.02	.02	.02	.02	.02	.02
56.00	ELEV	736.27	736.27	736.27	736.26	736.26	736.26	736.26	736.26	736.26	736.26
58.00	DISCHG	.02	.02	.02	.02	.02	.02	.02	.02	.02	.02
58.00	ELEV	736.26	736.26	736.26	736.26	736.25	736.25	736.25	736.25	736.25	736.25

RUNOFF VOLUME ABOVE BASEFLOW = .58 WATERSHED INCHES, 530.86 CFS-HRS, 43.87 ACRE-FEET; BASEFLOW = .00 CFS

OPERATION REACH CROSS SECTION 8
INPUT HYDROGRAPH= 7 OUTPUT HYDROGRAPH= 3
LENGTH = 4800.00 FEET INPUT = RATING CURVE REPRESENTATIVE OF REACH
0 COEFFICIENTS USED IN ROUTING RELATED TO CROSS SECTION AREA, X= .45 M= 1.11
0 MODIFIED ATT-K IN ROUTING COEFFICIENT = .12 PEAK TRAVEL TIME = 2.00 HOURS

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
16.54	55.71	736.07

RUNOFF VOLUME ABOVE BASEFLOW = .58 WATERSHED INCHES, 530.64 CFS-HRS, 43.85 ACRE-FEET; BASEFLOW = .00 CFS

OPERATION RUNOFF CROSS SECTION 9
OUTPUT HYDROGRAPH= 6
AREA= .52 SQ MI INPUT RUNOFF CURVE= 72. TIME OF CONCENTRATION= 1.62 HOURS
INTERNAL HYDROGRAPH TIME INCREMENT= .2160 HOURS

PEAK TIME HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
13.31	36.78	(RUNOFF)
23.71	5.03	(RUNOFF)

RUNOFF VOLUME ABOVE BASEFLOW = .51 WATERSHED INCHES, 172.45 CFS-HRS, 14.25 ACRE-FEET; BASEFLOW = .00 CFS

INPUT HYDROGRAPHS= 3,6 OUTPUT HYDROGRAPH= 5

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
14.94	69.95	(NULL)

RUNOFF VOLUME ABOVE BASEFLOW = .56 WATERSHED INCHES, 703.10 CFS-HRS, 58.10 ACRE-FEET; BASEFLOW = .00 CFS

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OPERATION RUNOFF CROSS SECTION 11
OUTPUT HYDROGRAPH= 6
AREA= .44 SQ MI INPUT RUNOFF CURVE= 70. TIME OF CONCENTRATION= 1.27 HOURS
INTERNAL HYDROGRAPH TIME INCREMENT= .1693 HOURS

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
13.07	31.58	(RUNOFF)
23.65	3.91	(RUNOFF)

TIME(HRS) FIRST HYDROGRAPH POINT = .00 HOURS TIME INCREMENT = .20 HOURS DRAINAGE AREA = .44 SQ.MI.

10.00	DISCHG	.00	.00	.00	.00	.00	.00	.00	.00	.00	.82
12.00	DISCHG	5.28	11.77	19.25	26.80	30.79	31.53	31.37	30.48	29.04	27.15
14.00	DISCHG	24.89	22.31	19.43	16.34	13.63	11.96	10.89	10.02	9.34	8.79
16.00	DISCHG	8.33	7.95	7.66	7.44	7.24	7.05	6.86	6.69	6.53	6.40
18.00	DISCHG	6.26	6.11	5.93	5.74	5.56	5.41	5.30	5.21	5.14	5.07
20.00	DISCHG	4.99	4.87	4.74	4.58	4.44	4.31	4.20	4.11	4.03	3.97
[illegible]	DISCHG	3.92	3.88	3.87	3.87	3.87	3.88	3.89	3.90	3.91	3.91
[illegible]	DISCHG	3.85	3.70	3.41	3.00	2.52	2.04	1.62	1.24	.92	.64
26.00	DISCHG	.42	.24	.11	.04	.01					

RUNOFF VOLUME ABOVE BASEFLOW = .44 WATERSHED INCHES, 125.32 CFS-HRS, 10.36 ACRE-FEET; BASEFLOW = .00 CFS

OPERATION RESVOR STRUCTURE 3
INPUT HYDROGRAPH= 6 OUTPUT HYDROGRAPH= 1
SURFACE ELEVATION= 760.80

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
20.60	4.64	761.67

\+ * * FIRST POINT OF FLAT PEAK

TIME(HRS) FIRST HYDROGRAPH POINT = .00 HOURS TIME INCREMENT = .20 HOURS DRAINAGE AREA = .44 SQ.MI.

10.00	DISCHG	.00	.00	.00	.00	.00	.00	.00	.00	.00	.08
10.00	ELEV	760.80	760.80	760.80	760.80	760.80	760.80	760.80	760.80	760.80	760.84
12.00	DISCHG	.66	1.34	1.47	1.67	1.92	2.18	2.45	2.71	2.96	3.19
12.00	ELEV	761.15	761.50	761.51	761.52	761.53	761.55	761.56	761.57	761.59	761.60
14.00	DISCHG	3.39	3.58	3.74	3.87	3.97	4.05	4.11	4.17	4.22	4.27
14.00	ELEV	761.61	761.62	761.63	761.63	761.64	761.64	761.65	761.65	761.65	761.65
16.00	DISCHG	4.31	4.34	4.37	4.40	4.43	4.45	4.48	4.50	4.52	4.53
16.00	ELEV	761.66	761.66	761.66	761.66	761.66	761.66	761.66	761.67	761.67	761.67
18.00	DISCHG	4.55	4.57	4.58	4.59	4.60	4.61	4.61	4.62	4.63	4.63
18.00	ELEV	761.67	761.67	761.67	761.67	761.67	761.67	761.67	761.67	761.67	761.67
[illegible]	DISCHG	4.63	4.64	4.64	4.64	4.64	4.63	4.63	4.63	4.62	4.62
[illegible]	ELEV	761.67	761.67	761.67	761.67	761.67	761.67	761.67	761.67	761.67	761.67
22.00	DISCHG	4.61	4.60	4.60	4.59	4.58	4.58	4.57	4.56	4.56	4.55
22.00	ELEV	761.67	761.67	761.67	761.67	761.67	761.67	761.67	761.67	761.67	761.67
24.00	DISCHG	4.55	4.54	4.53	4.52	4.50	4.49	[illegible]	4.43	4.40	4.37
24.00	ELEV	761.67	761.67	761.67	761.67	761.67	761.66	761.66	761.66	761.66	761.66
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	4.07	[illegible]	3.99

26.00	DISCHG	3.96	3.92	3.89	3.85	3.81	3.78	3.75	3.71	3.68	3.64
28.00	ELEV	761.64	761.64	761.63	761.63	761.63	761.63	761.63	761.62	761.62	761.62
30.00	DISCHG	3.61	3.58	3.54	3.51	3.48	3.45	3.42	3.39	3.36	3.32
30.00	ELEV	761.62	761.62	761.62	761.61	761.61	761.61	761.61	761.61	761.61	761.60
32.00	DISCHG	3.29	3.26	3.23	3.20	3.18	3.15	3.12	3.09	3.06	3.03
32.00	ELEV	761.60	761.60	761.60	761.60	761.60	761.60	761.59	761.59	761.59	761.59
34.00	DISCHG	3.01	2.98	2.95	2.92	2.90	2.87	2.84	2.82	2.79	2.77
34.00	ELEV	761.59	761.59	761.59	761.58	761.58	761.58	761.58	761.58	761.58	761.58
36.00	DISCHG	2.74	2.72	2.69	2.67	2.64	2.62	2.60	2.57	2.55	2.53
36.00	ELEV	761.57	761.57	761.57	761.57	761.57	761.57	761.57	761.57	761.56	761.56
38.00	DISCHG	2.50	2.48	2.46	2.43	2.41	2.39	2.37	2.35	2.33	2.30
38.00	ELEV	761.56	761.56	761.56	761.56	761.56	761.56	761.56	761.55	761.55	761.55
40.00	DISCHG	2.28	2.26	2.24	2.22	2.20	2.18	2.16	2.14	2.12	2.10
40.00	ELEV	761.55	761.55	761.55	761.55	761.55	761.55	761.54	761.54	761.54	761.54
42.00	DISCHG	2.08	2.06	2.05	2.03	2.01	1.99	1.97	1.95	1.94	1.92
42.00	ELEV	761.54	761.54	761.54	761.54	761.54	761.54	761.53	761.53	761.53	761.53
44.00	DISCHG	1.90	1.88	1.87	1.85	1.33	1.82	1.80	1.78	1.77	1.75
44.00	ELEV	761.53	761.53	761.53	761.53	761.53	761.53	761.53	761.52	761.52	761.52
46.00	DISCHG	1.73	1.72	1.70	1.69	1.67	1.66	1.64	1.63	1.61	1.60
46.00	ELEV	761.52	761.52	761.52	761.52	761.52	761.52	761.52	761.52	761.52	761.52
48.00	DISCHG	1.58	1.57	1.55	1.54	1.53	1.51	1.50	1.48	1.47	1.46
48.00	ELEV	761.51	761.51	761.51	761.51	761.51	761.51	761.51	761.51	761.51	761.51
50.00	DISCHG	1.44	1.43	1.42	1.40	1.39	1.38	1.37	1.35	1.34	1.33
50.00	ELEV	761.51	761.51	761.51	761.51	761.50	761.50	761.50	761.50	761.50	761.50
[illegible]00	DISCHG	1.32	1.30	1.15	.93	.75	.60	.49	.39	.32	.25
[illegible]00	ELEV	761.50	761.50	761.42	761.30	761.20	761.12	761.06	761.01	760.97	760.94
54.00	DISCHG	.21	.17	.13	.11	.09	.07	.06	.05	.04	.03
54.00	ELEV	760.91	760.89	760.87	760.86	760.85	760.84	760.83	760.82	760.82	760.82
56.00	DISCHG	.02	.02	.02	.01	.01	.01	.01			
56.00	ELEV	760.81	760.81	760.81	760.81	760.81	760.80	760.80			

RUNOFF VOLUME ABOVE BASEFLOW = .44 WATERSHED INCHES, 125.33 CFS-HRS, 10.36 ACRE-FEET; BASEFLOW = .00 CFS

OPERATION ADDHYD CROSS SECTION 12
INPUT HYDROGRAPHS= 5,1 OUTPUT HYDROGRAPH= 7

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
14.96	73.97	(NULL)

RUNOFF VOLUME ABOVE BASEFLOW = .54 WATERSHED INCHES, 828.42 CFS-HRS, 68.46 ACRE-FEET; BASEFLOW = .00 CFS

OPERATION RUNOFF CROSS SECTION 13
OUTPUT HYDROGRAPH= 6
AREA= .46 SQ MI INPUT RUNOFF CURVE= 73. TIME OF CONCENTRATION= 1.70 HOURS
INTERNAL HYDROGRAPH TIME INCREMENT= .1899 HOURS

1

23.71 4.63 (RUNOFF)

TIME(HRS) FIRST HYDROGRAPH POINT = .00 HOURS TIME INCREMENT = .20 HOURS DRAINAGE AREA = .46 SQ.MI.

10.00	DISCHG	.00	.00	.00	.00	.00	.00	.00	.00	.08	1.26
12.00	DISCHG	4.95	10.38	16.47	23.10	29.96	34.78	36.21	36.39	36.01	35.16
14.00	DISCHG	33.93	32.39	30.58	28.55	26.31	23.90	21.35	18.66	15.89	13.60
16.00	DISCHG	12.25	11.38	10.69	10.13	9.67	9.28	8.95	8.66	8.39	8.16
[illegible]	DISCHG	7.95	7.75	7.55	7.34	7.13	6.93	6.76	6.61	6.47	6.35
20.00	DISCHG	6.22	6.09	5.95	5.80	5.63	5.46	5.31	5.18	5.07	4.98
22.00	DISCHG	4.90	4.83	4.77	4.72	4.68	4.65	4.63	4.63	4.63	4.63
24.00	DISCHG	4.60	4.49	4.30	4.02	3.66	3.24	2.80	2.38	2.00	1.66
26.00	DISCHG	1.34	1.06	.81	.60	.41	.26	.15	.07	.02	.00

RUNOFF VOLUME ABOVE BASEFLOW = .55 WATERSHED INCHES, 163.80 CFS-HRS, 13.54 ACRE-FEET; BASEFLOW = .00 CFS

OPERATION RUNOFF CROSS SECTION 14
OUTPUT HYDROGRAPH= 5
AREA= .19 SQ MI INPUT RUNOFF CURVE= 61. TIME OF CONCENTRATION= .51 HOURS
INTERNAL HYDROGRAPH TIME INCREMENT= .0680 HOURS

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
12.60	6.17	(RUNOFF)
23.64	1.04	(RUNOFF)

TIME(HRS) FIRST HYDROGRAPH POINT = .00 HOURS TIME INCREMENT = .20 HOURS DRAINAGE AREA = .19 SQ.MI.

12.00	DISCHG	.91	3.99	5.87	6.17	5.85	5.02	4.11	3.66	3.31	3.00
14.00	DISCHG	2.75	2.55	2.37	2.21	2.06	1.94	1.88	1.83	1.77	1.71
16.00	DISCHG	1.69	1.67	1.67	1.68	1.53	1.56	1.51	1.48	1.48	1.48
18.00	DISCHG	1.44	1.36	1.30	1.26	1.24	1.24	1.25	1.26	1.27	1.27
20.00	DISCHG	1.22	1.12	1.05	1.00	.98	.98	.99	.99	1.00	1.00
22.00	DISCHG	1.00	1.01	1.01	1.02	1.02	1.02	1.03	1.03	1.04	1.04
[illegible]	DISCHG	.97	.78	.48	.25	.09	.02				

RUNOFF VOLUME ABOVE BASEFLOW = .19 WATERSHED INCHES, 22.99 CFS-HRS, 1.90 ACRE-FEET; BASEFLOW = .00 CFS

OPERATION ADDHYD CROSS SECTION 15
INPUT HYDROGRAPHS= 6,5 OUTPUT HYDROGRAPH= 4

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
13.23	40.34	(NULL)
23.70	5.68	(NULL)

RUNOFF VOLUME ABOVE BASEFLOW = .45 WATERSHED INCHES, 186.79 CFS-HRS, 15.44 ACRE-FEET; BASEFLOW = .00 CFS

1

OPERATION ADDHYD CROSS SECTION 16
INPUT HYDROGRAPHS= 4,7 OUTPUT HYDROGRAPH= 2

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
14.34	104.46	(NULL)

RUNOFF VOLUME ABOVE BASEFLOW = .52 WATERSHED INCHES, 1015.22 CFS-HRS, 83.90 ACRE-FEET; BASEFLOW = .00 CFS

AREA= .44 SQ MI INPUT RUNOFF CURVE= 70. TIME OF CONCENTRATION= .63 HOURS
INTERNAL HYDROGRAPH TIME INCREMENT= .1107 HOURS

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
12.65	42.73	(RUNOFF)
19.70	4.98	(RUNOFF)
23.63	3.93	(RUNOFF)

TIME(HRS)		FIRST HYDROGRAPH POINT = .00 HOURS				TIME INCREMENT = .20 HOURS			DRAINAGE AREA =		.44 SQ.MI.
10.00	DISCHG	.00	.00	.00	.00	.00	.00	.00	.00	.00	1.04
12.00	DISCHG	9.89	24.67	39.23	42.59	41.51	38.79	34.79	29.71	23.76	18.27
14.00	DISCHG	15.39	13.69	12.36	11.26	10.32	9.53	8.92	8.47	8.07	7.71
16.00	DISCHG	7.44	7.25	7.14	7.06	6.91	6.71	6.51	6.35	6.23	6.13
18.00	DISCHG	5.98	5.77	5.54	5.36	5.21	5.10	5.02	4.98	4.97	4.97
20.00	DISCHG	4.89	4.71	4.49	4.29	4.12	4.00	3.91	3.85	3.84	3.85
22.00	DISCHG	3.85	3.86	3.87	3.88	3.89	3.90	3.91	3.92	3.93	3.92
24.00	DISCHG	3.82	3.47	2.87	2.15	1.50	.97	.56	.26	.08	.01

RUNOFF VOLUME ABOVE BASEFLOW = .44 WATERSHED INCHES, 125.29 CFS-HRS, 10.35 ACRE-FEET; BASEFLOW = .00 CFS

OPERATION ADDHYD CROSS SECTION 18
INPUT HYDROGRAPHS= 2,6 OUTPUT HYDROGRAPH= 1

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
13.20	126.40	(NULL)

RUNOFF VOLUME ABOVE BASEFLOW = .51 WATERSHED INCHES, 1140.51 CFS-HRS, 94.25 ACRE-FEET; BASEFLOW = .00 CFS

OPERATION RUNOFF CROSS SECTION 19
OUTPUT HYDROGRAPH= 7
AREA= .13 SQ MI INPUT RUNOFF CURVE= 77. TIME OF CONCENTRATION= 1.21 HOURS
INTERNAL HYDROGRAPH TIME INCREMENT= .1613 HOURS

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
12.85	18.87	(RUNOFF)
23.60	1.53	(RUNOFF)

1

TIME(HRS)		FIRST HYDROGRAPH POINT = .00 HOURS				TIME INCREMENT = .20 HOURS			DRAINAGE AREA =		.13 SQ.MI.
10.00	DISCHG	.00	.00	.00	.00	.00	.00	.00	.03	.20	1.20
12.00	DISCHG	4.52	8.97	13.68	17.73	18.82	18.48	17.73	16.66	15.30	13.75
14.00	DISCHG	12.03	10.17	8.24	6.53	5.45	4.85	4.42	4.07	3.79	3.56
16.00	DISCHG	3.37	3.22	3.11	3.02	2.93	2.85	2.77	2.70	2.63	2.58
18.00	DISCHG	2.52	2.45	2.37	2.28	2.21	2.15	2.10	2.07	2.04	2.01
20.00	DISCHG	1.98	1.93	1.87	1.81	1.75	1.69	1.65	1.61	1.58	1.55
22.00	DISCHG	1.54	1.52	1.52	1.52	1.52	1.52	1.53	1.53	1.53	1.53
24.00	DISCHG	1.51	1.44	1.31	1.14	.94	.75	.58	.44	.31	.21
26.00	DISCHG	.12	.06	.02	.01	.00					

RUNOFF VOLUME ABOVE BASEFLOW = .72 WATERSHED INCHES, 60.63 CFS-HRS, 5.01 ACRE-FEET; BASEFLOW = .00 CFS

OPERATION REACH CROSS SECTION 20
INPUT HYDROGRAPH= 7 OUTPUT HYDROGRAPH= 3
LENGTH = 3100.00 FEET INPUT = COEFFICIENTS RELATED TO CROSS SECTIONAL AREA, A= .71, M= 1.31
[illegible]

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
13.50	16.71	(NULL)
23.90	1.53	(NULL)

RUNOFF VOLUME ABOVE BASEFLOW = .72 WATERSHED INCHES, 60.60 CFS-HRS, 5.01 ACRE-FEET; BASEFLOW = .00 CFS

OPERATION RUNOFF CROSS SECTION 21
OUTPUT HYDROGRAPH= 6
AREA= .09 SQ MI INPUT RUNOFF CURVE= 75. TIME OF CONCENTRATION= 1.16 HOURS
INTERNAL HYDROGRAPH TIME INCREMENT= .1547 HOURS

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
12.85	11.34	(RUNOFF)

TIME(HRS) FIRST HYDROGRAPH POINT = .00 HOURS TIME INCREMENT = .20 HOURS DRAINAGE AREA = .09 SQ.MI.

10.00	DISCHG	.00	.00	.00	.00	.00	.00	.00	.00	.05	.59
12.00	DISCHG	2.53	5.29	8.28	10.67	11.41	11.12	10.64	9.97	9.13	8.14
14.00	DISCHG	7.04	5.86	4.66	3.78	3.29	2.97	2.72	2.52	2.35	2.22
16.00	DISCHG	2.11	2.02	1.95	1.90	1.85	1.81	1.76	1.71	1.67	1.63
18.00	DISCHG	1.60	1.55	1.50	1.45	1.40	1.37	1.34	1.32	1.30	1.28
20.00	DISCHG	1.26	1.23	1.19	1.15	1.11	1.08	1.05	1.03	1.01	.99
22.00	DISCHG	.98	.98	.98	.98	.98	.98	.98	.98	.99	.98
24.00	DISCHG	.97	.92	.83	.72	.58	.46	.35	.25	.17	.11
26.00	DISCHG	.06	.03	.01	.00						

RUNOFF VOLUME ABOVE BASEFLOW = .63 WATERSHED INCHES, 36.81 CFS-HRS, 3.04 ACRE-FEET; BASEFLOW = .00 CFS

OPERATION ADDHYD CROSS SECTION 22
INPUT HYDROGRAPHS= 6,3 OUTPUT HYDROGRAPH= 2

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PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
13.30	26.75	(NULL)
23.68	2.51	(NULL)

RUNOFF VOLUME ABOVE BASEFLOW = .69 WATERSHED INCHES, 97.40 CFS-HRS, 8.05 ACRE-FEET; BASEFLOW = .00 CFS

OPERATION RUNOFF CROSS SECTION 23
OUTPUT HYDROGRAPH= 6
AREA= .17 SQ MI INPUT RUNOFF CURVE= 79. TIME OF CONCENTRATION= 1.36 HOURS
INTERNAL HYDROGRAPH TIME INCREMENT= .1313 HOURS

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
12.94	26.26	(RUNOFF)
23.63	2.14	(RUNOFF)

RUNOFF VOLUME ABOVE BASEFLOW = .82 WATERSHED INCHES, 89.67 CFS-HRS, 7.41 ACRE-FEET; BASEFLOW = .00 CFS

OPERATION ADDHYD CROSS SECTION 24
INPUT HYDROGRAPHS= 6,2 OUTPUT HYDROGRAPH= 3

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
13.5	52.19	(NULL)

RUNOFF VOLUME ABOVE BASEFLOW = .74 WATERSHED INCHES, 187.07 CFS-HRS, 15.46 ACRE-FEET; BASEFLOW = .00 CFS

OPERATION RESVOR STRUCTURE 4
INPUT HYDROGRAPH= 3 OUTPUT HYDROGRAPH= 6
SURFACE ELEVATION= 737.90

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
15.22	16.30	739.73

TIME(HRS) FIRST HYDROGRAPH POINT = .00 HOURS TIME INCREMENT = .20 HOURS DRAINAGE AREA = .39 SQ.MI.

10.00	DISCHG	.00	.00	.00	.00	.00	.00	.00	.01	.02	.08
10.00	ELEV	737.90	737.90	737.90	737.90	737.90	737.90	737.90	737.90	737.90	737.91
12.00	DISCHG	.30	.82	1.72	3.00	4.57	6.27	7.96	9.58	11.06	12.40
12.00	ELEV	737.93	737.99	738.09	738.24	738.4	738.60	738.79	738.98	739.14	739.29
14.00	DISCHG	13.54	14.49	15.23	15.75	16.03	16.25	16.30	16.27	16.18	16.05
14.00	ELEV	739.42	739.52	739.61	739.67	739.7	739.72	739.73	739.73	739.72	739.70
16.00	DISCHG	15.90	15.72	15.52	15.32	15.10	14.89	14.67	14.44	14.22	14.00
16.00	ELEV	739.69	739.66	739.64	739.62	739.60	739.57	739.55	739.52	739.50	739.47
18.00	DISCHG	13.78	13.55	13.33	13.11	12.89	12.67	12.45	12.23	12.01	11.80
18.00	ELEV	739.45	739.42	739.40	739.37	739.35	739.32	739.30	739.27	739.25	739.23
20.00	DISCHG	11.60	11.39	11.19	10.99	10.79	10.59	10.40	10.20	10.01	9.82
20.00	ELEV	739.20	739.18	739.16	739.13	739.11	739.09	739.07	739.05	739.02	739.00
22.00	DISCHG	9.63	9.45	9.28	9.11	8.94	8.78	8.63	8.48	8.34	8.21

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TR20 XEQ 06-21-94 17:58 OWOSSO DRAIN - FPMS - SHIAWASSEE CO.MI. 06-20-94 JOB 1 PASS 5
REV PC 09/83(.2) EXISTING CONDITIONS-24 HOUR TYPE II STORM DISTRIBUTION PAGE 93

[illegible]	ELEV	738.98	738.96	738.94	738.92	738.90	738.89	738.87	738.85	738.84	738.82
[illegible]	DISCHG	8.07	7.94	7.81	7.67	7.52	7.35	7.18	6.99	6.79	6.59
24.00	ELEV	738.81	738.79	738.78	738.76	738.74	738.73	738.71	738.69	738.66	738.64
26.00	DISCHG	6.38	6.17	5.96	5.75	5.54	5.34	5.14	4.95	4.77	4.59
26.00	ELEV	738.62	738.59	738.57	738.55	738.52	738.50	738.48	738.46	738.44	738.42
28.00	DISCHG	4.42	4.26	4.10	3.95	3.80	3.66	3.53	3.40	3.27	3.15
28.00	ELEV	738.40	738.38	738.36	738.34	738.33	738.31	738.30	738.28	738.27	738.25
30.00	DISCHG	3.03	2.92	2.81	2.71	2.61	2.51	2.42	2.33	2.24	2.16
30.00	ELEV	738.24	738.23	738.22	738.20	738.19	738.18	738.17	738.16	738.15	738.14
32.00	DISCHG	2.08	2.00	1.93	1.86	1.79	1.72	1.66	1.60	1.54	1.48
32.00	ELEV	738.13	738.13	738.12	738.11	738.10	738.09	738.09	738.08	738.07	738.07
34.00	DISCHG	1.43	1.37	1.32	1.27	1.23	1.18	1.14	1.10	1.06	1.02
34.00	ELEV	738.06	738.05	738.05	738.04	738.04	738.03	738.03	738.02	738.02	738.01
36.00	DISCHG	.98	.94	.91	.87	.84	.81	.78	.75	.72	.70
36.00	ELEV	738.01	738.01	738.00	738.00	737.99	737.99	737.99	737.98	737.98	737.98
38.00	DISCHG	.67	.65	.62	.60	.58	.56	.54	.52	.50	.48
38.00	ELEV	737.98	737.97	737.97	737.97	737.96	737.96	737.96	737.96	737.96	737.95
40.00	DISCHG	.46	.44	.43	.41	.40	.38	.37	.35	.34	.33
40.00	ELEV	737.95	737.95	737.95	737.95	737.94	737.94	737.94	737.94	737.94	737.94
42.00	DISCHG	.32	.30	.29	.28	.27	.26	.25	.24	.23	.23
42.00	ELEV	737.94	737.93	737.93	737.93	737.93	737.93	737.93	737.93	737.93	737.93
44.00	DISCHG	.22	.21	.20	.19	.19	.18	.17	.17	.16	.15
44.00	ELEV	737.92	737.92	737.92	737.92	737.92	737.92	737.92	737.92	737.92	737.92
46.00	DISCHG	.15	.14	.14	.13	.13	.12	.12	.11	.11	.11
46.00	ELEV	737.92	737.92	737.92	737.91	737.91	737.91	737.91	737.91	737.91	737.91
48.00	DISCHG	.10	.10	.09	.09	.09	.08	.08	.08	.08	.07
[illegible]	ELEV	737.91	737.91	737.91	737.91	737.91	737.91	737.91	737.91	737.91	737.91
[illegible]	DISCHG	.07	.07	.06	.06	.06	.06	.06	.05	.05	.05
50.00	ELEV	737.91	737.91	737.91	737.91	737.91	737.91	737.91	737.91	737.91	737.91
52.00	DISCHG	.05	.05	.04	.04	.04	.04	.04	.04	.04	.03
52.00	ELEV	737.91	737.91	737.91	737.90	737.90	737.90	737.90	737.90	737.90	737.90
54.00	DISCHG	.03	.03	.03	.02	.03	.03	.03	.03	.02	.02
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

56.00	ELEV	737.90	737.90	737.90	737.90	737.90	737.90	737.90	737.90	737.90	737.90
58.00	DISCHG	.02	.01	.01	.01	.01	.01	.01	.01	.01	.01
58.00	ELEV	737.90	737.90	737.90	737.90	737.90	737.90	737.90	737.90	737.90	737.90

RUNOFF VOLUME ABOVE BASEFLOW = .74 WATERSHED INCHES, 187.03 CFS-HRS, 15.46 ACRE-FEET; BASEFLOW = .00 CFS

OPERATION ADDHYD CROSS SECTION 25
INPUT HYDROGRAPHS= 6,1 OUTPUT HYDROGRAPH= 5

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
13.37	134.96	(NULL)
14.17	132.46	(NULL)

RUNOFF VOLUME ABOVE BASEFLOW = .53 WATERSHED INCHES, 1327.53 CFS-HRS, 109.71 ACRE-FEET; BASEFLOW = .00 CFS

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OPERATION RESVOR STRUCTURE 5
INPUT HYDROGRAPH= 5 OUTPUT HYDROGRAPH= 7
SURFACE ELEVATION= 731.80

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
19.28	80.46	738.04

TIME(HRS) FIRST HYDROGRAPH POINT = .00 HOURS TIME INCREMENT = .20 HOURS DRAINAGE AREA = 3.85 SQ.MI.

8.00	DISCHG	.00	.00	.00	.00	.00	.00	.00	.00	.03	.79
10.00	ELEV	731.80	731.80	731.80	731.80	731.80	731.80	731.80	731.80	731.80	731.86
12.00	DISCHG	5.44	17.56	36.70	58.30	63.64	66.30	66.99	67.68	68.37	69.04
12.00	ELEV	732.20	733.09	734.49	736.07	736.63	737.01	737.07	737.14	737.20	737.27
14.00	DISCHG	69.69	70.34	70.97	71.60	72.20	72.76	73.29	73.77	74.20	74.60
14.00	ELEV	737.33	737.39	737.45	737.51	737.57	737.62	737.67	737.71	737.76	737.79
16.00	DISCHG	74.96	75.30	75.63	75.93	76.23	76.50	76.75	77.36	78.01	78.58
16.00	ELEV	737.83	737.86	737.89	737.92	737.95	737.97	738.00	738.01	738.01	738.02
18.00	DISCHG	79.08	79.50	79.83	80.10	80.28	80.40	80.46	80.45	80.39	80.27
18.00	ELEV	738.03	738.03	738.04	738.04	738.04	738.04	738.04	738.04	738.04	738.04
20.00	DISCHG	80.11	79.90	79.63	79.31	78.95	78.54	78.09	77.61	77.11	76.73
20.00	ELEV	738.04	738.04	738.03	738.03	738.03	738.02	738.02	738.01	738.00	737.99
22.00	DISCHG	76.55	76.36	76.16	75.95	75.74	75.52	75.29	75.05	74.81	74.57
22.00	ELEV	737.98	737.96	737.94	737.92	737.90	737.88	737.86	737.84	737.81	737.79
24.00	DISCHG	74.32	74.05	73.78	73.49	73.17	72.84	72.49	72.12	71.73	71.33
24.00	ELEV	737.77	737.74	737.72	737.69	737.66	737.63	737.59	737.56	737.52	737.48
26.00	DISCHG	70.93	70.50	70.07	69.63	69.18	68.73	68.26	67.79	67.32	66.84
26.00	ELEV	737.45	737.41	737.37	737.32	737.28	737.24	737.19	737.15	737.11	737.06
28.00	DISCHG	66.35	64.64	62.40	52.33	39.04	30.47	24.85	21.10	18.53	16.69
28.00	ELEV	737.01	736.77	736.45	735.64	734.66	734.03	733.62	733.35	733.16	733.02
30.00	DISCHG	15.33	14.28	13.43	12.71	12.09	11.53	11.02	10.56	10.12	9.71
30.00	ELEV	732.92	732.85	732.78	732.73	732.69	732.65	732.61	732.57	732.54	732.51
32.00	DISCHG	9.33	8.97	8.62	8.30	7.99	7.70	7.43	7.16	6.92	6.68
32.00	ELEV	732.48	732.46	732.43	732.41	732.39	732.36	732.34	732.32	732.31	732.29
34.00	DISCHG	6.46	6.25	6.04	5.85	5.67	5.50	5.33	5.18	5.03	4.89
34.00	ELEV	732.27	732.26	732.24	732.23	732.22	732.20	732.19	732.18	732.17	732.16
36.00	DISCHG	4.76	4.63	4.51	4.39	4.28	4.17	4.07	3.97	3.88	3.79
36.00	ELEV	732.15	732.14	732.13	732.12	732.11	732.11	732.10	732.09	732.08	732.08
38.00	DISCHG	3.71	3.63	3.55	3.48	3.40	3.34	3.27	3.21	3.15	3.09
38.00	ELEV	732.07	732.07	732.06	732.05	732.05	732.04	732.04	732.04	732.03	732.03
40.00	DISCHG	3.03	2.98	[illegible]	2.88	2.84	2.79	2.75	2.70	2.66	2.62
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

42.00	ELEV	731.99	731.99	731.98	731.98	731.98	731.98	731.97	731.97	731.97	731.97
44.00	DISCHG	2.26	2.23	2.20	2.17	2.15	2.12	2.09	2.07	2.04	2.02
44.00	ELEV	731.97	731.96	731.96	731.96	731.96	731.96	731.95	731.95	731.95	731.95
46.00	DISCHG	2.00	1.97	1.95	1.93	1.91	1.89	1.86	1.84	1.82	1.80
46.00	ELEV	731.95	731.94	731.94	731.94	731.94	731.94	731.94	731.94	731.93	731.93
48.00	DISCHG	1.78	1.76	1.74	1.72	1.70	1.68	1.67	1.65	1.63	1.61
48.00	ELEV	731.93	731.93	731.93	731.93	731.92	731.92	731.92	731.92	731.92	731.92

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50.00	DISCHG	1.60	1.58	1.56	1.54	1.53	1.51	1.49	1.48	1.46	1.45
50.00	ELEV	731.92	731.92	731.91	731.91	731.91	731.91	731.91	731.91	731.91	731.91
52.00	DISCHG	1.43	1.42	1.38	1.28	1.14	.99	.85	.72	.61	.51
52.00	ELEV	731.90	731.90	731.90	731.89	731.88	731.87	731.86	731.85	731.84	731.84
54.00	DISCHG	.43	.36	.30	.26	.22	.19	.16	.14	.12	.11
54.00	ELEV	731.83	731.83	731.82	731.82	731.82	731.81	731.81	731.81	731.81	731.81
56.00	DISCHG	.09	.09	.08	.07	.06	.06	.05	.05	.05	.04
56.00	ELEV	731.81	731.81	731.81	731.81	731.80	731.80	731.80	731.80	731.80	731.80
58.00	DISCHG	.04	.04	.04	.04	.03	.03	.03	.03	.03	.03
58.00	ELEV	731.80	731.80	731.80	731.80	731.80	731.80	731.80	731.80	731.80	731.80

RUNOFF VOLUME ABOVE BASEFLOW = .53 WATERSHED INCHES, 1327.84 CFS-HRS, 109.73 ACRE-FEET; BASEFLOW = .00 CFS

OPERATION RUNOFF CROSS SECTION 26
OUTPUT HYDROGRAPH= 6
AREA= .13 SQ MI INPUT RUNOFF CURVE= 72. TIME OF CONCENTRATION= 1.79 HOURS
INTERNAL HYDROGRAPH TIME INCREMENT= .1989 HOURS

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
13.49	9.03	(RUNOFF)

TIME(HRS) FIRST HYDROGRAPH POINT = .00 HOURS TIME INCREMENT = .20 HOURS DRAINAGE AREA = .13 SQ.MI.

10.00	DISCHG	.00	.00	.00	.00	.00	.00	.00	.00	.01	.27
12.00	DISCHG	1.11	2.35	3.75	5.28	6.90	8.25	8.86	9.01	9.00	8.87
14.00	DISCHG	8.65	8.34	7.97	7.54	7.05	6.53	5.96	5.36	4.73	4.08
16.00	DISCHG	3.54	3.20	2.99	2.82	2.63	2.56	2.46	2.38	2.30	2.23
18.00	DISCHG	2.17	2.11	2.06	2.00	1.95	1.89	1.85	1.80	1.77	1.73
20.00	DISCHG	1.70	1.66	1.62	1.58	1.54	1.49	1.45	1.42	1.39	1.36
22.00	DISCHG	1.34	1.32	1.30	1.29	1.23	1.27	1.26	1.26	1.25	1.25
24.00	DISCHG	1.24	1.22	1.17	1.10	1.01	.91	.80	.69	.59	.49
26.00	DISCHG	.41	.33	.26	.20	.15	.10	.07	.04	.02	.01
28.00	DISCHG	.00									

RUNOFF VOLUME ABOVE BASEFLOW = .51 WATERSHED INCHES, 43.04 CFS-HRS, 3.56 ACRE-FEET; BASEFLOW = .00 CFS

OPERATION ADDHYD CROSS SECTION 27
INPUT HYDROGRAPHS= 7,6 OUTPUT HYDROGRAPH= 5

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
19.12	82.31	(NULL)

RUNOFF VOLUME ABOVE BASEFLOW = .53 WATERSHED INCHES, 1370.89 CFS-HRS, 113.29 ACRE-FEET; BASEFLOW = .00 CFS

OPERATION RUNOFF CROSS SECTION 28
OUTPUT HYDROGRAPH= 6
AREA= .21 SQ MI INPUT RUNOFF CURVE= 78. TIME OF CONCENTRATION= .69 HOURS
[illegible] INCREMENT= .0910 HOURS

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
12.45	101.63	(RUNOFF)
19.62	6.64	(RUNOFF)
23.56	5.14	(RUNOFF)

TIME(HRS) FIRST HYDROGRAPH POINT = .00 HOURS TIME INCREMENT = .20 HOURS DRAINAGE AREA = .42 SQ.MI.

10.00	DISCHG	.00	.00	.00	.00	.00	.01	.14	.60	2.30	10.79
12.00	DISCHG	41.90	81.93	100.85	94.49	82.53	67.83	51.14	35.20	26.48	22.79
14.00	DISCHG	20.11	18.01	16.33	14.91	13.65	12.61	11.89	11.34	10.82	10.35
16.00	DISCHG	10.02	9.81	9.68	9.56	9.34	9.01	8.70	8.46	8.29	8.17
18.00	DISCHG	7.96	7.63	7.29	7.02	6.82	6.69	6.63	6.63	6.64	6.63
20.00	DISCHG	6.47	6.13	5.78	5.49	5.23	5.14	5.07	5.06	5.07	5.08
22.00	DISCHG	5.08	5.09	5.10	5.11	5.11	5.12	5.13	5.14	5.14	5.13
24.00	DISCHG	4.95	4.32	3.30	2.21	1.34	.69	.26	.05	.00	

RUNOFF VOLUME ABOVE BASEFLOW = .77 WATERSHED INCHES, 208.41 CFS-HRS, 17.22 ACRE-FEET; BASEFLOW = .00 CFS

OPERATION ADDHYD CROSS SECTION 29
INPUT HYDROGRAPHS= 5,6 OUTPUT HYDROGRAPH= 7

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
12.65	158.88	(NULL)
18.17	89.24	(NULL)

T [illegible]RS) FIRST HYDROGRAPH POINT = .00 HOURS TIME INCREMENT = .20 HOURS DRAINAGE AREA = 4.40 SQ.MI.

10.00	DISCHG	.00	.00	.00	.00	.00	.01	.14	.60	2.34	11.85
12.00	DISCHG	48.45	101.84	141.30	158.07	153.11	142.37	126.99	111.90	103.85	100.70
14.00	DISCHG	98.45	96.69	95.27	94.04	92.90	91.90	91.14	90.47	89.76	89.03
16.00	DISCHG	88.52	88.32	88.29	88.31	88.24	88.06	87.91	88.20	88.60	88.98
18.00	DISCHG	89.21	89.24	89.18	89.12	89.05	88.98	88.93	88.88	88.80	88.64
20.00	DISCHG	88.28	87.69	87.03	86.39	85.76	85.17	84.62	84.09	83.56	83.17
22.00	DISCHG	82.97	82.77	82.56	82.35	82.13	81.91	81.68	81.44	81.21	80.95
24.00	DISCHG	80.51	79.59	78.25	76.80	75.53	74.44	73.54	72.86	72.32	71.83
26.00	DISCHG	71.33	70.84	70.34	69.83	69.33	68.83	68.33	67.83	67.33	66.84
28.00	DISCHG	66.35	64.64	62.40	52.33	39.04	30.47	24.85	21.10	18.53	16.69
30.00	DISCHG	15.33	14.28	13.43	12.71	12.09	11.53	11.02	10.56	10.12	9.71
32.00	DISCHG	9.33	8.97	8.62	8.30	7.99	7.70	7.43	7.16	6.92	6.68
34.00	DISCHG	6.46	6.25	6.04	5.85	5.67	5.50	5.33	5.18	5.03	4.89
36.00	DISCHG	4.76	4.63	4.51	4.39	4.28	4.17	4.07	3.97	3.88	3.79
38.00	DISCHG	3.71	3.63	3.55	3.48	3.40	3.34	3.27	3.21	3.15	3.09
40.00	DISCHG	3.03	2.98	2.93	2.88	2.84	2.79	2.75	2.70	2.66	2.62
42.00	DISCHG	2.59	2.55	2.51	2.48	2.44	2.41	2.38	2.35	2.32	2.29
44.00	DISCHG	2.26	2.23	2.20	2.17	2.15	2.12	2.09	2.07	2.04	2.02
46.00	DISCHG	2.00	1.97	1.95	1.93	1.91	1.89	1.86	1.84	1.82	1.80
48.00	DISCHG	1.78	1.76	1.74	1.72	1.70	1.68	1.67	1.65	1.63	1.61
50.00	DISCHG	1.60	1.58	1.56	1.54	1.53	1.51	1.49	1.48	1.46	1.45
52.00	DISCHG	1.43	1.42	1.38	1.28	1.14	.99	.85	.72	.61	.51

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58.00	DISCHG	.04	.04	.04	.04	.03	.03	.03	.03	.03	.03

RUNOFF VOLUME ABOVE BASEFLOW = .56 WATERSHED INCHES, 1579.29 CFS-HRS, 130.51 ACRE-FEET; BASEFLOW = .00 CFS

OPERATION RESVOR STRUCTURE 6
INPUT HYDROGRAPH= 7 OUTPUT HYDROGRAPH= 1
SURFACE ELEVATION= 728.40

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
12.68	159.58	734.63
18.25	89.24	732.82

TIME(HRS) FIRST HYDROGRAPH POINT = .00 HOURS TIME INCREMENT = .20 HOURS DRAINAGE AREA = 4.40 SQ.MI.

10.00	DISCHG	.00	.00	.00	.00	.00	.00	.04	.22	.91	4.30
10.00	ELEV	728.40	728.40	728.40	728.40	728.40	728.40	728.40	728.42	728.46	728.70
12.00	DISCHG	18.48	70.25	133.43	157.47	154.67	144.41	130.02	115.52	106.51	101.52
12.00	ELEV	729.67	732.09	734.21	734.60	734.56	734.39	734.16	733.83	733.48	733.29
14.00	DISCHG	99.23	97.27	95.75	94.46	93.29	92.24	91.39	90.70	90.01	89.28
14.00	ELEV	733.20	733.13	733.07	733.02	732.97	732.93	732.90	732.87	732.85	732.82
16.00	DISCHG	88.68	88.37	88.29	88.30	88.27	88.13	87.96	88.07	88.46	88.85
16.00	ELEV	732.80	732.78	732.78	732.78	732.78	732.77	732.77	732.77	732.79	732.80
18.00	DISCHG	89.14	89.24	89.20	89.14	89.07	89.01	88.95	88.90	88.83	88.70
18.00	ELEV	732.81	732.82	732.82	732.81	732.81	732.81	732.81	732.80	732.80	732.80
20.00	DISCHG	88.42	87.91	87.26	86.61	85.98	85.38	84.81	84.27	83.75	83.30
20.00	ELEV	732.79	732.77	732.74	732.72	732.69	732.67	732.65	732.63	732.61	732.59
22.00	DISCHG	83.03	82.84	82.64	82.42	82.21	81.98	81.76	81.53	81.29	81.04
22.00	ELEV	732.58	732.57	732.56	732.55	732.55	732.54	732.53	732.52	732.51	732.50
24.00	DISCHG	80.67	79.94	78.74	77.31	75.96	74.81	73.85	73.09	72.50	72.00
24.00	ELEV	732.49	732.46	732.41	732.36	732.31	732.26	732.22	732.20	732.17	732.15
26.00	DISCHG	71.51	71.01	70.51	70.01	69.51	69.01	68.50	68.00	67.50	67.01
26.00	ELEV	732.13	732.12	732.10	732.08	732.06	732.04	732.02	732.00	731.98	731.96
[illegible]	DISCHG	66.52	65.29	63.17	56.22	43.62	33.01	29.53	25.94	22.58	19.85
[illegible]	ELEV	731.94	731.89	731.81	731.54	731.05	730.64	730.43	730.18	729.95	729.76
30.00	DISCHG	17.75	16.13	14.88	13.89	13.07	12.38	11.77	11.23	10.74	10.29
30.00	ELEV	729.62	729.51	729.42	729.35	729.30	729.25	729.21	729.17	729.14	729.11
32.00	DISCHG	9.87	9.47	9.10	8.75	8.42	8.11	7.81	7.53	7.26	7.01
32.00	ELEV	729.08	729.05	729.03	729.00	728.93	728.96	728.94	728.92	728.90	728.88
34.00	DISCHG	6.77	6.54	6.32	6.12	5.92	5.74	5.56	5.39	5.24	5.08
34.00	ELEV	728.87	728.85	728.83	728.82	728.81	728.79	728.78	728.77	728.76	728.75
36.00	DISCHG	4.94	4.80	4.67	4.55	4.43	4.32	4.21	4.11	4.01	3.92
36.00	ELEV	728.74	728.73	728.72	728.71	728.70	728.70	728.69	728.68	728.68	728.67
38.00	DISCHG	3.83	3.74	3.66	3.58	3.50	3.43	3.36	3.29	3.23	3.17
38.00	ELEV	728.66	728.66	728.65	728.65	728.64	728.64	728.63	728.63	728.62	728.62
40.00	DISCHG	3.11	3.05	3.00	2.95	2.90	2.85	2.81	2.76	2.72	2.68
40.00	ELEV	728.61	728.61	728.61	728.60	728.60	728.60	728.59	728.59	728.59	728.58
42.00	DISCHG	2.64	2.60	2.56	2.53	2.49	2.46	2.42	2.39	2.36	2.33
42.00	ELEV	728.58	728.58	728.58	728.57	728.57	728.57	728.57	728.56	728.56	728.56

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44.00	DISCHG	2.30	2.27	2.24	2.21	2.18	2.16	2.13	2.10	2.08	2.05
44.00	ELEV	728.56	728.56	728.55	728.55	728.55	728.55	728.55	728.54	728.54	728.54
[illegible]	DISCHG	2.03	2.01	1.98	1.96	1.94	1.91	1.89	1.87	1.85	1.82
[illegible]	ELEV	728.54	728.54	728.54	728.53	728.53	728.53	728.53	728.53	728.53	728.53
48.00	DISCHG	1.81	1.79	1.77	1.75	1.73	1.71	1.69	1.67	1.65	1.64
48.00	ELEV	728.52	728.52	728.52	728.52	728.52	728.52	728.52	728.52	728.51	728.51
50.00	DISCHG	1.62	1.60	1.59	1.57	1.55	1.53	1.52	1.50	1.48	1.47
50.00	ELEV	728.51	728.51	728.51	728.51	728.51	728.51	728.50	728.50	728.50	728.50

54.00	DISCHG	.59	.47	.39	.33	.28	.24	.20	.17	.15	.13
54.00	ELEV	728.44	728.43	728.43	728.42	728.42	728.42	728.41	728.41	728.41	728.41
56.00	DISCHG	.11	.10	.09	.08	.07	.07	.06	.06	.05	.05
56.00	ELEV	728.41	728.41	728.41	728.41	728.41	728.40	728.40	728.40	728.40	728.40
58.00	DISCHG	.04	.04	.04	.04	.04	.04	.03	.03	.03	.03
58.00	ELEV	728.40	728.40	728.40	728.40	728.40	728.40	728.40	728.40	728.40	728.40

RUNOFF VOLUME ABOVE BASEFLOW = .56 WATERSHED INCHES, 1579.12 CFS-HRS, 130.50 ACRE-FEET; BASEFLOW = .00 CFS

OPERATION RUNOFF CROSS SECTION 30
OUTPUT HYDROGRAPH= 6
AREA= .28 SQ MI INPUT RUNOFF CURVE= 83. TIME OF CONCENTRATION= 1.27 HOURS
INTERNAL HYDROGRAPH TIME INCREMENT= .1693 HOURS

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
12.83	61.19	(RUNOFF)
23.56	4.00	(RUNOFF)

TIME(HRS) FIRST HYDROGRAPH POINT = .00 HOURS TIME INCREMENT = .20 HOURS DRAINAGE AREA = .28 SQ.MI.

8.00	DISCHG	.00	.00	.00	.00	.00	.00	.00	.00	.00	.01
10.00	DISCHG	.02	.07	.15	.30	.52	.84	1.32	2.01	3.47	8.06
12.00	DISCHG	19.03	32.59	46.54	57.68	61.12	59.44	56.56	52.74	48.25	43.24
14.00	DISCHG	37.83	32.11	26.18	20.50	16.23	13.93	12.54	11.45	10.59	9.90
16.00	DISCHG	9.33	8.86	8.50	8.21	7.96	7.73	7.50	7.28	7.09	6.92
18.00	DISCHG	6.75	6.57	6.36	6.14	5.93	5.76	5.62	5.51	5.43	5.35
20.00	DISCHG	5.25	5.12	4.97	4.80	4.64	4.50	4.38	4.27	4.18	4.11
22.00	DISCHG	4.05	4.01	3.99	3.98	3.98	3.99	3.99	4.00	4.00	3.99
24.00	DISCHG	3.93	3.77	3.47	3.05	2.56	2.08	1.64	1.26	.93	.65
26.00	DISCHG	.42	.24	.11	.04	.01					

RUNOFF VOLUME ABOVE BASEFLOW = 1.03 WATERSHED INCHES, 186.86 CFS-HRS, 15.44 ACRE-FEET; BASEFLOW = .00 CFS

OPERATION ADDHYD CROSS SECTION 31
INPUT HYDROGRAPHS= 1,6 OUTPUT HYDROGRAPH= 7

PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
12.71	217.07	(NULL)
18.01	95.89	(NULL)

1

TIME(HRS) FIRST HYDROGRAPH POINT = .00 HOURS TIME INCREMENT = .20 HOURS DRAINAGE AREA = 4.68 SQ.MI.

8.00	DISCHG	.00	.00	.00	.00	.00	.00	.00	.00	.00	.01
10.00	DISCHG	.02	.07	.15	.30	.52	.84	1.36	2.24	4.38	12.37
12.00	DISCHG	37.50	102.84	179.96	215.15	215.41	203.85	186.58	168.26	154.76	144.76
14.00	DISCHG	137.05	129.38	121.93	114.96	109.52	106.17	103.93	102.15	100.61	99.19
16.00	DISCHG	98.01	97.23	96.79	96.51	96.23	95.86	95.46	95.35	95.55	95.78
18.00	DISCHG	95.89	95.80	95.56	95.28	95.01	94.77	94.57	94.41	94.26	94.05
20.00	DISCHG	93.66	93.03	92.23	91.41	90.62	89.88	89.19	88.55	87.93	87.41
22.00	DISCHG	87.08	86.86	86.63	86.41	86.19	85.97	85.75	85.52	85.29	85.03
[illegible]	DISCHG	84.60	83.71	82.21	80.36	78.32	76.89	75.49	74.34	73.42	72.65
[illegible]	DISCHG	71.93	71.23	70.62	70.05	69.51	69.01	68.50	68.00	67.50	67.01
28.00	DISCHG	66.52	65.29	63.17	56.22	43.62	33.01	29.53	25.94	22.58	19.85
30.00	DISCHG	17.75	16.13	14.88	13.89	13.07	12.33	11.77	11.23	10.74	10.29
32.00	DISCHG	9.87	9.47	9.10	8.75	8.42	8.11	7.81	7.53	7.26	7.02
34.00	DISCHG	6.77	6.54	6.32	6.12	5.92	5.74	5.56	5.39	5.24	5.05
[illegible]	[illegible]	[illegible]	[illegible]	4.67	4.55	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

40.00	DISCHG	3.11	3.05	3.00	2.95	2.90	2.85	2.81	2.76	2.72	2.68
42.00	DISCHG	2.64	2.60	2.56	2.53	2.49	2.46	2.42	2.39	2.36	2.33
44.00	DISCHG	2.30	2.27	2.24	2.21	2.18	2.16	2.13	2.10	2.08	2.05
46.00	DISCHG	2.03	2.01	1.98	1.96	1.94	1.91	1.89	1.87	1.85	1.83
48.00	DISCHG	1.81	1.79	1.77	1.75	1.73	1.71	1.69	1.67	1.65	1.64
50.00	DISCHG	1.62	1.60	1.58	1.57	1.55	1.53	1.52	1.50	1.48	1.47
52.00	DISCHG	1.45	1.44	1.41	1.37	1.28	1.16	1.05	.90	.77	.66
[illegible]0	DISCHG	.55	.47	.39	.33	.28	.24	.20	.17	.15	.13
56.00	DISCHG	.11	.10	.09	.08	.07	.07	.06	.06	.05	.05
58.00	DISCHG	.04	.04	.04	.04	.04	.04	.03	.03	.03	.03

RUNOFF VOLUME ABOVE BASEFLOW = .58 WATERSHED INCHES, 1765.98 CFS-HRS, 145.94 ACRE-FEET; BASEFLOW = .00 CFS

EXECUTIVE CONTROL OPERATION ENDCMP RECORD ID
+ COMPUTATIONS COMPLETED FOR PASS 5

EXECUTIVE CONTROL OPERATION ENDJOB RECORD ID
1

SUMMARY TABLE 1 - SELECTED RESULTS OF STANDARD AND EXECUTIVE CONTROL INSTRUCTIONS IN THE ORDER PERFORMED
(A STAR(*) AFTER THE PEAK DISCHARGE TIME AND RATE (CFS) VALUES INDICATES A FLAT TOP HYDROGRAPH
A QUESTION MARK(?) INDICATES A HYDROGRAPH WITH PEAK AS LAST POINT.)

SECTION/ STRUCTURE ID	STANDARD CONTROL OPERATION	DRAINAGE AREA (SQ MI)	RAIN TABLE #	ANTEC MOIST COND	MAIN TIME INCREM (HR)	PRECIPITATION BEGIN (HR)	PRECIPITATION AMOUNT (IN)	PRECIPITATION DURATION (HR)	RUNOFF AMOUNT (IN)	PEAK DISCHARGE ELEVATION (FT)	PEAK DISCHARGE TIME (HR)	PEAK DISCHARGE RATE (CFS)	PEAK DISCHARGE RATE (CSM)
ALTERNATE 1 STORM 1													
XSECTION 1	RUNOFF	.58	2	2	.20	.0	6.00	24.00	2.90	---	12.68	400.64	690.8
XSECTION 2	RUNOFF	.24	2	2	.20	.0	6.00	24.00	2.81	---	12.37	240.75	1003.1
XSECTION 3	ADDHYD	.82	2	2	.20	.0	6.00	24.00	2.88	---	12.58	605.59	738.5
XSECTION 4	RUNOFF	.23	2	2	.20	.0	6.00	24.00	3.29	---	12.41	257.71	1120.5
STRUCTURE 1	RESVOR	.23	2	2	.20	.0	6.00	24.00	3.29	743.81	14.15	35.96	156.3
XSECTION 5	ADDHYD	1.05	2	2	.20	.0	6.00	24.00	2.97	---	12.58	639.67	609.4
XSECTION 6	RUNOFF	.36	2	2	.20	.0	6.00	24.00	3.68	---	13.27	211.90	588.6
XSECTION 7	ADDHYD	1.41	2	2	.20	.0	6.00	24.00	3.15	---	12.66	789.64	559.3
STRUCTURE 2	RESVOR	1.41	2	2	.20	.0	6.00	24.00	3.15	742.80	13.56	568.28	403.0
XSECTION 8	REACH	1.41	2	2	.20	.0	6.00	24.00	3.15	738.33	17.26	266.87	189.3
XSECTION 9	RUNOFF	.52	2	2	.20	.0	6.00	24.00	3.00	---	13.05	282.91	544.0
XSECTION 10	ADDHYD	1.93	2	2	.20	.0	6.00	24.00	3.11	---	17.04	306.79	159.1
XSECTION 11	RUNOFF	.44	2	2	.20	.0	6.00	24.00	2.81	---	12.82	265.77	604.0
STRUCTURE 3	RESVOR	.44	2	2	.20	.0	6.00	24.00	2.52	762.71	18.61	24.95	56.5
[illegible]ON 12	ADDHYD	2.37	2	2	.20	.0	6.00	24.00	3.00	---	17.05	331.69	140.0
XSECTION 13	RUNOFF	.46	2	2	.20	.0	6.00	24.00	3.09	---	12.69	249.90	543.2
XSECTION 14	RUNOFF	.19	2	2	.20	.0	6.00	24.00	2.91	---	12.29	152.17	800.9
XSECTION 15	ADDHYD	.65	2	2	.20	.0	6.00	24.00	2.77	---	12.76	310.39	478.3
XSECTION 16	ADDHYD	3.02	2	2	.20	.0	6.00	24.00	2.95	---	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

XSECTION	18	ADDHYD	3.46	2	2	.20	.0	6.00	24.00	2.93	---	12.76	912.01	263.6
XSECTION	19	RUNOFF	.13	2	2	.20	.0	6.00	24.00	3.48	---	12.73	103.17	793.6
XSECTION	20	REACH	.13	2	2	.20	.0	6.00	24.00	3.48	---	13.18	95.95	738.1
XSECTION	21	RUNOFF	.09	2	2	.20	.0	6.00	24.00	3.28	---	12.71	69.00	766.7
XSECTION	22	ADDHYD	.22	2	2	.20	.0	6.00	24.00	3.40	---	13.03	159.01	722.8
XSECTION	23	RUNOFF	.17	2	2	.20	.0	6.00	24.00	3.68	---	12.84	131.49	773.5
XSECTION	24	ADDHYD	.39	2	2	.20	.0	6.00	24.00	3.52	---	12.94	287.47	737.1
STRUCTURE	4	RESVOR	.39	2	2	.20	.0	6.00	24.00	3.52	741.61	15.92	41.29	105.9
XSECTION	25	ADDHYD	3.85	2	2	.20	.0	6.00	24.00	2.99	---	12.77	934.74	242.8
STRUCTURE	5	RESVOR	3.85	2	2	.20	.0	6.00	24.00	2.99	739.99	18.03	425.22	110.4
XSECTION	26	RUNOFF	.13	2	2	.20	.0	6.00	24.00	2.99	---	13.20	65.12	500.9
XSECTION	27	ADDHYD	3.98	2	2	.20	.0	6.00	24.00	2.99	---	17.92	434.26	109.1

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SUMMARY TABLE 1 - SELECTED RESULTS OF STANDARD AND EXECUTIVE CONTROL INSTRUCTIONS IN THE ORDER PERFORMED
(A STAR(*) AFTER THE PEAK DISCHARGE TIME AND RATE (CFS) VALUES INDICATES A FLAT TOP HYDROGRAPH
A QUESTION MARK(?) INDICATES A HYDROGRAPH WITH PEAK AS LAST POINT.)

SECTION/ STRUCTURE ID	STANDARD CONTROL OPERATION	DRAINAGE AREA (SQ MI)	RAIN TABLE #	ANTEC MOIST COND	MAIN TIME INCREM (HR)	PRECIPITATION BEGIN (HR)	PRECIPITATION AMOUNT (IN)	PRECIPITATION DURATION (HR)	RUNOFF AMOUNT (IN)	PEAK DISCHARGE ELEVATION (FT)	PEAK DISCHARGE TIME (HR)	PEAK DISCHARGE RATE (CFS)	PEAK DISCHARGE RATE (CSM)
ALTERNATE 1 STORM 1													
XSECTION	28	RUNOFF	.42	2	2	.20	.0	6.00	24.00	3.58	---	12.40	517.60	1232.4
XSECTION	29	ADDHYD	4.40	2	2	.20	.0	6.00	24.00	3.05	---	12.46	646.23	146.9
STRUCTURE	6	RESVOR	4.40	2	2	.20	.0	6.00	24.00	3.05	738.60	25.23	288.04	65.5
XSECTION	30	RUNOFF	.28	2	2	.20	.0	6.00	24.00	4.09	---	12.77	253.15	904.1
XSECTION	31	ADDHYD	4.68	2	2	.20	.0	6.00	24.00	3.11	---	12.81	483.52	103.2
ALTERNATE 1 STORM 2													
XSECTION	1	RUNOFF	.58	2	2	.20	.0	4.85	24.00	2.01	---	12.69	269.89	465.3
XSECTION	2	RUNOFF	.24	2	2	.20	.0	4.85	24.00	1.93	---	12.39	161.74	673.9
XSECTION	3	ADDHYD	.82	2	2	.20	.0	4.85	24.00	1.98	---	12.59	408.01	497.6
XSECTION	4	RUNOFF	.23	2	2	.20	.0	4.85	24.00	2.33	---	12.42	181.02	787.0
STRUCTURE	1	RESVOR	.23	2	2	.20	.0	4.85	24.00	2.33	743.41	13.77	34.50	150.0
XSECTION	5	ADDHYD	1.05	2	2	.20	.0	4.85	24.00	2.06	---	12.60	441.78	420.7
XSECTION	6	RUNOFF	.36	2	2	.20	.0	4.85	24.00	2.67	---	13.29	152.56	423.8
XSECTION	7	ADDHYD	1.41	2	2	.20	.0	4.85	24.00	2.22	---	12.68	546.58	389.1
STRUCTURE	2	RESVOR	1.41	2	2	.20	.0	4.85	24.00	2.22	74.68	13.76	276.96	267.4
XSECTION	8	REACH	1.41	2	2	.20	.0	4.85	24.00	2.22	738.06	17.94	161.05	114.2
XSECTION	9	RUNOFF	.52	2	2	.20	.0	4.85	24.00	2.09	---	13.07	192.41	370.0
XSECTION	10	ADDHYD	1.93	2	2	.20	.0	4.85	24.00	2.18	---	13.07	193.29	100.1
XSECTION	11	RUNOFF	.44	2	2	.20	.0	4.85	24.00	1.93	---	12.94	177.46	403.2
STRUCTURE	3	RESVOR	.44	2	2	.20	.0	4.85	24.00	1.76	762.36	18.76	17.71	40.7
XSECTION	12	ADDHYD	2.37	2	2	.20	.0	4.85	24.00	2.10	---	17.00	205.93	[illegible]
XSECTION	13	RUNOFF	.46	2	2	.20	.0	4.85	24.00	2.16	---	13.13	176.17	370.0
XSECTION	14	RUNOFF	.19	2	2	.20	.0	4.85	24.00	1.22	---	12.21	87.29	459.9
XSECTION	15	ADDHYD	.65	2	2	.20	.0	4.85	24.00	1.91	---	12.63	261.51	[illegible]
[illegible]											---	[illegible]	[illegible]	[illegible]

XSECTION	18	ADDHYD	3.46	2	2	.20	.0	4.85	24.00	2.04	---	12.80	611.79	176.8
XSECTION	19	RUNOFF	.13	2	2	.20	.0	4.85	24.00	2.50	---	12.75	73.31	563.9
XSECTION	20	REACH	.13	2	2	.20	.0	4.85	24.00	2.50	---	13.23	67.60	520.0
XSECTION	21	RUNOFF	.09	2	2	.20	.0	4.85	24.00	2.33	---	12.73	48.25	536.2
XSECTION	22	ADDHYD	.22	2	2	.20	.0	4.85	24.00	2.43	---	13.06	111.40	506.4
XSECTION	23	RUNOFF	.17	2	2	.20	.0	4.85	24.00	2.67	---	12.86	94.86	558.0
XSECTION	24	ADDHYD	.39	2	2	.20	.0	4.85	24.00	2.54	---	12.97	203.80	522.6
STRUCTURE	4	RESVOR	.39	2	2	.20	.0	4.85	24.00	2.53	741.00	15.83	32.73	83.9
XSECTION	25	ADDHYD	3.85	2	2	.20	.0	4.85	24.00	2.09	---	12.82	631.88	164.1
STRUCTURE	5	RESVOR	3.85	2	2	.20	.0	4.85	24.00	2.09	739.53	19.20	267.73	69.5

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SUMMARY TABLE 1 - SELECTED RESULTS OF STANDARD AND EXECUTIVE CONTROL INSTRUCTIONS IN THE ORDER PERFORMED
(A STAR(*) AFTER THE PEAK DISCHARGE TIME AND RATE (CFS) VALUES INDICATES A FLAT TOP HYDROGRAPH
A QUESTION MARK(?) INDICATES A HYDROGRAPH WITH PEAK AS LAST POINT.)

SECTION/ STRUCTURE ID	STANDARD CONTROL OPERATION	DRAINAGE AREA (SQ MI)	RAIN TABLE #	ANTEC MOIST COND	MAIN TIME INCREM (HR)	PRECIPITATION BEGIN (HR)	PRECIPITATION AMOUNT (IN)	PRECIPITATION DURATION (HR)	RUNOFF AMOUNT (IN)	PEAK DISCHARGE ELEVATION (FT)	PEAK DISCHARGE TIME (HR)	PEAK DISCHARGE RATE (CFS)	PEAK DISCHARGE RATE (CSM)
ALTERNATE 1 STORM 2													
+													
XSECTION 26	RUNOFF	.13	2	2	.20	.0	4.85	24.00	2.08	---	13.23	44.27	340.5
XSECTION 27	ADDHYD	3.98	2	2	.20	.0	4.85	24.00	2.09	---	19.05	273.40	68.7
XSECTION 28	RUNOFF	.42	2	2	.20	.0	4.85	24.00	2.59	---	12.41	372.25	886.3
XSECTION 29	ADDHYD	4.40	2	2	.20	.0	4.85	24.00	2.14	---	12.44	470.89	107.0
STRUCTURE 6	RESVOR	4.40	2	2	.20	.0	4.85	24.00	2.14	737.08	24.17	249.14	56.6
XSECTION 30	RUNOFF	.28	2	2	.20	.0	4.85	24.00	2.04	---	12.78	187.96	671.3
XSECTION 31	ADDHYD	4.68	2	2	.20	.0	4.85	24.00	2.19	---	12.81	410.63	87.7
ALTERNATE 1 STORM 3													
+													
XSECTION 1	RUNOFF	.58	2	2	.20	.0	4.40	24.00	1.68	---	12.70	221.63	382.1
XSECTION 2	RUNOFF	.24	2	2	.20	.0	4.40	24.00	1.61	---	12.40	132.64	552.7
XSECTION 3	ADDHYD	.82	2	2	.20	.0	4.40	24.00	1.66	---	12.60	335.15	408.7
XSECTION 4	RUNOFF	.23	2	2	.20	.0	4.40	24.00	1.97	---	12.43	152.19	661.7
STRUCTURE 1	RESVOR	.23	2	2	.20	.0	4.40	24.00	1.97	743.24	13.64	34.13	148.4
XSECTION 5	ADDHYD	1.05	2	2	.20	.0	4.40	24.00	1.73	---	12.61	368.69	351.1
XSECTION 6	RUNOFF	.36	2	2	.20	.0	4.40	24.00	2.29	---	13.30	130.02	361.2
XSECTION 7	ADDHYD	1.41	2	2	.20	.0	4.40	24.00	1.87	---	12.69	459.64	326.0
STRUCTURE 2	RESVOR	1.41	2	2	.20	.0	4.40	24.00	1.87	742.59	13.89	305.59	215.7
XSECTION 8	REACH	1.41	2	2	.20	.0	4.40	24.00	1.87	737.96	17.96	137.41	97.5
XSECTION 9	RUNOFF	.52	2	2	.20	.0	4.40	24.00	1.75	---	13.08	158.92	205.6
XSECTION 10	ADDHYD	1.93	2	2	.20	.0	4.40	24.00	1.84	---	17.44	161.14	83.5
XSECTION 11	RUNOFF	.44	2	2	.20	.0	4.40	24.00	1.60	---	12.85	145.02	329.6
STRUCTURE 3	RESVOR	.44	2	2	.20	.0	4.40	24.00	1.46	742.21	19.77	15.09	34.1
XSECTION 12	ADDHYD	2.37	2	2	.20	.0	4.40	24.00	1.77	---	17.46	176.01	74.3
XSECTION 13	RUNOFF	.46	2	2	.20	.0	4.40	24.00	1.82	---	12.16	141.25	307.1
XSECTION 14	RUNOFF	.14	2	2	.20	.0	4.40	24.00	1.03	---	12.33	66.74	351.3
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

XSECTION 17	RUNOFF	.44	2	2	.20	.0	4.40	24.00	1.80	---	12.50	202.46	460.1
XSECTION 18	ADDHYD	3.46	2	2	.20	.0	4.40	24.00	1.72	---	12.83	502.73	145.3
XSECTION 19	RUNOFF	.13	2	2	.20	.0	4.40	24.00	2.15	---	12.76	62.04	477.3
XSECTION 20	REACH	.13	2	2	.20	.0	4.40	24.00	2.13	---	13.26	56.95	438.1
XSECTION 21	RUNOFF	.09	2	2	.20	.0	4.40	24.00	1.97	---	12.75	40.48	449.8
XSECTION 22	ADDHYD	.22	2	2	.20	.0	4.40	24.00	2.07	---	13.08	93.57	425.3
XSECTION 23	RUNOFF	.17	2	2	.20	.0	4.40	24.00	2.29	---	12.86	80.92	476.0
XSECTION 24	ADDHYD	.39	2	2	.20	.0	4.40	24.00	2.17	---	12.99	172.29	441.8
STRUCTURE 4	RESVOR	.39	2	2	.20	.0	4.40	24.00	2.16	740.77	15.76	29.53	75.7

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SUMMARY TABLE 1 - SELECTED RESULTS OF STANDARD AND EXECUTIVE CONTROL INSTRUCTIONS IN THE ORDER PERFORMED
(A STAR(*) AFTER THE PEAK DISCHARGE TIME AND RATE (CFS) VALUES INDICATES A FLAT TOP HYDROGRAPH
A QUESTION MARK(?) INDICATES A HYDROGRAPH WITH PEAK AS LAST POINT.)

SECTION/ STRUCTURE ID	STANDARD CONTROL OPERATION	DRAINAGE AREA (SQ MI)	RAIN TABLE #	ANTEC MOIST COND	MAIN TIME INCREM (HR)	PRECIPITATION BEGIN (HR)	PRECIPITATION AMOUNT (IN)	PRECIPITATION DURATION (HR)	RUNOFF AMOUNT (IN)	PEAK DISCHARGE ELEVATION (FT)	PEAK DISCHARGE TIME (HR)	PEAK DISCHARGE RATE (CFS)	PEAK DISCHARGE RATE (CSM)
ALTERNATE 1 STORM 3													
+													
XSECTION 25	ADDHYD	3.85	2	2	.20	.0	4.40	24.00	1.76	---	12.85	522.12	135.6
STRUCTURE 5	RESVOR	3.85	2	2	.20	.0	4.40	24.00	1.76	739.34	19.49	227.42	59.1
XSECTION 26	RUNOFF	.13	2	2	.20	.0	4.40	24.00	1.75	---	13.25	36.57	281.3
XSECTION 27	ADDHYD	3.98	2	2	.20	.0	4.40	24.00	1.76	---	19.27	232.18	58.3
XSECTION 28	RUNOFF	.42	2	2	.20	.0	4.40	24.00	2.21	---	12.41	317.01	754.8
XSECTION 29	ADDHYD	4.40	2	2	.20	.0	4.40	24.00	1.80	---	12.44	408.09	92.7
STRUCTURE 6	RESVOR	4.40	2	2	.20	.0	4.40	24.00	1.80	736.42	22.43	230.28	52.3
XSECTION 30	RUNOFF	.28	2	2	.20	.0	4.40	24.00	2.64	---	12.79	162.83	581.5
XSECTION 31	ADDHYD	4.68	2	2	.20	.0	4.40	24.00	1.85	---	12.82	382.72	81.8
ALTERNATE 1 STORM 4													
+													
XSECTION 1	RUNOFF	.58	2	2	.20	.0	3.37	24.00	.98	---	12.76	118.70	204.7
XSECTION 2	RUNOFF	.24	2	2	.20	.0	3.37	24.00	.93	---	12.43	71.64	298.5
XSECTION 3	ADDHYD	.82	2	2	.20	.0	3.37	24.00	.97	---	12.64	182.73	222.8
XSECTION 4	RUNOFF	.23	2	2	.20	.0	3.37	24.00	1.21	---	12.44	90.11	391.8
STRUCTURE 1	RESVOR	.23	2	2	.20	.0	3.37	24.00	1.22	742.76	13.38	33.13	144.0
XSECTION 5	ADDHYD	1.05	2	2	.20	.0	3.37	24.00	1.02	---	12.64	215.38	205.1
XSECTION 6	RUNOFF	.36	2	2	.20	.0	3.37	24.00	1.47	---	13.36	80.42	223.4
XSECTION 7	ADDHYD	1.41	2	2	.20	.0	3.37	24.00	1.14	---	12.80	270.39	191.8
STRUCTURE 2	RESVOR	1.41	2	2	.20	.0	3.37	24.00	1.13	742.34	14.50	148.61	105.4
XSECTION 8	REACH	1.41	2	2	.20	.0	3.37	24.00	1.13	737.52	17.33	93.93	66.6
XSECTION 9	RUNOFF	.52	2	2	.20	.0	3.37	24.00	1.04	---	13.13	97.98	189.2
XSECTION 10	ADDHYD	1.93	2	2	.20	.0	3.37	24.00	1.11	---	14.57	116.26	60.2
XSECTION 11	RUNOFF	.44	2	2	.20	.0	3.37	24.00	.93	---	12.89	77.87	177.0
STRUCTURE 3	RESVOR	.44	2	2	.20	.0	3.37	24.00	.89	741.90	17.90*	8.95*	20.4
XSECTION 12	ADDHYD	2.37	2	2	.20	.0	3.37	24.00	1.07	---	14.62	122.94	51.9
SECTION 13	RUNOFF	.46	2	2	.20	.0	3.37	24.00	1.00	---	12.23	80.21	174.6
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	---	[illegible]	[illegible]	[illegible]

XSECTION	16	ADDHYD	3.02	2	2	.20	.0	3.37	24.00	1.04	---	13.58	200.66	66.4
XSECTION	17	RUNOFF	.44	2	2	.20	.0	3.37	24.00	.93	---	12.56	106.09	241.1
XSECTION	18	ADDHYD	3.46	2	2	.20	.0	3.37	24.00	1.02	---	12.97	284.47	82.2
XSECTION	19	RUNOFF	.13	2	2	.20	.0	3.37	24.00	1.34	---	12.80	37.63	289.5
XSECTION	20	REACH	.13	2	2	.20	.0	3.37	24.00	1.34	---	13.35	33.98	261.4
XSECTION	21	RUNOFF	.09	2	2	.20	.0	3.37	24.00	1.21	---	12.79	23.82	264.7
XSECTION	22	ADDHYD	.22	2	2	.20	.0	3.37	24.00	1.29	---	13.17	55.26	251.2
XSECTION	23	RUNOFF	.17	2	2	.20	.0	3.37	24.00	1.47	---	12.88	50.44	296.7

1

SUMMARY TABLE 1 - SELECTED RESULTS OF STANDARD AND EXECUTIVE CONTROL INSTRUCTIONS IN THE ORDER PERFORMED
(A STAR(*) AFTER THE PEAK DISCHARGE TIME AND RATE (CFS) VALUES INDICATES A FLAT TOP HYDROGRAPH
A QUESTION MARK(?) INDICATES A HYDROGRAPH WITH PEAK AS LAST POINT.)

SECTION/ STRUCTURE ID	STANDARD CONTROL OPERATION	DRAINAGE AREA (SQ MI)	RAIN TABLE #	ANTEC MOIST COND	MAIN TIME INCREM (HR)	PRECIPITATION BEGIN (HR)	PRECIPITATION AMOUNT (IN)	PRECIPITATION DURATION (HR)	RUNOFF AMOUNT (IN)	PEAK DISCHARGE ELEVATION (FT)	PEAK DISCHARGE TIME (HR)	PEAK DISCHARGE RATE (CFS)	PEAK DISCHARGE RATE (CSM)
ALTERNATE 1 STORM 4													
XSECTION 24	ADDHYD	.39	2	2	.20	.0	3.37	24.00	1.36	---	13.05	104.25	267.3
STRUCTURE 4	RESVOR	.39	2	2	.20	.0	3.37	24.00	1.36	740.29	15.50	22.77	58.4
XSECTION 25	ADDHYD	3.85	2	2	.20	.0	3.37	24.00	1.06	---	13.02	298.22	77.5
STRUCTURE 5	RESVOR	3.85	2	2	.20	.0	3.37	24.00	1.06	738.81	19.91	144.12	37.4
XSECTION 26	RUNOFF	.13	2	2	.20	.0	3.37	24.00	1.04	---	13.30	20.45	157.3
XSECTION 27	ADDHYD	3.98	2	2	.20	.0	3.37	24.00	1.06	---	19.75	147.12	37.0
XSECTION 28	RUNOFF	.42	2	2	.20	.0	3.37	24.00	1.40	---	12.43	196.30	467.4
XSECTION 29	ADDHYD	4.40	2	2	.20	.0	3.37	24.00	1.09	---	12.46	274.17	62.3
STRUCTURE 6	RESVOR	4.40	2	2	.20	.0	3.37	24.00	1.09	735.52	13.09	202.31	46.0 RR/Fletcher
XSECTION 30	RUNOFF	.28	2	2	.20	.0	3.37	24.00	1.75	---	12.81	106.86	381.6
XSECTION 31	ADDHYD	4.68	2	2	.20	.0	3.37	24.00	1.13	---	12.85	307.76	65.8
ALTERNATE 1 STORM 5													
XSECTION 1	RUNOFF	.58	2	2	.20	.0	2.47	24.00	.48	---	12.89	49.89	86.0
XSECTION 2	RUNOFF	.24	2	2	.20	.0	2.47	24.00	.44	---	12.47	28.75	119.8
XSECTION 3	ADDHYD	.82	2	2	.20	.0	2.47	24.00	.47	---	12.69	75.62	92.2
XSECTION 4	RUNOFF	.23	2	2	.20	.0	2.47	24.00	.63	---	12.47	42.89	186.5
STRUCTURE 1	RESVOR	.23	2	2	.20	.0	2.47	24.00	.63	742.24	12.94	32.08	139.5
XSECTION 5	ADDHYD	1.05	2	2	.20	.0	2.47	24.00	.50	---	12.69	108.09	102.9
XSECTION 6	RUNOFF	.36	2	2	.20	.0	2.47	24.00	.82	---	13.45	42.34	117.6
XSECTION 7	ADDHYD	1.41	2	2	.20	.0	2.47	24.00	.59	---	12.93	139.82	99.2
STRUCTURE 2	RESVOR	1.41	2	2	.20	.0	2.47	24.00	.58	740.77	14.60	68.45	48.5
XSECTION 8	REACH	1.41	2	2	.20	.0	2.47	24.00	.58	736.07	16.54	55.71	39.5
XSECTION 9	RUNOFF	.52	2	2	.20	.0	2.47	24.00	.51	---	13.21	38.78	74.6
XSECTION 10	ADDHYD	1.93	2	2	.20	.0	2.47	24.00	.56	---	14.94	69.95	36.2
XSECTION 11	RUNOFF	.44	2	2	.20	.0	2.47	24.00	.44	---	13.07	31.58	71.8
STRUCTURE 3	RESVOR	.44	2	2	.20	.0	2.47	24.00	.44	751.61	20.60*	4.64*	10.5
XSECTION 12	ADDHYD	2.37	2	2	.20	.0	2.47	24.00	.54	---	14.91	73.77	31.2

XSECTION	14	RUNOFF	.19	2	2	.20	.0	2.47	24.00	.19	---	12.60	6.17	32.5
XSECTION	15	ADDHYD	.65	2	2	.20	.0	2.47	24.00	.45	---	13.23	40.34	62.1
XSECTION	16	ADDHYD	3.02	2	2	.20	.0	2.47	24.00	.52	---	14.34	104.46	34.6
XSECTION	17	RUNOFF	.44	2	2	.20	.0	2.47	24.00	.44	---	12.65	42.73	97.1
XSECTION	18	ADDHYD	3.46	2	2	.20	.0	2.47	24.00	.51	---	13.20	126.40	36.5
XSECTION	19	RUNOFF	.13	2	2	.20	.0	2.47	24.00	.72	---	12.85	18.87	145.2
XSECTION	20	REACH	.13	2	2	.20	.0	2.47	24.00	.72	---	13.50	16.71	128.5
XSECTION	21	RUNOFF	.09	2	2	.20	.0	2.47	24.00	.63	---	12.85	11.34	126.0

1

SUMMARY TABLE 1 - SELECTED RESULTS OF STANDARD AND EXECUTIVE CONTROL INSTRUCTIONS IN THE ORDER PERFORMED
(A STAR(*) AFTER THE PEAK DISCHARGE TIME AND RATE (CFS) VALUES INDICATES A FLAT TOP HYDROGRAPH
A QUESTION MARK(?) INDICATES A HYDROGRAPH WITH PEAK AS LAST POINT.)

SECTION/ STRUCTURE ID	STANDARD CONTROL OPERATION	DRAINAGE AREA (SQ MI)	RAIN TABLE #	ANTEC MOIST COND	MAIN TIME INCREM (HR)	PRECIPITATION BEGIN (HR)	PRECIPITATION AMOUNT (IN)	PRECIPITATION DURATION (HR)	RUNOFF AMOUNT (IN)	PEAK DISCHARGE ELEVATION (FT)	PEAK DISCHARGE TIME (HR)	PEAK DISCHARGE RATE (CFS)	PEAK DISCHARGE RATE (CSM)	
ALTERNATE 1 STORM 5														
XSECTION 22	ADDHYD	.22	2	2	.20	.0	2.47	24.00	.69	---	13.30	26.75	121.6	
XSECTION 23	RUNOFF	.17	2	2	.20	.0	2.47	24.00	.82	---	12.94	26.26	154.5	
XSECTION 24	ADDHYD	.39	2	2	.20	.0	2.47	24.00	.74	---	13.15	52.19	133.8	
STRUCTURE 4	RESVOR	.39	2	2	.20	.0	2.47	24.00	.74	739.73	15.22	16.30	41.8	Dark Branch
XSECTION 25	ADDHYD	3.85	2	2	.20	.0	2.47	24.00	.53	---	13.37	134.96	35.1	
STRUCTURE 5	RESVOR	3.85	2	2	.20	.0	2.47	24.00	.53	738.04	19.28	80.46	20.9	@ Freeman
XSECTION 26	RUNOFF	.13	2	2	.20	.0	2.47	24.00	.51	---	13.49	9.03	69.4	
XSECTION 27	ADDHYD	3.98	2	2	.20	.0	2.47	24.00	.53	---	19.12	82.31	20.7	
XSECTION 28	RUNOFF	.42	2	2	.20	.0	2.47	24.00	.77	---	12.45	101.63	242.0	
XSECTION 29	ADDHYD	4.40	2	2	.20	.0	2.47	24.00	.56	---	12.65	158.88	36.1	
STRUCTURE 6	RESVOR	4.40	2	2	.20	.0	2.47	24.00	.56	734.63	12.68	159.58	36.3	~Mt/Fletcher
XSECTION 30	RUNOFF	.28	2	2	.20	.0	2.47	24.00	1.03	---	12.83	61.19	218.5	
XSECTION 31	ADDHYD	4.68	2	2	.20	.0	2.47	24.00	.58	---	12.71	217.07	46.4	

1

SUMMARY TABLE 2 - SELECTED MODIFIED ATT-K IN REACH ROUTINGS IN ORDER OF STANDARD EXECUTIVE CONTROL INSTRUCTIONS
(A STAR(*) AFTER VOLUME ABOVE BASE(IN) INDICATES A HYDROGRAPH TRUNCATED AT A VALUE EXCEEDING BASE + 10% OF PEAK
A QUESTION MARK (?) AFTER COEFF.(C) INDICATES PARAMETERS OUTSIDE ACCEPTABLE LIMITS, SEE PREVIOUS WARNINGS)

	HYDROGRAPH INFORMATION					ROUTING PARAMETERS							PEAK TRAVEL TIME	
XSEC REACH	INFLOW	OUTFLOW	OUTFLOW INTERV.(FT)	E-SEP	VOLUME ABOVE	MAIN TIME	ITER-ATION	Q AND A EQUATION	LENGTH	PEAK RATIO	S/Q PEAK	ATT-K	STOP-	INE-
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

```
    ALTERNATE    1   STORM    1
+   ------------------------
                                                                                                .207
+  8   4800     568  13.6     267  17.2                 0     3.15    .20    2        1.08   .712   .470  12312  .06   2.20  3.50
+                                          ---   ---
                                                                                                .710
+ 20   3100     103  12.8      96  13.2                 0     3.48    .20    1        1.31   .070   .933   1027  .52    .40   .29
+                                          ---   ---

    ALTERNATE    1   STORM    2
+   ------------------------
                                                                                                .237
+  8   4800     377  13.8     161  18.0                 0     2.22    .20    3        1.04   .808   .427  15138  .05   2.80  4.26
+                                          ---   ---
                                                                                                .710
+ 20   3100      73  12.8      68  13.2                 0     2.50    .20    1        1.31   .077   .923   1113  .49    .40   .31
+                                          ---   ---

    ALTERNATE    1   STORM    3
+   ------------------------
                                                                                                .300
+  8   4800     305  13.8     137  17.8                 0     1.87    .20    2        1.01   .729   .451  14531  .05   3.00  4.05
+                                          ---   ---
                                                                                                .710
+ 20   3100      62  12.8      57  13.2                 0     2.13    .20    1        1.31   .080   .917   1157  .47    .40   .32
+                                          ---   ---

    ALTERNATE    1   STORM    4
+   ------------------------
                                                                                                .439
+  8   4800     148  14.4      94  17.4                 0     1.13    .20    4        1.00   .436   .633  10930  .06   3.00  3.04
+                                          ---   ---
                                                                                                .710
+ 20   3100      38  12.8      34  13.4                 0     1.34    .20    1        1.31   .090   .902   1303  .43    .60   .37
+                                          ---   ---

    ALTERNATE    1   STORM    5
+   ------------------------
                                                                                                .452
+  8   4800      68  14.6      56  16.6                 0      .58    .20    3        1.11   .196   .814   5795  .12   2.00  1.63
+                                          ---   ---
                                                                                                .710
+ 20   3100      19  12.8      17  13.6                 0      .72    .20    1        1.31   .101   .885   1535  .38    .80   .43
+                                          ---   ---
1
```


SUMMARY TABLE 3 - DISCHARGE (CFS) AT XSECTIONS AND STRUCTURES FOR ALL STORMS AND ALTERNATES

XSECTION/ STRUCTURE	DRAINAGE AREA (SQ MI)	STORM NUMBERS..... 1	2	3	4	5
0 STRUCTURE 6	4.4					
ALTERNATE 1		128.04	249.14	230.28	201.31	159.58

ALTERNATE	1		425.22	261.13	227.42	144.12	80.46
0 STRUCTURE	4	.39					
+							
ALTERNATE	1		41.29	32.73	29.53	22.77	16.30
0 STRUCTURE	3	.44					
+							
ALTERNATE	1		24.85	17.91	15.00	8.95	4.64
0 STRUCTURE	2	1.41					
+							
ALTERNATE	1		568.28	376.96	305.59	148.61	68.45
0 STRUCTURE	1	.23					
+							
ALTERNATE	1		35.96	34.50	34.13	33.13	32.08
0 XSECTION	1	.58					
+							
ALTERNATE	1		400.64	269.89	221.63	118.70	49.89
0 XSECTION	2	.24					
+							
ALTERNATE	1		240.75	161.74	132.64	71.64	28.75
0 XSECTION	3	.82					
+							
ALTERNATE	1		605.59	408.01	335.15	182.73	75.62
0 XSECTION	4	.23					
+							
ALTERNATE	1		257.71	181.02	152.19	90.11	42.89
0 XSECTION	5	1.05					
+							
ALTERNATE	1		639.87	441.78	368.69	215.38	108.09
0 XSECTION	6	.36					
+							
ALTERNATE	1		211.90	152.56	130.02	80.43	42.34
0 XSECTION	7	1.41					
+							
ALTERNATE	1		788.64	548.58	459.64	270.38	139.82
0 XSECTION	8	1.41					
+							
ALTERNATE	1		266.87	161.05	137.41	93.93	55.71
1							

Discharge used in Bockwsp2.OUT

SUMMARY TABLE 3 - DISCHARGE (CFS) AT XSECTIONS AND STRUCTURES FOR ALL STORMS AND ALTERNATES

XSECTION/ STRUCTURE ID	DRAINAGE AREA (SQ MI)	STORM NUMBERS..... 1	2	3	4	5
0 XSECTION 9	.52					
+						
ALTERNATE 1		282.91	192.41	158.92	87.98	38.78
0 XSECTION 10	1.93					
+						
ALTERNATE 1		306.99	192.29	161.14	114.26	69.95
0 XSECTION 11	.44					
+						
ALTERNATE 1		265.77	177.45	145.03	71.37	31.58
0 XSECTION 12	2.37					
+						
ALTERNATE 1		352.69	215.03	176.91	123.94	73.97

ALTERNATE 1		249.90	170.19	141.25	80.30	36.40	
0 XSECTION 14	.19						
+							
ALTERNATE 1		152.17	87.39	66.74	27.77	6.17	
0 XSECTION 15	.65						
+							
ALTERNATE 1		310.89	207.51	170.04	93.17	40.34	
0 XSECTION 16	3.02						
+							
ALTERNATE 1		596.40	403.13	333.20	200.66	104.46	Discharges used in OWOSOFWS.OUT
0 XSECTION 17	.44						
+							
ALTERNATE 1		370.44	247.64	202.48	106.09	42.73	
0 XSECTION 18	3.46						
+							
ALTERNATE 1		912.01	611.79	502.73	284.47	126.40	
0 XSECTION 19	.13						
+							
ALTERNATE 1		103.17	73.31	62.04	37.63	18.87	Discharge used in BOCKWSP2.OUT
0 XSECTION 20	.13						
+							
ALTERNATE 1		95.95	67.60	56.95	33.98	16.71	
0 XSECTION 21	.09						
+							
ALTERNATE 1		69.00	48.25	40.48	23.82	11.34	
0 XSECTION 22	.22						
+							
ALTERNATE 1		159.01	111.40	93.57	55.26	26.75	Discharge used in BockWSP2.OUT
1							

SUMMARY TABLE 2 - DISCHARGE (CFS) AT XSECTIONS AND STRUCTURES FOR ALL STORMS AND ALTERNATES

XSECTION/ STRUCTURE ID	DRAINAGE AREA (SQ MI)	STORM NUMBERS..... 1	2	3	4	5	
0 XSECTION 23	.17						
+							
ALTERNATE 1		131.49	94.86	80.92	50.44	26.26	
0 XSECTION 24	.39						
+							
ALTERNATE 1		287.47	203.80	172.29	104.25	52.19	Discharge used in BockWSP2.OUT
0 XSECTION 25	3.85						
+							
ALTERNATE 1		934.74	621.88	522.12	298.22	134.96	
0 XSECTION 26	.13						
+							
ALTERNATE 1		65.12	44.27	36.57	20.45	9.03	
0 XSECTION 27	3.98						
+							
ALTERNATE 1		434.26	272.40	232.18	147.12	82.31	
0 XSECTION 28	.42						
+							
ALTERNATE 1		517.60	372.25	317.61	196.30	101.63	
0 XSECTION 29	4.40						
+							
ALTERNATE 1		646.23	470.89	405.09	274.17	152.95	

```
    ALTERNATE    1                    293.15    167.96    162.83    106.66     61.19
0 XSECTION   31          4.68
+_____________________________
    ALTERNATE    1                    483.52    410.63    382.72    307.76    217.07
1END OF  1 JOBS IN THIS RUN
```

50

PLAN OF WORK

for

FLOOD PLAIN MANAGEMENT STUDY ASSISTANCE

OWOSSO/COMSTOCK DRAIN

Shiawassee County, Michigan

Prepared for

City of Owosso

Shiawassee County Drain Commissioner

Owosso Township

In Cooperation With

Michigan Department of Natural Resources

By the

United States Department of Agriculture
Soil Conservation Service

Assisting the

Shiawassee County Soil Conservation District

October 1992

6355E

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PLAN OF WORK

for

FLOOD PLAIN MANAGEMENT ASSISTANCE

OWOSSO/COMSTOCK DRAIN

Shiawassee County, Michigan

INTRODUCTION

The Owosso/Comstock Drain comprises an area of approximately 5.4 square miles south of the city of Owosso in Shiawassee County, Michigan. Owosso/Comstock Drain outlets into the Shiawassee River in Owosso, Michigan. Shiawassee County lies in central Michigan.

There are several homes that are potentially within the flood plain, and lack of information about flood hazard areas hampers wise development in this area. Development will continue to be very heavy.

STUDY AREA

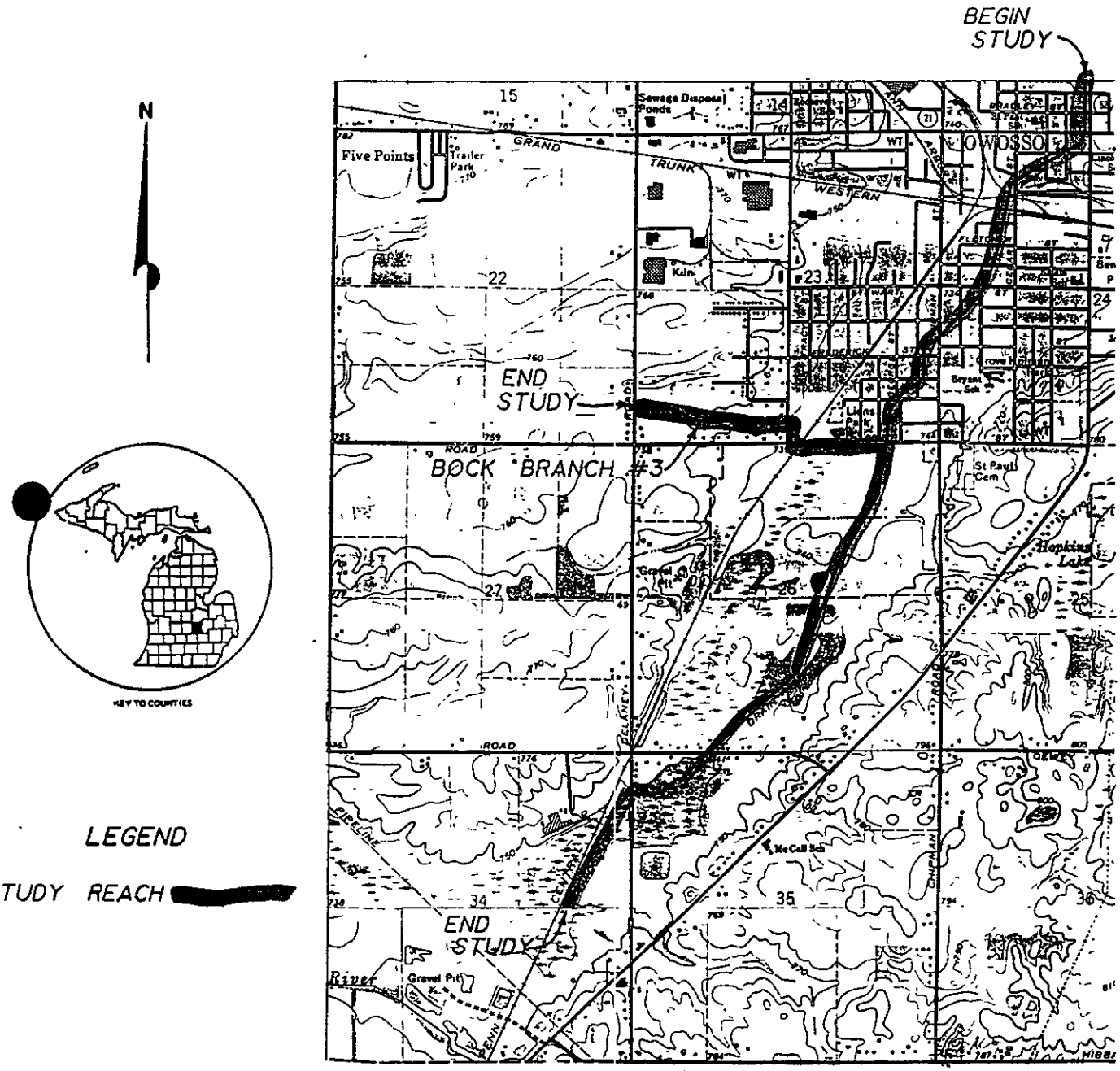
The study area will be the Owosso/Comstock Drain in Owosso Township and the city of Owosso. Approximately 18 percent of the watershed is urban. Effects of floodwater leaving the watershed will be evaluated. High water profiles and flood plain delineations will be prepared for approximately 3.4 miles of drain from the outlet of the Owosso/Comstock Drain, in the city of Owosso, to approximately 2,500 feet above Delaney Road in Section 34 of Owosso Township. In addition, flood plain delineations will be prepared for about 5,000 feet of the Bock Branch #3 from the Owosso Drain to above Delaney Road in Section 22 of Owosso Township. Approximately 7,500 feet are closed conduit and 15,200 feet are open drain. The study reaches are identified in red on the Flood Plain Management Study Area Map (Figure 1). This watershed is part of hydrologic area 04080203. The study area is within the tributaries of the Saginaw River Basin.

FIGURE 1

FLOOD PLAIN MANAGEMENT STUDY AREA

OWOSSO / COMSTOCK DRAIN

SHIAWASSEE COUNTY, MICHIGAN



Land use by area and percentages in the Owosso/Comstock Study Area are shown in Table 1.1.

TABLE 1.1 - LAND USE AND COVER OF NON-FEDERAL LAND IN 1982 1/

Owosso/Comstock Drain - Shiawassee County, Michigan

Item	Acres	Percent
Cropland	1,925	56.0
Pasture and Meadow	589	17.1
Forest Land	292	8.5
Open Spaces	32	0.9
Commercial and Industrial Areas	48	1.4
Residential	437	12.7
Roads and Parking Lots	116	3.4
TOTAL	3,439	100.0

1/ Owosso Drain Study, CHMP Inc., 1982.

LOCAL OBJECTIVES AND NEED FOR STUDY

Flood hazards may increase in developing areas. Various uses of land in a developing area compete for each parcel of land. Flood plain lands are no exception. Encroachments into the flood plain by land filling and development constrict the flow of flood water. This increases flood water depths and areas inundated. Potential users of flood plains should base their land use decisions upon the advantages and disadvantages of such a location. Knowledge of flood plain hazards is not wide-spread and, consequently, the land manager, potential land users and occupants cannot always accurately assess these risks. Technical assistance provided by the federal government is desirable if state and local people, officials and planners are to understand and wisely apply flood hazard data in the development or revision of flood plain management programs and land-use regulations.

The Michigan Natural Resources Commission, Michigan Department of Natural Resources (MDNR), has the responsibility and the authority to regulate development in flood plain areas under Michigan Public Act 245, Public Acts of 1929, as amended. The Commission also establishes building restrictions for new residential subdivisions within or adjacent to flood plains under the authority of Michigan Public Act 288, Public Acts of 1967. Owosso/Comstock Drain is fourth on MDNR's list of priorities for Potential Flood Plain Management Studies (FPMS) in Michigan.

The Shiawassee County Soil Conservation District (SCD), Shiawassee County Drain Commissioner, city of Owosso and Owosso Township Board believe that a FPMS is needed in this watershed due to the flooding problems that have already occurred. Some development is occurring along the drain. Requests for permits to build near the drain are also received by the city and the township for the study reach. The Sponsors have determined that there is an increasing need to properly plan for the preservation and use of their flood plain. They have indicated a need to develop technical information along Owosso/Comstock Drain to implement effective management programs through zoning, health and building codes and other regulations to protect the health, safety and welfare of their community.

The Sponsors will adopt resolutions indicating they intend to use the technical information from the FPMS report as a basis for adopting zoning regulations, health and building codes, subdivision control regulations and such other regulations that may be needed to preserve the environmental quality of their natural resources, and to protect the health, safety, welfare and well-being of the citizens of their community.

COORDINATION WITH STATE AND OTHER AGENCIES

The Joint Coordination Agreement for FPMS for the state of Michigan dated September 1987 was made and entered into by and between the Michigan Department of Natural Resources (MDNR), Land and Water Management Division, and the United States Department of Agriculture (USDA), Soil Conservation Service (SCS).

SCS carries out FPMS under the authority of Section 6 of Public Law 83-566, Watershed and Protection Act; in compliance with Executive Order 11988, dated May 24, 1977; and in accordance with Federal Level Recommendation 3 of a Unified National Program for Flood Plain Management, Water Resources Council, September 1979.

Two Michigan state laws provide MDNR the responsibility and the authority to regulate all development in the flood plain areas.

Act 288, Public Acts of 1967, establishes minimum standards for subdividing land and for new development for residential purposes within flood plain areas. Act 245, Public Acts of 1929, as amended by Act 167, Public Acts of 1968, requires that a permit be obtained from MDNR before filling or otherwise occupying the flood plain or altering the channel of any watercourse in the state.

To avoid study duplication and to use existing data to the maximum extent possible, MDNR shall consult with the U.S. Army Corps of Engineers, U.S. Geological Survey, Federal Emergency Management Agency and any other agencies deemed appropriate to determine if any such agencies are conducting or planning to conduct a flood plain mapping study in the area for which the FPMS is desired. Before initiating a FPMS which SCS and MDNR have agreed to conduct, SCS shall notify the same agencies of the area selected for study and the scheduled date SCS plans to initiate the study.

STUDY ELEMENTS AND INTENSITY

The flood hazard evaluation intensity for this FPMS will be of detailed intensity. Basic data will be collected. This includes items such as maps, photos, flooding history, existing survey data and available hydrologic data. Topographic data will be based on 7-1/2 minute USGS topographic maps, 2-foot contour maps and field surveys.

Engineering field surveys will be conducted to measure the roads, bridges, channels, valleys and hydraulic structures. Approximately 8 road and bridge cross-sections, in addition to 16 valley sections, are needed to complete the hydrologic and hydraulic studies. Also, profiles for approximately 7,500 feet of closed conduit (main only) need to be verified.

Water surface profiles will be calculated using established SCS computer programs. Bridge head losses are an important part of the computations. Output will include stage-discharge curves, selected velocities and conveyances.

Computer flood routings are necessary to establish discharge-frequency relationships. The water surface profile stage-discharge relationships will be used to determine flood elevations and area flooded relationships for selected events at each valley cross-section location. Computer output will include printouts of selected peak discharges, times, hydrographs and elevations. The effects of land use and flood plain changes anticipated within the next 10 to 15 years will be included within the study.

Existing aerial photography will be used as the base for surveys and flood plain delineations.

There are no known sites of archaeological or historical significance nor are there any known endangered or threatened species that are affected by the flood problems or possible flood prevention measures.

SCS has overall study responsibility to assure technical adequacy and completeness of the study and published report.

SCS will coordinate with the Land and Water Management Division, MDNR regarding flood discharges and elevations. SCS will also furnish MDNR technical documentation such as computer output, maps, schematics, surveyed sections, profiles and copies of other basic data pertinent to the study. SCS will coordinate with the U.S. Army Corps of Engineers and the U.S. Geological Survey to obtain available hydraulic and hydrologic data.

SCS will contact local and county officials to obtain available data. The Sponsors will obtain permission for survey access.

The Land and Water Management Division, MDNR will review the various technical aspects of the study and concur with study results, as applicable, to implement various state statutes and the Federal Flood Insurance Program. MDNR will assist the Sponsors with flood plain management as related to this study and state statutes. The Sponsors will use results of these studies to revise, update and implement flood plain management measures.

The regional director for the Insurance and Hazard Mitigation Division of the Federal Emergency Management Agency (FEMA) will be informed by SCS when the study begins. The director will be invited to all public meetings, especially when technical aspects are discussed.

The local Sponsors will provide in-kind assistance for aerial photography, contour mapping and field surveys. They will assist in gathering basic data and historic flooding information. They will provide available base maps and topographic surveys. The Sponsors will assist with identification and evaluation of flood plain management alternatives. The Sponsors will also be responsible for implementation of their selected flood plain management plan after the technical data is available.

The SCS district conservationist will provide technical assistance to the Sponsors, as needed, and coordinate study efforts.

The SCS area office and field office staffs will make needed engineering field surveys under the direction of the hydraulic engineer. They will also survey needed roads, bridges, structures and valley sections. The field office staff (with support from state and area office personnel) will also provide assistance in developing and evaluating flood plain management alternatives and providing follow-up assistance.

The local Sponsors and Shiawassee County SCD will be responsible for public information dissemination. A public participation program will be established at the beginning of the study. It will provide for an information exchange and for public participation in the development of study recommendations. Two additional meetings are needed. One is to solicit public participation in developing flood plain management recommendations. The second is to present the final report to the public.

STUDY PRODUCTS

The study will produce a report with flood hazard maps. The report will be a bound document. The maps will show hazard areas on aerial photo mosaics. A horizontal scale of 1-inch equal to 400 feet will be used for the flood hazard maps.

Two floods will be delineated on the flood hazard maps. They are the 100-year and 500-year floods for existing land use and cover conditions. Flood profiles will be given for four floods. These are the 10-, 50-, 100- and 500-year floods.

The delineation of the floodway will be included with the technical support data.

The report content will include an introduction, study area description, flood problems, existing flood plain management, alternatives for flood plain management, flood hazard maps, glossary and reference, and a technical appendix. The technical appendix will contain flood profiles, cross-sections, technical tables and an investigation and analyses section.

A minimum of 400 copies of the report will be available for distribution within the state and to the local community.

STUDY FOLLOW-UP

SCS and MDNR will provide study follow-up to the Sponsors after the technical findings have been made available. The purpose of the follow-up is to help the Sponsors develop and implement a local flood plain management program incorporating the data provided by SCS. Assistance will be in the form of sample ordinances, brochures showing what other communities are doing, booklets showing various flood plain management techniques, consultive assistance in interpreting SCS data and helping draft or revise standards or criteria used in flood plain regulations. SCS follow-up will not include surveying, marking floodway boundaries or providing legal interpretations.

It is estimated that SCS will make available up to 10 staff-days within the two-year study period for follow-up assistance. The Shiawassee County SCD will assign a high priority for follow-up assistance by the district conservationist. The district conservationist will coordinate requests for assistance and utilize other resource people from the area and state office as needed.

SCHEDULE AND COSTS ESTIMATES

Work is scheduled to begin in October 1992.

Detailed hydraulic and hydrology studies will begin in April 1993, with the study finished in April 1994, and final printing completed in June 1994.

Table 1.2 lists major work items, scheduled times and estimated costs. Table 1.3 shows sources of funds by time and responsible organization. Federal monies allocated for FPMS are contingent upon Congressional appropriations.

TABLE 1.2 - SCHEDULE AND COST ESTIMATES

Owosso/Comstock Drain - Shiawassee County, Michigan

	Work Item	Begin	Complete	Est. Cost ($) SCS	State*	Local*
1.	Obtain Aerial Photography	10/92	10/92			2,400
2.	Field Surveys and 2-Foot Contour Maps	10/92	12/92	7,200		10,600
3.	Basic Data and Previous Engineering Studies	11/92	12/92	1,500		15,200
4.	Base Map	11/92	12/92	1,000		
5.	Natural Value Inventory	11/92	1/93	2,000		
6.	Drafting	11/92	~~3/93~~ 8/93	5,000		
7.	Hydraulics	4/93	6/93	5,550		
8.	Hydrology	4/93	6/93	8,300		
9.	High Water Profiles	7/93	8/93	2,400		
10.	Flood Plain Delineation	7/93	8/93	2,400		
11.	Economics	7/93	8/93	1,300		
12.	Technical Report	7/93	12 ~~9~~/93	2,400		
13.	Review and Concurrence	10/93	10/93	500	750	600
14.	Flood Plain Management Alternatives	10/93	11/93	2,500	250	750
15.	Land Use Change - Effects and Alternatives	10/93	11/93	2,500		
16.	Draft Report	11/93	3/94 ~~12/93~~	1,500		
17.	Workshop and Public Meeting	1/94	2/94	500	500	600
18.	Cartography	9/93	3/94	2,700		
19.	Final Report	1/94	4/94	1,000		
20.	Printing	5/94	6/94	1,700		
21.	Public Information and Report Distribution	6/94	8/94	1,000	500	1,200
22.	Follow-up Assistance and Implementation		9/94	1,000	500	1,200
TOTALS				53,950	2,500	32,550

* 100 percent in-kind services.

TABLE 1.3 - SUMMARY OF COSTS BY FISCAL YEAR

Owosso/Comstock Drain - Shiawassee County, Michigan

Agency	FY1993	FY1994	TOTAL
Soil Conservation Service	$39,050	$14,900	$53,950
City of Owosso	21,550 1/	1,000 5/	22,550
Shiawassee County Drain Commissioner	7,550 2/	1,000 5/	8,550
Owosso Township	450 3/	1,000 5/	1,450
Michigan Department of Natural Resources	1,000 4/	1,500 6/	2,500
TOTAL	$69,600	$19,400	$89,000

1/ In-kind services: review and concurrence - $200; flood plain management alternatives - $250; 96 staff-hours for survey crew - $1,500; previous engineering studies - $13,400; 1991 aerial photography - $2,400; existing 2-foot contour maps - $3,800.

2/ In-kind services: review and concurrence - $200; flood plain management alternatives - $250; 96 staff-hours for survey crew - $1,500; previous engineering studies - $1,800; existing 2-foot contour maps - $3,800.

3/ In-kind services: review and concurrence - $200; flood plain management alternatives - $250.

4/ In-kind services: review and concurrence - $750; flood plain management alternatives - $250.

5/ In-kind services: workshop and public meeting - $200; public information and report distribution - $400; follow-up assistance and implementation - $400.

6/ In-kind services: workshop and public meeting - $500; public information and report distribution - $500; follow-up assistance and implementation - $500.

SIGNATURE PAGES

The undersigned concur and agree to carry out the responsibilites indicated in this Plan of Work for FPMS assistance in the Owosso/Comstock Drain study area.

CITY OF OWOSSO

Signature Gary M. Burk

Name GARY M. BURK

Title DIRECTOR OF UTILITIES

Date OCTOBER 6, 1992

Address CITY OF OWOSSO
301 W. MAIN ST
OWOSSO, MI. 48867

SHIAWASSEE COUNTY DRAIN COMMISSIONER

Signature Bernard A. Butcher

Name Bernard A. Butcher

Title Deputy Drain Commissioner

Date October 6, 1992

Address 208 N Shiawassee Corunna 48817

OWOSSO TOWNSHIP

Signature [illegible]

Name [illegible]

Title [illegible]

Date [illegible]

Address [illegible]

SHIAWASSEE COUNTY SOIL CONSERVATION DISTRICT

Signature Kennard E. Dysinger

Name Kennard E. Dysinger

Title S.S.W.C.D. Chairman

Date October 7, 1992

Address 1900 S. Morrice Rd. Owosso Mi. 48867

The undersigned concur and agree to carry out the responsibilites indicated in this Plan of Work for FPMS assistance in the Owosso/Comstock Drain study area.

MICHIGAN DEPARTMENT OF NATURAL RESOURCES

Signature Lawrence N Witte

Name Lawrence N. Witte

Title Chief

Date _____

Address Land and Water Mgmt. Division
P.O. Box 30028
Lansing, Michigan 48909

SOIL CONSERVATION SERVICE

Signature James Stacey for

Name Homer R. Hilner

Title State Conservationist

Date 10/21/92

Address U.S. Department of Agriculture
Room 101, 1405 South Harrison Rd.
East Lansing, Michigan 48823

6355E

Midwest National Technical Center
Federal Building, Room 1[illegible]
100 Centennial Mall North
Lincoln, NE 68508-3866

MGF - MNTC Technical Assistance - Trip Report, January 24-27, 1994

January [illegible], 1994

John Edwards
Acting State Conservationist
SCS, East Lansing, MI

Purpose: The purpose of this trip was to provide water resources planning assistance and to view the Owasso Flood Plain Management study in the field.

Participants:

SCS State Office, East Lansing, MI

James R. Stacey, Assistant State Conservationist
Russel H. Bauerle, Resource Planning Staff Leader
Thomas D. Bourdon, Planning Engineer
W. Ronnie Clark, Water Resources Specialist
Ruth D. Shaffer, Water Quality Specialist
James A. Squires, Resource Conservationist

Midwest NTC, Lincoln, NE
Ivan Wilkinson, Water Resources Specialist

Background:

Monday afternoon was spent with the water resources staff discussing planning procedures for Boardman River and Swan Creek watersheds. On Tuesday morning we visited the Owasso Drain Watershed. On Tuesday afternoon through Thursday, discussion continued on Owasso Drain as well as the [illegible] procedures for evaluating environmental [illegible] projects where economic benefits are lacking.

Comments and/or Recommendations:

Project Formulation for Water Quality

[illegible] of our projects are now being [illegible] [illegible] of [illegible] [illegible]

values. The Environmental Quality Procedures presented in P&G provide a means of evaluation and documentation of these values. You are encouraged to utilize the expertise of disciplines from other agencies and develop a consensus on the impacts that are expected to be achieved. Problem identification and the development of a cause and effect relationship is very important in this process along with a forecast of future conditions.

Plans of Work

National Bulletin No. 390-4-1 has just been issued which transmits documentation requirements for obtaining PL-566 and WB-68 funding in FY-85. To aid in meeting these requirements we spent some time discussing the South NTC's Planning Tech Note No. 170R which describes how a well developed POW can improve the planning process and lead to successful implementation.

Boardman River

Boardman River has been described as a watershed that does not presently display critical water quality problems. However, there is a concern that if development and growth continue at their present rate, the streams in the watershed may not maintain their current state. For a PL-566 project, rationale must show that there is a strong potential for serious impairment of the streams to occur if future trends continue. These projection can be made based on predicted population growth, increased tourism, and changes in land use and intensification of land use. Using these assumptions, the planning team can make predictions on future water impairments. Formulation will focus on identifying alternatives to maintain water quality conditions in their present state.

Swan Creek

This watershed was recently approved for a PL-566 planning start. The primary purposes were for watershed protection and improved water quality. With information gained from the recent completion of a flood plain management study, there is a desire to include flood prevention as a project purpose. [illegible] Division. The [illegible] to show [illegible] a revised WSP report [illegible] with [illegible]

Owasso Drain

A flood plain management study is being completed on this watershed and is now being considered as a potential PL-566 project. Measures being considered [illegible] low head dam to reduce peak flows and provide a permanent [illegible] pool for a wetland development. Planning considerations must include:

- both structural and nonstructural alternatives.
- the low head dam will cause [illegible] relocation or flood proofing of structures within the flood pool.
- remaining flooding below the [illegible] require flood proofing or relocation of structures to obtain total protection.
- benefited area includes [illegible] depressed areas which may qualify the project for [illegible] consideration for a Secretarial exception.
- new storm and sanitary sewers or tieing in to existing facilities must comply with the following provisions of the NWSM.

  501.29 Storm and Sanitary Sewers.
  New storm and sanitary sewers, or relocations and changes to existing sewer facilities, in urban or built-up areas are the responsibility of the sponsor. No Public Law 83-566 cost share is available for these features. Storm sewers include facilities for the collection and conveyance of urban runoff to outlets in natural drainageways or channels. However, this restriction does not apply to measures to improve natural drainageways or channels to prevent significant flood damage to existing developed property. Such measures are not considered to be storm sewers and are, therefore, eligible for assistance.

Linden Creek

Discussion on this project indicated that it was believed that an enlarged outlet would probably solve the flood problems that have been identified. The staff is cautioned to look at all resources and not [illegible] other alternatives that may surface during detailed [illegible].

I appreciate the hospitality and [illegible] by all of the Michigan staff. If [illegible] needed, please contact me.

[illegible]
[illegible]

INVOICE № 2109

NORTHERN AERIAL SURVEY INC.

3025 Airport Road
Hastings, Michigan 49058

OLD TO:

SHIP TO:

Atten: Tom Bourdon, SCS
U.S. Dept. of Agriculture, Soil Conserv. Serv.
1405 South Harrison Road Room 101
East Lansing, MI 48823-5243

ATE	DATE SHIPPED	CUSTOMER ORDER	TERMS
Dec. 28, 1993	Dec. 28, 1993		
/.O. # 1448		SHIPPED VIA UPS	

DESCRIPTION	PRICE
1 Reproducible Mylar semi-controlled photo mosaic, scale: 1" = 400' Sheet 5 of Owosso & Comstock Drain and 1 contact negative, each in format with title block for your approval before we proceed with the remaining 4 sheets. Please contact us as soon as possible with any further instructions.	

Thank you,

Peg Bradford

Peg Bradford

Ph. (616) 945-3216

TOPOGRAPHIC MAPPING ○ PLANEMETRIC MAPPING

U.S. DEPARTMENT OF AGRICULTURE **SPEED MEMO**

TO Jim Dicki DC Owosso FO	PART NUMBER **2**
FROM Tom Bourdon PE Elgin, SO	DATE 6-13-94
	SUBJECT Owosso Drain FPMS

MESSAGE (WRITE CONCISE MESSAGE SIGN AND FORWARD PARTS 1 AND 3 TO ADDRESSEE RETAIN PART 2.)

I received a call from Gary Birk, City Engineer, Owosso requesting an update on the project. I advised Gary that we expect to get the technical report out by the end of the month. I would had deliver. Also we discussed delineating the 100 & 500 yr flood around Hopkins Lake & Tabe dont under alternatives. I told Gary we were way behind schedule on this project but that Stacy does not want to carry over to FY96 Bottom Line was we will complete an interim final report by Sept 30, 1994 and have public meetings in Dec 1994 then carto complete their work!

SIGNATURE Thomas D Bourdon

REPLY (USE THIS SPACE FOR REPLY SIGN AND DATE. RETURN PART 3 TO SENDER. RETAIN PART 1.)

cc Magee
Stacy
Davis

PS When the interim report is done the project will essentially be completed.

SIGNATURE	DATE

(DESTROY THIS PART 2 UPON RECEIPT OF REPLY) FORM AD-311 (REV 3/81)

United States
Department of
Agriculture

Soil
Conservation
Service

Michigan State Office
Room 101
1405 South Harrison Road
East Lansing, MI 48823-5243

June 30, 1994

SUBJECT: BAP - 150-12-5 - Owosso Drain Flood Plain Management
Study - Technical Report

James C. Dickie
District Conservationist
Soil Conservation Service
Owosso, Michigan

Enclosed for your review and comment are 5 copies of the Technical Report for the Owosso Drain Flood Plain Management Study. Please distribute to the field office and sponsors for their review and comments.

We have also provided copies to the Midwest National Technical Center, Lincoln, Nebraska, and Michigan Department of Natural Resources for their review and comments. This information is to be reviewed now so Cartographic map work can be completed while alternatives and narratives are being prepared for the flood plain management study report.

Tom Bourdon, P.E. is available for assistance in interpreting information in the report. Please contact him if you need any assistance

We would like to have your comments by August 15, 1994

Carole Jett
State Conservationist

Enclosures - 5

cc: Fred Gasper, Acting State Conservation Engineer, SCS, East Lansing, MI
With 1 Set of Enclosures
Percy Magee, Jr., Area Conservationist, SCS, Burton, MI

CJ:tdb:glo Lowosso2.dcx

TDB

United States
Department of
Agriculture

Soil
Conservation
Service

Michigan State Office
Room 101
1405 South Harrison Road
East Lansing, MI 48823-5243

June 30, 1994

SUBJECT: BAP - 150-12-5 - Owosso Drain Flood Plain Management
Study - Technical Report

August J. Dornbusch, Jr., Director
Midwest National Technical Center
Soil Conservation Service
Lincoln, Nebraska

Enclosed for your review and comment is a copy of the Technical Report for the Owosso Drain Flood Plain Management Study. Also enclosed are a study documentation book and a set of computer printouts. This information is submitted for review so Cartographic map work can be completed while alternatives and narratives are being prepared for the flood plain management study report.

We would like to have your comments by August 15, 1994.

Carole Jett
State Conservationist

Enclosures

cc: Edward G. Riekert, Director, BAP Division, SCS, Washington, D.C.
With 1 copy of Technical Report

CJ:tdb:glo Lowosso1.dcx

TDB

United States Department of Agriculture

Soil Conservation Service

Michigan State Office
Room 101
1405 South Harrison Road
East Lansing, MI 48823-5243

June 30, 1994

Mr. Lawrence Witte, Chief
Land and Water Management Division
Michigan Department of Natural Resources
P.O. Box 30028
Lansing, Michigan 48909

Dear Mr. Witte:

Enclosed for your review and comment is a copy of the Technical Report for the Owosso Drain Flood Plain Management Study. Also enclosed are a study documentation book and a set of computer printouts. This information is submitted for review so Cartographic map work can be completed while alternatives and narratives are being prepared for the flood plain management study report.

We would like to have your comments by August 15, 1994.

Sincerely,

Carole Jart
State Conservationist

Enclosures

CJ:tdb:glo Lowosso3.dcx

TPB

00BREAK00

1) COUNTY: SHIAWASSEE

2) STUDY NAME: VILLAGE OF VERNON

3) WATERCOURSE: SHIAWASSEE RIVER HOLLY DR

4) DOCUMENT TYPE: STUDY

00BREAK00

LIMITED-DETAIL FLOOD-INSURANCE STUDY

Village of Vernon

Shiawassee County
Michigan

August 1986

PRINCIPAL FLOOD PROBLEMS

Vernon's flooding problems are due primarily to overflow of Shiawassee River, Holly Drain, and Conrad Drain. Shiawassee River flows from the southwest along the northwestern village boundary. Both Holly Drain and Conrad Drain are tributaries of Shiawassee River and flow from the east through the village. The only flooding sources studied were Shiawassee River and Holly Drain. Flooding along Conrad Drain, which has a drainage area of 0.7 mi^2 (square miles), is the result of inadequate drainage. Low lying farm land is inundated by a 100-year flood west of Shiawassee River near Parmenter Road while little flooding occurs along Holly Drain as shown on the flood profiles and the map.

The results of this study supersede the approximate flood plain delineation shown in the Village of Vernon, Michigan Flood Hazard Boundary Maps (1975) and are consistent with information contained in the Flood Insurance Study for Township of Caledonia, Michigan (1981).

On April 6, 1947 the largest flood of record occurred at the U.S. Geological Survey (USGS) stream-gaging station located on Shiawassee River 14 miles downstream from the village corporate limits. The corresponding discharge was 6,240 cfs (cubic feet per second) with a recurrence interval of 40 years, or 1 chance in 40, on the average, of occurring in any given year.

FLOOD PROTECTION MEASURES

At the present time, the Village of Vernon has no flood protection measures within the village boundaries. However, recent dredging on Holly Drain and channel improvements on Conrad Drain have kept the waterways free from excessive vegetation.

ANALYTICAL METHODS

Hydrologic Analyses

Hydrologic analyses were carried out to establish the peak discharge-frequency relation for the 100-year flood for the flooding sources studied in limited detail.

For Shiawassee River, peak discharge estimates were based on analysis of USGS gaging station records at Owosso (station number 04144500) and Byron (station number 04144000), Michigan. Flood frequencies and magnitudes at the gaging stations were estimated based on log-Pearson Type III distribution analysis of peak flows (U.S. Water Resources Council, 1981). The 100-year peak discharge at Owosso (drainage area 538 mi^2) is 6,990 cfs and the corresponding runoff is 13.0 cfsm (cubic feet per second per square mile). At the Byron station (drainage area 368 mi^2) the 100-year peak discharge is 4,130 cfs and the runoff is 11.2 cfsm. Based on the average 100-year runoff (12.1 cfsm) at these gaging stations, the 100-year peak at Vernon (drainage area 451 mi^2), is 5,450 cfs. The 100-year peak discharge for Holly Drain was estimated using regional regression equations (Holtschlag and Croskey, 1984) and basin characteristics determined from USGS quadrangle maps and Quaternary geology maps (Farrand and Bell, 1984).

The discharges and drainages for the 100-year recurrence interval floods are presented in Table 1 "Summary of 100-Year Discharges."

TABLE 1 - SUMMARY OF 100-YEAR DISCHARGES

FLOODING SOURCE	DRAINAGE AREA (square miles)	PEAK DISCHARGE (cfs) 100-year flood
Shiawassee River	451	5450
Holly Drain	34.5	1290

Hydraulic Analysis

Analysis of the hydraulic characteristics of the flooding sources in the village of Vernon was carried out to provide estimates of the elevation of the 100-year flood along the flooding sources studied.

For Shiawassee River, backwater analysis was conducted from the northern township limit at state highway 71 to the downstream side of Ann Arbor railroad bridge. This analysis was used to determine the effect of Shiawassee River on water-surface elevations on Holly Drain. Two channel cross sections were obtained from a field survey and four were synthesized for the analysis. The synthesized cross sections were estimated from adjacent surveyed sections and topographic maps. Structural geometry and elevations for two bridges and road sections were also obtained from a field survey. The locations of the cross sections used in the analysis are shown on the flood profile and map. Cross sections were located upstream and downstream from bridges in order to compute backwater effects of these structures. Flood boundaries on Shiawassee River upstream from Ann Arbor railroad bridge were based on the depth frequency relation determined by backwater analysis in the lower reach. For the backwater analysis of Holly Drain, 8 cross sections were surveyed and 11 were synthesized. Structural geometry and elevations were obtained for 6 bridges and road profiles.

Channel roughness factors (Mannings's "n") used in the hydraulic computations were chosen by engineering judgement based on field observations of the flood-plain areas. For Shiawassee River, roughness values averaged 0.040 for the channel and ranged from 0.072 to 0.140 for the overbank areas. Roughness values for Holly Drain averaged 0.045 for the channel and ranged from 0.035 to 0.120 for the overbank areas.

Water-surface elevations for the 100-year flood were computed using WSPRO, a step-backwater computer program developed by the USGS for the Federal Highway Administration (Shearman and others, 1985). Starting water-surface elevation for Shiawassee River and Holly Drain were based on channnel slope and conveyance characteristics. Flood profiles were drawn showing computed water-surface elevations to a plotted accuracy of 0.5 foot for the 100-year flood. The flood profiles show the streambed elevation and location of bridges, cross sections, and confluences of tributaries.

All elevations are referenced to the National Geodetic Vertical Datum of 1929 (NGVD); elevation reference marks used in this study are shown and described on the map. Flood boundaries were plotted at cross sections and interpolated between sections based on the contours shown on the Corunna, Michigan 7.5 minute quadrangle (topographic) map.

Flood elevations in the village of Vernon may be raised by debris blockage of the streams in the study area. The hydraulic analysis for this study, however, is based on the effect of unobstructed flow. The flood elevations as shown on the profiles are considered valid only if hydraulic structures remain unobstructed and do not fail.

SELECTED REFERENCES

Farrand, W. R. and Bell D. L., reprinted 1984, Quaternary geology of Michigan with surface water drainage divides, Michigan Department of Natural Resources, Geological Survey Division, 2 maps.

Holtschlag, D. J., and Croskey, H. M., 1984, Statistical models for estimating flow characteristics of Michigan streams: U.S. Geological Survey Water-Resources Investigations Report 84-4207, 80 p.

Shearman, J. O., Kirby, W. H., Schneider, V. R., and Flippo, H. N., 1985, Bridge waterways analysis model/research report: U.S. Geological Survey, and the Federal Highway Administration, Office of Research and Development, FWWA/RD- (in press).

U.S. Department of Housing and Urban Development, 1981, Federal Insurance Administration, Flood Insurance Study, Township of Caledonia, Shiawassee County, Michigan.

U.S. Department of Housing and Urban Development, 1975, Federal Insurance Administration, Flood Hazard Boundary Map, Village of Vernon, Michigan.

U.S. Water Resources Council, 1981, Guidelines for determining flood flow frequency, Bulletin No. 17B, Washington, D. C., 183 p.

DESCRIPTION OF ELEVATION REFERENCE MARKS FOR THE VERNON FLOOD STUDY

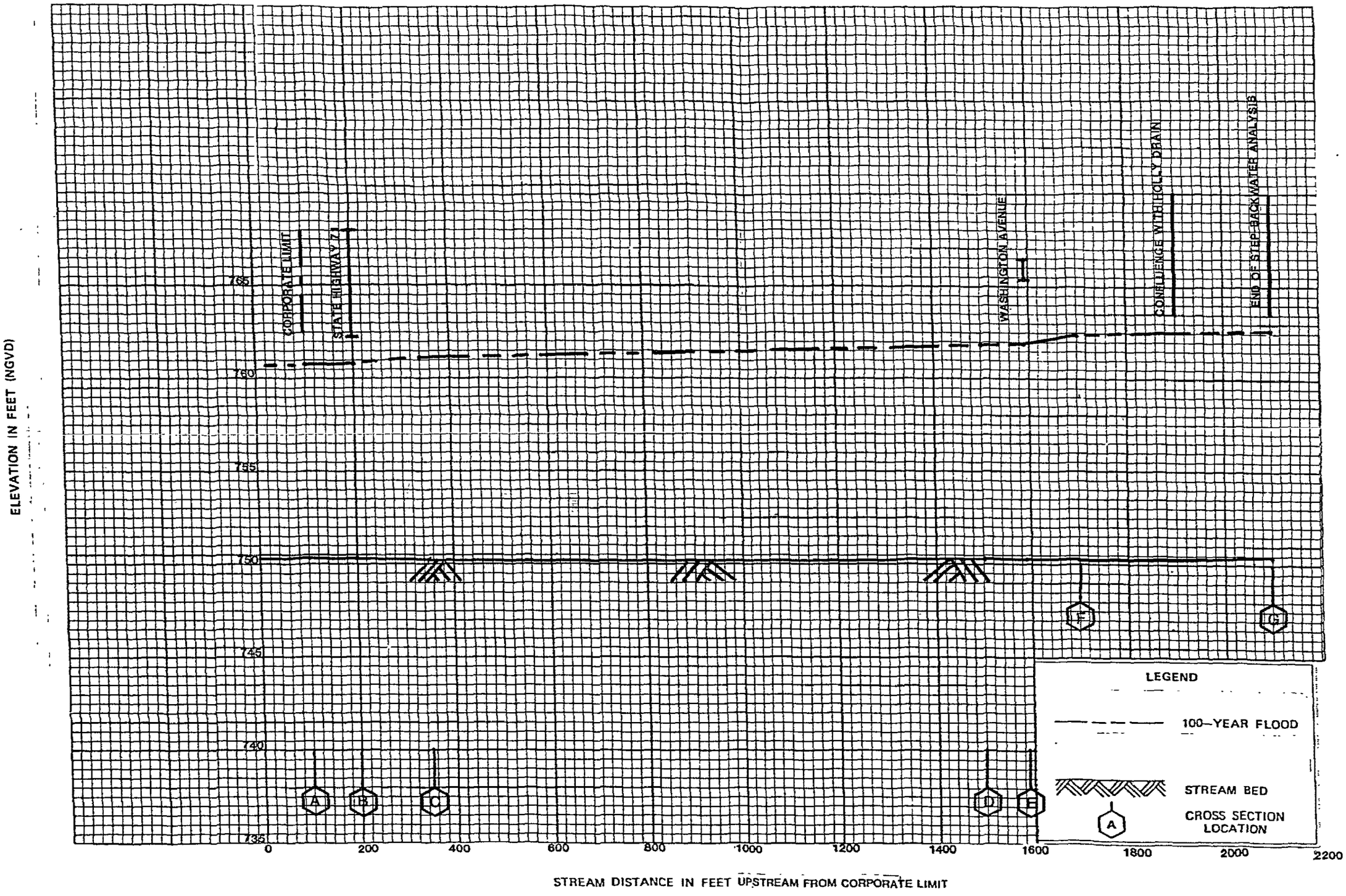
RM 1.--Steel pin set flush in the top of the south end of west abutment of state highway 71 bridge across Shiawassee River (elevation 762.25) in the northwest quarter of the southeast quarter of section 6 township 6 north and range 4 east, about 0.1 feet lower than the low chord elevation of the bridge.

RM 2.--Chiseled 'X' on the northeast corner of the south bridge curb (elevation 766.62) west side of Vernon in northwest quarter of the northeast quarter of section 7 in township 6 north and range 4 east, about 2300 feet west of Maple Street (Vernon Road) and 40 feet east of Ann Arbor railroad crossing, on Main Street (Bennington Road) bridge across Holly Drain.

RM 3.--Cut arrow in the middle of the iron sidewalk railing on the east (upstream) side of Walnut Street bridge across Holly Drain (elevation 769.24) southwest part of Vernon in the northwest quarter of the northeast quarter of section 7 in township 6 north and range 4 east, about 750 feet south of Main Street, 3 feet higher than the sidewalk.

RM 4.--Chiseled "X" on top of the northeast corner of southeast headwall of Maple Street bridge across Holly Drain (elevation 766.27) south part of Vernon in the southeast quarter of the northeast quarter of section 7 in township 6 north and range 4 east, about 1350 feet south of Main Street.

RM 5.--Highpoint of 3-foot diameter boulder west of Sunnybrooke Park sign, 70 feet east of Leaver Street and 70 feet north of Holly Drain (elevation 765.99) in the northwest quarter of section 8 in township 6 north range 4 east, about 1700 feet south of Main Street, 3 feet higher than average ground elevation.



FLOOD PROFILES

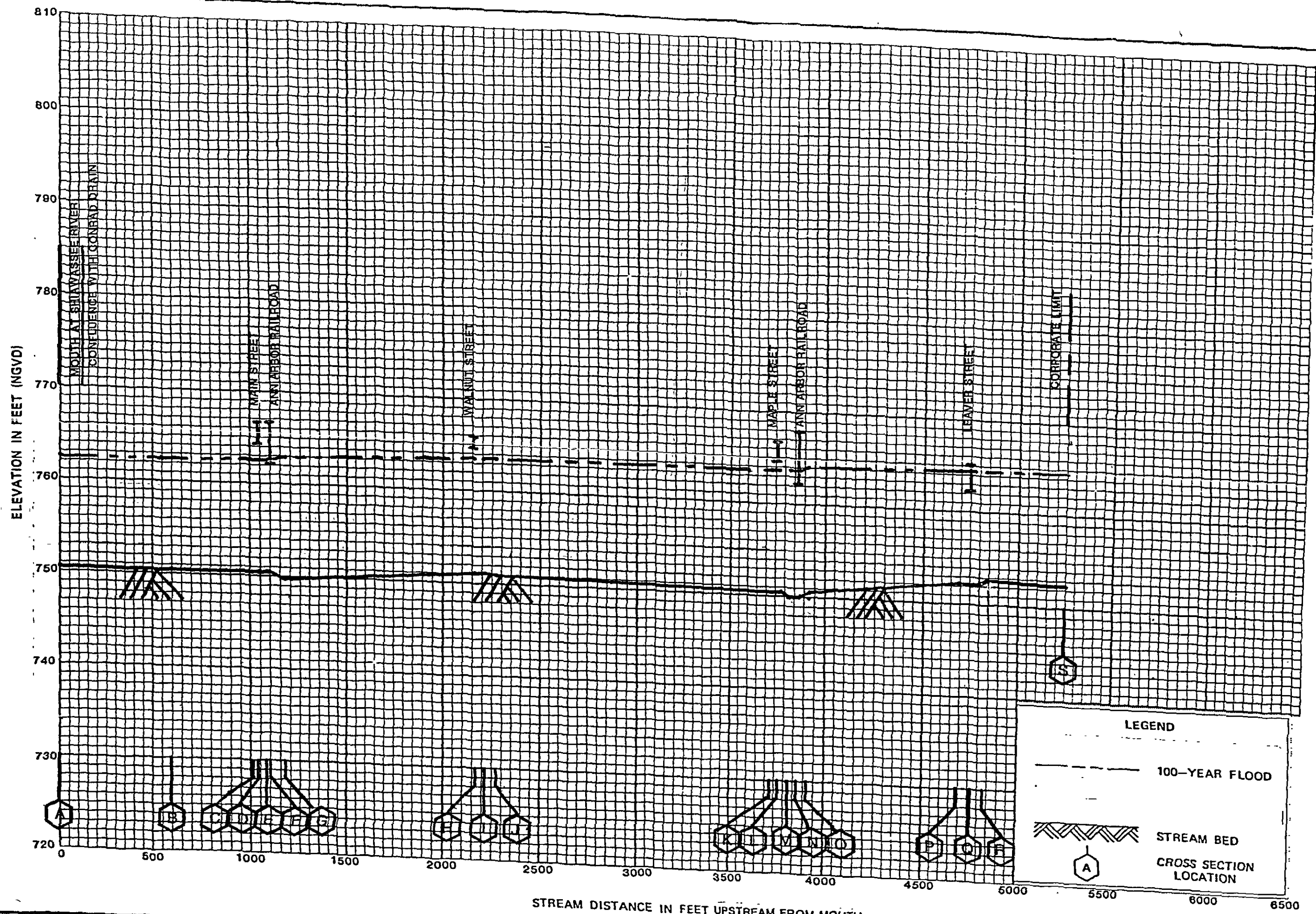
SHIAWASSEE RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

TOWNSHIP OF VERNON, MI
(SHIAWASSEE CO.)

01P

★U.S. GOVERNMENT PRINTING OFFICE: 1982—361-772/2879 MI



FLOOD PROFILES

HOLLY DRAIN

FEDERAL EMERGENCY MANAGEMENT AGENCY

TOWNSHIP OF VERNON, MI
(SHIAWASSEE CO.)

☆U.S. GOVERNMENT PRINTING OFFICE: 1982–361-772/2879 MI

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WSPRO          FEDERAL HIGHWAY ADMINISTRATION - U. S. GEOLOGICAL SURVEY
V050286            MODEL  FOR  WATER-SURFACE  PROFILE  COMPUTATIONS

            *** RUN DATE & TIME: 07/22/86 07:03
  T1         HOLLY DRAIN FROM MOUTH TO USS MAIN ST BRIDGE
  T2                     100 YEAR FLOOD
  Q          1290.
*** Q-DATA FOR SEC-ID, ISEQ =             1
  SK         3.3E-04
```

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WSPRO          FEDERAL HIGHWAY ADMINISTRATION - U. S. GEOLOGICAL SURVEY
V050286            MODEL  FOR  WATER-SURFACE  PROFILE  COMPUTATIONS

        HOLLY DRAIN FROM MOUTH TO USS MAIN ST BRIDGE
                    100 YEAR FLOOD
           *** RUN DATE & TIME: 07/22/86 07:03


*** START PROCESSING CROSS SECTION - "SEC 0"
  XS   SEC 0  0
  GR        0,766.8  30,762.8  40,752.9  51,751.0  57,750.9  68,750.5  75,753.0
  GR        87,761 4  188,761.0  301,761.7  316,766.4
  N         0.120  0.050  0.035
  SA        30  87

*** FINISH PROCESSING CROSS SECTION - "SEC 0"
*** CROSS SECTION "SEC 0" ADDED TO DAF, RECORD NO. =    1, IXTYPE =    1

--- DATA SUMMARY FOR SECID "SEC 0" AT SRD =      0.  ERR-CODE =      0

     SKEW     IHFNO    VSLOPE        EK        CK
      0.0         0    0.0000      0.50      0.00

X-Y COORDINATE PAIRS  (NGP =  11):
       X      Y          X      Y          X      Y          X      Y
      0.0  766.80      30.0  762.80      40.0  752.90      51.0  751.00
     57.0  750.90      68.0  750.50      75.0  753.00      87.0  761.40
    188.0  761.00     301.0  761.70     316.0  766.40

 X-Y MAX-MIN POINTS:
     XMIN       Y          X    YMIN      XMAX       Y          X    YMAX
      0.0  766.80      68.0  750.50     316.0  766.40       0.0  766.80

SUBAREA BREAKPOINTS (NSA =  3):
         30.      87.

ROUGHNESS COEFFICIENTS (NSA =  3):
        0.120   0.050   0.035
```

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WSPRO          FEDERAL HIGHWAY ADMINISTRATION - U. S. GEOLOGICAL SURVEY
V050286            MODEL  FOR  WATER-SURFACE  PROFILE  COMPUTATIONS

        HOLLY DRAIN FROM MOUTH TO USS MAIN ST BRIDGE
                    100 YEAR FLOOD
           *** RUN DATE & TIME:  07/22/86 07:03


*** START PROCESSING CROSS SECTION - "SEC 1"
  XS   SEC 1  600
  GR        0,766.8  30,762.8  40,752.9  51,751.0  57,750.9  68,750.5  75,753.0
  GR        87,761.4  188,761.0  301,761.7  316,766.4
  N         0.120  0.050  0.035
  SA        30  87

*** FINISH PROCESSING CROSS SECTION - "SEC 1"
*** CROSS SECTION "SEC 1" ADDED TO DAF, RECORD NO. =    2, IXTYPE =    1

--- DATA SUMMARY FOR SECID "SEC 1" AT SRD =    600.  ERR-CODE =      0

     SKEW     IHFNO    VSLOPE        EK        CK
      0.0         0    0.0000      0.50      0.00

X-Y COORDINATE PAIRS  (NGP =  11):
       X       Y          X       Y          X       Y          X       Y
      0.0  766.80      30 0  762.80      40.0  752.90      51.0  751.00
     57 0  750.90      68.0  750.50      75.0  753.00      87.0  761.40
    188.0  761.00     301 0  761.70     316.0  766.40

 X-Y MAX-MIN POINTS:
     XMIN       Y          X    YMIN      XMAX       Y          X    YMAX
      0.0  766.80      68.0  750.50     316 0  766.40       0.0  766.80

SUBAREA BREAKPOINTS (NSA =  3):
         30.      87.

ROUGHNESS COEFFICIENTS (NSA =  3):
        0.120   0.050   0.035
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WSPRO          FEDERAL HIGHWAY ADMINISTRATION - U. S. GEOLOGICAL SURVEY
V050286            MODEL  FOR  WATER-SURFACE  PROFILE  COMPUTATIONS

        HOLLY DRAIN FROM MOUTH TO USS MAIN ST BRIDGE
                   100 YEAR FLOOD
           *** RUN DATE & TIME: 07/22/86 07:03


*** START PROCESSING CROSS SECTION - "EXIT1"
  XS   EXIT1 1005
  GR        0,766.8  30,762.8  40,752.9  51,751.0  57,750.9  68,750.5  75,753.0
  GR        87,761.4  188,761.0  301,761.7  316,766.4
  N         0.120  0.050  0.035
  SA        30  87

*** FINISH PROCESSING CROSS SECTION - "EXIT1"
*** CROSS SECTION "EXIT1" ADDED TO DAF, RECORD NO  =    3, IXTYPE =    1

--- DATA SUMMARY FOR SECID "EXIT1" AT SRD =   1005.  ERR-CODE =      0

     SKEW     IHFNO    VSLOPE        EK        CK
      0.0         0    0.0000      0.50      0.00

X-Y COORDINATE PAIRS  (NGP =  11):
       X      Y          X      Y          X      Y          X      Y
      0.0  766.80      30.0  762.80      40.0  752.90      51.0  751.00
     57.0  750.90      68.0  750.50      75.0  753.00      87.0  761.40
    188.0  761.00     301.0  761.70     316.0  766.40

 X-Y MAX-MIN POINTS:
     XMIN      Y          X    YMIN      XMAX      Y          X    YMAX
      0.0  766.80      68.0  750.50     316.0  766.40       0.0  766.80

SUBAREA BREAKPOINTS (NSA =  3):
         30      87.

ROUGHNESS COEFFICIENTS (NSA =  3):
        0.120   0.050   0.035
```

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WSPRO          FEDERAL HIGHWAY ADMINISTRATION - U. S. GEOLOGICAL SURVEY
V050286            MODEL  FOR  WATER-SURFACE  PROFILE  COMPUTATIONS

        HOLLY DRAIN FROM MOUTH TO USS MAIN ST BRIDGE
                    100 YEAR FLOOD
           *** RUN DATE & TIME: 07/22/86 07.03


*** START PROCESSING CROSS SECTION - "NV1   "
  XS   NV1   1036
  GR        0,766.8  30,762.8  40,752.9  51,751.0  57,750.9  68,750.5  75,753.0
  GR        87,761.4  188,761.0  301,761.7  316,766.4
  N         0.120  0.050  0.035
  SA        30  87

*** FINISH PROCESSING CROSS SECTION - "NV1   "
*** CROSS SECTION "NV1   " ADDED TO DAF, RECORD NO. =    4, IXTYPE =    1

--- DATA SUMMARY FOR SECID "NV1   " AT SRD =   1036.  ERR-CODE =      0

     SKEW     IHFNO    VSLOPE        EK        CK
      0.0         0    0.0000      0.50      0.00

X-Y COORDINATE PAIRS  (NGP =  11):
       X      Y          X      Y          X      Y          X      Y
      0.0  766.80      30.0  762.80      40.0  752.90      51.0  751.00
     57.0  750.90      68.0  750.50      75.0  753.00      87.0  761.40
    188.0  761.00     301.0  761.70     316.0  766.40

X-Y MAX-MIN POINTS:
     XMIN      Y          X    YMIN      XMAX      Y          X    YMAX
      0.0  766.80      68.0  750.50     316.0  766.40       0.0  766.80

SUBAREA BREAKPOINTS (NSA =  3):
         30      87.

ROUGHNESS COEFFICIENTS (NSA =  3):
        0.120   0.050   0.035
```

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WSPRO          FEDERAL HIGHWAY ADMINISTRATION - U. S. GEOLOGICAL SURVEY
V050286            MODEL  FOR  WATER-SURFACE  PROFILE  COMPUTATIONS

        HOLLY DRAIN FROM MOUTH TO USS MAIN ST BRIDGE
                    100 YEAR FLOOD
           *** RUN DATE & TIME: 07/22/86 07:03


*** START PROCESSING CROSS SECTION - "MAIN "
  BR   MAIN  1036  764.4
  GR        14,764.6  15,751.2  20,751.1  25,750.8  30,750.5  35,750.9  40,751.2
  GR        46,751.4  47,764 2  14,764.6
  N         0.030
  CD        4  35  1.0  766.3  0

*** FINISH PROCESSING CROSS SECTION - "MAIN "
*** CROSS SECTION "MAIN " ADDED TO DAF, RECORD NO. =    5, IXTYPE =    2

--- DATA SUMMARY FOR SECID "MAIN " AT SRD =   1036.  ERR-CODE =      0

     SKEW     IHFNO    VSLOPE        EK        CK
      0.0         0    0.0000      0.50      0.00

X-Y COORDINATE PAIRS  (NGP =  10):
       X      Y          X      Y          X      Y          X      Y
     14.0  764.60      15.0  751.20      20.0  751.10      25.0  750.80
     30.0  750.50      35.0  750.90      40.0  751.20      46.0  751.40
     47.0  764.20      14 0  764.60

 X-Y MAX-MIN POINTS:
     XMIN       Y          X    YMIN      XMAX       Y          X    YMAX
     14.0  764.60      30.0  750.50      47.0  764.20      14.0  764.60

SUBAREA BREAKPOINTS (NSA =  3):
         30      87.

ROUGHNESS COEFFICIENTS (NSA =  3):
        0.030   0.030   0.030

BRIDGE PARAMETERS:
 BRTYPE  BRWDTH     LSEL  USERCD  EMBSS   EMBELV  WWANGL
    4      35.0   764.40 *******   1.00   766.30    0.00

PIER DATA:  NPW =  0   PCODE = **
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WSPRO          FEDERAL HIGHWAY ADMINISTRATION - U. S. GEOLOGICAL SURVEY
V050286            MODEL  FOR  WATER-SURFACE  PROFILE  COMPUTATIONS

        HOLLY DRAIN FROM MOUTH TO USS MAIN ST BRIDGE
                   100 YEAR FLOOD
           *** RUN DATE & TIME: 07/22/86 07:03


*** START PROCESSING CROSS SECTION - "APP1 "
  AS   APP1  1080
  GR        12,766.8  16,751.7  24,750.5  32,750.4  40,751.0  47,753.2  53,759.0
  GR        70,764.2
  N         0.045
  PX   SEC 0

*** FINISH PROCESSING CROSS SECTION - "APP1 "
*** CROSS SECTION "APP1 " ADDED TO DAF, RECORD NO  =    6, IXTYPE =    5

--- DATA SUMMARY FOR SECID "APP1 " AT SRD =   1080.  ERR-CODE =      0

     SKEW     IHFNO    VSLOPE        EK        CK
      0.0         0    0.0000      0.50      0.00

X-Y COORDINATE PAIRS  (NGP =   8):
       X      Y          X      Y          X      Y          X      Y
     12.0  766.80      16.0  751.70      24.0  750.50      32.0  750.40
     40.0  751.00      47.0  753.20      53.0  759.00      70.0  764.20

 X-Y MAX-MIN POINTS:
     XMIN      Y          X    YMIN      XMAX      Y          X    YMAX
     12.0  766.80      32.0  750.40      70.0  764.20      12.0  766.80

SUBAREA BREAKPOINTS (NSA =  3):
         30.      87.

ROUGHNESS COEFFICIENTS (NSA =  3):
        0 045   0.045   0.045

BRIDGE PROJECTION DATA:  XREFLT  XREFRT  FDSTLT  FDSTRT
                        ******* ******* ******* *******
```

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WSPRO          FEDERAL HIGHWAY ADMINISTRATION - U. S. GEOLOGICAL SURVEY
V050286            MODEL  FOR  WATER-SURFACE  PROFILE  COMPUTATIONS

        HOLLY DRAIN FROM MOUTH TO USS MAIN ST BRIDGE
                   100 YEAR FLOOD
           *** RUN DATE & TIME: 07/22/86 07:03


 XSID:CODE   SRDL    LEW     AREA   VHD    HF     EGL    CRWS       Q    WSEL
       SRD   FLEN    REW        K  ALPH    HO     ERR     FR#     VEL

SEC 0:XS   ******    30.      757.  0.06 *****  762.54  754.86   1290.  762.48
        0. ******   303.    70981.  1.34 ***** *******    0.21    1.70

SEC 1:XS     600.     30.      811.  0.05  0.18  762.73 *******   1290.  762.68
      600.   600.    304.    76521.  1.32  0.00    0.00    0.19    1.59

EXIT1:XS     405.     30.      843.  0.05  0.11  762.84 *******   1290.  762.79
     1005.   405.    304.    80016.  1.31  0.00    0.00    0.18    1.53

NV1  :FV      31.     30.      846.  0.05  0.01  762.85 *******   1290.  762.80
     1036.    31.    305.    80317.  1.30  0.00    0.00    0.18    1.53
         <<<<<THE ABOVE RESULTS REFLECT "NORMAL" (UNCONSTRICTED) FLOW>>>>>

 ===135 CONVEYANCE RATIO OUTSIDE OF RECOMMENDED LIMITS.
                            "APP1 "     KRATIO =  0.66

APP1 :AS      44.     13.      443.  0.13  0.02  762.91 *******   1290.  762.78
     1080.    44.     65.    53217.  1.00  0.04    0.00    0.18    2.91
         <<<<<THE ABOVE RESULTS REFLECT "NORMAL" (UNCONSTRICTED) FLOW>>>>>

            <<<<<RESULTS REFLECTING THE CONSTRICTED FLOW FOLLOW>>>>>

 XSID:CODE   SRDL    LEW     AREA   VHD    HF     EGL    CRWS       Q    WSEL
       SRD   FLEN    REW        K  ALPH    HO     ERR     FR#     VEL

MAIN :BR      31.     14.      374.  0.19  0.01  762.90  754.74   1290.  762.72
     1036.    31.     47.    67522.  1.00  0.05    0.00    0.18    3.45

     TYPE PPCD FLOW      C     P/A    LSEL   BLEN   XLAB   XRAB
       4. ****   1.  1.000 ******  764.40 ****** ****** ******

 XSID:CODE   SRDL    LEW     AREA   VHD    HF     EGL    CRWS       Q    WSEL
       SRD   FLEN    REW        K  ALPH    HO     ERR     FR#     VEL

APP1 :AS       9.     13.      444.  0.13  0.00  762.92  754.85   1290.  762.79
     1080.     9.     65.    53332.  1.00  0.01    0.00    0.18    2.91

       M(G)   M(K)       KQ   XLKQ   XRKQ    OTEL
      0.373  0.000   62095.     16.    48.   762.79

                    <<<<<END OF BRIDGE COMPUTATIONS>>>>>
  ER
```

Low steel @ 764.4

```
WSPRO          FEDERAL HIGHWAY ADMINISTRATION - U. S. GEOLOGICAL SURVEY
V050286            MODEL  FOR  WATER-SURFACE  PROFILE  COMPUTATIONS

           *** RUN DATE & TIME:  07/22/86 07:10
  T1        HOLLY DRAIN FROM USS MAIN STREET BRIDGE TO DSS WALNUT BRIDGE
  T2                    100 YEAR FLOOD
  Q         1290.
*** Q-DATA FOR SEC-ID, ISEQ =            1
  WS        762.80
```

```
WSPRO          FEDERAL HIGHWAY ADMINISTRATION - U. S. GEOLOGICAL SURVEY
V050286            MODEL  FOR  WATER-SURFACE  PROFILE  COMPUTATIONS

        HOLLY DRAIN FROM USS MAIN STREET BRIDGE TO DSS WALNUT BRIDGE
                    100 YEAR FLOOD
           *** RUN DATE & TIME: 07/22/86 07:10


*** START PROCESSING CROSS SECTION - "APP1 "
  XS   APP1  1080
  GR        12,766.8  16,751.7  24,750.5  32,750.4  40,751.0  47,753.2  53,759.0
  GR        70,764.2
  N         0.045

*** FINISH PROCESSING CROSS SECTION - "APP1 "
*** CROSS SECTION "APP1 " ADDED TO DAF, RECORD NO. =    1, IXTYPE =    1

--- DATA SUMMARY FOR SECID "APP1 " AT SRD =   1080.  ERR-CODE =      0

     SKEW     IHFNO    VSLOPE        EK        CK
      0.0         0    0.0000     0.50      0.00

X-Y COORDINATE PAIRS  (NGP =   8):
       X      Y          X      Y          X      Y          X      Y
     12.0  766.80      16.0  751.70      24.0  750.50      32.0  750.40
     40.0  751.00      47.0  753.20      53.0  759.00      70.0  764.20

 X-Y MAX-MIN POINTS:
     XMIN      Y          X    YMIN      XMAX      Y          X    YMAX
     12.0  766.80      32.0  750.40      70.0  764.20      12.0  766.80

ROUGHNESS COEFFICIENTS (NSA =  1):
        0.045
```

```
WSPRO          FEDERAL HIGHWAY ADMINISTRATION - U. S. GEOLOGICAL SURVEY
V050286            MODEL  FOR  WATER-SURFACE  PROFILE  COMPUTATIONS

        HOLLY DRAIN FROM USS MAIN STREET BRIDGE TO DSS WALNUT BRIDGE
                    100 YEAR FLOOD
           *** RUN DATE & TIME: 07/22/86 07:10


*** START PROCESSING CROSS SECTION - "NV2  "
  XS   NV2   1099
  GR         12,766.8  16,751.7  24,750.5  32,750.4  40,751.0  47,753.2  53,759.0
  GR         70,764.2
  N          0.045

*** FINISH PROCESSING CROSS SECTION - "NV2  "
*** CROSS SECTION "NV2  " ADDED TO DAF, RECORD NO. =    2, IXTYPE =    1

--- DATA SUMMARY FOR SECID "NV2  " AT SRD =   1099.  ERR-CODE =      0

     SKEW      IHFNO     VSLOPE        EK        CK
      0.0          0    0.0000      0.50      0.00

X-Y COORDINATE PAIRS  (NGP =   8):
       X       Y          X       Y          X       Y          X       Y
     12.0  766.80      16.0  751.70      24.0  750 50      32.0  750.40
     40.0  751.00      47.0  753.20      53.0  759.00      70.0  764.20

 X-Y MAX-MIN POINTS.
     XMIN       Y          X    YMIN      XMAX       Y          X    YMAX
     12.0  766.80      32.0  750.40      70.0  764.20      12.0  766.80

ROUGHNESS COEFFICIENTS (NSA =  1):
        0.045
```

```
WSPRO          FEDERAL HIGHWAY ADMINISTRATION - U. S. GEOLOGICAL SURVEY
V050286            MODEL  FOR  WATER-SURFACE  PROFILE  COMPUTATIONS

        HOLLY DRAIN FROM USS MAIN STREET BRIDGE TO DSS WALNUT BRIDGE
                    100 YEAR FLOOD
           *** RUN DATE & TIME: 07/22/86 07:10


*** START PROCESSING CROSS SECTION - "RR BR"
  BR   RR BR 1099  762.6  45
  GR        20,762.8  20,753.7  27,752.5  35,751.0  43,750.4  51,750.5  59,751.5
  GR        67,752.0  73,754.1  73,762.5  20,762.8
  N         0.030
  CD        4  18  1.0  766.5  45

*** FINISH PROCESSING CROSS SECTION - "RR BR"
*** CROSS SECTION "RR BR" ADDED TO DAF, RECORD NO. =    3, IXTYPE =    2

--- DATA SUMMARY FOR SECID "RR BR" AT SRD =   1099.  ERR-CODE =      0

     SKEW      IHFNO    VSLOPE        EK        CK
     45.0          0    0.0000      0.50      0.00

X-Y COORDINATE PAIRS  (NGP =  11):
       X       Y          X       Y          X       Y          X       Y
     20.0  762.80      20.0  753.70      27.0  752.50      35.0  751.00
     43.0  750.40      51.0  750.50      59.0  751.50      67.0  752.00
     73.0  754.10      73.0  762.50      20.0  762.80

 X-Y MAX-MIN POINTS:
     XMIN       Y          X    YMIN      XMAX       Y          X    YMAX
     20.0  762.80      43.0  750.40      73.0  754.10      20.0  762.80

ROUGHNESS COEFFICIENTS (NSA =  1):
        0.030

BRIDGE PARAMETERS:
 BRTYPE  BRWDTH     LSEL  USERCD  EMBSS   EMBELV  WWANGL
    4      18.0   762.60 *******   1.00   766.50   45.00

PIER DATA:  NPW =  0   PCODE = **
```

```
WSPRO          FEDERAL HIGHWAY ADMINISTRATION - U. S. GEOLOGICAL SURVEY
V050286            MODEL  FOR  WATER-SURFACE  PROFILE  COMPUTATIONS

        HOLLY DRAIN FROM USS MAIN STREET BRIDGE TO DSS WALNUT BRIDGE
                    100 YEAR FLOOD
           *** RUN DATE & TIME: 07/22/86 07:10


*** START PROCESSING CROSS SECTION - "APP2 "
  AS   APP2  1170
  GR         0,769.6  16,764.9  29,754.7  35,751.0  40,750.2  45,749.8  49,750.0
  GR         58,751.3  81,765.5
  N          0.065

*** FINISH PROCESSING CROSS SECTION - "APP2 "
*** CROSS SECTION "APP2 " ADDED TO DAF, RECORD NO. =    4, IXTYPE =    5

--- DATA SUMMARY FOR SECID "APP2 " AT SRD =   1170.   ERR-CODE =      0

     SKEW     IHFNO    VSLOPE        EK        CK
      0.0         0    0.0000      0.50      0.00

X-Y COORDINATE PAIRS  (NGP =   9).
       X      Y          X      Y          X      Y          X      Y
      0.0  769.60      16.0  764.90      29.0  754.70      35.0  751.00
     40.0  750.20      45.0  749.80      49.0  750.00      58.0  751.30
     81.0  765.50

 X-Y MAX-MIN POINTS:
     XMIN      Y          X    YMIN      XMAX      Y          X    YMAX
      0.0  769.60      45.0  749.80      81.0  765.50       0.0  769.60

ROUGHNESS COEFFICIENTS (NSA =  1):
        0.065

BRIDGE PROJECTION DATA:  XREFLT  XREFRT  FDSTLT  FDSTRT
                        ******* ******* ******* *******
```

```
WSPRO          FEDERAL HIGHWAY ADMINISTRATION - U. S. GEOLOGICAL SURVEY
V050286            MODEL  FOR  WATER-SURFACE  PROFILE  COMPUTATIONS

        HOLLY DRAIN FROM USS MAIN STREET BRIDGE TO DSS WALNUT BRIDGE
                    100 YEAR FLOOD
           *** RUN DATE & TIME: 07/22/86 07:10


*** START PROCESSING CROSS SECTION - "EXIT3"
  XS   EXIT3 2164
  GR        189,764.0  202,753.4  212,751.7  220,751.1  226,751.2  244,753.4
  GR        259,763.5  276,763.8
  N         0.044
  PX   APP2

*** FINISH PROCESSING CROSS SECTION - "EXIT3"
*** CROSS SECTION "EXIT3" ADDED TO DAF, RECORD NO. =    5, IXTYPE =    1

--- DATA SUMMARY FOR SECID "EXIT3" AT SRD =   2164.  ERR-CODE =      0

     SKEW     IHFNO    VSLOPE        EK        CK
      0.0         0    0.0000      0.50      0.00

X-Y COORDINATE PAIRS  (NGP =   8):
       X      Y          X      Y          X      Y          X      Y
    189.0  764.00     202.0  753.40     212.0  751.70     220.0  751.10
    226.0  751.20     244.0  753.40     259.0  763.50     276.0  763.80

 X-Y MAX-MIN POINTS:
     XMIN      Y          X    YMIN      XMAX      Y          X    YMAX
    189.0  764.00     220.0  751.10     276.0  763.80     189.0  764.00

ROUGHNESS COEFFICIENTS (NSA =  1):
        0.044
```

```
WSPRO          FEDERAL HIGHWAY ADMINISTRATION - U. S. GEOLOGICAL SURVEY
V050286            MODEL  FOR  WATER-SURFACE  PROFILE  COMPUTATIONS

        HOLLY DRAIN FROM USS MAIN STREET BRIDGE TO DSS WALNUT BRIDGE
                    100 YEAR FLOOD
           *** RUN DATE & TIME: 07/22/86 07:10


 XSID:CODE   SRDL    LEW     AREA   VHD    HF     EGL    CRWS       Q    WSEL
       SRD   FLEN    REW        K  ALPH    HO     ERR     FR#     VEL

APP1 :XS   ******   13.      444.  0.13 *****  762.93  754.85   1290.  762.80
     1080. ******   65.    53371.  1.00 ***** *******    0.18    2.90

NV2  :FV      19.    13.      445.  0.13  0.01  762.94 *******   1290.  762.81
     1099.    19.    65     53487.  1.00  0.00    0.00    0.18    2.90
         <<<<<THE ABOVE RESULTS REFLECT "NORMAL" (UNCONSTRICTED) FLOW>>>>>

APP2 :AS      71.    19.      500.  0.10  0.05  762.99 *******   1290.  762.89
     1170.    71.    77.    44383.  1.00  0.00    0.00    0.16    2.58
         <<<<<THE ABOVE RESULTS REFLECT "NORMAL" (UNCONSTRICTED) FLOW>>>>>

 ===255 ATTEMPTING FLOW CLASS 3 (6) SOLUTION.
                         WS3N,LSEL =    762.81      762.60

            <<<<<RESULTS REFLECTING THE CONSTRICTED FLOW FOLLOW>>>>>

 XSID:CODE   SRDL    LEW     AREA   VHD    HF     EGL    CRWS       Q    WSEL
       SRD   FLEN    REW        K  ALPH    HO     ERR     FR#     VEL

RR BR:BR      19.    20.      414.  0.15 *****  762.95  754.93   1286.  762.80
     1099. ******   73.    55436.  1.00 ***** *******    0.20    3.11

     TYPE PPCD FLOW      C     P/A     LSEL    BLEN   XLAB   XRAB
       4. ****   3.   0.800 ******  762.60 ****** ****** ******

 XSID:CODE   SRDL    LEW     AREA   VHD    HF     EGL    CRWS       Q    WSEL
       SRD   FLEN    REW        K  ALPH    HO     ERR     FR#     VEL

APP2 :AS      53.    18.      505.  0.10  0.04  763.09  754.74   1290.  762.99
     1170.    59.    77.    45060.  1.00  0.00    0.00    0.15    2.55

       M(G)   M(K)        KQ   XLKQ   XRKQ    OTEL
     ****** ************** ****** ******   762.94

                    <<<<<END OF BRIDGE COMPUTATIONS>>>>>

 ===135 CONVEYANCE RATIO OUTSIDE OF RECOMMENDED LIMITS.
                             "EXIT3"     KRATIO =  1.87

 XSID:CODE   SRDL    LEW     AREA   VHD    HF     EGL    CRWS       Q    WSEL
       SRD   FLEN    REW        K  ALPH    HO     ERR     FR#     VEL

EXIT3:XS     994.   190.      617.  0.07  0.44  763.52 *******   1290.  763.46
     2164.   994    259.    84288.  1.00  0.00    0.00    0.12    2.09
  ER
```

762.89
.22
763.11

763.11

maybe 3-4 ft low

```
WSPRO          FEDERAL HIGHWAY ADMINISTRATION - U. S. GEOLOGICAL SURVEY
V050286            MODEL  FOR  WATER-SURFACE  PROFILE  COMPUTATIONS

            *** RUN DATE & TIME: 07/22/86 07:12
  T1         HOLLY DRAIN FROM DSS WALNUT BRIDGE TO DSS MAPLE BRIDGE
  T2                    100 YEAR FLOOD
  Q          1290.
*** Q-DATA FOR SEC-ID, ISEQ =            1
  WS         763.46
```

```
WSPRO          FEDERAL HIGHWAY ADMINISTRATION - U. S. GEOLOGICAL SURVEY
V050286            MODEL  FOR  WATER-SURFACE  PROFILE  COMPUTATIONS

        HOLLY DRAIN FROM DSS WALNUT BRIDGE TO DSS MAPLE BRIDGE
                    100 YEAR FLOOD
           *** RUN DATE & TIME: 07/22/86 07:12


*** START PROCESSING CROSS SECTION - "EXIT3"
  XS   EXIT3 2164
  GR        189,764.0  202,753.4  212,751.7  220,751.1  226,751.2  244,753.4
  GR        259,763.5  276,763.8
  N         0.044

*** FINISH PROCESSING CROSS SECTION - "EXIT3"
*** CROSS SECTION "EXIT3" ADDED TO DAF, RECORD NO. =    1, IXTYPE =    1

--- DATA SUMMARY FOR SECID "EXIT3" AT SRD =   2164.  ERR-CODE =      0

     SKEW     IHFNO    VSLOPE        EK        CK
      0.0         0    0.0000      0.50      0.00

X-Y COORDINATE PAIRS  (NGP =   8):
       X      Y          X      Y          X      Y          X      Y
    189.0  764.00     202.0  753.40     212.0  751.70     220.0  751.10
    226.0  751.20     244.0  753.40     259.0  763.50     276.0  763.80

 X-Y MAX-MIN POINTS:
     XMIN      Y          X    YMIN      XMAX      Y          X    YMAX
    189.0  764.00     220.0  751.10     276.0  763.80     189.0  764.00

ROUGHNESS COEFFICIENTS (NSA =  1):
        0.044
```

```
WSPRO          FEDERAL HIGHWAY ADMINISTRATION - U. S. GEOLOGICAL SURVEY
V050286            MODEL  FOR  WATER-SURFACE  PROFILE  COMPUTATIONS

        HOLLY DRAIN FROM DSS WALNUT BRIDGE TO DSS MAPLE BRIDGE
                    100 YEAR FLOOD
           *** RUN DATE & TIME: 07/22/86 07:12


*** START PROCESSING CROSS SECTION - "NV 3 "
  XS   NV 3  2206
  GR        189,764.0  202,753.4  212,751.7  220,751.1  226,751.2  244,753.4
  GR        259,763.5  273,763.8
  N         0.044

*** FINISH PROCESSING CROSS SECTION - "NV 3 "
*** CROSS SECTION "NV 3 " ADDED TO DAF, RECORD NO. =    2, IXTYPE =    1

--- DATA SUMMARY FOR SECID "NV 3 " AT SRD =   2206.  ERR-CODE =      0

     SKEW      IHFNO     VSLOPE        EK        CK
      0.0          0     0.0000      0.50      0.00

X-Y COORDINATE PAIRS  (NGP =   8):
       X       Y          X       Y          X       Y          X       Y
    189.0  764.00     202.0  753.40     212.0  751.70     220.0  751.10
    226.0  751.20     244.0  753.40     259.0  763.50     273.0  763.80

 X-Y MAX-MIN POINTS:
     XMIN       Y          X    YMIN      XMAX       Y          X    YMAX
    189.0  764.00     220.0  751.10     273.0  763.80     189.0  764.00

ROUGHNESS COEFFICIENTS (NSA =  1):
        0.044
```

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WSPRO          FEDERAL HIGHWAY ADMINISTRATION - U. S. GEOLOGICAL SURVEY
V050286            MODEL  FOR  WATER-SURFACE  PROFILE  COMPUTATIONS

        HOLLY DRAIN FROM DSS WALNUT BRIDGE TO DSS MAPLE BRIDGE
                    100 YEAR FLOOD
           *** RUN DATE & TIME: 07/22/86 07:12


*** START PROCESSING CROSS SECTION - "WALNT"
  BR   WALNT 2206  764.8
  GR         202,764.8  205,755.0  207,754.8  207,753.5  210,752.4  215,751.6
  GR         220,751.4
  GR         225,751.2  230,751.0  235,751.4  240,752.2  240,754.8  242,755.0
  GR         244,764.8  202,764.8
  N          0.030
  CD         4  24  1.0  765.4  45

*** FINISH PROCESSING CROSS SECTION - "WALNT"
*** CROSS SECTION "WALNT" ADDED TO DAF, RECORD NO. =    3, IXTYPE =    2

--- DATA SUMMARY FOR SECID "WALNT" AT SRD =   2206.  ERR-CODE =      0

     SKEW     IHFNO    VSLOPE        EK        CK
      0.0         0    0.0000      0.50      0.00

X-Y COORDINATE PAIRS  (NGP =  15):
       X       Y          X       Y          X       Y          X       Y
    202.0  764.80     205.0  755.00     207.0  754.80     207.0  753.50
    210.0  752.40     215.0  751.60     220.0  751.40     225.0  751.20
    230.0  751.00     235.0  751.40     240.0  752.20     240.0  754.80
    242.0  755.00     244.0  764.80     202.0  764.80

 X-Y MAX-MIN POINTS:
     XMIN       Y          X    YMIN      XMAX       Y          X    YMAX
    202.0  764.80     230.0  751.00     244.0  764.80     202.0  764.80

ROUGHNESS COEFFICIENTS (NSA =  1):
        0.030

BRIDGE PARAMETERS:
 BRTYPE  BRWDTH     LSEL  USERCD  EMBSS   EMBELV  WWANGL
    4      24.0   764.80 *******   1.00   765.40   45.00

PIER DATA:  NPW =  0   PCODE = **
```

```
WSPRO          FEDERAL HIGHWAY ADMINISTRATION - U. S. GEOLOGICAL SURVEY
V050286            MODEL  FOR  WATER-SURFACE  PROFILE  COMPUTATIONS

        HOLLY DRAIN FROM DSS WALNUT BRIDGE TO DSS MAPLE BRIDGE
                    100 YEAR FLOOD
           *** RUN DATE & TIME: 07/22/86 07:12


*** START PROCESSING CROSS SECTION - "APP3 "
  AS   APP3  2272
  GR        189,764.0  202,753.4  212,751.7  220,751.1  226,751.2  244,753.4
  GR        259,763.5  273,763.8
  N         0.044

*** FINISH PROCESSING CROSS SECTION - "APP3 "
*** CROSS SECTION "APP3 " ADDED TO DAF, RECORD NO. =    4, IXTYPE =    5

--- DATA SUMMARY FOR SECID "APP3 " AT SRD =   2272.  ERR-CODE =      0

     SKEW     IHFNO    VSLOPE        EK        CK
      0.0         0    0.0000      0.50      0.00

X-Y COORDINATE PAIRS  (NGP =   8):
       X      Y          X      Y          X      Y          X      Y
    189.0  764.00     202.0  753.40     212.0  751.70     220.0  751.10
    226.0  751.20     244.0  753.40     259.0  763.50     273.0  763.80

 X-Y MAX-MIN POINTS:
     XMIN      Y          X    YMIN      XMAX      Y          X    YMAX
    189.0  764.00     220.0  751.10     273.0  763.80     189.0  764.00

ROUGHNESS COEFFICIENTS (NSA =  1):
        0.044

BRIDGE PROJECTION DATA:  XREFLT  XREFRT  FDSTLT  FDSTRT
                        ******* ******* ******* *******
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WSPRO          FEDERAL HIGHWAY ADMINISTRATION - U. S. GEOLOGICAL SURVEY
V050286            MODEL  FOR  WATER-SURFACE  PROFILE  COMPUTATIONS

        HOLLY DRAIN FROM DSS WALNUT BRIDGE TO DSS MAPLE BRIDGE
                    100 YEAR FLOOD
           *** RUN DATE & TIME: 07/22/86 07:12


*** START PROCESSING CROSS SECTION - "EXIT4"
  XS   EXIT4 3737
  GR        0,763.4  17,752.3  26,750.8  28,750.8  31,750 5  34,750.6  48,751.6
  GR        59,753.3  64,757.9  75,762.1  88,762.4  200,767.9
  N         0.042
  PX   EXIT3

*** FINISH PROCESSING CROSS SECTION - "EXIT4"
*** CROSS SECTION "EXIT4" ADDED TO DAF, RECORD NO. =    5, IXTYPE =    1

--- DATA SUMMARY FOR SECID "EXIT4" AT SRD =   3737.  ERR-CODE =      0

     SKEW     IHFNO    VSLOPE        EK        CK
      0.0         0    0.0000      0.50      0.00

X-Y COORDINATE PAIRS  (NGP =  12):
       X      Y          X      Y          X      Y          X      Y
      0.0  763.40      17.0  752.30      26.0  750.80      28.0  750.80
     31.0  750.50      34.0  750.60      48.0  751.60      59.0  753.30
     64.0  757.90      75.0  762.10      88.0  762.40     200.0  767.90

 X-Y MAX-MIN POINTS:
     XMIN      Y          X    YMIN      XMAX      Y          X    YMAX
      0.0  763.40      31.0  750.50     200.0  767.90     200.0  767.90

  ROUGHNESS COEFFICIENTS (NSA =  1):
          0.042
```

```
WSPRO          FEDERAL HIGHWAY ADMINISTRATION - U. S. GEOLOGICAL SURVEY
V050286            MODEL  FOR  WATER-SURFACE  PROFILE  COMPUTATIONS

        HOLLY DRAIN FROM DSS WALNUT BRIDGE TO DSS MAPLE BRIDGE
                    100 YEAR FLOOD
           *** RUN DATE & TIME: 07/22/86 07:12


 XSID: CODE   SRDL    LEW     AREA   VHD    HF     EGL    CRWS       Q    WSEL
        SRD   FLEN    REW        K  ALPH    HO     ERR     FR#     VEL

EXIT3: XS   ******   190.     618.  0.07 *****  763.53  755.12   1290.  763.46
     2164.  ******   259.   84348.  1.00 ***** *******    0.12    2.09

NV 3 : FV     42.    190.     618.  0.07  0.01  763.54 *******   1290.  763.47
     2206.    42.    259.   84512.  1.00  0.00    0.00    0.12    2.09
         <<<<<THE ABOVE RESULTS REFLECT "NORMAL" (UNCONSTRICTED) FLOW>>>>>

APP3 : AS     66.    190.     620.  0.07  0.02  763.56 *******   1290.  763.49
     2272.    66.    259.   84754.  1.00  0.00    0.00    0.12    2.08
         <<<<<THE ABOVE RESULTS REFLECT "NORMAL" (UNCONSTRICTED) FLOW>>>>>

            <<<<<RESULTS REFLECTING THE CONSTRICTED FLOW FOLLOW>>>>>

 XSID: CODE   SRDL    LEW     AREA   VHD    HF     EGL    CRWS       Q    WSEL
        SRD   FLEN    REW        K  ALPH    HO     ERR     FR#     VEL

WALNT: BR     42.    202.     442.  0.13  0.01  763.55  755.34   1290.  763.42
     2206.    42.    244.   84215.  1.00  0.01    0.00    0.16    2.92

     TYPE PPCD FLOW      C    P/A    LSEL   BLEN   XLAB   XRAB
       4. ****   1.  0.999 ******  764.80 ****** ****** ******

 XSID: CODE   SRDL    LEW     AREA   VHD    HF     EGL    CRWS       Q    WSEL
        SRD   FLEN    REW        K  ALPH    HO     ERR     FR#     VEL

APP3 : AS     42.    190.     620.  0.07  0.01  763.57  755.12   1290.  763.50
     2272.    43.    259.   84851.  1.00  0.01    0.00    0.12    2.08

       M(G)   M(K)       KQ   XLKQ   XRKQ    OTEL
      0.404  0.040   81482.   202.   243.   763.49

                     <<<<<END OF BRIDGE COMPUTATIONS>>>>>

 ===140 AT SECID "EXIT4":  END OF CROSS SECTION EXTENDED VERTICALLY.
                             WSEL,YLT,YRT =   763.85     763.40     767.90

 XSID: CODE   SRDL    LEW     AREA   VHD    HF     EGL    CRWS       Q    WSEL
        SRD   FLEN    REW        K  ALPH    HO     ERR     FR#     VEL

EXIT4: XS   1465.     0.     747.  0.05  0.33  763.89 *******   1290.  763.85
     3737.  1465.   117.   87786.  1.00  0.00    0.00    0.12    1.73
  ER
```

```
WSPRO          FEDERAL HIGHWAY ADMINISTRATION - U. S. GEOLOGICAL SURVEY
V050286            MODEL  FOR  WATER-SURFACE  PROFILE  COMPUTATIONS

           *** RUN DATE & TIME: 07/22/86 07:16
  T1        HOLLY DRAIN FROM DSS MAPLE BRIDGE TO DSS LEAVER STREET
  T2                    100 YEAR FLOOD
  Q         1290.
*** Q-DATA FOR SEC-ID, ISEQ =            1
  WS        763.85
```

```
WSPRO          FEDERAL HIGHWAY ADMINISTRATION - U. S. GEOLOGICAL SURVEY
V050286            MODEL  FOR  WATER-SURFACE  PROFILE  COMPUTATIONS

        HOLLY DRAIN FROM DSS MAPLE BRIDGE TO DSS LEAVER STREET
                    100 YEAR FLOOD
           *** RUN DATE & TIME: 07/22/86 07:16


*** START PROCESSING CROSS SECTION - "EXIT4"
  XS   EXIT4 3737
  GR        0,763.4  17,752.3  26,750.8  28,750.8  31,750.5  34,750.6  48,751.6
  GR        59,753.3  64,757.9  75,762.1  88,762.4  200,767.9
  N         0.042

*** FINISH PROCESSING CROSS SECTION - "EXIT4"
*** CROSS SECTION "EXIT4" ADDED TO DAF, RECORD NO. =    1, IXTYPE =    1

--- DATA SUMMARY FOR SECID "EXIT4" AT SRD =   3737.  ERR-CODE =      0

     SKEW     IHFNO    VSLOPE        EK        CK
      0.0         0    0.0000      0.50      0.00

X-Y COORDINATE PAIRS  (NGP =  12):
       X      Y          X      Y          X      Y          X      Y
      0.0  763.40      17.0  752.30      26.0  750.80      28.0  750.80
     31.0  750.50      34.0  750.60      48.0  751.60      59.0  753.30
     64.0  757.90      75.0  762.10      88.0  762.40     200.0  767.90

 X-Y MAX-MIN POINTS:
     XMIN       Y          X    YMIN      XMAX       Y          X    YMAX
      0.0  763.40      31.0  750.50     200.0  767.90     200.0  767.90

ROUGHNESS COEFFICIENTS (NSA =  1):
        0.042
```

```
WSPRO          FEDERAL HIGHWAY ADMINISTRATION - U. S. GEOLOGICAL SURVEY
V050286            MODEL  FOR  WATER-SURFACE  PROFILE  COMPUTATIONS

        HOLLY DRAIN FROM DSS MAPLE BRIDGE TO DSS LEAVER STREET
                    100 YEAR FLOOD
           *** RUN DATE & TIME: 07/22/86 07:16


*** START PROCESSING CROSS SECTION - "NV 4 "
  XS   NV 4  3770
  GR        0,763.4  17,752.3  26,750.8  28,750.8  31,750.5  34,750.6  48,751.6
  GR        59,753.3  64,757.9  75,762.1  88,762.4  200,767.9
  N         0.042

*** FINISH PROCESSING CROSS SECTION - "NV 4 "
*** CROSS SECTION "NV 4 " ADDED TO DAF, RECORD NO. =    2, IXTYPE =    1

--- DATA SUMMARY FOR SECID "NV 4 " AT SRD =   3770.   ERR-CODE =      0

     SKEW     IHFNO    VSLOPE        EK        CK
      0.0         0    0.0000      0.50      0.00

X-Y COORDINATE PAIRS  (NGP =  12):
       X       Y          X       Y          X       Y          X       Y
      0.0  763.40      17.0  752.30      26.0  750.80      28.0  750.80
     31.0  750.50      34.0  750.60      48.0  751 60      59.0  753.30
     64.0  757.90      75.0  762.10      88.0  762.40     200 0  767.90

 X-Y MAX-MIN POINTS:
     XMIN       Y          X    YMIN      XMAX       Y          X    YMAX
      0.0  763.40      31.0  750.50     200.0  767.90     200.0  767.90

ROUGHNESS COEFFICIENTS (NSA =  1):
        0.042
```

```
WSPRO          FEDERAL HIGHWAY ADMINISTRATION - U. S. GEOLOGICAL SURVEY
V050286            MODEL  FOR  WATER-SURFACE  PROFILE  COMPUTATIONS

        HOLLY DRAIN FROM DSS MAPLE BRIDGE TO DSS LEAVER STREET
                    100 YEAR FLOOD
           *** RUN DATE & TIME: 07/22/86 07:16


*** START PROCESSING CROSS SECTION - "MAPL "
  BR   MAPL  3770  764.6
  GR        0,764.7  0,761.1  1.5,761.1  1.5,760.0  3,760.0  6,754.5  9.5,754.5
  GR        9.5,751.9  12,750.9  16,751.1  20,750.7  24,751.2  28,753.8  28,754.3
  GR        30,754.4  32,761.0  33,761.0  33,764.6  0,764.7
  N         0.040
  CD        4  24  1.0  766.4  30

*** FINISH PROCESSING CROSS SECTION - "MAPL "
*** CROSS SECTION "MAPL " ADDED TO DAF, RECORD NO. =    3, IXTYPE =    2

--- DATA SUMMARY FOR SECID "MAPL " AT SRD =   3770.   ERR-CODE =      0

     SKEW     IHFNO    VSLOPE        EK        CK
      0.0         0    0.0000      0.50      0.00

X-Y COORDINATE PAIRS  (NGP =  19):
       X      Y          X      Y          X      Y          X      Y
      0.0  764.70       0.0  761.10       1.5  761.10       1.5  760.00
      3.0  760.00       6.0  754.50       9.5  754.50       9.5  751.90
     12.0  750.90      16.0  751.10      20.0  750.70      24.0  751.20
     28.0  753.80      28.0  754.30      30.0  754.40      32.0  761.00
     33.0  761.00      33.0  764.60       0.0  764.70

 X-Y MAX-MIN POINTS:
     XMIN      Y          X    YMIN      XMAX      Y          X    YMAX
      0.0  764.70      20.0  750.70      33.0  761.00       0.0  764.70

ROUGHNESS COEFFICIENTS (NSA =  1):
        0.040

BRIDGE PARAMETERS:
 BRTYPE  BRWDTH     LSEL  USERCD  EMBSS   EMBELV  WWANGL
    4      24.0   764.60 *******   1.00   766.40   30.00

PIER DATA:  NPW =  0   PCODE = **
```

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WSPRO          FEDERAL HIGHWAY ADMINISTRATION - U. S. GEOLOGICAL SURVEY
V050286            MODEL  FOR  WATER-SURFACE  PROFILE  COMPUTATIONS

        HOLLY DRAIN FROM DSS MAPLE BRIDGE TO DSS LEAVER STREET
                    100 YEAR FLOOD
           *** RUN DATE & TIME: 07/22/86 07:16


*** START PROCESSING CROSS SECTION - "APP4 "
  AS   APP4  3826
  GR        0,767.0  0,755.7  5,753.5  10,751.5  15,751.0  20,750.3  25,750.0
  GR        30,750.5  32,753.4  32,757.6  34,757.6  34,767.0
  N         0.040

*** FINISH PROCESSING CROSS SECTION - "APP4 "
*** CROSS SECTION "APP4 " ADDED TO DAF, RECORD NO. =    4, IXTYPE =    5

--- DATA SUMMARY FOR SECID "APP4 " AT SRD =   3826.  ERR-CODE =      0

     SKEW     IHFNO    VSLOPE        EK        CK
      0.0         0    0.0000      0.50      0.00

X-Y COORDINATE PAIRS  (NGP =  12):
       X      Y          X      Y          X      Y          X      Y
      0.0  767.00       0.0  755.70       5.0  753.50      10.0  751.50
     15.0  751.00      20.0  750.30      25.0  750.00      30.0  750.50
     32.0  753.40      32.0  757.60      34.0  757.60      34.0  767.00

 X-Y MAX-MIN POINTS:
     XMIN       Y          X    YMIN      XMAX       Y          X    YMAX
      0.0  767.00      25.0  750.00      34.0  757.60       0.0  767.00

ROUGHNESS COEFFICIENTS (NSA =  1):
        0.040

BRIDGE PROJECTION DATA:  XREFLT  XREFRT  FDSTLT  FDSTRT
                        ******* ******* ******* *******
```

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WSPRO          FEDERAL HIGHWAY ADMINISTRATION - U. S. GEOLOGICAL SURVEY
V050286            MODEL  FOR  WATER-SURFACE  PROFILE  COMPUTATIONS

        HOLLY DRAIN FROM DSS MAPLE BRIDGE TO DSS LEAVER STREET
                    100 YEAR FLOOD
           *** RUN DATE & TIME: 07/22/86 07:16


*** START PROCESSING CROSS SECTION - "NV 5 "
  XS   NV 5 3865
  GR        0,767.0  0,755.7  5,753.5  10,751.5  15,751.0  20,750.3  25,750.0
  GR        30,750.5  32,753.4  32,757.6  34,757.6  34,767.0
  N         0 040

*** FINISH PROCESSING CROSS SECTION - "NV 5 "
*** CROSS SECTION "NV 5 " ADDED TO DAF, RECORD NO. =    5, IXTYPE =    1

--- DATA SUMMARY FOR SECID "NV 5 " AT SRD =   3865.  ERR-CODE =      0

     SKEW     IHFNO    VSLOPE        EK        CK
      0.0         0    0.0000      0.50      0.00

X-Y COORDINATE PAIRS  (NGP =  12):
       X       Y          X       Y          X       Y          X       Y
      0.0  767.00       0.0  755.70       5.0  753.50      10.0  751.50
     15.0  751.00      20.0  750.30      25.0  750.00      30.0  750.50
     32.0  753 40      32.0  757.60      34.0  757.60      34.0  767.00

 X-Y MAX-MIN POINTS:
     XMIN       Y          X    YMIN      XMAX       Y          X    YMAX
      0.0  767.00      25.0  750.00      34.0  757.60       0.0  767.00

ROUGHNESS COEFFICIENTS (NSA =  1):
        0.040
```

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WSPRO          FEDERAL HIGHWAY ADMINISTRATION - U. S. GEOLOGICAL SURVEY
V050286            MODEL  FOR  WATER-SURFACE  PROFILE  COMPUTATIONS

        HOLLY DRAIN FROM DSS MAPLE BRIDGE TO DSS LEAVER STREET
                    100 YEAR FLOOD
           *** RUN DATE & TIME: 07/22/86 07:16


*** START PROCESSING CROSS SECTION - "RR    "
  BR   RR    3865  762.4
  GR         19,762.4  19,755.7  24,753.5  29,751.5  34,751.0  39,750.3  44,750.0
  GR         49,750.5  51,753.4  51,757.6  53,757.6  53,762.4  19,762.4
  N          0.040
  CD         4  12  1.0  767.9  45
  PW 1       750.0,1  762.4,1

*** FINISH PROCESSING CROSS SECTION - "RR    "
*** CROSS SECTION "RR    " ADDED TO DAF, RECORD NO. =    6, IXTYPE =    2

--- DATA SUMMARY FOR SECID "RR    " AT SRD =   3865.  ERR-CODE =      0

     SKEW     IHFNO    VSLOPE        EK        CK
      0.0         0    0.0000      0.50      0.00

X-Y COORDINATE PAIRS  (NGP =  13):
       X      Y          X      Y          X      Y          X      Y
     19.0  762.40      19.0  755.70      24.0  753.50      29.0  751.50
     34.0  751.00      39.0  750.30      44.0  750.00      49.0  750.50
     51.0  753.40      51.0  757.60      53.0  757.60      53.0  762.40
     19.0  762.40

 X-Y MAX-MIN POINTS:
     XMIN       Y          X    YMIN      XMAX       Y          X    YMAX
     19.0  762.40      44.0  750.00      53.0  757.60      19.0  762.40

ROUGHNESS COEFFICIENTS (NSA =  1):
        0.040

BRIDGE PARAMETERS·
 BRTYPE  BRWDTH     LSEL  USERCD  EMBSS   EMBELV  WWANGL
    4      12.0   762.40 *******   1.00   767.90   45.00

PIER DATA.  NPW =  2   PCODE = 1.
     PELV  PWDTH      PELV  PWDTH      PELV  PWDTH      PELV  PWDTH
   750.00   1.0     762.40   1.0
```

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WSPRO          FEDERAL HIGHWAY ADMINISTRATION - U. S. GEOLOGICAL SURVEY
V050286            MODEL  FOR  WATER-SURFACE  PROFILE  COMPUTATIONS

        HOLLY DRAIN FROM DSS MAPLE BRIDGE TO DSS LEAVER STREET
                    100 YEAR FLOOD
           *** RUN DATE & TIME: 07/22/86 07:16


*** START PROCESSING CROSS SECTION - "APP5 "
  AS   APP5  3911
  GR        0,763.4  17,752.3  26,750.8  28,750.8  31,750.5  34,750.6  48,751.6
  GR        59,753.3  64,757.9  75,762.1  88,762.4  200,767.9
  N         0.042

*** FINISH PROCESSING CROSS SECTION - "APP5 "
*** CROSS SECTION "APP5 " ADDED TO DAF, RECORD NO. =    7, IXTYPE =    5

--- DATA SUMMARY FOR SECID "APP5 " AT SRD =   3911.  ERR-CODE =      0

     SKEW     IHFNO    VSLOPE        EK        CK
      0.0         0    0.0000      0.50      0.00

X-Y COORDINATE PAIRS  (NGP =  12):
       X       Y          X       Y          X       Y          X       Y
      0.0  763.40       17.0  752.30       26.0  750.80       28.0  750.80
     31.0  750.50       34.0  750.60       48.0  751.60       59.0  753.30
     64.0  757.90       75.0  762.10       88.0  762.40      200.0  767.90

 X-Y MAX-MIN POINTS:
     XMIN       Y          X    YMIN       XMAX       Y          X    YMAX
      0.0  763.40       31.0  750.50      200.0  767.90      200.0  767.90

ROUGHNESS COEFFICIENTS (NSA =  1):
        0.042

BRIDGE PROJECTION DATA:  XREFLT  XREFRT  FDSTLT  FDSTRT
                        ******* ******* ******* *******
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WSPRO          FEDERAL HIGHWAY ADMINISTRATION - U. S. GEOLOGICAL SURVEY
V050286            MODEL  FOR  WATER-SURFACE  PROFILE  COMPUTATIONS

        HOLLY DRAIN FROM DSS MAPLE BRIDGE TO DSS LEAVER STREET
                    100 YEAR FLOOD
           *** RUN DATE & TIME: 07/22/86 07:16


*** START PROCESSING CROSS SECTION - "EXIT6"
  XS   EXIT6 4697
  GR        0,764.9  15,764.1  27,753.5  39,752.3  47,753.6  57,754.2  76,764.5
  N         0.044
  PX   EXIT4

*** FINISH PROCESSING CROSS SECTION - "EXIT6"
*** CROSS SECTION "EXIT6" ADDED TO DAF, RECORD NO. =    8, IXTYPE =    1

--- DATA SUMMARY FOR SECID "EXIT6" AT SRD =   4697.  ERR-CODE =      0

     SKEW     IHFNO    VSLOPE        EK        CK
      0.0         0    0.0000      0.50      0.00

X-Y COORDINATE PAIRS  (NGP =   7):
       X       Y          X       Y          X       Y          X       Y
      0.0  764 90       15.0  764.10       27.0  753.50       39.0  752.30
     47.0  753.60       57.0  754.20       76.0  764.50

 X-Y MAX-MIN POINTS:
     XMIN       Y          X    YMIN       XMAX       Y          X    YMAX
      0.0  764.90       39.0  752.30       76.0  764.50        0.0  764.90

ROUGHNESS COEFFICIENTS (NSA =  1):
        0.044
```

```
WSPRO          FEDERAL HIGHWAY ADMINISTRATION - U. S. GEOLOGICAL SURVEY
V050286            MODEL  FOR  WATER-SURFACE  PROFILE  COMPUTATIONS

        HOLLY DRAIN FROM DSS MAPLE BRIDGE TO DSS LEAVER STREET
                    100 YEAR FLOOD
           *** RUN DATE & TIME: 07/22/86 07:16


 XSID:CODE   SRDL    LEW     AREA   VHD    HF     EGL    CRWS       Q    WSEL
       SRD   FLEN    REW        K  ALPH    HO     ERR     FR#     VEL

EXIT4:XS   ******     0.     748.  0.05 *****  763.90  754.55   1290.  763.85
     3737. ******   118.   87844.  1.00 ***** *******    0.12    1.72

 ===140 AT SECID "NV 4 ":  END OF CROSS SECTION EXTENDED VERTICALLY.
                             WSEL,YLT,YRT =   763.86     763.40     767.90

NV 4 :FV      33.     0.     749.  0.05  0.01  763.90 *******   1290.  763.86
     3770.    33.   118.   87955.  1.00  0.00    0.00    0.12    1.72
         <<<<<THE ABOVE RESULTS REFLECT "NORMAL" (UNCONSTRICTED) FLOW>>>>>

 ===135 CONVEYANCE RATIO OUTSIDE OF RECOMMENDED LIMITS.
                             "APP4 "     KRATIO =  0.65

APP4 :AS      56.     0.     404.  0.16  0.02  763.98 *******   1290.  763.82
     3826.    56.    34.   56805.  1.00  0.06    0.00    0.16    3.19
         <<<<<THE ABOVE RESULTS REFLECT "NORMAL" (UNCONSTRICTED) FLOW>>>>>

            <<<<<RESULTS REFLECTING THE CONSTRICTED FLOW FOLLOW>>>>>

 XSID:CODE   SRDL    LEW     AREA   VHD    HF     EGL    CRWS       Q    WSEL
       SRD   FLEN    REW        K  ALPH    HO     ERR     FR#     VEL

MAPL :BR      33.     0.     324.  0.25  0.02  763.99  756.58   1290.  763.74
     3770.    33.    33.   41074.  1.00  0.08    0.00    0.22    3.98

     TYPE PPCD FLOW      C    P/A    LSEL   BLEN   XLAB   XRAB
       4. ****   1.  1.000 ******  764.60 ****** ****** ******

 XSID:CODE   SRDL    LEW     AREA   VHD    HF     EGL    CRWS       Q    WSEL
       SRD   FLEN    REW        K  ALPH    HO     ERR     FR#     VEL

APP4 :AS      32.     0.     406.  0.16  0.02  764.04  755.23   1290.  763.88
     3826.    32.    34.   57210.  1 00  0.03    0.01    0.16    3.18

       M(G)   M(K)       KQ   XLKQ   XRKQ    OTEL
      0.029  0.000   61218.     0.     33.   763.87

                     <<<<<END OF BRIDGE COMPUTATIONS>>>>>

 XSID:CODE   SRDL    LEW     AREA   VHD    HF     EGL    CRWS       Q    WSEL
       SRD   FLEN    REW        K  ALPH    HO     ERR     FR#     VEL

NV 5 :FV      39.     0.     407.  0.16  0.02  764.06 *******   1290.  763.90
     3865.    39.    34.   57361.  1.00  0.00    0.00    0.16    3.17
         <<<<<THE ABOVE RESULTS REFLECT "NORMAL" (UNCONSTRICTED) FLOW>>>>>

 ===135 CONVEYANCE RATIO OUTSIDE OF RECOMMENDED LIMITS.
                             "APP5 "     KRATIO =  1.57

 ===140 AT SECID "APP5 ":  END OF CROSS SECTION EXTENDED VERTICALLY.
                             WSEL,YLT,YRT =   764.03     763 40     767.90

APP5 :AS      46.     0.     770.  0.04  0.01  764.08 *******   1290.  764.03
     3911.    46.   121.   90258.  1.00  0.00    0.00    0.12    1.68
         <<<<<THE ABOVE RESULTS REFLECT "NORMAL" (UNCONSTRICTED) FLOW>>>>>

 ===255 ATTEMPTING FLOW CLASS 3 (6) SOLUTION.
                        WS3N,LSEL =   763.90     762.40
```

```
WSPRO          FEDERAL HIGHWAY ADMINISTRATION - U. S. GEOLOGICAL SURVEY
V050286            MODEL  FOR  WATER-SURFACE  PROFILE  COMPUTATIONS

        HOLLY DRAIN FROM DSS MAPLE BRIDGE TO DSS LEAVER STREET
                    100 YEAR FLOOD
           *** RUN DATE & TIME: 07/22/86 07:16

            <<<<<RESULTS REFLECTING THE CONSTRICTED FLOW FOLLOW>>>>>  ← Use

 XSID: CODE   SRDL    LEW     AREA   VHD    HF     EGL    CRWS       Q    WSEL
       SRD   FLEN    REW        K  ALPH    HO     ERR     FR#     VEL

RR    :BR      39.     19      343.  0.21 *****  762.61  755.35   1273.  762.40   M
     3865. ******     53.    34061.  1.00 ***** *******    0.21    3.71

     TYPE PPCD FLOW      C    P/A    LSEL   BLEN   XLAB   XRAB
       4.    1.    3.  0.800  0.035  762.40 ****** ****** ******

===140 AT SECID "APP5 ":  END OF CROSS SECTION EXTENDED VERTICALLY.
                            WSEL,YLT,YRT =   764.22      763.4      767.9

 XSID: CODE   SRDL    LEW     AREA   VHD    HF     EGL    CRWS       Q    WSEL
       SRD   FLEN    REW        K  ALPH    HO     ERR     FR#     VEL

APP5  :AS      34.      0.     792.  0.04  0.02  764.26  754.55   1290.  764.22   N
     3911.     36.    125.   92850.  1.00  0.00   -0.01    0.11    1.63

       M(Q)   M(K)       KQ   XLKQ   XRKQ    OTEL
     ****** ****** ******** ****** ******   764.21

                  <<<<<END OF BRIDGE COMPUTATIONS>>>>>

===135 CONVEYANCE RATIO OUTSIDE OF RECOMMENDED LIMITS.
                            "EXIT6"     KRATIO =  0.65

 XSID: CODE   SRDL    LEW     AREA   VHD    HF     EGL    CRWS       Q    WSEL
       SRD   FLEN    REW        K  ALPH    HO     ERR     FR#     VEL

EXIT6: XS     786.      9.     500.  0.10  0.23  764.52 *******   1290.  764.42   P
     4697.    786.     76.   60695.  1.00  0.03    0.00    0.17    2.58
  ER
```

```
WSPRO          FEDERAL HIGHWAY ADMINISTRATION - U. S. GEOLOGICAL SURVEY
V050286            MODEL  FOR  WATER-SURFACE  PROFILE  COMPUTATIONS

           *** RUN DATE & TIME:  07/22/86 07:18
  T1        HOLLY DRAIN FROM DSS LEAVER STREET TO US CORPORATE LIMITS
  T2                    100 YEAR FLOOD
  Q         1290.
*** Q-DATA FOR SEC-ID,  ISEQ =            1
  WS        764.42
```

```
WSPRO          FEDERAL HIGHWAY ADMINISTRATION - U. S. GEOLOGICAL SURVEY
V050286            MODEL  FOR  WATER-SURFACE  PROFILE  COMPUTATIONS

        HOLLY DRAIN FROM DSS LEAVER STREET TO US CORPORATE LIMITS
                    100 YEAR FLOOD
           *** RUN DATE & TIME:  07/22/86 07:18


*** START PROCESSING CROSS SECTION - "EXIT6"
  XS   EXIT6 4697
  GR        0,764.9  15,764.1  27,753.5  39,752.3  47,753.6  57,754.2  76,764.5
  N         0.044

*** FINISH PROCESSING CROSS SECTION - "EXIT6"
*** CROSS SECTION "EXIT6" ADDED TO DAF, RECORD NO. =    1, IXTYPE =    1

--- DATA SUMMARY FOR SECID "EXIT6" AT SRD =   4697.  ERR-CODE =      0

     SKEW     IHFNO    VSLOPE        EK        CK
      0.0         0    0.0000      0.50      0.00

X-Y COORDINATE PAIRS  (NGP =   7):
       X       Y          X       Y          X       Y          X       Y
      0.0  764.90       15.0  764.10       27.0  753.50       39.0  752.30
     47.0  753.60       57.0  754.20       76.0  764.50

 X-Y MAX-MIN POINTS:
     XMIN       Y          X    YMIN       XMAX       Y          X    YMAX
      0.0  764.90       39.0  752.30       76.0  764.50        0.0  764.90

ROUGHNESS COEFFICIENTS (NSA =  1):
0.044
```

```
WSPRO          FEDERAL HIGHWAY ADMINISTRATION - U. S. GEOLOGICAL SURVEY
V050286            MODEL  FOR  WATER-SURFACE  PROFILE  COMPUTATIONS

        HOLLY DRAIN FROM DSS LEAVER STREET TO US CORPORATE LIMITS
                    100 YEAR FLOOD
           *** RUN DATE & TIME: 07/22/86 07:18


*** START PROCESSING CROSS SECTION - "NV 6 "
  XS   NV 6 4752
  GR         0,764.9  15,764.1  27,753.5  39,752.3  47,753.6  57,754.2  76,764.5
  N          0.044

*** FINISH PROCESSING CROSS SECTION - "NV 6 "
*** CROSS SECTION "NV 6 " ADDED TO DAF, RECORD NO. =    2, IXTYPE =    1

--- DATA SUMMARY FOR SECID "NV 6 " AT SRD =   4752.  ERR-CODE =      0

     SKEW     IHFNO    VSLOPE        EK        CK
      0.0         0    0.0000      0.50      0.00

X-Y COORDINATE PAIRS  (NGP =   7):
       X       Y          X       Y          X       Y          X       Y
      0.0  764.90       15.0  764.10       27.0  753.50       39.0  752.30
     47.0  753 60       57.0  754.20       76.0  764.50

 X-Y MAX-MIN POINTS:
     XMIN       Y          X    YMIN       XMAX       Y          X    YMAX
      0.0  764.90       39.0  752.30       76.0  764.50       0.0  764.90

ROUGHNESS COEFFICIENTS (NSA =  1):
        0.044
```

```
WSPRO          FEDERAL HIGHWAY ADMINISTRATION - U. S. GEOLOGICAL SURVEY
V050286            MODEL  FOR  WATER-SURFACE  PROFILE  COMPUTATIONS

        HOLLY DRAIN FROM DSS LEAVER STREET TO US CORPORATE LIMITS
                   100 YEAR FLOOD
           *** RUN DATE & TIME: 07/22/86 07:18


*** START PROCESSING CROSS SECTION - "FRMRD"
  BR   FRMRD 4752  762.2
  GR         17,762.2  17,760.5  25,756 1  33,753 2  41,752.9  49,752.7  57,753.0
  GR         65,754.4  72,757.4  72,762.2  17,762.2
  N          0.030
  CD         4  17  1.0  765.0  30

*** FINISH PROCESSING CROSS SECTION - "FRMRD"
*** CROSS SECTION "FRMRD" ADDED TO DAF, RECORD NO. =    3, IXTYPE =    2

--- DATA SUMMARY FOR SECID "FRMRD" AT SRD =   4752.  ERR-CODE =      0

     SKEW     IHFNO    VSLOPE        EK        CK
      0.0         0    0.0000      0.50      0.00

X-Y COORDINATE PAIRS  (NGP =  11):
       X      Y          X      Y          X      Y          X      Y
     17.0  762.20      17.0  760.50      25.0  756.10      33.0  753.20
     41.0  752.90      49.0  752.70      57.0  753.00      65.0  754.40
     72.0  757.40      72.0  762.20      17.0  762.20

 X-Y MAX-MIN POINTS:
     XMIN       Y          X     YMIN      XMAX       Y          X     YMAX
     17.0  762.20      49.0  752.70      72.0  757.40      17.0  762.20

ROUGHNESS COEFFICIENTS (NSA =  1):
        0.030

BRIDGE PARAMETERS:
 BRTYPE  BRWDTH     LSEL  USERCD  EMBSS   EMBELV  WWANGL
    4      17.0   762.20 *******   1.00   765.00   30.00

PIER DATA:  NPW =  0   PCODE = **
```

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WSPRO          FEDERAL HIGHWAY ADMINISTRATION - U. S. GEOLOGICAL SURVEY
V050286            MODEL  FOR  WATER-SURFACE  PROFILE  COMPUTATIONS

        HOLLY DRAIN FROM DSS LEAVER STREET TO US CORPORATE LIMITS
                   100 YEAR FLOOD
           *** RUN DATE & TIME: 07/22/86 07:18


*** START PROCESSING CROSS SECTION - "APP6 "
  AS   APP6  4825
  GR         0,764.9  15,764.1  27,753.5  39,752.3  47,753.6  57,754.2  76,764.5
  N          0.044

*** FINISH PROCESSING CROSS SECTION - "APP6 "
*** CROSS SECTION "APP6 " ADDED TO DAF, RECORD NO. =    4, IXTYPE =    5

--- DATA SUMMARY FOR SECID "APP6 " AT SRD =   4825.  ERR-CODE =      0

     SKEW     IHFNO    VSLOPE        EK        CK
      0.0         0    0.0000      0.50      0.00

X-Y COORDINATE PAIRS  (NGP =   7):
       X      Y          X      Y          X      Y          X      Y
      0.0  764.90      15.0  764.10      27.0  753.50      39.0  752.30
     47.0  753.60      57.0  754.20      76.0  764.50

 X-Y MAX-MIN POINTS:
     XMIN      Y          X    YMIN      XMAX      Y          X    YMAX
      0.0  764.90      39.0  752.30      76.0  764.50       0.0  764.90

ROUGHNESS COEFFICIENTS (NSA =  1):
        0.044

BRIDGE PROJECTION DATA:  XREFLT  XREFRT  FDSTLT  FDSTRT
                        ******* ******* ******* *******
```

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WSPRO          FEDERAL HIGHWAY ADMINISTRATION - U. S. GEOLOGICAL SURVEY
V050286            MODEL  FOR  WATER-SURFACE  PROFILE  COMPUTATIONS

        HOLLY DRAIN FROM DSS LEAVER STREET TO US CORPORATE LIMITS
                    100 YEAR FLOOD
           *** RUN DATE & TIME: 07/22/86 07:18


*** START PROCESSING CROSS SECTION - "LAST "
  XS   LAST  5250  *   *   *   3.32E-04
  PX   EXIT6

*** FINISH PROCESSING CROSS SECTION - "LAST "
*** CROSS SECTION "LAST " ADDED TO DAF, RECORD NO. =    5, IXTYPE =    1

--- DATA SUMMARY FOR SECID "LAST " AT SRD =   5250.  ERR-CODE =      0

     SKEW     IHFNO    VSLOPE        EK        CK
      0.0         0    0.0003      0.50      0.00

X-Y COORDINATE PAIRS  (NGP =   7):
       X      Y          X      Y          X      Y          X      Y
      0.0  765.04      15.0  764.24      27.0  753.64      39.0  752.44
     47.0  753.74      57.0  754.34      76.0  764.64

 X-Y MAX-MIN POINTS:
     XMIN      Y          X    YMIN      XMAX      Y          X    YMAX
      0.0  765.04      39.0  752.44      76.0  764.64       0.0  765.04

ROUGHNESS COEFFICIENTS (NSA =  1):
        0.044
```

```
WSPRO          FEDERAL HIGHWAY ADMINISTRATION - U. S. GEOLOGICAL SURVEY
V050286            MODEL  FOR  WATER-SURFACE  PROFILE  COMPUTATIONS

        HOLLY DRAIN FROM DSS LEAVER STREET TO US CORPORATE LIMITS
                    100 YEAR FLOOD
           *** RUN DATE & TIME: 07/22/86 07:18


 XSID:CODE   SRDL    LEW     AREA   VHD    HF     EGL    CRWS       Q    WSEL
       SRD   FLEN    REW        K  ALPH    HO     ERR     FR#     VEL

EXIT6:XS   ******     9.     500.  0.10 *****  764.52  757.00   1290.  764.42
     4697. ******    76.   60695.  1.00 ***** *******    0.17    2.58

NV 6 :FV      55.     8.     502.  0.10  0.02  764.55 *******   1290.  764.45
     4752.    55.    76.   60756.  1.00  0.00    0.00    0.17    2.57
         <<<<<THE ABOVE RESULTS REFLECT "NORMAL" (UNCONSTRICTED) FLOW>>>>>

APP6 :AS      73.     8.     504.  0.10  0.03  764.59 *******   1290.  764.48
     4825.    73.    76.   60841.  1.00  0.00    0.00    0.17    2.56
         <<<<<THE ABOVE RESULTS REFLECT "NORMAL" (UNCONSTRICTED) FLOW>>>>>

 ===255 ATTEMPTING FLOW CLASS 3 (6) SOLUTION.
                       WS3N,LSEL =   764.45     762.20

           <<<<<RESULTS REFLECTING THE CONSTRICTED FLOW FOLLOW>>>>>

 XSID:CODE   SRDL    LEW     AREA   VHD    HF     EGL    CRWS       Q    WSEL
       SRD   FLEN    REW        K  ALPH    HO     ERR     FR#     VEL

FRMRD:BR      55.    17.     427.  0.14 *****  762.34  756.61   1293.  762.20
     4752. ******    72.   49718.  1.00 ***** *******    0.19    3.03

     TYPE PPCD FLOW      C    P/A    LSEL   BLEN   XLAB   XRAB
       4. ****   3.  0.800 ******  762.20 ****** ****** ******

===140 AT SECID "APP6 ":  END OF CROSS SECTION EXTENDED VERTICALLY.
                            WSEL,YLT,YRT =   764.60      764.9      764.5

 XSID:CODE   SRDL    LEW     AREA   VHD    HF     EGL    CRWS       Q    WSEL
       SRD   FLEN    REW        K  ALPH    HO     ERR     FR#     VEL

APP6 :AS      56.     6.     513.  0.10  0.03  764.70  757.00   1290.  764.60
     4825.    57.    76.   61224.  1.00  0.00    0.00    0.16    2.52

       M(G)   M(K)       KQ   XLKQ   XRKQ    OTEL
     ****** ************** ****** ******   764.58

                   <<<<<END OF BRIDGE COMPUTATIONS>>>>>

 ===140 AT SECID "LAST ":  END OF CROSS SECTION EXTENDED VERTICALLY.
                            WSEL,YLT,YRT =   764.79     765.04     764.64

 XSID:CODE   SRDL    LEW     AREA   VHD    HF     EGL    CRWS       Q    WSEL
       SRD   FLEN    REW        K  ALPH    HO     ERR     FR#     VEL

LAST :XS     425.     5.     516.  0.10  0.19  764.89 *******   1290.  764.79
     5250.   425.    76.   61410.  1.00  0.00    0.00    0.16    2.50
  ER
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WSPRO          FEDERAL HIGHWAY ADMINISTRATION - U. S. GEOLOGICAL SURVEY
V050286            MODEL  FOR  WATER-SURFACE  PROFILE  COMPUTATIONS

           *** RUN DATE & TIME:  07/24/86 11:36
  T1         VILLAGE OF VERNON LESS-DETAILED FLOOD INSURANCE STUDY
  T2         SHIAWASSEE RIVER FROM DS OF M-71 TO DS OF RAILROAD BRIDGE
  T3                          100-YR FLOOD
  Q         5450.
*** Q-DATA FOR SEC-ID, ISEQ =            1
  *  STARTING ELEVATION BASED ON SLOPE CONVEYANCE METHODOLOGY
  SK        6.6E-04
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00064

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WSPRO          FEDERAL HIGHWAY ADMINISTRATION - U. S. GEOLOGICAL SURVEY
V050286            MODEL  FOR  WATER-SURFACE  PROFILE  COMPUTATIONS

         VILLAGE OF VERNON LESS-DETAILED FLOOD INSURANCE STUDY
         SHIAWASSEE RIVER FROM DS OF M-71 TO DS OF RAILROAD BRIDGE
                         100-YR FLOOD
           *** RUN DATE & TIME: 07/24/86 11:36


*** START PROCESSING CROSS SECTION - "TMPLT"
  XT   TMPLT 89100
  GR        0,763.3                          368,760.0  438,757.9  481,756.7
  GR        516,757.4  520,753.7  522,752.3  532,751.5  542,751.0  552,750.9
  GR        562,750.8  572,750.9  582,751.0  592,751.1  602,751.3  612,751.3
  GR        622,752.2  628,753.3  631,753.7  633,754.8  654,757.8  692,759.3
  GR        720,763.9

*** FINISH PROCESSING CROSS SECTION - "TMPLT"
*** TEMPLATE CROSS SECTION "TMPLT" SAVED INTERNALLY.
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WSPRO          FEDERAL HIGHWAY ADMINISTRATION - U. S. GEOLOGICAL SURVEY
V050286            MODEL  FOR  WATER-SURFACE  PROFILE  COMPUTATIONS

         VILLAGE OF VERNON LESS-DETAILED FLOOD INSURANCE STUDY
         SHIAWASSEE RIVER FROM DS OF M-71 TO DS OF RAILROAD BRIDGE
                          100-YR FLOOD
           *** RUN DATE & TIME: 07/24/86 11:36


*** START PROCESSING CROSS SECTION - "M71NV"
  XS   M71NV 89100
  GT              -0.1
  N          0.072  0.040  0.105
  SA         516  654

*** FINISH PROCESSING CROSS SECTION - "M71NV"
*** CROSS SECTION "M71NV" ADDED TO DAF, RECORD NO. =    1, IXTYPE =    1

--- DATA SUMMARY FOR SECID "M71NV" AT SRD =  89100.  ERR-CODE =      0

     SKEW     IHFNO    VSLOPE        EK        CK
      0.0         0    0.0000      0.50      0.00

X-Y COORDINATE PAIRS  (NGP =  23):
       X      Y          X      Y          X      Y          X      Y
     0.0  763.20     368.0  759.90     438.0  757.80     481.0  756.60
   516.0  757.30     520.0  753.60     522.0  752.20     532.0  751.40
   542.0  750.90     552.0  750.80     562.0  750.70     572.0  750.80
   582.0  750.90     592.0  751.00     602.0  751.20     612.0  751.20
   622.0  752.10     628.0  753.20     631.0  753.60     633.0  754.70
   654.0  757.70     692.0  759.20     720.0  763.80

 X-Y MAX-MIN POINTS:
     XMIN       Y          X    YMIN      XMAX       Y          X    YMAX
      0.0  763.20     562.0  750.70     720.0  763.80     720.0  763.80

SUBAREA BREAKPOINTS (NSA =  3):
        516.     654.

ROUGHNESS COEFFICIENTS (NSA =  3):
        0.072   0.040   0.105
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WSPRO          FEDERAL HIGHWAY ADMINISTRATION - U. S. GEOLOGICAL SURVEY
V050286            MODEL  FOR  WATER-SURFACE  PROFILE  COMPUTATIONS

         VILLAGE OF VERNON LESS-DETAILED FLOOD INSURANCE STUDY
         SHIAWASSEE RIVER FROM DS OF M-71 TO DS OF RAILROAD BRIDGE
                          100-YR FLOOD
           *** RUN DATE & TIME: 07/24/86 11:36


*** START PROCESSING CROSS SECTION - "M71E "
  XS   M71E  89200
  GT

*** FINISH PROCESSING CROSS SECTION - "M71E "
*** CROSS SECTION "M71E " ADDED TO DAF, RECORD NO. =    2, IXTYPE =    1

--- DATA SUMMARY FOR SECID "M71E " AT SRD =  89200.   ERR-CODE =      0

     SKEW      IHFNO     VSLOPE        EK        CK
      0.0          0     0.0000      0.50      0.00

X-Y COORDINATE PAIRS  (NGP =  23):
       X       Y          X       Y          X       Y          X       Y
     0.0  763.30      368.0  760.00      438.0  757.90      481.0  756.70
   516.0  757.40      520.0  753.70      522.0  752.30      532.0  751.50
   542.0  751.00      552.0  750.90      562.0  750.80      572.0  750.90
   582.0  751.00      592.0  751.10      602.0  751.30      612.0  751.30
   622.0  752.20      628.0  753.30      631.0  753.70      633.0  754.80
   654.0  757.80      692.0  759.30      720.0  763.90

 X-Y MAX-MIN POINTS:
     XMIN       Y          X    YMIN       XMAX       Y          X    YMAX
      0.0  763.30      562.0  750.80      720.0  763.90      720.0  763.90

 SUBAREA BREAKPOINTS (NSA =  3):
         516.     654.

 ROUGHNESS COEFFICIENTS (NSA =  3):
         0.072   0.040   0.105
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WSPRO          FEDERAL HIGHWAY ADMINISTRATION - U. S. GEOLOGICAL SURVEY
V050286            MODEL  FOR  WATER-SURFACE  PROFILE  COMPUTATIONS

         VILLAGE OF VERNON LESS-DETAILED FLOOD INSURANCE STUDY
         SHIAWASSEE RIVER FROM DS OF M-71 TO DS OF RAILROAD BRIDGE
                          100-YR FLOOD
           *** RUN DATE & TIME: 07/24/86 11:36


*** START PROCESSING CROSS SECTION - "M71B "
  BR   M71B  89200  762.2
  GR          522.0,762.2  522.0,752.2    530.2,751.8    539.4,751.2
  GR          548.5,751.0  557.7,750.7    566.9,750.4    569.6,750.0
  GR          576.6,750.0  579.4,750.3    588.7,750.9    598.1,751.2
  GR          605.4,751.2  616.7,751.1    624.0,752.6    624.0,762.2
  GR          522.0,762.2
  N           .027
  CD          4,56,1.0,768.,0.,10.0,0.
  PW 0        750.0,7.0   762.2,7.0

*** FINISH PROCESSING CROSS SECTION - "M71B "
*** CROSS SECTION "M71B " ADDED TO DAF, RECORD NO. =    3, IXTYPE =    2

--- DATA SUMMARY FOR SECID "M71B " AT SRD =  89200.  ERR-CODE =      0

     SKEW     IHFNO    VSLOPE        EK        CK
      0.0         0    0.0000      0.50      0.00

X-Y COORDINATE PAIRS (NGP =  17):
       X       Y          X       Y          X       Y          X       Y
   522.0  762.20      522.0  752.20      530.2  751.80      539.4  751.20
   548.5  751.00      557.7  750.70      566.9  750.40      569.6  750.00
   576.6  750.00      579.4  750.30      588.7  750.90      598.1  751.20
   605.4  751.20      616.7  751.10      624.0  752.60      624.0  762.20
   522.0  762.20

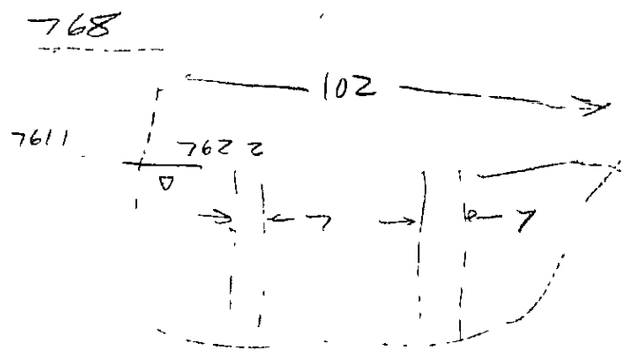
 X-Y MAX-MIN POINTS:
     XMIN       Y          X    YMIN       XMAX       Y          X    YMAX
   522.0  762.20      569.6  750.00      624.0  752.60      522.0  762.20

SUBAREA BREAKPOINTS (NSA =  3):
        516.     654.

ROUGHNESS COEFFICIENTS (NSA =  3):
        0.027   0.027   0.027

BRIDGE PARAMETERS:
 BRTYPE  BRWDTH     LSEL  USERCD  EMBSS   EMBELV  WWANGL
    4      56.0   762.20 *******   1.00   768.00    0.00

PIER DATA:  NPW =  2   PCODE = 0.
     PELV  PWDTH      PELV  PWDTH      PELV  PWDTH      PELV  PWDTH
   750.00   7.0     762.20   7.0
```



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WSPRO          FEDERAL HIGHWAY ADMINISTRATION - U. S. GEOLOGICAL SURVEY
V050286            MODEL  FOR  WATER-SURFACE  PROFILE  COMPUTATIONS

         VILLAGE OF VERNON LESS-DETAILED FLOOD INSURANCE STUDY
         SHIAWASSEE RIVER FROM DS OF M-71 TO DS OF RAILROAD BRIDGE
                          100-YR FLOOD
           *** RUN DATE & TIME: 07/24/86 11:36

*** START PROCESSING CROSS SECTION - "M71RD"
  XR   M71RD    89230   40  1
  GR          0,780.   650.,770.   750.,766.8  790.,766.8  975.,770.   1725.,780.

*** FINISH PROCESSING CROSS SECTION - "M71RD"
*** CROSS SECTION "M71RD" ADDED TO DAF, RECORD NO. =    4, IXTYPE =    4

--- DATA SUMMARY FOR SECID "M71RD" AT SRD =  89230.  ERR-CODE =      0

     SKEW      IHFNO    VSLOPE        EK        CK
      0.0          0    0.0000      0.50      0.00

X-Y COORDINATE PAIRS  (NGP =   6):
       X       Y          X       Y          X       Y          X       Y
      0.0  780.00     650.0  770.00     750.0  766.80     790.0  766.80
    975.0  770.00    1725.0  780.00

 X-Y MAX-MIN POINTS:
     XMIN       Y          X    YMIN      XMAX       Y          X    YMAX
      0.0  780.00     750.0  766.80    1725.0  780.00        0.0  780.00

SUBAREA BREAKPOINTS (NSA =  3):
        516.     654.

ROUGHNESS COEFFICIENTS (NSA =  3):
        0.072   0.040   0.105

ROAD GRADE DATA:   IPAVE  RDWID  USERCF
                      1.    40.0 *******

BRIDGE PROJECTION DATA:  XREFLT  XREFRT  FDSTLT  FDSTRT
                        ******* ******* ******* *******
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WSPRO          FEDERAL HIGHWAY ADMINISTRATION - U. S. GEOLOGICAL SURVEY
V050286            MODEL  FOR  WATER-SURFACE  PROFILE  COMPUTATIONS

         VILLAGE OF VERNON LESS-DETAILED FLOOD INSURANCE STUDY
         SHIAWASSEE RIVER FROM DS OF M-71 TO DS OF RAILROAD BRIDGE
                          100-YR FLOOD
           *** RUN DATE & TIME: 07/24/86 11:36


*** START PROCESSING CROSS SECTION - "M71A "
  AS   M71A 89350
  GR        0,763.3                          368,760.0  438,757.9  481,756.7
  GR        516,757.4  520,753.7  522,752.3  532,751.5  542,751.0  552,750.9
  GR        562,750.8  572,750.9  582,751.0  592,751.1  602,751.3  612,751.3
  GR        622,752.2  628,753.3  631,753.7  633,754.8  654,757.8  692,759.3
  GR        720,763.9
  N         0.072  0.040  0.105
  SA        516  654

*** FINISH PROCESSING CROSS SECTION - "M71A "
*** CROSS SECTION "M71A " ADDED TO DAF, RECORD NO. =    5, IXTYPE =    5

--- DATA SUMMARY FOR SECID "M71A " AT SRD =  89350.  ERR-CODE =      0

     SKEW     IHFNO    VSLOPE        EK        CK
      0.0         0    0.0000      0.50      0.00

X-Y COORDINATE PAIRS  (NGP =  23):
       X       Y          X       Y          X       Y          X       Y
     0.0  763.30      368.0  760.00      438.0  757.90      481.0  756.70
   516.0  757.40      520.0  753.70      522.0  752.30      532.0  751.50
   542.0  751.00      552.0  750.90      562.0  750.80      572.0  750.90
   582.0  751.00      592.0  751.10      602.0  751.30      612.0  751.30
   622.0  752.20      628.0  753.30      631.0  753.70      633.0  754.80
   654.0  757.80      692.0  759.30      720.0  763.90

 X-Y MAX-MIN POINTS:
     XMIN       Y          X    YMIN       XMAX       Y          X    YMAX
      0.0  763.30      562.0  750.80      720.0  763.90      720.0  763.90

SUBAREA BREAKPOINTS (NSA =  3):
        516.     654.

ROUGHNESS COEFFICIENTS (NSA =  3):
        0.072   0.040   0.105

BRIDGE PROJECTION DATA:  XREFLT  XREFRT  FDSTLT  FDSTRT
                        ******* ******* ******* *******
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WSPRO          FEDERAL HIGHWAY ADMINISTRATION - U. S. GEOLOGICAL SURVEY
V050286            MODEL  FOR  WATER-SURFACE  PROFILE  COMPUTATIONS

         VILLAGE OF VERNON LESS-DETAILED FLOOD INSURANCE STUDY
         SHIAWASSEE RIVER FROM DS OF M-71 TO DS OF RAILROAD BRIDGE
                          100-YR FLOOD
           *** RUN DATE & TIME: 07/24/86 11:36


*** START PROCESSING CROSS SECTION - "PAREX"
  XS   PAREX  90500
  GR         -230,765.0
  GR         -100,760.7 200,760.7 251,758.7  256,757.9  262,752.8  278,752.0
  GR         294,751.4  311,750.6  314,750.7  328,751.4  344,751.6  351,751.7
  GR         369,754.5  373,756.8  386,758.8  462,762.4  500,766.2
  N          0.072  0.040  0.100
  SA         256  386

*** FINISH PROCESSING CROSS SECTION - "PAREX"
*** CROSS SECTION "PAREX" ADDED TO DAF, RECORD NO. =    6, IXTYPE =    1

--- DATA SUMMARY FOR SECID "PAREX" AT SRD =  90500.  ERR-CODE =      0

     SKEW     IHFNO    VSLOPE        EK        CK
      0.0         0    0.0000      0.50      0.00

X-Y COORDINATE PAIRS  (NGP =  18):
       X       Y          X       Y          X       Y          X       Y
   -230.0  765.00     -100.0  760.70     200.0  760.70     251.0  758.70
    256.0  757.90      262.0  752.80     278.0  752.00     294.0  751.40
    311.0  750.60      314.0  750.70     328.0  751.40     344.0  751.60
    351.0  751.70      369.0  754.50     373.0  756.80     386.0  758.80
    462.0  762.40      500.0  766.20

  X-Y MAX-MIN POINTS:
      XMIN       Y          X    YMIN      XMAX       Y          X    YMAX
   -230.0  765.00      311.0  750.60     500.0  766.20     500.0  766.20

SUBAREA BREAKPOINTS (NSA =  3):
        256.     386.

ROUGHNESS COEFFICIENTS (NSA =  3):
        0.072    0.040    0.100
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WSPRO          FEDERAL HIGHWAY ADMINISTRATION - U. S. GEOLOGICAL SURVEY
V050286            MODEL  FOR  WATER-SURFACE  PROFILE  COMPUTATIONS

         VILLAGE OF VERNON LESS-DETAILED FLOOD INSURANCE STUDY
         SHIAWASSEE RIVER FROM DS OF M-71 TO DS OF RAILROAD BRIDGE
                          100-YR FLOOD
           *** RUN DATE & TIME: 07/24/86 11:36


*** START PROCESSING CROSS SECTION - "PARNV"
  XS   PARNV  90590  *     *     *     0.

*** FINISH PROCESSING CROSS SECTION - "PARNV"
*** CROSS SECTION "PARNV" ADDED TO DAF, RECORD NO. =    7, IXTYPE =    1

--- DATA SUMMARY FOR SECID "PARNV" AT SRD =  90590.  ERR-CODE =      0

     SKEW     IHFNO    VSLOPE        EK        CK
      0.0         0    0.0000      0.50      0.00

X-Y COORDINATE PAIRS  (NGP =  18)
        X      Y          X      Y          X      Y          X      Y
   -230.0  765.00    -100.0  760.70     200.0  760.70     251.0  758.70
    256.0  757.90     262.0  752.80     278.0  752.00     294.0  751.40
    311.0  750.60     314.0  750.70     328.0  751.40     344.0  751.60
    351.0  751.70     369.0  754.50     373.0  756.80     386.0  758.80
    462.0  762.40     500.0  766.20

 X-Y MAX-MIN POINTS:
     XMIN      Y          X    YMIN      XMAX      Y          X    YMAX
   -230.0  765.00     311.0  750.60     500.0  766.20     500.0  766.20

SUBAREA BREAKPOINTS (NSA =  3):
        256.     386.

ROUGHNESS COEFFICIENTS (NSA =  3):
        0.072   0.040   0.100
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WSPRO          FEDERAL HIGHWAY ADMINISTRATION - U. S. GEOLOGICAL SURVEY
V050286            MODEL  FOR  WATER-SURFACE  PROFILE  COMPUTATIONS

         VILLAGE OF VERNON LESS-DETAILED FLOOD INSURANCE STUDY
         SHIAWASSEE RIVER FROM DS OF M-71 TO DS OF RAILROAD BRIDGE
                          100-YR FLOOD
           *** RUN DATE & TIME: 07/24/86 11:36


*** START PROCESSING CROSS SECTION - "PARBR"
  BR    PARBR  90590  765.4
  GR          260,765.4    260,753.6     270,753.1    280,753.0    290,752.6
  GR         300,752.3   310,752.3     320,751.9    330,751.5    340,752.3
  GR         347,753.5   347,755.6     348,755.6    348,757.9    350,757.9
  GR         350,765.4    260,765.4
  N          0.033
  CD         4,18,0,0,45,0,0

*** FINISH PROCESSING CROSS SECTION - "PARBR"
*** CROSS SECTION "PARBR" ADDED TO DAF, RECORD NO. =    8, IXTYPE =    2

--- DATA SUMMARY FOR SECID "PARBR" AT SRD =  90590.  ERR-CODE =      0

     SKEW     IHFNO    VSLOPE        EK        CK
      0.0         0    0.0000      0.50      0.00

X-Y COORDINATE PAIRS  (NGP =  17):
       X       Y          X       Y          X       Y          X       Y
    260.0  765.40     260.0  753.60     270.0  753.10     280.0  753.00
    290.0  752.60     300.0  752.30     310.0  752.30     320.0  751.90
    330.0  751.50     340.0  752.30     347.0  753.50     347.0  755.60
    348.0  755.60     348.0  757.90     350.0  757.90     350.0  765.40
    260.0  765.40

 X-Y MAX-MIN POINTS:
     XMIN       Y          X    YMIN      XMAX       Y          X    YMAX
    260.0  765.40     330.0  751.50     350.0  757.90     260.0  765.40

SUBAREA BREAKPOINTS (NSA =  3):
        256.     386.

ROUGHNESS COEFFICIENTS (NSA =  3):
        0.033   0.033   0.033

BRIDGE PARAMETERS:
 BRTYPE  BRWDTH     LSEL  USERCD  EMBSS   EMBELV  WWANGL
    4      18.0   765.40 *******   0.00     0.00   45.00

PIER DATA:  NPW =  0   PCODE = **
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WSPRO          FEDERAL HIGHWAY ADMINISTRATION - U. S. GEOLOGICAL SURVEY
V050286            MODEL  FOR  WATER-SURFACE  PROFILE  COMPUTATIONS

         VILLAGE OF VERNON LESS-DETAILED FLOOD INSURANCE STUDY
         SHIAWASSEE RIVER FROM DS OF M-71 TO DS OF RAILROAD BRIDGE
                          100-YR FLOOD
           *** RUN DATE & TIME: 07/24/86 11:36


*** START PROCESSING CROSS SECTION - "PARRD"
  XR   PARRD  90600  16.    1
  GR          -500,780.   -300.,770.       0.,761.0   100.,762.3   300.,766.3
  GR         450,770.    550.,780.

*** FINISH PROCESSING CROSS SECTION - "PARRD"
*** CROSS SECTION "PARRD" ADDED TO DAF, RECORD NO. =    9, IXTYPE =    4

--- DATA SUMMARY FOR SECID "PARRD" AT SRD =  90600.  ERR-CODE =      0

     SKEW     IHFNO    VSLOPE        EK        CK
      0.0         0    0.0000      0.50      0.00

X-Y COORDINATE PAIRS  (NGP =   7):
       X       Y          X       Y          X       Y          X       Y
   -500.0  780.00    -300.0  770.00       0.0  761.00     100.0  762.30
    300.0  766.30     450.0  770.00     550.0  780.00

 X-Y MAX-MIN POINTS:
     XMIN       Y          X    YMIN      XMAX       Y          X    YMAX
   -500.0  780.00       0.0  761.00     550.0  780.00    -500.0  780.00

SUBAREA BREAKPOINTS (NSA =  3):
        256.     386.

ROUGHNESS COEFFICIENTS (NSA =  3):
        0.072   0.040   0.100

ROAD GRADE DATA:   IPAVE  RDWID  USERCF
                      1.   16.0 *******

BRIDGE PROJECTION DATA:  XREFLT  XREFRT  FDSTLT  FDSTRT
                        ******* ******* ******* *******
```

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WSPRO          FEDERAL HIGHWAY ADMINISTRATION - U. S. GEOLOGICAL SURVEY
V050286            MODEL  FOR  WATER-SURFACE  PROFILE  COMPUTATIONS

         VILLAGE OF VERNON LESS-DETAILED FLOOD INSURANCE STUDY
         SHIAWASSEE RIVER FROM DS OF M-71 TO DS OF RAILROAD BRIDGE
                          100-YR FLOOD
           *** RUN DATE & TIME: 07/24/86 11:36


*** START PROCESSING CROSS SECTION - "HLDR "
  AS   HLDR 90700
  GR        -230,765.0
  GR        -100,760.7 200,760.7   251,758.7  256,757.9  262,752.8  278,752.0
  GR        294,751.4  311,750.6  314,750.7  328,751.4  344,751.6  351,751.7
  GR        369,754.5  373,756.8  386,758.8  462,762.4  500,766.2
  N         0.072  0.040  0.100
  SA        256  386

*** FINISH PROCESSING CROSS SECTION - "HLDR "
*** CROSS SECTION "HLDR " ADDED TO DAF, RECORD NO. =   10, IXTYPE =    5

--- DATA SUMMARY FOR SECID "HLDR " AT SRD =  90700.  ERR-CODE =      0

     SKEW      IHFNO     VSLOPE        EK        CK
      0.0          0     0.0000      0.50      0.00

X-Y COORDINATE PAIRS  (NGP =  18):
        X       Y           X       Y           X       Y           X       Y
   -230.0  765.00     -100.0  760.70      200.0  760.70      251.0  758.70
    256.0  757.90      262.0  752.80      278.0  752.00      294.0  751.40
    311.0  750.60      314.0  750.70      328.0  751.40      344.0  751.60
    351.0  751.70      369.0  754.50      373.0  756.80      386.0  758.80
    462.0  762.40      500.0  766.20

  X-Y MAX-MIN POINTS:
     XMIN       Y           X    YMIN       XMAX       Y           X    YMAX
   -230.0  765.00      311.0  750.60      500.0  766.20      500.0  766.20

SUBAREA BREAKPOINTS (NSA =  3):
        256.     386.

ROUGHNESS COEFFICIENTS (NSA =  3):
        0.072   0.040   0.100

BRIDGE PROJECTION DATA:  XREFLT  XREFRT  FDSTLT  FDSTRT
                        ******* ******* ******* *******
```

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WSPRO          FEDERAL HIGHWAY ADMINISTRATION - U. S. GEOLOGICAL SURVEY
V050286            MODEL  FOR  WATER-SURFACE  PROFILE  COMPUTATIONS

         VILLAGE OF VERNON LESS-DETAILED FLOOD INSURANCE STUDY
         SHIAWASSEE RIVER FROM DS OF M-71 TO DS OF RAILROAD BRIDGE
                          100-YR FLOOD
           *** RUN DATE & TIME: 07/24/86 11:36


*** START PROCESSING CROSS SECTION - "RR EX"
  XS   RR EX  91100  *    *    *    6.6E-04
  PX   M71NV

*** FINISH PROCESSING CROSS SECTION - "RR EX"
*** CROSS SECTION "RR EX" ADDED TO DAF, RECORD NO. =   11, IXTYPE =    1

--- DATA SUMMARY FOR SECID "RR EX" AT SRD =  91100.  ERR-CODE =      0

     SKEW     IHFNO    VSLOPE        EK        CK
      0.0         0    0.0007      0.50      0.00

X-Y COORDINATE PAIRS  (NGP =  18):
       X      Y          X      Y          X      Y          X      Y
   -230.0  765.26    -100.0  760.96     200.0  760.96     251.0  758.96
    256.0  758.16     262.0  753.06     278.0  752.26     294.0  751.66
    311.0  750.86     314.0  750.96     328.0  751.66     344.0  751.86
    351.0  751.96     369.0  754.76     373.0  757.06     386.0  759.06
    462.0  762.66     500.0  766.46

 X-Y MAX-MIN POINTS:
     XMIN       Y          X    YMIN      XMAX       Y          X    YMAX
   -230.0  765.26     311.0  750.86     500.0  766.46     500.0  766.46

SUBAREA BREAKPOINTS (NSA =  3):
        256.     386.

ROUGHNESS COEFFICIENTS (NSA =  3):
        0.072   0.040   0.100
```

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WSPRO          FEDERAL HIGHWAY ADMINISTRATION - U. S. GEOLOGICAL SURVEY
V050286            MODEL  FOR  WATER-SURFACE  PROFILE  COMPUTATIONS

         VILLAGE OF VERNON LESS-DETAILED FLOOD INSURANCE STUDY
         SHIAWASSEE RIVER FROM DS OF M-71 TO DS OF RAILROAD BRIDGE
                          100-YR FLOOD
           *** RUN DATE & TIME: 07/24/86 11:36


 XSID:CODE   SRDL    LEW     AREA   VHD    HF     EGL    CRWS       Q    WSEL
       SRD   FLEN    REW        K  ALPH    HO     ERR     FR#     VEL

M71NV:XS   ******   241.    1865.  0.23 *****  761.27  755.57   5450.  761.04
    89100. ******   703.  212049.  1.74 ***** *******    0.34    2.92

M71E :FV     100.   244.    1852.  0.23  0.07  761.35 *******   5450.  761.12
    89200.   100.   703.  210743.  1.74  0.00    0.01    0.34    2.94
         <<<<<THE ABOVE RESULTS REFLECT "NORMAL" (UNCONSTRICTED) FLOW>>>>>

M71A :AS     150.   231.    1905.  0.22  0.10  761.45 *******   5450.  761.23
    89350.   150.   704.  216199.  1.77  0.00    0.01    0.33    2.86
         <<<<<THE ABOVE RESULTS REFLECT "NORMAL" (UNCONSTRICTED) FLOW>>>>>

            <<<<<RESULTS REFLECTING THE CONSTRICTED FLOW FOLLOW>>>>>

 XSID:CODE   SRDL    LEW     AREA   VHD    HF     EGL    CRWS       Q    WSEL
       SRD   FLEN    REW        K  ALPH    HO     ERR     FR#     VEL

M71B :BR     100.   522.    1011.  0.52  0.08  761.46  755.78   5450.  760.93
    89200.   100.   624.  231700.  1.16  0.10   -0.01    0.32    5.39

    TYPE PPCD FLOW      C    P/A   LSEL   BLEN   XLAB   XRAB
      4.   0.    1.  0.930  0.076 762.20 ****** ****** ******

    XSID:CODE    SRD   FLEN    HF    VHD     EGL     ERR       Q    WSEL
   M71RD:RG   89230.         <<<<<EMBANKMENT IS NOT OVERTOPPED>>>>>

 XSID:CODE   SRDL    LEW     AREA   VHD    HF     EGL    CRWS       Q    WSEL
       SRD   FLEN    REW        K  ALPH    HO     ERR     FR#     VEL

M71A :AS      94.   218.    1963.  0.22  0.08  761.56  755.67   5450.  761.35
    89350.   101.   704.  222173.  1.80  0.03    0.01    0.33    2.78

       M(G)   M(K)       KQ   XLKQ   XRKQ    OTEL
      0.784  0.192  178970.   521.   623.   761.28

                     <<<<<END OF BRIDGE COMPUTATIONS>>>>>

 XSID:CODE   SRDL    LEW     AREA   VHD    HF     EGL    CRWS       Q    WSEL
       SRD   FLEN    REW        K  ALPH    HO     ERR     FR#     VEL

PAREX:XS    1150.  -141.    1904.  0.24  0.71  762.29 *******   5450.  762.05
    90500.  1150.   455.  216639.  1.90  0.01    0.01    0.39    2.86

PARNV:FV      90.  -143.    1946.  0.23  0.06  762.36 *******   5450.  762.12
    90590.    90.   456.  220474.  1.92  0.00    0.01    0.38    2.80
         <<<<<THE ABOVE RESULTS REFLECT "NORMAL" (UNCONSTRICTED) FLOW>>>>>

HLDR :AS     110.  -145.    1995.  0.23  0.07  762.43 *******   5450.  762.20
    90700.   110.   458.  224935.  1.95  0.00    0.01    0.37    2.73
         <<<<<THE ABOVE RESULTS REFLECT "NORMAL" (UNCONSTRICTED) FLOW>>>>>

 ===215 FLOW CLASS 1 SOLUTION INDICATES POSSIBLE ROAD OVERFLOW.
          WS1,WSSD,WS3,RGMIN =   762.65       0.00     761.78     761.00

 ===260 ATTEMPTING FLOW CLASS 4 SOLUTION.
```

760.93 < 762.2
US < ELLC
Road = 766.8

$K_b = .3 + .14$
$\Delta H = .44 \frac{(5.0)^2}{2g} = .2$

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WSPRO          FEDERAL HIGHWAY ADMINISTRATION - U. S. GEOLOGICAL SURVEY
V050286            MODEL  FOR  WATER-SURFACE  PROFILE  COMPUTATIONS

         VILLAGE OF VERNON LESS-DETAILED FLOOD INSURANCE STUDY
         SHIAWASSEE RIVER FROM DS OF M-71 TO DS OF RAILROAD BRIDGE
                         100-YR FLOOD
           *** RUN DATE & TIME: 07/24/86 11:36


            <<<<<RESULTS REFLECTING THE CONSTRICTED FLOW FOLLOW>>>>>

 XSID: CODE   SRDL    LEW     AREA   VHD    HF     EGL    CRWS       Q    WSEL
       SRD   FLEN    REW        K  ALPH    HO     ERR     FR#     VEL

PARBR: BR      90.   260.     834.  0 76  0.08  762.67  757.15   4956.  761.92
    90590.     90.   350.  148171.  1.38  0.30    0.00    0.40    5.94

     TYPE PPCD FLOW      C    P/A    LSEL   BLEN   XLAB   XRAB
       4.  ****   4.  0.852 ******  765.40 ****** ****** ******

    XSID: CODE    SRD   FLEN    HF   VHD     EGL     ERR       Q    WSEL
   PARRD: RG   90600.     94.  0.05  0.19  762.73    0.00    494.  762.44

              Q   WLEN    LEW.    REW  DMAX  DAVG  VMAX  VAVG  HAVG  CAVG
   LT:      494.   155.   -48.    107.   1.4   0.7   4.7   4.3   1.0   3.1
   RT:        0. ****** ****** ****** ***** ***** ***** ***** ***** *****

 XSID: CODE   SRDL    LEW     AREA   VHD    HF     EGL    CRWS       Q    WSEL
       SRD   FLEN    REW        K  ALPH    HO     ERR     FR#     VEL

HLDR : AS      92.  -157.    2221.  0.19  0.08  762.77  756.11   5450.  762.57
    90700.    102.   464.  246318.  2.07  0.02    0.01    0.33    2.45

        M(G)   M(K)       KQ   XLKQ   XRKQ    OTEL
       0.851  0.251  184153.   265.   355. ********

                     <<<<<END OF BRIDGE COMPUTATIONS>>>>>

 XSID: CODE   SRDL    LEW     AREA   VHD    HF     EGL    CRWS       Q    WSEL
       SRD   FLEN    REW        K  ALPH    HO     ERR     FR#     VEL

RR EX: XS     400.  -155.    2183.  0.20  0.20  762.97 *******   5450.  762.78
    91100.    400    463.  242634.  2.05  0.00    0.01    0.34    2.50
   ER
```