00BREAK00

1) COUNTY: Mecosta

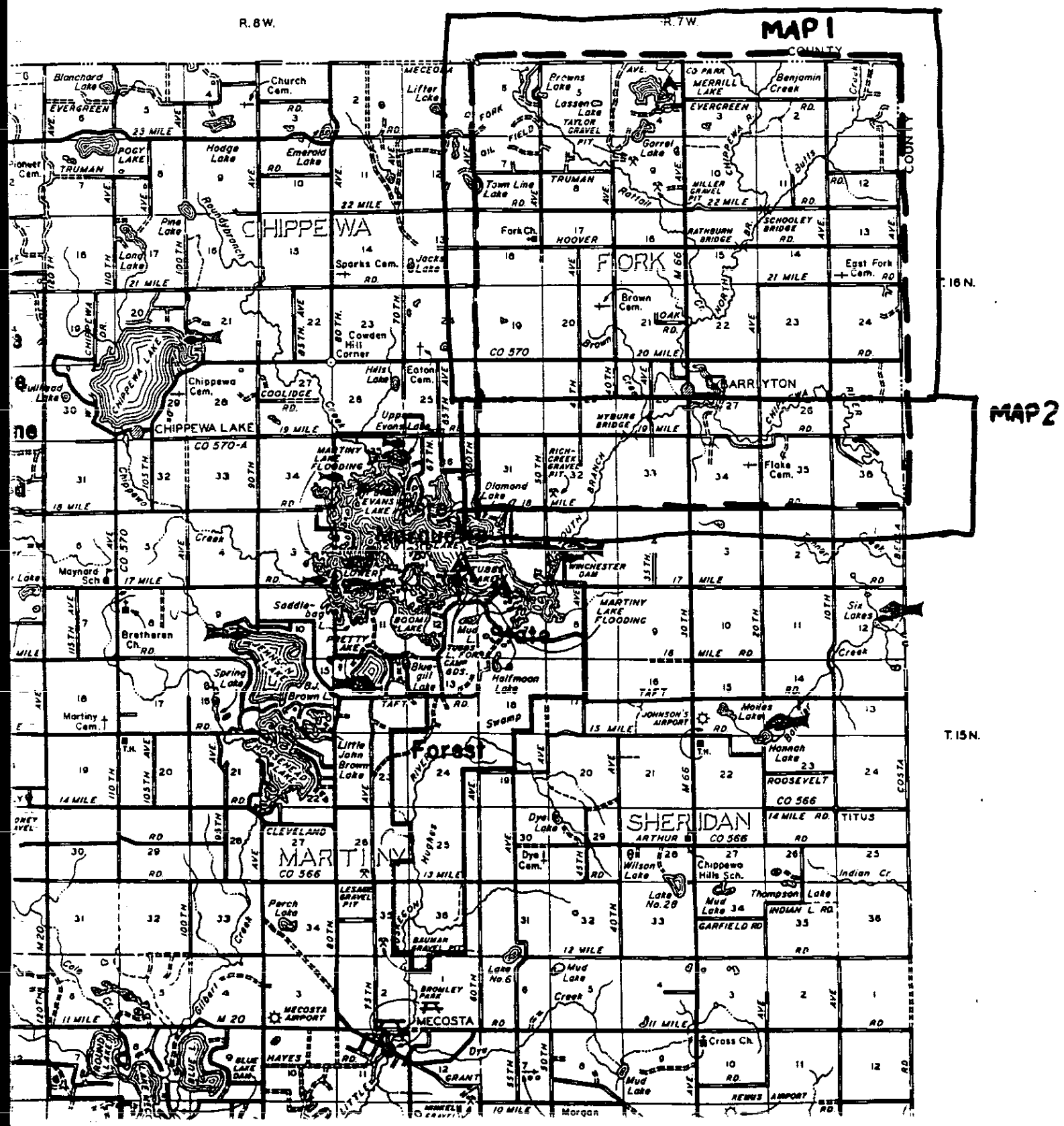
2) STUDY NAME: Fork Township

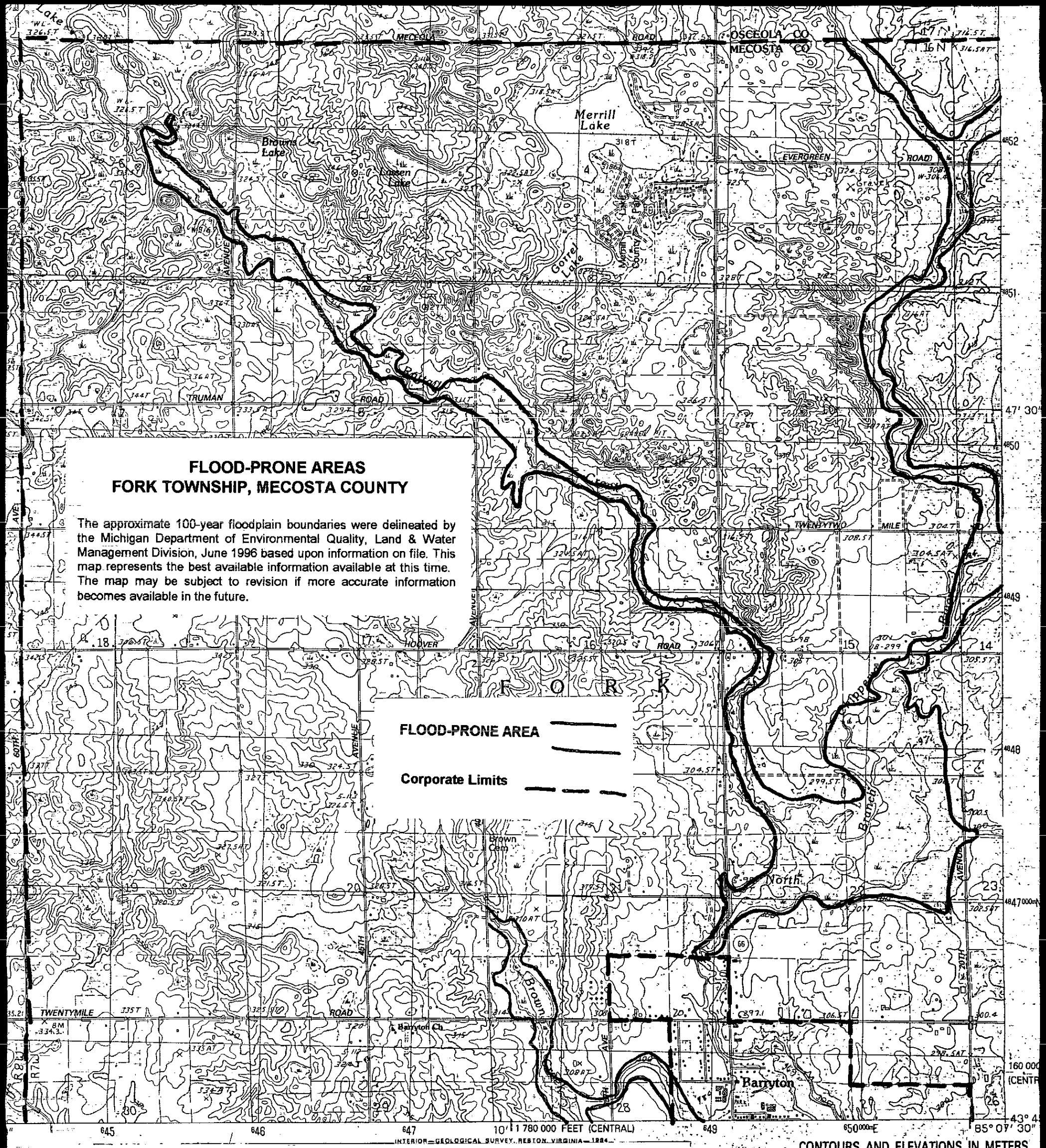
3) WATERCOURSE: Chippewa River

4) DOCUMENT TYPE: 100 year flood

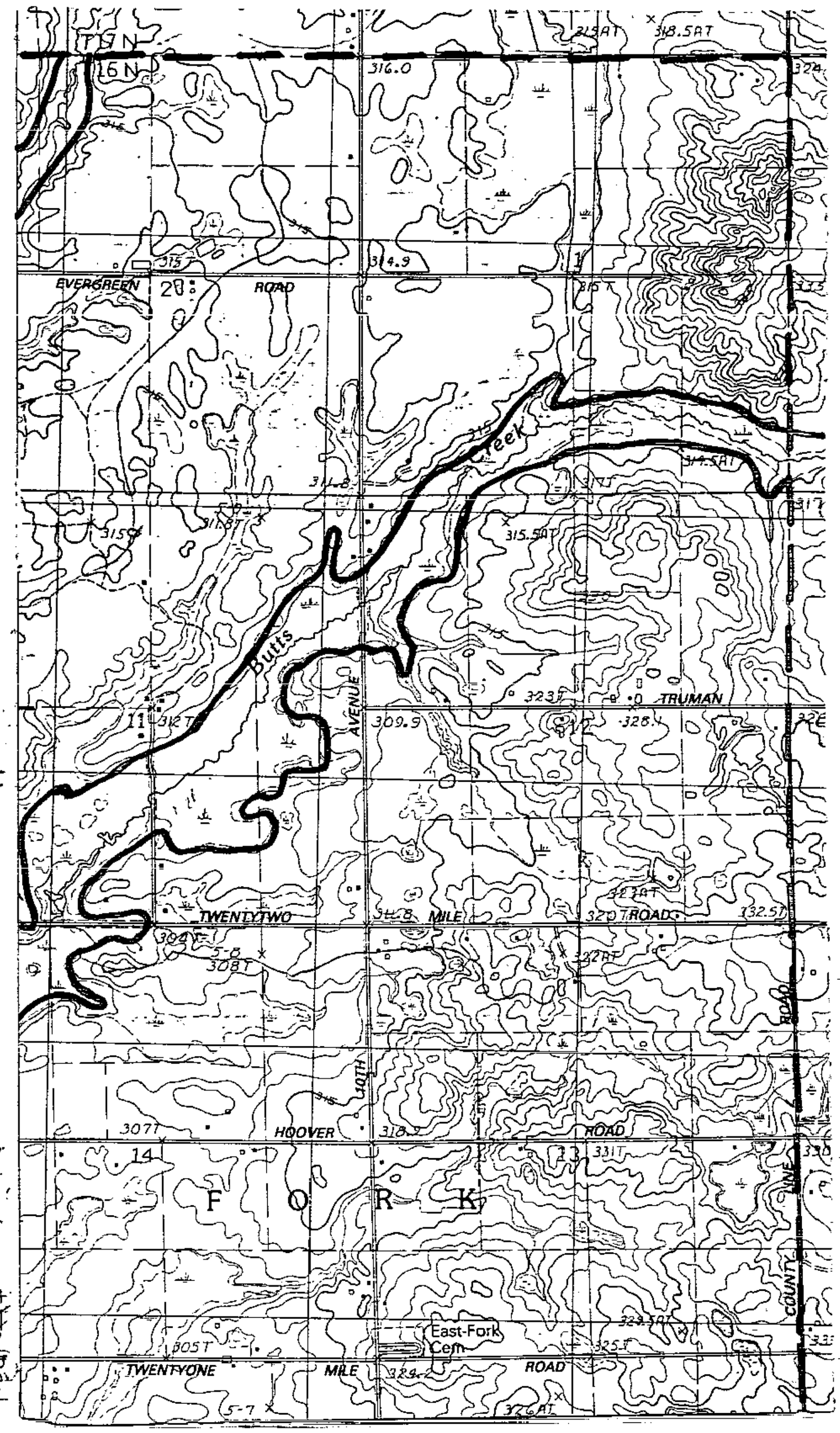
00BREAK00

Fork Township
Mecosta County





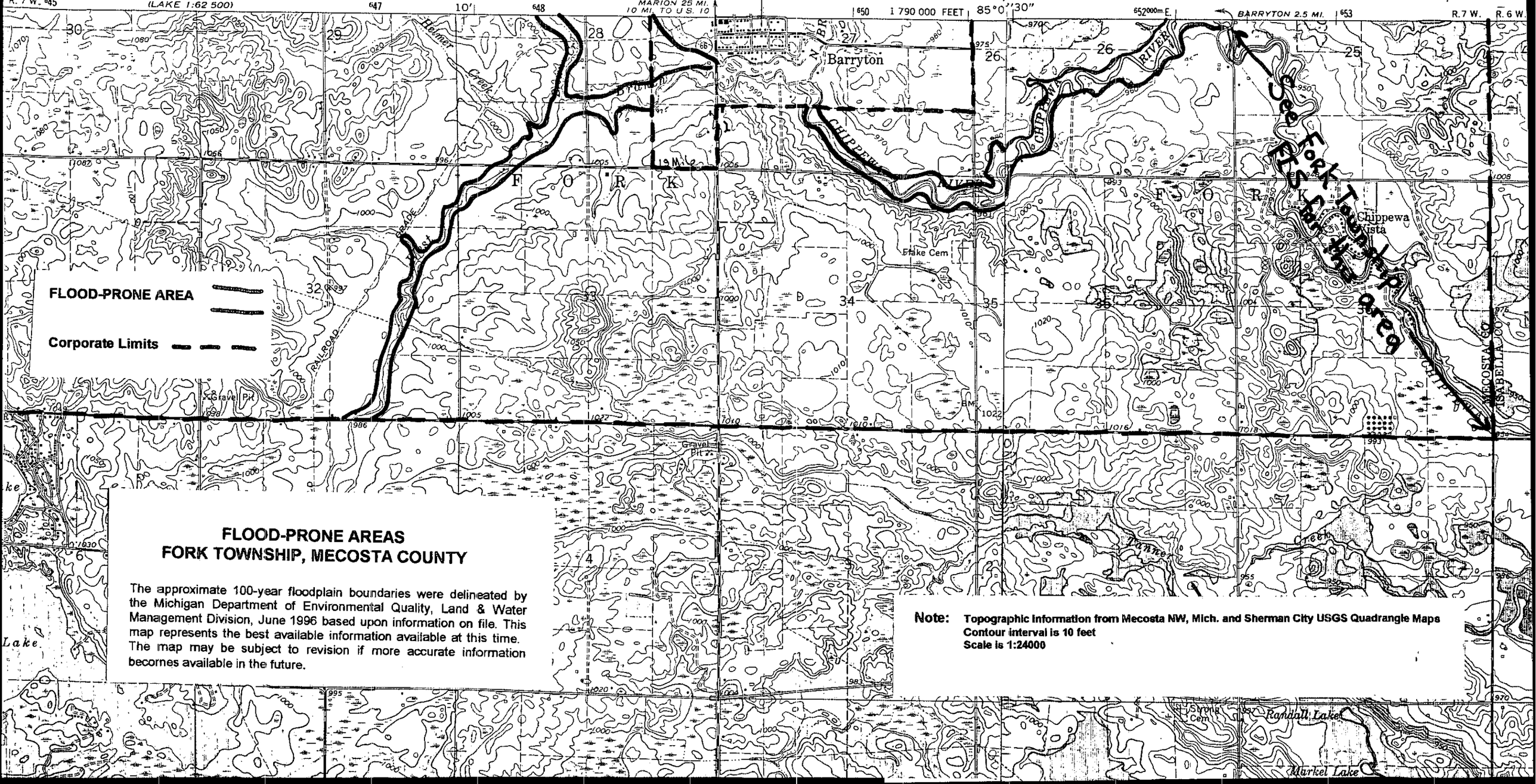
Note: Topographic information from Merrill Lake and Lake USGS Quadrangle Maps
Contour interval is 3 meters
Scale is approximately 1:28100 (Original map has been reduced by 89%)


T17N
T16N
316.0
318.5AT
314.9
EVERGREEN
ROAD
Butts Creek
315.5AT
314.5AT
TRUMAN
323T
328
309.9
AVENUE
312T
TWENTYTWO
MILE
ROAD
320T
332.5T
308T
40TH
HOOVER
ROAD
307T
331T
14
F O R K
COUNTY LINE ROAD
East-Fork Cem
305T
TWENTYONE
MILE
ROAD
325T
326AT

MICHIGAN
STATE HIGHWAY DEPARTMENT

MECOSTA NW QUADRANGLE
MICHIGAN–MECOSTA CO.
7.5 MINUTE SERIES (TOPOGRAPHIC)

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY



FLOOD-PRONE AREAS
FORK TOWNSHIP, MECOSTA COUNTY

The approximate 100-year floodplain boundaries were delineated by the Michigan Department of Environmental Quality, Land & Water Management Division, June 1996 based upon information on file. 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.

Note: Topographic Information from Mecosta NW, Mich. and Sherman City USGS Quadrangle Maps
Contour interval is 10 feet
Scale is 1:24000

MICHIGAN
STATE HIGHWAY DEPARTMENT

MECOSTA NW QUADRANGLE
MICHIGAN–MECOSTA CO.
7.5 MINUTE SERIES (TOPOGRAPHIC)

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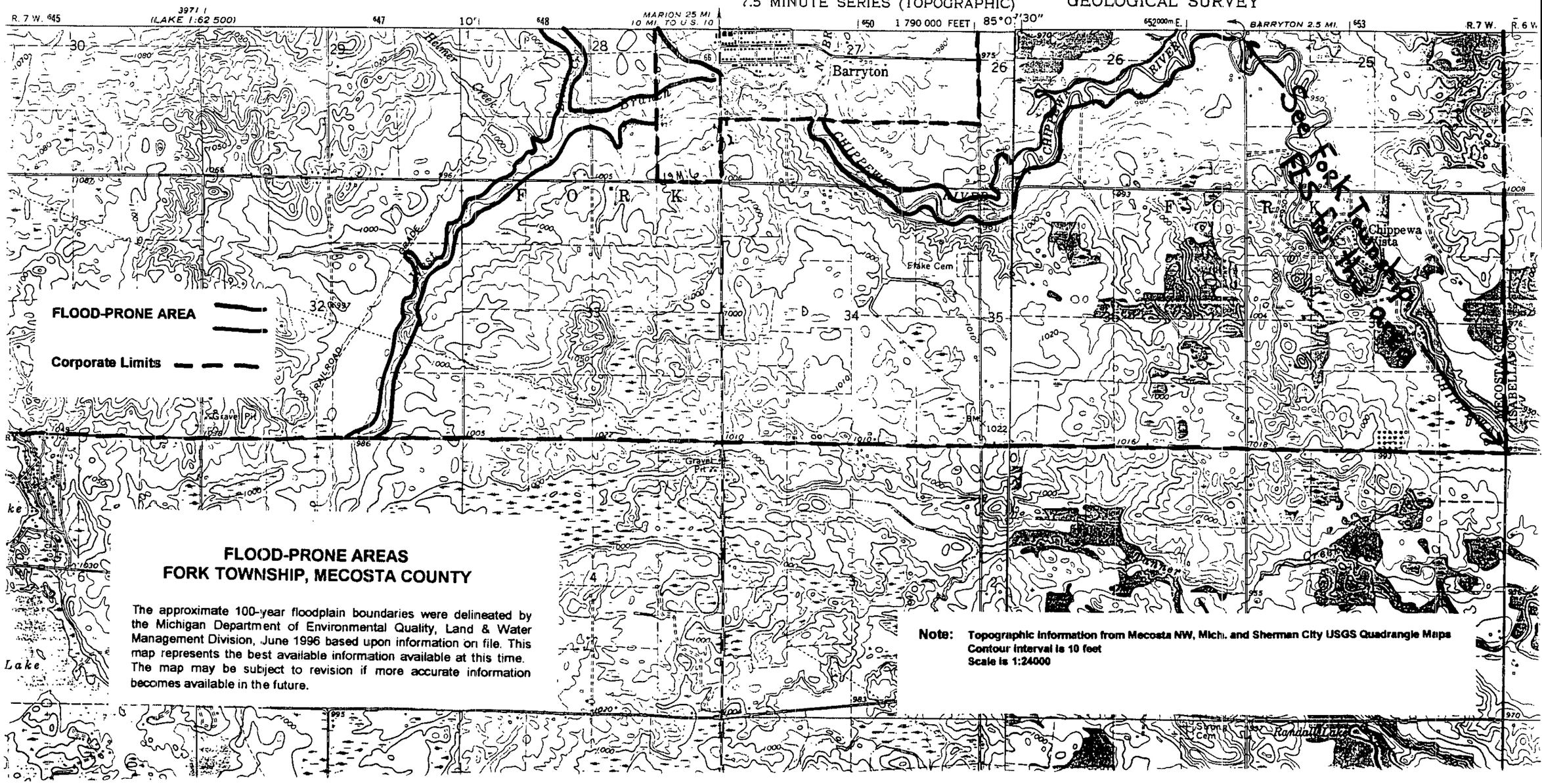
GEOLOGICAL SURVEY



FLOOD-PRONE AREAS
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MECOSTA NW QUADRANGLE
MICHIGAN–MECOSTA CO.
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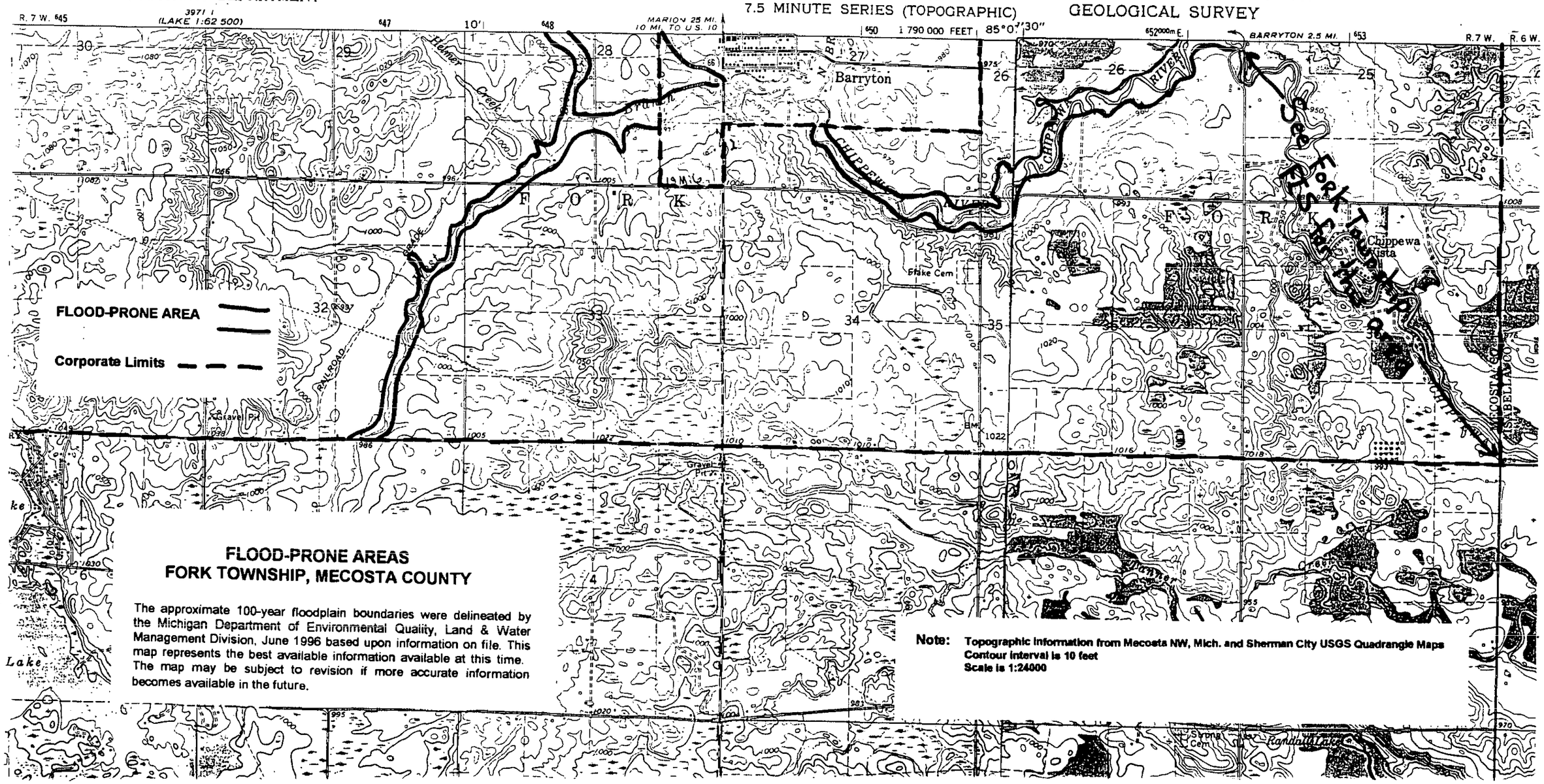

FLOOD-PRONE AREAS
FORK TOWNSHIP, MECOSTA COUNTY

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Contour interval is 10 feet
Scale is 1:24000

```
T1    FORK TWP     APPROXIMATE FLOOD HAZARD AREA
T2      STARTING U/S M-66  TO U/S TWP LIMIT
T3     W BR CHIPPEWA

J1  ICHECK    INQ      NINV     IDIR     STRT     METRIC   HVINS    Q        WSEL     FQ

              2                          .0012                              972

J2  NPROF     IPLOT    PRFVS    XSECV    XSECH    FN       ALLDC    IBW      CHNIM    ITRACE

                       -1


QT       2      820       10
NC      .1       .1     .045       .1       .3
X1                6      405      435
GR     980             972      405      968      410      968      430      972      435
GR     980      600

X1      10        6      205      235     1000     1000     1000
GR     980             973      205      969      210      969      230      973      235
GR     980      400

X1      20                               1000     1000     1000               1.2

X1      38                               1800     1800     1800               2.1

QT       2      330       10
X1      41        6      150      205      300      300      300
GR     980             975      150      973      155      973      200      975      205
GR     980      300

X1      66                               2500     2500     2500                 3

X1      68        7      600      630      200      200      200
GR     990             980      550      978      600      976      605      976      625
GR     978      630      980      650      990      850

X1      84                               1600     1600     1600               1.9

X1     104                               2000     2000     2000               2.4
1
   04JUN96     15:57:52                                                                PAGE    2


    SECNO    DEPTH    CWSEL    CRIWS    WSELK    EG       HV       HL       OLOSS    L-BANK ELEV
    Q        QLOB     QCH      QROB     ALOB     ACH      AROB     VOL      TWA      R-BANK ELEV
    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  .000
      .000     6.72   974.72      .00   972.00   974.89      .16      .00      .00   972.00
     820.0    119.1    652.4     48.5    187.9    181.7     76.6       .0       .0   972.00
       .00      .63     3.59      .63     .100     .045     .100     .000   968.00   267.07
   .001205       0.       0.       0.        0        0        5      .00   224.13   491.20
```

```
*SECNO 10.000
   10.000     6.91   975.91      .00      .00   976.07      .17     1.19      .00   973.00
    820.0     80.6    674.6     64.8    123.7    187.2     99.6      9.8      4.7   973.00
      .09      .65     3.60      .65     .100     .045     .100     .000   969.00   119.88
  .001168    1000.    1000.    1000.        2        0        0      .00   183.63   303.51


*SECNO 20.000
   20.000     6.88   977.08      .00      .00   977.25      .17     1.18      .00   974.20
    820.0     79.7    676.2     64.1    122.0    186.6     98.2     19.2      8.9   974.20
      .18      .65     3.62      .65     .100     .045     .100     .000   970.20   120.48
  .001186    1000.    1000.    1000.        1        0        0      .00   182.55   303.03


*SECNO 38.000
   38.000     6.91   979.21      .00      .00   979.37      .17     2.12      .00   976.30
    820.0     80.3    675.1     64.6    123.2    187.0     99.1     36.1     16.4   976.30
      .34      .65     3.61      .65     .100     .045     .100     .000   972.30   120.06
  .001173    1800.    1800.    1800.        0        0        0      .00   183.30   303.36


*SECNO 41.000

3302 WARNING:  CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE,  KRATIO =  2.12

   41.000     6.46   979.46      .00      .00   979.46      .01      .07      .02   975.00
    330.0     49.1    249.8     31.1    297.8    345.1    188.6     40.3     18.0   975.00
      .48      .16      .72      .16     .100     .045     .100     .000   973.00    16.32
  .000042     300.     300.     300.        2        0        0      .00   273.34   289.66


*SECNO 66.000
1
   04JUN96     15:57:52                                                                    PAGE    3


    SECNO     DEPTH     CWSEL     CRIWS     WSELK     EG        HV        HL        OLOSS     L-BANK ELEV
    Q         QLOB      QCH       QROB      ALOB      ACH       AROB      VOL       TWA       R-BANK ELEV
    TIME      VLOB      VCH       VROB      XNL       XNCH      XNR       WTN       ELMIN     SSTA
    SLOPE     KLOBL     KLCH      KLOBR     ITRIAL    IDC       ICONT     CORAR     TOPWID    ENDST


3302 WARNING:  CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE,  KRATIO =  .30

   66.000     3.68   979.68      .00      .00   979.72      .04      .25      .01   978.00
    330.0     12.0    310.4      7.6     42.5    192.6     26.9     71.7     29.8   978.00
      .94      .28     1.61      .28     .100     .045     .100     .000   976.00    99.50
  .000456    2500.    2500.    2500.        2        0        0      .00   137.48   236.98


*SECNO 68.000

3302 WARNING:  CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE,  KRATIO =  .54

   68.000     3.78   979.78      .00      .00   979.90      .12      .15      .02   978.00
    330.0     21.3    300.2      8.5     39.5    103.3     15.8     72.7     30.3   978.00
      .96      .54     2.91      .54     .100     .045     .100     .000   976.00   555.55
  .001539     200.     200.     200.        2        0        0      .00    92.23   647.78
```

*SECNO 84.000
3280 CROSS SECTION 84.00 EXTENDED .03 FEET

84.000	4.03	981.93	.00	.00	982.03	.10	2.13	.00	979.90
330.0	26.5	292.9	10.6	51.5	110.9	20.6	79.0	33.9	979.90
1.14	.52	2.64	.51	.100	.045	.100	.000	977.90	548.41
.001159	1600.	1600.	1600.	3	0	0	.00	101.59	650.00

*SECNO 104.000

104.000	3.99	984.29	.00	.00	984.39	.10	2.37	.00	982.30
330.0	25.6	294.2	10.2	49.7	109.8	19.9	87.3	38.5	982.30
1.37	.51	2.68	.51	.100	.045	.100	.000	980.30	550.16
.001207	2000.	2000.	2000.	2	0	0	.00	99.78	649.94

1
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T1
T2
T3

J1	ICHECK	INQ	NINV	IDIR	STRT	METRIC	HVINS	Q	WSEL	FQ
		3							969	

J2	NPROF	IPLOT	PRFVS	XSECV	XSECH	FN	ALLDC	IBW	CHNIM	ITRACE
	2		-1							

1
04JUN96 15:57:52 PAGE 5

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

*PROF 2
0

CCHV= .100 CEHV= .300
*SECNO .000

.000	1.00	969.00	.00	969.00	969.00	.00	.00	.00	972.00
10.0	.0	10.0	.0	.0	21.3	.0	.0	.0	972.00
.00	.00	.47	.00	.000	.045	.000	.000	968.00	408.75
.000228	0.	0.	0.	0	0	0	.00	22.50	431.25

*SECNO 10.000

3302 WARNING: CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE, KRATIO = .33

10.000	.51	969.51	.00	.00	969.52	.01	.52	.00	973.00
10.0	.0	10.0	.0	.0	10.6	.0	.4	.5	973.00
.29	.00	.94	.00	.000	.045	.000	.000	969.00	209.36
.002113	1000.	1000.	1000.	2	0	0	.00	21.28	230.64

*SECNO 20.000

3302 WARNING: CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE, KRATIO = 1.50

20.000	.66	970.86	.00	.00	970.87	.01	1.35	.00	974.20
10.0	.0	10.0	.0	.0	13.7	.0	.6	1.0	974.20
.67	.00	.73	.00	.000	.045	.000	.000	970.20	209.18
.000933	1000.	1000.	1000.	3	0	0	.00	21.64	230.82

*SECNO 38.000

38.000	.58	972.88	.00	.00	972.89	.01	2.02	.00	976.30
10.0	.0	10.0	.0	.0	12.1	.0	1.2	1.9	976.30
1.28	.00	.83	.00	.000	.045	.000	.000	972.30	209.27
.001376	1800.	1800.	1800.	4	0	0	.00	21.46	230.73

*SECNO 41.000

41.000	.34	973.34	.00	.00	973.34	.01	.45	.00	975.00
10.0	.0	10.0	.0	.0	15.6	.0	1.3	2.1	975.00
1.41	.00	.64	.00	.000	.045	.000	.000	973.00	154.15
.001645	300.	300.	300.	2	0	0	.00	46.70	200.85

1

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

*SECNO 66.000

66.000	.40	976.40	.00	.00	976.41	.00	3.06	.00	978.00
10.0	.0	10.0	.0	.0	18.4	.0	2.2	4.8	978.00
2.69	.00	.54	.00	.000	.045	.000	.000	976.00	154.00
.000948	2500.	2500.	2500.	5	0	0	.00	47.00	201.00

*SECNO 68.000

68.000	.61	976.61	.00	.00	976.62	.01	.21	.00	978.00
10.0	.0	10.0	.0	.0	13.1	.0	2.3	5.0	978.00
2.76	.00	.76	.00	.000	.045	.000	.000	976.00	603.48
.001153	200.	200.	200.	2	0	0	.00	23.04	626.52

*SECNO 84.000

84.000	.60	978.50	.00	.00	978.51	.01	1.89	.00	979.90
10.0	.0	10.0	.0	.0	12.9	.0	2.8	5.8	979.90
3.33	.00	.78	.00	.000	.045	.000	.000	977.90	603.50

.001212	1600.	1600.	1600.	3	0	0	.00	23.00	626.50

*SECNO 104.000

104.000	.61	980.91	.00	.00	980.92	.01	2.41	.00	982.30
10.0	.0	10.0	.0	.0	12.9	.0	3.4	6.9	982.30
4.05	.00	.77	.00	.000	.045	.000	.000	980.30	603.50
.001197	2000.	2000.	2000.	3	0	0	.00	23.01	626.50

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************************************
 HEC-2 WATER SURFACE PROFILES

 Version   4.6.2;  May 1991
************************************


T1      FORK TOWNSHIP, MICHIGAN
T2      CHIPPEWA RIVER    USPSTREAM OF XSEC 316049  PROFILE APPROXIMATED ONLY
T3      100-YEAR FLOOD

J1  ICHECK    INQ      NINV     IDIR     STRT     METRIC   HVINS    Q        WSEL     FQ

       0        2        0        0        0        0        0        0    955.2

J2  NPROF    IPLOT    PRFVS    XSECV    XSECH    FN       ALLDC    IBW      CHNIM    ITRACE

      1        0       -1


QT       2     2700     3700
NC    .100     .100     .040       .1       .3
          CROSS SECTION H
X1   315865       30      250      372     2815     2815     2815
X3        0        0        0      250        0      401
GR    954.7        0    954.8       25    954.7       50    955.4       75    956.4      100
GR    958.1      125    957.9      150    957.4      175    957.6      200    957.6      225
GR    955.9      250    951.1      263    949.2      275    948.5      300    948.4      310
GR    948.9      320    948.7      330    949.0      340    948.9      350    948.6      360
GR    949.2      362    954.0      372    954.0      400    953.8      425    954.4      450
GR    954.2      475    954.8      500    955.5      550    955.5      575    955.5      600

NC     .080     .080     .035       .1       .3
X1   315964       30      256    351.6       99       99       99
GR    959.3        0    958.4       50    957.2      100    956.5      150    956.1      200
GR    956.0      250    951.6      250    951.0      256    949.8      258    949.2      262
GR    948.4      272    948.4    274.5    948.3    275.5    948.3      286    947.9      296
GR    947.8      301    947.8      302    947.5      312    947.5      322    947.2      326
GR    947.2      327    948.0      339    949.1      349    951.0    351.6    955.8    351.6
GR    955.9      400    956.1      450    956.6      500    957.4      550    958.6      600

NC     .080     .080     .035       .3       .5
          DOWNSTREAM FACE OF 10TH AVE.
X1   315965        0        0        0        1        1        1
BT       26        0    959.3        0       50    958.4        0      100    957.2        0
BT      150    956.5        0      200    956.1        0      250    956.0    951.6      250
BT    956.0    954.8    274.5    956.0    954.8    274.5    956.0    948.4    275.5    956.0
BT    948.3    275.5    956.0    954.8      301    955.9    954.8      301    955.9    947.8
BT      302    955.9    947.8      302    955.9    954.8      326    955.8    954.8      326
BT    955.8    947.2      327    955.8    947.2      327    955.8    954.7    351.6    955.8
BT    954.8    351.6    955.8    951.0      400    955.9        0      450    956.1        0
BT      500    956.6        0      550    957.4        0      600    958.6        0
1
   20JUN96      11:46:16                                                          PAGE    2


          UPSTREAM FACE OF 10TH AVE.
X1   315999        0        0        0       34       34       34
X2        0        0        0        0        0        0        1
```

```
NC     .080      .080      .035       .1        .3
X1   316000         0         0        0         1         1         1

          CROSS SECTION I
X1   316049        37       250      318        49        49        49
X3        0         0         0      160         0       360
GR    955.8         0     955.3       25     954.9        50     954.7        75     954.7       100
GR    954.4       125     954.3      150     954.4       175     953.9       196     950.3       213
GR    949.2       214     949.0      215     949.2       217     950.4       218     950.8       225
GR    950.6       250     949.3      253     949.2       260     948.3       270     947.3       280
GR    946.2       290     945.7      300     946.7       310     949.2       314     953.3       318
GR    953.1       325     952.8      350     952.7       375     953.7       400     953.9       425
GR    954.6       450     956.2      475     956.7       500     957.5       525     958.7       550
GR    959.7       575     962.7      775

NC       .1        .1
          XSEC I DUPED UPSTREAM ELEV ADJUSTED
X1   317849                                  1500      1800      1800                  1.5

X1   319849                                  1600      1600      2000                  1.7

X1   322249                                  2400      2400      2400                  2.0

X1   324649                                  2400      2400      2400                  2.0

X1   326649                                  2000      2000      2000                  1.7

X1   329049                                  2400      2400      2400                  2.0
```

1

20JUN96 11:46:16 PAGE 3

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


*PROF 1
0

CCHV=     .100 CEHV=     .300
*SECNO 315865.000

3470 ENCROACHMENT STATIONS=     250.0     401.0  TYPE=     1  TARGET=     151.000
          CROSS SECTION H
315865.000     6.80    955.20       .00    955.20    955.44       .24       .00       .00    955.90
    2700.0       .0    2680.5     19.5        .0     678.2      34.8        .0        .0    954.00
       .00      .00      3.95       .56      .000      .040      .100      .000    948.40    251.90
   .001152    2815.     2815.    2815.         0         0         0       .00    149.10    401.00


CCHV=     .100 CEHV=     .300
*SECNO 315964.000
315964.000     8.09    955.29       .00       .00    955.53       .24       .09       .00    951.00
    2700.0     21.1    2678.9        .0      23.9     679.2        .0       1.6        .3    955.80
```

```
      .01      .88     3.94      .00     .080     .035     .000     .000   947.20   250.00
  .000680      99.      99.      99.        2        0        0      .00   101.60   351.60


CCHV=     .300 CEHV=     .500
*SECNO 315965.000

3302 WARNING:  CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE,  KRATIO =   .48


3370 NORMAL BRIDGE, NRD=  26 MIN ELTRD=   955.80 MAX ELLC=   954.80

         DOWNSTREAM FACE OF 10TH AVE.
315965.000     8.06   955.26      .00      .00   955.56      .30      .00      .03   951.00
   2700.0     23.3   2676.7       .0     21.0    610.3       .0      1.6       .3   955.80
      .01     1.11     4.39      .00     .080     .035     .000     .000   947.20   250.00
  .003005       1.       1.       1.        2        0        0   -69.05   101.60   351.60


*SECNO 315999.000

3370 NORMAL BRIDGE, NRD=  26 MIN ELTRD=   955.80 MAX ELLC=   954.80

         UPSTREAM FACE OF 10TH AVE.
315999.000     8.16   955.36      .00      .00   955.66      .30      .10      .00   951.00
   2700.0     23.3   2676.7       .0     21.0    610.3       .0      2.1       .4   955.80
      .01     1.11     4.39      .00     .080     .035     .000     .000   947.20   250.00
  .003005      34.      34.      34.        2        0        0   -79.43   101.60   351.60


1
   20JUN96     11:46:16                                                                PAGE    4


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


CCHV=     .100 CEHV=     .300
*SECNO 316000.000

3302 WARNING:  CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE,  KRATIO =  2.17

316000.000     8.24   955.44      .00      .00   955.67      .23      .00      .01   951.00
   2700.0     21.5   2678.5       .0     24.8    693.5       .0      2.1       .4   955.80
      .01      .87     3.86      .00     .080     .035     .000     .000   947.20   250.00
  .000636       1.       1.       1.        2        0        0      .00   101.60   351.60


*SECNO 316049.000

3470 ENCROACHMENT STATIONS=     160.0     360.0  TYPE=     1  TARGET=     200.000
         CROSS SECTION I
316049.000     9.76   955.46      .00      .00   955.70      .24      .03      .00   950.60
   2700.0    347.8   2259.5     92.7    284.4    525.4    105.4      3.1       .5   953.30
      .01     1.22     4.30      .88     .080     .035     .080     .000   945.70   160.00
  .000711      49.      49.      49.        2        0        0      .00   200.00   360.00
```

*SECNO 317849.000

XSEC I DUPED UPSTREAM ELEV ADJUSTED

317849.000	9.56	956.76	.00	.00	957.01	.25	1.30	.00	952.10
2700.0	289.9	2246.8	163.3	345.3	511.6	251.2	42.7	12.5	954.80
.14	.84	4.39	.65	.100	.035	.100	.000	947.20	27.66
.000768	1500.	1800.	1800.	2	0	0	.00	432.61	460.27

*SECNO 319849.000

319849.000	9.40	958.30	.00	.00	958.57	.27	1.56	.01	953.80
2700.0	275.5	2275.5	149.1	311.1	500.9	229.0	86.8	28.8	956.50
.28	.89	4.54	.65	.100	.035	.100	.000	948.90	37.50
.000845	1600.	2000.	1600.	2	0	0	.00	420.31	457.81

*SECNO 322249.000

322249.000	9.42	960.32	.00	.00	960.59	.27	2.02	.00	955.80
2700.0	277.1	2272.1	150.7	315.0	502.1	231.6	144.4	52.0	958.50
.45	.88	4.52	.65	.100	.035	.100	.000	950.90	36.36
.000835	2400.	2400.	2400.	2	0	0	.00	421.74	458.10

1

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

*SECNO 324649.000

324649.000	9.42	962.32	.00	.00	962.59	.27	2.00	.00	957.80
2700.0	277.8	2270.7	151.4	316.7	502.7	232.6	202.2	75.3	960.50
.62	.88	4.52	.65	.100	.035	.100	.000	952.90	35.87
.000831	2400.	2400.	2400.	1	0	0	.00	422.35	458.22

*SECNO 326649.000

326649.000	9.40	964.00	.00	.00	964.27	.27	1.68	.00	959.50
2700.0	274.9	2276.6	148.5	309.8	500.5	228.1	250.2	94.6	962.20
.76	.89	4.55	.65	.100	.035	.100	.000	954.60	37.89
.000848	2000.	2000.	2000.	1	0	0	.00	419.82	457.71

*SECNO 329049.000

329049.000	9.42	966.02	.00	.00	966.29	.27	2.02	.00	961.50
2700.0	277.1	2272.2	150.7	315.0	502.1	231.5	307.7	117.8	964.20
.93	.88	4.53	.65	.100	.035	.100	.000	956.60	36.37
.000836	2400.	2400.	2400.	1	0	0	.00	421.73	458.10

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************************************
 HEC-2 WATER SURFACE PROFILES

 Version   4.6.2;  May 1991
************************************


T1    FORK TWP     APPROXIMATE FLOOD HAZARD AREA
T2       STARTING U/S M-66  TO U/S TWP LIMIT
T3      W BR CHIPPEWA

J1  ICHECK    INQ      NINV     IDIR     STRT     METRIC   HVINS    Q        WSEL     FQ

              2                         .0012                              972

J2  NPROF     IPLOT    PRFVS    XSECV    XSECH    FN       ALLDC    IBW      CHNIM    ITRACE

                       -1


QT       2      820       10
NC      .1       .1     .045       .1       .3
X1                6      405      435
GR     980             972      405      968      410      968      430      972      435
GR     980      600

X1      10        6      205      235     1000     1000     1000
GR     980             973      205      969      210      969      230      973      235
GR     980      400

X1      20                               1000     1000     1000               1.2

X1      38                               1800     1800     1800               2.1

QT       2      330       10
X1      41        6      150      205      300      300      300
GR     980             975      150      973      155      973      200      975      205
GR     980      300

X1      66                               2500     2500     2500                 3

X1      68        7      600      630      200      200      200
GR     990             980      550      978      600      976      605      976      625
GR     978      630      980      650      990      850

X1      84                               1600     1600     1600               1.9

X1     104                               2000     2000     2000               2.4
1
   20JUN96     13:13:58                                                                PAGE    2


    SECNO     DEPTH     CWSEL     CRIWS     WSELK     EG        HV        HL        OLOSS     L-BANK ELEV
    Q         QLOB      QCH       QROB      ALOB      ACH       AROB      VOL       TWA       R-BANK ELEV
    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 .000

.000	6.72	974.72	.00	972.00	974.89	.16	.00	.00	972.00
820.0	119.1	652.4	48.5	187.9	181.7	76.6	.0	.0	972.00
.00	.63	3.59	.63	.100	.045	.100	.000	968.00	267.07
.001205	0.	0.	0.	0	0	5	.00	224.13	491.20

*SECNO 10.000

10.000	6.91	975.91	.00	.00	976.07	.17	1.19	.00	973.00
820.0	80.6	674.6	64.8	123.7	187.2	99.6	9.8	4.7	973.00
.09	.65	3.60	.65	.100	.045	.100	.000	969.00	119.88
.001168	1000.	1000.	1000.	2	0	0	.00	183.63	303.51

*SECNO 20.000

20.000	6.88	977.08	.00	.00	977.25	.17	1.18	.00	974.20
820.0	79.7	676.2	64.1	122.0	186.6	98.2	19.2	8.9	974.20
.18	.65	3.62	.65	.100	.045	.100	.000	970.20	120.48
.001186	1000.	1000.	1000.	1	0	0	.00	182.55	303.03

*SECNO 38.000

38.000	6.91	979.21	.00	.00	979.37	.17	2.12	.00	976.30
820.0	80.3	675.1	64.6	123.2	187.0	99.1	36.1	16.4	976.30
.34	.65	3.61	.65	.100	.045	.100	.000	972.30	120.06
.001173	1800.	1800.	1800.	0	0	0	.00	183.30	303.36

*SECNO 41.000

3302 WARNING: CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE, KRATIO = 2.12

41.000	6.46	979.46	.00	.00	979.46	.01	.07	.02	975.00
330.0	49.1	249.8	31.1	297.8	345.1	188.6	40.3	18.0	975.00
.48	.16	.72	.16	.100	.045	.100	.000	973.00	16.32
.000042	300.	300.	300.	2	0	0	.00	273.34	289.66

*SECNO 66.000

1

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

3302 WARNING: CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE, KRATIO = .30

66.000	3.68	979.68	.00	.00	979.72	.04	.25	.01	978.00
330.0	12.0	310.4	7.6	42.5	192.6	26.9	71.7	29.8	978.00
.94	.28	1.61	.28	.100	.045	.100	.000	976.00	99.50
.000456	2500.	2500.	2500.	2	0	0	.00	137.48	236.98

*SECNO 68.000

3302 WARNING: CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE, KRATIO = .54

68.000	3.78	979.78	.00	.00	979.90	.12	.15	.02	978.00
330.0	21.3	300.2	8.5	39.5	103.3	15.8	72.7	30.3	978.00
.96	.54	2.91	.54	.100	.045	.100	.000	976.00	555.55
.001539	200.	200.	200.	2	0	0	.00	92.23	647.78

*SECNO 84.000
3280 CROSS SECTION 84.00 EXTENDED .03 FEET

84.000	4.03	981.93	.00	.00	982.03	.10	2.13	.00	979.90
330.0	26.5	292.9	10.6	51.5	110.9	20.6	79.0	33.9	979.90
1.14	.52	2.64	.51	.100	.045	.100	.000	977.90	548.41
.001159	1600.	1600.	1600.	3	0	0	.00	101.59	650.00

*SECNO 104.000

104.000	3.99	984.29	.00	.00	984.39	.10	2.37	.00	982.30
330.0	25.6	294.2	10.2	49.7	109.8	19.9	87.3	38.5	982.30
1.37	.51	2.68	.51	.100	.045	.100	.000	980.30	550.16
.001207	2000.	2000.	2000.	2	0	0	.00	99.78	649.94

1
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T1
T2
T3

J1	ICHECK	INQ	NINV	IDIR	STRT	METRIC	HVINS	Q	WSEL	FQ
		3							969	

J2	NPROF	IPLOT	PRFVS	XSECV	XSECH	FN	ALLDC	IBW	CHNIM	ITRACE
	2		-1							

1
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SECNO	DEPTH	CWSEL	CRIWS	WSELR	EG	HV	HL	OLOSS	L-BANK ELEV
Q	QLOB	QCH	QROB	ALOB	ACH	AROB	VOL	TWA	R-BANK ELEV
TIME	VLOB	VCH	VROB	XNL	XNCH	XNR	WTN	ELMIN	SSTA
SLOPE	XLOBL	XLCH	XLOBR	ITRIAL	IDC	ICONT	CORAR	TOPWID	ENDST

*PROF 2
0

CCHV= .100 CEHV= .300
*SECNO .000

.000	1.00	969.00	.00	969.00	969.00	.00	.00	.00	972.00

```
      10.0       .0     10.0       .0       .0     21.3       .0       .0       .0   972.00
       .00      .00      .47      .00     .000     .045     .000     .000   968.00   408.75
   .000228       0.       0.       0.        0        0        0      .00    22.50   431.25


 *SECNO 10.000

 3302 WARNING:  CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE,  KRATIO =  .33

     10.000      .51   969.51      .00      .00   969.52      .01      .52      .00   973.00
       10.0       .0     10.0       .0       .0     10.6       .0       .4       .5   973.00
        .29      .00      .94      .00     .000     .045     .000     .000   969.00   209.36
   .002113     1000.    1000.    1000.        2        0        0      .00    21.28   230.64


 *SECNO 20.000

 3302 WARNING:  CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE,  KRATIO =  1.50

     20.000      .66   970.86      .00      .00   970.87      .01     1.35      .00   974.20
       10.0       .0     10.0       .0       .0     13.7       .0       .6      1.0   974.20
        .67      .00      .73      .00     .000     .045     .000     .000   970.20   209.18
   .000933     1000.    1000.    1000.        3        0        0      .00    21.64   230.82


 *SECNO 38.000
     38.000      .58   972.88      .00      .00   972.89      .01     2.02      .00   976.30
       10.0       .0     10.0       .0       .0     12.1       .0      1.2      1.9   976.30
       1.28      .00      .83      .00     .000     .045     .000     .000   972.30   209.27
   .001376     1800.    1800.    1800.        4        0        0      .00    21.46   230.73


 *SECNO 41.000
     41.000      .34   973.34      .00      .00   973.34      .01      .45      .00   975.00
       10.0       .0     10.0       .0       .0     15.6       .0      1.3      2.1   975.00
       1.41      .00      .64      .00     .000     .045     .000     .000   973.00   154.15
   .001645      300.     300.     300.        2        0        0      .00    46.70   200.85


1
   20JUN96     13:13:58                                                                PAGE    6


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


 *SECNO 66.000
     66.000      .40   976.40      .00      .00   976.41      .00     3.06      .00   978.00
       10.0       .0     10.0       .0       .0     18.4       .0      2.2      4.8   978.00
       2.69      .00      .54      .00     .000     .045     .000     .000   976.00   154.00
   .000948     2500.    2500.    2500.        5        0        0      .00    47.00   201.00


 *SECNO 68.000
     68.000      .61   976.61      .00      .00   976.62      .01      .21      .00   978.00
       10.0       .0     10.0       .0       .0     13.1       .0      2.3      5.0   978.00
       2.76      .00      .76      .00     .000     .045     .000     .000   976.00   603.48
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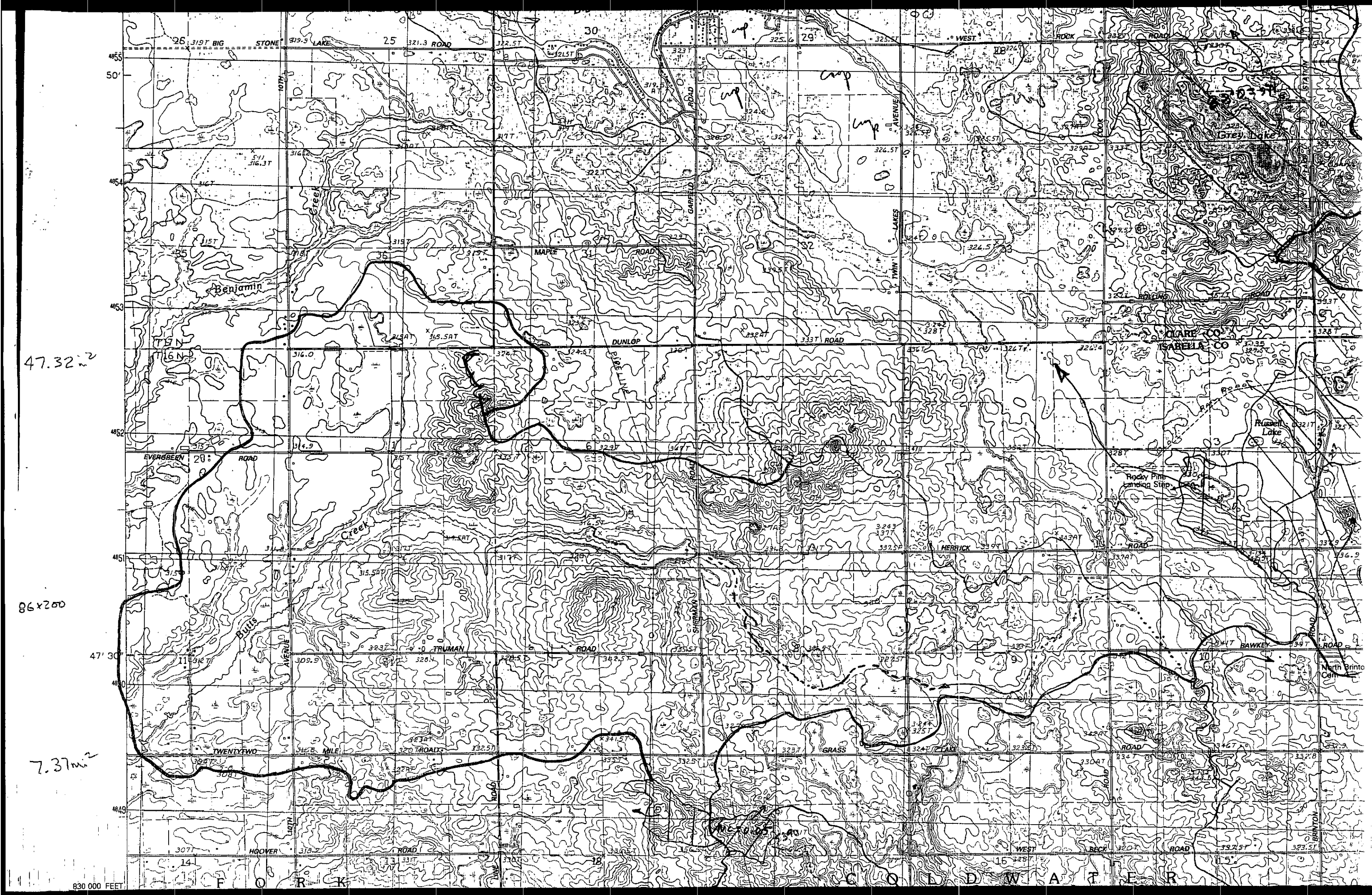
.001153	200.	200.	200.	2	0	0	.00	23.04	626.52

*SECNO 84.000

84.000	.60	978.50	.00	.00	978.51	.01	1.89	.00	979.90
10.0	.0	10.0	.0	.0	12.9	.0	2.8	5.8	979.90
3.33	.00	.78	.00	.000	.045	.000	.000	977.90	603.50
.001212	1600.	1600.	1600.	3	0	0	.00	23.00	626.50

*SECNO 104.000

104.000	.61	980.91	.00	.00	980.92	.01	2.41	.00	982.30
10.0	.0	10.0	.0	.0	12.9	.0	3.4	6.9	982.30
4.05	.00	.77	.00	.000	.045	.000	.000	980.30	603.50
.001197	2000.	2000.	2000.	3	0	0	.00	23.01	626.50


BIG STONE LAKE ROAD
WEST ROCK ROAD
Grey Lake
Benjamin Creek
MAPLE ROAD
DUNLOP ROAD
CLARE CO
ISABELLA CO
Russell Lake
Rocky Pine Landing Strip
EVERGREEN ROAD
Bulls Creek
HERRICK ROAD
TRUMAN ROAD
BAWKEY ROAD
North Brinton Cem
TWENTYTWO MILE ROAD
GRASS LAKE ROAD
HOOVER ROAD
WEST BECK ROAD
FORK
COLDWATER
830 000 FEET
47.32 mi²
86x200
7.37 mi²

FILE: FORK1E

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1*****************************************
*  HEC-2 WATER SURFACE PROFILES          *
*                                        *
*  Version   4.6.2;  May 1991            *
*                                        *
*  RUN DATE    16NOV94    TIME   13:49:48 *
*****************************************
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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

16NOV94 13:49:48 PAGE 1

THIS RUN EXECUTED 16NOV94 13:49:48

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************************************
 HEC-2 WATER SURFACE PROFILES

 Version   4.6.2;  May 1991
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```
T1      FORK TOWNSHIP, MICHIGAN
T2      CHIPPEWA RIVER
T3      100-YEAR FLOOD

J1  ICHECK    INQ      NINV     IDIR     STRT     METRIC   HVINS    Q        WSEL     FQ

      0        2        0        0        0        0        0        0      941.3

J2  NPROF     IPLOT    PRFVS    XSECV    XSECH    FN       ALLDC    IBW      CHNIM    ITRACE

     1        0       -1


J3  VARIABLE CODES FOR SUMMARY PRINTOUT

    110       150       200

NC    .070      .120      .040       .1       .3
QT       2     2700      2700
ET       0        0       4.1      970     1330
          D/S STUDY LIMIT - C.S. BP FROM ISABELLA CO. MOVED UPSTREM
X1  298500       27      1236     1300        0        0        0                .27
GR   950.0        0     940.0      860    935.9     1000    936.2     1050    936.3     1105
GR   937.1     1130     938.4     1155    937.4     1180    935.7     1205    935.6     1236
GR   934.8     1240     933.0     1250    931.1     1260    931.1     1270    931.5     1280
GR   932.3     1290     934.8     1299    937.0     1300    936.8     1320    952.5     1360
GR   951.7     1390     947.0     1410    951.4     1435    952.3     1460    953.5     1485
GR   953.5     1510     953.9     1535

          CROSS SECTION A MOVED DOWNSTREAM
X1  299500       23       254      300     1000     1000     1000                -.56
GR   955.1        0     954.9       50    954.1      100    953.5      150    953.1      200
GR   953.0      216     938.9      245    936.7      254    934.2      261    933.1      265
GR   932.5      270     932.5      275    932.7      280    933.1      285    934.2      290
GR   938.1      300     938.6      336    936.7      369    940.2      385    943.6      423
GR   949.6      479     952.6      493    954.0      550

NC    .070      .080      .035
          CROSS SECTION A
```

```
X1   300500      23      254      300     1000     1000     1000
GR    955.1       0    954.9       50    954.1      100    953.5      150    953.1      200
GR    953.0     216    938.9      245    936.7      254    934.2      261    933.1      265
GR    932.5     270    932.5      275    932.7      280    933.1      285    934.2      290
GR    938.1     300    938.6      336    936.7      369    940.2      385    943.6      423
GR    949.6     479    952.6      493    954.0      550
1
   16NOV94     13:49:48                                                                PAGE    2

ET       0       0      1.4
         CROSS SECTION B
X1   302050      25      170      250     1550     1550     1550
GR    954.1       0    953.2       25    952.1       50    943.8       65    941.6       75
GR    941.5     100    940.6      125    940.5      150    940.0      170    937.7      185
GR    937.1     193    936.7      194    935.9      204    935.8      214    936.0      224
GR    936.5     234    937.1      244    940.1      250    940.7      300    940.7      350
GR    941.2     400    941.6      450    942.3      500    942.3      575    950.0      650

X1     5.01      44     197.     266.   1300.0   1300.0   1300.0
GR    954.4      0.    953.7      29.    953.4      39.    952.9      58.    947.3      75.
GR    946.9     78.    945.7      87.    945.7      97.    945.5     110.    945.0     116.
GR    942.5    139.    942.1     145.    941.5     158.    941.3     174.    941.2     178.
GR    940.6    197.    939.1     204.    938.3     210.    937.6     216.    937.3     217.
GR    936.7    225.    936.5     234.    936.8     243.    937.1     246.    937.4     252.
GR    938.0    259.    938.3     261.    941.0     266.    941.1     282.    942.1     295.
GR    942.5    310.    942.8     337.    942.9     354.    943.0     372.    943.1     398.
GR    943.1    407.    943.3     442.    944.0     477.    944.1     486.    944.3     512.
GR    944.3    547.    944.3     551.    946.8     582.    949.8     617.

X1     5.02      44     225.     283.   1300.0   1300.0   1300.0
GR    954.7      0.    954.2      33.    954.1      44.    953.7      66.    950.7      86.
GR    950.5     89.    949.9      99.    949.8     111.    949.5     125.    948.4     132.
GR    944.2    158.    943.6     165.    942.4     180.    942.1     198.    942.1     202.
GR    941.1    225.    939.6     230.    938.8     234.    938.2     240.    938.0     240.
GR    937.5    247.    937.2     253.    937.7     262.    937.9     265.    938.4     270.
GR    939.0    276.    939.5     278.    941.8     283.    941.9     296.    943.7     307.
GR    944.2    321.    944.9     343.    945.0     358.    945.2     373.    945.0     396.
GR    945.0    403.    945.0     434.    945.7     464.    945.9     471.    946.3     494.
GR    946.4    524.    946.4     528.    947.7     554.    949.5     584.

ET       0     4.1       0                375
         CROSS SECTION C
X1   306000      26      253       300     1350     1350     1350
GR    955.0       0    954.7       50    954.3      100    954.1      125    953.7      141
GR    945.9     178    943.4      203    942.9      228    941.7      253    940.0      257
GR    938.7     264    937.9      274    938.8      284    940.0      294    942.7      300
GR    942.8     311    945.4      320    947.1      350    947.4      375    946.9      400
GR    946.7     425    947.6      450    948.4      475    948.5      500    948.6      525
GR    949.3     550

         CROSS SECTION D
X1   307400      28      346      400     1400     1400     1400
GR    950.0       0    945.2      125    945.1      150    945.5      175    945.5      200
GR    945.5     225    945.3      250    945.5      275    945.6      300    945.4      325
GR    943.2     346    940.9      350    939.4      355    938.7      365    938.3      375
GR    938.2     385    940.9      395    941.8      400    945.4      400    947.6      407
GR    947.6     425    948.1      450    948.5      475    950.1      500    951.3      508
GR    957.4     524    957.9      553    959.1      569
1
   16NOV94     13:49:48                                                                PAGE    3

ET       0     4.1      4.1      228      328
         CROSS SECTION E
X1   309056      29      250      319     1656     1656     1656
GR    954.3       0    954.5       25    954.3       50    954.5       75    954.4      100
GR    954.3     125    954.4      150    953.7      175    951.8      200    950.0      220
GR    945.6     250    942.2      260    941.1      270    940.8      280    940.9      290
GR    941.2     300    941.6      310    942.2      312    945.9      319    946.3      350
GR    946.3     375    946.2      400    946.2      425    946.0      450    946.6      475
GR    947.4     500    947.9      525    949.0      550    950.0      600

NC     .070    .070     .035       .1       .3
X1   309105      24      249      325       49       49       49
GR    952.9       0    952.8       25    952.4       75    952.0      125    951.6      175
GR    951.2     225    951.0      249    946.7      249    942.5      268    941.0      272
GR    940.9     273    940.4      279    939.1      289    940.9    298.5    941.2    299.5
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GR    941.8       304      942.5       314      944.1       325      951.0       325      951.0       375
GR    950.8       425      951.0       475      951.3       525      951.5       575

NC     .070      .070       .035        .3        .5
          DOWNSTREAM FACE OF 19 MILE ROAD
X1   309106        24        249       325          1         1          1
BT       23         0      952.9         0         25     952.8          0        75     952.4          0
BT      125     952.0          0       175      951.6         0        225     951.2          0        249
BT    951.0     946.7        249     951.0      949.7       272      951.0     949.7        272      951.0
BT    941.0       273      951.0     940.9        273     951.0      949.7     298.5      951.0      949.7
BT    298.5     951.0      940.9     299.5      951.0     941.2      299.5     951.0      949.7        325
BT    951.0     949.7        325     951.0      944.1       375      951.0         0        425      950.8
BT        0       475      951.0         0        525     951.3          0       575      951.5          0
GR    952.9         0      952.8        25      952.4        75      952.0       125      951.6        175
GR    951.2       225      951.0       249      946.7       249      942.5       268      941.0        272
GR    940.9       273      940.4       279      939.1       289      940.9     298.5      941.2      299.5
GR    941.8       304      942.5       314      944.1       325      951.0       325      951.0        375
GR    950.8       425      951.0       475      951.3       525      951.5       575

          UPSTREAM FACE OF 19 MILE ROAD
X1   309138         0          0         0         32        32         32
X2        0         0          0         0          0         0          1

NC     .080      .080       .035        .1        .3
X1   309139         0          0         0          1         1          1

ET        0       4.1        4.1       227       402
X1   309188        29        250       319        49        49         49
GR    954.3         0      954.5        25      954.3        50      954.5        75      954.4       100
GR    954.3       125      954.4       150      953.7       175      951.8       200      950.0       220
GR    945.6       250      942.2       260      941.1       270      940.8       280      940.9       290
GR    941.2       300      941.6       310      942.2       312      945.9       319      946.3       350
GR    946.3       375      946.2       400      946.2       425      946.0       450      946.6       475
GR    947.4       500      947.9       525      949.0       550      950.0       600
1
   16NOV94      13:49:48                                                                          PAGE     4


NC     .100      .100       .040        .1        .3
          CROSS SECTION F
X1   310850        22        344       400      1662      1662       1662
GR    951.0         0      946.7       125      946.4       150      945.8       175      946.5       200
GR    946.5       225      945.9       250      946.0       275      946.0       300      945.4       325
GR    945.8       344      943.4       354      942.7       360      941.6       370      941.7       380
GR    943.4       390      953.6       400      952.0       425      959.5       566      959.3       600
GR    958.8       625      959.0       650

ET        0         0        4.1       130       400
          CROSS SECTION G
X1   313050        26        321       400      2200      2200       2200
GR    952.6         0      949.4       100      949.9       125      949.6       150      948.1       175
GR    948.4       200      948.1       225      947.9       250      947.9       275      947.1       300
GR    946.7       321      945.4       321      945.1       322      944.3       325      944.0       335
GR    943.6       345      944.1       355      945.1       365      947.3       366      955.1       400
GR    956.3       425      956.1       450      956.8       500      957.5       550      957.8       600
GR    958.2       650

ET        0       4.1        4.1       250       401
          CROSS SECTION H
X1   315865        30        250       372      2815      2815       2815
GR    954.7         0      954.8        25      954.7        50      955.4        75      956.4       100
GR    958.1       125      957.9       150      957.4       175      957.6       200      957.6       225
GR    955.9       250      951.1       263      949.2       275      948.5       300      948.4       310
GR    948.9       320      948.7       330      949.0       340      948.9       350      948.6       360
GR    949.2       362      954.0       372      954.0       400      953.8       425      954.4       450
GR    954.2       475      954.8       500      955.5       550      955.5       575      955.5       600

NC     .080      .080       .035        .1        .3
ET        0         0        1.4
X1   315964        30        256     351.6        99        99         99
GR    959.3         0      958.4        50      957.2       100      956.5       150      956.1       200
GR    956.0       250      951.6       250      951.0       256      949.8       258      949.2       262
GR    948.4       272      948.4     274.5      948.3     275.5      948.3       286      947.9       296
GR    947.8       301      947.8       302      947.5       312      947.5       322      947.2       326
GR    947.2       327      948.0       339      949.1       349      951.0     351.6      955.8     351.6
GR    955.9       400      956.1       450      956.6       500      957.4       550      958.6       600

NC     .080      .080       .035        .3        .5
          DOWNSTREAM FACE OF 10TH AVE.
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X1   315965        0        0        0        1        1        1
BT       26        0    959.3        0       50    958.4        0      100    957.2        0
BT      150    956.5        0      200    956.1        0      250    956.0    951.6      250
BT    956.0    954.8    274.5    956.0    954.8    274.5    956.0    948.4    275.5    956.0
BT    948.3    275.5    956.0    954.8      301    955.9    954.8      301    955.9    947.8
BT      302    955.9    947.8      302    955.9    954.8      326    955.8    954.8      326
BT    955.8    947.2      327    955.8    947.2      327    955.8    954.7    351.6    955.8
BT    954.8    351.6    955.8    951.0      400    955.9        0      450    956.1        0
BT      500    956.6        0      550    957.4        0      600    958.6        0
1
   16NOV94      13:49:48                                                                    PAGE    5


          UPSTREAM FACE OF 10TH AVE.
X1   315999        0        0        0       34       34       34
X2        0        0        0        0        0        0        1

NC     .080     .080     .035       .1       .3
X1   316000        0        0        0        1        1        1

ET        0      4.1        0      160      360
          CROSS SECTION I
X1   316049       37      250      318       49       49       49
GR    955.8        0    955.3       25    954.9       50    954.7       75    954.7      100
GR    954.4      125    954.3      150    954.4      175    953.9      196    950.3      213
GR    949.2      214    949.0      215    949.2      217    950.4      218    950.8      225
GR    950.6      250    949.3      253    949.2      260    948.3      270    947.3      280
GR    946.2      290    945.7      300    946.7      310    949.2      314    953.3      318
GR    953.1      325    952.8      350    952.7      375    953.7      400    953.9      425
GR    954.6      450    956.2      475    956.7      500    957.5      525    958.7      550
GR    959.7      575    962.7      775
1
   16NOV94      13:49:48                                                                    PAGE    6


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


*PROF 1
0

CCHV=     .100 CEHV=     .300
*SECNO 298500.000
          O/S STUDY LIMIT - C.S. BP FROM ISABELLA CO. MOVED UPSTREM
298500.000      9.93    941.30       .00    941.30    941.35       .05       .00       .00    935.87
    2700.0    1321.9    1328.6      49.6    1536.0     544.8     105.4        .0        .0    937.27
       .00       .86      2.44       .47      .070      .040      .120      .000    931.37    771.42
   .000259        0.        0.        0.         0         0         0       .00    559.35   1330.78


*SECNO 299500.000

3302 WARNING:  CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE,  KRATIO =   .40

          CROSS SECTION A MOVED DOWNSTREAM
299500.000      9.62    941.56       .00       .00    941.99       .43       .53       .11    936.14
    2700.0      97.2    2165.1     437.7      49.5     371.0     362.5      34.1       8.3    937.54
       .06      1.96      5.84      1.21      .070      .040      .120      .000    931.94    238.38
   .001592     1000.     1000.     1000.         0         0         0       .00    168.07    406.45


*SECNO 300500.000

3302 WARNING:  CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE,  KRATIO =  1.42

          CROSS SECTION A
300500.000     10.30    942.80       .00       .00    943.09       .29      1.09       .01    936.70
    2700.0      90.8    1998.5     610.7      60.7     402.4     437.8      53.4      12.3    938.10
       .12      1.50      4.97      1.39      .070      .035      .080      .000    932.50    236.97
   .000792     1000.     1000.     1000.         2         0         0       .00    177.11    414.09


*SECNO 302050.000
          CROSS SECTION B
302050.000      8.11    943.91       .00       .00    944.02       .11       .91       .02    940.00
    2700.0     280.8    1781.2     638.1     299.7     551.2     840.4      99.5      24.8    940.10
```

Dec ?
HWM ~ 6.5 above USEL
100 = 943.9 - 937.1 = 6.8
June ?

```
      .30       .94      3.23       .76      .070      .035      .080      .000    935.80     64.80
  .000449     1550.     1550.     1550.         3         0         0       .00    525.87    590.67
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90 Left
380 Right

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1
  16NOV94      13:49:48                                                                          PAGE    7

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

*SECNO 5.010
     5.010      8.10    944.60       .00       .00    944.84       .24       .79       .04    940.60
    2700.0     264.9    2098.0     337.1     205.6     473.2     406.7     141.0      39.2    941.00
       .40      1.29      4.43       .83      .070      .035      .080      .000    936.50    119.66
   .000854     1300.     1300.     1300.         2         0         0       .00    435.09    554.75

*SECNO 5.020
     5.020      8.57    945.77       .00       .00    946.09       .32      1.22       .02    941.10
    2700.0     368.2    2137.8     194.0     236.1     421.5     215.4     170.2      50.4    941.80
       .49      1.56      5.07       .90      .070      .035      .080      .000    937.20    148.29
   .001041     1300.     1300.     1300.         2         0         0       .00    318.11    466.40

*SECNO 306000.000
          CROSS SECTION C
306000.000      9.29    947.19       .00       .00    947.56       .37      1.46       .01    941.70
    2700.0     517.2    2048.3     134.4     290.7     370.5     105.2     195.6      58.2    942.70
       .57      1.78      5.53      1.28      .070      .035      .080      .000    937.90    171.88
   .001117     1350.     1350.     1350.         2         0         0       .00    185.64    357.52

*SECNO 307400.000

3302 WARNING:  CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE,  KRATIO =  1.49

          CROSS SECTION D
307400.000     10.22    948.42       .00       .00    948.59       .17      1.01       .02    943.20
    2700.0     792.7    1889.0      18.3     823.6     485.6      45.8     229.7      68.1    945.40
       .70       .96      3.89       .40      .070      .035      .080      .000    938.20     41.09
   .000504     1400.     1400.     1400.         2         0         0       .00    429.03    470.13

*SECNO 309056.000

3470 ENCROACHMENT STATIONS=      228.0     328.0  TYPE=      1  TARGET=      100.000
          CROSS SECTION E
309056.000      8.61    949.41       .00       .00    949.79       .38      1.13       .06    945.60
    2700.0      53.0    2613.6      33.4      48.3     519.0      31.0     266.8      78.1    945.90
       .79      1.10      5.04      1.08      .070      .035      .080      .000    940.80    228.00
   .000985     1656.     1656.     1656.         2         0         0       .00    100.00    328.00
```

305 LOB
70' ROB

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1
  16NOV94      13:49:48                                                                          PAGE    8

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

CCHV=     .100 CEHV=     .300
*SECNO 309105.000
309105.000     10.38    949.48       .00       .00    949.84       .36       .05       .00    951.00
    2700.0        .0    2700.0        .0        .0     558.0        .0     267.5      78.2    951.00
       .79       .00      4.84       .00      .000      .035      .000      .000    939.10    249.00
   .001063       49.       49.       49.         2         0         0       .00     76.00    325.00

CCHV=     .300 CEHV=     .500
*SECNO 309106.000

3370 NORMAL BRIDGE, NRD=  23 MIN ELTRD=   950.80 MAX ELLC=   949.70
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          DOWNSTREAM FACE OF 19 MILE ROAD
309106.000     10.37    949.47       .00       .00    949.86       .39       .00       .01    951.00
    2700.0        .0    2700.0        .0        .0     540.7        .0     267.5      78.2    951.00
       .79       .00      4.99       .00      .000      .035      .000      .000    939.10    249.00
   .001970        1.        1.        1.         1         0         0    -16.95     76.00    325.00


*SECNO 309138.000

3370 NORMAL BRIDGE, NRD=  23 MIN ELTRD=   950.80 MAX ELLC=   949.70

          UPSTREAM FACE OF 19 MILE ROAD
309138.000     10.44    949.54       .00       .00    949.92       .38       .06       .00    951.00
    2700.0        .0    2700.0        .0        .0     545.5        .0     267.9      78.3    951.00
       .80       .00      4.95       .00      .000      .035      .000      .000    939.10    249.00
   .001923       32.       32.       32.         2         0         0    -17.08     76.00    325.00


CCHV=     .100 CEHV=     .300
*SECNO 309139.000
309139.000     10.47    949.57       .00       .00    949.92       .35       .00       .00    951.00
    2700.0        .0    2700.0        .0        .0     564.9        .0     267.9      78.3    951.00
       .80       .00      4.78       .00      .000      .035      .000      .000    939.10    249.00
   .001023        1.        1.        1.         2         0         0       .00     76.00    325.00


*SECNO 309188.000

3470 ENCROACHMENT STATIONS=      227.0     402.0  TYPE=      1  TARGET=      175.000
309188.000      8.92    949.72       .00       .00    949.97       .25       .04       .01    945.60
    2700.0      47.9    2328.7     323.4      56.0     540.8     291.8     268.7      78.4    945.90
       .80       .85      4.31      1.11      .080      .035      .080      .000    940.80    227.00
   .000682       49.       49.       49.         2         0         0       .00    175.00    402.00


1
   16NOV94      13:49:48                                                                          PAGE    9

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


CCHV=     .100 CEHV=     .300
*SECNO 310850.000
          CROSS SECTION F
310850.000      9.37    950.97       .00       .00    951.08       .10      1.09       .01    945.80
    2700.0    1309.1    1390.9        .0    1333.6     405.1        .0     318.8      89.3    953.60
      1.00       .98      3.43       .00      .100      .040      .000      .000    941.60       .76
   .000627     1662.     1662.     1662.         2         0         0       .00    396.66    397.43


*SECNO 313050.000
          CROSS SECTION G
313050.000      8.94    952.54       .00       .00    952.67       .12      1.58       .01    946.70
    2700.0    1143.1    1556.9        .0    1077.7     434.8        .0     400.9     109.1    955.10
      1.25      1.06      3.58       .00      .100      .040      .000      .000    943.60      1.78
   .000835     2200.     2200.     2200.         2         0         0       .00    387.07    388.85


*SECNO 315865.000

3470 ENCROACHMENT STATIONS=      250.0     401.0  TYPE=      1  TARGET=      151.000
          CROSS SECTION H
315865.000      6.80    955.20       .00       .00    955.44       .24      2.74       .04    955.90
    2700.0        .0    2680.5      19.5        .0     678.1      34.8     472.8     126.5    954.00
      1.45       .00      3.95       .56      .000      .040      .100      .000    948.40    251.90
   .001152     2815.     2815.     2815.         2         0         0       .00    149.10    401.00


CCHV=     .100 CEHV=     .300
*SECNO 315964.000
315964.000      8.09    955.29       .00       .00    955.53       .24       .09       .00    951.00
    2700.0      21.2    2678.8        .0      24.0     680.1        .0     474.4     126.7    955.80
      1.45       .88      3.94       .00      .080      .035      .000      .000    947.20    250.00
   .000677       99.       99.       99.         1         0         0       .00    101.60    351.60
```

```
CCHV=     .300 CEHV=     .500
*SECNO 315965.000

3302 WARNING:  CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE,  KRATIO =   .47


3370 NORMAL BRIDGE, NRD=  26 MIN ELTRD=   955.80 MAX ELLC=   954.80

1
   16NOV94      13:49:48                                                                                    PAGE   10


          DOWNSTREAM FACE OF 10TH AVE.
315965.000      8.06    955.26       .00       .00    955.56       .30       .00       .03    951.00
    2700.0      23.3    2676.7        .0      21.0     610.3        .0     474.5     126.7    955.80
      1.45      1.11      4.39       .00      .080      .035      .000      .000    947.20    250.00
   .003005        1.        1.        1.         2         0         0    -69.42    101.60    351.60


*SECNO 315999.000

3370 NORMAL BRIDGE, NRD=  26 MIN ELTRD=   955.80 MAX ELLC=   954.80

          UPSTREAM FACE OF 10TH AVE.
315999.000      8.17    955.37       .00       .00    955.66       .30       .10       .00    951.00
    2700.0      23.3    2676.7        .0      21.0     610.3        .0     475.0     126.8    955.80
      1.46      1.11      4.39       .00      .080      .035      .000      .000    947.20    250.00
   .003005       34.       34.       34.         2         0         0    -79.80    101.60    351.60


CCHV=     .100 CEHV=     .300
*SECNO 316000.000

3302 WARNING:  CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE,  KRATIO =  2.18
                                                   955.78
316000.000      8.24    955.44       .00       .00    955.67       .23       .00       .01    951.00
    2700.0      21.5    2678.5        .0      24.8     693.9        .0     475.0     126.8    955.80
      1.46       .87      3.86       .00      .080      .035      .000      .000    947.20    250.00
   .000634        1.        1.        1.         2         0         0       .00    101.60    351.60


*SECNO 316049.000

3470 ENCROACHMENT STATIONS=      160.0     360.0  TYPE=      1  TARGET=      200.000
          CROSS SECTION I
316049.000      9.76    955.46       .00       .00    955.71       .24       .03       .00    950.60
    2700.0     348.0    2259.1      92.8     284.8     525.6     105.5     475.9     127.0    953.30
      1.46      1.22      4.30       .88      .080      .035      .080      .000    945.70    160.00
   .000709       49.       49.       49.         2         0         0       .00    200.00    360.00


1
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T1      FORK TOWNSHIP, MICHIGAN
T2      CHIPPEWA RIVER
T3      100-YEAR ENCROACHED RUN

J1  ICHECK    INQ      NINV     IDIR     STRT     METRIC   HVINS    Q        WSEL     FQ

      0        3        0        0        0        0        0        0      941.4      0

J2  NPROF    IPLOT    PRFVS    XSECV    XSECH    FN       ALLDC    IBW      CHNIM    ITRACE

     15        0       -1


1
   16NOV94      13:49:48                                                                                    PAGE   12


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

1.61 $\left(\frac{2700}{610}\right)^2$
-4.4

SB

```
*PROF 2
0

CCHV=     .100 CEHV=     .300
*SECNO 298500.000

3470 ENCROACHMENT STATIONS=      970.0    1330.0  TYPE=      1  TARGET=      360.000
          D/S STUDY LIMIT - C.S. BP FROM ISABELLA CO. MOVED UPSTREM
298500.000     10.03    941.40       .00    941.30    941.46       .06       .00       .00    935.87
    2700.0    1222.6    1422.8      54.5    1226.5     551.2     108.3        .0        .0    937.27
       .00      1.00      2.58       .50      .070      .040      .120      .000    931.37    970.00
   .000286        0.        0.        0.         0         0         0       .00    360.00   1330.00


*SECNO 299500.000

3302 WARNING:  CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE,  KRATIO =   .44

          CROSS SECTION A MOVED DOWNSTREAM
299500.000      9.77    941.71       .00    941.56    942.12       .41       .55       .10    936.14
    2700.0      99.9    2150.5     449.6      51.9     377.9     378.7      30.9       6.1    937.54
       .06      1.92      5.69      1.19      .070      .040      .120      .000    931.94    238.07
   .001476     1000.     1000.     1000.         2         0         0       .00    170.07    408.14


*SECNO 300500.000
          CROSS SECTION A
300500.000     10.38    942.88       .00    942.80    943.16       .28      1.03       .01    936.70
    2700.0      91.8    1991.1     617.1      62.0     405.9     446.5      50.7      10.1    938.10
       .13      1.48      4.91      1.38      .070      .035      .080      .000    932.50    236.82
   .000764     1000.     1000.     1000.         2         0         0       .00    178.12    414.94


*SECNO 302050.000
 2800 NAT Q1=     1273.66  WSELK=     943.91  ENC Q1=     1273.66  WSEL=     944.01  RATIO=     .0000
 NAT Q1=     1321.  RATIOS LOB, CH, ROB=     .1060    .6516    .2424  WSEL=     944.01

3470 ENCROACHMENT STATIONS=       95.8     529.3  TYPE=      4  TARGET=         .036
          CROSS SECTION B
302050.000      8.17    943.97       .00    943.91    944.09       .12       .91       .02    940.00
    2700.0     244.3    1832.8     622.9     243.1     555.9     770.7      94.9      21.0    940.10
       .30      1.00      3.30       .81      .070      .035      .080      .000    935.80     95.77
   .000463     1550.     1550.     1550.         2         0         0       .00    433.57    529.34


1
   16NOV94      13:49:48                                                                          PAGE   13


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


*SECNO 5.010
 2800 NAT Q1=      923.78  WSELK=     944.60  ENC Q1=      923.78  WSEL=     944.70  RATIO=     .0000
 NAT Q1=      957.  RATIOS LOB, CH, ROB=     .1000    .7681    .1319  WSEL=     944.70

3470 ENCROACHMENT STATIONS=      148.8     426.5  TYPE=      4  TARGET=         .035
     5.010      8.18    944.68       .00    944.60    944.93       .26       .80       .04    940.60
    2700.0     230.3    2153.1     316.6     165.2     478.3     336.5     133.0      31.6    941.00
       .39      1.39      4.50       .94      .070      .035      .080      .000    936.50    148.75
   .000868     1300.     1300.     1300.         2         0         0       .00    277.76    426.51


*SECNO 5.020
 2800 NAT Q1=      836.68  WSELK=     945.77  ENC Q1=      836.68  WSEL=     945.87  RATIO=     .0000
 NAT Q1=      864.  RATIOS LOB, CH, ROB=     .1386    .7847    .0767  WSEL=     945.87

3470 ENCROACHMENT STATIONS=      170.4     348.9  TYPE=      4  TARGET=         .031
     5.020      8.65    945.85       .00    945.77    946.19       .34      1.24       .02    941.10
    2700.0     343.1    2187.1     169.8     207.7     427.0     147.1     159.2      38.4    941.80
       .47      1.65      5.12      1.15      .070      .035      .080      .000    937.20    170.39
   .001044     1300.     1300.     1300.         1         0         0       .00    178.51    348.90


*SECNO 306000.000
 2800 NAT Q1=      807.74  WSELK=     947.19  ENC Q1=      807.74  WSEL=     947.29  RATIO=     .0000
 NAT Q1=      832.  RATIOS LOB, CH, ROB=     .1940    .7522    .0538  WSEL=     947.29
```

```
3470 ENCROACHMENT STATIONS=      191.8     317.2  TYPE=      4  TARGET=         .029
          CROSS SECTION C
306000.000      9.38    947.28       .00    947.19    947.67       .39      1.46       .02    941.70
    2700.0     497.5    2092.7     109.8     264.7     374.5      72.0     182.4      43.1    942.70
       .55      1.88      5.59      1.53      .070      .035      .080      .000    937.90    191.81
   .001125     1350.     1350.     1350.         1         0         0       .00    125.38    317.19
```

12' ROB

```
*SECNO 307400.000
 2800 NAT Q1=    1202.62  WSELK=     948.42  ENC Q1=    1202.62  WSEL=     948.52  RATIO=    .0000
 NAT Q1=    1240.  RATIOS LOB, CH, ROB=    .3011    .6911    .0079  WSEL=     948.52

3302 WARNING:  CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE,  KRATIO =  1.47

3470 ENCROACHMENT STATIONS=      113.4     400.0  TYPE=      4  TARGET=         .030
          CROSS SECTION D
1
   16NOV94      13:49:48                                                                                    PAGE   14

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

307400.000     10.36     948.56       .00     948.42     948.72       .17      1.03       .02    943.20
    2700.0     799.6    1900.4        .0      754.2      492.8        .0     213.8      49.7 100000.00
       .68      1.06      3.86       .00      .070      .035      .000      .000    938.20    113.38
   .000521     1400.     1400.     1400.         2         0         0       .00    286.62    400.00
```

NAT. DOFM. 7'
V = .4fps in ROB
⇒ NOT FW

```
*SECNO 309056.000

3470 ENCROACHMENT STATIONS=      228.0     328.0  TYPE=      1  TARGET=      100.000
          CROSS SECTION E
309056.000      8.74    949.54       .00    949.41    949.91       .37      1.13       .06    945.60
    2700.0      56.5    2609.3      34.2      51.2     528.2      32.3     249.2      57.1    945.90
       .78      1.10      4.94      1.06      .070      .035      .080      .000    940.80    228.00
   .000926     1656.     1656.     1656.         2         0         0       .00    100.00    328.00

CCHV=     .100 CEHV=     .300
*SECNO 309105.000
309105.000     10.51    949.61       .00    949.48    949.96       .35       .05       .00    951.00
    2700.0        .0    2700.0        .0        .0     567.8        .0     249.8      57.2    951.00
       .78       .00      4.76       .00      .000      .035      .000      .000    939.10    249.00
   .001007       49.       49.       49.         2         0         0       .00     76.00    325.00

CCHV=     .300 CEHV=     .500
*SECNO 309106.000

3370 NORMAL BRIDGE, NRD=  23 MIN ELTRD=   950.80 MAX ELLC=   949.70

          DOWNSTREAM FACE OF 19 MILE ROAD
309106.000     10.50    949.60       .00    949.47    949.97       .37       .00       .01    951.00
    2700.0        .0    2700.0        .0        .0     550.2        .0     249.9      57.2    951.00
       .78       .00      4.91       .00      .000      .035      .000      .000    939.10    249.00
   .001879        1.        1.        1.         1         0         0    -17.20     76.00    325.00

*SECNO 309138.000

3370 NORMAL BRIDGE, NRD=  23 MIN ELTRD=   950.80 MAX ELLC=   949.70

          UPSTREAM FACE OF 19 MILE ROAD
309138.000     10.56    949.66       .00    949.54    950.03       .37       .06       .00    951.00
    2700.0        .0    2700.0        .0        .0     554.8        .0     250.3      57.2    951.00
       .78       .00      4.87       .00      .000      .035      .000      .000    939.10    249.00
   .001838       32.       32.       32.         2         0         0    -17.33     76.00    325.00

1
   16NOV94      13:49:48                                                                                    PAGE   15

    SECNO      DEPTH      CWSEL      CRIWS      WSELK      EG         HV         HL         OLOSS      L-BANK ELEV
```

```
    Q          QLOB       QCH        QROB       ALOB       ACH        AROB       VOL        TWA        R-BANK ELEV
    TIME       VLOB       VCH        VROB       XNL        XNCH       XNR        WTN        ELMIN      SSTA
    SLOPE      XLOBL      XLCH       XLOBR      ITRIAL     IDC        ICONT      CORAR      TOPWID     ENDST

CCHV=      .100 CEHV=      .300
*SECNO 309139.000
309139.000     10.59     949.69        .00     949.57     950.04        .34        .00        .00     951.00
    2700.0        .0     2700.0         .0         .0      574.3         .0      250.3       57.2     951.00
       .78       .00       4.70        .00       .000       .035       .000       .000     939.10     249.00
   .000972        1.         1.         1.          2          0          0        .00      76.00     325.00

*SECNO 309188.000

3470 ENCROACHMENT STATIONS=      227.0     402.0  TYPE=      1  TARGET=      175.000
309188.000      9.04     949.84        .00     949.72     950.08        .24        .04        .01     945.60
    2700.0      50.2     2317.9      331.9       58.8      549.1      301.8      251.1       57.4     945.90
       .79       .85       4.22       1.10       .080       .035       .080       .000     940.80     227.00
   .000642       49.        49.        49.          2          0          0        .00     175.00     402.00

CCHV=      .100 CEHV=      .300
*SECNO 310850.000
3280 CROSS SECTION 310850.00 EXTENDED       .04 FEET

          CROSS SECTION F
310850.000      9.44     951.04        .00     950.97     951.13        .10       1.04        .01     945.80
    2700.0    1316.6     1383.4         .0      1354.7      408.4         .0      302.1       68.3     953.60
      1.00       .97       3.39        .00       .100       .040       .000       .000     941.60        .00
   .000605     1662.      1662.      1662.          2          0          0        .00     397.49     397.49

*SECNO 313050.000

3470 ENCROACHMENT STATIONS=      130.0     400.0  TYPE=      1  TARGET=      270.000
          CROSS SECTION G
313050.000      9.02     952.62        .00     952.54     952.76        .14       1.62        .01     946.70
    2700.0    1047.4     1652.6         .0       852.2      440.0         .0      379.3       84.9 100000.00
      1.22      1.23       3.76        .00       .100       .040       .000       .000     943.60     130.00
   .000910     2200.      2200.      2200.          2          0          0        .00     259.19     389.19

*SECNO 315865.000

3470 ENCROACHMENT STATIONS=      250.0     401.0  TYPE=      1  TARGET=      151.000
          CROSS SECTION H
315865.000      6.93     955.33        .00     955.20     955.56        .23       2.77        .03     955.90
    2700.0        .0     2677.7       22.3         .0      693.7       38.5      444.7       98.1     954.00
      1.42       .00       3.86        .58       .000       .040       .100       .000     948.40     251.55
   .001070     2815.      2815.      2815.          2          0          0        .00     149.45     401.00

1
   16NOV94      13:49:48                                                                                PAGE   16

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

CCHV=      .100 CEHV=      .300
*SECNO 315964.000
 2800 NAT Q1=     1037.50  WSELK=      955.29  ENC Q1=     1051.65  WSEL=      955.39  RATIO=    -.0136
 NAT Q1=     1060.  RATIOS LOB, CH, ROB=     .0079    .9921    .0000  WSEL=      955.39

3470 ENCROACHMENT STATIONS=      256.0     351.6  TYPE=      4  TARGET=          .008
315964.000      8.21     955.41        .00     955.29     955.65        .24        .08        .00     951.00
    2700.0        .0     2700.0         .0         .0      691.7         .0      446.3       98.4 100000.00
      1.43       .00       3.90        .00       .000       .035       .000       .000     947.20     256.00
   .000689       99.        99.        99.          0          0          0        .00      95.60     351.60

CCHV=      .300 CEHV=      .500
*SECNO 315965.000

3302 WARNING:  CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE,  KRATIO =    .48
```

```
3370 NORMAL BRIDGE, NRD=  26 MIN ELTRD=   955.80 MAX ELLC=   954.80

          DOWNSTREAM FACE OF 10TH AVE.
315965.000      8.18    955.38       .00    955.26    955.68       .30       .00       .03    951.00
    2700.0      23.3    2676.7        .0      21.0     610.3        .0     446.3      98.4    955.80
      1.43      1.11      4.39       .00      .080      .035      .000      .000    947.20    250.00
   .003005        1.        1.        1.         1         0         0    -81.55    101.60    351.60


*SECNO 315999.000

3370 NORMAL BRIDGE, NRD=  26 MIN ELTRD=   955.80 MAX ELLC=   954.80

          UPSTREAM FACE OF 10TH AVE.
315999.000      8.29    955.49       .00    955.37    955.78       .30       .10       .00    951.00
    2700.0      23.3    2676.7        .0      21.0     610.3        .0     446.8      98.4    955.80
      1.43      1.11      4.39       .00      .080      .035      .000      .000    947.20    250.00
   .003005       34.       34.       34.         1         0         0    -90.95    101.60    351.60


CCHV=     .100 CEHV=     .300
*SECNO 316000.000
 2800 NAT Q1=    1071.89  WSELK=     955.44  ENC Q1=    1087.13  WSEL=     955.54  RATIO=   -.0142
 NAT Q1=    1096.  RATIOS LOB, CH, ROB=    .0081   .9919   .0000  WSEL=     955.54
1
   16NOV94      13:49:48                                                                          PAGE   17


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


3302 WARNING:  CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE,  KRATIO =  2.15


3470 ENCROACHMENT STATIONS=      256.0     351.6  TYPE=      4  TARGET=         .008
316000.000      8.36    955.56       .00    955.44    955.79       .23       .00       .01    951.00
    2700.0        .0    2700.0        .0        .0     705.5        .0     446.8      98.4 100000.00
      1.43       .00      3.83       .00      .000      .035      .000      .000    947.20    256.00
   .000648        1.        1.        1.         2         0         0       .00     95.60    351.60


*SECNO 316049.000
 2800 NAT Q1=    1013.94  WSELK=     955.46  ENC Q1=    1013.94  WSEL=     955.56  RATIO=    .0000
 NAT Q1=    1119.  RATIOS LOB, CH, ROB=    .1416   .7744   .0841  WSEL=     955.56

3470 ENCROACHMENT STATIONS=      210.7     364.3  TYPE=      4  TARGET=         .094
          CROSS SECTION I
316049.000      9.88    955.58       .00    955.46    955.83       .25       .03       .01    950.60
    2700.0     278.5    2309.9     111.6     199.8     533.9     122.8     447.7      98.6    953.30
      1.43      1.39      4.33       .91      .080      .035      .080      .000    945.70    210.69
   .000704       49.       49.       49.         1         0         0       .00    153.59    364.28


1
   16NOV94      13:49:48                                                                          PAGE   18


                                                                          THIS RUN EXECUTED 16NOV94    13:49:55
************************************
 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


100-YEAR FLOOD

SUMMARY PRINTOUT TABLE  110
```

SECNO	CWSEL	DIFKWS	EG	TOPWID	QLOB	QCH	QROB	PERENC	STENCL	STCHL	STCHR	STENCR
298500.000	941.30	.00	941.35	559.35	1321.85	1328.60	49.55	.00	.00	1236.00	1300.00	.00
298500.000	941.40	.10	941.46	360.00	1222.64	1422.82	54.55	360.00	970.00	1236.00	1300.00	1330.00
* 299500.000	941.56	.00	941.99	168.07	97.21	2165.08	437.71	.00	.00	254.00	300.00	.00
* 299500.000	941.71	.15	942.12	170.07	99.93	2150.46	449.62	.00	.00	254.00	300.00	.00
* 300500.000	942.80	.00	943.09	177.11	90.78	1998.52	610.70	.00	.00	254.00	300.00	.00
300500.000	942.88	.08	943.16	178.12	91.78	1991.10	617.12	.00	.00	254.00	300.00	.00
302050.000	943.91	.00	944.02	525.87	280.78	1781.16	638.06	.00	.00	170.00	250.00	.00
302050.000	943.97	.06	944.09	433.57	244.29	1832.83	622.88	.04	95.77	170.00	250.00	529.34
5.010	944.60	.00	944.84	435.09	264.93	2097.97	337.10	.00	.00	197.00	266.00	.00
5.010	944.68	.07	944.93	277.76	230.28	2153.12	316.60	.04	148.75	197.00	266.00	426.51
5.020	945.77	.00	946.09	318.11	368.23	2137.77	194.00	.00	.00	225.00	283.00	.00
5.020	945.85	.09	946.19	178.51	343.11	2187.07	169.82	.03	170.39	225.00	283.00	348.90
306000.000	947.19	.00	947.56	185.64	517.24	2048.34	134.42	375.00	.00	253.00	300.00	375.00
306000.000	947.28	.09	947.67	125.38	497.51	2092.68	109.81	.03	191.81	253.00	300.00	317.19
* 307400.000	948.42	.00	948.59	429.03	792.71	1888.96	18.33	.00	.00	346.00	400.00	.00
* 307400.000	948.56	.13	948.72	286.62	799.58	1900.42	.00	.03	113.38	346.00	400.00	400.00
309056.000	949.41	.00	949.79	100.00	53.02	2613.59	33.39	100.00	228.00	250.00	319.00	328.00
309056.000	949.54	.13	949.91	100.00	56.51	2609.25	34.24	100.00	228.00	250.00	319.00	328.00
309105.000	949.48	.00	949.84	76.00	.00	2700.00	.00	.00	.00	249.00	325.00	.00
309105.000	949.61	.13	949.96	76.00	.00	2700.00	.00	.00	.00	249.00	325.00	.00
309106.000	949.47	.00	949.86	76.00	.00	2700.00	.00	.00	.00	249.00	325.00	.00
309106.000	949.60	.13	949.97	76.00	.00	2700.00	.00	.00	.00	249.00	325.00	.00

SECNO	CWSEL	DIFKWS	EG	TOPWID	QLOB	QCH	QROB	PERENC	STENCL	STCHL	STCHR	STENCR
309138.000	949.54	.00	949.92	76.00	.00	2700.00	.00	.00	.00	249.00	325.00	.00
309138.000	949.66	.12	950.03	76.00	.00	2700.00	.00	.00	.00	249.00	325.00	.00
309139.000	949.57	.00	949.92	76.00	.00	2700.00	.00	.00	.00	249.00	325.00	.00
309139.000	949.69	.12	950.04	76.00	.00	2700.00	.00	.00	.00	249.00	325.00	.00
309188.000	949.72	.00	949.97	175.00	47.85	2328.70	323.44	175.00	227.00	250.00	319.00	402.00
309188.000	949.84	.12	950.08	175.00	50.16	2317.89	331.95	175.00	227.00	250.00	319.00	402.00
310850.000	950.97	.00	951.08	396.66	1309.06	1390.94	.00	.00	.00	344.00	400.00	.00
310850.000	951.04	.06	951.13	397.49	1316.60	1383.40	.00	.00	.00	344.00	400.00	.00
313050.000	952.54	.00	952.67	387.07	1143.15	1556.85	.00	.00	.00	321.00	400.00	.00
313050.000	952.62	.08	952.76	259.19	1047.44	1652.56	.00	270.00	130.00	321.00	400.00	400.00
315865.000	955.20	.00	955.44	149.10	.00	2680.47	19.53	151.00	250.00	250.00	372.00	401.00
315865.000	955.33	.13	955.56	149.45	.00	2677.68	22.32	151.00	250.00	250.00	372.00	401.00
315964.000	955.29	.00	955.53	101.60	21.16	2678.84	.00	.00	.00	256.00	351.60	.00
315964.000	955.41	.12	955.65	95.60	.00	2700.00	.00	.01	256.00	256.00	351.60	351.60
* 315965.000	955.26	.00	955.56	101.60	23.33	2676.67	.00	.00	.00	256.00	351.60	.00
* 315965.000	955.38	.12	955.68	101.60	23.33	2676.67	.00	.00	.00	256.00	351.60	.00
315999.000	955.37	.00	955.66	101.60	23.33	2676.67	.00	.00	.00	256.00	351.60	.00
315999.000	955.49	.12	955.78	101.60	23.33	2676.67	.00	.00	.00	256.00	351.60	.00
* 316000.000	955.44	.00	955.67	101.60	21.51	2678.49	.00	.00	.00	256.00	351.60	.00
* 316000.000	955.56	.12	955.79	95.60	.00	2700.00	.00	.01	256.00	256.00	351.60	351.60
316049.000	955.46	.00	955.71	200.00	348.02	2259.14	92.84	200.00	160.00	250.00	318.00	360.00
316049.000	955.58	.11	955.83	153.59	278.48	2309.92	111.60	.09	210.69	250.00	318.00	364.28

SUMMARY PRINTOUT TABLE 150

SECNO	XLCH	ELTRD	ELLC	ELMIN	Q	CWSEL	CRIWS	EG	10*KS	VCH	AREA	.01K
298500.000	.00	.00	.00	931.37	2700.00	941.30	.00	941.35	2.59	2.44	2186.14	1676.25
298500.000	.00	.00	.00	931.37	2700.00	941.40	.00	941.46	2.86	2.58	1885.95	1596.02
* 299500.000	1000.00	.00	.00	931.94	2700.00	941.56	.00	941.99	15.92	5.84	783.01	676.73
* 299500.000	1000.00	.00	.00	931.94	2700.00	941.71	.00	942.12	14.76	5.69	808.57	702.75
* 300500.000	1000.00	.00	.00	932.50	2700.00	942.80	.00	943.09	7.92	4.97	900.91	959.45
300500.000	1000.00	.00	.00	932.50	2700.00	942.88	.00	943.16	7.64	4.91	914.43	977.03
302050.000	1550.00	.00	.00	935.80	2700.00	943.91	.00	944.02	4.49	3.23	1691.35	1273.66
302050.000	1550.00	.00	.00	935.80	2700.00	943.97	.00	944.09	4.63	3.30	1569.76	1255.33
5.010	1300.00	.00	.00	936.50	2700.00	944.60	.00	944.84	8.54	4.43	1085.50	923.78
5.010	1300.00	.00	.00	936.50	2700.00	944.68	.00	944.93	8.68	4.50	980.07	916.25
5.020	1300.00	.00	.00	937.20	2700.00	945.77	.00	946.09	10.41	5.07	873.00	836.68
5.020	1300.00	.00	.00	937.20	2700.00	945.85	.00	946.19	10.44	5.12	781.85	835.65
306000.000	1350.00	.00	.00	937.90	2700.00	947.19	.00	947.56	11.17	5.53	766.41	807.74
306000.000	1350.00	.00	.00	937.90	2700.00	947.28	.00	947.67	11.25	5.59	711.14	805.00
* 307400.000	1400.00	.00	.00	938.20	2700.00	948.42	.00	948.59	5.04	3.89	1355.01	1202.62
* 307400.000	1400.00	.00	.00	938.20	2700.00	948.56	.00	948.72	5.21	3.86	1247.00	1183.09
309056.000	1656.00	.00	.00	940.80	2700.00	949.41	.00	949.79	9.85	5.04	598.33	860.33
309056.000	1656.00	.00	.00	940.80	2700.00	949.54	.00	949.91	9.26	4.94	611.72	887.47
309105.000	49.00	.00	.00	939.10	2700.00	949.48	.00	949.84	10.63	4.84	558.00	828.12
309105.000	49.00	.00	.00	939.10	2700.00	949.61	.00	949.96	10.07	4.76	567.75	850.69
309106.000	1.00	950.80	949.70	939.10	2700.00	949.47	.00	949.86	19.70	4.99	540.71	608.29
309106.000	1.00	950.80	949.70	939.10	2700.00	949.60	.00	949.97	18.79	4.91	550.22	622.82
309138.000	32.00	950.80	949.70	939.10	2700.00	949.54	.00	949.92	19.23	4.95	545.55	615.67
309138.000	32.00	950.80	949.70	939.10	2700.00	949.66	.00	950.03	18.38	4.87	554.79	629.82
309139.000	1.00	.00	.00	939.10	2700.00	949.57	.00	949.92	10.23	4.78	564.87	844.00
309139.000	1.00	.00	.00	939.10	2700.00	949.69	.00	950.04	9.72	4.70	574.26	865.84
309188.000	49.00	.00	.00	940.80	2700.00	949.72	.00	949.97	6.82	4.31	888.60	1033.99
309188.000	49.00	.00	.00	940.80	2700.00	949.84	.00	950.08	6.42	4.22	909.73	1065.64
310850.000	1662.00	.00	.00	941.60	2700.00	950.97	.00	951.08	6.27	3.43	1738.69	1078.27
310850.000	1662.00	.00	.00	941.60	2700.00	951.04	.00	951.13	6.05	3.39	1763.08	1097.73
313050.000	2200.00	.00	.00	943.60	2700.00	952.54	.00	952.67	8.35	3.58	1512.51	934.33
313050.000	2200.00	.00	.00	943.60	2700.00	952.62	.00	952.76	9.10	3.76	1292.23	894.95

SECNO	XLCH	ELTRD	ELLC	ELMIN	Q	CWSEL	CRIWS	EG	10*KS	VCH	AREA	.01K
315865.000	2815.00	.00	.00	948.40	2700.00	955.20	.00	955.44	11.52	3.95	712.93	795.47
315865.000	2815.00	.00	.00	948.40	2700.00	955.33	.00	955.56	10.70	3.86	732.30	825.39
315964.000	99.00	.00	.00	947.20	2700.00	955.29	.00	955.53	6.77	3.94	704.06	1037.50
315964.000	99.00	.00	.00	947.20	2700.00	955.41	.00	955.65	6.89	3.90	691.68	1028.25
* 315965.000	1.00	955.80	954.80	947.20	2700.00	955.26	.00	955.56	30.05	4.39	631.32	492.56
* 315965.000	1.00	955.80	954.80	947.20	2700.00	955.38	.00	955.68	30.05	4.39	631.32	492.56
315999.000	34.00	955.80	954.80	947.20	2700.00	955.37	.00	955.66	30.05	4.39	631.32	492.56
315999.000	34.00	955.80	954.80	947.20	2700.00	955.49	.00	955.78	30.05	4.39	631.32	492.56
* 316000.000	1.00	.00	.00	947.20	2700.00	955.44	.00	955.67	6.34	3.86	718.70	1071.89
* 316000.000	1.00	.00	.00	947.20	2700.00	955.56	.00	955.79	6.48	3.83	705.50	1060.77
316049.000	49.00	.00	.00	945.70	2700.00	955.46	.00	955.71	7.09	4.30	915.98	1013.94
316049.000	49.00	.00	.00	945.70	2700.00	955.58	.00	955.83	7.04	4.33	856.45	1017.79

100-YEAR FLOOD

SUMMARY PRINTOUT TABLE 150

SECNO	Q	CWSEL	DIFWSP	DIFWSX	DIFKWS	TOPWID	XLCH
298500.000	2700.00	941.30	.00	.00	.00	559.35	.00
298500.000	2700.00	941.40	.10	.00	.10	360.00	.00
* 299500.000	2700.00	941.56	.00	.26	.00	168.07	1000.00
* 299500.000	2700.00	941.71	.15	.31	.15	170.07	1000.00
* 300500.000	2700.00	942.80	.00	1.24	.00	177.11	1000.00
300500.000	2700.00	942.88	.08	1.17	.08	178.12	1000.00
302050.000	2700.00	943.91	.00	1.11	.00	525.87	1550.00
302050.000	2700.00	943.97	.06	1.09	.06	433.57	1550.00
5.010	2700.00	944.60	.00	.69	.00	435.09	1300.00
5.010	2700.00	944.68	.07	.71	.07	277.76	1300.00
5.020	2700.00	945.77	.00	1.17	.00	318.11	1300.00
5.020	2700.00	945.85	.09	1.18	.09	178.51	1300.00
306000.000	2700.00	947.19	.00	1.42	.00	185.64	1350.00
306000.000	2700.00	947.28	.09	1.43	.09	125.38	1350.00
* 307400.000	2700.00	948.42	.00	1.23	.00	429.03	1400.00
* 307400.000	2700.00	948.56	.13	1.27	.13	286.62	1400.00
309056.000	2700.00	949.41	.00	.99	.00	100.00	1656.00
309056.000	2700.00	949.54	.13	.99	.13	100.00	1656.00
309105.000	2700.00	949.48	.00	.07	.00	76.00	49.00
309105.000	2700.00	949.61	.13	.06	.13	76.00	49.00
309106.000	2700.00	949.47	.00	-.01	.00	76.00	1.00
309106.000	2700.00	949.60	.13	-.01	.13	76.00	1.00
309138.000	2700.00	949.54	.00	.07	.00	76.00	32.00
309138.000	2700.00	949.66	.12	.07	.12	76.00	32.00
309139.000	2700.00	949.57	.00	.03	.00	76.00	1.00
309139.000	2700.00	949.69	.12	.03	.12	76.00	1.00
309188.000	2700.00	949.72	.00	.15	.00	175.00	49.00
309188.000	2700.00	949.84	.12	.15	.12	175.00	49.00
310850.000	2700.00	950.97	.00	1.25	.00	396.66	1662.00
310850.000	2700.00	951.04	.06	1.19	.06	397.49	1662.00
313050.000	2700.00	952.54	.00	1.57	.00	387.07	2200.00
313050.000	2700.00	952.62	.08	1.58	.08	259.19	2200.00

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SECNO	Q	CWSEL	DIFWSP	DIFWSX	DIFKWS	TOPWID	XLCH
315865.000	2700.00	955.20	.00	2.66	.00	149.10	2815.00
315865.000	2700.00	955.33	.13	2.71	.13	149.45	2815.00
315964.000	2700.00	955.29	.00	.09	.00	101.60	99.00
315964.000	2700.00	955.41	.12	.08	.12	95.60	99.00
* 315965.000	2700.00	955.26	.00	-.03	.00	101.60	1.00
* 315965.000	2700.00	955.38	.12	-.03	.12	101.60	1.00
315999.000	2700.00	955.37	.00	.10	.00	101.60	34.00
315999.000	2700.00	955.49	.12	.10	.12	101.60	34.00
* 316000.000	2700.00	955.44	.00	.07	.00	101.60	1.00
* 316000.000	2700.00	955.56	.12	.08	.12	95.60	1.00
316049.000	2700.00	955.46	.00	.02	.00	200.00	49.00
316049.000	2700.00	955.58	.11	.02	.11	153.59	49.00

SUMMARY OF ERRORS AND SPECIAL NOTES

WARNING SECNO= 299500.000 PROFILE= 1 CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
WARNING SECNO= 299500.000 PROFILE= 2 CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

WARNING SECNO= 300500.000 PROFILE= 1 CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

WARNING SECNO= 307400.000 PROFILE= 1 CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
WARNING SECNO= 307400.000 PROFILE= 2 CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

WARNING SECNO= 315965.000 PROFILE= 1 CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
WARNING SECNO= 315965.000 PROFILE= 2 CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

WARNING SECNO= 316000.000 PROFILE= 1 CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
WARNING SECNO= 316000.000 PROFILE= 2 CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

FLOODWAY DATA, 100-YEAR FLOOD
PROFILE NO. 2

STATION	FLOODWAY WIDTH	FLOODWAY SECTION AREA	FLOODWAY MEAN VELOCITY	WATER SURFACE ELEVATION WITH FLOODWAY	WITHOUT FLOODWAY	DIFFERENCE
298500.000	360.	1886.	1.4	941.4	941.3	.1
299500.000	170.	809.	3.3	941.7	941.6	.1
300500.000	178.	914.	3.0	942.9	942.8	.1
302050.000	434.	1570.	1.7	944.0	943.9	.1
5.010	278.	980.	2.8	944.7	944.6	.1
5.020	179.	782.	3.5	945.9	945.8	.1
306000.000	125.	711.	3.8	947.3	947.2	.1
307400.000	287.	1247.	2.2	948.5	948.4	.1
309056.000	100.	612.	4.4	949.5	949.4	.1
309105.000	76.	568.	4.8	949.6	949.5	.1
309106.000	76.	550.	4.9	949.6	949.5	.1
309138.000	76.	555.	4.9	949.6	949.5	.1
309139.000	76.	574.	4.7	949.7	949.6	.1
309188.000	175.	910.	3.0	949.8	949.7	.1
310850.000	397.	1763.	1.5	951.1	951.0	.1
313050.000	259.	1292.	2.1	952.6	952.5	.1
315865.000	149.	732.	3.7	955.3	955.2	.1
315964.000	96.	692.	3.9	955.4	955.3	.1
315965.000	102.	631.	4.3	955.4	955.3	.1
315999.000	102.	631.	4.3	955.5	955.4	.1
316000.000	96.	706.	3.8	955.5	955.4	.1
316049.000	154.	856.	3.2	955.6	955.5	.1

DEPARTMENT OF THE ARMY
DETROIT DISTRICT, CORPS OF ENGINEERS
BOX 1027
DETROIT, MICHIGAN 48231-1027

IN REPLY REFER TO

November 17, 1994

RECEIVED
NOV 18 1994
NATURAL RESOURCES
LAND & WATER MANAGEMENT

Great Lake Hydraulics and Hydrology Branch
Engineering & Planning Division

Mr. Bruce Menerey, P.E.
Technical Programs
Land and Water Management Division
Michigan Department of Natural Resources
P.O. Box 30028
Lansing, Michigan 48909

Dear Mr. Menerey:

Submitted for your review and approval is a copy of the hydraulic calculations for the Chippewa River in the Fork Township, Mecosta County, Michigan Flood Insurance Study. The hydraulic analysis is being submitted in the form of a PC diskette containing the HEC-2, 100- and 500-year unencroached and encroached input and output data. Also enclosed are; a brief write-up dealing with items that will assist the review process, a copy of the field notes at bridge and valley sections, and a map showing the surveyed cross-section locations.

Based on current scheduling and workload, a response from your office within two weeks would be appreciated.

If you have any questions regarding the enclosed data, please contact Ms. Hanna Kobylinski at (313) 226-4761 or Mr. David Schweiger at (313) 226-4886.

Sincerely,

Ronald E. Wilshaw, P.E.
Chief, G.L. Hydraulics and
Hydrology Branch

Enclosure

Fork Township, Mecosta County, Michigan FIS
Hydraulic Computation Background Information

This study covers the Chippewa River from 10th Avenue, the upstream corporate limit to the Mecosta-Isabella county line, the downstream corporate limit. The 100- and 500-year floods are being modeled with discharges as previously approved by the Michigan Department of Natural Resources. Water surface elevations were computed using the COE HEC-2 step-backwater computer program.

Cross section data for the backwater analysis were obtained by a field survey completed in June 1994. All bridges and valley sections were surveyed to obtain elevation data and structural geometry.

Channel and overbank roughness factors (Manning's "n") used in the hydraulic computations were chosen by engineering judgement and were based on field observations of the stream and flood plain areas.

The starting water surface elevations for the Chippewa River were based on the existing Isabella County FIS.

The floodway profile model was determined by further encroaching the natural profile model to obtain allowable 0.1 foot increase in the 100-year water surface profile.

FILE: FORK10

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1*******************************************
 *  HEC-2 WATER SURFACE PROFILES           *
 *                                         *
 *  Version   4.6.2;  May 1991             *
 *                                         *
 *  RUN DATE    16NOV94    TIME   13:10:21 *
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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

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THIS RUN EXECUTED 16NOV94 13:10:21

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************************************
 HEC-2 WATER SURFACE PROFILES

 Version   4.6.2;  May 1991
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T1      FORK TOWNSHIP, MICHIGAN
T2      CHIPPEWA RIVER
T3      100-YEAR FLOOD

J1  ICHECK    INQ      NINV     IDIR     STRT     METRIC   HVINS    Q        WSEL     FQ

      0        2        0        0        0        0        0        0      941.3

J2  NPROF     IPLOT    PRFVS    XSECV    XSECH    FN       ALLDC    IBW      CHNIM    ITRACE

      1        0       -1


J3  VARIABLE CODES FOR SUMMARY PRINTOUT

    150

NC     .070      .120      .040       .1       .3
QT        2     2700      3700
          D/S STUDY LIMIT - C.S. BP FROM ISABELLA CO. MOVED UPSTREM
X1   298500       27      1236     1300        0        0        0                .27
GR    950.0        0     940.0      860    935.9     1000    936.2     1050    936.3     1105
GR    937.1     1130     938.4     1155    937.4     1180    935.7     1205    935.6     1236
GR    934.8     1240     933.0     1250    931.1     1260    931.1     1270    931.5     1280
GR    932.3     1290     934.8     1299    937.0     1300    936.8     1320    952.5     1360
GR    951.7     1390     947.0     1410    951.4     1435    952.3     1460    953.5     1485
GR    953.5     1510     953.9     1535

          CROSS SECTION A MOVED DOWNSTREAM
X1   299500       23       254      300     1000     1000     1000               -.56
GR    955.1        0     954.9       50    954.1      100    953.5      150    953.1      200
GR    953.0      216     938.9      245    936.7      254    934.2      261    933.1      265
GR    932.5      270     932.5      275    932.7      280    933.1      285    934.2      290
GR    938.1      300     938.6      336    936.7      369    940.2      385    943.6      423
GR    949.6      479     952.6      493    954.0      550

NC     .070      .080      .035
          CROSS SECTION A
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X1   300500      23      254      300      1000      1000      1000
GR   955.1        0     954.9       50     954.1       100     953.5      150     953.1      200
GR   953.0      216     938.9      245     936.7       254     934.2      261     933.1      265
GR   932.5      270     932.5      275     932.7       280     933.1      285     934.2      290
GR   938.1      300     938.6      336     936.7       369     940.2      385     943.6      423
GR   949.6      479     952.6      493     954.0       550
1
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          CROSS SECTION B
X1   302050      25      170      250      1550      1550      1550
GR   954.1        0     953.2       25     952.1        50     943.8       65     941.6       75
GR   941.5      100     940.6      125     940.5       150     940.0      170     937.7      185
GR   937.1      193     936.7      194     935.9       204     935.8      214     936.0      224
GR   936.5      234     937.1      244     940.1       250     940.7      300     940.7      350
GR   941.2      400     941.6      450     942.3       500     942.3      575     950.0      650

X1     5.01       44      197.     266.     1300.0    1300.0    1300.0
GR   954.4       0.     953.7      29.     953.4       39.     952.9      58.     947.3      75.
GR   946.9      78.     945.7      87.     945.7       97.     945.5     110.     945.0     116.
GR   942.5     139.     942.1     145.     941.5      158.     941.3     174.     941.2     178.
GR   940.6     197.     939.1     204.     938.3      210.     937.6     216.     937.3     217.
GR   936.7     225.     936.5     234.     936.8      243.     937.1     246.     937.4     252.
GR   938.0     259.     938.3     261.     941.0      266.     941.1     282.     942.1     295.
GR   942.5     310.     942.8     337.     942.9      354.     943.0     372.     943.1     398.
GR   943.1     407.     943.3     442.     944.0      477.     944.1     486.     944.3     512.
GR   944.3     547.     944.3     551.     946.8      582.     949.8     617.

X1     5.02       44      225.     283.     1300.0    1300.0    1300.0
GR   954.7       0.     954.2      33.     954.1       44.     953.7      66.     950.7      86.
GR   950.5      89.     949.9      99.     949.8      111.     949.5     125.     948.4     132.
GR   944.2     158.     943.6     165.     942.4      180.     942.1     198.     942.1     202.
GR   941.1     225.     939.6     230.     938.8      234.     938.2     240.     938.0     240.
GR   937.5     247.     937.2     253.     937.7      262.     937.9     265.     938.4     270.
GR   939.0     276.     939.5     278.     941.8      283.     941.9     296.     943.7     307.
GR   944.2     321.     944.9     343.     945.0      358.     945.2     373.     945.0     396.
GR   945.0     403.     945.0     434.     945.7      464.     945.9     471.     946.3     494.
GR   946.4     524.     946.4     528.     947.7      554.     949.5     584.

          CROSS SECTION C
X1   306000      26      253      300      1350      1350      1350
X3                                                   375
GR   955.0        0     954.7       50     954.3       100     954.1      125     953.7      141
GR   945.9      178     943.4      203     942.9       228     941.7      253     940.0      257
GR   938.7      264     937.9      274     938.8       284     940.0      294     942.7      300
GR   942.8      311     945.4      320     947.1       350     947.4      375     946.9      400
GR   946.7      425     947.6      450     948.4       475     948.5      500     948.6      525
GR   949.3      550

          CROSS SECTION D
X1   307400      28      346      400      1400      1400      1400
GR   950.0        0     945.2      125     945.1       150     945.5      175     945.5      200
GR   945.5      225     945.3      250     945.5       275     945.6      300     945.4      325
GR   943.2      346     940.9      350     939.4       355     938.7      365     938.3      375
GR   938.2      385     940.9      395     941.8       400     945.4      400     947.6      407
GR   947.6      425     948.1      450     948.5       475     950.1      500     951.3      508
GR   957.4      524     957.9      553     959.1       569
1
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          CROSS SECTION E
X1   309056      29      250      319      1656      1656      1656
X3        0       0        0      228         0       328
GR   954.3        0     954.5       25     954.3        50     954.5       75     954.4      100
GR   954.3      125     954.4      150     953.7       175     951.8      200     950.0      220
GR   945.6      250     942.2      260     941.1       270     940.8      280     940.9      290
GR   941.2      300     941.6      310     942.2       312     945.9      319     946.3      350
GR   946.3      375     946.2      400     946.2       425     946.0      450     946.6      475
GR   947.4      500     947.9      525     949.0       550     950.0      600

NC    .070     .070      .035       .1        .3
X1   309105      24      249      325        49        49        49
GR   952.9        0     952.8       25     952.4        75     952.0      125     951.6      175
GR   951.2      225     951.0      249     946.7       249     942.5      268     941.0      272
GR   940.9      273     940.4      279     939.1       289     940.9    298.5     941.2    299.5
GR   941.8      304     942.5      314     944.1       325     951.0      325     951.0      375
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GR    950.8       425      951.0       475      951.3       525      951.5       575

NC     .070      .070       .035        .3        .5
            DOWNSTREAM FACE OF 19 MILE ROAD
X1   309106        24        249       325         1         1         1
BT       23         0      952.9         0        25     952.8         0        75     952.4         0
BT      125     952.0          0       175     951.6         0       225     951.2         0       249
BT    951.0     946.7        249     951.0     949.7       272     951.0     949.7       272     951.0
BT    941.0       273      951.0     940.9       273     951.0     949.7     298.5     951.0     949.7
BT    298.5     951.0      940.9     299.5     951.0     941.2     299.5     951.0     949.7       325
BT    951.0     949.7        325     951.0     944.1       375     951.0         0       425     950.8
BT        0       475      951.0         0       525     951.3         0       575     951.5         0
GR    952.9         0      952.8        25     952.4        75     952.0       125     951.6       175
GR    951.2       225      951.0       249     946.7       249     942.5       268     941.0       272
GR    940.9       273      940.4       279     939.1       289     940.9     298.5     941.2     299.5
GR    941.8       304      942.5       314     944.1       325     951.0       325     951.0       375
GR    950.8       425      951.0       475     951.3       525     951.5       575

            UPSTREAM FACE OF 19 MILE ROAD
X1   309138         0          0         0        32        32        32
X2        0         0          0         0         0         0         1

NC     .080      .080       .035        .1        .3
X1   309139         0          0         0         1         1         1

X1   309188        29        250       319        49        49        49
X3        0         0          0       227         0       402
GR    954.3         0      954.5        25     954.3        50     954.5        75     954.4       100
GR    954.3       125      954.4       150     953.7       175     951.8       200     950.0       220
GR    945.6       250      942.2       260     941.1       270     940.8       280     940.9       290
GR    941.2       300      941.6       310     942.2       312     945.9       319     946.3       350
GR    946.3       375      946.2       400     946.2       425     946.0       450     946.6       475
GR    947.4       500      947.9       525     949.0       550     950.0       600
1
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NC     .100      .100       .040        .1        .3
            CROSS SECTION F
X1   310850        22        344       400      1662      1662      1662
GR    951.0         0      946.7       125     946.4       150     945.8       175     946.5       200
GR    946.5       225      945.9       250     946.0       275     946.0       300     945.4       325
GR    945.8       344      943.4       354     942.7       360     941.6       370     941.7       380
GR    943.4       390      953.6       400     952.0       425     959.5       566     959.3       600
GR    958.8       625      959.0       650

            CROSS SECTION G
X1   313050        26        321       400      2200      2200      2200
GR    952.6         0      949.4       100     949.9       125     949.6       150     948.1       175
GR    948.4       200      948.1       225     947.9       250     947.9       275     947.1       300
GR    946.7       321      945.4       321     945.1       322     944.3       325     944.0       335
GR    943.6       345      944.1       355     945.1       365     947.3       366     955.1       400
GR    956.3       425      956.1       450     956.8       500     957.5       550     957.8       600
GR    958.2       650

            CROSS SECTION H
X1   315865        30        250       372      2815      2815      2815
X3        0         0          0       250         0       401
GR    954.7         0      954.8        25     954.7        50     955.4        75     956.4       100
GR    958.1       125      957.9       150     957.4       175     957.6       200     957.6       225
GR    955.9       250      951.1       263     949.2       275     948.5       300     948.4       310
GR    948.9       320      948.7       330     949.0       340     948.9       350     948.6       360
GR    949.2       362      954.0       372     954.0       400     953.8       425     954.4       450
GR    954.2       475      954.8       500     955.5       550     955.5       575     955.5       600

NC     .080      .080       .035        .1        .3
X1   315964        30        256     351.6        99        99        99
GR    959.3         0      958.4        50     957.2       100     956.5       150     956.1       200
GR    956.0       250      951.6       250     951.0       256     949.8       258     949.2       262
GR    948.4       272      948.4     274.5     948.3     275.5     948.3       286     947.9       296
GR    947.8       301      947.8       302     947.5       312     947.5       322     947.2       326
GR    947.2       327      948.0       339     949.1       349     951.0     351.6     955.8     351.6
GR    955.9       400      956.1       450     956.6       500     957.4       550     958.6       600

NC     .080      .080       .035        .3        .5
            DOWNSTREAM FACE OF 10TH AVE.
X1   315965         0          0         0         1         1         1
BT       26         0      959.3         0        50     958.4         0       100     957.2         0
BT      150     956.5          0       200     956.1         0       250     956.0     951.6       250
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BT    956.0     954.8     274.5     956.0     954.8     274.5     956.0     948.4     275.5     956.0
BT    948.3     275.5     956.0     954.8       301     955.9     954.8       301     955.9     947.8
BT      302     955.9     947.8       302     955.9     954.8       326     955.8     954.8       326
BT    955.8     947.2       327     955.8     947.2       327     955.8     954.7     351.6     955.8
BT    954.8     351.6     955.8     951.0       400     955.9         0       450     956.1         0
BT      500     956.6         0       550     957.4         0       600     958.6         0
1
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          UPSTREAM FACE OF 10TH AVE.
X1   315999         0         0         0        34        34        34
X2        0         0         0         0         0         0         1

NC     .080      .080      .035        .1        .3
X1   316000         0         0         0         1         1         1

          CROSS SECTION I
X1   316049        37       250       318        49        49        49
X3        0         0         0       160         0       360
GR    955.8         0     955.3        25     954.9        50     954.7        75     954.7       100
GR    954.4       125     954.3       150     954.4       175     953.9       196     950.3       213
GR    949.2       214     949.0       215     949.2       217     950.4       218     950.8       225
GR    950.6       250     949.3       253     949.2       260     948.3       270     947.3       280
GR    946.2       290     945.7       300     946.7       310     949.2       314     953.3       318
GR    953.1       325     952.8       350     952.7       375     953.7       400     953.9       425
GR    954.6       450     956.2       475     956.7       500     957.5       525     958.7       550
GR    959.7       575     962.7       775
1
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     SECNO     DEPTH     CWSEL     CRIWS     WSELK     EG        HV        HL        OLOSS     L-BANK ELEV
     Q         QLOB      QCH       QROB      ALOB      ACH       AROB      VOL       TWA       R-BANK ELEV
     TIME      VLOB      VCH       VROB      XNL       XNCH      XNR       WTN       ELMIN     SSTA
     SLOPE     XLOBL     XLCH      XLOBR     ITRIAL    IDC       ICONT     CORAR     TOPWID    ENDST


*PROF 1
0

CCHV=      .100 CEHV=      .300
*SECNO 298500.000
          D/S STUDY LIMIT - C.S. BP FROM ISABELLA CO. MOVED UPSTREM
298500.000      9.93    941.30       .00    941.30    941.35       .05       .00       .00    935.87
    2700.0    1321.9    1328.6      49.6    1536.0     544.8     105.4        .0        .0    937.27
       .00       .86      2.44       .47      .070      .040      .120      .000    931.37    771.42
   .000259        0.        0.        0.         0         0         0       .00    559.35   1330.78


*SECNO 299500.000

3302 WARNING:  CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE,  KRATIO =   .40

          CROSS SECTION A MOVED DOWNSTREAM
299500.000      9.62    941.56       .00       .00    941.99       .43       .53       .11    936.14
    2700.0      97.2    2165.1     437.7      49.5     371.0     362.5      34.1       8.3    937.54
       .06      1.96      5.84      1.21      .070      .040      .120      .000    931.94    238.38
   .001592     1000.     1000.     1000.         0         0         0       .00    168.07    406.45


*SECNO 300500.000

3302 WARNING:  CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE,  KRATIO =  1.42

          CROSS SECTION A
300500.000     10.30    942.80       .00       .00    943.09       .29      1.09       .01    936.70
    2700.0      90.8    1998.5     610.7      60.7     402.4     437.8      53.4      12.3    938.10
       .12      1.50      4.97      1.39      .070      .035      .080      .000    932.50    236.97
   .000792     1000.     1000.     1000.         2         0         0       .00    177.11    414.09


*SECNO 302050.000
          CROSS SECTION B
302050.000      8.11    943.91       .00       .00    944.02       .11       .91       .02    940.00
    2700.0     280.8    1781.2     638.1     299.7     551.2     840.4      99.5      24.8    940.10
       .30       .94      3.23       .76      .070      .035      .080      .000    935.80     64.80
   .000449     1550.     1550.     1550.         3         0         0       .00    525.87    590.67
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 SECNO     DEPTH     CWSEL     CRIWS     WSELK     EG        HV        HL        OLOSS     L-BANK ELEV
 Q         QLOB      QCH       QROB      ALOB      ACH       AROB      VOL       TWA       R-BANK ELEV
 TIME      VLOB      VCH       VROB      XNL       XNCH      XNR       WTN       ELMIN     SSTA
 SLOPE     XLOBL     XLCH      XLOBR     ITRIAL    IDC       ICONT     CORAR     TOPWID    ENDST

*SECNO 5.010
   5.010      8.10    944.60       .00       .00    944.84       .24       .79       .04    940.60
  2700.0     264.9    2098.0     337.1     205.6     473.2     406.7     141.0      39.2    941.00
     .40      1.29      4.43       .83      .070      .035      .080      .000    936.50    119.66
 .000854     1300.     1300.     1300.         2         0         0       .00    435.09    554.75

*SECNO 5.020
   5.020      8.57    945.77       .00       .00    946.09       .32      1.22       .02    941.10
  2700.0     368.2    2137.8     194.0     236.1     421.5     215.4     170.2      50.4    941.80
     .49      1.56      5.07       .90      .070      .035      .080      .000    937.20    148.29
 .001041     1300.     1300.     1300.         2         0         0       .00    318.11    466.40

*SECNO 306000.000

3470 ENCROACHMENT STATIONS=        .0     375.0  TYPE=      1  TARGET=      374.999
          CROSS SECTION C
306000.000      9.29    947.19       .00       .00    947.56       .37      1.46       .01    941.70
  2700.0       517.2    2048.3     134.4     290.7     370.5     105.2     195.6      58.2    942.70
     .57      1.78      5.53      1.28      .070      .035      .080      .000    937.90    171.88
 .001117     1350.     1350.     1350.         2         0         0       .00    185.64    357.52

*SECNO 307400.000

3302 WARNING:  CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE,  KRATIO =  1.49

          CROSS SECTION D
307400.000     10.22    948.42       .00       .00    948.59       .17      1.01       .02    943.20
  2700.0       792.7    1889.0      18.3     823.6     485.6      45.8     229.7      68.1    945.40
     .70       .96      3.89       .40      .070      .035      .080      .000    938.20     41.09
 .000504     1400.     1400.     1400.         2         0         0       .00    429.03    470.13

*SECNO 309056.000

3470 ENCROACHMENT STATIONS=      228.0     328.0  TYPE=      1  TARGET=      100.000
          CROSS SECTION E
309056.000      8.61    949.41       .00       .00    949.79       .38      1.13       .06    945.60
  2700.0        53.0    2613.6      33.4      48.3     519.0      31.0     266.8      78.1    945.90
     .79      1.10      5.04      1.08      .070      .035      .080      .000    940.80    228.00
 .000985     1656.     1656.     1656.         2         0         0       .00    100.00    328.00
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 SECNO     DEPTH     CWSEL     CRIWS     WSELK     EG        HV        HL        OLOSS     L-BANK ELEV
 Q         QLOB      QCH       QROB      ALOB      ACH       AROB      VOL       TWA       R-BANK ELEV
 TIME      VLOB      VCH       VROB      XNL       XNCH      XNR       WTN       ELMIN     SSTA
 SLOPE     XLOBL     XLCH      XLOBR     ITRIAL    IDC       ICONT     CORAR     TOPWID    ENDST

CCHV=     .100 CEHV=     .300
*SECNO 309105.000
309105.000     10.38    949.48       .00       .00    949.84       .36       .05       .00    951.00
  2700.0         .0    2700.0        .0        .0     558.0        .0     267.5      78.2    951.00
     .79       .00      4.84       .00      .000      .035      .000      .000    939.10    249.00
 .001063       49.       49.       49.         2         0         0       .00     76.00    325.00

CCHV=     .300 CEHV=     .500
*SECNO 309106.000

3370 NORMAL BRIDGE, NRD=  23 MIN ELTRD=   950.80 MAX ELLC=   949.70

          DOWNSTREAM FACE OF 19 MILE ROAD
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309106.000     10.37    949.47      .00      .00    949.86      .39      .00      .01    951.00
    2700.0        .0    2700.0       .0       .0     540.7       .0    267.5     78.2    951.00
       .79       .00      4.99      .00     .000      .035     .000     .000   939.10    249.00
   .001970        1.        1.       1.        1         0        0   -16.95    76.00    325.00

*SECNO 309138.000

3370 NORMAL BRIDGE, NRD=  23 MIN ELTRD=   950.80 MAX ELLC=   949.70

          UPSTREAM FACE OF 19 MILE ROAD
309138.000     10.44    949.54      .00      .00    949.92      .38      .06      .00    951.00
    2700.0        .0    2700.0       .0       .0     545.5       .0    267.9     78.3    951.00
       .80       .00      4.95      .00     .000      .035     .000     .000   939.10    249.00
   .001923       32.       32.      32.        2         0        0   -17.08    76.00    325.00

CCHV=     .100 CEHV=     .300
*SECNO 309139.000
309139.000     10.47    949.57      .00      .00    949.92      .35      .00      .00    951.00
    2700.0        .0    2700.0       .0       .0     564.9       .0    267.9     78.3    951.00
       .80       .00      4.78      .00     .000      .035     .000     .000   939.10    249.00
   .001023        1.        1.       1.        2         0        0      .00    76.00    325.00

*SECNO 309188.000

3470 ENCROACHMENT STATIONS=      227.0     402.0  TYPE=      1  TARGET=      175.000
309188.000      8.92    949.72      .00      .00    949.97      .25      .04      .01    945.60
    2700.0      47.9    2328.7    323.4     56.0     540.8    291.8    268.7     78.4    945.90
       .80       .85      4.31     1.11     .080      .035     .080     .000   940.80    227.00
   .000682       49.       49.      49.        2         0        0      .00   175.00    402.00

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

CCHV=     .100 CEHV=     .300
*SECNO 310850.000
          CROSS SECTION F
310850.000      9.37    950.97      .00      .00    951.08      .10     1.09      .01    945.80
    2700.0    1309.1    1390.9       .0   1333.6     405.1       .0    318.8     89.3    953.60
      1.00       .98      3.43      .00     .100      .040     .000     .000   941.60       .76
   .000627     1662.     1662.    1662.        2         0        0      .00   396.66    397.43

*SECNO 313050.000
          CROSS SECTION G
313050.000      8.94    952.54      .00      .00    952.67      .12     1.58      .01    946.70
    2700.0    1143.1    1556.9       .0   1077.7     434.8       .0    400.9    109.1    955.10
      1.25      1.06      3.58      .00     .100      .040     .000     .000   943.60      1.78
   .000835     2200.     2200.    2200.        2         0        0      .00   387.07    388.85

*SECNO 315865.000

3470 ENCROACHMENT STATIONS=      250.0     401.0  TYPE=      1  TARGET=      151.000
          CROSS SECTION H
315865.000      6.80    955.20      .00      .00    955.44      .24     2.74      .04    955.90
    2700.0        .0    2680.5     19.5       .0     678.1     34.8    472.8    126.5    954.00
      1.45       .00      3.95      .56     .000      .040     .100     .000   948.40    251.90
   .001152     2815.     2815.    2815.        2         0        0      .00   149.10    401.00

CCHV=     .100 CEHV=     .300
*SECNO 315964.000
315964.000      8.09    955.29      .00      .00    955.53      .24      .09      .00    951.00
    2700.0      21.2    2678.8       .0     24.0     680.1       .0    474.4    126.7    955.80
      1.45       .88      3.94      .00     .080      .035     .000     .000   947.20    250.00
   .000677       99.       99.      99.        1         0        0      .00   101.60    351.60

CCHV=     .300 CEHV=     .500
```

*SECNO 315965.000

3302 WARNING: CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE, KRATIO = .47

3370 NORMAL BRIDGE, NRD= 26 MIN ELTRD= 955.80 MAX ELLC= 954.80

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DOWNSTREAM FACE OF 10TH AVE.

315965.000	8.06	955.26	.00	.00	955.56	.30	.00	.03	951.00
2700.0	23.3	2676.7	.0	21.0	610.3	.0	474.5	126.7	955.80
1.45	1.11	4.39	.00	.080	.035	.000	.000	947.20	250.00
.003005	1.	1.	1.	2	0	0	-69.42	101.60	351.60

*SECNO 315999.000

3370 NORMAL BRIDGE, NRD= 26 MIN ELTRD= 955.80 MAX ELLC= 954.80

UPSTREAM FACE OF 10TH AVE.

315999.000	8.17	955.37	.00	.00	955.66	.30	.10	.00	951.00
2700.0	23.3	2676.7	.0	21.0	610.3	.0	475.0	126.8	955.80
1.46	1.11	4.39	.00	.080	.035	.000	.000	947.20	250.00
.003005	34.	34.	34.	2	0	0	-79.80	101.60	351.60

CCHV= .100 CEHV= .300
*SECNO 316000.000

3302 WARNING: CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE, KRATIO = 2.18

316000.000	8.24	955.44	.00	.00	955.67	.23	.00	.01	951.00
2700.0	21.5	2678.5	.0	24.8	693.9	.0	475.0	126.8	955.80
1.46	.87	3.86	.00	.080	.035	.000	.000	947.20	250.00
.000634	1.	1.	1.	2	0	0	.00	101.60	351.60

*SECNO 316049.000

3470 ENCROACHMENT STATIONS= 160.0 360.0 TYPE= 1 TARGET= 200.000

CROSS SECTION I

316049.000	9.76	955.46	.00	.00	955.71	.24	.03	.00	950.60
2700.0	348.0	2259.1	92.8	284.8	525.6	105.5	475.9	127.0	953.30
1.46	1.22	4.30	.88	.080	.035	.080	.000	945.70	160.00
.000709	49.	49.	49.	2	0	0	.00	200.00	360.00

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T1 FORK TOWNSHIP, MICHIGAN
T2 CHIPPEWA RIVER
T3 500-YEAR FLOW

J1	ICHECK	INQ	NINV	IDIR	STRT	METRIC	HVINS	Q	WSEL	FQ
	0	3	0	0	0	0	0	0	943.2	0

J2	NPROF	IPLOT	PRFVS	XSECV	XSECH	FN	ALLDC	IBW	CHNIM	ITRACE
	15	0	-1							

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

*PROF 2

```
0

CCHV=     .100 CEHV=     .300
*SECNO 298500.000
          D/S STUDY LIMIT - C.S. BP FROM ISABELLA CO. MOVED UPSTREM
298500.000     11.83    943.20       .00    943.20    943.24       .04       .00       .00    935.87
    3700.0    2126.3    1494.2      79.5    2573.9     666.4     168.5        .0        .0    937.27
       .00       .83      2.24       .47      .070      .040      .120      .000    931.37    608.02
   .000168        0.        0.        0.         0         0         0       .00    727.60   1335.62


*SECNO 299500.000

3302 WARNING:  CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE,  KRATIO =   .35

          CROSS SECTION A MOVED DOWNSTREAM
299500.000     11.34    943.28       .00       .00    943.73       .45       .37       .12    936.14
    3700.0     171.9    2761.5     766.6      79.5     450.2     562.4      51.7      10.5    937.54
       .06      2.16      6.13      1.36      .070      .040      .120      .000    931.94    234.84
   .001358     1000.     1000.     1000.         2         0         0       .00    190.42    425.26


*SECNO 300500.000
          CROSS SECTION A
300500.000     11.90    944.40       .00       .00    944.72       .32       .97       .01    936.70
    3700.0     150.5    2543.1    1006.5      90.5     475.8     633.4      78.0      15.0    938.10
       .12      1.66      5.34      1.59      .070      .035      .080      .000    932.50    233.69
   .000734     1000.     1000.     1000.         2         0         0       .00    196.75    430.44


*SECNO 302050.000

3302 WARNING:  CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE,  KRATIO =  1.50

          CROSS SECTION B
302050.000      9.57    945.37       .00       .00    945.47       .09       .73       .02    940.00
    3700.0     467.6    2090.7    1141.7     455.2     668.1    1348.3     143.3      28.1    940.10
       .32      1.03      3.13       .85      .070      .035      .080      .000    935.80     62.16
   .000326     1550.     1550.     1550.         2         0         0       .00    542.73    604.89


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


*SECNO 5.010

3302 WARNING:  CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE,  KRATIO =   .69

      5.010      9.38    945.88       .00       .00    946.09       .21       .59       .04    940.60
    3700.0     439.4    2488.3     772.3     317.9     561.5     786.4     205.0      43.5    941.00
        .43      1.38      4.43       .98      .070      .035      .080      .000    936.50     85.63
   .000679     1300.     1300.     1300.         2         0         0       .00    484.98    570.62


*SECNO 5.020
      5.020      9.65    946.85       .00       .00    947.19       .34      1.06       .04    941.10
    3700.0     577.0    2644.5     478.6     323.1     484.5     455.7     248.7      56.6    941.80
        .51      1.79      5.46      1.05      .070      .035      .080      .000    937.20    141.57
   .001002     1300.     1300.     1300.         2         0         0       .00    395.53    537.09


*SECNO 306000.000

3470 ENCROACHMENT STATIONS=          .0     375.0  TYPE=      1  TARGET=      374.999
          CROSS SECTION C
306000.000     10.36    948.26       .00       .00    948.71       .45      1.48       .03    941.70
    3700.0     807.2    2632.0     260.7     380.1     420.7     183.5     283.6      66.0    942.70
        .59      2.12      6.26      1.42      .070      .035      .080      .000    937.90    166.81
   .001208     1350.     1350.     1350.         2         0         0       .00    208.19    375.00


*SECNO 307400.000
```

3302 WARNING: CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE, KRATIO = 1.58

CROSS SECTION D

307400.000	11.38	949.58	.00	.00	949.75	.17	1.01	.03	943.20
3700.0	1357.7	2258.1	84.2	1194.3	548.1	141.6	329.7	77.0	945.40
.72	1.14	4.12	.59	.070	.035	.080	.000	938.20	10.92
.000481	1400.	1400.	1400.	2	0	0	.00	480.96	491.88

*SECNO 309056.000
3280 CROSS SECTION 309056.00 EXTENDED .50 FEET

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

3302 WARNING: CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE, KRATIO = .65

3470 ENCROACHMENT STATIONS= 228.0 328.0 TYPE= 1 TARGET= 100.000

CROSS SECTION E

309056.000	9.70	950.50	.00	.00	951.03	.53	1.17	.11	945.60
3700.0	108.9	3537.2	53.9	72.4	594.6	40.9	378.9	88.1	945.90
.80	1.50	5.95	1.32	.070	.035	.080	.000	940.80	228.00
.001146	1656.	1656.	1656.	2	0	0	.00	100.00	328.00

CCHV= .100 CEHV= .300
*SECNO 309105.000

309105.000	11.47	950.57	.00	.00	951.09	.52	.06	.00	951.00
3700.0	.0	3700.0	.0	.0	641.3	.0	379.7	88.2	951.00
.80	.00	5.77	.00	.000	.035	.000	.000	939.10	249.00
.001299	49.	49.	49.	2	0	0	.00	76.00	325.00

CCHV= .300 CEHV= .500
*SECNO 309106.000

3302 WARNING: CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE, KRATIO = .45

3370 NORMAL BRIDGE, NRD= 23 MIN ELTRD= 950.80 MAX ELLC= 949.70

DOWNSTREAM FACE OF 19 MILE ROAD

309106.000	11.39	950.49	.00	.00	951.18	.68	.00	.08	951.00
3700.0	.0	3700.0	.0	.0	557.5	.0	379.7	88.2	951.00
.80	.00	6.64	.00	.000	.035	.000	.000	939.10	249.00
.006279	1.	1.	1.	2	0	0	-77.67	76.00	325.00

*SECNO 309138.000

3370 NORMAL BRIDGE, NRD= 23 MIN ELTRD= 950.80 MAX ELLC= 949.70

UPSTREAM FACE OF 19 MILE ROAD

309138.000	11.59	950.69	.00	.00	951.38	.68	.20	.00	951.00
3700.0	.0	3700.0	.0	.0	557.5	.0	380.1	88.2	951.00
.80	.00	6.64	.00	.000	.035	.000	.000	939.10	249.00
.006279	32.	32.	32.	2	0	0	-92.94	76.00	325.00

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

CCHV= .100 CEHV= .300
*SECNO 309139.000

3265 DIVIDED FLOW

3302 WARNING: CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE, KRATIO = 2.34

```
309139.000     11.82    950.92       .00       .00    951.40       .48       .00       .02    951.00
    3700.0        .0    3699.6        .4        .0     668.0       3.9     380.1      88.2    951.00
       .80       .00      5.54       .10      .000      .035      .080      .000    939.10    249.00
   .001146        1.        1.        1.         2         0         0       .00    138.56    456.28
```

*SECNO 309188.000
3280 CROSS SECTION 309188.00 EXTENDED 1.17 FEET

3470 ENCROACHMENT STATIONS= 227.0 402.0 TYPE= 1 TARGET= 175.000

```
309188.000     10.37    951.17       .00       .00    951.46       .29       .04       .02    945.60
    3700.0      98.4    3037.7     563.9      89.3     640.6     411.8     381.1      88.4    945.90
       .81      1.10      4.74      1.37      .080      .035      .080      .000    940.80    227.00
   .000660       49.       49.       49.         2         0         0       .00    175.00    402.00
```

CCHV= .100 CEHV= .300
*SECNO 310850.000

3265 DIVIDED FLOW

3280 CROSS SECTION 310850.00 EXTENDED 1.38 FEET

CROSS SECTION F

```
310850.000     10.78    952.38       .00       .00    952.48       .10      1.00       .02    945.80
    3700.0    1996.6    1703.1        .3    1818.2     481.4       2.5     446.8      99.6    953.60
      1.02      1.10      3.54       .12      .100      .040      .100      .000    941.60       .00
   .000554     1662.     1662.     1662.         2         0         0       .00    411.98    432.19
```

*SECNO 313050.000
3280 CROSS SECTION 313050.00 EXTENDED 1.19 FEET

CROSS SECTION G


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

313050.000     10.19    953.79       .00       .00    953.91       .12      1.42       .01    946.70
    3700.0    1771.0    1929.0        .0    1478.5     522.9        .0     555.5     120.0    955.10
      1.26      1.20      3.69       .00      .100      .040      .000      .000    943.60       .00
   .000766     2200.     2200.     2200.         2         0         0       .00    394.30    394.30
```

*SECNO 315865.000
3280 CROSS SECTION 315865.00 EXTENDED .81 FEET

3470 ENCROACHMENT STATIONS= 250.0 401.0 TYPE= 1 TARGET= 151.000

CROSS SECTION H

```
315865.000      7.92    956.32       .00       .00    956.62       .31      2.66       .06    955.90
    3700.0        .0    3641.0      59.0        .0     813.5      67.1     648.6     137.6    954.00
      1.44       .00      4.48       .88      .000      .040      .100      .000    948.40    250.00
   .001190     2815.     2815.     2815.         2         0         0       .00    151.00    401.00
```

CCHV= .100 CEHV= .300
*SECNO 315964.000

```
315964.000      9.20    956.40       .00       .00    956.73       .33       .09       .01    951.00
    3700.0      38.1    3646.1      15.9      54.2     786.1      51.8     650.7     138.1    955.80
      1.44       .70      4.64       .31      .080      .035      .080      .000    947.20    161.84
   .000779       99.       99.       99.         1         0         0       .00    318.69    480.53
```

CCHV= .300 CEHV= .500
*SECNO 315965.000

3302 WARNING: CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE, KRATIO = .33

3370 NORMAL BRIDGE, NRD= 26 MIN ELTRD= 955.80 MAX ELLC= 954.80

DOWNSTREAM FACE OF 10TH AVE.

315965.000	9.13	956.33	.00	.00	956.80	.47	.00	.07	951.00
3700.0	44.5	3620.7	34.9	40.1	651.7	42.1	650.7	138.1	955.80
1.44	1.11	5.56	.83	.080	.035	.080	.000	947.20	171.56
.006953	1.	1.	1.	2	0	0	-134.11	301.19	472.75

*SECNO 315999.000

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

337D NORMAL BRIDGE, NRD= 26 MIN ELTRD= 955.80 MAX ELLC= 954.80

UPSTREAM FACE OF 10TH AVE.

315999.000	9.43	956.63	.00	.00	957.03	.40	.21	.02	951.00
3700.0	74.7	3539.5	85.8	70.7	680.5	83.1	651.3	138.4	955.80
1.44	1.06	5.20	1.03	.080	.035	.080	.000	947.20	140.81
.005753	34.	34.	34.	2	0	0	-134.11	360.99	501.80

CCHV= .100 CEHV= .300
*SECNO 316000.000

3302 WARNING: CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE, KRATIO = 2.94

316000.000	9.55	956.75	.00	.00	957.04	.29	.00	.01	951.00
3700.0	53.4	3607.1	39.5	92.4	819.0	101.8	651.3	138.4	955.80
1.44	.58	4.40	.39	.080	.035	.080	.000	947.20	132.14
.000665	1.	1.	1.	2	0	0	.00	377.23	509.38

*SECNO 316049.000

3470 ENCROACHMENT STATIONS= 160.0 360.0 TYPE= 1 TARGET= 200.000

CROSS SECTION I

316049.000	11.09	956.79	.00	.00	957.08	.29	.03	.00	950.60
3700.0	576.7	2937.9	185.4	404.3	615.9	161.3	652.5	138.7	953.30
1.45	1.43	4.77	1.15	.080	.035	.080	.000	945.70	160.00
.000707	49.	49.	49.	2	0	0	.00	200.00	360.00

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THIS RUN EXECUTED 16NOV94 13:10:28

****
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

100-YEAR FLOOD

SUMMARY PRINTOUT TABLE 150

SECNO	XLCH	ELTRD	ELLC	ELMIN	Q	CWSEL	CRIWS	EG	10*KS	VCH	AREA	.01K
298500.000	.00	.00	.00	931.37	2700.00	941.30	.00	941.35	2.59	2.44	2186.14	1676.25
298500.000	.00	.00	.00	931.37	3700.00	943.20	.00	943.24	1.68	2.24	3408.76	2857.58

* 299500.000	1000.00	.00	.00	931.94	2700.00	941.56	.00	941.99	15.92	5.84	783.01	676.73
* 299500.000	1000.00	.00	.00	931.94	3700.00	943.28	.00	943.73	13.58	6.13	1092.14	1003.94
* 300500.000	1000.00	.00	.00	932.50	2700.00	942.80	.00	943.09	7.92	4.97	900.91	959.45
300500.000	1000.00	.00	.00	932.50	3700.00	944.40	.00	944.72	7.34	5.34	1199.67	1365.99
302050.000	1550.00	.00	.00	935.80	2700.00	943.91	.00	944.02	4.49	3.23	1691.35	1273.66
* 302050.000	1550.00	.00	.00	935.80	3700.00	945.37	.00	945.47	3.26	3.13	2471.56	2048.50
5.010	1300.00	.00	.00	936.50	2700.00	944.60	.00	944.84	8.54	4.43	1085.50	923.78
* 5.010	1300.00	.00	.00	936.50	3700.00	945.88	.00	946.09	6.79	4.43	1665.83	1419.56
5.020	1300.00	.00	.00	937.20	2700.00	945.77	.00	946.09	10.41	5.07	873.00	836.68
5.020	1300.00	.00	.00	937.20	3700.00	946.85	.00	947.19	10.02	5.46	1263.28	1169.08
306000.000	1350.00	.00	.00	937.90	2700.00	947.19	.00	947.56	11.17	5.53	766.41	807.74
306000.000	1350.00	.00	.00	937.90	3700.00	948.26	.00	948.71	12.08	6.26	984.38	1064.77
* 307400.000	1400.00	.00	.00	938.20	2700.00	948.42	.00	948.59	5.04	3.89	1355.01	1202.62
* 307400.000	1400.00	.00	.00	938.20	3700.00	949.58	.00	949.75	4.81	4.12	1884.10	1687.16
309056.000	1656.00	.00	.00	940.80	2700.00	949.41	.00	949.79	9.85	5.04	598.33	860.33
* 309056.000	1656.00	.00	.00	940.80	3700.00	950.50	.00	951.03	11.46	5.95	707.91	1092.75
309105.000	49.00	.00	.00	939.10	2700.00	949.48	.00	949.84	10.63	4.84	558.00	828.12
309105.000	49.00	.00	.00	939.10	3700.00	950.57	.00	951.09	12.99	5.77	641.28	1026.72
309106.000	1.00	950.80	949.70	939.10	2700.00	949.47	.00	949.86	19.70	4.99	540.71	608.29
* 309106.000	1.00	950.80	949.70	939.10	3700.00	950.49	.00	951.18	62.79	6.64	557.45	466.92

SECNO	XLCH	ELTRD	ELLC	ELMIN	Q	CWSEL	CRIWS	EG	10*KS	VCH	AREA	.01K
309138.000	32.00	950.80	949.70	939.10	2700.00	949.54	.00	949.92	19.23	4.95	545.55	615.67
309138.000	32.00	950.80	949.70	939.10	3700.00	950.69	.00	951.38	62.79	6.64	557.45	466.92
309139.000	1.00	.00	.00	939.10	2700.00	949.57	.00	949.92	10.23	4.78	564.87	844.00
* 309139.000	1.00	.00	.00	939.10	3700.00	950.92	.00	951.40	11.46	5.54	671.87	1093.17
309188.000	49.00	.00	.00	940.80	2700.00	949.72	.00	949.97	6.82	4.31	888.60	1033.99
309188.000	49.00	.00	.00	940.80	3700.00	951.17	.00	951.46	6.60	4.74	1141.70	1440.51
310850.000	1662.00	.00	.00	941.60	2700.00	950.97	.00	951.08	6.27	3.43	1738.69	1078.27
310850.000	1662.00	.00	.00	941.60	3700.00	952.38	.00	952.48	5.54	3.54	2302.10	1572.62
313050.000	2200.00	.00	.00	943.60	2700.00	952.54	.00	952.67	8.35	3.58	1512.51	934.33
313050.000	2200.00	.00	.00	943.60	3700.00	953.79	.00	953.91	7.66	3.69	2001.43	1336.72
315865.000	2815.00	.00	.00	948.40	2700.00	955.20	.00	955.44	11.52	3.95	712.93	795.47
315865.000	2815.00	.00	.00	948.40	3700.00	956.32	.00	956.62	11.90	4.48	880.58	1072.61
315964.000	99.00	.00	.00	947.20	2700.00	955.29	.00	955.53	6.77	3.94	704.06	1037.50
315964.000	99.00	.00	.00	947.20	3700.00	956.40	.00	956.73	7.79	4.64	892.08	1325.39
* 315965.000	1.00	955.80	954.80	947.20	2700.00	955.26	.00	955.56	30.05	4.39	631.32	492.56
* 315965.000	1.00	955.80	954.80	947.20	3700.00	956.33	.00	956.80	69.53	5.56	733.88	443.73
315999.000	34.00	955.80	954.80	947.20	2700.00	955.37	.00	955.66	30.05	4.39	631.32	492.56
315999.000	34.00	955.80	954.80	947.20	3700.00	956.63	.00	957.03	57.53	5.20	834.35	487.83
* 316000.000	1.00	.00	.00	947.20	2700.00	955.44	.00	955.67	6.34	3.86	718.70	1071.89
* 316000.000	1.00	.00	.00	947.20	3700.00	956.75	.00	957.04	6.65	4.40	1013.22	1434.64
316049.000	49.00	.00	.00	945.70	2700.00	955.46	.00	955.71	7.09	4.30	915.98	1013.94
316049.000	49.00	.00	.00	945.70	3700.00	956.79	.00	957.08	7.07	4.77	1181.52	1391.51

100-YEAR FLOOD

SUMMARY PRINTOUT TABLE 150

SECNO	Q	CWSEL	DIFWSP	DIFWSX	DIFKWS	TOPWID	XLCH

	298500.000	2700.00	941.30	.00	.00	.00	559.35	.00
	298500.000	3700.00	943.20	1.90	.00	.00	727.60	.00
*	299500.000	2700.00	941.56	.00	.26	.00	168.07	1000.00
*	299500.000	3700.00	943.28	1.72	.08	.00	190.42	1000.00
*	300500.000	2700.00	942.80	.00	1.24	.00	177.11	1000.00
	300500.000	3700.00	944.40	1.59	1.12	.00	196.75	1000.00
	302050.000	2700.00	943.91	.00	1.11	.00	525.87	1550.00
*	302050.000	3700.00	945.37	1.47	.98	.00	542.73	1550.00
	5.010	2700.00	944.60	.00	.69	.00	435.09	1300.00
*	5.010	3700.00	945.88	1.28	.51	.00	484.98	1300.00
	5.020	2700.00	945.77	.00	1.17	.00	318.11	1300.00
	5.020	3700.00	946.85	1.09	.97	.00	395.53	1300.00
	306000.000	2700.00	947.19	.00	1.42	.00	185.64	1350.00
	306000.000	3700.00	948.26	1.07	1.40	.00	208.19	1350.00
*	307400.000	2700.00	948.42	.00	1.23	.00	429.03	1400.00
*	307400.000	3700.00	949.58	1.16	1.32	.00	480.96	1400.00
	309056.000	2700.00	949.41	.00	.99	.00	100.00	1656.00
*	309056.000	3700.00	950.50	1.10	.92	.00	100.00	1656.00
	309105.000	2700.00	949.48	.00	.07	.00	76.00	49.00
	309105.000	3700.00	950.57	1.10	.07	.00	76.00	49.00
	309106.000	2700.00	949.47	.00	-.01	.00	76.00	1.00
*	309106.000	3700.00	950.49	1.03	-.08	.00	76.00	1.00
	309138.000	2700.00	949.54	.00	.07	.00	76.00	32.00
	309138.000	3700.00	950.69	1.15	.20	.00	76.00	32.00
	309139.000	2700.00	949.57	.00	.03	.00	76.00	1.00
*	309139.000	3700.00	950.92	1.36	.23	.00	138.56	1.00
	309188.000	2700.00	949.72	.00	.15	.00	175.00	49.00
	309188.000	3700.00	951.17	1.45	.24	.00	175.00	49.00
	310850.000	2700.00	950.97	.00	1.25	.00	396.66	1662.00
	310850.000	3700.00	952.38	1.41	1.21	.00	411.98	1662.00
	313050.000	2700.00	952.54	.00	1.57	.00	387.07	2200.00
	313050.000	3700.00	953.79	1.25	1.41	.00	394.30	2200.00

	SECNO	Q	CWSEL	DIFWSP	DIFWSX	DIFKWS	TOPWID	XLCH
	315865.000	2700.00	955.20	.00	2.66	.00	149.10	2815.00
	315865.000	3700.00	956.32	1.11	2.53	.00	151.00	2815.00
	315964.000	2700.00	955.29	.00	.09	.00	101.60	99.00
	315964.000	3700.00	956.40	1.10	.08	.00	318.69	99.00
*	315965.000	2700.00	955.26	.00	-.03	.00	101.60	1.00
*	315965.000	3700.00	956.33	1.06	-.07	.00	301.19	1.00
	315999.000	2700.00	955.37	.00	.10	.00	101.60	34.00
	315999.000	3700.00	956.63	1.26	.30	.00	360.99	34.00
*	316000.000	2700.00	955.44	.00	.07	.00	101.60	1.00
*	316000.000	3700.00	956.75	1.31	.12	.00	377.23	1.00
	316049.000	2700.00	955.46	.00	.02	.00	200.00	49.00
	316049.000	3700.00	956.79	1.33	.04	.00	200.00	49.00

SUMMARY OF ERRORS AND SPECIAL NOTES

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WARNING SECNO= 299500.000  PROFILE=  1  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
WARNING SECNO= 299500.000  PROFILE=  2  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

WARNING SECNO= 300500.000  PROFILE=  1  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

WARNING SECNO= 302050.000  PROFILE=  2  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

WARNING SECNO=      5.010  PROFILE=  2  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

WARNING SECNO= 307400.000  PROFILE=  1  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
WARNING SECNO= 307400.000  PROFILE=  2  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

WARNING SECNO= 309056.000  PROFILE=  2  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

WARNING SECNO= 309106.000  PROFILE=  2  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

WARNING SECNO= 309139.000  PROFILE=  2  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

WARNING SECNO= 315965.000  PROFILE=  1  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
WARNING SECNO= 315965.000  PROFILE=  2  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

WARNING SECNO= 316000.000  PROFILE=  1  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
WARNING SECNO= 316000.000  PROFILE=  2  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
```

00BREAK00

1) COUNTY: Mecosta

2) STUDY NAME: Fork Township

3) WATERCOURSE: Chippewa River

4) DOCUMENT TYPE: Analysis

00BREAK00

FORK TWP, MECOSTA COUNTY, MI - FIS
VICINITY MAP

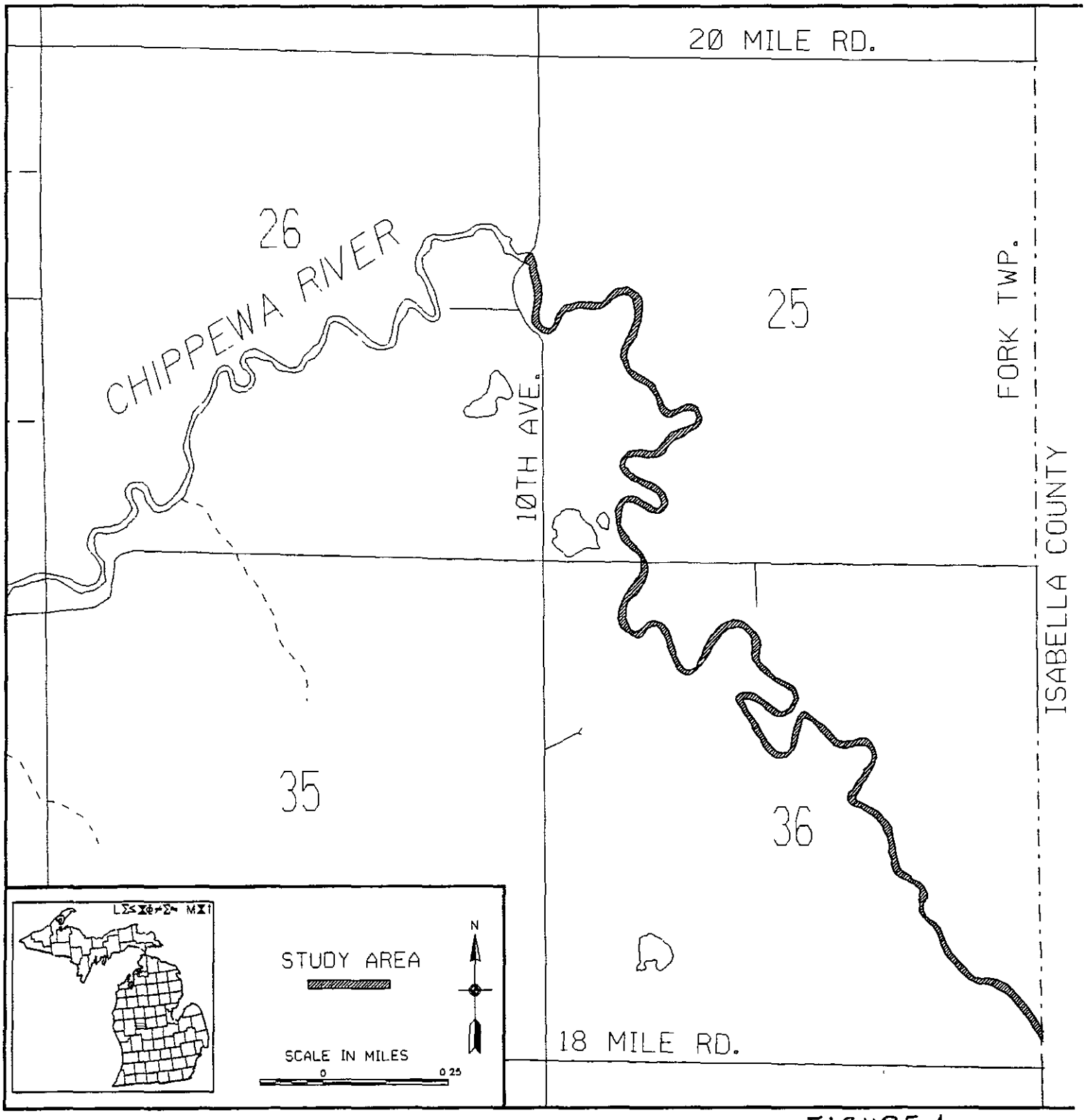


FIGURE 1

2.2 Community Description

Fork Township is located in the northeastern portion of Mecosta County, in the west-central part of Michigan's lower peninsula. It is situated about 15 miles east of Big Rapids. The community is surrounded by Osceola County to the north, Isabella County to the east, Sheridan Township to the south, and Chippewa Township to the west. The total land area contained within the township limits is 36.0 square miles. It is served by the State Highway 66 running north-south. According to the U.S. Department of Commerce, Bureau of Census (Reference 1), the 1990 population of Fork Township was 1395 compared to a 1980 population of 1348 (Reference 2). Development in the township is concentrated along the State Highway 66 at Barryton and along the Chippewa River at Chippewa Vista.

The inland location of Fork Township, away from Lake Michigan, substantially reduces the lake influence on the climate, which is predominantly continental in character. The mean annual temperature as recorded at Big Rapids in the period 1949 to 1978 is 45.2 degrees Fahrenheit (F). July is normally the warmest month, with a mean monthly temperature of 81.8 degrees F.; whereas January is the coldest month, with a mean monthly temperature of 11.8 degrees F. The average annual precipitation is about 32.2 inches. September, with an average precipitation of 3.31 inches, is the wettest month, while February, with a 1.64 inches average, is the driest. Snowfall averages approximately 70.4 inches annually (Reference 3).

The surrounding terrain of Fork Township is mostly undulating to steep moraines and has nearly level to gently rolling outwash plaines along the major rivers. The soil is variable, mostly well drained to moderately drained, loamy and sandy soils that formed in outwash deposits or glacial till. Farming is the main economic enterprise in the township. Dairy farms are scattered throughout the township. Field crops include hay, corn, wheat, oats, dry beans, and potatoes (Reference 4).

Land use in the flood plain of the Chippewa River is primarily public park land and undeveloped land except residential areas developed at Chippewa Vista and Barryton. The flood plain varies significantly through the community, being wide at some locations and relatively narrow at others.

2.3 Principal Flood Problems

Flooding occurs in Fork Township when high runoff causes the Chippewa River to overflow its banks. The highest recorded flood occurred in September 1986 with a peak flow

6,660 cubic feet per second (cfs), which is about a 100-year flood. Based on gage records collected on the Chippewa River, at the City of Midland, Midland County, it appears that an even larger flood occurred in March 1904, which had an estimated discharge for the Chippewa River near Mt. Pleasant, Isabella County of 7900 cfs, which is slightly more than a 200-year flood.

2.4 Flood Protection Measures

Flood protection measures are not known to exist within the study area.

3.0 ENGINEERING METHODS

3.1 Hydrologic Analyses

A period of record gage analysis, based on USGS gage number 04154000, was performed for the Chippewa River covering the years of 1931-1991. In addition, a historic event for the year 1904 was included, based on USGS gage number 04154500, by using correlation analysis. The HECWRC computer program, which is based on the criteria described in the U.S. Water Resources Council Bulletin 17B, Guidelines for Determining Flood Flow Frequency, was used to determine the existing relationships (Reference 5). A generalized skew of -0.17 was used with a mean square error of 0.20. For the area upstream of the Mecosta-Isabella county line, the 100- and 500-year flows were determined by the drainage area ratio method.

Peak discharges for the 100-, and 500-year floods of each flooding source studied in detail in the community are shown in Table 1.

TABLE 1 - SUMMARY OF DISCHARGES

Location	Drainage Area (Sq. Mi.)	100-year Discharge (cfs)	500-year Discharge (cfs)
CHIPPEWA RIVER			
Mecosta-Isabella county line	151.0	2700	3700

3.2 Hydraulic Analyses

Analyses of the hydraulic characteristics of flooding from the riverine sources studied were carried out to provide estimates of the elevation of the 100- and 500-year floods.

Cross section data for the backwater analysis were obtained by a field survey completed in June 1994. All bridges and valley sections were surveyed to obtain elevation data and structural geometry.

Channel and overbank roughness coefficients (Manning's "n") used in the hydraulic computations were chosen by engineering judgement and were based on field observations of the stream and flood plain areas. The channel roughness coefficients ranged from 0.035 to 0.040, and the overbank roughness coefficients ranged from 0.070 to 0.120 for all floods.

Water-surface elevations of floods of the selected recurrence intervals for the streams studied in detail were calculated using the COE HEC-2 step-backwater computer program (Reference 6).

The starting water surface elevations for the Chippewa River were based on the existing Isabella County FIS.

The coding for this data included the new 100- and 500-year discharges which previously were approved by the MDNR.

All elevations are referenced to the National Geodetic Vertical Datum of 1929 (NGVD). Elevations reference marks used in the study are shown on the work map.

4.0 FLOOD PLAIN MANAGEMENT APPLICATIONS

4.1 Flood Plain Boundaries

Mapping used in the study for flood plain delineation and as base maps came from the U.S.G.S. quadrangle topographic maps (both digital without contours and paper copies with contours). All base maps have been placed on the U.S.G.S. quadrangle digital map files. The Sherman City U.S.G.S. topographic map is at a scale of 1:24000 with contour interval of 10 feet (Reference 7) and the Lake U.S.G.S. topographic map is at a scale of 1:25000 with contour interval of 3 meters (Reference 8). The flood plain delineation for the Chippewa River was supplemented over the entire study area by use of the U.S.G.S topographic maps and then it was electronically transferred to the MDNR base maps in GIS design files.

4.2 Floodways

In Michigan, based on the Flood Plain Act of 1968, Act 245, P.A. 1929, as amended by Act 167, P.A. 1968, encroachment in the flood plain is limited to that which will cause only an insignificant increase in flood heights (Reference 9). Typically this is interpreted as meaning a surcharge of no

more than 0.1-foot.

The floodway presented in this study was initially computed on the basis of equal conveyance reduction from each side of the flood plain. In those areas where problems arose with the equal conveyance reduction encroachment option of the HEC-2 backwater program, modifications were applied based on experience.

7.0 OTHER STUDIES

Fork Township was enrolled in the regular program of the National Flood Insurance Program (NFIP) on May 25, 1984 as an area with no special flood hazard areas.

Within Mecosta County, City of Big Rapids (Reference 10) and Big Rapids Township (Reference 11) are in the regular program of NFIP as communities which are minimallt flood prone and have FHBM. Mecosta Township participated in the NFIP on September 4, 1986, but there was no special flood hazard areas for this community. There is the Flood Insurance Rate Map printed for the Village of Morey, Michigan, but no flood elevations were published on this map (Reference 12).

8.0 REFERENCES AND BIBLIOGRAPHY

1. U.S. Department of Commerce, Bureau of the Census, 1990 Census of Population, General Population Characteristics, Michigan, Washington, D.C., July 1992.

2. U.S. Department of Commerce, Bureau of the Census, 1980 Census of Population, Number of Inhabitants, Michigan, Washington, D.C., January 1982.

3. Michigan Department of Agriculture, Weather Service, Climate of Michigan by Stations, State of Michigan, East Lansing, Michigan.

4. U.S. Department of Agriculture, Soil Conservation Service, Soil Survey of Mecosta County, Michigan, May 1984.

5. U. S. Water Resources Council, Bulletin No. 17B, Guidelines for Determining Flood Flow Frequency, Washington, D.C., September 1981.

6. U.S. Army Corps of Engineers, Hydrologic Engineering Center, Generalized Computer Program, HEC-2, May 1991.

7. U.S. Department of the Interior Geological Survey, 7.5 Minute Series Topographic Maps, Scale 1:24000, Contour Interval 10 Feet: Sherman City, Michigan, 1964.

8. U.S. Department of the Interior Geological Survey, 7.5 Minute Series Topographic Maps, Scale 1:25000, Contour Interval 3 Meters: Lake, Michigan, provisional edition 1984.

9. State of Michigan, Flood Plain Control Act of 1968, Act 245, P.A. 1929 as amended by Act 167, P.A. 1968, Michigan Resources Commission, Lansing, Michigan, 1968.

10. U. S. Department of Housing and Urban Development, Federal Insurance Administration, Flood Hazard Boundary Map, City of Big Rapids, Michigan, September 1986.

11. U. S. Department of Housing and Urban Development, Federal Insurance Administration, Flood Hazard Boundary Map, Big Rapids Township, Michigan, September 1988.

12. U. S. Department of Housing and Urban Development, Federal Insurance Administration, Flood Insurance Rate Map, Village of Morey, Michigan, July 1987.

REFERENCE MARKS	ELEVATION FEET (NGVD)	DESCRIPTION OF LOCATION
RM 1	954.52	A railroad spike in the west face of power pole on the "x" northeast side of Oxbow Drive, at dead end @ residence No. 18286, 1.3 miles southeast of 19 Mile Road.
RM 2	955.20	A railroad spike in the west face of power pole, on east side of Oxbow Drive at southeast corner of Oxbow Drive and Beaver Road, 0.9 mile southeast of 19 Mile Road.
RM 3	941.69	A railroad spike in the west face of power pole at dead end of Beaver Road, 0.1 mile north of intersection of Beaver Road and Oxbow Drive.
RM 4	947.08	A 2x2 wood hub set at northeast side of Oxbow Drive loop, at intersection of Partridge Run Drive, 0.6 mile southeast of 19 Mile Road.
RM 5	949.08	A railroad spike in the southwest face of power pole on the north side of Oxbow Drive, at Y in road at residence No. 694, 0.4 mile south and east of 19 Mile Road.
RM 6	1004.95	A chiseled "x" on the north end of 12" CMP, on the east side of 10th Avenue, 0.65 mile north of 18 Mile Road and 10th Avenue.
RM 7	956.21	5/8" rerod set in 3" diameter concrete post, 1" above ground for a property corner marker on the southeast corner of 19 Mile Road and Oxbow Drive, 0.1 mile east of intersection of 10th Avenue and 19 Mile Road.
RM 8	949.02	A railroad spike driven in south end, downstream side of a 1.5x1.5' wood beam for bridge seat on wooden bridge on 19 Mile Road over Chippewa River. Spike is on the southeast corner of bridge, 2' below road level.

REFERENCE MARKS	ELEVATION FEET (NGVD)	DESCRIPTION OF LOCATION
RM 9	963.56	A boat spike driven inflush with asphalt and center line of intersection of 10th Avenue and 19 Mile Road.
RM 10	966.92	A chiseled "+" on the northeast of CMP on the east side of 10th Avenue, 0.15 mile north of intersection of 19 Mile Road. CMP is under drive to field with steel gate at entrance residence No. on gate post 19150.
RM 11	966.19	A chiseled "+" on the north end of 12" CMP on the east side of 10th Avenue, 0.3 mile north of 19 Mile Road. CMP is at drive to field and is cable off, 200' of two-story brick house.
RM 12	955.22	A railroad spike driven in the 1.5'x2.0' wood beam for bridge beam. Spike is on the notrhwest upstream corner of bridge on 10th Avenue over Chippewa River, 0.7 mile north of 19 Mile Road.

TABLE 2

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATIONS			
CROSS SECTION	DISTANCE[1]	WIDTH (ft)	SECTION AREA (sq ft)	MEAN VELOCITY (ft/sec)	REGULATORY (NGVD)	WITHOUT FLOODWAY (NGVD)	WITH FLOODWAY (NGVD)	INCREASE (ft)
CHIPPEWA RIVER								
A	300500	178.0	914.0	3.0	942.8	942.8	942.9	0.1
B	302050	434.0	1570.0	1.7	943.9	943.9	944.0	0.1
C	306000	125.0	711.0	3.8	947.2	947.2	947.3	0.1
D	307400	287.0	1247.0	2.2	948.4	948.4	948.5	0.1
E	309056	100.0	612.0	4.4	949.4	949.4	949.5	0.1
F	310850	397.0	1763.0	1.5	951.0	951.0	951.1	0.1
G	313050	259.0	1292.0	2.1	952.5	952.5	952.6	0.1
H	315865	149.0	732.0	3.7	955.2	955.2	955.3	0.1
I	316049	154.0	856.0	3.2	955.5	955.5	955.6	0.1

[1]FEET ABOVE DOWNSTREAM CORPORATE LIMIT OF ISABELLA COUNTY

FLOOD PROFILES

CHIPPEWA RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

OLD FORK TOWNSHIP, MI

(MECOSTA COUNTY)

November 17, 1994

Great Lake Hydraulics and Hydrology Branch
Engineering & Planning Division

Mr. Bruce Menerey, P.E.
Technical Programs
Land and Water Management Division
Michigan Department of Natural Resources
P.O. Box 30028
Lansing, Michigan 48909

Dear Mr. Menerey:

Submitted for your review and approval is a copy of the hydraulic calculations for the Chippewa River in the Fork Township, Mecosta County, Michigan Flood Insurance Study. The hydraulic analysis is being submitted in the form of a PC diskette containing the HEC-2, 100- and 500-year unencroached and encroached input and output data. Also enclosed are; a brief write-up dealing with items that will assist the review process, a copy of the field notes at bridge and valley sections, and a map showing the surveyed cross-section locations.

Based on current scheduling and workload, a response from your office within two weeks would be appreciated.

If you have any questions regarding the enclosed data, please contact Ms. Hanna Kobylinski at (313) 226-4761 or Mr. David Schweiger at (313) 226-4886.

Sincerely,

Ronald E. Wilshaw, P.E.
Chief, G.L. Hydraulics and
Hydrology Branch

Enclosure

Fork Township, Mecosta County, Michigan FIS
Hydraulic Computation Background Information

This study covers the Chippewa River from 10th Avenue, the upstream corporate limit to the Mecosta-Isabella county line, the downstream corporate limit. The 100- and 500-year floods are being modeled with discharges as previously approved by the Michigan Department of Natural Resources. Water surface elevations were computed using the COE HEC-2 step-backwater computer program.

Cross section data for the backwater analysis were obtained by a field survey completed in June 1994. All bridges and valley sections were surveyed to obtain elevation data and structural geometry.

Channel and overbank roughness factors (Manning's "n") used in the hydraulic computations were chosen by engineering judgement and were based on field observations of the stream and flood plain areas.

The starting water surface elevations for the Chippewa River were based on the existing Isabella County FIS.

The floodway profile model was determined by further encroaching the natural profile model to obtain allowable 0.1 foot increase in the 100-year water surface profile.

DEPARTMENT OF THE ARMY
DETROIT DISTRICT, CORPS OF ENGINEERS
BOX 1027
DETROIT, MICHIGAN 48231-1027

IN REPLY REFER TO

March 10, 1995

RECEIVED
MAR 14 1995
NATURAL RESOURCES
LAND & WATER MANAGEMENT

Engineering & Planning Division
Planning Branch

Mr. Norbert Schwartz
Natural and Technological Hazards Division
Federal Emergency Management Agency
175 W. Jackson Blvd., 4th Floor
Chicago, Illinois 60604

Dear Mr. Schwartz:

In fulfillment of the requirements of the Limited Map Maintenance Program (LMMP), please note the early completion of the draft report for the township of Fork, Mecosta County, Michigan. This LMMP was completed by the Detroit District, Corps of Engineers, under Inter-agency Agreement EMW-94-E-4432, Project Order Nos. 4 and 6, as amended, and your Task Number LMMP 94-1.

In accordance with your guidance, the following information is being transmitted to you for subsequent use by your technical evaluation coordinator:

Draft Revised Pages (original and one copy)	Enclosure 1
Study Certification	Enclosure 2
Profile (original and one copy)	Enclosure 3
FBFM/FIRM (original and one copy)	Enclosure 4
Computer Input Files (diskette)	Enclosure 5
Summary Computer Output	Enclosure 6
Study Documentation,(including survey data)	Enclosure 7

A required floodway meeting will be held with the community in the near future. The results of this study have been fully coordinated with the Michigan Department of Natural Resources, Land and Water Management Division. If questions arise regarding the enclosed data, please contact Mr. Joseph R. Wanielista, program manager, Flood Plain Management Services, at (313) 226-6773.

Sincerely,

David L. Dulong, P.E.
Chief, Engineering &
Planning Division

Enclosures

✓ CC: Bruce Menerey, MDNR

This is to certify that all work accomplished in the conduct of this study was done in accordance with the Statement of Work and General Provisions of Interagency Agreement No. EMW-94-E-4432, Project Order No. 4, Amendment No. 1 together with all such modifications, either written or oral, as the Project Officer and/or the Contracting Officer or their representatives have directed, as such modifications affect this contract, and that all such work has been accomplished in accordance with sound and accepted engineering practice within the contract provisions for respective phases of the work.

David L. Schweiger

DAVID L. SCHWEIGER, P.E.
Chief, Riverine & Coastal Section,
Great Lakes Hydraulics and
Hydrology Branch

FLOOD INSURANCE STUDY

FORK TOWNSHIP, MECOSTA COUNTY, MICHIGAN

FEBRUARY 1995

U.S. ARMY ENGINEER DISTRICT

DETROIT, MICHIGAN

1.0 INTRODUCTION

1.1 Purpose of Study

Community Name: FORK TOWNSHIP

County: MECOSTA

State: Michigan

1.2 Authority and Acknowledgments

The hydrologic and hydraulic analyses for this study were prepared by the U.S. Army Corps of Engineers, Detroit District (COE), for the Federal Emergency Management Agency (FEMA), under Inter-Agency Agreement No. EMW-94-E-4432, Project Order No. 4, Amendment No. 1. This work was completed in February 1995.

1.3 Coordination

On August 5, 1993, an initial Consultation and Coordination Officer's (CCO) meeting was held with representatives of FEMA, the Michigan Department of Natural Resources (MDNR), the Fork Township personnel, and the study contractor.

Results of the technical aspects of this study were coordinated with, reviewed and approved by the Michigan Department of Natural Resources, the State coordinating agency.

On , the results of this Flood Insurance Study were reviewed and accepted at a final coordination meeting attended by representatives of the Study Contractor, FEMA, and the community.

2.0 AREA STUDIED

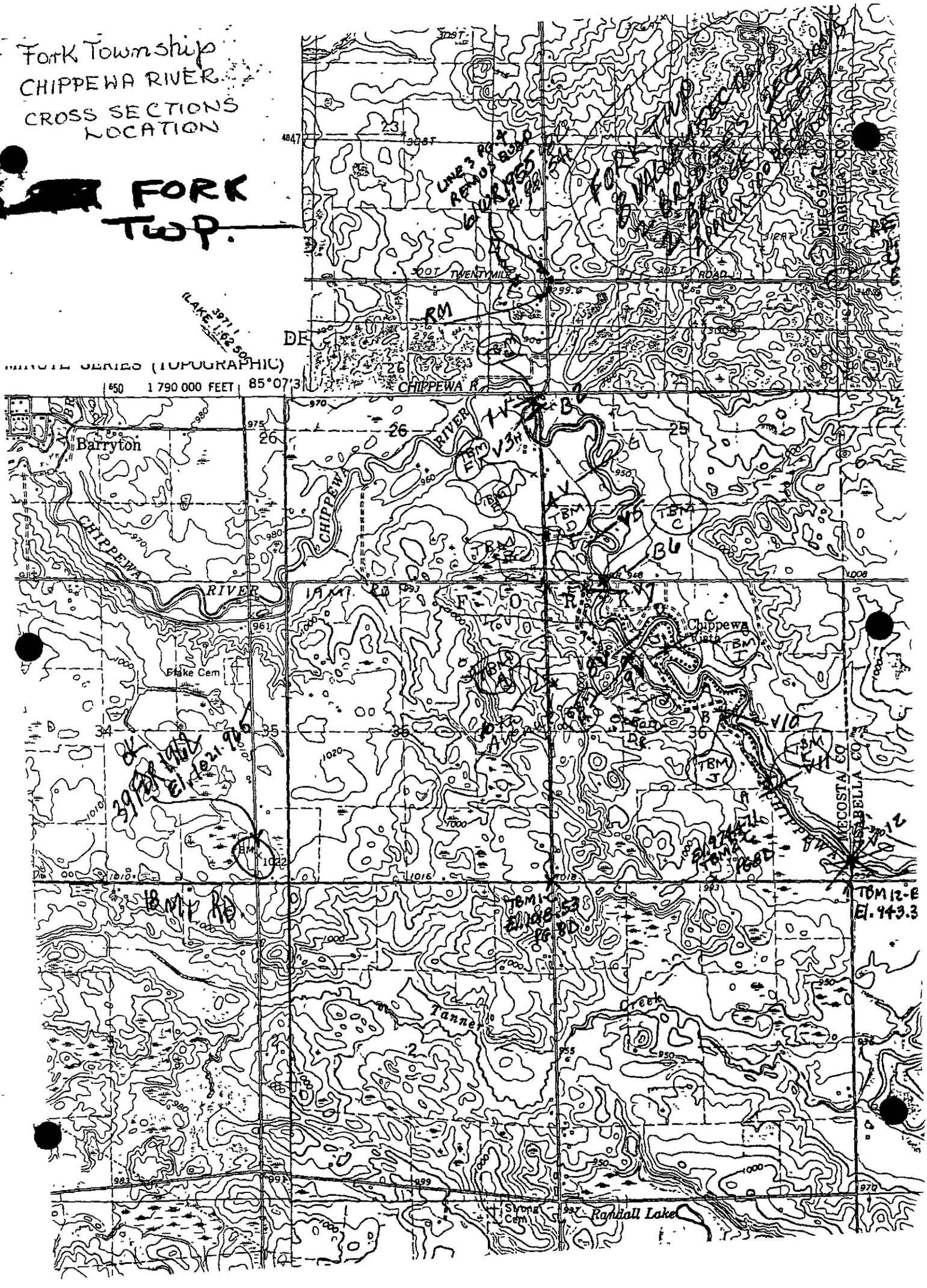
2.1 Scope of Study

This Flood Insurance Study covers the incorporated area of the Fork Township, Mecosta County, Michigan. The area of study is shown on the vicinity map (Figure 1).

Flooding caused by the overflow of the Chippewa River from the Mecosta-Isabella county line, downstream corporate limit to 10th Avenue, upstream corporate limit was studied in detail.

Fork Township
CHIPPEWA RIVER
CROSS SECTIONS
LOCATION

FORK TWP.



FORK TOWNSHIP

MECOSTA COUNTY

F.I.S.

JUNE 20 - JUNE 24, 94

T. ROZNOWSKI

K. DRAKE

V. GOEDDEKE

AUTO LEVEL = N.Z

TOTAL STATION

GEODAMETER 440

INDEX

INDEX

TBM Desc.

Pg-1D - 4D

Levels

Level Loop No1.
SET TBM A & B
Pg-1L - Pg-6L

Level Loop No.2
SET TBM E, F & G
Pg-7L - Pg-10L

Level Loop No.3
SET TBM D, & C
Pg-11L - Pg-13L

Level Loop No.4
SET TBM H & I
Pg-14L - Pg-17L

Level Loop No.5
SET TBM J & K
Pg-18L - Pg-21L

Level Loop No.6
SET Hub No.1 for
@ SECTION 4V
Pg-22L - 23L

Level Loop No.7
SET Hub No 2 for
@ SECTION 5V
Pg-24L-25L

Level S

Level Loop No. 8

Set TBM L

Pg-26L - Pg-27L

Cross Sections

Water Surface Elev.

Pg-1WS @ Beginning of Cross Sections

⊗ Section 1V

Valley Section

Pg-1C - 4C

⊗ Section 2B

Bridge Section 10th Ave

Pg-5C - 10C

⊗ Section 3V

Valley Section

Pg-11C - 13C

⊗ Section 4V

Valley Section

Pg-14C - 16C

⊗ Section 5V

Valley Section

Pg-17C - 19C

⊗ Section 6B

Bridge Section

Pg-20C - 24C

⊗ SECTION 7V
VALLEY SECTION
pg-25C - 27C

⊗ SECTION 8V
VALLEY SECTION
pg-28C - 30C

⊗ SECTION 9V
VALLEY SECTION
pg 31C - 33C

⊗ SECTION 10V
VALLEY SECTION
pg 34C - 36C

⊗ SECTION 11V
VALLEY SECTION
Pg 37C - 39C

TBM DESCRIPTIONS

~~70~~-1D

2D

TBM Desc

1B

TBM A

A chiseled 'X' on N. end of 12" cmp. on E. side of 10th Ave 0.65 mi N. of inter. of 18 mi. Rd. & 10th Ave.

ELEV. 1004.95

TBM B

A Boat spike driven in flush with asphalt @ ℄ of inter. of 10th Ave. & 19 mi. Rd.

ELEV. 963.56

TBM C

A R.R. spike driven in S. end, D/S side of a 1.5x1.5 wood beam for bridge sert. on wooden bridge on 19 mi. Rd, over Chippewa River. Spike is on SE corner of bridge 2' below Rd level. ELEV. 949.02

TBM D

5/8" Re Rod set in 3" Dia conc. post 1' above grnd for a property corner marker on the S.E. corner of 19 mi. Rd. & Oxbow Dr. 0.1 mi. E. of inter of 10th Ave & 19 mi. Rd.

ELEV. 956.21

TBM E

A chiseled + on N. E. of 12" cmp on the E. side of 10th Ave. 0.15 mi. N. of inter of 19 mi. Rd. cmp is under Dr. to Field with steel gate @ ent. Resid. # on gate post 19150.

ELEV. 966.92

TBM F

A chiseled + on N. end of 12" cmp on E. side of 10th Ave. 0. mi. N. of 19 mi. Rd. cmp. is @ Dr. to Field & is cabled off, 200' S. of 2 story brick house.

ELEV. 966.19

TBM G

A R.R. spike driven in the 1.5'x2' wood beam for bridge beam. Spike is on N.W. U/S corner of bridge on 10th Ave., over Chippewa River 0.7 mi N. of 19 mi Rd.

ELEV. 955.22

TBM H

A R.R. spike in the S.W face of P.P. on the N. side of Oxbow Dr. @ Y in Rd. @ Resid. No. 699 0.4 mi. S. & E. of 19 mi. Rd.

ELEV. 949.08

TBM I

A 2x2 WOOD stub SET @ N.E. SIDE of OXBOW DR. LOOP @ INTER of PARTRIDGE RUN DR. 0.6 mi S.E. of 19 Mi. RD. ELEV. 997.08

TBM J

A RR SPIKE IN THE W. FACE of P.P. E. SIDE of OX BOW DR. @ S.E. CORNER OX BOW DR & BEAVER RD. 0.9 mi. S.E. of 19 Mi. RD. ELEV. 955.20

17

TBM K

A R.R. SPIKE IN THE W. FACE of P.P. ON THE N.E. SIDE of OXBOW DR. @ DEAD END @ Resid. No. 18286 1.3 mi. S.E. of 19 mi. RD. ELEV. 954.52

TBM L

A R.R SPIKE IN THE W. FACE OF P.P @ DEAD END OF BEAVER RD 0.1 N. OF INTER OF BEAVER RD & OXBOW DR. ELEV 941.69

LEVELS

Level Loop

No. 1

TBM 1C 10th Ave & 18 mi. RD

SET TBM A & B. 10th Ave. &

19 mi. RD.

2.2 mi. Loop

T. KAZIMIERSKI
K. DRAKE
ZO JUNE
V. GOEDDEKE

80°
CLOUDY

pg-1

	+	Hi	−	ELEV	
TBM-1C				1018.23	
	8.170 ~~8.025~~				
Tp-1			5.284 ~~5.132~~	1021.416	✓ +2.886 +2.893
	5.501				
Tp-2			5.008	1021.909	✓ .49[illegible]
	0.542				
Tp-3			6.545	1015.906	✓ 6.003
	7.665				
Tp-4			7.908	1015.663	✓ -.243
	2.403 2.388				
Tp-5			6.720 ~~6.685~~	1011.352	✓ 4.311 ~~4.297~~
	7.184 ~~7.448~~				
Tp-6			1.772 ~~2.230~~	1016.764	✓ 5.412 ~~5.016~~
	8.025				
Tp-7			7.823	1016.966	✓ .202
	4.408				
Tp-8			7.129	1019.245	✓ 2.721
	1.302				
Tp-9			9.249	1006.318	✓ 7.947

A FR. 1/4 MI. IN THE ¢ OF 18 MILE
LD AT 1 IN THE AVE WIDO = Asph. Rd &
BEGINING OF GRAVEL RD.
DOT ON E SIDE OF 10TH

" " "

" " "

" " "

" " "

" " "

" " "

" " "

" " "

	+	Hi	−	ELEV		
Tp-9				1006.298		DOT ON E. SIDE 10TH
	1.275					
Tp-10			6.548	1001.025	5.273	" " "
	5.785					
Tp-11			3.160	1003.650	2.625	" " "
	7.150 ~~7.001~~					
Tp-12			10.168 ~~10.022~~	1000.632	3.018 ~~3.021~~	" " "
	5.849					
Tp-13			1.040	1005.491	4.809	" " "
	~~5.804~~ ~~5.601~~					
TBM-A 14			6.283 ~~6.234~~	1004.951 1004.962	Adj -.011 -4.11 ~~-4.493~~	A CHISELED + ON N END 12" CMP. 0.65 MILES N OF 18 MILE RD.
	8.053					
TP-14			2.322	1010.693	5.731	DOT E Edge 10TH Ave
	7.969 ~~7.948~~					
Tp-15			1.949 ~~1.922~~	1016.713	6.020 6.026	" " "
	2.790					
Tp-16			9.293	1010.210	-6.503	" " "
	1.401 ~~1.028~~					
Tp-17			9.773 ~~9.401~~	1001.838	8.372	" " "
					Kid	

	+	HI	−	ELEV		
Tp-17				1001.838		Line pg. 2L
	x 4.629					
Tp-18			x 6.002	996.865 ✓	4.973	" " "
	5.739					
Tp-19			2.039	1000.565 ✓	3.700	" " "
	2.965					
Tp-20			9.709	993.821 ✓	6.744	" " "
	2.045					
Tp-21			4.065	991.801 ✓	2.020	" " "
	6.069					
Tp-22			9.172	988.698 ✓	3.103	" " "
	1.287					
Tp-23			9.199	980.826 ✓	7.872	" " "
	1.102					
TP-24			10.155	972.773 ✓	9.053	
	1.695					
TBM B				963.563	Adj −.021	bent spike @ Inter. Am. Rd & 10th Ave
			9.889	963.584	8.189	
		Return				
		Tp-4L				
					✓	

Pg-3L

	+	HI	-	ELEV.	
TBM B				963.584	
	9.741				
TP-24			1.549	971.776 ✓	8.192
	10.249				
TP-23			1.200	980.825 ✓	9.049
	9.364				
TP-22			1.485	988.704 ✓	7.879
	9.285				
TP-21			6.185	991.804 ✓	3.100
	4.035				
TP-20			2.010	993.829 ✓	2.025
	9.559				
TP-19			2.810	1000.569 ✓	6.740
RESET	2.049 ~~1.949~~				
TP-18			5.742 ~~5.642~~	996.876 ✓	[illegible]93
	x ~~6.645~~				
TP-17		x	~~1.662~~	1001.859 ✓	~~4.985~~
	9.710 ~~9.510~~				
TP-16			1.339 ~~1.130~~	1010.230 ✓	8.371
					✓ 14

	+	Hi	−	ELEV	
Tp-16				1010.230	
	9.215				
Tp-15			2.710	1016.735	6.505
	2 059 ~~1.049~~				
Tp-14			8 078 ~~7.659~~	1010.716	6.019 ~~6.040~~
	2.069				
TBM A			7 799	1004.986	5.730
	6.248 ~~6.055~~				
Tp-13			5 769 ~~5.525~~	1005.965	.479 ~~[illegible]~~
	0 985				
Tp-12			5 783	1000.661	4.804
	10 103 ~~10.020~~				
Tp-11			7 082 ~~7.339~~	1003.682	[illegible] ~~7.30~~
	3.225				
Tp-10			5.849	1001.058	2.624
	6.456				
Tp-9			1.185	1006.328	5.270
	9.235				
Tp-8			1.290	1014.273	7.945

	+	Hi	-	ELEV	
Tp-8				1014.273	
	7.313				
Tp-7			4.588	1016.998	2.725
	8.000				
TP-6			8.201	1016.797	.201
	1.830				
Tp-5			7241 ~~7259~~	1011.386	5.411
	6.671 ~~6.779~~				
Tp-4			2.359 ~~2.473~~	1015.698	4.312 ~~4.306~~
	8.012				
Tp-3			7.767	1015.993	245
	6.655				
TP-2			0.650	1021.948	6.005
	5.101				
Tp-1			5.591	1021.458	49
	5.163 ~~5.588~~				
TBM #C			8.249 8.473	1018.572	2.886 2.885

1018.572 Closure
1018.530 PLS
.042

Level Loop

No. 2

TBM B Along 10th Ave

To TBM C @ wood

Bridge on 10th Ave & Chippewa

Riv.

1.4 mi. Loop

	+	HI	-	ELEV.	
TBM B				963.563	
	0.815				
Tp-1			6.190	958.188	5.375
	6.420				
Tp-2			3.368	961.240	3 052
	7.185				
Tp-3			2.223	966.202	4.962
	6.072				
TBM E			5.351	966.918 966.923	Adj.-.005 721
	4.905				
Tp-4			5.647	966.181	.742
	6.025				
Tp-5			5408	966.798	.617
	5.091				
TBM F			5.688	966.192 966.201	Adj.-.009 5.97
	5.255				
Tp-6			6.749	964.707	1.494
	4.519				
Tp-7			4.865	964.361	346

π K Drake
Φ V. Goeddeke

Survey

Refer pg. 32

JUNE 21, 94 Pg-8L

DOAT spike @ Inter. 10th Ave & 19 mi Rd

DOT ON E. EDGE OF 10TH

" " "

" " "

A CHISELED "+" ON N END CMP @ EDGE OF 10TH 0.11 N OF INTER OF 10TH &

DOT E. EDGE 10TH

" " "

A CHISELED "+" ON N. END CMP @ EDGE OF 10TH 0.11 N OF INTER OF 10TH &

DOT E. EDGE 10TH

" " "

	+	HI	-	ELEV		
Tp-7				964.361		
	4.830					
Tp-8			5.689	963.502	✓.859	
	1.969					
Tp-9			8.205	957.266	✓1.-36	
Re-set	3.689 ~~3.679~~					
TBM G			5.720 ~~5.707~~	955.219 ~~955.235~~	ADJ -.016 ✓2.031	
		RETURN				
TBM G				955.235	✓	
Re-set	5.545 ~~3.609~~				2.028	
Tp-9			3.517 ~~8.635~~	957.263	✓	
	8.235					
TP-8			1.995	963.503	✓6.240	
	5.755					
Tp-7			4.889	964.369	✓.866	
	4.775					
Tp-6			4.443	964.701	✓.332	
	6.805					
TBM F			5.310	966.196	✓1.495	
					14	

pg-9L

pg. 8L

DOT EL EDGE 10TH

" " "

A R R SPIKE DRIVEN IN THE N.W CORNER OF BRIDGE

RETURN

	+	HI	−	ELEV	
TBM F				966.196	
	5.743				
Tp-5			5.141	966.798	✓0.602
	5.468				
Tp-4			6.069	966.197	✓.601
	5.399				
TBM E			4.655	966.941	✓.744
	5.580				
Tp-3			6.301	966.220	✓.721
	2.901				
Tp-2			7.853	961.268	✓4.952
	3.435				
Tp-1			6.488	958.215	✓3.053
	6.321				
TBM B			0.942	963.599	✓5.379

Pg-32	Closure Levels	963.599
		963.563
	diff.	.031

LEVEL Loop No. #3

0.4 mi. Loop

K. DRAKE
& V. GOEDDEKE

JUNE 22, 99

Pg-12L

	+	Hi	−	ELEV					
TBM B				963.563			RLFER Pg. 32 2 levels		
	2.887 ~~3.683~~								
Tp-1			8.859 ~~8.642~~	957.591	✓5.959		DOT ON S. SIDE	19 M. RD	
Re-set	2.104 ~~2.039~~								
Tp-2			5.549 ~~5.455~~	959.196	✓3.445 ~~3.446~~		" "	"	
	3.901								
TBM-D			1.839	956.210 956.208	Adj. +.002 ✓2.062		CONC. POST WITH ROD S W CORNER OF INTER OF OXBOW DR. & 19 MI. RD.		
	0.288								
Tp-3			5.388	951.108	✓5.100				
	4.155								
TBM C			6.249	949.017 949.014	Adj +.003 ✓-2.099		RR SPIKE S.W. CORNER WOOD BRIDGE 19 mi. RD & Chippewa Riv.		
		RETURN					RETURN		
TBM C				949.014	✓		ABOVE		
	6.219								
TP-3			4.125	951.108	✓2.094				
	5.329								
TBM D			0.228	956.209	✓5.101				
	1.822								
TP-2			3.885	959.146	✓2.063				

	+	HI	-	ELEV.	
TP-2				959.146	
	5.489				
TP-1			2.045	957.590 ✓	3.444
	8.787				
TBM B			2.820	963.557 ✓	5.967

✓ K

Pg-3L Levels 963.563
Closure 963.557
diff. = .006

Loop No. 4

1.2 mi. Loop

K. DRAKE
V. DOEDDEKE
JUNE 22, 99
pg. 15L

	+	HI	−	ELEV					
TBM D				956.210		KLLR pg 122 Levels			
	6.012								
Tp-1			1.205	961.017	4.807	DOI ON W. EDGE O' ROW DR.			
	11.402								
Tp-2			0.509	971.910	10.873	"	"	"	
	8.122 ~~8.895~~								
Tp-3			4.192 ~~4.109~~	975.840	3.930 ~~4.290~~	"	"	"	
	2.995 ~~2.819~~								
Tp-4			7.564 ~~7.365~~	971.271	4.569 ~~4.552~~	"	"	"	
	5.490 ~~5.425~~								
Tp-5			1.189 ~~1.129~~	975.572	4.301 ~~4.296~~	"	"	"	
	10.359								
Tp-6			0.229	985.702	10.130	"	"	"	
	10.222 ~~10.599~~								
Tp-7			9.659 ~~9.485~~	986.265	.563 ~~1.114~~	"	"	"	
	4.829								
Tp-8			7.908	983.186	3.079	"	"	"	
	0.868								
Tp-9			10.129	973.925	9.261	"	"	"	

	+	HI	-	ELEV		
Tp-9				973.925		
	0.565					
	x ~~1.122~~					
Tp-10			10.369 ~~10.912~~	964.122	9.803 ✓9.790	
	1.069					
Tp-11			11.189	954.002	✓10.120	
	1.569					
TBM H			6.488	949.081 / 949.083	Adj -.002 ✓4.919	
	7.032					
TBM I			9.028	947.084 / 947.087	Adj -.003 ✓1.996	
		RETURN				
TBM I				947.087		
	8.997					
TBM H			7.005	949.079	✓1.992	
	6.581					
Tp-11			1.661	953.999	✓4.920	
	10.301					
Tp-10			0.179	964.121	✓10.122	
	10.450					
Tp-9			0.651	973.920	✓9.799	

p-15L

Refer pg-15L

DoT E. Edge OxBow Dr.

Pg-9D desc → RR. Spike in S.W. Face P.P. N. Side OxBow Dr. @ Y

2x2 wood Hub @ OxBow Dr Loop & Partridge Run Dr.

Above

	+	HI	−	ELEV	
Tp-9				973.920	
	10.365				
Tp-8			1.098	983.187	9.267
	7.933				
Tp-7			4.850	986.270	3.083
	9.609				
Tp-6			10.174	985.705	.565
	0.852				
Tp-5			10.978	975.579	10.126
	1.271				
Tp-4			5.574 ~~5.570~~	971.276	4.227
	7.569 ~~7.575~~				
Tp-3			2.998	975.847	4.571 ~~4.577~~
	4.231				
Tp-2			8.161	971.917	3.930
	1.901 ~~1.399~~				
TP-1			11.901	961.017	
	1.527				
TBM D			6.329	956.215	

Refer p-152

Pg-122 Levels 956.210
Closure 956.215
diff. +.005

Level Loop
NO. 5
OXBOW DR
SET TBM J & K

1.9 mi. Loop

T. Roznowski
V. Doeddeke

Sunny 60°

June, 23, 99

Pg-162 Levels

2/2 Hub @ Oxbow Dr Loop & Partridge Run Dr.

	+	HI	−	ELEV.		
TBM I				947.084		
	9.260					
TP-1			5.725	950.619	+3.535	DOT E. Edge Oxbow Dr.
	2.020					
TP-2			4.270	948.369	-2.256	" "
	8.763					
TP-3			0.984	956.148	+7.779	" "
	11.541					
TP-4			3.049	964.640	+8.492	" "
	5.671					
TP5			2.389	967.922	+3.282	" "
	0.788					
TP-6			9.375	959.335	8.587	" "
	1.979					
TBM J			6.117	955.197	-4.138	R.R. spike in P.P. Oxbow Dr & Beaver Rd
	3.334					
TP-7			5.329	953.202	1.995	DOT E Edge Oxbow Dr
	7.145					
TP-8			4.760	955.[illegible]	+2.385	" "

	+	HI	−	ELEV		
TP-8				955.587		DOT ℄ Edge OxBow DR
	4.901	960.488				
TP-9			4.811	955.677	+ .090	" "
	5.361					
TP-10			5.655	955.383	- .299	" " "
	5.125	960.508				
TBM K			5.988	954.520	.863	
		Return				
TBM K				954.520		
	5.938	960.458				
TP-10			5.070	955.388	+ .868	
	5.64					
Tp-9			5.375	955.677	+ .289	
	4.920					
Tp-8			5.011	955.586	- .091	
	4.795					
Tp-7			7.184	953.197	- 2.389	
	5.501	958.698				

.21L

	+	HI	−	ELEV		
TBM J			3.500	955.198	+2.001	Refer pg-19L
	6.180					
Tp-6			2.041	959.337	+4.139	
	9.476	968.813				
Tp-5			0.890	967.923	+8.586	
	2.421					
Tp-4			5.698	964.646	-3.277	
	3.252					
Tp-3			11.742	956.156	-8.490	
	1.108	957.264				
Tp-2			8.889	948.375	-7.784	
	4.315					
Tp-1			2.068	950.622	+2.247	
	5.779					
TBM I			9.310	947.082	-3.540	947.084

closure = 947.082
.002

Level Loop NO.6
Set Hub @ Top
of RT BNK for
@ SECTION 4V

JUNE 22,94 pg-232

	+	H.	-	ELEV.
TBM F				966.19
Hub NO. 1				957.9
		RETURN		
Hub 1				957.9
TBM F				966.2

Pg- 8 L Levels

IH = 5.2
SH = 5.0
VD = +4.5

965.12
- 4.5
961.7
+ 5.2
966.9

Dist TBM F TO Hub 1

465
480
945

RETURN

957.9
3.8
961.7
5.2
966.9

IH = 5.2
SH = 5.0
VD = -3.8

Level Loop No. 7

SET TRM Hub 2

	+	HI	−	ELEV		
TBM E				966.92		
TBM Hub 2				959.8	(SH 5.0)	
		Return				
TBM Hub				959.8		
TBM E				966.9	(SH) 8.0	

Pg 8 L Levels

IH = 5.2
SH = 8.0
VD = −0.1

967
309
771'

2x2 wood Hub set in Field for
OSV.

Return

IH = 5.2
SH = 5.0
VD = −7.2

959.8
+ 7.2
967.0
+ 5.2
972.2

966.9
+ 0.1
967.0
+ 5.2
972.2

Level Loop

NO 8

TBM 2 BEAVER RD

	+	HI	−	ELEV.	
TBM J				955.20	
	1.27	956.47			
TP-1			9.06	947.41	-7.79
	1.00	948.41			
TBM L			6.72	941.69	-5.72
		Return			
TBM L				941.69	
	6.65	948.34			
TP 1			0.93	947.41	5.73
	9.15	956.56			
TBM J			1.35	955.21	7.80

JUNE 23, 94 Pg-27L

Pg-19L Levels

DOT w. Edge Beaver Rd

RR. Tracks @ Dead End of Beaver Rd

CROSS SECTIONS

WATER SURFACE ELEV.

⊗ 1V	949.2	Pg-3C
⊗ 2B	949.2	Pg-7C
⊗ 3V	949.2	Pg-12C
⊗ 4V	945.1	Pg-15C
⊗ 5V	943.4	Pg-18C
⊗ 6B	942.5	Pg-22C
⊗ 7V	942.2	Pg-24C
⊗ 8V	940.9	Pg-27C
⊗ 9V	940.0	Pg-30C
⊗ 10V	937.1	Pg-33C
⊗ 11V	934.2	Pg-36C

VALLEY SECTION

NO. 1 V

50' U/S 10TH AVE

BRIDGE & Chippewa Riv

	+	HI	−	ELEV.	
TBM G				955.22	
	5.98	961.20			
	DIST	Rod	ELEV.		
	0	10.6	950.6		
	25' LT	10.3	950.9		
	32' LT	10.8	950.4		
	33' LT	12.0	949.2		
	35' LT	12.2	949.0		
	36' LT	12.0	949.2		
	37' LT	10.9	950.3		
	54' LT	7.3	953.9		
	75' LT	6.8	954.4		
	100' LT	6.9	954.3		
	125' LT	6.8	954.4		
	150' LT	6.5	954.7		
	175' LT	6.5	954.7		
	200' LT	6.3	954.9		
	225' LT	5.9	955.3		
	250' LT	5.4	955.8		

V. GOEDDEKE JUNE
Pg. 96 Levels R.R. spike N.W. corner wood p
BRIDGE on 10th Ave

Desc.
TOP LT BNK
GE
TOP RT BNK @ creek
u/s s/L
PTM & CRK
u/s s/L
TOP LT BNK @ CRK. & TOE SLOPE
TOP SLOPE
GE

LAND CONT. FLAT.

+	HI	-	ELEV.		Desc	
	961.2					
DIST	Rod	ELEV.				
3' RT	11.9	949.3			TOE LT BNK	
10' RT	12.0	949.2			u/s s/L	
20' RT	0.9	948.3		SNDG	SNDG	MUD
30' RT	1.9	947.3			SNDG	"
40' RT	3.0	946.2				ROCK
50' RT	3.5	945.7				"
60' RT	2.5	946.7				"
64' RT	12.0	949.2			u/s s/L	
68' RT	7.9	953.3			TOP RT BNK	
75' RT	8.1	953.1			GE	
100' RT	8.4	952.8				
125' RT	8.5	952.7				
150' RT	7.5	953.7				
175' RT	7.3	953.9				
200' RT	6.6	954.6				
225' RT	5.0	956.2				
250' RT	4.5	956.7				

	+	HI	-	ELEV.
		961.2		
	DIST	Rod	ELEV.	
	275' RT	3.7	957.5	
	300' RT	2.5	958.7	
	325' RT	1.5	959.7	
TBM 6		5.98	955.2	

Desc

6E

LAND RISES 3'± NEXT 200'± THEN FLAT.

BRIDGE SECTION
10th Ave over Chippewa Riv.
⊗ SECTION 2B

	+	HI	−	ELEV.
TBM G				955.22
	5.98	961.20		
	DIST	ROD	ELEV.	
	0'	5.25	955.95	
	50' LT	5.12	956.08	
	100' L	4.72	956.48	
	150' L	3.98	957.22	
	200' L	2.84	958.36	
	250' L	1.93	959.27	
	101.6' R	5.35	955.85	
	150' R	5.34	955.86	
	200' R	5.15	956.05	
	250' R	4.62	956.58	
	300' R	3.78	957.42	
	350' R	2.62	958.58	

JUNE 22, 94 Pg-6C

Refer Pg. 9L Levels

Desc

Top ℄ 10th Ave @ Face LT Abut.
℄ 10th Ave

Rd Rises 8-10' Next 350'

Top ℄ 10th Ave @ Face Rt Abut
℄

Rd Rises 4' Next 100' Then Flattens

+	HI	−	ELEV
	961.20		

DIST	ROD	ELEV	
0' L	6.6	954.6	Top Lt. (WOOD) ABUT'D FACE
0' L	9.6	951.6	Btm " (WOOD) " "
6' L	10.2	951.0	Top of Bank (Lt)
8' L	11.4	949.8	Toe " " "
12' L	12.0	949.2	w/- s/L
22' L	0.8	948.4	SNDS SOIL'D RCK
24.5'	0.8	948.4	"
25.5	0.9	948.3	"
36'	0.9	948.3	
46'	1.3	947.9	
51'	1.4	947.8	
52'	1.4	947.8	
62'	1.7	947.5	
72'	1.7	947.5	
78'	2.0	947.2	
79'	2.0	947.2	

✓ KLD

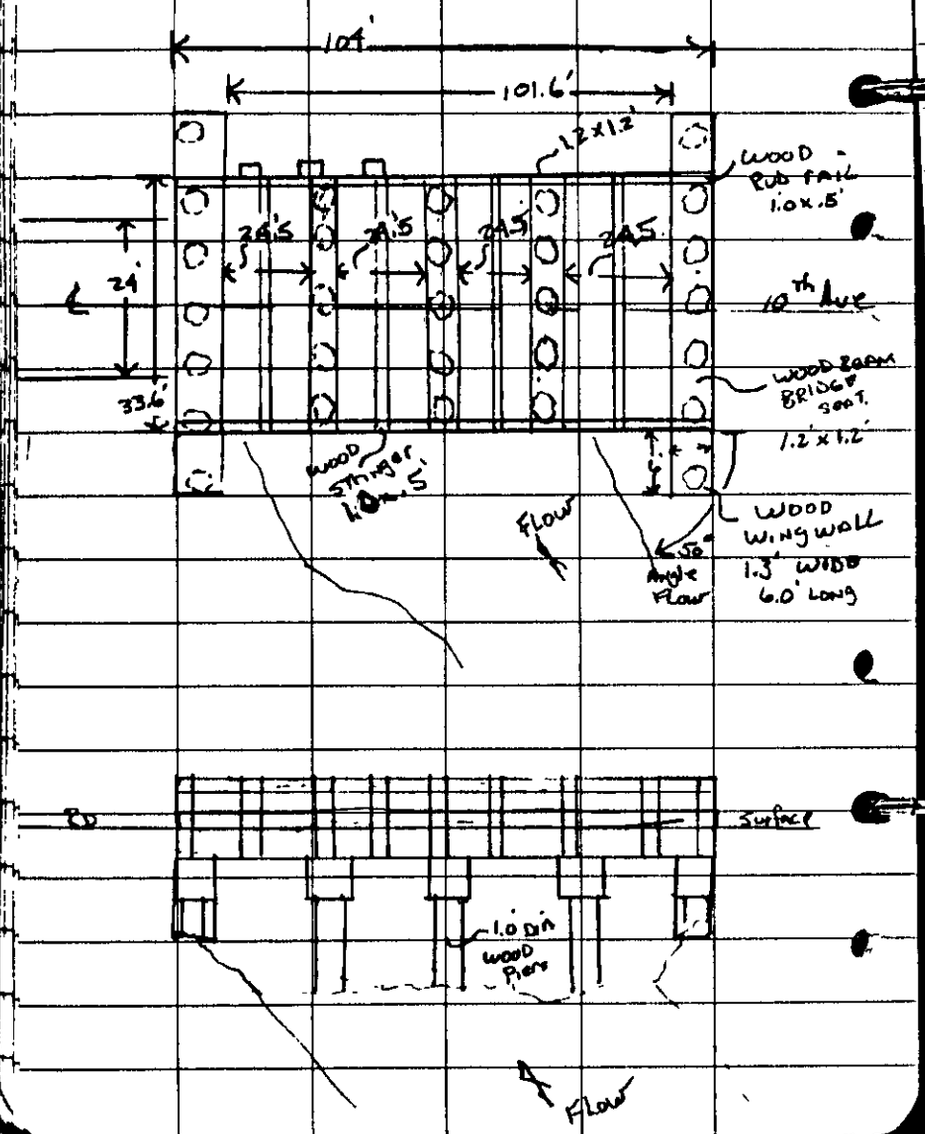
T	HI	—	ELEV							
	961.20									
DIST	ROD	ELEV				DESC				
89'	1.2	948.0		SOUND		SNDG		RCK		
92'	12.0	949.2				W/S / S/L				
99'	12.1	949.1				TOE OF SNK				
101.6'	10.2	951.0				TOP OF SNK & BTM RT HOOT				
101.6'	6.4	954.8				" OF RT HOOT @ FACE				
101.6	6.4	954.8				L/S RT				
0'	6.4	954.8				L/S LT				
TBM C	✓	5.98	955.2							

SKETCH

@ SECTION 82

WOOD BRIDGE ON 10TH

AVE over CHIPPEWA RIVER



TOTAL Lenght = 104

Lenght = 101.6

BRIDGE WIDTH = 33.6' (OUTSIDE) (31.6' INSIDE)

Road " = 24'

Guard Rail post = 1.0' x .5' x 3.5' high

WOOD Piers 1.0 DIA = 5 under ea. of 3 center cross Beams & 6 under WOOD Beam Headwall & wingwalls

FLOW Angle = 50°

NO SKEW

12C

VALLEY SECTION
NO. 3V
100' D/S of WOOD BRIDGE
ON 10TH AVE & CHIPPEWA

	+	HI	−	ELEV.
TBM C				955.22
	7.21	962.43 ✓		

DIST	Rod	ELEV.		Desc
0'	6.5	955.9 ✓		CE TOP LT BNK
25' LT	4.8	957.6 ✓		CE
50' LT	4.8	957.6 ✓		
75' LT	5.0	957.4 ✓		
100' LT	4.5	957.9 ✓		
125' LT	4.3	958.1 ✓		
150' LT	6.0	956.4 ✓		
175' LT	7.0	955.4 ✓		
200' LT	7.7	954.7 ✓		
225' LT	7.6	954.8 ✓		
250' LT	7.7	954.7 ✓		SAND CONT FLAT NEXT 100' ± THEN RISES 15/20' NEXT 300' ±
13' RT	11.3	951.1 ✓		TOE LT BNK
25' RT	13.2	949.2		W/S S/L
50' RT	0.7	948.5 ✓	SNDG	SNDG Rock & Gravel
60' RT	0.8	948.4 ✓		

JUNE 22, 94 Pg 126

Refer 96 Levels

112 L
122 TB

+	HI	−	ELEV.
	962.43		
DIST	ROD	ELEV.	
70' RT	0.3	948.9	
80' RT	0.5	948.7	
90' RT	0.2	949.0	
100' RT	0.3	948.9	
110' RT	0.6	948.6	
112' RT	13.2	949.2	
122' RT	8.4	954.0	
150' RT	8.4	954.0	
175 RT	8.6	953.8	
200' RT	8.0	954.4	
225' RT	8.2	954.2	
250' RT	7.6	954.8	
300' RT	6.9	955.5	
325' RT	6.9	955.5	
350' RT	6.9	955.5	
TBM C		7.21	955.2

DESC

SNDG

SNDG

Rock & Gravel

SNDG

W/S S/L

TOP RT BNK

OF WOODED AREA BRUSH

LAND CONT FLAT NEXT 100'

VALLEY SECTION

NO. 4V

945' E. of 10th Ave

FROM TBM E.

TBM Hub1	+	Hi	-	ELEV.
	3.0	960.9		957.9 ✓
	DIST	Rod	ELEV.	
	0'R	5.8	955.1	✓
	25'R	4.6	956.3	✓
	50'R	4.8	956.1	✓
	100'R	4.1	956.8	✓
	150'R	3.4	957.5	✓
	200'R	3.1	957.8	✓
	250'R	2.7	958.2	✓
	34' LT	13.6	947.3	✓
	35' LT	15.8	945.1	✓
	45' LT	1.0	949.1	✓
	55' LT	1.5	943.6	✓
	65' LT	1.1	949.0	✓
	75' LT	0.8	949.3	✓
	78' LT	15.8	945.1	✓
	79' LT	15.5	945.4	✓

SNDC

VG

JUNE 22, 99 Pg-15C

Pg-23L Level

Desc

Top Rt BNK

G.E.

LAND CONT FLAT NLT 1000' ±

TOE RT BNK / TOP SEC. BNK

W/S S/L

SNDC

ROCK

W/S S/L

TOE LT BNK

+	HI	-	ELEV.	DESC
	960.9 ✓			
Dist	Rod	ELEV		
79' LT	14.2	946.7	✓	TOP LT BNK
100' LT	13.8	947.1	✓	GE
125' LT	13.0	947.9	✓	
150' LT	13.0	947.9	✓	
175' LT	12.8	948.1	✓	
200' LT	12.5	948.4	✓	
225' LT	12.8	948.1	✓	
250' LT	11.3	949.6	✓	
275' LT	11.0	949.9	✓	
300' LT	11.5	949.4	✓	LAND CONT. FLAT NEXT 100'±
TBM Hub 1	3.0	957.9	✓	(Thick Brush.)

JC

VALLEY SECTION

NO 5V.

770' E. of 10th AVE

FROM TBM E.

	+	HI	−	ELEV.
TBM HUB 2				959.8 ✓
		958.3		

DIST	Rod	ELEV.		
0'		953.6		
25' RT		952.0		
166' RT		959.5		
200' RT		959.3		
225' RT		958.8		
250' RT		959.0		
10' LT		943.4		(SH 12.0)
20'	1.7	941.7	✓	SNDG
30'	1.8	941.8	✓	
40'	0.7	942.7	✓	
46' LT		943.4		
56' LT		945.8		
75' LT		945.9		
			UG	

JUNE 22,94 pg-18C

Pg-25L Levels

IH = 5.3

SH = 5.0

VD = +6.8

959.8
− 6.8
953.0 ✓
+ 5.3
HI 958.3 ✓

Desc	
Top RT BNK	
GE Toe Slope	
Top Slope	
GE	
GE	
GE LAND CONT FLAT Soil	
Toe RT BNK { W/S SL	
SNDG	Rock
W/S S/L	
Top LT BNK	
GE Thick Brush	

	+	HI	−	ELEV.						
		958.3								
	DIST	Rod	ELEV.					Desc		
	100' LT		946.0				GE			
	125' LT		946.0							
	150' LT		945.9							
	175' LT		946.5							
	200' LT		946.5							
	225' LT		945.8							
	250' LT		946.4							
	275' LT		946.7				LAND CONT FLAT (Thick Brush)			
TBm Hub 2	✓		959.8							

CROSS SECTION
WOOD BRIDGE @
19 mi. Rd & Chippewa
NO. 6B

	+	HI	-	ELEV.
TBM C				999.02
	7.24	956.26		
	DIST	Rod	ELEV.	
	0'	5.25	950.97	✓
	50'R	5.25	951.01	✓
	100'R	5.51	950.75	✓
	150'R	5.22	951.04	✓
	200'R	4.92	951.34	✓
	250'R	4.80	951.46	✓
	76 'L	5.31	950.95	✓
	100' L	5.08	951.18	✓
	150' L	4.71	951.55	✓
	200 L	4.30	951.96	✓
	250' L	3.26	952.40	✓
	300 ~	3.50	952.76	✓
	325' L	3.36	952.90	✓

✓ ✓ KLD

JUNE 23, 99 Pg-21C

Pg- 12L Levels

DESC.

TOP ℄ OF 19 MI RD @ FACE RT ABOUT

TOP ℄ OF 19 MI LD

LD CONT FLAT 0.2 MI

TOP ℄ 19 MI RD @ FACE LT ABOUT.

TOP ℄ RD

RD CON'T FLAT NEXT 100± WILL

VIEW 10'±

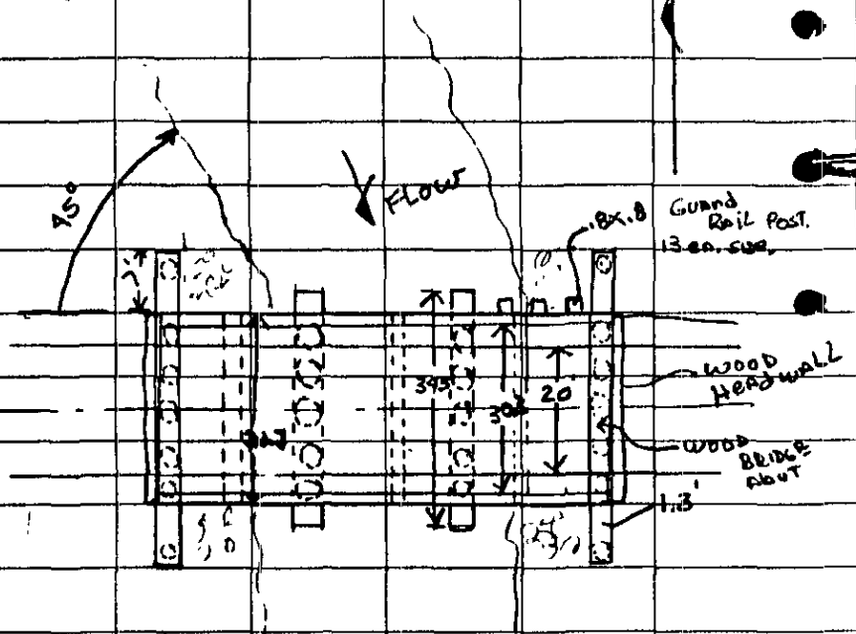
	+	Hi	−	ELEV		
		956.26	✓			
	DIST	ROD	ELEV			
	0'	6.6	949.7	✓		Top RT FOOT SURFACE
	0'	12.2	944.1	✓		BTM RT " " "
	11' L	13.8	942.5	✓		W/S S/L
	21' L	0.7	941.8	✓	ENDG	CHILG ROCK
	25.5 L	1.3	941.2	✓		RT EDGE RT PIER
	26.5 L	1.6	940.9	✓		LT " RT PIER
	36' L	3.4	939.1	✓		
	46' L	2.1	940.4	✓		
	52' L	1.6	940.9	✓		RT EDGE LT PIER
	53' L	1.5	941.0	✓		LT " LT PIER
	57' L	13.8	942.5	✓		W/S S/L
	76' L	9.6	996.7	✓		BTM LT FOOT SURFACE
	76' L	6.6	949.7	✓		TOP " " " "
TBM C	✓	7.24	949.02	✓		
				VG		

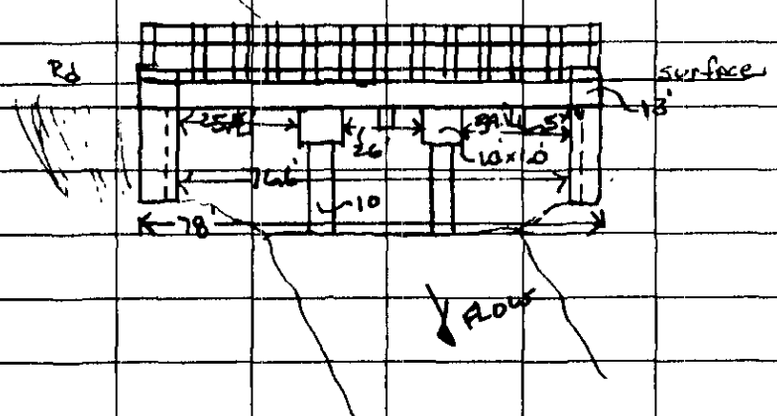
SKETCH

@ SECTION B6

WOOD BRIDGE ON 19 Mi. Rd

over CHIPPEWA RIVER





WOOD PILLARS 1.0' DIA

WOOD SUPPORT BEAMS = 1.0' x 1.0' sq.

WOOD STRINGERS = 1.0' x .5' sq.

WIDTH of BRIDGE = 31.7

WIDTH of ROAD = 20'

LENTH = 76.6

TOTAL LENGHT = 78'

FLOW ANGLE = 45°

NO SKEW

VALLEY SECTION

50' D/S OF 6B 19 mi RD

No. 7V

JUNE 23, 94 pg. 26C

Pg - 12 L Levels

	+	HI	-	ELEV	DESC
TBM C				949.02	
	7.24	956.26			
	DIST	ROD	ELEV		
	0'	10.7	945.6 ✓		Top Lt Bnk & Toe of Slope
	30'L	6.3	950.0 ✓		Top of Slope
	50'L	4.5	951.8 ✓		GC
	75'L	2.6	953.7 ✓		
	100'L	1.9	954.4 ✓		
	125'L	2.0	954.3 ✓		
	150'L	1.9	954.4 ✓		
	175'L	1.8	954.5 ✓		
	200'L	2.0	954.3 ✓		
	225'L	1.8	954.5 ✓		
	250'L	2.0	954.3 ✓		
TBM C	✓	7.24	949.0 ✓		LAND CONT FLAT
TBM C				949.02 ✓	
	7.04	956.06			
	10'R	13.9		942.2 ✓	W/S S/L

	+	HI	−	ELEV							
		w/s 941.6									
	DIST	ROD	ELEV					DESC			
	20'R	1.1	941.1 ✓		SNDG		SNDG	RCK			
	30'R	1.4	940.8 ✓								
	40'R	1.3	940.9 ✓								
	50'R	1.0	941.2 ✓								
	60'R	0.6	941.6 ✓		SNDG						
	62'R	13.9	942.2 ✓					W/S S/L			
	69'R	10.2	945.9 ✓					TOP RT BNK			
	100'R	9.8	946.3 ✓					GE			
	125'R	9.8	946.3 ✓								
	150'R	9.9	946.2 ✓								
	175'R	9.9	946.2 ✓								
	200'R	10.1	946.0 ✓								
	225'R	9.5	946.6 ✓								
	250.R	8.7	947.4 ✓								
7.1	275'R	8.2	947.9 ✓								
	300'R	7.1	949.0 ✓					LAND CONT FLAT Then Rises			
TBM	✓	7.04	949.0 ✓					TO OXBOW RD			
					✓ ✓ Key						

VALLEY SECTION

NO. 8 V

≈ 0.4 mi. from

9 mi. Rd.

	+	HI	−	ELEV.
TBM H				949.08
	3.79	952.87		
	Dist	Rod	ELEV.	
	0'	7.5	945.4	✓
	0'	11.1	941.8	✓
	5' LT	12.0	940.9	✓
	15' LT	2.7	938.2	✓
	25' LT	2.6	938.3	✓
	35' LT	2.2	938.7	✓
	45' LT	1.5	939.4	✓
	50' LT	12.0	940.9	✓
	54' LT	9.7	943.2	✓
	75' LT	7.5	945.4	✓
	100' L	7.3	945.6	✓
	125' L	7.4	945.5	✓
	150' L	7.6	945.3	✓
	175' L	7.4	945.5	✓
	200' L	7.4	945.5	✓
	225	7.5	945.5	✓
				✓

T. Roznowski
R. Drake
V. Goeddeke

Cloudy 48°

JUNE 23, 97 Pg. 29C

Pg - 16L Levels

Desc

Top RT BNK & Toe Slope

Toe RT BNK

W/S S/L

SNDG

Rock

W/S S/L

Top LT BNK

GE

+	Hi	−	ELEV
DIST	ROD	ELEV	
250'L	7.8	945.1	✓
275'L	7.7	945.2	✓
7'R	5.3	947.6	✓
25'R	5.3	947.6	✓
50'R	4.8	948.1	✓
75'R	4.4	948.5	✓
~~TP~~ 100R	2.8	950.1	
	13.4	HI 963.5	
108R	12.2	951.3	✓
124'R	6.1	957.4	✓
152'R	5.6	957.9	✓
169'R	4.4	959.1	✓
TP-1 @ 100'R	✓	13.4	950.1 ✓

DESC
GE
GE
LAND CON'T FLAT
Top of slope
G.E
"
"
"
Top of slope
Top " " Lt EDGE OXBOW DR.
Rt EDGE OXBOW DR
Top of slope
Top of Bank is Approx 20'± 15'±
HIGHER.

VALLEY SECTION

No. 9V

OXBOW DR.

T.S.

T. ROZNOWSKI
K. DRAKE
V. GOGGEICKE
JUNE 23, 94

pg. 32C

	+	Hi	-	ELEV			
TBM I				947.08			
						IH = 5.3	REFER TO pg. 16L LEVELS
						SH = 5.0	
						V.D. = +0.8	
	DIST	ROD	ELEV				DESC
	0'		942.7				Top Rt BANK
	6'R		940.0				WS/SL
	16'L	1.2	938.8	✓	SNDG	SNDG	LCK
	26'L	2.1	937.9	✓			
	36'L	1.3	938.7	✓			
	43'L		940.0				WS/SL
	47'L		941.7				Top Lt BANK
	72'L		942.9				GE
	97'L		943.4				
	122'L		945.9				TOE OF SLOPE
	150'L		953.7				Top " "
	175'L		954.1				G.E
	200'L		954.3				
	250'L		954.7				
	300'L		955.0				
							LAND CON'T FLAT

947.11
- 0.8
946.3
+ 5.3
951.6

	+	Ht	-	ELEV
	DIST	ROD	ELEV	
	11'R		942.8	
	20'R		945.4	
	50'R		947.1	
	75'R		947.4	
	100'R		946.9	
	125'R		946.7	
	150'R		947.6	
	175'R		948.4	
	200'R		948.5	
	225.R		948.6	
	250'R		949.3	
TBM I	✓		947.1	

DESC

Toe of Slope

Top " "

℄

LAND Cont'd FLAT NEXT 300'±

VALLEY SECTION

NO. 10V

OXBOW DR

	+	HI	−	ELEV.
TBM L				941.69

Dist	Rod	ELEV.	
0'		940.1	
6'L		937.1	
16'L	0.6	936.5	✓
26'L	1.1	936.0	✓
36'L	1.3	935.8	✓
46'L	1.2	935.9	✓
56'L	0.4	936.7	✓
57'L		937.1	
65'L		937.7	
80'L		940.0	
100'L		940.5	
125'L		940.6	
150'L		941.5	
175'L		941.6	

VG 1/2

JUNE 29,94 Pg-35C

Pg-27L Levels

IH = 5.3

SH = 5.0

VD = +0.8

941.7
+0.8
940.9
+5.3
946.2

	Desc	
Top of Rt BNK		
w/s s/L		
SNDG		RCK
w/s s/L		
Toe Lt BNK		
Top " "		
GE		

+	HI	-	ELEV.	Desc
DIST	Rod	ELEV.		
185' L		943.8		TOE OF BANK
200' L		952.1		top
225' L		953.2		G.C
250' L		954.1		
				RD CONT FLAT NEXT 200' ±
50' RT		940.7		GE
100' RT		940.7		
150' RT		941.2		
200' RT		941.6		
250' RT		942.3		LAND CONT FLAT 75' Then Rises
TBM L		941.7		10' ± Then is FLAT.

Valley Section
No. 11 V

T. ROZNOWSKI
K. DRAKE
V. GOEDDEKE
JONES 2424

Pg-38C

	+	HI	−	ELEV.
TBM K				959.52

REFER TO pg. 20L LEVELS

IH = 5.2

SH = 5.0

VD E + 16.1

DIST	Rod	ELEV.	
0		928.1	
10' L		934.2	
15' L	1.1	933.1	✓
20' L	1.5	932.7	✓
25' L	1.7	932.5	✓
30' L	1.7	932.5	✓
35 L	1.1	933.1	✓
25' L		934.2	
46' L		936.7	
55' L		938.0	
84 L		952.0	
100' L		953.1	
150' L		953.5	
200'		954.1	

DESC

Top Rt BNK

W/S S/L

SDG RCK

W/S S/L & TOE LT BNK

Top LT BANK

TOE OF SLOPE

Top " "

OE

VC

959.5
- 16.1
943.4
+ 5.2
948.6

+	HI	-	ELEV

DIST	ROD	ELEV	DESC
250-	~~954.3~~	954.9	GE
300'L	~~955.1~~	955.1	
			LAND RISES 4' ± NEXT 200' ± THEN STARTS TO DECLINE
36'R		938.6	TOP OF SLOPE
69'R		936.7	TOE & TOC
85'R		940.2	TOP OF SLOPE
123'R		943.6	TOE ON SLOPE
179'R		949.6	TOE OF "
193'R		952.6	TOP " "
250'R		954.0	GE LAND CONT FLAT

TPM K ✓

VALLEY SECTION
NO 1 (C.S.BP)

200' D/S FROM ISABELLA &
MECOSTA CO LINE

	+	HI	−	ELEV
TBM Hub 1				937.2
	4.0	941.2		
	DIST	Rod	ELEV.	
	0'	4.2	937.0	
	20' RT	4.4	936.8	
TBM Hub 1	CK	4.0	937.2	
TBM 13.B		HI		953.84
	1.22	955.06		
	60' RT	2.6	952.5 ✓	
	90' RT	3.4	951.7	
	110' RT	8.1	947.0	
	135' RT	3.7	951.4	
	160' RT	2.8	952.3	
	185' RT	1.6	953.5	
	210' RT	1.6	953.5	
	235' RT	1.2	953.9	
TBM 13B	CK	1.25	953.81	

W T. Rozniowski
T M. Clint
P K. Drake

Sunny 50°
April 13, 93 Pg-3

Hub set @ Top RT BNK @ CS NO. 1 (Pg-2 VALLEY SECTIONS Book 4)

Desc.
Top RT BNK (Secondary)
Toe primary BNK

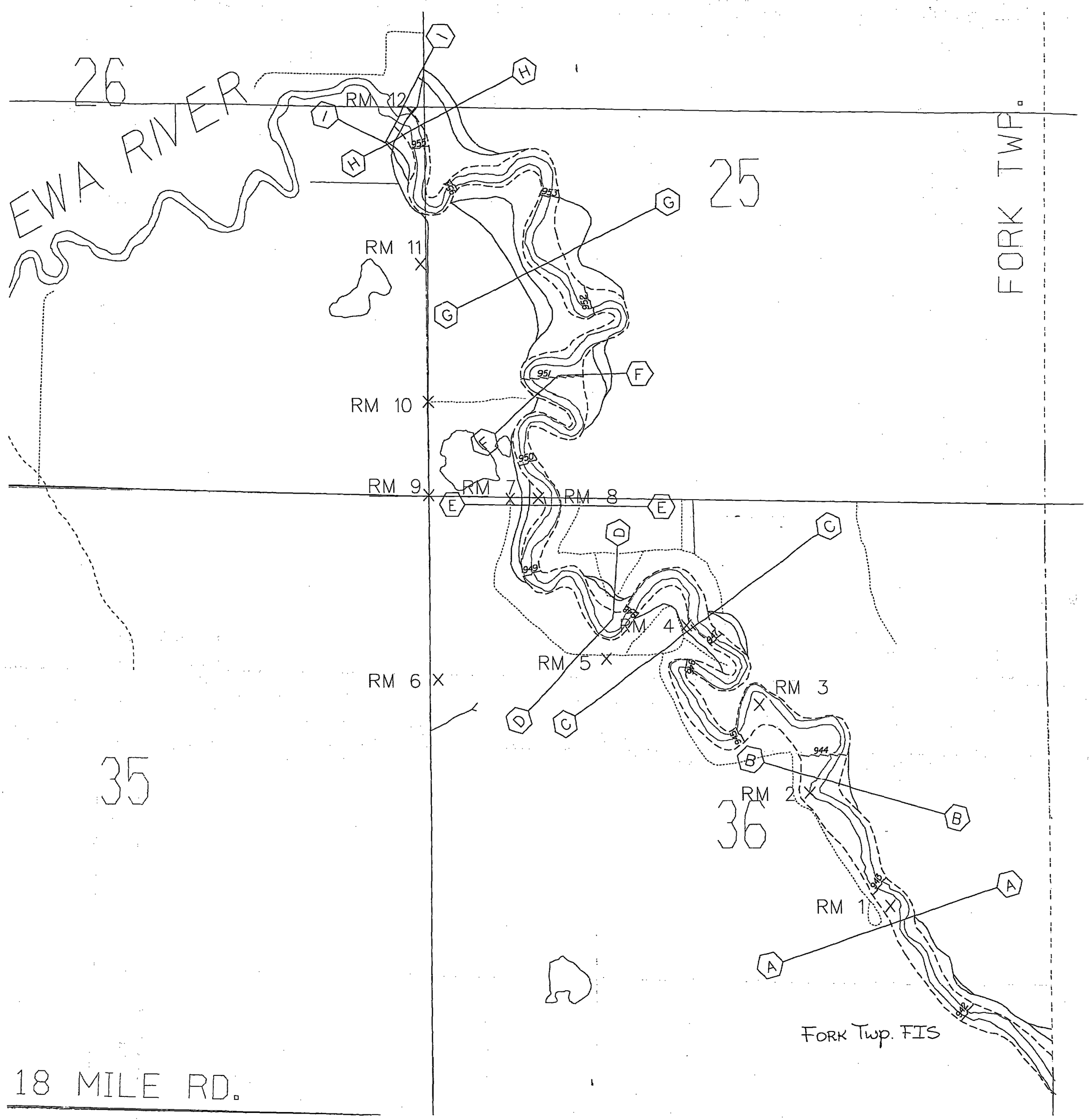
CHISELEP + N. END CMP N SIDE VERNON Rd @ COSTA BELLA Rd. (Pg-32 Levels Book 1)

Top Prim BNK
Top slope
Toe slope
Top slope
GE

LAND CONT SLIGHT RISE NEXT 500' ±

	+	HI	−	ELEV.						
TBM Hub 1				937.2		HUB SET @ RT BNK CS No. 1 (Refer To pg-2)				
	4.1	941.3								
	DIST	Rod	ELEV.			Desc				
	1' LT	5.7	935.6			W/S S/L				
	1' LT	0.8	939.8	SND6		SNDG BTM RT BNK				
	10' LT	3.3	932.3							
	20' LT	4.1	931.5						SAND BTM	
	30' LT	4.5	931.1							
	40' LT	4.5	931.1							
	50' LT	2.6	933.0							
	60' LT	0.8	934.8	SND6						
	64' LT	5.7	935.6			W/S S/L				
	70' LT	5.6	935.7			TOP BANK				
	95' LT	5.6	935.7			6 E				
	120' LT	3.9	937.4			"			(BRUSH)	
	145' LT	2.9	938.4			"				
	170' LT	4.2	937.1			"				
	195' LT	5.0	936.3			"				
	220' LT	5.4	935.9			"				

	+	HI	—	ELEV					
		941.3							
	DIST	ROD	ELEV			DESC.			
	250' LT	5.1	936.2			GE		Brush	
	275' LT	5.3	936.0						
	300' LT	5.4	935.9						
TBM Hub 1	CK	4.1	937.2			LAND CONT. FLAT			


26
EWA RIVER
RM 12
955
953
25
FORK TWP.
RM 11
952
951
RM 10
950
RM 9
RM 7
RM 8
949
RM 4
948
RM 5
947
RM 6
946
RM 3
944
RM 2
36
RM 1
943
942
35
18 MILE RD.
A
B
C
D
E
F
G
H
I
Fork Twp. FIS