FOR DAVID RAMIREZ

ENGINEERING (Y&G)

Job 8152 Sub # 2 rec'd 7/10/03

HTE 02-5655

CONDITIONAL LETTER OF MAP REVISION "CLOMR" FOR BULLARD WASH CHANNEL WITHIN GOODYEAR PLANNED REGIONAL CENTER

Stantec

CONDITIONAL LETTER OF MAP REVISION "CLOMR" FOR BULLARD WASH CHANNEL WITHIN GOODYEAR PLANNED REGIONAL CENTER

Prepared for:

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Registered Professional Engineer (Civil)
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Date Signed 5-6-03
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Prepared by:

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May 5, 2003
81500260

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Date S
ARIZON

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Registered Professional Engineer (Civil)
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1.0 Scope

This report has been prepared in support of a conditional Letter of Map Revision "CLOMR" along Bullard Wash in conjunction with the improvements of parcels 9,10, and 11 of the proposed master planned development known as Goodyear Planned Regional Center. This report was prepared in accordance with the City of Goodyear Engineering Design Standard and Policies Manual (Ref. 2) and supplemented by the Flood Control District of Maricopa County (FCDMC) Drainage Manuals (Ref. 3 & 4).

The completed applicable FEMA forms are included in Appendix B.

2.0 Location

The Goodyear Planned Regional Center is located north of McDowell Road, south of Thomas Road, east of Pebble Creek Parkway and west of Bullard Avenue in the City of Goodyear, Arizona (Figure 1). Parcels 9, 10 and 11 are located on the north side of the project. The Roosevelt Irrigation District "RID" Canal runs on the south side of Thomas Road as shown on Figure 1.

The project site is located within section 32, Township 2 North, Range 1 West, Gila and Salt River Base and Meridian, Maricopa County, Arizona.

3.0 Flood Insurance Rate Map

The Maricopa County, Arizona and Incorporated Area Flood Insurance Rate Map (FIRM), map No.04013C2060 F, panel 2060 of 4350, dated July 19, 2001, shows that the project site is located within flood hazard zone AE and X (shaded), (Figure 2).

Zone AE is defined by FEMA as:

Special flood hazard areas inundated by 100-yr flood, base flood elevations determined.

Zone X (shaded) is defined by FEMA as:

Areas of 500-year flood; areas of 100-year flood with average depth of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 100-year flood.

Further discussion on a proposed revision to the current effective flood limits is included in Section 6 of this report.

4.0 Description and Proposed Development

The Goodyear Planned Regional Center site, approximately 605 gross acres is currently composed of agricultural fields (Figure 3) with a north to south slope of approximately 0.3%. The RID canal, an irrigation structure, crosses the project site as shown on Figure 1. Bullard Wash, a natural drainage way defined by a wide depression, crosses the project site in a southerly direction. A golf course community development known as Pebble Creek is located north of the project side, on the north side of Thomas Road.

Parcel 9, 10 and 11 of the project site are proposed to be developed into a single-family residential development. It is proposed in conjunction with the development of these parcels to channelize the segment of Bullard Wash within the parcels boundaries. The channelization process will involve the introduction of a drop structure at the inlet of the proposed channel, a box culvert under Virginia Avenue, and interim downstream grading within the future phases of this development. Further discussion on the channel improvements, are included in Section 6 of this report.

5.0 Offsite Drainage and Design Flow

The project site falls within the watershed boundary of a regional master drainage study known as Loop 303 Corridor/ White Tanks Area Master Drainage Plan Update, hereafter ADMP, which currently is being conducted by the engineering consultants URS for the Flood Control District of Maricopa County (Ref. 5). Bullard Wash runs across the project site in a north to south direction. The City of Goodyear, in coordination with the FCDMC, requested that the design off-site flow for the proposed channel improvements along Bullard Wash should be based on the HEC-1 analysis of the existing conditions scenario of the ADMP, in combination of providing a minimum of 1.0 feet of freeboard in the channel, and that the most current version of this model, named L303M6K.DAT , should be used. According to this HEC-1 model, the 100-year peak flow along Bullard Wash at Thomas Road, concentration point CP267, is 2557 cfs. No other offsite flows are anticipated to impact the project site.

Excerpts from the ADMP in addition to electronic copies of the input and output files of the HEC-1 model L303M6k.DAT, as obtained from the FCDMC, are included in Appendix A. Also included in Appendix A, are correspondence letters confirming the selected design flow along Bullard Wash.

6.0 Bullard Wash Channel

6.1 PROPOSED CHANNEL ELEMENTS

It is proposed, in conjunction with the proposed improvement for parcels 10 and 11 of the project site, to channelize the segment of the Bullard Wash from the Roosevelt Irrigation District "IRD" Canal, on the south side of Thomas Road, to Virginia Avenue, the downstream limits of the subject parcels. The proposed channel section will be grass-lined.

The alignment of the proposed channel and its anticipated future extension downstream to McDowell Road is shown on Figure 4. This proposed alignment deviates from the existing low flow line of Bullard Wash. Additionally, the proposed flow line of the proposed channel, within parcels 10 and 11, is lower than the existing

low flow line of Bullard Wash. It is proposed in the interim condition, until future downstream channel extension within the future phases of the project site, to grade along the downstream alignment of the proposed channel to daylight back into the existing flow line of Bullard Wash (Figure 4).

A drop structure is proposed to be constructed from the existing overchute at the RID canal to the upstream end of the improved channel (Figure 5). The configuration and the hydraulic calculations for the drop structure are included in Appendix A. Details of the structure are shown on Figure 5A.

A 9-cell box culvert (7-10ft x 6ft, 1-10ft x 8ft and 1-10ft x 10ft) is proposed at the Bullard Wash crossing with Virginia Avenue (Figure 5). The 8ft and 10ft-high cells will be extended below the flow line of the channel. These two cells will be used for a cart path, pedestrian and horse trail purposes. A pump will be used to drain the depressed portion of the culverts. The depressed portions of the deeper culverts will be ignored in the hydraulic modeling.

6.2 CLOMR / LOMR APPLICATION

It is proposed, as a result of the proposed channel improvements along Bullard Wash, to revise the current effective floodplain and floodway boundaries, through a Conditional Letter of Map Revision "CLOMR" and eventually, based on as-built conditions, a Letter of Map Revision "LOMR" application to FEMA, along the improved section of the wash and along the downstream interim grading. The entire flow will be contained in the improved section of the channel and the floodplain and floodway boundaries will be set at its banks. It is anticipated that as the future downstream channel extension takes place, the downstream floodplain and floodway limits will be revised again through another CLOMR and LOMR.

6.3 BACKGROUND ON EXISTING FLOOD LIMITS

Figure 2 shows the current effective floodplain and floodway limits along Bullard Wash, in the vicinity of the project site. Our research indicates that the project site fall within the limits of two different LOMR studies. The immediate portion downstream of Section L (Figure 2), Section 6.320 (Figure 7), was based on a LOMR study (FEMA case number 00-09-975P) prepared by J.E. Fuller in the year 2000. Figure 7 is a copy of one of the base maps used in the J.E. Fuller Study. The immediate portion upstream of Section L (Section 6.320) was based on a LOMR study (FEMA case number 95-09-266P) prepared by WLB Group in 1995. It appears

that the WLB work was a joint effort, or in coordination, with B & R Engineering, the consultants for the Avondale Drain improvements, upstream of the RID canal. Figures 8A & 8B are copies of the base maps used in this joint study. As noted on Figure 8A, the flood limits between sections 6.320 and 6.631 represent an extension to the limits established in the original Flood Insurance study that was prepared by WLB Group and shown on the corresponding FIRM dated 1995.

Due to the ever-changing conditions and implemented improvements within the watershed of the ADMP, those detailed studies were based on design flows that are different from the prevailing flows at this time. As discussed earlier in this section, the proposed channel improvements along Bullard Wash in this project will be based on a 100-year peak flow of 2,557 cfs.

6.4 HYDRAULICS AND REVISED FLOOD LIMITS

The computer program HEC-RAS, version 2.2, was used in the hydraulic analysis and in estimating the revised flood limits along the proposed channel. The hydraulic profile along Bullard Wash is essentially sub-critical. To tie into the current effective floodplain and floodway limits downstream and to model the interim grading along the alignment of the proposed channel, a portion of the HEC-2 model "Bull.Dat" from the J.E. Fuller LOMR study, section 5.727 to section 6.320, was imported into the HEC-RAS model established for the proposed channel. A printout and an electronic copy of this HEC-2 model are included in Appendix A. The geometry of these sections was modified as needed to incorporate the interim grading along the alignment of the future channel extension downstream (Figure 5 & 6). Additional cross-sections to the HEC-RAS model were added upstream, to the downstream end of the proposed drop structure, to incorporate the improved segment of the channel along with a proposed Box Culvert under Virginia Avenue. The new cross sections were based on the recent topography conducted for the project site. The survey datum of the J.E. Fuller LOMR study was checked against the datum of the recent survey for the project site and was found to be the same.

A manning number of 0.03 was used for the proposed channel, which will be grass-lined, and for the interim grading downstream. A value of 0.035 was used for the overbanks.

The 100-year design peak flow used in the imported portion of the HEC-2 model was 3,400 cfs. As discussed earlier in this Section, the new 100-year design peak flow is 2,557 cfs. Conservatively, the downstream boundary conditions in the HEC-RAS

model for each of the floodplain and floodway profiles were set as known water surface elevations from the LOMR HEC-2 model.

In the process of revising the current effective floodplain and floodway boundaries, a portion of the current effective floodway in the interim downstream reach of the proposed channel, upstream of section 5.9601, was also revised. The new floodway limits were essentially expanded toward the floodplain limits. Discussions with FEMA indicated that since these floodway revisions are contained within the same project boundary and only affected the same property owner, only a letter of acknowledgement to these floodway revisions would be required from that property owner. A signed letter is included in Appendix A.

Consistent with FEMA guidelines and local jurisdictions, the water surface elevations for the revised floodway are not more than 1.0 feet higher than the revised floodplain water surface elevations.

The computer program CHECK-RAS, developed by FEMA, was executed on the HEC-RAS file as recommended by FEMA. A copy of the output is included in Appendix A.

The proposed drop structure at the upstream end of the proposed channel was analyzed separately and incorporated the tail water elevation in the channel. The entire flow will be contained in the drop structure. The revised floodplain and floodway will tie-in upstream at the existing overchute at the RID canal, at Section 6.672 (Figure 8B). Due to the proposed drop structure, the water surface elevation in the improved channel will have no backwater affect upstream of the drop structure.

The revised floodplain and floodway boundaries, along with other related data, such as cross-section locations and peak flows are shown on Figures 5 and 6. An electronic copy of the HEC-RAS model "GYPRCCHN3.PRJ" along with an output printout are included in Appendix A. Additionally, the revised floodplain and floodway boundaries are shown on a copy of the current effective FIRM (Figure 9).

7.0 References

1. Coe & Van Loo Consultants, Inc. "CVL", Master Drainage Report for Goodyear Planned Regional Center, February 28, 2001.

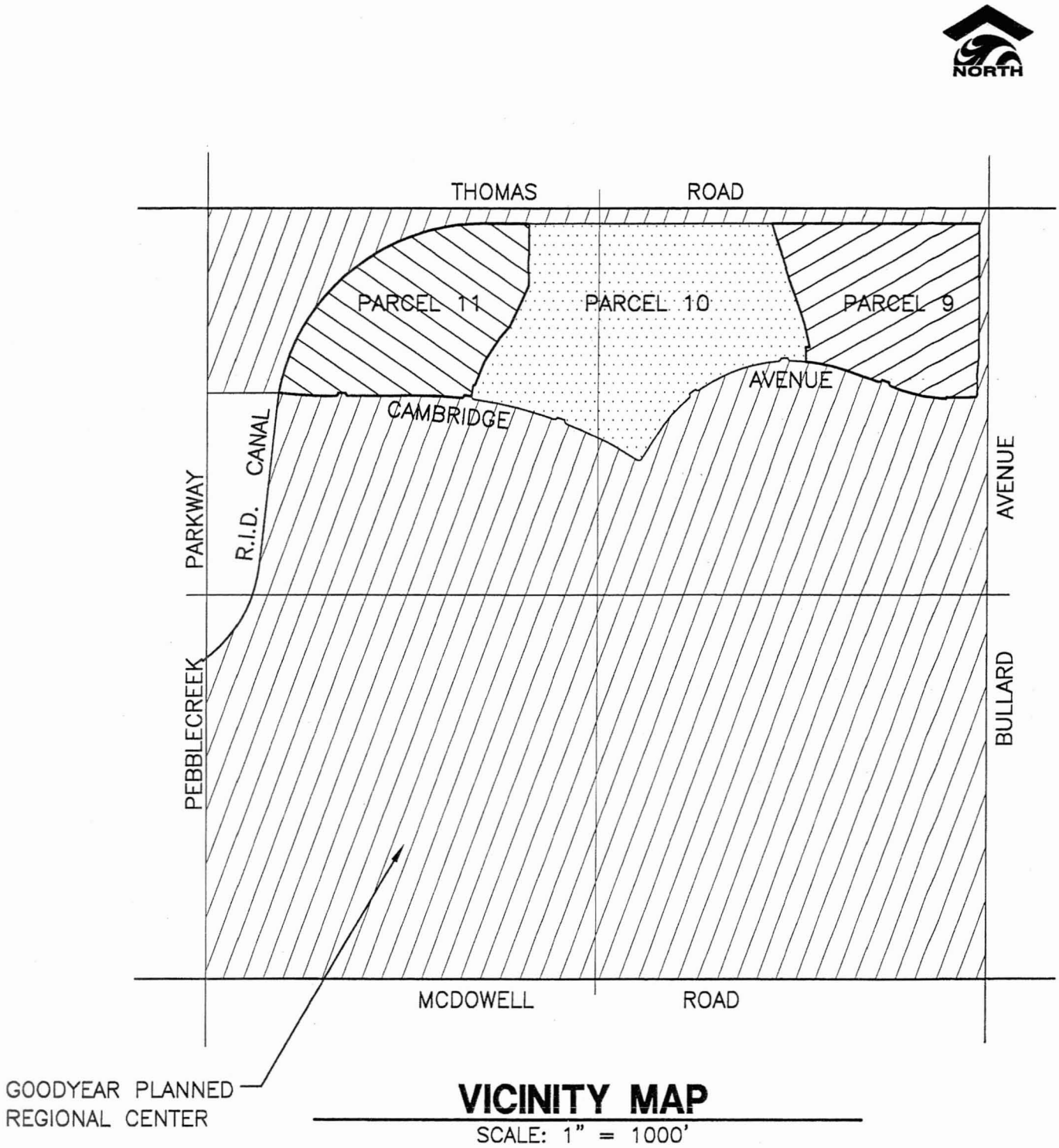
2. City of Goodyear, Engineering Design Standards and Policies Manual, July 22, 1997.

3. Flood Control District of Maricopa County, Drainage Design Manual, Volume I, Hydrology, January 1, 1995.

4. Flood Control District of Maricopa County, Drainage Design Manual, Volume II, Hydraulics, January 28, 1996.

5. URS Greiner Woodward Clyde "URS", Loop 303 Corridor/White Tanks Area Drainage Master Plan Update, prepared for the Flood Control District of Maricopa County, progress date of August, 2002.

Figures



VICINITY MAP

SCALE: 1" = 1000'

Legend

Stantec

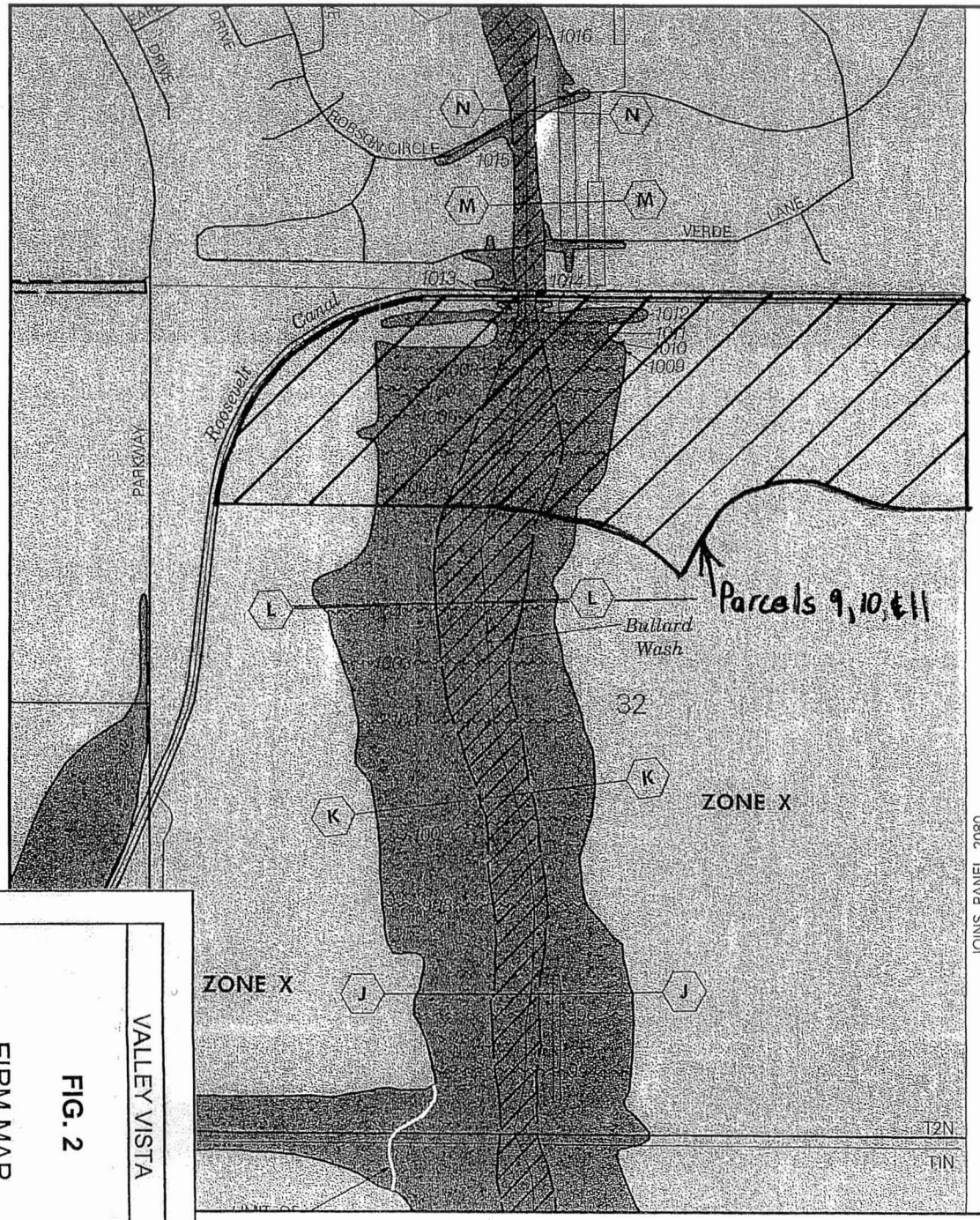
K:\Active\81500260\Drawings\Exhibits\260EX01.dwg

Client/Project
ARIZONA LAND ADVISORS
6710 N. Scottsdale Rd., Suite 10
Scottsdale, AZ 85253

Figure No.
1

Title
VICINITY MAP

11/06/02
81500260



APPROXIMATE SCALE IN FEET

1000 0 1000

NATIONAL FLOOD INSURANCE PROGRAM

FIRM

FLOOD INSURANCE RATE MAP

MARICOPA COUNTY, ARIZONA AND INCORPORATED AREAS

PANEL 2060 OF 4350

(SEE MAP INDEX FOR PANELS NOT PRINTED)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
GOODYEAR, CITY OF	040046	2060	F
LITCHFIELD PARK, CITY OF	040128	2060	F
MARICOPA COUNTY, UNINCORPORATED AREAS	040037	2060	F

MAP NUMBER 04013C2060 F

MAP REVISED: JULY 19, 2001

Federal Emergency Management Agency

This is an official copy of a portion of the above referenced flood map. It was extracted using F-MIT On-Line. This map does not reflect changes or amendments which may have been made subsequent to the date on the title block. For the latest product information about National Flood Insurance Program flood maps check the FEMA Flood Map Store at www.msc.fema.gov

VALLEY VISTA

FIG. 2

FIRM MAP

VALLEY VISTA

FIG. 3

AERIAL PHOTO

Stantec

Project: Project Number:

Notes: Scale:

Page of Page(s)

Computed By: Date: Checked By: Date:

please see Figures 4 → 9

and the digital disks at the

end of this report

Appendix A

Technical Data

Stantec

Project: Goodyear Planned Regional Center Project Number:

Notes: Scale:

Page of Page(s)

Computed By: Date: / / Checked By: Date: / /

HEC-1 & Channel Design

Flow Data

```
1****************************************
 *                                      *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)  *
 *              JUN  1998               *
 *            VERSION 4.1               *
 *                                      *
 *  RUN DATE   27SEP02  TIME  11:49:42  *
 *                                      *
 ****************************************
```

```
****************************************
*                                      *
*   U.S. ARMY CORPS OF ENGINEERS       *
*   HYDROLOGIC ENGINEERING CENTER      *
*          609 SECOND STREET           *
*       DAVIS, CALIFORNIA 95616        *
*          (916) 756-1104              *
*                                      *
****************************************
```

```
X     X  XXXXXXX   XXXXX          X
X     X  X        X     X        XX
X     X  X        X               X
XXXXXXX  XXXX     X        XXXXX  X
X     X  X        X               X
X     X  X        X     X         X
X     X  XXXXXXX   XXXXX         XXX
```

THIS PROGRAM REPLACES ALL PREVIOUS VERSIONS OF HEC-1 KNOWN AS HEC1 (JAN 73), HEC1GS, HEC1DB, AND HEC1KW.

THE DEFINITIONS OF VARIABLES -RTIMP- AND -RTIOR- HAVE CHANGED FROM THOSE USED WITH THE 1973-STYLE INPUT STRUCTURE.
THE DEFINITION OF -AMSKK- ON RM-CARD WAS CHANGED WITH REVISIONS DATED 28 SEP 81. THIS IS THE FORTRAN77 VERSION
NEW OPTIONS: DAMBREAK OUTFLOW SUBMERGENCE , SINGLE EVENT DAMAGE CALCULATION, DSS:WRITE STAGE FREQUENCY,
DSS:READ TIME SERIES AT DESIRED CALCULATION INTERVAL LOSS RATE:GREEN AND AMPT INFILTRATION
KINEMATIC WAVE: NEW FINITE DIFFERENCE ALGORITHM


```
LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

   1          ID        ***THE RESULTS OF THE FLOODPLAIN FLOW SPLIT ANALYSIS
   2          ID        ***AT PERRYVILLE & 83RD AVE BETWEEN GLENDALE AND BETHANY
   3          ID        ***HOME ROAD HAVE BEEN INCORPORATED INTO THIS MODEL
   4          ID
   5          ID         08-02-02
   6          ID         **ADOT BASIN GEOMETRY REPRESENTS MOST RECENT 2' CONTOURS**
   7          ID         WHITE TANKS AREA DRAINAGE MASTER STUDY *UPDATE*
   8          ID         Original MODEL BY THE WLB Group for FCDMC AS PART OF THE WHITE
   9          ID         TANKS/AGUA FRIA ADMS, Date: October 1991
  10          ID
  11          ID         REVISED HYDROLOGY HEC-1 RUN FOR WHITE TANKS ADMS
  12          ID         100-YEAR, 24-HOUR STORM                  original file: WTADMS.24
  13          ID
  14          ID         SOME NOMENCLATURE CHANGES HAVE BEEN MADE PER REQUEST OF
  15          ID         FCDMC - 5-09-01
  16          ID
  17          ID         INCORPORATED CHANGES PROPOSED BY DAVID EVANS AND ASSOCIATES
  18          ID         AT CACTUS AND REEMS IN REGARD TO RANCHO GABRIELA AT THE
  19          ID         DIRECTION OF THE FCDMC 9-20-01
  20          ID
  21          ID         REVISED CONTRIBUTING AREAS ALONG CACTUS WEST OF REEMS AND
  22          ID         IN ADOT WATERSHED AREA
  23          ID
  24          ID
  25          ID
  26          ID                                   REVISED BY URS     DATE: 08-02-02
  27          ID                                                      FILE: L303M6K.DAT
  28          ID
  29          ID        NOTES:
  30          ID        1. THIS HEC-1 MODEL CONTAINS THE FOLLOWING SUPER BASINS: WHITE TANKS 3,
  31          ID           2A, 2B, 2C, 2D, 2E, 2F, 2G, 2H, 2I, 2J, 2K, 2 & 3, 4 THRU 26.
  32          ID        2. REVISED TO REFLECT UPDATED SOILS MAPS AND NEW DEVELOPMENT.
  33          ID        3. AVERAGE XKSAT VALUES FOR EACH SUBBASIN WAS RECEIVED FROM FCDMC
  34          ID           GIS DATA AND THEN ADJUSTED FOR VEGETATION, OR LEFT AS ORIGINALLY IN
  35          ID           THE WLB MODEL.
  36          ID        4. FOR NEW DEVELOPMENTS ONLY 80% OF REPORTED PROVIDED RETENTION
  37          ID           WAS INCLUDED IN THIS MODEL (AS A CONSERVATIVE ESTIMATE). RETENTION
  38          ID           CAPACITIES WERE ESTIMATED BY EEC FOR DEVELOPMENTS WITH NO
  39          ID           DRAINAGE REPORTS.
  40          ID        5. REVISED DRAINAGE BOUNDARIES BASED UPON FIELD INSPECTION OF SUN CITY.
  41          ID           GRAND.  COMBINED SEVERAL BASINS TOGETHER TO MAKE NEW BASINS 114 &115.
  42          ID           ALSO REROUTED SUBBASINS 100A, 101, 102A AND 106 TO THE SOUTH TO 113A.
  43          ID        6. CHANNEL ROUTE ALONG REEMS ROAD UPDATED TO REFLECT NEW CONSTRUCTION.
  44          ID        7. REVISED SCS TYPE II RAINFALL DISTRIBUTION FOR THE 24-HOUR GENERAL
  45          ID           STORM.
  46          ID        8. REVISED RAINFALL DEPTH-AREA REDUCTION FACTORS.
  47          ID        9. PSIF WERE ADJUSTED BASED ON THE VALUES OF XKSAT AND WERE EDITED INTO
  48          ID           THE DATA FILE BY THE FCDMC.
  49          ID       10. AVERAGE XKSAT VALUES FOR SUBBASINS WITH BORROW PITS (WHITE TANKS
  50          ID           AREAS #3 & #4) WERE ESTIMATED BY EEC.
  51          ID
              *DIAGRAM
  52          IT      5                    600
  53          IO      5
  54          IN     15
```

L303M6K.DAT

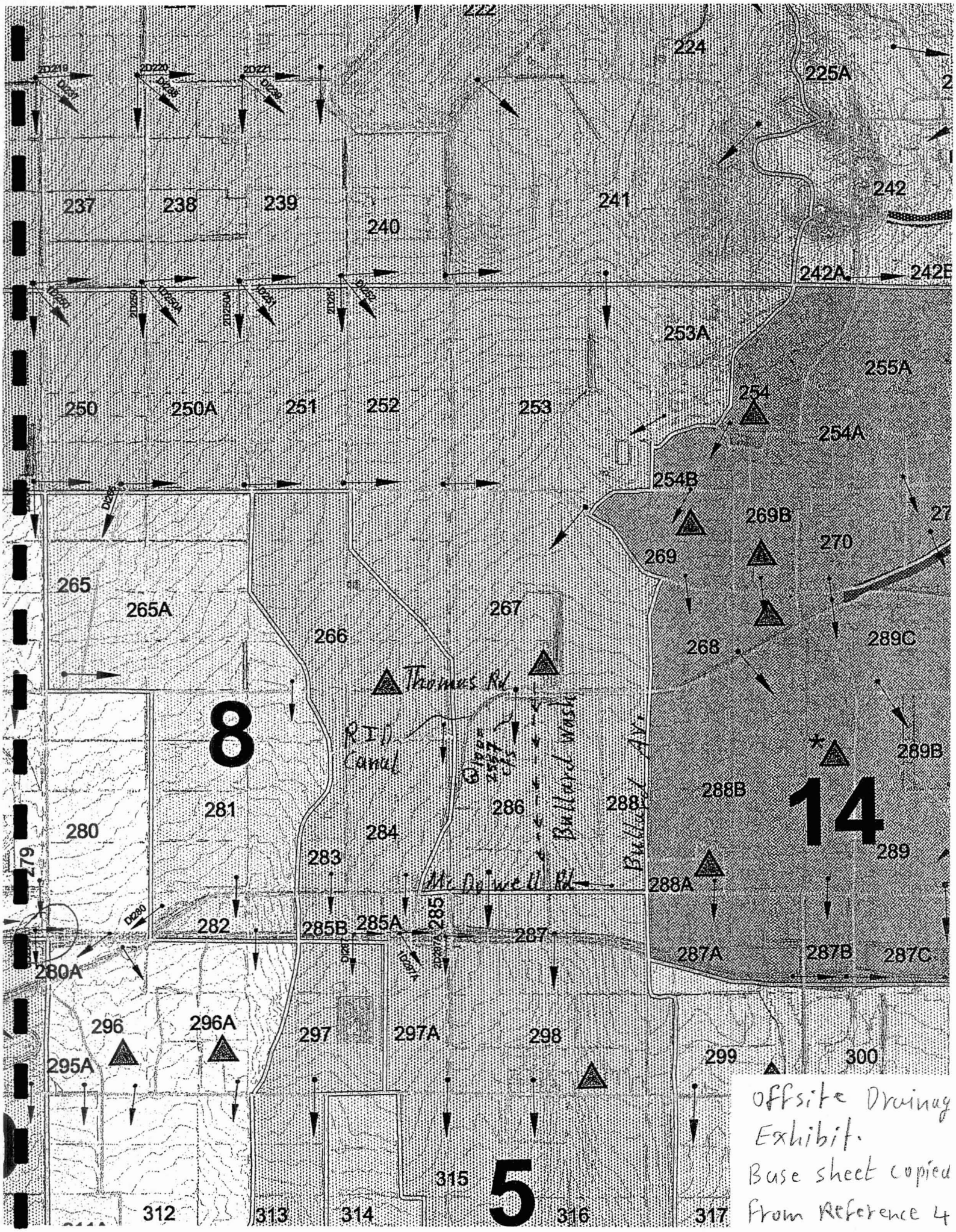
```
LINE          ID.......1.......2.......3.......4.......5.......6.......7.......8.......9......10

 55           JD    4.03    .001
 56           PC    .000    .002    .005    .008    .011    .014    .017    .020    .023    .026
 57           PC    .029    .032    .035    .038    .041    .044    .048    .052    .056    .060
 58           PC    .064    .068    .072    .076    .080    .085    .090    .095    .100    .105
 59           PC    .110    .115    .120    .126    .133    .140    .147    .155    .163    .172
 60           PC    .181    .191    .203    .218    .236    .257    .283    .387    .663    .707
 61           PC    .735    .758    .776    .791    .804    .815    .825    .834    .842    .849
 62           PC    .856    .863    .869    .875    .881    .887    .893    .898    .903    .908
 63           PC    .913    .918    .922    .926    .930    .934    .938    .942    .946    .950
 64           PC    .953    .956    .959    .962    .965    .968    .971    .974    .977    .980
 65           PC    .983    .986    .989    .992    .995    .998    1.00   1.000   1.000   1.000
 66           JD    3.79      10
 67           JD    3.51      50
 68           JD    3.39     100
 69           JD    3.29     200
              * ************************************************************************
              * **************THE FOLLOWING SECTION IS WHITE TANKS 3**********************
              * ************************************************************************
              * ******TRANSMISSION LOSSES REMOVED - 4/25/00 - ERE************************
              * ************************************************************************
              *

 70           KK       1
 71           KM         RUNOFF HYDROGRAPH FROM SUB-BASIN 1.
 72           KM   RAINFALL DEPTH OF 4.00 WAS SPACIALLY REDUCED AS SHOWN BY THE PB RECORD
 73           KM   AN AREAL REDUCTION COEFFICIENT OF 1.000 WAS USED
 74           BA    1.94
              *     LG    0.35    0.15   7.981   0.082  19.802
 75           LG     .20     .35    4.00     .52   10.00
 76           UI    182.    327.    743.    975.   1188.   1505.   2189.   1955.   1537.   1242.
 77           UI    988.    748.    415.    308.    229.    182.     63.     56.     56.     56.
 78           UI     56.      0.      0.      0.      0.      0.      0.      0.      0.      0.
 79           UI      0.      0.      0.      0.      0.      0.      0.      0.      0.      0.

 80           KK    RCP1
 81           KM        ROUTE FLOW FROM CP1 TO CP2.
 82           RS       5              -1       0
 83           RC     .06     .04     .06   17800   .0469
 84           RX    1000    1125    1300    1390    1405    1490    1590    1750
 85           RY    1440    1439    1437    1428    1428    1439    1442    1444
              *
```

+	2 COMBINED AT	CP251	1519.	16.50	966.	277.	133.	35.76
+	ROUTED TO	R251	1512.	16.75	964.	277.	133.	35.76
+	HYDROGRAPH AT	252	294.	13.17	67.	17.	8.	.50
+	HYDROGRAPH AT	2D239	147.	15.92	100.	25.	12.	31.76
+	ROUTED TO	R239	137.	18.17	87.	25.	12.	31.76
+	3 COMBINED AT	CP252	1552.	16.83	1041.	317.	152.	36.26
+	ROUTED TO	R252	1501.	17.83	1014.	316.	152.	36.26
+	2 COMBINED AT	CP253	2640.	13.33	1962.	755.	369.	84.50
+	ROUTED TO	R253	2521.	13.75	1944.	752.	367.	84.50
+	HYDROGRAPH AT	267	1412.	12.42	179.	50.	24.	1.19
+	DIVERSION TO	267RET	1412.	12.42	179.	50.	24.	1.19
+	HYDROGRAPH AT	267OUT	1.	23.92	0.	0.	0.	1.19
+	2 COMBINED AT	CP267	2557.	13.75	1978.	762.	373.	70.64
+	ROUTED TO	R267	2458.	14.42	1967.	762.	373.	70.64
+	HYDROGRAPH AT	286	420.	12.92	111.	29.	14.	.70
+	2 COMBINED AT	1I286	2497.	14.42	1967.	782.	383.	86.98
+	HYDROGRAPH AT	288	125.	13.25	31.	8.	4.	.22
+	ROUTED TO	R288	119.	13.42	31.	8.	4.	.22
+	2 COMBINED AT	CP286	2553.	14.33	1987.	792.	387.	71.63
+	ROUTED TO	R286	2521.	14.50	1981.	792.	387.	71.63
+	HYDROGRAPH AT	283	84.	12.75	19.	5.	2.	.14
+	ROUTED TO	R283	79.	13.17	19.	5.	2.	.14
+	HYDROGRAPH AT	285B	81.	12.33	8.	2.	1.	.06
+	2 COMBINED AT	CP285B						



Offsite Drainag Exhibit.
Base sheet copied from Reference 4

Stantec Consulting Inc.
8211 South 48th Street
Phoenix AZ 85044
Tel: (602) 438-2200 Fax: (602) 431-9562

stantec.com

Stantec

14 October, 2002
File: 81500260

Mr. David Ramirez, P.E, City Engineer
City of Goodyear
190 N. Litchfield Road
Goodyear, AZ 85338

Reference: Goodyear Planned Regional Center/Design Flows Along Bullard Wash

Dear Mr. Ramirez:

Thank you for calling me regarding the design flows along Bullard Wash within the proposed Goodyear Planned Regional Center, located between Thomas Road and McDowell Road. I know you were coordinating with Mr. Greg Jones of the Flood Control District of Maricopa County "FCDMC" on this subject.

It is my understanding, based on our phone conversation, that it has been decided that the subject design flows should be based on the Existing Conditions scenario of the Loop 303 Corridor/White Tanks ADMP update, currently being undertaken by the engineering consultants URS. The most current version of the corresponding HEC-1 model is named L303M6K. According to this model, the 100-year peak flow along Bullard Wash at Thomas Road, concentration point CP267, is 2557 cfs.

Subsequent to your call, and as you indicated to me would take place, I received a call from Mr. Greg Jones of the FCDMC on this subject. Mr. Jones confirmed the design model and peak flows you indicated.

Accordingly, we are proceeding to base the design flows for the proposed Goodyear Planned Regional Center on the HEC-1 model indicated above.

If you have any questions or concerns to the contents of this letter, please let me know as soon as possible. You can reach me at (602) 438-2200. Otherwise we are proceeding with the recommended design flows discussed in this letter.

Buildings
Environment
Industrial
Transportation
Urban Land

Reference: Goodyear Planned Regional Center/ Design Flows Along Bullard Wash

Thank you for your time and effort in providing this information.

Sincerely,

STANTEC CONSULTING INC.

Ghassan Aouad

Ghassan Aouad, P.E.
Senior Hydrologist

cc : Mr. Gregory L. Jones, P.E, Regional Planning Manager

document3

Stantec

190 North Litchfield Road
Goodyear, Arizona 85338
Phone: (623) 932-3005
Fax: (623) 932-7748
Email: dramirez@ci.goodyear.az.us

City of Goodyear
Community Development
Engineering

Fax

To:	Ghassan Aouad	**From:**	David Ramirez DJR
Fax:	602-431-9562	**Pages:**	3
Phone:		**Date:**	10/18/02
Re:	Goodyear Planned Regional Center, Design Flows along Bullard Wash	**CC:**	Greg Jones, FCD (602-506-8561 fax)

In follow-up to our telephone conversation today, please revise your October 14, 2002 letter and reissue it to reflect the design flow of 2557 CFS with one foot of freeboard from water surface elevation to top of channel.

If you have any questions, please call me.

Stantec Consulting Inc.
8211 South 48th Street
Phoenix AZ 85044
Tel: (602) 438-2200 Fax: (602) 431-9562
stantec.com

Stantec

21 October, 2002
File: 81500260

Mr. David Ramirez, P.E, City Engineer
City of Goodyear
190 N. Litchfield Road
Goodyear, AZ 85338

Reference: Goodyear Planned Regional Center/Design Flows Along Bullard Wash

Dear Mr. Ramirez:

This letter replaces that I sent to you with a date of October 14,2002. Per your comment, I revised that letter to incorporate the requested freeboard along with the selected design flows. The revised letter is as follows:

Thank you for calling me regarding the design flows along Bullard Wash within the proposed Goodyear Planned Regional Center, located between Thomas Road and McDowell Road. I know you were coordinating with Mr. Greg Jones of the Flood Control District of Maricopa County "FCDMC" on this subject.

It is my understanding, based on our phone conversation, that it has been decided that the subject design flows should be based on the Existing Conditions scenario of the Loop 303 Corridor/White Tanks ADMP update, currently being undertaken by the engineering consultants URS. The most current version of the corresponding HEC-1 model is named L303M6K. According to this model, the 100-year peak flow along Bullard Wash at Thomas Road, concentration point CP267, is 2557 cfs. Additionally, it has been requested that a minimum of 1.0 feet of freeboard be provided in the proposed improved channel along the wash from the water surface elevation to the top of channel.

Subsequent to your call, and as you indicated to me would take place; I received a call from Mr. Greg Jones of the FCDMC on this subject. Mr. Jones confirmed the design model and approach you indicated.

Accordingly, we are proceeding to base the design of the proposed channel in the Goodyear Planned Regional Center on the HEC-1 model and free board indicated above.

Reference: Goodyear Planned Regional Center/ Design Flows Along Bullard Wash

If you have any questions or concerns to the contents of this letter, please let me know as soon as possible. You can reach me at (602) 438-2200. Otherwise we are proceeding with the recommended design approach discussed in this letter.

Thank you for your time and effort in providing this information.

Sincerely,

STANTEC CONSULTING INC.

Ghassan Aouad

Ghassan Aouad, P.E.
Senior Hydrologist

cc: Mr. Gregory L. Jones, P.E, Regional Planning Manager

document3

Stantec

5/5

Generated from file GYPRCCHN3.prj with the listed Qs starting at normal depth @ the dnst. end.

HEC-RAS Plan: Imported Pla River: RIVER-1 Reach: Reach-1

Reach	River Sta	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
		(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach-1	7385	2557.00	996.75	1003.14		1003.32	0.000975	3.37	759.49	151.92	0.27
Reach-1	7385	2000.00	996.75	1002.51		1002.65	0.000822	2.99	668.16	140.19	0.24
Reach-1	7385	1500.00	996.75	1001.87	*	1001.97	0.000674	2.58	580.78	131.08	0.22
Reach-1	7385	1000.00	996.75	1001.03		1001.10	0.000556	2.11	473.69	125.35	0.19
Reach-1	7385	500.00	996.75	999.94		999.98	0.000380	1.46	341.48	117.89	0.15
Reach-1	7370	2557.00	996.75	1003.14		1003.29	0.001001	3.14	814.41	185.11	0.26
Reach-1	7370	2000.00	996.75	1002.51		1002.63	0.000832	2.84	704.11	161.88	0.24
Reach-1	7370	1500.00	996.75	1001.86		1001.96	0.000630	2.47	607.58	139.89	0.21
Reach-1	7370	1000.00	996.75	1001.03		1001.09	0.000524	2.03	493.42	133.21	0.19
Reach-1	7370	500.00	996.75	999.94		999.97	0.000364	1.41	353.38	124.51	0.15
Reach-1	7200	2557.00	998.00	1003.08		1003.18	0.000383	2.51	1019.39	244.26	0.22
Reach-1	7200	2000.00	998.00	1002.45		1002.53	0.000383	2.31	867.42	235.72	0.21
Reach-1	7200	1500.00	998.00	1001.79		1001.86	0.000391	2.10	714.70	227.38	0.21
Reach-1	7200	1000.00	998.00	1000.94		1001.00	0.000448	1.90	526.92	215.95	0.21
Reach-1	7200	500.00	998.00	999.85		999.89	0.000568	1.63	306.47	188.40	0.23
Reach-1	7000	2557.00	998.00	1002.97		1003.09	0.000454	2.77	923.48	216.34	0.24
Reach-1	7000	2000.00	998.00	1002.35		1002.45	0.000445	2.53	790.02	208.60	0.23
Reach-1	7000	1500.00	998.00	1001.69		1001.77	0.000441	2.29	655.93	200.51	0.22
Reach-1	7000	1000.00	998.00	1000.84		1000.90	0.000483	2.04	489.66	190.01	0.22
Reach-1	7000	500.00	998.00	999.73		999.78	0.000652	1.75	286.38	176.32	0.24
Reach-1	6800	2557.00	998.00	1002.93		1003.01	0.000277	2.19	1168.49	269.06	0.19
Reach-1	6800	2000.00	998.00	1002.31		1002.37	0.000273	2.00	1002.09	262.64	0.18
Reach-1	6800	1500.00	998.00	1001.65		1001.70	0.000277	1.81	830.78	255.87	0.18
Reach-1	6800	1000.00	998.00	1000.79		1000.83	0.000321	1.63	614.39	247.05	0.18
Reach-1	6800	500.00	998.00	999.62		999.66	0.000524	1.48	337.27	225.46	0.21
Reach-1	6600	2557.00	997.00	1002.89		1002.95	0.000200	1.95	1311.86	281.42	0.16
Reach-1	6600	2000.00	997.00	1002.27		1002.32	0.000181	1.75	1140.98	266.55	0.15
Reach-1	6600	1500.00	997.00	1001.61		1001.65	0.000159	1.54	971.08	249.31	0.14
Reach-1	6600	1000.00	997.00	1000.75		1000.78	0.000139	1.30	766.96	228.90	0.13
Reach-1	6600	500.00	997.00	999.59		999.60	0.000123	0.98	509.93	213.43	0.11

* : Q_{100} = 2557 cfs. Other Qs were used to demonstrate conditions at lower flows.

TRAPEZOIDAL CHANNEL ANALYSIS
CRITICAL DEPTH COMPUTATION

April 29, 2003

==========

PROGRAM INPUT DATA

DESCRIPTION	VALUE				
Flow Rate (cfs)	2,557.0	2000	1500	1000	500
Channel Bottom Slope (ft/ft)	0.002				
Manning's Roughness Coefficient (n-value)	0.018				
Channel Left Side Slope (horizontal/vertical)	2.0				
Channel Right Side Slope (horizontal/vertical)	2.0				
Channel Bottom Width (ft)	95.0				

==========

COMPUTATION RESULTS

DESCRIPTION	VALUE				
Critical Depth (ft)	2.77	2.36	1.95	1.49	.94
Critical Slope (ft/ft)	0.0035				
Flow Velocity (fps)	9.19	8.51	7.77	6.83	5.46
Froude Number	1.0				
Velocity Head (ft)	1.31				
Energy Head (ft)	4.08				
Cross-Sectional Area of Flow (sq ft)	278.3				
Top Width of Flow (ft)	106.07				

==========

HYDROCALC Hydraulics for Windows, Version 1.2a Copyright (c) 1996
Dodson & Associates, Inc., 5629 FM 1960 West, Suite 314, Houston, TX 77069
Phone:(281)440-3787, Fax:(281)440-4742, Email:software@dodson-hydro.com
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Overchute at the RID Canal

CONCRETE DROP SRUCTURE WITH SLOPING SPILLWAY

Per the Drainage Design Manual of the Flood Control District of Maricpa County,Arizona,

Volume II, Hydraulics

Project: ---

Proj no.: ---

Calc. By: ---

Design Storm	Q (cfs)	Crest Elev. (ft)	Dnst Chn Invert (ft)	Tailwater Elev (ft)	Crest dcrit (ft)	Crest Vcrit (fps)	Basin BW (ft)	Basin S.Slope (Z:1)
100-yr	2557	1007.01	996.75	1003.14	2.77	9.19	95	2

H,drop (ft)	Toe Elev (ft)	HVc (ft)	Ht,c (ft)	d1 (ft)	T1 (ft)	A1 (sf)	V1 (fps)	HV1 (ft)	Ht,1 (ft)	HD1 (ft)	F1	d,conj (ft)	L,jump (ft)
10.26	996.75	1.31	14.34	0.898	98.59	86.92	29.42	13.44	14.34	0.88	5.52	6.58	41

H-drop (ft)	Crest-Chn (ft)	Sill Height (ft)	d,conj (ft)	dconj-Sill (ft)	Tailwater Depth (ft)	Conj. WSEL (ft)	Tailwater WSEL (ft)
10.26	10.26	0.00	6.58	6.58	6.39	1003.33	1003.14

d1 (ft)	d,conj (ft)	Fs @ d,conj (sf)	Fs @ d1 (sf)	Fs Equalizes @ d1= (ft)
0.90	6.58	25.05	25.46	0.914

Definitions:

Subscript "c" denotes conditions at the Crest

Subscript "1" denotes conditions at the Toe

Q=Design Flow (cfs)

dcrit=Critical depth

H,Drop=Height of Drop Across the Spillway

HV=Velocity Head

Ht=Total Head relative to basin bottom

d=Water Depth

T=Flow Top Width

A=Flow Area

V=Flow Velocity

HD=Hydraulic Depth

F=Froude Number

d,conj=Conjugate Depth of Jump

L,jump=Length of the Jump

Fs=Specific Force

Procedure:

- Assume H,drop
- dcrit,crest=from Manning Eq, see attached calc.
- Vcrit,crest=from Manning Eq, see attached calc.
- Hv,crest=(Vcrit,crest)^2/2g
- Ht,crest=H,drop+dcrit,crest+Hv,crest
- d1=will be solved for
- T1=BW+2Zd1
- A1=(BW+T1)/2xd1
- V1=Q/A1
- Hv1=V1^2/2g
- Ht1=d1+V1^2/2g
- Set Ht,crest=Ht1 to find d1,by trial and error
- HD1=A1/T1
- F1=V1/(gxHD1)^0.5
- For F1>or=1.7==>d,conj=0.5d1[(1+8F1^2)^0.5-1]
- For 1<F1<1.7==>d,conj=d1(F1^2-1)+d1
- Conj. WSEL=Basin bot. WSEL+d,conj
- Compare Conj. WSEL & Tailwater WSEL ;Adjsut H,drop until acceptable tolerance in the WSEL comparison
- L,jump=from fig 7.7 of FCDMC
- Check Specific Forces For d,conj (which was set approximate to Tailwater Depth) and d1. Specific forces should be equal within acceptable tolerance

CONCRETE DROP SRUCTURE WITH SLOPING SPILLWAY

Per the Drainage Design Manual of the Flood Control District of Maricpa County,Arizona,

Volume II, Hydraulics

Project: ----

Proj no.: ----

Calc. By: ----

Design Storm	Q (cfs)	Crest Elev. (ft)	Dnst Chn Invert (ft)	Tailwater Elev (ft)	Crest dcrit (ft)	Crest Vcrit (fps)	Basin BW (ft)	Basin S.Slope (Z:1)
~~100-yr~~	2000	1007.01	996.75	1002.51	2.36	8.51	95	2

H,drop (ft)	Toe Elev (ft)	HVc (ft)	Ht,c (ft)	d1 (ft)	T1 (ft)	A1 (sf)	V1 (fps)	HV1 (ft)	Ht,1 (ft)	HD1 (ft)	F1	d,conj (ft)	L,jump (ft)
10.26	996.75	1.12	13.74	0.716	97.86	69.05	28.97	13.03	13.74	0.71	6.08	5.81	37

H-drop (ft)	Crest-Chn (ft)	Sill Height (ft)	d,conj (ft)	dconj-Sill (ft)	Tailwater Depth (ft)	Conj. WSEL (ft)	Tailwater WSEL (ft)
10.26	10.26	0.00	5.81	5.81	5.76	1002.56	1002.51

d1 (ft)	d,conj (ft)	Fs @ d,conj (sf)	Fs @ d1 (sf)	Fs Equalize @ d1= (ft)
0.72	5.81	19.23	19.48	0.726

Definitions:

Subscript "c" denotes conditions at the Crest

Subscript "1" denotes conditions at the Toe

Q=Design Flow (cfs)

dcrit=Critical depth

H,Drop=Height of Drop Across the Spillway

HV=Velocity Head

Ht=Total Head relative to basin bottom

d=Water Depth

T=Flow Top Width

A=Flow Area

V=Flow Velocity

HD=Hydraulic Depth

F=Froude Number

d,conj=Conjugate Depth of Jump

L,jump=Length of the Jump

Fs=Specific Force

Procedure:

- Assume H,drop
- dcrit,crest=from Manning Eq, see attached calc.
- Vcrit,crest=from Manning Eq, see attached calc.
- Hv,crest=(Vcrit,crest)^2/2g
- Ht,crest=H,drop+dcrit,crest+Hv,crest
- d1=will be solved for
- T1=BW+2Zd1
- A1=(BW+T1)/2xd1
- V1=Q/A1
- Hv1=V1^2/2g
- Ht1=d1+V1^2/2g
- Set Ht,crest=Ht1 to find d1,by trial and error
- HD1=A1/T1
- F1=V1/(gxHD1)^0.5
- For F1>or=1.7==>d,conj=0.5d1[(1+8F1^2)^0.5-1]
- For 1<F1<1.7==>d,conj=d1(F1^2-1)+d1
- Conj. WSEL=Basin bot. WSEL+d,conj
- Compare Conj. WSEL & Tailwater WSEL ;Adjsut H,drop until acceptable tolerance in the WSEL comparison
- L,jump=from fig 7.7 of FCDMC
- Check Specific Forces For d,conj (which was set approximate to Tailwater Depth) and d1. Specific forces should be equal within acceptable tolerance

CONCRETE DROP SRUCTURE WITH SLOPING SPILLWAY

Per the Drainage Design Manual of the Flood Control District of Maricpa County,Arizona,
Volume II, Hydraulics

Project: ---
Proj no.: ---
Calc. By: ---

Design Storm	Q (cfs)	Crest Elev. (ft)	Dnst Chn Invert (ft)	Tailwater Elev (ft)	Crest dcrit (ft)	Crest Vcrit (fps)	Basin BW (ft)	Basin S.Slope (Z:1)
~~100-yr~~	1500	1007.01	996.75	1001.87	1.95	7.77	95	2

H,drop (ft)	Toe Elev (ft)	HVc (ft)	Ht,c (ft)	d1 (ft)	T1 (ft)	A1 (sf)	V1 (fps)	HV1 (ft)	Ht,1 (ft)	HD1 (ft)	F1	d,conj (ft)	L,jump (ft)
10.26	996.75	0.94	13.15	0.548	97.19	52.66	28.48	12.60	13.15	0.54	6.82	5.02	32

H-drop (ft)	Crest-Chn (ft)	Sill Height (ft)	d,conj (ft)	dconj-Sill (ft)	Tailwater Depth (ft)	Conj. WSEL (ft)	Tailwater WSEL (ft)
10.26	10.26	0.00	5.02	5.02	5.12	1001.77	1001.87

d1 (ft)	d,conj (ft)	Fs @ d,conj (sf)	Fs @ d1 (sf)	Fs Equalize @ d1= (ft)
0.55	5.02	14.13	14.28	0.554

Definitions:

Subscript "c" denotes conditions at the Crest
Subscript "1" denotes conditions at the Toe

Q=Design Flow (cfs)
dcrit=Critical depth
H,Drop=Height of Drop Across the Spillway
HV=Velocity Head
Ht=Total Head relative to basin bottom
d=Water Depth
T=Flow Top Width
A=Flow Area
V=Flow Velocity
HD=Hydraulic Depth
F=Froude Number
d,conj=Conjugate Depth of Jump
L,jump=Length of the Jump
Fs=Specific Force

Procedure:

- Assume H,drop
- dcrit,crest=from Manning Eq, see attached calc.
- Vcrit,crest=from Manning Eq, see attached calc.
- Hv,crest=(Vcrit,crest)^2/2g
- Ht,crest=H,drop+dcrit,crest+Hv,crest
- d1=will be solved for
- T1=BW+2Zd1
- A1=(BW+T1)/2xd1
- V1=Q/A1
- Hv1=V1^2/2g
- Ht1=d1+V1^2/2g
- Set Ht,crest=Ht1 to find d1,by trial and error
- HD1=A1/T1
- F1=V1/(gxHD1)^0.5
- For F1>or=1.7==>d,conj=0.5d1[(1+8F1^2)^0.5-1]
- For 1<F1<1.7==>d,conj=d1(F1^2-1)+d1
- Conj. WSEL=Basin bot. WSEL+d,conj
- Compare Conj. WSEL & Tailwater WSEL ;Adjsut H,drop until acceptable tolerance in the WSEL comparison
- L,jump=from fig 7.7 of FCDMC
- Check Specific Forces For d,conj (which was set approximate to Tailwater Depth) and d1. Specific forces should be equal within acceptable tolerance

CONCRETE DROP SRUCTURE WITH SLOPING SPILLWAY

Per the Drainage Design Manual of the Flood Control District of Maricpa County,Arizona,

Volume II, Hydraulics

Project: ----

Proj no.: ----

Calc. By: ----

Design Storm	Q (cfs)	Crest Elev. (ft)	Dnst Chn Invert (ft)	Tailwater Elev (ft)	Crest dcrit (ft)	Crest Vcrit (fps)	Basin BW (ft)	Basin S.Slope (Z:1)
~~100-yr~~	1000	1007.01	996.75	1001.03	1.49	6.83	95	2

H,drop (ft)	Toe Elev (ft)	HVc (ft)	Ht,c (ft)	d1 (ft)	T1 (ft)	A1 (sf)	V1 (fps)	HV1 (ft)	Ht,1 (ft)	HD1 (ft)	F1	d,conj (ft)	L,jump (ft)
10.26	996.75	0.72	12.47	0.374	96.50	35.81	27.93	12.11	12.48	0.37	8.08	4.09	26

H-drop (ft)	Crest-Chn (ft)	Sill Height (ft)	d,conj (ft)	dconj-Sill (ft)	Tailwater Depth (ft)	Conj. WSEL (ft)	Tailwater WSEL (ft)
10.26	10.26	0.00	4.09	4.09	4.28	1000.84	1001.03

d1 (ft)	d,conj (ft)	Fs @ d,conj (sf)	Fs @ d1 (sf)	Fs Equalize @ d1= (ft)
0.37	4.09	9.20	9.27	0.377

Definitions:

Subscript "c" denotes conditions at the Crest

Subscript "1" denotes conditions at the Toe

Q=Design Flow (cfs)

dcrit=Critical depth

H,Drop=Height of Drop Across the Spillway

HV=Velocity Head

Ht=Total Head relative to basin bottom

d=Water Depth

T=Flow Top Width

A=Flow Area

V=Flow Velocity

HD=Hydraulic Depth

F=Froude Number

d,conj=Conjugate Depth of Jump

L,jump=Length of the Jump

Fs=Specific Force

Procedure:

- Assume H,drop
- dcrit,crest=from Manning Eq, see attached calc.
- Vcrit,crest=from Manning Eq, see attached calc.
- Hv,crest=(Vcrit,crest)^2/2g
- Ht,crest=H,drop+dcrit,crest+Hv,crest
- d1=will be solved for
- T1=BW+2Zd1
- A1=(BW+T1)/2xd1
- V1=Q/A1
- Hv1=V1^2/2g
- Ht1=d1+V1^2/2g
- Set Ht,crest=Ht1 to find d1,by trial and error
- HD1=A1/T1
- F1=V1/(gxHD1)^0.5
- For F1>or=1.7==>d,conj=0.5d1[(1+8F1^2)^0.5-1]
- For 1<F1<1.7==>d,conj=d1(F1^2-1)+d1
- Conj. WSEL=Basin bot. WSEL+d,conj
- Compare Conj. WSEL & Tailwater WSEL ;Adjsut H,drop until acceptable tolerance in the WSEL comparison
- L,jump=from fig 7.7 of FCDMC
- Check Specific Forces For d,conj (which was set approximate to Tailwater Depth) and d1. Specific forces should be equal within acceptable tolerance

CONCRETE DROP SRUCTURE WITH SLOPING SPILLWAY

Per the Drainage Design Manual of the Flood Control District of Maricpa County,Arizona,
Volume II, Hydraulics

Project: ---
Proj no.: ---
Calc. By: ---

Design Storm	Q (cfs)	Crest Elev. (ft)	Dnst Chn Invert (ft)	Tailwater Elev (ft)	Crest dcrit (ft)	Crest Vcrit (fps)	Basin BW (ft)	Basin S.Slope (Z:1)
~~100-yr~~	500	1007.01	996.75	999.94	0.94	5.46	95	2

H,drop (ft)	Toe Elev (ft)	HVc (ft)	Ht,c (ft)	d1 (ft)	T1 (ft)	A1 (sf)	V1 (fps)	HV1 (ft)	Ht,1 (ft)	HD1 (ft)	F1	d,conj (ft)	L,jump (ft)
10.26	996.75	0.46	11.66	0.193	95.77	18.41	27.16	11.45	11.65	0.19	10.92	2.88	19

H-drop (ft)	Crest-Chn (ft)	Sill Height (ft)	d,conj (ft)	dconj-Sill (ft)	Tailwater Depth (ft)	Conj. WSEL (ft)	Tailwater WSEL (ft)
10.26	10.26	0.00	2.88	2.88	3.19	999.63	999.94

d1 (ft)	d,conj (ft)	Fs @ d,conj (sf)	Fs @ d1 (sf)	Fs Equalize @ d1= (ft)
0.19	2.88	4.46	4.48	0.194

Definitions:

Subscript "c" denotes conditions at the Crest
Subscript "1" denotes conditions at the Toe

Q=Design Flow (cfs)
dcrit=Critical depth
H,Drop=Height of Drop Across the Spillway
HV=Velocity Head
Ht=Total Head relative to basin bottom
d=Water Depth
T=Flow Top Width
A=Flow Area
V=Flow Velocity
HD=Hydraulic Depth
F=Froude Number
d,conj=Conjugate Depth of Jump
L,jump=Length of the Jump
Fs=Specific Force

Procedure:

- Assume H,drop
- dcrit,crest=from Manning Eq, see attached calc.
- Vcrit,crest=from Manning Eq, see attached calc.
- Hv,crest=(Vcrit,crest)^2/2g
- Ht,crest=H,drop+dcrit,crest+Hv,crest
- d1=will be solved for
- T1=BW+2Zd1
- A1=(BW+T1)/2xd1
- V1=Q/A1
- Hv1=V1^2/2g
- Ht1=d1+V1^2/2g
- Set Ht,crest=Ht1 to find d1,by trial and error
- HD1=A1/T1
- F1=V1/(gxHD1)^0.5
- For F1>or=1.7==>d,conj=0.5d1[(1+8F1^2)^0.5-1]
- For 1<F1<1.7==>d,conj=d1(F1^2-1)+d1
- Conj. WSEL=Basin bot. WSEL+d,conj
- Compare Conj. WSEL & Tailwater WSEL ;Adjsut H,drop until acceptable tolerance in the WSEL comparison
- L,jump=from fig 7.7 of FCDMC
- Check Specific Forces For d,conj (which was set approximate to Tailwater Depth) and d1. Specific forces should be equal within acceptable tolerance

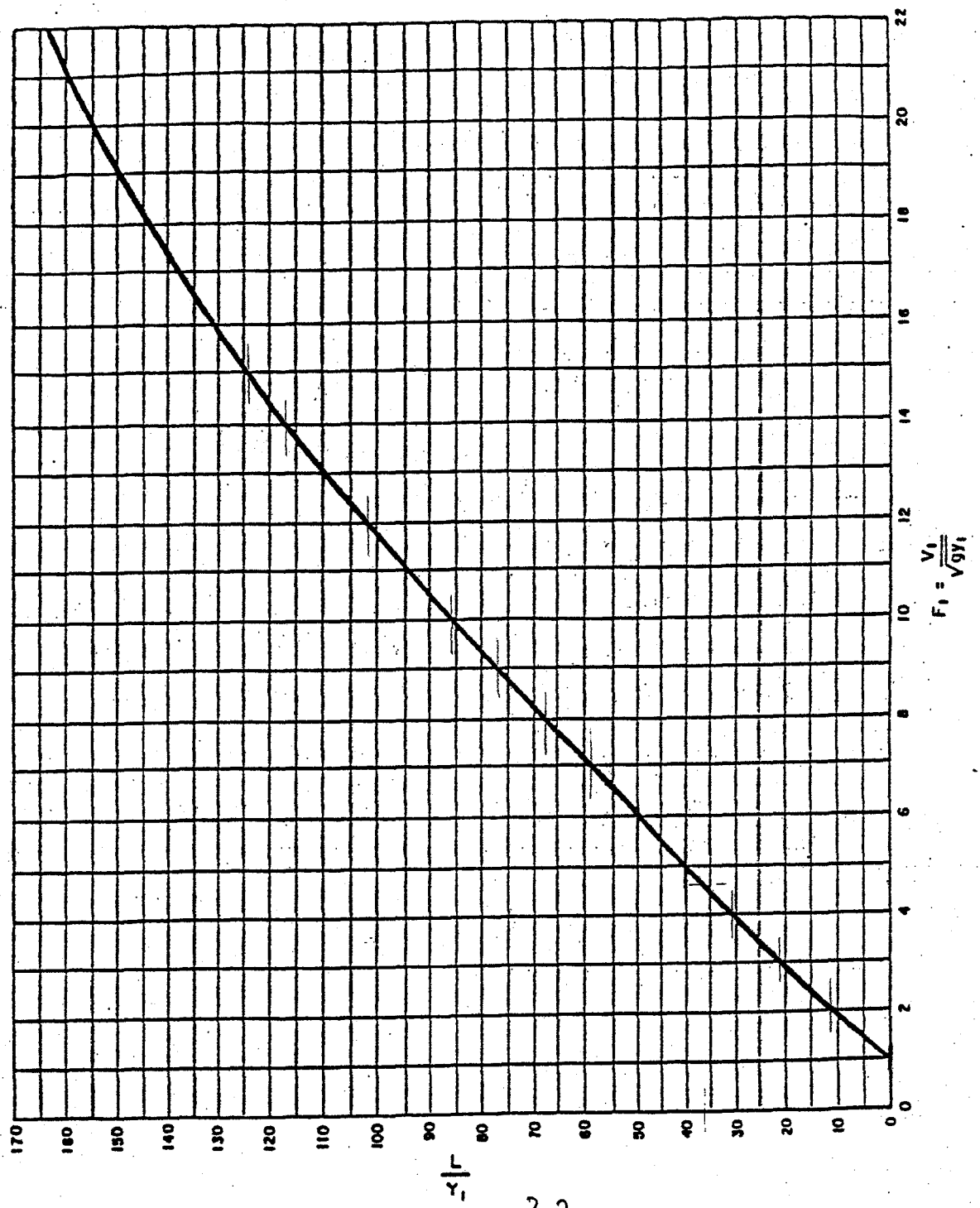
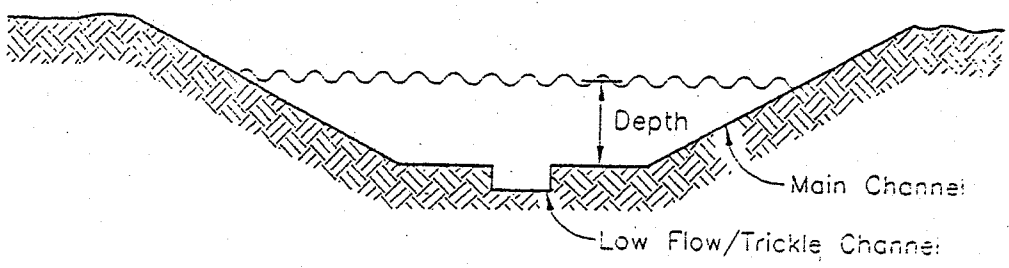
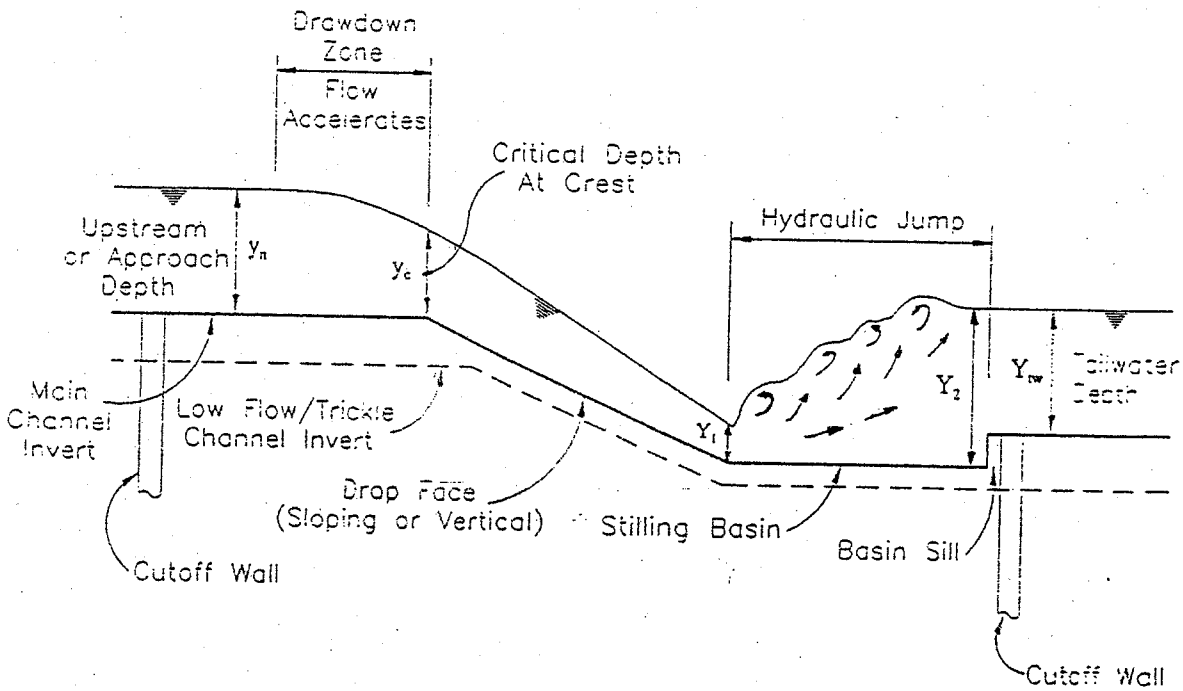


Figure ~~6.29~~ 7.7
Length of a Hydraulic Jump for Rectangular Channels
(Simons, Li and Associates, Inc. 1989)



CHANNEL SECTION



CHANNEL PROFILE

Figure 7.1
Typical Drop Structure Components
(Adapted from McLaughlin Water Engineers, Ltd. 1986)

Federal Emergency Management Agency

Washington, D.C. 20472

CERTIFIED MAIL
RETURN RECEIPT REQUESTED

IN REPLY REFER TO:
Case No.: 00-09-975P

The Honorable Bill Arnold
Mayor, City of Goodyear
119 North Litchfield Road
Goodyear, AZ 85338

Community: City of Goodyear, AZ
Community No.: 040046
Panels Affected: 04013C2060 E and 2070 F
Effective Date of This Revision: DEC 19 2000

102-D-A

Dear Mayor Arnold:

This responds to a request that the Federal Emergency Management Agency (FEMA) revise the effective Flood Insurance Rate Map (FIRM) and Flood Insurance Study (FIS) report for Maricopa County, Arizona and Incorporated Areas (the effective FIRM and FIS report for your community), in accordance with Part 65 of the National Flood Insurance Program (NFIP) regulations. In a letter dated May 31, 2000, Mr. John M. Wallace, P.E., Vice President, JE Fuller/Hydrology & Geomorphology, Inc., requested that FEMA revise the FIRM and FIS report to show the effects of an updated hydrologic analysis, placement of fill, and channelization along Bullard Wash from Van Buren Street to approximately 1,200 feet upstream. This request follows up on a Conditional Letter of Map Revision issued on October 4, 1999.

All data required to complete our review of this request were submitted with letters from Mr. Wallace.

We have completed our review of the submitted data and the flood data shown on the effective FIRM and FIS report. We have revised the FIRM and FIS report to modify the elevations and floodplain and floodway boundary delineations of the flood having a 1-percent chance of being equaled or exceeded in any given year (base flood) along Bullard Wash from approximately 1,650 feet downstream of Lower Buckeye Parkway to approximately 3,500 feet upstream of McDowell Road. As a result of the modifications, the Base Flood Elevations (BFEs) for Bullard Wash and the widths of the Special Flood Hazard Area (SFHA), the area that would be inundated by the base flood, and the regulatory floodway decreased. The base flood is contained in the channel along Bullard Wash from Van Buren Street to approximately 1,200 feet upstream. In addition, a correction was made to the alignment of Lower Buckeye Parkway. The modifications are shown on the enclosed annotated copies of FIRM Panels 04013C2060 E and 04013C2070 F; Profile Panels 627P, 628P, 629P and 630P; and affected portions of the Summary of Discharges Table and Floodway Data Table. This Letter of Map Revision (LOMR) hereby revises the above-referenced panels of the effective FIRM and the affected portions of the FIS report, both dated September 30, 1995.

The modifications are effective as of the date shown above. The map panels as listed above and as modified by this letter will be used for all flood insurance policies and renewals issued for your community.

The following table is a partial listing of existing and modified BFEs:

Location	Existing BFE (feet)*	Modified BFE (feet)*
Approximately 1,400 feet downstream of Lower Buckeye Parkway	950	949
Approximately 600 feet upstream of Yuma Road	968	966
Approximately 700 feet upstream of Van Buren Street	982	981
Approximately 425 feet upstream of Interstate Highway 10	993	992
Approximately 3,100 feet upstream of McDowell Road	1,004	1,003

*Referenced to the National Geodetic Vertical Datum, rounded to the nearest whole foot

Public notification of the modified BFEs will be given in the *West Valley View* on or about January 17, 2001, and January 24, 2001. A copy of this notification is enclosed. In addition, a notice of changes will be published in the *Federal Register*. Within 90 days of the second publication in the *West Valley View*, any interested party may request that FEMA reconsider the determination made by this LOMR. Any request for reconsideration must be based on scientific or technical data. All interested parties are on notice that, until the 90-day period elapses, the determination to modify the BFEs made by this LOMR may itself be modified.

Because this LOMR will not be printed and distributed to primary users, such as local insurance agents and mortgage lenders, your community will serve as a repository for these new data. We encourage you to disseminate the information reflected by this LOMR throughout the community, so that interested persons, such as property owners, local insurance agents, and mortgage lenders, may benefit from the information. We also encourage you to prepare a related article for publication in your community's local newspaper. This article should describe the assistance that officials of your community will give to interested persons by providing these data and interpreting the NFIP maps.

We are processing a revised FIRM and FIS report for Maricopa County; therefore, we will not physically revise and republish the FIRM and FIS report for your community to incorporate the modifications made by this LOMR at this time. Preliminary copies of the revised FIRM and FIS report were submitted to your community for review on December 23, 1997. Please note that updated road base information for your community has been incorporated into the Revised Preliminary FIRM. For display purposes, this updated information is shown on the enclosed annotated copies of FIRM Panels 04013C2060 E and 04013C2070 F. We will incorporate the modifications made by this LOMR into the revised FIRM and FIS report before they become effective.

The floodway is provided to your community as a tool to regulate floodplain development. Therefore, the floodway modifications described in this LOMR, while acceptable to FEMA, must also be acceptable to your community and adopted by appropriate community action, as specified in Paragraph 60.3(d) of the NFIP regulations.

This LOMR is based on minimum floodplain management criteria established under the NFIP. Your community is responsible for approving all floodplain development and for ensuring all necessary permits required by Federal or State law have been received. State, county, and community officials, based on knowledge of local conditions and in the interest of safety, may set higher standards for construction in the SFHA. If the State, county, or community has adopted more restrictive or comprehensive floodplain management criteria, these criteria take precedence over the minimum NFIP criteria.

The basis of this LOMR is, in whole or in part, a channel-modification project. NFIP regulations, as cited in Paragraph 60.3(b)(7), require that communities ensure that the flood-carrying capacity within the altered or relocated portion of any watercourse is maintained. This provision is incorporated into your community's existing floodplain management regulations. Consequently, the ultimate responsibility for maintenance of the modified channel rests with your community.

This determination has been made pursuant to Section 206 of the Flood Disaster Protection Act of 1973 (Public Law 93-234) and is in accordance with the National Flood Insurance Act of 1968, as amended (Title XIII of the Housing and Urban Development Act of 1968, Public Law 90-448), 42 U.S.C. 4001-4128, and 44 CFR Part 65. Pursuant to Section 1361 of the National Flood Insurance Act of 1968, as amended, communities participating in the NFIP are required to adopt and enforce floodplain management regulations that meet or exceed NFIP criteria. These criteria are the minimum requirements and do not supersede any State or local requirements of a more stringent nature. This includes adoption of the effective FIRM and FIS report to which the regulations apply and the modifications described in this LOMR.

FEMA makes flood insurance available in participating communities; in addition, we encourage communities to develop their own loss reduction and prevention programs. Through the *Project Impact: Building Disaster Resistant Communities* initiative, launched by FEMA Director James Lee Witt in 1997, we seek to focus the energy of businesses, citizens, and communities in the United States on the importance of reducing their susceptibility to the impact of all natural disasters, including floods, hurricanes, severe storms, earthquakes, and wildfires. Natural hazard mitigation is most effective when it is planned for and implemented at the local level, by the entities who are most knowledgeable of local conditions and whose economic stability and safety are at stake. For your information, we are enclosing a copy of a pamphlet describing this nationwide initiative. For additional information on *Project Impact*, please visit our website at **www.fema.gov/impact**.

If you have any questions regarding floodplain management regulations for your community or the NFIP in general, please contact the Consultation Coordination Officer (CCO) for your community. Information on the CCO for your community may be obtained by calling the Chief, Community

Mitigation Programs Branch, Mitigation Division of FEMA in San Francisco, California, at (415) 923-7184. If you have any questions regarding this LOMR, please call our Map Assistance Center, toll free, at 1-877-FEMA MAP (1-877-336-2627).

Sincerely,

Max H. Yuan, P.E., Project Engineer
Hazards Study Branch
Mitigation Directorate

For: Matthew B. Miller, P.E., Chief
Hazards Study Branch
Mitigation Directorate

Enclosures

cc: Mr. Harvey Krauss
Community Development Director
City of Goodyear

Mr. Joe Tram, P.E.
Engineering Division
Flood Control District of
Maricopa County

Mr. John M. Wallace, P.E.
Vice President
JE Fuller/Hydrology & Geomorphology, Inc.

Federal Emergency Management Agency

Washington, D.C. 20472

MAR 03 1995

CERTIFIED MAIL
RETURN RECEIPT REQUESTED

IN REPLY REFER TO:
Case No.: 95-09-266P

The Honorable Carl Gow
Mayor, City of Goodyear
629 North Litchfield Road
Goodyear, Arizona 85338

Community: City of Goodyear, Arizona
Community No.: 040046

106

Dear Mayor Gow:

This is in response to a letter dated February 7, 1995, from Mr. Mark T. Gavan, P.E., R.L.S., Project Manager, The WLB Group Inc., regarding the effective Flood Insurance Study (FIS) report and Flood Insurance Rate Map (FIRM) for Maricopa County, Arizona and Incorporated Areas. With his February 7 letter, Mr. Gavan submitted additional data in support of his February 1, 1995, request for a revision to the effective FIS and FIRM for Bullard Wash, from the Roosevelt Irrigation District Canal to Indian School Road. This revision is based on a detailed hydraulic analysis of this reach of Bullard Wash, which was previously unstudied. All data required to review this revision request were submitted by Mr. Gavan with his February 1 and February 7 letters.

We have completed our review of the data submitted and have determined that the items listed below represent the best available data for the flooding source listed above.

- Sheets 1 and 2 of the as-built topographic work maps entitled "Bullard Wash FIS Work Map," prepared by B & R Engineering, dated January 30, 1995

- HEC-2 hydraulic model, entitled "White Tanks/Agua Fria Drainage Master Study, 100-Year Storm Event Floodplain Run File: 'BULL-RID.H2I,' Bullard Wash, Wash 10, Roosevelt Irrigation District Canal (RID Canal) to Indian School Road Reach. Sections 6.320-7.753," dated January 25, 1995

C/ Goodyear, AZ
March 3, 1995

95-09-266P

We will include this information in our next physical map revision of the FIRM for Maricopa County, Arizona and Incorporated Areas. The tentative date for the next preliminary FIRM is fall 1996. In the interim, your community may use these data in its floodplain management programs.

If you have any questions regarding this matter, please contact Mr. John Magnotti of our staff in Washington, DC, either by telephone at (202) 646-3932 or by facsimile at (202) 646-4596.

Sincerely,

Michael K. Buckley, P.E., Chief
Hazard Identification Branch
Mitigation Directorate

cc: Mr. Ron Nevitt
Floodplain Administration
Flood Control District of Maricopa County

Mr. Mark T. Gavan, P.E., R.L.S.
Project Manager
The WLB Group Inc.

As Received from FEMA
(Case No. 00-09-975P)

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 *                                        *
 *  Version   4.6.2;  May 1991            *
 *                                        *
 *  RUN DATE    29NOV00    TIME   10:27:40 *
 *****************************************
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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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 HEC-2 WATER SURFACE PROFILES

 Version   4.6.2;  May 1991
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End WLB Comment Records

T1 BULLARD WASH LOMR - PINNACLE ENGINEERING/MARWEST DEVELOPMENT
T2 FLOODPLAIN/FLOODWAY RUN FILE: BULL.DAT
T3 BULLARD WASH LOMR - FROM LOWER BUCKEYE ROAD TO MCDOWELL RD

Modeling performed by JE Fuller/ Hydrology & Geomorphology, Inc.
John Wallace, P.E. 520-623-3112
The following revisions were made to the orginal FIS HEC-2 by WLB
Hydrology:
HEC-1 was revised by Stanley Consultants & FCDMC to reflect construction of Dysart Drain. New Q100 values were input based on revised HEC-1 model (see discussion in TDN report). Revised discharges are shown in WLB comment cards next to original values
Hydraulics:
Original WLB model shortened to include only detailed study reach from Section 2.680 to Section 6.320. Downstream WSEL matches WSEL at Section 2.68 per pending Maricopa County Flood Control District CLOMR known as FEMA Case No. 99-09-862R.
Section 4.625 (at Van Buren St.) modified to reflect encroachment associated with upstream channel improvements (see below)
Sections 4.634, 4.670, 4.752 4.820 and 4.840 added to model to adequately define proposed Bullard Wash channel improvements at Mountain View Estates (upstream of Van Buren Street)

J1	ICHECK	INQ	NINV	IDIR	STRT	METRIC	HVINS	Q	WSEL	FQ
	0	2	0	0	0	0	0	0	949.13	0
J2	NPROF	IPLOT	PRFVS	XSECV	XSECH	FN	ALLDC	IBW	CHNIM	ITRACE
	1	0	0	0	0	0	0	0	0	0

J3 VARIABLE CODES FOR SUMMARY PRINTOUT

38	43	1	53	21	22	54	51	4	8
42	5	26	0	110	0	200			

1
29NOV00 10:27:40 PAGE 2

NC	.045	.07	.03	.1	.3					
QT	3	3200	3200	3200						
ET			9.1						9850	10250

** BEGIN DETAILED FLOODPLAIN\FLOODWAY ANALYSIS.
Q = Q AT CP335 (=4906 CFS). REVISED Q = 3191 CFS

DIVIDED FLOW OCCURS FOR THE NEXT TWO UPSTREAM CROSS-SECTIONS, HOWEVER,THESE FLOWS ARE EFFECTIVE DUE TO UPSTREM INFLOW AT X1= 2.883

X1	2.680	17	9925	10050	735	725	760			
GR	954	9265	952	9400	950	9505	948	9645	947.2	9735
GR	948	9790	949.9	9805	948.8	9900	948	9905	947.3	9925

```
GR      946      9940     945.2    10000     945.6    10050      946    10165      948    10565
GR      950     10935       952    11160

ET                          9.1                                                  9917.92  10211.92
X1    2.771        16      9985    10020       480      480      480
GR      954      9440       952     9545       950     9660    948.1     9810      950     9880
GR    951.4      9890       950     9900     949.4     9985    947.4    10000    948.2    10020
GR    947.3     10075       948    10210       950    10505    950.9    10795      952    11105
GR    953.5     11255

ET                          9.1                                                   9853    10130
X1    2.883        15      9985    10015       580      580      590
GR      958      9190       956     9360       954     9535      952     9640      950     9840
GR    949.6      9920     950.2     9985     948.5    10000    950.1    10015    949.2    10035
GR      950     10165       952    10385       954    10600      956    11230    956.5    11270

QT        3      3194      3194     3194
ET                          9.1                                                   9875    10050

                Q = Q AT CP334        (= 4915 CFS). REVISED Q = 3194 CFS

X1    2.977        15      9980    10050       500      500      500
GR      960      9170       958     9345       956     9530      954     9660      952     9830
GR      951      9960     951.5     9980       950     9990    949.9    10000      950    10010
GR    952.1     10050       954    10480       956    10740      958    11200    958.5    11305

ET                          9.1                                                9847.43  10134.02
X1    3.070        13      9945    10025       485      495      490
GR    958.5      9510     953.8     9545     954.5     9600    954.5     9945      954     9960
GR    952.5      9975     954.2     9985     952.3    10000    953.2    10025    952.7    10060
GR      954     10290       956    10635       958    10875

QT        3      2742      2742     2742
ET                          9.1                                                   9788    10130
1
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                Q = Q AT 1I334        (= 4432 CFS). REVISED Q = 2742 CFS

X1    3.167        18      9970    10020       475      515      510
GR    960.7      9530       956     9585       955     9625    955.4     9730    954.9     9865
GR    955.8      9935     955.1     9970       954     9990    953.9    10000      954    10005
GR    954.9     10020     954.5    10080     955.1    10120    954.8    10220      956    10425
GR      958     10770       960    10990       962    11230

ET                          9.1                                                9970.00  10287.36

                DIVIDED FLOW OCCURS FOR THE NEXT TWO UPSTREAM CROSS-SECTIONS,
                HOWEVER,THESE FLOWS ARE EFFECTIVE DUE TO UPSTREM INFLOW AT
                X1= 3.602

X1    3.291        23      9970    10020       660      650      655
GR      964      9530       962     9670     961.3     9690    961.8     9725    960.4     9770
GR    961.8      9785     960.1     9940     960.5     9970      960     9985      958     9995
GR    957.2     10000       958    10005       960    10015    960.1    10020      960    10025
GR      958     10040     957.2    10110     957.8    10360    957.6    10460      958    10700
GR      960     10910       962    10970       964    11600

ET                          9.1                                                9985.00  10291.17
X1    3.376        17      9985    10015       460      440      450
GR    967.9      9300       966     9370       964     9520      962     9630    960.5     9900
GR    961.9      9985       960     9995     958.3    10000      960    10005      961    10015
GR      960     10030     958.4    10055     958.6    10170    958.8    10365      960    10590
GR      962     10930       964    11490

ET                          9.1                                                9911.46  10234.03
X1    3.491        17      9980    10020       605      605      605
GR      968      9255       966     9435       964     9555      962     9660    960.5     9930
GR    961.9      9980       960     9995     959.5    10000      960    10005    961.9    10020
GR      960     10040     959.6    10130       960    10240      962    10540      964    10735
GR      966     11000       968    11780

QT        3      2746      2746     2746
NC      .07       .07       .04       .1        .3
ET                          9.1                                                9880.00  10100.00

                CROSS-SECTION AT YUMA RD.

                Q = Q AT CP316        (= 4438 CFS). REVISED Q = 2746 CFS

X1    3.602        13      9880    10100       590      590      590
GR      970      9225       968     9450       966     9600      964     9750      962     9880
GR    961.9     10000       962    10100     963.2    10330      964    10445      966    10625
GR      968     10770     968.9    10945       970    11005
1
   29NOV00      10:27:40                                                                    PAGE    4

ET                          9.1                                                   9600    10075

                DIVIDED FLOW OCCURS FOR THE NEXT TWO UPSTREAM CROSS-SECTIONS,
                HOWEVER,THESE FLOWS ARE EFFECTIVE DUE TO UPSTREM INFLOW AT
```

```
                X1= 4.101

X1    3.702       20     9955    10055      535      490      525
GR      972     8720      970     8925      968     9115      966     9315      964     9550
GR    963.5     9620      964     9665    970.5     9750    970.5     9900      970     9920
GR      968     9935      964     9945    963.5     9950    963.9     9955    963.4    10000
GR      964    10055      966    10370      968    10660      970    10980      972    11360

ET                        9.1                                                 9588.66 10070.00
X1    3.841       23     9955    10070      735      735      735
GR      976     8355      974     8700      972     8995      970     9130      968     9280
GR      966     9550    965.5     9650      966     9685    970.5     9700    970.2     9900
GR      970     9915      968     9925      966     9930    965.1     9935      966     9940
GR    967.1     9955    966.3    10000    967.3    10070      968    10260      970    10495
GR      972    10710      974    11090      976    11350

ET                        9.1                                                    9700    10095
X1    3.978       23     9930    10095      725      725      725
GR      978     8360      976     8690      974     8990      972     9180      970     9335
GR    968.8     9570      970     9705    970.5     9740    970.5     9885      970     9900
GR      968     9910    966.9     9915      968     9920      969     9930      968     9990
GR    967.9    10000      968    10015    968.4    10095      970    10300      972    10515
GR      974    10655      976    10850      978    11110

ET                        9.1                                                 9852.45 10091.34
X1    4.101       23     9960    10080      650      650      650
GR      980     8400      976     8715      974     8955      974     9255      972     9540
GR      971     9715    971.4     9780    970.2     9890    971.3     9920      970     9935
GR    968.7     9945      970     9950      971     9960      970     9985    969.8    10000
GR      970    10015    970.9    10080    970.7    10160      972    10400      974    10560
GR      976    10620      978    10915      980    11180

ET                        9.1                                                 9869.06    10075
X1    4.237       19     9935    10075      715      715      715
GR      980     8695      978     9160    976.5     9270    977.4     9305      976     9390
GR      974     9535      972     9850    971.8     9870      972     9885    972.4     9910
GR    972.2     9920    972.6     9935      972     9940    971.3    10000      972    10075
GR      974    10290      976    10430      978    10600      980    10870

ET                        9.1                                                 9852.43    10070
X1    4.356       16     9950    10070      630      630      630
GR    980.5     9300      980     9320      978     9430      976     9525      974     9725
GR    973.1     9895    973.5     9915    973.3     9935    973.5     9950    972.6    10000
GR    973.4    10070      974    10155      976    10360      978    10485      980    10615
GR      982    10870
1
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ET                        9.1                                                 9957.70 10131.67
X1    4.496       14     9975    10130      740      740      740
GR      984     9180      982     9365      980     9540      978     9645      976     9845
GR    974.8     9945    975.2     9975    974.4    10000      975    10130      976    10275
GR      978    10420      980    10540      982    10620      984    10840

QT        3     2754     2754     2754
NC      1.0      1.0
ET                        9.1                                                    9835    10095

                CROSS-SECTION AT VAN BUREN ST.
                Q = Q AT CP298        (= 4446 CFS). REVISED Q = 2754 CFS
X1    4.625       14     9835    10095      680      680      680
GR      986     9220      984     9310      982     9450      980     9650    978.5     9810
GR    978.3     9835    978.1    10000    978.2    10095    978.3    10160      980    10345
GR      982    10480      984    10650    985.1    10810      986    10950

NC     .07      .07     .035
ET                        9.1                                                    9862    10138

                Begin Marwest Property Channelization and Fill

X1    4.634        4     9862    10138       50       50       50
GR   981.15     9862   976.15     9882   976.15    10118   981.15    10138

ET                        9.1                                                    9869    10131
X1    4.670        4     9869    10131      185      185      185
GR    981.4     9869    976.4     9889    976.4    10111    981.4    10131

ET                        9.1                                                    9869    10131
X1    4.752        4     9869    10131      438      438      438
GR   981.48     9869   977.48     9885   977.48    10115   981.48    10131

ET                        9.1                                                    9869    10131
X1    4.820        4     9869    10131      357      357      357
GR   982.09     9869   978.09     9885   978.09    10115   983.09    10131

ET                        9.1                                                    9835    10165
X1    4.840        4     9835    10165      103      103      103
GR   982.31     9835   978.31     9851   978.31    10149   982.31    10165

ET                        9.1                                                    9680    10177
X1    4.855        6     9680    10177      126      126      126
GR   985.54     9680   978.57     9700   978.57     9850   978.76     9925   980.23    10175
GR   982.50    10177
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NC                          0.04
ET                           9.1                                                                  9850      10150
1
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                End Marwest Property

X1    4.858        12       9705     10290        15        15        15
GR      988      9200        986      9420       984      9620       982      9705       980     10000
GR    980.3     10060        980     10090     980.5     10260       982     10290       984     10555
GR      986     10820        988     11220

ET                           9.1                                                                  9875      10105
X1    5.009        14       9935     10100       800       840       795
GR      990      9190        988      9410       986      9575       984      9715       982      9820
GR    981.9      9860        982      9900     983.7      9935       982     10000     982.5     10100
GR      984     10270        986     10445       988     10700       990     10880

ET                           9.1                                                                  9865      10090
X1    5.153        12       9945     10090       775       730       765
GR      992      9110        990      9280       988      9480       986      9645     984.5      9800
GR    985.6      9945      984.3     10000     985.4     10090       986     10145       988     10410
GR      990     10480        992     10885

ET                           9.1                                                               9757.55      10055
X1    5.282        13       9945     10055       690       665       680
GR      992      8865        990      9105       988      9440       986      9710     985.6      9850
GR      986      9915        987      9945       986      9960     985.5     10000       986     10055
GR      988     10230        990     10590       992     10870

NC      .07       .07       .035        .3        .5
ET                           9.1                                                            9899.90   10100.10

                A 7-SPAN BRIDGE AT I-10

X1    5.430        11     9899.9   10100.1       680       820       780
X3       10                                                          996       996
GR     1000      9050        997    9899.9     994.2      9900     994.2      9906       988      9919
GR      988     10000        988     10081     994.2     10094     994.2     10100       997   10100.1
GR     1000     10450

QT        3      3538       3538      3538
SB     1.05       1.6        2.6         0       162         6      1203         2       988       988
ET                           10.4

                Q = Q AT CP287       (= 5319 CFS). REVISED Q = 3538 CFS

X1    5.460        11     9899.9   10100.1       160       160       160
X2        0         0          1       995       997
X3       10                                                          997       997
BT        4      9050       1000               9899.9       997               10100.1       997
BT    10450      1000
GR     1000      9050        997    9899.9     994.2      9900     994.2      9906       988      9919
GR      988     10000        988     10081     994.2     10094     994.2     10100       997   10100.1
GR     1000     10450
1
   29NOV00      10:27:40                                                                                    PAGE    7


NC      .07       .07        .04        .3        .5
ET                           9.1                                                                  9850  10232.27
X1    5.563        13       9850     10100       540       535       540
GR      996      8140      994.2      8850       994      9085       992      9470       990      9790
GR    990.9      9815      989.5      9850     988.5     10000     988.9     10100       990     10370
GR      992     10655        994     10920       996     11105

QT        3      3400       3400      3400
NC      .07       .07       .045        .1        .3
ET                           9.1                                                                  9935     10135

                CROSS-SECTION AT 280 FEET(ALONG FLOW PATH) NORTH OF MCDOWELL RD.

                Q = Q AT CP286       (= 4662 CFS). REVISED Q = 3400 CFS

                DIVIDED FLOW OCCURS FOR THE NEXT TWO UPSTREAM CROSS-SECTIONS,
                HOWEVER,THESE FLOWS ARE EFFECTIVE DUE TO UPSTREM INFLOW AT
                X1= 5.960

X1    5.727        21       9935     10135       870       835       870
GR      999      8415        998      8710       996      9045       994      9250     992.4      9690
GR      994      9730      996.1      9780     993.5      9800     993.5      9830    1000.4      9870
GR     1000      9890        994      9900       992      9935       991     10000     991.8     10135
GR      992     10190        994     10550     994.6     10565       994     10600       996     10890
GR      998     11170

ET                           9.1                                                            9953.67  10240.41
X1    5.840        22       9970     10170       590       580       595
GR   1001.6      8460       1000      8815       998      9090       996      9400     994.5      9760
GR      996      9805      998.1      9840     993.5      9865     993.5      9895     998.6      9920
GR      998      9925        996      9940       994      9970     993.4     10000     993.7     10170
GR      994     10300        996     10605     996.3     10620     995.8     10650       996     10675
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GR      998      10945      1000      11190

ET                          9.1                                                          9960    10274.08
X1    5.960         16      9960      10150       640       610       635
GR     1002       8825      1000       9240       998      9760       997       9910     997.3       9960
GR      996       9990     995.9      10000       996     10010     996.2      10150       996      10230
GR    996.2      10520     997.3      10680       997     10715       998      10935      1000      11210
GR     1002      11560

ET                          9.1                                                          9900    10206.34
X1    6.086         12      9900      10100       655       685       665
GR     1004       8350      1002       9210      1000      9650     999.6       9810     999.2       9900
GR    998.3      10000     999.2      10100       999     10420     999.7      10495      1000      10720
GR     1002      10990      1004      11285

ET                          9.1                                                          9850      10270
X1    6.217         15      9900      10100       620       745       690
GR     1006       8300      1004       9175      1002      9565    1001.2       9630    1001.7       9665
GR   1000.6       9695    1000.3       9900    1000.1     10000    1000.3      10100    1000.7      10445
GR   1001.5      10535    1001.4      10600      1002     10730      1004      11080      1006      11110
1
   29NOV00      10:27:40                                                                                PAGE    8


ET                          9.1                                                          9900    10279.30
X1    6.320         13      9900      10100       580       525       545
GR     1008       8860      1006       9230      1004      9555    1002.5       9660      1002       9670
GR   1001.3       9900    1000.9      10000    1001.4     10100      1002      10480    1003.1      10800
GR     1004      11030      1006      11060      1007     11220
1
   29NOV00      10:27:40                                                                                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


 *PROF 1
0

 CCHV=     .100 CEHV=     .300
 *SECNO 2.680

 3265 DIVIDED FLOW


            **  BEGIN DETAILED FLOODPLAIN\FLOODWAY ANALYSIS.
                Q = Q AT CP335       (=4906 CFS). REVISED Q = 3191 CFS

                DIVIDED FLOW OCCURS FOR THE NEXT TWO UPSTREAM CROSS-SECTIONS,
                HOWEVER,THESE FLOWS ARE EFFECTIVE DUE TO UPSTREM INFLOW AT
                X1= 2.883

     2.680      3.93    949.13       .00    949.13    949.21       .08       .00       .00    947.30
    3200.0     351.6    1421.0    1427.4     309.5     435.5    1353.1        .0        .0    945.60
       .00      1.14      3.26      1.05      .045      .030      .070      .000    945.20   9565.90
   .000822      735.      760.      725.         0         0         0       .00   1135.57  10774.05

 *SECNO 2.771

 3265 DIVIDED FLOW

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

     2.771      2.66    949.96       .00       .00    950.19       .23       .93       .05    949.40
    3200.0     630.0     482.1    2087.9     221.7      66.5     715.3      17.1      10.7    948.20
       .04      2.84      7.25      2.92      .045      .030      .070      .000    947.30   9663.39
   .009154      480.      480.      480.         3         0         0       .00    807.62  10498.67

 *SECNO 2.883

 3302 WARNING:  CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE,  KRATIO =  2.06

     2.883      3.87    952.37       .00       .00    952.48       .11      2.28       .01    950.20
    3200.0    1574.8     442.2    1183.0     647.1      91.6     727.0      33.5      21.5    950.10
       .10      2.43      4.83      1.63      .045      .030      .070      .000    948.50   9620.09
   .002159      580.      590.      580.         3         0         0       .00    805.66  10425.76


1
   29NOV00      10:27:40                                                                                PAGE   10

    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
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*SECNO 2.977

3302 WARNING: CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE, KRATIO = .70

Q = Q AT CP334 (= 4915 CFS). REVISED Q = 3194 CFS

2.977	3.77	953.67	.00	.00	954.06	.39	1.49	.08	951.50
3194.0	1451.1	1411.2	331.7	447.7	208.1	277.4	47.3	30.2	952.10
.13	3.24	6.78	1.20	.045	.030	.070	.000	949.90	9688.42
.004399	500.	500.	500.	3	0	0	.00	715.89	10404.32

*SECNO 3.070

3.070	3.33	955.63	.00	.00	955.75	.12	1.67	.03	954.50
3194.0	926.4	844.9	1422.7	482.9	186.7	846.3	61.1	40.1	953.20
.19	1.92	4.52	1.68	.045	.030	.070	.000	952.30	9531.39
.002711	485.	490.	495.	3	0	0	.00	1039.44	10570.83

*SECNO 3.167

Q = Q AT 1I334 (= 4432 CFS). REVISED Q = 2742 CFS

3.167	2.94	956.84	.00	.00	956.93	.09	1.17	.00	955.10
2742.0	1230.7	513.0	998.3	611.9	125.1	756.3	78.4	51.7	954.90
.25	2.01	4.10	1.32	.045	.030	.070	.000	953.90	9575.14
.002020	475.	510.	515.	3	0	0	.00	995.15	10570.29

*SECNO 3.291

3265 DIVIDED FLOW

3302 WARNING: CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE, KRATIO = .50

DIVIDED FLOW OCCURS FOR THE NEXT TWO UPSTREAM CROSS-SECTIONS,
HOWEVER,THESE FLOWS ARE EFFECTIVE DUE TO UPSTREM INFLOW AT
X1= 3.602

3.291	1.98	959.18	.00	.00	959.28	.10	2.34	.00	960.50
2742.0	.0	101.7	2640.3	.0	22.5	1079.5	97.8	65.3	960.10
.32	.00	4.51	2.45	.000	.030	.070	.000	957.20	9989.15
.008074	660.	655.	650.	2	0	0	.00	813.21	10822.75

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 3.376

3265 DIVIDED FLOW

3302 WARNING: CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE, KRATIO = 1.68

3.376	2.91	961.21	.00	.00	961.26	.06	1.98	.00	961.90
2742.0	53.2	92.2	2596.6	60.2	31.5	1391.5	110.9	74.3	961.00
.39	.88	2.93	1.87	.045	.030	.070	.000	958.30	9772.70
.002860	460.	450.	440.	3	0	0	.00	976.82	10795.23

*SECNO 3.491

3.491	3.10	962.60	.00	.00	962.66	.05	1.40	.00	961.90
2742.0	780.9	263.4	1697.6	446.8	78.3	1095.3	132.4	87.9	961.90
.48	1.75	3.36	1.55	.045	.030	.070	.000	959.50	9628.07
.001900	605.	605.	605.	4	0	0	.00	971.22	10599.29

CCHV= .100 CEHV= .300
*SECNO 3.602

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

CROSS-SECTION AT YUMA RD.

Q = Q AT CP316 (= 4438 CFS). REVISED Q = 2746 CFS

3.602	2.20	964.10	.00	.00	964.28	.18	1.58	.04	962.00
2746.0	207.9	1872.9	665.2	144.2	474.3	405.0	150.3	99.3	962.00
.53	1.44	3.95	1.64	.070	.040	.070	.000	961.90	9742.07
.004058	590.	590.	590.	1	0	0	.00	712.44	10454.51

*SECNO 3.702

3265 DIVIDED FLOW

DIVIDED FLOW OCCURS FOR THE NEXT TWO UPSTREAM CROSS-SECTIONS,
HOWEVER, THESE FLOWS ARE EFFECTIVE DUE TO UPSTREM INFLOW AT

X1= 4.101

3.702	2.78	966.18	.00	.00	966.31	.13	2.03	.00	963.90
2746.0	1162.9	1047.0	536.1	617.0	249.5	371.6	163.7	108.5	964.00
.59	1.88	4.20	1.44	.070	.040	.070	.000	963.40	9297.71
.003769	535.	525.	490.	3	0	0	.00	851.19	10395.06

*SECNO 3.841

3265 DIVIDED FLOW

3.841	3.57	968.67	.00	.00	968.75	.08	2.43	.01	967.10
2746.0	1827.1	678.6	240.3	947.1	219.7	220.6	185.9	123.1	967.30
.68	1.93	3.09	1.09	.070	.040	.070	.000	965.10	9229.63
.002915	735.	735.	735.	3	0	0	.00	881.54	10338.91

*SECNO 3.978

3.978	3.81	970.71	.00	.00	970.83	.12	2.07	.01	969.00
2746.0	839.4	1433.3	473.3	630.3	402.6	337.0	208.8	139.6	968.40
.76	1.33	3.56	1.40	.070	.040	.070	.000	966.90	9279.88
.002796	725.	725.	725.	3	0	0	.00	1096.58	10376.46

*SECNO 4.101

4.101	3.93	972.63	.00	.00	972.72	.09	1.89	.00	971.00
2746.0	1074.1	986.5	685.4	675.3	276.5	468.3	229.7	155.2	970.90
.84	1.59	3.57	1.46	.070	.040	.070	.000	968.70	9450.68
.003032	650.	650.	650.	2	0	0	.00	999.47	10450.15

*SECNO 4.237

4.237	3.17	974.47	.00	.00	974.58	.11	1.85	.00	972.60
2746.0	962.7	1368.3	415.0	672.3	392.1	324.8	252.7	170.2	972.00
.93	1.43	3.49	1.28	.070	.040	.070	.000	971.30	9500.62
.002235	715.	715.	715.	2	0	0	.00	822.57	10323.19

*SECNO 4.356

4.356	3.26	975.86	.00	.00	975.96	.10	1.39	.00	973.50
2746.0	1092.4	1182.6	471.0	703.8	340.9	361.5	272.9	181.9	973.40
1.00	1.55	3.47	1.30	.070	.040	.070	.000	972.60	9538.80
.002167	630.	630.	630.	2	0	0	.00	807.05	10345.85

*SECNO 4.496

4.496	3.12	977.52	.00	.00	977.65	.13	1.68	.01	975.20
2746.0	611.2	1573.8	561.0	405.0	435.6	378.3	295.2	194.7	975.00
1.08	1.51	3.61	1.48	.070	.040	.070	.000	974.40	9692.35
.002385	740.	740.	740.	1	0	0	.00	693.32	10385.67

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 4.625

3302 WARNING: CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE, KRATIO = .53

CROSS-SECTION AT VAN BUREN ST.
Q = Q AT CP298 (= 4446 CFS). REVISED Q = 2754 CFS

4.625	2.00	980.10	.00	.00	980.53	.43	2.79	.09	978.30
2754.0	25.6	2679.3	49.1	180.8	501.2	298.7	312.4	205.7	978.20
1.11	.14	5.35	.16	1.000	.040	1.000	.000	978.10	9639.07
.008633	680.	680.	680.	3	0	0	.00	713.30	10352.38

*SECNO 4.634

3302 WARNING: CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE, KRATIO = 4.08

Begin Marwest Property Channelization and Fill

4.634	4.39	980.54	.00	.00	980.63	.10	.07	.03	981.15
2754.0	.0	2754.0	.0	.0	1112.8	.0	313.6	206.2	981.15

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      1.12       .00      2.47       .00      .000      .035      .000      .000    976.15   9864.44
   .000520       50.       50.       50.         2         0         0       .00    271.11  10135.56

*SECNO 4.670
     4.670      4.23    980.63       .00       .00    980.75       .12       .11       .01    981.40
    2754.0        .0    2754.0        .0        .0    1010.2        .0     318.1     207.3    981.40
      1.14       .00      2.73       .00      .000      .035      .000      .000    976.40   9872.09
   .000664      185.      185.      185.         2         0         0       .00    255.83  10127.91

*SECNO 4.752
     4.752      3.50    980.98       .00       .00    981.14       .16       .38       .01    981.48
    2754.0        .0    2754.0        .0        .0     854.0        .0     327.5     209.9    981.48
      1.17       .00      3.23       .00      .000      .035      .000      .000    977.48   9871.00
   .001175      438.      438.      438.         2         0         0       .00    258.00  10129.00

*SECNO 4.820
     4.820      3.33    981.42       .00       .00    981.60       .18       .46       .01    982.09
    2754.0        .0    2754.0        .0        .0     806.3        .0     334.3     212.0    983.09
      1.20       .00      3.42       .00      .000      .035      .000      .000    978.09   9871.67
   .001394      357.      357.      357.         2         0         0       .00    253.99  10125.66
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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 4.840
     4.840      3.30    981.61       .00       .00    981.72       .11       .11       .01    982.31
    2754.0        .0    2754.0        .0        .0    1026.9        .0     336.4     212.7    982.31
      1.21       .00      2.68       .00      .000      .035      .000      .000    978.31   9837.80
   .000861      103.      103.      103.         2         0         0       .00    324.40  10162.20

*SECNO 4.855
     4.855      3.18    981.75       .00       .00    981.82       .07       .10       .00    985.54
    2754.0        .0    2754.0        .0        .0    1288.5        .0     339.8     213.9    982.50
      1.23       .00      2.14       .00      .000      .035      .000      .000    978.57   9690.87
   .000692      126.      126.      126.         0         0         0       .00    485.47  10176.34

*SECNO 4.858

3302 WARNING:  CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE,  KRATIO =   .19

               End Marwest Property
     4.858      1.54    981.54       .00       .00    981.96       .42       .03       .10    982.00
    2754.0        .0    2754.0        .0        .0     529.1        .0     340.1     214.1    982.00
      1.23       .00      5.20       .00      .000      .040      .000      .000    980.00   9773.13
   .018572       15.       15.       15.         3         0         0       .00    507.63  10280.76

*SECNO 5.009

3302 WARNING:  CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE,  KRATIO =  3.28

     5.009      3.25    985.15       .00       .00    985.23       .08      3.24       .03    983.70
    2754.0     975.3    1305.3     473.4     609.2     439.9     381.4     358.2     225.6    982.50
      1.33      1.60      2.97      1.24      .070      .040      .070      .000    981.90   9634.35
   .001726      800.      795.      840.         6         0         0       .00    736.47  10370.81

*SECNO 5.153

3302 WARNING:  CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE,  KRATIO =   .64

     5.153      2.77    987.07       .00       .00    987.22       .15      1.97       .02    985.60
    2754.0    1270.2    1286.4     197.4     622.2     316.4     151.2     380.3     238.3    985.40
      1.41      2.04      4.07      1.31      .070      .040      .070      .000    984.30   9556.74
   .004234      775.      765.      730.         5         0         0       .00    730.01  10286.75
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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 5.282

3302 WARNING:  CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE,  KRATIO =  1.77
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    5.282      3.19    988.69       .00       .00    988.74       .05      1.51       .01    987.00
   2754.0    1551.1     857.0     345.8    1157.2     312.7     340.0     403.0     252.1    986.00
     1.51      1.34      2.74      1.02      .070      .040      .070      .000    985.50   9323.66
  .001353      690.      680.      665.         2         0         0       .00   1031.37  10355.02

CCHV=     .300 CEHV=     .500
*SECNO 5.430

3301 HV CHANGED MORE THAN HVINS

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

3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA=       996.00 ELREA=       996.00

                A 7-SPAN BRIDGE AT I-10

    5.430      2.42    990.42       .00       .00    991.14       .72      2.07       .33    997.00
   2754.0        .0    2754.0        .0        .0     405.1        .0     421.7     262.3    997.00
     1.55       .00      6.80       .00      .000      .035      .000      .000    988.00   9913.92
  .008261      680.      780.      820.         2         0         0       .00    172.17  10086.08


SPECIAL BRIDGE

5227 DOWNSTREAM ELEV IS     990.10 , NOT     990.42 HYDRAULIC JUMP OCCURS DOWNSTREAM (IF LOW FLOW CONTROLS)

SB  XK        XKOR      COFQ      RDLEN     BWC       BWP       BAREA     SS        ELCHU     ELCHD
     1.05      1.60      2.60       .00    162.00      6.00   1203.00      2.00    988.00    988.00

*SECNO 5.460

3302 WARNING:  CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE,  KRATIO =  1.43
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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

CLASS B LOW FLOW

3420 BRIDGE W.S.=     990.49 BRIDGE VELOCITY=       8.83     CALCULATED CHANNEL AREA=       401.

 EGPRS      EGLWC      H3       QWEIR      QLOW      BAREA   TRAPEZOID      ELLC      ELTRD     WEIRLN
                                                              AREA
      .00    991.76      .00        0.     3538.     1203.     1190.     995.00    997.00        0.


3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA=       997.00 ELREA=       997.00

                Q = Q AT CP287       (= 5319 CFS). REVISED Q = 3538 CFS

    5.460      3.00    991.00       .00       .00    991.76       .76       .62       .00    997.00
   3538.0        .0    3538.0        .0        .0     504.6        .0     423.4     262.9    997.00
     1.55       .00      7.01       .00      .000      .035      .000      .000    988.00   9912.71
  .006692      160.      160.      160.         0         0         0       .00    174.57  10087.29

CCHV=     .300 CEHV=     .500
*SECNO 5.563

3301 HV CHANGED MORE THAN HVINS

3302 WARNING:  CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE,  KRATIO =  3.63

    5.563      4.11    992.61       .00       .00    992.65       .04       .67       .22    989.50
   3538.0     464.8    1882.7    1190.6     692.3     934.0    1340.5     444.8     272.6    988.90
     1.65       .67      2.02       .89      .070      .040      .070      .000    988.50   9351.43
  .000508      540.      540.      535.         4         0         0       .00   1385.19  10736.62

CCHV=     .100 CEHV=     .300
*SECNO 5.727

3265 DIVIDED FLOW

3302 WARNING:  CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE,  KRATIO =   .21
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CROSS-SECTION AT 280 FEET(ALONG FLOW PATH) NORTH OF MCDOWELL RD.

Q = Q AT CP286 (= 4662 CFS). REVISED Q = 3400 CFS

DIVIDED FLOW OCCURS FOR THE NEXT TWO UPSTREAM CROSS-SECTIONS,
HOWEVER,THESE FLOWS ARE EFFECTIVE DUE TO UPSTREM INFLOW AT
X1= 5.960

5.727	2.54	993.54	.00	.00	993.90	.37	1.15	.10	992.00
3400.0	337.4	2386.3	676.3	218.3	422.2	304.8	483.2	295.3	991.80
1.71	1.55	5.65	2.22	.070	.045	.070	.000	991.00	9375.53
.010818	870.	870.	835.	3	0	0	.00	933.49	10467.83

*SECNO 5.840

3265 DIVIDED FLOW

3302 WARNING: CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE, KRATIO = 2.23

5.840	2.90	996.30	.00	.00	996.39	.08	2.45	.03	994.00
3400.0	700.6	1644.5	1054.9	597.7	545.8	741.7	502.3	310.3	993.70
1.78	1.17	3.01	1.42	.070	.045	.070	.000	993.40	9353.26
.002183	590.	595.	580.	4	0	0	.00	1293.70	10715.71

*SECNO 5.960

5.960	2.19	998.09	.00	.00	998.18	.09	1.80	.00	997.30
3400.0	145.3	1175.1	2079.6	137.7	365.5	1117.9	527.4	328.3	996.20
1.86	1.06	3.21	1.86	.070	.045	.070	.000	995.90	9735.32
.003962	640.	635.	610.	4	0	0	.00	1212.73	10948.05

*SECNO 6.086

6.086	2.49	1000.79	.00	.00	1000.89	.10	2.71	.00	999.20
3400.0	477.0	1385.7	1537.3	354.0	408.9	905.6	552.9	348.1	999.20
1.94	1.35	3.39	1.70	.070	.045	.070	.000	998.30	9475.24
.004060	655.	665.	685.	4	0	0	.00	1352.00	10827.24

*SECNO 6.217

3302 WARNING: CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE, KRATIO = 1.54

6.217	2.51	1002.61	.00	.00	1002.66	.05	1.77	.00	1000.30
3400.0	814.4	1187.6	1398.0	630.3	482.5	1092.0	584.0	370.1	1000.30
2.05	1.29	2.46	1.28	.070	.045	.070	.000	1000.10	9445.54
.001717	620.	690.	745.	3	0	0	.00	1391.67	10837.21

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 6.320

6.320	2.70	1003.60	.00	.00	1003.66	.06	1.00	.00	1001.30
3400.0	699.5	1322.5	1378.1	504.7	495.2	1091.0	610.9	387.2	1001.40
2.14	1.39	2.67	1.26	.070	.045	.070	.000	1000.90	9582.91
.001952	580.	545.	525.	3	0	0	.00	1345.19	10928.10

1

PROFILE FOR STREAM BULLARD WASH LOMR -

PLOTTED POINTS (BY PRIORITY) E-ENERGY,W-WATER SURFACE,I-INVERT,C-CRITICAL W.S.,L-LEFT BANK,R-RIGHT BANK,M-LOWER END STA

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ELEVATION   945.     955.     965.     975.     985.     995.     1005.    1015.    1025.    1035.
   SECNO   CUMDIS

    2.68     0.  I L E  M  .        .        .        .        .        .        .        .        .
           100.  IR LE  M  .        .        .        .        .        .        .        .        .
           200.  CI LE  M  .        .        .        .        .        .        .        .        .
           300.  CIRLWE  M .        .        .        .        .        .        .        .        .
           400.  C IRLE  M .        .        .        .        .        .        .        .        .
    2.77   500.  C IRLE  M .        .        .        .        .        .        .        .        .
           600.  C IRLE   M.        .        .        .        .        .        .        .        .
           700.  C  IL E  M.        .        .        .        .        .        .        .        .
           800.  C  IRLE   M        .        .        .        .        .        .        .        .
           900.  C  IRLWE  M        .        .        .        .        .        .        .        .
          1000.  C  I L E  .M       .        .        .        .        .        .        .        .
    2.88  1100.  C  I L E  .M       .        .        .        .        .        .        .        .
          1200.  C   IL WE . M      .        .        .        .        .        .        .        .
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       1300.  C   I L E . M       .         .         .         .         .         .         .         .
       1400.  C   I L E . M       .         .         .         .         .         .         .         .
       1500.  C   I L WE.  M      .         .         .         .         .         .         .         .
 2.98  1600.  C    ILRWE.  M       .         .         .         .         .         .         .         .
       1700.  C    I L E.  M       .         .         .         .         .         .         .         .
       1800.  C     IRLWE  M       .         .         .         .         .         .         .         .
       1900.  C     I L E  M       .         .         .         .         .         .         .         .
       2000.  C      IRLE  M       .         .         .         .         .         .         .         .
 3.07  2100.  C      IRLWE M       .         .         .         .         .         .         .         .
       2200.  C      IRL.E M       .         .         .         .         .         .         .         .
       2300.  C       IRLE  M      .         .         .         .         .         .         .         .
       2400.  C       IRLE  M      .         .         .         .         .         .         .         .
       2500.  C       IRLE   M     .         .         .         .         .         .         .         .
 3.17  2600.  C        IL E   M    .         .         .         .         .         .         .         .
       2700.  C        IRLE   M    .         .         .         .         .         .         .         .
       2800.  C         IRE    M   .         .         .         .         .         .         .         .
       2900.  C         I LE   M   .         .         .         .         .         .         .         .
       3000.  C         .I E    M  .         .         .         .         .         .         .         .
       3100.  C         .I WE   M  .         .         .         .         .         .         .         .
       3200.  C         . I EL   M.         .         .         .         .         .         .         .
 3.29  3300.  C         . I EL   M.         .         .         .         .         .         .         .
       3400.  C         . I WEL  M.         .         .         .         .         .         .         .
       3500.  C         . I  EL  M.         .         .         .         .         .         .         .
       3600.  C         .  I EL  M.         .         .         .         .         .         .         .
 3.38  3700.  C         .  I  EL M.         .         .         .         .         .         .         .
       3800.  C         .  I  EL M.         .         .         .         .         .         .         .
       3900.  C         .  I  WE  M         .         .         .         .         .         .         .
       4000.  C         .   I RE  .M        .         .         .         .         .         .         .
       4100.  C         .   I RE  .M        .         .         .         .         .         .         .
       4200.  C         .   I  E  . M       .         .         .         .         .         .         .
 3.49  4300.  C         .   I  E  .  M      .         .         .         .         .         .         .
       4400.  C         .    I LE .  M      .         .         .         .         .         .         .
       4500.  C         .    I LE .  M      .         .         .         .         .         .         .
       4600.  C         .     ILE .   M     .         .         .         .         .         .         .
       4700.  C         .     ILWE.   M     .         .         .         .         .         .         .
       4800.  C         .     IL E.   M     .         .         .         .         .         .         .
 3.60  4900.  C         .      I E.    M    .         .         .         .         .         .         .
       5000.  C         .      I E.    M    .         .         .         .         .         .         .
       5100.  C         .      IL E     M   .         .         .         .         .         .         .
       5200.  C         .       I E     M   .         .         .         .         .         .         .
       5300.  C         .       I WE    M   .         .         .         .         .         .         .
 3.70  5400.  C         .       IL.E     M  .         .         .         .         .         .         .
       5500.  C         .       IL.E     M  .         .         .         .         .         .         .
       5600.  C         .        IL E     M .         .         .         .         .         .         .
       5700.  C         .        IL E     M .         .         .         .         .         .         .
       5800.  C         .        ILRE      M.         .         .         .         .         .         .
       5900.  C         .        I.L E      M         .         .         .         .         .         .
       6000.  C         .         IL E      M         .         .         .         .         .         .
       6100.  C         .         I LE      .M        .         .         .         .         .         .
 3.84  6200.  C         .         I LWE     .M        .         .         .         .         .         .
       6300.  C         .         I L E     .M        .         .         .         .         .         .
       6400.  C         .         I L E     .M        .         .         .         .         .         .
       6500.  C         .         .I LE     . M       .         .         .         .         .         .
       6600.  C         .         .I L E    . M       .         .         .         .         .         .
       6700.  C         .         .I L E    . M       .         .         .         .         .         .
       6800.  C         .         .I L E    . M       .         .         .         .         .         .
 3.98  6900.  C         .         . IRL E   .  M      .         .         .         .         .         .
       7000.  C         .         . I L E   .  M      .         .         .         .         .         .
       7100.  C         .         . I L E   .  M      .         .         .         .         .         .
       7200.  C         .         .  IRLWE  .   M     .         .         .         .         .         .
       7300.  C         .         .  I L E  .   M     .         .         .         .         .         .
       7400.  C         .         .  I L E  .   M     .         .         .         .         .         .
       7500.  C         .         .  I  LE  .    M    .         .         .         .         .         .
 4.10  7600.  C         .         .   I LWE .    M    .         .         .         .         .         .
       7700.  C         .         .   I L E .    M    .         .         .         .         .         .
       7800.  C         .         .   I L E .    M    .         .         .         .         .         .
       7900.  C         .         .    IL E .    M    .         .         .         .         .         .
       8000.  C         .         .    IRLWE.    M    .         .         .         .         .         .
       8100.  C         .         .    IRL E.    M    .         .         .         .         .         .
       8200.  C         .         .     IL E.    M    .         .         .         .         .         .
 4.24  8300.  C         .         .     IL E.    M    .         .         .         .         .         .
       8400.  C         .         .     IRLWE    M    .         .         .         .         .         .
       8500.  C         .         .      IL E    M    .         .         .         .         .         .
       8600.  C         .         .      IL E    M    .         .         .         .         .         .
       8700.  C         .         .      IL E    M    .         .         .         .         .         .
       8800.  C         .         .      IL E    M    .         .         .         .         .         .
 4.36  8900.  C         .         .      IL .E   M    .         .         .         .         .         .
       9000.  C         .         .       IL.E    M   .         .         .         .         .         .
       9100.  C         .         .       IL.E    M   .         .         .         .         .         .
       9200.  C         .         .       IL.E     M  .         .         .         .         .         .
       9300.  C         .         .       IL. E    M  .         .         .         .         .         .
       9400.  C         .         .        I. E     M .         .         .         .         .         .
       9500.  C         .         .        IL E     M .         .         .         .         .         .
 4.50  9600.  C         .         .        IL E      M.         .         .         .         .         .
       9700.  C         .         .         I  E     M.         .         .         .         .         .
       9800.  C         .         .         IL E     M.         .         .         .         .         .
       9900.  C         .         .         .I WE     M         .         .         .         .         .
      10000.  C         .         .         .IL E     M         .         .         .         .         .
      10100.  C         .         .         . I WE    M         .         .         .         .         .
      10200.  C         .         .         . IL E    .M        .         .         .         .         .
 4.63 10300.  C         .         .         .  I E    .M        .         .         .         .         .
 4.63 10400.  C         .         .         .I   EL   .         .         .         .         .         .
      10500.  C         .         .         .I   EL   .         .         .         .         .         .
 4.67 10600.  C         .         .         .I   WE   .         .         .         .         .         .
      10700.  C         .         .         .I    E   .         .         .         .         .         .
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     10800.  C          .         .         . I   E   .         .         .         .         .         .         .
     10900.  C          .         .         . I   E   .         .         .         .         .         .         .
4.75 11000.  C          .         .         . I   E   .         .         .         .         .         .         .
     11100.  C          .         .         . I   ER  .         .         .         .         .         .         .
     11200.  C          .         .         .  I  EL  .         .         .         .         .         .         .
4.82 11300.  C          .         .         .  I  ELR .         .         .         .         .         .         .
     11400.  C          .         .         .  I  WE  .         .         .         .         .         .         .
4.84 11500.  C          .         .         .  I  WE  .         .         .         .         .         .         .
4.86 11600.  C          .         .         .  I    E L         .         .         .         .         .         .
4.86 11700.  C          .         .         .    IWE  .  M      .         .         .         .         .         .
     11800.  C          .         .         .    I E  .  M      .         .         .         .         .         .
     11900.  C          .         .         .    I WE .  M      .         .         .         .         .         .
     12000.  C          .         .         .     ILE .   M     .         .         .         .         .         .
     12100.  C          .         .         .     IRE .   M     .         .         .         .         .         .
     12200.  C          .         .         .     IRLE.   M     .         .         .         .         .         .
     12300.  C          .         .         .     IRLE.   M     .         .         .         .         .         .
5.01 12400.  C          .         .         .      I LE    M    .         .         .         .         .         .
     12500.  C          .         .         .      IRLE    M    .         .         .         .         .         .
     12600.  C          .         .         .      IRLWE   M    .         .         .         .         .         .
     12700.  C          .         .         .       IL.E    M   .         .         .         .         .         .
     12800.  C          .         .         .       IL.E    M   .         .         .         .         .         .
     12900.  C          .         .         .       IRLE    M   .         .         .         .         .         .
     13000.  C          .         .         .        ILWE   M   .         .         .         .         .         .
     13100.  C          .         .         .        IL E    M  .         .         .         .         .         .
5.15 13200.  C          .         .         .        IL E    M  .         .         .         .         .         .
     13300.  C          .         .         .        IRLE    M  .         .         .         .         .         .
     13400.  C          .         .         .        IRLE    M  .         .         .         .         .         .
     13500.  C          .         .         .         IL E   M  .         .         .         .         .         .
     13600.  C          .         .         .         IL E   M  .         .         .         .         .         .
     13700.  C          .         .         .         IL E   M  .         .         .         .         .         .
5.28 13800.  C          .         .         .         IRLWE  M  .         .         .         .         .         .
     13900.  C          .         .         .         .IRLE   M .         .         .         .         .         .
     14000.  C          .         .         .         .I  E    M.         .         .         .         .         .
     14100.  C          .         .         .         .I  ERL   M         .         .         .         .         .
     14200.  C          .         .         .         . I WERL  .M        .         .         .         .         .
     14300.  C          .         .         .         . I  E  L . M       .         .         .         .         .
     14400.  C          .         .         .         . I  E   L.  M      .         .         .         .         .
     14500.  C          .         .         .         .  I WE   .L  M     .         .         .         .         .
5.43 14600.  C          .         .         .         .  I WE   . L  M    .         .         .         .         .
     14700.  C          .         .         .         .  I  E   . L  M    .         .         .         .         .
5.46 14800.  C          .         .         .         .  I  WE  . L  M    .         .         .         .         .
     14900.  C          .         .         .         .  I  WE  L   M     .         .         .         .         .
     15000.  C          .         .         .         .  I  WE L.  M      .         .         .         .         .
     15100.  C          .         .         .         .  I   EL .  M      .         .         .         .         .
     15200.  C          .         .         .         .  I  LE  . M       .         .         .         .         .
5.56 15300.  C          .         .         .         .  IL  E  .M        .         .         .         .         .
     15400.  C          .         .         .         .   IL  E .M        .         .         .         .         .
     15500.  C          .         .         .         .   IL  E .M        .         .         .         .         .
     15600.  C          .         .         .         .   IL  E .M        .         .         .         .         .
     15700.  C          .         .         .         .   IL  E . M       .         .         .         .         .
     15800.  C          .         .         .         .    IL E . M       .         .         .         .         .
     15900.  C          .         .         .         .    IL E . M       .         .         .         .         .
     16000.  C          .         .         .         .    IL E . M       .         .         .         .         .
     16100.  C          .         .         .         .     ILWE.  M      .         .         .         .         .
5.73 16200.  C          .         .         .         .     ILWE.  M      .         .         .         .         .
     16300.  C          .         .         .         .     IL E.  M      .         .         .         .         .
     16400.  C          .         .         .         .      I WE  M      .         .         .         .         .
     16500.  C          .         .         .         .      IL E   M     .         .         .         .         .
     16600.  C          .         .         .         .      IL E   M     .         .         .         .         .
     16700.  C          .         .         .         .       I .E  M     .         .         .         .         .
5.84 16800.  C          .         .         .         .       IL.E   M    .         .         .         .         .
     16900.  C          .         .         .         .        I.E   M    .         .         .         .         .
     17000.  C          .         .         .         .        IL E  M    .         .         .         .         .
     17100.  C          .         .         .         .        IL E   M   .         .         .         .         .
     17200.  C          .         .         .         .         ILE   M   .         .         .         .         .
     17300.  C          .         .         .         .         IL E  M   .         .         .         .         .
5.96 17400.  C          .         .         .         .         .ILE   M  .         .         .         .         .
     17500.  C          .         .         .         .         .ILE   M  .         .         .         .         .
     17600.  C          .         .         .         .         .IRLE  M  .         .         .         .         .
     17700.  C          .         .         .         .         . ILE   M .         .         .         .         .
     17800.  C          .         .         .         .         . IL E  M .         .         .         .         .
     17900.  C          .         .         .         .         .  ILE  M .         .         .         .         .
     18000.  C          .         .         .         .         .  ILE   M.         .         .         .         .
6.09 18100.  C          .         .         .         .         .  IL E  M.         .         .         .         .
     18200.  C          .         .         .         .         .  IL E  M.         .         .         .         .
     18300.  C          .         .         .         .         .   I E  M.         .         .         .         .
     18400.  C          .         .         .         .         .   I E   M         .         .         .         .
     18500.  C          .         .         .         .         .   IL E  M         .         .         .         .
     18600.  C          .         .         .         .         .   IL E  M         .         .         .         .
     18700.  C          .         .         .         .         .    I E  .M        .         .         .         .
6.22 18800.  C          .         .         .         .         .    I E  .M        .         .         .         .
     18900.  C          .         .         .         .         .    I  E .M        .         .         .         .
     19000.  C          .         .         .         .         .    IR E .M        .         .         .         .
     19100.  C          .         .         .         .         .    IL E .M        .         .         .         .
     19200.  C          .         .         .         .         .    IL E . M       .         .         .         .
6.32 19300.  C          .         .         .         .         .     I E . M       .         .         .         .
1
  29NOV00       10:27:40                                                                                    PAGE  19


T1      WHITE TANKS / AGUA FRIA AREA DRAINAGE MASTER STUDY
T2      100 - YEAR STORM EVENT   FLOODWAY RUN  FILE: 10.H2I
T3      BULLARD WASH  (WASH 10) - FROM BUCKEYE CANAL TO DYSART DRAIN.

J1  ICHECK    INQ       NINV      IDIR      STRT      METRIC    HVINS     Q         WSEL      FQ
```

```
       0         3         0         0         0         0         0         0    949.50         0

 J2  NPROF     IPLOT     PRFVS     XSECV     XSECH     FN        ALLDC     IBW       CHNIM     ITRACE

      14                  -1

1
   29NOV00      10:27:40                                                                                    PAGE   20

     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 2.680

 3470 ENCROACHMENT STATIONS=     9850.0   10250.0  TYPE=      1  TARGET=      400.000

             **  BEGIN DETAILED FLOODPLAIN\FLOODWAY ANALYSIS.
                 Q = Q AT CP335       (=4906 CFS). REVISED Q = 3191 CFS

                 DIVIDED FLOW OCCURS FOR THE NEXT TWO UPSTREAM CROSS-SECTIONS,
                 HOWEVER,THESE FLOWS ARE EFFECTIVE DUE TO UPSTREM INFLOW AT
                 X1= 2.883

     2.680      4.30    949.50       .00    949.13    949.67       .17       .00       .00    947.30
    3200.0      80.7    1965.6    1153.7      63.0     481.8     704.9        .0        .0    945.60
       .00      1.28      4.08      1.64      .045      .030      .070      .000    945.20   9850.00
   .001124      735.      760.      725.         0         0         0       .00    400.00  10250.00

 *SECNO 2.771

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

 3470 ENCROACHMENT STATIONS=     9917.9   10211.9  TYPE=      1  TARGET=      294.000
     2.771      3.18    950.48       .00    949.96    950.98       .50      1.21       .10    949.40
    3200.0     167.7     761.0    2271.3      56.8      84.9     537.7      10.6       3.8    948.20
       .03      2.95      8.96      4.22      .045      .030      .070      .000    947.30   9917.92
   .010090      480.      480.      480.         3         0         0       .00    294.00  10211.92

 *SECNO 2.883

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

 3470 ENCROACHMENT STATIONS=     9853.0   10130.0  TYPE=      1  TARGET=      277.000
     2.883      4.70    953.20       .00    952.37    953.42       .22      2.41       .03    950.20
    3200.0    1535.9     669.9     994.2     444.5     116.3     423.2      21.7       7.6    950.10
       .07      3.46      5.76      2.35      .045      .030      .070      .000    948.50   9853.00
   .002241      580.      590.      580.         3         0         0       .00    277.00  10130.00

1
   29NOV00      10:27:40                                                                                    PAGE   21

     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 2.977

 3470 ENCROACHMENT STATIONS=     9875.0   10050.0  TYPE=      1  TARGET=      175.000

                 Q = Q AT CP334       (= 4915 CFS). REVISED Q = 3194 CFS

     2.977      4.49    954.39       .00    953.67    954.95       .57      1.43       .10    951.50
    3194.0    1359.4    1834.5        .0     323.0     258.7        .0      30.7      10.2 100000.00
       .09      4.21      7.09       .00      .045      .030      .000      .000    949.90   9875.00
   .003757      500.      500.      500.         3         0         0       .00    175.00  10050.00

 *SECNO 3.070

 3470 ENCROACHMENT STATIONS=     9847.4   10134.0  TYPE=      1  TARGET=      286.590
     3.070      4.10    956.40       .00    955.63    956.77       .37      1.79       .02    954.50
    3194.0     552.8    1559.6    1081.6     185.0     248.2     378.8      38.5      12.8    953.20
       .12      2.99      6.28      2.86      .045      .030      .070      .000    952.30   9847.43
   .003577      485.      490.      495.         2         0         0       .00    286.59  10134.02

 *SECNO 3.167
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3470 ENCROACHMENT STATIONS=     9788.0   10130.0  TYPE=      1  TARGET=      342.000

                Q = Q AT 1I334       (= 4432 CFS). REVISED Q = 2742 CFS

     3.167      3.97    957.87      .00    956.84    958.04       .17      1.26       .02    955.10
    2742.0    1253.1     850.4    638.5     477.4     176.1     340.0      48.9      16.4    954.90
       .17      2.62      4.83     1.88      .045      .030      .070      .000    953.90   9788.00
   .001776      475.      510.     515.         2         0         0       .00    342.00  10130.00

*SECNO 3.291

3265 DIVIDED FLOW

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

3470 ENCROACHMENT STATIONS=     9970.0   10287.4  TYPE=      1  TARGET=      317.360
1
   29NOV00      10:27:40                                                                                PAGE   22

                DIVIDED FLOW OCCURS FOR THE NEXT TWO UPSTREAM CROSS-SECTIONS,
                HOWEVER,THESE FLOWS ARE EFFECTIVE DUE TO UPSTREM INFLOW AT
                X1= 3.602

     3.291      2.86    960.06      .00    959.18    960.30       .25      2.24       .02    960.50
    2742.0        .0     260.4   2481.6        .0      45.8     656.9      61.6      21.2    960.10
       .21       .00      5.68     3.78      .000      .030      .070      .000    957.20   9983.29
   .009209      660.      655.     650.         3         0         0       .00    299.77  10287.36

*SECNO 3.376

3302 WARNING:  CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE,  KRATIO =  1.82

3470 ENCROACHMENT STATIONS=     9985.0   10291.2  TYPE=      1  TARGET=      306.170
     3.376      3.94    962.24      .00    961.21    962.36       .12      2.04       .01    961.90
    2742.0        .0     250.6   2491.4        .0      61.2     965.9      70.4      24.3    961.00
       .26       .00      4.09     2.58      .000      .030      .070      .000    958.30   9985.00
   .002772      460.      450.     440.         2         0         0       .00    306.17  10291.17

*SECNO 3.491

3470 ENCROACHMENT STATIONS=     9911.5   10234.0  TYPE=      1  TARGET=      322.570
     3.491      4.11    963.61      .00    962.60    963.74       .13      1.38       .00    961.90
    2742.0     467.9     525.2   1748.9     177.3     118.4     793.8      85.1      28.6    961.90
       .32      2.64      4.43     2.20      .045      .030      .070      .000    959.50   9911.46
   .001903      605.      605.     605.         4         0         0       .00    322.57  10234.03

CCHV=     .100 CEHV=     .300
*SECNO 3.602

3470 ENCROACHMENT STATIONS=     9880.0   10100.0  TYPE=      1  TARGET=      220.000

                CROSS-SECTION AT YUMA RD.

                Q = Q AT CP316       (= 4438 CFS). REVISED Q = 2746 CFS

     3.602      3.02    964.92      .00    964.10    965.19       .27      1.41       .04    962.00
    2746.0        .0    2746.0       .0        .0     653.2        .0      96.9      32.3 100000.00
       .36       .00      4.20      .00      .000      .040      .000      .000    961.90   9880.00
   .003107      590.      590.     590.         2         0         0       .00    220.00  10100.00

*SECNO 3.702
1
   29NOV00      10:27:40                                                                                PAGE   23

    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

3265 DIVIDED FLOW

3470 ENCROACHMENT STATIONS=     9600.0   10075.0  TYPE=      1  TARGET=      475.000

                DIVIDED FLOW OCCURS FOR THE NEXT TWO UPSTREAM CROSS-SECTIONS,
                HOWEVER,THESE FLOWS ARE EFFECTIVE DUE TO UPSTREM INFLOW AT
                X1= 4.101

     3.702      3.46    966.86      .00    966.18    967.21       .35      1.99       .02    963.90
    2746.0     840.9    1756.5    148.6     300.5     318.0      55.9     104.9      35.1    964.00
       .39      2.80      5.52     2.66      .070      .040      .070      .000    963.40   9600.00
   .004726      535.      525.     490.         2         0         0       .00    239.52  10075.00
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*SECNO 3.841

3265 DIVIDED FLOW

3470 ENCROACHMENT STATIONS=     9588.7   10070.0  TYPE=      1  TARGET=      481.340
     3.841      4.60     969.70       .00     968.67     969.88       .18      2.66       .02     967.10
    2746.0    1387.4    1358.6        .0      518.9      338.1        .0     117.8      39.3 100000.00
       .45      2.67      4.02       .00       .070       .040      .000      .000    965.10    9588.66
   .002855      735.      735.      735.          2          0         0       .00    262.18   10070.00

*SECNO 3.978

3470 ENCROACHMENT STATIONS=     9700.0   10095.0  TYPE=      1  TARGET=      395.000
     3.978      4.70     971.60       .00     970.71     971.82       .22      1.93       .01     969.00
    2746.0     509.3    2236.7        .0      333.9      549.5        .0     132.3      44.8 100000.00
       .51      1.53      4.07       .00       .070       .040      .000      .000    966.90    9700.00
   .002477      725.      725.      725.          3          0         0       .00    395.00   10095.00

*SECNO 4.101

3470 ENCROACHMENT STATIONS=     9852.5   10091.3  TYPE=      1  TARGET=      238.890
     4.101      4.78     973.48       .00     972.63     973.75       .27      1.91       .02     971.00
    2746.0     880.7    1804.2      61.2      331.3      378.6      29.4     144.4      49.5     970.90
       .55      2.66      4.77      2.08       .070       .040      .070      .000    968.70    9852.45
   .003557      650.      650.      650.          2          0         0       .00    238.89   10091.34
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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 4.237

3470 ENCROACHMENT STATIONS=     9869.1   10075.0  TYPE=      1  TARGET=      205.940
     4.237      4.20     975.50       .00     974.47     975.74       .24      1.99       .00     972.60
    2746.0     482.4    2263.6        .0      218.3      535.4        .0     156.6      53.2 100000.00
       .61      2.21      4.23       .00       .070       .040      .000      .000    971.30    9869.06
   .002239      715.      715.      715.          2          0         0       .00    205.94   10075.00

*SECNO 4.356

3470 ENCROACHMENT STATIONS=     9852.4   10070.0  TYPE=      1  TARGET=      217.570
     4.356      4.31     976.91       .00     975.86     977.13       .22      1.38       .00     973.50
    2746.0     796.9    1949.1        .0      352.0      466.2        .0     168.0      56.2 100000.00
       .65      2.26      4.18       .00       .070       .040      .000      .000    972.60    9852.43
   .002155      630.      630.      630.          2          0         0       .00    217.57   10070.00

*SECNO 4.496

3470 ENCROACHMENT STATIONS=     9957.7   10131.7  TYPE=      1  TARGET=      173.970
     4.496      4.13     978.53       .00     977.52     978.82       .29      1.67       .02     975.20
    2746.0     124.3    2615.1       6.6       59.7      592.1       5.9     180.5      59.6     975.00
       .70      2.08      4.42      1.12       .070       .040      .070      .000    974.40    9957.70
   .002367      740.      740.      740.          0          0         0       .00    173.97   10131.67

*SECNO 4.625

3470 ENCROACHMENT STATIONS=     9835.0   10095.0  TYPE=      1  TARGET=      260.000

                CROSS-SECTION AT VAN BUREN ST.
                Q = Q AT CP298        (= 4446 CFS). REVISED Q = 2754 CFS
     4.625      2.53     980.63       .00     980.10     980.92       .29      2.10       .00     978.30
    2754.0        .0    2754.0        .0         .0      636.9        .0     190.6      63.0 100000.00
       .75       .00      4.32       .00       .000       .040      .000      .000    978.10    9835.00
   .004203      680.      680.      680.          3          0         0       .00    260.00   10095.00

*SECNO 4.634

3302 WARNING:  CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE,  KRATIO =  3.26
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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
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3470 ENCROACHMENT STATIONS=     9862.0   10138.0  TYPE=      1  TARGET=      276.000

                Begin Marwest Property Channelization and Fill

     4.634      4.76    980.91       .00    980.54    980.99       .08       .05       .02   1031.15
    2754.0        .0    2754.0        .0        .0    1213.7        .0     191.7      63.3 100000.00
       .75       .00      2.27       .00      .000      .035      .000      .000    976.15   9862.96
   .000395       50.       50.       50.         2         0         0       .00    274.07  10137.04

*SECNO 4.670

3470 ENCROACHMENT STATIONS=     9869.0   10131.0  TYPE=      1  TARGET=      262.000
     4.670      4.58    980.98       .00    980.63    981.08       .10       .08       .01   1031.40
    2754.0        .0    2754.0        .0        .0    1100.6        .0     196.6      64.4 100000.00
       .77       .00      2.50       .00      .000      .035      .000      .000    976.40   9870.68
   .000507      185.      185.      185.         2         0         0       .00    258.64  10129.32

*SECNO 4.752

3470 ENCROACHMENT STATIONS=     9869.0   10131.0  TYPE=      1  TARGET=      262.000
     4.752      3.76    981.24       .00    980.98    981.38       .14       .29       .01   1031.48
    2754.0        .0    2754.0        .0        .0     922.1        .0     206.8      67.0 100000.00
       .81       .00      2.99       .00      .000      .035      .000      .000    977.48   9869.95
   .000920      438.      438.      438.         2         0         0       .00    260.10  10130.05

*SECNO 4.820

3470 ENCROACHMENT STATIONS=     9869.0   10131.0  TYPE=      1  TARGET=      262.000
     4.820      3.51    981.60       .00    981.42    981.76       .16       .37       .01   1032.09
    2754.0        .0    2754.0        .0        .0     850.5        .0     214.1      69.1 100000.00
       .84       .00      3.24       .00      .000      .035      .000      .000    978.09   9870.98
   .001174      357.      357.      357.         2         0         0       .00    255.24  10126.22

*SECNO 4.840

3470 ENCROACHMENT STATIONS=     9835.0   10165.0  TYPE=      1  TARGET=      330.000
     4.840      3.45    981.76       .00    981.61    981.86       .10       .09       .01   1032.31
    2754.0        .0    2754.0        .0        .0    1074.9        .0     216.3      69.8 100000.00
       .85       .00      2.56       .00      .000      .035      .000      .000    978.31   9837.21
   .000743      103.      103.      103.         2         0         0       .00    325.58  10162.79
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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 4.855

3470 ENCROACHMENT STATIONS=     9680.0   10177.0  TYPE=      1  TARGET=      497.000
     4.855      3.31    981.88       .00    981.75    981.95       .06       .08       .00   1035.54
    2754.0        .0    2754.0        .0        .0    1350.0        .0     219.8      71.0 100000.00
       .87       .00      2.04       .00      .000      .035      .000      .000    978.57   9690.51
   .000593      126.      126.      126.         0         0         0       .00    485.94  10176.45

*SECNO 4.858

3301 HV CHANGED MORE THAN HVINS

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

3470 ENCROACHMENT STATIONS=     9850.0   10150.0  TYPE=      1  TARGET=      300.000

                End Marwest Property

     4.858      1.70    981.70    981.70    981.54    982.38       .69       .03       .19 100000.00
    2754.0        .0    2754.0        .0        .0     413.6        .0     220.1      71.1 100000.00
       .87       .00      6.66       .00      .000      .040      .000      .000    980.00   9850.00
   .021144       15.       15.       15.        20         8         0       .00    300.00  10150.00

*SECNO 5.009

3302 WARNING:  CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE,  KRATIO =  3.22

3470 ENCROACHMENT STATIONS=     9875.0   10105.0  TYPE=      1  TARGET=      230.000
     5.009      4.11    986.01       .00    985.15    986.22       .21      3.79       .05    983.70
    2754.0     453.3    2273.5      27.2     212.3     583.2      17.5     231.4      75.9    982.50
       .93      2.14      3.90      1.56      .070      .040      .070      .000    981.90   9875.00
   .002046      800.      795.      840.         5         0         0       .00    230.00  10105.00
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*SECNO 5.153

3470 ENCROACHMENT STATIONS=     9865.0   10090.0  TYPE=      1  TARGET=      225.000
     5.153      3.73    988.03       .00    987.07    988.34       .31      2.09       .03    985.60
    2754.0     545.0    2209.0       .0     218.4     455.1        .0     244.5      80.0 100000.00
       .98      2.50      4.85       .00      .070      .040      .000      .000    984.30   9865.00
   .003804      775.      765.      730.         5         0         0       .00    225.00  10090.00


1
   29NOV00      10:27:40                                                                          PAGE   27

    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 5.282

3302 WARNING:  CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE,  KRATIO =  1.67

3470 ENCROACHMENT STATIONS=     9757.5   10055.0  TYPE=      1  TARGET=      297.450
     5.282      4.21    989.71       .00    988.69    989.82       .11      1.46       .02    987.00
    2754.0    1358.4    1395.6       .0     716.7     423.4        .0     258.7      84.1 100000.00
      1.06      1.90      3.30       .00      .070      .040      .000      .000    985.50   9757.55
   .001364      690.      680.      665.         2         0         0       .00    297.45  10055.00

CCHV=     .300 CEHV=     .500
*SECNO 5.430

3302 WARNING:  CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE,  KRATIO =   .62

3470 ENCROACHMENT STATIONS=     9899.9   10100.1  TYPE=      1  TARGET=      200.199

3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA=       996.00 ELREA=       996.00

                A 7-SPAN BRIDGE AT I-10

     5.430      3.12    991.12       .00    990.42    991.55       .43      1.57       .16    997.00
    2754.0        .0    2754.0       .0        .0     525.1        .0     272.8      88.1 100000.00
      1.10       .00      5.24       .00      .000      .035      .000      .000    988.00   9912.47
   .003566      680.      780.      820.         2         0         0       .00    175.07  10087.53


SPECIAL BRIDGE

SB  XK        XKOR      COFQ      RDLEN     BWC       BWP       BAREA     SS        ELCHU     ELCHD
     1.05      1.60      2.60       .00    162.00      6.00   1203.00      2.00    988.00    988.00

*SECNO 5.460

3302 WARNING:  CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE,  KRATIO =  1.52

CLASS A LOW FLOW

1
   29NOV00      10:27:40                                                                          PAGE   28

    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

3420 BRIDGE W.S.=     991.00 BRIDGE VELOCITY=       7.27     CALCULATED CHANNEL AREA=       487.

 EGPRS      EGLWC      H3       QWEIR      QLOW      BAREA   TRAPEZOID      ELLC      ELTRD     WEIRLN
                                                              AREA
       .00    992.42      .06        0.     3538.     1203.     1190.     995.00    997.00        0.


3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA=       997.00 ELREA=       997.00

                Q = Q AT CP287       (= 5319 CFS). REVISED Q = 3538 CFS

     5.460      4.00    992.00       .00    991.00    992.42       .42       .87       .00    997.00
    3538.0        .0    3538.0       .0        .0     681.3        .0     275.0      88.7    997.00
      1.10       .00      5.19       .00      .000      .035      .000      .000    988.00   9910.62
   .002547      160.      160.      160.         0         0         0       .00    178.77  10089.38

CCHV=     .300 CEHV=     .500
*SECNO 5.563
```

```
3302 WARNING:  CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE,  KRATIO =  1.83

3470 ENCROACHMENT STATIONS=     9850.0   10232.3  TYPE=      1  TARGET=      382.270
     5.563      4.61    993.11       .00    992.61    993.20       .09       .69       .10    989.50
    3538.0       .0    2794.1     743.9        .0    1054.9     519.8     289.0      92.2    988.90
      1.17      .00      2.65      1.43      .000      .040      .070      .000    988.50   9850.00
   .000760     540.      540.      535.         2         0         0       .00    382.27  10232.27

CCHV=     .100 CEHV=     .300
*SECNO 5.727

3302 WARNING:  CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE,  KRATIO =   .29

3470 ENCROACHMENT STATIONS=     9935.0   10135.0  TYPE=      1  TARGET=      200.000

                CROSS-SECTION AT 280 FEET(ALONG FLOW PATH) NORTH OF MCDOWELL RD.

                Q = Q AT CP286        (= 4662 CFS). REVISED Q = 3400 CFS
1
   29NOV00      10:27:40                                                                          PAGE   29


                DIVIDED FLOW OCCURS FOR THE NEXT TWO UPSTREAM CROSS-SECTIONS,
                HOWEVER,THESE FLOWS ARE EFFECTIVE DUE TO UPSTREM INFLOW AT
                X1= 5.960

     5.727      3.30    994.30       .00    993.54    994.85       .54      1.51       .14    992.00
    3400.0       .0    3400.0        .0        .0     574.6        .0     310.2      98.0 100000.00
      1.21      .00      5.92       .00      .000      .045      .000      .000    991.00   9935.00
   .008113     870.      870.      835.         2         0         0       .00    200.00  10135.00

*SECNO 5.840

3302 WARNING:  CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE,  KRATIO =  1.80

3470 ENCROACHMENT STATIONS=     9953.7   10240.4  TYPE=      1  TARGET=      286.740
     5.840      3.74    997.14       .00    996.30    997.35       .20      2.47       .03    994.00
    3400.0      79.1    2770.7     550.3      42.5     715.2     237.1     320.9     101.3    993.70
      1.25      1.86      3.87      2.32      .070      .045      .070      .000    993.40   9953.67
   .002516     590.      595.      580.         2         0         0       .00    286.74  10240.41

*SECNO 5.960

3470 ENCROACHMENT STATIONS=     9960.0   10274.1  TYPE=      1  TARGET=      314.080
     5.960      3.19    999.09       .00    998.09    999.32       .23      1.97       .01    997.30
    3400.0       .0    2361.1    1038.9        .0     556.0     375.6     334.8     105.6    996.20
      1.30      .00      4.25      2.77      .000      .045      .070      .000    995.90   9960.00
   .004002     640.      635.      610.         3         0         0       .00    314.08  10274.08

*SECNO 6.086

3470 ENCROACHMENT STATIONS=     9900.0   10206.3  TYPE=      1  TARGET=      306.340
     6.086      3.49   1001.79       .00   1000.79   1002.05       .26      2.72       .01    999.20
    3400.0       .0    2687.1     712.9        .0     608.8     279.4     348.8     110.4    999.20
      1.35      .00      4.41      2.55      .000      .045      .070      .000    998.30   9900.00
   .004121     655.      665.      685.         3         0         0       .00    306.34  10206.34

*SECNO 6.217

3302 WARNING:  CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE,  KRATIO =  1.61

3470 ENCROACHMENT STATIONS=     9850.0   10270.0  TYPE=      1  TARGET=      420.000
     6.217      3.56   1003.66       .00   1002.61   1003.76       .11      1.69       .02   1000.30
    3400.0     299.9    2081.9    1018.3     166.1     691.8     554.3     367.4     116.3   1000.30
      1.42      1.80      3.01      1.84      .070      .045      .070      .000   1000.10   9850.00
   .001587     620.      690.      745.         3         0         0       .00    420.00  10270.00

1
   29NOV00      10:27:40                                                                          PAGE   30

    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 6.320

3470 ENCROACHMENT STATIONS=     9900.0   10279.3  TYPE=      1  TARGET=      379.300
     6.320      3.69   1004.59       .00   1003.60   1004.73       .14       .96       .01   1001.30
    3400.0       .0    2319.6    1080.4        .0     693.9     547.4     383.8     121.2   1001.40
      1.47      .00      3.34      1.97      .000      .045      .070      .000   1000.90   9900.00
   .001994     580.      545.      525.         3         0         0       .00    379.30  10279.30
```

THIS RUN EXECUTED 29NOV00 10:27:41

****
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

BULLARD WASH LOMR -

SUMMARY PRINTOUT

	SECNO	Q	CWSEL	SSTA	STCHL	STCHR	ENDST	DIFWSX	TOPWID	DEPTH	ELMIN	10*KS	VCH
	2.680	3200.00	949.13	9565.90	9925.00	10050.00	10774.05	.00	1135.57	3.93	945.20	8.22	3.26
	2.680	3200.00	949.50	9850.00	9925.00	10050.00	10250.00	.00	400.00	4.30	945.20	11.24	4.08
*	2.771	3200.00	949.96	9663.39	9985.00	10020.00	10498.67	.83	807.62	2.66	947.30	91.54	7.25
*	2.771	3200.00	950.48	9917.92	9985.00	10020.00	10211.92	.98	294.00	3.18	947.30	100.90	8.96
*	2.883	3200.00	952.37	9620.09	9985.00	10015.00	10425.76	2.41	805.66	3.87	948.50	21.59	4.83
*	2.883	3200.00	953.20	9853.00	9985.00	10015.00	10130.00	2.72	277.00	4.70	948.50	22.41	5.76
*	2.977	3194.00	953.67	9688.42	9980.00	10050.00	10404.32	1.30	715.89	3.77	949.90	43.99	6.78
	2.977	3194.00	954.39	9875.00	9980.00	10050.00	10050.00	1.19	175.00	4.49	949.90	37.57	7.09
	3.070	3194.00	955.63	9531.39	9945.00	10025.00	10570.83	1.96	1039.44	3.33	952.30	27.11	4.52
	3.070	3194.00	956.40	9847.43	9945.00	10025.00	10134.02	2.01	286.59	4.10	952.30	35.77	6.28
	3.167	2742.00	956.84	9575.14	9970.00	10020.00	10570.29	1.21	995.15	2.94	953.90	20.20	4.10
	3.167	2742.00	957.87	9788.00	9970.00	10020.00	10130.00	1.47	342.00	3.97	953.90	17.76	4.83
*	3.291	2742.00	959.18	9989.15	9970.00	10020.00	10822.75	2.33	813.21	1.98	957.20	80.74	4.51
*	3.291	2742.00	960.06	9983.29	9970.00	10020.00	10287.36	2.19	299.77	2.86	957.20	92.09	5.68
*	3.376	2742.00	961.21	9772.70	9985.00	10015.00	10795.23	2.03	976.82	2.91	958.30	28.60	2.93
*	3.376	2742.00	962.24	9985.00	9985.00	10015.00	10291.17	2.18	306.17	3.94	958.30	27.72	4.09
	3.491	2742.00	962.60	9628.07	9980.00	10020.00	10599.29	1.40	971.22	3.10	959.50	19.00	3.36
	3.491	2742.00	963.61	9911.46	9980.00	10020.00	10234.03	1.37	322.57	4.11	959.50	19.03	4.43
*	3.602	2746.00	964.10	9742.07	9880.00	10100.00	10454.51	1.49	712.44	2.20	961.90	40.58	3.95
	3.602	2746.00	964.92	9880.00	9880.00	10100.00	10100.00	1.31	220.00	3.02	961.90	31.07	4.20
	3.702	2746.00	966.18	9297.71	9955.00	10055.00	10395.06	2.08	851.19	2.78	963.40	37.69	4.20
	3.702	2746.00	966.86	9600.00	9955.00	10055.00	10075.00	1.94	239.52	3.46	963.40	47.26	5.52

	SECNO	Q	CWSEL	SSTA	STCHL	STCHR	ENDST	DIFWSX	TOPWID	DEPTH	ELMIN	10*KS	VCH
	3.841	2746.00	968.67	9229.63	9955.00	10070.00	10338.91	2.49	881.54	3.57	965.10	29.15	3.09
	3.841	2746.00	969.70	9588.66	9955.00	10070.00	10070.00	2.84	262.18	4.60	965.10	28.55	4.02
	3.978	2746.00	970.71	9279.88	9930.00	10095.00	10376.46	2.04	1096.58	3.81	966.90	27.96	3.56
	3.978	2746.00	971.60	9700.00	9930.00	10095.00	10095.00	1.90	395.00	4.70	966.90	24.77	4.07
	4.101	2746.00	972.63	9450.68	9960.00	10080.00	10450.15	1.92	999.47	3.93	968.70	30.32	3.57
	4.101	2746.00	973.48	9852.45	9960.00	10080.00	10091.34	1.88	238.89	4.78	968.70	35.57	4.77
	4.237	2746.00	974.47	9500.62	9935.00	10075.00	10323.19	1.84	822.57	3.17	971.30	22.35	3.49
	4.237	2746.00	975.50	9869.06	9935.00	10075.00	10075.00	2.02	205.94	4.20	971.30	22.39	4.23
	4.356	2746.00	975.86	9538.80	9950.00	10070.00	10345.85	1.40	807.05	3.26	972.60	21.67	3.47
	4.356	2746.00	976.91	9852.43	9950.00	10070.00	10070.00	1.41	217.57	4.31	972.60	21.55	4.18
	4.496	2746.00	977.52	9692.35	9975.00	10130.00	10385.67	1.66	693.32	3.12	974.40	23.85	3.61
	4.496	2746.00	978.53	9957.70	9975.00	10130.00	10131.67	1.62	173.97	4.13	974.40	23.67	4.42
*	4.625	2754.00	980.10	9639.07	9835.00	10095.00	10352.38	2.58	713.30	2.00	978.10	86.33	5.35
	4.625	2754.00	980.63	9835.00	9835.00	10095.00	10095.00	2.10	260.00	2.53	978.10	42.03	4.32
*	4.634	2754.00	980.54	9864.44	9862.00	10138.00	10135.56	.44	271.11	4.39	976.15	5.20	2.47
*	4.634	2754.00	980.91	9862.96	9862.00	10138.00	10137.04	.28	274.07	4.76	976.15	3.95	2.27
	4.670	2754.00	980.63	9872.09	9869.00	10131.00	10127.91	.09	255.83	4.23	976.40	6.64	2.73
	4.670	2754.00	980.98	9870.68	9869.00	10131.00	10129.32	.07	258.64	4.58	976.40	5.07	2.50
	4.752	2754.00	980.98	9871.00	9869.00	10131.00	10129.00	.35	258.00	3.50	977.48	11.75	3.23
	4.752	2754.00	981.24	9869.95	9869.00	10131.00	10130.05	.26	260.10	3.76	977.48	9.20	2.99

Reset as starting conditions in the HEC-RAS Analysis

	4.820	2754.00	981.42	9871.67	9869.00	10131.00	10125.66	.44	253.99	3.33	978.09	13.94	3.42
	4.820	2754.00	981.60	9870.98	9869.00	10131.00	10126.22	.35	255.24	3.51	978.09	11.74	3.24
	4.840	2754.00	981.61	9837.80	9835.00	10165.00	10162.20	.19	324.40	3.30	978.31	8.61	2.68
	4.840	2754.00	981.76	9837.21	9835.00	10165.00	10162.79	.16	325.58	3.45	978.31	7.43	2.56
	4.855	2754.00	981.75	9690.87	9680.00	10177.00	10176.34	.14	485.47	3.18	978.57	6.92	2.14
	4.855	2754.00	981.88	9690.51	9680.00	10177.00	10176.45	.12	485.94	3.31	978.57	5.93	2.04
*	4.858	2754.00	981.54	9773.13	9705.00	10290.00	10280.76	-.22	507.63	1.54	980.00	185.72	5.20
	4.858	2754.00	981.70	9850.00	9705.00	10290.00	10150.00	-.19	300.00	1.70	980.00	211.44	6.66
*	5.009	2754.00	985.15	9634.35	9935.00	10100.00	10370.81	3.61	736.47	3.25	981.90	17.26	2.97
	5.009	2754.00	986.01	9875.00	9935.00	10100.00	10105.00	4.32	230.00	4.11	981.90	20.46	3.90
	5.153	2754.00	987.07	9556.74	9945.00	10090.00	10286.75	1.92	730.01	2.77	984.30	42.34	4.07
	5.153	2754.00	988.03	9865.00	9945.00	10090.00	10090.00	2.01	225.00	3.73	984.30	38.04	4.85
*	5.282	2754.00	988.69	9323.66	9945.00	10055.00	10355.02	1.62	1031.37	3.19	985.50	13.53	2.74
*	5.282	2754.00	989.71	9757.55	9945.00	10055.00	10055.00	1.68	297.45	4.21	985.50	13.64	3.30

	SECNO	Q	CWSEL	SSTA	STCHL	STCHR	ENDST	DIFWSX	TOPWID	DEPTH	ELMIN	10*KS	VCH
*	5.430	2754.00	990.42	9913.92	9899.90	10100.10	10086.08	1.74	172.17	2.42	988.00	82.61	6.80
*	5.430	2754.00	991.12	9912.47	9899.90	10100.10	10087.53	1.42	175.07	3.12	988.00	35.66	5.24
*	5.460	3538.00	991.00	9912.71	9899.90	10100.10	10087.29	.57	174.57	3.00	988.00	66.92	7.01
*	5.460	3538.00	992.00	9910.62	9899.90	10100.10	10089.38	.88	178.77	4.00	988.00	25.47	5.19
*	5.563	3538.00	992.61	9351.43	9850.00	10100.00	10736.62	1.62	1385.19	4.11	988.50	5.08	2.02
*	5.563	3538.00	993.11	9850.00	9850.00	10100.00	10232.27	1.11	382.27	4.61	988.50	7.60	2.65
*	5.727	3400.00	993.54	9375.53	9935.00	10135.00	10467.83	.92	933.49	2.54	991.00	108.18	5.65
*	5.727	3400.00	994.30	9935.00	9935.00	10135.00	10135.00	1.20	200.00	3.30	991.00	81.13	5.92
*	5.840	3400.00	996.30	9353.26	9970.00	10170.00	10715.71	2.77	1293.70	2.90	993.40	21.83	3.01
*	5.840	3400.00	997.14	9953.67	9970.00	10170.00	10240.41	2.84	286.74	3.74	993.40	25.16	3.87
	5.960	3400.00	998.09	9735.32	9960.00	10150.00	10948.05	1.79	1212.73	2.19	995.90	39.62	3.21
	5.960	3400.00	999.09	9960.00	9960.00	10150.00	10274.08	1.95	314.08	3.19	995.90	40.02	4.25
	6.086	3400.00	1000.79	9475.24	9900.00	10100.00	10827.24	2.70	1352.00	2.49	998.30	40.60	3.39
	6.086	3400.00	1001.79	9900.00	9900.00	10100.00	10206.34	2.70	306.34	3.49	998.30	41.21	4.41
*	6.217	3400.00	1002.61	9445.54	9900.00	10100.00	10837.21	1.82	1391.67	2.51	1000.10	17.17	2.46
*	6.217	3400.00	1003.66	9850.00	9900.00	10100.00	10270.00	1.86	420.00	3.56	1000.10	15.87	3.01
	6.320	3400.00	1003.60	9582.91	9900.00	10100.00	10928.10	.99	1345.19	2.70	1000.90	19.52	2.67
	6.320	3400.00	1004.59	9900.00	9900.00	10100.00	10279.30	.94	379.30	3.69	1000.90	19.94	3.34

BULLARD WASH LOMR -

SUMMARY PRINTOUT TABLE 110

	SECNO	CWSEL	DIFKWS	EG	TOPWID	QLOB	QCH	QROB	PERENC	STENCL	STCHL	STCHR	STENCR
	2.680	949.13	.00	949.21	1135.57	351.55	1421.01	1427.43	.00	.00	9925.00	10050.00	.00
	2.680	949.50	.37	949.67	400.00	80.66	1965.65	1153.69	400.00	9850.00	9925.00	10050.00	10250.00
*	2.771	949.96	.00	950.19	807.62	629.98	482.08	2087.95	.00	.00	9985.00	10020.00	.00
*	2.771	950.48	.53	950.98	294.00	167.73	761.01	2271.26	294.00	9917.92	9985.00	10020.00	10211.92
*	2.883	952.37	.00	952.48	805.66	1574.81	442.20	1182.99	.00	.00	9985.00	10015.00	.00
*	2.883	953.20	.83	953.42	277.00	1535.90	669.87	994.23	277.00	9853.00	9985.00	10015.00	10130.00
*	2.977	953.67	.00	954.06	715.89	1451.12	1411.19	331.70	.00	.00	9980.00	10050.00	.00
	2.977	954.39	.72	954.95	175.00	1359.45	1834.55	.00	175.00	9875.00	9980.00	10050.00	10050.00
	3.070	955.63	.00	955.75	1039.44	926.41	844.94	1422.65	.00	.00	9945.00	10025.00	.00
	3.070	956.40	.77	956.77	286.59	552.79	1559.61	1081.60	286.59	9847.43	9945.00	10025.00	10134.02
	3.167	956.84	.00	956.93	995.15	1230.70	512.96	998.34	.00	.00	9970.00	10020.00	.00
	3.167	957.87	1.03	958.04	342.00	1253.09	850.45	638.46	342.00	9788.00	9970.00	10020.00	10130.00
*	3.291	959.18	.00	959.28	813.21	.00	101.69	2640.31	.00	.00	9970.00	10020.00	.00
*	3.291	960.06	.88	960.30	299.77	.00	260.41	2481.59	317.36	9970.00	9970.00	10020.00	10287.36
*	3.376	961.21	.00	961.26	976.82	53.16	92.20	2596.64	.00	.00	9985.00	10015.00	.00
*	3.376	962.24	1.03	962.36	306.17	.00	250.62	2491.38	306.17	9985.00	9985.00	10015.00	10291.17
	3.491	962.60	.00	962.66	971.22	780.94	263.43	1697.63	.00	.00	9980.00	10020.00	.00
	3.491	963.61	1.01	963.74	322.57	467.92	525.17	1748.92	322.57	9911.46	9980.00	10020.00	10234.03
*	3.602	964.10	.00	964.28	712.44	207.91	1872.87	665.22	.00	.00	9880.00	10100.00	.00
	3.602	964.92	.82	965.19	220.00	.00	2746.00	.00	220.00	9880.00	9880.00	10100.00	10100.00

3.702	966.18	.00	966.31	851.19	1162.91	1047.03	536.05	.00	.00	9955.00	10055.00	.00
3.702	966.86	.68	967.21	239.52	840.92	1756.51	148.57	475.00	9600.00	9955.00	10055.00	10075.00
3.841	968.67	.00	968.75	881.54	1827.07	678.60	240.33	.00	.00	9955.00	10070.00	.00
3.841	969.70	1.03	969.88	262.18	1387.42	1358.58	.00	481.34	9588.66	9955.00	10070.00	10070.00
3.978	970.71	.00	970.83	1096.58	839.44	1433.31	473.25	.00	.00	9930.00	10095.00	.00
3.978	971.60	.89	971.82	395.00	509.30	2236.70	.00	395.00	9700.00	9930.00	10095.00	10095.00
4.101	972.63	.00	972.72	999.47	1074.12	986.48	685.40	.00	.00	9960.00	10080.00	.00
4.101	973.48	.85	973.75	238.89	880.65	1804.17	61.17	238.89	9852.45	9960.00	10080.00	10091.34
4.237	974.47	.00	974.58	822.57	962.69	1368.27	415.04	.00	.00	9935.00	10075.00	.00
4.237	975.50	1.03	975.74	205.94	482.42	2263.58	.00	205.94	9869.06	9935.00	10075.00	10075.00
4.356	975.86	.00	975.96	807.05	1092.40	1182.59	471.00	.00	.00	9950.00	10070.00	.00
4.356	976.91	1.05	977.13	217.57	796.94	1949.06	.00	217.57	9852.43	9950.00	10070.00	10070.00

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	SECNO	CWSEL	DIFKWS	EG	TOPWID	QLOB	QCH	QROB	PERENC	STENCL	STCHL	STCHR	STENCR
	4.496	977.52	.00	977.65	693.32	611.19	1573.83	560.97	.00	.00	9975.00	10130.00	.00
	4.496	978.53	1.01	978.82	173.97	124.29	2615.09	6.62	173.97	9957.70	9975.00	10130.00	10131.67
*	4.625	980.10	.00	980.53	713.30	25.60	2679.33	49.07	.00	.00	9835.00	10095.00	.00
	4.625	980.63	.53	980.92	260.00	.00	2754.00	.00	260.00	9835.00	9835.00	10095.00	10095.00
*	4.634	980.54	.00	980.63	271.11	.00	2754.00	.00	.00	.00	9862.00	10138.00	.00
*	4.634	980.91	.37	980.99	274.07	.00	2754.00	.00	276.00	9862.00	9862.00	10138.00	10138.00
	4.670	980.63	.00	980.75	255.83	.00	2754.00	.00	.00	.00	9869.00	10131.00	.00
	4.670	980.98	.35	981.08	258.64	.00	2754.00	.00	262.00	9869.00	9869.00	10131.00	10131.00
	4.752	980.98	.00	981.14	258.00	.00	2754.00	.00	.00	.00	9869.00	10131.00	.00
	4.752	981.24	.26	981.38	260.10	.00	2754.00	.00	262.00	9869.00	9869.00	10131.00	10131.00
	4.820	981.42	.00	981.60	253.99	.00	2754.00	.00	.00	.00	9869.00	10131.00	.00
	4.820	981.60	.17	981.76	255.24	.00	2754.00	.00	262.00	9869.00	9869.00	10131.00	10131.00
	4.840	981.61	.00	981.72	324.40	.00	2754.00	.00	.00	.00	9835.00	10165.00	.00
	4.840	981.76	.15	981.86	325.58	.00	2754.00	.00	330.00	9835.00	9835.00	10165.00	10165.00
	4.855	981.75	.00	981.82	485.47	.00	2754.00	.00	.00	.00	9680.00	10177.00	.00
	4.855	981.88	.13	981.95	485.94	.00	2754.00	.00	497.00	9680.00	9680.00	10177.00	10177.00
*	4.858	981.54	.00	981.96	507.63	.00	2754.00	.00	.00	.00	9705.00	10290.00	.00
*	4.858	981.70	.16	982.38	300.00	.00	2754.00	.00	300.00	9850.00	9705.00	10290.00	10150.00
*	5.009	985.15	.00	985.23	736.47	975.35	1305.30	473.35	.00	.00	9935.00	10100.00	.00
*	5.009	986.01	.86	986.22	230.00	453.30	2273.48	27.22	230.00	9875.00	9935.00	10100.00	10105.00
*	5.153	987.07	.00	987.22	730.01	1270.18	1286.45	197.37	.00	.00	9945.00	10090.00	.00
	5.153	988.03	.96	988.34	225.00	544.99	2209.01	.00	225.00	9865.00	9945.00	10090.00	10090.00
*	5.282	988.69	.00	988.74	1031.37	1551.15	857.01	345.84	.00	.00	9945.00	10055.00	.00
*	5.282	989.71	1.02	989.82	297.45	1358.44	1395.56	.00	297.45	9757.55	9945.00	10055.00	10055.00
*	5.430	990.42	.00	991.14	172.17	.00	2754.00	.00	.00	.00	9899.90	10100.10	.00
*	5.430	991.12	.70	991.55	175.07	.00	2754.00	.00	200.20	9899.90	9899.90	10100.10	10100.10
*	5.460	991.00	.00	991.76	174.57	.00	3538.00	.00	.00	.00	9899.90	10100.10	.00
*	5.460	992.00	1.00	992.42	178.77	.00	3538.00	.00	.00	.00	9899.90	10100.10	.00
*	5.563	992.61	.00	992.65	1385.19	464.76	1882.65	1190.59	.00	.00	9850.00	10100.00	.00
*	5.563	993.11	.49	993.20	382.27	.00	2794.09	743.91	382.27	9850.00	9850.00	10100.00	10232.27
*	5.727	993.54	.00	993.90	933.49	337.36	2386.34	676.30	.00	.00	9935.00	10135.00	.00
*	5.727	994.30	.77	994.85	200.00	.00	3400.00	.00	200.00	9935.00	9935.00	10135.00	10135.00
*	5.840	996.30	.00	996.39	1293.70	700.60	1644.53	1054.87	.00	.00	9970.00	10170.00	.00
*	5.840	997.14	.84	997.35	286.74	79.10	2770.65	550.25	286.74	9953.67	9970.00	10170.00	10240.41

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SECNO	CWSEL	DIFKWS	EG	TOPWID	QLOB	QCH	QROB	PERENC	STENCL	STCHL	STCHR	STENCR
5.960	998.09	.00	998.18	1212.73	145.33	1175.10	2079.57	.00	.00	9960.00	10150.00	.00
5.960	999.09	1.00	999.32	314.08	.00	2361.11	1038.89	314.08	9960.00	9960.00	10150.00	10274.08
6.086	1000.79	.00	1000.89	1352.00	476.98	1385.72	1537.30	.00	.00	9900.00	10100.00	.00
6.086	1001.79	1.00	1002.05	306.34	.00	2687.06	712.94	306.34	9900.00	9900.00	10100.00	10206.34
* 6.217	1002.61	.00	1002.66	1391.67	814.38	1187.59	1398.03	.00	.00	9900.00	10100.00	.00
* 6.217	1003.66	1.05	1003.76	420.00	299.86	2081.88	1018.26	420.00	9850.00	9900.00	10100.00	10270.00
6.320	1003.60	.00	1003.66	1345.19	699.47	1322.46	1378.07	.00	.00	9900.00	10100.00	.00
6.320	1004.59	.99	1004.73	379.30	.00	2319.63	1080.37	379.30	9900.00	9900.00	10100.00	10279.30

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SUMMARY OF ERRORS AND SPECIAL NOTES

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WARNING SECNO=      2.771  PROFILE=  1  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
WARNING SECNO=      2.771  PROFILE=  2  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

WARNING SECNO=      2.883  PROFILE=  1  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
WARNING SECNO=      2.883  PROFILE=  2  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

WARNING SECNO=      2.977  PROFILE=  1  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

WARNING SECNO=      3.291  PROFILE=  1  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
WARNING SECNO=      3.291  PROFILE=  2  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

WARNING SECNO=      3.376  PROFILE=  1  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
WARNING SECNO=      3.376  PROFILE=  2  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

WARNING SECNO=      3.602  PROFILE=  1  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

WARNING SECNO=      4.625  PROFILE=  1  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

WARNING SECNO=      4.634  PROFILE=  1  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
WARNING SECNO=      4.634  PROFILE=  2  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

WARNING SECNO=      4.858  PROFILE=  1  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
CAUTION SECNO=      4.858  PROFILE=  2  CRITICAL DEPTH ASSUMED
CAUTION SECNO=      4.858  PROFILE=  2  PROBABLE MINIMUM SPECIFIC ENERGY
CAUTION SECNO=      4.858  PROFILE=  2  20 TRIALS ATTEMPTED TO BALANCE WSEL

WARNING SECNO=      5.009  PROFILE=  1  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
WARNING SECNO=      5.009  PROFILE=  2  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

WARNING SECNO=      5.153  PROFILE=  1  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

WARNING SECNO=      5.282  PROFILE=  1  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
WARNING SECNO=      5.282  PROFILE=  2  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

WARNING SECNO=      5.430  PROFILE=  1  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
WARNING SECNO=      5.430  PROFILE=  2  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

CAUTION SECNO=      5.460  PROFILE=  1  HYDRAULIC JUMP D.S.
WARNING SECNO=      5.460  PROFILE=  1  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
WARNING SECNO=      5.460  PROFILE=  2  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

WARNING SECNO=      5.563  PROFILE=  1  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
WARNING SECNO=      5.563  PROFILE=  2  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

WARNING SECNO=      5.727  PROFILE=  1  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
WARNING SECNO=      5.727  PROFILE=  2  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

WARNING SECNO=      5.840  PROFILE=  1  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
WARNING SECNO=      5.840  PROFILE=  2  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

WARNING SECNO=      6.217  PROFILE=  1  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE
1
   29NOV00      10:27:40                                                          PAGE   38

WARNING SECNO=      6.217  PROFILE=  2  CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

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   29NOV00      10:27:40                                                          PAGE   39
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FLOODWAY DATA, BULLARD WASH LOMR -
PROFILE NO. 2

STATION	FLOODWAY WIDTH	FLOODWAY SECTION AREA	FLOODWAY MEAN VELOCITY	WATER SURFACE ELEVATION WITH FLOODWAY	WATER SURFACE ELEVATION WITHOUT FLOODWAY	DIFFERENCE
2.680	400.	1250.	2.6	949.5	949.1	.4
2.771	294.	679.	4.7	950.5	950.0	.5
2.883	277.	984.	3.3	953.2	952.4	.8
2.977	175.	582.	5.5	954.4	953.7	.7
3.070	287.	812.	3.9	956.4	955.6	.8
3.167	342.	994.	2.8	957.8	956.8	1.0
3.291	304.	703.	3.9	960.1	959.2	.9
3.376	306.	1027.	2.7	962.2	961.2	1.0
3.491	323.	1090.	2.5	963.6	962.6	1.0
3.602	220.	653.	4.2	964.9	964.1	.8
3.702	475.	674.	4.1	966.9	966.2	.7
3.841	481.	857.	3.2	969.7	968.7	1.0
3.978	395.	883.	3.1	971.6	970.7	.9
4.101	239.	739.	3.7	973.5	972.6	.9
4.237	206.	754.	3.6	975.5	974.5	1.0
4.356	218.	818.	3.4	976.9	975.9	1.0
4.496	174.	658.	4.2	978.5	977.5	1.0

4.625	260.	637.	4.3	980.6	980.1	.5
4.634	274.	1214.	2.3	980.9	980.5	.4
4.670	259.	1101.	2.5	980.9	980.6	.3
4.752	260.	922.	3.0	981.3	981.0	.3
4.820	255.	851.	3.2	981.6	981.4	.2
4.840	326.	1075.	2.6	981.7	981.6	.1
4.855	486.	1350.	2.0	981.9	981.8	.1
4.858	300.	414.	6.7	981.7	981.5	.2
5.009	230.	813.	3.4	986.1	985.2	.9
5.153	225.	674.	4.1	988.1	987.1	1.0
5.282	297.	1140.	2.4	989.7	988.7	1.0
5.430	175.	525.	5.2	991.1	990.4	.7
5.460	179.	681.	5.2	992.0	991.0	1.0
5.563	382.	1575.	2.2	993.1	992.6	.5
5.727	200.	575.	5.9	994.3	993.5	.8
5.840	287.	995.	3.4	997.1	996.3	.8
5.960	314.	932.	3.6	999.1	998.1	1.0
6.086	306.	888.	3.8	1001.8	1000.8	1.0
6.217	420.	1412.	2.4	1003.6	1002.6	1.0
6.320	379.	1241.	2.7	1004.6	1003.6	1.0

Stantec

Project: Goodyear Planned Regional Center Project Number:

Notes: Scale:

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Computed By: Date: / / Checked By: Date: / /

HEC-RAS Data

Table 1 (GYPRCCHW3.Prj) 1/2

HEC-RAS Plan: Imported Pla River: RIVER-1 Reach: Reach-1

Reach	River Sta	Length Chnl	Q Total	Min El	W.S. Elev	Crit W.S.	Max Chl Dpth	Vel Chnl	Sta W.S. Lft	Sta W.S. Rgt	Top Width
		(ft)	(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/s)	(ft)	(ft)	(ft)
Reach-1	7385	15.00	2557.00	996.75	1003.14		6.39	3.37	9918.45	10070.32	151.88
Reach-1	7385	15.00	2557.00	996.75	1003.14		6.39	3.37	9918.45	10070.31	151.86
Reach-1	7370	170.00	2557.00	996.75	1003.14		6.39	3.14	9912.44	10097.51	185.07
Reach-1	7370	170.00	2557.00	996.75	1003.14		6.39	3.14	9912.44	10097.50	185.06
Reach-1	7200	200.00	2557.00	998.00	1003.08		5.08	2.51	9931.98	10176.20	244.22
Reach-1	7200	200.00	2557.00	998.00	1003.08		5.08	2.51	9931.98	10176.19	244.21
Reach-1	7000	200.00	2557.00	998.00	1002.97		4.97	2.77	9938.17	10154.49	216.32
Reach-1	7000	200.00	2557.00	998.00	1002.97		4.97	2.77	9938.17	10154.48	216.31
Reach-1	6800	200.00	2557.00	998.00	1002.93		4.93	2.19	9917.40	10186.47	269.07
Reach-1	6800	200.00	2557.00	998.00	1002.93		4.93	2.19	9917.40	10186.46	269.06
Reach-1	6600	200.00	2557.00	997.00	1002.90		5.90	1.95	9858.64	10140.20	281.56
Reach-1	6600	200.00	2557.00	997.00	1002.90		5.90	1.95	9858.65	10140.19	281.55
Reach-1	6400	116.00	2557.00	997.00	1002.84		5.84	2.07	9846.93	10134.67	287.75
Reach-1	6400	116.00	2557.00	997.00	1002.84		5.84	2.07	9846.93	10134.67	287.73
Reach-1	6284	108.00	2557.00	997.00	1002.65		5.65	3.53	9856.97	10077.34	220.37
Reach-1	6284	108.00	2557.00	997.00	1002.65		5.65	3.53	9857.00	10077.34	220.34
Reach-1	6176	186.00	2557.00	997.04	1002.49	999.48	5.45	3.97	9927.69	10069.88	142.18
Reach-1	6176	186.00	2557.00	997.04	1002.49	999.48	5.45	3.97	9927.71	10069.87	142.17
Reach-1	6083	Culvert									
Reach-1	5990	520.00	2557.00	996.68	1002.01	999.18	5.33	3.77	9924.70	10076.74	152.04
Reach-1	5990	520.00	2557.00	996.68	1002.01	999.18	5.33	3.77	9924.70	10076.74	152.04
Reach-1	6.32	545.00	2557.00	996.38	1001.44		5.06	0.49	9853.51	10667.48	813.96
Reach-1	6.32	545.00	2557.00	996.38	1001.44		5.06	0.49	9856.00	10667.00	811.00
Reach-1	6.217	690.00	2557.00	996.31	1000.93		4.62	0.92	9685.90	10872.54	1095.12

Table 1, 2/2

HEC-RAS Plan: Imported Pla River: RIVER-1 Reach: Reach-1 (Continued)

Reach	River Sta	Length Chnl	Q Total	Min El	W.S. Elev	Crit W.S.	Max Chl Dpth	Vel Chnl	Sta W.S. Lft	Sta W.S. Rgt	Top Width
		(ft)	(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/s)	(ft)	(ft)	(ft)
Reach-1	6.217	690.00	2557.00	996.31	1000.92		4.61	0.92	9686.20	10871.80	1089.69
Reach-1	6.086	665.00	2557.00	996.18	999.67	999.38	3.49	1.62	9781.00	10996.52	1215.52
Reach-1	6.086	665.00	2557.00	996.18	1000.11		3.93	1.40	9783.00	10996.00	1213.00
Reach-1	5.96	635.00	2557.00	995.90	997.74		1.84	2.53	9798.90	11176.11	1377.21
Reach-1	5.96	635.00	2557.00	995.90	998.61		2.71	3.83	9960.00	10274.08	314.08
Reach-1	5.84	595.00	2557.00	993.40	995.93		2.53	2.97	9415.85	10666.75	1121.05
Reach-1	5.84	595.00	2557.00	993.40	996.52		3.12	3.55	9953.67	10240.41	286.74
Reach-1	5.727		2557.00	991.00	993.54	993.06	2.54	4.31	9376.51	10467.20	931.68
Reach-1	5.727		2557.00	991.00	994.30	993.14	3.30	4.46	9935.00	10135.00	200.00

Standard Table 1 (GYPRCCHN3.prj) 1/2

HEC-RAS Plan: Imported Pla River: RIVER-1 Reach: Reach-1

Reach	River Sta	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
		(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach-1	7385	2557.00	996.75	1003.14		1003.31	0.000976	3.37	759.26	151.88	0.27
Reach-1	7385	2557.00	996.75	1003.14		1003.31	0.000976	3.37	759.19	151.86	0.27
Reach-1	7370	2557.00	996.75	1003.14		1003.29	0.001002	3.14	814.13	185.07	0.26
Reach-1	7370	2557.00	996.75	1003.14		1003.29	0.001002	3.14	814.04	185.06	0.26
Reach-1	7200	2557.00	998.00	1003.08		1003.18	0.000384	2.51	1018.94	244.22	0.22
Reach-1	7200	2557.00	998.00	1003.08		1003.18	0.000384	2.51	1018.81	244.21	0.22
Reach-1	7000	2557.00	998.00	1002.97		1003.09	0.000454	2.77	923.07	216.32	0.24
Reach-1	7000	2557.00	998.00	1002.97		1003.09	0.000454	2.77	922.94	216.31	0.24
Reach-1	6800	2557.00	998.00	1002.93		1003.01	0.000276	2.19	1168.69	269.07	0.19
Reach-1	6800	2557.00	998.00	1002.93		1003.01	0.000277	2.19	1168.54	269.06	0.19
Reach-1	6600	2557.00	997.00	1002.90		1002.96	0.000199	1.95	1313.56	281.56	0.16
Reach-1	6600	2557.00	997.00	1002.90		1002.96	0.000199	1.95	1313.40	281.55	0.16
Reach-1	6400	2557.00	997.00	1002.84		1002.91	0.000250	2.07	1237.64	287.75	0.18
Reach-1	6400	2557.00	997.00	1002.84		1002.91	0.000251	2.07	1237.48	287.73	0.18
Reach-1	6284	2557.00	997.00	1002.65		1002.85	0.001042	3.53	724.55	220.37	0.34
Reach-1	6284	2557.00	997.00	1002.65		1002.85	0.001043	3.53	724.43	220.34	0.34
Reach-1	6176	2557.00	997.04	1002.49	999.48	1002.74	0.000722	3.97	643.37	142.18	0.30
Reach-1	6176	2557.00	997.04	1002.49	999.48	1002.74	0.000723	3.97	643.31	142.17	0.30
Reach-1	6083	Culvert									
Reach-1	5990	2557.00	996.68	1002.01	999.18	1002.23	0.000822	3.77	677.81	152.04	0.31
Reach-1	5990	2557.00	996.68	1002.01	999.18	1002.23	0.000822	3.77	677.72	152.04	0.31
Reach-1	6.32	2557.00	1000.90	1001.44		1001.68	0.001021	0.49	703.14	813.96	0.15
Reach-1	6.32	2557.00	1000.90	1001.44		1001.68	0.001026	0.49	699.47	811.00	0.15
Reach-1	6.217	2557.00	1000.10	1000.93		1001.08	0.001175	0.92	998.42	1095.12	0.19

Standard Table 1, 2/2

HEC-RAS Plan: Imported Pla River: RIVER-1 Reach: Reach-1 (Continued)

Reach	River Sta	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
		(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Reach-1	6.217	2557.00	1000.10	1000.92		1001.07	0.001192	0.92	986.42	1089.69	0.19
Reach-1	6.086	2557.00	998.30	999.67	999.38	999.83	0.002683	1.62	891.51	1215.52	0.30
Reach-1	6.086	2557.00	998.30	1000.11		1000.16	0.001191	1.40	1420.91	1213.00	0.21
Reach-1	5.96	2557.00	995.90	997.74		997.80	0.003230	2.53	1455.09	1377.21	0.36
Reach-1	5.96	2557.00	995.90	998.61		998.79	0.004137	3.83	777.10	314.08	0.43
Reach-1	5.84	2557.00	993.40	995.93		996.02	0.002572	2.97	1439.33	1121.05	0.34
Reach-1	5.84	2557.00	993.40	996.52		996.69	0.002742	3.55	814.37	286.74	0.36
Reach-1	5.727	2557.00	991.00	993.54	993.06	993.76	0.006320	4.31	942.02	931.68	0.52
Reach-1	5.727	2557.00	991.00	994.30	993.14	994.61	0.004619	4.46	573.50	200.00	0.46

Standard Table 2 (GYPRCCHN3.prj) 1/2

HEC-RAS Plan: Imported Pla River: RIVER-1 Reach: Reach-1

Reach	River Sta	E.G. Elev	W.S. Elev	Vel Head	Frctn Loss	C & E Loss	Q Left	Q Channel	Q Right	Top Width
		(ft)	(ft)	(ft)	(ft)	(ft)	(cfs)	(cfs)	(cfs)	(ft)
Reach-1	7385	1003.31	1003.14	0.18	0.01	0.01		2557.00		151.88
Reach-1	7385	1003.31	1003.14	0.18	0.01	0.01		2557.00		151.86
Reach-1	7370	1003.29	1003.14	0.15	0.10	0.02		2557.00		185.07
Reach-1	7370	1003.29	1003.14	0.15	0.10	0.02		2557.00		185.06
Reach-1	7200	1003.18	1003.08	0.10	0.08	0.00		2557.00		244.22
Reach-1	7200	1003.18	1003.08	0.10	0.08	0.00		2557.00		244.21
Reach-1	7000	1003.09	1002.97	0.12	0.07	0.01		2557.00		216.32
Reach-1	7000	1003.09	1002.97	0.12	0.07	0.01		2557.00		216.31
Reach-1	6800	1003.01	1002.93	0.07	0.05	0.00		2557.00		269.07
Reach-1	6800	1003.01	1002.93	0.07	0.05	0.00		2557.00		269.06
Reach-1	6600	1002.96	1002.90	0.06	0.04	0.00		2557.00		281.56
Reach-1	6600	1002.96	1002.90	0.06	0.04	0.00		2557.00		281.55
Reach-1	6400	1002.91	1002.84	0.07	0.05	0.01		2557.00		287.75
Reach-1	6400	1002.91	1002.84	0.07	0.05	0.01		2557.00		287.73
Reach-1	6284	1002.85	1002.65	0.19	0.09	0.02		2557.00		220.37
Reach-1	6284	1002.85	1002.65	0.19	0.09	0.02		2557.00		220.34
Reach-1	6176	1002.74	1002.49	0.25				2557.00		142.18
Reach-1	6176	1002.74	1002.49	0.25				2557.00		142.17
Reach-1	6083	Culvert								
Reach-1	5990	1002.23	1002.01	0.22	0.54	0.01		2557.00		152.04
Reach-1	5990	1002.23	1002.01	0.22	0.54	0.01		2557.00		152.04
Reach-1	6.32	1001.68	1001.44	0.24	0.58	0.03	0.38	31.02	2525.60	813.96
Reach-1	6.32	1001.68	1001.44	0.24	0.58	0.03	0.36	30.35	2526.30	811.00
Reach-1	6.217	1001.08	1000.93	0.15	1.25	0.00	44.27	135.04	2377.69	1095.12

Standard Table 2 , 2/2

HEC-RAS Plan: Imported Pla River: RIVER-1 Reach: Reach-1 (Continued)

Reach	River Sta	E.G. Elev (ft)	W.S. Elev (ft)	Vel Head (ft)	Frctn Loss (ft)	C & E Loss (ft)	Q Left (cfs)	Q Channel (cfs)	Q Right (cfs)	Top Width (ft)
Reach-1	6.217	1001.07	1000.92	0.15	0.88	0.03	42.91	132.67	2381.42	1089.69
Reach-1	6.086	999.83	999.67	0.15	2.00	0.03	10.09	299.03	2247.88	1215.52
Reach-1	6.086	1000.16	1000.11	0.06	1.36	0.01	42.24	379.99	2134.78	1213.00
Reach-1	5.96	997.80	997.74	0.06	1.77	0.00	49.23	755.78	1751.99	1377.21
Reach-1	5.96	998.79	998.61	0.19	2.10	0.00		1769.22	787.78	314.08
Reach-1	5.84	996.02	995.93	0.09	2.25	0.01	437.82	1402.57	716.61	1121.05
Reach-1	5.84	996.69	996.52	0.17	2.07	0.01	53.29	2094.54	409.18	286.74
Reach-1	5.727	993.76	993.54	0.22			255.74	1818.68	482.58	931.68
Reach-1	5.727	994.61	994.30	0.31				2557.00		200.00

CHECRAS Table (GYPRCCHN3. Prj)

HEC-RAS Plan: Imported Pla River: RIVER-1 Reach: Reach-1

Reach	River Sta	Froude # Chl	Top Wdth Act	Conv. Total	Prof Delta WS	Left Sta Eff	Enc Sta L	Center Station	Enc Sta R	Rght Sta Eff	Min Ch El	Left Stagn	Right Stagn
			(ft)	(cfs)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)
Reach-1	7385	0.27	151.88	81845.5		9918.45		10012.50		10070.32	996.75		
Reach-1	7385	0.27	151.86	81837.0	0.00	9918.45	9911.00	10012.50	10114.00	10070.31	996.75		
Reach-1	7370	0.26	185.07	80793.3		9912.44		10016.50		10097.51	996.75		
Reach-1	7370	0.26	185.06	80781.5	0.00	9912.44	9902.00	10016.50	10131.00	10097.50	996.75		
Reach-1	7200	0.22	244.22	130566.1		9931.98		10044.00		10176.20	998.00		
Reach-1	7200	0.22	244.21	130541.0	0.00	9931.98	9900.00	10044.00	10188.00	10176.19	998.00		
Reach-1	7000	0.24	216.32	119986.9		9938.17		10031.50		10154.49	998.00		
Reach-1	7000	0.24	216.31	119961.5	0.00	9938.17	9896.00	10031.50	10167.00	10154.48	998.00		
Reach-1	6800	0.19	269.07	153774.9		9917.40		10041.00		10186.47	998.00		
Reach-1	6800	0.19	269.06	153744.5	0.00	9917.40	9891.00	10041.00	10191.00	10186.46	998.00		
Reach-1	6600	0.16	281.56	181308.2		9858.64		10012.50		10140.20	997.00		
Reach-1	6600	0.16	281.55	181278.0	0.00	9858.65	9853.00	10012.50	10172.00	10140.19	997.00		
Reach-1	6400	0.18	287.75	161567.4		9846.93		9995.00		10134.67	997.00		
Reach-1	6400	0.18	287.73	161537.7	0.00	9846.93	9842.00	9995.00	10148.00	10134.67	997.00		
Reach-1	6284	0.34	220.37	79208.4		9856.97		9960.00		10077.34	997.00		
Reach-1	6284	0.34	220.34	79193.2	0.00	9857.00	9837.00	9960.00	10083.00	10077.34	997.00		
Reach-1	6176	0.30	118.00	95136.8		9945.00		9993.50		10063.00	997.04		
Reach-1	6176	0.30	118.00	95122.6	0.00	9945.00	9911.00	9993.50	10076.00	10063.00	997.04		
Reach-1	6083 Culvert #1												
Reach-1	6083 Culvert #1												
Reach-1	5990	0.31	152.04	89190.1		9924.70		10001.00		10076.74	996.68		
Reach-1	5990	0.31	152.04	89171.3	0.00	9924.70	9924.00	10001.00	10078.00	10076.74	996.68		
Reach-1	6.32	0.15	813.96	80010.6		9853.51		10000.00		10667.48	1000.90		
Reach-1	6.32	0.15	811.00	79837.4	0.00	9856.00	9856.00	10000.00	10667.00	10667.00	1000.90		
Reach-1	6.217	0.19	1095.12	74609.1		9685.90		10000.00		10872.54	1000.10		
Reach-1	6.217	0.19	1089.69	74056.9	-0.01	9686.20	9686.00	10000.00	10872.00	10871.80	1000.10		
Reach-1	6.086	0.30	1215.52	49365.1		9781.00		10000.00		10996.52	998.30		
Reach-1	6.086	0.21	1213.00	74091.6	0.44	9783.00	9783.00	10000.00	10996.00	10996.00	998.30		
Reach-1	5.96	0.36	1377.21	44993.0		9798.90		10055.00		11176.11	995.90		
Reach-1	5.96	0.43	314.08	39755.1	0.86	9960.00	9960.00	10055.00	10274.08	10274.08	995.90		
Reach-1	5.84	0.34	1121.05	50416.3		9415.85		10070.00		10666.75	993.40		
Reach-1	5.84	0.36	286.74	48828.7	0.59	9953.67	9953.67	10070.00	10240.41	10240.41	993.40		
Reach-1	5.727	0.52	931.68	32164.7		9376.51		10035.00		10467.20	991.00		
Reach-1	5.727	0.46	200.00	37621.4	0.76	9935.00	9935.00	10035.00	10135.00	10135.00	991.00		

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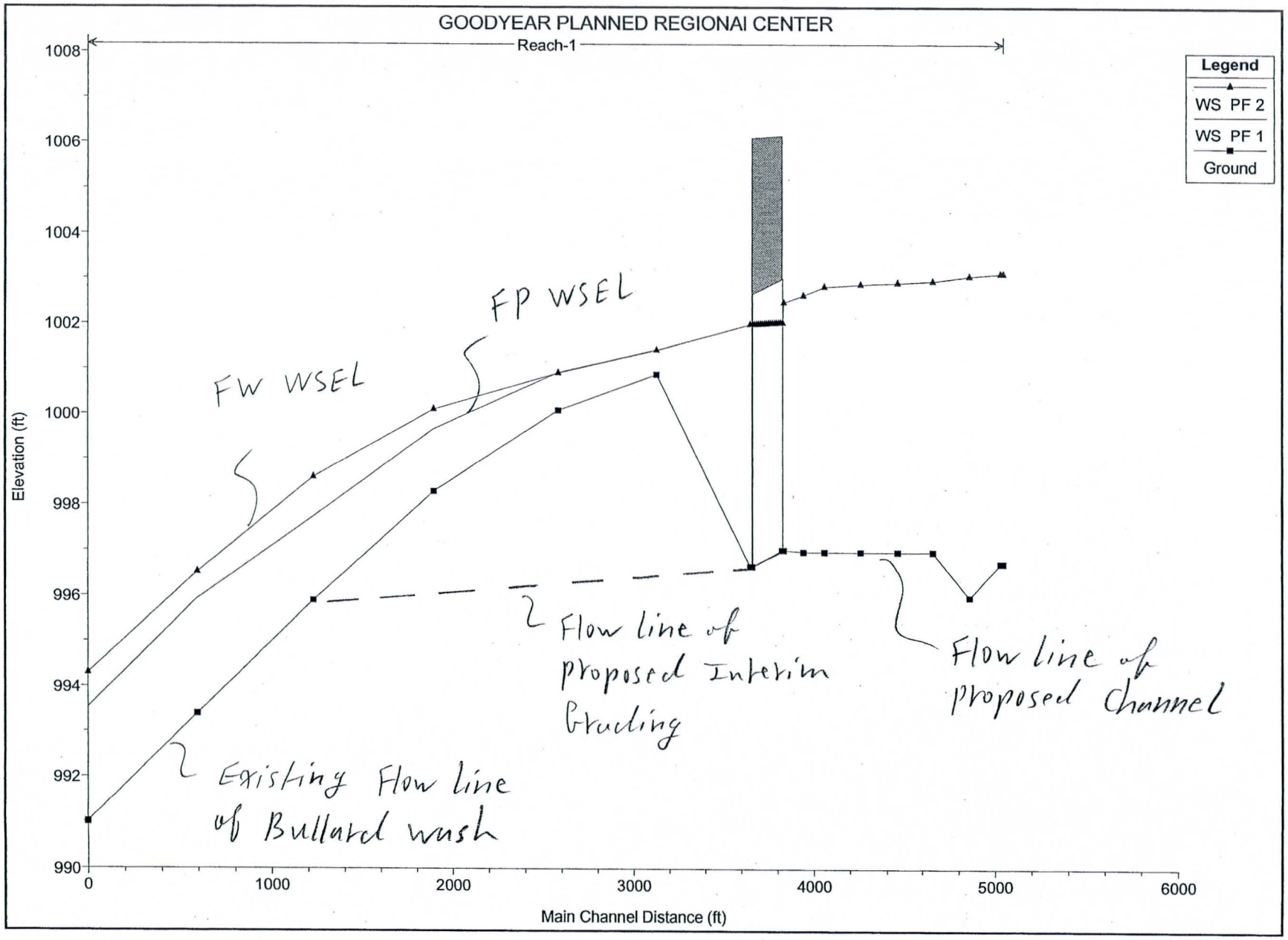

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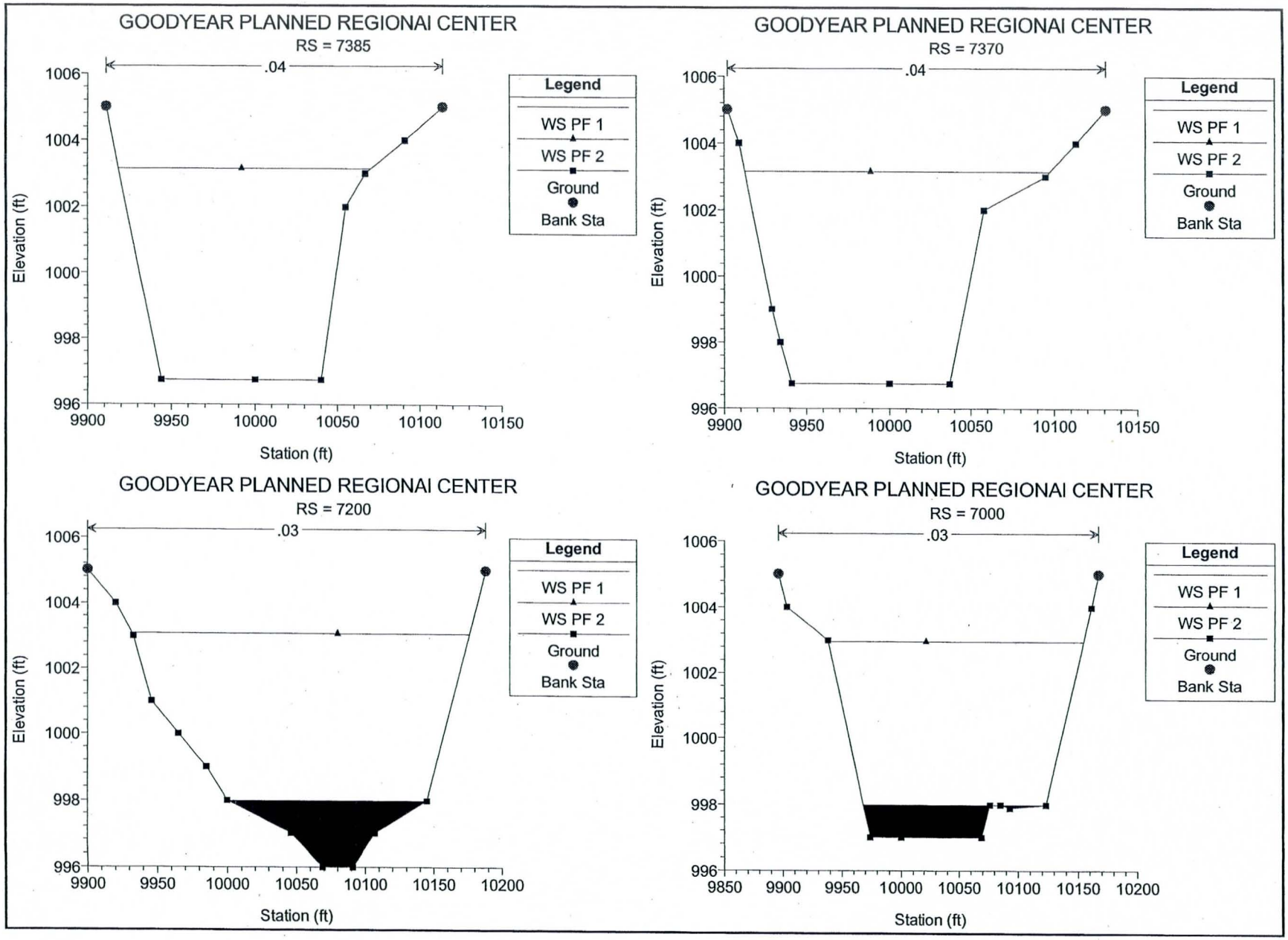

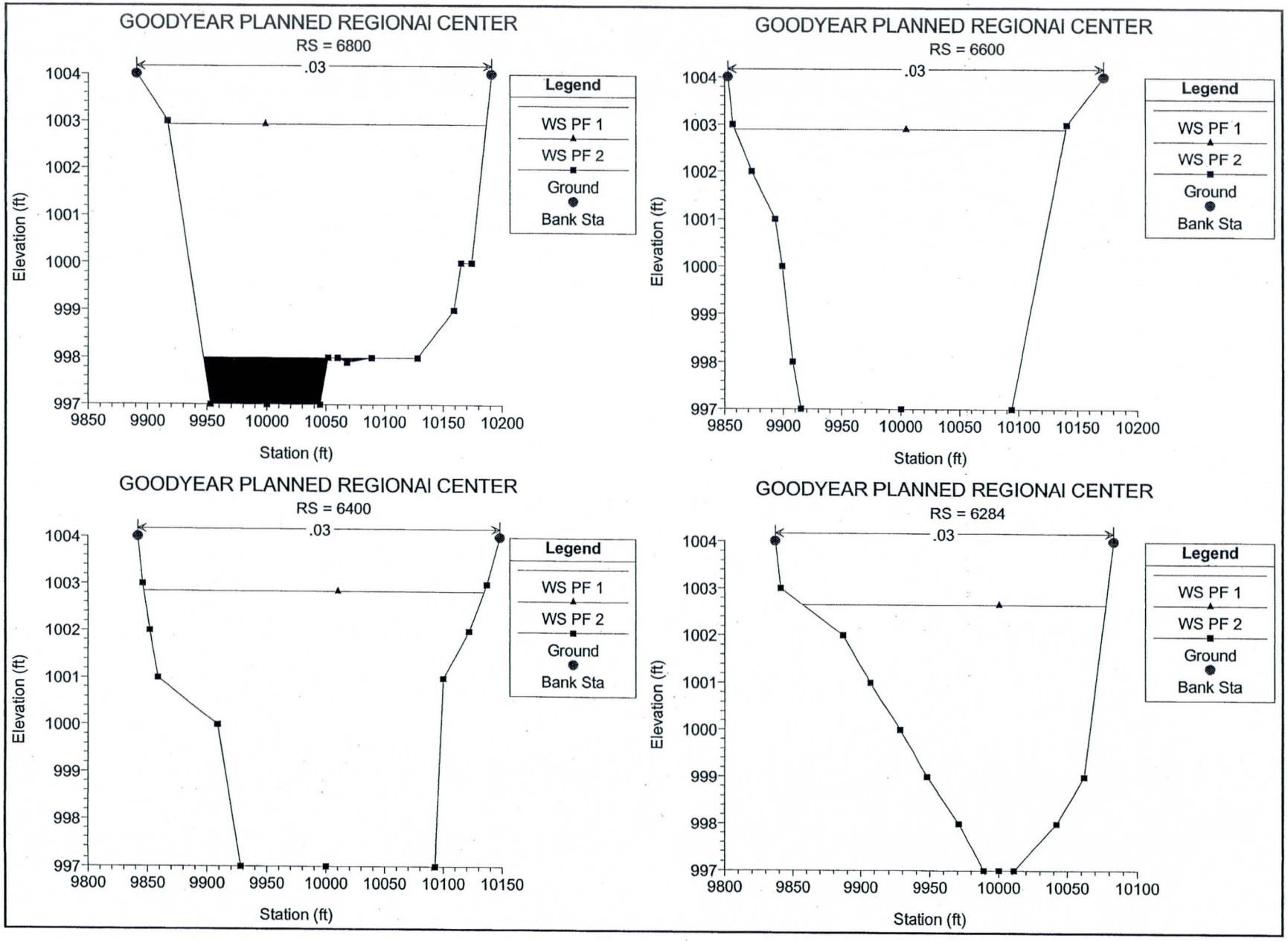
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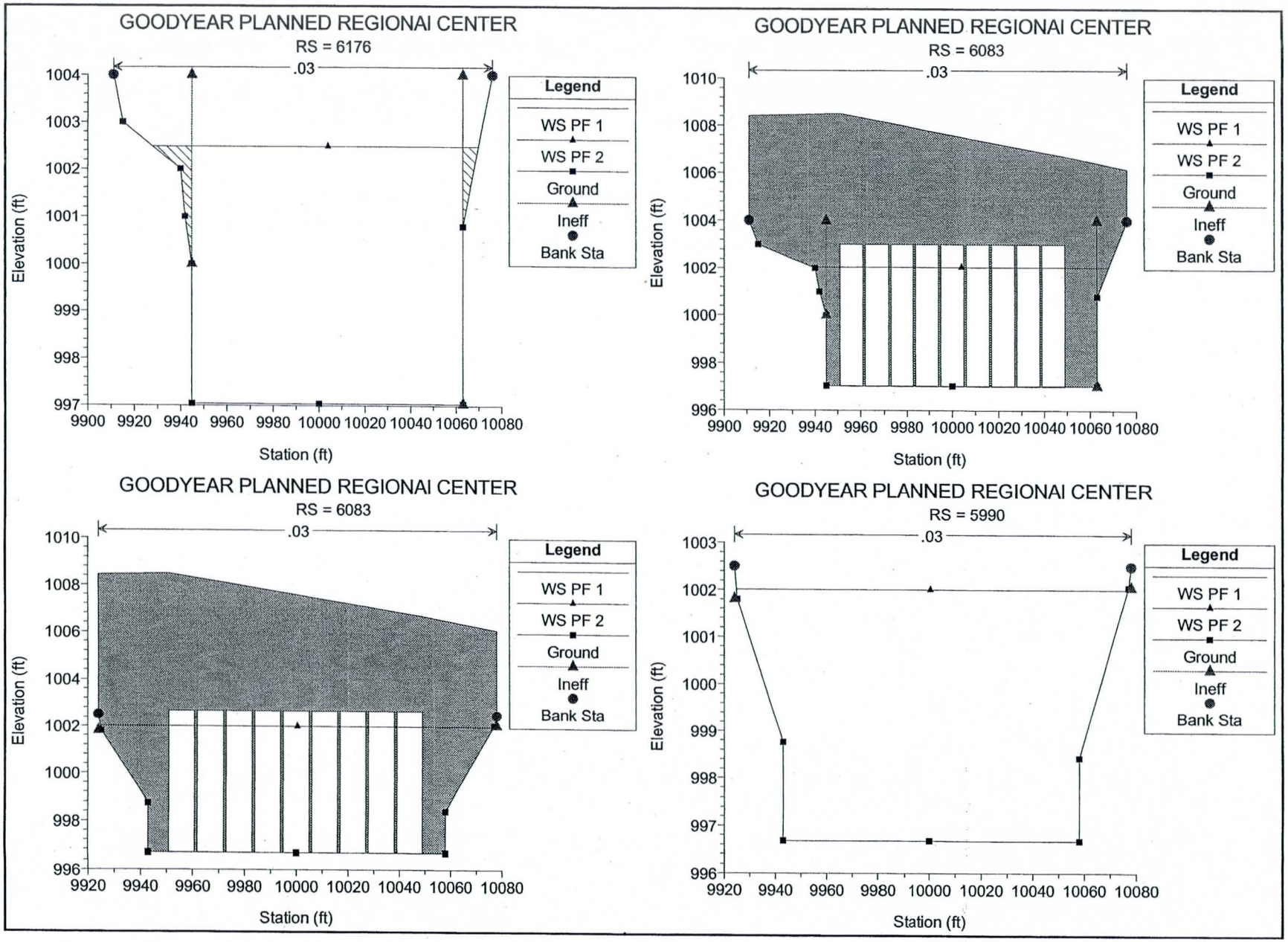
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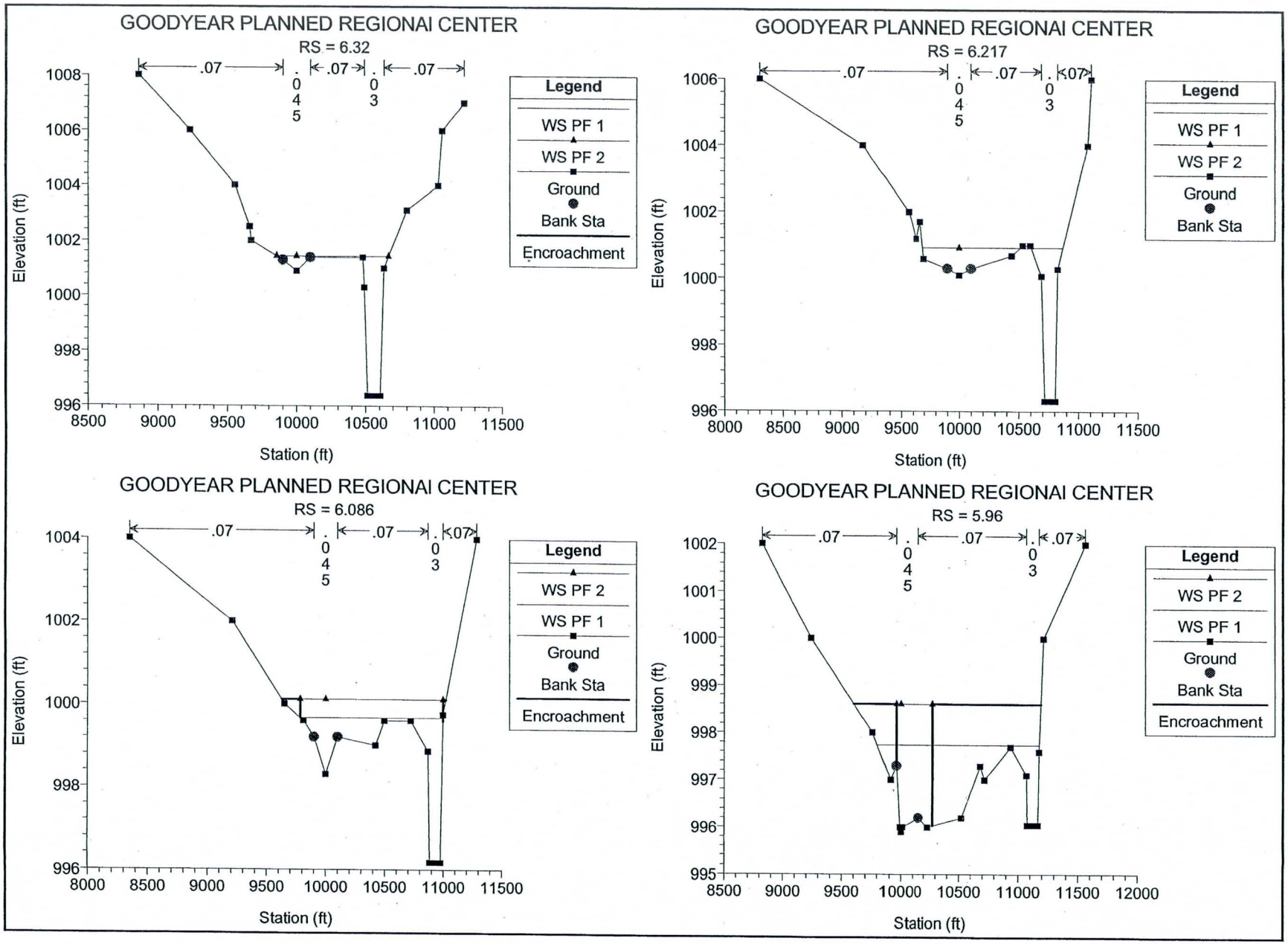
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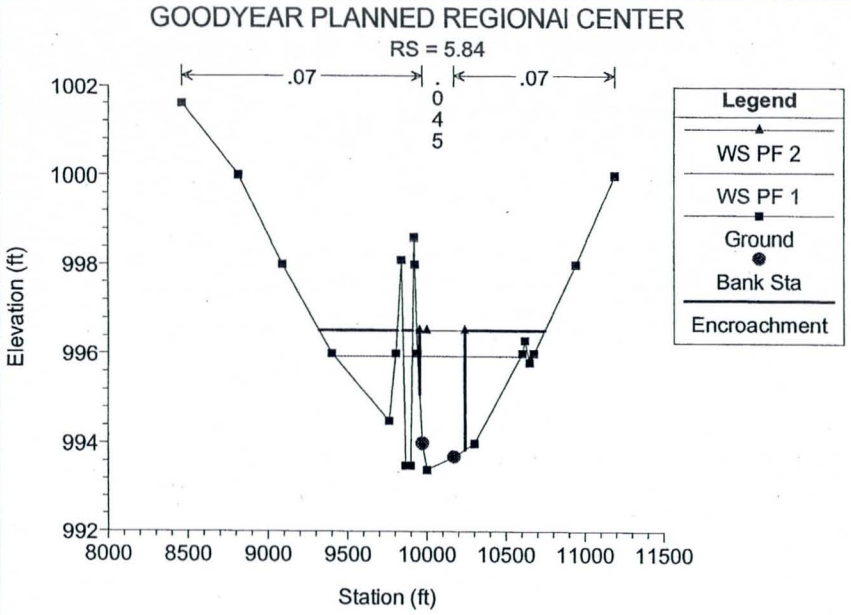
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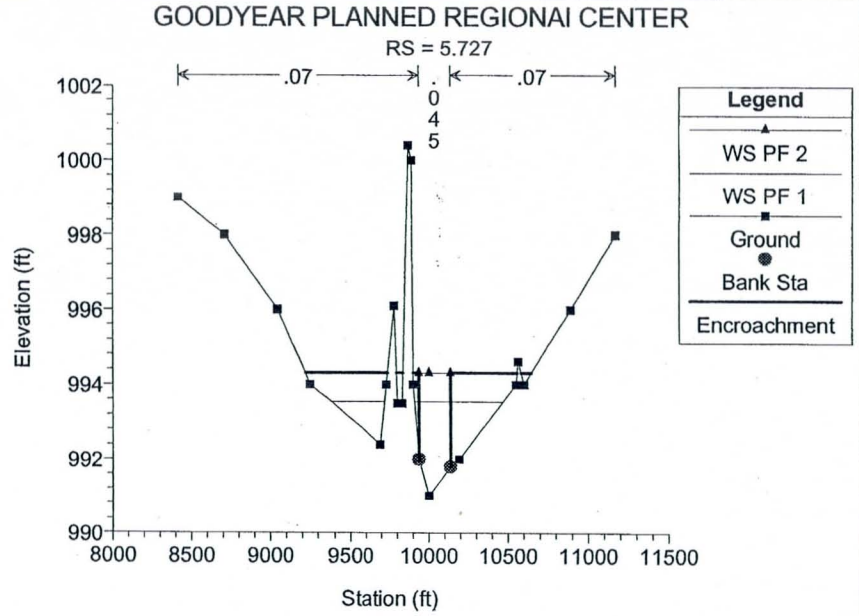
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HEC-RAS September 1998 Version 2.2
U.S. Army Corp of Engineers
Hydrologic Engineering Center
609 Second Street, Suite D
Davis, California 95616-4687
(916) 756-1104

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Run Date and Time: 5/5/03 7:43:21 AM

Project in English units

Project Description:
GOOD YEAR PLANNED REGIONAL CENTER

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BULLARD WASH LOMR - PINNACLE
ENGINEERING/MARWEST DEVELOPMENT T1 039

FLOODPLAIN/FLOODWAY RUN FILE: BULL_CLM.DAT T2
040

BULLARD WASH LOMR - FROM LOWER BUCKEYE ROAD TO MCDOWELL RD
T3 041

* 001

Modeling performed by JE
Fuller/ Hydrology & Geomorphology, Inc. * 001

John
Wallace, P.E. 520-623-3112 *
001

The following revisions were made to the orginal FIS HEC-2 by WLB
* 001

Hydrology:
* 001

HEC-1 was revised by Stanley
Consultants & FCDMC to reflect * 001

construction of Dysart Drain. New Q100 values were input

based on revised HEC-1 model (see discussion in TDN report).

Revised discharges are shown in WLB comment
cards next to

original values

Hydraulics:
* 001

Original WLB model shortened to include only detailed study reach

from Section 2.680 to Section 6.320. Downstream WSEL
matches

WSEL at Section 2.68 per pending
Maricopa County Flood Control

District CLOMR
known as FEMA Case No. 99-09-862R.

Section 4.625 (at Van Buren St.) modified to reflect encroachment

associated with upstream channel improvements (see below)

Sections 4.634, 4.670, 4.752 4.820 and 4.840
added to model to

adequately define
proposed Bullard Wash channel improvements

at Mountain View Estates (upstream of Van Buren Street)

* 001

PLAN DATA

Plan Title: Imported Plan 02
Plan File : K:\Active\81500260\REPORTS\DRAINAGE\HCRASFLS\GYPRCCHN3.p02

Geometry Title: Imported Geom 02
Geometry File : K:\Active\81500260\REPORTS\DRAINAGE\HCRASFLS\GYPRCCHN3.g02

Flow Title : Imported Flow 02
Flow File : K:\Active\81500260\REPORTS\DRAINAGE\HCRASFLS\GYPRCCHN3.f02

Plan Summary Information:
Number of: Cross Sections = 16 Mulitple Openings = 0
Culverts = 1 Inline Weirs = 0
Bridges = 0

Computational Information
Water surface calculation tolerance = 0.01
Critical depth calculaton tolerance = 0.01
Maximum number of interations = 20
Maximum difference tolerance = 0.3
Flow tolerance factor = 0.001

Computation Options

Critical depth computed only where necessary
Conveyance Calculation Method: At breaks in n values only
Friction Slope Method: Average Conveyance
Computational Flow Regime: Subcritical Flow

Encroachment Data
Equal Conveyance = True
Left Offset = 0
Right Offset = 0

River = RIVER-1 Reach = Reach-1

RS	Profile	Method	Value1	Value2
7385	PF 2	1	9911	10114
7370	PF 2	1	9902	10131
7200	PF 2	1	9900	10188
7000	PF 2	1	9896	10167
6800	PF 2	1	9891	10191
6600	PF 2	1	9853	10172
6400	PF 2	1	9842	10148
6284	PF 2	1	9837	10083
6176	PF 2	1	9911	10076
6083	PF 2	1	9943	10063
5990	PF 2	1	9924	10078
6.32	PF 2	1	9856	10667
6.217	PF 2	1	9686	10872
6.086	PF 2	1	9783	10996
5.96	PF 2	1	9960	10274.08
5.84	PF 2	1	9953.67	10240.41
5.727	PF 2	1	9935	10135

FLOW DATA

Flow Title: Imported Flow 02
Flow File : K:\Active\81500260\REPORTS\DRAINAGE\HCRASFLS\GYPRCCHN3.f02

Flow Data (cfs)

River	Reach	RS	PF 1	PF 2
RIVER-1	Reach-1	7385	2557	2557

Boundary Conditions

River	Reach	Profile	Upstream	Downstream
RIVER-1	Reach-1	PF 1		Known WS = 993.54
RIVER-1	Reach-1	PF 2		Known WS = 994.3

GEOMETRY DATA

Geometry Title: Imported Geom 02
Geometry File : K:\Active\81500260\REPORTS\DRAINAGE\HCRASFLS\GYPRCCHN3.g02

CROSS SECTION RIVER: RIVER-1
REACH: Reach-1 RS: 7385

INPUT
Description:
Station Elevation Data num= 8

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
9911	1005	9944	996.75	10000	996.75	10040	996.75	10055	1002
10067	1003	10091	1004	10114	1005				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
9911	.04	9911	.04	10114	.04

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
9911	10114	15	15	15	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

			Left OB	Channel	Right OB
E.G. Elev (ft)	1003.31	Element			
Vel Head (ft)	0.18	Wt. n-Val.		0.040	
W.S. Elev (ft)	1003.14	Reach Len. (ft)	15.00	15.00	15.00
Crit W.S. (ft)		Flow Area (sq ft)		759.26	
E.G. Slope (ft/ft)	0.000976	Area (sq ft)		759.26	
Q Total (cfs)	2557.00	Flow (cfs)		2557.00	
Top Width (ft)	151.88	Top Width (ft)		151.88	

Vel Total (ft/s)	3.37	Avg. Vel. (ft/s)		3.37	
Max Chl Dpth (ft)	6.39	Hydr. Depth (ft)		5.00	
Conv. Total (cfs)	81845.5	Conv. (cfs)		81845.5	
Length Wtd. (ft)	15.00	Wetted Per. (ft)		153.60	
Min Ch El (ft)	996.75	Shear (lb/sq ft)		0.30	
Alpha	1.00	Stream Power (lb/ft s)		1.01	
Frctn Loss (ft)	0.01	Cum Volume (acre-ft)	10.10	55.61	56.65
C & E Loss (ft)	0.01	Cum SA (acres)	17.02	23.72	56.03

CROSS SECTION OUTPUT Profile #PF 2

E.G. Elev (ft)	1003.31	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.18	Wt. n-Val.		0.040	
W.S. Elev (ft)	1003.14	Reach Len. (ft)	15.00	15.00	15.00
Crit W.S. (ft)		Flow Area (sq ft)		759.19	
E.G. Slope (ft/ft)	0.000976	Area (sq ft)		759.19	
Q Total (cfs)	2557.00	Flow (cfs)		2557.00	
Top Width (ft)	151.86	Top Width (ft)		151.86	
Vel Total (ft/s)	3.37	Avg. Vel. (ft/s)		3.37	
Max Chl Dpth (ft)	6.39	Hydr. Depth (ft)		5.00	
Conv. Total (cfs)	81837.0	Conv. (cfs)		81837.0	
Length Wtd. (ft)	15.00	Wetted Per. (ft)		153.59	
Min Ch El (ft)	996.75	Shear (lb/sq ft)		0.30	
Alpha	1.00	Stream Power (lb/ft s)		1.01	
Frctn Loss (ft)	0.01	Cum Volume (acre-ft)	2.97	62.07	44.45
C & E Loss (ft)	0.01	Cum SA (acres)	5.43	23.72	35.14

CROSS SECTION RIVER: RIVER-1
REACH: Reach-1 RS: 7370

INPUT
Description:
Station Elevation Data num= 11

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
9902	1005	9909	1004	9929	999	9934	998	9941	996.75
10000	996.75	10037	996.75	10058	1002	10095	1003	10113	1004
10131	1005								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
9902	.04	9902	.04	10131	.04

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
9902	10131	170	170	170	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	1003.29	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.15	Wt. n-Val.		0.040	
W.S. Elev (ft)	1003.14	Reach Len. (ft)	170.00	170.00	170.00
Crit W.S. (ft)		Flow Area (sq ft)		814.13	
E.G. Slope (ft/ft)	0.001002	Area (sq ft)		814.13	
Q Total (cfs)	2557.00	Flow (cfs)		2557.00	
Top Width (ft)	185.07	Top Width (ft)		185.07	
Vel Total (ft/s)	3.14	Avg. Vel. (ft/s)		3.14	
Max Chl Dpth (ft)	6.39	Hydr. Depth (ft)		4.40	
Conv. Total (cfs)	80793.3	Conv. (cfs)		80793.3	
Length Wtd. (ft)	170.00	Wetted Per. (ft)		186.46	
Min Ch El (ft)	996.75	Shear (lb/sq ft)		0.27	
Alpha	1.00	Stream Power (lb/ft s)		0.86	
Frctn Loss (ft)	0.10	Cum Volume (acre-ft)	10.10	55.34	56.65
C & E Loss (ft)	0.02	Cum SA (acres)	17.02	23.66	56.03

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #PF 2

E.G. Elev (ft)	1003.29	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.15	Wt. n-Val.		0.040	
W.S. Elev (ft)	1003.14	Reach Len. (ft)	170.00	170.00	170.00
Crit W.S. (ft)		Flow Area (sq ft)		814.04	
E.G. Slope (ft/ft)	0.001002	Area (sq ft)		814.04	
Q Total (cfs)	2557.00	Flow (cfs)		2557.00	
Top Width (ft)	185.06	Top Width (ft)		185.06	
Vel Total (ft/s)	3.14	Avg. Vel. (ft/s)		3.14	
Max Chl Dpth (ft)	6.39	Hydr. Depth (ft)		4.40	
Conv. Total (cfs)	80781.5	Conv. (cfs)		80781.5	
Length Wtd. (ft)	170.00	Wetted Per. (ft)		186.44	
Min Ch El (ft)	996.75	Shear (lb/sq ft)		0.27	
Alpha	1.00	Stream Power (lb/ft s)		0.86	
Frctn Loss (ft)	0.10	Cum Volume (acre-ft)	2.97	61.80	44.45

C & E Loss (ft)	0.02	Cum SA (acres)	5.43	23.66	35.14

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.

CROSS SECTION RIVER: RIVER-1
REACH: Reach-1 RS: 7200

INPUT
Description:
Station Elevation Data num= 13

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
9900	1005	9920	1004	9933	1003	9946	1001	9965	1000
9985	999	10000	998	10046	997	10069	996	10091	996
10107	997	10145	998	10188	1005				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
9900	.035	9900	.03	10188	.035

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
9900	10188	200	200	200	.1	.3

Blocked Obstructions num= 1

Sta L	Sta R	Elev
9900	10188	998

CROSS SECTION OUTPUT Profile #PF 1

		Element	Left OB	Channel	Right OB
E.G. Elev (ft)	1003.18	Wt. n-Val.		0.030	
Vel Head (ft)	0.10	Reach Len. (ft)	200.00	200.00	200.00
W.S. Elev (ft)	1003.08	Flow Area (sq ft)		1018.94	
Crit W.S. (ft)		Area (sq ft)		1018.94	
E.G. Slope (ft/ft)	0.000384	Flow (cfs)		2557.00	
Q Total (cfs)	2557.00	Top Width (ft)		244.22	
Top Width (ft)	244.22	Avg. Vel. (ft/s)		2.51	
Vel Total (ft/s)	2.51	Hydr. Depth (ft)		4.17	
Max Chl Dpth (ft)	5.08	Conv. (cfs)		130566.1	
Conv. Total (cfs)	130566.1	Wetted Per. (ft)		244.87	
Length Wtd. (ft)	200.00	Shear (lb/sq ft)		0.10	
Min Ch El (ft)	998.00	Stream Power (lb/ft s)		0.25	
Alpha	1.00	Cum Volume (acre-ft)	10.10	51.77	56.65
Frctn Loss (ft)	0.08	Cum SA (acres)	17.02	22.82	56.03
C & E Loss (ft)	0.00				

CROSS SECTION OUTPUT Profile #PF 2

		Element	Left OB	Channel	Right OB
E.G. Elev (ft)	1003.18	Wt. n-Val.		0.030	
Vel Head (ft)	0.10	Reach Len. (ft)	200.00	200.00	200.00
W.S. Elev (ft)	1003.08	Flow Area (sq ft)		1018.81	
Crit W.S. (ft)		Area (sq ft)		1018.81	
E.G. Slope (ft/ft)	0.000384	Flow (cfs)		2557.00	
Q Total (cfs)	2557.00	Top Width (ft)		244.21	
Top Width (ft)	244.21	Avg. Vel. (ft/s)		2.51	
Vel Total (ft/s)	2.51	Hydr. Depth (ft)		4.17	
Max Chl Dpth (ft)	5.08	Conv. (cfs)		130541.0	
Conv. Total (cfs)	130541.0	Wetted Per. (ft)		244.86	
Length Wtd. (ft)	200.00	Shear (lb/sq ft)		0.10	
Min Ch El (ft)	998.00	Stream Power (lb/ft s)		0.25	
Alpha	1.00	Cum Volume (acre-ft)	2.97	58.22	44.45
Frctn Loss (ft)	0.08	Cum SA (acres)	5.43	22.82	35.14
C & E Loss (ft)	0.00				

CROSS SECTION RIVER: RIVER-1
REACH: Reach-1 RS: 7000

INPUT
Description:
Station Elevation Data num= 12

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
9896	1005	9903	1004	9938	1003	9974	997	10000	997
10069	997	10076	998	10085	998	10093	997.9	10123	998
10161	1004	10167	1005						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
9896	.035	9896	.03	10167	.035

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
9896	10167	200	200	200	.1	.3

Blocked Obstructions num= 1

Sta L	Sta R	Elev
9896	10167	998

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	1003.09	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.12	Wt. n-Val.		0.030	
W.S. Elev (ft)	1002.97	Reach Len. (ft)	200.00	200.00	200.00
Crit W.S. (ft)		Flow Area (sq ft)		923.07	
E.G. Slope (ft/ft)	0.000454	Area (sq ft)		923.07	
Q Total (cfs)	2557.00	Flow (cfs)		2557.00	
Top Width (ft)	216.32	Top Width (ft)		216.32	
Vel Total (ft/s)	2.77	Avg. Vel. (ft/s)		2.77	
Max Chl Dpth (ft)	4.97	Hydr. Depth (ft)		4.27	
Conv. Total (cfs)	119986.9	Conv. (cfs)		119986.9	
Length Wtd. (ft)	200.00	Wetted Per. (ft)		217.12	
Min Ch El (ft)	998.00	Shear (lb/sq ft)		0.12	
Alpha	1.00	Stream Power (lb/ft s)		0.33	
Frctn Loss (ft)	0.07	Cum Volume (acre-ft)	10.10	47.31	56.65
C & E Loss (ft)	0.01	Cum SA (acres)	17.02	21.76	56.03

CROSS SECTION OUTPUT Profile #PF 2

E.G. Elev (ft)	1003.09	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.12	Wt. n-Val.		0.030	
W.S. Elev (ft)	1002.97	Reach Len. (ft)	200.00	200.00	200.00
Crit W.S. (ft)		Flow Area (sq ft)		922.94	
E.G. Slope (ft/ft)	0.000454	Area (sq ft)		922.94	
Q Total (cfs)	2557.00	Flow (cfs)		2557.00	
Top Width (ft)	216.31	Top Width (ft)		216.31	
Vel Total (ft/s)	2.77	Avg. Vel. (ft/s)		2.77	
Max Chl Dpth (ft)	4.97	Hydr. Depth (ft)		4.27	
Conv. Total (cfs)	119961.5	Conv. (cfs)		119961.5	
Length Wtd. (ft)	200.00	Wetted Per. (ft)		217.11	
Min Ch El (ft)	998.00	Shear (lb/sq ft)		0.12	
Alpha	1.00	Stream Power (lb/ft s)		0.33	
Frctn Loss (ft)	0.07	Cum Volume (acre-ft)	2.97	53.76	44.45
C & E Loss (ft)	0.01	Cum SA (acres)	5.43	21.76	35.14

CROSS SECTION RIVER: RIVER-1
REACH: Reach-1 RS: 6800

INPUT
Description:
Station Elevation Data num= 14

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
9891	1004	9917	1003	9953	997	10000	997	10045	997
10052	998	10060	998	10068	997.9	10089	998	10128	998
10159	999	10165	1000	10174	1000	10191	1004		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
9891	.035	9891	.03	10191	.035

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
9891	10191	200	200	200	.1	.3

Blocked Obstructions num= 1

Sta L	Sta R	Elev
9891	10191	998

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	1003.01	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.07	Wt. n-Val.		0.030	
W.S. Elev (ft)	1002.93	Reach Len. (ft)	200.00	200.00	200.00
Crit W.S. (ft)		Flow Area (sq ft)		1168.69	
E.G. Slope (ft/ft)	0.000276	Area (sq ft)		1168.69	
Q Total (cfs)	2557.00	Flow (cfs)		2557.00	
Top Width (ft)	269.07	Top Width (ft)		269.07	
Vel Total (ft/s)	2.19	Avg. Vel. (ft/s)		2.19	
Max Chl Dpth (ft)	4.93	Hydr. Depth (ft)		4.34	
Conv. Total (cfs)	153774.9	Conv. (cfs)		153774.9	
Length Wtd. (ft)	200.00	Wetted Per. (ft)		269.92	
Min Ch El (ft)	998.00	Shear (lb/sq ft)		0.07	
Alpha	1.00	Stream Power (lb/ft s)		0.16	
Frctn Loss (ft)	0.05	Cum Volume (acre-ft)	10.10	42.51	56.65
C & E Loss (ft)	0.00	Cum SA (acres)	17.02	20.65	56.03

CROSS SECTION OUTPUT Profile #PF 2

E.G. Elev (ft)	1003.01	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.07	Wt. n-Val.		0.030	
W.S. Elev (ft)	1002.93	Reach Len. (ft)	200.00	200.00	200.00
Crit W.S. (ft)		Flow Area (sq ft)		1168.54	

E.G. Slope (ft/ft)	0.000277	Area (sq ft)		1168.54	
Q Total (cfs)	2557.00	Flow (cfs)		2557.00	
Top Width (ft)	269.06	Top Width (ft)		269.06	
Vel Total (ft/s)	2.19	Avg. Vel. (ft/s)		2.19	
Max Chl Dpth (ft)	4.93	Hydr. Depth (ft)		4.34	
Conv. Total (cfs)	153744.5	Conv. (cfs)		153744.5	
Length Wtd. (ft)	200.00	Wetted Per. (ft)		269.91	
Min Ch El (ft)	998.00	Shear (lb/sq ft)		0.07	
Alpha	1.00	Stream Power (lb/ft s)		0.16	
Frctn Loss (ft)	0.05	Cum Volume (acre-ft)	2.97	48.96	44.45
C & E Loss (ft)	0.00	Cum SA (acres)	5.43	20.65	35.14

CROSS SECTION RIVER: RIVER-1
REACH: Reach-1 RS: 6600

INPUT
Description:
Station Elevation Data num= 11

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
9853	1004	9857	1003	9873	1002	9893	1001	9899	1000
9908	998	9915	997	10000	997	10094	997	10141	1003
10172	1004								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
9853	.035	9853	.03	10172	.035

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
9853	10172	200	200	200	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	1002.96	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.06	Wt. n-Val.		0.030	
W.S. Elev (ft)	1002.90	Reach Len. (ft)	200.00	200.00	200.00
Crit W.S. (ft)		Flow Area (sq ft)		1313.56	
E.G. Slope (ft/ft)	0.000199	Area (sq ft)		1313.56	
Q Total (cfs)	2557.00	Flow (cfs)		2557.00	
Top Width (ft)	281.56	Top Width (ft)		281.56	
Vel Total (ft/s)	1.95	Avg. Vel. (ft/s)		1.95	
Max Chl Dpth (ft)	5.90	Hydr. Depth (ft)		4.67	
Conv. Total (cfs)	181308.2	Conv. (cfs)		181308.2	
Length Wtd. (ft)	200.00	Wetted Per. (ft)		282.36	
Min Ch El (ft)	997.00	Shear (lb/sq ft)		0.06	
Alpha	1.00	Stream Power (lb/ft s)		0.11	
Frctn Loss (ft)	0.04	Cum Volume (acre-ft)	10.10	36.81	56.65
C & E Loss (ft)	0.00	Cum SA (acres)	17.02	19.38	56.03

CROSS SECTION OUTPUT Profile #PF 2

E.G. Elev (ft)	1002.96	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.06	Wt. n-Val.		0.030	
W.S. Elev (ft)	1002.90	Reach Len. (ft)	200.00	200.00	200.00
Crit W.S. (ft)		Flow Area (sq ft)		1313.40	
E.G. Slope (ft/ft)	0.000199	Area (sq ft)		1313.40	
Q Total (cfs)	2557.00	Flow (cfs)		2557.00	
Top Width (ft)	281.55	Top Width (ft)		281.55	
Vel Total (ft/s)	1.95	Avg. Vel. (ft/s)		1.95	
Max Chl Dpth (ft)	5.90	Hydr. Depth (ft)		4.66	
Conv. Total (cfs)	181278.0	Conv. (cfs)		181278.0	
Length Wtd. (ft)	200.00	Wetted Per. (ft)		282.35	
Min Ch El (ft)	997.00	Shear (lb/sq ft)		0.06	
Alpha	1.00	Stream Power (lb/ft s)		0.11	
Frctn Loss (ft)	0.04	Cum Volume (acre-ft)	2.97	43.26	44.45
C & E Loss (ft)	0.00	Cum SA (acres)	5.43	19.38	35.14

CROSS SECTION RIVER: RIVER-1
REACH: Reach-1 RS: 6400

INPUT
Description:
Station Elevation Data num= 12

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
9842	1004	9846	1003	9852	1002	9859	1001	9909	1000
9928	997	10000	997	10093	997	10100	1001	10122	1002
10137	1003	10148	1004						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
9842	.035	9842	.03	10148	.035

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.

9842	10148	95	116	140	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

			Left OB	Channel	Right OB
E.G. Elev (ft)	1002.91	Element			
Vel Head (ft)	0.07	Wt. n-Val.		0.030	
W.S. Elev (ft)	1002.84	Reach Len. (ft)	95.00	116.00	140.00
Crit W.S. (ft)		Flow Area (sq ft)		1237.64	
E.G. Slope (ft/ft)	0.000250	Area (sq ft)		1237.64	
Q Total (cfs)	2557.00	Flow (cfs)		2557.00	
Top Width (ft)	287.75	Top Width (ft)		287.75	
Vel Total (ft/s)	2.07	Avg. Vel. (ft/s)		2.07	
Max Chl Dpth (ft)	5.84	Hydr. Depth (ft)		4.30	
Conv. Total (cfs)	161567.4	Conv. (cfs)		161567.4	
Length Wtd. (ft)	116.00	Wetted Per. (ft)		289.24	
Min Ch El (ft)	997.00	Shear (lb/sq ft)		0.07	
Alpha	1.00	Stream Power (lb/ft s)		0.14	
Frctn Loss (ft)	0.05	Cum Volume (acre-ft)	10.10	30.95	56.65
C & E Loss (ft)	0.01	Cum SA (acres)	17.02	18.08	56.03

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #PF 2

			Left OB	Channel	Right OB
E.G. Elev (ft)	1002.91	Element			
Vel Head (ft)	0.07	Wt. n-Val.		0.030	
W.S. Elev (ft)	1002.84	Reach Len. (ft)	95.00	116.00	140.00
Crit W.S. (ft)		Flow Area (sq ft)		1237.48	
E.G. Slope (ft/ft)	0.000251	Area (sq ft)		1237.48	
Q Total (cfs)	2557.00	Flow (cfs)		2557.00	
Top Width (ft)	287.73	Top Width (ft)		287.73	
Vel Total (ft/s)	2.07	Avg. Vel. (ft/s)		2.07	
Max Chl Dpth (ft)	5.84	Hydr. Depth (ft)		4.30	
Conv. Total (cfs)	161537.7	Conv. (cfs)		161537.7	
Length Wtd. (ft)	116.00	Wetted Per. (ft)		289.23	
Min Ch El (ft)	997.00	Shear (lb/sq ft)		0.07	
Alpha	1.00	Stream Power (lb/ft s)		0.14	
Frctn Loss (ft)	0.05	Cum Volume (acre-ft)	2.97	37.41	44.45
C & E Loss (ft)	0.01	Cum SA (acres)	5.43	18.08	35.14

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.

CROSS SECTION RIVER: RIVER-1
REACH: Reach-1 RS: 6284

INPUT
Description:
Station Elevation Data num= 13

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
9837	1004	9841	1003	9887	1002	9907	1001	9928	1000
9948	999	9971	998	9989	997	10000	997	10011	997
10042	998	10062	999	10083	1004				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
9837	.035	9837	.03	10083	.035

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
9837	10083	115	108	100	.3	.5

CROSS SECTION OUTPUT Profile #PF 1

			Left OB	Channel	Right OB
E.G. Elev (ft)	1002.85	Element			
Vel Head (ft)	0.19	Wt. n-Val.		0.030	
W.S. Elev (ft)	1002.65	Reach Len. (ft)	115.00	108.00	100.00
Crit W.S. (ft)		Flow Area (sq ft)		724.55	
E.G. Slope (ft/ft)	0.001042	Area (sq ft)		724.55	
Q Total (cfs)	2557.00	Flow (cfs)		2557.00	
Top Width (ft)	220.37	Top Width (ft)		220.37	
Vel Total (ft/s)	3.53	Avg. Vel. (ft/s)		3.53	
Max Chl Dpth (ft)	5.65	Hydr. Depth (ft)		3.29	
Conv. Total (cfs)	79208.4	Conv. (cfs)		79208.4	
Length Wtd. (ft)	108.00	Wetted Per. (ft)		220.97	
Min Ch El (ft)	997.00	Shear (lb/sq ft)		0.21	
Alpha	1.00	Stream Power (lb/ft s)		0.75	
Frctn Loss (ft)	0.09	Cum Volume (acre-ft)	10.10	28.34	56.65
C & E Loss (ft)	0.02	Cum SA (acres)	17.02	17.40	56.03

CROSS SECTION OUTPUT Profile #PF 2

E.G. Elev (ft)	1002.85	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.19	Wt. n-Val.		0.030	
W.S. Elev (ft)	1002.65	Reach Len. (ft)	115.00	108.00	100.00
Crit W.S. (ft)		Flow Area (sq ft)		724.43	
E.G. Slope (ft/ft)	0.001043	Area (sq ft)		724.43	
Q Total (cfs)	2557.00	Flow (cfs)		2557.00	
Top Width (ft)	220.34	Top Width (ft)		220.34	
Vel Total (ft/s)	3.53	Avg. Vel. (ft/s)		3.53	
Max Chl Dpth (ft)	5.65	Hydr. Depth (ft)		3.29	
Conv. Total (cfs)	79193.2	Conv. (cfs)		79193.2	
Length Wtd. (ft)	108.00	Wetted Per. (ft)		220.94	
Min Ch El (ft)	997.00	Shear (lb/sq ft)		0.21	
Alpha	1.00	Stream Power (lb/ft s)		0.75	
Frctn Loss (ft)	0.09	Cum Volume (acre-ft)	2.97	34.80	44.45
C & E Loss (ft)	0.02	Cum SA (acres)	5.43	17.40	35.14

CROSS SECTION RIVER: RIVER-1
REACH: Reach-1 RS: 6176

INPUT
Description:
Station Elevation Data num= 10

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
9911	1004	9915	1003	9940	1002	9942	1001	9945	1000
9945	997.04	10000	997.04	10063	997.04	10063	1000.8	10076	1004

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
9911	.035	9911	.03	10076	.035

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
9911	10076	186	186	186	.3	.5

Ineffective Flow num= 2

Sta L	Sta R	Elev	Sta L	Sta R	Elev
9911	9945		10063	10076	

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	1002.74	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.25	Wt. n-Val.		0.030	
W.S. Elev (ft)	1002.49	Reach Len. (ft)	186.00	186.00	186.00
Crit W.S. (ft)	999.48	Flow Area (sq ft)		643.37	
E.G. Slope (ft/ft)	0.000722	Area (sq ft)		660.18	
Q Total (cfs)	2557.00	Flow (cfs)		2557.00	
Top Width (ft)	142.18	Top Width (ft)		142.18	
Vel Total (ft/s)	3.97	Avg. Vel. (ft/s)		3.97	
Max Chl Dpth (ft)	5.45	Hydr. Depth (ft)		5.45	
Conv. Total (cfs)	95136.8	Conv. (cfs)		95136.8	
Length Wtd. (ft)	186.00	Wetted Per. (ft)		124.72	
Min Ch El (ft)	997.04	Shear (lb/sq ft)		0.23	
Alpha	1.00	Stream Power (lb/ft s)		0.92	
Frctn Loss (ft)		Cum Volume (acre-ft)	10.10	26.62	56.65
C & E Loss (ft)		Cum SA (acres)	17.02	16.95	56.03

CROSS SECTION OUTPUT Profile #PF 2

E.G. Elev (ft)	1002.74	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.25	Wt. n-Val.		0.030	
W.S. Elev (ft)	1002.49	Reach Len. (ft)	186.00	186.00	186.00
Crit W.S. (ft)	999.48	Flow Area (sq ft)		643.31	
E.G. Slope (ft/ft)	0.000723	Area (sq ft)		660.11	
Q Total (cfs)	2557.00	Flow (cfs)		2557.00	
Top Width (ft)	142.17	Top Width (ft)		142.17	
Vel Total (ft/s)	3.97	Avg. Vel. (ft/s)		3.97	
Max Chl Dpth (ft)	5.45	Hydr. Depth (ft)		5.45	
Conv. Total (cfs)	95122.6	Conv. (cfs)		95122.6	
Length Wtd. (ft)	186.00	Wetted Per. (ft)		124.72	
Min Ch El (ft)	997.04	Shear (lb/sq ft)		0.23	
Alpha	1.00	Stream Power (lb/ft s)		0.92	
Frctn Loss (ft)		Cum Volume (acre-ft)	2.97	33.08	44.45
C & E Loss (ft)		Cum SA (acres)	5.43	16.95	35.14

CULVERT RIVER: RIVER-1
REACH: Reach-1 RS: 6083

INPUT
Description:
Distance from Upstream XS = 10
Deck/Roadway Width = 166
Weir Coefficient = 2.6
Bridge Deck/Roadway Skew = 0
Upstream Deck/Roadway Coordinates

```
    num=        4
     Sta Hi Cord Lo Cord      Sta Hi Cord Lo Cord      Sta Hi Cord Lo Cord
    9911  1008.4            9951  1008.5            10049  1006.7
   10093  1005.8

Upstream Bridge Cross Section Data
Station Elevation Data     num=       10
     Sta     Elev     Sta     Elev     Sta     Elev     Sta     Elev     Sta     Elev
    9911     1004    9915     1003    9940     1002    9942     1001    9945     1000
    9945   997.04   10000   997.04   10063   997.04   10063   1000.8   10076     1004

Manning's n Values         num=        3
     Sta   n Val     Sta   n Val     Sta   n Val
    9911    .035    9911     .03   10076    .035

Bank Sta: Left   Right    Coeff Contr.   Expan.
          9911   10076            .3        .5
Ineffective Flow     num=        2
   Sta L   Sta R    Elev   Sta L   Sta R    Elev
    9911    9945           10063   10076

Downstream  Deck/Roadway Coordinates
    num=        4
     Sta Hi Cord Lo Cord      Sta Hi Cord Lo Cord      Sta Hi Cord Lo Cord
    9924 1008.45            9951  1008.5            10049  1006.7
   10078  1006.1

Downstream Bridge Cross Section Data
Station Elevation Data     num=        9
     Sta     Elev     Sta     Elev     Sta     Elev     Sta     Elev     Sta     Elev
    9924   1002.5    9925   1001.8    9943   998.76    9943   996.68   10000   996.68
   10058   996.68   10058   998.43   10077  1002.06   10078   1002.5

Manning's n Values         num=        3
     Sta   n Val     Sta   n Val     Sta   n Val
    9924    .045    9924     .03   10078    .045

Bank Sta: Left   Right    Coeff Contr.   Expan.
          9924   10078            .3        .5
Ineffective Flow     num=        2
   Sta L   Sta R    Elev   Sta L   Sta R    Elev
    9924    9924  1001.8   10078   10078  1002.06

Upstream Embankment side slope                =       0 horiz. to 1.0 vertical
Downstream Embankment side slope              =       0 horiz. to 1.0 vertical
Maximum allowable submergence for weir flow =     .95
Elevation at which weir flow begins           =
Energy head used in spillway design           =
Spillway height used in design                =
Weir crest shape                              = Broad Crested

Number of Culverts =  1

Culvert Name      Shape      Rise    Span
Culvert #1          Box         6      10
FHWA Chart # 8 - flared wingwalls
FHWA Scale # 1 - Wingwall flared 30 to 75 deg.
Solution Criteria = Highest U.S. EG
Culvert Upstrm Dist  Length    n Value   Entrance Loss Coef   Exit Loss Coef
                  6     166       .012                   .4                1
Number of Barrels =  9
Upstream   Elevation =  997.02
Centerline Stations
    Sta.    Sta.    Sta.    Sta.    Sta.    Sta.    Sta.    Sta.    Sta.
    9956    9967    9978    9989   10000   10011   10022   10033   10044
Downstream Elevation =  996.68
Centerline Stations
    Sta.    Sta.    Sta.    Sta.    Sta.    Sta.    Sta.    Sta.    Sta.
    9956    9967    9978    9989   10000   10011   10022   10033   10044

CULVERT OUTPUT    Profile #PF 1
Culvert ID : Culvert #1

  Culv Q (cfs)           2557.00   Culv Vel In (ft/s)        5.65
  # Barrels                    9   Culv Vel Out (ft/s)       5.33
  Q Barrel (cfs)          284.11   Culv Inv El Up (ft)     997.02
  E.G. US. (ft)          1002.74   Culv Inv El Dn (ft)     996.68
  W.S. US. (ft)          1002.49   Culv Frctn Ls (ft)        0.09
  Delta EG (ft)             0.51   Culv Ext Lss (ft)         0.22
  Delta WS (ft)             0.48   Culv Ent Lss (ft)         0.20
  E.G. IC (ft)           1001.71   Q Weir (cfs)
  E.G. OC (ft)           1002.74   Weir Sta Lft (ft)
  Culvert Control         Outlet   Weir Sta Rgt (ft)
  Culv WS In (ft)        1002.05   Weir Submerg
  Culv WS Out (ft)       1002.01   Weir Max Depth (ft)
```

Culv Nml Depth (ft)	3.23	Weir Avg Depth (ft)	
Culv Crt Depth (ft)	2.93	Wr Flw Area (sq ft)	
Culv Ful Lngh (ft)		Min Top Rd (ft)	1006.41

CULVERT OUTPUT Profile #PF 2
Culvert ID : Culvert #1

Culv Q (cfs)	2557.00	Culv Vel In (ft/s)	5.65
# Barrels	9	Culv Vel Out (ft/s)	5.33
Q Barrel (cfs)	284.11	Culv Inv El Up (ft)	997.02
E.G. US. (ft)	1002.74	Culv Inv El Dn (ft)	996.68
W.S. US. (ft)	1002.49	Culv Frctn Ls (ft)	0.09
Delta EG (ft)	0.51	Culv Ext Lss (ft)	0.22
Delta WS (ft)	0.48	Culv Ent Lss (ft)	0.20
E.G. IC (ft)	1001.71	Q Weir (cfs)	
E.G. OC (ft)	1002.74	Weir Sta Lft (ft)	
Culvert Control	Outlet	Weir Sta Rgt (ft)	
Culv WS In (ft)	1002.05	Weir Submerg	
Culv WS Out (ft)	1002.01	Weir Max Depth (ft)	
Culv Nml Depth (ft)	3.23	Weir Avg Depth (ft)	
Culv Crt Depth (ft)	2.93	Wr Flw Area (sq ft)	
Culv Ful Lngh (ft)		Min Top Rd (ft)	1006.41

CROSS SECTION RIVER: RIVER-1
REACH: Reach-1 RS: 5990

INPUT
Description:
Station Elevation Data num= 9

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
9924	1002.5	9925	1001.8	9943	998.76	9943	996.68	10000	996.68
10058	996.68	10058	998.43	10077	1002.06	10078	1002.5		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
9924	.045	9924	.03	10078	.045

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
9924	10078	500	520	670	.3	.5

Ineffective Flow num= 2

Sta L	Sta R	Elev	Sta L	Sta R	Elev
9924	9924	1001.8	10078	10078	1002.06

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	1002.23	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.22	Wt. n-Val.		0.030	
W.S. Elev (ft)	1002.01	Reach Len. (ft)	500.00	520.00	670.00
Crit W.S. (ft)	999.18	Flow Area (sq ft)		677.81	
E.G. Slope (ft/ft)	0.000822	Area (sq ft)		677.81	
Q Total (cfs)	2557.00	Flow (cfs)		2557.00	
Top Width (ft)	152.04	Top Width (ft)		152.04	
Vel Total (ft/s)	3.77	Avg. Vel. (ft/s)		3.77	
Max Chl Dpth (ft)	5.33	Hydr. Depth (ft)		4.46	
Conv. Total (cfs)	89190.1	Conv. (cfs)		89190.1	
Length Wtd. (ft)	594.08	Wetted Per. (ft)		156.54	
Min Ch El (ft)	996.68	Shear (lb/sq ft)		0.22	
Alpha	1.00	Stream Power (lb/ft s)		0.84	
Frctn Loss (ft)	0.54	Cum Volume (acre-ft)	10.10	23.77	56.65
C & E Loss (ft)	0.01	Cum SA (acres)	17.02	16.32	56.03

CROSS SECTION OUTPUT Profile #PF 2

E.G. Elev (ft)	1002.23	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.22	Wt. n-Val.		0.030	
W.S. Elev (ft)	1002.01	Reach Len. (ft)	500.00	520.00	670.00
Crit W.S. (ft)	999.18	Flow Area (sq ft)		677.72	
E.G. Slope (ft/ft)	0.000822	Area (sq ft)		677.72	
Q Total (cfs)	2557.00	Flow (cfs)		2557.00	
Top Width (ft)	152.04	Top Width (ft)		152.04	
Vel Total (ft/s)	3.77	Avg. Vel. (ft/s)		3.77	
Max Chl Dpth (ft)	5.33	Hydr. Depth (ft)		4.46	
Conv. Total (cfs)	89171.3	Conv. (cfs)		89171.3	
Length Wtd. (ft)	594.10	Wetted Per. (ft)		156.53	
Min Ch El (ft)	996.68	Shear (lb/sq ft)		0.22	
Alpha	1.00	Stream Power (lb/ft s)		0.84	
Frctn Loss (ft)	0.54	Cum Volume (acre-ft)	2.97	30.22	44.45
C & E Loss (ft)	0.01	Cum SA (acres)	5.43	16.32	35.14

CROSS SECTION RIVER: RIVER-1
REACH: Reach-1 RS: 6.32

INPUT
Description:
Station Elevation Data num= 18

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
8860	1008	9230	1006	9555	1004	9660	1002.5	9670	1002
9900	1001.3	10000	1000.9	10100	1001.4	10480	1001.4	10491	1000.3
10515	996.38	10560	996.38	10605	996.38	10633	1001.01	10800	1003.1
11030	1004	11060	1006	11220	1007				

Manning's n Values num= 5

Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
8860	.07	9900	.045	10100	.07	10491	.03	10633	.07

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
9900	10100	580	545	525	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

			Left OB	Channel	Right OB
E.G. Elev (ft)	1001.68	Element			
Vel Head (ft)	0.24	Wt. n-Val.	0.070	0.045	0.030
W.S. Elev (ft)	1001.44	Reach Len. (ft)	580.00	545.00	525.00
Crit W.S. (ft)		Flow Area (sq ft)	3.29	63.29	636.56
E.G. Slope (ft/ft)	0.001021	Area (sq ft)	3.29	63.29	636.56
Q Total (cfs)	2557.00	Flow (cfs)	0.38	31.02	2525.60
Top Width (ft)	813.96	Top Width (ft)	46.49	200.00	567.48
Vel Total (ft/s)	3.64	Avg. Vel. (ft/s)	0.12	0.49	3.97
Max Chl Dpth (ft)	5.06	Hydr. Depth (ft)	0.07	0.32	1.12
Conv. Total (cfs)	80010.6	Conv. (cfs)	11.9	970.5	79028.1
Length Wtd. (ft)	526.12	Wetted Per. (ft)	46.49	200.00	568.23
Min Ch El (ft)	1000.90	Shear (lb/sq ft)	0.00	0.02	0.07
Alpha	1.18	Stream Power (lb/ft s)	0.00	0.01	0.28
Frctn Loss (ft)	0.58	Cum Volume (acre-ft)	10.08	19.34	51.76
C & E Loss (ft)	0.03	Cum SA (acres)	16.75	14.22	51.67

CROSS SECTION OUTPUT Profile #PF 2

			Left OB	Channel	Right OB
E.G. Elev (ft)	1001.68	Element			
Vel Head (ft)	0.24	Wt. n-Val.	0.070	0.045	0.030
W.S. Elev (ft)	1001.44	Reach Len. (ft)	580.00	545.00	525.00
Crit W.S. (ft)		Flow Area (sq ft)	3.08	62.39	634.00
E.G. Slope (ft/ft)	0.001026	Area (sq ft)	3.08	62.39	634.00
Q Total (cfs)	2557.00	Flow (cfs)	0.36	30.35	2526.30
Top Width (ft)	811.00	Top Width (ft)	44.00	200.00	567.00
Vel Total (ft/s)	3.66	Avg. Vel. (ft/s)	0.12	0.49	3.98
Max Chl Dpth (ft)	5.06	Hydr. Depth (ft)	0.07	0.31	1.12
Conv. Total (cfs)	79837.4	Conv. (cfs)	11.1	947.5	78878.8
Length Wtd. (ft)	526.10	Wetted Per. (ft)	44.00	200.00	567.76
Min Ch El (ft)	1000.90	Shear (lb/sq ft)	0.00	0.02	0.07
Alpha	1.17	Stream Power (lb/ft s)	0.00	0.01	0.28
Frctn Loss (ft)	0.58	Cum Volume (acre-ft)	2.95	25.80	39.57
C & E Loss (ft)	0.03	Cum SA (acres)	5.18	14.22	30.78

CROSS SECTION RIVER: RIVER-1
REACH: Reach-1 RS: 6.217

INPUT
Description:
Station Elevation Data num= 19

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
8300	1006	9175	1004	9565	1002	9630	1001.2	9665	1001.7
9695	1000.6	9900	1000.3	10000	1000.1	10100	1000.3	10445	1000.7
10535	1001	10600	1001	10692	1000.07	10715	996.31	10760	996.31
10805	996.31	10829	1000.29	11080	1004	11110	1006		

Manning's n Values num= 5

Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
8300	.07	9900	.045	10100	.07	10692	.03	10829	.07

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
9900	10100	620	690	745	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

			Left OB	Channel	Right OB
E.G. Elev (ft)	1001.08	Element			
Vel Head (ft)	0.15	Wt. n-Val.	0.070	0.045	0.031
W.S. Elev (ft)	1000.93	Reach Len. (ft)	620.00	690.00	745.00
Crit W.S. (ft)		Flow Area (sq ft)	100.65	146.71	751.07
E.G. Slope (ft/ft)	0.001175	Area (sq ft)	100.65	146.71	751.07
Q Total (cfs)	2557.00	Flow (cfs)	44.27	135.04	2377.69
Top Width (ft)	1095.12	Top Width (ft)	214.10	200.00	681.02
Vel Total (ft/s)	2.56	Avg. Vel. (ft/s)	0.44	0.92	3.17
Max Chl Dpth (ft)	4.62	Hydr. Depth (ft)	0.47	0.73	1.10

Conv. Total (cfs)	74609.1	Conv. (cfs)	1291.6	3940.3	69377.2
Length Wtd. (ft)	738.96	Wetted Per. (ft)	214.10	200.00	681.67
Min Ch El (ft)	1000.10	Shear (lb/sq ft)	0.03	0.05	0.08
Alpha	1.43	Stream Power (lb/ft s)	0.02	0.05	0.26
Frctn Loss (ft)	1.25	Cum Volume (acre-ft)	9.39	18.03	43.39
C & E Loss (ft)	0.00	Cum SA (acres)	15.02	11.72	44.15

Warning: Divided flow computed for this cross-section.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #PF 2

			Left OB	Channel	Right OB
E.G. Elev (ft)	1001.07	Element			
Vel Head (ft)	0.15	Wt. n-Val.	0.070	0.045	0.031
W.S. Elev (ft)	1000.92	Reach Len. (ft)	620.00	690.00	745.00
Crit W.S. (ft)		Flow Area (sq ft)	98.29	144.51	743.61
E.G. Slope (ft/ft)	0.001192	Area (sq ft)	98.29	144.51	743.61
Q Total (cfs)	2557.00	Flow (cfs)	42.91	132.67	2381.42
Top Width (ft)	1089.69	Top Width (ft)	213.80	200.00	675.90
Vel Total (ft/s)	2.59	Avg. Vel. (ft/s)	0.44	0.92	3.20
Max Chl Dpth (ft)	4.61	Hydr. Depth (ft)	0.46	0.72	1.10
Conv. Total (cfs)	74056.9	Conv. (cfs)	1242.9	3842.4	68971.6
Length Wtd. (ft)	737.41	Wetted Per. (ft)	213.80	200.00	676.54
Min Ch El (ft)	1000.10	Shear (lb/sq ft)	0.03	0.05	0.08
Alpha	1.43	Stream Power (lb/ft s)	0.01	0.05	0.26
Frctn Loss (ft)	0.88	Cum Volume (acre-ft)	2.28	24.51	31.27
C & E Loss (ft)	0.03	Cum SA (acres)	3.46	11.72	23.29

Warning: Divided flow computed for this cross-section.

CROSS SECTION RIVER: RIVER-1
REACH: Reach-1 RS: 6.086

INPUT
Description:
Station Elevation Data num= 16

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
8350	1004	9210	1002	9650	1000	9810	999.6	9900	999.2
10000	998.3	10100	999.2	10420	999	10495	999.6	10720	999.6
10868	998.86	10885	996.18	10930	996.18	10975	996.18	10997	999.75
11285	1004								

Manning's n Values num= 5

Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
8350	.07	9900	.045	10100	.07	10868	.03	10997	.07

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
9900	10100	655	665	685	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

			Left OB	Channel	Right OB
E.G. Elev (ft)	999.83	Element			
Vel Head (ft)	0.15	Wt. n-Val.	0.070	0.045	0.033
W.S. Elev (ft)	999.67	Reach Len. (ft)	655.00	665.00	685.00
Crit W.S. (ft)	999.38	Flow Area (sq ft)	25.58	184.50	681.44
E.G. Slope (ft/ft)	0.002683	Area (sq ft)	25.58	184.50	681.44
Q Total (cfs)	2557.00	Flow (cfs)	10.09	299.03	2247.88
Top Width (ft)	1215.52	Top Width (ft)	119.00	200.00	896.52
Vel Total (ft/s)	2.87	Avg. Vel. (ft/s)	0.39	1.62	3.30
Max Chl Dpth (ft)	3.49	Hydr. Depth (ft)	0.21	0.92	0.76
Conv. Total (cfs)	49365.1	Conv. (cfs)	194.8	5773.0	43397.3
Length Wtd. (ft)	680.53	Wetted Per. (ft)	119.00	200.01	897.02
Min Ch El (ft)	998.30	Shear (lb/sq ft)	0.04	0.15	0.13
Alpha	1.20	Stream Power (lb/ft s)	0.01	0.25	0.42
Frctn Loss (ft)	2.00	Cum Volume (acre-ft)	8.49	15.41	31.14
C & E Loss (ft)	0.03	Cum SA (acres)	12.65	8.55	30.66

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #PF 2

			Left OB	Channel	Right OB
E.G. Elev (ft)	1000.16	Element			
Vel Head (ft)	0.06	Wt. n-Val.	0.070	0.045	0.038
W.S. Elev (ft)	1000.11	Reach Len. (ft)	655.00	665.00	685.00
Crit W.S. (ft)		Flow Area (sq ft)	76.64	271.79	1072.48
E.G. Slope (ft/ft)	0.001191	Area (sq ft)	76.64	271.79	1072.48
Q Total (cfs)	2557.00	Flow (cfs)	42.24	379.99	2134.78
Top Width (ft)	1213.00	Top Width (ft)	117.00	200.00	896.00

Vel Total (ft/s)	1.80	Avg. Vel. (ft/s)	0.55	1.40	1.99
Max Chl Dpth (ft)	3.93	Hydr. Depth (ft)	0.66	1.36	1.20
Conv. Total (cfs)	74091.6	Conv. (cfs)	1223.9	11010.5	61857.3
Length Wtd. (ft)	676.34	Wetted Per. (ft)	117.44	200.01	897.01
Min Ch El (ft)	998.30	Shear (lb/sq ft)	0.05	0.10	0.09
Alpha	1.11	Stream Power (lb/ft s)	0.03	0.14	0.18
Frctn Loss (ft)	1.36	Cum Volume (acre-ft)	1.03	21.21	15.74
C & E Loss (ft)	0.01	Cum SA (acres)	1.11	8.55	9.85

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION RIVER: RIVER-1
REACH: Reach-1 RS: 5.96

INPUT
Description:
Station Elevation Data num= 21

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
8825	1002	9240	1000	9760	998	9910	997	9960	997.3
9990	996	10000	995.9	10010	996	10150	996.2	10230	996
10520	996.2	10680	997.3	10715	997	10935	997.7	11068	997.1
11075	996.05	11120	996.05	11165	996.05	11174	997.6	11210	1000
11560	1002								

Manning's n Values num= 5

Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
8825	.07	9960	.045	10150	.07	11068	.03	11174	.07

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
9960	10150	640	635	610	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

E.G. Elev (ft)	997.80	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.06	Wt. n-Val.	0.070	0.045	0.055
W.S. Elev (ft)	997.74	Reach Len. (ft)	640.00	635.00	610.00
Crit W.S. (ft)		Flow Area (sq ft)	70.68	298.22	1086.18
E.G. Slope (ft/ft)	0.003230	Area (sq ft)	70.68	298.22	1086.18
Q Total (cfs)	2557.00	Flow (cfs)	49.23	755.78	1751.99
Top Width (ft)	1377.21	Top Width (ft)	161.10	190.00	1026.11
Vel Total (ft/s)	1.76	Avg. Vel. (ft/s)	0.70	2.53	1.61
Max Chl Dpth (ft)	1.84	Hydr. Depth (ft)	0.44	1.57	1.06
Conv. Total (cfs)	44993.0	Conv. (cfs)	866.2	13298.7	30828.1
Length Wtd. (ft)	623.40	Wetted Per. (ft)	161.10	190.03	1026.33
Min Ch El (ft)	995.90	Shear (lb/sq ft)	0.09	0.32	0.21
Alpha	1.20	Stream Power (lb/ft s)	0.06	0.80	0.34
Frctn Loss (ft)	1.77	Cum Volume (acre-ft)	7.77	11.72	17.25
C & E Loss (ft)	0.00	Cum SA (acres)	10.54	5.57	15.54

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #PF 2

E.G. Elev (ft)	998.79	Element	Left OB	Channel	Right OB
Vel Head (ft)	0.19	Wt. n-Val.		0.045	0.070
W.S. Elev (ft)	998.61	Reach Len. (ft)	640.00	635.00	610.00
Crit W.S. (ft)		Flow Area (sq ft)		462.50	314.59
E.G. Slope (ft/ft)	0.004137	Area (sq ft)		462.50	314.59
Q Total (cfs)	2557.00	Flow (cfs)		1769.22	787.78
Top Width (ft)	314.08	Top Width (ft)		190.00	124.08
Vel Total (ft/s)	3.29	Avg. Vel. (ft/s)		3.83	2.50
Max Chl Dpth (ft)	2.71	Hydr. Depth (ft)		2.43	2.54
Conv. Total (cfs)	39755.1	Conv. (cfs)		27507.1	12248.0
Length Wtd. (ft)	629.20	Wetted Per. (ft)		191.33	126.66
Min Ch El (ft)	995.90	Shear (lb/sq ft)		0.62	0.64
Alpha	1.11	Stream Power (lb/ft s)		2.39	1.61
Frctn Loss (ft)	2.10	Cum Volume (acre-ft)	0.46	15.61	4.84
C & E Loss (ft)	0.00	Cum SA (acres)	0.23	5.57	1.83

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION RIVER: RIVER-1
REACH: Reach-1 RS: 5.84

INPUT
Description:
Station Elevation Data num= 22

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
8460	1001.6	8815	1000	9090	998	9400	996	9760	994.5
9805	996	9840	998.1	9865	993.5	9895	993.5	9920	998.6
9925	998	9940	996	9970	994	10000	993.4	10170	993.7
10300	994	10605	996	10620	996.3	10650	995.8	10675	996
10945	998	11190	1000						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
8460	.07	9970	.045	10170	.07

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
9970	10170	590	595	580	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

			Left OB	Channel	Right OB
E.G. Elev (ft)	996.02	Element			
Vel Head (ft)	0.09	Wt. n-Val.	0.070	0.045	0.070
W.S. Elev (ft)	995.93	Reach Len. (ft)	590.00	595.00	580.00
Crit W.S. (ft)		Flow Area (sq ft)	409.28	472.29	557.76
E.G. Slope (ft/ft)	0.002572	Area (sq ft)	409.28	472.29	557.76
Q Total (cfs)	2557.00	Flow (cfs)	437.82	1402.57	716.61
Top Width (ft)	1121.05	Top Width (ft)	471.34	200.00	449.71
Vel Total (ft/s)	1.78	Avg. Vel. (ft/s)	1.07	2.97	1.28
Max Chl Dpth (ft)	2.53	Hydr. Depth (ft)	0.87	2.36	1.24
Conv. Total (cfs)	50416.3	Conv. (cfs)	8632.5	27654.5	14129.3
Length Wtd. (ft)	590.80	Wetted Per. (ft)	471.90	200.01	449.72
Min Ch El (ft)	993.40	Shear (lb/sq ft)	0.14	0.38	0.20
Alpha	1.74	Stream Power (lb/ft s)	0.15	1.13	0.26
Frctn Loss (ft)	2.25	Cum Volume (acre-ft)	4.24	6.10	5.73
C & E Loss (ft)	0.01	Cum SA (acres)	5.90	2.73	5.21

Warning: Divided flow computed for this cross-section.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #PF 2

			Left OB	Channel	Right OB
E.G. Elev (ft)	996.69	Element			
Vel Head (ft)	0.17	Wt. n-Val.	0.070	0.045	0.070
W.S. Elev (ft)	996.52	Reach Len. (ft)	590.00	595.00	580.00
Crit W.S. (ft)		Flow Area (sq ft)	32.25	589.34	192.78
E.G. Slope (ft/ft)	0.002742	Area (sq ft)	32.25	589.34	192.78
Q Total (cfs)	2557.00	Flow (cfs)	53.29	2094.54	409.18
Top Width (ft)	286.74	Top Width (ft)	16.33	200.00	70.41
Vel Total (ft/s)	3.14	Avg. Vel. (ft/s)	1.65	3.55	2.12
Max Chl Dpth (ft)	3.12	Hydr. Depth (ft)	1.97	2.95	2.74
Conv. Total (cfs)	48828.7	Conv. (cfs)	1017.5	39997.4	7813.7
Length Wtd. (ft)	593.75	Wetted Per. (ft)	17.80	200.01	73.07
Min Ch El (ft)	993.40	Shear (lb/sq ft)	0.31	0.50	0.45
Alpha	1.13	Stream Power (lb/ft s)	0.51	1.79	0.96
Frctn Loss (ft)	2.07	Cum Volume (acre-ft)	0.22	7.94	1.28
C & E Loss (ft)	0.01	Cum SA (acres)	0.11	2.73	0.47

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION RIVER: RIVER-1
REACH: Reach-1 RS: 5.727

INPUT
Description:
C 006

CROSS-SECTION AT 280 FEET(ALONG FLOW PATH) NORTH OF MCDOWELL RD.C
006

Station Elevation Data num= 21

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
8415	999	8710	998	9045	996	9250	994	9690	992.4
9730	994	9780	996.1	9800	993.5	9830	993.5	9870	1000.4
9890	1000	9900	994	9935	992	10000	991	10135	991.8
10190	992	10550	994	10565	994.6	10600	994	10890	996
11170	998								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val

8415 .07 9935 .045 10135 .07

Bank Sta: Left	Right	Lengths: Left	Channel	Right	Coeff Contr.	Expan.
9935	10135	0	0	0	.1	.3

CROSS SECTION OUTPUT Profile #PF 1

			Left OB	Channel	Right OB
E.G. Elev (ft)	993.76	Element			
Vel Head (ft)	0.22	Wt. n-Val.	0.070	0.045	0.070
W.S. Elev (ft)	993.54	Reach Len. (ft)			
Crit W.S. (ft)	993.06	Flow Area (sq ft)	216.89	421.50	303.64
E.G. Slope (ft/ft)	0.006320	Area (sq ft)	216.89	421.50	303.64
Q Total (cfs)	2557.00	Flow (cfs)	255.74	1818.68	482.58
Top Width (ft)	931.68	Top Width (ft)	399.48	200.00	332.20
Vel Total (ft/s)	2.71	Avg. Vel. (ft/s)	1.18	4.31	1.59
Max Chl Dpth (ft)	2.54	Hydr. Depth (ft)	0.54	2.11	0.91
Conv. Total (cfs)	32164.7	Conv. (cfs)	3217.0	22877.3	6070.5
Length Wtd. (ft)		Wetted Per. (ft)	399.55	200.01	332.20
Min Ch El (ft)	991.00	Shear (lb/sq ft)	0.21	0.83	0.36
Alpha	1.88	Stream Power (lb/ft s)	0.25	3.59	0.57
Frctn Loss (ft)		Cum Volume (acre-ft)			
C & E Loss (ft)		Cum SA (acres)			

Warning: Divided flow computed for this cross-section.

CROSS SECTION OUTPUT Profile #PF 2

			Left OB	Channel	Right OB
E.G. Elev (ft)	994.61	Element			
Vel Head (ft)	0.31	Wt. n-Val.		0.045	
W.S. Elev (ft)	994.30	Reach Len. (ft)			
Crit W.S. (ft)	993.14	Flow Area (sq ft)		573.50	
E.G. Slope (ft/ft)	0.004619	Area (sq ft)		573.50	
Q Total (cfs)	2557.00	Flow (cfs)		2557.00	
Top Width (ft)	200.00	Top Width (ft)		200.00	
Vel Total (ft/s)	4.46	Avg. Vel. (ft/s)		4.46	
Max Chl Dpth (ft)	3.30	Hydr. Depth (ft)		2.87	
Conv. Total (cfs)	37621.4	Conv. (cfs)		37621.4	
Length Wtd. (ft)		Wetted Per. (ft)		204.81	
Min Ch El (ft)	991.00	Shear (lb/sq ft)		0.81	
Alpha	1.00	Stream Power (lb/ft s)		3.60	
Frctn Loss (ft)		Cum Volume (acre-ft)			
C & E Loss (ft)		Cum SA (acres)			

SUMMARY OF REACH LENGTHS

River: RIVER-1

Reach	River Sta.	Left	Channel	Right
Reach-1	7385	15	15	15
Reach-1	7370	170	170	170
Reach-1	7200	200	200	200
Reach-1	7000	200	200	200
Reach-1	6800	200	200	200
Reach-1	6600	200	200	200
Reach-1	6400	95	116	140
Reach-1	6284	115	108	100
Reach-1	6176	186	186	186
Reach-1	6083	Culvert		
Reach-1	5990	500	520	670
Reach-1	6.32	580	545	525
Reach-1	6.217	620	690	745
Reach-1	6.086	655	665	685
Reach-1	5.96	640	635	610
Reach-1	5.84	590	595	580
Reach-1	5.727	0	0	0

SUMMARY OF CONTRACTION AND EXPANSION COEFFICIENTS
River: RIVER-1

Reach	River Sta.	Contr.	Expan.
Reach-1	7385	.1	.3
Reach-1	7370	.1	.3
Reach-1	7200	.1	.3
Reach-1	7000	.1	.3
Reach-1	6800	.1	.3

Reach-1	6600	.1	.3
Reach-1	6400	.1	.3
Reach-1	6284	.3	.5
Reach-1	6176	.3	.5
Reach-1	6083	Culvert	
Reach-1	5990	.3	.5
Reach-1	6.32	.1	.3
Reach-1	6.217	.1	.3
Reach-1	6.086	.1	.3
Reach-1	5.96	.1	.3
Reach-1	5.84	.1	.3
Reach-1	5.727	.1	.3

Profile Output Table - CHECKRAS

Reach	River Sta	Froude # Chl	Top Wdth Act	Conv. Total	Prof Delta WS	Left Sta Eff	Enc Sta L	Center Sta
tion Enc Sta R	Rght Sta Eff	Min Ch El	Left Stagn Right Stagn					
			(ft)	(cfs)	(ft)	(ft)	(ft)	
(ft) (ft)	(ft)	(ft)	(ft)	(ft)				
Reach-1	7385	0.27	151.88	81845.5		9918.45		1001
2.50	10070.32	996.75						
Reach-1	7385	0.27	151.86	81837.0	0.00	9918.45	9911.00	1001
2.50 10114.00	10070.31	996.75						
Reach-1	7370	0.26	185.07	80793.3		9912.44		1001
6.50	10097.51	996.75						
Reach-1	7370	0.26	185.06	80781.5	0.00	9912.44	9902.00	1001
6.50 10131.00	10097.50	996.75						
Reach-1	7200	0.22	244.22	130566.1		9931.98		1004
4.00	10176.20	998.00						
Reach-1	7200	0.22	244.21	130541.0	0.00	9931.98	9900.00	1004
4.00 10188.00	10176.19	998.00						
Reach-1	7000	0.24	216.32	119986.9		9938.17		1003
1.50	10154.49	998.00						
Reach-1	7000	0.24	216.31	119961.5	0.00	9938.17	9896.00	1003
1.50 10167.00	10154.48	998.00						
Reach-1	6800	0.19	269.07	153774.9		9917.40		1004
1.00	10186.47	998.00						
Reach-1	6800	0.19	269.06	153744.5	0.00	9917.40	9891.00	1004
1.00 10191.00	10186.46	998.00						
Reach-1	6600	0.16	281.56	181308.2		9858.64		1001
2.50	10140.20	997.00						
Reach-1	6600	0.16	281.55	181278.0	0.00	9858.65	9853.00	1001
2.50 10172.00	10140.19	997.00						
Reach-1	6400	0.18	287.75	161567.4		9846.93		999
5.00	10134.67	997.00						
Reach-1	6400	0.18	287.73	161537.7	0.00	9846.93	9842.00	999
5.00 10148.00	10134.67	997.00						
Reach-1	6284	0.34	220.37	79208.4		9856.97		996
0.00	10077.34	997.00						
Reach-1	6284	0.34	220.34	79193.2	0.00	9857.00	9837.00	996
0.00 10083.00	10077.34	997.00						
Reach-1	6176	0.30	118.00	95136.8		9945.00		999
3.50	10063.00	997.04						
Reach-1	6176	0.30	118.00	95122.6	0.00	9945.00	9911.00	999
3.50 10076.00	10063.00	997.04						
Reach-1	6083	Culvert #1						
Reach-1	6083	Culvert #1						
Reach-1	5990	0.31	152.04	89190.1		9924.70		1000
1.00	10076.74	996.68						

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  Reach-1        5990                 0.31        152.04       89171.3          0.00       9924.70    9924.00        1000
1.00    10078.00       10076.74     996.68

  Reach-1        6.32                 0.15        813.96       80010.6                     9853.51                      1000
0.00                   10667.48    1000.90
  Reach-1        6.32                 0.15        811.00       79837.4          0.00       9856.00    9856.00        1000
0.00    10667.00       10667.00    1000.90

  Reach-1        6.217                0.19       1095.12       74609.1                     9685.90                      1000
0.00                   10872.54    1000.10
  Reach-1        6.217                0.19       1089.69       74056.9         -0.01       9686.20    9686.00        1000
0.00    10872.00       10871.80    1000.10

  Reach-1        6.086                0.30       1215.52       49365.1                     9781.00                      1000
0.00                   10996.52     998.30
  Reach-1        6.086                0.21       1213.00       74091.6          0.44       9783.00    9783.00        1000
0.00    10996.00       10996.00     998.30

  Reach-1        5.96                 0.36       1377.21       44993.0                     9798.90                      1005
5.00                   11176.11     995.90
  Reach-1        5.96                 0.43        314.08       39755.1          0.86       9960.00    9960.00        1005
5.00    10274.08       10274.08     995.90

  Reach-1        5.84                 0.34       1121.05       50416.3                     9415.85                      1007
0.00                   10666.75     993.40
  Reach-1        5.84                 0.36        286.74       48828.7          0.59       9953.67    9953.67        1007
0.00    10240.41       10240.41     993.40

  Reach-1        5.727                0.52        931.68       32164.7                     9376.51                      1003
5.00                   10467.20     991.00
  Reach-1        5.727                0.46        200.00       37621.4          0.76       9935.00    9935.00        1003
5.00    10135.00       10135.00     991.00
```

Stantec

Project: Goodyear planned Regional Center Project Number:

Notes: Scale:

Page of Page(s)

Computed By: Date: / / Checked By: Date: / /

CHECK-RAS OUTPUT

CHECK-RAS Program: NT Check
Manning's n Value and Transition Loss Coefficient Review

Project File: K:\Active\81500260\REPORTS\DRAINAGE\HCRASFLS\GYPRCCHN3.prj
Plan File: K:\Active\81500260\REPORTS\DRAINAGE\HCRASFLS\GYPRCCHN3.p02
Geometry File: K:\Active\81500260\REPORTS\DRAINAGE\HCRASFLS\GYPRCCHN3.g02
Flow File: K:\Active\81500260\REPORTS\DRAINAGE\HCRASFLS\GYPRCCHN3.f02
Report File: K:\Active\81500260\REPORTS\DRAINAGE\HCRASFLS\GYPRCCHN3.nt
Selected profiles: PF 1;PF 2
Date: 5/5/03
Time: 3:16:55 PM

SECNO	STRUCTURE	NLOB	NCHL	NROB	CNTR	EXP
RIVER-1,Reach-1						
7385		-----	0.04	0.04	0.1	0.3
		-----	0.04	-----		
7370		-----	0.04	0.04	0.1	0.3
		-----	0.04	-----		
7200		-----	0.035	0.035	0.1	0.3
		-----	0.03	-----		
7000		-----	0.035	0.035	0.1	0.3
		-----	0.03	-----		
6800		-----	0.035	0.035	0.1	0.3
		-----	0.03	-----		
6600		-----	0.03	0.035	0.1	0.3
		-----	0.035	-----		
6400		-----	0.035	0.035	0.1	0.3
		-----	0.03	-----		
6284		-----	0.03	0.035	0.3	0.5
		-----	0.035	-----		
6176		-----	0.03	0.035	0.3	0.5
		-----	0.035	-----		
6083	Culvert-Up	-----	0.035	0.035	0.3	0.5
		-----	0.03	-----		
6083	Culvert-Dn	-----	0.03	0.045	0.3	0.5
		-----	0.045	-----		
5990		-----	0.045	0.045	0.3	0.5
		-----	0.03	-----		
6.32		0.07	0.045	0.07	0.1	0.3
		-----	-----	0.03		
		-----	-----	0.07		
6.217		0.07	0.045	0.07	0.1	0.3
		-----	-----	0.03		
		-----	-----	0.07		
6.086		0.07	0.045	0.07	0.1	0.3
		-----	-----	0.03		
		-----	-----	0.07		
5.96		0.07	0.045	0.07	0.1	0.3
		-----	-----	0.03		
		-----	-----	0.07		
5.84		0.07	0.045	0.07	0.1	0.3
5.727		0.07	0.045	0.07	0.1	0.3

---Summary of Statistics---

	Minimum	Maximum
Left Overbank n Value:	0.07	0.07
Right Overbank n Value:	0.03	0.07
Channel n Value:	0.03	0.045
Contraction Coefficient:	0.1	0.3
Expansion Coefficient:	0.3	0.5

ROUGHNESS COEFFICIENT CHECK

TRANSITION LOSS COEFFICIENT CHECK

ROUGHNESS COEFFICIENT AT STRUCTURES

RS: 5990
NT RS 01 This is Section 2.
Channel n value of 0.03 is less than the channel n value of 0.045
at Section 1.

---END---

The downstream value is for the existing unimproved wash

CHECK-RAS Program, XS Check
Cross Section Location and Alignment Review

Project File: K:\Active\81500260\REPORTS\DRAINAGE\HCRASFLS\GYPRCCHN3.prj
Plan File: K:\Active\81500260\REPORTS\DRAINAGE\HCRASFLS\GYPRCCHN3.p02
Geometry File: K:\Active\81500260\REPORTS\DRAINAGE\HCRASFLS\GYPRCCHN3.g02
Flow File: K:\Active\81500260\REPORTS\DRAINAGE\HCRASFLS\GYPRCCHN3.f02
Report File: K:\Active\81500260\REPORTS\DRAINAGE\HCRASFLS\GYPRCCHN3.xs
Selected profiles: PF 1;PF 2
Date: 5/5/03
Time: 3:17:09 PM

SECNO	Len Lob	Len Chl	Len Rob	TopWdthAct	Q Total	Flow Code
RIVER-1,Reach-1						
7385	15	15	15	151.88	2557	
7370	170	170	170	185.07	2557	
7200	200	200	200	244.22	2557	B
7000	200	200	200	216.32	2557	B
6800	200	200	200	269.07	2557	B
6600	200	200	200	281.56	2557	
6400	95	116	140	287.75	2557	
6284	115	108	100	220.37	2557	
6176	186	186	186	118	2557	
6083	Culvert #1-Up					
6083	Culvert #1-Dn					
5990	500	520	670	152.04	2557	
6.32	580	545	525	813.96	2557	
6.217	620	690	745	1095.12	2557	D
6.086	655	665	685	1215.52	2557	
5.96	640	635	610	1377.21	2557	
5.84	590	595	580	1121.05	2557	D
5.727	0	0	0	931.68	2557	D

B=blocked obstruction XS SC 05
C=critial depth XS SC 03
D=divided flow XS SC 01
E=cross section extended XS SC 02
K=known water-surface XS SC 04

DISTANCE CHECK

SPACING CHECK

INEFFECTIVE FLOW CHECK

DISCHARGE CHECK

XS DC 02 Constant dicharge used for the RIVER-1,Reach-1

LOCATION CHECK

BOUNDARY CONDITION CHECK

XS BC 02 The name of the stream is RIVER-1,Reach-1
Known WS = 993.54 is specified as the downstream boundary
for profile PF 1

XS BC 02 The name of the stream is RIVER-1,Reach-1
Known WS = 994.3 is specified as the downstream boundary
for profile PF 2

---END---

CHECK-RAS Program: Structure Check

Project File: K:\Active\81500260\REPORTS\DRAINAGE\HCRASFLS\GYPRCCHN3.prj
Plan File: K:\Active\81500260\REPORTS\DRAINAGE\HCRASFLS\GYPRCCHN3.p02
Geometry File: K:\Active\81500260\REPORTS\DRAINAGE\HCRASFLS\GYPRCCHN3.g02
Flow File: K:\Active\81500260\REPORTS\DRAINAGE\HCRASFLS\GYPRCCHN3.f02
Report File: K:\Active\81500260\REPORTS\DRAINAGE\HCRASFLS\GYPRCCHN3.br
Selected profiles: PF 1;PF 2
Date: 5/5/03
Time: 3:20:09 PM

RS	MaxLoChord	MnTpRd	EGEL	WSEL	MinChEl	Structure
RIVER-1,Reach-1						
7385			1003.31	1003.14	996.75	
7370			1003.29	1003.14	996.75	
7200			1003.18	1003.08	998	
7000			1003.09	1002.97	998	
6800			1003.01	1002.93	998	
6600			1002.96	1002.9	997	
6400			1002.91	1002.84	997	
6284			1002.85	1002.65	997	
6176			1002.74	1002.49	997.04	
6083	1003.02	1006.15	0	1002.05	997.02	Culvert #1-Up
6083	1002.68	1006.1	0	1002.01	996.68	Culvert #1-Dn
5990			1002.23	1002.01	996.68	
6.32			1001.68	1001.44	1000.9	
6.217			1001.08	1000.93	1000.1	
6.086			999.83	999.67	998.3	
5.96			997.8	997.74	995.9	
5.84			996.02	995.93	993.4	
5.727			993.76	993.54	991	

RIVER/REACH: RIVER-1, Reach-1
RIVER STATION: 6083
TYPE OF STRUCTURE: Culvert

Description:

Distance from Upstream XS:	10
Deck/Roadway Width:	166
Weir Coefficient:	2.6
Maximum allowable submergence for weir flow:	0.95
Elevation at which weir flow begins:	0
Weir crest shape:	Broad Crested

Sec	River Station	Length Channel	WSEL	Surch.	EGEL	TopWidth Actual	
4	6284	108.00	1002.65	0	1002.85	220.37	
4	6284	108.00	1002.65	0	1002.85	220.34	
3	6176	186.00	1002.49	0	1002.74	118	
3	6176	186.00	1002.49	0	1002.74	118	
	6083	166.00	1002.05	0	0	0	Culvert #1-Up
	6083	14.00	1002.01	0	0	0	Culvert #1-Dn
	6083	166.00	1002.05	0	0	0	Culvert #1-Up
	6083	14.00	1002.01	0	0	0	Culvert #1-Dn
2	5990	520.00	1002.01	0	1002.23	152.04	
2	5990	520.00	1002.01	0	1002.23	152.04	
1	6.32	545.00	1001.44	0	1001.68	813.96	
1	6.32	545.00	1001.44	0	1001.68	811	

	Ineffective Flow, Section 3			Ineffective Flow, Section 2		
	Sta L	Sta R	Elev	Sta L	Sta R	Elev
1	9911	9945	0	9924	9924	1001.8
2	10063	10076	0	10078	10078	1002.06

Opening Type	StagStaL	StagStaR	EncStaL	EncStaR	LIfStaS	RIfStaS	
Culvert Group					9945	10063	U
					9924	9924	D
			9943	10063			U
			9943	10063			D

1/2

CULVERT:
Culvert Name: Culvert #1

Shape:	Box	Rise:	6	Span:	10	Barrels:	9

FHWA Chart #: # 8 - flared wingwalls
FHWA Scale #: # 1 - Wingwall flared 30 to 75 deg.
Solution Crit:Highest U.S. EG

UpstrmDist:	6	Length:	166	n-Value:	0.012		
EntLossCoef:	0.4	ExtLossCoef:	1	CulvInvElU	997.02	CulvInvElD	996.68
LCntStaU:	9956	RCntStaU:	10044	LCntStaD	9956	RCntStaD	10044

Culv Area:	540	CulvQ:	2557	MinTopRd:	1006.41
	540		2557		1006.41

	LAbutSt	RAbutSt	LMnTpRd	RMnTpRd	MnTpRd	MxLoCd	
Culvert #1	9951	10049	1006.7	1006.15	1006.15	1003.02	U
	9951	10049	1006.7	1006.1	1006.1	1002.68	D
	9951	10049	1006.7	1006.41	1006.41	1003.02	U
	9951	10049	1006.7	1006.41	1006.41	1002.68	D

Name	Q Total.	Q Struc	Q Weir	Selected Method	Flow Type
Culvert #1		2557	0	Highest U.S. EG	Low Flow
		2557	0	Highest U.S. EG	Low Flow

GEOMETRIC CHECK

TYPE OF FLOW CHECK

RS: 6083 This is Culvert #1
CV LF 01 Type of flow is low flow because,
1. EGEL 3 of 1002.74 is less than or equal to MinTopRd of 1006.41.
2. EGEL 3 of 1002.74 is less than MxLoCdU of 1003.02.

RS: 6083 This is Culvert #1
CV LF 01 Type of flow is low flow because,
1. EGEL 3 of 1002.74 is less than or equal to MinTopRd of 1006.41.
2. EGEL 3 of 1002.74 is less than MxLoCdU of 1003.02.

DISTANCE CHECK

CULVERT COEFFICIENT CHECK

CULVERT CRITERIA CHECK

INEFFECTIVE FLOW CHECK

FLOODWAY CHECK

---END

CHECK-RAS Program: Floodway Check
Encroachment Method, Starting WSEL, Floodway Width, and Surcharge Review

Project File: K:\Active\81500260\REPORTS\DRAINAGE\HCRASFLS\GYPRCCHN3.prj
Plan File: K:\Active\81500260\REPORTS\DRAINAGE\HCRASFLS\GYPRCCHN3.p02
Geometry File: K:\Active\81500260\REPORTS\DRAINAGE\HCRASFLS\GYPRCCHN3.g02
Flow File: K:\Active\81500260\REPORTS\DRAINAGE\HCRASFLS\GYPRCCHN3.f02
Report File: K:\Active\81500260\REPORTS\DRAINAGE\HCRASFLS\GYPRCCHN3.fw
Selected profiles: PF 1;PF 2
Date: 5/5/03
Time: 3:19:56 PM

SECNO	Method	Surcharge	EncStaL	EncStaR	LStaEff	RStaEff	Structure
RIVER-1,Reach-1							
7385					9918.45	10070.32	
7385	1	0	9911	10114	9918.45	10070.31	
7370					9912.44	10097.51	
7370	1	0	9902	10131	9912.44	10097.5	
7200					9931.98	10176.2	
7200	1	0	9900	10188	9931.98	10176.19	
7000					9938.17	10154.49	
7000	1	0	9896	10167	9938.17	10154.48	
6800					9917.4	10186.47	
6800	1	0	9891	10191	9917.4	10186.46	
6600					9858.64	10140.2	
6600	1	0	9853	10172	9858.65	10140.19	
6400					9846.93	10134.67	
6400	1	0	9842	10148	9846.93	10134.67	
6284					9856.97	10077.34	
6284	1	0	9837	10083	9857	10077.34	
6176					9945	10063	
6176	1	0	9911	10076	9945	10063	
6083					0	0	Culvert #1-Up
6083					0	0	Culvert #1-Dn
6083	1	0	9943	10063	0	0	Culvert #1-Up
6083	1	0	9943	10063	0	0	Culvert #1-Dn
5990					9924.7	10076.74	
5990	1	0	9924	10078	9924.7	10076.74	
6.32					9853.51	10667.48	
6.32	1	0	9856	10667	9856	10667	
6.217					9685.9	10872.54	
6.217	1	-0.01	9686	10872	9686.2	10871.8	
6.086					9781	10996.52	
6.086	1	0.44	9783	10996	9783	10996	
5.96					9798.9	11176.11	
5.96	1	0.86	9960	10274.08	9960	10274.08	
5.84					9415.85	10666.75	
5.84	1	0.59	9953.67	10240.41	9953.67	10240.41	
5.727					9376.51	10467.2	
5.727	1	0.76	9935	10135	9935	10135	

ENCROACHMENT METHOD CHECK

FLOODWAY WIDTH CHECK

RS: 5.96
FW FW 03 The right channel bank station may not be at the proper location.

RS: 5.84
FW FW 03 The Left channel bank station may not be at the proper location.

RS: 5.84
FW FW 03 The right channel bank station may not be at the proper location.

RS: 5.727
FW FW 03 The Left channel bank station may not be at the proper location.

SURCHARGE CHECK

DISCHARGE CHECK

STARTING WATER-SURFACE ELEVATION CHECK

FW SW 04 The name of the stream is RIVER-1
Encroachment method 1 is used.
The difference in conveyance between the floodway profile and the natural profile is more than 1%.
Normal Depth option with the same energy slope as the natural profile must be used for the floodway profile and rerun the plan.
This message is not applicable for the revisions.

---END---

Stantec Consulting Inc.
8211 South 48th Street
Phoenix AZ 85044
Tel: (602) 438-2200 Fax: (602) 431-9562
stantec.com

Stantec

05 December 2002
File: 81500260

Mr. Raymond H. Carter
Globe Land Investors, LLC
6730 N. Scottsdale Rd., Ste. 250
Scottsdale, AZ 85253

Reference: Goodyear Planned Regional Center
Effective Floodway Revisions

Dear Mr. Carter:

As the property owner, your signature is required on the contents of this letter. Please sign below. If you have any questions please call me at the listed number.

I, Raymond H. Carter of the Globe Land Investors, LLC, the property owner of the proposed development known as Goodyear Planned Regional Center, hereby acknowledge that the current effective floodway limits within this development, as shown on the Flood Insurance Rate Map "FIRM", number 04013C2060F, dated July 19, 2002, will be revised. This revision will be as addressed in this Conditional Letter of Map Revision (CLOMR) application, and subsequent letter of Map Revision (LOMR), to the Federal Emergency Management Agency (FEMA) in conjunction with the improvement of parcels 10 and 11 of this development.

I understand that these revisions are confined within the Goodyear Planned Regional Center and do not impact any other downstream or upstream properties. I further understand that a separate CLOMR/LOMR application will be needed at the time of future Bullard Wash Channel extensions downstream of the channel segment associated with parcels 10 and 11.

Buildings

Environment

Industrial

Transportation

Urban Land

Sincerely,

STANTEC CONSULTING INC.

Ghassan Aouad, P.E.
Senior Hydrologist
gaouad@stantec.com

GLOBE LAND INVESTORS, LLC

Raymond H. Carter

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Appendix B

FEMA Forms

FEDERAL EMERGENCY MANAGEMENT AGENCY

OVERVIEW & CONCURRENCE FORM

O.M.B No. 3067-0148
Expires September 30, 2005

PAPERWORK BURDEN DISCLOSURE NOTICE

Public reporting burden for this form is estimated to average 1 hour per response. The burden estimate includes the time for reviewing instructions, searching existing data sources, gathering and maintaining the needed data, and completing, reviewing, and submitting the form. You are not required to respond to this collection of information unless a valid OMB control number appears in the upper right corner of this form. Send comments regarding the accuracy of the burden estimate and any suggestions for reducing this burden to: Information Collections Management, Federal Emergency Management Agency, 500 C Street, SW, Washington DC 20472, Paperwork Reduction Project (3067-0148). Submission of the form is required to obtain or retain benefits under the National Flood Insurance Program. **Please do not send your completed survey to the above address.**

A. REQUESTED RESPONSE FROM FEMA

This request is for a (check one):

☒ CLOMR: A letter from FEMA commenting on whether a proposed project, if built as proposed, would justify a map revision, or proposed hydrology changes (See 44 CFR Ch. 1, Parts 60, 65 & 72).

☐ LOMR: A letter from FEMA officially revising the current NFIP map to show the changes to floodplains, regulatory floodway or flood elevations. (See Parts 60 & 65 of the NFIP Regulations.)

B. OVERVIEW

1. The NFIP map panel(s) affected for all impacted communities is (are):

Community No.	Community Name	State	Map No.	Panel No.	Effective Date
Ex: 480301	City of Katy	TX	480301	0005D	02/08/83
480287	Harris County	TX	48201C	0220G	09/28/90
040046	City of Goodyear	AZ	4013C	2060F	07/19/2001

2. Flooding Source: Bullard Wash, City of Goodyear, Maricopa County, Arizona
3. Project Name/Identifier: Bullard Wash channel at Goodyear planned Regional Center
4. FEMA zone designations affected: AE, X (choices: A, AH, AO, A1-A30, A99, AE, AR, V, V1-V30, VE, B, C, D, X)
5. Basis for Request and Type of Revision:

a. The basis for this revision request is (check all that apply)

☒ Physical Change ☐ Improved Methodology/Data

☒ Regulatory Floodway Revision ☐ Other (Attach Description)

Note: A photograph and narrative description of the area of concern is not required, but is very helpful during review.

b. The area of revision encompasses the following types of flooding and structures (check all that apply)

Types of Flooding: ☒ Riverine ☐ Coastal ☐ Shallow Flooding (e.g., Zones AO and AH)

☐ Alluvial fan ☐ Lakes ☐ Other (Attach Description)

Structures: ☒ Channelization ☐ Levee/Floodwall ☒ Bridge/Culvert

☐ Dam ☒ Fill ☐ Other, Attach Description

C. REVIEW FEE

Has the review fee for the appropriate request category been included? ☒ Yes Fee amount: $ 4000.00

☐ No, Attach Explanation

Please see the FEMA Web site at http://www.fema.gov/mit/tsd/frm_fees.htm for Fee Amounts and Exemptions.

D. SIGNATURE

All documents submitted in support of this request are correct to the best of my knowledge. I understand that any false statement may be punishable by fine or imprisonment under Title 18 of the United States Code, Section 1001.

Name: Ghassan Aouad	Company: Stantec Consulting Inc.
Mailing Address: 8211 South 48th st. Phoenix, AZ 85044	Daytime Telephone No.: 602-438-2200 / Fax No.: 602-431-9562
	E-Mail Address: gaouad@stantec.com
Signature of Requester (required): Ghassan Aouad	Date: ~~12-05-2002~~ 5-06-2003

As the community official responsible for floodplain management, I hereby acknowledge that we have received and reviewed this Letter of Map Revision (LOMR) or conditional LOMR request. Based upon the community's review, we find the completed or proposed project meets or is designed to meet all of the community floodplain management requirements, including the requirement that no fill be placed in the regulatory floodway, and that all necessary Federal, State, and local permits have been, or in the case of a conditional LOMR, will be obtained. In addition, we have determined that the land and any existing or proposed structures to be removed from the SFHA are or will be reasonably safe from flooding as defined in 44CFR 65.2(c), and that we have available upon request by FEMA, all analyses and documentation used to make this determination.

Community Official's Name and Title: HARVEY H. KRAUSS, Community Development Dir.		Telephone No.: 623-932-3005
Community Name: City of Goodyear, AZ	Community Official's Signature (required):	Date: 7/2/03

CERTIFICATION BY REGISTERED PROFESSIONAL ENGINEER AND/OR LAND SURVEYOR

This certification is to be signed and sealed by a licensed land surveyor, registered professional engineer, or architect authorized by law to certify elevation information. All documents submitted in support of this request are correct to the best of my knowledge. I understand that any false statement may be punishable by fine or imprisonment under Title 18 of the United States Code, Section 1001.

Certifier's Name: Ghassan Aouad	License No.: 34565	Expiration Date: 3-31-2003
Company Name: Stantec Consulting Inc.	Telephone No.: 602-438-2200	Fax No.: 602-431-9562
Signature: Ghassan Aouad		Date: ~~12-05-2002~~ 5-06-2003

Ensure the forms that are appropriate to your revision request are included in your submittal.

Form Name and (Number)	Required if ...
☒ Riverine Hydrology and Hydraulics Form (Form 2)	New or revised discharges or water-surface elevations
☒ Riverine Structures Form (Form 3)	Channel is modified, addition/revision of bridge/culverts, addition/revision of levee/floodwall, addition/revision of dam
☐ Coastal Analysis Form (Form 4)	New or revised coastal elevations
☐ Coastal Structures Form (Form 5)	Addition/revision of coastal structure
☐ Alluvial Fan Flooding Form (Form 6)	Flood control measures on alluvial fans

Seal (Optional)

FEDERAL EMERGENCY MANAGEMENT AGENCY

RIVERINE HYDROLOGY & HYDRAULICS FORM

O.M.B No. 3067-0148
Expires September 30, 2005

PAPERWORK REDUCTION ACT

Public reporting burden for this form is estimated to average 3 hours per response. The burden estimate includes the time for reviewing instructions, searching existing data sources, gathering and maintaining the needed data, and completing, reviewing, and submitting the form. You are not required to respond to this collection of information unless a valid OMB control number appears in the upper right corner of this form. Send comments regarding the accuracy of the burden estimate and any suggestions for reducing this burden to: Information Collections Management, Federal Emergency Management Agency, 500 C Street, SW, Washington DC 20472, Paperwork Reduction Project (3067-0148). Submission of the form is required to obtain or retain benefits under the National Flood Insurance Program. **Please do not send your completed survey to the above address.**

Flooding Source:
Note: Fill out one form for each flooding source studied

A. HYDROLOGY

1. Reason for New Hydrologic Analysis (check all that apply)

☐ Not revised (skip to section 2) ☐ No existing analysis ☐ Improved data
☐ Alternative methodology ☐ Proposed Conditions (CLOMR) ☒ Changed physical condition of watershed

2. Comparison of Representative 1%-Annual-Chance Discharges

Location	Drainage Area (Sq. Mi.)	FIS (cfs)	Revised (cfs)
Bullard wash @ Thomas Road	70.6	3400 & LOMR Case # 00-09-975P	2557

3. Methodology for New Hydrologic Analysis (check all that apply)

☐ Statistical Analysis of Gage Records ☒ Precipitation/Runoff Model [TR-20, HEC-1, HEC-HMS etc.]
☐ Regional Regression Equations ☐ Other (please attach description)

Please enclose all relevant models in digital format, maps, computations (including computation of parameters) and documentation to support the new analysis. The document, "Numerical Models Accepted by FEMA for NFIP Usage" lists the models accepted by FEMA. This document can be found at: http://www.fema.gov/mit/tsd/en_modl.htm.

4. Review/Approval of Analysis

If your community requires a regional, state, or federal agency to review the hydrologic analysis, please attach evidence of approval/review.

5. Impacts of Sediment Transport on Hydrology

Was sediment transport considered? ☐ Yes ☒ No If yes, then fill out Section F (Sediment Transport) of Form 3. If No, then attach your explanation for why sediment transport was not considered.

Please see attachment

B. HYDRAULICS

1. Reach to be Revised

	Description	Cross Section	Water-Surface Elevations (ft.) Effective	Proposed/Revised
Downstream Limit	Approx. 250' north of McDowell Road	5.727	993.54	993.54
Upstream Limit	The overchute at the RID Canal	6.679	1011.80	1011.80

2. Hydraulic Method Used

Hydraulic Analysis HEC-RAS (version 2.2) [HEC-2 , HEC-RAS, Other (Attach description)]

MT-2 Form 2 page 1 of 2, Section A-5

Attachment

Bullard Wash is a poorly defined watercourse along a mainly agricultural area. The sediment transport characteristics of the watercourse are discussed in more detail in the White Tanks Area Drainage Master Study (ADMS) Part A, Flood Study Technical Documentation Notebook (TDN), prepared by WLB Group, Inc., in October 1992. This ADMS includes Bullard Wash. Flow in the wash is generally characterized by a high width to depth ratio and low sediment transport capacity. The proposed channel section will maintain the high width to depth ratio. No significant changes to the sediment transport characteristics are expected.

B. HYDRAULICS (CONTINUED)

3. Pre-Submittal Review of Hydraulic Models

FEMA has developed two review programs, CHECK-2 and CHECK-RAS, to aid in the review of HEC-2 and HEC-RAS hydraulic models, respectively. These review programs verify that the hydraulic estimates and assumptions in the model data are in accordance with NFIP requirements, and that the data are comparable with the assumptions and limitations of HEC-2/HEC-RAS. CHECK-2 and CHECK-RAS identify areas of potential error or concern. These tools do not replace engineering judgment. CHECK-2 and CHECK-RAS can be downloaded from http://www.fema.gov/mit/tsd/frm_soft.htm. We recommend that you review your HEC-2 and HEC-RAS models with CHECK-2 and CHECK-RAS. If you disagree with a message, please attach an explanation of why the message is not valid in this case. Review of your submittal and resolution of valid modeling discrepancies will result in reduced review time.

HEC-2/HEC-RAS models reviewed with CHECK-2/CHECK-RAS? ☒ Yes ☐ No

4. Models Submitted

—	Duplicate Effective Model*	Natural File Name: Bull. DAT	Floodway File Name: Bull. DAT	
	Corrected Effective Model*	Natural File Name:	Floodway File Name:	
	Existing or Pre-Project Conditions Model	Natural File Name:	Floodway File Name:	
—	Revised or Post-Project Conditions Model	Natural File Name: GPRCCHN3.PRJ	Floodway File Name: GPRCCHN3.PRJ	
	Other - (attach description)	Natural File Name:	Floodway File Name:	

*Not required for revisions to approximate 1%-annual-chance floodplains (Zone A) – for details, refer to the corresponding section of the instructions.

The document "Numerical Models Accepted by FEMA for NFIP Usage" lists the models accepted by FEMA. This document can be found at: http://www.fema.gov/mit/tsd/en_modl.htm.

C. MAPPING REQUIREMENTS

A **certified topographic map** must be submitted showing the following information (where applicable): the boundaries of the effective, existing, and proposed conditions 1%-annual-chance floodplain (for approximate Zone A revisions) or the boundaries of the 1%- and 0.2%-annual-chance floodplains and regulatory floodway (for detailed Zone AE, AO, and AH revisions); location and alignment of all cross sections with stationing control indicated; stream, road, and other alignments (e.g., dams, levees, etc.); current community easements and boundaries; boundaries of the requester's property; certification of a registered professional engineer registered in the subject State; location and description of reference marks; and the referenced vertical datum (NGVD, NAVD, etc.).

Note that the boundaries of the existing or proposed conditions floodplains and regulatory floodway to be shown on the revised FIRM and/or FBFM must tie-in with the effective floodplain and regulatory floodway boundaries. Please attach a **copy of the effective FIRM and/or FBFM,** annotated to show the boundaries of the revised 1%- and 0.2%-annual-chance floodplains and regulatory floodway that tie-in with the boundaries of the effective 1%- and 0.2%-annual-chance floodplain and regulatory floodway at the upstream and downstream limits of the area of revision.

D. COMMON REGULATORY REQUIREMENTS

1. For CLOMR requests, do Base Flood Elevations (BFEs) increase? ☐ Yes ☒ No

For CLOMR requests, if either of the following is true, please submit evidence of compliance with Section 65.12 of the NFIP regulations:
- The proposed project encroaches upon a regulatory floodway and would result in increases above 0.00 foot.
- The proposed project encroaches upon a SFHA with BFEs established and would result in increases above 1.00 foot.

2. Does the request involve the placement or proposed placement of fill? ☒ Yes ☐ No

If Yes, the community must be able to certify that the area to be removed from the special flood hazard area, to include any structures or proposed structures, meets all of the standards of the local floodplain ordinances, and is reasonably safe from flooding in accordance with the NFIP regulations set forth at 44 CFR 60.3(a)(3), 65.5(a)(4), and 65.6(a)(14). Please see the MT-2 instructions for more information.

3. For LOMR requests, is the regulatory floodway being revised? ☐ Yes ☐ No

If Yes, attach evidence of regulatory floodway revision notification. As per Paragraph 65.7(b)(1) of the NFIP Regulations, notification is required for requests involving revisions to the regulatory floodway. (Not required for revisions to approximate 1%-annual-chance floodplains [studied Zone A designation] unless a regulatory floodway is being added. Elements and examples of regulatory floodway revision notification can be found in the MT-2 Form 2 Instructions.)

4. For LOMR requests, does this request require property owner notification and acceptance of BFE increases? ☐ Yes ☐ No

If Yes, please attach proof of property owner notification and acceptance (if available). Elements of and examples of property owner notification can be found in the MT-2 Form 2 Instructions.

FEDERAL EMERGENCY MANAGEMENT AGENCY

RIVERINE STRUCTURES FORM

O.M.B. No. 3067-0148
Expires September 30, 2005

PAPERWORK REDUCTION ACT

Public reporting burden for this form is estimated to average 7 hours per response. The burden estimate includes the time for reviewing instructions, searching existing data sources, gathering and maintaining the needed data, and completing, reviewing, and submitting the form. You are not required to respond to this collection of information unless a valid OMB control number appears in the upper right corner of this form. Send comments regarding the accuracy of the burden estimate and any suggestions for reducing this burden to: Information Collections Management, Federal Emergency Management Agency, 500 C Street, SW, Washington DC 20472, Paperwork Reduction Project (3067-0148). Submission of the form is required to obtain or retain benefits under the National Flood Insurance Program. **Please do not send your completed survey to the above address.**

Flooding Source: Bullard Wash
Note: Fill out one form for each flooding source studied

A. GENERAL

Complete the appropriate section(s) for each Structure listed below:

Channelization ..... complete Section B
Bridge/Culvert ..... complete Section C
Dam..... complete Section D
Levee/Floodwall..... complete Section E
Sediment Transport..... complete Section F (if required)

Description Of Structure

1. **Name of Structure:** Bullard Wash channel

   Type (check one): ☒ Channelization ☐ Bridge/Culvert ☐ Levee/Floodwall ☐ Dam

   Location of Structure:

   Downstream Limit/Cross Section: 5993

   Upstream Limit/Cross Section: 7385

2. **Name of Structure:** Culvert # 1

   Type (check one): ☐ Channelization ☒ Bridge/Culvert ☐ Levee/Floodwall ☐ Dam

   Location of Structure: At Verginia Avenue

   Downstream Limit/Cross Section: 5993

   Upstream Limit/Cross Section: 6171

3. **Name of Structure:**

   Type (check one) ☐ Channelization ☐ Bridge/Culvert ☐ Levee/Floodwall ☐ Dam

   Location of Structure:

   Downstream Limit/Cross Section:

   Upstream Limit/Cross Section:

NOTE: For more structures, attach additional pages as needed.

B. CHANNELIZATION

Flooding Source: Bullard wash

Name of Structure: Bullard wash channel

1. Accessory Structures

The channelization includes (check one):

- ☐ Levees [Attach Section E (Levee/Floodwall)]
- ☐ Superelevated sections
- ☐ Debris basin/detention basin
- ☐ Other (Describe):
- ☐ Drop structures
- ☐ Transitions in cross sectional geometry
- ☐ Energy dissipator

2. Drawing Checklist

Attach the plans of the channelization certified by a registered professional engineer, as described in the instructions.

3. Hydraulic Considerations

The channel was designed to carry 2557 (cfs) and/or the 100 -year flood.

The design elevation in the channel is based on (check one):

☒ Subcritical flow ☐ Critical flow ☐ Supercritical flow ☐ Energy grade line

If there is the potential for a hydraulic jump at the following locations, check all that apply and attach an explanation of how the hydraulic jump is controlled without affecting the stability of the channel.

☐ Inlet to channel ☐ Outlet of channel ☐ At Drop Structures ☐ At Transitions
☐ Other locations (specify):

4. Sediment Transport Considerations

Was sediment transport considered? ☐ Yes ☒ No If Yes, then fill out Section F (Sediment Transport).
If No, then attach your explanation for why sediment transport was not considered.
Please see Form 2 - Section A-5

C. BRIDGE/CULVERT

Flooding Source: Bullard wash

Name of Structure: Culvert #1

1. This revision reflects (check one):

- ☒ New bridge/culvert not modeled in the FIS
- ☐ Modified bridge/culvert previously modeled in the FIS
- ☐ New analysis of bridge/culvert previously modeled in the FIS

2. Hydraulic model used to analyze the structure (e.g., HEC-2 with special bridge routine, WSPRO, HY8):
If different than hydraulic analysis for the flooding source, justify why the hydraulic analysis used for the flooding source could not analyze the structures. Attach justification. HEC-RAS (version 2.2)

3. Attach plans of the structures certified by a registered professional engineer. The plan detail and information should include the following (check the information that has been provided):

- ☒ Dimensions (height, width, span, radius, length)
- ☒ Shape (culverts only)
- ☒ Material
- ☐ Beveling or Rounding
- ☒ Wing Wall Angle per plan
- ☐ Skew Angle
- ☒ Distances Between Cross Sections
- ☐ Erosion Protection N/A, low velocities
- ☒ Low Chord Elevations – Upstream and Downstream
- ☒ Top of Road Elevations – Upstream and Downstream
- ☒ Structure Invert Elevations – Upstream and Downstream
- ☒ Stream Invert Elevations – Upstream and Downstream
- ☒ Cross-Section Locations

4. Sediment Transport Considerations

Was sediment transport considered? ☐ Yes ☒ No If yes, then fill out Section F (Sediment Transport).
If No, then attach your explanation for why sediment transport was not considered.
Please see Form 2 - Section A-5

D. DAM N/A

Flooding Source:

Name of Structure:

1. This request is for (check one): ☐ Existing dam ☐ New dam ☐ Modification of existing dam
2. The dam was designed by (check one): ☐ Federal agency ☐ State agency ☐ Local government agency

   ☐ Private organization Name of the agency or organization:
3. Does the project involve revised hydrology? ☐ Yes ☐ No

   If Yes, complete the Riverine Hydrology & Hydraulics Form (Form 2).
4. Does the submittal include debris/sediment yield analysis? ☐ Yes ☐ No

   If yes, then fill out Section F (Sediment Transport).
   If No, then attach your explanation for why debris/sediment analysis was not considered.
5. Does the Base Flood Elevation behind the dam or downstream of the dam change?

   ☐ Yes ☐ No If Yes, complete the Riverine Hydrology & Hydraulics Form (Form 2) and complete the table below.

Stillwater Elevation Behind the Dam

FREQUENCY (% annual chance)	FIS	REVISED
10-year (10%)		
50-year (2%)		
100-year (1%)		
500-year (0.2%)		
Normal Pool Elevation		

6. Please attach a copy of the formal Operation and Maintenance Plan

E. LEVEE/FLOODWALL N/A

1. System Elements

a. This Levee/Floodwall analysis is based on (check one):

☐ upgrading of an existing levee/floodwall system
☐ a newly constructed levee/floodwall system
☐ reanalysis of an existing levee/floodwall system

b. Levee elements and locations are (check one):

☐ earthen embankment, dike, berm, etc.	Station	to
☐ structural floodwall	Station	to
☐ Other (describe):	Station	to

c. Structural Type (check one):

☐ monolithic cast-in place reinforced concrete
☐ reinforced concrete masonry block
☐ sheet piling
☐ Other (describe):

d. Has this levee/floodwall system been certified by a Federal agency to provide protection from the base flood?

☐ Yes ☐ No

If Yes, by which agency?

e. Attach certified drawings containing the following information (indicate drawing sheet numbers):

1. Plan of the levee embankment and floodwall structures. Sheet Numbers:
2. A profile of the levee/floodwall system showing the Base Flood Elevation (BFE), levee and/or wall crest and foundation, and closure locations for the total levee system. Sheet Numbers:
3. A profile of the BFE, closure opening outlet and inlet invert elevations, type and size of opening, and kind of closure. Sheet Numbers:
4. A layout detail for the embankment protection measures. Sheet Numbers:
5. Location, layout, and size and shape of the levee embankment features, foundation treatment, floodwall structure, closure structures, and pump stations. Sheet Numbers:

2. Freeboard

a. The minimum freeboard provided above the BFE is:

Riverine

3.0 feet or more at the downstream end and throughout	☐ Yes	☐ No
3.5 feet or more at the upstream end	☐ Yes	☐ No
4.0 feet within 100 feet upstream of all structures and/or constrictions	☐ Yes	☐ No

Coastal

1.0 foot above the height of the one percent wave associated with the 1%-annual-chance stillwater surge elevation or maximum wave runup (whichever is greater).	☐ Yes	☐ No
2.0 feet above the 1%-annual-chance stillwater surge elevation	☐ Yes	☐ No

N/A

2. Freeboard (continued)

Please note, occasionally exceptions are made to the minimum freeboard requirement. If an exception is requested, attach documentation addressing Paragraph 65.10(b)(1)(ii) of the NFIP Regulations.

If No is answered to any of the above, please attach an explanation.

b. Is there an indication from historical records that ice-jamming can affect the BFE? ☐ Yes ☐ No

If Yes, provide ice-jam analysis profile and evidence that the minimum freeboard discussed above still exists.

3. Closures

a. Openings through the levee system (check one): ☐ exists ☐ does not exist

If opening exists, list all closures:

Channel Station	Left or Right Bank	Opening Type	Highest Elevation for Opening Invert	Type of Closure Device

(Extend table on an added sheet as needed and reference)

Note: Geotechnical and geologic data

In addition to the required detailed analysis reports, data obtained during field and laboratory investigations and used in the design analysis for the following system features should be submitted in a tabulated summary form. (Reference U.S. Army Corps of Engineers [USACE] EM-1110-2-1906 Form 2086.)

4. Embankment Protection

a. The maximum levee slope landside is:

b. The maximum levee slope floodside is:

c. The range of velocities along the levee during the base flood is: (min.) to (max.)

d. Embankment material is protected by (describe what kind):

e. Riprap Design Parameters (check one): ☐ Velocity ☐ Tractive stress
Attach references

Reach		Sideslope	Flow Depth	Velocity	Curve or Straight	Stone Riprap			Depth of Toedown
						D_{100}	D_{50}	Thickness	
Sta	to								
Sta	to								
Sta	to								
Sta	to								
Sta	to								
Sta	to								

(Extend table on an added sheet as needed and reference each entry)

E. LEVEE/FLOODWALL (CONTINUED) N/A

4. Embankment Protection (continued)

   f. Is a bedding/filter analysis and design attached? ☐ Yes ☐ No

   g. Describe the analysis used for other kinds of protection used (include copies of the design analysis):

   Attach engineering analysis to support construction plans.

5. Embankment And Foundation Stability

   a. Identify locations and describe the basis for selection of critical location for analysis:

   ☐ Overall height: Sta. ; height ft.

   ☐ Limiting foundation soil strength:

   Sta. , depth to

   strength ϕ = degrees, c = psf

   slope: SS = (h) to (v)

   (Repeat as needed on an added sheet for additional locations)

   b. Specify the embankment stability analysis methodology used (e.g., circular arc, sliding block, infinite slope, etc.):

   c. Summary of stability analysis results:

Case	Loading Conditions	Critical Safety Factor	Criteria (Min.)
I	End of construction		1.3
II	Sudden drawdown		1.0
III	Critical flood stage		1.4
IV	Steady seepage at flood stage		1.4
VI	Earthquake (Case I)		1.0

(Reference: USACE EM-1110-2-1913 Table 6-1)

   d. Was a seepage analysis for the embankment performed? ☐ Yes ☐ No

   If Yes, describe methodology used:

   e. Was a seepage analysis for the foundation performed? ☐ Yes ☐ No

   f. Were uplift pressures at the embankment landside toe checked? ☐ Yes ☐ No

   g. Were seepage exit gradients checked for piping potential? ☐ Yes ☐ No

   h. The duration of the base flood hydrograph against the embankment is hours.

   Attach engineering analysis to support construction plans.

E. LEVEE/FLOODWALL (CONTINUED) N/A

6. Floodwall And Foundation Stability

a. Describe analysis submittal based on Code (check one):

☐ UBC (1988) or ☐ Other (specify):

b. Stability analysis submitted provides for:

☐ Overturning ☐ Sliding If not, explain:

c. Loading included in the analyses were:

☐ Lateral earth @ P_A = psf; P_p = psf

☐ Surcharge-Slope @ ☐ surface psf

☐ Wind @ P_w = psf

☐ Seepage (Uplift); ☐ Earthquake @ P_{eq} = %g

☐ 1%-annual-chance significant wave height: ft.

☐ 1%-annual-chance significant wave period: sec.

d. Summary of Stability Analysis Results: Factors of Safety.

Itemize for each range in site layout dimension and loading condition limitation for each respective reach.

Loading Condition	Criteria (Min)		Sta	To	Sta	To
	Overturn	Sliding	Overturn	Sliding	Overturn	Sliding
Dead & Wind	1.5	1.5				
Dead & Soil	1.5	1.5				
Dead, Soil, Flood, & Impact	1.5	1.5				
Dead, Soil, & Seismic	1.3	1.3				

(Ref: FEMA 114 Sept 1986; USACE EM 1110-2-2502)

(Note: Extend table on an added sheet as needed and reference)

e. Foundation bearing strength for each soil type:

Bearing Pressure	Sustained Load (psf)	Short Term Load (psf)
Computed design maximum		
Maximum allowable		

f. Foundation scour protection ☐ is, ☐ is not provided. If provided, attach explanation and supporting documentation:

Attach engineering analysis to support construction plans.

E. LEVEE/FLOODWALL (CONTINUED) N/A

7. Settlement

a. Has anticipated potential settlement been determined and incorporated into the specified construction elevations to maintain the established freeboard margin? ☐ Yes ☐ No

b. The computed range of settlement is ft. to ft.

c. Settlement of the levee crest is determined to be primarily from :

☐ Foundation consolidation
☐ Embankment compression
☐ Other (Describe):

d. Differential settlement of floodwalls ☐ has ☐ has not been accommodated in the structural design and construction.

Attach engineering analysis to support construction plans.

8. Interior Drainage

a. Specify size of each interior watershed:

Draining to pressure conduit: acres
Draining to ponding area: acres

b. Relationships Established

Ponding elevation vs. storage	☐ Yes	☐ No
Ponding elevation vs. gravity flow	☐ Yes	☐ No
Differential head vs. gravity flow	☐ Yes	☐ No

c. The river flow duration curve is enclosed: ☐ Yes ☐ No

d. Specify the discharge capacity of the head pressure conduit: cfs

e. Which flooding conditions were analyzed?

• Gravity flow (Interior Watershed)	☐ Yes	☐ No
• Common storm (River Watershed)	☐ Yes	☐ No
• Historical ponding probability	☐ Yes	☐ No
• Coastal wave overtopping	☐ Yes	☐ No

If No for any of the above, attach explanation.

f. Interior drainage has been analyzed based on joint probability of interior and exterior flooding and the capacities of pumping and outlet facilities to provide the established level of flood protection. ☐ Yes ☐ No

If No, attach explanation.

g. The rate of seepage through the levee system for the base flood is cfs

h. The length of levee system used to drive this seepage rate in item g: ft.

E. LEVEE/FLOODWALL (CONTINUED) N/A

8. Interior Drainage (continued)

i. Will pumping plants be used for interior drainage? ☐ Yes ☐ No

If Yes, include the number of pumping plants:
For each pumping plant, list:

	Plant #1	Plant #2
The number of pumps		
The ponding storage capacity		
The maximum pumping rate		
The maximum pumping head		
The pumping starting elevation		
The pumping stopping elevation		
Is the discharge facility protected?		
Is there a flood warning plan?		
How much time is available between warning and flooding?		

Will the operation be automatic? ☐ Yes ☐ No

If the pumps are electric, are there backup power sources? ☐ Yes ☐ No

(Reference: USACE EM-1110-2-3101, 3102, 3103, 3104, and 3105)

Include a copy of supporting documentation of data and analysis. Provide a map showing the flooded area and maximum ponding elevations for all interior watersheds that result in flooding.

9. Other Design Criteria

a. The following items have been addressed as stated:

Liquefaction ☐ is ☐ is not a problem
Hydrocompaction ☐ is ☐ is not a problem
Heave differential movement due to soils of high shrink/swell ☐ is ☐ is not a problem

b. For each of these problems, state the basic facts and corrective action taken:

Attach supporting documentation

c. If the levee/floodwall is new or enlarged, will the structure adversely impact flood levels and/or flow velocities floodside of the structure?
☐ Yes ☐ No

Attach supporting documentation

d. Sediment Transport Considerations:

Was sediment transport considered? ☐ Yes ☐ No If Yes, then fill out Section F (Sediment Transport).
If No, then attach your explanation for why sediment transport was not considered.

E. LEVEE/FLOODWALL (CONTINUED) N/A

10. Operational Plan And Criteria

    a. Are the planned/installed works in full compliance with Part 65.10 of the NFIP Regulations? ☐ Yes ☐ No

    b. Does the operation plan incorporate all the provisions for closure devices as required in Paragraph 65.10(c)(1) of the NFIP regulations? ☐ Yes ☐ No

    c. Does the operation plan incorporate all the provisions for interior drainage as required in Paragraph 65.10(c)(2) of the NFIP regulations? ☐ Yes ☐ No

    If the answer is No to any of the above, please attach supporting documentation.

11. Maintenance Plan

    a. Are the planned/installed works in full compliance with Part 65.10 of the NFIP Regulations? ☐ Yes ☐ No
    If No, please attach supporting documentation.

12. Operations and Maintenance Plan

    Please attach a copy of the formal Operations and Maintenance Plan for the levee/floodwall.

F. SEDIMENT TRANSPORT

Flooding Source:

Name of Structure:

If there is any indication from historical records that sediment transport (including scour and deposition) can affect the Base Flood Elevation (BFE); and/or based on the stream morphology, vegetative cover, development of the watershed and bank conditions, there is a potential for debris and sediment transport (including scour and deposition) to affect the BFEs, then provide the following information along with the supporting documentation:

Sediment load associated with the base flood discharge: Volume acre-feet

Debris load associated with the base flood discharge: Volume acre-feet

Sediment transport rate (percent concentration by volume)

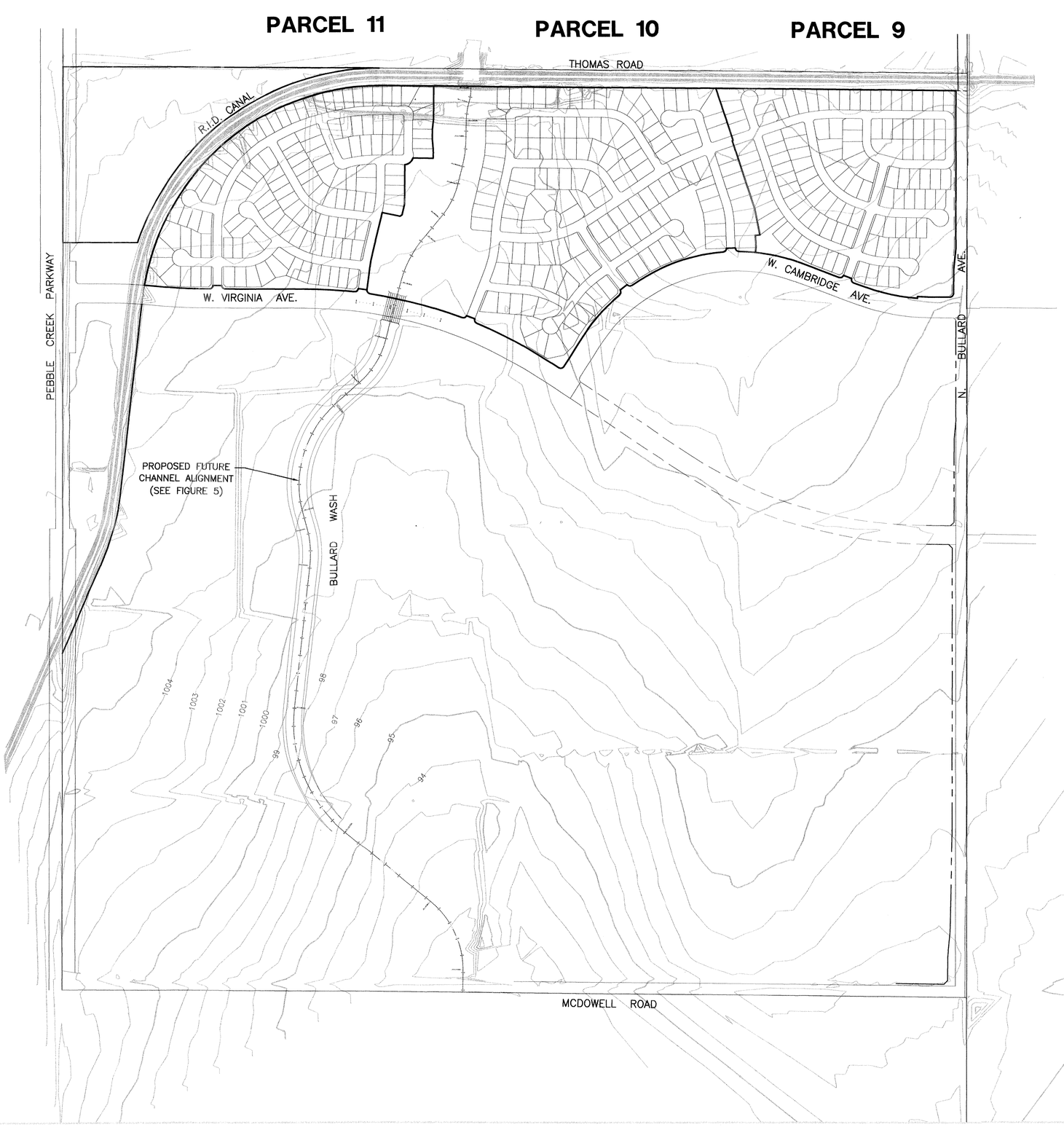
Method used to estimate sediment transport:

Most sediment transport formulas are intended for a range of hydraulic conditions and sediment sizes; attach a detailed explanation for using the selected method.

Method used to estimate scour and/or deposition:

Method used to revise hydraulic or hydrologic analysis (model) to account for sediment transport:
Please note that bulked flows are used to evaluate the performance of a structure during the base flood; however, FEMA does not map BFEs based on bulked flows.

If a sediment analysis has not been performed, an explanation as to why sediment transport (including scour and deposition) will not affect the BFEs or structures must be provided.



NORTH

0 300' 600' 900'

SCALE: 1" = 300'

Stantec Consulting Inc.
8211 South 48th Street
Phoenix AZ USA
85044-5355
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www.stantec.com

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Revision	By	Appd.	Date
0			

File Name:

Dwn.	Chkd.	Dsgn.	Date

Permit/Seal

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Telephone: (480) 483-8100

GOODYEAR PLANNED REGIONAL CENTER - PARCELS 9, 10 & 11

Goodyear, Arizona

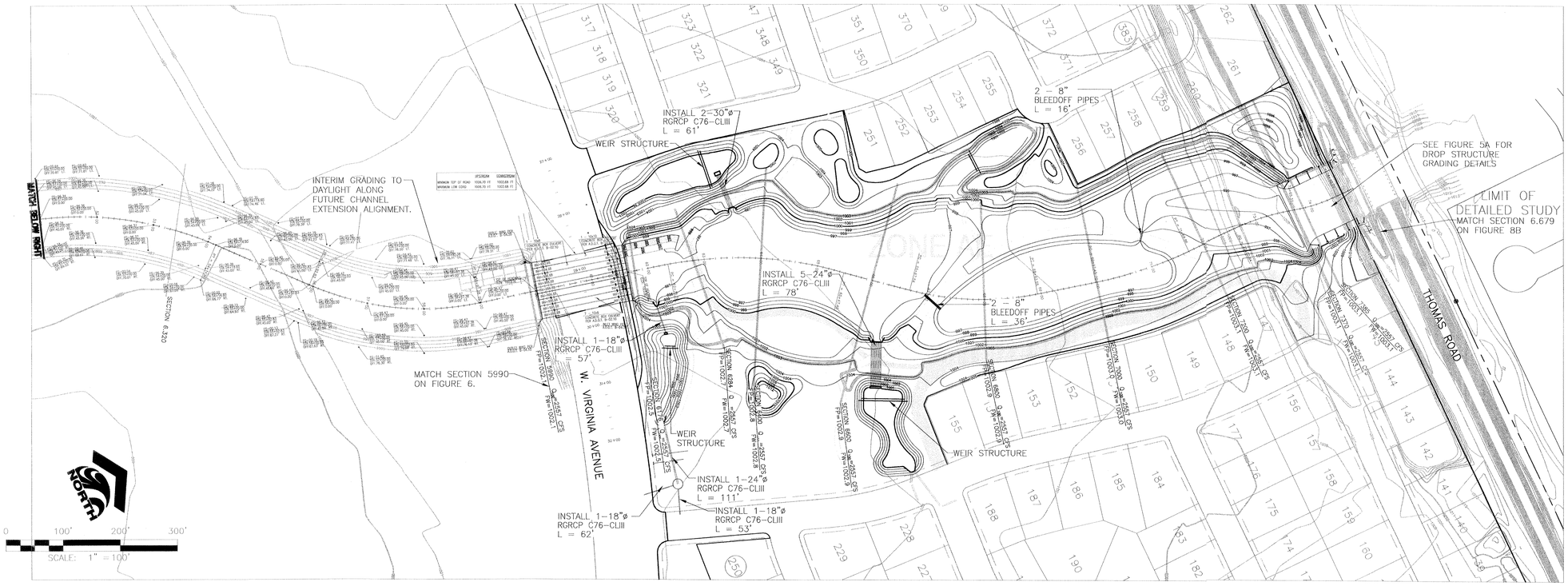
Title

FIGURE 4
SITE PLAN

Project No.	Scale
81500260	1"=300'

Drawing No.	Sheet	Revision

K:\Active\81500260\Drainage\Drainage 9-10-11\260A030.dwg
2003-06-05 03:21PM By: short



GRADE TO DAYLIGHT 6:1 90' 6:1 GRADE TO DAYLIGHT

SECTION A–A
TYPICAL SECTION ALONG INTERIM GRADING DOWNSTREAM OF VIRGINIA AVENUE
N.T.S.

Stantec Consulting Inc.
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LEGEND

FP=1158.9	FLOODPLAIN WATER SURFACE ELEVATION = 1158.9
FW=1159.8	FLOODWAY WATER SURFACE ELEVATION = 1159.8
Q_{100}=764cfs	100-YEAR PEAK DISCHARGE = 764 CUBIC FEET PER SEC.
	FLOODWAY BOUNDARY
	FLOODPLAIN BOUNDARY
	CROSS SECTION MARKER
SECTION 6.217	CROSS SECTION NUMBER
	STREAM CENTERLINE

Revision	By	Appd.	Date
0			

File Name:

Dwn.	Chkd.	Dsgn.	Date

Permit/Seal

REGISTERED PROFESSIONAL ENGINEER (CIVIL) CERTIFICATE NO. 34565 GHASSAN M. AOUAD ARIZONA U.S.A.

CALL TWO WORKING DAYS BEFORE YOU DIG (602) 263-1100 1-800-STAKE-IT (OUTSIDE MARICOPA COUNTY)

Client/Project

ARIZONA LAND ADVISORS
6710 N. SCOTTSDALE ROAD, SUITE 10
Scottsdale, AZ 85253
Telephone: (480) 483-8100

GOODYEAR PLANNED REGIONAL CENTER - PARCELS 9, 10 & 11

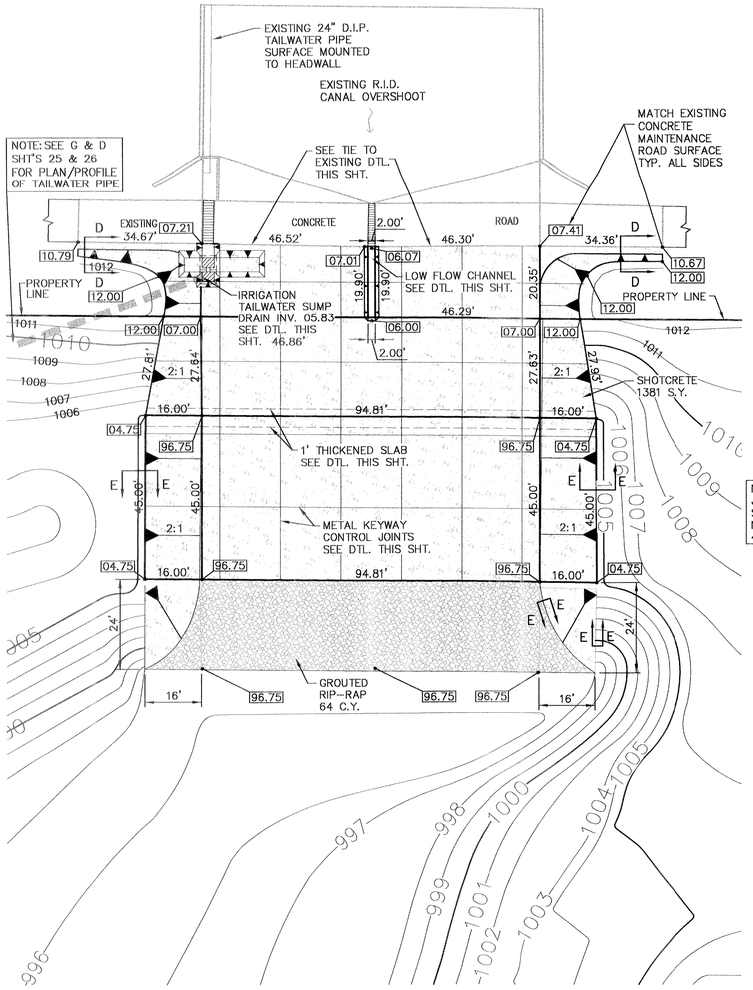
Goodyear, Arizona

Title

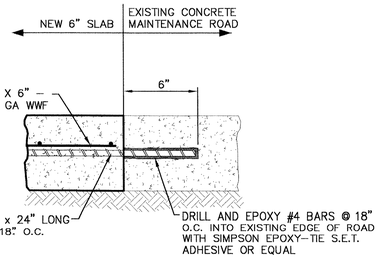
FIGURE 5
BULLARD WASH CHANNEL

Project No.	Scale
81500260	1"=100'

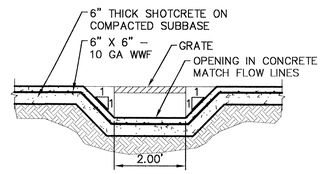
Drawing No. | Sheet | Revision



PLAN
SCALE: 1" = 20'

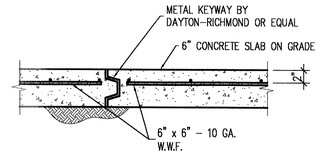


TIE TO EXISTING
SCALE: NTS

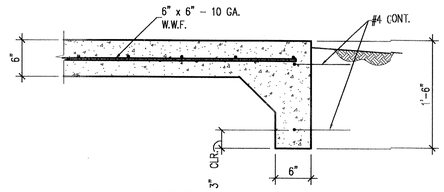


SECTION F–F
SCALE: 1/2" = 1'–0"

NOTE: CONTROL JOINTS TO BREAK SLAB INTO AREAS NOT TO EXCEED 400 SQ. FT.



TYPICAL CONTROL JOINT
SCALE: 1 1/2" = 1'–0"

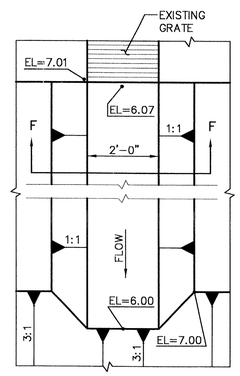


SECTION E–E
TYPICAL TURN DOWN AT SLAB EDGE
SCALE: 1 1/2" = 1'–0"

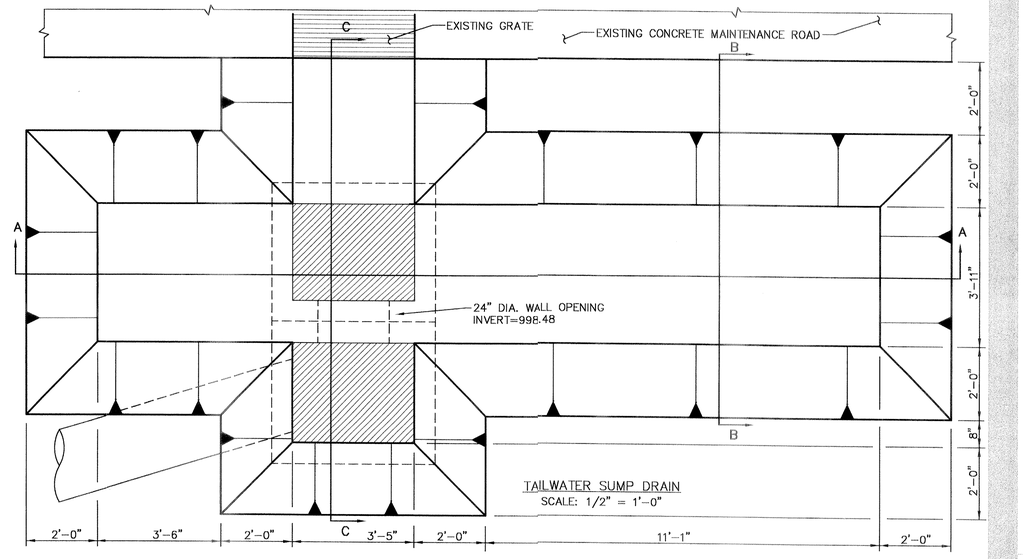
MATERIAL SPECIFICATIONS

1. PNEUMATICALLY PLACED CONCRETE (SHOTCRETE) SHALL BE 3000 psi @ 28 DAYS w/ FIBER MESH ADDITIVE.
2. REINFORCING STEEL SHALL BE DEFORMED BARS CONFORMING TO ASTM A-615, GRADE 60.
3. WELDED WIRE FABRIC SHALL CONFORM TO ASTM A185 WITH A MINIMUM YIELD STRENGTH OF 70,000 psi.
4. EPOXY FOR RE-BAR EMBEDMENT SHALL BE SIMPSON EPOXY-TIE S.E.T. ADHESIVE OR AN EQUAL.

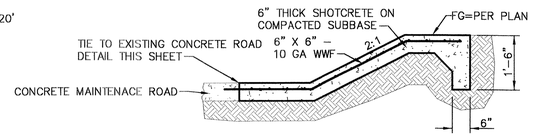
NOTE: ALL SHOTCRETE TO HAVE POPCORN FINISH



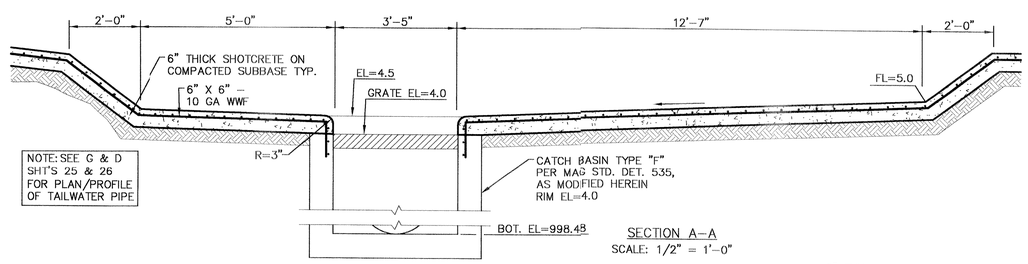
LOW FLOW CHANNEL
SCALE: 1/2" = 1'–0"



TAILWATER SUMP DRAIN
SCALE: 1/2" = 1'–0"

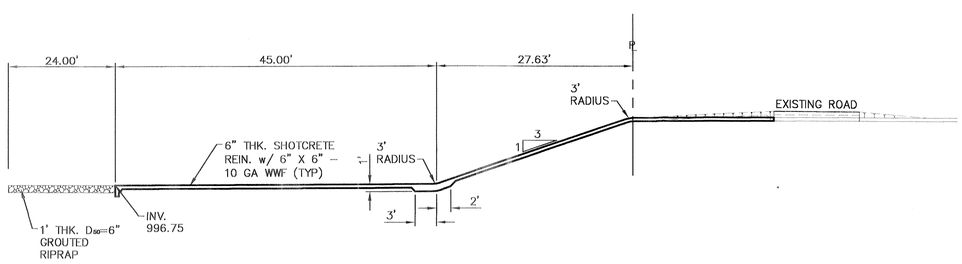


SECTION D–D
SCALE: 1/2" = 1'–0"

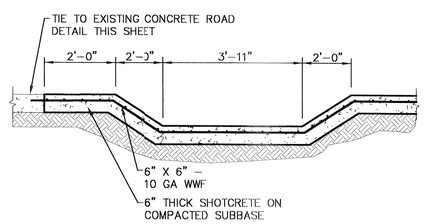


NOTE: SEE G & D SHT'S 25 & 26 FOR PLAN/PROFILE OF TAILWATER PIPE

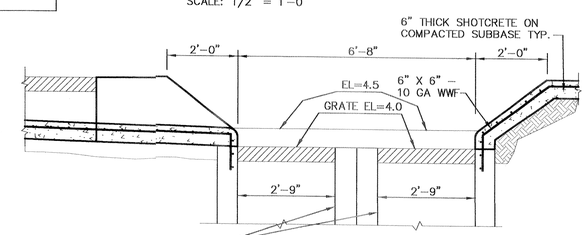
SECTION A–A
SCALE: 1/2" = 1'–0"



PROFILE
SCALE: 1" = 10'



SECTION B–B
SCALE: 1/2" = 1'–0"



SECTION C–C
SCALE: 1/2" = 1'–0"

Stantec Consulting Inc.
8211 South 48th Street
Phoenix AZ USA
85044-5355
Tel. 602.438.2200
Fax. 602.431.9562
www.stantec.com

Stantec

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Revision	By	Appd.	Date
0			

File Name:

Dwn.	Chkd.	Dsgn.	Date

Permit/Seal

Registered Professional Engineer (Civil) CERTIFICATE NO. 21455 ROBERT B. MURPHY Date Signed ARIZONA U.S.A.

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Client/Project
ARIZONA LAND ADVISORS
6710 N. SCOTTSDALE ROAD, SUITE 10
Scottsdale, AZ 85253
Telephone: (480) 483-8100

GOODYEAR PLANNED REGIONAL CENTER - PARCELS 9, 10, & 11

Goodyear, Arizona

FIG. 5A

Title
GRADING AND DRAINAGE PLANS
DROP STRUCTURE DETAILS

Project No.	Scale	
81500260		
Drawing No.	**Sheet**	**Revision**
24	24 of 26	0

WHITE TANKS/AGUA FRIA
AREA DRAINAGE MASTER STUDY

FLOOD CONTROL DISTRICT
OF MARICOPA COUNTY

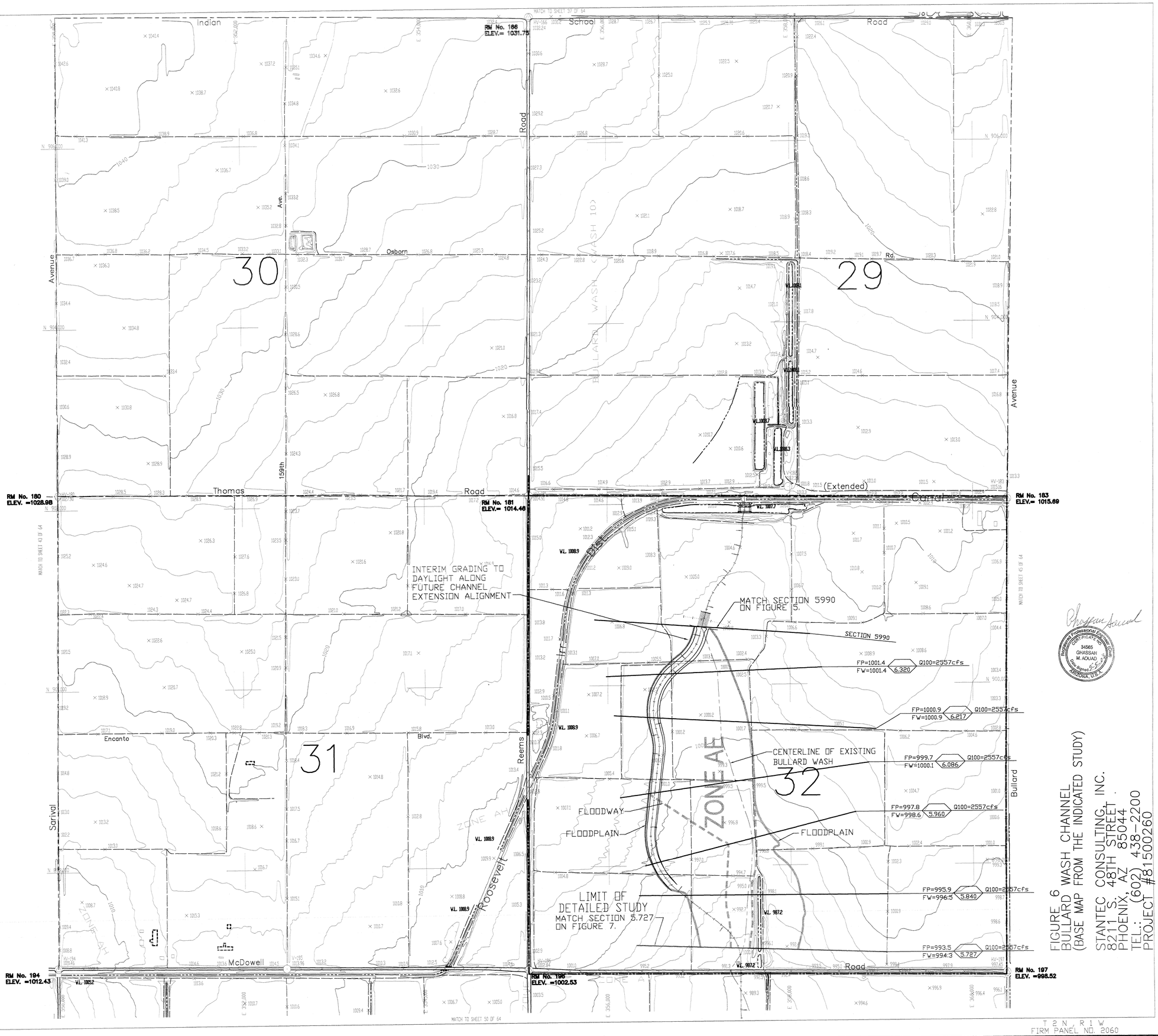


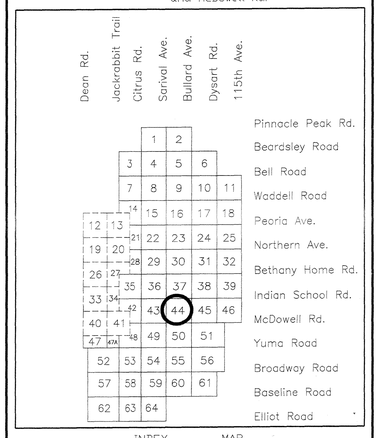
FIGURE 6
BULLARD WASH CHANNEL
(BASE MAP FROM THE INDICATED STUDY)

STANTEC CONSULTING, INC.
8211 S. 48TH STREET
PHOENIX, AZ 85044
TEL.: (602) 438-2200
PROJECT #81500260

Registered Professional Engineer (Civil) CERTIFICATE NO. 34565 GHASSAN M. AOUAD Date Signed 5-5-89 ARIZONA, U.S.A.

REFERENCE MARKS (RM'S)

NO.	ELEVATION	DESCRIPTION
166	1031.75	Maricopa County Highway Dept. Brass Cap in Hand Hole, Reems Rd. and Indian School Rd.
180	1028.98	Chiseled Square on Top Concrete Headwall at Northwest Corner Intersection of Sarival Ave. and Thomas Rd.
181	1014.46	Maricopa County Highway Dept. Brass Cap in Hand Hole, Reems Rd. and Thomas Rd.
183	1015.69	Brass Cap in Southeast Corner of Bridge on Bullard Ave. over the R.I.D. Canal Stamped- 1983 LS 6450 (R.I.D.-2-33-14)
194	1012.43	"X" Chiseled on Top of Concrete Headwall at Southeast Corner of Intersection of Sarival Ave. and Thomas Rd.
196	1002.53	Brass Cap in Hand Hole, ± 45' South of Intersection of Reems Rd. and McDowell Rd.
197	998.52	"X" Chiseled on Top of Concrete Wing Southeast Corner of Intersection of Bullard Ave. and McDowell Rd.



INDEX MAP

N

400 200 0 400 800 1200

BASE MAP: WHITE TANKS/AGUA FRIA A.D.M.S. TOPOGRAPHIC MAPS
CONTOUR INTERVAL = 2'

LEGEND

1.452	CROSS SECTION NUMBER
FP=1158.9	FLOODPLAIN WATER SURFACE ELEVATION = 1158.9
FW=1159.8	FLOODWAY WATER SURFACE ELEVATION = 1159.8
Q100=764cfs	100-YEAR PEAK DISCHARGE = 764 CUBIC FEET PER SEC.
	BASE FLOOD ELEVATION
	STREAM CENTERLINE
	FLOODWAY BOUNDARY
	FLOODPLAIN BOUNDARY
RM NO. 100	ELEVATION REFERENCE MARK
ZONE AE	FLOOD INSURANCE RATE ZONE

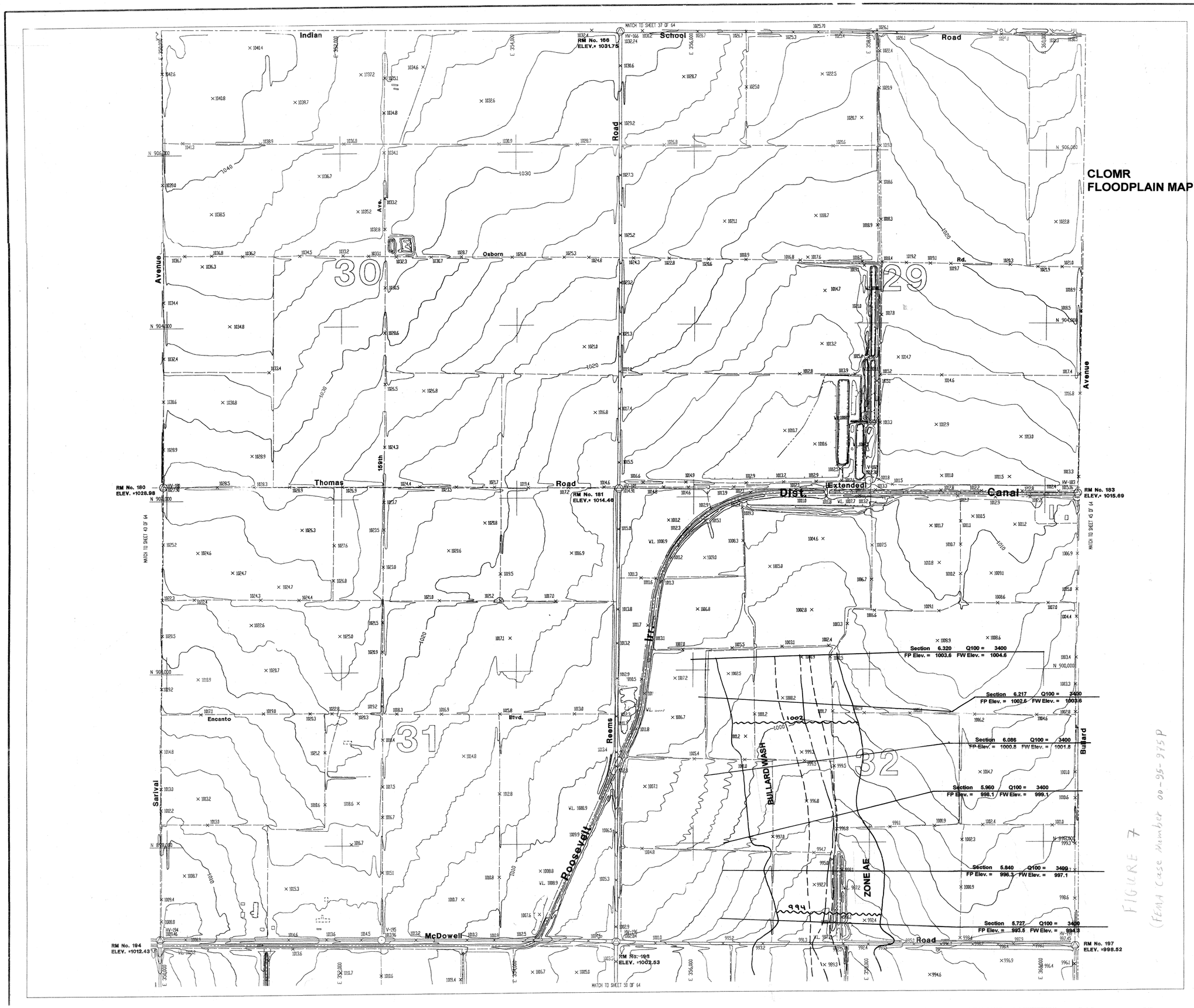
SHEET TITLE: FLOODPLAIN MAP

STUDY CONSULTANT: The WLB Group INC.

MAPPING COMPANY: Cooper Aerial of Phoenix, Inc.

FIG. 6

SHEET 44 OF 64 | DATE FLOWN 12/22/89



CLOMR
FLOODPLAIN MAP

WHITE TANKS/AGUA FRIA

AREA DRAINAGE MASTER STUDY

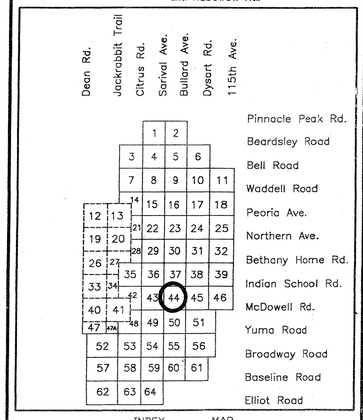
FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

LEGEND

Section 2.883	- HEC-2 section number
Q100 = 3191	- 100-year discharge (cfs)
FP Elev. = 952.3	- 100-year floodplain elevation
FW Elev. = 953.3	- Floodway elevation
	- Floodplain boundary
	- Floodway boundary
	- Stream centerline (sta=10000)
ZONE AE	- Flood Insurance Rate Zone

REFERENCE MARKS (RM'S)

NO.	ELEVATION	DESCRIPTION
166	1031.75	Maricopa County Highway Dept. Brass Cap in Hand Hole, Reems Rd. and Indian School Rd.
180	1028.98	Chiseled Square on Top Concrete Headwall at Northwest Corner Intersection of Sarival Ave. and Thomas Rd.
181	1014.46	Maricopa County Highway Dept. Brass Cap in Hand Hole, Reems Rd. and Thomas Rd.
183	1015.69	Brass Cap in Southeast Corner of Bridge on Bullard Ave. over the R.I.D. Canal Stamped- 1983 LS 6450 (R.I.D.-2-33-14)
194	1012.43	'X' Chiseled on Top of Concrete Headwall at Southeast Corner of Intersection of Sarival Ave. and Thomas Rd.
196	1002.53	Brass Cap in Hand Hole, ± 45' South of Intersection of Reems Rd. and McDowell Rd.
197	998.52	'X' Chiseled on Top of Concrete Wing Southeast Corner of Intersection of Bullard Ave. and McDowell Rd.



CERTIFICATION

This is to certify that the horizontal and vertical control surveys on which this map was based were prepared under my supervision during the time from December, 1989 to April, 1990. The topography was developed from photogrammetric methods by Cooper Aerial Survey Co. and checked with field surveyed profiles conducted under my supervision. It was determined with the field surveys that over 90% of the contour lines and spot elevations were within one foot of the true elevation.

REGISTERED LAND SURVEYOR CERTIFICATE NO. 14184 MARK T. GAVAN ARIZONA U.S.A.

FIG. 7

MARK T. GAVAN, R.L.S.

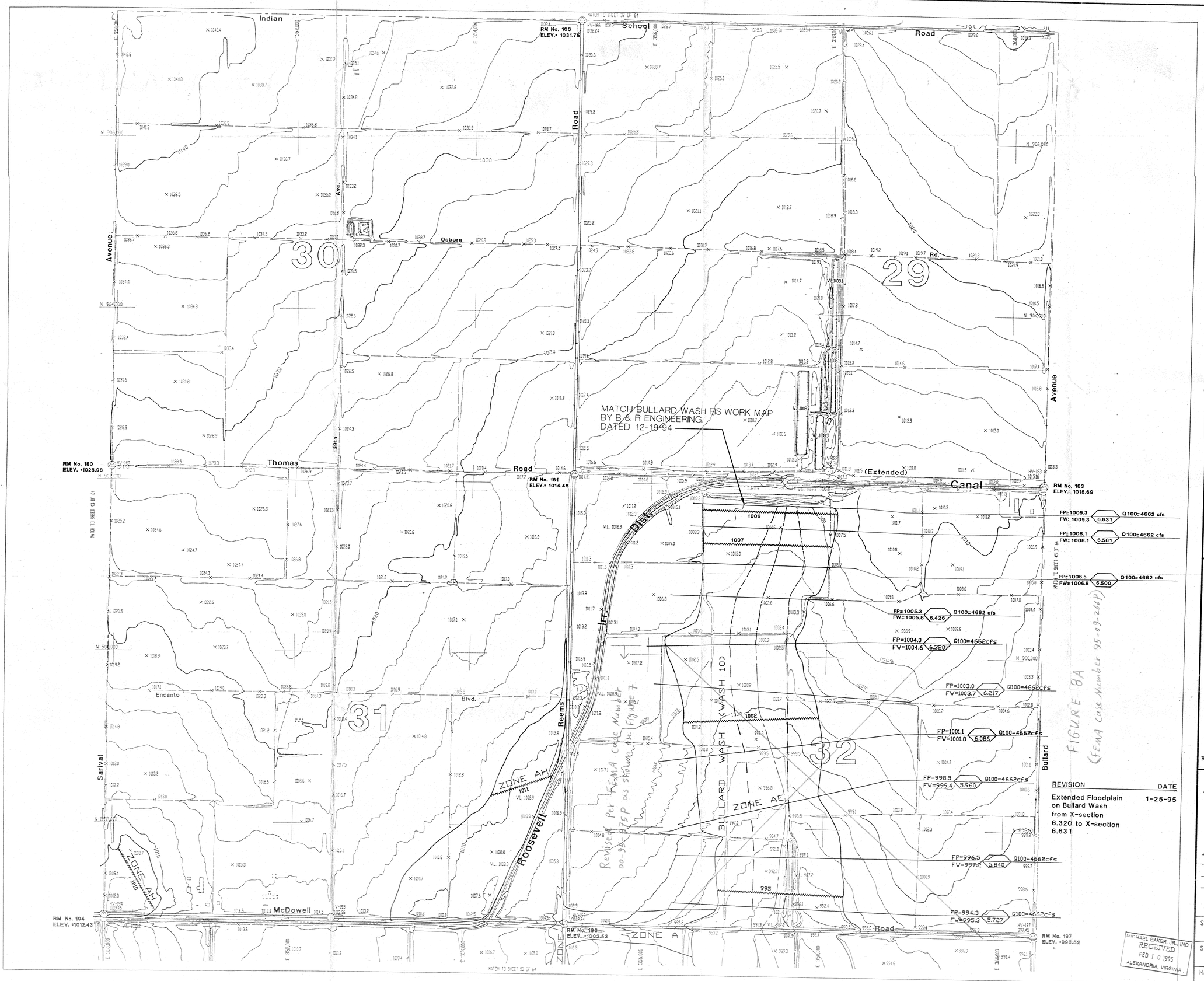
FIGURE 7
(FEMA Case Number 00-95-975P)

SHEET TITLE: **TOPOGRAPHIC MAP**

STUDY CONSULTANT: **The WLB Group** INC.

MAPPING COMPANY: Cooper Aerial of Phoenix, Inc.

SHEET 44 OF 64 | DATE FLOWN: 12/22/89



REVISION	DATE
Extended Floodplain on Bullard Wash from X-section 6.320 to X-section 6.631	1-25-95

WHITE TANKS/AGUA FRIA

AREA DRAINAGE MASTER STUDY

FLOOD CONTROL DISTRICT OF MARICOPA COUNTY

REFERENCE MARKS (RM'S)

NO.	ELEVATION	DESCRIPTION
166	1031.75	Maricopa County Highway Dept. Brass Cap in Hand Hole, Reems Rd. and Indian School Rd.
180	1028.98	Chiseled Square on Top Concrete Headwall at Northwest Corner Intersection of Sarival Ave. and Thomas Rd.
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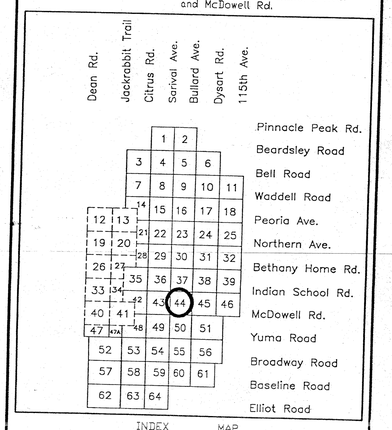


400 200 0 400 800 1200

BASE MAP: WHITE TANKS/AGUA FRIA A.D.M.S. TOPOGRAPHIC MAPS
CONTOUR INTERVAL = 2'

LEGEND

1.452	CROSS SECTION NUMBER
FP=1158.9	FLOODPLAIN WATER SURFACE ELEVATION = 1158.9
FW=1159.8	FLOODWAY WATER SURFACE ELEVATION = 1159.8
Q100=764cfs	100-YEAR PEAK DISCHARGE = 764 CUBIC FEET PER SEC.
1157	BASE FLOOD ELEVATION
	STREAM CENTERLINE
	FLOODWAY BOUNDARY
	FLOODPLAIN BOUNDARY
RM NO. 100	ELEVATION REFERENCE MARK
ZONE AE	FLOOD INSURANCE RATE ZONE

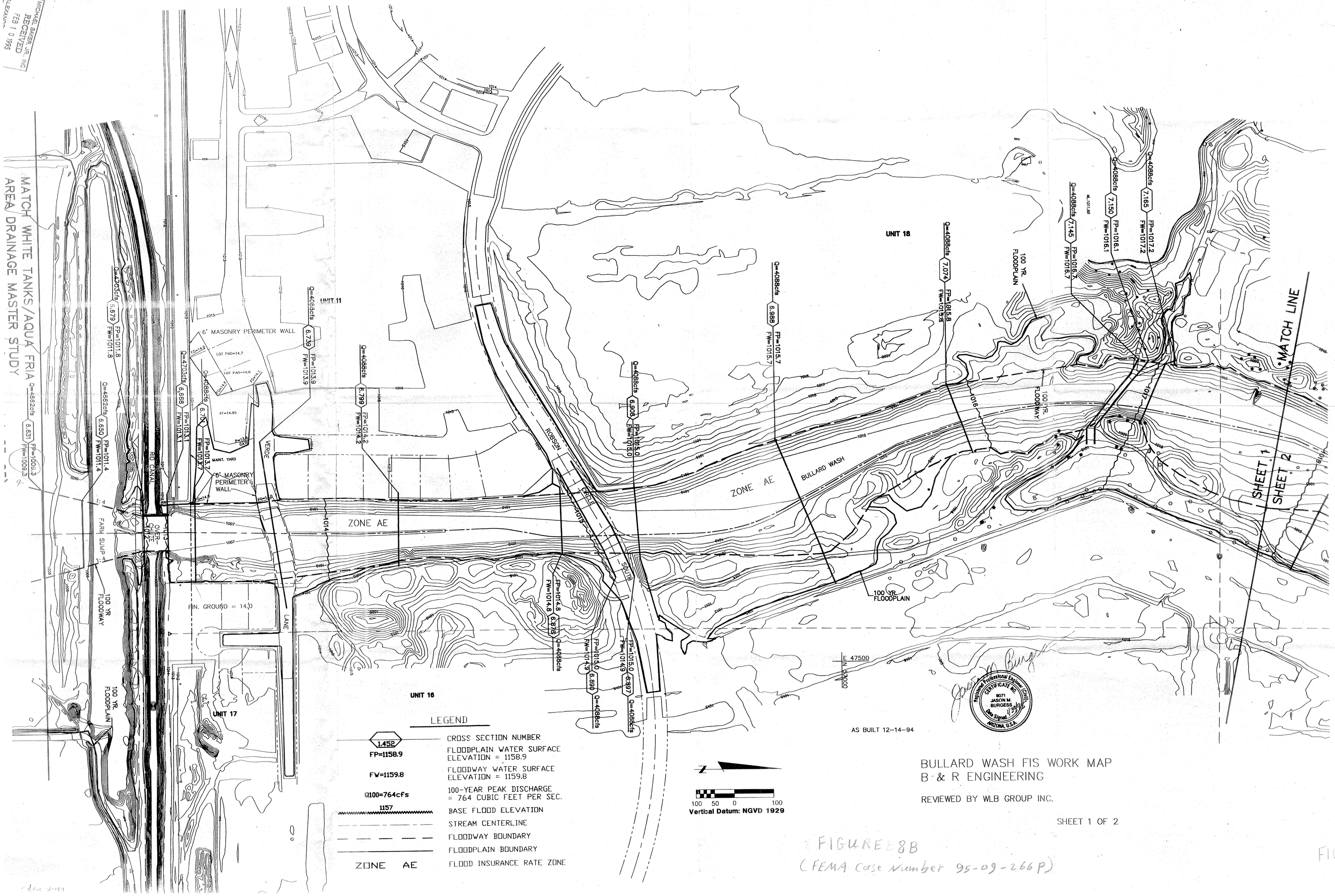
SHEET TITLE: **FLOODPLAIN MAP**

STUDY CONSULTANT: The WLB Group INC.

MAPPING COMPANY: Cooper Aerial of Phoenix, Inc.

FIG. 8A

MICHAEL BAKER JR., INC.
RECEIVED
FEB 10 1995
ALEXANDRIA



BULLARD WASH FIS WORK MAP
B & R ENGINEERING

REVIEWED BY WLB GROUP INC.

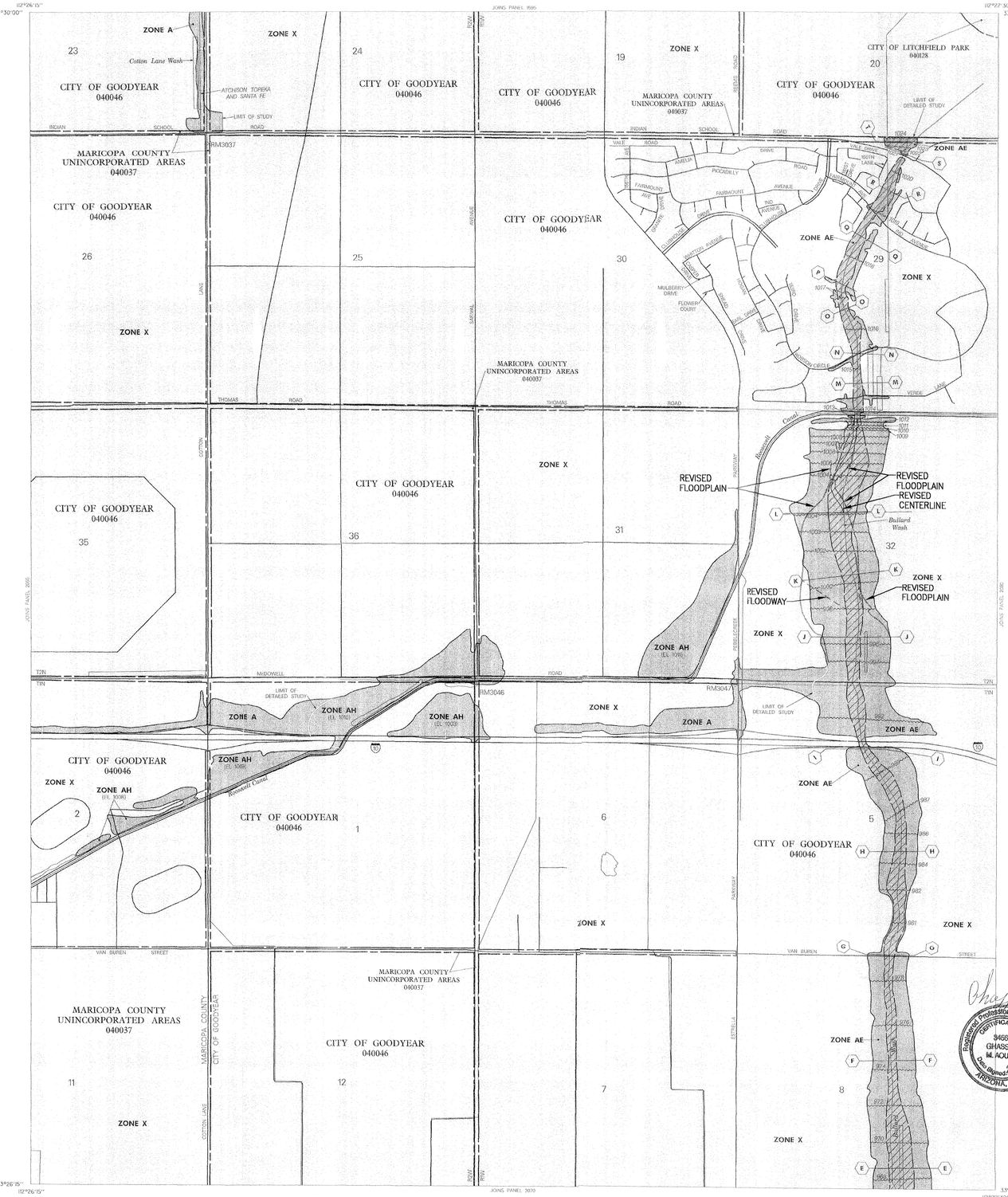
SHEET 1 OF 2

FIGURE 8B
(FEMA case number 95-09-266P)

FIG. 8B

ELEVATION REFERENCE MARKS

REFERENCE MARK	ELEVATION (FEET NGVD)	DESCRIPTION OF LOCATION
RM3037	1064.65	Iron rod in pothole, Cotton Lane and Indian School Road, southeast corner section 23, T2N, R3W.
RM3046	1012.43	Chiseled X on top of concrete headwall at southeast corner of intersection of Sarival Avenue and McDowell Road, near southeast corner section 36, T2N, R1W.
RM3047	1002.53	Brass cap in handhole, 945 feet south of intersection of Reems and McDowell Roads, southeast corner section 31, T2N, R1W.



FIRM WITH REVISED FLOOD LIMITS
FIGURE 9

LEGEND

SPECIAL FLOOD HAZARD AREAS INUNDATED BY 100-YEAR FLOOD

ZONE A No base flood elevations determined.

ZONE AE Base flood elevations determined.

ZONE AH Flood depths of 1 to 3 feet (usually areas of ponding); base flood elevations determined.

ZONE AO Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined; for areas of alluvial fan flooding, velocities also determined.

ZONE A99 To be protected from 100-year flood by Federal flood protection system under construction; no base flood elevations determined.

ZONE V Coastal flood with velocity hazard (wave action); no base flood elevations determined.

ZONE VE Coastal flood with velocity hazard (wave action); base flood elevations determined.

FLOODWAY AREAS IN ZONE AE

OTHER FLOOD AREAS

ZONE X Areas of 500-year flood; areas of 100-year flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 100-year flood.

OTHER AREAS

ZONE X Areas determined to be outside 500-year floodplain.

ZONE D Areas in which flood hazards are undetermined.

UNDEVELOPED COASTAL BARRIERS

Identified 1983 — Mentioned 1984 — Differently Delineated 1984

Coastal barrier areas are normally located within or adjacent to Special Flood Hazard Areas.

Floodplain Boundary

Floodway Boundary

Zone D Boundary

Boundary Dividing Special Flood Hazard Zones, and Boundary Dividing Areas of Different Coastal Base Flood Elevations Within Special Flood Hazard Zones.

513 — Base Flood Elevation Line; Elevation in Feet. See Map Index for Elevation Datum.

D — D — Cross Section Line

(EL 987) — Base Flood Elevation in Feet Where Uniform Within Zone. See Map Index for Elevation Datum.

RM7 — Elevation Reference Mark

M2 — River Mile

97°07'30", 32°22'30" — Horizontal Coordinates Based on North American Datum of 1927 (NAD 27) Projection.

NOTES

This map is for use in administering the National Flood Insurance Program; it does not necessarily identify all areas subject to flooding, particularly from local drainage sources of small size, or all planimetric features outside Special Flood Hazard Areas. The community map repository should be consulted for more detailed data on BFE's, and for any information on floodway delineations, prior to use of this map for property purchase or construction purposes.

Areas of Special Flood Hazard (100-year flood) include Zones A, AE, A1-A30, AH, AO, A99, V, VE and V1-V30.

Certain areas not in Special Flood Hazard Areas may be protected by flood control structures.

Boundaries of the floodways were computed at cross sections and interpolated between cross sections. The floodways were based on hydraulic considerations with regard to requirements of the Federal Emergency Management Agency.

Floodway widths in some areas may be too narrow to show to scale. Refer to Floodway Data Table where floodway width is shown at 100 inch.

Corporate limits shown are current as of the date of this map. The user should contact appropriate community officials to determine if corporate limits have changed subsequent to the issuance of this map.

This map may incorporate approximate boundaries of Coastal Barrier Resource System Units and/or Otherwise Protected Areas established under the Coastal Barrier Improvement Act of 1990 (P.L. 101-591).

For community map revision history prior to countywide mapping, see Section 6.0 of the Flood Insurance Study Report.

For adjoining map panels and listing map source see separately printed Map Index.

MAP REPOSITORY
Refer to Repository Listing on Map Index

EFFECTIVE DATE OF
COUNTYWIDE FLOOD INSURANCE RATE MAP
APRIL 15, 1988

EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL
SEPTEMBER 30, 1995

Map revised July 19, 2001 to update corporate limits, to change base flood elevations, to add base flood elevations, to add Special Flood Hazard Areas, to change Special Flood Hazard Areas, to change zone designations, to update map format, to add roads and road names, and to incorporate previously issued Letters of Map Revision.

To determine if flood insurance is available, contact an insurance agent or call the National Flood Insurance Program at (800) 638-6620.

APPROXIMATE SCALE IN FEET
1000 0 1000

LEGEND

To obtain more detailed information in areas where Base Flood Elevations (BFE's) and/or floodways have been determined, users are encouraged to consult the Flood Profiles and Floodway Data tables contained within the Flood Insurance Study (FIS) report that accompanies this FIRM. Users should be aware that BFE's shown on the FIRM represent rounded whole-foot elevations and therefore may not exactly reflect the flood elevation data presented in the FIS. BFE's shown on the FIRM are intended for flood insurance rating purposes only and should not be used as the sole source of flood elevation information. Accordingly, flood elevation data presented in the FIS should be utilized in conjunction with the FIRM for purposes of construction and/or floodplain management.

FIRM elevations listed on this map were obtained and/or developed to establish vertical control for determination of flood elevations and floodplain boundaries portrayed on this map. Users should be aware that these FIRM elevations may have changed since the publication of this map. To obtain up-to-date elevation information on National Geodetic Survey (NGS) FIRM's shown on this map, please contact the Information Services Branch of the NGS at (301) 713-3242 or visit their website at www.ngs.noaa.gov. Map users should seek verification of non-NGS FIRM monument elevations when using these elevations for construction or floodplain management purposes.

Coastal BFE's shown on this map may apply only landward of 0.0' NGVD. Users of this FIRM should be aware that coastal flood elevations are also provided in the Summary of Stillwater Elevations table in the Flood Insurance Study report for this community. Elevations shown in the Summary of Stillwater Elevations table should be used for construction and/or floodplain management purposes when they are higher than the elevations shown on this FIRM.

NATIONAL FLOOD INSURANCE PROGRAM

FIRM
FLOOD INSURANCE RATE MAP

MARICOPA COUNTY, ARIZONA AND INCORPORATED AREAS

PANEL 2060 OF 4350
(SEE MAP INDEX FOR PANELS NOT PRINTED)

CONTAINS: COMMUNITY	NUMBER	PANEL	SUFFIX
GOODYEAR, CITY OF	040046	2060	F
LITCHFIELD PARK, CITY OF	047021	2060	F
MARICOPA COUNTY UNINCORPORATED AREAS	040037	2060	F

Registered Professional Engineer CERTIFICATE NO. 34665 GHASSAN M. AOUAD Date Signed 7-19-01 ARIZONA, U.S.A.

MAP NUMBER
04013C2060 F

MAP REVISED:
JULY 19, 2001

Federal Emergency Management Agency

FIG. 9

K:\Arcinfo\R5\50283\Drawing\Drawings 8-15-11\2050040D.dwg
2003-05-05 03:17PM By bhart