GREEN VALLEY DRAINAGEWAYS
BASIN MANAGEMENT STUDY

PIMA COUNTY, ARIZONA
NAVD88 VERTICAL DATUM

Prepared for:

PIMA COUNTY
FLOOD CONTROL

Pima County Regional Flood Control District
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CMG Project No. 13-008
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TABLE OF CONTENTS

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Page

1.0 INTRODUCTION 1
1.1 Data Collection, Initial Coordination and Surveying 2

2.0 HYDROLOGIC ANALYSES 4
2.1 General Overview of Methodology 4
2.2 HEC-1 Modeling Description 6
2.2.1 Watershed Physical Characteristics 6
2.2.2 Rainfall 6
2.2.3 Rainfall Losses / Soil Characteristics 7
2.2.4 Rainfall-Runoff Modeling 8
2.2.5 Channel Routing 9
2.2.6 HEC-1 Modeling Results 10
2.3 PC-Hydro Modeling Description 10
2.3.1 PC-Hydro Modeling Results 10

3.0 HYDRAULIC ANALYSES 13
3.1 Floodplain Modeling Methodology 13
3.2 Study Work Maps 13
3.3 Parameter Estimation 13
3.3.1 Roughness Coefficients 13
3.3.2 Expansion and Contraction Coefficients 14
3.4 Cross Section Description 14
3.5 Bridges and Culverts 15
3.6 Levees and Dikes 18
3.7 Ineffective Flow Areas 18

4.0 Flood and Erosion Hazard Assessment 19
4.1 Previous Studies 19
4.2 Summary of Flood and Erosion Control Recommendations 19
4.3 Special Problem Areas 23

5.0 REFERENCES 24

List of Figures

Follows

Figure 1: Location Map 1
Figure 2A: Watersheds Soils Map 1
Figure 2B: Soils Map for Drainageway #9 3
Figure 3: 3-Hour Storm Duration Rainfall Map 8
Figure 4A: Watershed Map for Drainageway #9 10
Figure 4B: Watershed Map for Drainageways #1-8 and 10-25 ..... Appendix F
Figure 4C: Watershed Map for Santa Cruz West Channel 10
Figure 5: Hydraulic Work Maps ..... Appendix J

List of Tables

Page

Table 1 – Summary of Pima County Public Drainageways and Study Limits 1
Table 2 – Summary of Hydrology Methods 4
Table 3 – Hydrology Methods and Data Sources 5
Table 4 – Summary of Hydrologic Computations 11
Table 5 – Culvert Summary Table 15
Table 6 – Drainage Structure Maintenance Needs 20
Table 7 – Bank Erosion, Degradation and Sediment Deposition Problem Locations 20
Table 8 – Undersized Roadway Culverts 21
Table 9 – Locations Requiring Channel Modifications to Increase Capacity 22

List of Appendices

APPENDIX A – Rainfall Data
APPENDIX B – HEC-1 Soils Type Data
APPENDIX C – TR55 Travel Time Computations for HEC-1
APPENDIX D – HEC-1 Channel / Watershed Parameters
APPENDIX E – Sub–Basin Routing Parameters / HEC-1 Input & Output
APPENDIX F – Watershed Maps
APPENDIX G – PC-Hydro Input Parameter Tables
APPENDIX H – PC-Hydro Data Sheets
APPENDIX I – Downstream Boundary Condition Water Surface Elevations
APPENDIX J – Hydraulic Work Maps
APPENDIX K – Culvert & Channel Photographs
APPENDIX L – HEC-RAS Models Printouts
APPENDIX M – RFCD - Green Valley 2013 Drainageway Evaluations
APPENDIX N – Preliminary Floodplain Analysis Report for Drainageway #8
APPENDIX O – Electronic Files on DVD

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1.0 INTRODUCTION

The Pima County Regional Flood Control District (RFCD) owns and maintains 25 urban drainageways within Green Valley (via public rights of way or easement). These drainageways function to convey stormwater that emanates from the urban areas and from undeveloped areas west of the community. Some of the drainageways are lined channels while others are fully earthen. The RFCD has spent significant funds during past decades to maintain these drainageways and repair periodic damages. Bank erosion has occurred threatening adjoining neighborhoods and channel degradation has, in some locations, undercut bank protection, underground utilities and roadway crossings. In addition, the RFCD does not have reliable hydrologic and hydraulic data to verify whether or not existing drainageways and structures (such as roadway culverts) have sufficient capacity to contain current regulatory discharges. Study area topography, hydrologic calculations and floodplain mapping, most of which date to studies conducted in the 1960's, was in need of being updated to current RFCD standards. CMG Drainage Engineering, Inc. (CMG) was contracted by the RFCD in March 2013 to conduct this study. A location map showing the study limits and named watersheds within those limits is provided on Figure 1.

The purpose of the study is to develop updated hydrologic and hydraulic mapping for the watercourses, to inspect and determine the condition of the drainageways, to prioritize needed repairs needed to mitigate ongoing flood and erosion damages. The study area for this project will include Green Valley Drainageways #1 through #25. Study limits for each of these watercourses are summarized in the table below.

Table 1 - Summary of Pima County Public Drainageways and Study Limits

Drainageway	Upstream Study Limit	Downstream Study Limit	Length (ft)
1	Rio Altar	Santa Cruz River	11,600
2	Interstate 19	Santa Cruz River	3,400
3	Interstate 19	Santa Cruz River	3,700
4	Avenida Del Abaco	Interstate 19	8,300
5	Avenida Del Abaco	Interstate 19	15,500
6	Near Bell Tower Dr.	Santa Cruz River	8,500
7	Near Circulo Napa	Santa Cruz River	8,200
8	Interstate 19	Santa Cruz River	2,400
9	Freeport McMoren Property line	Santa Cruz River	13,500
10	El Viento	Santa Cruz River	450
11	La Granadas	Santa Cruz River	1,600
12	La Huerta	Santa Cruz River	500

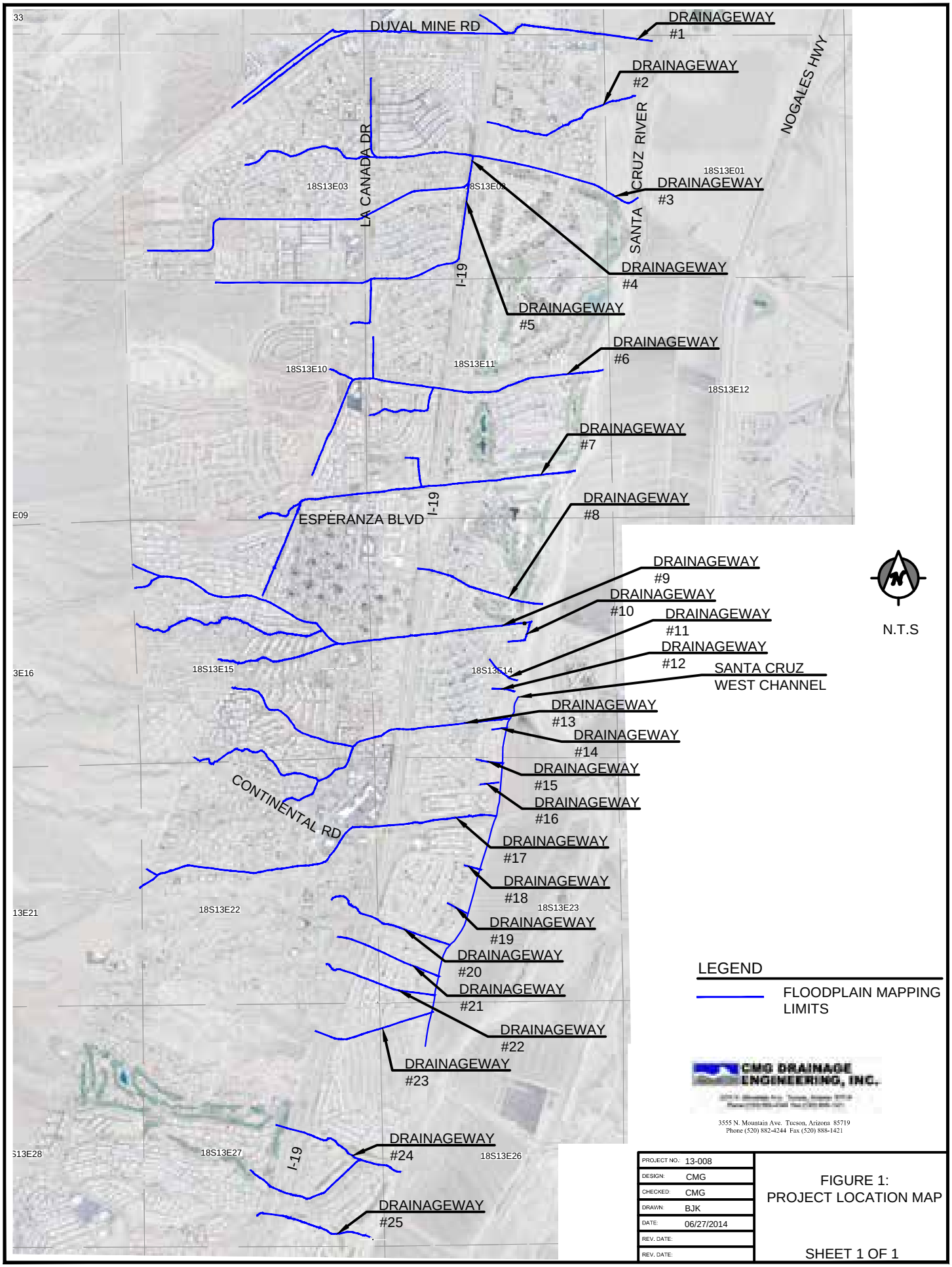

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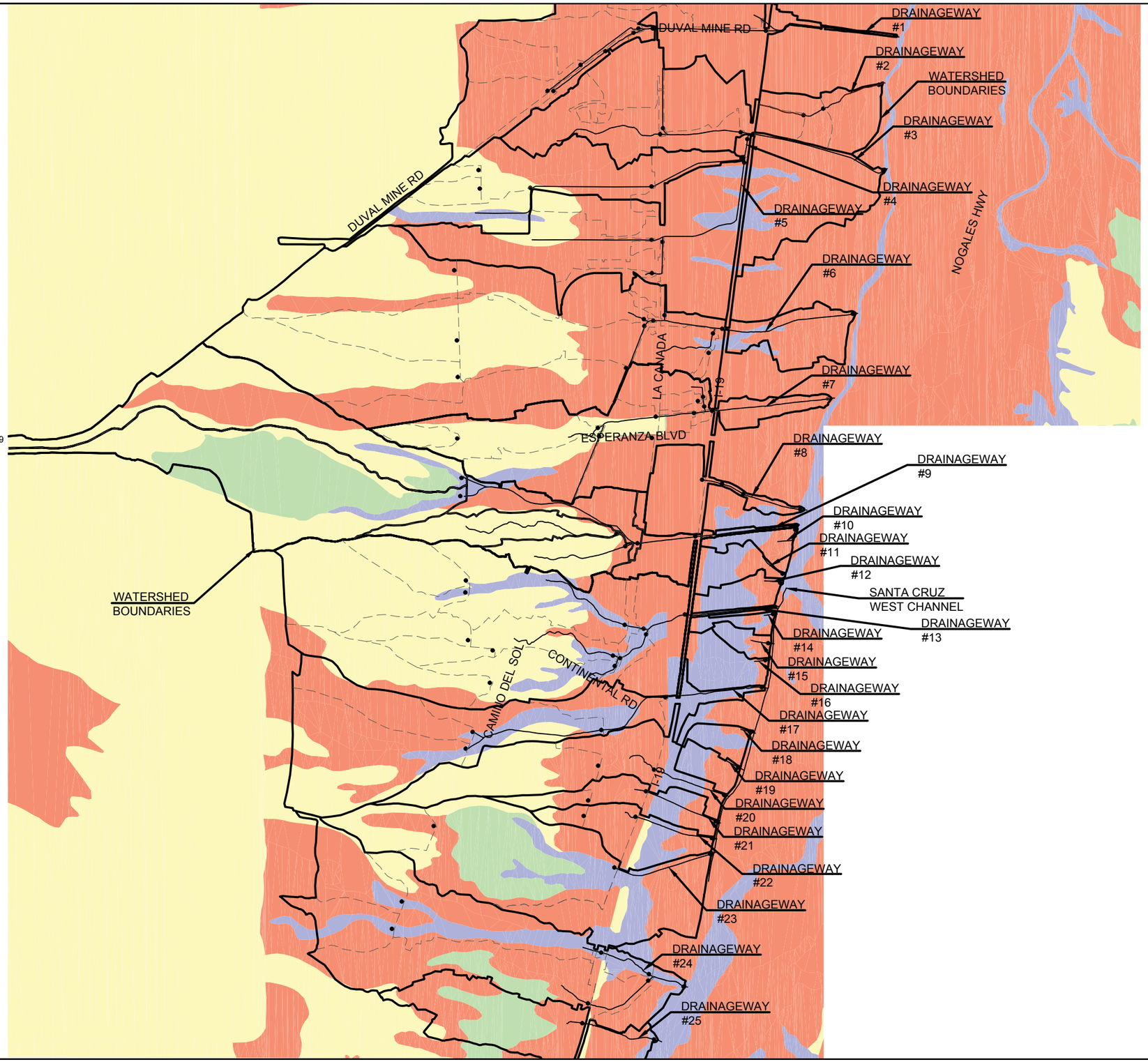
FIGURE 1:
PROJECT LOCATION MAP

SHEET 1 OF 1



NOTES:

1. VERTICAL DATUM = NAVD88
   HORIZONTAL PROJECTION = ARIZONA STATE PLANE CENTRAL, NAD83 HARN

LEGEND

- MAJOR WATERSHED BOUNDARIES
- SUB-BASIN WATERSHED BOUNDARIES
- DRAINAGEWAYS
- SOILS GROUP A
- SOILS GROUP B
- SOILS GROUP C
- SOILS GROUP D
- SOILS GROUP MIXED
- CONCENTRATION POINT LOCATIONS

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FIGURE 2A:
WATERSHEDS
SOILS MAP

SHEET 1 OF 2

Drainageway	Upstream Study Limit	Downstream Study Limit	Length (ft)
13	Camino Del Portillo	Santa Cruz River	10,600
14	La Espina	Santa Cruz River	320
15	La Pera	Santa Cruz River	500
16	La Huerta	Santa Cruz River	400
17	Camino Del Sol	Santa Cruz River	8,400
18	Santa Belia	Santa Cruz River	450
19	Abrego Dr.	Santa Cruz River	460
20	Interstate 19	Santa Cruz River	2,000
21	Interstate 19	Santa Cruz River	1,800
22	Interstate 19	Santa Cruz River	1,900
23	Interstate 19	Santa Cruz River	2,300
24	Desert Ridge	Santa Cruz River	4,700
25	Interstate 19	Santa Cruz River	1,700

1.1 Data Collection, Initial Coordination and Surveying

The following information was obtained and reviewed by CMG Drainage Engineering. Inc.in conjunction with completion of this report.

- PAG digital elevation bare earth LIDAR data dated 2008 and 2011
- Digital USGS quadrangle map data obtained for areas not covered by PAG mapping
- Available roadway plans for any streets or highways within the study area that have roadway drainage culverts or have an effect on drainage patterns including:
- Pima County Plan #4 BLCAC Continental Drive to Apero Drive
- Pima County Plan #4BLACA Green Valley Drainageways Esperanza Drive to Duval Mine Road
- Pima County Plan #4BLACA-II Country Club Vistas Drainageway
- Pima County Plan #4BBRGA Continental Road _ Abrego Dr. to Old Nogales Hwy.
- Pima County Plan #4BRGVV Drainageway #4
- ADOT Plan # 4INFRC I-19 East Frontage Road Canoa Rd. to Continental Rd.
- Pima County Plan #4ISNFC I-19 West Frontage Road at Continental Road
- Pima County Plan #4FPDG Abrego Dr. Culvert at Drainageway #3
- Pima County Plan #CO12-94-60 Abrego Dr. Extension
- Pima County Plan #I83-222 Camino Casa Verde
- Duval Mine Rd. Improvements R804 & R806 - C012-89-35
- Pima County Plan #4FGVD9 Green Valley Drainageway #9 Improvements
- Pima County Plan #HVV09 La Canada Drive Box Culvert
- ADOT I-19 I(44) Phase 1
- ADOT 1-19 I(57) Continental Rd. to 3 Miles South
- La Joya Verde - Abrego Dr. Paving and Drainage Improvements CO-94-40
- ADOT Tucson to Nogales Hwy. Section II Plans
- RS Engineering, Inc., RFCD Green Valley Drainageways Erosion Hazard Assessment , May 24, 2004
- CMG Drainage Engineering. Inc., RFCD Special Study #11 Green Valley

Drainageway #9, January 12, 1989

- Pertinent drainage complaints *from RFCD records*

The previous study data that was not complete or available on project datum mostly included elevations and sizes of roadway drainage culverts. CMG contracted OPW Surveying, LLC to obtain additional survey data for all culverts within the project area including inlet/outlet inverts, headwall/wing wall geometries, top of road elevations and culvert size/material. OPW Surveying, LLC perform the field surveys on all area drainage structures to supplement as-built plans. CMG also conducted site visits to examine drainage patterns and structures along the public drainageways, and to investigate significant drainage complaint locations.

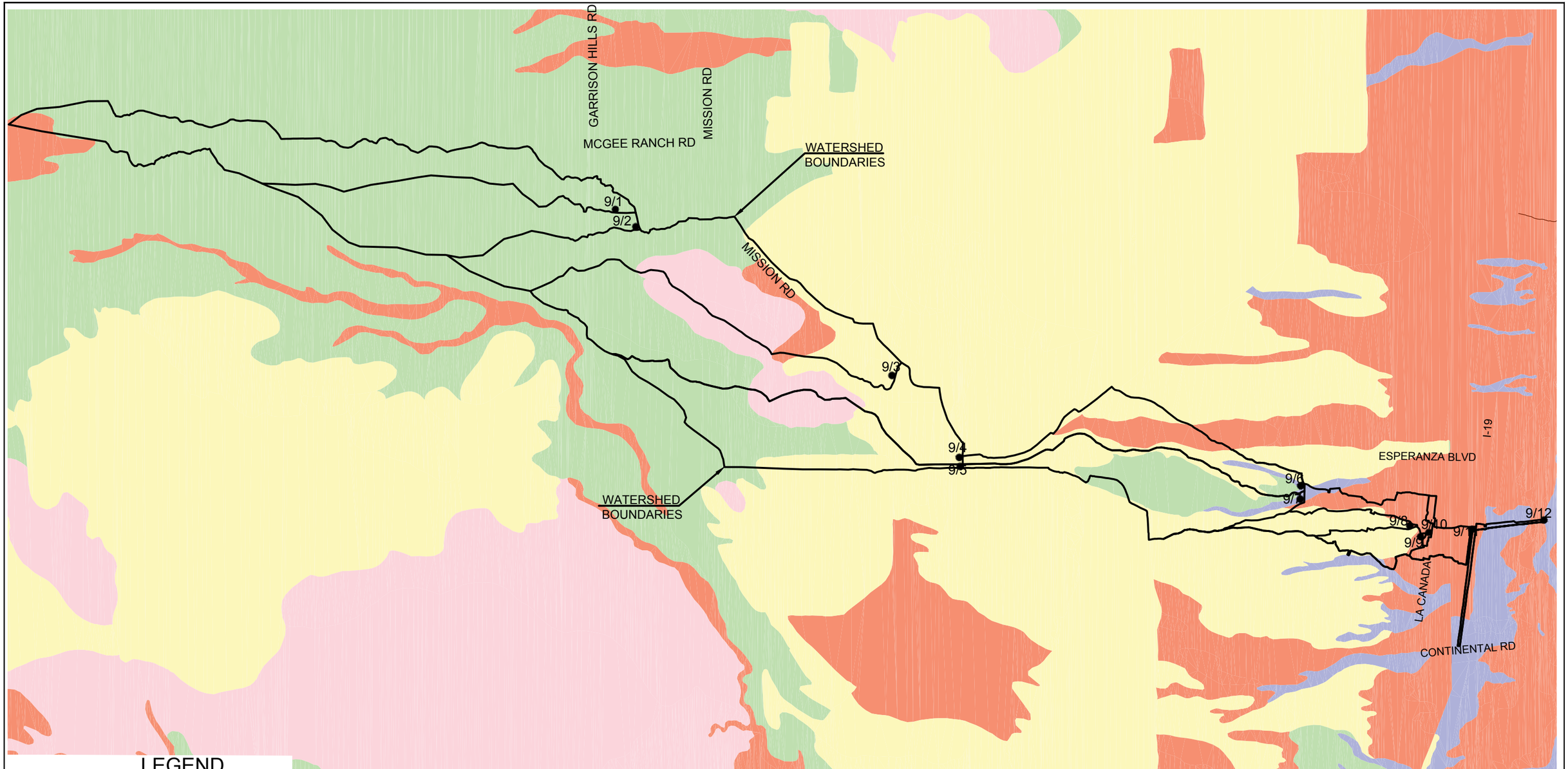

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FIGURE 2B:
WATERSHEDS
SOILS MAP

SHEET 2 OF 2

2.0 HYDROLOGIC ANALYSES

2.1 General Overview of Methodology

The scope of work and methodology for the Hydrologic Analyses was developed in cooperation with the Pima County Regional Flood Control District (PCRFCD). The methodology follows closely to procedures adopted by the PCRFCD as a part of previous studies and is consistent with State Standard for Hydrologic Modeling Guidelines (SS10-07).

There are twenty five drainageways within this project study area. Drainage areas for these drainageways, at the east terminus of the drainageways, vary from approximately 18.3 acres (Drainageway #14) to approximately 4044.8 acres (Drainageway #9). The large variation in watershed sizes warrant using different methods to compute discharge rates for different watersheds. Per instructions from PCRFCD, for drainageways have drainage areas over 1 square mile, HEC-1 was used to obtain their 100-year peak discharge rates. For drainageways have drainage areas less than 1 square mile, their 100-year peak discharge rates were calculated using PC-Hydro, Version 5.4.2. Hydrologic methodologies for each watershed are summarized in Table 2.

Table 2: Summary of Hydrology Methods

Drainageways	Drainage Area on Drainageway over 1 Square Mile (Y/N)	Hydrology Method
Drainageway #3, 4*, 5*, 6, 9, & 13, Santa Cruz River West Channel	Y	HEC-1
All other drainageways	N	PC-Hydro

*Drainageway #4 &5 drains to Drainageway #3.

Watershed delineations in rural areas, the areas west of Green Valley development limit, were based on Pima Association of Governments (PAG)'s 2008 and 2011 aerials photos and 2-ft interval contours generated by using 2008 and 2011 PAG bare earth LIDAR data. Drainage structures, such as detention basins on mine facilities, were not accounted for in hydrologic computations. Watershed delineations in urbanized areas were based on 2008 and 2011 PAG aerial photos, 2-ft interval contours (some areas used 1-ft interval contours), as-built plans, Google Map, and field visits. Urbanized watershed delineations did not fully evaluate drainage capacities for drainage structures. For example, drainage capacities for storm drain inlets, storm

drain systems, curb openings, and scuppers were not fully evaluated. Rather, sound engineering judgment was applied in determining flow directions and watershed boundaries at those locations. Hydrologic data sources and computational procedures for each of the hydrologic method are summarized in Table 3.

Table 3: Hydrology Methods and Data Sources

PC-HYDRO	
Item	Description
Reference	PC-Hydro User Manual, PCRFCD's TECH-015 and TECH-018.
Mapping Data Source	2008 and 2011 PAG bare earth LIDAR data and aerial photos.
Hydrologic Soil Data	Soil Survey of Pima County, Arizona as provided in GIS format by the PCRFCD.
HEC-1	
Reference	HEC-1 User Manual, PCRFCD's TECH-015 and TECH-018.
Mapping Data Source	2008 and 2011 PAG bare earth LIDAR data and aerial photos. USGS Quad Maps.
Rainfall Loss Method	NRCS Curve Number method.
Time of Concentration Computation	NRCS segmented Time of Concentration calculation per Technical Release 55.
Hydrologic Soil Data	Soil Survey of Pima County, Arizona as provided in GIS format by the PCRFCD.
Channel Routing	Modified Puls Method for rural areas and Kinematic Wave Method for urbanized areas.
Rainfall	NOAA 14 upper 90% rainfall data. One representative rainfall data (ID#2: 3.20 inch) was used on Drainageway #3, 4, 5, 6, & 13. Two representative rainfall data, one in the upper watershed (ID#6: 3.57 inch) and the other in the lower watershed (ID#4: 3.29 inch), were used for Drainageway #9. Average of these two representative rainfall data values (3.43 inch) was used in the HEC-1 model for Drainageway #9.
Rainfall Distribution	SCS Type II 3-hr storm. Largest watershed, watershed #9, has time of concentration of 1.98 hr. Therefore, per TECH-018, 3-hr storm was used.
Rainfall Aerial Reduction Factor	Per Table 3.0 Arizona State Standard SS10-07.
Detention @ Upstream of I-19 culverts	Included in HEC-1 models.
Detention/Retention Basins on Mine Facilities	Neglected the detention/retention capacities of the basins on the mine facilities per RFCD's instruction.

2.2 HEC-1 Modeling Description

Determination of peak discharge rates for washes having a contributing drainage area greater than one square mile (Drainageways #3, 4, 5, 6, 9, 13, and the Santa Cruz River West Channel) was conducted using US Army Corps of Engineer's HEC-1 computer program, Version 4.1.

The following sections of this report detail the development of HEC-1 model, including a discussion of the selection of model parameters, model structure, and any assumptions made as a part of the model preparation.

2.2.1 Watershed Physical Characteristics

All of the study watersheds emanate from the east slope of the Sierrita Mountain piedmont. Piemont sediments deposited as alluvial sands and gravels were derived from igneous rock undergoing rapid disintegration and erosion. The sediments are non-cohesive, of low durability and transport readily along the steep slopes of the piedmont. The density of drainage systems (i.e. tributary washes) within the study area is quite high as a result of the steep slopes and soils type. Vegetation density within the watersheds is generally high as a result of wide spread sheet flow conditions.

Surface slope increases from east to west. Land surface and channel slopes near the Santa Cruz River generally range from 1.0% to 1.6% between I-19 and the Santa Cruz River, from 1.7% to 2.5% between La Canada Dr. and I-19, and, from 2.5% to 3.0% west of La Canada Dr. The decrease in slope from west to east creates a general trend of degradation along upstream reaches and sediment deposition along downstream reaches. Other factors such as urbanization, channelization and base level changes associated with Santa Cruz River degradation also influence channel changes locally.

Many of the smaller watersheds within the community of Green Valley emanate from areas that are fully or almost fully urbanized at moderate to high density. Impervious cover and drainageway characteristics rather than soils conditions and vegetation often determine storm water runoff conditions along these watercourses.

2.2.2 Rainfall

Point rainfall depths were derived from the rainfall intensity-duration-frequency data from NOAA Precipitation-Frequency Atlas 14 of the Western United States, Volume I, Version 4, NOAA National Weather Service, Silver Spring, Maryland (G. M. Bonnin, et al., 2006). The HEC-1

models are based on NOAA 14 upper 90% rainfall data for the SCS Type II 3-hr storm. The largest watershed, watershed #9, has time of concentration of 1.98 hr. Therefore, per TECH-018, 3-hr storm was used. One representative rainfall data point was used on Drainageway #3, 4, 5, 6, & 13 (ID#2: 3.20 inch). Two representative rainfall data points were used for Drainageway #9, one in the upper watershed (ID#6: 3.57 inch) and the other in the lower watershed (ID#4: 3.29 inch),. Average of these two representative rainfall data values (3.43 inch) was used in the HEC-1 model for Drainageway #9. This storm type and duration are consistent with RFCD hydrologic modeling policies and procedures used in conjunction with other studies in Pima County that have similar watershed size. A map showing the location of the point rainfalls and depths for the 3-hour duration storm is provided on Figure 3.

A reduction factor was used to convert the point rainfall to an equivalent depth of rainfall over each watershed based on the procedures found in Section 3.3.3 of Arizona State Standard SS 10-07 (and as discussed above). The reduction factor varies depending on storm duration, watershed area, and watershed location. The eastern Arizona depth-area reduction factors were applied to the 3-hour point rainfall input based on the area of each of the individual watersheds. A summary table, chart (Depth-Area Reduction Relationship for Eastern Arizona, adapted from Figure 14, NWS HYDRO 40) and supporting information used to develop the rainfall depth and distribution is provided in Appendix A.

A one-hour duration storm depth was also derived from the NOAA Precipitation-Frequency Atlas 14 of the Western United States, Volume I, Version 4 for watersheds having an area less than one square mile. The point rainfall depth used for those watersheds was 2.78 inches.

2.2.3 Rainfall Losses / Soil Characteristics

Rainfall losses were computed using the Natural Resources Conservation Services (NRCS) curve number methodology (U. S. Department of Agriculture). This methodology requires the curve number, which is a function of the following soils information: Soil type and Hydrologic Soils Group, Vegetation Cover Type and Vegetation Cover Density. The drainage characteristics of soil groups to a curve number (CN) was then calculated per the Pima County Chart (Hydrologic Soil – Cover Complexes and Associated Curve Numbers) for estimating Curve Numbers provided in Appendix B. Soil types and associated Hydrologic Soils Grouping were determined using the Pima County Soils Survey for watersheds within Pima County. In general, Soil Group B is predominate within the study area including the mountainous areas west of the community. Soil Group C is present in isolated areas of watersheds west of the

community. Soil Group D is absent in all watersheds. A soils map covering the contributing watersheds is shown in Figures 2A and 2B. The majority of the watersheds west of Green Valley are undeveloped. An impervious cover of 0% to 5% was used for areas that are undeveloped. For the developed areas, the impervious cover was estimated by using aerial photos and conducting site visits. The impervious cover in the developed areas ranged as high as 75%. Per Pima County's vegetation cover data, Desert Brush is the only hydrologic vegetation cover within the study limit. Vegetation Cover density for the watersheds west of the urban area were estimated to be approximately 30%.

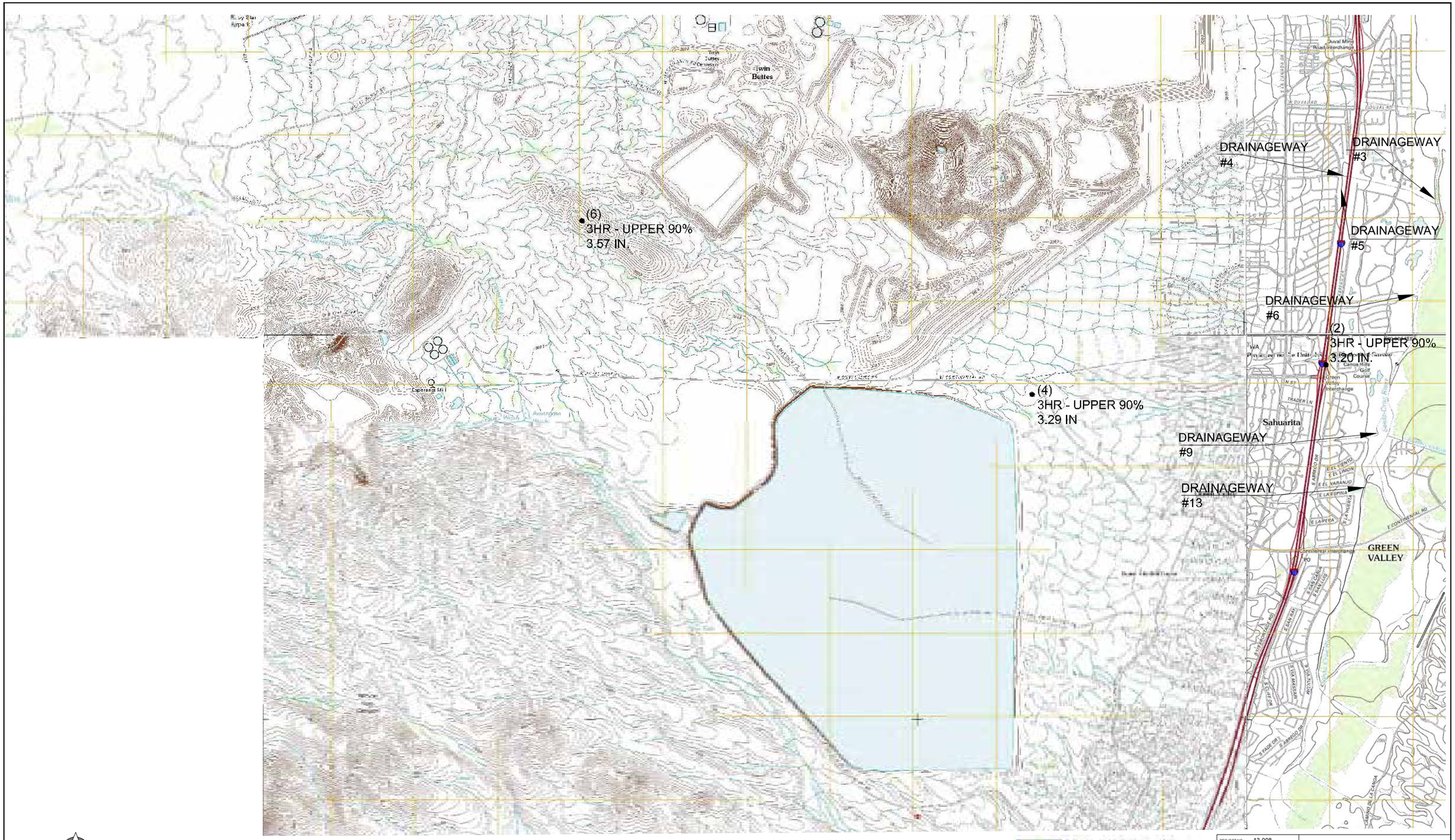
2.2.4 Rainfall-Runoff Modeling

Watershed runoff parameters were computed using the U.S. Department of Agriculture, Natural Resources Conservation Service, Technical Release-55 methodology (TR-55, 1986). The time of concentration (T_c) is used to develop runoff hydrograph or estimate peak discharges. The hydraulic flow length for each sub-watershed is divided into three parts: overland flow, shallow concentrated flow, and channel flow. Hydraulic properties are determined for each part in each watershed. These properties include but are not limited to Manning's roughness coefficient, hydraulic length, and land slope. The total time of concentration for each watershed is calculated as the sum of the individual travel times for each segment.

The first part, overland flow, includes thin sheet flow over plane surfaces and non-converging flows over irregular surfaces. 100 feet flow length (L_1) was used for overland flow computations for each watershed. Manning's roughness coefficient of 0.13, which is obtained from Table 3-1 for natural surfaces in the TR-55 Manual, was used for all the watersheds. 2-year rainfall depths are NOAA 14 upper 90% without area-depth reduction factor Travel times (T_1) for this segment are obtained from Equation 3-3 in TR-55 Manual and are shown in Appendix C.

Shallow concentrated surface flow is the next modeling element. As shown on Figure 3-1 in the TR-55 Manual, the average velocity in this segment is a function of land slope (S_2). The average velocities also depend on whether the flow path is paved or unpaved. The travel time (T_2) is then calculated by using the flow length (L_2) and the average velocity in this segment and are shown in Appendix C.

Channel flow is the final routing element in each watershed. Flow length (L_3), land slope (S_3), channel size, channel Manning's roughness coefficient, and peak discharge rate are needed for computing the travel time (T_3) in this segment, Representative channel shapes were assumed



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SCALE: 1" = 3500'

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FIGURE 3:
3-HOUR STORM DURATION RAINFALL MAP

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Z:\PROJECTS\2013\13-008 RFCD-Green Valley Drainageways Bsn Mgt Plan\dwg\cmg base.dwg, Fig 3 Rainfall 11x17, 4/21/2014 12:41:46 PM

to be trapezoidal. The channel sizes and their respective Manning's roughness coefficients are shown in Appendix D. The peak discharge rates that were used to calculate velocity were obtained by Regional Regression Equation 13 for Southern Arizona by USGS. This number was estimated using regional regression equation and is within an acceptable range of the discharge rates eventually obtained from the HEC-1 modeling results. The channel velocities were then obtained by applying Manning's Equation and using the Microsoft Excel Solver.

The total time of concentration (T_c) is calculated as the sum of the individual travel time for the three consecutive flow segments: $T_c = T_1 + T_2 + T_3$ and a lag time formula of $T_{lag} = 0.6\ T_c$ is used to estimate the 100-year, 3-hour recurrence interval peak discharge. A summary table summarizes the physical characteristics used to develop the runoff hydrographs was used to develop the HEC-1 input for each sub-basin is provided within Appendix D. Figure 4A shows the boundaries of the watershed contributing to Drainageway #9. Figure 4B shows the boundaries of the watersheds contributing to all other Drainageways in the study area. Larger versions of the Figure 4B sheets are also provided in Appendix F. Figure 4C shows the boundaries of the watersheds contributing to the Santa Cruz West Branch channel.

2.2.5 Channel Routing

The Modified Puls normal depth storage routing was used to route runoff in natural channels between sub-basins and the Kinematic Wave Method was used to route runoff in constructed channels and steeps channels.

A typical Modified Puls normal depth storage-outflow was applied in HEC-1 routing method. Eight-point cross sections were used for representing the routing channels. All routing channel shapes were assumed to be trapezoidal. Dimensions of the trapezoidal channels and their respective Manning's roughness coefficient were obtained from field study and aerial photos. The number of steps to be used in the normal depth storage routing is determined from the routing reach length, average velocities in the channel, and the time interval. As mentioned in Section 2.2.4, the average velocities are determined by solving Manning's Equation using Microsoft Excel Solver. The time interval is 4 minutes for all sub-basins.

All routing channels were assumed to be trapezoidal for the channel routing by utilizing Kinematic Wave Method. A summary table for the routing parameters for each sub-basin is also provided in Appendix E.

2.2.6 HEC-1 Modeling Results

Table 4 in Section 2.3.1 summarizes the results of the HEC-1 modeling. The Figure 4 watershed maps and those in Appendix F show the concentration point locations and includes a table of peak discharge rates.

2.3 PC-Hydro Modeling Description

The Pima County hydrology method (computer program PC-Hydro Version 5.4.3) was used to compute the peak discharges for watersheds having a contributing area of less than one square mile. The PC-Hydro program is an updated version of the traditional Pima County hydrology method, originally established in 1979. The methodology is fully described in the PC-Hydro User Manual and PCRFCD's TECH-015 and TECH-018. The new program incorporates the latest available rainfall depth-duration-frequency data from NOAA Atlas 14, which superseded NOAA Atlas 2 data used in the original methodology. The 100-year frequency, one-hour duration storm precipitation depth was determined from NOAA Atlas 14 data to be 2.78 inches per hour.

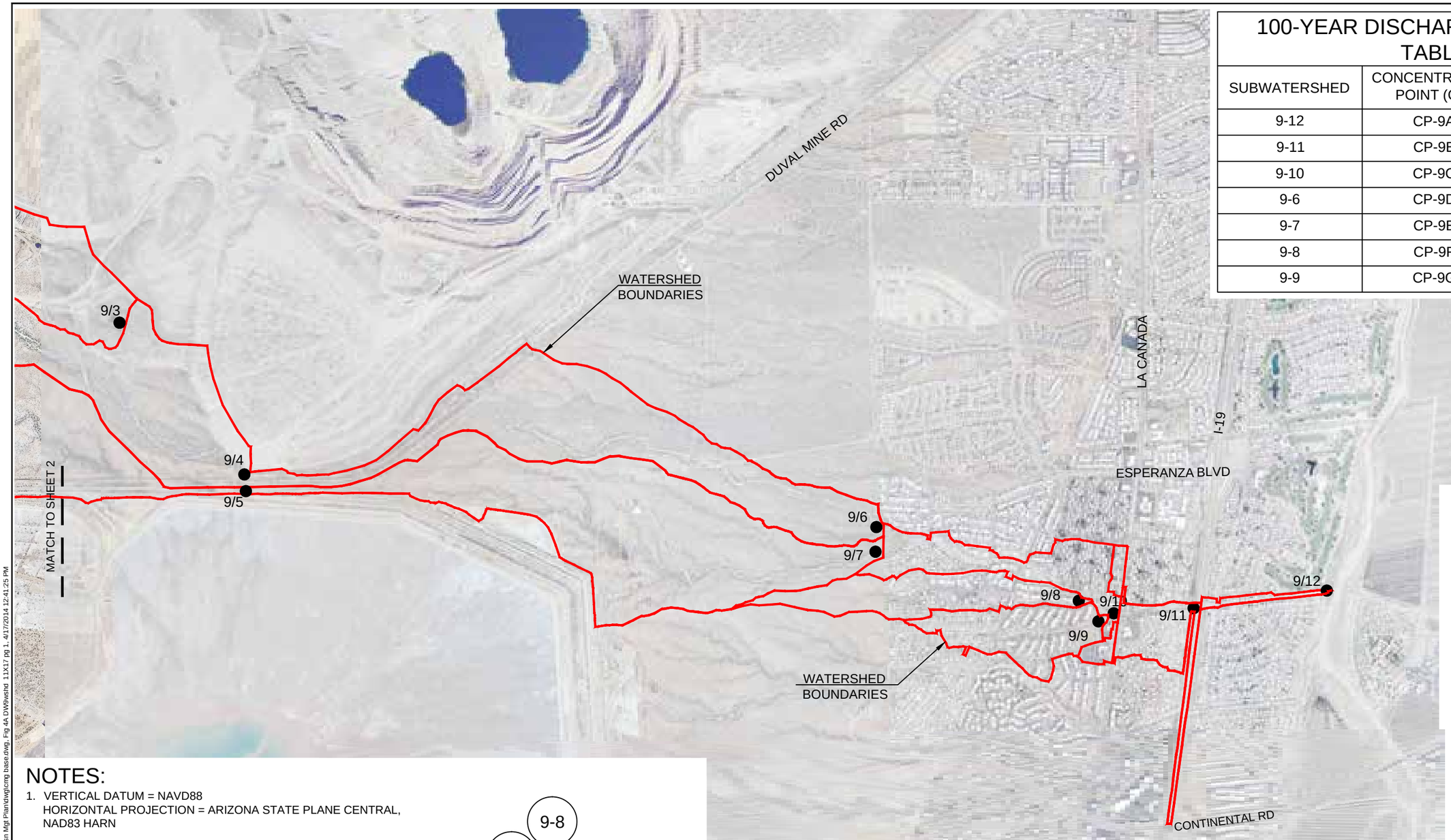
Soils data was acquired from the Pima County Regional Flood Control District GIS internet site. As, previously noted, Soils Group B is the predominate soils type throughout the study area with Soils Group C being present in some isolated areas. The percentage of each soils type within each watershed was calculated so that area weighted SCS Runoff Curve numbers and runoff coefficients could be determined for each concentration point.

Impervious cover for each watershed subarea were estimated from land use type and review of aerial photography. Area weighted impervious cover was calculated for concentration points consisting of two or more sub-areas. Basin factors were also estimated from Tables D-5 and D-6 of *PC-Hydro User Guide* based on land use type and area weighted for concentration points consisting of two or more sub-areas.

Tables summarizing the Soils Group information, Basin Factors and Impervious Cover for each concentration point are provided in Appendix G.

2.3.1 PC-Hydro Modeling Results

PC-Hydro data sheets are provided in Appendix H. The PC-Hydro results for the one hour duration storm event along with the HEC-1 modeling results are summarized by watershed and



100-YEAR DISCHARGE SUMMARY TABLE

SUBWATERSHED	CONCENTRATION POINT (CP)	Q100 (CFS)
9-12	CP-9A	3430
9-11	CP-9B	3473
9-10	CP-9C	3456
9-6	CP-9D	2630
9-7	CP-9E	1356
9-8	CP-9F	337
9-9	CP-9G	353

0' 2000'

SCALE: 1" = 2000'

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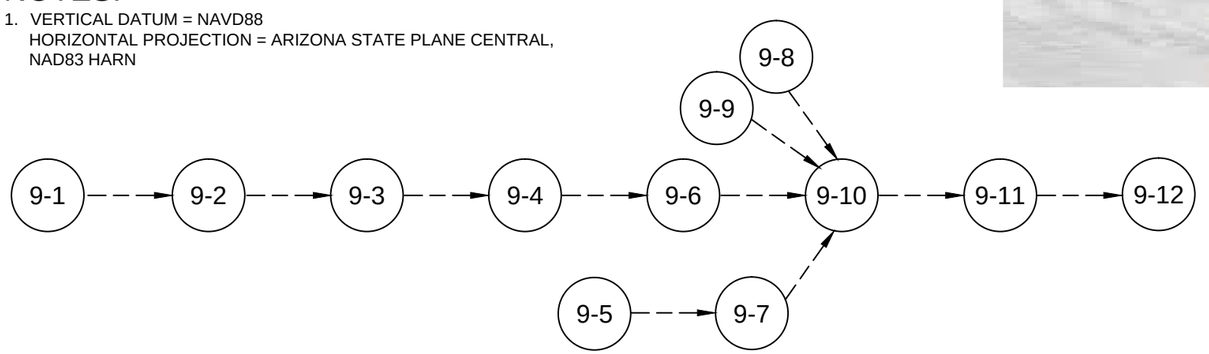
1. VERTICAL DATUM = NAVD88
   HORIZONTAL PROJECTION = ARIZONA STATE PLANE CENTRAL, NAD83 HARN



HEC-1 SCHEMATIC DIAGRAM

LEGEND

———	WATERSHED BOUNDARIES FOR DRAINAGEWAY #9
●	CONCENTRATION POINT (CP)
9/12	SUBWATERSHED ID

3555 N. Mountain Ave. Tucson, Arizona 85719
Phone (520) 882-4244 Fax (520) 888-1421

PROJECT NO.:	13-008
DESIGN:	JKW
CHECKED:	JKW
DRAWN:	BJK
DATE:	04/24/2014
REV. DATE:	
REV. DATE:	
REV. DATE:	

FIGURE 4A:
WATERSHED MAP
FOR
DRAINAGEWAY #9

SHEET 1 OF 2

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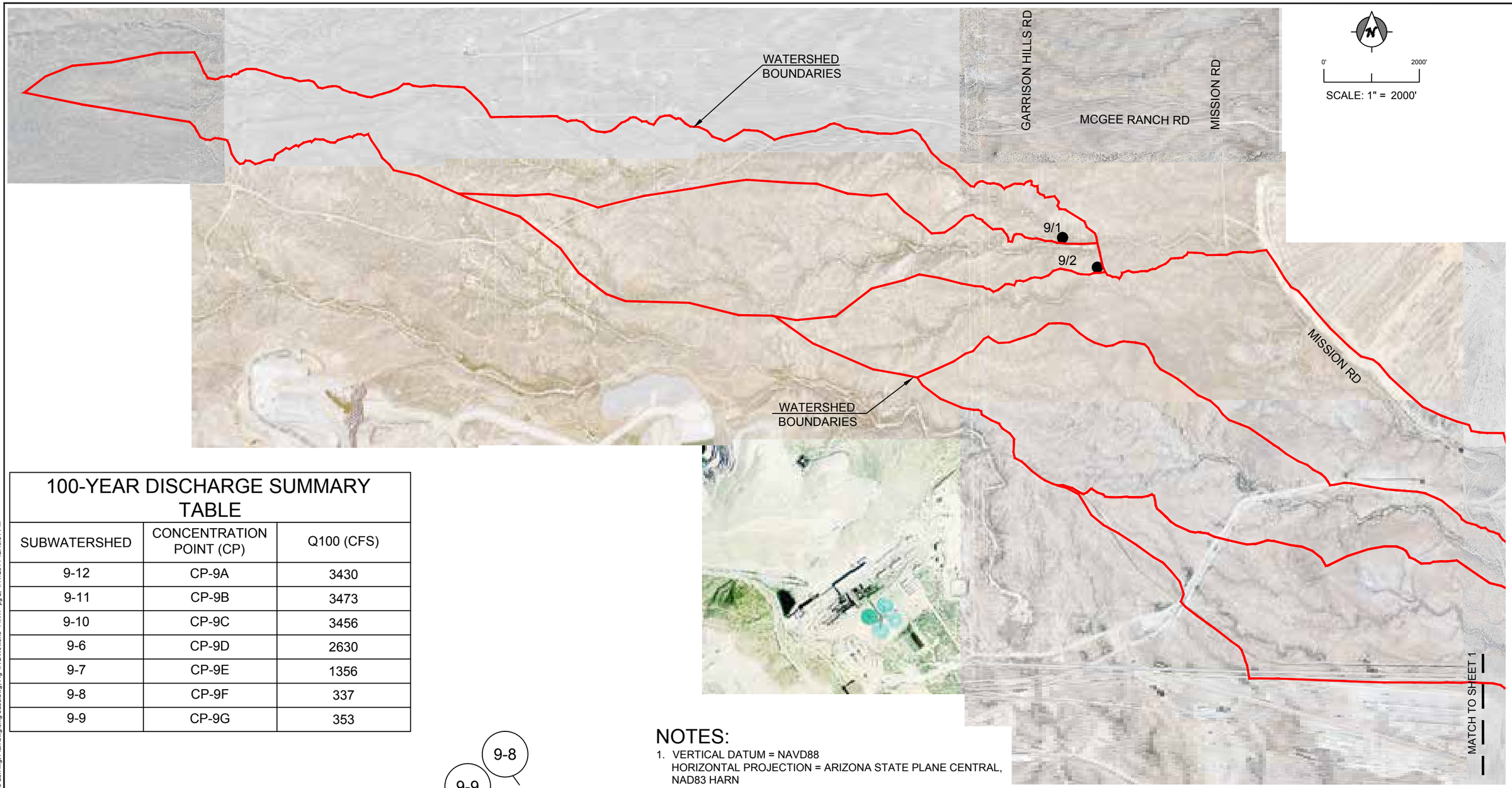
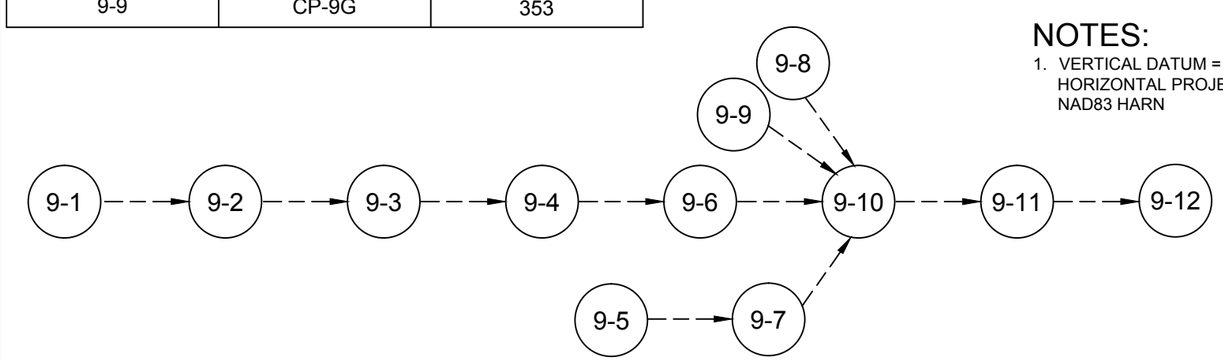


100-YEAR DISCHARGE SUMMARY TABLE

SUBWATERSHED	CONCENTRATION POINT (CP)	Q100 (CFS)
9-12	CP-9A	3430
9-11	CP-9B	3473
9-10	CP-9C	3456
9-6	CP-9D	2630
9-7	CP-9E	1356
9-8	CP-9F	337
9-9	CP-9G	353

NOTES:

1. VERTICAL DATUM = NAVD88
   HORIZONTAL PROJECTION = ARIZONA STATE PLANE CENTRAL, NAD83 HARN



HEC-1 SCHEMATIC DIAGRAM

LEGEND

———	WATERSHED BOUNDARIES FOR DRAINAGEWAY #9
●	CONCENTRATION POINT (CP)
9/12	SUBWATERSHED ID

3555 N. Mountain Ave. Tucson, Arizona 85719
Phone (520) 882-4244 Fax (520) 888-1421

PROJECT NO.:	13-008
DESIGN:	JKW
CHECKED:	JKW
DRAWN:	BJK
DATE:	04/24/2014
REV. DATE:	
REV. DATE:	
REV. DATE:	

FIGURE 4A:
WATERSHED MAP
FOR
DRAINAGEWAY #9

SHEET 2 OF 2

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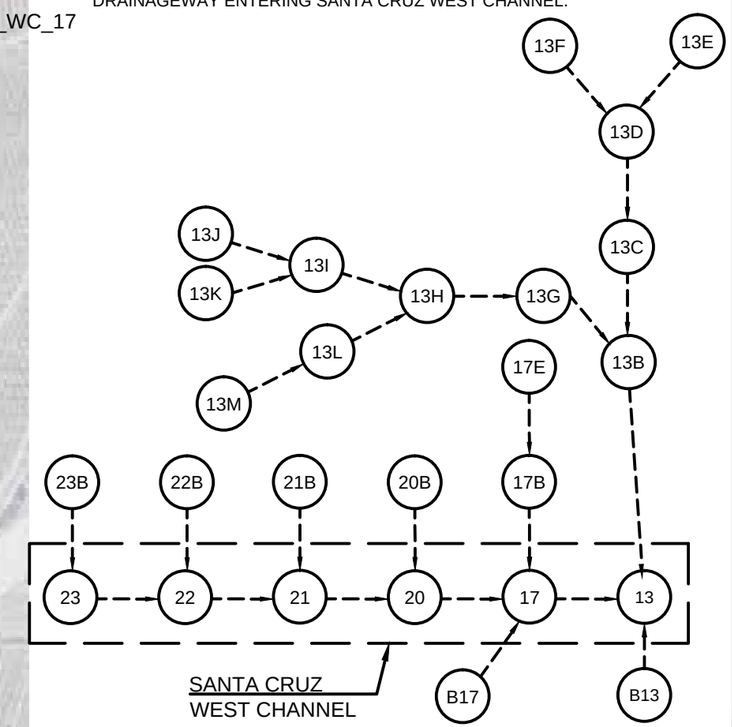
TABLE 1: SUMMARY OF EXISTING CONDITIONS 100-YEAR PEAK DISCHARGE RATES		
CONCENTRATION POINT (CP)	WS AREA (CUMULATIVE) (ACRES)	Q100 PER ACRE (CFS/ACRE)
SC_WC_13*	2357.3	5099
SC_WC_17*	1413.2	3301
SC_WC_20*	864.2	2200
SC_WC_21*	644.6	1743
SC_WC_22*	565.5	1542
SC_WC_23*	469.9	1286

* CONCENTRATION POINTS AT SANTA CRUZ WEST CHANNEL. CONCENTRATION POINT IDS ARE CORRESPONDING TO THE IDS FOR DRAINAGEWAY ENTERING SANTA CRUZ WEST CHANNEL.



HEC-1 SCHEMATIC DIAGRAM

LEGEND

WATERSHED BOUNDARY

SANTA CRUZ WEST CHANNEL

CONCENTRATION POINT (CP)

SC_WC_23 WATERSHED ID

3555 N. Mountain Ave. Tucson, Arizona 85719
Phone (520) 882-4244 Fax (520) 888-1421

PROJECT NO.:	13-008
DESIGN:	JKW
CHECKED:	JKW
DRAWN:	BJK
DATE:	04/24/2014
REV. DATE:	06/26/2014
REV. DATE:	
REV. DATE:	

FIGURE 4C:
WATERSHED MAP
FOR
SANTA CRUZ WEST CHANNEL

SHEET 1 OF 1

concentration point in Table 4. Watershed maps showing the boundary of contributing area and the concentration point locations are provided in Appendix F.

Table 4: Summary of Hydrologic Computations

Concentration Point	WS Area (Cumulative) (acres)	Q100 (cfs)
1A	581.0	1,963
1B	188.4	683
1C	379.5	1,488
1D	245.9	1,007
1E	218.6	884
1F	147.0	555
1G	23.2	159
1H	19.9	146
1I	8.9	75
1J	85.7	359
2A	100.6	567
2B	51.2	359
2C	20.2	144
3A	1136.3	2,849
3B	952.0	2,832
3C	212.0	830
3D	75.5	339
3E	105.9	437
4A	662.1	1,981
4B	301.5	1,007
4C	221.5	793
4D	9.7	54
4E	18.1	84
4F	64.4	252
5A	355.9	1,134
5B	136.7	473
5C	33.1	147
5D	15.0	74
6A	922.2	3,014
6B	837.3	3,017
6C	6.7	33
6D	744.5	2,781
6E	297.4	1,052

Concentration Point	WS Area (Cumulative) (acres)	Q100 (cfs)
6F	186.5	730
6G	600.0	1,952
6H	107.3	488
6I	186.1	718
6J	52.0	217
6K	4.0	22
6L	154.2	524
7A	329.3	1,492
7B	293.6	1,575
7C	54.2	388
7D	38.6	293
7E	9.2	66
7F	234.8	1,268
7G	224.5	1,260
7H	115.56	614
7I	21.92	129
7J	77.44	559
7K	53.80	415
8A	95.44	597
8B	84.16	588
8C	82.20	586
8D	75.45	567
8E	38.50	290
8F	51.60	370
9A	4044.80	3430
9B	4038.40	3473
9C	3980.80	3456
9D	2905.60	2630
9E	838.40	1356
9F	85.70	337
9G	71.80	353

Concentration Point	WS Area (Cumulative) (acres)	Q100 (cfs)
10A	29.3	235
11A	41.6	286
12A	36.0	264
13A	846.8	2,162
13B	842.6	2,204
13C	390.2	1,285
13D	378.9	1,253
13E	64.4	255
13F	155.1	592
13G	361.1	1,018
13H	346.3	994
13I	142.6	438
13J	44.4	152
13K	33.5	111
13L	203.0	638
13M	106.2	357
14A	18.3	147
15A	20.0	161
16A	55.5	412
17A	461.5	1,281
17B	431.9	1,241
17C	378.0	1,110
17D	83.0	284
17E	212.5	712

Concentration Point	WS Area (Cumulative) (acres)	Q100 (cfs)
18A	26.6	202
19A	30.1	215
20A	219.6	739
20B	184.9	649
20C	128.2	509
21A	79.0	382
21B	43.6	203
21C	19.8	107
22A	95.7	503
22B	45.8	236
22C	13.8	88
23A	469.9	1,638
23B	319.8	1,044
23C	60.2	299
24A	539.1	1,637
24B	294.7	793
24C	278.7	767
24D	208.8	907
24E	173.3	815
24F	78.0	312
24G	63.4	263
25A	217.6	1,164
25B	166.3	963

3.0 HYDRAULIC ANALYSES

3.1 Floodplain Modeling Methodology

HEC-RAS, Version 4.1.0 (January 2010, U.S. Army Corps of Engineers) was used to determine the floodplain limits and water surface elevations for the 100-year discharge. All Green Valley Drainageways described in Table 1 and shown on Figure 1 were analyzed using HEC-RAS to establish existing 100-year floodplain limits and flow parameters. The downstream boundary condition for the HEC-RAS models are the 10-year water surface elevation for the Santa Cruz River or 100-year water surface elevation for West Channel with tributary flows, whichever is higher. 100-year water surface elevations for the Santa Cruz West Branch channel which forms the downstream boundary for Tributary Washes #13 through 23 were also determined and used if higher than the 10-year water surface elevations for the Santa Cruz River. Downstream boundary condition water surface elevations for each Drainageway are listed in Appendix I of this report.

3.2 Study Work Maps

Existing conditions hydraulic work maps were developed for the project using PAG aerial photography and topographic LIDAR data dated 2008. These maps were generated at a horizontal scale of 1 inch = 200 feet and the topography is provided with a contour interval of 2 feet. Contours and all ground elevation data are based on NAVD88 vertical datum.

In addition to the information mentioned above, the Hydraulic Work Maps, which are provided in Appendix J as Figure 5, illustrate the following:

- Survey Township, Range & Section information;
- Stream channel center lines / profile base lines;
- River & reach identifiers that correspond to the HEC-RAS model;
- HEC-RAS hydraulic cross-section lines with graphic representation of the 1% annual chance flood water surface elevations on NAVD88 vertical datum;
- Lateral weir crest boundary lines where present;
- Existing culvert type, size and capacity;

3.3 Parameter Estimation

3.3.1 Roughness Coefficients

A field reconnaissance study was conducted to observe channel and overbank conditions, and to determine Mannings Roughness Coefficients. Manning's values were selected based on "HEC-RAS 4.1 Reference Manual, Table 3-1".

3.3.2 Expansion and Contraction Coefficients

Expansion and contraction coefficients used in the HEC-RAS model are based on guidance provided in the HEC-RAS User's Guide and Hydraulic Reference Manual (Reference #21). An expansion coefficient of 0.1 and contraction coefficient of 0.3 were used at all cross sections, except at culvert inlets and outlets where they were set respectively, at 0.3 and 0.5.

3.4 Cross Section Description

The cross-section channel reach lengths range from approximately 20 feet to approximately 200 feet with an average reach length of about 150 feet. All cross-sections are based on PAG 2008 or 2011 bear earth LIDAR data. Ground surveys and other Pima County GIS ground point data were also used to supplement the 2008 topography in areas where more detail was required, such as at roadway culverts and flood walls. All topography and ground elevation data are based on NAVD88 vertical datum.

Cross section locations were chosen based on guidance provided in the HEC-RAS User's Guide, Hydraulic Reference Manual, and Arizona State Standard for Floodplain Hydraulic Modeling (SS 09-02) (Reference #13). The cross sections were located considering changes in channel geometry, discharge, slope, roughness, and distance between cross sections for computational stability. Ground points for each cross section were initially obtained by ArcGIS methods, with points being added or modified manually to select cross sections, where needed, to make the model more representative of actual ground conditions. The cross sections were oriented to be perpendicular to estimated flow paths of the 100-year flood event. In most cases, hanging cross-sections were eliminated by extending them to high ground. Some hanging sections remain where high ground was not present; unusually at cross-sections located just upstream of roadway culverts with deficient capacity.

There are several flow split reaches throughout the study area. Split flows occur as a result of inadequate channel capacity, inadequate culvert capacity, or culvert sedimentation which in some cases almost completely filled the structures. Culvert sedimentation is a significant problem at several of the Abrego Drive culverts as well as a few other locations throughout the community. Culvert obstruction due to sediment deposition was modeled in HEC-RAS where

the depth of sedimentation obstructs roughly 25% or more of the culvert open area. Sediment obstructions of this magnitude or greater are not likely to be washed away during floods.

Lateral weirs were also modeled using the junction and split flow optimization features in HEC-RAS. The location of lateral weirs is noted on the work maps.

3.5 Bridges and Culverts

The culvert modeling procedures within HEC-RAS were used to analyze the hydraulics of the culverts. Geometric input data for the culverts were obtained from as-built plans and/or field surveys. A summary of the culvert information is provided in Table 5. Culvert sizes and capacities by discharge are also shown on the work maps in Appendix J. Approximate capacity by storm frequency is also referenced if less than the 100-year storm event. Several photographs of the culverts and of the channels along upstream and downstream reaches are provided in Appendix K.

Table 5: Culvert Summary Table

Wash #	Road	HEC-RAS Station (RM)	Culvert Size	Q100 (cfs)*	Qcap (cfs)	Notes
1	Abrego Drive	Reach 1 0.377	4-10'x4' RCBC	1963	253	Photo #1, Severe Culvert Sedimentation – ±2 Year Storm Capacity
	I-19	Tributary 1 5.093	1-12'x8' RCBC	683	683	Photo #4
	I-19	Reach 2 0.701	6-10'x8' RCBC	1488	1488	Photo #5
	La Canada Drive	Reach 2 1.220	2-8'x4' RCBC	1007	871	Photo #7 - ±50 Year Storm Capacity
	Santa Cecilia	Tributary 2 7.205	2-48" CMP	146	146	Photo #8
	Duval Mine Rd	Reach 3 1.349	6-10'x8' RCBC	884	884	Photo #10 & 12
	Duval Commerce Dr	Reach 3 1.631	2-11.5'x3' ConArch	555	521	Photo #14
	Rio La Junita	Tributary 2	2-24" CMP	75	Not Modeled	Photo #16
3	Abrego Drive	Reach 1 0.330	4-10'x8' RCBC	2193	2193	Photo #19 & 20
	I-19 NB	Reach 1 0.695	4-10'x6' RCBC	2176	2176	Photo #21 & 23
	I-19 SB	Reach 1 0.716	4-10'x6' RCBC	2702	1792	
	La Canada Drive	Reach 3 1.184	2-8'x3' RCBC	437	437	Photo #25
	Paseo Tinaja	Reach 3 1.288	1-10'x4' RCBC	437	433	Photo #27
	Aliso Drive	Tributary 1 3.323	2-8'x4' RCBC	339	339	Photo #29
4	La Canada Drive	Reach 3 0.580	2-10'x5' RCBC	793	793	Photo #32
	Via Alamos	Reach 2 1.431	3-42" CMP	252	234	Photos #34 & 35

Wash #	Road	HEC-RAS Station (RM)	Culvert Size	Q100 (cfs)*	Qcap (cfs)	Notes
5	La Canoa Drive	Reach 1 0.368	3-10'x4' RCBC	1134	1134	Photo #38 & 39
	La Canada Drive	Tributary 1	2-8'x3' RCBC	74	Not Modeled	Photo #43
	La Canada Drive	Reach 2 0.734	1-'10x4' RCBC	473	439	Photo #45 & 48
6	Abrego Dr.	Reach 1 0.591	4-10'x4' RCBC	2325	1887	Photos #54 & 55 - ±50 Year Storm Capacity
	I-19	Reach 1 0.660	6-10'x5' RCBC	2763	2734	Photo #56
	La Canada Drive	Reach 2 1.005	4-10'x9' RCBC	2781	2781	Photos #58 & 59
7	Golf Cart Bridge	Reach 1 0.341		1736	1736	Photo #65
	Abrego Drive	Reach 1 0.474	5-10'x5' RCBC	1251	1251	Photo #68 & 69
	I-19 NB	Reach 1 0.561	6-10'x6' RCBC	1251	1251	Photo #70 & 71
	I-19 SB	Reach 1 0.588	6-10'x6' RCBC	1251	1251	
	La Canada Drive	Reach 2 0.870	5-10'x5' RCBC	936	936	Photo #72& 73
	Bridge 200ft Upstream of La Canada	Reach 2 0.921	Bridge	936	936	Photo #76
	Esperanza Blvd.	Tributary 2 7.080	3-48"x36" ACMP	559	235	Photos #79 & 81 - ±10 Year Storm Capacity
	Desert Bell Dr	Reach 3 1.276	2-10'x4' RCBC	614	614	Photo #82
8	Vista Del Rio	Reach 1 0.280	2-4.5'x3' ACMP	192	191	Photos #85 & 87
	Abrego Drive	Reach 1 0.39	2-5'x3' ACMP	190	190	Photo #90
	I-19	Reach 1 0.49	1-6'x4' RCBC	567	171	Photos #91 & 93 - ±5 Year Storm Capacity
9	Abrego Drive	Reach 1 0.445	5-10'x5' RCBC	3473	2692	Photo #95 - ±50 Year Storm Capacity
	I-19 NB	Reach 1 0.506	6-10'x5' RCBC	3473	3120	Photos #97 & 98
	I-19 SB	Reach 1 0.528	6-10'x5' RCBC	3473	3120	Photos #97 & 98
	La Canada Drive	Reach 1	4-12'x10' RCBC	3456	3456	Photos #100 & 101
	Camino del Poso	Tributary Reach 2 7.043	4-36" CMP	337	166	Photo #103 & 105 -±10 Year Storm Capacity
	Camino Portillo	Reach 3 1.345	3-8'x4' RCBC &4-10'x3' RCBC	3456	1435	Photos #107 & 109 -±10 Year Storm Capacity
	Camino Holgado	Reach 3 1.594	3-8'x4' RCBC &7-10'x5' RCBC	3456	3171	Photo #111 - ±50 Year Storm Capacity
	Camino Portillo	Tributary 2 7.442	2-42" RCP	178	159	Photo #112
	Camino Holgado	Tributary 2 7.679	4-30" CMP	179	158	Photo #114
	Camino del Monte	Tributary 3 9.057	3-36"x24" ACMP	353	63	Photo #115 & 117 - ±5 Year Storm Capacity

Wash #	Road	HEC-RAS Station (RM)	Culvert Size	Q100 (cfs)*	Qcap (cfs)	Notes
13	Abrego Drive	Reach 1 0.365	4-10'x5' RCBC	2204	1770	Photo #122 & 123 - ±50 Year Storm Capacity
	I-19	Reach 1 0.470	5-10'x5' RCBC	2204	2038	Photos #125 & 126
	La Canada Drive	Reach 2 0.779	4-8'x6' RCBC	1253	1182	Photo #128
	La Canada Drive	Tributary 1 5.214	3-10'x6' RCBC	944	944	Photo #132
17	Abrego Drive	Reach 1 0.112	5-10'x5' RCBC	874	874	Photos #141 & 143
	I-19	Reach 1 0.500	5-60" CMP	1241	834	Photos#145 & 146 - ±25 Year Storm Capacity
	Continental Plaza	Reach 1 0.604	5-6'x4' ACMP	1016	1002	Photos#148 & 150
	Continental Road	Reach 1 0.648	5-6'x4' ACMP	1110	948	Photos#151 & 152 - ±50 Year Storm Capacity
20	I-19	Reach 1 0.398	1-8'x6' RCBC	649	521	Photos #158 & 160 -±50 Year Storm Capacity
21	I-19	Reach 1 0.401	1-10'x4' RCBC	203	203	Photos#162 & 163
22	I-19	Reach 1 0.415	2-42" CMP	236	236	Photo #165
23	Abrego Drive	Reach 1 0.123	3-16'x4' ConArch	1638	1019	Photo # 167 - ±25 Year Storm Capacity
	I-19	Reach 1 0.514	1-10'x8' RCBC	1044	1044	Photo #169
24	Abrego Drive	Reach 1 0.066	2-16'x5' ConArch	1637	1273	Photos #172 & 173 - ±50 Year Storm Capacity
	I-19 NB 0.475	Reach 2 0.475	2-10'x4' RCBC	767	767	Photo #174
	I-19 SB	Reach 2 0.527	2-10'x4' RCBC	767	767	Photo #176
	I-19 NB	Tributary 1 3.391	1-10'x4' RCBC	815	512	Photos #178 - ±25 Year Storm Capacity
	I-19 SB	Tributary 1 3.441	1-72" RCP	815	574	Photos #179 - ±25 Year Storm Capacity
25	Abrego Drive	Reach 1 0.213	1-16'x4' ConArch	963	456	Photos #181 & 183 - ±10 Year Storm Capacity
	I-19 NB	Reach 1 0.410	2-48" CMP	963	305	Photo #185 -±5 Year Storm Capacity
	I-19 SB	Reach 1 0.467	1-66" CMP	963	371	Photo #187 - ±10 Year Storm Capacity

*Q100 values account for upstream breakouts

Results of the hydraulic analysis indicated that several culverts do not have adequate capacity to convey the 100-year discharge. Flows overtopping the roadway surface may or may not return to the downstream channel; instead flowing north or south along the intersecting streets to the nearest low point then east toward the Santa Cruz River. Locations where flows are diverted away from the downstream channel are indicated on the floodplain maps.

Complete electronic files for the HEC-RAS models have been provided in Appendix L on compact disk.

3.6 Levees and Dikes

Many of the man-made channels within the community of Green Valley and east of I-19 were created by the construction of earthen berms which form the channel banks. In some cases, ground elevations on the land side of these berms are only a foot or two above channel thalweg elevation. The presence of earthen levees is particularly common along the reaches of the larger drainageways west of interstate 19. These structures were, in most cases, assumed to be ineffective toward containing flows since they are not stabilized and vulnerable to failure by erosion. None of the earthen berms within the study area comply with FEMA levee standards as most of them either lack the necessary freeboard, are not compacted to any engineered standards and contain animal burrows which increase the probability of piping. Historically, maintenance of the berms has occurred only in response to significant erosion damages and repairs are usually done by field crews without engineering support.

Lands behind the levees that are below water surface elevation were in most instances modeled in the HEC-RAS analysis as ineffective flow areas and mapped as areas potentially subject to shallow sheet flow. Flood elevations within the sheet flow areas are not likely to be as high as the channel flow depths since the quantity of overbank flow will be limited to that passing through narrow breaches of the levees. Wide spread breaching of the levees is highly unlikely. However, areas landward of the levees and below water surface elevation are mapped within the 100-year floodplain area in recognition of a potential flood risk should a levee failure occur.

3.7 Ineffective Flow Areas

Locations landward of unstabilized earthen berms or levees were modeled as ineffective flow areas if the height of the berm is several feet greater than the water surface elevation and field observations found that the berms were not subject to ongoing bank erosion. A different approach was used where water surface elevation were near the top of berm and where the water surface elevations exceed top of berm. In those cases, the upper $\pm$1 foot of overbank flow depth was modeled effective since there is a higher probability of a berm overtopping. In addition to the above stated approach, ineffective flow was assumed where overbank floodplain areas are not hydraulically connected to the main channel, and at some cross sections immediately upstream and downstream of culverts to account for expansion and contraction of flows. 3:1 expansion and 1:1 contraction ratios were used.

4.0 Flood and Erosion Hazard Assessment

4.1 Previous Studies

There have been four previous studies to address flood and erosion control needs along the Green Valley Drainageways. These studies included:

- CMG Drainage Engineering Inc., RFCD Special Study #11 Green Valley Drainageway #9, January 12, 1989
- RS Engineering, Inc., RFCD Green Valley Drainageways Erosion Hazard Assessment , May 24, 2004
- Pima County RFCD, Green Valley 2010 Drainageway Evaluations, May 17, 2010
- Pima County RFCD, Green Valley 2013 Drainageway Evaluations, April 2, 2013

CMG also reviewed the drainage complaints on record at the Pima County RFCD as a part of this study. The majority of the complaints were related to requests for minor maintenance, concerns about changes in drainage patterns or flow quantities resulting from activity on adjoining property or flood damages usually associated with local flows rather that the major drainageways. The records indicate that the RFCD and DOT engaged in actions to conduct the needed maintenance for those locations within public right of way. A few comments pertained to erosion along major channels, particularly Drainageway #9. General recommendations for mitigating those issues are discussed in the following sections of this report.

4.2 Summary of Flood and Erosion Control Recommendations

The scope of work for this project included updating hydrologic and hydraulic analyses to comply with current RFCD policies and standards such as peak flow determination methodologies and floodplain modeling techniques; and an inventory and prioritization of locations requiring erosion or flood control measures to prevent future damages to adjoining property or to public improvements. The floodplain mapping completed in conjunction with the study provides the public with an up to date assessment of flood hazards within that portion of Green Valley east of the Santa Cruz River.

The flood and erosion control needs identified by the study fall into one of the following categories:

(1) Maintenance repairs to existing grade control structures, bank protection and removal of vegetation/debris. The primary needs within this category are described in the April 2, 2013, Pima County RFCD, Green Valley 2013 Drainageway Evaluations report. A copy

of this report is provided in Appendix M. Table 6 provides a description of the moderate and high priority maintenance needs associated with existing structures (other than roadway drainage culverts).

Table 6 – Drainage Structure Maintenance Needs

DW#	Location	Priority Level	Notes
3	Grade Control Structures between I-19 and Abrego Dr.	Moderate	Add 24”+ downstream of grade control structures (ref. Appendix M DW#3-Photos 3-6)
3	Grade Control Structures east of Abrego Dr.	Moderate	Add 24”+ downstream of grade control structures (ref. Appendix M DW#3-Photos 11-13)
4	Bank protect west of Via Alamosa	Moderate	Slurry backfill cavities developing at top of gunite bank protection (ref. Appendix M DW#4-Photo 1)
4	Bank protect east of Via Alamosa	Moderate	Slurry backfill cavities developing at top of gunite bank protection (ref. Appendix M DW-#4-Photos 3-6)
6	Santa Cruz River confluence	Moderate	Add 24”+ downstream of grade control structure
6	Vicinity of Abrego Dr.	Moderate	Loose rock on sideslopes unstable, extension of gabions may be required if bed and bank erosion continues (ref. Appendix M DW#6 Photos 5-14)
22	West of Abrego Dr.	Moderate	Add 24”+ downstream of grade control structures (ref. Appendix M DW#22-Photo 13)

(2) Uncontrolled bank erosion, degradation and sediment deposition. Table 7 provides a description of the moderate and high priority needs associated with this problem type.

Table 7 - Bank Erosion, Degradation and Sediment Deposition Problem Locations

DW#	Location	Priority Level	Notes
1	Abrego Drive	High	Remove sediment deposits, provide downstream grade out channel. This culvert is within the Town of Sahuarita.
4	East of Via Alamosa	Moderate	Remove sediment deposits (ref. Appendix M DW#4-Photo 4)
7	West of Abrego Dr.	High	Exposed Utility lines crossing wash (ref. Appendix M DW#7-Photos 16-17 & 20-22). Utility lines should be reinstalled below existing thalweg and grade control structures installed.
9	Downstream of Portillo Hills	Moderate	Bank erosion and degradation undercutting existing petro-flex. Provide grade controls to arrest degradation. Repair bank protection

(3) Undersized culverts at roadway crossings. The HEC-RAS modeling of roadway drainage culverts identified several structures that do not have capacity to convey the 100-year discharge. Table 5 in section 3.5 of this report lists all roadway drainage culverts, their hydraulic capacity and capacity by storm frequency if less than 100-years. Table 8 below lists culverts which are sufficiently under capacity that all-weather access is not present, the culverts cause significant backwater ponding along the upstream reach, or they cause channel breakouts that can potentially result in downstream flooding. Table 8 also provides a preliminary estimate of culvert modifications required to provide all-weather access. Moderate and high priority locations were identified as those having a capacity less than the 25-year storm. Highest priority was assigned to the larger drainageways since the breakout flows can pose a threat to public safety.

The culverts at the Drainageway #7 crossing of Esperanza Blvd. only have sufficient capacity to convey 235 cfs which is approximately equal to the 10-year return period storm. Flows in excess of the culvert capacity pass onto Esperanza Blvd. and drain east toward I-19. Additional flows are added to Esperanza Blvd. at CP-7K (415 cfs) located at the southwest corner of I-19/Esperanza Blvd., and from breakout at CP-8D (369 cfs) also located at I-19 (see Figure 5 – Sheet 4/7). Combined, the three sources discussed above discharge 1,135 cfs into Esperanza Blvd. east of I-19. Historical floods confirm the presence of significant flows along this street. As noted in Table 8, increasing the capacity of the culverts beneath Esperanza Blvd. at the Drainageway #7 Tributary 2 crossing can reduce flow in the street by 294 cfs.

Table 8 – Undersized Roadway Culverts

DW#	Location	Priority Level	Modifications to achieve All-Weather Access
1	Abrego Drive 4-10'x4' RCBC (Town of Sahuarita Responsibility)	High	Culvert 80% blocked by sediment. Remove sediment, lower downstream invert ± 4 feet and channelize downstream to prevent culvert deposition. Add 1-10'x4' cell (Culvert located within Town of Sahuarita)
7	Esperanza Blvd. 3-48"x36" ACMP	High	Add 4-48"x36" ACMP or replace with 2-10'x4' RCBC.
8	I-19 1-6'x4' RCBC	Moderate	Add 2-6'x4' RCBC
9 Trib 2	Camino del Poso 4-36" CMP	Moderate	Replace with 1-10'x4' RCBC
9 Trib 3	Camino Portillo 3-8'x4'RCBC and 4-10'x3' RCBC	High	Replace with 8-10'x6' RCBC, Lower Channel invert 1'-2', install grade control structures

DW#	Location	Priority Level	Modifications to achieve All-Weather Access
9 Trib 3	Camino del Monte 3-36”x24” ACMP	Moderate	Replace with 1-10’x4’ RCBC
23	Abrego Drive 3-16’x4’ ConArch	Moderate	Add 1-16’x4’ ConArch
25	Abrego Drive 1-16’x4’ ConArch	Moderate	Add 1-16’x4’ ConArch

(4) Undersized Drainageways. Under capacity drainageways are most commonly present along the channel reaches east of I-19. Many of the larger drainageways east of I-19 lack adequate depth and slope to convey the volume of water and sediment expected during the 100-year storm. Presently, earthen berms form the banks of several drainageways but these berms are not stabilized and are subject to erosion and breaching during floods. Low areas including several residential homes that are landward of these berms have been mapped within a 100-year floodplain. A detailed description of the modifications needed to provide flow containment has not been addressed by the current study. Much more detailed analyses will be required to determine the channel cross-sections, profile, limits and stabilization methods. At some locations, the channel modifications may require additional rights of way or easements to facilitate construction and maintenance; and significant removal of native vegetation which suggests that public involvement may be necessary. Table 9 below lists the most important locations where existing drainageways are under capacity and further studies are needed. Unstabilized earthen berms are currently providing some protection to structures on their landward side but they are insufficient to resist erosion during high magnitude flows and do not meet FEMA standards as certified flood protection structures.

Table 9 – Locations Requiring Channel Modifications to Increase Capacity

DW#	Location	Preliminary Opinion on Required Modifications
1	Reach east of Abrego Drive for minimum distance of 1000 ft	Lower channel flow line 3’ to 5’ to replace existing berms. Provide bank stabilization and install grade control structures at project boundaries. These modifications will likely solve sediment deposition at Abrego Drive culvert
6	Reach 900 feet west of I-19	Lower channel flow line 3’ to 5’ and replace existing riprap bank protection which periodically washes out. Provide new bank stabilization and install grade control structures at project boundaries.
6	Just upstream of I-19 South Bound culverts	Install berm/slope protection on north bank to prevent 254 cfs breakout to Drainageway #5. Include small diameter culvert through berm for local drainage flowing south

DW#	Location	Preliminary Opinion on Required Modifications
9	Reach east of Abrego Drive to Santa Cruz River	Lower channel flow line 5' to 7' to replace existing berms. Provide bank stabilization and install grade control structures at project boundaries.
9	Reach 800 feet west of I-19	Several residences within floodplain along this reach. No record of drainage complaints. Low frequency of overbank flooding. Channel modifications along this reach probably not feasible unless I-19 culvert lowered.
13	Reach within 1000-feet of Santa Cruz River channel	Lower channel flow line 3' to 5' to replace existing berms. Provide bank stabilization and install grade control structures at project boundaries.

4.3 Special Problems Areas

The RFCD requested CMG Drainage Engineering, Inc. to complete a preliminary analysis of Drainageway #8 and to identify the source street flooding along Los Arcos and Placita Los Arcos just north of DW#8 and east of Abrego Drive. The results of the preliminary analysis determined that flows along Los Arcos and Placita Los Arcos are a result of storm water that emanates from residential subdivisions east of I-19 and both south and north of DW#8. Most of the flow emanating from watershed area west of I-19 is diverted north to DW#7 as a result of inadequate I-19 culvert capacity. HEC-RAS modeling of the flow conditions at I-19 determined that 396 cfs of the 100-year peak flow (567 cfs) is diverted to DW#7 at I-19, thus substantially reducing the flow being conveyed to the downstream section of DW#8. Hydrologic computations based on the PC Hydro Method determined estimated the 100-year storm discharges along Los Arcos and Placita Los Arcos to be between 290 cfs and 370 cfs. These flows could be reduced to between 120 cfs and 200 cfs by directing that portion of the flow emanating from residential subdivision areas south of DW#8, to DW#8 at the Vista del Rio crossing. Directing additional flows into DW#8 will not increase width of the floodplain or cause additional flooding along DW#8 east of Vista del Rio. A copy of the Preliminary Floodplain Analysis report for DW#8 is provided in Appendix N of this report.

5.0 REFERENCES

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12. Pima County Regional Flood Control District *Technical Policy TECH-018, Acceptable Model Parameterization for Determining Peak Discharge,* April 1, 2011

13. NRCS, *National Engineering Handbook, Section 4- Hydrology (NEH-4), Chapter 15. Travel Time, Time of Concentration and Lag, Chapter 16 – Hydrographs*, August 1972

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APPENDIX A

RAINFALL DATA

NOAA Atlas 14, Volume 1, Version 5
Location name: Green Valley, Arizona, US*
Latitude: 31.8716°, Longitude: -110.9896°
Elevation: 2864ft*
* source: Google Maps

POINT PRECIPITATION FREQUENCY ESTIMATES

Sanja Perica, Sarah Dietz, Sarah Heim, Lillian Hiner, Kazungu Maitaria, Deborah Martin, Sandra Pavlovic, Ishani Roy, Carl Trypaluk, Dale Unruh, Fenglin Yan, Michael Yekta, Tan Zhao, Geoffrey Bonnin, Daniel Brewer, Li-Chuan Chen, Tye Parzybok, John Yarchoan

NOAA, National Weather Service, Silver Spring, Maryland

PF_tabular | PF_graphical | Maps_&_aerials

PF tabular

PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches)[1]

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	0.258 (0.231–0.291)	0.332 (0.297–0.373)	0.434 (0.387–0.487)	0.512 (0.454–0.574)	0.618 (0.542–0.692)	0.699 (0.606–0.785)	0.782 (0.669–0.883)	0.866 (0.730–0.983)	0.978 (0.805–1.12)	1.06 (0.859–1.23)
10-min	0.393 (0.352–0.442)	0.505 (0.452–0.568)	0.661 (0.589–0.742)	0.779 (0.692–0.873)	0.941 (0.826–1.05)	1.06 (0.922–1.20)	1.19 (1.02–1.34)	1.32 (1.11–1.50)	1.49 (1.23–1.71)	1.62 (1.31–1.87)
15-min	0.486 (0.436–0.548)	0.626 (0.560–0.704)	0.819 (0.730–0.919)	0.966 (0.857–1.08)	1.17 (1.02–1.31)	1.32 (1.14–1.48)	1.48 (1.26–1.67)	1.64 (1.38–1.86)	1.85 (1.52–2.12)	2.01 (1.62–2.32)
30-min	0.656 (0.588–0.738)	0.843 (0.754–0.948)	1.10 (0.984–1.24)	1.30 (1.15–1.46)	1.57 (1.38–1.76)	1.78 (1.54–2.00)	1.99 (1.70–2.24)	2.20 (1.86–2.50)	2.49 (2.05–2.85)	2.70 (2.18–3.12)
60-min	0.811 (0.727–0.914)	1.04 (0.934–1.17)	1.37 (1.22–1.53)	1.61 (1.43–1.80)	1.94 (1.71–2.18)	2.20 (1.91–2.47)	2.46 (2.10–2.78)	2.73 (2.30–3.09)	3.08 (2.53–3.53)	3.34 (2.70–3.86)
2-hr	0.923 (0.830–1.04)	1.17 (1.06–1.32)	1.52 (1.36–1.69)	1.78 (1.59–1.99)	2.16 (1.90–2.40)	2.45 (2.14–2.73)	2.75 (2.37–3.09)	3.07 (2.59–3.46)	3.49 (2.88–3.98)	3.83 (3.10–4.41)
3-hr	0.971 (0.875–1.09)	1.22 (1.10–1.37)	1.56 (1.41–1.75)	1.83 (1.64–2.05)	2.22 (1.96–2.47)	2.52 (2.20–2.82)	2.84 (2.44–3.20)	3.18 (2.68–3.60)	3.65 (3.00–4.18)	4.02 (3.23–4.66)
6-hr	1.12 (0.998–1.25)	1.39 (1.25–1.57)	1.76 (1.57–1.98)	2.06 (1.83–2.31)	2.49 (2.19–2.79)	2.83 (2.46–3.18)	3.20 (2.73–3.61)	3.58 (3.00–4.07)	4.12 (3.36–4.73)	4.56 (3.64–5.30)
12-hr	1.28 (1.16–1.43)	1.60 (1.44–1.78)	2.00 (1.79–2.23)	2.32 (2.07–2.58)	2.78 (2.45–3.08)	3.13 (2.74–3.49)	3.51 (3.02–3.93)	3.90 (3.30–4.40)	4.44 (3.67–5.07)	4.87 (3.95–5.63)
24-hr	1.49 (1.36–1.63)	1.86 (1.69–2.03)	2.30 (2.10–2.52)	2.66 (2.42–2.91)	3.14 (2.85–3.44)	3.52 (3.18–3.85)	3.91 (3.51–4.29)	4.30 (3.83–4.74)	4.83 (4.26–5.35)	5.24 (4.58–5.84)
2-day	1.67 (1.51–1.83)	2.07 (1.88–2.28)	2.56 (2.33–2.82)	2.96 (2.69–3.26)	3.52 (3.17–3.87)	3.95 (3.54–4.35)	4.41 (3.92–4.87)	4.88 (4.30–5.41)	5.51 (4.81–6.16)	6.01 (5.18–6.76)
3-day	1.79 (1.62–1.99)	2.22 (2.02–2.47)	2.75 (2.49–3.05)	3.19 (2.88–3.54)	3.81 (3.42–4.22)	4.29 (3.83–4.77)	4.80 (4.25–5.35)	5.34 (4.68–5.97)	6.07 (5.25–6.84)	6.65 (5.68–7.53)
4-day	1.91 (1.73–2.14)	2.38 (2.15–2.66)	2.95 (2.66–3.29)	3.42 (3.08–3.82)	4.10 (3.66–4.57)	4.63 (4.12–5.18)	5.20 (4.58–5.84)	5.80 (5.05–6.53)	6.63 (5.69–7.52)	7.29 (6.18–8.30)
7-day	2.23 (2.02–2.48)	2.78 (2.51–3.09)	3.45 (3.12–3.85)	4.01 (3.61–4.46)	4.78 (4.27–5.33)	5.39 (4.79–6.02)	6.02 (5.32–6.75)	6.68 (5.85–7.52)	7.59 (6.56–8.60)	8.31 (7.10–9.47)
10-day	2.50 (2.26–2.77)	3.12 (2.82–3.46)	3.85 (3.48–4.27)	4.44 (4.01–4.92)	5.25 (4.70–5.81)	5.87 (5.23–6.52)	6.51 (5.77–7.26)	7.17 (6.29–8.02)	8.05 (6.97–9.07)	8.74 (7.48–9.92)
20-day	3.37 (3.07–3.69)	4.19 (3.83–4.60)	5.16 (4.70–5.66)	5.91 (5.37–6.47)	6.89 (6.24–7.55)	7.63 (6.87–8.37)	8.36 (7.49–9.20)	9.09 (8.09–10.0)	10.0 (8.85–11.2)	10.8 (9.41–12.1)
30-day	4.06 (3.73–4.42)	5.05 (4.64–5.51)	6.15 (5.64–6.70)	6.98 (6.38–7.60)	8.02 (7.32–8.76)	8.79 (7.99–9.60)	9.53 (8.63–10.4)	10.2 (9.24–11.3)	11.2 (9.96–12.3)	11.8 (10.5–13.1)
45-day	4.97 (4.57–5.42)	6.18 (5.68–6.75)	7.45 (6.85–8.11)	8.36 (7.67–9.11)	9.49 (8.70–10.3)	10.3 (9.40–11.2)	11.0 (10.0–12.0)	11.7 (10.6–12.8)	12.5 (11.3–13.8)	13.1 (11.8–14.4)
60-day	5.59 (5.14–6.08)	6.93 (6.37–7.55)	8.32 (7.65–9.05)	9.33 (8.57–10.1)	10.6 (9.69–11.5)	11.4 (10.5–12.4)	12.2 (11.2–13.3)	13.0 (11.8–14.2)	13.8 (12.5–15.2)	14.4 (13.0–15.9)

[1] Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).

Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values.

Please refer to NOAA Atlas 14 document for more information.

Back to Top

PF graphical

NOAA Atlas 14, Volume 1, Version 5
Location name: Green Valley, Arizona, US*
Latitude: 31.8680°, Longitude: -111.0270°
Elevation: 3163ft*
* source: Google Maps

POINT PRECIPITATION FREQUENCY ESTIMATES

Sanja Perica, Sarah Dietz, Sarah Heim, Lillian Hiner, Kazungu Maitaria, Deborah Martin, Sandra Pavlovic, Ishani Roy, Carl Trypaluk, Dale Unruh, Fenglin Yan, Michael Yekta, Tan Zhao, Geoffrey Bonnin, Daniel Brewer, Li-Chuan Chen, Tye Parzybok, John Yarchoan

NOAA, National Weather Service, Silver Spring, Maryland

PF_tabular | PF_graphical | Maps_&_aerials

PF tabular

PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches)[1]

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	0.269 (0.241-0.303)	0.346 (0.309-0.389)	0.452 (0.403-0.508)	0.533 (0.472-0.597)	0.642 (0.563-0.719)	0.724 (0.628-0.814)	0.809 (0.692-0.913)	0.894 (0.755-1.02)	1.01 (0.830-1.15)	1.09 (0.886-1.26)
10-min	0.409 (0.366-0.461)	0.526 (0.471-0.593)	0.688 (0.613-0.773)	0.811 (0.719-0.909)	0.976 (0.857-1.09)	1.10 (0.956-1.24)	1.23 (1.05-1.39)	1.36 (1.15-1.55)	1.53 (1.26-1.76)	1.66 (1.35-1.92)
15-min	0.507 (0.454-0.572)	0.652 (0.583-0.735)	0.853 (0.760-0.958)	1.01 (0.892-1.13)	1.21 (1.06-1.36)	1.37 (1.19-1.54)	1.53 (1.31-1.72)	1.69 (1.43-1.92)	1.90 (1.57-2.18)	2.06 (1.67-2.38)
30-min	0.683 (0.612-0.770)	0.878 (0.786-0.990)	1.15 (1.02-1.29)	1.35 (1.20-1.52)	1.63 (1.43-1.83)	1.84 (1.60-2.07)	2.06 (1.76-2.32)	2.27 (1.92-2.58)	2.56 (2.11-2.93)	2.78 (2.25-3.21)
60-min	0.846 (0.757-0.953)	1.09 (0.973-1.23)	1.42 (1.27-1.60)	1.68 (1.49-1.88)	2.02 (1.77-2.26)	2.28 (1.98-2.56)	2.54 (2.18-2.87)	2.81 (2.37-3.19)	3.17 (2.61-3.63)	3.44 (2.79-3.97)
2-hr	0.955 (0.859-1.07)	1.22 (1.09-1.36)	1.57 (1.40-1.75)	1.85 (1.64-2.06)	2.23 (1.97-2.48)	2.53 (2.20-2.82)	2.84 (2.44-3.19)	3.16 (2.67-3.56)	3.59 (2.96-4.09)	3.93 (3.19-4.53)
3-hr	1.00 (0.904-1.12)	1.26 (1.14-1.42)	1.61 (1.45-1.80)	1.89 (1.69-2.11)	2.29 (2.03-2.55)	2.60 (2.27-2.90)	2.93 (2.52-3.29)	3.28 (2.77-3.70)	3.76 (3.09-4.29)	4.14 (3.33-4.78)
6-hr	1.15 (1.03-1.30)	1.44 (1.29-1.62)	1.82 (1.62-2.04)	2.13 (1.89-2.39)	2.57 (2.26-2.88)	2.92 (2.53-3.28)	3.30 (2.81-3.72)	3.69 (3.09-4.19)	4.24 (3.45-4.87)	4.69 (3.74-5.44)
12-hr	1.33 (1.20-1.48)	1.66 (1.49-1.85)	2.07 (1.85-2.31)	2.41 (2.15-2.68)	2.87 (2.54-3.19)	3.24 (2.84-3.61)	3.63 (3.13-4.07)	4.03 (3.42-4.56)	4.59 (3.80-5.24)	5.03 (4.09-5.81)
24-hr	1.53 (1.40-1.67)	1.91 (1.74-2.09)	2.37 (2.16-2.59)	2.73 (2.49-2.99)	3.23 (2.93-3.54)	3.62 (3.27-3.96)	4.01 (3.60-4.40)	4.41 (3.94-4.86)	4.95 (4.38-5.48)	5.37 (4.71-5.97)
2-day	1.72 (1.56-1.90)	2.14 (1.94-2.36)	2.64 (2.39-2.91)	3.06 (2.76-3.37)	3.63 (3.26-4.01)	4.08 (3.64-4.51)	4.55 (4.03-5.04)	5.04 (4.43-5.60)	5.70 (4.95-6.39)	6.22 (5.35-7.01)
3-day	1.85 (1.67-2.06)	2.30 (2.08-2.56)	2.84 (2.56-3.17)	3.30 (2.96-3.68)	3.93 (3.51-4.39)	4.43 (3.93-4.95)	4.96 (4.36-5.56)	5.51 (4.81-6.19)	6.26 (5.40-7.09)	6.86 (5.85-7.80)
4-day	1.98 (1.78-2.23)	2.46 (2.21-2.77)	3.05 (2.73-3.43)	3.54 (3.16-3.99)	4.23 (3.76-4.77)	4.78 (4.22-5.40)	5.37 (4.70-6.07)	5.98 (5.18-6.79)	6.83 (5.84-7.80)	7.51 (6.34-8.60)
7-day	2.31 (2.08-2.58)	2.88 (2.59-3.23)	3.58 (3.21-4.01)	4.15 (3.72-4.65)	4.94 (4.40-5.55)	5.56 (4.92-6.26)	6.22 (5.46-7.01)	6.89 (6.00-7.79)	7.81 (6.72-8.88)	8.53 (7.27-9.76)
10-day	2.59 (2.33-2.88)	3.23 (2.91-3.59)	3.99 (3.59-4.44)	4.59 (4.12-5.11)	5.42 (4.84-6.03)	6.05 (5.38-6.75)	6.70 (5.92-7.50)	7.36 (6.45-8.27)	8.25 (7.14-9.32)	8.93 (7.65-10.2)
20-day	3.51 (3.19-3.85)	4.37 (3.98-4.80)	5.37 (4.88-5.89)	6.14 (5.56-6.72)	7.14 (6.46-7.83)	7.89 (7.10-8.66)	8.63 (7.73-9.51)	9.36 (8.33-10.3)	10.3 (9.10-11.5)	11.0 (9.66-12.3)
30-day	4.24 (3.88-4.62)	5.27 (4.82-5.75)	6.41 (5.86-6.99)	7.26 (6.62-7.92)	8.34 (7.58-9.11)	9.12 (8.26-9.98)	9.87 (8.91-10.8)	10.6 (9.53-11.6)	11.5 (10.3-12.7)	12.2 (10.8-13.5)
45-day	5.20 (4.77-5.69)	6.47 (5.93-7.07)	7.79 (7.14-8.50)	8.74 (8.00-9.53)	9.91 (9.05-10.8)	10.7 (9.78-11.7)	11.5 (10.4-12.6)	12.2 (11.1-13.4)	13.0 (11.8-14.3)	13.6 (12.2-15.0)
60-day	5.86 (5.38-6.40)	7.28 (6.68-7.94)	8.73 (8.02-9.52)	9.78 (8.97-10.6)	11.1 (10.1-12.0)	11.9 (10.9-13.0)	12.8 (11.7-13.9)	13.5 (12.3-14.8)	14.4 (13.1-15.9)	15.0 (13.6-16.6)

[1] Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).

Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values.

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Back to Top

PF graphical

NOAA Atlas 14, Volume 1, Version 5
Location name: Sahuarita, Arizona, US*
Latitude: 31.8882°, Longitude: -111.0846°
Elevation: 3786ft*
* source: Google Maps

POINT PRECIPITATION FREQUENCY ESTIMATES

Sanja Perica, Sarah Dietz, Sarah Heim, Lillian Hiner, Kazungu Maitaria, Deborah Martin, Sandra Pavlovic, Ishani Roy, Carl Trypaluk, Dale Unruh, Fenglin Yan, Michael Yekta, Tan Zhao, Geoffrey Bonnin, Daniel Brewer, Li-Chuan Chen, Tye Parzybok, John Yarchoan

NOAA, National Weather Service, Silver Spring, Maryland

PF_tabular | PF_graphical | Maps_&_aerials

PF tabular

PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches)[1]

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	0.295 (0.263–0.333)	0.380 (0.339–0.428)	0.497 (0.441–0.558)	0.584 (0.516–0.655)	0.701 (0.613–0.784)	0.788 (0.682–0.885)	0.876 (0.749–0.987)	0.965 (0.814–1.09)	1.08 (0.891–1.24)	1.17 (0.948–1.35)
10-min	0.449 (0.401–0.507)	0.578 (0.516–0.652)	0.756 (0.671–0.850)	0.889 (0.786–0.997)	1.07 (0.933–1.19)	1.20 (1.04–1.35)	1.33 (1.14–1.50)	1.47 (1.24–1.66)	1.64 (1.36–1.88)	1.78 (1.44–2.06)
15-min	0.556 (0.497–0.628)	0.716 (0.640–0.809)	0.937 (0.832–1.05)	1.10 (0.974–1.24)	1.32 (1.16–1.48)	1.49 (1.29–1.67)	1.65 (1.41–1.86)	1.82 (1.54–2.06)	2.04 (1.68–2.33)	2.21 (1.79–2.55)
30-min	0.749 (0.670–0.846)	0.964 (0.861–1.09)	1.26 (1.12–1.42)	1.48 (1.31–1.66)	1.78 (1.56–1.99)	2.00 (1.73–2.25)	2.23 (1.90–2.51)	2.45 (2.07–2.78)	2.74 (2.27–3.14)	2.97 (2.41–3.43)
60-min	0.927 (0.829–1.05)	1.19 (1.07–1.35)	1.56 (1.39–1.76)	1.84 (1.62–2.06)	2.20 (1.93–2.47)	2.48 (2.15–2.78)	2.76 (2.36–3.11)	3.03 (2.56–3.44)	3.40 (2.80–3.89)	3.68 (2.98–4.25)
2-hr	1.04 (0.935–1.17)	1.33 (1.19–1.49)	1.71 (1.53–1.92)	2.01 (1.79–2.25)	2.42 (2.13–2.71)	2.75 (2.39–3.07)	3.07 (2.64–3.45)	3.41 (2.88–3.85)	3.86 (3.19–4.40)	4.21 (3.42–4.85)
3-hr	1.09 (0.983–1.22)	1.38 (1.24–1.55)	1.76 (1.58–1.97)	2.06 (1.84–2.31)	2.49 (2.20–2.78)	2.82 (2.46–3.15)	3.18 (2.72–3.57)	3.54 (2.98–4.00)	4.05 (3.32–4.62)	4.45 (3.57–5.13)
6-hr	1.26 (1.13–1.42)	1.57 (1.41–1.77)	1.98 (1.77–2.23)	2.31 (2.06–2.60)	2.79 (2.45–3.12)	3.16 (2.74–3.55)	3.56 (3.04–4.01)	3.97 (3.33–4.50)	4.54 (3.71–5.20)	5.01 (4.00–5.79)
12-hr	1.46 (1.31–1.62)	1.82 (1.64–2.03)	2.27 (2.03–2.53)	2.63 (2.35–2.93)	3.14 (2.78–3.50)	3.55 (3.10–3.95)	3.97 (3.41–4.45)	4.40 (3.73–4.97)	4.99 (4.14–5.70)	5.47 (4.44–6.30)
24-hr	1.63 (1.50–1.78)	2.04 (1.87–2.22)	2.54 (2.32–2.77)	2.93 (2.68–3.20)	3.47 (3.16–3.78)	3.89 (3.53–4.23)	4.32 (3.90–4.72)	4.75 (4.26–5.21)	5.34 (4.74–5.89)	5.79 (5.11–6.42)
2-day	1.85 (1.67–2.05)	2.31 (2.08–2.55)	2.86 (2.57–3.16)	3.32 (2.97–3.67)	3.95 (3.52–4.38)	4.45 (3.94–4.94)	4.98 (4.37–5.53)	5.52 (4.81–6.16)	6.27 (5.40–7.06)	6.86 (5.85–7.77)
3-day	2.00 (1.79–2.26)	2.49 (2.23–2.81)	3.09 (2.76–3.49)	3.60 (3.20–4.07)	4.30 (3.79–4.87)	4.86 (4.26–5.51)	5.45 (4.74–6.19)	6.06 (5.23–6.91)	6.91 (5.89–7.94)	7.60 (6.40–8.75)
4-day	2.15 (1.91–2.47)	2.67 (2.38–3.07)	3.32 (2.95–3.83)	3.87 (3.42–4.46)	4.64 (4.07–5.35)	5.26 (4.59–6.08)	5.92 (5.10–6.84)	6.60 (5.65–7.67)	7.56 (6.39–8.82)	8.33 (6.96–9.73)
7-day	2.52 (2.23–2.85)	3.15 (2.79–3.58)	3.93 (3.48–4.47)	4.58 (4.04–5.22)	5.47 (4.79–6.24)	6.17 (5.38–7.07)	6.91 (5.98–7.94)	7.67 (6.60–8.83)	8.73 (7.41–10.1)	9.56 (8.04–11.1)
10-day	2.84 (2.53–3.19)	3.55 (3.16–3.99)	4.40 (3.91–4.95)	5.09 (4.50–5.72)	6.02 (5.29–6.77)	6.74 (5.89–7.61)	7.48 (6.50–8.48)	8.23 (7.10–9.36)	9.25 (7.88–10.6)	10.0 (8.47–11.5)
20-day	3.90 (3.53–4.29)	4.86 (4.41–5.36)	5.99 (5.41–6.61)	6.86 (6.17–7.56)	7.99 (7.17–8.82)	8.84 (7.89–9.78)	9.69 (8.60–10.7)	10.5 (9.28–11.7)	11.6 (10.2–13.0)	12.4 (10.8–14.0)
30-day	4.75 (4.32–5.20)	5.91 (5.38–6.49)	7.22 (6.55–7.93)	8.19 (7.42–9.01)	9.43 (8.51–10.4)	10.3 (9.29–11.4)	11.2 (10.0–12.4)	12.1 (10.8–13.4)	13.1 (11.6–14.7)	13.9 (12.3–15.6)
45-day	5.87 (5.35–6.47)	7.30 (6.66–8.06)	8.82 (8.03–9.72)	9.92 (9.01–10.9)	11.3 (10.2–12.5)	12.3 (11.1–13.6)	13.2 (11.9–14.6)	14.1 (12.6–15.6)	15.1 (13.5–16.9)	15.9 (14.1–17.8)
60-day	6.69 (6.10–7.35)	8.32 (7.59–9.15)	10.0 (9.14–11.0)	11.2 (10.2–12.4)	12.7 (11.6–14.0)	13.8 (12.5–15.2)	14.8 (13.4–16.3)	15.7 (14.2–17.4)	16.9 (15.1–18.8)	17.7 (15.8–19.8)

[1] Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).

Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values.

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Back to Top

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APPENDIX B

HEC-1 SOILS TYPE DATA

Green Valley HEC-1 Watershed Soil Characteristics, Vegetation Cover, and Impevious Cover Summary Table

Watershed ID	% Impervious	Hydrological Soil Group (%)			Hydrological Vegetation Type	Vegetation Cover Density (%)	Curve Number*
		B	C	D			
9-1	0	2.5	71.1	26.3	Desert Brush	30	88.2
9-2	0	0.0	73.0	27.0	Desert Brush	30	88.4
9-3	0	10.8	48.8	40.4	Desert Brush	30	88.2
9-4	0	4.7	62.5	32.8	Desert Brush	30	88.3
9-5	5	21.8	59.0	19.2	Desert Brush	30	86.9
9-6	5	41.8	58.2	0.0	Desert Brush	30	85.2
9-7	5	47.9	52.1	0.0	Desert Brush	30	84.9
9-8	35	2.5	97.5	0.0	Desert Brush	30	87.5
9-9	40	15.9	84.1	0.0	Desert Brush	30	86.7
9-10	40	89.3	10.7	0.0	Desert Brush	30	82.5
9-11	40	100.0	0.0	0.0	Desert Brush	30	81.9
9-12	15	100.0	0.0	0.0	Desert Brush	30	81.9
6L	35	92.5	7.5	0.0	Desert Brush	30	82.3
6K	35	100.0	0.0	0.0	Desert Brush	30	81.9
6J	50	100.0	0.0	0.0	Desert Brush	30	81.9
6I	5	16.3	83.7	0.0	Desert Brush	30	86.7
6H	0	5.0	95.0	0.0	Desert Brush	30	87.3
6G	35	27.0	73.0	0.0	Desert Brush	30	86.1
6F	5	27.0	73.0	0.0	Desert Brush	30	86.1
6E	35	90.0	10.0	0.0	Desert Brush	30	82.5
6D	40	100.0	0.0	0.0	Desert Brush	30	81.9
6C	30	100.0	0.0	0.0	Desert Brush	30	81.9
6B	35	100.0	0.0	0.0	Desert Brush	30	81.9
6A	35	100.0	0.0	0.0	Desert Brush	30	81.9
13M	0	34.0	66.0	0.0	Desert Brush	30	85.7
13L	25	31.0	69.0	0.0	Desert Brush	30	85.8
13K	5	100.0	0.0	0.0	Desert Brush	30	81.9
13J	5	100.0	0.0	0.0	Desert Brush	30	81.9
13I	35	29.0	71.0	0.0	Desert Brush	30	85.9
13H	55	100.0	0.0	0.0	Desert Brush	30	81.9
13G	60	100.0	0.0	0.0	Desert Brush	30	81.9
13F	5	3.0	97.0	0.0	Desert Brush	30	87.4
13E	0	0.2	99.8	0.0	Desert Brush	30	87.6
13D	40	43.0	57.0	0.0	Desert Brush	30	85.1
13C	55	100.0	0.0	0.0	Desert Brush	30	81.9
13B	55	100.0	0.0	0.0	Desert Brush	30	81.9
13A	10	100.0	0.0	0.0	Desert Brush	30	81.9
5D	70	100.0	0.0	0.0	Desert Brush	30	81.9
5C	40	100.0	0.0	0.0	Desert Brush	30	81.9
5B	15	80.0	20.0	0.0	Desert Brush	30	83.0
5A	40	100.0	0.0	0.0	Desert Brush	30	81.9
4F	25	41.1	58.9	0.0	Desert Brush	30	85.3
4E	5	0.0	100.0	0.0	Desert Brush	30	87.6
4D	5	0.0	100.0	0.0	Desert Brush	30	87.6
4C	35	20.3	79.7	0.0	Desert Brush	30	86.4
4B	35	100.0	0.0	0.0	Desert Brush	30	81.9
4A	35	100.0	0.0	0.0	Desert Brush	30	81.9
3E	40	100.0	0.0	0.0	Desert Brush	30	81.9
3D	40	100.0	0.0	0.0	Desert Brush	30	81.9
3C	35	100.0	0.0	0.0	Desert Brush	30	81.9
3B	60	100.0	0.0	0.0	Desert Brush	30	81.9
3A	30	100.0	0.0	0.0	Desert Brush	30	81.9
23B	12	70.4	29.6	0.0	Desert Brush	30	83.6
23	50	95.0	5.0	0.0	Desert Brush	30	82.2
22B	10	89.5	10.5	0.0	Desert Brush	30	82.5
22	40	87.0	13.0	0.0	Desert Brush	30	82.6
21B	10	74.1	25.9	0.0	Desert Brush	30	83.4
21	40	100.0	0.0	0.0	Desert Brush	30	81.9
20B	12	46.1	53.9	0.0	Desert Brush	30	85.0
20	40	100.0	0.0	0.0	Desert Brush	30	81.9
17E	0	65.0	35.0	0.0	Desert Brush	30	83.9
17B	19	77.4	22.6	0.0	Desert Brush	30	83.2
17	35	100.0	0.0	0.0	Desert Brush	30	81.9
B17	40	100.0	0.0	0.0	Desert Brush	30	81.9
B13	50	100.0	0.0	0.0	Desert Brush	30	81.9

* Curve Number does not include impervious cover

APPENDIX C

TR-55 TRAVEL TIME COMPUTATIONS FOR HEC-1

Green Valley HEC-1 Watershed Lagging Time Computation Summary Table

Watershed ID	T_1	T_2	T_3	T_c	T_{lag}
	(hr)				
9-1	0.126	1.270	0.521	1.917	1.150
9-2	0.105	0.279	0.644	1.028	0.617
9-3	0.096	0.149	0.918	1.164	0.698
9-4	0.126	0.120	0.766	1.012	0.607
9-5	0.155	0.181	0.643	0.980	0.588
9-6	0.182	0.494	0.425	1.102	0.661
9-7	0.205	0.366	0.468	1.038	0.623
9-8	0.133	0.214	0.218	0.565	0.339
9-9	0.138	0.140	0.110	0.388	0.233
9-10	0.167	0.029	0.222	0.418	0.251
9-11	0.182	0.086	0.228	0.496	0.298
9-12	0.118	0.112	0.177	0.407	0.244
6L	0.162	0.105	0.206	0.473	0.284
6K	0.182	0.057	0.074	0.313	0.188
6J	0.318	0.048	0.077	0.443	0.266
6I	0.073	0.050	0.228	0.351	0.211
6H	0.155	0.103	0.163	0.421	0.253
6G	0.241	0.094	0.158	0.493	0.296
6F	0.054	0.073	0.198	0.325	0.195
6E	0.182	0.111	0.165	0.459	0.275
6D	0.224	0.008	0.009	0.240	0.144
6C	0.182	0.058	0.101	0.341	0.205
6B	0.182	0.108	0.113	0.403	0.242
6A	0.241	0.051	0.123	0.415	0.249
13M	0.089	0.069	0.292	0.451	0.270
13L	0.167	0.051	0.264	0.482	0.289
13K	0.199	0.064	0.185	0.449	0.270
13J	0.176	0.038	0.194	0.408	0.245
13I	0.241	0.149	0.183	0.572	0.343
13H	0.182	0.002	0.016	0.201	0.121
13G	0.138	0.048	0.100	0.287	0.172
13F	0.126	0.032	0.231	0.389	0.233
13E	0.199	0.085	0.134	0.418	0.251
13D	0.048	0.083	0.386	0.517	0.310
13C	0.146	0.220	0.020	0.386	0.232
13B	0.146	0.017	0.057	0.220	0.132
13A	0.126	0.008	0.228	0.362	0.217
5D	0.241	0.050	0.149	0.440	0.264
5C	0.241	0.042	0.111	0.394	0.236
5B	0.176	0.061	0.159	0.396	0.238
5A	0.241	0.052	0.175	0.468	0.281
4F	0.111	0.118	0.216	0.445	0.267
4E	0.241	0.030	0.115	0.386	0.232
4D	0.155	0.043	0.099	0.297	0.178
4C	0.138	0.103	0.134	0.375	0.225
4B	0.241	0.200	0.070	0.511	0.306
4A	0.167	0.011	0.083	0.261	0.157
3E	0.182	0.047	0.137	0.367	0.220
3D	0.118	0.068	0.136	0.322	0.193
3C	0.132	0.065	0.068	0.266	0.159
3B	0.118	0.092	0.101	0.311	0.186
3A	0.132	0.184	0.143	0.459	0.276
23B	0.241	0.045	0.243	0.529	0.318
23	0.182	0.085	0.150	0.417	0.250
22B	0.182	0.050	0.088	0.320	0.192
22	0.205	0.173	0.066	0.443	0.266
21B	0.172	0.109	0.127	0.408	0.245
21	0.241	0.085	0.066	0.391	0.235
20B	0.182	0.180	0.199	0.561	0.337
20	0.205	0.246	0.063	0.513	0.308
17E	0.096	0.242	0.076	0.414	0.248
17B	0.113	0.287	0.189	0.588	0.353
17	0.241	0.149	0.056	0.445	0.267
B17	0.205	0.099	0.130	0.433	0.260
B13	0.132	0.015	0.120	0.267	0.160

Where
$Tc=T_1+T_2+T_3$
$T_{lag}=0.6T_c$

APPENDIX D

HEC-1 CHANNEL/ WATERSHED PARAMETERS

Green Valley HEC-1 Watershed Characters Summary Table

Watershed ID	WaterShed Area	Overall Flow Length (L)	Overall ΔHeight (ΔH)	Overall Land Slope (S)
	(sq mile)	(ft)	(ft)	(ft/ft)
9-1	1.049	25179	700	0.028
9-2	0.776	16141	370	0.023
9-3	1.135	20940.4	415	0.020
9-4	1.146	18545	412	0.022
9-5	0.733	15124	328	0.022
9-6	0.436	13914	321	0.023
9-7	0.575	14159	315	0.022
9-8	0.134	7574	192	0.025
9-9	0.112	4152	117	0.028
9-10	0.126	5841	148	0.025
9-11	0.091	4307	42	0.010
9-12	0.011	2544	53	0.021
6L	0.241	8945	228.7	0.026
6K	0.006	930	8	0.009
6J	0.075	2800	53	0.019
6I	0.291	7518	208	0.028
6H	0.168	5605	154	0.027
6G	0.238	5755	140	0.024
6F	0.291	6700	201	0.030
6E	0.173	5638	140	0.025
6D	0.002	257	9	0.035
6C	0.010	1750	28	0.016
6B	0.053	2100	10	0.005
6A	0.133	3900	65	0.017
13M	0.166	7289	165	0.023
13L	0.151	6485	146	0.023
13K	0.052	3913	94	0.024
13J	0.069	4196	108	0.026
13I	0.101	4785	89	0.019
13H	0.001	187	4	0.021
13G	0.023	2300	49	0.021
13F	0.242	6160	141	0.023
13E	0.101	3809	101	0.027
13D	0.249	6275	101	0.016
13C	0.018	1855	33	0.018
13B	0.143	1992	39.5	0.020
13A	0.007	2332	45	0.019
5D	0.023	3304	76	0.023
5C	0.028	2670	60	0.022
5B	0.214	6900	204.2	0.030
5A	0.291	5432	55	0.010
4F	0.101	5753	149	0.026
4E	0.028	2170	62	0.029
4D	0.015	1750	52	0.030
4C	0.202	5636	165	0.029
4B	0.125	3419	56	0.016
4A	0.007	829	12	0.014
3E	0.166	5000	138	0.028
3D	0.118	4075	74	0.018
3C	0.048	2461	65	0.026
3B	0.122	3842	73	0.019
3A	0.288	5881	75	0.013
23B	0.500	9692	182	0.019
23	0.234	7089	156	0.022
22B	0.072	3323	108.5	0.033
22	0.078	3570	70	0.020
21B	0.068	4644	113	0.024
21	0.055	2583	46	0.018
20B	0.289	8746	172	0.020
20	0.054	3675	59	0.016
17E	0.332	5480	110	0.020
17B	0.343	11047	236	0.021
17	0.046	3591	60	0.017
B17	0.137	4064	40	0.010
B13	0.152	3663	46	0.013

APPENDIX E

SUB-BASIN ROUTING PARAMETERS / HEC-1 INPUT & OUTPUT

Green Valley HEC-1 Routing Channel Summary Table

Watershed ID	HEC Channel Length (ft)	From (Upstream Watershed)	To (Downstream Watershed)	ΔHeight (ft)	Slope (ft/ft)
9-1	1069	9-01	9-02	13	0.0122
9-2	12996	9-02	9-03	195	0.0150
9-3	4042	9-03	9-04	97	0.0240
9-4	13914	9-04	9-06	321	0.0231
9-5	14159	9-05	9-07	315	0.0222
9-6	5021	9-06	9-10	132	0.0263
9-7	5048	9-07	9-10	132	0.0261
9-8	623	9-08	9-10	17	0.0273
9-9	214	9-09	9-10	8	0.0374
9-10	1601	9-10	9-11	27	0.0169
9-11	2544	9-11	9-12	53	0.0208
6L	1271	6L	6G	13	0.0102
6K	538	6K	6J	7	0.0130
6J	265	6J	6B	3	0.0113
6I	5733	6I	6G	141	0.0246
6H	5752	6H	6G	140	0.0243
6G	257	6G	6D	9	0.0350
6F	5458	6F	6E	143	0.0262
6E	271	6E	6D	14	0.0517
6D	1796	6D	6B	36	0.0200
6C	1612	6C	6B	36	0.0223
6B	3504	6B	6A	66	0.0188
13M	4459	13M	13L	73	0.0164
13L	187	13L	13H	4	0.0214
13K	3949	13K	13I	76	0.0192
13J	4513	13J	13I	84	0.0186
13I	123	13I	13H	8	0.0650
13H	1101	13H	13G	18	0.0163
13G	1151	13G	13B	18	0.0156
13F	4757	13F	13D	111	0.0233
13E	4719	13E	13D	111	0.0235
13D	514	13D	13C	13	0.0253
13C	1159	13C	13B	12	0.0104
13B	2333	13B	13A	47	0.0201
5D	1072	5D	5C	10	0.0093
5C	3711	5C	5A	52	0.0140
5B	3889	5B	5A	54	0.0139
5A	598	5A	4A	4	0.0067
4F	3243	4F	4C	95	0.0293
4E	4646	4E	4C	134	0.0288
4D	4779	4D	4C	134	0.0280
4C	2501	4C	4B	54	0.0216
4B	592	4B	4A	4	0.0068
4A	172	4A	3B	6	0.0349
3E	2073	3E	3C	53	0.0256
3D	2071	3D	3C	52	0.0251
3C	268	3C	3B	7	0.0261
3B	3638	3B	3A	54	0.0148
23B	2675	23B	23	53	0.0198
23	370	23	22	2	0.0054
22B	2090	22B	22	38	0.0182
22	438	22	21	2	0.0046
21B	2000	21B	21	42	0.0210
21	720	21	20	2.5	0.0035
20B	1977	20B	20	39.5	0.0200
20	2973	20	17	11.5	0.0039
17E	5830	17E	17B	117	0.0201
17B	2586	17B	17	48	0.0186
B17	2020	17	13	15	0.0074

```
1****************************************
****************************************
 *                                      *                                                    *
  *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)  *                                                    *    U.S. ARMY CORPS OF ENGINEERS
  *
 *               JUN   1998             *                                                    *    HYDROLOGIC ENGINEERING CENTER
  *
 *            VERSION 4.1               *                                                    *          609 SECOND STREET
  *
 *                                      *                                                    *       DAVIS, CALIFORNIA 95616
  *
 *  RUN DATE   27JUN14  TIME  14:39:10  *                                                    *           (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

1 HEC-1 INPUT PAGE 1

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

   1          ID   DRAINAGEWAY #3, #4, & #5 IN GREEN VALLEY
   2          ID   GREEN VALLEY DRAINAGEWAYS BASIN MANAGEMENT STUDY
   3          ID   100-YEAR RUNOFF ANALYSIS
   4          ID   CMG DRAINAGE ENGINEERING---JIANKANG WANG
   5          ID   NOAA 14 UPPER 90% RAINFALL---3-HOUR STORM---SCS TYPE II
   6          ID   SCS METHOD WITH STANDARD SCS NON-ADJUSTED CN'S
   7          ID   AERIAL REDUCTION FACTORS PER TABLE 3.0 AZ STATE STD SS10-07
   8          ID   REVISED 10/14/2013
              *DIAGRAM
   9          IT       2                    500
  10          IO       5       0
              *
  11          IN       5
  12          JD    3.20    1.00
  13          PC    .000    .008    .015    .024    .033    .042    .052    .063    .074    .087
  14          PC    .102    .116    .133    .163    .223    .305    .452    .647    .771    .801
  15          PC    .821    .844    .863    .879    .892    .904    .916    .926    .936    .946
  16          PC    .955    .963    .971    .979    .986    .993   1.000
  17          JD    3.02    2.00
  18          JD    2.93    3.00
  19          JD    2.84    4.00
  20          JD    2.75    5.00
  21          JD    2.71    6.00
  22          JD    2.68    7.00
              *

  23          KK  _5D
  24          KM   HEADWATERS OF DRAINAGEWAY #3
  25          KM   BASIN 5D
  26          BA   0.023
  27          LS       0    81.9      70
  28          UD   0.264
              *

  29          KK  5D-5C
  30          KM   KINEMATIC WAVE CHANNEL ROUTING
  31          KM   FROM NODE 5D TO 5C
  32          RK    1072   0.009   0.025            TRAP      20       4
              *

  33          KK  _5C
  34          KM   LOCAL RUNOFF AT 5C
  35          KM   BASIN 5C
  36          BA   0.028
  37          LS       0    81.9      40
  38          UD   0.236
              *

  39          KK  CO_5C
```

```
          40          KM   COMBINE HYDROGRAPHS
          41          KM   AT NODE CP-5C
          42          HC       2
                      *
1                                                HEC-1 INPUT                                                    PAGE  2

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


          43          KK  5C-5A
          44          KM   KINEMATIC WAVE CHANNEL ROUTING
          45          KM   FROM NODE 5C TO 5A
          46          RK    3711   0.014   0.020            TRAP      17       4
                      *

          47          KK  _5B
          48          KM   LOCAL RUNOFF AT 5B
          49          KM   BASIN 5B
          50          BA   0.214
          51          LS       0    83.0      15
          52          UD   0.238
                      *

          53          KK  5B-5A
          54          KM   KINEMATIC WAVE CHANNEL ROUTING
          55          KM   FROM NODE 5B TO 5A
          56          RK    3889   0.014   0.020            TRAP      17       4
                      *

          57          KK  _5A
          58          KM   LOCAL RUNOFF AT 5A
          59          KM   BASIN 5A
          60          BA   0.291
          61          LS       0    81.9      40
          62          UD   0.281
                      *

          63          KK  CO_5A
          64          KM   COMBINE HYDROGRAPHS
          65          KM   AT NODE CP-5A
          66          HC       3
                      *

          67          KK  5A-4A
          68          KM   KINEMATIC WAVE CHANNEL ROUTING
          69          KM   FROM NODE 5A TO 4A
          70          RK     598   0.007   0.030            TRAP      17       4
                      *
                      *
                      *
                      *

          71          KK  _4F
          72          KM   LOCAL RUNOFF AT 4F
          73          KM   BASIN 4F
          74          BA   0.101
          75          LS       0    85.3      25
          76          UD   0.267
                      *
1                                                HEC-1 INPUT                                                    PAGE  3

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


          77          KK  4F-4C
          78          KM   KINEMATIC WAVE CHANNEL ROUTING
          79          KM   FROM NODE 4F TO 4C
          80          RK    3243   0.029   0.020            TRAP      14       4
                      *

          81          KK  _4E
          82          KM   LOCAL RUNOFF AT 4E
          83          KM   BASIN 4E
          84          BA   0.028
          85          LS       0    87.6       5
          86          UD   0.232
                      *

          87          KK  4E-4C
          88          KM   KINEMATIC WAVE CHANNEL ROUTING
          89          KM   FROM NODE 4E TO 4C
          90          RK    4646   0.028   0.020            TRAP      14       4
                      *

          91          KK  _4D
          92          KM   LOCAL RUNOFF AT 4D
          93          KM   BASIN 4D
          94          BA   0.015
          95          LS       0    87.6       5
          96          UD   0.178
                      *

          97          KK  4D-4C
          98          KM   KINEMATIC WAVE CHANNEL ROUTING
          99          KM   FROM NODE 4D TO 4C
         100          RK    4779   0.028   0.020            TRAP      14       4
```

```
                    *

 101                KK  _4C
 102                KM   LOCAL RUNOFF AT 4C
 103                KM   BASIN 4C
 104                BA   0.202
 105                LS       0    83.1      35
 106                UD   0.225
                    *

 107                KK  CO_4C
 108                KM   COMBINE HYDROGRAPHS
 109                KM   AT NODE CP-4C
 110                HC       4
                    *

 111                KK  4C-4B
 112                KM   KINEMATIC WAVE CHANNEL ROUTING
 113                KM   FROM NODE 4C TO 4B
 114                RK    2501   0.021   0.012            TRAP      17       4
                    *
1                                          HEC-1 INPUT                                                    PAGE  4

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

 115                KK  _4B
 116                KM   LOCAL RUNOFF AT 4B
 117                KM   BASIN 4B
 118                BA   0.125
 119                LS       0    81.9      35
 120                UD   0.306
                    *

 121                KK  CO_4B
 122                KM   COMBINE HYDROGRAPHS
 123                KM   AT NODE CP-4B
 124                HC       2
                    *

 125                KK  4B-4A
 126                KM   KINEMATIC WAVE CHANNEL ROUTING
 127                KM   FROM NODE 4B TO 4A
 128                RK     592   0.015   0.030            TRAP      17       4
                    *

 129                KK  _4A
 130                KM   LOCAL RUNOFF AT 4A
 131                KM   BASIN 4A
 132                BA   0.007
 133                LS       0    81.9      35
 134                UD   0.157
                    *

 135                KK  CO_4A
 136                KM   COMBINE HYDROGRAPHS
 137                KM   AT NODE CP-4A
 138                HC       3
                    *

 139                KK  4A-3B
 140                KM   KINEMATIC WAVE CHANNEL ROUTING
 141                KM   FROM NODE 4A TO 3B
 142                RK     172   0.034   0.025            TRAP      17       4
                    *
                    *
                    *
                    *

 143                KK  _3E
 144                KM   LOCAL RUNOFF AT 3E
 145                KM   BASIN 3E
 146                BA   0.166
 147                LS       0    81.9      40
 148                UD   0.220
                    *
1                                          HEC-1 INPUT                                                    PAGE  5

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

 149                KK  3E-3C
 150                KM   KINEMATIC WAVE CHANNEL ROUTING
 151                KM   FROM NODE 3E TO 3C
 152                RK    2073   0.025   0.030            TRAP      17       4
                    *

 153                KK  _3D
 154                KM   LOCAL RUNOFF AT 3D
 155                KM   BASIN 3D
 156                BA   0.118
 157                LS       0    81.9      40
 158                UD   0.193
                    *

 159                KK  3D-3C
```

```
 160          KM   KINEMATIC WAVE CHANNEL ROUTING
 161          KM   FROM NODE 3D TO 3C
 162          RK    2071   0.025   0.030            TRAP      17       4
              *

 163          KK  _3C
 164          KM   LOCAL RUNOFF AT 3C
 165          KM   BASIN 3C
 166          BA   0.048
 167          LS       0    81.9      35
 168          UD   0.159
              *

 169          KK  CO_3C
 170          KM   COMBINE HYDROGRAPHS
 171          KM   AT NODE CP-3C
 172          HC       3
              *

 173          KK  3C-3B
 174          KM   KINEMATIC WAVE CHANNEL ROUTING
 175          KM   FROM NODE 3C TO 3B
 176          RK     268   0.026   0.030            TRAP      17       4
              *

 177          KK  _3B
 178          KM   LOCAL RUNOFF AT 3B
 179          KM   BASIN 3B
 180          BA   0.122
 181          LS       0    81.9      60
 182          UD   0.186
              *

 183          KK  CO_3B
 184          KM   COMBINE HYDROGRAPHS
 185          KM   AT NODE CP-3B
 186          HC       3
              *
              *
              *
              *
1                                                HEC-1 INPUT                                                    PAGE  6

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


 187          KK  I-19
 188          KM   RESERVOIR ROUTE FLOW THROUGH CULVERTS @ I-19
 189          RS       1    FLOW      -1
 190          SA       0   0.043   0.173   0.458   0.868   1.959   3.728   5.495   6.045   6.319
 191          SQ       0      33     196     400     690    1028    1415    1834    2423    3000
 192          SE  2846.8  2847.0  2848.0  2849.0  2850.0  2851.0  2852.0  2853.0  2854.0  2854.4
              *

 193          KK  3B-3A
 194          KM   KINEMATIC WAVE CHANNEL ROUTING
 195          KM   FROM NODE 3B TO 3A
 196          RK    3638   0.015   0.030            TRAP      17       4
              *

 197          KK  _3A
 198          KM   LOCAL RUNOFF AT 3A
 199          KM   BASIN 3A
 200          BA   0.288
 201          LS       0    81.9      30
 202          UD   0.276
              *

 203          KK  CO_3A
 204          KM   COMBINE HYDROGRAPHS
 205          KM   AT NODE CP-3A
 206          HC       2
              *
 207          ZZ
1
                SCHEMATIC DIAGRAM OF STREAM NETWORK
 INPUT
  LINE      (V) ROUTING          (--->) DIVERSION OR PUMP FLOW

   NO.      (.) CONNECTOR        (<---) RETURN OF DIVERTED OR PUMPED FLOW

    23      _5D
                 V
                 V
    29      5D-5C
                 .
                 .
    33           .      _5C
                 .           .
                 .           .
    39      CO_5C ............
                 V
                 V
    43      5C-5A
                 .
                 .
```

```
 47          .      _5B
             .           V
             .           V
 53          .      5B-5A
             .           .
             .           .
 57          .           .      _5A
             .           .           .
             .           .           .
 63      CO_5A .......................
             V
             V
 67      5A-4A
             .
             .
 71          .      _4F
             .           V
             .           V
 77          .      4F-4C
             .           .
             .           .
 81          .           .      _4E
             .           .           V
             .           .           V
 87          .           .      4E-4C
             .           .           .
             .           .           .
 91          .           .           .      _4D
             .           .           .           V
             .           .           .           V
 97          .           .           .      4D-4C
             .           .           .           .
             .           .           .           .
101          .           .           .           .      _4C
             .           .           .           .           .
             .           .           .           .           .
107          .      CO_4C ....................................
             .           V
             .           V
111          .      4C-4B
             .           .
             .           .
115          .           .      _4B
             .           .           .
             .           .           .
121          .      CO_4B ............
             .           V
             .           V
125          .      4B-4A
             .           .
             .           .
129          .           .      _4A
             .           .           .
             .           .           .
135      CO_4A .......................
             V
             V
139      4A-3B
             .
             .
143          .      _3E
             .           V
             .           V
149          .      3E-3C
             .           .
             .           .
153          .           .      _3D
             .           .           V
             .           .           V
159          .           .      3D-3C
             .           .           .
             .           .           .
163          .           .           .      _3C
             .           .           .           .
             .           .           .           .
169          .      CO_3C .......................
             .           V
             .           V
173          .      3C-3B
             .           .
             .           .
177          .           .      _3B
             .           .           .
             .           .           .
183      CO_3B .......................
             V
             V
187      I-19
             V
             V
193      3B-3A
             .
             .
197          .      _3A
             .           .
             .           .
```

```
   203      CO_3A ............

 (***) RUNOFF ALSO COMPUTED AT THIS LOCATION
1****************************************
****************************************
 *                                      *                                                    *
  *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)  *                                                    *    U.S. ARMY CORPS OF ENGINEERS
  *
 *               JUN   1998             *                                                    *    HYDROLOGIC ENGINEERING CENTER
  *
 *            VERSION 4.1               *                                                    *          609 SECOND STREET
  *
 *                                      *                                                    *       DAVIS, CALIFORNIA 95616
  *
 *  RUN DATE   27JUN14  TIME  14:39:10  *                                                    *           (916) 756-1104
  *
 *                                      *                                                    *
  *
 ****************************************
****************************************



                           DRAINAGEWAY #3, #4, & #5 IN GREEN VALLEY
                           GREEN VALLEY DRAINAGEWAYS BASIN MANAGEMENT STUDY
                           100-YEAR RUNOFF ANALYSIS
                           CMG DRAINAGE ENGINEERING---JIANKANG WANG
                           NOAA 14 UPPER 90% RAINFALL---3-HOUR STORM---SCS TYPE II
                           SCS METHOD WITH STANDARD SCS NON-ADJUSTED CN'S
                           AERIAL REDUCTION FACTORS PER TABLE 3.0 AZ STATE STD SS10-07
                           REVISED 10/14/2013

   10 IO          OUTPUT CONTROL VARIABLES
                        IPRNT           5  PRINT CONTROL
                        IPLOT           0  PLOT CONTROL
                        QSCAL          0.  HYDROGRAPH PLOT SCALE

      IT          HYDROGRAPH TIME DATA
                         NMIN           2  MINUTES IN COMPUTATION INTERVAL
                        IDATE      1    0  STARTING DATE
                        ITIME        0000  STARTING TIME
                           NQ         500  NUMBER OF HYDROGRAPH ORDINATES
                       NDDATE      1    0  ENDING DATE
                       NDTIME        1638  ENDING TIME
                       ICENT          19  CENTURY MARK

                    COMPUTATION INTERVAL     .03 HOURS
                         TOTAL TIME BASE   16.63 HOURS

          ENGLISH UNITS
               DRAINAGE AREA          SQUARE MILES
               PRECIPITATION DEPTH    INCHES
               LENGTH, ELEVATION      FEET
               FLOW                   CUBIC FEET PER SECOND
               STORAGE VOLUME         ACRE-FEET
               SURFACE AREA           ACRES
               TEMPERATURE            DEGREES FAHRENHEIT

   12 JD          INDEX STORM NO. 1
                         STRM        3.20  PRECIPITATION DEPTH
                         TRDA        1.00  TRANSPOSITION DRAINAGE AREA

           *** FDKRUT WARNING TIME STEP CALCULATION FAILED TO CONVERGE. STABILITY PROBLEMS MAY RESULT
         *** FDKRUT - NEWTON RAPHSON FAILEDFIXED POINT ITERATION USED - ITERATION=  1
         *** FDKRUT - NEWTON RAPHSON FAILEDFIXED POINT ITERATION USED - ITERATION=  1


1
                                                    RUNOFF SUMMARY
                                               FLOW IN CUBIC FEET PER SECOND
                                            TIME IN HOURS,  AREA IN SQUARE MILES

                                       PEAK   TIME OF     AVERAGE FLOW FOR MAXIMUM PERIOD      BASIN     MAXIMUM     TIME OF
         OPERATION       STATION      FLOW    PEAK                                           AREA      STAGE     MAX STAGE
+                                                          6-HOUR     24-HOUR     72-HOUR

         HYDROGRAPH AT
+                         _5D           74.    1.63           9.          3.          3.        .02

         ROUTED TO
+                         5D-5C         74.    1.70           9.          3.          3.        .02

         HYDROGRAPH AT
+                         _5C           82.    1.63           9.          3.          3.        .03

         2 COMBINED AT
+                         CO_5C        147.    1.63          17.          6.          6.        .05

         ROUTED TO
+                         5C-5A        143.    1.70          17.          6.          6.        .05

         HYDROGRAPH AT
+                         _5B          473.    1.63          50.         18.         18.        .21
```

+	ROUTED TO	5B-5A	468.	1.67	50.	18.	18.	.21
+	HYDROGRAPH AT	_5A	639.	1.67	78.	28.	28.	.29
+	3 COMBINED AT	CO_5A	1134.	1.67	133.	48.	48.	.56
+	ROUTED TO	5A-4A	1128.	1.70	133.	48.	48.	.56
+	HYDROGRAPH AT	_4F	252.	1.67	29.	10.	10.	.10
+	ROUTED TO	4F-4C	252.	1.70	29.	10.	10.	.10
+	HYDROGRAPH AT	_4E	84.	1.63	9.	3.	3.	.03
+	ROUTED TO	4E-4C	81.	1.70	9.	3.	3.	.03
+	HYDROGRAPH AT	_4D	54.	1.57	5.	2.	2.	.01
+	ROUTED TO	4D-4C	57.	1.67	5.	2.	2.	.01
+	HYDROGRAPH AT	_4C	515.	1.60	55.	20.	20.	.20
+	4 COMBINED AT	CO_4C	793.	1.63	89.	32.	32.	.35
+	ROUTED TO	4C-4B	792.	1.67	89.	32.	32.	.35
+	HYDROGRAPH AT	_4B	274.	1.70	35.	13.	13.	.13
+	2 COMBINED AT	CO_4B	1007.	1.67	117.	42.	42.	.47
+	ROUTED TO	4B-4A	1002.	1.67	117.	42.	42.	.47
+	HYDROGRAPH AT	_4A	27.	1.53	2.	1.	1.	.01
+	3 COMBINED AT	CO_4A	1981.	1.70	234.	84.	84.	1.03
+	ROUTED TO	4A-3B	1981.	1.70	234.	84.	84.	1.03
+	HYDROGRAPH AT	_3E	437.	1.60	47.	17.	17.	.17
+	ROUTED TO	3E-3C	436.	1.63	47.	17.	17.	.17
+	HYDROGRAPH AT	_3D	339.	1.57	34.	12.	12.	.12
+	ROUTED TO	3D-3C	337.	1.60	34.	12.	12.	.12
+	HYDROGRAPH AT	_3C	157.	1.57	14.	5.	5.	.05
+	3 COMBINED AT	CO_3C	830.	1.60	87.	31.	31.	.33
+	ROUTED TO	3C-3B	826.	1.60	87.	31.	31.	.33
+	HYDROGRAPH AT	_3B	393.	1.57	40.	14.	14.	.12
+	3 COMBINED AT	CO_3B	2832.	1.67	332.	120.	120.	1.49
+	ROUTED TO	I-19	2511.	1.73	332.	120.	120.	1.49
+	ROUTED TO	3B-3A	2496.	1.77	332.	120.	120.	1.49
+	HYDROGRAPH AT	_3A	602.	1.67	72.	26.	26.	.29
+	2 COMBINED AT	CO_3A	2849.	1.77	384.	139.	139.	1.78

```
1
 *** NORMAL END OF HEC-1 ***
```

```
1****************************************
****************************************
 *                                      *                                                    *
  *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)  *                                                    *    U.S. ARMY CORPS OF ENGINEERS
  *
 *               JUN   1998             *                                                    *    HYDROLOGIC ENGINEERING CENTER
  *
 *            VERSION 4.1               *                                                    *          609 SECOND STREET
  *
 *                                      *                                                    *       DAVIS, CALIFORNIA 95616
  *
 *  RUN DATE   27JUN14  TIME  14:39:40  *                                                    *           (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

```
1                                                HEC-1 INPUT                                                PAGE  1

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

             1          ID   DRAINAGEWAY #6 IN GREEN VALLEY
             2          ID   GREEN VALLEY DRAINAGEWAYS BASIN MANAGEMENT STUDY
             3          ID   100-YEAR RUNOFF ANALYSIS
             4          ID   CMG DRAINAGE ENGINEERING---JIANKANG WANG
             5          ID   NOAA 14 UPPER 90% RAINFALL---3-HOUR STORM---SCS TYPE II
             6          ID   SCS METHOD WITH STANDARD SCS NON-ADJUSTED CN'S
             7          ID   AERIAL REDUCTION FACTORS PER TABLE 3.0 AZ STATE STD SS10-07
             8          ID   REVISED 10/14/2013
                        *DIAGRAM
             9          IT       2                    500
            10          IO       5       0
                        *
            11          IN       5
            12          JD    3.20    1.00
            13          PC    .000    .008    .015    .024    .033    .042    .052    .063    .074    .087
            14          PC    .102    .116    .133    .163    .223    .305    .452    .647    .771    .801
            15          PC    .821    .844    .863    .879    .892    .904    .916    .926    .936    .946
            16          PC    .955    .963    .971    .979    .986    .993   1.000
            17          JD    3.02    2.00
            18          JD    2.93    3.00
            19          JD    2.84    4.00
            20          JD    2.75    5.00
            21          JD    2.71    6.00
            22          JD    2.68    7.00
                        *

            23          KK  _6H
            24          KM   HEADWATERS OF DRAINAGEWAY #6
            25          KM   BASIN 6H
            26          BA   0.168
            27          LS       0    87.3       0
            28          UD   0.168
                        *

            29          KK  6H-6G
            30          KM   KINEMATIC WAVE CHANNEL ROUTING
            31          KM   FROM NODE 6H TO 6G
            32          RK    5752   0.024   0.030            TRAP      36       4
                        *

            33          KK  _6I
            34          KM   LOCAL RUNOFF AT 6I
            35          KM   BASIN 6I
            36          BA   0.291
            37          LS       0    86.7       5
            38          UD   0.211
                        *

            39          KK  6I-6G
```

```
  40          KM   KINEMATIC WAVE CHANNEL ROUTING
  41          KM   FROM NODE 6I TO 6G
  42          RK    5733   0.024   0.030            TRAP      36       4
              *
1                                        HEC-1 INPUT                                                    PAGE  2

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


  43          KK  _6L
  44          KM   LOCAL RUNOFF AT 6L
  45          KM   BASIN 6L
  46          BA   0.241
  47          LS       0    82.3      35
  48          UD   0.284
              *

  49          KK  6L-6G
  50          KM   KINEMATIC WAVE CHANNEL ROUTING
  51          KM   FROM NODE 6I TO 6G
  52          RK    1271   0.010   0.030            TRAP      36       4
              *

  53          KK  _6G
  54          KM   LOCAL RUNOFF AT 6G
  55          KM   BASIN 6G
  56          BA   0.238
  57          LS       0    86.1      35
  58          UD   0.296
              *

  59          KK  CO_6G
  60          KM   COMBINE HYDROGRAPHS
  61          KM   AT NODE CP-6G
  62          HC       4
              *

  63          KK  6G-6D
  64          KM   KINEMATIC WAVE CHANNEL ROUTING
  65          KM   FROM NODE 6G TO 6D
  66          RK     257   0.035   0.022            TRAP      30       4
              *

  67          KK  _6F
  68          KM   LOCAL RUNOFF AT 6F
  69          KM   BASIN 6F
  70          BA   0.291
  71          LS       0    86.1       5
  72          UD   0.195
              *

  73          KK  6F-6E
  74          KM   KINEMATIC WAVE CHANNEL ROUTING
  75          KM   FROM NODE 6F TO 6E
  76          RK    5458   0.026   0.030            TRAP      36       4
              *

  77          KK  _6E
  78          KM   LOCAL RUNOFF AT 6E
  79          KM   BASIN 6E
  80          BA   0.173
  81          LS       0    82.5      35
  82          UD   0.275
              *
1                                        HEC-1 INPUT                                                    PAGE  3

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


  83          KK  CO_6E
  84          KM   COMBINE HYDROGRAPHS
  85          KM   AT NODE CP-6E
  86          HC       2
              *

  87          KK  6E-6D
  88          KM   KINEMATIC WAVE CHANNEL ROUTING
  89          KM   FROM NODE 6E TO 6D
  90          RK     271   0.051   0.022            TRAP      30       4
              *

  91          KK  _6D
  92          KM   LOCAL RUNOFF AT 6D
  93          KM   BASIN 6D
  94          BA   0.002
  95          LS       0    81.9      40
  96          UD   0.144
              *

  97          KK  CO_6D
  98          KM   COMBINE HYDROGRAPHS
  99          KM   AT NODE CP-6D
 100          HC       3
              *

 101          KK  6D-6B
```

```
 102          KM   KINEMATIC WAVE CHANNEL ROUTING
 103          KM   FROM NODE 6D TO 6B
 104          RK    1796   0.020   0.030            TRAP      24       4
              *

 105          KK  _6K
 106          KM   LOCAL RUNOFF AT 6K
 107          KM   BASIN 6K
 108          BA   0.006
 109          LS       0    81.9      35
 110          UD   0.188
              *

 111          KK  6K-6J
 112          KM   KINEMATIC WAVE CHANNEL ROUTING
 113          KM   FROM NODE 6K TO 6J
 114          RK     538   0.013   0.022            TRAP      24       4
              *

 115          KK  _6J
 116          KM   LOCAL RUNOFF AT 6J
 117          KM   BASIN 6J
 118          BA   0.075
 119          LS       0    81.9      50
 120          UD   0.266
              *
1                                          HEC-1 INPUT                                                    PAGE  4

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

 121          KK  CO_6J
 122          KM   COMBINE HYDROGRAPHS
 123          KM   AT NODE CP-6J
 124          HC       2
              *

 125          KK  6J-6B
 126          KM   KINEMATIC WAVE CHANNEL ROUTING
 127          KM   FROM NODE 6J TO 6B
 128          RK     265   0.011   0.030            TRAP      24       4
              *

 129          KK  _6C
 130          KM   LOCAL RUNOFF AT 6C
 131          KM   BASIN 6C
 132          BA   0.010
 133          LS       0    81.9      30
 134          UD   0.205
              *

 135          KK  6C-6B
 136          KM   KINEMATIC WAVE CHANNEL ROUTING
 137          KM   FROM NODE 6C TO 6B
 138          RK    1612   0.022   0.030            TRAP      24       4
              *

 139          KK  _6B
 140          KM   LOCAL RUNOFF AT 6B
 141          KM   BASIN 6B
 142          BA   0.053
 143          LS       0    81.9      35
 144          UD   0.242
              *

 145          KK  CO_6B
 146          KM   COMBINE HYDROGRAPHS
 147          KM   AT NODE CP-6B
 148          HC       4
              *
              *
              *
              *

 149          KK  I-19
 150          KM   RESERVOIR ROUTE FLOW THROUGH CULVERTS @ I-19
 151          RS       1    FLOW      -1
 152          SA       0   0.007   0.177   0.261   0.416   0.689   2.234   3.451   3.623
 153          SQ       0      44     262     579    1002    1514    2087    2673    3299
 154          SE  2864.8  2865.0  2866.0  2867.0  2868.0  2869.0  2870.0  2871.0  2872.0
              *
              *
1                                          HEC-1 INPUT                                                    PAGE  5

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

 155          KK  6B-6A
 156          KM   KINEMATIC WAVE CHANNEL ROUTING
 157          KM   FROM NODE 6B TO 6A
 158          RK    3504   0.018   0.025            TRAP      24       4
              *

 159          KK  _6A
 160          KM   LOCAL RUNOFF AT 6A
 161          KM   BASIN 6A
```

```
162          BA   0.133
163          LS       0    81.9      35
164          UD   0.249
             *

165          KK  CO_6A
166          KM   COMBINE HYDROGRAPHS
167          KM   AT NODE CP-6A
168          HC       2
             *
169          ZZ
1
                 SCHEMATIC DIAGRAM OF STREAM NETWORK
 INPUT
  LINE      (V) ROUTING          (--->) DIVERSION OR PUMP FLOW

   NO.      (.) CONNECTOR        (<---) RETURN OF DIVERTED OR PUMPED FLOW

    23      _6H
                 V
                 V
    29      6H-6G
                 .
                 .
    33           .      _6I
                 .           V
                 .           V
    39           .      6I-6G
                 .           .
                 .           .
    43           .           .      _6L
                 .           .           V
                 .           .           V
    49           .           .      6L-6G
                 .           .           .
                 .           .           .
    53           .           .           .      _6G
                 .           .           .           .
                 .           .           .           .
    59      CO_6G ..................................
                 V
                 V
    63      6G-6D
                 .
                 .
    67           .      _6F
                 .           V
                 .           V
    73           .      6F-6E
                 .           .
                 .           .
    77           .           .      _6E
                 .           .           .
                 .           .           .
    83           .      CO_6E ............
                 .           V
                 .           V
    87           .      6E-6D
                 .           .
                 .           .
    91           .           .      _6D
                 .           .           .
                 .           .           .
    97      CO_6D ......................
                 V
                 V
   101      6D-6B
                 .
                 .
   105           .      _6K
                 .           V
                 .           V
   111           .      6K-6J
                 .           .
                 .           .
   115           .           .      _6J
                 .           .           .
                 .           .           .
   121           .      CO_6J ............
                 .           V
                 .           V
   125           .      6J-6B
                 .           .
                 .           .
   129           .           .      _6C
                 .           .           V
                 .           .           V
   135           .           .      6C-6B
                 .           .           .
                 .           .           .
   139           .           .           .      _6B
                 .           .           .           .
                 .           .           .           .
   145      CO_6B ..................................
                 V
                 V
```

```
   149      I-19
                 V
                 V
   155      6B-6A
                 .
                 .
   159           .      _6A
                 .          .
                 .          .
   165      CO_6A ...........

 (***) RUNOFF ALSO COMPUTED AT THIS LOCATION
1****************************************
****************************************
 *                                      *                                                    *
  *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)  *                                                    *    U.S. ARMY CORPS OF ENGINEERS
  *
 *               JUN   1998             *                                                    *    HYDROLOGIC ENGINEERING CENTER
  *
 *            VERSION 4.1               *                                                    *          609 SECOND STREET
  *
 *                                      *                                                    *       DAVIS, CALIFORNIA 95616
  *
 *  RUN DATE   27JUN14  TIME  14:39:40  *                                                    *           (916) 756-1104
  *
 *                                      *                                                    *
  *
 ****************************************
****************************************
```

```
                          DRAINAGEWAY #6 IN GREEN VALLEY
                          GREEN VALLEY DRAINAGEWAYS BASIN MANAGEMENT STUDY
                          100-YEAR RUNOFF ANALYSIS
                          CMG DRAINAGE ENGINEERING---JIANKANG WANG
                          NOAA 14 UPPER 90% RAINFALL---3-HOUR STORM---SCS TYPE II
                          SCS METHOD WITH STANDARD SCS NON-ADJUSTED CN'S
                          AERIAL REDUCTION FACTORS PER TABLE 3.0 AZ STATE STD SS10-07
                          REVISED 10/14/2013

   10 IO          OUTPUT CONTROL VARIABLES
                        IPRNT           5  PRINT CONTROL
                        IPLOT           0  PLOT CONTROL
                        QSCAL          0.  HYDROGRAPH PLOT SCALE

      IT          HYDROGRAPH TIME DATA
                         NMIN           2  MINUTES IN COMPUTATION INTERVAL
                        IDATE      1    0  STARTING DATE
                        ITIME        0000  STARTING TIME
                           NQ         500  NUMBER OF HYDROGRAPH ORDINATES
                       NDDATE      1    0  ENDING DATE
                       NDTIME        1638  ENDING TIME
                        ICENT          19  CENTURY MARK

                   COMPUTATION INTERVAL     .03 HOURS
                        TOTAL TIME BASE   16.63 HOURS

           ENGLISH UNITS
                DRAINAGE AREA         SQUARE MILES
                PRECIPITATION DEPTH   INCHES
                LENGTH, ELEVATION     FEET
                FLOW                  CUBIC FEET PER SECOND
                STORAGE VOLUME        ACRE-FEET
                SURFACE AREA          ACRES
                TEMPERATURE           DEGREES FAHRENHEIT

   12 JD          INDEX STORM NO. 1
                         STRM        3.20  PRECIPITATION DEPTH
                         TRDA        1.00  TRANSPOSITION DRAINAGE AREA


         *** FDKRUT WARNING TIME STEP CALCULATION FAILED TO CONVERGE. STABILITY PROBLEMS MAY RESULT

         *** FDKRUT - NEWTON RAPHSON FAILEDFIXED POINT ITERATION USED - ITERATION=  1

         *** FDKRUT - NEWTON RAPHSON FAILEDFIXED POINT ITERATION USED - ITERATION=  1


1
                                                        RUNOFF SUMMARY
                                                   FLOW IN CUBIC FEET PER SECOND
                                                 TIME IN HOURS,  AREA IN SQUARE MILES

                                       PEAK   TIME OF     AVERAGE FLOW FOR MAXIMUM PERIOD      BASIN     MAXIMUM     TIME OF
         OPERATION       STATION       FLOW    PEAK                                          AREA      STAGE     MAX STAGE
+                                                          6-HOUR     24-HOUR     72-HOUR

         HYDROGRAPH AT
+                         _6H          488.    1.57          42.         15.         15.        .17

         ROUTED TO
+                         6H-6G        490.    1.67          43.         15.         15.        .17
```

+	HYDROGRAPH AT	_6I	718.	1.60	70.	25.	25.	.29
+	ROUTED TO	6I-6G	708.	1.70	70.	25.	25.	.29
+	HYDROGRAPH AT	_6L	524.	1.67	64.	23.	23.	.24
+	ROUTED TO	6L-6G	521.	1.70	64.	23.	23.	.24
+	HYDROGRAPH AT	_6G	551.	1.67	68.	25.	25.	.24
+	4 COMBINED AT	CO_6G	1952.	1.70	212.	77.	77.	.94
+	ROUTED TO	6G-6D	1952.	1.70	213.	77.	77.	.94
+	HYDROGRAPH AT	_6F	730.	1.60	69.	25.	25.	.29
+	ROUTED TO	6F-6E	727.	1.67	69.	25.	25.	.29
+	HYDROGRAPH AT	_6E	397.	1.67	47.	17.	17.	.17
+	2 COMBINED AT	CO_6E	1052.	1.67	109.	39.	39.	.46
+	ROUTED TO	6E-6D	1051.	1.67	109.	39.	39.	.46
+	HYDROGRAPH AT	_6D	9.	1.53	1.	0.	0.	.00
+	3 COMBINED AT	CO_6D	2781.	1.67	300.	108.	108.	1.40
+	ROUTED TO	6D-6B	2777.	1.70	300.	108.	108.	1.40
+	HYDROGRAPH AT	_6K	22.	1.57	2.	1.	1.	.01
+	ROUTED TO	6K-6J	21.	1.60	2.	1.	1.	.01
+	HYDROGRAPH AT	_6J	201.	1.63	24.	9.	9.	.08
+	2 COMBINED AT	CO_6J	217.	1.63	26.	9.	9.	.08
+	ROUTED TO	6J-6B	216.	1.63	26.	9.	9.	.08
+	HYDROGRAPH AT	_6C	33.	1.60	3.	1.	1.	.01
+	ROUTED TO	6C-6B	33.	1.63	3.	1.	1.	.01
+	HYDROGRAPH AT	_6B	143.	1.63	16.	6.	6.	.05
+	4 COMBINED AT	CO_6B	3017.	1.70	329.	119.	119.	1.55
+	ROUTED TO	I-19	2849.	1.77	329.	119.	119.	1.55
+	ROUTED TO	6B-6A	2842.	1.77	330.	119.	119.	1.55
+	HYDROGRAPH AT	_6A	326.	1.63	37.	13.	13.	.13
+	2 COMBINED AT	CO_6A	3014.	1.77	355.	128.	128.	1.68

*** NORMAL END OF HEC-1 ***

```
1****************************************
****************************************
 *                                      *                                                    *
  *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)  *                                                    *    U.S. ARMY CORPS OF ENGINEERS
  *
 *               JUN   1998             *                                                    *    HYDROLOGIC ENGINEERING CENTER
  *
 *            VERSION 4.1               *                                                    *          609 SECOND STREET
  *
 *                                      *                                                    *       DAVIS, CALIFORNIA 95616
  *
 *  RUN DATE   27JUN14  TIME  14:40:15  *                                                    *           (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.
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DSS:READ TIME SERIES AT DESIRED CALCULATION INTERVAL LOSS RATE:GREEN AND AMPT INFILTRATION
KINEMATIC WAVE: NEW FINITE DIFFERENCE ALGORITHM

1 HEC-1 INPUT PAGE 1

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

   1          ID   DRAINAGEWAY #9 IN GREEN VALLEY
   2          ID   GREEN VALLEY DRAINAGEWAYS BASIN MANAGEMENT STUDY
   3          ID   100-YEAR RUNOFF ANALYSIS
   4          ID   CMG DRAINAGE ENGINEERING---JIANKANG WANG
   5          ID   NOAA 14 UPPER 90% RAINFALL---3-HOUR STORM---SCS TYPE II
   6          ID   SCS METHOD WITH STANDARD SCS NON-ADJUSTED CN'S
   7          ID     AERIAL REDUCTION FACTORS PER TABLE 3.0 AZ STATE STD SS10-07
   8          ID   REVISED 10/14/2013
              *DIAGRAM
   9          IT       2                    500
  10          IO       5       0
              *
  11          IN       5
  12          JD    3.43    1.00
  13          PC    .000    .008    .015    .024    .033    .042    .052    .063    .074    .087
  14          PC    .102    .116    .133    .163    .223    .305    .452    .647    .771    .801
  15          PC    .821    .844    .863    .879    .892    .904    .916    .926    .936    .946
  16          PC    .955    .963    .971    .979    .986    .993   1.000
  17          JD    3.24    2.00
  18          JD    3.14    3.00
  19          JD    3.05    4.00
  20          JD    2.95    5.00
  21          JD    2.91    6.00
  22          JD    2.87    7.00
              *

  23          KK  _1
  24          KM   HEADWATERS OF DRAINAGEWAY #9
  25          KM   BASIN 9/1
  26          BA   1.049
  27          LS       0    91.4       5
  28          UD   1.150
              *

  29          KK  1TO2
  30          KM   MODIFIED PULS NORMAL DEPTH STORAGE ROUTING
  31          KM   FROM NODE 9/1 TO 9/2
  32          RS       1    FLOW      -1
  33          RC   0.080   0.060   0.080    1069  0.0122
  34          RX       0      24      33      36      56      59      68      92
  35          RY       6       2     0.5       0       0     0.5       2       6
              *

  36          KK  _2
  37          KM   LOCAL RUNOFF AT 9/2
  38          KM   BASIN 9/2
  39          BA   0.776
  40          LS       0    88.4       0
  41          UD   0.617
```

```
                    *
1                                                HEC-1 INPUT                                                    PAGE  2

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

        42          KK  CO_2
        43          KM   COMBINE HYDROGRAPHS
        44          KM   AT NODE 9/2
        45          HC       2
                    *

        46          KK  2TO3
        47          KM   MODIFIED PULS NORMAL DEPTH STORAGE ROUTING
        48          KM   FROM NODE 9/2 TO 9/3
        49          RS       9    FLOW      -1
        50          RC   0.080   0.060   0.080   12996  0.0150
        51          RX       0      24      33      36      56      59      68      92
        52          RY       6       2     0.5       0       0     0.5       2       6
                    *

        53          KK  _3
        54          KM   LOCAL RUNOFF AT 9/3
        55          KM   BASIN 9/3
        56          BA   1.135
        57          LS       0    88.2       0
        58          UD   0.698
                    *

        59          KK  CO_3
        60          KM   COMBINE HYDROGRAPHS
        61          KM   AT NODE 9/3
        62          HC       2
                    *

        63          KK  3TO4
        64          KM   MODIFIED PULS NORMAL DEPTH STORAGE ROUTING
        65          KM   FROM NODE 9/3 TO 9/4
        66          RS       3    FLOW      -1
        67          RC   0.080   0.060   0.080    4042  0.0240
        68          RX       0      24      33      36      56      59      68      92
        69          RY       6       2     0.5       0       0     0.5       2       6
                    *

        70          KK  _4
        71          KM   LOCAL RUNOFF AT 9/4
        72          KM   BASIN 9/4
        73          BA   1.146
        74          LS       0    88.3       0
        75          UD   0.607
                    *

        76          KK  CO_4
        77          KM   COMBINE HYDROGRAPHS
        78          KM   AT NODE 9/4
        79          HC       2
                    *
1                                                HEC-1 INPUT                                                    PAGE  3

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

        80          KK  4TO6
        81          KM   MODIFIED PULS NORMAL DEPTH STORAGE ROUTING
        82          KM   FROM NODE 9/4 TO 9/6
        83          RS       8    FLOW      -1
        84          RC   0.060   0.040   0.060   13914  0.0231
        85          RX       0      15    27.5      30      55    57.5      70      85
        86          RY       6       3     0.5       0       0     0.5       3       6
                    *

        87          KK  _6
        88          KM   LOCAL RUNOFF AT 9/6
        89          KM   BASIN 9/6
        90          BA   0.436
        91          LS       0    85.2       5
        92          UD   0.661
                    *

        93          KK  CO_6
        94          KM   COMBINE HYDROGRAPHS
        95          KM   AT NODE 9/6 (CP-9D)
        96          HC       2
                    *

        97          KK  6TO10
        98          KM   KINEMATIC WAVE CHANNEL ROUTING
        99          KM   FROM NODE 9/6 TO 9/10
       100          RK    5021  0.0263   0.025            TRAP      25       4
                    *

       101          KK  _5
       102          KM   LOCAL RUNOFF AT 9/5
       103          KM   BASIN 9/5
       104          BA   0.733
       105          LS       0    86.9       5
```

```
 106          UD   0.588
              *

 107          KK  5TO7
 108          KM   MODIFIED PULS NORMAL DEPTH STORAGE ROUTING
 109          KM   FROM NODE 9/5 TO 9/7
 110          RS      10    FLOW      -1
 111          RC   0.060   0.040   0.060   14159  0.0222
 112          RX       0      15    27.5      30      55    57.5      70      85
 113          RY       6       3     0.5       0       0     0.5       3       6
              *

 114          KK  _7
 115          KM   LOCAL RUNOFF AT 9/7
 116          KM   BASIN 9/7
 117          BA   0.575
 118          LS       0    84.9       5
 119          UD   0.623
              *
1                                          HEC-1 INPUT                                                    PAGE  4

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

 120          KK  CO_7
 121          KM   COMBINE HYDROGRAPHS
 122          KM   AT NODE 9/7 (CP-9E)
 123          HC       2
              *

 124          KK  7TO10
 125          KM   KINEMATIC WAVE CHANNEL ROUTING
 126          KM   FROM NODE 9/7 TO 9/10
 127          RK    5048  0.0261   0.025            TRAP      25       4
              *

 128          KK  _8
 129          KM   LOCAL RUNOFF AT 9/8
 130          KM   BASIN 9/8 (CP-9F)
 131          BA   0.134
 132          LS       0    87.5      35
 133          UD   0.339
              *

 134          KK  8TO10
 135          KM   KINEMATIC WAVE CHANNEL ROUTING
 136          KM   FROM NODE 9/8 TO 9/10
 137          RK     623  0.0273   0.025            TRAP      25       4
              *

 138          KK  _9
 139          KM   LOCAL RUNOFF AT 9/9
 140          KM   BASIN 9/9 (CP-9G)
 141          BA   0.112
 142          LS       0    86.7      40
 143          UD   0.233
              *

 144          KK  9TO10
 145          KM   KINEMATIC WAVE CHANNEL ROUTING
 146          KM   FROM NODE 9/9 TO 9/10
 147          RK     214  0.0374   0.025            TRAP      25       4
              *

 148          KK  _10
 149          KM   LOCAL RUNOFF AT 9/10
 150          KM   BASIN 9/10
 151          BA   0.126
 152          LS       0    82.5      40
 153          UD   0.251
              *

 154          KK  CO_10
 155          KM   COMBINE HYDROGRAPHS
 156          KM   AT NODE 9/10 (CP-9C)
 157          HC       5
              *
1                                          HEC-1 INPUT                                                    PAGE  5

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

 158          KK  10TO11
 159          KM   KINEMATIC WAVE CHANNEL ROUTING
 160          KM   FROM NODE 9/10 TO 9/11
 161          RK    5048  0.0169   0.025            TRAP      25       4
              *

 162          KK  _11
 163          KM   LOCAL RUNOFF AT 9/11
 164          KM   BASIN 9/11
 165          BA   0.091
 166          LS       0    81.9      40
 167          UD   0.298
              *
```

```
168          KK  CO_11
169          KM   COMBINE HYDROGRAPHS
170          KM   AT NODE 9/11 (CP-9B)
171          HC       2
             *
             *
             *
             *

172          KK  I-19
173          KM   RESERVOIR ROUTE FLOW THROUGH CULVERTS @ I-19
174          RS       1    FLOW     -1
175          SA       0   0.062   0.143   0.269   0.475   1.151   5.960   6.019   6.079   6.139
176          SQ       0     253     509     936    1434    1994    2604    3443    4500    5000
177          SE  2881.0  2882.0  2883.0  2884.0  2885.0  2886.0  2887.0  2888.0 2888.99 2889.43
             *
             *

178          KK  11TO12
179          KM   KINEMATIC WAVE CHANNEL ROUTING
180          KM   FROM NODE 9/11 TO 9/12
181          RK    2544  0.0208   0.025            TRAP      25       4
             *

182          KK  _12
183          KM   LOCAL RUNOFF AT 9/12
184          KM   BASIN 9/12
185          BA   0.011
186          LS       0    81.9      15
187          UD   0.244
             *

188          KK  CO_12
189          KM   COMBINE HYDROGRAPHS
190          KM   AT NODE 9/12 (CP-9A)
191          HC       2
             *
192          ZZ
```

1

```
                 SCHEMATIC DIAGRAM OF STREAM NETWORK
 INPUT
  LINE      (V) ROUTING          (--->) DIVERSION OR PUMP FLOW

   NO.      (.) CONNECTOR        (<---) RETURN OF DIVERTED OR PUMPED FLOW

    23      _1
                 V
                 V
    29      1TO2
                 .
                 .
    36           .      _2
                 .           .
                 .           .
    42      CO_2  ............
                 V
                 V
    46      2TO3
                 .
                 .
    53           .      _3
                 .           .
                 .           .
    59      CO_3  ............
                 V
                 V
    63      3TO4
                 .
                 .
    70           .      _4
                 .           .
                 .           .
    76      CO_4  ............
                 V
                 V
    80      4TO6
                 .
                 .
    87           .      _6
                 .           .
                 .           .
    93      CO_6  ............
                 V
                 V
    97      6TO10
                 .
                 .
   101           .      _5
                 .           V
                 .           V
   107           .      5TO7
                 .           .
                 .           .
   114           .           .      _7
                 .           .           .
                 .           .           .
```

```
  120          .      CO_7  ............
               .          V
               .          V
  124          .      7TO10
               .          .
               .          .
  128          .          .      _8
               .          .          V
               .          .          V
  134          .          .      8TO10
               .          .          .
               .          .          .
  138          .          .          .      _9
               .          .          .          V
               .          .          .          V
  144          .          .          .      9TO10
               .          .          .          .
               .          .          .          .
  148          .          .          .          .      _10
               .          .          .          .           .
               .          .          .          .           .
  154      CO_10 ..............................................
               V
               V
  158      10TO11
               .
               .
  162          .      _11
               .          .
               .          .
  168      CO_11 ............
               V
               V
  172      I-19
               V
               V
  178      11TO12
               .
               .
  182          .      _12
               .          .
               .          .
  188      CO_12 ............
```

(***) RUNOFF ALSO COMPUTED AT THIS LOCATION

```
1****************************************
****************************************
 *                                      *                                                      *
  *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)  *                                                      *    U.S. ARMY CORPS OF ENGINEERS
  *
 *              JUN   1998              *                                                      *    HYDROLOGIC ENGINEERING CENTER
  *
 *           VERSION 4.1                *                                                      *          609 SECOND STREET
  *
 *                                      *                                                      *       DAVIS, CALIFORNIA 95616
  *
 *  RUN DATE   27JUN14  TIME  14:40:15  *                                                      *           (916) 756-1104
  *
 *                                      *                                                      *
  *
 ****************************************
****************************************
```

```
                          DRAINAGEWAY #9 IN GREEN VALLEY
                          GREEN VALLEY DRAINAGEWAYS BASIN MANAGEMENT STUDY
                          100-YEAR RUNOFF ANALYSIS
                          CMG DRAINAGE ENGINEERING---JIANKANG WANG
                          NOAA 14 UPPER 90% RAINFALL---3-HOUR STORM---SCS TYPE II
                          SCS METHOD WITH STANDARD SCS NON-ADJUSTED CN'S
                            AERIAL REDUCTION FACTORS PER TABLE 3.0 AZ STATE STD SS10-07
                          REVISED 10/14/2013

  10 IO          OUTPUT CONTROL VARIABLES
                       IPRNT           5  PRINT CONTROL
                       IPLOT           0  PLOT CONTROL
                       QSCAL          0.  HYDROGRAPH PLOT SCALE

     IT          HYDROGRAPH TIME DATA
                        NMIN           2  MINUTES IN COMPUTATION INTERVAL
                       IDATE      1    0  STARTING DATE
                       ITIME        0000  STARTING TIME
                          NQ         500  NUMBER OF HYDROGRAPH ORDINATES
                      NDDATE      1    0  ENDING DATE
                      NDTIME        1638  ENDING TIME
                       ICENT          19  CENTURY MARK

                 COMPUTATION INTERVAL     .03 HOURS
                      TOTAL TIME BASE   16.63 HOURS

           ENGLISH UNITS
                DRAINAGE AREA         SQUARE MILES
```

```
          PRECIPITATION DEPTH   INCHES
          LENGTH, ELEVATION     FEET
          FLOW                  CUBIC FEET PER SECOND
          STORAGE VOLUME        ACRE-FEET
          SURFACE AREA          ACRES
          TEMPERATURE           DEGREES FAHRENHEIT

12 JD          INDEX STORM NO. 1
                 STRM        3.43  PRECIPITATION DEPTH
                 TRDA        1.00  TRANSPOSITION DRAINAGE AREA

      *** FDKRUT - NEWTON RAPHSON FAILEDFIXED POINT ITERATION USED - ITERATION=  1

1
                                                RUNOFF SUMMARY
                                          FLOW IN CUBIC FEET PER SECOND
                                       TIME IN HOURS,  AREA IN SQUARE MILES
```

	OPERATION	STATION	PEAK FLOW	TIME OF PEAK	AVERAGE FLOW FOR MAXIMUM PERIOD 6-HOUR	24-HOUR	72-HOUR	BASIN AREA	MAXIMUM STAGE	TIME OF MAX STAGE
+	HYDROGRAPH AT	_1	916.	2.60	287.	104.	104.	1.05		
+	ROUTED TO	1TO2	914.	2.63	287.	104.	104.	1.05		
+	HYDROGRAPH AT	_2	990.	2.03	192.	69.	69.	.78		
+	2 COMBINED AT	CO_2	1482.	2.23	445.	161.	161.	1.83		
+	ROUTED TO	2TO3	1429.	2.73	442.	161.	161.	1.83		
+	HYDROGRAPH AT	_3	1253.	2.13	267.	96.	96.	1.13		
+	2 COMBINED AT	CO_3	2045.	2.53	657.	239.	239.	2.96		
+	ROUTED TO	3TO4	2031.	2.63	656.	239.	239.	2.96		
+	HYDROGRAPH AT	_4	1409.	2.00	271.	98.	98.	1.15		
+	2 COMBINED AT	CO_4	2539.	2.53	856.	311.	311.	4.11		
+	ROUTED TO	4TO6	2512.	2.77	852.	311.	311.	4.11		
+	HYDROGRAPH AT	_6	509.	2.07	105.	38.	38.	.44		
+	2 COMBINED AT	CO_6	2630.	2.73	909.	333.	333.	4.54		
+	ROUTED TO	6TO10	2629.	2.80	909.	333.	333.	4.54		
+	HYDROGRAPH AT	_5	941.	2.00	178.	64.	64.	.73		
+	ROUTED TO	5TO7	904.	2.33	178.	64.	64.	.73		
+	HYDROGRAPH AT	_7	672.	2.03	133.	48.	48.	.57		
+	2 COMBINED AT	CO_7	1356.	2.27	287.	104.	104.	1.31		
+	ROUTED TO	7TO10	1354.	2.30	287.	104.	104.	1.31		
+	HYDROGRAPH AT	_8	337.	1.70	45.	16.	16.	.13		
+	ROUTED TO	8TO10	336.	1.73	45.	16.	16.	.13		
+	HYDROGRAPH AT	_9	353.	1.60	38.	14.	14.	.11		
+	ROUTED TO	9TO10	352.	1.63	38.	14.	14.	.11		
+	HYDROGRAPH AT	_10	351.	1.63	40.	14.	14.	.13		

```
          5 COMBINED AT
+                         CO_10       3456.    2.40        1175.        432.        432.       6.22

          ROUTED TO
+                         10TO11      3455.    2.47        1175.        432.        432.       6.22

          HYDROGRAPH AT
+                         _11          233.    1.67          29.         11.         11.        .09

          2 COMBINED AT
+                         CO_11       3473.    2.47        1191.        438.        438.       6.31

          ROUTED TO
+                         I-19        3429.    2.60        1191.        438.        438.       6.31

          ROUTED TO
+                         11TO12      3429.    2.60        1191.        438.        438.       6.31

          HYDROGRAPH AT
+                         _12           33.    1.63           4.          1.          1.        .01

          2 COMBINED AT
+                         CO_12       3430.    2.60        1192.        439.        439.       6.32
1

 *** NORMAL END OF HEC-1 ***
```

```
1****************************************
****************************************
 *                                      *                                                      *
  *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)  *                                                      *    U.S. ARMY CORPS OF ENGINEERS
  *
 *               JUN   1998             *                                                      *    HYDROLOGIC ENGINEERING CENTER
  *
 *            VERSION 4.1               *                                                      *          609 SECOND STREET
  *
 *                                      *                                                      *       DAVIS, CALIFORNIA 95616
  *
 *  RUN DATE   27JUN14  TIME  14:40:50  *                                                      *           (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

```
1                                                    HEC-1 INPUT                                                    PAGE  1

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

             1          ID   DRAINAGEWAY #13 IN GREEN VALLEY
             2          ID   GREEN VALLEY DRAINAGEWAYS BASIN MANAGEMENT STUDY
             3          ID   100-YEAR RUNOFF ANALYSIS
             4          ID   CMG DRAINAGE ENGINEERING---JIANKANG WANG
             5          ID   NOAA 14 UPPER 90% RAINFALL---3-HOUR STORM---SCS TYPE II
             6          ID   SCS METHOD WITH STANDARD SCS NON-ADJUSTED CN'S
             7          ID   AERIAL REDUCTION FACTORS PER TABLE 3.0 AZ STATE STD SS10-07
             8          ID   REVISED 10/14/2013
                        *DIAGRAM
             9          IT       2                    500
            10          IO       5       0
                        *
            11          IN       5
            12          JD    3.20    1.00
            13          PC    .000    .008    .015    .024    .033    .042    .052    .063    .074    .087
            14          PC    .102    .116    .133    .163    .223    .305    .452    .647    .771    .801
            15          PC    .821    .844    .863    .879    .892    .904    .916    .926    .936    .946
            16          PC    .955    .963    .971    .979    .986    .993   1.000
            17          JD    3.02    2.00
            18          JD    2.93    3.00
            19          JD    2.84    4.00
            20          JD    2.75    5.00
            21          JD    2.71    6.00
            22          JD    2.68    7.00
                        *

            23          KK  _13F
            24          KM   HEADWATERS OF DRAINAGEWAY #13
            25          KM   BASIN 13F
            26          BA   0.242
            27          LS       0    87.4       5
            28          UD   0.233
                        *

            29          KK  13F-D
            30          KM   KINEMATIC WAVE CHANNEL ROUTING
            31          KM   FROM NODE 13F TO 13D
            32          RK    4757   0.023   0.030            TRAP      20       4
                        *

            33          KK  _13E
            34          KM   LOCAL RUNOFF AT 13E
            35          KM   BASIN 13E
            36          BA   0.101
            37          LS       0    87.6       0
            38          UD   0.251
                        *

            39          KK  13E-D
```

```
  40          KM   KINEMATIC WAVE CHANNEL ROUTING
  41          KM   FROM NODE 13E TO 13D
  42          RK    4719   0.023   0.030            TRAP      20       4
              *
1                                        HEC-1 INPUT                                                    PAGE  2

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


  43          KK  _13D
  44          KM   LOCAL RUNOFF AT 13D
  45          KM   BASIN 13D
  46          BA   0.249
  47          LS       0    85.1      40
  48          UD   0.310
              *

  49          KK  CO_13D
  50          KM   COMBINE HYDROGRAPHS
  51          KM   AT NODE CP-13D
  52          HC       3
              *

  53          KK  13D-C
  54          KM   KINEMATIC WAVE CHANNEL ROUTING
  55          KM   FROM NODE 13D TO 13C
  56          RK     514   0.025   0.030            TRAP      20       4
              *

  57          KK  _13C
  58          KM   LOCAL RUNOFF AT 13C
  59          KM   BASIN 13C
  60          BA   0.018
  61          LS       0    81.9      55
  62          UD   0.232
              *

  63          KK  CO_13C
  64          KM   COMBINE HYDROGRAPHS
  65          KM   AT NODE CP-13C
  66          HC       2
              *

  67          KK  13C-B
  68          KM   KINEMATIC WAVE CHANNEL ROUTING
  69          KM   FROM NODE 13C TO 13B
  70          RK    1159   0.010   0.030            TRAP      36       4
              *

  71          KK  _13J
  72          KM   LOCAL RUNOFF AT 13J
  73          KM   BASIN 13J
  74          BA   0.069
  75          LS       0    81.9       5
  76          UD   0.245
              *

  77          KK  13J-I
  78          KM   KINEMATIC WAVE CHANNEL ROUTING
  79          KM   FROM NODE 13J TO 13I
  80          RK    4513   0.018   0.035            TRAP      15       4
              *
1                                        HEC-1 INPUT                                                    PAGE  3

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


  81          KK  _13K
  82          KM   LOCAL RUNOFF AT 13K
  83          KM   BASIN 13K
  84          BA   0.052
  85          LS       0    81.9       5
  86          UD   0.270
              *

  87          KK  13K-I
  88          KM   KINEMATIC WAVE CHANNEL ROUTING
  89          KM   FROM NODE 13K TO 13I
  90          RK    3949   0.019   0.035            TRAP      15       4
              *

  91          KK  _13I
  92          KM   LOCAL RUNOFF AT 13I
  93          KM   BASIN 13I
  94          BA   0.101
  95          LS       0    85.9      35
  96          UD   0.343
              *

  97          KK  CO_13I
  98          KM   COMBINE HYDROGRAPHS
  99          KM   AT NODE CP-13I
 100          HC       3
              *

 101          KK  13I-H
```

```
 102          KM   KINEMATIC WAVE CHANNEL ROUTING
 103          KM   FROM NODE 13I TO 13H
 104          RK     123   0.065   0.035            TRAP      15       4
              *

 105          KK  _13M
 106          KM   LOCAL RUNOFF AT 13M
 107          KM   BASIN 13M
 108          BA   0.166
 109          LS       0    85.7       0
 110          UD   0.270
              *

 111          KK  13M-L
 112          KM   KINEMATIC WAVE CHANNEL ROUTING
 113          KM   FROM NODE 13M TO 13L
 114          RK    4459   0.016   0.035            TRAP      15       4
              *

 115          KK  _13L
 116          KM   LOCAL RUNOFF AT 13L
 117          KM   BASIN 13L
 118          BA   0.151
 119          LS       0    85.8      25
 120          UD   0.289
              *
1                                   HEC-1 INPUT                                                    PAGE  4

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

 121          KK  CO_13L
 122          KM   COMBINE HYDROGRAPHS
 123          KM   AT NODE CP-13L
 124          HC       2
              *

 125          KK  13L-H
 126          KM   KINEMATIC WAVE CHANNEL ROUTING
 127          KM   FROM NODE 13L TO 13H
 128          RK     187   0.021   0.035            TRAP      15       4
              *

 129          KK  _13H
 130          KM   LOCAL RUNOFF AT 13H
 131          KM   BASIN 13H
 132          BA   0.001
 133          LS       0    81.9      55
 134          UD   0.121
              *

 135          KK  CO_13H
 136          KM   COMBINE HYDROGRAPHS
 137          KM   AT NODE CP-13H
 138          HC       3
              *

 139          KK  13H-G
 140          KM   KINEMATIC WAVE CHANNEL ROUTING
 141          KM   FROM NODE 13H TO 13G
 142          RK    1101   0.016   0.035            TRAP      15       4
              *

 143          KK  _13G
 144          KM   LOCAL RUNOFF AT 13G
 145          KM   BASIN 13G
 146          BA   0.023
 147          LS       0    81.9      60
 148          UD   0.172
              *

 149          KK  CO_13G
 150          KM   COMBINE HYDROGRAPHS
 151          KM   AT NODE CP-13G
 152          HC       2
              *

 153          KK  13G-B
 154          KM   KINEMATIC WAVE CHANNEL ROUTING
 155          KM   FROM NODE 13G TO 13B
 156          RK    1151   0.016   0.030            TRAP      36       4
              *
1                                   HEC-1 INPUT                                                    PAGE  5

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

 157          KK  _13B
 158          KM   LOCAL RUNOFF AT 13B
 159          KM   BASIN 13B
 160          BA   0.143
 161          LS       0    81.9      55
 162          UD   0.132
              *

 163          KK  CO_13B
```

```
164          KM   COMBINE HYDROGRAPHS
165          KM   AT NODE CP-13B
166          HC       3
             *
             *
             *
             *

167          KK  I-19
168          KM   RESERVOIR ROUTE FLOW THROUGH CULVERTS @ I-19
169          RS       1    FLOW      -1
170          SA       0   0.011   0.088   0.228   0.371   0.764   1.420   2.051   2.072
171          SQ       0      88     274     589     968    1415    1897    2380    2500
172          SE  2879.5  2880.0  2881.0  2882.0  2883.0  2884.0  2885.0  2886.0 2886.26
             *
             *

173          KK  13B-A
174          KM   KINEMATIC WAVE CHANNEL ROUTING
175          KM   FROM NODE 13B TO 13A
176          RK    2333   0.020   0.025            TRAP      40       4
             *

177          KK  _13A
178          KM   LOCAL RUNOFF AT 13A
179          KM   BASIN 13A
180          BA   0.007
181          LS       0    81.9      10
182          UD   0.217
             *

183          KK  CO_13A
184          KM   COMBINE HYDROGRAPHS
185          KM   AT NODE CP-13A
186          HC       2
             *
187          ZZ
```

1

SCHEMATIC DIAGRAM OF STREAM NETWORK

```
 INPUT
  LINE      (V) ROUTING          (--->) DIVERSION OR PUMP FLOW

   NO.      (.) CONNECTOR        (<---) RETURN OF DIVERTED OR PUMPED FLOW

    23      _13F
                 V
                 V
    29      13F-D
                 .
                 .
    33           .      _13E
                 .           V
                 .           V
    39           .      13E-D
                 .           .
                 .           .
    43           .           .      _13D
                 .           .           .
                 .           .           .
    49      CO_13D......................
                 V
                 V
    53      13D-C
                 .
                 .
    57           .      _13C
                 .           .
                 .           .
    63      CO_13C............
                 V
                 V
    67      13C-B
                 .
                 .
    71           .      _13J
                 .           V
                 .           V
    77           .      13J-I
                 .           .
                 .           .
    81           .           .      _13K
                 .           .           V
                 .           .           V
    87           .           .      13K-I
                 .           .           .
                 .           .           .
    91           .           .           .      _13I
                 .           .           .           .
                 .           .           .           .
    97           .      CO_13I......................
                 .           V
                 .           V
   101           .      13I-H
                 .           .
                 .           .
   105           .           .      _13M
```

```
                 .          .          V
                 .          .          V
   111           .          .     13M-L
                 .          .          .
                 .          .          .
   115           .          .          .     _13L
                 .          .          .          .
                 .          .          .          .
   121           .          .     CO_13L............
                 .          .          V
                 .          .          V
   125           .          .     13L-H
                 .          .          .
                 .          .          .
   129           .          .          .     _13H
                 .          .          .          .
                 .          .          .          .
   135           .     CO_13H........................
                 .          V
                 .          V
   139           .     13H-G
                 .          .
                 .          .
   143           .          .     _13G
                 .          .          .
                 .          .          .
   149           .     CO_13G............
                 .          V
                 .          V
   153           .     13G-B
                 .          .
                 .          .
   157           .          .     _13B
                 .          .          .
                 .          .          .
   163      CO_13B........................
                 V
                 V
   167      I-19
                 V
                 V
   173      13B-A
                 .
                 .
   177           .     _13A
                 .          .
                 .          .
   183      CO_13A............
```

(***) RUNOFF ALSO COMPUTED AT THIS LOCATION

```
1****************************************
****************************************
 *                                      *                                                    *
  *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)  *                                                    *    U.S. ARMY CORPS OF ENGINEERS
  *
 *              JUN   1998              *                                                    *    HYDROLOGIC ENGINEERING CENTER
  *
 *           VERSION 4.1                *                                                    *          609 SECOND STREET
  *
 *                                      *                                                    *       DAVIS, CALIFORNIA 95616
  *
 *  RUN DATE   27JUN14  TIME  14:40:50  *                                                    *           (916) 756-1104
  *
 *                                      *                                                    *
  *
 ****************************************
****************************************
```

```
                         DRAINAGEWAY #13 IN GREEN VALLEY
                         GREEN VALLEY DRAINAGEWAYS BASIN MANAGEMENT STUDY
                         100-YEAR RUNOFF ANALYSIS
                         CMG DRAINAGE ENGINEERING---JIANKANG WANG
                         NOAA 14 UPPER 90% RAINFALL---3-HOUR STORM---SCS TYPE II
                         SCS METHOD WITH STANDARD SCS NON-ADJUSTED CN'S
                         AERIAL REDUCTION FACTORS PER TABLE 3.0 AZ STATE STD SS10-07
                         REVISED 10/14/2013

   10 IO          OUTPUT CONTROL VARIABLES
                        IPRNT           5  PRINT CONTROL
                        IPLOT           0  PLOT CONTROL
                        QSCAL          0.  HYDROGRAPH PLOT SCALE

      IT          HYDROGRAPH TIME DATA
                         NMIN           2  MINUTES IN COMPUTATION INTERVAL
                        IDATE      1    0  STARTING DATE
                        ITIME        0000  STARTING TIME
                           NQ         500  NUMBER OF HYDROGRAPH ORDINATES
                       NDDATE      1    0  ENDING DATE
                       NDTIME        1638  ENDING TIME
                       ICENT          19  CENTURY MARK
```

```
          COMPUTATION INTERVAL     .03 HOURS
               TOTAL TIME BASE   16.63 HOURS

     ENGLISH UNITS
          DRAINAGE AREA         SQUARE MILES
          PRECIPITATION DEPTH   INCHES
          LENGTH, ELEVATION     FEET
          FLOW                  CUBIC FEET PER SECOND
          STORAGE VOLUME        ACRE-FEET
          SURFACE AREA          ACRES
          TEMPERATURE           DEGREES FAHRENHEIT

12 JD          INDEX STORM NO. 1
                 STRM        3.20  PRECIPITATION DEPTH
                 TRDA        1.00  TRANSPOSITION DRAINAGE AREA

     *** FDKRUT WARNING TIME STEP CALCULATION FAILED TO CONVERGE. STABILITY PROBLEMS MAY RESULT
     *** FDKRUT WARNING TIME STEP CALCULATION FAILED TO CONVERGE. STABILITY PROBLEMS MAY RESULT
     *** FDKRUT WARNING TIME STEP CALCULATION FAILED TO CONVERGE. STABILITY PROBLEMS MAY RESULT


1
                                   RUNOFF SUMMARY
                          FLOW IN CUBIC FEET PER SECOND
                        TIME IN HOURS,  AREA IN SQUARE MILES
```

	OPERATION	STATION	PEAK FLOW	TIME OF PEAK	AVERAGE FLOW FOR MAXIMUM PERIOD 6-HOUR	24-HOUR	72-HOUR	BASIN AREA	MAXIMUM STAGE	TIME OF MAX STAGE
+	HYDROGRAPH AT	_13F	592.	1.63	61.	22.	22.	.24		
+	ROUTED TO	13F-D	581.	1.67	61.	22.	22.	.24		
+	HYDROGRAPH AT	_13E	255.	1.63	27.	10.	10.	.10		
+	ROUTED TO	13E-D	258.	1.73	27.	10.	10.	.10		
+	HYDROGRAPH AT	_13D	559.	1.70	71.	26.	26.	.25		
+	3 COMBINED AT	CO_13D	1253.	1.70	144.	52.	52.	.59		
+	ROUTED TO	13D-C	1250.	1.70	144.	52.	52.	.59		
+	HYDROGRAPH AT	_13C	59.	1.60	7.	2.	2.	.02		
+	2 COMBINED AT	CO_13C	1285.	1.70	149.	54.	54.	.61		
+	ROUTED TO	13C-B	1276.	1.73	149.	54.	54.	.61		
+	HYDROGRAPH AT	_13J	152.	1.63	16.	6.	6.	.07		
+	ROUTED TO	13J-I	148.	1.77	16.	6.	6.	.07		
+	HYDROGRAPH AT	_13K	111.	1.67	12.	5.	5.	.05		
+	ROUTED TO	13K-I	114.	1.80	13.	5.	5.	.05		
+	HYDROGRAPH AT	_13I	230.	1.73	31.	11.	11.	.10		
+	3 COMBINED AT	CO_13I	438.	1.77	54.	19.	19.	.22		
+	ROUTED TO	13I-H	438.	1.77	54.	19.	19.	.22		
+	HYDROGRAPH AT	_13M	357.	1.67	39.	14.	14.	.17		
+	ROUTED TO	13M-L	354.	1.77	39.	14.	14.	.17		
+	HYDROGRAPH AT	_13L	352.	1.67	42.	15.	15.	.15		
+	2 COMBINED AT	CO_13L	638.	1.73	76.	28.	28.	.32		
+	ROUTED TO	13L-H	638.	1.73	76.	28.	28.	.32		

```
          HYDROGRAPH AT
+                         _13H          5.    1.50          0.          0.          0.        .00
          3 COMBINED AT
+                         CO_13H      994.    1.73        122.         44.         44.        .54
          ROUTED TO
+                         13H-G       992.    1.77        122.         44.         44.        .54
          HYDROGRAPH AT
+                         _13G         87.    1.57          8.          3.          3.        .02
          2 COMBINED AT
+                         CO_13G     1018.    1.77        128.         46.         46.        .56
          ROUTED TO
+                         13G-B      1014.    1.77        128.         46.         46.        .56
          HYDROGRAPH AT
+                         _13B        502.    1.53         45.         16.         16.        .14
          3 COMBINED AT
+                         CO_13B     2204.    1.73        290.        105.        105.       1.32
          ROUTED TO
+                         I-19       2160.    1.77        290.        105.        105.       1.32
          ROUTED TO
+                         13B-A      2156.    1.80        290.        105.        105.       1.32
          HYDROGRAPH AT
+                         _13A         21.    1.60          2.          1.          1.        .01
          2 COMBINED AT
+                         CO_13A     2162.    1.80        291.        105.        105.       1.32
 *** NORMAL END OF HEC-1 ***
```

```
1****************************************
****************************************
 *                                      *                                                      *
  *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)  *                                                      *    U.S. ARMY CORPS OF ENGINEERS
  *
 *               JUN   1998             *                                                      *    HYDROLOGIC ENGINEERING CENTER
  *
 *            VERSION 4.1               *                                                      *          609 SECOND STREET
  *
 *                                      *                                                      *       DAVIS, CALIFORNIA 95616
  *
 *  RUN DATE   27JUN14  TIME  14:37:28  *                                                      *           (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

```
1                                                    HEC-1 INPUT                                                    PAGE  1

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

             1          ID   SANTA CRUZ WESTERN CHANNEL IN GREEN VALLEY
             2          ID   GREEN VALLEY DRAINAGEWAYS BASIN MANAGEMENT STUDY
             3          ID   100-YEAR RUNOFF ANALYSIS
             4          ID   CMG DRAINAGE ENGINEERING---JIANKANG WANG
             5          ID   NOAA 14 UPPER 90% RAINFALL---3-HOUR STORM---SCS TYPE II
             6          ID   SCS METHOD WITH STANDARD SCS NON-ADJUSTED CN'S
             7          ID     AERIAL REDUCTION FACTORS PER TABLE 3.0 AZ STATE STD SS10-07
             8          ID   REVISED 03/12/2014
                        *DIAGRAM
             9          IT       2                    500
            10          IO       5       0
                        *
            11          IN       5
            12          JD    3.20    1.00
            13          PC    .000    .008    .015    .024    .033    .042    .052    .063    .074    .087
            14          PC    .102    .116    .133    .163    .223    .305    .452    .647    .771    .801
            15          PC    .821    .844    .863    .879    .892    .904    .916    .926    .936    .946
            16          PC    .955    .963    .971    .979    .986    .993   1.000
            17          JD    3.02    2.00
            18          JD    2.93    3.00
            19          JD    2.84    4.00
            20          JD    2.75    5.00
            21          JD    2.71    6.00
            22          JD    2.68    7.00
                        *

            23          KK  _23B
            24          KM   HEADWATERS OF Santa Cruz Western Channel
            25          KM   BASIN 23B
            26          BA   0.500
            27          LS       0    83.6      12
            28          UD   0.318
                        *

            29          KK  23B-23
            30          KM   KINEMATIC WAVE CHANNEL ROUTING
            31          KM   FROM NODE 23B TO 23
            32          RK    2675  0.0198   0.035            TRAP      15       3
                        *

            33          KK  _23
            34          KM   LOCAL RUNOFF AT 23
            35          KM   BASIN 23
            36          BA   0.234
            37          LS       0    82.2      50
            38          UD   0.250
                        *

            39          KK  CO_23
```

```
  40          KM   COMBINE HYDROGRAPHS
  41          KM   AT NODE CP-23 (WESTERN CHANNEL @ DW#23)
  42          HC       2
              *
```



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

  43          KK  23-22
  44          KM   KINEMATIC WAVE CHANNEL ROUTING
  45          KM   FROM NODE CP-23 TO CP-22
  46          RK     370  0.0054   0.035            TRAP      25       4
              *

  47          KK  _22B
  48          KM   LOCAL RUNOFF AT 22B
  49          KM   BASIN 22B
  50          BA   0.072
  51          LS       0    82.5      10
  52          UD   0.192
              *

  53          KK  22B-22
  54          KM   KINEMATIC WAVE CHANNEL ROUTING
  55          KM   FROM NODE 22B TO 22
  56          RK    2090  0.0182   0.035            TRAP      15       3
              *

  57          KK  _22
  58          KM   LOCAL RUNOFF AT 22
  59          KM   BASIN 22
  60          BA   0.078
  61          LS       0    82.6      40
  62          UD   0.266
              *

  63          KK  CO_22
  64          KM   COMBINE HYDROGRAPHS
  65          KM   AT NODE CP-22 (WESTERN CHANNEL @ DW#22)
  66          HC       3
              *

  67          KK  22-21
  68          KM   KINEMATIC WAVE CHANNEL ROUTING
  69          KM   FROM NODE CP-22 TO CP-21
  70          RK     438  0.0046   0.035            TRAP      25       4
              *

  71          KK  _21B
  72          KM   LOCAL RUNOFF AT 21B
  73          KM   BASIN 21B
  74          BA   0.068
  75          LS       0    83.4      10
  76          UD   0.245
              *

  77          KK  21B-21
  78          KM   KINEMATIC WAVE CHANNEL ROUTING
  79          KM   FROM NODE 21B TO 21
  80          RK    2000  0.0210   0.035            TRAP      15       3
              *
```



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

  81          KK  _21
  82          KM   LOCAL RUNOFF AT 21
  83          KM   BASIN 21
  84          BA   0.055
  85          LS       0    81.9      40
  86          UD   0.235
              *

  87          KK  CO_21
  88          KM   COMBINE HYDROGRAPHS
  89          KM   AT NODE CP-21 (WESTERN CHANNEL @ DW#21)
  90          HC       3
              *

  91          KK  21-20
  92          KM   KINEMATIC WAVE CHANNEL ROUTING
  93          KM   FROM NODE 21 TO 20
  94          RK     720  0.0035   0.035            TRAP      25       4
              *

  95          KK  _20B
  96          KM   LOCAL RUNOFF AT 20B
  97          KM   BASIN 20B
  98          BA   0.289
  99          LS       0    85.0      12
 100          UD   0.337
              *

 101          KK  20B-20
```

```
 102          KM   KINEMATIC WAVE CHANNEL ROUTING
 103          KM   FROM NODE 20B TO 20
 104          RK    1977  0.0200   0.035            TRAP      15       3
              *

 105          KK  _20
 106          KM   LOCAL RUNOFF AT 20
 107          KM   BASIN 20
 108          BA   0.054
 109          LS       0    81.9      40
 110          UD   0.308
              *

 111          KK  CO_20
 112          KM   COMBINE HYDROGRAPHS
 113          KM   AT NODE CP-20 (WESTERN CHANNEL @ DW#20)
 114          HC       3
              *

 115          KK  20-17
 116          KM   KINEMATIC WAVE CHANNEL ROUTING
 117          KM   FROM NODE 20 TO 17
 118          RK    2973  0.0039   0.035            TRAP      25       4
              *
1                                          HEC-1 INPUT                                                PAGE  4

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

 119          KK  _17E
 120          KM   LOCAL RUNOFF AT 17E
 121          KM   BASIN 17E
 122          BA   0.332
 123          LS       0    83.9       0
 124          UD   0.248
              *

 125          KK  17E-B
 126          KM   KINEMATIC WAVE CHANNEL ROUTING
 127          KM   FROM NODE 17E TO 17B
 128          RK    5830  0.0201   0.035            TRAP      15       6
              *

 129          KK  _17B
 130          KM   LOCAL RUNOFF AT 17B
 131          KM   BASIN 17B
 132          BA   0.343
 133          LS       0    83.2      19
 134          UD   0.353
              *

 135          KK  CO_17B
 136          KM   COMBINE HYDROGRAPHS
 137          KM   AT NODE CP-17B
 138          HC       2
              *

 139          KK  17B-17
 140          KM   KINEMATIC WAVE CHANNEL ROUTING
 141          KM   FROM NODE 17B TO 17
 142          RK    2586  0.0186   0.035            TRAP      15       3
              *

 143          KK  _B17
 144          KM   LOCAL RUNOFF AT B17
 145          KM   BASIN B17
 146          BA   0.137
 147          LS       0    81.9      40
 148          UD   0.260
              *

 149          KK  _17
 150          KM   LOCAL RUNOFF AT 17
 151          KM   BASIN 17
 152          BA   0.046
 153          LS       0    81.9      35
 154          UD   0.267
              *
1                                          HEC-1 INPUT                                                PAGE  5

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

 155          KK  CO_17
 156          KM   COMBINE HYDROGRAPHS
 157          KM   AT NODE CP-17
 158          HC       4
              *

 159          KK  17-13
 160          KM   KINEMATIC WAVE CHANNEL ROUTING
 161          KM   FROM NODE 17 TO 13
 162          RK    2586  0.0186   0.035            TRAP      25       4
              *

 163          KK  _B13
```

```
 164          KM   LOCAL RUNOFF AT B13
 165          KM   BASIN B13
 166          BA   0.152
 167          LS       0    81.9      50
 168          UD   0.160
              *
              *

 169          KK  _13F
 170          KM   HEADWATERS OF DRAINAGEWAY #13
 171          KM   BASIN 13F
 172          BA   0.242
 173          LS       0    87.4       5
 174          UD   0.233
              *

 175          KK  13F-D
 176          KM   KINEMATIC WAVE CHANNEL ROUTING
 177          KM   FROM NODE 13F TO 13D
 178          RK    4757   0.023   0.030            TRAP      20       4
              *

 179          KK  _13E
 180          KM   LOCAL RUNOFF AT 13E
 181          KM   BASIN 13E
 182          BA   0.101
 183          LS       0    87.6       0
 184          UD   0.251
              *

 185          KK  13E-D
 186          KM   KINEMATIC WAVE CHANNEL ROUTING
 187          KM   FROM NODE 13E TO 13D
 188          RK    4719   0.023   0.030            TRAP      20       4
              *
1                                        HEC-1 INPUT                                                PAGE  6

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

 189          KK  _13D
 190          KM   LOCAL RUNOFF AT 13D
 191          KM   BASIN 13D
 192          BA   0.249
 193          LS       0    85.1      40
 194          UD   0.310
              *

 195          KK  CO_13D
 196          KM   COMBINE HYDROGRAPHS
 197          KM   AT NODE CP-13D
 198          HC       3
              *

 199          KK  13D-C
 200          KM   KINEMATIC WAVE CHANNEL ROUTING
 201          KM   FROM NODE 13D TO 13C
 202          RK     514   0.025   0.030            TRAP      20       4
              *

 203          KK  _13C
 204          KM   LOCAL RUNOFF AT 13C
 205          KM   BASIN 13C
 206          BA   0.018
 207          LS       0    81.9      55
 208          UD   0.232
              *

 209          KK  CO_13C
 210          KM   COMBINE HYDROGRAPHS
 211          KM   AT NODE CP-13C
 212          HC       2
              *

 213          KK  13C-B
 214          KM   KINEMATIC WAVE CHANNEL ROUTING
 215          KM   FROM NODE 13C TO 13B
 216          RK    1159   0.010   0.030            TRAP      36       4
              *

 217          KK  _13J
 218          KM   LOCAL RUNOFF AT 13J
 219          KM   BASIN 13J
 220          BA   0.069
 221          LS       0    81.9       5
 222          UD   0.245
              *

 223          KK  13J-I
 224          KM   KINEMATIC WAVE CHANNEL ROUTING
 225          KM   FROM NODE 13J TO 13I
 226          RK    4513   0.018   0.035            TRAP      15       4
              *
1                                        HEC-1 INPUT                                                PAGE  7

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

```
 227          KK  _13K
 228          KM   LOCAL RUNOFF AT 13K
 229          KM   BASIN 13K
 230          BA   0.052
 231          LS       0    81.9       5
 232          UD   0.270
              *

 233          KK  13K-I
 234          KM   KINEMATIC WAVE CHANNEL ROUTING
 235          KM   FROM NODE 13K TO 13I
 236          RK    3949   0.019   0.035            TRAP      15       4
              *

 237          KK  _13I
 238          KM   LOCAL RUNOFF AT 13I
 239          KM   BASIN 13I
 240          BA   0.101
 241          LS       0    85.9      35
 242          UD   0.343
              *

 243          KK  CO_13I
 244          KM   COMBINE HYDROGRAPHS
 245          KM   AT NODE CP-13I
 246          HC       3
              *

 247          KK  13I-H
 248          KM   KINEMATIC WAVE CHANNEL ROUTING
 249          KM   FROM NODE 13I TO 13H
 250          RK     123   0.065   0.035            TRAP      15       4
              *

 251          KK  _13M
 252          KM   LOCAL RUNOFF AT 13M
 253          KM   BASIN 13M
 254          BA   0.166
 255          LS       0    85.7       0
 256          UD   0.270
              *

 257          KK  13M-L
 258          KM   KINEMATIC WAVE CHANNEL ROUTING
 259          KM   FROM NODE 13M TO 13L
 260          RK    4459   0.016   0.035            TRAP      15       4
              *

 261          KK  _13L
 262          KM   LOCAL RUNOFF AT 13L
 263          KM   BASIN 13L
 264          BA   0.151
 265          LS       0    85.8      25
 266          UD   0.289
              *
```



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

 267          KK  CO_13L
 268          KM   COMBINE HYDROGRAPHS
 269          KM   AT NODE CP-13L
 270          HC       2
              *

 271          KK  13L-H
 272          KM   KINEMATIC WAVE CHANNEL ROUTING
 273          KM   FROM NODE 13L TO 13H
 274          RK     187   0.021   0.035            TRAP      15       4
              *

 275          KK  _13H
 276          KM   LOCAL RUNOFF AT 13H
 277          KM   BASIN 13H
 278          BA   0.001
 279          LS       0    81.9      55
 280          UD   0.121
              *

 281          KK  CO_13H
 282          KM   COMBINE HYDROGRAPHS
 283          KM   AT NODE CP-13H
 284          HC       3
              *

 285          KK  13H-G
 286          KM   KINEMATIC WAVE CHANNEL ROUTING
 287          KM   FROM NODE 13H TO 13G
 288          RK    1101   0.016   0.035            TRAP      15       4
              *

 289          KK  _13G
 290          KM   LOCAL RUNOFF AT 13G
```

```
291          KM   BASIN 13G
292          BA   0.023
293          LS       0    81.9      60
294          UD   0.172
             *

295          KK  CO_13G
296          KM   COMBINE HYDROGRAPHS
297          KM   AT NODE CP-13G
298          HC       2
             *

299          KK  13G-B
300          KM   KINEMATIC WAVE CHANNEL ROUTING
301          KM   FROM NODE 13G TO 13B
302          RK    1151   0.016   0.030            TRAP      36       4
             *
```



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

303          KK  _13B
304          KM   LOCAL RUNOFF AT 13B
305          KM   BASIN 13B
306          BA   0.143
307          LS       0    81.9      55
308          UD   0.132
             *

309          KK  CO_13B
310          KM   COMBINE HYDROGRAPHS
311          KM   AT NODE CP-13B
312          HC       3
             *
             *

313          KK  I-19
314          KM   RESERVOIR ROUTE FLOW THROUGH CULVERTS @ I-19
315          RS       1    FLOW      -1
316          SA       0   0.011   0.088   0.228   0.371   0.764   1.420   2.051   2.072
317          SQ       0      88     274     589     968    1415    1897    2380    2500
318          SE  2879.5  2880.0  2881.0  2882.0  2883.0  2884.0  2885.0  2886.0 2886.26
             *
             *

319          KK  13B-A
320          KM   KINEMATIC WAVE CHANNEL ROUTING
321          KM   FROM NODE 13B TO 13A
322          RK    2333   0.020   0.025            TRAP      40       4
             *

323          KK  _13A
324          KM   LOCAL RUNOFF AT 13A
325          KM   BASIN 13A
326          BA   0.007
327          LS       0    81.9      10
328          UD   0.217
             *

329          KK  CO_13A
330          KM   COMBINE HYDROGRAPHS
331          KM   AT NODE CP-13A
332          HC       2
             *
             *

333          KK  CO_13
334          KM   COMBINE HYDROGRAPHS
335          KM   AT NODE CP-13
336          HC       3
             *
337          ZZ
```

1

SCHEMATIC DIAGRAM OF STREAM NETWORK

```
 INPUT
  LINE      (V) ROUTING          (--->) DIVERSION OR PUMP FLOW

   NO.      (.) CONNECTOR        (<---) RETURN OF DIVERTED OR PUMPED FLOW

    23      _23B
                 V
                 V
    29      23B-23
                 .
                 .
    33           .      _23
                 .           .
                 .           .
    39      CO_23 ............
                 V
                 V
    43      23-22
                 .
                 .
    47           .      _22B
```

```
                 .          V
                 .          V
 53              .     22B-22
                 .          .
                 .          .
 57              .          .     _22
                 .          .          .
                 .          .          .
 63      CO_22 ......................
                 V
                 V
 67      22-21
                 .
                 .
 71              .     _21B
                 .          V
                 .          V
 77              .     21B-21
                 .          .
                 .          .
 81              .          .     _21
                 .          .          .
                 .          .          .
 87      CO_21 ......................
                 V
                 V
 91      21-20
                 .
                 .
 95              .     _20B
                 .          V
                 .          V
101              .     20B-20
                 .          .
                 .          .
105              .          .     _20
                 .          .          .
                 .          .          .
111      CO_20 ......................
                 V
                 V
115      20-17
                 .
                 .
119              .     _17E
                 .          V
                 .          V
125              .     17E-B
                 .          .
                 .          .
129              .          .     _17B
                 .          .          .
                 .          .          .
135              .     CO_17B...........
                 .          V
                 .          V
139              .     17B-17
                 .          .
                 .          .
143              .          .     _B17
                 .          .          .
                 .          .          .
149              .          .          .     _17
                 .          .          .          .
                 .          .          .          .
155      CO_17 ................................
                 V
                 V
159      17-13
                 .
                 .
163              .     _B13
                 .          .
                 .          .
169              .          .     _13F
                 .          .          V
                 .          .          V
175              .          .     13F-D
                 .          .          .
                 .          .          .
179              .          .          .     _13E
                 .          .          .          V
                 .          .          .          V
185              .          .          .     13E-D
                 .          .          .          .
                 .          .          .          .
189              .          .          .          .     _13D
                 .          .          .          .          .
                 .          .          .          .          .
195              .          .     CO_13D......................
                 .          .          V
                 .          .          V
199              .          .     13D-C
                 .          .          .
                 .          .          .
203              .          .          .     _13C
```

```
                 .          .          .          .
                 .          .          .          .
   209           .          .     CO_13C............
                 .          .          V
                 .          .          V
   213           .          .     13C-B
                 .          .          .
                 .          .          .
   217           .          .          .     _13J
                 .          .          .          V
                 .          .          .          V
   223           .          .          .     13J-I
                 .          .          .          .
                 .          .          .          .
   227           .          .          .          .     _13K
                 .          .          .          .          V
                 .          .          .          .          V
   233           .          .          .          .     13K-I
                 .          .          .          .          .
                 .          .          .          .          .
   237           .          .          .          .          .     _13I
                 .          .          .          .          .          .
                 .          .          .          .          .          .
   243           .          .          .     CO_13I........................
                 .          .          .          V
                 .          .          .          V
   247           .          .          .     13I-H
                 .          .          .          .
                 .          .          .          .
   251           .          .          .          .     _13M
                 .          .          .          .          V
                 .          .          .          .          V
   257           .          .          .          .     13M-L
                 .          .          .          .          .
                 .          .          .          .          .
   261           .          .          .          .          .     _13L
                 .          .          .          .          .          .
                 .          .          .          .          .          .
   267           .          .          .          .     CO_13L............
                 .          .          .          .          V
                 .          .          .          .          V
   271           .          .          .          .     13L-H
                 .          .          .          .          .
                 .          .          .          .          .
   275           .          .          .          .          .     _13H
                 .          .          .          .          .          .
                 .          .          .          .          .          .
   281           .          .          .     CO_13H........................
                 .          .          .          V
                 .          .          .          V
   285           .          .          .     13H-G
                 .          .          .          .
                 .          .          .          .
   289           .          .          .          .     _13G
                 .          .          .          .          .
                 .          .          .          .          .
   295           .          .          .     CO_13G............
                 .          .          .          V
                 .          .          .          V
   299           .          .          .     13G-B
                 .          .          .          .
                 .          .          .          .
   303           .          .          .          .     _13B
                 .          .          .          .          .
                 .          .          .          .          .
   309           .          .     CO_13B........................
                 .          .          V
                 .          .          V
   313           .          .     I-19
                 .          .          V
                 .          .          V
   319           .          .     13B-A
                 .          .          .
                 .          .          .
   323           .          .          .     _13A
                 .          .          .          .
                 .          .          .          .
   329           .          .     CO_13A............
                 .          .          .
                 .          .          .
   333      CO_13 ........................
```

(***) RUNOFF ALSO COMPUTED AT THIS LOCATION

```
1****************************************
****************************************
 *                                      *                                                    *
  *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)  *                                                    *    U.S. ARMY CORPS OF ENGINEERS
  *
 *              JUN   1998              *                                                    *    HYDROLOGIC ENGINEERING CENTER
  *
 *           VERSION 4.1                *                                                    *          609 SECOND STREET
  *
 *                                      *                                                    *       DAVIS, CALIFORNIA 95616
  *
 *  RUN DATE   27JUN14  TIME  14:37:28  *                                                    *           (916) 756-1104
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 *                                    *                                                    *
  *
 ****************************************
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                          SANTA CRUZ WESTERN CHANNEL IN GREEN VALLEY
                          GREEN VALLEY DRAINAGEWAYS BASIN MANAGEMENT STUDY
                          100-YEAR RUNOFF ANALYSIS
                          CMG DRAINAGE ENGINEERING---JIANKANG WANG
                          NOAA 14 UPPER 90% RAINFALL---3-HOUR STORM---SCS TYPE II
                          SCS METHOD WITH STANDARD SCS NON-ADJUSTED CN'S
                            AERIAL REDUCTION FACTORS PER TABLE 3.0 AZ STATE STD SS10-07
                          REVISED 03/12/2014

   10 IO          OUTPUT CONTROL VARIABLES
                        IPRNT           5  PRINT CONTROL
                        IPLOT           0  PLOT CONTROL
                        QSCAL          0.  HYDROGRAPH PLOT SCALE

      IT          HYDROGRAPH TIME DATA
                         NMIN           2  MINUTES IN COMPUTATION INTERVAL
                        IDATE      1    0  STARTING DATE
                        ITIME        0000  STARTING TIME
                           NQ         500  NUMBER OF HYDROGRAPH ORDINATES
                       NDDATE      1    0  ENDING DATE
                       NDTIME        1638  ENDING TIME
                       ICENT          19  CENTURY MARK

                   COMPUTATION INTERVAL     .03 HOURS
                        TOTAL TIME BASE   16.63 HOURS

          ENGLISH UNITS
               DRAINAGE AREA          SQUARE MILES
               PRECIPITATION DEPTH    INCHES
               LENGTH, ELEVATION      FEET
               FLOW                   CUBIC FEET PER SECOND
               STORAGE VOLUME         ACRE-FEET
               SURFACE AREA           ACRES
               TEMPERATURE            DEGREES FAHRENHEIT

   12 JD          INDEX STORM NO. 1
                         STRM        3.20  PRECIPITATION DEPTH
                         TRDA        1.00  TRANSPOSITION DRAINAGE AREA

         *** FDKRUT WARNING TIME STEP CALCULATION FAILED TO CONVERGE. STABILITY PROBLEMS MAY RESULT


1
                                                    RUNOFF SUMMARY
                                               FLOW IN CUBIC FEET PER SECOND
                                            TIME IN HOURS,  AREA IN SQUARE MILES

                                      PEAK   TIME OF     AVERAGE FLOW FOR MAXIMUM PERIOD      BASIN     MAXIMUM     TIME OF
         OPERATION       STATION      FLOW    PEAK                                          AREA      STAGE     MAX STAGE
+                                                          6-HOUR     24-HOUR     72-HOUR

         HYDROGRAPH AT
+                         _23B         851.    1.70         107.         39.         39.        .50

         ROUTED TO
+                         23B-23       848.    1.73         107.         39.         39.        .50

         HYDROGRAPH AT
+                         _23          594.    1.63          68.         25.         25.        .23

         2 COMBINED AT
+                         CO_23       1286.    1.70         164.         59.         59.        .73

         ROUTED TO
+                         23-22       1282.    1.70         164.         59.         59.        .73

         HYDROGRAPH AT
+                         _22B         189.    1.60          18.          6.          6.        .07

         ROUTED TO
+                         22B-22       188.    1.63          18.          6.          6.        .07

         HYDROGRAPH AT
+                         _22          201.    1.63          24.          9.          9.        .08

         3 COMBINED AT
+                         CO_22       1542.    1.70         194.         70.         70.        .88

         ROUTED TO
+                         22-21       1539.    1.70         194.         70.         70.        .88

         HYDROGRAPH AT
+                         _21B         163.    1.63          17.          6.          6.        .07

         ROUTED TO
+                         21B-21       162.    1.67          17.          6.          6.        .07
```

+	HYDROGRAPH AT	_21	154.	1.63	17.	6.	6.	.05
+	3 COMBINED AT	CO_21	1743.	1.70	217.	78.	78.	1.01
+	ROUTED TO	21-20	1735.	1.70	217.	78.	78.	1.01
+	HYDROGRAPH AT	_20B	529.	1.73	69.	25.	25.	.29
+	ROUTED TO	20B-20	528.	1.77	69.	25.	25.	.29
+	HYDROGRAPH AT	_20	130.	1.70	17.	6.	6.	.05
+	3 COMBINED AT	CO_20	2200.	1.73	280.	101.	101.	1.35
+	ROUTED TO	20-17	2196.	1.77	280.	101.	101.	1.35
+	HYDROGRAPH AT	_17E	646.	1.63	68.	25.	25.	.33
+	ROUTED TO	17E-B	645.	1.73	69.	25.	25.	.33
+	HYDROGRAPH AT	_17B	586.	1.73	80.	29.	29.	.34
+	2 COMBINED AT	CO_17B	1130.	1.73	137.	49.	49.	.67
+	ROUTED TO	17B-17	1125.	1.77	137.	50.	50.	.67
+	HYDROGRAPH AT	_B17	336.	1.63	39.	14.	14.	.14
+	HYDROGRAPH AT	_17	118.	1.67	14.	5.	5.	.05
+	4 COMBINED AT	CO_17	3301.	1.77	423.	153.	153.	2.21
+	ROUTED TO	17-13	3293.	1.80	423.	153.	153.	2.21
+	HYDROGRAPH AT	_B13	485.	1.53	46.	17.	17.	.15
+	HYDROGRAPH AT	_13F	592.	1.63	61.	22.	22.	.24
+	ROUTED TO	13F-D	581.	1.67	61.	22.	22.	.24
+	HYDROGRAPH AT	_13E	255.	1.63	27.	10.	10.	.10
+	ROUTED TO	13E-D	258.	1.73	27.	10.	10.	.10
+	HYDROGRAPH AT	_13D	559.	1.70	71.	26.	26.	.25
+	3 COMBINED AT	CO_13D	1253.	1.70	144.	52.	52.	.59
+	ROUTED TO	13D-C	1250.	1.70	144.	52.	52.	.59
+	HYDROGRAPH AT	_13C	59.	1.60	7.	2.	2.	.02
+	2 COMBINED AT	CO_13C	1285.	1.70	149.	54.	54.	.61
+	ROUTED TO	13C-B	1276.	1.73	149.	54.	54.	.61
+	HYDROGRAPH AT	_13J	152.	1.63	16.	6.	6.	.07
+	ROUTED TO	13J-I	148.	1.77	16.	6.	6.	.07
+	HYDROGRAPH AT	_13K	111.	1.67	12.	5.	5.	.05
+	ROUTED TO	13K-I	114.	1.80	13.	5.	5.	.05

+	HYDROGRAPH AT	_13I	230.	1.73	31.	11.	11.	.10
+	3 COMBINED AT	CO_13I	438.	1.77	54.	19.	19.	.22
+	ROUTED TO	13I-H	438.	1.77	54.	19.	19.	.22
+	HYDROGRAPH AT	_13M	357.	1.67	39.	14.	14.	.17
+	ROUTED TO	13M-L	354.	1.77	39.	14.	14.	.17
+	HYDROGRAPH AT	_13L	352.	1.67	42.	15.	15.	.15
+	2 COMBINED AT	CO_13L	638.	1.73	76.	28.	28.	.32
+	ROUTED TO	13L-H	638.	1.73	76.	28.	28.	.32
+	HYDROGRAPH AT	_13H	5.	1.50	0.	0.	0.	.00
+	3 COMBINED AT	CO_13H	994.	1.73	122.	44.	44.	.54
+	ROUTED TO	13H-G	992.	1.77	122.	44.	44.	.54
+	HYDROGRAPH AT	_13G	87.	1.57	8.	3.	3.	.02
+	2 COMBINED AT	CO_13G	1018.	1.77	128.	46.	46.	.56
+	ROUTED TO	13G-B	1014.	1.77	128.	46.	46.	.56
+	HYDROGRAPH AT	_13B	502.	1.53	45.	16.	16.	.14
+	3 COMBINED AT	CO_13B	2204.	1.73	290.	105.	105.	1.32
+	ROUTED TO	I-19	2160.	1.77	290.	105.	105.	1.32
+	ROUTED TO	13B-A	2156.	1.80	290.	105.	105.	1.32
+	HYDROGRAPH AT	_13A	21.	1.60	2.	1.	1.	.01
+	2 COMBINED AT	CO_13A	2162.	1.80	291.	105.	105.	1.32
+	3 COMBINED AT	CO_13	5099.	1.80	688.	248.	248.	3.68

*** NORMAL END OF HEC-1 ***

APPENDIX F

WATERSHED MAPS

APPENDIX G

PC – HYDRO INPUT PARAMETER TABLES

Table 1: Summary of Existing Conditions 100-Year Peak Discharge Rates and Watershed Characters

Concentration Point (CP)*	WS Area (Cumulative) (acres)	Q100 (cfs)**	Q100 per acre (cfs/acre)	Hydrologic Soils Group Area Weighted (100%)			Flow length L (ft) (Cumulative)	L_{ca} (ft)	H_1 (ft)	L_1 (ft)	Basin Factor (n_b)	H_2 (ft)	L_2 (ft)	Basin Factor (n_b)	H_3 (ft)	L_3 (ft)	Basin Factor (n_b)	H_4 (ft)	L_4 (ft)	Basin Factor (n_b)	Impervious Cover (Area Weighted)	Vegetation Cover
				B	C	D																
1A	581.0	1,963	3.4	98.5%	1.5%	0.0%	12,867	7,346	98	4,250	0.035	47	1,861	0.022	3	369	0.022	140	6,387	0.022	21%	30%
1B	188.4	683	3.6	100.0%	0.0%	0.0%	7,028	3,500	152	7,028	0.03										20%	30%
1C	379.5	1,488	3.9	97.8%	2.2%	0.0%	9,403	4,600	98	4,250	0.035	47	1,861	0.022	3	369	0.022	76	2,923	0.022	21%	30%
1D	245.9	1,007	4.1	96.6%	3.4%	0.0%	6,480	3,400	98	4,250	0.035	47	1,861	0.022	3	369	0.022				16%	30%
1E	218.6	884	4.0	96.4%	3.6%	0.0%	6,111	3,300	98	4,250	0.035	47	1,861	0.022							12%	30%
1F	147.0	555	3.8	95.6%	4.4%	0.0%	4,250	2,402	98	4,250	0.035										5%	30%
1G	23.2	159	6.8	97.7%	2.3%	0.0%	5,745	2,873	70	2,895	0.022	36	1,760	0.022	27	1,090	0.022				57%	30%
1H	19.9	146	7.3	97.3%	2.7%	0.0%	4,655	2,328	70	2,895	0.022	36	1,760	0.022							60%	30%
1I	8.9	75	8.5	94.0%	6.0%	0.0%	2,895	1,448	70	2,895	0.022										60%	30%
1J	85.7	359	4.2	94.0%	6.0%	0.0%	3,530	1,754	83	3,530	0.035										0%	30%
2A	100.6	567	5.6	100.0%	0.0%	0.0%	4,059	1,768	63	4,059	0.025										30%	30%
2B	51.2	359	7.0	100.0%	0.0%	0.0%	2,364	846	46	2,364	0.025										18%	30%
2C	20.2	144	7.1	100.0%	0.0%	0.0%	1,794	897	34	1,794	0.025										30%	30%
3A	1,136.3	2,849	2.5	See Detail on HEC-1 Inputs																		
3B	952.0	2,832	3.0																			
3C	212.0	830	3.9																			
3D	75.5	339	4.5																			
3E	105.9	437	4.1																			
4A	662.1	1,981	3.0																			
4B	301.5	1,007	3.3																			
4C	221.5	793	3.6																			
4D	9.7	54	5.6																			
4E	18.1	84	4.6																			
4F	64.4	252	3.9																			
5A	355.9	1,134	3.2																			
5B	136.7	473	3.5																			
5C	33.1	147	4.4																			
5D	15.0	74	4.9																			
6A	922.2	3,014	3.3																			
6B	837.3	3,017	3.6																			
6C	6.7	33	5.0																			
6D	744.5	2,781	3.7																			

Table 1: Summary of Existing Conditions 100-Year Peak Discharge Rates and Watershed Characters

Concentration Point (CP)*	WS Area (Cumulative) (acres)	Q100 (cfs)**	Q100 per acre (cfs/acre)	Hydrologic Soils Group Area Weighted (100%) B	C	D	Flow length L (ft) (Cumulative)	L_{ca} (ft)	H_1 (ft)	L_1 (ft)	Basin Factor (n_b)	H_2 (ft)	L_2 (ft)	Basin Factor (n_b)	H_3 (ft)	L_3 (ft)	Basin Factor (n_b)	H_4 (ft)	L_4 (ft)	Basin Factor (n_b)	Impervious Cover (Area Weighted)	Vegetation Cover
6E	297.4	1,052	3.5																			
6F	186.5	730	3.9																			
6G	600.0	1,952	3.3																			
6H	107.3	488	4.5																			
6I	186.1	718	3.9																			
6J	52.0	217	4.2																			
6K	4.0	22	5.5																			
6L	154.2	524	3.4																			
7A	329.3	1,492	4.5	61.0%	39.0%	0.0%	12,863	6,097	83	2,656	0.035	108	4,150	0.025	24	1,513	0.022	91	4,544	0.022	40%	30%
7B	293.6	1,575	5.4	56.2%	43.8%	0.0%	9,864	3,700	83	2,656	0.035	108	4,150	0.025	24	1,513	0.022	38	1,545	0.022	43%	30%
7C	54.2	388	7.2	100.0%	0.0%	0.0%	3,394	1,728	56	3,118	0.022	3	276	0.022							51%	30%
7D	38.6	293	7.6	100.0%	0.0%	0.0%	3,118	1,584	56	3,118	0.022										55%	30%
7E	9.2	66	7.1	100.0%	0.0%	0.0%	1,194	597	30	1,194	0.03										30%	30%
7F	234.8	1,268	5.4	45.3%	54.7%	0.0%	9,499	3,700	83	2,656	0.035	108	4,150	0.025	24	1,513	0.022	33	1,180	0.022	41%	30%
7G	224.5	1,260	5.6	43.5%	56.5%	0.0%	8,319	3,100	83	2,656	0.035	108	4,150	0.025	24	1,513	0.022				40%	30%
7H	115.6	614	5.3	23.7%	76.3%	0.0%	6,806	3,101	83	2,656	0.035	108	4,150	0.025							24%	30%
7I	21.9	129	5.9	1.3%	98.7%	0.0%	2,656	1,151	83	2,656	0.035										0%	30%
7J	77.4	559	7.2	54.0%	46.0%	0.0%	4,941	2,628	118	4,941	0.022										55%	30%
7K	53.8	415	7.7	100.0%	0.0%	0.0%	3,230	1,700	58	3,230	0.022										60%	30%
8A	95.4	597	6.3	100.0%	0.0%	0.0%	5,752	3,300	31	2,997	0.022	64	2,755	0.022							60%	30%
8B	84.2	588	7.0	100.0%	0.0%	0.0%	4,196	1,650	31	2,997	0.022	32	1,199	0.022							60%	30%
8C	82.2	586	7.1	100.0%	0.0%	0.0%	3,611	1,500	31	2,997	0.022	20	614	0.022							60%	30%
8D	75.4	567	7.5	100.0%	0.0%	0.0%	2,997	1,100	31	2,997	0.022										70%	30%
8E	38.5	290	7.5	100.0%	0.0%	0.0%	2,582	1,136	36	2,582	0.022										50%	30%
8F	51.6	370	7.2	100.0%	0.0%	0.0%	2,995	1,268	40	2,995	0.022										50%	30%
9A	4,044.8	3,430	0.8	See Detail on HEC-1 Inputs																		
9B	4,038.4	3,473	0.9																			
9C	3,980.8	3,456	0.9																			
9D	2,905.6	2,630	0.9																			
9E	838.4	1,356	1.6																			
9F	85.7	337	3.9																			
9G	71.8	353	4.9																			

Table 1: Summary of Existing Conditions 100-Year Peak Discharge Rates and Watershed Characters

Concentration Point (CP)*	WS Area (Cumulative) (acres)	Q100 (cfs)**	Q100 per acre (cfs/acre)	Hydrologic Soils Group Area Weighted (100%) B	C	D	Flow length L (ft) (Cumulative)	L_{ca} (ft)	H_1 (ft)	L_1 (ft)	Basin Factor (n_b)	H_2 (ft)	L_2 (ft)	Basin Factor (n_b)	H_3 (ft)	L_3 (ft)	Basin Factor (n_b)	H_4 (ft)	L_4 (ft)	Basin Factor (n_b)	Impervious Cover (Area Weighted)	Vegetation Cover
10A	29.3	235	8.0	100.0%	0.0%	0.0%	3,042	1,078	60	3,042	0.022										50%	30%
11A	41.6	286	6.9	100.0%	0.0%	0.0%	3,319	1,792	48	3,319	0.022										50%	30%
12A	36.0	264	7.3	100.0%	0.0%	0.0%	3,040	1,507	51	3,040	0.022										50%	30%
13A	846.8	2,162	2.6	See Detail on HEC-1 Inputs																		
13B	842.6	2,204	2.6																			
13C	390.2	1,285	3.3																			
13D	378.9	1,253	3.3																			
13E	64.4	255	4.0																			
13F	155.1	592	3.8																			
13G	361.1	1,018	2.8																			
13H	346.3	994	2.9																			
13I	142.6	438	3.1																			
13J	44.4	152	3.4																			
13K	33.5	111	3.3																			
13L	203.0	638	3.1																			
13M	106.2	357	3.4																			
14A	18.3	147	8.0	100.0%	0.0%	0.0%	2,358	850	42	2,358	0.022										50%	30%
15A	20.0	161	8.0	100.0%	0.0%	0.0%	1,935	700	28	1,935	0.022										50%	30%
16A	55.5	412	7.4	100.0%	0.0%	0.0%	2,467	1,500	38	2,467	0.022										50%	30%
17A	461.5	1,281	2.8	78.9%	21.1%	0.0%	13,866	8,500	9	42	0.035	103	5,438	0.035	74	3,746	0.03	91	4,640	0.022	11%	30%
17B	431.9	1,241	2.9	77.4%	22.6%	0.0%	11,311	6,700	9	42	0.035	103	5,438	0.035	74	3,746	0.03	41	2,085	0.022	9%	30%
17C	378.0	1,110	2.9	74.2%	25.8%	0.0%	9,226	5,000	9	42	0.035	103	5,438	0.035	74	3,746	0.03				4%	30%
17D	83.0	284	3.4	96.0%	4.0%	0.0%	5,488	2,821	10	195	0.035	114	5,293	0.035							0%	30%
17E	212.5	712	3.4	65.0%	35.0%	0.0%	5,480	3,461	9	42	0.035	103	5,438	0.035							0%	30%
18A	26.6	202	7.6	100.0%	0.0%	0.0%	1,991	720	43	1,991	0.022										40%	30%
19A	30.1	215	7.1	100.0%	0.0%	0.0%	2,161	1,300	31	2,161	0.022										40%	30%
20A	219.6	739	3.4	54.6%	45.4%	0.0%	10,722	4,650	135	6,952	0.035	29	1,793	0.03	47	1,977	0.022				16%	30%
20B	184.9	649	3.5	46.1%	53.9%	0.0%	8,745	3,400	135	6,952	0.035	29	1,793	0.03							12%	30%
20C	128.2	509	4.0	22.3%	77.7%	0.0%	6,952	2,700	135	6,952	0.035										10%	30%
21A	79.0	382	4.8	85.7%	14.3%	0.0%	6,644	2,200	64	2,931	0.035	43	1,713	0.03	49	2,000	0.022				23%	30%
21B	43.6	203	4.7	74.1%	25.9%	0.0%	4,644	1,690	64	2,931	0.035	43	1,713	0.03							10%	30%

Table 1: Summary of Existing Conditions 100-Year Peak Discharge Rates and Watershed Characters

Concentration Point (CP)*	WS Area (Cumulative) (acres)	Q100 (cfs)**	Q100 per acre (cfs/acre)	Hydrologic Soils Group Area Weighted (100%)			Flow length L (ft) (Cumulative)	L_{ca} (ft)	H_1 (ft)	L_1 (ft)	Basin Factor (n_b)	H_2 (ft)	L_2 (ft)	Basin Factor (n_b)	H_3 (ft)	L_3 (ft)	Basin Factor (n_b)	H_4 (ft)	L_4 (ft)	Basin Factor (n_b)	Impervious Cover (Area Weighted)	Vegetation Cover
				B	C	D																
21C	19.8	107	5.4	43.0%	57.0%	0.0%	2,931	1,150	64	2,931	0.035										10%	30%
22A	95.7	503	5.3	88.2%	11.8%	0.0%	5,313	2,500	41	1,608	0.035	42	1,615	0.03	48	2,090	0.022				26%	30%
22B	45.8	236	5.1	89.5%	10.5%	0.0%	3,223	1,300	41	1,608	0.035	42	1,615	0.03							10%	30%
22C	13.8	88	6.4	65.0%	35.0%	0.0%	1,608	600	41	1,608	0.035										10%	30%
23A	469.9	1,638	3.5	78.3%	21.7%	0.0%	12,367	4,500	84	3,406	0.035	97	6,286	0.03	52	2,675	0.022				24%	30%
23B	319.8	1,044	3.3	70.4%	29.6%	0.0%	9,692	4,250	84	3,406	0.035	97	6,286	0.03							12%	30%
23C	60.2	299	5.0	29.0%	71.0%	0.0%	3,406	1,650	84	3,406	0.035										0%	30%
24A	539.1	1,637	3.0	92.6%	7.4%	0.0%	12,258	6,800	75	3,935	0.035	105	5,854	0.03	43	1,486	0.022	15	983	0.022	20%	30%
24B	294.7	793	2.7	91.1%	8.9%	0.0%	11,275	6,950	75	3,935	0.035	105	5,854	0.03	43	1,486	0.022				5%	30%
24C	278.7	767	2.8	90.7%	9.3%	0.0%	9,789	5,900	75	3,935	0.035	105	5,854	0.03							5%	30%
24D	208.8	907	4.3	95.0%	5.0%	0.0%	9,987	4,456	117	4,558	0.035	67	3,413	0.022	31	2,016	0.022				36%	30%
24E	173.3	815	4.7	95.0%	5.0%	0.0%	7,971	3,612	117	4,558	0.035	67	3,413	0.022							35%	30%
24F	78.0	312	4.0	86.0%	14.0%	0.0%	3,935	1,719	75	3,935	0.035										0%	30%
24G	63.4	263	4.1	100.0%	0.0%	0.0%	3,653	1,419	63	1,290	0.035	35	2,363	0.035							0%	30%
25A	217.6	1,164	5.3	88.8%	11.2%	0.0%	8,325	3,652	158	6,335	0.025	36	1,990	0.022							39%	30%
25B	166.3	963	5.8	89.0%	11.0%	0.0%	6,335	2,575	158	6,335	0.025										35%	30%
13***	2,357.3	5,099	2.2	See Detail on HEC-1 Inputs																		
17***	1,413.2	3,301	2.3																			
20***	864.2	2,200	2.5																			
21***	644.6	1,743	2.7																			
22***	565.5	1,542	2.7																			
23***	469.9	1,286	2.7																			

*Numerical numbers at the beginning of the Concentration Point ID are corresponding to drainageway IDs.

**Q100 at Drainageway #3, 4, 5, 6, 9, 13, Santa Cruz Western Channel are obtained from HEC-1 models. Q100 at all other Drainageways are obtained from PC-HYDRO.

*** Concentration Points at Santa Cruz Cruz Western Channel. Concentration Point IDs are corresponding to the IDs for drainageway entering Santa Cruz Western Channel.

APPENDIX H

PC – HYDRO DATA SHEETS

HYDROLOGIC DATA SHEET FOR PIMA COUNTY FLOOD PEAK PROCEDURE

Pima County Regional Flood Control District

Client: _____ Prepared by: BJK

Project Name: Green Valley Drainageway Date: 09/18/2013

Concentration Point: CP1A Job #: 13-008

Watershed Area: 581.0 ac Watershed Type: Medium Density Urbanized

Watercourse Data By Reach

Reach No.	Height (Hi)	Length (Li)	Slope (Si)	Basin Factor (Nb)
1	98.0	4,250	0.0231	.035
2	47.0	1,861	0.0253	.022
3	3.0	369	0.0081	.022
4	140.0	6,387	0.0219	.022

Length of Watercourse (Lc): 12,867 feet Mean Slope: 0.0219

Length to Cen. of Gravity (Lca): 7,346 feet Weighted Basin Fac.: 0.026

Veg. Cover Type(s): Desert Brush Veg. Cover Density: 30 %

RETURN PERIOD: 100-years

Rainfall Depths: NOAA Atlas 14 (90% UCL) @ Latitude: 31.8680 Longitude: -111.0040

Duration:	5-min	10-min	15-min	30-min	60-min	2-hr	3-hr	6-hr	12-hr	24-hr
Point Values (in)	0.88	1.35	1.67	2.25	2.78	3.10	3.20	3.62	3.94	4.30
Areal Values (in)	0.88	1.35	1.67	2.25	2.78	3.10	3.20	3.62	3.94	4.30

Soils Data

Soil Type	Percent	Curve # (CN)	Adj. Curve # (CN*)	Runoff Coef. (C)
B	98	82.	86.64	0.548
C	2	87.	90.25	0.649
D	0	.	.	0.000
Imp.	21	99.	99.	0.958

Weighted Runoff Coef. (Cw): 0.635

Time of Concentration: 22.1 min

Rainfall Intensity (i) @ Tc: 5.28 in/hr

Runoff Supply Rate (q) @ Tc: 3.35 in/hr

PEAK DISCHARGE: 1,963 cfs

PC-Hydro, Ver 5.4.2

HYDROLOGIC DATA SHEET FOR PIMA COUNTY FLOOD PEAK PROCEDURE

Pima County Regional Flood Control District

Client: _____ Prepared by: BJK

Project Name: Green Valley Drainageway Date: 09/06/2013

Concentration Point: CP1B Job #: 13-008

Watershed Area: 188.4 ac Watershed Type: Medium Density Urbanized

Watercourse Data By Reach

Reach No.	Height (Hi)	Length (Li)	Slope (Si)	Basin Factor (Nb)
1	152.0	7,028	0.0216	.035

Length of Watercourse (Lc): 7,028 feet Mean Slope: 0.0216

Length to Cen. of Gravity (Lca): 3,500 feet Weighted Basin Fac.: 0.035

Veg. Cover Type(s): Desert Brush Veg. Cover Density: 30 %

RETURN PERIOD: 100-years

Rainfall Depths: NOAA Atlas 14 (90% UCL) @ Latitude: 31.8680 Longitude: -111.0040

Duration:	5-min	10-min	15-min	30-min	60-min	2-hr	3-hr	6-hr	12-hr	24-hr
Point Values (in)	0.88	1.35	1.67	2.25	2.78	3.10	3.20	3.62	3.94	4.30
Areal Values (in)	0.88	1.35	1.67	2.25	2.78	3.10	3.20	3.62	3.94	4.30

Soils Data

Soil Type	Percent	Curve # (CN)	Adj. Curve # (CN*)	Runoff Coef. (C)
B	100	82.	86.64	0.548
C	0	.	.	0.000
D	0	.	.	0.000
Imp.	20	99.	99.	0.958

Weighted Runoff Coef. (Cw): 0.630

Time of Concentration: 19.3 min

Rainfall Intensity (i) @ Tc: 5.71 in/hr

Runoff Supply Rate (q) @ Tc: 3.59 in/hr

PEAK DISCHARGE: 683 cfs

PC-Hydro, Ver 5.4.2

HYDROLOGIC DATA SHEET FOR PIMA COUNTY FLOOD PEAK PROCEDURE

Pima County Regional Flood Control District

Client: _____ Prepared by: BJK

Project Name: Green Valley Drainageway Date: 09/18/2013

Concentration Point: CP1C Job #: 13-008

Watershed Area: 379.5 ac Watershed Type: Medium Density Urbanized

Watercourse Data By Reach

Reach No.	Height (Hi)	Length (Li)	Slope (Si)	Basin Factor (Nb)
1	98.0	4,250	0.0231	.035
2	47.0	1,861	0.0253	.022
3	3.0	369	0.0081	.022
4	76.0	2,923	0.0260	.022

Length of Watercourse (Lc): 9,403 feet Mean Slope: 0.0231

Length to Cen. of Gravity (Lca): 4,600 feet Weighted Basin Fac.: 0.028

Veg. Cover Type(s): Desert Brush Veg. Cover Density: 30 %

RETURN PERIOD: 100-years

Rainfall Depths: NOAA Atlas 14 (90% UCL) @ Latitude: 31.8680 Longitude: -111.0040

Duration:	5-min	10-min	15-min	30-min	60-min	2-hr	3-hr	6-hr	12-hr	24-hr
Point Values (in)	0.88	1.35	1.67	2.25	2.78	3.10	3.20	3.62	3.94	4.30
Areal Values (in)	0.88	1.35	1.67	2.25	2.78	3.10	3.20	3.62	3.94	4.30

Soils Data

Soil Type	Percent	Curve # (CN)	Adj. Curve # (CN*)	Runoff Coef. (C)
B	98	82.	86.64	0.548
C	2	87.	90.25	0.649
D	0	.	.	0.000
Imp.	21	99.	99.	0.958

Weighted Runoff Coef. (Cw): 0.635

Time of Concentration: 17.2 min

Rainfall Intensity (i) @ Tc: 6.12 in/hr

Runoff Supply Rate (q) @ Tc: 3.89 in/hr

PEAK DISCHARGE: 1,488 cfs

PC-Hydro, Ver 5.4.2

HYDROLOGIC DATA SHEET FOR PIMA COUNTY FLOOD PEAK PROCEDURE

Pima County Regional Flood Control District

Client: _____ Prepared by: BJK

Project Name: Green Valley Drainageway Date: 09/18/2013

Concentration Point: CP1D Job #: 13-008

Watershed Area: 245.9 ac Watershed Type: Medium Density Urbanized

Watercourse Data By Reach

Reach No.	Height (Hi)	Length (Li)	Slope (Si)	Basin Factor (Nb)
1	98.0	4,250	0.0231	.035
2	47.0	1,861	0.0253	.022
3	3.0	369	0.0081	.022

Length of Watercourse (Lc): 6,480 feet Mean Slope: 0.0219

Length to Cen. of Gravity (Lca): 3,400 feet Weighted Basin Fac.: 0.030

Veg. Cover Type(s): Desert Brush Veg. Cover Density: 30 %

RETURN PERIOD: 100-years

Rainfall Depths: NOAA Atlas 14 (90% UCL) @ Latitude: 31.8680 Longitude: -111.0040

Duration:	5-min	10-min	15-min	30-min	60-min	2-hr	3-hr	6-hr	12-hr	24-hr
Point Values (in)	0.88	1.35	1.67	2.25	2.78	3.10	3.20	3.62	3.94	4.30
Areal Values (in)	0.88	1.35	1.67	2.25	2.78	3.10	3.20	3.62	3.94	4.30

Soils Data

Soil Type	Percent	Curve # (CN)	Adj. Curve # (CN*)	Runoff Coef. (C)
B	97	82.	86.64	0.548
C	3	87.	90.25	0.649
D	0	.	.	0.000
Imp.	16	99.	99.	0.958

Weighted Runoff Coef. (Cw): 0.616

Time of Concentration: 15.3 min

Rainfall Intensity (i) @ Tc: 6.60 in/hr

Runoff Supply Rate (q) @ Tc: 4.06 in/hr

PEAK DISCHARGE: 1,007 cfs

PC-Hydro, Ver 5.4.2

HYDROLOGIC DATA SHEET FOR PIMA COUNTY FLOOD PEAK PROCEDURE

Pima County Regional Flood Control District

Client: _____ Prepared by: BJK

Project Name: Green Valley Drainageway Date: 09/18/2013

Concentration Point: CP1E Job #: 13-008

Watershed Area: 218.6 ac Watershed Type: Medium Density Urbanized

Watercourse Data By Reach

Reach No.	Height (Hi)	Length (Li)	Slope (Si)	Basin Factor (Nb)
1	98.0	4,250	0.0231	.035
2	47.0	1,861	0.0253	.022

Length of Watercourse (Lc): 6,111 feet Mean Slope: 0.0237

Length to Cen. of Gravity (Lca): 3,300 feet Weighted Basin Fac.: 0.031

Veg. Cover Type(s): Desert Brush Veg. Cover Density: 30 %

RETURN PERIOD: 100-years

Rainfall Depths: NOAA Atlas 14 (90% UCL) @ Latitude: 31.8680 Longitude: -111.0040

Duration:	5-min	10-min	15-min	30-min	60-min	2-hr	3-hr	6-hr	12-hr	24-hr
Point Values (in)	0.88	1.35	1.67	2.25	2.78	3.10	3.20	3.62	3.94	4.30
Areal Values (in)	0.88	1.35	1.67	2.25	2.78	3.10	3.20	3.62	3.94	4.30

Soils Data

Soil Type	Percent	Curve # (CN)	Adj. Curve # (CN*)	Runoff Coef. (C)
B	96	82.	86.64	0.548
C	4	87.	90.25	0.649
D	0	.	.	0.000
Imp.	12	99.	99.	0.958

Weighted Runoff Coef. (Cw): 0.600

Time of Concentration: 15.0 min

Rainfall Intensity (i) @ Tc: 6.69 in/hr

Runoff Supply Rate (q) @ Tc: 4.01 in/hr

PEAK DISCHARGE: 884 cfs

PC-Hydro, Ver 5.4.2

HYDROLOGIC DATA SHEET FOR PIMA COUNTY FLOOD PEAK PROCEDURE

Pima County Regional Flood Control District

Client: _____ Prepared by: BJK

Project Name: Green Valley Drainageway Date: 11/04/2013

Concentration Point: CP1F Job #: 13-008

Watershed Area: 147.0 ac Watershed Type: Medium Density Urbanized

Watercourse Data By Reach

Reach No.	Height (Hi)	Length (Li)	Slope (Si)	Basin Factor (Nb)
1	98.0	4,250	0.0231	.035

Length of Watercourse (Lc): 4,250 feet Mean Slope: 0.0231

Length to Cen. of Gravity (Lca): 2,402 feet Weighted Basin Fac.: 0.035

Veg. Cover Type(s): Desert Brush Veg. Cover Density: 30 %

RETURN PERIOD: 100-years

Rainfall Depths: NOAA Atlas 14 (90% UCL) @ Latitude: 31.8680 Longitude: -111.0040

Duration:	5-min	10-min	15-min	30-min	60-min	2-hr	3-hr	6-hr	12-hr	24-hr
Point Values (in)	0.88	1.35	1.67	2.25	2.78	3.10	3.20	3.62	3.94	4.30
Areal Values (in)	0.88	1.35	1.67	2.25	2.78	3.10	3.20	3.62	3.94	4.30

Soils Data

Soil Type	Percent	Curve # (CN)	Adj. Curve # (CN*)	Runoff Coef. (C)
B	100	82.	86.64	0.548
C	0	.	.	0.000
D	0	.	.	0.000
Imp.	0	99.	99.	0.000

Weighted Runoff Coef. (Cw): 0.548

Time of Concentration: 14.2 min

Rainfall Intensity (i) @ Tc: 6.84 in/hr

Runoff Supply Rate (q) @ Tc: 3.74 in/hr

PEAK DISCHARGE: 555 cfs

PC-Hydro, Ver 5.4.2

HYDROLOGIC DATA SHEET FOR PIMA COUNTY FLOOD PEAK PROCEDURE

Pima County Regional Flood Control District

Client: _____ Prepared by: BJK

Project Name: Green Valley Drainageway Date: 09/06/2013

Concentration Point: CP1G Job #: 13-008

Watershed Area: 23.2 ac Watershed Type: Medium Density Urbanized

Watercourse Data By Reach

Reach No.	Height (Hi)	Length (Li)	Slope (Si)	Basin Factor (Nb)
1	70.0	2,895	0.0242	.022
2	36.0	1,760	0.0205	.022
3	27.0	1,090	0.0248	.022

Length of Watercourse (Lc): 5,745 feet Mean Slope: 0.0230

Length to Cen. of Gravity (Lca): 2,873 feet Weighted Basin Fac.: 0.022

Veg. Cover Type(s): Desert Brush Veg. Cover Density: 30 %

RETURN PERIOD: 100-years

Rainfall Depths: NOAA Atlas 14 (90% UCL) @ Latitude: 31.8680 Longitude: -111.0040

Duration:	5-min	10-min	15-min	30-min	60-min	2-hr	3-hr	6-hr	12-hr	24-hr
Point Values (in)	0.88	1.35	1.67	2.25	2.78	3.10	3.20	3.62	3.94	4.30
Areal Values (in)	0.88	1.35	1.67	2.25	2.78	3.10	3.20	3.62	3.94	4.30

Soils Data

Soil Type	Percent	Curve # (CN)	Adj. Curve # (CN*)	Runoff Coef. (C)
B	98	82.	86.64	0.548
C	2	87.	90.25	0.649
D	0	.	.	0.000
Imp.	57	99.	99.	0.958

Weighted Runoff Coef. (Cw): 0.782

Time of Concentration: 8.1 min

Rainfall Intensity (i) @ Tc: 8.67 in/hr

Runoff Supply Rate (q) @ Tc: 6.78 in/hr

PEAK DISCHARGE: 159 cfs

PC-Hydro, Ver 5.4.2

HYDROLOGIC DATA SHEET FOR PIMA COUNTY FLOOD PEAK PROCEDURE

Pima County Regional Flood Control District

Client: _____ Prepared by: BJK

Project Name: Green Valley Drainageway Date: 09/06/2013

Concentration Point: CP1H Job #: 13-008

Watershed Area: 19.9 ac Watershed Type: Medium Density Urbanized

Watercourse Data By Reach

Reach No.	Height (Hi)	Length (Li)	Slope (Si)	Basin Factor (Nb)
1	70.0	2,895	0.0242	.022
2	36.0	1,760	0.0205	.022

Length of Watercourse (Lc): 4,655 feet Mean Slope: 0.0227

Length to Cen. of Gravity (Lca): 2,328 feet Weighted Basin Fac.: 0.022

Veg. Cover Type(s): Desert Brush Veg. Cover Density: 30 %

RETURN PERIOD: 100-years

Rainfall Depths: NOAA Atlas 14 (90% UCL) @ Latitude: 31.8680 Longitude: -111.0040

Duration:	5-min	10-min	15-min	30-min	60-min	2-hr	3-hr	6-hr	12-hr	24-hr
Point Values (in)	0.88	1.35	1.67	2.25	2.78	3.10	3.20	3.62	3.94	4.30
Areal Values (in)	0.88	1.35	1.67	2.25	2.78	3.10	3.20	3.62	3.94	4.30

Soils Data

Soil Type	Percent	Curve # (CN)	Adj. Curve # (CN*)	Runoff Coef. (C)
B	97	82.	86.64	0.548
C	3	87.	90.25	0.649
D	0	.	.	0.000
Imp.	60	99.	99.	0.958

Weighted Runoff Coef. (Cw): 0.795

Time of Concentration: 7.0 min

Rainfall Intensity (i) @ Tc: 9.15 in/hr

Runoff Supply Rate (q) @ Tc: 7.27 in/hr

PEAK DISCHARGE: 146 cfs

PC-Hydro, Ver 5.4.2

HYDROLOGIC DATA SHEET FOR PIMA COUNTY FLOOD PEAK PROCEDURE

Pima County Regional Flood Control District

Client: _____ Prepared by: BJK

Project Name: Green Valley Drainageway Date: 09/06/2013

Concentration Point: CP1I Job #: 13-008

Watershed Area: 8.9 ac Watershed Type: Medium Density Urbanized

Watercourse Data By Reach

Reach No.	Height (Hi)	Length (Li)	Slope (Si)	Basin Factor (Nb)
1	70.0	2,895	0.0242	.022

Length of Watercourse (Lc): 2,895 feet Mean Slope: 0.0242

Length to Cen. of Gravity (Lca): 1,448 feet Weighted Basin Fac.: 0.022

Veg. Cover Type(s): Desert Brush Veg. Cover Density: 30 %

RETURN PERIOD: 100-years

Rainfall Depths: NOAA Atlas 14 (90% UCL) @ Latitude: 31.8680 Longitude: -111.0040

Duration:	5-min	10-min	15-min	30-min	60-min	2-hr	3-hr	6-hr	12-hr	24-hr
Point Values (in)	0.88	1.35	1.67	2.25	2.78	3.10	3.20	3.62	3.94	4.30
Areal Values (in)	0.88	1.35	1.67	2.25	2.78	3.10	3.20	3.62	3.94	4.30

Soils Data

Soil Type	Percent	Curve # (CN)	Adj. Curve # (CN*)	Runoff Coef. (C)
B	94	82.	86.64	0.548
C	6	87.	90.25	0.649
D	0	.	.	0.000
Imp.	60	99.	99.	0.958

Weighted Runoff Coef. (Cw): 0.796

Time of Concentration: 5.0 min

Rainfall Intensity (i) @ Tc: 10.56 in/hr

Runoff Supply Rate (q) @ Tc: 8.41 in/hr

PEAK DISCHARGE: 75 cfs

PC-Hydro, Ver 5.4.2

HYDROLOGIC DATA SHEET FOR PIMA COUNTY FLOOD PEAK PROCEDURE

Pima County Regional Flood Control District

Client: _____ Prepared by: BJK

Project Name: Green Valley Drainageway Date: 11/04/2013

Concentration Point: CP1J Job #: 13-008

Watershed Area: 85.7 ac Watershed Type: Medium Density Urbanized

Watercourse Data By Reach

Reach No.	Height (Hi)	Length (Li)	Slope (Si)	Basin Factor (Nb)
1	83.0	3,530	0.0235	.035

Length of Watercourse (Lc): 3,530 feet Mean Slope: 0.0235

Length to Cen. of Gravity (Lca): 1,754 feet Weighted Basin Fac.: 0.035

Veg. Cover Type(s): Desert Brush Veg. Cover Density: 30 %

RETURN PERIOD: 100-years

Rainfall Depths: NOAA Atlas 14 (90% UCL) @ Latitude: 31.8680 Longitude: -111.0040

Duration:	5-min	10-min	15-min	30-min	60-min	2-hr	3-hr	6-hr	12-hr	24-hr
Point Values (in)	0.88	1.35	1.67	2.25	2.78	3.10	3.20	3.62	3.94	4.30
Areal Values (in)	0.88	1.35	1.67	2.25	2.78	3.10	3.20	3.62	3.94	4.30

Soils Data

Soil Type	Percent	Curve # (CN)	Adj. Curve # (CN*)	Runoff Coef. (C)
B	94	82.	86.64	0.548
C	6	87.	90.25	0.649
D	0	.	.	0.000
Imp.	0	99.	99.	0.000

Weighted Runoff Coef. (Cw): 0.554

Time of Concentration: 11.6 min

Rainfall Intensity (i) @ Tc: 7.50 in/hr

Runoff Supply Rate (q) @ Tc: 4.15 in/hr

PEAK DISCHARGE: 359 cfs

PC-Hydro, Ver 5.4.2

HYDROLOGIC DATA SHEET FOR PIMA COUNTY FLOOD PEAK PROCEDURE

Pima County Regional Flood Control District

Client: _____ Prepared by: BJK

Project Name: Green Valley Drainageway Date: 11/13/2013

Concentration Point: CP2A Job #: 13-008

Watershed Area: 100.6 ac Watershed Type: Medium Density Urbanized

Watercourse Data By Reach

Reach No.	Height (Hi)	Length (Li)	Slope (Si)	Basin Factor (Nb)
1	63.0	4,059	0.0155	.025

Length of Watercourse (Lc): 4,059 feet Mean Slope: 0.0155

Length to Cen. of Gravity (Lca): 1,768 feet Weighted Basin Fac.: 0.025

Veg. Cover Type(s): Desert Brush Veg. Cover Density: 30 %

RETURN PERIOD: 100-years

Rainfall Depths: NOAA Atlas 14 (90% UCL) @ Latitude: 31.8680 Longitude: -111.0040

Duration:	5-min	10-min	15-min	30-min	60-min	2-hr	3-hr	6-hr	12-hr	24-hr
Point Values (in)	0.88	1.35	1.67	2.25	2.78	3.10	3.20	3.62	3.94	4.30
Areal Values (in)	0.88	1.35	1.67	2.25	2.78	3.10	3.20	3.62	3.94	4.30

Soils Data

Soil Type	Percent	Curve # (CN)	Adj. Curve # (CN*)	Runoff Coef. (C)
B	100	82.	86.64	0.548
C	0	.	.	0.000
D	0	.	.	0.000
Imp.	30	99.	99.	0.958

Weighted Runoff Coef. (Cw): 0.671

Time of Concentration: 9.1 min

Rainfall Intensity (i) @ Tc: 8.34 in/hr

Runoff Supply Rate (q) @ Tc: 5.60 in/hr

PEAK DISCHARGE: 567 cfs

PC-Hydro, Ver 5.4.2

HYDROLOGIC DATA SHEET FOR PIMA COUNTY FLOOD PEAK PROCEDURE

Pima County Regional Flood Control District

Client: _____ Prepared by: BJK

Project Name: Green Valley Drainageway Date: 11/13/2013

Concentration Point: CP2B Job #: 13-008

Watershed Area: 51.2 ac Watershed Type: Medium Density Urbanized

Watercourse Data By Reach

Reach No.	Height (Hi)	Length (Li)	Slope (Si)	Basin Factor (Nb)
1	46.0	2,364	0.0195	.025

Length of Watercourse (Lc): 2,364 feet Mean Slope: 0.0195

Length to Cen. of Gravity (Lca): 846 feet Weighted Basin Fac.: 0.025

Veg. Cover Type(s): Desert Brush Veg. Cover Density: 30 %

RETURN PERIOD: 100-years

Rainfall Depths: NOAA Atlas 14 (90% UCL) @ Latitude: 31.8680 Longitude: -111.0040

Duration:	5-min	10-min	15-min	30-min	60-min	2-hr	3-hr	6-hr	12-hr	24-hr
Point Values (in)	0.88	1.35	1.67	2.25	2.78	3.10	3.20	3.62	3.94	4.30
Areal Values (in)	0.88	1.35	1.67	2.25	2.78	3.10	3.20	3.62	3.94	4.30

Soils Data

Soil Type	Percent	Curve # (CN)	Adj. Curve # (CN*)	Runoff Coef. (C)
B	100	82.	86.64	0.548
C	0	.	.	0.000
D	0	.	.	0.000
Imp.	30	99.	99.	0.958

Weighted Runoff Coef. (Cw): 0.671

Time of Concentration: 5.2 min

Rainfall Intensity (i) @ Tc: 10.37 in/hr

Runoff Supply Rate (q) @ Tc: 6.96 in/hr

PEAK DISCHARGE: 359 cfs

PC-Hydro, Ver 5.4.2

HYDROLOGIC DATA SHEET FOR PIMA COUNTY FLOOD PEAK PROCEDURE

Pima County Regional Flood Control District

Client: _____ Prepared by: BJK

Project Name: Green Valley Drainageway Date: 11/13/2013

Concentration Point: CP2C Job #: 13-008

Watershed Area: 20.2 ac Watershed Type: Medium Density Urbanized

Watercourse Data By Reach

Reach No.	Height (Hi)	Length (Li)	Slope (Si)	Basin Factor (Nb)
1	34.0	1,794	0.0190	.025

Length of Watercourse (Lc): 1,794 feet Mean Slope: 0.0190

Length to Cen. of Gravity (Lca): 897 feet Weighted Basin Fac.: 0.025

Veg. Cover Type(s): Desert Brush Veg. Cover Density: 30 %

RETURN PERIOD: 100-years

Rainfall Depths: NOAA Atlas 14 (90% UCL) @ Latitude: 31.8680 Longitude: -111.0040

Duration:	5-min	10-min	15-min	30-min	60-min	2-hr	3-hr	6-hr	12-hr	24-hr
Point Values (in)	0.88	1.35	1.67	2.25	2.78	3.10	3.20	3.62	3.94	4.30
Areal Values (in)	0.88	1.35	1.67	2.25	2.78	3.10	3.20	3.62	3.94	4.30

Soils Data

Soil Type	Percent	Curve # (CN)	Adj. Curve # (CN*)	Runoff Coef. (C)
B	100	82.	86.64	0.548
C	0	.	.	0.000
D	0	.	.	0.000
Imp.	30	99.	99.	0.958

Weighted Runoff Coef. (Cw): 0.671

Time of Concentration: 5.0 min

Rainfall Intensity (i) @ Tc: 10.56 in/hr

Runoff Supply Rate (q) @ Tc: 7.08 in/hr

PEAK DISCHARGE: 144 cfs

PC-Hydro, Ver 5.4.2

HYDROLOGIC DATA SHEET FOR PIMA COUNTY FLOOD PEAK PROCEDURE

Pima County Regional Flood Control District

Client: _____ Prepared by: BJK

Project Name: Green Valley Drainageway Date: 11/05/2013

Concentration Point: CP-7A Job #: 13-008

Watershed Area: 329.3 ac Watershed Type: High Density Urbanized

Watercourse Data By Reach

Reach No.	Height (Hi)	Length (Li)	Slope (Si)	Basin Factor (Nb)
1	83.0	2,656	0.0313	.035
2	108.0	4,150	0.0260	.025
3	24.0	1,513	0.0159	.022
4	91.0	4,544	0.0200	.022

Length of Watercourse (Lc): 12,863 feet Mean Slope: 0.0230

Length to Cen. of Gravity (Lca): 6,097 feet Weighted Basin Fac.: 0.025

Veg. Cover Type(s): Desert Brush Veg. Cover Density: 30 %

RETURN PERIOD: 100-years

Rainfall Depths: NOAA Atlas 14 (90% UCL) @ Latitude: 31.8680 Longitude: -111.0040

Duration:	5-min	10-min	15-min	30-min	60-min	2-hr	3-hr	6-hr	12-hr	24-hr
Point Values (in)	0.88	1.35	1.67	2.25	2.78	3.10	3.20	3.62	3.94	4.30
Areal Values (in)	0.88	1.35	1.67	2.25	2.78	3.10	3.20	3.62	3.94	4.30

Soils Data

Soil Type	Percent	Curve # (CN)	Adj. Curve # (CN*)	Runoff Coef. (C)
B	65	82.	86.64	0.548
C	35	87.	90.25	0.649
D	0	.	.	0.000
Imp.	43	99.	99.	0.958

Weighted Runoff Coef. (Cw): 0.744

Time of Concentration: 17.6 min

Rainfall Intensity (i) @ Tc: 6.04 in/hr

Runoff Supply Rate (q) @ Tc: 4.50 in/hr

PEAK DISCHARGE: 1,492 cfs

PC-Hydro, Ver 5.4.2

HYDROLOGIC DATA SHEET FOR PIMA COUNTY FLOOD PEAK PROCEDURE

Pima County Regional Flood Control District

Client: _____ Prepared by: BJK

Project Name: Green Valley Drainageway Date: 11/05/2013

Concentration Point: CP-7B Job #: 13-008

Watershed Area: 293.6 ac Watershed Type: High Density Urbanized

Watercourse Data By Reach

Reach No.	Height (Hi)	Length (Li)	Slope (Si)	Basin Factor (Nb)
1	83.0	2,656	0.0313	.035
2	108.0	4,150	0.0260	.025
3	24.0	1,513	0.0159	.022
4	38.0	1,545	0.0246	.022

Length of Watercourse (Lc): 9,864 feet Mean Slope: 0.0248

Length to Cen. of Gravity (Lca): 3,700 feet Weighted Basin Fac.: 0.026

Veg. Cover Type(s): Desert Brush Veg. Cover Density: 30 %

RETURN PERIOD: 100-years

Rainfall Depths: NOAA Atlas 14 (90% UCL) @ Latitude: 31.8680 Longitude: -111.0040

Duration:	5-min	10-min	15-min	30-min	60-min	2-hr	3-hr	6-hr	12-hr	24-hr
Point Values (in)	0.88	1.35	1.67	2.25	2.78	3.10	3.20	3.62	3.94	4.30
Areal Values (in)	0.88	1.35	1.67	2.25	2.78	3.10	3.20	3.62	3.94	4.30

Soils Data

Soil Type	Percent	Curve # (CN)	Adj. Curve # (CN*)	Runoff Coef. (C)
B	61	82.	86.64	0.548
C	39	87.	90.25	0.649
D	0	.	.	0.000
Imp.	45	99.	99.	0.958

Weighted Runoff Coef. (Cw): 0.754

Time of Concentration: 13.2 min

Rainfall Intensity (i) @ Tc: 7.06 in/hr

Runoff Supply Rate (q) @ Tc: 5.32 in/hr

PEAK DISCHARGE: 1,575 cfs

PC-Hydro, Ver 5.4.2

HYDROLOGIC DATA SHEET FOR PIMA COUNTY FLOOD PEAK PROCEDURE

Pima County Regional Flood Control District

Client: _____ Prepared by: BJK

Project Name: Green Valley Drainageway Date: 09/09/2013

Concentration Point: CP-7C Job #: 13-008

Watershed Area: 54.2 ac Watershed Type: High Density Urbanized

Watercourse Data By Reach

Reach No.	Height (Hi)	Length (Li)	Slope (Si)	Basin Factor (Nb)
1	56.0	3,118	0.0180	.022
2	3.0	276	0.0109	.022

Length of Watercourse (Lc): 3,394 feet Mean Slope: 0.0172

Length to Cen. of Gravity (Lca): 1,728 feet Weighted Basin Fac.: 0.022

Veg. Cover Type(s): Desert Brush Veg. Cover Density: 30 %

RETURN PERIOD: 100-years

Rainfall Depths: NOAA Atlas 14 (90% UCL) @ Latitude: 31.8680 Longitude: -111.0040

Duration:	5-min	10-min	15-min	30-min	60-min	2-hr	3-hr	6-hr	12-hr	24-hr
Point Values (in)	0.88	1.35	1.67	2.25	2.78	3.10	3.20	3.62	3.94	4.30
Areal Values (in)	0.88	1.35	1.67	2.25	2.78	3.10	3.20	3.62	3.94	4.30

Soils Data

Soil Type	Percent	Curve # (CN)	Adj. Curve # (CN*)	Runoff Coef. (C)
B	100	82.	86.64	0.548
C	0	.	.	0.000
D	0	.	.	0.000
Imp.	51	99.	99.	0.958

Weighted Runoff Coef. (Cw): 0.757

Time of Concentration: 6.6 min

Rainfall Intensity (i) @ Tc: 9.38 in/hr

Runoff Supply Rate (q) @ Tc: 7.09 in/hr

PEAK DISCHARGE: 388 cfs

PC-Hydro, Ver 5.4.2

HYDROLOGIC DATA SHEET FOR PIMA COUNTY FLOOD PEAK PROCEDURE

Pima County Regional Flood Control District

Client: _____ Prepared by: BJK

Project Name: Green Valley Drainageway Date: 09/09/2013

Concentration Point: CP-7D Job #: 13-008

Watershed Area: 38.6 ac Watershed Type: High Density Urbanized

Watercourse Data By Reach

Reach No.	Height (Hi)	Length (Li)	Slope (Si)	Basin Factor (Nb)
1	56.0	3,118	0.0180	.022

Length of Watercourse (Lc): 3,118 feet Mean Slope: 0.0180

Length to Cen. of Gravity (Lca): 1,584 feet Weighted Basin Fac.: 0.022

Veg. Cover Type(s): Desert Brush Veg. Cover Density: 30 %

RETURN PERIOD: 100-years

Rainfall Depths: NOAA Atlas 14 (90% UCL) @ Latitude: 31.8680 Longitude: -111.0040

Duration:	5-min	10-min	15-min	30-min	60-min	2-hr	3-hr	6-hr	12-hr	24-hr
Point Values (in)	0.88	1.35	1.67	2.25	2.78	3.10	3.20	3.62	3.94	4.30
Areal Values (in)	0.88	1.35	1.67	2.25	2.78	3.10	3.20	3.62	3.94	4.30

Soils Data

Soil Type	Percent	Curve # (CN)	Adj. Curve # (CN*)	Runoff Coef. (C)
B	100	82.	86.64	0.548
C	0	.	.	0.000
D	0	.	.	0.000
Imp.	55	99.	99.	0.958

Weighted Runoff Coef. (Cw): 0.773

Time of Concentration: 6.0 min

Rainfall Intensity (i) @ Tc: 9.74 in/hr

Runoff Supply Rate (q) @ Tc: 7.53 in/hr

PEAK DISCHARGE: 293 cfs

PC-Hydro, Ver 5.4.2

HYDROLOGIC DATA SHEET FOR PIMA COUNTY FLOOD PEAK PROCEDURE

Pima County Regional Flood Control District

Client: _____ Prepared by: BJK

Project Name: Green Valley Drainageway Date: 09/09/2013

Concentration Point: CP-7E Job #: 13-008

Watershed Area: 9.2 ac Watershed Type: High Density Urbanized

Watercourse Data By Reach

Reach No.	Height (Hi)	Length (Li)	Slope (Si)	Basin Factor (Nb)
1	30.0	1,194	0.0251	.030

Length of Watercourse (Lc): 1,194 feet Mean Slope: 0.0251

Length to Cen. of Gravity (Lca): 597 feet Weighted Basin Fac.: 0.030

Veg. Cover Type(s): Desert Brush Veg. Cover Density: 30 %

RETURN PERIOD: 100-years

Rainfall Depths: NOAA Atlas 14 (90% UCL) @ Latitude: 31.8680 Longitude: -111.0040

Duration:	5-min	10-min	15-min	30-min	60-min	2-hr	3-hr	6-hr	12-hr	24-hr
Point Values (in)	0.88	1.35	1.67	2.25	2.78	3.10	3.20	3.62	3.94	4.30
Areal Values (in)	0.88	1.35	1.67	2.25	2.78	3.10	3.20	3.62	3.94	4.30

Soils Data

Soil Type	Percent	Curve # (CN)	Adj. Curve # (CN*)	Runoff Coef. (C)
B	100	82.	86.64	0.548
C	0	.	.	0.000
D	0	.	.	0.000
Imp.	30	99.	99.	0.958

Weighted Runoff Coef. (Cw): 0.671

Time of Concentration: 5.0 min

Rainfall Intensity (i) @ Tc: 10.56 in/hr

Runoff Supply Rate (q) @ Tc: 7.08 in/hr

PEAK DISCHARGE: 66 cfs

PC-Hydro, Ver 5.4.2

HYDROLOGIC DATA SHEET FOR PIMA COUNTY FLOOD PEAK PROCEDURE

Pima County Regional Flood Control District

Client: _____ Prepared by: BJK

Project Name: Green Valley Drainageway Date: 11/05/2013

Concentration Point: CP-7F Job #: 13-008

Watershed Area: 234.8 ac Watershed Type: High Density Urbanized

Watercourse Data By Reach

Reach No.	Height (Hi)	Length (Li)	Slope (Si)	Basin Factor (Nb)
1	83.0	2,656	0.0313	.035
2	108.0	4,150	0.0260	.025
3	24.0	1,513	0.0159	.022
4	33.0	1,180	0.0280	.022

Length of Watercourse (Lc): 9,499 feet Mean Slope: 0.0252

Length to Cen. of Gravity (Lca): 3,700 feet Weighted Basin Fac.: 0.027

Veg. Cover Type(s): Desert Brush Veg. Cover Density: 30 %

RETURN PERIOD: 100-years

Rainfall Depths: NOAA Atlas 14 (90% UCL) @ Latitude: 31.8680 Longitude: -111.0040

Duration:	5-min	10-min	15-min	30-min	60-min	2-hr	3-hr	6-hr	12-hr	24-hr
Point Values (in)	0.88	1.35	1.67	2.25	2.78	3.10	3.20	3.62	3.94	4.30
Areal Values (in)	0.88	1.35	1.67	2.25	2.78	3.10	3.20	3.62	3.94	4.30

Soils Data

Soil Type	Percent	Curve # (CN)	Adj. Curve # (CN*)	Runoff Coef. (C)
B	54	82.	86.64	0.548
C	46	87.	90.25	0.649
D	0	.	.	0.000
Imp.	44	99.	99.	0.958

Weighted Runoff Coef. (Cw): 0.754

Time of Concentration: 13.1 min

Rainfall Intensity (i) @ Tc: 7.10 in/hr

Runoff Supply Rate (q) @ Tc: 5.36 in/hr

PEAK DISCHARGE: 1,268 cfs

PC-Hydro, Ver 5.4.2

HYDROLOGIC DATA SHEET FOR PIMA COUNTY FLOOD PEAK PROCEDURE

Pima County Regional Flood Control District

Client: _____ Prepared by: BJK

Project Name: Green Valley Drainageway Date: 11/05/2013

Concentration Point: CP-7G Job #: 13-008

Watershed Area: 224.5 ac Watershed Type: High Density Urbanized

Watercourse Data By Reach

Reach No.	Height (Hi)	Length (Li)	Slope (Si)	Basin Factor (Nb)
1	83.0	2,656	0.0313	.035
2	108.0	4,150	0.0260	.025
3	24.0	1,513	0.0159	.022

Length of Watercourse (Lc): 8,319 feet Mean Slope: 0.0249

Length to Cen. of Gravity (Lca): 3,100 feet Weighted Basin Fac.: 0.027

Veg. Cover Type(s): Desert Brush Veg. Cover Density: 30 %

RETURN PERIOD: 100-years

Rainfall Depths: NOAA Atlas 14 (90% UCL) @ Latitude: 31.8680 Longitude: -111.0040

Duration:	5-min	10-min	15-min	30-min	60-min	2-hr	3-hr	6-hr	12-hr	24-hr
Point Values (in)	0.88	1.35	1.67	2.25	2.78	3.10	3.20	3.62	3.94	4.30
Areal Values (in)	0.88	1.35	1.67	2.25	2.78	3.10	3.20	3.62	3.94	4.30

Soils Data

Soil Type	Percent	Curve # (CN)	Adj. Curve # (CN*)	Runoff Coef. (C)
B	53	82.	86.64	0.548
C	48	87.	90.25	0.649
D	0	.	.	0.000
Imp.	44	99.	99.	0.958

Weighted Runoff Coef. (Cw): 0.755

Time of Concentration: 12.1 min

Rainfall Intensity (i) @ Tc: 7.37 in/hr

Runoff Supply Rate (q) @ Tc: 5.57 in/hr

PEAK DISCHARGE: 1,260 cfs

PC-Hydro, Ver 5.4.2

HYDROLOGIC DATA SHEET FOR PIMA COUNTY FLOOD PEAK PROCEDURE

Pima County Regional Flood Control District

Client: _____ Prepared by: BJK

Project Name: Green Valley Drainageway Date: 09/09/2013

Concentration Point: CP-7H Job #: 13-008

Watershed Area: 115.6 ac Watershed Type: High Density Urbanized

Watercourse Data By Reach

Reach No.	Height (Hi)	Length (Li)	Slope (Si)	Basin Factor (Nb)
1	83.0	2,656	0.0313	.035
2	108.0	4,150	0.0260	.025

Length of Watercourse (Lc): 6,806 feet Mean Slope: 0.0279

Length to Cen. of Gravity (Lca): 3,101 feet Weighted Basin Fac.: 0.029

Veg. Cover Type(s): Desert Brush Veg. Cover Density: 30 %

RETURN PERIOD: 100-years

Rainfall Depths: NOAA Atlas 14 (90% UCL) @ Latitude: 31.8680 Longitude: -111.0040

Duration:	5-min	10-min	15-min	30-min	60-min	2-hr	3-hr	6-hr	12-hr	24-hr
Point Values (in)	0.88	1.35	1.67	2.25	2.78	3.10	3.20	3.62	3.94	4.30
Areal Values (in)	0.88	1.35	1.67	2.25	2.78	3.10	3.20	3.62	3.94	4.30

Soils Data

Soil Type	Percent	Curve # (CN)	Adj. Curve # (CN*)	Runoff Coef. (C)
B	24	82.	86.64	0.548
C	76	87.	90.25	0.649
D	0	.	.	0.000
Imp.	24	99.	99.	0.958

Weighted Runoff Coef. (Cw): 0.705

Time of Concentration: 11.7 min

Rainfall Intensity (i) @ Tc: 7.48 in/hr

Runoff Supply Rate (q) @ Tc: 5.27 in/hr

PEAK DISCHARGE: 614 cfs

PC-Hydro, Ver 5.4.2

HYDROLOGIC DATA SHEET FOR PIMA COUNTY FLOOD PEAK PROCEDURE

Pima County Regional Flood Control District

Client: _____ Prepared by: BJK

Project Name: Green Valley Drainageway Date: 09/09/2013

Concentration Point: CP-7I Job #: 13-008

Watershed Area: 21.9 ac Watershed Type: High Density Urbanized

Watercourse Data By Reach

Reach No.	Height (Hi)	Length (Li)	Slope (Si)	Basin Factor (Nb)
1	83.0	2,656	0.0313	.035

Length of Watercourse (Lc): 2,656 feet Mean Slope: 0.0313

Length to Cen. of Gravity (Lca): 1,151 feet Weighted Basin Fac.: 0.035

Veg. Cover Type(s): Desert Brush Veg. Cover Density: 30 %

RETURN PERIOD: 100-years

Rainfall Depths: NOAA Atlas 14 (90% UCL) @ Latitude: 31.8680 Longitude: -111.0040

Duration:	5-min	10-min	15-min	30-min	60-min	2-hr	3-hr	6-hr	12-hr	24-hr
Point Values (in)	0.88	1.35	1.67	2.25	2.78	3.10	3.20	3.62	3.94	4.30
Areal Values (in)	0.88	1.35	1.67	2.25	2.78	3.10	3.20	3.62	3.94	4.30

Soils Data

Soil Type	Percent	Curve # (CN)	Adj. Curve # (CN*)	Runoff Coef. (C)
B	1	82.	86.64	0.548
C	99	87.	90.25	0.649
D	0	.	.	0.000
Imp.	0	99.	99.	0.000

Weighted Runoff Coef. (Cw): 0.648

Time of Concentration: 7.3 min

Rainfall Intensity (i) @ Tc: 8.99 in/hr

Runoff Supply Rate (q) @ Tc: 5.82 in/hr

PEAK DISCHARGE: 129 cfs

PC-Hydro, Ver 5.4.2

HYDROLOGIC DATA SHEET FOR PIMA COUNTY FLOOD PEAK PROCEDURE

Pima County Regional Flood Control District

Client: _____ Prepared by: BJK

Project Name: Green Valley Drainageway Date: 09/09/2013

Concentration Point: CP7J Job #: 13-008

Watershed Area: 77.4 ac Watershed Type: High Density Urbanized

Watercourse Data By Reach

Reach No.	Height (Hi)	Length (Li)	Slope (Si)	Basin Factor (Nb)
1	118.0	4,941	0.0239	.022

Length of Watercourse (Lc): 4,941 feet Mean Slope: 0.0239

Length to Cen. of Gravity (Lca): 2,628 feet Weighted Basin Fac.: 0.022

Veg. Cover Type(s): Desert Brush Veg. Cover Density: 30 %

RETURN PERIOD: 100-years

Rainfall Depths: NOAA Atlas 14 (90% UCL) @ Latitude: 31.8680 Longitude: -111.0040

Duration:	5-min	10-min	15-min	30-min	60-min	2-hr	3-hr	6-hr	12-hr	24-hr
Point Values (in)	0.88	1.35	1.67	2.25	2.78	3.10	3.20	3.62	3.94	4.30
Areal Values (in)	0.88	1.35	1.67	2.25	2.78	3.10	3.20	3.62	3.94	4.30

Soils Data

Soil Type	Percent	Curve # (CN)	Adj. Curve # (CN*)	Runoff Coef. (C)
B	54	82.	86.64	0.548
C	46	87.	90.25	0.649
D	0	.	.	0.000
Imp.	55	99.	99.	0.958

Weighted Runoff Coef. (Cw): 0.794

Time of Concentration: 7.3 min

Rainfall Intensity (i) @ Tc: 9.01 in/hr

Runoff Supply Rate (q) @ Tc: 7.16 in/hr

PEAK DISCHARGE: 559 cfs

PC-Hydro, Ver 5.4.2

HYDROLOGIC DATA SHEET FOR PIMA COUNTY FLOOD PEAK PROCEDURE

Pima County Regional Flood Control District

Client: _____ Prepared by: BJK

Project Name: Green Valley Drainageway Date: 10/17/2013

Concentration Point: CP-7K Job #: 13-008

Watershed Area: 53.8 ac Watershed Type: High Density Urbanized

Watercourse Data By Reach

Reach No.	Height (Hi)	Length (Li)	Slope (Si)	Basin Factor (Nb)
1	58.0	3,233	0.0179	.022

Length of Watercourse (Lc): 3,233 feet Mean Slope: 0.0179

Length to Cen. of Gravity (Lca): 1,700 feet Weighted Basin Fac.: 0.022

Veg. Cover Type(s): Desert Brush Veg. Cover Density: 30 %

RETURN PERIOD: 100-years

Rainfall Depths: NOAA Atlas 14 (90% UCL) @ Latitude: 31.8680 Longitude: -111.0040

Duration:	5-min	10-min	15-min	30-min	60-min	2-hr	3-hr	6-hr	12-hr	24-hr
Point Values (in)	0.88	1.35	1.67	2.25	2.78	3.10	3.20	3.62	3.94	4.30
Areal Values (in)	0.88	1.35	1.67	2.25	2.78	3.10	3.20	3.62	3.94	4.30

Soils Data

Soil Type	Percent	Curve # (CN)	Adj. Curve # (CN*)	Runoff Coef. (C)
B	100	82.	86.64	0.548
C	0	.	.	0.000
D	0	.	.	0.000
Imp.	60	99.	99.	0.958

Weighted Runoff Coef. (Cw): 0.794

Time of Concentration: 6.2 min

Rainfall Intensity (i) @ Tc: 9.64 in/hr

Runoff Supply Rate (q) @ Tc: 7.65 in/hr

PEAK DISCHARGE: 415 cfs

PC-Hydro, Ver 5.4.2

HYDROLOGIC DATA SHEET FOR PIMA COUNTY FLOOD PEAK PROCEDURE

Pima County Regional Flood Control District

Client: _____ Prepared by: BJK

Project Name: Green Valley Date: 05/30/2013

Concentration Point: 8A Job #: 13-008

Watershed Area: 95.4 ac Watershed Type: High Density Urbanized

Watercourse Data By Reach

Reach No.	Height (Hi)	Length (Li)	Slope (Si)	Basin Factor (Nb)
1	31.0	2,997	0.0103	.022
2	64.0	2,755	0.0232	.022

Length of Watercourse (Lc): 5,752 feet Mean Slope: 0.0146

Length to Cen. of Gravity (Lca): 3,300 feet Weighted Basin Fac.: 0.022

Veg. Cover Type(s): Desert Brush Veg. Cover Density: 30 %

RETURN PERIOD: 100-years

Rainfall Depths: NOAA Atlas 14 (90% UCL) @ Latitude: 31.8674 Longitude: -110.9907

Duration:	5-min	10-min	15-min	30-min	60-min	2-hr	3-hr	6-hr	12-hr	24-hr
Point Values (in)	0.88	1.34	1.66	2.24	2.77	3.08	3.19	3.61	3.92	4.29
Areal Values (in)	0.88	1.34	1.66	2.24	2.77	3.08	3.19	3.61	3.92	4.29

Soils Data

Soil Type	Percent	Curve # (CN)	Adj. Curve # (CN*)	Runoff Coef. (C)
B	100	82.	86.62	0.546
C	0	.	.	0.000
D	0	.	.	0.000
Imp.	60	99.	99.	0.958

Weighted Runoff Coef. (Cw): 0.793

Time of Concentration: 10.5 min

Rainfall Intensity (i) @ Tc: 7.82 in/hr

Runoff Supply Rate (q) @ Tc: 6.20 in/hr

PEAK DISCHARGE: 597 cfs

PC-Hydro, Ver 5.4.2

HYDROLOGIC DATA SHEET FOR PIMA COUNTY FLOOD PEAK PROCEDURE

Pima County Regional Flood Control District

Client: _____ Prepared by: BJK

Project Name: Green Valley Date: 05/30/2013

Concentration Point: 8B Job #: 13-008

Watershed Area: 84.1 ac Watershed Type: High Density Urbanized

Watercourse Data By Reach

Reach No.	Height (Hi)	Length (Li)	Slope (Si)	Basin Factor (Nb)
1	31.0	2,997	0.0103	.022
2	32.0	1,199	0.0267	.022

Length of Watercourse (Lc): 4,196 feet Mean Slope: 0.0130

Length to Cen. of Gravity (Lca): 1,650 feet Weighted Basin Fac.: 0.022

Veg. Cover Type(s): Desert Brush Veg. Cover Density: 30 %

RETURN PERIOD: 100-years

Rainfall Depths: NOAA Atlas 14 (90% UCL) @ Latitude: 31.8674 Longitude: -110.9907

Duration:	5-min	10-min	15-min	30-min	60-min	2-hr	3-hr	6-hr	12-hr	24-hr
Point Values (in)	0.88	1.34	1.66	2.24	2.77	3.08	3.19	3.61	3.92	4.29
Areal Values (in)	0.88	1.34	1.66	2.24	2.77	3.08	3.19	3.61	3.92	4.29

Soils Data

Soil Type	Percent	Curve # (CN)	Adj. Curve # (CN*)	Runoff Coef. (C)
B	100	82.	86.62	0.546
C	0	.	.	0.000
D	0	.	.	0.000
Imp.	60	99.	99.	0.958

Weighted Runoff Coef. (Cw): 0.793

Time of Concentration: 7.8 min

Rainfall Intensity (i) @ Tc: 8.75 in/hr

Runoff Supply Rate (q) @ Tc: 6.94 in/hr

PEAK DISCHARGE: 588 cfs

PC-Hydro, Ver 5.4.2

HYDROLOGIC DATA SHEET FOR PIMA COUNTY FLOOD PEAK PROCEDURE

Pima County Regional Flood Control District

Client: _____ Prepared by: BJK

Project Name: Green Valley Date: 05/30/2013

Concentration Point: 8C Job #: 13-008

Watershed Area: 82.2 ac Watershed Type: High Density Urbanized

Watercourse Data By Reach

Reach No.	Height (Hi)	Length (Li)	Slope (Si)	Basin Factor (Nb)
1	31.0	2,997	0.0103	.022
2	20.0	614	0.0326	.022

Length of Watercourse (Lc): 3,611 feet Mean Slope: 0.0121

Length to Cen. of Gravity (Lca): 1,500 feet Weighted Basin Fac.: 0.022

Veg. Cover Type(s): Desert Brush Veg. Cover Density: 30 %

RETURN PERIOD: 100-years

Rainfall Depths: NOAA Atlas 14 (90% UCL) @ Latitude: 31.8674 Longitude: -110.9907

Duration:	5-min	10-min	15-min	30-min	60-min	2-hr	3-hr	6-hr	12-hr	24-hr
Point Values (in)	0.88	1.34	1.66	2.24	2.77	3.08	3.19	3.61	3.92	4.29
Areal Values (in)	0.88	1.34	1.66	2.24	2.77	3.08	3.19	3.61	3.92	4.29

Soils Data

Soil Type	Percent	Curve # (CN)	Adj. Curve # (CN*)	Runoff Coef. (C)
B	100	82.	86.62	0.546
C	0	.	.	0.000
D	0	.	.	0.000
Imp.	60	99.	99.	0.958

Weighted Runoff Coef. (Cw): 0.793

Time of Concentration: 7.4 min

Rainfall Intensity (i) @ Tc: 8.92 in/hr

Runoff Supply Rate (q) @ Tc: 7.07 in/hr

PEAK DISCHARGE: 586 cfs

PC-Hydro, Ver 5.4.2

HYDROLOGIC DATA SHEET FOR PIMA COUNTY FLOOD PEAK PROCEDURE

Pima County Regional Flood Control District

Client: _____ Prepared by: BJK

Project Name: Green Valley Date: 05/24/2013

Concentration Point: 8D Job #: 13-008

Watershed Area: 75.4 ac Watershed Type: High Density Urbanized

Watercourse Data By Reach

Reach No.	Height (Hi)	Length (Li)	Slope (Si)	Basin Factor (Nb)
1	24.0	2,997	0.0080	.022

Length of Watercourse (Lc): 2,997 feet Mean Slope: 0.0080

Length to Cen. of Gravity (Lca): 1,100 feet Weighted Basin Fac.: 0.022

Veg. Cover Type(s): Desert Brush Veg. Cover Density: 30 %

RETURN PERIOD: 100-years

Rainfall Depths: NOAA Atlas 14 (90% UCL) @ Latitude: 31.8674 Longitude: -110.9907

Duration:	5-min	10-min	15-min	30-min	60-min	2-hr	3-hr	6-hr	12-hr	24-hr
Point Values (in)	0.88	1.34	1.66	2.24	2.77	3.08	3.19	3.61	3.92	4.29
Areal Values (in)	0.88	1.34	1.66	2.24	2.77	3.08	3.19	3.61	3.92	4.29

Soils Data

Soil Type	Percent	Curve # (CN)	Adj. Curve # (CN*)	Runoff Coef. (C)
B	100	82.	86.62	0.546
C	0	.	.	0.000
D	0	.	.	0.000
Imp.	70	99.	99.	0.958

Weighted Runoff Coef. (Cw): 0.834

Time of Concentration: 7.4 min

Rainfall Intensity (i) @ Tc: 8.94 in/hr

Runoff Supply Rate (q) @ Tc: 7.46 in/hr

PEAK DISCHARGE: 567 cfs

PC-Hydro, Ver 5.4.2

HYDROLOGIC DATA SHEET FOR PIMA COUNTY FLOOD PEAK PROCEDURE

Pima County Regional Flood Control District

Client: _____ Prepared by: BJK

Project Name: Green Valley Date: 05/31/2013

Concentration Point: E Job #: 13-008

Watershed Area: 38.5 ac Watershed Type: High Density Urbanized

Watercourse Data By Reach

Reach No.	Height (Hi)	Length (Li)	Slope (Si)	Basin Factor (Nb)
1	36.0	2,582	0.0139	.022

Length of Watercourse (Lc): 2,582 feet Mean Slope: 0.0139

Length to Cen. of Gravity (Lca): 1,136 feet Weighted Basin Fac.: 0.022

Veg. Cover Type(s): Desert Brush Veg. Cover Density: 30 %

RETURN PERIOD: 100-years

Rainfall Depths: NOAA Atlas 14 (90% UCL) @ Latitude: 31.8674 Longitude: -110.9907

Duration:	5-min	10-min	15-min	30-min	60-min	2-hr	3-hr	6-hr	12-hr	24-hr
Point Values (in)	0.88	1.34	1.66	2.24	2.77	3.08	3.19	3.61	3.92	4.29
Areal Values (in)	0.88	1.34	1.66	2.24	2.77	3.08	3.19	3.61	3.92	4.29

Soils Data

Soil Type	Percent	Curve # (CN)	Adj. Curve # (CN*)	Runoff Coef. (C)
B	100	82.	86.62	0.546
C	0	.	.	0.000
D	0	.	.	0.000
Imp.	50	99.	99.	0.958

Weighted Runoff Coef. (Cw): 0.752

Time of Concentration: 5.7 min

Rainfall Intensity (i) @ Tc: 9.95 in/hr

Runoff Supply Rate (q) @ Tc: 7.48 in/hr

PEAK DISCHARGE: 290 cfs

PC-Hydro, Ver 5.4.2

HYDROLOGIC DATA SHEET FOR PIMA COUNTY FLOOD PEAK PROCEDURE

Pima County Regional Flood Control District

Client: _____ Prepared by: BJK

Project Name: Green Valley Date: 05/31/2013

Concentration Point: F Job #: 13-008

Watershed Area: 51.6 ac Watershed Type: High Density Urbanized

Watercourse Data By Reach

Reach No.	Height (Hi)	Length (Li)	Slope (Si)	Basin Factor (Nb)
1	40.0	2,995	0.0134	.022

Length of Watercourse (Lc): 2,995 feet Mean Slope: 0.0134

Length to Cen. of Gravity (Lca): 1,268 feet Weighted Basin Fac.: 0.022

Veg. Cover Type(s): Desert Brush Veg. Cover Density: 30 %

RETURN PERIOD: 100-years

Rainfall Depths: NOAA Atlas 14 (90% UCL) @ Latitude: 31.8674 Longitude: -110.9907

Duration:	5-min	10-min	15-min	30-min	60-min	2-hr	3-hr	6-hr	12-hr	24-hr
Point Values (in)	0.88	1.34	1.66	2.24	2.77	3.08	3.19	3.61	3.92	4.29
Areal Values (in)	0.88	1.34	1.66	2.24	2.77	3.08	3.19	3.61	3.92	4.29

Soils Data

Soil Type	Percent	Curve # (CN)	Adj. Curve # (CN*)	Runoff Coef. (C)
B	100	82.	86.62	0.546
C	0	.	.	0.000
D	0	.	.	0.000
Imp.	50	99.	99.	0.958

Weighted Runoff Coef. (Cw): 0.752

Time of Concentration: 6.4 min

Rainfall Intensity (i) @ Tc: 9.47 in/hr

Runoff Supply Rate (q) @ Tc: 7.12 in/hr

PEAK DISCHARGE: 370 cfs

PC-Hydro, Ver 5.4.2

HYDROLOGIC DATA SHEET FOR PIMA COUNTY FLOOD PEAK PROCEDURE

Pima County Regional Flood Control District

Client: _____ Prepared by: BJK

Project Name: Green Valley Drainageway Date: 09/09/2013

Concentration Point: CP10A Job #: 13-008

Watershed Area: 29.3 ac Watershed Type: High Density Urbanized

Watercourse Data By Reach

Reach No.	Height (Hi)	Length (Li)	Slope (Si)	Basin Factor (Nb)
1	60.0	3,042	0.0197	.022

Length of Watercourse (Lc): 3,042 feet Mean Slope: 0.0197

Length to Cen. of Gravity (Lca): 1,078 feet Weighted Basin Fac.: 0.022

Veg. Cover Type(s): Desert Brush Veg. Cover Density: 30 %

RETURN PERIOD: 100-years

Rainfall Depths: NOAA Atlas 14 (90% UCL) @ Latitude: 31.8680 Longitude: -111.0040

Duration:	5-min	10-min	15-min	30-min	60-min	2-hr	3-hr	6-hr	12-hr	24-hr
Point Values (in)	0.88	1.35	1.67	2.25	2.78	3.10	3.20	3.62	3.94	4.30
Areal Values (in)	0.88	1.35	1.67	2.25	2.78	3.10	3.20	3.62	3.94	4.30

Soils Data

Soil Type	Percent	Curve # (CN)	Adj. Curve # (CN*)	Runoff Coef. (C)
B	100	82.	86.64	0.548
C	0	.	.	0.000
D	0	.	.	0.000
Imp.	50	99.	99.	0.958

Weighted Runoff Coef. (Cw): 0.753

Time of Concentration: 5.0 min

Rainfall Intensity (i) @ Tc: 10.56 in/hr

Runoff Supply Rate (q) @ Tc: 7.94 in/hr

PEAK DISCHARGE: 235 cfs

PC-Hydro, Ver 5.4.2

HYDROLOGIC DATA SHEET FOR PIMA COUNTY FLOOD PEAK PROCEDURE

Pima County Regional Flood Control District

Client: _____ Prepared by: BJK

Project Name: Green Valley Drainageway Date: 09/09/2013

Concentration Point: CP11A Job #: 13-008

Watershed Area: 41.6 ac Watershed Type: High Density Urbanized

Watercourse Data By Reach

Reach No.	Height (Hi)	Length (Li)	Slope (Si)	Basin Factor (Nb)
1	48.0	3,319	0.0145	.022

Length of Watercourse (Lc): 3,319 feet Mean Slope: 0.0145

Length to Cen. of Gravity (Lca): 1,792 feet Weighted Basin Fac.: 0.022

Veg. Cover Type(s): Desert Brush Veg. Cover Density: 30 %

RETURN PERIOD: 100-years

Rainfall Depths: NOAA Atlas 14 (90% UCL) @ Latitude: 31.8680 Longitude: -111.0040

Duration:	5-min	10-min	15-min	30-min	60-min	2-hr	3-hr	6-hr	12-hr	24-hr
Point Values (in)	0.88	1.35	1.67	2.25	2.78	3.10	3.20	3.62	3.94	4.30
Areal Values (in)	0.88	1.35	1.67	2.25	2.78	3.10	3.20	3.62	3.94	4.30

Soils Data

Soil Type	Percent	Curve # (CN)	Adj. Curve # (CN*)	Runoff Coef. (C)
B	100	82.	86.64	0.548
C	0	.	.	0.000
D	0	.	.	0.000
Imp.	50	99.	99.	0.958

Weighted Runoff Coef. (Cw): 0.753

Time of Concentration: 7.2 min

Rainfall Intensity (i) @ Tc: 9.06 in/hr

Runoff Supply Rate (q) @ Tc: 6.82 in/hr

PEAK DISCHARGE: 286 cfs

PC-Hydro, Ver 5.4.2

HYDROLOGIC DATA SHEET FOR PIMA COUNTY FLOOD PEAK PROCEDURE

Pima County Regional Flood Control District

Client: _____ Prepared by: BJK

Project Name: Green Valley Drainageway Date: 09/09/2013

Concentration Point: CP12A Job #: 13-008

Watershed Area: 36.0 ac Watershed Type: High Density Urbanized

Watercourse Data By Reach

Reach No.	Height (Hi)	Length (Li)	Slope (Si)	Basin Factor (Nb)
1	51.0	3,040	0.0168	.022

Length of Watercourse (Lc): 3,040 feet Mean Slope: 0.0168

Length to Cen. of Gravity (Lca): 1,507 feet Weighted Basin Fac.: 0.022

Veg. Cover Type(s): Desert Brush Veg. Cover Density: 30 %

RETURN PERIOD: 100-years

Rainfall Depths: NOAA Atlas 14 (90% UCL) @ Latitude: 31.8680 Longitude: -111.0040

Duration:	5-min	10-min	15-min	30-min	60-min	2-hr	3-hr	6-hr	12-hr	24-hr
Point Values (in)	0.88	1.35	1.67	2.25	2.78	3.10	3.20	3.62	3.94	4.30
Areal Values (in)	0.88	1.35	1.67	2.25	2.78	3.10	3.20	3.62	3.94	4.30

Soils Data

Soil Type	Percent	Curve # (CN)	Adj. Curve # (CN*)	Runoff Coef. (C)
B	100	82.	86.64	0.548
C	0	.	.	0.000
D	0	.	.	0.000
Imp.	50	99.	99.	0.958

Weighted Runoff Coef. (Cw): 0.753

Time of Concentration: 6.1 min

Rainfall Intensity (i) @ Tc: 9.67 in/hr

Runoff Supply Rate (q) @ Tc: 7.28 in/hr

PEAK DISCHARGE: 264 cfs

PC-Hydro, Ver 5.4.2

HYDROLOGIC DATA SHEET FOR PIMA COUNTY FLOOD PEAK PROCEDURE

Pima County Regional Flood Control District

Client: _____ Prepared by: BJK

Project Name: Green Valley Drainageway Date: 09/09/2013

Concentration Point: CP14A Job #: 13-008

Watershed Area: 18.3 ac Watershed Type: High Density Urbanized

Watercourse Data By Reach

Reach No.	Height (Hi)	Length (Li)	Slope (Si)	Basin Factor (Nb)
1	42.0	2,358	0.0178	.022

Length of Watercourse (Lc): 2,358 feet Mean Slope: 0.0178

Length to Cen. of Gravity (Lca): 850 feet Weighted Basin Fac.: 0.022

Veg. Cover Type(s): Desert Brush Veg. Cover Density: 30 %

RETURN PERIOD: 100-years

Rainfall Depths: NOAA Atlas 14 (90% UCL) @ Latitude: 31.8680 Longitude: -111.0040

Duration:	5-min	10-min	15-min	30-min	60-min	2-hr	3-hr	6-hr	12-hr	24-hr
Point Values (in)	0.88	1.35	1.67	2.25	2.78	3.10	3.20	3.62	3.94	4.30
Areal Values (in)	0.88	1.35	1.67	2.25	2.78	3.10	3.20	3.62	3.94	4.30

Soils Data

Soil Type	Percent	Curve # (CN)	Adj. Curve # (CN*)	Runoff Coef. (C)
B	100	82.	86.64	0.548
C	0	.	.	0.000
D	0	.	.	0.000
Imp.	50	99.	99.	0.958

Weighted Runoff Coef. (Cw): 0.753

Time of Concentration: 5.0 min

Rainfall Intensity (i) @ Tc: 10.56 in/hr

Runoff Supply Rate (q) @ Tc: 7.95 in/hr

PEAK DISCHARGE: 147 cfs

PC-Hydro, Ver 5.4.2

HYDROLOGIC DATA SHEET FOR PIMA COUNTY FLOOD PEAK PROCEDURE

Pima County Regional Flood Control District

Client: _____ Prepared by: BJK

Project Name: Green Valley Drainageway Date: 09/10/2013

Concentration Point: CP15A Job #: 13-008

Watershed Area: 20.0 ac Watershed Type: High Density Urbanized

Watercourse Data By Reach

Reach No.	Height (Hi)	Length (Li)	Slope (Si)	Basin Factor (Nb)
1	28.0	1,935	0.0145	.022

Length of Watercourse (Lc): 1,935 feet Mean Slope: 0.0145

Length to Cen. of Gravity (Lca): 700 feet Weighted Basin Fac.: 0.022

Veg. Cover Type(s): Desert Brush Veg. Cover Density: 30 %

RETURN PERIOD: 100-years

Rainfall Depths: NOAA Atlas 14 (90% UCL) @ Latitude: 31.8566 Longitude: -110.9883

Duration:	5-min	10-min	15-min	30-min	60-min	2-hr	3-hr	6-hr	12-hr	24-hr
Point Values (in)	0.88	1.34	1.66	2.24	2.78	3.09	3.19	3.61	3.93	4.30
Areal Values (in)	0.88	1.34	1.66	2.24	2.78	3.09	3.19	3.61	3.93	4.30

Soils Data

Soil Type	Percent	Curve # (CN)	Adj. Curve # (CN*)	Runoff Coef. (C)
B	100	82.	86.64	0.548
C	0	.	.	0.000
D	0	.	.	0.000
Imp.	50	99.	99.	0.958

Weighted Runoff Coef. (Cw): 0.753

Time of Concentration: 5.0 min

Rainfall Intensity (i) @ Tc: 10.56 in/hr

Runoff Supply Rate (q) @ Tc: 7.95 in/hr

PEAK DISCHARGE: 161 cfs

PC-Hydro, Ver 5.4.2

HYDROLOGIC DATA SHEET FOR PIMA COUNTY FLOOD PEAK PROCEDURE

Pima County Regional Flood Control District

Client: _____ Prepared by: BJK

Project Name: Green Valley Drainageway Date: 09/10/2013

Concentration Point: CP16A Job #: 13-008

Watershed Area: 55.5 ac Watershed Type: High Density Urbanized

Watercourse Data By Reach

Reach No.	Height (Hi)	Length (Li)	Slope (Si)	Basin Factor (Nb)
1	38.0	2,467	0.0154	.022

Length of Watercourse (Lc): 2,467 feet Mean Slope: 0.0154

Length to Cen. of Gravity (Lca): 1,500 feet Weighted Basin Fac.: 0.022

Veg. Cover Type(s): Desert Brush Veg. Cover Density: 30 %

RETURN PERIOD: 100-years

Rainfall Depths: NOAA Atlas 14 (90% UCL) @ Latitude: 31.8566 Longitude: -110.9883

Duration:	5-min	10-min	15-min	30-min	60-min	2-hr	3-hr	6-hr	12-hr	24-hr
Point Values (in)	0.88	1.34	1.66	2.24	2.78	3.09	3.19	3.61	3.93	4.30
Areal Values (in)	0.88	1.34	1.66	2.24	2.78	3.09	3.19	3.61	3.93	4.30

Soils Data

Soil Type	Percent	Curve # (CN)	Adj. Curve # (CN*)	Runoff Coef. (C)
B	100	82.	86.64	0.548
C	0	.	.	0.000
D	0	.	.	0.000
Imp.	50	99.	99.	0.958

Weighted Runoff Coef. (Cw): 0.753

Time of Concentration: 5.9 min

Rainfall Intensity (i) @ Tc: 9.79 in/hr

Runoff Supply Rate (q) @ Tc: 7.37 in/hr

PEAK DISCHARGE: 412 cfs

PC-Hydro, Ver 5.4.2

HYDROLOGIC DATA SHEET FOR PIMA COUNTY FLOOD PEAK PROCEDURE

Pima County Regional Flood Control District

Client: _____ Prepared by: BJK

Project Name: Green Valley Drainageway Date: 09/10/2013

Concentration Point: CP17A Job #: 13-008

Watershed Area: 461.5 ac Watershed Type: Low Density Urbanized

Watercourse Data By Reach

Reach No.	Height (Hi)	Length (Li)	Slope (Si)	Basin Factor (Nb)
1	9.0	42	0.2143	.035
2	103.0	5,438	0.0189	.035
3	74.0	3,746	0.0198	.030
4	91.0	4,640	0.0196	.022

Length of Watercourse (Lc): 13,866 feet Mean Slope: 0.0195

Length to Cen. of Gravity (Lca): 8,500 feet Weighted Basin Fac.: 0.029

Veg. Cover Type(s): Desert Brush Veg. Cover Density: 30 %

RETURN PERIOD: 100-years

Rainfall Depths: NOAA Atlas 14 (90% UCL) @ Latitude: 31.8680 Longitude: -111.0040

Duration:	5-min	10-min	15-min	30-min	60-min	2-hr	3-hr	6-hr	12-hr	24-hr
Point Values (in)	0.88	1.35	1.67	2.25	2.78	3.10	3.20	3.62	3.94	4.30
Areal Values (in)	0.88	1.35	1.67	2.25	2.78	3.10	3.20	3.62	3.94	4.30

Soils Data

Soil Type	Percent	Curve # (CN)	Adj. Curve # (CN*)	Runoff Coef. (C)
B	79	82.	86.64	0.548
C	21	87.	90.25	0.649
D	0	.	.	0.000
Imp.	11	99.	99.	0.958

Weighted Runoff Coef. (Cw): 0.612

Time of Concentration: 30.0 min

Rainfall Intensity (i) @ Tc: 4.50 in/hr

Runoff Supply Rate (q) @ Tc: 2.75 in/hr

PEAK DISCHARGE: 1,281 cfs

PC-Hydro, Ver 5.4.2

HYDROLOGIC DATA SHEET FOR PIMA COUNTY FLOOD PEAK PROCEDURE

Pima County Regional Flood Control District

Client: _____ Prepared by: BJK

Project Name: Green Valley Drainageway Date: 09/10/2013

Concentration Point: CP17B Job #: 13-008

Watershed Area: 431.9 ac Watershed Type: Low Density Urbanized

Watercourse Data By Reach

Reach No.	Height (Hi)	Length (Li)	Slope (Si)	Basin Factor (Nb)
1	9.0	42	0.2143	.035
2	103.0	5,438	0.0189	.035
3	74.0	3,746	0.0198	.030
4	41.0	2,085	0.0197	.022

Length of Watercourse (Lc): 11,311 feet Mean Slope: 0.0194

Length to Cen. of Gravity (Lca): 6,700 feet Weighted Basin Fac.: 0.031

Veg. Cover Type(s): Desert Brush Veg. Cover Density: 30 %

RETURN PERIOD: 100-years

Rainfall Depths: NOAA Atlas 14 (90% UCL) @ Latitude: 31.8680 Longitude: -111.0040

Duration:	5-min	10-min	15-min	30-min	60-min	2-hr	3-hr	6-hr	12-hr	24-hr
Point Values (in)	0.88	1.35	1.67	2.25	2.78	3.10	3.20	3.62	3.94	4.30
Areal Values (in)	0.88	1.35	1.67	2.25	2.78	3.10	3.20	3.62	3.94	4.30

Soils Data

Soil Type	Percent	Curve # (CN)	Adj. Curve # (CN*)	Runoff Coef. (C)
B	77	82.	86.64	0.548
C	23	87.	90.25	0.649
D	0	.	.	0.000
Imp.	9	99.	99.	0.958

Weighted Runoff Coef. (Cw): 0.605

Time of Concentration: 27.4 min

Rainfall Intensity (i) @ Tc: 4.71 in/hr

Runoff Supply Rate (q) @ Tc: 2.85 in/hr

PEAK DISCHARGE: 1,241 cfs

PC-Hydro, Ver 5.4.2

HYDROLOGIC DATA SHEET FOR PIMA COUNTY FLOOD PEAK PROCEDURE

Pima County Regional Flood Control District

Client: _____ Prepared by: BJK

Project Name: Green Valley Drainageway Date: 09/10/2013

Concentration Point: CP17C Job #: 13-008

Watershed Area: 378.0 ac Watershed Type: Low Density Urbanized

Watercourse Data By Reach

Reach No.	Height (Hi)	Length (Li)	Slope (Si)	Basin Factor (Nb)
1	9.0	42	0.2143	.035
2	103.0	5,438	0.0189	.035
3	74.0	3,746	0.0198	.030

Length of Watercourse (Lc): 9,226 feet Mean Slope: 0.0194

Length to Cen. of Gravity (Lca): 5,000 feet Weighted Basin Fac.: 0.033

Veg. Cover Type(s): Desert Brush Veg. Cover Density: 30 %

RETURN PERIOD: 100-years

Rainfall Depths: NOAA Atlas 14 (90% UCL) @ Latitude: 31.8680 Longitude: -111.0040

Duration:	5-min	10-min	15-min	30-min	60-min	2-hr	3-hr	6-hr	12-hr	24-hr
Point Values (in)	0.88	1.35	1.67	2.25	2.78	3.10	3.20	3.62	3.94	4.30
Areal Values (in)	0.88	1.35	1.67	2.25	2.78	3.10	3.20	3.62	3.94	4.30

Soils Data

Soil Type	Percent	Curve # (CN)	Adj. Curve # (CN*)	Runoff Coef. (C)
B	74	82.	86.64	0.548
C	26	87.	90.25	0.649
D	0	.	.	0.000
Imp.	4	99.	99.	0.958

Weighted Runoff Coef. (Cw): 0.589

Time of Concentration: 24.9 min

Rainfall Intensity (i) @ Tc: 4.94 in/hr

Runoff Supply Rate (q) @ Tc: 2.91 in/hr

PEAK DISCHARGE: 1,110 cfs

PC-Hydro, Ver 5.4.2

HYDROLOGIC DATA SHEET FOR PIMA COUNTY FLOOD PEAK PROCEDURE

Pima County Regional Flood Control District

Client: _____ Prepared by: BJK

Project Name: Green Valley Drainageway Date: 09/10/2013

Concentration Point: CP17D Job #: 13-008

Watershed Area: 83.0 ac Watershed Type: Low Density Urbanized

Watercourse Data By Reach

Reach No.	Height (Hi)	Length (Li)	Slope (Si)	Basin Factor (Nb)
1	10.0	195	0.0513	.035
2	114.0	5,293	0.0215	.035

Length of Watercourse (Lc): 5,488 feet Mean Slope: 0.0221

Length to Cen. of Gravity (Lca): 2,821 feet Weighted Basin Fac.: 0.035

Veg. Cover Type(s): Desert Brush Veg. Cover Density: 30 %

RETURN PERIOD: 100-years

Rainfall Depths: NOAA Atlas 14 (90% UCL) @ Latitude: 31.8680 Longitude: -111.0040

Duration:	5-min	10-min	15-min	30-min	60-min	2-hr	3-hr	6-hr	12-hr	24-hr
Point Values (in)	0.88	1.35	1.67	2.25	2.78	3.10	3.20	3.62	3.94	4.30
Areal Values (in)	0.88	1.35	1.67	2.25	2.78	3.10	3.20	3.62	3.94	4.30

Soils Data

Soil Type	Percent	Curve # (CN)	Adj. Curve # (CN*)	Runoff Coef. (C)
B	96	82.	86.64	0.548
C	4	87.	90.25	0.649
D	0	.	.	0.000
Imp.	0	99.	99.	0.000

Weighted Runoff Coef. (Cw): 0.552

Time of Concentration: 17.0 min

Rainfall Intensity (i) @ Tc: 6.16 in/hr

Runoff Supply Rate (q) @ Tc: 3.40 in/hr

PEAK DISCHARGE: 284 cfs

PC-Hydro, Ver 5.4.2

HYDROLOGIC DATA SHEET FOR PIMA COUNTY FLOOD PEAK PROCEDURE

Pima County Regional Flood Control District

Client: _____ Prepared by: BJK

Project Name: Green Valley Drainageway Date: 09/10/2013

Concentration Point: CP17E Job #: 13-008

Watershed Area: 212.5 ac Watershed Type: Low Density Urbanized

Watercourse Data By Reach

Reach No.	Height (Hi)	Length (Li)	Slope (Si)	Basin Factor (Nb)
1	9.0	42	0.2143	.035
2	103.0	5,438	0.0189	.035

Length of Watercourse (Lc): 5,480 feet Mean Slope: 0.0191

Length to Cen. of Gravity (Lca): 3,461 feet Weighted Basin Fac.: 0.035

Veg. Cover Type(s): Desert Brush Veg. Cover Density: 30 %

RETURN PERIOD: 100-years

Rainfall Depths: NOAA Atlas 14 (90% UCL) @ Latitude: 31.8680 Longitude: -111.0040

Duration:	5-min	10-min	15-min	30-min	60-min	2-hr	3-hr	6-hr	12-hr	24-hr
Point Values (in)	0.88	1.35	1.67	2.25	2.78	3.10	3.20	3.62	3.94	4.30
Areal Values (in)	0.88	1.35	1.67	2.25	2.78	3.10	3.20	3.62	3.94	4.30

Soils Data

Soil Type	Percent	Curve # (CN)	Adj. Curve # (CN*)	Runoff Coef. (C)
B	65	82.	86.64	0.548
C	35	87.	90.25	0.649
D	0	.	.	0.000
Imp.	0	99.	99.	0.000

Weighted Runoff Coef. (Cw): 0.583

Time of Concentration: 19.3 min

Rainfall Intensity (i) @ Tc: 5.70 in/hr

Runoff Supply Rate (q) @ Tc: 3.33 in/hr

PEAK DISCHARGE: 712 cfs

PC-Hydro, Ver 5.4.2

HYDROLOGIC DATA SHEET FOR PIMA COUNTY FLOOD PEAK PROCEDURE

Pima County Regional Flood Control District

Client: _____ Prepared by: BJK

Project Name: Green Valley Drainageway Date: 09/10/2013

Concentration Point: CP18A Job #: 13-008

Watershed Area: 26.6 ac Watershed Type: Low Density Urbanized

Watercourse Data By Reach

Reach No.	Height (Hi)	Length (Li)	Slope (Si)	Basin Factor (Nb)
1	43.0	1,991	0.0216	.022

Length of Watercourse (Lc): 1,991 feet Mean Slope: 0.0216

Length to Cen. of Gravity (Lca): 720 feet Weighted Basin Fac.: 0.022

Veg. Cover Type(s): Desert Brush Veg. Cover Density: 30 %

RETURN PERIOD: 100-years

Rainfall Depths: NOAA Atlas 14 (90% UCL) @ Latitude: 31.8680 Longitude: -111.0040

Duration:	5-min	10-min	15-min	30-min	60-min	2-hr	3-hr	6-hr	12-hr	24-hr
Point Values (in)	0.88	1.35	1.67	2.25	2.78	3.10	3.20	3.62	3.94	4.30
Areal Values (in)	0.88	1.35	1.67	2.25	2.78	3.10	3.20	3.62	3.94	4.30

Soils Data

Soil Type	Percent	Curve # (CN)	Adj. Curve # (CN*)	Runoff Coef. (C)
B	100	82.	86.64	0.548
C	0	.	.	0.000
D	0	.	.	0.000
Imp.	40	99.	99.	0.958

Weighted Runoff Coef. (Cw): 0.712

Time of Concentration: 5.0 min

Rainfall Intensity (i) @ Tc: 10.56 in/hr

Runoff Supply Rate (q) @ Tc: 7.51 in/hr

PEAK DISCHARGE: 202 cfs

PC-Hydro, Ver 5.4.2

HYDROLOGIC DATA SHEET FOR PIMA COUNTY FLOOD PEAK PROCEDURE

Pima County Regional Flood Control District

Client: _____ Prepared by: BJK

Project Name: Green Valley Drainageway Date: 09/10/2013

Concentration Point: CP19A Job #: 13-008

Watershed Area: 30.1 ac Watershed Type: Medium Density Urbanized

Watercourse Data By Reach

Reach No.	Height (Hi)	Length (Li)	Slope (Si)	Basin Factor (Nb)
1	31.0	2,161	0.0143	.022

Length of Watercourse (Lc): 2,161 feet Mean Slope: 0.0143

Length to Cen. of Gravity (Lca): 1,300 feet Weighted Basin Fac.: 0.022

Veg. Cover Type(s): Desert Brush Veg. Cover Density: 30 %

RETURN PERIOD: 100-years

Rainfall Depths: NOAA Atlas 14 (90% UCL) @ Latitude: 31.8680 Longitude: -111.0040

Duration:	5-min	10-min	15-min	30-min	60-min	2-hr	3-hr	6-hr	12-hr	24-hr
Point Values (in)	0.88	1.35	1.67	2.25	2.78	3.10	3.20	3.62	3.94	4.30
Areal Values (in)	0.88	1.35	1.67	2.25	2.78	3.10	3.20	3.62	3.94	4.30

Soils Data

Soil Type	Percent	Curve # (CN)	Adj. Curve # (CN*)	Runoff Coef. (C)
B	100	82.	86.64	0.548
C	0	.	.	0.000
D	0	.	.	0.000
Imp.	40	99.	99.	0.958

Weighted Runoff Coef. (Cw): 0.712

Time of Concentration: 5.7 min

Rainfall Intensity (i) @ Tc: 9.98 in/hr

Runoff Supply Rate (q) @ Tc: 7.10 in/hr

PEAK DISCHARGE: 215 cfs

PC-Hydro, Ver 5.4.2

HYDROLOGIC DATA SHEET FOR PIMA COUNTY FLOOD PEAK PROCEDURE

Pima County Regional Flood Control District

Client: _____ Prepared by: BJK

Project Name: Green Valley Drainageway Date: 09/11/2013

Concentration Point: CP20A Job #: 13-008

Watershed Area: 219.6 ac Watershed Type: Medium Density Urbanized

Watercourse Data By Reach

Reach No.	Height (Hi)	Length (Li)	Slope (Si)	Basin Factor (Nb)
1	135.0	6,952	0.0194	.035
2	29.0	1,793	0.0162	.030
3	47.0	1,977	0.0238	.022

Length of Watercourse (Lc): 10,722 feet Mean Slope: 0.0195

Length to Cen. of Gravity (Lca): 4,650 feet Weighted Basin Fac.: 0.032

Veg. Cover Type(s): Desert Brush Veg. Cover Density: 30 %

RETURN PERIOD: 100-years

Rainfall Depths: NOAA Atlas 14 (90% UCL) @ Latitude: 31.8680 Longitude: -111.0040

Duration:	5-min	10-min	15-min	30-min	60-min	2-hr	3-hr	6-hr	12-hr	24-hr
Point Values (in)	0.88	1.35	1.67	2.25	2.78	3.10	3.20	3.62	3.94	4.30
Areal Values (in)	0.88	1.35	1.67	2.25	2.78	3.10	3.20	3.62	3.94	4.30

Soils Data

Soil Type	Percent	Curve # (CN)	Adj. Curve # (CN*)	Runoff Coef. (C)
B	55	82.	86.64	0.548
C	45	87.	90.25	0.649
D	0	.	.	0.000
Imp.	16	99.	99.	0.958

Weighted Runoff Coef. (Cw): 0.652

Time of Concentration: 23.3 min

Rainfall Intensity (i) @ Tc: 5.12 in/hr

Runoff Supply Rate (q) @ Tc: 3.34 in/hr

PEAK DISCHARGE: 739 cfs

PC-Hydro, Ver 5.4.2

HYDROLOGIC DATA SHEET FOR PIMA COUNTY FLOOD PEAK PROCEDURE

Pima County Regional Flood Control District

Client: _____ Prepared by: BJK

Project Name: Green Valley Drainageway Date: 09/11/2013

Concentration Point: CP20B Job #: 13-008

Watershed Area: 184.9 ac Watershed Type: Medium Density Urbanized

Watercourse Data By Reach

Reach No.	Height (Hi)	Length (Li)	Slope (Si)	Basin Factor (Nb)
1	135.0	6,952	0.0194	.035
2	29.0	1,793	0.0162	.030

Length of Watercourse (Lc): 8,745 feet Mean Slope: 0.0187

Length to Cen. of Gravity (Lca): 3,400 feet Weighted Basin Fac.: 0.034

Veg. Cover Type(s): Desert Brush Veg. Cover Density: 30 %

RETURN PERIOD: 100-years

Rainfall Depths: NOAA Atlas 14 (90% UCL) @ Latitude: 31.8680 Longitude: -111.0040

Duration:	5-min	10-min	15-min	30-min	60-min	2-hr	3-hr	6-hr	12-hr	24-hr
Point Values (in)	0.88	1.35	1.67	2.25	2.78	3.10	3.20	3.62	3.94	4.30
Areal Values (in)	0.88	1.35	1.67	2.25	2.78	3.10	3.20	3.62	3.94	4.30

Soils Data

Soil Type	Percent	Curve # (CN)	Adj. Curve # (CN*)	Runoff Coef. (C)
B	46	82.	86.64	0.548
C	54	87.	90.25	0.649
D	0	.	.	0.000
Imp.	12	99.	99.	0.958

Weighted Runoff Coef. (Cw): 0.645

Time of Concentration: 21.2 min

Rainfall Intensity (i) @ Tc: 5.40 in/hr

Runoff Supply Rate (q) @ Tc: 3.48 in/hr

PEAK DISCHARGE: 649 cfs

PC-Hydro, Ver 5.4.2

HYDROLOGIC DATA SHEET FOR PIMA COUNTY FLOOD PEAK PROCEDURE

Pima County Regional Flood Control District

Client: _____ Prepared by: BJK

Project Name: Green Valley Drainageway Date: 09/11/2013

Concentration Point: CP20C Job #: 13-008

Watershed Area: 128.2 ac Watershed Type: Medium Density Urbanized

Watercourse Data By Reach

Reach No.	Height (Hi)	Length (Li)	Slope (Si)	Basin Factor (Nb)
1	135.0	6,952	0.0194	.035

Length of Watercourse (Lc): 6,952 feet Mean Slope: 0.0194

Length to Cen. of Gravity (Lca): 2,700 feet Weighted Basin Fac.: 0.035

Veg. Cover Type(s): Desert Brush Veg. Cover Density: 30 %

RETURN PERIOD: 100-years

Rainfall Depths: NOAA Atlas 14 (90% UCL) @ Latitude: 31.8680 Longitude: -111.0040

Duration:	5-min	10-min	15-min	30-min	60-min	2-hr	3-hr	6-hr	12-hr	24-hr
Point Values (in)	0.88	1.35	1.67	2.25	2.78	3.10	3.20	3.62	3.94	4.30
Areal Values (in)	0.88	1.35	1.67	2.25	2.78	3.10	3.20	3.62	3.94	4.30

Soils Data

Soil Type	Percent	Curve # (CN)	Adj. Curve # (CN*)	Runoff Coef. (C)
B	22	82.	86.64	0.548
C	78	87.	90.25	0.649
D	0	.	.	0.000
Imp.	10	99.	99.	0.958

Weighted Runoff Coef. (Cw): 0.659

Time of Concentration: 17.9 min

Rainfall Intensity (i) @ Tc: 5.97 in/hr

Runoff Supply Rate (q) @ Tc: 3.94 in/hr

PEAK DISCHARGE: 509 cfs

PC-Hydro, Ver 5.4.2

HYDROLOGIC DATA SHEET FOR PIMA COUNTY FLOOD PEAK PROCEDURE

Pima County Regional Flood Control District

Client: _____ Prepared by: BJK

Project Name: Green Valley Drainageway Date: 09/11/2013

Concentration Point: CP21A Job #: 13-008

Watershed Area: 79.0 ac Watershed Type: Medium Density Urbanized

Watercourse Data By Reach

Reach No.	Height (Hi)	Length (Li)	Slope (Si)	Basin Factor (Nb)
1	64.0	2,931	0.0218	.035
2	43.0	1,713	0.0251	.030
3	49.0	2,000	0.0245	.022

Length of Watercourse (Lc): 6,644 feet Mean Slope: 0.0234

Length to Cen. of Gravity (Lca): 2,200 feet Weighted Basin Fac.: 0.030

Veg. Cover Type(s): Desert Brush Veg. Cover Density: 30 %

RETURN PERIOD: 100-years

Rainfall Depths: NOAA Atlas 14 (90% UCL) @ Latitude: 31.8680 Longitude: -111.0040

Duration:	5-min	10-min	15-min	30-min	60-min	2-hr	3-hr	6-hr	12-hr	24-hr
Point Values (in)	0.88	1.35	1.67	2.25	2.78	3.10	3.20	3.62	3.94	4.30
Areal Values (in)	0.88	1.35	1.67	2.25	2.78	3.10	3.20	3.62	3.94	4.30

Soils Data

Soil Type	Percent	Curve # (CN)	Adj. Curve # (CN*)	Runoff Coef. (C)
B	86	82.	86.64	0.548
C	14	87.	90.25	0.649
D	0	.	.	0.000
Imp.	23	99.	99.	0.958

Weighted Runoff Coef. (Cw): 0.653

Time of Concentration: 12.2 min

Rainfall Intensity (i) @ Tc: 7.34 in/hr

Runoff Supply Rate (q) @ Tc: 4.79 in/hr

PEAK DISCHARGE: 382 cfs

PC-Hydro, Ver 5.4.2

HYDROLOGIC DATA SHEET FOR PIMA COUNTY FLOOD PEAK PROCEDURE

Pima County Regional Flood Control District

Client: _____ Prepared by: BJK

Project Name: Green Valley Drainageway Date: 09/11/2013

Concentration Point: CP21B Job #: 13-008

Watershed Area: 43.6 ac Watershed Type: Medium Density Urbanized

Watercourse Data By Reach

Reach No.	Height (Hi)	Length (Li)	Slope (Si)	Basin Factor (Nb)
1	64.0	2,931	0.0218	.035
2	43.0	1,713	0.0251	.030

Length of Watercourse (Lc): 4,644 feet Mean Slope: 0.0230

Length to Cen. of Gravity (Lca): 1,690 feet Weighted Basin Fac.: 0.033

Veg. Cover Type(s): Desert Brush Veg. Cover Density: 30 %

RETURN PERIOD: 100-years

Rainfall Depths: NOAA Atlas 14 (90% UCL) @ Latitude: 31.8680 Longitude: -111.0040

Duration:	5-min	10-min	15-min	30-min	60-min	2-hr	3-hr	6-hr	12-hr	24-hr
Point Values (in)	0.88	1.35	1.67	2.25	2.78	3.10	3.20	3.62	3.94	4.30
Areal Values (in)	0.88	1.35	1.67	2.25	2.78	3.10	3.20	3.62	3.94	4.30

Soils Data

Soil Type	Percent	Curve # (CN)	Adj. Curve # (CN*)	Runoff Coef. (C)
B	74	82.	86.64	0.548
C	26	87.	90.25	0.649
D	0	.	.	0.000
Imp.	10	99.	99.	0.958

Weighted Runoff Coef. (Cw): 0.612

Time of Concentration: 11.5 min

Rainfall Intensity (i) @ Tc: 7.55 in/hr

Runoff Supply Rate (q) @ Tc: 4.62 in/hr

PEAK DISCHARGE: 203 cfs

PC-Hydro, Ver 5.4.2

HYDROLOGIC DATA SHEET FOR PIMA COUNTY FLOOD PEAK PROCEDURE

Pima County Regional Flood Control District

Client: _____ Prepared by: BJK

Project Name: Green Valley Drainageway Date: 09/11/2013

Concentration Point: CP21C Job #: 13-008

Watershed Area: 19.8 ac Watershed Type: Medium Density Urbanized

Watercourse Data By Reach

Reach No.	Height (Hi)	Length (Li)	Slope (Si)	Basin Factor (Nb)
1	64.0	2,931	0.0218	.035

Length of Watercourse (Lc): 2,931 feet Mean Slope: 0.0218

Length to Cen. of Gravity (Lca): 1,150 feet Weighted Basin Fac.: 0.035

Veg. Cover Type(s): Desert Brush Veg. Cover Density: 30 %

RETURN PERIOD: 100-years

Rainfall Depths: NOAA Atlas 14 (90% UCL) @ Latitude: 31.8680 Longitude: -111.0040

Duration:	5-min	10-min	15-min	30-min	60-min	2-hr	3-hr	6-hr	12-hr	24-hr
Point Values (in)	0.88	1.35	1.67	2.25	2.78	3.10	3.20	3.62	3.94	4.30
Areal Values (in)	0.88	1.35	1.67	2.25	2.78	3.10	3.20	3.62	3.94	4.30

Soils Data

Soil Type	Percent	Curve # (CN)	Adj. Curve # (CN*)	Runoff Coef. (C)
B	43	82.	86.64	0.548
C	57	87.	90.25	0.649
D	0	.	.	0.000
Imp.	10	99.	99.	0.958

Weighted Runoff Coef. (Cw): 0.641

Time of Concentration: 9.0 min

Rainfall Intensity (i) @ Tc: 8.37 in/hr

Runoff Supply Rate (q) @ Tc: 5.36 in/hr

PEAK DISCHARGE: 107 cfs

PC-Hydro, Ver 5.4.2

HYDROLOGIC DATA SHEET FOR PIMA COUNTY FLOOD PEAK PROCEDURE

Pima County Regional Flood Control District

Client: _____ Prepared by: BJK

Project Name: Green Valley Drainageway Date: 09/11/2013

Concentration Point: CP22A Job #: 13-008

Watershed Area: 95.7 ac Watershed Type: Medium Density Urbanized

Watercourse Data By Reach

Reach No.	Height (Hi)	Length (Li)	Slope (Si)	Basin Factor (Nb)
1	41.0	1,608	0.0255	.035
2	42.0	1,615	0.0260	.030
3	48.0	2,090	0.0230	.022

Length of Watercourse (Lc): 5,313 feet Mean Slope: 0.0246

Length to Cen. of Gravity (Lca): 2,500 feet Weighted Basin Fac.: 0.028

Veg. Cover Type(s): Desert Brush Veg. Cover Density: 30 %

RETURN PERIOD: 100-years

Rainfall Depths: NOAA Atlas 14 (90% UCL) @ Latitude: 31.8680 Longitude: -111.0040

Duration:	5-min	10-min	15-min	30-min	60-min	2-hr	3-hr	6-hr	12-hr	24-hr
Point Values (in)	0.88	1.35	1.67	2.25	2.78	3.10	3.20	3.62	3.94	4.30
Areal Values (in)	0.88	1.35	1.67	2.25	2.78	3.10	3.20	3.62	3.94	4.30

Soils Data

Soil Type	Percent	Curve # (CN)	Adj. Curve # (CN*)	Runoff Coef. (C)
B	88	82.	86.64	0.548
C	12	87.	90.25	0.649
D	0	.	.	0.000
Imp.	26	99.	99.	0.958

Weighted Runoff Coef. (Cw): 0.663

Time of Concentration: 10.6 min

Rainfall Intensity (i) @ Tc: 7.86 in/hr

Runoff Supply Rate (q) @ Tc: 5.21 in/hr

PEAK DISCHARGE: 503 cfs

PC-Hydro, Ver 5.4.2

HYDROLOGIC DATA SHEET FOR PIMA COUNTY FLOOD PEAK PROCEDURE

Pima County Regional Flood Control District

Client: _____ Prepared by: BJK

Project Name: Green Valley Drainageway Date: 09/11/2013

Concentration Point: CP22B Job #: 13-008

Watershed Area: 45.8 ac Watershed Type: Medium Density Urbanized

Watercourse Data By Reach

Reach No.	Height (Hi)	Length (Li)	Slope (Si)	Basin Factor (Nb)
1	41.0	1,608	0.0255	.035
2	42.0	1,615	0.0260	.030

Length of Watercourse (Lc): 3,223 feet Mean Slope: 0.0258

Length to Cen. of Gravity (Lca): 1,300 feet Weighted Basin Fac.: 0.033

Veg. Cover Type(s): Desert Brush Veg. Cover Density: 30 %

RETURN PERIOD: 100-years

Rainfall Depths: NOAA Atlas 14 (90% UCL) @ Latitude: 31.8680 Longitude: -111.0040

Duration:	5-min	10-min	15-min	30-min	60-min	2-hr	3-hr	6-hr	12-hr	24-hr
Point Values (in)	0.88	1.35	1.67	2.25	2.78	3.10	3.20	3.62	3.94	4.30
Areal Values (in)	0.88	1.35	1.67	2.25	2.78	3.10	3.20	3.62	3.94	4.30

Soils Data

Soil Type	Percent	Curve # (CN)	Adj. Curve # (CN*)	Runoff Coef. (C)
B	89	82.	86.64	0.548
C	11	87.	90.25	0.649
D	0	.	.	0.000
Imp.	10	99.	99.	0.958

Weighted Runoff Coef. (Cw): 0.598

Time of Concentration: 8.5 min

Rainfall Intensity (i) @ Tc: 8.52 in/hr

Runoff Supply Rate (q) @ Tc: 5.10 in/hr

PEAK DISCHARGE: 236 cfs

PC-Hydro, Ver 5.4.2

HYDROLOGIC DATA SHEET FOR PIMA COUNTY FLOOD PEAK PROCEDURE

Pima County Regional Flood Control District

Client: _____ Prepared by: BJK

Project Name: Green Valley Drainageway Date: 09/11/2013

Concentration Point: CP22C Job #: 13-008

Watershed Area: 13.8 ac Watershed Type: Medium Density Urbanized

Watercourse Data By Reach

Reach No.	Height (Hi)	Length (Li)	Slope (Si)	Basin Factor (Nb)
1	41.0	1,608	0.0255	.035

Length of Watercourse (Lc): 1,608 feet Mean Slope: 0.0255

Length to Cen. of Gravity (Lca): 600 feet Weighted Basin Fac.: 0.035

Veg. Cover Type(s): Desert Brush Veg. Cover Density: 30 %

RETURN PERIOD: 100-years

Rainfall Depths: NOAA Atlas 14 (90% UCL) @ Latitude: 31.8680 Longitude: -111.0040

Duration:	5-min	10-min	15-min	30-min	60-min	2-hr	3-hr	6-hr	12-hr	24-hr
Point Values (in)	0.88	1.35	1.67	2.25	2.78	3.10	3.20	3.62	3.94	4.30
Areal Values (in)	0.88	1.35	1.67	2.25	2.78	3.10	3.20	3.62	3.94	4.30

Soils Data

Soil Type	Percent	Curve # (CN)	Adj. Curve # (CN*)	Runoff Coef. (C)
B	65	82.	86.64	0.548
C	35	87.	90.25	0.649
D	0	.	.	0.000
Imp.	10	99.	99.	0.958

Weighted Runoff Coef. (Cw): 0.621

Time of Concentration: 5.5 min

Rainfall Intensity (i) @ Tc: 10.14 in/hr

Runoff Supply Rate (q) @ Tc: 6.30 in/hr

PEAK DISCHARGE: 88 cfs

PC-Hydro, Ver 5.4.2

HYDROLOGIC DATA SHEET FOR PIMA COUNTY FLOOD PEAK PROCEDURE

Pima County Regional Flood Control District

Client: _____ Prepared by: BJK

Project Name: Green Valley Drainageway Date: 09/11/2013

Concentration Point: CP23A Job #: 13-008

Watershed Area: 469.9 ac Watershed Type: Medium Density Urbanized

Watercourse Data By Reach

Reach No.	Height (Hi)	Length (Li)	Slope (Si)	Basin Factor (Nb)
1	84.0	3,406	0.0247	.035
2	97.0	6,286	0.0154	.030
3	52.0	2,675	0.0194	.022

Length of Watercourse (Lc): 12,367 feet Mean Slope: 0.0183

Length to Cen. of Gravity (Lca): 4,500 feet Weighted Basin Fac.: 0.030

Veg. Cover Type(s): Desert Brush Veg. Cover Density: 30 %

RETURN PERIOD: 100-years

Rainfall Depths: NOAA Atlas 14 (90% UCL) @ Latitude: 31.8680 Longitude: -111.0040

Duration:	5-min	10-min	15-min	30-min	60-min	2-hr	3-hr	6-hr	12-hr	24-hr
Point Values (in)	0.88	1.35	1.67	2.25	2.78	3.10	3.20	3.62	3.94	4.30
Areal Values (in)	0.88	1.35	1.67	2.25	2.78	3.10	3.20	3.62	3.94	4.30

Soils Data

Soil Type	Percent	Curve # (CN)	Adj. Curve # (CN*)	Runoff Coef. (C)
B	78	82.	86.64	0.548
C	22	87.	90.25	0.649
D	0	.	.	0.000
Imp.	24	99.	99.	0.958

Weighted Runoff Coef. (Cw): 0.663

Time of Concentration: 22.6 min

Rainfall Intensity (i) @ Tc: 5.22 in/hr

Runoff Supply Rate (q) @ Tc: 3.46 in/hr

PEAK DISCHARGE: 1,638 cfs

PC-Hydro, Ver 5.4.2

HYDROLOGIC DATA SHEET FOR PIMA COUNTY FLOOD PEAK PROCEDURE

Pima County Regional Flood Control District

Client: _____ Prepared by: BJK

Project Name: Green Valley Drainageway Date: 09/11/2013

Concentration Point: CP23B Job #: 13-008

Watershed Area: 319.8 ac Watershed Type: Medium Density Urbanized

Watercourse Data By Reach

Reach No.	Height (Hi)	Length (Li)	Slope (Si)	Basin Factor (Nb)
1	84.0	3,406	0.0247	.035
2	97.0	6,286	0.0154	.030

Length of Watercourse (Lc): 9,692 feet Mean Slope: 0.0180

Length to Cen. of Gravity (Lca): 4,250 feet Weighted Basin Fac.: 0.032

Veg. Cover Type(s): Desert Brush Veg. Cover Density: 30 %

RETURN PERIOD: 100-years

Rainfall Depths: NOAA Atlas 14 (90% UCL) @ Latitude: 31.8680 Longitude: -111.0040

Duration:	5-min	10-min	15-min	30-min	60-min	2-hr	3-hr	6-hr	12-hr	24-hr
Point Values (in)	0.88	1.35	1.67	2.25	2.78	3.10	3.20	3.62	3.94	4.30
Areal Values (in)	0.88	1.35	1.67	2.25	2.78	3.10	3.20	3.62	3.94	4.30

Soils Data

Soil Type	Percent	Curve # (CN)	Adj. Curve # (CN*)	Runoff Coef. (C)
B	70	82.	86.64	0.548
C	30	87.	90.25	0.649
D	0	.	.	0.000
Imp.	12	99.	99.	0.958

Weighted Runoff Coef. (Cw): 0.623

Time of Concentration: 22.7 min

Rainfall Intensity (i) @ Tc: 5.20 in/hr

Runoff Supply Rate (q) @ Tc: 3.24 in/hr

PEAK DISCHARGE: 1,044 cfs

PC-Hydro, Ver 5.4.2

HYDROLOGIC DATA SHEET FOR PIMA COUNTY FLOOD PEAK PROCEDURE

Pima County Regional Flood Control District

Client: _____ Prepared by: BJK

Project Name: Green Valley Drainageway Date: 09/11/2013

Concentration Point: CP23C Job #: 13-008

Watershed Area: 60.2 ac Watershed Type: Medium Density Urbanized

Watercourse Data By Reach

Reach No.	Height (Hi)	Length (Li)	Slope (Si)	Basin Factor (Nb)
1	84.0	3,406	0.0247	.035

Length of Watercourse (Lc): 3,406 feet Mean Slope: 0.0247

Length to Cen. of Gravity (Lca): 1,650 feet Weighted Basin Fac.: 0.035

Veg. Cover Type(s): Desert Brush Veg. Cover Density: 30 %

RETURN PERIOD: 100-years

Rainfall Depths: NOAA Atlas 14 (90% UCL) @ Latitude: 31.8680 Longitude: -111.0040

Duration:	5-min	10-min	15-min	30-min	60-min	2-hr	3-hr	6-hr	12-hr	24-hr
Point Values (in)	0.88	1.35	1.67	2.25	2.78	3.10	3.20	3.62	3.94	4.30
Areal Values (in)	0.88	1.35	1.67	2.25	2.78	3.10	3.20	3.62	3.94	4.30

Soils Data

Soil Type	Percent	Curve # (CN)	Adj. Curve # (CN*)	Runoff Coef. (C)
B	29	82.	86.64	0.548
C	71	87.	90.25	0.649
D	0	.	.	0.000
Imp.	0	99.	99.	0.000

Weighted Runoff Coef. (Cw): 0.620

Time of Concentration: 10.4 min

Rainfall Intensity (i) @ Tc: 7.95 in/hr

Runoff Supply Rate (q) @ Tc: 4.93 in/hr

PEAK DISCHARGE: 299 cfs

PC-Hydro, Ver 5.4.2

HYDROLOGIC DATA SHEET FOR PIMA COUNTY FLOOD PEAK PROCEDURE

Pima County Regional Flood Control District

Client: _____ Prepared by: BJK

Project Name: Green Valley Drainageway Date: 09/11/2013

Concentration Point: CP24A Job #: 13-008

Watershed Area: 539.1 ac Watershed Type: Medium Density Urbanized

Watercourse Data By Reach

Reach No.	Height (Hi)	Length (Li)	Slope (Si)	Basin Factor (Nb)
1	75.0	3,935	0.0191	.035
2	105.0	5,854	0.0179	.030
3	43.0	1,486	0.0289	.022
4	15.0	983	0.0153	.022

Length of Watercourse (Lc): 12,258 feet Mean Slope: 0.0190

Length to Cen. of Gravity (Lca): 6,800 feet Weighted Basin Fac.: 0.030

Veg. Cover Type(s): Desert Brush Veg. Cover Density: 30 %

RETURN PERIOD: 100-years

Rainfall Depths: NOAA Atlas 14 (90% UCL) @ Latitude: 31.8680 Longitude: -111.0040

Duration:	5-min	10-min	15-min	30-min	60-min	2-hr	3-hr	6-hr	12-hr	24-hr
Point Values (in)	0.88	1.35	1.67	2.25	2.78	3.10	3.20	3.62	3.94	4.30
Areal Values (in)	0.88	1.35	1.67	2.25	2.78	3.10	3.20	3.62	3.94	4.30

Soils Data

Soil Type	Percent	Curve # (CN)	Adj. Curve # (CN*)	Runoff Coef. (C)
B	93	82.	86.64	0.548
C	7	87.	90.25	0.649
D	0	.	.	0.000
Imp.	20	99.	99.	0.958

Weighted Runoff Coef. (Cw): 0.636

Time of Concentration: 27.0 min

Rainfall Intensity (i) @ Tc: 4.74 in/hr

Runoff Supply Rate (q) @ Tc: 3.01 in/hr

PEAK DISCHARGE: 1,637 cfs

PC-Hydro, Ver 5.4.2

HYDROLOGIC DATA SHEET FOR PIMA COUNTY FLOOD PEAK PROCEDURE

Pima County Regional Flood Control District

Client: _____ Prepared by: BJK

Project Name: Green Valley Drainageway Date: 09/11/2013

Concentration Point: CP24B Job #: 13-008

Watershed Area: 294.7 ac Watershed Type: Medium Density Urbanized

Watercourse Data By Reach

Reach No.	Height (Hi)	Length (Li)	Slope (Si)	Basin Factor (Nb)
1	75.0	3,935	0.0191	.035
2	105.0	5,854	0.0179	.030
3	43.0	1,486	0.0289	.022

Length of Watercourse (Lc): 11,275 feet Mean Slope: 0.0194

Length to Cen. of Gravity (Lca): 6,950 feet Weighted Basin Fac.: 0.031

Veg. Cover Type(s): Desert Brush Veg. Cover Density: 30 %

RETURN PERIOD: 100-years

Rainfall Depths: NOAA Atlas 14 (90% UCL) @ Latitude: 31.8680 Longitude: -111.0040

Duration:	5-min	10-min	15-min	30-min	60-min	2-hr	3-hr	6-hr	12-hr	24-hr
Point Values (in)	0.88	1.35	1.67	2.25	2.78	3.10	3.20	3.62	3.94	4.30
Areal Values (in)	0.88	1.35	1.67	2.25	2.78	3.10	3.20	3.62	3.94	4.30

Soils Data

Soil Type	Percent	Curve # (CN)	Adj. Curve # (CN*)	Runoff Coef. (C)
B	91	82.	86.64	0.548
C	9	87.	90.25	0.649
D	0	.	.	0.000
Imp.	5	99.	99.	0.958

Weighted Runoff Coef. (Cw): 0.577

Time of Concentration: 28.3 min

Rainfall Intensity (i) @ Tc: 4.63 in/hr

Runoff Supply Rate (q) @ Tc: 2.67 in/hr

PEAK DISCHARGE: 793 cfs

PC-Hydro, Ver 5.4.2

HYDROLOGIC DATA SHEET FOR PIMA COUNTY FLOOD PEAK PROCEDURE

Pima County Regional Flood Control District

Client: _____ Prepared by: BJK

Project Name: Green Valley Drainageway Date: 09/11/2013

Concentration Point: CP24C Job #: 13-008

Watershed Area: 278.7 ac Watershed Type: Medium Density Urbanized

Watercourse Data By Reach

Reach No.	Height (Hi)	Length (Li)	Slope (Si)	Basin Factor (Nb)
1	75.0	3,935	0.0191	.035
2	105.0	5,854	0.0179	.030

Length of Watercourse (Lc): 9,789 feet Mean Slope: 0.0184

Length to Cen. of Gravity (Lca): 5,900 feet Weighted Basin Fac.: 0.032

Veg. Cover Type(s): Desert Brush Veg. Cover Density: 30 %

RETURN PERIOD: 100-years

Rainfall Depths: NOAA Atlas 14 (90% UCL) @ Latitude: 31.8680 Longitude: -111.0040

Duration:	5-min	10-min	15-min	30-min	60-min	2-hr	3-hr	6-hr	12-hr	24-hr
Point Values (in)	0.88	1.35	1.67	2.25	2.78	3.10	3.20	3.62	3.94	4.30
Areal Values (in)	0.88	1.35	1.67	2.25	2.78	3.10	3.20	3.62	3.94	4.30

Soils Data

Soil Type	Percent	Curve # (CN)	Adj. Curve # (CN*)	Runoff Coef. (C)
B	91	82.	86.64	0.548
C	9	87.	90.25	0.649
D	0	.	.	0.000
Imp.	5	99.	99.	0.958

Weighted Runoff Coef. (Cw): 0.577

Time of Concentration: 27.1 min

Rainfall Intensity (i) @ Tc: 4.73 in/hr

Runoff Supply Rate (q) @ Tc: 2.73 in/hr

PEAK DISCHARGE: 767 cfs

PC-Hydro, Ver 5.4.2

HYDROLOGIC DATA SHEET FOR PIMA COUNTY FLOOD PEAK PROCEDURE

Pima County Regional Flood Control District

Client: _____ Prepared by: BJK

Project Name: Green Valley Drainageway Date: 09/11/2013

Concentration Point: CP24D Job #: 13-008

Watershed Area: 208.8 ac Watershed Type: Medium Density Urbanized

Watercourse Data By Reach

Reach No.	Height (Hi)	Length (Li)	Slope (Si)	Basin Factor (Nb)
1	117.0	4,558	0.0257	.035
2	67.0	3,413	0.0196	.022
3	31.0	2,016	0.0154	.022

Length of Watercourse (Lc): 9,987 feet Mean Slope: 0.0209

Length to Cen. of Gravity (Lca): 4,456 feet Weighted Basin Fac.: 0.027

Veg. Cover Type(s): Desert Brush Veg. Cover Density: 30 %

RETURN PERIOD: 100-years

Rainfall Depths: NOAA Atlas 14 (90% UCL) @ Latitude: 31.8680 Longitude: -111.0040

Duration:	5-min	10-min	15-min	30-min	60-min	2-hr	3-hr	6-hr	12-hr	24-hr
Point Values (in)	0.88	1.35	1.67	2.25	2.78	3.10	3.20	3.62	3.94	4.30
Areal Values (in)	0.88	1.35	1.67	2.25	2.78	3.10	3.20	3.62	3.94	4.30

Soils Data

Soil Type	Percent	Curve # (CN)	Adj. Curve # (CN*)	Runoff Coef. (C)
B	95	82.	86.64	0.548
C	5	87.	90.25	0.649
D	0	.	.	0.000
Imp.	36	99.	99.	0.958

Weighted Runoff Coef. (Cw): 0.698

Time of Concentration: 17.0 min

Rainfall Intensity (i) @ Tc: 6.17 in/hr

Runoff Supply Rate (q) @ Tc: 4.31 in/hr

PEAK DISCHARGE: 907 cfs

PC-Hydro, Ver 5.4.2

HYDROLOGIC DATA SHEET FOR PIMA COUNTY FLOOD PEAK PROCEDURE

Pima County Regional Flood Control District

Client: _____ Prepared by: BJK

Project Name: Green Valley Drainageway Date: 09/11/2013

Concentration Point: CP24E Job #: 13-008

Watershed Area: 173.3 ac Watershed Type: Medium Density Urbanized

Watercourse Data By Reach

Reach No.	Height (Hi)	Length (Li)	Slope (Si)	Basin Factor (Nb)
1	117.0	4,558	0.0257	.035
2	67.0	3,413	0.0196	.022

Length of Watercourse (Lc): 7,971 feet Mean Slope: 0.0228

Length to Cen. of Gravity (Lca): 3,612 feet Weighted Basin Fac.: 0.029

Veg. Cover Type(s): Desert Brush Veg. Cover Density: 30 %

RETURN PERIOD: 100-years

Rainfall Depths: NOAA Atlas 14 (90% UCL) @ Latitude: 31.8680 Longitude: -111.0040

Duration:	5-min	10-min	15-min	30-min	60-min	2-hr	3-hr	6-hr	12-hr	24-hr
Point Values (in)	0.88	1.35	1.67	2.25	2.78	3.10	3.20	3.62	3.94	4.30
Areal Values (in)	0.88	1.35	1.67	2.25	2.78	3.10	3.20	3.62	3.94	4.30

Soils Data

Soil Type	Percent	Curve # (CN)	Adj. Curve # (CN*)	Runoff Coef. (C)
B	95	82.	86.64	0.548
C	5	87.	90.25	0.649
D	0	.	.	0.000
Imp.	35	99.	99.	0.958

Weighted Runoff Coef. (Cw): 0.694

Time of Concentration: 14.8 min

Rainfall Intensity (i) @ Tc: 6.72 in/hr

Runoff Supply Rate (q) @ Tc: 4.67 in/hr

PEAK DISCHARGE: 815 cfs

PC-Hydro, Ver 5.4.2

HYDROLOGIC DATA SHEET FOR PIMA COUNTY FLOOD PEAK PROCEDURE

Pima County Regional Flood Control District

Client: _____ Prepared by: BJK

Project Name: Green Valley Drainageway Date: 09/11/2013

Concentration Point: CP24F Job #: 13-008

Watershed Area: 78.0 ac Watershed Type: Medium Density Urbanized

Watercourse Data By Reach

Reach No.	Height (Hi)	Length (Li)	Slope (Si)	Basin Factor (Nb)
1	75.0	3,935	0.0191	.035

Length of Watercourse (Lc): 3,935 feet Mean Slope: 0.0191

Length to Cen. of Gravity (Lca): 1,719 feet Weighted Basin Fac.: 0.035

Veg. Cover Type(s): Desert Brush Veg. Cover Density: 30 %

RETURN PERIOD: 100-years

Rainfall Depths: NOAA Atlas 14 (90% UCL) @ Latitude: 31.8680 Longitude: -111.0040

Duration:	5-min	10-min	15-min	30-min	60-min	2-hr	3-hr	6-hr	12-hr	24-hr
Point Values (in)	0.88	1.35	1.67	2.25	2.78	3.10	3.20	3.62	3.94	4.30
Areal Values (in)	0.88	1.35	1.67	2.25	2.78	3.10	3.20	3.62	3.94	4.30

Soils Data

Soil Type	Percent	Curve # (CN)	Adj. Curve # (CN*)	Runoff Coef. (C)
B	86	82.	86.64	0.548
C	14	87.	90.25	0.649
D	0	.	.	0.000
Imp.	0	99.	99.	0.000

Weighted Runoff Coef. (Cw): 0.562

Time of Concentration: 13.2 min

Rainfall Intensity (i) @ Tc: 7.06 in/hr

Runoff Supply Rate (q) @ Tc: 3.96 in/hr

PEAK DISCHARGE: 312 cfs

PC-Hydro, Ver 5.4.2

HYDROLOGIC DATA SHEET FOR PIMA COUNTY FLOOD PEAK PROCEDURE

Pima County Regional Flood Control District

Client: _____ Prepared by: BJK

Project Name: Green Valley Drainageway Date: 09/11/2013

Concentration Point: CP24G Job #: 13-008

Watershed Area: 63.4 ac Watershed Type: Medium Density Urbanized

Watercourse Data By Reach

Reach No.	Height (Hi)	Length (Li)	Slope (Si)	Basin Factor (Nb)
1	63.0	1,290	0.0488	.035
2	35.0	2,363	0.0148	.035

Length of Watercourse (Lc): 3,653 feet Mean Slope: 0.0209

Length to Cen. of Gravity (Lca): 1,419 feet Weighted Basin Fac.: 0.035

Veg. Cover Type(s): Desert Brush Veg. Cover Density: 30 %

RETURN PERIOD: 100-years

Rainfall Depths: NOAA Atlas 14 (90% UCL) @ Latitude: 31.8680 Longitude: -111.0040

Duration:	5-min	10-min	15-min	30-min	60-min	2-hr	3-hr	6-hr	12-hr	24-hr
Point Values (in)	0.88	1.35	1.67	2.25	2.78	3.10	3.20	3.62	3.94	4.30
Areal Values (in)	0.88	1.35	1.67	2.25	2.78	3.10	3.20	3.62	3.94	4.30

Soils Data

Soil Type	Percent	Curve # (CN)	Adj. Curve # (CN*)	Runoff Coef. (C)
B	100	82.	86.64	0.548
C	0	.	.	0.000
D	0	.	.	0.000
Imp.	0	99.	99.	0.000

Weighted Runoff Coef. (Cw): 0.548

Time of Concentration: 11.6 min

Rainfall Intensity (i) @ Tc: 7.51 in/hr

Runoff Supply Rate (q) @ Tc: 4.11 in/hr

PEAK DISCHARGE: 263 cfs

PC-Hydro, Ver 5.4.2

HYDROLOGIC DATA SHEET FOR PIMA COUNTY FLOOD PEAK PROCEDURE

Pima County Regional Flood Control District

Client: _____ Prepared by: BJK

Project Name: Green Valley Drainageway Date: 09/11/2013

Concentration Point: CP25A Job #: 13-008

Watershed Area: 217.6 ac Watershed Type: Medium Density Urbanized

Watercourse Data By Reach

Reach No.	Height (Hi)	Length (Li)	Slope (Si)	Basin Factor (Nb)
1	158.0	6,335	0.0249	.025
2	36.0	1,990	0.0181	.022

Length of Watercourse (Lc): 8,325 feet Mean Slope: 0.0230

Length to Cen. of Gravity (Lca): 3,652 feet Weighted Basin Fac.: 0.024

Veg. Cover Type(s): Desert Brush Veg. Cover Density: 30 %

RETURN PERIOD: 100-years

Rainfall Depths: NOAA Atlas 14 (90% UCL) @ Latitude: 31.8680 Longitude: -111.0040

Duration:	5-min	10-min	15-min	30-min	60-min	2-hr	3-hr	6-hr	12-hr	24-hr
Point Values (in)	0.88	1.35	1.67	2.25	2.78	3.10	3.20	3.62	3.94	4.30
Areal Values (in)	0.88	1.35	1.67	2.25	2.78	3.10	3.20	3.62	3.94	4.30

Soils Data

Soil Type	Percent	Curve # (CN)	Adj. Curve # (CN*)	Runoff Coef. (C)
B	89	82.	86.64	0.548
C	11	87.	90.25	0.649
D	0	.	.	0.000
Imp.	39	99.	99.	0.958

Weighted Runoff Coef. (Cw): 0.714

Time of Concentration: 11.9 min

Rainfall Intensity (i) @ Tc: 7.43 in/hr

Runoff Supply Rate (q) @ Tc: 5.31 in/hr

PEAK DISCHARGE: 1,164 cfs

PC-Hydro, Ver 5.4.2

HYDROLOGIC DATA SHEET FOR PIMA COUNTY FLOOD PEAK PROCEDURE

Pima County Regional Flood Control District

Client: _____ Prepared by: BJK

Project Name: Green Valley Drainageway Date: 09/11/2013

Concentration Point: CP25B Job #: 13-008

Watershed Area: 166.3 ac Watershed Type: Medium Density Urbanized

Watercourse Data By Reach

Reach No.	Height (Hi)	Length (Li)	Slope (Si)	Basin Factor (Nb)
1	158.0	6,335	0.0249	.025

Length of Watercourse (Lc): 6,335 feet Mean Slope: 0.0249

Length to Cen. of Gravity (Lca): 2,575 feet Weighted Basin Fac.: 0.025

Veg. Cover Type(s): Desert Brush Veg. Cover Density: 30 %

RETURN PERIOD: 100-years

Rainfall Depths: NOAA Atlas 14 (90% UCL) @ Latitude: 31.8680 Longitude: -111.0040

Duration:	5-min	10-min	15-min	30-min	60-min	2-hr	3-hr	6-hr	12-hr	24-hr
Point Values (in)	0.88	1.35	1.67	2.25	2.78	3.10	3.20	3.62	3.94	4.30
Areal Values (in)	0.88	1.35	1.67	2.25	2.78	3.10	3.20	3.62	3.94	4.30

Soils Data

Soil Type	Percent	Curve # (CN)	Adj. Curve # (CN*)	Runoff Coef. (C)
B	89	82.	86.64	0.548
C	11	87.	90.25	0.649
D	0	.	.	0.000
Imp.	35	99.	99.	0.958

Weighted Runoff Coef. (Cw): 0.698

Time of Concentration: 9.5 min

Rainfall Intensity (i) @ Tc: 8.22 in/hr

Runoff Supply Rate (q) @ Tc: 5.74 in/hr

PEAK DISCHARGE: 963 cfs

PC-Hydro, Ver 5.4.2

APPENDIX I

DOWNSTREAM BOUNDARY CONDITION WATER SURFACE ELEVATIONS

CMG DRAINAGE ENGINEERING, INC.
3555 N. Mountain Ave. Tucson, Arizona 85719
Phone (520) 882-4244 Fax (520) 888-1421

Green Valley Drainageways Basin Mngt Study

Downstream Boundary Condtion Water Surface Elevations

DRNGWAY ID	Downstream known WSE	Source
1	2784.61	Santa Cruz 10-year WSE
2	2789.37	Santa Cruz 10-year WSE
3	2797.58	Santa Cruz 10-year WSE
4	2797.58	Santa Cruz 10-year WSE
5	2797.58	Santa Cruz 10-year WSE
6	2810.90	Santa Cruz 10-year WSE
7	2818.33	Santa Cruz 10-year WSE
8	2828.24	Santa Cruz 10-year WSE
9	2829.61	Santa Cruz 10-year WSE
10	2830.62	Santa Cruz 10-year WSE
11	2833.31	Santa Cruz 10-year WSE
12	2834.02	Santa Cruz 10-year WSE
13	2836.28	Santa Cruz 10-year WSE
14	2837.4	Santa Cruz 10-year WSE
15	2840.78	Santa Cruz 10-year WSE
16	2841.70	Santa Cruz 10-year WSE
17	2855.5	Santa Cruz West Channel 100-year WSE
18	2852.33	Santa Cruz 10-year WSE
19	2857.01	Santa Cruz 10-year WSE
20	2860.27	Santa Cruz 10-year WSE
21	2862.73	Santa Cruz 10-year WSE
22	2867.46	Santa Cruz West Channel 100-year WSE
23	2867.69	Santa Cruz West Channel 100-year WSE
24	2878.22	Santa Cruz 10-year WSE
25	2884.68	Santa Cruz 10-year WSE

APPENDIX J

HYDRAULIC WORK MAPS

APPENDIX K

CULVERT AND CHANNEL PHOTOGRAPHS

Photo #1 Green Valley Drainageway #1 – Abrego Drive 4-10’x4’ RCBC

Photo #2 Green Valley Drainageway #1 – Downstream of Abrego Dr. Nb = 0.038

Photo #3 Green Valley Drainageway #1 – Upstream of Abrego Drive Nb = 0.045

Photo #4 Green Valley Drainageway #1 – Tributary #1 I-19 Culvert 1-12’x8’ RCBC

Photo #5 Green Valley Drainageway #1 – I-19 Culvert Outlet 6-10’x8’ RCBC

Photo #6 Green Valley Drainageway #1 –Reach Upstream of I-19 Nb = 0.032

Photo #7 Green Valley Drainageway #1 – La Canada Drive Culvert Outlet 2-8’x4’ RCBC

Photo #8 Green Valley Drainageway #1 – Upstream of Santa Cecilia 2-48”CMP

Photo #9 Green Valley Drainageway #1 – Downstream of Santa Cecilia Nb = 0.032

Photo #10 Green Valley Drainageway #1 – Upstream of Duval Mine Rd. 6-10’x8’ RCBC

Photo #11 Green Valley Drainageway #1 – Reach Upstream of Duval Mine Rd. Nb=0.032

Photo #12 Green Valley Drainageway #1 – Downstream of Duval Mine Rd. 6-10’x8’ RCBC

Photo #13 Green Valley Drainageway #1 – Downstream of Duval Mine Rd. Nb=0.032

Photo #14 Green Valley Drainageway #1 – Downstream of Duval Commerce Dr. 2-11.5’x3’ CA

Photo #15 Green Valley Drainageway #1 – Upstream of Duval Commerce Dr. Nb=0.032

Photo #16 Green Valley Drainageway #1 – Rio La Junita 2-24” CMP

Photo #17 Green Valley Drainageway #2 – Downstream of Abrego Drive Nb=0.032

Photo #18 Green Valley Drainageway #2 – Upstream of Abrego Drive Nb=0.032

Photo #19 Green Valley Drainageway #3 – Downstream of Abrego Drive 4-10’x8’ RCBC

Photo #20 Green Valley Drainageway #3 – Upstream of Abrego Drive Nb=0.013

Photo #21 Green Valley Drainageway #3 – Downstream of I-19 4-10’x6’ RCBC

Photo #22 Green Valley Drainageway #3 – Downstream of I-19 Nb= 0.030

Photo #23 Green Valley Drainageway #3 – Upstream of I-19 4-10’x6’ RCBC

Photo #24 Green Valley Drainageway #3 – Upstream of I-19 Nb= 0.033

Photo #25 Green Valley Drainageway #3 – Upstream of La Canada Drive 2-8’x3’ RCBC

Photo #26 Green Valley Drainageway #3 – Upstream of La Canada Nb=0.030 Upstream of Conc.

Photo #27 Green Valley Drainageway #3 – Upstream of Paseo Tinaja 1-10’x4’ RCBC

Photo #28 Green Valley Drainageway #3 – Downstream of Paseo Tinaja Nb=0.033

Photo #29 Green Valley Drainageway #3 – Upstream of Aliso Drive 2-8’x4’ RCBC

Photo #30 Green Valley Drainageway #3 – Upstream of Aliso Drive Nb=0.025

Photo #31 Green Valley Drainageway #4 – Upstream of I-19 Nb=0.050

Photo #32 Green Valley Drainageway #4 – Upstream of La Canada Drive 2-10’x5’ RCBC

Photo #33 Green Valley Drainageway #4 – Upstream of La Canada Dr. Nb=0.013

Photo #34 Green Valley Drainageway #4 – Upstream side of Via Alamos 3-42” CMP

Photo #35 Green Valley Drainageway #4 – Downstream side of Via Alamos 3-42” CMP

Photo #36 Green Valley Drainageway #4 – Reach Downstream side of Via Alamos Nb=0.025

Photo #37 Green Valley Drainageway #4 – Reach Upstream side of Via Alamos Nb=0.020

Photo #38 Green Valley Drainageway #5 – Upstream of La Canoa Drive 3-10’x3’ RCBC

Photo #39 Green Valley Drainageway #5 – Downstream of La Canoa Drive 3-10’x3’ RCBC

Photo #40 Green Valley Drainageway #5 – Upstream of La Canoa Drive Nb=0.013

Photo #41 Green Valley Drainageway #5 – Downstream of La Canoa Drive Nb=0.050

Photo #42 Green Valley Drainageway #5 – Aneida Cabeza De Elefante Dip Section Nb=0.013

Photo #43 Green Valley Drainageway #5 – Tributary 1 Upstream of La Canada Drive 2-8’x3’

Photo #44 Green Valley Drainageway #5 – Tributary 1 Downstream of La Canada Dr. Nb=0.020

Photo #45 Green Valley Drainageway #5 – Reach 2 Downstream of La Canada Dr 10’x4’ RCBC

Photo #46 Green Valley Drainageway #5 – Tributary 1 Downstream of La Canada Dr. Nb=0.020

Photo #47 Green Valley Drainageway #5 – Reach 1 Downstream of La Canada Drive Nb=0.013

Photo #48 Green Valley Drainageway #5 –Upstream of La Canada Drive 1-10’x4’ RCBC

Photo #49 Green Valley Drainageway #5 – Upstream of La Canada Drive Nb=0.025

Photo #50 Green Valley Drainageway #6 – Reach just Upstream of Santa Cruz River Nb= 0.030

Photo #51 Green Valley Drainageway #6 – Reach Vicinity of RM 0.128 Nb= 0.035

Photo #52 Green Valley Drainageway #6 – Reach Vicinity of RM 0.23 Nb= 0.030

Photo #53 Green Valley Drainageway #6 – Reach just Downstream of Abrego Dr. Nb= 0.035

Photo #54 Green Valley Drainageway #6 – Downstream side of Abrego Drive 4-10’x4’ RCBC

Photo #55 Green Valley Drainageway #6 – Upstream side of Abrego Drive 4-10’x4’ RCBC

Photo #56 Green Valley Drainageway #6 – Downstream side of I-19 6-10’x5’ RCBC

Photo #57 Green Valley Drainageway #6 – Reach Upstream of I-19 Nb=0.030

Photo #58 Green Valley Drainageway #6 – Upstream Side of La Canada Drive 4- 10’x9’ RCBC

Photo #59 Green Valley Drainageway #6 – Downstream Side of La Canada Dr 4-10’x9’ RCBC

Photo #60 Green Valley Drainageway #6 – Vicinity of RM 1.110 Nb=0.025

Photo #61 Green Valley Drainageway #6 – Vicinity of RM 1.220 Looking Upstream Nb=0.025

Photo #62 Green Valley Drainageway #7 – Golf Cart Bridge just Upstream of Santa Cruz

Photo #63 Green Valley Drainageway #7 – Reach 1 Upstream of Golf Cart Bridge Nb=0.030

Photo #64 Green Valley Drainageway #7 – Reach 1Vicinity RM 0.175 Water Line Nb=0.030

Photo #65 Green Valley Drainageway #7 – Reach 1 0.341 Golf Cart Bridge River Nb=0.030

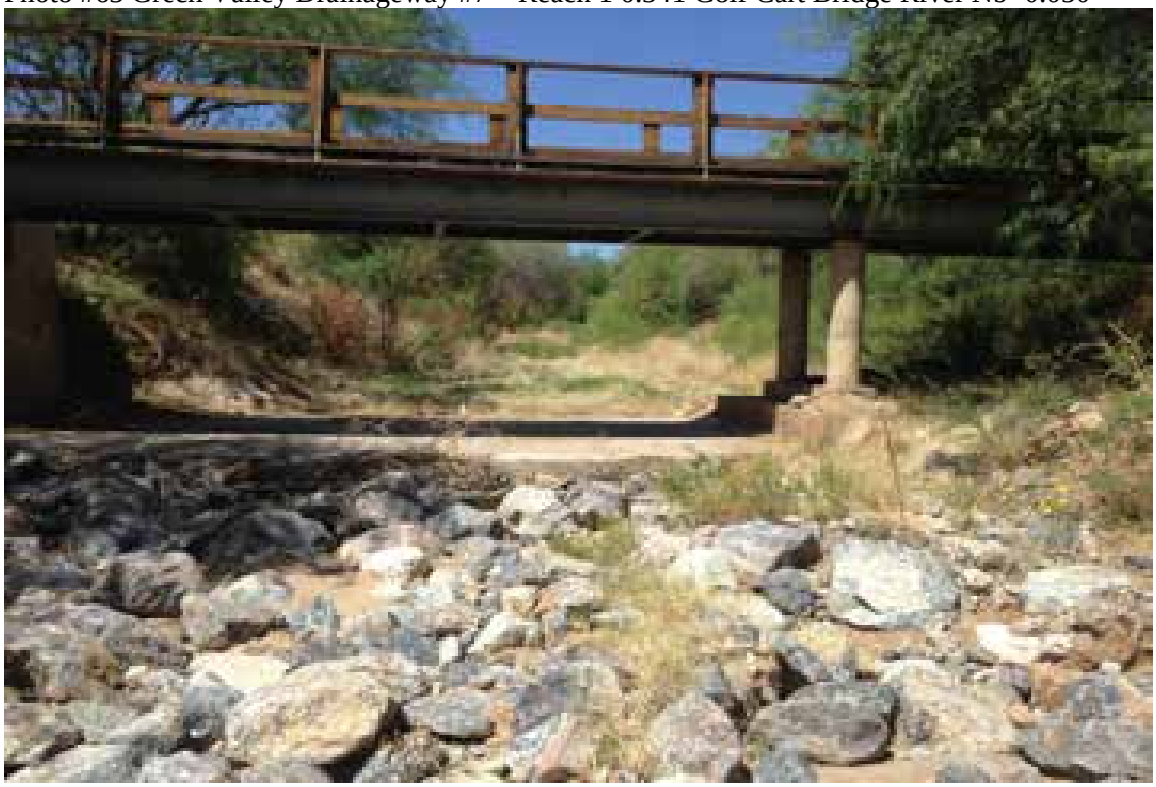


Photo #66 Green Valley Drainageway #7 – Reach 1 downstream of Pedestrian Bridge Nb=0.030

Photo #67 Green Valley Drainageway #7 – Reach 1 0.412 upstream of Golf Bridge Nb=0.030

Photo #68 Green Valley Drainageway #7 – Downstream of Abrego Drive 5-10’x5’RCBC

Photo #69 Green Valley Drainageway #7 – Upstream of Abrego Drive 5-10’x5’RCBC

Photo #70 Green Valley Drainageway #7 – Downstream of I-19 6-10’x6’RCBC

Photo #71 Green Valley Drainageway #7 – Upstream of I-19 6-10’x6’RCBC

Photo #72 Green Valley Drainageway #7 – Upstream of La Canada Dr. 5-10’x5’ RCBC

Photo #73 Green Valley Drainageway #7 – Downstream of La Canada Dr. 5-10’x5’ RCBC

Photo #74 Green Valley Drainageway #7 – Drop Structure Downstream of La Canada Dr.

Photo #75 Green Valley Drainageway #7 – Reach Downstream of La Canada Dr. Nb=0.030

Photo #76 Green Valley Drainageway #7 – Bridge Upstream of La Canada Dr. Nb=0.030

Photo #77 Green Valley Drainageway #7 – Drop Structure 100ft Upstream of La Canada Dr.

Photo #78 Green Valley Drainageway #7 – Channel Vicinity of Reach 3 RM 1.135

Photo #79 Green Valley Drainageway #7 – Esperanza Blvd. 3-48”x36” ACMP

Photo #80 Green Valley Drainageway #7 – Reach Upstream of Esperanza Blvd.

Photo #81 Green Valley Drainageway #7 – Reach Downstream of Esperanza Blvd.

Photo #82 Green Valley Drainageway #7 – Desert Bell Dr. 2-10’x4’ RCBC

Photo #83 Green Valley Drainageway #8 – 500-ft Upstream of Santa Cruz River Looking East
Nb=0.040

Photo #84 Green Valley Drainageway #8 – 500-ft Upstream of Santa Cruz River Looking West
Nb=0.030

Photo #85 Green Valley Drainageway #8 – Downstream of Vista Del Rio 2-4.5’x3’ ACMP

Photo #86 Green Valley Drainageway #8 – Downstream of Vista Del Rio Nb=0.030

Photo #87 Green Valley Drainageway #8 – Upstream of Vista Del Rio 2-4.5’x3’ ACMP

Photo #88 Green Valley Drainageway #8 – Upstream of Vista Del Rio Nb=0.035

Photo #89 Green Valley Drainageway #8 – Upstream of Abrego Drive Nb=0.030

Photo #90 Green Valley Drainageway #8 – Upstream of Abrego Drive 2-5’x3’ ACMP

Photo #91 Green Valley Drainageway #8 – Downstream of I-19 1-6’x4’ RCBC

Photo #92 Green Valley Drainageway #8 – Downstream of I-19 Nb=0.030

Photo #93 Green Valley Drainageway #8 – Upstream of I-19 1-6’x4’ RCBC

Photo #94 Green Valley Drainageway #8 – Upstream of I-19 Looking North from 1-6’x4’ RCBC at Weir flow Reach

Photo #95 Green Valley Drainageway #9 – Downstream side of Abrego Dr. 5-10’x5’ RCBC

Photo #96 Green Valley Drainageway #9 – Reach Downstream of Abrego Dr. Nb=0.030

Photo #97 Green Valley Drainageway #9 – Downstream side of I-19 6-10’x5’ RCBC

Photo #98Green Valley Drainageway #9 – Upstream side of I-19 6-10’x5’ RCBC

Photo #99 Green Valley Drainageway #9 – Reach Upstream of I-19 Nb=0.030

Photo #100 Green Valley Drainageway #9 – Downstream of La Canada Dr. 4-12’x10’ RCBC

Photo #101 Green Valley Drainageway #9 – Upstream side of La Canada 4-12’x10’ RCBC

Photo #102 Green Valley Drainageway #9 – Reach Upstream of La Canada Dr. Nb=0.030

Photo #103 Green Valley Drainageway #9 – Downstream side of Camino del Poso 4-36” CMP

Photo #104 Green Valley Drainageway #9 – Downstream of Camino del Poso Nb=0.035

Photo #105 Green Valley Drainageway #9 – Upstream side of Camino del Poso 4-36” CMP

Photo #106 Green Valley Drainageway #9 – Reach Upstream of Camino del Poso Nb=0.035

Photo #107 Green Valley Drainageway #9 – Downstream side of Camino Portillo 3-8’x4’ RCBC and 4-10’x3’ RCBC Nb=0.030

Photo #108 Green Valley Drainageway #9 – Reach Downstream of Camino Portillo Nb=0.030

Photo #109 Green Valley Drainageway #9 – Upstream side of Camino Portillo 3-8’x4’ RCBC and 4-10’x3’ RCBC Nb=0.030

Photo #110 Green Valley Drainageway #9 – Reach Upstream of Camino Portillo Nb=0.030

Photo #111 Green Valley Drainageway #9 – Downstream side of Camino Hodalgo 3-8’x4’ RCBC and 7-10’x5’ RCBC Nb=0.030

Photo #112 Green Valley Drainageway #9 – Tributary Reach 2 Downstream side of Camino Portillo 2-42”RCP

Photo #113 Green Valley Drainageway #9 – Tributary Reach 2 Reach on Downstream side of Camino Portillo Nb=0.035

Photo #114 Green Valley Drainageway #9 – Tributary Reach 2 Upstream side of Camino Hodalgo 4-30” CMP

Photo #115 Green Valley Drainageway #9 – Tributary Reach 3 Downstream side of Camino del Monte 3-36”x24” ACMP

Photo #116 Green Valley Drainageway #9 – Tributary Reach 3 Reach Downstream of Camino del Monte Nb=0.035

Photo #117 Green Valley Drainageway #9 – Tributary Reach 3 Upstream side of Camino del Monte 3-36”x24” ACMP

Photo #118 Green Valley Drainageway #9 – Tributary Reach 3 Upstream side of Camino del Monte Nb=0.035

Photo #119 Green Valley Drainageway #11 – Reach Downstream of El Vento Nb=0.020

Photo #120 Green Valley Drainageway #12 – Reach Downstream of La Huerta Nb=0.020

Photo #121 Green Valley Drainageway #13 – Reach Downstream side of Abrego Drive
Nb=0.030

Photo #122 Green Valley Drainageway #13 – Downstream side of Abrego Drive 4-10’x5’ RCBC

Photo #123 Green Valley Drainageway #13 – Upstream side of Abrego Drive 4-10’x5’ RCBC

Photo #124 Green Valley Drainageway #13 – Reach Upstream side of Abrego Drive Nb=0.035

Photo #12 Green Valley Drainageway #13 – Downstream side of I-19 5-10’x5’ RCBC

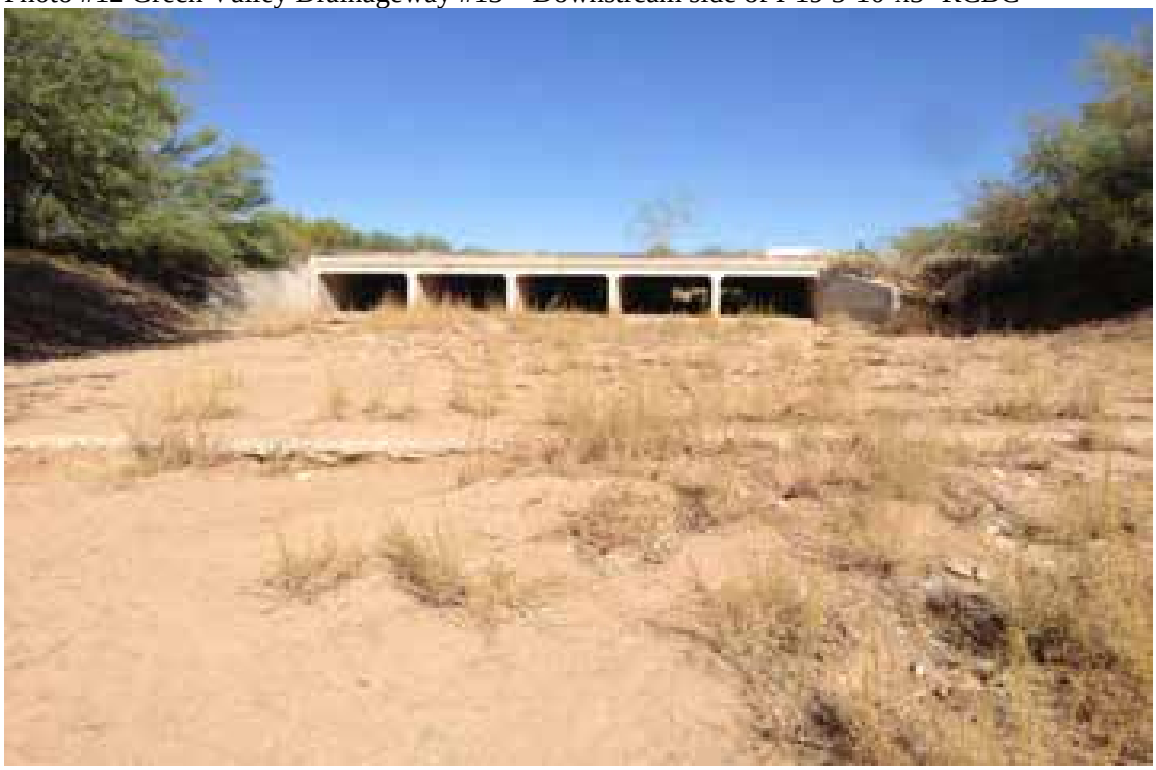


Photo #126 Green Valley Drainageway #13 – Upstream side of I-19 5-10’x5’ RCBC

Photo #127 Green Valley Drainageway #13 – Reach Upstream of I-19 Nb=0.035

Photo #128 Green Valley Drainageway #13 – Upstream side of La Canada Dr. 4-8'x6' RCBC

Photo #129 Green Valley Drainageway #13 – Upstream side of La Canada Dr. Nb=0.040

Photo #130 Green Valley Drainageway #13 – Pedestrian Bridge Vicinity RM 1.126 Nb=0.040

Photo #131 Green Valley Drainageway #13 – Reach Upstream of RM 1.126 Nb=0.040

Photo #132 Green Valley Drainageway #13 – Tributary 2 Upstream side of La Canada Dr.
3-10’x6’ RCBC

Photo #133 Green Valley Drainageway #13 – Tributary 2 Reach Upstream of La Canada Dr.
Nb=0.040

Photo #134 Green Valley Drainageway #13 – Tributary 3 Vista Hermosa Dip Section

Photo #135 Green Valley Drainageway #14 – Looking Upstream from channel inlet

Photo #136 Green Valley Drainageway #14 – Looking Downstream from Channel inlet
Nb=0.020

Photo #137 Green Valley Drainageway #15 – Looking Upstream from La Huerta

Photo #138 Green Valley Drainageway #15 – Looking Downstream from La Huerta Nb=0.020

Photo #139 Green Valley Drainageway #16 – Looking Downstream from La Huerta Nb=0.030

Photo #140 Green Valley Drainageway #16 – Looking Upstream from La Huerta Nb=0.030

Photo #141 Green Valley Drainageway #17 – Downstream of Abrego Drive 5-10’x5’ RCBC

Photo #142 Green Valley Drainageway #17 – Reach Downstream of Abrego Drive
Nb=0.030

Photo #143 Green Valley Drainageway #17 – Upstream of Abrego Drive 5-10’x5’ RCBC

Photo #144 Green Valley Drainageway #17 – Reach Upstream of Abrego Drive Nb=0.030

Photo #145 Green Valley Drainageway #17 – Upstream of I-19 5-60” CMP

Photo #146 Green Valley Drainageway #17 – Downstream of I-19 5-60” CMP

Photo #147 Green Valley Drainageway #17 – Reach Upstream of I-19 Nb=0.030

Photo #148 Green Valley Drainageway #17 – Downstream of Continental Plaza Dr 5-6’x4’ ACMP

Photo #149 Green Valley Drainageway #17 – Downstream of Continental Plaza Dr. Nb=0.030

Photo #150 Green Valley Drainageway #17 – Upstream of Continental Plaza Dr 5-6’x4’ ACMP

Photo #151 Green Valley Drainageway #17 – Downstream of Continental Road 5-6’x4’ ACMP

Photo #152 Green Valley Drainageway #17 – Upstream of Continental Road 5-6’x4’ ACMP

Photo #153 Green Valley Drainageway #17 – Reach Upstream of Continental Road Nb=0.035

Photo #154 Green Valley Drainageway #18 – Looking Downstream from Abego Dr. Inlet Nb=0.035

Photo #155 Green Valley Drainageway #18 – Looking Upstream from Abego Dr. Inlet

Photo #156 Green Valley Drainageway #19 – Looking Downstream from Abego Dr. Inlet
Nb=0.035

Photo #157 Green Valley Drainageway #19 – Looking Upstream from Abego Dr. Inlet

Photo #158 Green Valley Drainageway #20 – Downstream of I-19 1-8’x5’ RCBC

Photo #159 Green Valley Drainageway #20 – Reach Downstream of I-19 Nb=0.035

Photo #160 Green Valley Drainageway #20 – Upstream of I-19 1-8’x5’ RCBC

Photo #161 Green Valley Drainageway #20 – Reach Up stream of I-19 Nb=0.045

Photo #162 Green Valley Drainageway #21 – Downstream of I-19 1-10’x4’ RCBC

Photo #163 Green Valley Drainageway #21 – Upstream of I-19 1-10’x4’ RCBC

Photo #164 Green Valley Drainageway #22 – Upstream of I-19 2-42” CMP

Photo #165 Green Valley Drainageway #22 – Downstream of I-19 2-42” CMP

Photo #166 Green Valley Drainageway #22 – At Santa Carla Drive Dip Section Nb=0.035

Photo #167 Green Valley Drainageway #23 – Outlet of Abrego Dr. Culvert 3-16'x4' ConArch

Photo #168 Green Valley Drainageway #23 – Reach Upstream of Abrego Dr. Nb=0.030

Photo #169 Green Valley Drainageway #23 – Outlet of I-19 Culvert 1-10’x8’ RCBC

Photo #170 Green Valley Drainageway #23 – Inlet of I-19 Culvert 1-10’x8’ RCBC

Photo #171 Green Valley Drainageway #24 – Reach Downstream of Abrego Dr. Nb=0.035

Photo #172 Green Valley Drainageway #24 – Outlet of Abrego Dr. Culvert 2-16’x5’ ConArch

Photo #173 Green Valley Drainageway #24 – Inlet to Abrego Dr. . Culvert 2-16’x5’ ConArch

Photo #174 Green Valley Drainageway #24 North Branch– Outlet of I-19 Culvert 2-10’x4’ RCBC

Photo #175 Green Valley Drainageway #24 North Branch – Reach Downstream of I-19 Culvert 2-10’x4’ Nb=0.030

Photo #176 Green Valley Drainageway #24 North Branch– Inlet of I-19 Culvert 2-10’x4’ RCBC

Photo #177 Green Valley Drainageway #24 North Branch – Reach Upstream of I-19 2-10'x4' RCBC Culvert Nb=0.025

Photo #178 Green Valley Drainageway #24 – South Tributary Outlet of North Bound I-19 Culvert 1-10'x4' RCBC with Baffle Block Drop Structure

Photo #179 Green Valley Drainageway #24 – South Tributary Inlet of South Bound I-19 Culvert 1-72” RCP

Photo #180 Green Valley Drainageway #24 – South Tributary Upstream of I-19

Photo #181 Green Valley Drainageway #25 – Inlet to Abrego Drive Culvert 1-16’x4’ RCBC

Photo #182 Green Valley Drainageway #25 – Reach Upstream of Abrego Drive Drop Structure Nb=0.040

Photo #183 Green Valley Drainageway #25 – Outlet of Abrego Drive Culvert 1-16’x4’ RCBC

Photo #184 Green Valley Drainageway #25 – Reach Downstream of Abrego Drive Culvert
Nb=0.030

Photo #185 Green Valley Drainageway #25 – Outlet of I-19 NB Culverts 2-48” CMP

Photo #186 Green Valley Drainageway #25 – Reach Downstream of I-19 NB Culverts Nb=0.040

Photo #187 Green Valley Drainageway #25 – Intlet of I-19 SB Culverts 1-66” CMP

APPENDIX L

HEC-RAS MODELS PRINTOUTS

DRAINAGEWAY#01

HEC-RAS Plan: Plan 01 Profile: PF 1

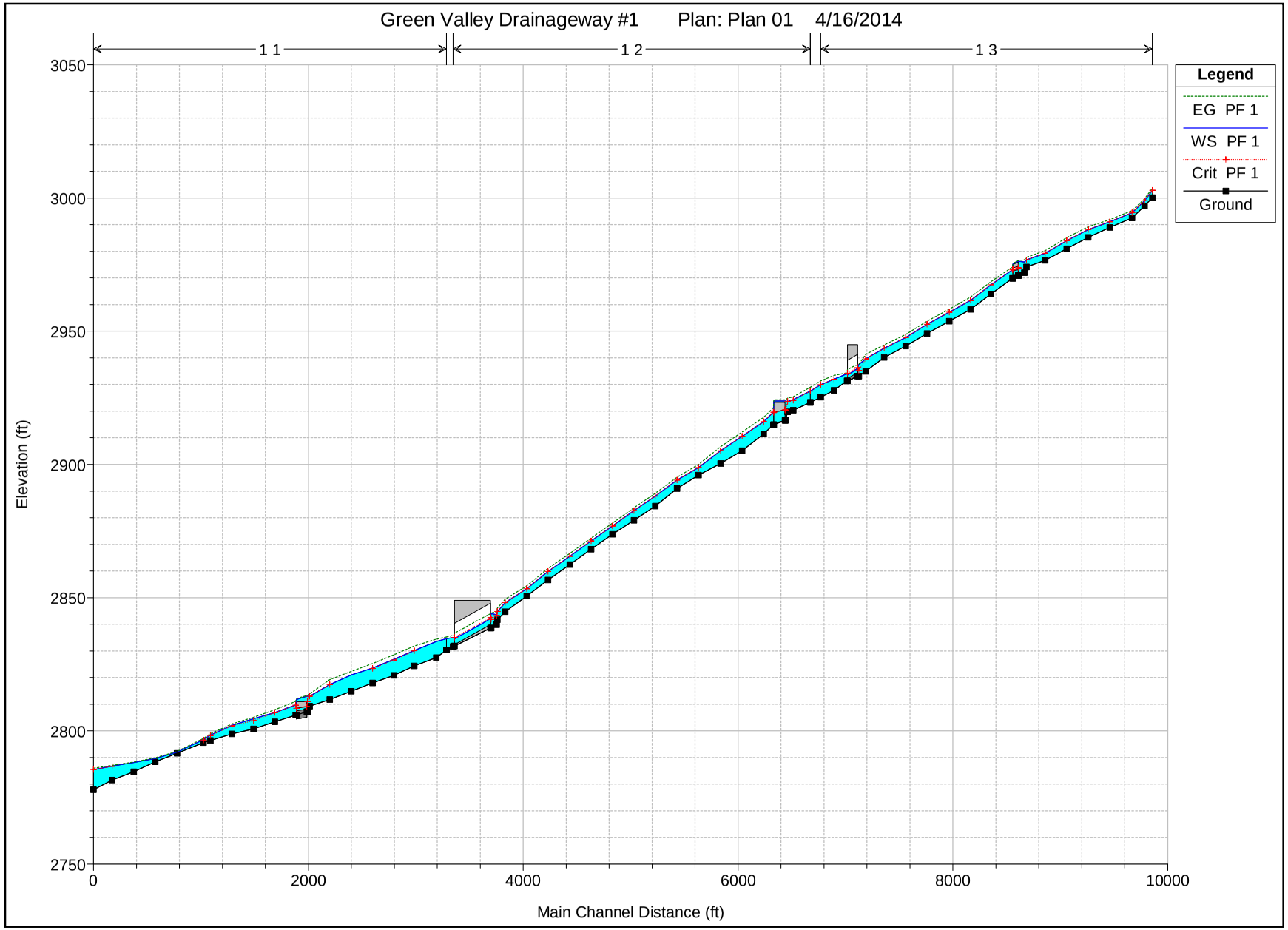
River	Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
				(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
1trib2	5	7.532	PF 1	75.00	2986.72	2988.40		2988.69	0.006842	4.30	17.43	13.87	0.68
1trib2	5	7.494	PF 1	75.00	2985.31	2986.25	2986.25	2986.62	0.017182	4.88	15.36	21.11	1.01
1trib2	5	7.456	PF 1	75.00	2981.04	2982.39	2982.39	2982.81	0.016360	5.19	14.46	17.41	1.00
1trib2	5	7.418	PF 1	75.00	2975.57	2976.76	2976.76	2977.14	0.016638	4.97	15.08	19.73	1.00
1trib2	5	7.38	PF 1	75.00	2970.55	2971.72	2971.72	2972.16	0.016280	5.37	13.98	15.89	1.01
1trib2	5	7.343	PF 1	75.00	2966.09	2967.38	2967.38	2967.86	0.016000	5.55	13.53	14.33	1.01
1trib2	5	7.305	PF 1	75.00	2961.39	2962.74	2962.74	2963.22	0.016113	5.56	13.50	14.36	1.01
1trib2	5	7.267	PF 1	75.00	2956.62	2957.98	2957.98	2958.42	0.016479	5.33	14.08	16.35	1.01
1trib2	5	7.229	PF 1	75.00	2952.01	2954.42		2954.48	0.000877	1.96	38.34	21.64	0.26
1trib2	5	7.212	PF 1	146.00	2950.39	2954.32	2952.23	2954.41	0.000761	2.31	63.15	24.21	0.25
1trib2	5	7.205		Culvert									
1trib2	5	7.193	PF 1	146.00	2948.49	2950.30	2950.30	2950.92	0.014829	6.31	23.14	19.05	1.01
1trib2	5	7.169	PF 1	146.00	2945.65	2947.39	2947.39	2948.03	0.014638	6.44	22.67	17.88	1.01
1trib2	5	7.153	PF 1	146.00	2943.16	2944.95	2944.95	2945.57	0.014748	6.31	23.13	18.98	1.01
1trib2	5	7.114	PF 1	146.00	2938.27	2940.15	2940.15	2940.81	0.014658	6.53	22.35	17.21	1.01
1trib2	5	7.077	PF 1	159.00	2934.39	2936.48	2936.37	2936.98	0.011113	5.71	27.83	21.41	0.88
1trib2	5	7.04	PF 1	159.00	2932.11	2934.08	2934.08	2934.61	0.013497	5.82	28.31	33.53	0.96
1trib1	4	5.118	PF 1	683.00	2848.75	2851.10	2851.10	2851.73	0.014104	6.34	107.77	91.89	1.01
1trib1	4	5.094	PF 1	683.00	2840.00	2847.90	2844.64	2848.37	0.002177	5.55	125.81	32.09	0.41
1trib1	4	5.093		Culvert									
1trib1	4	5.015	PF 1	683.00	2832.34	2835.75	2835.75	2837.23	0.012445	9.77	69.91	23.82	1.01
1trib1	4	5.012	PF 1	683.00	2831.96	2835.30	2835.30	2836.78	0.012571	9.78	69.82	23.70	1.00
1	3	1.866	PF 1	359.00	3000.11	3002.89	3002.89	3003.71	0.013422	7.26	49.48	31.23	1.01
1	3	1.853	PF 1	359.00	2997.03	2999.01	2999.01	2999.71	0.013728	6.73	53.33	38.38	1.01
1	3	1.832	PF 1	359.00	2992.52	2994.50	2994.50	2995.26	0.013493	7.00	51.30	34.22	1.01
1	3	1.792	PF 1	359.00	2988.94	2991.09	2991.09	2991.93	0.013177	7.36	48.79	29.18	1.00
1	3	1.754	PF 1	555.00	2985.25	2988.16	2988.16	2989.26	0.012242	8.39	66.11	30.62	1.01
1	3	1.716	PF 1	555.00	2980.96	2983.98	2983.98	2985.10	0.012106	8.50	65.33	29.37	1.00
1	3	1.678	PF 1	555.00	2976.58	2979.31	2979.31	2980.28	0.012528	7.91	70.16	36.49	1.01
1	3	1.645	PF 1	555.00	2974.08	2976.79	2976.79	2977.78	0.012515	7.99	69.50	35.59	1.01
1	3	1.642	PF 1	555.00	2972.01	2975.99		2976.81	0.007068	7.26	76.42	28.38	0.78
1	3	1.632	PF 1	555.00	2970.93	2976.28	2973.69	2976.50	0.001185	3.78	146.94	35.83	0.33
1	3	1.631		Culvert									
1	3	1.621	PF 1	555.00	2969.86	2973.00	2973.00	2974.08	0.012827	8.35	66.49	31.35	1.01
1	3	1.583	PF 1	555.00	2964.01	2967.44	2967.44	2968.63	0.012318	8.75	63.40	27.27	1.01
1	3	1.547	PF 1	555.00	2958.19	2961.59	2961.59	2962.79	0.011877	8.81	62.99	26.00	1.00
1	3	1.509	PF 1	555.00	2953.77	2957.17	2957.17	2958.30	0.012162	8.54	65.00	29.04	1.01
1	3	1.47	PF 1	555.00	2949.18	2952.62	2952.62	2953.74	0.012170	8.51	65.23	29.31	1.00
1	3	1.433	PF 1	555.00	2944.47	2947.62	2947.62	2948.75	0.012225	8.52	65.16	29.35	1.01
1	3	1.395	PF 1	555.00	2940.21	2943.65	2943.65	2944.88	0.012091	8.92	62.23	25.21	1.00

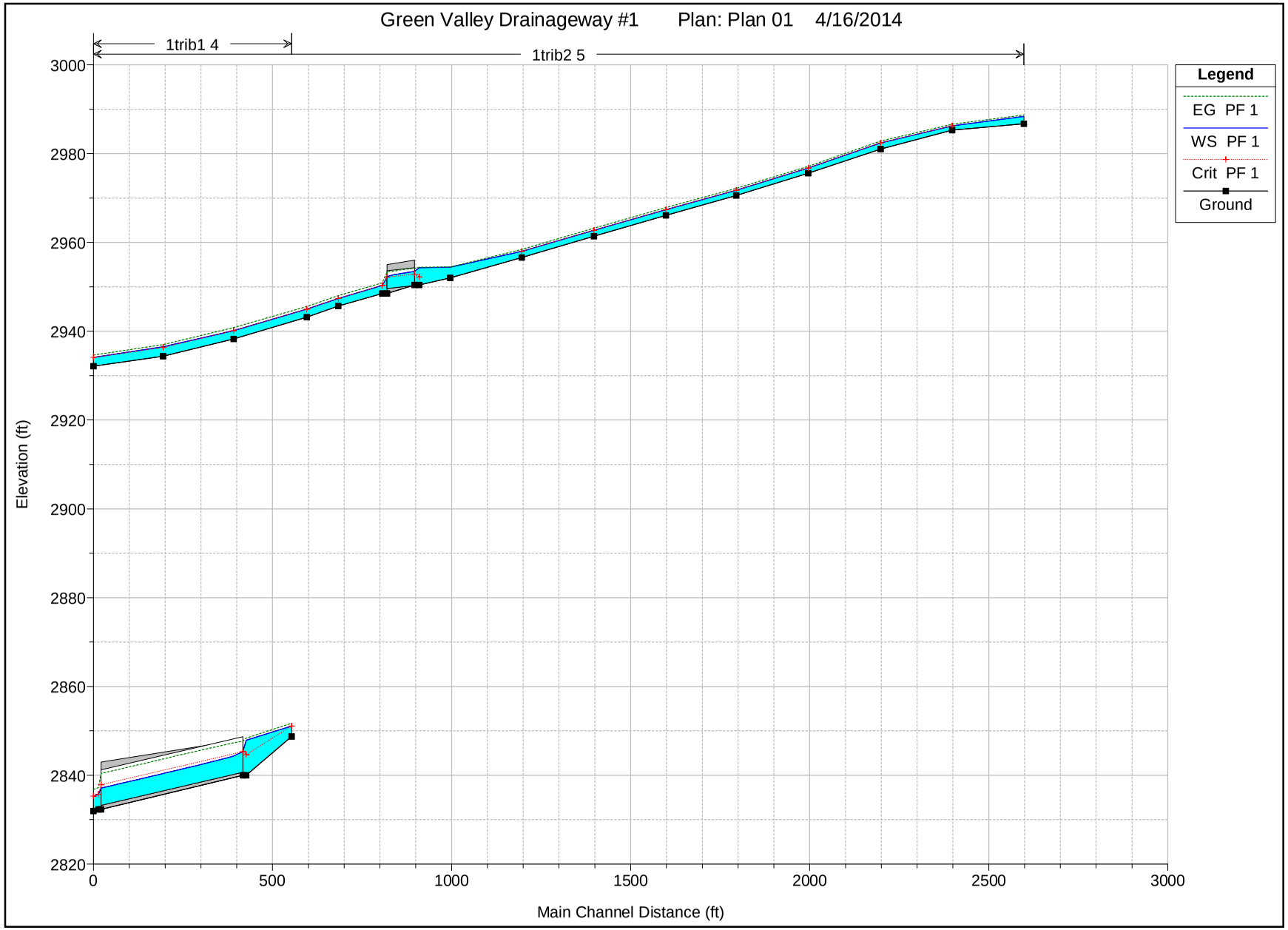
HEC-RAS Plan: Plan 01 Profile: PF 1 (Continued)

River	Reach	River Sta	Profile	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)	
1	3	1.362	PF 1	884.00	2934.88	2939.60	2939.60	2941.33	0.011517	10.55	83.76	24.27	1.00
1	3	1.35	PF 1	884.00	2933.16	2937.54	2935.30	2937.62	0.000452	2.18	405.87	121.37	0.21
1	3	1.349		Culvert									
1	3	1.329	PF 1	884.00	2931.34	2934.03		2934.42	0.005424	5.00	176.93	99.34	0.66
1	3	1.306	PF 1	884.00	2927.77	2931.99	2931.99	2933.39	0.011636	9.50	93.10	33.87	1.01
1	3	1.283	PF 1	884.00	2925.26	2929.99	2929.99	2931.39	0.011631	9.52	92.83	33.33	1.01
1	2	1.264	PF 1	1007.00	2923.27	2927.55	2927.55	2928.96	0.011298	9.54	105.51	37.87	1.01
1	2	1.234	PF 1	1007.00	2920.33	2924.38	2924.07	2925.45	0.008135	8.27	121.73	42.53	0.86
1	2	1.224	PF 1	1007.00	2919.74	2923.62	2923.62	2924.92	0.011385	9.17	109.93	43.34	1.01
1	2	1.221	PF 1	1007.00	2916.50	2923.85	2920.31	2924.24	0.001320	5.00	216.27	59.49	0.35
1	2	1.220		Culvert									
1	2	1.199	PF 1	1007.00	2914.94	2919.62	2919.62	2921.31	0.012613	10.43	96.53	28.92	1.01
1	2	1.182	PF 1	1007.00	2911.44	2916.13	2916.13	2917.66	0.011078	9.94	101.31	33.06	1.00
1	2	1.144	PF 1	1007.00	2905.11	2910.59	2910.59	2912.13	0.011457	9.97	101.03	33.04	1.00
1	2	1.106	PF 1	1007.00	2900.33	2905.12	2905.12	2906.69	0.011176	10.05	100.18	32.26	1.01
1	2	1.067	PF 1	1007.00	2896.01	2898.89	2898.89	2900.01	0.012027	8.51	118.31	53.39	1.01
1	2	1.029	PF 1	1007.00	2890.95	2894.12	2894.12	2895.20	0.011916	8.36	120.52	56.17	1.01
1	2	0.991	PF 1	1007.00	2884.39	2888.11	2888.11	2889.18	0.012021	8.29	121.54	57.91	1.01
1	2	0.954	PF 1	1007.00	2879.07	2882.70	2882.70	2883.74	0.012017	8.20	122.84	59.37	1.00
1	2	0.915	PF 1	1007.00	2873.81	2876.90	2876.90	2877.96	0.011890	8.27	121.74	57.63	1.00
1	2	0.878	PF 1	1007.00	2868.22	2871.34	2871.34	2872.40	0.012129	8.26	121.92	58.72	1.01
1	2	0.84	PF 1	1007.00	2862.38	2865.54	2865.54	2866.57	0.012064	8.16	123.48	60.53	1.01
1	2	0.802	PF 1	1007.00	2856.63	2859.82	2859.82	2860.95	0.011744	8.54	117.85	52.58	1.01
1	2	0.764	PF 1	1007.00	2850.56	2853.34	2853.34	2854.37	0.012005	8.18	123.15	59.92	1.01
1	2	0.726	PF 1	1488.00	2844.74	2848.11	2848.11	2849.45	0.011186	9.27	160.52	61.00	1.01
1	2	0.713	PF 1	1488.00	2841.75	2844.84	2844.84	2846.03	0.011697	8.75	170.02	72.62	1.01
1	2	0.711	PF 1	1488.00	2839.87	2843.61	2843.32	2844.68	0.008198	8.30	179.37	62.99	0.87
1	2	0.702	PF 1	1488.00	2838.58	2843.98	2841.76	2844.31	0.001447	4.61	322.50	71.48	0.38
1	2	0.701		Culvert									
1	2	0.636	PF 1	1488.00	2831.85	2835.07		2835.97	0.014104	7.63	195.12	69.34	0.80
1	2	0.634	PF 1	1488.00	2831.64	2835.06		2835.85	0.012676	7.16	207.91	75.61	0.76
1	1	0.623	PF 1	1963.00	2830.32	2834.57		2835.25	0.007349	6.62	296.37	80.13	0.61
1	1	0.605	PF 1	1963.00	2827.47	2833.57		2834.46	0.009105	7.59	265.99	79.30	0.68
1	1	0.566	PF 1	1963.00	2824.37	2830.19	2830.04	2831.85	0.017989	10.36	189.94	54.27	0.95
1	1	0.53	PF 1	1963.00	2820.83	2826.87	2826.56	2828.59	0.016298	10.55	186.02	44.27	0.91
1	1	0.493	PF 1	1963.00	2817.97	2823.60	2823.36	2825.31	0.016919	10.50	186.90	46.69	0.93
1	1	0.455	PF 1	1963.00	2814.84	2821.03		2822.36	0.012004	9.24	212.37	49.68	0.79
1	1	0.417	PF 1	1963.00	2811.73	2817.37	2817.37	2819.24	0.020149	10.98	178.82	47.88	1.00
1	1	0.382	PF 1	1963.00	2809.24	2813.00	2813.00	2813.92	0.018785	8.52	285.54	291.73	0.93
1	1	0.378	PF 1	1963.00	2807.23	2813.03	2810.94	2813.32	0.002523	4.74	613.21	329.87	0.38

HEC-RAS Plan: Plan 01 Profile: PF 1 (Continued)

River	Reach	River Sta	Profile	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)	
1	1	.377		Culvert									
1	1	0.357	PF 1	1963.00	2805.87	2809.71	2809.66	2811.08	0.014938	9.39	209.12	227.48	0.99
1	1	0.32	PF 1	1963.00	2803.42	2806.90	2806.90	2807.93	0.016694	9.40	281.79	541.59	1.03
1	1	0.283	PF 1	1963.00	2800.78	2804.56	2803.82	2805.06	0.011199	7.47	404.77	572.03	0.84
1	1	0.245	PF 1	1963.00	2798.88	2802.04	2801.85	2802.60	0.013629	7.58	382.50	761.14	0.91
1	1	0.207	PF 1	1963.00	2796.43	2798.45	2798.27	2799.00	0.025022	6.81	336.28	964.58	1.11
1	1	0.195	PF 1	1963.00	2795.57	2796.70	2796.61	2797.22	0.031496	6.63	347.12	1205.32	1.21
1	1	0.148	PF 1	1963.00	2791.57	2792.05		2792.34	0.013132	1.70	463.96	1562.86	0.62
1	1	0.11	PF 1	1963.00	2788.43	2789.67		2789.87	0.011211	3.37	552.55	1583.84	0.69
1	1	0.072	PF 1	1963.00	2784.67	2788.14		2788.28	0.005767	4.82	716.80	1593.28	0.58
1	1	0.033	PF 1	1963.00	2781.57	2786.77	2786.67	2787.06	0.006356	6.17	673.76	1273.82	0.64
1	1	0.001	PF 1	1963.00	2777.92	2785.43	2785.43	2785.95	0.006125	6.79	561.48	1336.56	0.64

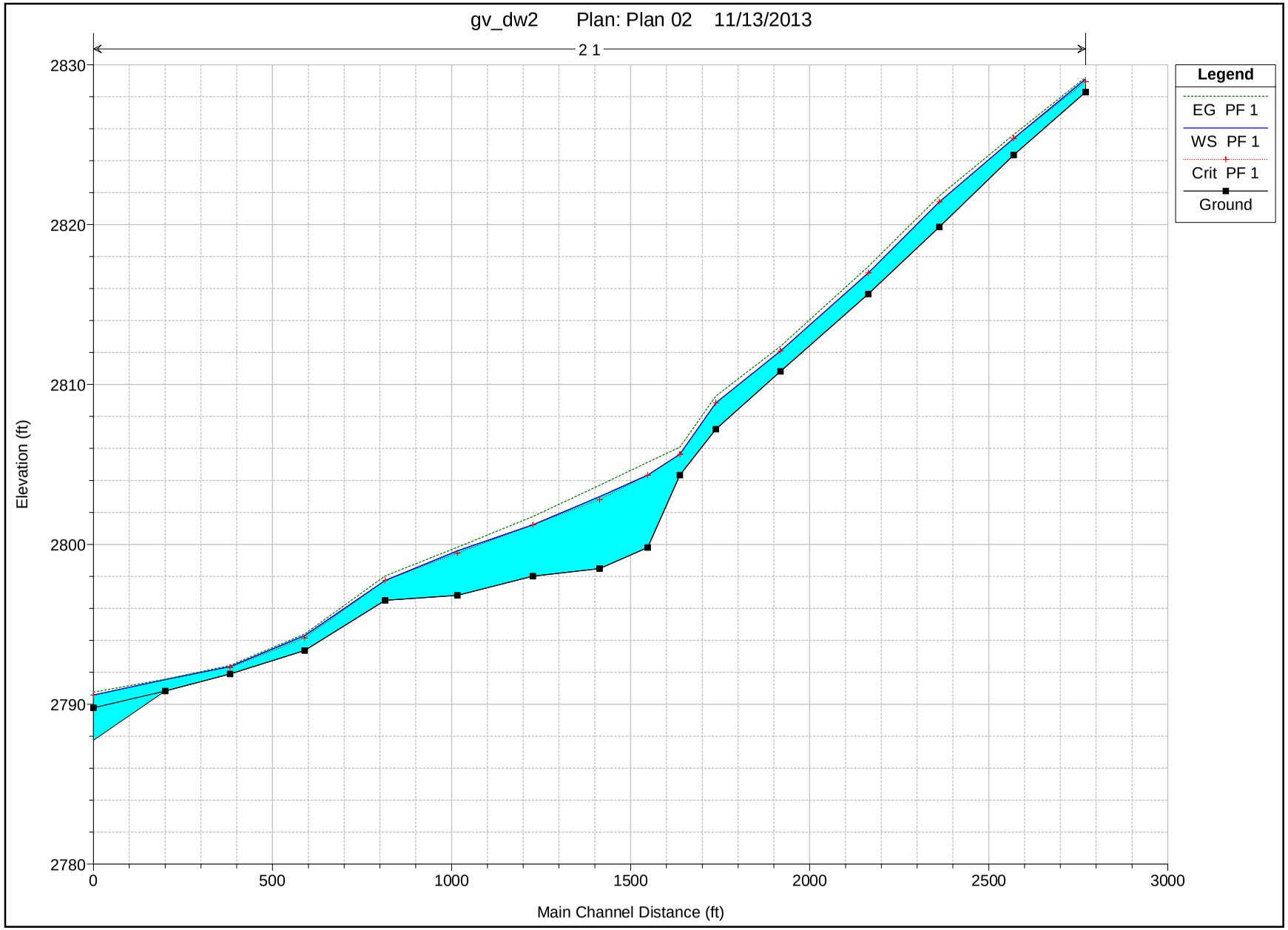

Green Valley Drainageway #1 Plan: Plan 01 4/16/2014
1 1
1 2
1 3
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Elevation (ft)
3050
3000
2950
2900
2850
2800
2750
0
2000
4000
6000
8000
10000
Main Channel Distance (ft)


Green Valley Drainageway #1 Plan: Plan 01 4/16/2014
1trib1 4
1trib2 5
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Elevation (ft)
3000
2980
2960
2940
2920
2900
2880
2860
2840
2820
0
500
1000
1500
2000
2500
3000
Main Channel Distance (ft)

DRAINAGEWAY#02

HEC-RAS Plan:

Reach	River Sta	Profile	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)	
1	0.525	PF 1	144.00	2828.30	2829.11	2828.94	2829.22	0.017982	3.62	57.79	107.13	0.96
1	0.487	PF 1	144.00	2824.36	2825.39	2825.39	2825.63	0.017621	4.14	41.11	83.28	0.98
1	0.447	PF 1	359.00	2819.86	2821.43	2821.43	2821.79	0.012666	5.06	88.31	142.00	0.91
1	0.410	PF 1	359.00	2815.67	2816.99	2816.99	2817.38	0.014846	5.03	74.19	108.26	0.97
1	0.363	PF 1	359.00	2810.82	2812.09	2812.09	2812.39	0.012705	5.00	110.63	184.98	0.91
1	0.329	PF 1	359.00	2807.20	2808.85	2808.85	2809.28	0.013536	5.47	76.99	100.47	0.95
1	0.310	PF 1	567.00	2804.34	2805.64	2805.64	2806.08	0.014541	5.34	110.24	142.90	0.97
1	0.293	PF 1	567.00	2799.80	2804.33	2804.33	2805.14	0.007318	7.92	115.59	94.55	0.81
1	0.268	PF 1	567.00	2798.49	2802.98	2802.80	2803.69	0.010117	6.75	84.05	47.32	0.89
1	0.232	PF 1	567.00	2798.01	2801.22	2801.22	2801.75	0.010116	6.02	116.04	129.27	0.87
1	0.192	PF 1	567.00	2796.81	2799.60	2799.45	2799.82	0.004832	4.87	250.41	302.50	0.63
1	0.154	PF 1	567.00	2796.50	2797.74	2797.74	2798.02	0.021703	6.22	169.80	278.59	1.18
1	0.112	PF 1	567.00	2793.36	2794.29	2794.15	2794.39	0.007938	2.57	223.62	473.17	0.65
1	0.072	PF 1	567.00	2791.89	2792.35	2792.29	2792.42	0.011201	2.20	270.72	991.35	0.71
1	0.038	PF 1	567.00	2790.83	2791.54		2791.57	0.002546	1.44	418.29	1027.68	0.37
1	0.000	PF 1	567.00	2787.74	2790.58	2790.58	2790.76	0.007005	4.63	307.28	629.53	0.71


gv_dw2 Plan: Plan 02 11/13/2013
2 1
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Elevation (ft)
2830
2820
2810
2800
2790
2780
0
500
1000
1500
2000
2500
3000
Main Channel Distance (ft)

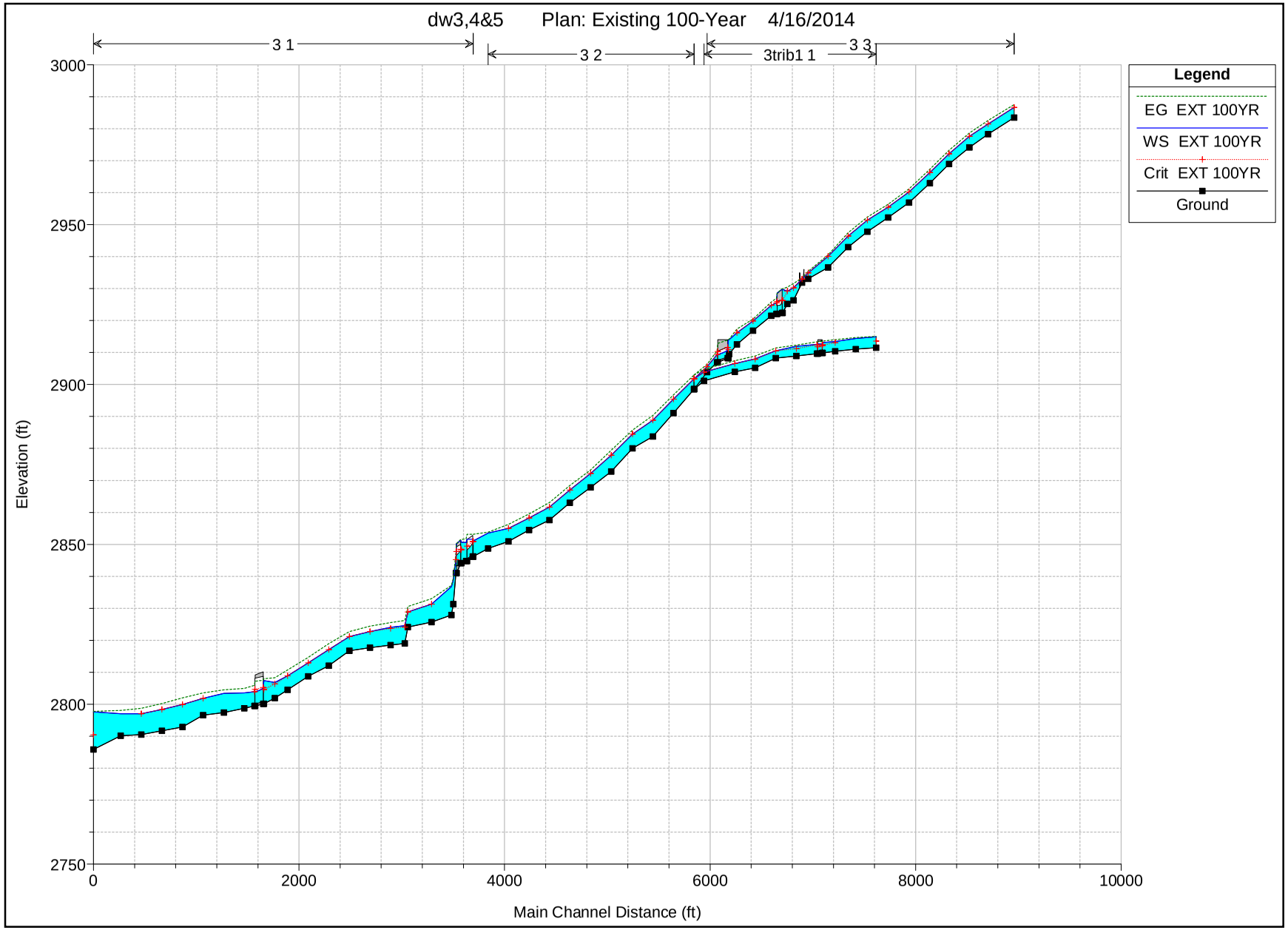
DRAINAGEWAY#03

HEC-RAS Plan: EXT Profile: EXT 100YR

River	Reach	River Sta	Profile	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)	
3trib1	1	3.336	EXT 100YR	339.00	2911.51	2914.89	2913.56	2915.04	0.000916	3.07	110.46	48.73	0.36
3trib1	1	3.298	EXT 100YR	339.00	2911.06	2914.40		2914.73	0.002666	4.60	73.78	41.18	0.59
3trib1	1	3.26	EXT 100YR	339.00	2910.42	2913.45	2913.04	2914.03	0.004297	6.13	55.27	27.03	0.76
3trib1	1	3.237	EXT 100YR	339.00	2909.85	2913.15	2912.42	2913.60	0.002567	5.33	63.61	36.84	0.60
3trib1	1	3.232		Culvert									
3trib1	1	3.227	EXT 100YR	339.00	2909.64	2912.52	2912.40	2913.37	0.006384	7.39	45.88	28.61	0.91
3trib1	1	3.189	EXT 100YR	339.00	2908.92	2911.94	2911.23	2912.33	0.002787	5.06	67.02	31.87	0.61
3trib1	1	3.151	EXT 100YR	339.00	2908.24	2910.52	2910.52	2911.41	0.007990	7.53	44.99	25.80	1.01
3trib1	1	3.113	EXT 100YR	339.00	2905.18	2908.00	2907.88	2908.91	0.006811	7.66	44.26	21.16	0.93
3trib1	1	3.075	EXT 100YR	339.00	2903.96	2906.54	2906.54	2907.42	0.008072	7.53	44.99	26.07	1.01
3trib1	1	3.018	EXT 100YR	339.00	2901.17	2903.88	2903.88	2904.76	0.008052	7.51	45.16	26.29	1.01
3	3	1.72	EXT 100YR	437.00	2983.47	2986.64	2986.64	2987.56	0.013710	7.69	56.84	31.48	1.01
3	3	1.672	EXT 100YR	437.00	2978.32	2981.52	2981.52	2982.62	0.013288	8.41	51.95	23.96	1.01
3	3	1.637	EXT 100YR	437.00	2974.18	2977.62	2977.62	2978.64	0.013324	8.08	54.07	26.66	1.00
3	3	1.6	EXT 100YR	437.00	2968.94	2972.19	2972.19	2973.26	0.013369	8.29	52.70	25.03	1.01
3	3	1.565	EXT 100YR	437.00	2962.96	2966.32	2966.32	2967.36	0.013381	8.19	53.36	26.00	1.01
3	3	1.526	EXT 100YR	437.00	2956.93	2960.23	2960.23	2961.19	0.013460	7.87	55.49	28.95	1.00
3	3	1.488	EXT 100YR	437.00	2952.25	2955.50	2955.50	2956.42	0.013767	7.70	56.72	51.03	1.01
3	3	1.449	EXT 100YR	437.00	2947.77	2951.39	2951.39	2952.39	0.013427	8.00	54.60	27.55	1.00
3	3	1.414	EXT 100YR	437.00	2942.98	2946.45	2946.45	2947.49	0.012877	8.18	53.43	37.40	0.99
3	3	1.377	EXT 100YR	437.00	2936.62	2940.06	2940.06	2940.52	0.009681	5.72	90.24	104.33	0.82
3	3	1.341	EXT 100YR	437.00	2933.07	2934.94	2934.94	2935.43	0.017444	5.95	78.95	88.08	1.05
3	3	1.335		Lat Struct									
3	3	1.329	EXT 100YR	437.00	2931.85	2932.96	2932.96	2933.38	0.004048	5.18	84.30	205.80	1.01
3	3	1.313	EXT 100YR	437.00	2926.29	2930.22	2930.22	2931.60	0.014170	9.46	46.22	16.88	1.01
3	3	1.302	EXT 100YR	437.00	2925.19	2929.18	2929.18	2930.47	0.013455	9.11	47.98	18.64	1.00
3	3	1.293	EXT 100YR	437.00	2922.42	2929.75	2926.22	2929.97	0.001029	3.76	116.15	26.14	0.29
3	3	1.288		Culvert									
3	3	1.282	EXT 100YR	437.00	2922.13	2925.56	2925.56	2926.98	0.009990	9.56	45.70	20.37	1.00
3	3	1.272	EXT 100YR	437.00	2921.50	2924.75	2924.75	2925.79	0.011006	8.18	53.43	26.16	1.00
3	3	1.239	EXT 100YR	437.00	2916.85	2919.86	2919.86	2920.49	0.007451	7.03	79.90	63.09	0.83
3	3	1.209	EXT 100YR	437.00	2912.56	2916.18	2916.18	2917.34	0.010675	8.63	50.63	21.53	0.99
3	3	1.195	EXT 100YR	437.00	2909.52	2914.01		2914.15	0.000123	2.94	150.77	50.39	0.27
3	3	1.193	EXT 100YR	437.00	2908.23	2913.85	2910.91	2914.13	0.000260	4.23	103.23	49.49	0.32
3	3	1.184		Culvert									
3	3	1.172	EXT 100YR	437.00	2906.92	2909.34	2909.34	2910.51	0.002432	8.68	50.36	21.60	1.00
3	3	1.154	EXT 100YR	437.00	2903.91	2905.62	2905.62	2906.36	0.002251	6.92	63.16	43.15	1.01
3	2	1.13	EXT 100YR	830.00	2898.55	2901.79	2901.79	2902.99	0.012496	8.80	94.35	39.64	1.00
3	2	1.092	EXT 100YR	830.00	2891.09	2895.43	2895.43	2896.78	0.012060	9.32	89.06	33.04	1.00
3	2	1.054	EXT 100YR	830.00	2883.72	2888.83	2888.83	2890.32	0.012344	9.79	84.80	29.04	1.01
3	2	1.017	EXT 100YR	830.00	2880.00	2884.51	2884.51	2885.77	0.012413	9.00	92.17	36.65	1.00
3	2	0.977	EXT 100YR	830.00	2872.76	2877.89	2877.89	2879.46	0.012254	10.05	82.62	26.48	1.00
3	2	0.939	EXT 100YR	830.00	2867.82	2872.15	2872.15	2873.32	0.012635	8.67	95.68	41.25	1.00

HEC-RAS Plan: EXT Profile: EXT 100YR (Continued)

River	Reach	River Sta	Profile	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)	
3	2	0.901	EXT 100YR	830.00	2862.99	2867.01	2867.01	2868.41	0.012230	9.49	87.49	31.68	1.01
3	2	0.864	EXT 100YR	830.00	2857.61	2861.66	2861.66	2863.10	0.012192	9.62	86.32	30.51	1.01
3	2	0.826	EXT 100YR	830.00	2854.50	2858.27	2858.27	2859.56	0.010191	9.13	90.96	35.65	1.01
3	2	0.788	EXT 100YR	830.00	2850.93	2855.00	2855.00	2856.27	0.010277	9.05	91.76	36.71	1.01
3	2	0.751	EXT 100YR	830.00	2848.70	2853.50		2853.84	0.001863	4.66	178.14	53.80	0.45
3	1	0.723	EXT 100YR	2701.88	2846.23	2851.12	2850.93	2853.14	0.004706	11.42	237.28	64.30	0.94
3	1	0.716		Culvert									
3	1	0.71	EXT 100YR	2175.88	2844.79	2850.53		2851.74	0.000803	8.83	246.36	43.30	0.65
3	1	0.701	EXT 100YR	2175.88	2844.10	2850.66	2848.34	2851.55	0.000509	7.59	286.77	43.72	0.52
3	1	0.695		Culvert									
3	1	0.691	EXT 100YR	2175.88	2841.03	2845.24	2845.24	2847.37	0.001949	11.71	185.76	44.10	1.01
3	1	0.687	EXT 100YR	2175.88	2831.34	2838.88		2839.46	0.160826	6.11	355.94	61.91	0.45
3	1	0.683	EXT 100YR	2175.88	2827.91	2836.78		2837.15	0.086200	4.88	446.30	66.97	0.33
3	1	0.646	EXT 100YR	2192.88	2825.70	2831.30	2831.30	2833.03	0.009079	10.57	207.39	59.81	1.00
3	1	0.603	EXT 100YR	2192.88	2824.15	2828.83	2828.83	2830.55	0.006231	10.52	208.49	60.81	1.00
3	1	0.597	EXT 100YR	2192.88	2819.03	2824.59	2824.15	2826.20	0.004506	10.20	215.03	49.97	0.87
3	1	0.571	EXT 100YR	2192.88	2818.51	2824.08	2823.65	2825.52	0.004509	9.64	227.36	58.72	0.86
3	1	0.533	EXT 100YR	2192.88	2817.67	2822.73	2822.73	2824.43	0.006403	10.47	209.36	62.58	1.01
3	1	0.495	EXT 100YR	2192.88	2816.69	2821.15	2821.15	2822.68	0.006574	9.95	220.40	73.13	1.01
3	1	0.457	EXT 100YR	2192.88	2812.08	2817.06	2817.06	2818.91	0.006239	10.90	201.18	54.65	1.00
3	1	0.419	EXT 100YR	2192.88	2808.75	2812.93	2812.93	2814.67	0.001696	10.60	206.86	59.48	1.00
3	1	0.381	EXT 100YR	2192.88	2804.48	2808.88	2808.88	2810.69	0.001695	10.79	203.22	56.68	1.00
3	1	0.357	EXT 100YR	2192.88	2801.93	2806.77	2806.37	2808.31	0.001233	9.95	220.47	53.75	0.87
3	1	0.337	EXT 100YR	2192.88	2800.16	2807.36	2804.60	2807.98	0.000272	6.29	348.40	58.67	0.44
3	1	0.33		Culvert									
3	1	0.32	EXT 100YR	2192.88	2799.49	2803.92	2803.92	2805.92	0.001625	11.36	193.05	51.35	1.00
3	1	0.301	EXT 100YR	2192.88	2798.76	2803.56		2804.91	0.001173	9.32	235.21	62.30	0.85
3	1	0.263	EXT 100YR	2192.88	2797.43	2803.37		2804.47	0.003295	8.44	259.96	65.21	0.74
3	1	0.225	EXT 100YR	2192.88	2796.58	2801.81	2801.81	2803.52	0.006249	10.50	208.88	61.22	1.00
3	1	0.187	EXT 100YR	2192.88	2792.90	2799.92	2799.92	2801.96	0.006232	11.46	191.37	47.29	1.00
3	1	0.149	EXT 100YR	2192.88	2791.66	2798.35	2798.35	2800.24	0.006131	11.05	198.41	51.85	1.00
3	1	0.111	EXT 100YR	2192.88	2790.53	2797.01	2797.01	2798.73	0.006363	10.55	207.80	60.47	1.00
3	1	0.073	EXT 100YR	2192.88	2790.15	2797.02		2798.03	0.000759	8.07	271.77	64.38	0.69
3	1	0.023	EXT 100YR	2192.88	2785.86	2797.58	2790.44	2797.74	0.000061	3.20	721.58	141.85	0.21


dw3,4&5 Plan: Existing 100-Year 4/16/2014
3 1
3 2
3 3
3trib1 1
Legend
EG EXT 100YR
WS EXT 100YR
Crit EXT 100YR
Ground
Elevation (ft)
3000
2950
2900
2850
2800
2750
0
2000
4000
6000
8000
10000
Main Channel Distance (ft)

DRAINAGEWAY#05 & 04

HEC-RAS Plan: EXT Profile: EXT 100YR

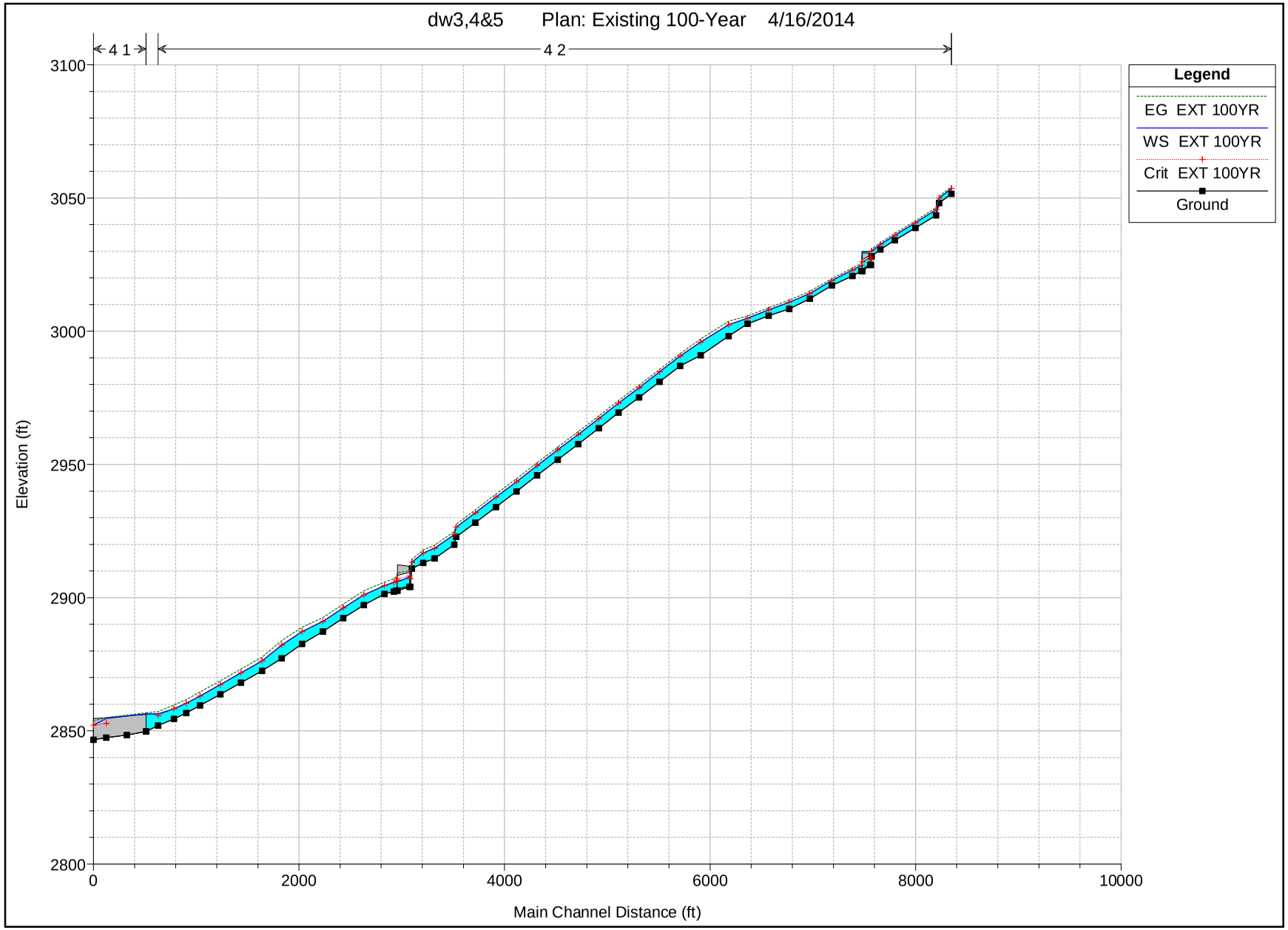
River	Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
				(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
5trib1	1	5.169	EXT 100YR	147.00	2907.69	2909.24	2909.24	2909.82	0.005798	6.10	24.10	20.96	1.00
5trib1	1	5.131	EXT 100YR	147.00	2906.33	2907.51	2907.27	2907.73	0.002727	3.77	39.00	40.35	0.68
5trib1	1	5.108	EXT 100YR	147.00	2906.00	2906.96	2906.96	2907.29	0.004391	4.63	31.77	48.65	1.01
5trib1	1	5.07	EXT 100YR	147.00	2904.41	2906.82		2906.86	0.000168	1.52	96.68	47.86	0.19
5trib1	1	5.032	EXT 100YR	147.00	2903.31	2906.82	2904.50	2906.83	0.000053	1.06	142.21	57.80	0.11
5trib1	1	5.012	EXT 100YR	147.00	2903.10	2906.81	2904.27	2906.83	0.000051	1.05	141.89	75.89	0.11
5	2	1.352	EXT 100YR	473.00	3009.14	3011.11	3011.11	3011.79	0.002001	6.71	77.81	60.54	0.96
5	2	1.315	EXT 100YR	473.00	2999.41	3002.07	3002.07	3003.10	0.007760	8.17	57.90	28.36	1.01
5	2	1.277	EXT 100YR	473.00	2992.66	2995.48	2995.48	2996.54	0.007668	8.29	57.05	27.03	1.01
5	2	1.239	EXT 100YR	473.00	2986.44	2989.25	2989.25	2990.31	0.007673	8.23	57.46	27.74	1.01
5	2	1.201	EXT 100YR	473.00	2979.21	2981.97	2981.97	2983.01	0.007630	8.18	57.83	28.19	1.01
5	2	1.163	EXT 100YR	473.00	2972.67	2975.50	2975.50	2976.58	0.007646	8.34	56.69	26.57	1.01
5	2	1.125	EXT 100YR	473.00	2965.85	2968.78	2968.78	2969.85	0.007613	8.28	57.11	27.06	1.00
5	2	1.087	EXT 100YR	473.00	2959.05	2961.68	2961.68	2962.73	0.007655	8.22	57.53	27.66	1.00
5	2	1.049	EXT 100YR	473.00	2952.58	2955.20	2955.20	2956.23	0.007669	8.17	57.88	28.32	1.01
5	2	1.012	EXT 100YR	473.00	2946.97	2949.54	2949.54	2950.57	0.007674	8.15	58.06	28.51	1.01
5	2	0.974	EXT 100YR	473.00	2941.65	2944.36	2944.36	2945.43	0.007619	8.30	56.96	26.73	1.00
5	2	0.936	EXT 100YR	473.00	2936.61	2939.36	2939.36	2940.39	0.007683	8.16	57.97	28.45	1.01
5	2	0.898	EXT 100YR	473.00	2930.35	2933.18	2933.18	2934.31	0.007657	8.56	55.25	24.71	1.01
5	2	0.86	EXT 100YR	473.00	2925.17	2927.85	2927.85	2928.92	0.007587	8.30	56.98	26.79	1.00
5	2	0.822	EXT 100YR	473.00	2920.27	2922.97	2922.97	2924.04	0.007670	8.29	57.05	27.13	1.01
5	2	0.784	EXT 100YR	473.00	2915.45	2918.08	2918.08	2919.19	0.007694	8.46	55.92	25.53	1.01
5	2	0.764	EXT 100YR	473.00	2912.20	2914.94	2914.94	2916.00	0.007612	8.27	57.18	27.15	1.00
5	2	0.747	EXT 100YR	473.00	2910.50	2912.97	2912.97	2914.10	0.002302	8.54	55.42	28.46	0.99
5	2	0.746	EXT 100YR	473.00	2905.60	2912.80	2908.38	2913.00	0.000158	3.63	130.28	33.76	0.24
5	2	0.734		Culvert									
5	2	0.722	EXT 100YR	473.00	2903.73	2906.75	2906.75	2908.09	0.002307	9.31	50.82	19.00	1.00
5	2	0.718	EXT 100YR	473.00	2903.51	2906.20	2906.20	2907.29	0.002065	8.38	56.46	26.18	1.01
5	1	0.7	EXT 100YR	1134.00	2901.76	2905.37	2905.37	2906.66	0.001670	9.14	131.25	64.87	0.96
5	1	0.664	EXT 100YR	1134.00	2897.15	2901.53	2901.53	2903.10	0.001821	10.06	112.74	36.26	1.01
5	1	0.626	EXT 100YR	1134.00	2892.16	2896.15	2896.15	2897.68	0.001822	9.92	114.31	37.72	1.00
5	1	0.588	EXT 100YR	1134.00	2887.49	2891.49	2891.49	2892.99	0.001819	9.81	115.64	38.94	1.00
5	1	0.55	EXT 100YR	1134.00	2883.26	2887.33	2887.33	2888.80	0.001829	9.71	116.77	40.29	1.01
5	1	0.524	EXT 100YR	1134.00	2880.10	2882.37	2882.37	2883.19	0.003230	7.27	155.98	140.52	1.01
5	1	0.499	EXT 100YR	1134.00	2876.95	2881.36	2881.36	2882.74	0.001689	9.44	125.18	52.79	0.97
5	1	0.461	EXT 100YR	1134.00	2871.14	2875.62	2875.62	2877.18	0.001827	10.03	113.05	36.43	1.00
5	1	0.423	EXT 100YR	1134.00	2866.14	2870.56	2870.56	2872.06	0.001801	9.85	115.68	46.14	1.00
5	1	0.398	EXT 100YR	1134.00	2862.57	2867.02	2867.02	2868.50	0.001834	9.79	115.89	39.25	1.00
5	1	0.377	EXT 100YR	1134.00	2860.30	2864.91	2863.60	2865.76	0.000760	7.41	152.99	33.20	0.61
5	1	0.368		Culvert									
5	1	0.359	EXT 100YR	1134.00	2859.96	2863.34	2863.34	2864.94	0.005017	10.16	111.66	35.30	1.01
5	1	0.321	EXT 100YR	1388.00	2857.36	2862.88	2861.63	2863.12	0.002766	4.00	355.93	139.97	0.35
5	1	0.30		Lat Struct									

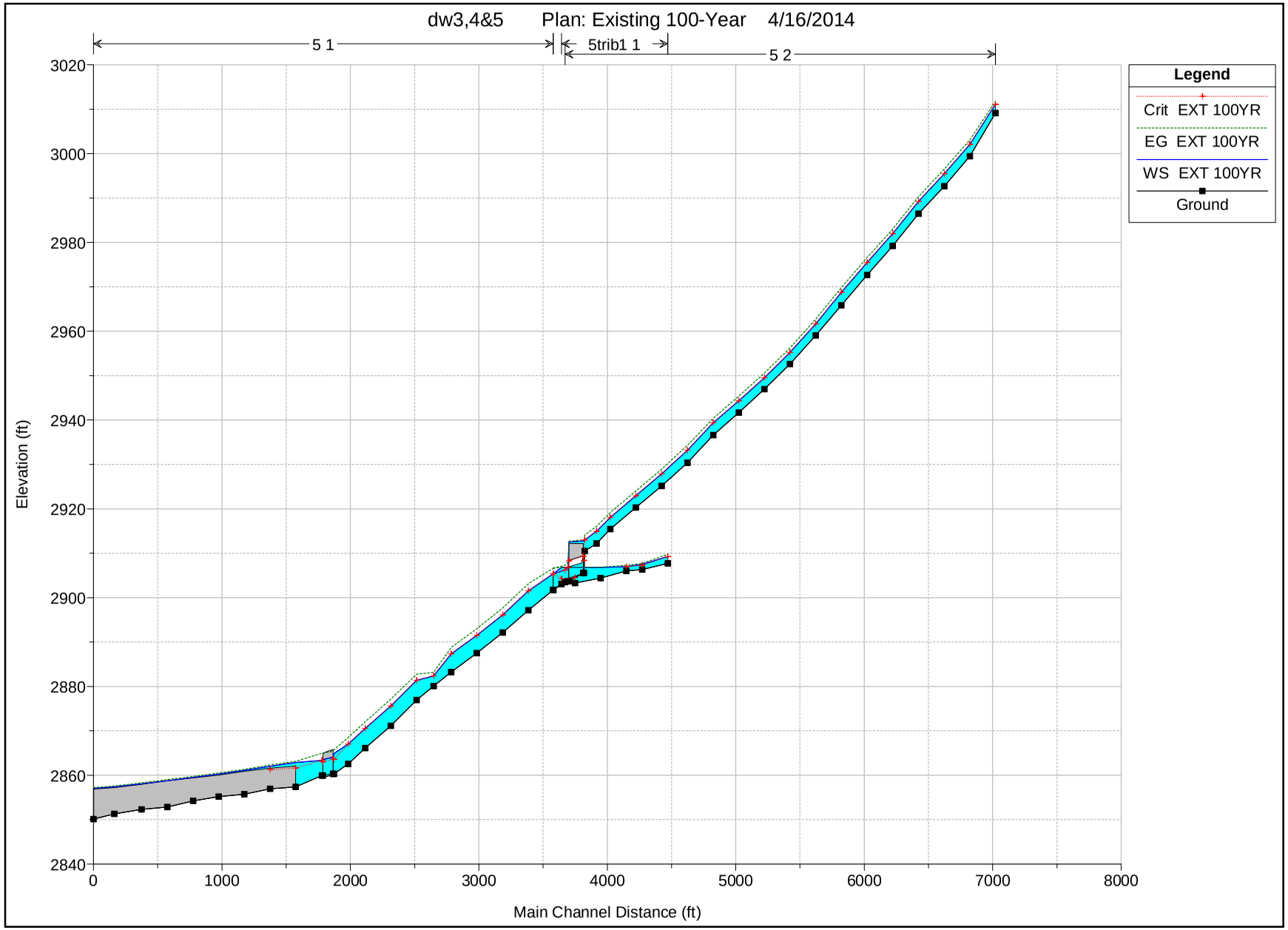
HEC-RAS Plan: EXT Profile: EXT 100YR (Continued)

River	Reach	River Sta	Profile	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)	
5	1	0.283	EXT 100YR	1195.20	2856.94	2862.02	2861.30	2862.35	0.005978	4.80	264.25	145.29	0.48
5	1	0.245	EXT 100YR	1121.80	2855.75	2861.10		2861.34	0.004052	4.13	296.38	145.55	0.40
5	1	0.207	EXT 100YR	1084.04	2855.20	2860.26		2860.51	0.004197	4.22	279.53	141.13	0.41
5	1	0.169	EXT 100YR	1055.66	2854.22	2859.53		2859.75	0.003343	3.86	286.31	129.24	0.37
5	1	0.131	EXT 100YR	1045.89	2852.84	2858.79		2859.05	0.003696	4.21	267.30	130.21	0.39
5	1	0.093	EXT 100YR	1037.99	2852.31	2858.07		2858.29	0.003673	3.86	277.81	124.67	0.38
5	1	0.053	EXT 100YR	1020.64	2851.29	2857.38		2857.60	0.002901	4.09	278.92	129.57	0.35
5	1	0.022	EXT 100YR	1003.88	2850.15	2857.04		2857.22	0.001809	3.48	304.74	110.73	0.28
4	2	1.588	EXT 100YR	252.00	3051.60	3053.57	3053.57	3054.25	0.005615	6.61	38.15	28.93	1.01
4	2	1.565	EXT 100YR	252.00	3048.07	3049.98	3049.98	3050.69	0.005478	6.75	37.31	26.84	1.01
4	2	1.56	EXT 100YR	252.00	3043.52	3045.62	3045.62	3046.38	0.005436	6.98	36.13	24.26	1.01
4	2	1.522	EXT 100YR	252.00	3038.81	3040.74	3040.74	3041.47	0.005448	6.84	36.83	25.80	1.01
4	2	1.484	EXT 100YR	252.00	3034.16	3036.03	3036.03	3036.73	0.005480	6.69	37.67	27.31	1.00
4	2	1.457	EXT 100YR	252.00	3030.69	3032.58	3032.58	3033.25	0.005542	6.58	38.29	28.95	1.01
4	2	1.441	EXT 100YR	252.00	3028.12	3030.14	3030.14	3030.84	0.005493	6.76	37.30	26.77	1.01
4	2	1.44	EXT 100YR	252.00	3024.91	3029.96	3026.85	3030.01	0.000126	1.85	136.52	39.16	0.17
4	2	1.431		Culvert									
4	2	1.422	EXT 100YR	252.00	3022.57	3024.74	3024.74	3025.50	0.008317	6.98	36.13	24.08	1.00
4	2	1.406	EXT 100YR	252.00	3020.77	3022.92	3022.92	3023.69	0.008428	7.05	35.73	23.53	1.01
4	2	1.368	EXT 100YR	252.00	3017.21	3019.06	3019.06	3019.74	0.008588	6.63	38.03	28.34	1.01
4	2	1.327	EXT 100YR	252.00	3012.17	3014.18	3014.18	3014.99	0.008380	7.24	34.83	21.82	1.01
4	2	1.289	EXT 100YR	252.00	3008.40	3010.89	3010.89	3011.71	0.008286	7.26	34.70	21.44	1.01
4	2	1.251	EXT 100YR	252.00	3005.78	3008.06	3008.06	3008.86	0.008057	7.21	34.95	21.40	0.99
4	2	1.212	EXT 100YR	252.00	3002.82	3004.94	3004.94	3005.75	0.008209	7.23	34.87	21.62	1.00
4	2	1.177	EXT 100YR	793.00	2998.14	3002.45	3002.45	3003.79	0.007124	9.30	85.25	31.88	1.00
4	2	1.126	EXT 100YR	793.00	2990.95	2995.91	2995.91	2997.12	0.001774	8.83	93.97	46.52	0.96
4	2	1.088	EXT 100YR	793.00	2986.94	2990.67	2990.67	2991.55	0.001864	7.58	110.53	77.58	0.96
4	2	1.05	EXT 100YR	793.00	2981.03	2984.71	2984.71	2985.60	0.001682	7.68	109.20	67.95	0.93
4	2	1.013	EXT 100YR	793.00	2975.11	2978.83	2978.83	2979.75	0.001931	7.72	105.62	65.13	0.98
4	2	0.975	EXT 100YR	793.00	2969.42	2973.02	2973.02	2973.97	0.001773	7.87	103.95	60.18	0.95
4	2	0.938	EXT 100YR	793.00	2963.57	2967.22	2967.22	2968.26	0.001897	8.17	98.99	56.73	0.99
4	2	0.901	EXT 100YR	793.00	2957.60	2961.30	2961.30	2962.34	0.002008	8.18	96.92	47.69	1.01
4	2	0.863	EXT 100YR	793.00	2951.77	2955.49	2955.49	2956.47	0.002041	7.94	99.83	52.29	1.01
4	2	0.825	EXT 100YR	793.00	2945.87	2949.55	2949.55	2950.60	0.001904	8.24	98.86	51.78	0.99
4	2	0.787	EXT 100YR	793.00	2939.88	2943.55	2943.55	2944.70	0.001836	8.63	95.64	50.38	0.99
4	2	0.749	EXT 100YR	793.00	2934.04	2937.73	2937.73	2938.87	0.001797	8.57	97.44	55.47	0.98
4	2	0.711	EXT 100YR	793.00	2928.15	2931.84	2931.84	2932.90	0.001984	8.26	97.16	51.79	1.00
4	2	0.676	EXT 100YR	793.00	2922.79	2926.47	2926.47	2927.51	0.001681	8.28	109.97	68.90	0.94
4	2	0.672	EXT 100YR	793.00	2919.86	2923.65	2923.65	2924.87	0.001930	8.86	89.49	37.09	1.01
4	2	0.636	EXT 100YR	793.00	2914.76	2918.51	2918.51	2919.69	0.001948	8.75	90.67	38.74	1.01
4	2	0.615	EXT 100YR	793.00	2913.00	2916.81	2916.81	2917.95	0.001961	8.59	92.32	40.77	1.01
4	2	0.594	EXT 100YR	793.00	2910.89	2913.33	2913.33	2914.40	0.001997	8.31	95.41	44.96	1.01
4	2	0.591	EXT 100YR	793.00	2904.10	2910.09	2907.12	2910.47	0.000281	4.93	160.81	27.00	0.36

HEC-RAS Plan: EXT Profile: EXT 100YR (Continued)

River	Reach	River Sta	Profile	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)	
4	2	0.580		Culvert									
4	2	0.565	EXT 100YR	793.00	2902.60	2906.36	2906.36	2907.93	0.001880	10.05	78.91	26.60	0.99
4	2	0.561	EXT 100YR	793.00	2902.28	2905.73	2905.73	2907.10	0.001914	9.36	84.69	31.44	1.01
4	2	0.543	EXT 100YR	1007.00	2901.37	2904.53	2904.53	2905.82	0.001878	9.13	110.35	42.71	1.00
4	2	0.505	EXT 100YR	1007.00	2897.24	2901.04	2901.04	2902.51	0.001851	9.76	103.17	35.23	1.01
4	2	0.467	EXT 100YR	1007.00	2892.31	2896.15	2896.15	2897.61	0.001853	9.71	103.68	35.86	1.01
4	2	0.43	EXT 100YR	1007.00	2887.30	2891.08	2891.08	2892.50	0.001857	9.56	105.37	37.49	1.00
4	2	0.392	EXT 100YR	1007.00	2882.64	2887.27	2887.27	2888.85	0.001820	10.07	99.97	31.72	1.00
4	2	0.354	EXT 100YR	1007.00	2877.18	2882.20	2882.20	2883.89	0.001864	10.42	96.60	29.01	1.01
4	2	0.317	EXT 100YR	1007.00	2872.48	2876.25	2876.25	2877.68	0.001863	9.61	104.77	37.00	1.01
4	2	0.279	EXT 100YR	1007.00	2868.10	2871.77	2871.77	2873.20	0.001860	9.61	104.78	36.93	1.01
4	2	0.241	EXT 100YR	1007.00	2863.72	2867.33	2867.33	2868.77	0.001855	9.62	104.65	36.72	1.00
4	2	0.203	EXT 100YR	1007.00	2859.50	2863.14	2863.14	2864.58	0.001854	9.63	104.61	36.69	1.00
4	2	0.178	EXT 100YR	1007.00	2856.66	2860.32	2860.32	2861.77	0.001862	9.66	104.28	36.49	1.01
4	2	0.155	EXT 100YR	1007.00	2854.51	2858.29	2858.29	2859.76	0.001863	9.73	103.49	35.60	1.01
4	2	0.126	EXT 100YR	1007.00	2852.02	2856.31	2855.74	2857.23	0.001039	7.73	137.74	78.92	0.77
4	1	0.104	EXT 100YR	1850.88	2849.80	2856.34		2856.80	0.005077	5.60	368.85	151.84	0.47
4	1	0.09		Lat Struct									
4	1	0.068	EXT 100YR	1850.88	2848.40	2855.51		2855.91	0.004209	5.11	374.40	122.75	0.43
4	1	0.03	EXT 100YR	1850.88	2847.42	2854.65	2852.79	2855.04	0.004486	5.12	396.85	160.82	0.44
4	1	0.007	EXT 100YR	1850.88	2846.64	2852.18	2852.18	2853.75	0.031615	10.06	183.93	59.09	1.01


dw3,4&5 Plan: Existing 100-Year 4/16/2014
4 1
4 2
Legend
EG EXT 100YR
WS EXT 100YR
Crit EXT 100YR
Ground
Elevation (ft)
3100
3050
3000
2950
2900
2850
2800
0
2000
4000
6000
8000
10000
Main Channel Distance (ft)


dw3,4&5 Plan: Existing 100-Year 4/16/2014
5 1
5trib1 1
5 2
Legend
Crit EXT 100YR
EG EXT 100YR
WS EXT 100YR
Ground
Elevation (ft)
3020
3000
2980
2960
2940
2920
2900
2880
2860
2840
0
1000
2000
3000
4000
5000
6000
7000
8000
Main Channel Distance (ft)

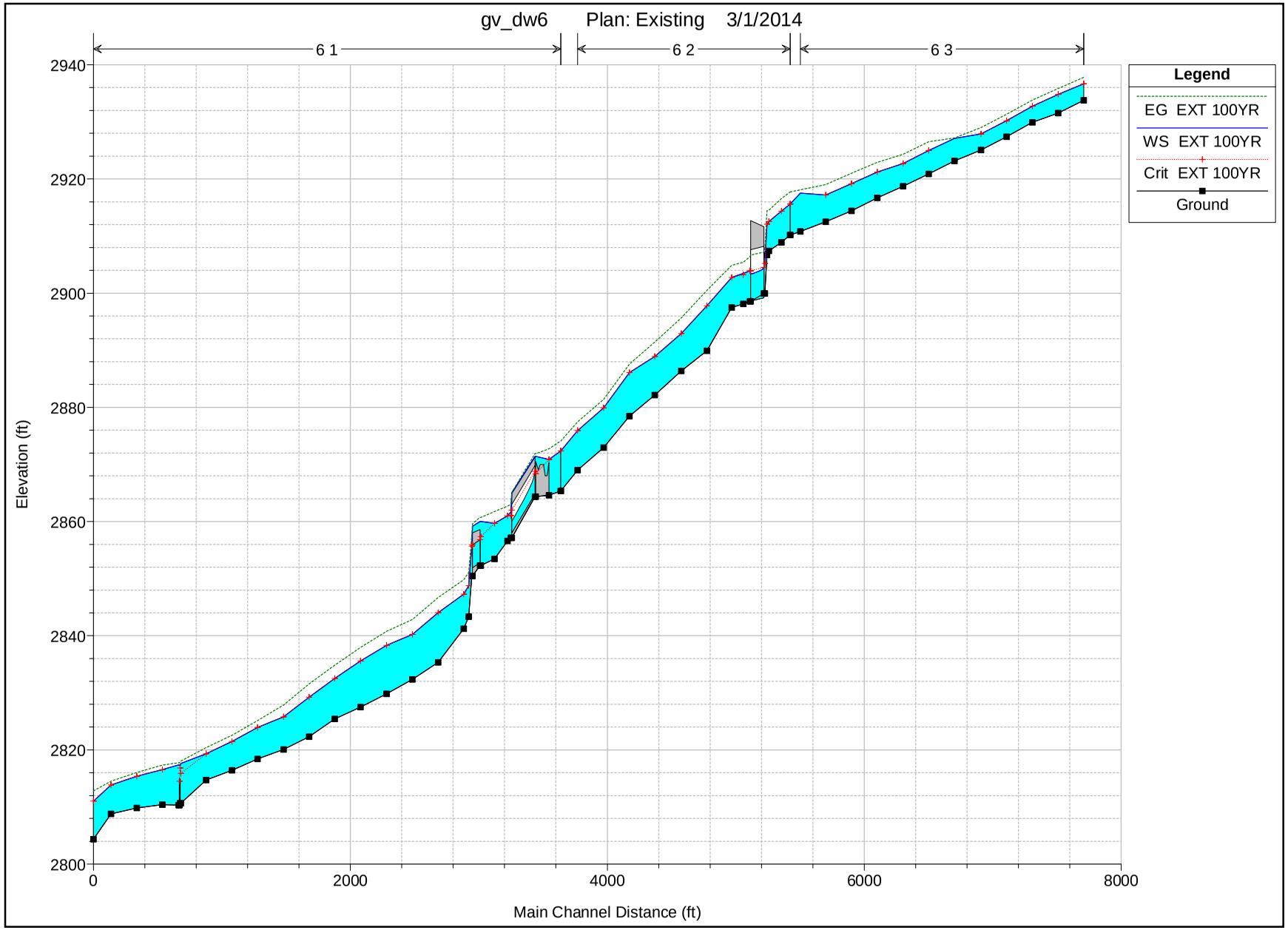
DRAINAGEWAY#06

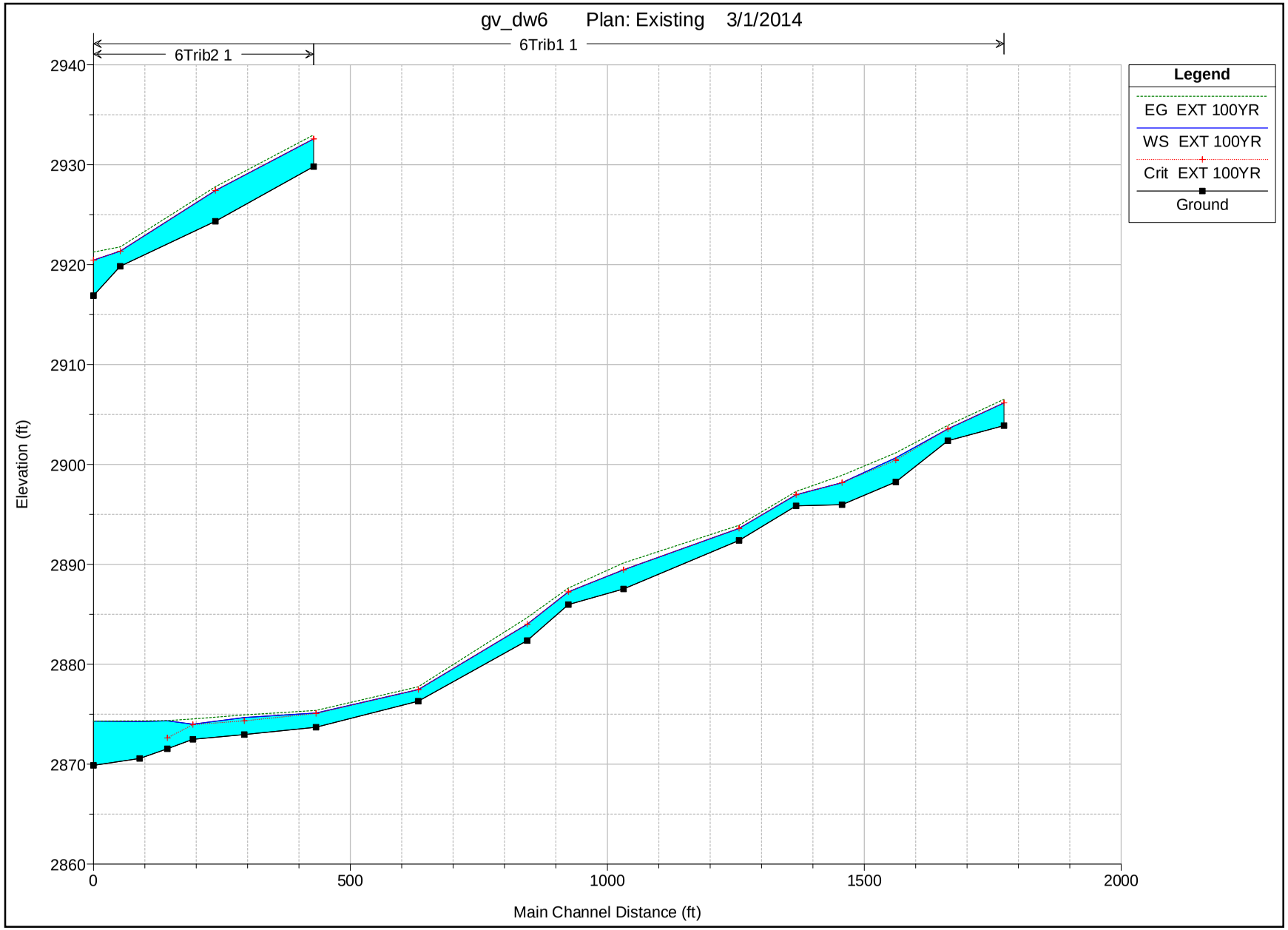
HEC-RAS Plan: EXT Profile: EXT 100YR

River	Reach	River Sta	Profile	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)	
6Trib2	1	6.094	EXT 100YR	1052.00	2929.81	2932.59	2932.59	2932.99	0.024939	4.71	217.71	270.25	0.89
6Trib2	1	6.058	EXT 100YR	1052.00	2924.33	2927.42	2927.42	2927.79	0.018522	5.57	239.81	310.93	0.83
6Trib2	1	6.023	EXT 100YR	1052.00	2919.83	2921.34	2921.34	2921.78	0.003490	5.38	201.88	234.82	0.96
6Trib2	1	6.013	EXT 100YR	1052.00	2916.90	2920.45	2920.45	2921.25	0.006600	7.51	166.31	162.79	0.82
6Trib1	1	4.342	EXT 100YR	217.00	2903.88	2906.15	2906.15	2906.53	0.021213	5.11	47.80	67.08	0.86
6Trib1	1	4.322	EXT 100YR	217.00	2902.37	2903.55	2903.55	2903.91	0.004339	4.83	44.93	63.97	1.02
6Trib1	1	4.302	EXT 100YR	217.00	2898.25	2900.67	2900.42	2901.16	0.017096	5.62	38.65	25.47	0.80
6Trib1	1	4.283	EXT 100YR	217.00	2895.98	2898.17	2898.17	2898.91	0.027527	6.93	31.32	21.31	1.01
6Trib1	1	4.266	EXT 100YR	217.00	2895.86	2896.97	2896.97	2897.30	0.004453	4.67	46.50	71.08	1.02
6Trib1	1	4.245	EXT 100YR	217.00	2892.39	2893.59	2893.59	2893.91	0.004177	4.55	47.71	72.22	0.99
6Trib1	1	4.202	EXT 100YR	217.00	2887.54	2889.47	2889.47	2890.14	0.005544	6.56	33.07	25.16	1.01
6Trib1	1	4.182	EXT 100YR	217.00	2885.96	2887.25	2887.25	2887.63	0.004256	4.94	43.89	59.43	1.01
6Trib1	1	4.167	EXT 100YR	217.00	2882.38	2884.00	2884.00	2884.67	0.005530	6.54	33.20	25.18	1.00
6Trib1	1	4.127	EXT 100YR	217.00	2876.30	2877.46	2877.46	2877.75	0.004511	4.30	50.44	103.37	1.00
6Trib1	1	4.089	EXT 100YR	217.00	2873.69	2875.11	2875.06	2875.39	0.003934	4.49	60.34	93.81	0.81
6Trib1	1	4.062	EXT 100YR	217.00	2872.97	2874.67	2874.34	2874.93	0.002761	4.10	55.24	81.65	0.69
6Trib1	1	4.043	EXT 100YR	217.00	2872.48	2873.99	2873.97	2874.52	0.005380	5.84	37.15	33.18	0.97
6Trib1	1	4.034	EXT 100YR	217.00	2871.53	2874.33	2872.64	2874.36	0.000056	1.20	180.45	203.09	0.14
6Trib1	1	4.024	EXT 100YR	217.00	2870.56	2874.26		2874.35	0.000126	2.39	91.25	37.99	0.26
6Trib1	1	4.007	EXT 100YR	217.00	2869.89	2874.30		2874.32	0.000019	1.03	214.35	99.56	0.10
6	3	1.486	EXT 100YR	524.00	2933.80	2936.70	2936.70	2937.78	0.007320	8.35	62.74	31.06	0.99
6	3	1.448	EXT 100YR	524.00	2931.56	2934.83	2934.83	2935.86	0.007378	8.11	64.60	32.58	0.99
6	3	1.411	EXT 100YR	524.00	2929.91	2932.74	2932.74	2933.83	0.007503	8.39	62.47	28.97	1.01
6	3	1.373	EXT 100YR	524.00	2927.39	2930.22	2930.22	2931.32	0.007510	8.41	62.27	28.67	1.01
6	3	1.335	EXT 100YR	524.00	2925.08	2927.89	2927.89	2929.00	0.007512	8.45	62.03	28.41	1.01
6	3	1.296	EXT 100YR	524.00	2923.18	2927.09		2927.19	0.000484	2.58	202.87	71.70	0.27
6	3	1.258	EXT 100YR	1952.00	2920.87	2924.98	2924.98	2926.52	0.006547	9.95	196.14	64.42	1.01
6	3	1.22	EXT 100YR	1952.00	2918.73	2922.70	2922.70	2924.34	0.006498	10.29	189.65	58.38	1.01
6	3	1.182	EXT 100YR	1952.00	2916.69	2921.20	2921.20	2922.92	0.006359	10.52	185.58	54.58	1.01
6	3	1.144	EXT 100YR	1952.00	2914.41	2919.17	2919.17	2921.00	0.006290	10.85	179.95	49.75	1.01
6	3	1.106	EXT 100YR	1952.00	2912.52	2917.21	2917.21	2919.02	0.006247	10.81	180.61	49.83	1.00
6	3	1.068	EXT 100YR	1952.00	2910.79	2917.53		2918.10	0.001319	6.04	323.12	66.77	0.48
6	2	1.053	EXT 100YR	2781.00	2910.18	2915.60	2915.60	2917.72	0.006062	11.69	237.96	56.83	1.01
6	2	1.041	EXT 100YR	2781.00	2908.88	2914.39	2914.39	2916.55	0.006013	11.80	235.60	55.06	1.01
6	2	1.022	EXT 100YR	2781.00	2907.39	2912.54	2912.54	2914.53	0.001640	11.32	245.66	62.40	1.01
6	2	1.019	EXT 100YR	2781.00	2906.69	2912.11	2912.11	2914.44	0.001672	12.26	227.71	51.19	1.00
6	2	1.016	EXT 100YR	2781.00	2899.94	2905.22	2905.20	2907.74	0.001896	12.74	218.35	43.20	1.00
6	2	1.005		Culvert									
6	2	0.994	EXT 100YR	2781.00	2898.59	2903.92	2903.92	2906.39	0.007049	12.63	220.13	44.40	1.00
6	2	0.984	EXT 100YR	2781.00	2898.10	2903.47	2903.20	2905.40	0.005166	11.15	249.52	55.06	0.92
6	2	0.967	EXT 100YR	2781.00	2897.50	2902.75	2902.75	2904.88	0.006025	11.71	237.55	55.85	1.00
6	2	0.931	EXT 100YR	2781.00	2889.91	2897.79	2897.79	2900.48	0.009228	13.16	211.34	39.36	1.00
6	2	0.893	EXT 100YR	2781.00	2886.37	2892.92	2892.92	2895.68	0.009166	13.34	208.44	38.42	1.01

HEC-RAS Plan: EXT Profile: EXT 100YR (Continued)

River	Reach	River Sta	Profile	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)	
6	2	0.854	EXT 100YR	2781.00	2882.15	2888.93	2888.93	2891.43	0.008761	12.69	219.07	44.26	1.01
6	2	0.816	EXT 100YR	2781.00	2878.45	2886.08	2886.08	2887.57	0.004907	10.59	336.75	112.33	0.76
6	2	0.778	EXT 100YR	2781.00	2872.94	2879.92	2879.92	2881.41	0.005311	10.21	321.47	116.31	0.80
6	2	0.74	EXT 100YR	2781.00	2869.01	2875.95	2875.95	2877.45	0.005721	10.36	320.04	114.46	0.83
6	1	0.715	EXT 100YR	3017.00	2865.37	2872.37	2872.37	2874.10	0.007973	10.57	292.03	90.50	0.96
6	1	0.698	EXT 100YR	3017.00	2864.60	2870.89	2870.89	2872.73	0.007139	10.94	287.19	93.67	0.92
6	1	0.68		Lat Struct									
6	1	0.678	EXT 100YR	2762.93	2864.37	2871.42	2868.39	2871.89	0.001143	5.55	522.81	105.22	0.38
6	1	0.66		Culvert									
6	1	0.642	EXT 100YR	2762.93	2857.16	2861.67	2861.04	2863.00	0.005684	9.26	298.49	69.20	0.79
6	1	0.637	EXT 100YR	2762.93	2856.62	2861.02	2861.02	2862.71	0.009071	10.43	264.98	79.44	1.01
6	1	0.618	EXT 100YR	2762.93	2853.47	2859.68	2859.68	2861.76	0.008616	11.58	238.61	57.64	1.00
6	1	0.597	EXT 100YR	2762.93	2852.28	2860.00	2857.34	2860.73	0.000853	6.98	454.70	127.26	0.47
6	1	0.591		Culvert									
6	1	0.584	EXT 100YR	2324.93	2850.47	2855.70	2855.70	2857.61	0.009361	11.09	209.70	55.20	1.00
6	1	0.58	EXT 100YR	2324.93	2843.33	2848.76	2848.76	2851.08	0.009212	12.22	190.21	41.11	1.00
6	1	0.572	EXT 100YR	2324.93	2841.23	2847.27	2847.27	2849.81	0.009258	12.79	181.79	35.82	1.00
6	1	0.534	EXT 100YR	2324.93	2835.34	2844.05	2844.05	2846.70	0.009379	13.06	178.00	34.03	1.01
6	1	0.496	EXT 100YR	2324.93	2832.36	2840.24	2840.24	2842.85	0.009300	12.96	179.40	34.42	1.00
6	1	0.458	EXT 100YR	2324.93	2829.81	2838.30	2838.30	2840.77	0.009308	12.59	184.63	37.78	1.00
6	1	0.42	EXT 100YR	2324.93	2827.51	2835.57	2835.57	2837.96	0.008938	12.40	187.54	39.67	1.00
6	1	0.382	EXT 100YR	2324.93	2825.43	2832.53	2832.53	2834.84	0.008768	12.21	190.48	41.29	1.00
6	1	0.344	EXT 100YR	2324.93	2822.32	2829.24	2829.24	2831.54	0.008885	12.18	190.96	41.79	1.00
6	1	0.307	EXT 100YR	2324.93	2820.08	2825.79	2825.79	2827.88	0.009036	11.59	200.63	49.10	1.01
6	1	0.268	EXT 100YR	2324.93	2818.43	2823.92	2823.92	2825.13	0.005212	9.20	495.43	442.80	0.79
6	1	0.23	EXT 100YR	2324.93	2816.43	2821.48	2821.48	2822.55	0.005303	8.85	619.50	435.58	0.78
6	1	0.193	EXT 100YR	2324.93	2814.72	2819.33	2819.33	2820.42	0.006586	9.23	675.56	447.34	0.86
6	1	0.155	EXT 100YR	2324.93	2810.65	2817.63	2815.90	2818.03	0.001315	5.66	1163.17	485.12	0.41
6	1	0.153		Bridge									
6	1	0.152	EXT 100YR	2762.93	2810.34	2817.37		2817.76	0.001234	5.39	1124.64	486.52	0.40
6	1	0.128	EXT 100YR	2762.93	2810.42	2816.56	2816.56	2817.35	0.005210	8.85	560.51	425.13	0.77
6	1	0.09	EXT 100YR	2762.93	2809.82	2815.37	2815.37	2816.07	0.005699	8.37	521.81	363.32	0.80
6	1	0.052	EXT 100YR	2762.93	2808.79	2813.86	2813.86	2814.52	0.005771	8.49	529.17	420.35	0.80
6	1	0.026	EXT 100YR	2762.93	2804.37	2811.03	2811.03	2812.83	0.008080	10.82	263.28	83.37	0.96


gv_dw6 Plan: Existing 3/1/2014
6 1
6 2
6 3
Legend
EG EXT 100YR
WS EXT 100YR
Crit EXT 100YR
Ground
Elevation (ft)
2940
2920
2900
2880
2860
2840
2820
2800
0
2000
4000
6000
8000
Main Channel Distance (ft)


gv_dw6 Plan: Existing 3/1/2014
6Trib2 1
6Trib1 1
Legend
EG EXT 100YR
WS EXT 100YR
Crit EXT 100YR
Ground
Elevation (ft)
2940
2930
2920
2910
2900
2890
2880
2870
2860
0
500
1000
1500
2000
Main Channel Distance (ft)

DRAINAGEWAY#07

HEC-RAS Plan: EXT Profile: EXT 100YR

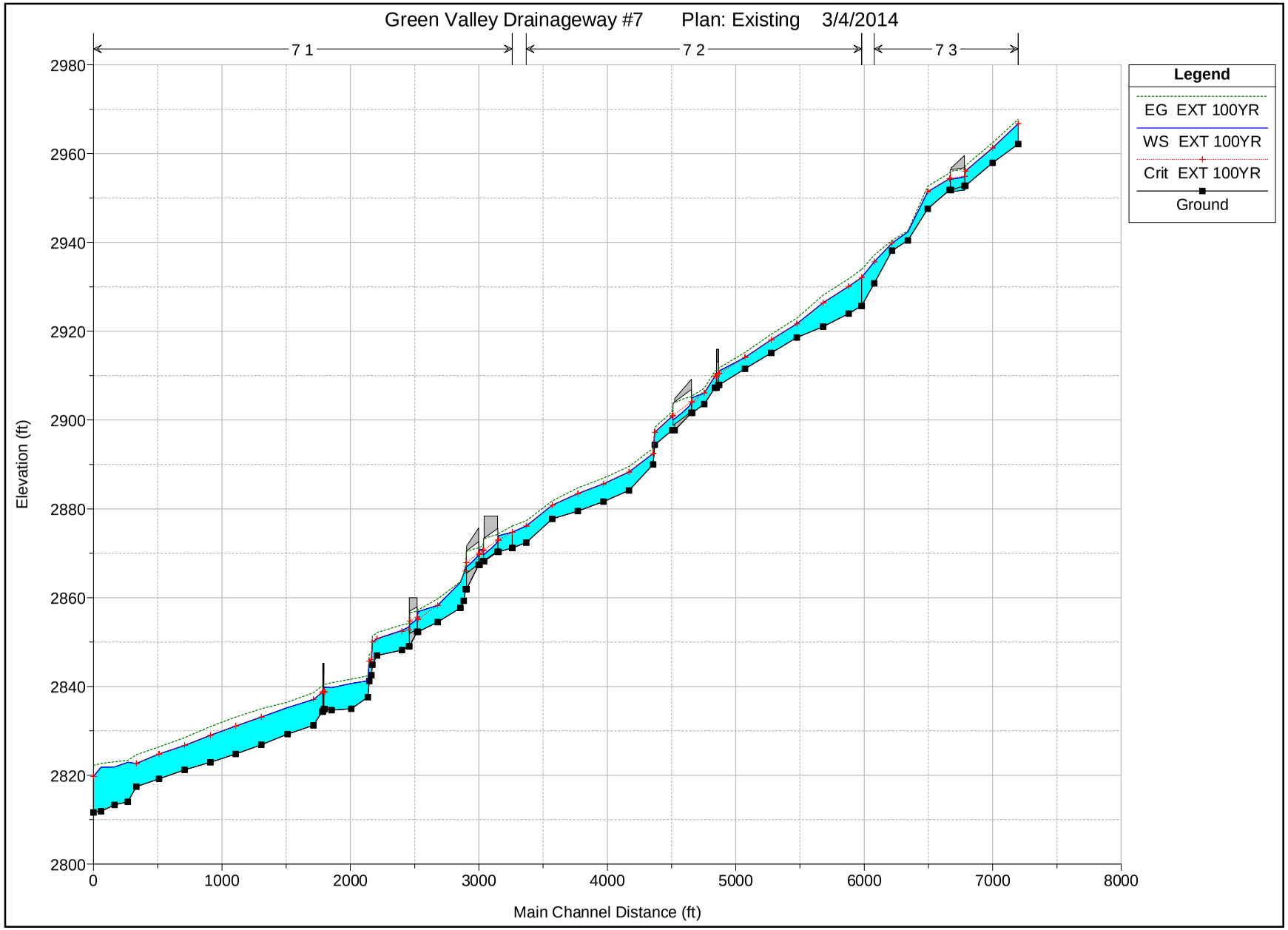
River	Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
				(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
7Trib2	7	7.412	EXT 100YR	559.00	2964.93	2968.32	2968.32	2969.39	0.010901	8.28	67.53	32.35	1.01
7Trib2	7	7.374	EXT 100YR	559.00	2963.07	2966.87		2967.60	0.006308	6.85	81.62	34.47	0.78
7Trib2	7	7.336	EXT 100YR	559.00	2961.54	2964.86	2964.86	2965.95	0.010689	8.38	66.72	30.94	1.01
7Trib2	7	7.311	EXT 100YR	559.00	2959.57	2963.34	2963.34	2964.43	0.010779	8.40	66.58	30.90	1.01
7Trib2	7	7.284	EXT 100YR	559.00	2954.91	2960.26	2960.26	2961.55	0.011067	9.11	61.38	23.98	1.00
7Trib2	7	7.246	EXT 100YR	559.00	2953.39	2958.04	2958.01	2959.31	0.010329	9.04	61.83	23.66	0.99
7Trib2	7	7.208	EXT 100YR	559.00	2951.65	2955.94	2955.94	2957.22	0.010617	9.07	61.61	24.15	1.00
7Trib2	7	7.17	EXT 100YR	559.00	2949.78	2953.16	2953.16	2954.29	0.010748	8.50	65.76	29.61	1.01
7Trib2	7	7.132	EXT 100YR	559.00	2946.58	2950.40		2950.94	0.003951	5.90	94.72	34.84	0.63
7Trib2	7	7.096	EXT 100YR	559.00	2943.24	2950.65	2946.20	2950.71	0.000171	2.02	292.31	61.66	0.15
7Trib2	7	7.08		Culvert									
7Trib2	7	7.059	EXT 100YR	235.00	2938.49	2940.21	2940.21	2940.91	0.012396	6.70	35.07	25.36	1.00
7Trib2	7	7.055	EXT 100YR	235.00	2935.31	2937.28		2937.81	0.007721	5.85	40.15	24.66	0.81
7Trib2	7	7.034	EXT 100YR	235.00	2932.75	2935.69	2935.69	2936.72	0.012388	8.15	28.83	14.11	1.00
7Trib2	7	7.015	EXT 100YR	235.00	2930.32	2934.32		2934.86	0.004958	5.90	39.85	15.74	0.65
7Trib1	5	4.165	EXT 100YR	293.00	2879.63	2881.88	2881.88	2882.57	0.009484	6.84	46.97	36.49	0.92
7Trib1	5	4.145	EXT 100YR	293.00	2878.22	2880.45	2879.29	2880.51	0.000197	2.05	143.95	171.02	0.26
7Trib1	5	4.134	EXT 100YR	293.00	2877.80	2879.96		2880.44	0.007134	5.55	53.63	38.52	0.79
7Trib1	5	4.111	EXT 100YR	293.00	2876.88	2879.62		2879.87	0.002621	4.06	76.54	50.49	0.50
7Trib1	5	4.096	EXT 100YR	293.00	2876.50	2879.22		2879.57	0.004954	4.77	61.59	40.80	0.66
7Trib1	5	4.068	EXT 100YR	293.00	2875.88	2878.91		2879.09	0.001932	3.40	86.22	44.69	0.43
7Trib1	5	4.053	EXT 100YR	388.00	2875.57	2878.21	2877.83	2878.78	0.006231	6.05	64.18	33.33	0.76
7Trib1	5	4.042	EXT 100YR	388.00	2875.23	2877.48	2877.48	2878.28	0.011622	7.19	53.99	34.01	1.00
7Trib1	5	4.032	EXT 100YR	388.00	2874.45	2877.22	2876.02	2877.31	0.000219	2.34	169.70	176.81	0.28
7Trib1	5	4.019	EXT 100YR	388.00	2873.57	2876.78		2877.23	0.004160	5.38	72.08	31.94	0.63
7Trib1	5	4.009	EXT 100YR	388.00	2873.33	2875.94	2875.94	2876.85	0.011334	7.65	50.71	28.28	1.01
7	3	1.366	EXT 100YR	614.00	2962.12	2966.70	2966.70	2967.71	0.025172	8.06	76.22	38.15	1.00
7	3	1.328	EXT 100YR	614.00	2957.91	2961.29	2961.29	2962.44	0.023776	8.60	71.36	31.40	1.01
7	3	1.288	EXT 100YR	614.00	2952.78	2956.06	2956.06	2957.29	0.004757	8.92	68.80	33.18	0.99
7	3	1.276		Culvert									
7	3	1.265	EXT 100YR	614.00	2951.80	2954.35	2954.35	2955.61	0.004223	9.01	68.11	27.80	0.99
7	3	1.232	EXT 100YR	614.00	2947.58	2951.42	2951.42	2952.65	0.023890	8.90	69.02	28.45	1.01
7	3	1.203	EXT 100YR	614.00	2940.44	2942.36		2942.62	0.011480	4.07	151.02	121.84	0.64
7	3	1.18	EXT 100YR	614.00	2938.15	2939.88	2939.88	2940.45	0.029543	6.07	101.08	90.82	1.01
7	3	1.154	EXT 100YR	614.00	2930.79	2935.64	2935.64	2937.12	0.013027	9.75	62.94	21.60	1.01
7	2	1.135	EXT 100YR	936.00	2925.73	2932.14	2932.14	2933.94	0.012600	10.76	87.02	24.25	1.00
7	2	1.116	EXT 100YR	936.00	2923.95	2930.10	2930.10	2931.82	0.012707	10.51	89.06	26.44	1.01
7	2	1.078	EXT 100YR	936.00	2921.03	2926.43	2926.43	2928.15	0.010204	10.52	88.95	26.19	1.01
7	2	1.039	EXT 100YR	936.00	2918.58	2921.69	2921.69	2922.93	0.010315	8.94	104.72	42.86	1.01
7	2	1.001	EXT 100YR	936.00	2915.10	2918.10	2918.10	2919.33	0.010225	8.90	105.18	43.31	1.01
7	2	0.963	EXT 100YR	936.00	2911.54	2914.11	2914.11	2915.22	0.010547	8.47	110.57	50.40	1.01

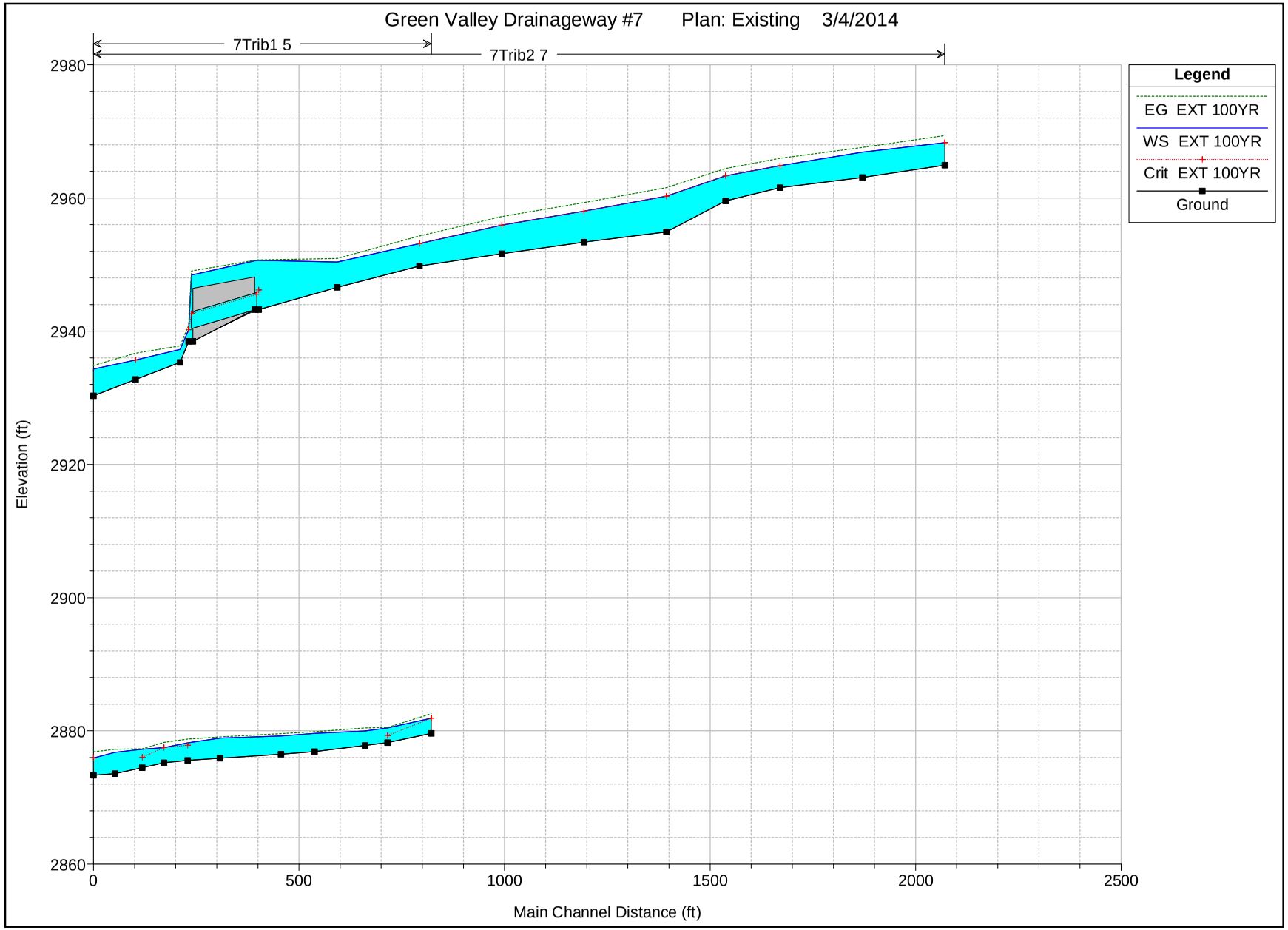
HEC-RAS Plan: EXT Profile: EXT 100YR (Continued)

River	Reach	River Sta	Profile	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)	
7	2	0.925	EXT 100YR	936.00	2907.92	2911.08	2910.48	2911.77	0.005035	6.62	141.31	53.36	0.72
7	2	0.921		Bridge									
7	2	0.918	EXT 100YR	936.00	2907.30	2909.88	2909.88	2910.99	0.010550	8.43	111.02	51.02	1.01
7	2	0.903	EXT 100YR	936.00	2903.57	2906.09	2906.09	2907.14	0.004780	8.25	113.43	54.58	1.01
7	2	0.885	EXT 100YR	936.00	2901.61	2905.03	2904.05	2905.45	0.001251	5.18	180.63	63.58	0.54
7	2	0.870		Culvert									
7	2	0.856	EXT 100YR	936.00	2897.71	2900.90	2900.90	2901.92	0.004632	8.10	115.62	57.01	0.99
7	2	0.83	EXT 100YR	936.00	2894.44	2897.27	2897.27	2898.32	0.010877	8.24	113.64	54.92	1.01
7	2	0.827	EXT 100YR	936.00	2889.98	2892.47	2892.47	2893.60	0.002011	8.54	109.66	48.97	1.01
7	2	0.792	EXT 100YR	936.00	2884.16	2888.27	2888.27	2889.54	0.010065	9.03	103.69	41.20	1.00
7	2	0.754	EXT 100YR	936.00	2881.62	2885.63	2885.63	2886.91	0.010271	9.08	103.12	41.01	1.01
7	2	0.716	EXT 100YR	936.00	2879.47	2883.46	2883.46	2884.73	0.009981	9.07	103.14	40.48	1.00
7	2	0.679	EXT 100YR	936.00	2877.74	2880.83	2880.83	2881.82	0.010707	7.98	117.35	59.50	1.00
7	2	0.64	EXT 100YR	936.00	2872.40	2876.16	2876.16	2877.34	0.010430	8.70	107.63	46.77	1.01
7	1	0.62	EXT 100YR	1251.00	2871.16	2874.76	2874.76	2876.13	0.009849	9.39	133.18	49.25	1.01
7	1	0.6	EXT 100YR	1251.00	2870.30	2873.94	2872.92	2874.41	0.001307	5.52	226.52	72.60	0.55
7	1	0.588		Culvert									
7	1	0.576	EXT 100YR	1251.00	2868.20	2870.73	2870.52	2871.66	0.001541	7.74	161.73	66.60	0.87
7	1	0.571	EXT 100YR	1251.00	2867.40	2870.93	2869.77	2871.41	0.000528	5.55	225.56	66.70	0.53
7	1	0.561		Culvert									
7	1	0.551	EXT 100YR	1251.00	2861.91	2866.87	2866.00	2867.45	0.379065	6.09	205.53	66.00	0.61
7	1	0.548	EXT 100YR	1251.00	2859.31	2865.35		2865.53	0.059954	3.40	367.98	75.24	0.27
7	1	0.543	EXT 100YR	1251.00	2857.67	2863.42		2863.62	0.082103	3.61	346.60	83.07	0.31
7	1	0.51	EXT 100YR	1251.00	2854.47	2858.25	2858.25	2859.70	0.009719	9.67	129.36	45.12	1.01
7	1	0.481	EXT 100YR	1251.00	2852.33	2856.82	2855.15	2857.20	0.000760	4.97	251.79	63.40	0.44
7	1	0.474		Culvert									
7	1	0.467	EXT 100YR	1251.00	2849.04	2853.43	2852.75	2854.18	0.002013	6.95	179.92	62.03	0.70
7	1	0.457	EXT 100YR	1251.00	2848.19	2852.63	2852.39	2853.85	0.007628	8.85	141.29	46.67	0.90
7	1	0.42	EXT 100YR	1251.00	2846.96	2850.75	2850.75	2852.16	0.009772	9.52	131.37	47.17	1.01
7	1	0.413	EXT 100YR	1251.00	2844.91	2850.00	2850.00	2851.31	0.010137	9.19	136.09	51.95	1.00
7	1	0.412	EXT 100YR	1251.00	2842.53	2846.07	2846.07	2847.55	0.004356	9.78	127.97	43.65	1.01
7	1	0.409	EXT 100YR	1251.00	2841.21	2845.69	2845.69	2847.17	0.004528	9.77	128.11	44.13	1.01
7	1	0.407	EXT 100YR	1251.00	2837.58	2841.26		2842.38	0.007968	8.48	147.53	44.58	0.82
7	1	0.382	EXT 100YR	1251.00	2834.98	2840.66		2841.64	0.003969	7.92	157.86	35.28	0.66
7	1	0.353	EXT 100YR	1251.00	2834.67	2839.73		2840.87	0.006114	8.55	146.28	42.49	0.81
7	1	0.343	EXT 100YR	1251.00	2834.93	2839.85	2838.71	2840.48	0.003314	6.39	195.85	56.26	0.60
7	1	0.341		Bridge									
7	1	0.339	EXT 100YR	1251.00	2834.31	2838.66	2838.66	2840.09	0.009910	9.58	130.54	46.54	1.01
7	1	0.327	EXT 100YR	1251.00	2831.26	2837.05	2837.05	2838.61	0.010067	10.02	124.86	40.09	1.00
7	1	0.288	EXT 100YR	1736.00	2829.27	2835.23		2836.47	0.005501	8.97	193.62	48.73	0.79
7	1	0.25	EXT 100YR	1736.00	2826.85	2833.09	2833.09	2834.98	0.009278	11.03	157.35	42.04	1.00

HEC-RAS Plan: EXT Profile: EXT 100YR (Continued)

River	Reach	River Sta	Profile	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)	
7	1	0.212	EXT 100YR	1736.00	2824.77	2831.07	2831.07	2833.09	0.009048	11.40	152.33	37.77	1.00
7	1	0.175	EXT 100YR	1736.00	2822.95	2829.02	2829.02	2831.00	0.009206	11.29	153.81	39.27	1.00
7	1	0.137	EXT 100YR	1736.00	2821.23	2826.71	2826.71	2828.49	0.009293	10.72	161.88	46.02	1.01
7	1	0.099	EXT 100YR	1736.00	2819.21	2824.79	2824.79	2826.41	0.009296	10.21	169.95	52.37	1.00
7	1	0.065	EXT 100YR	1736.00	2817.43	2822.68	2822.68	2824.61	0.009018	11.15	155.70	39.96	1.00
7	1	0.053	EXT 100YR	1736.00	2814.01	2822.94		2823.35	0.001271	5.12	338.85	64.26	0.39
7	1	0.033	EXT 100YR	1736.00	2813.33	2821.87		2823.06	0.003917	8.76	198.14	37.41	0.66
7	1	0.013	EXT 100YR	1736.00	2811.87	2821.81		2822.65	0.002209	7.34	236.51	33.42	0.49
7	1	0.002	EXT 100YR	1736.00	2811.62	2819.75	2819.75	2822.24	0.009864	12.67	137.05	27.81	1.01

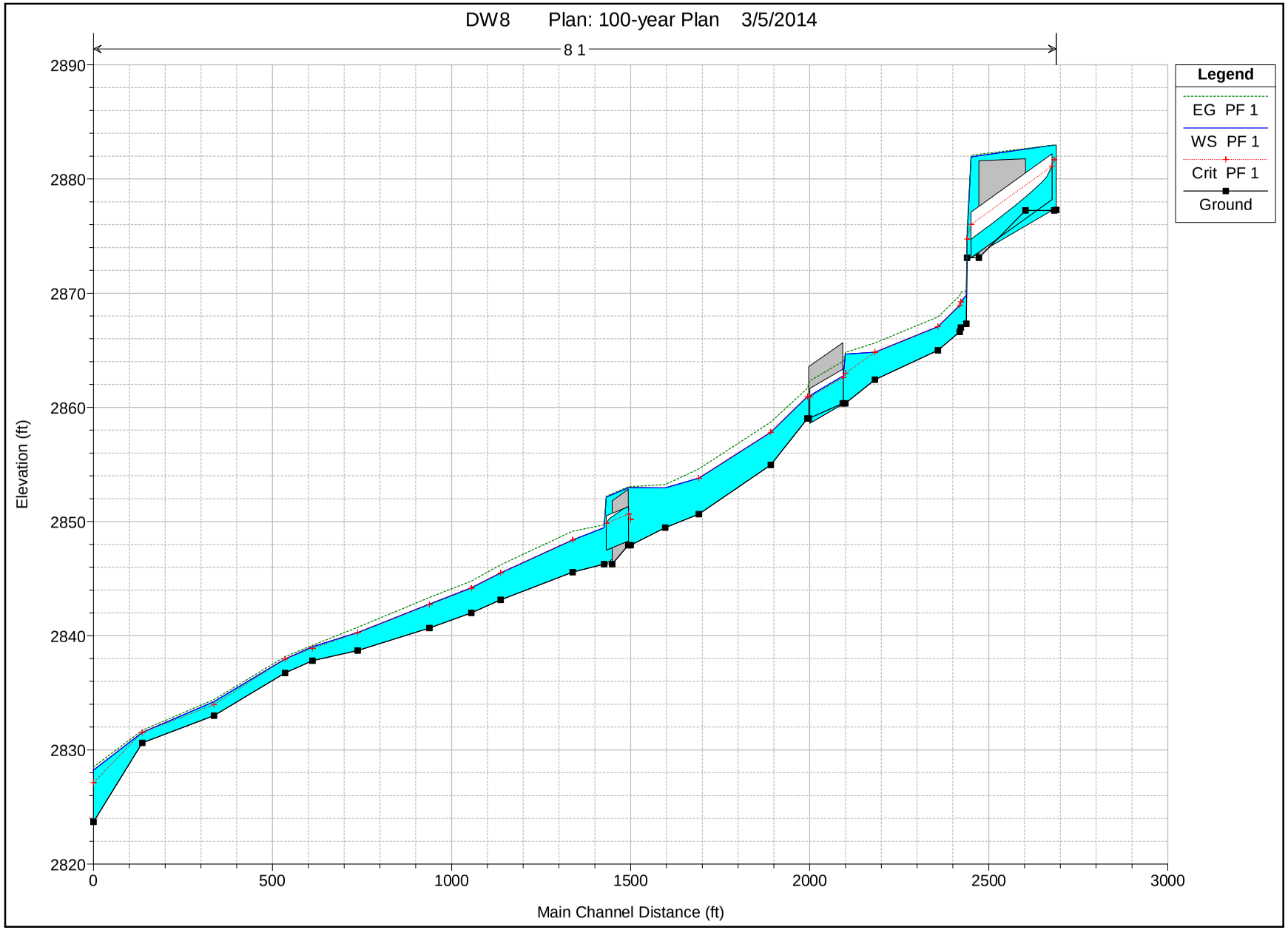

Green Valley Drainageway #7 Plan: Existing 3/4/2014
7 1
7 2
7 3
Legend
EG EXT 100YR
WS EXT 100YR
Crit EXT 100YR
Ground
Elevation (ft)
2980
2960
2940
2920
2900
2880
2860
2840
2820
2800
0
1000
2000
3000
4000
5000
6000
7000
8000
Main Channel Distance (ft)


Green Valley Drainageway #7 Plan: Existing 3/4/2014
7Trib1 5
7Trib2 7
Legend
EG EXT 100YR
WS EXT 100YR
Crit EXT 100YR
Ground
Elevation (ft)
2980
2960
2940
2920
2900
2880
2860
0
500
1000
1500
2000
2500
Main Channel Distance (ft)

DRAINAGEWAY#08

HEC-RAS Plan: 100-Year River: 8 Reach: 1 Profile: PF 1

Reach	River Sta	Profile	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)	
1	0.5092	PF 1	567.00	2877.30	2882.95		2882.95	0.000034	0.68	1653.88	1059.00	0.06
1	0.5080	PF 1	567.00	2877.25	2882.95	2881.68	2882.95	0.000031	0.65	1706.88	1059.00	0.06
1	0.49		Culvert									
1	0.4621	PF 1	171.00	2873.10	2874.73	2874.73	2875.52	0.003991	7.15	23.92	14.84	0.99
1	0.4617	PF 1	171.00	2867.31	2869.82		2870.22	0.004775	5.06	33.76	16.31	0.62
1	0.4587	PF 1	171.00	2866.98	2869.24	2869.24	2870.07	0.012640	7.29	23.46	14.45	1.01
1	0.4581	PF 1	171.00	2866.62	2868.94	2868.94	2869.77	0.012536	7.30	23.41	14.29	1.01
1	0.4465	PF 1	190.00	2864.99	2867.06	2867.06	2867.91	0.012449	7.38	25.76	15.34	1.00
1	0.4133	PF 1	190.00	2862.43	2864.82	2864.82	2865.64	0.012573	7.28	26.11	16.21	1.01
1	0.3976	PF 1	190.00	2860.35	2864.66	2862.98	2864.81	0.001720	3.11	61.03	24.29	0.35
1	0.39		Culvert									
1	0.3777	PF 1	192.00	2859.02	2860.95	2860.95	2861.69	0.012425	6.90	27.82	19.06	1.01
1	0.3583	PF 1	192.00	2854.95	2857.81	2857.81	2858.72	0.012626	7.63	25.16	14.12	1.01
1	0.3201	PF 1	192.00	2850.65	2853.80	2853.80	2854.60	0.016813	7.18	26.75	16.79	1.00
1	0.3023	PF 1	192.00	2849.47	2852.95		2853.24	0.003657	4.28	44.81	19.02	0.49
1	0.2841	PF 1	192.00	2847.92	2852.98	2850.19	2853.06	0.000603	2.28	87.55	42.57	0.21
1	0.28		Culvert									
1	0.2701	PF 1	201.00	2846.28	2849.46		2849.71	0.003235	3.97	50.59	22.30	0.46
1	0.2534	PF 1	201.00	2845.57	2848.40	2848.40	2849.15	0.012546	6.99	28.75	19.25	1.01
1	0.2154	PF 1	201.00	2843.14	2845.49	2845.49	2846.22	0.012366	6.83	29.42	20.63	1.01
1	0.1999	PF 1	201.00	2842.00	2844.19	2844.17	2844.78	0.012274	6.18	32.50	26.73	0.99
1	0.1776	PF 1	201.00	2840.68	2842.77	2842.73	2843.35	0.012170	6.14	32.75	27.05	0.98
1	0.1397	PF 1	201.00	2838.70	2840.28	2840.28	2840.74	0.013689	5.47	36.74	39.84	1.00
1	0.1158	PF 1	201.00	2837.81	2839.04	2838.89	2839.16	0.007324	3.34	74.25	217.22	0.70
1	0.1013	PF 1	201.00	2836.74	2837.95	2837.95	2838.17	0.028902	3.82	54.45	249.03	0.98
1	0.0638	PF 1	201.00	2833.00	2834.23	2833.96	2834.41	0.009849	3.40	59.05	66.43	0.64
1	0.0257	PF 1	201.00	2830.61	2831.54	2831.54	2831.71	0.019172	3.46	65.95	213.02	0.82
1	0.0000	PF 1	201.00	2823.69	2828.24	2827.14	2828.51	0.007884	4.14	48.57	22.79	0.50


DW8 Plan: 100-year Plan 3/5/2014
8 1
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Elevation (ft)
2890
2880
2870
2860
2850
2840
2830
2820
0
500
1000
1500
2000
2500
3000
Main Channel Distance (ft)

DRAINAGEWAY#09

HEC-RAS Plan: Plan 01 Profile: PF 1

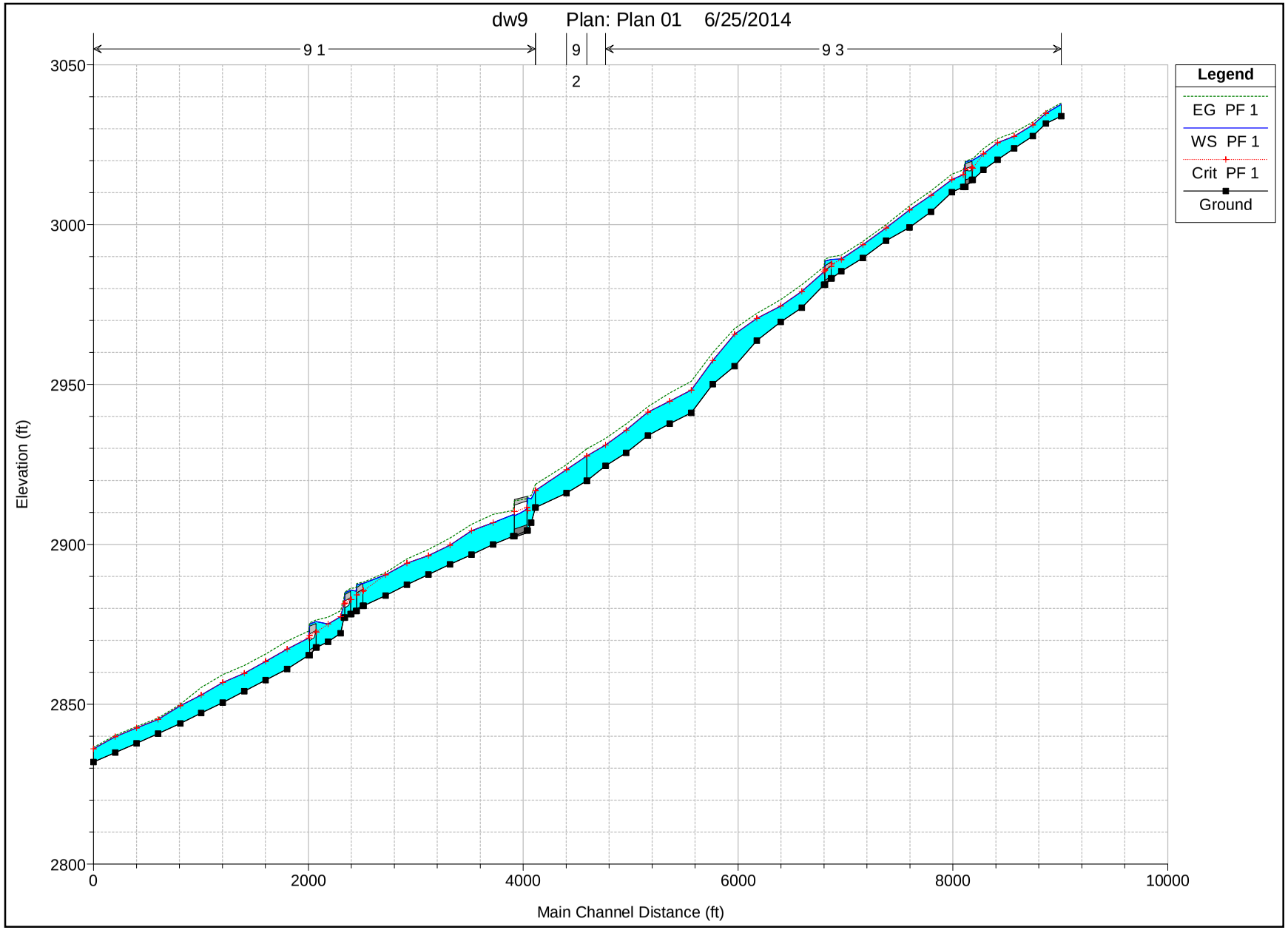
River	Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
				(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
9trib	2	7.83	PF 1	337.00	3026.89	3028.32	3028.32	3028.82	0.022912	5.71	60.60	64.32	0.99
9trib	2	7.793	PF 1	337.00	3021.70	3023.61	3023.55	3024.16	0.017040	5.99	59.47	57.89	0.90
9trib	2	7.753	PF 1	337.00	3018.04	3019.47	3019.47	3019.99	0.023915	5.75	58.66	60.29	1.01
9trib	2	7.714	PF 1	337.00	3013.82	3015.34		3015.51	0.007046	3.30	102.11	93.46	0.56
9trib	2	7.68	PF 1	337.00	3010.02	3015.29	3012.32	3015.32	0.000291	1.80	312.62	110.97	0.14
9trib	2	7.679		Culvert									
9trib	2	7.662	PF 1	337.00	3006.62	3008.13	3008.13	3008.59	0.021174	6.12	70.63	79.96	0.98
9trib	2	7.627	PF 1	337.00	2998.82	3002.07	3002.07	3002.90	0.019766	7.29	46.51	31.13	0.98
9trib	2	7.589	PF 1	337.00	2995.56	2998.52	2998.52	2999.02	0.015419	5.91	69.40	75.48	0.86
9trib	2	7.551	PF 1	337.00	2992.64	2994.50	2994.43	2994.75	0.019697	4.01	84.05	124.32	0.86
9trib	2	7.516	PF 1	337.00	2989.02	2990.26	2990.26	2990.71	0.025166	5.33	63.19	73.13	1.01
9trib	2	7.443	PF 1	337.00	2979.75	2985.29	2981.59	2985.30	0.000052	0.75	689.68	227.17	0.06
9trib	2	7.442		Culvert									
9trib	2	7.427	PF 1	337.00	2977.17	2979.88	2979.88	2980.52	0.013004	6.63	59.24	51.02	0.91
9trib	2	7.41	PF 1	337.00	2970.76	2974.12	2974.03	2974.83	0.014457	6.80	49.54	30.76	0.94
9trib	2	7.373	PF 1	337.00	2966.62	2970.64	2970.64	2971.78	0.016134	8.58	39.27	17.47	1.01
9trib	2	7.335	PF 1	337.00	2964.68	2967.05	2967.05	2967.76	0.016260	6.78	49.71	35.01	1.00
9trib	2	7.321	PF 1	337.00	2963.63	2964.77	2964.77	2965.16	0.019496	5.03	68.86	95.41	1.00
9trib	2	7.284	PF 1	337.00	2956.81	2959.72	2959.51	2960.50	0.011381	7.07	47.69	23.33	0.87
9trib	2	7.252	PF 1	337.00	2953.98	2957.24	2957.24	2958.28	0.015563	8.16	41.28	20.29	1.01
9trib	2	7.209	PF 1	337.00	2948.14	2951.80	2951.80	2952.86	0.016025	8.28	40.69	19.40	1.01
9trib	2	7.171	PF 1	337.00	2944.34	2947.23	2947.23	2948.24	0.013991	8.08	41.72	20.94	1.01
9trib	2	7.134	PF 1	337.00	2940.04	2943.04	2943.04	2944.09	0.015442	8.22	40.98	19.69	1.00
9trib	2	7.096	PF 1	337.00	2935.64	2939.04	2939.04	2940.11	0.015628	8.30	40.60	19.24	1.01
9trib	2	7.067	PF 1	337.00	2933.41	2936.44	2936.44	2937.09	0.013804	6.72	58.33	47.69	0.94
9trib	2	7.044	PF 1	337.00	2930.46	2934.29	2932.57	2934.39	0.001330	2.60	157.79	144.63	0.31
9trib	2	7.043		Culvert									
9trib	2	7.035	PF 1	337.00	2928.36	2931.33	2931.33	2932.28	0.015631	7.82	43.09	23.16	1.01
9trib	2	7.026	PF 1	337.00	2926.60	2930.17		2930.80	0.008450	6.38	52.82	23.86	0.76
9trib	2	7.012	PF 1	337.00	2925.09	2930.31		2930.46	0.001372	3.19	126.65	71.98	0.32
9trib	3	9.515	PF 1	353.00	2976.94	2979.96	2979.96	2980.78	0.012112	7.51	55.35	39.23	0.92
9trib	3	9.48	PF 1	353.00	2973.50	2974.98	2974.98	2975.58	0.017146	6.18	57.21	49.31	1.00
9trib	3	9.447	PF 1	353.00	2967.92	2969.34	2969.34	2969.83	0.008142	5.75	69.48	80.24	0.96
9trib	3	9.405	PF 1	353.00	2956.72	2960.36	2960.36	2961.58	0.015757	8.84	39.94	16.73	1.01
9trib	3	9.367	PF 1	353.00	2951.35	2955.12	2955.12	2956.35	0.015933	8.92	39.57	16.25	1.01
9trib	3	9.332	PF 1	353.00	2947.05	2950.74	2950.74	2951.91	0.015797	8.68	40.68	17.71	1.01
9trib	3	9.289	PF 1	353.00	2942.23	2946.00	2946.00	2947.18	0.015818	8.70	40.58	17.52	1.01
9trib	3	9.252	PF 1	353.00	2937.15	2941.18	2941.18	2942.35	0.015910	8.70	40.59	17.56	1.01
9trib	3	9.215	PF 1	353.00	2933.77	2937.25	2937.25	2938.40	0.015396	8.60	41.05	17.89	1.00
9trib	3	9.177	PF 1	353.00	2929.81	2933.55	2933.55	2934.61	0.015474	8.28	42.66	20.24	1.00

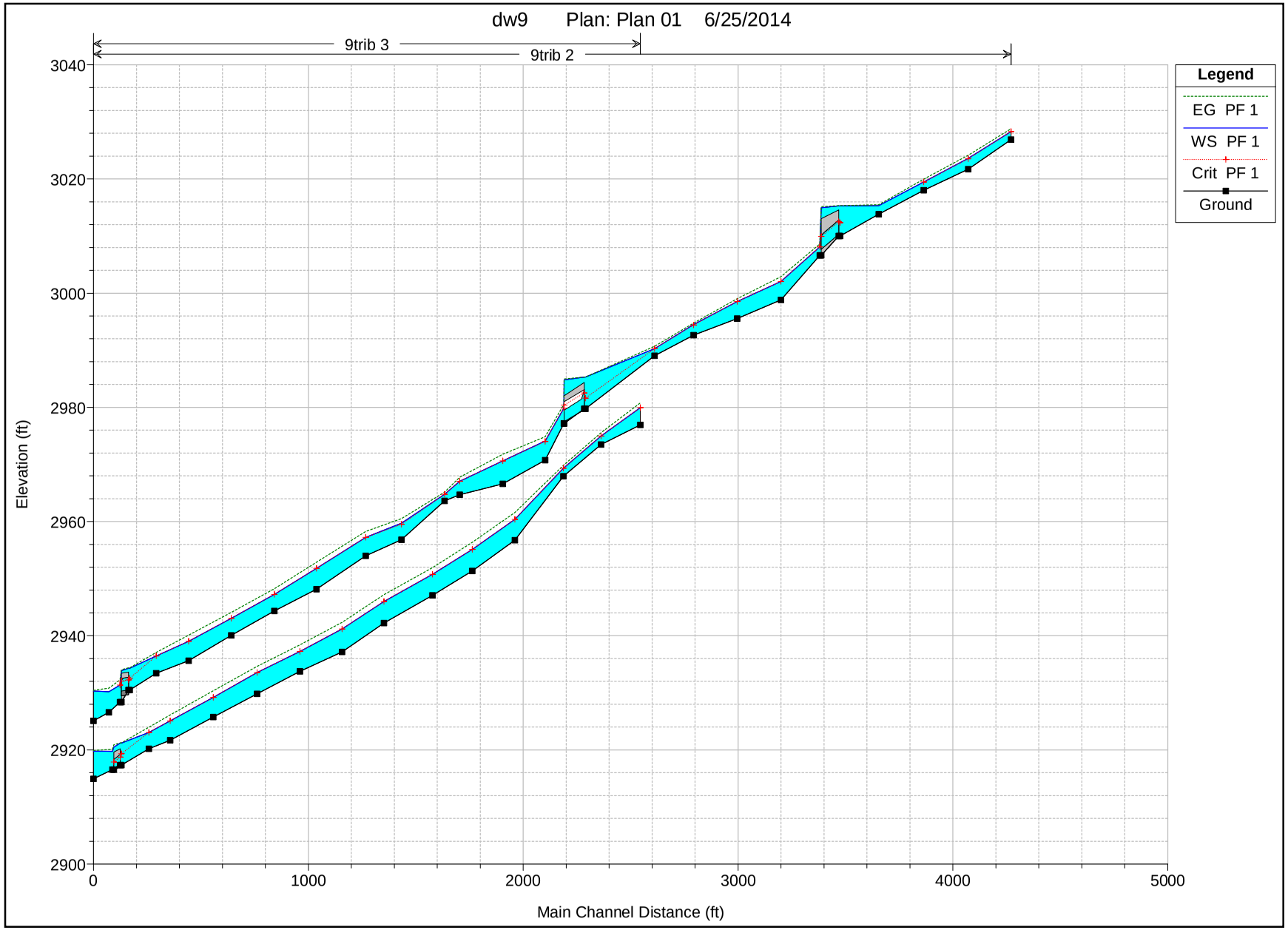
HEC-RAS Plan: Plan 01 Profile: PF 1 (Continued)

River	Reach	River Sta	Profile	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)	
9trib	3	9.139	PF 1	353.00	2925.75	2929.20	2929.20	2930.34	0.015578	8.59	41.11	18.28	1.01
9trib	3	9.101	PF 1	353.00	2921.67	2925.09	2925.09	2926.13	0.015430	8.19	43.09	20.97	1.01
9trib	3	9.082	PF 1	353.00	2920.21	2923.05	2923.05	2923.98	0.015692	7.74	45.60	24.99	1.01
9trib	3	9.058	PF 1	353.00	2917.35	2921.17	2919.34	2921.22	0.000469	1.86	251.13	120.61	0.19
9trib	3	9.057		Culvert									
9trib	3	9.05	PF 1	353.00	2916.54	2919.76		2920.11	0.004557	4.79	83.28	65.17	0.57
9trib	3	9.033	PF 1	353.00	2914.94	2919.79		2919.90	0.000781	2.79	169.49	89.92	0.25
9	3	1.751	PF 1	2630.00	3033.95	3037.65		3038.07	0.015292	5.16	510.97	429.63	0.83
9	3	1.724	PF 1	2630.00	3031.62	3034.84	3034.84	3035.41	0.023002	6.06	433.86	387.07	1.01
9	3	1.701	PF 1	2630.00	3027.69	3031.18	3031.18	3032.07	0.022055	8.07	376.25	263.84	1.06
9	3	1.668	PF 1	2630.00	3023.84	3027.63	3027.63	3028.84	0.009849	8.83	299.59	206.41	1.00
9	3	1.639	PF 1	3456.00	3020.27	3025.64	3025.64	3026.91	0.008609	9.20	416.89	269.37	0.96
9	3	1.614	PF 1	3456.00	3017.11	3022.16	3022.16	3023.76	0.007918	10.20	358.27	173.53	0.95
9	3	1.595	PF 1	3456.00	3014.04	3020.16	3017.67	3020.57	0.001274	5.16	683.81	158.72	0.40
9	3	1.594		Culvert									
9	3	1.578	PF 1	3456.00	3011.82	3015.61	3015.61	3017.15	0.009431	9.95	347.49	114.65	1.01
9	3	1.558	PF 1	3456.00	3010.14	3014.10	3014.10	3015.79	0.008756	10.43	334.75	107.65	0.99
9	3	1.521	PF 1	3456.00	3004.05	3009.20	3009.20	3010.61	0.007446	9.60	392.73	192.18	0.92
9	3	1.483	PF 1	3456.00	2999.10	3004.58	3004.58	3005.89	0.009743	9.43	402.26	159.01	1.01
9	3	1.442	PF 1	3456.00	2995.01	2998.95	2998.95	3000.04	0.010138	9.13	441.69	282.65	1.01
9	3	1.401	PF 1	3456.00	2989.61	2993.73	2993.73	2994.72	0.005688	8.52	593.98	346.51	0.80
9	3	1.363	PF 1	3456.00	2985.44	2989.28	2989.06	2990.45	0.007137	8.72	407.94	174.16	0.88
9	3	1.346	PF 1	3456.00	2983.21	2989.14	2987.69	2989.97	0.002800	7.43	560.36	286.45	0.58
9	3	1.345		Culvert									
9	3	1.333	PF 1	3456.00	2981.24	2985.26	2985.26	2986.81	0.009176	9.98	348.40	117.94	1.00
9	3	1.294	PF 1	3456.00	2974.04	2979.17	2979.17	2981.23	0.008675	11.51	300.18	73.68	1.01
9	3	1.256	PF 1	3456.00	2969.56	2974.56	2974.56	2976.56	0.008695	11.36	304.29	76.52	1.00
9	3	1.214	PF 1	3456.00	2963.76	2970.68	2970.68	2972.27	0.004951	10.40	443.21	241.00	0.78
9	3	1.175	PF 1	3456.00	2955.70	2965.71	2965.71	2967.48	0.005490	10.85	388.64	179.61	0.81
9	3	1.136	PF 1	3456.00	2950.14	2957.53	2957.53	2959.92	0.848451	12.40	278.62	59.16	1.01
9	3	1.098	PF 1	3456.00	2941.15	2948.28	2948.28	2950.98	0.008390	13.20	261.83	48.99	1.01
9	3	1.061	PF 1	3456.00	2937.71	2944.80	2944.80	2947.38	0.008259	12.87	268.50	52.41	1.00
9	3	1.022	PF 1	3456.00	2934.03	2941.40	2941.40	2943.07	0.006468	10.77	397.58	133.91	0.88
9	3	0.984	PF 1	3456.00	2928.62	2935.71	2935.71	2937.69	0.008815	11.29	306.19	80.13	1.01
9	3	0.948	PF 1	3456.00	2924.55	2931.06	2931.06	2933.11	0.008034	11.93	352.92	111.09	0.98
9	2	0.915	PF 1	3456.00	2919.90	2927.68	2927.68	2929.88	0.007313	11.91	302.94	117.23	0.94
9	2	0.879	PF 1	3456.00	2916.05	2923.40	2923.40	2924.95	0.007197	10.10	380.33	246.37	0.91
9	1	0.832	PF 1	3456.00	2911.50	2916.88	2916.88	2918.77	0.007407	11.10	336.00	243.78	0.94
9	1	0.824	PF 1	3456.00	2906.76	2914.28		2915.27	0.002723	7.96	433.91	76.24	0.59
9	1	0.818	PF 1	3456.00	2904.34	2914.54	2910.56	2915.08	0.001161	5.87	594.24	107.11	0.39

HEC-RAS Plan: Plan 01 Profile: PF 1 (Continued)

River	Reach	River Sta	Profile	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)	
9	1	.817		Culvert									
9	1	0.793	PF 1	3456.00	2902.56	2909.27		2910.67	0.004572	9.49	364.08	69.83	0.73
9	1	0.757	PF 1	3456.00	2899.96	2906.78	2906.78	2909.41	0.008304	13.02	265.53	50.63	1.00
9	1	0.719	PF 1	3456.00	2896.79	2904.27	2904.27	2906.24	0.008926	11.28	306.61	102.95	1.01
9	1	0.681	PF 1	3456.00	2893.74	2899.78	2899.78	2901.95	0.008522	11.83	292.14	67.66	1.00
9	1	0.643	PF 1	3456.00	2890.53	2896.50	2896.50	2898.41	0.006513	11.15	364.77	388.53	0.89
9	1	0.605	PF 1	3456.00	2887.35	2894.15	2894.15	2895.43	0.004028	9.70	730.02	790.34	0.72
9	1	0.567	PF 1	3456.00	2884.01	2890.53	2890.53	2891.14	0.003472	7.23	1250.34	1179.92	0.64
9	1	0.529	PF 1	3473.00	2880.82	2887.83	2885.52	2888.22	0.000679	5.52	1480.70	1155.51	0.44
9	1	0.528		Culvert									
9	1	0.516	PF 1	3473.00	2879.14	2885.37		2886.42	0.000596	8.23	433.28	163.57	0.63
9	1	0.507	PF 1	3473.00	2878.17	2885.66	2882.69	2886.26	0.000274	6.24	637.48	167.20	0.44
9	1	0.506		Culvert									
9	1	0.494	PF 1	3473.00	2877.10	2881.39	2881.39	2883.32	0.003910	11.16	311.29	81.28	1.00
9	1	0.488	PF 1	3473.00	2872.23	2877.37	2877.37	2879.26	0.008626	11.03	315.55	85.71	1.00
9	1	0.466	PF 1	3473.00	2869.51	2875.05	2875.05	2877.25	0.008464	11.89	292.03	66.68	1.00
9	1	0.446	PF 1	3473.00	2867.75	2875.86	2872.57	2876.36	0.001306	5.80	691.22	339.63	0.41
9	1	0.445		Culvert									
9	1	0.432	PF 1	3430.00	2865.35	2870.75	2870.75	2872.88	0.008560	11.73	292.45	69.21	1.01
9	1	0.394	PF 1	3430.00	2861.01	2867.27	2867.27	2869.78	0.008507	12.72	269.55	427.44	1.00
9	1	0.356	PF 1	3430.00	2857.54	2863.38	2863.38	2865.70	0.008434	12.23	280.46	203.34	1.00
9	1	0.318	PF 1	3430.00	2854.03	2859.70	2859.70	2862.11	0.008530	12.46	275.37	188.39	1.01
9	1	0.28	PF 1	3430.00	2850.50	2856.77	2856.77	2859.26	0.008487	12.65	271.05	323.65	1.01
9	1	0.242	PF 1	3430.00	2847.22	2852.91	2852.91	2855.27	0.008405	12.32	278.46	285.61	1.00
9	1	0.206	PF 1	3430.00	2843.96	2849.54	2849.54	2850.02	0.003252	7.22	1158.57	1061.68	0.62
9	1	0.166	PF 1	3430.00	2840.77	2845.28	2845.28	2845.69	0.004438	7.27	1138.69	1143.88	0.70
9	1	0.128	PF 1	3430.00	2837.75	2842.58	2842.58	2843.06	0.003935	7.35	1103.71	1036.21	0.67
9	1	0.091	PF 1	3430.00	2834.90	2839.81	2839.81	2840.27	0.003437	6.92	1176.02	1228.44	0.63
9	1	0.053	PF 1	3430.00	2831.93	2836.10	2836.10	2836.50	0.005028	7.20	1198.29	1272.90	0.74

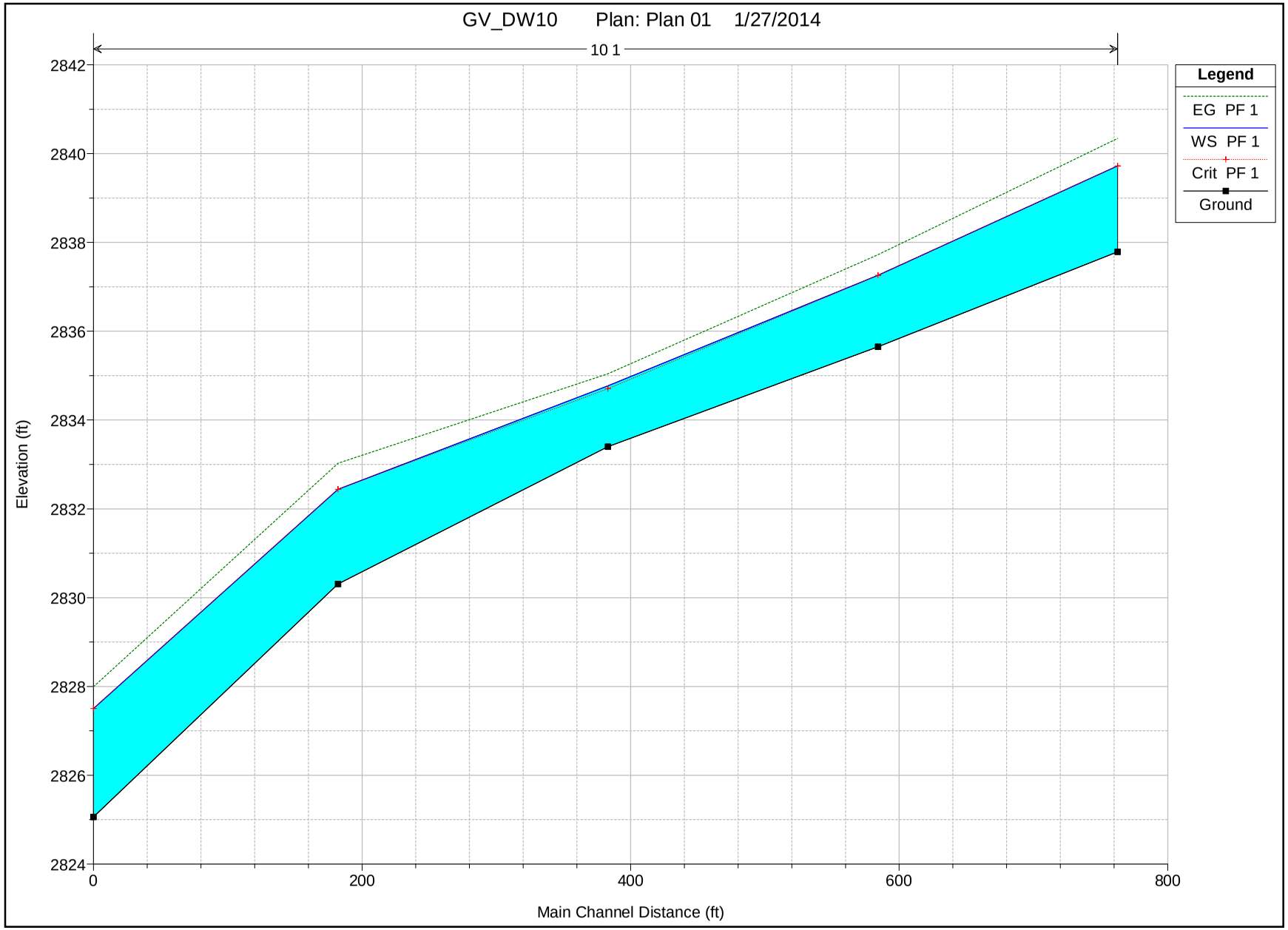

dw9 Plan: Plan 01 6/25/2014
9 1
9
2
9 3
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Elevation (ft)
3050
3000
2950
2900
2850
2800
0
2000
4000
6000
8000
10000
Main Channel Distance (ft)


dw9 Plan: Plan 01 6/25/2014
9trib 3
9trib 2
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Elevation (ft)
3040
3020
3000
2980
2960
2940
2920
2900
0
1000
2000
3000
4000
5000
Main Channel Distance (ft)

DRAINAGEWAY#10

HEC-RAS Plan: Plan 01 River: 10 Reach: 1 Profile: PF 1

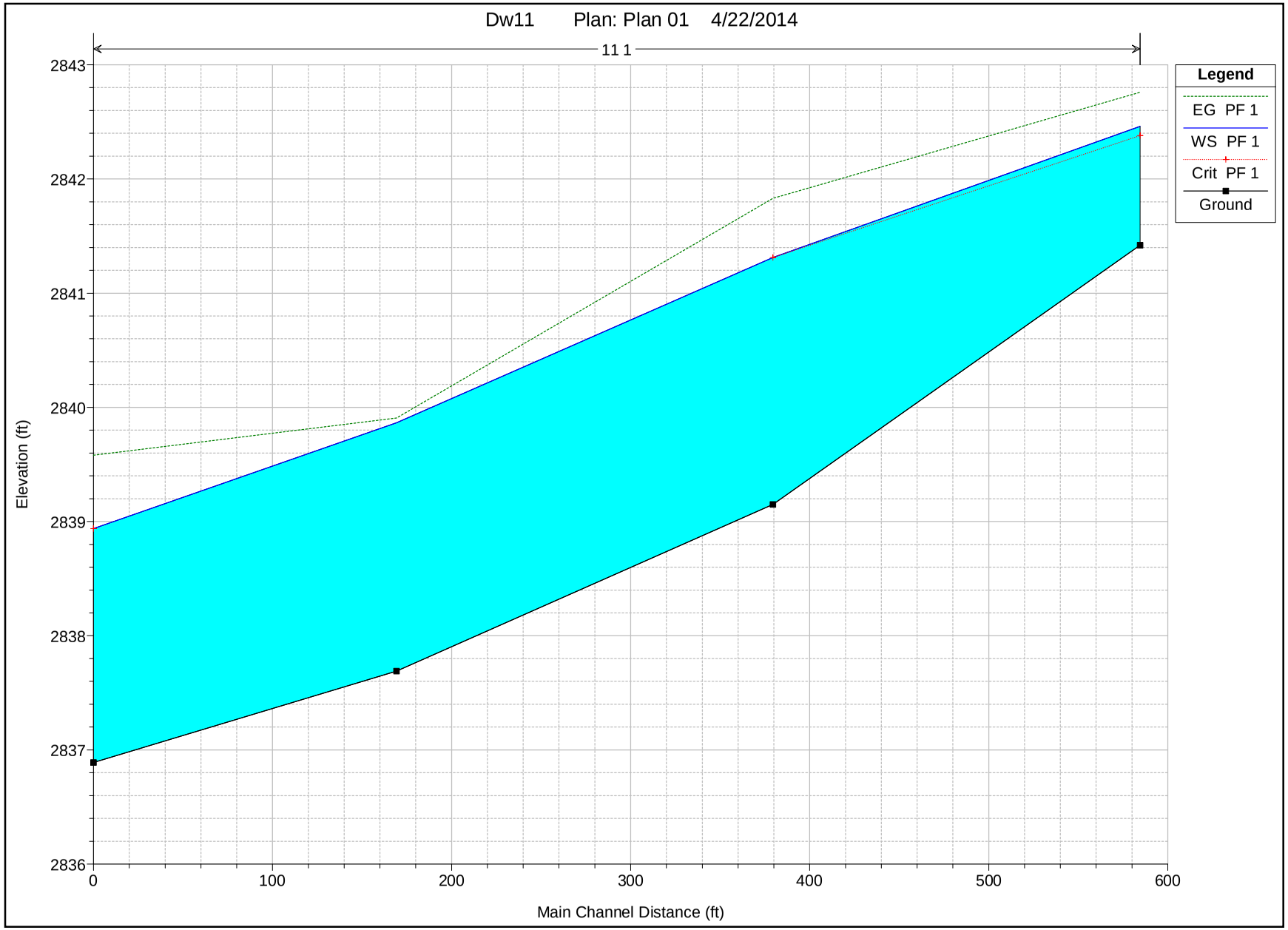
Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
1	0.148	PF 1	235.00	2837.79	2839.72	2839.72	2840.34	0.010036	6.54	43.13	37.96	0.93
1	0.114	PF 1	235.00	2835.65	2837.26	2837.26	2837.73	0.013230	6.50	56.97	61.38	1.03
1	0.076	PF 1	235.00	2833.40	2834.77	2834.71	2835.04	0.010163	5.50	80.11	104.33	0.90
1	0.038	PF 1	235.00	2830.31	2832.44	2832.44	2833.03	0.009682	6.34	45.40	48.10	0.91
1	0.004	PF 1	235.00	2825.06	2827.50	2827.50	2827.99	0.010583	5.84	48.62	54.61	0.92


GV_DW10 Plan: Plan 01 1/27/2014
10 1
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Elevation (ft)
2842
2840
2838
2836
2834
2832
2830
2828
2826
2824
0
200
400
600
800
Main Channel Distance (ft)

DRAINAGEWAY#11

HEC-RAS Plan: Plan 01 River: 11 Reach: 1 Profile: PF 1

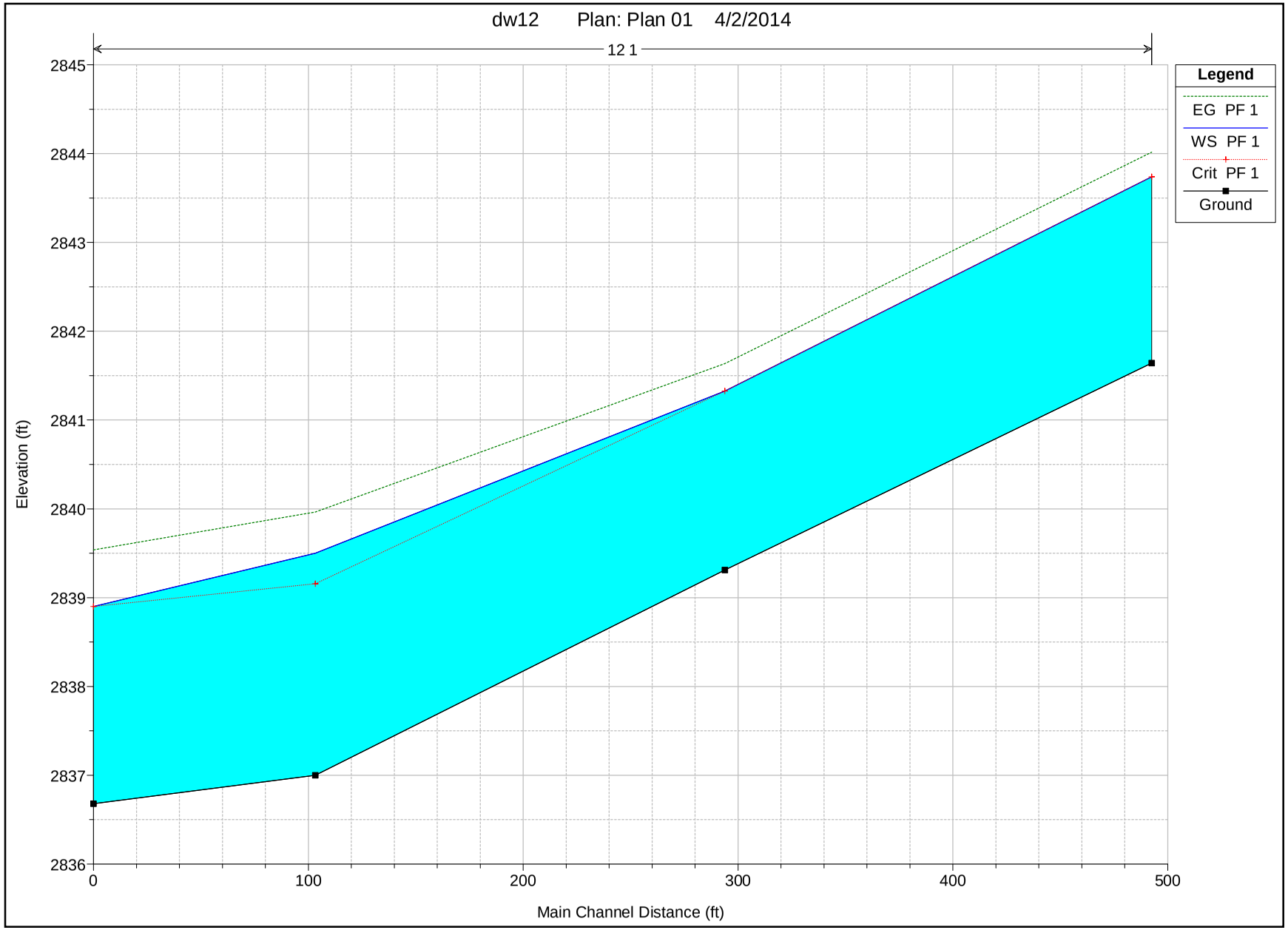
Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
1	0.113	PF 1	286.00	2841.42	2842.46	2842.38	2842.76	0.004215	4.78	91.03	150.88	0.85
1	0.074	PF 1	286.00	2839.15	2841.31	2841.31	2841.83	0.004657	6.64	97.57	214.93	0.95
1	0.034	PF 1	286.00	2837.69	2839.86		2839.91	0.000749	2.32	375.23	684.28	0.37
1	0.002	PF 1	286.00	2836.89	2838.94	2838.94	2839.58	0.005592	6.43	44.45	35.35	1.01


Dw11 Plan: Plan 01 4/22/2014
11 1
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Elevation (ft)
2843
2842
2841
2840
2839
2838
2837
2836
0
100
200
300
400
500
600
Main Channel Distance (ft)

DRAINAGEWAY#12

HEC-RAS Plan: Plan 01 River: 12 Reach: 1 Profile: PF 1

Reach	River Sta	Profile	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)	
1	0.095	PF 1	264.00	2841.64	2843.74	2843.74	2844.02	0.003263	4.88	128.12	361.06	0.77
1	0.058	PF 1	264.00	2839.31	2841.33	2841.33	2841.64	0.003999	5.04	104.41	184.93	0.84
1	0.022	PF 1	264.00	2837.00	2839.50	2839.16	2839.97	0.002971	5.47	48.26	133.41	0.76
1	0.002	PF 1	264.00	2836.68	2838.90	2838.90	2839.54	0.005558	6.41	41.18	32.72	1.01


dw12 Plan: Plan 01 4/2/2014
12 1
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Elevation (ft)
2845
2844
2843
2842
2841
2840
2839
2838
2837
2836
0
100
200
300
400
500
Main Channel Distance (ft)

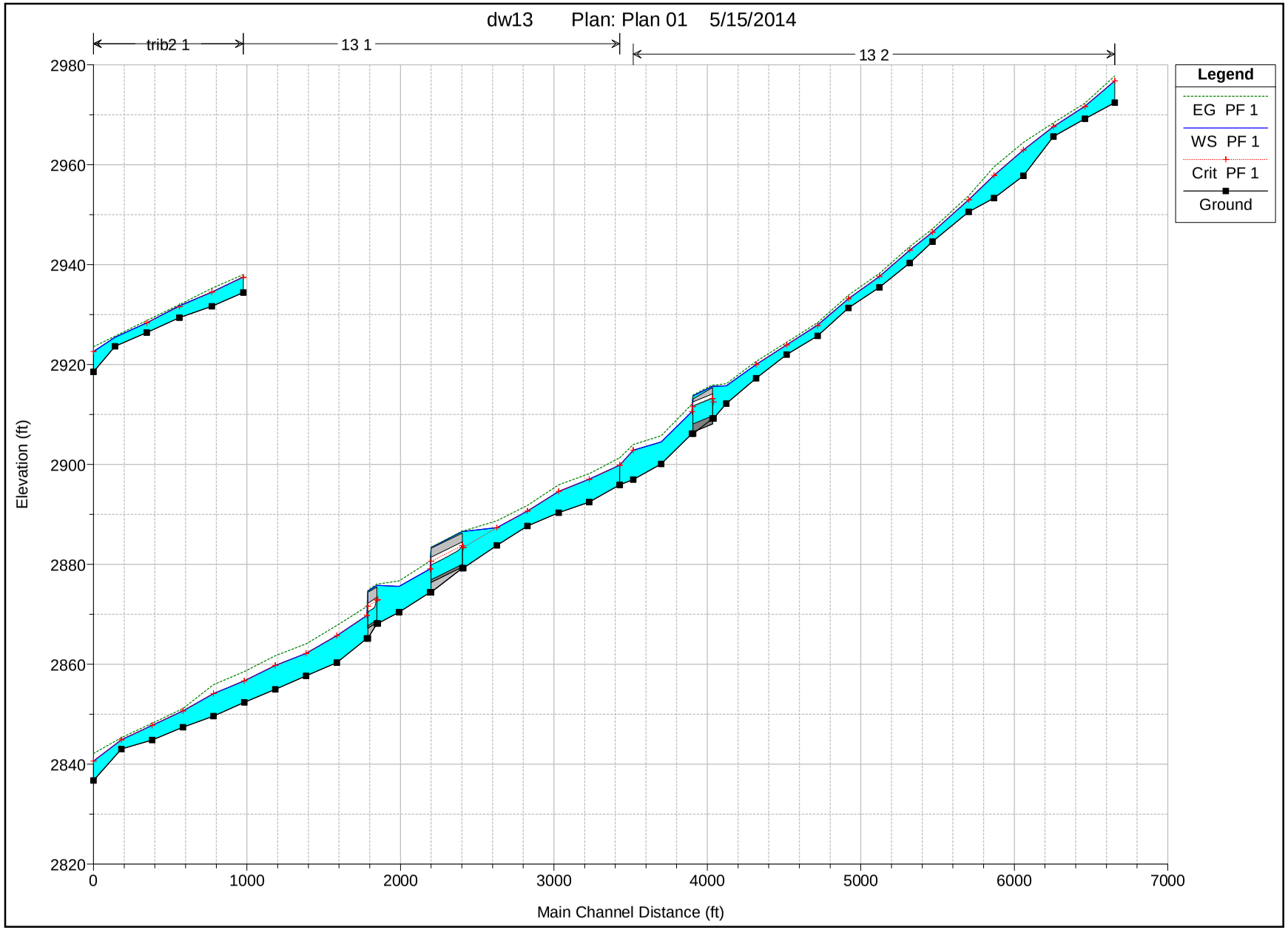
DRAINAGEWAY#13

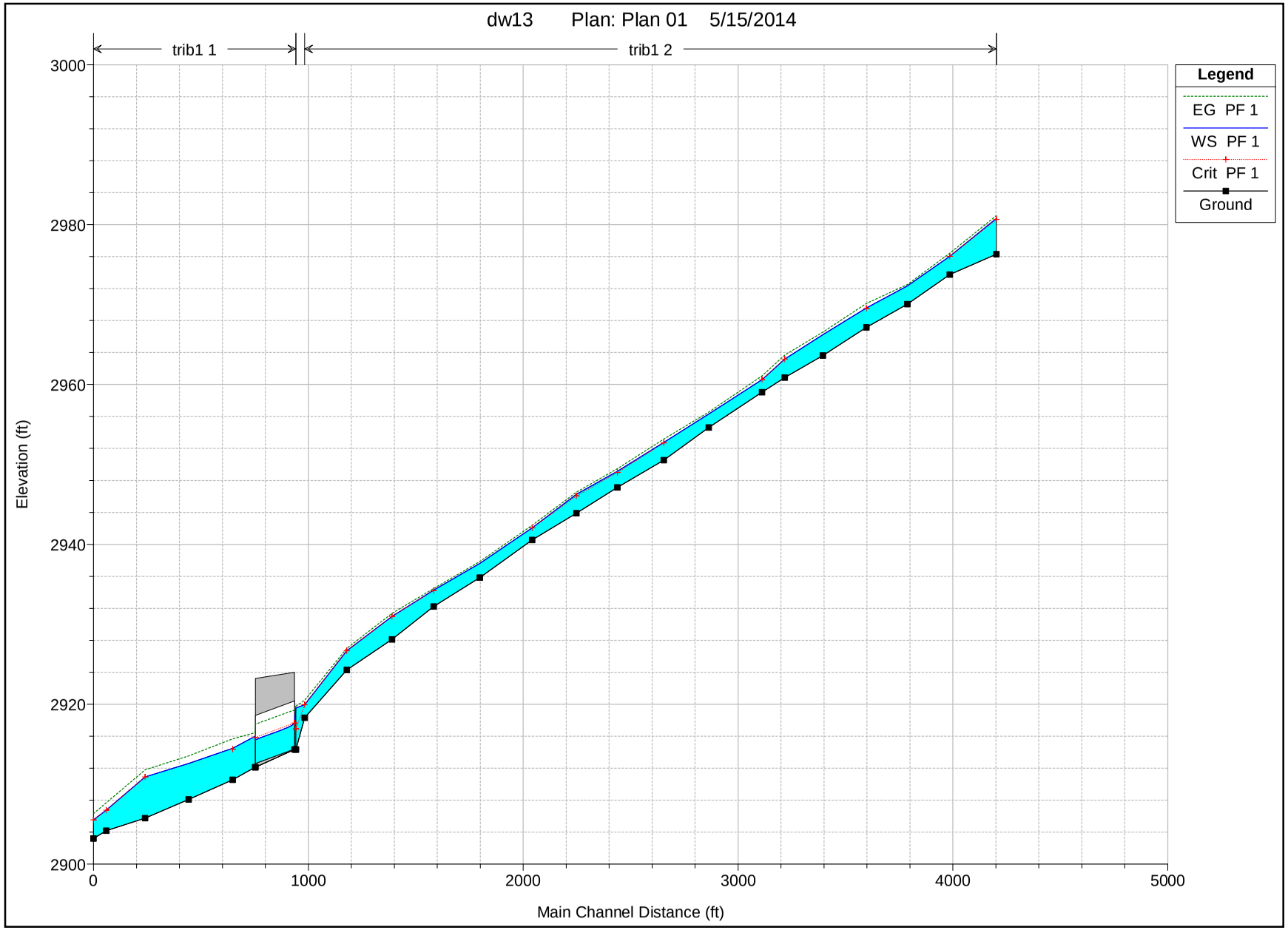
HEC-RAS Plan: Plan 01 Profile: PF 1

River	Reach	River Sta	Profile	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)	
trib2	1	7.195	PF 1	638.00	2934.42	2937.52	2937.42	2938.02	0.010010	6.08	137.42	111.17	0.74
trib2	1	7.156	PF 1	638.00	2931.66	2934.49	2934.49	2935.28	0.018018	7.34	97.59	93.42	0.96
trib2	1	7.116	PF 1	638.00	2929.40	2931.75	2931.55	2931.99	0.011626	5.06	195.15	188.13	0.74
trib2	1	7.075	PF 1	638.00	2926.42	2928.34	2928.34	2928.80	0.019841	6.51	140.28	143.73	0.97
trib2	1	7.036	PF 1	638.00	2923.67	2925.44		2925.67	0.011022	3.91	164.15	174.87	0.69
trib2	1	7.010	PF 1	638.00	2918.52	2922.63	2922.63	2923.55	0.020229	7.68	83.05	45.75	1.00
trib1	2	5.833	PF 1	438.00	2976.29	2980.79	2980.65	2981.14	0.017087	4.71	92.92	95.78	0.84
trib1	2	5.792	PF 1	438.00	2973.76	2976.04	2976.04	2976.44	0.028527	5.20	89.72	127.87	1.05
trib1	2	5.754	PF 1	438.00	2970.06	2972.33		2972.51	0.008538	3.37	130.07	132.67	0.60
trib1	2	5.718	PF 1	438.00	2967.14	2969.59	2969.53	2970.13	0.018946	5.89	75.44	103.91	0.93
trib1	2	5.680	PF 1	438.00	2963.64	2966.23		2966.55	0.016082	5.33	106.00	147.26	0.85
trib1	2	5.646	PF 1	438.00	2960.87	2963.18	2963.18	2963.70	0.015797	6.01	86.54	86.93	0.87
trib1	2	5.626	PF 1	438.00	2959.04	2960.60	2960.60	2961.08	0.018760	6.12	93.09	101.16	0.94
trib1	2	5.579	PF 1	438.00	2954.63	2956.31		2956.55	0.013544	3.92	111.68	128.59	0.74
trib1	2	5.540	PF 1	438.00	2950.53	2952.75	2952.69	2953.18	0.019122	5.29	84.68	87.53	0.91
trib1	2	5.499	PF 1	438.00	2947.14	2949.15	2948.99	2949.47	0.015310	4.53	96.70	98.30	0.80
trib1	2	5.463	PF 1	438.00	2943.89	2946.28	2946.07	2946.53	0.015129	4.00	109.39	133.02	0.78
trib1	2	5.424	PF 1	438.00	2940.56	2942.06	2942.06	2942.40	0.027969	5.69	108.74	165.25	1.07
trib1	2	5.377	PF 1	438.00	2935.83	2937.63		2937.85	0.011852	3.76	116.66	134.11	0.70
trib1	2	5.337	PF 1	438.00	2932.22	2934.26	2934.22	2934.49	0.021790	3.94	117.81	242.29	0.89
trib1	2	5.3	PF 1	438.00	2928.10	2931.00	2931.00	2931.36	0.012286	5.60	129.86	184.93	0.78
trib1	2	5.260	PF 1	438.00	2924.29	2926.70	2926.70	2927.00	0.012938	5.39	141.14	207.00	0.79
trib1	2	5.223	PF 1	438.00	2918.32	2919.93	2919.93	2920.51	0.022888	6.13	71.50	62.54	1.01
trib1	1	5.215	PF 1	994.00	2914.33	2919.53	2916.93	2919.74	0.001155	3.74	265.86	60.80	0.32
trib1	1	5.214		Culvert									
trib1	1	5.181	PF 1	994.00	2912.12	2916.01		2916.45	0.004235	5.35	185.96	67.64	0.57
trib1	1	5.161	PF 1	994.00	2910.54	2914.50	2914.36	2915.68	0.011787	8.72	113.99	42.65	0.94
trib1	1	5.123	PF 1	994.00	2908.09	2912.59		2913.54	0.008813	7.79	127.65	45.49	0.82
trib1	1	5.084	PF 1	994.00	2905.76	2910.90	2910.90	2911.78	0.008286	7.73	160.54	123.61	0.79
trib1	1	5.050	PF 1	994.00	2904.17	2906.76	2906.76	2907.69	0.012662	7.86	139.48	84.29	0.95
trib1	1	5.039	PF 1	994.00	2903.21	2905.53	2905.53	2906.30	0.003753	7.65	212.75	158.52	0.91
13	2	1.275	PF 1	1253.00	2972.44	2976.78	2976.78	2977.76	0.019420	7.97	157.26	150.80	1.00
13	2	1.238	PF 1	1253.00	2969.19	2971.72	2971.65	2972.33	0.017568	6.25	201.78	143.99	0.92
13	2	1.200	PF 1	1253.00	2965.65	2967.65	2967.65	2968.39	0.020807	6.91	181.22	123.25	1.00
13	2	1.162	PF 1	1253.00	2957.75	2962.92	2962.92	2964.47	0.017157	9.98	126.40	43.08	1.00
13	2	1.126	PF 1	1253.00	2953.31	2957.85	2957.85	2959.56	0.015949	10.53	120.24	37.18	0.99
13	2	1.095	PF 1	1253.00	2950.58	2952.97	2952.97	2953.79	0.016211	7.43	185.26	171.21	0.93
13	2	1.050	PF 1	1253.00	2944.58	2946.48	2946.48	2947.18	0.021511	6.70	187.04	137.47	1.01
13	2	1.022	PF 1	1253.00	2940.32	2942.88	2942.88	2943.59	0.019844	6.79	188.95	139.49	0.98
13	2	0.985	PF 1	1253.00	2935.44	2937.61	2937.61	2938.25	0.022476	6.43	194.77	156.49	1.02

HEC-RAS Plan: Plan 01 Profile: PF 1 (Continued)

River	Reach	River Sta	Profile	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)	
13	2	0.946	PF 1	1253.00	2931.35	2933.17	2933.17	2933.86	0.019699	6.73	193.47	147.86	0.98
13	2	0.908	PF 1	1253.00	2925.75	2927.91	2927.78	2928.37	0.016119	5.48	232.37	189.73	0.86
13	2	0.870	PF 1	1253.00	2921.97	2923.95	2923.95	2924.44	0.024295	5.58	224.53	236.90	1.01
13	2	0.833	PF 1	1253.00	2917.26	2920.01	2920.01	2920.63	0.015399	7.35	247.31	194.04	0.91
13	2	0.796	PF 1	1253.00	2912.20	2915.75		2916.16	0.006341	5.80	324.73	245.28	0.61
13	2	0.780	PF 1	1253.00	2909.18	2915.66	2912.51	2915.89	0.001388	3.93	326.11	77.34	0.31
13	2	0.779		Culvert									
13	2	0.754	PF 1	1253.00	2906.15	2910.56	2910.56	2912.08	0.013447	9.90	126.55	42.18	1.01
13	2	0.716	PF 1	1253.00	2900.08	2904.51		2905.74	0.009315	8.89	140.97	41.89	0.85
13	2	0.681	PF 1	1253.00	2896.95	2902.86	2902.86	2903.98	0.009584	8.85	180.62	104.27	0.86
13	1	0.664	PF 1	2204.00	2895.92	2899.86	2899.86	2901.34	0.012961	9.78	225.37	76.95	1.01
13	1	0.627	PF 1	2204.00	2892.48	2897.07	2897.03	2898.18	0.009429	8.70	297.05	181.98	0.87
13	1	0.589	PF 1	2204.00	2890.33	2894.62	2894.62	2895.93	0.013605	9.18	240.13	186.65	1.01
13	1	0.55	PF 1	2204.00	2887.68	2890.68	2890.68	2891.82	0.014108	8.55	257.90	116.15	1.01
13	1	0.513	PF 1	2204.00	2883.81	2887.34	2887.34	2888.70	0.013360	9.37	235.27	120.09	1.01
13	1	0.471	PF 1	2204.00	2879.24	2886.57	2883.39	2886.68	0.000534	3.12	1340.60	580.29	0.23
13	1	0.470		Culvert									
13	1	0.43	PF 1	2204.00	2874.42	2879.11	2879.11	2880.66	0.012792	10.02	220.00	70.91	1.00
13	1	0.392	PF 1	2204.00	2870.44	2875.57		2876.70	0.007353	8.52	258.54	70.31	0.78
13	1	0.366	PF 1	2204.00	2868.16	2875.80	2872.93	2876.08	0.001310	4.79	856.42	611.01	0.35
13	1	0.365		Culvert									
13	1	0.352	PF 1	2162.00	2865.15	2869.77	2869.77	2871.57	0.009128	10.76	200.94	56.57	1.01
13	1	0.315	PF 1	2162.00	2860.34	2865.72	2865.72	2867.75	0.008814	11.43	189.12	46.71	1.00
13	1	0.277	PF 1	2162.00	2857.69	2862.20	2862.20	2864.08	0.009058	10.98	196.82	53.01	1.00
13	1	0.239	PF 1	2162.00	2854.96	2859.75	2859.75	2861.69	0.008949	11.16	193.71	50.52	1.00
13	1	0.201	PF 1	2162.00	2852.37	2856.70	2856.70	2858.55	0.009066	10.90	198.32	94.02	1.01
13	1	0.163	PF 1	2162.00	2849.60	2854.14	2854.14	2855.93	0.009097	10.75	201.07	465.23	1.01
13	1	0.125	PF 1	2162.00	2847.41	2850.68	2850.68	2851.15	0.006144	7.46	741.47	765.61	0.80
13	1	0.087	PF 1	2162.00	2844.82	2847.79	2847.79	2848.21	0.009396	8.15	754.12	1003.95	0.95
13	1	0.049	PF 1	2162.00	2843.05	2844.86	2844.86	2845.30	0.016688	8.49	556.35	632.76	1.20
13	1	0.015	PF 1	2162.00	2836.74	2840.60	2840.60	2842.15	0.009708	10.01	216.02	105.19	1.02

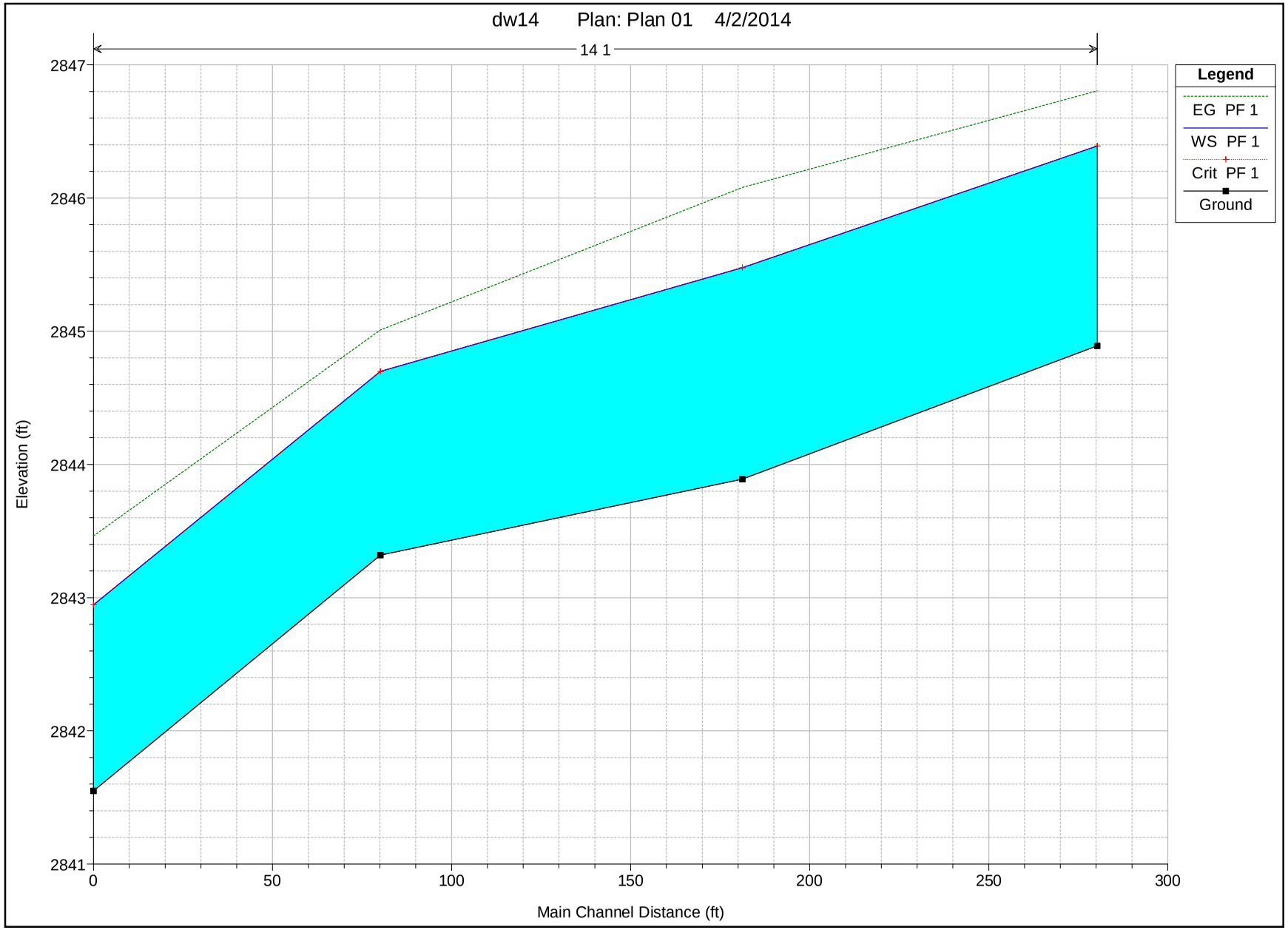

dw13 Plan: Plan 01 5/15/2014
trib2 1
13 1
13 2
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Elevation (ft)
2980
2960
2940
2920
2900
2880
2860
2840
2820
0
1000
2000
3000
4000
5000
6000
7000
Main Channel Distance (ft)


dw13 Plan: Plan 01 5/15/2014
trib1 1
trib1 2
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Elevation (ft)
3000
2980
2960
2940
2920
2900
0
1000
2000
3000
4000
5000
Main Channel Distance (ft)

DRAINAGEWAY#14

HEC-RAS Plan: Plan 01 River: 14 Reach: 1 Profile: PF 1

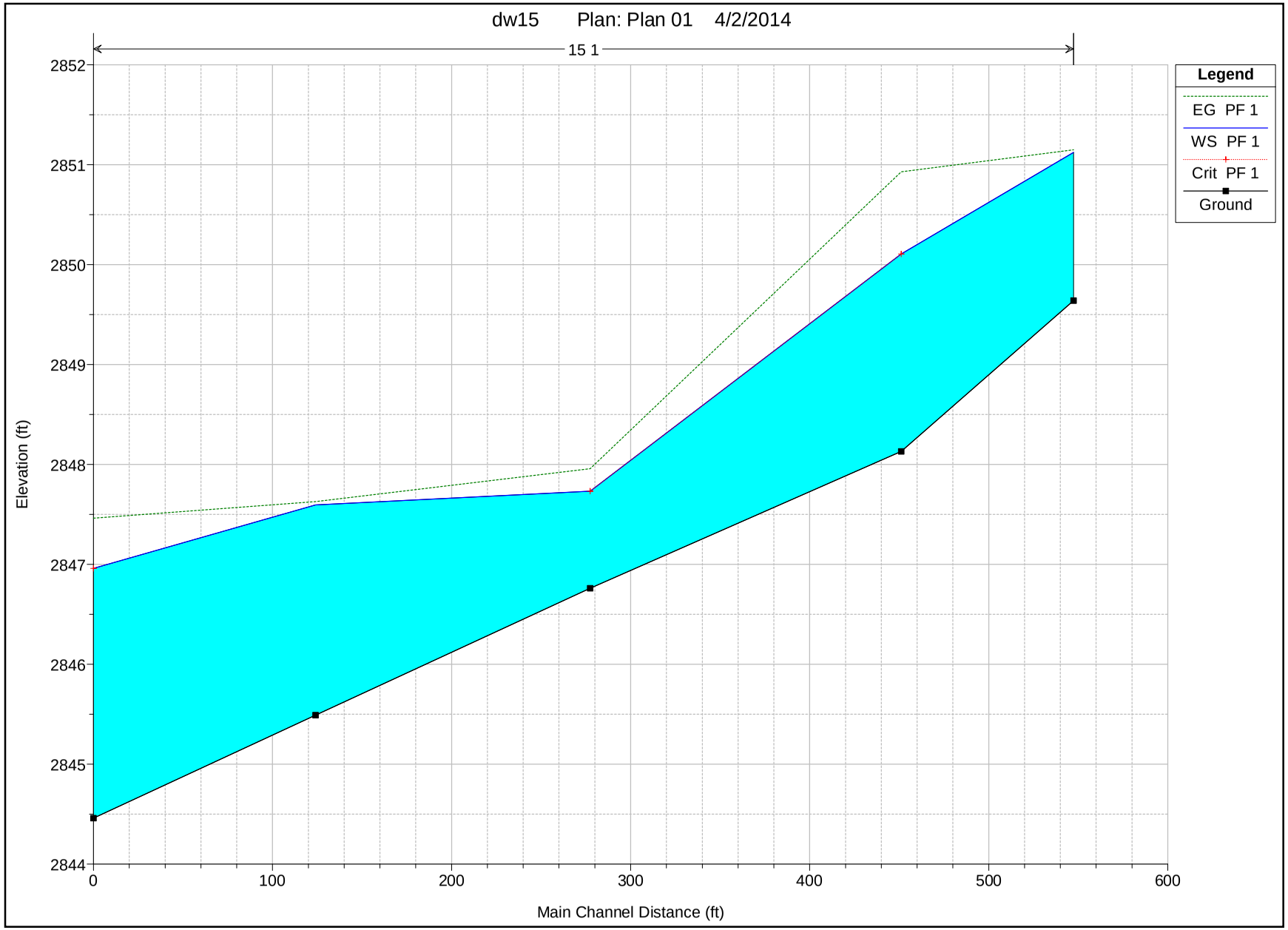
Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
1	0.065	PF 1	147.00	2844.89	2846.39	2846.39	2846.80	0.003942	5.33	39.87	73.76	0.85
1	0.046	PF 1	147.00	2843.89	2845.48	2845.48	2846.08	0.005642	6.23	23.97	22.45	1.00
1	0.027	PF 1	147.00	2843.32	2844.70	2844.70	2845.01	0.004160	5.13	61.59	119.71	0.86
1	0.012	PF 1	147.00	2841.55	2842.95	2842.95	2843.46	0.006005	5.77	25.50	26.42	1.01


dw14 Plan: Plan 01 4/2/2014
14 1
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Elevation (ft)
2847
2846
2845
2844
2843
2842
2841
0
50
100
150
200
250
300
Main Channel Distance (ft)

DRAINAGEWAY#15

HEC-RAS Plan: Plan 01 River: 15 Reach: 1 Profile: PF 1

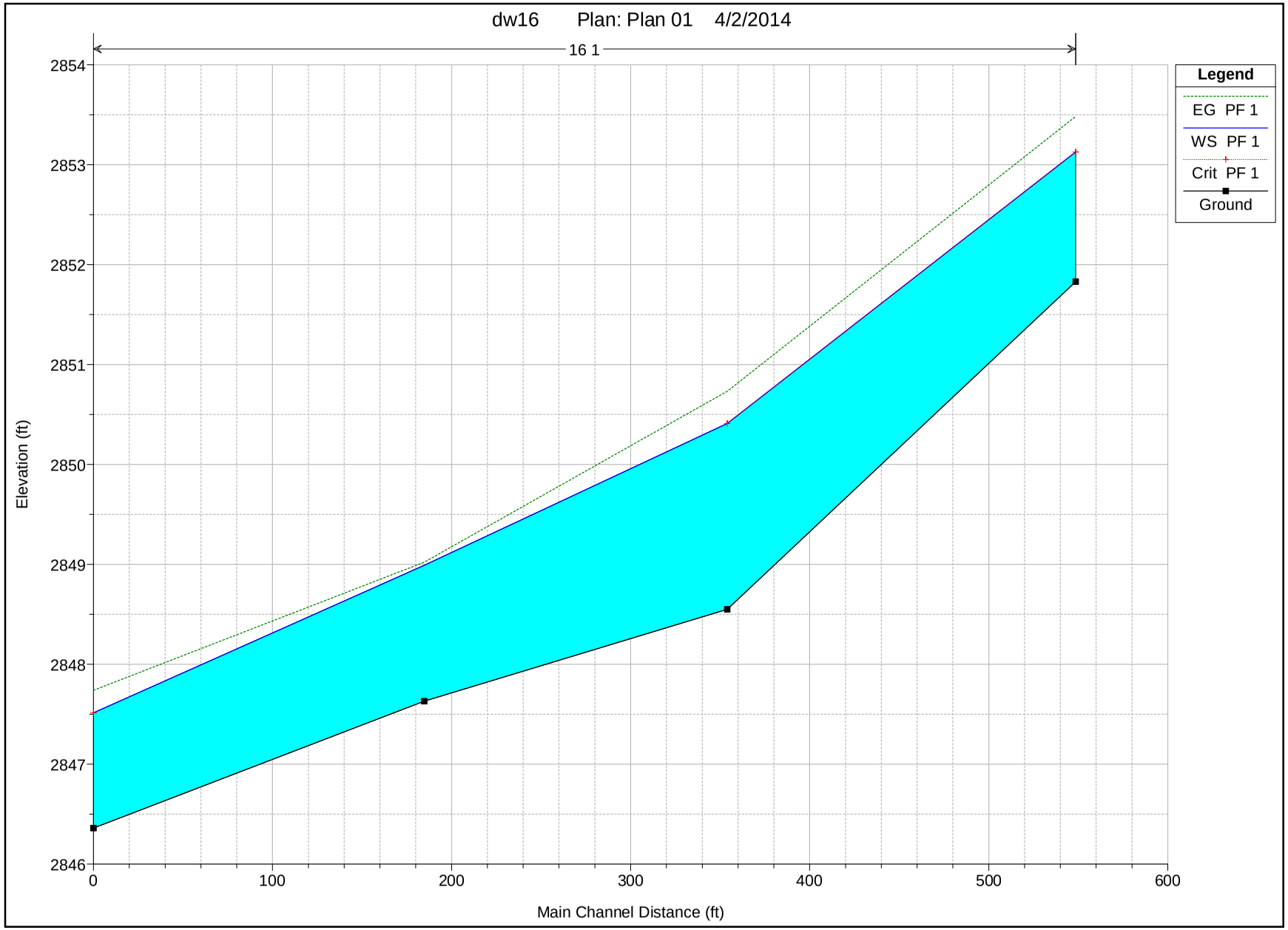
Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
1	0.105	PF 1	161.00	2849.64	2851.12		2851.15	0.000679	2.47	183.51	141.41	0.36
1	0.086	PF 1	161.00	2848.13	2850.11	2850.11	2850.93	0.004992	7.94	32.11	24.06	1.02
1	0.054	PF 1	161.00	2846.76	2847.73	2847.73	2847.96	0.009131	6.40	81.03	170.96	1.22
1	0.024	PF 1	161.00	2845.49	2847.60		2847.63	0.000464	2.55	246.72	265.06	0.32
1	0.001	PF 1	161.00	2844.46	2846.96	2846.96	2847.46	0.002914	6.50	57.44	93.86	0.79


dw15 Plan: Plan 01 4/2/2014
15 1
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Elevation (ft)
2852
2851
2850
2849
2848
2847
2846
2845
2844
0
100
200
300
400
500
600
Main Channel Distance (ft)

DRAINAGEWAY#16

HEC-RAS Plan: Plan 01 River: 16 Reach: 1 Profile: PF 1

Reach	River Sta	Profile	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)	
1	0.112	PF 1	412.00	2851.83	2853.13	2853.13	2853.48	0.009961	4.92	104.45	192.01	0.87
1	0.076	PF 1	412.00	2848.55	2850.41	2850.41	2850.73	0.009544	6.48	147.77	222.20	0.92
1	0.044	PF 1	412.00	2847.63	2848.99		2849.02	0.002798	2.70	353.87	471.90	0.46
1	0.009	PF 1	412.00	2846.36	2847.51	2847.51	2847.74	0.035507	7.25	130.40	270.59	1.52


dw16 Plan: Plan 01 4/2/2014
16 1
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Elevation (ft)
2854
2853
2852
2851
2850
2849
2848
2847
2846
0
100
200
300
400
500
600
Main Channel Distance (ft)

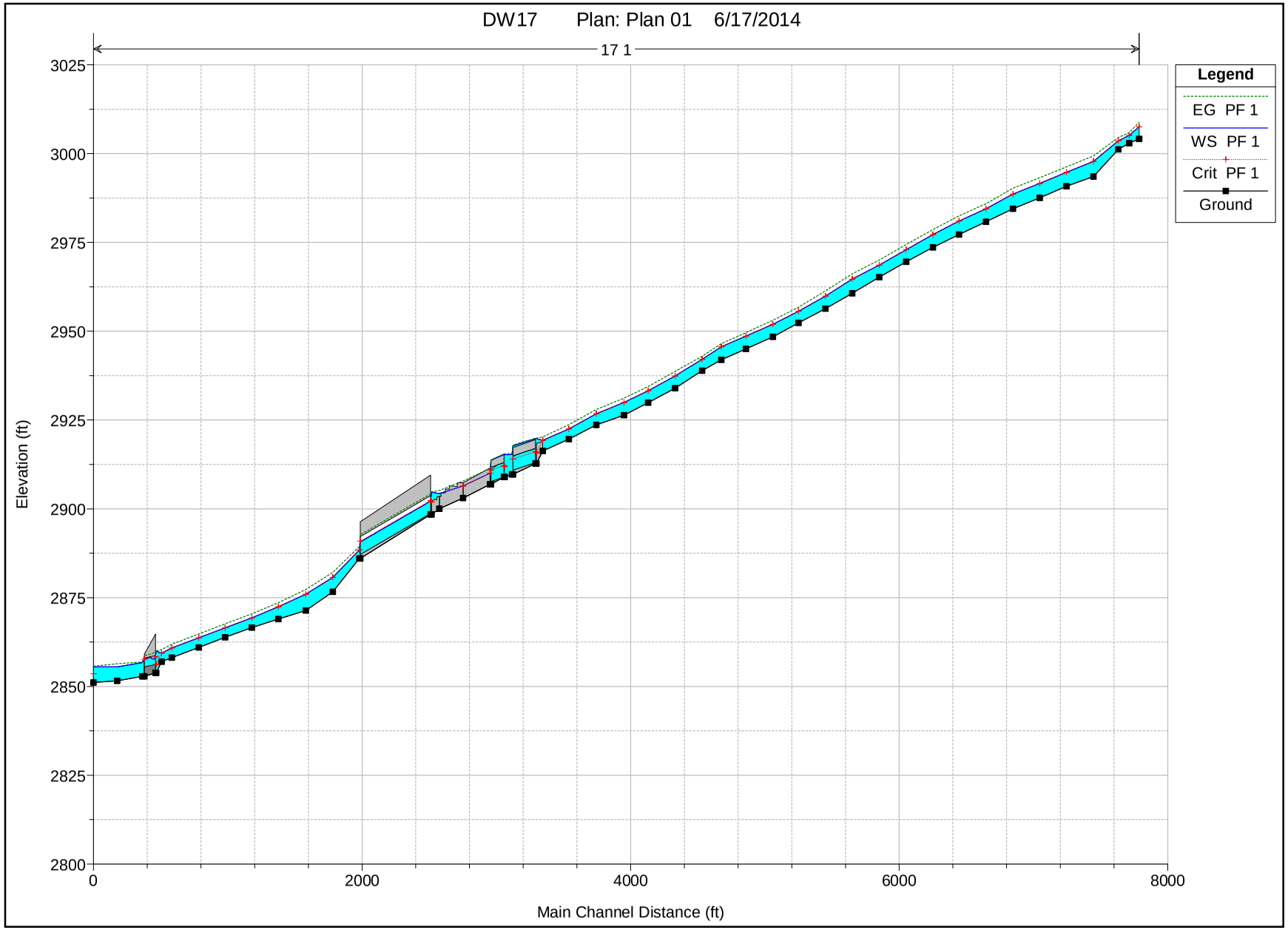
DRAINAGEWAY#17

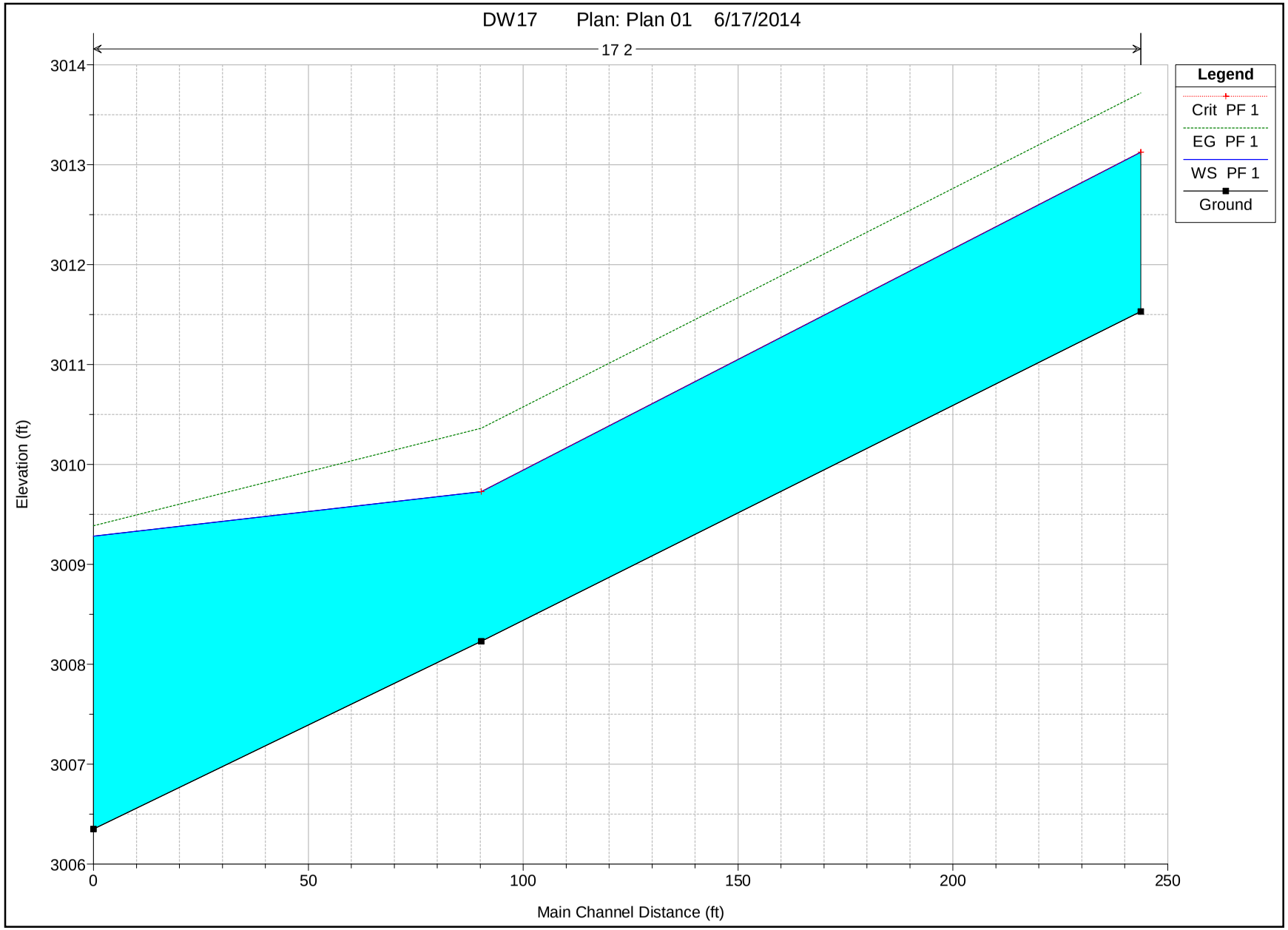
HEC-RAS Plan: Plan 01 Profile: PF 1

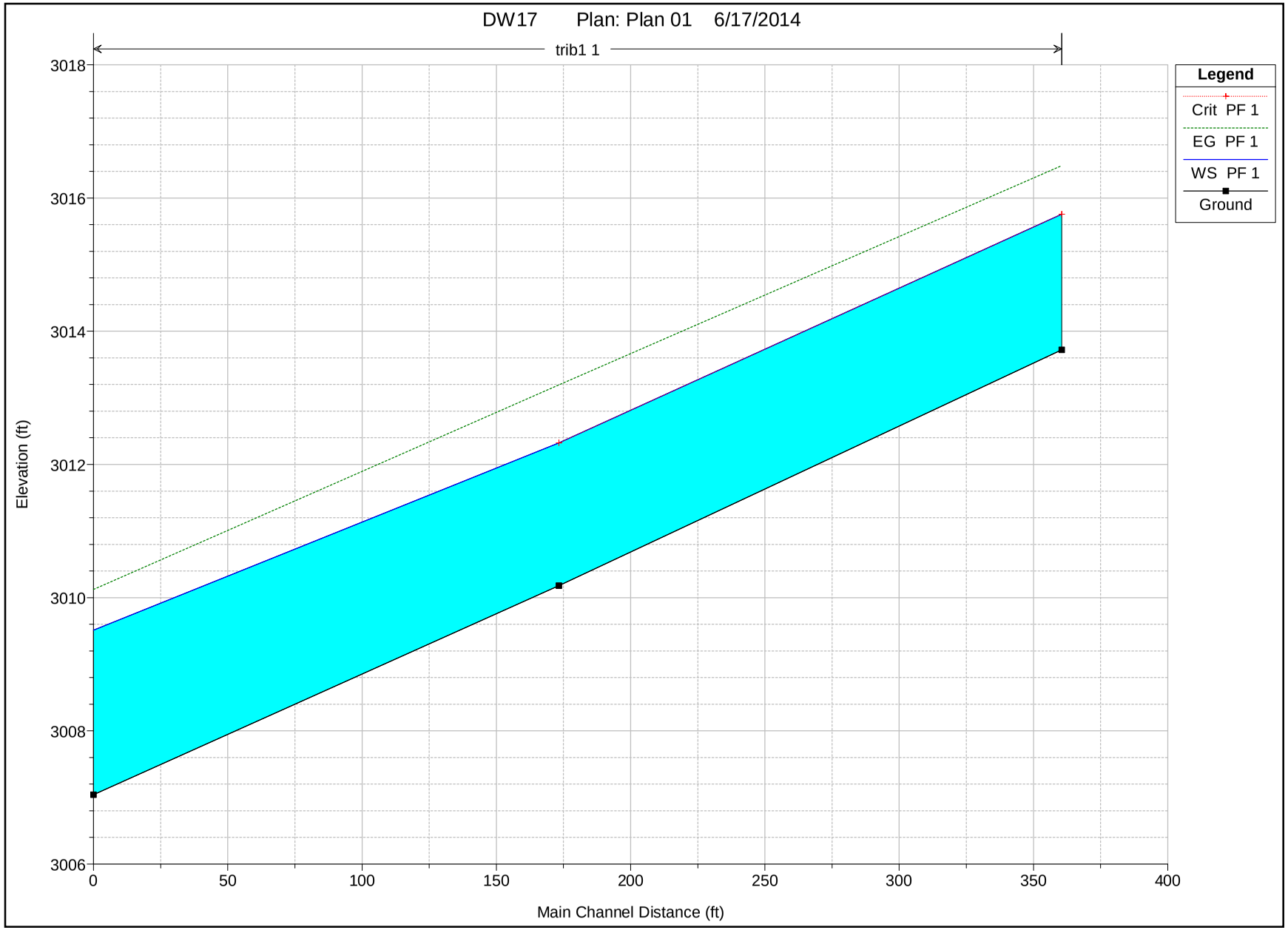
River	Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
				(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
trib1	1	17.089	PF 1	712.00	3013.72	3015.76	3015.76	3016.49	0.014755	7.58	123.15	87.08	1.00
trib1	1	17.054	PF 1	712.00	3010.18	3012.32	3012.32	3013.20	0.013750	7.81	106.93	72.82	0.98
trib1	1	17.021	PF 1	712.00	3007.04	3009.51		3010.12	0.008903	7.00	132.05	68.20	0.81
17	2	1.56	PF 1	284.00	3011.53	3013.13	3013.13	3013.72	0.014434	6.24	49.84	52.96	0.94
17	2	1.531	PF 1	284.00	3008.23	3009.73	3009.73	3010.36	0.016459	6.40	44.90	36.85	1.00
17	2	1.514	PF 1	284.00	3006.35	3009.28		3009.39	0.001075	2.63	116.70	54.53	0.29
17	1	1.5	PF 1	1110.00	3004.12	3007.52	3007.52	3008.84	0.012710	9.20	122.51	51.60	0.98
17	1	1.485	PF 1	1110.00	3002.95	3005.13	3005.13	3005.85	0.013219	6.90	178.10	142.30	0.94
17	1	1.47	PF 1	1110.00	3001.22	3003.63	3003.63	3004.54	0.014772	7.67	146.07	84.83	1.00
17	1	1.435	PF 1	1110.00	2993.52	2997.82	2997.82	2999.34	0.013384	9.89	112.18	37.53	1.01
17	1	1.397	PF 1	1110.00	2990.78	2994.77	2994.77	2996.28	0.013287	9.86	112.57	37.80	1.01
17	1	1.359	PF 1	1110.00	2987.52	2991.62	2991.62	2993.19	0.013272	10.07	110.18	35.28	1.00
17	1	1.321	PF 1	1110.00	2984.45	2988.64	2988.64	2990.25	0.013286	10.20	108.87	34.18	1.01
17	1	1.283	PF 1	1110.00	2980.79	2984.45	2984.45	2985.91	0.013366	9.71	114.31	39.53	1.01
17	1	1.245	PF 1	1110.00	2977.22	2981.01	2981.01	2982.47	0.013355	9.70	114.42	39.66	1.01
17	1	1.209	PF 1	1110.00	2973.59	2977.24	2977.24	2978.62	0.013447	9.43	117.67	43.07	1.01
17	1	1.171	PF 1	1110.00	2969.58	2972.98	2972.98	2974.39	0.013476	9.51	116.70	41.98	1.01
17	1	1.133	PF 1	1110.00	2965.25	2968.65	2968.65	2970.04	0.013411	9.47	117.39	43.51	1.01
17	1	1.095	PF 1	1110.00	2960.69	2964.66	2964.66	2966.18	0.013322	9.91	112.05	37.16	1.00
17	1	1.057	PF 1	1110.00	2956.34	2959.90	2959.90	2961.37	0.013398	9.72	114.22	39.38	1.01
17	1	1.019	PF 1	1110.00	2952.34	2955.61	2955.61	2956.74	0.011348	8.58	137.53	86.69	0.92
17	1	0.983	PF 1	1110.00	2948.42	2951.94	2951.94	2953.10	0.011062	8.76	139.67	73.12	0.92
17	1	0.945	PF 1	1110.00	2945.00	2948.63	2948.63	2949.60	0.009302	8.07	160.38	119.54	0.85
17	1	0.91	PF 1	1110.00	2941.98	2945.62	2945.62	2946.49	0.008008	8.06	196.85	128.05	0.80
17	1	0.883	PF 1	1110.00	2938.87	2942.06	2942.06	2942.94	0.010744	7.82	178.42	160.99	0.89
17	1	0.845	PF 1	1110.00	2933.97	2937.44	2937.44	2938.66	0.013834	8.86	125.29	52.24	1.01
17	1	0.807	PF 1	1110.00	2929.90	2933.25	2933.25	2934.42	0.013768	8.67	128.76	58.28	1.00
17	1	0.773	PF 1	1110.00	2926.33	2929.99	2929.99	2931.19	0.013062	8.83	127.90	56.57	0.99
17	1	0.734	PF 1	1110.00	2923.62	2926.79	2926.79	2927.97	0.012662	8.75	131.73	63.22	0.97
17	1	0.695	PF 1	1110.00	2919.64	2922.53	2922.53	2923.68	0.013925	8.61	129.29	59.06	1.00
17	1	0.658	PF 1	1110.00	2916.28	2919.33	2919.33	2920.23	0.011993	8.04	167.42	95.47	0.94
17	1	0.657		Lat Struct									
17	1	0.649	PF 1	1016.07	2912.78	2919.79	2915.76	2919.92	0.000335	2.94	394.32	99.73	0.21
17	1	0.648		Culvert									
17	1	0.615	PF 1	1016.07	2909.70	2915.27		2915.54	0.000898	4.25	268.72	66.00	0.34
17	1	0.605	PF 1	1016.07	2909.00	2915.26	2911.88	2915.49	0.000671	3.92	302.43	64.22	0.28
17	1	0.604		Culvert									
17	1	0.584	PF 1	1016.07	2906.91	2910.05	2910.05	2911.34	0.009481	9.14	113.43	49.66	0.98
17	1	0.583		Lat Struct									
17	1	0.546	PF 1	1016.07	2903.03	2906.44	2906.44	2907.86	0.010273	10.77	132.81	49.60	1.07
17	1	0.545		Lat Struct									
17	1	0.513	PF 1	1124.25	2900.03	2904.32		2905.17	0.004440	7.65	172.90	59.87	0.72

HEC-RAS Plan: Plan 01 Profile: PF 1 (Continued)

River	Reach	River Sta	Profile	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)	
17	1	0.512		Lat Struct									
17	1	0.501	PF 1	834.28	2898.44	2904.71	2901.91	2904.85	0.000737	3.15	337.40	127.66	0.26
17	1	0.500		Culvert									
17	1	0.4	PF 1	834.28	2886.01	2888.47	2888.47	2889.40	0.015331	7.77	107.31	58.20	1.01
17	1	0.362	PF 1	834.28	2876.65	2880.74	2880.74	2882.10	0.013864	9.34	89.34	33.33	1.01
17	1	0.324	PF 1	874.28	2871.36	2876.00	2876.00	2877.31	0.014754	9.18	95.23	38.29	1.03
17	1	0.286	PF 1	874.28	2869.00	2872.47	2872.47	2873.61	0.010227	8.54	102.36	45.20	1.00
17	1	0.248	PF 1	874.28	2866.55	2869.33	2869.33	2870.46	0.010474	8.54	102.40	45.84	1.01
17	1	0.21	PF 1	874.28	2863.86	2866.51	2866.51	2867.62	0.010436	8.44	103.55	47.07	1.00
17	1	0.173	PF 1	874.28	2861.01	2863.70	2863.70	2864.75	0.010542	8.24	106.11	270.69	1.00
17	1	0.135	PF 1	874.28	2858.11	2860.83	2860.83	2861.92	0.010531	8.37	104.42	428.00	1.01
17	1	0.121	PF 1	874.28	2857.01	2859.37	2859.37	2860.36	0.010857	7.97	109.68	198.03	1.01
17	1	0.113	PF 1	874.28	2853.85	2859.99	2856.21	2860.04	0.000191	1.97	734.54	360.31	0.15
17	1	0.112		Culvert									
17	1	0.094	PF 1	874.28	2852.84	2856.70		2856.93	0.001468	3.83	228.36	78.13	0.39
17	1	0.058	PF 1	874.28	2851.61	2855.54		2856.36	0.006697	7.24	120.77	168.87	0.82
17	1	0.025	PF 1	874.28	2851.14	2855.50	2853.61	2855.75	0.001298	4.00	218.60	282.49	0.38


DW17 Plan: Plan 01 6/17/2014
17 1
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Elevation (ft)
3025
3000
2975
2950
2925
2900
2875
2850
2825
2800
0
2000
4000
6000
8000
Main Channel Distance (ft)

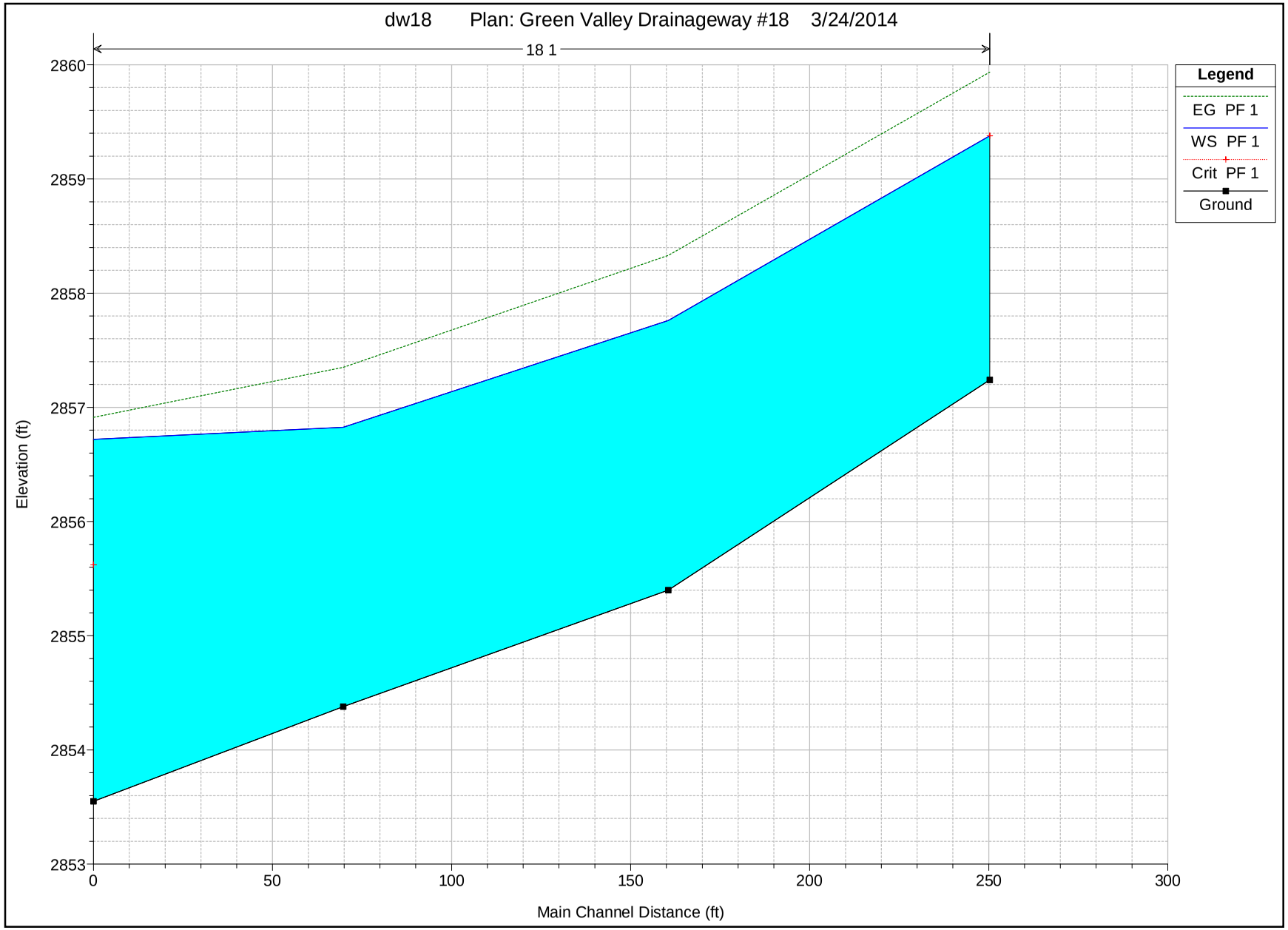

DW17 Plan: Plan 01 6/17/2014
17 2
Legend
Crit PF 1
EG PF 1
WS PF 1
Ground
Elevation (ft)
3014
3013
3012
3011
3010
3009
3008
3007
3006
0
50
100
150
200
250
Main Channel Distance (ft)


DW17 Plan: Plan 01 6/17/2014
trib1 1
Legend
Crit PF 1
EG PF 1
WS PF 1
Ground
Elevation (ft)
3018
3016
3014
3012
3010
3008
3006
0
50
100
150
200
250
300
350
400
Main Channel Distance (ft)

DRAINAGEWAY#18

HEC-RAS Plan: GVDW#18 River: 18 Reach: 1 Profile: PF 1

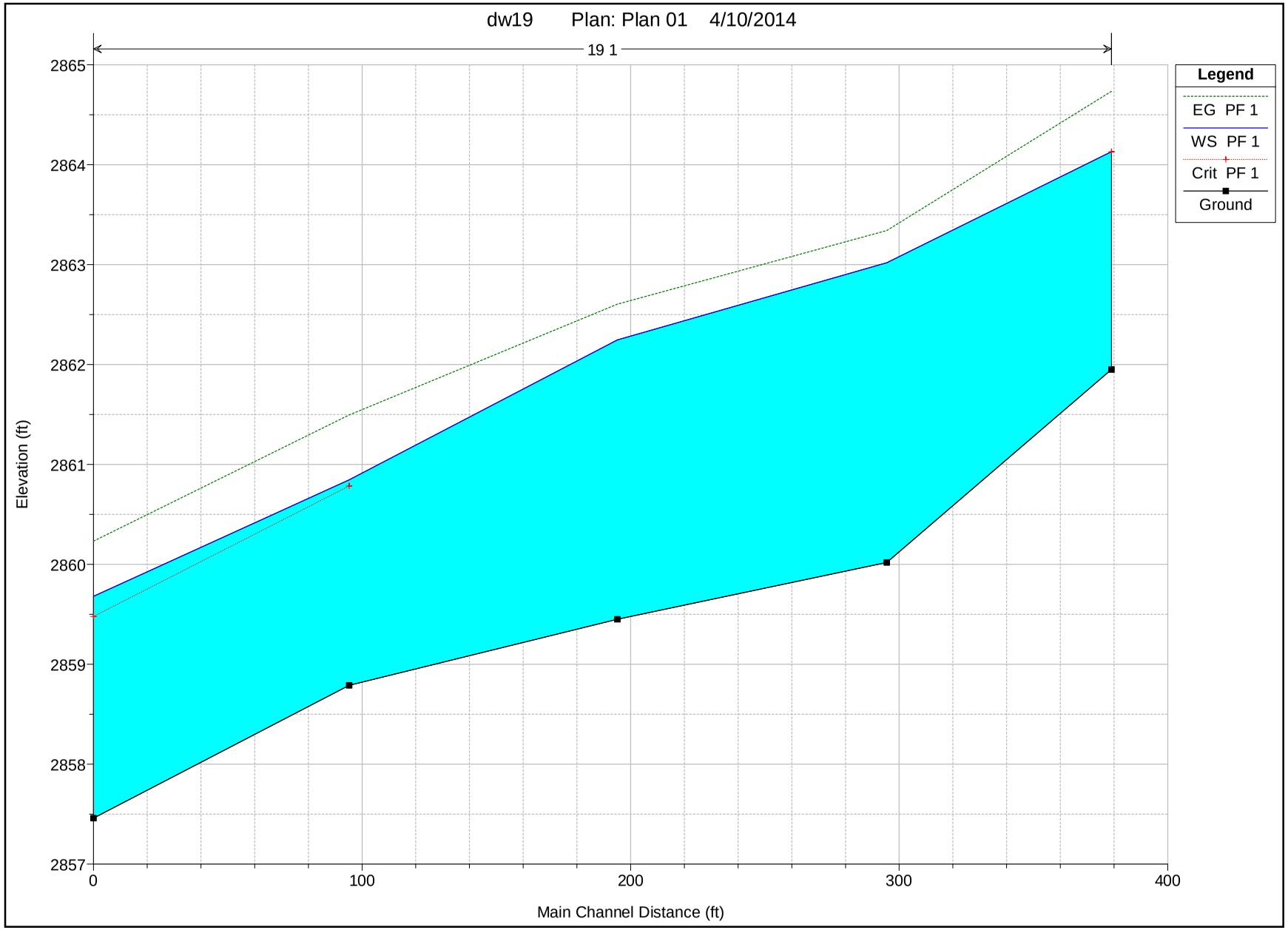
Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
1	0.071	PF 1	202.00	2857.24	2859.38	2859.38	2859.94	0.015944	6.02	34.96	37.86	0.97
1	0.054	PF 1	202.00	2855.40	2857.76		2858.33	0.011361	6.07	33.31	20.65	0.84
1	0.037	PF 1	202.00	2854.38	2856.83		2857.35	0.009997	5.82	34.74	20.84	0.79
1	0.024	PF 1	202.00	2853.55	2856.72	2855.62	2856.91	0.002844	3.53	57.21	28.46	0.44


dw18 Plan: Green Valley Drainageway #18 3/24/2014
18 1
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Elevation (ft)
2860
2859
2858
2857
2856
2855
2854
2853
0
50
100
150
200
250
300
Main Channel Distance (ft)

DRAINAGEWAY#19

HEC-RAS Plan: Plan 01 River: 19 Reach: 1 Profile: PF 1

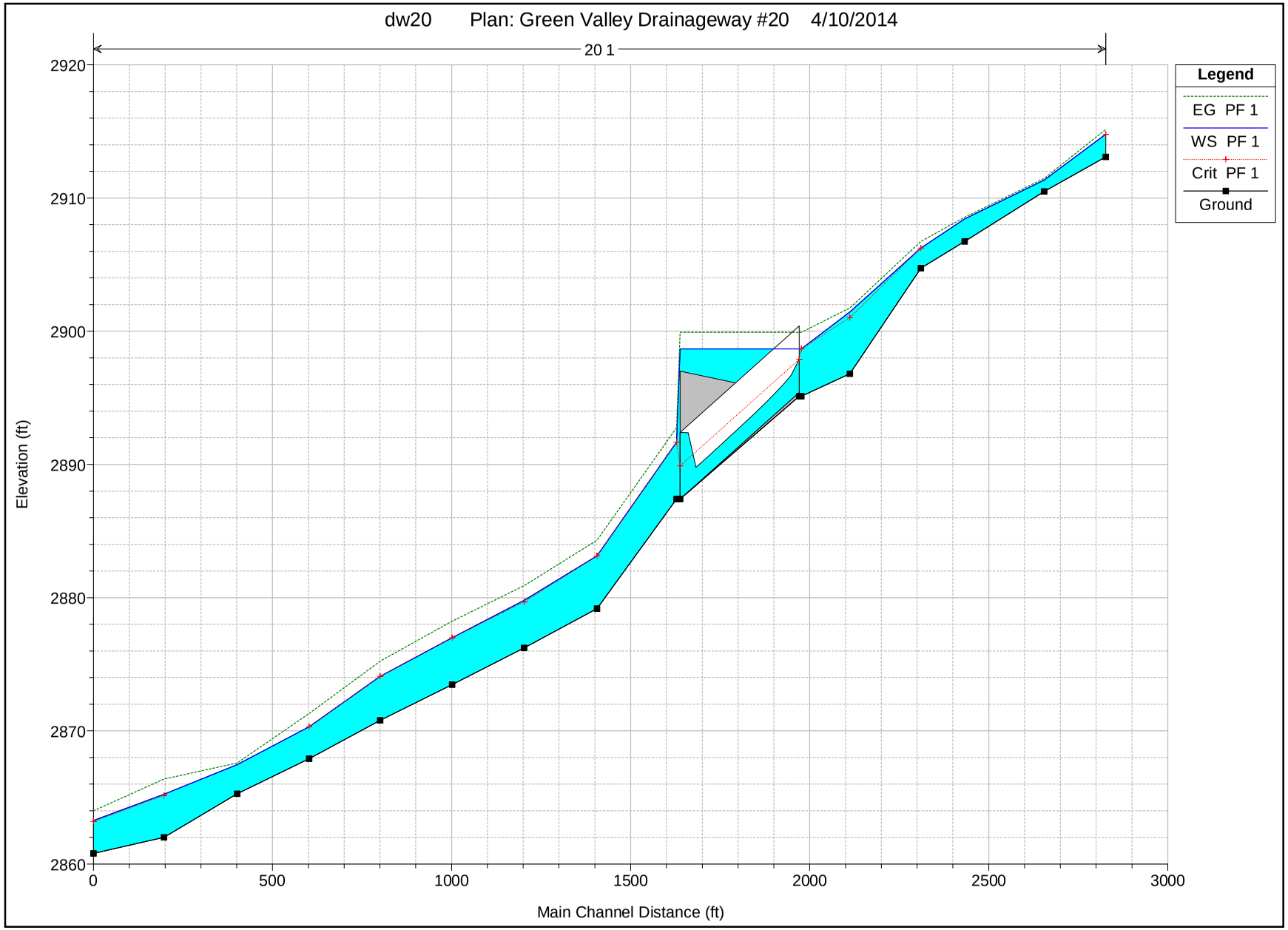
Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
1	0.088	PF 1	215.00	2861.95	2864.13	2864.13	2864.74	0.017453	6.24	34.45	28.99	1.01
1	0.072	PF 1	215.00	2860.02	2863.02		2863.34	0.006537	4.56	47.14	30.13	0.64
1	0.053	PF 1	215.00	2859.45	2862.25		2862.60	0.008234	4.81	44.74	31.40	0.71
1	0.034	PF 1	215.00	2858.79	2860.85	2860.78	2861.50	0.014819	6.47	33.24	23.26	0.95
1	0.016	PF 1	215.00	2857.46	2859.68	2859.48	2860.23	0.011422	5.97	36.02	23.22	0.84


dw19 Plan: Plan 01 4/10/2014
19 1
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Elevation (ft)
2865
2864
2863
2862
2861
2860
2859
2858
2857
0
100
200
300
400
Main Channel Distance (ft)

DRAINAGEWAY#20

HEC-RAS Plan: GVDW#20 River: 20 Reach: 1 Profile: PF 1

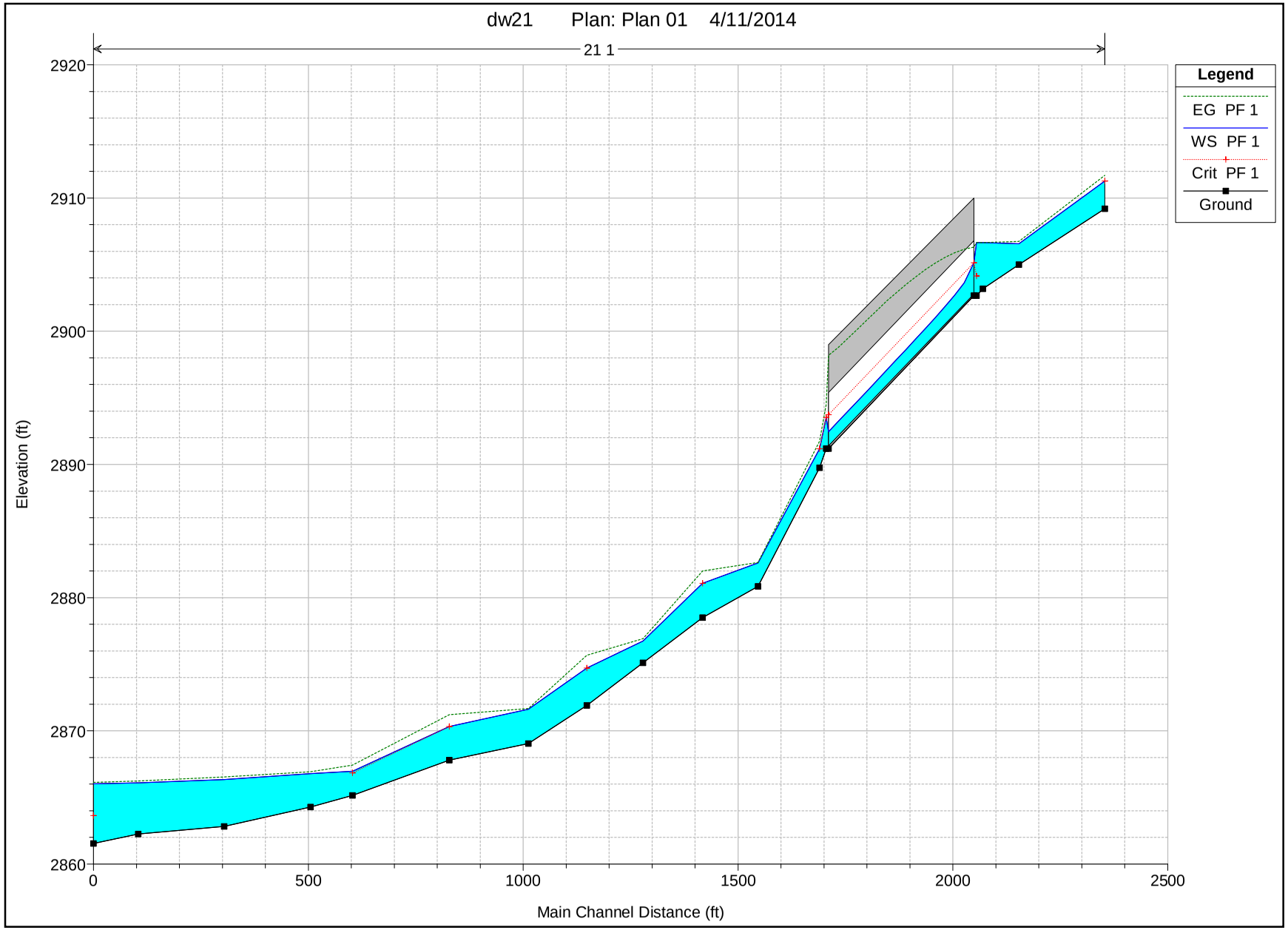
Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
1	0.56	PF 1	509.00	2913.09	2914.80	2914.77	2915.15	0.023432	5.37	119.07	143.04	0.90
1	0.528	PF 1	509.00	2910.49	2911.35		2911.47	0.019104	3.18	184.98	283.40	0.73
1	0.486	PF 1	509.00	2906.75	2908.43		2908.55	0.009588	3.96	200.81	256.45	0.60
1	0.462	PF 1	649.00	2904.74	2906.25	2906.25	2906.74	0.023058	6.18	133.26	140.82	0.93
1	0.425	PF 1	649.00	2896.81	2901.44	2901.02	2901.74	0.008009	4.91	179.63	160.00	0.58
1	0.399	PF 1	649.00	2895.12	2898.67	2898.67	2899.92	0.023351	8.98	72.24	28.83	1.00
1	0.398		Culvert									
1	0.333	PF 1	649.00	2887.41	2891.68	2891.68	2892.75	0.015369	8.31	78.14	36.99	1.01
1	0.291	PF 1	649.00	2879.17	2883.14	2883.14	2884.31	0.014799	8.71	74.53	32.20	1.01
1	0.253	PF 1	649.00	2876.23	2879.79	2879.68	2880.90	0.012476	8.45	76.80	31.00	0.95
1	0.214	PF 1	649.00	2873.47	2876.99	2876.99	2878.23	0.014026	8.94	72.56	29.25	1.00
1	0.176	PF 1	649.00	2870.79	2874.09	2874.09	2875.23	0.014284	8.56	75.84	33.65	1.00
1	0.139	PF 1	649.00	2867.91	2870.31	2870.31	2871.30	0.014817	7.97	81.42	41.70	1.01
1	0.101	PF 1	739.00	2865.28	2867.46		2867.58	0.003140	2.80	264.92	223.16	0.44
1	0.062	PF 1	739.00	2862.01	2865.25	2865.15	2866.39	0.010946	8.72	92.25	40.33	0.92
1	0.025	PF 1	739.00	2860.80	2863.27	2863.20	2863.99	0.012149	6.90	114.61	77.66	0.91


dw20 Plan: Green Valley Drainageway #20 4/10/2014
20 1
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Elevation (ft)
2920
2910
2900
2890
2880
2870
2860
0
500
1000
1500
2000
2500
3000
Main Channel Distance (ft)

DRAINAGEWAY#21

HEC-RAS Plan: Plan 01 River: 21 Reach: 1 Profile: PF 1

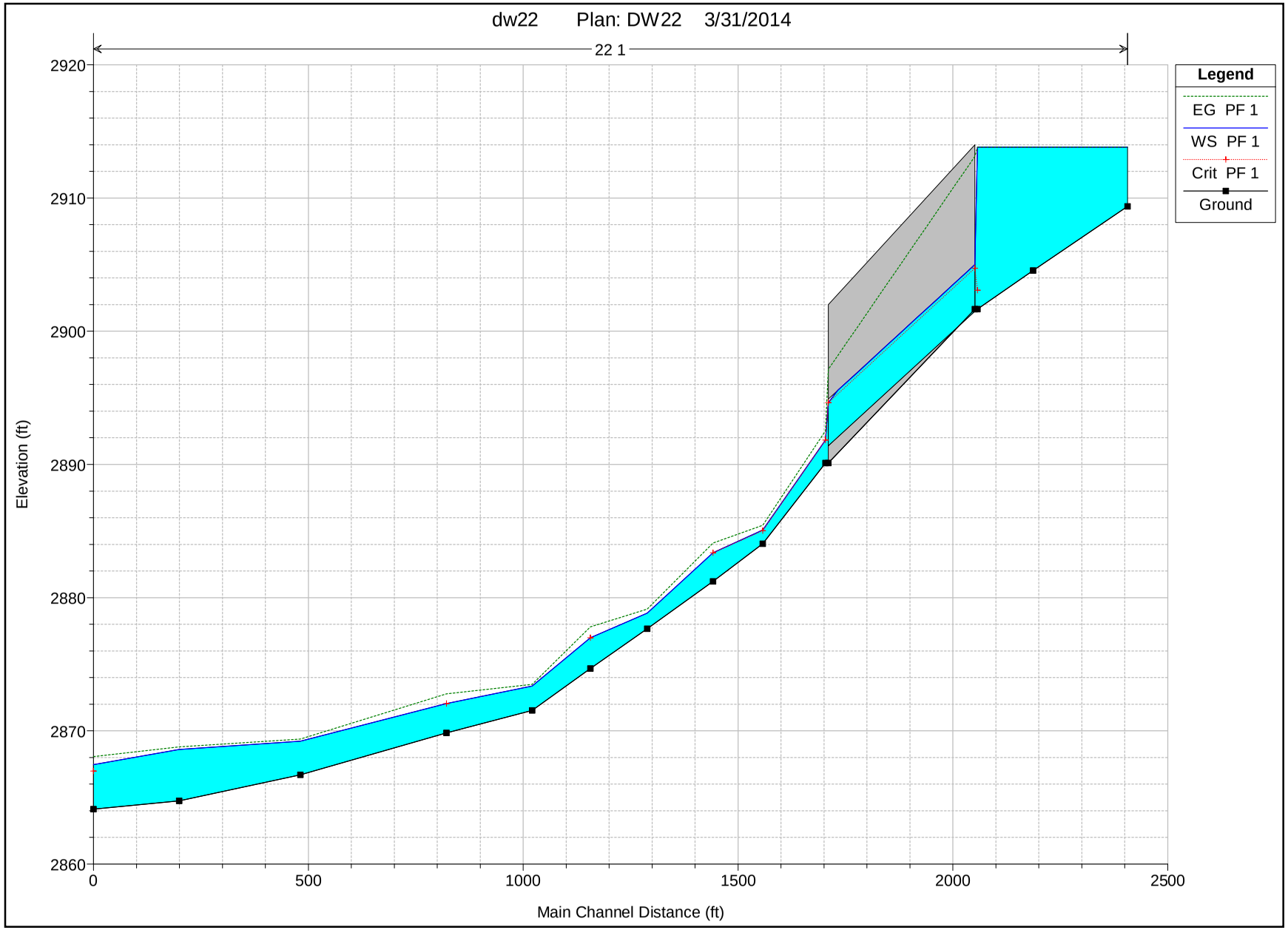
Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
1	0.458	PF 1	203.00	2909.19	2911.27	2911.27	2911.70	0.014519	5.39	43.66	72.22	0.91
1	0.421	PF 1	203.00	2905.00	2906.56		2906.74	0.009542	3.77	70.39	105.22	0.71
1	0.405	PF 1	203.00	2903.19	2906.65		2906.66	0.000087	0.79	359.61	169.03	0.08
1	0.402	PF 1	203.00	2902.67	2906.65	2904.15	2906.66	0.000110	1.06	354.62	170.85	0.10
1	0.401		Culvert									
1	0.336	PF 1	203.00	2891.19	2893.53	2893.53	2894.50	0.018544	7.91	25.68	13.31	1.00
1	0.333	PF 1	203.00	2889.75	2891.18	2891.18	2891.74	0.018071	6.02	33.71	30.69	1.01
1	0.306	PF 1	203.00	2880.85	2882.60		2882.65	0.001248	1.71	125.06	131.82	0.27
1	0.281	PF 1	382.00	2878.51	2881.08	2881.08	2882.00	0.015539	7.67	49.80	27.75	1.01
1	0.255	PF 1	382.00	2875.11	2876.74		2876.92	0.005843	3.42	117.50	155.83	0.58
1	0.23	PF 1	382.00	2871.90	2874.72	2874.72	2875.67	0.015259	7.83	48.76	25.85	1.01
1	0.204	PF 1	382.00	2869.05	2871.63		2871.67	0.000760	2.05	360.13	340.95	0.24
1	0.17	PF 1	382.00	2867.81	2870.32	2870.32	2871.21	0.014708	7.58	51.12	32.54	0.99
1	0.127	PF 1	382.00	2865.15	2866.96	2866.84	2867.43	0.011355	6.49	98.16	102.78	0.87
1	0.108	PF 1	382.00	2864.28	2866.80		2866.93	0.002047	3.20	162.68	114.28	0.38
1	0.07	PF 1	382.00	2862.83	2866.34		2866.54	0.001744	3.68	116.98	51.16	0.37
1	0.032	PF 1	382.00	2862.25	2866.10		2866.25	0.001155	3.14	132.01	57.00	0.31
1	0.013	PF 1	382.00	2861.55	2866.03	2863.65	2866.14	0.000794	2.59	147.53	46.45	0.25


dw21 Plan: Plan 01 4/11/2014
21 1
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Elevation (ft)
2920
2910
2900
2890
2880
2870
2860
0
500
1000
1500
2000
2500
Main Channel Distance (ft)

DRAINAGEWAY#22

HEC-RAS Plan: 1 River: 22 Reach: 1 Profile: PF 1

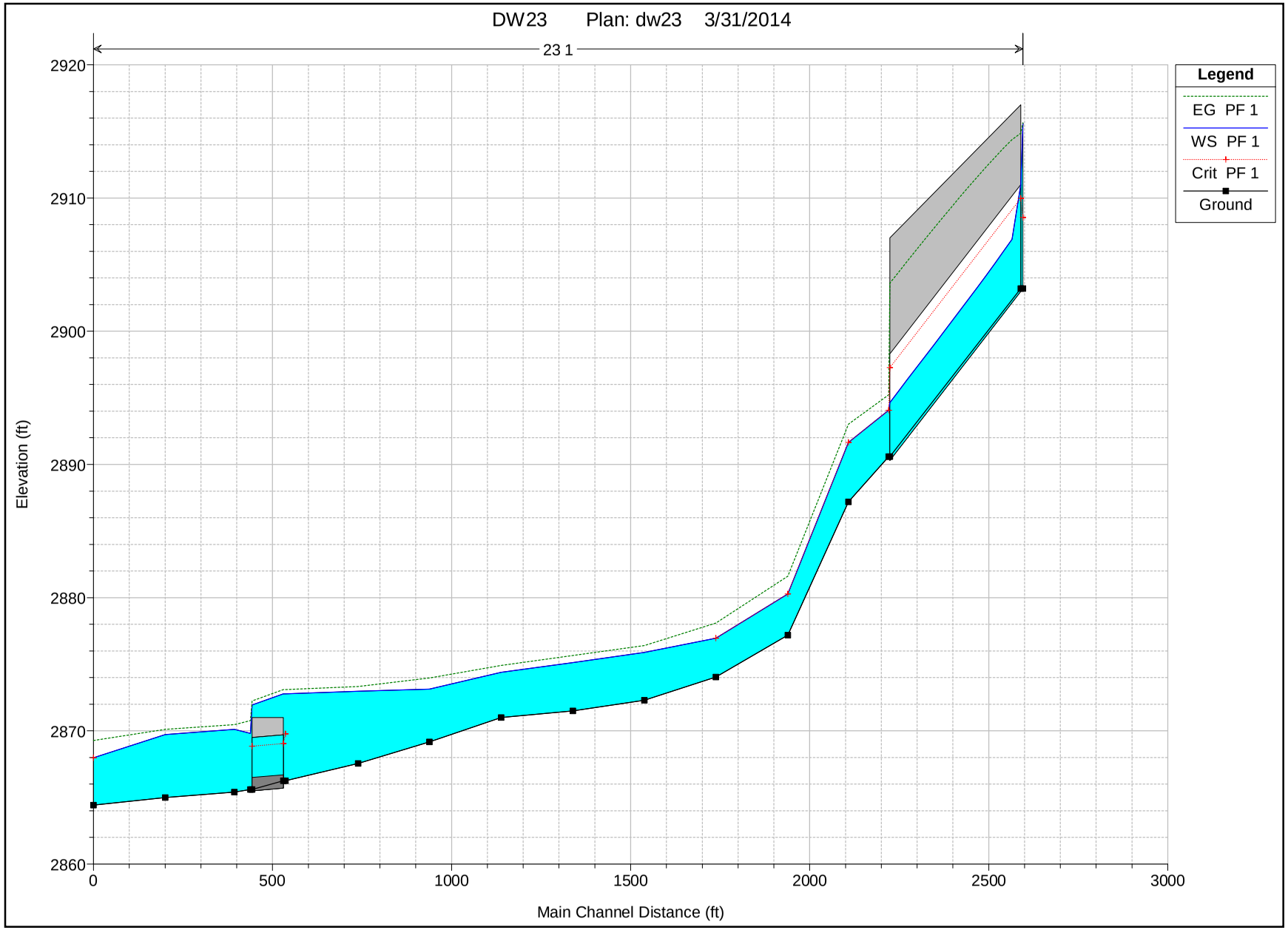
Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
1	0.483	PF 1	236.00	2909.38	2913.82		2913.82	0.000074	0.71	367.40	110.74	0.06
1	0.441	PF 1	236.00	2904.55	2913.82		2913.82	0.000002	0.20	1435.44	218.55	0.01
1	0.416	PF 1	236.00	2901.65	2913.82	2903.08	2913.82	0.000001	0.13	1817.82	215.91	0.01
1	0.415		Culvert									
1	0.349	PF 1	236.00	2890.11	2891.83	2891.83	2892.52	0.016811	6.65	35.51	26.23	1.01
1	0.322	PF 1	236.00	2884.04	2885.08	2885.03	2885.43	0.008036	4.72	50.02	87.79	0.91
1	0.3	PF 1	236.00	2881.22	2883.36	2883.36	2884.10	0.016598	6.89	34.24	23.66	1.01
1	0.271	PF 1	236.00	2877.66	2878.84		2879.14	0.006409	4.41	53.54	90.86	0.82
1	0.246	PF 1	236.00	2874.68	2877.00	2877.00	2877.81	0.016372	7.23	32.64	20.48	1.01
1	0.22	PF 1	236.00	2871.53	2873.37		2873.49	0.001356	2.77	85.32	130.33	0.41
1	0.182	PF 1	236.00	2869.84	2872.05	2872.05	2872.77	0.016582	6.80	34.71	24.48	1.01
1	0.118	PF 1	503.00	2866.70	2869.22		2869.39	0.002313	3.37	155.46	160.14	0.52
1	0.065	PF 1	503.00	2864.74	2868.61		2868.80	0.001941	3.47	144.85	916.44	0.38
1	0.027	PF 1	503.00	2864.12	2867.46	2866.99	2868.06	0.007809	6.23	80.70	604.54	0.74


dw22 Plan: DW22 3/31/2014
22 1
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Elevation (ft)
2920
2910
2900
2890
2880
2870
2860
0
500
1000
1500
2000
2500
Main Channel Distance (ft)

DRAINAGEWAY#23

HEC-RAS Plan: 1 River: 23 Reach: 1 Profile: PF 1

Reach	River Sta	Profile	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)	
1	0.515	PF 1	1044.00	2903.20	2915.63	2908.53	2915.65	0.000075	1.59	1297.35	299.13	0.09
1	0.514		Culvert									
1	0.443	PF 1	1044.00	2890.59	2894.07	2894.07	2895.22	0.010308	8.62	121.07	52.67	1.00
1	0.422	PF 1	1044.00	2887.19	2891.65	2891.65	2893.01	0.009800	9.39	111.24	40.82	1.00
1	0.39	PF 1	1044.00	2877.18	2880.28	2880.28	2881.62	0.010180	9.28	112.52	42.58	1.01
1	0.352	PF 1	1044.00	2874.04	2876.96	2876.96	2878.10	0.010396	8.55	122.03	54.52	1.01
1	0.314	PF 1	1044.00	2872.29	2875.88		2876.40	0.003671	5.76	181.13	67.15	0.62
1	0.276	PF 1	1044.00	2871.50	2875.13		2875.65	0.003760	5.80	180.14	67.50	0.63
1	0.239	PF 1	1044.00	2871.01	2874.40		2874.91	0.003631	5.71	182.93	68.21	0.61
1	0.201	PF 1	1638.00	2869.17	2873.13		2873.97	0.005242	7.36	222.62	75.25	0.75
1	0.163	PF 1	1638.00	2867.56	2872.97		2873.33	0.001445	4.88	380.29	167.27	0.42
1	0.124	PF 1	1638.00	2866.25	2872.79	2869.77	2873.09	0.000888	4.46	386.47	319.07	0.34
1	0.123		Culvert									
1	0.106	PF 1	1638.00	2865.59	2869.80		2870.78	0.005096	7.93	206.60	58.77	0.75
1	0.097	PF 1	1638.00	2865.41	2870.12		2870.47	0.001672	4.79	342.07	92.79	0.44
1	0.061	PF 1	1638.00	2865.00	2869.72		2870.12	0.001970	5.07	323.27	97.61	0.47
1	0.023	PF 1	1638.00	2864.43	2867.98	2867.98	2869.27	0.009829	9.14	179.16	69.83	1.01


DW23 Plan: dw23 3/31/2014
23 1
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Elevation (ft)
2920
2910
2900
2890
2880
2870
2860
0
500
1000
1500
2000
2500
3000
Main Channel Distance (ft)

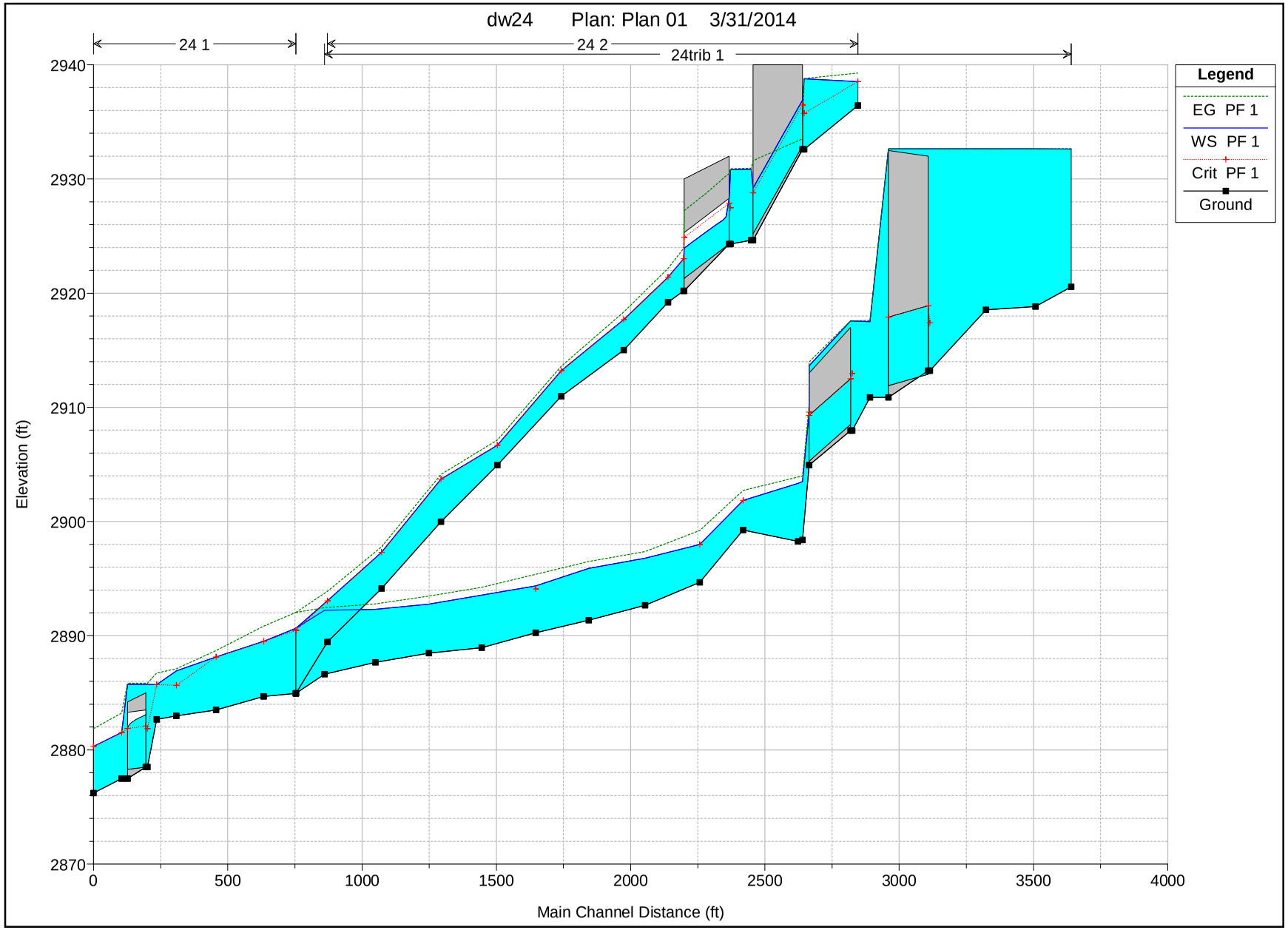
DRAINAGEWAY#24

HEC-RAS Plan: Plan 01 Profile: PF 1

River	Reach	River Sta	Profile	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)	
24trib	1	3.547	PF 1	815.00	2920.55	2932.62		2932.65	0.000057	1.49	678.82	172.98	0.08
24trib	1	3.521	PF 1	815.00	2918.83	2932.64		2932.64	0.000008	0.62	2260.85	312.41	0.03
24trib	1	3.487	PF 1	815.00	2918.55	2932.64		2932.64	0.000005	0.52	2698.73	334.01	0.03
24trib	1	3.447	PF 1	815.00	2913.22	2932.64	2917.39	2932.64	0.000001	0.33	4146.50	352.55	0.01
24trib	1	3.446		Culvert									
24trib	1	3.405	PF 1	815.00	2910.86	2917.51		2917.62	0.000529	2.70	378.21	181.65	0.22
24trib	1	3.392	PF 1	815.00	2907.96	2917.56	2912.96	2917.58	0.000077	1.37	1063.45	269.11	0.09
24trib	1	3.391		Culvert									
24trib	1	3.362	PF 1	815.00	2904.94	2909.58	2909.58	2910.31	0.009524	7.44	144.23	104.32	0.83
24trib	1	3.357	PF 1	815.00	2898.38	2903.51		2903.97	0.002823	5.50	157.08	49.32	0.49
24trib	1	3.354	PF 1	815.00	2898.27	2903.35		2903.91	0.003824	6.08	141.26	46.47	0.56
24trib	1	3.315	PF 1	815.00	2899.26	2901.85	2901.85	2902.72	0.009197	8.12	120.71	77.91	0.96
24trib	1	3.285	PF 1	815.00	2894.67	2898.00	2898.00	2899.22	0.009956	8.88	92.40	40.53	1.00
24trib	1	3.246	PF 1	907.00	2892.67	2896.79		2897.37	0.003972	6.33	162.09	80.52	0.65
24trib	1	3.206	PF 1	907.00	2891.35	2895.90		2896.51	0.004289	6.29	147.25	61.46	0.67
24trib	1	3.169	PF 1	907.00	2890.26	2894.37	2894.09	2895.37	0.007506	8.05	112.72	42.70	0.87
24trib	1	3.131	PF 1	907.00	2888.96	2893.55		2894.25	0.003717	6.71	138.99	48.34	0.64
24trib	1	3.094	PF 1	907.00	2888.47	2892.76		2893.47	0.004257	6.74	137.67	52.85	0.68
24trib	1	3.056	PF 1	907.00	2887.66	2892.32		2892.78	0.002317	5.62	183.91	91.07	0.51
24trib	1	3.02	PF 1	907.00	2886.63	2892.23		2892.46	0.000852	4.01	264.78	119.84	0.33
24	2	0.566	PF 1	767.00	2936.44	2938.53	2938.53	2939.28	0.013790	7.36	124.22	91.39	0.97
24	2	0.528	PF 1	767.00	2932.59	2938.78	2935.75	2938.80	0.000133	1.44	905.80	346.40	0.11
24	2	0.527		Culvert									
24	2	0.491	PF 1	767.00	2924.64	2930.85		2930.94	0.000560	2.87	394.66	151.53	0.23
24	2	0.476	PF 1	767.00	2924.30	2930.81	2927.48	2930.89	0.000721	2.67	405.02	175.00	0.23
24	2	0.475		Culvert									
24	2	0.443	PF 1	767.00	2920.20	2923.01	2923.01	2923.92	0.010204	7.70	103.83	68.44	0.98
24	2	0.432	PF 1	793.00	2919.21	2921.40	2921.40	2922.17	0.011667	7.06	112.44	75.18	1.01
24	2	0.401	PF 1	793.00	2915.01	2917.69	2917.69	2918.36	0.008182	6.98	140.07	114.76	0.88
24	2	0.357	PF 1	793.00	2910.97	2913.20	2913.20	2913.61	0.009688	5.80	169.38	247.18	0.80
24	2	0.312	PF 1	793.00	2904.94	2906.68	2906.68	2907.14	0.014583	6.22	159.75	218.51	0.95
24	2	0.274	PF 1	793.00	2899.98	2903.71	2903.71	2904.12	0.004569	5.70	219.36	408.33	0.59
24	2	0.232	PF 1	793.00	2894.14	2897.31	2897.31	2897.77	0.009923	7.24	175.58	161.17	0.85
24	2	0.194	PF 1	793.00	2889.44	2893.05	2893.05	2893.90	0.009792	7.74	120.05	103.83	0.86
24	1	0.172	PF 1	1637.00	2884.96	2890.65	2890.46	2892.04	0.010280	9.46	174.20	57.04	0.91
24	1	0.149	PF 1	1637.00	2884.67	2889.51	2889.51	2890.85	0.009351	9.42	189.66	84.15	0.88
24	1	0.116	PF 1	1637.00	2883.49	2888.15	2888.15	2888.70	0.004972	6.94	390.62	338.51	0.65
24	1	0.088	PF 1	1637.00	2882.97	2886.92	2885.66	2887.10	0.001858	3.92	543.47	252.58	0.39
24	1	0.074	PF 1	1637.00	2882.67	2885.71	2885.71	2886.73	0.012041	8.43	211.73	231.96	0.95
24	1	0.067	PF 1	1637.00	2878.50	2885.73	2881.87	2885.83	0.000424	2.64	687.90	297.46	0.20

HEC-RAS Plan: Plan 01 Profile: PF 1 (Continued)

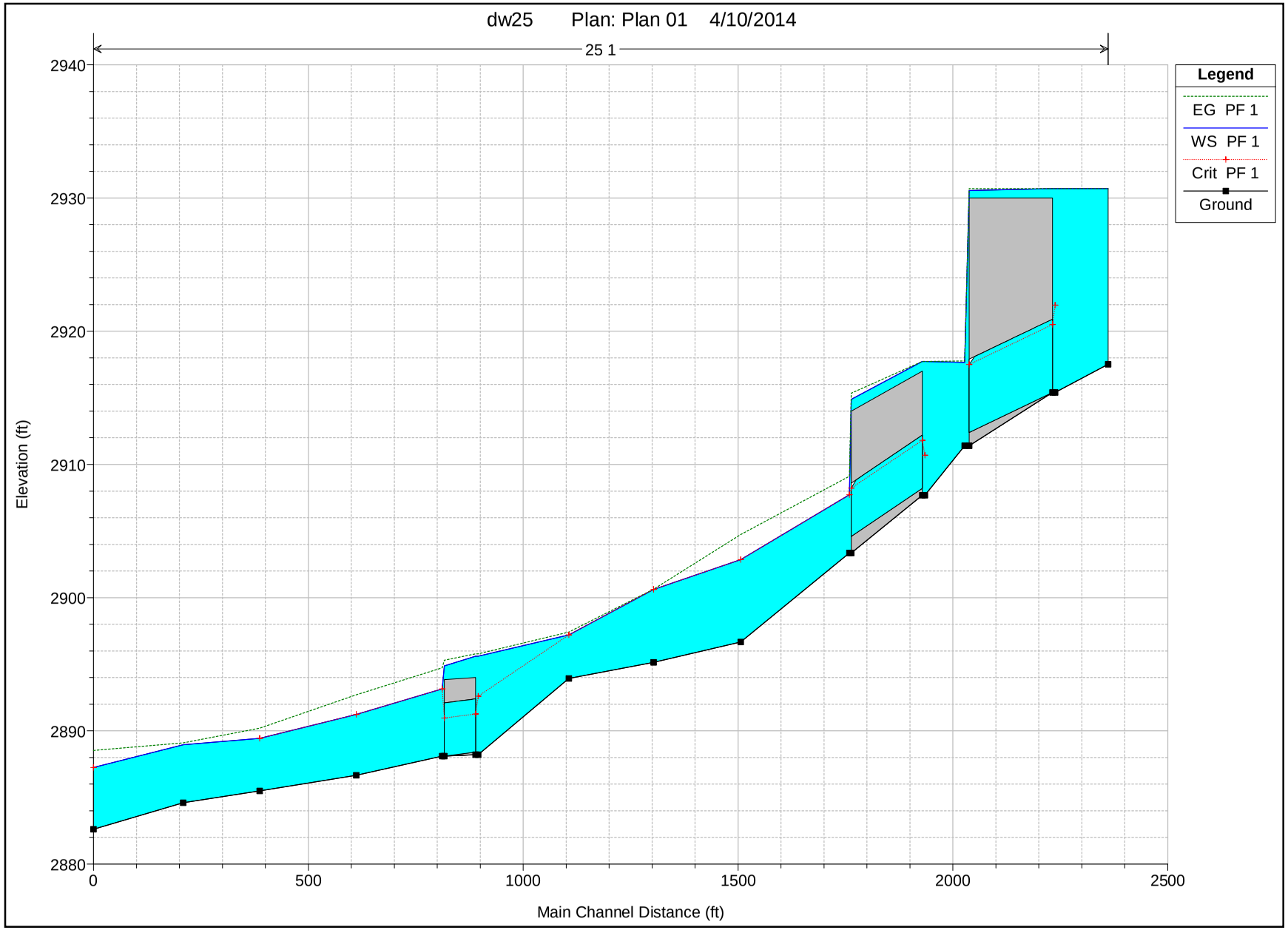
River	Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
				(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
24	1	0.066		Culvert									
24	1	0.049	PF 1	1637.00	2877.48	2881.53	2881.53	2883.22	0.009475	10.45	156.61	46.70	1.01
24	1	0.029	PF 1	1637.00	2876.23	2880.30	2880.30	2881.86	0.009464	10.03	163.29	53.05	1.01


dw24 Plan: Plan 01 3/31/2014
24 1
24 2
24trib 1
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Elevation (ft)
Main Channel Distance (ft)
2940
2930
2920
2910
2900
2890
2880
2870
0
500
1000
1500
2000
2500
3000
3500
4000

DRAINAGEWAY#25

HEC-RAS Plan: Plan 01 River: 25 Reach: 1 Profile: PF 1

Reach	River Sta	Profile	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)	
1	0.488	PF 1	963.00	2917.52	2930.71		2930.71	0.000005	0.44	2856.00	287.20	0.02
1	0.468	PF 1	963.00	2915.40	2930.71	2921.97	2930.71	0.000010	0.61	2929.50	408.04	0.03
1	0.467		Culvert									
1	0.428	PF 1	963.00	2911.41	2917.66		2917.76	0.000795	3.26	567.56	244.16	0.24
1	0.411	PF 1	963.00	2907.69	2917.73	2910.69	2917.73	0.000017	0.65	2593.50	409.89	0.04
1	0.410		Culvert									
1	0.377	PF 1	963.00	2903.36	2907.72	2907.72	2909.11	0.014099	9.57	109.42	48.64	0.93
1	0.33	PF 1	963.00	2896.67	2902.86	2902.86	2904.74	0.017872	11.02	87.47	23.60	1.00
1	0.291	PF 1	963.00	2895.14	2900.61	2900.61	2900.64	0.000578	1.92	656.92	262.58	0.18
1	0.254	PF 1	963.00	2893.94	2897.21	2897.21	2897.42	0.007775	4.75	282.83	232.78	0.63
1	0.214	PF 1	963.00	2888.21	2895.61	2892.59	2895.78	0.000981	3.74	334.07	82.81	0.26
1	0.213		Culvert									
1	0.198	PF 1	1164.00	2888.10	2893.16	2893.16	2894.73	0.007375	10.30	127.06	49.62	0.89
1	0.16	PF 1	1164.00	2886.66	2891.24	2891.24	2892.72	0.007358	9.92	128.27	50.10	0.92
1	0.118	PF 1	1164.00	2885.50	2889.43	2889.43	2890.21	0.007417	9.13	207.49	124.65	0.90
1	0.084	PF 1	1164.00	2884.60	2888.97		2889.10	0.000920	3.53	445.24	584.35	0.33
1	0.044	PF 1	1164.00	2882.62	2887.26	2887.26	2888.53	0.010016	9.06	128.51	51.05	1.01


dw25 Plan: Plan 01 4/10/2014
25 1
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Elevation (ft)
2940
2930
2920
2910
2900
2890
2880
0
500
1000
1500
2000
2500
Main Channel Distance (ft)

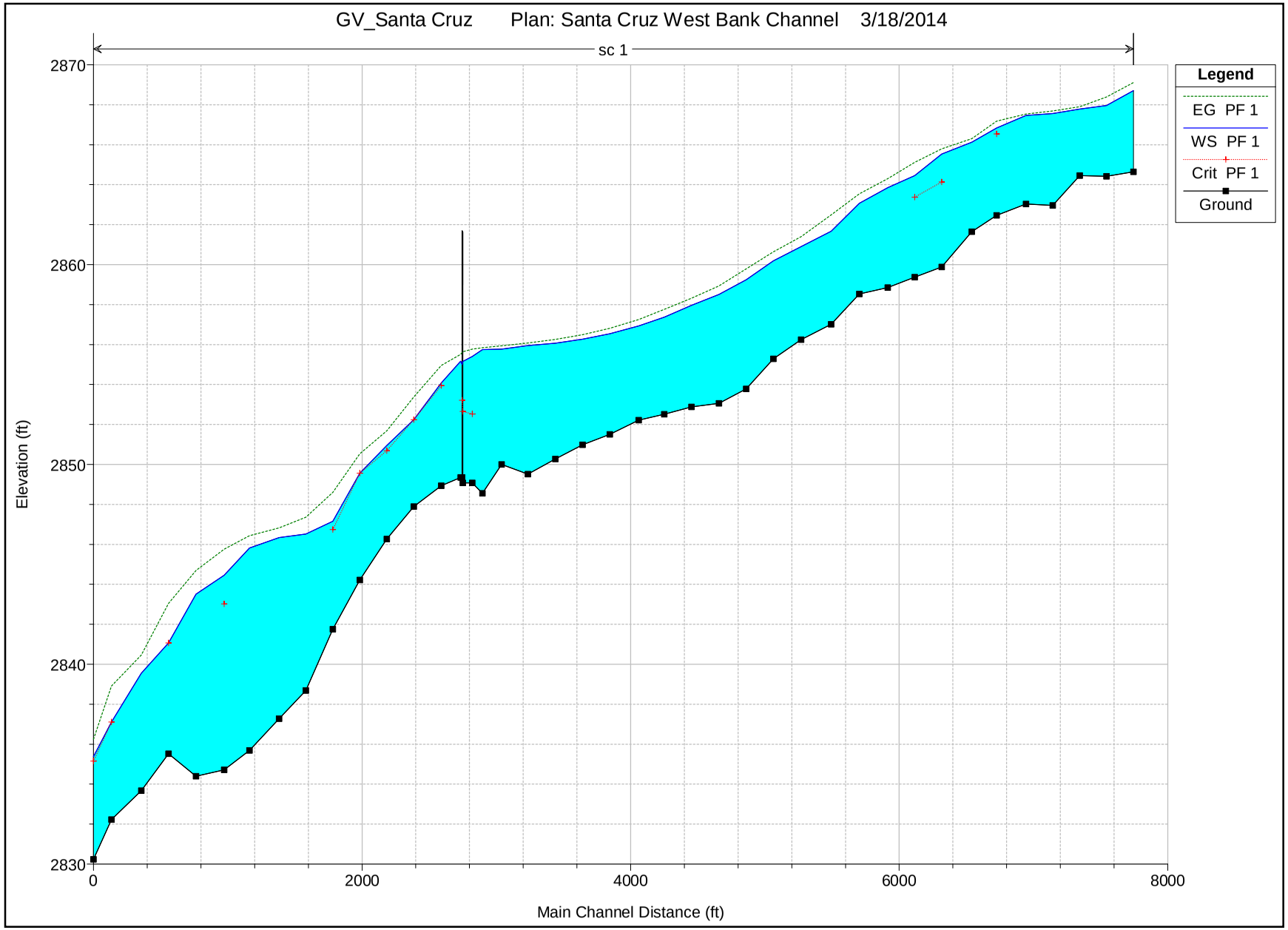
SANTA CRUZ WEST CHANNEL

HEC-RAS Plan: scw River: sc Reach: 1 Profile: PF 1

Reach	River Sta	Profile	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)	
1	1.48	PF 1	1286.00	2864.64	2868.71		2869.11	0.003170	5.06	253.93	81.22	0.50
1	1.44	PF 1	1286.00	2864.42	2867.96		2868.39	0.004112	5.22	246.18	91.78	0.56
1	1.40	PF 1	1286.00	2864.45	2867.79		2867.90	0.001144	2.74	470.00	306.94	0.30
1	1.37	PF 1	1286.00	2862.96	2867.56		2867.69	0.000939	2.89	445.58	404.09	0.28
1	1.33	PF 1	1542.00	2863.03	2867.46		2867.54	0.000562	2.25	694.74	509.07	0.22
1	1.29	PF 1	1542.00	2862.47	2866.84	2866.54	2867.18	0.012110	5.70	366.05	646.72	0.86
1	1.25	PF 1	1542.00	2861.65	2866.13		2866.30	0.002321	4.18	575.47	478.49	0.43
1	1.21	PF 1	1743.00	2859.88	2865.53	2864.14	2865.79	0.002222	4.61	708.45	629.15	0.43
1	1.17	PF 1	1743.00	2859.37	2864.45	2863.38	2865.12	0.004742	6.55	290.62	574.63	0.63
1	1.13	PF 1	1743.00	2858.85	2863.85		2864.30	0.003041	5.40	323.07	366.31	0.51
1	1.09	PF 1	2200.00	2858.53	2863.07		2863.54	0.004142	5.88	475.37	202.52	0.58
1	1.05	PF 1	2200.00	2857.02	2861.67		2862.49	0.005644	7.26	303.00	112.45	0.69
1	1.01	PF 1	2200.00	2856.24	2860.90		2861.40	0.003625	5.65	393.75	288.20	0.55
1	0.97	PF 1	2200.00	2855.28	2860.19		2860.64	0.003578	5.42	415.44	270.80	0.54
1	0.93	PF 1	2200.00	2853.78	2859.24		2859.79	0.004876	5.96	369.48	137.50	0.62
1	0.89	PF 1	2200.00	2853.06	2858.51		2858.93	0.003407	5.23	420.29	136.56	0.53
1	0.86	PF 1	2200.00	2852.88	2857.96		2858.31	0.002558	4.76	462.75	143.05	0.46
1	0.82	PF 1	2200.00	2852.51	2857.37		2857.76	0.002889	4.97	443.02	152.08	0.49
1	0.78	PF 1	2200.00	2852.22	2856.93		2857.25	0.002265	4.54	484.35	232.78	0.44
1	0.74	PF 1	2200.00	2851.51	2856.54		2856.82	0.001719	4.20	524.25	142.53	0.38
1	0.70	PF 1	2200.00	2850.98	2856.27		2856.50	0.001345	3.87	568.62	144.23	0.34
1	0.66	PF 1	2200.00	2850.27	2856.07		2856.25	0.000967	3.44	654.03	271.62	0.29
1	0.63	PF 1	2200.00	2849.52	2855.95		2856.08	0.000624	2.92	797.73	279.79	0.24
1	0.59	PF 1	2200.00	2850.00	2855.77		2855.94	0.000852	3.24	686.42	186.47	0.28
1	0.56	PF 1	2200.00	2848.56	2855.75		2855.84	0.000341	2.45	915.30	220.47	0.18
1	0.55	PF 1	2200.00	2849.08	2855.41	2852.52	2855.77	0.001474	4.83	455.48	85.99	0.37
1	0.549		Bridge									
1	0.53	PF 1	2200.00	2849.35	2855.16		2855.51	0.001783	4.71	466.98	106.93	0.40
1	0.50	PF 1	3301.00	2848.93	2854.07	2853.95	2854.95	0.006426	7.74	546.54	371.75	0.73
1	0.46	PF 1	3301.00	2847.89	2852.24	2852.24	2853.37	0.009024	8.65	438.88	281.32	0.86
1	0.43	PF 1	3301.00	2846.27	2850.95	2850.69	2851.68	0.005073	7.34	639.60	351.12	0.66
1	0.39	PF 1	3301.00	2844.22	2849.56	2849.56	2850.54	0.006184	8.25	560.66	422.40	0.73
1	0.35	PF 1	3301.00	2841.75	2847.15	2846.74	2848.60	0.008651	9.65	342.20	229.45	0.86
1	0.31	PF 1	3301.00	2838.69	2846.52		2847.36	0.003533	7.34	449.58	117.44	0.57
1	0.27	PF 1	3301.00	2837.28	2846.34		2846.83	0.001415	5.64	592.40	211.97	0.38
1	0.23	PF 1	3301.00	2835.69	2845.81		2846.44	0.002122	6.37	556.71	203.60	0.45
1	0.20	PF 1	3301.00	2834.71	2844.46	2843.02	2845.76	0.005516	9.17	360.15	68.85	0.70
1	0.16	PF 1	3301.00	2834.39	2843.50		2844.70	0.004441	8.77	376.53	64.49	0.64

HEC-RAS Plan: scw River: sc Reach: 1 Profile: PF 1 (Continued)

Reach	River Sta	Profile	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)	
1	0.12	PF 1	5099.00	2835.52	2841.07	2841.07	2843.05	0.011941	11.28	451.84	116.37	1.01
1	0.08	PF 1	5099.00	2833.67	2839.55		2840.47	0.004154	7.67	664.92	137.65	0.61
1	0.04	PF 1	5099.00	2832.23	2837.11	2837.11	2838.91	0.012126	10.75	474.28	133.95	1.01
1	0.00	PF 1	5099.00	2830.24	2835.39	2835.15	2836.25	0.010006	7.89	750.52	344.62	0.87


GV_Santa Cruz Plan: Santa Cruz West Bank Channel 3/18/2014
sc 1
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Elevation (ft)
2870
2860
2850
2840
2830
0
2000
4000
6000
8000
Main Channel Distance (ft)

APPENDIX M

RFCD - GREEN VALLEY 2013 DRAINAGEWAY EVALUATIONS

PIMA COUNTY
REGIONAL FLOOD CONTROL DISTRICT
97 EAST CONGRESS STREET, THIRD FLOOR
TUCSON, ARIZONA 85701-1797

SUZANNE SHIELDS, P.E.
DIRECTOR

Phone (520) 243-1800
FAX (520) 243-1821

April 2, 2013

Re: Green Valley 2013 Drainage Way Evaluations

BACKGROUND

The Pima County Regional Flood Control District, herein referred to as the District, conducted an initial study utilizing RS Engineering as the consultant to assess the condition of numerous drainage ways in Green Valley in May 2004. The report, titled *Green Valley Erosion Hazard Assessment Report,* analyzed 25 drainage ways in Green Valley. Since May 2004 the District has completed three phases of repairs and improvements on the drainage ways. To update the 2004 RS Engineering report and evaluate the status of the drainage ways, the *Green Valley 2010 Drainage Way Evaluations* was conducted. The 2010 District report served to update maintenance and engineering priorities for repairs and improvements needed in Green Valley.

The Green Valley 2013 Drainage Way Evaluations was conducted to confirm the projects identified in the 2010 update had been completed, improvements were functioning as designed, and if any new areas within the drainage way system in Green Valley needed improvements.

DISCUSSION

Site visits were conducted in March 2013 by Deirdre Brosnihan and Paul Wassmuth to assess the condition of all of the drainage ways in Green Valley where the District has minimum flowage responsibility. This excludes Drainage Ways #1, #2, #24 and #25 which are private drainage ways. Figure 1 shows the location of the Green Valley Drainage Ways. The remaining drainage ways were walked and photograph to document the condition of the drainage ways. The drainage ways were photographed using a GPS camera to aid later location of the site. The maps that show the drainage ways, District responsibilities, and photo points are provided in Appendix A.

The majority of the drainage ways were in good condition and the only recommended action is to continue vegetation removal and treatment. Minor repairs utilizing additional rip-rap to repair or prevent scour were the most common recommendation. Information and recommendations on conditions of each site for repairs and improvements were compiled in Table 1.

FUTURE PHASES

The District has contracted CMG Engineering to perform a full update on the drainage ways in Green Valley including updated watershed discharges, drainage way capacity calculations, and floodplain mapping. Additionally, the District will continue to address the current summary of needed improvements and routine maintenance.

TABLE 1: Drainage Way Summary

Drainage Way	Direction Details	Notes
DW3	West of Abrego	Additional rock (24”+) at Grade Control 1 and Grade Control 2 to supplement and fill scour hole. All rock on top of bank adjacent to I-19 in scour hole on north bank.
DW3	East of Abrego	Additional rock (24”+) at Grade Control 1 and at Grade Control just prior to Santa Cruz River confluence. Vegetation removal at north bank near Grade Control 1 and confluence with Santa Cruz River vegetation removal.
DW3	East of La Canada	Noted dumping by business (Green Valley Garage Doors) adjacent to I-19 into the drainage way.
DW4	West at Via Alamos	Bank protection needs a slurry to fill holes at top of bank and along seam lines.
DW4	East at Via Alamos	Bank protection needs a slurry to fill holes at top of bank and along seam lines at the corner.
DW4A	South of DW4 N/S	Tree Branch removal.
DW6	West of Abrego	At Santa Cruz River and Grade Control 2 need rock (24”+).
DW7	West of Abrego	West of Golf Course bridge there is an exposed gas line and exposed water/irrigation lines.
DW9	All	Vegetation spraying on new growth needed.
DW9	La Canada to I-19	Trees removed upstream and downstream of boxes to return capacity for flow.
DW17	West of La Canada	Exposed irrigation and larger line adjacent to the utility box.
DW19	All	Vegetation removal to clear out sapplings.

APPENDIX A: Green Valley 2013 Drainage Way Maps and Photographic Log

Pima County Regional Flood Control District
97 E. Congress – 3rd Floor
Tucson, Arizona 85701-1207
(520) 243-1800 FAX (520)243-1821
http://www.rfcd.pima.gov

Green Valley Drainageway No. 3

- Photo Points
- RFCD EASEMENT
- RFCD FULL MAINTENTANCE
- OTHER MAINTENTANCE

1 inch = 600 feet

0 150 300 600 900 1,200 Feet

Date: 4/1/2013

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Green Valley 2013 Drainage Way Evaluations
1
Drainageway Polygon
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N 31° 53' 28"
W 110° 58' 51"
R0012548.JPG
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3/4/2013

Green Valley 2013 Drainage Way Evaluations
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3/4/2013

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2013 9:34:53 AM
3/4/2013

Green Valley 2013 Drainage Way Evaluations
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Green Valley 2013 Drainage Way Evaluations
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3/4/2013

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3/4/2013

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3/4/2013

Green Valley 2013 Drainage Way Evaluations
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Green Valley 2013 Drainage Way Evaluations
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Green Valley 2013 Drainage Way Evaluations
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Green Valley 2013 Drainage Way Evaluations
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Drainageway Polygon
2594
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W 110° 59' 40"
R0012690.JPG
2012:43:52 PM
3/11/2013

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Green Valley Drainageway No. 4

- Photo Points
- RFCD EASEMENT
- RFCD FULL MAINTENTANCE
- OTHER MAINTENTANCE

1 inch = 600 feet

0 150 300 600 900 1,200 Feet

Date: 4/1/2013

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Green Valley 2013 Drainage Way Evaluations
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3/18/2013

Green Valley 2013 Drainage Way Evaluations
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R0012698.JPG
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3/18/2013

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3/18/2013

Green Valley 2013 Drainage Way Evaluations
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Green Valley 2013 Drainage Way Evaluations
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Green Valley 2013 Drainage Way Evaluations
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Green Valley 2013 Drainage Way Evaluations
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3/18/2013

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Green Valley Drainageway No. 5

- Photo Points
- RFCD EASEMENT
- RFCD FULL MAINTENTANCE
- OTHER MAINTENTANCE

1 inch = 600 feet

0 150 300 600 900 1,200 Feet

Date: 4/1/2013

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Green Valley 2013 Drainage Way Evaluations
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Green Valley 2013 Drainage Way Evaluations
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3/18/2013

Green Valley 2013 Drainage Way Evaluations
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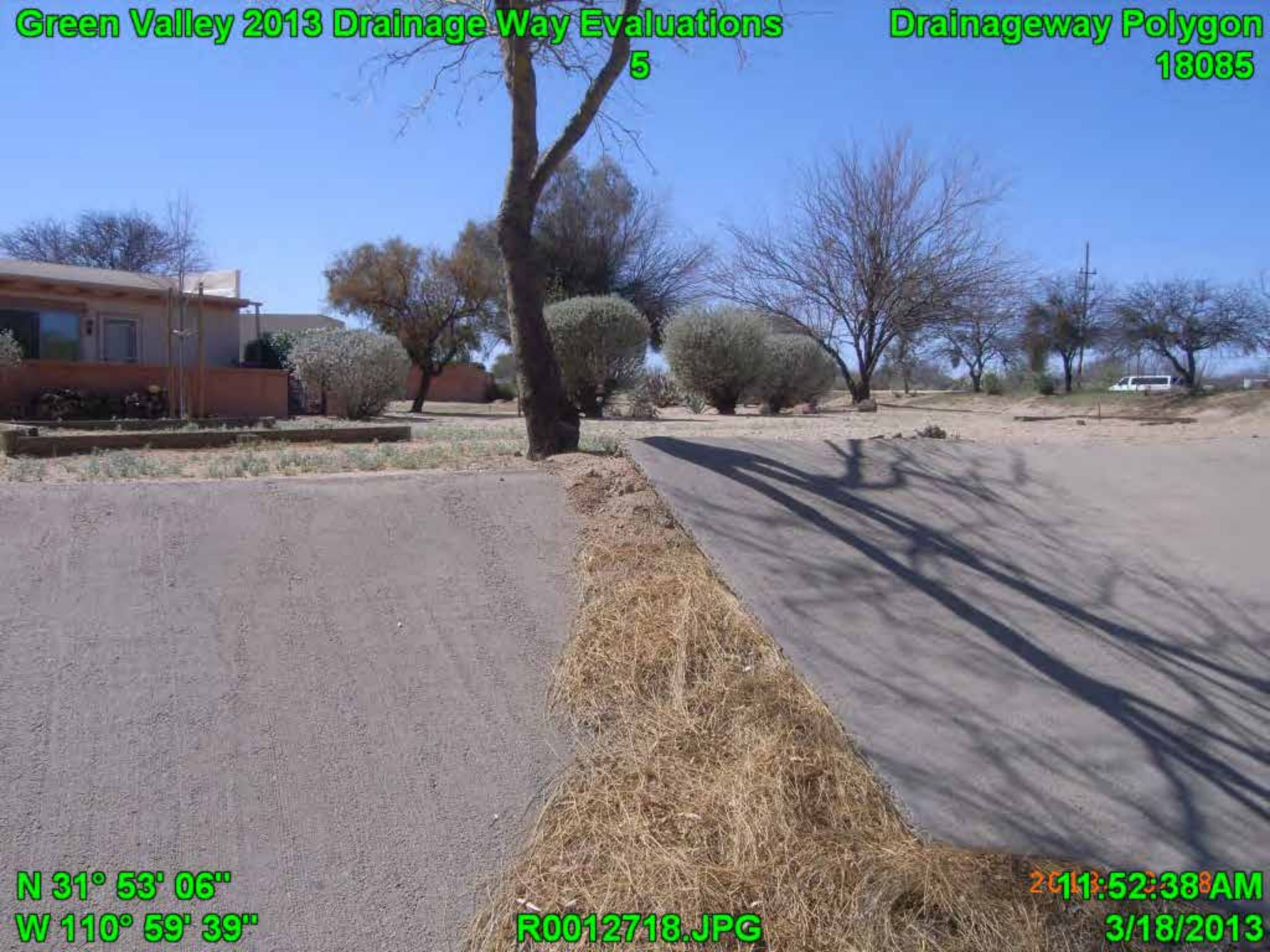
3/18/2013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Green Valley 2013 Drainage Way Evaluations
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Green Valley 2013 Drainage Way Evaluations
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Green Valley 2013 Drainage Way Evaluations
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3/18/2013

Green Valley 2013 Drainage Way Evaluations
9
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19344
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12:04:48 PM
3/18/2013

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(520) 243-1800 FAX (520)243-1821
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Green Valley Drainageway No. 6

- Photo Points
- RFCD EASEMENT
- RFCD FULL MAINTENTANCE
- OTHER MAINTENTANCE

1 inch = 600 feet

0 150 300 600 900 1,200 Feet

Date: 4/1/2013

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Green Valley 2013 Drainage Way Evaluations
1
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3/4/2013

Green Valley 2013 Drainage Way Evaluations
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3/4/2013

Green Valley 2013 Drainage Way Evaluations
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3/4/2013

Green Valley 2013 Drainage Way Evaluations
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3/4/2013

Green Valley 2013 Drainage Way Evaluations
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Green Valley 2013 Drainage Way Evaluations
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3/4/2013

Green Valley 2013 Drainage Way Evaluations
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3/4/2013

Green Valley 2013 Drainage Way Evaluations
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3/4/2013

Green Valley 2013 Drainage Way Evaluations
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3/4/2013

Green Valley 2013 Drainage Way Evaluations
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3/4/2013

Green Valley 2013 Drainage Way Evaluations
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Green Valley 2013 Drainage Way Evaluations
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Green Valley 2013 Drainage Way Evaluations
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Green Valley 2013 Drainage Way Evaluations
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3/4/2013

Green Valley 2013 Drainage Way Evaluations
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R0012579.JPG
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3/4/2013

Green Valley 2013 Drainage Way Evaluations
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3/4/2013

Green Valley 2013 Drainage Way Evaluations
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3/4/2013

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3/4/2013

Green Valley 2013 Drainage Way Evaluations
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3/4/2013

Green Valley 2013 Drainage Way Evaluations
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3/4/2013

Green Valley 2013 Drainage Way Evaluations
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3/4/2013

Green Valley 2013 Drainage Way Evaluations
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Green Valley 2013 Drainage Way Evaluations
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3/18/2013

Green Valley 2013 Drainage Way Evaluations
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3/18/2013

Green Valley 2013 Drainage Way Evaluations
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Drainageway Polygon
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R0012726.JPG
1:34:53 PM
3/18/2013

Green Valley 2013 Drainage Way Evaluations
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Green Valley 2013 Drainage Way Evaluations
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3/18/2013

Green Valley 2013 Drainage Way Evaluations
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3/18/2013

Green Valley 2013 Drainage Way Evaluations
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3/18/2013

Green Valley 2013 Drainage Way Evaluations
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3/18/2013

Green Valley 2013 Drainage Way Evaluations
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Green Valley 2013 Drainage Way Evaluations
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Green Valley 2013 Drainage Way Evaluations
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3/18/2013

Green Valley 2013 Drainage Way Evaluations
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2608
N 31° 52' 37"
W 110° 59' 49"
R0012735.JPG
2:07:08 PM
3/18/2013

Green Valley 2013 Drainage Way Evaluations
37
Drainageway Polygon
2608
N 31° 52' 29"
W 110° 59' 53"
R0012736.JPG
2:12:17 PM
3/18/2013

Green Valley 2013 Drainage Way Evaluations
38
Drainageway Polygon
2608
N 31° 52' 23"
W 110° 59' 56"
R0012737.JPG
2:14:15 PM
3/18/2013

Pima County Regional Flood Control District
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Tucson, Arizona 85701-1207
(520) 243-1800 FAX (520)243-1821
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Green Valley Drainageway No. 7

- Photo Points
- RFCD EASEMENT
- RFCD FULL MAINTENTANCE
- OTHER MAINTENTANCE

1 inch = 750 feet

0 190 380 760 1,140 1,520 Feet

Date: 4/1/2013

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This product is subject to the GIS Division Disclaimer and Use Restrictions.

Green Valley 2013 Drainage Way Evaluations
1
Drainageway Polygon
19183
N 31° 52' 21"
W 110° 59' 19"
R0012588.JPG
11:30:28 AM
3/4/2013

Green Valley 2013 Drainage Way Evaluations
2
Drainageway Polygon
19183
N 31° 52' 21"
W 110° 59' 19"
R0012589.JPG
11:30:57 AM
3/4/2013

Green Valley 2013 Drainage Way Evaluations
3
Drainageway Polygon
19183
N 31° 52' 21"
W 110° 59' 22"
R0012590.JPG
11:33:57 AM
3/4/2013

Green Valley 2013 Drainage Way Evaluations
4
Drainageway Polygon
19187
N 31° 52' 21"
W 110° 59' 23"
R0012591.JPG
11:34:37 AM
3/4/2013

Green Valley 2013 Drainage Way Evaluations
5
Drainageway Polygon
19186
N 31° 52' 21"
W 110° 59' 18"
R0012592.JPG
11:42:02 AM
3/4/2013

Green Valley 2013 Drainage Way Evaluations
6
Drainageway Polygon
19184
N 31° 52' 21"
W 110° 59' 18"
R0012593.JPG
11:43:16 AM
3/4/2013

Green Valley 2013 Drainage Way Evaluations
7
Drainageway Polygon
19186
N 31° 52' 21"
W 110° 59' 14"
R0012594.JPG
11:45:02 AM
3/4/2013

Green Valley 2013 Drainage Way Evaluations
8
Drainageway Polygon
19186
N 31° 52' 21"
W 110° 59' 15"
R0012595.JPG
2013:45:47 AM
3/4/2013

Green Valley 2013 Drainage Way Evaluations
9
Drainageway Polygon
2614
N 31° 52' 21"
W 110° 59' 10"
R0012596.JPG
11:48:18 AM
3/4/2013

Green Valley 2013 Drainage Way Evaluations
10
Drainageway Polygon
2614
N 31° 52' 22"
W 110° 59' 10"
R0012597.JPG
2013:48:57 4AM
3/4/2013

Green Valley 2013 Drainage Way Evaluations
11
Drainageway Polygon
2614
N 31° 52' 22"
W 110° 59' 06"
R0012598.JPG
11:53:51 AM
3/4/2013

Green Valley 2013 Drainage Way Evaluations
12
Drainageway Polygon
2614
N 31° 52' 22"
W 110° 59' 08"
R0012599.JPG
11:55:03AM
3/4/2013

Green Valley 2013 Drainage Way Evaluations
13
Drainageway Polygon
2614
N 31° 52' 22"
W 110° 59' 04"
R0012600.JPG
11:57:27 AM
3/4/2013

Green Valley 2013 Drainage Way Evaluations
14
Drainageway Polygon
2614
N 31° 52' 23"
W 110° 58' 60"
R0012601.JPG
11:59:48 AM
3/4/2013

Green Valley 2013 Drainage Way Evaluations
15
Drainageway Polygon
2614
N 31° 52' 23"
W 110° 58' 60"
R0012602.JPG
11:59:56 AM
3/4/2013

Green Valley 2013 Drainage Way Evaluations
16
Drainageway Polygon
2614
N 31° 52' 23"
W 110° 58' 57"
R0012603.JPG
12:01:27 PM
3/4/2013

Green Valley 2013 Drainage Way Evaluations
17
Drainageway Polygon
2614
N 31° 52' 23"
W 110° 58' 57"
R0012604.JPG
12:02:57 PM
3/4/2013

Green Valley 2013 Drainage Way Evaluations
18
Drainageway Polygon
2614
N 31° 52' 23"
W 110° 58' 54"
R0012605.JPG
12:04:24 PM
3/4/2013

Green Valley 2013 Drainage Way Evaluations
19
Drainageway Polygon
2614
N 31° 52' 23"
W 110° 58' 52"
R0012606.JPG
12:05:42 PM
3/4/2013

Green Valley 2013 Drainage Way Evaluations
20
Drainageway Polygon
2614
N 31° 52' 23"
W 110° 58' 51"
R0012607.JPG
2012:07:04 12:04PM
3/4/2013

Green Valley 2013 Drainage Way Evaluations
21
Drainageway Polygon
2614
N 31° 52' 23"
W 110° 58' 50"
R0012608.JPG
12:07:59 PM
3/4/2013

Green Valley 2013 Drainage Way Evaluations
22
Drainageway Polygon
2614
N 31° 52' 24"
W 110° 58' 49"
R0012609.JPG
12:09:00 PM
3/4/2013

Green Valley 2013 Drainage Way Evaluations
23
Drainageway Polygon
2617
N 31° 52' 15"
W 110° 59' 59"
R0012738.JPG
2:21:24PM
3/18/2013

Green Valley 2013 Drainage Way Evaluations
24
Drainageway Polygon
2617
N 31° 52' 15"
W 110° 59' 60"
R0012739.JPG
2012:22:12 PM
3/18/2013

Green Valley 2013 Drainage Way Evaluations
25
Drainageway Polygon
2617
N 31° 52' 15"
W 110° 59' 60"
R0012740.JPG
2:22:54 PM
3/18/2013

Green Valley 2013 Drainage Way Evaluations
26
Drainageway Polygon
2617
N 31° 52' 17"
W 110° 59' 59"
R0012741.JPG
2:24:20 PM
3/18/2013

Green Valley 2013 Drainage Way Evaluations
27
Drainageway Polygon
2617
N 31° 52' 17"
W 110° 59' 59"
R0012742.JPG
2:24:51 PM
3/18/2013

Green Valley 2013 Drainage Way Evaluations
28
Drainageway Polygon
2617
N 31° 52' 17"
W 110° 59' 59"
R0012743.JPG
2:25:10 PM
3/18/2013

Green Valley 2013 Drainage Way Evaluations
29
Drainageway Polygon
2617
N 31° 52' 18"
W 110° 59' 58"
R0012744.JPG
2:25:40 PM
3/18/2013

Green Valley 2013 Drainage Way Evaluations
30
Drainageway Polygon
2617
N 31° 52' 18"
W 110° 59' 58"
R0012745.JPG
2:26:03 PM
3/18/2013

Green Valley 2013 Drainage Way Evaluations
31
Drainageway Polygon
2617
N 31° 52' 18"
W 110° 59' 57"
R0012746.JPG
2:28:32 PM
3/18/2013

Green Valley 2013 Drainage Way Evaluations
32
Drainageway Polygon
2617
N 31° 52' 18"
W 110° 59' 56"
R0012747.JPG
2:29:53 PM
3/18/2013

Green Valley 2013 Drainage Way Evaluations
33
Drainageway Polygon
2617
N 31° 52' 18"
W 110° 59' 56"
R0012748.JPG
2:30:17 PM
3/18/2013

Green Valley 2013 Drainage Way Evaluations
34
Drainageway Polygon
2617
N 31° 52' 18"
W 110° 59' 53"
R0012749.JPG
2:32:13 PM
3/18/2013

Green Valley 2013 Drainage Way Evaluations
35
Drainageway Polygon
2617
N 31° 52' 19"
W 110° 59' 46"
R0012750.JPG
2:35:15 PM
3/18/2013

Green Valley 2013 Drainage Way Evaluations
36
Drainageway Polygon
2617
N 31° 52' 19"
W 110° 59' 45"
R0012751.JPG
2:36:05 PM
3/18/2013

Green Valley 2013 Drainage Way Evaluations
37
Drainageway Polygon
2582
N 31° 52' 19"
W 110° 59' 40"
R0012752.JPG
2:53:14 PM
3/18/2013

Green Valley 2013 Drainage Way Evaluations
38
Drainageway Polygon
2582
N 31° 52' 19"
W 110° 59' 40"
R0012753.JPG
2:53:56 PM
3/18/2013

Green Valley 2013 Drainage Way Evaluations
39
Drainageway Polygon
2582
N 31° 52' 20"
W 110° 59' 35"
R0012754.JPG
2:56:45 PM
3/18/2013

Green Valley 2013 Drainage Way Evaluations
40
Drainageway Polygon
2582
N 31° 52' 20"
W 110° 59' 31"
R0012755.JPG
2:58:40PM
3/18/2013

Green Valley 2013 Drainage Way Evaluations
41
Drainageway Polygon
2582
N 31° 52' 20"
W 110° 59' 27"
R0012756.JPG
2013 3:00:48 PM
3/18/2013

Green Valley 2013 Drainage Way Evaluations
42
Drainageway Polygon
3460
N 31° 52' 14"
W 111° 00' 04"
MAR 26 2013 08
RIMG1836.JPG
9:29:38 AM
3/26/2013

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Green Valley Drainageway No. 8

- Photo Points
- RFCD EASEMENT
- RFCD FULL MAINTENTANCE
- OTHER MAINTENTANCE

1 inch = 500 feet

0 125 250 500 750 1,000 Feet

Date: 4/1/2013

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Green Valley 2013 Drainage Way Evaluations
1
Drainageway Polygon
19203
N 31° 52' 02"
W 110° 59' 22"
R0012610.JPG
2013-11-1 10:35 AM
3/11/2013

Green Valley 2013 Drainage Way Evaluations
2
Drainageway Polygon
19202
N 31° 52' 02"
W 110° 59' 25"
R0012611.JPG
9:13:37 AM
3/11/2013

Green Valley 2013 Drainage Way Evaluations
3
Drainageway Polygon
19202
N 31° 52' 02"
W 110° 59' 26"
R0012612.JPG
2013 9:14:39 AM
3/11/2013

Green Valley 2013 Drainage Way Evaluations
4
Drainageway Polygon
19204
N 31° 52' 01"
W 110° 59' 20"
R0012613.JPG
9:17:12 AM
3/11/2013

Green Valley 2013 Drainage Way Evaluations
5
Drainageway Polygon
19204
N 31° 52' 01"
W 110° 59' 20"
R0012614.JPG
9:19:14 AM
3/11/2013

Green Valley 2013 Drainage Way Evaluations
6
Drainageway Polygon
19260
N 31° 51' 59"
W 110° 59' 16"
R0012615.JPG
2013:10:21 10:56:11AM
3/11/2013

Green Valley 2013 Drainage Way Evaluations
7
Drainageway Polygon
19205
N 31° 51' 59"
W 110° 59' 15"
R0012616.JPG
9:23:32 AM
3/11/2013

Green Valley 2013 Drainage Way Evaluations
8
Drainageway Polygon
19205
N 31° 51' 59"
W 110° 59' 15"
R0012617.JPG
9:25:10 AM
3/11/2013

Green Valley 2013 Drainage Way Evaluations
9
Drainageway Polygon
19205
N 31° 51' 57"
W 110° 59' 11"
R0012618.JPG
2013 9:26:55 AM
3/11/2013

Green Valley 2013 Drainage Way Evaluations
10
Drainageway Polygon
19349
N 31° 51' 56"
W 110° 59' 06"
R0012619.JPG
2013:29:02 AM
3/11/2013

Green Valley 2013 Drainage Way Evaluations
11
Drainageway Polygon
2618
N 31° 51' 55"
W 110° 59' 01"
R0012620.JPG
9:31:16 AM
3/11/2013

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Green Valley Drainageway No. 9

- Photo Points
- RFCD EASEMENT
- RFCD FULL MAINTENTANCE
- OTHER MAINTENTANCE

1 inch = 750 feet

0 190 380 760 1,140 1,520 Feet

Date: 4/1/2013

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Green Valley 2013 Drainage Way Evaluations
1
Drainageway Polygon
19386
N 31° 51' 48"
W 110° 59' 28"
R0012621.JPG
2013 9:46:28 AM
3/11/2013

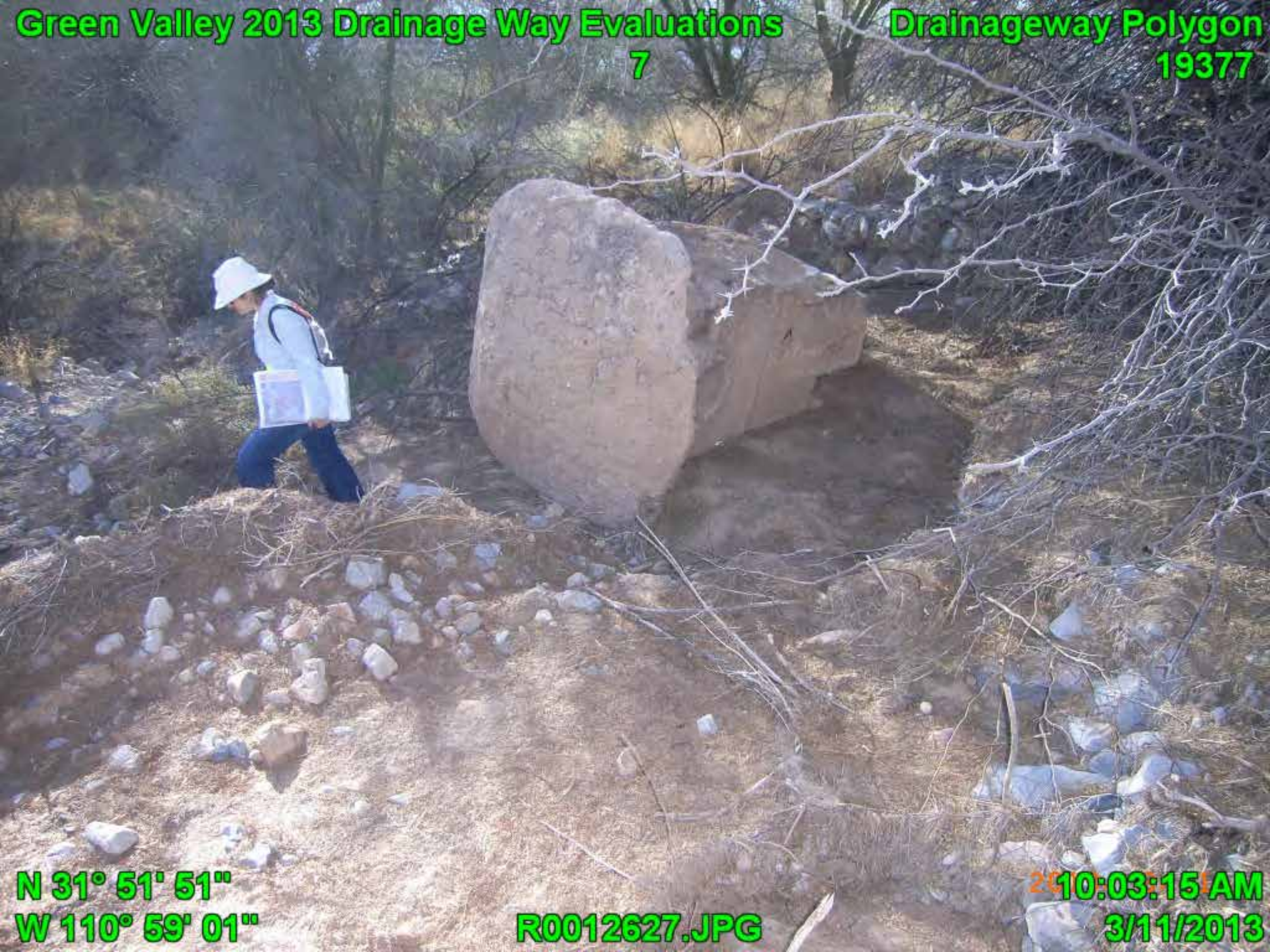
Green Valley 2013 Drainage Way Evaluations
2
Drainageway Polygon
19386
N 31° 51' 49"
W 110° 59' 28"
R0012622.JPG
9:47:57 AM
3/11/2013

Green Valley 2013 Drainage Way Evaluations
3
Drainageway Polygon
19378
N 31° 51' 49"
W 110° 59' 27"
R0012623.JPG
2013 9:49:07 AM
3/11/2013

Green Valley 2013 Drainage Way Evaluations
4
Drainageway Polygon
2717
N 31° 51' 49"
W 110° 59' 25"
R0012624.JPG
9:50:44AM
3/11/2013

Green Valley 2013 Drainage Way Evaluations
5
Drainageway Polygon
2717
N 31° 51' 48"
W 110° 59' 24"
R0012625.JPG
9:51:32 AM
3/11/2013

Green Valley 2013 Drainage Way Evaluations
6
Drainageway Polygon
19377
N 31° 51' 50"
W 110° 59' 11"
R0012626.JPG
2013 9:58:21 AM
3/11/2013


Green Valley 2013 Drainage Way Evaluations
7
Drainageway Polygon
19377
N 31° 51' 51"
W 110° 59' 01"
R0012627.JPG
10:03:15 AM
3/11/2013

Green Valley 2013 Drainage Way Evaluations
8
Drainageway Polygon
19377
N 31° 51' 51"
W 110° 59' 01"
R0012628.JPG
10:03:46 AM
3/11/2013

Green Valley 2013 Drainage Way Evaluations
9
Drainageway Polygon
19377
N 31° 51' 50"
W 110° 59' 00"
R0012629.JPG
10:05:06 AM
3/11/2013

Green Valley 2013 Drainage Way Evaluations
10
Drainageway Polygon
16634
N 31° 52' 11"
W 111° 00' 04"
RIMG1837.JPG
MAR 26 2013 08:36
9:35:17 AM
3/26/2013

Green Valley 2013 Drainage Way Evaluations
11
Drainageway Polygon
2586
N 31° 52' 08"
W 111° 00' 03"
MAR 26 2013 08:
RIMG1838.JPG
9:36:59 AM
3/26/2013

Green Valley 2013 Drainage Way Evaluations
12
Drainageway Polygon
2586
N 31° 52' 03"
W 111° 00' 05"
RIMG1839.JPG
MAR 26 2013 08:41
9:39:47 AM
3/26/2013

Green Valley 2013 Drainage Way Evaluations
13
Drainageway Polygon
2586
N 31° 52' 03"
W 111° 00' 05"
RIMG1840.JPG
MAR 26 2013 08:47
9:40:58 AM
3/26/2013

Green Valley 2013 Drainage Way Evaluations
14
Drainageway Polygon
2586
N 31° 52' 01"
W 111° 00' 06"
RIMG1841.JPG
MAR 26 2013 08:44
9:43:02 AM
3/26/2013

Green Valley 2013 Drainage Way Evaluations
15
Drainageway Polygon
2586
N 31° 51' 58"
W 111° 00' 08"
MAR 26 2013 08:47
RIMG1842.JPG
9:45:36 AM
3/26/2013

Green Valley 2013 Drainage Way Evaluations
16
Drainageway Polygon
19398
N 31° 51' 57"
W 111° 00' 09"
RIMG1843.JPG
MAR 26 2013 08
9:46:15 AM
3/26/2013

Green Valley 2013 Drainage Way Evaluations
17
Drainageway Polygon
19322
N 31° 51' 57"
W 111° 00' 17"
RIMG1844.JPG
MAR 26 2013 09:15
10:02:15 AM
3/26/2013

Green Valley 2013 Drainage Way Evaluations
18
Drainageway Polygon
19392
N 31° 51' 58"
W 111° 00' 21"
RIMG1845.JPG
MAR 26 2013 09:16
10:05:13 AM
3/26/2013

Green Valley 2013 Drainage Way Evaluations
19
Drainageway Polygon
19392
N 31° 51' 58"
W 111° 00' 22"
RIMG1846.JPG
MAR 26 2013 09:17
10:05:21 AM
3/26/2013

Green Valley 2013 Drainage Way Evaluations
20
Drainageway Polygon
19392
N 31° 51' 59"
W 111° 00' 23"
MAR 26 2013 09:18
RIMG1847.JPG
10:07:12 AM
3/26/2013

Green Valley 2013 Drainage Way Evaluations
21
Drainageway Polygon
19317
N 31° 52' 00"
W 111° 00' 27"
RIMG1848.JPG
MAR 26 2013 09:11
10:09:31 AM
3/26/2013

Green Valley 2013 Drainage Way Evaluations
22

Drainageway Polygon
19388

Green Valley 2013 Drainage Way Evaluations
23
Drainageway Polygon
19381
N 31° 52' 02"
W 111° 00' 30"
RIMG1850.JPG
MAR 26 2013 09:14
10:12:51 AM
3/26/2013

Green Valley 2013 Drainage Way Evaluations
24
Drainageway Polygon
2788
N 31° 52' 01"
W 111° 00' 31"
MAR 26 2013 09:16
RIMG1851.JPG
10:15:18 AM
3/26/2013

Green Valley 2013 Drainage Way Evaluations
25
Drainageway Polygon
19320
N 31° 51' 56"
W 111° 00' 16"
RIMG1852.JPG
MAR 26 2013 09:26
10:24:43 AM
3/26/2013

Green Valley 2013 Drainage Way Evaluations
26
Drainageway Polygon
19320
N 31° 51' 57"
W 111° 00' 14"
RIMG1853.JPG
MAR 26 2013 09:27
10:25:51 AM
3/26/2013

Green Valley 2013 Drainage Way Evaluations
27
Drainageway Polygon
19318
N 31° 51' 57"
W 111° 00' 10"
RIMG1854.JPG
MAR 26 2013 09:24
10:27:44 AM
3/26/2013

Green Valley 2013 Drainage Way Evaluations
28
Drainageway Polygon
24587
N 31° 51' 56"
W 111° 00' 07"
RIMG1855.JPG
MAR 26 2013 09:11
10:29:28 AM
3/26/2013

Green Valley 2013 Drainage Way Evaluations
29
Drainageway Polygon
24587
N 31° 51' 55"
W 111° 00' 05"
RIMG1856.JPG
MAR 26 2013
10:31:01 AM
3/26/2013

Green Valley 2013 Drainage Way Evaluations
30
Drainageway Polygon
24587
N 31° 51' 55"
W 111° 00' 05"
RIMG1857.JPG
MAR 26 2013
10:31:48 AM
3/26/2013

Green Valley 2013 Drainage Way Evaluations
31
Drainageway Polygon
19394
N 31° 51' 53"
W 111° 00' 01"
RIMG1858.JPG
10:34:40 AM
3/26/2013

Green Valley 2013 Drainage Way Evaluations
32
Drainageway Polygon
19394
N 31° 51' 51"
W 110° 59' 58"
MAR 26 2013 09:37
RIMG1859.JPG
10:36:17 AM
3/26/2013

Green Valley 2013 Drainage Way Evaluations
33
Drainageway Polygon
19394
N 31° 51' 50"
W 110° 59' 54"
RIMG1860.JPG
MAR 26 2013 09:39
10:38:14 AM
3/26/2013

Green Valley 2013 Drainage Way Evaluations
34
Drainageway Polygon
19394
N 31° 51' 50"
W 110° 59' 54"
MAR 26 2013 09:40
RIMG1861.JPG
10:38:41 AM
3/26/2013

Green Valley 2013 Drainage Way Evaluations
35
Drainageway Polygon
19394
N 31° 51' 49"
W 110° 59' 53"
RIMG1862.JPG
MAR 26 2013 09:41
10:39:23 AM
3/26/2013

Green Valley 2013 Drainage Way Evaluations
36
Drainageway Polygon
19394
N 31° 51' 48"
W 110° 59' 52"
RIMG1863.JPG
MAR 26 2013
10:40:47 AM
3/26/2013

Green Valley 2013 Drainage Way Evaluations
37
Drainageway Polygon
19394
N 31° 51' 46"
W 110° 59' 49"
RIMG1864.JPG
MAR 26 2013 09:44
10:42:55 AM
3/26/2013

Green Valley 2013 Drainage Way Evaluations
38
Drainageway Polygon
18047
N 31° 51' 47"
W 110° 59' 46"
RIMG1865.JPG
MAR 26 2013
11:16:23 AM
3/26/2013

Green Valley 2013 Drainage Way Evaluations
39
Drainageway Polygon
18047
N 31° 51' 47"
W 110° 59' 41"
RIMG1866.JPG
11:19:18 AM
3/26/2013

Green Valley 2013 Drainage Way Evaluations
40
Drainageway Polygon
18047
N 31° 51' 48"
W 110° 59' 33"
RIMG1867.JPG
MAR 26 2013 10:28
11:22:38 AM
3/26/2013

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Green Valley Drainageway No. 10, 11 & 12

- Photo Points
- RFCD EASEMENT
- RFCD FULL MAINTENTANCE
- OTHER MAINTENTANCE

1 inch = 300 feet

0 75 150 300 450 600 Feet

Date: 4/1/2013

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Green Valley 2013 Drainage Way Evaluations
1
Drainageway Polygon
2754
N 31° 51' 47"
W 110° 59' 02"
R0012631.JPG
10:11:28 AM
3/11/2013

Green Valley 2013 Drainage Way Evaluations
2
Drainageway Polygon
2776
N 31° 51' 47"
W 110° 59' 06"
R0012632.JPG
10:13:34 AM
3/11/2013

Green Valley 2013 Drainage Way Evaluations
3
Drainageway Polygon
2766
N 31° 51' 41"
W 110° 59' 09"
R0012633.JPG
10:28:02 AM
3/11/2013

Green Valley 2013 Drainage Way Evaluations
4
Drainageway Polygon
2767
N 31° 51' 37"
W 110° 59' 10"
R0012635.JPG
10:36:17 AM
3/11/2013

Green Valley 2013 Drainage Way Evaluations
5
Drainageway Polygon
2767
N 31° 51' 36"
W 110° 59' 07"
R0012636.JPG
10:40:23 AM
3/11/2013

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Green Valley Drainageway No. 13

- Photo Points
- RFCD EASEMENT
- RFCD FULL MAINTENTANCE
- OTHER MAINTENTANCE

1 inch = 600 feet

0 150 300 600 900 1,200 Feet

Date: 4/1/2013

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3/26/2013

Green Valley 2013 Drainage Way Evaluations
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Pima County Regional Flood Control District
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Green Valley Drainageway No. 14-16 & Santa Cruz Easement

- Photo Points
- RFCD EASEMENT
- RFCD FULL MAINTENTANCE
- OTHER MAINTENTANCE

1 inch = 300 feet

0 75 150 300 450 600 Feet

Date: 4/1/2013

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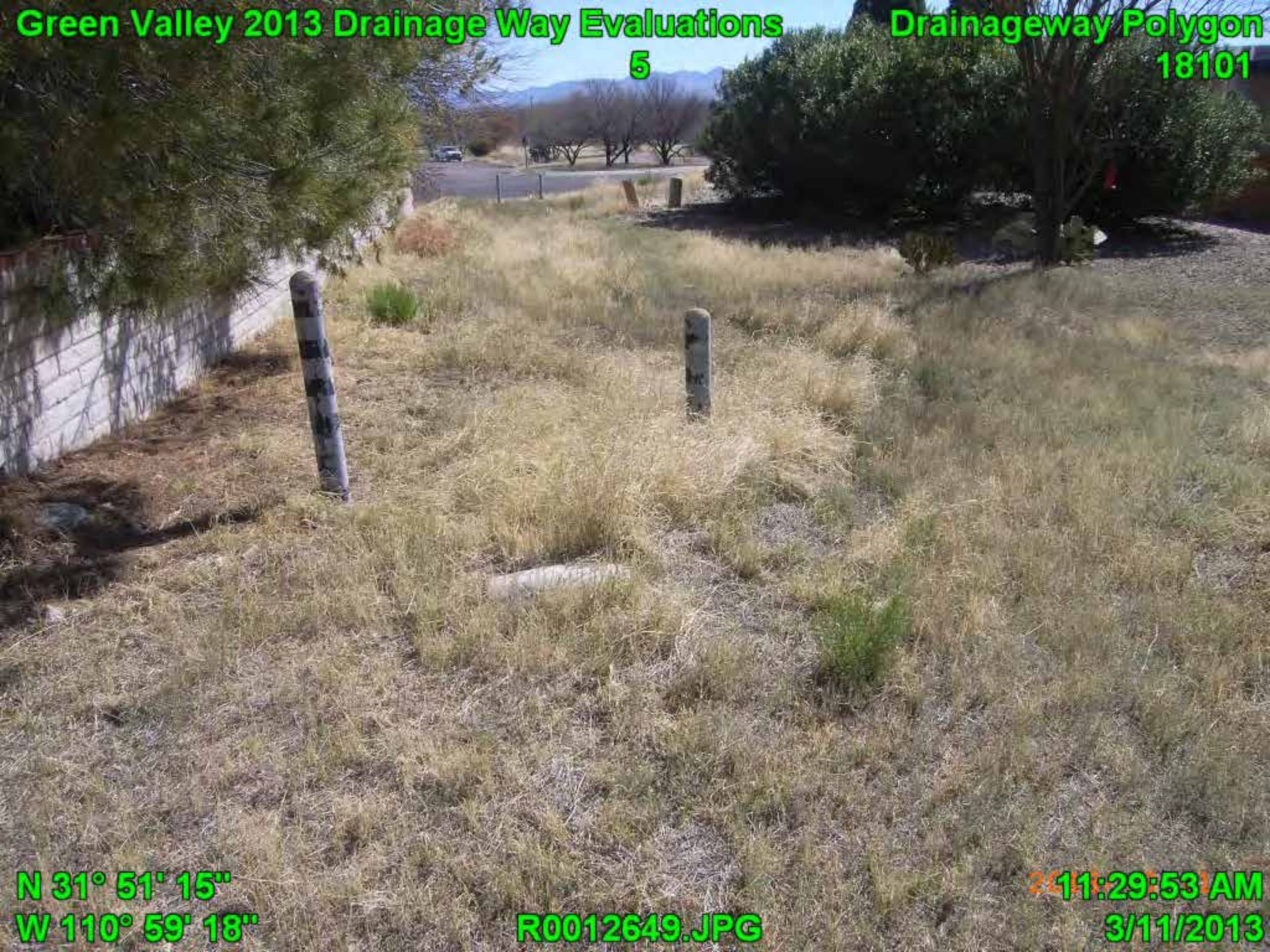
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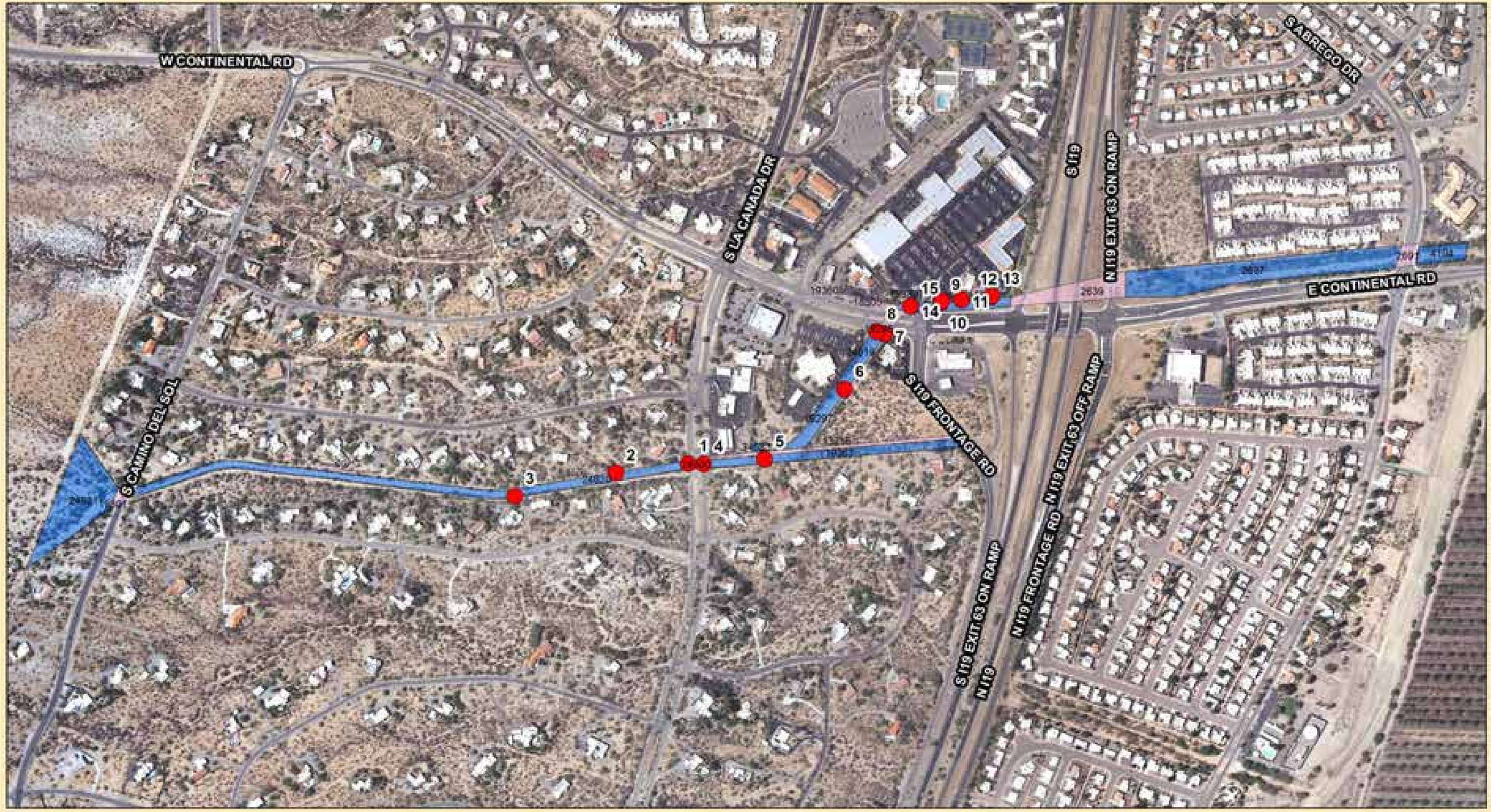

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(520) 243-1800; FAX: (520)243-1821
http://www.rfcd.pima.gov

Green Valley Drainageway No. 14-16 & Santa Cruz Easement

- Photo Points
- RFCD EASEMENT
- RFCD FULL MAINTENTANCE
- OTHER MAINTENTANCE

1 inch = 500 feet

0 125 250 500 750 1,000 Feet

Date: 4/1/2013

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THE SEAL OF PIMA COUNTY ARIZONA

Green Valley 2013 Drainage Way Evaluations
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3/26/2013

Green Valley 2013 Drainage Way Evaluations
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Green Valley 2013 Drainage Way Evaluations
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3/26/2013

Green Valley 2013 Drainage Way Evaluations
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Green Valley 2013 Drainage Way Evaluations
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3/26/2013

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Green Valley Drainageway No. 18-23

- Photo Points
- RFCD EASEMENT
- RFCD FULL MAINTENTANCE
- OTHER MAINTENTANCE

1 inch = 500 feet

0 125 250 500 750 1,000 Feet

Date: 4/1/2013

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Green Valley 2013 Drainage Way Evaluations
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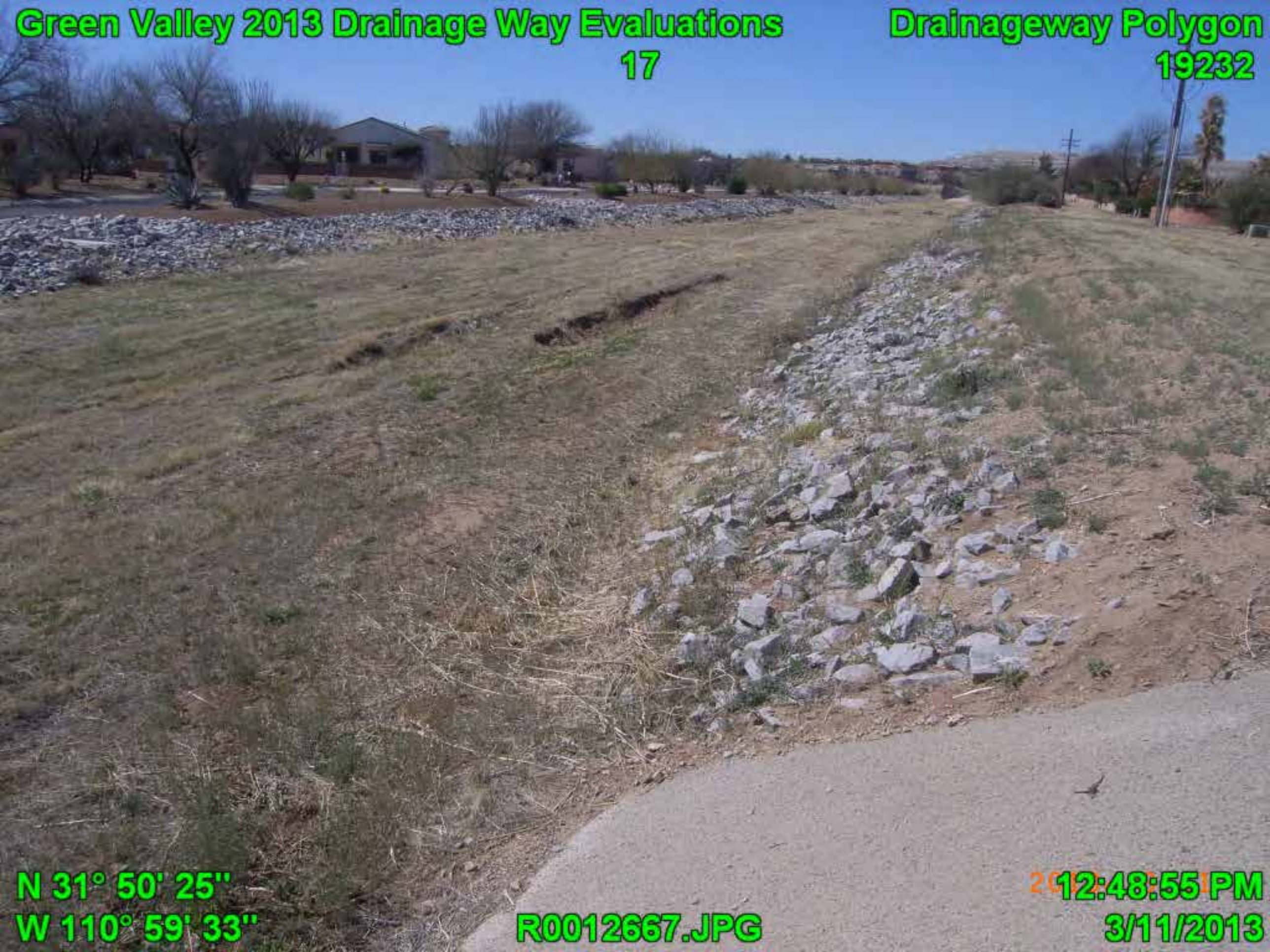
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Green Valley 2013 Drainage Way Evaluations
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2013/ 3/11
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Green Valley 2013 Drainage Way Evaluations
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3/11/2013

APPENDIX N

PRELIMINARY FLOODPLAIN ANALYSIS REPORT FOR DRAINAGEWAY #8

CMG DRAINAGE ENGINEERING, INC.

3555 N. MOUNTAIN AVE. • P.O. BOX 64880 (MAIL) • TUCSON, AZ 85728 • PHONE: (520) 882-4244 • FAX: (520) 888-1421

June 6, 2013

Deirdre Brosnihan, P.E.
Pima County Regional Flood Control District
97 E Congress St, 2nd Floor
Tucson, AZ 85701

Re: Green Valley Drainageway #8 Preliminary Floodplain Analyses

Dear Deirdre:

This letter and the attached appendices are being forwarded to you for review of the advanced floodplain modeling that's been done on Drainageway #8. Short descriptions for each of the exhibits, which are included in Appendix A, or alternatives are provided below to facilitate your review.

Hydrology

Based on the size of the contributing watersheds, Pima County Hydrology method, PC-Hydro, Version 5.4.2, was used to obtain the 100-year discharge rates. Hydrologic parameters were determined according to instructions provided in the PC-Hydro User Guide. Hydrologic computations are provided in Appendix B.

- As shown on Figure 1 (watershed map), four Concentration Points (CP-8A through CP-8D) were determined for Drainageway #8. Two CPs (CP-E and CP-F) were determined at key locations on the streets north of Drainageway #8. Drainage areas and their 100-year discharge rates are summarized in a tabular format on Figure 1.
- Watersheds boundaries for Drainageway #8 and for the CPs on the street have different line types (see the legend on Figure 1). Drainageway #8 watersheds include an area west of I-19, a portion of the I-19 right-of-way, and long narrow watersheds along Drainageway #8 downstream of I-19. Watersheds for CP-E include an area south of Drainageway #8 (marked as "Area drains to CP-E") and an area north of Drainageway #8. The area south of Drainageway #8 drains northerly across Drainageway #8 via two curbed streets, Abrego Drive and Vista Del Rio. These streets have no curb openings and only small grate inlets at Drainageway #8 to transmit flow into the drainageway. Therefore, for this preliminary exercise, we assumed that these two streets would convey the entire flow from the south across Drainageway #8 to CP-E.
- The watershed for CP-F includes the entire drainage areas contributing to CP-E and an additional area to the northwest.

Existing Conditions Floodplain Analyses

US Army Corps of Engineer's HEC-RAS 4.1.0 was used for the hydraulic analyses for Drainageway #8. The normal depth method was used to evaluate street flow. The floodplain analyses results are shown on Figure 2.

Summary of Methodology and Results for Drainageway #8

- A Q100=567 cfs was computed for Drainageway #8 @ I-19. The culvert @ I-19 is 1-6'x4' RCBC, which has a capacity of 171 cfs (approximate 5-year storm). The remainder (approximately 396 cfs) will breakout to the north in a ditch along west of I-19. The headwater elevation developed at the culvert inlet will cause the 396 cfs breakout flow to weir over an embankment onto the southbound I-19 entrance ramp (weir outflow location shown in Magenta with flow arrow) at Esperanza Blvd. The weir flow drains northerly within the I-19 ramp and then turns east on Esperanza Blvd. This weir flow (396 cfs) will eventually make its way to Drainageway #7 or sheet flow to the Santa Cruz River directly.
- We found that the construction plan for this segment of I-19 and this culvert (1-6'x4' RCBC) was dated 1967. No discharge was shown on the plan/profile for this culvert, while bigger culverts (on the same plan set) beneath I-19 in the vicinity were found to be designed to convey the 50-year discharge. CMG's determination of approximate 5-year capacity for the Drainageway #8 culvert obviously disagrees with this design frequency.
- The Q100s used downstream of the I-19 culvert in Drainageway #8 takes the breakout flow upstream of the I-19 culvert (396 cfs) into consideration. For example, at Abrego Drive, the PC-Hydro Q100 is 586 cfs. Deducting the 396 cfs breakout flow, the actual channel flow at Abrego Drive is only 190 cfs (586-396=190).
- The resulting runoff in Drainageway #8 does not break out at the Abrego Drive culvert (2-4.8'x3' CMPA) crossing, and only 0.6 cfs breaks out at the Vista Del Rio culvert (2-4.8'x3' CMPA). The 100-year floodplain limits show that the 100-year runoff is contained within the channel except for the areas where the channel crosses the golf course just before reaching the Santa Cruz River.

Summary of Methodology and Results for Street Flow North of Drainageway #8

- Flow arrows (in Orange) indicate how street flow drains.
- 100-year peak discharges at the two street locations north of Drainageway #8 are 290 cfs (CP-E) and 370 cfs (CP-F), which is a significant amount of flow to be conveyed within the residential streets.
- The normal depth method was used to estimate average the street flow depths at two representative locations (see Figure 2). Street flow depths of 0.85feet and 1.2 feet were determined, respectively at those two locations. The approximate floodplain limits are shown in yellow lines on Figure 2. Please be advised that the floodplain limits shown on Figure 2 do not account for wave action, super-elevation and momentum losses associated with abrupt changes in flow direction. Flow depths overtop curbs by as much as 0.9 feet even when these other factors are not considered.

Preliminary Analysis of Flooding Conditions Associated with Increasing Drainageway #8 Culvert Capacities

This analysis assumed that the culverts/channel upstream of Vista Del Rio have adequate capacity to convey 100-year runoff within Drainageway #8. Hydraulic analyses were again performed using HEC-RAS and were limited to the area downstream of Vista Del Rio. The approximate proposed conditions floodplain limits are shown on Figure 3.

- As shown on Figure 3, 100-year peak flow breaks out of the channel banks near Cross Section 0.2154 and at downstream Cross Sections. Overbank flows on the north side of Drainageway #8 will drain to the open space area between houses and then into the streets. The overbank flows will then either drain to an existing ditch that crosses the golf course, or sheet flow into the Santa Cruz River.
- The floodplain limits north of Drainageway #8, where channel flow breaks out, were approximately drawn by following the street flow and the ditch on the golf course.

Preliminary Analysis of Flooding Conditions Associated with Capturing Abrego Dr. and Vista Del Rio flows at Drainageway #8

This analysis assumes that the peak flows currently being conveyed within Abrego Dr. and Vista Del Rio are captured and directed into Drainageway #8. The method of directing flows to Drainageway #8 at these locations has not yet been evaluated.

- Combined 100-year peak discharges at the two street locations are estimated to be 170 cfs. Directing these flows to Drainageway #8 where the streets cross the channel increases the Drainageway #8 peak flow downstream of Vista Del Rio to approximately 370 cfs. Concurrently, the 100-year peak flow rates at CP-E and CP-F are reduced from 290 cfs and 370 cfs to approximately 120 cfs and 200 cfs, respectively.
- The normal depth method was used to estimate the street flow depths for the assumed conditions. Street flow depths of 0.58 feet and 0.97 feet were determined, respectively for the same two locations analyzed above. This analysis shows that directing an additional 170 cfs to Drainageway #8 decreases flow depths in Los Arcos and Placita Arcos Streets by 0.23 to 0.27 feet.
- The HEC-RAS model for Drainageway #8 downstream of Vista Del Rio was revised to determine flooding limits associated with capturing flows at the Abrego Dr, and Vista Del Rio street crossings. As noted above, the peak discharge rate for this condition is approximately 370 cfs. Results of the HEC-RAS modeling for this condition determined that the existing channel does not have enough capacity to contain additional flows from the streets. Channel improvements would be needed to avoid worsening flooding conditions on adjacent properties. The channel adjacent to the residential subdivision is contained in a public drainageway owned by Pima County and the channel downstream of the subdivision crosses the golf course through a public drainage easement.

Please review this information and let us know if you have any comments. We'd be happy to meet and discuss the results further if needed.

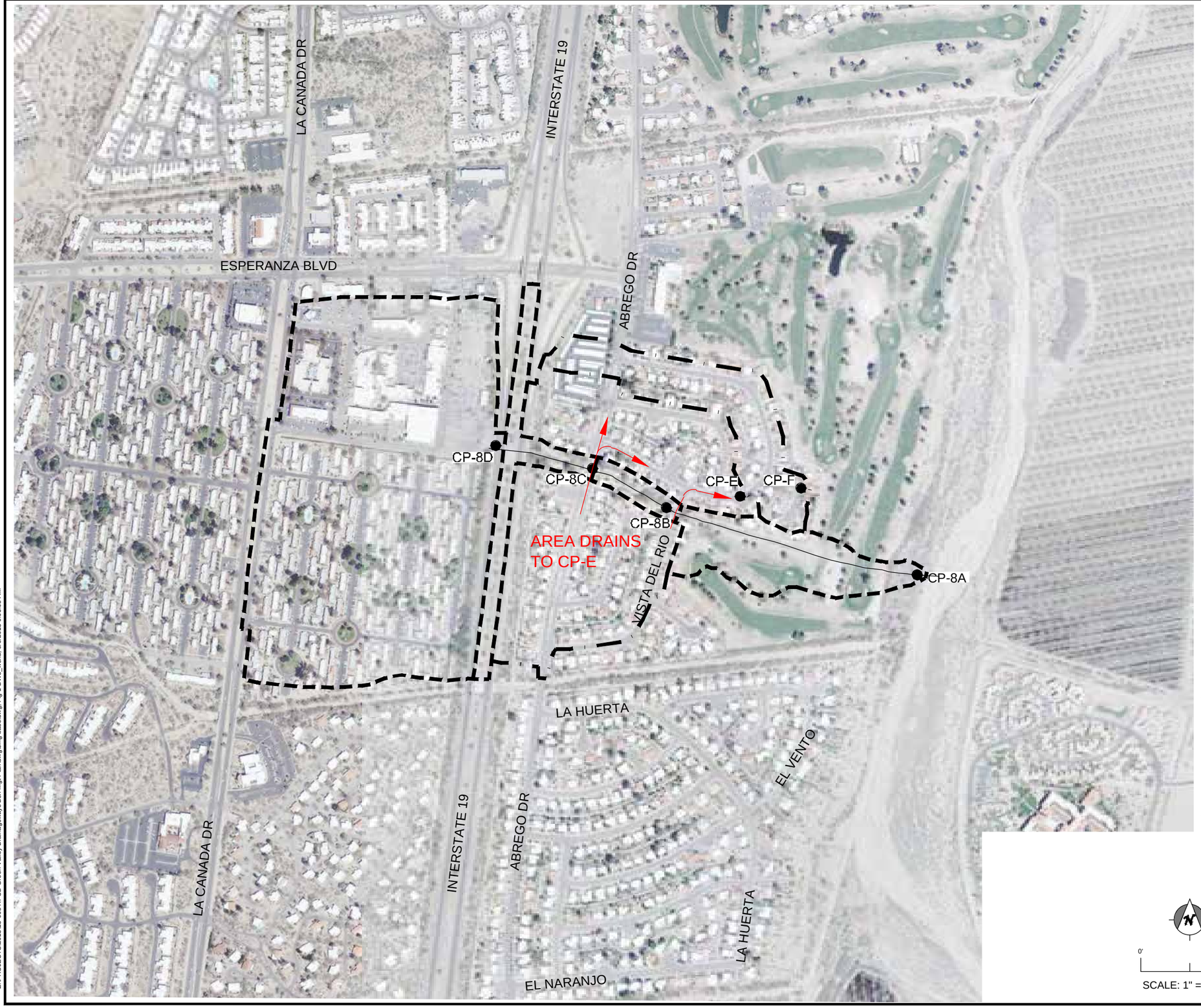
Sincerely,
CMG Drainage Engineering, Inc.

Jiankang Wang, PE

Enclosures:

Appendix A: Figures
Appendix B: Hydrologic Computations
Appendix C: Existing Conditions HEC-RAS Outputs
Appendix D: HEC-RAS Outputs with Increasing Drainageway #8 Culvert Capacities

Appendix A: Figures



CONCENTRATION POINTS SUMMARY TABLE		
ID	AREA (AC)	Q_{100}(CFS)*
CP-8A	95.4	597
CP-8B	84.10	588
CP-8C	82.2	586
CP-8D	75.4	567
CP-E	38.5	290
CP-F	51.60	370

* Q_{100} DATA DOES NOT TAKE CULVERTS/CHANNEL CAPACITY INTO CONSIDERATION FOR POTENTIAL FLOW BREAKOUT

PRELIMINARY

NOTES:

1. VERTICAL DATUM = NAVD88
   HORIZONTAL PROJECTION = ARIZONA STATE PLANE CENTRAL, NAD83 HARN
2. AERIAL PHOTO PROVIDED BY PAG, DATED 2008.

LEGEND

- WATERSHED BOUNDARY FOR LOS ARCOS
- WATERSHED BOUNDARY FOR DRAINAGEWAY #8
- CONCENTRATION POINT (CP)

CMG DRAINAGE ENGINEERING, INC.
3555 N. Mountain Ave. Tucson, Arizona 85719
Phone (520) 882-4244 Fax (520) 888-1421

0' 600'
SCALE: 1" = 600'

PROJECT NO.:	13-008
DESIGN:	JKW
CHECKED:	JKW
DRAWN:	BJK
DATE:	06/06/2013
REV. DATE:	
REV. DATE:	
REV. DATE:	

FIGURE 1:
GREEN VALLEY
DRAINAGEWAY #8
WATERSHED MAP

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Culvert/Channel 100-Year Runoff Summary Table for Drainageway #8

Culvert		Concentration Points	Q_{100} (cfs)			
Location	Size		PC-Hydro	Upstream Channel Flow	Culvert Conveyance	Flow Leaving Channel
DW8 @ I-19	1-6'x4' RCBC	CP-8D	567	567	171	396
DW8 @ Abrego	2-5'x3' CMPs	CP-8C	586	190	190	0
DW8 @ Vista Del Rio	2-4.8'x3' CMPs	CP-8B	588	192	191.4	0.6

NOTES:

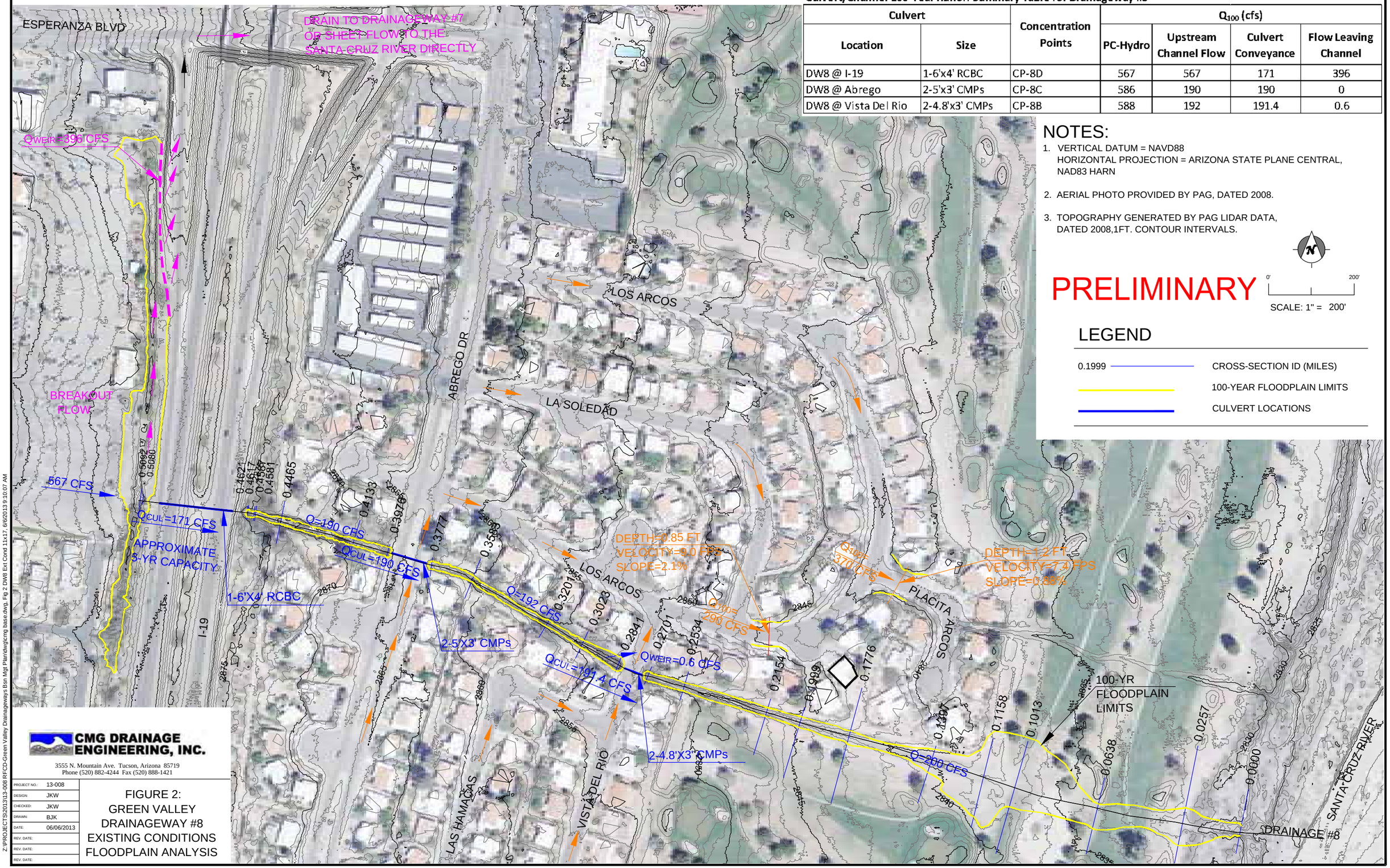
1. VERTICAL DATUM = NAVD88
   HORIZONTAL PROJECTION = ARIZONA STATE PLANE CENTRAL, NAD83 HARN
2. AERIAL PHOTO PROVIDED BY PAG, DATED 2008.
3. TOPOGRAPHY GENERATED BY PAG LIDAR DATA, DATED 2008,1FT. CONTOUR INTERVALS.

PRELIMINARY

0' 200'
SCALE: 1" = 200'

LEGEND

0.1999 — CROSS-SECTION ID (MILES)
100-YEAR FLOODPLAIN LIMITS
CULVERT LOCATIONS



CMG DRAINAGE ENGINEERING, INC.
3555 N. Mountain Ave. Tucson, Arizona 85719
Phone (520) 882-4244 Fax (520) 888-1421

PROJECT NO.:	13-008
DESIGN:	JKW
CHECKED:	JKW
DRAWN:	BJK
DATE:	06/06/2013
REV. DATE:	
REV. DATE:	
REV. DATE:	

FIGURE 2:
GREEN VALLEY DRAINAGEWAY #8
EXISTING CONDITIONS
FLOODPLAIN ANALYSIS

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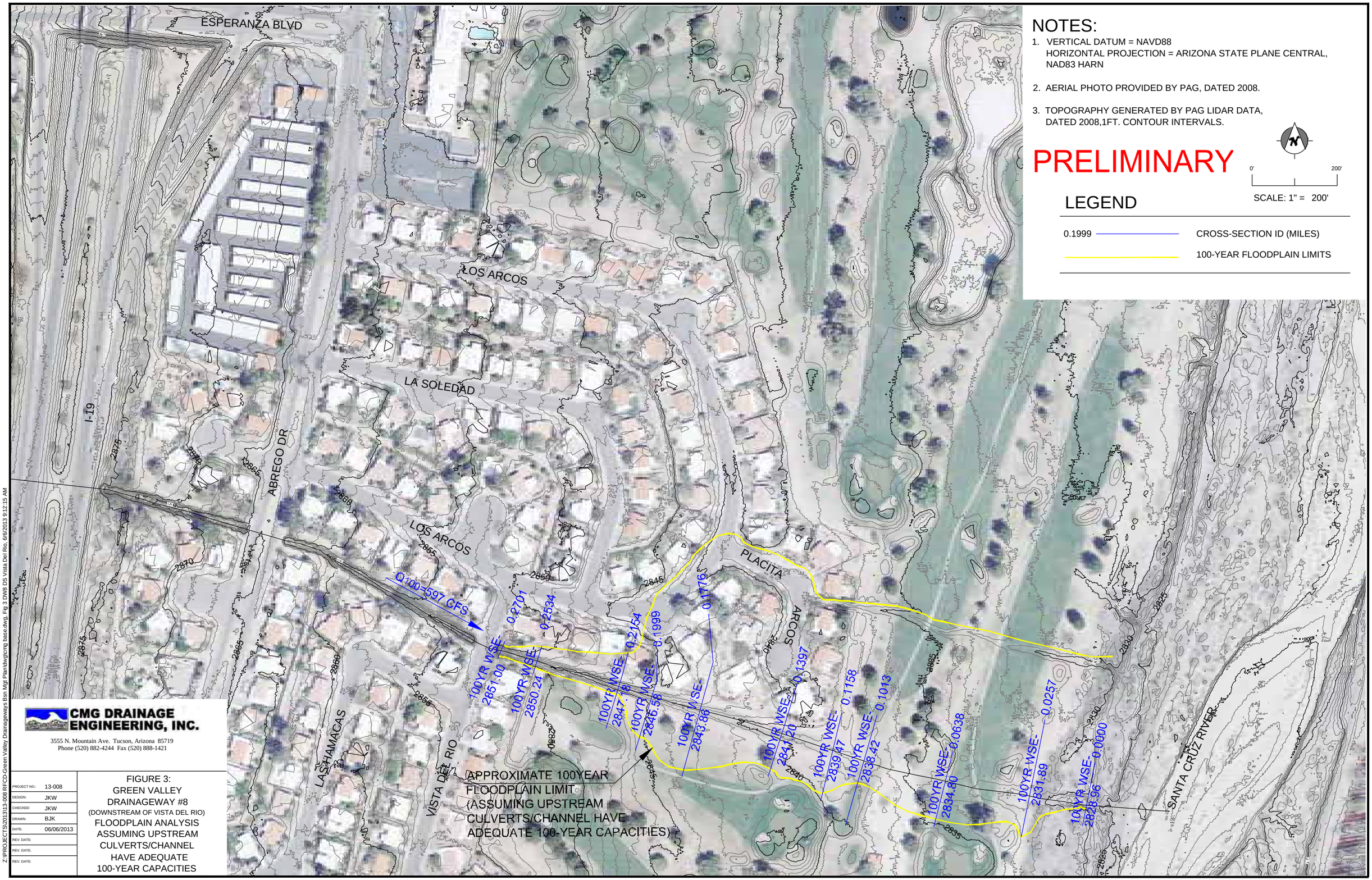

NOTES:

1. VERTICAL DATUM = NAVD88
   HORIZONTAL PROJECTION = ARIZONA STATE PLANE CENTRAL, NAD83 HARN
2. AERIAL PHOTO PROVIDED BY PAG, DATED 2008.
3. TOPOGRAPHY GENERATED BY PAG LIDAR DATA, DATED 2008,1FT. CONTOUR INTERVALS.

PRELIMINARY

0' 200'

SCALE: 1" = 200'

LEGEND

0.1999 — CROSS-SECTION ID (MILES)

— 100-YEAR FLOODPLAIN LIMITS

CMG DRAINAGE ENGINEERING, INC.

3555 N. Mountain Ave. Tucson, Arizona 85719
Phone (520) 882-4244 Fax (520) 888-1421

PROJECT NO.:	13-008
DESIGN:	JKW
CHECKED:	JKW
DRAWN:	BJK
DATE:	06/06/2013
REV. DATE:	
REV. DATE:	
REV. DATE:	

FIGURE 3:
GREEN VALLEY DRAINAGEWAY #8
(DOWNSTREAM OF VISTA DEL RIO)
FLOODPLAIN ANALYSIS ASSUMING UPSTREAM CULVERTS/CHANNEL HAVE ADEQUATE 100-YEAR CAPACITIES

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Appendix B: Hydrologic Computations

HYDROLOGIC DATA SHEET FOR PIMA COUNTY FLOOD PEAK PROCEDURE

Pima County Regional Flood Control District

Client: _____ Prepared by: BJK

Project Name: Green Valley Date: 05/30/2013

Concentration Point: 8A Job #: 13-008

Watershed Area: 95.4 ac Watershed Type: High Density Urbanized

Watercourse Data By Reach

Reach No.	Height (Hi)	Length (Li)	Slope (Si)	Basin Factor (Nb)
1	31.0	2,997	0.0103	.022
2	64.0	2,755	0.0232	.022

Length of Watercourse (Lc): 5,752 feet Mean Slope: 0.0146

Length to Cen. of Gravity (Lca): 3,300 feet Weighted Basin Fac.: 0.022

Veg. Cover Type(s): Desert Brush Veg. Cover Density: 30 %

RETURN PERIOD: 100-years

Rainfall Depths: NOAA Atlas 14 (90% UCL) @ Latitude: 31.8674 Longitude: -110.9907

Duration:	5-min	10-min	15-min	30-min	60-min	2-hr	3-hr	6-hr	12-hr	24-hr
Point Values (in)	0.88	1.34	1.66	2.24	2.77	3.08	3.19	3.61	3.92	4.29
Areal Values (in)	0.88	1.34	1.66	2.24	2.77	3.08	3.19	3.61	3.92	4.29

Soils Data

Soil Type	Percent	Curve # (CN)	Adj. Curve # (CN*)	Runoff Coef. (C)
B	100	82.	86.62	0.546
C	0	.	.	0.000
D	0	.	.	0.000
Imp.	60	99.	99.	0.958

Weighted Runoff Coef. (Cw): 0.793

Time of Concentration: 10.5 min

Rainfall Intensity (i) @ Tc: 7.82 in/hr

Runoff Supply Rate (q) @ Tc: 6.20 in/hr

PEAK DISCHARGE: 597 cfs

PC-Hydro, Ver 5.4.2

HYDROLOGIC DATA SHEET FOR PIMA COUNTY FLOOD PEAK PROCEDURE

Pima County Regional Flood Control District

Client: _____ Prepared by: BJK

Project Name: Green Valley Date: 05/30/2013

Concentration Point: 8B Job #: 13-008

Watershed Area: 84.1 ac Watershed Type: High Density Urbanized

Watercourse Data By Reach

Reach No.	Height (Hi)	Length (Li)	Slope (Si)	Basin Factor (Nb)
1	31.0	2,997	0.0103	.022
2	32.0	1,199	0.0267	.022

Length of Watercourse (Lc): 4,196 feet Mean Slope: 0.0130

Length to Cen. of Gravity (Lca): 1,650 feet Weighted Basin Fac.: 0.022

Veg. Cover Type(s): Desert Brush Veg. Cover Density: 30 %

RETURN PERIOD: 100-years

Rainfall Depths: NOAA Atlas 14 (90% UCL) @ Latitude: 31.8674 Longitude: -110.9907

Duration:	5-min	10-min	15-min	30-min	60-min	2-hr	3-hr	6-hr	12-hr	24-hr
Point Values (in)	0.88	1.34	1.66	2.24	2.77	3.08	3.19	3.61	3.92	4.29
Areal Values (in)	0.88	1.34	1.66	2.24	2.77	3.08	3.19	3.61	3.92	4.29

Soils Data

Soil Type	Percent	Curve # (CN)	Adj. Curve # (CN*)	Runoff Coef. (C)
B	100	82.	86.62	0.546
C	0	.	.	0.000
D	0	.	.	0.000
Imp.	60	99.	99.	0.958

Weighted Runoff Coef. (Cw): 0.793

Time of Concentration: 7.8 min

Rainfall Intensity (i) @ Tc: 8.75 in/hr

Runoff Supply Rate (q) @ Tc: 6.94 in/hr

PEAK DISCHARGE: 588 cfs

PC-Hydro, Ver 5.4.2

HYDROLOGIC DATA SHEET FOR PIMA COUNTY FLOOD PEAK PROCEDURE

Pima County Regional Flood Control District

Client: _____ Prepared by: BJK

Project Name: Green Valley Date: 05/30/2013

Concentration Point: 8C Job #: 13-008

Watershed Area: 82.2 ac Watershed Type: High Density Urbanized

Watercourse Data By Reach

Reach No.	Height (Hi)	Length (Li)	Slope (Si)	Basin Factor (Nb)
1	31.0	2,997	0.0103	.022
2	20.0	614	0.0326	.022

Length of Watercourse (Lc): 3,611 feet Mean Slope: 0.0121

Length to Cen. of Gravity (Lca): 1,500 feet Weighted Basin Fac.: 0.022

Veg. Cover Type(s): Desert Brush Veg. Cover Density: 30 %

RETURN PERIOD: 100-years

Rainfall Depths: NOAA Atlas 14 (90% UCL) @ Latitude: 31.8674 Longitude: -110.9907

Duration:	5-min	10-min	15-min	30-min	60-min	2-hr	3-hr	6-hr	12-hr	24-hr
Point Values (in)	0.88	1.34	1.66	2.24	2.77	3.08	3.19	3.61	3.92	4.29
Areal Values (in)	0.88	1.34	1.66	2.24	2.77	3.08	3.19	3.61	3.92	4.29

Soils Data

Soil Type	Percent	Curve # (CN)	Adj. Curve # (CN*)	Runoff Coef. (C)
B	100	82.	86.62	0.546
C	0	.	.	0.000
D	0	.	.	0.000
Imp.	60	99.	99.	0.958

Weighted Runoff Coef. (Cw): 0.793

Time of Concentration: 7.4 min

Rainfall Intensity (i) @ Tc: 8.92 in/hr

Runoff Supply Rate (q) @ Tc: 7.07 in/hr

PEAK DISCHARGE: 586 cfs

PC-Hydro, Ver 5.4.2

HYDROLOGIC DATA SHEET FOR PIMA COUNTY FLOOD PEAK PROCEDURE

Pima County Regional Flood Control District

Client: _____ Prepared by: BJK

Project Name: Green Valley Date: 05/24/2013

Concentration Point: 8D Job #: 13-008

Watershed Area: 75.4 ac Watershed Type: High Density Urbanized

Watercourse Data By Reach

Reach No.	Height (Hi)	Length (Li)	Slope (Si)	Basin Factor (Nb)
1	24.0	2,997	0.0080	.022

Length of Watercourse (Lc): 2,997 feet Mean Slope: 0.0080

Length to Cen. of Gravity (Lca): 1,100 feet Weighted Basin Fac.: 0.022

Veg. Cover Type(s): Desert Brush Veg. Cover Density: 30 %

RETURN PERIOD: 100-years

Rainfall Depths: NOAA Atlas 14 (90% UCL) @ Latitude: 31.8674 Longitude: -110.9907

Duration:	5-min	10-min	15-min	30-min	60-min	2-hr	3-hr	6-hr	12-hr	24-hr
Point Values (in)	0.88	1.34	1.66	2.24	2.77	3.08	3.19	3.61	3.92	4.29
Areal Values (in)	0.88	1.34	1.66	2.24	2.77	3.08	3.19	3.61	3.92	4.29

Soils Data

Soil Type	Percent	Curve # (CN)	Adj. Curve # (CN*)	Runoff Coef. (C)
B	100	82.	86.62	0.546
C	0	.	.	0.000
D	0	.	.	0.000
Imp.	70	99.	99.	0.958

Weighted Runoff Coef. (Cw): 0.834

Time of Concentration: 7.4 min

Rainfall Intensity (i) @ Tc: 8.94 in/hr

Runoff Supply Rate (q) @ Tc: 7.46 in/hr

PEAK DISCHARGE: 567 cfs

PC-Hydro, Ver 5.4.2

HYDROLOGIC DATA SHEET FOR PIMA COUNTY FLOOD PEAK PROCEDURE

Pima County Regional Flood Control District

Client: _____ Prepared by: BJK

Project Name: Green Valley Date: 05/31/2013

Concentration Point: E Job #: 13-008

Watershed Area: 38.5 ac Watershed Type: High Density Urbanized

Watercourse Data By Reach

Reach No.	Height (Hi)	Length (Li)	Slope (Si)	Basin Factor (Nb)
1	36.0	2,582	0.0139	.022

Length of Watercourse (Lc): 2,582 feet Mean Slope: 0.0139

Length to Cen. of Gravity (Lca): 1,136 feet Weighted Basin Fac.: 0.022

Veg. Cover Type(s): Desert Brush Veg. Cover Density: 30 %

RETURN PERIOD: 100-years

Rainfall Depths: NOAA Atlas 14 (90% UCL) @ Latitude: 31.8674 Longitude: -110.9907

Duration:	5-min	10-min	15-min	30-min	60-min	2-hr	3-hr	6-hr	12-hr	24-hr
Point Values (in)	0.88	1.34	1.66	2.24	2.77	3.08	3.19	3.61	3.92	4.29
Areal Values (in)	0.88	1.34	1.66	2.24	2.77	3.08	3.19	3.61	3.92	4.29

Soils Data

Soil Type	Percent	Curve # (CN)	Adj. Curve # (CN*)	Runoff Coef. (C)
B	100	82.	86.62	0.546
C	0	.	.	0.000
D	0	.	.	0.000
Imp.	50	99.	99.	0.958

Weighted Runoff Coef. (Cw): 0.752

Time of Concentration: 5.7 min

Rainfall Intensity (i) @ Tc: 9.95 in/hr

Runoff Supply Rate (q) @ Tc: 7.48 in/hr

PEAK DISCHARGE: 290 cfs

PC-Hydro, Ver 5.4.2

HYDROLOGIC DATA SHEET FOR PIMA COUNTY FLOOD PEAK PROCEDURE

Pima County Regional Flood Control District

Client: _____ Prepared by: BJK

Project Name: Green Valley Date: 05/31/2013

Concentration Point: F Job #: 13-008

Watershed Area: 51.6 ac Watershed Type: High Density Urbanized

Watercourse Data By Reach

Reach No.	Height (Hi)	Length (Li)	Slope (Si)	Basin Factor (Nb)
1	40.0	2,995	0.0134	.022

Length of Watercourse (Lc): 2,995 feet Mean Slope: 0.0134

Length to Cen. of Gravity (Lca): 1,268 feet Weighted Basin Fac.: 0.022

Veg. Cover Type(s): Desert Brush Veg. Cover Density: 30 %

RETURN PERIOD: 100-years

Rainfall Depths: NOAA Atlas 14 (90% UCL) @ Latitude: 31.8674 Longitude: -110.9907

Duration:	5-min	10-min	15-min	30-min	60-min	2-hr	3-hr	6-hr	12-hr	24-hr
Point Values (in)	0.88	1.34	1.66	2.24	2.77	3.08	3.19	3.61	3.92	4.29
Areal Values (in)	0.88	1.34	1.66	2.24	2.77	3.08	3.19	3.61	3.92	4.29

Soils Data

Soil Type	Percent	Curve # (CN)	Adj. Curve # (CN*)	Runoff Coef. (C)
B	100	82.	86.62	0.546
C	0	.	.	0.000
D	0	.	.	0.000
Imp.	50	99.	99.	0.958

Weighted Runoff Coef. (Cw): 0.752

Time of Concentration: 6.4 min

Rainfall Intensity (i) @ Tc: 9.47 in/hr

Runoff Supply Rate (q) @ Tc: 7.12 in/hr

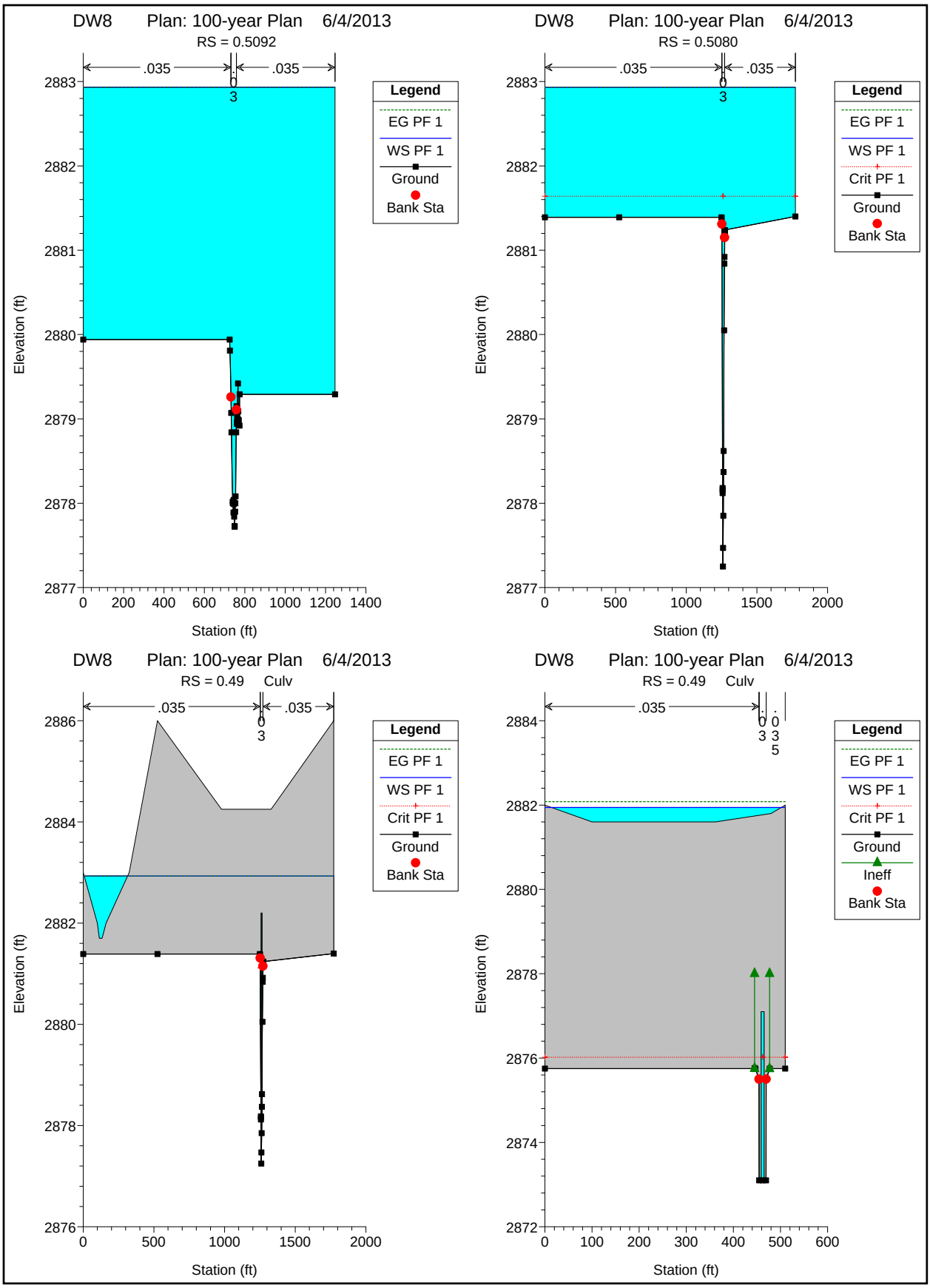
PEAK DISCHARGE: 370 cfs

PC-Hydro, Ver 5.4.2

Appendix C: Existing Conditions HEC-RAS Outputs

HEC-RAS Plan: 100-Year River: 8 Reach: 1 Profile: PF 1

Reach	River Sta	Profile	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)	
1	0.5092	PF 1	567.00	2877.72	2882.93		2882.93	0.000002	0.20	4098.76	1247.00	0.02
1	0.5080	PF 1	567.00	2877.25	2882.93	2881.64	2882.93	0.000012	0.40	2810.68	1772.00	0.04
1	0.49		Culvert									
1	0.4621	PF 1	567.00	2873.10	2876.79	2876.79	2877.87	0.007957	8.85	74.46	510.00	0.82
1	0.4617	PF 1	567.00	2867.31	2871.15	2871.15	2872.69	0.011765	9.94	57.01	18.77	1.01
1	0.4587	PF 1	171.00	2866.98	2869.24	2869.24	2870.07	0.012640	7.29	23.46	14.45	1.01
1	0.4581	PF 1	171.00	2866.62	2868.94	2868.94	2869.77	0.012536	7.30	23.41	14.29	1.01
1	0.4465	PF 1	190.00	2864.99	2867.06	2867.06	2867.91	0.012449	7.38	25.76	15.34	1.00
1	0.4133	PF 1	190.00	2862.43	2864.82	2864.82	2865.64	0.012573	7.28	26.11	16.21	1.01
1	0.3976	PF 1	190.00	2860.35	2864.66	2862.98	2864.81	0.001264	3.11	61.03	24.29	0.35
1	0.39		Culvert									
1	0.3777	PF 1	192.00	2859.02	2860.95	2860.95	2861.69	0.012425	6.90	27.82	19.06	1.01
1	0.3583	PF 1	192.00	2854.95	2857.81	2857.81	2858.72	0.012626	7.63	25.16	14.12	1.01
1	0.3201	PF 1	192.00	2850.65	2853.80	2853.80	2854.60	0.012352	7.18	26.75	16.79	1.00
1	0.3023	PF 1	192.00	2849.47	2852.96		2853.25	0.002654	4.27	45.01	19.06	0.49
1	0.2841	PF 1	192.00	2847.92	2853.02	2850.20	2853.10	0.000423	2.24	88.70	35.15	0.21
1	0.28		Culvert									
1	0.2701	PF 1	200.00	2846.28	2849.37		2849.63	0.002650	4.12	48.52	21.98	0.49
1	0.2534	PF 1	200.00	2845.57	2848.40	2848.40	2849.15	0.012335	6.94	28.82	19.26	1.00
1	0.2154	PF 1	200.00	2843.14	2845.49	2845.49	2846.21	0.012369	6.82	29.32	20.61	1.01
1	0.1999	PF 1	200.00	2842.00	2844.18	2844.16	2844.78	0.012550	6.22	32.13	26.62	1.00
1	0.1776	PF 1	200.00	2840.68	2842.78	2842.73	2843.35	0.011771	6.06	33.03	27.15	0.97
1	0.1397	PF 1	200.00	2838.70	2840.26	2840.26	2840.74	0.014209	5.53	36.14	39.61	1.02
1	0.1158	PF 1	200.00	2837.81	2838.99	2838.88	2839.14	0.009621	3.64	67.35	178.91	0.80
1	0.1013	PF 1	200.00	2836.74	2837.95	2837.95	2838.17	0.017063	3.91	54.45	160.79	1.01
1	0.0638	PF 1	200.00	2833.00	2833.99	2833.96	2834.31	0.013424	4.57	43.79	61.58	0.95
1	0.0257	PF 1	200.00	2830.61	2831.52	2831.52	2831.71	0.012090	3.61	62.57	206.97	0.87
1	0.0000	PF 1	200.00	2823.69	2828.24	2827.13	2828.50	0.002810	4.12	48.57	22.79	0.50


DW8 Plan: 100-year Plan 6/4/2013
RS = 0.5092
.035
.035
.03
Legend
EG PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
DW8 Plan: 100-year Plan 6/4/2013
RS = 0.5080
.035
.035
.03
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
DW8 Plan: 100-year Plan 6/4/2013
RS = 0.49 Culv
.035
.035
.03
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
DW8 Plan: 100-year Plan 6/4/2013
RS = 0.49 Culv
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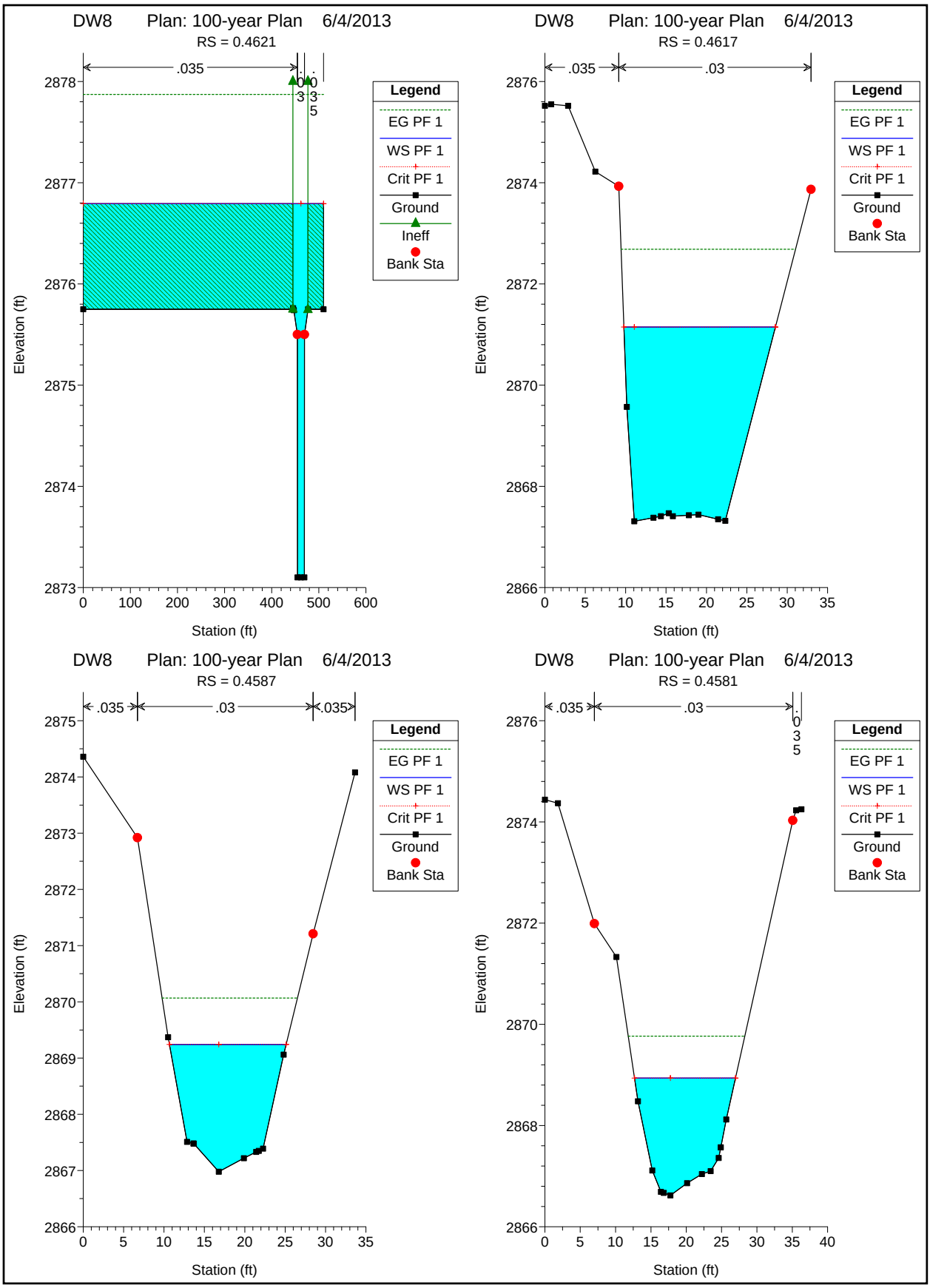
.035
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)


DW8 Plan: 100-year Plan 6/4/2013
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Crit PF 1
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)
DW8 Plan: 100-year Plan 6/4/2013
RS = 0.4617
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Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
DW8 Plan: 100-year Plan 6/4/2013
RS = 0.4587
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Legend
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WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
DW8 Plan: 100-year Plan 6/4/2013
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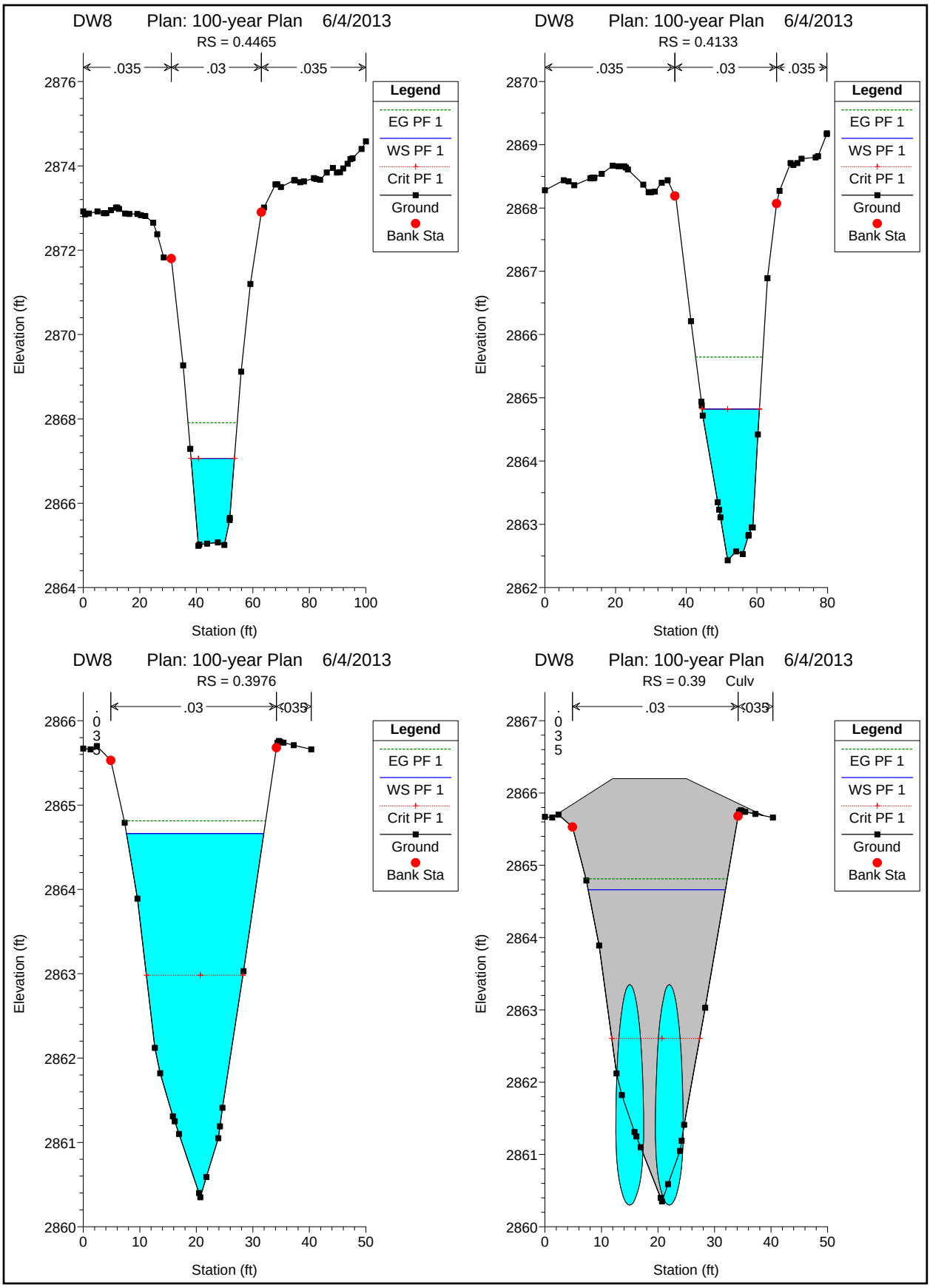
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)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Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
DW8 Plan: 100-year Plan 6/4/2013
RS = 0.4133
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Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
DW8 Plan: 100-year Plan 6/4/2013
RS = 0.3976
.035
.03
.035
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
DW8 Plan: 100-year Plan 6/4/2013
RS = 0.39 Culv
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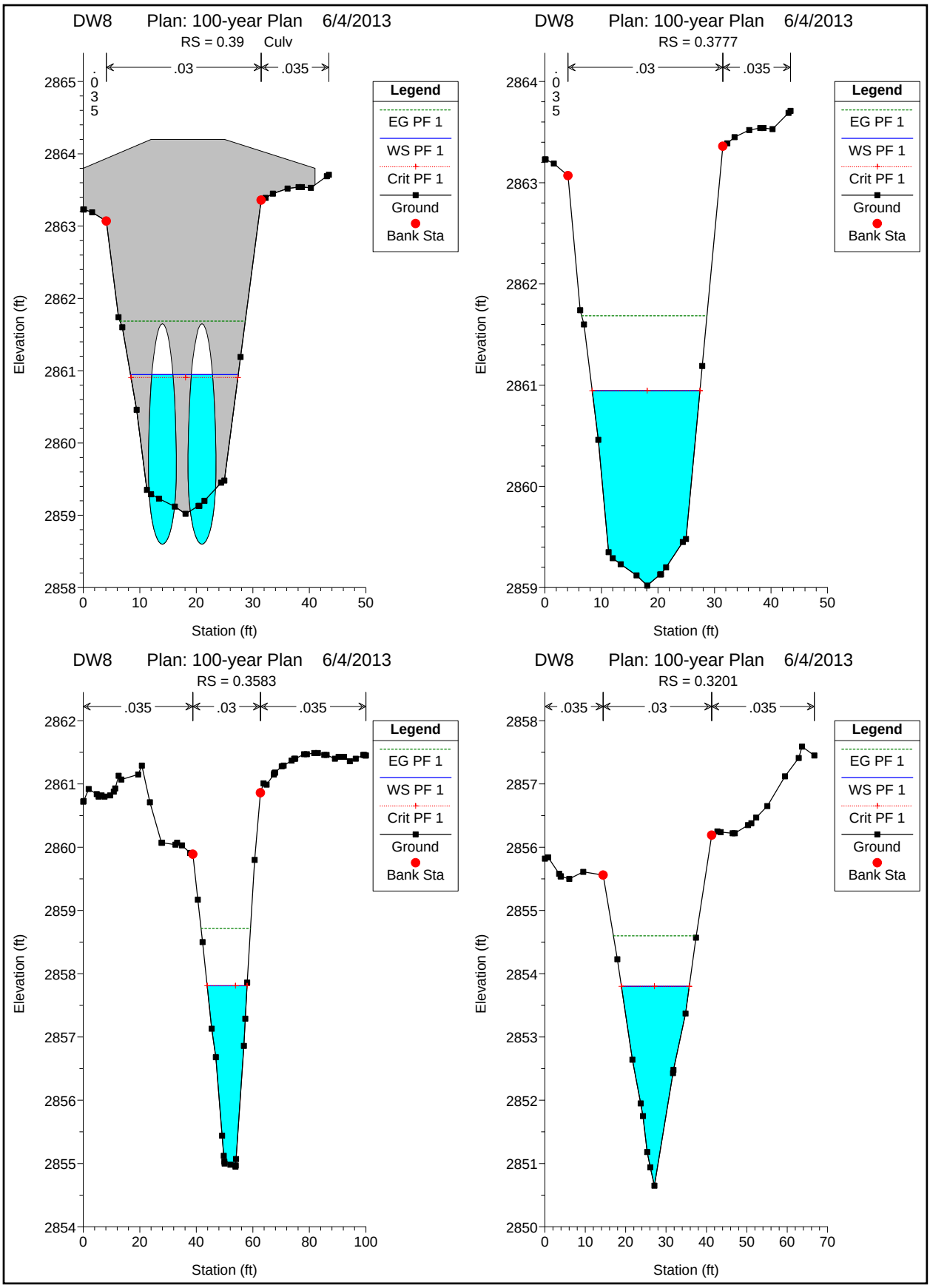
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)


DW8 Plan: 100-year Plan 6/4/2013
RS = 0.39 Culv
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Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
DW8 Plan: 100-year Plan 6/4/2013
RS = 0.3777
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.03
.035
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
DW8 Plan: 100-year Plan 6/4/2013
RS = 0.3583
.035
.03
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Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
DW8 Plan: 100-year Plan 6/4/2013
RS = 0.3201
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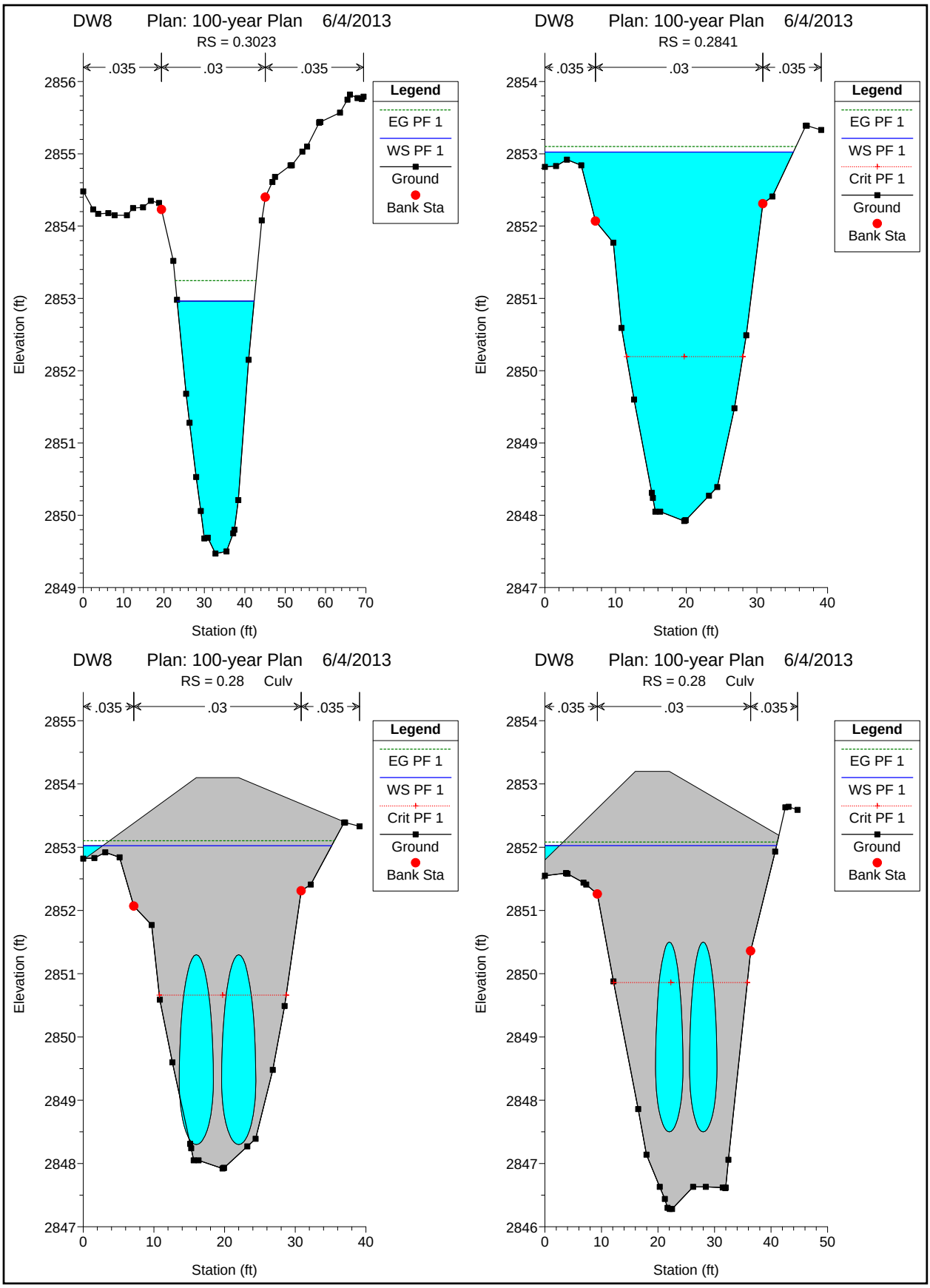
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)


DW8 Plan: 100-year Plan 6/4/2013
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Legend
EG PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
DW8 Plan: 100-year Plan 6/4/2013
RS = 0.2841
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.03
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Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
DW8 Plan: 100-year Plan 6/4/2013
RS = 0.28 Culv
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Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
DW8 Plan: 100-year Plan 6/4/2013
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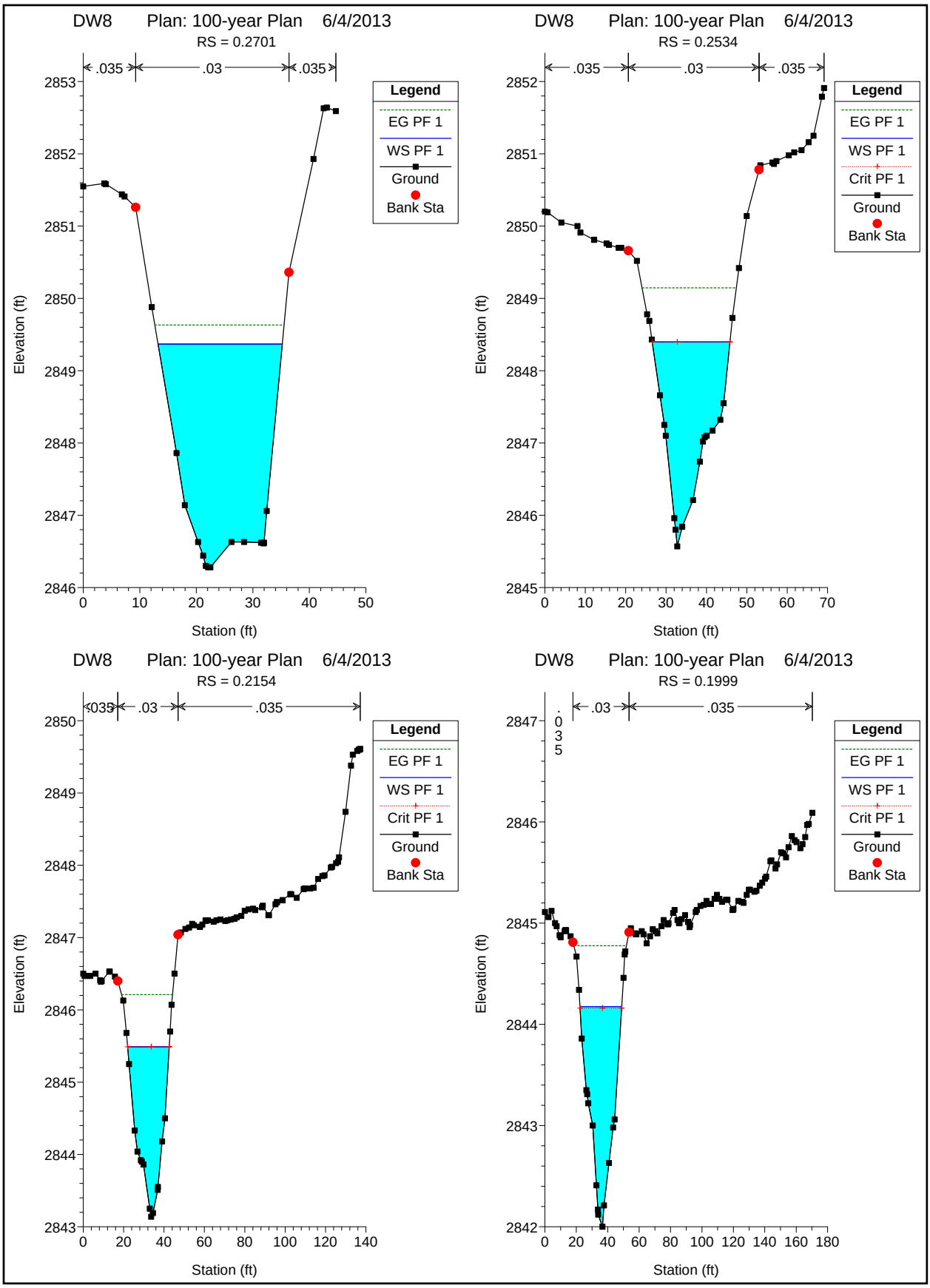
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)


DW8 Plan: 100-year Plan 6/4/2013
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Legend
EG PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
DW8 Plan: 100-year Plan 6/4/2013
RS = 0.2534
.035
.03
.035
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
DW8 Plan: 100-year Plan 6/4/2013
RS = 0.2154
.035
.03
.035
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
DW8 Plan: 100-year Plan 6/4/2013
RS = 0.1999
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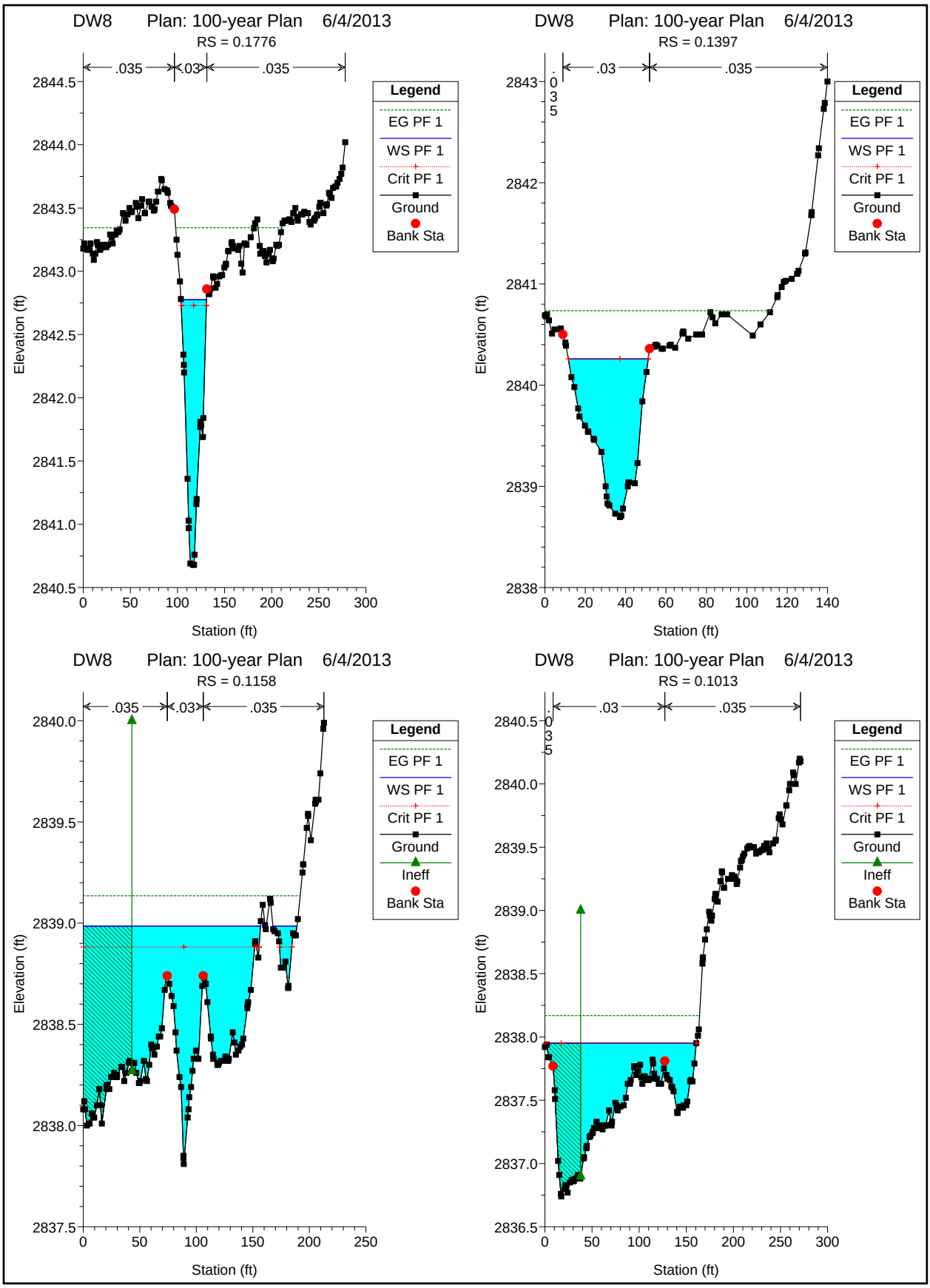
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)


DW8 Plan: 100-year Plan 6/4/2013
RS = 0.1776
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Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
DW8 Plan: 100-year Plan 6/4/2013
RS = 0.1397
.035
.03
.035
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
DW8 Plan: 100-year Plan 6/4/2013
RS = 0.1158
.035
.03
.035
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)
DW8 Plan: 100-year Plan 6/4/2013
RS = 0.1013
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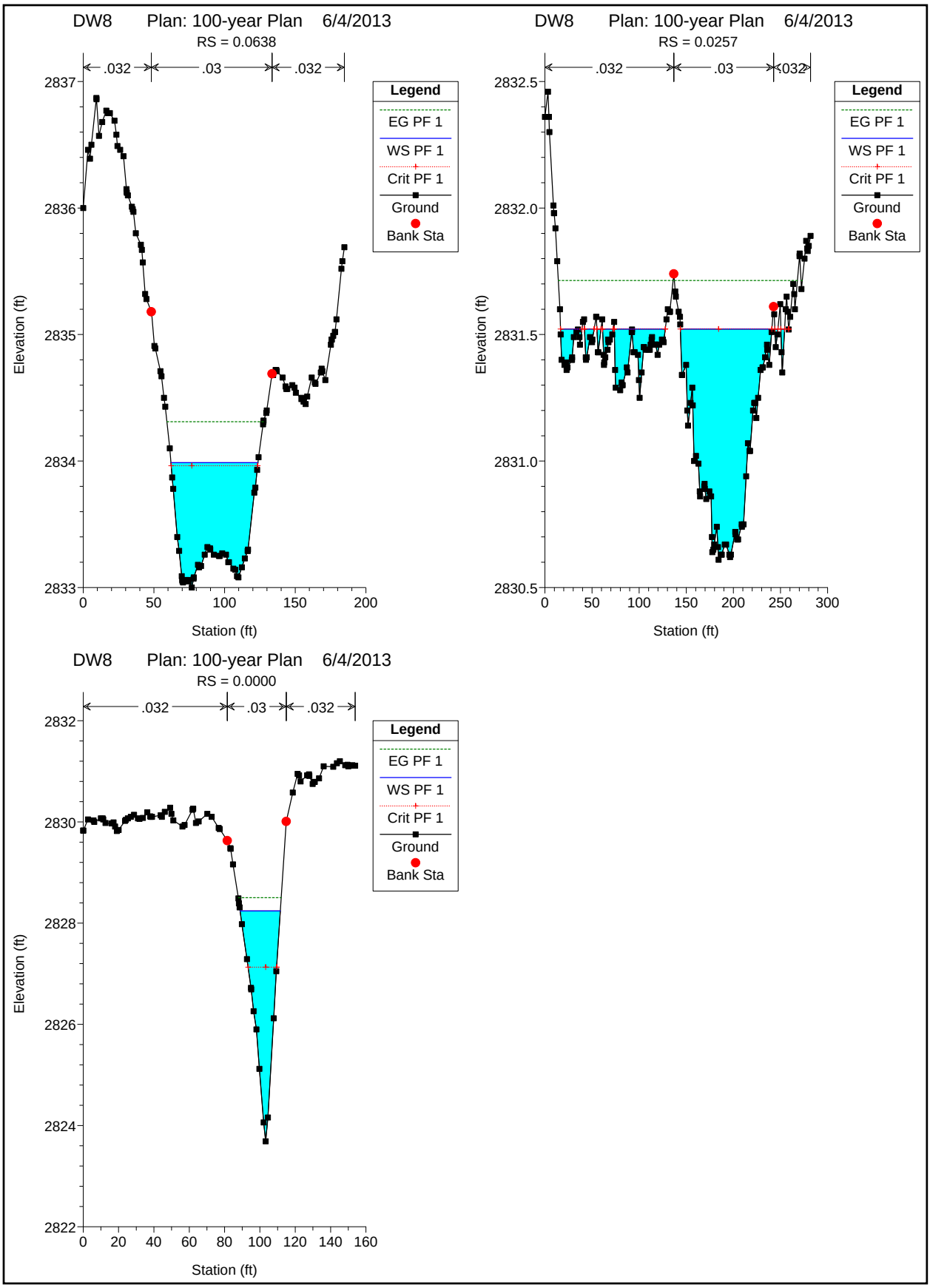
.03
.035
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)


DW8 Plan: 100-year Plan 6/4/2013
RS = 0.0638
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.03
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Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
DW8 Plan: 100-year Plan 6/4/2013
RS = 0.0257
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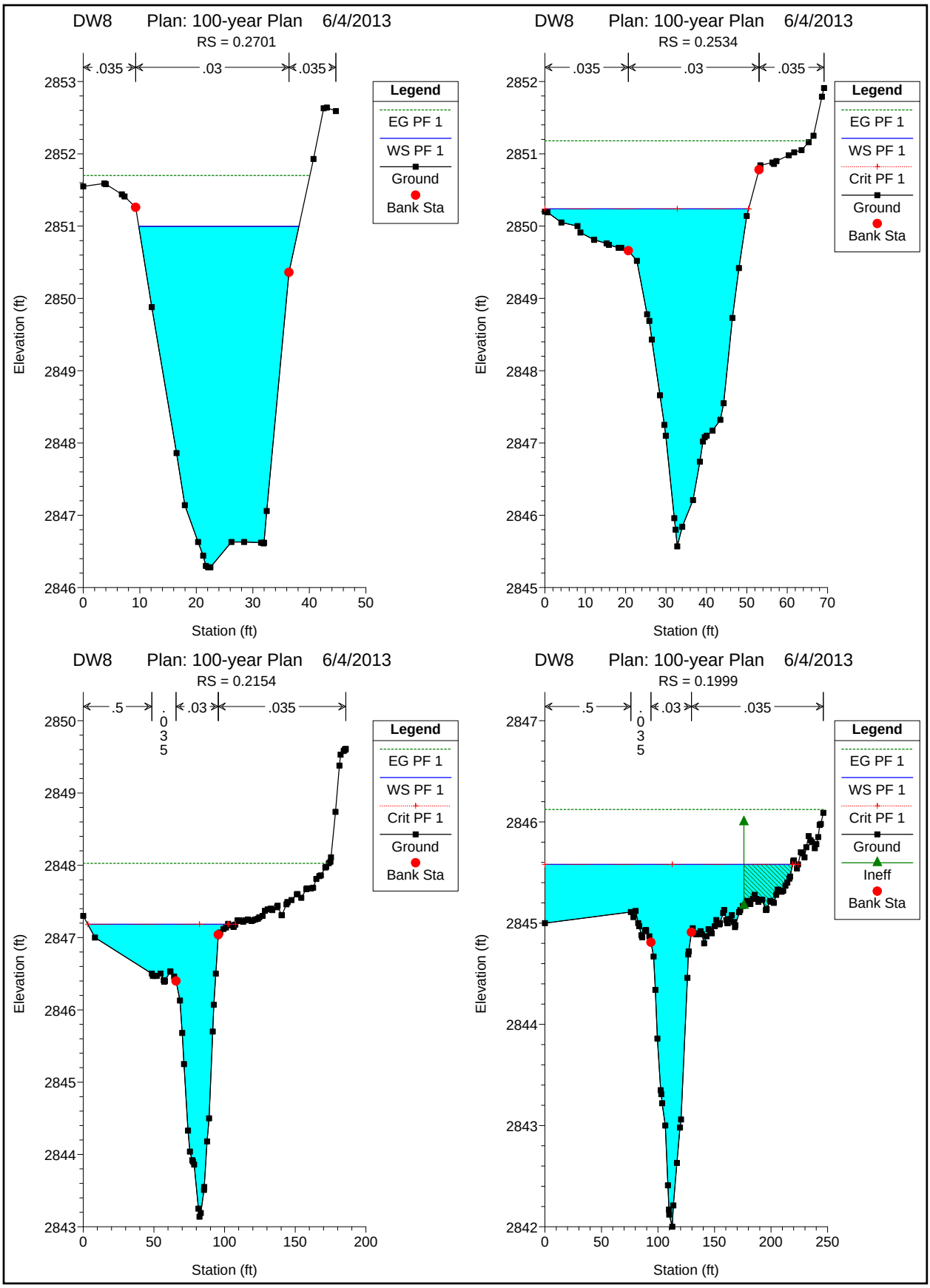
.03
.032
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
DW8 Plan: 100-year Plan 6/4/2013
RS = 0.0000
.032
.03
.032
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)

Appendix D: HEC-RAS Outputs with Increasing Drainageway #8 Culvert Capacities

HEC-RAS Plan: 100-Year River: 8 Reach: 1 Profile: PF 1

Reach	River Sta	Profile	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)	
1	0.2701	PF 1	597.00	2846.28	2851.00		2851.70	0.004174	6.74	89.01	28.33	0.65
1	0.2534	PF 1	597.00	2845.57	2850.24	2850.24	2851.18	0.008015	7.87	81.26	50.46	0.88
1	0.2154	PF 1	597.00	2843.14	2847.18	2847.18	2848.03	0.007462	7.61	104.07	103.94	0.86
1	0.1999	PF 1	597.00	2842.00	2845.58	2845.58	2846.12	0.005988	6.40	156.75	221.30	0.76
1	0.1776	PF 1	597.00	2840.68	2843.86	2843.86	2844.21	0.005547	5.74	286.76	388.74	0.72
1	0.1397	PF 1	597.00	2838.70	2841.20	2841.20	2841.66	0.007079	6.08	198.31	213.91	0.80
1	0.1158	PF 1	597.00	2837.81	2839.47	2839.39	2839.78	0.010128	5.42	139.71	200.19	0.90
1	0.1013	PF 1	597.00	2836.74	2838.42	2838.42	2838.87	0.013919	5.61	113.88	166.06	1.02
1	0.0638	PF 1	597.00	2833.00	2834.80	2834.80	2835.31	0.009946	5.75	109.36	120.87	0.90
1	0.0257	PF 1	597.00	2830.61	2831.89	2831.89	2832.17	0.011157	4.71	154.29	270.29	0.90
1	0.0000	PF 1	597.00	2823.69	2828.96	2828.96	2830.21	0.011065	8.97	66.54	27.25	1.01


DW8 Plan: 100-year Plan 6/4/2013
RS = 0.2701
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.035
Legend
EG PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
DW8 Plan: 100-year Plan 6/4/2013
RS = 0.2534
.035
.03
.035
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
DW8 Plan: 100-year Plan 6/4/2013
RS = 0.2154
.5
.035
.03
.035
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
DW8 Plan: 100-year Plan 6/4/2013
RS = 0.1999
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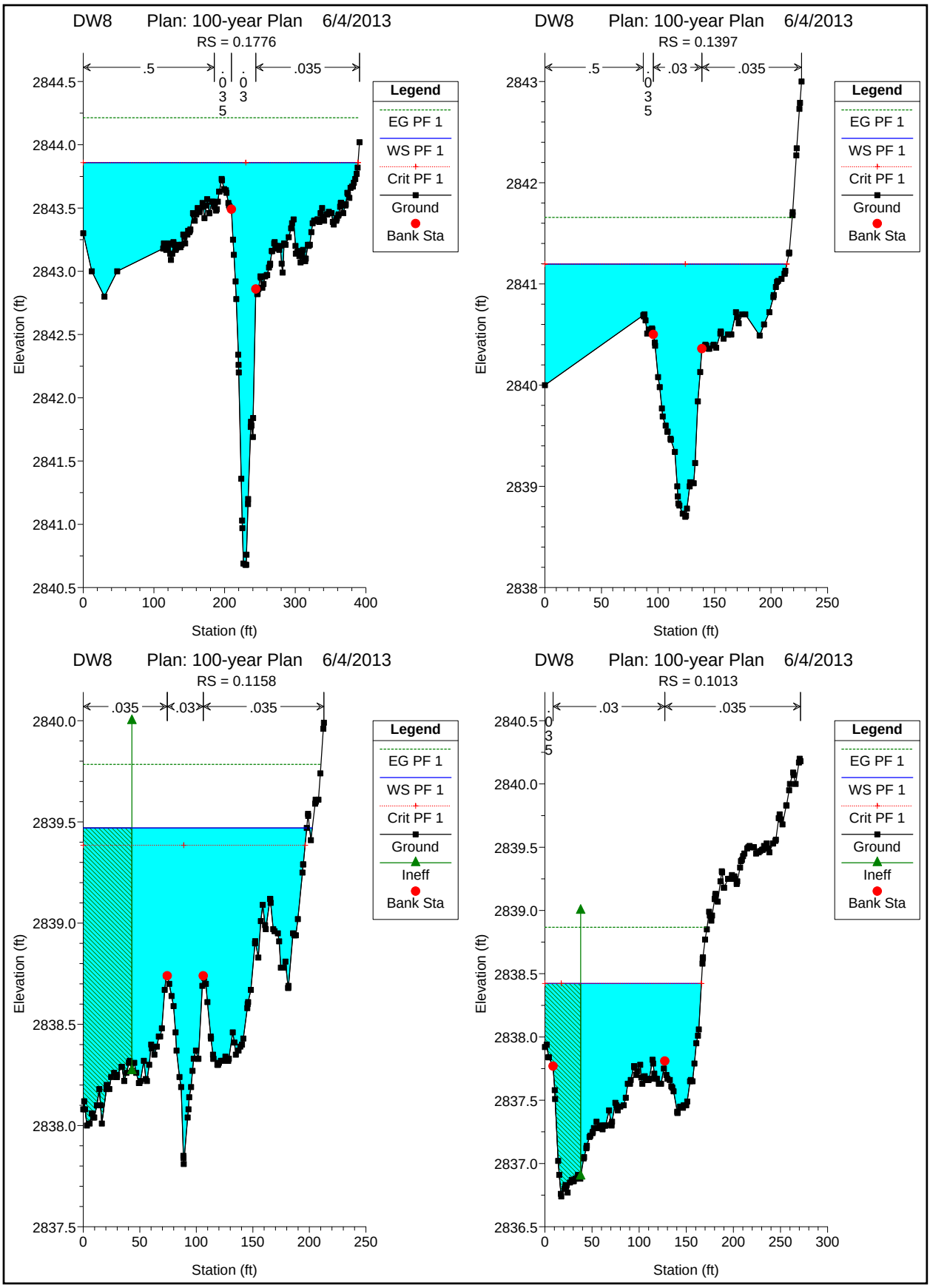
.035
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)


DW8 Plan: 100-year Plan 6/4/2013
RS = 0.1776
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Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
DW8 Plan: 100-year Plan 6/4/2013
RS = 0.1397
.5
.03
.035
.035
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
DW8 Plan: 100-year Plan 6/4/2013
RS = 0.1158
.035
.03
.035
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)
DW8 Plan: 100-year Plan 6/4/2013
RS = 0.1013
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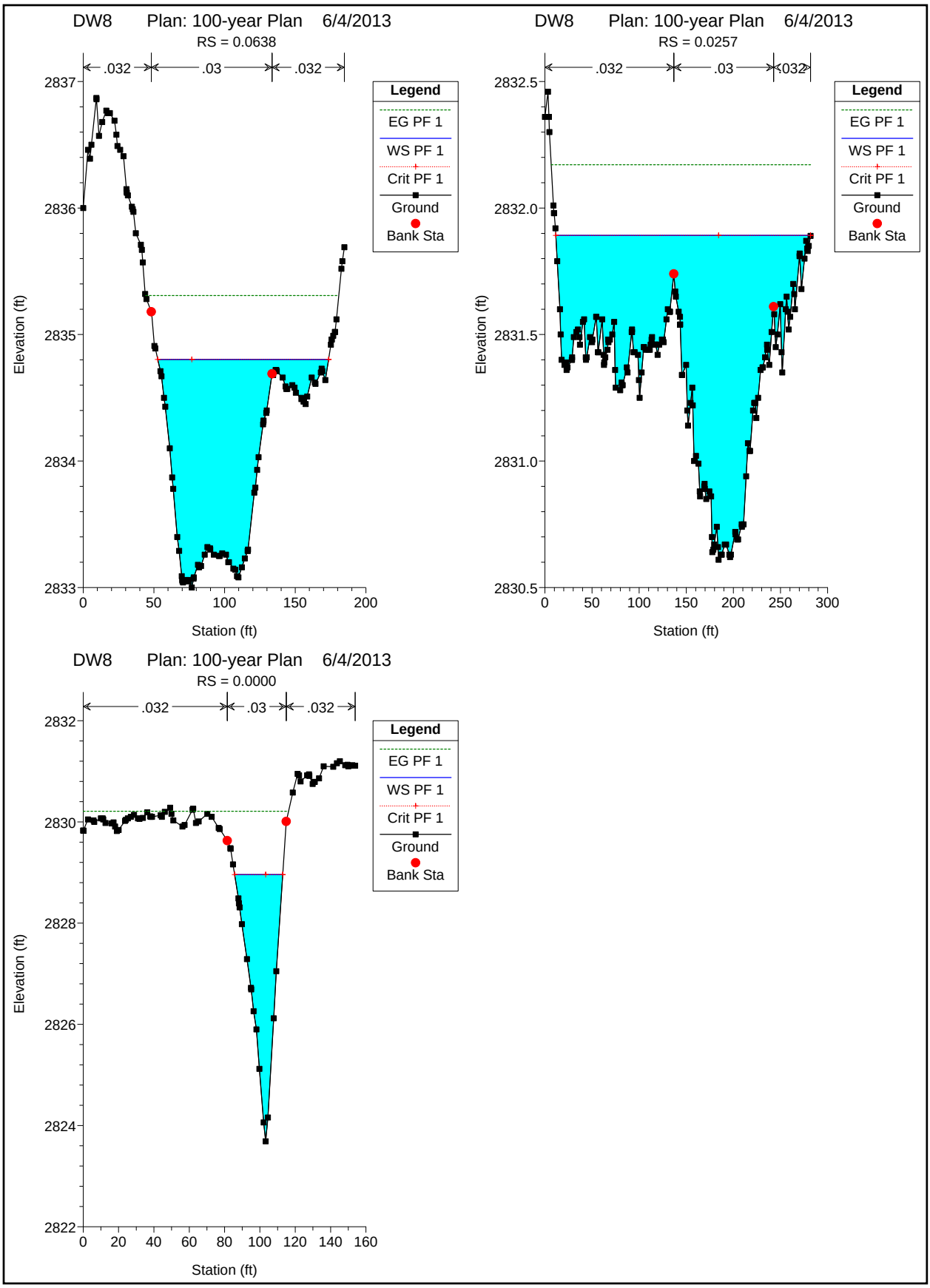
.035
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)


DW8 Plan: 100-year Plan 6/4/2013
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Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
DW8 Plan: 100-year Plan 6/4/2013
RS = 0.0257
.032
.03
.032
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
DW8 Plan: 100-year Plan 6/4/2013
RS = 0.0000
.032
.03
.032
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)

APPENDIX O

Electronic Files on DVD

Include:

- Report (text, all appendices and Figures) (pdf format)
- HEC-1 Models (DW#3&4&5, #6, #9, #13, and Santa Cruz West Channel)
- HEC-RAS Models (DW#1 through #25, Santa Cruz West Channel)
- Topographic Contours (2-ft interval) in CAD format
- Shapefiles:

  Hydrology:
  Shapefiles for Concentration Points @ GV drainageways
  Shapefiles for watersheds @ GV drainageways
  Shapefile for Concentration Points at Santa Cruz West Channel
  Shapefile for watersheds drain to Santa Cruz West Channel

  Hydraulic:
  Shapefiles for culverts & bridges
  Shapefiles for weirs (both point and line shapefiles)
  Shapefiles for HEC-RAS cross sections
  Shapefiles for stream maintenance and discharges
  Shapefiles for floodplains