



# FINAL DRAINAGE REPORT FOR ZINDORF — MCDANIEL'S SUBDIVISION

PCD FILE NO. MS-22-006



**PREPARED BY**

Richard Gallegos, P.E.  
RESPEC  
121 S. Tejon St., Suite 1110  
Colorado Springs, CO 80903

**PREPARED FOR**

Greg Zindorf  
Z Investments LLC  
PO Box 50005  
Colorado Springs, CO

July 2023





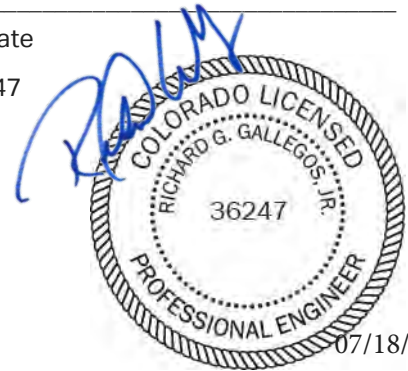
# ENGINEER'S STATEMENT

This report and plan for the drainage design of Zindorf - McDaniels Subdivision, was prepared by me (or under my direct supervision) and is correct to the best of my knowledge and belief. Said report and plan has been prepared according to the criteria established by the County for drainage reports and said report is in conformity with the master plan of the drainage basin. I understand that El Paso County does not, and will not, assume liability for drainage facilities designed by others. I accept responsibility for any liability caused by any negligent acts, errors or omissions on my part in preparing this report.

Richard Gallegos, P.E.

Date

Registered Professional Engineer State of Colorado No. 36247



# DEVELOPER'S STATEMENT

Greg Zindorf hereby certifies that the drainage facilities for the Zindorf – McDaniels Subdivision shall be constructed according to the design presented in this report. I understand that El Paso County does not, and will not, assume liability for the drainage facilities designed and/or certified by my engineer and that are submitted to El Paso County; and cannot, on behalf of the Zindorf – McDaniels Road guarantee that final drainage design review will absolve Greg Zindorf and/or their successors and/or assigns of future liability for improper design. I further understand that approval of the final plat does not imply approval of my engineer's drainage design.

*GREG ZINDORF*

12-20-2022

Authorized Signature

Date

Greg Zindorf

Printed Name

Owner

Address:

PO Box 50005

Title

Colorado Springs, CO

# EL PASO COUNTY STATEMENT

Filed in accordance with the requirements of the Drainage Criteria Manual, Volumes 1 and 2, El Paso County Engineering Criteria Manual and Land Development Code as amended.

Joshua Palmer, P.E.

Date

County Engineer/ECM Administrator



# TABLE OF CONTENTS

1.0 PURPOSE.....	1
2.0 SOIL CONDITIONS.....	1
3.0 DRAINAGE CRITERIA .....	1
4.0 EXISTING DRAINAGE CONDITIONS.....	2
5.0 DEVELOPED DRAINAGE CONDITIONS .....	3
6.0 WATER QUALITY .....	6
8.0 FLOODPLAIN STATEMENT .....	6
9.0 FLOODPLAIN STATEMENT .....	6
10.0 DRAINAGE BASIN FEES .....	7
11.0 CONSTRUCTION COST OPINION .....	7
12.0 CONCLUSIONS .....	7
13.0 REFERENCES.....	8

# BACK POCKET

APPENDIX A - MAPS

APPENDIX B - CALCULATIONS

APPENDIX C - ELLICOTT CONSOLIDATED FLOODPLAIN ANALYSIS

APPENDIX D - DESIGN CHARTS

BACK POCKET - DRAINAGE MAPS



## 1.0 PURPOSE

This drainage report is for the design of Zindorf – McDaniels Subdivision (McDaniels Tract). The site is located at 22755 McDaniels Road, Calhan CO in eastern El Paso County. See Vicinity Map in the Appendix below for reference. It is further described as the Northeast One-Quarter of the Northeast One-Quarter of Section 11, Township 14 South, Range 63 West of the 6<sup>th</sup> P.M.

This site is located in the Ellicott Consolidation – CHBS1200 Drainage Basin. Work will include subdividing the 39.7-acre site into four residential lots. An existing home will remain, and the driveway will be reconstructed. On the other three lots, home pads and gravel driveways will be constructed.

## 2.0 SOIL CONDITIONS

According to the El Paso County Area Soil Survey, the soil on the site is classified as follows:

SOIL #	SOIL TYPE	HYDROLOGIC CLASSIFICATION
19	Columbine Gravelly Sandy Loam	A
28	Ellicot Loamy Coarse Sand	A
95	Truckton Loamy Sand	A

The Columbine soil can be described as having a very high permeability, very low surface runoff, and slight hazard of erosion. The Ellicot soil also can be described as very low surface runoff and slight erosion hazard. The Truckton soil includes a moderate hazard of erosion and low water surface runoff. The soil classification used for this study is 'A'. See Soils Map below in the Appendix for reference.

## 3.0 DRAINAGE CRITERIA

The methodology utilized for this report is in accordance with the *El Paso County Drainage Criteria Manual*. The Rational Method for computation of runoff was used.

Q =  $cia$                       Where  
Q = maximum rate of runoff in cubic feet per second  
c = runoff coefficient representing drainage area characteristics  
i = average rainfall intensity, in inches per hour, for the duration required for the runoff to become established  
a = drainage basin size in acres

The storm recurrence intervals used for this study were the 5-year storm and the 100-year storm. ManningSolver Version 1.019 was used in this analysis to calculate the Manning's normal depth within the proposed swale.



## 4.0 EXISTING DRAINAGE CONDITIONS

The overall site consists of 39.7 acres, of this area approximately 1.03 acres is developed as a single family home, yard, and gravel driveway accessing McDaniel's Road. The areas of the site not covered by gravel road or the residential home are covered with short grass pastures. These undeveloped areas include slopes that range from 0.5% to 2.4%. The overall existing site is approximately 2.1% impervious. See Existing Drainage Map in Appendix for reference.

Flows from Sub-basins EX1 through EX3 and OS1 through OS3 are tributary to the Ellicott Consolidated Drainage Basin (CHBS1200).

Sub-basin OS1 contains 8.67 acres and drains southeast into Subbasin EX2. It produces flows of 1.1 cfs for the 5-year storm and 8.2 cfs for the 100-year storm. These flows sheetflow and continue towards the FEMA 100-year floodway in the middle of the site.

Sub-basin OS2 contains 0.49 acres and drain southwest into the Haegler Ranch floodway that runs through the middle of the site. It produces flows of 0.1 cfs for the 5-year storm and 1.0 cfs for the 100-year storm. These flows sheetflow to the southwest.

Sub-basin OS3 contains 1.02 acres and drains the east along McDaniels Road. It contains half of McDaniels Road that drains south into the ditch. It produces flows of 0.5 cfs for the 5-year storm and 1.5 cfs for the 100-year storm. All flows north of the site are directed into a drainage ditch that flows into a culvert under McDaniels Road. These flows bypass the development occurring on the site in a ditch along North Log Road. Flows overtopping the intersection of McDaniels Road and North Log Road sheetflow to the east.

Sub-basin EX1 contains 1.06 acres and drains due southwest. It produces flows of 0.2 cubic feet per second (cfs) for the 5-year storm and 1.4 cfs for the 100-year storm. These flows are directed to the southerly direction.

Sub-basin EX2 contains 14.59 acres and drains southeast into the Haeglar Ranch floodway in the middle of the site. It produces flows of 1.8 cfs for the 5-year storm and 14.0 cfs for the 100-year storm. These flows sheetflow to the southeast.

Sub-basin EX3 contains 22.89 acres and sheetflows to the southwest into the Haegler Ranch floodway in the middle of the site. It produces flows of 3.5 cfs for the 5-year storm and 22.8 cfs for the 100-year storm. These flows will combine with flows from Sub-basin EX2, Sub-basin EX3, Sub-basin OS1, Sub-basin OS2, and Sub-basin OS3 to produce total flows of 7.1 cfs for the 5-year storm and 48.0 cfs for the 100-year storm at Design Point 1. FEMA Zone 'A' 100-year floodplain flows entering the site are approximately 1,900 cfs.

The total flow leaving the site at Design Point 1 (DP1) is 7.1 cfs for the 5-year storm and 48.0 cfs for the 100-year storm. The estimated runoff amounts produced for the project under Existing Conditions are shown in Table 1 below.



Sub-basin	Q <sub>5</sub> (CFS)	Q <sub>100</sub> (CFS)
EX1	0.2	1.4
EX2	1.8	14.0
EX3	3.5	22.8
OS1	1.1	8.2
OS2	0.1	1.0
OS3	0.5	1.5
DP1 (EX2 + EX3 + OS1 + OS2 + OS3)	7.1	48.0

## 5.0 ELLICOTT CONSOLIDATED FLOODPLAIN ANALYSIS

FEMA has previously studied the Ellicott Consolidated floodway with limited results presented on the Flood Insurance Rate Map and Flood Insurance Study. The available information from FEMA is presented in the appendix of this report. The peak 100-year flow rate of 7,019 at the confluence of the East Tributary is the only flow value provided in the study, and is located approximately 1.6 miles downstream of our site.

The information provided in the FEMA study does not provide sufficient detail to determine the channel's stability. A more detailed analysis hydraulic analysis was completed utilizing several sources of information, including

- Colorado LiDAR data from the Colorado Hazard Mapping and Risk MAP Portal
- FEMA GIS data
- Hydrologic and hydraulic data from the "Haegler Ranch Basin Drainage Basin Planning Study," by URS, May 2009

A HEC-RAS version 6.2 hydraulic model was prepared utilizing the same cross section locations as the previous FEMA study, except for modifications made at Log Road at the downstream end of the project. Cross sections in this vicinity were modified to cross the channel and better consider the roadway alignment and profile. A total of eight cross sections were used to model 2609 linear feet of channel, including an existing 48" CMP under Log Road. Peak flow rates of 570 cfs for the 5-year and 3200 cfs for the 100-year storms were used and are based upon the downstream most portion of the Haegler Ranch Basing Drainage Planning Study (DBPS) located at McDaniels Road. A total tributary area of 16.6 square miles drains to McDaniels Road. Mannings coefficients of 0.074 for light brush and 0.065 for native grasses were used and are the same values recommended in the DBPS. Photographs from 2023 are also included in the appendix of this report to help support the assumptions used.

The project site is located between HEC-RAS river cross section station s 3609 to 1814, see Floodplain Evaluation Map in the appendix. The additional cross sections located downstream of the site were used to model the backwater effects resulting from the Log Road crossing. Within the site, three key items were reviewed to help determine that the natural channel is scour stable:



1. Vegetative cover at the site, including shrubs, native grasses and trees appear well established indicating that the channel is stable.
2. The computed flow velocities through the project site range between 2.04 fps and 5.91 fps for the 100-year flow rate. The publication by Craig Fischenich with the USAE Research and Development Center, "Stability Thresholds for Stream Restoration Materials," dated May 2001, indicates that for long native grasses the maximum permissible velocity of a channel is 7.0 fps.
3. The Froude number for the 100-year storm ranges from 0.17 to .74 indicating a subcritical flow regime. Any number less than 1.0 (critical depth), and, ideally less than 0.80, is expected to be stable.

Based upon the floodplain analysis completed as part of this study, no additional channel stabilization measure are needed as a result of this project. The channel in it's natural condition is considered scour stable.

## 6.0 DEVELOPED DRAINAGE CONDITIONS

Although the overall site consists of 39.7 acre only approximately 1.37 acres will be disturbed. The site will be subdivided into four separate lots with three house and gravel driveway being constructed on the four lots. The existing house will remain and the gravel driveway will be reconstructed. See Proposed Conditions Map below in Appendix for reference.

The overall drainage pattern will remain the same as existing conditions with developed flows directed to the same locations as described in the Existing Conditions Section. Proposed site imperviousness is 2.8%, versus 2.1% in the existing conditions.

Sub-basin OS1 contains 8.67 acres and drains southeast into Subbasin PP2. It produces flows of 1.1 cfs for the 5-year storm and 8.2 cfs for the 100-year storm. These flows continue towards the FEMA 100-year floodway in the middle of the site.

Sub-basin OS2 contains 0.49 acres and drain southwest into the Haegler Ranch floodway that runs through the middle of the site. It produces flows of 0.1 cfs for the 5-year storm and 1.0 cfs for the 100-year storm. These flows sheetflow to the southwest and will combine with flows from Design Point 1, described above.

Sub-basin OS3 contains 1.02 acres and drains the east along McDaniels Road. It contains half of McDaniels Road that drains south into the ditch. It produces flows of 0.5 cfs for the 5-year storm and 1.5 cfs for the 100-year storm. All flows north of the site are directed into a drainage ditch that flows into a culvert under McDaniels Road. These flows bypass the development occurring on the site in a ditch along North Log Road. Flows overtopping the intersection of McDaniels Road and North Log Road sheetflow to the east.

Sub-basin PP1 contains 1.06 acres and drains due southwest. It produces flows of 0.2 cfs for the 5-year storm and 1.4 cfs for the 100-year storm. These flows sheetflow in a southerly direction.



Sub-basin PP2 contains 14.59 acres and drains southeast into the Haeglar Ranch floodway in the middle of the site. It produces flows of 1.8 cfs for the 5-year storm and 14.0 cfs for the 100-year storm. These flows sheetflow to the southeast.

Sub-basin PP3 contains 22.89 acres and sheetflows to the southwest into the Haeglar Ranch floodway in the middle of the site. It produces flows of 3.9 cfs for the 5-year storm and 22.9 cfs for the 100-year storm. These flows will combine with flows from Sub-basin PP2, Sub-basin PP3, Sub-basin OS1, Sub-basin OS2, and Sub-basin OS3 to produce total flows of 7.5 cfs for the 5-year storm and 48.0 cfs for the 100-year storm at Design Point 1. The majority of runoff will sheet flow and have similar time of concentrations as seen in the existing conditions. The 100-year peak rate in the proposed conditions is the same as that of the existing, and the 5-year increases 0.4 cfs in the proposed conditions, existing 5-year flow rate of 7.1 cfs versus the proposed flow rate of 7.5 cfs. Because the peak flow rate for the 100-year storm event remains unchanged, and only a slight increase in the 5-year flow rate is seen, mitigation is not required. All flows north of the site are directed into a drainage ditch that flows into a culvert under McDaniels Road. These flows bypass the development occurring on the site in a ditch along North Log Road. Flows overtopping the intersection of McDaniels Road and North Log Road sheetflow to the east.

Flows from Design Point 1 will sheetflow into Ellicott Consolidated channel and continue downstream toward an existing public 48" CMP under Log Road. The flows from the floodplain do overtop Log Road and continue downstream to the southeast. The computed flows are either generated from this site, or sheet flow through the site from adjacent parcels, but do not include the flows within the floodplain from the upstream watershed.

The estimated runoff amounts produced for the project for Developed Conditions are shown in Table 2 below.

TABLE 2 – DEVELOPED CONDITIONS		
Sub-basin	Q <sub>5</sub> (CFS)	Q <sub>100</sub> (CFS)
PP1	0.2	1.4
PP2	1.8	14.0
PP3	3.9	22.9
OS1	1.1	8.2
OS2	0.1	1.0
OS3	0.5	1.5
DP1 (PP2 + PP3 + OS1 + OS2 + OS3)	7.5	48.0





## 6.0 WATER QUALITY

The total disturbance for this development will be 1.37 acres. According to the El Paso County Engineering Criteria Manual (ECM), "The following types of sites and associated land disturbances are excluded from the requirements of this Section 1.7". Furthermore, in El Paso County ECM Appendix I.7, 1.B, a "Large Lot Single Family Site" is excluded from the requirements defined in Section 1.7. Since this site will be divided in single-family residential lots greater than 2.5 acres in size per dwelling and having a total lot imperviousness of less than 10 percent, the site can be excluded from water quality control measure requirements.

## 7.0 EROSION CONTROL PLAN

The site construction consists of four single family residential lots, which includes four houses and gravel driveways that all occupy greater than 2.5 acres in size per dwelling and a total lot imperviousness of less than 10 percent. With single family residential lots greater than 2.5 acres in size and less than 10 percent imperviousness, the site is excluded from stormwater quality control measures and ESQCP requirements. Although exclusions apply, each lot is still responsible for providing appropriate temporary control measures when each site is developed, which may include items such as silt fence, vehicle tracking control surfaces, etc.

## 8.0 FLOODPLAIN STATEMENT

Portions of the site are within the designated FEMA 100-year floodplain and designated FEMA 100-year floodway as designated on Map No. 08041C0810G and Map No. 08041C0807G, both dated December 7<sup>th</sup>, 2018. A large portion of the site consists of a FEMA Flood Zone 'AE'. A small portion on the north end of the site is considered a FEMA Flood Zone 'A'.

All structures will be a minimum of 150' away from the FEMA delineated Zone AE floodplains and homes shall be constructed in accordance with El Paso County's Chapter 12 for to either elevate any residence 1' above the 100-year base flood elevation of 6090 (NAVD 88 Datum), or floodproof the structure for any areas below the floodplain elevation. There is currently not an approved drainage basin planning study for the Ellicott Consolidated (CHBS1200) Drainage Basin, and no County identified improvements were identified for this segment of stream. Based upon field observations, significant vegetation consisting of rangeland grasses, shrubs and trees exist in the area meaning the floodplain area is scour stable. No baseflow exists within the channel. For these reasons, drainageway improvements and channel stabilization requirements have not been identified for the drainageway shown in the Drainage Maps below. No improvements are proposed for this drainageway as a result, an no additional hydraulic analysis beyond what FEMA has provided is needed for this Final Drainage Report.

Indicate what flows were used in the analysis (FEMA lists 7019 cfs but HEC-RAS shows 3200 cfs). Indicate what velocity, FR # and how these all meet channel requirements from DCM.



## 9.0 DRAINAGE BASIN FEES

The proposed development is located within the Ellicott Consolidated Drainage Basin.

### **2023 Ellicott Consolidated Drainage Fees**

There are no drainage fees associated with the Ellicott Consolidated Drainage Basin.

### **2023 Ellicott Consolidated Bridge Fees**

There are no bridge fees associated with the Ellicott Consolidated Drainage Basin.

## 10.0 CONSTRUCTION COST OPINION

There are no proposed drainage structures for this project, therefore, no engineer's estimate of probable costs are required for this drainage report.

## 11.0 CONCLUSIONS

For this 39.7-acre site, the site will be divided into four separate lots. The existing gravel driveway will be removed and reconstructed, while the 1850 sf house will remain. Three additional home pads and gravel driveways will be constructed on the other lots. The total estimated new disturbance area of the site will be 1.37 acres, which will allow for new driveways for all four lots, and home construction on three of the lots. The fourth lot currently has a single family residence, which will remain and only the gravel driveway will be reconfigured. Construction will occur within drainage sub-basin PP3. The development increases total routed flows exiting the site at Design Point 1 (DP1) from 7.1 cfs to 7.5 cfs for the 5-year storm, while the 100-year storm flow remains unchanged at 48.0 cfs. This is a 5.6% increase for the 5-year storm. These increases do not warrant the need for detention, nor water quality as each lot is also greater than five acres in size. All developed flows will continue to flow along existing drainage patterns. All areas disturbed by construction will be repaired, and erosion control measures will be installed during construction of the proposed site. The proposed project will not, with respect to stormwater runoff, negatively impact the adjacent properties and downstream properties. Because there is no increase to the 100-year peak flow rates from the site and only a minimal increase in the 5-year event, the proposed development will not adversely impact adjacent and downstream properties.



## 12.0 REFERENCES

**Haegler Ranch Drainage Basin Planning Study**, URS Corporation, Dated May 2009.

**LiDAR Data**, Colorado Hazard Mapping and Risk MAP Portal, obtained 2023

**Municipal Code Corporation (2018)**. *Engineering Criteria Manual of El Paso County, Colorado (ECM)*

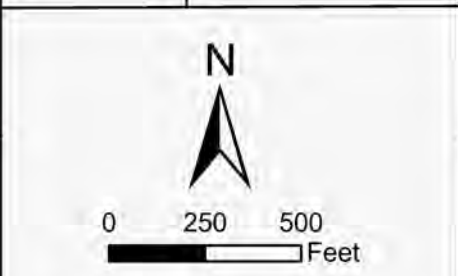
**Municipal Code Corporation (2018)**. *Drainage Criteria Manual of El Paso County, Colorado (DPM)*

**USDA, NRCS**. Soil Survey of El Paso County Area, Colorado.



# APPENDIX A

## MAPS



Prepared by:



121 S. TEJON ST., SUITE 1110  
COLORADO SPRINGS, CO 80903  
WWW.RESPEC.COM (719) 266-5212

---

22755 McDaniels Road

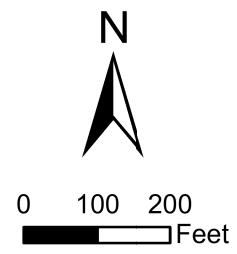
**VICINITY MAP**

Esri Community Maps Contributors, © OpenStreetMap, Microsoft, Esri, HERE, Garmin, SafeGraph, GeoTechnologies, Inc., METI/NASA, USGS, EPA, NPS, US Census Bureau, USDA

Path: N:\Projects\W0008 - Guman & Associates\### 22755 McDaniels Road\8. GIS\McDaniels\McDaniels.aprx



Map Unit Symbol	Map Unit Name	Rating
19	Columbine gravelly sandy loam, 0 to 3 percent slopes	A
28	Ellicot loamy coarse sand, 0 to 5 percent slopes	A
95	Truckton loamy sand, 1 to 9 percent slopes	A



Prepared by:



121 S. TEJON ST., SUITE 1110  
 COLORADO SPRINGS, CO 80903  
 WWW.RESPEC.COM (719) 266-5212

22755 McDaniels Road

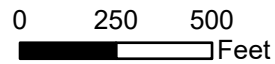
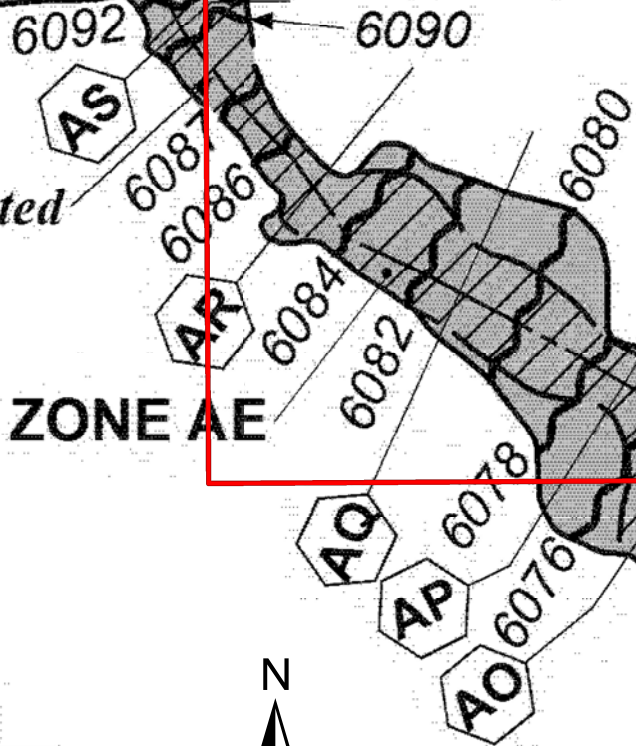
**SOILS MAP**

Esri Community Maps Contributors, © OpenStreetMap, Microsoft, Esri, HERE, Garmin, SafeGraph, GeoTechnologies, Inc, METI/NASA, USGS, EPA, NPS, US Census Bureau, USDA, Maxar

Path: \\Projects\W0008 - Guman & Associates\### 22755 McDaniels Road\6. GIS\McDaniels\McDaniels.aprx

*Ellicott Consolidated*

**ZONE AE**



**NFP** PANEL 0810G

**FIRM**  
FLOOD INSURANCE RATE MAP  
EL PASO COUNTY,  
COLORADO  
AND INCORPORATED AREAS

PANEL 810 OF 1300  
(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
EL PASO COUNTY	8009	810	0

Notice to User: The Map Number shown herein should be used when placing map orders. The Community Number shown above should be used on insurance applications for the subject community.

**MAP NUMBER**  
08041C0810G

**MAP REVISED**  
DECEMBER 7, 2018

Federal Emergency Management Agency

11

Prepared by:

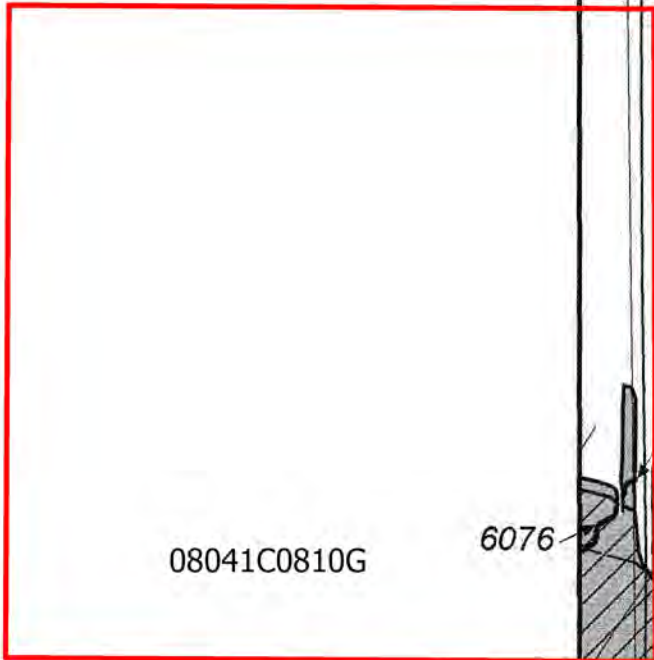


**RESPEC**

121 S. TEJON ST., SUITE 1110  
COLORADO SPRINGS, CO 80903  
WWW.RESPEC.COM (719) 266-5212

22755 McDaniels Road

**FIRM MAP**



08041C0810G

6076

6076



*Ellicott Consolidated*

6072



**ZONE AE**

6068

6064

6064

6062

11

6062



6058

6056

LOG RD

1370000 FT

38° 50' 37.50"

104° 24' 22.00"



0 250 500 Feet

Prepared by:



**RESPEC**

121 S. TEJON ST., SUITE 1110  
COLORADO SPRINGS, CO 80903  
WWW.RESPEC.COM (719) 266-5212

22755 McDaniels Road

**FIRM MAP**

**FIRM**  
FLOOD INSURANCE RATE MAP  
EL PASO COUNTY,  
COLORADO  
AND INCORPORATED AREAS

PANEL 807 OF 1300

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:  
COMMENTS: NUMBER: PANEL: SHEETS:  
F. ABBREVIATION: ABBREVIATION: MAP: C.

MAP NUMBER  
08041C0807G  
MAP REVISED  
DECEMBER 7, 2018  
Federal Emergency Management Agency







---

# APPENDIX B

## CALCULATIONS

---



<b>McDaniels Subdivision</b>									
<b>C FACTOR CALCULATION SHEET</b>									
<b>EXISTING CONDITIONS</b>									
<b>RUNOFF COEFFICIENT</b>									
<b>TYPE A/B SOILS</b>									
<b>LAND USE</b>		<b>Imperv %</b>	<b>5 YR</b>	<b>100 YR</b>					
UNDEV		0	0.08	0.35					
GRAVEL ROAD		80	0.59	0.7					
ASPHALT ROAD		100	0.9	0.96					
ROOFS		90	0.73	0.81					
<b>EXISTING CONDITIONS</b>									
	<b>TOTAL</b>	<b>SURFACE CONDITION AREAS</b>				<b>CALCULATED C</b>			
<b>AREA</b>	<b>AREA</b>	<b>UNDEV</b>	<b>GRAVEL</b>	<b>ASPHALT</b>	<b>ROOFS</b>	<b>5</b>	<b>100</b>	<b>% IMPERVIOUS</b>	
<b>DESIG.</b>	<b>(acre)</b>		<b>ROAD</b>	<b>ROAD</b>		<b>YR</b>	<b>YR</b>		
EX1	1.06	1.06	0.00	0.00	0.00	<b>0.08</b>	<b>0.35</b>		<b>0.00</b>
EX2	14.59	14.59	0.00	0.00	0.00	<b>0.08</b>	<b>0.35</b>		<b>0.00</b>
EX3	22.86	21.83	0.98	0.00	0.05	<b>0.10</b>	<b>0.37</b>		<b>3.63</b>
OS1	8.67	8.67	0.00	0.00	0.00	<b>0.08</b>	<b>0.35</b>		<b>0.00</b>
OS2	0.49	0.49	0.00	0.00	0.00	<b>0.08</b>	<b>0.35</b>		<b>0.00</b>
OS3	1.02	0.60	0.42	0.00	0.00	<b>0.29</b>	<b>0.49</b>		<b>32.94</b>
Site Percent Impervious		2.11							

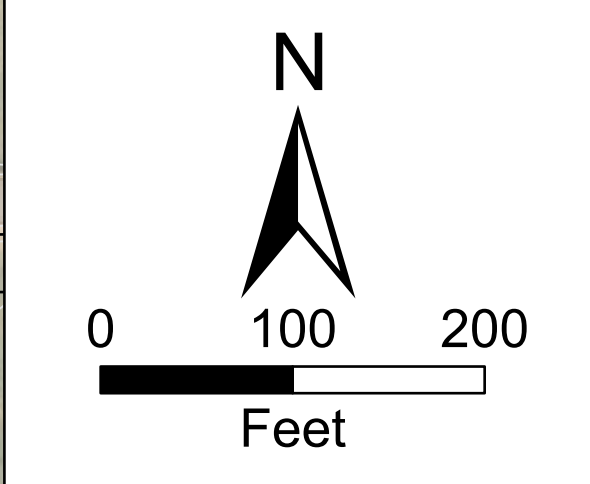
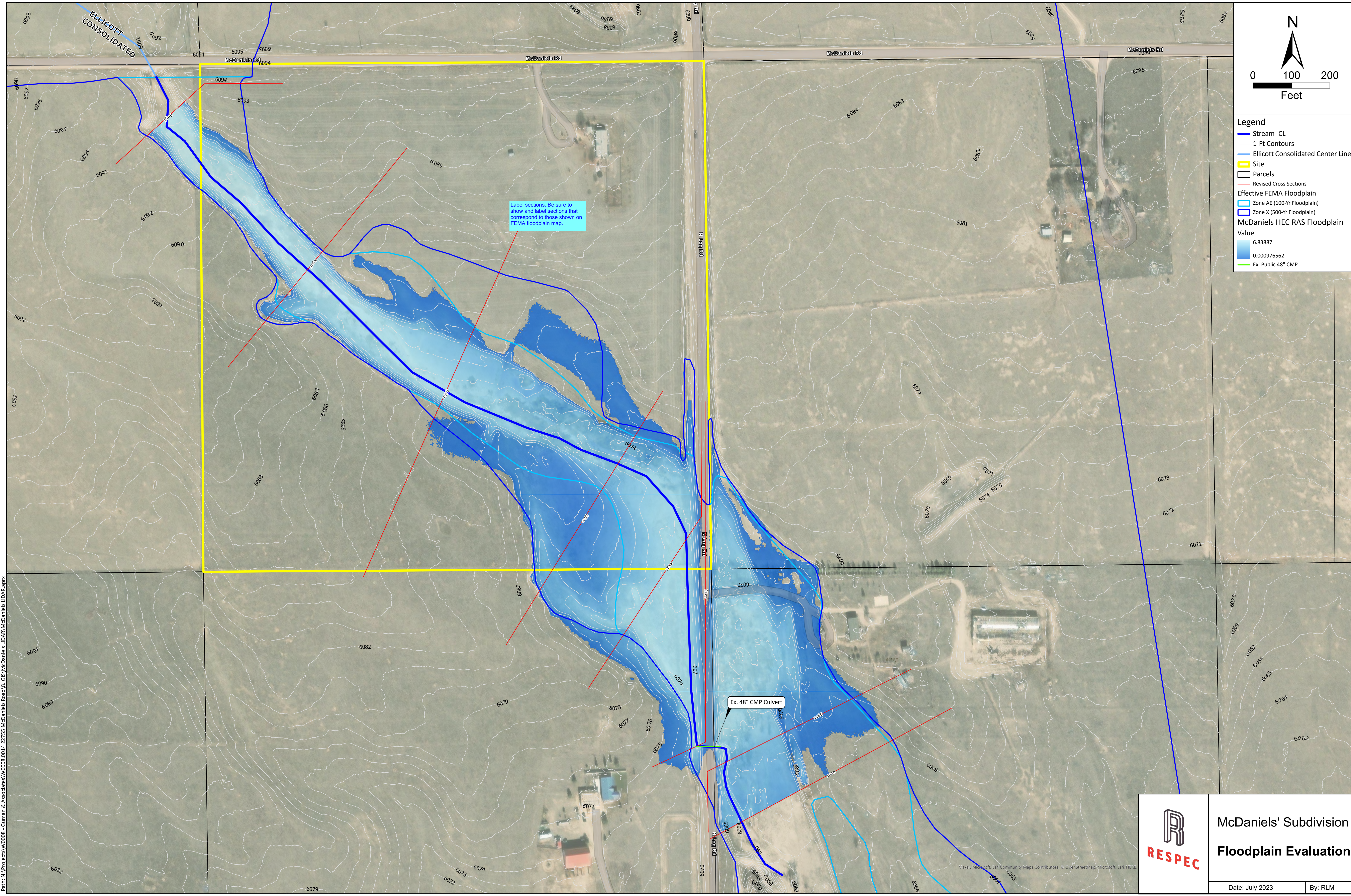
DEVELOPED CONDITIONS									
RUNOFF COEFFICIENT									
TYPE A/B SOILS									
LAND USE		Imperv %	5 YR	100 YR					
UNDEV		0	0.08	0.35					
GRAVEL ROAD		80	0.59	0.7					
ASPHALT ROAD		100	0.9	0.96					
ROOFS		90	0.73	0.81					
Developed Conditions									
	TOTAL	SURFACE CONDITION AREAS				CALCULATED C			
AREA	AREA	UNDEV	GRAVEL	ASPHALT	ROOFS	5	100	% IMPERVIOUS	
DESIG.	(acre)		ROAD	ROAD		YR	YR		
PP1	1.06	1.06	0.00	0.00	0.00	0.08	0.35	0.00	
PP2	14.59	14.59	0.00	0.00	0.00	0.08	0.35	0.00	
PP3	22.86	21.49	1.16	0.00	0.21	0.11	0.37	4.89	
Total	38.51	37.14	1.16	0.00	0.21	TOTAL SITE IMPERVIOUSNESS		2.90	
OS1	8.67	8.67	0.00	0.00	0.00	0.08	0.35	0.00	
OS2	0.49	0.49	0.00	0.00	0.00	0.08	0.35	0.00	
OS3	1.02	0.60	0.42	0.00	0.00	0.29	0.49	32.94	
Site Percent Impervious		2.83							





# APPENDIX C

## ELLICOTT CONSOLIDATED FLOODPLAIN ANALYSIS



- Legend**
- Stream\_CL
  - 1-Ft Contours
  - Ellicott Consolidated Center Line
  - Site
  - Parcels
  - Revised Cross Sections
  - Effective FEMA Floodplain**
  - Zone AE (100-Yr Floodplain)
  - Zone X (500-Yr Floodplain)
  - McDaniels HEC RAS Floodplain**
  - Value**
  - 6.83887
  - 0.000976562
  - Ex. Public 48" CMP

Label sections. Be sure to show and label sections that correspond to those shown on FEMA floodplain map.

Ex. 48" CMP Culvert



**McDaniels' Subdivision  
Floodplain Evaluation**

Date: July 2023 By: RLM

Path: N:\Projects\W0008 - Guman & Associates\W0008.0014 22755 McDaniels Road\8. GIS\McDaniels LIDAR\McDaniels LIDAR.aprx

Maxar, Microsoft, Esri, Community Maps Contributors, © OpenStreetMap, Microsoft, Esri, HERE

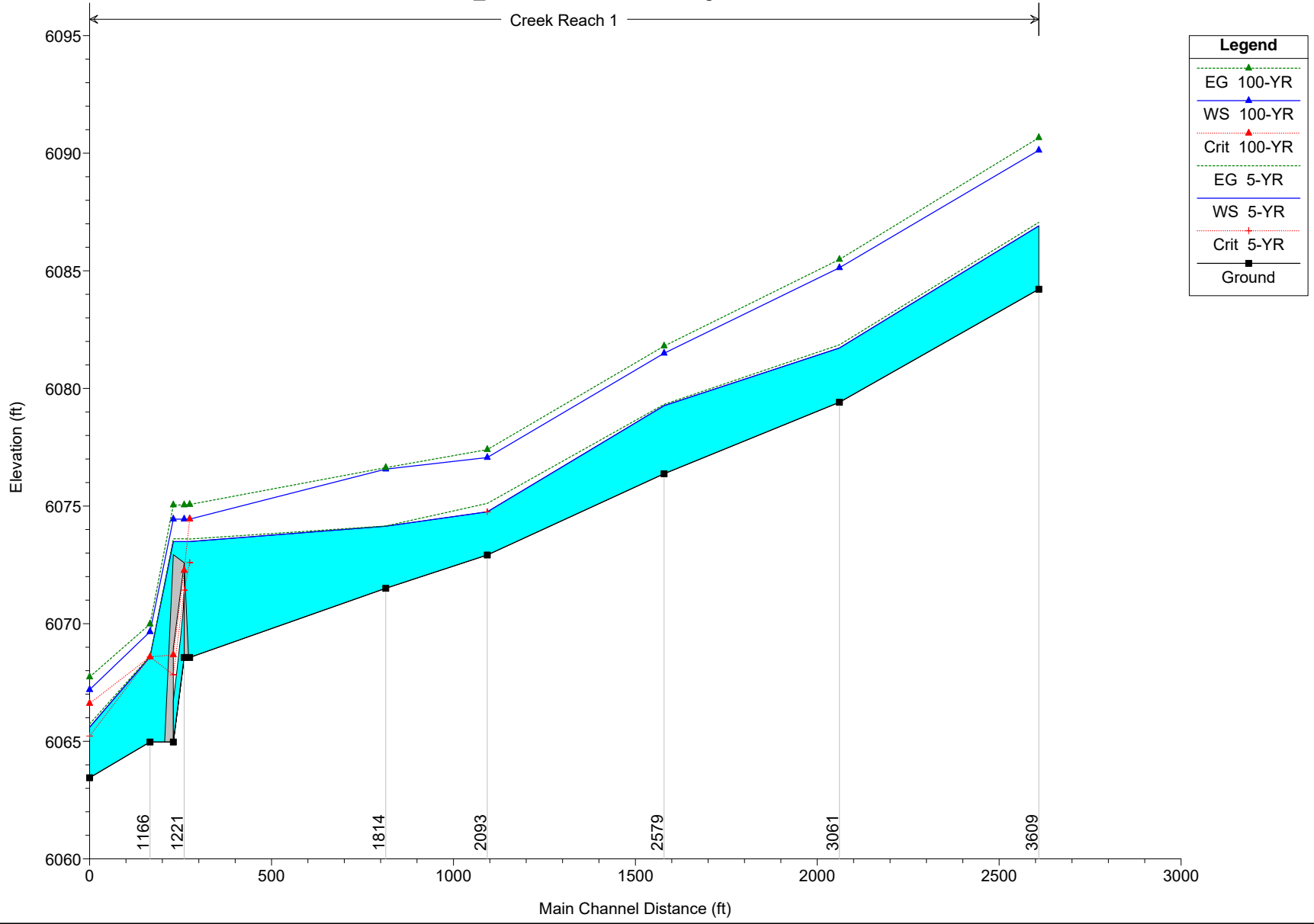
HEC-RAS Plan: Existing River: Creek Reach: Reach 1

Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Reach 1	3609	5-YR	570.00	6084.22	6086.91		6087.06	0.009843	3.07	185.91	97.05	0.39
Reach 1	3609	100-YR	3200.00	6084.22	6090.13		6090.66	0.010752	5.91	552.72	129.32	0.48
Reach 1	3061	5-YR	570.00	6079.41	6081.72		6081.85	0.009166	2.97	191.95	99.59	0.38
Reach 1	3061	100-YR	3200.00	6079.41	6085.13		6085.49	0.008188	4.97	696.78	203.06	0.41
Reach 1	2579	5-YR	570.00	6076.37	6079.27		6079.32	0.003368	1.91	298.05	171.93	0.26
Reach 1	2579	100-YR	3200.00	6076.37	6081.50		6081.80	0.007120	4.43	729.05	271.04	0.42
Reach 1	2093	5-YR	570.00	6072.92	6074.75	6074.75	6075.11	0.053393	4.88	122.53	173.74	0.91
Reach 1	2093	100-YR	3200.00	6072.92	6077.06		6077.40	0.011847	5.18	798.25	528.22	0.53
Reach 1	1814	5-YR	570.00	6071.50	6074.14		6074.15	0.000435	0.81	706.10	325.46	0.10
Reach 1	1814	100-YR	3200.00	6071.50	6076.57		6076.63	0.001031	2.04	1665.55	444.88	0.17
Reach 1	1275	5-YR	570.00	6068.56	6073.49	6072.60	6073.60	0.004497	2.98	274.92	293.02	0.32
Reach 1	1275	100-YR	3200.00	6068.56	6074.44	6074.44	6075.07	0.022462	8.11	631.73	461.52	0.74
Reach 1	1221		Culvert									
Reach 1	1166	5-YR	570.00	6064.97	6068.59	6068.59	6068.62	0.001328	1.38	416.37	213.24	0.17
Reach 1	1166	100-YR	3200.00	6064.97	6069.66	6068.59	6069.99	0.009293	4.76	771.19	418.96	0.47
Reach 1	1000	5-YR	570.00	6063.45	6065.60	6065.22	6065.74	0.020012	2.98	191.22	215.85	0.56
Reach 1	1000	100-YR	3200.00	6063.45	6067.19	6066.61	6067.73	0.020008	5.90	546.94	238.09	0.66

FEMA flow in channel is 7019 cfs. Where was 3200 cfs obtained?

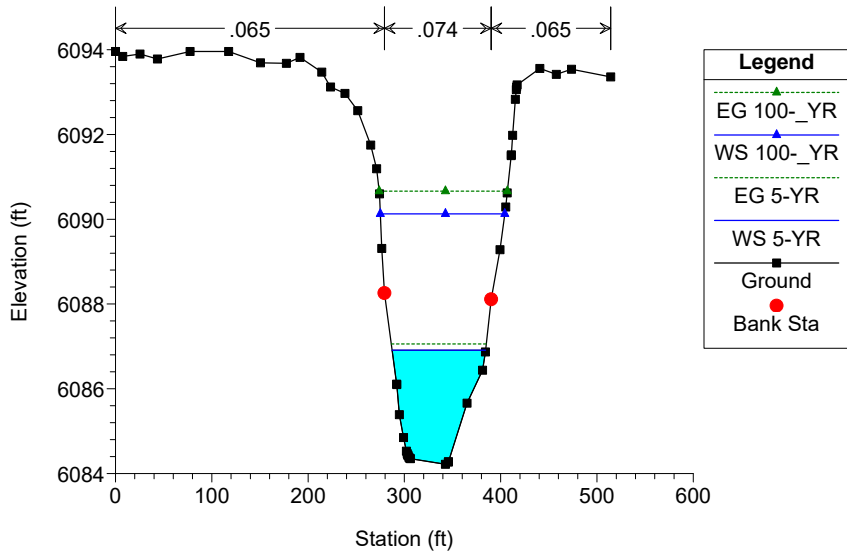
McDaniels\_June23 Plan: Existing Conditions 7/18/2023

Creek Reach 1

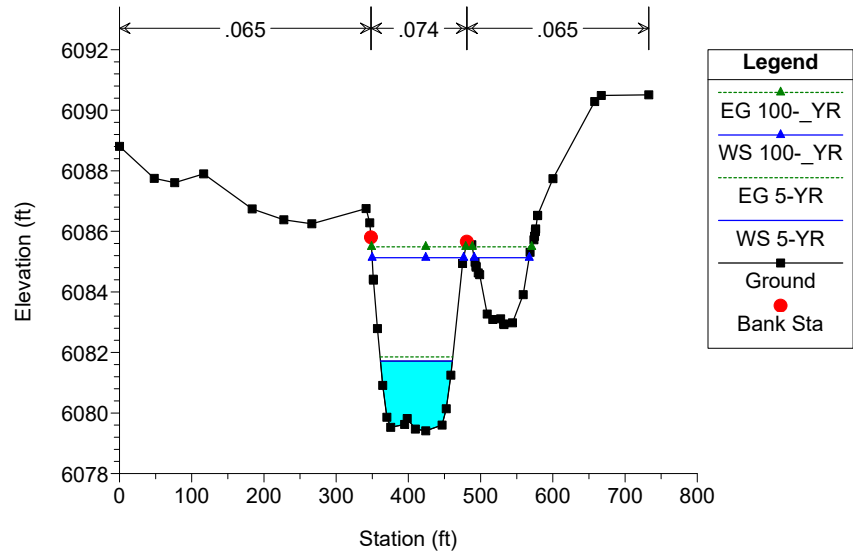




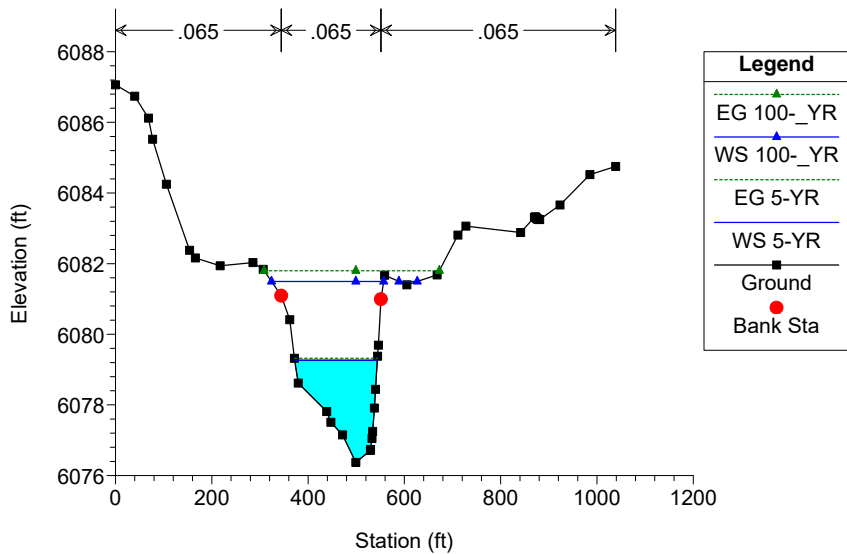
McDaniels\_June23 Plan: Existing Conditions 7/18/2023



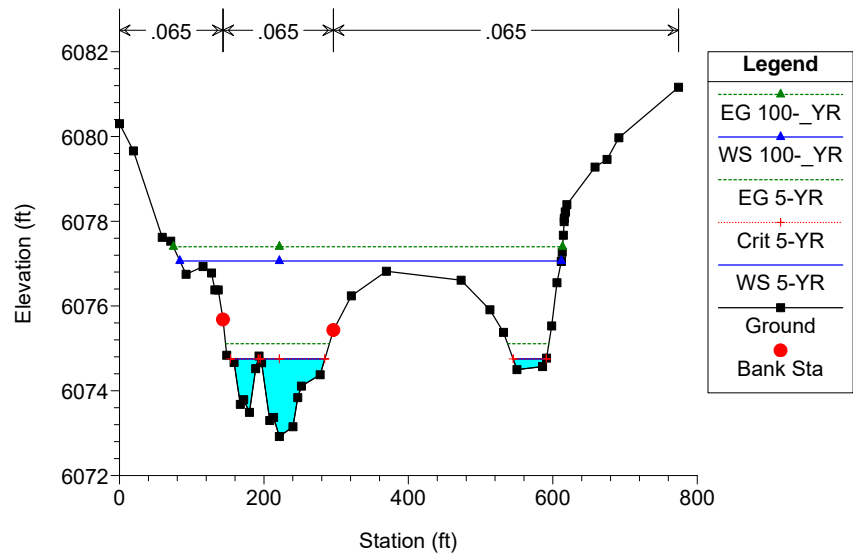
McDaniels\_June23 Plan: Existing Conditions 7/18/2023



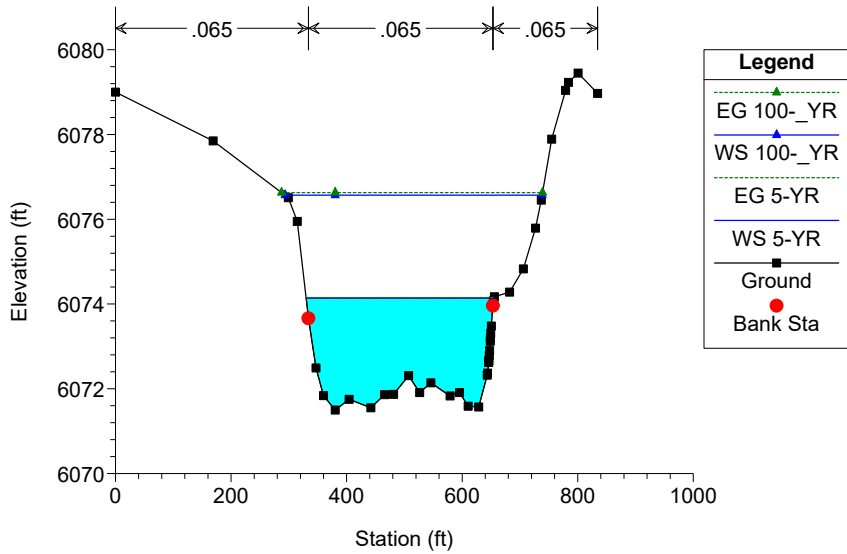
McDaniels\_June23 Plan: Existing Conditions 7/18/2023



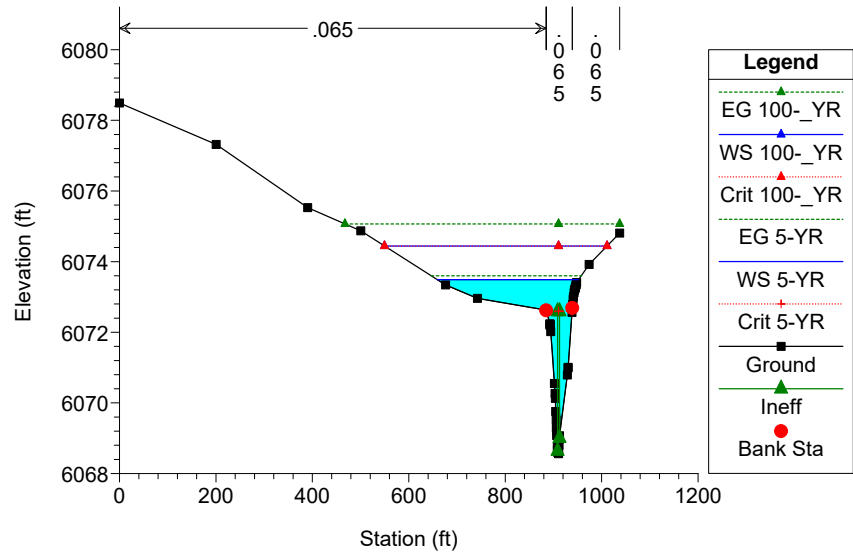
McDaniels\_June23 Plan: Existing Conditions 7/18/2023



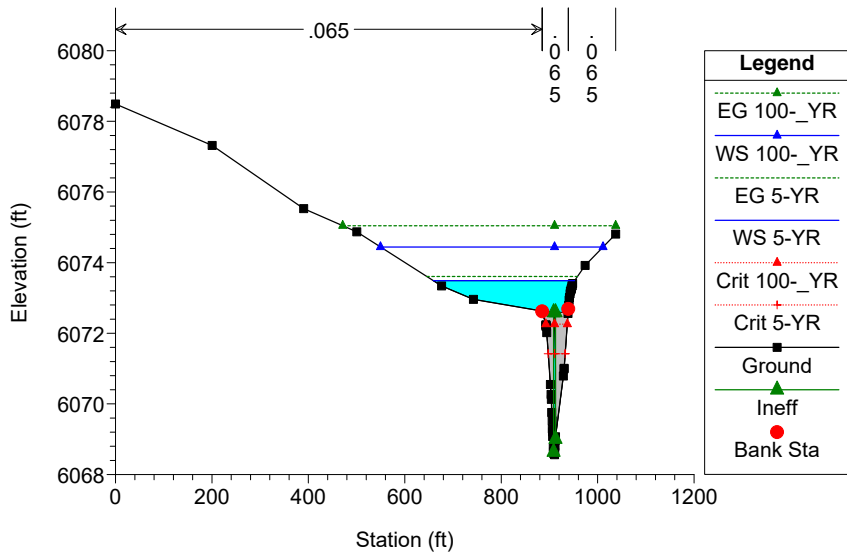
McDaniels\_June23 Plan: Existing Conditions 7/18/2023



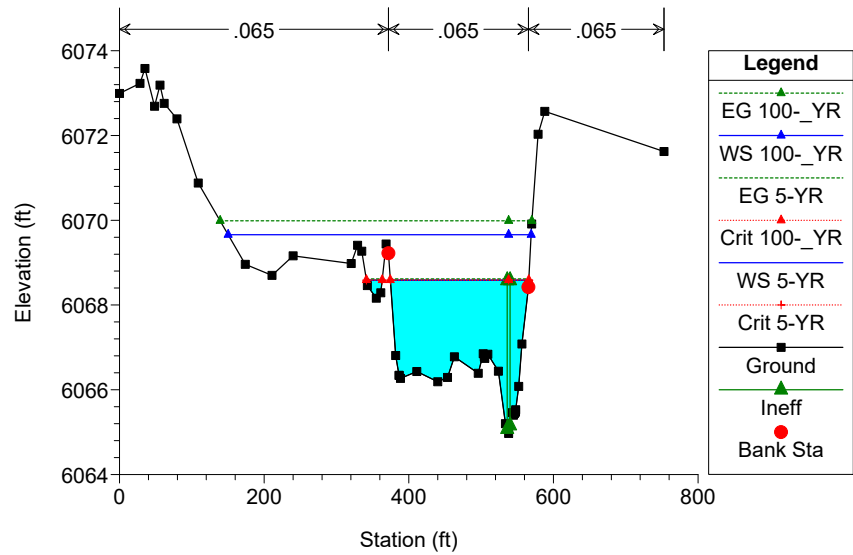
McDaniels\_June23 Plan: Existing Conditions 7/18/2023



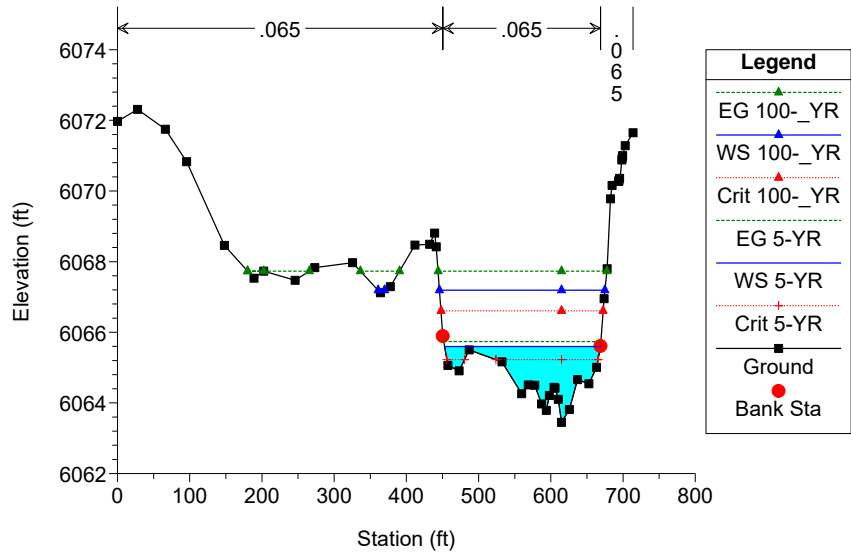
McDaniels\_June23 Plan: Existing Conditions 7/18/2023



McDaniels\_June23 Plan: Existing Conditions 7/18/2023



McDaniels\_June23 Plan: Existing Conditions 7/18/2023





Woody shrubs along channel thalweg on north end of site (looking southeast)



Native grasses within channel within midpoint of property (looking northwest)



Native grasses within channel within midpoint of property (looking southeast)



48" CMP at North Log Road crossing (downstream of project, looking west)



48" CMP at North Log Road Crossing (downstream of project, looking east)

HEC-RAS HEC-RAS 6.2 March 2022  
 U.S. Army Corps of Engineers  
 Hydrologic Engineering Center  
 609 Second Street  
 Davis, California

```

X    X  XXXXXX   XXXX       XXXX       XX       XXXX
X    X  X        X    X     X    X     X    X     X
X    X  X        X        X    X     X    X     X
XXXXXXXX XXXX    X        XXX XXXX   XXXXXXX   XXXX
X    X  X        X        X    X     X    X           X
X    X  X        X    X     X    X     X    X           X
X    X  XXXXXX   XXXX       X    X     X    X     XXXXX
  
```

PROJECT DATA

Project Title: McDaniels\_June23  
 Project File : McDaniels\_Jun23.prj  
 Run Date and Time: 7/18/2023 7:05:20 AM

Project in English units

PLAN DATA

Plan Title: Existing Conditions  
 Plan File : n:\Projects\W0008 - Guman & Associates\W0008.0014 22755 McDaniels Road\5. ENG\HEC-RAS\McDaniels\_Jun23.p01

Geometry Title: McDaniels  
 Geometry File : n:\Projects\W0008 - Guman & Associates\W0008.0014 22755 McDaniels Road\5. ENG\HEC-RAS\McDaniels\_Jun23.g01

Flow Title : DBPS Flows  
 Flow File : n:\Projects\W0008 - Guman & Associates\W0008.0014 22755 McDaniels Road\5. ENG\HEC-RAS\McDaniels\_Jun23.f01

Plan Summary Information:

Number of:	Cross Sections =	8	Multiple Openings =	0
	Culverts =	1	Inline Structures =	0
	Bridges =	0	Lateral Structures =	0

Computational Information

Water surface calculation tolerance =	0.01
Critical depth calculation tolerance =	0.01
Maximum number of iterations =	20
Maximum difference tolerance =	0.3
Flow tolerance factor =	0.001

Computation Options

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

FLOW DATA

Flow Title: DBPS Flows  
 Flow File : n:\Projects\W0008 - Guman & Associates\W0008.0014 22755 McDaniels Road\5. ENG\HEC-RAS\McDaniels\_Jun23.f01

Flow Data (cfs)

River	Reach	RS	5-YR	100-YR
Creek	Reach 1	3609	570	3200

Boundary Conditions

River	Reach	Profile	Upstream	Downstream
Creek	Reach 1	5-YR		Normal S = 0.02
Creek	Reach 1	100-YR		Normal S = 0.02

GEOMETRY DATA

Geometry Title: McDaniels  
 Geometry File : n:\Projects\W0008 - Guman & Associates\W0008.0014 22755 McDaniels Road\5. ENG\HEC-RAS\McDaniels\_Jun23.g01

CROSS SECTION

RIVER: Creek  
 REACH: Reach 1                    RS: 3609

INPUT

Description:

Station Elevation Data		num=	50						
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	6093.96	7.5	6093.84	25.5	6093.9	43.5	6093.78	77.5	6093.96
117.5	6093.96	150.6	6093.69	177.5	6093.68	191.5	6093.82	214.2	6093.47
223.4	6093.12	238.2	6092.97	251.6	6092.56	265.1	6091.75	271.1	6091.19
274.1	6090.6	276.5	6089.31	279.3	6088.26	292	6086.11	292.1	6086.1
294.8	6085.39	299.1	6084.85	302	6084.53	302.9	6084.47	303.4	6084.44
303.9	6084.42	304.8	6084.38	305.6	6084.36	306.2	6084.35	342.6	6084.22
345.6	6084.27	345.8	6084.28	365	6085.66	381.2	6086.44	384.1	6086.87
390.2	6088.11	399.2	6089.28	405.3	6090.29	406.7	6090.62	410.9	6091.5
411	6091.52	412.4	6091.98	415.2	6092.83	416.3	6093.06	416.6	6093.12
417	6093.17	440.6	6093.56	457.7	6093.42	473.6	6093.54	514.27	6093.36

Manning's n Values		num=	3				
Sta	n Val	Sta	n Val	Sta	n Val		
0	.065	279.3	.074	390.2	.065		

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff	Contr.	Expan.
	279.3	390.2		548    548	548		.1	.3

CROSS SECTION

RIVER: Creek  
 REACH: Reach 1                    RS: 3061

INPUT

Description:

Station Elevation Data		num=	50						
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	6088.81	48	6087.75	76.4	6087.61	116.5	6087.9	183.6	6086.74
227.5	6086.38	266.2	6086.25	341.5	6086.75	346.4	6086.28	348.2	6085.8
351.4	6084.42	351.5	6084.39	357.1	6082.79	364.4	6080.91	370.3	6079.86
375.6	6079.53	394.8	6079.62	398.4	6079.82	409.7	6079.47	424	6079.41
446.7	6079.6	452.5	6080.14	458.8	6081.25	475.1	6084.94	480.9	6085.66
487.9	6085.56	492.2	6084.98	493.5	6084.85	493.9	6084.82	496.7	6084.63
498.8	6084.57	509.2	6083.27	516.9	6083.09	527.7	6083.11	532	6082.94
532.4	6082.92	544.1	6082.98	559	6083.91	568.5	6085.31	573.7	6085.72
574.6	6085.84	575.7	6085.99	576	6086.04	576.3	6086.08	578.8	6086.52
578.9	6086.53	600.2	6087.74	657.9	6090.29	667	6090.49	732.82	6090.51

Manning's n Values		num=	3				
Sta	n Val	Sta	n Val	Sta	n Val		



0 .065 348.2 .074 480.9 .065

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.  
348.2 480.9 482 482 482 .1 .3

CROSS SECTION

RIVER: Creek  
REACH: Reach 1 RS: 2579

INPUT

Description:

Station Elevation Data		num= 47		Sta Elev		Sta Elev		Sta Elev	
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	6087.06	39.9	6086.74	68.4	6086.12	77.2	6085.52	105.6	6084.25
153.8	6082.38	165.9	6082.16	217.3	6081.94	285.6	6082.03	306.8	6081.84
344.4	6081.09	361.9	6080.41	371.4	6079.32	379.5	6078.62	438.5	6077.81
447.3	6077.51	471.4	6077.15	499.1	6076.37	529.4	6076.71	529.6	6076.74
532.7	6077.05	533.9	6077.25	537.6	6077.91	540	6078.44	544.5	6079.38
545.9	6079.69	551.3	6080.99	559	6081.67	605	6081.4	668.1	6081.68
711.1	6082.81	727.7	6083.06	841.5	6082.88	869.9	6083.31	871.6	6083.32
872.2	6083.32	873.1	6083.31	873.8	6083.3	874.6	6083.28	875.1	6083.27
876.6	6083.26	877.7	6083.26	878.8	6083.25	881	6083.25	923.1	6083.66
985.2	6084.52	1038.69	6084.75						

Manning's n Values num= 3  
Sta n Val Sta n Val Sta n Val  
0 .065 344.4 .065 551.3 .065

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.  
344.4 551.3 486 486 486 .1 .3

CROSS SECTION

RIVER: Creek  
REACH: Reach 1 RS: 2093

INPUT

Description:

Station Elevation Data		num= 49		Sta Elev		Sta Elev		Sta Elev	
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	6080.3	19.3	6079.66	59.2	6077.62	71	6077.53	92.1	6076.75
115.6	6076.93	127.4	6076.78	132	6076.38	136.8	6076.38	143.3	6075.68
148.5	6074.84	158.6	6074.67	167.3	6073.68	172	6073.79	180	6073.49
188.5	6074.52	193.2	6074.82	196.7	6074.66	208.1	6073.3	213.4	6073.37
221.4	6072.92	240.2	6073.15	246.8	6073.84	251.9	6074.11	277.8	6074.38
296.2	6075.43	321	6076.24	369.5	6076.82	472.9	6076.61	512.8	6075.91
531.6	6075.38	550.4	6074.5	585.7	6074.57	591.3	6074.77	598.5	6075.53
605.8	6076.55	611.6	6077.05	611.8	6077.06	613.1	6077.27	614.5	6077.67
615.6	6077.99	616	6078.07	617.3	6078.21	617.4	6078.22	619.4	6078.39
658.5	6079.28	675	6079.46	691.5	6079.97	774.14	6081.16		

Manning's n Values num= 3  
Sta n Val Sta n Val Sta n Val  
0 .065 143.3 .065 296.2 .065

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.  
143.3 296.2 279 279 279 .1 .3

CROSS SECTION

RIVER: Creek  
REACH: Reach 1 RS: 1814

INPUT

Description:

Station Elevation Data		num= 44		Sta Elev		Sta Elev		Sta Elev	
Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev

0	6079	169	6077.85	299.1	6076.51	314.7	6075.95	334.1	6073.66
347.1	6072.49	360.1	6071.84	380.2	6071.5	404.4	6071.75	442	6071.55
465.6	6071.86	481.4	6071.87	507.4	6072.31	526.5	6071.91	545.7	6072.14
579.2	6071.83	595.5	6071.91	610.3	6071.59	628.7	6071.57	643.2	6072.32
643.8	6072.37	645.8	6072.62	646.1	6072.65	646.2	6072.67	646.9	6072.79
647.5	6072.9	648.6	6073.12	648.9	6073.19	649.5	6073.31	650.4	6073.48
653.3	6073.96	653.4	6073.97	653.9	6074.01	654.7	6074.08	655.8	6074.17
682.1	6074.28	706	6074.83	726.9	6075.79	736.8	6076.45	755	6077.89
778.9	6079.04	784.1	6079.23	800.6	6079.45	834.33	6078.97		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.065	334.1	.065	653.3	.065

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff	Contr.	Expan.
	334.1	653.3		539	539		.1	.3

CROSS SECTION

RIVER: Creek  
 REACH: Reach 1 RS: 1275

INPUT

Description:

Station Elevation Data num= 49

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	6078.49	200.3	6077.32	390.3	6075.53	500.3	6074.87	676.3	6073.34
742.3	6072.96	884.3	6072.63	885.1	6072.62	892.6	6072.24	892.8	6072.22
892.9	6072.22	893.1	6072.19	894.3	6072.02	902.1	6070.55	903.3	6070.27
903.9	6070.13	904.8	6069.76	905.5	6069.52	906.1	6069.29	906.3	6069.21
906.8	6069.08	907.8	6068.77	908.3	6068.65	909.3	6068.6	909.6	6068.59
910.5	6068.56	910.8	6068.63	911.5	6068.8	912.4	6068.97	912.7	6069.07
928.9	6070.79	930.3	6070.99	930.4	6071.01	938.6	6072.56	939.2	6072.69
939.4	6072.72	939.9	6072.79	940.9	6072.94	941.4	6073.01	942.7	6073.12
943.6	6073.19	944.7	6073.23	945.5	6073.27	945.8	6073.28	946.9	6073.34
947	6073.35	948	6073.41	974.1	6073.92	1037.31	6074.81		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.065	885.1	.065	939.2	.065

Bank Sta:	Left	Right	Lengths:	Left Channel	Right	Coeff	Contr.	Expan.
	885.1	939.2		109	109		.3	.5

Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
0	908.5	6072.59	F
912.5	1037.31	6072.59	F

CULVERT

RIVER: Creek  
 REACH: Reach 1 RS: 1221

INPUT

Description:

Distance from Upstream XS = 15  
 Deck/Roadway Width = 30  
 Weir Coefficient = 2.6

Upstream Deck/Roadway Coordinates

num= 10

Sta	Hi	Cord	Lo	Cord	Sta	Hi	Cord	Lo	Cord	Sta	Hi	Cord	Lo	Cord
0	6078.49		6060		200.3	6077.32		6060		390.3	6075.53		6060	
500.3	6074.87		6060		676.3	6073.34		6060		742.3	6072.96		6060	
884.3	6072.63		6060		885.1	6072.62		6060		961.4	6072.57		6060	
1126.32	6071.62		6060											

Upstream Bridge Cross Section Data

Station Elevation Data num= 49

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-----	------	-----	------	-----	------	-----	------	-----	------

0	6078.49	200.3	6077.32	390.3	6075.53	500.3	6074.87	676.3	6073.34
742.3	6072.96	884.3	6072.63	885.1	6072.62	892.6	6072.24	892.8	6072.22
892.9	6072.22	893.1	6072.19	894.3	6072.02	902.1	6070.55	903.3	6070.27
903.9	6070.13	904.8	6069.76	905.5	6069.52	906.1	6069.29	906.3	6069.21
906.8	6069.08	907.8	6068.77	908.3	6068.65	909.3	6068.6	909.6	6068.59
910.5	6068.56	910.8	6068.63	911.5	6068.8	912.4	6068.97	912.7	6069.07
928.9	6070.79	930.3	6070.99	930.4	6071.01	938.6	6072.56	939.2	6072.69
939.4	6072.72	939.9	6072.79	940.9	6072.94	941.4	6073.01	942.7	6073.12
943.6	6073.19	944.7	6073.23	945.5	6073.27	945.8	6073.28	946.9	6073.34
947	6073.35	948	6073.41	974.1	6073.92	1037.31	6074.81		

Manning's n Values num= 3  
 Sta n Val Sta n Val Sta n Val  
 0 .065 885.1 .065 939.2 .065

Bank Sta: Left Right Coeff Contr. Expan.  
 885.1 939.2 .3 .5

Ineffective Flow num= 2  
 Sta L Sta R Elev Permanent  
 0 908.5 6072.59 F  
 912.5 1037.31 6072.59 F

Downstream Deck/Roadway Coordinates  
 num= 10  
 Sta Hi Cord Lo Cord Sta Hi Cord Lo Cord Sta Hi Cord Lo Cord  
 0 6078.49 6060 200.3 6077.32 6060 390.3 6075.53 6060  
 500.3 6074.87 6060 676.3 6073.34 6060 742.3 6072.96 6060  
 884.3 6072.63 6060 885.1 6072.62 6060 961.4 6072.57 6060  
 1126.32 6071.62 6060

Downstream Bridge Cross Section Data  
 Station Elevation Data num= 50  
 Sta Elev Sta Elev Sta Elev Sta Elev Sta Elev  
 0 6072.99 28.4 6073.23 35.1 6073.58 48.5 6072.69 55.9 6073.19  
 61.8 6072.76 79.4 6072.39 108.9 6070.88 173.8 6068.96 210.8 6068.7  
 240 6069.16 320.3 6068.98 329.2 6069.41 334.9 6069.27 342.6 6068.46  
 355 6068.16 361.3 6068.29 368.5 6069.44 371.8 6069.22 381.9 6066.81  
 386.4 6066.34 386.7 6066.34 388.6 6066.27 411 6066.43 440.1 6066.19  
 453.5 6066.29 463.1 6066.78 496 6066.39 502.9 6066.85 504.4 6066.77  
 505 6066.74 509.4 6066.84 523.8 6066.44 533.6 6065.2 538.1 6064.97  
 543.4 6065.46 544.6 6065.4 546.1 6065.44 547.1 6065.47 547.5 6065.48  
 547.6 6065.5 547.8 6065.53 552.1 6066.08 556.5 6067.08 565.4 6068.42  
 565.5 6068.45 569.9 6069.91 578.8 6072.03 588 6072.57 752.92 6071.62

Manning's n Values num= 3  
 Sta n Val Sta n Val Sta n Val  
 0 .065 371.8 .065 565.4 .065

Bank Sta: Left Right Coeff Contr. Expan.  
 371.8 565.4 .3 .5

Ineffective Flow num= 2  
 Sta L Sta R Elev Permanent  
 0 536.1 6068.58 F  
 540.1 752.92 6068.58 F

Upstream Embankment side slope = 3 horiz. to 1.0 vertical  
 Downstream Embankment side slope = 3 horiz. to 1.0 vertical  
 Maximum allowable submergence for weir flow = .98  
 Elevation at which weir flow begins = 6072.59  
 Energy head used in spillway design =  
 Spillway height used in design =  
 Weir crest shape = Broad Crested

Number of Culverts = 1

Culvert Name Shape Rise Span  
 Culvert #1 Circular 4 4  
 FHWA Chart # 2 - Corrugated Metal Pipe Culvert  
 FHWA Scale # 2 - Mitered to conform to slope  
 Solution Criteria = Highest U.S. EG  
 Culvert Upstrm Dist Length Top n Bottom n Depth Blocked Entrance Loss Coef Exit Loss Coef

15      30      .024      .024      0      .5      1  
 Upstream Elevation = 6068.56  
           Centerline Station = 910.5  
 Downstream Elevation = 6064.97  
           Centerline Station = 538.1

CROSS SECTION

RIVER: Creek  
 REACH: Reach 1                      RS: 1166

INPUT

Description:

Station Elevation Data      num=      50  
   Sta    Elev      Sta    Elev      Sta    Elev      Sta    Elev      Sta    Elev  
   0 6072.99    28.4 6073.23    35.1 6073.58    48.5 6072.69    55.9 6073.19  
  61.8 6072.76    79.4 6072.39    108.9 6070.88    173.8 6068.96    210.8 6068.7  
  240 6069.16    320.3 6068.98    329.2 6069.41    334.9 6069.27    342.6 6068.46  
  355 6068.16    361.3 6068.29    368.5 6069.44    371.8 6069.22    381.9 6066.81  
  386.4 6066.34    386.7 6066.34    388.6 6066.27    411 6066.43    440.1 6066.19  
  453.5 6066.29    463.1 6066.78    496 6066.39    502.9 6066.85    504.4 6066.77  
  505 6066.74    509.4 6066.84    523.8 6066.44    533.6 6065.2    538.1 6064.97  
  543.4 6065.46    544.6 6065.4    546.1 6065.44    547.1 6065.47    547.5 6065.48  
  547.6 6065.5    547.8 6065.53    552.1 6066.08    556.5 6067.08    565.4 6068.42  
  565.5 6068.45    569.9 6069.91    578.8 6072.03    588 6072.57    752.92 6071.62

Manning's n Values                      num=      3  
   Sta    n Val      Sta    n Val      Sta    n Val  
   0    .065    371.8    .065    565.4    .065

Bank Sta: Left    Right    Lengths: Left Channel    Right    Coeff Contr.    Expan.  
                   371.8    565.4                    166    166                    166                    .3                    .5

Ineffective Flow      num=      2  
   Sta L    Sta R    Elev    Permanent  
   0    536.1    6068.58    F  
  540.1    752.92    6068.58    F

CROSS SECTION

RIVER: Creek  
 REACH: Reach 1                      RS: 1000

INPUT

Description:

Station Elevation Data      num=      49  
   Sta    Elev      Sta    Elev      Sta    Elev      Sta    Elev      Sta    Elev  
   0 6071.97    27.7 6072.31    66.2 6071.75    95.7 6070.83    148.1 6068.46  
   189 6067.53    202.6 6067.73    245.9 6067.47    273.1 6067.83    325.4 6067.97  
  364.1 6067.12    377.8 6067.29    411.9 6068.47    432.3 6068.49    439.1 6068.81  
  441.4 6068.42    450.5 6065.89    457.4 6065.06    473.1 6064.91    486.9 6065.5  
  532.4 6065.16    559.7 6064.26    568.8 6064.51    577.8 6064.5    587 6063.97  
  593.8 6063.79    598 6064.21    604.4 6064.44    605.2 6064.43    605.8 6064.42  
  610.3 6064.1    614.7 6063.45    625.7 6063.81    637 6064.66    652.6 6064.54  
  663.4 6065.01    668.9 6065.61    673.7 6066.95    678 6067.8    682.6 6069.78  
  684.8 6070.16    693.9 6070.27    694.4 6070.3    695.3 6070.36    698.4 6070.88  
  698.8 6070.93    699.5 6071    703 6071.28    713.77 6071.65

Manning's n Values                      num=      3  
   Sta    n Val      Sta    n Val      Sta    n Val  
   0    .065    450.5    .065    668.9    .065

Bank Sta: Left    Right    Lengths: Left Channel    Right    Coeff Contr.    Expan.  
                   450.5    668.9                    50    50                    50                    .1                    .3

SUMMARY OF MANNING'S N VALUES

River:Creek

Reach	River Sta.	n1	n2	n3
Reach 1	3609	.065	.074	.065
Reach 1	3061	.065	.074	.065
Reach 1	2579	.065	.065	.065
Reach 1	2093	.065	.065	.065
Reach 1	1814	.065	.065	.065
Reach 1	1275	.065	.065	.065
Reach 1	1221	Culvert		
Reach 1	1166	.065	.065	.065
Reach 1	1000	.065	.065	.065

SUMMARY OF REACH LENGTHS

River: Creek

Reach	River Sta.	Left	Channel	Right
Reach 1	3609	548	548	548
Reach 1	3061	482	482	482
Reach 1	2579	486	486	486
Reach 1	2093	279	279	279
Reach 1	1814	539	539	539
Reach 1	1275	109	109	109
Reach 1	1221	Culvert		
Reach 1	1166	166	166	166
Reach 1	1000	50	50	50

SUMMARY OF CONTRACTION AND EXPANSION COEFFICIENTS

River: Creek

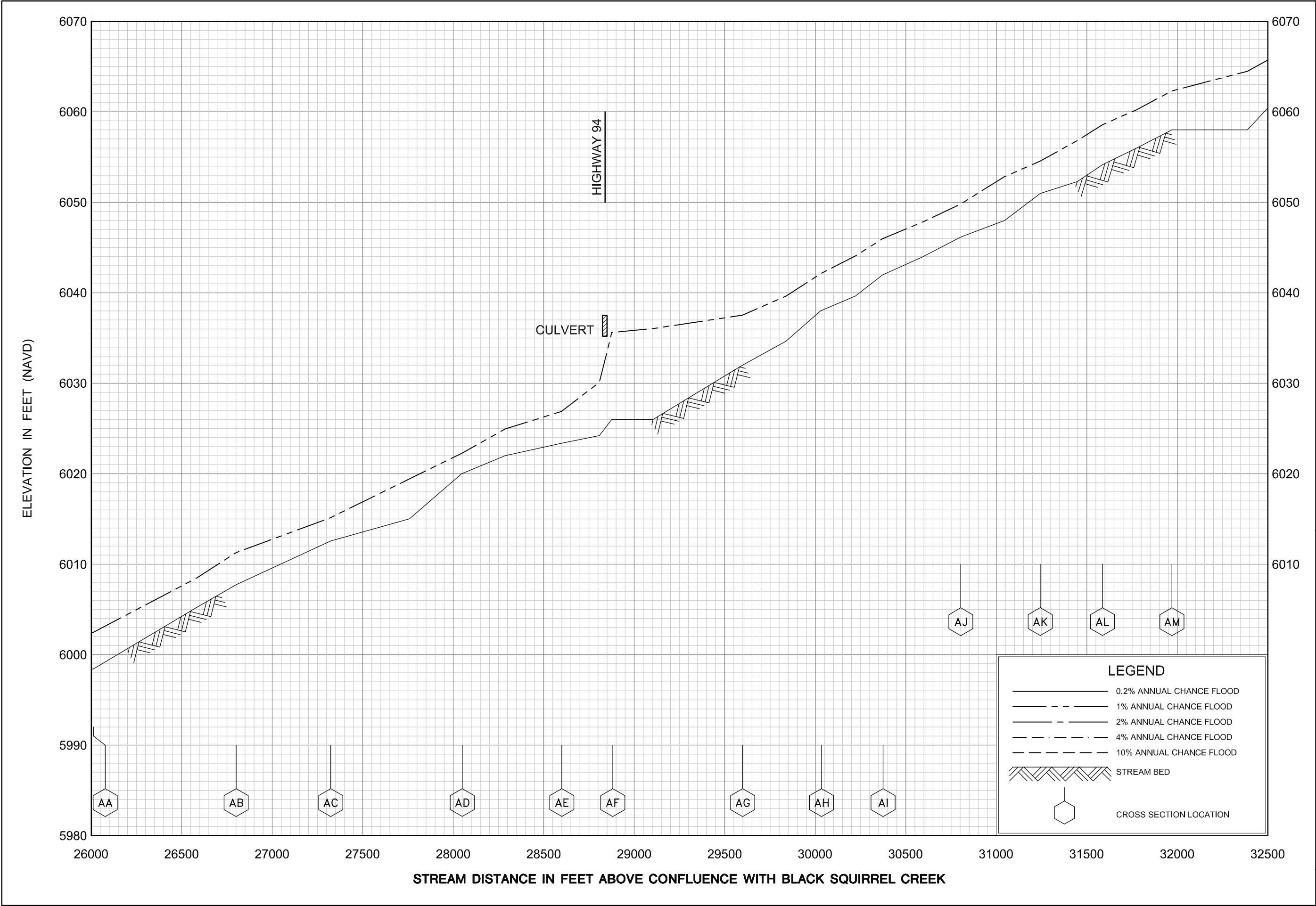
Reach	River Sta.	Contr.	Expan.
Reach 1	3609	.1	.3
Reach 1	3061	.1	.3
Reach 1	2579	.1	.3
Reach 1	2093	.1	.3
Reach 1	1814	.1	.3
Reach 1	1275	.3	.5
Reach 1	1221	Culvert	
Reach 1	1166	.3	.5
Reach 1	1000	.1	.3

Table 4. Summary of Discharges (cont.)

<u>Flooding Source and Location</u>	<u>Drainage Area (Square Miles)</u>	<u>Peak Discharges (Cubic Feet Per Second)</u>			
		<u>10-Year</u>	<u>50-Year</u>	<u>100-Year</u>	<u>500-Year</u>
East Cherry Creek At Walker Road	10.30	-- <sup>1</sup>	-- <sup>1</sup>	2,000	-- <sup>1</sup>
East Tributary to Black Squirrel Creek At confluence with Black Squirrel Creek	0.97	-- <sup>1</sup>	-- <sup>1</sup>	569	-- <sup>1</sup>
East Tributary to Black Squirrel Creek – West Fork Bennett Ranch Basin At Black Squirrel Creek – West Fork Bennett Ranch Basin	0.40	-- <sup>1</sup>	-- <sup>1</sup>	230	-- <sup>1</sup>
Ellicott Consolidated At confluence with Black Squirrel Creek	-- <sup>1</sup>	-- <sup>1</sup>	-- <sup>1</sup>	8,000	-- <sup>1</sup>
At confluence with East Tributary	-- <sup>1</sup>	-- <sup>1</sup>	-- <sup>1</sup>	7,019	-- <sup>1</sup>
Ellicott Consolidated – East Tributary At confluence with Ellicott Consolidated	-- <sup>1</sup>	-- <sup>1</sup>	-- <sup>1</sup>	183	-- <sup>1</sup>
Fairfax Creek At Research Parkway	0.70	-- <sup>1</sup>	-- <sup>1</sup>	1,000	-- <sup>1</sup>
Fisher’s Canyon At confluence with Fountain Creek	5.30	1,420	2,590	3,090	4,800
Fisher’s Canyon-Above Loomis Avenue At West Meadows Drive	3.59	-- <sup>1</sup>	-- <sup>1</sup>	1,640	-- <sup>1</sup>
Upstream of Fisher’s Canyon-South Branch	2.36	-- <sup>1</sup>	-- <sup>1</sup>	440	-- <sup>1</sup>
Fisher’s Canyon-South Branch At confluence with Fisher’s Canyon	1.23	-- <sup>1</sup>	-- <sup>1</sup>	1,290	-- <sup>1</sup>

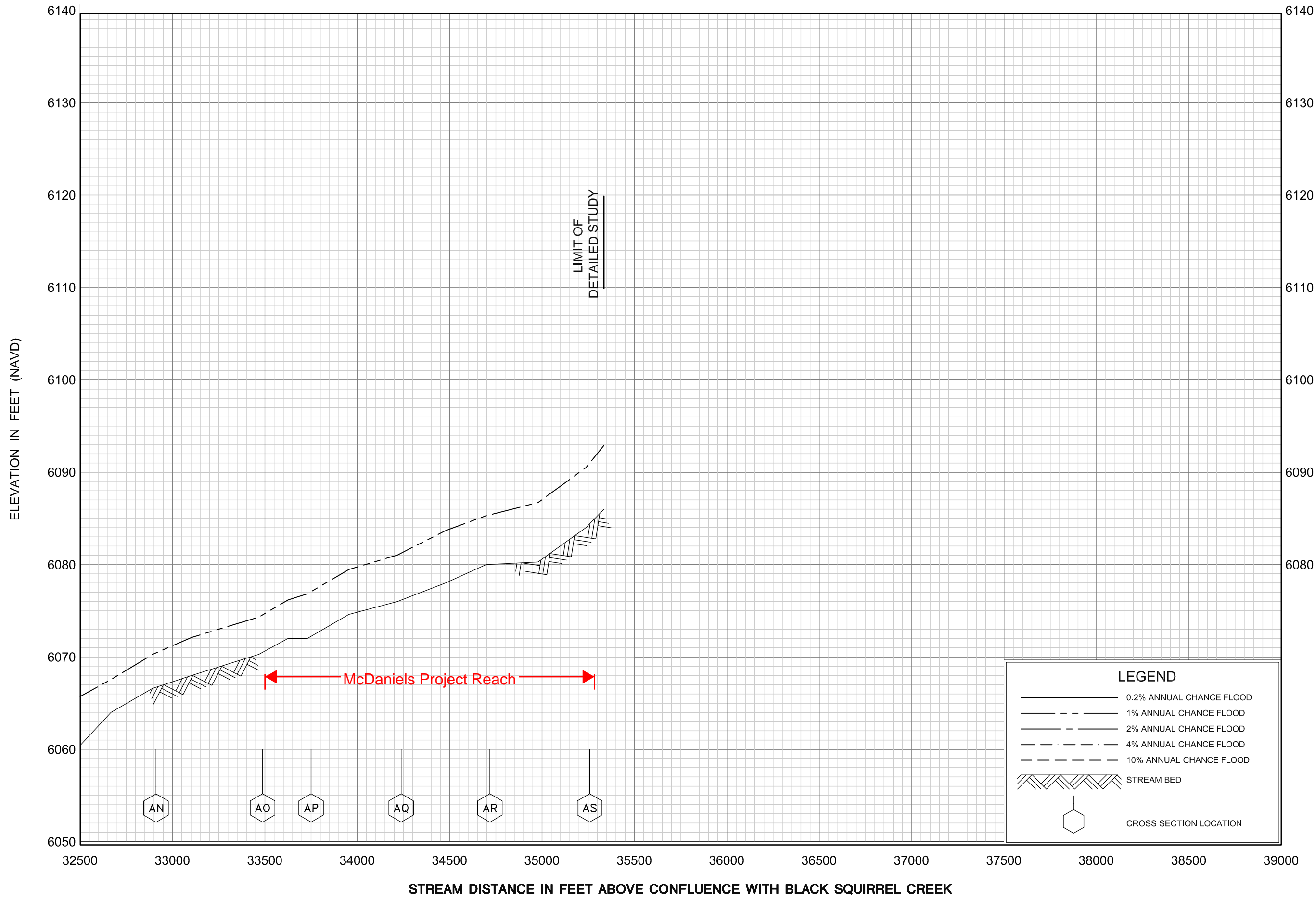
Flow rate  
through  
project  
reach

<sup>1</sup>Data not available



FLOOD PROFILES  
ELLICOTT CONSOLIDATED

FEDERAL EMERGENCY MANAGEMENT AGENCY  
EL PASO COUNTY, CO  
AND INCORPORATED AREAS



**FLOOD PROFILES**

**ELLCOTT CONSOLIDATED**

FEDERAL EMERGENCY MANAGEMENT AGENCY

**EL PASO COUNTY, CO  
AND INCORPORATED AREAS**





---

# APPENDIX D

## DESIGN CHARTS

---



**Table 6-6. Runoff Coefficients for Rational Method**  
(Source: UDFCD 2001)

Land Use or Surface Characteristics	Percent Impervious	Runoff Coefficients											
		2-year		5-year		10-year		25-year		50-year		100-year	
		HSG A&B	HSG C&D	HSG A&B	HSG C&D	HSG A&B	HSG C&D	HSG A&B	HSG C&D	HSG A&B	HSG C&D	HSG A&B	HSG C&D
<b>Business</b>													
Commercial Areas	95	0.79	0.80	0.81	0.82	0.83	0.84	0.85	0.87	0.87	0.88	0.88	0.89
Neighborhood Areas	70	0.45	0.49	0.49	0.53	0.53	0.57	0.58	0.62	0.60	0.65	0.62	0.68
<b>Residential</b>													
1/8 Acre or less	65	0.41	0.45	0.45	0.49	0.49	0.54	0.54	0.59	0.57	0.62	0.59	0.65
1/4 Acre	40	0.23	0.28	0.30	0.35	0.36	0.42	0.42	0.50	0.46	0.54	0.50	0.58
1/3 Acre	30	0.18	0.22	0.25	0.30	0.32	0.38	0.39	0.47	0.43	0.52	0.47	0.57
1/2 Acre	25	0.15	0.20	0.22	0.28	0.30	0.36	0.37	0.46	0.41	0.51	0.46	0.56
1 Acre	20	0.12	0.17	0.20	0.26	0.27	0.34	0.35	0.44	0.40	0.50	0.44	0.55
<b>Industrial</b>													
Light Areas	80	0.57	0.60	0.59	0.63	0.63	0.66	0.66	0.70	0.68	0.72	0.70	0.74
Heavy Areas	90	0.71	0.73	0.73	0.75	0.75	0.77	0.78	0.80	0.80	0.82	0.81	0.83
<b>Parks and Cemeteries</b>	7	0.05	0.09	0.12	0.19	0.20	0.29	0.30	0.40	0.34	0.46	0.39	0.52
Playgrounds	13	0.07	0.13	0.16	0.23	0.24	0.31	0.32	0.42	0.37	0.48	0.41	0.54
Railroad Yard Areas	40	0.23	0.28	0.30	0.35	0.36	0.42	0.42	0.50	0.46	0.54	0.50	0.58
<b>Undeveloped Areas</b>													
Historic Flow Analysis-- Greenbelts, Agriculture	2	0.03	0.05	0.09	0.16	0.17	0.26	0.26	0.38	0.31	0.45	0.36	0.51
Pasture/Meadow	0	0.02	0.04	0.08	0.15	0.15	0.25	0.25	0.37	0.30	0.44	0.35	0.50
Forest	0	0.02	0.04	0.08	0.15	0.15	0.25	0.25	0.37	0.30	0.44	0.35	0.50
Exposed Rock	100	0.89	0.89	0.90	0.90	0.92	0.92	0.94	0.94	0.95	0.95	0.96	0.96
Offsite Flow Analysis (when landuse is undefined)	45	0.26	0.31	0.32	0.37	0.38	0.44	0.44	0.51	0.48	0.55	0.51	0.59
<b>Streets</b>													
Paved	100	0.89	0.89	0.90	0.90	0.92	0.92	0.94	0.94	0.95	0.95	0.96	0.96
Gravel	80	0.57	0.60	0.59	0.63	0.63	0.66	0.66	0.70	0.68	0.72	0.70	0.74
<b>Drive and Walks</b>	100	0.89	0.89	0.90	0.90	0.92	0.92	0.94	0.94	0.95	0.95	0.96	0.96
Roofs	90	0.71	0.73	0.73	0.75	0.75	0.77	0.78	0.80	0.80	0.82	0.81	0.83
Lawns	0	0.02	0.04	0.08	0.15	0.15	0.25	0.25	0.37	0.30	0.44	0.35	0.50

Figure 6-25. Estimate of Average Concentrated Shallow Flow

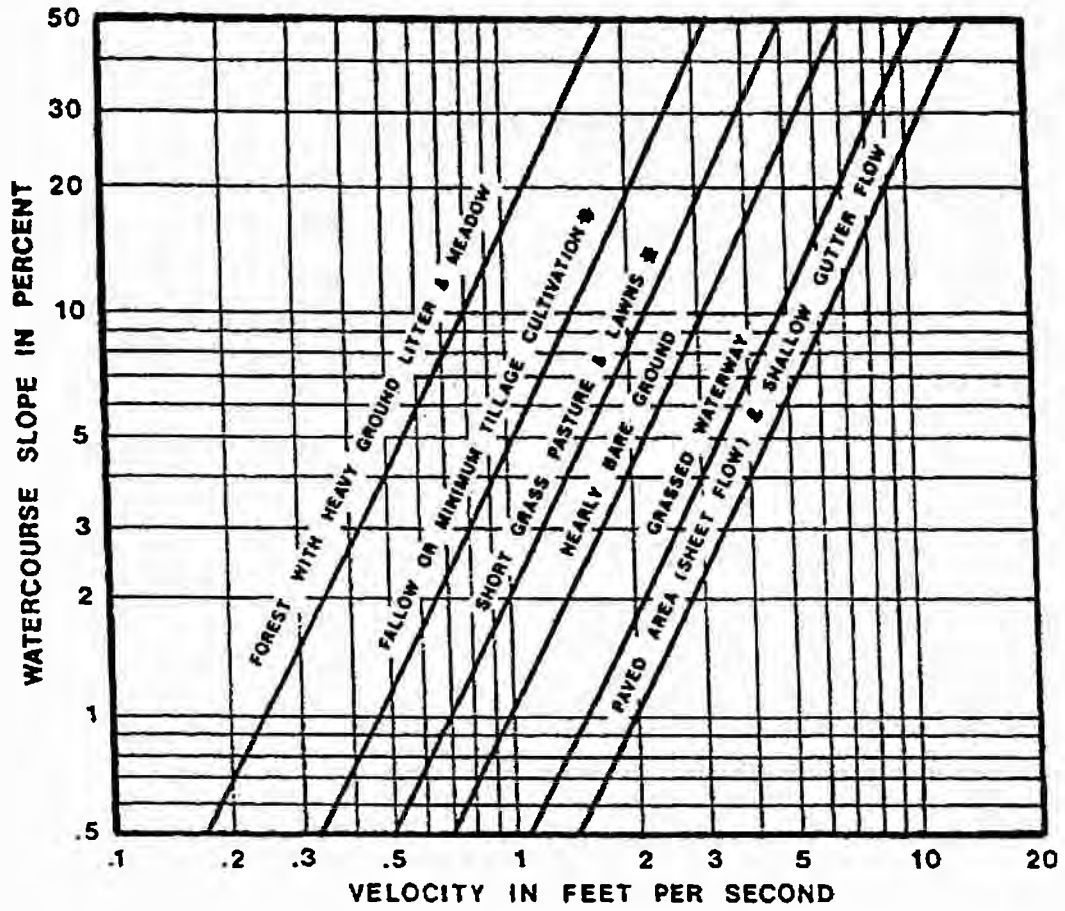
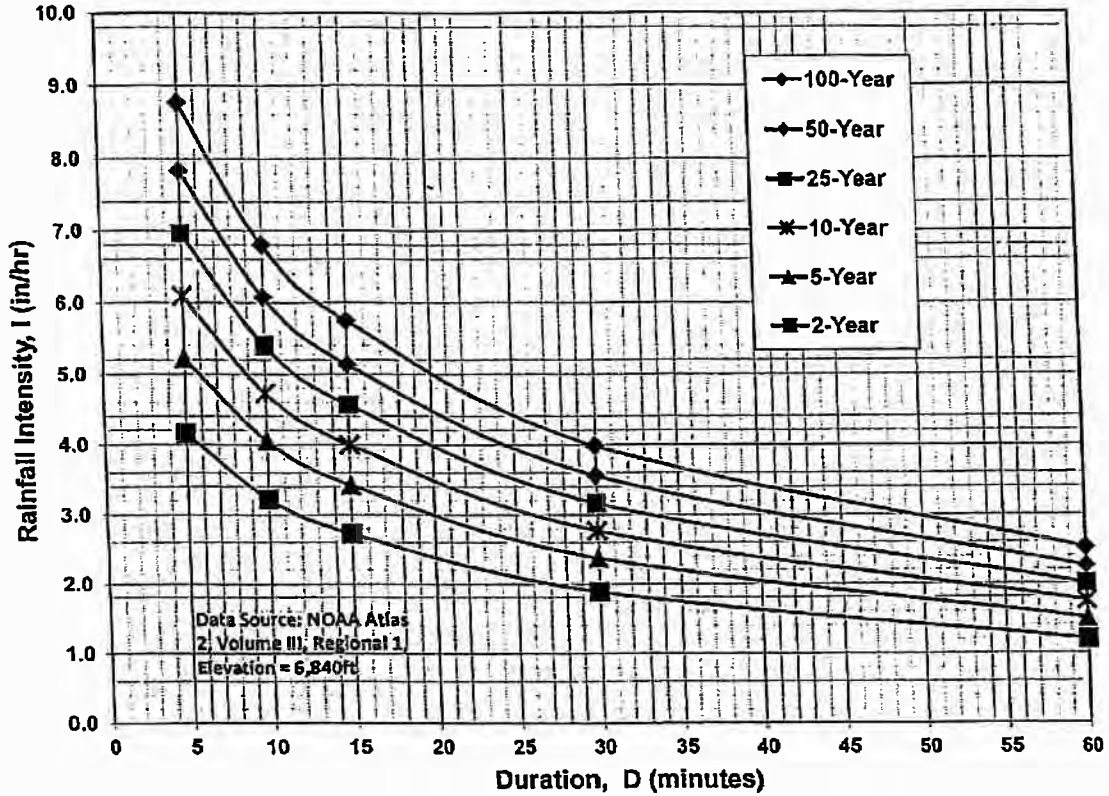


Figure 6-5. Colorado Springs Rainfall Intensity Duration Frequency



**IDF Equations**

$$I_{100} = -2.52 \ln(D) + 12.735$$

$$I_{50} = -2.25 \ln(D) + 11.375$$

$$I_{25} = -2.00 \ln(D) + 10.111$$

$$I_{10} = -1.75 \ln(D) + 8.847$$

$$I_5 = -1.50 \ln(D) + 7.583$$

$$I_2 = -1.19 \ln(D) + 6.035$$

Note: Values calculated by equations may not precisely duplicate values read from figure.

**Table 2. Permissible Shear and Velocity for Selected Lining Materials<sup>1</sup>**

Boundary Category	Boundary Type	Permissible Shear Stress (lb/sq ft)	Permissible Velocity (ft/sec)	Citation(s)
<u>Soils</u>	Fine colloidal sand	0.02 - 0.03	1.5	A
	Sandy loam (noncolloidal)	0.03 - 0.04	1.75	A
	Alluvial silt (noncolloidal)	0.045 - 0.05	2	A
	Silty loam (noncolloidal)	0.045 - 0.05	1.75 – 2.25	A
	Firm loam	0.075	2.5	A
	Fine gravels	0.075	2.5	A
	Stiff clay	0.26	3 – 4.5	A, F
	Alluvial silt (colloidal)	0.26	3.75	A
	Graded loam to cobbles	0.38	3.75	A
	Graded silts to cobbles	0.43	4	A
	Shales and hardpan	0.67	6	A
<u>Gravel/Cobble</u>	1-in.	0.33	2.5 – 5	A
	2-in.	0.67	3 – 6	A
	6-in.	2.0	4 – 7.5	A
	12-in.	4.0	5.5 – 12	A
<u>Vegetation</u>	Class A turf	3.7	6 – 8	E, N
	Class B turf	2.1	4 - 7	E, N
	Class C turf	1.0	3.5	E, N
	Long native grasses	1.2 – 1.7	4 – 6	G, H, L, N
	Short native and bunch grass	0.7 - 0.95	3 – 4	G, H, L, N
	Reed plantings	0.1-0.6	N/A	E, N
<u>Temporary Degradable RECPs</u>	Hardwood tree plantings	0.41-2.5	N/A	E, N
	Jute net	0.45	1 – 2.5	E, H, M
	Straw with net	1.5 – 1.65	1 – 3	E, H, M
	Coconut fiber with net	2.25	3 – 4	E, M
	Fiberglass roving	2.00	2.5 – 7	E, H, M
<u>Non-Degradable RECPs</u>	Unvegetated	3.00	5 – 7	E, G, M
	Partially established	4.0-6.0	7.5 – 15	E, G, M
	Fully vegetated	8.00	8 – 21	F, L, M
<u>Riprap</u>	6 – in. d <sub>50</sub>	2.5	5 – 10	H
	9 – in. d <sub>50</sub>	3.8	7 – 11	H
	12 – in. d <sub>50</sub>	5.1	10 – 13	H
	18 – in. d <sub>50</sub>	7.6	12 – 16	H
	24 – in. d <sub>50</sub>	10.1	14 – 18	E
<u>Soil Bioengineering</u>	Wattles	0.2 – 1.0	3	C, I, J, N
	Reed fascine	0.6-1.25	5	E
	Coir roll	3 - 5	8	E, M, N
	Vegetated coir mat	4 - 8	9.5	E, M, N
	Live brush mattress (initial)	0.4 – 4.1	4	B, E, I
	Live brush mattress (grown)	3.90-8.2	12	B, C, E, I, N
	Brush layering (initial/grown)	0.4 – 6.25	12	E, I, N
	Live fascine	1.25-3.10	6 – 8	C, E, I, J
	Live willow stakes	2.10-3.10	3 – 10	E, N, O
<u>Hard Surfacing</u>	Gabions	10	14 – 19	D
	Concrete	12.5	>18	H

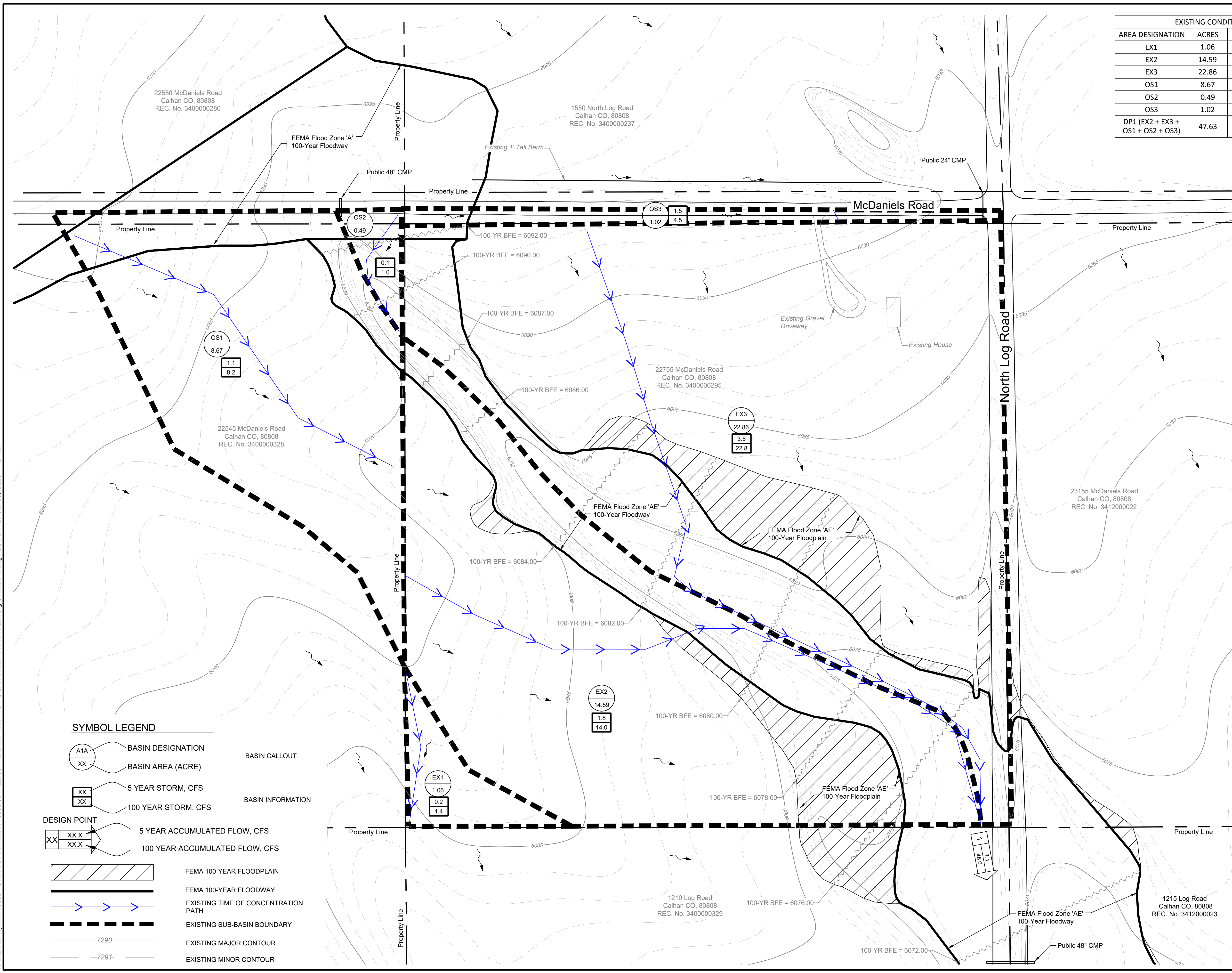
<sup>1</sup> Ranges of values generally reflect multiple sources of data or different testing conditions.

- |  |   |                            |
|--|---|----------------------------|
| A. Chang, H.H. (1988).                 | F. Julien, P.Y. (1995).                             | K. Sprague, C.J. (1999).   |
| B. Florineth. (1982)                   | G. Kouwen, N.; Li, R. M.; and Simons, D.B., (1980). | L. Temple, D.M. (1980).    |
| C. Gerstgraser, C. (1998).             | H. Norman, J. N. (1975).                            | M. TXDOT (1999)            |
| D. Goff, K. (1999).                    | I. Schiechl, H. M. and R. Stern. (1996).            | N. Data from Author (2001) |
| E. Gray, D.H., and Sotir, R.B. (1996). | J. Schoklitsch, A. (1937).                          | O. USACE (1997).           |



# BACK POCKET

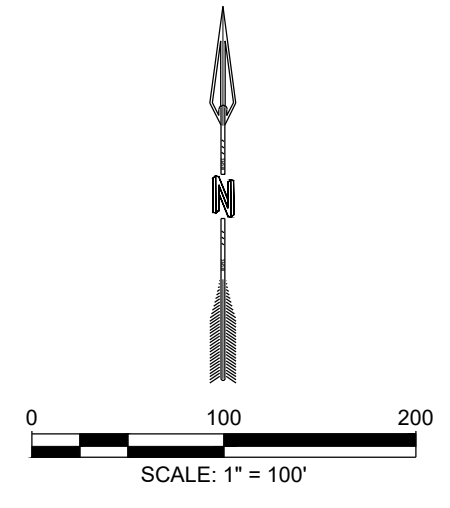
NAME: N:\Projects\W0008 - Guman & Associates\W0008\0014 22755 McDaniels Road.dwg SHEETS\Sheet Set\1 Existing Conditions.dwg PLOT DATE: Jan 03, 2023 11:07am



EXISTING CONDITIONS			
AREA DESIGNATION	ACRES	Q5 (CFS)	Q100 (CFS)
EX1	1.06	0.2	1.4
EX2	14.59	1.8	14.0
EX3	22.86	3.5	22.8
OS1	8.67	1.1	8.2
OS2	0.49	0.1	1.0
OS3	1.02	1.5	4.5
DP1 (EX2 + EX3 + OS1 + OS2 + OS3)	47.63	7.1	48.0

NOTE: ALL ELEVATIONS IN NAVD88

- SYMBOL LEGEND**
- A1A BASIN DESIGNATION
  - XX BASIN AREA (ACRE)
  - XX 5 YEAR STORM, CFS
  - XX 100 YEAR STORM, CFS
  - XX 5 YEAR ACCUMULATED FLOW, CFS
  - XX 100 YEAR ACCUMULATED FLOW, CFS
  - FEMA 100-YEAR FLOODPLAIN
  - FEMA 100-YEAR FLOODWAY
  - EXISTING TIME OF CONCENTRATION PATH
  - EXISTING SUB-BASIN BOUNDARY
  - EXISTING MAJOR CONTOUR
  - EXISTING MINOR CONTOUR



<p>DESIGNED CTD DRAWN RGG CHECKED RGG DATE 1.03.2023</p>	<p>REVISION</p>
<p><b>RESPEC</b> COMMUNITY DESIGN SOLUTIONS 17 SOUTH PEARSON STREET SUITE 1110 CALHAN CO, CALHAN, CO 80808 WWW.RESPEC.COM PHONE (719) 266-5212</p>	
<p>STAMP</p>	
<p><b>PRELIMINARY</b> NOT FOR CONSTRUCTION 1/2023</p> <p>THIS DRAWING IS INCOMPLETE AND NOT TO BE USED FOR CONSTRUCTION UNLESS IT IS STAMPED, SIGNED AND DATED</p>	
<p><b>811</b> Know what's below. Call before you dig.</p>	
<p>PROJECT NAME: <b>Zindorf - McDaniels Subdivision</b></p>	
<p>SHEET TITLE: <b>Existing Conditions</b></p>	
<p>SUBMITTED FOR: <b>Greg Zindorf</b></p>	
<p>SHEET NUMBER: <b>1 OF 2</b></p>	

PROPOSED CONDITIONS			
AREA DESIGNATION	ACRES	Q5 (CFS)	Q100 (CFS)
PP1	1.06	0.2	1.4
PP2	14.59	1.8	14.0
PP3	22.86	3.9	22.9
OS1	8.67	1.1	8.2
OS2	0.49	0.1	1.0
OS3	1.02	1.5	4.5
DP1 (PP2 + PP3 + OS1 + OS2 + OS3)	47.63	7.5	48.0

DESIGNED CTD		DRAWN CTD		CHECKED RGG		DATE 1.03.2023	
DESIGNED CTD	CTD	DRAWN	CTD	CHECKED	RGG	DATE	1.03.2023

PRELIMINARY  
NOT FOR CONSTRUCTION  
1/2023

THIS DRAWING IS INCOMPLETE AND NOT TO BE USED FOR CONSTRUCTION UNLESS IT IS STAMPED, SIGNED AND DATED

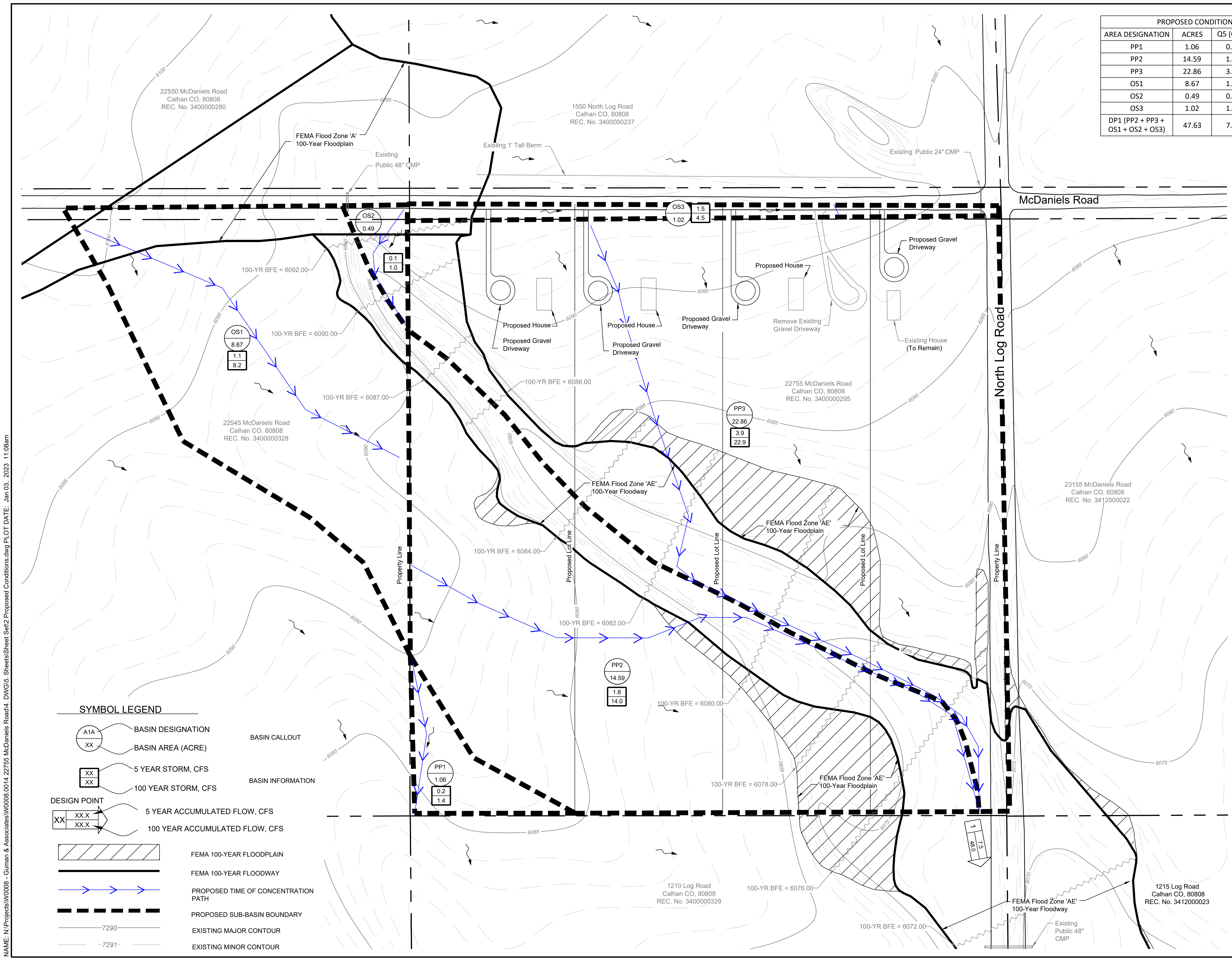


PROJECT NAME:  
**Zindorf - McDaniels Subdivision**

SHEET TITLE:  
**Proposed Conditions**

SUBMITTED FOR:  
**Greg Zindorf**

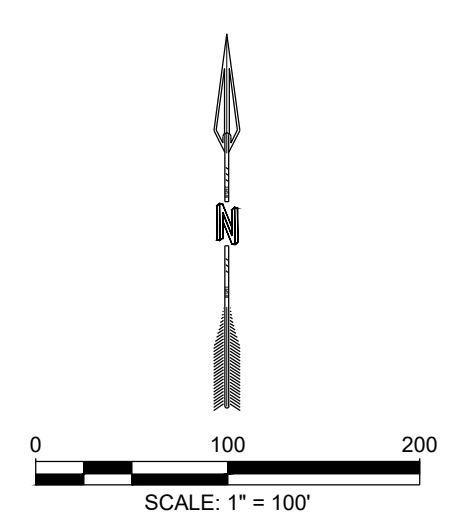
SHEET NUMBER:  
**2 OF 2**



NOTE: ALL ELEVATIONS IN NAVD88

**SYMBOL LEGEND**

	BASIN DESIGNATION	BASIN CALLOUT
	BASIN AREA (ACRE)	BASIN INFORMATION
	5 YEAR STORM, CFS	
	100 YEAR STORM, CFS	
	5 YEAR ACCUMULATED FLOW, CFS	
	100 YEAR ACCUMULATED FLOW, CFS	
	FEMA 100-YEAR FLOODPLAIN	
	FEMA 100-YEAR FLOODWAY	
	PROPOSED TIME OF CONCENTRATION PATH	
	PROPOSED SUB-BASIN BOUNDARY	
	EXISTING MAJOR CONTOUR	
	EXISTING MINOR CONTOUR	



NAME: N:\Projects\W0008 - Guman & Associates\W0008\0014 22755 McDaniels Road\4. DWG\5. Sheets\Sheet Set\2 Proposed Conditions.dwg PLOT DATE: Jan 03, 2023, 11:08am

PCD File No. MS-22-006



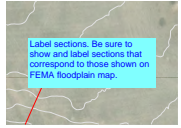
# v4\_Drainage Report - Final.pdf Markup Summary

CDurham (3)

stable. No backflow exists within the channel. For channel stabilization requirements have not been a Maps below. No improvements are proposed for the analysis beyond what FEMA has provided or needs. Indicate what flows were used in the analysis (FEMA lists 7019 cfs but HEC-RAS shows 3200 cfs). Indicate what velocity, FR # and how these all meet channel requirements from DCM.

**Subject:** Text Box  
**Page Label:** 9  
**Author:** CDurham  
**Date:** 7/31/2023 4:34:39 PM  
**Color:** ■

Indicate what flows were used in the analysis (FEMA lists 7019 cfs but HEC-RAS shows 3200 cfs). Indicate what velocity, FR # and how these all meet channel requirements from DCM.



**Subject:** Text Box  
**Page Label:** 22  
**Author:** CDurham  
**Date:** 7/31/2023 4:32:21 PM  
**Color:** ■

Label sections. Be sure to show and label sections that correspond to those shown on FEMA floodplain map.

Station	Flow (cfs)	Velocity (ft/s)	FR #
1+00	7019	1.5	1
1+25	3200	1.5	1
1+50	7019	1.5	1
1+75	3200	1.5	1
2+00	7019	1.5	1
2+25	3200	1.5	1
2+50	7019	1.5	1
2+75	3200	1.5	1
3+00	7019	1.5	1
3+25	3200	1.5	1
3+50	7019	1.5	1
3+75	3200	1.5	1
4+00	7019	1.5	1
4+25	3200	1.5	1
4+50	7019	1.5	1
4+75	3200	1.5	1
5+00	7019	1.5	1
5+25	3200	1.5	1
5+50	7019	1.5	1
5+75	3200	1.5	1
6+00	7019	1.5	1
6+25	3200	1.5	1
6+50	7019	1.5	1
6+75	3200	1.5	1
7+00	7019	1.5	1
7+25	3200	1.5	1
7+50	7019	1.5	1
7+75	3200	1.5	1
8+00	7019	1.5	1
8+25	3200	1.5	1
8+50	7019	1.5	1
8+75	3200	1.5	1
9+00	7019	1.5	1
9+25	3200	1.5	1
9+50	7019	1.5	1
9+75	3200	1.5	1
10+00	7019	1.5	1
10+25	3200	1.5	1
10+50	7019	1.5	1
10+75	3200	1.5	1

FEMA flow (7019 cfs) is 7019 cfs. Where was 3200 cfs obtained?

**Subject:** Callout  
**Page Label:** 23  
**Author:** CDurham  
**Date:** 7/31/2023 4:29:36 PM  
**Color:** ■

FEMA flow in channel is 7019 cfs. Where was 3200 cfs obtained?