



INNOVATIVE DESIGN. **CLASSIC RESULTS.**

**MASTER DEVELOPMENT DRAINAGE PLAN  
FOR  
THE RANCH  
(ADDITIONS NO. 1, 2, 3 AND 4)**

**NOVEMBER 2020  
REVISED MARCH 2021**

**PREPARED FOR:  
LA PLATA CRUZ HOLDINGS, LLC  
1755 TELSTAR DRIVE, SUITE 211  
COLORADO SPRINGS, CO 80920  
(719) 867-2279**

**PREPARED BY:  
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COLORADO SPRINGS, CO 80903  
(719) 785-0790**

**JOB NUMBER 2550.00**



**MASTER DEVELOPMENT DRAINAGE PLAN  
FOR THE RANCH**

**DRAINAGE REPORT STATEMENT**

**ENGINEER'S STATEMENT:**

The attached drainage plan and report were prepared under my direction and supervision and are correct to the best of my knowledge and belief. Said drainage report has been prepared according to the criteria established by the City for drainage reports and said report is in conformity with the master plan of the drainage basin. I accept responsibility for any liability caused by any negligent acts, errors, or omissions on my part in preparing this report.

\_\_\_\_\_  
Kyle R. Campbell, Colorado P.E. #29794

\_\_\_\_\_  
Date

**DEVELOPER'S STATEMENT:**

I, the developer, have read and will comply with all of the requirements specified in this drainage report and plan.

Business Name: La Plata Cruz Holdings, LLC

By: \_\_\_\_\_

Title: \_\_\_\_\_

Address: 1755 Telstar Drive, Suite 211

Colorado Springs, CO 80920

**CITY OF FOUNTAIN:**

Filed in accordance with the code of the City of Fountain.

\_\_\_\_\_  
City Engineer

\_\_\_\_\_  
Date



**MASTER DEVELOPMENT DRAINAGE PLAN  
FOR THE RANCH (ADDITIONS NO. 1, 2, 3 and 4)**

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# **MASTER DEVELOPMENT DRAINAGE PLAN FOR THE RANCH (ADDITIONS NO. 1, 2, 3 and 4)**

## **PURPOSE**

This document is the Master Development Drainage Plan for The Ranch (Additions No. 1, 2, 3 and 4). The purpose of this report is to identify at a high level of analysis on-site existing and developed drainage patterns, areas tributary to the site, and to indicate major facilities that will need to be constructed with the development of the proposed Overall Development Plans (ODP's). These areas are proposed to be annexed into the City of Fountain. Utilization of recommendations in the Jimmy Camp Creek Drainage Basin Planning Study (or equivalent treatments) is assumed. No stakeholder process was conducted (nor anticipated to be needed) due to the area of development being generally contained within a single ownership, and flows being tributary directly to Jimmy Camp Creek.

## **GENERAL DESCRIPTION**

The Ranch (Additions No. 1, 2, 3 and 4) is a 857.554-acre site comprised of land lying within portions of Sections 27, 28, 33 and 34, Township 15 South, Range 65 West of the sixth principal meridian, County of El Paso, State of Colorado. The site is generally bounded on the north by existing Marksheffel Road, un-platted county land, and Foothills Subdivision (El Paso County), to the south by an existing Squirrel Creek Road, unplatted county parcels and Fountain Valley Land and Irrigation Co. Subdivision No. 1, to the east by un-platted El Paso County land, and to the west by existing Link Road. The site is within the Jimmy Camp Drainage Basin except for a small southeasterly section of Addition No. 3 which drains into the Williams Creek Drainage Basin. Multiple proposed land uses including multi and single family residential, commercial, a school site, open space, a community park and two (2) neighborhood parks are included in the proposed Overall Development Plan for this site.

There is a mix of on-site soil conditions reflecting Hydrologic Group "B" (Nelson-Tassel Sandy Loam, Fort Collins), Hydrologic Group "C" (Nunn Clay Loam), and Hydrologic Group "A" (Blakeland Loamy, Ellicott Loamy Coarse Sands and Truckton Sandy Loam) as determined by the "Soil Survey of El Paso County Area," prepared by the Soil Conservation Service (see Appendix).



## EXISTING DRAINAGE CONDITIONS

The proposed The Ranch Annexation (Additions No. 1, 2, 3 and 4) is predominantly within the Jimmy Camp Creek Drainage Basin (see Jimmy Camp Creek section within the Proposed Conditions section of this report). As reflected on the attached Existing Conditions Drainage Map, the proposed annexation boundary is comprised of several Basins defined by existing ridges and valley. There are also off-site tributary Basins that enter this site (see Basins H, I, and J) and are predominantly located within the Kane Ranch ODP (See MDDP for Kane Ranch by Classic Consulting Engineers & Surveyors, LLC, dated September 2007 for more details). It is assumed that these three (3) currently undeveloped Basins will be restricted to historic levels of flows when they are ultimately developed by utilizing Full Spectrum Detention (FSD) facilities along the south side of Squirrel Creek Road.

In addition, directly south of The Ranch boundary and north of Squirrel Creek Road, the Fountain Valley Land & Irrigation Co. Subdivision No. 1 and unplatted large lot parcels are partially developed and also tributary to The Ranch. It is assumed that any redevelopment of Basin G, M and L will also trigger the installation of FSD facilities to restrict flows to existing rates in order to help minimize downstream storm infrastructure sizing.

A summary of the on-site existing / historic flow rates is as follows (only 100-year flows were calculated at this level of analysis as it is the controlling rainfall event for sizing facilities):

<u>Basin</u>	<u>100 Year Flow</u>
A	30.05
B	76.37
C	137.11
D	33.99
E	11.82
F	61.30
G	55.13

K	13.21
N	20.57

As most of these Basins are directly tributary to Jimmy Camp Creek, the focus of this analysis is to predominately identified release flows into the creek for use in analyzing proposed conditions.

A small easterly portion of Addition No. 3 sits within the Williams Creek Drainage Basin. As this basin has not been studied, any development within this area will be required to be routed to a proposed Full Spectrum Detention Facility.

No existing storm facilities exist on the site.

**PROPOSED DRAINAGE CONDITIONS**

All drainage basins within this section correspond to the basins described in the ‘Existing Conditions: Jimmy Camp, Calhan, and Williams Creek Drainage Basins: (Kane Ranch: Existing Conditions Map)’ sections of this report. For each of the following drainage basins, average CN rainfall runoff numbers have been calculated using basin specific land uses and soil types (See Appendix for calculations). CN values used are from ‘Table 5-5 Runoff Curve Numbers for Hydrologic Soil Cover Complexes – Urban and Suburban Conditions’ City of Colorado Springs and El Paso County Drainage Criteria Manual, Vol. 1. Time of concentrations has been estimated and runoff calculations are preliminary. Actual developed runoff values will be quantified at time of final construction with each parcels’ own drainage report.

Squirrel Creek Road will be improved with the development of the proposed site to a multi-lane arterial road. With these improvements, all storm sewer crossings will be examined beyond the analysis within this report and recommendations for improvements will be given. Replacement of every existing storm sewer crossing is very likely since most of the storm crossings are substandard CMP (replace with RCP at a minimum).



All detention facilities within this report have been conceptually sized with a 2.0' freeboard (above 100-yr W.S.E.) to the top of the pond embankment and with an area including a 16.0' wide maintenance access road. Storm water release into the existing creek shall be in accordance with all appropriate agencies and FEMA floodplain regulations. Exact detention pond locations, quantity, and configuration to be determined at final design.

**Basin C (365 acres, Q<sub>100</sub> = 1016.95 cfs)**

The proposed development consists of a portion of future Powers Boulevard, predominantly single family residential, a neighborhood park and open space. Storm water runoff from this proposed development area shall be collected and detained at a location determined during final design. Release rates shall be held to historic flow quantities described in the previous section. A detention facility has been sized, 27.38 ac.-ft., to restrict developed flows to historic flow rates. A site-specific drainage study shall be completed at time of final design. To detail the probable multiple FSD facilities and ultimate released to Jimmy Camp Creek.

**Basin B (64 acres, Q<sub>100</sub> = 272.68 cfs)**

The proposed development consists residential development and open space. Storm water runoff from the proposed development shall be collected and detained at a location determined during final design. Release rates shall be held to historic flow quantities described in the previous section. A detention facility has been sized, 4.74 ac.-ft., to restrict developed flows to historic flow rates as it is released into Jimmy Camp Creek.

**Basin D (55 acres, Q<sub>100</sub> = 191.03 cfs)**

Basin D is comprised of a portion of the proposed Powers corridor and adjacent residential communities. These flows will be directed in a generally northeast direction where a proposed 40.04 ac-ft FSD will detain flows to historic levels before being released into Jimmy Camp Creek

**Basin E (19 acres, Q<sub>100</sub> = 66.14 cfs)**

Basin E is comprised of residential neighborhoods that flow in a northwesterly direction where a proposed 1.40 ac-ft FSD will detain flows to historic levels before being released into Jimmy Camp Creek.

**Basin F (148 acres, Q<sub>100</sub> = 439.70 cfs)**

Basin F includes a small portion of future proposed Powers Boulevard, a school site, parks and multiple single family and multi-family communities. These flows generally travel west toward Design Point 6 where a 11.08 ac-ft FSD facility will detain the flows before being released into Jimmy Camp Creek off-site historic flows from Basins H, I, J, L and M will be routed through Basin F, but not through the proposed FSD facility.

**Basin G (44 acres, Q<sub>100</sub> = 271.43 cfs)**

Basin G includes the main Link Road access and adjacent residential areas. This area flows in a northwesterly direction where a proposed 4.87 ac-ft FSD will be proposed to detain flows before being released into Jimmy Camp Creek.

Possible realignment of the Fountain Mutual Irrigation Channel (FMIC) ditch will be proposed in subsequent more detailed applications, and coordination with FMIC has already taken place.

**Jimmy Camp Creek**

The proposed annexation area includes portions of the main corridor of Jimmy Camp Creek. This Basin was recently analyzed in the “Jimmy Camp Creek Drainage Basin Planning Study – Development of Alternatives and Design of Selected Plan Report,” dated March 9, 2015 as prepared by Kiowa Engineering Corporation. This report details the required improvements for Jimmy Camp Creek that runs within the annexation area. This corridor carries significant drainage flows of Q<sub>5</sub> = 450 cfs and Q<sub>100</sub> = 21,750 cfs to 21,870 cfs.





Excerpts from Drainage Basin Planning Study (DBPS) area included in this report appendix and include sheets 4JC, 5JC, 6aJC, and 6bJC. The Ranch annexation boundary has been included on the sheets for identification of the site within the creek corridor.

The Drainage Basin Planning Study includes costs associated with the recommended improvements in Jimmy Camp Creek in "Table VII-1: Conveyance Costs". The costs as applicable to the portion of Jimmy Camp Creek within The Ranch are:

Low Flow Channel > 300 cfs (\$/lf), 20' BW	\$ 200.00
Low Flow Drop > 300 cfs (ea)	\$25,000.00
Stabilized Bank (\$/lf)	\$ 200.00

Based upon the conceptual DBPS design the following are the recommendations associated with The Ranch:

7200 LF	Low Flow Channel	at \$200/lf	=	\$1,440,000.00
31 EA	Low Flow Drop	at \$25,000/ea	=	\$ 775,000.00
6400 LF	Stabilization	at \$200/lf	=	<u>\$1,280,000.00</u>
				SUBTOTAL \$3,495,000.00
		15% Engineering & Contingency		\$ 524,250.00
				TOTAL \$4,019,250.00

This is an initial approximation of the possible Jimmy Camp Creek channel improvements per the DBPS, not per actual design analysis. The actual need, timing, location, and design of creek improvements will take place with more detailed site plans and analysis. Bank stabilization not adjacent to The Ranch property was not included in the costs as it is assumed that would be the responsibly of the adjacent property when developed.

Improvements to Jimmy Camp Creek may require coordination and/or permitting with USFWS, USACOE and FEMA.



The Jimmy Camp Creek crossing at Link Road is shown in the DBPS to require rip-rap armoring of the channel and abutments with Type M rip-rap. As The Ranch Community will be paying bridge fees with platting, those fees could be utilized to make the improvements.

As the Jimmy Camp Creek corridor design will be based upon the DBPS recommendations, preparation of CLOMR and LOMR applications may be required, along with detailed wetlands evaluation and permitting, in conjunction with Construction Drawing preparation.

### **FULL SPECTRUM DETENTION FACILITIES**

All detention facilities recommended within this report shall include planning for water quality management at time of the final site layout and drainage report(s). This treatment will take place within the FSD Facility or possibly prior to the facility. If alternate methods of detention and conveyance of storm water is designed, appropriate storm water quality facilities shall be installed per city/county criteria.

Storm water quality measures will be utilized in order to reduce the amount of sediment, debris and pollutants that are allowed to enter the drainage basin. These features include but are not limited to Extended Detention Basin Sedimentation Facilities, Sand Filter Extended Detention Basins, and Constructed Wetlands Basin Sedimentation Facilities. These measures will be taken into consideration upon final design of the individual detention facilities as well as the development of the individual land uses within the The Ranch property.

At this time, it is proposed that all major storm water quality features will be included in the regional detention facilities and that no site-specific facilities will be required. It is also anticipated that some form of storm water quality features may be incorporated into parking lot design, parks, school sites and proposed park sites.

As on-site FSD facilities will be provided, prior anticipated land uses per the DBPS have no bearing on the proposed capture, treatment and release of developed flows, as they will be restricted to historic levels regardless of imperviousness.

## **MAINTENANCE**

The proposed regional detention facilities and channels are to be public facilities with maintenance of the surface by the proposed Metro District with all inlet, outlet and access to be maintained by the City. It is proposed that all other standard storm facilities be public with maintenance performed by the City of Fountain.

## **HYDROLOGIC CALCULATIONS**

Hydrologic calculations were performed using the City of Colorado Springs / El Paso County Drainage Criteria Manual (DCM), as revised May 2014 was used to estimate peak storm water runoff and hydrograph generation anticipated from design storms with 100-year recurrence interval. Rainfall data was obtained from the City of Colorado Springs 2- hour design storm – cumulative depth distributions (in.) This report accepts the use of the Jimmy Camp Creek DBPS Hydrology for use in the actual corridor design. Site development will all be routed to Full Spectrum Detention Facilities designed per DCM Criteria in effect at the time of design. More detailed (community specific) MDDP's will be created in conjunction with smaller sub-area preliminary plat submittals to further define community layouts, storm infrastructure and FSD facility locations.

## **FLOODPLAIN STATEMENT**

A portion of this site is located within a 100-year floodplain as determined by the Flood Insurance Rate Maps (F.I.R.M.) Map Number 0841C0958 G with an effective date of December 7, 2018 (See Appendix). The affected area is located within the studied main channel of Jimmy Camp Creek. Developed storm water release into Jimmy Camp Creek shall be in accordance with all appropriate agencies and FEMA floodplain regulations. A Floodplain Development Permit will be required to support construction areas within the existing 100-year floodplain.



**DRAINAGE AND BRIDGE FEES**

At this time within the City of Fountain, the Jimmy Camp Drainage Basin has adopted Drainage and Bridge Fees. Fees will be calculated at the time of final plat submittal, but the following summary reflects an initial analysis using the current City of Fountain fees of:

- 2020 Drainage Fee: \$12,086.66 / Impervious acre
- 2020 Bridge Fee: \$ 1,967.43 / Impervious Acre

Based upon the overall annexation area of acres and assuming a conservative imperviousness of 50% (to be confirmed with site development), the resultant would be:

2020 Drainage Fee	(0.5) (516.338) (12,086.66) =	\$3,120,400.93
2020 Bridge Fee	(0.5) (516.338) (1,967.43) =	\$507,929.44
	Total Fees	= \$3,628,330.37

**SUMMARY**

Developed flows are to be routed to the various proposed Full Spectrum Detention (FSD) facilities that are required to detain the 5 and 100-year storm events and release only the historic flows from the various drainage basins. Flows for the land uses were calculated using the Horton Method (SWMM) and are conceptual only. Upon development of the individual Overall Development Plan components, a Preliminary/Final Drainage Report will be required as well as Full Spectrum Detention as specified by the Urban Drainage and Flood Control District (UDFCD). Storm runoff tributary to the proposed site will be accepted to historic levels. Any development of the proposed The Ranch site will not adversely affect the existing drainage ways or surrounding developments since storm water release is to be of historic conditions for the entire proposed site. Full adherence to the Jimmy Camp Creek DBPS and the Drainage corridor improvements (or subsequently approved alternatives) is anticipated.



PREPARED BY:

Kyle R. Campbell P.E.  
Division Manager

Sm/255000/MDDP.doc



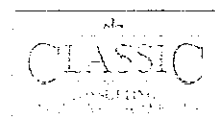
## REFERENCES

1. City of Colorado Springs/County of El Paso Drainage Criteria Manual Volume 1 dated May 2014.
2. Soil Survey of El Paso County Area, Colorado Soil Conservation Service, June 1981.
3. Jimmy Camp Creek Drainage Basin Planning Study, Kiowa Engineering Corp., March 9, 2015.
4. Kane Ranch Master Development Drainage Plan, Classic Consulting, September 2007.



## APPENDIX

VICINITY MAP

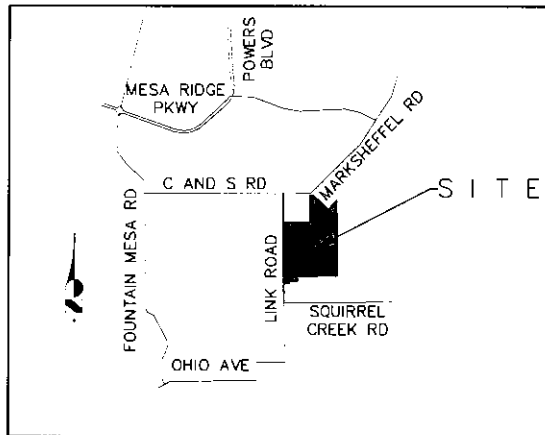




**ANNEXATION PLAT**  
**THE RANCH ADDITION NO. 1**

TO THE CITY OF FOUNTAIN, COLORADO

THE EAST HALF OF SECTION 33, TOWNSHIP 15 SOUTH, RANGE 65 WEST  
OF THE SIXTH PRINCIPAL MERIDIAN, EL PASO COUNTY, COLORADO

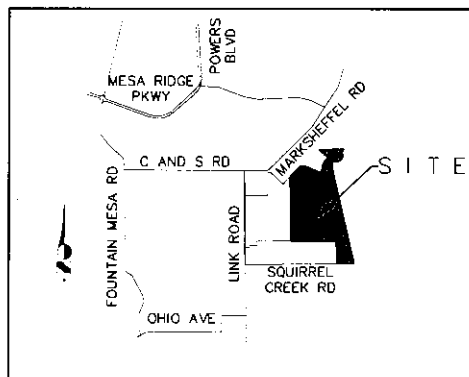


VICINITY MAP  
NOT TO SCALE

**ANNEXATION PLAT**  
**THE RANCH ADDITION NO. 2**

TO THE CITY OF FOUNTAIN, COLORADO

A PARCEL OF LAND LOCATED IN SECTION 34, TOWNSHIP 15 SOUTH,  
RANGE 65 WEST OF THE SIXTH PRINCIPAL MERIDIAN, EL PASO COUNTY, COLORADO

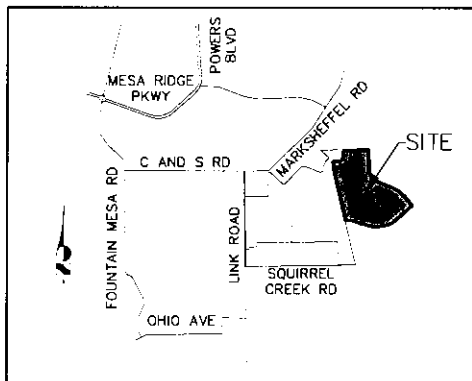


VICINITY MAP  
NOT TO SCALE

**ANNEXATION PLAT**  
**THE RANCH ADDITION NO. 3**

TO THE CITY OF FOUNTAIN, COLORADO

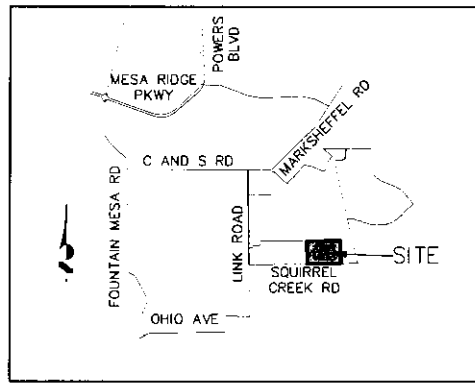
A PARCEL OF LAND LOCATED IN SECTIONS 27, 34 AND 35 TOWNSHIP 15 SOUTH,  
RANGE 65 WEST OF THE SIXTH PRINCIPAL MERIDIAN, EL PASO COUNTY, COLORADO



VICINITY MAP  
NOT TO SCALE

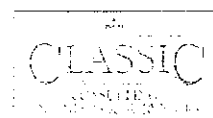
**ANNEXATION PLAT**  
**THE RANCH ADDITION NO. 4**

TO THE CITY OF FOUNTAIN, COLORADO  
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RANGE 65 WEST OF THE SIXTH PRINCIPAL MERIDIAN, EL PASO COUNTY, COLORADO

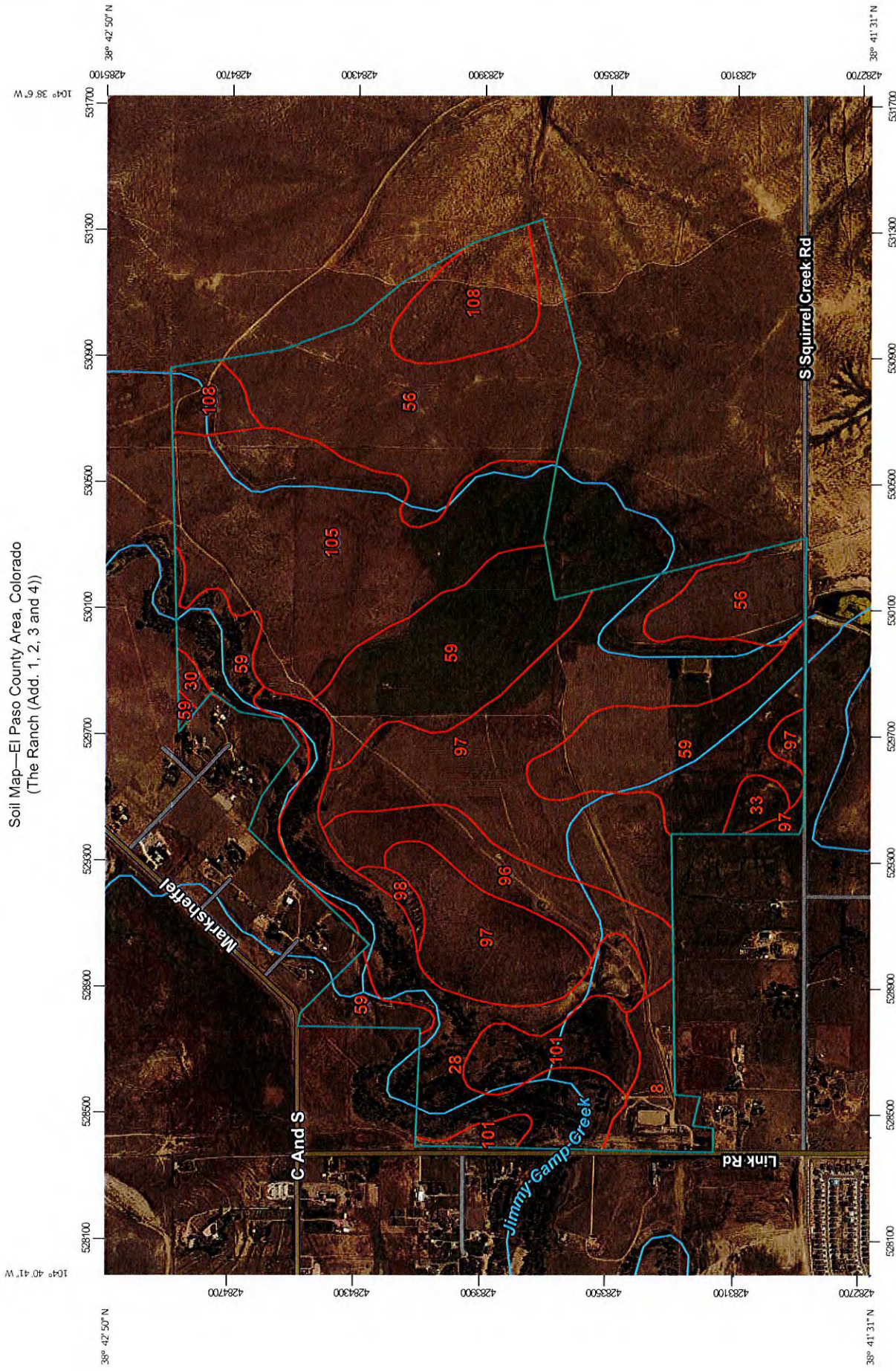


VICINITY MAP  
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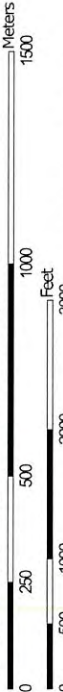
**SOILS MAP (S.C.S SURVEY)**



Soil Map—El Paso County Area, Colorado  
(The Ranch (Add. 1, 2, 3 and 4))











































Map Scale: 1:17,100 if printed on A landscape (11" x 8.5") sheet.



Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 13N WGS84

## MAP LEGEND

 Area of Interest (AOI)	 Spoil Area
 Soils	 Stony Spot
 Soil Map Unit Polygons	 Very Stony Spot
 Soil Map Unit Lines	 Wet Spot
 Soil Map Unit Points	 Other
 Special Point Features	 Special Line Features
 Blowout	 Streams and Canals
 Borrow Pit	 Transportation
 Clay Spot	 Rails
 Closed Depression	 Interstate Highways
 Gravel Pit	 US Routes
 Gravelly Spot	 Major Roads
 Landfill	 Local Roads
 Lava Flow	 Background
 Marsh or swamp	 Aerial Photography
 Mine or Quarry	
 Miscellaneous Water	
 Perennial Water	
 Rock Outcrop	
 Saline Spot	
 Sandy Spot	
 Severely Eroded Spot	
 Sinkhole	
 Slide or Slip	
 Sodic Spot	

## MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service  
Web Soil Survey URL:  
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: El Paso County Area, Colorado  
Survey Area Data: Version 18, Jun 5, 2020

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Aug 14, 2018—Sep 23, 2018

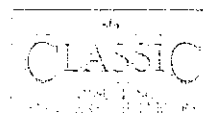
The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

## Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
8	Blakeland loamy sand, 1 to 9 percent slopes	22.5	2.5%
28	Ellicott loamy coarse sand, 0 to 5 percent slopes	90.2	10.1%
30	Fort Collins loam, 0 to 3 percent slopes	2.8	0.3%
33	Heldt clay loam, 0 to 3 percent slopes	6.4	0.7%
56	Nelson-Tassel fine sandy loams, 3 to 18 percent slopes	138.8	15.5%
59	Nunn clay loam, 0 to 3 percent slopes	174.8	19.5%
96	Truckton sandy loam, 0 to 3 percent slopes	43.9	4.9%
97	Truckton sandy loam, 3 to 9 percent slopes	188.8	21.0%
98	Truckton-Blakeland complex, 9 to 20 percent slopes	4.4	0.5%
101	Ustic Torrifuvents, loamy	30.8	3.4%
105	Vona sandy loam, warm, 3 to 6 percent slopes	146.8	16.4%
108	Wiley silt loam, 3 to 9 percent slopes	46.8	5.2%
<b>Totals for Area of Interest</b>		<b>897.1</b>	<b>100.0%</b>



F.E.M.A. MAP

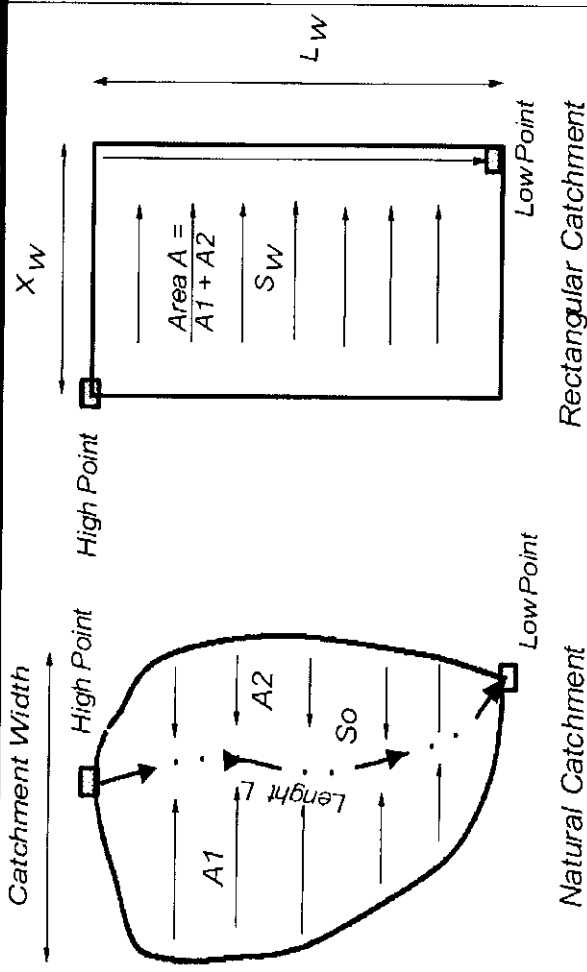




## DRAINAGE CALCULATIONS

Password: Width

# Convert Natural Catchment to a Rectangular Shape



Subcatchment Center	Z=0.5
Side Collector	Z=1
Skewed Location	0.5 < Z < 1

Dimensionless Variables

$$Y = \frac{L}{L_w}; \quad X = \frac{A}{L^2}$$

$$Y = (1.5 - Z)(2.286X - 0.286X^2)$$

$$\frac{L_w}{L} = (1.5 - Z) \left[ 2.286 \left( \frac{A}{L^2} \right) - 0.286 \left( \frac{A}{L^2} \right)^2 \right]$$

$$S_o / S_w = A / (L L_w) + L_w / L$$

$$X_w = A / L_w$$

Subarea ID	Area acre	A1 acre	A2 acre	L ft	High Pt Elev. ft	Low Pt Elev. ft	Z=A/L <sup>2</sup>	X=A/L <sup>2</sup>	Y=L <sup>w</sup> /L	L <sub>w</sub> ft	X <sub>w</sub> ft	S <sub>o</sub> %	S <sub>o</sub> /S <sub>w</sub>	S <sub>w</sub> %
A	46.00	23.00	23.00	1,402	5,736.0	5,680.0	0.50	1.02	2.03	2,850	703	3.99	2.53	1.58
B	64.00	41.60	22.40	2,905	5,754.0	5,640.0	0.65	0.33	0.62	1,788	1,559	3.92	1.15	3.41
C	365.00	92.24	272.76	5,700	5,734	5,630	0.75	0.49	0.79	4,506	3,529	1.82	1.41	1.29
D	55.00	16.50	38.50	2,174	5,654	5,628	0.70	0.51	0.87	1,888	1,269	1.20	1.45	0.82
E	19.00	9.00	10.00	651	5,646	5,618	0.53	1.95	3.28	2,138	387	4.30	3.88	1.11
F	148.00	53.09	94.91	3,315	5,656	5,608	0.64	0.59	1.07	3,537	1,822	1.45	1.62	0.90
G	44.00	26.40	17.60	2,457	5,678	5,606	0.60	0.32	0.63	1,541	1,244	2.93	1.13	2.59
H	16.00	7.00	9.00	446	5,684	5,674	0.56	3.50	4.22	1,881	371	2.24	5.05	0.44
I	21.00	15.24	5.76	1,152	5,718	5,673	0.73	0.69	1.11	1,284	712	3.91	1.73	2.25
J	97.00	32.70	64.30	3,180	5,776	5,681	0.66	0.42	0.76	2,410	1,753	2.99	1.31	2.28
K	21.00	11.00	10.00	690	5,722	5,689	0.52	1.92	3.26	2,247	407	4.78	3.85	1.24
L	26.00	14.14	11.86	1,718	5,702	5,654	0.54	0.38	0.80	1,372	826	2.79	1.28	2.18
M	84.00	21.00	63.00	3,167	5,678	5,660	0.75	0.36	0.60	1,890	1,936	0.57	1.21	0.47
N	11.00	2.00	9.00	840	5,762	5,702	0.82	0.68	0.97	814	589	7.14	1.67	4.28

**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

### 3.2 Time of Concentration

One of the basic assumptions underlying the Rational Method is that runoff is a function of the average rainfall rate during the time required for water to flow from the hydraulically most remote part of the drainage area under consideration to the design point. However, in practice, the time of concentration can be an empirical value that results in reasonable and acceptable peak flow calculations.

For urban areas, the time of concentration ( $t_c$ ) consists of an initial time or overland flow time ( $t_i$ ) plus the travel time ( $t_t$ ) in the storm sewer, paved gutter, roadside drainage ditch, or drainage channel. For non-urban areas, the time of concentration consists of an overland flow time ( $t_i$ ) plus the time of travel in a concentrated form, such as a swale or drainageway. The travel portion ( $t_t$ ) of the time of concentration can be estimated from the hydraulic properties of the storm sewer, gutter, swale, ditch, or drainageway. Initial time, on the other hand, will vary with surface slope, depression storage, surface cover, antecedent rainfall, and infiltration capacity of the soil, as well as distance of surface flow. The time of concentration is represented by Equation 6-7 for both urban and non-urban areas.

$$T_i = 0.007(n \cdot L)^{0.8} / (P_2)^{0.5} S^{0.4} \quad (\text{Eq. 6-15})$$

Where:

- $T_i$  = overland flow time (hr)
- $n$  = Manning's roughness coefficient
- $L$  = flow length (ft)
- $P_2$  = 2-year, 24-hour rainfall (in)
- $S$  = slope of hydraulic grade line (ft/ft)

Typical roughness coefficients for the overland flow portion of the drainage basin are provided in Table 6-11. Be aware that Manning's roughness coefficients for overland flow are different from Manning's  $n$  values for open channels and conduits. Manning's  $n$  values for channels and conduits should not be used for overland flow.

**Table 6-11. Roughness Coefficients (Manning's  $n$ ) for NRCS Overland Flow**

Surface description	$n^1$
Smooth surfaces (concrete, asphalt, gravel, bare soil, etc.)	0.011
Fallow (no residue)	0.05
Cultivated Soils:	
Residue cover $\leq 20\%$	0.06
Residue cover $> 20\%$	0.17
Grass:	
Short grass prairie	0.15
Dense grasses <sup>2</sup>	0.24
Bermuda grass	0.41
Range (natural)	0.13
Woods <sup>3</sup>	
Light underbrush	0.40
Dense underbrush	0.80

4. <sup>1</sup>The values are a composite of information compiled by Engman (1986).
5. <sup>2</sup>Includes species such as weeping lovegrass, bluegrass, buffalograss, blue gramma grass, native grass mixtures.
6. <sup>3</sup>When selecting  $n$ , consider cover to a height of about 0.1 feet. This is the only part of the plant cover that will obstruct sheet flow.

#### 4.6.2 Shallow Concentrated Flow

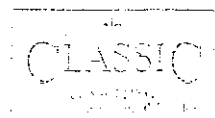
Flow that travels in defined flow paths, small shallow channels in undeveloped basins or in swales or gutters in developed basins normally has higher velocities than overland flow. Its travel time can be estimated by dividing its flow length by its average velocity. Average velocities for shallow concentrated flow can be estimated from Figure 6-25.

Cumulative Rainfall Depths in Inches - 100-yr Storm

Time Min.	Drainage Basin Area (square miles)						
	0-1	>1-5	>5-10	>10-15	>15-20	>20-40	>40-60
0	0.000	0.000	0.000	0.000	0.000	0.000	0.000
5	0.035	0.035	0.035	0.035	0.038	0.038	0.043
10	0.116	0.111	0.103	0.103	0.106	0.106	0.101
15	0.199	0.192	0.186	0.186	0.184	0.176	0.171
20	0.302	0.292	0.275	0.275	0.267	0.257	0.239
25	0.451	0.444	0.426	0.423	0.411	0.396	0.370
30	0.650	0.627	0.602	0.595	0.572	0.544	0.499
35	1.061	0.998	0.892	0.824	0.774	0.696	0.610
40	1.794	1.651	1.409	1.247	1.129	0.960	0.794
45	2.076	1.905	1.605	1.411	1.275	1.063	0.869
50	2.248	2.076	1.764	1.560	1.426	1.207	0.998
55	2.356	2.182	1.865	1.658	1.515	1.290	1.079
60	2.449	2.271	1.950	1.739	1.598	1.368	1.149
65	2.530	2.354	2.031	1.807	1.666	1.436	1.215
70	2.565	2.389	2.069	1.845	1.709	1.484	1.263
75	2.596	2.424	2.104	1.880	1.744	1.520	1.298
80	2.623	2.452	2.139	1.915	1.779	1.555	1.333
85	2.651	2.480	2.175	1.950	1.814	1.590	1.368
90	2.679	2.507	2.205	1.986	1.850	1.625	1.404
95	2.701	2.535	2.233	2.021	1.885	1.661	1.439
100	2.727	2.563	2.258	2.049	1.920	1.696	1.474
105	2.749	2.586	2.286	2.076	1.948	1.731	1.509
110	2.772	2.611	2.313	2.104	1.973	1.759	1.540
115	2.795	2.633	2.341	2.132	2.001	1.787	1.567
120	2.820	2.656	2.364	2.160	2.029	1.814	1.595

City of COS  
 2-Hr Design Storm  
 Cumulative Depth Distribution

**EXISTING CONDITIONS  
DRAINAGE CALCULATIONS  
(100 YEAR)**

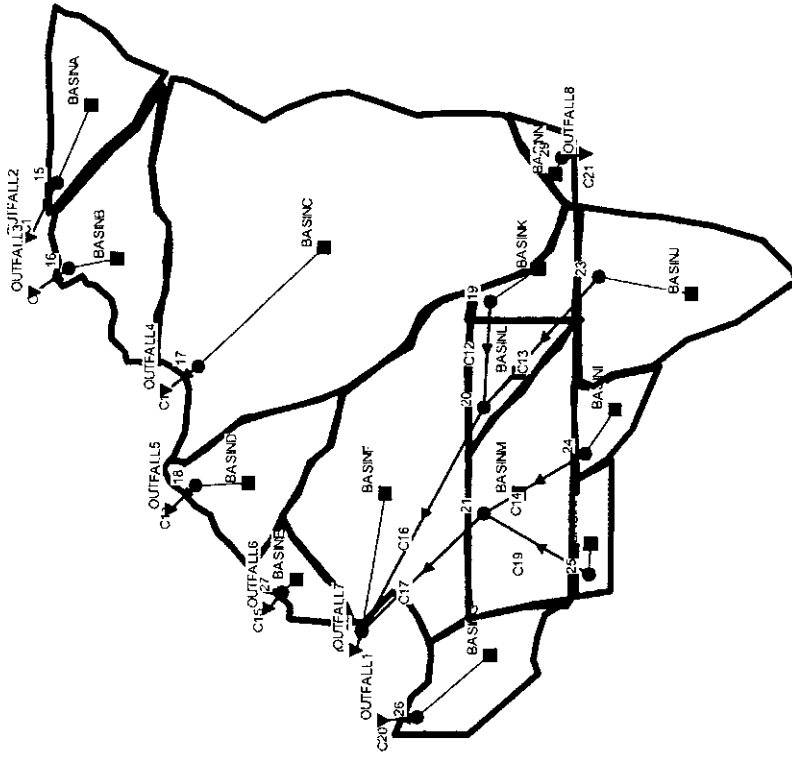




# THE RANCH HISTORIC 100 YR CONDTIONS

11/15/2020 00:05:00

100YR



# THE RANCH HISTORIC 100 YR CONTDITIONS

EPA STORM WATER MANAGEMENT MODEL - VERSION 5.1 (Build 5.1.013)

## THE RANCH HISTORIC 100 YR CONTDITIONS

```

*****
Element Count
*****
Number of rain gages ..... 1
Number of subcatchments ... 14
Number of nodes ..... 22
Number of links ..... 14
Number of pollutants ..... 0
Number of land uses ..... 0
    
```

```

*****
Raingage Summary
*****
    
```

Name	Data Source	Data	Recording Type	Interval
100YR	100YR		CUMULATIVE	5 min.

Name	Area	Width	%Imperv	%Slope	Rain Gage	Outlet
BASINA	46.00	1402.00	2.00	1.5800	100YR	15
BASINB	64.00	2905.00	2.00	3.4100	100YR	16
BASINC	365.00	5700.00	2.00	1.2900	100YR	17
BASIND	55.00	2174.00	2.00	0.8200	100YR	18
BASINE	19.00	651.00	2.00	1.1100	100YR	27
BASINF	148.00	3315.00	2.00	0.9000	100YR	22
BASING	44.00	2457.00	2.00	2.5900	100YR	26
BASINH	16.00	446.00	2.00	0.4400	100YR	25
BASINI	21.00	1152.00	2.00	2.2500	100YR	24

```

*****
Subcatchment Summary
*****
    
```

# THE RANCH HISTORIC 100 YR CONTDITIONS

BASINJ	97.00	3180.00	2.00	2,2800	100YR	23
BASINK	21.00	690.00	2.00	1,2400	100YR	19
BASINL	26.00	1718.00	2.00	2,1800	100YR	20
BASINM	84.00	3167.00	2.00	0,4700	100YR	21
BASINN	11.00	840.00	2.00	4,2800	100YR	29

\*\*\*\*\*

Node Summary

\*\*\*\*\*

Name	Type	Invert Elev.	Max. Depth	Ponded Area	External Inflow
15	JUNCTION	5680.00	6.00	6.00	0.0
16	JUNCTION	5640.00	6.00	6.00	0.0
17	JUNCTION	5630.00	8.00	0.0	0.0
18	JUNCTION	5628.00	6.00	0.0	0.0
19	JUNCTION	5689.00	6.00	0.0	0.0
20	JUNCTION	5654.00	6.00	0.0	0.0
21	JUNCTION	5660.00	6.00	0.0	0.0
22	JUNCTION	5608.00	8.00	0.0	0.0
23	JUNCTION	5681.00	6.00	0.0	0.0
24	JUNCTION	5673.00	6.00	0.0	0.0
25	JUNCTION	5673.00	6.00	0.0	0.0
26	JUNCTION	5606.00	6.00	0.0	0.0
27	JUNCTION	5618.00	6.00	0.0	0.0
29	JUNCTION	5702.00	6.00	0.0	0.0
OUTFALL1	OUTFALL	5594.00	6.00	6.00	0.0
OUTFALL2	OUTFALL	5646.00	6.00	6.00	0.0
OUTFALL3	OUTFALL	5638.00	6.00	6.00	0.0
OUTFALL4	OUTFALL	5626.00	8.00	8.00	0.0
OUTFALL5	OUTFALL	5623.00	6.00	6.00	0.0
OUTFALL6	OUTFALL	5609.00	6.00	6.00	0.0
OUTFALL7	OUTFALL	5596.00	8.00	8.00	0.0
OUTFALL8	OUTFALL	5700.00	6.00	6.00	0.0

\*\*\*\*\*

Link Summary

\*\*\*\*\*

Name	From Node	To Node	Type	Length	%Slope	Roughness
<b>SWMM 5.1</b>						

THE RANCH HISTORIC 100 YR CONDTIONS

C1	15	OUTFALL2	CONDUIT	470.0	7.2530	0.0130
C9	16	OUTFALL3	CONDUIT	450.0	0.4444	0.0100
C10	17	OUTFALL4	CONDUIT	355.0	1.1268	0.0130
C11	18	OUTFALL5	CONDUIT	100.0	5.0063	0.0100
C12	19	20	CONDUIT	1793.0	1.9524	0.0130
C13	23	20	CONDUIT	1580.0	1.7091	0.0130
C14	24	21	CONDUIT	400.0	3.2517	0.0130
C15	27	OUTFALL6	CONDUIT	125.0	7.2187	0.0130
C16	20	22	CONDUIT	2996.0	1.5356	0.0130
C17	21	22	CONDUIT	1651.0	3.1512	0.0130
C18	22	OUTFALL7	CONDUIT	200.0	6.0108	0.0130
C19	25	21	CONDUIT	1320.0	0.9849	0.0130
C20	26	OUTFALL1	CONDUIT	431.0	2.7853	0.0130
C21	29	OUTFALL8	CONDUIT	50.0	4.0032	0.0130

\*\*\*\*\*

Cross Section Summary

\*\*\*\*\*

Conduit	Shape	Full Depth	Hyd. Area	Max. Rad.	No. of Width	Full Barrels	Flow
C1	CIRCULAR	6.00	28.27	1.50	6.00	1	1140.57
C9	CIRCULAR	6.00	28.27	1.50	6.00	1	367.04
C10	CIRCULAR	8.00	50.27	2.00	8.00	1	968.19
C11	CIRCULAR	6.00	28.27	1.50	6.00	1	1231.86
C12	CIRCULAR	6.00	28.27	1.50	6.00	1	591.76
C13	CIRCULAR	6.00	28.27	1.50	6.00	1	553.66
C14	CIRCULAR	6.00	28.27	1.50	6.00	1	763.69
C15	CIRCULAR	6.00	28.27	1.50	6.00	1	1137.87
C16	CIRCULAR	6.00	28.27	1.50	6.00	1	524.80
C17	CIRCULAR	6.00	28.27	1.50	6.00	1	751.79
C18	CIRCULAR	8.00	50.27	2.00	8.00	1	2236.14
C19	CIRCULAR	6.00	28.27	1.50	6.00	1	420.30
C20	CIRCULAR	6.00	28.27	1.50	6.00	1	706.80
C21	CIRCULAR	6.00	28.27	1.50	6.00	1	847.36

\*\*\*\*\*

# THE RANCH HISTORIC 100 YR CONDTIONS

NOTE: The summary statistics displayed in this report are based on results found at every computational time step, not just on results from each reporting time step.

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\*\*\*\*\*

Analysis Options

\*\*\*\*\*

Flow Units ..... CFS

Process Models:

Rainfall/Runoff ..... YES

RDII ..... NO

Snowmelt ..... NO

Groundwater ..... NO

Flow Routing ..... YES

Ponding Allowed ..... NO

Water Quality ..... NO

Infiltration Method ..... HORTON

Flow Routing Method ..... KINWAVE

Starting Date ..... 11/15/2020 00:00:00

Ending Date ..... 11/15/2020 06:00:00

Antecedent Dry Days ..... 0.0

Report Time Step ..... 00:05:00

Wet Time Step ..... 00:01:00

Dry Time Step ..... 01:00:00

Routing Time Step ..... 5.00 sec

\*\*\*\*\*

Runoff Quantity Continuity	acre-feet	Volume	inches	Depth
----------------------------	-----------	--------	--------	-------

Total Precipitation	238.995		2.820	
Evaporation Loss	0.000		0.000	
Infiltration Loss	177.899		2.099	
Surface Runoff	60.978		0.720	
Final Storage	0.132		0.002	
Continuity Error (%)	-0.006			

\*\*\*\*\*

Flow Routing Continuity	acre-feet	Volume	10 <sup>6</sup> gal
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Flow Routing Continuity	10 <sup>6</sup> gal		
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# THE RANCH HISTORIC 100 YR CONTDITIONS

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*****
Dry Weather Inflow ..... 0.000 0.000
Wet Weather Inflow ..... 60.978 19.871
Groundwater Inflow ..... 0.000 0.000
RDII Inflow ..... 0.000 0.000
External Inflow ..... 0.000 0.000
External Outflow ..... 60.905 19.847
Flooding Loss ..... 0.000 0.000
Evaporation Loss ..... 0.000 0.000
Exfiltration Loss ..... 0.000 0.000
Initial Stored Volume .... 0.000 0.000
Final Stored Volume ..... 0.000 0.000
Continuity Error (%) ..... 0.119

```

```

*****
Highest Flow Instability Indexes
*****

```

All links are stable.

```

*****
Routing Time Step Summary
*****
Minimum Time Step : 5.00 sec
Average Time Step : 5.00 sec
Maximum Time Step : 5.00 sec
Percent in Steady State : 0.00
Average Iterations per Step : 1.05
Percent Not Converging : 0.00

```

```

*****
Subcatchment Runoff Summary
*****

```

```

-----
Subcatchment   Total Precip   Total Runon   Total Evap   Total Infil   Total Imperv   Perv Runoff   Total Runoff   Peak Runoff
                in          in          in          in          in          in          in 10^6 gal   Runoff Coeff
                in          in          in          in          in          in          in          CFS
-----

```

# THE RANCH HISTORIC 100 YR CONDTIONS

BASINA	2.82	0.00	0.00	0.00	2.02	0.05	0.75	0.80	1.00	30.05	0.284
BASINB	2.82	0.00	0.00	0.00	1.75	0.05	1.01	1.07	1.86	76.37	0.379
BASINC	2.82	0.00	0.00	0.00	2.27	0.05	0.49	0.54	5.40	137.11	0.193
BASIND	2.82	0.00	0.00	0.00	2.04	0.05	0.72	0.78	1.16	33.99	0.276
BASINE	2.82	0.00	0.00	0.00	2.04	0.05	0.73	0.78	0.40	11.82	0.277
BASINF	2.82	0.00	0.00	0.00	2.22	0.05	0.55	0.60	2.42	61.30	0.213
BASING	2.82	0.00	0.00	0.00	1.73	0.05	1.04	1.09	1.30	55.13	0.387
BASINH	2.82	0.00	0.00	0.00	2.26	0.05	0.50	0.56	0.24	6.14	0.198
BASINI	2.82	0.00	0.00	0.00	1.76	0.05	1.01	1.06	0.61	24.73	0.377
BASINJ	2.82	0.00	0.00	0.00	1.93	0.06	0.84	0.89	2.35	77.83	0.317
BASINK	2.82	0.00	0.00	0.00	2.03	0.05	0.73	0.79	0.45	13.21	0.279
BASINL	2.82	0.00	0.00	0.00	1.70	0.05	1.06	1.12	0.79	34.46	0.396
BASINM	2.82	0.00	0.00	0.00	2.15	0.05	0.61	0.67	1.52	39.82	0.236
BASINN	2.82	0.00	0.00	0.00	1.57	0.05	1.20	1.25	0.37	20.57	0.443

\*\*\*\*\*

### Node Depth Summary

\*\*\*\*\*

### Average Maximum Time of Max Reported

Node	Type	Depth		HGL		Occurrence		Max Depth	
		Feet	Feet	Feet	Feet	hr:min	hr:min	Feet	Feet
15	JUNCTION	0.20	0.67	5680.67	0	00:55	0	00:55	0.67
16	JUNCTION	0.41	1.86	5641.86	0	00:55	0	00:55	1.86
17	JUNCTION	0.71	2.03	5632.03	0	00:45	0	00:45	2.02
18	JUNCTION	0.21	0.68	5628.68	0	00:55	0	00:55	0.68
19	JUNCTION	0.19	0.62	5689.62	0	00:55	0	00:55	0.61
20	JUNCTION	0.53	1.99	5655.99	0	00:55	0	00:55	1.98
21	JUNCTION	0.39	1.23	5661.23	0	00:55	0	00:55	1.23
22	JUNCTION	0.57	1.98	5609.98	0	00:57	0	00:57	1.97
23	JUNCTION	0.41	1.52	5682.52	0	00:55	0	00:55	1.52
24	JUNCTION	0.17	0.74	5673.74	0	00:55	0	00:55	0.74
25	JUNCTION	0.18	0.51	5673.51	0	00:45	0	00:45	0.50
26	JUNCTION	0.25	1.13	5607.13	0	00:55	0	00:55	1.13
27	JUNCTION	0.13	0.43	5618.43	0	00:55	0	00:55	0.43
29	JUNCTION	0.12	0.64	5702.64	0	00:50	0	00:50	0.64
OUTFALL1	OUTFALL	0.25	1.13	5595.13	0	00:55	0	00:55	1.13
OUTFALL2	OUTFALL	0.20	0.67	5646.67	0	00:55	0	00:55	0.67

SWMM 5.1

# THE RANCH HISTORIC 100 YR CONTDITIONS

OUTFALL3	OUTFALL	0.41	1.86	5639.86	0	00:55	1.85
OUTFALL4	OUTFALL	0.71	2.02	5628.02	0	00:45	1.99
OUTFALL5	OUTFALL	0.21	0.68	5623.68	0	00:55	0.68
OUTFALL6	OUTFALL	0.13	0.43	5609.43	0	00:55	0.43
OUTFALL7	OUTFALL	0.56	1.81	5597.81	0	00:57	1.81
OUTFALL8	OUTFALL	0.11	0.64	5700.64	0	00:50	0.64

\*\*\*\*\*  
Node Inflow Summary  
\*\*\*\*\*

Node	Type	Maximum		Lateral		Total		Flow Balance Error
		Time of Max Occurrence		Inflow Volume		Inflow Volume		
		CFS	CFS days hr:min	10^6 gal	10^6 gal	10^6 gal	10^6 gal	
15	JUNCTION	30.05	30.05	0	00:55	1	1	0.000
16	JUNCTION	76.37	76.37	0	00:55	1.86	1.86	0.000
17	JUNCTION	137.11	137.11	0	00:45	5.4	5.4	0.000
18	JUNCTION	33.99	33.99	0	00:55	1.16	1.16	0.000
19	JUNCTION	13.21	13.21	0	00:55	0.448	0.448	0.000
20	JUNCTION	34.46	124.07	0	00:55	0.787	3.59	0.000
21	JUNCTION	39.82	69.84	0	00:55	1.52	2.37	0.000
22	JUNCTION	61.30	250.75	0	00:57	2.42	8.36	0.000
23	JUNCTION	77.83	77.83	0	00:55	2.35	2.35	0.000
24	JUNCTION	24.73	24.73	0	00:55	0.606	0.606	0.000
25	JUNCTION	6.14	6.14	0	00:45	0.242	0.242	0.000
26	JUNCTION	55.13	55.13	0	00:55	1.3	1.3	0.000
27	JUNCTION	11.82	11.82	0	00:55	0.403	0.403	0.000
29	JUNCTION	20.57	20.57	0	00:50	0.373	0.373	-0.000
OUTFALL1	OUTFALL	0.00	55.10	0	00:55	0	1.3	0.000
OUTFALL2	OUTFALL	0.00	30.00	0	00:55	0	1	0.000
OUTFALL3	OUTFALL	0.00	76.27	0	00:55	0	1.85	0.000
OUTFALL4	OUTFALL	0.00	135.01	0	00:45	0	5.39	0.000
OUTFALL5	OUTFALL	0.00	33.98	0	00:55	0	1.16	0.000
OUTFALL6	OUTFALL	0.00	11.82	0	00:55	0	0.403	0.000
OUTFALL7	OUTFALL	0.00	250.75	0	00:57	0	8.36	0.000
OUTFALL8	OUTFALL	0.00	20.56	0	00:50	0	0.373	0.000



# THE RANCH HISTORIC 100 YR CONDTIONS

\*\*\*\*\*  
 Node Flooding Summary  
 \*\*\*\*\*

No nodes were flooded.

\*\*\*\*\*  
 Outfall Loading Summary  
 \*\*\*\*\*

Outfall Node	Flow Freq		Avg Flow		Max Flow		Total Volume	
	Pent	CFS	CFS	CFS	CFS	CFS	10 <sup>6</sup> gal	10 <sup>6</sup> gal
OUTFALL1	49.17	16.38	55.10	1.301				
OUTFALL2	57.59	10.77	30.00	1.002				
OUTFALL3	52.89	21.70	76.27	1.854				
OUTFALL4	77.66	42.99	135.01	5.394				
OUTFALL5	56.55	12.72	33.98	1.162				
OUTFALL6	56.27	4.43	11.82	0.403				
OUTFALL7	93.94	55.05	250.75	8.355				
OUTFALL8	40.39	5.72	20.56	0.373				
System	60.56	169.76	20.56	19.845				

\*\*\*\*\*  
 Link Flow Summary  
 \*\*\*\*\*

Link	Type	Maximum Time of Max Occurrence		Maximum  Veloc		Max/ Full	
		CFS days hr:min	ft/sec	Flow	Depth	Flow	Depth
C1	CONDUIT	30.00	0 00:55	17.32	0.03	0.11	
C9	CONDUIT	76.27	0 00:55	10.26	0.21	0.31	
C10	CONDUIT	135.01	0 00:45	13.73	0.14	0.25	

SWMM 5.1

# THE RANCH HISTORIC 100 YR CONTDITIONS

C11	CONDUIT	33.98	0 00:55	19.03	0.03	0.11
C12	CONDUIT	13.07	0 01:01	8.70	0.02	0.10
C13	CONDUIT	77.31	0 00:56	13.83	0.14	0.25
C14	CONDUIT	24.71	0 00:55	12.45	0.03	0.12
C15	CONDUIT	11.82	0 00:55	13.02	0.01	0.07
C16	CONDUIT	123.17	0 00:57	15.19	0.23	0.33
C17	CONDUIT	69.56	0 00:56	16.67	0.09	0.21
C18	CONDUIT	250.75	0 00:57	29.44	0.11	0.23
C19	CONDUIT	5.81	0 01:11	5.32	0.01	0.08
C20	CONDUIT	55.10	0 00:55	14.90	0.08	0.19
C21	CONDUIT	20.56	0 00:50	12.60	0.02	0.11

\*\*\*\*\*

## Conduit Surcharge Summary

\*\*\*\*\*

No conduits were surcharged.

Analysis begun on: Mon Nov 16 16:20:31 2020

Analysis ended on: Mon Nov 16 16:20:31 2020

Total elapsed time: < 1 sec

# THE RANCH HISTORIC 100 YR CONDTIONS

## Subcatchment Runoff Summary

Subcatchment	Total Precip in	Total Runon in	Total Evap in	Total Infil in	Imperv Runoff in	Perv Runoff in	Total Runoff in	Total Runoff 10^6 gal	Peak Runoff CFS
BASINA	2.82	0.00	0.00	2.02	0.05	0.75	0.80	1.00	30.05
BASINB	2.82	0.00	0.00	1.75	0.05	1.01	1.07	1.86	76.37
BASINC	2.82	0.00	0.00	2.27	0.05	0.49	0.54	5.40	137.11
BASIND	2.82	0.00	0.00	2.04	0.05	0.72	0.78	1.16	33.99
BASINE	2.82	0.00	0.00	2.04	0.05	0.73	0.78	0.40	11.82
BASINF	2.82	0.00	0.00	2.22	0.05	0.55	0.60	2.42	61.30
BASING	2.82	0.00	0.00	1.73	0.05	1.04	1.09	1.30	55.13
BASINH	2.82	0.00	0.00	2.26	0.05	0.50	0.56	0.24	6.14
BASINI	2.82	0.00	0.00	1.76	0.05	1.01	1.06	0.61	24.73
BASINJ	2.82	0.00	0.00	1.93	0.06	0.84	0.89	2.35	77.83
BASINK	2.82	0.00	0.00	2.03	0.05	0.73	0.79	0.45	13.21
BASINL	2.82	0.00	0.00	1.70	0.05	1.06	1.12	0.79	34.46
BASINM	2.82	0.00	0.00	2.15	0.05	0.61	0.67	1.52	39.82
BASINN	2.82	0.00	0.00	1.57	0.05	1.20	1.25	0.37	20.57

# THE RANCH HISTORIC 100 YR CONTDITIONS

Subcatchment Runoff Summary

Subcatchment	Runoff Coeff
BASINA	0.284
BASINB	0.379
BASINC	0.193
BASIND	0.276
BASINE	0.277
BASINF	0.213
BASING	0.387
BASINH	0.198
BASINI	0.377
BASINJ	0.317
BASINK	0.279
BASINL	0.396
BASINM	0.236
BASINN	0.443

# THE RANCH HISTORIC 100 YR CONDTIONS

## Node Inflow Summary

Node	Type	Maximum Lateral Inflow CFS	Maximum Total Inflow CFS	Day of Maximum Inflow	Hour of Maximum Inflow	Lateral Inflow Volume 10 <sup>6</sup> gal	Total Inflow Volume 10 <sup>6</sup> gal	Flow Balance Error Percent
15	JUNCTION	30.05	30.05	0	00:55	1	1	0.000
16	JUNCTION	76.37	76.37	0	00:55	1.86	1.86	0.000
17	JUNCTION	137.11	137.11	0	00:45	5.4	5.4	0.000
18	JUNCTION	33.99	33.99	0	00:55	1.16	1.16	0.000
19	JUNCTION	13.21	13.21	0	00:55	0.448	0.448	0.000
20	JUNCTION	34.46	124.07	0	00:55	0.787	3.59	0.000
21	JUNCTION	39.82	69.84	0	00:55	1.52	2.37	0.000
22	JUNCTION	61.30	250.75	0	00:57	2.42	8.36	0.000
23	JUNCTION	77.83	77.83	0	00:55	2.35	2.35	0.000
24	JUNCTION	24.73	24.73	0	00:55	0.606	0.606	0.000
25	JUNCTION	6.14	6.14	0	00:45	0.242	0.242	0.000
26	JUNCTION	55.13	55.13	0	00:55	1.3	1.3	0.000
27	JUNCTION	11.82	11.82	0	00:55	0.403	0.403	0.000
29	JUNCTION	20.57	20.57	0	00:50	0.373	0.373	-0.000
OUTFALL1	OUTFALL	0.00	55.10	0	00:55	0	1.3	0.000
OUTFALL2	OUTFALL	0.00	30.00	0	00:55	0	1	0.000
OUTFALL3	OUTFALL	0.00	76.27	0	00:55	0	1.85	0.000
OUTFALL4	OUTFALL	0.00	135.01	0	00:45	0	5.39	0.000
OUTFALL5	OUTFALL	0.00	33.98	0	00:55	0	1.16	0.000
OUTFALL6	OUTFALL	0.00	11.82	0	00:55	0	0.403	0.000

# THE RANCH HISTORIC 100 YR CONDITONS

Node	Type	Maximum Lateral Inflow CFS	Maximum Total Inflow CFS	Day of Maximum Inflow	Hour of Maximum Inflow	Lateral Inflow Volume 10 <sup>6</sup> gal	Total Inflow Volume 10 <sup>6</sup> gal	Flow Balance Error Percent
OUTFALL7	OUTFALL	0.00	250.75	0	00:57	0	8.36	0.000
OUTFALL8	OUTFALL	0.00	20.56	0	00:50	0	0.373	0.000

# THE RANCH HISTORIC 100 YR CONDTIONS

## Link Flow Summary

Link	Type	Maximum  Flow  CFS	Day of Maximum Flow	Hour of Maximum Flow	Maximum  Velocity  ft/sec	Max / Full Flow	Max / Full Depth
C1	CONDUIT	30.00	0	00:55	17.32	0.03	0.11
C9	CONDUIT	76.27	0	00:55	10.26	0.21	0.31
C10	CONDUIT	135.01	0	00:45	13.73	0.14	0.25
C11	CONDUIT	33.98	0	00:55	19.03	0.03	0.11
C12	CONDUIT	13.07	0	01:01	8.70	0.02	0.10
C13	CONDUIT	77.31	0	00:56	13.83	0.14	0.25
C14	CONDUIT	24.71	0	00:55	12.45	0.03	0.12
C15	CONDUIT	11.82	0	00:55	13.02	0.01	0.07
C16	CONDUIT	123.17	0	00:57	15.19	0.23	0.33
C17	CONDUIT	69.56	0	00:56	16.67	0.09	0.21
C18	CONDUIT	250.75	0	00:57	29.44	0.11	0.23
C19	CONDUIT	5.81	0	01:11	5.32	0.01	0.08
C20	CONDUIT	55.10	0	00:55	14.90	0.08	0.19
C21	CONDUIT	20.56	0	00:50	12.60	0.02	0.11

# THE RANCH HISTORIC 100 YR CONDTIONS

## Outfall Loading Summary

Outfall Node	Flow Freq. Pent.	Avg. Flow CFS	Max. Flow CFS	Total Volume 10 <sup>6</sup> gal
OUTFALL1	49.17	16.38	55.10	1.301
OUTFALL2	57.59	10.77	30.00	1.002
OUTFALL3	52.89	21.70	76.27	1.854
OUTFALL4	77.66	42.99	135.01	5.394
OUTFALL5	56.55	12.72	33.98	1.162
OUTFALL6	56.27	4.43	11.82	0.403
OUTFALL7	93.94	55.05	250.75	8.355
OUTFALL8	40.39	5.72	20.56	0.373



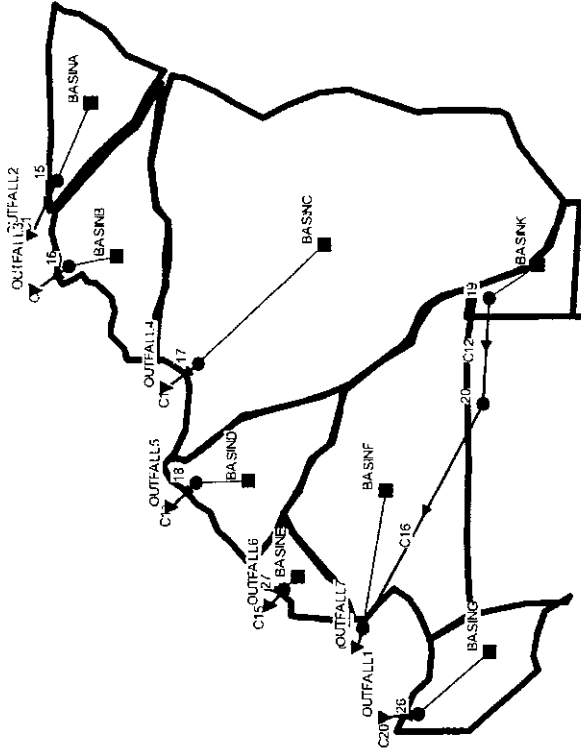
**PROPOSED CONDITIONS  
DRAINAGE CALCULATIONS  
(100 YEAR)**



# THE RANCH DEVELOPED 100 YR

11/15/2020 00:05:00

100YR



# THE RANCH DEVELOPED 100 YR

EPA STORM WATER MANAGEMENT MODEL - VERSION 5.1 (Build 5.1.013)

## THE RANCH DEVELOPED 100 YR

\*\*\*\*\*

Element Count

\*\*\*\*\*

Number of rain gages ..... 1  
 Number of subcatchments ... 8  
 Number of nodes ..... 16  
 Number of links ..... 9  
 Number of pollutants ..... 0  
 Number of land uses ..... 0

\*\*\*\*\*

Raingage Summary

\*\*\*\*\*

Name	Data Source	Data	Recording Type	Interval
------	-------------	------	----------------	----------

100YR	100YR		CUMULATIVE	5 min.
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Subcatchment Summary

\*\*\*\*\*

Name	Area	Width	%Imperv	%Slope	Rain Gage	Outlet
BASINA	46.00	1402.00	40.00	1.5800	100YR	15
BASINB	64.00	2905.00	40.00	3.4100	100YR	16
BASINC	365.00	5700.00	40.00	1.2900	100YR	17
BASIND	55.00	2174.00	40.00	0.8200	100YR	18
BASINE	19.00	651.00	40.00	1.1100	100YR	27
BASINF	148.00	3315.00	40.00	0.9000	100YR	22
BASING	44.00	2457.00	65.00	2.5900	100YR	26
BASINK	21.00	690.00	65.00	1.2400	100YR	19

THE RANCH DEVELOPED 100 YR

\*\*\*\*\*  
 Node Summary  
 \*\*\*\*\*

Name	Type	Invert Elev.	Max. Depth	Ponded Area	External Inflow
15	JUNCTION	5680.00	6.00	0.0	0.0
16	JUNCTION	5640.00	6.00	0.0	0.0
17	JUNCTION	5630.00	8.00	0.0	0.0
18	JUNCTION	5628.00	6.00	0.0	0.0
19	JUNCTION	5689.00	6.00	0.0	0.0
20	JUNCTION	5654.00	6.00	0.0	0.0
22	JUNCTION	5608.00	8.00	0.0	0.0
26	JUNCTION	5606.00	6.00	0.0	0.0
27	JUNCTION	5618.00	6.00	0.0	0.0
OUTFALL1	OUTFALL	5594.00	6.00	0.0	0.0
OUTFALL2	OUTFALL	5646.00	6.00	0.0	0.0
OUTFALL3	OUTFALL	5638.00	6.00	0.0	0.0
OUTFALL4	OUTFALL	5626.00	8.00	0.0	0.0
OUTFALL5	OUTFALL	5623.00	6.00	0.0	0.0
OUTFALL6	OUTFALL	5609.00	6.00	0.0	0.0
OUTFALL7	OUTFALL	5596.00	8.00	0.0	0.0

\*\*\*\*\*  
 Link Summary  
 \*\*\*\*\*

Name	From Node	To Node	Type	Length	%Slope	Roughness
C1	15	OUTFALL2	CONDUIT	470.0	7.2530	0.0130
C9	16	OUTFALL3	CONDUIT	450.0	0.4444	0.0100
C10	17	OUTFALL4	CONDUIT	355.0	1.1268	0.0130
C11	18	OUTFALL5	CONDUIT	100.0	5.0063	0.0100
C12	19	20	CONDUIT	1793.0	1.9524	0.0130
C15	27	OUTFALL6	CONDUIT	125.0	7.2187	0.0130
C16	20	22	CONDUIT	2996.0	1.5356	0.0130
C18	22	OUTFALL7	CONDUIT	200.0	6.0108	0.0130
C20	26	OUTFALL1	CONDUIT	431.0	2.7853	0.0130

# THE RANCH DEVELOPED 100 YR

\*\*\*\*\*  
 Cross Section Summary  
 \*\*\*\*\*

Conduit	Shape	Full Depth	Hyd. Area	Max. Rad.	No. of Width	Full Barrels	Flow
C1	CIRCULAR	6.00	28.27	1.50	6.00	1	1140.57
C9	CIRCULAR	6.00	28.27	1.50	6.00	1	367.04
C10	CIRCULAR	8.00	50.27	2.00	8.00	1	968.19
C11	CIRCULAR	6.00	28.27	1.50	6.00	1	1231.86
C12	CIRCULAR	6.00	28.27	1.50	6.00	1	591.76
C15	CIRCULAR	6.00	28.27	1.50	6.00	1	1137.87
C16	CIRCULAR	6.00	28.27	1.50	6.00	1	524.80
C18	CIRCULAR	8.00	50.27	2.00	8.00	1	2236.14
C20	CIRCULAR	6.00	28.27	1.50	6.00	1	706.80

\*\*\*\*\*  
 NOTE: The summary statistics displayed in this report are based on results found at every computational time step, not just on results from each reporting time step.  
 \*\*\*\*\*

\*\*\*\*\*  
 Analysis Options  
 \*\*\*\*\*

Flow Units ..... CFS  
 Process Models:  
 Rainfall/Runoff ..... YES  
 RDII ..... NO  
 Snowmelt ..... NO  
 Groundwater ..... NO  
 Flow Routing ..... YES  
 Ponding Allowed ..... NO  
 Water Quality ..... NO  
 Infiltration Method ..... HORTON  
 Flow Routing Method ..... KINWAVE  
 Starting Date ..... 11/15/2020 00:00:00  
 Ending Date ..... 11/15/2020 06:00:00  
 Antecedent Dry Days ..... 0.0

THE RANCH DEVELOPED 100 YR

Report Time Step ..... 00:05:00  
 Wet Time Step ..... 00:01:00  
 Dry Time Step ..... 01:00:00  
 Routing Time Step ..... 5.00 sec

\*\*\*\*\*  
 Runoff Quantity Continuity    acre-feet    Volume    Depth  
 \*\*\*\*\*    inches    \*\*\*\*\*  
 Total Precipitation ..... 179.070    2.820  
 Evaporation Loss ..... 0.000    0.000  
 Infiltration Loss ..... 74.448    1.172  
 Surface Runoff ..... 102.207    1.610  
 Final Storage ..... 2.447    0.039  
 Continuity Error (%) ..... -0.018

\*\*\*\*\*  
 Flow Routing Continuity    acre-feet    Volume    Volume  
 \*\*\*\*\*    10^6 gal    \*\*\*\*\*  
 Dry Weather Inflow ..... 0.000    0.000  
 Wet Weather Inflow ..... 102.206    33.305  
 Groundwater Inflow ..... 0.000    0.000  
 RDII Inflow ..... 0.000    0.000  
 External Inflow ..... 0.000    0.000  
 External Outflow ..... 102.060    33.258  
 Flooding Loss ..... 0.041    0.013  
 Evaporation Loss ..... 0.000    0.000  
 Exfiltration Loss ..... 0.000    0.000  
 Initial Stored Volume ..... 0.000    0.000  
 Final Stored Volume ..... 0.005    0.002  
 Continuity Error (%) ..... 0.098

\*\*\*\*\*  
 Highest Flow Instability Indexes  
 \*\*\*\*\*  
 All links are stable.

\*\*\*\*\*

# THE RANCH DEVELOPED 100 YR

Routing Time Step Summary  
 \*\*\*\*\*  
 Minimum Time Step : 5.00 sec  
 Average Time Step : 5.00 sec  
 Maximum Time Step : 5.00 sec  
 Percent in Steady State : 0.00  
 Average Iterations per Step : 1.19  
 Percent Not Converging : 0.00

\*\*\*\*\*  
 Subcatchment Runoff Summary  
 \*\*\*\*\*

Subcatchment	Total Precip		Total Runon		Total Evap		Total Infil		Total Imperv		Perv		Total Runoff		Total Peak Runoff	
	in	in	in	in	in	in	in	in	in	in	in	in	in	in	in	CFS
BASINA	2.82	0.00	0.00	0.00	1.13	1.09	0.56	1.65	2.07	162.65	0.587					
BASINB	2.82	0.00	0.00	0.00	0.98	1.09	0.71	1.80	3.13	272.68	0.639					
BASINC	2.82	0.00	0.00	0.00	1.29	1.09	0.40	1.49	14.76	1016.95	0.528					
BASIND	2.82	0.00	0.00	0.00	1.14	1.09	0.55	1.64	2.45	191.03	0.582					
BASINE	2.82	0.00	0.00	0.00	1.14	1.09	0.55	1.64	0.85	66.14	0.582					
BASINF	2.82	0.00	0.00	0.00	1.26	1.09	0.44	1.53	6.14	439.76	0.542					
BASING	2.82	0.00	0.00	0.00	0.52	1.78	0.46	2.24	2.68	271.43	0.795					
BASINK	2.82	0.00	0.00	0.00	0.60	1.77	0.38	2.16	1.23	102.89	0.765					

\*\*\*\*\*  
 Node Depth Summary  
 \*\*\*\*\*

Average Maximum		Maximum Time of Max		Reported		
Depth	Depth	HGL	Occurrence	Max	Depth	
Type	Feet	Feet	days hr:min	Feet	Feet	
15	JUNCTION	0.27	1.53	5681.53	0 00:45	1.53
16	JUNCTION	0.55	3.85	5643.85	0 00:45	3.84
17	JUNCTION	1.15	8.00	5638.00	0 00:44	8.00

THE RANCH DEVELOPED 100 YR

18	JUNCTION	0.29	1.60	5629.60	0 00:45	1.59	
19	JUNCTION	0.29	1.69	5690.69	0 00:45	1.69	
20	JUNCTION	0.31	1.76	5655.76	0 00:46	1.66	
22	JUNCTION	0.52	2.56	5610.56	0 00:45	2.55	
26	JUNCTION	0.36	2.58	5608.58	0 00:45	2.57	
27	JUNCTION	0.18	0.98	5618.98	0 00:45	0.98	
	OUTFALL1		0.36	2.57	5596.57	0 00:45	2.55
	OUTFALL2		0.27	1.52	5647.52	0 00:45	1.51
	OUTFALL3		0.55	3.83	5641.83	0 00:45	3.77
	OUTFALL4		1.14	7.19	5633.19	0 00:45	6.65
	OUTFALL5		0.29	1.59	5624.59	0 00:45	1.59
	OUTFALL6		0.18	0.98	5609.98	0 00:45	0.97
	OUTFALL7		0.51	2.56	5598.56	0 00:45	2.54

\*\*\*\*\*  
Node Inflow Summary  
\*\*\*\*\*

Node	Type	CFS	Maximum Inflow	Maximum Time of Occurrence	CFS days hr:min	Lateral		Total		Flow Balance
						Inflow	Volume	Inflow	Volume	
						10^6 gal	10^6 gal	Percent		
15	JUNCTION	162.65	162.65	0 00:45	2.07	2.07	2.07	2.07	-0.000	
16	JUNCTION	272.68	272.68	0 00:45	3.13	3.13	3.13	3.13	-0.000	
17	JUNCTION	1016.95	1016.95	0 00:45	14.8	14.8	14.8	14.8	0.000	
18	JUNCTION	191.03	191.03	0 00:45	2.45	2.45	2.45	2.45	0.000	
19	JUNCTION	102.89	102.89	0 00:45	1.23	1.23	1.23	1.23	0.000	
20	JUNCTION	0.00	97.80	0 00:46	0	1.22	0.000			
22	JUNCTION	439.76	495.36	0 00:45	6.14	7.36	0.000			
26	JUNCTION	271.43	271.43	0 00:45	2.68	2.68	0.000			
27	JUNCTION	66.14	66.14	0 00:45	0.847	0.847	-0.000			
OUTFALL1	OUTFALL	0.00	269.78	0 00:45	0	2.67	0.000			
OUTFALL2	OUTFALL	0.00	161.30	0 00:45	0	2.06	0.000			
OUTFALL3	OUTFALL	0.00	270.76	0 00:45	0	3.13	0.000			
OUTFALL4	OUTFALL	0.00	1034.46	0 00:45	0	14.7	0.000			
OUTFALL5	OUTFALL	0.00	190.52	0 00:45	0	2.45	0.000			
OUTFALL6	OUTFALL	0.00	65.94	0 00:45	0	0.847	0.000			
OUTFALL7	OUTFALL	0.00	494.35	0 00:45	0	7.36	0.000			



# THE RANCH DEVELOPED 100 YR

\*\*\*\*\*  
 Node Flooding Summary  
 \*\*\*\*\*

Flooding refers to all water that overflows a node, whether it ponds or not.

Node	Total Maximum		
	Maximum Hours Flooded	Time of Rate CFS	Maximum Flood Volume 10^6 gal
17	0.02	45.70	0.013
		0 00:45	0.013 0.000

\*\*\*\*\*  
 Outfall Loading Summary  
 \*\*\*\*\*

Outfall Node	Flow Freq		Avg Flow		Max Flow		Total Volume	
	Per	Cent	CFS	CFS	CFS	CFS	10^6 gal	10^6 gal
OUTFALL1	97.99	16.89	269.78	2.674				
OUTFALL2	97.94	13.04	161.30	2.064				
OUTFALL3	97.85	19.79	270.76	3.128				
OUTFALL4	98.03	93.05	1034.46	14.738				
OUTFALL5	98.38	15.41	190.52	2.449				
OUTFALL6	98.17	5.34	65.94	0.847				
OUTFALL7	98.24	46.34	494.35	7.356				
System	98.09	209.86	494.35	33.255				

\*\*\*\*\*  
 Link Flow Summary  
 \*\*\*\*\*

# THE RANCH DEVELOPED 100 YR

Link	Type	CFS	days	hr:min	ft/sec	Flow	Depth	Max/ Full	Max/ Full	Max/ Full
C1	CONDUIT	161.30	0	00:45	28.68	0.14	0.25			
C9	CONDUIT	270.76	0	00:45	14.50	0.74	0.64			
C10	CONDUIT	1034.46	0	00:45	22.52	1.07	0.92			
C11	CONDUIT	190.52	0	00:45	31.66	0.15	0.27			
C12	CONDUIT	97.80	0	00:46	15.84	0.17	0.27			
C15	CONDUIT	65.94	0	00:45	22.02	0.06	0.16			
C16	CONDUIT	89.95	0	00:48	14.32	0.17	0.28			
C18	CONDUIT	494.35	0	00:45	35.77	0.22	0.32			
C20	CONDUIT	269.78	0	00:45	23.51	0.38	0.43			

\*\*\*\*\*  
 Conduit Surge Summary  
 \*\*\*\*\*

Conduit	Hours		
	Hours Full	Above Full	Capacity
C10	0.02	0.02	0.02

Analysis begun on: Mon Nov 16 16:12:53 2020  
 Analysis ended on: Mon Nov 16 16:12:54 2020  
 Total elapsed time: 00:00:01

# THE RANCH DEVELOPED 100 YR

## Subcatchment Runoff Summary

Subcatchment	Total Precip in	Total Runon in	Total Evap in	Total Infil in	Imperv Runoff in	Perv Runoff in	Total Runoff in	Total Runoff 10 <sup>6</sup> gal	Peak Runoff CFS
BASINA	2.82	0.00	0.00	1.13	1.09	0.56	1.65	2.07	162.65
BASINB	2.82	0.00	0.00	0.98	1.09	0.71	1.80	3.13	272.68
BASINC	2.82	0.00	0.00	1.29	1.09	0.40	1.49	14.76	1016.95
BASIND	2.82	0.00	0.00	1.14	1.09	0.55	1.64	2.45	191.03
BASINE	2.82	0.00	0.00	1.14	1.09	0.55	1.64	0.85	66.14
BASINF	2.82	0.00	0.00	1.26	1.09	0.44	1.53	6.14	439.76
BASING	2.82	0.00	0.00	0.52	1.78	0.46	2.24	2.68	271.43
BASINK	2.82	0.00	0.00	0.60	1.77	0.38	2.16	1.23	102.89

# THE RANCH DEVELOPED 100 YR

## Subcatchment Runoff Summary

Subcatchment	Runoff Coeff
BASINA	0.587
BASINB	0.639
BASINC	0.528
BASIND	0.582
BASINE	0.582
BASINF	0.542
BASING	0.795
BASINK	0.765

# THE RANCH DEVELOPED 100 YR

## Node Inflow Summary

Node	Type	Maximum Lateral Inflow CFS	Maximum Total Inflow CFS	Day of Maximum Inflow	Hour of Maximum Inflow	Lateral Inflow Volume 10 <sup>6</sup> gal	Total Inflow Volume 10 <sup>6</sup> gal	Flow Balance Error Percent
15	JUNCTION	162.65	162.65	0	00:45	2.07	2.07	-0.000
16	JUNCTION	272.68	272.68	0	00:45	3.13	3.13	-0.000
17	JUNCTION	1016.95	1016.95	0	00:45	14.8	14.8	0.000
18	JUNCTION	191.03	191.03	0	00:45	2.45	2.45	0.000
19	JUNCTION	102.89	102.89	0	00:45	1.23	1.23	0.000
20	JUNCTION	0.00	97.80	0	00:46	0	1.22	0.000
22	JUNCTION	439.76	495.36	0	00:45	6.14	7.36	0.000
26	JUNCTION	271.43	271.43	0	00:45	2.68	2.68	0.000
27	JUNCTION	66.14	66.14	0	00:45	0.847	0.847	-0.000
OUTFALL1	OUTFALL	0.00	269.78	0	00:45	0	2.67	0.000
OUTFALL2	OUTFALL	0.00	161.30	0	00:45	0	2.06	0.000
OUTFALL3	OUTFALL	0.00	270.76	0	00:45	0	3.13	0.000
OUTFALL4	OUTFALL	0.00	1034.46	0	00:45	0	14.7	0.000
OUTFALL5	OUTFALL	0.00	190.52	0	00:45	0	2.45	0.000
OUTFALL6	OUTFALL	0.00	65.94	0	00:45	0	0.847	0.000
OUTFALL7	OUTFALL	0.00	494.35	0	00:45	0	7.36	0.000

# THE RANCH DEVELOPED 100 YR

## Link Flow Summary

Link	Type	Maximum  Flow  CFS	Day of Maximum Flow	Hour of Maximum Flow	Maximum  Velocity  ft/sec	Max / Full Flow	Max / Full Depth
C1	CONDUIT	161.30	0	00:45	28.68	0.14	0.25
C9	CONDUIT	270.76	0	00:45	14.50	0.74	0.64
C10	CONDUIT	1034.46	0	00:45	22.52	1.07	0.92
C11	CONDUIT	190.52	0	00:45	31.66	0.15	0.27
C12	CONDUIT	97.80	0	00:46	15.84	0.17	0.27
C15	CONDUIT	65.94	0	00:45	22.02	0.06	0.16
C16	CONDUIT	89.95	0	00:48	14.32	0.17	0.28
C18	CONDUIT	494.35	0	00:45	35.77	0.22	0.32
C20	CONDUIT	269.78	0	00:45	23.51	0.38	0.43

# THE RANCH DEVELOPED 100 YR

## Outfall Loading Summary

Outfall Node	Flow Freq. Pent.	Avg. Flow CFS	Max. Flow CFS	Total Volume 10 <sup>6</sup> gal
OUTFALL1	97.99	16.89	269.78	2.674
OUTFALL2	97.94	13.04	161.30	2.064
OUTFALL3	97.85	19.79	270.76	3.128
OUTFALL4	98.03	93.05	1034.46	14.738
OUTFALL5	98.38	15.41	190.52	2.449
OUTFALL6	98.17	5.34	65.94	0.847
OUTFALL7	98.24	46.34	494.35	7.356

**PRELIMINARY FULL  
SPECTRUM DENTENTION  
CALCULATIONS**



# THE RANCH

11/16/2020

CMT

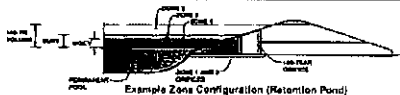
## THE RANCH UD-DETENTION STORAGE ESTIMATES - DEVELOPED CONDITON 100 YEAR

<b>BASIN</b>	<b>ACREAGE</b>	<b>REQUIRED STORAGE (AC-FT):</b>
BASIN A	46	3.683
BASIN B	64	4.742
BASIN C	365	27.380
BASIN D	55	4.042
BASIN E	19	1.395
BASIN F	147	11.080
BASIN G	44	4.870
BASIN K	21	2.253

# DETENTION BASIN STAGE-STORAGE TABLE BUILDER

UD-Detention, Version 3.07 (February 2017)

Project: **THE RANCH**  
 Basin ID: **BASIMA**



### Required Volume Calculation

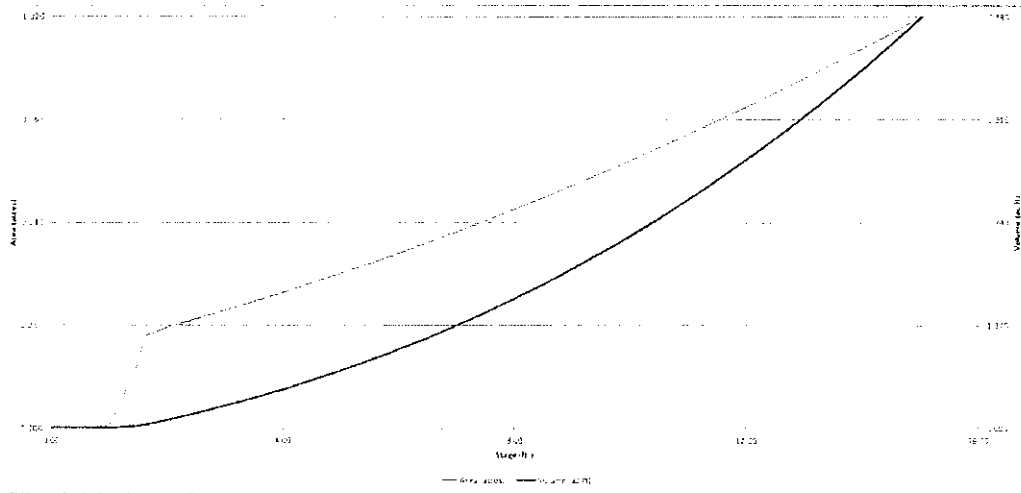
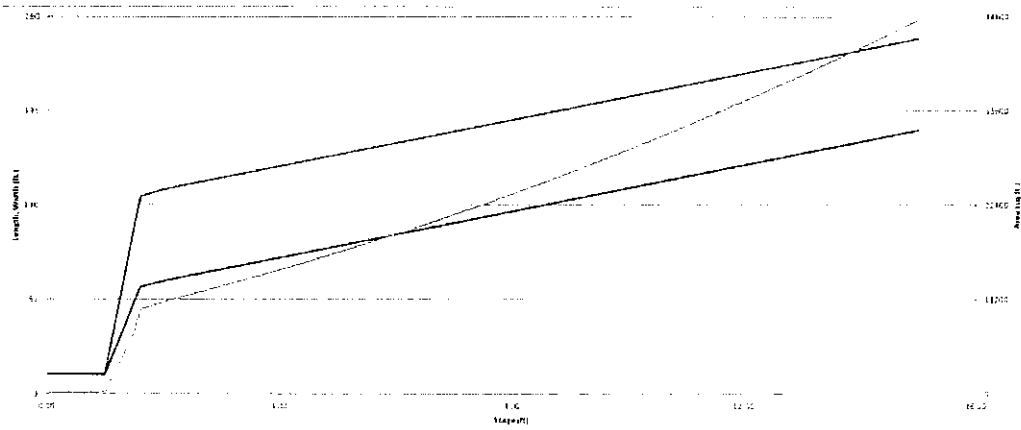
Selected Basin Type	<b>EDB</b>
Watershed Area	46.00 acres
Watershed Length	1.492 mi
Watershed Slope	0.016 %
Watershed Imperviousness	40.00% percent
Percentage Hydrologic Soil Group A	0.0% percent
Percentage Hydrologic Soil Group B	100.0% percent
Percentage Hydrologic Soil Group C/D	0.0% percent
Desired WQCV Drain Time	40.0 hours
Location for 1 hr Rainfall Depth	Peak Inflow
Water Quality Capture Volume (WQCV)	3.589 acre-feet
Flowing Above-Basin Volume (FABV)	1.312 acre-feet
2 ft Rainfall Volume (R <sup>2</sup> + 19 in.)	1.521 acre-feet
3 ft Rainfall Volume (R <sup>3</sup> + 19 in.)	2.116 acre-feet
4 ft Rainfall Volume (R <sup>4</sup> + 19 in.)	3.211 acre-feet
5 ft Rainfall Volume (R <sup>5</sup> + 19 in.)	4.526 acre-feet
6 ft Rainfall Volume (R <sup>6</sup> + 19 in.)	6.206 acre-feet
7 ft Rainfall Volume (R <sup>7</sup> + 19 in.)	8.369 acre-feet
8 ft Rainfall Volume (R <sup>8</sup> + 19 in.)	11.246 acre-feet
9 ft Rainfall Volume (R <sup>9</sup> + 19 in.)	15.081 acre-feet
10 ft Rainfall Volume (R <sup>10</sup> + 19 in.)	19.934 acre-feet
11 ft Rainfall Volume (R <sup>11</sup> + 19 in.)	25.875 acre-feet
12 ft Rainfall Volume (R <sup>12</sup> + 19 in.)	32.974 acre-feet
13 ft Rainfall Volume (R <sup>13</sup> + 19 in.)	41.292 acre-feet
14 ft Rainfall Volume (R <sup>14</sup> + 19 in.)	50.891 acre-feet
15 ft Rainfall Volume (R <sup>15</sup> + 19 in.)	61.834 acre-feet
16 ft Rainfall Volume (R <sup>16</sup> + 19 in.)	74.285 acre-feet
17 ft Rainfall Volume (R <sup>17</sup> + 19 in.)	88.418 acre-feet
18 ft Rainfall Volume (R <sup>18</sup> + 19 in.)	104.308 acre-feet
19 ft Rainfall Volume (R <sup>19</sup> + 19 in.)	122.130 acre-feet
20 ft Rainfall Volume (R <sup>20</sup> + 19 in.)	142.058 acre-feet
21 ft Rainfall Volume (R <sup>21</sup> + 19 in.)	164.267 acre-feet
22 ft Rainfall Volume (R <sup>22</sup> + 19 in.)	188.933 acre-feet
23 ft Rainfall Volume (R <sup>23</sup> + 19 in.)	216.232 acre-feet
24 ft Rainfall Volume (R <sup>24</sup> + 19 in.)	246.341 acre-feet
25 ft Rainfall Volume (R <sup>25</sup> + 19 in.)	279.438 acre-feet
26 ft Rainfall Volume (R <sup>26</sup> + 19 in.)	315.700 acre-feet
27 ft Rainfall Volume (R <sup>27</sup> + 19 in.)	355.306 acre-feet
28 ft Rainfall Volume (R <sup>28</sup> + 19 in.)	398.535 acre-feet
29 ft Rainfall Volume (R <sup>29</sup> + 19 in.)	445.666 acre-feet
30 ft Rainfall Volume (R <sup>30</sup> + 19 in.)	496.880 acre-feet
31 ft Rainfall Volume (R <sup>31</sup> + 19 in.)	552.357 acre-feet
32 ft Rainfall Volume (R <sup>32</sup> + 19 in.)	612.378 acre-feet
33 ft Rainfall Volume (R <sup>33</sup> + 19 in.)	677.224 acre-feet
34 ft Rainfall Volume (R <sup>34</sup> + 19 in.)	747.187 acre-feet
35 ft Rainfall Volume (R <sup>35</sup> + 19 in.)	822.550 acre-feet
36 ft Rainfall Volume (R <sup>36</sup> + 19 in.)	903.606 acre-feet
37 ft Rainfall Volume (R <sup>37</sup> + 19 in.)	990.649 acre-feet
38 ft Rainfall Volume (R <sup>38</sup> + 19 in.)	1084.063 acre-feet
39 ft Rainfall Volume (R <sup>39</sup> + 19 in.)	1184.134 acre-feet
40 ft Rainfall Volume (R <sup>40</sup> + 19 in.)	1291.250 acre-feet
41 ft Rainfall Volume (R <sup>41</sup> + 19 in.)	1405.800 acre-feet
42 ft Rainfall Volume (R <sup>42</sup> + 19 in.)	1528.172 acre-feet
43 ft Rainfall Volume (R <sup>43</sup> + 19 in.)	1658.764 acre-feet
44 ft Rainfall Volume (R <sup>44</sup> + 19 in.)	1797.974 acre-feet
45 ft Rainfall Volume (R <sup>45</sup> + 19 in.)	1946.201 acre-feet
46 ft Rainfall Volume (R <sup>46</sup> + 19 in.)	2103.944 acre-feet
47 ft Rainfall Volume (R <sup>47</sup> + 19 in.)	2271.603 acre-feet
48 ft Rainfall Volume (R <sup>48</sup> + 19 in.)	2449.578 acre-feet
49 ft Rainfall Volume (R <sup>49</sup> + 19 in.)	2637.269 acre-feet
50 ft Rainfall Volume (R <sup>50</sup> + 19 in.)	2835.077 acre-feet
51 ft Rainfall Volume (R <sup>51</sup> + 19 in.)	3043.403 acre-feet
52 ft Rainfall Volume (R <sup>52</sup> + 19 in.)	3262.748 acre-feet
53 ft Rainfall Volume (R <sup>53</sup> + 19 in.)	3493.614 acre-feet
54 ft Rainfall Volume (R <sup>54</sup> + 19 in.)	3735.502 acre-feet
55 ft Rainfall Volume (R <sup>55</sup> + 19 in.)	3988.914 acre-feet
56 ft Rainfall Volume (R <sup>56</sup> + 19 in.)	4253.351 acre-feet
57 ft Rainfall Volume (R <sup>57</sup> + 19 in.)	4529.315 acre-feet
58 ft Rainfall Volume (R <sup>58</sup> + 19 in.)	4816.307 acre-feet
59 ft Rainfall Volume (R <sup>59</sup> + 19 in.)	5114.828 acre-feet
60 ft Rainfall Volume (R <sup>60</sup> + 19 in.)	5424.379 acre-feet
61 ft Rainfall Volume (R <sup>61</sup> + 19 in.)	5745.461 acre-feet
62 ft Rainfall Volume (R <sup>62</sup> + 19 in.)	6078.575 acre-feet
63 ft Rainfall Volume (R <sup>63</sup> + 19 in.)	6424.221 acre-feet
64 ft Rainfall Volume (R <sup>64</sup> + 19 in.)	6782.900 acre-feet
65 ft Rainfall Volume (R <sup>65</sup> + 19 in.)	7154.112 acre-feet
66 ft Rainfall Volume (R <sup>66</sup> + 19 in.)	7538.367 acre-feet
67 ft Rainfall Volume (R <sup>67</sup> + 19 in.)	7936.175 acre-feet
68 ft Rainfall Volume (R <sup>68</sup> + 19 in.)	8348.036 acre-feet
69 ft Rainfall Volume (R <sup>69</sup> + 19 in.)	8774.450 acre-feet
70 ft Rainfall Volume (R <sup>70</sup> + 19 in.)	9215.917 acre-feet
71 ft Rainfall Volume (R <sup>71</sup> + 19 in.)	9672.938 acre-feet
72 ft Rainfall Volume (R <sup>72</sup> + 19 in.)	10246.014 acre-feet
73 ft Rainfall Volume (R <sup>73</sup> + 19 in.)	10835.647 acre-feet
74 ft Rainfall Volume (R <sup>74</sup> + 19 in.)	11442.339 acre-feet
75 ft Rainfall Volume (R <sup>75</sup> + 19 in.)	12066.691 acre-feet
76 ft Rainfall Volume (R <sup>76</sup> + 19 in.)	12709.214 acre-feet
77 ft Rainfall Volume (R <sup>77</sup> + 19 in.)	13370.419 acre-feet
78 ft Rainfall Volume (R <sup>78</sup> + 19 in.)	14050.807 acre-feet
79 ft Rainfall Volume (R <sup>79</sup> + 19 in.)	14750.979 acre-feet
80 ft Rainfall Volume (R <sup>80</sup> + 19 in.)	15471.436 acre-feet
81 ft Rainfall Volume (R <sup>81</sup> + 19 in.)	16212.780 acre-feet
82 ft Rainfall Volume (R <sup>82</sup> + 19 in.)	16975.513 acre-feet
83 ft Rainfall Volume (R <sup>83</sup> + 19 in.)	17759.137 acre-feet
84 ft Rainfall Volume (R <sup>84</sup> + 19 in.)	18564.154 acre-feet
85 ft Rainfall Volume (R <sup>85</sup> + 19 in.)	19391.066 acre-feet
86 ft Rainfall Volume (R <sup>86</sup> + 19 in.)	20240.375 acre-feet
87 ft Rainfall Volume (R <sup>87</sup> + 19 in.)	21112.583 acre-feet
88 ft Rainfall Volume (R <sup>88</sup> + 19 in.)	22008.191 acre-feet
89 ft Rainfall Volume (R <sup>89</sup> + 19 in.)	22927.711 acre-feet
90 ft Rainfall Volume (R <sup>90</sup> + 19 in.)	23871.654 acre-feet
91 ft Rainfall Volume (R <sup>91</sup> + 19 in.)	24840.531 acre-feet
92 ft Rainfall Volume (R <sup>92</sup> + 19 in.)	25834.854 acre-feet
93 ft Rainfall Volume (R <sup>93</sup> + 19 in.)	26855.134 acre-feet
94 ft Rainfall Volume (R <sup>94</sup> + 19 in.)	27891.873 acre-feet
95 ft Rainfall Volume (R <sup>95</sup> + 19 in.)	28945.574 acre-feet
96 ft Rainfall Volume (R <sup>96</sup> + 19 in.)	30016.739 acre-feet
97 ft Rainfall Volume (R <sup>97</sup> + 19 in.)	31105.870 acre-feet
98 ft Rainfall Volume (R <sup>98</sup> + 19 in.)	32213.471 acre-feet
99 ft Rainfall Volume (R <sup>99</sup> + 19 in.)	33339.946 acre-feet
100 ft Rainfall Volume (R <sup>100</sup> + 19 in.)	34485.798 acre-feet
101 ft Rainfall Volume (R <sup>101</sup> + 19 in.)	35651.530 acre-feet
102 ft Rainfall Volume (R <sup>102</sup> + 19 in.)	36837.645 acre-feet
103 ft Rainfall Volume (R <sup>103</sup> + 19 in.)	38044.546 acre-feet
104 ft Rainfall Volume (R <sup>104</sup> + 19 in.)	39272.736 acre-feet
105 ft Rainfall Volume (R <sup>105</sup> + 19 in.)	40522.718 acre-feet
106 ft Rainfall Volume (R <sup>106</sup> + 19 in.)	41794.904 acre-feet
107 ft Rainfall Volume (R <sup>107</sup> + 19 in.)	43089.708 acre-feet
108 ft Rainfall Volume (R <sup>108</sup> + 19 in.)	44407.542 acre-feet
109 ft Rainfall Volume (R <sup>109</sup> + 19 in.)	45748.819 acre-feet
110 ft Rainfall Volume (R <sup>110</sup> + 19 in.)	47114.043 acre-feet
111 ft Rainfall Volume (R <sup>111</sup> + 19 in.)	48503.728 acre-feet
112 ft Rainfall Volume (R <sup>112</sup> + 19 in.)	49918.478 acre-feet
113 ft Rainfall Volume (R <sup>113</sup> + 19 in.)	51358.807 acre-feet
114 ft Rainfall Volume (R <sup>114</sup> + 19 in.)	52825.230 acre-feet
115 ft Rainfall Volume (R <sup>115</sup> + 19 in.)	54318.261 acre-feet
116 ft Rainfall Volume (R <sup>116</sup> + 19 in.)	55838.514 acre-feet
117 ft Rainfall Volume (R <sup>117</sup> + 19 in.)	57385.603 acre-feet
118 ft Rainfall Volume (R <sup>118</sup> + 19 in.)	58959.142 acre-feet
119 ft Rainfall Volume (R <sup>119</sup> + 19 in.)	60559.756 acre-feet
120 ft Rainfall Volume (R <sup>120</sup> + 19 in.)	62187.060 acre-feet
121 ft Rainfall Volume (R <sup>121</sup> + 19 in.)	63840.670 acre-feet
122 ft Rainfall Volume (R <sup>122</sup> + 19 in.)	65521.192 acre-feet
123 ft Rainfall Volume (R <sup>123</sup> + 19 in.)	67229.233 acre-feet
124 ft Rainfall Volume (R <sup>124</sup> + 19 in.)	68964.400 acre-feet
125 ft Rainfall Volume (R <sup>125</sup> + 19 in.)	70727.309 acre-feet
126 ft Rainfall Volume (R <sup>126</sup> + 19 in.)	72518.567 acre-feet
127 ft Rainfall Volume (R <sup>127</sup> + 19 in.)	74338.681 acre-feet
128 ft Rainfall Volume (R <sup>128</sup> + 19 in.)	76188.158 acre-feet
129 ft Rainfall Volume (R <sup>129</sup> + 19 in.)	78067.505 acre-feet
130 ft Rainfall Volume (R <sup>130</sup> + 19 in.)	79977.230 acre-feet
131 ft Rainfall Volume (R <sup>131</sup> + 19 in.)	81917.951 acre-feet
132 ft Rainfall Volume (R <sup>132</sup> + 19 in.)	83890.276 acre-feet
133 ft Rainfall Volume (R <sup>133</sup> + 19 in.)	85893.813 acre-feet
134 ft Rainfall Volume (R <sup>134</sup> + 19 in.)	87929.170 acre-feet
135 ft Rainfall Volume (R <sup>135</sup> + 19 in.)	89996.956 acre-feet
136 ft Rainfall Volume (R <sup>136</sup> + 19 in.)	92097.780 acre-feet
137 ft Rainfall Volume (R <sup>137</sup> + 19 in.)	94232.250 acre-feet
138 ft Rainfall Volume (R <sup>138</sup> + 19 in.)	96401.074 acre-feet
139 ft Rainfall Volume (R <sup>139</sup> + 19 in.)	98604.961 acre-feet
140 ft Rainfall Volume (R <sup>140</sup> + 19 in.)	100844.619 acre-feet
141 ft Rainfall Volume (R <sup>141</sup> + 19 in.)	103120.756 acre-feet
142 ft Rainfall Volume (R <sup>142</sup> + 19 in.)	105434.080 acre-feet
143 ft Rainfall Volume (R <sup>143</sup> + 19 in.)	107785.300 acre-feet
144 ft Rainfall Volume (R <sup>144</sup> + 19 in.)	110174.126 acre-feet
145 ft Rainfall Volume (R <sup>145</sup> + 19 in.)	112601.268 acre-feet
146 ft Rainfall Volume (R <sup>146</sup> + 19 in.)	115067.436 acre-feet
147 ft Rainfall Volume (R <sup>147</sup> + 19 in.)	117572.340 acre-feet
148 ft Rainfall Volume (R <sup>148</sup> + 19 in.)	120116.790 acre-feet
149 ft Rainfall Volume (R <sup>149</sup> + 19 in.)	122700.506 acre-feet
150 ft Rainfall Volume (R <sup>150</sup> + 19 in.)	125324.299 acre-feet
151 ft Rainfall Volume (R <sup>151</sup> + 19 in.)	127988.879 acre-feet
152 ft Rainfall Volume (R <sup>152</sup> + 19 in.)	130694.957 acre-feet
153 ft Rainfall Volume (R <sup>153</sup> + 19 in.)	133443.244 acre-feet
154 ft Rainfall Volume (R <sup>154</sup> + 19 in.)	136235.451 acre-feet
155 ft Rainfall Volume (R <sup>155</sup> + 19 in.)	139073.289 acre-feet
156 ft Rainfall Volume (R <sup>156</sup> + 19 in.)	141958.468 acre-feet
157 ft Rainfall Volume (R <sup>157</sup> + 19 in.)	144892.706 acre-feet
158 ft Rainfall Volume (R <sup>158</sup> + 19 in.)	147876.824 acre-feet
159 ft Rainfall Volume (R <sup>159</sup> + 19 in.)	150912.542 acre-feet
160 ft Rainfall Volume (R <sup>160</sup> + 19 in.)	154001.570 acre-feet
161 ft Rainfall Volume (R <sup>161</sup> + 19 in.)	157145.528 acre-feet
162 ft Rainfall Volume (R <sup>162</sup> + 19 in.)	160346.126 acre-feet
163 ft Rainfall Volume (R <sup>163</sup> + 19 in.)	163604.974 acre-feet
164 ft Rainfall Volume (R <sup>164</sup> + 19 in.)	166923.682 acre-feet
165 ft Rainfall Volume (R <sup>165</sup> + 19 in.)	170303.859 acre-feet
166 ft Rainfall Volume (R <sup>166</sup> + 19 in.)	173747.115 acre-feet
167 ft Rainfall Volume (R <sup>167</sup> + 19 in.)	177255.161 acre-feet
168 ft Rainfall Volume (R <sup>168</sup> + 19 in.)	180829.607 acre-feet
169 ft Rainfall Volume (R <sup>169</sup> + 19 in.)	184472.063 acre-feet
170 ft Rainfall Volume (R <sup>170</sup> + 19 in.)	188184.239 acre-feet
171 ft Rainfall Volume (R <sup>171</sup> + 19 in.)	191967.745 acre-feet
172 ft Rainfall Volume (R <sup>172</sup> + 19 in.)	195824.291 acre-feet
173 ft Rainfall Volume (R <sup>173</sup> + 19 in.)	199755.587 acre-feet
174 ft Rainfall Volume (R <sup>174</sup> + 19 in.)	203763.243 acre-feet
175 ft Rainfall Volume (R <sup>175</sup> + 19 in.)	207848.070 acre-feet
176 ft Rainfall Volume (R <sup>176</sup> + 19 in.)	211911.788 acre-feet
177 ft Rainfall Volume (R <sup>177</sup> + 19 in.)	216055.207 acre-feet
178 ft Rainfall Volume (R <sup>178</sup> + 19 in.)	220279.137 acre-feet
179 ft Rainfall Volume (R <sup>179</sup> + 19 in.)	224584.287 acre-feet
180 ft Rainfall Volume (R <sup>180</sup> + 19 in.)	228971.467 acre-feet
181 ft Rainfall Volume (R <sup>181</sup> + 19 in.)	233441.487 acre-feet
182 ft Rainfall Volume (R <sup>182</sup> + 19 in.)	237995.157 acre-feet
183 ft Rainfall Volume (R <sup>183</sup> + 19 in.)	242633.287 acre-feet
184 ft Rainfall Volume (R <sup>184</sup> + 19 in.)	247356.687 acre-feet
185 ft Rainfall Volume (R <sup>185</sup> + 19 in.)	252166.167 acre-feet
186 ft Rainfall Volume (R <sup>186</sup> + 19 in.)	257062.637 acre-feet
187 ft Rainfall Volume (R <sup>187</sup> + 19 in.)	262047.007 acre-feet
188 ft Rainfall Volume (R <sup>188</sup> + 19 in.)	267120.287 acre-feet
189 ft Rainfall Volume (R <sup>189</sup> + 19 in.)	272283.487 acre-feet
190 ft Rainfall Volume (R <sup>190</sup> + 19 in.)	277537.517 acre-feet
191 ft Rainfall Volume (R <sup>191</sup> + 19 in.)	282883.287 acre-feet
192 ft Rainfall Volume (R <sup>192</sup> + 19 in.)	288321.707 acre-feet
193 ft Rainfall Volume (R <sup>193</sup> + 19 in.)	293853.687 acre-feet
194 ft Rainfall Volume (R <sup>194</sup> + 19 in.)	299480.127 acre-feet
195 ft Rainfall Volume (R <sup>195</sup> + 19 in.)	305202.937 acre-feet
196 ft Rainfall Volume (R <sup>196</sup> + 19 in.)	310923.027 acre-feet
197 ft Rainfall Volume (R <sup>197</sup> + 19 in.)	316741.307 acre-feet
198 ft Rainfall Volume (R <sup>198</sup> + 19 in.)	322658.687 acre-feet
199 ft Rainfall Volume (R <sup>199</sup> + 19 in.)	328676.067 acre-feet
200 ft Rainfall Volume (R <sup>200</sup> + 19 in.)	334794.347 acre-feet

### Stage-Storage Calculation

Zone 1 Volume (WQCV)	3.589	acre-feet
Zone 2 Volume (EURV)	1.312	acre-feet
Zone 3 Volume (100 year)	1.748	acre-feet
Total Detention Basin Volume	6.649	acre-feet
Final Detention Depth (H <sub>2</sub> )	9.0	feet
Initial Detention Depth (H <sub>1</sub> )	0.50	feet
Total Available Detention Depth (H <sub>2</sub> -H <sub>1</sub> )	8.50	feet
Depth of Freely Channel (H <sub>2</sub> -H <sub>1</sub> )	0.60	feet
Slope of Freely Channel (S <sub>2</sub> -S <sub>1</sub> )	0.005	feet
Slopes of Main Basin Sides (S <sub>2</sub> -S <sub>1</sub> )	4	feet
Basin Length to Area Ratio (L <sub>2</sub> -L <sub>1</sub> )	2	feet
Initial Detention Area (A <sub>1</sub> )	150	sq-ft
Detention Volume (V <sub>1</sub> )	1.14	cu-ft
Detention Volume (V <sub>2</sub> )	1.22	cu-ft
Depth of Basin Floor (H <sub>2</sub> -H <sub>1</sub> )	0.41	feet
Length of Basin Floor (L <sub>2</sub> -L <sub>1</sub> )	17.6	feet
Width of Basin Floor (W <sub>2</sub> -W <sub>1</sub> )	18.3	feet
Area of Basin Floor (A <sub>2</sub> -A <sub>1</sub> )	12.278	sq-ft
Volume of Basin Floor (V <sub>2</sub> -V <sub>1</sub> )	2.359	cu-ft

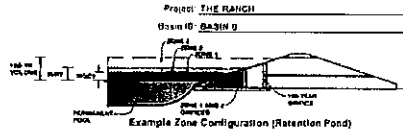
# DETENTION BASIN STAGE-STORAGE TABLE BUILDER

UD-Detention, Version 3.07 (February 2017)



# DETENTION BASIN STAGE-STORAGE TABLE BUILDER

UD-Detention, Version 3.07 (February 2017)



### Required Volume Calculation

Retention Basin Type	<b>EOB</b>	
Watershed Area	84.00	acres
Watershed Slope	2.90%	ft/ft
Watershed Area	0.034	sq mi
Watershed Imperviousness	40.00%	percent
Percentage Hydrologic Soil Group A	80.0%	percent
Percentage Hydrologic Soil Group B	10.0%	percent
Percentage Hydrologic Soil Group C/D	0.0%	percent
Detention V/C/V (From Time of Concentration)	40.0	inches
Water Quality Capture Volume (WQCV)	0.399	acre feet
First 75% of Runoff Volume (75% of V)	2.769	acre feet
75% of Runoff Volume (75% of V)	1.03	acre feet
75% of Runoff Volume (75% of V)	2.331	acre feet
75% of Runoff Volume (75% of V)	1.78	acre feet
75% of Runoff Volume (75% of V)	4.139	acre feet
75% of Runoff Volume (75% of V)	3.388	acre feet
75% of Runoff Volume (75% of V)	0.983	acre feet
75% of Runoff Volume (75% of V)	19.074	acre feet
Approximate 75% Detention Volume	1.87	acre feet
Approximate 75% Detention Volume	3.35	acre feet
Approximate 75% Detention Volume	2.375	acre feet
Approximate 75% Detention Volume	4.793	acre feet
Approximate 75% Detention Volume	4.749	acre feet

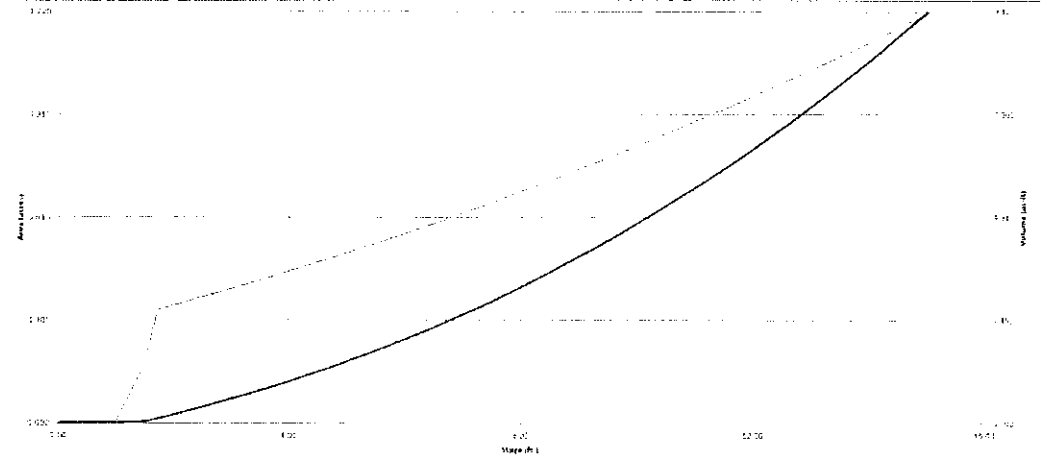
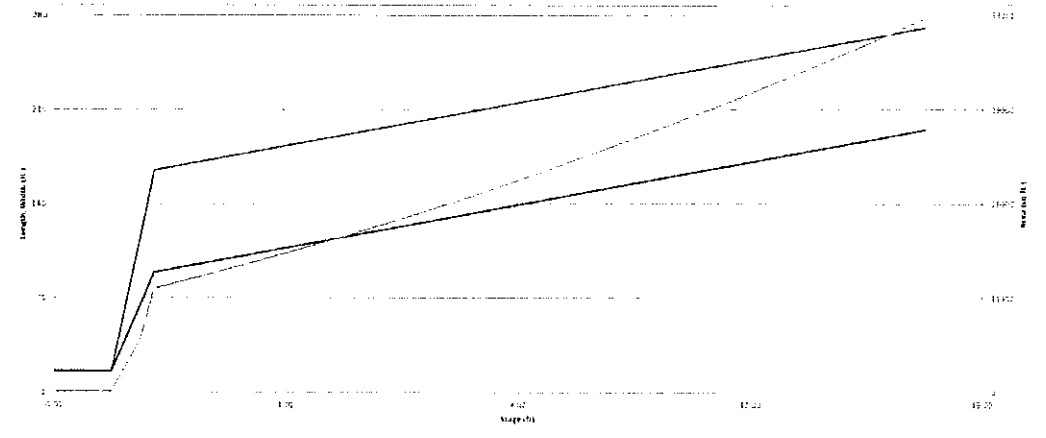
### Slope-Storage Calculation

Zone 1 Volume (WQCV)	3.399	acre feet
Zone 2 Volume (75% of V)	1.03	acre feet
Zone 3 Volume (100-year)	1.376	acre feet
Total Detention Basin Volume	4.749	acre feet
Initial Surge Storage Volume (SSV)	1.25	acre feet
Final Available Detention Depth (ft)	0.50	ft
Depth of Trench Channel (ft)	0.50	ft
Slope of Trench Channel (ft/ft)	0.005	ft/ft
Slope of Main Basin Basin (ft/ft)	4	ft/ft
Basin Length to Width Ratio (L/W)	7	
Initial Surge Storage Area (sq ft)	25	sq ft
Surge Storage Volume (cu ft)	19.3	cu ft
Surge Storage Volume (cu ft)	15.3	cu ft
Depth of Basin Floor (ft)	2.7	ft
Length of Basin Floor (ft)	84.8	ft
Width of Basin Floor (ft)	88.3	ft
Area of Basin Floor (sq ft)	74,612	sq ft
Volume of Basin Floor (cu ft)	4,287	cu ft
Depth of Main Basin (ft)	8.27	ft
Length of Main Basin (ft)	237.2	ft
Width of Main Basin (ft)	155.7	ft
Area of Main Basin (sq ft)	35,922	sq ft
Volume of Main Basin (cu ft)	292,144	cu ft
Combined Total Basin Volume (cu ft)	4,743	cu ft

Top of Micropeak	Slope Storage Detention	Slope (ft/ft)	Optional Overlap Storage (ft)	Length (ft)	Width (ft)	Area (sq ft)	Optional Overlap Area (sq ft)	Area (acres)	Volume (cu ft)	Volume (acre feet)
0.00	0.00	15.0	15.0	25.0	25.0	625.0	0.00	0.019	0.000	0.000
1.00	1.00	15.0	15.0	25.0	25.0	625.0	0.00	0.019	0.000	0.000
2.00	2.00	15.0	15.0	25.0	25.0	625.0	0.00	0.019	0.000	0.000
3.00	3.00	15.0	15.0	25.0	25.0	625.0	0.00	0.019	0.000	0.000
4.00	4.00	15.0	15.0	25.0	25.0	625.0	0.00	0.019	0.000	0.000
5.00	5.00	15.0	15.0	25.0	25.0	625.0	0.00	0.019	0.000	0.000
6.00	6.00	15.0	15.0	25.0	25.0	625.0	0.00	0.019	0.000	0.000
7.00	7.00	15.0	15.0	25.0	25.0	625.0	0.00	0.019	0.000	0.000
8.00	8.00	15.0	15.0	25.0	25.0	625.0	0.00	0.019	0.000	0.000
9.00	9.00	15.0	15.0	25.0	25.0	625.0	0.00	0.019	0.000	0.000
10.00	10.00	15.0	15.0	25.0	25.0	625.0	0.00	0.019	0.000	0.000
11.00	11.00	15.0	15.0	25.0	25.0	625.0	0.00	0.019	0.000	0.000
12.00	12.00	15.0	15.0	25.0	25.0	625.0	0.00	0.019	0.000	0.000
13.00	13.00	15.0	15.0	25.0	25.0	625.0	0.00	0.019	0.000	0.000
14.00	14.00	15.0	15.0	25.0	25.0	625.0	0.00	0.019	0.000	0.000
15.00	15.00	15.0	15.0	25.0	25.0	625.0	0.00	0.019	0.000	0.000
16.00	16.00	15.0	15.0	25.0	25.0	625.0	0.00	0.019	0.000	0.000
17.00	17.00	15.0	15.0	25.0	25.0	625.0	0.00	0.019	0.000	0.000
18.00	18.00	15.0	15.0	25.0	25.0	625.0	0.00	0.019	0.000	0.000
19.00	19.00	15.0	15.0	25.0	25.0	625.0	0.00	0.019	0.000	0.000
20.00	20.00	15.0	15.0	25.0	25.0	625.0	0.00	0.019	0.000	0.000
21.00	21.00	15.0	15.0	25.0	25.0	625.0	0.00	0.019	0.000	0.000
22.00	22.00	15.0	15.0	25.0	25.0	625.0	0.00	0.019	0.000	0.000
23.00	23.00	15.0	15.0	25.0	25.0	625.0	0.00	0.019	0.000	0.000
24.00	24.00	15.0	15.0	25.0	25.0	625.0	0.00	0.019	0.000	0.000
25.00	25.00	15.0	15.0	25.0	25.0	625.0	0.00	0.019	0.000	0.000
26.00	26.00	15.0	15.0	25.0	25.0	625.0	0.00	0.019	0.000	0.000
27.00	27.00	15.0	15.0	25.0	25.0	625.0	0.00	0.019	0.000	0.000
28.00	28.00	15.0	15.0	25.0	25.0	625.0	0.00	0.019	0.000	0.000
29.00	29.00	15.0	15.0	25.0	25.0	625.0	0.00	0.019	0.000	0.000
30.00	30.00	15.0	15.0	25.0	25.0	625.0	0.00	0.019	0.000	0.000
31.00	31.00	15.0	15.0	25.0	25.0	625.0	0.00	0.019	0.000	0.000
32.00	32.00	15.0	15.0	25.0	25.0	625.0	0.00	0.019	0.000	0.000
33.00	33.00	15.0	15.0	25.0	25.0	625.0	0.00	0.019	0.000	0.000
34.00	34.00	15.0	15.0	25.0	25.0	625.0	0.00	0.019	0.000	0.000
35.00	35.00	15.0	15.0	25.0	25.0	625.0	0.00	0.019	0.000	0.000
36.00	36.00	15.0	15.0	25.0	25.0	625.0	0.00	0.019	0.000	0.000
37.00	37.00	15.0	15.0	25.0	25.0	625.0	0.00	0.019	0.000	0.000
38.00	38.00	15.0	15.0	25.0	25.0	625.0	0.00	0.019	0.000	0.000
39.00	39.00	15.0	15.0	25.0	25.0	625.0	0.00	0.019	0.000	0.000
40.00	40.00	15.0	15.0	25.0	25.0	625.0	0.00	0.019	0.000	0.000
41.00	41.00	15.0	15.0	25.0	25.0	625.0	0.00	0.019	0.000	0.000
42.00	42.00	15.0	15.0	25.0	25.0	625.0	0.00	0.019	0.000	0.000
43.00	43.00	15.0	15.0	25.0	25.0	625.0	0.00	0.019	0.000	0.000
44.00	44.00	15.0	15.0	25.0	25.0	625.0	0.00	0.019	0.000	0.000
45.00	45.00	15.0	15.0	25.0	25.0	625.0	0.00	0.019	0.000	0.000
46.00	46.00	15.0	15.0	25.0	25.0	625.0	0.00	0.019	0.000	0.000
47.00	47.00	15.0	15.0	25.0	25.0	625.0	0.00	0.019	0.000	0.000
48.00	48.00	15.0	15.0	25.0	25.0	625.0	0.00	0.019	0.000	0.000
49.00	49.00	15.0	15.0	25.0	25.0	625.0	0.00	0.019	0.000	0.000
50.00	50.00	15.0	15.0	25.0	25.0	625.0	0.00	0.019	0.000	0.000

# DETENTION BASIN STAGE-STORAGE TABLE BUILDER

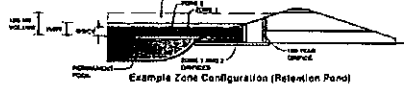
UD-Detention, Version 3.07 (February 2017)



**DETENTION BASIN STAGE-STORAGE TABLE BUILDER**

UD-Detention, Version 3.07 (February 2017)

Project: THE RANCH  
Basin ID: BASIN C



**Required Volume Calculation**

Storage SWP Type	EDB	
Watershed Area	305.00	acres
Watershed Length	5.700	feet
Watershed Slope	0.013	%
Watershed Imperviousness	40.00%	percent
Percentage Retention Soil Group A	60.0%	percent
Percentage Retention Soil Group B	0.0%	percent
Percentage Retention Soil Group C/D	39.0%	percent
Desired WQC/Draw Time	40.0	hours
Location for the Rainfall Depth	State Input	
Water Depth/Storage Volume (WQC/)	3.672	cube feet
Excess Inflow Volume (EIV)	15.261	cube feet
2 yr Rainfall Volume (2 yr 1" Rain)	11.563	cube feet
5 yr Rainfall Volume (5 yr 1" Rain)	16.273	cube feet
10 yr Rainfall Volume (10 yr 1" Rain)	22.578	cube feet
25 yr Rainfall Volume (25 yr 1" Rain)	32.858	cube feet
50 yr Rainfall Volume (50 yr 1" Rain)	46.679	cube feet
100 yr Rainfall Volume (100 yr 1" Rain)	63.782	cube feet
Approximate 2 yr Detention Volume	15.280	cube feet
Approximate 5 yr Detention Volume	18.218	cube feet
Approximate 10 yr Detention Volume	21.372	cube feet
Approximate 25 yr Detention Volume	27.362	cube feet

**Optional Jaw Overlays for Precipitation**

1.19	inches
1.90	inches
1.15	inches
2.00	inches
2.25	inches
2.52	inches
3.10	inches

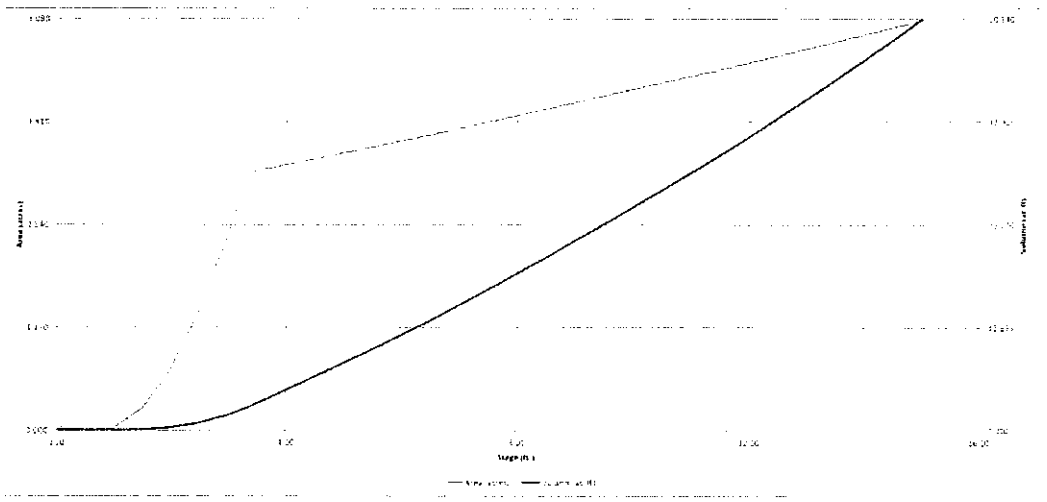
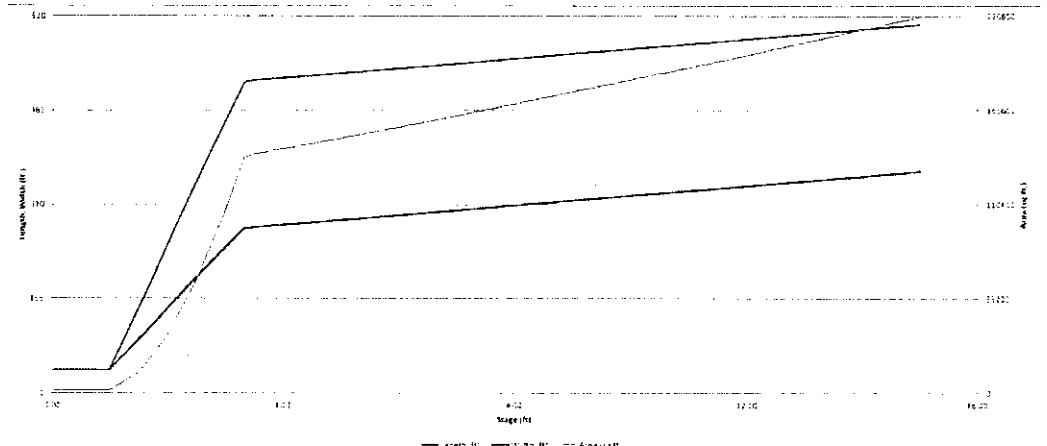
**Stage-Storage Calculation**

Zone 1 Volume (WQC/)	6.472	cube feet
Zone 2 Volume (EIV) - Zone 1	8.881	cube feet
Zone 3 Volume (100 year) - Zones 1 & 2	32.712	cube feet
Total Detention Basin Volume	47.362	cube feet
Total Storage Volume (SWP)	7.15	ft <sup>3</sup>
Total Storage Depth (SWP)	0.50	feet
Total Available Detention Depth (ft)	10.00	feet
Depth of Inflow Channel (ft)	0.50	feet
Slope of Inflow Channel (ft)	0.005	feet
Slopes of Main Basin Sides (ft)	4	feet
Basin Length (ft)	2	feet
<b>Basin Dimensions</b>		
Total Storage Area (ft <sup>2</sup> )	1432	ft <sup>2</sup>
Storage Volume Length (ft)	37.4	ft
Storage Volume Width (ft)	37.3	ft
Depth of Basin 1 foot (ft)	2.12	ft
Length of Basin Floor (ft)	572.6	ft
Width of Basin Floor (ft)	276.4	ft
Area of Basin Floor (ft <sup>2</sup> )	158,854	ft <sup>2</sup>
Volume of Basin 1 foot (ft <sup>3</sup> )	115,825	ft <sup>3</sup>
Depth of Main Basin (ft)	5.47	ft
Length of Main Basin (ft)	568.0	ft
Width of Main Basin (ft)	181.8	ft
Area of Main Basin (ft <sup>2</sup> )	83,139	ft <sup>2</sup>
Volume of Main Basin (ft <sup>3</sup> )	459,268	ft <sup>3</sup>
Calculated Total Basin Volume (ft <sup>3</sup> )	77,364	ft <sup>3</sup>

Stage Storage Description	Stage (ft)	Optional Storage (ft)	Height (ft)	Width (ft)	Area (ft <sup>2</sup> )	Optional Storage Area (ft <sup>2</sup> )	Area (ft <sup>2</sup> )	Volume (ft <sup>3</sup> )	Volume (ft <sup>3</sup> )
<b>Top of Macropool</b>	7.00		37.8	37.8	1432		3,232	1,432,000	1,432,000
<b>ISV</b>	2.20		37.8	37.8	1432		3,232	7,219	7,219
	7.20		37.8	37.8	1432		3,232	7,473	7,473
	7.30		37.8	37.8	1432		3,232	7,616	7,616
	7.40		37.8	37.8	1432		3,232	7,759	7,759
	7.50		37.8	37.8	1432		3,232	7,902	7,902
	7.60		37.8	37.8	1432		3,232	8,045	8,045
<b>Floor</b>	3.00		37.8	37.8	1432		3,232	15,268	15,268
	3.10		37.8	37.8	1432		3,232	15,411	15,411
	3.20		37.8	37.8	1432		3,232	15,554	15,554
	3.30		37.8	37.8	1432		3,232	15,697	15,697
	3.40		37.8	37.8	1432		3,232	15,840	15,840
	3.50		37.8	37.8	1432		3,232	15,983	15,983
<b>Zone 1 (WQC/)</b>	4.00		37.8	37.8	1432		3,232	16,126	16,126
	4.10		37.8	37.8	1432		3,232	16,269	16,269
	4.20		37.8	37.8	1432		3,232	16,412	16,412
	4.30		37.8	37.8	1432		3,232	16,555	16,555
	4.40		37.8	37.8	1432		3,232	16,698	16,698
<b>Zone 2 (EIV)</b>	4.50		37.8	37.8	1432		3,232	16,841	16,841
	4.60		37.8	37.8	1432		3,232	16,984	16,984
	4.70		37.8	37.8	1432		3,232	17,127	17,127
	4.80		37.8	37.8	1432		3,232	17,270	17,270
	4.90		37.8	37.8	1432		3,232	17,413	17,413
<b>Zone 3 (100 year)</b>	5.00		37.8	37.8	1432		3,232	17,556	17,556
	5.10		37.8	37.8	1432		3,232	17,699	17,699
	5.20		37.8	37.8	1432		3,232	17,842	17,842
	5.30		37.8	37.8	1432		3,232	17,985	17,985
	5.40		37.8	37.8	1432		3,232	18,128	18,128
	5.50		37.8	37.8	1432		3,232	18,271	18,271
	5.60		37.8	37.8	1432		3,232	18,414	18,414
	5.70		37.8	37.8	1432		3,232	18,557	18,557
	5.80		37.8	37.8	1432		3,232	18,700	18,700
	5.90		37.8	37.8	1432		3,232	18,843	18,843
	6.00		37.8	37.8	1432		3,232	18,986	18,986
	6.10		37.8	37.8	1432		3,232	19,129	19,129
	6.20		37.8	37.8	1432		3,232	19,272	19,272
	6.30		37.8	37.8	1432		3,232	19,415	19,415
	6.40		37.8	37.8	1432		3,232	19,558	19,558
	6.50		37.8	37.8	1432		3,232	19,701	19,701
	6.60		37.8	37.8	1432		3,232	19,844	19,844
	6.70		37.8	37.8	1432		3,232	19,987	19,987
	6.80		37.8	37.8	1432		3,232	20,130	20,130
	6.90		37.8	37.8	1432		3,232	20,273	20,273
	7.00		37.8	37.8	1432		3,232	20,416	20,416

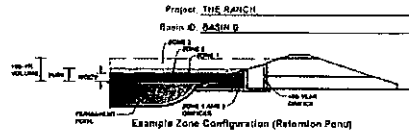
**DETENTION BASIN STAGE-STORAGE TABLE BUILDER**

UD-Detention, Version 3.07 (February 2017)



# DETENTION BASIN STAGE-STORAGE TABLE BUILDER

UD-Detention, Version 3.07 (February 2017)



**Required Volume Calculation**

Selected BMP Type	600
Watershed Area	53.00 acres
Watershed Length	2,174
Watershed Slope	0.00%
Watershed Imperviousness	40.00%
Percentage Hydrologic Soil Group A	100.0%
Percentage Hydrologic Soil Group B	0.0%
Percentage Hydrologic Soil Group C	0.0%
Percentage Hydrologic Soil Group D	0.0%
Desired WQCV Retention Time	48.0
Desired WQCV Retention Time	48.0

**Optional User Overrides for Retention**

Water Quality Capture Volume (WQCV)	0.824
2 yr Runoff Volume (2 yr 15 min)	1.474
7 yr Runoff Volume (7 yr 15 min)	2.235
10 yr Runoff Volume (10 yr 15 min)	2.655
20 yr Runoff Volume (20 yr 15 min)	3.289
50 yr Runoff Volume (50 yr 15 min)	4.208
100 yr Runoff Volume (100 yr 15 min)	5.025
100 yr Runoff Volume (100 yr 15 min)	5.027
Approximate 2 yr Detention Volume	2.218
Approximate 5 yr Detention Volume	2.203
Approximate 10 yr Detention Volume	2.279
Approximate 20 yr Detention Volume	2.276
Approximate 50 yr Detention Volume	2.277
Approximate 100 yr Detention Volume	2.277

**Stage-Storage Calculation**

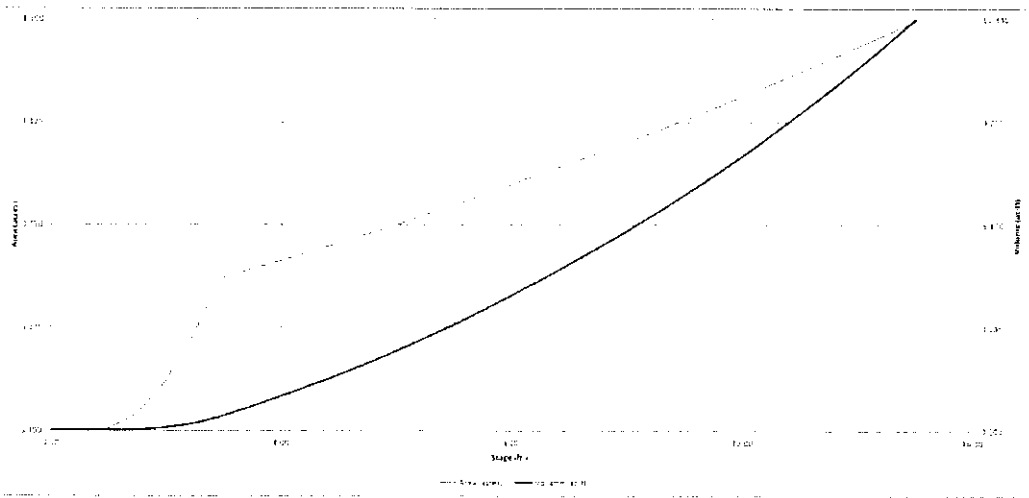
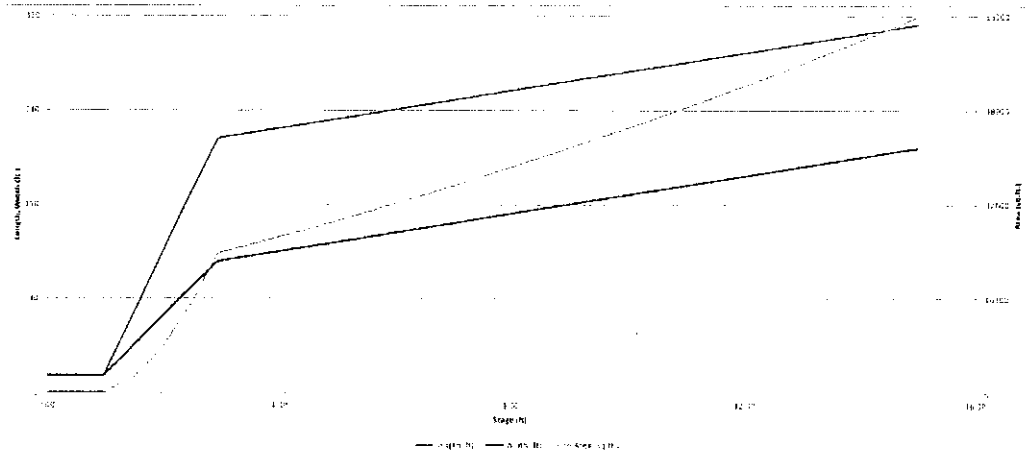
Zone 1 Volume (WQCV)	0.824
Zone 2 Volume (BURY)	1.474
Zone 3 Volume (100-year)	2.655
Total Retention Basin Volume	4.953
Initial Surcharge Volume (20 yr)	1.88
Final Surcharge Depth (20 yr)	0.50
Total Available Retention Depth (20 yr)	0.50
Depth of Fringe Channel (20 yr)	0.010
Radius of Main Basin Sides (20 yr)	8
Water Depth to Water Table (20 yr)	2
Final Surcharge Area (20 yr)	215
Surcharge Volume (20 yr)	167
Surcharge Volume (50 yr)	147
Depth of Basin Floor (20 yr)	1.81
Depth of Basin Floor (50 yr)	2.61
Width of Basin Floor (20 yr)	111.6
Area of Basin Floor (20 yr)	24,144
Volume of Basin Floor (20 yr)	42,217
Depth of Main Basin (20 yr)	0.26
Depth of Main Basin (50 yr)	2.61
Depth of Main Basin (100 yr)	4.21
Area of Main Basin (20 yr)	33,281
Volume of Main Basin (20 yr)	168,417
Calculated Total Basin Volume (20 yr)	8,038

Stage Storage	Stage (ft)	Optional Overflow Stage (ft)	Length (ft)	Width (ft)	Area (sq ft)	Optional Overflow Area (sq ft)	Area (sq ft)	Volume (cu ft)	Volume (cu ft)
Top of Micropeak	3.20		14.7	14.7	214		3,255	16,248	24,393
ISV	3.50		14.7	14.7	214		3,255	16,248	24,393
	1.20		14.7	14.7	214		3,255	16,248	24,393
	1.20		14.7	14.7	214		3,255	16,248	24,393
	2.30		117.6	44.2	5,180		8,113	3,218	9,328
	2.10		117.6	44.2	5,180		8,113	3,218	9,328
Floor	2.84		215.1	111.2	23,947		3,559	17,387	3,287
	3.20		216.8	111.2	24,325		3,598	18,390	3,436
	1.80		222.3	111.2	24,657		3,640	19,480	3,723
Zone 1 (WQCV)	3.48		222.7	111.2	24,744		3,650	19,728	3,828
	4.20		224.3	111.2	24,927		3,670	20,428	4,025
	4.20		225.5	111.2	25,100		3,694	21,185	4,243
	4.20		227.3	111.2	25,374		3,721	22,002	4,487
	4.20		228.5	111.2	25,641		3,750	22,882	4,757
Zone 2 (BURY)	4.90		240.7	116.3	27,945		3,792	24,093	5,088
	6.20		240.5	116.3	27,915		3,788	25,378	5,355
	6.50		241.4	116.3	27,959		3,791	26,785	5,703
	7.00		245.1	116.3	28,254		3,823	28,617	6,183
	7.50		252.9	116.3	29,442		3,880	30,955	6,803
Zone 3 (100-year)	8.00		256.5	121.1	31,061		3,927	33,973	7,442
	8.50		260.5	121.1	31,711		3,975	36,321	8,130
	9.20		264.4	121.1	32,287		4,013	38,928	8,877
	9.50		265.5	121.1	32,412		4,013	39,824	9,473
	10.20		272.9	121.1	33,080		4,051	42,715	10,390
	10.50		276.5	121.1	33,640		4,084	45,825	11,426
	11.20		282.3	121.1	34,351		4,120	49,262	12,591
	11.40		284.3	121.1	34,595		4,126	50,744	13,167
	12.20		288.2	121.1	35,171		4,161	54,557	14,281
	12.50		292.4	121.1	35,678		4,194	58,692	15,527
	13.20		298.9	121.1	36,318		4,229	63,161	16,826
	13.50		300.5	121.1	36,480		4,235	64,745	17,320
	14.20		308.9	121.1	37,393		4,270	70,613	18,883
	14.50		308.9	121.1	37,393		4,270	70,613	18,883
	15.20		312.9	121.1	37,956		4,304	76,871	20,527



**DETENTION BASIN STAGE-STORAGE TABLE BUILDER**

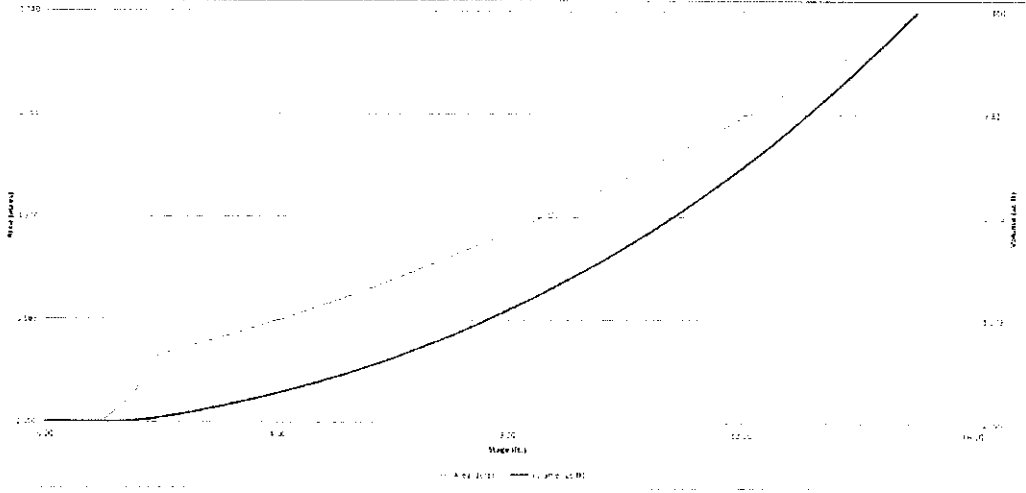
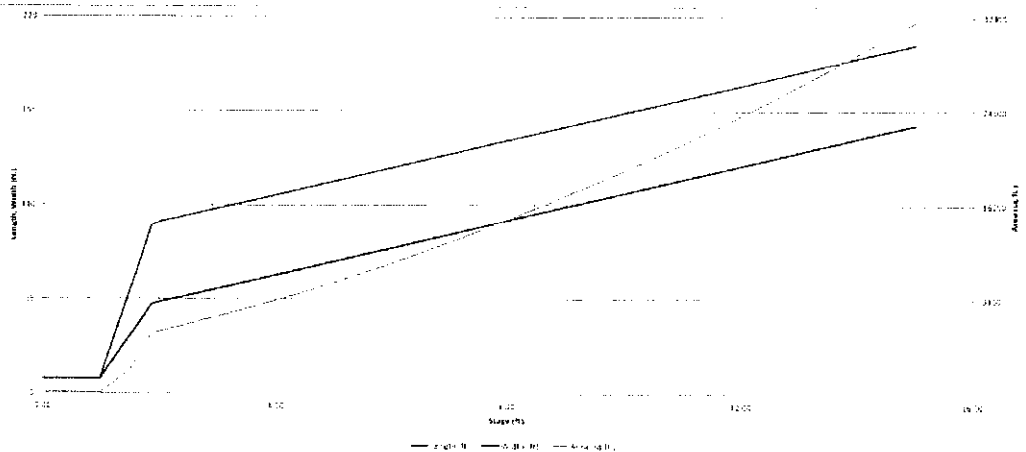
UD-Defenton, Version 3.07 (February 2017)





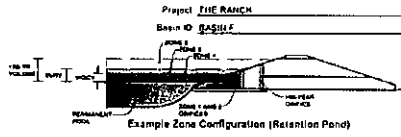
**DETENTION BASIN STAGE-STORAGE TABLE BUILDER**

UD-Detention, Version 3.07 (February 2017)



### DETENTION BASIN STAGE-STORAGE TABLE BUILDER

UD-Detention, Version 3.07 (February 2017)



**Required Volume Calculation**

Detention BMP Type	EDB
Watershed Area	148.00 acres
Watershed Length	3.315 miles
Watershed Slope	0.02% percent
Watershed Imperviousness	40.0% percent
Percentage Hydrologic Soil Group A	70.0% percent
Percentage Hydrologic Soil Group B	0.0% percent
Percentage Hydrologic Soil Group C	30.0% percent
Detention WQCV Storm Frequency	4.00 years
Detention Depth	10.00 feet
Water Storage Volume (WQCV)	2,718 cubic feet
Excess Stream Runoff Volume (EURV)	6,739 cubic feet
1% of Runoff Volume (P1 = 1.5 in)	4,977 cubic feet
5% of Runoff Volume (P5 = 7.5 in)	8,106 cubic feet
10% of Runoff Volume (P10 = 15 in)	9,209 cubic feet
20% of Runoff Volume (P20 = 30 in)	11,230 cubic feet
30% of Runoff Volume (P30 = 45 in)	14,213 cubic feet
40% of Runoff Volume (P40 = 60 in)	17,191 cubic feet
50% of Runoff Volume (P50 = 75 in)	20,162 cubic feet
Approximate 7.5' Detention Volume	4,758 cubic feet
Approximate 15' Detention Volume	9,515 cubic feet
Approximate 20' Detention Volume	12,687 cubic feet
Approximate 30' Detention Volume	19,028 cubic feet
Approximate 40' Detention Volume	25,368 cubic feet

**Optional User-Entered Run Precipitation**

1.18	inches
1.30	inches
1.75	inches
2.00	inches
2.25	inches
3.00	inches

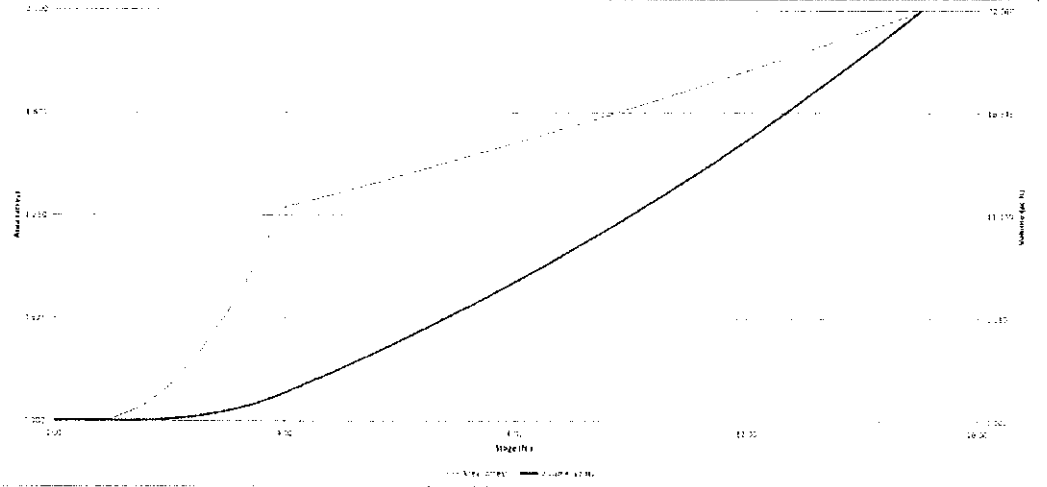
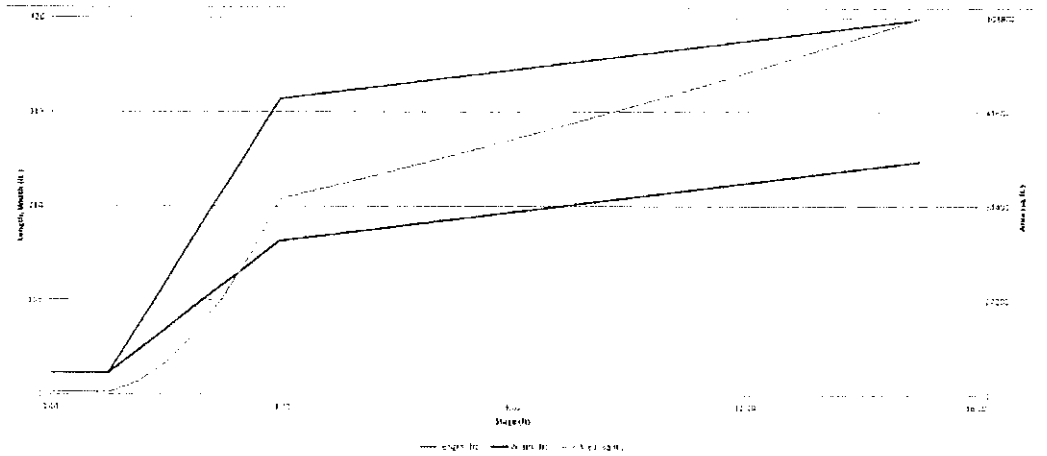
**Stage-Storage Calculation**

Zone 1 Volume (WQCV)	2,718	cubic feet
Zone 2 Volume (EURV)	3,821	cubic feet
Zone 3 Volume (100-year)	8,220	cubic feet
Total Detention Basin Volume	11,564	cubic feet
Initial Surge Storage Volume (SSV)	700	cubic feet
Final Surge Storage Volume (SSV)	0.00	cubic feet
Total Available Retention Depth (ARD)	10.00	feet
Depth of Trickle Channel (H <sub>TC</sub> )	0.50	feet
Slope of Trickle Channel (S <sub>TC</sub> )	0.010	feet
Slopes of Main Basin Sides (S <sub>M</sub> )	4	feet
Basin Length in Feet (L <sub>B</sub> )	7	feet
Initial Surge Storage Area (A <sub>SSV</sub> )	580	sq ft
Retention Volume Length (L <sub>R</sub> )	25.1	feet
Surge Storage Volume (SSV)	24.1	feet
Depth of Basin Floor (H <sub>B</sub> )	2.34	feet
Length of Basin Floor (L <sub>B</sub> )	328.8	feet
Width of Basin Floor (W <sub>B</sub> )	6.24	feet
Area of Basin Floor (A <sub>B</sub> )	56,428	sq ft
Volume of Basin Floor (V <sub>B</sub> )	67,172	cu ft
Depth of Main Basin (H <sub>M</sub> )	8.18	feet
Length of Main Basin (L <sub>M</sub> )	378.3	feet
Width of Main Basin (W <sub>M</sub> )	27.2	feet
Area of Main Basin (A <sub>M</sub> )	13,282	sq ft
Volume of Main Basin (V <sub>M</sub> )	120,762	cu ft
Tabulated Total Basin Volume (V <sub>T</sub> )	11,068	cubic feet

Top Water Surface Elevation	Stage	Storage Volume	Stage Depth	Optional Overlap Storage (ft)	Length (ft)	Width (ft)	Area (sq ft)	Optional Overlap Area (sq ft)	Area (sq ft)	Volume (cu ft)	Volume (cu ft)
Top of Micropond	0.00	0.00	24.1	24.1	580						
15'	0.00	0.00	24.1	24.1	580						
1'	0.00	0.00	24.1	24.1	580						
0.5'	0.00	0.00	24.1	24.1	580						
0.25'	0.00	0.00	24.1	24.1	580						
0.125'	0.00	0.00	24.1	24.1	580						
0.0625'	0.00	0.00	24.1	24.1	580						
0.03125'	0.00	0.00	24.1	24.1	580						
0.015625'	0.00	0.00	24.1	24.1	580						
0.0078125'	0.00	0.00	24.1	24.1	580						
0.00390625'	0.00	0.00	24.1	24.1	580						
0.001953125'	0.00	0.00	24.1	24.1	580						
0.0009765625'	0.00	0.00	24.1	24.1	580						
0.00048828125'	0.00	0.00	24.1	24.1	580						
0.000244140625'	0.00	0.00	24.1	24.1	580						
0.0001220703125'	0.00	0.00	24.1	24.1	580						
0.00006103515625'	0.00	0.00	24.1	24.1	580						
0.000030517578125'	0.00	0.00	24.1	24.1	580						
0.0000152587890625'	0.00	0.00	24.1	24.1	580						
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0.000003814697265625'	0.00	0.00	24.1	24.1	580						
0.0000019073486328125'	0.00	0.00	24.1	24.1	580						
0.00000095367431640625'	0.00	0.00	24.1	24.1	580						
0.000000476837158203125'	0.00	0.00	24.1	24.1	580						
0.0000002384185791015625'	0.00	0.00	24.1	24.1	580						
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**DETENTION BASIN STAGE-STORAGE TABLE BUILDER**

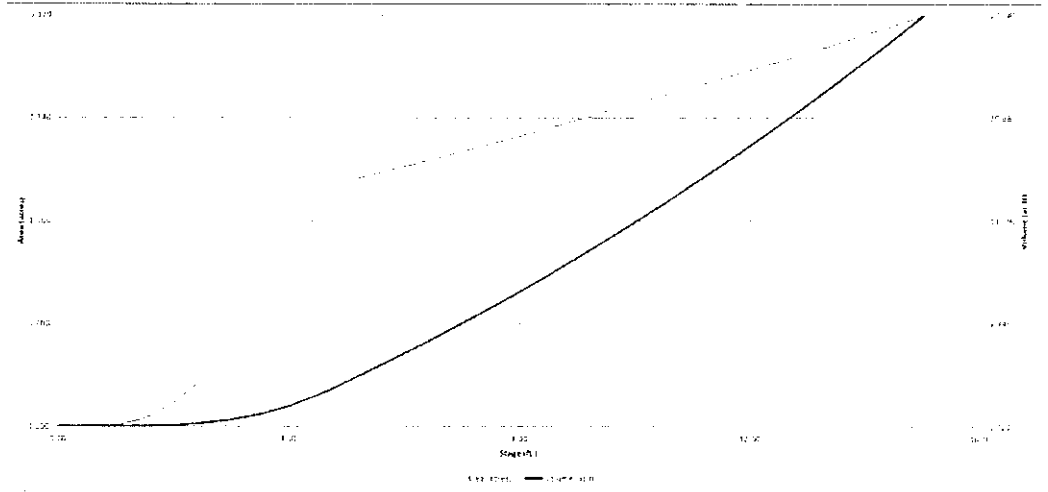
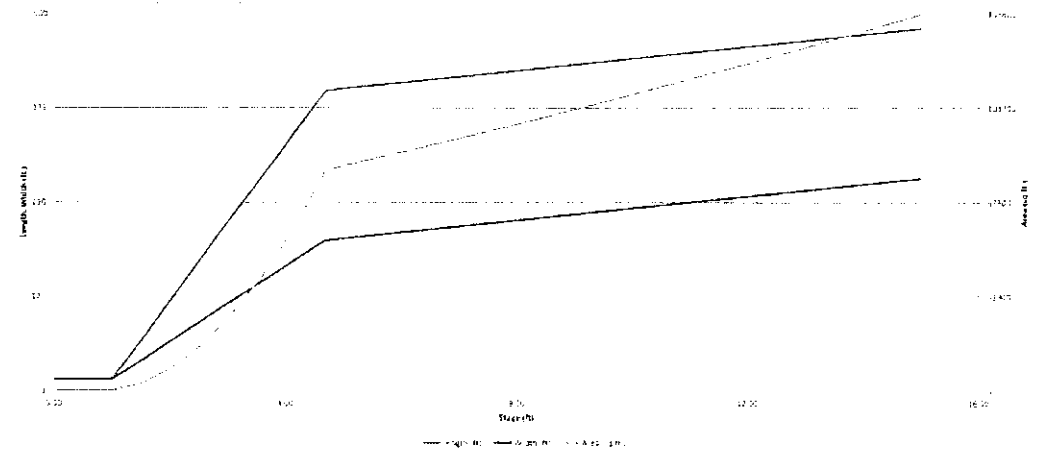
UD-Detention, Version 3.07 (February 2017)





**DETENTION BASIN STAGE-STORAGE TABLE BUILDER**

UD-Detention, Version 3.07 (February 2017)



**DETENTION BASIN STAGE-STORAGE TABLE BUILDER**

UD-Detention, Version 3.07 (February 2017)

Project: **THE RANCH**

Basin ID: **BASIN K**



**Required Volume Calculation**

Detention Basin Type	<b>EDB</b>	
Watershed Area	21.00	acres
Watershed Length	1.000	mi
Watershed Slope	0.812	%
Waterbody Imperviousness	60.0%	percent
Percentage Hydrology Soil Group A	0.0%	percent
Percentage Hydrology Soil Group B	100.0%	percent
Percentage Hydrology Soil Group C/D	0.0%	percent
Tested WQCV Drain Time	40.0	hours
Location for 1 hr Bankfull Depth	1000 ft	feet
Water Quality Capture Volume (WQCV)	0.472	acre-feet
Excess Storm Runoff Volume (ERV)	1.367	acre-feet
2 yr Runoff Volume (1.58 in)	1.222	acre-feet
5 yr Runoff Volume (2.03 in)	1.510	acre-feet
10 yr Runoff Volume (2.78 in)	1.970	acre-feet
25 yr Runoff Volume (3.75 in)	2.830	acre-feet
50 yr Runoff Volume (4.72 in)	3.543	acre-feet
100 yr Runoff Volume (5.70 in)	4.330	acre-feet
Approximate 2 yr Detention Volume	1.295	acre-feet
Approximate 5 yr Detention Volume	1.619	acre-feet
Approximate 10 yr Detention Volume	1.997	acre-feet
Approximate 25 yr Detention Volume	2.877	acre-feet
Approximate 50 yr Detention Volume	3.591	acre-feet
Approximate 100 yr Detention Volume	4.330	acre-feet

**Stage-Storage Calculation**

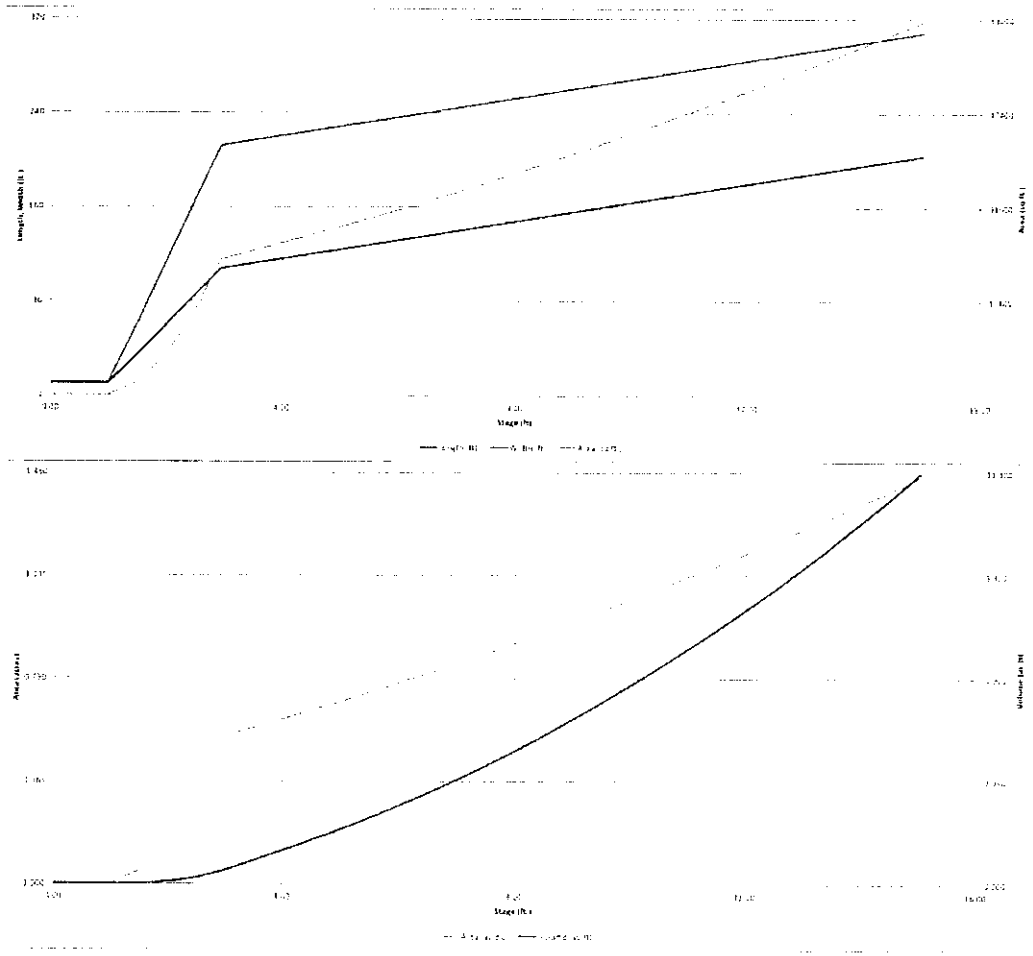
Zone 1 Volume (WQCV)	0.473	acre-feet
Zone 2 Volume (ERV)	0.894	acre-feet
Zone 3 Volume (10 yr)	0.804	acre-feet
Total Detention Basin Volume	2.171	acre-feet
Initial Surcharge Depth (ISD)	0.50	ft
Total Available Detention Depth (TADD)	6.00	ft
Depth of Freeway Channel (DFC)	0.50	ft
Depth of Freeway Channel (DFC)	0.010	ft
Depth of Main Basin Sides (MBS)	4	ft
Basin Slope to Area Ratio (BAR)	2	ft
Initial Surcharge Area (ISA)	108	sq-ft
Surcharge Volume (SV)	10.4	cu-ft
Surcharge Volume (SV)	10.4	cu-ft
Depth of Basin Floor (BF)	1.0	ft
Length of Basin Floor (LBF)	211.2	ft
Width of Basin Floor (WBF)	107.3	ft
Area of Basin Floor (ABF)	22,723	sq-ft
Volume of Basin Floor (VBF)	15,761	cu-ft
Depth of Main Basin (MBS)	3.25	ft
Length of Main Basin (LMB)	226.4	ft
Width of Main Basin (WMB)	131.8	ft
Area of Main Basin (AMB)	29,759	sq-ft
Volume of Main Basin (VMB)	37,763	cu-ft
Calculated Total Basin Volume (CTBV)	3,153	acre-feet

Depth (ft)	Volume (cu-ft)	Volume (acre-ft)	Area (sq-ft)	Area (ac)	Perimeter (ft)	Perimeter (ft)	Perimeter (ft)	Perimeter (ft)
0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.5	10.4	0.238	108	0.008	108	108	108	108
1.0	21.2	0.484	211.2	0.015	211.2	211.2	211.2	211.2
1.5	32.0	0.730	320	0.023	320	320	320	320
2.0	42.8	0.976	428	0.031	428	428	428	428
2.5	53.6	1.222	536	0.039	536	536	536	536
3.0	64.4	1.468	644	0.047	644	644	644	644
3.5	75.2	1.714	752	0.055	752	752	752	752
4.0	86.0	1.960	860	0.063	860	860	860	860
4.5	96.8	2.206	968	0.071	968	968	968	968
5.0	107.6	2.452	1076	0.079	1076	1076	1076	1076
5.5	118.4	2.698	1184	0.087	1184	1184	1184	1184
6.0	129.2	2.944	1292	0.095	1292	1292	1292	1292



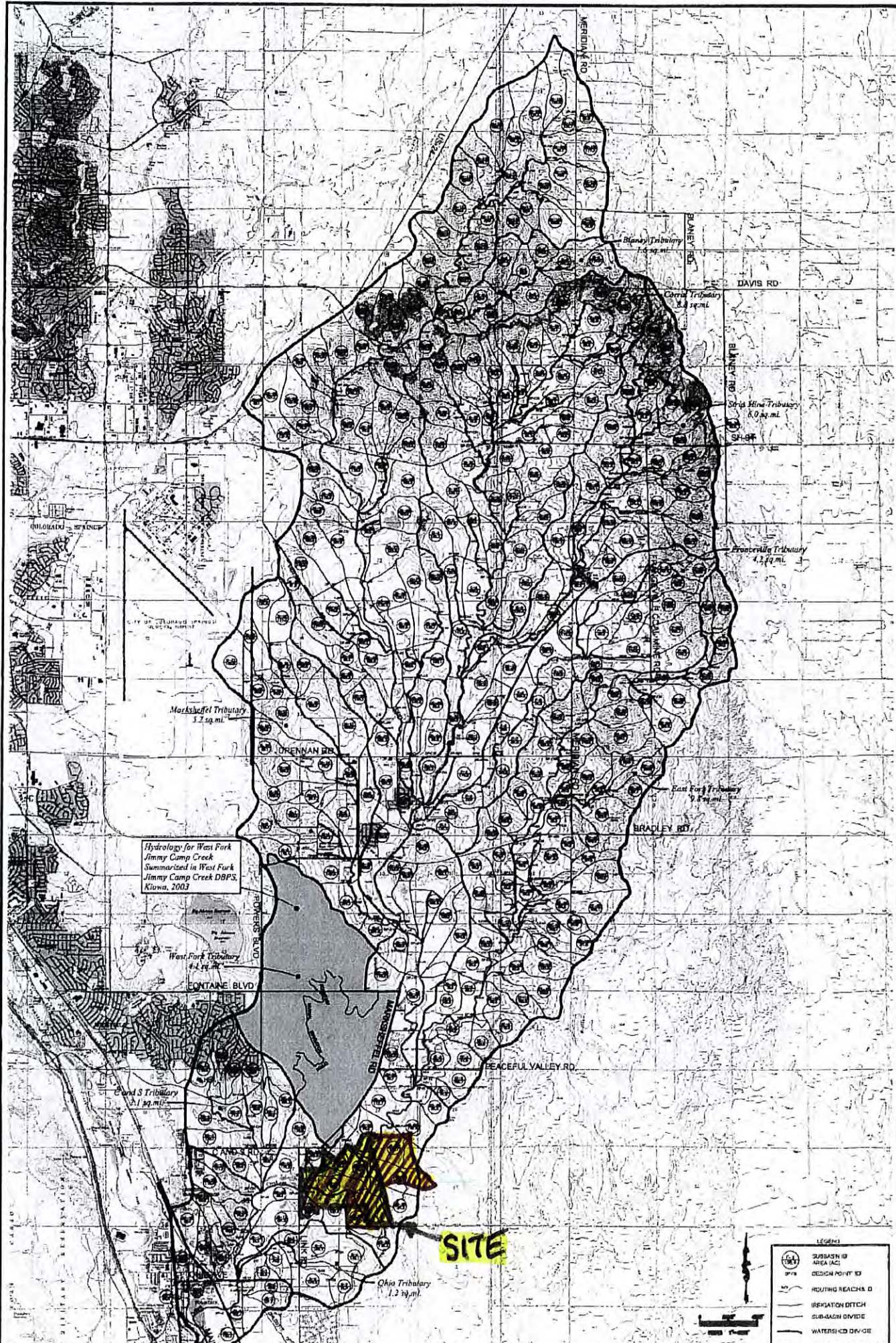
**DETENTION BASIN STAGE-STORAGE TABLE BUILDER**

UD-Detention, Version 3.07 (February 2017)



**JIMMY CAMP CREEK  
DRAINAGE BASIN  
(2015)**





Hydrology for West Fork Jimmy Camp Creek Summarized in West Fork Jimmy Camp Creek DBPS, Kiowa, 2003

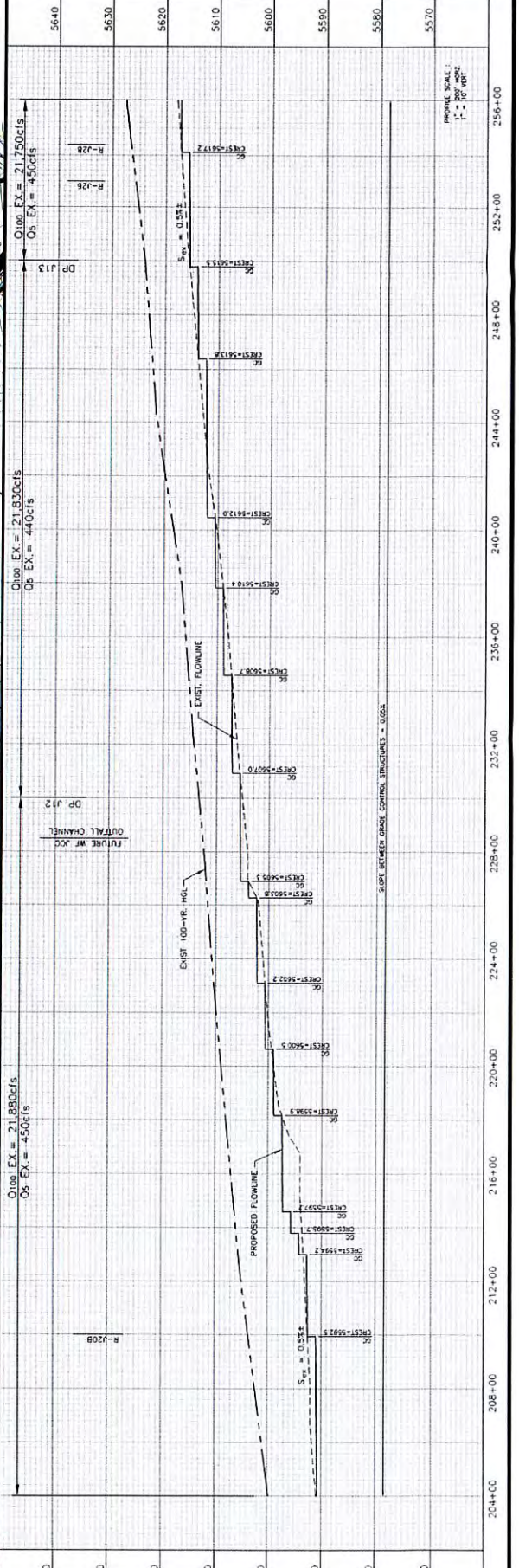
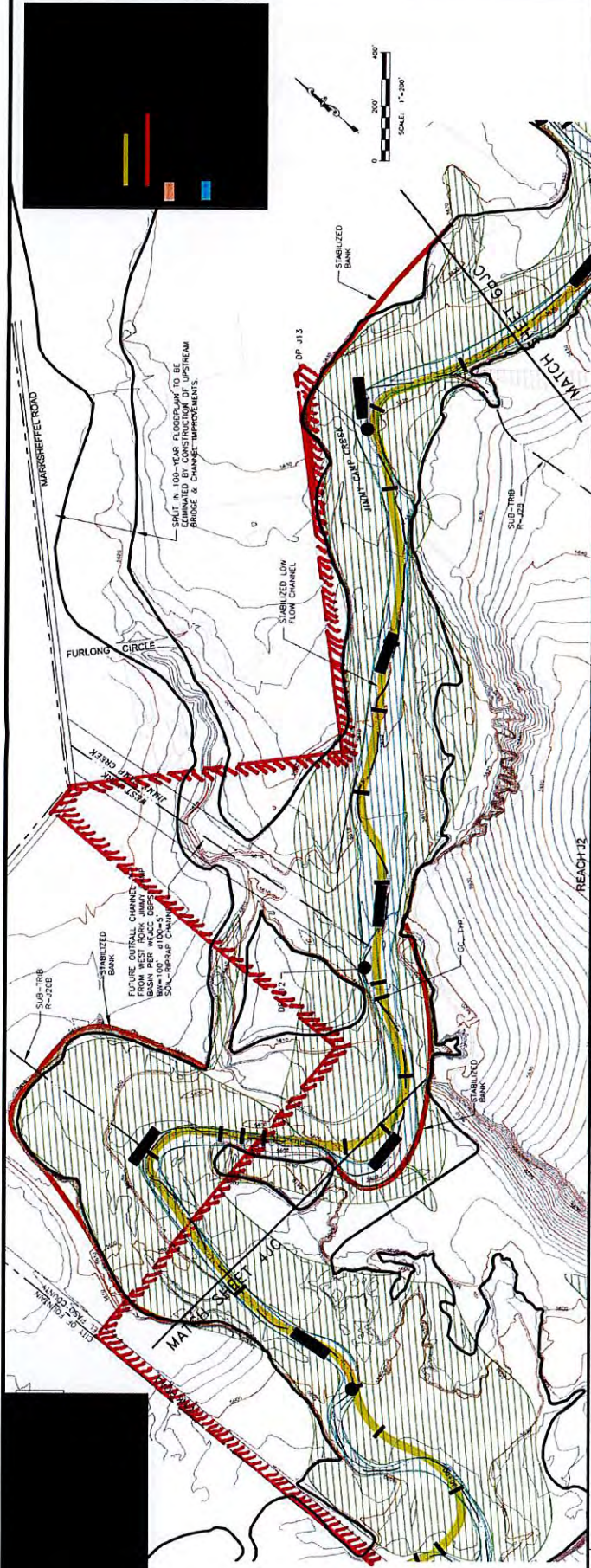


**JIMMY CAMP CREEK WATERSHED  
DRAINAGE BASIN PLANNING STUDY  
SUBBASIN MAP**  
CITY OF COLORADO SPRINGS, COLORADO

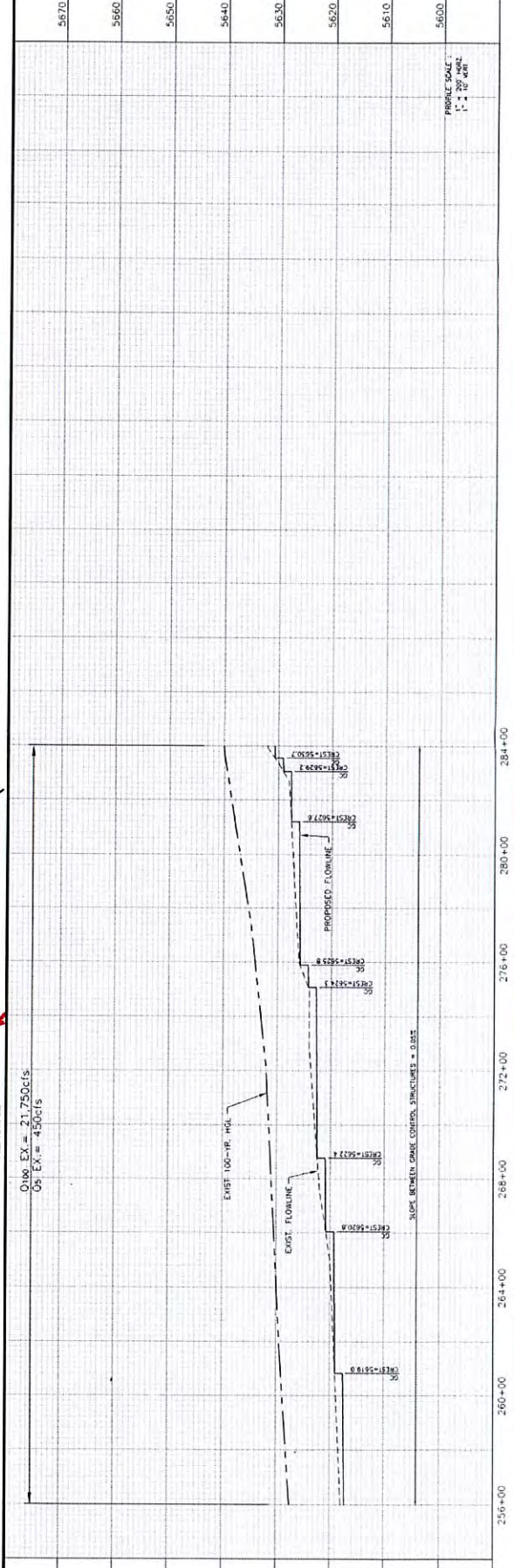
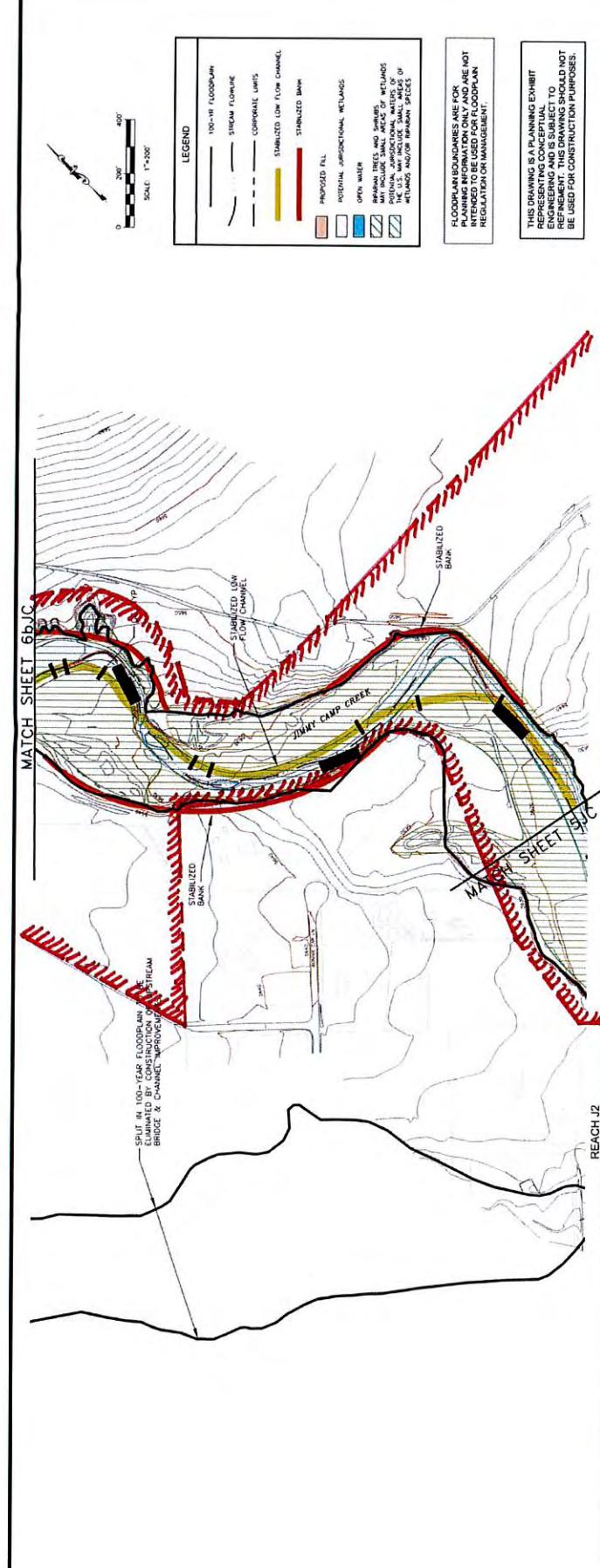
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Design:	IRW
Drawn:	EAK
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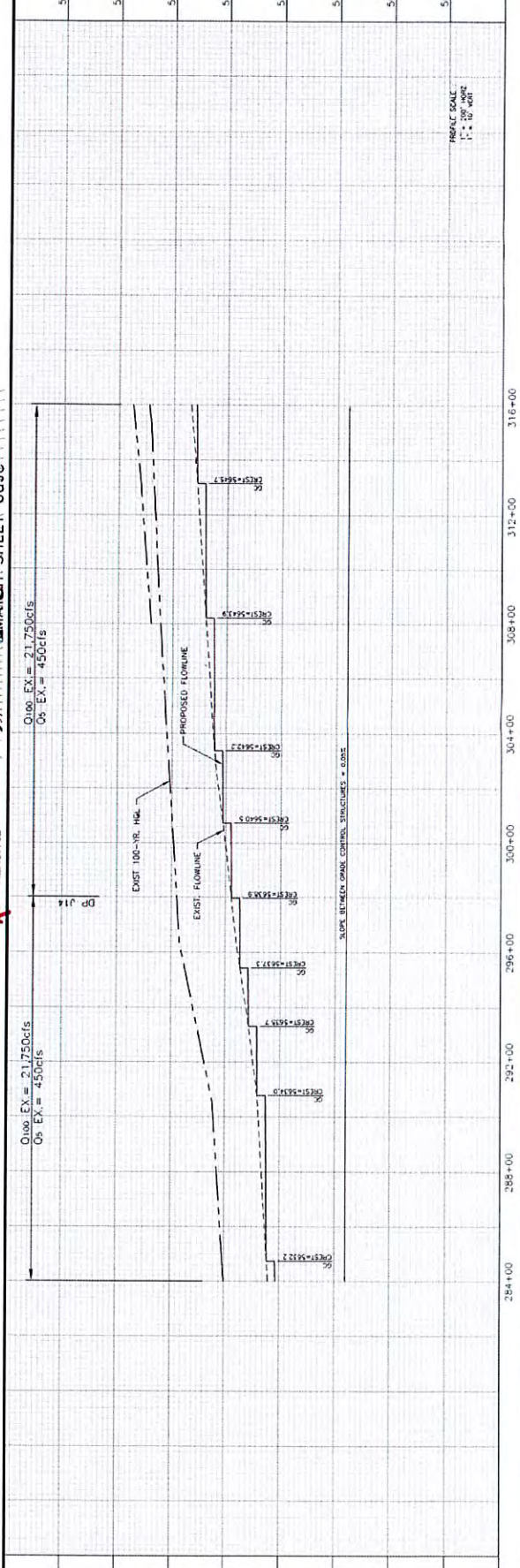
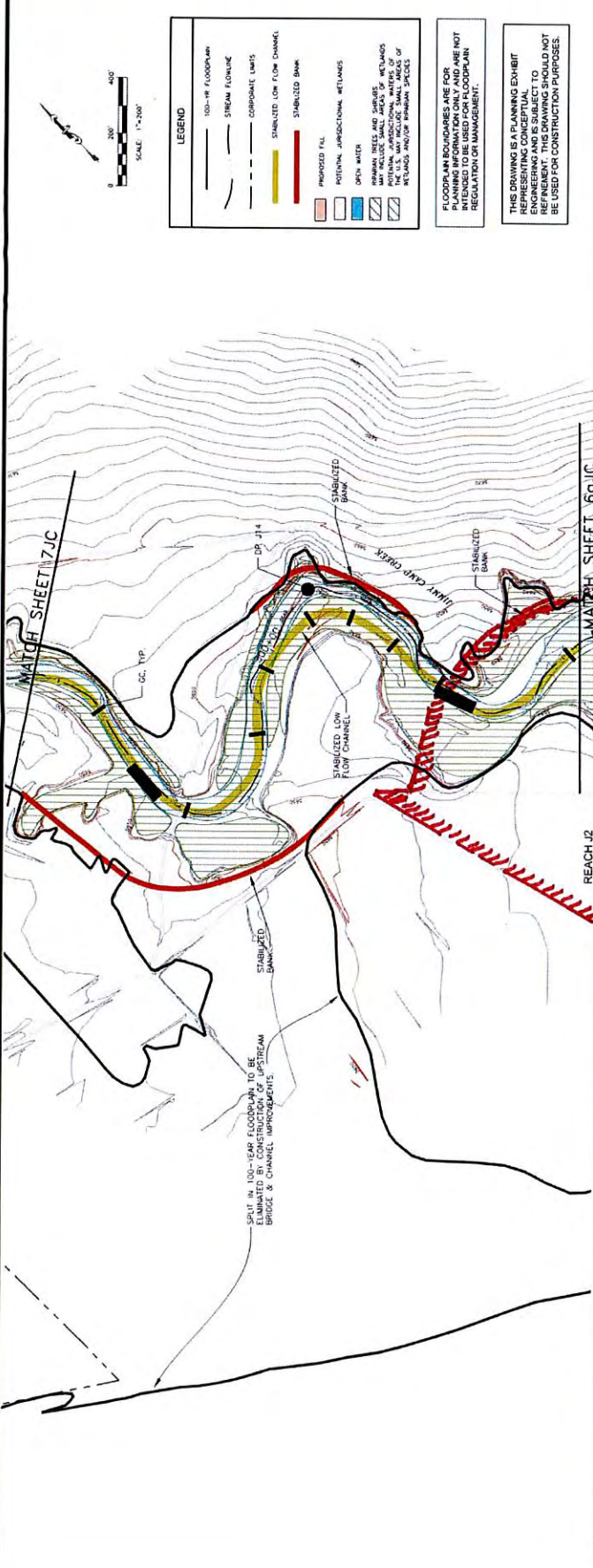
**EXHIBIT 1**





GRAPHIC SCALE:  
1" = 100'  
1" = 100'





REACH J2

MATCH SHEET 60JC

MATCH SHEET 7JC

SCALE: 1"=100'

DATE: OCTOBER 2014

DESIGN: RHW

DRAWN: JLN

CHECKED: RHW

REVISIONS:

PROJECT NO.: 140203

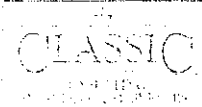
CITY OF COLORADO SPRINGS, COLORADO

JIMMY CAMP CREEK DRAINAGE BASIN PLANNING STUDY

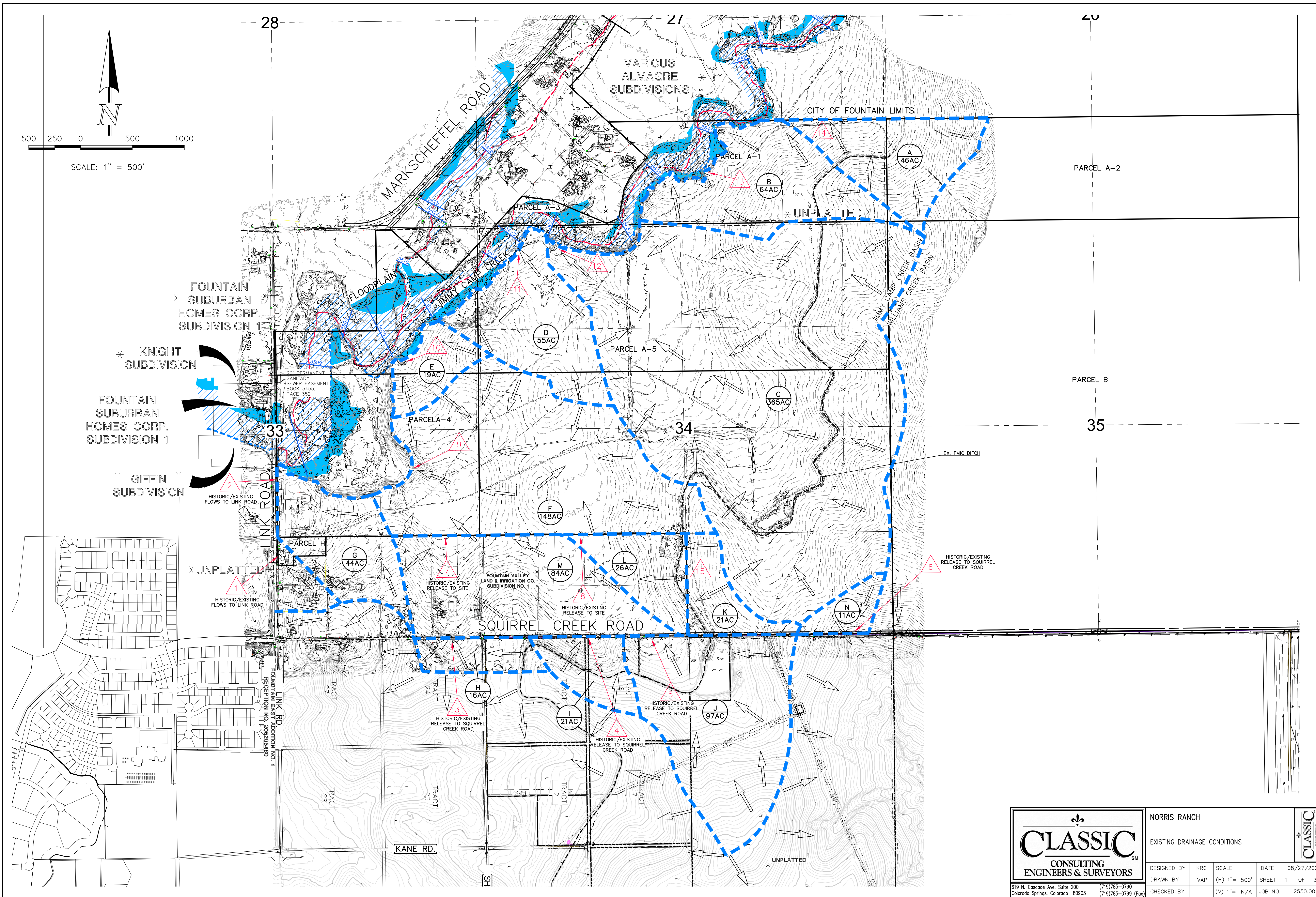
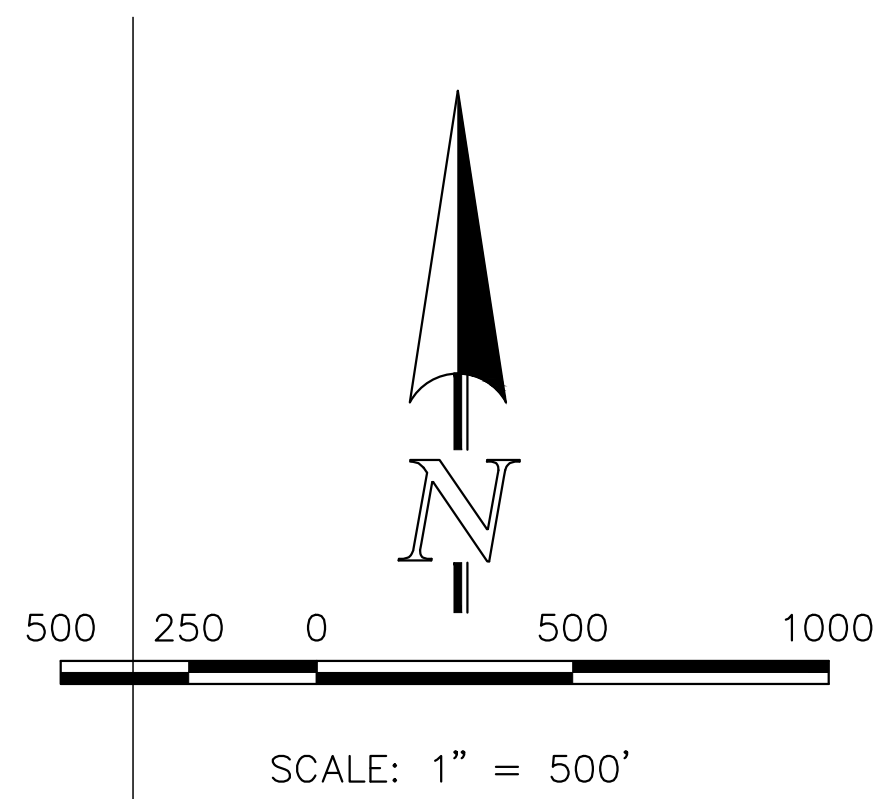
CONCEPTUAL DESIGN PLAN & PROFILE

6BJC

**EXISTING CONDITIONS**  
**(Drainage Map)**







FOUNTAIN  
SUBURBAN  
HOMES CORP.  
SUBDIVISION 1

\* KNIGHT  
SUBDIVISION

FOUNTAIN  
SUBURBAN  
HOMES CORP.  
SUBDIVISION 1

GIFFIN  
SUBDIVISION

20' PERMANENT  
SEWER EASEMENT  
BOOK 5455  
PAGE 352

\* UNPLATTED

LINK RD.  
FOUNTAIN EAST ADDITION NO. 1  
REGISTRATION NO. 209206480

FOUNTAIN VALLEY  
LAND & IRRIGATION CO.  
SUBDIVISION NO. 1

SQUIRREL CREEK ROAD

KANE RD.

VARIOUS  
ALMAGRE  
SUBDIVISIONS

CITY OF FOUNTAIN LIMITS

PARCEL A-1

A  
46AC

B  
64AC

PARCEL A-2

PARCEL A-3

\* UNPLATTED \*

D  
55AC

PARCEL A-5

JIMMY CAMP CREEK BASIN  
WILLIAMS CREEK BASIN

PARCEL B

PARCELA-4

C  
365AC

EX. FMIC DITCH

F  
148AC

HISTORIC/EXISTING  
RELEASE TO SQUIRREL  
CREEK ROAD

M  
84AC

L  
26AC

K  
21AC

N  
11AC

G  
44AC

H  
16AC

I  
21AC

J  
97AC

HISTORIC/EXISTING  
RELEASE TO SQUIRREL  
CREEK ROAD

HISTORIC/EXISTING  
RELEASE TO SQUIRREL  
CREEK ROAD

HISTORIC/EXISTING  
RELEASE TO SQUIRREL  
CREEK ROAD

UNPLATTED

**CLASSIC**  
CONSULTING  
ENGINEERS & SURVEYORS

NORRIS RANCH			
EXISTING DRAINAGE CONDITIONS			
DESIGNED BY	KRC	SCALE	DATE 08/27/2020
DRAWN BY	VAP	(H) 1" = 500'	SHEET 1 OF 3
CHECKED BY		(V) 1" = N/A	JOB NO. 2550.00

619 N. Cascade Ave, Suite 200  
Colorado Springs, Colorado 80903  
(719) 785-0780  
(719) 785-0789 (Fax)

CLASSIC  
ENGINEERS & SURVEYORS

N:\255000\DRAWINGS\EXHIBITS\255000 EXISTING DRAINAGE BASINS 01 9-17-20.dwg, 9/17/2020, 9:36:53 AM, 1:1

**PROPOSED CONDITIONS**  
**(Drainage Map)**

28

21

20

VARIOUS ALMAGRE SUBDIVISIONS

CITY OF FOUNTAIN LIMITS

THE RANCH ADDITION NO. 2 318.826 AC.

PARCEL A-1

PARCEL A-2

LEGEND

- EXISTING GROUND CONTOUR 5910
- PROPOSED FINISHED CONTOUR 5910
- ANNEXATION BOUNDARY
- LOT LINE
- PROPOSED BASIN BOUNDARY
- OVERFLOW ROUTE
- DIRECTION OF DRAINAGE
- DIRECTION OF EXISTING DRAINAGE
- LOW POINT/HIGH POINT LP/HP
- BASIN IDENTIFIER AREA IN ACRES
- OUTFALL POINT (SWMM MODEL)
- CONCEPT ROADWAY
- ANTICIPATED CONCEPT FSD FACILITIES

THE RANCH ADDITION NO. 1 192.445 AC.

FOUNTAIN SUBURBAN HOMES CORP. SUBDIVISION 1

\* KNIGHT SUBDIVISION

FOUNTAIN SUBURBAN HOMES CORP. SUBDIVISION 1

GIFFIN SUBDIVISION

PARCELA-4

PARCEL A-5

THE RANCH ADDITION NO. 3 288.285 AC.

PARCEL B

PROPOSED CONDITIONS SUMMARY

BASIN	100 YEAR FLOW (CFS)
A	162.65
B	272.68
C	1016.95
D	191.03
E	66.14
F	739.76
G	271.43
K	102.89

WILLIAMS CREEK DRAINAGE BASIN (56.16 ACRES) DEVELOPED FLOWS TO BE ROUTED TO A TEMPORARY OR PERMANENT FULL SPECTRUM DETENTION FACILITY

HISTORIC/EXISTING RELEASE TO SQUIRREL CREEK ROAD

SQUIRREL CREEK ROAD

THE RANCH ADDITION NO. 4 57.998 AC.

FOUNTAIN VALLEY LAND & IRRIGATION CO. SUBDIVISION NO. 1

PARCEL A-3

PARCEL A-4

PARCEL A-5

PARCEL A-6

PARCEL A-7

PARCEL A-8

PARCEL A-9

PARCEL A-10

PARCEL A-11

PARCEL A-12

PARCEL A-13

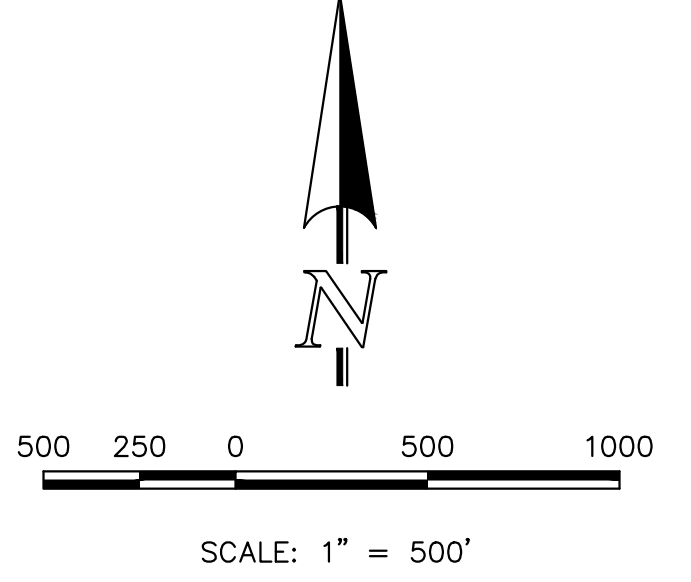
SQUIRREL CREEK ROAD

CUMBERLAND GREEN

LINK RD. FOUNDATION EAST ADDITION NO. 1 REGISTRATION NO. 2092906480

KANE RD.

SEE KANE RANCH MDDP FOR DETAILS OF THIS AREA.



THE RANCH  
PROPOSED DRAINAGE CONDITIONS

DESIGNED BY	KRC	SCALE	DATE	03/05/2021
DRAWN BY	VAP	(H) 1" = 500'	SHEET	2 OF 2
CHECKED BY		(V) 1" = N/A	JOB NO.	2550.00

619 N. Cascade Ave, Suite 200  
Colorado Springs, Colorado 80903  
(719) 785-0780  
(719) 785-0789 (Fax)



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