EPC STORMWATER REVIEW COMMENTS
IN ORANGE BOXES WITH BLACK TEXT

RED ROCK ACRES

FINAL DRAINAGE REPORT

Prepared for:

Challenger Homes
8605 Explorer Drive
Colorado Springs, CO 80920
(719) 598-5192

Prepared by:

2435 Research Parkway, Suite 300
Colorado Springs, CO 80920
(719) 575-0100
fax (719) 572-0208

October 2024

Project No. 24.1282.004

PCD # SF2513

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 County for drainage reports and said report is in conformity with the applicable 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.

_____ _____

Jesse Sullivan Date
Registered Professional Engineer
State of Colorado
No. 55600

Owner/Developer's Statement:
I, the owner/developer have read and will comply with all of the requirements specified in this drainage report and plan.

Challenger Homes
Business Name

By: _____ _____
Date

Title: _____

Address: 8605 Explorer Drive
Colorado Springs, CO 80920

El Paso County:

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

_____ _____

Joshua Palmer, P.E.
County Engineer / ECM Administrator Date
Conditions:

TABLE OF CONTENTS

I. INTRODUCTION

The Red Rock Acres site is comprised of approximately 14.82 acres of unplatted and undeveloped land. The site is bound by Monument Creek to the north, Rockbrook Road to the east, the Cloven Hoof Estates development to the south, and Red Rock Ranch Drive to the west. The site will be divided into 5 residential lots with a minimum area of 2.5 acres.

a. PURPOSE AND SCOPE OF STUDY

The purpose of this Final Drainage Report (FDR) is to evaluate the specific drainage infrastructure requirements which will provide compliance with the County Drainage Criteria Manual (DCM) and provide storm water conveyance for associated developments. This study will identify off-site, and on-site drainage patterns associated with respective land uses, provide hydrologic and hydraulic analysis of tributary basins, and identify effective, safe routing to the downstream outfall. No detention is required for this development because it will be large lot residential and increases in runoff resulting from the development will be minimal. Runoff from the proposed access drive will be treated for water quality by infiltration.

b. GENERAL PROJECT DESCRIPTION

The Red Rock Acres site is located southwest of Highway 105 between Rockbrook Drive and Red Rock Acres Drive. The site is located as follows:

1. General Location: Section 9, Township 11 South, Range 67 West of the 6th P.M. in the County of El Paso, State of Colorado.
2. Drainageway: The site is located on the northern edge of the Raspberry Mountain Drainage Basin. The site drains into Monument Creek which flows along the north boundary of the site.
3. Surrounding Developments: The site is bound by unplatted parcels to the north, the Merrick Subdivision to the east, the Cloven Hoof Subdivision to the south, and an unplatted parcel to the west.
4. Lots to be Platted: The site is to be subdivided into 5 large residential lots (2.5 acres or larger).
5. Area of Disturbance: The site development is expected to disturb a total area of approximately 0.94 acres.
6. Vegetation: The site contains natural vegetative land cover in the form of grasses and shrubs with sparse trees throughout.

Refer to Appendix D for the Vicinity Map.

c. SOILS CONDITIONS

Soils can be classified in four different hydrologic groups, A, B, C, or D to help predict stormwater runoff rates. Hydrologic group "A" is characterized by deep, well-drained coarse-grained soils with a rapid infiltration rate when thoroughly wet and having a low runoff potential. Group "D" typically has a clay layer at or near to the surface, or a very shallow depth to impervious bedrock and has a very slow infiltration rate and a high runoff potential. See Soils Map, Appendix A. The following soil types are present on the site:

Table 1 – NRCS Soil Survey for El Paso County – Red Rock Acres

Soil ID Number	***Soil***	***Hydrologic Classification***	***Drainage Class***
41	Kettle gravelly loamy sand, 8 to 40 percent slopes	B	Well Drained
92	Tomah-Crowfoot loamy sands, 3 to 8 percent slopes	B	Well Drained

d. DATA SOURCES

Topographical information for the district was found using a combination of ***United States Geological Survey*** (USGS) mapping as well as field surveying. The ***Web Soil Survey,*** created by the ***Natural Resources Conservation Service,*** was utilized to investigate the existing general soil types within the district. Offsite contours are taken from the ***2018 El Paso County LIDAR*** survey and/or USGS Quad Sheets.

e. APPLICABLE CRITERIA AND STANDARDS

This report has been prepared in accordance with the criteria set forth in the City of Colorado Springs and El Paso County DCM, El Paso County Engineering Criteria Manual (ECM) and El Paso County Resolutions 15-042 and 19-245. In addition to the DCM, the **Urban Storm Drainage Criteria Manuals, Volumes 1 through 3**, most recent versions, have been used to supplement the County's Criteria Manual.

II. Hydrologic Methodology

Please include reference to appropriate exemption from Appendix I of the ECM

a. MAJOR BASINS AND SUBBASINS

The site is in the Raspberry Mountain Drainage Fee Basin. Runoff presently flows north overland until reaching Monument Creek which flows along the north bound of the site. Detention is not required because development of these lots will alter the site discharge by a negligible amount and site disturbance will be less than one acre. The proposed shared private driveways will be treated for water quality by infiltration into a receiving pervious area downhill of the drive.

b. METHODOLOGY

i. UD Methods

The hydrology for basins less than 100 acres uses the **Rational Method** as recommended by the Drainage Criteria Manual (DCM) for the minor and major storms. The Rational Method uses the following equation: $Q=C*i*A$

Where:

Q = Maximum runoff rate in cubic feet per second (cfs)
C = Runoff coefficient
i = Average rainfall intensity (inches per hour)
A = Area of drainage sub-basin (acres)

Rational Method coefficients from 6-6 of the Drainage Criteria Manual for developed land were utilized in the Rational Method calculations. See Appendix B for more information.

Time of Concentration
The time of concentration consists of the initial time of overland flow and the travel time in a channel to the inlet or point of interest. A minimum time of concentrations of 5 minutes is utilized for urban areas. The Rational Calculation spreadsheet included in Appendix A shows an initial overland flow length, a channel or street flow length for each sub-basin, and also demonstrates the time of concentration calculations for initial (overland) and channel (or street) conditions. A maximum "True Initial" Flow Length of 300 feet will be used for pre-developed sub-basins and a maximum length of 100 feet will be used for Developed sub-basins for time of concentration calculations in compliance with the DCM.

Rainfall Intensity
The hypothetical rainfall depths for the 1-hour storm duration were derived using NOAA Atlas 14 Point Precipitation Frequency Estimates. See Appendix B.

Table 2 – Project Area 1-Hour Rainfall Depth

Storm Recurrence Interval	Rainfall Depth (inches)
5-year	1.19
100-year	2.51

Runoff Coefficients
Runoff coefficients for the Rational Method are based on anticipated land use and are taken from Tables 3-1 and 6-6 of the DCM. Anticipated single-family areas are considered under the single family – 2.5-acre lots category in table 3-1 with a percent imperviousness of 11%. When included areas which will be future open spaces or detention facilities are modeled under the Parks and Cemeteries category. Undeveloped or pre-development areas are model under Undeveloped Areas-Historic Flow Analysis—Greenbelts, Agriculture category.

III. Project Characteristics

a. BASIN LOCATION AND FLOWS

The site is located within the Raspberry Mountain Drainage Basin. In addition to the 14.82-acre site, there are off-site basins north of the site that contribute a total tributary area of 20.8 acres. The Red Rock Acres Road & Storm improvements are anticipated to disturb approximately 0.94 acres.

b. MAJOR DRAINAGEWAYS

Monument Creek
The site is located within the Raspberry Mountain Drainage Basin. Runoff generated by the site presently flows overland until reaching Monument Creek located within the site. Drainage from the developed site will flow overland to Monument Creek. Water quality is provided by infiltration.

c. LAND USES

The site will consist of 5 residential lots containing 2.5-acres or more (ranging from 2.56 to 3.3 acres.

IV. BASIN HYDROLOGY

a. The ***existing conditions*** for the site have been analyzed and are presented by design points. Runoff calculations can be found in Appendix A. Generally, all existing basins drain into Monument Creek flowing north from the proposed development and offsite areas. A delineation of the basin boundaries can be found in Appendix D. The existing design points are described below:

Design Point 1 (Q_5 = 2.2 cfs, Q_{100} = 9.9 cfs) (sub-basins: OS-A, OS B, & Lot 1; Area: 6.9 Ac.) (Slopes: 5 to 25%) This design point represents the total anticipated discharge to the Red Rock Ranch Drive ditch from the proposed Red Rock Acres development. Runoff from these basins will flow overland until reaching the road ditch where the concentrated flows will be conveyed downstream to Monument Creek via historic paths.

Please ensure these values are consistent with the table on the maps

Design Point 2 (Q_5 = 4.8 cfs, Q_{100} = 17.5 cfs) (sub-basins: OS-C; Area: 15.58 Ac.) (Slopes: 6 to 10%) This design point represents an offsite basin which is tributary to Lot 3 of the proposed development. Runoff in this basin sheet flows towards a low-lying area between houses in sub-basin OS-C where they are then conveyed towards lot 3 of the proposed development.

Please revise to include the final outfall

(Q_5 = 4.0 cfs, Q_{100} = 16.5 cfs) (sub-basin: DP 2, Lot 2, & Lot 3; Area: 21.7 Ac.) (Slopes: 5 to 10%) This point represents the discharge from the proposed development including Lots 2 & 3 combined with offsite runoff from sub-basin OS-C. Runoff in these basins will sheet flow towards low-lying areas which will then convey the flows northwards, eventually discharging into Monument Creek near the middle of the proposed development's northern boundary.

Design Point 4 (Q_5 = 2.2 cfs, Q_{100} = 12.2 cfs) (sub-basins: OS-D, OS-E, OS-F, Lot 4, & Lot 5; Area: 7.04 Ac.) (Slopes: 5 to 10%) This point represents the combined discharge from offsite sub-basins OS-D, OS-E, and OS-F combined with runoff from Lots 4 and 5 of the proposed development. The combined discharge will enter the Monument Creek drainageway near the northeast corner of the proposed development.

please include a discussion of the driveway culvert on Red Rock Ranch Rd and what size is required to be installed

b. The ***fully developed conditions*** for the site a

Design Point 1 (Q_5 = 2.6 cfs, Q_{100} = 10.5 cfs) (sub-basins: OS-A, OS B, & Lot 1; Area: 7.17 Ac.) (Slopes: 5 to 25%) This design point represents the total anticipated discharge to the Red Rock Ranch Drive ditch from the proposed Red Rock Acres development. Runoff from these basins will flow overland until reaching the road ditch where the concentrated flows will be conveyed downstream to Monument Creek via historic paths.

Design Point 2 (Q_5 = 4.8 cfs, Q_{100} = 17.5 cfs) (sub-basins: OS-C; Area: 15.58 Ac.) (Slopes: 6 to 10%) This design point represents an offsite basin which is tributary to Lot 3 of the proposed development. Runoff in this basin sheet flows towards a low-lying area between houses in sub-basin OS-C where they are then conveyed towards lot 3 of the proposed development.

Design Point 3 (Q_5 = 4.4 cfs, Q_{100} = 17.0 cfs) (sub-basin: DP 2, Lot 2, & Lot 3; Area: 21.54 Ac.) (Slopes: 5 to 10%) This point represents the discharge from the proposed development including Lots 2 & 3 combined with offsite runoff from sub-basin OS-C. Runoff in these basins will sheet

please include a statement about the capacity of the ditch and that it can handle the additional flow

Pre-treatment via RPAs is a requirement for City of Colorado Springs' projects, but not for projects in the County. In the County, we consider RPAs to be official PCMs (like a pond), meaning we need an O&M Manual and Maintenance Agreement for them. And then they must be entered into our post-construction program which means inspections at least once every 5-yrs. I don't think any of that voluntary formality (extra work) is desired by your client or EPC. Instead of removing everything related to RR in the report and plans, feel free to leave the RR calcs plans in your Drainage Report but in all the report text, calcs, and figures, add disclaimers that the RR is informal and not considered a PCM.

into Monument Creek near the middle of the proposed development's northern boundary.

Design Point 4 (Q_5 = 3.1 cfs, Q_{100} = 13.4 cfs) (sub-basins: OS-D, OS-E, OS-F, Lot 4, & Lot 5; Area: 7.04 Ac.) (Slopes: 5 to 10%) This point represents the combined discharge from offsite sub-basins OS-D, OS-E, and OS-F combined with run development. The combined discharge will enter t northeast corner of the proposed development.

PCM applicability form indicates water quality is not required because Exclusion E "Large Lot Single-Family Site" is used. Discuss water quality in this report, specifically why an ESQCP and PCM are not required and the exclusions used.

Because the development proposed will be disturbing less than an acre and because the anticipated increase in runoff associated with the proposed large residential lots is shown above to be negligible, no detention is proposed for this development. Water quality treatment for the proposed private drives will be provide by infiltration into the receiving pervious surfaces downhill from the driveway. The runoff reduction sheet is included in Appendix A.

V. Floodplains

Per the ***Flood Insurance Rate Map (FIRM) 08041CO257 G***, effective date December 7, 2018, published by the Federal Emergency Management Agency (FEMA), Monument Creek runs along the northern bound of the five lots and has designated 100-year floodway and floodplain which cover some of the lower lying parts of the five lots. Refer to the map in Appendix C.

VI. Fee Development

a. UNDEVELOPED PLATTABLE LAND

The site is located within the Raspberry Mountain Drainage Fee Basin and within previously unplatted land. The 2024 Drainage Basin Fees for the Beaver Creek Drainage Fee Basin are: $5,789/impervious acre for the Drainage Fee and $0.00/impervious acre for the Bridge Fee. Per the ***El Paso County Engineering Criteria Manual,*** Appendix L, Section 3.10.1a Fee Reductions for Low Density Lots, with the site being developed into 2.5 and 5-acre lots, drainage fees may be reduced by 25%.

Please update to 2025 fees

RED ROCK ACRES 2.5 ACRE LOTS

DRAINAGE LETTER

2024 Drainage and Bridge Fees

	Impervious Area (ac.)	Fee/Imp. Acre	Fee Due	Reimbursable Const. Costs	Drainage Fee Reduction	Fee Due at Platting	Drainage Fee Credit
RASPBERRY MOUNTAIN							
Drainage Fee	1.6302	$5,789.00	$9,437.23	$0.00	$2,359.31	$7,077.92	$0.00
TOTAL						$7,077.92	

Cost Estimate

No storm improvements are anticipated for this development.

VII. Summary

This report demonstrates that the proposed infrastructure associated with Red Rock Acres Filing No. 1 is in conformance with the El Paso County Drainage Criteria Manual, Volumes 1 and 2, October

2018. The negligible increase in flows associated with the proposed improvements should not adversely affect downstream or surrounding developments and water quality for the proposed private drive will be provided by infiltration.

VIII. References

1. ***El Paso County and City of Colorado Springs Drainage Criteria Manual, Volume 1 & 2***, El Paso County, May 2014
2. ***El Paso County Engineering Criteria Manual,*** El Paso County, Rev. December 2016
3. ***Web Soil Survey of El Paso County Area, Colorado. Unites States Department of Agriculture Soil Conservation Service***.
4. ***Flood Insurance Rate Maps for El Paso County, Colorado and Incorporated Areas, Panel 257 of 1275, Federal Emergency Management Agency***, Effective Date December 7, 2018.
5. ***Urban Storm Drainage Criteria Manual, Vol. 1-3*** by Urban Drainage and Flood Control District (UDFCD), January 2016

IX. Appendices

APPENDIX A

HYDROLOGIC AND HYDRAULIC CALCULATIONS

Rational Method - Existing Conditions

Project Name:	RED ROCK ACRES FILING NO. 1
Project Location:	EL PASO COUNTY
Designer	JTS
Notes:	EXISTING CONDITIONS

Average Channel Velocity 4.00 ft/s (If specific channel vel is used, this will be ignored)
Average Slope for Initial Flow 0.04 ft/ft (If Elevations are used, this will be ignored)

Channel Flow Type Key

Heavy Meadow	2
Tillage/Field	3
Short Pasture and Lawns	4
Nearly Bare Ground	5
Grassed Waterway	6
Paved Areas	7

		Area			Rational 'C' Values									Flow Lengths										Tc	Rainfall Intensity & Rational Flow Rate					
					20%			2%																							
					Residential (1 acre lots) (20% Impervious)			Undeveloped/Pervious Areas (2% Impervious)			Composite																					
Sub-basin	**Comments**			Soil Group									Percent Impervious	Initial	True Initial	Channel	True Channel	Average (decimal)	Initial	Average (%)	Channel Flow Type (See Key above)	Velocity	Channel	Total	i5	Q5	i100	Q100	**Sub-basin**
		sf	acres		C5	C100	Area (SF)	C5	C100	Area	C5	C100		ft	Length ft	ft	Length ft	Slope	Tc (min)	Slope	Ground Type	(ft/s)	Tc (min)	(min)	in/hr	cfs	in/hr	cfs	
EX-Lot 1		154628	3.55	B	0.20	0.44		0.09	0.36	154628	0.09	0.36	2.0%	250	250	752	752	0.05	17.04	8.0	2	0.70	17.84	34.87	2.26	**0.7**	3.78	**4.9**	***EX-Lot 1***
EX-Lot 2		122935	2.82	B	0.20	0.44		0.09	0.36	122935	0.09	0.36	2.0%	100	100	515	515	0.15	7.37	11.7	2	0.85	10.08	17.45	3.29	**0.8**	5.53	**5.7**	***EX-Lot 2***
EX-Lot 3		136645	3.14	B	0.20	0.44		0.09	0.36	136645	0.09	0.36	2.0%	300	300	617	617	0.33	9.82	7.6	2	0.69	14.92	24.73	2.77	**0.8**	4.65	**5.3**	***EX-Lot 3***
EX-Lot 4		122395	2.81	B	0.20	0.44		0.09	0.36	122395	0.09	0.36	2.0%	300	300	538	538	0.33	9.82	11.2	2	0.83	10.77	20.58	3.05	**0.8**	5.11	**5.2**	***EX-Lot 4***
EX-Lot 5		115379	2.65	B	0.20	0.44		0.09	0.36	115379	0.09	0.36	2.0%	100	100	405	405	0.33	5.67	15.3	2	0.98	6.90	12.57	3.79	**0.9**	6.36	**6.1**	***EX-Lot 5***
OS-A		41455	0.95	B	0.20	0.44	41455	0.09	0.36		0.20	0.44	20.0%	100	100	226	226	0.16	6.43	16.0	2	1.00	3.77	10.19	4.10	**0.8**	6.89	**2.9**	***OS-A***
OS-B		116392	2.67	B	0.20	0.44	116392	0.09	0.36		0.20	0.44	20.0%	100	100	700	700	0.10	7.52	10.0	2	0.79	14.76	22.27	2.93	**1.6**	4.91	**5.8**	***OS-B***
OS-C		678754	15.58	B	0.20	0.44	678754	0.09	0.36		0.20	0.44	20.0%	100	100	1825	1825	0.10	7.52	6.0	2	0.61	49.67	57.18	1.51	**4.8**	2.54	**17.5**	***OS-C***
OS-D		39247	0.90	B	0.20	0.44	39247	0.09	0.36		0.20	0.44	20.0%	100	100	244	244	0.10	7.52	6.1	2	0.62	6.59	14.10	3.61	**0.7**	6.07	**2.4**	***OS-D***
OS-E		8300	0.19	B	0.20	0.44	8300	0.09	0.36		0.20	0.44	20.0%	50	50	266	266	0.05	6.70	3.4	2	0.45	9.76	16.46	3.38	**0.1**	5.68	**0.5**	***OS-E***
OS-F		21370	0.49	B	0.20	0.44	21370	0.09	0.36		0.20	0.44	20.0%	100	100	382	382	0.05	9.47	33.0	2	1.25	5.09	14.56	3.57	**0.4**	5.99	**1.3**	***OS-F***
DESIGN POINTS	***Sub-basins***																													***DESIGN POINTS***
1	***OS A, OS B & Lot 1***	312475	7.17	B	0.20	0.44	157847	0.09	0.36	154628	0.15	0.40	11.1%	100	100	1201	1201	0.16	6.82	5.8	2	0.60	33.25	40.06	2.05	**2.2**	3.44	**9.9**	***1***
2	***OS C***	678754	15.58	B	0.20	0.44	678754	0.09	0.36	0	0.20	0.44	20.0%	100	100	1825	1825	0.10	7.52	6.0	2	0.61	49.67	57.18	1.51	**4.8**	2.54	**17.5**	***2***
3	***DP 2, Lot 2 & Lot 3***	938334	21.54	B	0.20	0.44	678754	0.09	0.36	259580	0.17	0.42	15.0%	100	100	2442	2442	0.10	7.77	5.7	2	0.60	68.19	75.96	1.09	**4.0**	1.82	**16.5**	***3***
4	***OS D, OS E, OS F, Lot 4, & Lot 5***	306691	7.04	B	0.20	0.44	68917	0.09	0.36	237774	0.11	0.38	6.0%	100	100	782	782	0.10	8.23	9.1	2	0.75	17.38	25.60	2.72	**2.2**	4.56	**12.2**	***4***

Rational Method - Proposed Conditions

Project Name:	RED ROCK ACRES FILING NO. 1
Project Location:	EL PASO COUNTY
Designer	JTS
Notes:	PROPOSED CONDITIONS

Average Channel Velocity	4.00	ft/s	(If specific channel vel is used, this will be ignored)
Average Slope for Initial Flow	0.04	ft/ft	(If Elevations are used, this will be ignored)

Channel Flow Type Key

Heavy Meadow	2
Tillage/Field	3
Short Pasture and Lawns	4
Nearly Bare Ground	5
Grassed Waterway	6
Paved Areas	7

		Area			Rational 'C' Values (20% / 11%)									Flow Lengths										Tc	Rainfall Intensity & Rational Flow Rate				
Sub-basin	**Comments**			Soil Group	Residential (1 acre lots) (20% Impervious)			Residential (2.5 acres or more) (11% Impervious)			Composite		Percent Impervious	Initial	True Initial	Channel	True Channel	Average (decimal)	Initial	Average (%)	Channel Flow Type (See Key above)	Velocity	Channel	Total	i5	Q5	i100	Q100	**Sub-basin**
		sf	acres		C5	C100		C5	C100	Area (SF)	C5	C100		ft	Length ft	ft	Length ft	Slope	Tc (min)	Slope	Ground Type	(ft/s)	Tc (min)	(min)	in/hr	cfs	in/hr	cfs	
PR LOT 1		154628	3.55	B	0.20	0.44		0.15	0.40	154628	0.15	0.40	11.0%	250	250	752	752	0.05	16.03	8.0	2	0.70	17.84	33.86	2.30	**1.2**	3.86	**5.5**	***PR LOT 1***
PR LOT 2		122935	2.82	B	0.20	0.44		0.15	0.40	122935	0.15	0.40	11.0%	100	100	515	515	0.15	6.93	11.7	2	0.85	10.08	17.01	3.33	**1.4**	5.59	**6.4**	***PR LOT 2***
PR LOT 3		136645	3.14	B	0.20	0.44		0.15	0.40	136645	0.15	0.40	11.0%	300	300	617	617	0.33	9.23	7.6	2	0.69	14.92	24.15	2.81	**1.3**	4.71	**6.0**	***PR LOT 3***
PR LOT 4		122395	2.81	B	0.20	0.44		0.15	0.40	122395	0.15	0.40	11.0%	300	300	538	538	0.33	9.23	11.2	2	0.83	10.77	19.99	3.09	**1.3**	5.19	**5.9**	***PR LOT 4***
PR LOT 5		115379	2.65	B	0.20	0.44		0.15	0.40	115379	0.15	0.40	11.0%	100	100	405	405	0.33	5.33	15.3	2	0.98	6.90	12.23	3.83	**1.5**	6.43	**6.9**	***PR LOT 5***
OS-A		41455	0.95	B	0.20	0.44	41455	0.15	0.40		0.20	0.44	20.0%	100	100	226	226	0.16	6.43	16.0	2	1.00	3.77	10.19	4.10	**0.8**	6.89	**2.9**	***OS-A***
OS-B		116392	2.67	B	0.20	0.44	116392	0.15	0.40		0.20	0.44	20.0%	100	100	700	700	0.10	7.52	10.0	2	0.79	14.76	22.27	2.93	**1.6**	4.91	**5.8**	***OS-B***
OS-C		678754	15.58	B	0.20	0.44	678754	0.15	0.40		0.20	0.44	20.0%	100	100	1825	1825	0.10	7.52	6.0	2	0.61	49.67	57.18	1.51	**4.8**	2.54	**17.5**	***OS-C***
OS-D		39247	0.90	B	0.20	0.44	39247	0.15	0.40		0.20	0.44	20.0%	100	100	244	244	0.10	7.52	6.1	2	0.62	6.59	14.10	3.61	**0.7**	6.07	**2.4**	***OS-D***
OS-E		8300	0.19	B	0.20	0.44	8300	0.15	0.40		0.20	0.44	20.0%	50	50	266	266	0.05	6.70	3.4	2	0.45	9.76	16.46	3.38	**0.1**	5.68	**0.5**	***OS-E***
OS-F		21370	0.49	B	0.20	0.44	21370	0.15	0.40		0.20	0.44	20.0%	100	100	382	382	0.05	9.47	33.0	2	1.25	5.09	14.56	3.57	**0.4**	5.99	**1.3**	***OS-F***
DESIGN POINTS	***Sub-basins***																												***DESIGN POINTS***
1	***OS A, OS B & Lot 1***	312475	7.17	B	0.20	0.44	157847	0.15	0.40	154628	0.18	0.42	15.5%	100	100	1201	1201	0.16	6.61	5.8	2	0.60	33.25	39.85	2.06	**2.6**	3.45	**10.5**	***1***
2	***OS C***	678754	15.58	B	0.20	0.44	678754	0.15	0.40	0	0.20	0.44	20.0%	100	100	1825	1825	0.10	7.52	6.0	2	0.61	49.67	57.18	1.51	**4.8**	2.54	**17.5**	***2***
3	***DP 2, Lot 2 & Lot 3***	938334	21.54	B	0.20	0.44	678754	0.15	0.40	259580	0.19	0.43	86.70	100	100	2442	2442	0.10	7.63	5.7	2	0.60	68.19	75.82	1.09	**4.4**	1.83	**17.0**	***3***
4	***OS D, OS E, OS F, Lot 4, & Lot 5***	306691	7.04	B	0.20	0.44	68917	0.15	0.40	237774	0.16	0.41	71.74	100	100	782	782	0.10	7.84	9.1	2	0.75	17.38	25.22	2.74	**3.1**	4.60	**13.4**	***4***

Use MHFD's most current spreadsheet "SCM Design" in future county projects. This version is okay for this project since the runoff reduction is not an official PCM.

Design Procedure Form: Runoff Reduction

UD-BMP (Version 3.07, March 2018)

Designer:	**JTS**
Company:	**MATRIX DESIGN GROUP**
Date:	**October 24, 2024**
Project:	**RED ROCK ACRES FILING NO. 1**
Location:	**EL PASO COUNTY, COLORADO**

SITE INFORMATION (User Input in Blue Cells)

WQCV Rainfall Depth	0.60	inches
Depth of Average Runoff Producing Storm, d_6 =	0.43	inches (for Watersheds Outside of the Denver Region, Figure

Area Type	UIA:RPA	UIA:RPA	UIA:RPA				
Area ID	DRV WEST A	DRV WEST B	DRV EAST				
Downstream Design Point ID	Monument CRK	Monument CRK	Monument CRK				
Downstream BMP Type	RP						
DCIA (ft^2)	--	--	--				
UIA (ft^2)	6,829	5,804	4,013				
RPA (ft^2)	8,787	4,531	11,300				
SPA (ft^2)	--	--	--				
HSG A (%)	0%	0%	0%				
HSG B (%)	100%	100%	100%				
HSG C/D (%)	0%	0%	0%				
Average Slope of RPA (ft/ft)	0.023	0.015	0.157				
UIA:RPA Interface Width (ft)	700.00	430.00	55.00				

CALCULATED RUNOFF RESULTS

Area ID	DRV WEST A	DRV WEST B	DRV EAST				
UIA:RPA Area (ft^2)	15,616	10,335	15,313				
L / W Ratio	0.06	0.06	5.06				
UIA / Area	0.4373	0.5616	0.2621				
Runoff (in)	0.00	0.00	0.00				
Runoff (ft^3)	0	0	0				
Runoff Reduction (ft^3)	285	242	167				

CALCULATED WQCV RESULTS

Area ID	DRV WEST A	DRV WEST B	DRV EAST				
WQCV (ft^3)	228						
WQCV Reduction (ft^3)	285						
WQCV Reduction (%)	125%						
Untreated WQCV (ft^3)	-57						

CALCULATED DESIGN POINT RESULTS (sums results from all columns with the same Downstream Design Point ID)

Downstream Design Point ID	Monument CRK						
DCIA (ft^2)	0						
UIA (ft^2)	16,646						
RPA (ft^2)	24,618						
SPA (ft^2)	0						
Total Area (ft^2)	41,264						
Total Impervious Area (ft^2)	16,646						
WQCV (ft^3)	228						
WQCV Reduction (ft^3)	285						
WQCV Reduction (%)	125%						
Untreated WQCV (ft^3)	-57						

CALCULATED SITE RESULTS (sums results from all columns in worksheet)

Total Area (ft^2)	41,264
Total Impervious Area (ft^2)	16,646
WQCV (ft^3)	228
WQCV Reduction (ft^3)	285
WQCV Reduction (%)	125%
Untreated WQCV (ft^3)	-57

APPENDIX B

STANDARD DESIGN CHARTS AND TABLES

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
Business													
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
Residential													
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
Industrial													
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
Parks and Cemeteries	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
Undeveloped Areas													
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
Streets													
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
Drive and Walks	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

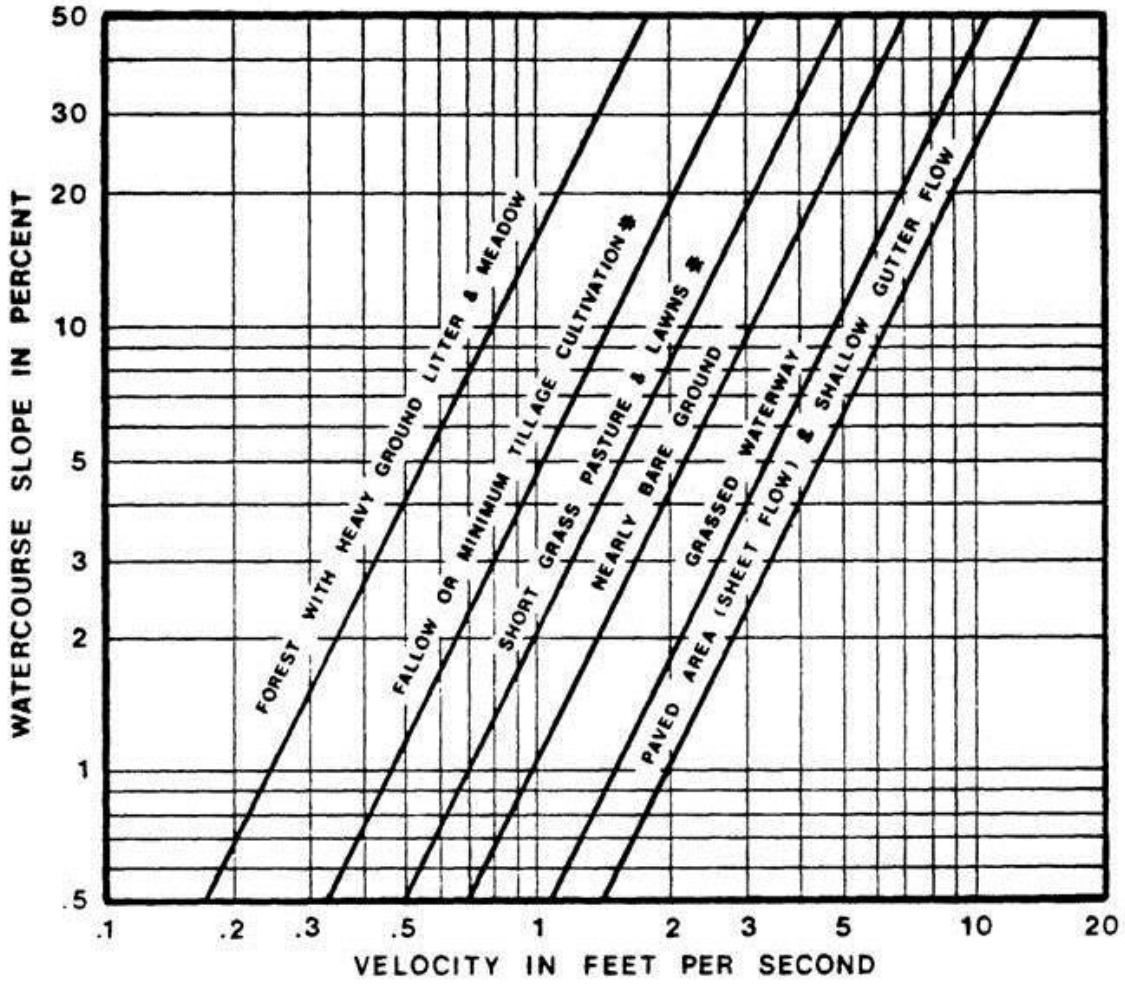
3.2 Time of Concentration

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.

Type of Development	Percent Impervious
Commercial	95%
Industrial	85%
Multi-Family	65%
Single Family - 0.1377 acre lots (6,000 SF)	53%
Single-Family - 0.20 acre lots	43%
Single-Family - 0.25 acre lots	40%
Single-Family - 0.33 acre lots	30%
Single-Family - 0.5 acre lots	25%
Single-Family - 1.0 acre lots	20%
Single-Family - 2.5 acre lots	11%
Single-Family - 5 acre lots	7%

Figure 6-25. Estimate of Average Concentrated Shallow Flow



Please update to 2025 fees and resolution 24-436

El Paso County Drainage Basin Fees

Resolution No. 23-400

Basin Number	Receiving Waters	Year Studied	Drainage Basin Name	2024 Drainage Fee (per Impervious Acre)	2024 Bridge Fee (per Impervious Acre)
Drainage Basins with DBPS's:					
CHMS0200	Chico Creek	2013	Haegler Ranch	$13,971	$2,062
CHWS1200	Chico Creek	2001	Bennett Ranch	$15,641	$6,000
CHWS1400	Chico Creek	2013	Falcon	$40,088	$5,507
FOFO2000	Fountain Creek	2001	West Fork Jimmy Camp Creek	$17,003	$5,031
FOFO2600	Fountain Creek	1991*	Big Johnson / Crews Gulch	$24,832	$3,207
FOFO2800	Fountain Creek	1988*	Widefield	$24,832	$0
FOFO2900	Fountain Creek	1988*	Security	$24,832	$0
FOFO3000	Fountain Creek	1991*	Windmill Gulch	$24,832	$372
FOFO3100 / FOFO3200	Fountain Creek	1988*	Carson Street / Little Johnson	$15,147	$0
FOFO3400	Fountain Creek	1984*	Peterson Field	$17,911	$1,358
FOFO3600	Fountain Creek	1991*	Fisher's Canyon	$24,832	$0
FOFO4000	Fountain Creek	1996	Sand Creek	$25,632	$10,484
FOFO4200	Fountain Creek	1977	Spring Creek	$12,879	$0
FOFO4600	Fountain Creek	1984*	Southwest Area	$24,832	$0
FOFO4800	Fountain Creek	1991	Bear Creek	$24,832	$1,358
FOFO5800	Fountain Creek	1964	Camp Creek	$2,752	$0
FOMO1000	Monument Creek	1981	Douglas Creek	$15,617	$345
FOMO1200	Monument Creek	1977	Templeton Gap	$16,032	$372
FOMO2000	Monument Creek	1971	Pulpit Rock	$8,234	$0
FOMO2200	Monument Creek	1994	Cottonwood Creek / S. Pine	$24,832	$1,358
FOMO2400	Monument Creek	1966	Dry Creek	$19,603	$710
FOMO3600	Monument Creek	1989*	Black Squirrel Creek	$11,275	$710
FOMO3700	Monument Creek	1987*	Middle Tributary	$20,722	$0
FOMO3800	Monument Creek	1987*	Monument Branch	$24,832	$0
FOMO4000	Monument Creek	1996	Smith Creek	$10,124	$1,358
FOMO4200	Monument Creek	1989*	Black Forest	$24,832	$676
FOMO5200	Monument Creek	1993*	Dirty Woman Creek	$24,832	$1,358
FOMO5300	Fountain Creek	1993*	Crystal Creek	$24,832	$1,358
Miscellaneous Drainage Basins: [1]					
CHBS0800	Chico Creek		Book Ranch	$23,300	$3,373
CHEC0400	Chico Creek		Upper East Chico	$12,694	$368
CHWS0200	Chico Creek		Telephone Exchange	$13,947	$327
CHWS0400	Chico Creek		Livestock Company	$22,973	$273
CHWS0600	Chico Creek		West Squirrel	$11,975	$4,970
CHWS0800	Chico Creek		Solberg Ranch	$24,832	$0
FOFO1200	Fountain Creek		Crooked Canyon	$7,497	$0
FOFO1400	Fountain Creek		Calhan Reservoir	$6,259	$365
FOFO1600	Fountain Creek		Sand Canyon	$4,522	$0
FOFO2000	Fountain Creek		Jimmy Camp Creek	$24,832	$1,161
FOFO2200	Fountain Creek		Fort Carson	$19,603	$710
FOFO2700	Fountain Creek		West Little Johnson	$1,636	$0
FOFO3800	Fountain Creek		Stratton	$11,911	$533
FOFO5000	Fountain Creek		Midland	$19,603	$710
FOFO6000	Fountain Creek		Palmer Trail	$19,603	$710
FOFO6800	Fountain Creek		Black Canyon	$19,603	$710
FOMO4600	Monument Creek		Beaver Creek	$14,846	$0
FOMO3000	Monument Creek		Kettle Creek	$13,410	$0
FOMO3400	Monument Creek		Elkhorn	$2,253	$0
FOMO5000	Monument Creek		Monument Rock	$10,763	$0
FOMO5400	Monument Creek		Palmer Lake	$17,210	$0
FOMO5600	Monument Creek		Raspberry Mountain	$5,789	$0
PLPL0200	Monument Creek		Bald Mountain	$12,337	$0
Interim Drainage Basins: [2]					
FOFO1800	Fountain Creek		Little Fountain Creek	$3,175	$0
FOMO4400	Monument Creek		Jackson Creek	$9,829	$0
FOMO4800	Monument Creek		Teachout Creek	$6,825	$1,026

1. The miscellaneous drainage fee previous to September 1999 resolution was the average of all drainage fees for basins with Basin Planning Studies performed within the last 14 years.

2. Interim Drainage Fees are based upon draft Drainage Basin Planning Studies or the Drainage Basin Identification and Fee Estimation Report. (Best available information suitable for setting a fee.)

EPC Stormwater Management

Joshua Palmer, P.E.

APPENDIX C

REPORT REFERENCES

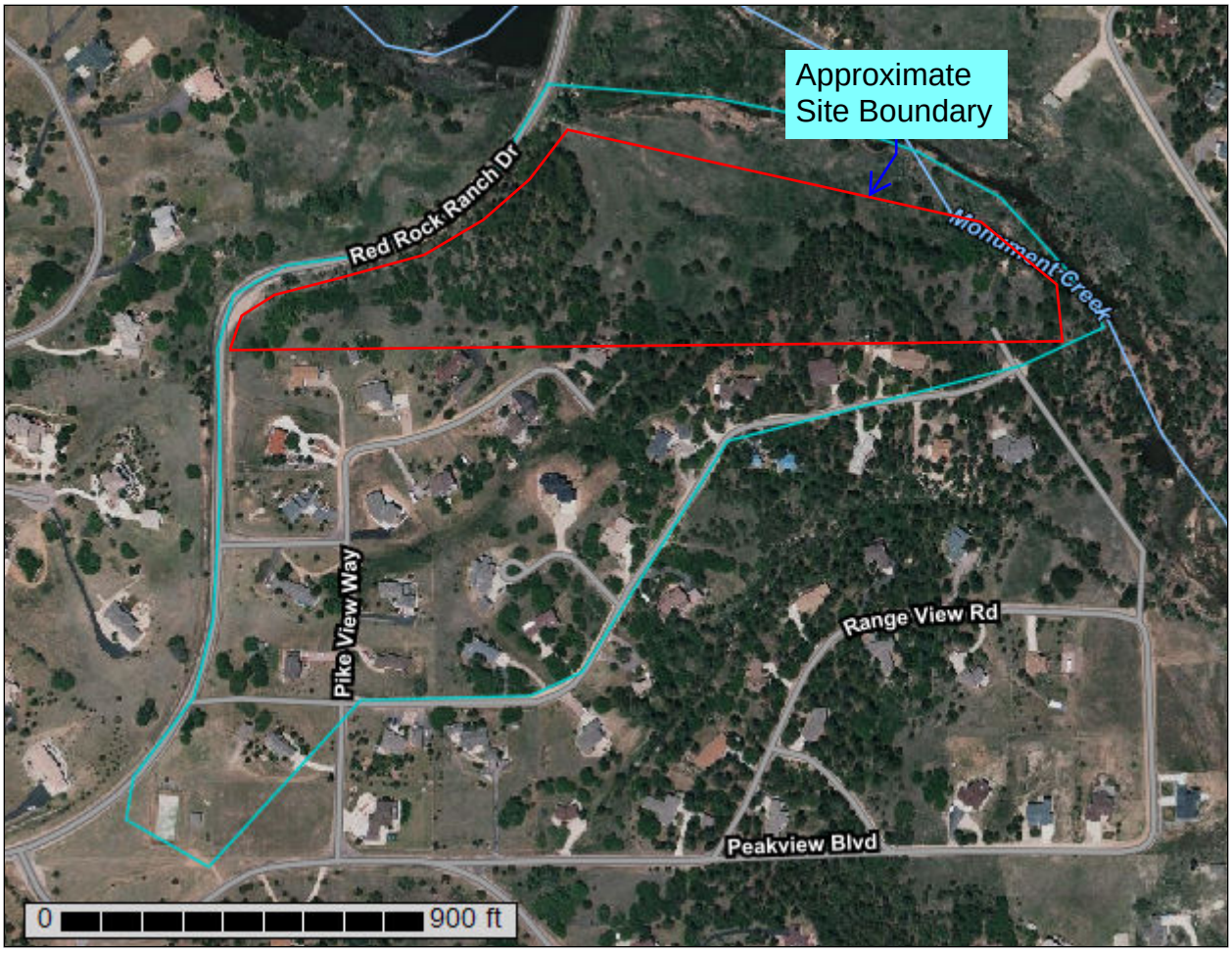
United States Department of Agriculture

NRCS

Natural Resources Conservation Service

A product of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local participants

Custom Soil Resource Report for El Paso County Area, Colorado



September 26, 2024

Preface

Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (http://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/health/) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (https://offices.sc.egov.usda.gov/locator/app?agency=nrcs) or your NRCS State Soil Scientist (http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/contactus/?cid=nrcs142p2_053951).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Web Soil Survey, the site for official soil survey information.

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Contents

How Soil Surveys Are Made

Soil surveys are made to provide information about the soils and miscellaneous areas in a specific area. They include a description of the soils and miscellaneous areas and their location on the landscape and tables that show soil properties and limitations affecting various uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They observed and described many soil profiles. A soil profile is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed or from the surface down to bedrock. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

Currently, soils are mapped according to the boundaries of major land resource areas (MLRAs). MLRAs are geographically associated land resource units that share common characteristics related to physiography, geology, climate, water resources, soils, biological resources, and land uses (USDA, 2006). Soil survey areas typically consist of parts of one or more MLRA.

The soils and miscellaneous areas in a survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept, or model, of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil

scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

The objective of soil mapping is not to delineate pure map unit components; the objective is to separate the landscape into landforms or landform segments that have similar use and management requirements. Each map unit is defined by a unique combination of soil components and/or miscellaneous areas in predictable proportions. Some components may be highly contrasting to the other components of the map unit. The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The delineation of such landforms and landform segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

Soil scientists make many field observations in the process of producing a soil map. The frequency of observation is dependent upon several factors, including scale of mapping, intensity of mapping, design of map units, complexity of the landscape, and experience of the soil scientist. Observations are made to test and refine the soil-landscape model and predictions and to verify the classification of the soils at specific locations. Once the soil-landscape model is refined, a significantly smaller number of measurements of individual soil properties are made and recorded. These measurements may include field measurements, such as those for color, depth to bedrock, and texture, and laboratory measurements, such as those for content of sand, silt, clay, salt, and other components. Properties of each soil typically vary from one point to another across the landscape.

Observations for map unit components are aggregated to develop ranges of characteristics for the components. The aggregated values are presented. Direct measurements do not exist for every property presented for every map unit component. Values for some properties are estimated from combinations of other properties.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and

identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.

Custom Soil Resource Report
Soil Map

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background
- Aerial Photography

MAP INFORMATION

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

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

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 21, Aug 24, 2023

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

Date(s) aerial images were photographed: Jun 9, 2021—Jun 12, 2021

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
41	Kettle gravelly loamy sand, 8 to 40 percent slopes	23.3	47.2%
92	Tomah-Crowfoot loamy sands, 3 to 8 percent slopes	26.1	52.8%
Totals for Area of Interest		**49.4**	**100.0%**

Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however,

onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

El Paso County Area, Colorado

41—Kettle gravelly loamy sand, 8 to 40 percent slopes

Map Unit Setting

National map unit symbol: 368h
Elevation: 7,000 to 7,700 feet
Farmland classification: Not prime farmland

Map Unit Composition

Kettle and similar soils: 85 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Kettle

Setting

Landform: Hills
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Sandy alluvium derived from arkose

Typical profile

E - 0 to 16 inches: gravelly loamy sand
Bt - 16 to 40 inches: gravelly sandy loam
C - 40 to 60 inches: extremely gravelly loamy sand

Properties and qualities

Slope: 8 to 40 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Somewhat excessively drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): High (2.00 to 6.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Low (about 3.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7e
Hydrologic Soil Group: B
Ecological site: F048AY908CO - Mixed Conifer
Hydric soil rating: No

Minor Components

Other soils

Percent of map unit:
Hydric soil rating: No

Pleasant

Percent of map unit:
Landform: Depressions
Hydric soil rating: Yes

92—Tomah-Crowfoot loamy sands, 3 to 8 percent slopes

Map Unit Setting

National map unit symbol: 36b9
Elevation: 7,300 to 7,600 feet
Farmland classification: Not prime farmland

Map Unit Composition

Tomah and similar soils: 50 percent
Crowfoot and similar soils: 30 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Tomah

Setting

Landform: Hills, alluvial fans
Landform position (three-dimensional): Crest, side slope
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium derived from arkose and/or residuum weathered from arkose

Typical profile

A - 0 to 10 inches: loamy sand
E - 10 to 22 inches: coarse sand
Bt - 22 to 48 inches: stratified coarse sand to sandy clay loam
C - 48 to 60 inches: coarse sand

Properties and qualities

Slope: 3 to 8 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 2.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Low (about 4.6 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: B
Ecological site: R049XY216CO - Sandy Divide
Hydric soil rating: No

Description of Crowfoot

Setting

Landform: Alluvial fans, hills
Landform position (three-dimensional): Crest, side slope
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium

Typical profile

A - 0 to 12 inches: loamy sand
E - 12 to 23 inches: sand
Bt - 23 to 36 inches: sandy clay loam
C - 36 to 60 inches: coarse sand

Properties and qualities

Slope: 3 to 8 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 2.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Low (about 4.7 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: B
Ecological site: R049XY216CO - Sandy Divide
Hydric soil rating: No

Minor Components

Other soils

Percent of map unit:
Hydric soil rating: No

Pleasant

Percent of map unit:
Landform: Depressions
Hydric soil rating: Yes

Soil Information for All Uses

Soil Properties and Qualities

The Soil Properties and Qualities section includes various soil properties and qualities displayed as thematic maps with a summary table for the soil map units in the selected area of interest. A single value or rating for each map unit is generated by aggregating the interpretive ratings of individual map unit components. This aggregation process is defined for each property or quality.

Soil Qualities and Features

Soil qualities are behavior and performance attributes that are not directly measured, but are inferred from observations of dynamic conditions and from soil properties. Example soil qualities include natural drainage, and frost action. Soil features are attributes that are not directly part of the soil. Example soil features include slope and depth to restrictive layer. These features can greatly impact the use and management of the soil.

Hydrologic Soil Group

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

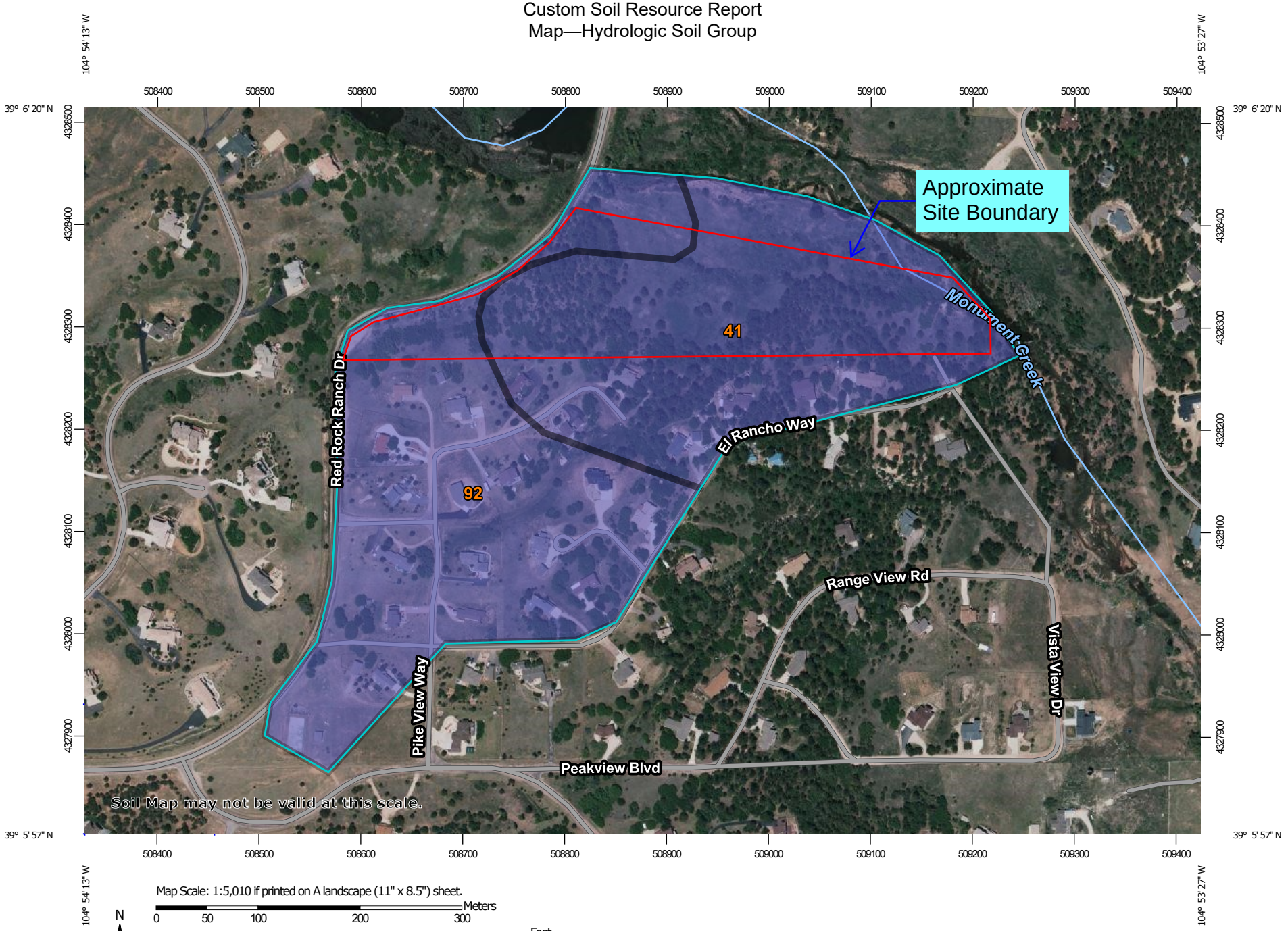
Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.


104° 54' 13" W
104° 53' 27" W
508400
508500
508600
508700
508800
508900
509000
509100
509200
509300
509400
39° 6' 20" N
39° 5' 57" N
4328500
4328400
4328300
4328200
4328100
4328000
4327900
Approximate Site Boundary
41
92
Red Rock Ranch Dr
El Rancho Way
Monument Creek
Range View Rd
Vista View Dr
Pike View Way
Peakview Blvd
Soil Map may not be valid at this scale.
Map Scale: 1:5,010 if printed on A landscape (11" x 8.5") sheet.
N
Meters
0 50 100 200 300
Feet
0 200 400 800 1200
Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 13N WGS84

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils

Soil Rating Polygons
- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Lines
- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Points
- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background
- Aerial Photography

MAP INFORMATION

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

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

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 21, Aug 24, 2023

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

Date(s) aerial images were photographed: Jun 9, 2021—Jun 12, 2021

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.

Table—Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
41	Kettle gravelly loamy sand, 8 to 40 percent slopes	B	23.3	47.2%
92	Tomah-Crowfoot loamy sands, 3 to 8 percent slopes	B	26.1	52.8%
Totals for Area of Interest			**49.4**	**100.0%**

Rating Options—Hydrologic Soil Group

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

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NOAA Atlas 14, Volume 8, Version 2
Location name: Palmer Lake, Colorado, USA*
Latitude: 39.108°, Longitude: -104.8943°
Elevation: 7040 ft**
* source: ESRI Maps
** source: USGS

POINT PRECIPITATION FREQUENCY ESTIMATES

Sanja Perica, Deborah Martin, Sandra Pavlovic, Ishani Roy, Michael St. Laurent, Carl Trypaluk, Dale Unruh, Michael Yekta, Geoffery Bonnin

NOAA, National Weather Service, Silver Spring, Maryland

PF_tabular | PF_graphical | Maps_&_aerials

PF tabular

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

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	0.246 (0.202-0.298)	0.318 (0.260-0.386)	0.438 (0.357-0.532)	0.539 (0.437-0.657)	0.680 (0.532-0.853)	0.792 (0.604-1.00)	0.905 (0.667-1.16)	1.02 (0.721-1.34)	1.18 (0.800-1.58)	1.30 (0.859-1.76)
10-min	0.360 (0.295-0.437)	0.466 (0.381-0.565)	0.641 (0.523-0.779)	0.789 (0.639-0.961)	0.996 (0.779-1.25)	1.16 (0.885-1.47)	1.32 (0.977-1.71)	1.50 (1.06-1.96)	1.73 (1.17-2.31)	1.90 (1.26-2.58)
15-min	0.440 (0.360-0.533)	0.568 (0.465-0.689)	0.782 (0.637-0.950)	0.962 (0.780-1.17)	1.22 (0.950-1.52)	1.41 (1.08-1.79)	1.62 (1.19-2.08)	1.82 (1.29-2.40)	2.11 (1.43-2.82)	2.32 (1.53-3.14)
30-min	0.566 (0.464-0.686)	0.734 (0.601-0.890)	1.01 (0.825-1.23)	1.25 (1.01-1.52)	1.58 (1.23-1.97)	1.83 (1.40-2.32)	2.09 (1.54-2.69)	2.36 (1.67-3.10)	2.72 (1.84-3.65)	3.00 (1.98-4.06)
60-min	0.716 (0.586-0.867)	0.890 (0.728-1.08)	1.19 (0.971-1.45)	1.46 (1.18-1.78)	1.85 (1.46-2.34)	2.17 (1.67-2.77)	2.51 (1.86-3.26)	2.88 (2.04-3.80)	3.38 (2.30-4.55)	3.78 (2.50-5.12)
2-hr	0.865 (0.713-1.04)	1.04 (0.860-1.26)	1.37 (1.12-1.65)	1.67 (1.36-2.02)	2.13 (1.70-2.69)	2.52 (1.95-3.19)	2.94 (2.19-3.79)	3.39 (2.42-4.46)	4.04 (2.77-5.42)	4.57 (3.04-6.15)
3-hr	0.980 (0.811-1.17)	1.15 (0.949-1.37)	1.47 (1.21-1.76)	1.78 (1.46-2.14)	2.28 (1.84-2.88)	2.71 (2.12-3.45)	3.19 (2.40-4.13)	3.73 (2.68-4.91)	4.51 (3.11-6.04)	5.15 (3.44-6.90)
6-hr	1.20 (1.00-1.42)	1.39 (1.16-1.65)	1.76 (1.46-2.09)	2.12 (1.75-2.53)	2.71 (2.20-3.41)	3.23 (2.54-4.08)	3.82 (2.89-4.90)	4.47 (3.24-5.85)	5.42 (3.78-7.23)	6.22 (4.18-8.28)
12-hr	1.46 (1.23-1.72)	1.73 (1.45-2.03)	2.23 (1.86-2.62)	2.69 (2.23-3.18)	3.41 (2.77-4.22)	4.02 (3.17-5.00)	4.69 (3.57-5.94)	5.42 (3.95-7.01)	6.48 (4.53-8.55)	7.34 (4.96-9.71)
24-hr	1.78 (1.50-2.06)	2.11 (1.78-2.46)	2.72 (2.28-3.16)	3.26 (2.72-3.81)	4.08 (3.32-4.97)	4.76 (3.78-5.85)	5.50 (4.20-6.88)	6.29 (4.60-8.04)	7.41 (5.20-9.68)	8.31 (5.66-10.9)
2-day	2.12 (1.80-2.44)	2.47 (2.10-2.84)	3.10 (2.62-3.58)	3.68 (3.09-4.26)	4.54 (3.72-5.48)	5.27 (4.20-6.41)	6.04 (4.65-7.50)	6.88 (5.07-8.74)	8.07 (5.71-10.5)	9.03 (6.19-11.8)
3-day	2.29 (1.95-2.62)	2.68 (2.28-3.07)	3.36 (2.86-3.86)	3.98 (3.36-4.58)	4.89 (4.02-5.86)	5.65 (4.52-6.83)	6.45 (4.98-7.96)	7.32 (5.41-9.24)	8.53 (6.05-11.0)	9.51 (6.54-12.4)
4-day	2.43 (2.08-2.76)	2.84 (2.43-3.24)	3.57 (3.04-4.08)	4.21 (3.57-4.83)	5.16 (4.25-6.16)	5.95 (4.77-7.16)	6.78 (5.24-8.33)	7.66 (5.68-9.64)	8.90 (6.33-11.5)	9.90 (6.83-12.8)
7-day	2.82 (2.42-3.18)	3.26 (2.80-3.68)	4.03 (3.45-4.57)	4.71 (4.01-5.37)	5.73 (4.75-6.79)	6.58 (5.30-7.86)	7.47 (5.81-9.12)	8.43 (6.28-10.5)	9.77 (6.99-12.5)	10.8 (7.52-14.0)
10-day	3.18 (2.74-3.58)	3.64 (3.14-4.10)	4.46 (3.83-5.03)	5.19 (4.43-5.88)	6.27 (5.21-7.38)	7.16 (5.80-8.52)	8.11 (6.33-9.86)	9.13 (6.82-11.4)	10.6 (7.58-13.5)	11.7 (8.14-15.0)
20-day	4.19 (3.65-4.67)	4.80 (4.17-5.36)	5.84 (5.05-6.53)	6.74 (5.80-7.56)	8.03 (6.70-9.32)	9.07 (7.38-10.7)	10.2 (7.97-12.2)	11.3 (8.48-13.9)	12.9 (9.28-16.2)	14.1 (9.88-18.0)
30-day	5.02 (4.38-5.56)	5.76 (5.02-6.39)	6.99 (6.08-7.77)	8.03 (6.94-8.96)	9.48 (7.92-10.9)	10.6 (8.66-12.4)	11.8 (9.27-14.0)	13.0 (9.78-15.9)	14.6 (10.6-18.3)	15.8 (11.1-20.1)
45-day	6.05 (5.31-6.67)	6.95 (6.09-7.66)	8.40 (7.33-9.29)	9.59 (8.32-10.6)	11.2 (9.38-12.8)	12.5 (10.2-14.4)	13.7 (10.8-16.2)	14.9 (11.3-18.1)	16.5 (12.0-20.6)	17.7 (12.5-22.4)
60-day	6.92 (6.09-7.60)	7.94 (6.97-8.72)	9.56 (8.37-10.5)	10.9 (9.45-12.0)	12.6 (10.5-14.3)	13.9 (11.4-16.0)	15.2 (12.0-17.8)	16.4 (12.4-19.8)	18.0 (13.0-22.2)	19.1 (13.5-24.1)

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

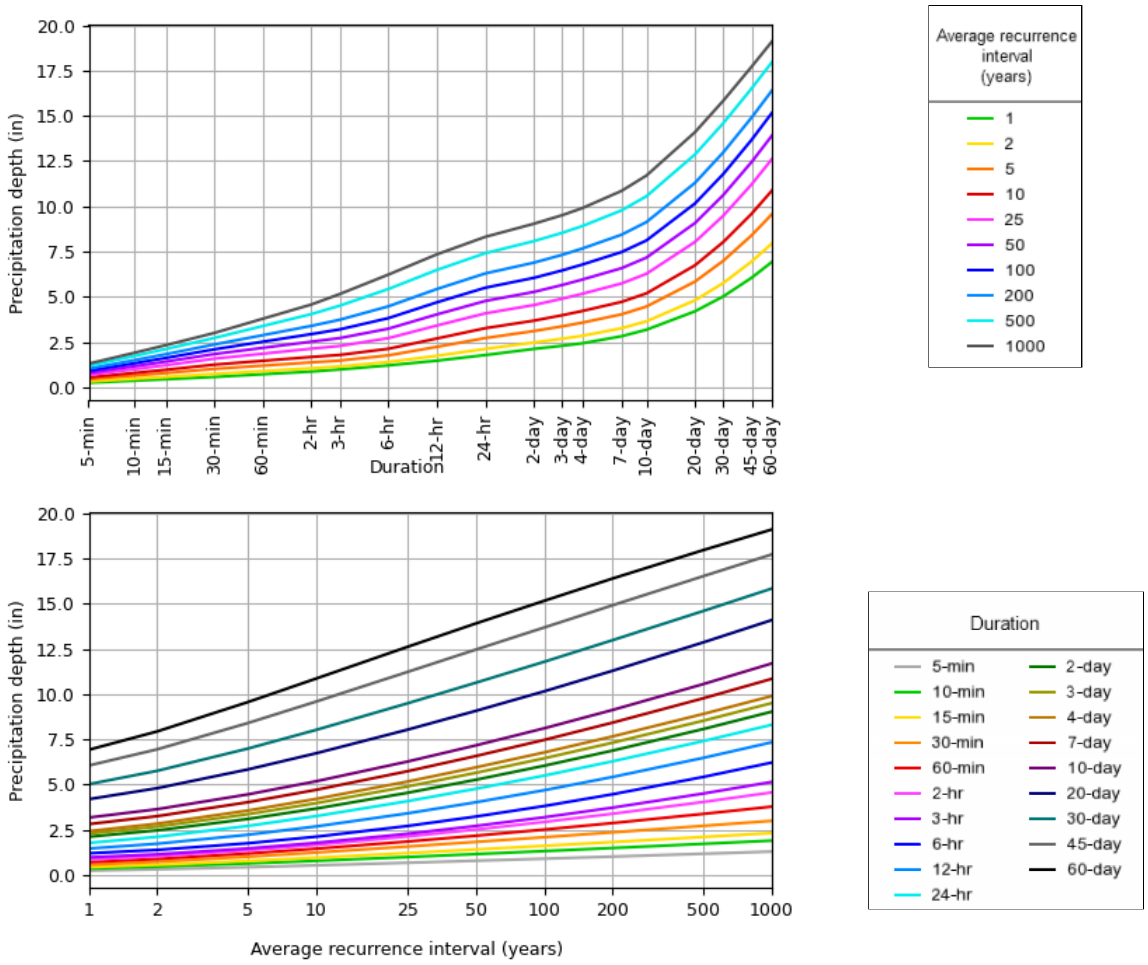
Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper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

Please refer to NOAA Atlas 14 document for more information.

Back to Top

PF graphical

PDS-based depth-duration-frequency (DDF) curves
Latitude: 39.1080°, Longitude: -104.8943°



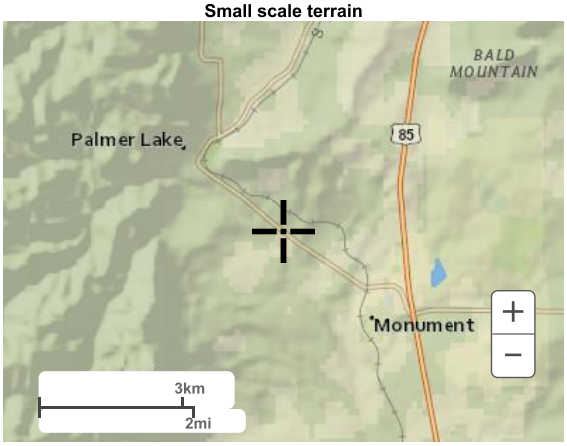
NOAA Atlas 14, Volume 8, Version 2

Created (GMT): Mon Sep 30 12:43:03 2024

Back to Top

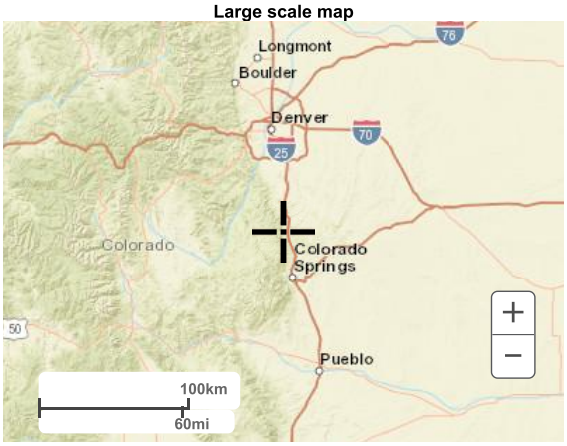
Maps & aerials

Small scale terrain

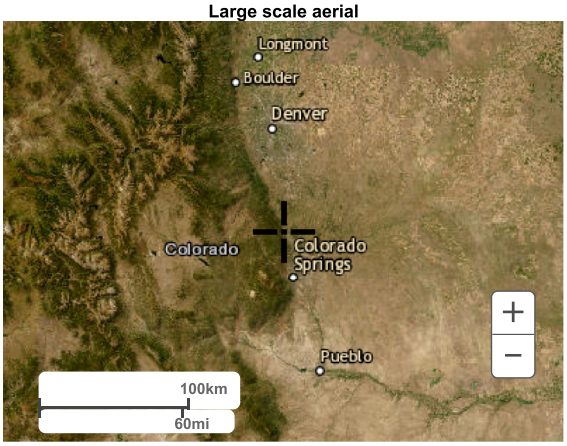


Large scale terrain

Large scale map



Large scale aerial



Back to Top

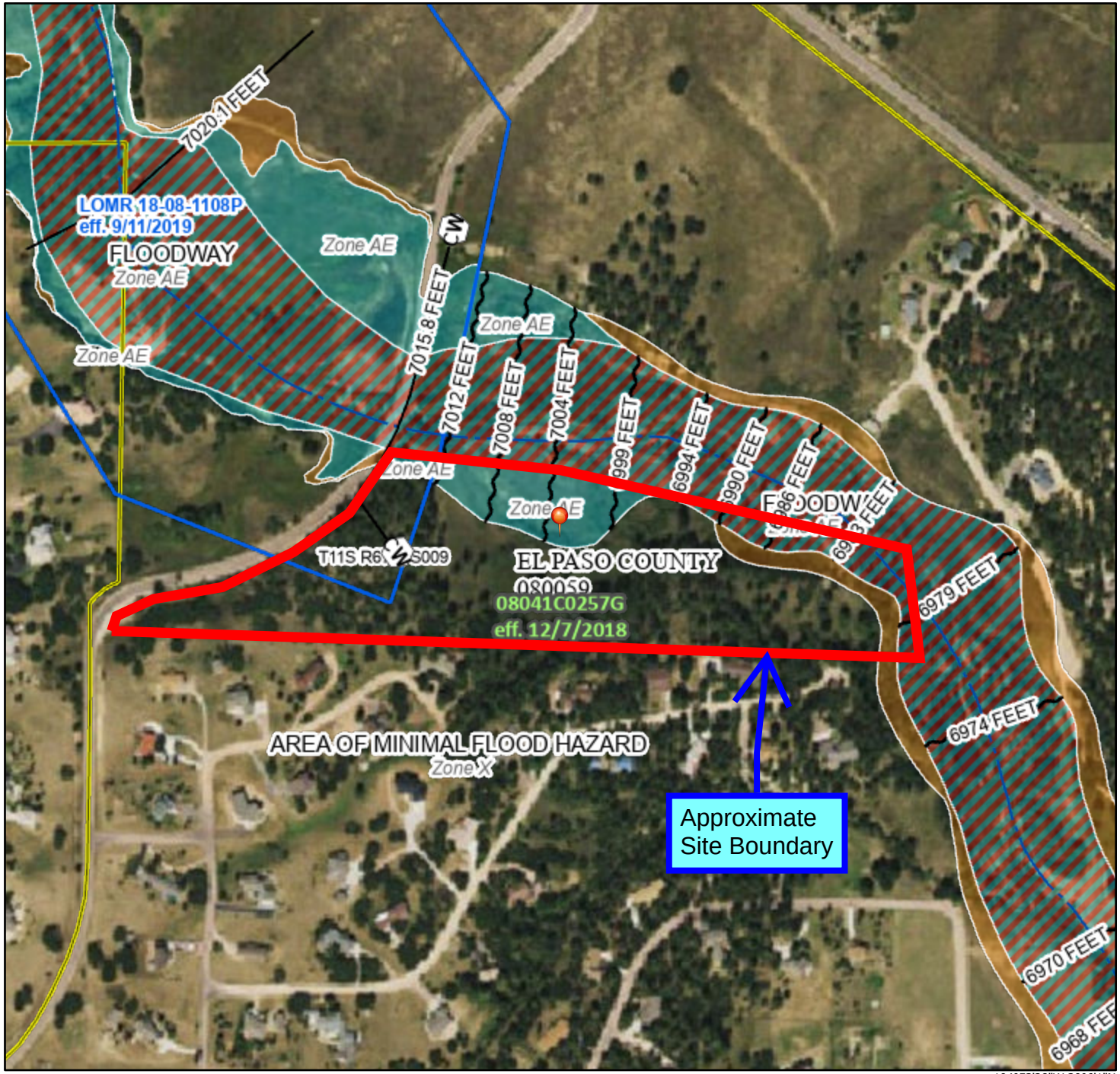
US Department of Commerce
National Oceanic and Atmospheric Administration
National Weather Service
National Water Center
1325 East West Highway
Silver Spring, MD 20910
Questions?: HDSC.Questions@noaa.gov

Disclaimer

National Flood Hazard Layer FIRMette

FEMA

104°54'6"W 39°6'29"N



104°53'28"W 39°6'1"N

Feet

0 250 500 1,000 1,500 2,000

1:6,000

Basemap Imagery Source: USGS National Map 2023

Legend

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

SPECIAL FLOOD HAZARD AREAS
- Without Base Flood Elevation (BFE) *Zone A, V, A99*
- With BFE or Depth *Zone AE, AO, AH, VE, AR*
- Regulatory Floodway

OTHER AREAS OF FLOOD HAZARD
- 0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile *Zone X*
- Future Conditions 1% Annual Chance Flood Hazard *Zone X*
- Area with Reduced Flood Risk due to Levee. See Notes. *Zone X*
- Area with Flood Risk due to Levee *Zone D*

OTHER AREAS
- NO SCREEN Area of Minimal Flood Hazard *Zone X*
- Effective LOMRs
- Area of Undetermined Flood Hazard *Zone D*

GENERAL STRUCTURES
- Channel, Culvert, or Storm Sewer
- Levee, Dike, or Floodwall

OTHER FEATURES
- 20.2 Cross Sections with 1% Annual Chance
- 17.5 Water Surface Elevation
- Coastal Transect
- 513 Base Flood Elevation Line (BFE)
- Limit of Study
- Jurisdiction Boundary
- Coastal Transect Baseline
- Profile Baseline
- Hydrographic Feature

MAP PANELS
- Digital Data Available
- No Digital Data Available
- Unmapped

N

The pin displayed on the map is an approximate point selected by the user and does not represent an authoritative property location.

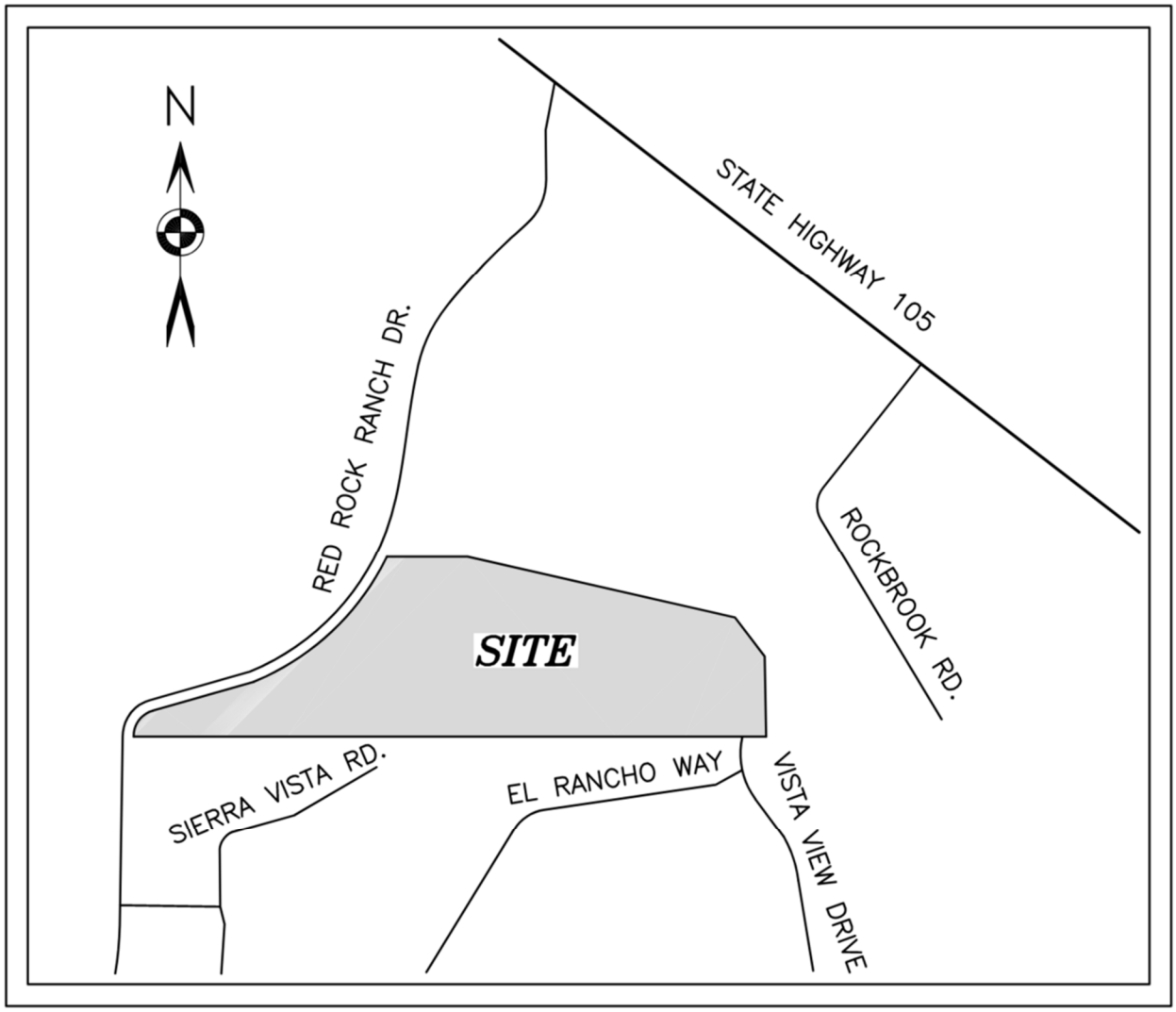
This map complies with FEMA's standards for the use of digital flood maps if it is not void as described below. The basemap shown complies with FEMA's basemap accuracy standards

The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on 10/7/2024 at 2:17 PM and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

This map image is void if the one or more of the following map elements do not appear: basemap imagery, flood zone labels, legend, scale bar, map creation date, community identifiers, FIRM panel number, and FIRM effective date. Map images for unmapped and unmodernized areas cannot be used for regulatory purposes.

APPENDIX D

MAPS



VICINITY MAP
(NOT TO SCALE)

Know what's **below.** **Call** before you dig.

N

100 0 100 200

SCALE IN FEET
ORIGINAL SCALE

please identify if a culvert is needed in the ditch and what size

driveway culvert required?

label slope

Driveway will require license agreement approval or the road will need to be constructed to EPC standard.

RED ROCK ACRES FILING NO. 1

Existing Conditions
Sub-basin Summary

Basin	Area	Q5	Q100
	acres	cfs	cfs
EX-Lot 1	3.55	0.7	4.9
EX-Lot 2	2.82	0.8	5.7
EX-Lot 3	3.14	0.8	5.3
EX-Lot 4	2.81	0.8	5.2
EX-Lot 5	2.65	0.9	6.1
OS-A	0.95	0.8	2.9
OS-B	2.67	1.6	5.8
OS-C	15.58	4.8	17.5
OS-D	0.90	0.7	2.4
OS-E	0.19	0.1	0.5
OS-F	0.49	0.4	1.3

RED ROCK ACRES FILING NO. 1

Proposed Conditions
Sub-basin Summary

Basin	Area	Q5	Q100
	acres	cfs	cfs
PR LOT 1	3.55	1.2	5.5
PR LOT 2	2.82	1.4	6.4
PR LOT 3	3.14	1.3	6.0
PR LOT 4	2.81	1.3	5.9
PR LOT 5	2.65	1.5	6.9
OS-A	0.95	0.8	2.9
OS-B	2.67	1.6	5.8
OS-C	15.58	4.8	17.5
OS-D	0.90	0.7	2.4
OS-E	0.19	0.1	0.5
OS-F	0.49	0.4	1.3

Existing Design Point Summary

RED ROCK ACRES FILING NO. 1

Design Point	Sub-Basins	Total Area (ac.)	Q(5) (cfs)	Q(100) (cfs)
1	OS A, OS B & Lot 1	7.17	2.2	9.9
2	OS C	15.58	4.8	17.5
3	DP 2, Lot 2 & Lot 3	21.54	4.0	16.5
4	OS D, OS E, OS F, Lot 4, & Lot 5	7.04	2.2	12.2

Values do not match descriptions in report

Proposed Design Point Summary

RED ROCK ACRES FILING NO. 1

Design Point	Sub-Basins	Total Area (ac.)	Q(5) (cfs)	Q(100) (cfs)
1	OS A, OS B & Lot 1	7.17	2.6	10.5
2	OS C	15.58	4.8	17.5
3	DP 2, Lot 2 & Lot 3	21.54	4.4	17.0
4	OS D, OS E, OS F, Lot 4, & Lot 5	7.04	3.1	13.4

LEGEND

- EX BASIN BOUNDARY
- PR BASIN BOUNDARY
- EXISTING CONTOUR
- PROPOSED CONTOUR
- PROPOSED STORM DRAIN PIPE
- EXISTING STORM DRAIN PIPE
- DRAINAGE CHANNEL
- EXISTING EDGE OF ROAD
- PROPOSED PROPERTY LINE
- FLOW DIRECTION
- 2 — DESIGN POINT
- EX-2 — SUB BASIN DESIGNATION
- #### / xx.xx / xx.xx — 5-YEAR STORM EVENT PEAK FLOW (CFS) / 100-YEAR STORM EVENT PEAK FLOW (CFS) / SUB BASIN AREA (AC.)
- PROPOSED RIP RAP
- UIA
- RPA

Please separate into separate proposed and existing condition maps

REFERENCE DRAWINGS

X-24.1282- EX-MAP (BY OTHERS)
X-1282-EX-MAP
X-MOD30x42

No.	DATE	DESCRIPTION	BY

REVISIONS

COMPUTER FILE MANAGEMENT

FILE NAME: S:\24.1282.004 Red Rock Acres 2.5 Acre Sub\200 Design\220 Drainage-WR\222 Reports\FDR\DWG\DR-RR Acres.dwg
CTB FILE: ----
PLOT DATE: October 25, 2024 8:10:18 AM
THIS DRAWING IS CURRENT AS OF PLOT DATE AND MAY BE SUBJECT TO CHANGE.

PREPARED BY: Matrix

SEAL

PRELIMINARY
THIS DRAWING HAS NOT BEEN APPROVED BY GOVERNING AGENCIES AND IS SUBJECT TO CHANGE

FOR AND ON BEHALF OF MATRIX DESIGN GROUP, INC.
PROJECT No. 24.1282.001

RED ROCK ACRES FILING NO. 1

CHALLENGER HOMES
FINAL DRAINAGE REPORT

DRAINAGE PLAN
PROPOSED AND EXISTING CONDITIONS

DESIGNED BY:	JTS	SCALE	
DRAWN BY:	JTS	HORIZ.	
CHECKED BY:	CP	VERT.	
DATE ISSUED:	OCTOBER 2024	DRAWING No.	DR-01
SHEET	1 OF 1		