DRAINAGE LETTER

7280 N. NEVADA LANE

AN UNPLATTED PARCEL IN THE NW1/4 NE1/4, SECTION 8, T. 13 S., R. 65 W. 6TH P.M.
EL PASO COUNTY, COLORADO

PCD File: PPR2411

November 3, 2023

Revised
May 17, 2024

prepared for
GREENER PASTURES LLC
Jeff Weisburg
4450 Mark Dabling Blvd
Colorado Springs, CO 80907

Oliver E. Watts, Consulting Engineer, Inc.
Colorado Springs, Colorado

OLIVER E. WATTS, PE-LS
OLIVER E. WATTS, CONSULTING ENGINEER, INC.
CIVIL ENGINEERING AND SURVEYING
614 ELKTON DRIVE
COLORADO SPRINGS, COLORADO 80907
(719) 593-0173
fax (719) 265-9660
olliewatts@aol.com
Celebrating over 45 years in business

May 17, 2024

El Paso County Planning and Community Development
2880 International Circle
Colorado Springs, CO 80910

ATTN: *Joshua Palmer, P.E.*

SUBJECT: Drainage Letter, 7280 N. Nevada Lane

Transmitted herewith for your review and approval is the drainage letter for 7280 N. Nevada Lane, to accompany the zone change submittal on subject property. It has been revised in accordance with your comments of April 18, 2024.

There will be no construction involved and no change in the runoff as a result of this zone change request. This letter reflects current conditions as well as historic conditions (Post 3/10/28). Please contact our office if we may provide any further information.

Oliver E. Watts, Consulting Engineer, Inc.

BY: ______________________________
Oliver E. Watts, President

Encl:

Drainage Letter 2 pages
Computations 3 pages
MHFD Detention, 5 pages
Soils Map and Interpretation Sheet
Backup Information, 4 pages
FEMA Flood Panel 08041C0529 G, December 7, 2018
Sand Creek Drainage Basin (1977) Sheet 44
Offsite Drainage Map
Drainage Plan Dwg 23-5924-04

1. 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.

Oliver E. Watts, Consulting Engineer, Inc.

____
Oliver E. Watts Colo. PE-LS No. 9853

2. OWNERS / DEVELOPER'S STATEMENT:

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

Greener Pastures, LLC

By: ____
Jeff Weisburg
4450 Mark Dabling Blvd
Colorado Springs, CO 80907
(719) 291-0291

3. EL PASO COUNTY:

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

____ _________________
Joshua Palmer, P.E. Date
County Engineer / ECM Administrator

Conditions:

4. LOCATION AND DESCRIPTION:
7280 N. Nevada Lane is located south of Woodmen Road, East of Black Forest Road and West of Sand Creek, as shown on the enclosed vicinity map. It occupies 4.984 acres in the Sand Creek Drainage basin in part of the Northwest quarter of the Northeast Quarter of Section 8, Township 13 South, Range 65 West of the 6th P.M. in El Paso County. The Assessor's Parcel No. is 5308000074. It is an unplatted parcel for which a zone change is being processed, which is the reason for this drainage letter. The site is bounded on the South by California Drive, on the East by Nevada Lane, on the West by Omaha Lane, and on the North by unplatted property.

5. FLOOD PLAIN STATEMENT:
This subdivision is not within the limits of a designated flood plain or flood hazard area, as identified on FEMA panel no. 08041C0533 G, dated December 7, 2018, a copy of which is enclosed for reference.

6. CRITERIA AND METHOD:
All computations are based on the rational method described in Volume 1 and 2, revised October 31, 2023 of the City – County drainage criteria and the El Paso County "Engineering Criteria Manual, revised December 13, 2016. Computations are enclosed, along with pertinent criteria backup information. All soils in the area are of the Blakeland Complex, hydrologic group "A", and a soils map and interpretation sheet are enclosed.

7. DESCRIPTION OF RUNOFF:
A. Historic:
Historically (pre 2008) this area was in a range land condition. As shown on the offsite area to the North (basins O-1 and O-2) would discharge into the property and combine with basins A-C in historic conditions to develop a total of 1.3 cfs \ 9.6 cfs. The outfall would be California Drive along the South boundary. This runoff is not concentrated but is distributed over the length of the street adjacent to the development. The low area of the site is the Southwest corner.
B. Developed:
As shown on the enclosed offsite drainage map, 1.89 acres of the adjacent northerly lot will drain into subject property. No other inflows exist. The routing across the property is delineated on the enclosed drainage plan. Basin D in the southeast corner is isolated from the remainder of the parcel by a dike and area grading and the 0.63 office parcel drains 0.1 cfs / 0.3 cfs (5-year / 100- year runoffs) in concentrated form into California Drive. This portion of the area is historic and considered exempt. The remainder of the property is graded around a number of shop buildings to drain into California Drive over the westerly 360 feet of the South boundary with no specific outfall structure, totaling 3.8 cfs/12.2 cfs.
Since the total area of disturbance of the site exceeds one acre a full spectrum detention pond is required and is placed in the Southwest corner of the site. Storage computations are enclosed. A temporary swale is provided to concentrate the otherwise sheet flow into the pond, and the pond discharges into California Drive near Utah Lane, where energy dissipation is provided. As shown on the hydrograph in the detention computations the 100-year outflow from the pond will be 4.4 cfs, compared with the historic undeveloped runoff of 9.6 cfs.
The streets in this area are unpaved or lightly graveled and further routing may be seen in a southerly direction, primarily on Wyoming Lane, some 3800 feet to the Sand Creek channel. No specific routing has been addressed in the Sand Creek study. Sheet 44 of the study in enclosed for reference.

8. FEES: This site is unplatted and no construction is proposed in subject zone change request. Drainage fees are not applicable until the site is subdivided.

9. Cost Estimate:

Item No.	Description	Quantity	Unit Cost	Cost
1	Drainage Swale	240 LF	$ 3.00	$ 720.00
2	18" PVC	35 LF	76.00	2660.00
3	Concrete Downdrain	96 LF	70.00	6720.00
4	Detention Pond Grading	315 CY	8.00	2520.00
	Subtotal Construction Cost			$ 12620.00
	Engineering	10%		1262.00
	Total Estimated Cost			$13882.00

10. Summary:
The owner of the 4.984 acre site is required to provide a drainage report as part of his zone change request. Since the area disturbed exceeds one acre, he is required to mitigate the increase. Of the total area, 0.63 acres is historic and considered exempt. The remaining 4.35 acres will be drained to a full spectrum detention pond that will store and release into California Drive near Utah Lane at the Southwest corner of the site. The historic runoff for the project area, including the inflows from adjacent properties north of the site, is 9.6 cfs (100-year storm). The resulting computed release from the proposed pond is 4.4 cfs, which is more than appropriate.

11. References.

1. City – County drainage criteria, Volumes 1 and 2, revised October 31, 2023.
2. El Paso County "Engineering Criteria Manual, revised December 13, 2016.
3. Sand Creek Drainage Basin Planning Study, revised March, 1996.

MAJOR BASIN	SUB BASIN	AREA 1"=30'		BASIN		Tc MIN	I in./hr.		SOIL GRP	DEV. TYPE	C		FLOW 5-ry	100-yr	RETURN PERIOD -years-	
		PLANIM READ	ACRES	LENGTH -FT.-	HEIGHT -FT.-								qp -CFS-	qp -CFS-		
SAND CREEK	O-1	5.93	0.49	100	7.5	7.8			A	BARE	0.30	0.50	C=7		5	100
		1.25	0.10	+254	14.5	+1.8				R/L	0.08	0.35	C=10	V=2.4		
DEVELOPED		TOTAL	0.59			9.6	4.2	7.0		MIX	0.265	0.475	0.65	2.0	5	100
	O-2	4.62	0.38	100	8	8.7				BARE	0.30	0.50	C=7			
		11.15	0.962	+314	22	+2.0				R/L	0.08	0.35	C=10	V=2.6		
		TOTAL	1.30			10.7	4.3	6.8		MIX	0.144	0..39	0.80	3.5	5	100
	A	COGO	0.018	100	6.5	8.7			A	ROOF	0.73	0.81				
			0.010	+180	11	+2.4				CONC	0.89	0.96	C=5	V=1.24		
			0.700							R/L	0.08	0.35				
			0.680							BARE	0.30	0.50				
		TOTAL	1.41			11.1	4.0	6.7		MIX	0.200	0.422				
	O-1 +A			+280	17.5	+2.7							C=7	V=1.7		
	DP1	TOTAL	2.00			12.3	3.0	6.4		MIX	0.218	0.438	1.3	5.6	5	100
	B	COGO	0.227	100	2.5	9.7			A	ROOF	0.73	0.81				
			0.028	+290	6.5	+4.6				CONC.	0.90	0.96	C=7	V=1.05		
			1.285			14.3	3.6	6.0		BARE	0.30	0.50				
		TOTAL	1.54							MIX	0.374	0.554	2.1	5.1	5	100
	DP2		2.84	+390	9	+8.6							C=7	V=0.76		
	B+O2					19.2	3.2	5.3	A	MOX	0.318	0.588	2.8	8.5	5	100

HYDROLOGICAL COMPUTATION – BASIC DATA

PROJ: 7280 N. NEVADA LANE BY: O.E. WATTS

RATIONAL METHOD DATE: 11-3-23

OLIVER E. WATTS, CONSULTING ENGINEER, INC.

614 ELKTON DRIVE COLORADO SPRINGS, CO 80907

MAJOR BASIN	SUB BASIN	AREA		BASIN		Tc MIN	I in./hr.		SOIL GRP	DEV. TYPE	C		FLOW		RETURN PERIOD -years-	
		PLANIM READ	ACRES	LENGTH -FT.-	HEIGHT -FT.-								5-ry qp -CFS-	100-yr qp -CFS-		
SAND CREEK	C	COGO	0.068	100	2	12.7			A	BARE	0.30	0.50			5	100
DEVELOPED			0.035	+100	2	+1.9				CONC	0.90	0.96	C=5	V=0.87		
			0.043							ROOF	0.73	0.81				
			1.264							R/L	0.08	0.35				
		TOTAL	1.41			14.6	3.4	6.0		MIX	0.130	0.386	0.6	3.5	5	100
01+O2+A-C	DP3			+200	5	+4.2							C=5	V=0.79		
		TOTAL	4.95			18.5	3.2	5.4			0.242	0.459	3.8	12.2	5	100
	D	COGO	0.033	100	3	13.1			A	ROOF	0.73	0.81				
			0.017	+155	4	+3.2				CONC	0.90	0.96	C=5	V=0.80		
			0.096							A.C.	0.90	0.96				
			0.058							L/S	0.08	0.35				
			0.426							BARE	0.30	0.50				
		TOTAL	0.63			16.3	3.4	5.7		MIX	0.052	0.074	0.1	0.3	5	100

HYDROLOGICAL COMPUTATION – BASIC DATA

PROJ: 7280 N NEVADA LN BY: O.E. WATTS

RATIONAL METHOD DATE: 11-3-23

OLIVER E. WATTS, CONSULTING ENGINEER, INC.
614 ELKTON DRIVE COLORADO SPRINGS, CO 80907

MAJOR BASIN	SUB BASIN	AREA		BASIN		Tc MIN	I in./hr.		SOIL GRP	DEV. TYPE	C		FLOW 5-ry	FLOW 100-yr	RETURN PERIOD -years-	
		PLANIM READ	ACRES	LENGTH -FT.-	HEIGHT -FT.-								qp -CFS-	qp -CFS-		
SAND CREEK	01+02	COGO	0.72	300	24	16.0			A	R/L	0.08	0.35			5	100
		V=1.33	C=7	+580	21	+7.2										
HISTORIC			+498			23.2	2.9	4.8								
	TOTAL		5.70	880	45								1.3	9.6	5	100
FOR TOTAL IMPERVIOUS %																
	01	0.59							A		0.265	0.475				
	O2	1.30									0.144	0.39				
	A	1.41									0.200	0.422				
	B	1.54									0.374	0.554				
	C	1.41									0.130	0.386				
	D	0.63									0.052	0.074				
	TOTAL	6.88	880	45	+5.11%						0.200	0.411	=13%	IMP		

HYDROLOGICAL COMPUTATION – BASIC DATA

PROJ: 7280 N NEVADA LN BY:O.E. WATTS

RATIONAL METHOD DATE: MAY 7, 2024

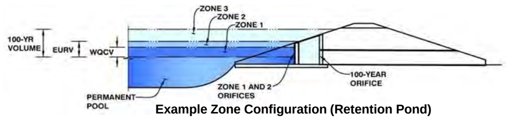
OLIVER E. WATTS, CONSULTING ENGINEER, INC.
614 ELKTON DRIVE COLORADO SPRINGS, CO 80907

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.04 (February 2021)

Project: 7280 N NEVADA AVE

Basin ID: 5-17-24 EDP POND 20-5924 7280 NEVADA LANE



Example Zone Configuration (Retention Pond)

Watershed Information

Selected BMP Type =	**SF**	
Watershed Area =	6.88	acres
Watershed Length =	880	ft
Watershed Length to Centroid =	440	ft
Watershed Slope =	0.051	ft/ft
Watershed Imperviousness =	13.00%	percent
Percentage Hydrologic Soil Group A =	100.0%	percent
Percentage Hydrologic Soil Group B =	0.0%	percent
Percentage Hydrologic Soil Groups C/D =	0.0%	percent
Target WQCV Drain Time =	12.0	hours
Location for 1-hr Rainfall Depths =	User Input	

After providing required inputs above including 1-hour rainfall depths, click 'Run CUHP' to generate runoff hydrographs using the embedded Colorado Urban Hydrograph Procedure.

			Optional User Overrides	
Water Quality Capture Volume (WQCV) =	0.032	acre-feet	0.032	acre-feet
Excess Urban Runoff Volume (EURV) =	0.098	acre-feet	0.098	acre-feet
2-yr Runoff Volume (P1 = 1.19 in.) =	0.039	acre-feet	1.19	inches
5-yr Runoff Volume (P1 = 1.5 in.) =	0.060	acre-feet	1.50	inches
10-yr Runoff Volume (P1 = 1.75 in.) =	0.080	acre-feet	1.75	inches
25-yr Runoff Volume (P1 = 2 in.) =	0.176	acre-feet	2.00	inches
50-yr Runoff Volume (P1 = 2.25 in.) =	0.271	acre-feet	2.25	inches
100-yr Runoff Volume (P1 = 2.52 in.) =	0.402	acre-feet	2.52	inches
500-yr Runoff Volume (P1 = 3.41 in.) =	0.834	acre-feet	3.41	inches
Approximate 2-yr Detention Volume =	0.043	acre-feet		
Approximate 5-yr Detention Volume =	0.058	acre-feet		
Approximate 10-yr Detention Volume =	0.076	acre-feet		
Approximate 25-yr Detention Volume =	0.101	acre-feet		
Approximate 50-yr Detention Volume =	0.130	acre-feet		
Approximate 100-yr Detention Volume =	0.194	acre-feet		

Define Zones and Basin Geometry

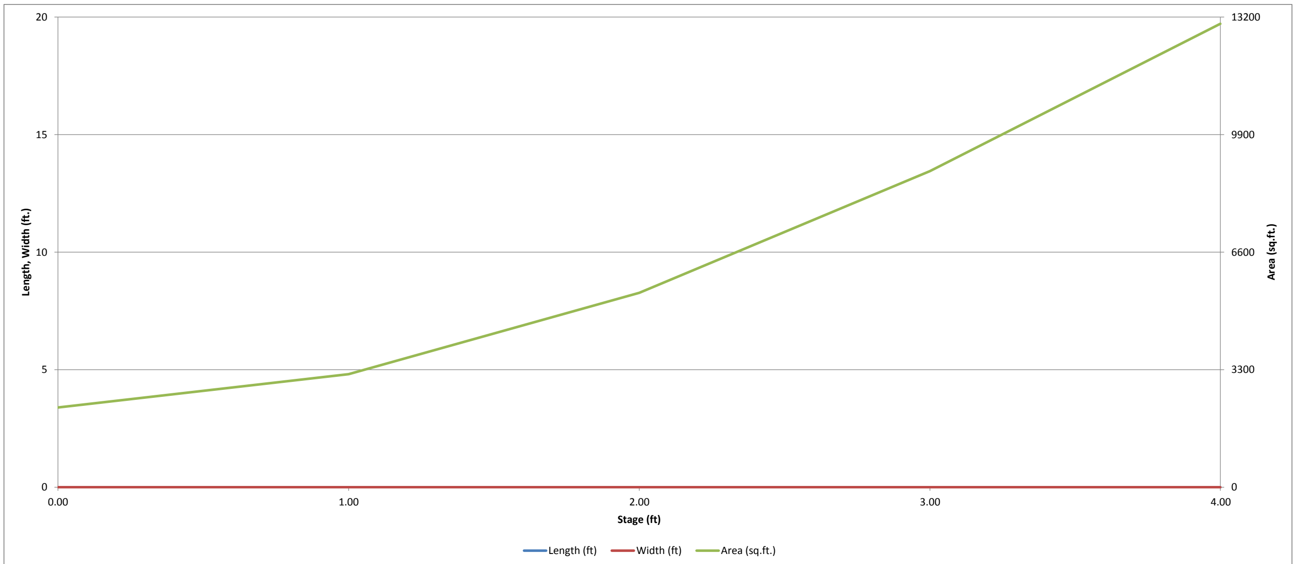
Select Zone 1 Storage Volume (Required) =		acre-feet
Select Zone 2 Storage Volume (Optional) =		acre-feet
Select Zone 3 Storage Volume (Optional) =		acre-feet
Total Detention Basin Volume =		acre-feet
Initial Surcharge Volume (ISV) =	N/A	ft^3
Initial Surcharge Depth (ISD) =	N/A	ft
Total Available Detention Depth (H_{total}) =	user	ft
Depth of Trickle Channel (H_{TC}) =	N/A	ft
Slope of Trickle Channel (S_{TC}) =	N/A	ft/ft
Slopes of Main Basin Sides (S_{main}) =	user	H:V
Basin Length-to-Width Ratio ($R_{L/W}$) =	user	
Initial Surcharge Area (A_{ISV}) =	user	ft^2
Surcharge Volume Length (L_{ISV}) =	user	ft
Surcharge Volume Width (W_{ISV}) =	user	ft
Depth of Basin Floor (H_{FLOOR}) =	user	ft
Length of Basin Floor (L_{FLOOR}) =	user	ft
Width of Basin Floor (W_{FLOOR}) =	user	ft
Area of Basin Floor (A_{FLOOR}) =	user	ft^2
Volume of Basin Floor (V_{FLOOR}) =	user	ft^3
Depth of Main Basin (H_{MAIN}) =	user	ft
Length of Main Basin (L_{MAIN}) =	user	ft
Width of Main Basin (W_{MAIN}) =	user	ft
Area of Main Basin (A_{MAIN}) =	user	ft^2
Volume of Main Basin (V_{MAIN}) =	user	ft^3
Calculated Total Basin Volume (V_{total}) =	**user**	acre-feet

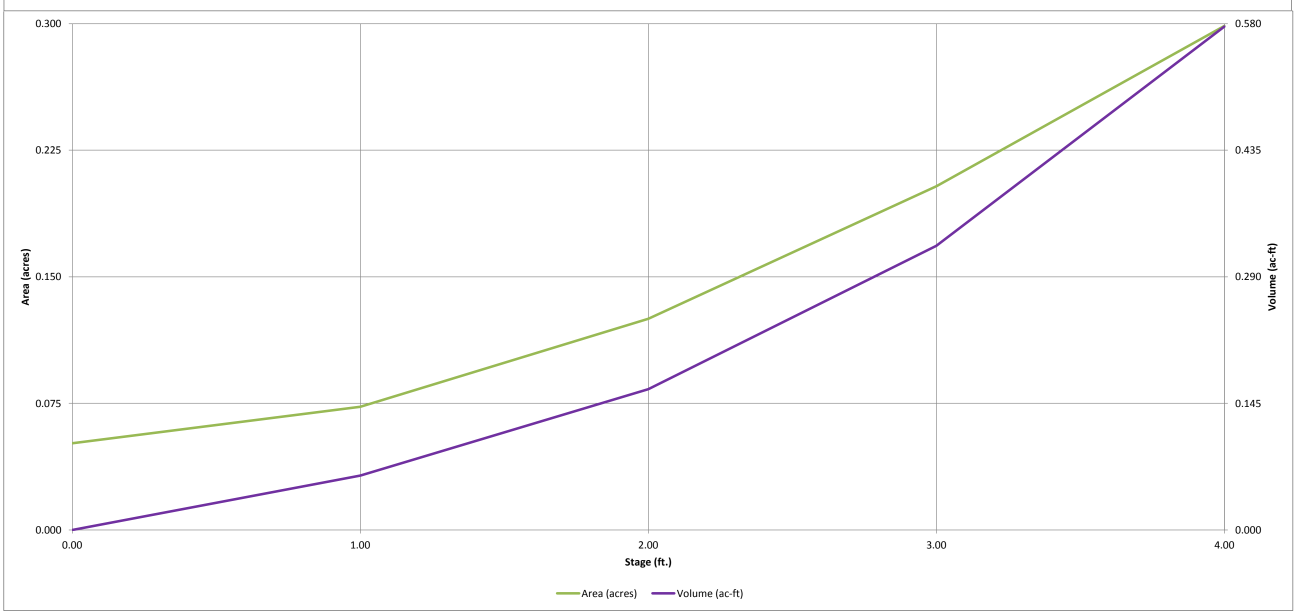
Depth Increment = ft

Stage - Storage Description	Stage (ft)	Optional Override Stage (ft)	Length (ft)	Width (ft)	Area (ft^2)	Optional Override Area (ft^2)	Area (acre)	Volume (ft^3)	Volume (ac-ft)
Media Surface	--	0.00	--	--	--	2,234	0.051		
	--	1.00	--	--	--	3,175	0.073	2,704	0.062
	--	2.00	--	--	--	5,454	0.125	7,019	0.161
	--	3.00	--	--	--	8,874	0.204	14,183	0.326
	--	4.00	--	--	--	13,013	0.299	25,126	0.577
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.04 (February 2021)



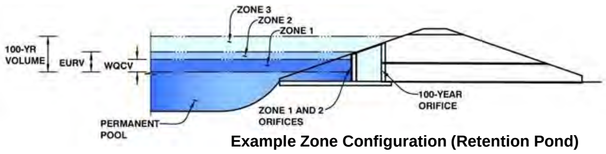


DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.04 (February 2021)

Project: **7280 N NEVADA AVE**

Basin ID: **5-17-24 EDP POND 20-5924 7280 NEVADA LANE**



Example Zone Configuration (Retention Pond)

	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1	#N/A		
Zone 2			
Zone 3			
Total (all zones)			

User Input: Orifice at Underdrain Outlet (typically used to drain WQCV in a Filtration BMP)

				Calculated Parameters for Underdrain	
Underdrain Orifice Invert Depth =	0.50	ft (distance below the filtration media surface)	Underdrain Orifice Area =	0.0	ft^2
Underdrain Orifice Diameter =	0.88	inches	Underdrain Orifice Centroid =	0.04	feet

User Input: Orifice Plate with one or more orifices or Elliptical Slot Weir (typically used to drain WQCV and/or EURV in a sedimentation BMP)

				Calculated Parameters for Plate	
Invert of Lowest Orifice =	0.17	ft (relative to basin bottom at Stage = 0 ft)	WQ Orifice Area per Row =	8.729E-02	ft^2
Depth at top of Zone using Orifice Plate =		ft (relative to basin bottom at Stage = 0 ft)	Elliptical Half-Width =	N/A	feet
Orifice Plate: Orifice Vertical Spacing =	4.00	inches	Elliptical Slot Centroid =	N/A	feet
Orifice Plate: Orifice Area per Row =	12.57	inches	Elliptical Slot Area =	N/A	ft^2

User Input: Stage and Total Area of Each Orifice Row (numbered from lowest to highest)

	Row 1 (optional)	Row 2 (optional)	Row 3 (optional)	Row 4 (optional)	Row 5 (optional)	Row 6 (optional)	Row 7 (optional)	Row 8 (optional)
Stage of Orifice Centroid (ft)	0.17	0.67	1.17					
Orifice Area (sq. inches)	6.28	6.29	6.28					

	Row 9 (optional)	Row 10 (optional)	Row 11 (optional)	Row 12 (optional)	Row 13 (optional)	Row 14 (optional)	Row 15 (optional)	Row 16 (optional)
Stage of Orifice Centroid (ft)								
Orifice Area (sq. inches)								

User Input: Vertical Orifice (Circular or Rectangular)

	Not Selected	Not Selected		Calculated Parameters for Vertical Orifice	Not Selected	Not Selected	
Invert of Vertical Orifice =	0.00		ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Area =	0.79		ft^2
Depth at top of Zone using Vertical Orifice =			ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Centroid =	0.50		feet
Vertical Orifice Diameter =	12.00		inches				

User Input: Overflow Weir (Dropbox with Flat or Sloped Grate and Outlet Pipe OR Rectangular/Trapezoidal Weir (and No Outlet Pipe)

	Not Selected	Not Selected		Calculated Parameters for Overflow Weir	Not Selected	Not Selected	
Overflow Weir Front Edge Height, Ho =	1.50		ft (relative to basin bottom at Stage = 0 ft)	Height of Grate Upper Edge, H_t =	1.50		feet
Overflow Weir Front Edge Length =	2.00		feet	Overflow Weir Slope Length =	2.00		feet
Overflow Weir Grate Slope =	0.00		H:V	Grate Open Area / 100-yr Orifice Area =	3.54		
Horiz. Length of Weir Sides =	2.00		feet	Overflow Grate Open Area w/o Debris =	2.78		ft^2
Overflow Grate Type =	Type C Grate	Type C Grate		Overflow Grate Open Area w/ Debris =	2.78		ft^2
Debris Clogging % =	0%		%				

User Input: Outlet Pipe w/ Flow Restriction Plate (Circular Orifice, Restrictor Plate, or Rectangular Orifice)

	Not Selected	Not Selected		Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate	Not Selected	Not Selected	
Depth to Invert of Outlet Pipe =	1.50		ft (distance below basin bottom at Stage = 0 ft)	Outlet Orifice Area =	0.79		ft^2
Circular Orifice Diameter =	12.00		inches	Outlet Orifice Centroid =	0.50		feet
				Half-Central Angle of Restrictor Plate on Pipe =	N/A	N/A	radians

User Input: Emergency Spillway (Rectangular or Trapezoidal)

			Calculated Parameters for Spillway		
Spillway Invert Stage=	3.08	ft (relative to basin bottom at Stage = 0 ft)	Spillway Design Flow Depth=	0.69	feet
Spillway Crest Length =	5.00	feet	Stage at Top of Freeboard =	4.27	feet
Spillway End Slopes =	4.00	H:V	Basin Area at Top of Freeboard =	0.30	acres
Freeboard above Max Water Surface =	0.50	feet	Basin Volume at Top of Freeboard =	0.58	acre-ft

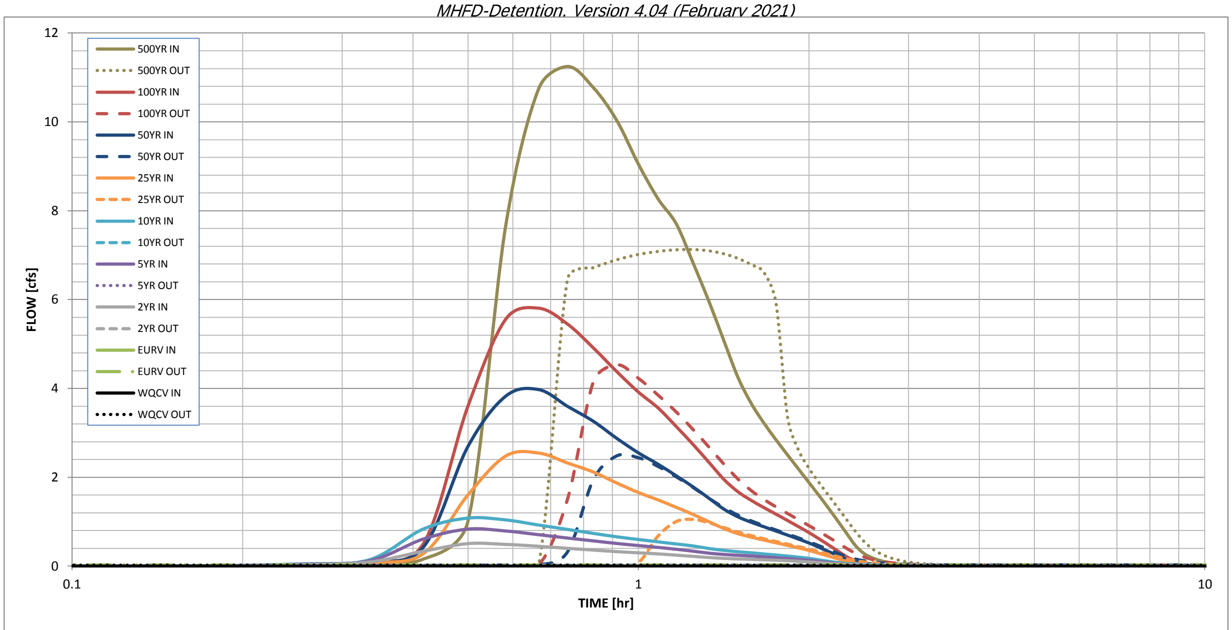
Routed Hydrograph Results

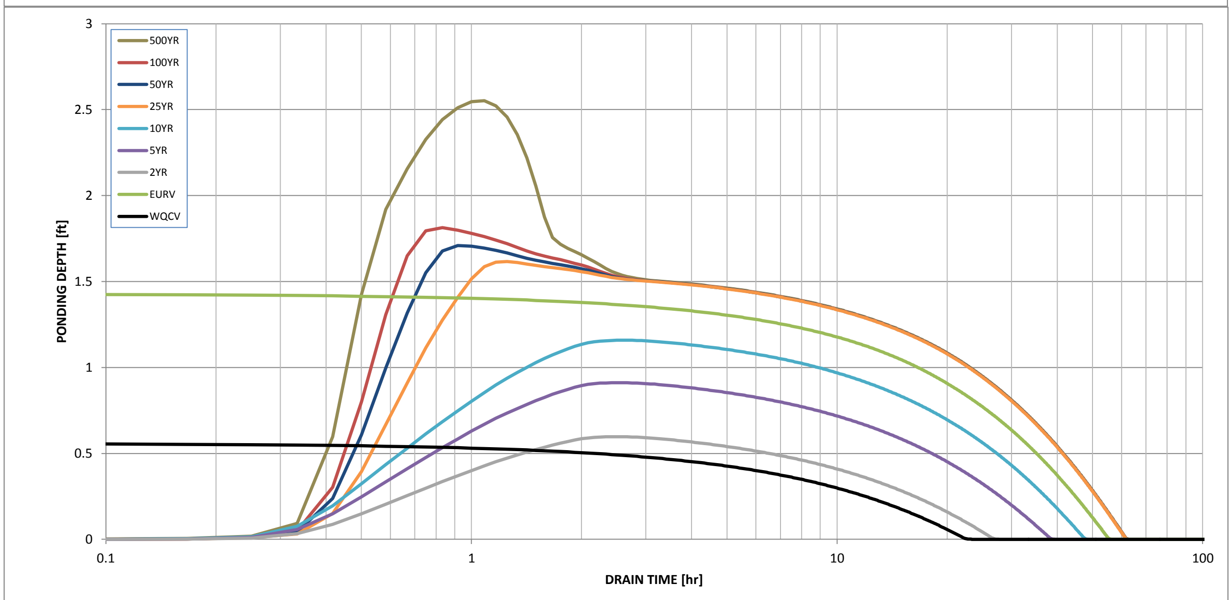
The user can override the default CUHP hydrographs and runoff volumes by entering new values in the Inflow Hydrographs table (Columns W through AF).

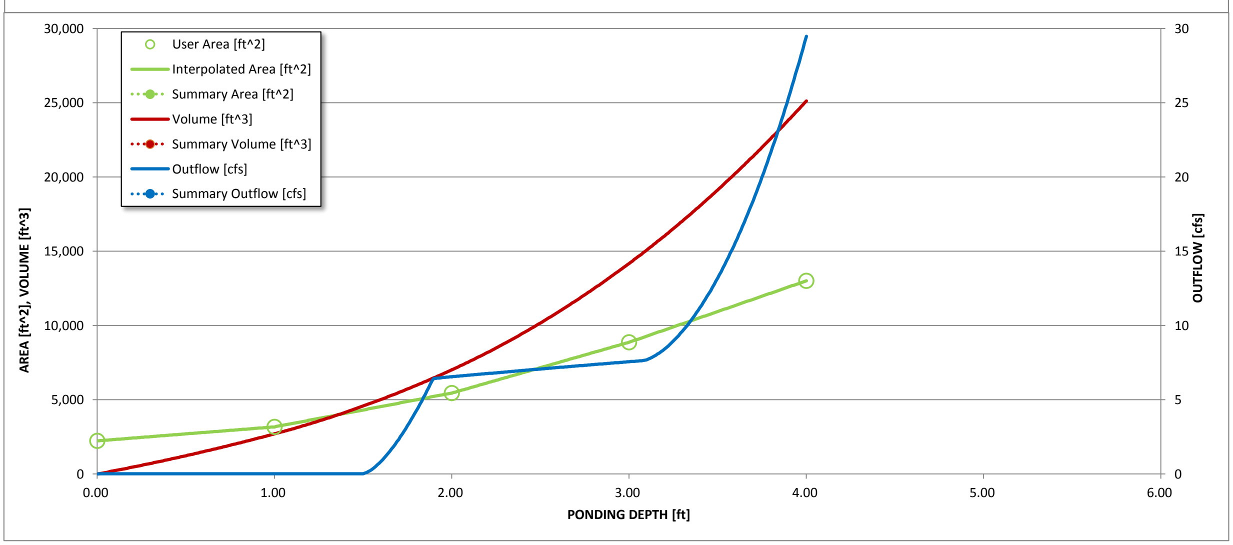
Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
One-Hour Rainfall Depth (in) =	N/A	N/A	1.19	1.50	1.75	2.00	2.25	2.52	3.41
CUHP Runoff Volume (acre-ft) =	0.032	0.098	0.039	0.060	0.080	0.176	0.271	0.402	0.834
Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	0.039	0.060	0.080	0.176	0.271	0.402	0.834
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	0.1	0.1	0.2	1.4	2.8	4.6	9.9
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A		2.5					
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	0.01	0.36	0.02	0.20	0.41	0.67	1.44
Peak Inflow Q (cfs) =	N/A	N/A	0.5	0.8	1.1	2.5	4.0	5.8	11.2
Peak Outflow Q (cfs) =	0.0	0.0	0.0	0.0	0.0	1.0	2.5	4.5	7.1
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	0.0	0.2	0.7	0.9	1.0	0.7
Structure Controlling Flow =	Filtration Media	Filtration Media	Filtration Media	Filtration Media	Filtration Media	Overflow Weir 1	Overflow Weir 1	Overflow Weir 1	Outlet Plate 1
Max Velocity through Grate 1 (fps) =	N/A	N/A	N/A	N/A	N/A	0.4	0.9	1.6	2.5
Max Velocity through Grate 2 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Time to Drain 97% of Inflow Volume (hours) =	22	53	26	37	46	57	55	52	44
Time to Drain 99% of Inflow Volume (hours) =	**22**	55	27	38	47	60	60	59	55
Maximum Ponding Depth (ft) =	0.56	1.43	0.60	0.91	1.16	1.62	1.71	1.81	2.55
Area at Maximum Ponding Depth (acres) =	0.06	0.10	0.06	0.07	0.08	0.10	0.11	0.12	0.17
Maximum Volume Stored (acre-ft) =	0.032	0.098	0.034	0.056	0.074	0.116	0.126	0.138	0.242

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.04 (February 2021)







S-A-V-D Chart Axis Override	X-axis	Left Y-Axis	Right Y-Axis
minimum bound			
maximum bound			

DETENTION BASIN OUTLET STRUCTURE DESIGN

Outflow Hydrograph Workbook Filename:

Inflow Hydrographs

The user can override the calculated inflow hydrographs from this workbook with inflow hydrographs developed in a separate program.

Time Interval: 5.00 min

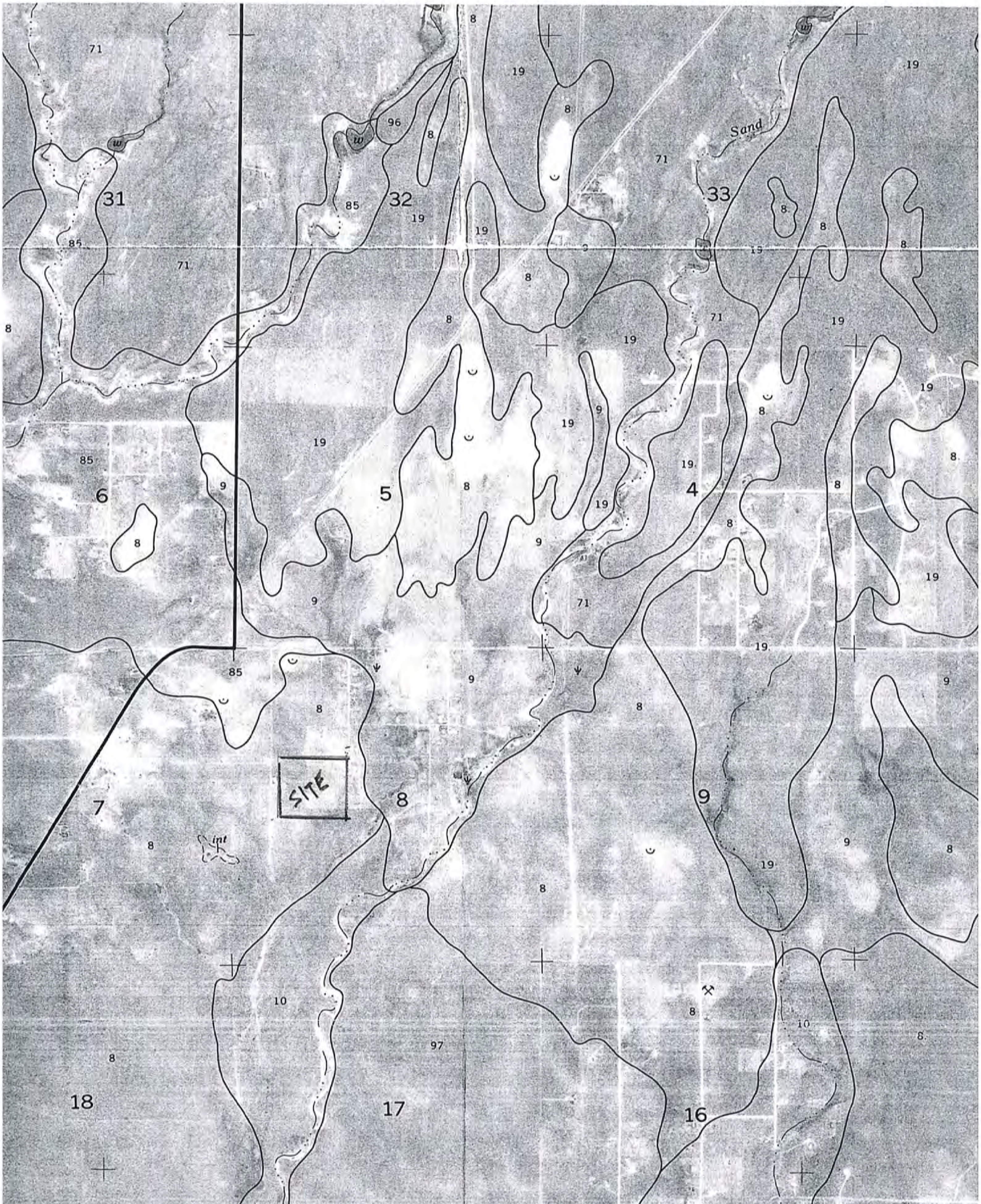
SOURCE	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP
TIME	WQCV [cfs]	EURV [cfs]	2 Year [cfs]	5 Year [cfs]	10 Year [cfs]	25 Year [cfs]	50 Year [cfs]	100 Year [cfs]	500 Year [cfs]
0:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
0:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01
0:15:00	0.00	0.00	0.02	0.04	0.05	0.03	0.04	0.04	0.06
0:20:00	0.00	0.00	0.09	0.11	0.13	0.08	0.10	0.11	0.15
0:25:00	0.00	0.00	0.33	0.61	0.83	0.28	0.41	0.50	1.00
0:30:00	0.00	0.00	0.50	0.83	1.08	1.60	2.69	3.60	7.66
0:35:00	0.00	0.00	0.49	0.79	1.04	2.48	3.83	5.56	10.74
0:40:00	0.00	0.00	0.44	0.71	0.93	2.54	3.98	5.81	11.25
0:45:00	0.00	0.00	0.40	0.63	0.83	2.32	3.60	5.45	10.77
0:50:00	0.00	0.00	0.36	0.57	0.74	2.12	3.26	4.91	10.03
0:55:00	0.00	0.00	0.32	0.51	0.66	1.87	2.87	4.38	9.05
1:00:00	0.00	0.00	0.30	0.46	0.60	1.66	2.55	3.92	8.27
1:05:00	0.00	0.00	0.27	0.42	0.55	1.49	2.29	3.56	7.71
1:10:00	0.00	0.00	0.24	0.38	0.50	1.32	2.03	3.14	6.82
1:15:00	0.00	0.00	0.22	0.34	0.46	1.16	1.78	2.74	5.95
1:20:00	0.00	0.00	0.19	0.29	0.40	1.00	1.52	2.33	5.07
1:25:00	0.00	0.00	0.17	0.26	0.35	0.85	1.28	1.95	4.24
1:30:00	0.00	0.00	0.16	0.25	0.33	0.73	1.11	1.67	3.66
1:35:00	0.00	0.00	0.15	0.23	0.30	0.65	0.98	1.48	3.22
1:40:00	0.00	0.00	0.14	0.21	0.27	0.59	0.88	1.32	2.84
1:45:00	0.00	0.00	0.13	0.19	0.25	0.53	0.79	1.17	2.51
1:50:00	0.00	0.00	0.12	0.17	0.23	0.47	0.70	1.03	2.19
1:55:00	0.00	0.00	0.11	0.15	0.20	0.41	0.61	0.89	1.88
2:00:00	0.00	0.00	0.09	0.13	0.18	0.36	0.52	0.76	1.59
2:05:00	0.00	0.00	0.08	0.11	0.14	0.29	0.42	0.62	1.30
2:10:00	0.00	0.00	0.06	0.08	0.11	0.23	0.33	0.48	1.02
2:15:00	0.00	0.00	0.05	0.06	0.08	0.17	0.23	0.34	0.73
2:20:00	0.00	0.00	0.03	0.04	0.06	0.11	0.15	0.21	0.46
2:25:00	0.00	0.00	0.03	0.04	0.05	0.07	0.09	0.12	0.29
2:30:00	0.00	0.00	0.02	0.03	0.04	0.05	0.06	0.08	0.19
2:35:00	0.00	0.00	0.02	0.02	0.03	0.03	0.04	0.05	0.13
2:40:00	0.00	0.00	0.02	0.02	0.03	0.03	0.03	0.04	0.09
2:45:00	0.00	0.00	0.01	0.02	0.02	0.02	0.02	0.03	0.06
2:50:00	0.00	0.00	0.01	0.01	0.02	0.02	0.02	0.02	0.04
2:55:00	0.00	0.00	0.01	0.01	0.01	0.01	0.01	0.01	0.02
3:00:00	0.00	0.00	0.01	0.01	0.01	0.01	0.01	0.01	0.02
3:05:00	0.00	0.00	0.01	0.01	0.01	0.01	0.01	0.01	0.01
3:10:00	0.00	0.00	0.00	0.01	0.01	0.01	0.01	0.01	0.01
3:15:00	0.00	0.00	0.00	0.00	0.01	0.01	0.01	0.01	0.01
3:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01
3:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
6:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

TABLE 16.--SOIL AND WATER FEATURES

[Absence of an entry indicates the feature is not a concern. See "flooding" in Glossary for definition of terms as "rare," "brief," and "very brief." The symbol > means greater than]

Soil name and map symbol	Hydro-logic group	Flooding			Bedrock		Potential frost action
		Frequency	Duration	Months	Depth	Hardness	
					In		
Alamosa: 1	C	Frequent	Brief	May-Jun	>60	---	High.
Ascalon: 2, 3	B	None	---	---	>60	---	Moderate.
Badland: 4	D	---	---	---	---	---	---
Bijou: 5, 6, 7	B	None	---	---	>60	---	Low.
Blakeland: 8	A	None	---	---	>60	---	Low.
[1]9: Blakeland part	A	None	---	---	>60	---	Low.
Fluvaquentic Haplaquolls part	D	Common	Very brief	Mar-Aug	>60	---	High.
Blendon: 10	B	None	---	---	>60	---	Moderate.
Bresser: 11, 12, 13	B	None	---	---	>60	---	Low.
Brussett: 14, 15	B	None	---	---	>60	---	Moderate.
Chaseville: 16, 17	A	None	---	---	>60	---	Low.
[1]18: Chaseville part	A	None	---	---	>60	---	Low.
Midway part	D	None	---	---	10-20	Rippable	Moderate.
Columbine: 19	A	None to rare	---	---	>60	---	Low.
Connerton: [1]20: Connerton part	B	None	---	---	>60	---	High.
Rock outcrop part	D	---	---	---	---	---	---
Cruckton: 21	B	None	---	---	>60	---	Moderate.
Cushman: 22, 23	C	None	---	---	20-40	Rippable	Moderate.
[1]24: Cushman part	C	None	---	---	20-40	Rippable	Moderate.
Kutch part	C	None	---	---	20-40	Rippable	Moderate.
Elbeth: 25, 26	B	None	---	---	>60	---	Moderate.
[1]27: Elbeth part	B	None	---	---	>60	---	Moderate.

See footnote at end of table.



SITE
Sand
31
32
33
6
5
4
7
8
9
18
17
16
w
int

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.

$$t_c = t_i + t_t \quad \text{(Eq. 6-7)}$$

Where:

t_c = time of concentration (min)

t_i = overland (initial) flow time (min)

t_t = travel time in the ditch, channel, gutter, storm sewer, etc. (min)

3.2.1 Overland (Initial) Flow Time

The overland flow time, t_i, may be calculated using Equation 6-8.

$$t_i = \frac{0.395(1.1 - C_5)\sqrt{L}}{S^{0.33}} \quad \text{(Eq. 6-8)}$$

Where:

t_i = overland (initial) flow time (min)
C_5 = runoff coefficient for 5-year frequency (see Table 6-6)
L = length of overland flow (300 ft <u>maximum</u> for non-urban land uses, 100 ft <u>maximum</u> for urban land uses)
S = average basin slope (ft/ft)

Note that in some urban watersheds, the overland flow time may be very small because flows quickly concentrate and channelize.

3.2.2 Travel Time

For catchments with overland and channelized flow, the time of concentration needs to be considered in combination with the travel time, t_t, which is calculated using the hydraulic properties of the swale, ditch, or channel. For preliminary work, the overland travel time, t_t, can be estimated with the help of Figure 6-25 or Equation 6-9 (Guo 1999).

$$V = C_v S_w^{0.5} \quad \text{(Eq. 6-9)}$$

Where:

V = velocity (ft/s)

C_v = conveyance coefficient (from Table 6-7)

S_w = watercourse slope (ft/ft)

Table 6-7. Conveyance Coefficient, C_v

Type of Land Surface	C_v
Heavy meadow	2.5
Tillage/field	5
Riprap (not buried)*	6.5
Short pasture and lawns	7
Nearly bare ground	10
Grassed waterway	15
Paved areas and shallow paved swales	20

* For buried riprap, select C_v value based on type of vegetative cover.

The travel time is calculated by dividing the flow distance (in feet) by the velocity calculated using Equation 6-9 and converting units to minutes.

The time of concentration (t_c) is then the sum of the overland flow time (t_i) and the travel time (t_t) per Equation 6-7.

3.2.3 First Design Point Time of Concentration in Urban Catchments

Using this procedure, the time of concentration at the first design point (typically the first inlet in the system) in an urbanized catchment should not exceed the time of concentration calculated using Equation 6-10. The first design point is defined as the point where runoff first enters the storm sewer system.

$$t_c = \frac{L}{180} + 10 \qquad \text{(Eq. 6-10)}$$

Where:

t_c = maximum time of concentration at the first design point in an urban watershed (min)

L = waterway length (ft)

Equation 6-10 was developed using the rainfall-runoff data collected in the Denver region and, in essence, represents regional "calibration" of the Rational Method. Normally, Equation 6-10 will result in a lesser time of concentration at the first design point and will govern in an urbanized watershed. For subsequent design points, the time of concentration is calculated by accumulating the travel times in downstream drainageway reaches.

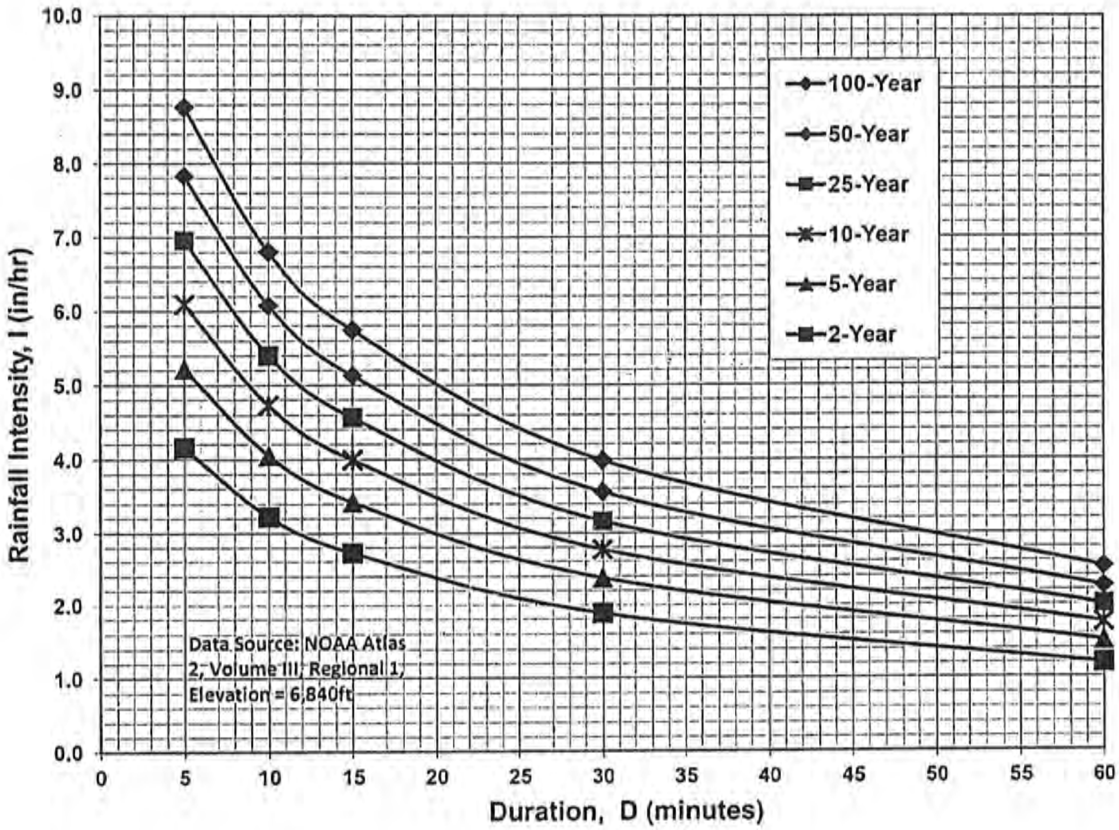
3.2.4 Minimum Time of Concentration

If the calculations result in a t_c of less than 10 minutes for undeveloped conditions, it is recommended that a minimum value of 10 minutes be used. The minimum t_c for urbanized areas is 5 minutes.

3.2.5 Post-Development Time of Concentration

As Equation 6-8 indicates, the time of concentration is a function of the 5-year runoff coefficient for a drainage basin. Typically, higher levels of imperviousness (higher 5-year runoff coefficients) correspond to shorter times of concentration, and lower levels of imperviousness correspond to longer times of

Figure 6-5. Colorado Springs Rainfall Intensity Duration Frequency



IDF Equations

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

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

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

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

$I_{5} = -1.50 \ln(D) + 7.583$

$I_{2} = -1.19 \ln(D) + 6.035$

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

National Flood Hazard Layer FIRMette

FEMA

104°41'38"W 38°56'29"N

104°41'1"W 38°56'1"N

Feet

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

1:6,000

Basemap: USGS National Map: Orthoimagery: Data refreshed October, 2020

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 / 17.5 Cross Sections with 1% Annual Chance Water Surface Elevation
- Coastal Transect
- 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

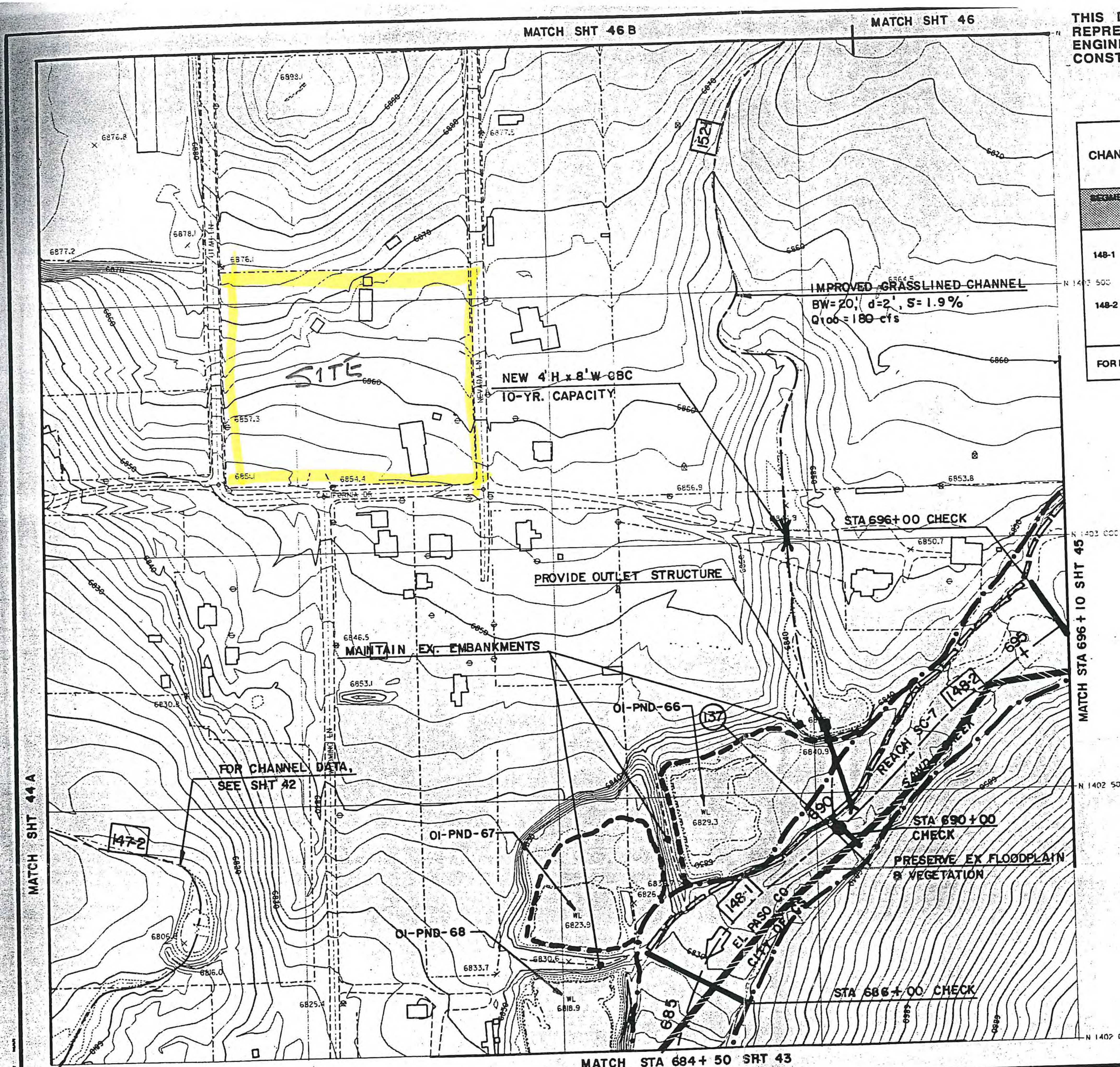
The pin displayed on the map is an approximate point selected by the user and does not represent an authoritative property location.

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 3/30/2023 at 4:55 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.

THIS DRAWING IS A MASTER PLANNING SHEET REPRESENTING PRELIMINARY AND CONCEPTUAL ENGINEERING. IT SHOULD NOT BE USED FOR CONSTRUCTION PURPOSES.



CHANNEL IMPROVEMENTS

SEGMENT NO.	BOTTOM WIDTH (FT)	CHANNEL TYPE
148-1	N/A	SELECTIVE RIPRAP LININGS AND GRADE CONTROL
148-2		

FOR PROFILE SEE SHEET P-12

OLIVER E. WATTS
CONSULTING ENGINEER, INC.
COLORADO SPRINGS

7280 NEVADA LANE
SAND CREEK DRAINAGE MAP
1"=200'

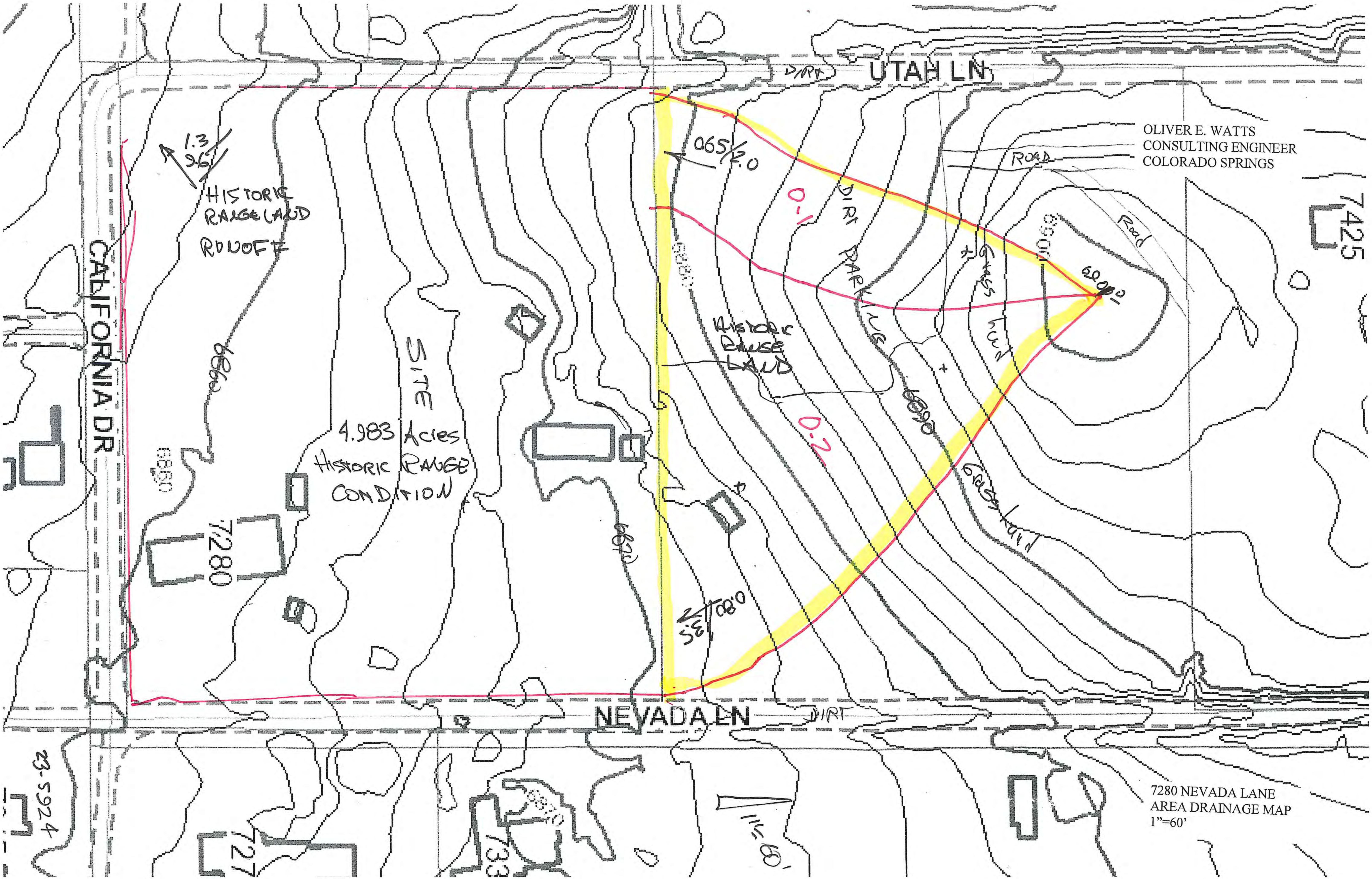
0' 200' 400'

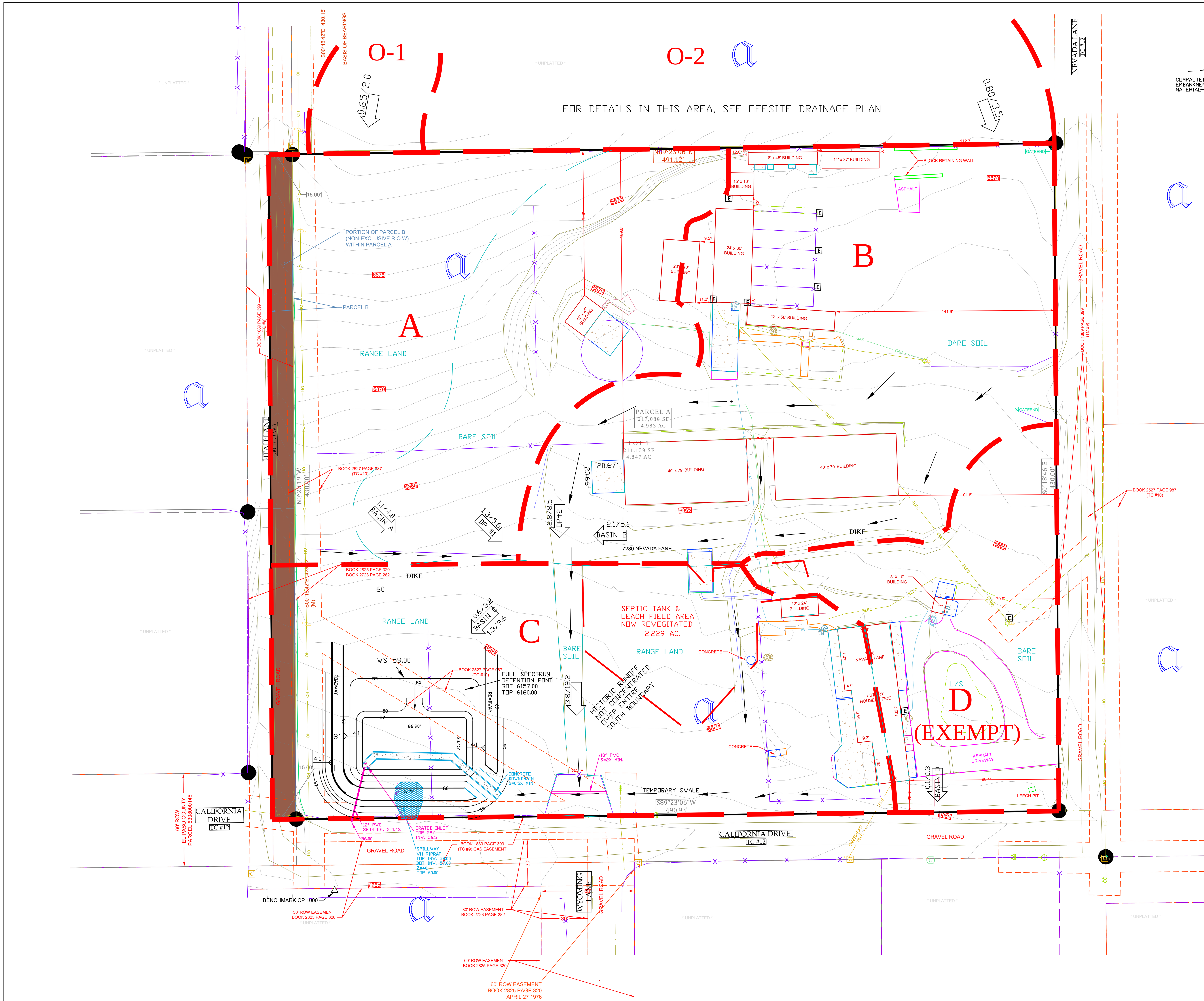
Kiowa Engineering Corporation
419 W. Bijou Street
Colorado Springs, Colorado

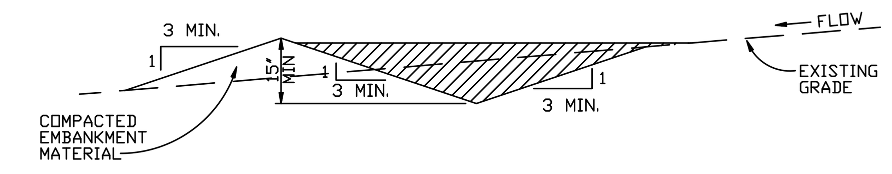
SAND CREEK DRAINAGE
BASIN PLANNING STUDY
PRELIMINARY DESIGN PLANS

Project No.	90-0
Date:	9-92
Design:	RNW
Drawn:	EAK
Check:	RNW
Revisions:	

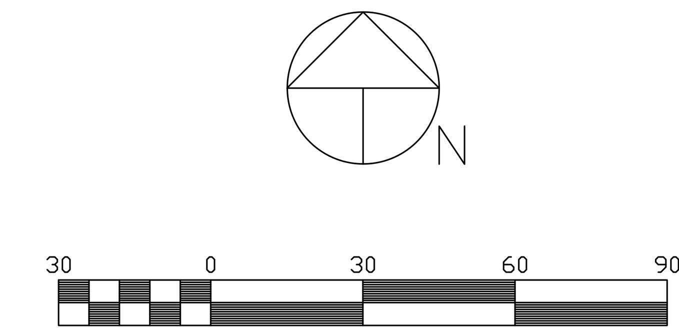
44


UTAH LN
DIRT
OLIVER E. WATTS
CONSULTING ENGINEER
COLORADO SPRINGS
ROAD
Road
7425
CALIFORNIA DR
1.3
9.6
HISTORIC
RANGELAND
RUNOFF
065
0.1
DIRT PARKING
Historic
Range
LAND
SITE
4.983 Acres
Historic Range
CONDITION
0.2
6890
Grass
6860
6870
7280
NEVADA LN
DIRT
7280 NEVADA LANE
AREA DRAINAGE MAP
1"=60'
23-5924
1" = 60'





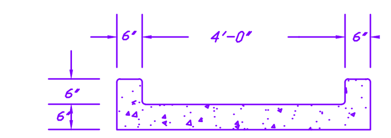
TEMPORARY SWALE
NTS



Scale 1" = 30'

LEGEND:

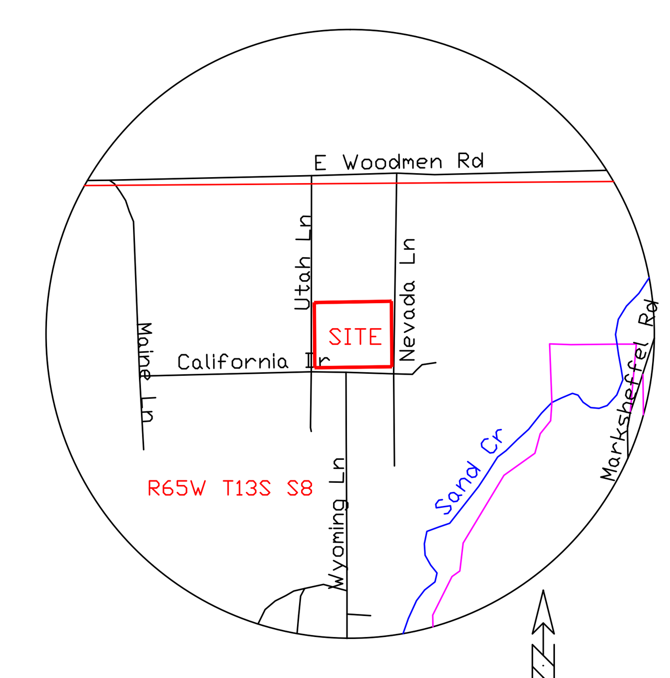
- ⇨ 10.5/20.4 RUNOFF IN CFS 5-YEAR/100-YEAR
- A LIMIT OF DRAINAGE BASIN AND DESIGNATION
- EXISTING STORM SEWER AS LABELED
- PROPOSED STORM SEWER AS LABELED
- B LIMIT OF SOILS TYPE AND GROUP
- GROUND COVER
- DIRECTION OF RUNOFF TEMPORARY SWALE WHERE SHOWN



DOWNDRAIN SECTION
1/2" = 1'-0"

DRAINAGE BASIN SUMMARY

BASIN	AREA -AC.-	RUNOFF IN CFS 5-YEAR	RUNOFF IN CFS 100-YEAR
O-1	0.59	0.65	2.0
O-2	1.30	0.80	3.5
A	1.41	1.1	4.0
B	1.54	2.1	5.1
C	1.41	0.6	3.2
D	0.63	0.1	0.3
DESIGN POINTS			
1	2.00	1.3	5.6
2	2.84	2.8	8.5
3	4.95	3.8	12.2
TOTAL HISTORIC	5.70	1.3	9.6



VICINITY MAP
1"=1000'

DRAWN BY: O.E. WATTS DATE: 11-2-23 DWG. NO.: 23-5924-04 BASE PLAN BY: EDWARD-JAMES SURVEYING 2-8-21	APPROVED BY: PROJ. NO. DWG.	REVISIONS: 5-16-24 DETENTION POND OEW	OLIVER E. WATTS CONSULTING ENGINEER COLORADO SPRINGS	PROJECT: 7280 NEVADA LANE P NW1/4, NE1/4 S.8, T.13S., R.65W. 6TH P.M. EL PASO COUNTY

SHT. NAME: DRAINAGE PLAN

SHT. NO. 1 OF 1