EPC STORMWATER REVIEW COMMENTS
IN ORANGE BOXES WITH BLACK TEXT

PRELIMINARY AND FINAL
DRAINAGE PLAN AND REPORT
FALCON STORAGE SUBDIVISION

PART OF THE SW1/4 SECTION 1, T.13S. R.65W. OF THE 6TH P.M.
EL PASO COUNTY

February 4, 2021

Revised
November 23, 2022

Revised
June 7, 2023

Revised
June 22, 2023

Revised
August 31, 2023

Revised
December 12, 2023

PCD File No. PPR2232
PCD File No. MS232

Prepared for
Falcon Storage Partners LLLP
4615 Northpark Drive
Colorado Springs, CO 80918

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

OLIVER E. WATTS, PE-LS
OLIVER E. WATTS, CONSULTING ENGINEER, INC.
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December 13, 2023

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

ATTN: *Joshua Palmer, P.E.*

SUBJECT: Preliminary and Final Drainage Plan and Report
Falcon Storage Subdivision

Transmitted herewith for your review and approval is the drainage plan and report for The Falcon Storage Subdivision in El Paso County. This report will accompany the development plan and subdivision plat submittal. This report has been revised in accordance with your review comments of November 23, 2022, March 2, 2023, August 18, 2023 and October 16, 2023.

Please contact me if I may provide any further information.

Oliver E. Watts, Consulting Engineer, Inc.

BY: _____
Oliver E. Watts, President

FALCON STORAGE SUBDIVISION
DRAINAGE REPORT
TABLE OF CONTENTS

FALCON STORAGE SUBDIVISION
DRAINAGE REPORT
REFERENCES

City-County Drainage Criteria, current edition
Fema Firm Insurance Rate Map
El Paso County Soils Survey, SCS
Falcon Drainage Basin Planning Study
Drainage Report, Falcon Meadows at Bent Grass
Drainage Report, Latigo Business Center, Lot 1

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 date

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.

Falcon Storage Partners LLLP

By: _____

Richard Graham Date
4615 Northpark Drive
Colorado Springs, CO 80918

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:

The Falcon Storage Subdivision is located in the Latigo Business Center development of El Paso County as shown on the enclosed vicinity map. Occupying a portion of the West half of Section 1, Township 13 South, Range 65 West of the 6th P.M., totaling 5.004 acres. It is located in the Falcon Drainage Basin as shown on the enclosed basin map. It lies west of Bent Grass Meadows Drive north of the Latigo Business Center Filing No. 1 as shown on the enclosed drainage plan. The site will be developed into an RV Storage site as shown on the enclosed drainage plan, as an expansion to the one in the Latigo Business Center Filing No. 1, both owned by the developer.

5. FLOOD PLAIN STATEMENT:

This subdivision is not within the limits of a flood plain or flood hazard area, according to FEMA map panel number 08041C0553 G, dated December 7, 2018, a copy of which is enclosed for reference.

6. METHOD AND CRITERIA:

The method used for all computations is that specified in the City-County Drainage Criteria Manual, using the rational method for areas of the size of the development. All computations are enclosed for reference and review. Pertinent portions of the criteria are enclosed.

The soils in the subdivision have been mapped by the local USDA/SCS office, and a soils map and interpretation sheet are enclosed for reference. All soils in this area are of hydrologic group "A" within the development area.

7. DESCRIPTION OF RUNOFF:

A. Drainage Inflows: The drainage Report for Falcon Meadows at Bent Grass indicates an existing drainage swale above the north boundary to divert runoff from this site and route it to Bent Grass Meadows and then past this development in Bent Grass Meadows Drive to outfall points to an existing detention pond across the street. A copy of this drainage plan is enclosed. Also shown on this map is that portion of the Meadows Filing No. 1 that drains 0.62 cfs / 3.5 cfs (5-year / 100-year runoffs) into this subdivision along the westerly boundary (Basin O-1), and it indicates the historic undeveloped runoff of the site, Basin A (historic) totaling 1.25 cfs / 7.6 cfs at the lowest (southeast) portion of the subdivision.

B. Interior Routing: The area will be graded to conform to the existing topography shown on the drainage plan. The property has been rough graded, which complies with the historic runoff pattern. Additional grading is indicated which is intended to contain the runoff into the interior drive isle street network, and along the streets to the water quality pond The westerly street (Basin A) will combine with offset basin O-1 to develop 3.0 cfs \ 6.2 cfs (5-year / 100-year runoffs) near the in the southwest corner of the plat (Design Point 1). Basin B will develop 1.3/2.5 cfs in the southerly driveway adjacent to the north entrance. It will combine with basin C along the same routing for 5.2/10.4 cfs at the southwest intersection (design point 2). This will combine basin D to outfall into the water quality pond (design point 3). The total outfall at this point 5.5 cfs/12.5 cfs, into the sand filter basin.

C. Detention Storage: At the proposed outfall point a sand filter water quality pond is proposed, as required by the County. The pond is sized for a temporary sedimentation basin to be used during the construction period and converted into a permanent sand filter basin upon completion. The sedimentation basin will contain 9000 +CF (at 1800 CF per acre). An 8-inch riser pipe is used as an outlet, with holes drilled as computed to detain the runoff as required. One foot of freeboard is provided with a spillway that will pass the 100-year runoff. Details are shown on the enclosed drainage plan. Following construction the basin will be converted to a sand filter basin. A 4-inch slotted underdrain will be placed in a section of CDOT class C Filter material and drain into the grated inlet outlet structure set at the WQCV level, and sized for the 100-year runoff. An orifice plate will be provided on the end of the underdrain with an orifice sized for the installation. Sand filter water quality basin computation sheet is included for the basin. Fully

developed runoffs are analyzed for the basin. As required by the County, the basin is used for water quality storage only and the outfall will run across Latigo Business Center Filing No. 1 to an existing full spectrum pond (Pond WU) to the south of Woodmen Road, north of Highway 24, between Tamlin and Meridian Roads, in accordance with the approved drainage reports for the area. This outfall run is described below.

D. Outfall Point: Discharge from the subdivision will be into existing north-south street of Lot 1 of the Latigo Business Center, filing no. 1, as shown on the drainage plan. Some minor construction is shown along the north boundary of Lot 1 as shown on the drainage plan to create a positive installation. The two properties are under common ownership and permission to outfall into the Latigo Business Center is granted. The drainage plan for the Latigo Business Center is enclosed. This report indicated two existing discharges: 0.2 cfs / 0.5 cfs near the southwest corner and 4.1 cfs / 10.1 cfs over the remaining south frontage. A 24 inch RCP will run from the CDOT Type C outlet box at a minimum slope of 0.22% into the existing ditch shown on the drainage plan.

As shown on the enclosed drainage plan for Lot 1 of the Latigo Business Park and the enclosed sheet 7 of the computations the swales along said Lot 1 adjacent to Bent Grass Meadows Boulevard are more than adequate to safely contain the drainage outfall from this subdivision. The depth of runoff from the pond is 0.21 feet in the upper swale and 0.49 feet below the entrance to Lot 1. These swales also indicate more that adequate freeboard according to the grading plan. At the bottom (South) of Lot 1 is the storm sewer system that diverts the runoff from the District 49 bus facility and Bent Grass Meadows Boulevard eastward toward the above mentioned full spectrum pond. This being the limit of the first public storm sewer and our required justification.

As indicated in the meeting with staff, Please analyze this storm pipe and indicate whether it is adequate for the increase in flows. As indicated above this site will increase flows 2.4 cfs (100yr) from what the Lot 1 report indicates.

WATER QUALITY

A sand filter basin water quality facility will be provided

FOUR STEP PROCESS

The following process has been followed to minimize adv

Runoff Reduction: The scope of the development has b ments to present the minimum footprint in providing a RV Storage development. The undisturbed portions are to be landscaped to reduce the impervious percent.

Water Quality Unresolved.

Provide WQCV: ~~Detention~~ water quality storage is being provided for this subdivision by a sand filter ~~detention~~ pond and runoff will be routed to a full spectrum pond located downstream, south of Woodmen Road, north of Highway 24, between Tamlin and Meridian Roads, by others as a sub regional facility.

Stabilize Drainage Ways: The site will be graded to route the runoff over improved street installations to provide channel stabilization in the natural erosive material over the site. Discharge from the site will be into adjacent and downstream facilities in accordance with the master drainage basin plan for the Falcon drainage basin and previously approved subdivision drainage reports. Copies of each plan are enclosed. There will be no adverse affect on downstream developments as a result of this subdivision

Consider need for Industrial and Commercial BMP's: This is a RV Storage site, so source control problems will be a minimum. During construction, standard site specific state of the art BMP's will be employed to minimize and mitigate erosive problems.

8. COST ESTIMATE:

Item No.	Description	Quantity	Unit Cost	Cost
1	Pond/BMP Earthwork	881 CY	$ 23.00	$ 20263.00
2	Slotted drain	187 LF	40.00	7480.00
3	Riprap	14 Tons	80.00	1096.00
4	Grated Inlet	1 ea	5611.00	5611.00
4	12” PVC drain	106 LF	112.00	11872.00
5	Concrete Pond Inlet	15 CY	589.00	10335.00
6	24” RCP Pond Outlet	106 LF	91.00	9646.00
	Subtotal Construction Cost			$ 66303.00
	Engineering	10%		6630.30
	Total Estimated Cost			$ 72933.30

9. FEES: Due at plat recording.
2023 Falcon Basin Fees: 5.004 acres @46.4% Impervious = 3.1175 Impervious acres (see p. 6-17)
Drainage fees @ $ 37,256 per acre = $ 86,503.07
Bridge fees @ $ 5,118 per acre = $ 11,083.26
Total Fees: $ 90,386.33

10. SUMMARY

The Falcon Storage Subdivision is a proposed 1-lot, RV Storage subdivision containing 5.004 acres. The proposed street facilities will adequately convey, detain and outfall runoff from the site to existing sufficient adjacent and downstream facilities, as described in this report and the respective drainage reports. Water Quality is being utilized in lieu of a full spectrum detention pond due to the existing regional facility as described earlier in this report. Flows from site will be greater than historic levels. Site appurtenances will not adversely affect the downstream and surrounding developments.

This report and findings is in general conformance with the MDDP and Preliminary Drainage Reports or other pertinent studies

MAJOR BASIN	SUB BASIN	AREA		BASIN		Tc MIN	I in./hr.		SOIL GRP	DEV. TYPE	C		FLOW 5-ry qp -CFS-	FLOW 100-yr qp -CFS-	RETURN PERIOD -years-	
		PLANIM READ	ACRES	LENGTH -FT.-	HEIGHT -FT.-											
FALCON	0-1	9.75	2.47	300	4.5	27			A	SF 5AC.	0.12	0.39				
			V=0.82	+480	1.3	+10										
						37	2.1	3.6					0.62	3.5	5	100
HISTORIC	A	COGO	5.00	+525	9	+13										
			V=0.65			50	1.8	2.8	A	R/L	0.08	0.35				
	TOTAL		7.47							MIX	0.093	0.362	1.25	7.6	5	100
DEVELOPED	A	COGO	1.68	300	2.5	15.2			A	GRAVEL	0.59	0.70			5	100
			V=3.06	+300	7	+1.6										
						16.8	3.2	5.5					3.2	6.5	5	100
	O1 + A	(DP-1)	4.15	=400	8	+2	3.2	5.5	A	MIX	0.310	0.516				
			V=2.82			52	1.7	2.9					2.1	6.2	5	100
	B	COGO	0.66	370	2.4	16.4			A	GRAVEL	0.59	0.70	1.3	2.5	5	100
	C	COGO	2.30	300	4	14.5			A	GRAVEL	0.59	0.70				
			V=2.66	+340	6	+2.1										
						16.6	3.3	5.5					4.5	8.9	5	100
	B+C			+360	8	+2.7										
		(DP-2)	2.96			19.3	3.0	5.1	A	GRAVEL	0.59	0.70	5.2	10.4	5	100
	D	COGO	0.36	240	4.5	11.6	3.8	6.4	A	GRAVEL	0.59	0.70	0.8	1.6	5	100
	B+C+D		V=2.22	+50		+0.4										
		(DP-3)	3.32			19.7	3.0	5.1	A	GRAVEL	0.59	0.70	5.9	11.9	5	100
	+0-1+A		7.47	+240	2.4	+2										
						54	1.7	2.8	A	MIX	0.434	0.598	5.5	12.5	5	100

HYDROLOGICAL COMPUTATION – BASIC DATA
PROJ: FALCON STORAGE SUB BY: O.E. WATTS
RATIONAL METHOD DATE: 2/4/21 10/17/22 11-21-21

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

Design Procedure Form: Sand Filter (SF)

UD-BMP (Version 3.07, March 2018)

3/

Designer:	Oliver E. Watts
Company:	Olier E. Watts, Consulting Engineer, Inc.
Date:	December 15, 2023
Project:	Falcon Storage
Location:	

1. Basin Storage Volume

A) Effective Imperviousness of Tributary Area, I_a (100% if all paved and roofed areas upstream of sand filter): I_a = 46.4 %

provide calculations for determining percentage Unresolved.

B) Tributary Area's Imperviousness Ratio ($i = I_a/100$): i = 0.464

C) Water Quality Capture Volume (WQCV) Based on 12-hour Drain Time
$WQCV = 0.8 * (0.91 * i^3 - 1.19 * i^2 + 0.78 * i)$: WQCV = 0.16 watershed inches

D) Contributing Watershed Area (including sand filter area): Area = 325,393 sq ft

E) Water Quality Capture Volume (WQCV) Design Volume
$V_{WQCV} = WQCV / 12 * Area$: V_{WQCV} = 4,265 cu ft

F) For Watersheds Outside of the Denver Region, Depth of Average Runoff Producing Storm: d_6 = in

G) For Watersheds Outside of the Denver Region, Water Quality Capture Volume (WQCV) Design Volume: $V_{WQCV\ OTHER}$ = cu ft

H) User Input of Water Quality Capture Volume (WQCV) Design Volume (Only if a different WQCV Design Volume is desired): $V_{WQCV\ USER}$ = cu ft

2. Basin Geometry

A) WQCV Depth: D_{WQCV} = 3.0 ft

B) Sand Filter Side Slopes (Horizontal distance per unit vertical, 4:1 or flatter preferred). Use "0" if sand filter has vertical walls.: Z = 3.00 ft / ft
DIFFICULT TO MAINTAIN, INCREASE WHERE POSSIBLE

C) Minimum Filter Area (Flat Surface Area): A_{Min} = 1887 sq ft

D) Actual Filter Area: A_{Actual} = 2100 sq ft

E) Volume Provided: V_T = 11278 cu ft

3. Filter Material

Choose One
- (●) 18" CDOT Class B or C Filter Material
- ( ) Other (Explain):

4. Underdrain System

A) Are underdrains provided?

Choose One
- (●) YES
- ( ) NO

B) Underdrain system orifice diameter for 12 hour drain time

i) Distance From Lowest Elevation of the Storage Volume to the Center of the Orifice: y = 0.5 ft

ii) Volume to Drain in 12 Hours: Vol_{12} = 4,265 cu ft

iii) Orifice Diameter, 3/8" Minimum: D_O = 2 in

Design Procedure Form: Sand Filter (SF)

Designer: Oliver E. Watts
Company: Oller E. Watts, Consulting Engineer, Inc.
Date: December 15, 2023
Project: Falcon Storage
Location:

5. Impermeable Geomembrane Liner and Geotextile Separator Fabric A) Is an impermeable liner provided due to proximity of structures or groundwater contamination?	Choose One ○ YES ◉ NO
6. Inlet / Outlet Works A) Describe the type of energy dissipation at inlet points and means of conveying flows in excess of the WQCV through the outlet	Riprap at inlet and spillway and pipe end

Notes:

Required Area per Row (in^2)

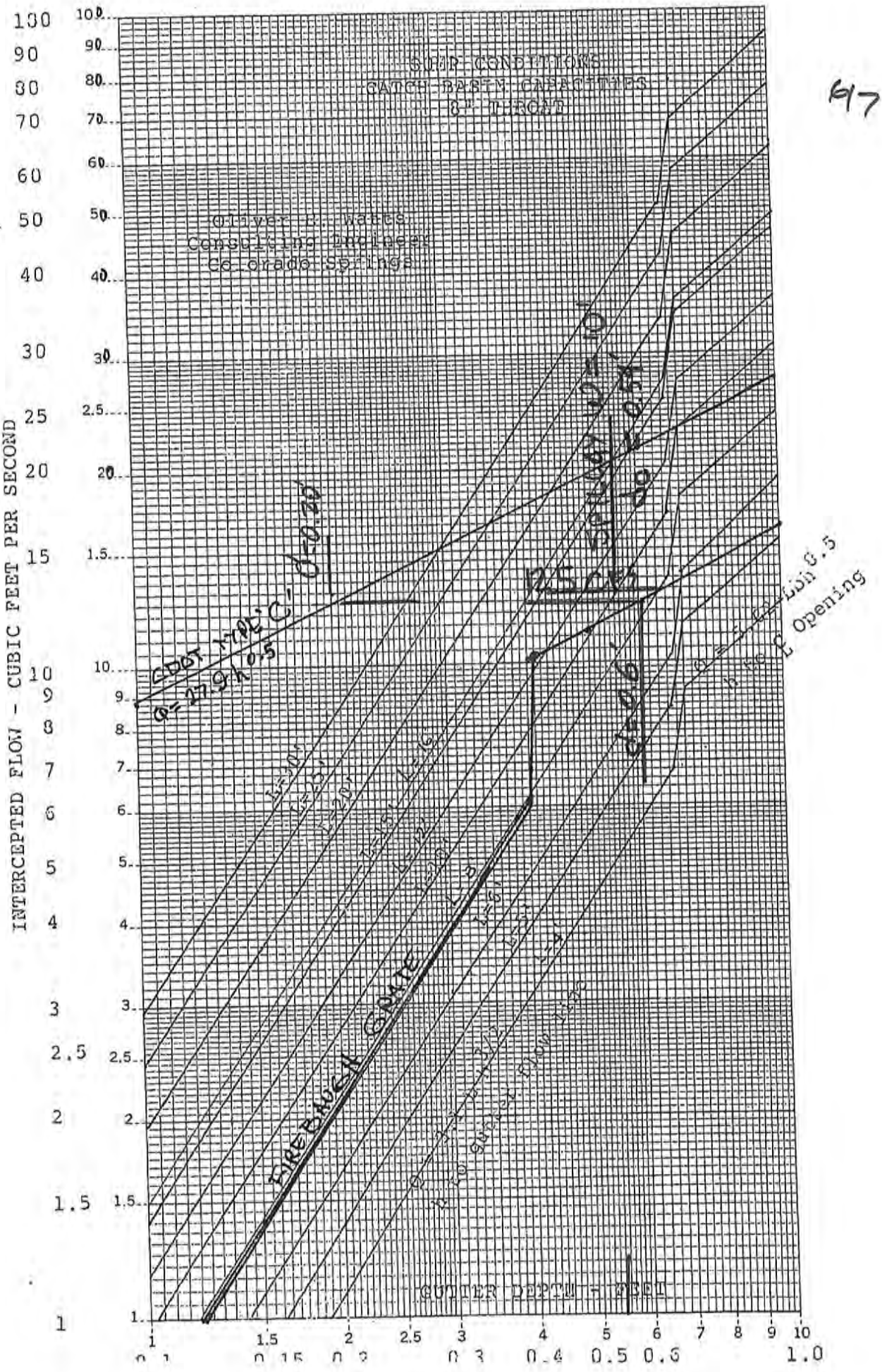
Design Volume (acre-ft)	Depth at Outlet (ft)							
	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5
2	15.04	7.71	5.10	3.76	2.95	2.41	2.02	1.73
1	7.52	3.86	2.55	1.88	1.48	1.21	1.01	0.87
0.6	4.51	2.31	1.53	1.13	0.89	0.72	0.61	0.52
0.4	3.01	1.54	1.02	0.75	0.59	0.48	0.40	0.35
0.2	1.50	0.77	0.51	0.38	0.30	0.24	0.20	0.17
0.1	0.75	0.39	0.26	0.19	0.15	0.12	0.10	0.09
0.06	0.45	0.23	0.15	0.11	0.09	0.07	0.06	0.05
0.04	0.30	0.15	0.10	0.08	0.06	0.05	0.04	0.03
0.02	0.15	0.08	0.05	0.04	0.03	0.02	0.02	0.02
0.01	0.08	0.04	0.03	0.02	0.01	0.01	0.01	0.01

TABLE SB-1

Circular Perforation Sizing

Hole Diameter (in)	Hole Diameter (in)	Area per Row (in^2)		
		n = 1	n = 2	n = 3
1/4	0.250	0.05	0.10	0.15
5/16	0.313	0.08	0.15	0.23
3/8	0.375	0.11	0.22	0.33
7/16	0.438	0.15	0.30	0.45
1/2	0.500	0.20	0.39	0.59
9/16	0.563	0.25	0.50	0.75
5/8	0.625	0.31	0.61	0.92
11/16	0.688	0.37	0.74	1.11
3/4	0.750	0.44	0.88	1.33
7/8	0.875	0.60	1.20	1.80
1	1.000	0.79	1.57	2.36
1 1/8	1.125	0.99	1.99	2.98
1 1/4	1.250	1.23	2.45	3.68
1 3/8	1.375	1.48	2.97	4.45
1 1/2	1.500	1.77	3.53	5.30
1 5/8	1.625	2.07	4.15	6.22
1 3/4	1.750	2.41	4.81	7.22
1 7/8	1.875	2.76	5.52	8.28
2	2.000	3.14	6.28	9.42
n = Number of columns of perforations				
Minimum steel plate thickness		1/4"	5/16"	3/8"

TABLE SB-2



46 7080

LOGARITHMIC 2 X 1 CYCLES
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02
5523 | FALCON STORAGE | OUTFALL SWALE | DEWATTS 12/13/23 | 7/7

$Q = \frac{1.486}{n} A R^{2/3} S^{1/2}$

$Q = 125$ CFS

$S = 1/53.73 = 0.0186$

$A = 16d$

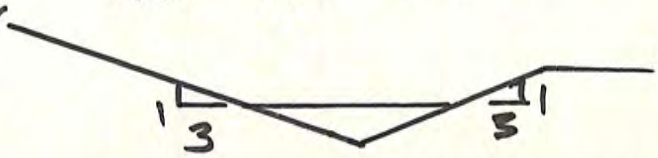
$WP = 16.03d \times 2$

$n = 0.035$

Upper Half A-A

d	A	WP	R	Q	
~~0.25~~	~~4.00~~	~~9.0390~~	~~0.9981~~	~~5.78~~	
~~0.50~~	~~8.00~~	~~16.0312~~	~~0.5~~	~~3.64~~	
0.80	12.80	25.65	0.499	46.6	
0.50	8.00	16.0312	0.499	23.1	
0.30	4.80	9.618	✓	17.5	
0.20	3.20	6.425	✓	12.2	
0.21	3.36	6.733	✓	12.24	← T = 6.72
0.25	4.00	8.056	✓	14.37	

Lower Half B-B



$A = 6d$

$WP = 2\sqrt{10}d$

$S = 1/92 = 0.0109$

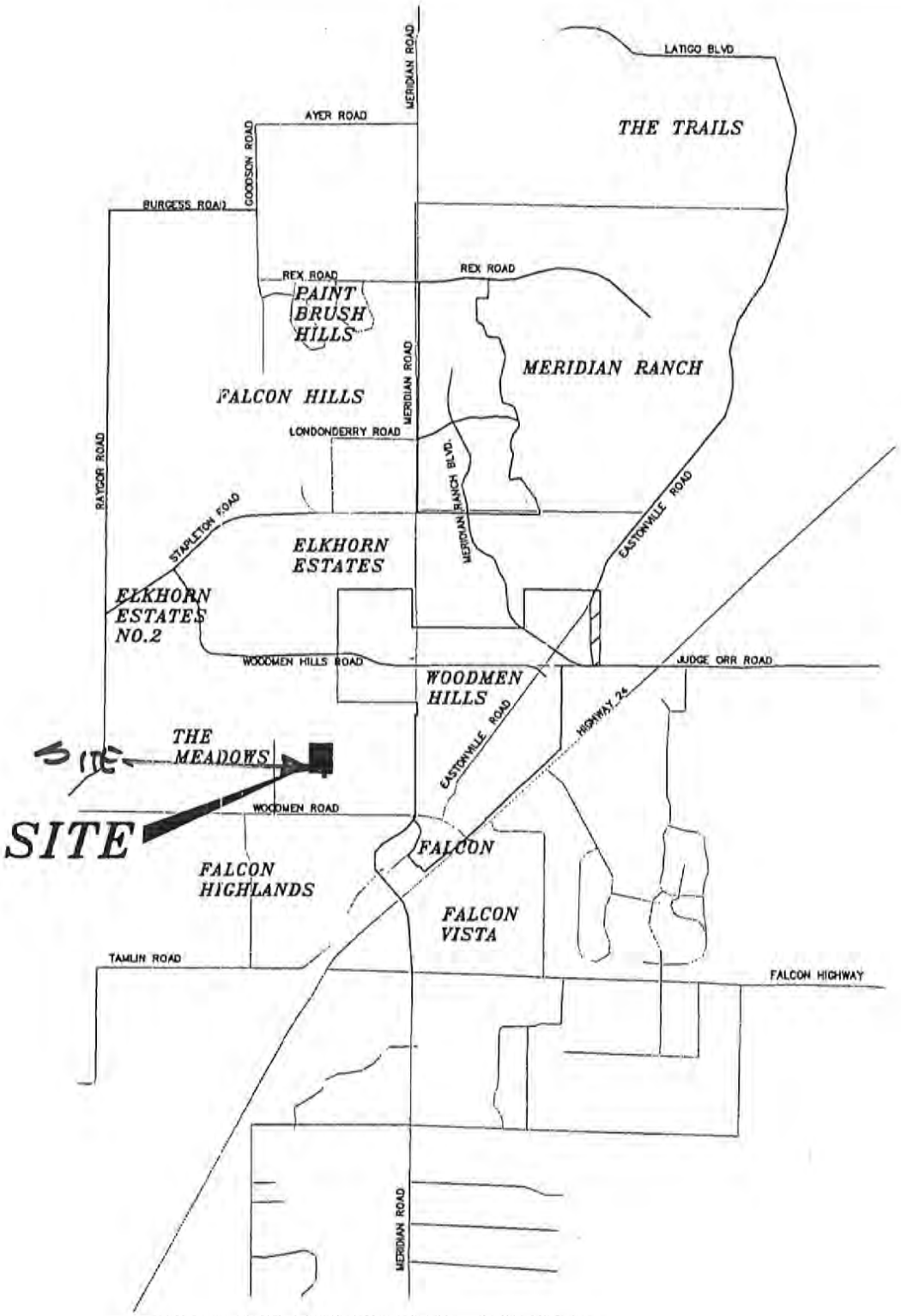
0.3	1.80	1.897	0.9487	7.60	
0.5	3.00	3.162	~~0.9487~~ ~~2.846~~	~~3072~~ 12.84	
0.35	2.10	2.2136	0.9487	8.99	
0.40	2.40	2529	0.9487	10.27	
0.99	2.94	3.099	0.9487	12.58	← T = 2.94

$$Q=\frac{0.463}{n} D^{8/3} S^{\frac{1}{2}}$$

$$Q=KS^{\frac{1}{2}}$$

DIAMETER -IN.-	AREA -FT^2-	D 8/3 -FT-	K			
			N=0.010	N=0.013	N=0.024	N=0.026
2	0.02182	0.008413	0.3895	---	---	---
4	0.08727	0.053420	2.4733	---	---	---
6	0.19630	0.157500	7.2922	5.609	---	---
8	0.34910	0.339200	15.7050	12.081	---	---
10	0.54540	0.615000	28.4745	21.903	---	---
12	0.78540	1.000000	46.3000	35.615	---	---
15	1.22720	1.813100	83.9465	64.574	---	---
18	1.76710	2.948300	136.5100	105.000	56.88	52.50
21	2.40530	4.447400	205.9100	158.400	85.80	79.20
24	3.14160	6.349600	293.9900	226.140	122.49	113.07
27	3.97610	8.692700	402.4700	309.590	167.70	154.79
30	4.90870	11.512600	533.0300	410.030	222.10	205.02
33	5.93960	14.844100	---	528.680	---	---
36	7.06860	18.720800	866.7700	666.700	361.20	333.30
39	8.29580	23.175100	---	825.400	---	---
42	9.62110	28.238900	---	1005.000	544.80	502.50
48	12.56640	40.317500	---	1436.000	777.80	718.00
54	15.90430	55.195000	---	1966.000	1065.00	983.00
60	19.63500	73.100400	---	2604.000	1410.00	1302.00
66	23.75830	94.254200	---	3357.000	1818.00	1678.00
72	28.27430	118.869400	---	4234.000	2293.00	2117.00
78	33.18310	147.152900	---	5241.000	2839.00	2620.00
84	38.48450	179.306000	---	6386.000	3459.00	3193.00
90	44.17860	215.524500	---	7676.000	4158.00	3838.00
96	50.26550	256.000000	---	9118.000	4939.00	4559.00
108	63.61730	350.466600	---	12480.000	6761.00	6140.00
120	78.53980	464.158900	---	16530.000	8954.00	8265.00

Oliver E. Watts
Consulting Engine
Colorado Springs



FALCON STORAGE SUBDIVISION

VICINITY MAP

LATIGO

(719) 380-1090
Architectural Planning & Design
Colorado Design Concepts
3578 Hartsel Drive E323
Colorado Springs, CO 80920

FIGURE.1

PROJECT NO. 200401

National Flood Hazard Layer FIRMette

FEMA

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
- 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 represen 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 3/25/2021 at 9:47 AM 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.

NOTES TO USERS

This map is for use in administering the National Flood Insurance Program. It does not necessarily identify all areas subject to flooding, particularly from local drainage sources of small size. The community map repository should be consulted for possible updated or additional flood hazard information.

To obtain more detailed information in areas where **Base Flood Elevations** (BFEs) and/or **floodways** have been determined, users are encouraged to consult the Flood Profiles and Floodway Data and/or Summary of Stillwater Elevations tables contained within the Flood Insurance Study (FIS) report that accompanies this FIRM. Users should be aware that BFEs shown on the FIRM represent rounded whole-foot elevations. These BFEs are intended for flood insurance rating purposes only and should not be used as the sole source of flood elevation information. Accordingly, flood elevation data presented in the FIS report should be utilized in conjunction with the FIRM for purposes of construction and/or floodplain management.

Coastal Base Flood Elevations shown on this map apply only landward of 0.0' North American Vertical Datum of 1988 (NAVD88). Users of this FIRM should be aware that coastal flood elevations are also provided in the Summary of Stillwater Elevations table in the Flood Insurance Study report for this jurisdiction. Elevations shown in the Summary of Stillwater Elevations table should be used for construction and/or floodplain management purposes when they are higher than the elevations shown on this FIRM.

Boundaries of the **floodways** were computed at cross sections and interpolated between cross sections. The floodways were based on hydraulic considerations with regard to requirements of the National Flood Insurance Program. Floodway widths and other pertinent floodway data are provided in the Flood Insurance Study report for this jurisdiction.

Certain areas not in Special Flood Hazard Areas may be protected by **flood control structures**. Refer to section 2.4 "Flood Protection Measures" of the Flood Insurance Study report for information on flood control structures for this jurisdiction.

The **projection** used in the preparation of this map was Universal Transverse Mercator (UTM) zone 13. The **horizontal datum** was NAD83, GRS80 spheroid. Differences in datum, spheroid, projection or UTM zones zones used in the production of FIRMs for adjacent jurisdictions may result in slight positional differences in map features across jurisdiction boundaries. These differences do not affect the accuracy of this FIRM.

Flood elevations on this map are referenced to the **North American Vertical Datum of 1988 (NAVD88)**. These flood elevations must be compared to structure and ground elevations referenced to the same **vertical datum**. For information regarding conversion between the National Geodetic Vertical Datum of 1929 and the North American Vertical Datum of 1988, visit the National Geodetic Survey website at http://www.ngs.noaa.gov/ or contact the National Geodetic Survey at the following address:

NGS Information Services
NOAA, N/NGS12
National Geodetic Survey
SSMC-3, #9202
1315 East-West Highway
Silver Spring, MD 20910-3282

To obtain current elevation, description, and/or location information for **bench marks** shown on this map, please contact the Information Services Branch of the National Geodetic Survey at (301) 713-3242 or visit its website at http://www.ngs.noaa.gov/.

Base Map information shown on this FIRM was provided in digital format by El Paso County, Colorado Springs Utilities, City of Fountain, Bureau of Land Management, National Oceanic and Atmospheric Administration, United States Geological Survey, and Anderson Consulting Engineers, Inc. These data are current as of 2006.

This map reflects more detailed and up-to-date **stream channel configurations** and **floodplain delineations** than those shown on the previous FIRM for this jurisdiction. The floodplains and floodways that were transferred from the previous FIRM may have been adjusted to conform to these new stream channel configurations. As a result, the Flood Profiles and Floodway Data tables in the Flood Insurance Study Report (which contains authoritative hydraulic data) may reflect stream channel distances that differ from what is shown on this map. The profile baselines depicted on this map represent the hydraulic modeling baselines that match the flood profiles and Floodway Data Tables if applicable, in the FIS report. As a result, the profile baselines may deviate significantly from the new base map channel representation and may appear outside of the floodplain.

Corporate limits shown on this map are based on the best data available at the time of publication. Because changes due to annexations or de-annexations may have occurred after this map was published, map users should contact appropriate community officials to verify current corporate limit locations.

Please refer to the separately printed **Map Index** for an overview map of the county showing the layout of map panels; community map repository addresses; and a Listing of Communities table containing National Flood Insurance Program dates for each community as well as a listing of the panels on which each community is located.

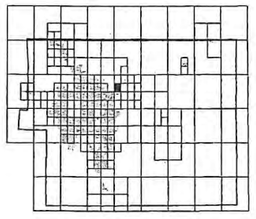
Contact **FEMA Map Service Center** (MSC) via the FEMA Map Information eXchange (FMIX) 1-877-336-2627 for information on available products associated with this FIRM. Available products may include previously issued Letters of Map Change, a Flood Insurance Study Report, and/or digital versions of this map. The MSC may also be reached by Fax at 1-800-358-9620 and its website at http://www.msc.fema.gov/.

If you have questions about this map or questions concerning the National Flood Insurance Program in general, please call 1-877-FEMA MAP (1-877-336-2627) or visit the FEMA website at http://www.fema.gov/business/nfip.

El Paso County Vertical Datum Offset Table

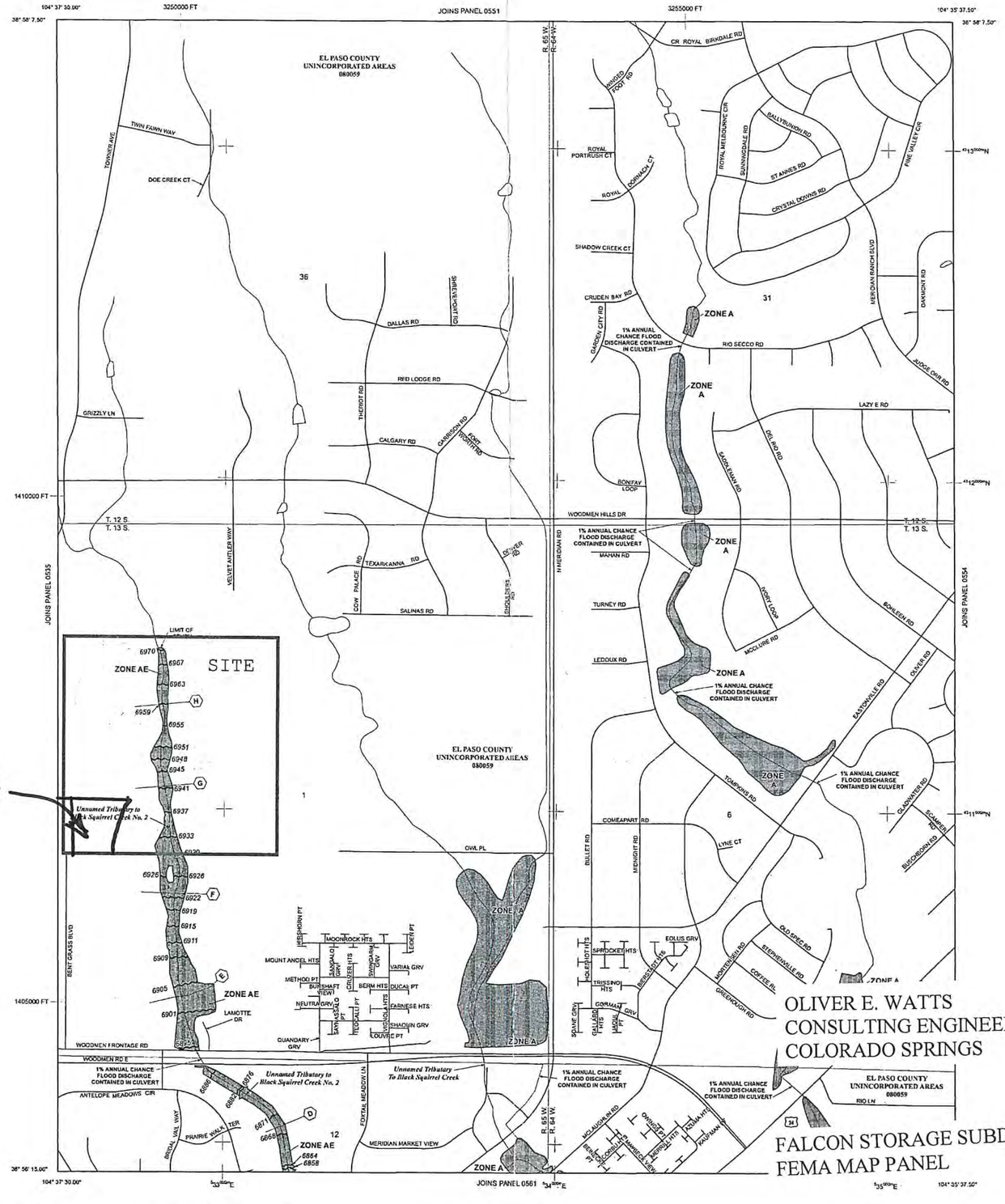
Flooding Source	Vertical Datum Offset (ft)
REFER TO SECTION 3.3 OF THE EL PASO COUNTY FLOOD INSURANCE STUDY FOR STREAM BY STREAM VERTICAL DATUM CONVERSION INFORMATION	

Panel Location Map



This Digital Flood Insurance Rate Map (DFIRM) was produced through a Cooperating Technical Partner (CTP) agreement between the State of Colorado Water Conservation Board (CWCB) and the Federal Emergency Management Agency (FEMA).

Additional Flood Hazard information and resources are available from local communities and the Colorado Water Conservation Board.



LEGEND

SPECIAL FLOOD HAZARD AREAS (SFHAS) SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD

The 1% annual chance flood (100-year flood), also known as the base flood, is the flood that has a 1% chance of being equaled or exceeded in any given year. The Special Flood Hazard Area is the area subject to flooding by the 1% annual chance flood. Areas of Special Flood Hazard include Zones A, AE, AH, AO, AR, A99, V, and VE. The Base Flood Elevation is the water-surface elevation of the 1% annual chance flood.

ZONE A	No Base Flood Elevations determined.
ZONE AE	Base Flood Elevations determined.
ZONE AH	Flood depths of 1 to 3 feet (usually areas of ponding); Base Flood Elevations determined.
ZONE AO	Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.
ZONE AR	Special Flood Hazard Area Formerly protected from the 1% annual chance flood by a flood control system that was subsequently decertified. Zone AR indicates that the former flood control system is being restored to provide protection from the 1% annual chance or greater flood.
ZONE A99	Area to be protected from 1% annual chance flood by a Federal flood protection system under construction; no Base Flood Elevations determined.
ZONE V	Coastal flood zone with velocity hazard (wave action); no Base Flood Elevations determined.
ZONE VE	Coastal flood zone with velocity hazard (wave action); Base Flood Elevations determined.

FLOODWAY AREAS IN ZONE AE

The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without substantial increases in flood heights.

OTHER FLOOD AREAS

ZONE X	Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.

OTHER AREAS

ZONE X	Areas determined to be outside the 0.2% annual chance floodplain.
ZONE D	Areas in which flood hazards are undetermined, but possible.

COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS

OTHERWISE PROTECTED AREAS (OPAs)

CBRS areas and OPAs are normally located within or adjacent to Special Flood Hazard Areas.

- Floodplain boundary
- Floodway boundary
- Zone D Boundary
- CBRS and OPA boundary
- Boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths or flood velocities.
- 513 — Base Flood Elevation line and value; elevation in feet*
- (EL 987) — Base Flood Elevation value where uniform within zone; elevation in feet*

* Referenced to the North American Vertical Datum of 1988 (NAVD 88)

- A — A — Cross section line
- 23 — 23 — Transect line
- 97° 07' 30.00" / 32° 22' 30.00" — Geographic coordinates referenced to the North American Datum of 1983 (NAD 83)
- 4275000mN — 1000-meter Universal Transverse Mercator grid ticks, zone 13
- 6000000 FT — 5000-foot grid ticks: Colorado State Plane coordinate system, central zone (FIPSZONE 0502), Lambert Conformal Conic Projection
- DX5510 — Bench mark (see explanation in Notes to Users section of this FIRM panel)
- M1.5 — River Mile

MAP REPOSITORIES
Refer to Map Repositories list on Map Index

EFFECTIVE DATE OF COUNTYWIDE FLOOD INSURANCE RATE MAP
MARCH 17, 1997

EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL
DECEMBER 7, 2018 - to update corporate limits, to change Base Flood Elevations and Special Flood Hazard Areas, to update map format, to add roads and road names, and to incorporate previously issued Letters of Map Revision.

For community map revision history prior to countywide mapping, refer to the Community Map History Table located in the Flood Insurance Study report for this jurisdiction.

To determine if flood insurance is available in this community, contact your insurance agent or call the National Flood Insurance Program at 1-800-638-6620.

1" = 1200'

MAP SCALE 1" = 500'

250 0 500 1000 FEET
150 0 150 300 METERS

NFIP

PANEL 0553G

FIRM

FLOOD INSURANCE RATE MAP

EL PASO COUNTY, COLORADO AND INCORPORATED AREAS

PANEL 553 OF 1300

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
EL PASO COUNTY	080059	0553	G

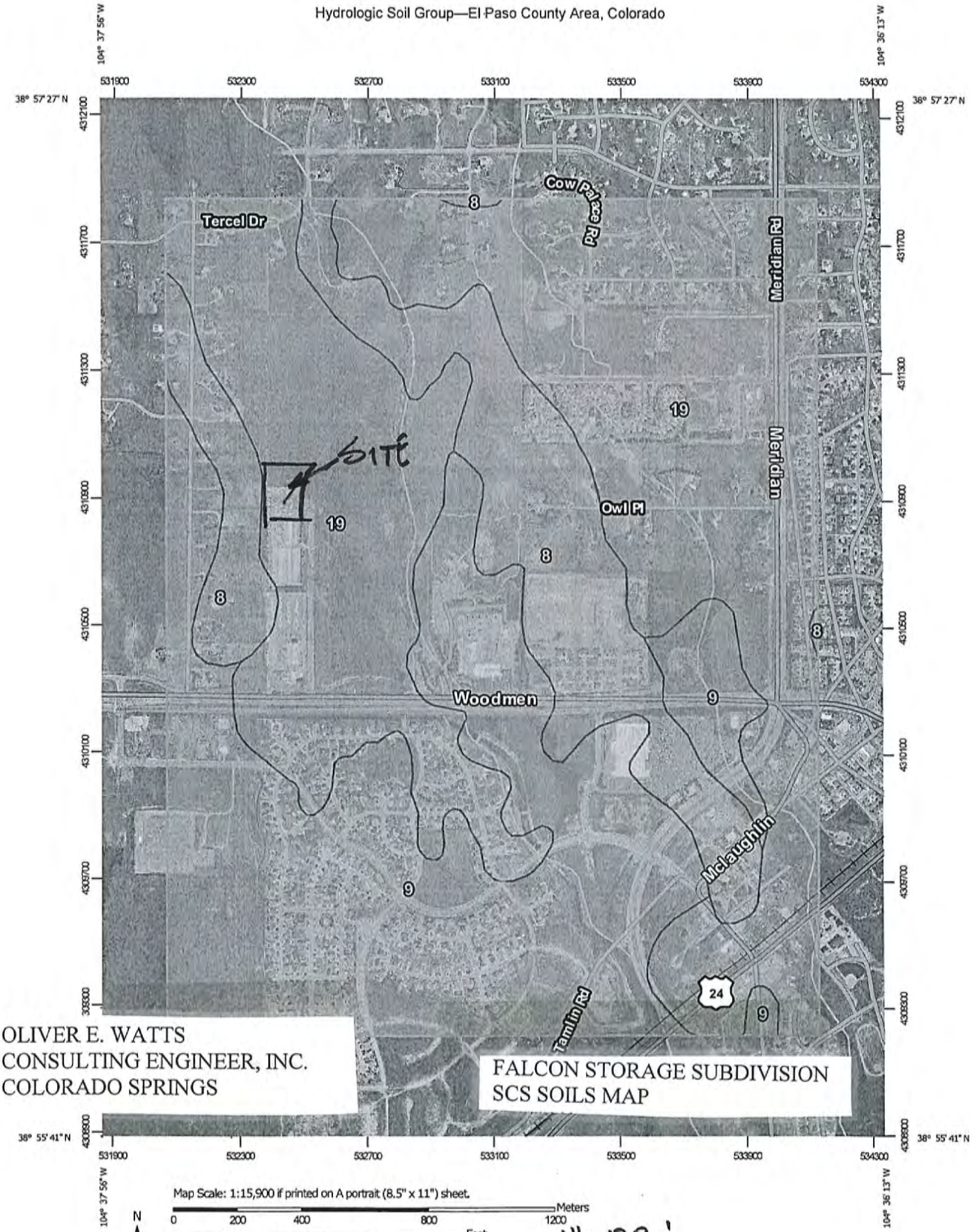
Notice to User: The Map Number shown below should be used when placing map orders; the Community Number shown above should be used on insurance applications for the subject community.

MAP NUMBER
08041C0553G

MAP REVISED
DECEMBER 7, 2018

Federal Emergency Management Agency

NATIONAL FLOOD INSURANCE PROGRAM



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COLORADO SPRINGS

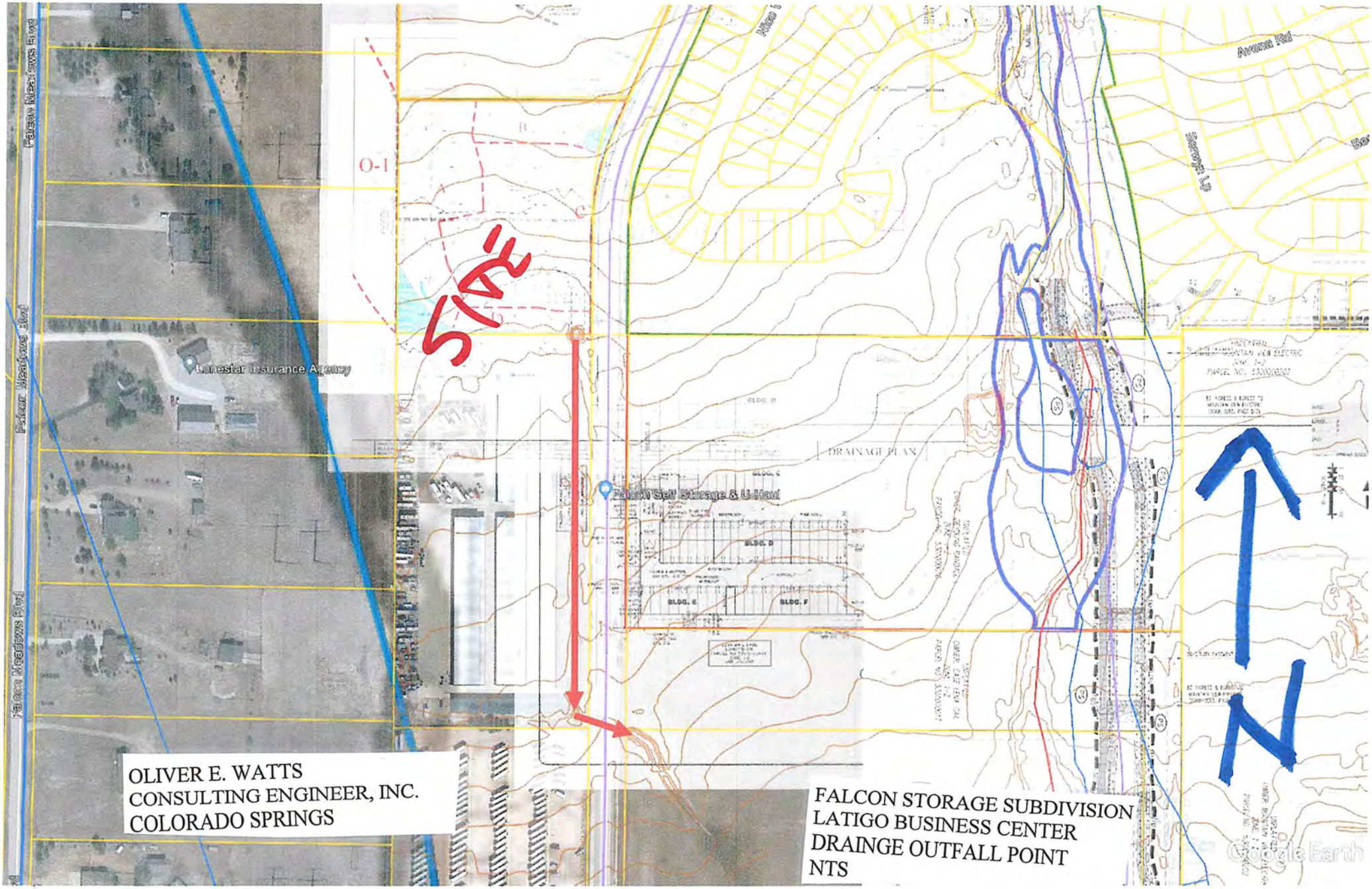
FALCON STORAGE SUBDIVISION
SCS SOILS MAP

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	Hydrologic 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.



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COLORADO SPRINGS

FALCON STORAGE SUBDIVISION
LATIGO BUSINESS CENTER
DRAINGE OUTFALL POINT
NTS

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 maximum for non-urban land uses, 100 ft maximum 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.

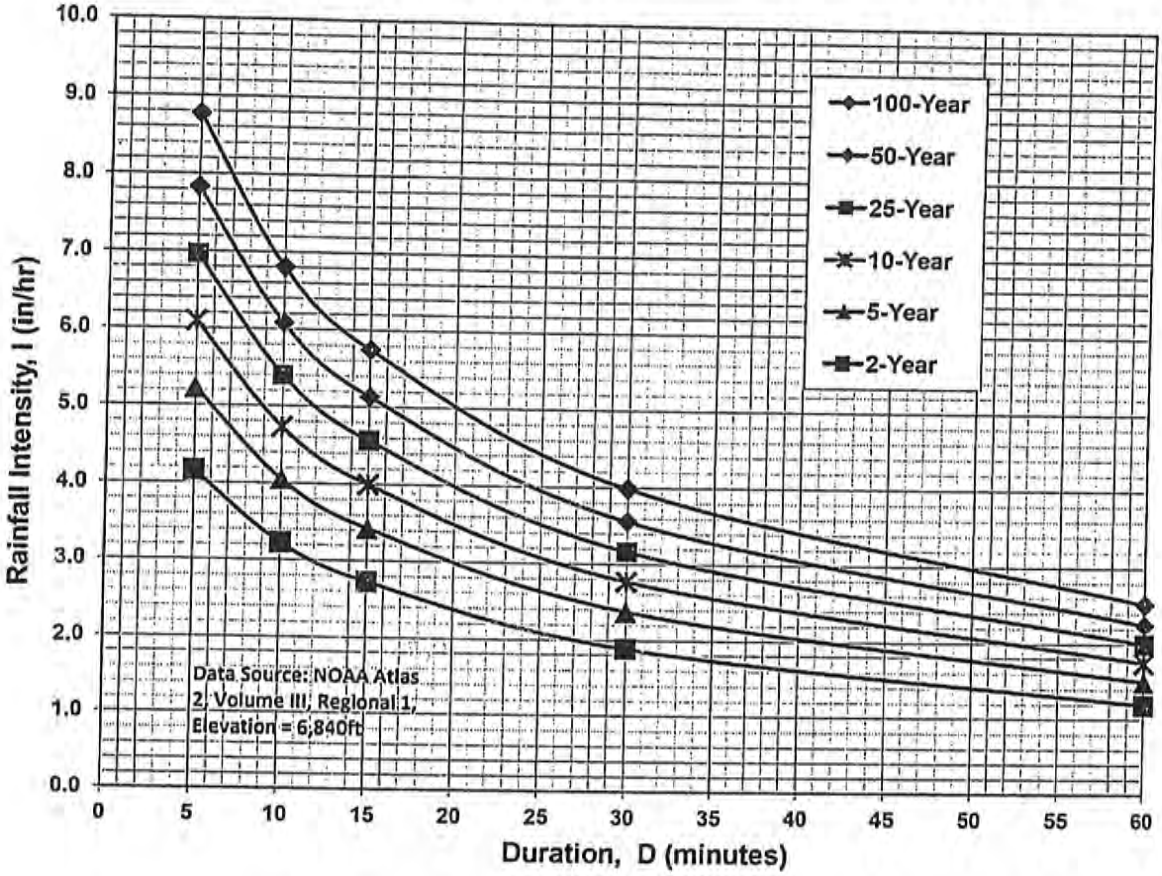
3.2.4 Minimum Time of Concentration

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

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

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

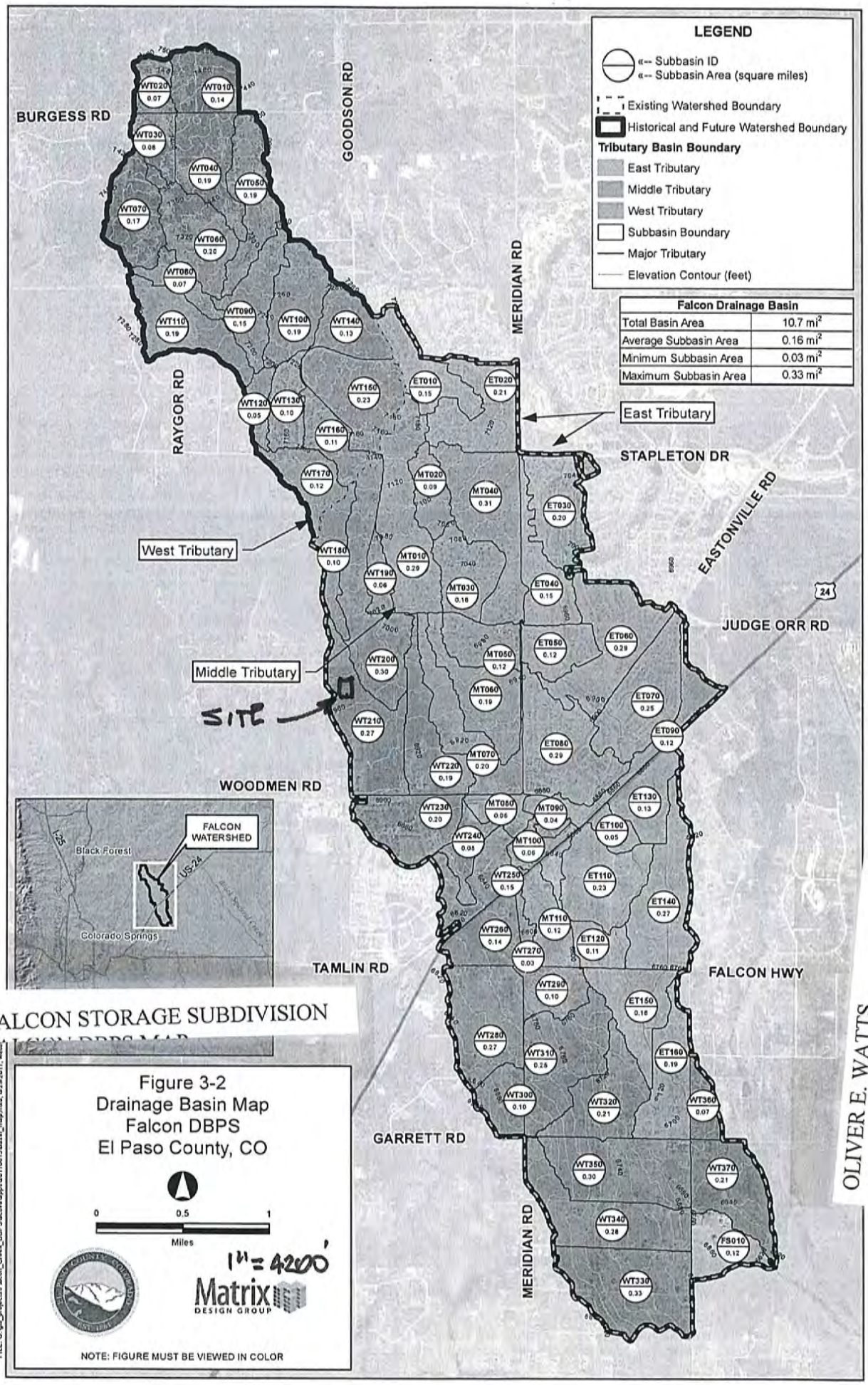
$I_{25} = -2.00 \ln(D) + 10.111$

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

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

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

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



FALCON STORAGE SUBDIVISION

Figure 3-2
Drainage Basin Map
Falcon DBPS
El Paso County, CO

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EX 10' CDOT TYPE R INLET
EX 24" RCP STM PIPE
EX 42" RCP STM PIPE
EX 10' CDOT TYPE R INLET
EX 42" RCP STM PIPE
SWALE E (EXISTING)
CDOT TYPE D AREA INLET
BENT GRASS MEADOWS DRIVE (80' COLLECTOR)
ROWENA WAY (PUBLIC-LOCAL-50' ROW)
NICO WAY (PUBLIC-LOCAL-50' ROW)
JAYCA TRAIL (PUBLIC-LOCAL-50' ROW)
LINLEY WAY (PUBLIC-LOCAL-50' ROW)
EX 42" RCP STM PIPE
EX 8' STM MANHOLE
EX 42" RCP STM PIPE
EX 15' CDOT TYPE R INLET
EX 48" RCP STM PIPE
EX 8' STM MANHOLE
EX 48" RCP STM PIPE
EX 48" RCP STM PIPE
EX 8' STM MANHOLE
EX 48" RCP STM PIPE
EX 8' STM MANHOLE
EX 8' STM MANHOLE
EX 15' CDOT TYPE R INLET
EX 10' CDOT TYPE R INLET
EX 24" RCP SD
EX SEDIMENT BASIN - TO BE REMOVED
EX RIPRAP OUTLET PROTECTION
SWALE F
SITE 5.004 Ac
5 Ac LOTS
1"=20'S' CF=1'
SOIL 1.5'
AH
LP
HP
D-4a (0.98 / 2.1 / 4.4)
D-6a (1.33 / 3.8 / 7.5)
D-4b (0.95 / 2.5 / 4.9)
E-4 (0.91 / 3.0 / 5.7)
E-5 (0.89 / 3.3 / 6.1)
I-1 (0.31 / 1.0 / 2.1)
0.78 / 2.9 / 5.3
1.63 / 4.7
2.69
10
11
12
17a
17
17b
18
24
25
26
7.6
1.25
LOT 1, LATIGO BUSINESS CENTER FILING NO. 1 ZONE: I-2 PLAT NO.: 12807 PARCEL NO.: 5301002005
WARRANTY DEED RECEPTION NO. 215055554 OWNER: FALCON STORAGE PARTNERS, LLLP
THIS AREA DRAINS ONTO LATIGO BUSINESS CENTER LOT 1. SEE APPENDIX A FOR LATIGO BUSINESS PARK FDR DRAINAGE MAP
LOT 10, THE MEADOWS FILING NO. 1 ZONE: RR-5 PLAT NO.: 5746 PARCEL NO.: 5302001008
LOT 9, THE MEADOWS FILING NO. 1 ZONE: RR-5 PLAT NO.: 5746 PARCEL NO.: 5302001009
LOT 8, THE MEADOWS FILING NO. 1 ZONE: RR-5 PLAT NO.: 5746 PARCEL NO.: 5302001010
MEADOWS FILING NO. 1 ZONE: RR-5 PLAT NO.: 5746 PARCEL NO.: 5302001011
DEYOUNG RANDALL L ZONE: I-2 RECEPTION NO.: 208053974 PARCEL NO.: 5301000016
6960
6955
6950
6945
6940
6935
6930

OLIVER E. WATTS
CONSULTING ENGINEER, INC.
COLORADO SPRINGS

FALCON MEADOWS AT BENT GRASS
DRAINAGE PLAN
NTS

LOT 1
LATIGO BUSINESS CENTER
DEVELOPED BASINS MAP

SCALE: 1"=40'

40 0 40 80

DESIGN POINT	CONTRIBUTING BASINS	TIME OF CONCENTRATION (MINUTES)	Q_5 (CFS)	Q_{100} (CFS)
1	OFF-1	22.6	4.1	10.1
2	BASIN 2	5.0	1.2	2.2
3	BASIN 1, BASIN 2	5.2	3.8	7.4
4	DP-3, BASIN 3	5.3	5.6	10.7
5	DP-4,BASIN 6	7.3	6.7	12.9
6	OFF-2	17.5	0.2	0.5
7	DP-6, BASIN 4	7.1	12.5	23.2
8	BASIN 5	5.0	13.6	25.1
9	BASIN 7	6.4	1.0	2.1
10	DP-9, DP-7	7.4	30.9	57.8
11	DP-10, BASIN 7	7.4	31.8	59.6

Modify Flow Rate 5.5/12.5

As indicated in the meeting with staff, Please analyze this storm line and indicate whether it is adequate for the increase in flows. As indicated above this site will increase flows 2.4 cfs (100yr) from what the Lot 1 report indicates.

OLIVER E. WATTS
CONSULTING ENGINEER, INC.
COLORADO SPRINGS

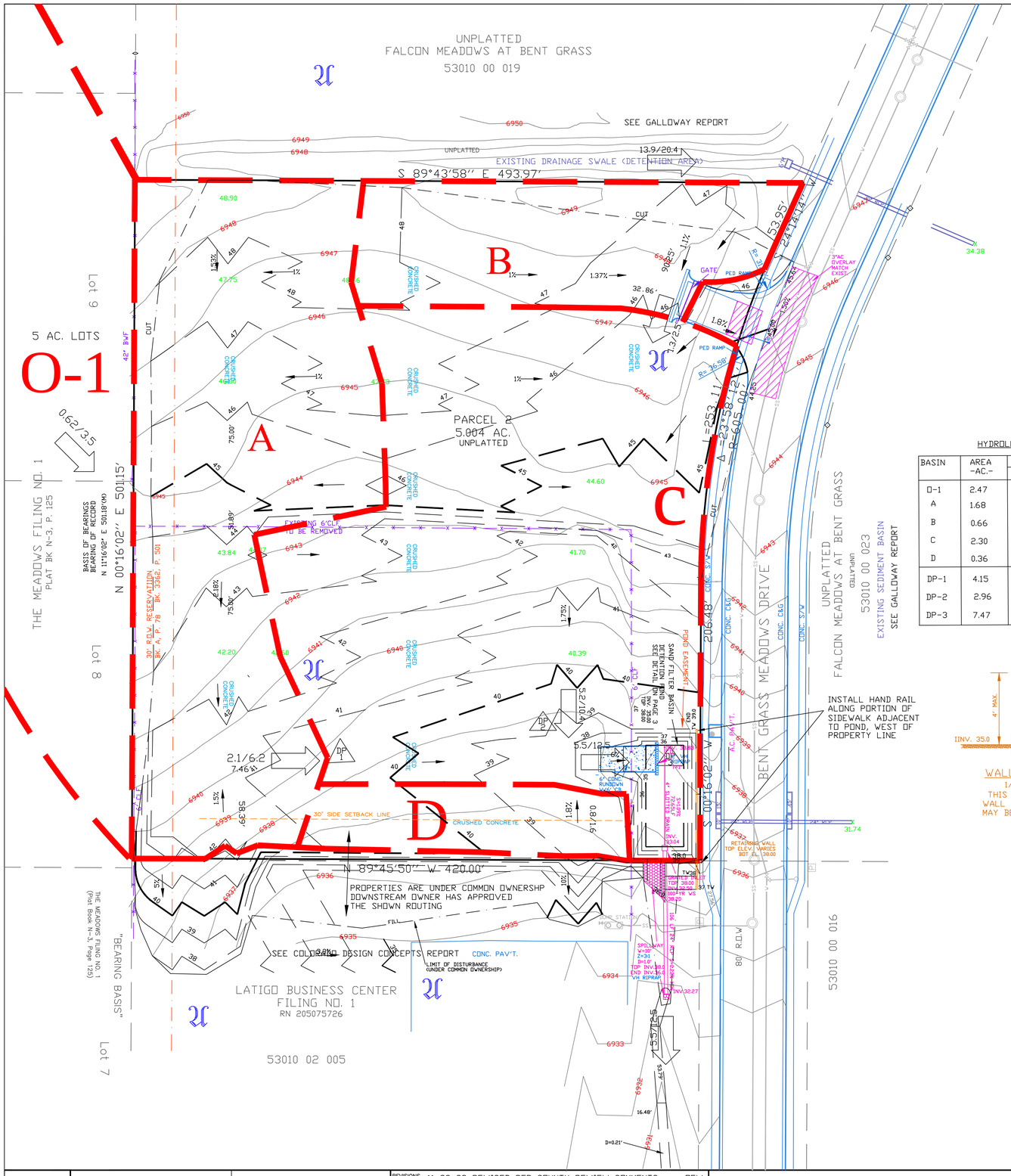
FALCON STORAGE SUBDIVISION
LATIGO BUSINESS CENTER, LOT 1
DRAINAGE PLAN
NTS

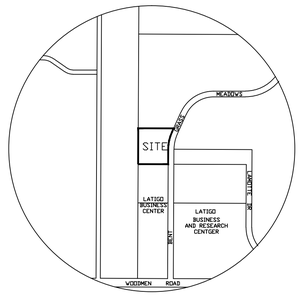
REVISIONS:		
NO.	DESCRIPTION	DATE

ENGINEER:
DESIGNED BY: DC DATE: 7/17/04
DRAWN BY: DC DATE: 7/17/04
CHECKED BY: XXX DATE: XX/XX/XX

48 HOURS BEFORE YOU DIG,
CALL UTILITY LOCATORS
1-800-922-1987
(SEE COVER FOR LIST OF UTILITY CONTACTS)

PROJECT LATIGO BUSINESS CENTER LOT 1
SHEET TITLE NA
FROM _____ TO _____
JOB NO. 2004-1 SHEET 2 OF 2





REGIONAL DETENTION POND FOR THIS SIDE IS POND WU, SOUTH OF WOODMEN ROAD

VICINITY MAP

1"=1000'

CONTOUR LEGEND:

ORIGINAL CONTOURS: 2' / 10'

PROPOSED CONTOURS: 2' / 10'

GRADED AREAS NOT COVERED BY CONCRETE, ASPHALT OF LANDSCAPE SHALL BE RESEEDED (FINAL) SEE LANDSCAPE PLAN FOR DETAILS. NO BATCH PLANTS WILL BE UTILIZED ON THIS SITE THERE ARE NO SURFACE WATERS ON THIS SITE.

N

40 0 40 80 120

Scale 1" = 40'

Contour Interval: 1

BENCH MARK: SE CORNER SECTION 1
1-1/2" AL. CAP, EL. 6901.70

LEGEND:

- FOUND RED LDC CAP ON #4 REBAR
- SEWER MANHOLE (EXISTING)
- WATER MANHOLE (EXISTING)
- WATER VALVE (EXISTING)
- FIRE HYDRANT (EXISTING)
- RV DUMP SITE (EXISTING)
- ELECTRICAL VAULT (EXISTING)

HYDROLOGIC SUMMARY

BASIN	AREA -AC.-	RUNOFF - CFS 5-YEAR	RUNOFF - CFS 100-YEAR
O-1	2.47	0.62	3.5
A	1.68	3.2	6.5
B	0.66	1.3	2.5
C	2.30	4.5	8.9
D	0.36	0.8	1.6
DP-1	4.15	2.1	6.2
DP-2	2.96	5.2	10.4
DP-3	7.47	5.5	12.5

LEGEND:

- 10.5/20.4 — RUNOFF IN CFS 5-YEAR/100-YEAR
- A — LIMIT OF DRAINAGE BASIN AND DESIGNATION
- EXISTING STORM SEWER AS LABELED
- LIMIT OF SOILS TYPE AND GROUP
- PROPOSED STORM SEWER AS LABELED

GRATED INLET

1/2"=1'-0"

INLET SHALL CONFORM TO CDOT TYPE C INLET

WALL SECTION

1/2"=1'-0"

THIS IS A NON-ENGINEERED WALL AND SIMILAR WALLS MAY BE SUBSTITUTED

DRAIN PIPE

SEDIMENTATION POND TOP 38.00 V=7.47AC.@1800=13,320CF

TEMPORARY SEDIMENTATION BASIN (TSB)

INTERIM CONDITION: TEMPORARY SEDIMENT BASIN DURING CONSTRUCTION, TO BE CONVERTED TO SAND FILTER BASIN UPON COMPLETION

PCD PROJECT NO: PPR2232 & MS232

DRAWN BY: O.E. WATTS	APPROVED BY:	REVISIONS 11-23-22 REVISED PER COUNTY REVIEW COMMENTS	OEW
DATE: 2-4-21	PROJ. NO.	8-22-23 REVISED PER COUNTY REVIEW COMMENTS	OEW
DWG. NO.: 20-5523-04	DWG.	12-13-23 REVISED PER COUNTY REVIEW COMMENTS	OEW
SURVEYED BY: OEW, ESW, 10-6-20			

OLIVER E. WATTS
CONSULTING ENGINEER
COLORADO SPRINGS

PROJECT
FALCON STORAGE PARCEL
PART W 1/2 SEC. 1, T.13S., R.65W., 6TH P.M.
EL PASO COUNTY

SHT. NAME
DRAINAGE PLAN

SHT. NO.
1 OF 1

please remove the previous submittal report from this set.

PRELIMINARY AND FINAL

DRAINAGE PLAN AND REPORT

FALCON STORAGE SUBDIVISION

PART OF THE SW1/4 SECTION 1, T.13S. R.65W. OF THE 6TH P.M.
EL PASO COUNTY

February 4, 2021

Revised
November 23, 2022

Revised
June 7.2023

Revised
June 22, 2023

Revised
August 31, 2023

PCD File No. PPR2232
PCD File No. MS232

Prepared for

Falcon Storage Partners LLLP
4615 Northpark Drive
Colorado Springs, CO 80918

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 43 years in business

August 31, 2023

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

ATTN: *Joshua Palmer, P.E.*

SUBJECT: Preliminary and Final Drainage Plan and Report
Falcon Storage Subdivision

Transmitted herewith for your review and approval is the drainage plan and report for The Falcon Storage Subdivision in El Paso County. This report will accompany the development plan and subdivision plat submittal. This report has been revised in accordance with your review comments of November 23, 2022, March 2, 2023, and August 18, 2023.

Please contact me if I may provide any further information.

Oliver E. Watts, Consulting Engineer, Inc.

BY: _____
Oliver E. Watts, President

FALCON STORAGE SUBDIVISION
DRAINAGE REPORT
TABLE OF CONTENTS

FALCON STORAGE SUBDIVISION
DRAINAGE REPORT
REFERENCES

City-County Drainage Criteria, current edition
Fema Firm Insurance Rate Map
El Paso County Soils Survey, SCS
Falcon Drainage Basin Planning Study
Drainage Report, Falcon Meadows at Bent Grass
Drainage Report, Latigo Business Center, Lot 1

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 date

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.

Falcon Storage Partners LLLP

By: _____

Richard Graham Date
4615 Northpark Drive
Colorado Springs, CO 80918

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:

The Falcon Storage Subdivision is located in the Latigo Business Center development of El Paso County as shown on the enclosed vicinity map. Occupying a portion of the West half of Section 1, Township 13 South, Range 65 West of the 6th P.M., totaling 5.004 acres. It is located in the Falcon Drainage Basin as shown on the enclosed basin map. It lies west of Bent Grass Meadows Drive north of the Latigo Business Center Filing No. 1 as shown on the enclosed drainage plan. The site will be developed into an RV Storage site as shown on the enclosed drainage plan, as an expansion to the one in the Latigo Business Center Filing No. 1, both owned by the developer.

5. FLOOD PLAIN STATEMENT:

This subdivision is not within the limits of a flood plain or flood hazard area, according to FEMA map panel number 08041C0553 G, dated December 7, 2018, a copy of which is enclosed for reference.

6. METHOD AND CRITERIA:

The method used for all computations is that specified in the City-County Drainage Criteria Manual, using the rational method for areas of the size of the development. All computations are enclosed for reference and review. Pertinent portions of the criteria are enclosed.

The soils in the subdivision have been mapped by the local USDA/SCS office, and a soils map and interpretation sheet are enclosed for reference. All soils in this area are of hydrologic group "A" within the development area.

7. DESCRIPTION OF RUNOFF:

A. Drainage Inflows: The drainage Report for Falcon Meadows at Bent Grass indicates an existing drainage swale above the north boundary to divert runoff from this site and route it to Bent Grass Meadows and then past this development in Bent Grass Meadows Drive to outfall points to an existing detention pond across the street. A copy of this drainage plan is enclosed. Also shown on this map is that portion of the Meadows Filing No. 1 that drains 0.62 cfs / 3.5 cfs (5-year / 100-year runoffs) into this subdivision along the westerly boundary (Basin O-1), and it indicates the historic undeveloped runoff of the site, Basin A (historic) totaling 1.25 cfs / 7.6 cfs at the lowest (southeast) portion of the subdivision.

B. Interior Routing: The area will be graded to conform to the existing topography shown on the drainage plan. The property has been rough graded, which complies with the historic runoff pattern. Additional grading is indicated which is intended to contain the runoff into the interior drive isle street network, and along the streets to the ~~detention~~ pond The westerly street (Basin A) will combine with offset basin O-1 to develop 3.0 cfs \ 6.2 cfs (5-ye[illegible]/100-year runoffs) near the in the southwest corner of the plat (Design Point 1). Basin B will develope 1.[illegible]2.5 cfs in the southerly driveway adjacent to the north entrance. It will combine with basin C along the same routing for 5.2/10.4 cfs at the southwest intersection (design point 2). This will combine basin D to outfall into the ~~detention~~ pond (design point 3). The total outfall at this point 5.5 cfs/12.5 cfs, into the sand filter basin.

Water Quality

C. Detention Storage: At the proposed outfall point a sand filter ~~detention~~ pond is proposed, as required by the County. The pond is sized for a temporary sedimentation basin to be used during the construction period and converted into a permanent sand filter basin upon completion. The sedimentation basin will contain 13000 +CF (at 1800 CF per acre). An 8-inch riser pipe is used as an outlet, with holes drilled as computed to detain the runoff as required. One foot of freeboard is provided with a spillway that will pass the 100-year runoff. Details are shown on the enclosed drainage plan. Following construction the basin will be converted to a sand filter basin. A 4-inch slotted underdrain will be placed in a 5-inch section of CDOT class C Filter material and drain into the grated inlet outlet structure set at the WQCV level, and sized for the 100-year runoff. An orifice plate will be provided on the end of the underdrain with an orifice

[illegible]sign a [illegible]me/number to all PBMPs and then update all submitted text and drawings accordingly with consistent labeling throughout (example: "Pond A" or "Pond 1"). Unresolved

discuss flow path to existing detention facility and provide calcs for capacities and velocities to meet criteria for conveyance system

this was not included

please analyze and state whether the existing pond accounted for this sites developed flows. Address any improvements/upgrades needed to the pond. If the existing pond did not account for developed flows from this site provide detention onsite or identify the necessary upgrades needed for the existing pond and provide CD's of work to be done by this development.

sized for the installation. A detention basin stage-storage table is included for the basin. As required by the County, the basin is used for water quality storage only and the outfall will run across Latigo Business Center Filing No. 1 to an existing full spectrum pond to the south of Woodmen Road, south of Highway 24, between Tamlin and Meridian Roads, in accordance with the approved drainage reports for the area.

D. Outfall Point: Discharge from the subdivision will be into existing north-south street of Lot 1 of the Latigo Business Center, filing no. 1, as shown on the drainage plan. Some minor construction is shown along the north boundary of Lot 1 as shown on the drainage plan to provide positive installation. The two properties are under common ownership and permission to outfall into the Latigo Business Center is granted. The drainage plan for the Latigo Business Center is enclosed. This report indicated two existing discharges: 0.2 cfs / 0.5 cfs near the southwest corner and 4.1 cfs / 10.1 cfs over the remaining south frontage. A 24 inch CMP will run from the CDOT Type C outlet box at a minimum slope of one percent into the existing ditch shown on the drainage plan.

Please identify how the flow is conveyed to the full spectrum pond to the south of Woodmen from Lot 1. Will it enter an existing storm system? is the system adequate for this sites developed flows? Please address. The sites developed flows must be conveyed to a suitable outfall.

WATER QUALITY

A sand filter basin water quality facility will be provided as described above.

FOUR STEP PROCESS

The following process has been followed to minimize adverse impacts of urbanization

Runoff Reduction: The scope of the development has been minimized consistent with zoning requirements to present the minimum footprint in providing a RV Storage development. The undisturbed portions are to be landscaped to reduce the impervious percent.

Water Quality

Provide WQCV: ~~Detention~~ water quality storage is being provided for this subdivision by a sand filter ~~detention~~ pond and runoff will be routed to a full spectrum pond located downstream, south of Woodmen Road, north of Highway 24, between Tamlin and Meridian Roads, by others as a sub regional facility.

Stabilize Drainage Ways: The site will be graded to route the runoff over improved street installations to provide channel stabilization in the natural erosive material over the site. Discharge from the site will be into adjacent and downstream facilities in accordance with the master drainage basin plan for the Falcon drainage basin and previously approved subdivision drainage reports. Copies of each plan are enclosed. There will be no adverse affect on downstream developments as a result of this subdivision

Consider need for Industrial and Commercial BMP's: This is a RV Storage site, so source control problems will be a minimum. During construction, standard site specific state of the art BMP's will be employed to minimize and mitigate erosive problems.

provide analysis of the ditch and downstream facilities and show that it is adequate to convey the flows down stream.

8. COST ESTIMATE:

Item No.	Description	Quantity	Unit Cost	Cost
1	Pond/BMP Earthwork	881 CY	$ 23.00	$ 20263.00
2	Slotted drain	187 LF	40.00	7480.00
3	Riprap	14 Tons	80.00	1096.00
4	Grated Inlet	1 ea	5611.00	5611.00
4	12" PVC drain	106 LF	112.00	11872.00

5	Concrete Pond Inlet	15 CY	589.00	10335.00
	Subtotal Construction Cost			$ 56657.00
	Engineering	10%		5665.71
	Total Estimated Cost			$ 62322.70

Please revise to 2023

9. FEES: At plat recording.
2021 Falcon Basin Fees: 5.004 acres @62.3% Impervious = 3.1175 Impervious acres
Drainage fees @ $ 37,256 per acre = $ 116,145.28
Bridge fees @ $ 5,118 per acre = $ 15,955.32
Total Fees: $ 132,100.61

10. SUMMARY
The Falcon Storage Subdivision is a proposed 1-lot, RV Storage subdivision containing 5.004 acres. The proposed street facilities will adequately convey, detain and outfall runoff from the site to existing sufficient adjacent and downstream facilities, as described in the respective drainage reports. Water Quality is being utilized in lieu of a full spectrum detention pond due to the existing regional facility as described earlier in this report. Flows from site will be greater than historic levels. Site appurtenances will not adversely affect the downstream and surrounding developments.

This report and findings is in general conformance with the MDDP and Preliminary Drainage Reports or other pertinent studies

Review 1 comment: Please identify and analyze whether the downstream facilities are adequate to accept the developments flows.

Additionally, compare the detained flows and the historical flow leaving the site. Indicate whether or not the sites flow is at or below historic flows leaving the site.

Review 2: unresolved. Please analyze the downstream facilities (ditches, culverts, storm pipes etc.) and indicate whether they are adequate to accept the developments flows. Please identify the total developed flows of the site and compare with what the existing facilities where designed to.

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-		
FALCON	0-1	9.75	2.47	300	4.5	27			A	SF 5AC.	0.12	0.39				
			V=0.82	+480	1.3	+10										
						37	2.1	3.6					0.62	3.5	5	100
HISTORIC	A	COGO	5.00	+525	9	+13										
			V=0.65			50	1.8	2.8	A	R/L	0.08	0.35				
	TOTAL		7.47							MIX	0.093	0.362	1.25	7.6	5	100
DEVELOPED	A	COGO	1.68	300	2.5	15.2			A	GRAVEL	0.59	0.70			5	100
			V=3.06	+300	7	+1.6										
						16.8	3.2	5.5					3.2	6.5	5	100
	O1 + A	(DP-1)	4.15	=400	8	+2	3.2	5.5	A	MIX	0.310	0.516				
			V=2.82			52	1.7	2.9					2.1	6.2	5	100
	B	COGO	0.66	370	2.4	16.4			A	GRAVEL	0.59	0.70	1.3	2.5	5	100
	C	COGO	2.30	300	4	14.5			A	GRAVEL	0.59	0.70				
			V=2.66	+340	6	+2.1										
						16.6	3.3	5.5					4.5	8.9	5	100
	B+C			+360	8	+2.7										
		(DP-2)	2.96			19.3	3.0	5.1	A	GRAVEL	0.59	0.70	5.2	10.4	5	100
	D	COGO	0.36	240	4.5	11.6	3.8	6.4	A	GRAVEL	0.59	0.70	0.8	1.6	5	100
	B+C+D		V=2.22	+50		+0.4										
		(DP-3)	3.32			19.7	3.0	5.1	A	GRAVEL	0.59	0.70	5.9	11.9	5	100
	+0-1+A		7.47	+240	2.4	+2										
						54	1.7	2.8	A	MIX	0.434	0.598	5.5	12.5	5	100

HYDROLOGICAL COMPUTATION – BASIC DATA
PROJ: FALCON STORAGE SUB BY: O.E. WATTS
RATIONAL METHOD DATE: 2/4/21 10/17/22 11-21-21

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

Design Procedure Form: Sand Filter (SF)

UD-BMP (Version 3.06, November 2016)

Designer: O.E, Watts
Company: Oliver E. Watts, CE
Date: June 5, 2023
Project: Falcon Storage Subdivision
Location:

provide calculation as to how this was determined

1. Basin Storage Volume	
A) Effective Imperviousness of Tributary Area, I_a (100% if all paved and roofed areas upstream of sand filter)	I_a = 62.3 %
B) Tributary Area's Imperviousness Ratio (i = I_a/100)	i = 0.623
C) Water Quality Capture Volume (WQCV) Based on 12-hour Drain Time WQCV= 0.8 * (0.91* i^3 - 1.19 * i^2 + 0.78 * i)	WQCV = 0.20 watershed inches
D) Contributing Watershed Area (including sand filter area)	Area = 325,393 sq ft
E) Water Quality Capture Volume (WQCV) Design Volume V_{WQCV} = WQCV / 12 * Area	V_{WQCV} = 5,295 cu ft
F) For Watersheds Outside of the Denver Region, Depth of Average Runoff Producing Storm	d_6 = in
G) For Watersheds Outside of the Denver Region, Water Quality Capture Volume (WQCV) Design Volume	$V_{WQCV\ OTHER}$ = cu ft
H) User Input of Water Quality Capture Volume (WQCV) Design Volume (Only if a different WQCV Design Volume is desired)	$V_{WQCV\ USER}$ = cu ft
2. Basin Geometry	
A) WQCV Depth	D_{WQCV} = 3.0 ft
B) Sand Filter Side Slopes (Horizontal distance per unit vertical, 4:1 or flatter preferred). Use "0" if sand filter has vertical walls.	Z = 3.00 ft / ft
C) Minimum Filter Area (Flat Surface Area)	A_{Min} = 2534 sq ft
D) Actual Filter Area	A_{Actual} = 50400 sq ft 2534
E) Volume Provided	V_T = 13027 cu ft
3. Filter Material	Choose One: (•) 18" CDOT Class B or C Filter Material ( ) Other (Explain):
4. Underdrain System	
A) Are underdrains provided?	Choose One: (•) YES ( ) NO
B) Underdrain system orifice diameter for 12 hour drain time	
i) Distance From Lowest Elevation of the Storage Volume to the Center of the Orifice	y = 0.5 ft
ii) Volume to Drain in 12 Hours	Vol_{12} = 5,295 cu ft
iii) Orifice Diameter, 3/8" Minimum	D_O = 5 / 8 in

The spreadsheet should not be filled in by hand

orifice doesnt match GEC

Design Procedure Form: Sand Filter (SF)

Designer: O.E, Watts
Company: Oliver E. Watts, CE
Date: June 5, 2023
Project: Falcon Storage Subdivision
Location:

5. Impermeable Geomembrane Liner and Geotextile Separator Fabric A) Is an impermeable liner provided due to proximity of structures or groundwater contamination?	Choose One ○ YES ◉ NO
6-7. Inlet / Outlet Works A) Describe the type of energy dissipation at inlet points and means of conveying flows in excess of the WQCV through the outlet	Riprap at inlet and outlet

Notes:

include inlet and outlet riprap protection calculations

Required Area per Row (in^2)

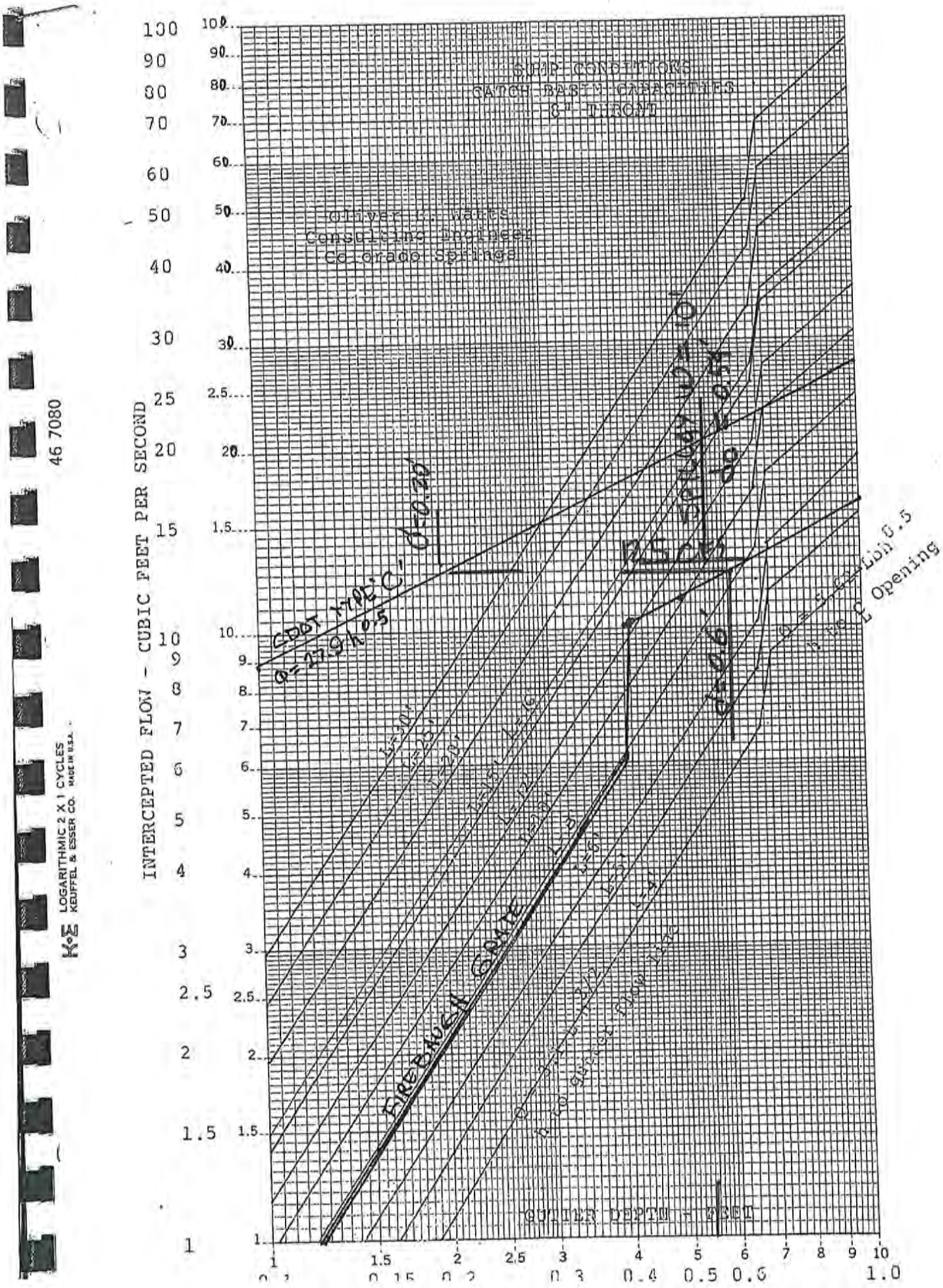
Design Volume (acre-ft)	Depth at Outlet (ft)							
	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5
2	15.04	7.71	5.10	3.76	2.95	2.41	2.02	1.73
1	7.52	3.86	2.55	1.88	1.48	1.21	1.01	0.87
0.6	4.51	2.31	1.53	1.13	0.89	0.72	0.61	0.52
0.4	3.01	1.54	1.02	0.75	0.59	0.48	0.40	0.35
0.2	1.50	0.77	0.51	0.38	0.30	0.24	0.20	0.17
0.1	0.75	0.39	0.26	0.19	0.15	0.12	0.10	0.09
0.06	0.45	0.23	0.15	0.11	0.09	0.07	0.06	0.05
0.04	0.30	0.15	0.10	0.08	0.06	0.05	0.04	0.03
0.02	0.15	0.08	0.05	0.04	0.03	0.02	0.02	0.02
0.01	0.08	0.04	0.03	0.02	0.01	0.01	0.01	0.01

TABLE SB-1

Circular Perforation Sizing

Hole Diameter (in)	Hole Diameter (in)	Area per Row (in^2)		
		n = 1	n = 2	n = 3
1/4	0.250	0.05	0.10	0.15
5/16	0.313	0.08	0.15	0.23
3/8	0.375	0.11	0.22	0.33
7/16	0.438	0.15	0.30	0.45
1/2	0.500	0.20	0.39	0.59
9/16	0.563	0.25	0.50	0.75
5/8	0.625	0.31	0.61	0.92
11/16	0.688	0.37	0.74	1.11
3/4	0.750	0.44	0.88	1.33
7/8	0.875	0.60	1.20	1.80
1	1.000	0.79	1.57	2.36
1 1/8	1.125	0.99	1.99	2.98
1 1/4	1.250	1.23	2.45	3.68
1 3/8	1.375	1.48	2.97	4.45
1 1/2	1.500	1.77	3.53	5.30
1 5/8	1.625	2.07	4.15	6.22
1 3/4	1.750	2.41	4.81	7.22
1 7/8	1.875	2.76	5.52	8.28
2	2.000	3.14	6.28	9.42
n = Number of columns of perforations				
Minimum steel plate thickness		1/4"	5/16"	3/8"

TABLE SB-2



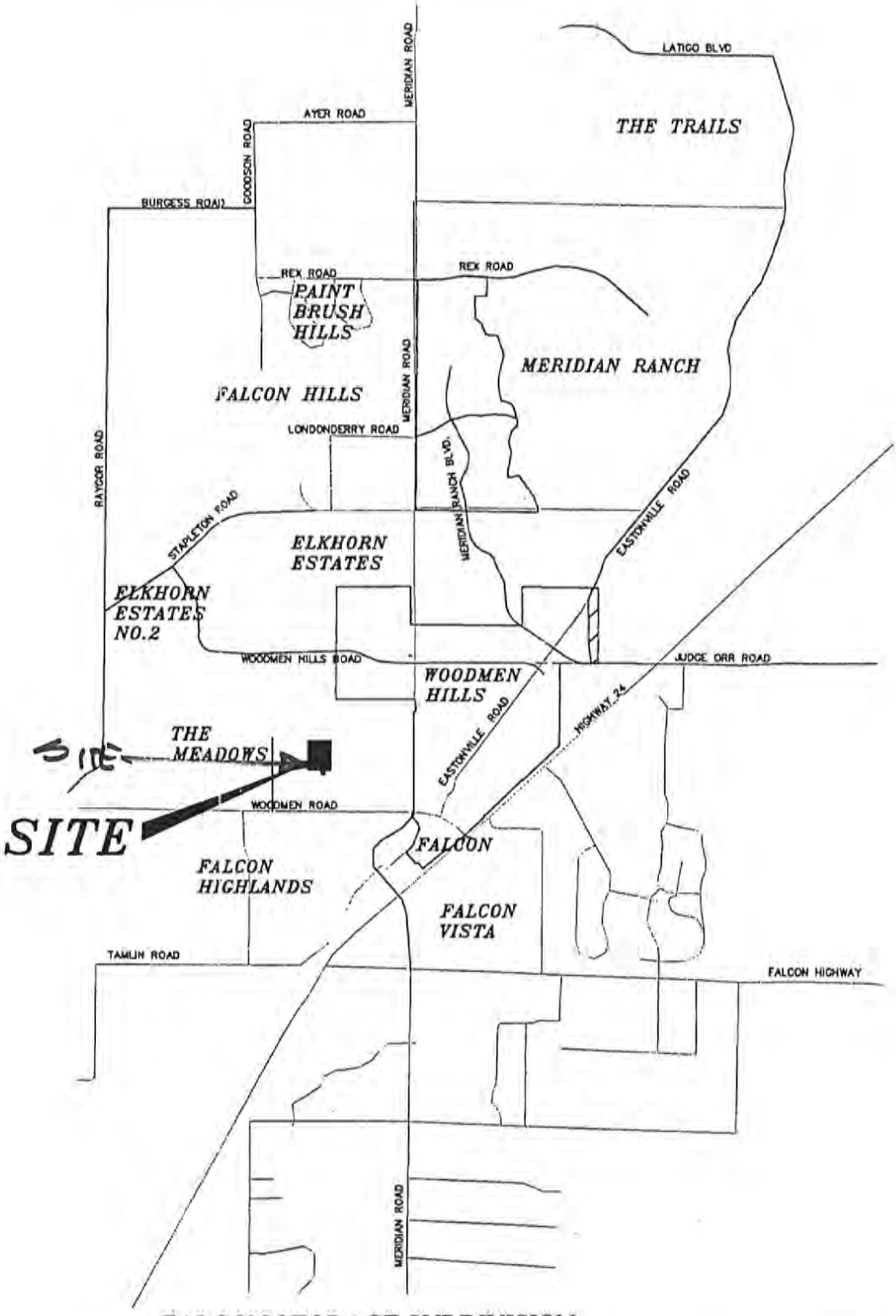
LOGARITHMIC 2 X 1 CYCLES
KEUFFEL & ESSER CO. MADE IN U.S.A.

46 7080

$$Q=\frac{0.463}{n} D^{8/3} S^{\frac{1}{2}} \qquad Q=KS^{\frac{1}{2}}$$

DIAMETER -IN.-	AREA -FT^2-	D 8/3 -FT-	K			
			N=0.010	N=0.013	N=0.024	N=0.026
2	0.02182	0.008413	0.3895	---	---	---
4	0.08727	0.053420	2.4733	---	---	---
6	0.19630	0.157500	7.2922	5.609	---	---
8	0.34910	0.339200	15.7050	12.081	---	---
10	0.54540	0.615000	28.4745	21.903	---	---
12	0.78540	1.000000	46.3000	35.615	---	---
15	1.22720	1.813100	83.9465	64.574	---	---
18	1.76710	2.948300	136.5100	105.000	56.88	52.50
21	2.40530	4.447400	205.9100	158.400	85.80	79.20
24	3.14160	6.349600	293.9900	226.140	122.49	113.07
27	3.97610	8.692700	402.4700	309.590	167.70	154.79
30	4.90870	11.512600	533.0300	410.030	222.10	205.02
33	5.93960	14.844100	---	528.680	---	---
36	7.06860	18.720800	866.7700	666.700	361.20	333.30
39	8.29580	23.175100	---	825.400	---	---
42	9.62110	28.238900	---	1005.000	544.80	502.50
48	12.56640	40.317500	---	1436.000	777.80	718.00
54	15.90430	55.195000	---	1966.000	1065.00	983.00
60	19.63500	73.100400	---	2604.000	1410.00	1302.00
66	23.75830	94.254200	---	3357.000	1818.00	1678.00
72	28.27430	118.869400	---	4234.000	2293.00	2117.00
78	33.18310	147.152900	---	5241.000	2839.00	2620.00
84	38.48450	179.306000	---	6386.000	3459.00	3193.00
90	44.17860	215.524500	---	7676.000	4158.00	3838.00
96	50.26550	256.000000	---	9118.000	4939.00	4559.00
108	63.61730	350.466600	---	12480.000	6761.00	6140.00
120	78.53980	464.158900	---	16530.000	8954.00	8265.00

Oliver E. Watts
Consulting Engine
Colorado Springs



FALCON STORAGE SUBDIVISION

VICINITY MAP

LATIGO

(719) 380-1090
Architectural Planning & Design
Colorado Design Concepts
3578 Hartsel Drive E323
Colorado Springs, CO 80920

FIGURE.1

PROJECT NO. 200401

National Flood Hazard Layer FIRMette

FEMA

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 represen 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 3/25/2021 at 9:47 AM 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.

NOTES TO USERS

This map is for use in administering the National Flood Insurance Program. It does not necessarily identify all areas subject to flooding, particularly from local drainage sources of small size. The community map repository should be consulted for possible updated or additional flood hazard information.

To obtain more detailed information in areas where **Base Flood Elevations** (BFEs) and/or **floodways** have been determined, users are encouraged to consult the Flood Profiles and Floodway Data and/or Summary of Stillwater Elevations tables contained within the Flood Insurance Study (FIS) report that accompanies this FIRM. Users should be aware that BFEs shown on the FIRM represent rounded whole-foot elevations. These BFEs are intended for flood insurance rating purposes only and should not be used as the sole source of flood elevation information. Accordingly, flood elevation data presented in the FIS report should be utilized in conjunction with the FIRM for purposes of construction and/or floodplain management.

Coastal Base Flood Elevations shown on this map apply only landward of 0.0' North American Vertical Datum of 1988 (NAVD88). Users of this FIRM should be aware that coastal flood elevations are also provided in the Summary of Stillwater Elevations table in the Flood Insurance Study report for this jurisdiction. Elevations shown in the Summary of Stillwater Elevations table should be used for construction and/or floodplain management purposes when they are higher than the elevations shown on this FIRM.

Boundaries of the **floodways** were computed at cross sections and interpolated between cross sections. The floodways were based on hydraulic considerations with regard to requirements of the National Flood Insurance Program. Floodway widths and other pertinent floodway data are provided in the Flood Insurance Study report for this jurisdiction.

Certain areas not in Special Flood Hazard Areas may be protected by **flood control structures**. Refer to section 2.4 "Flood Protection Measures" of the Flood Insurance Study report for information on flood control structures for this jurisdiction.

The **projection** used in the preparation of this map was Universal Transverse Mercator (UTM) zone 13. The horizontal datum was NAD83, GRS80 spheroid. Differences in datum, spheroid, projection or UTM zones zones used in the production of FIRMs for adjacent jurisdictions may result in slight positional differences in map features across jurisdiction boundaries. These differences do not affect the accuracy of this FIRM.

Flood elevations on this map are referenced to the **North American Vertical Datum of 1988 (NAVD88)**. These flood elevations must be compared to structure and ground elevations referenced to the same vertical datum. For information regarding conversion between the National Geodetic Vertical Datum of 1929 and the North American Vertical Datum of 1988, visit the National Geodetic Survey website at http://www.ngs.noaa.gov/ or contact the National Geodetic Survey at the following address:

NGS Information Services
NOAA, N/NGS12
National Geodetic Survey
SSMC-3, #9202
1315 East-West Highway
Silver Spring, MD 20910-3282

To obtain current elevation, description, and/or location information for **bench marks** shown on this map, please contact the Information Services Branch of the National Geodetic Survey at (301) 713-3242 or visit its website at http://www.ngs.noaa.gov/.

Base Map information shown on this FIRM was provided in digital format by El Paso County, Colorado Springs Utilities, City of Fountain, Bureau of Land Management, National Oceanic and Atmospheric Administration, United States Geological Survey, and Anderson Consulting Engineers, Inc. These data are current as of 2006.

This map reflects more detailed and up-to-date **stream channel configurations and floodplain delineations** than those shown on the previous FIRM for this jurisdiction. The floodplains and floodways that were transferred from the previous FIRM may have been adjusted to conform to these new stream channel configurations. As a result, the Flood Profiles and Floodway Data tables in the Flood Insurance Study Report (which contains authoritative hydraulic data) may reflect stream channel distances that differ from what is shown on this map. The profile baselines depicted on this map represent the hydraulic modeling baselines that match the flood profiles and Floodway Data Tables if applicable, in the FIS report. As a result, the profile baselines may deviate significantly from the new base map channel representation and may appear outside of the floodplain.

Corporate limits shown on this map are based on the best data available at the time of publication. Because changes due to annexations or de-annexations may have occurred after this map was published, map users should contact appropriate community officials to verify current corporate limit locations.

Please refer to the separately printed **Map Index** for an overview map of the county showing the layout of map panels; community map repository addresses; and a Listing of Communities table containing National Flood Insurance Program dates for each community as well as a listing of the panels on which each community is located.

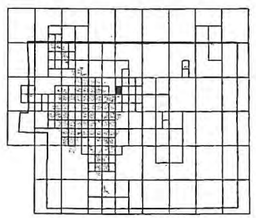
Contact **FEMA Map Service Center** (MSC) via the FEMA Map Information eXchange (FMIX) 1-877-336-2627 for information on available products associated with this FIRM. Available products may include previously issued Letters of Map Change, a Flood Insurance Study Report, and/or digital versions of this map. The MSC may also be reached by Fax at 1-800-358-9620 and its website at http://www.msc.fema.gov/.

If you have questions about this map or questions concerning the National Flood Insurance Program in general, please call 1-877-FEMA MAP (1-877-336-2627) or visit the FEMA website at http://www.fema.gov/business/nfip.

El Paso County Vertical Datum Offset Table

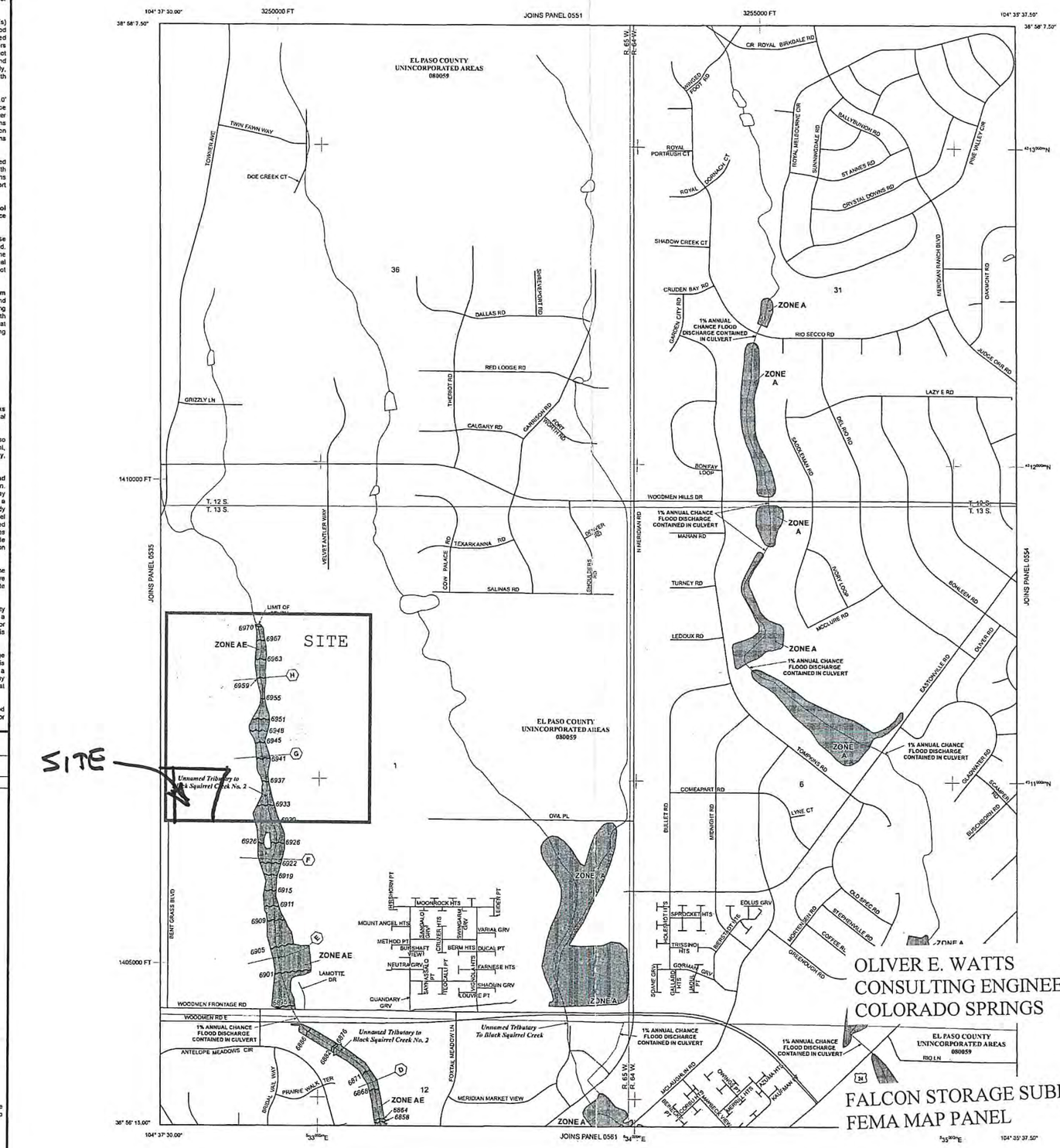
Flooding Source	Vertical Datum Offset (ft)
REFER TO SECTION 3.3 OF THE EL PASO COUNTY FLOOD INSURANCE STUDY FOR STREAM BY STREAM VERTICAL DATUM CONVERSION INFORMATION	

Panel Location Map



This Digital Flood Insurance Rate Map (DFIRM) was produced through a Cooperating Technical Partner (CTP) agreement between the State of Colorado Water Conservation Board (CWCB) and the Federal Emergency Management Agency (FEMA).

Additional Flood Hazard information and resources are available from local communities and the Colorado Water Conservation Board.



SITE

OLIVER E. WATTS
CONSULTING ENGINEER, INC.
COLORADO SPRINGS

FALCON STORAGE SUBDIVISION
FEMA MAP PANEL

LEGEND

SPECIAL FLOOD HAZARD AREAS (SFHAS) SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD

The 1% annual chance flood (100-year flood), also known as the base flood, is the flood that has a 1% chance of being equaled or exceeded in any given year. The Special Flood Hazard Area is the area subject to flooding by the 1% annual chance flood. Areas of Special Flood Hazard include Zones A, AE, AH, AO, AR, A99, V, and VE. The Base Flood Elevation is the water-surface elevation of the 1% annual chance flood.

- ZONE A — No Base Flood Elevations determined.
- ZONE AE — Base Flood Elevations determined.
- ZONE AH — Flood depths of 1 to 3 feet (usually areas of ponding); Base Flood Elevations determined.
- ZONE AO — Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.
- ZONE AR — Special Flood Hazard Area Formerly protected from the 1% annual chance flood by a flood control system that was subsequently decertified. Zone AR indicates that the former flood control system is being restored to provide protection from the 1% annual chance or greater flood.
- ZONE A99 — Area to be protected from 1% annual chance flood by a Federal flood protection system under construction; no Base Flood Elevations determined.
- ZONE V — Coastal flood zone with velocity hazard (wave action); no Base Flood Elevations determined.
- ZONE VE — Coastal flood zone with velocity hazard (wave action); Base Flood Elevations determined.

FLOODWAY AREAS IN ZONE AE

The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without substantial increases in flood heights.

OTHER FLOOD AREAS

- ZONE X — Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.

OTHER AREAS

- ZONE X — Areas determined to be outside the 0.2% annual chance floodplain.
- ZONE D — Areas in which flood hazards are undetermined, but possible.

COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS

OTHERWISE PROTECTED AREAS (OPAs)

CBRS areas and OPAs are normally located within or adjacent to Special Flood Hazard Areas.

- Floodplain boundary
- Floodway boundary
- Zone D Boundary
- CBRS and OPA boundary
- Boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths or flood velocities.
- 513 — Base Flood Elevation line and value; elevation in feet*
- (EL 987) — Base Flood Elevation value where uniform within zone; elevation in feet*

* Referenced to the North American Vertical Datum of 1988 (NAVD 88)

- (A)—(A) — Cross section line
- (23)—(23) — Transect line
- 97° 07' 30.00" / 32° 22' 30.00" — Geographic coordinates referenced to the North American Datum of 1983 (NAD 83)
- 4275000mN — 1000-meter Universal Transverse Mercator grid ticks, zone 13
- 6000000 FT — 5000-foot grid ticks: Colorado State Plane coordinate system, central zone (FIPSZONE 0502), Lambert Conformal Conic Projection
- DX5510 — Bench mark (see explanation in Notes to Users section of this FIRM panel)
- M1.5 — River Mile

MAP REPOSITORIES
Refer to Map Repositories list on Map Index

EFFECTIVE DATE OF COUNTYWIDE FLOOD INSURANCE RATE MAP
MARCH 17, 1997

EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL
DECEMBER 7, 2018 - to update corporate limits, to change Base Flood Elevations and Special Flood Hazard Areas, to update map format, to add roads and road names, and to incorporate previously issued Letters of Map Revision.

For community map revision history prior to countywide mapping, refer to the Community Map History Table located in the Flood Insurance Study report for this jurisdiction.

To determine if flood insurance is available in this community, contact your insurance agent or call the National Flood Insurance Program at 1-800-638-6620.

MAP SCALE 1" = 500'

250 0 500 1000 FEET
150 0 150 300 METERS

11"x17"

NFIP

NATIONAL FLOOD INSURANCE PROGRAM

PANEL 0553G

FIRM

FLOOD INSURANCE RATE MAP

EL PASO COUNTY, COLORADO AND INCORPORATED AREAS

PANEL 553 OF 1300

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
EL PASO COUNTY	080059	0553	G

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

MAP NUMBER
08041C0553G

MAP REVISED
DECEMBER 7, 2018

Federal Emergency Management Agency

OLIVER E. WATTS
CONSULTING ENGINEER, INC.
COLORADO SPRINGS

FALCON STORAGE SUBDIVISION
SCS SOILS MAP

Map Scale: 1:15,900 if printed on A portrait (8.5" x 11") sheet.

Meters: 0 200 400 800 1200

Feet: 0 500 1000 2000 3000

1" = 1380'

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

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	Hydrologic 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.
[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.
[18]:							
Chaseville part	A	None	---	---	>60	---	Low.
Midway part	D	None	---	---	10-20	Rippable	Moderate.
Columbine: 19	A	None to rare	---	---	>60	---	Low.
Connerton:							
[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.
[24]:							
Cushman part	C	None	---	---	20-40	Rippable	Moderate.
Kutch part	C	None	---	---	20-40	Rippable	Moderate.
Elbeth: 25, 26	B	None	---	---	>60	---	Moderate.
[27]:							
Elbeth part	B	None	---	---	>60	---	Moderate.

See footnote at end of table.

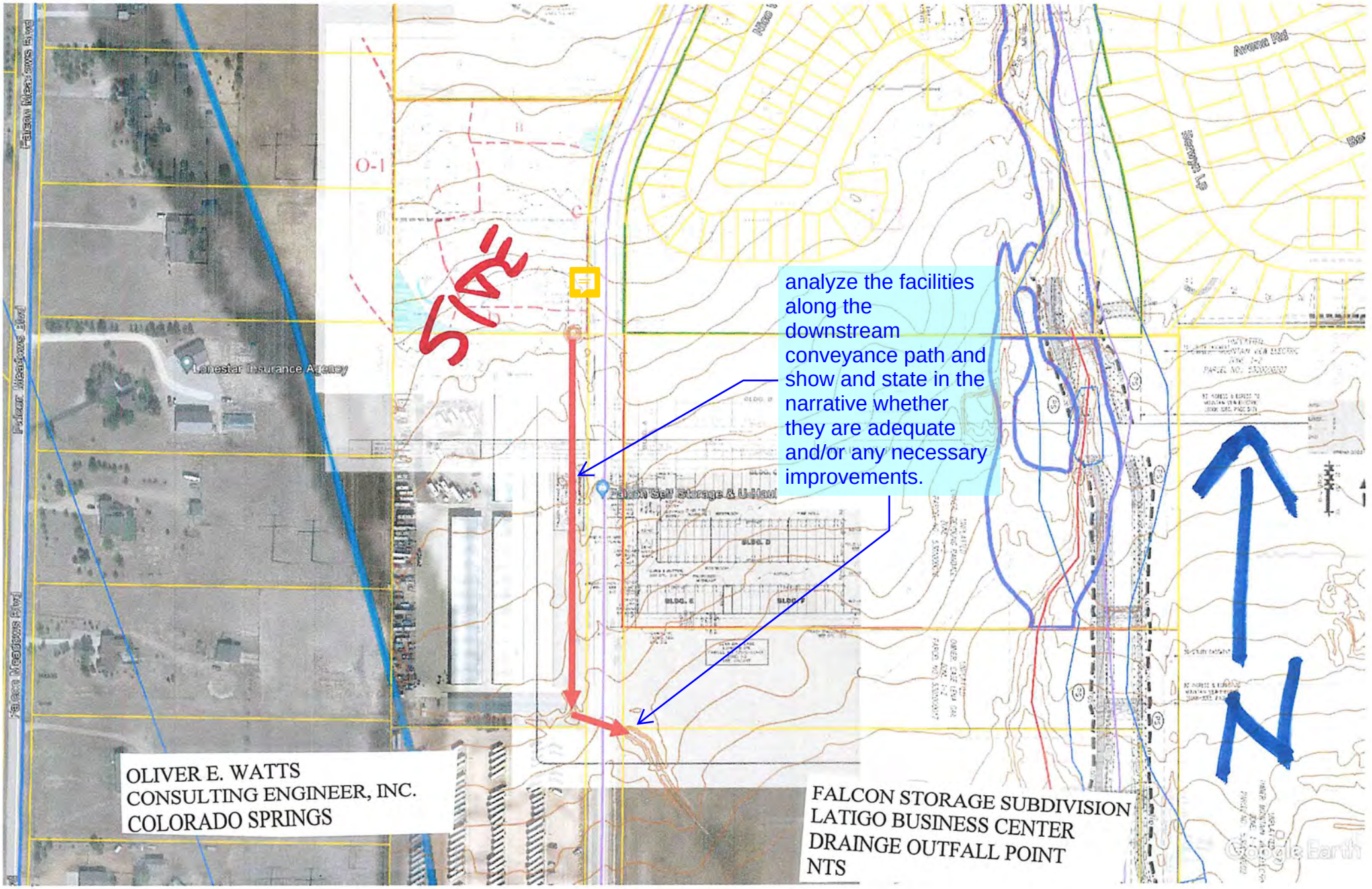

analyze the facilities along the downstream conveyance path and show and state in the narrative whether they are adequate and/or any necessary improvements.
O-1
Falcon Meadows Blvd
Lonestar Insurance Agency
Falcon Self Storage & U-Haul
OLIVER E. WATTS
CONSULTING ENGINEER, INC.
COLORADO SPRINGS
FALCON STORAGE SUBDIVISION
LATIGO BUSINESS CENTER
DRAINGE OUTFALL POINT
NTS
N

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 maximum for non-urban land uses, 100 ft maximum 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.

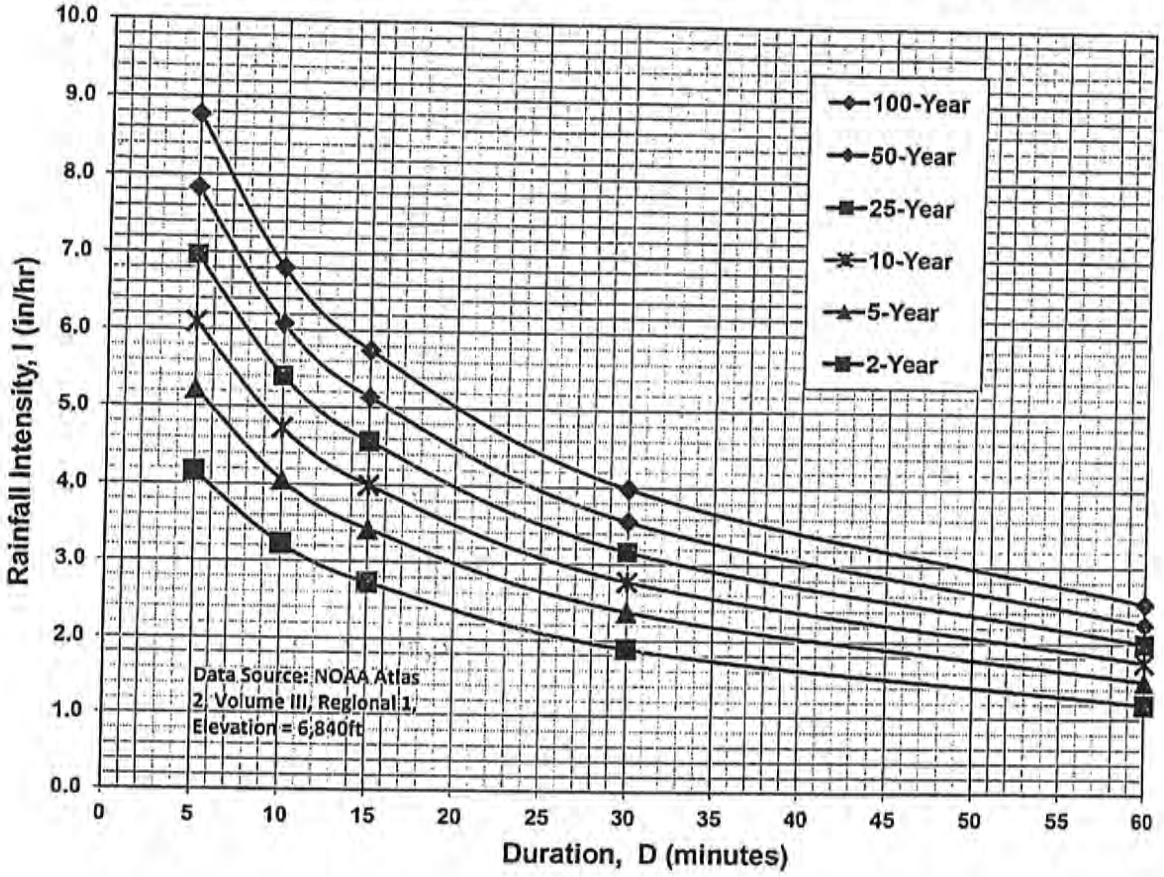
3.2.4 Minimum Time of Concentration

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

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

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

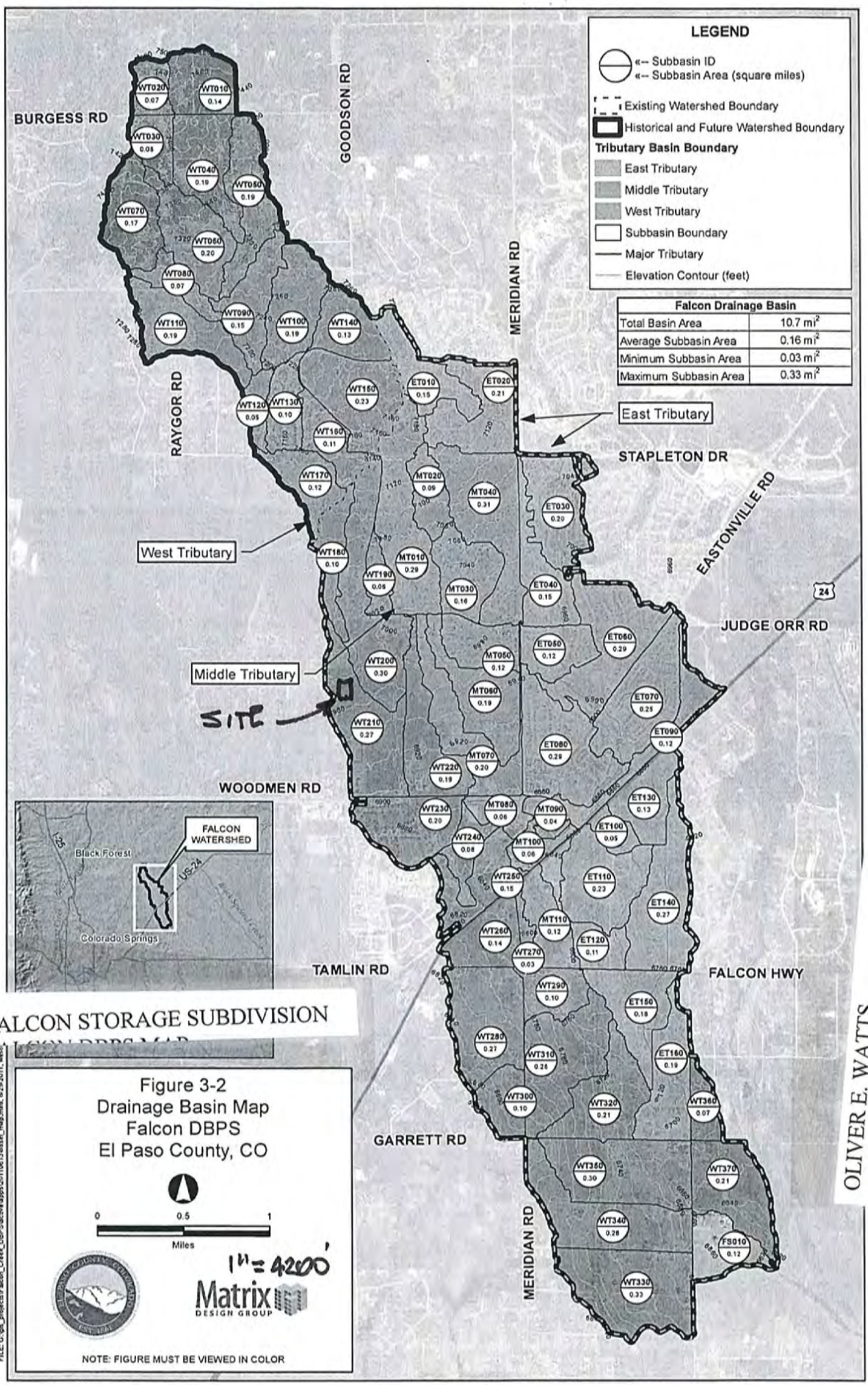
$I_{25} = -2.00 \ln(D) + 10.111$

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

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

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

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



FALCON STORAGE SUBDIVISION

Figure 3-2
Drainage Basin Map
Falcon DBPS
El Paso County, CO

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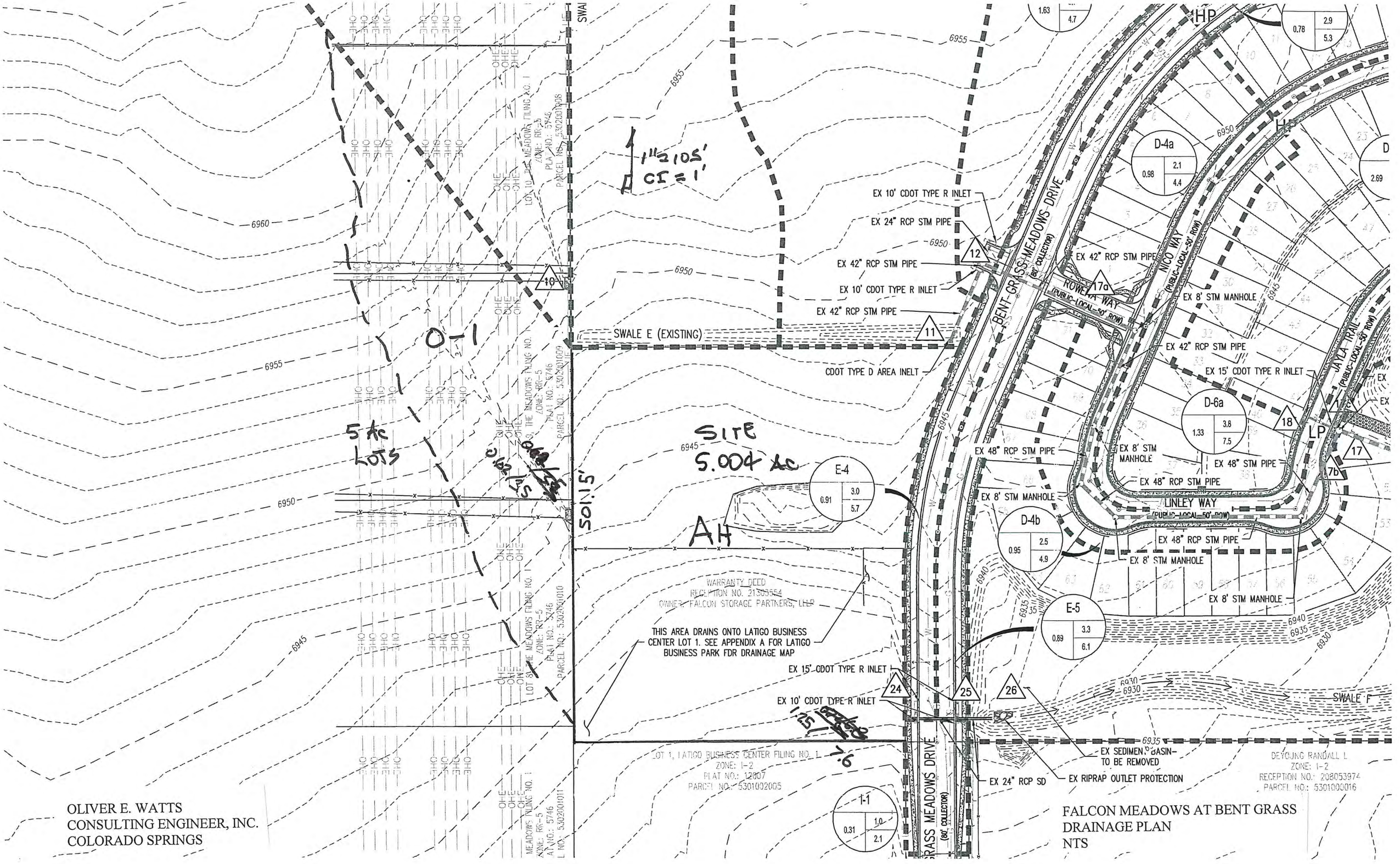
COLORADO SPRINGS



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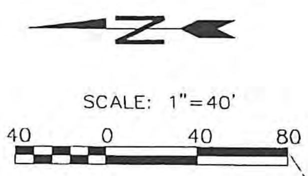
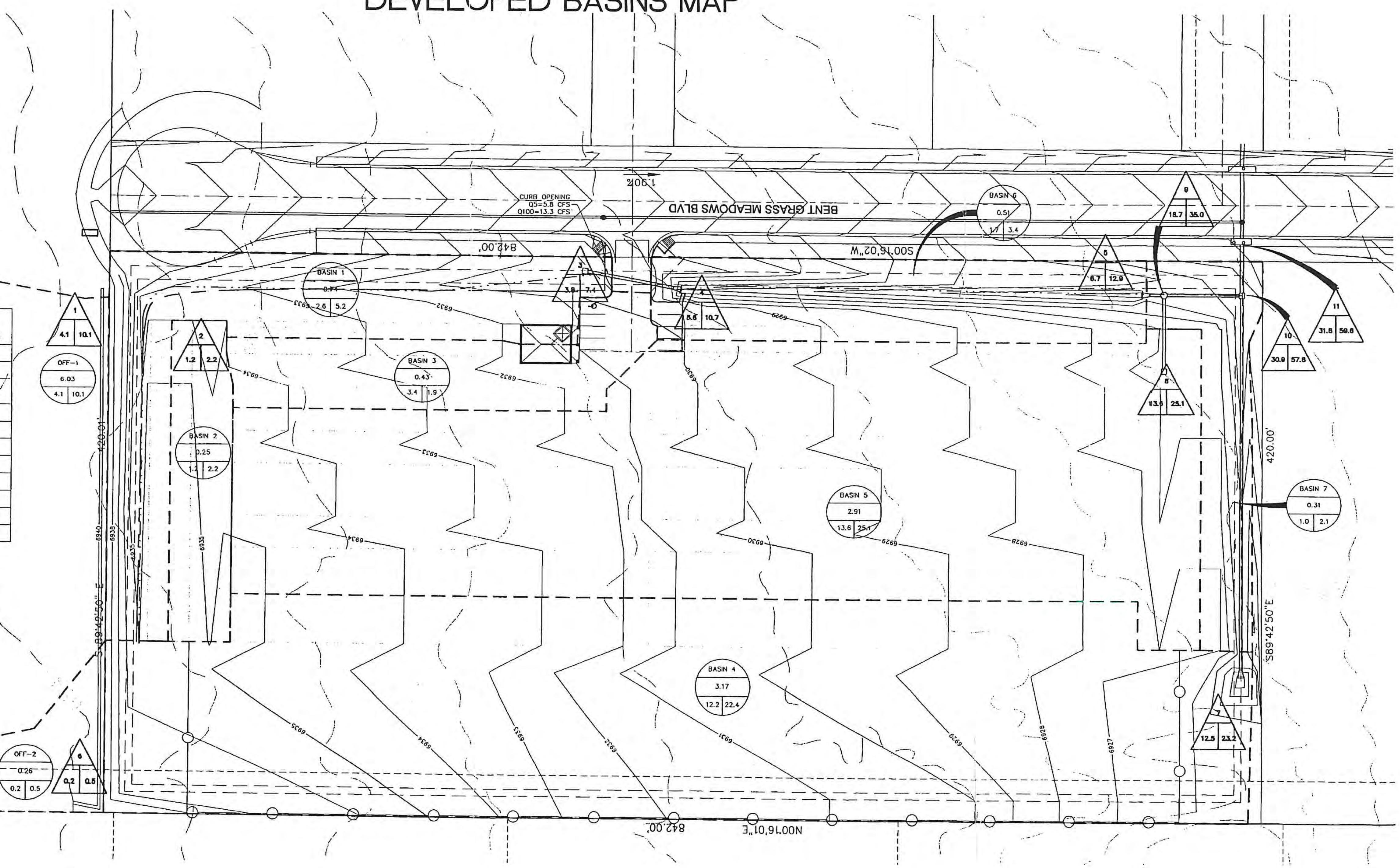
CONSULTING ENGINEER, INC.
COLORADO SPRINGS

FALCON MEADOWS AT BENT GRASS
DRAINAGE PLAN
NTS



LOT 1
LATIGO BUSINESS CENTER
DEVELOPED BASINS MAP



DESIGN POINT	CONTRIBUTING BASINS	TIME OF CONCENTRATION (MINUTES)	Q_5 (CFS)	Q_{100} (CFS)
1	OFF-1	22.6	4.1	10.1
2	BASIN 2	5.0	1.2	2.2
3	BASIN 1, BASIN 2	5.2	3.8	7.4
4	DP-3, BASIN 3	5.3	5.6	10.7
5	DP-4,BASIN 6	7.3	6.7	12.9
6	OFF-2	17.5	0.2	0.5
7	DP-6, BASIN 4	7.1	12.5	23.2
8	BASIN 5	5.0	13.6	25.1
9	BASIN 7	6.4	1.0	2.1
10	DP-9, DP-7	7.4	30.9	57.8
11	DP-10, BASIN 7	7.4	31.8	59.6

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CONSULTING ENGINEER, INC.
COLORADO SPRINGS

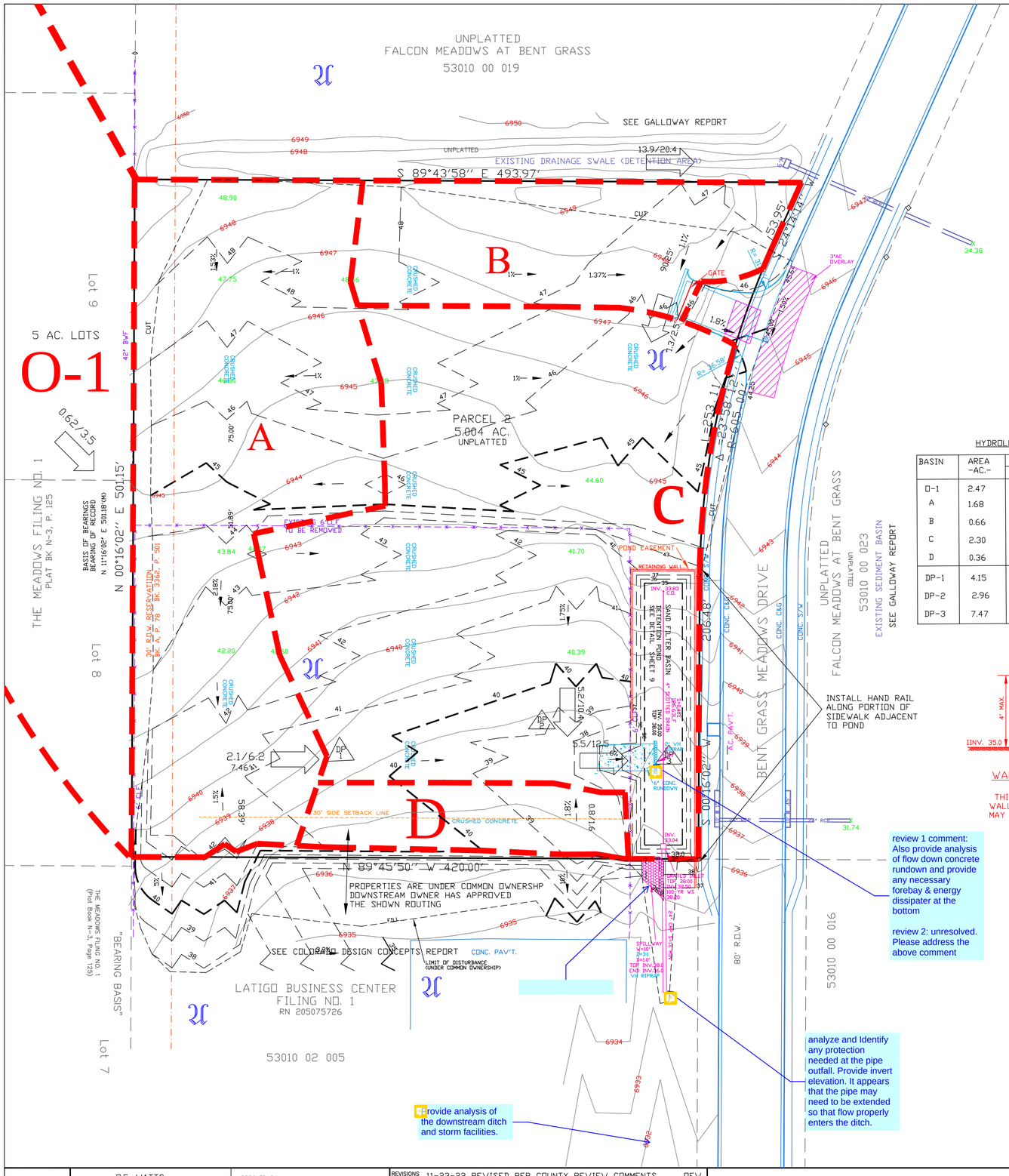
FALCON STORAGE SUBDIVISION
LATIGO BUSINESS CENTER, LOT 1
DRAINAGE PLAN
NTS

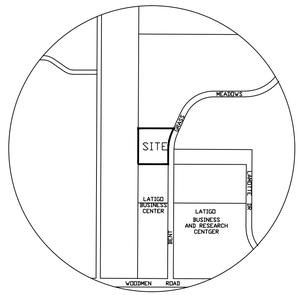
REVISIONS:		
NO.	DESCRIPTION	DATE

ENGINEER:
DESIGNED BY: DC DATE: 7/17/04
DRAWN BY: DC DATE: 7/17/04
CHECKED BY: XXX DATE: XX/XX/XX

48 HOURS BEFORE YOU DIG, CALL UTILITY LOCATORS
1-800-922-1987
(SEE COVER FOR LIST OF UTILITY CONTACTS)

PROJECT LATIGO BUSINESS CENTER LOT 1
SHEET TITLE NA
FROM ______ TO ______
JOB NO. 2004-1 SHEET 2 OF 2





VICINITY MAP

1"=1000'

CONTOUR LEGEND:

ORIGINAL CONTOURS: 2' / 10'

PROPOSED CONTOURS: 2' / 10'

GRADED AREAS NOT COVERED BY CONCRETE, ASPHALT OF LANDSCAPE SHALL BE RESEEDED (FINAL) SEE LANDSCAPE PLAN FOR DETAILS. NO BATCH PLANTS WILL BE UTILIZED ON THIS SITE THERE ARE NO SURFACE WATERS ON THIS SITE.

N

40 0 40 80 120

Scale 1" = 40'

Contour Interval: 1

BENCH MARK: SE CORNER SECTION 1
1-1/2" AL. CAP, EL. 6901.70

LEGEND:

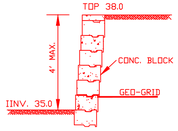
- FOUND RED LDC CAP ON #4 REBAR
- SEWER MANHOLE (EXISTING)
- WATER MANHOLE (EXISTING)
- WATER VALVE (EXISTING)
- FIRE HYDRANT (EXISTING)
- RV DUMP SITE (EXISTING)
- ELECTRICAL VAULT (EXISTING)

HYDROLOGIC SUMMARY

BASIN	AREA -AC.-	RUNOFF - CFS	
		5-YEAR	100-YEAR
O-1	2.47	0.62	3.5
A	1.68	3.2	6.5
B	0.66	1.3	2.5
C	2.30	4.5	8.9
D	0.36	0.8	1.6
DP-1	4.15	2.1	6.2
DP-2	2.96	5.2	10.4
DP-3	7.47	5.5	12.5

LEGEND:

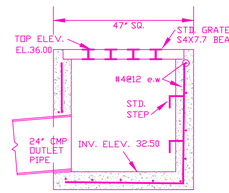
- 10.5/20.4 — RUNOFF IN CFS 5-YEAR/100-YEAR
- A — LIMIT OF DRAINAGE BASIN AND DESIGNATION
- EXISTING STORM SEWER AS LABELED
- LIMIT OF SOILS TYPE AND GROUP
- PROPOSED STORM SEWER AS LABELED



WALL SECTION

1/2"=1'-0"

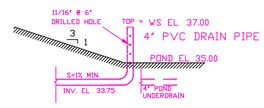
THIS IS A NON-ENGINEERED WALL AND SIMILAR WALLS MAY BE SUBSTITUTED



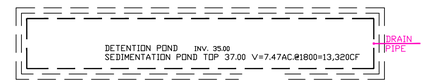
GRATED INLET

1/2"=1'-0"

INLET SHALL CONFORM TO CDOT TYPE C INLET



DRAIN PIPE



TEMPORARY SEDIMENTATION BASIN (TSB)

INTERIM CONDITION: TEMPORARY SEDIMENT BASIN DURING CONSTRUCTION, TO BE CONVERTED TO SAND FILTER BASIN UPON COMPLETION

PCD PROJECT NO: PPR2232 & MS232

DRAWN BY: D.E. WATTS DATE: 2-4-21 DWG. NO.: 20-5523-04 SURVEYED BY: DEW, ESW, 10-6-20	APPROVED BY: PROJ. NO. DWG.	REVISIONS 11-23-22 REVISED PER COUNTY REVIEW COMMENTS DEW 8-22-23 REVISED PER COUNTY REVIEW COMMENTS DEW	OLIVER E. WATTS CONSULTING ENGINEER COLORADO SPRINGS	PROJECT FALCON STORAGE PARCEL PART W 1/2 SEC. 1, T.13S., R.65W., 6TH P.M. EL PASO COUNTY	SHT. NAME DRAINAGE PLAN	SHT. NO. 1 OF 1