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

Prepared for

Falcon Storage Partners LLLP

Please add PCD File No. PPR2232

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

OLIVER E. WATTS, PE-LS
OLIVER E. WATTS, CONSULTING ENGINEER, INC.
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614 ELKTON DRIVE
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(719) 593-0173
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olliewatts@aol.com
Celebrating over 41 years in business

Jennifer Irvine is no longer the County Engineer. You may remove this or you may indicate Elizabeth Nijkamp, P.E. or Joshua Palmer, P.E. (he's our interim county engineer).

February 4, 2021

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

ATTN: *Jennifer Irvine, 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 submittal.

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.

_____ _____

~~Jennifer Irvine, P.E.~~, date
County Engineer / ECM Administrator

Conditions:

Please delete

Please provide a historic conditions sub basin description and analysis of the site. provide an existing conditions drainage map also

did you mean Latigo Business Center?

4. LOCATION AND DESCRIPTION:

The Falcon Storage Subdivision is located in the Latigo 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 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, 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.

per contours shown on the reference drainage plan (falcon meadows at Bent Grass Filing 2) it appears that offsite flow from the westerly subdivision (The Meadows Filing 1) enters the site. Revise you analysis/design accordingly.to account for this off-site flow.

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 enclosed for reference and review. Pertinent portions of the criteria are

Please reference and provide a copy of the final drainage report as what is attached is the preliminary drainage report. I have provided a link below to the file for your use.

https://epcdevplanreview.com/Public/ProjectDetails/174325

The soils in the subdivision have been mapped by the local USDA/SCS interpretation sheet are enclosed for reference. All soils in this area are within the development areas.

The site plan submitted has only 1 entrance on the north end of the site. Revise your design accordingly.

7. DESCRIPTION OF RUNOFF:

A. Drainage Inflows: In accordance with other reference drainage plans there are no areas discharging into this property. Specifically the 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.

please clarify that this is the interior private drive aisles of the site.

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. Minor grading is indicated which is intended to contain the runoff into the interior street network. Some runoff will be routed to and contained within the private streets, terminating in the two north-south existing streets. Basin A will develop 3.2 cfs \6.5 cfs (5-uear / 100-year runoffs) in the westerly street. Basin D will develop 0.8 cfs / 1.6 cfs into the easterly street. The majority of the development will be routed to Bent Grass Meadows Drive. Basin B will discharge 1.3 cfs / 2.5 cfs at the northerly entrance and Basin C will discharge 4.5 cfs / 8.9 cfs at the southerly entrance, just above the catch basins routing the runoff to the detention pond.

C. Outfall Point: Discharge from Basins A and D will be into Lot 1 of the Latigo Business Center (under common ownership). The drainage plan for this property is enclosed. This report indicated two existing discharges: 0.2 cfs / 0.5 cfs near the southwest corner and 6.1 cfs / 10.1 cfs over the remaining south frontage. These historic total runoffs are greater than computed for developed totals.

The developed flows at this design point are much larger than the historic flows identified. Please compare developed flows to historic flows at all proposed design points and address detention and/or why it is not provided.

the historic runoff at basin D is larger as the flow upstream (basin C & B) are diverted to the east

4.1 cfs is indicated in the Latigo drainage report. Please also provide an excerpt of the narrative from this report.

WATER QUALITY
Water quality will be provided as
FOUR STEP PROCESS
The following process has been follo

Runoff Reduction: The scope of the
requirements to present the minimum
undisturbed portions are to be landsca

The above basin description identifies that developed flow from the site will either be conveyed to the roadway or to the adjacent lot to the south with no mention of how it is being treated. Per ECM Appendix I.7.1.C.1 100% of the applicable development site shall be captured. Please address how permanent water quality will be addressed for the site. Also, per the Falcon Meadows at Bent Grass drainage reports, this sites flows were not accounted for in their design of the nearby pond. If it is your intent to utilize the existing storm facilities (inlet, storm sewers, pond) installed by Falcon Meadows then please prove that they have the capacity and can treat this sites developed flows.

Treat and Slowly Release: Detention storage is being provided by others with sub regional facilities.

Channel Stabilizing: 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 and previously approved subdivision drainage reports. There will be no adverse affect on downstream developments as a result of this subdivision

Source Controls: 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.

Please identify what the downstream facilities are.

8. COST ESTIMATE:
No drainage structures are required for this subdivision.

9. FEES:
2021 Falcon Basin Fees: 5.004 acres @80% Impervious = 4.0032 Impervious acres
Drainage fees @ $ 27,762.00 per acre = $ 111,136.83
Bridge fees @ $ 3.814.00 per acre = $ 15,268.20
Total Fees: $ 126,405.04

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. Site appurtenances will not adversely affect the downstream and surrounding developments.

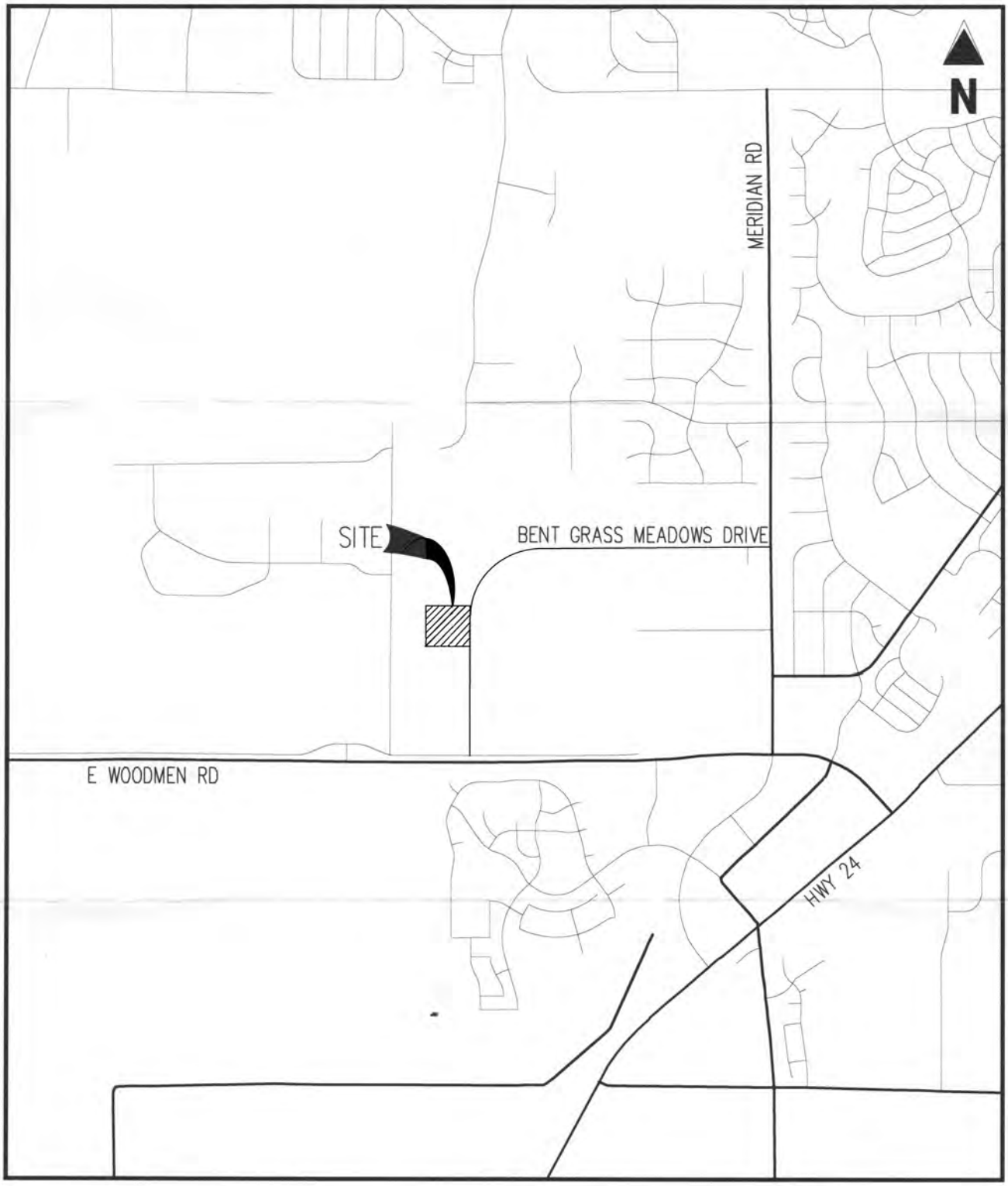
This report and findings is in general conformance with the MDDP and Preliminary Drainage Reports or other pertinent studies

Fees are not collected on site development plan applications. You may state that here in this section. Should it be determined by the planning staff that a platting action is required then fees will be required at plat recordation. Also, the fees for 2022 are $34,117 and $4,687

MAJOR BASIN	SUB BASIN	AREA		BASIN		T_c 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	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
	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
	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

HYDROLOGICAL COMPUTATION – BASIC DATA
PROJ: FALCON STORAGE SUB BY: O.E. WATTS
RATIONAL METHOD DATE: April 20, 2021

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



Latigo Business Center Filing No. 1
Bent Grass Meadows Drive
VICINITY MAP

Project No:	Falcon Storage
Drawn By:	RAG
Checked By:	
Date:	3/30/2021

Falcon Storage
4615 Northpark Dr., Ste. 101
Colorado Springs, 80918
719-593-1330

National Flood Hazard Layer FIRMette

FEMA

104°37'51"W 38°56'56"N

104°37'13"W 38°56'28"N

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

1:6,000

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

Legend

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

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

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

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

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

OTHER FEATURES
- 20.2 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 represent an authoritative property location.

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

The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on 3/25/2021 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.

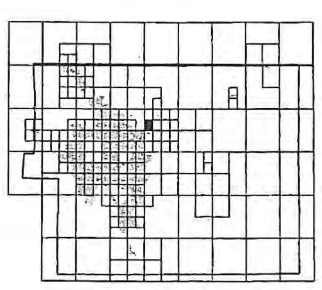
Contact **FEMA Map Service Center** (MSC) via the FEMA Map Information eXchange (FMIX) 1-877-336-2627 for information on available products associated with this FIRM. Available products may include previously issued Letters of Map Change, a Flood Insurance Study Report, and/or digital versions of this 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

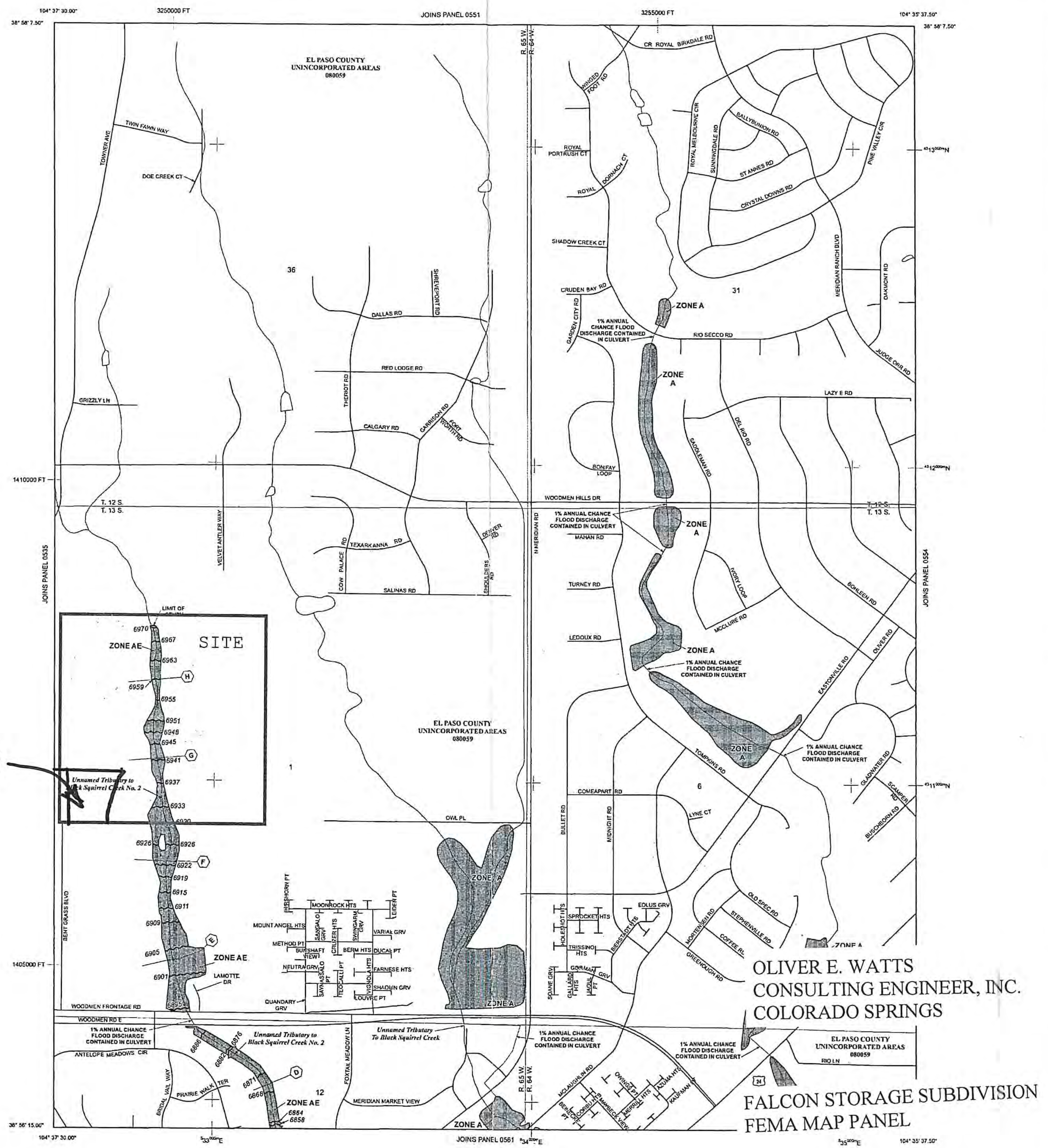
Flooding Source	Vertical Datum Offset (ft)
REFER TO SECTION 3.3 OF THE EL PASO COUNTY FLOOD INSURANCE STUDY FOR STREAM BY STREAM VERTICAL DATUM CONVERSION INFORMATION	

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.



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.

1" = 1200'

MAP SCALE 1" = 500'

250 0 500 1000 FEET

150 0 150 300 METERS

NFIP

PANEL 0553G

NATIONAL FLOOD INSURANCE PROGRAM

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.
[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.

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.

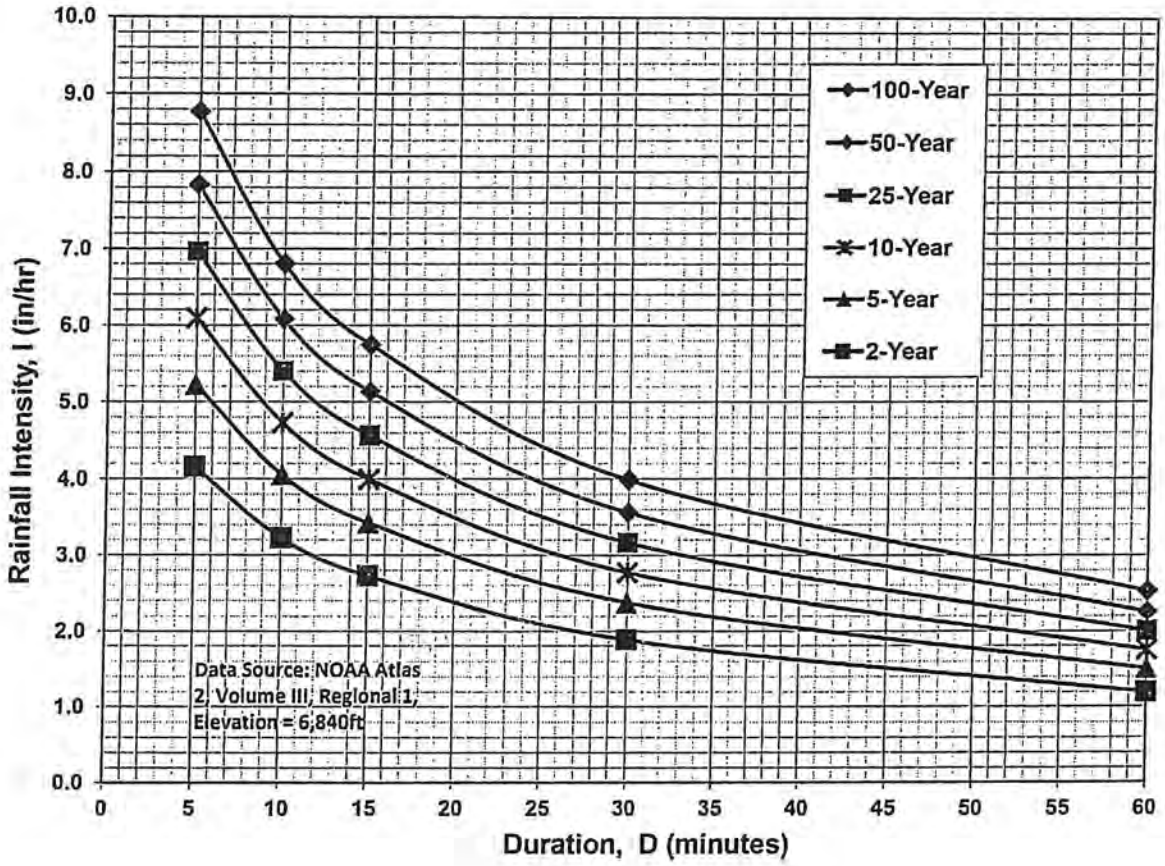
3.2.4 Minimum Time of Concentration

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

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

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

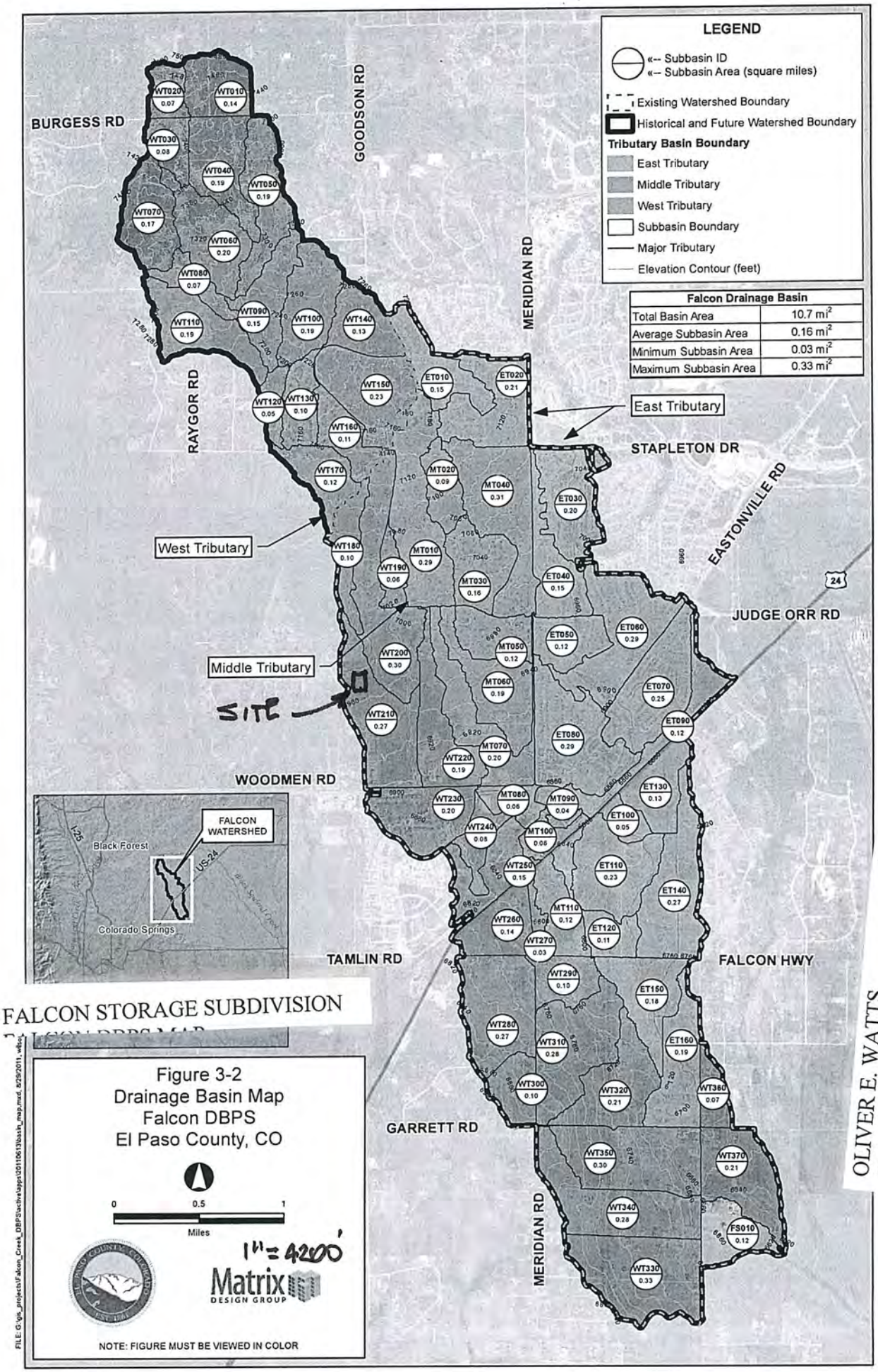
$I_{25} = -2.00 \ln(D) + 10.111$

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

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

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

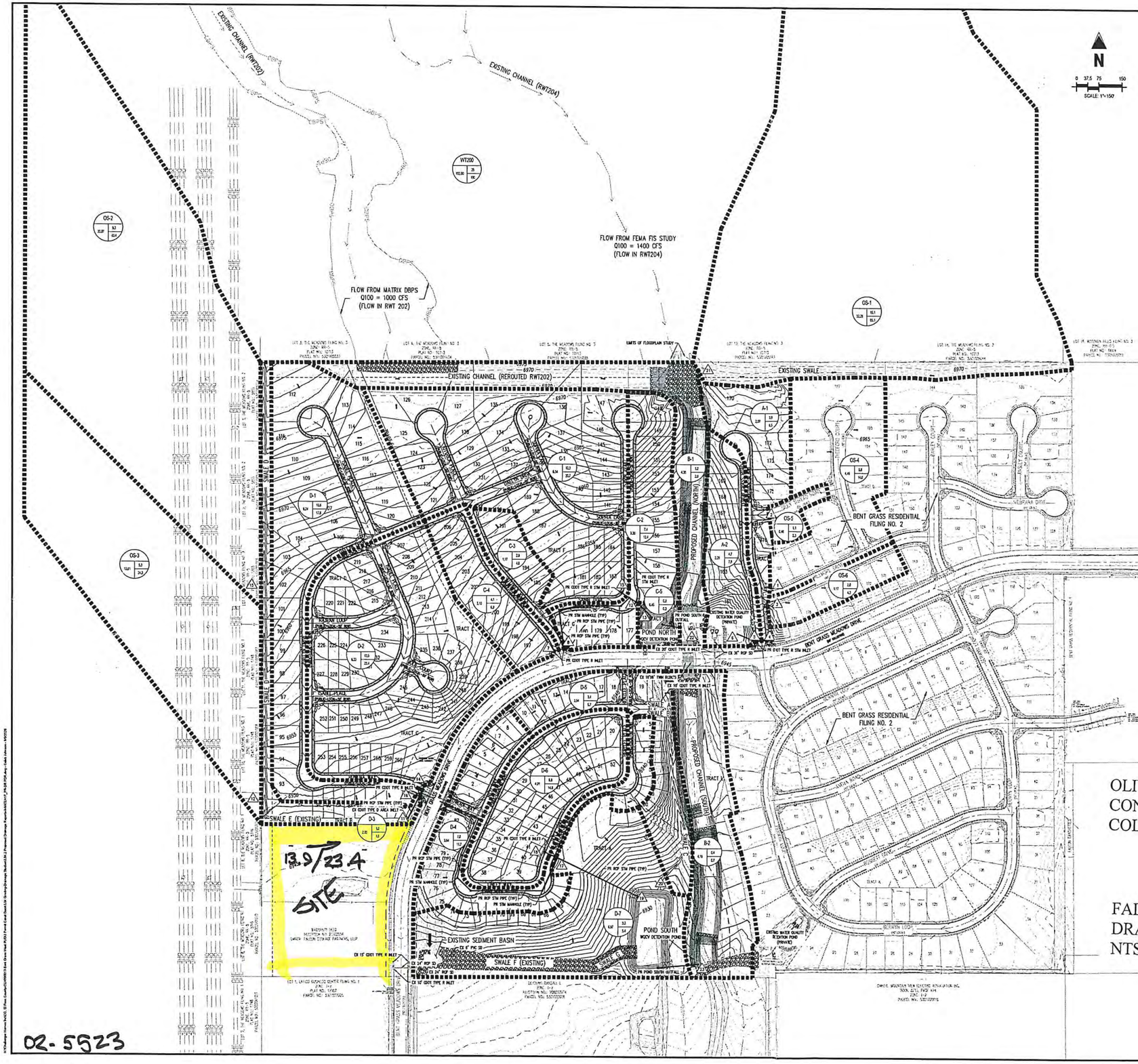
Note: Values calculated by equations may not precisely duplicate values read from figure.

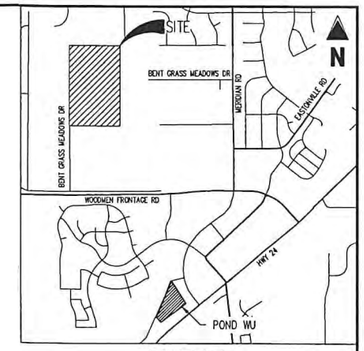


FALCON STORAGE SUBDIVISION

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

OLIVER E. WATTS
CONSULTING ENGINEER, INC.
COLORADO SPRINGS





VICINITY MAP
1"=2,000'

DRAINAGE LEGEND

- PROPERTY LINE
- 6485 EXISTING MAJOR CONTOUR
- EXISTING MINOR CONTOUR
- BASIN BOUNDARY LINE
- FEMA EFFECTIVE 100-YR FLOODPLAIN
- CENTERLINE OF STREAM
- BASIN DESIGNATION
- 5-YEAR RUNOFF IN CUBIC FEET PER SECOND
- 100-YEAR RUNOFF IN CUBIC FEET PER SECOND
- BASIN AREA IN ACRES
- DESIGN POINT
- DIRECTION OF RUNOFF

RUNOFF SUMMARY TABLE

Basin ID	Area (acres)	Qs (cfs)	Qloo (cfs)
A-1	2.57	3.9	6.5
A-2	2.28	4.7	7.9
B-1	4.35	1.2	2.0
B-2	1.17	0.4	0.7
C-1	9.34	12.3	20.7
C-2	3.30	7.4	12.4
C-3	1.17	2.9	4.8
C-4	2.10	4.1	6.9
C-5	0.45	0.2	0.3
D-1	8.24	10.6	17.8
D-2	9.33	13.9	23.4
D-3	2.03	1.0	1.6
D-4	3.64	7.0	11.7
D-5	2.94	3.4	5.7
D-6	4.01	8.8	14.8
D-7	6.97	3.2	5.4
OS-1	32.28	15.1	65.1
OS-2	20.07	9.3	43.4
OS-3	10.61	5.3	24.3
OS-4	4.46	5.6	14.0
OS-5	0.46	1.1	2.3
OS-6	1.17	2.0	4.3

DESIGN POINT SUMMARY TABLE

Design Point	Qs (cfs)	Qloo (cfs)
1	5.6	14.0
2	1.1	2.3
3	2.0	4.3
4	11.9	19.9
5	4.7	7.9
6	15.5	26.0
7	4.1	6.9
8	2.9	4.8
9	2.9	4.8
10	5.3	24.3
11	23.8	39.9
12	0.0	0.0
13	5.6	9.3
14	13.9	23.4
15	9.3	43.4
16	19.0	31.9
17	7.0	11.7
18	8.8	14.8
19	49.2	82.7
20	3.4	5.7
21	15.1	65.1
22	41.3	257.1
23	42.0	258.3

OLIVER E. WATTS
CONSULTING ENGINEER, INC.
COLORADO SPRINGS

FALCON MEADOWS AT BENT GRASS
DRAINAGE PLAN
NTS

13.9 T 23.4 SITE

02-5523

Galloway
1155 Kelly Johnson Blvd., Suite 305
Colorado Springs, CO 80920
719.900.7220
GallowayUS.com

PRELIMINARY
NOT FOR BIDDING
NOT FOR CONSTRUCTION

CHALLENGER HOMES

PRELIMINARY DRAINAGE REPORT
FALCON MEADOWS AT BENT GRASS
FOR
CHALLENGER COMMUNITIES, LLC

BENT GRASS MEADOWS DRIVE & MERIDIAN ROAD
FALCON, CO 80831 - EL PASO COUNTY

#	Date	Issue / Description	Init.

Project No:	CLH000017
Drawn By:	CMWJ
Checked By:	RGD
Date:	08/05/2020

PROPOSED DRAINAGE MAP

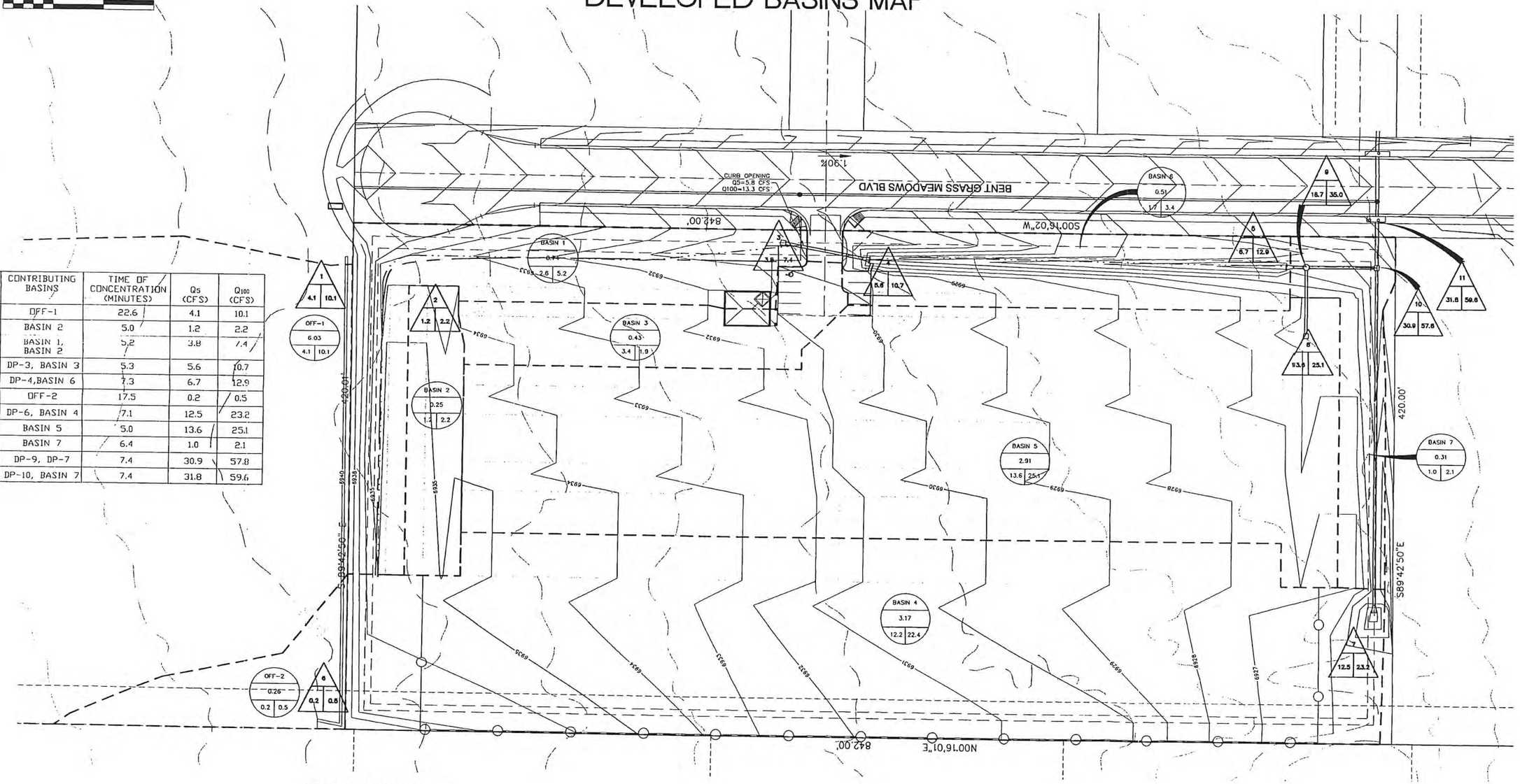
DR-2

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



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

The contours shown on the drainage map do not match those shown on the GEC plan. Please ensure that the proposed contours are consistent with each other.

Please show the proposed driveway

Please provide analysis and state whether Bent Grass Meadows drive has the capacity to accept the developed flows of the site as it is already taking the developed flows from Falcon Meadows subdivision. Additionally, please be sure to analyze the existing downstream facilities(inlet, storm pipes, pond) that the developed flow will be conveyed to.

Also it appears that the flows from basin B and C are being diverted from their historical discharge point at the southern boundary. Please provide discussion on this. What is the ultimate outfall for the site?

The flow arrow does not appear to match the proposed contours. Please revise. Additionally, the site plan does not show a driveway entrance at this location as specified in the narrative.

Please discuss in your narrative where the developed flows from basins A and D will be conveyed to once on the southerly property. Please analyze any existing facilities that these flows may be conveyed to. Also, address how/where these flows are being treated. Is there a pond that is treating Latigo Business Center? If so, provide information regarding the existing facility. Does the facility have the capacity to accept these developed flows? What are the existing conditions of the pond? are any changes required? Please address.

UNPLATTED
FALCON MEADOWS AT BENT GRASS

SEE GALLOWAY REPORT

EXISTING DRAINAGE SWALE

S 89°43'58" E 493.97'

RV STORAGE

RV STORAGE

RV STORAGE 5.004 AC.

PARCEL 2
5.004 AC.
UNPLATTED

RV STORAGE

PARCEL NO. 1
UNPLATTED

A

B

C

D

13.9/20.4

1.3/2.5

4.5/8.9

19.1/8.0

6.5/3.2

Δ = 23°58'12"
R=605.00'
L=253.11'

S 24°14'14" W
53.95'

206.48'

S 00°16'02" W

CONC. C&G

CONC. C&G

CONC. PAV'T.

UNDER CONSTRUCTION

EXISTING SEDIMENT BASIN

SEE GALLOWAY REPORT

UNPLATTED
FALCON MEADOWS AT BENT GRASS

BENT GRASS MEADOWS DRIVE

80' R.O.W.

SEC. PAV'T.

N 00°16'02" E 501.15'

BASIS OF BEARINGS
BEARING OF RECORD
N 11°16'02" E 501.18'(M)

THE MEADOWS FILING NO. 1
PLAT BK N-3, P. 125

30' R.O.W. RESERVATION
BK. 4, PG. 181, BK. 3462, P. 561

42" BWF

6' CLF

"BEARING BASIS"
THE MEADOWS FILING NO. 1
(Plat Book N-3, Page 125)

N 89°45'50" W 420.00'

SEE COLORADO DESIGN CONCEPTS REPORT

CONC. PAV'T.

LATIGO BUSINESS CENTER
FILING NO. 1
RN 205075726

55' TEMP. TURN AROUND
AND DRAINAGE EASEMENT

Lot 9
Lot 8
Lot 7

31.74

34.38

CONTOUR LEGEND:

ORIGINAL CONTOURS: 2' / 10'

FINISH CONTOURS: 2' / 10'

HYDROLOGIC SUMMARY

BASIN	AREA -AC.-	RUNOFF - CFS	
		5-YEAR	100-YEAR
A	1.68	3.2	6.5
B	0.66	1.3	2.5
C	2.30	4.5	8.9
D	0..3	0.8	1.6

LEGEND:

10.5/20.4 — RUNOFF IN CFS 5-YEAR/100-YEAR

A — LIMIT OF DRAINAGE BASIN AND DESIGNATION

EXISTING STORM SEWER AS LABELED

B — LIMIT OF SOILS TYPE AND GROUP

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
- WATER MANHOLE
- WATER VALVE
- FIRE HYDRANT
- RV DUMP SITE
- ELECTRICAL VAULT

DRAWN BY: O.E. WATTS	APPROVED BY:	REVISIONS	OLIVER E. WATTS CONSULTING ENGINEER COLORADO SPRINGS
DATE: 2-4-21	PROJ. NO.		
DWG. NO.: 20-5523-04	DWG.		
SURVEYED BY: DEW, ESW, 10-6-20			

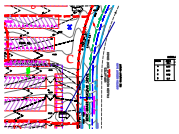
PROJECT
FALCON STORAGE PARCEL
PART W 1/2 SEC. 1, T.13S., R.65W., 6TH P.M.
EL PASO COUNTY

SHT. NAME
DRAINAGE PLAN

SHT. NO.
1
OF
1

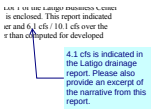
Drainage Report - Final_v1 eng.sw.pdf Markup Summary

(1)



Page Label: 21
Author: Daniel Torres

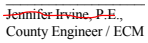
4.1 cfs is indicated in the Latigo drainage report. Please also provide an excerpt of the narrative from this report. (1)



Page Label: 6
Author: Daniel Torres

4.1 cfs is indicated in the Latigo drainage report. Please also provide an excerpt of the narrative from this report.

_ (1)



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Author: Daniel Torres

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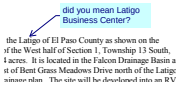
did you mean Latigo Business Center? (1)



Page Label: 6
Author: Daniel Torres

did you mean Latigo Business Center?

Fees are not collected on site development plan applications. You may state that here in this section. Should it be determined by th

Page Label: 7
Author: Daniel Torres

Fees are not collected on site development plan applications. You may state that here in this section. Should it be determined by the planning staff that a platting action is required then fees will be required at plat recordation. Also, the fees for 2022 are $34,117 and $4,687

Jennifer Irvine is no longer the County Engineer. You may remove this or you may indicate Elizabeth Nijkamp, P.E. or Joshua Paln

Page Label: 2
Author: Daniel Torres

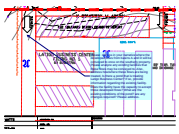
Jennifer Irvine is no longer the County Engineer. You may remove this or you may indicate Elizabeth Nijkamp, P.E. or Joshua Palmer, P.E. (he's our interim county engineer).

per contours shown on the reference drainage plan (falcon meadows at Bent Grass Filing 2) it appears that offsite flow from the we

Page Label: 6
Author: Daniel Torres

per contours shown on the reference drainage plan (falcon meadows at Bent Grass Filing 2) it appears that offsite flow from the westerly subdivision (The Meadows Filing 1) enters the site. Revise you analysis/design accordingly.to account for this off-site flow.

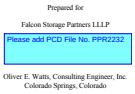
Please discuss in your narrative where the developed flows from basins A and D will be conveyed to once on the southerly proper



Page Label: 21
Author: Daniel Torres

Please discuss in your narrative where the developed flows from basins A and D will be conveyed to once on the southerly property. Please analyze any existing facilities that these flows may be conveyed to. Also, address how/where these flows are being treated. Is there a pond that is treating Latigo Business Center? If so, provide information regarding the existing facility. Does the facility have the capacity to accept these developed flows? What are the existing conditions of the pond? are any changes required? Please address.

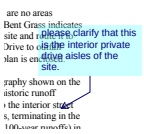
Please add PCD File No. PPR2232 (1)



Page Label: 1
Author: Daniel Torres

Please add PCD File No. PPR2232

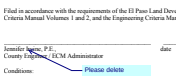
please clarify that this is the interior private drive aisles of the site. (1)



Page Label: 6
Author: Daniel Torres

please clarify that this is the interior private drive aisles of the site.

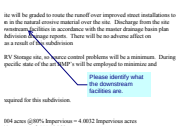
Please delete (1)



Page Label: 5
Author: Daniel Torres

Please delete

Please identify what the downstream facilities are. (1)



Page Label: 7
Author: Daniel Torres

Please identify what the downstream facilities are.

Please provide a historic conditions sub basin description and analysis of the site. provide an existing conditions drainage map also

Page Label: 6
Author: Daniel Torres

Please provide a historic conditions sub basin description and analysis of the site. provide an existing conditions drainage map also

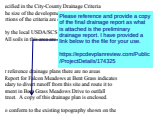
Please provide analysis and state whether Bent Grass Meadows drive has the capacity to accept the developed flows of the site as

Page Label: 21
Author: Daniel Torres

Please provide analysis and state whether Bent Grass Meadows drive has the capacity to accept the developed flows of the site as it is already taking the developed flows from Falcon Meadows subdivision. Additionally, please be sure to analyze the existing downstream facilities(inlet, storm pipes, pond) that the developed flow will be conveyed to.

Also it appears that the flows from basin B and C are being diverted from their historical discharge point at the southern boundary. Please provide discussion on this. What is the ultimate outfall for the site?

Please reference and provide a copy of the final drainage report as what is attached is the preliminary drainage report. I have provi



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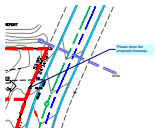
Author: Daniel Torres

Please reference and provide a copy of the final drainage report as what is attached is the preliminary drainage report. I have provided a link below to the file for your use.

https://epcdevplanreview.com/Public/ProjectDetails/174325

Please show the proposed driveway (1)



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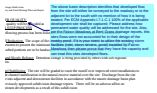
Please show the proposed driveway

The above basin description identifies that developed flow from the site will either be conveyed to the adjacent lo



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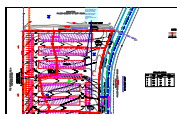
Author: Daniel Torres

The above basin description identifies that developed flow from the site will either be conveyed to the roadway or to the adjacent lot to the south with no mention of how it is being treated. Per ECM Appendix I.7.1.C.1 100% of the applicable development site shall be captured. Please address how permanent water quality will be addressed for the site. Also, per the Falcon Meadows at Bent Grass drainage reports, this sites flows were not accounted for in their design of the nearby pond. If it is your intent to utilize the existing storm facilities (inlet, storm sewers, pond) installed by Falcon Meadows then please prove that they have the capacity and can treat this sites developed flows.

The contours shown on the drainage map do not match those shown on the GEC plan. Please ensure that the proposed contours a



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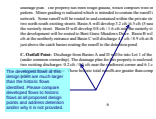
The contours shown on the drainage map do not match those shown on the GEC plan. Please ensure that the proposed contours are consistent with each other.

The developed flows at this design point are much larger than the historic flows identified. Please compare developed flows to histo



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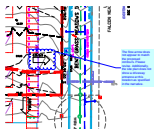
The developed flows at this design point are much larger than the historic flows identified. Please compare developed flows to historic flows at all proposed design points and address detention and/or why it is not provided.

The flow arrow does not appear to match the proposed contours. Please revise. Additionally, the site plan does not show a drivewa



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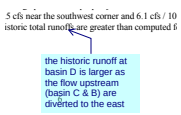
Author: Daniel Torres

The flow arrow does not appear to match the proposed contours. Please revise. Additionally, the site plan does not show a driveway entrance at this location as specified in the narrative.

the historic runoff at basin D is larger as the flow upstream (basin C & B) are diverted to the east (1)



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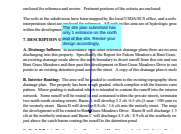
Author: Daniel Torres

the historic runoff at basin D is larger as the flow upstream (basin C & B) are diverted to the east

The site plan submitted has only 1 entrance on the north end of the site. Revise your design accordingly. (1)



Page Label: 6
Author: Daniel Torres

The site plan submitted has only 1 entrance on the north end of the site. Revise your design accordingly.