EPC STORMWATER REVIEW COMMENTS IN ORANGE BOXES WITH BLACK TEXT

provide original PDF. This version seems to have been scanned in and is difficult to read.

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

PCD File No. PPR2232

Please also add PCD File No. MS232

Prepared for

Falcon Storage Partners LLLP

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

Due to the type and quantity of comments provided additional comments may be generated on the resubmittal.

OLIVER E. WATTS, PE-LS
OLIVER E. WATTS, CONSULTING ENGINEER, INC.
CIVIL ENGINEERING AND SURVEYING
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Celebrating over 41 years in business

November 23, 2022

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.

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:

Filing 1

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 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.

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.

Please see comments on the drainage plan regarding the conveyance of flows from the basins into the pond as portions of each of the basins do not reach the pond. Elaborate in your description of each of the basins and how the flow is conveyed to the pond and/or subsequent basin that will convey the flow to the pond.

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, and it indicates the historic undeveloped runoff of the site, 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. Minor grading is indicated which is intended to contain the runoff into the interior drive isle street network. The site will be graded to route and contain all runoff within the private north-south streets, terminating at the south boundary. The westerly street (Basin A) will develop 4.1 cfs \ 11.8 cfs (5-year / 100-year runoffs) near the in the southwest corner of the plat. Basins B, C, and D will develop 5.9 cfs / 11.9 cfs in the easterly street near the southeast corner. The total outfall into the detention pond near the southeast corner is 5.5 cfs/12.5 cfs.

full spectrum detention is required per criteria. Please state that.

C. Detention Storage: At the proposed outfall point a detention pond is proposed. The pond is sized for sedimentation basins to be used during the construction period and converted into a sand filter basins upon completion. The basin will contain 13320 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

Please identify these as basins O-1 and AH in the narrative as shown on the drainage plan.

Temporary Sediment

singular

18-inch (minimum) filter layer

4.1 cfs per the excerpt provided. revise accordingly.

Temporary Sediment

The underdrain system should be placed within an 5-inch-thick section of CDOT Class C filter material

Assign a name/number to all PBMPs and then update all submitted text and drawings accordingly with consistent labeling throughout (example: “Pond A” or “Pond 1”).

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 modified to a sand filter basin, with one foot of sand in the bottom. A 4-inch underdrain will drain into the grated inlet outlet structures 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. Detention basin stage-storage tables are included for each basin.

slotted

C. Outfall Point: Discharge from the subdivision will be into existing north-south street of Lot 1 of the Latigo Business Center. Some minor construction is shown along the north boundary of Lot 1. The two properties are 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.

Per the drainage plan the spillway is located in the landscape strip along Bentgrass. The outfall pipe is not shown on the plan. Please clarify where the outfall is and where the developments flow will be ultimately conveyed to.

WATER QUALITY

Water quality facilities will be provided as described above.

FOUR STEP PROCESS

The following process has been followed to minimize adverse impact 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.

show these locations on the plans

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

Identify that detention/WQCV is being provided by the sand filter detention pond as identified above.

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 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

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.

revise the 4-step headings to match ECM Appendix I.7.2, (Runoff reduction, stabilize drainage ways, provide WQCV, Consider need for industrial and Commercial BMPs).

8. COST ESTIMATE:

Item No.	Description	Quantity	Unit Cost	Cost
1	Sand Filter Basin	1 ea	$ 4000.00	$ 4000.00
2	Grated inlet	1 ea	1800.00	1800.00
3	24” CMP drainage pipe	105 lf	40.00	4200.00
	Subtotal Construction Cost			$ 10,000.00
	Engineering	10%		1,000.00

Please show on the drainage plan

These costs do not match the FAE please revise.

Total Estimated Cost	$ 11,000.00

As the subdivision was submitted in 2023, the site is subject to the 2023 drainage basin fees ($37,256 drainage & $5,118 bridge). Please revise

9. FEES: At plat recording.
2021 Falcon Basin Fees: 5.004 acres @80% Impervious = 4.0032 Impervious acres
Drainage fees @ $ 34,117 per acre = $ 136,577.17
Bridge fees @ $ 4,687 per acre = $ 10,762.99
Total Fees: $ 155,340.17

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

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.

MAJOR BASIN	SUB BASIN	AREA		BASIN		Tc MIN	I in./hr.		SOIL GRP	DEV. TYPE	C		FLOW 5-ry	100-yr	RETURN PERIOD -years-	
		PLANIM READ	ACRES	LENGTH -FT.-	HEIGHT -FT.-								qp -CFS-	qp -CFS-		
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

Flows for DP1 do not match the drainage plan nor the table on the drainage plan for DP1. Revise accordingly.

see comment on drainage map regarding total flow at the pond and revise accordingly.

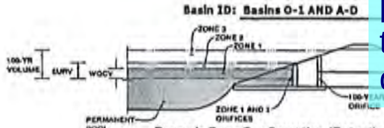
DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.06 (July 2022)

Project: Falcon Storage Sub.

Basin ID: Basins O-1 AND A-D

provide calculation as to how this was determined



Example Zone Configuration (Retention Pond)

<u>Watershed Information</u>

Selected BMP Type =	SF	
Watershed Area =	7.47	acres
Watershed Length =	1,640	ft
Watershed Length to Centroid =	790	ft
Watershed Slope =	0.010	ft/ft
Watershed Imperviousness =	64.00%	percent
Percentage Hydrologic Soil Group A =	100.0%	percent
Percentage Hydrologic Soil Group B =	0.0%	percent
Percentage Hydrologic Soil Groups C/D =	0.0%	percent
Target WQCV Drain Time =	12.0	hours
Location for 1-hr Rainfall Depths =	User Input	

Note: L / W Ratio > 8

L / W Ratio = 8.27

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

			Optional User Overrides	
Water Quality Capture Volume (WQCV) =	0.125	acre-feet		acre-feet
Excess Urban Runoff Volume (EURV) =	0.591	acre-feet		acre-feet
2-yr Runoff Volume (P1 = 1.19 in.) =	0.438	acre-feet	1.19	inches
5-yr Runoff Volume (P1 = 1.5 in.) =	0.575	acre-feet	1.50	inches
10-yr Runoff Volume (P1 = 1.75 in.) =	0.685	acre-feet	1.75	inches
25-yr Runoff Volume (P1 = 2 in.) =	0.829	acre-feet	2.00	inches
50-yr Runoff Volume (P1 = 2.25 in.) =	0.971	acre-feet	2.25	inches
100-yr Runoff Volume (P1 = 2.52 in.) =	1.145	acre-feet	2.52	inches
500-yr Runoff Volume (P1 = 3.14 in.) =	1.523	acre-feet		inches
Approximate 2-yr Detention Volume =	0.384	acre-feet		
Approximate 5-yr Detention Volume =	0.502	acre-feet		
Approximate 10-yr Detention Volume =	0.606	acre-feet		
Approximate 25-yr Detention Volume =	0.730	acre-feet		
Approximate 50-yr Detention Volume =	0.805	acre-feet		
Approximate 100-yr Detention Volume =	0.883	acre-feet		

<u>Define Zones and Basin Geometry</u>

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

Please fill out the zones (i.e. WQCV, EURV-zone 1, 100yr-Zones 1 & 2)

Initial Surcharge Area (A_{ISV}) =	user	
Surcharge Volume Length (L_{ISV}) =	user	
Surcharge Volume Width (W_{ISV}) =	user	
Depth of Basin Floor (H_{FLOOR}) =	user	
Length of Basin Floor (L_{FLOOR}) =	user	
Width of Basin Floor (W_{FLOOR}) =	user	
Area of Basin Floor (A_{FLOOR}) =	user	
Volume of Basin Floor (V_{FLOOR}) =	user	ft^3
Depth of Main Basin (H_{MAIN}) =	user	ft
Length of Main Basin (L_{MAIN}) =	user	ft
Width of Main Basin (W_{MAIN}) =	user	ft
Area of Main Basin (A_{MAIN}) =	user	ft^2
Volume of Main Basin (V_{MAIN}) =	user	ft^3
Calculated Total Basin Volume (V_{total}) =	**user**	acre-feet

Depth Increment = 1.00 ft

Stage - Storage Description	Stage (ft)	Optional Override Stage (ft)	Length (ft)	Width (ft)	Area (ft^2)	Optional Override Area (ft^2)	Area (acre)	Volume (ft^3)	Volume (ac-ft)
Media Surface	--	0.00	--	--	--	5,432	0.125		
	--	1.00	--	--	--	6,800	0.156	6,116	0.140
	--	2.00	--	--	--	8,240	0.189	13,636	0.313
	--	3.00	--	--	--	9,752	0.224	22,632	0.520
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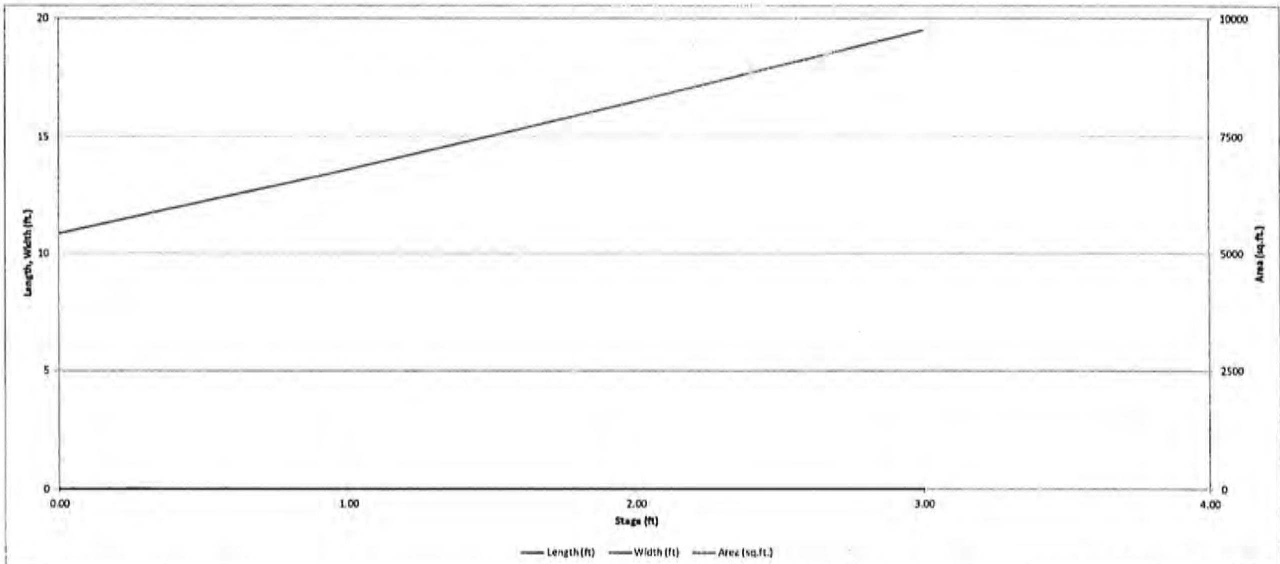
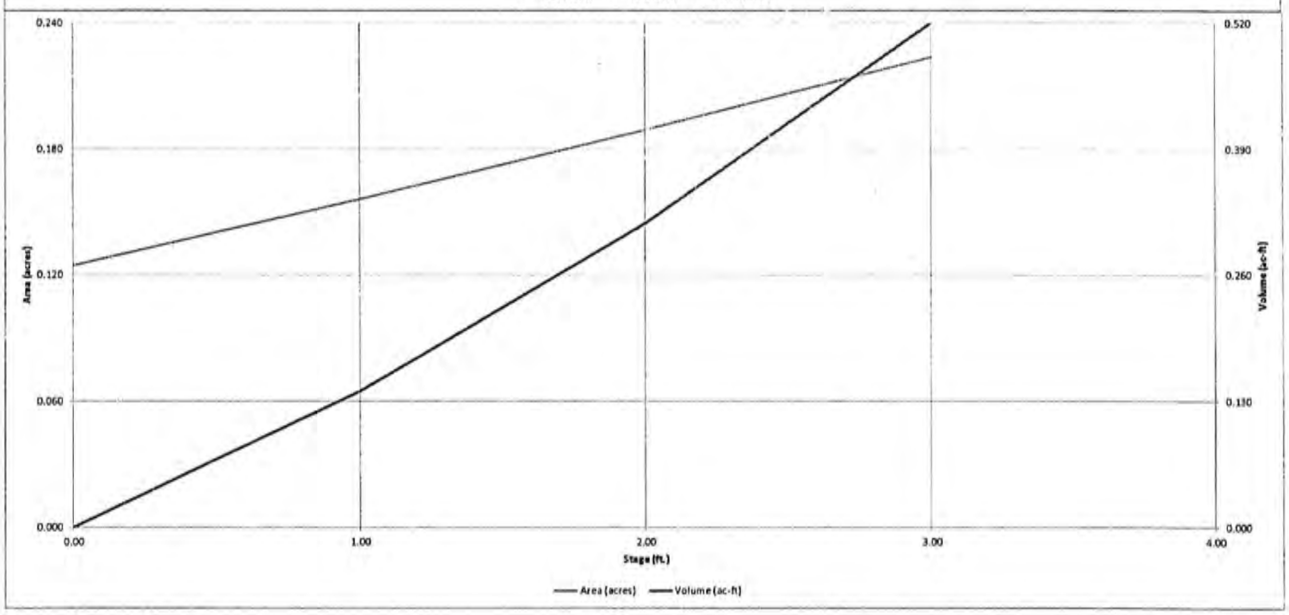

Length, Width (ft.)
Area (sq.ft.)
Stage (ft)
Length (ft)
Width (ft)
Area (sq.ft.)


Area (acres)
Volume (ac-ft)
Stage (ft.)
Area (acres)
Volume (ac-ft)

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.06 (July 2022)

please fill out the spreadsheet accordingly. MHFD has an example in Volume 2 chapter 12 page 39 of a full spectrum detention Sand filter basin. Please also provide the UD-BMP worksheet.

further review and possible comments will be provided once design of pond has been updated/revised.

Project: Falcon Storage Sub.
Basin ID: Basins O-1 AND A-D

Example Zone Configuration (Retention Pond)

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

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

Underdrain Orifice Invert Depth =	1.00	ft (distance below the filtration media surface)	Underdrain Orifice Area =	0.1	ft²
Underdrain Orifice Diameter =	4.00	inches	Underdrain Orifice Centroid =	0.17	feet

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

Centroid of Lowest Orifice =		ft (relative to basin bottom at Stage = 0 ft)	WQ Orifice Area per Row =	N/A	ft²
Depth at top of Zone using Orifice Plate =		ft (relative to basin bottom at Stage = 0 ft)	Elliptical Half-Width =	N/A	feet
Orifice Plate: Orifice Vertical Spacing =		inches	Elliptical Slot Centroid =	N/A	feet
Orifice Plate: Orifice Area per Row =		sq. inches	Elliptical Slot Area =	N/A	ft²

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

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

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

User Input: Vertical Orifice (Circular or Rectangular) — Calculated Parameters for Vertical Orifice

	Not Selected	Not Selected			Not Selected	Not Selected	
Invert of Vertical Orifice =			ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Area =			ft²
Depth at top of Zone using Vertical Orifice =			ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Centroid =			feet
Vertical Orifice Diameter =			inches				

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

	Not Selected	Not Selected			Not Selected	Not Selected	
Overflow Weir Front Edge Height, Ho =			ft (relative to basin bottom at Stage = 0 ft)	Height of Grate Upper Edge, H_t =			feet
Overflow Weir Front Edge Length =			feet	Overflow Weir Slope Length =			feet
Overflow Weir Grate Slope =			H:V	Grate Open Area / 100-yr Orifice Area =			
Horiz. Length of Weir Sides =			feet	Overflow Grate Open Area w/o Debris =			ft²
Overflow Grate Type =				Overflow Grate Open Area w/ Debris =			ft²
Debris Clogging % =			%				

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

	Not Selected	Not Selected			Not Selected	Not Selected	
Depth to Invert of Outlet Pipe =			ft (distance below basin bottom at Stage = 0 ft)	Outlet Orifice Area =			ft²
Circular Orifice Diameter =			inches	Outlet Orifice Centroid =			feet
				Half-Central Angle of Restrictor Plate on Pipe =	N/A	N/A	radians

User Input: Emergency Spillway (Rectangular or Trapezoidal) — Calculated Parameters for Spillway

Spillway Invert Stage=	1.00	ft (relative to basin bottom at Stage = 0 ft)	Spillway Design Flow Depth=	0.53	feet
Spillway Crest Length =	10.00	feet	Stage at Top of Freeboard =	2.53	feet
Spillway End Slopes =	3.00	H:V	Basin Area at Top of Freeboard =	0.21	acres
Freeboard above Max Water Surface =	1.00	feet	Basin Volume at Top of Freeboard =	0.42	acre-ft

provide spillway riprap calculations. Show detail and riprap gradation on GEC Plans

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

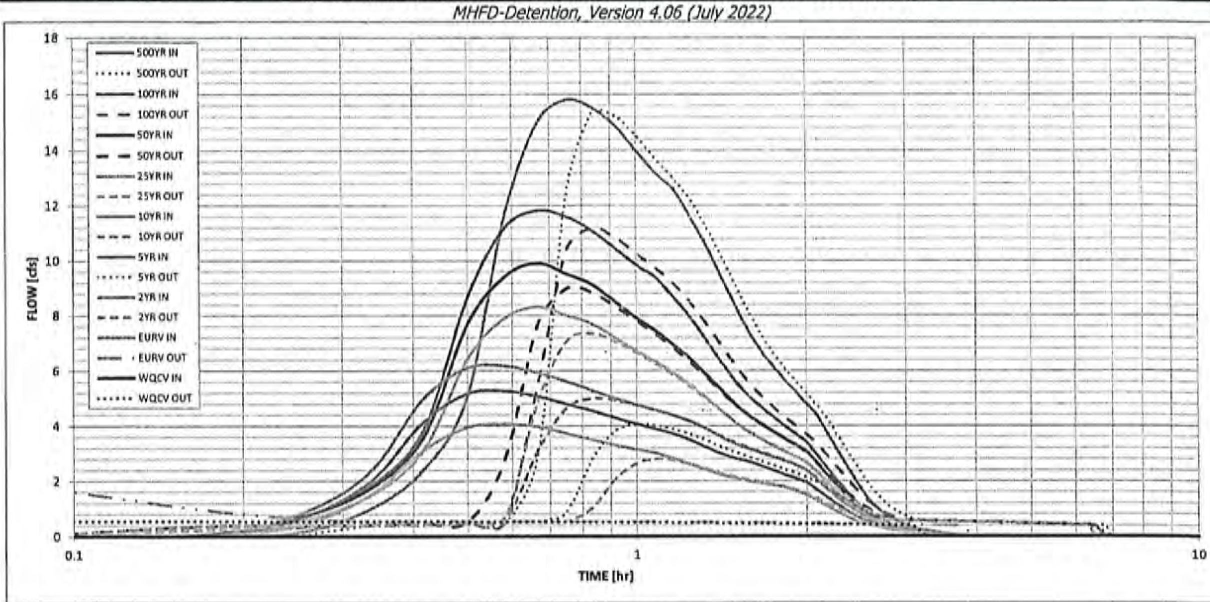
Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
One-Hour Rainfall Depth (in) =	N/A	N/A	1.19	1.50	1.75	2.00	2.25	2.52	3.14
CUHP Runoff Volume (acre-ft) =	0.125	0.591	0.438	0.575	0.685	0.829	0.971	1.145	1.523
Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	0.438	0.575	0.685	0.829	0.971	1.145	1.523
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	0.0	0.0	0.1	0.6	1.3	2.2	4.1
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A							
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	0.00	0.01	0.01	0.09	0.17	0.29	0.54
Peak Inflow Q (cfs) =	N/A	N/A	4.1	5.[illegible]	[illegible].2	8.[illegible]	[illegible].9	11.[illegible]	15.[illegible]
Peak Outflow Q (cfs) =	0.6	61.8	2.8	4.1	5.0	7.4	9.0	11.2	15.3
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	81.7	71.6	11.4	6.9	5.2	3.8
Structure Controlling Flow =	Filtration Media	Spillway	Spillway	Spillway	Spillway	Spillway	Spillway	Spillway	Spillway
Max Velocity through Grate 1 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Max Velocity through Grate 2 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Time to Drain 97% of Inflow Volume (hours) =	3	4	6	6	6	6	6	6	5
Time to Drain 99% of Inflow Volume (hours) =	3	4	6	6	6	6	6	6	6
Maximum Ponding Depth (ft) =	0.91	1.12	1.17	1.23	1.27	1.35	1.40	1.46	1.57
Area at Maximum Ponding Depth (acres) =	0.15	0.16	0.16	0.16	0.16	0.17	0.17	0.17	0.17
Maximum Volume Stored (acre-ft) =	0.126	0.158	0.167	0.176	0.182	0.195	0.205	0.216	0.233

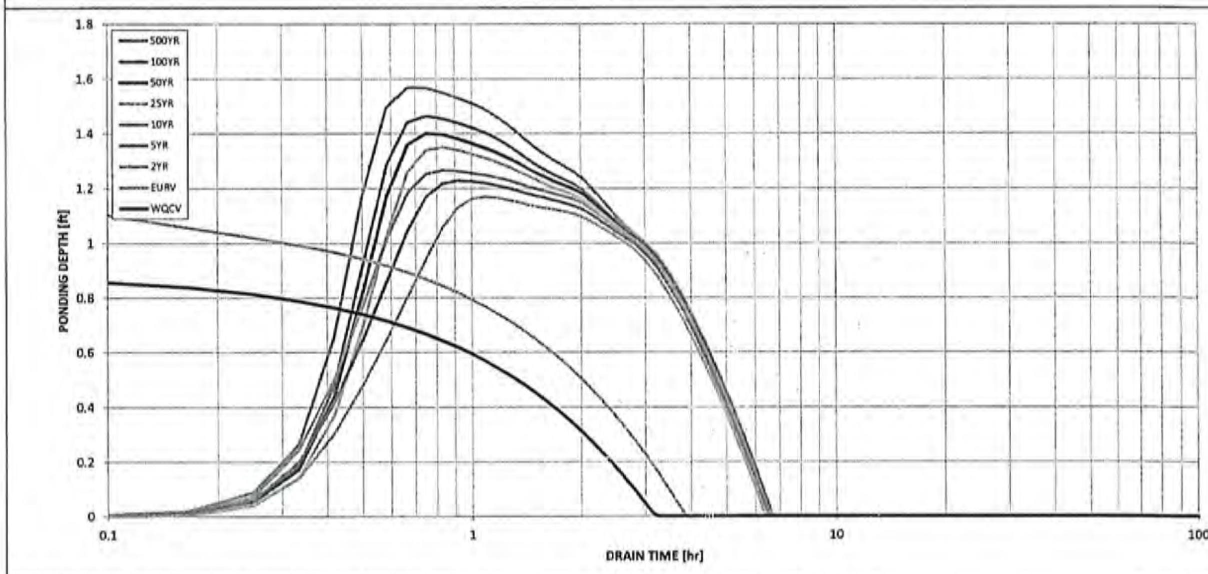
revise so that peak outflow is less than predevelopment flow. Design must comply for the full spectrum of storms.

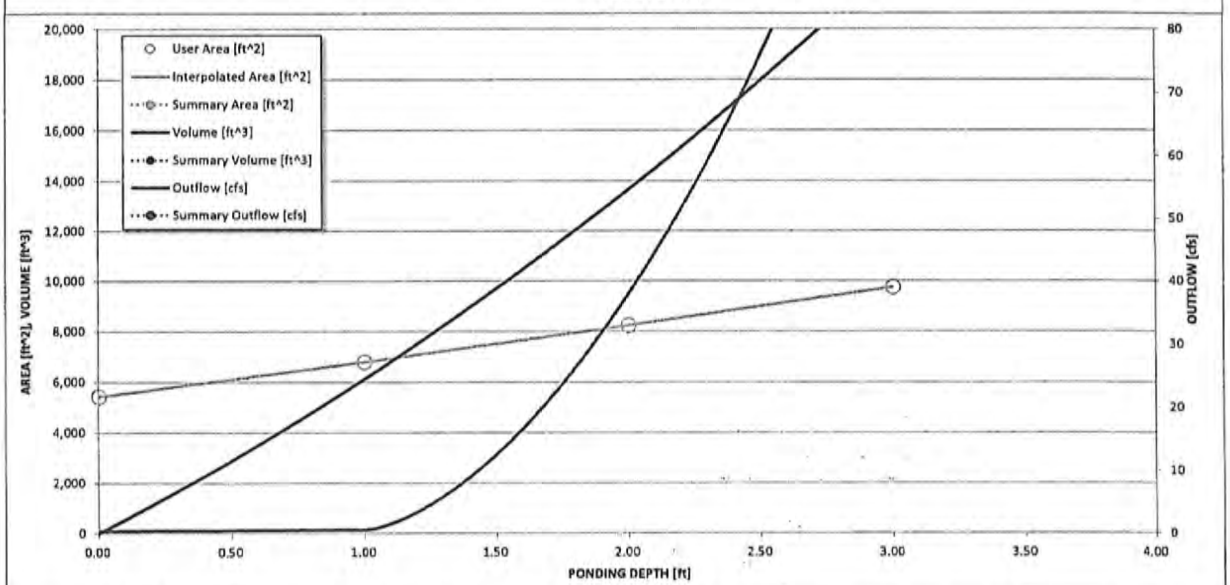
5/7

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.06 (July 2022)







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

DETENTION BASIN OUTLET STRUCTURE DESIGN

Outflow Hydrograph Workbook Filename:

Inflow Hydrographs

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

	SOURCE	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP
Time Interval	TIME	WQCV [cfs]	EURV [cfs]	2 Year [cfs]	5 Year [cfs]	10 Year [cfs]	25 Year [cfs]	50 Year [cfs]	100 Year [cfs]	500 Year [cfs]
5.00 min	0:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.04	0.00	0.14
	0:15:00	0.00	0.00	0.40	0.65	0.80	0.54	0.68	0.66	0.96
	0:20:00	0.00	0.00	1.46	1.93	2.28	1.44	1.70	1.80	2.38
	0:25:00	0.00	0.00	3.10	4.12	4.97	3.10	3.55	3.81	5.08
	0:30:00	0.00	0.00	3.94	5.18	6.11	6.41	7.66	8.63	11.65
	0:35:00	0.00	0.00	4.07	5.28	6.19	7.90	9.41	11.18	14.97
	0:40:00	0.00	0.00	3.97	5.08	5.93	8.31	9.91	11.82	15.81
	0:45:00	0.00	0.00	3.73	4.80	5.62	8.01	9.52	11.60	15.55
	0:50:00	0.00	0.00	3.50	4.55	5.29	7.70	9.13	11.09	14.90
	0:55:00	0.00	0.00	3.29	4.29	5.00	7.19	8.50	10.44	14.02
	1:00:00	0.00	0.00	3.13	4.07	4.77	6.71	7.91	9.84	13.20
	1:05:00	0.00	0.00	2.99	3.88	4.57	6.32	7.43	9.36	12.58
	1:10:00	0.00	0.00	2.79	3.70	4.37	5.89	6.90	8.62	11.55
	1:15:00	0.00	0.00	2.58	3.46	4.16	5.47	6.39	7.88	10.53
	1:20:00	0.00	0.00	2.38	3.21	3.88	4.99	5.82	7.06	9.40
	1:25:00	0.00	0.00	2.21	2.98	3.58	4.55	5.29	6.29	8.35
	1:30:00	0.00	0.00	2.08	2.82	3.34	4.10	4.76	5.59	7.41
	1:35:00	0.00	0.00	1.99	2.70	3.16	3.76	4.36	5.07	6.70
	1:40:00	0.00	0.00	1.91	2.54	3.01	3.49	4.04	4.66	6.15
	1:45:00	0.00	0.00	1.84	2.38	2.86	3.26	3.77	4.31	5.66
	1:50:00	0.00	0.00	1.76	2.23	2.72	3.05	3.52	3.98	5.22
	1:55:00	0.00	0.00	1.63	2.09	2.57	2.85	3.29	3.68	4.81
	2:00:00	0.00	0.00	1.49	1.94	2.38	2.66	3.06	3.39	4.41
	2:05:00	0.00	0.00	1.29	1.69	2.06	2.32	2.66	2.94	3.82
	2:10:00	0.00	0.00	1.10	1.43	1.75	1.98	2.27	2.50	3.25
	2:15:00	0.00	0.00	0.92	1.20	1.46	1.65	1.89	2.08	2.69
	2:20:00	0.00	0.00	0.75	0.98	1.20	1.35	1.54	1.69	2.18
	2:25:00	0.00	0.00	0.61	0.79	0.98	1.08	1.23	1.34	1.71
	2:30:00	0.00	0.00	0.50	0.65	0.80	0.85	0.96	1.02	1.30
	2:35:00	0.00	0.00	0.41	0.54	0.68	0.68	0.76	0.80	1.01
	2:40:00	0.00	0.00	0.34	0.45	0.57	0.55	0.62	0.64	0.80
	2:45:00	0.00	0.00	0.29	0.38	0.47	0.45	0.51	0.51	0.64
	2:50:00	0.00	0.00	0.24	0.32	0.39	0.37	0.41	0.41	0.51
	2:55:00	0.00	0.00	0.20	0.26	0.33	0.30	0.34	0.32	0.40
	3:00:00	0.00	0.00	0.17	0.21	0.27	0.24	0.27	0.26	0.32
	3:05:00	0.00	0.00	0.14	0.18	0.22	0.20	0.22	0.21	0.26
	3:10:00	0.00	0.00	0.11	0.14	0.18	0.16	0.18	0.17	0.21
	3:15:00	0.00	0.00	0.09	0.12	0.14	0.13	0.15	0.14	0.17
	3:20:00	0.00	0.00	0.07	0.09	0.11	0.11	0.12	0.11	0.14
	3:25:00	0.00	0.00	0.06	0.07	0.09	0.08	0.09	0.09	0.11
	3:30:00	0.00	0.00	0.04	0.05	0.07	0.06	0.07	0.07	0.08
	3:35:00	0.00	0.00	0.03	0.04	0.05	0.05	0.05	0.05	0.06
	3:40:00	0.00	0.00	0.02	0.03	0.03	0.03	0.03	0.03	0.04
	3:45:00	0.00	0.00	0.01	0.02	0.02	0.02	0.02	0.02	0.02
	3:50:00	0.00	0.00	0.01	0.01	0.01	0.01	0.01	0.01	0.01
	3:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	6:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Required Area per Row (in^2)

		Depth at Outlet (ft)							
		1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5
Design Volume (acre-ft)	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

O-1 + A
7420 CF
0.1715 AF
0.439 in²
1ea ϕ 3/4" @ 6"

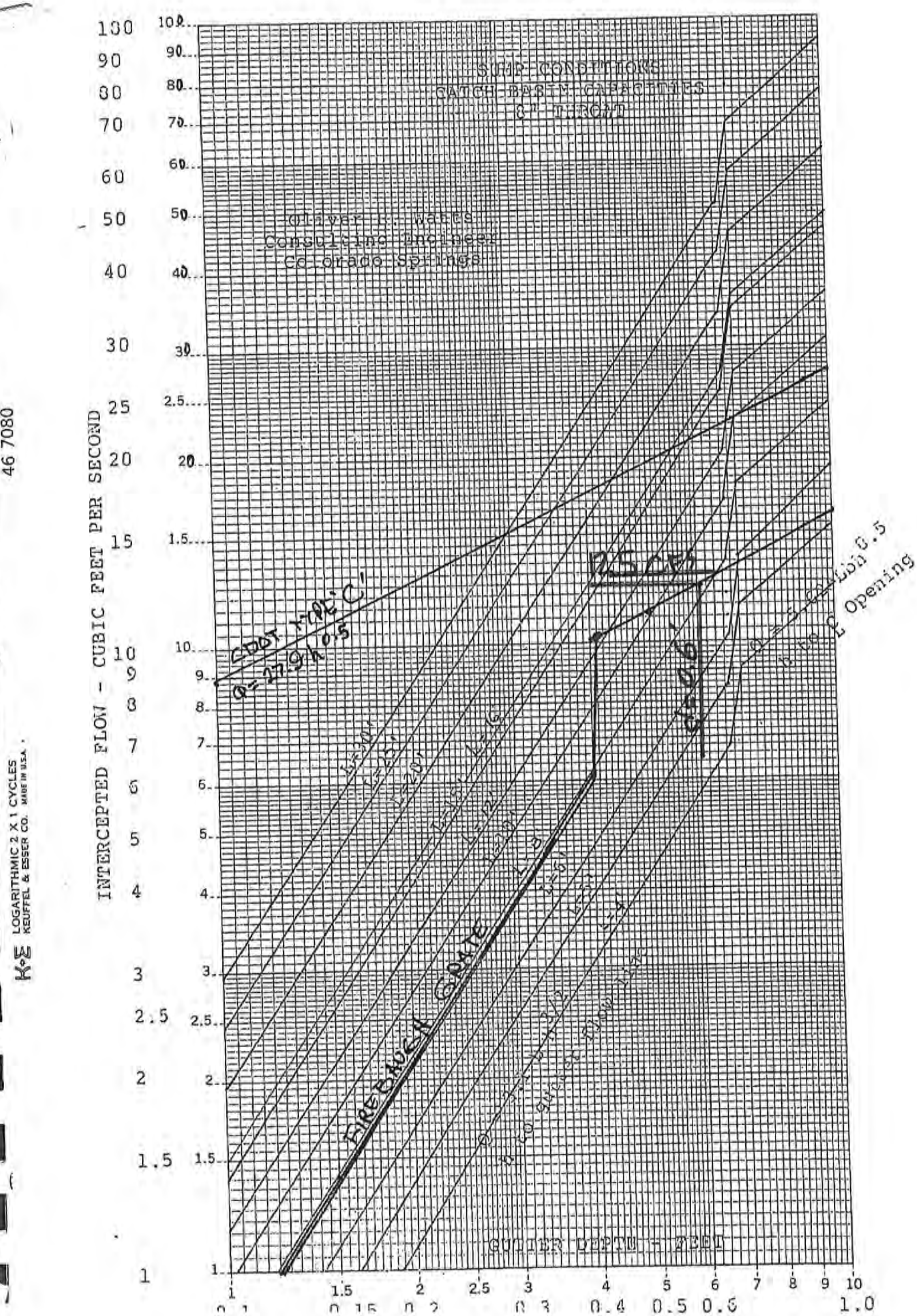
O-1 + A-D WQCV
0.125 AF = 5445 CF
0.3225 in²
1ea 11/16" ϕ @ 6"

4B
7/7

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

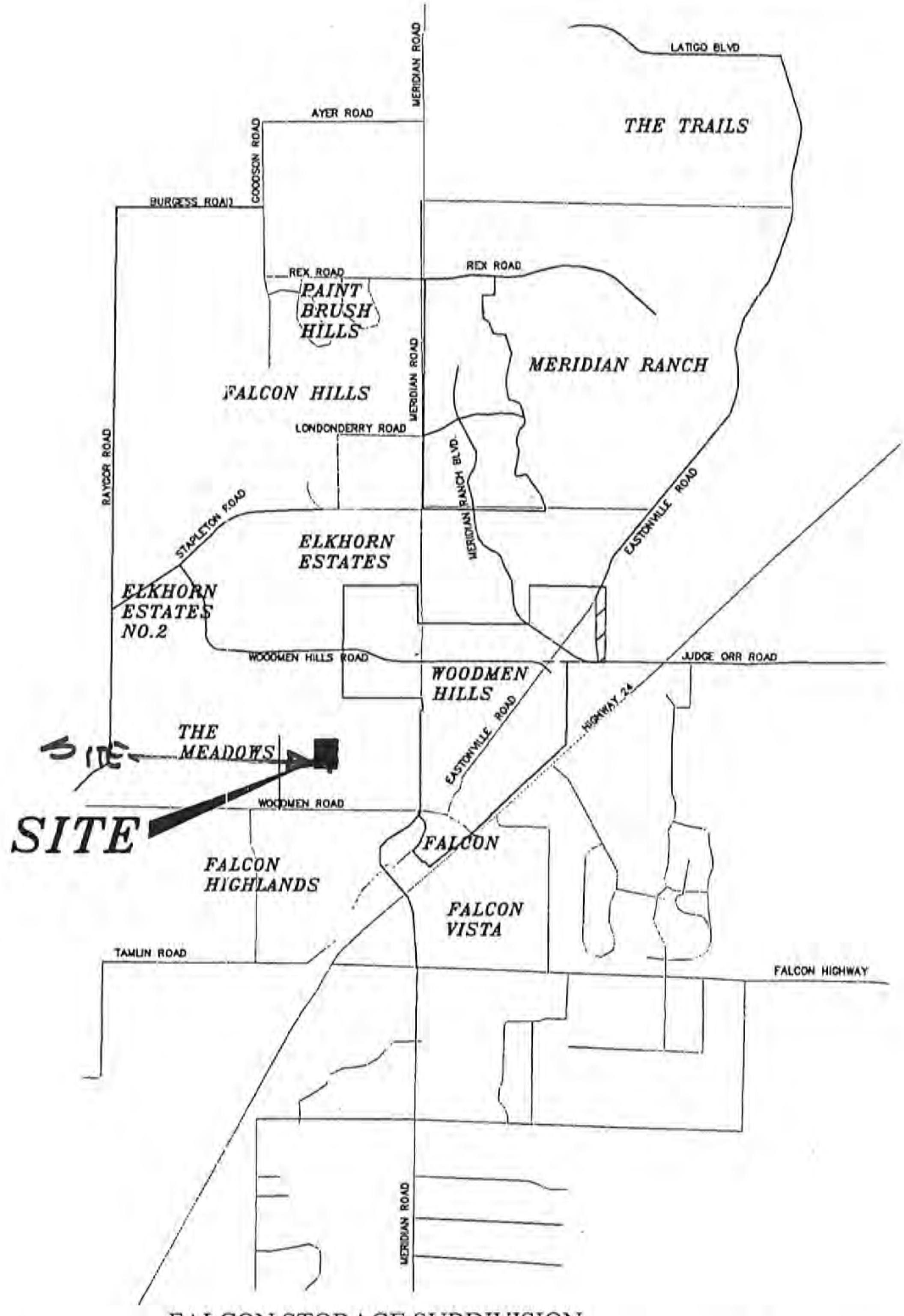


SUMP CONDITIONS
CATCH BASIN CAPACITIES
8" THROAT
Oliver E. Watts
Consulting Engineer
Colorado Springs
INTERCEPTED FLOW - CUBIC FEET PER SECOND
GUTTER DEPTH - FEET
CDOT TYPE 'C'
Q=27.9h^0.5
12.5 CFS
d=0.6'
FIREBAUGH GRATE
L=30'
L=25'
L=20'
L=15'
L=12'
L=10'
L=8'
L=6'
L=5'
L=4'
L=6
h to ℄ Opening
h to gutter flow line
46 7080
K&E LOGARITHMIC 2 X 1 CYCLES
KEUFFEL & ESSER CO. MADE IN U.S.A.

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

DIAMETER -IN.-	AREA $-FT^2-$	D 8/3 -FT-	K N=0.010	K N=0.013	K N=0.024	K 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

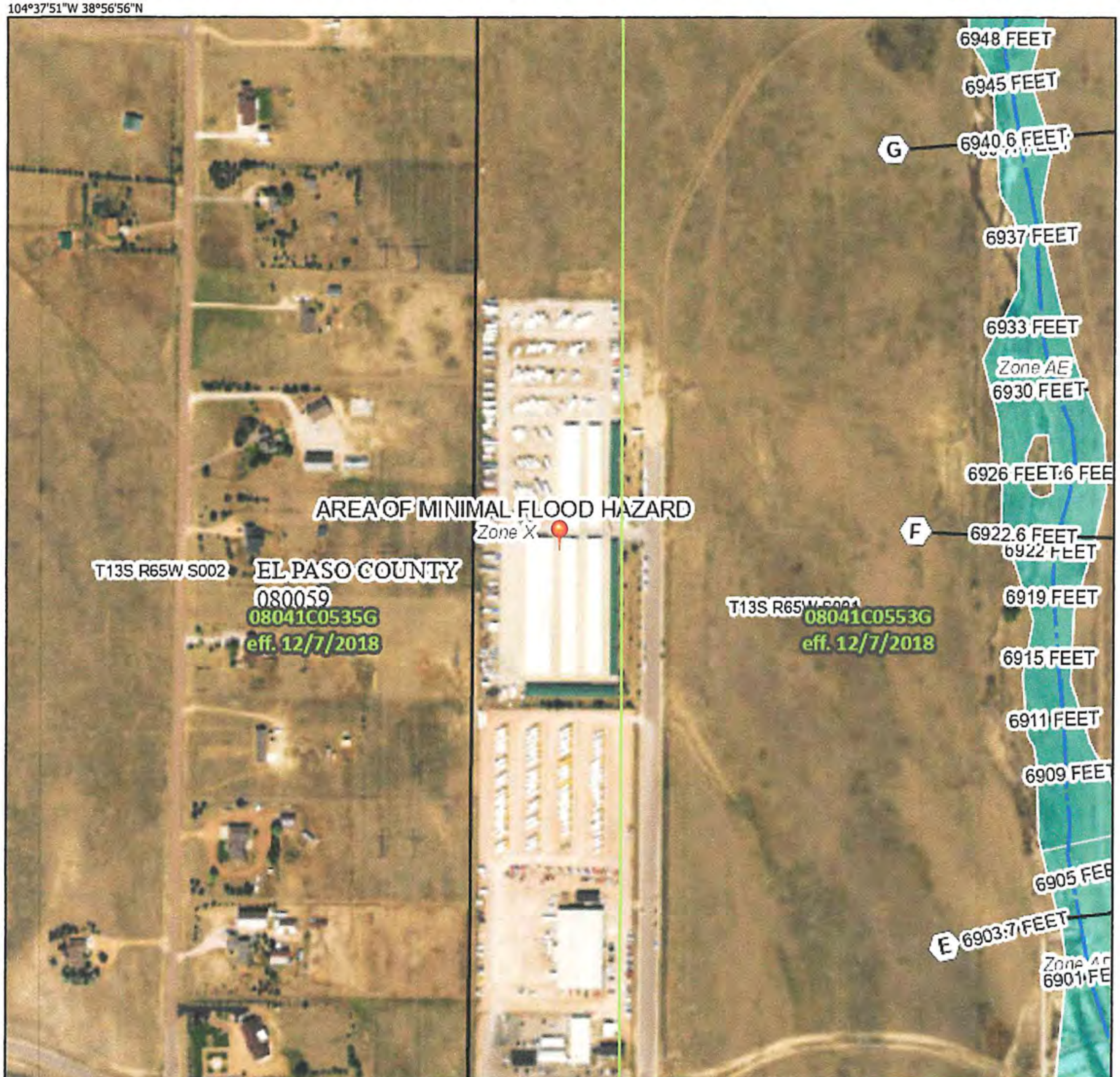
FIGURE.1

PROJECT NO. 200401

National Flood Hazard Layer FIRMette

FEMA

104°37'51"W 38°56'56"N



104°37'13"W 38°56'28"N

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

1:6,000

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
- B 20.2 / 17.5 Cross Sections with 1% Annual Chance Water Surface Elevation
- 8 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.

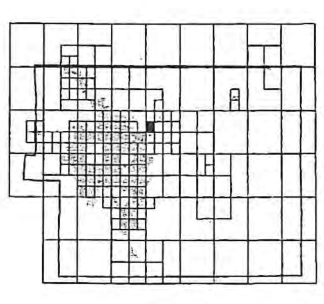
Contact **FEMA Map Service Center** (MSC) via the FEMA Map Information eXchange (FMIX) 1-877-336-2627 for information on available products associated with this FIRM. Available products may include previously issued Letters of Map Change, a Flood Insurance Study Report, and/or digital versions of this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

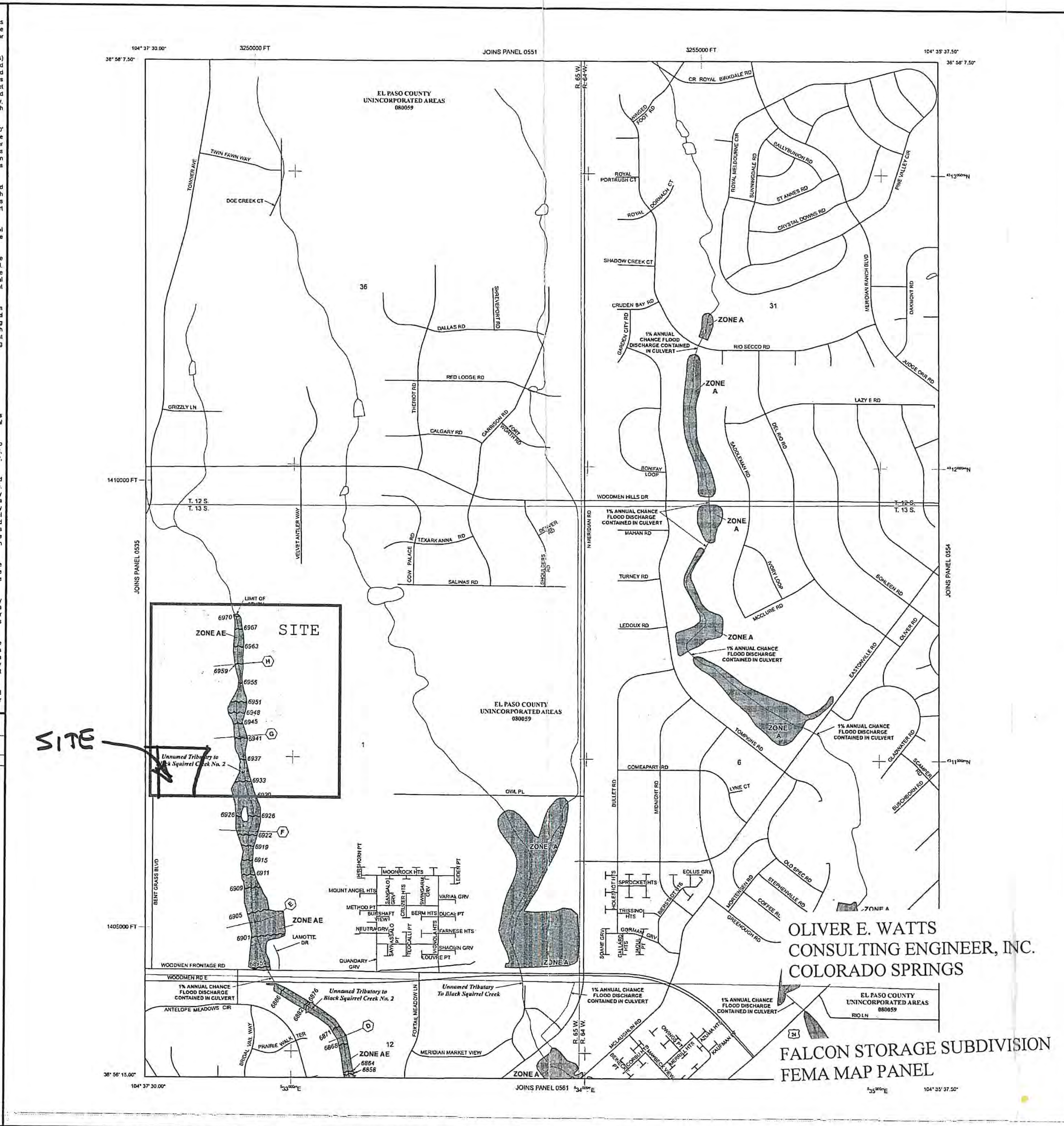
Flooding Source	Vertical Datum Offset (ft)
REFER TO SECTION 3.3 OF THE EL PASO COUNTY FLOOD INSURANCE STUDY FOR STREAM BY STREAM VERTICAL DATUM CONVERSION INFORMATION	

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

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

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'

N

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

See footnote at end of table.

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.

$$t_c = t_i + t_t$$ (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.

$$t_i = \frac{0.395(1.1 - C_5)\sqrt{L}}{S^{0.33}}$$ (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).

$$V = C_v S_w^{0.5}$$ (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.

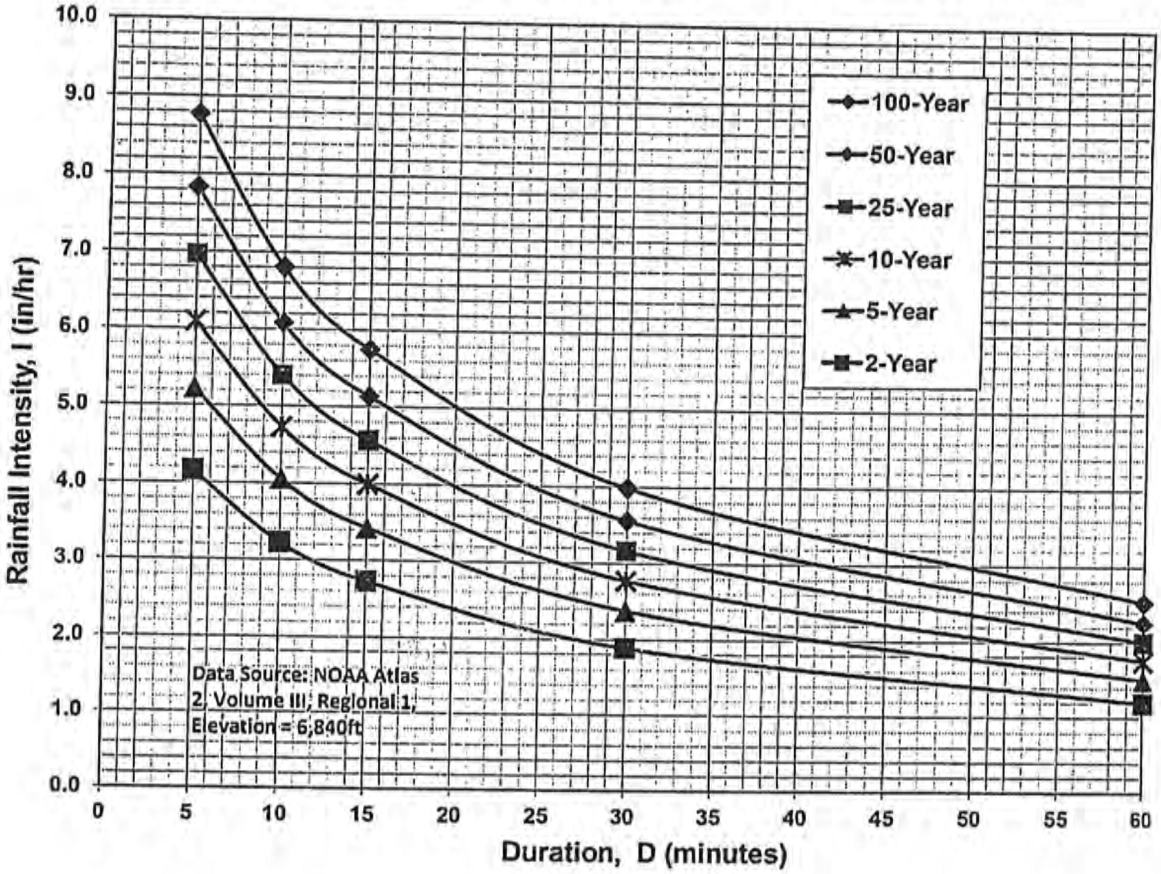
3.2.4 Minimum Time of Concentration

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

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

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

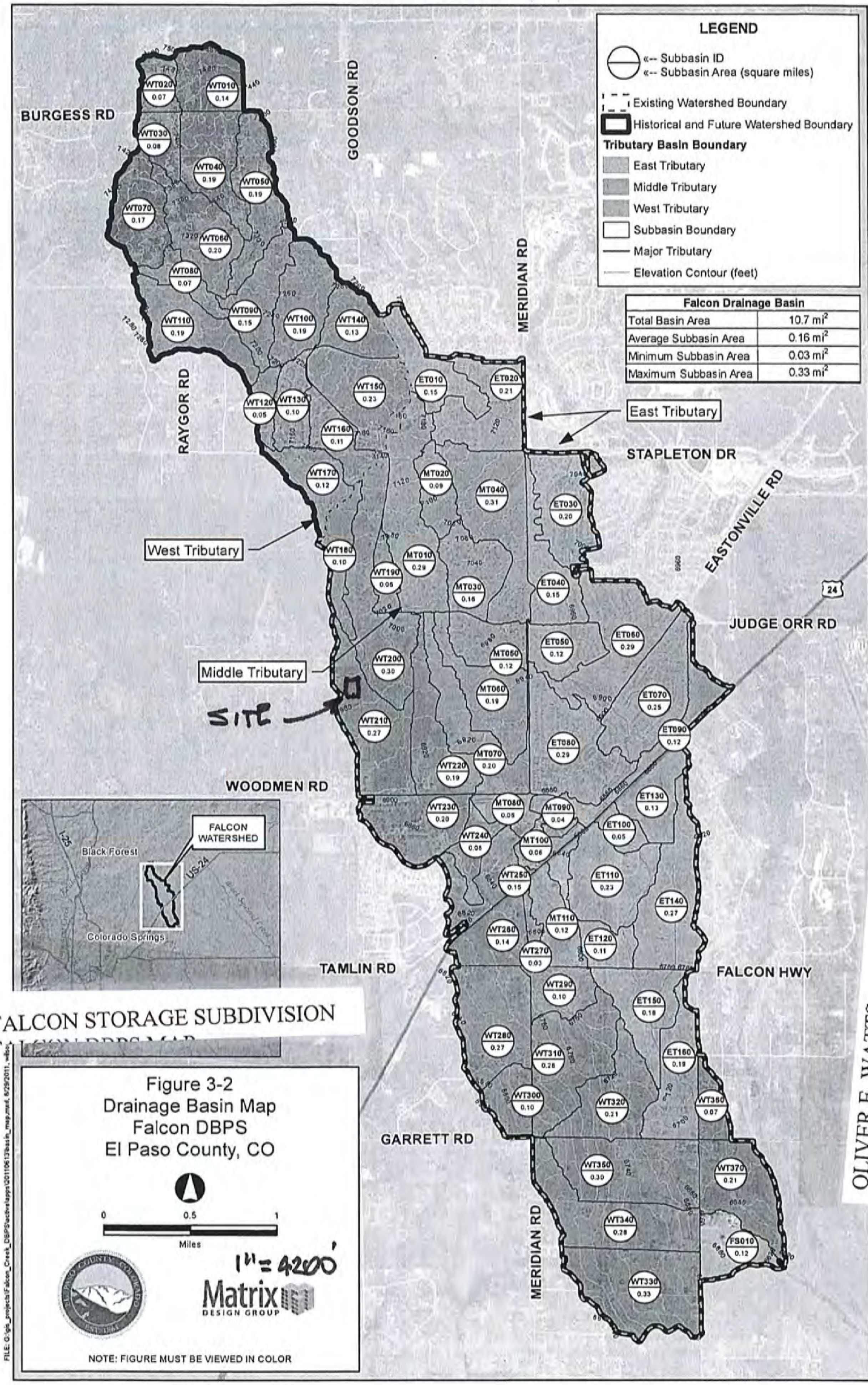
$$I_{25} = -2.00 \ln(D) + 10.111$$

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

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

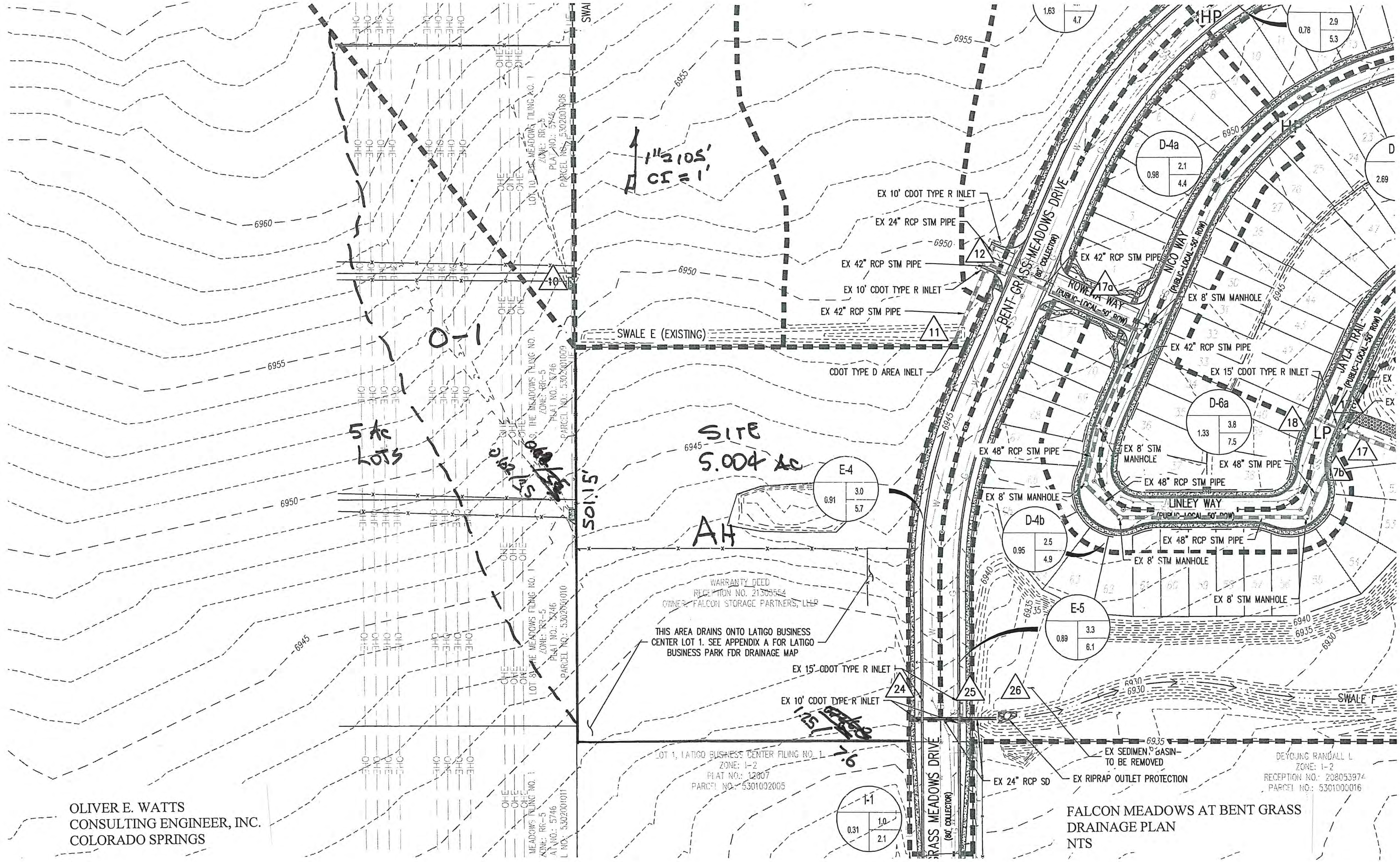
$$I_{2} = -1.19 \ln(D) + 6.035$$

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



FALCON STORAGE SUBDIVISION

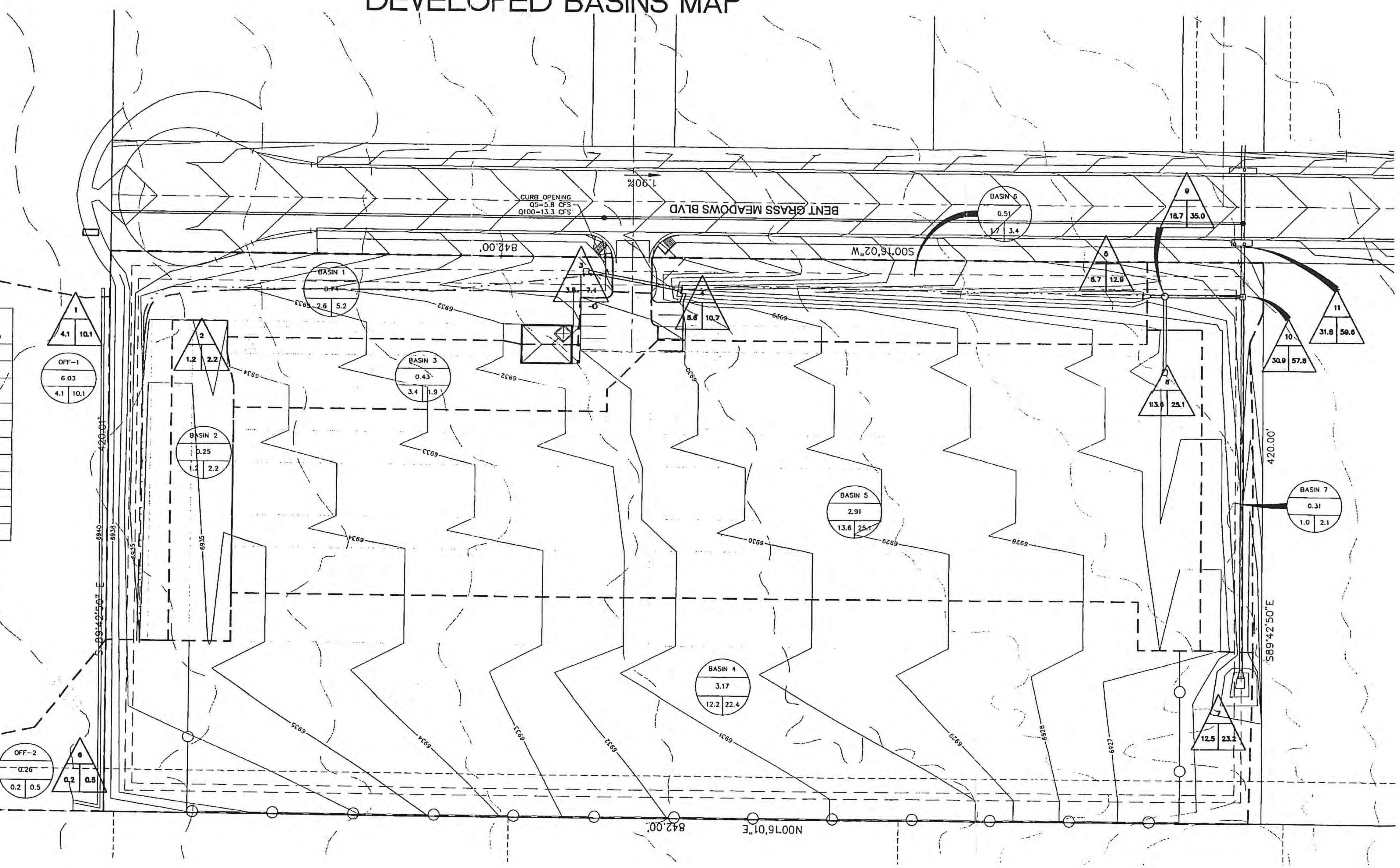
OLIVER E. WATTS
CONSULTING ENGINEER, INC.
COLORADO SPRINGS


OLIVER E. WATTS
CONSULTING ENGINEER, INC.
COLORADO SPRINGS
FALCON MEADOWS AT BENT GRASS
DRAINAGE PLAN
NTS
1" = 105'
CI = 1'
O-1
5 Ac LOTS
SITE
5.004 Ac
AH
501.15'
SWALE E (EXISTING)
SWALE F
BENT GRASS MEADOWS DRIVE
(80' COLLECTOR)
ROWENA WAY
(PUBLIC-LOCAL-50' ROW)
NICO WAY
(PUBLIC-LOCAL-50' ROW)
JAYLA TRAIL
(PUBLIC-LOCAL-50' ROW)
LINLEY WAY
(PUBLIC-LOCAL-50' ROW)
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
CDOT TYPE D AREA INELT
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
WARRANTY DEED
RECEPTION NO. 213[illegible]
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 1, LATIGO BUSINESS CENTER FILING NO. 1
ZONE: I-2
PLAT NO.: 12007
PARCEL NO.: 5301002005
DEYOUNG RANDALL L
ZONE: I-2
RECEPTION NO.: 208053974
PARCEL NO.: 5301000016
LOT 10, THE MEADOWS FILING NO. 1
ZONE: RR-5
PLAT NO.: 5746
PARCEL NO.: 5302001008
THE MEADOWS FILING NO. 1
ZONE: RR-5
PLAT NO.: 5746
PARCEL NO.: 5302001009
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
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
HP
LP
6960
6955
6950
6945
6940
6935
6930

LOT 1
LATIGO BUSINESS CENTER
DEVELOPED BASINS MAP

SCALE: 1"=40'

40 0 40 80



DESIGN POINT	CONTRIBUTING BASINS	TIME OF CONCENTRATION (MINUTES)	Q5 (CFS)	Q100 (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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COLORADO SPRINGS

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

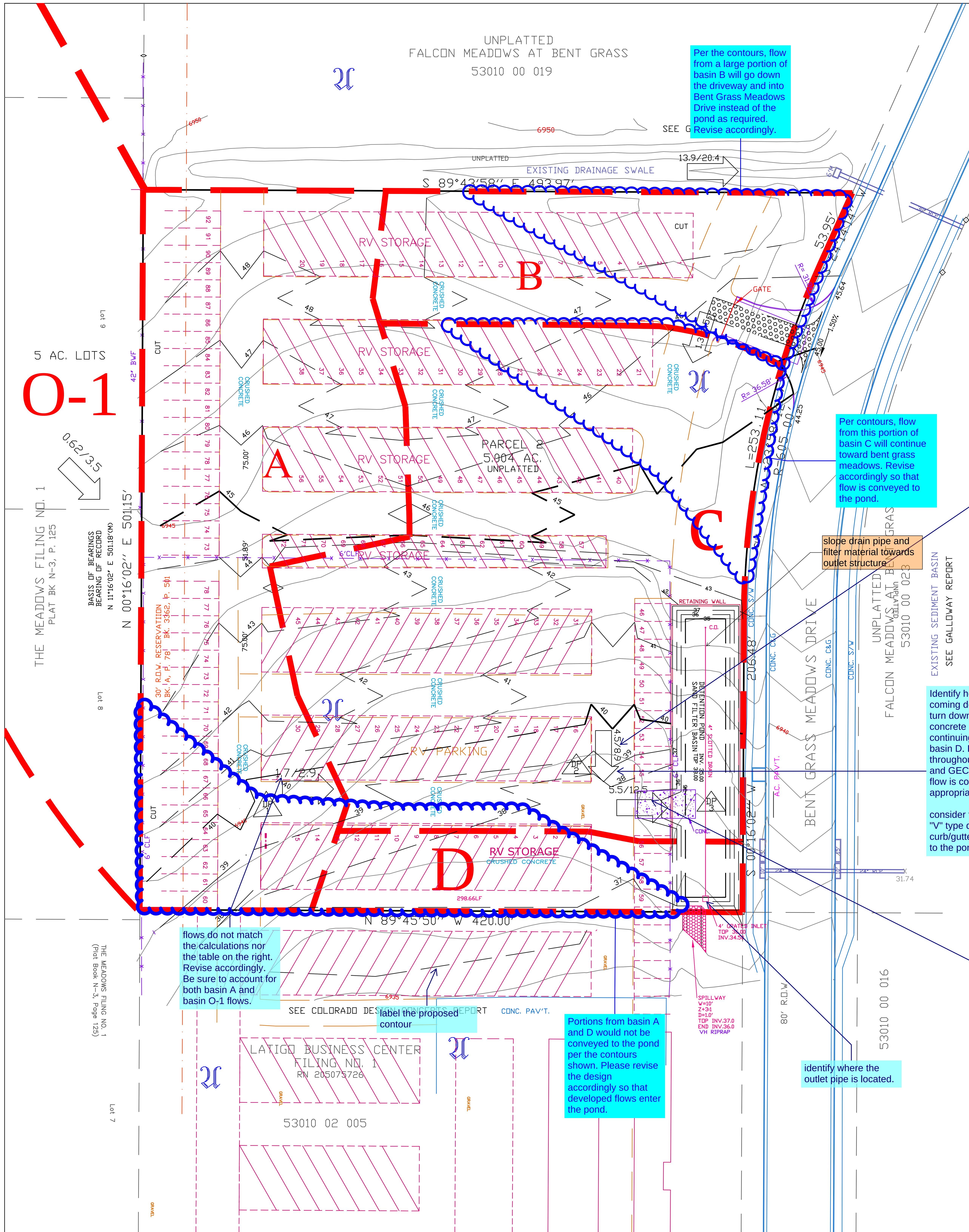
REVISIONS:

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



Per the contours, flow from a large portion of basin B will go down the driveway and into Bent Grass Meadows Drive instead of the pond as required. Revise accordingly.

Per contours, flow from this portion of basin C will continue toward bent grass meadows. Revise accordingly so that flow is conveyed to the pond.

slope drain pipe and filter material towards outlet structure

DP 2 is indicated as 5.2 cfs and 10.4 cfs (5yr & 100yr) in the calculations. revise so that they are consistent with each other.

Identify how the flow from DP 2 coming down the drive aisle will turn down what i assume is a concrete rundown instead of continuing to the south into basin D. Provide spot elevations throughout the drainage plan and GEC plan to ensure that flow is conveyed to the appropriate locations.

consider the use of cross pans, "V" type driveway sections, curb/gutter etc to convey flows to the pond

Provide energy dissipation at all inlet points into the sand filter (and calcs in drainage report). Use an impact basin for pipes and a baffle chute or grouted sloping boulder drop if a channel or swale is used, or install a Type VL or L riprap basin underlain with geotextile fabric at the inlet. Fill all rock voids with the filter material specified in Table SF-1.

If DP1 (11.8 cfs) and DP2 (10.4 cfs) will converge at this location how is the total flow going into the pond (DP3) only 12.5 cfs? revise accordingly.

Also provide analysis of flow down concrete rundown and provide any necessary forebay & energy dissipater at the bottom

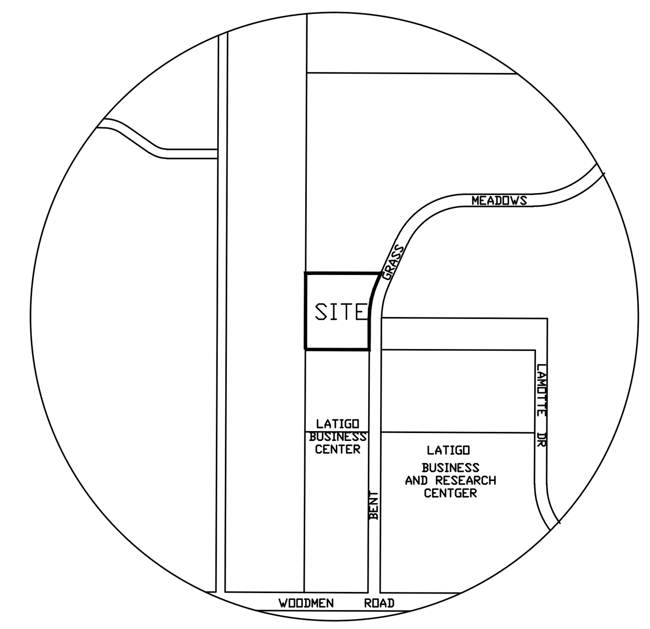
flows do not match the calculations nor the table on the right. Revise accordingly. Be sure to account for both basin A and basin O-1 flows.

label the proposed contour

Portions from basin A and D would not be conveyed to the pond per the contours shown. Please revise the design accordingly so that developed flows enter the pond.

identify where the outlet pipe is located.

TSBs collect water in pond and discharge to outfall. adjust drain pipe accordingly



VICINITY MAP
1"=1000'

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)

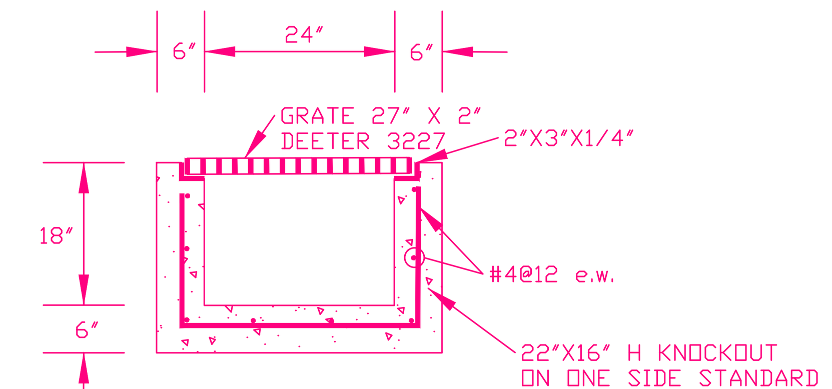
CONTOUR LEGEND:
ORIGINAL CONTOURS:
PROPOSED CONTOURS

GRADED AREAS NOT COVERED BY CONCRETE, ASPHALT OR 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.

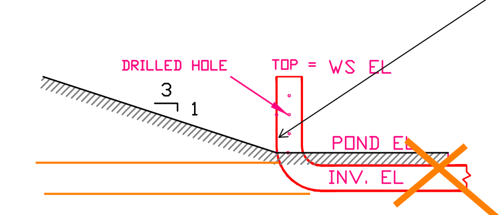
HYDROLOGIC SUMMARY

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	0.3	0.8	1.6
DP-1	4.15	4.1	11.8
DP-2	3.26	4.5	8.9
DP-3	7.41	5.5	12.5

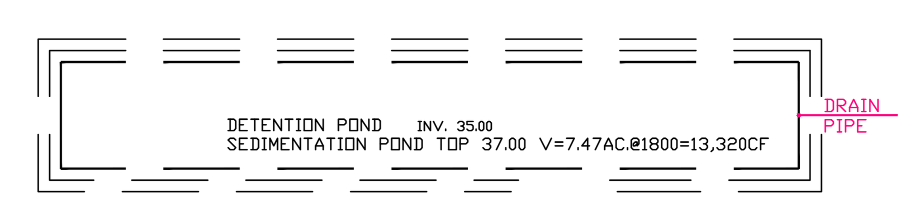
LEGEND:
- 10.5/20.4 RUNOFF IN CFS 5-YEAR/100-YEAR
- A LIMIT OF DRAINAGE BASIN AND DESIGNATION
- EXISTING STORM SEWER AS LABELED
- LIMIT OF SOILS TYPE AND GROUP
- PROPOSED STORM SEWER AS LABELED



GRATED INLET
1/2"=1'-0"
INLETS SHALL CONFORM TO FIREBAUGH PRECAST CO. STD. INLET OR EQUAL



DRAIN PIPE



DRAWN BY: O.E. WATTS DATE: 2-4-21 DWG. NO.: 20-5523-04 SURVEYED BY: OEW, ESW, 10-6-20	APPROVED BY: PROJ. NO. DWG.	REVISIONS	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