Galloway
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Colorado Springs, CO 80920
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September 12, 2024

Brady Shyrock, on Behalf of Galloway
1155 Kelly Johnson Blvd., Suite 305
Colorado Springs, CO 80920

RE: Lot 2 Elm Grove Villa - Smith Plumbing & Heating; Water Quality Detention Pond Certification

Dear Natahsa Grimaldo,

Please accept this letter as formal documentation of conformance of the Water Quality Detention Pond for stormwater quality and detention at the Lot 2 Elm Grove Villa - Smith Plumbing & Heating development. The Lot 2 Elm Grove Villa - Smith Plumbing & Heating (Site) is located at 1875 Main Street, Colorado Springs within El Paso County, Colorado. The project site is located east of Main Street, which is also designated as Hancock Expressway and south/southwest of Bradley Road. The Site is located in the Southwest ¼ of the Southwest ¼ of Section 01, Township 15 South, Range 66 West of the 6th Principal Meridian, City of Colorado Springs, County of El Paso, State of Colorado.

Survey data detailing the Water Quality Detention Pond at the site was provided to Galloway & Company, Inc. on February 14, 2024 and updated February 23, 2024 & March 12, 2024, by Ridge Line Land Surveying. The pond was constructed based on the pond design prepared by Galloway, Inc. in the approved Lot 2 Elm Grove Villa Subdivision Final Drainage Report dated March, 2022.

WQCV Design

The WQCV has a volume of 0.030-acre feet and a depth of 2.74 feet. The WQCV has a 99% drain time of 45 hours which is in conformance with MHFD Criteria and City of Colorado Springs Criteria.

EURV, 5-Year, & 100-Year Design

Per the approved FDR, the EURV and 100-year volumes will be conveyed via the Modified CDOT Type C Outlet structure to the existing inlet, downstream to the existing concrete flume, and outfalls into the existing 6’ concrete valley pan flowing in a southward direction within the townhome site. concrete pan and Elm Grove Drive roadway section with curb & gutter). The proposed development does not increase runoff being discharged from the site, therefore the pond release flows can sufficiently be handled by the existing conveyance system as originally intended. Runoff then sheet flows across Elm Grove Drive (to the east) to an existing low point on the east side of Elm Grove Drive (existing concrete chase), to the existing concrete rundown structure and into the existing pond situated to the south of the existing townhomes. Storm events larger than the 100-year storm will overtop the emergency overflow weir and free release into the structures as described below.

The water quality volume release will be controlled with an orifice plate that will release over a period of 45 hours. The water quality pond will release treated flows into the existing flume and existing 6' concrete valley pan within the Elm Grove Villa townhome development to the south as described above. According to the approved **FDR**, the existing detention pond to the south was designed to accommodate runoff from this development and is functioning as intended.

Total area which will not be treated via the on-site facility is less than 1.0 acre and less than 20%, which of the total site, as required.

Miscellaneous

As-builts were also conducted to verify the construction of the roof drain that conveys developed runoff from the southern half of the building roof to the WQCV pond, as well as the forebay and trickle channel of the pond. Based on those as-builts, the roof drain, forebay and trickle channel are in substantial compliance with the approved design.

Per the approved WQ Plan ("*Final Drainage Report for Lot 2 Elm Grove Villa Subdivision; Smith Plumbing & Heating; PCD Filing No. PPR2143*", Galloway & Company, Inc., May 18, 2022), the area designated as a grass buffer was intended to be a receiving pervious area (RPA). The area was constructed as a landscaped area complete with trees, shrubs, and landscaped rock. Due to the fact that there is no upstream impervious surface that drains to this area, the landscaped area is to be considered a separate pervious area (SPA) and will not be detained in the PBMP per Section I.7.1.C.1. The % imperviousness that drains to this area is negligible in size and carries a 2% imperviousness. Therefore, the grass buffer area may remain as landscaping (SPA).

Conclusion

In summary I, Brady Shyrock, a registered professional engineer in the State of Colorado, do hereby affirm, to the best of my knowledge, based on the as-built survey provided by Ridge Line Land Surveying and information provided to date by the general contractor, the Water Quality Detention Pond for Lot 2 Elm Grove Villa - Smith Plumbing & Heating and associated drainage facilities were constructed in accordance with the design intent of the approved drainage report and construction drawings, and in accordance with local standards and specifications, regional jurisdictional design criteria and state statutes.

The site and adjacent properties (as affected by work performed under the County permit) are stable with respect to settlement and subsidence, sloughing of cut and fill slopes, revegetation or other ground cover, and that the improvements (public improvements, common improvements, site grading and paving) meet or exceed the minimum design requirements.

The facilities outlined in this certification letter provide the required WQCV and will meet the required release rates (as documented by the attached MHFD design form), the stage areas, elevations, and outlet dimensions.

Should you have any further questions, or require additional information, please do not hesitate to contact me at (719) 900-7220.

Sincerely,
GALLOWAY

Brady Shyrock, PE
Project Manager
BradyShyrock@GallowayUS.com

cc: John Radcliffe, PE
Principal & Regional Office Manager
JohnRadcliffe@GallowayUS.com

Attached Documents:

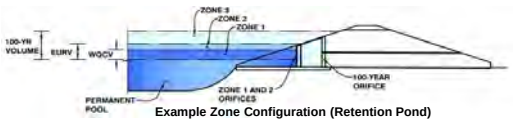
- MHFD WQ Detention Pond Calculations
- Roof Drain Drainage Map
- Roof Drain Rational Calculations
- Roof Drain Capacity Calculations
- As-Built Drawings

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.05 (January 2022)

Project: Smith Plumbing

Basin ID: WQCV Pond As-Built



Example Zone Configuration (Retention Pond)

Watershed Information

Selected BMP Type =	EDB	
Watershed Area =	1.00	acres
Watershed Length =	520	ft
Watershed Length to Centroid =	55	ft
Watershed Slope =	0.030	ft/ft
Watershed Imperviousness =	84.60%	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 =	40.0	hours
Location for 1-hr Rainfall Depths =	User Input	

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

			Optional User Overrides
Water Quality Capture Volume (WQCV) =	0.030	acre-feet	acre-feet
Excess Urban Runoff Volume (EURV) =	0.113	acre-feet	acre-feet
2-yr Runoff Volume (P1 = 1.19 in.) =	0.073	acre-feet	1.19 inches
5-yr Runoff Volume (P1 = 1.5 in.) =	0.094	acre-feet	1.50 inches
10-yr Runoff Volume (P1 = 1.75 in.) =	0.111	acre-feet	1.75 inches
25-yr Runoff Volume (P1 = 2 in.) =	0.131	acre-feet	2.00 inches
50-yr Runoff Volume (P1 = 2.25 in.) =	0.150	acre-feet	2.25 inches
100-yr Runoff Volume (P1 = 2.52 in.) =	0.171	acre-feet	2.52 inches
500-yr Runoff Volume (P1 = 3.68 in.) =	0.262	acre-feet	3.68 inches
Approximate 2-yr Detention Volume =	0.074	acre-feet	
Approximate 5-yr Detention Volume =	0.097	acre-feet	
Approximate 10-yr Detention Volume =	0.115	acre-feet	
Approximate 25-yr Detention Volume =	0.136	acre-feet	
Approximate 50-yr Detention Volume =	0.148	acre-feet	
Approximate 100-yr Detention Volume =	0.159	acre-feet	

Define Zones and Basin Geometry

Zone 1 Volume (WQCV) =	0.030	acre-feet
Zone 2 Volume (User Defined - Zone 1) =	0.020	acre-feet
Select Zone 3 Storage Volume (Optional) =		acre-feet
Total Detention Basin Volume =	0.050	acre-feet
Initial Surcharge Volume (ISV) =	user	ft^3
Initial Surcharge Depth (ISD) =	user	ft
Total Available Detention Depth (H_{total}) =	user	ft
Depth of Trickle Channel (H_{TC}) =	user	ft
Slope of Trickle Channel (S_{TC}) =	user	ft/ft
Slopes of Main Basin Sides (S_{main}) =	user	H:V
Basin Length-to-Width Ratio ($R_{L/W}$) =	user	

Total detention volume is less than 100-year volume.

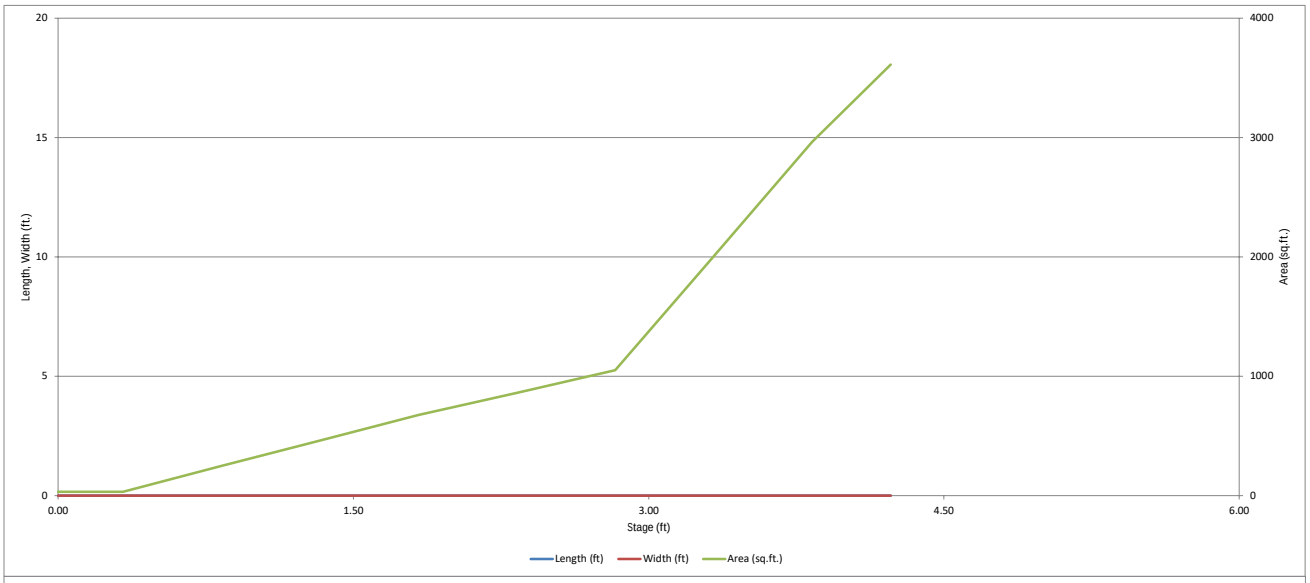
Initial Surcharge Area (A_{ISV}) =	user	ft^2
Surcharge Volume Length (L_{ISV}) =	user	ft
Surcharge Volume Width (W_{ISV}) =	user	ft
Depth of Basin Floor (H_{FLOOR}) =	user	ft
Length of Basin Floor (L_{FLOOR}) =	user	ft
Width of Basin Floor (W_{FLOOR}) =	user	ft
Area of Basin Floor (A_{FLOOR}) =	user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

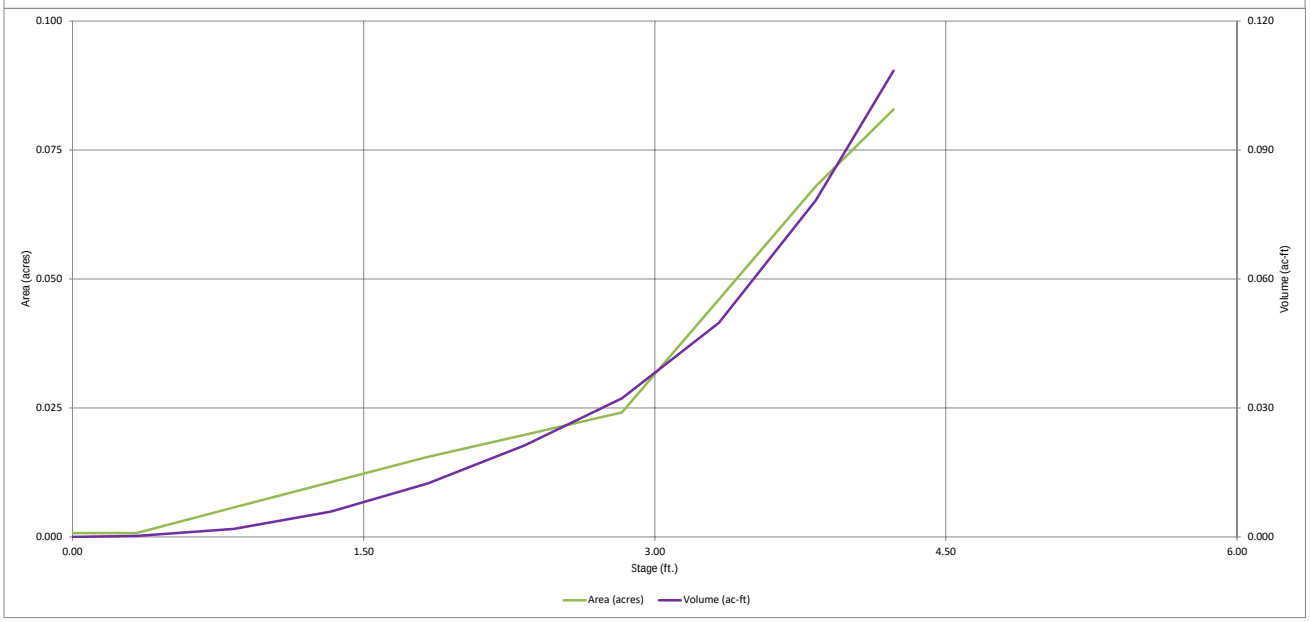
Depth Increment = ft

Stage - Storage Description	Stage (ft)	Optional Override Stage (ft)	Length (ft)	Width (ft)	Area (ft^2)	Optional Override Area (ft^2)	Area (acre)	Volume (ft^3)	Volume (ac-ft)
Top of Micropool	--	0.00	--	--	--	32	0.001		
5846.17									
5846.5	--	0.33	--	--	--	32	0.001	11	0.000
5847	--	0.83	--	--	--	248	0.006	80	0.002
5847.5	--	1.33	--	--	--	462	0.011	258	0.006
5848	--	1.83	--	--	--	676	0.016	542	0.012
5848.5	--	2.33	--	--	--	861	0.020	926	0.021
5849	--	2.83	--	--	--	1,050	0.024	1,404	0.032
5849.5	--	3.33	--	--	--	2,005	0.046	2,168	0.050
5850	--	3.83	--	--	--	2,961	0.068	3,410	0.078
5850.4	--	4.23	--	--	--	3,610	0.083	4,724	0.108

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.05 (January 2022)



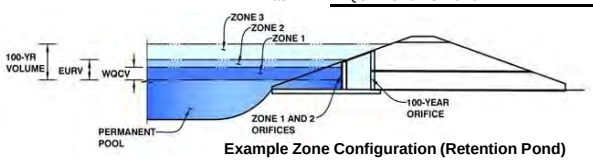


DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.05 (January 2022)

Project: Smith Plumbing

Basin ID: WQCV Pond As-Built



Example Zone Configuration (Retention Pond)

	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	2.74	0.030	Orifice Plate
Zone 2 (User)	3.34	0.020	Weir&Pipe (Restrict)
Zone 3			
Total (all zones)		0.050	

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

Underdrain Orifice Invert Depth =		ft (distance below the filtration media surface)	Underdrain Orifice Area =		ft^2
Underdrain Orifice Diameter =		inches	Underdrain Orifice Centroid =		feet

Calculated Parameters for Underdrain

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)

Centroid of Lowest Orifice =	0.00	ft (relative to basin bottom at Stage = 0 ft)	WQ Orifice Area per Row =	8.333E-04	ft^2
Depth at top of Zone using Orifice Plate =	2.92	ft (relative to basin bottom at Stage = 0 ft)	Elliptical Half-Width =	N/A	feet
Orifice Plate: Orifice Vertical Spacing =	N/A	inches	Elliptical Slot Centroid =	N/A	feet
Orifice Plate: Orifice Area per Row =	0.12	sq. inches (diameter = 3/8 inch)	Elliptical Slot Area =	N/A	ft^2

Calculated Parameters for Plate

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

	Row 1 (required)	Row 2 (optional)	Row 3 (optional)	Row 4 (optional)	Row 5 (optional)	Row 6 (optional)	Row 7 (optional)	Row 8 (optional)
Stage of Orifice Centroid (ft)	0.01	1.09	2.09					
Orifice Area (sq. inches)	0.12	0.12	0.12					

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

User Input: Vertical Orifice (Circular or Rectangular)

	Not Selected	Not Selected			Not Selected	Not Selected	
Invert of Vertical Orifice =			ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Area =			ft^2
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				

Calculated Parameters for Vertical Orifice

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

	Zone 2 Weir	Not Selected			Zone 2 Weir	Not Selected	
Overflow Weir Front Edge Height, Ho =	2.76		ft (relative to basin bottom at Stage = 0 ft)	Height of Grate Upper Edge, H_t =	2.76		feet
Overflow Weir Front Edge Length =	2.92		feet	Overflow Weir Slope Length =	2.92		feet
Overflow Weir Grate Slope =	0.00		H:V	Grate Open Area / 100-yr Orifice Area =	29.40		
Horiz. Length of Weir Sides =	2.92		feet	Overflow Grate Open Area w/o Debris =	6.74		ft^2
Overflow Grate Type =	Close Mesh Grate			Overflow Grate Open Area w/ Debris =	3.37		ft^2
Debris Clogging % =	50%		%				

Calculated Parameters for Overflow Weir

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

	Zone 2 Restrictor	Not Selected			Zone 2 Restrictor	Not Selected	
Depth to Invert of Outlet Pipe =	2.50		ft (distance below basin bottom at Stage = 0 ft)	Outlet Orifice Area =	0.23		ft^2
Outlet Pipe Diameter =	18.00		inches	Outlet Orifice Centroid =	0.17		feet
Restrictor Plate Height Above Pipe Invert =	3.38		inches	Half-Central Angle of Restrictor Plate on Pipe =	0.90	N/A	radians

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate

User Input: Emergency Spillway (Rectangular or Trapezoidal)

Spillway Invert Stage=	3.82	ft (relative to basin bottom at Stage = 0 ft)	Spillway Design Flow Depth=	0.21	feet
Spillway Crest Length =	12.02	feet	Stage at Top of Freeboard =	4.03	feet
Spillway End Slopes =	4.00	H:V	Basin Area at Top of Freeboard =	0.08	acres
Freeboard above Max Water Surface =	0.00	feet	Basin Volume at Top of Freeboard =	0.09	acre-ft

Calculated Parameters for Spillway

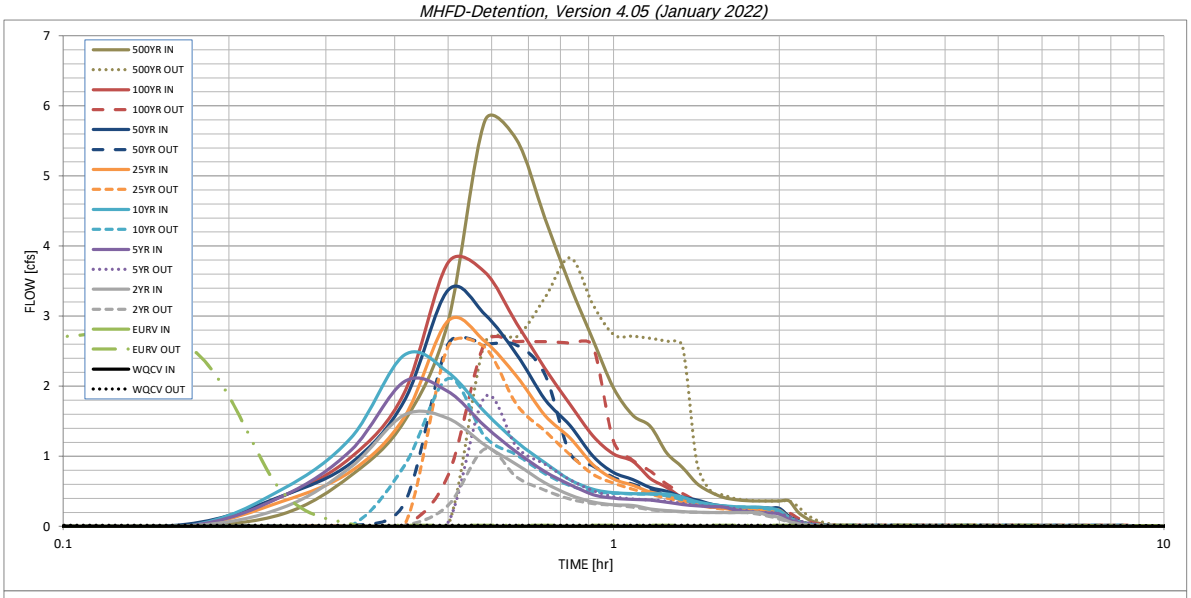
Routed Hydrograph Results

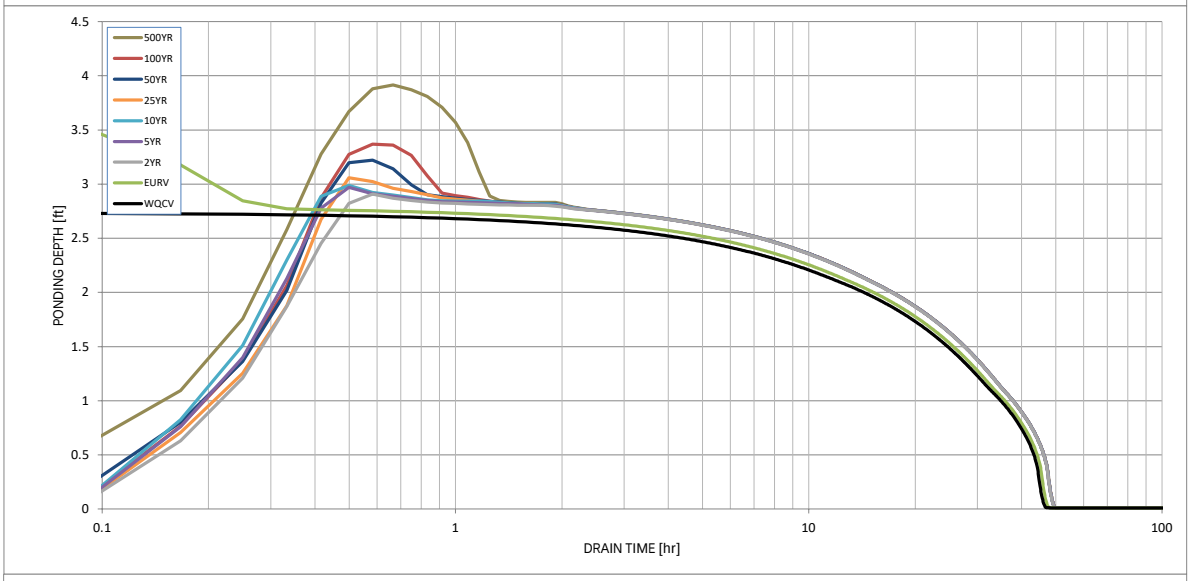
The user can override the default CUHP hydrographs and runoff volumes by entering new values in the Inflow Hydrographs table (Columns W through AF).

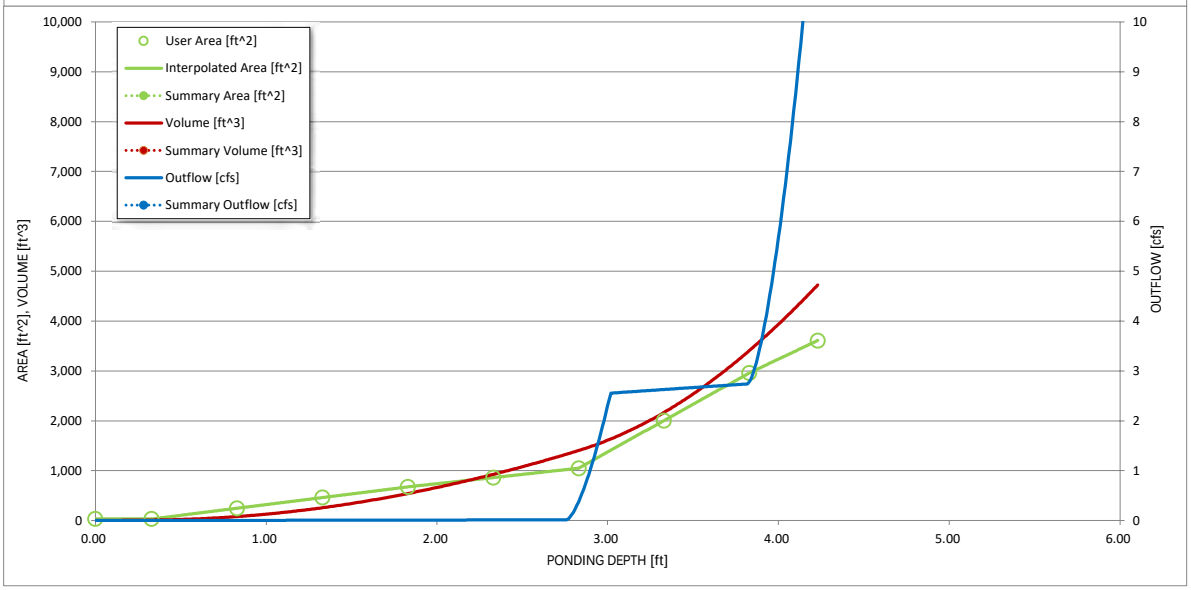
Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
One-Hour Rainfall Depth (in) =	N/A	N/A	1.19	1.50	1.75	2.00	2.25	2.52	3.68
CUHP Runoff Volume (acre-ft) =	0.030	0.113	0.073	0.094	0.111	0.131	0.150	0.171	0.262
Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	0.073	0.094	0.111	0.131	0.150	0.171	0.262
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	0.0	0.0	0.0	0.3	0.5	0.8	2.0
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A							
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	0.01	0.02	0.03	0.25	0.48	0.79	1.97
Peak Inflow Q (cfs) =	N/A	N/A	1.6	2.1	2.4	2.9	3.4	3.8	5.8
Peak Outflow Q (cfs) =	0.0	6.2	1.1	1.8	2.1	2.6	2.6	2.6	3.8
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	90.4	75.4	10.2	5.4	3.4	1.9
Structure Controlling Flow =	Plate	Outlet Plate 1	Overflow Weir 1	Overflow Weir 1	Overflow Weir 1	Outlet Plate 1	Outlet Plate 1	Outlet Plate 1	Spillway
Max Velocity through Grate 1 (fps) =	N/A	0.39	0.17	0.3	0.3	0.4	0.4	0.4	0.4
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) =	42	37	40	38	37	35	34	33	28
Time to Drain 99% of Inflow Volume (hours) =	44	43	45	45	44	43	43	42	39
Maximum Ponding Depth (ft) =	2.74	3.56	2.91	2.97	2.99	3.06	3.22	3.37	3.91
Area at Maximum Ponding Depth (acres) =	0.02	0.06	0.03	0.03	0.03	0.03	0.04	0.05	0.07
Maximum Volume Stored (acre-ft) =	0.030	0.061	0.034	0.036	0.036	0.039	0.045	0.051	0.084

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.05 (January 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	0.03	0.00	0.18
	0:15:00	0.00	0.00	0.26	0.43	0.53	0.36	0.43	0.43	0.73
	0:20:00	0.00	0.00	0.85	1.09	1.26	0.79	0.91	0.99	1.50
	0:25:00	0.00	0.00	1.59	2.07	2.44	1.56	1.79	1.91	2.92
	0:30:00	0.00	0.00	1.54	1.92	2.20	2.93	3.37	3.76	5.79
	0:35:00	0.00	0.00	1.16	1.43	1.63	2.64	3.03	3.63	5.52
	0:40:00	0.00	0.00	0.88	1.06	1.21	2.14	2.45	2.90	4.40
	0:45:00	0.00	0.00	0.62	0.78	0.91	1.58	1.81	2.26	3.44
	0:50:00	0.00	0.00	0.45	0.60	0.67	1.26	1.44	1.74	2.67
	0:55:00	0.00	0.00	0.35	0.46	0.53	0.88	1.01	1.29	1.98
	1:00:00	0.00	0.00	0.31	0.40	0.48	0.68	0.77	1.03	1.58
	1:05:00	0.00	0.00	0.30	0.38	0.47	0.59	0.67	0.93	1.43
	1:10:00	0.00	0.00	0.25	0.38	0.46	0.49	0.55	0.68	1.04
	1:15:00	0.00	0.00	0.23	0.34	0.46	0.44	0.50	0.55	0.84
	1:20:00	0.00	0.00	0.21	0.31	0.42	0.37	0.42	0.41	0.61
	1:25:00	0.00	0.00	0.20	0.29	0.35	0.33	0.38	0.33	0.49
	1:30:00	0.00	0.00	0.20	0.28	0.31	0.28	0.32	0.28	0.41
	1:35:00	0.00	0.00	0.20	0.28	0.29	0.26	0.29	0.26	0.38
	1:40:00	0.00	0.00	0.20	0.23	0.28	0.24	0.27	0.25	0.37
	1:45:00	0.00	0.00	0.20	0.21	0.28	0.23	0.26	0.25	0.36
	1:50:00	0.00	0.00	0.20	0.20	0.27	0.23	0.26	0.25	0.36
	1:55:00	0.00	0.00	0.15	0.19	0.26	0.23	0.26	0.25	0.36
	2:00:00	0.00	0.00	0.13	0.18	0.23	0.23	0.26	0.25	0.36
	2:05:00	0.00	0.00	0.07	0.10	0.12	0.13	0.14	0.14	0.20
	2:10:00	0.00	0.00	0.04	0.05	0.07	0.07	0.08	0.07	0.11
	2:15:00	0.00	0.00	0.02	0.03	0.03	0.04	0.04	0.04	0.05
	2:20:00	0.00	0.00	0.01	0.01	0.01	0.02	0.02	0.02	0.02
	2:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01
	2:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	6:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

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PRELIMINARY
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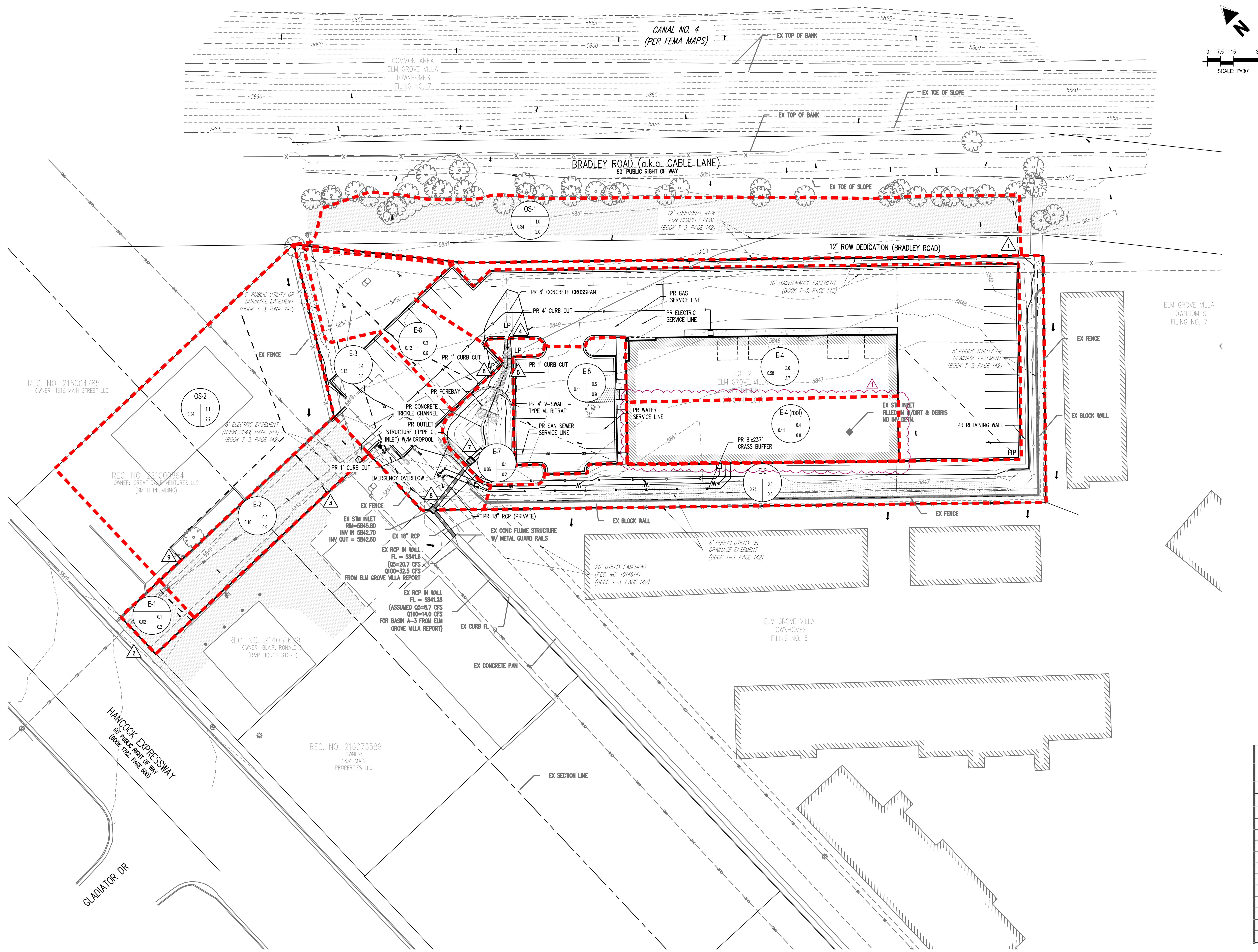


DRAINAGE LEGEND

- PROPERTY LINE
- ADJACENT PROPERTY LINE
- SECTION LINE
- EXISTING MAJOR CONTOUR
- EXISTING MINOR CONTOUR
- PROPOSED MAJOR CONTOUR
- PROPOSED MINOR CONTOUR
- BASIN BOUNDARY LINE
- DRAINAGE TRAVEL PATH
- TOE OF SLOPE
- TOP OF SLOPE
- EXISTING BUILDING
- EXISTING GRAVEL PARKING AREA
- EXISTING ACCESS
- PROPOSED RIPRAP
- PROPOSED ACCESS
- 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)	Q_5 (cfs)	Q_{100} (cfs)
OS-1	0.34	1.0	2.0
OS-2	0.34	1.1	2.2
E-1	0.02	0.1	0.2
E-2	0.10	0.5	0.9
E-3	0.13	0.4	0.8
E-4	0.58	2.0	3.7
E-5	0.11	0.5	0.9
E-6	0.26	0.1	0.6
E-7	0.06	0.1	0.2
E-8	0.12	0.3	0.6
E-4 (roof)	0.14	0.4	0.8

DESIGN POINT SUMMARY TABLE

Design Point	Q_5 (cfs)	Q_{100} (cfs)
1	1.0	2.0
2	0.1	0.2
3	0.5	0.9
4	2.0	3.7
5	0.5	0.9
6	0.3	0.6
7	0.0	5.0
8	0.4	0.8
9	1.1	2.2

FINAL DRAINAGE REPORT
SMITH PLUMBING & HEATING
FOR
HAMMERS CONSTRUCTION

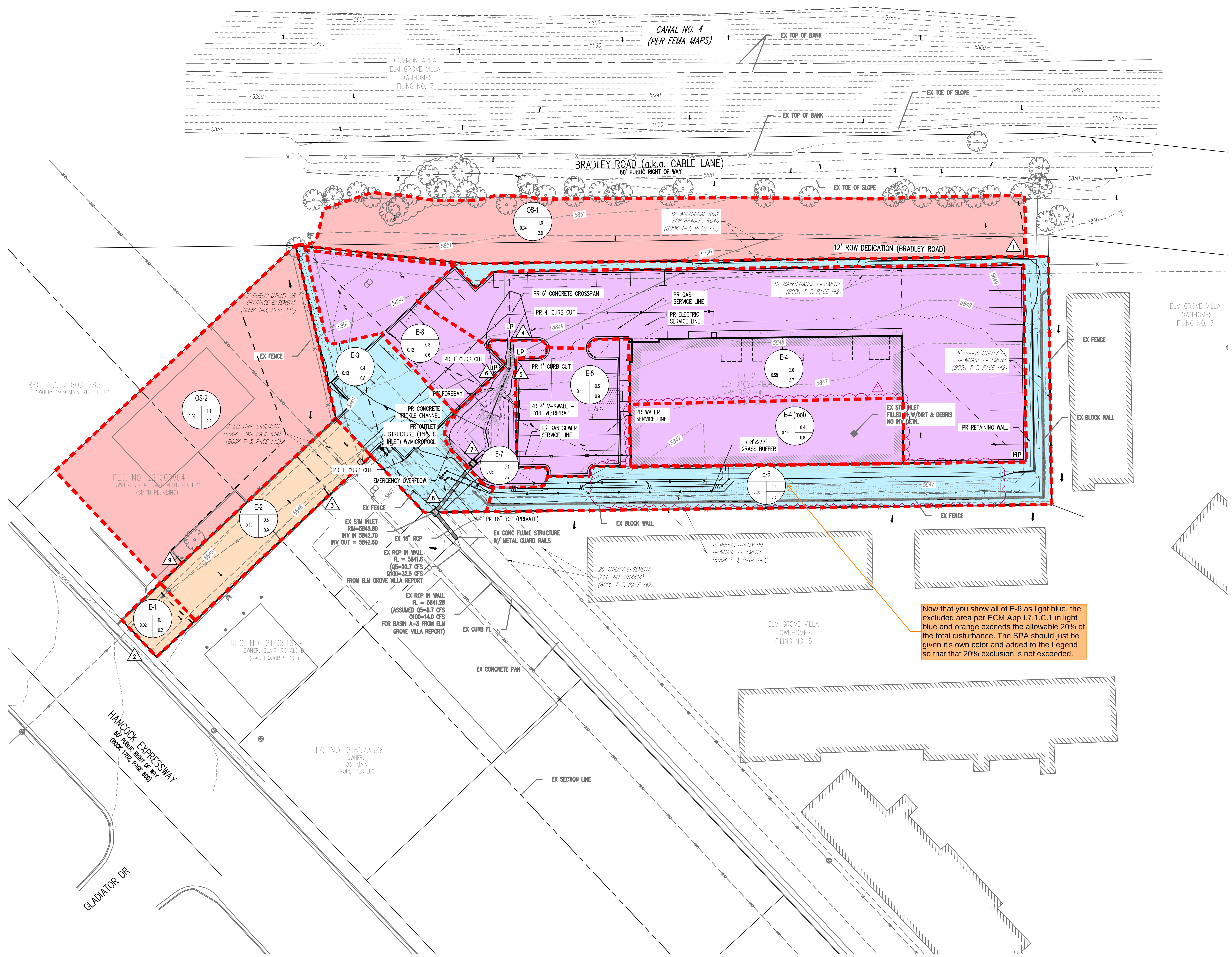
1875 MAIN STREET
COLORADO SPRINGS, CO 80911 - EL PASO COUNTY

#	Date	Issue / Description	Init.
1	09/10/2024	ADDED ROOF DRAIN BASIN	BAS

Project No:	HCI000007
Drawn By:	DDJ
Checked By:	GD
Date:	03/24/2022

PROPOSED DRAINAGE MAP

DR-2



Now that you show all of E-6 as light blue, the excluded area per ECM App I.7.1.C.1 in light blue and orange exceeds the allowable 20% of the total disturbance. The SPA should just be given it's own color and added to the Legend so that that 20% exclusion is not exceeded.

SCALE: 1"=30'

DRAINAGE LEGEND

- PROPERTY LINE
- 6485 — EXISTING MAJOR CONTOUR
- 6483 — EXISTING MINOR CONTOUR
- 6485 — PROPOSED MAJOR CONTOUR
- 6483 — PROPOSED MINOR CONTOUR
- BASIN BOUNDARY LINE
- FEMA EFFECTIVE 100-YR FLOODPLAIN
- CENTERLINE OF STREAM
- HP — HIGH POINT
- LP — LOW POINT
- DIRECTION OF RUNOFF
- AREA OF OFFSITE FLOWS
- AREA TO BE DETAINED IN PBMP
- AREA TO BE TREATED WITH GRASS BUFFER
- AREA (UNCHANGED) NOT DETAINED IN PBMP PER SECTION I.7.1.C.1
- AREA (DEVELOPED) NOT DETAINED IN PBMP PER SECTION I.7.1.C.1 (20% UP TO 1 AC. OF DEVELOPMENT SITE CAN BE EXCLUDED, DUE TO TOPOGRAPHY)
- 1 — BASIN DESIGNATION
- 1.8 — 5-YEAR RUNOFF IN CUBIC FEET PER SECOND
- 4.8 — 100-YEAR RUNOFF IN CUBIC FEET PER SECOND
- 0.71 — BASIN AREA IN ACRES
- DESIGN POINT

please put a red line through this text so that it is clear that the grass buffer has been removed.

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FINAL DRAINAGE REPORT
SMITH PLUMBING & HEATING
FOR
HAMMERS CONSTRUCTION

1875 MAIN STREET
COLORADO SPRINGS, CO 80911 - EL PASO COUNTY

#	Date	Issue / Description	Init.
1	09/10/2024	ADDED ROOF DRAIN BASIN	BAS

Project No:	HCI000007
Drawn By:	DDJ
Checked By:	GD
Date:	11/12/2021

WQ PLAN

DR-3

COMPOSITE % IMPERVIOUS CALCULATIONS: PROPOSED CONDITIONS

Subdivision: Elm Grove Villa
Location: CO, Colorado Springs

Project Name: Smith Plumbing
Project No.: HCI000008
Calculated By: BAS
Checked By: TJE
Date: 9/10/24

Basin ID	Total Area (ac)	Paved/Gravel Roads			Undeveloped			Roofs			Basins Total Weighted % Imp.
		% Imp.	Area (ac)	Weighted % Imp.	% Imp.	Area (ac)	Weighted % Imp.	% Imp.	Area (ac)	Weighted % Imp.	
OS-1	0.34	100	0.20	58.8	2	0.14	0.8	90	0.00	0.0	59.6
OS-2	0.34	100	0.18	52.9	2	0.08	0.5	90	0.08	21.2	74.6
E-1	0.02	100	0.02	100.0	2	0.00	0.0	90	0.00	0.0	100.0
E-2	0.10	100	0.10	100.0	2	0.00	0.0	90	0.00	0.0	100.0
E-3	0.13	100	0.07	51.6	2	0.06	1.0	90	0.00	0.0	52.6
E-4	0.58	100	0.31	52.8	2	0.00	0.0	90	0.27	42.5	95.3
E-5	0.11	100	0.11	96.3	2	0.00	0.0	90	0.00	0.0	96.3
E-6	0.26	100	0.00	0.0	2	0.26	2.0	90	0.00	0.0	2.0
E-7	0.06	100	0.00	0.0	2	0.06	2.0	90	0.00	0.0	2.0
E-8	0.12	100	0.05	44.4	2	0.07	1.1	90	0.00	0.0	45.5
E-4 (roof)	0.14	100	0.00	0.0	2	0.00	0.0	90	0.14	90.0	90.0

NOTES:
% Impervious values are taken directly from Table 6-6 in the Colorado Springs DCM Vol. 1. CH. 6 (Referencing UDFCD 2001)

COMPOSITE RUNOFF COEFFICIENT CALCULATIONS: PROPOSED CONDITIONS

Subdivision: Elm Grove Villa
Location: CO, Colorado Springs

Project Name: Smith Plumbing
Project No.: HCI000008
Calculated By: BAS
Checked By: TJE
Date: 9/10/24

Basin ID	Total Area (ac)	Paved/Gravel Roads			Lawns/Undeveloped			Roofs			Composite C_5	Composite C_{100}
		C_5	C_{100}	Area (ac)	C_5	C_{100}	Area (ac)	C_5	C_{100}	Area (ac)		
OS-1	0.34	0.90	0.96	0.20	0.09	0.36	0.14	0.73	0.81	0.00	0.57	0.71
OS-2	0.34	0.90	0.96	0.18	0.09	0.36	0.08	0.73	0.81	0.08	0.67	0.78
E-1	0.02	0.90	0.96	0.02	0.09	0.36	0.00	0.73	0.81	0.00	0.90	0.96
E-2	0.10	0.90	0.96	0.10	0.09	0.36	0.00	0.73	0.81	0.00	0.90	0.96
E-3	0.13	0.90	0.96	0.07	0.09	0.36	0.06	0.73	0.81	0.00	0.51	0.67
E-4	0.58	0.90	0.96	0.31	0.09	0.36	0.00	0.73	0.81	0.27	0.82	0.89
E-5	0.11	0.90	0.96	0.11	0.09	0.36	0.00	0.73	0.81	0.00	0.87	0.94
E-6	0.26	0.90	0.96	0.00	0.09	0.36	0.26	0.73	0.81	0.00	0.09	0.36
E-7	0.06	0.90	0.96	0.00	0.09	0.36	0.06	0.73	0.81	0.00	0.09	0.36
E-8	0.12	0.90	0.96	0.05	0.09	0.36	0.07	0.73	0.81	0.00	0.45	0.63
E-4 (roof)	0.14	0.90	0.96	0.00	0.09	0.36	0.00	0.73	0.81	0.14	0.73	0.81

NOTES:
C values are taken directly from Table 6-6 in the Colorado Springs DCM Vol. 1. CH. 6 (Referencing UDFCD 2001)
Coeffficients use HSG A&B soils - Refer to "Appendix A: Exhibits and Figures" for soil map

STANDARD FORM SF-2: PROPOSED CONDITIONS
TIME OF CONCENTRATION

Subdivision: Elm Grove Villa
Location: CO, Colorado Springs

Project Name: Smith Plumbing
Project No.: HCI000008
Calculated By: BAS
Checked By: TJE
Date: 9/10/24

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
SUB-BASIN DATA						**INITIAL/OVERLAND (T_i)**			**TRAVEL TIME (T_t)**					**Tc CHECK (URBANIZED BASINS)**			**FINAL**
BASIN ID	**D.A. (AC)**	**Hydrologic Soils Group**	**Impervious (%)**	**C_5**	**C_{100}**	**L (FT)**	**S (%)**	**T_i (MIN)**	**L (FT)**	**S (%)**	**Cv**	**VEL. (FPS)**	**T_t (MIN)**	**COMP. T_c (MIN)**	**TOTAL LENGTH(FT**	**Urbanized T_c (MIN)**	**T_c (MIN)**
OS-1	0.34	A	59.6	0.57	0.71	35	1.2	5.4	0	0.0	15	0.0	0.0	5.4	35.0	10.2	5.4
OS-2	0.34	A	74.6	0.67	0.78	75	2.0	5.4	100	2.0	20	2.8	0.6	6.0	175.0	11.0	6.0
E-1	0.02	A	100.0	0.90	0.96	30	4.5	1.2	0	0.0	20	0.0	0.0	1.2	30.0	10.2	5.0
E-2	0.10	A	100.0	0.90	0.96	30	4.5	1.2	0	0.0	20	0.0	0.0	1.2	30.0	10.2	5.0
E-3	0.13	A	52.6	0.51	0.67	5	4.0	1.5	185	3.3	20	3.6	0.8	2.4	190.0	11.1	5.0
E-4	0.58	A	95.3	0.82	0.89	100	0.7	5.8	300	0.5	20	1.4	3.5	9.3	400.0	12.2	9.3
E-5	0.11	A	96.3	0.87	0.94	65	1.4	3.0	45	0.5	20	1.4	0.5	3.6	110.0	10.6	5.0
E-6	0.26	A	2.0	0.09	0.36	10	25.0	2.0	450	0.5	15	1.1	7.1	9.1	460.0	12.6	9.1
E-7	0.06	A	2.0	0.09	0.36	10	25.0	2.0	50	0.5	15	1.1	0.8	2.8	60.0	10.3	5.0
E-8	0.12	A	45.5	0.45	0.63	5	2.0	2.1	65	2.0	20	2.8	0.4	2.5	70.0	10.4	5.0
E-4 (roof)	0.14	A	90.0	0.73	0.81	25	0.1	6.9	170	1.2	20	2.2	1.3	8.2	195.0	11.1	8.2

NOTES:

T_i = (0.395*(1.1 - C_5)*(L)^0.5)/((S)^0.33), S in ft/ft

T_t=L/60V (Velocity From Fig. 501)

Velocity V=Cv*S^0.5, S in ft/ft

T_c Check = 10+L/180

For Urbanized basins a minimum T_c of 5.0 minutes is required.

For non-urbanized basins a minimum T_c of 10.0 minutes is required

Type of Land Surface	Cv
Heavy Meadow	2.5
Tillage/field	5
Short pasture and lawns	7
Nearly bare ground	10
Grassed waterway	15
Paved areas and shallow paved swales	20

STANDARD FORM SF-3: PROPOSEDCONDITIONS

STORM DRAINAGE SYSTEM DESIGN

(RATIONAL METHOD PROCEDURE)

Subdivision: Elm Grove Villa
Location: CO, Colorado Springs
Design Storm: 5-Year

Project Name: Smith Plumbing
Project No.: HCI000008
Calculated By: BAS
Checked By: TJE
Date: 9/10/24

		DIRECT RUNOFF							TOTAL RUNOFF				STREET		PIPE			TRAVEL TIME			
STREET	Design Point	Basin ID	Area (Ac)	Runoff Coeff.	Tc (min)	C*A (Ac)	I (in/hr)	Q (cfs)	Tc (min)	C*A (Ac)	I (in/hr)	Q (cfs)	Slope (%)	Street Flow (cfs)	Design Flow (cfs)	Slope (%)	Pipe Size (inches)	Length (ft)	Velocity (fps)	Tt (min)	REMARKS
	1	OS-1	0.34	0.57	5.4	0.19	5.05	1.0													Offsite flows north of property directed southeast per exisitng report
	9	OS-2	0.34	0.67	6.0	0.23	4.90	1.1													Offiste flows northwest of property flowing through site
	2	E-1	0.02	0.90	5.0	0.02	5.17	0.1													Existing basin at entrance which reach Hanock Expressway
	3	E-2	0.10	0.90	5.0	0.09	5.17	0.5													Existing basin through entrace which flows offsite (across existing parking lot)
	8	E-3	0.13	0.51	5.0	0.07	5.17	0.4													Basin located along western edge of property line, reaches existing inlet through curb cut
	4	E-4	0.58	0.82	9.3	0.48	4.24	2.0													Bulk of site which flows towards proposed curb cut-north side pond
		E-4 (roof)	0.14	0.73	8.2	0.10	4.44	0.4													One-half of roof area draining to 6-inch PVC roof drain
	5	E-5	0.11	0.87	5.0	0.10	5.17	0.5													Basin along east of pond-releases through curb cut
	6	E-8	0.12	0.45	5.0	0.05	5.17	0.3													Basin along north of pond-releases through curb cut
		E-6	0.26	0.09	9.1	0.02	4.28	0.1													Basin along north, east & south property line which drains to the the townhome property per the exisitng report
		E-7	0.06	0.09	5.0	0.01	5.17	0.1													Pond area
	7								9.3	0.64	4.24	2.7									All flows entering pond (Basins E-4, E-5, E-7, E-8) Detained for a 0.2 cfs reduction
									Pond Detained Release =			2.5									
Total Release Into Conc. Pan												23.6									EX 23.7 cfs Basin B - 3 cfs (Basin A-6) + DP8 + DP7

STANDARD FORM SF-3: PROPOSED CONDITIONS

STORM DRAINAGE SYSTEM DESIGN

(RATIONAL METHOD PROCEDURE)

Subdivision: Elm Grove Villa
Location: CO, Colorado Springs
Design Storm: 100-Year

Project Name: Smith Plumbing
Project No.: HCI000008
Calculated By: BAS
Checked By: TJE
Date: 9/10/24

		DIRECT RUNOFF							TOTAL RUNOFF				STREET		PIPE			TRAVEL TIME			
STREET	Design Point	Basin ID	Area (Ac)	Runoff Coeff.	Tc (min)	C*A (Ac)	I (in/hr)	Q (cfs)	Tc (min)	C*A (Ac)	I (in/hr)	Q (cfs)	Slope (%)	Street Flow (cfs)	Design Flow (cfs)	Slope (%)	Pipe Size (inches)	Length (ft)	Velocity (fps)	Tt (min)	REMARKS
	1	OS-1	0.34	0.71	5.4	0.24	8.48	2.0													Offsite flows north of property directed southeast per exisitng report
	9	OS-2	0.34	0.78	6.0	0.27	8.22	2.2													Offiste flows northwest of property flowing through site
	2	E-1	0.02	0.96	5.0	0.02	8.68	0.2													Existing basin at entrance which reach Hanock Expressway
	3	E-2	0.10	0.96	5.0	0.10	8.68	0.9													Existing basin through entrace which flows offsite (across existing parking lot)
	8	E-3	0.13	0.67	5.0	0.09	8.68	0.8													Basin located along western edge of property line, reaches existing inlet through curb cut
	4	E-4	0.58	0.89	9.3	0.52	7.11	3.7													Bulk of site which flows towards proposed curb cut-north side pond
		E-4 (roof)	0.14	0.81	8.2	0.11	7.45	0.8													One-half of roof area draining to 6-inch PVC roof drain
	5	E-5	0.11	0.94	5.0	0.10	8.68	0.9													Basin along east of pond-releases through curb cut
	6	E-8	0.12	0.63	5.0	0.07	8.68	0.6													Basin along north of pond-releases through curb cut
		E-6	0.26	0.36	9.1	0.09	7.18	0.6													Basin along north, east & south property line which drains to the the townhome property per the exisitng report
		E-7	0.06	0.36	5.0	0.02	8.68	0.2													Pond area
	7								9.3	0.71	7.11	5.0									All flows entering pond (Basins E-4, E-5, E-7, E-8) Detained to release 1 cfs lower
									Pond Detained Release =			4.0									
Total Release Into Conc. Pan												37.3									EX 38.4 cfs Basin B - 5.9 cfs (Basin A-6) + DP8 + DP7

Roof Drain 6 IN - PVC

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.010	
Channel Slope	0.01203	ft/ft
Diameter	0.50	ft
Discharge	0.80	ft³/s

Results

Normal Depth	0.41	ft
Flow Area	0.17	ft²
Wetted Perimeter	1.13	ft
Hydraulic Radius	0.15	ft
Top Width	0.38	ft
Critical Depth	0.44	ft
Percent Full	82.0	%
Critical Slope	0.01072	ft/ft
Velocity	4.64	ft/s
Velocity Head	0.34	ft
Specific Energy	0.75	ft
Froude Number	1.22	
Maximum Discharge	0.86	ft³/s
Discharge Full	0.80	ft³/s
Slope Full	0.01203	ft/ft
Flow Type	SuperCritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Average End Depth Over Rise	0.00	%
Normal Depth Over Rise	81.96	%
Downstream Velocity	Infinity	ft/s

Roof Drain 6 IN - PVC

GVF Output Data

Upstream Velocity	Infinity	ft/s
Normal Depth	0.41	ft
Critical Depth	0.44	ft
Channel Slope	0.01203	ft/ft
Critical Slope	0.01072	ft/ft