



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

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 $\frac{1}{4}$ of the Southwest $\frac{1}{4}$ 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.

Lot 2 Elm Grove Villa
Water Quality Detention Pond Certification
September 12, 2024

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:

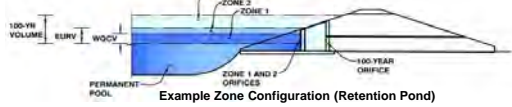
- MHFD WQ Detention Pond Calculations
- Roof Drain Drainage Map
- Roof Drain Rational Calculations
- Roof Drain Capacity Calculations
- As-Built Drawings

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-DETENTION, Version 4.05 (January 2022)

Project: Smith Plumbing

Basin ID: WQCV Pond AS-Built



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.

Water Quality Capture Volume (WQCV) =	0.030 acre-feet
Excess Urban Runoff Volume (EURV) =	0.113 acre-feet
2-yr Runoff Volume (P1 = 1.19 in.) =	0.073 acre-feet
5-yr Runoff Volume (P1 = 1.5 in.) =	0.094 acre-feet
10-yr Runoff Volume (P1 = 1.75 in.) =	0.111 acre-feet
25-yr Runoff Volume (P1 = 2 in.) =	0.131 acre-feet
50-yr Runoff Volume (P1 = 2.25 in.) =	0.150 acre-feet
100-yr Runoff Volume (P1 = 2.52 in.) =	0.171 acre-feet
500-yr Runoff Volume (P1 = 3.68 in.) =	0.262 acre-feet
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

Optional User Overrides

	acre-feet
	acre-feet
	1.19 inches
	1.50 inches
	1.75 inches
	2.00 inches
	2.25 inches
	2.52 inches
	3.68 inches

Total detention volume is less than 100-year volume.

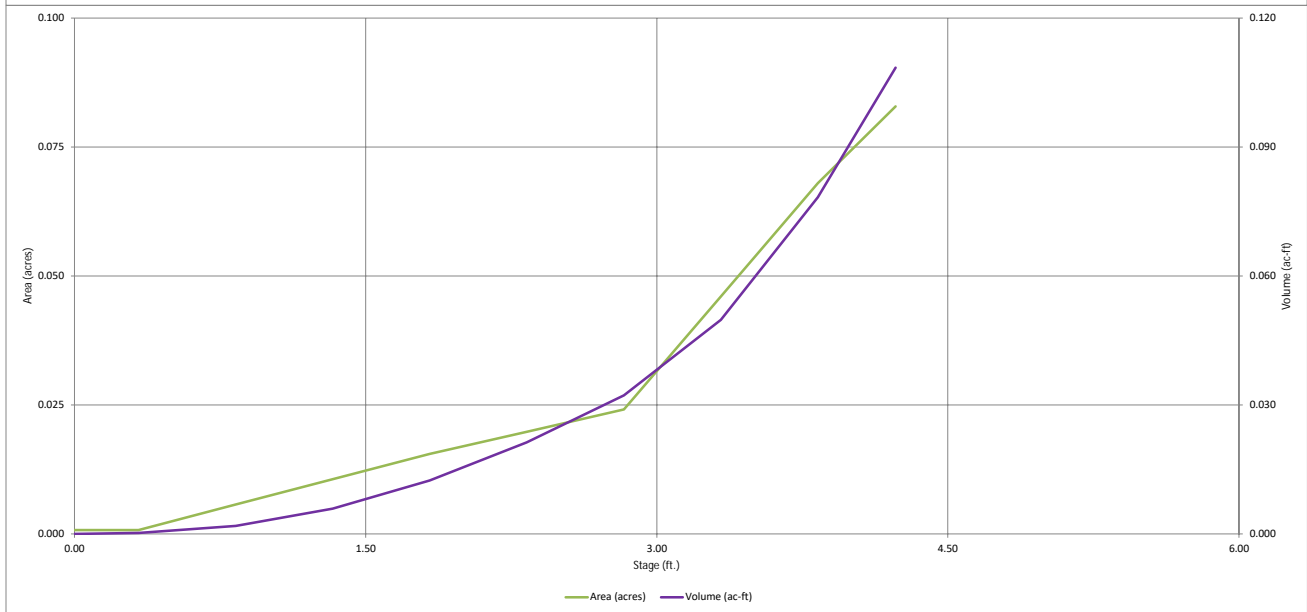
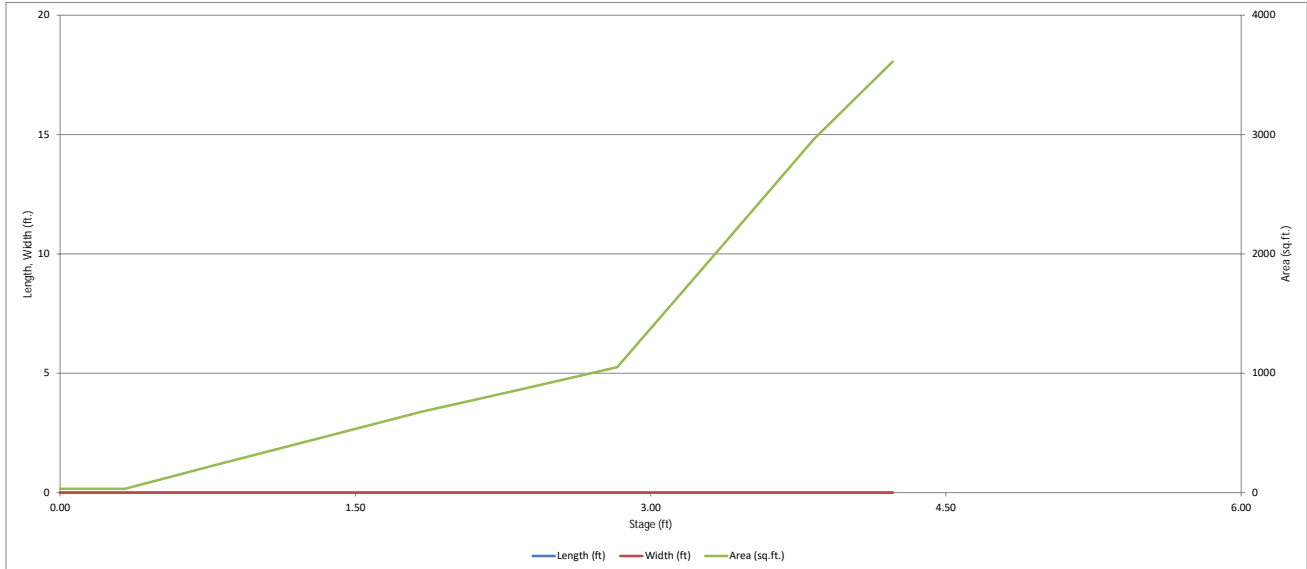
Define Zones and Basin Geometry

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
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 =	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		--	0.33	--	--	--	32	0.001	11	0.000
5846.5	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

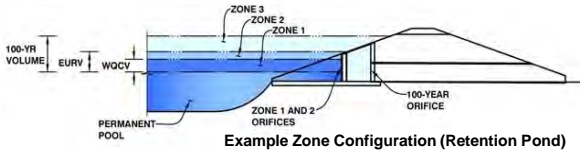
MHFD-*Detention*, Version 4.05 (January 2022)



DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.05 (January 2022)

Project: Smith Plumbing
Basin ID: WQCV Pond As-Built



	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 Diameter = inches

Calculated Parameters for Underdrain
Underdrain Orifice Area = ft²
Underdrain Orifice Centroid = 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)

Centroid of Lowest Orifice = 0.00 ft (relative to basin bottom at Stage = 0 ft)
Depth at top of Zone using Orifice Plate = 2.92 ft (relative to basin bottom at Stage = 0 ft)
Orifice Plate: Orifice Vertical Spacing = N/A inches
Orifice Plate: Orifice Area per Row = 0.12 sq. inches (diameter = 3/8 inch)

Calculated Parameters for Plate
WQ Orifice Area per Row = 8.333E-04 ft²
Elliptical Half-Width = N/A feet
Elliptical Slot Centroid = N/A feet
Elliptical Slot Area = N/A ft²

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)

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

Calculated Parameters for Vertical Orifice
Vertical Orifice Area = Not Selected Not Selected ft²
Vertical Orifice Centroid = feet

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

Overflow Weir Front Edge Height, Ho = 2.76 ft (relative to basin bottom at Stage = 0 ft)
Overflow Weir Front Edge Length = 2.92 feet
Overflow Weir Gate Slope = 0.00 H:V
Horiz. Length of Weir Sides = 2.92 feet
Overflow Gate Type = Close Mesh Gate
Debris Clogging % = 50% %

Calculated Parameters for Overflow Weir
Height of Gate Upper Edge, H₁ = 2.76 feet
Overflow Weir Slope Length = 2.92 feet
Gate Open Area / 100-yr Orifice Area = 29.40
Overflow Gate Open Area w/o Debris = 6.74 ft²
Overflow Gate Open Area w/ Debris = 3.37 ft²

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

Depth to Invert of Outlet Pipe = 2.50 ft (distance below basin bottom at Stage = 0 ft)
Outlet Pipe Diameter = 18.00 inches
Restrictor Plate Height Above Pipe Invert = 3.38 inches

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate
Outlet Orifice Area = 0.23 ft²
Outlet Orifice Centroid = 0.17 feet
Half-Central Angle of Restrictor Plate on Pipe = 0.90 N/A radians

User Input: Emergency Spillway (Rectangular or Trapezoidal)

Spillway Invert Stage = 3.82 ft (relative to basin bottom at Stage = 0 ft)
Spillway Crest Length = 12.02 feet
Spillway End Slopes = 4.00 H:V
Freeboard above Max Water Surface = 0.00 feet

Calculated Parameters for Spillway
Spillway Design Flow Depth = 0.21 feet
Stage at Top of Freeboard = 4.03 feet
Basin Area at Top of Freeboard = 0.08 acres
Basin Volume at Top of Freeboard = 0.09 acre-ft

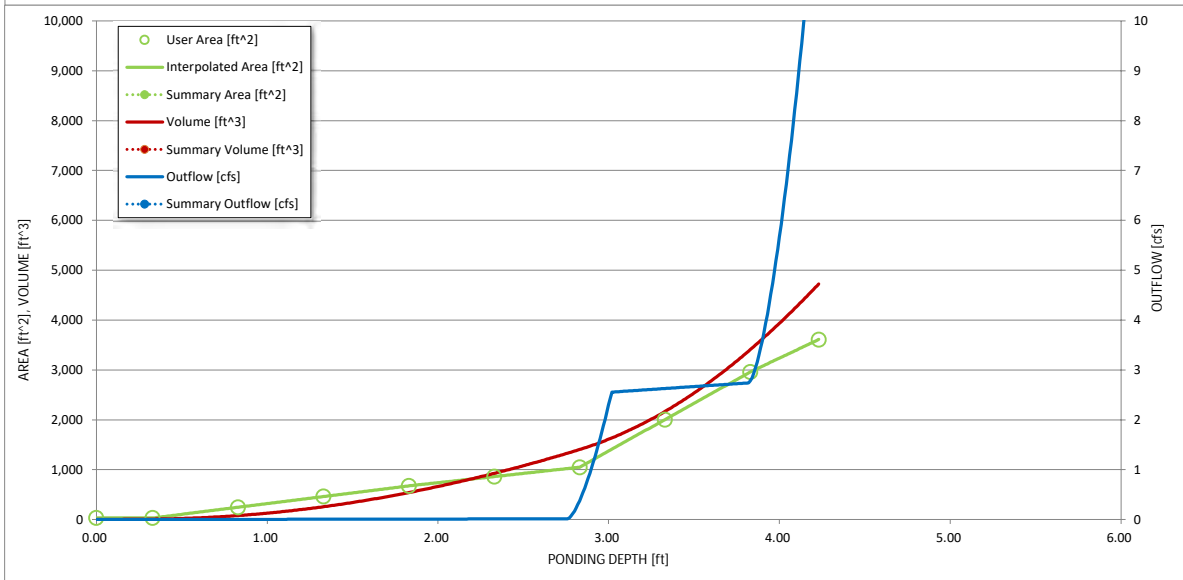
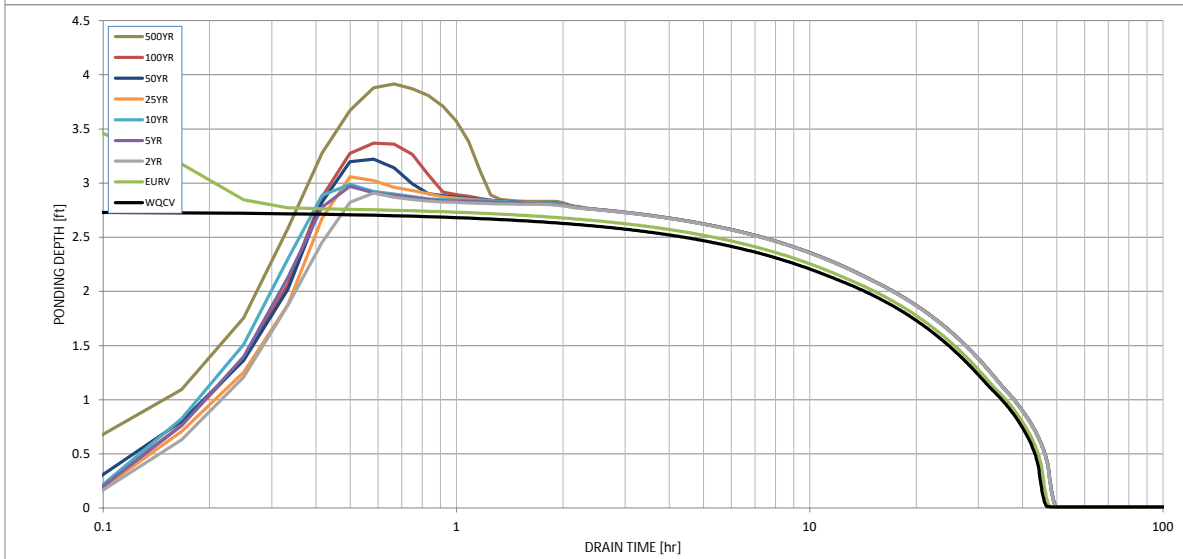
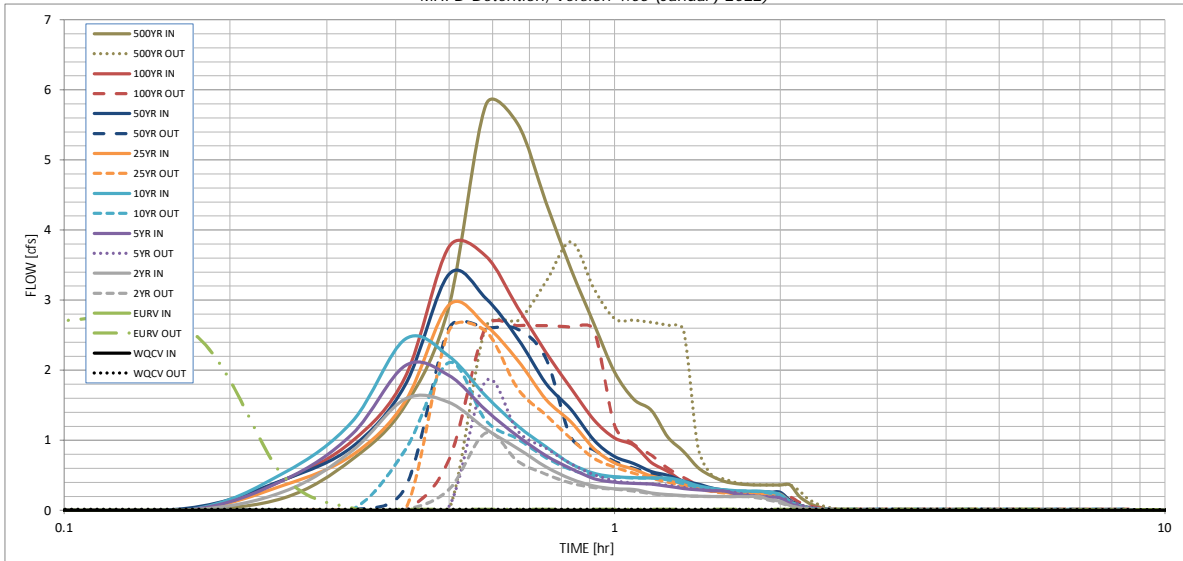
Routed Hydrograph Results

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

	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
Design Storm Return Period	N/A	N/A	1.19	1.50	1.75	2.00	2.25	2.52	3.68
One-Hour Rainfall Depth (in)	0.030	0.113	0.073	0.094	0.111	0.131	0.150	0.171	0.262
CUHP Runoff Volume (acre-ft)	N/A	N/A	0.073	0.094	0.111	0.131	0.150	0.171	0.262
Inflow Hydrograph Volume (acre-ft)	N/A	N/A	0.0	0.0	0.0	0.3	0.5	0.8	2.0
CUHP Predevelopment Peak Q (cfs)	N/A	N/A	0.01	0.02	0.03	0.25	0.48	0.79	1.97
OPTIONAL Override Predevelopment Peak Q (cfs)	N/A	N/A	0.01	0.02	0.03	0.25	0.48	0.79	1.97
Predevelopment Unit Peak Flow, q (cfs/acre)	N/A	N/A	1.6	2.1	2.4	2.9	3.4	3.8	5.8
Peak Inflow Q (cfs)	0.0	6.2	1.1	1.8	2.1	2.6	2.6	2.6	3.8
Peak Outflow Q (cfs)	N/A	N/A	N/A	90.4	75.4	10.2	5.4	3.4	1.9
Ratio Peak Outflow to Predevelopment Q	Plate	Outlet Plate 1	Overflow Weir 1	Overflow Weir 1	Overflow Weir 1	Outlet Plate 1	Outlet Plate 1	Outlet Plate 1	Spillway
Structure Controlling Flow	N/A	0.39	0.17	0.3	0.3	0.4	0.4	0.4	0.4
Max Velocity through Gate 1 (fps)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Max Velocity through Gate 2 (fps)	42	37	40	38	37	35	34	33	28
Time to Drain 97% of Inflow Volume (hours)	44	43	45	45	44	43	43	42	39
Time to Drain 99% of Inflow Volume (hours)	2.74	3.56	2.91	2.97	2.99	3.06	3.22	3.37	3.91
Maximum Ponding Depth (ft)	0.02	0.06	0.03	0.03	0.03	0.03	0.04	0.05	0.07
Area at Maximum Ponding Depth (acres)	0.030	0.061	0.034	0.036	0.036	0.039	0.045	0.051	0.084
Maximum Volume Stored (acre-ft)									

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.

Time Interval	SOURCE	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP
	TIME	WOCV [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

PRELIMINARY
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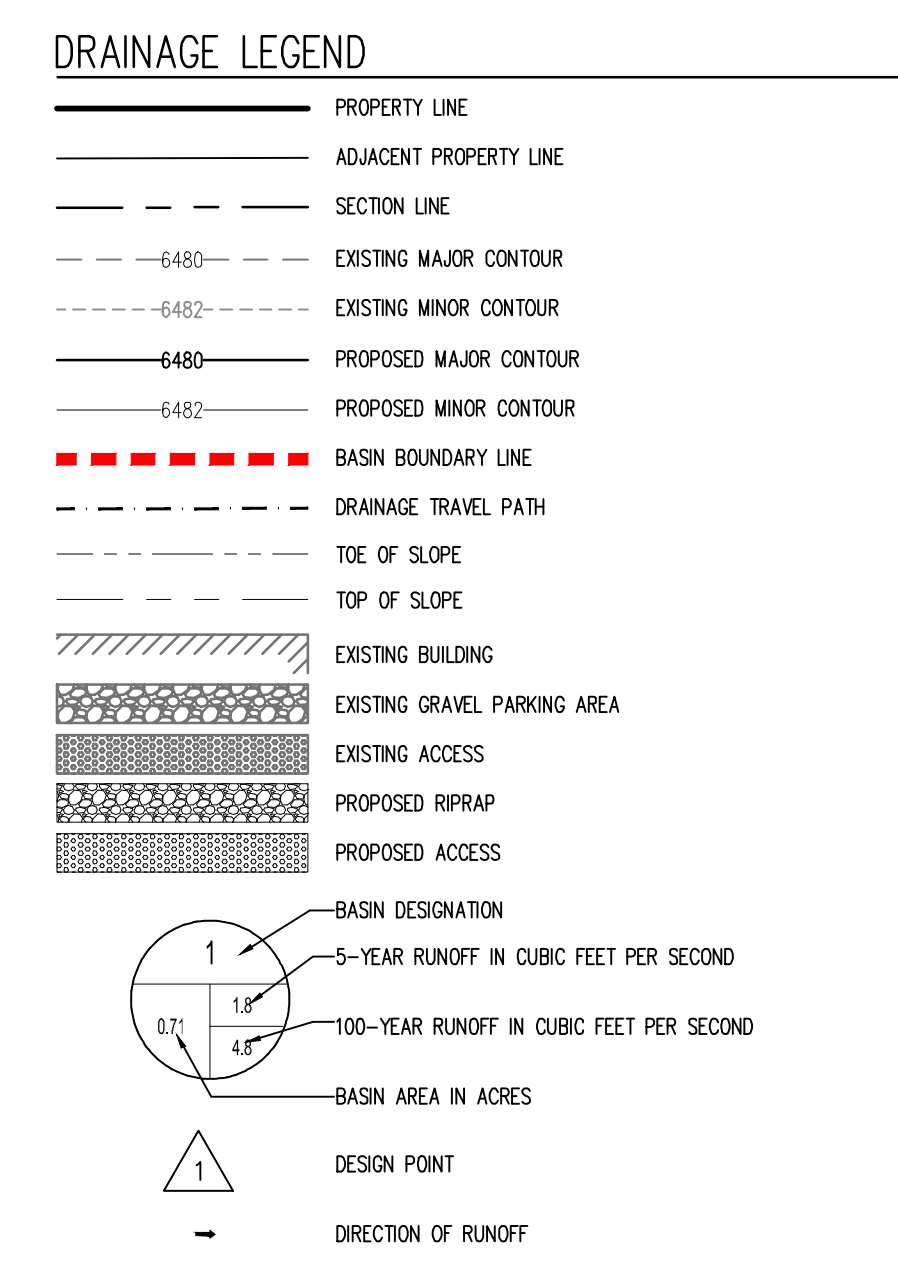
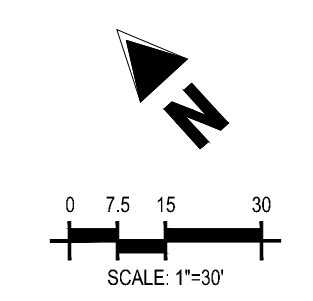
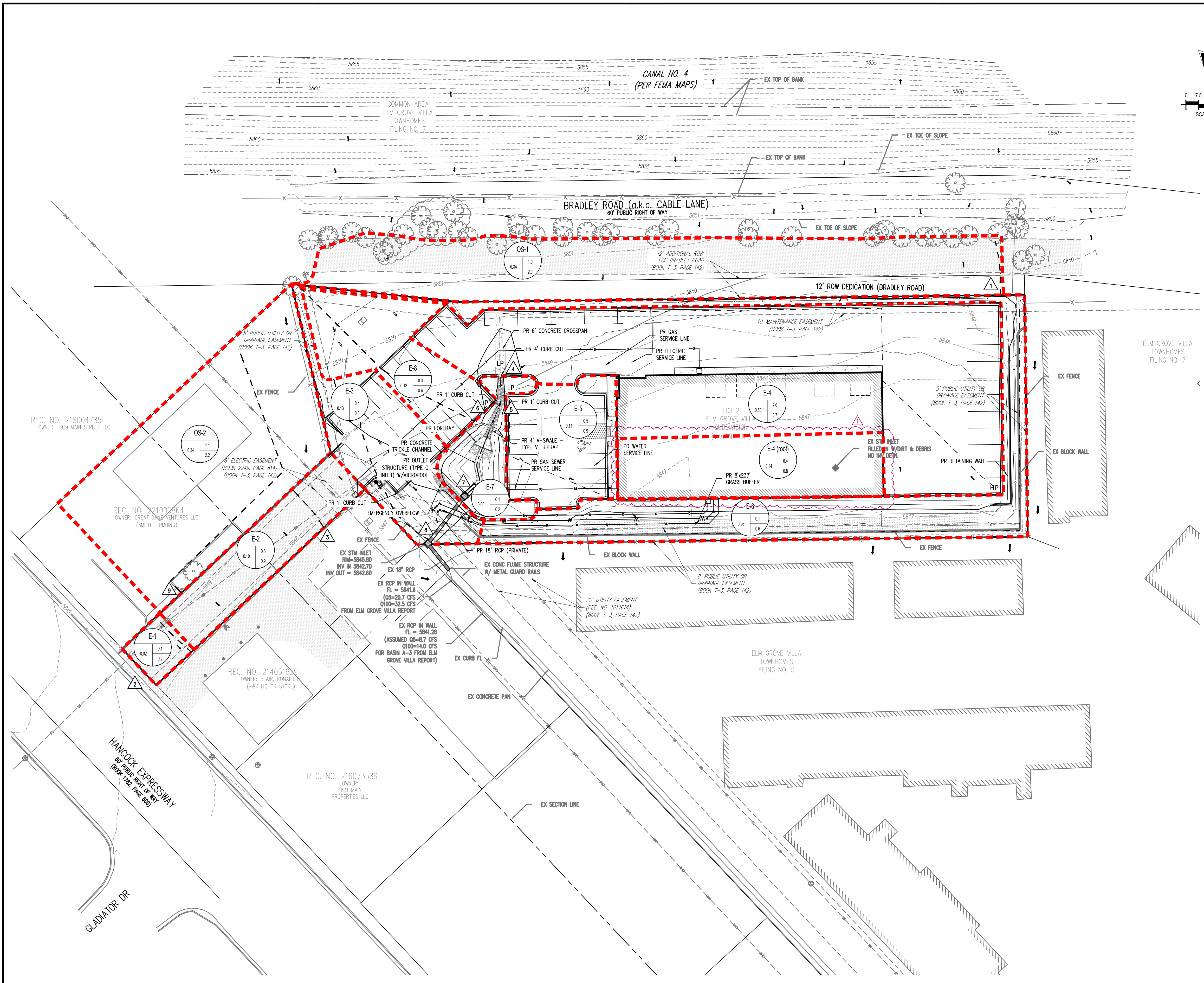
FINAL DRAINAGE REPORT
SMITH PLUMBING & HEATING
FOR
HAMMERS CONSTRUCTION
 1875 MAIN STREET
 COLORADO SPRINGS, CO 80911 - EL PASO COUNTY

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

Project No: HCl000007
 Drawn By: DDJ
 Checked By: GD
 Date: 03/24/2022

PROPOSED DRAINAGE MAP

DR-2



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

11/19/2024 10:00 AM C:\Users\ddj\OneDrive\Documents\Projects\2024\1875 Main Street\1875 Main Street.dwg (PLOT)

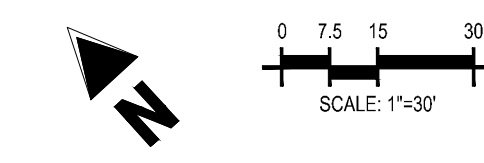
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**FINAL DRAINAGE REPORT
 SMITH PLUMBING & HEATING
 FOR
 HAMMERS CONSTRUCTION**
 1875 MAIN STREET
 COLORADO SPRINGS, CO 80911 - EL PASO COUNTY

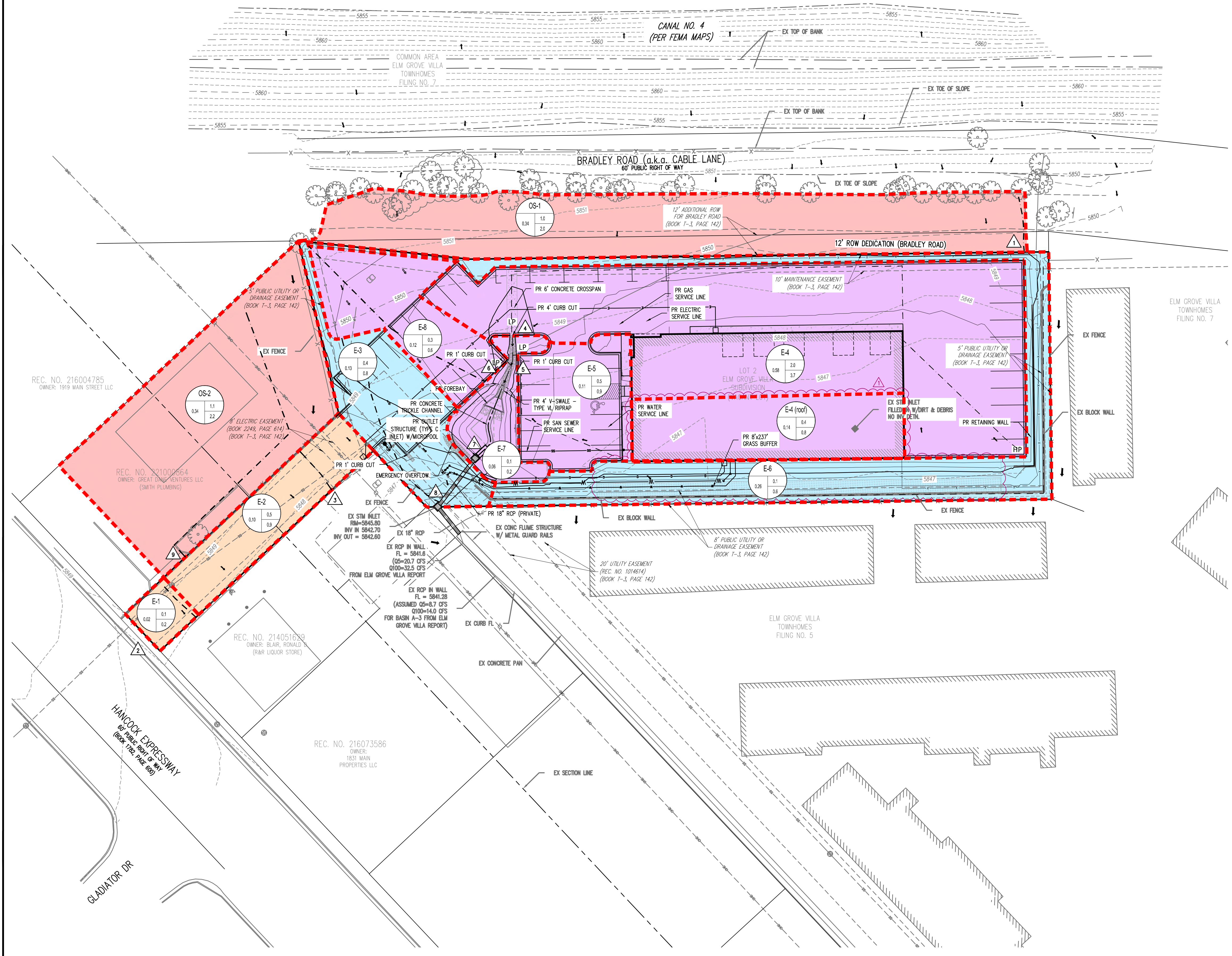
#	Date	Issue / Description	Init.
1	09/10/2024	ADDED ROOF DRAIN BASIN	BAS

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



DRAINAGE LEGEND

- 6485 — 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 PMBP
- Area to be Treated with Grass Buffer
- Area (Unchanged) Not Detained in PMBP per Section 17.1.C.1
- Area (Developed) Not Detained in PMBP per Section 17.1.C.1 (20% up to 1 ac. of development site can be excluded, due to topography)
- BASIN DESIGNATION
- 100-YEAR RUNOFF IN CUBIC FEET PER SECOND
- BASIN AREA IN ACRES
- DESIGN POINT



11/12/2021 11:00 AM C:\Users\DDJ\OneDrive - Galloway\Documents\Projects\HCI000007\Drawings\WQ PLAN.dwg (PLOT) Plot Date: 11/12/2021 11:00 AM Plot Scale: 1"=30' Plot Size: 24" x 36" Plot Orientation: Landscape

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)
Coefficients 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

SUB-BASIN						INITIAL/OVERLAND			TRAVEL TIME					T _c CHECK			FINAL
DATA						(T _i)			(T _t)					(URBANIZED BASINS)			
BASIN ID	D.A. (AC)	Hydrologic Soils Group	Impervious (%)	C ₅	C ₁₀₀	L (FT)	S (%)	T _i (MIN)	L (FT)	S (%)	C _v	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 $V = C_v * S^{0.5}$, 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	C _v
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: PROPOSED CONDITIONS
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.: HC1000008
Calculated By: BAS
Checked By: TJE
Date: 9/10/24

STREET	Design Point	DIRECT RUNOFF							TOTAL RUNOFF				STREET		PIPE			TRAVEL TIME			REMARKS
		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)	
	1	OS-1	0.34	0.57	5.4	0.19	5.05	1.0													Offsite flows north of property directed southeast per existing report
	9	OS-2	0.34	0.67	6.0	0.23	4.90	1.1													Offsite 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 entrance 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 existing 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

STREET	Design Point	DIRECT RUNOFF							TOTAL RUNOFF				STREET		PIPE			TRAVEL TIME			REMARKS
		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)	
	1	OS-1	0.34	0.71	5.4	0.24	8.48	2.0													Offsite flows north of property directed southeast per existing report
	9	OS-2	0.34	0.78	6.0	0.27	8.22	2.2													Offsite 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 entrance 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 existing 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	ft ³ /s

Results

Normal Depth	0.41	ft
Flow Area	0.17	ft ²
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	ft ³ /s
Discharge Full	0.80	ft ³ /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