

Civil Engineer
Stormwater Best Management Practice (Permanent) Certification Letter

December 3rd, 2021

El Paso County
Planning and Community Development
2880 International Circle, Suite 110
Colorado Springs, CO 80910

Attn.: Jeff Rice
Engineer III-Permanent WQ Structures

Gentlemen:

Site visits were made by M&S Civil Consultants on 2/5/21, 6/11/21, 12/1/21, and 12/2/21 to review the construction of the Sand Filter Water Quality Pond, Pond 2, located on the southwestern end of Claremont Business Park 2 Filing No. 1. The pond has been constructed conforming to the appropriate size and design of all structures. Pond volume has been surveyed and confirmed to be adequate.

Statement Of Engineer In Responsible Charge:

To the best of my knowledge, information, and belief, the referenced Claremont Business Park 2 Filing No. 1 onsite Water Quality improvements have been constructed in general compliance with the approved design plans and specifications as filed with El Paso County.

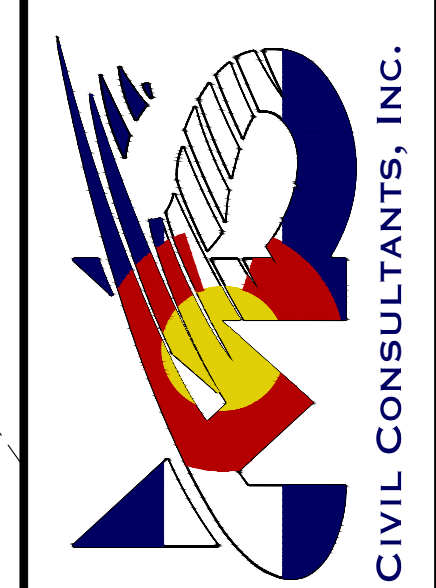


Virgil A. Sanchez P.E.
Colorado No. 37160
For and on Behalf of M&S Civil Consultants, Inc.

FOR LOCATING & MARKING GAS, ELECTRIC, WATER & TELEPHONE LINES
 FOR BURIED UTILITY INFORMATION 48 HRS BEFORE YOU DIG CALL 1-800-922-1987

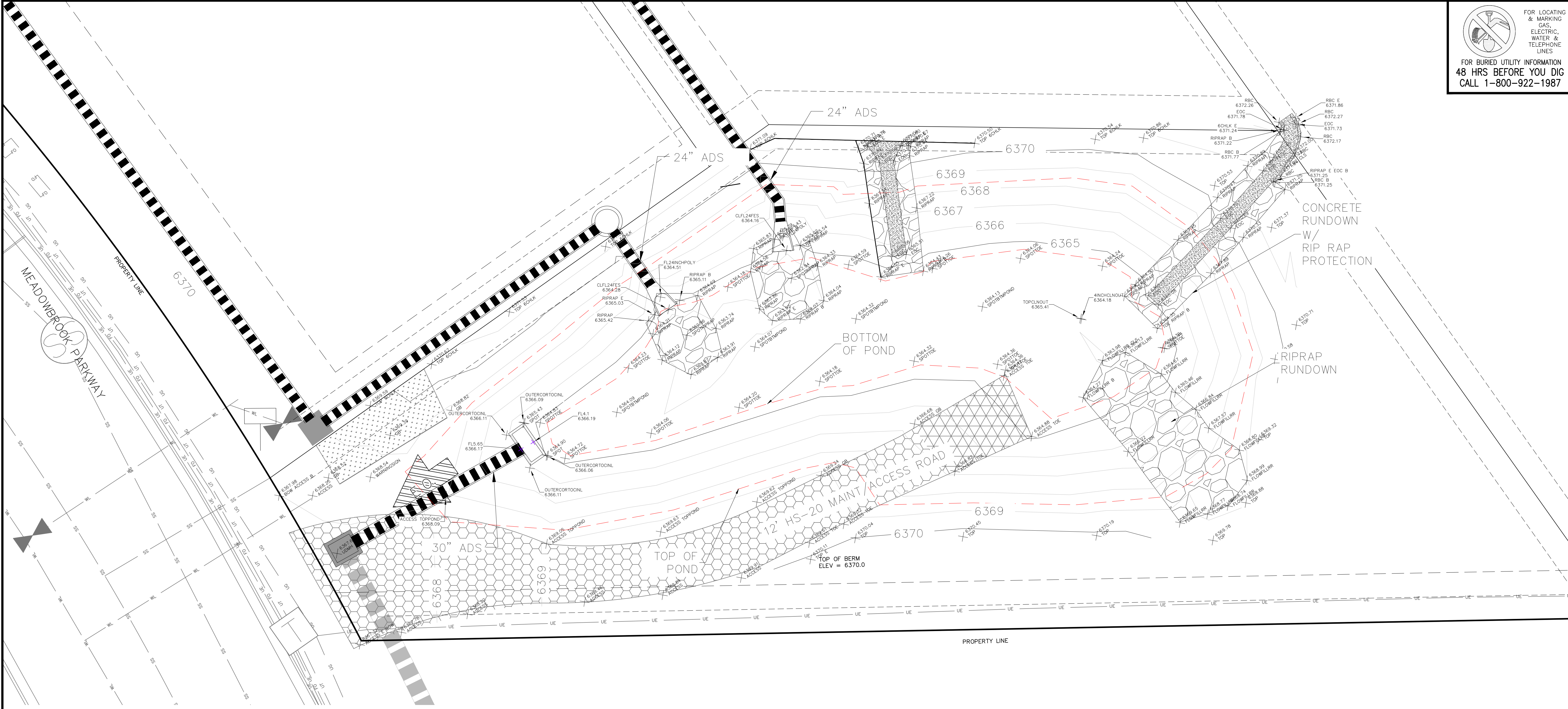
CLAREMONT BUSINESS PARK 2 FILING NO. 1
 WATER QUALITY POND 2 CERTIFICATION
 PROJECT NO. 44-037
 SCALE: HORIZONTAL: N/A VERTICAL: N/A
 DATE: 12/3/21
 SHEET 1 OF 1
 BMP01

212 N WAHATCH AVE, STE 303
 COLORADO SPRINGS, CO 80903
 PHONE: 719.555.5485



FOR AND ON BEHALF OF M&S CIVIL CONSULTANTS, INC.

VIRGIL A. SANCHEZ, COLORADO P.E. NO. 377160



SAND FILTER WATER QUALITY POND 2 (PRIVATE)

Pond 2 Certification

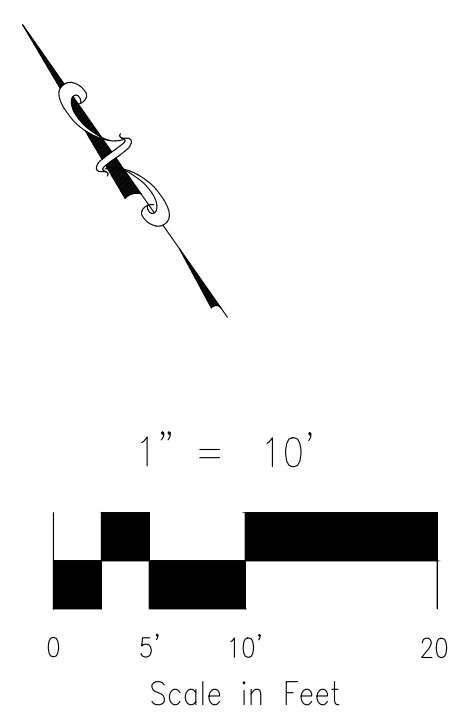
Inlet Pipes
 Designed 24" invert in = 6364.45', Survey 24" invert in = 6364.16'
 Designed 24" invert in = 6364.45', Survey 24" invert in = 6364.28'

Outlet Structure Grated Inlet
 Designed Invert In = 6361.70', Survey Invert In = 6361.99'
 Designed 30" invert out = 6360.53', Survey 30" invert out = 6360.52
 Design Top Conc. Grate = 6366.20, Survey Top Conc. Grate = 6366.11

Spillway = Grated Inlet
 Design Spillway elevation = 6367.74, Survey Spillway elevation = 6367.68

Design Volume = 0.299 Acre Feet @ 6367.38' (100 yr surface)

Provided Volume = 0.320 Acre Feet @ 6367.23' (100 yr surface)



- LEGEND**
- POND BOTTOM (6364.45)
 - EXIST MAJ CONT
 - EXIST MIN CONT
 - MAINTENANCE/ACCESS ROAD ABOVE EURV 8" CDOT CLASS 2
 - MAINTENANCE/ACCESS ROAD BELOW EURV 12" CDOT CLASS 2
 - RIPRAP RUNDOWN & LOW TAILWATER BASIN
 - SC150 NORTH AMERICAN GREEN EROSION CONTROL BLANKET OR EQUIVALENT
 - PROPERTY LINE
 - PROP STORM SEWER PIPE
 - EASEMENT LINE
 - EMERGENCY OVERTFLOW

NO.	DATE	BY	DESCRIPTION	APPROVED BY	DATE

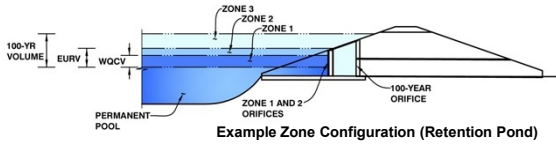
THE ENGINEER PREPARING THESE PLANS WILL NOT BE RESPONSIBLE OR LIABLE FOR UNAUTHORIZED CHANGES TO OR USES OF THESE PLANS. ALL CHANGES TO THE PLANS MUST BE IN WRITING AND MUST BE APPROVED BY THE PREPARER OF THESE PLANS.

CAUTION

PRE-CONSTRUCTION

DETENTION BASIN OUTLET STRUCTURE DESIGN

Project: **Claremont Business Park 2 Filing No.1** Version 4.02 (February 2020)
 Basin ID: **WQCV POND 2**



	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	1.72	0.142	Filtration Media
Zone 2 (100-year)	#VALUE!	0.818	Weir&Pipe (Restrict)
Zone 3			
Total (all zones)		0.960	

User Input: Orifice at Underdrain Outlet (typically used to drain WQCV in a Filtration BMP)
 Underdrain Orifice Invert Depth = 2.50 ft (distance below the filtration media surface)
 Underdrain Orifice Diameter = 1.66 inches
 Underdrain Orifice Area = 0.0 ft²
 Underdrain Orifice Centroid = 0.07 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)
 Invert of Lowest Orifice = N/A ft (relative to basin bottom at Stage = 0 ft)
 Depth at top of Zone using Orifice Plate = N/A ft (relative to basin bottom at Stage = 0 ft)
 Orifice Plate: Orifice Vertical Spacing = N/A inches
 Orifice Plate: Orifice Area per Row = N/A inches
 WQ Orifice Area per Row = N/A 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 (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)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Orifice Area (sq. inches)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

	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)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Orifice Area (sq. inches)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

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)		
Depth at top of Zone using Vertical Orifice =			ft (relative to basin bottom at Stage = 0 ft)		
Vertical Orifice Diameter =			inches		
Vertical Orifice Area =			ft ²		
Vertical Orifice Centroid =			feet		

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, H _o =	1.75		ft (relative to basin bottom at Stage = 0 ft)	1.75	
Overflow Weir Front Edge Length =	7.00		feet	2.91	
Overflow Weir Grate Slope =	0.00		H:V	6.47	
Horiz. Length of Weir Sides =	2.91		feet	14.26	
Overflow Grate Open Area % =	70%		%, grate open area/total area	7.13	
Debris Clogging % =	50%		%		

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 =	2.75		ft (distance below basin bottom at Stage = 0 ft)	2.20	
Outlet Pipe Diameter =	30.00		inches	0.67	
Restrictor Plate Height Above Pipe Invert =	13.80		inches	1.49	
Outlet Orifice Area =			ft ²		
Outlet Orifice Centroid =			feet		
Half-Central Angle of Restrictor Plate on Pipe =			radians		

User Input: Emergency Spillway (Rectangular or Trapezoidal)

Spillway Invert Stage =	3.00		ft (relative to basin bottom at Stage = 0 ft)	Spillway Design Flow Depth =	0.75
Spillway Crest Length =	12.50		feet	Stage at Top of Freeboard =	4.75
Spillway End Slopes =	4.00		H:V	Basin Area at Top of Freeboard =	0.18
Freeboard above Max Water Surface =	1.00		feet	Basin Volume at Top of Freeboard =	0.40

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	2.53
One-Hour Rainfall Depth (in)	0.142	0.593	0.521	0.713	0.877	1.080	1.254	1.466	1.473
CUHP Runoff Volume (acre-ft)	N/A	N/A	0.521	0.713	0.877	1.080	1.254	1.466	1.473
Inflow Hydrograph Volume (acre-ft)	N/A	N/A	1.2	3.2	4.8	8.5	10.7	13.3	13.4
CUHP Predevelopment Peak Q (cfs)	N/A	N/A							
OPTIONAL Override Predevelopment Peak Q (cfs)	N/A	N/A							
Predevelopment Unit Peak Flow, q (cfs/acre)	N/A	N/A	0.14	0.38	0.56	0.99	1.24	1.56	1.57
Peak Inflow Q (cfs)	N/A	N/A	10.5	14.4	17.1	21.3	24.8	29.5	29.6
Peak Outflow Q (cfs)	0.1	42.6	8.0	13.3	15.9	22.1	22.9	23.8	23.8
Ratio Peak Outflow to Predevelopment Q	N/A	N/A	N/A	4.1	3.3	2.6	2.2	1.8	1.8
Structure Controlling Flow	Filtration Media	Outlet Plate 1	Overflow Weir 1	Overflow Weir 1	Overflow Weir 1	Outlet Plate 1	Outlet Plate 1	Outlet Plate 1	Outlet Plate 1
Max Velocity through Grate 1 (fps)	N/A	1.53	0.54	0.9	1.1	1.5	1.6	1.7	1.7
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)	13	12	14	14	13	13	12	12	12
Time to Drain 99% of Inflow Volume (hours)	13	13	15	15	15	15	14	14	14
Maximum Ponding Depth (ft)	1.72	2.39	2.07	2.21	2.26	2.39	2.58	2.93	2.94
Area at Maximum Ponding Depth (acres)	0.11	0.13	0.12	0.13	0.13	0.13	0.14	0.15	0.15
Maximum Volume Stored (acre-ft)	0.143	0.223	0.183	0.199	0.207	0.224	0.250	0.299	0.302

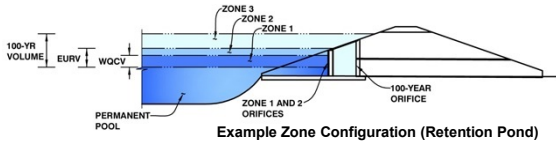
Per resolution 16-426 of the BoCC, on-site WQCV is required but on-site stormwater detention is not required per the FDR for Claremont Business Park Filing No. 2.

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.02 (February 2020)

Project: **CLAREMONT COMMERCIAL FILING NO.2**

Basin ID: **WQCV POND 2**



Example Zone Configuration (Retention Pond)

	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	1.45	0.142	Filtration Media
Zone 2 (100-year)	#VALUE!	0.818	Weir&Pipe (Restrict)
Zone 3			
Total (all zones)		0.960	

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

Underdrain Orifice Invert Depth =	2.41	ft (distance below the filtration media surface)
Underdrain Orifice Diameter =	1.66	inches

Underdrain Orifice Area =	0.0	ft ²
Underdrain Orifice Centroid =	0.07	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)

Invert of Lowest Orifice =	N/A	ft (relative to basin bottom at Stage = 0 ft)
Depth at top of Zone using Orifice Plate =	N/A	ft (relative to basin bottom at Stage = 0 ft)
Orifice Plate: Orifice Vertical Spacing =	N/A	inches
Orifice Plate: Orifice Area per Row =	N/A	inches

WQ Orifice Area per Row =	N/A	ft ²
Elliptical Half-Width =	N/A	feet
Elliptical Slot Centroid =	N/A	feet
Elliptical Slot Area =	N/A	ft ²

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)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Orifice Area (sq. inches)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

	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)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Orifice Area (sq. inches)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

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

Vertical Orifice Area =	Not Selected	Not Selected	ft ²
Vertical Orifice Centroid =			feet

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	
Overflow Weir Front Edge Height, H _o =	1.61		ft (relative to basin bottom at Stage = 0 ft)
Overflow Weir Front Edge Length =	7.00		feet
Overflow Weir Grate Slope =	0.00		H:V
Horiz. Length of Weir Sides =	2.91		feet
Overflow Grate Open Area % =	70%		%, grate open area/total area
Debris Clogging % =	50%		%

	Zone 2 Weir	Not Selected	
Height of Grate Upper Edge, H _g =	1.61		feet
Overflow Weir Slope Length =	2.91		feet
Grate Open Area / 100-yr Orifice Area =	6.47		
Overflow Grate Open Area w/o Debris =	14.26		ft ²
Overflow Grate Open Area w/ Debris =	7.13		ft ²

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

	Zone 2 Restrictor	Not Selected	
Depth to Invert of Outlet Pipe =	2.46		ft (distance below basin bottom at Stage = 0 ft)
Outlet Pipe Diameter =	30.00		inches
Restrictor Plate Height Above Pipe Invert =	13.80		inches

Outlet Orifice Area =	2.20		ft ²
Outlet Orifice Centroid =	0.67		feet
Half-Central Angle of Restrictor Plate on Pipe =	1.49	N/A	radians

User Input: Emergency Spillway (Rectangular or Trapezoidal)

Spillway Invert Stage =	3.23	ft (relative to basin bottom at Stage = 0 ft)
Spillway Crest Length =	12.50	feet
Spillway End Slopes =	4.00	H:V
Freeboard above Max Water Surface =	1.00	feet

Spillway Design Flow Depth =	0.75	feet
Stage at Top of Freeboard =	4.98	feet
Basin Area at Top of Freeboard =	0.21	acres
Basin Volume at Top of Freeboard =	0.48	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	2.53
One-Hour Rainfall Depth (in) =	N/A	N/A	0.521	0.713	0.877	1.080	1.254	1.466	1.473
CUHP Runoff Volume (acre-ft) =	0.142	0.593	0.521	0.713	0.877	1.080	1.254	1.466	1.473
Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	1.2	3.2	4.8	8.5	10.7	13.3	13.4
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	0.14	0.38	0.56	0.99	1.24	1.56	1.57
Peak Inflow Q (cfs) =	N/A	N/A	10.5	14.4	17.1	21.3	24.8	29.5	29.6
Peak Outflow Q (cfs) =	0.1	30.1	7.4	11.9	15.3	20.1	21.8	22.7	22.7
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	3.7	3.2	2.4	2.0	1.7	1.7
Structure Controlling Flow =	Filtration Media	Outlet Plate 1	Overflow Weir 1	Overflow Weir 1	Overflow Weir 1	Overflow Weir 1	Outlet Plate 1	Outlet Plate 1	Outlet Plate 1
Max Velocity through Grate 1 (fps) =	N/A	1.54	0.52	0.8	1.1	1.4	1.5	1.6	1.6
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) =	13	14	16	16	15	15	14	13	13
Time to Drain 99% of Inflow Volume (hours) =	13	15	17	17	17	17	17	16	16
Maximum Ponding Depth (ft) =	1.45	2.57	1.92	2.03	2.11	2.21	2.42	2.78	2.79
Area at Maximum Ponding Depth (acres) =	0.13	0.17	0.15	0.15	0.15	0.16	0.16	0.18	0.18
Maximum Volume Stored (acre-ft) =	0.142	0.308	0.206	0.224	0.236	0.251	0.283	0.345	0.346

SPILLWAY LOCATION AND POND OVERVIEW



RUNDOWNS 1/2



RUNDOWNS 2/2



OUTLET STRUCTURE 1/3



OUTLET STRUCTURE 2/3



OUTLET STRUCTURE 3/3

