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 | DESIGNED BY: GW | DRAWN BY: CVW | CHECKED BY: VAS | SCALE: HORIZONTAL: N/A VERTICAL: N/A | DATE: 12/3/21 | SHEET 1 OF 1 | BMP01

212 N. WAHSATCH AVE., STE 305
COLORADO SPRINGS, CO 80903
PHONE: 719.955.5485

CIVIL CONSULTANTS, INC.

FOR AND ON BEHALF OF MCS CIVIL CONSULTANTS, INC.

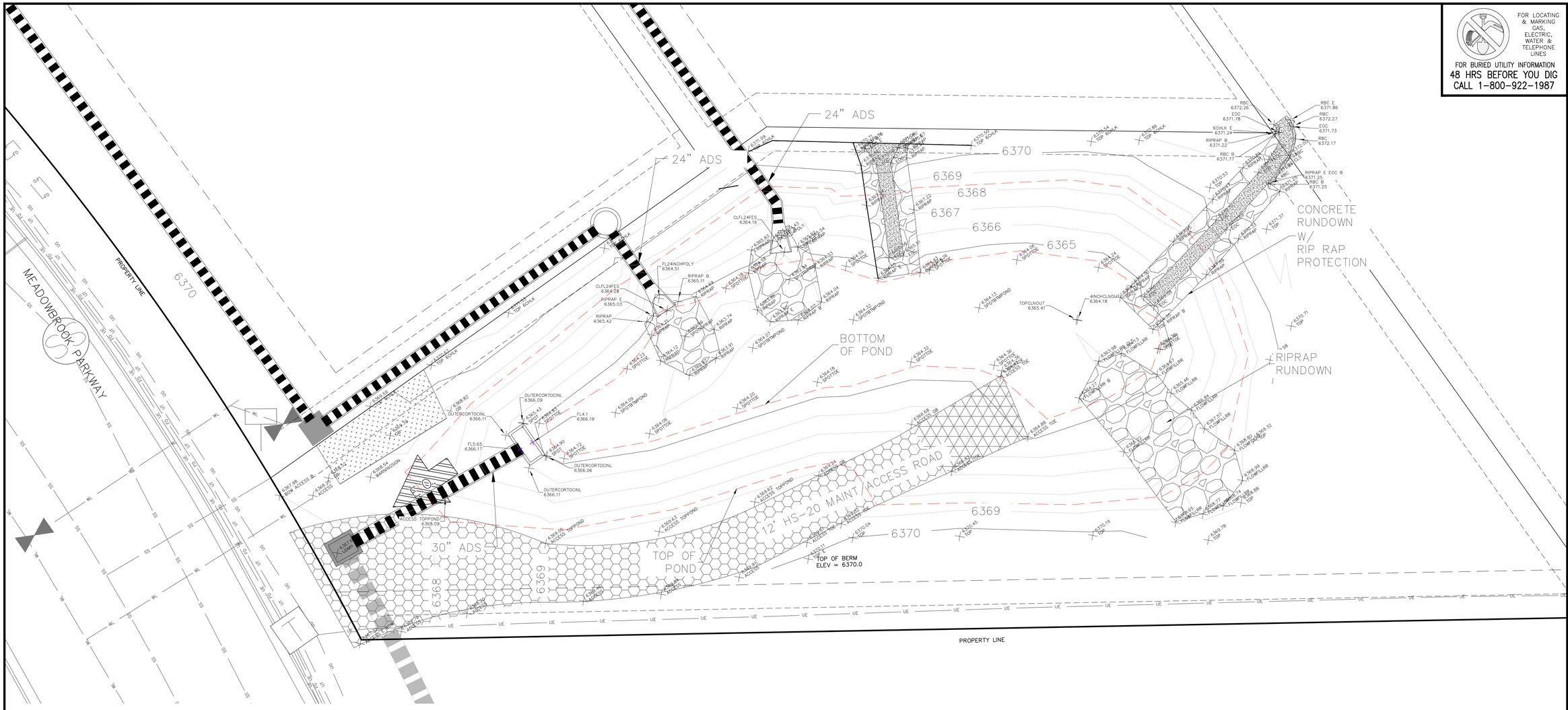
VIRGIL A. SANCHEZ, COLORADO P.E. NO. 37160

REVISIONS:

NO.	DATE:	BY:	DESCRIPTION:	APPV'D. 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



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)

1" = 10'

0 5' 10' 20'
Scale in Feet

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 OVERFLOW

File: O:\44037A-CBP F2-Lots 1-8\44037A-CBP F2-Lots 1-8\dwg\Eng Exhibits\BMP AS BUILT-CERTIFICATION.dwg Plotstamp: 12/3/2021 12:48 PM

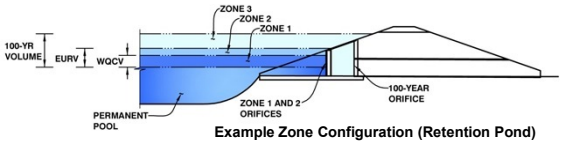
PRE-CONSTRUCTION

DETENTION BASIN OUTLET STRUCTURE DESIGN

Version 4.02 (February 2020)

Project: Claremont Business Park 2 Filing No.1

Basin ID: WQCV POND 2



Example Zone Configuration (Retention Pond)

	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 Area =	0.0	ft^2
Underdrain Orifice Diameter =	1.66	inches	Underdrain Orifice Centroid =	0.07	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)

Invert of Lowest Orifice =	N/A	ft (relative to basin bottom at Stage = 0 ft)	WQ Orifice Area per Row =	N/A	ft^2
Depth at top of Zone using Orifice Plate =	N/A	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 =	N/A	inches	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 (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)	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 =	1.75		ft (relative to basin bottom at Stage = 0 ft)	Height of Grate Upper Edge, H_t =	1.75		feet
Overflow Weir Front Edge Length =	7.00		feet	Overflow Weir Slope Length =	2.91		feet
Overflow Weir Grate Slope =	0.00		H:V	Grate Open Area / 100-yr Orifice Area =	6.47		
Horiz. Length of Weir Sides =	2.91		feet	Overflow Grate Open Area w/o Debris =	14.26		ft^2
Overflow Grate Open Area % =	70%		%, grate open area/total area	Overflow Grate Open Area w/ Debris =	7.13		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 =	2.75		ft (distance below basin bottom at Stage = 0 ft)	Outlet Orifice Area =	2.20		ft^2
Outlet Pipe Diameter =	30.00		inches	Outlet Orifice Centroid =	0.67		feet
Restrictor Plate Height Above Pipe Invert =	13.80		inches	Half-Central Angle of Restrictor Plate on Pipe =	1.49	N/A	radians

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate

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	feet
Spillway Crest Length =	12.50	feet	Stage at Top of Freeboard =	4.75	feet
Spillway End Slopes =	4.00	H:V	Basin Area at Top of Freeboard =	0.18	acres
Freeboard above Max Water Surface =	1.00	feet	Basin Volume at Top of Freeboard =	0.40	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	2.53
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	0.521	0.713	0.877	1.080	1.254	1.466	1.473
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	1.2	3.2	4.8	8.5	10.7	13.3	13.4
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	15	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.

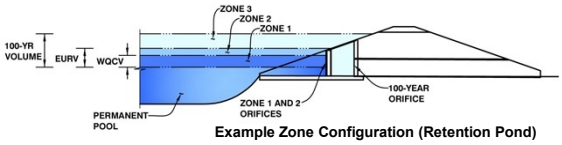
AS-BUILT

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 Area =	0.0	ft^2
Underdrain Orifice Diameter =	1.66	inches	Underdrain Orifice Centroid =	0.07	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)

Invert of Lowest Orifice =	N/A	ft (relative to basin bottom at Stage = 0 ft)	WQ Orifice Area per Row =	N/A	ft^2
Depth at top of Zone using Orifice Plate =	N/A	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 =	N/A	inches	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 (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)	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	
Overflow Weir Front Edge Height, Ho =	1.61		ft (relative to basin bottom at Stage = 0
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%		%

Calculated Parameters for Overflow Weir

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page 9 of 13 of latest as-builts shows a difference of 0.09ft between designed and as-built. But these calc sheets show a difference of 0.14ft. Please revise to remove discrepancy.

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 =	2.46		ft (distance below basin bottom at Stage = 0 ft)	Outlet Orifice Area =	2.20		ft^2
Outlet Pipe Diameter =	30.00		inches	Outlet Orifice Centroid =	0.67		feet
Restrictor Plate Height Above Pipe Invert =	13.80		inches	Half-Central Angle of Restrictor Plate on Pipe =	1.49	N/A	radians

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate

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

page 9 of 13 of latest as-builts shows a difference of 0.06ft between designed and as-built. But these calc sheets show a difference of 0.23ft. Please revise to remove discrepancy.

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	2.53
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	0.521	0.713	0.877	1.080	1.254	1.466	1.473
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	1.2	3.2	4.8	8.5	10.7	13.3	13.4
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	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