



El Paso County MS4 Post Construction Detention / Water Quality Facility Documentation Form

This document **must be completed and submitted** with required attachments to the County for projects requiring a detention and/or a water quality facility. A separate completed form must be submitted for each facility.

Project name: The Hills at Lorson Ranch– Pond C4

Owner name: Lorson Ranch Metropolitan District

Location Address: 212 N. Wahsatch Avenue, Suite 301

Latitude and Longitude:

Latitude: 38°44'34.40"N, Longitude: 104°36'54.20"W

Assessor's Parcel #: 55000002754 Section: 13 Township: 15 South Range: 65 West

Expected Completion date: August, 2020

Project acreage: 123.167 acres **81 Ac. cont.** Design Ponding Acres: 1.59acres Design Storm: 100-year

Design Engineer Email Address: rich@ceg1.com

To ensure compliance with C.R.S. 37-92-602(8), the completed Stormwater Detention and Infiltration Design Data Sheet **must be attached**. The form can be found here: <https://maperture.digitaldataservices.com/gvh/?viewer=cswdif#> (click on Download SDI Design Data Sheet)

List all permanent water quality control measure(s) (EDBs, rain gardens, etc):

Pond C3 is an Extended Detention Basin with only existing undeveloped overland flows entering the pond. An outlet structure for Water quality capture volume will be added when upstream development occurs. The detention pond has been sized in accordance with future full spectrum designs requirements for fully developed tributary areas. The interim outlet structure is a RCP storm sewer.

For all projects for which the constrained redevelopment sites standard is applied, provide an explanation of why it is not practicable to meet the full design standards. Answer: full design standards will be achieved when tributary area is developed and a full spectrum outlet structure is constructed.

Attach Operations and Maintenance (O&M) Plan describing the operation and maintenance procedures that ensure the long-term observation, maintenance, and operation of control measure(s), including routine inspection frequencies and maintenance activities. If multiple, different water quality control measures are used at the same location, a separate O & M Plan must be provided for each facility.

Attach Private Detention Basin / Stormwater Quality Best Management Practice Maintenance Agreement and Easement addressing maintenance of BMPs that shall be binding on all subsequent owners of the permanent BMPs.

Attachments:

Stormwater Detention and Infiltration Design Data Sheet
O & M Plan
Maintenance and Access Agreement

Review Engineer

JDR

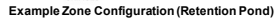
EPC Project File No.

PUDSP20003

MHFD-Detention, Version 4.02 (February 2020)

dsdnijkamp

Basin ID: Pond C4



Depth Increment =	0.20	ft
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Selected BMP Type =	EDB	
Watershed Area =	81.00	acres
Watershed Length =	2,300	ft
Watershed Length to Centroid =	1,200	ft
Watershed Slope =	0.050	ft/ft
Watershed Imperviousness =	55.00%	percent
Percentage Hydrologic Soil Group A =	0.0%	percent
Percentage Hydrologic Soil Group B =	40.0%	percent
Percentage Hydrologic Soil Groups C/D =	60.0%	percent
Target WQCV Drain Time =	40.0	hours
Location for 1-hr Rainfall Depths = User Input		

Optional User Overrides

Water Quality Capture Volume (WQCV) =	1.488	acre-feet
Excess Urban Runoff Volume (EURV) =	4.468	acre-feet
2-yr Runoff Volume ($P_1 = 1.19$ in.) =	4.607	acre-feet
5-yr Runoff Volume ($P_1 = 1.5$ in.) =	6.475	acre-feet
10-yr Runoff Volume ($P_1 = 1.75$ in.) =	8.109	acre-feet
25-yr Runoff Volume ($P_1 = 2.2$ in.) =	10.045	acre-feet
50-yr Runoff Volume ($P_1 = 2.5$ in.) =	11.748	acre-feet
100-yr Runoff Volume ($P_1 = 2.52$ in.) =	13.830	acre-feet
500-yr Runoff Volume ($P_1 = 3.14$ in.) =	18.178	acre-feet
Approximate 2-yr Detention Volume =	3.723	acre-feet
Approximate 5-yr Detention Volume =	5.293	acre-feet
Approximate 10-yr Detention Volume =	6.364	acre-feet
Approximate 25-yr Detention Volume =	6.876	acre-feet
Approximate 50-yr Detention Volume =	7.136	acre-feet
Approximate 100-yr Detention Volume =	7.948	acre-feet

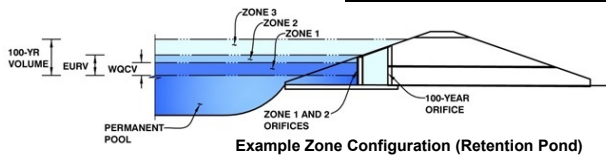
Zone 1 Volume (WQVQ) =	1.488	acre-feet
Zone 2 Volume (EURV - Zone 1) =	2.980	acre-feet
Zone 3 (100yr + 1 / 2 WQVQ - Zones 1 & 2) =	4.225	acre-feet
Total Detention Basin Volume =	8.692	acre-feet
Initial Surge Volume (ISV) =	user	ft ³
Initial Surge Depth (ISD) =	user	ft
Total Available Detention Depth (H_{Dmax}) =	user	ft
Depth of Trickle Channel (H_{TC}) =	user	ft
Slope of Trickle Channel (S_{TC}) =	user	ft/ft
Slopes of Main Basin Channels (S_{main}) =	user	ft/V
Basin Length-to-Width Ratio ($R_{L/W}$) =	user	

Initial Surcharge Area (A_{SV})	=	user	ft ²
Surcharge Volume Length (L_{SV})	=	user	ft
Surcharge Volume Width (W_{SV})	=	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_{TBL})	=	user	acre-feet

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.02 (February 2020)

Project: **The Hills at Lorson Ranch**
Basin ID: **Pond C4**



	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	2.97	1.488	Orifice Plate
Zone 2 (EURV)	5.41	2.980	Rectangular Orifice
Zone 3 (100+1/2WQCV)	8.40	4.225	Weir&Pipe (Restrict)
Total (all zones)		8.692	

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)

Invert of Lowest Orifice = ft (relative to basin bottom at Stage = 0 ft)
Depth at top of Zone using Orifice Plate = ft (relative to basin bottom at Stage = 0 ft)
Orifice Plate: Orifice Vertical Spacing = inches
Orifice Plate: Orifice Area per Row = sq. inches (use rectangular openings)

Calculated Parameters for Plate

WQ Orifice Area per Row = ft²
Elliptical Half-Width = feet
Elliptical Slot Centroid = feet
Elliptical Slot Area = 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)	0.00	0.99	1.98					
Orifice Area (sq. inches)	4.68	4.68	4.68					

	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 = 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 Height = inches
Vertical Orifice Width = inches

Calculated Parameters for Vertical Orif

Vertical Orifice Area = ft²
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)

Overflow Weir Front Edge Height, H_o = ft (relative to basin bottom at Stage = 0 ft)
Overflow Weir Front Edge Length = feet
Overflow Weir Grate Slope = H:V
Horiz. Length of Weir Sides = feet
Overflow Grate Open Area % =
Debris Clogging % =

Calculated Parameters for Overflow We

Height of Grate Upper Edge, H_u = ft
Overflow Weir Slope Length = feet
Grate Open Area / 100-yr Orifice Area =
Overflow Grate Open Area w/o Debris =
Overflow Grate Open Area w/ Debris =

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

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

Calculated Parameters for Outlet Pipe w/ Flow Restriction Pl

Outlet Orifice Area = ft²
Outlet Orifice Centroid = feet
Half-Central Angle of Restrictor Plate on Pipe = degrees

User Input: Emergency Spillway (Rectangular or Trapezoidal)

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

Calculated Parameters for Spillway

Spillway Design Flow Depth = feet
Stage at Top of Freeboard = feet
Basin Area at Top of Freeboard = acres
Basin Volume at Top of Freeboard = acre-ft

micropool = 0 = 5765

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
Design Storm Return Period	N/A	N/A	1.19	1.50	1.75	2.00	2.25	2.52
One-Hour Rainfall Depth (in)	N/A	N/A	1.19	1.50	1.75	2.00	2.25	2.52
CUHP Runoff Volume (acre-ft)	1.488	4.468	4.607	6.475	8.109	10.045	11.748	13.830
Inflow Hydrograph Volume (acre-ft)	N/A	N/A	4.607	6.475	8.109	10.045	11.748	13.830
CUHP Predevelopment Peak Q (cfs)	N/A	N/A	17.5	39.6	56.8	90.6	111.9	138.5
OPTIONAL Override Predevelopment Peak Q (cfs)	N/A	N/A						
Predevelopment Unit Peak Flow, q (cfs/acre)	N/A	N/A	0.22	0.49	0.70	1.12	1.38	1.71
Peak Inflow Q (cfs)	N/A	N/A	93.5	131.6	158.6	200.0	232.9	277.2
Peak Outflow Q (cfs)	0.6	5.8	5.3	16.5	34.4	38.0	40.5	43.7
Ratio Peak Outflow to Predevelopment Q	N/A	N/A	N/A	0.4	0.6	0.4	0.4	0.3
Structure Controlling Flow	Vertical Orifice 1	Vertical Orifice 1	Vertical Orifice 1	Overflow Weir 1	Outlet Plate 1	Outlet Plate 1	Outlet Plate 1	Outlet Plate 1
Max Velocity through Grate 1 (fps)	N/A	N/A	N/A	0.4	1.1	1.2	1.3	1.4
Max Velocity through Grate 2 (fps)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Time to Drain 97% of Inflow Volume (hours)	39	48	49	49	47	45	44	42
Time to Drain 99% of Inflow Volume (hours)	40	52	53	54	53	53	53	52
Maximum Ponding Depth (ft)	2.97	5.41	5.00	5.84	6.17	7.31	8.15	9.34
Area at Maximum Ponding Depth (acres)	1.14	1.31	1.28	1.34	1.36	1.44	1.50	1.59
Maximum Volume Stored (acre-ft)	1.488	4.477	3.934	5.031	5.476	7.083	8.317	10.152

Stormwater Detention and Infiltration Design Data Sheet

Worksheet Protected

User Input: Watershed Characteristics

Watershed Slope = 0.050 ft/ft

Watershed Length = 2300 ft

Watershed Area =	81.00	acres
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Watershed Imperviousness = 55.0% percent

Percentage Hydrologic Soil Group A = percent

Percentage Hydrologic Soil Group B = 40.0% percent

Percentage Hydrologic Soil Groups C/D = 60.0% percent

Location for 1-hr Rainfall Depths (use dropdown):

Denver - Capitol Building

WQCV Treatment Method = Extended Detention ▼

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After completing and printing this worksheet to a pdf, go to:

<https://maperture.digitaldataservices.com/gvh/?viewer=cswdif>

create a new stormwater facility, and

attach the pdf of this worksheet to that record.

Routed Hydrograph Results

Design Storm Return Period =		WQCV	2 Year	5 Year	10 Year	50 Year	100 Year	
One-Hour Rainfall Depth =	0.53	0.83	1.09	1.33	1.99	2.31		in
Calculated Runoff Volume =	1.488	2.754	4.087	5.506	10.207	12.709		acre-ft
OPTIONAL Override Runoff Volume =								acre-ft
Inflow Hydrograph Volume =	1.487	2.754	4.086	5.502	10.198	12.700		acre-ft
Time to Drain 97% of Inflow Volume =	40.1	47.4	49.0	48.6	44.6	42.7		hours
Time to Drain 99% of Inflow Volume =	41.8	50.2	52.8	53.5	52.4	52.0		hours
Maximum Ponding Depth =	2.90	3.83	4.76	5.51	7.67	8.94		ft
Maximum Poned Area =	1.12	1.20	1.26	1.31	1.46	1.56		acres
Maximum Volume Stored =	1.404	2.481	3.626	4.592	7.587	9.506		acre-ft

Stormwater Detention and Infiltration Design Data Sheet

