



Engineers/Surveyors

**Colorado Springs
Lafayette**

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Drexel, Barrell & Co.

October 17, 2023

El Paso County
Department of Public Works
3275 Akers Drive
Colorado Springs, CO 80922

Attn: Jeff Rice, P.E.

RE: Windermere Filing No. 1
Certification Letter

Mr. Rice,

Based upon information gathered from periodic site visits during significant/key phases of the project development, Drexel, Barrell & Co., is of the opinion that the subdivision improvements have been constructed in general conformance with the approved design plans as filed with El Paso County.

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 development improvements, site grading and paving) meet or exceed the minimum design requirements.

Drainage improvements for the site consist of two Extended Detention Basins. The facilities have been constructed in general compliance with the approved Erosion Control and Stormwater Quality Plan. The facilities provide the required storage volume and meet the required release rates as documented by the attached MHFD design forms. The Engineering Record Drawings accurately depict the installation of the facilities and verify the detention volume provided.

Tim D. McConnell, P.E.
Colorado No. 33797



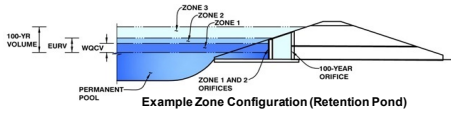
EPC STORMWATER REVIEW COMMENTS
IN ORANGE BOXES WITH BLACK TEXT

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.04 (February 2021)

Project: **Windermere Filing No. 1**

Basin ID: **North Pond**



NORTH POND DESIGN

Watershed Information

Selected BMP Type =	EDB
Watershed Area =	133.15 acres
Watershed Length =	4,000 ft
Watershed Length to Centroid =	600 ft
Watershed Slope =	0.025 ft/ft
Watershed Imperviousness =	40.70% 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 WQC 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) =	2.016 acre-feet
Excess Urban Runoff Volume (EURV) =	5.899 acre-feet
2-yr Runoff Volume (P1 = 1.19 in.) =	4.477 acre-feet
5-yr Runoff Volume (P1 = 1.5 in.) =	6.022 acre-feet
10-yr Runoff Volume (P1 = 1.75 in.) =	7.245 acre-feet
25-yr Runoff Volume (P1 = 2 in.) =	9.501 acre-feet
50-yr Runoff Volume (P1 = 2.25 in.) =	11.710 acre-feet
100-yr Runoff Volume (P1 = 2.52 in.) =	14.604 acre-feet
500-yr Runoff Volume (P1 = 3.49 in.) =	24.649 acre-feet
Approximate 2-yr Detention Volume =	3.759 acre-feet
Approximate 5-yr Detention Volume =	4.975 acre-feet
Approximate 10-yr Detention Volume =	6.130 acre-feet
Approximate 25-yr Detention Volume =	7.597 acre-feet
Approximate 50-yr Detention Volume =	8.584 acre-feet
Approximate 100-yr Detention Volume =	9.941 acre-feet

Optional User Overrides

	acre-feet
	inches
	inches
	inches
	inches
	inches
	inches
	inches

Define Zones and Basin Geometry

Zone 1 Volume (WQCV) =	2.016 acre-feet
Zone 2 Volume (EURV - Zone 1) =	3.883 acre-feet
Zone 3 Volume (100-year - Zones 1 & 2) =	4.043 acre-feet
Total Detention Basin Volume =	9.941 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 _{MAN}) =	user ft
Length of Main Basin (L _{MAN}) =	user ft
Width of Main Basin (W _{MAN}) =	user ft
Area of Main Basin (A _{MAN}) =	user ft ²
Volume of Main Basin (V _{MAN}) =	user ft ³
Calculated Total Basin Volume (V _{total}) =	user acre-feet

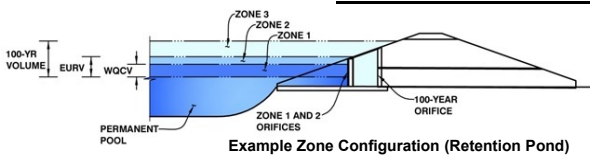
Stage - Storage Description	Stage (ft)	Optional Override Stage (ft)	Length (ft)	Width (ft)	Area (ft ²)	Optional Override Area (ft ²)	Area (acre)	Volume (ft ³)	Volume (ac-ft)
Top of Micropool	--	0.00	--	--	--	250	0.006		
6572	--	0.50	--	--	--	7,926	0.182	2,044	0.047
6576	--	4.50	--	--	--	135,531	3.111	288,957	6.634
6578	--	6.50	--	--	--	209,825	4.817	634,313	14.562
6579	--	7.50	--	--	--	220,020	5.051	849,236	19.496
6580	--	8.50	--	--	--	225,118	5.168	1,071,805	24.605

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.04 (February 2021)

Project: Windermere Filing No. 1

Basin ID: North Pond



	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	2.59	2.016	Orifice Plate
Zone 2 (EURV)	4.26	3.883	Orifice Plate
Zone 3 (100-year)	5.45	4.043	Weir&Pipe (Circular)
Total (all zones)		9.941	

NORTH POND DESIGN

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

Underdrain Orifice Invert Depth =	N/A	ft (distance below the filtration media surface)
Underdrain Orifice Diameter =	N/A	inches

Calculated Parameters for Underdrain

Underdrain Orifice Area =	N/A	ft ²
Underdrain Orifice Centroid =	N/A	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 =	0.00	ft (relative to basin bottom at Stage = 0 ft)
Depth at top of Zone using Orifice Plate =	4.26	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

Calculated Parameters for Plate

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 (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	1.42	2.83					
Orifice Area (sq. inches)	11.00	11.00	11.00					

	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	
Invert of Vertical Orifice =	N/A	N/A	ft (relative to basin bottom at Stage = 0 ft)
Depth at top of Zone using Vertical Orifice =	N/A	N/A	ft (relative to basin bottom at Stage = 0 ft)
Vertical Orifice Diameter =	N/A	N/A	inches

Calculated Parameters for Vertical Orifice

	Not Selected	Not Selected	
Vertical Orifice Area =	N/A	N/A	ft ²
Vertical Orifice Centroid =	N/A	N/A	feet

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

	Zone 3 Weir	Not Selected	
Overflow Weir Front Edge Height, H _o =	4.30	N/A	ft (relative to basin bottom at Stage = 0 ft)
Overflow Weir Front Edge Length =	6.75	N/A	feet
Overflow Weir Gate Slope =	0.00	N/A	H:V
Horiz. Length of Weir Sides =	6.75	N/A	feet
Overflow Gate Type =	Type C Gate	N/A	
Debris Clogging % =	50%	N/A	%

Calculated Parameters for Overflow Weir

	Zone 3 Weir	Not Selected	
Height of Gate Upper Edge, H _t =	4.30	N/A	feet
Overflow Weir Slope Length =	6.75	N/A	feet
Gate Open Area / 100-yr Orifice Area =	4.49	N/A	
Overflow Gate Open Area w/o Debris =	31.71	N/A	ft ²
Overflow Gate Open Area w/ Debris =	15.86	N/A	ft ²

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

	Zone 3 Circular	Not Selected	
Depth to Invert of Outlet Pipe =	0.00	N/A	ft (distance below basin bottom at Stage = 0 ft)
Circular Orifice Diameter =	36.00	N/A	inches

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate

	Zone 3 Circular	Not Selected	
Outlet Orifice Area =	7.07	N/A	ft ²
Outlet Orifice Centroid =	1.50	N/A	feet
Half-Central Angle of Restrictor Plate on Pipe =	N/A	N/A	radians

User Input: Emergency Spillway (Rectangular or Trapezoidal)

Spillway Invert Stage =	6.00	ft (relative to basin bottom at Stage = 0 ft)
Spillway Crest Length =	70.00	feet
Spillway End Slopes =	4.00	H:V
Freeboard above Max Water Surface =	1.00	feet

Calculated Parameters for Spillway

Spillway Design Flow Depth =	0.92	feet
Stage at Top of Freeboard =	7.92	feet
Basin Area at Top of Freeboard =	5.10	acres
Basin Volume at Top of Freeboard =	21.63	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).

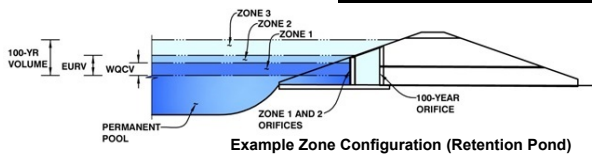
	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
Design Storm Return Period =	N/A	N/A	1.19	1.50	1.75	2.00	2.25	2.52	3.49
One-Hour Rainfall Depth (in) =	2.016	5.899	4.477	6.022	7.245	9.501	11.710	14.604	24.649
CUHP Runoff Volume (acre-ft) =	N/A	N/A	4.477	6.022	7.245	9.501	11.710	14.604	24.649
Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	1.4	2.7	3.8	35.3	69.5	113.7	257.4
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	0.01	0.02	0.03	0.26	0.52	0.85	1.93
Peak Inflow Q (cfs) =	N/A	N/A	76.6	105.2	127.2	182.0	232.6	297.1	501.8
Peak Outflow Q (cfs) =	1.0	1.8	1.6	1.8	6.7	20.3	38.5	67.6	189.1
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	0.7	1.8	0.6	0.6	0.6	0.7
Structure Controlling Flow =	Plate	Plate	Plate	Plate	Overflow Weir 1	Overflow Weir 1	Overflow Weir 1	Overflow Weir 1	Spillway
Max Velocity through Gate 1 (fps) =	N/A	N/A	N/A	N/A	0.2	0.6	1.2	2.06	2.4
Max Velocity through Gate 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) =	38	66	59	68	71	69	68	65	59
Time to Drain 99% of Inflow Volume (hours) =	40	71	62	72	76	76	75	75	72
Maximum Ponding Depth (ft) =	2.59	4.26	3.64	4.20	4.53	4.86	5.19	5.61	6.64
Area at Maximum Ponding Depth (acres) =	1.71	2.94	2.48	2.88	3.13	3.42	3.69	4.06	4.85
Maximum Volume Stored (acre-ft) =	2.027	5.908	4.229	5.704	6.696	7.809	8.946	10.613	15.238

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.04 (February 2021)

Project: Windermere Filing No. 1 - AS BUILT

Basin ID: North Pond



	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	2.59	2.016	Orifice Plate
Zone 2 (EURV)	4.26	3.883	Orifice Plate
Zone 3 (100-year)	5.45	4.043	Weir&Pipe (Circular)
Total (all zones)		9.941	

NORTH POND AS-BUILT

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

Underdrain Orifice Invert Depth =	N/A	ft (distance below the filtration media surface)
Underdrain Orifice Diameter =	N/A	inches

Calculated Parameters for Underdrain

Underdrain Orifice Area =	N/A	ft ²
Underdrain Orifice Centroid =	N/A	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 =	0.00	ft (relative to basin bottom at Stage = 0 ft)
Depth at top of Zone using Orifice Plate =	4.26	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

Calculated Parameters for Plate

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 (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	1.50	2.90					
Orifice Area (sq. inches)	12.00	12.00	12.00					

	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	
Invert of Vertical Orifice =	N/A	N/A	ft (relative to basin bottom at Stage = 0 ft)
Depth at top of Zone using Vertical Orifice =	N/A	N/A	ft (relative to basin bottom at Stage = 0 ft)
Vertical Orifice Diameter =	N/A	N/A	inches

Calculated Parameters for Vertical Orifice

	Not Selected	Not Selected	
Vertical Orifice Area =	N/A	N/A	ft ²
Vertical Orifice Centroid =	N/A	N/A	feet

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

	Zone 3 Weir	Not Selected	
Overflow Weir Front Edge Height, Ho =	4.27	N/A	ft (relative to basin bottom at Stage = 0 ft)
Overflow Weir Front Edge Length =	6.75	N/A	feet
Overflow Weir Gate Slope =	0.00	N/A	H:V
Horiz. Length of Weir Sides =	6.75	N/A	feet
Overflow Gate Type =	Type C Gate	N/A	
Debris Clogging % =	50%	N/A	%

Calculated Parameters for Overflow Weir

	Zone 3 Weir	Not Selected	
Height of Gate Upper Edge, H _g =	4.27	N/A	feet
Overflow Weir Slope Length =	6.75	N/A	feet
Grate Open Area / 100-yr Orifice Area =	4.49	N/A	
Overflow Grate Open Area w/o Debris =	31.71	N/A	ft ²
Overflow Grate Open Area w/ Debris =	15.86	N/A	ft ²

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

	Zone 3 Circular	Not Selected	
Depth to Invert of Outlet Pipe =	0.19	N/A	ft (distance below basin bottom at Stage = 0 ft)
Circular Orifice Diameter =	36.00	N/A	inches

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate

	Zone 3 Circular	Not Selected	
Outlet Orifice Area =	7.07	N/A	ft ²
Outlet Orifice Centroid =	1.50	N/A	feet
Half-Central Angle of Restrictor Plate on Pipe =	N/A	N/A	radians

User Input: Emergency Spillway (Rectangular or Trapezoidal)

Spillway Invert Stage =	6.00	ft (relative to basin bottom at Stage = 0 ft)
Spillway Crest Length =	70.00	feet
Spillway End Slopes =	4.00	H:V
Freeboard above Max Water Surface =	1.00	feet

Calculated Parameters for Spillway

Spillway Design Flow Depth =	0.92	feet
Stage at Top of Freeboard =	7.92	feet
Basin Area at Top of Freeboard =	5.10	acres
Basin Volume at Top of Freeboard =	21.63	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).

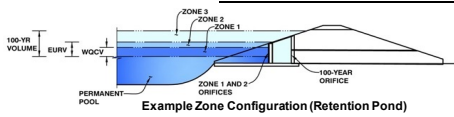
	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
Design Storm Return Period =									
One-Hour Rainfall Depth (in) =	N/A	N/A	1.19	1.50	1.75	2.00	2.25	2.52	3.49
CUHP Runoff Volume (acre-ft) =	2.016	5.899	4.477	6.022	7.245	9.501	11.710	14.604	24.649
Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	4.477	6.022	7.245	9.501	11.710	14.604	24.649
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	1.4	2.7	3.8	35.3	69.5	113.7	257.4
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	0.26	0.52	0.85	1.93
Peak Inflow Q (cfs) =	N/A	N/A	76.6	105.2	127.2	182.0	232.6	297.1	501.8
Peak Outflow Q (cfs) =	1.1	2.0	1.7	1.9	7.3	21.1	39.5	68.7	189.0
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	0.7	1.9	0.6	0.6	0.6	0.7
Structure Controlling Flow =	Plate	Plate	Plate	Plate	Overflow Weir 1	Overflow Weir 1	Overflow Weir 1	Overflow Weir 1	Spillway
Max Velocity through Grate 1 (fps) =	N/A	N/A	N/A	N/A	0.2	0.6	1.2	2.08	2.4
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) =	36	62	55	64	66	65	63	61	55
Time to Drain 99% of Inflow Volume (hours) =	38	66	58	68	71	71	70	70	67
Maximum Ponding Depth (ft) =	2.59	4.26	3.63	4.19	4.51	4.84	5.17	5.59	6.64
Area at Maximum Ponding Depth (acres) =	1.71	2.94	2.47	2.88	3.12	3.40	3.68	4.04	4.85
Maximum Volume Stored (acre-ft) =	2.027	5.908	4.204	5.704	6.665	7.741	8.910	10.532	15.190

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.03 (May 2020)

Project: Windermere Filing No. 1

Basin ID: South Pond - Interim Condition



SOUTH POND INTERIM DESIGN

Watershed Information

Table with Watershed Information including Selected BMP Type, Watershed Area, Length, Slope, etc.

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

Table with Water Quality Capture Volume (WQCV), Excess Urban Runoff Volume (EURV), etc.

Optional User Overrides

Table with Optional User Overrides including 1.19 inches, 1.50 inches, etc.

Define Zones and Basin Geometry

Table with Define Zones and Basin Geometry including Zone 1 Volume, Total Detention Basin Volume, etc.

Main data table for Stage-Storage with columns: 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).

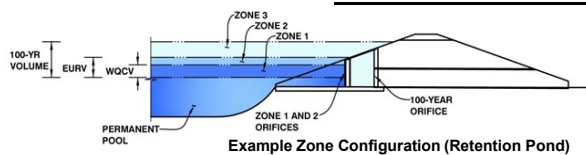
DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-*Detention, Version 4.03 (May 2020)*

Project: Windermere Filing No. 1

Basin ID: South Pond - Interim Condition

SOUTH POND INTERIM DESIGN



	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	2.52	0.118	Orifice Plate
Zone 2 (EURV)	3.53	0.124	Orifice Plate
Zone 3 (100-year)	4.82	0.253	Weir&Pipe (Restrict)
Total (all zones)		0.496	

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 = inches

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	1.18	2.35					
Orifice Area (sq. inches)	0.67	0.67	0.67					

	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	
Invert of Vertical Orifice =	N/A	N/A	ft (relative to basin bottom at Stage = 0 ft)
Depth at top of Zone using Vertical Orifice =	N/A	N/A	ft (relative to basin bottom at Stage = 0 ft)
Vertical Orifice Diameter =	N/A	N/A	inches

Calculated Parameters for Vertical Orifice

	Not Selected	Not Selected	
Vertical Orifice Area =	N/A	N/A	ft ²
Vertical Orifice Centroid =	N/A	N/A	feet

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

	Zone 3 Weir	Not Selected	
Overflow Weir Front Edge Height, H _o =	6.40	N/A	ft (relative to basin bottom at Stage = 0 ft)
Overflow Weir Front Edge Length =	3.92	N/A	feet
Overflow Weir Grate Slope =	0.00	N/A	H:V
Horiz. Length of Weir Sides =	3.92	N/A	feet
Overflow Grate Open Area % =	70%	N/A	%, grate open area/total area
Debris Clogging % =	50%	N/A	%

Calculated Parameters for Overflow Weir

	Zone 3 Weir	Not Selected	
Height of Grate Upper Edge, H _t =	6.40	N/A	feet
Overflow Weir Slope Length =	3.92	N/A	feet
Grate Open Area / 100-yr Orifice Area =	16.92	N/A	
Overflow Grate Open Area w/o Debris =	10.76	N/A	ft ²
Overflow Grate Open Area w/ Debris =	5.38	N/A	ft ²

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

	Zone 3 Restrictor	Not Selected	
Depth to Invert of Outlet Pipe =	2.50	N/A	ft (distance below basin bottom at Stage = 0 ft)
Outlet Pipe Diameter =	18.00	N/A	inches
Restrictor Plate Height Above Pipe Invert =	7.00		inches

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate

	Zone 3 Restrictor	Not Selected	
Outlet Orifice Area =	0.64	N/A	ft ²
Outlet Orifice Centroid =	0.34	N/A	feet
Half-Central Angle of Restrictor Plate on Pipe =	1.35	N/A	radians

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

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	3.49
One-Hour Rainfall Depth (in) =	N/A	N/A	1.19	1.50	1.75	2.00	2.25	2.52	3.49
CUHP Runoff Volume (acre-ft) =	0.118	0.243	0.156	0.221	0.279	0.448	0.608	0.825	1.590
Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	0.156	0.221	0.279	0.448	0.608	0.825	1.590
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	0.1	0.2	0.3	2.9	5.6	9.1	20.5
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	0.27	0.52	0.84	1.89
Peak Inflow Q (cfs) =	N/A	N/A	2.5	3.6	4.5	7.7	10.6	14.5	27.0
Peak Outflow Q (cfs) =	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	9.2
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	0.4	0.3	0.0	0.0	0.0	0.4
Structure Controlling Flow =	Plate	Plate	Plate	Plate	Plate	Plate	Plate	Plate	Outlet Plate 1
Max Velocity through Grate 1 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.8
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) =	38	53	44	51	57	71	83	99	103
Time to Drain 99% of Inflow Volume (hours) =	40	57	47	55	61	77	91	108	116
Maximum Ponding Depth (ft) =	2.51	3.53	2.76	3.27	3.64	4.53	5.17	5.93	6.91
Area at Maximum Ponding Depth (acres) =	0.10	0.15	0.11	0.14	0.16	0.22	0.27	0.30	0.36
Maximum Volume Stored (acre-ft) =	0.118	0.243	0.144	0.204	0.260	0.427	0.585	0.799	1.127

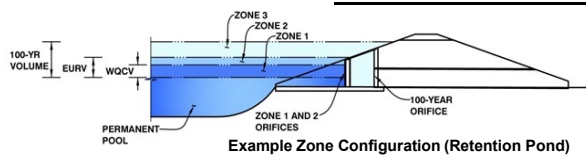
DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-*Detention*, Version 4.03 (May 2020)

Project: Windermere Filing No. 1 - AS BUILT

SOUTH POND INTERIM AS-BUILT

Basin ID: South Pond - Interim Condition



	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	2.52	0.118	Orifice Plate
Zone 2 (EURV)	3.53	0.124	Orifice Plate
Zone 3 (100-year)	4.82	0.253	Weir&Pipe (Restrict)
Total (all zones)		0.496	

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 = inches

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	1.20	2.40					
Orifice Area (sq. inches)	0.78	0.78	0.78					

	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	
Invert of Vertical Orifice =	N/A	N/A	ft (relative to basin bottom at Stage = 0 ft)
Depth at top of Zone using Vertical Orifice =	N/A	N/A	ft (relative to basin bottom at Stage = 0 ft)
Vertical Orifice Diameter =	N/A	N/A	inches

Calculated Parameters for Vertical Orifice

	Not Selected	Not Selected	
Vertical Orifice Area =	N/A	N/A	ft ²
Vertical Orifice Centroid =	N/A	N/A	feet

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

	Zone 3 Weir	Not Selected	
Overflow Weir Front Edge Height, H _o =	6.22	N/A	ft (relative to basin bottom at Stage = 0 ft)
Overflow Weir Front Edge Length =	3.92	N/A	feet
Overflow Weir Grate Slope =	0.00	N/A	H:V
Horiz. Length of Weir Sides =	3.92	N/A	feet
Overflow Grate Open Area % =	70%	N/A	%, grate open area/total area
Debris Clogging % =	50%	N/A	%

Calculated Parameters for Overflow Weir

	Zone 3 Weir	Not Selected	
Height of Grate Upper Edge, H _t =	6.22	N/A	feet
Overflow Weir Slope Length =	3.92	N/A	feet
Grate Open Area / 100-yr Orifice Area =	16.92	N/A	
Overflow Grate Open Area w/o Debris =	10.76	N/A	ft ²
Overflow Grate Open Area w/ Debris =	5.38	N/A	ft ²

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

	Zone 3 Restrictor	Not Selected	
Depth to Invert of Outlet Pipe =	2.50	N/A	ft (distance below basin bottom at Stage = 0 ft)
Outlet Pipe Diameter =	18.00	N/A	inches
Restrictor Plate Height Above Pipe Invert =	7.00		inches

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate

	Zone 3 Restrictor	Not Selected	
Outlet Orifice Area =	0.64	N/A	ft ²
Outlet Orifice Centroid =	0.34	N/A	feet
Half-Central Angle of Restrictor Plate on Pipe =	1.35	N/A	radians

User Input: Emergency Spillway (Rectangular or Trapezoidal)

Spillway Invert Stage =	6.94	ft (relative to basin bottom at Stage = 0 ft)
Spillway Crest Length =	27.00	feet
Spillway End Slopes =	4.00	H:V
Freeboard above Max Water Surface =	1.00	feet

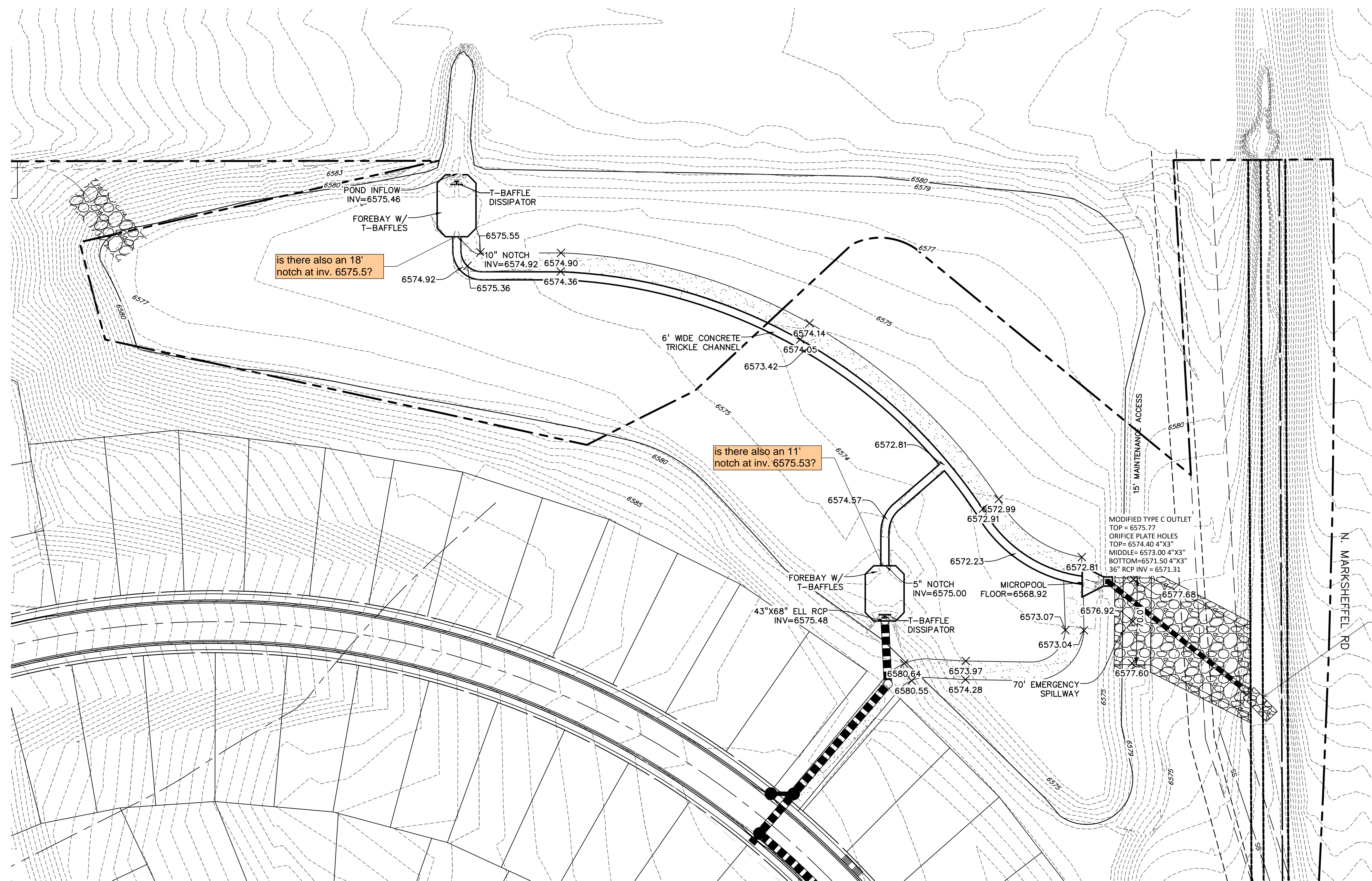
Calculated Parameters for Spillway

Spillway Design Flow Depth =	0.55	feet
Stage at Top of Freeboard =	8.49	feet
Basin Area at Top of Freeboard =	0.58	acres
Basin Volume at Top of Freeboard =	1.80	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	3.49
One-Hour Rainfall Depth (in) =	N/A	N/A	1.19	1.50	1.75	2.00	2.25	2.52	3.49
CUHP Runoff Volume (acre-ft) =	0.118	0.243	0.156	0.221	0.279	0.448	0.608	0.825	1.590
Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	0.156	0.221	0.279	0.448	0.608	0.825	1.590
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	0.1	0.2	0.3	2.9	5.6	9.1	20.5
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	0.27	0.52	0.84	1.89
Peak Inflow Q (cfs) =	N/A	N/A	2.5	3.6	4.5	7.7	10.6	14.5	27.0
Peak Outflow Q (cfs) =	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.2	9.2
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	0.5	0.4	0.0	0.0	0.0	0.4
Structure Controlling Flow =	Plate	Plate	Plate	Plate	Plate	Plate	Plate	Plate	Outlet Plate 1
Max Velocity through Grate 1 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.8
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) =	33	45	38	44	49	62	72	85	85
Time to Drain 99% of Inflow Volume (hours) =	35	49	40	47	53	67	79	93	97
Maximum Ponding Depth (ft) =	2.51	3.53	2.75	3.25	3.63	4.51	5.16	5.91	6.82
Area at Maximum Ponding Depth (acres) =	0.10	0.15	0.11	0.14	0.16	0.22	0.26	0.30	0.35
Maximum Volume Stored (acre-ft) =	0.118	0.243	0.141	0.203	0.257	0.424	0.580	0.796	1.095

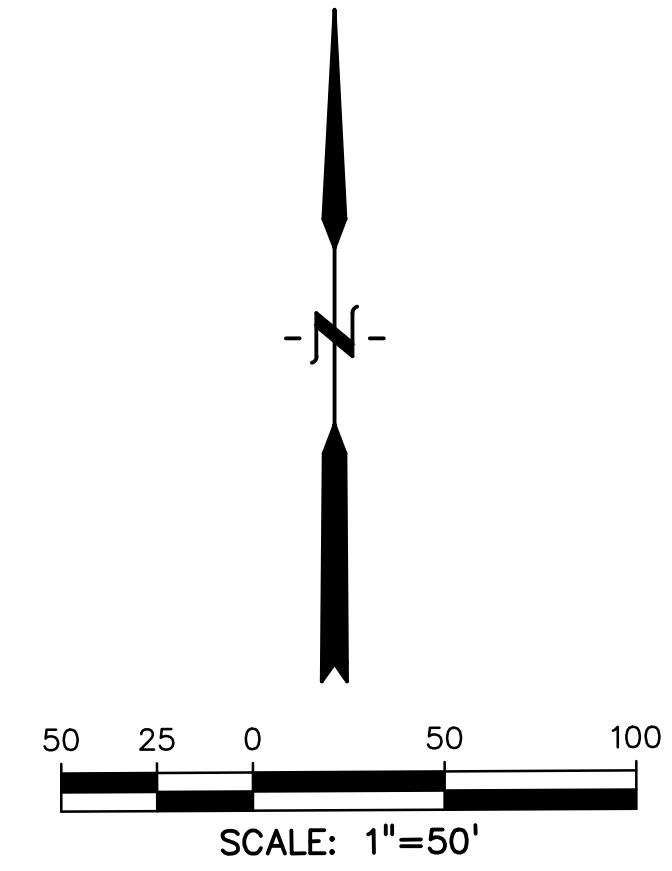


is there also an 18' notch at inv. 6575.5?

is there also an 11' notch at inv. 6575.53?

provide pipe invert and riprap elevations

As-built value does match spreadsheet. Please verify.

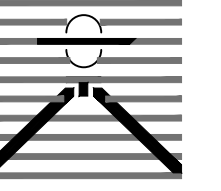


NORTH POND
WQCV: DESIGN: 2.02 ac-ft
 AS-BUILT: 2.03 ac-ft

100 YEAR: DESIGN: 4.04 ac-ft
 AS-BUILT: 7.16 ac-ft

AS-BUILT
 9/12/23

PREPARED BY:



DREXEL, BARRELL & CO.
 Engineers + Surveyors
 3 SOUTH 7TH STREET
 COLORADO SPGS, COLORADO 80905
 CONTACT: TIM D. MCCONNELL, P.E.
 (719) 260-0887
 BOULDER • COLORADO SPRINGS • GREELEY

CLIENT:



THE LANDHUIS COMPANY
 212 N. WAHSATCH AVE., #301
 COLORADO SPRINGS, CO 80903
 (719) 635-3200
 CONTACT: JEFF MARK

**WINDERMERE
 POND AS-BUILTS**
 N. MARKSHEFFEL ROAD
 EL PASO COUNTY, COLORADO

ISSUE	DATE
INITIAL ISSUE	6/15/23
SUBMITTAL #2	9/12/23

DESIGNED BY: KGV
 DRAWN BY: CGH
 CHECKED BY: TDM
 FILE NAME: 21187-01PND AB2

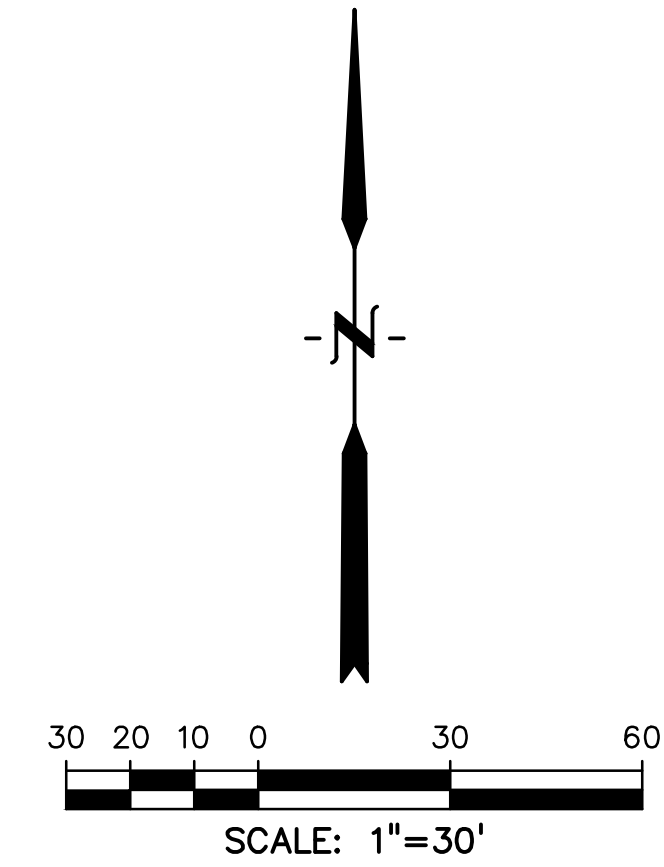
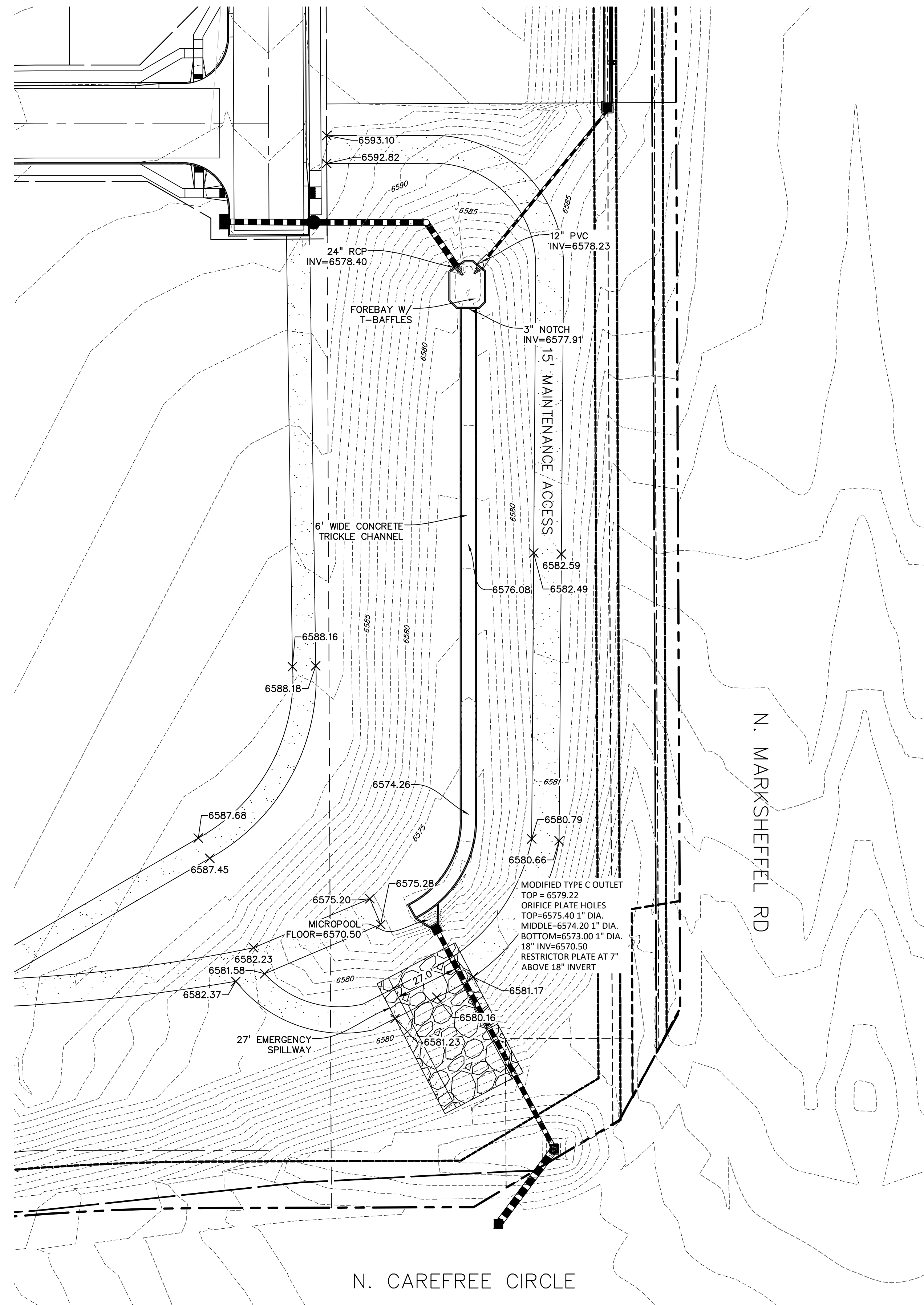
PREPARED UNDER MY DIRECT SUPERVISION FOR AND ON BEHALF OF DREXEL, BARRELL & CO.

DRAWING SCALE:
 HORIZONTAL: 1"=50'
 VERTICAL: N/A

**NORTH POND
 AS-BUILT**

PROJECT NO. 21187-01CSCV
 DRAWING NO.

PD-AB



SOUTH POND
 WQCV: DESIGN: 0.12 ac-ft
 AS-BUILT: 0.19 ac-ft

100 YEAR: DESIGN: 0.25 ac-ft
 AS-BUILT: 4.00 ac-ft

AS-BUILT
 9/12/23

As-built value does not match spreadsheet. Please verify.

PREPARED BY:



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WINDERMERE
 POND AS-BUILTS
 N. MARKSHEFFEL ROAD
 EL PASO COUNTY, COLORADO

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 FILE NAME: 21187-01PND AB2

PREPARED UNDER MY DIRECT SUPERVISION FOR AND ON BEHALF OF DREXEL, BARRELL & CO.

DRAWING SCALE:
 HORIZONTAL: 1"=30'
 VERTICAL: N/A

SOUTH POND
 AS-BUILT

PROJECT NO. 21187-01CSCV
 DRAWING NO.

PD-AB