



**RG AND ASSOCIATES, LLC**

Del Norte • Wheat Ridge  
303-293-8107 • www.rgengineers.com

## MEMO

**Date:** October 9, 2023  
**To:** El Paso County  
**From:** RG and Associates, LLC  
Paintbrush Hills Metropolitan District  
**RGA Job No.** 1070.0022  
**RE:** Scenic View at Paintbrush Hills Pond Modifications  
As-Built Drainage Conformance

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### Scenic View at Paintbrush Hills Pond Modifications:

The Scenic View Detention Pond has been completed with the following modification were made to the detention pond:

- The outlet structure elevation was to be raised and a new orifice plate was installed.
- A concrete trickle channel was to be installed.
- A concrete forebay was to be installed with energy dissipation boulders and a weir wall.
- The top of berm for the detention pond was to be increased to 7147 +/-.
- A riprap emergency spillway was installed at to be 7145+/-.

The completed modifications are in general conformance with the approved plans. The outlet structure was modified accordingly, the berm was raised, the emergency spillway raised, the concrete trickle channel installed, the volume is adequate and the concrete forebay installed with energy dissipation boulder that are of adequate size.

The modified Scenic View Detention Pond provides the required storage volume and meets the required release rates (see attached UD-Detention calculations) based upon the as-built information provided.

The site is stable and there are no signs of settlement, subsidence, sloughing of the slopes associated with this project. The site ground cover appears to be adequate and there are no obvious signs of erosion. The site improvements associated with this project meet or exceed the approved design for this site.





Sincerely,

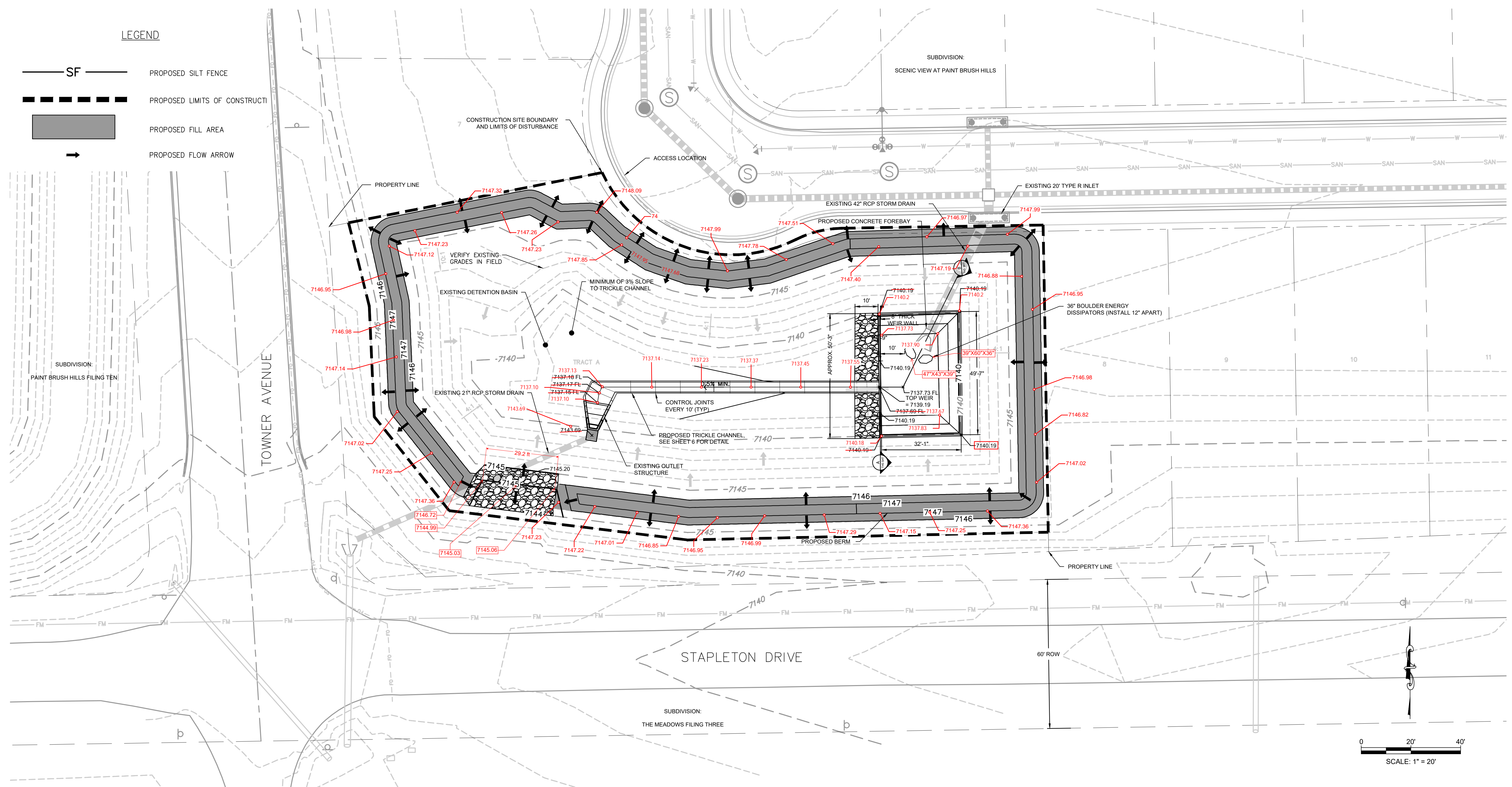
Gary E. Welp, P.E., CFM  
Senior Project Manager



As-Built Attachments

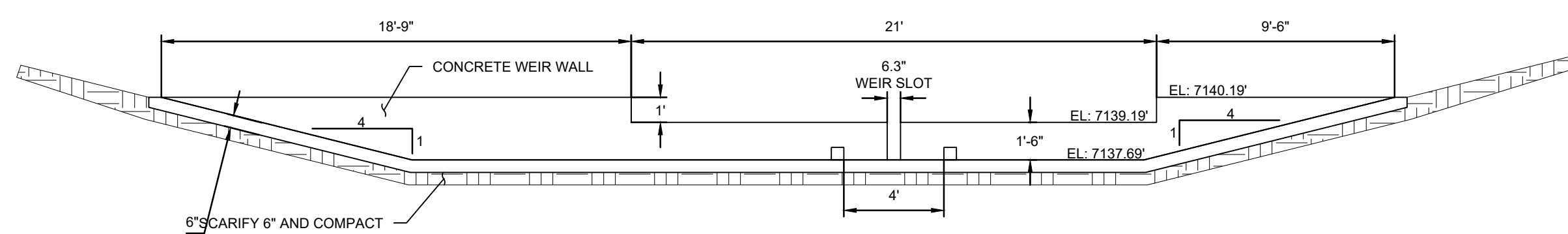
**LEGEND**

-  SF PROPOSED SILT FENCE
-  PROPOSED LIMITS OF CONSTRUCTION
-  PROPOSED FILL AREA
-  PROPOSED FLOW ARROW

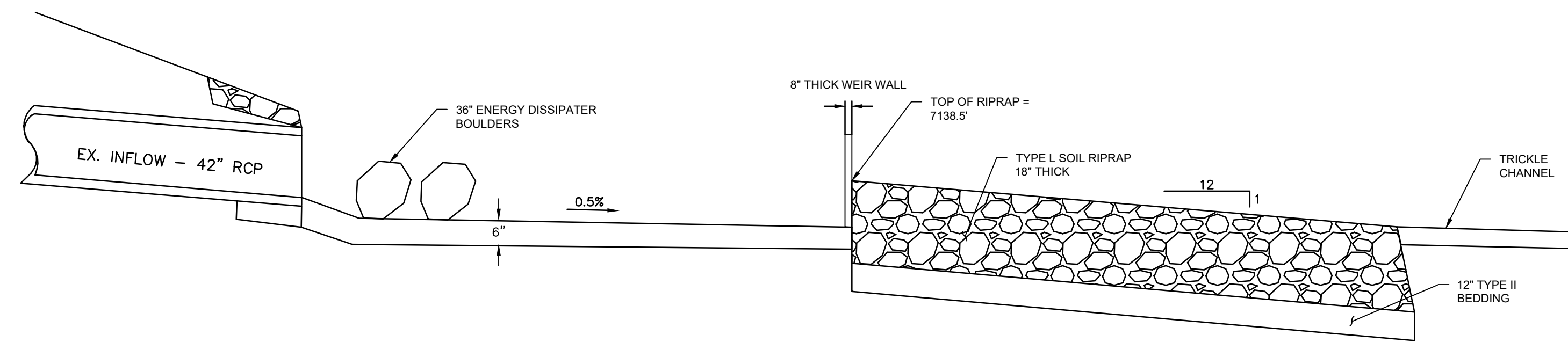


**SCENIC VIEW AT PAINT BRUSH HILLS POND PLAN**

SCALE: 1" = 20'



**A WEIR WALL SECTION**  
N.T.S.



**B FOREBAY STRUCTURE SECTION**  
N.T.S.

**ISSUED FOR CONSTRUCTION**  
APPROVED: RG DATE: 10/31/22



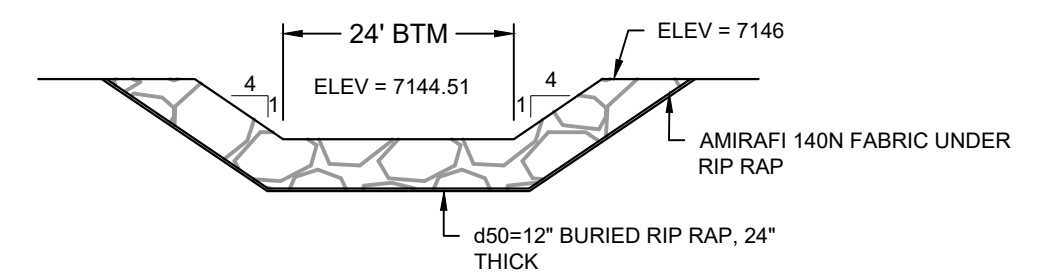
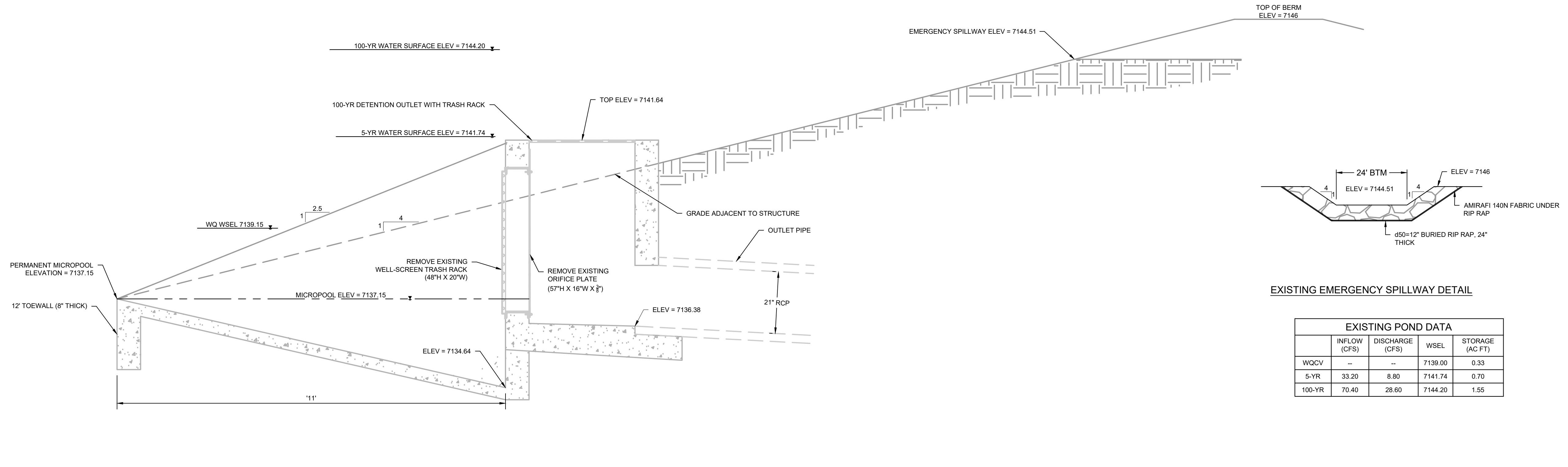
48 hours before you file, CALL UTILITY NOTIFICATION CENTER OF COLORADO (UNCC) **811**  
Goa, Electric, Telephone, CATV, and Penetration Eastern Pipeline Locations  
**SCALE VERIFICATION**  
BAR IS ONE INCH ON ORIGINAL DRAWING  
IF NOT ONE INCH ON THIS SHEET SCALE ACCORDINGLY

NO.	REVISIONS DESCRIPTION	DATE	BY
1	ISSUED FOR CONSTRUCTION	10/31/22	JGS

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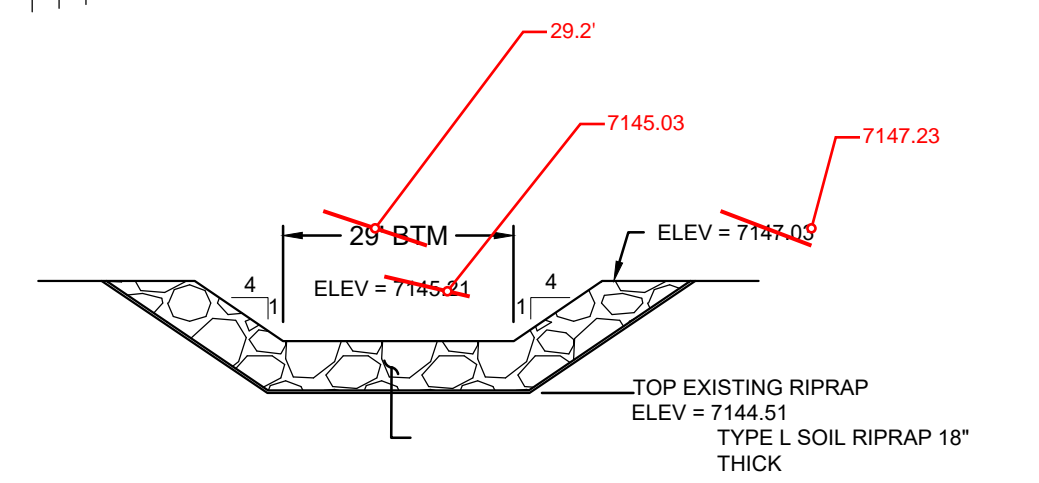
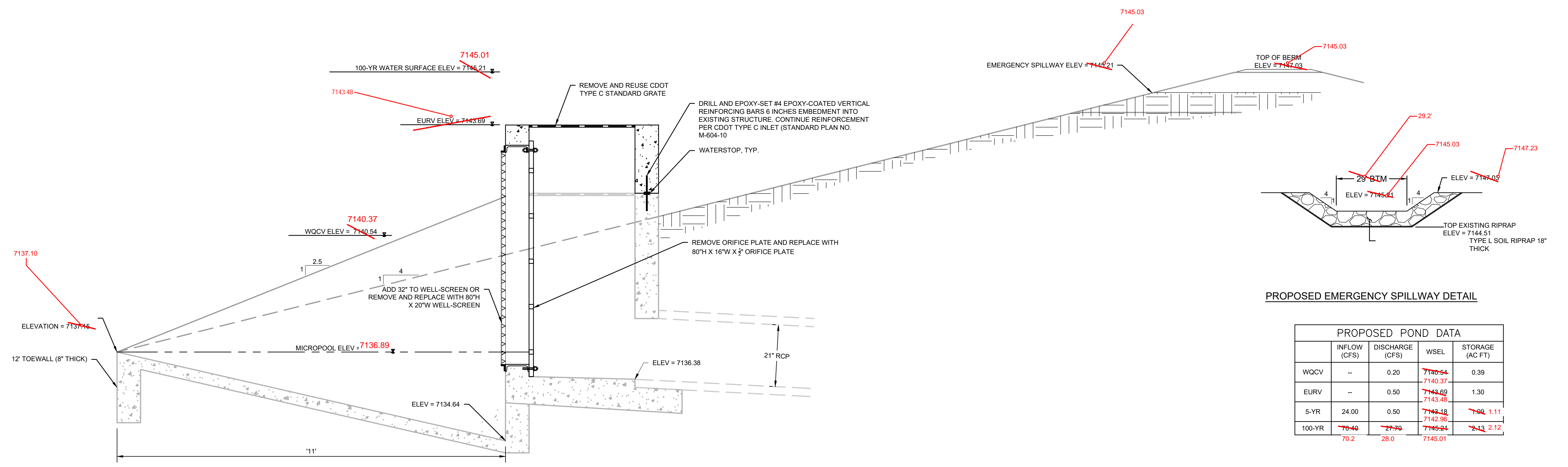
<b>SCENIC VIEW AT PAINT BRUSH HILLS DETENTION POND MODIFICATIONS</b>	
DESIGNED BY: JGS	DESIGNED BY: GEW
JOB NUMBER: 1070.0022	
DATE: 10/31/22	
SCALE: N.T.S.	
DRAWING NAME: GRADING PLAN	
SHEET NO: 3 of 8	

S:\1070 - Paint Brush Hills Metropolitan District\1070.0022 - Scenic View Detention Pond\DWG\3D DETAILS.dwg, 05/OUTLET STRUCTURE, 8/23/2022 1:32:16 PM, jaramolade, 1:1



EXISTING POND DATA				
	INFLOW (CFS)	DISCHARGE (CFS)	WSEL	STORAGE (AC FT)
WQCV	--	--	7139.00	0.33
5-YR	33.20	8.80	7141.74	0.70
100-YR	70.40	28.60	7144.20	1.55

**OUTLET STRUCTURE DEMOLITION PLAN**  
SCALE: 1" = 20'  
TYPICAL WQCV OUTLET STRUCTURE PROFILES INCLUDING 5-YEAR AND 100-YEAR DETENTION



PROPOSED POND DATA				
	INFLOW (CFS)	DISCHARGE (CFS)	WSEL	STORAGE (AC FT)
WQCV	--	0.20	7140.54	0.39
EURV	--	0.50	7143.89	1.30
5-YR	24.00	0.50	7143.89	1.11
100-YR	70.40	27.70	7145.01	2.12

**OUTLET STRUCTURE MODIFICATIONS**  
SCALE: 1" = 20'  
TYPICAL WQCV OUTLET STRUCTURE PROFILES INCLUDING EURV AND 100-YEAR DETENTION

48 hours before you file CALL UTILITY NOTIFICATION CENTER OF COLORADO (UNCC) **811**  
Goa,Electric,Telephone,CATV, and Penetration Eastern Pipeline Locations  
SCALE VERIFICATION  
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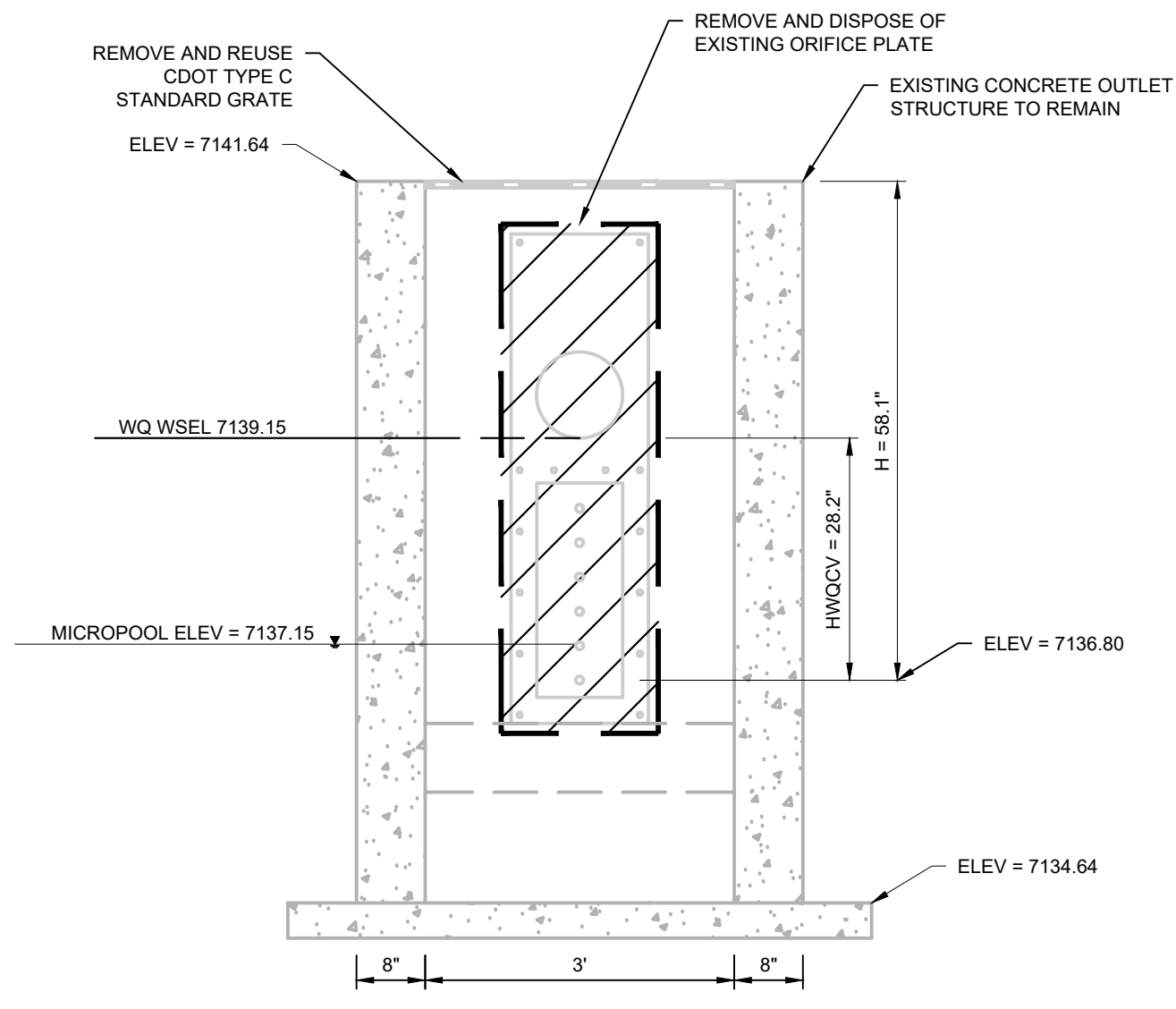
NO.	REVISIONS	
	DESCRIPTION	DATE

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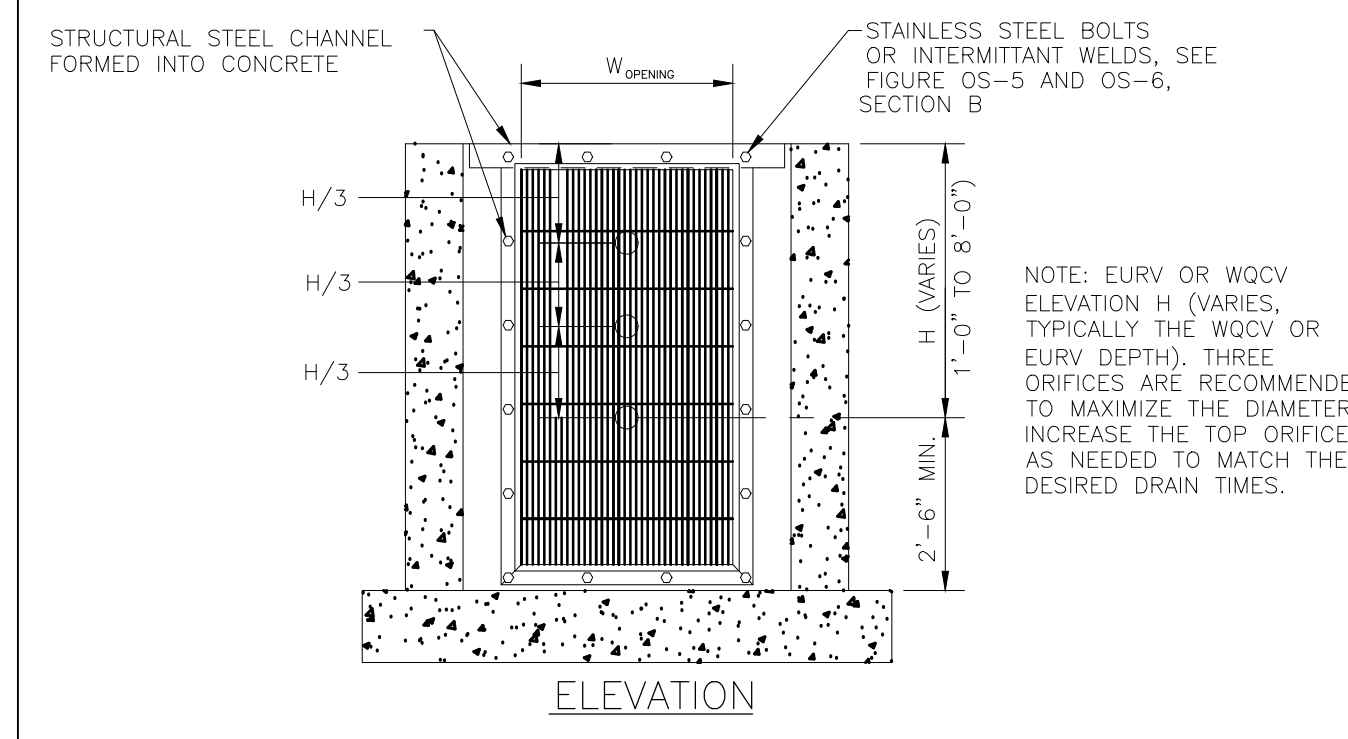
SCENIC VIEW AT PAINT BRUSH HILLS  
DETENTION POND MODIFICATIONS  
OUTLET STRUCTURE  
PAINT BRUSH HILLS METROPOLITAN DISTRICT  
EL PASO COUNTY, COLORADO

DRAWN BY:	DESIGNED BY:
JCS	GEW
JOB NUMBER:	1070.0022
DATE:	8/23/22
SCALE:	1" = 20'
DRAWING NAME:	OUTLET
SHEET NO.:	4 of 8



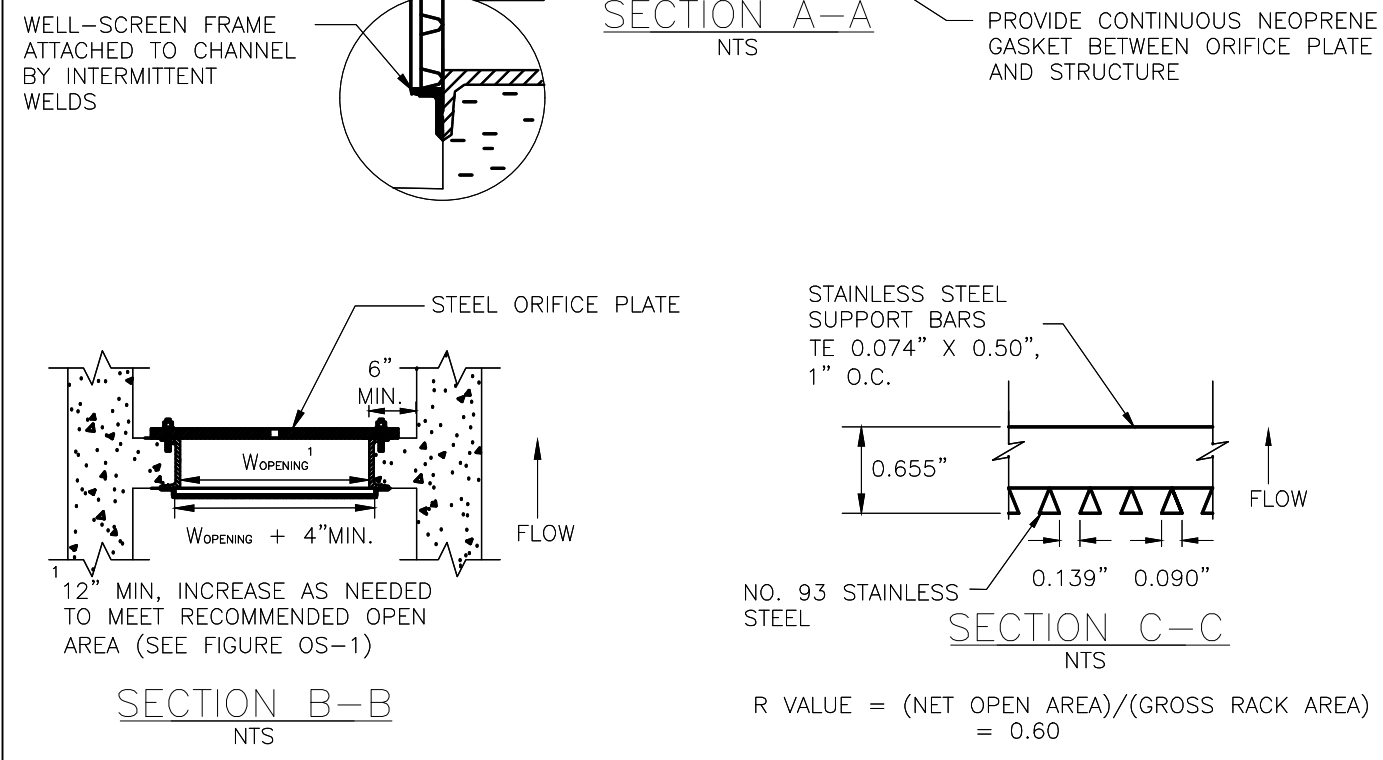
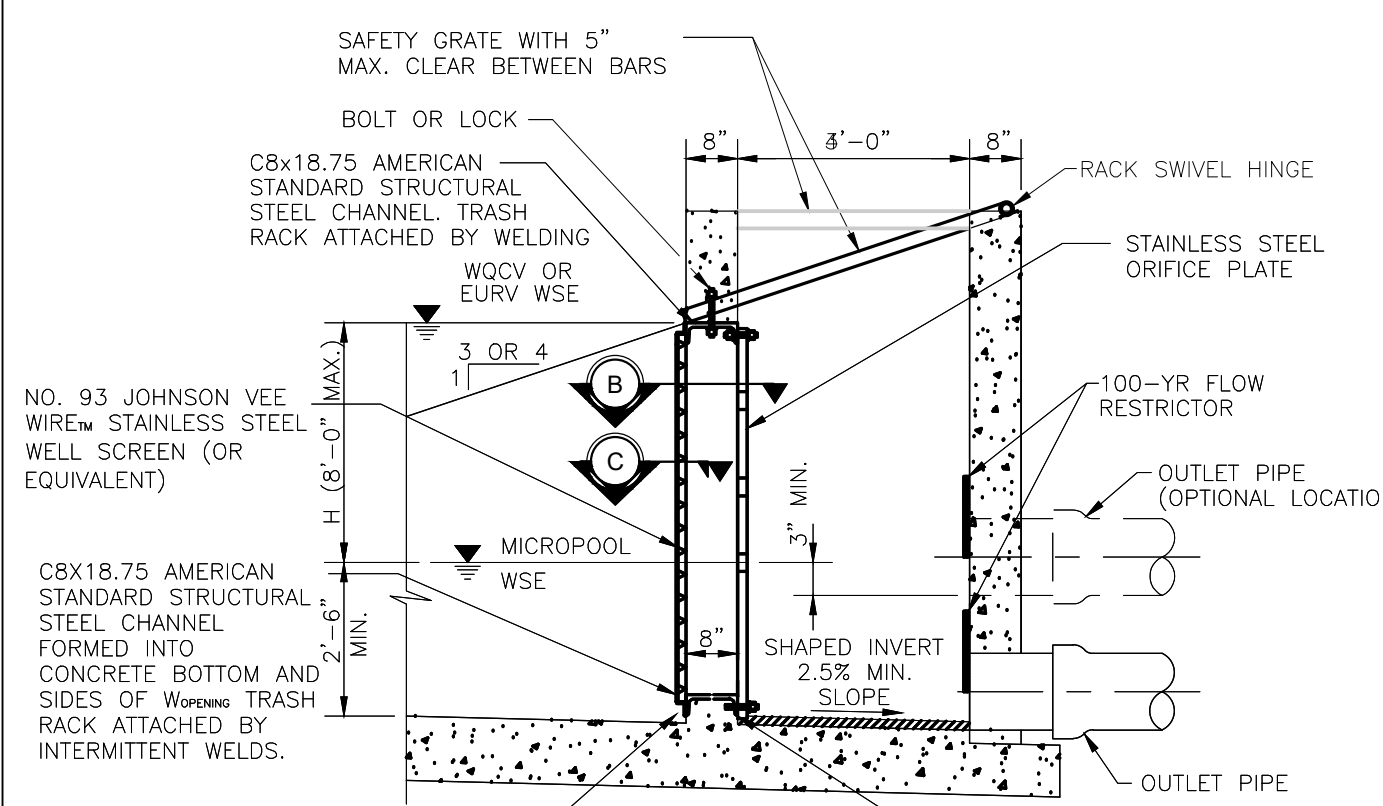


**OUTLET STRUCTURE DEMOLITION DETAIL**  
SCALE: 1" = 20'

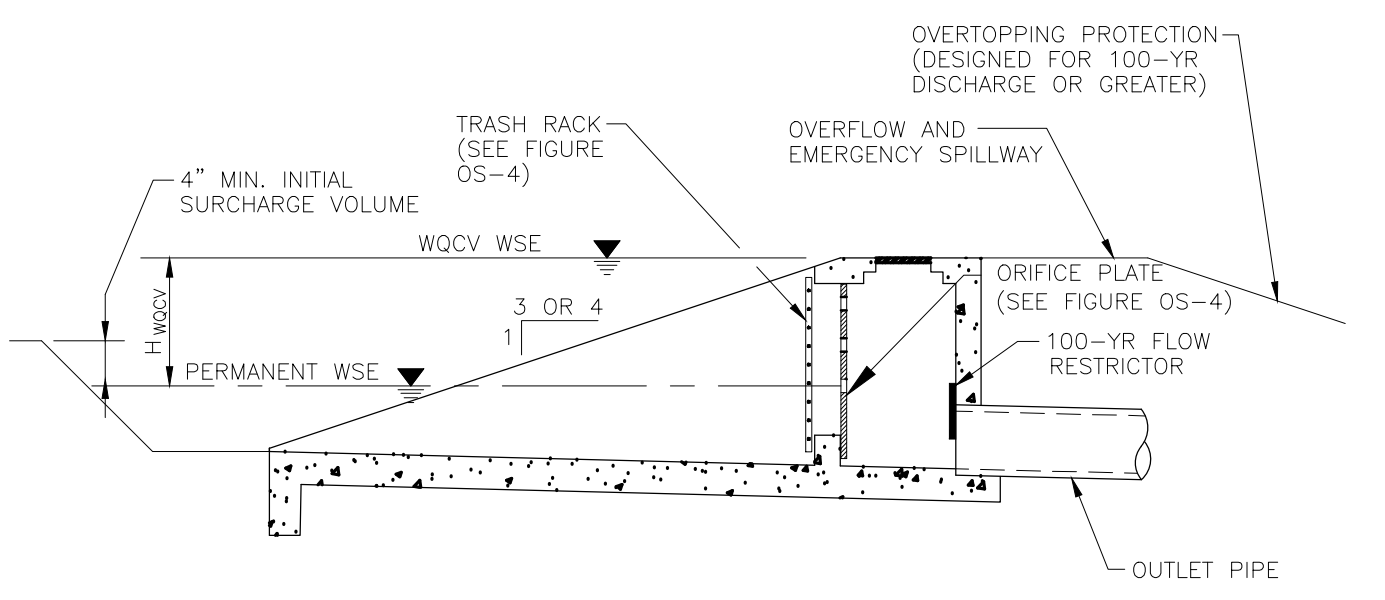


- ORIFICE PLATE NOTES:**
1. PROVIDE CONTINUOUS NEOPRENE GASKET MATERIAL BETWEEN THE ORIFICE PLATE AND CONCRETE.
  2. BOLT PLATE TO CONCRETE 12" MAX. ON CENTER. SEE TABLE OS-2 FOR PLATE THICKNESS.
- EURV AND WQCV TRASH RACKS:**
1. WELL-SCREEN TRASH RACKS SHALL BE STAINLESS STEEL AND SHALL BE ATTACHED BY INTERMITTENT WELDS ALONG THE EDGE OF THE MOUNTING FRAME.
  2. BAR GATE TRASH RACKS SHALL BE ALUMINUM AND SHALL BE BOLTED USING STAINLESS STEEL HARDWARE.
  3. TRASH RACK OPEN AREAS ARE FOR SPECIFIED TRASH RACK MATERIALS. TOTAL TRASH RACK SIZE MAY NEED TO BE ADJUSTED FOR MATERIALS HAVING DIFFERENT OPEN AREA/GROSS AREA RATIO (R VALUE).
  4. STRUCTURAL DESIGN OF TRASH RACKS SHALL BE BASED ON FULL HYDROSTATIC HEAD WITH ZERO HEAD DOWNSTREAM OF THE RACK.
- OVERFLOW SAFETY GRATES:**
1. ALL SAFETY GRATES SHALL BE MOUNTED USING STAINLESS STEEL HARDWARE AND PROVIDED WITH HINGED AND LOCKABLE OR BOLTABLE ACCESS PANELS.
  2. SAFETY GRATES SHALL BE STAINLESS STEEL, ALUMINUM, OR STEEL. STEEL GRATES SHALL BE HOT DIP GALVANIZED AND MAY BE HOT POWDER COATED AFTER GALVANIZING.
  3. SAFETY GRATES SHALL BE DESIGNED SUCH THAT THE DIAGONAL DIMENSION OF EACH OPENING IS SMALLER THAN THE DIAMETER OF THE OUTLET PIPE.
  4. STRUCTURAL DESIGN OF SAFETY GRATES SHALL BE BASED ON FULL HYDROSTATIC HEAD WITH ZERO HEAD DOWNSTREAM OF THE RACK.

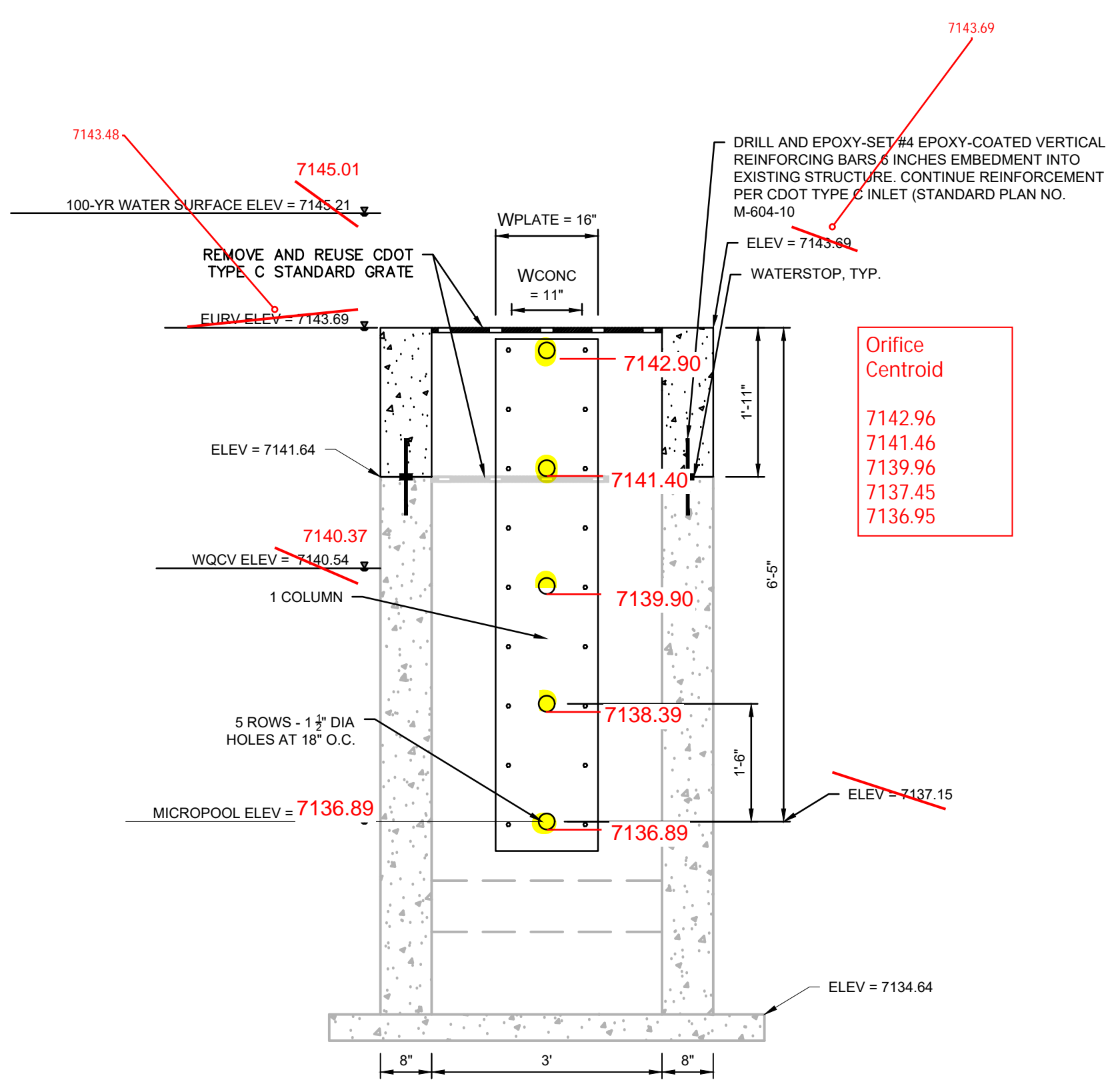
**FIGURE OS-4 PROPOSED ORIFICE PLATE AND TRASH RACK DETAILS AND NOTES**  
NTS



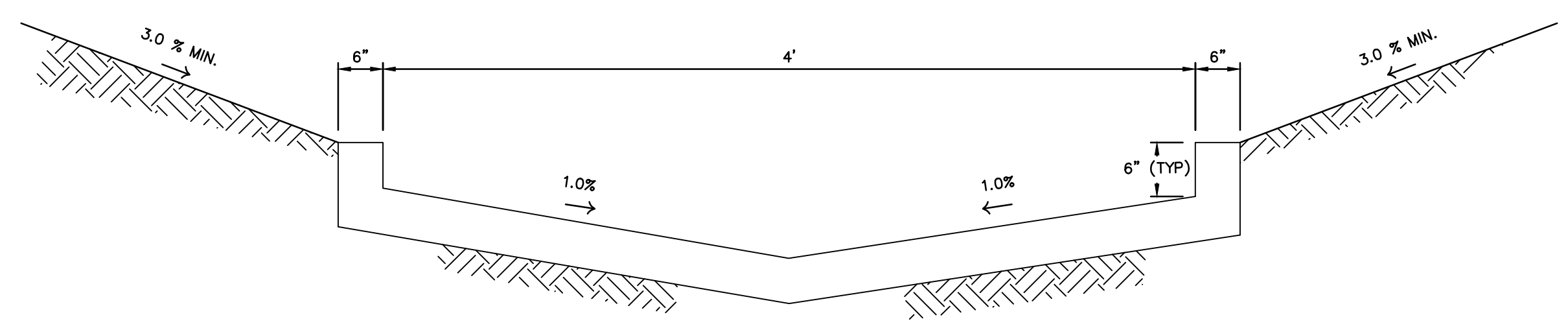
**FIGURE OS-2 TYPICAL OUTLET STRUCTURE FOR FULL SPECTRUM DETENTION**



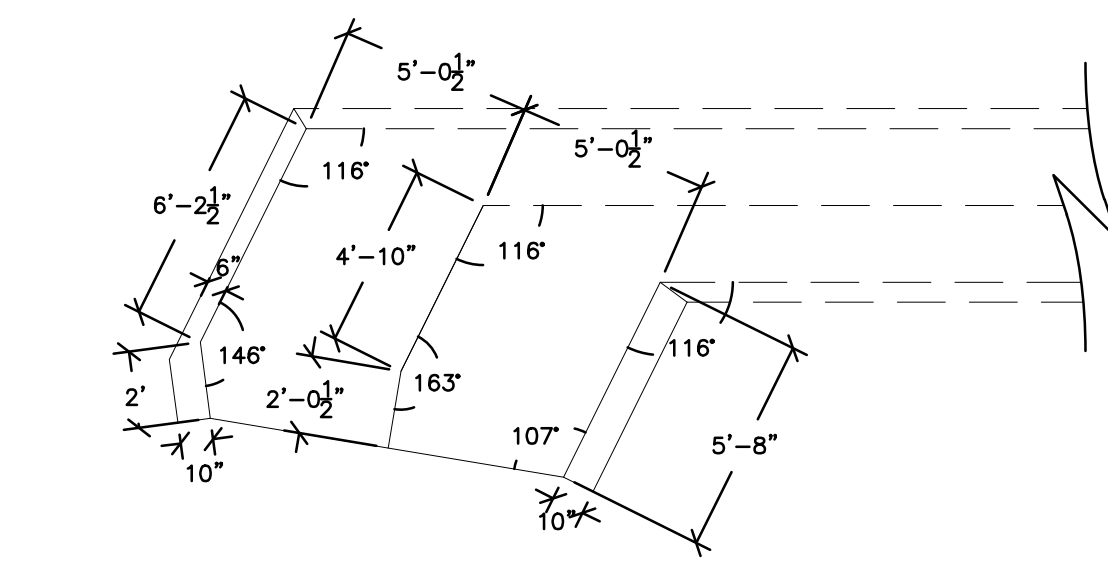
**FIGURE OS-3 PROPOSED TYPICAL OUTLET STRUCTURE FOR WQCV TREATMENT AND ATTENUATION**



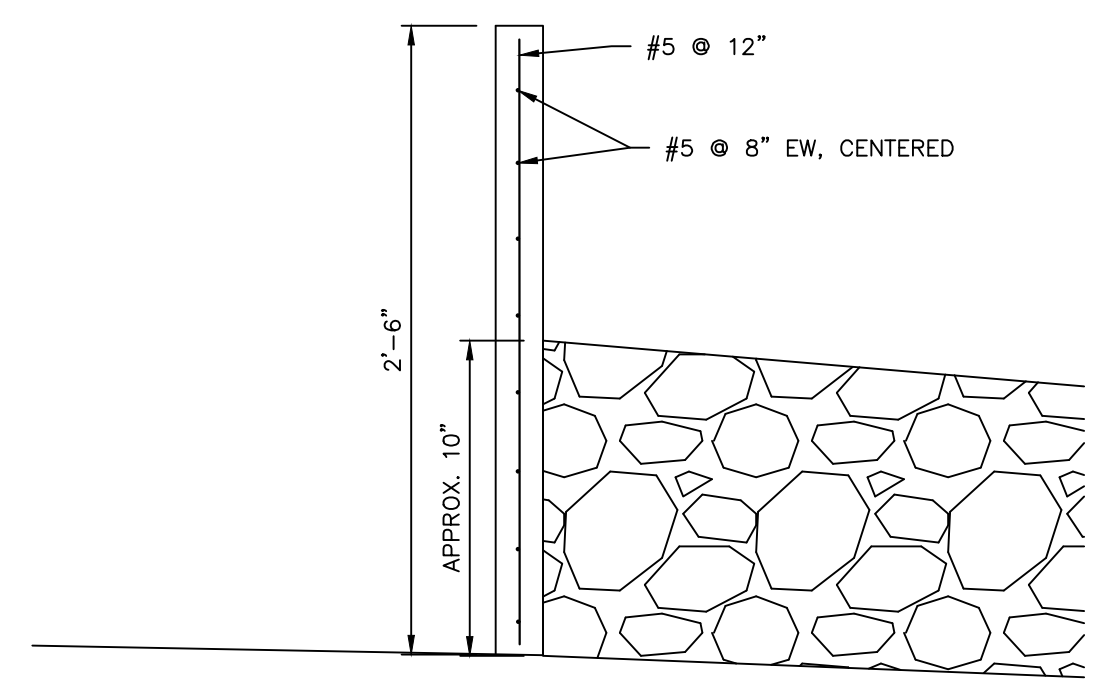
**OUTLET STRUCTURE MODIFICATION**  
SCALE: 1" = 20'



**TRICKLE CHANNEL TYP. SECTION**  
N.T.S.



**TRICKLE CHANNEL TRANSITION**  
SCALE: 1" = 20'



**WEIR WALL REINFORCING DETAIL**  
SCALE: 1" = 20'

48 hours before you file, CALL UTILITY NOTIFICATION CENTER OF COLORADO (UNCC)		811	
Goa,Electric,Telephone,CATV and Penetration Eastern Pipeline Locations		SCALE VERIFICATION	
BAR IS ONE INCH ON ORIGINAL DRAWING IF NOT ONE INCH ON THIS SHEET SCALE ACCORDINGLY		REVISIONS	
NO.	DESCRIPTION	DATE	BY

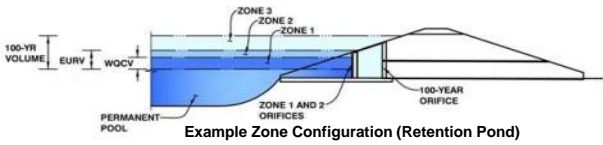
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**SCENIC VIEW AT PAINT BRUSH HILLS DETENTION POND MODIFICATIONS**  
DETAILS  
Prepared for  
**PAINT BRUSH HILLS METROPOLITAN DISTRICT**  
EL PASO COUNTY, COLORADO

DRAWN BY:	DESIGNED BY:
JCS	GEW
JOB NUMBER:	1070.0022
DATE:	8/23/22
SCALE:	N.T.S.
DRAWING NAME:	DETAILS
SHEET NO.:	5 of 8

S:\1070 - Paint Brush Hills Metropolitan District\1070.0022 - Scenic View Detention Pond\DWG\04 DETAILS.dwg, 08/23/2022 1:32:18 PM, jcschneider, 1:1

**Project: Paintbrush Hills Scenic View Detention Pond**  
**Basin ID: Pond #2 - As-built Conditions**



Watershed Information

Selected BMP Type =	<b>EDB</b>
Watershed Area =	19.72 acres
Watershed Length =	1,000 ft
Watershed Length to Centroid =	500 ft
Watershed Slope =	0.031 ft/ft
Watershed Imperviousness =	60.50% percent
Percentage Hydrologic Soil Group A =	2.0% percent
Percentage Hydrologic Soil Group B =	98.0% 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.

Optional User Overrides

Water Quality Capture Volume (WQCV) =	0.391	acre-feet
Excess Urban Runoff Volume (EURV) =	1.298	acre-feet
2-yr Runoff Volume (P1 = 0.94 in.) =	0.843	acre-feet
5-yr Runoff Volume (P1 = 1.22 in.) =	1.180	acre-feet
10-yr Runoff Volume (P1 = 1.47 in.) =	1.534	acre-feet
25-yr Runoff Volume (P1 = 1.85 in.) =	2.204	acre-feet
50-yr Runoff Volume (P1 = 2.17 in.) =	2.715	acre-feet
100-yr Runoff Volume (P1 = 2.52 in.) =	3.332	acre-feet
500-yr Runoff Volume (P1 = 3.14 in.) =	4.364	acre-feet
Approximate 2-yr Detention Volume =	0.786	acre-feet
Approximate 5-yr Detention Volume =	1.092	acre-feet
Approximate 10-yr Detention Volume =	1.450	acre-feet
Approximate 25-yr Detention Volume =	1.729	acre-feet
Approximate 50-yr Detention Volume =	1.882	acre-feet
Approximate 100-yr Detention Volume =	2.124	acre-feet

Define Zones and Basin Geometry

Zone 1 Volume (WQCV) =	0.391	acre-feet
Zone 2 Volume (EURV - Zone 1) =	0.907	acre-feet
Zone 3 Volume (100-year - Zones 1 & 2) =	0.826	acre-feet
Total Detention Basin Volume =	2.124	acre-feet

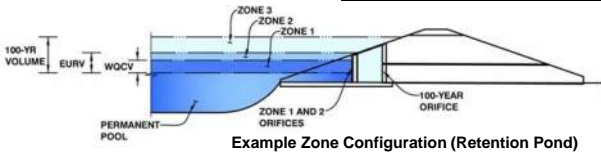
Depth Increment = 1.00 ft										
Stage - Storage Description	Stage (ft)	Optional Override Stage (ft)	Length (ft)	Width (ft)	Area (ft <sup>2</sup> )	Optional Override Area (ft <sup>2</sup> )	Area (acre)	Volume (ft <sup>3</sup> )	Volume (ac-ft)	
<b>Top of Micropool</b>	--	0.00	--	--	--	33	0.001			
<b>7138</b>	--	1.11	--	--	--	3,174	0.073	1,780		0.041
<b>7139</b>	--	2.00	--	--	--	6,012	0.138	5,868		0.135
<b>7140</b>	--	3.00	--	--	--	8,153	0.187	12,950		0.297
<b>7141</b>	--	4.00	--	--	--	10,260	0.236	22,157		0.509
<b>7142</b>	--	5.00	--	--	--	12,558	0.288	33,566		0.771
<b>7143</b>	--	6.00	--	--	--	15,009	0.345	47,349		1.087
<b>7144</b>	--	7.00	--	--	--	17,647	0.405	63,677		1.462
<b>7145</b>	--	8.00	--	--	--	20,403	0.468	82,702		1.899
<b>7146</b>	--	9.00	--	--	--	22,356	0.513	104,082		2.389
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# DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.04 (February 2021)

**Project:** Paintbrush Hills Scenic View Detention Pond

**Basin ID:** Pond #2 - As-built Conditions



	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	3.48	0.391	Orifice Plate
Zone 2 (EURV)	6.59	0.907	Orifice Plate
Zone 3 (100-year)	8.48	0.826	Weir&Pipe (Circular)
<b>Total (all zones)</b>		<b>2.124</b>	

**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 =  ft<sup>2</sup>  
 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 =  0.00 ft (relative to basin bottom at Stage = 0 ft)  
 Depth at top of Zone using Orifice Plate =  6.57 ft (relative to basin bottom at Stage = 0 ft)  
 Orifice Plate: Orifice Vertical Spacing =  N/A inches  
 Orifice Plate: Orifice Area per Row =  1.83 sq. inches (diameter = 1-1/2 inches)

**Calculated Parameters for Plate**  
 WQ Orifice Area per Row =  1.271E-02 ft<sup>2</sup>  
 Elliptical Half-Width =  N/A feet  
 Elliptical Slot Centroid =  N/A feet  
 Elliptical Slot Area =  N/A ft<sup>2</sup>

**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	3.01	4.51	6.01			
Orifice Area (sq. inches)	1.83	1.83	1.83	1.83	1.83			

	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 =  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**  
 Vertical Orifice Area =  Not Selected  Not Selected ft<sup>2</sup>  
 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))

Overflow Weir Front Edge Height, Ho =  Zone 3 Weir 6.80  Not Selected N/A ft (relative to basin bottom at Stage = 0 ft)  
 Overflow Weir Front Edge Length =  Zone 3 Weir 3.00  Not Selected N/A feet  
 Overflow Weir Grate Slope =  Zone 3 Weir 0.00  Not Selected N/A H:V  
 Horiz. Length of Weir Sides =  Zone 3 Weir 2.50  Not Selected N/A feet  
 Overflow Grate Type =  Zone 3 Weir Type C Grate  Not Selected N/A  
 Debris Clogging % =  Zone 3 Weir 20%  Not Selected N/A %

**Calculated Parameters for Overflow Weir**  
 Height of Grate Upper Edge, H<sub>1</sub> =  Zone 3 Weir 6.80  Not Selected N/A feet  
 Overflow Weir Slope Length =  Zone 3 Weir 2.50  Not Selected N/A feet  
 Grate Open Area / 100-yr Orifice Area =  Zone 3 Weir 2.17  Not Selected N/A  
 Overflow Grate Open Area w/o Debris =  Zone 3 Weir 5.23  Not Selected N/A ft<sup>2</sup>  
 Overflow Grate Open Area w/ Debris =  Zone 3 Weir 4.18  Not Selected N/A ft<sup>2</sup>

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

Depth to Invert of Outlet Pipe =  Zone 3 Circular 0.50  Not Selected N/A ft (distance below basin bottom at Stage = 0 ft)  
 Circular Orifice Diameter =  Zone 3 Circular 21.00  Not Selected N/A inches

**Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate**  
 Outlet Orifice Area =  Zone 3 Circular 2.41  Not Selected N/A ft<sup>2</sup>  
 Outlet Orifice Centroid =  Zone 3 Circular 0.88  Not Selected N/A feet  
 Half-Central Angle of Restrictor Plate on Pipe =  Zone 3 Circular N/A  Not Selected N/A radians

**User Input:** Emergency Spillway (Rectangular or Trapezoidal)

Spillway Invert Stage =  8.14 ft (relative to basin bottom at Stage = 0 ft)  
 Spillway Crest Length =  29.20 feet  
 Spillway End Slopes =  4.00 H:V  
 Freeboard above Max Water Surface =  1.00 feet

**Calculated Parameters for Spillway**  
 Spillway Design Flow Depth =  0.81 feet  
 Stage at Top of Freeboard =  9.95 feet  
 Basin Area at Top of Freeboard =  0.51 acres  
 Basin Volume at Top of Freeboard =  2.39 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	0.94	1.22	1.47	1.85	2.17	2.52	3.14
One-Hour Rainfall Depth (in) =	N/A	N/A	0.94	1.22	1.47	1.85	2.17	2.52	3.14
CUHP Runoff Volume (acre-ft) =	0.391	1.298	0.843	1.180	1.534	2.204	2.715	3.332	4.364
Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	0.843	1.180	1.534	2.204	2.715	3.332	4.364
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	0.3	2.5	6.6	17.9	24.7	33.0	46.1
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A							
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	0.02	0.12	0.34	0.91	1.25	1.68	2.34
Peak Inflow Q (cfs) =	N/A	N/A	17.1	24.0	31.1	45.5	56.8	70.2	90.8
Peak Outflow Q (cfs) =	0.2	0.5	0.4	0.5	1.7	11.8	20.2	28.0	54.1
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	0.2	0.3	0.7	0.8	0.8	1.2
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	2.1	3.7	5.2	6.0
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) =	37	60	52	59	63	60	58	55	52
Time to Drain 99% of Inflow Volume (hours) =	39	66	56	64	70	68	67	66	64
Maximum Ponding Depth (ft) =	3.48	6.59	5.07	6.07	6.91	7.33	7.64	8.12	8.53
Area at Maximum Ponding Depth (acres) =	0.21	0.38	0.29	0.35	0.40	0.43	0.45	0.47	0.49
Maximum Volume Stored (acre-ft) =	0.393	1.301	0.788	1.111	1.426	1.599	1.734	1.955	2.148