



Final Drainage Report - Amendment No. 1

# Widefield Parks and Recreation Facility Expansion El Paso County, Colorado

Prepared for:

**Widefield School District 3**  
**1820 Main Street**  
**Colorado Springs, CO 80911**  
**Contact: Dave Gish**

Prepared by:

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Project #: 096958002

Prepared: January 19, 2023

PCD File Number: PPR-2213

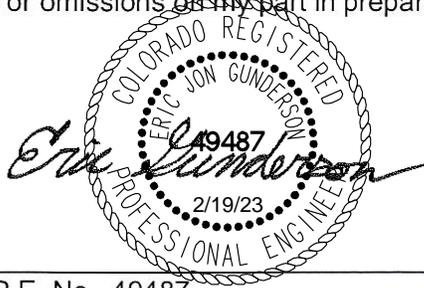
**Kimley»»Horn**



**CERTIFICATION**

**DESIGN ENGINEER'S STATEMENT**

The attached drainage plan and report were prepared under my direction and supervision and are correct to the best of my knowledge and belief. Said drainage report has been prepared according to the criteria established by the County for drainage reports and said report is in conformity with the master plan of the drainage basin. I accept responsibility for any liability caused by any negligent acts, errors or omissions on my part in preparation of this report.



SIGNATURE (Affix Seal): \_\_\_\_\_ 2/19/23  
Colorado P.E. No. 49487 Date

**OWNER/DEVELOPER'S STATEMENT**

I, the developer, have read and will comply with all of the requirements specified in this Drainage Report and Plan.

Widefield School District 3  
Name of Developer

 \_\_\_\_\_ 2-17-2023  
Authorized Signature Date

Eric T. Nelson  
Printed Name

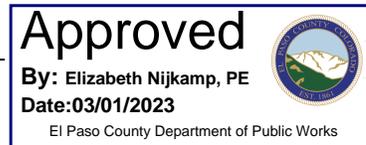
Director of Parks & Recreation - WSD3  
Title

705 Aspen Dr., C.S., CO 80911  
Address:

**EL PASO COUNTY**

Filed in accordance with the requirements of the Drainage Criteria Manual, Volumes 1 and 2, El Paso County Engineering Criteria Manual and Land Development Code as amended.

Joshua Palmer, P.E.  
Interim County Engineer/ ECM Administrator



Conditions:

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## **INTRODUCTION**

### ***PURPOSE AND SCOPE OF STUDY***

The purpose of this Final Drainage Report Amendment No. 1 (Amendment) is to provide calculations and analysis for a revised pond design that differs from the pond as part of the previously approved Final Drainage Report titled “Widefield Parks and Recreation Facility Expansion El Paso County, Colorado” prepared by Kimley-Horn and Associates. Additionally, expanded parking areas that were considered in the approved FDR have been added to drainage sub-basins A2 and A11 and updated hydrologic calculations have been included. The Project is located within the jurisdictional limits of El Paso County (“the County”). Thus, the guidelines for the hydrologic and hydraulic design components were based on the criteria for the County and City of Colorado Springs, described below.

### ***LOCATION***

The 39.26-acre parcel (TSN: 6513100001, 6513100003, 6512300003) is bounded between Widick St. to the east and Aspen Dr. to the west. A vicinity map has been provided in the **Appendix A** of this report.

### ***DESCRIPTION OF PROPERTY***

The Project is located on approximately 39.26 acres of land consisting of an existing park, with five (5) baseball fields, soccer field, parking lots, playground equipment, dirt trail around the perimeter, tennis courts, public library, aquatic center, and hardscape. The Project consists of a new recreation center with associated sidewalk and hardscape extensions, and a proposed onsite full spectrum detention basin. With the exception of pavement replacement over the proposed sanitary sewer service connection, the existing parking lot to the west of the proposed recreation building will remain undisturbed and be restriped. The Site does not currently provide water quality or detention for the Project area. The existing land use per El Paso County’s Assessor is Exempt, Political Subdivision (Public School Use).

The existing topography consists of slopes ranging from 1% to 30% and generally slopes from Northeast to Southwest.

NRCS soil data is available for this Site and it has been noted that soils onsite are generally USCS Type A. There are no major drainage ways or irrigation facilities within the Site.

Improvements will consist of mowing, clearing and grubbing, weed control, paved access road construction, building pad grading, one detention pond, culverts, drainage swales, and native seeding.

An updated Topographic field survey was completed for the Project by Drexel, Barrell & CO, dated August 6, 2021 and is the basis for design for the drainage improvements.

## **AMENDMENTS TO FINAL DRAINAGE REPORT**

### ***WATER QUALITY AND DETENTION POND***

Due to existing utility conflicts discovered in the field during construction of the proposed water quality and detention pond, the pond was required to be redesigned to avoid the utility lines. This Amendment provides the revised storage calculations and revised pond details. Further description of the updated calculations is listed below and in the attached Appendix.

### **HYDRAULIC CRITERIA**

Applicable design methods were utilized to size the proposed pond, which includes the use of the UD-Detention spreadsheet and rational calculations spreadsheet.

Proposed drainage features on-site have been analyzed and sized for the following design storm events:

- Major Storm: 100-year Storm Event

One full spectrum detention pond is proposed in order to maintain historic flows and water quality. The detention pond known as the South Pond. The South Pond is in the southwest corner of the Site with a proposed volume of 1.55 ac-ft and designed for the 100-year storm event. The pond has a discharge rate of 12.8 cfs in the 100-year condition. Water from the South Pond is discharged into an existing culvert at the southwest corner of the site and ultimately outfalls to Fountain Creek. Pond calculations are provided in the Appendix.

The pond is designed to release the 100-year flow rates below the pre-development flow rate.

Emergency overflows will be routed over the western side of the pond. It will follow existing drainage conditions and cross the property line to the West, where it will avoid the single family residence and enter the Grand Boulevard right of way.

### **SUB-BASIN A2**

Sub-Basin A2 is located on the north side of the proposed building and consists of an asphalt parking area, sidewalks, retaining wall and landscape areas. The approved FDR considered the full parking building out and assumed a larger amount of asphalt parking. The hydrologic calculations have been revised as part of this Amendment to be reflective of the final parking lot design. The actual impervious area is less than what was assumed in the approved FDR. The basin imperviousness is 63% and the 5-year and 100-year flows are 1.07 cfs and 2.22 cfs respectively. Both minor and major flows are less than what is shown in the Approved FDR, therefore not changes to the overall storm system are proposed.

### **SUB-BASIN A11**

Sub-Basin A11 is located on the south side of the proposed building and consists of an asphalt parking area, sidewalks and landscape areas. The approved FDR considered the full parking building out and assumed a larger amount of asphalt parking. The hydrologic calculations have been revised as part of this Amendment to be reflective of the final parking lot design. The actual impervious area is less than what was assumed in the approved FDR. The basin imperviousness is 55% and the 5-year and 100-year flows are 3.92 cfs and 7.30 cfs respectively. Both minor and major flows are less than what is shown in the Approved FDR, therefore not changes to the overall storm system are proposed.

## **DRAINAGE FACILITY DESIGN**

### ***GENERAL CONCEPT***

The proposed drainage patterns will match the historic patterns. To maintain historic flows, a full spectrum detention pond is being proposed and will capture and control the flows from the proposed development to convey flows with a series of swales, parking lot sheet flow, and a storm drain system.

The revised proposed drainage map showing the updated pond grading can be found in the Appendix.

### ***SPECIFIC DETAILS***

On site flows enter the South Pond which then release controlled flows into the existing 24" CMP culvert that conveys flows south underneath the adjacent property's drive access. The 24" CMP has a 100% flow capacity of 41.59 cfs. The proposed pond has a 100 year discharge rate of 12.8 cfs. Therefore the pipe has capacity for the released flows.

### ***FOREBAY AND TRICKLE CHANNEL***

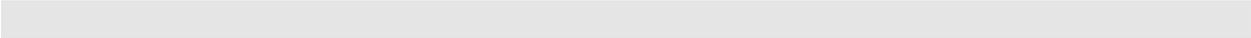
Capacity calculations for the concrete trickle channel in the South Pond were not provided in the approved FDR. The capacity calculations for the forebay outlet and trickle channel have been provided in the Appendix. The max flow rate for the forebay outlet is 2.17 cfs and the capacity of the concrete trickle channel is 8.78 cfs which is greater than two times the flow coming from the forebay.

## **SUMMARY**

The proposed drainage design is to maintain the historic drainage patterns, the overall imperviousness and release rates for the Site. Runoff from the Site will flow through an existing storm drain system to an existing El Paso County drainage basin: The Windmill Gulch Drainage Basin. The basin ultimately discharges to Fountain Creek. The drainage design presented within this report conforms to the criteria presented in both the MANUAL and the Colorado Springs MANUAL. Additionally, the Site runoff and storm drain facilities will not adversely affect the downstream and surrounding developments, including Fountain Creek.

## **REFERENCES**

1. City of Colorado Springs "Drainage Criteria Manual (DCM) Volume 1", dated May, 2014
2. El Paso County "Drainage Criteria Manual", dated October 31, 2018
3. El Paso County "Engineering Criteria Manual" Revision 6, dated December 13, 2016
4. Chapter 6 and Section 3.2.1. of Chapter 13-City of Colorado Springs Drainage Criteria Manual, May 2014.
5. Urban Drainage and Flood Control District Drainage Criteria Manual (UDFCDCM), Vol. 1, prepared by Wright-McLaughlin Engineers, June 2001, with latest revisions.

6. Flood Insurance Rate Map, El Paso County, Colorado and Incorporated Areas, Map Number 08041C0763G and 08041C0951G effective date, December 7, 2018, prepared by the Federal Emergency Management Agency (FEMA).
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**APPENDIX**

$$I = \frac{28.5 P_1}{(10 + T_D)^{0.786}}$$

Where:

I = rainfall intensity (inches per hour)

P<sub>1</sub> = one-hour rainfall depth (inches) from Table 6-2 One-hour Point Rainfall  
 City of Colorado Springs Drainage Design

T<sub>c</sub> = storm duration (minutes)

	<u>2-yr</u>	<u>5-yr</u>	<u>10-yr</u>	<u>100-yr</u>
P <sub>1</sub> =	1.19	1.52	1.75	2.55

Time Intensity Frequency Tabulation

TIME	2 YR	5 YR	10 YR	100 YR
5	4.05	5.16	5.94	8.65
10	3.23	4.11	4.73	6.90
15	2.71	3.45	3.97	5.79
30	1.87	2.38	2.75	4.00
60	1.21	1.54	1.77	2.58
120	0.74	0.94	1.09	1.58

Weighted Imperviousness Calculations

SUB-BASIN	AREA (SF)	AREA (Acres)	ROOF AREA	ROOF IMPERVIOUSNESS	ROOF				LANDSCAPE AREA	LANDSCAPE IMPERVIOUSNESS	LANDSCAPE				PAVEMENT AREA	PAVEMENT IMPERVIOUSNESS	PAVEMENT				WEIGHTED IMPERVIOUSNESS	WEIGHTED COEFFICIENTS			
					C2	C5	C10	C100			C2	C5	C10	C100			C2	C5	C10	C100		C2	C5	C10	C100
EX-1	133517	3.07	0.18	90%	0.71	0.73	0.75	0.81	1.21	2%	0.03	0.09	0.17	0.36	1.67	100%	0.89	0.90	0.92	0.96	61%	0.54	0.57	0.61	0.71
EX-2	89883	2.06	-	90%	0.71	0.73	0.75	0.81	1.99	2%	0.03	0.09	0.17	0.36	0.07	100%	0.89	0.90	0.92	0.96	5%	0.06	0.12	0.20	0.38
EX-3	190790	4.38	0.27	90%	0.71	0.73	0.75	0.81	2.73	2%	0.03	0.09	0.17	0.36	1.38	100%	0.89	0.90	0.92	0.96	38%	0.34	0.39	0.44	0.58
EX-4	34437	0.79	-	90%	0.71	0.73	0.75	0.81	0.24	2%	0.03	0.09	0.17	0.36	0.55	100%	0.89	0.90	0.92	0.96	70%	0.63	0.65	0.69	0.78
A1	108597	2.49	-	90%	0.71	0.73	0.75	0.81	1.17	2%	0.03	0.09	0.17	0.36	1.32	100%	0.89	0.90	0.92	0.96	54%	0.49	0.52	0.57	0.68
A2	15277	0.35	-	90%	0.71	0.73	0.75	0.81	0.13	2%	0.03	0.09	0.17	0.36	0.22	100%	0.89	0.90	0.92	0.96	63%	0.56	0.59	0.64	0.73
A3	3880	0.09	-	90%	0.71	0.73	0.75	0.81	0.09	2%	0.03	0.09	0.17	0.36	0.00	100%	0.89	0.90	0.92	0.96	6%	0.07	0.13	0.20	0.39
A4	36061	0.83	-	90%	0.71	0.73	0.75	0.81	0.70	2%	0.03	0.09	0.17	0.36	0.13	100%	0.89	0.90	0.92	0.96	17%	0.16	0.22	0.29	0.45
A5	35595	0.82	-	90%	0.71	0.73	0.75	0.81	0.73	2%	0.03	0.09	0.17	0.36	0.09	100%	0.89	0.90	0.92	0.96	13%	0.12	0.18	0.25	0.43
A6	31808	0.73	-	90%	0.71	0.73	0.75	0.81	0.72	2%	0.03	0.09	0.17	0.36	0.01	100%	0.89	0.90	0.92	0.96	4%	0.04	0.10	0.18	0.37
A7	45386	1.04	1.04	90%	0.71	0.73	0.75	0.81	-	2%	0.03	0.09	0.17	0.36	-	100%	0.89	0.90	0.92	0.96	90%	0.71	0.73	0.75	0.81
A8	18831	0.43	-	90%	0.71	0.73	0.75	0.81	0.07	2%	0.03	0.09	0.17	0.36	0.36	100%	0.89	0.90	0.92	0.96	83%	0.74	0.76	0.79	0.86
A9	148438	3.41	0.02	90%	0.71	0.73	0.75	0.81	2.29	2%	0.03	0.09	0.17	0.36	1.11	100%	0.89	0.90	0.92	0.96	34%	0.31	0.36	0.42	0.56
A10	176750	4.06	0.07	90%	0.71	0.73	0.75	0.81	3.78	2%	0.03	0.09	0.17	0.36	0.21	100%	0.89	0.90	0.92	0.96	8%	0.09	0.14	0.22	0.40
A11	50356	1.16	-	90%	0.71	0.73	0.75	0.81	0.53	2%	0.03	0.09	0.17	0.36	0.62	100%	0.89	0.90	0.92	0.96	55%	0.49	0.53	0.57	0.68
A12	613982	14.10	0.02	90%	0.71	0.73	0.75	0.81	13.62	2%	0.03	0.09	0.17	0.36	0.45	100%	0.89	0.90	0.92	0.96	5%	0.06	0.12	0.19	0.38
TOTAL	1,733,588	39.80	1.60	90%	0.71	0.73	0.75	0.81	30.01	2%	0.03	0.09	0.17	0.36	8.20	100%	0.89	0.90	0.92	0.96	26%	0.23	0.28	0.35	0.50

Widefield Rec Center Expansion  
 Drainage Report  
 El Paso County, CO

Widefield Rec Center - Drainage Report																
Proposed Runoff Calculations																
Time of Concentration																
Watercourse Coefficient																
					Forest & Meadow 2.50			Short Grass Pasture & Lawns 7.00			Grassed Waterway 15.00					
					Fallow or Cultivation 5.00			Nearly Bare Ground 10.00			Paved Area & Shallow Gutter 20.00					
DESIGN POINT	SUB-BASIN DATA				INITIAL / OVERLAND TIME			TRAVEL TIME T(t)					T(c) CHECK (URBANIZED BASINS)			FINAL T(c) min.
	DRAIN BASIN	AREA sq. ft.	AREA ac.	C(5)	Length ft.	Slope %	T(l) min	Length ft.	Slope %	Coeff.	Velocity fps	T(t) min.	COMP. T(c)	TOTAL LENGTH	L/180+10	
1	EX-1	133,517	3.07	0.57	68	4.8%	4.8	624	6.1%	20.00	4.9	2.1	6.9	692	13.8	6.9
2	EX-2	89,883	2.06	0.12	100	11.7%	7.9	187	9.1%	7.00	2.1	1.5	9.4	287	11.6	9.4
3	EX-3	190,790	4.38	0.39	100	2.5%	9.6	873	6.8%	10.00	2.6	5.6	15.2	973	15.4	15.2
4	EX-4	34,437	0.79	0.65	100	4.4%	5.0	678	3.5%	10.00	1.9	6.0	11.0	778	14.3	11.0
5	A1	108,597	2.49	0.52	100	5.5%	6.0	864	3.5%	20.00	3.7	3.8	9.8	964	15.4	9.8
6	A2	15,277	0.35	0.59	50	22.0%	2.3	143	0.5%	20.00	1.4	1.7	5.0	193	11.1	5.0
7	A3	3,880	0.09	0.13	55	22.0%	4.7	0	0.0%	7.00	0.0	0.0	5.0	55	10.3	5.0
8	A4	36,061	0.83	0.22	100	3.3%	10.9	285	12.2%	7.00	2.4	1.9	12.8	385	12.1	12.1
9	A5	35,595	0.82	0.18	100	5.4%	9.6	256	9.2%	7.00	2.1	2.0	11.6	356	12.0	11.6
10	A6	31,808	0.73	0.10	100	9.4%	8.7	345	3.7%	7.00	1.3	4.3	13.0	445	12.5	12.5
11	A7	45,386	1.04	0.73	100	5.0%	4.0	15	5.0%	20.00	4.5	0.1	5.0	115	10.6	5.0
12	A8	18,831	0.43	0.76	100	5.1%	3.6	121	1.5%	20.00	2.4	0.8	5.0	221	11.2	5.0
13	A9	148,438	3.41	0.36	75	3.5%	7.8	731	4.9%	10.00	2.2	5.5	13.3	806	14.5	13.3
14	A10	176,750	4.06	0.14	100	15.0%	7.1	1016	2.7%	7.00	1.2	14.7	21.8	1116	16.2	16.2
15	A11	50,356	1.16	0.53	100	1.2%	9.9	197	4.4%	20.00	4.2	0.8	10.7	297	11.7	10.7
16	A12	613,982	14.10	0.12	100	13.9%	7.5	1273	4.6%	7.00	1.5	14.1	21.6	1373	17.6	17.6

Widefield Rec Center Expansion  
 Drainage Report  
 El Paso County, CO

Widefield Rec Center - Drainage Report												
Proposed Runoff Calculations												
(Rational Method Procedure)												
Design Storm 5 Year												
BASIN INFORMATION				DIRECT RUNOFF				CUMULATIVE RUNOFF				NOTES
DESIGN POINT	DRAIN BASIN	AREA ac.	RUNOFF COEFF	T(c) min	C x A	I in/hr	Q cfs	T(c) min	C x A	I in/hr	Q cfs	
1	EX-1	3.07	0.57	6.9	1.75	4.69	8.19				8.19	
2	EX-2	2.06	0.12	9.4	0.24	4.22	1.03				1.03	
3	EX-3	4.38	0.39	15.2	1.69	3.43	5.79				5.79	
4	EX-4	0.79	0.65	11.0	0.52	3.95	2.04				2.04	
5	A1	2.49	0.52	9.8	1.29	4.14	5.35				5.35	
6	A2	0.35	0.59	5.0	0.21	5.16	1.07				1.07	
7	A3	0.09	0.13	5.0	0.01	5.16	0.06				0.06	
8	A4	0.83	0.22	12.1	0.18	3.80	0.68				0.68	
9	A5	0.82	0.18	11.6	0.15	3.87	0.56				0.56	
10	A6	0.73	0.10	12.5	0.08	3.75	0.28				0.28	
11	A7	1.04	0.73	5.0	0.76	5.16	3.92				3.92	
12	A8	0.43	0.76	5.0	0.33	5.16	1.70				1.70	
13	A9	3.41	0.36	13.3	1.21	3.65	4.42				4.42	
14	A10	4.06	0.14	16.2	0.58	3.33	1.92				1.92	
15	A11	1.16	0.53	10.7	0.61	4.01	2.44				2.44	
16	A12	14.10	0.12	17.6	1.65	3.19	5.26				5.26	

Widefield Rec Center Expansion  
 Drainage Report  
 El Paso County, CO

Widefield Rec Center - Drainage Report												
Proposed Runoff Calculations												
(Rational Method Procedure)												
Design Storm 100 Year												
BASIN INFORMATION				DIRECT RUNOFF				CUMULATIVE RUNOFF				NOTES
DESIGN POINT	DRAIN BASIN	AREA ac.	RUNOFF COEFF	T(c) min	C x A	I in/hr	Q cfs	T(c) min	C x A	I in/hr	Q cfs	
1	EX-1	3.07	0.71	6.9	2.19	7.87	17.22				17.22	
2	EX-2	2.06	0.38	9.4	0.79	7.07	5.56				5.56	
3	EX-3	4.38	0.58	15.2	2.53	5.76	14.55				14.55	
4	EX-4	0.79	0.78	11.0	0.61	6.63	4.07				4.07	
5	A1	2.49	0.68	9.8	1.69	6.94	11.73				11.73	
6	A2	0.35	0.73	5.0	0.26	8.65	2.22				2.22	
7	A3	0.09	0.39	5.0	0.03	8.65	0.30				0.30	
8	A4	0.83	0.45	12.1	0.38	6.38	2.40				2.40	
9	A5	0.82	0.43	11.6	0.35	6.49	2.26				2.26	
10	A6	0.73	0.37	12.5	0.27	6.29	1.70				1.70	
11	A7	1.04	0.81	5.0	0.84	8.65	7.30				7.30	
12	A8	0.43	0.86	5.0	0.37	8.65	3.21				3.21	
13	A9	3.41	0.56	13.3	1.90	6.12	11.61				11.61	
14	A10	4.06	0.40	16.2	1.62	5.58	9.02				9.02	
15	A11	1.16	0.68	10.7	0.79	6.72	5.31				5.31	
16	A12	14.10	0.38	17.6	5.35	5.36	28.67				28.67	

Widefield Rec Center Expansion  
Drainage Report  
El Paso County, CO

Widefield Rec Center - Drainage Report												
Proposed Runoff Calculations      Design Storm 10 Year												
(Rational Method Procedure)												
BASIN INFORMATION				DIRECT RUNOFF				CUMMULATIVE RUNOFF				NOTES
DESIGN POINT	DRAIN BASIN	AREA ac.	RUNOFF COEFF	T(c) min	C x A	I in/hr	Q cfs	T(c) min	C x A	I in/hr	Q cfs	
1	EX-1	3.065	0.61	6.9	1.88	5.40	10.15				10.15	
2	EX-2	2.063	0.20	9.4	0.41	4.85	1.97				1.97	
3	EX-3	4.38	0.44	15.2	1.94	3.95	7.66				7.66	
4	EX-4	0.791	0.69	11.0	0.55	4.55	2.48				2.48	
5	A1	2.493	0.57	9.8	1.41	4.76	6.73				6.73	
6	A2	0.351	0.64	5.0	0.22	5.94	1.32				1.32	
7	A3	0.089	0.20	5.0	0.02	5.94	0.11				0.11	
8	A4	0.828	0.29	12.1	0.24	4.38	1.04				1.04	
9	A5	0.817	0.25	11.6	0.21	4.46	0.92				0.92	
10	A6	0.73	0.18	12.5	0.13	4.32	0.57				0.57	
11	A7	1.042	0.75	5.0	0.78	5.94	4.64				4.64	
12	A8	0.432	0.79	5.0	0.34	5.94	2.03				2.03	
13	A9	3.408	0.42	13.3	1.42	4.20	5.96				5.96	
14	A10	4.058	0.22	16.2	0.89	3.83	3.39				3.39	
15	A11	1.156	0.57	10.7	0.66	4.61	3.06				3.06	
16	A12	14.1	0.19	17.6	2.75	3.68	10.09				10.09	

Widefield Rec Center Expansion  
 Drainage Report  
 El Paso County, CO

SUMMARY - PROPOSED RUNOFF TABLE						
DESIGN POINT	BASIN DESIGNATION	BASIN AREA (ACRES)	DIRECT 5-YR RUNOFF (CFS)	DIRECT 100-YR RUNOFF (CFS)	CUMULATIVE 5-YR RUNOFF (CFS)	CUMULATIVE 100-YR RUNOFF (CFS)
1	EX-1	3.07	8.19	17.22	8.19	17.22
2	EX-2	2.06	1.03	5.56	1.03	5.56
3	EX-3	4.38	5.79	14.55	5.79	14.55
4	EX-4	0.79	2.04	4.07	2.04	4.07
5	A1	2.49	5.35	11.73	5.35	11.73
6	A2	0.35	1.07	2.22	1.07	2.22
7	A3	0.09	0.06	0.30	0.06	0.30
8	A4	0.83	0.68	2.40	0.68	2.40
9	A5	0.82	0.56	2.26	0.56	2.26
10	A6	0.73	0.28	1.70	0.28	1.70
11	A7	1.04	3.92	7.30	3.92	7.30
12	A8	0.43	1.70	3.21	1.70	3.21
13	A9	3.41	4.42	11.61	4.42	11.61
14	A10	4.06	1.92	9.02	1.92	9.02
15	A11	1.16	2.44	5.31	2.44	5.31
16	A12	14.10	5.26	28.67	5.26	28.67

Table 6-6. Runoff coefficient equations based on NRCS soil group and storm return period

NRCS Soil Group	Storm Return Period					
	2-Year	5-Year	10-Year	25-Year	50-Year	100-Year
A	$C_A = 0.89i$	$C_A = 0.93i$	$C_A = 0.94i$	$C_A = 0.944i$	$C_A = 0.95i$	$C_A = 0.81i + 0.154$
B	$C_B = 0.89i$	$C_B = 0.93i$	$C_B = 0.81i + 0.125$	$C_B = 0.70i + 0.23$	$C_B = 0.59i + 0.364$	$C_B = 0.49i + 0.454$
C/D	$C_{C/D} = 0.89i$	$C_{C/D} = 0.87i + 0.052$	$C_{C/D} = 0.74i + 0.2$	$C_{C/D} = 0.64i + 0.31$	$C_{C/D} = 0.54i + 0.418$	$C_{C/D} = 0.45i + 0.508$

ROOF						
NRCS Soil Group	Storm Return Period					
	2-Year	5-Year	10-Year	25-Year	50-Year	100-Year
A	0.80	0.84	0.85	0.85	0.86	0.88
B						
C/D						

I (%)	
ROOF	90.00%
LANDSCAPE	2.00%
PAVEMENT	100.00%

Soil Type
A
B
C/D

LANDSCAPE						
NRCS Soil Group	Storm Return Period					
	2-Year	5-Year	10-Year	25-Year	50-Year	100-Year
A	0.02	0.02	0.02	0.02	0.02	0.17
B						
C/D						

PAVEMENT						
NRCS Soil Group	Storm Return Period					
	2-Year	5-Year	10-Year	25-Year	50-Year	100-Year
A	0.89	0.93	0.94	0.94	0.95	0.96
B						
C/D						

### BASIN IMPERVIOUSNESS (TRIBUTARY TO POND)

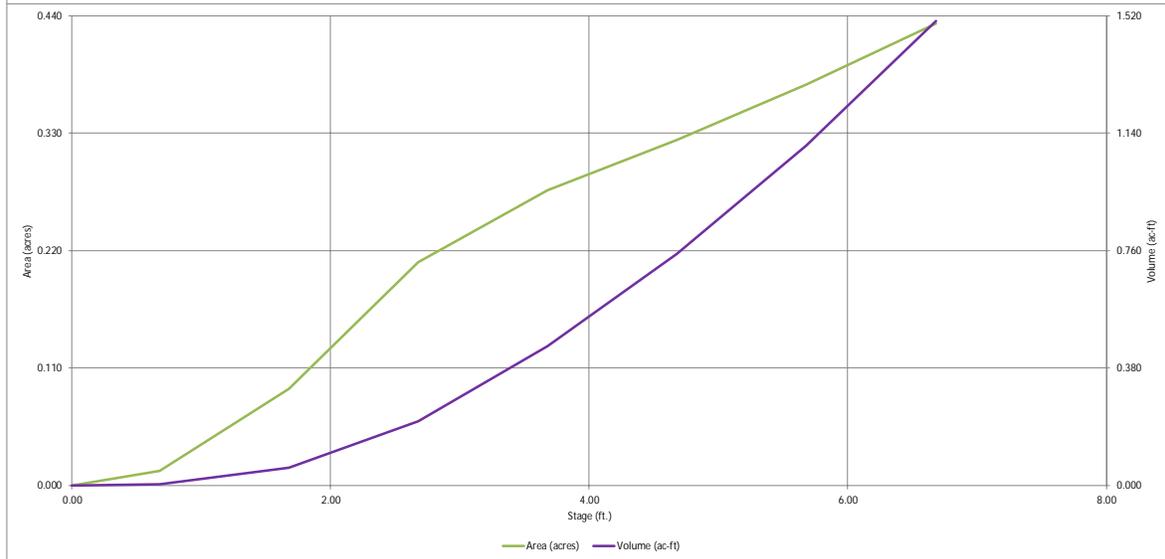
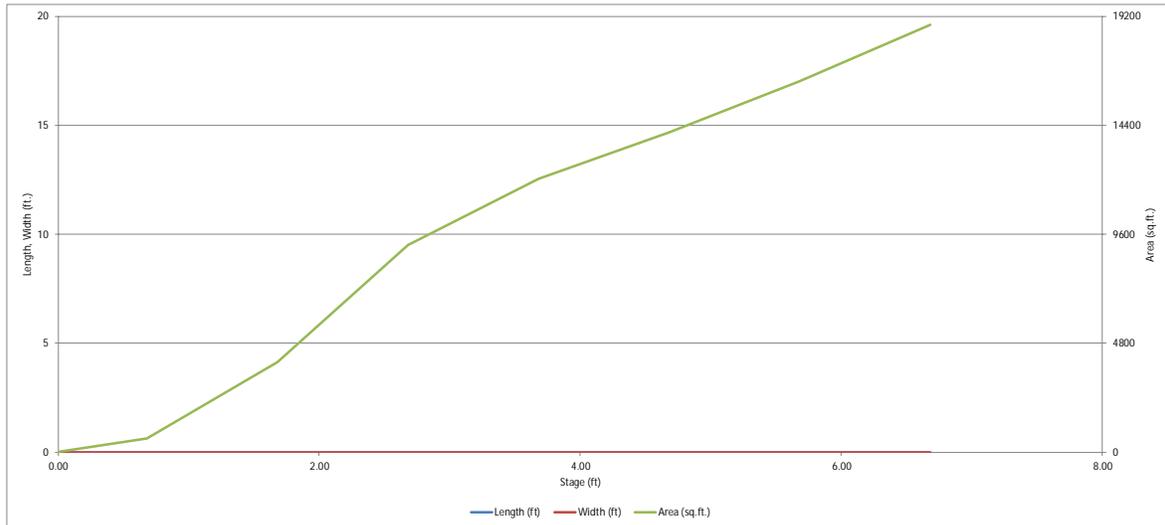
Landuse	I	Runoff Coefficient		
		2-YR	5-YR	100-YR
Landscape	2%	0.03	0.09	0.36
Roof	90%	0.71	0.73	0.81
Drives&Walks	100%	0.89	0.90	0.96

Basin Designation	A <sub>TOTAL</sub> (AC)	A <sub>TOTAL</sub> (SF)	A <sub>LANDSCAPE</sub> (SF)	A <sub>ROOF</sub> (SF)	A <sub>DRIVES &amp; WALKS</sub> (SF)	I <sub>WEIGHTED</sub>
A1	2.49	108,597	51,089	0	57,508	54%
A2	0.35	15,277	5,791	0	9,486	63%
A3	0.09	3,880	3,712	0	168	6%
A4	0.83	36,061	30,410	0	5,651	17%
A5	0.82	35,595	31,719	0	3,876	13%
A6	0.73	31,808	31,304	0	504	4%
A7	1.04	45,386	0	45,386	0	90%
A8	0.43	18,831	3,214	0	15,617	83%
A11	1.16	50,356	23,188	0	27,168	55%
A12	14.10	613,982	593,477	929	19,576	5%
<b>Total</b>	<b>22.03</b>	<b>959,773.00</b>	<b>773,904.00</b>	<b>46,315.00</b>	<b>139,554.00</b>	<b>20%</b>



# DETENTION BASIN STAGE-STORAGE TABLE BUILDER

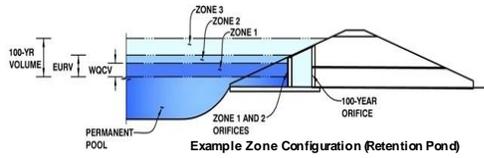
*MHFD-Detention, Version 4.06 (July 2022)*



# DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD- Detention, Version 4.06 (July 2022)

Project: Widefield Rec Center  
Basin ID: South Pond



	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WOCV)	2.71	0.212	Orifice Plate
Zone 2 (EURV)	3.47	0.181	Circular Orifice
Zone 3 (100-year)	5.06	0.483	Weir&Pipe (Restrict)
Total (all zones)		0.876	

User Input: Orifice at Underdrain Outlet (typically used to drain WOCV 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 WOCV and/or EURV in a sedimentation BMP)

Centroid 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 (diameter = 15/16 inch)

Calculated Parameters for Plate

WQ Orifice Area per Row =  ft<sup>2</sup>  
Elliptical Half-Width =  feet  
Elliptical Slot Centroid =  feet  
Elliptical Slot Area =  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	1.00	2.00					
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)

	Zone 2 Circular	Not Selected	
Invert of Vertical Orifice =	<input type="text" value="2.71"/>	<input type="text" value="N/A"/>	ft (relative to basin bottom at Stage = 0 ft)
Depth at top of Zone using Vertical Orifice =	<input type="text" value="3.47"/>	<input type="text" value="N/A"/>	ft (relative to basin bottom at Stage = 0 ft)
Vertical Orifice Diameter =	<input type="text" value="1.87"/>	<input type="text" value="N/A"/>	inches

Calculated Parameters for Vertical Orifice

	Zone 2 Circular	Not Selected	
Vertical Orifice Area =	<input type="text" value="0.02"/>	<input type="text" value="N/A"/>	ft <sup>2</sup>
Vertical Orifice Centroid =	<input type="text" value="0.08"/>	<input type="text" value="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 <sub>o</sub> =	<input type="text" value="3.47"/>	<input type="text" value="N/A"/>	ft (relative to basin bottom at Stage = 0 ft)
Overflow Weir Front Edge Length =	<input type="text" value="5.00"/>	<input type="text" value="N/A"/>	feet
Overflow Weir Gate Slope =	<input type="text" value="4.00"/>	<input type="text" value="N/A"/>	H:V
Horiz. Length of Weir Sides =	<input type="text" value="5.00"/>	<input type="text" value="N/A"/>	feet
Overflow Gate Type =	<input type="text" value="Type C Gate"/>	<input type="text" value="N/A"/>	
Debris Clogging % =	<input type="text" value="50%"/>	<input type="text" value="N/A"/>	%

Calculated Parameters for Overflow Weir

	Zone 3 Weir	Not Selected	
Height of Gate Upper Edge, H <sub>1</sub> =	<input type="text" value="4.72"/>	<input type="text" value="N/A"/>	feet
Overflow Weir Slope Length =	<input type="text" value="5.15"/>	<input type="text" value="N/A"/>	feet
Gate Open Area / 100-yr Orifice Area =	<input type="text" value="7.10"/>	<input type="text" value="N/A"/>	
Overflow Gate Open Area w/o Debris =	<input type="text" value="17.94"/>	<input type="text" value="N/A"/>	ft <sup>2</sup>
Overflow Gate Open Area w/ Debris =	<input type="text" value="8.97"/>	<input type="text" value="N/A"/>	ft <sup>2</sup>

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 =	<input type="text" value="0.08"/>	<input type="text" value="N/A"/>	ft (distance below basin bottom at Stage = 0 ft)
Outlet Pipe Diameter =	<input type="text" value="24.00"/>	<input type="text" value="N/A"/>	inches
Restrictor Plate Height Above Pipe Invert =	<input type="text" value="18.00"/>	<input type="text" value="N/A"/>	inches

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate

	Zone 3 Restrictor	Not Selected	
Outlet Orifice Area =	<input type="text" value="2.53"/>	<input type="text" value="N/A"/>	ft <sup>2</sup>
Outlet Orifice Centroid =	<input type="text" value="0.83"/>	<input type="text" value="N/A"/>	feet
Half-Central Angle of Restrictor Plate on Pipe =	<input type="text" value="2.09"/>	<input type="text" value="N/A"/>	radians

User Input: Emergency Spillway (Rectangular or Trapezoidal)

Spillway Invert Stage =	<input type="text" value="5.18"/>	ft (relative to basin bottom at Stage = 0 ft)
Spillway Crest Length =	<input type="text" value="21.00"/>	feet
Spillway End Slopes =	<input type="text" value="4.00"/>	H:V
Freeboard above Max Water Surface =	<input type="text" value="1.00"/>	feet

Calculated Parameters for Spillway

Spillway Design Flow Depth =	<input type="text" value="0.50"/>	feet
Stage at Top of Freeboard =	<input type="text" value="6.68"/>	feet
Basin Area at Top of Freeboard =	<input type="text" value="0.43"/>	acres
Basin Volume at Top of Freeboard =	<input type="text" value="1.50"/>	acre-ft

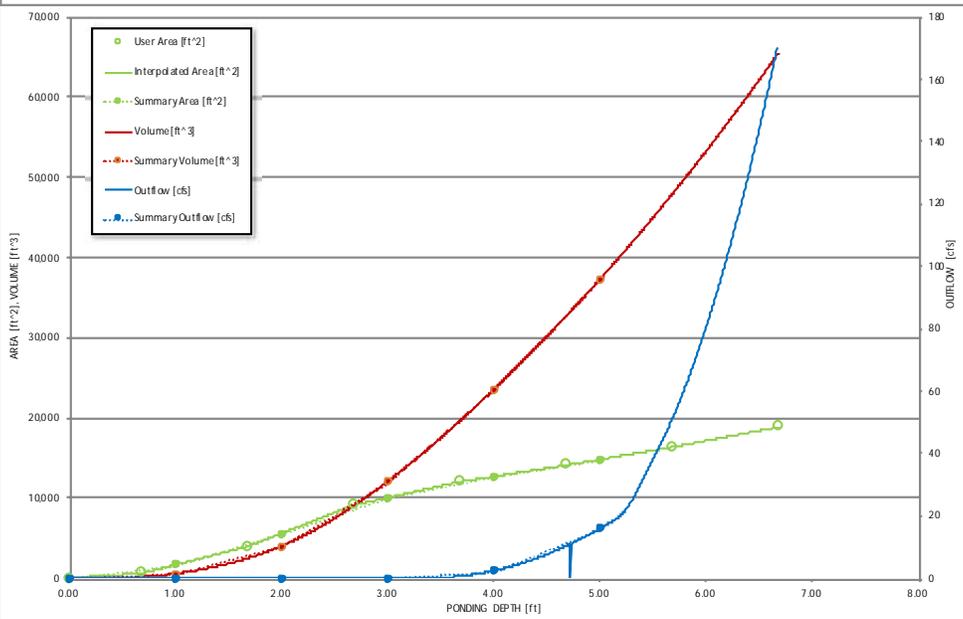
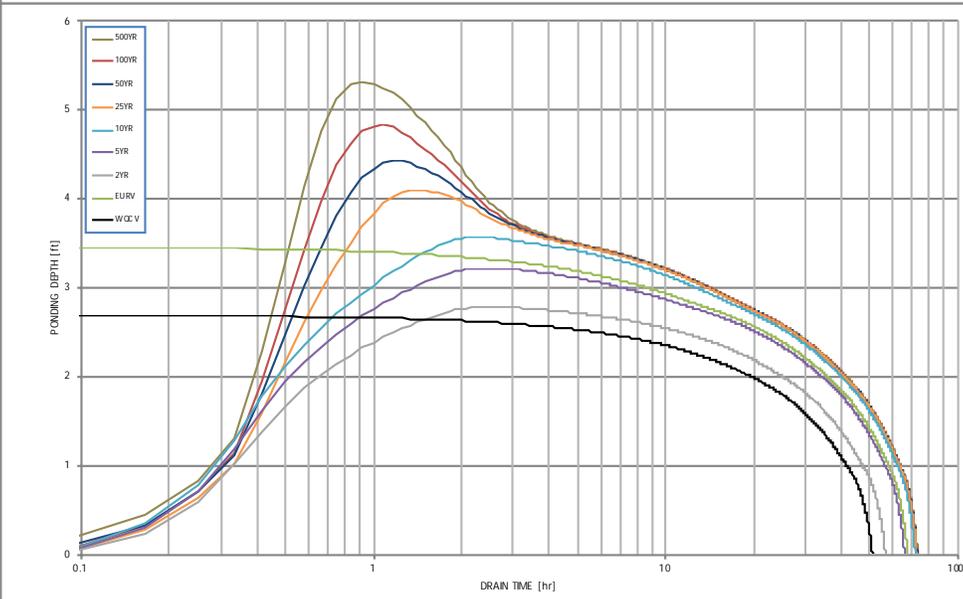
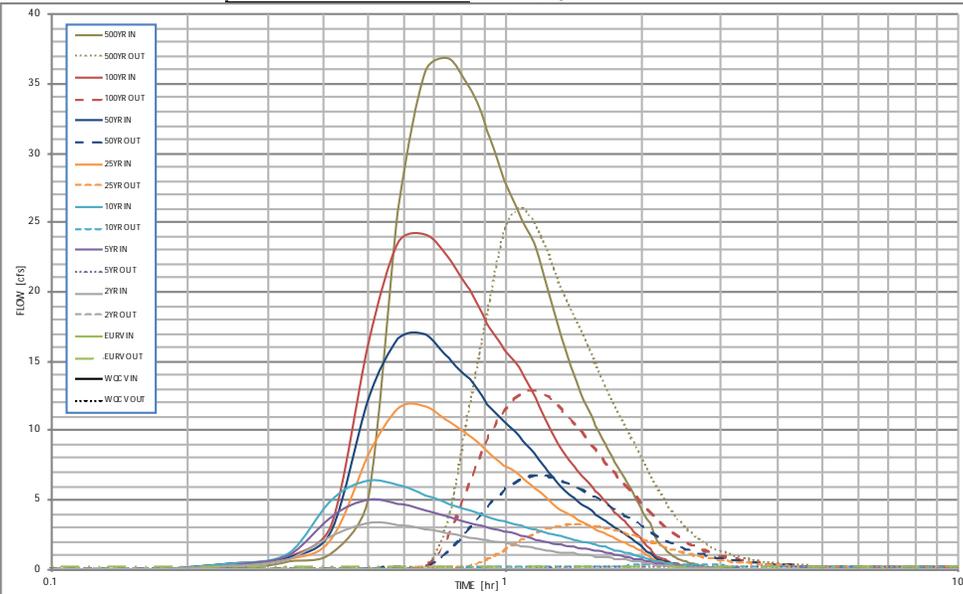
Routed Hydrograph Results

The user can override the default CUHP hydrographs and runoff volumes by entering new values in the Inflow Hydrographs table (Columns W through AF).

	WOCV	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	2.55	3.14
CUHP Runoff Volume (acre-ft)	0.212	0.393	0.248	0.358	0.460	0.797	1.118	1.599	2.515
Inflow Hydrograph Volume (acre-ft)	N/A	N/A	0.248	0.358	0.460	0.797	1.118	1.599	2.515
CUHP Predevelopment Peak Q (cfs)	N/A	N/A	0.2	0.4	0.5	4.9	9.8	16.6	28.6
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	0.02	0.22	0.44	0.76	1.30
Peak Inflow Q (cfs)	N/A	N/A	3.4	5.0	6.3	11.7	16.9	24.1	36.8
Peak Outflow Q (cfs)	0.1	0.2	0.1	0.2	0.3	3.2	6.8	12.8	26.1
Ratio Peak Outflow to Predevelopment Q	N/A	N/A	N/A	0.4	0.6	0.7	0.7	0.8	0.9
Structure Controlling Flow	Vertical Orifice 1	Overflow Weir 1	Vertical Orifice 1	Vertical Orifice 1	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	0.0	0.2	0.4	0.7	1.2
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)	46	59	51	58	62	59	56	52	46
Time to Drain 99% of Inflow Volume (hours)	49	64	54	62	67	66	65	62	59
Maximum Ponding Depth (ft)	2.71	3.47	2.79	3.23	3.57	4.10	4.43	4.83	5.32
Area at Maximum Ponding Depth (acres)	0.21	0.26	0.22	0.25	0.27	0.30	0.31	0.33	0.36
Maximum Volume Stored (acre-ft)	0.213	0.393	0.231	0.330	0.420	0.567	0.670	0.799	0.968

# DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.06 (July 2022)



S-A-V-D Chart Axis Override	X-axis	Left Y-Axis	Right Y-Axis
minimum bound			
maximum bound			

# DETENTION BASIN OUTLET STRUCTURE DESIGN

Outflow Hydrograph Workbook Filename: \_\_\_\_\_

**Inflow Hydrographs**

The user can override the calculated inflow hydrographs from this workbook with inflow hydrographs developed in a separate program.

Time Interval	SOURCE	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP
	TIME	WOCV [cfs]	EURV [cfs]	2 Year [cfs]	5 Year [cfs]	10 Year [cfs]	25 Year [cfs]	50 Year [cfs]	100 Year [cfs]	500 Year [cfs]
5.00 min	0:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.01	0.08
	0:15:00	0.00	0.00	0.21	0.33	0.42	0.28	0.35	0.35	0.50
	0:20:00	0.00	0.00	0.75	0.99	1.16	0.73	0.86	0.93	1.21
	0:25:00	0.00	0.00	2.41	3.82	5.04	2.18	2.89	3.38	5.07
	0:30:00	0.00	0.00	3.37	5.01	6.35	8.16	12.23	16.11	25.82
	0:35:00	0.00	0.00	3.22	4.77	6.05	11.57	16.56	23.57	35.92
	0:40:00	0.00	0.00	2.92	4.25	5.38	11.72	16.88	24.15	36.85
	0:45:00	0.00	0.00	2.59	3.77	4.77	10.64	15.20	22.47	34.75
	0:50:00	0.00	0.00	2.31	3.36	4.21	9.66	13.67	20.07	31.68
	0:55:00	0.00	0.00	2.09	3.02	3.79	8.46	11.95	17.71	28.04
	1:00:00	0.00	0.00	1.90	2.73	3.43	7.52	10.61	15.88	25.33
	1:05:00	0.00	0.00	1.71	2.44	3.10	6.73	9.46	14.34	23.18
	1:10:00	0.00	0.00	1.50	2.16	2.80	5.84	8.20	12.32	19.95
	1:15:00	0.00	0.00	1.32	1.91	2.57	4.99	6.99	10.37	16.82
	1:20:00	0.00	0.00	1.19	1.73	2.35	4.24	5.91	8.65	14.04
	1:25:00	0.00	0.00	1.11	1.60	2.14	3.71	5.15	7.42	12.02
	1:30:00	0.00	0.00	1.03	1.48	1.94	3.28	4.53	6.47	10.42
	1:35:00	0.00	0.00	0.95	1.36	1.75	2.91	3.99	5.66	9.04
	1:40:00	0.00	0.00	0.87	1.22	1.57	2.55	3.48	4.89	7.77
	1:45:00	0.00	0.00	0.79	1.07	1.39	2.22	2.99	4.16	6.56
	1:50:00	0.00	0.00	0.71	0.93	1.22	1.89	2.52	3.45	5.40
	1:55:00	0.00	0.00	0.60	0.79	1.04	1.57	2.06	2.78	4.30
	2:00:00	0.00	0.00	0.50	0.66	0.86	1.26	1.61	2.12	3.25
	2:05:00	0.00	0.00	0.39	0.51	0.67	0.90	1.11	1.42	2.15
	2:10:00	0.00	0.00	0.31	0.41	0.54	0.63	0.76	0.93	1.43
	2:15:00	0.00	0.00	0.26	0.34	0.45	0.46	0.56	0.65	1.01
	2:20:00	0.00	0.00	0.21	0.28	0.37	0.36	0.43	0.48	0.73
	2:25:00	0.00	0.00	0.17	0.23	0.30	0.28	0.33	0.36	0.53
	2:30:00	0.00	0.00	0.14	0.18	0.24	0.22	0.26	0.27	0.38
	2:35:00	0.00	0.00	0.11	0.15	0.20	0.18	0.20	0.20	0.27
	2:40:00	0.00	0.00	0.09	0.12	0.15	0.14	0.16	0.15	0.19
	2:45:00	0.00	0.00	0.07	0.09	0.12	0.11	0.12	0.11	0.14
	2:50:00	0.00	0.00	0.06	0.07	0.09	0.08	0.09	0.09	0.11
	2:55:00	0.00	0.00	0.05	0.06	0.07	0.07	0.08	0.07	0.09
	3:00:00	0.00	0.00	0.04	0.04	0.06	0.05	0.06	0.06	0.07
	3:05:00	0.00	0.00	0.03	0.03	0.04	0.04	0.04	0.04	0.05
	3:10:00	0.00	0.00	0.02	0.02	0.03	0.03	0.03	0.03	0.04
	3:15:00	0.00	0.00	0.01	0.02	0.02	0.02	0.02	0.02	0.03
	3:20:00	0.00	0.00	0.01	0.01	0.01	0.01	0.01	0.01	0.02
	3:25:00	0.00	0.00	0.00	0.01	0.01	0.01	0.01	0.01	0.01
	3:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
5:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
5:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
5:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
5:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
5:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
5:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
5:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
5:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
5:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
5:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
5:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
6:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	

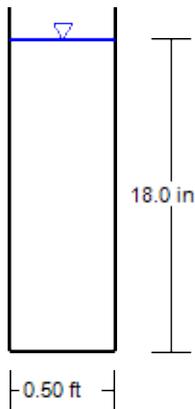


## Cross Section for Forebay Outlet

Project Description	
Friction Method	Manning Formula
Solve For	Discharge

Input Data	
Roughness Coefficient	0.013
Channel Slope	0.005 ft/ft
Normal Depth	18.0 in
Bottom Width	0.50 ft
Discharge	2.17 cfs



V: 1  
H: 1

## Worksheet for Forebay Outlet

Project Description	
Friction Method	Manning Formula
Solve For	Discharge

---

Input Data	
Roughness Coefficient	0.013
Channel Slope	0.005 ft/ft
Normal Depth	18.0 in
Bottom Width	0.50 ft

---

Results	
Discharge	2.17 cfs
Flow Area	0.8 ft <sup>2</sup>
Wetted Perimeter	3.5 ft
Hydraulic Radius	2.6 in
Top Width	0.50 ft
Critical Depth	10.0 in
Critical Slope	0.019 ft/ft
Velocity	2.89 ft/s
Velocity Head	0.13 ft
Specific Energy	1.63 ft
Froude Number	0.417
Flow Type	Subcritical

---

GVF Input Data	
Downstream Depth	0.0 in
Length	0.0 ft
Number Of Steps	0

---

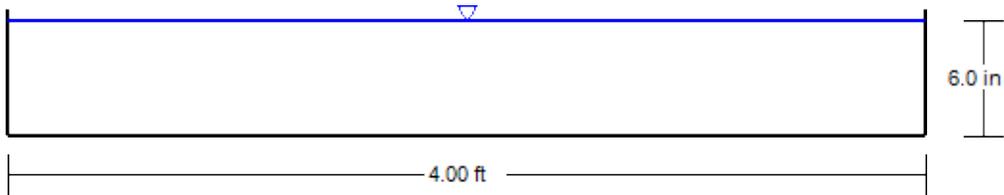
GVF Output Data	
Upstream Depth	0.0 in
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	0.00 ft/s
Upstream Velocity	0.00 ft/s
Normal Depth	18.0 in
Critical Depth	10.0 in
Channel Slope	0.005 ft/ft
Critical Slope	0.019 ft/ft

## Cross Section for Trickle Channel

Project Description	
Friction Method	Manning Formula
Solve For	Discharge

Input Data	
Roughness Coefficient	0.013
Channel Slope	0.005 ft/ft
Normal Depth	6.0 in
Bottom Width	4.00 ft
Discharge	8.78 cfs



V: 1  
H: 1

## Worksheet for Trickle Channel

Project Description	
Friction Method	Manning Formula
Solve For	Discharge
Input Data	
Roughness Coefficient	0.013
Channel Slope	0.005 ft/ft
Normal Depth	6.0 in
Bottom Width	4.00 ft
Results	
Discharge	8.78 cfs
Flow Area	2.0 ft <sup>2</sup>
Wetted Perimeter	5.0 ft
Hydraulic Radius	4.8 in
Top Width	4.00 ft
Critical Depth	6.4 in
Critical Slope	0.004 ft/ft
Velocity	4.39 ft/s
Velocity Head	0.30 ft
Specific Energy	0.80 ft
Froude Number	1.094
Flow Type	Supercritical
GVF Input Data	
Downstream Depth	0.0 in
Length	0.0 ft
Number Of Steps	0
GVF Output Data	
Upstream Depth	0.0 in
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	6.0 in
Critical Depth	6.4 in
Channel Slope	0.005 ft/ft
Critical Slope	0.004 ft/ft

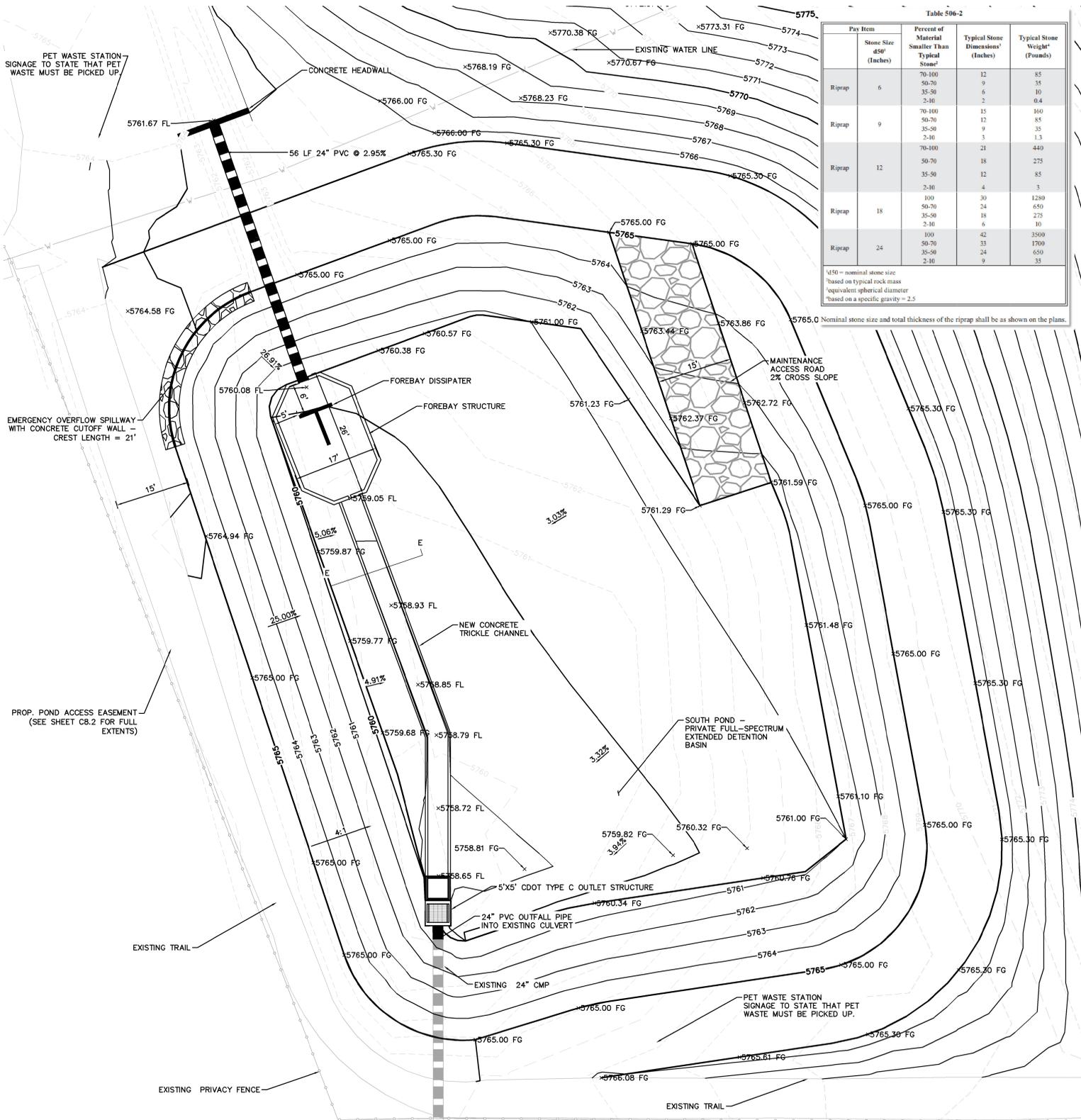
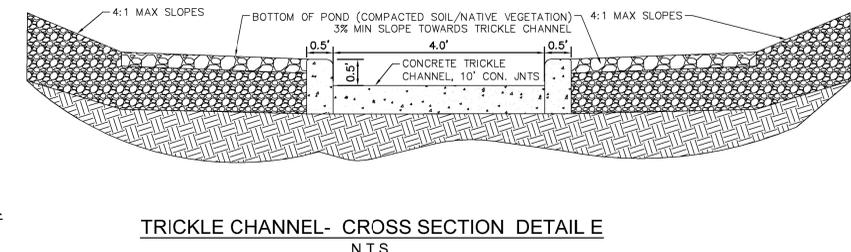
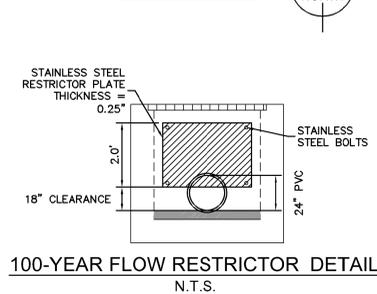
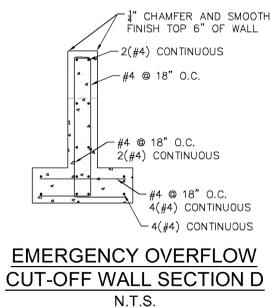
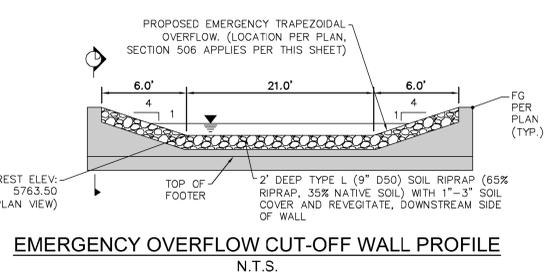
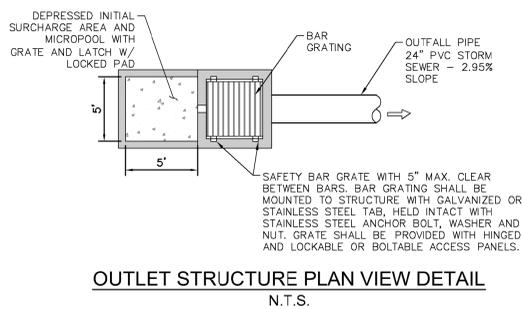
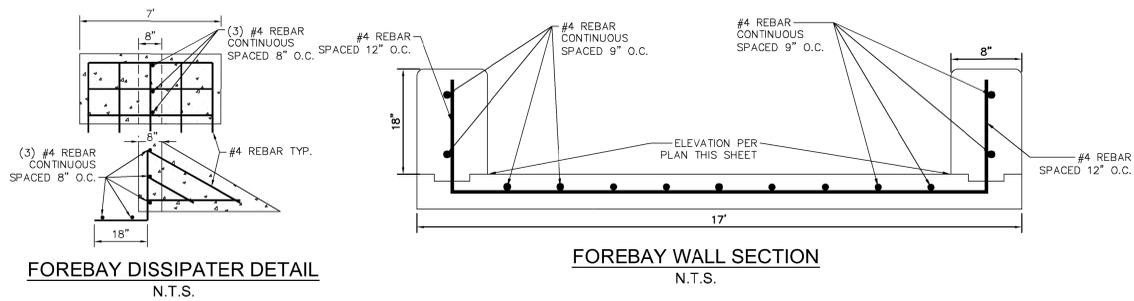
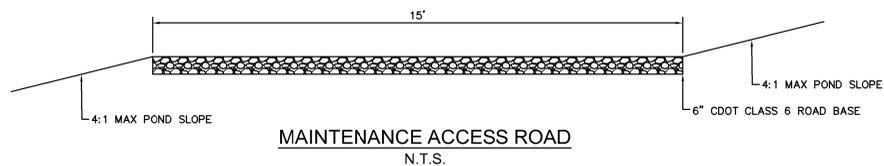
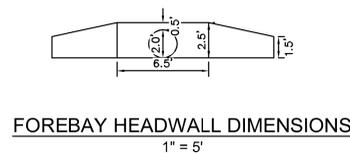
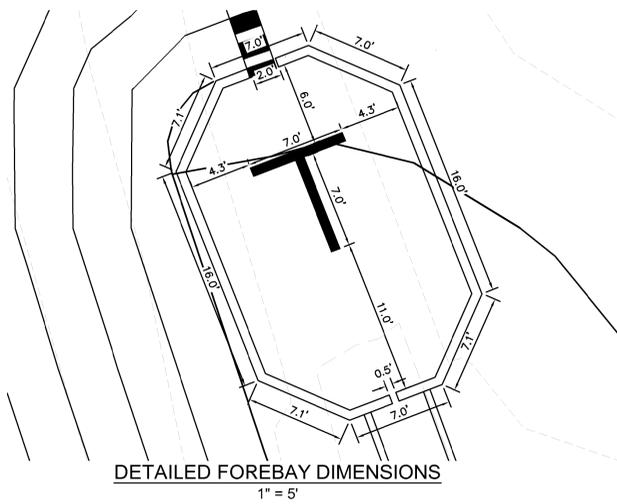
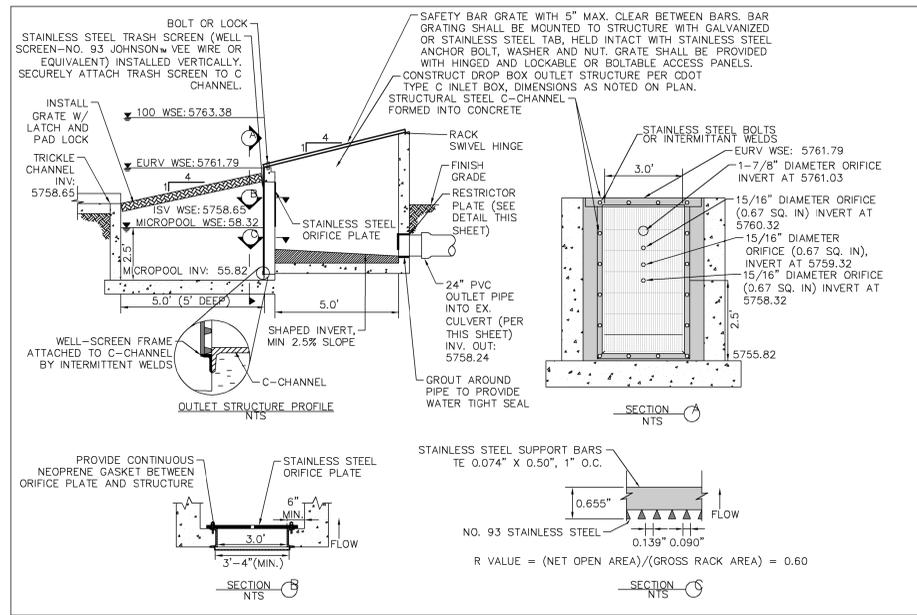


Table 506-2

Pay Item	Stone Size (Inches)	Percent of Material Smaller Than Typical Stone <sup>1</sup>	Typical Stone Dimensions <sup>2</sup> (Inches)	Typical Stone Weight <sup>3</sup> (Pounds)
Riprap 6	6	70-100	12	85
		50-70	9	35
		35-50	6	10
		2-10	2	0.4
Riprap 9	9	70-100	15	160
		50-70	12	85
		35-50	9	35
		2-10	3	1.3
Riprap 12	12	70-100	21	440
		50-70	18	275
		35-50	12	85
		2-10	4	3
Riprap 18	18	100	30	1280
		50-70	24	650
		35-50	18	275
		2-10	6	10
Riprap 24	24	100	42	3500
		50-70	33	1700
		35-50	24	650
		2-10	9	35

<sup>1</sup>4/50 = nominal stone size  
<sup>2</sup>based on typical rock mass  
<sup>3</sup>equivalent spherical diameter  
<sup>4</sup>based on a specific gravity = 2.5

Nominal stone size and total thickness of the riprap shall be as shown on the plans.



**CONSTRUCTION DOCUMENTS**

Drawn: \_\_\_\_\_ SL  
Checked: \_\_\_\_\_ JCP  
Issued: \_\_\_\_\_ 30 March 2022  
Revised: \_\_\_\_\_ 19 January 2023

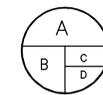
**Area Key Plan**

**POND DETAILS**

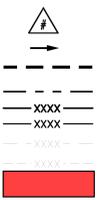
**C7.5**



**LEGEND**



A = BASIN DESIGNATION  
 B = AREA (ACRES)  
 C = 100-YR COMPOSITE RUNOFF COEFFICIENT  
 D = 100-YR DESIGN STORM RUNOFF (CFS)



DESIGN POINT  
 FLOW DIRECTION  
 DRAINAGE BASIN BOUNDARY  
 PROPERTY LINE  
 PROPOSED MAJOR CONTOUR  
 PROPOSED MINOR CONTOUR  
 EXISTING MAJOR CONTOUR  
 EXISTING MAJOR CONTOUR  
 DISTURBED AREA EXCLUDED FROM POND

**NOTES**

- THESE DETAILED PLANS AND SPECIFICATIONS WERE PREPARED UNDER MY DIRECTION AND SUPERVISION. SAID DETAILED PLANS AND SPECIFICATIONS HAVE BEEN PREPARED ACCORDING TO THE ESTABLISHED CRITERIA FOR DETAILED DRAINAGE PLANS AND SPECIFICATIONS, AND SAID DETAILED PLANS AND SPECIFICATIONS ARE IN CONFORMITY WITH THE MASTER PLAN OF THE DRAINAGE BASIN. SAID DETAILED DRAINAGE PLANS AND SPECIFICATIONS MEET THE PURPOSES FOR WHICH THE PARTICULAR DRAINAGE FACILITY(S) IS DESIGNED. I ACCEPT RESPONSIBILITY FOR ANY LIABILITY CAUSED BY ANY NEGLIGENT ACTS, ERRORS OR COMMISSIONS ON MY PART IN PREPARATION OF THE DETAILED DRAINAGE PLANS AND SPECIFICATIONS.
- PLAN REVIEW BY EL PASO COUNTY IS PROVIDED ONLY FOR GENERAL CONFORMANCE WITH DESIGN CRITERIA. EL PASO COUNTY IS NOT RESPONSIBLE FOR THE ACCURACY AND ADEQUACY OF THE DESIGN, DIMENSIONS, AND/OR ELEVATIONS WHICH SHALL BE CONFIRMED AT THE JOB SITE. EL PASO COUNTY, THROUGH APPROVAL OF THIS DOCUMENT, ASSUMES NO RESPONSIBILITY FOR COMPLETENESS AND/OR ACCURACY OF THIS DOCUMENT.
- PLEASE SEE THE FINAL DRAINAGE REPORT FOR THIS WIDEFIELD REC CENTER FOR PROPOSED 5 AND 100 YEAR FLOW VALUES.

BASINS TRIBUTARY TO POND		DISTURBED AREAS NOT TRIBUTARY TO POND	
A1	2.49 AC	AREA 1	0.49 AC
A2	0.35 AC	AREA 2	0.30 AC
A3	0.09 AC	AREA 3	0.14 AC
A4	0.83 AC	TOTAL	0.93 AC
A5	0.82 AC		
A6	0.73 AC		
A7	1.04 AC		
A8	0.43 AC		
A11	1.16 AC		
A12	14.10 AC		
<b>TOTAL</b>	<b>22.04 AC</b>		

DESIGN POINT	BASIN DESIGNATION	BASIN AREA (ACRES)	DIRECT 5-YR RUNOFF (CFS)	DIRECT 100-YR RUNOFF (CFS)	CUMULATIVE 5-YR RUNOFF (CFS)	CUMULATIVE 100-YR RUNOFF (CFS)
1	EX-1	3.07	8.19	17.22	8.19	17.22
2	EX-2	2.06	1.03	5.56	1.03	5.56
3	EX-3	4.38	5.79	14.55	5.79	14.55
4	EX-4	0.79	2.04	4.07	2.04	4.07
5	A1	2.49	5.35	11.73	5.35	11.73
6	A2	0.35	1.07	2.22	1.07	2.22
7	A3	0.09	0.06	0.30	0.06	0.30
8	A4	0.83	0.68	2.40	0.68	2.40
9	A5	0.82	0.56	2.26	0.56	2.26
10	A6	0.73	0.28	1.70	0.28	1.70
11	A7	1.04	3.92	7.30	3.92	7.30
12	A8	0.43	1.70	3.21	1.70	3.21
13	A9	3.41	4.42	11.61	4.42	11.61
14	A10	4.06	1.92	9.02	1.92	9.02
15	A11	1.16	2.44	5.31	2.44	5.31
16	A12	14.10	5.26	28.67	5.26	28.67



**Construction Documents**

Drawn: JAR  
 Checked: EUG  
 Issued: 30 March 2022  
 Revised:

**Area Key Plan**

