MASTER DEVELOPMENT DRAINAGE PLAN ANDFINAL DRAINAGE REPORT FOR COTTAGES AT DRY CREEK

April 2023

Prepared for:

BCC Management, LLC
Attn: Brian Schumann
150 Wuthering Heights Drive
Colorado Springs, CO 80921

Prepared By:

CATAMOUNT ENGINEERING
PO BOX 221
Woodland Park, CO 80866
719-426-2124

JOB NUMBER:20-270

MASTER DEVELOPMENT DRAINAGE PLAN AND FINAL DRAINAGE REPORT FOR COTTAGES AT DRY CREEK

Engineer's Statement:

This report and plan for the drainage design of COTTAGES AT DRY CREEK was prepared by me (or under my direct supervision) and is correct to the best of my knowledge and belief. Said report and plan has been prepared in accordance with the City of Colorado Springs Drainage Criteria Manual and is in conformity with the master plan of the drainage basin. I understand that the City of Colorado Springs does not and will not assume liability for drainage facilities designed by others. I accept responsibility for any liability caused by any negligent acts, errors, or omissions on my part in preparing this report.

COLORADO LICENSED DAVID L. MIJARES 40510 PROFESSIONAL ENGINEER

David L. Mijares, Colorado PE #40510 — Date 12/18/22
For and on behalf of Catamount Engineering

Developer's Statement:

BCC MANAGEMENT LLC hereby certifies that the drainage facilities for COTTAGES AT DRY CREEK shall be constructed according to the design presented in this report. I understand that the City of Colorado Springs does not and will not assume liability for the drainage facilities designed and/or certified by my engineer and that are submitted to the City of Colorado Springs pursuant to section 7.7.906 of the City Code; and cannot, on behalf of COTTAGES AT DRY CREEK guarantee that final drainage design review will absolve BCC MANAGEMENT, LLC and/or their successors and/or assigns of future liability for improper design. I further understand that approval of the final plat does not imply approval of my engineer's drainage design.

BCC MANAGEMENT, LLC
Name of Developer

Authorized Signature — Date 12-19-22

BRIAN SCHUMANN
Printed Name

MANAGER
Title

150 Weathering Heights Dr

Colorado Springs, CO 80921
Address

City of Colorado Springs Only:

Filed in accordance with Section 7.7.906 of the Code of the City of Colorado Springs, 2001, as amended.

Heidi M. McMacken — Date 05/10/2023

For City Engineer Heidi McMacken

CONDITIONS:

If the No-Rise is not approved by the time of building permit issuance, an FDR Amendment will be required.

MASTER DEVELOPMENT DRAINAGE PLAN AND FINAL DRAINAGE REPORT FOR COTTAGES AT DRY CREEK

PURPOSE

The purpose of this drainage report is to identify existing drainage patterns and establish outfall scenarios from the proposed development in support of the development plan and final plat for the duplex development. The site is contained within the Dry Creek Drainage Basin and outfalls to Dry Creek. The parcel was previously studied in the preliminary drainage report Corporate Centre Filing No. 3 dated February 2021, prepared by Catamount Engineering. Development of the Cottages at Dry Creek requires water quality and full spectrum detention.

GENERAL LOCATION AND DESCRIPTION

The Cottages at Dry Creek development is located within the SE ¼ of Section 7 Township 13 South and Range 66 West and the NE ¼ of Section 18 Township 13 South of the 6th principal meridian. The proposed residential filing contains approximately 12.78 acres to be developed within the City of Colorado Springs. The proposed development is bounded to the north by Lot 1, Corporate Center Filing No. 2, to the south and east by Mark Dabling Boulevard, and to the west the Denver Rio Grande Western Railroad. No improvements are proposed within the railroad right-of-way.

The proposed development consists of 12.78 acres to be developed as 2 single lots and a tract to be dedicated to the City of Colorado Springs. The development will consist of residential rental duplex units on a common lot, private roadway infrastructure, and private greenspace. Two existing structures in the southerly portion of the development (lot 2) will be removed prior to development.

Existing soils on the site consist of Chaseville-Midway complex (Hydrologic Group 'A') and Truckton Loamy Sand (Hydrologic Group 'A'). Soils have been identified as determined by the Natural Resources Conservation Service Web Soil Survey. Hydrologic Group 'A' soils have been used in hydrologic calculations. The parcel is bisected by Dry Creek with the north and south lots draining overland to the creek.

A portion of the development is contained within a FEMA designated floodplain per FIRM panel 08041C0512 G, effective December 07, 2018. The flood zone boundaries (AE and X) shown on the drainage plans reflect the referenced FIRM panel. Final channel improvements have been installed by Colorado Springs Utilities within the reach of Dry Creek in the proposed development. Final improvements were installed under a no-rise hydraulic memorandum.

Dry Creek Improvements were installed per 'Colorado Springs Utilities Dry Creek Stream Stabilization" construction drawings dated July 2018. The improvements with the Cottages at Dry Creek include reconstruction of the approximately 370 LF of channel proposed to be dedicated to

City of Colorado Springs with this development. The improvements installed Sculpted Concrete Drops 1 and 2 within the channel reach. Relevant portion of the plan set has been included in the Appendix. The reach was analyzed in the "Dry Creek Stream Stabilization-100% Design Report", prepared by ch2m and dated July 2. 2018.

The receiving reach of Monument Creek downstream of the project was reconstructed in accordance with the "CONSTRUCTION PLANS FOR CORPORATE CENTER CHANNEL REPAIRS PROJECT", dated 10/14/1997. Improvements include construction of a Riffle Drop and Ditch Check in the area of the Dry Creek Confluence with Monument Creek. Downstream Improvements include additional Riffle Drops (Boulder Drops) and selective bank armoring.

EXISTING DRAINAGE

See Existing Conditions Drainage Map

There appear to be no drainage reports on file for the subject parcel with the exception of the "Study of the Dry Creek Drainage Basin", prepared by KKBNA, dated February 1985. This report identifies the site at design point no. 57 with an anticipated developed flow of 2,586cfs in Dry Creek during the 100yr storm event. The report does not identify a future land use for the site and therefore cannot be compared against the findings of this study.

Basin EX1 (8.14 acres, Q_5=4.5 cfs, Q_{100}=16.2 cfs) contains the northerly portion of the development (lot 1). This basin consists of vacant land with grass and shrubs. Basin EX1 drains from north to south via unconcentrated sheet flow ultimately discharging into Dry Creek at Design Point E1. Basin EX1 is contained within MDDP basin 57 and is tributary to the Design Point 57 (box culvert crossing at Cascade Ave (currently renamed Mark Dabbling). The box culvert crossing consists of public dual 8'x5' reinforced concrete box culverts which outfall directly to Monument Creek.

Basin EX2 (8.87 acres, Q_5=18.1 cfs, Q_{100}=37.7 cfs) contains the southerly portion of the development (lot 2). This basin consists of gravel parking and drive aisles used a truck driving school facility. Basin EX2 drains from south to north via unconcentrated sheet flow ultimately discharging into Dry Creek at Design Point E2. Basin EX1 is contained within MDDP basin 57 and is tributary to the Design Point 57 (box culvert crossing at Cascade Ave (currently renamed Mark Dabbling). Existing basins were modeled at 100% pervious with no development. *See existing conditions map in the appendix.*

There is an existing public storm sewer system (36" and 48" RCP's) at the very south end of the parcel which conveys flow from the development west of the railroad corridor through the project ultimately discharging into Monument Creek to the east. At the existing manhole where developed system outfall connects to the system the pipe transitions from a slope of 1.03% to 25.70% with no additional inflow, other than proposed detained flow from the southerly pond, and has adequate capacity to convey additional flow to Monument Creek.

Dry Creek and Monument Creek have been reconstructed by the City of Colorado Springs Utilities/City of Colorado Springs within and downstream of the parcel boundaries. No channel improvements are required.

DEVELOPED DRAINAGE BASINS

See Proposed Conditions Drainage Map

The Rational method was used to determine runoff quantities for developed basins. Peak runoff for the 5-YR and 100-YR frequency storm were provided for each basin. Conservatively, additional travel time for pipe routing was not utilized in attenuating peak flows and additive flows were utilized beyond inlet capture providing 5-YR and 100-YR analysis. No off-site flows enter the site in the developed condition. The site 'Proposed Drainage' plan, is provided in the appendix.

BASIN A-

A1 (1.80 Acres, Q_5=5.9 cfs, Q_{100}=11.1 cfs)
A2 (3.20 Acres, Q_5=2.8 cfs, Q_{100}=7.3 cfs)
A3 (0.07 Acres, Q_5=0.3 cfs, Q_{100}=0.5 cfs)
A4 (0.18 Acres, Q_5=0.2 cfs, Q_{100}=0.7 cfs)

Basin A consists of the portion of the development tributary to the proposed on-site private full spectrum extended detention basin 'A' Designated Basins consist of rental duplex residences, roadway improvements and landscape areas which sheet flow to crowned roadways and grass lined swales are collected in private inlets and conveyed by private storm systems to proposed private extended detention basins. Emergency overflow of the inlets will be conveyed overland to extended detention basin at private roadway lowpoints.

Basin A1 (1.80 Acres, Q_5=5.9 cfs, and Q_{100}=11.1 cfs) consists of the northern and western basin of the development; interior to the limits of the site. Basin A1 primarily consists of the north half of the developments parking lot, drive aisle and residential frontage. Runoff within Basin A1 will primarily sheet flow to curb flow lines and be conveyed by a private 15' Type R At-Grade inlet and conveyed in a 18" private HDPE to confluence with runoff from Basin A2 pipe design point P1. Runoff from Basin A1 and A3 are modeled as equalizing across the roadway width. Equalized flows of Q_5=3.1 cfs, and Q_{100}=5.8 cfs are collected in a 15' at grade Type R inlet. 0.1 cfs of flow-by is incurred in the 100-YR storm event.

Basin A2 (3.20 Acres, Q_5=2.8 cfs, and Q_{100}=7.3 cfs) consists of the northern and eastern basin of the development; bordering along Mark Dabbling Blvd. Basin A2 primarily consists of the north half of the site's residential development, including the landscape and rear lot swale drainage. Runoff within Basin A2 will primarily sheet flow southwest toward the rear lot proposed drainage swale and be conveyed by a private CDOT Type C inlet and conveyed in an 18" private HDPE to confluence with runoff from Basin A1 pipe design point P1.

Basin A3 (0.07 Acres, Q_5=0.3 cfs, and Q_{100}=0.5 cfs) consists of the northerly half of the street section located directly south of the proposed EDB B; interior to the limits of the site. Runoff from Basin A1 and A3 are modeled as equalizing across the roadway width. Equalized flows of Q_5=3.1 cfs, and Q_{100}=5.8 cfs are collected in a 15' at grade Type R inlet. 0.1 cfs of flow-by is incurred in the 100-YR storm event.

Runoff within Basin A3 will primarily sheet flow south directly into EDB Basin A pond to confluence with runoff from Basin A1 and A2 pipe design point P2.

Basin A4 (0.18 Acres, Q_5=0.2 cfs, and Q_{100}=0.7 cfs) consists of the vegetated area directly tributary to proposed Extended Detention Basin A and the pond itself.

BASIN B-

B1 (0.69 Acres, Q_5=2.5 cfs, Q_{100}=4.7 cfs)
B2 (1.92 Acres, Q_5=2.4 cfs, Q_{100}=5.9 cfs)
B3 (0.13 Acres, Q_5=0.5 cfs, Q_{100}=0.9 cfs)
B4 (0.20 Acres, Q_5=0.1 cfs, Q_{100}=0.7 cfs)

Basin B consists of the portion of the development tributary to the proposed on-site private full spectrum extended detention basin 'B' Designated Basins consist of rental duplex residences, roadway improvements and landscape areas which sheet flow to crowned roadways and grass lined swales are collected in private inlets and conveyed by private storm systems to proposed private extended detention basins. Emergency overflow of the inlets will be conveyed overland to extended detention basin at private roadway low points.

Basin B1 (0.69 Acres, Q_5=2.5 cfs, and Q_{100}=4.7 cfs) consists of the northwestern portion of the southerly half of the development, interior to the limits of the site. Basin B1 primarily consists of the northern portion of the south half of the developments parking lot, drive aisle and residential frontage. Runoff within Basin B1 will primarily sheet flow to curb flow lines and be conveyed by a private 5' Type R Sump inlet and conveyed in an 18" private HDPE to confluence with runoff from Basin B2 pipe design point P3. Runoff from Basin B1 and B3 are modeled as equalizing across the roadway width. Equalized flows of Q_5=1.5 cfs, and Q_{100}=2.8 cfs are collected in a 10' at grade Type R inlet. 0.1 cfs of flow-by is incurred in the 100-YR storm event.

Basin B2 (1.92 Acres, Q_5=2.4 cfs, and Q_{100}=0.9 cfs) consists of the northeastern portion of the southerly half of the development; bordering along Mark Dabbling Blvd. Basin B2 primarily consists of residential development, including the landscape and rear lot swale drainage. Runoff within Basin B2 will primarily sheet flow southwest toward the rear lot proposed drainage swale and be conveyed by a private CDOT Type C inlet and conveyed in an 18" private HDPE to confluence with runoff from Basin B1 pipe design point P3.

Basin B3 (0.13 Acres, Q_5=0.5 cfs, and Q_{100}=0.5 cfs) consists of the northerly half of the street section located directly south of the proposed EDB B; interior to the limits of the site. Runoff from Basin B1 and B3 are modeled as equalizing across the roadway width. Equalized flows of Q_5=1.5 cfs, and Q_{100}=2.8 cfs are collected in a 10' at grade Type R inlet. 0.1 cfs of flow-by is incurred in the 100-YR storm event.

Basin B4 (0.20 Acres, Q_5=0.1 cfs, and Q_{100}=0.7 cfs) consists of the vegetated area directly tributary to proposed Extended Detention Basin B and the pond itself.

BASIN C-

C1 (0.60 Acres, Q_5=2.4 cfs, Q_{100}=4.4 cfs)
C2 (1.42 Acres, Q_5=1.9 cfs, Q_{100}=4.9 cfs)
C3 (0.58 Acres, Q_5=2.0 cfs, Q_{100}=3.7 cfs)

Basin C consists of the portion of the development tributary to the proposed on-site private full spectrum extended detention basin 'C' Designated Basins consist of rental duplex residences, roadway improvements and landscape areas which sheet flow to crowned roadways and grass lined swales are collected in private inlets and conveyed by private storm systems to proposed private extended detention basins. Emergency overflow of the inlet will be conveyed overland through the private drive to Mark Dabbling Blvd.

Basin C1 (0.60 Acres, Q_5=2.4 cfs, and Q_{100}=4.4 cfs) consists of the southwestern portion of the southerly half of the development, interior to the limits of the site. Basin C1 consists of the parking lot, drive aisle and residential frontage. Runoff within Basin C1 will primarily sheet flow to curb flow lines and be conveyed by a private 5' Type R Sump inlet and conveyed in a 15" private HDPE to EDB C.

Basin C2 (1.42 Acres, Q_5=1.9 cfs, and Q_{100}=4.9 cfs) consists of the Southeastern portion of the southerly half of the development; bordering along Mark Dabbling Blvd. Basin C2 primarily consists of the residential development, including the landscape and rear lot swale drainage. Runoff within Basin B2 will primarily sheet flow east to private EDB C.

Basin C3 (0.58 Acres, Q_5=2.0 cfs, and Q_{100}=3.7 cfs) consists of the central parking lot, landscaping, roofs and hardscape. Runoff within Basin C3 will primarily sheet flow into the central curb lines and be conveyed by the easterly curb chase to a grass lined swale conveying runoff to EDB C.

BASIN D-

D1 (1.91 Acres, Q_5=0.6 cfs, Q_{100}=3.4 cfs)
D2 (1.17 Acres, Q_5=0.5 cfs, Q_{100}=2.5 cfs)
D3 (1.19 Acres, Q_5=0.5 cfs, Q_{100}=2.7 cfs)
D4 (0.06 Acres, Q_5=0.1 cfs, Q_{100}=0.3 cfs)

Basin D consists of the portions of the development containing only landscape or not proposed for development tributary either directly to Dry Creek or Mark Dabbling Blvd. No storm sewer or inlet systems are proposed within Basin D.

Basin D1 (1.91 Acres, Q_5=0.6 cfs, and Q_{100}=3.4 cfs) consists of onsite landscaping and the easterly half of the offsite railroad embankment. Runoff from Basin D1 will sheetflow to a grassed swale running parallel to the proposed curb line conveying flows south directly to Dry Creek.

Basin D2 (1.17 Acres, Q_5=0.5 cfs, and Q_{100}=2.5 cfs) consists of onsite landscaping and the easterly half of the offsite railroad embankment. Runoff from Basin D2 will sheetflow to a grassed swale running parallel to the proposed curb line conveying flows north directly to Dry Creek.

Basin D3 (1.19 Acres, Q_5=0.5 cfs, and Q_{100}=2.7 cfs) consists of onsite landscaping and the easterly half of the offsite railroad embankment. Runoff from Basin D2 will sheetflow to a grassed swale running parallel to the proposed curb line conveying flows south to Mark Dabbling.

Basin D4 (0.06 Acres, Q_5=0.1 cfs, and Q_{100}=0.3 cfs) consists of portion of interior roadway directly tributary to Mark Dabbling Runoff from Basin D4 will sheetflow directly to Mark Dabbling.
See swale calculations in the appendix.

STORM SEWER

Runoff from Basin A2 of Q_5=2.8 cfs, Q_{100}=7.3 cfs will be conveyed in a grass lined swale and collected in a private Type C inlet. Captured flow will be conveyed in a private 18" HDPE to pipe design point P1. Runoff from Basin A1 of Q_5=5.9 cfs, Q_{100}=11.1 cfs will be conveyed in the private roadway section curb and collected in a private 10' type R sump inlet. Combined flows from P2 of Q_5=6.3 cfs, Q_{100}=14.0 cfs will be conveyed in a private 18" HDPE storm sewer to pipe design point P2. Runoff from Basin A3 of Q_5=0.3 cfs, Q_{100}=0.5 cfs will be conveyed in the private roadway section curb and collected in a private 10' type R sump inlet. . Combined flows from P2 of Q_5=6.3 cfs, Q_{100}=14.0 cfs will be conveyed in a private 18" HDPE storm sewer to private extended detention basin A.

Runoff from Basin B2 of Q_5=2.4 cfs, Q_{100}=5.9 cfs will be conveyed in a grass lined swale and collected in a private Type C inlet. Captured flow will be conveyed in a private 18" HDPE to pipe design point P3. Runoff from Basin B1 of Q_5=2.5 cfs, Q_{100}=4.7 cfs will be conveyed in the private roadway section curb and collected in a private 5' type R sump inlet. Combined flows from P3 of Q_5=4.1 cfs, Q_{100}=9.1 cfs will be conveyed in a private 18" HDPE storm sewer to pipe design point P4. Runoff from Basin B3 of Q_5=0.5 cfs, Q_{100}=0.9 cfs will be conveyed in the private roadway section curb and collected in a private 5' type R sump inlet. . Combined flows from P4 of Q_5=4.4 cfs, Q_{100}=9.7 cfs will be conveyed in a private 18" HDPE storm sewer to private extended detention basin B.

Runoff from Basin C1 of Q_5=2.4 cfs, Q_{100}=4.4 cfs will be conveyed in the private roadway section curb and collected in a private 5' type R sump inlet. Runoff will be conveyed in a private 15" HDPE storm sewer to private extended detention basin C.

See calculations in the report appendix.

EXTENDED DETENTION BASINS

This project proposes to develop 12.78 acres within the Dry Creek major drainage basin which necessitates water quality treatment and full-spectrum detention per the criteria of the City of Colorado Springs Drainage Criteria Manual Volume 2.

EDB A

The proposed private and full spectrum Extended Detention Basin located in the northerly section of the portion of the development adjacent to the internal reach of Dry Creek has 5.25 tributary acres of development with an average imperviousness of 51.40%. Full spectrum pond development requires 0.065 acre-ft of water quality capture volume ponding to an elevation of 6250.76, an EURV volume of 0.222-acre ft ponding to an elevation of 6253.48, and a total volume of 0.483 acre-ft ponding to an elevation of 6254.72 providing full spectrum detention including the 100-YR event.

Runoff generated within the site will be conveyed to the pond through storm sewer systems or as direct sheetflow. The storm sewer systems will outfall directly to 24" concrete forebays with baffle providing adequate protection at discharge point. The concrete forebays require a total volume of 88 cubic feet of volume (2% of the design WQCV). The forebay will be constructed of a concrete slab with sides conforming to the pond slopes and 1' wall with a 3.4" rectangular notch which outfalls to the proposed trickle channel at the downstream end.

The pond will be constructed with 4:1 minimum side slope to be vegetated per the final landscape plan. A 2' wide by 6" deep concrete trickle channel with a 1.0% longitudinal slope will convey low flows across the pond bottom to the micropool/outlet structure. The trickle channel will outfall to a 4' long by 4' wide by 2.5' deep concrete micropool. The micropool will provide a surface area of 16 square feet and an initial surcharge volume of 10.7 cubic feet utilizing a 8" initial surcharge depth.

The outlet structure will consist of a concrete box with orifice plate and screen providing water quality outlet and weir with trash rack for larger storm outfall. The pond will outfall through a private 12" RCP pipe to a rip rap energy dissipater directly to Dry Creek just upstream of box culvert crossing of Mark Dabbling Blvd.

The emergency spillway will consist of a 50' weir along the southerly end of the pond at an elevation of 6254.76. The 50' weir will convey developed undetained flows a depth of 0.22' and consist of 12" depth of type L soil riprap. Outfall from the extended detention basin of Q_5=0.1 cfs, Q_{100}=3.9 cfs will be conveyed in a private 12" HDPE to a 6' long by 3' wide 12" depth of type VL riprap.

Existing outfall to Dry Creek above the box culvert from EX1 is Q_5=4.5 cfs, Q_{100}=16.2 cfs. Combined flow from Basin D1 and proposed EDB A is Q_5=0.7 cfs, Q_{100}=7.3 cfs and is less than historic site contribution.

See Calculations in the Appendix

EDB B

The proposed private and full spectrum Extended Detention Basin located in the southerly section of the portion of the development adjacent to the internal reach of Dry Creek has 2.94 tributary acres of development with an average imperviousness of 54.20%. Full spectrum pond development requires 0.017 acre-ft of water quality capture volume ponding to an elevation of 6547.85, an EURV volume of 0.135-acre ft ponding to an elevation of 6550.18, and a total volume of 0.285

acre-ft ponding to an elevation of 6550.98 providing full spectrum detention including the 100-YR event.

Runoff generated within the site will be conveyed to the pond through storm sewer systems or as direct sheetflow. The storm sewer systems will outfall directly to 12" concrete forebays providing 66 cubic feet of volume and with baffle providing adequate protection at discharge point. The concrete forebays require a total volume of 49 cubic feet of volume (2% of the design WQCV). The forebay will be constructed of a concrete slab with sides conforming to the pond slopes and 1' wall with a 3.1"rectangular notch which outfalls to the proposed trickle channel at the downstream end.

The pond will be constructed with 4:1 minimum side slopes to be vegetated per the final landscape plan. A 2' wide by 6" deep concrete trickle channel with a 1.0% longitudinal slope will convey low flows across the pond bottom to the micropool/outlet structure. The trickle channel will outfall to a 4' long by 4' wide by 2.5' deep concrete micropool. The micropool will provide a surface area of 16 square feet and an initial surcharge volume of 10.7 cubic feet utilizing an 8" initial surcharge depth.

The outlet structure will consist of a concrete box with orifice plate and screen providing water quality outlet and weir with trash rack for larger storm outfall. The pond will outfall through a private 12" RCP pipe system to a rip rap energy dissipater directly to Dry Creek just upstream of box culvert crossing of Mark Dabbling Blvd..

The emergency spillway will consist of a 20' weir along the southerly end of the pond at an elevation of 6252.00. The 20' weir will convey developed undetained flows a depth of 0.30' and consist of 12" depth of type L soil riprap. Outfall from the extended detention basin of Q_5=0.1 cfs, Q_{100}=2.1 cfs will be conveyed in a private 12" HDPE to a 3' long by 2' wide 12" depth of type VL riprap.

Existing outfall to Dry Creek above the box culvert from EX2 is Q_5=18.1 cfs, Q_{100}=37.7 cfs. Combined flow from Basin D2 and proposed EDB A is Q_5=0.6 cfs, Q_{100}=4.6 cfs and is less than historic site contribution.

See Calculations in the Appendix

EDB C

The proposed private and full spectrum Extended Detention Basin located in the southerly section of the portion of the development has 2.60 tributary acres of development with an average imperviousness of 62.20%. Full spectrum pond development requires 0.030 acre-ft of water quality capture volume ponding to an elevation of 6551.01, an EURV volume of 0.145-acre ft ponding to a depth of 6553.72, and a total volume of 0.289 acre-ft ponding to an elevation of 6554.55 providing full spectrum detention including the 100-YR event.

Runoff generated within the site will be conveyed to the pond through storm sewer systems or as direct sheetflow. The storm sewer systems will outfall directly to 12" concrete forebays providing 66 cubic feet of volume and with baffle providing adequate protection at discharge point. The

concrete forebays require a total volume of 49 cubic feet of volume (2% of the design WQCV). The forebay will be constructed of a concrete slab with sides conforming to the pond slopes and 1' wall with a 3.2" rectangular notch which outfalls to the proposed trickle channel at the downstream end.

The pond will be constructed with 4:1 minimum side slopes to be vegetated per the final landscape plan. A 2' wide by 6" deep concrete trickle channel with a 1.0% longitudinal slope will convey low flows across the pond bottom to the micropool/outlet structure. The trickle channel will outfall to a 5' long by 4' wide by 2.5' deep concrete micropool. The micropool will provide a surface area of 16 square feet and an initial surcharge volume of 10.7 cubic feet utilizing an 8" initial surcharge depth.

The outlet structure will consist of a concrete box with orifice plate and screen providing water quality outlet and weir with trash rack for larger storm outfall. The pond will outfall Q_5=0.1 cfs, Q_{100}=2.0 cfs through a private 12" HDPE pipe system to existing public storm sewer manhole in the southerly portion of the site. Runoff will continue in an existing 48" RCP to outfall within Monument Creek adjacent to the easterly limits of Mark Dabbling Blvd.

The emergency spillway will consist of a 20' weir along the easterly end of the pond at an elevation of 6254.55. The 20' weir will convey developed undetained flows a depth of 0.29' and consist of 12" depth of type L soil riprap.

Outfall from EDB C to the existing 48" RCP increases flows by Q_5=0.1 cfs, Q_{100}=2.0 cfs. At the existing MH the pipe slope changes from 1.03% upstream to 25.70% downstream to outfall directly to Monument Creek. The existing outfall consists of a 25' long by 24' wide 5' depth of d50=30" riprap.

Combined pond routed outfall (Basins D-1, D-2, Pond A, and Pond B) of directly to the creek of Q_5=1.3 cfs, Q_{100}=11.9 cfs is significantly less than the sites historic contribution to the adjacent reach of Dry Creek above the box culvert (Basins EX-1 and EX-2) of Q_5=22.6 cfs, Q_{100}=53.9 cfs.

See Calculations in the Appendix

COST ESTIMATE

Private Improvements Non-reimbursable

12" RCP	174 LF	@$	35/LF	$	6,090
12" HDPE	464 LF	@$	18/LF	$	8,352
15" HDPE	311 LF	@$	24/LF	$	7,464
18" HDPE	74 LF	@$	32/LF	$	2,368
TYPE 1 MH	2 EA	@$	5000/EA	$	10,000
15' TYPE R INLET	2 EA	@$	10000/EA	$	20,000
10' TYPE R INLET	2 EA	@$	8000/EA	$	16,000
5' TYPE R INLET	2 EA	@$	6000/EA	$	12,000
12" RCP FES	4 EA	@$	2000/EA	$	8,000
RipRap (OUTFALL)	6 TONS	@$	25/TON	$	150

			SUBTOTAL	**$**	**90,424**
			10% CONTINGENCY	*$*	*9,042*
			TOTAL	**$**	**99,466**

COST ESTIMATE—EDB A

Private Improvements Non-reimbursable

Seeding	0.20 ACRE	@$	525/ACRE	$	105
Road Base [Class 5]	6.0 TONS	@$	17/TON	$	102
Concrete Forebays	52 SY	@$	100/SY	$	5,200
Outfall Structure	1 EA	@$	15,000/EA	$	15,000
Trickle Channel	4 CY	@$	30/CY	$	120
Soil RipRap	68 TONS	@$	25/TON	$	1,700
			SUBTOTAL	**$**	**22,227**
			10% CONTINGENCY	*$*	*2,223*
			TOTAL	**$**	**24,450**

COST ESTIMATE—EDB B

Private Improvements Non-reimbursable

Seeding	0.27 ACRE	@$	525/ACRE	$	142
Road Base [Class 5]	6.0 TONS	@$	17/TON	$	102
Concrete Forebays	52 SY	@$	100/SY	$	5,200
Outfall Structure	1 EA	@$	15,000/EA	$	15,000
Trickle Channel	5 CY	@$	30/CY	$	150
Soil RipRap	35 TONS	@$	25/TON	$	875
			SUBTOTAL	**$**	**21,496**
			10% CONTINGENCY	*$*	*2,147*
			TOTAL	**$**	**23,616**

COST ESTIMATE—EDB C

Private Improvements Non-reimbursable

Seeding	0.11 ACRE	@$	525/ACRE	$	58
Road Base [Class 5]	4.0 TONS	@$	17/TON	$	68
Concrete Forebays	52 SY	@$	100/SY	$	5,200
Outfall Structure	1 EA	@$	15,000/EA	$	15,000
Trickle Channel	4 CY	@$	30/CY	$	120
Soil RipRap	12 TONS	@$	25/TON	$	300

Retaining Walls	245 SF	@$	15/SF	$	3,675

SUBTOTAL	**$**	**24,421**
10% CONTINGENCY	*$*	*2,442*
TOTAL	**$**	**26,863**

4-STEP PROCESS

RUNOFF REDUCTION

The development addresses Low Impact Development strategies primarily through the utilization of landscape swales within sides and rear of proposed residential buildings and directing runoff from buildings and walkways through swales with minimal longitudinal grade prior to outfall to storm conveyance systems. Runoff reduction through routing of unconnected impervious areas through receiving swales and buffer areas was calculated utilizing MHFD UD-BMP Version 3.07. Overall reduction of WQCV for the development is 46%. See appendix for calculations.———

TREAT AND SLOW RELEASE

On-site flow is directed to three on-site private proposed full spectrum extended detention basins constructed with development of the project which outfall into Dry Creek. The extended detention basins provide the Water Quality Capture Volume required and attenuates peak flows to approximate historic runoff rates.

CHANNEL STABILIZATION

The ultimate recipient of runoff from the site is Dry Creek. Flows generated within the site are tributary to proposed full spectrum extended detention basins constructed on site. As mentioned above, creek improvements are completed. As channel improvements are being conducted with other funding sources; the development of this site will not necessitate any improvements to Dry Creek and therefore be of no expense to the project.

Dry Creek Improvements were installed per 'Colorado Springs Utilities Dry Creek Stream Stabilization" construction drawings dated July 2018. The improvements with the Cottages at Dry Creek include reconstruction of the approximately 370 LF of channel proposed to be dedicated to City of Colorado Springs with this development. The improvements installed Sculpted Concrete Drops 1 and 2 within the channel reach. Relevant portion of the plan set has been included in the Appendix.

Development of the project will require installation of water main crossing the reach of Dry Creek. The water mains are proposed to be bored within the area of sculpted concrete drop 2 providing additional protection for water mains. The outfalls and emergency overflows from extended detention basin 1 will outfall directly to the structural improvements installed with Dry Creek Improvements. The water main installation will be bored. 12" RCP storm sewer from offsite basins D1 and D2 will outfall directly to structural improvements installed with Dry Creek

Improvements. Outfalls shall be shaped to match existing improvements not affecting existing channel hydraulics.

Interaction of emergency overflows, Basin-D outfalls, ponds A and B outfalls, and water main boring installation into Dry Creek will require approval of a floodplain development permit from the El Paso County Floodplain Administrator. In conversation with the administrator the impact is considered minimal and permit will be sought with construction drawing submittal. As we are providing on-site detention in excess of historic flows A No-Rise certification will be pursued satisfying FEMA submittal will be sought if determined necessary from El Paso County Floodplain Administrator.

Installation of the FES outfalls within the channel at the sculpted concrete drops may require permitting through the Army Corps of Engineers through nationwide permit 7 for disturbance associated with outfall structures and associated intake structures. An application has been submitted to Army Corps of Engineers and is included in the appendix of this report. The application details the permanent disturbance associated with FES structures and temporary disturbance associated with pipe installation and development of emergency overflows from channel adjacent ponds A and B.

The receiving reach of Monument Creek downstream of the project was reconstructed in accordance with the "CONSTRUCTION PLANS FOR CORPORATE CENTER CHANNEL REPAIRS PROJECT", dated 10/14/1997. Improvements include construction of a Riffle Drop and Ditch Check in the area of the Dry Creek Confluence with Monument Creek. Downstream Improvements include additional Riffle Drops (Boulder Drops) and selective bank armoring.

SOURCE CONTROLS

To adhere to the City's Municipal Separate Storm Sewer System (MS4) requirements, temporary construction BMP's and permanent post construction BMP's will be implemented to reduce the potential of pollutants entering the creek. The implementation of these BMP's will be provided in the Grading, Erosion and Stormwater Quality Control Plan and Stormwater Management Plan for the site. The Stormwater Management Plan also addresses structural and procedural source control BMP's such as materials storage and spill prevention, containment, and control, etc. during construction to protect downstream receiving waters. If deemed necessary, site specific source controls including covering storage/handling areas and spill containment will be used.

DRAINAGE AND BRIDGE FEES

Mark Dabling Cottages contains 12.78 acres to be re-platted within the Dry Creek Drainage Basin. Since this site has already been platted, no drainage and bridge will be collected for this development.

DRAINAGE METHODOLOGY

This drainage report was prepared in accordance to the criteria established in the City of Colorado Springs Drainage Criteria Manual Volumes 1 and 2, as revised May 2014.

The rational method for drainage basin study areas of less than 100 acres was utilized in the analysis. For the Rational Method, flows were calculated for the 2, 5, 10, 25, 50, and 100-year recurrence intervals. The average runoff coefficients, 'C' values, are taken from Table 6-6 and the Intensity-Duration-Frequency curves are taken from Figure 6-5 of the City Drainage Criteria Manual. Time of concentration for overland flow and storm drain or gutter flow are calculated per Section 3.2 of the City Drainage Criteria Manual. Calculations for the Rational Method are shown in the Appendix of this report.

Urban Drainage and Flood Control District methodology was utilized for determination of the conceptual extended detention basin design. Details and analysis of final storm drain conveyance and collection system will be developed in the final drainage report submitted with the re-plat of the Corporate Centre Filing No. 3 subdivision. The MHFD-Detention v_4.03 spreadsheet was utilized in development of extended detention basin sizing. Calculations are included in the appendix of this report.

A grading and erosion control plan has been submitted for review and approval by the Colorado Springs Stormwater Engineering for the proposed phases of development. An addendum to the final drainage report providing MHFD UD-Sewer calculations required to be submitted with storm sewer submittal for hydraulic grade line analysis and will include modeling of existing off-site system for Pond C outfall.

SUMMARY

This Drainage Report is in conformance with the City of Colorado Springs Drainage Criteria Manual, Volumes 1&2, May 2014 editions. Mark Dabling Cottages will require that flows be treated for water quality and be detained to historic levels prior to release from the site. Site runoff and storm drain and appurtenances will not adversely affect the downstream and surrounding developments. This report is in general conformance with all previously approved reports which included this site. Private storm facilities will be owned or maintained by the Homeowner's Association.

REFERENCES:

City of Colorado Springs Engineering Division Drainage Criteria Manual Volumes 1 and 2, revised May 2014

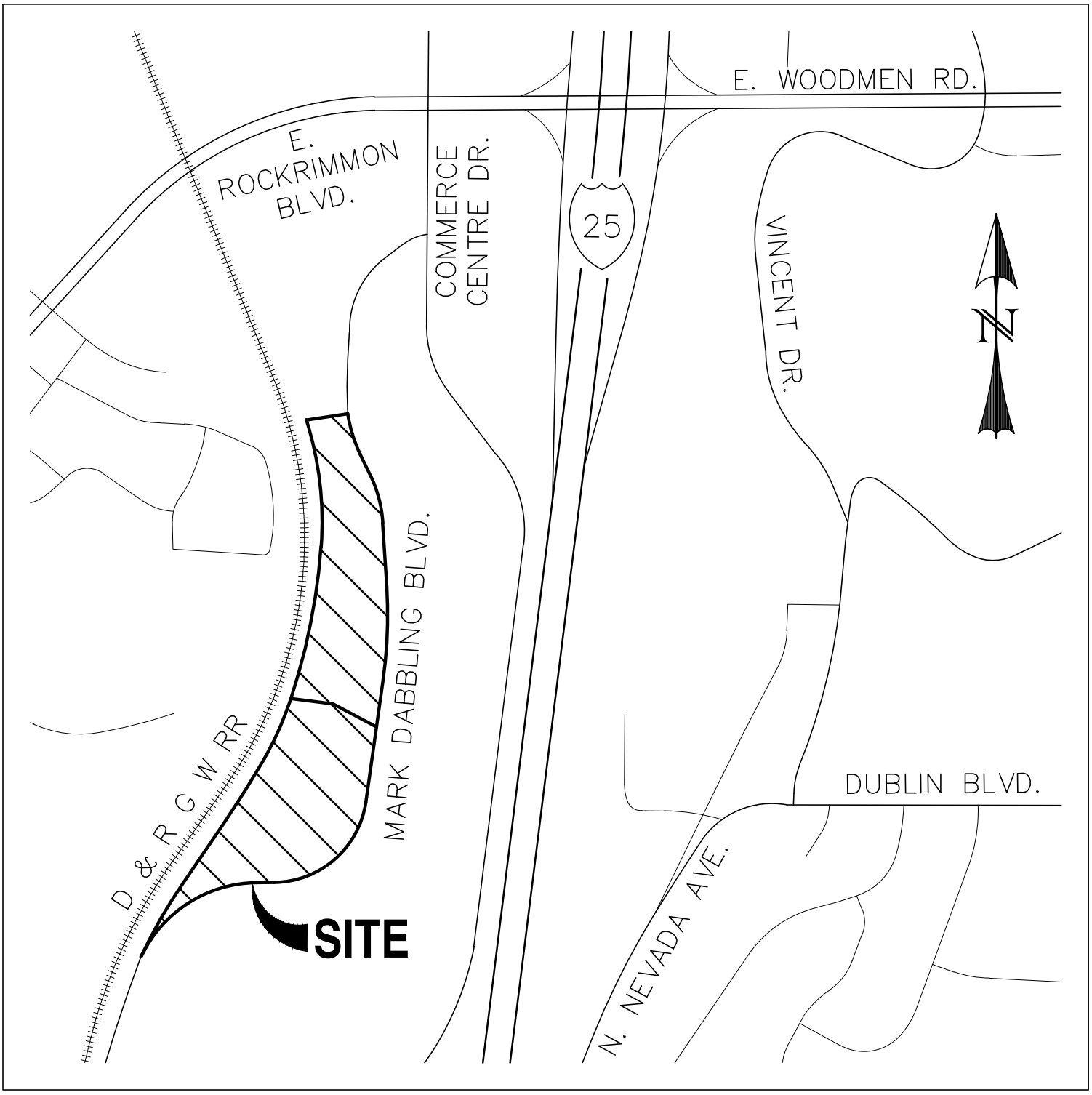
"Study of the Dry Creek Drainage Basin", prepared by KKBNA, dated February 1985

Urban Storm Drainage Criteria Manual, Volumes I-III, Mile High Flood District (MHFD)

FEMA Flood Insurance Rate Map Number 08041C0512 G, effective December 7, 2018

Natural Resources Conservation Service Web Soil Survey

APPENDIX

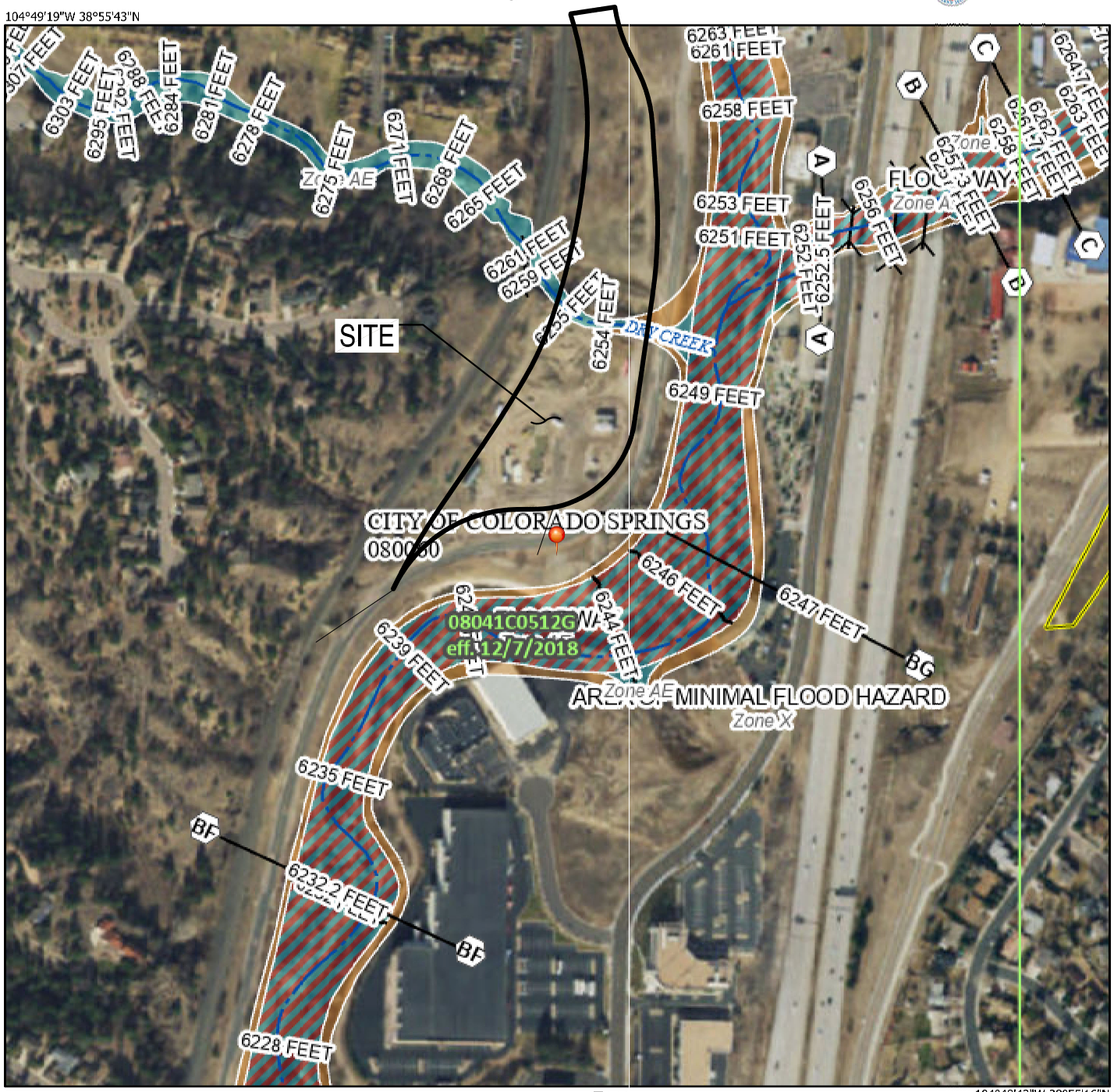


VICINITY MAP

SCALE: N.T.S.

National Flood Hazard Layer FIRMette

FEMA



Basemap: USGS National Map: Orthoimagery: Data refreshed October, 2020

Legend

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

SPECIAL FLOOD HAZARD AREAS
- Without Base Flood Elevation (BFE) *Zone A, V, A99*
- With BFE or Depth *Zone AE, AO, AH, VE, AR*
- Regulatory Floodway

OTHER AREAS OF FLOOD HAZARD
- 0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile *Zone X*
- Future Conditions 1% Annual Chance Flood Hazard *Zone X*
- Area with Reduced Flood Risk due to Levee. See Notes. *Zone X*
- Area with Flood Risk due to Levee *Zone D*

OTHER AREAS
- NO SCREEN — Area of Minimal Flood Hazard *Zone X*
- Effective LOMRs
- Area of Undetermined Flood Hazard *Zone D*

GENERAL STRUCTURES
- Channel, Culvert, or Storm Sewer
- Levee, Dike, or Floodwall

OTHER FEATURES
- 20.2 — Cross Sections with 1% Annual Chance
- 17.5 — Water Surface Elevation
- Coastal Transect
- Base Flood Elevation Line (BFE)
- Limit of Study
- Jurisdiction Boundary
- Coastal Transect Baseline
- Profile Baseline
- Hydrographic Feature

MAP PANELS
- Digital Data Available
- No Digital Data Available
- Unmapped

N

The pin displayed on the map is an approximate point selected by the user and does not represent an authoritative property location.

This map complies with FEMA's standards for the use of digital flood maps if it is not void as described below. The basemap shown complies with FEMA's basemap accuracy standards

The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on 2/10/2021 at 6:27 PM and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

This map image is void if the one or more of the following map elements do not appear: basemap imagery, flood zone labels, legend, scale bar, map creation date, community identifiers, FIRM panel number, and FIRM effective date. Map images for unmapped and unmodernized areas cannot be used for regulatory purposes.

Hydrologic Soil Group—El Paso County Area, Colorado
(Mark Dabbling)

Map Scale: 1:3,260 if printed on A portrait (8.5" x 11") sheet.

N

Meters
0 45 90 180 270

Feet
0 150 300 600 900

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 13N WGS84

MAP LEGEND

Area of Interest (AOI)

- Area of Interest (AOI)

Soils

Soil Rating Polygons

- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Lines

- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Points

- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Water Features

- Streams and Canals

Transportation

- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background

- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: El Paso County Area, Colorado
Survey Area Data: Version 18, Jun 5, 2020

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Aug 19, 2018—Sep 23, 2018

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
18	Chaseville-Midway complex	A	8.4	57.9%
95	Truckton loamy sand, 1 to 9 percent slopes	A	6.1	42.1%
Totals for Area of Interest			**14.6**	**100.0%**

Description

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

CALCULATIONS

											CONVEYANCE TC						TT	INTENSITY						TOTAL FLOWS					
BASIN	**AREA TOTAL (Acres)**	**C_2**	**C_5**	**C_{10}**	**C_{25}**	**C_{50}**	**C_{100}**	**Length (ft)**	**Height (ft)**	**TI (min)**	**Length (ft)**	**Height (ft)**	**C_V**	**Slope (%)**	**Velocity (fps)**	**TC (min)**	**TOTAL (min)**	**I_2 (in/hr)**	**I_5 (in/hr)**	**I_{10} (in/hr)**	**I_{25} (in/hr)**	**I_{50} (in/hr)**	**I_{100} (in/hr)**	**Q_2 (c.f.s.)**	**Q_5 (c.f.s.)**	**Q_{10} (c.f.s.)**	**Q_{25} (c.f.s.)**	**Q_{50} (c.f.s.)**	**Q_{100} (c.f.s.)**
EX1	8.14	**0.16**	**0.26**	**0.34**	**0.45**	**0.51**	**0.56**	300	8	19.1	800	16	5	2.0%	0.7	18.9	37.9	1.7	2.1	2.5	2.8	3.2	3.6	**2.3**	**4.5**	**6.9**	**10.3**	**14.5**	**16.2**
Street - Paved	*0.34*	*0.89*	*0.90*	*0.92*	*0.94*	*0.95*	*0.96*																						
Streets - Gravel	*1.29*	*0.60*	*0.63*	*0.66*	*0.70*	*0.72*	*0.74*																						
Pasture/Meadow	*6.51*	*0.04*	*0.15*	*0.25*	*0.37*	*0.44*	*0.50*																						
EX2	8.87	**0.54**	**0.58**	**0.62**	**0.67**	**0.70**	**0.72**	100	0.5	11.8	250	1	20	0.4%	1.3	3.3	15.1	2.8	3.5	4.1	4.7	5.3	5.9	**13.5**	**18.1**	**22.6**	**27.8**	**33.7**	**37.7**
Street - Paved	*0.41*	*0.89*	*0.90*	*0.92*	*0.94*	*0.95*	*0.96*																						
Industrial - Light	*7.34*	*0.60*	*0.63*	*0.66*	*0.70*	*0.72*	*0.74*																						
Pasture/Meadow	*1.12*	*0.04*	*0.15*	*0.25*	*0.37*	*0.44*	*0.50*																						

Calculated by: DLM

Date: 2/11/2021

		WEIGHTED						TT	INTENSITY						TOTAL FLOWS					
DESIGN POINT	**AREA TOTAL (Acres)**	**C_2**	**C_5**	**C_{10}**	**C_{25}**	**C_{50}**	**C_{100}**	**TOTAL (min)**	**I_2 (in/hr)**	**I_5 (in/hr)**	**I_{10} (in/hr)**	**I_{25} (in/hr)**	**I_{50} (in/hr)**	**I_{100} (in/hr)**	**Q_2 (c.f.s.)**	**Q_5 (c.f.s.)**	**Q_{10} (c.f.s.)**	**Q_{25} (c.f.s.)**	**Q_{50} (c.f.s.)**	**Q_{100} (c.f.s.)**
E1	8.14	**0.16**	**0.26**	**0.34**	**0.45**	**0.51**	**0.56**	**37.9**	1.7	2.1	2.5	2.8	3.2	3.6	**2.3**	**4.5**	**6.9**	**10.3**	**13.2**	**16.2**
BASIN EX1	8.14	0.16	0.26	0.34	0.45	0.51	0.56	37.9												
E2	8.87	**0.54**	**0.58**	**0.62**	**0.67**	**0.70**	**0.72**	**15.1**	2.8	3.5	4.1	4.7	5.3	5.9	**13.5**	**18.1**	**22.6**	**27.8**	**32.5**	**37.7**
BASIN EX2	8.87	0.54	0.58	0.62	0.67	0.70	0.72	15.1												

Calculated by: DLM

Date: 2/11/2021

							CONVEYANCE TC						TT				
BASIN	**AREA TOTAL (Acres)**	**C_5**	**C_{100}**	**Length (ft)**	**Height (ft)**	**TI (min)**	**Length (ft)**	**Height (ft)**	**C_V**	**Slope (%)**	**Velocity (fps)**	**TC (min)**	**TOTAL (min)**	**I_5 (in/hr)**	**I_{100} (in/hr)**	**Q_5 (c.f.s.)**	**Q_{100} (c.f.s.)**
A1	1.80	**0.78**	**0.87**	45	1	3.0	1108	23	20	2.1%	2.9	6.4	9.4	4.2	7.1	**5.9**	**11.1**
ROOF	0.04	0.73	0.81														
PAVEMENT	1.49	0.90	0.96														
LANDSCAPE	0.27	0.12	0.39														
A2	3.20	**0.35**	**0.55**	153	1.5	16.9	830	18	7	2.2%	1.0	13.4	30.3	2.5	4.1	**2.8**	**7.3**
ROOF	0.97	0.73	0.81														
PAVEMENT	0.18	0.90	0.96														
LANDSCAPE	2.05	0.12	0.39														
A3	0.07	**0.79**	**0.88**	15	1	1.2	100	2	20	2.0%	2.8	0.6	5.0	5.2	8.7	**0.3**	**0.5**
ROOF	0.00	0.73	0.81										*MIN*				
PAVEMENT	0.06	0.90	0.96														
LANDSCAPE	0.01	0.12	0.39														
A4	0.18	**0.17**	**0.42**	25	6	2.9	0	0	7	0.0%	0.0	0.0	5.0	5.2	8.7	**0.2**	**0.7**
ROOF	0.00	0.73	0.81										*MIN*				
GRAVEL	0.02	0.59	0.70														
LANDSCAPE	0.16	0.12	0.39														
B1	0.69	**0.80**	**0.89**	81	1.5	4.0	486	7	20	1.4%	2.4	3.4	7.4	4.6	7.7	**2.5**	**4.7**
ROOF	0.04	0.73	0.81														
PAVEMENT	0.57	0.90	0.96														
LANDSCAPE	0.08	0.12	0.39														
B2	1.92	**0.40**	**0.59**	100	2.2	9.7	423	4.5	7	1.1%	0.7	9.8	19.5	3.1	5.2	**2.4**	**5.9**
ROOF	0.69	0.73	0.81														
PAVEMENT	0.15	0.90	0.96														
LANDSCAPE	1.08	0.12	0.39														
B3	0.13	**0.73**	**0.81**	22	0.4	2.6	120	2.4	7	2.0%	1.0	2.0	5.0	5.2	8.7	**0.5**	**0.9**
ROOF	0.13	0.73	0.81										*MIN*				
PAVEMENT	0.00	0.90	0.96														
LANDSCAPE	0.00	0.12	0.39														

Calculated by: _____

Date: _____

							CONVEYANCE TC						TT				
BASIN	**AREA TOTAL (Acres)**	**C_5**	**C_{100}**	**Length (ft)**	**Height (ft)**	**TI (min)**	**Length (ft)**	**Height (ft)**	**C_V**	**Slope (%)**	**Velocity (fps)**	**TC (min)**	**TOTAL (min)**	**I_5 (in/hr)**	**I_{100} (in/hr)**	**Q_5 (c.f.s.)**	**Q_{100} (c.f.s.)**
B4	0.20	**0.12**	**0.39**	40	6	4.6	10	0.2	7	2.0%	1.0	0.2	5.0	5.2	8.7	**0.1**	**0.7**
ROOF	0.00	0.73	0.81										*MIN*				
PAVEMENT	0.00	0.90	0.96														
LANDSCAPE	0.20	0.12	0.39														
C1	0.60	**0.80**	**0.89**	79	1.5	3.9	297	5	20	1.7%	2.6	1.9	5.8	4.9	8.3	**2.4**	**4.4**
ROOF	0.03	0.73	0.81														
PAVEMENT	0.50	0.90	0.96														
LANDSCAPE	0.07	0.12	0.39														
C2	1.42	**0.39**	**0.58**	100	2	10.2	242	4	7	1.7%	0.9	4.5	14.7	3.5	6.0	**1.9**	**4.9**
ROOF	0.48	0.73	0.81														
PAVEMENT	0.11	0.90	0.96														
LANDSCAPE	0.83	0.12	0.39														
C3	0.58	**0.78**	**0.87**	56	1.2	3.4	219	3	20	1.4%	2.3	1.6	8.6	4.4	7.3	**2.0**	**3.7**
ROOF	0.10	0.73	0.81			POND-C	180	2.5	7	1.4%	0.8	3.6					
PAVEMENT	0.41	0.90	0.96														
LANDSCAPE	0.07	0.12	0.39														
D1	1.91	**0.12**	**0.39**	73	6.5	7.3	1036	20	7	1.9%	1.0	17.8	25.1	2.7	4.6	**0.6**	**3.4**
ROOF	0.00	0.73	0.81														
PAVEMENT	0.00	0.90	0.96														
LANDSCAPE	1.91	0.12	0.39														
D2	1.17	**0.12**	**0.39**	70	14	5.5	488	4	7	0.8%	0.6	12.8	18.3	3.2	5.4	**0.5**	**2.5**
ROOF	0.00	0.73	0.81														
PAVEMENT	0.00	0.90	0.96														
LANDSCAPE	1.17	0.12	0.39														
D3	1.19	**0.12**	**0.39**	64	14	5.1	428	4.5	7	1.1%	0.7	9.9	15.1	3.5	5.9	**0.5**	**2.7**
ROOF	0.00	0.73	0.81														
PAVEMENT	0.00	0.90	0.96														
LANDSCAPE	1.19	0.12	0.39														
D4	0.06	**0.38**	**0.58**	12	2	1.8	22	3	20	13.6%	7.4	0.0	5.0	5.2	8.7	**0.1**	**0.3**
ROOF	0.00	0.73	0.81										*MIN*				
PAVEMENT	0.02	0.90	0.96														
LANDSCAPE	0.04	0.12	0.39														

Calculated by: _____

Date: _____

DESIGN POINT	AREA TOTAL (Acres)	C_5	C_{100}	TT TOTAL (min)	I_5 (in/hr)	I_{100} (in/hr)	Q_5 (c.f.s.)	Q_{100} (c.f.s.)
1	**2.00**	**0.50**	**0.66**	**14.7**	3.5	6.0	**3.5**	**7.9**
BASIN C2	1.42	0.39	0.58	14.7				
BASIN C3	0.58	0.78	0.87	8.6				
P1	**5.00**	**0.50**	**0.67**	**30.3**	2.5	4.1	**6.2**	**13.8**
BASIN A1	1.80	0.78	0.87	9.4				
BASIN A2	3.20	0.35	0.55	30.3				
P2	**5.07**	**0.51**	**0.67**	**30.3**	2.5	4.1	**6.3**	**14.0**
BASIN A3	0.07	0.79	0.88	5.0				
PIPE DESIGN POINT P1	5.00	0.50	0.67	30.3				
P3	**2.61**	**0.51**	**0.66**	**19.5**	3.1	5.2	**4.1**	**9.1**
BASIN B1	0.69	0.80	0.89	7.4				
BASIN B2	1.92	0.40	0.59	19.5				
P4	**2.74**	**0.52**	**0.67**	**19.5**	3.1	5.2	**4.4**	**9.7**
BASIN B3	0.13	0.73	0.81	5.0				
PIPE DESIGN POINT P3	2.61	0.51	0.66	19.5				
POND A	**5.25**	**0.50**	**0.66**	**30.3**	2.5	4.1	**6.4**	**14.3**
BASIN A4	0.18	0.17	0.42	5.00				
PIPE DESIGN POINT P2	5.07	0.51	0.67	30.3				
POND B	**2.94**	**0.49**	**0.65**	**19.5**	3.1	5.2	**4.5**	**10.1**
BASIN B4	0.20	0.12	0.39	5.0				
PIPE DESIGN POINT P4	2.74	0.52	0.67	19.5				
POND C	**2.60**	**0.57**	**0.71**	**14.7**	3.5	6.0	**5.3**	**11.0**
BASIN C1	0.60	0.80	0.89	5.8				
DESIGN POINT 1	2.00	0.50	0.66	14.7				

Calculated by: _____

Date: _____

Version 4.05 Released March 2017

INLET MANAGEMENT

Worksheet Protected

INLET NAME	A1	A3	B1	B3	C1
Site Type (Urban or Rural)	URBAN	URBAN	URBAN	URBAN	URBAN
Inlet Application (Street or Area)	STREET	STREET	STREET	STREET	STREET
Hydraulic Condition	On Grade	On Grade	On Grade	On Grade	In Sump
Inlet Type	CDOT Type R Curb Opening	CDOT Type R Curb Opening	CDOT Type R Curb Opening	CDOT Type R Curb Opening	CDOT Type R Curb Opening

USER-DEFINED INPUT

User-Defined Design Flows

Minor Q_{Known} (cfs)	3.1	3.1	1.5	1.5	2.4
Major Q_{Known} (cfs)	5.8	5.8	2.8	2.8	4.4

Bypass (Carry-Over) Flow from Upstream

Receive Bypass Flow from:	No Bypass Flow Received	No Bypass Flow Received	No Bypass Flow Received	No Bypass Flow Received	No Bypass Flow Received
Minor Bypass Flow Received, Q_b (cfs)	0.0	0.0	0.0	0.0	0.0
Major Bypass Flow Received, Q_b (cfs)	0.0	0.0	0.0	0.0	0.0

Watershed Characteristics

Subcatchment Area (acres)					
Percent Impervious					
NRCS Soil Type					

Watershed Profile

Overland Slope (ft/ft)					
Overland Length (ft)					
Channel Slope (ft/ft)					
Channel Length (ft)					

Minor Storm Rainfall Input

Design Storm Return Period, T_r (years)					
One-Hour Precipitation, P_1 (inches)					

Major Storm Rainfall Input

Design Storm Return Period, T_r (years)					
One-Hour Precipitation, P_1 (inches)					

CALCULATED OUTPUT

Minor Total Design Peak Flow, Q (cfs)	**3.1**	**3.1**	**1.5**	**1.5**	**2.4**
Major Total Design Peak Flow, Q (cfs)	**5.8**	**5.8**	**2.8**	**2.8**	**4.4**
Minor Flow Bypassed Downstream, Q_b (cfs)	0.0	0.0	0.0	0.0	N/A
Major Flow Bypassed Downstream, Q_b (cfs)	0.1	0.1	0.0	0.0	N/A

Minor Storm (Calculated) Analysis of Flow Time

C	N/A	N/A	N/A	N/A	N/A
C_5	N/A	N/A	N/A	N/A	N/A
Overland Flow Velocity, Vi	N/A	N/A	N/A	N/A	N/A
Channel Flow Velocity, Vt	N/A	N/A	N/A	N/A	N/A
Overland Flow Time, Ti	N/A	N/A	N/A	N/A	N/A
Channel Travel Time, Tt	N/A	N/A	N/A	N/A	N/A
Calculated Time of Concentration, T_c	N/A	N/A	N/A	N/A	N/A
Regional T_c	N/A	N/A	N/A	N/A	N/A
Recommended T_c	N/A	N/A	N/A	N/A	N/A
T_c selected by User	N/A	N/A	N/A	N/A	N/A
Design Rainfall Intensity, I	N/A	N/A	N/A	N/A	N/A
Calculated Local Peak Flow, Q_p	N/A	N/A	N/A	N/A	N/A

Major Storm (Calculated) Analysis of Flow Time

C	N/A	N/A	N/A	N/A	N/A
C_5	N/A	N/A	N/A	N/A	N/A
Overland Flow Velocity, Vi	N/A	N/A	N/A	N/A	N/A
Channel Flow Velocity, Vt	N/A	N/A	N/A	N/A	N/A
Overland Flow Time, Ti	N/A	N/A	N/A	N/A	N/A
Channel Travel Time, Tt	N/A	N/A	N/A	N/A	N/A
Calculated Time of Concentration, T_c	N/A	N/A	N/A	N/A	N/A
Regional T_c	N/A	N/A	N/A	N/A	N/A
Recommended T_c	N/A	N/A	N/A	N/A	N/A
T_c selected by User	N/A	N/A	N/A	N/A	N/A
Design Rainfall Intensity, I	N/A	N/A	N/A	N/A	N/A
Calculated Local Peak Flow, Q_p	N/A	N/A	N/A	N/A	N/A

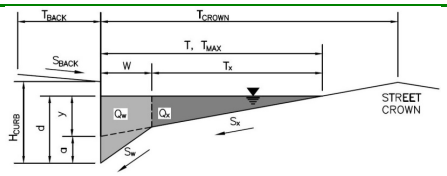
Version 4.05 Released March 2017

ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project: Cottages at Dry Creek

Inlet ID: A1



Gutter Geometry (Enter data in the blue cells)

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	5.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.013	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	12.0	ft
Gutter Width	W =	1.00	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.012	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.012	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	12.0	12.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	8.0	inches
Allow Flow Depth at Street Crown (leave blank for no)		☐	☐	check = yes

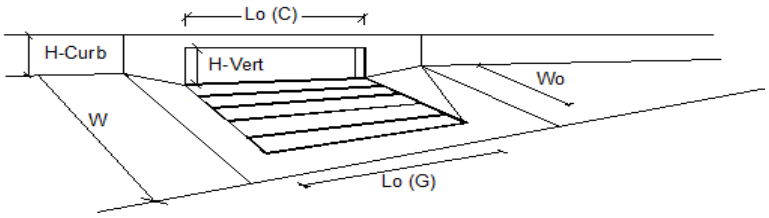
		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Spread Criterion				
MAJOR STORM Allowable Capacity is based on Spread Criterion	**Q_{allow} =**	**6.0**	**6.0**	**cfs**

Minor storm max. allowable capacity GOOD - greater than the design flow given on sheet 'Inlet Management'

Major storm max. allowable capacity GOOD - greater than the design flow given on sheet 'Inlet Management'

INLET ON A CONTINUOUS GRADE

Version 4.05 Released March 2017



Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a')	a_{LOCAL} =	3.0	3.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)	No =	1	1	
Length of a Single Unit Inlet (Grate or Curb Opening)	L_o =	15.00	15.00	ft
Width of a Unit Grate (cannot be greater than W, Gutter Width)	W_o =	N/A	N/A	ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)	C_f-G =	N/A	N/A	
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)	C_f-C =	0.10	0.10	

Street Hydraulics: OK - Q < Allowable Street Capacity'		MINOR	MAJOR	
Total Inlet Interception Capacity	**Q =**	**3.1**	**5.7**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**0.0**	**0.1**	**cfs**
Capture Percentage = Q_a/Q_o =	**C% =**	**100**	**98**	**%**

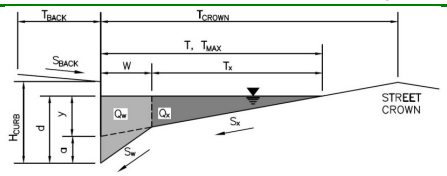
Version 4.05 Released March 2017

ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project: Cottages at Dry Creek

Inlet ID: A3



Gutter Geometry (Enter data in the blue cells)

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	5.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.013	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	12.0	ft
Gutter Width	W =	1.00	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.012	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.012	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	12.0	12.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	8.0	inches
Allow Flow Depth at Street Crown (leave blank for no)		☐	☐	check = yes

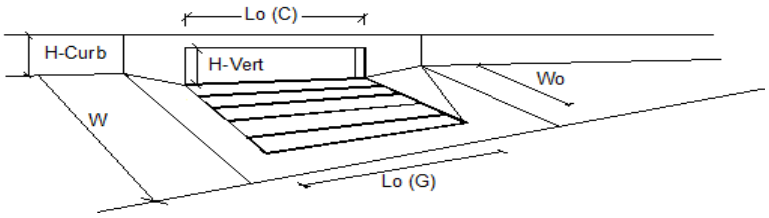
		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Spread Criterion				
MAJOR STORM Allowable Capacity is based on Spread Criterion	**Q_{allow} =**	**6.0**	**6.0**	**cfs**

Minor storm max. allowable capacity GOOD - greater than the design flow given on sheet 'Inlet Management'

Major storm max. allowable capacity GOOD - greater than the design flow given on sheet 'Inlet Management'

INLET ON A CONTINUOUS GRADE

Version 4.05 Released March 2017



Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a')	a_{LOCAL} =	3.0	3.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)	No =	1	1	
Length of a Single Unit Inlet (Grate or Curb Opening)	L_o =	15.00	15.00	ft
Width of a Unit Grate (cannot be greater than W, Gutter Width)	W_o =	N/A	N/A	ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)	C_f-G =	N/A	N/A	
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)	C_f-C =	0.10	0.10	

Street Hydraulics: OK - Q < Allowable Street Capacity'		MINOR	MAJOR	
Total Inlet Interception Capacity	**Q =**	**3.1**	**5.7**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**0.0**	**0.1**	**cfs**
Capture Percentage = Q_a/Q_o =	**C% =**	**100**	**98**	**%**

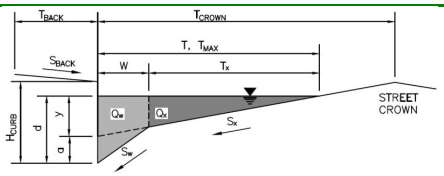
Version 4.05 Released March 2017

ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project: Cottages at Dry Creek

Inlet ID: B1



Gutter Geometry (Enter data in the blue cells)

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	5.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.013	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	12.0	ft
Gutter Width	W =	1.00	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.015	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.012	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	12.0	12.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	8.0	inches
Allow Flow Depth at Street Crown (leave blank for no)		☐	☐	check = yes

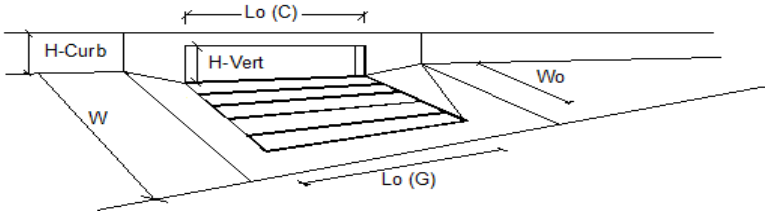
		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Spread Criterion				
MAJOR STORM Allowable Capacity is based on Spread Criterion	**Q_{allow} =**	**6.7**	**6.7**	**cfs**

Minor storm max. allowable capacity GOOD - greater than the design flow given on sheet 'Inlet Management'

Major storm max. allowable capacity GOOD - greater than the design flow given on sheet 'Inlet Management'

INLET ON A CONTINUOUS GRADE

Version 4.05 Released March 2017



Design Information (Input)		MINOR	MAJOR	
Type of Inlet	CDOT Type R Curb Opening	Type =	CDOT Type R Curb Opening	
Local Depression (additional to continuous gutter depression 'a')		a_{LOCAL} =	3.0	3.0 inches
Total Number of Units in the Inlet (Grate or Curb Opening)		No =	1	1
Length of a Single Unit Inlet (Grate or Curb Opening)		L_o =	10.00	10.00 ft
Width of a Unit Grate (cannot be greater than W, Gutter Width)		W_o =	N/A	N/A ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)		C_f-G =	N/A	N/A
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)		C_f-C =	0.10	0.10

Street Hydraulics: OK - Q < Allowable Street Capacity'		MINOR	MAJOR	
Total Inlet Interception Capacity	**Q =**	**1.5**	**2.8**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**0.0**	**0.0**	**cfs**
Capture Percentage = Q_a/Q_o =	**C% =**	**100**	**100**	**%**

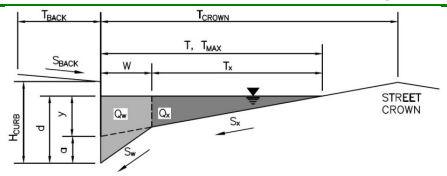
Version 4.05 Released March 2017

ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project: Cottages at Dry Creek

Inlet ID: B3



Gutter Geometry (Enter data in the blue cells)

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	5.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.013	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	12.0	ft
Gutter Width	W =	1.00	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.015	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.012	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	12.0	12.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	8.0	inches
Allow Flow Depth at Street Crown (leave blank for no)		☐	☐	check = yes

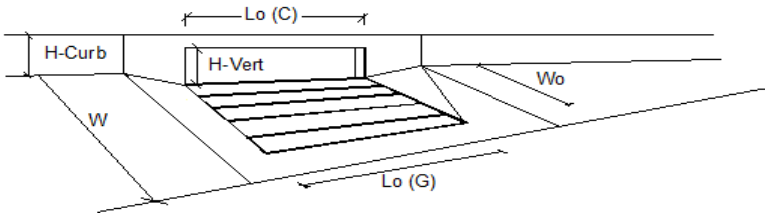
		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Spread Criterion				
MAJOR STORM Allowable Capacity is based on Spread Criterion	**Q_{allow} =**	**6.7**	**6.7**	**cfs**

Minor storm max. allowable capacity GOOD - greater than the design flow given on sheet 'Inlet Management'

Major storm max. allowable capacity GOOD - greater than the design flow given on sheet 'Inlet Management'

INLET ON A CONTINUOUS GRADE

Version 4.05 Released March 2017



Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a')	a_{LOCAL} =	3.0	3.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)	No =	1	1	
Length of a Single Unit Inlet (Grate or Curb Opening)	L_o =	10.00	10.00	ft
Width of a Unit Grate (cannot be greater than W, Gutter Width)	W_o =	N/A	N/A	ft
Clogging Factor for a Single Unit Grate (typical min. value = 0.5)	C_f-G =	N/A	N/A	
Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)	C_f-C =	0.10	0.10	

Street Hydraulics: OK - Q < Allowable Street Capacity'		MINOR	MAJOR	
Total Inlet Interception Capacity	**Q =**	**1.5**	**2.8**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**0.0**	**0.0**	**cfs**
Capture Percentage = Q_a/Q_o =	**C% =**	**100**	**100**	**%**

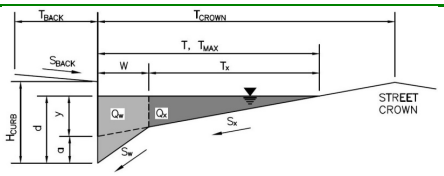
Version 4.05 Released March 2017

ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project: Cottages at Dry Creek

Inlet ID: C1



Gutter Geometry (Enter data in the blue cells)

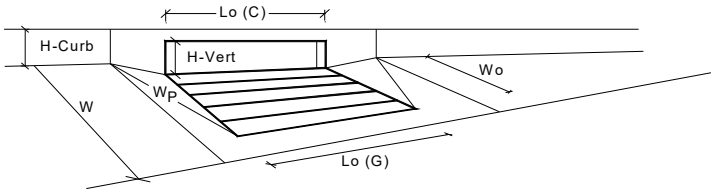
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	5.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.020	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.013	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	24.0	ft
Gutter Width	W =	1.00	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.000	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.012	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	18.0	18.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	6.0	inches
Check boxes are not applicable in SUMP conditions		☐	☐	

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	**Q_{allow} =**	**SUMP**	**SUMP**	**cfs**

INLET IN A SUMP OR SAG LOCATION

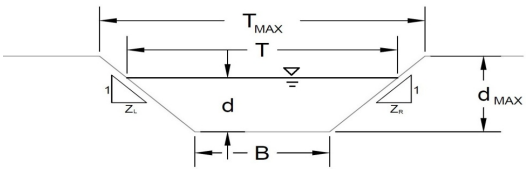
Version 4.05 Released March 2017



Design Information (Input)	CDOT Type R Curb Opening		MINOR	MAJOR	
Type of Inlet		Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from above)		a_{local} =	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)		No =	1	1	
Water Depth at Flowline (outside of local depression)		Ponding Depth =	5.1	5.1	inches
Grate Information			MINOR	MAJOR	Override Depths
Length of a Unit Grate		L_o (G) =	N/A	N/A	feet
Width of a Unit Grate		W_o =	N/A	N/A	feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)		A_{ratio} =	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)		C_f (G) =	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)		C_w (G) =	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)		C_o (G) =	N/A	N/A	
Curb Opening Information			MINOR	MAJOR	
Length of a Unit Curb Opening		L_o (C) =	5.00	5.00	feet
Height of Vertical Curb Opening in Inches		H_{vert} =	6.00	6.00	inches
Height of Curb Orifice Throat in Inches		H_{throat} =	6.00	6.00	inches
Angle of Throat (see USDCM Figure ST-5)		Theta =	63.40	63.40	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)		W_p =	1.00	1.00	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)		C_f (C) =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)		C_w (C) =	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)		C_o (C) =	0.67	0.67	
Low Head Performance Reduction (Calculated)			MINOR	MAJOR	
Depth for Grate Midwidth		d_{Grate} =	N/A	N/A	ft
Depth for Curb Opening Weir Equation		d_{Curb} =	0.34	0.34	ft
Combination Inlet Performance Reduction Factor for Long Inlets		$RF_{Combination}$ =	0.65	0.65	
Curb Opening Performance Reduction Factor for Long Inlets		RF_{Curb} =	1.00	1.00	
Grated Inlet Performance Reduction Factor for Long Inlets		RF_{Grate} =	N/A	N/A	
			MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)		**Q_a =**	**4.4**	**4.4**	**cfs**
WARNING: Inlet Capacity less than Q Peak for Major Storm		$Q_{PEAK\ REQUIRED}$ =	2.4	4.4	cfs

AREA INLET IN A TRAPEZOIDAL GRASS-LINED CHANNEL

Cottages at Dry Creek
Basin A2



Grass Type	Limiting Manning's n
A	0.06
B	0.04
C	0.033
D	0.03
E	0.024

Analysis of Trapezoidal Grass-Lined Channel Using SCS Method

NRCS Vegetal Retardance (A, B, C, D, or E)	A, B, C, D or E		
Manning's n (Leave cell D16 blank to manually enter an n value)	n =	0.022	
Channel Invert Slope	S_O =	0.0220	ft/ft
Bottom Width	B =	3.00	ft
Left Side Slope	Z1 =	33.00	ft/ft
Right Side Slope	Z2 =	33.00	ft/ft

Check one of the following soil types:

Soil Type:	Max. Velocity (V_{MAX})	Max Froude No. (F_{MAX})
Sandy	5.0 fps	0.50
Non-Sandy	7.0 fps	0.80

Choose One:
- ○ Sandy
- ◉ Non-Sandy

		Minor Storm	Major Storm	
Max. Allowable Top Width of Channel for Minor & Major Storm	T_{MAX} =	**15.00**	**20.00**	**feet**
Max. Allowable Water Depth in Channel for Minor & Major Storm	d_{MAX} =	**2.00**	**3.00**	**feet**

Maximum Channel Capacity Based On Allowable Top Width

		Minor Storm	Major Storm	
Max. Allowable Top Width	T_{MAX} =	**15.00**	**20.00**	**ft**
Water Depth	d =	0.18	0.26	ft
Flow Area	A =	1.64	2.96	sq ft
Wetted Perimeter	P =	15.01	20.01	ft
Hydraulic Radius	R =	0.11	0.15	ft
Manning's n based on NRCS Vegetal Retardance	n =	0.022	0.022	
Flow Velocity	V =	2.29	2.81	fps
Velocity-Depth Product	VR =	0.25	0.42	ft^2/s
Hydraulic Depth	D =	0.11	0.15	ft
Froude Number	Fr =	1.22	1.29	
Max. Flow Based On Allowable Top Width	Q_T =	**3.75**	**8.33**	**cfs**

Maximum Channel Capacity Based On Allowable Water Depth

		Minor Storm	Major Storm	
Max. Allowable Water Depth	d_{MAX} =	**2.00**	**3.00**	**feet**
Top Width	T =	135.00	201.00	feet
Flow Area	A =	138.00	306.00	square feet
Wetted Perimeter	P =	135.06	201.09	feet
Hydraulic Radius	R =	1.02	1.52	feet
Manning's n based on NRCS Vegetal Retardance	n =	0.022	0.022	
Flow Velocity	V =	10.19	13.29	fps
Velocity-Depth Product	VR =	10.41	20.22	ft^2/s
Hydraulic Depth	D =	1.02	1.52	feet
Froude Number	Fr =	1.78	1.90	
Max. Flow Based On Allowable Water Depth	Q_d =	**1406.33**	**4066.76**	**cfs**

Allowable Channel Capacity Based On Channel Geometry

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Top Width Criterion	Q_{allow} =	**3.75**	**8.33**	**cfs**
MAJOR STORM Allowable Capacity is based on Top Width Criterion	d_{allow} =	**0.18**	**0.26**	**ft**

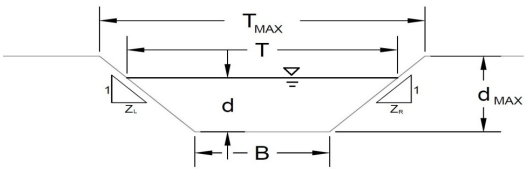
Water Depth in Channel Based On Design Peak Flow

Design Peak Flow	Q_o =	**2.80**	**7.30**	**cfs**
Water Depth	d =	**0.16**	**0.24**	**feet**
Top Width	T =	13.52	19.06	feet
Flow Area	A =	1.32	2.69	square feet
Wetted Perimeter	P =	13.53	19.07	feet
Hydraulic Radius	R =	0.10	0.14	feet
Manning's n based on NRCS Vegetal Retardance	n =	0.022	0.022	
Flow Velocity	V =	2.13	2.72	fps
Velocity-Depth Product	VR =	0.21	0.38	ft^2/s
Hydraulic Depth	D =	0.10	0.14	feet
Warning 04 Froude Number	Fr =	1.20	1.28	

Minor storm max. allowable capacity GOOD - greater than flow given on sheet 'Q-Peak'
Major storm max. allowable capacity GOOD - greater than flow given on sheet 'Q-Peak'

AREA INLET IN A TRAPEZOIDAL GRASS-LINED CHANNEL

Cottages at Dry Creek
Basin B2



Grass Type	Limiting Manning's n
A	0.06
B	0.04
C	0.033
D	0.03
E	0.024

Analysis of Trapezoidal Grass-Lined Channel Using SCS Method

NRCS Vegetal Retardance (A, B, C, D, or E)	A, B, C, D or E		
Manning's n (Leave cell D16 blank to manually enter an n value)	n =	0.022	
Channel Invert Slope	S_O =	0.0120	ft/ft
Bottom Width	B =	3.00	ft
Left Side Slope	Z1 =	33.00	ft/ft
Right Side Slope	Z2 =	33.00	ft/ft

Check one of the following soil types:

Soil Type:	Max. Velocity (V_{MAX})	Max Froude No. (F_{MAX})
Sandy	5.0 fps	0.50
Non-Sandy	7.0 fps	0.80

Choose One:
- ○ Sandy
- ◉ Non-Sandy

		Minor Storm	Major Storm	
Max. Allowable Top Width of Channel for Minor & Major Storm	T_{MAX} =	**15.00**	**20.00**	**feet**
Max. Allowable Water Depth in Channel for Minor & Major Storm	d_{MAX} =	**2.00**	**3.00**	**feet**

Maximum Channel Capacity Based On Allowable Top Width

		Minor Storm	Major Storm	
Max. Allowable Top Width	T_{MAX} =	**15.00**	**20.00**	**ft**
Water Depth	d =	0.18	0.26	ft
Flow Area	A =	1.64	2.96	sq ft
Wetted Perimeter	P =	15.01	20.01	ft
Hydraulic Radius	R =	0.11	0.15	ft
Manning's n based on NRCS Vegetal Retardance	n =	0.022	0.022	
Flow Velocity	V =	1.69	2.08	fps
Velocity-Depth Product	VR =	0.18	0.31	ft^2/s
Hydraulic Depth	D =	0.11	0.15	ft
Froude Number	Fr =	0.90	0.95	
Max. Flow Based On Allowable Top Width	Q_T =	**2.77**	**6.15**	**cfs**

Maximum Channel Capacity Based On Allowable Water Depth

		Minor Storm	Major Storm	
Max. Allowable Water Depth	d_{MAX} =	**2.00**	**3.00**	**feet**
Top Width	T =	135.00	201.00	feet
Flow Area	A =	138.00	306.00	square feet
Wetted Perimeter	P =	135.06	201.09	feet
Hydraulic Radius	R =	1.02	1.52	feet
Manning's n based on NRCS Vegetal Retardance	n =	0.022	0.022	
Flow Velocity	V =	7.53	9.82	fps
Velocity-Depth Product	VR =	7.69	14.94	ft^2/s
Hydraulic Depth	D =	1.02	1.52	feet
Froude Number	Fr =	1.31	1.40	
Max. Flow Based On Allowable Water Depth	Q_d =	**1038.64**	**3003.50**	**cfs**

Allowable Channel Capacity Based On Channel Geometry

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Top Width Criterion	Q_{allow} =	**2.77**	**6.15**	**cfs**
MAJOR STORM Allowable Capacity is based on Top Width Criterion	d_{allow} =	**0.18**	**0.26**	**ft**

Water Depth in Channel Based On Design Peak Flow

Design Peak Flow	Q_o =	**2.40**	**5.90**	**cfs**
Water Depth	d =	**0.17**	**0.25**	**feet**
Top Width	T =	14.25	19.70	feet
Flow Area	A =	1.47	2.87	square feet
Wetted Perimeter	P =	14.26	19.71	feet
Hydraulic Radius	R =	0.10	0.15	feet
Manning's n based on NRCS Vegetal Retardance	n =	0.022	0.022	
Flow Velocity	V =	1.63	2.05	fps
Velocity-Depth Product	VR =	0.17	0.30	ft^2/s
Hydraulic Depth	D =	0.10	0.15	feet
Warning 04 Froude Number	Fr =	0.90	0.95	

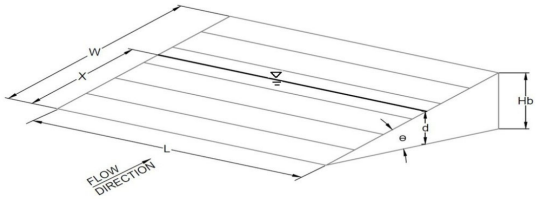
Minor storm max. allowable capacity GOOD - greater than flow given on sheet 'Q-Peak'
Major storm max. allowable capacity GOOD - greater than flow given on sheet 'Q-Peak'

AREA INLET IN A TRAPEZOIDAL GRASS-LINED CHANNEL

Cottages at Dry Creek
Basin B2

Inlet Design Information (Input)

Type of Inlet — Inlet Type = CDOT Type C (Depressed)



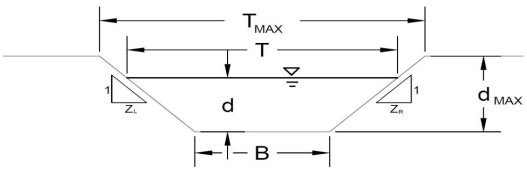
Angle of Inclined Grate (must be <= 30 degrees)	θ =	0.00	degrees
Width of Grate	W =	3.00	feet
Length of Grate	L =	3.00	feet
Open Area Ratio	A_{RATIO} =	0.70	
Height of Inclined Grate	H_B =	0.00	feet
Clogging Factor	C_f =	0.50	
Grate Discharge Coefficient	C_d =	0.84	
Orifice Coefficient	C_o =	0.56	
Weir Coefficient	C_w =	1.81	

		MINOR	MAJOR	
Water Depth at Inlet (for depressed inlets, 1 foot is added for depression)	d =	1.17	1.25	
Grate Capacity as a Weir				
Submerged Side Weir Length	X =	3.00	3.00	feet
Inclined Side Weir Flow	Q_{ws} =	12.01	13.30	cfs
Base Weir Flow	Q_{wb} =	17.16	19.00	cfs
Interception without Clogging	Q_{wi} =	41.17	45.60	cfs
Interception with Clogging	Q_{wa} =	20.59	22.80	cfs
Grate Capacity as an Orifice				
Interception without Clogging	Q_{oi} =	30.78	31.85	cfs
Interception with Clogging	Q_{oa} =	15.39	15.92	cfs
Total Inlet Interception Capacity (assumes clogged condition)	**Q_a =**	**15.39**	**15.92**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms (> Q PEAK)	**Bypassed Flow, Q_b =**	**0.00**	**0.00**	**cfs**
	Capture Percentage = Q_a/Q_o = C%	**100**	**100**	**%**

Warning 04: Froude No. exceeds USDCM Volume I recommendation.

AREA INLET IN A TRAPEZOIDAL GRASS-LINED CHANNEL

Cottages at Dry Creek
Swale D1



Grass Type	Limiting Manning's n
A	0.06
B	0.04
C	0.033
D	0.03
E	0.024

Analysis of Trapezoidal Grass-Lined Channel Using SCS Method

NRCS Vegetal Retardance (A, B, C, D, or E)	A, B, C, D or E		
Manning's n (Leave cell D16 blank to manually enter an n value)	n =	0.022	
Channel Invert Slope	S_O =	0.0200	ft/ft
Bottom Width	B =	0.00	ft
Left Side Slope	Z1 =	3.00	ft/ft
Right Side Slope	Z2 =	3.00	ft/ft

Check one of the following soil types:

Soil Type:	Max. Velocity (V_{MAX})	Max Froude No. (F_{MAX})
Sandy	5.0 fps	0.50
Non-Sandy	7.0 fps	0.80

Choose One:
- ○ Sandy
- ◉ Non-Sandy

		Minor Storm	Major Storm	
Max. Allowable Top Width of Channel for Minor & Major Storm	T_{MAX} =	**6.00**	**6.00**	**feet**
Max. Allowable Water Depth in Channel for Minor & Major Storm	d_{MAX} =	**1.00**	**1.00**	**feet**

Maximum Channel Capacity Based On Allowable Top Width

		Minor Storm	Major Storm	
Max. Allowable Top Width	T_{MAX} =	**6.00**	**6.00**	**ft**
Water Depth	d =	1.00	1.00	ft
Flow Area	A =	3.00	3.00	sq ft
Wetted Perimeter	P =	6.32	6.32	ft
Hydraulic Radius	R =	0.47	0.47	ft
Manning's n based on NRCS Vegetal Retardance	n =	0.022	0.022	
Flow Velocity	V =	5.83	5.83	fps
Velocity-Depth Product	VR =	2.76	2.76	ft^2/s
Hydraulic Depth	D =	0.50	0.50	ft
Froude Number	Fr =	1.45	1.45	
Max. Flow Based On Allowable Top Width	Q_T =	**17.48**	**17.48**	**cfs**

Maximum Channel Capacity Based On Allowable Water Depth

		Minor Storm	Major Storm	
Max. Allowable Water Depth	d_{MAX} =	**1.00**	**1.00**	**feet**
Top Width	T =	6.00	6.00	feet
Flow Area	A =	3.00	3.00	square feet
Wetted Perimeter	P =	6.32	6.32	feet
Hydraulic Radius	R =	0.47	0.47	feet
Manning's n based on NRCS Vegetal Retardance	n =	0.022	0.022	
Flow Velocity	V =	5.83	5.83	fps
Velocity-Depth Product	VR =	2.76	2.76	ft^2/s
Hydraulic Depth	D =	0.50	0.50	feet
Froude Number	Fr =	1.45	1.45	
Max. Flow Based On Allowable Water Depth	Q_d =	**17.48**	**17.48**	**cfs**

Allowable Channel Capacity Based On Channel Geometry

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion	Q_{allow} =	**17.48**	**17.48**	**cfs**
MAJOR STORM Allowable Capacity is based on Depth Criterion	d_{allow} =	**1.00**	**1.00**	**ft**

Water Depth in Channel Based On Design Peak Flow

Design Peak Flow	Q_o =	**0.60**	**3.40**	**cfs**
Water Depth	d =	**0.28**	**0.54**	**feet**
Top Width	T =	1.69	3.25	feet
Flow Area	A =	0.24	0.88	square feet
Wetted Perimeter	P =	1.79	3.42	feet
Hydraulic Radius	R =	0.13	0.26	feet
Manning's n based on NRCS Vegetal Retardance	n =	0.022	0.022	
Flow Velocity	V =	2.51	3.87	fps
Velocity-Depth Product	VR =	0.34	0.99	ft^2/s
Hydraulic Depth	D =	0.14	0.27	feet
Warning 04 Froude Number	Fr =	1.18	1.31	

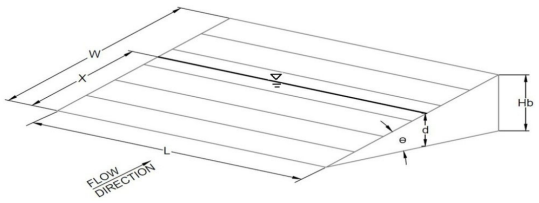
Minor storm max. allowable capacity GOOD - greater than flow given on sheet 'Q-Peak'
Major storm max. allowable capacity GOOD - greater than flow given on sheet 'Q-Peak'

AREA INLET IN A TRAPEZOIDAL GRASS-LINED CHANNEL

Cottages at Dry Creek
Swale D1

Inlet Design Information (Input)

Type of Inlet — Inlet Type =



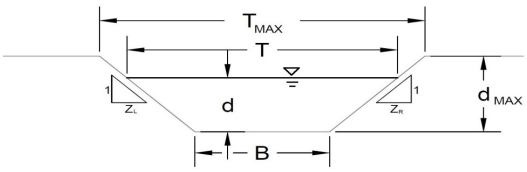
Angle of Inclined Grate (must be <= 30 degrees)	θ =		degrees
Width of Grate	W =		feet
Length of Grate	L =		feet
Open Area Ratio	A_{RATIO} =		
Height of Inclined Grate	H_B =		feet
Clogging Factor	C_f =		
Grate Discharge Coefficient	C_d =		
Orifice Coefficient	C_o =		
Weir Coefficient	C_w =		

		MINOR	MAJOR	
Water Depth at Inlet (for depressed inlets, 1 foot is added for depression)	d =			
Grate Capacity as a Weir				
Submerged Side Weir Length	X =			feet
Inclined Side Weir Flow	Q_{ws} =			cfs
Base Weir Flow	Q_{wb} =			cfs
Interception without Clogging	Q_{wi} =			cfs
Interception with Clogging	Q_{wa} =			cfs
Grate Capacity as an Orifice				
Interception without Clogging	Q_{oi} =			cfs
Interception with Clogging	Q_{oa} =			cfs
Total Inlet Interception Capacity (assumes clogged condition)	**Q_a =**			**cfs**
	Bypassed Flow, Q_b =			**cfs**
	Capture Percentage = Q_a/Q_o = C%			**%**

Warning 04: Froude No. exceeds USDCM Volume I recommendation.

AREA INLET IN A TRAPEZOIDAL GRASS-LINED CHANNEL

Cottages at Dry Creek
Swale D2



Grass Type	Limiting Manning's n
A	0.06
B	0.04
C	0.033
D	0.03
E	0.024

Analysis of Trapezoidal Grass-Lined Channel Using SCS Method

NRCS Vegetal Retardance (A, B, C, D, or E)	A, B, C, D or E		
Manning's n (Leave cell D16 blank to manually enter an n value)	n =	0.022	
Channel Invert Slope	S_O =	0.0100	ft/ft
Bottom Width	B =	0.00	ft
Left Side Slope	Z1 =	3.00	ft/ft
Right Side Slope	Z2 =	3.00	ft/ft

Check one of the following soil types:

Soil Type:	Max. Velocity (V_{MAX})	Max Froude No. (F_{MAX})
Sandy	5.0 fps	0.50
Non-Sandy	7.0 fps	0.80

Choose One:
- ○ Sandy
- ◉ Non-Sandy

		Minor Storm	Major Storm	
Max. Allowable Top Width of Channel for Minor & Major Storm	T_{MAX} =	**6.00**	**6.00**	**feet**
Max. Allowable Water Depth in Channel for Minor & Major Storm	d_{MAX} =	**1.00**	**1.00**	**feet**

Maximum Channel Capacity Based On Allowable Top Width

		Minor Storm	Major Storm	
Max. Allowable Top Width	T_{MAX} =	**6.00**	**6.00**	**ft**
Water Depth	d =	1.00	1.00	ft
Flow Area	A =	3.00	3.00	sq ft
Wetted Perimeter	P =	6.32	6.32	ft
Hydraulic Radius	R =	0.47	0.47	ft
Manning's n based on NRCS Vegetal Retardance	n =	0.022	0.022	
Flow Velocity	V =	4.12	4.12	fps
Velocity-Depth Product	VR =	1.95	1.95	ft^2/s
Hydraulic Depth	D =	0.50	0.50	ft
Froude Number	Fr =	1.03	1.03	
Max. Flow Based On Allowable Top Width	Q_T =	**12.36**	**12.36**	**cfs**

Maximum Channel Capacity Based On Allowable Water Depth

		Minor Storm	Major Storm	
Max. Allowable Water Depth	d_{MAX} =	**1.00**	**1.00**	**feet**
Top Width	T =	6.00	6.00	feet
Flow Area	A =	3.00	3.00	square feet
Wetted Perimeter	P =	6.32	6.32	feet
Hydraulic Radius	R =	0.47	0.47	feet
Manning's n based on NRCS Vegetal Retardance	n =	0.022	0.022	
Flow Velocity	V =	4.12	4.12	fps
Velocity-Depth Product	VR =	1.95	1.95	ft^2/s
Hydraulic Depth	D =	0.50	0.50	feet
Froude Number	Fr =	1.03	1.03	
Max. Flow Based On Allowable Water Depth	Q_d =	**12.36**	**12.36**	**cfs**

Allowable Channel Capacity Based On Channel Geometry

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion	Q_{allow} =	**12.36**	**12.36**	**cfs**
MAJOR STORM Allowable Capacity is based on Depth Criterion	d_{allow} =	**1.00**	**1.00**	**ft**

Water Depth in Channel Based On Design Peak Flow

Design Peak Flow	Q_o =	**0.50**	**2.50**	**cfs**
Water Depth	d =	**0.30**	**0.55**	**feet**
Top Width	T =	1.80	3.30	feet
Flow Area	A =	0.27	0.91	square feet
Wetted Perimeter	P =	1.90	3.47	feet
Hydraulic Radius	R =	0.14	0.26	feet
Manning's n based on NRCS Vegetal Retardance	n =	0.022	0.022	
Flow Velocity	V =	1.85	2.76	fps
Velocity-Depth Product	VR =	0.26	0.72	ft^2/s
Hydraulic Depth	D =	0.15	0.27	feet
Warning 04 Froude Number	Fr =	0.84	0.93	

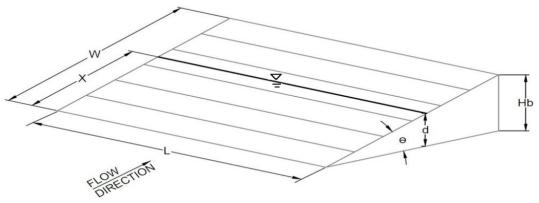
Minor storm max. allowable capacity GOOD - greater than flow given on sheet 'Q-Peak'
Major storm max. allowable capacity GOOD - greater than flow given on sheet 'Q-Peak'

AREA INLET IN A TRAPEZOIDAL GRASS-LINED CHANNEL

Cottages at Dry Creek
Swale D2

Inlet Design Information (Input)

Type of Inlet — Inlet Type =



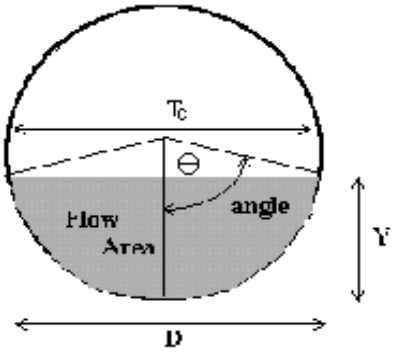
Angle of Inclined Grate (must be <= 30 degrees)	θ =		degrees
Width of Grate	W =		feet
Length of Grate	L =		feet
Open Area Ratio	A_{RATIO} =		
Height of Inclined Grate	H_B =		feet
Clogging Factor	C_f =		
Grate Discharge Coefficient	C_d =		
Orifice Coefficient	C_o =		
Weir Coefficient	C_w =		

		MINOR	MAJOR	
Water Depth at Inlet (for depressed inlets, 1 foot is added for depression)	d =			
Grate Capacity as a Weir				
Submerged Side Weir Length	X =			feet
Inclined Side Weir Flow	Q_{ws} =			cfs
Base Weir Flow	Q_{wb} =			cfs
Interception without Clogging	Q_{wi} =			cfs
Interception with Clogging	Q_{wa} =			cfs
Grate Capacity as an Orifice				
Interception without Clogging	Q_{oi} =			cfs
Interception with Clogging	Q_{oa} =			cfs
Total Inlet Interception Capacity (assumes clogged condition)	**Q_a =**			**cfs**
	Bypassed Flow, Q_b =			**cfs**
	Capture Percentage = Q_a/Q_o = C%			**%**

Warning 04: Froude No. exceeds USDCM Volume I recommendation.

CIRCULAR CONDUIT FLOW (Normal & Critical Depth Computation)

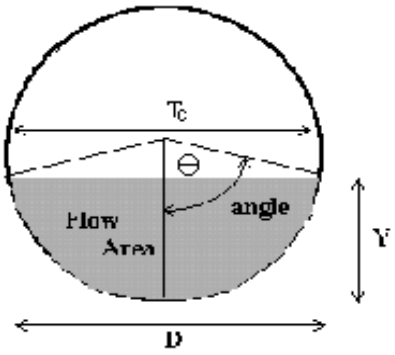
Project: COTTAGES AT DRY CREEK
Pipe ID: 15" HDPE Basin A1



Design Information (Input)			
Pipe Invert Slope	So =	0.0150	ft/ft
Pipe Manning's n-value	n =	0.0120	
Pipe Diameter	D =	15.00	inches
Design discharge	**Q =**	**7.30**	**cfs**
Full-flow Capacity (Calculated)			
Full-flow area	Af =	1.23	sq ft
Full-flow wetted perimeter	Pf =	3.93	ft
Half Central Angle	Theta =	3.14	radians
Full-flow capacity	Qf =	8.59	cfs
Calculation of Normal Flow Condition			
Half Central Angle (0<Theta<3.14)	Theta =	2.00	radians
Flow area	An =	0.93	sq ft
Top width	Tn =	1.14	ft
Wetted perimeter	Pn =	2.50	ft
Flow depth	Yn =	0.88	ft
Flow velocity	Vn =	7.86	fps
Discharge	Qn =	7.30	cfs
Percent Full Flow	Flow =	85.0%	of full flow
Normal Depth Froude Number	Fr_n =	1.53	supercritical
Calculation of Critical Flow Condition			
Half Central Angle (0<Theta-c<3.14)	Theta-c =	2.38	radians
Critical flow area	Ac =	1.13	sq ft
Critical top width	Tc =	0.86	ft
Critical flow depth	Yc =	1.08	ft
Critical flow velocity	Vc =	6.49	fps
Critical Depth Froude Number	Fr_c =	1.00	

CIRCULAR CONDUIT FLOW (Normal & Critical Depth Computation)

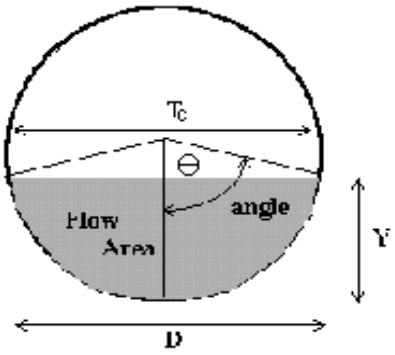
Project: COTTAGES AT DRY CREEK
Pipe ID: 15" HDPE Pipe Basin B2



Design Information (Input)			
Pipe Invert Slope	So =	0.0100	ft/ft
Pipe Manning's n-value	n =	0.0120	
Pipe Diameter	D =	15.00	inches
Design discharge	**Q =**	**4.74**	**cfs**
Full-flow Capacity (Calculated)			
Full-flow area	Af =	1.23	sq ft
Full-flow wetted perimeter	Pf =	3.93	ft
Half Central Angle	Theta =	3.14	radians
Full-flow capacity	Qf =	7.02	cfs
Calculation of Normal Flow Condition			
Half Central Angle (0<Theta<3.14)	Theta =	1.78	radians
Flow area	An =	0.77	sq ft
Top width	Tn =	1.22	ft
Wetted perimeter	Pn =	2.22	ft
Flow depth	Yn =	0.75	ft
Flow velocity	Vn =	6.14	fps
Discharge	Qn =	4.74	cfs
Percent Full Flow	Flow =	67.5%	of full flow
Normal Depth Froude Number	Fr_n =	1.36	supercritical
Calculation of Critical Flow Condition			
Half Central Angle (0<Theta-c<3.14)	Theta-c =	2.00	radians
Critical flow area	Ac =	0.93	sq ft
Critical top width	Tc =	1.14	ft
Critical flow depth	Yc =	0.88	ft
Critical flow velocity	Vc =	5.12	fps
Critical Depth Froude Number	Fr_c =	1.00	

CIRCULAR CONDUIT FLOW (Normal & Critical Depth Computation)

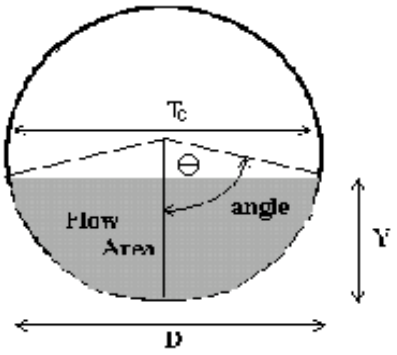
Project: COTTAGES AT DRY CREEK
Pipe ID: 15" HDPE Pipe Basin C1



Design Information (Input)			
Pipe Invert Slope	So =	0.0100	ft/ft
Pipe Manning's n-value	n =	0.0120	
Pipe Diameter	D =	15.00	inches
Design discharge	**Q =**	**4.40**	**cfs**
Full-flow Capacity (Calculated)			
Full-flow area	Af =	1.23	sq ft
Full-flow wetted perimeter	Pf =	3.93	ft
Half Central Angle	Theta =	3.14	radians
Full-flow capacity	Qf =	7.02	cfs
Calculation of Normal Flow Condition			
Half Central Angle (0<Theta<3.14)	Theta =	1.72	radians
Flow area	An =	0.73	sq ft
Top width	Tn =	1.24	ft
Wetted perimeter	Pn =	2.15	ft
Flow depth	Yn =	0.72	ft
Flow velocity	Vn =	6.04	fps
Discharge	Qn =	4.40	cfs
Percent Full Flow	Flow =	62.7%	of full flow
Normal Depth Froude Number	Fr_n =	1.39	supercritical
Calculation of Critical Flow Condition			
Half Central Angle (0<Theta-c<3.14)	Theta-c =	1.94	radians
Critical flow area	Ac =	0.89	sq ft
Critical top width	Tc =	1.17	ft
Critical flow depth	Yc =	0.85	ft
Critical flow velocity	Vc =	4.95	fps
Critical Depth Froude Number	Fr_c =	1.00	

CIRCULAR CONDUIT FLOW (Normal & Critical Depth Computation)

Project: COTTAGES AT DRY CREEK
Pipe ID: 18" HDPE Pipe Design Point P1



Design Information (Input)			
Pipe Invert Slope	So =	0.0150	ft/ft
Pipe Manning's n-value	n =	0.0120	
Pipe Diameter	D =	18.00	inches
Design discharge	**Q =**	**13.80**	**cfs**

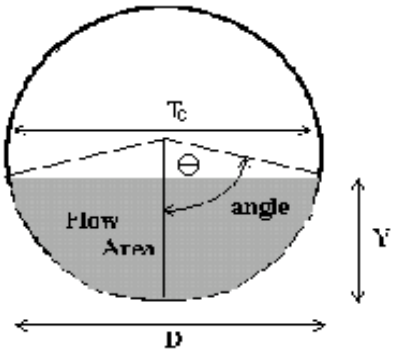
Full-flow Capacity (Calculated)			
Full-flow area	Af =	1.77	sq ft
Full-flow wetted perimeter	Pf =	4.71	ft
Half Central Angle	Theta =	3.14	radians
Full-flow capacity	Qf =	13.97	cfs

Calculation of Normal Flow Condition			
Half Central Angle (0<Theta<3.14)	Theta =	2.24	radians
Flow area	An =	1.53	sq ft
Top width	Tn =	1.18	ft
Wetted perimeter	Pn =	3.35	ft
Flow depth	Yn =	1.21	ft
Flow velocity	Vn =	9.02	fps
Discharge	Qn =	13.80	cfs
Percent Full Flow	Flow =	98.8%	of full flow
Normal Depth Froude Number	Fr_n =	1.40	supercritical

Calculation of Critical Flow Condition			
Half Central Angle (0<Theta-c<3.14)	Theta-c =	2.56	radians
Critical flow area	Ac =	1.70	sq ft
Critical top width	Tc =	0.83	ft
Critical flow depth	Yc =	1.38	ft
Critical flow velocity	Vc =	8.13	fps
Critical Depth Froude Number	Fr_c =	1.00	

CIRCULAR CONDUIT FLOW (Normal & Critical Depth Computation)

Project: COTTAGES AT DRY CREEK
Pipe ID: 18" HDPE Pipe Design Point P2



Design Information (Input)			
Pipe Invert Slope	So =	0.0400	ft/ft
Pipe Manning's n-value	n =	0.0120	
Pipe Diameter	D =	18.00	inches
Design discharge	**Q =**	**14.00**	**cfs**

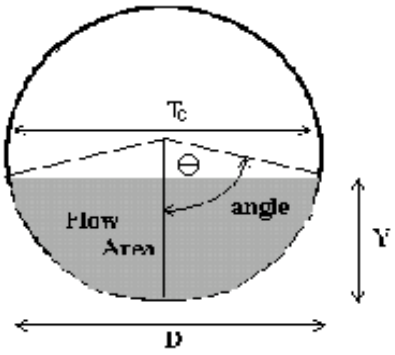
Full-flow Capacity (Calculated)			
Full-flow area	Af =	1.77	sq ft
Full-flow wetted perimeter	Pf =	4.71	ft
Half Central Angle	Theta =	3.14	radians
Full-flow capacity	Qf =	22.82	cfs

Calculation of Normal Flow Condition			
Half Central Angle (0<Theta<3.14)	Theta =	1.70	radians
Flow area	An =	1.03	sq ft
Top width	Tn =	1.49	ft
Wetted perimeter	Pn =	2.56	ft
Flow depth	Yn =	0.85	ft
Flow velocity	Vn =	13.57	fps
Discharge	Qn =	14.00	cfs
Percent Full Flow	Flow =	61.3%	of full flow
Normal Depth Froude Number	Fr_n =	2.87	supercritical

Calculation of Critical Flow Condition			
Half Central Angle (0<Theta-c<3.14)	Theta-c =	2.57	radians
Critical flow area	Ac =	1.70	sq ft
Critical top width	Tc =	0.81	ft
Critical flow depth	Yc =	1.38	ft
Critical flow velocity	Vc =	8.23	fps
Critical Depth Froude Number	Fr_c =	1.00	

CIRCULAR CONDUIT FLOW (Normal & Critical Depth Computation)

Project: COTTAGES AT DRY CREEK
Pipe ID: 18" HDPE Pipe Design Point P3



Design Information (Input)			
Pipe Invert Slope	So =	0.0100	ft/ft
Pipe Manning's n-value	n =	0.0120	
Pipe Diameter	D =	18.00	inches
Design discharge	**Q =**	**9.10**	**cfs**

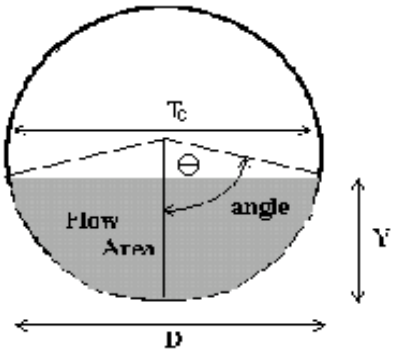
Full-flow Capacity (Calculated)			
Full-flow area	Af =	1.77	sq ft
Full-flow wetted perimeter	Pf =	4.71	ft
Half Central Angle	Theta =	3.14	radians
Full-flow capacity	Qf =	11.41	cfs

Calculation of Normal Flow Condition			
Half Central Angle (0<Theta<3.14)	Theta =	1.93	radians
Flow area	An =	1.27	sq ft
Top width	Tn =	1.41	ft
Wetted perimeter	Pn =	2.89	ft
Flow depth	Yn =	1.01	ft
Flow velocity	Vn =	7.17	fps
Discharge	Qn =	9.10	cfs
Percent Full Flow	Flow =	79.8%	of full flow
Normal Depth Froude Number	Fr_n =	1.33	supercritical

Calculation of Critical Flow Condition			
Half Central Angle (0<Theta-c<3.14)	Theta-c =	2.16	radians
Critical flow area	Ac =	1.47	sq ft
Critical top width	Tc =	1.25	ft
Critical flow depth	Yc =	1.17	ft
Critical flow velocity	Vc =	6.17	fps
Critical Depth Froude Number	Fr_c =	1.00	

CIRCULAR CONDUIT FLOW (Normal & Critical Depth Computation)

Project: COTTAGES AT DRY CREEK
Pipe ID: 18" HDPE Pipe Design Point P4



Design Information (Input)			
Pipe Invert Slope	So =	0.0500	ft/ft
Pipe Manning's n-value	n =	0.0120	
Pipe Diameter	D =	18.00	inches
Design discharge	**Q =**	**9.70**	**cfs**

Full-flow Capacity (Calculated)			
Full-flow area	Af =	1.77	sq ft
Full-flow wetted perimeter	Pf =	4.71	ft
Half Central Angle	Theta =	3.14	radians
Full-flow capacity	Qf =	25.51	cfs

Calculation of Normal Flow Condition			
Half Central Angle (0<Theta<3.14)	Theta =	1.43	radians
Flow area	An =	0.72	sq ft
Top width	Tn =	1.48	ft
Wetted perimeter	Pn =	2.14	ft
Flow depth	Yn =	0.64	ft
Flow velocity	Vn =	13.45	fps
Discharge	Qn =	9.70	cfs
Percent Full Flow	Flow =	38.0%	of full flow
Normal Depth Froude Number	Fr_n =	3.40	supercritical

Calculation of Critical Flow Condition			
Half Central Angle (0<Theta-c<3.14)	Theta-c =	2.22	radians
Critical flow area	Ac =	1.52	sq ft
Critical top width	Tc =	1.20	ft
Critical flow depth	Yc =	1.20	ft
Critical flow velocity	Vc =	6.39	fps
Critical Depth Froude Number	Fr_c =	1.00	

Worksheet Protected

Site-Level Low Impact Development (LID) Design Effective Impervious Calculator

LID Credit by Impervious Reduction Factor (IRF) Method

User Input

Calculated cells

***Design Storm: 1-Hour Rain Depth	2-Year Event	1.19	inches
***Minor Storm: 1-Hour Rain Depth	5-Year Event	1.50	inches
***Major Storm: 1-Hour Rain Depth	100-Year Event	2.52	inches
Optional User Defined Storm	CUHP		
(CUHP) NOAA 1 Hour Rainfall Depth and Frequency for User Defined Storm	100-Year Event		
Max Intensity for Optional User Defined Storm	0		

Designer: David Mijares
Company: Catamount Engineering
Date: April 30, 2022
Project: COTTAGES AT DRY CREEK
Location:

SITE INFORMATION (USER-INPUT)

Sub-basin Identifier	A	B	C											
Receiving Pervious Area Soil Type	Loamy Sand	Loamy Sand	Loamy Sand											
Total Area (ac., Sum of DCIA, UIA, RPA, & SPA)	5.250	3.060	2.600											
Directly Connected Impervious Area (DCIA, acres)	1.610	0.860	0.530											
Unconnected Impervious Area (UIA, acres)	1.150	0.840	1.100											
Receiving Pervious Area (RPA, acres)	0.440	0.280	0.070											
Separate Pervious Area (SPA, acres)	2.050	1.080	0.900											
RPA Treatment Type: Conveyance (C), Volume (V), or Permeable Pavement (PP)	C	C	C											

CALCULATED RESULTS (OUTPUT)

Total Calculated Area (ac, check against input)	5.250	3.060	2.600											
Directly Connected Impervious Area (DCIA, %)	30.7%	28.1%	20.4%											
Unconnected Impervious Area (UIA, %)	21.9%	27.5%	42.3%											
Receiving Pervious Area (RPA, %)	8.4%	9.2%	2.7%											
Separate Pervious Area (SPA, %)	39.0%	35.3%	34.6%											
A_R (RPA / UIA)	0.383	0.333	0.064											
I_a Check	0.720	0.750	0.940											
f / I for 2-Year Event:	1.6	1.6	1.6											
f / I for 5-Year Event:	0.5	0.5	0.5											
f / I for 100-Year Event:	0.4	0.4	0.4											
f / I for Optional User Defined Storm CUHP:														
IRF for 2-Year Event:	0.77	0.78	0.94											
IRF for 5-Year Event:	0.93	0.93	0.98											
IRF for 100-Year Event:	0.95	0.95	0.99											
IRF for Optional User Defined Storm CUHP:														
Total Site Imperviousness: I_{total}	52.6%	55.6%	62.7%											
Effective Imperviousness for 2-Year Event:	47.6%	49.6%	60.2%											
Effective Imperviousness for 5-Year Event:	51.0%	53.7%	62.0%											
Effective Imperviousness for 100-Year Event:	51.4%	54.2%	62.2%											
Effective Imperviousness for Optional User Defined Storm CUHP:														

LID / EFFECTIVE IMPERVIOUSNESS CREDITS

This line only for WQCV Event	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
This line only for 10-Year Event	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
100-Year Event CREDIT**: Reduce Detention By:	2.2%	2.4%	0.8%	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
User Defined CUHP CREDIT: Reduce Detention By:														

Total Site Imperviousness:	**55.8%**
Total Site Effective Imperviousness for 2-Year Event:	**51.2%**
Total Site Effective Imperviousness for 5-Year Event:	**54.4%**
Total Site Effective Imperviousness for 100-Year Event:	**54.8%**
Total Site Effective Imperviousness for Optional User Defined Storm CUHP:	

Notes:

* Use Green-Ampt average infiltration rate values from Table 3-3.

** Flood control detention volume credits based on empirical equations from Storage Chapter of USDCM.

*** Method assumes that 1-hour rainfall depth is equivalent to 1-hour intensity for calculation purposed

Design Procedure Form: Extended Detention Basin (EDB)

UD-BMP (Version 3.07, March 2018)

Designer: David Mijares
Company: Catamount Engineering
Date: October 27, 2022
Project: cottages at dry creek
Location: EDB A

1. Basin Storage Volume

A) Effective Imperviousness of Tributary Area, I_a — I_a = 51.4 %

B) Tributary Area's Imperviousness Ratio ($i = I_a / 100$) — i = 0.514

C) Contributing Watershed Area — Area = 5.250 ac

D) For Watersheds Outside of the Denver Region, Depth of Average Runoff Producing Storm — d_6 = in

E) Design Concept (Select EURV when also designing for flood control)

Choose One
- (●) Water Quality Capture Volume (WQCV)
- ( ) Excess Urban Runoff Volume (EURV)

F) Design Volume (WQCV) Based on 40-hour Drain Time
($V_{DESIGN} = (1.0 * (0.91 * i^3 - 1.19 * i^2 + 0.78 * i) / 12 * Area$)
V_{DESIGN} = 0.092 ac-ft

G) For Watersheds Outside of the Denver Region, Water Quality Capture Volume (WQCV) Design Volume
($V_{WQCV\ OTHER} = (d_6 * (V_{DESIGN}/0.43))$)
$V_{DESIGN\ OTHER}$ = ac-ft

H) User Input of Water Quality Capture Volume (WQCV) Design Volume (Only if a different WQCV Design Volume is desired)
$V_{DESIGN\ USER}$ = ac-ft

I) NRCS Hydrologic Soil Groups of Tributary Watershed
i) Percentage of Watershed consisting of Type A Soils — HSG_A = %
ii) Percentage of Watershed consisting of Type B Soils — HSG_B = %
iii) Percentage of Watershed consisting of Type C/D Soils — $HSG_{C/D}$ = %

J) Excess Urban Runoff Volume (EURV) Design Volume
For HSG A: $EURV_A = 1.68 * i^{1.28}$
For HSG B: $EURV_B = 1.36 * i^{1.08}$
For HSG C/D: $EURV_{C/D} = 1.20 * i^{1.08}$
$EURV_{DESIGN}$ = ac-f t

K) User Input of Excess Urban Runoff Volume (EURV) Design Volume (Only if a different EURV Design Volume is desired)
$EURV_{DESIGN\ USER}$ = ac-f t

2. Basin Shape: Length to Width Ratio (A basin length to width ratio of at least 2:1 will improve TSS reduction.)
L : W = 3.8 : 1

3. Basin Side Slopes

A) Basin Maximum Side Slopes (Horizontal distance per unit vertical, 4:1 or flatter preferred)
Z = 4.00 ft / ft

4. Inlet

A) Describe means of providing energy dissipation at concentrated inflow locations:

5. Forebay

A) Minimum Forebay Volume (V_{FMIN} = 2% of the WQCV)
V_{FMIN} = 0.002 ac-ft

B) Actual Forebay Volume
V_F = 0.002 ac-ft

C) Forebay Depth (D_F = 18 inch maximum)
D_F = 12.0 in

D) Forebay Discharge

i) Undetained 100-year Peak Discharge
Q_{100} = 14.30 cfs

ii) Forebay Discharge Design Flow ($Q_F = 0.02 * Q_{100}$)
Q_F = 0.29 cfs

E) Forebay Discharge Design

Choose One
- ( ) Berm With Pipe
- (●) Wall with Rect. Notch
- ( ) Wall with V-Notch Weir

Flow too small for berm w/ pipe

F) Discharge Pipe Size (minimum 8-inches)
Calculated D_P = in

G) Rectangular Notch Width
Calculated W_N = 3.4 in

Design Procedure Form: Extended Detention Basin (EDB)

Designer: David Mijares
Company: Catamount Engineering
Date: October 27, 2022
Project: cottages at dry creek
Location: EDB A

6. Trickle Channel	
A) Type of Trickle Channel	Choose One: (●) Concrete ( ) Soft Bottom
F) Slope of Trickle Channel	S = 0.0100 ft / ft
7. Micropool and Outlet Structure	
A) Depth of Micropool (2.5-feet minimum)	D_M = 2.5 ft
B) Surface Area of Micropool (10 ft^2 minimum)	A_M = 16 sq ft
C) Outlet Type	Choose One: (●) Orifice Plate ( ) Other (Describe):
	See UD-DETENTION FOR OUTFALL
D) Smallest Dimension of Orifice Opening Based on Hydrograph Routing (Use UD-Detention)	$D_{orifice}$ = inches
E) Total Outlet Area	A_{ot} = square inches
8. Initial Surcharge Volume	
A) Depth of Initial Surcharge Volume (Minimum recommended depth is 4 inches)	D_{IS} = 4 in
B) Minimum Initial Surcharge Volume (Minimum volume of 0.3% of the WQCV)	V_{IS} = cu ft
C) Initial Surcharge Provided Above Micropool	V_s = 5.3 cu ft
9. Trash Rack	
A) Water Quality Screen Open Area: $A_t = A_{ot} * 38.5*(e^{-0.095D})$	A_t = square inches
B) Type of Screen (If specifying an alternative to the materials recommended in the USDCM, indicate "other" and enter the ratio of the total open are to the total screen are for the material specified.)	
Other (Y/N): N	
C) Ratio of Total Open Area to Total Area (only for type 'Other')	User Ratio =
D) Total Water Quality Screen Area (based on screen type)	A_{total} = sq. in.
E) Depth of Design Volume (EURV or WQCV) (Based on design concept chosen under 1E)	H= feet
F) Height of Water Quality Screen (H_{TR})	H_{TR}= inches
G) Width of Water Quality Screen Opening ($W_{opening}$) (Minimum of 12 inches is recommended)	$W_{opening}$ = inches

Design Procedure Form: Extended Detention Basin (EDB)

Designer: David Mijares
Company: Catamount Engineering
Date: October 27, 2022
Project: cottages at dry creek
Location: EDB A

10. Overflow Embankment

A) Describe embankment protection for 100-year and greater overtopping:

B) Slope of Overflow Embankment
(Horizontal distance per unit vertical, 4:1 or flatter preferred)

Ze = 4.00 ft / ft

11. Vegetation

Choose One
- ○ Irrigated
- ○ Not Irrigated

12. Access

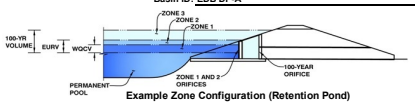
A) Describe Sediment Removal Procedures

Notes:

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

Project: COTTAGES AT DRY CREEK

Basin ID: EDB DP-A



Example Zone Configuration (Retention Pond)

Required Volume Calculation

Selected BMP Type =	EDB		
Watershed Area =	5.25	acres	
Watershed Length =	620	ft	
Watershed Slope =	0.031	ft/ft	
Watershed Imperviousness =	51.40%	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	
Desired WQCV Drain Time =	40.0	hours	
Location for 1-hr Rainfall Depths =	UDFCD Default		
Water Quality Capture Volume (WQCV) =	0.092	acre-feet	
Excess Urban Runoff Volume (EURV) =	0.314	acre-feet	
2-yr Runoff Volume (P1 = 1.19 in.) =	0.201	acre-feet	
5-yr Runoff Volume (P1 = 1.5 in.) =	0.269	acre-feet	
10-yr Runoff Volume (P1 = 1.75 in.) =	0.347	acre-feet	
25-yr Runoff Volume (P1 = 2 in.) =	0.485	acre-feet	
50-yr Runoff Volume (P1 = 2.25 in.) =	0.580	acre-feet	
100-yr Runoff Volume (P1 = 2.52 in.) =	0.695	acre-feet	
500-yr Runoff Volume (P1 = 3.29 in.) =	1.000	acre-feet	
Approximate 2-yr Detention Volume =	0.192	acre-feet	
Approximate 5-yr Detention Volume =	0.257	acre-feet	
Approximate 10-yr Detention Volume =	0.331	acre-feet	
Approximate 25-yr Detention Volume =	0.379	acre-feet	
Approximate 50-yr Detention Volume =	0.413	acre-feet	
Approximate 100-yr Detention Volume =	0.483	acre-feet	

Optional User Input 1-hr Precipitation

1.19	inches
1.50	inches
1.75	inches
2.00	inches
2.25	inches
2.52	inches
	inches

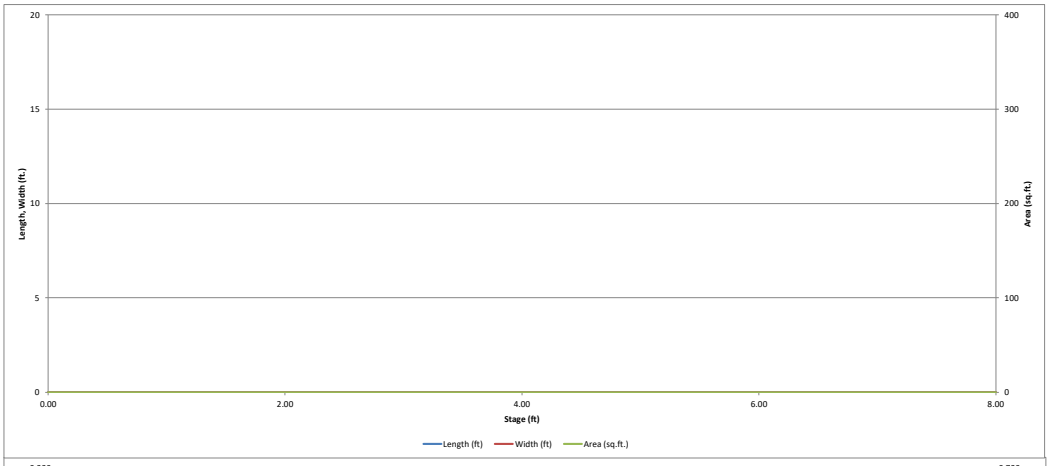
Stage-Storage Calculation

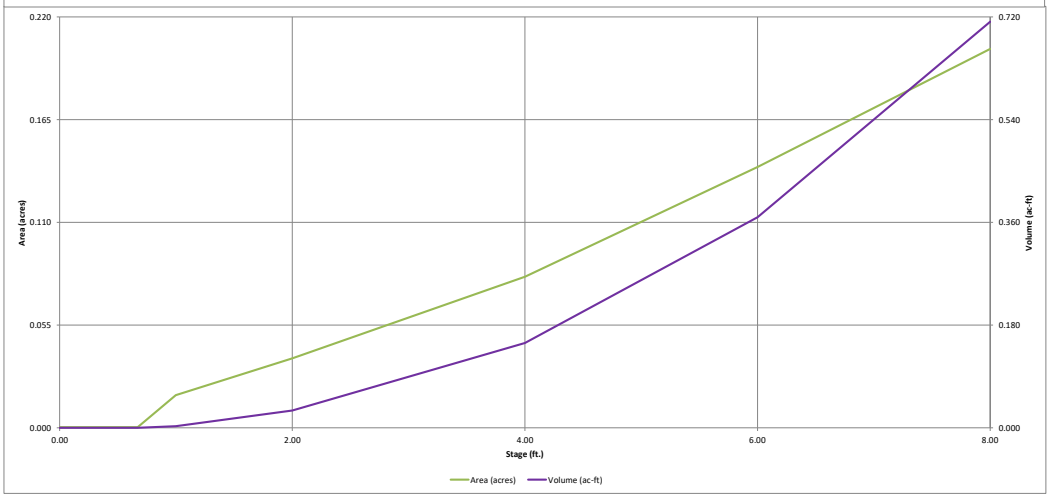
Zone 1 Volume (User Defined) =	0.065	acre-feet	WQCV not provided!
Zone 2 Volume (EURV - Zone 1) =	0.249	acre-feet	
Zone 3 Volume (100-year - Zones 1 & 2) =	0.170	acre-feet	
Total Detention Basin Volume =	0.483	acre-feet	
Initial Surcharge Volume (ISV) =	user	ft^3	
Initial Surcharge Depth (ISD) =	user	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_{MAIN}) =	user	ft	
Length of Main Basin (L_{MAIN}) =	user	ft	
Width of Main Basin (W_{MAIN}) =	user	ft	
Area of Main Basin (A_{MAIN}) =	user	ft^2	
Volume of Main Basin (V_{MAIN}) =	user	ft^3	
Calculated Total Basin Volume (V_{total}) =	user	acre-feet	

Depth Increment = ft

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)
Micropool	--	0.00	--	--	--	16	0.000		
ISV	--	0.67	--	--	--	16	0.000	11	0.000
6249	--	1.00	--	--	--	761	0.017	131	0.003
6250	--	2.00	--	--	--	1,620	0.037	1,313	0.030
6252	--	4.00	--	--	--	3,522	0.081	6,471	0.149
6254	--	6.00	--	--	--	6,079	0.140	16,072	0.369
6256	--	8.00	--	--	--	8,837	0.203	30,988	0.711

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

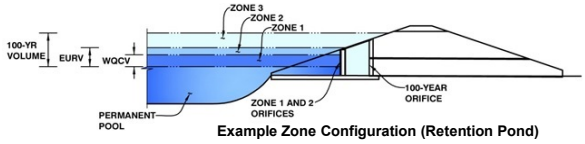




Detention Basin Outlet Structure Design

Project: COTTAGES AT DRY CREEK

Basin ID: EDB A



Example Zone Configuration (Retention Pond)

	Stage (ft)	Zone Volume (ac-ft)	Outlet Type
Zone 1 (User)	2.76	0.065	Orifice Plate
Zone 2 (EURV)	5.59	0.249	Orifice Plate
Zone 3 (100-year)	6.76	0.170	Weir&Pipe (Restrict)
		0.483	Total

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 =	5.68	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	2.75	4.00					
Orifice Area (sq. inches)	0.53	0.60	1.23					

	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) and Grate (Flat or Sloped)

	Zone 3 Weir	Not Selected	
Overflow Weir Front Edge Height, Ho =	5.59	N/A	ft (relative to basin bottom at Stage = 0 ft)
Overflow Weir Front Edge Length =	4.00	N/A	feet
Overflow Weir Slope =	0.00	N/A	H:V (enter zero for flat grate)
Horiz. Length of Weir Sides =	4.00	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 =	5.59	N/A	feet
Over Flow Weir Slope Length =	4.00	N/A	feet
Grate Open Area / 100-yr Orifice Area =	38.30	N/A	should be ≥ 4
Overflow Grate Open Area w/o Debris =	11.20	N/A	ft^2
Overflow Grate Open Area w/ Debris =	5.60	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 =	1.00	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 =	4.00		inches

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate

	Zone 3 Restrictor	Not Selected	
Outlet Orifice Area =	0.29	N/A	ft^2
Outlet Orifice Centroid =	0.20	N/A	feet
Half-Central Angle of Restrictor Plate on Pipe =	0.98	N/A	radians

User Input: Emergency Spillway (Rectangular or Trapezoidal)

Spillway Invert Stage=	6.76	ft (relative to basin bottom at Stage = 0 ft)
Spillway Crest Length =	50.00	feet
Spillway End Slopes =	20.00	H:V
Freeboard above Max Water Surface =	1.00	feet

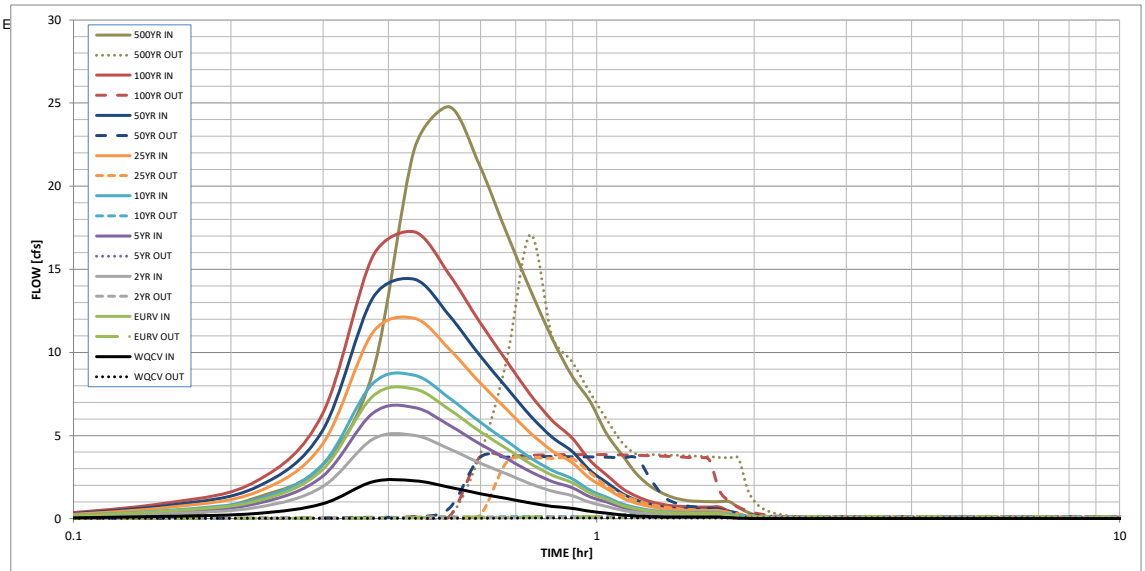
Calculated Parameters for Spillway

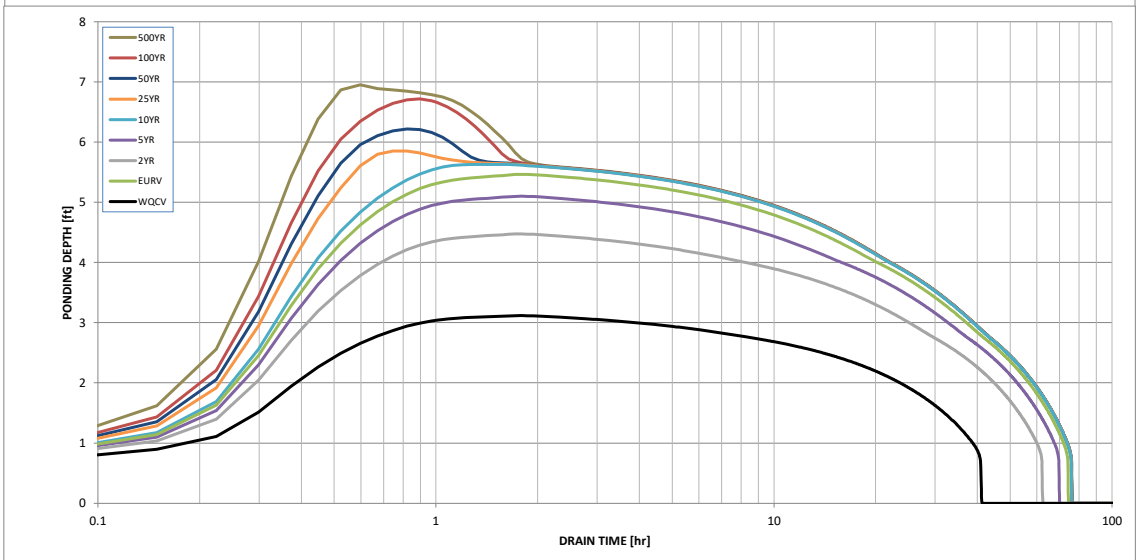
Spillway Design Flow Depth=	0.22	feet
Stage at Top of Freeboard =	7.98	feet
Basin Area at Top of Freeboard =	0.20	acres

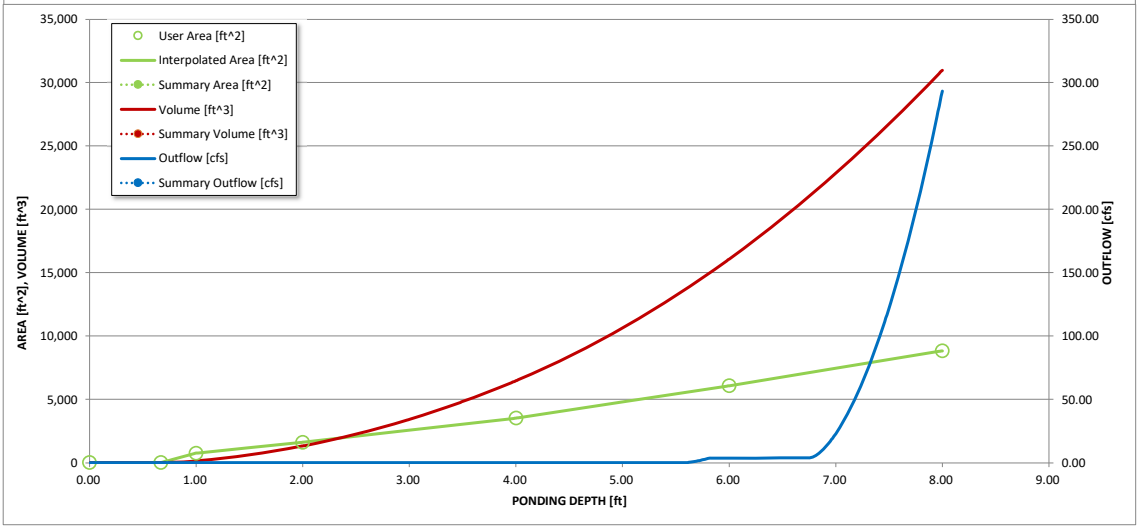
Routed Hydrograph Results

Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
One-Hour Rainfall Depth (in) =	0.53	1.07	1.19	1.50	1.75	2.00	2.25	2.52	3.29
Calculated Runoff Volume (acre-ft) =	0.092	0.314	0.201	0.269	0.347	0.485	0.580	0.695	1.000
OPTIONAL Override Runoff Volume (acre-ft) =									
Inflow Hydrograph Volume (acre-ft) =	0.091	0.313	0.201	0.269	0.347	0.485	0.579	0.695	0.999
Predevelopment Unit Peak Flow, q (cfs/acre) =	0.00	0.00	0.00	0.01	0.02	0.23	0.48	0.78	1.41
Predevelopment Peak Q (cfs) =	0.0	0.0	0.0	0.1	0.1	1.2	2.5	4.1	7.4
Peak Inflow Q (cfs) =	2.3	7.8	5.0	6.7	8.6	12.1	14.4	17.3	24.8
Peak Outflow Q (cfs) =	0.0	0.1	0.1	0.1	0.4	3.6	3.7	3.9	17.1
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	1.8	3.8	3.0	1.5	0.9	2.3
Structure Controlling Flow =	Plate	Plate	Plate	Plate	Overflow Grate 1	Outlet Plate 1	Outlet Plate 1	Outlet Plate 1	Spillway
Max Velocity through Grate 1 (fps) =	N/A	N/A	N/A	N/A	0.0	0.3	0.3	0.3	0.3
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) =	39	68	58	65	69	67	65	64	59
Time to Drain 99% of Inflow Volume (hours) =	**40**	72	61	68	74	73	72	71	70
Maximum Ponding Depth (ft) =	3.12	5.46	4.47	5.10	5.63	5.85	6.22	6.72	6.95
Area at Maximum Ponding Depth (acres) =	0.06	0.12	0.09	0.11	0.13	0.14	0.15	0.16	0.17
Maximum Volume Stored (acre-ft) =	0.085	0.298	0.190	0.254	0.318	0.348	0.399	0.476	0.514

Detention Basin Outlet Structure Design







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:

Storm Inflow Hydrographs

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

Time Interval	SOURCE	WORKBOOK	WORKBOOK	WORKBOOK	WORKBOOK	WORKBOOK	WORKBOOK	WORKBOOK	WORKBOOK	WORKBOOK
	TIME	WQCV [cfs]	EURV [cfs]	2 Year [cfs]	5 Year [cfs]	10 Year [cfs]	25 Year [cfs]	50 Year [cfs]	100 Year [cfs]	500 Year [cfs]
4.48 min	0:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:04:29	0.00	0.01	0.01	0.01	0.02	0.02	0.03	0.03	0.04
Hydrograph	0:08:58	0.14	0.44	0.29	0.38	0.49	0.66	0.78	0.92	1.29
Constant	0:13:26	0.32	1.06	0.69	0.91	1.17	1.61	1.91	2.27	3.20
1.117	0:17:55	0.88	2.93	1.90	2.53	3.23	4.45	5.27	6.26	8.80
	0:22:24	2.21	7.36	4.78	6.35	8.12	11.19	13.27	15.76	22.21
	0:26:53	2.28	7.79	5.01	6.69	8.62	12.06	14.40	17.25	24.78
	0:31:22	1.90	6.56	4.20	5.63	7.27	10.20	12.22	14.69	21.25
	0:35:50	1.51	5.26	3.35	4.51	5.83	8.20	9.84	11.85	17.20
	0:40:19	1.21	4.23	2.69	3.62	4.68	6.58	7.89	9.50	13.78
	0:44:48	0.94	3.31	2.10	2.83	3.67	5.16	6.20	7.47	10.85
	0:49:17	0.74	2.62	1.66	2.24	2.91	4.09	4.91	5.92	8.60
	0:53:46	0.63	2.18	1.39	1.87	2.42	3.39	4.06	4.88	7.06
	0:58:14	0.44	1.54	0.98	1.32	1.71	2.42	2.90	3.50	5.10
	1:02:43	0.33	1.17	0.74	1.00	1.29	1.82	2.18	2.63	3.82
	1:07:12	0.23	0.80	0.51	0.68	0.89	1.25	1.51	1.82	2.66
	1:11:41	0.17	0.59	0.37	0.50	0.65	0.92	1.10	1.33	1.93
	1:16:10	0.13	0.46	0.29	0.39	0.51	0.71	0.85	1.03	1.50
	1:20:38	0.11	0.38	0.24	0.32	0.42	0.59	0.70	0.85	1.23
	1:25:07	0.10	0.34	0.22	0.29	0.37	0.52	0.63	0.75	1.09
	1:29:36	0.09	0.32	0.21	0.28	0.36	0.50	0.60	0.72	1.04
	1:34:05	0.09	0.32	0.20	0.27	0.35	0.49	0.59	0.71	1.02
	1:38:34	0.09	0.32	0.20	0.27	0.35	0.49	0.59	0.71	1.02
	1:43:02	0.09	0.32	0.20	0.27	0.35	0.49	0.59	0.71	1.02
	1:47:31	0.06	0.20	0.12	0.17	0.22	0.31	0.37	0.45	0.66
	1:52:00	0.03	0.12	0.07	0.10	0.13	0.18	0.22	0.27	0.39
	1:56:29	0.02	0.06	0.04	0.05	0.07	0.10	0.12	0.15	0.22
	2:00:58	0.01	0.04	0.02	0.03	0.04	0.06	0.07	0.08	0.12
	2:05:26	0.00	0.02	0.01	0.01	0.02	0.03	0.03	0.04	0.06
	2:09:55	0.00	0.00	0.00	0.00	0.01	0.01	0.01	0.01	0.02
	2:14:24	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2:18:53	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2:23:22	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2:27:50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2:32:19	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2:36:48	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2:41:17	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2:45:46	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2:50:14	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2:54:43	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2:59:12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:03:41	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:08:10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:12:38	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:17:07	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:21:36	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:26:05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:30:34	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:35:02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:39:31	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:44:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:48:29	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:52:58	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:57:26	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:01:55	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:06:24	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:10:53	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:15:22	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:19:50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:24:19	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:28:48	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:33:17	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:37:46	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:42:14	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:46:43	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:51:12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:55:41	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:00:10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:04:38	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:09:07	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:13:36	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:18:05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:22:34	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Tuesday, Jan 3 2023

Trickle Channel EDB A

Triangular

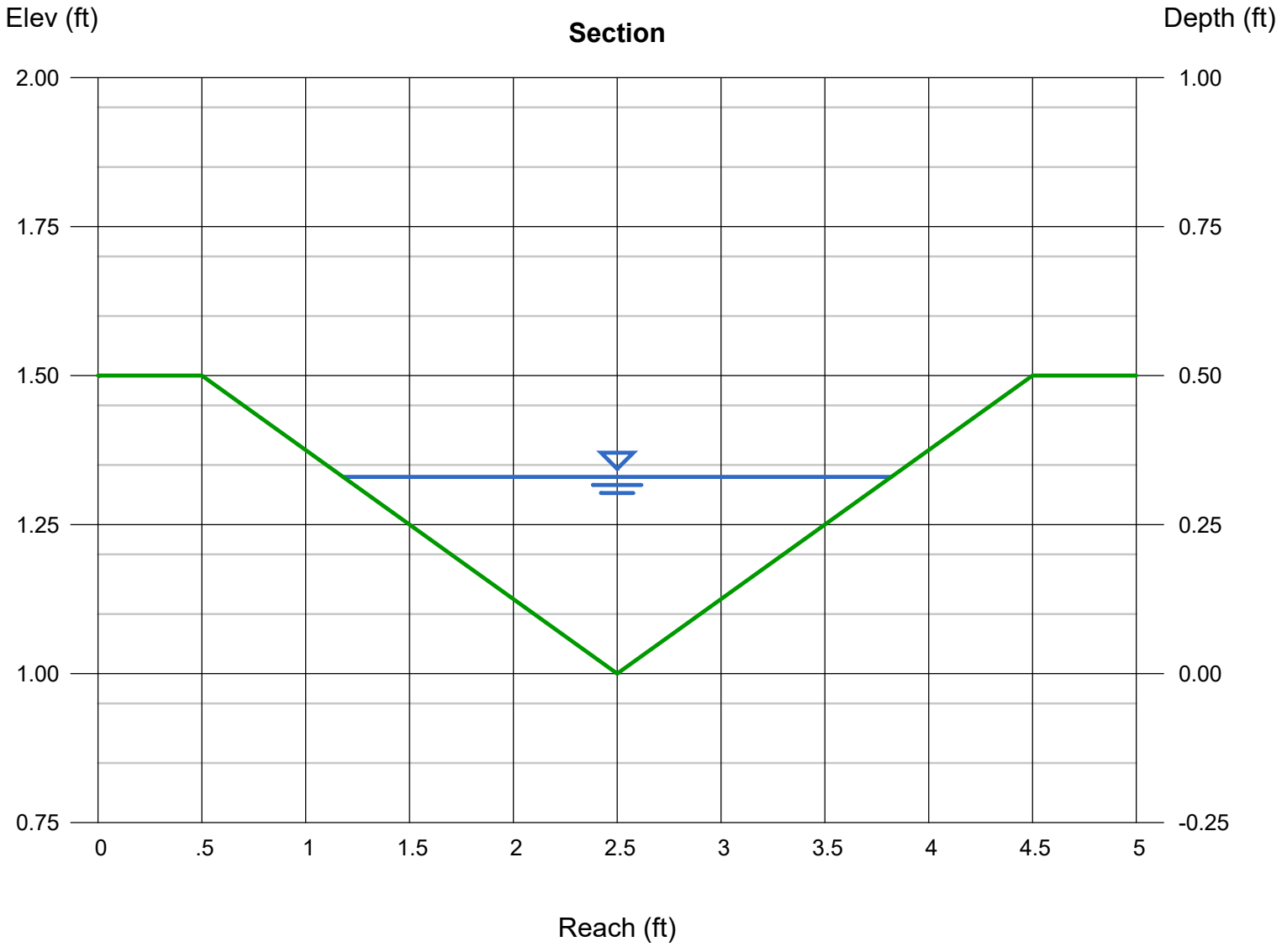
Side Slopes (z:1)	= 4.00, 4.00
Total Depth (ft)	= 0.50
Invert Elev (ft)	= 1.00
Slope (%)	= 0.05
N-Value	= 0.012

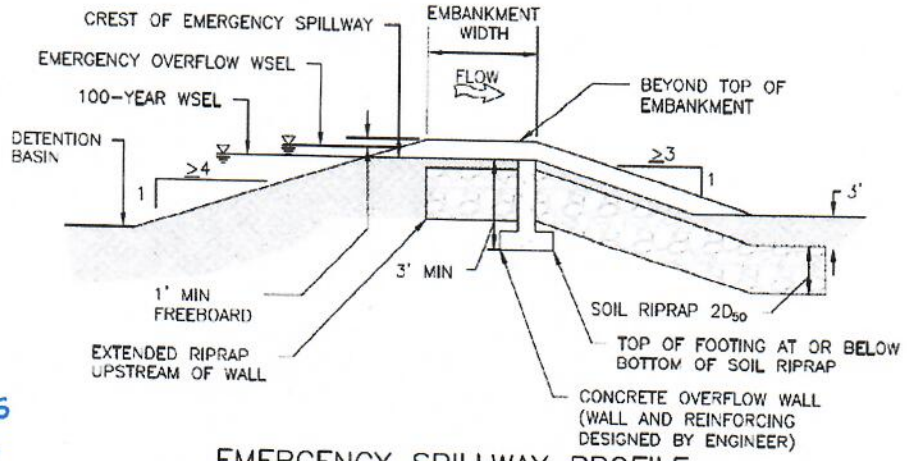
Calculations

Compute by:	Known Q
Known Q (cfs)	= 0.35

Highlighted

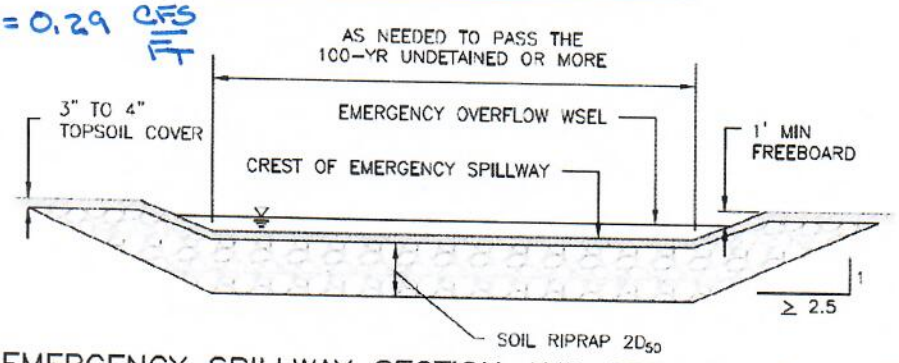
Depth (ft)	= 0.33
Q (cfs)	= 0.350
Area (sqft)	= 0.44
Velocity (ft/s)	= 0.80
Wetted Perim (ft)	= 2.72
Crit Depth, Yc (ft)	= 0.22
Top Width (ft)	= 2.64
EGL (ft)	= 0.34





EMERGENCY SPILLWAY PROFILE

Q_{100} = 14.3 CFS
WIER L = 50 FT
UNIT DISCHARGE = 0.29 CFS/FT



EMERGENCY SPILLWAY SECTION AND SPILLWAY CHANNEL

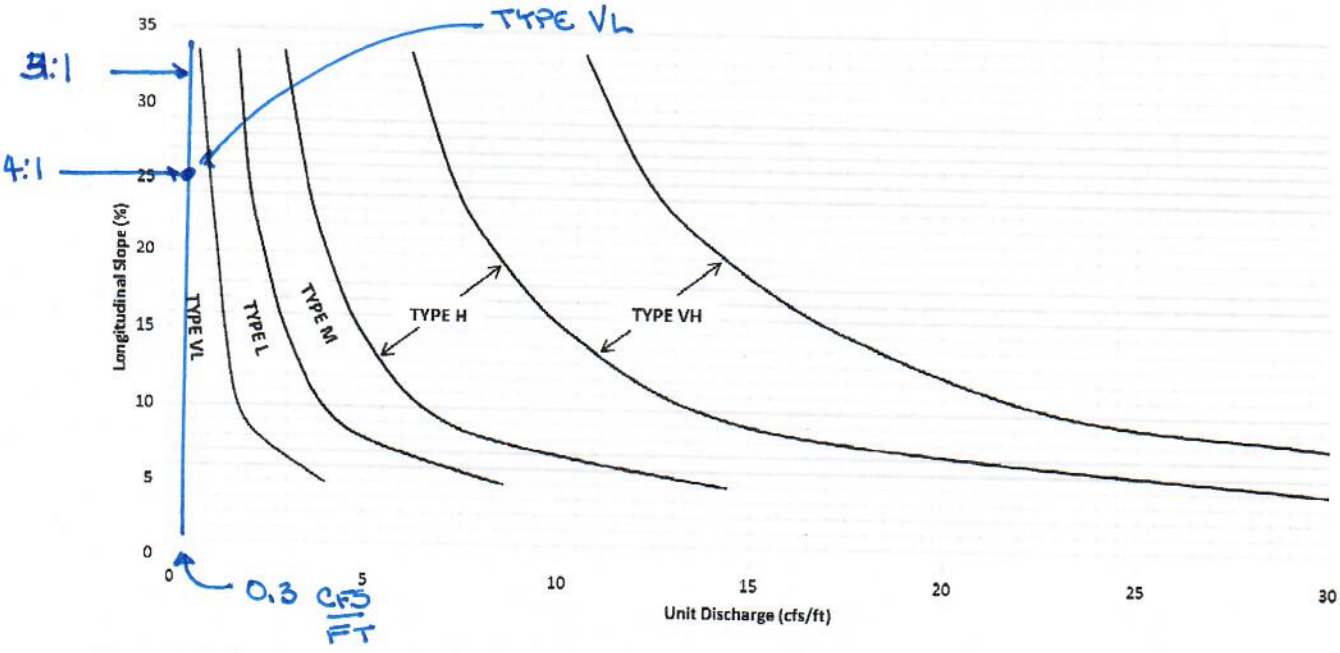


Figure 12-21. Embankment protection details and rock sizing chart (adapted from Arapahoe County)

Design Procedure Form: Extended Detention Basin (EDB)

UD-BMP (Version 3.07, March 2018)

Designer: David Mijares
Company: Catamount Engineering
Date: October 27, 2022
Project: cottages at dry creek
Location: EDB B

1. Basin Storage Volume

A) Effective Imperviousness of Tributary Area, I_a — I_a = 54.2 %

B) Tributary Area's Imperviousness Ratio ($i = I_a / 100$) — i = 0.542

C) Contributing Watershed Area — Area = 2.940 ac

D) For Watersheds Outside of the Denver Region, Depth of Average Runoff Producing Storm — d_6 = in

E) Design Concept (Select EURV when also designing for flood control)

Choose One
- (●) Water Quality Capture Volume (WQCV)
- ( ) Excess Urban Runoff Volume (EURV)

F) Design Volume (WQCV) Based on 40-hour Drain Time
($V_{DESIGN} = (1.0 * (0.91 * i^3 - 1.19 * i^2 + 0.78 * i) / 12 * Area$)
V_{DESIGN} = 0.053 ac-ft

G) For Watersheds Outside of the Denver Region, Water Quality Capture Volume (WQCV) Design Volume
($V_{WQCV\ OTHER} = (d_6 * (V_{DESIGN}/0.43))$)
$V_{DESIGN\ OTHER}$ = ac-ft

H) User Input of Water Quality Capture Volume (WQCV) Design Volume (Only if a different WQCV Design Volume is desired)
$V_{DESIGN\ USER}$ = ac-ft

I) NRCS Hydrologic Soil Groups of Tributary Watershed
i) Percentage of Watershed consisting of Type A Soils — HSG_A = %
ii) Percentage of Watershed consisting of Type B Soils — HSG_B = %
iii) Percentage of Watershed consisting of Type C/D Soils — $HSG_{C/D}$ = %

J) Excess Urban Runoff Volume (EURV) Design Volume
For HSG A: $EURV_A = 1.68 * i^{1.28}$
For HSG B: $EURV_B = 1.36 * i^{1.08}$
For HSG C/D: $EURV_{C/D} = 1.20 * i^{1.08}$
$EURV_{DESIGN}$ = ac-f t

K) User Input of Excess Urban Runoff Volume (EURV) Design Volume (Only if a different EURV Design Volume is desired)
$EURV_{DESIGN\ USER}$ = ac-f t

2. Basin Shape: Length to Width Ratio (A basin length to width ratio of at least 2:1 will improve TSS reduction.)
L : W = 3.5 : 1

3. Basin Side Slopes

A) Basin Maximum Side Slopes (Horizontal distance per unit vertical, 4:1 or flatter preferred)
Z = 4.00 ft / ft

4. Inlet

A) Describe means of providing energy dissipation at concentrated inflow locations:

5. Forebay

A) Minimum Forebay Volume (V_{FMIN} = 1% of the WQCV)
V_{FMIN} = 0.001 ac-ft

B) Actual Forebay Volume
V_F = 0.002 ac-ft

C) Forebay Depth (D_F = 12 inch maximum)
D_F = 12.0 in

D) Forebay Discharge

i) Undetained 100-year Peak Discharge
Q_{100} = 10.10 cfs

ii) Forebay Discharge Design Flow ($Q_F = 0.02 * Q_{100}$)
Q_F = 0.20 cfs

E) Forebay Discharge Design

Choose One
- ( ) Berm With Pipe
- (●) Wall with Rect. Notch
- ( ) Wall with V-Notch Weir

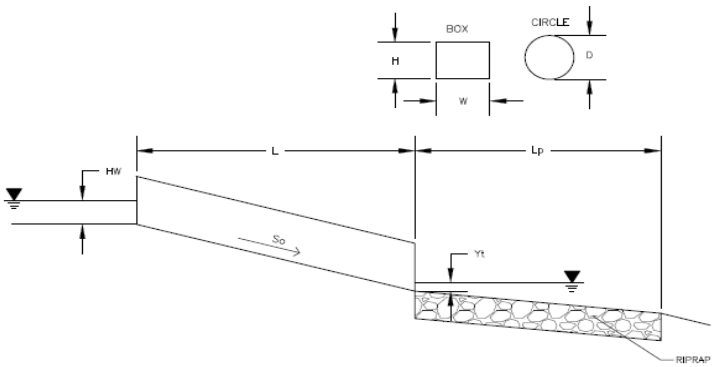
Flow too small for berm w/ pipe

F) Discharge Pipe Size (minimum 8-inches)
Calculated D_P = in

G) Rectangular Notch Width
Calculated W_N = 3.1 in

Determination of Culvert Headwater and Outlet Protection

Project: VILLAS AT DRY CREEK
Basin ID: POND A OUTFALL



Soil Type:
Choose One:
(•) Sandy
( ) Non-Sandy

Supercritical Flow! Using Da to calculate protection type.

Design Information (Input):

	Design Discharge	Q =	3.9	cfs
Circular Culvert:				
	Barrel Diameter in Inches	D =	12	inches
	Inlet Edge Type (Choose from pull-down list)		1.1 : 1 Beveled Edge	
Box Culvert:			**OR**	
	Barrel Height (Rise) in Feet	Height (Rise) =		ft
	Barrel Width (Span) in Feet	Width (Span) =		ft
	Inlet Edge Type (Choose from pull-down list)			
	Number of Barrels	No =	1	
	Inlet Elevation	Elev IN =	100	ft
	Outlet Elevation **OR** Slope	So =	0.07	ft/ft
	Culvert Length	L =	47	ft
	Manning's Roughness	n =	0.012	
	Bend Loss Coefficient	k_b =	0	
	Exit Loss Coefficient	k_x =	1	
	Tailwater Surface Elevation	Elev Y_t =		ft
	Max Allowable Channel Velocity	V =	5	ft/s

Required Protection (Output):

Tailwater Surface Height	Y_t =	0.40	ft
Flow Area at Max Channel Velocity	A_t =	0.78	ft^2
Culvert Cross Sectional Area Available	A =	0.79	ft^2
Entrance Loss Coefficient	k_e =	0.20	
Friction Loss Coefficient	k_f =	1.25	
Sum of All Losses Coefficients	k_s =	2.45	ft
Culvert Normal Depth	Y_n =	0.43	ft
Culvert Critical Depth	Y_c =	0.84	ft
Tailwater Depth for Design	d =	0.92	ft
Adjusted Diameter **OR** Adjusted Rise	D_a =	0.71	ft
Expansion Factor	1/(2*tan(Θ)) =	5.68	
Flow/Diameter$^{2.5}$ **OR** Flow/(Span * Rise$^{1.5}$)	Q/D^2.5 =	3.90	$ft^{0.5}/s$
Froude Number	Fr =	3.76	**Supercritical!**
Tailwater/Adjusted Diameter **OR** Tailwater/Adjusted Rise	Yt/D =	0.56	
Inlet Control Headwater	HW_I =	1.51	ft
Outlet Control Headwater	HW_O =	-1.43	
Design Headwater Elevation	**HW =**	**101.51**	**ft**
Headwater/Diameter OR Headwater/Rise Ratio	**HW/D =**	**1.51**	**HW/D > 1.5!**
Minimum Theoretical Riprap Size	d_{50} =	4	in
Nominal Riprap Size	d_{50} =	6	in
UDFCD Riprap Type	**Type =**	**VL**	
Length of Protection	**L_p =**	**6**	**ft**
Width of Protection	**T =**	**3**	**ft**

Design Procedure Form: Extended Detention Basin (EDB)

Designer: David Mijares
Company: Catamount Engineering
Date: October 27, 2022
Project: cottages at dry creek
Location: EDB B

6. Trickle Channel	
A) Type of Trickle Channel	Choose One: (●) Concrete ( ) Soft Bottom
F) Slope of Trickle Channel	S = 0.0100 ft / ft
7. Micropool and Outlet Structure	
A) Depth of Micropool (2.5-feet minimum)	D_M = 2.5 ft
B) Surface Area of Micropool (10 ft^2 minimum)	A_M = 16 sq ft
C) Outlet Type	Choose One: (●) Orifice Plate ( ) Other (Describe):
	See UD-DETENTION FOR OUTFALL
D) Smallest Dimension of Orifice Opening Based on Hydrograph Routing (Use UD-Detention)	$D_{orifice}$ = inches
E) Total Outlet Area	A_{ot} = square inches
8. Initial Surcharge Volume	
A) Depth of Initial Surcharge Volume (Minimum recommended depth is 4 inches)	D_{IS} = 8 in
B) Minimum Initial Surcharge Volume (Minimum volume of 0.3% of the WQCV)	V_{IS} = cu ft
C) Initial Surcharge Provided Above Micropool	V_s= 10.7 cu ft
9. Trash Rack	
A) Water Quality Screen Open Area: $A_t = A_{ot} * 38.5*(e^{-0.095D})$	A_t = square inches
B) Type of Screen (If specifying an alternative to the materials recommended in the USDCM, indicate "other" and enter the ratio of the total open are to the total screen are for the material specified.)	
Other (Y/N): N	
C) Ratio of Total Open Area to Total Area (only for type 'Other')	User Ratio =
D) Total Water Quality Screen Area (based on screen type)	A_{total} = sq. in.
E) Depth of Design Volume (EURV or WQCV) (Based on design concept chosen under 1E)	H= feet
F) Height of Water Quality Screen (H_{TR})	H_{TR}= inches
G) Width of Water Quality Screen Opening ($W_{opening}$) (Minimum of 12 inches is recommended)	$W_{opening}$ = inches

Design Procedure Form: Extended Detention Basin (EDB)

Designer: David Mijares
Company: Catamount Engineering
Date: October 27, 2022
Project: cottages at dry creek
Location: EDB B

10. Overflow Embankment

A) Describe embankment protection for 100-year and greater overtopping:

B) Slope of Overflow Embankment
(Horizontal distance per unit vertical, 4:1 or flatter preferred)

Ze = 4.00 ft / ft

11. Vegetation

Choose One
- ○ Irrigated
- ○ Not Irrigated

12. Access

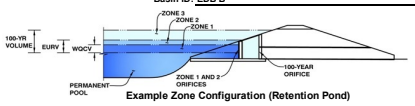
A) Describe Sediment Removal Procedures

Notes:

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

Project: COTTAGES AT DRY CREEK

Basin ID: EDB B



Example Zone Configuration (Retention Pond)

Required Volume Calculation

Selected BMP Type =	EDB	
Watershed Area =	2.94	acres
Watershed Length =	422	ft
Watershed Slope =	0.031	ft/ft
Watershed Imperviousness =	54.20%	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
Desired WQCV Drain Time =	40.0	hours
Location for 1-hr Rainfall Depths =	UDFCD Default	
Water Quality Capture Volume (WQCV) =	0.053	acre-feet
Excess Urban Runoff Volume (EURV) =	0.188	acre-feet
2-yr Runoff Volume (P1 = 1.19 in.) =	0.122	acre-feet
5-yr Runoff Volume (P1 = 1.5 in.) =	0.162	acre-feet
10-yr Runoff Volume (P1 = 1.75 in.) =	0.207	acre-feet
25-yr Runoff Volume (P1 = 2 in.) =	0.285	acre-feet
50-yr Runoff Volume (P1 = 2.25 in.) =	0.339	acre-feet
100-yr Runoff Volume (P1 = 2.52 in.) =	0.404	acre-feet
500-yr Runoff Volume (P1 = 3.29 in.) =	0.577	acre-feet
Approximate 2-yr Detention Volume =	0.116	acre-feet
Approximate 5-yr Detention Volume =	0.155	acre-feet
Approximate 10-yr Detention Volume =	0.198	acre-feet
Approximate 25-yr Detention Volume =	0.226	acre-feet
Approximate 50-yr Detention Volume =	0.245	acre-feet
Approximate 100-yr Detention Volume =	0.285	acre-feet

Optional User Input 1-hr Precipitation

1.19	inches
1.50	inches
1.75	inches
2.00	inches
2.25	inches
2.52	inches
	inches

Stage-Storage Calculation

Zone 1 Volume (User Defined) =	0.027	acre-feet
Zone 2 Volume (EURV - Zone 1) =	0.161	acre-feet
Zone 3 Volume (100-year - Zones 1 & 2) =	0.097	acre-feet
Total Detention Basin Volume =	0.285	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	

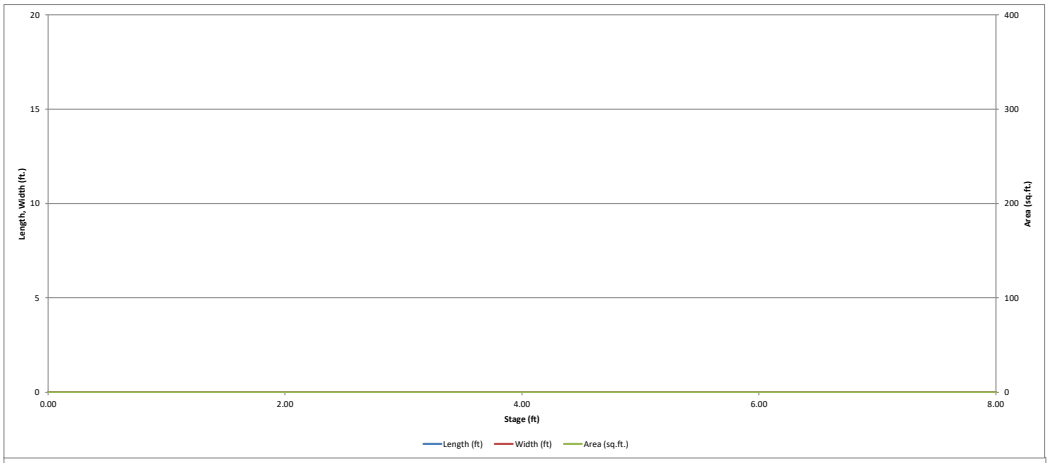
WQCV not provided!

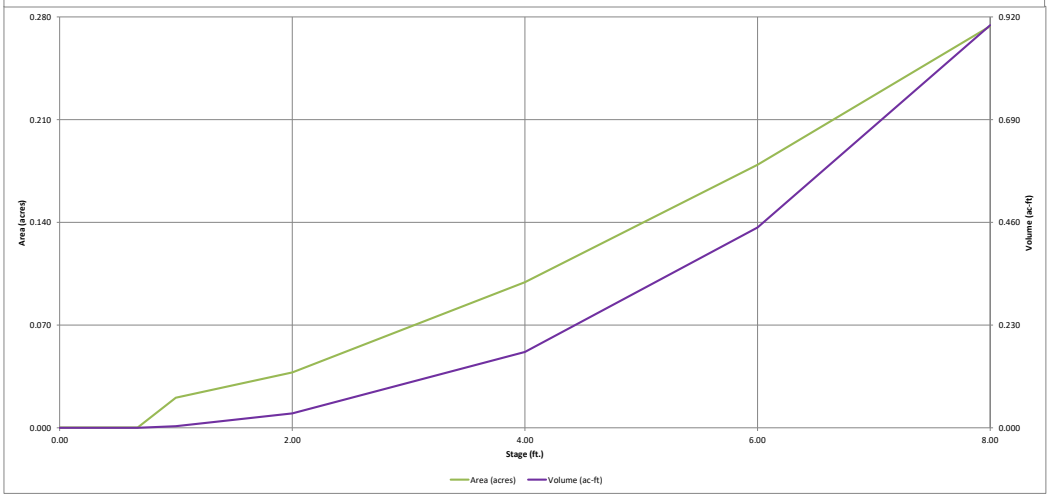
Initial Surcharge Area (A_{ISV}) =	user	ft^2
Surcharge Volume Length (L_{ISV}) =	user	ft
Surcharge Volume Width (W_{ISV}) =	user	ft
Depth of Basin Floor (H_{FLOOR}) =	user	ft
Length of Basin Floor (L_{FLOOR}) =	user	ft
Width of Basin Floor (W_{FLOOR}) =	user	ft
Area of Basin Floor (A_{FLOOR}) =	user	ft^2
Volume of Basin Floor (V_{FLOOR}) =	user	ft^3
Depth of Main Basin (H_{MAIN}) =	user	ft
Length of Main Basin (L_{MAIN}) =	user	ft
Width of Main Basin (W_{MAIN}) =	user	ft
Area of Main Basin (A_{MAIN}) =	user	ft^2
Volume of Main Basin (V_{MAIN}) =	user	ft^3
Calculated Total Basin Volume (V_{total}) =	user	acre-feet

Depth Increment = ft

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)
Micropool	--	0.00	--	--	--	16	0.000		
ISV	--	0.67	--	--	--	16	0.000	11	0.000
6247	--	1.00	--	--	--	897	0.021	152	0.004
6248	--	2.00	--	--	--	1,642	0.038	1,414	0.032
6250	--	4.00	--	--	--	4,319	0.099	7,392	0.170
6252	--	6.00	--	--	--	7,807	0.179	19,518	0.448
6254	--	8.00	--	--	--	11,924	0.274	39,249	0.901

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

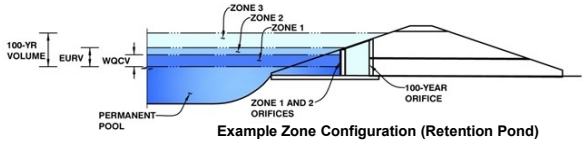




Detention Basin Outlet Structure Design

Project: COTTAGES AT DRY CREEK

Basin ID: EDB B



Example Zone Configuration (Retention Pond)

	Stage (ft)	Zone Volume (ac-ft)	Outlet Type
Zone 1 (User)	1.85	0.027	Orifice Plate
Zone 2 (EURV)	4.18	0.161	Orifice Plate
Zone 3 (100-year)	4.98	0.097	Weir&Pipe (Restrict)
		0.285	Total

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 =	4.18	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	2.46						
Orifice Area (sq. inches)	0.37	0.99						

	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) and Grate (Flat or Sloped)

	Zone 3 Weir	Not Selected	
Overflow Weir Front Edge Height, Ho =	4.18	N/A	ft (relative to basin bottom at Stage = 0 ft)
Overflow Weir Front Edge Length =	4.00	N/A	feet
Overflow Weir Slope =	0.00	N/A	H:V (enter zero for flat grate)
Horiz. Length of Weir Sides =	4.00	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 =	4.18	N/A	feet
Over Flow Weir Slope Length =	4.00	N/A	feet
Grate Open Area / 100-yr Orifice Area =	63.00	N/A	should be ≥ 4
Overflow Grate Open Area w/o Debris =	11.20	N/A	ft^2
Overflow Grate Open Area w/ Debris =	5.60	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 =	1.00	N/A	ft (distance below basin bottom at Stage = 0 ft)
Outlet Pipe Diameter =	12.00	N/A	inches
Restrictor Plate Height Above Pipe Invert =	3.33		inches

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate

	Zone 3 Restrictor	Not Selected	
Outlet Orifice Area =	0.18	N/A	ft^2
Outlet Orifice Centroid =	0.16	N/A	feet
Half-Central Angle of Restrictor Plate on Pipe =	1.11	N/A	radians

User Input: Emergency Spillway (Rectangular or Trapezoidal)

Spillway Invert Stage=	5.00	ft (relative to basin bottom at Stage = 0 ft)
Spillway Crest Length =	20.00	feet
Spillway End Slopes =	4.00	H:V
Freeboard above Max Water Surface =	1.00	feet

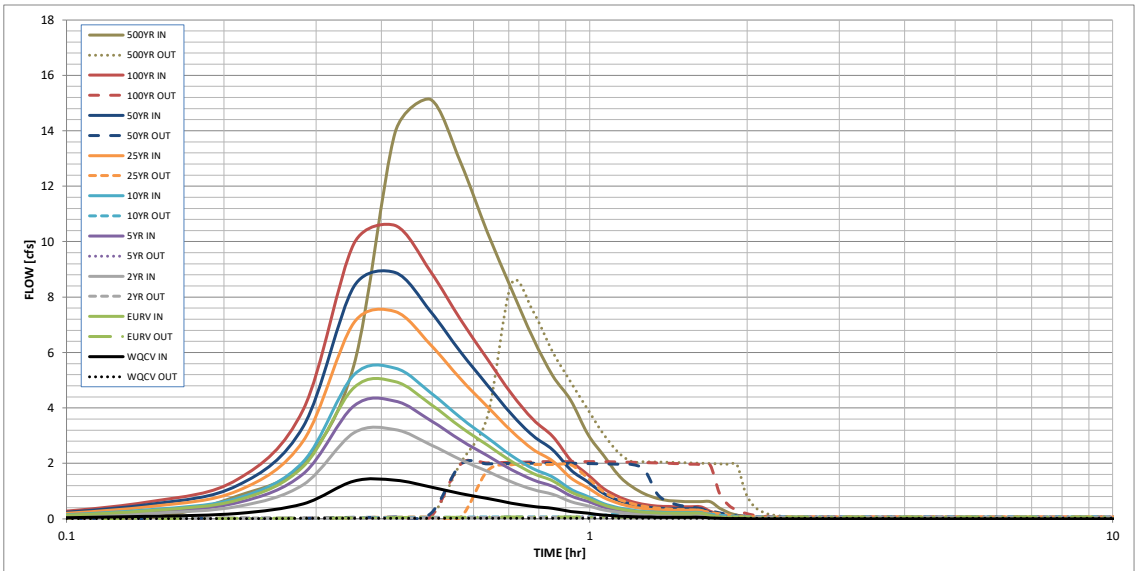
Calculated Parameters for Spillway

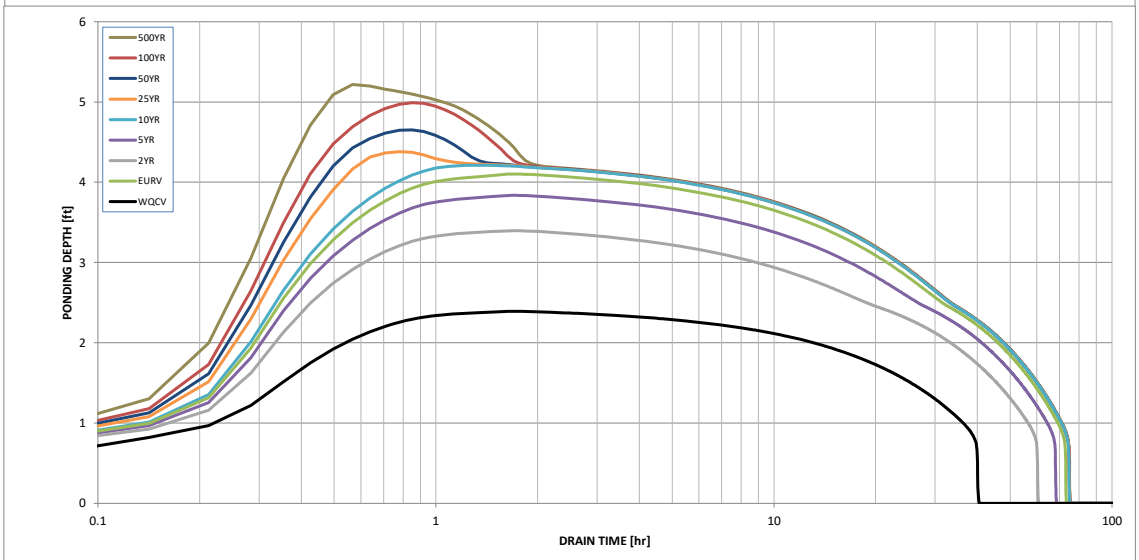
Spillway Design Flow Depth=	0.30	feet
Stage at Top of Freeboard =	6.30	feet
Basin Area at Top of Freeboard =	0.19	acres

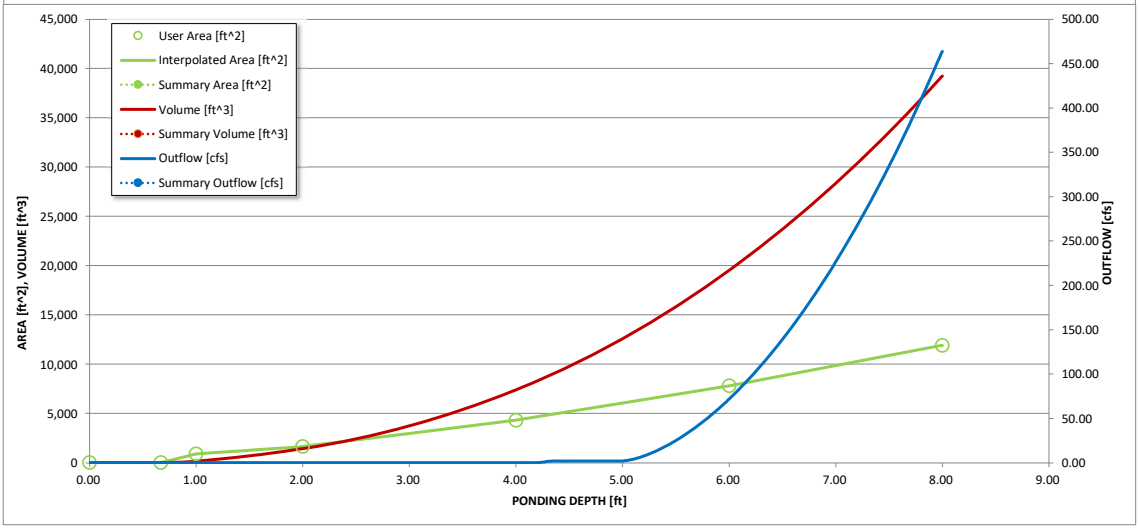
Routed Hydrograph Results

Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
One-Hour Rainfall Depth (in) =	0.53	1.07	1.19	1.50	1.75	2.00	2.25	2.52	3.29
Calculated Runoff Volume (acre-ft) =	0.053	0.188	0.122	0.162	0.207	0.285	0.339	0.404	0.577
OPTIONAL Override Runoff Volume (acre-ft) =									
Inflow Hydrograph Volume (acre-ft) =	0.053	0.188	0.122	0.161	0.207	0.285	0.339	0.404	0.578
Predevelopment Unit Peak Flow, q (cfs/acre) =	0.00	0.00	0.00	0.01	0.02	0.23	0.48	0.78	1.41
Predevelopment Peak Q (cfs) =	0.0	0.0	0.0	0.0	0.1	0.7	1.4	2.3	4.2
Peak Inflow Q (cfs) =	1.4	4.9	3.2	4.2	5.4	7.5	8.9	10.6	15.1
Peak Outflow Q (cfs) =	0.0	0.1	0.1	0.1	0.2	2.0	2.0	2.1	8.5
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	1.8	4.1	2.8	1.4	0.9	2.0
Structure Controlling Flow =	Plate	Plate	Plate	Plate	Overflow Grate 1	Outlet Plate 1	Outlet Plate 1	Outlet Plate 1	Spillway
Max Velocity through Grate 1 (fps) =	N/A	N/A	N/A	N/A	0.0	0.2	0.2	0.2	0.2
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) =	39	67	57	63	69	67	65	64	59
Time to Drain 99% of Inflow Volume (hours) =	**40**	71	59	67	73	72	71	71	69
Maximum Ponding Depth (ft) =	2.39	4.10	3.40	3.84	4.21	4.38	4.65	4.99	5.22
Area at Maximum Ponding Depth (acres) =	0.05	0.10	0.08	0.09	0.11	0.11	0.13	0.14	0.15
Maximum Volume Stored (acre-ft) =	0.050	0.180	0.115	0.153	0.190	0.210	0.243	0.287	0.319

Detention Basin Outlet Structure Design







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:

Storm Inflow Hydrographs

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

Time Interval	SOURCE	WORKBOOK	WORKBOOK	WORKBOOK	WORKBOOK	WORKBOOK	WORKBOOK	WORKBOOK	WORKBOOK	WORKBOOK
	TIME	WQCV [cfs]	EURV [cfs]	2 Year [cfs]	5 Year [cfs]	10 Year [cfs]	25 Year [cfs]	50 Year [cfs]	100 Year [cfs]	500 Year [cfs]
4.25 min	0:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:04:15	0.00	0.01	0.01	0.01	0.01	0.01	0.02	0.02	0.03
Hydrograph	0:08:30	0.08	0.29	0.19	0.25	0.31	0.43	0.50	0.59	0.82
Constant	0:12:45	0.20	0.68	0.44	0.58	0.74	1.02	1.20	1.42	2.01
1.178	0:17:00	0.54	1.88	1.24	1.62	2.07	2.82	3.33	3.95	5.54
	0:21:15	1.36	4.73	3.10	4.07	5.19	7.07	8.38	9.92	13.95
	0:25:30	1.40	4.94	3.21	4.25	5.44	7.47	8.89	10.58	15.14
	0:29:45	1.16	4.14	2.68	3.55	4.56	6.29	7.49	8.94	12.84
	0:34:00	0.91	3.31	2.13	2.84	3.64	5.04	6.01	7.18	10.34
	0:38:15	0.73	2.66	1.71	2.28	2.93	4.05	4.83	5.77	8.30
	0:42:30	0.57	2.07	1.33	1.78	2.29	3.17	3.78	4.52	6.52
	0:46:45	0.44	1.64	1.05	1.40	1.81	2.51	2.99	3.58	5.16
	0:51:00	0.38	1.37	0.88	1.18	1.51	2.09	2.49	2.97	4.27
	0:55:15	0.26	0.97	0.62	0.83	1.07	1.48	1.76	2.11	3.05
	0:59:30	0.20	0.73	0.47	0.63	0.81	1.12	1.33	1.59	2.29
	1:03:45	0.13	0.50	0.32	0.43	0.55	0.76	0.91	1.10	1.59
	1:08:00	0.10	0.37	0.24	0.31	0.40	0.56	0.67	0.80	1.16
	1:12:15	0.08	0.29	0.18	0.24	0.31	0.44	0.52	0.62	0.90
	1:16:30	0.06	0.24	0.15	0.20	0.26	0.36	0.43	0.52	0.74
	1:20:45	0.06	0.21	0.14	0.18	0.23	0.32	0.39	0.46	0.66
	1:25:00	0.06	0.20	0.13	0.18	0.23	0.31	0.37	0.44	0.63
	1:29:15	0.06	0.20	0.13	0.17	0.22	0.31	0.36	0.43	0.62
	1:33:30	0.06	0.20	0.13	0.17	0.22	0.31	0.36	0.43	0.62
	1:37:45	0.06	0.20	0.13	0.17	0.22	0.31	0.36	0.43	0.62
	1:42:00	0.03	0.12	0.08	0.10	0.14	0.19	0.23	0.27	0.39
	1:46:15	0.02	0.07	0.05	0.06	0.08	0.11	0.13	0.16	0.23
	1:50:30	0.01	0.04	0.03	0.03	0.04	0.06	0.07	0.09	0.13
	1:54:45	0.01	0.02	0.01	0.02	0.02	0.03	0.04	0.05	0.07
	1:59:00	0.00	0.01	0.01	0.01	0.01	0.02	0.02	0.02	0.03
	2:03:15	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.01
	2:07:30	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2:11:45	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2:16:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
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	2:24:30	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
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	2:33:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2:37:15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2:41:30	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2:45:45	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
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	3:02:45	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
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	3:15:30	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:19:45	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:24:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:28:15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:32:30	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:36:45	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:41:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:45:15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:49:30	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:53:45	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:58:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:02:15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:06:30	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:10:45	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
	4:19:15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:23:30	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:27:45	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:32:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:36:15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:40:30	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:44:45	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:49:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:53:15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:57:30	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:01:45	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:06:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Tuesday, Jan 3 2023

Trickle Channel EDB B

Triangular

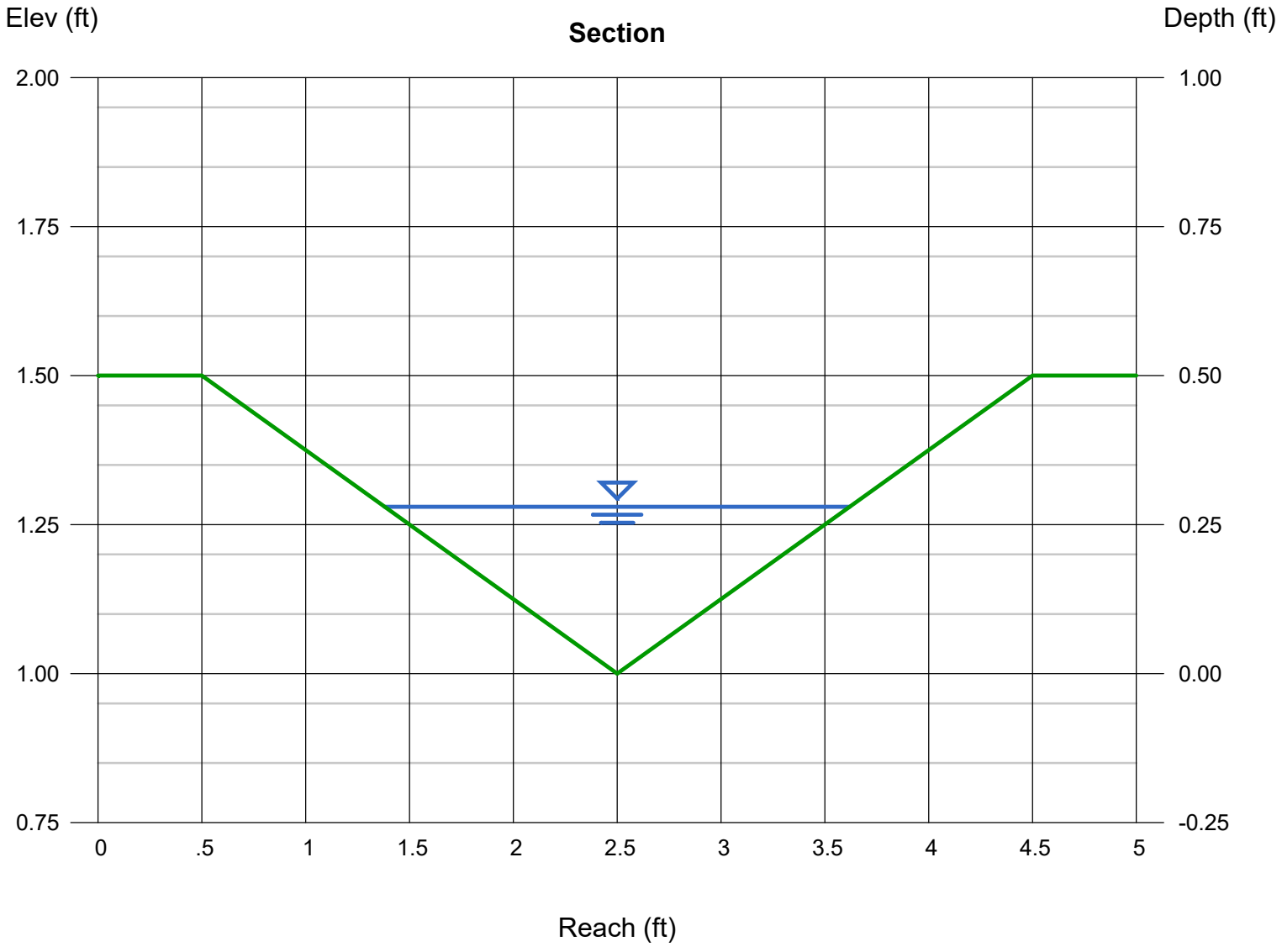
Side Slopes (z:1)	= 4.00, 4.00
Total Depth (ft)	= 0.50
Invert Elev (ft)	= 1.00
Slope (%)	= 0.05
N-Value	= 0.012

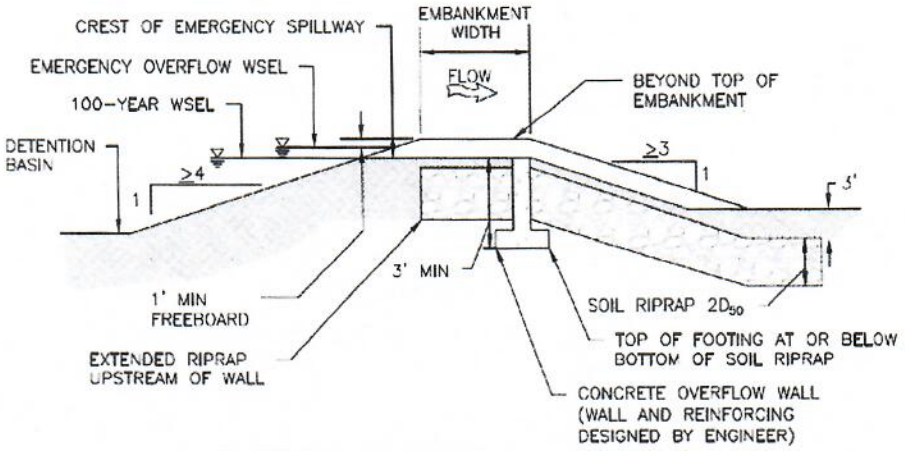
Calculations

Compute by:	Known Q
Known Q (cfs)	= 0.21

Highlighted

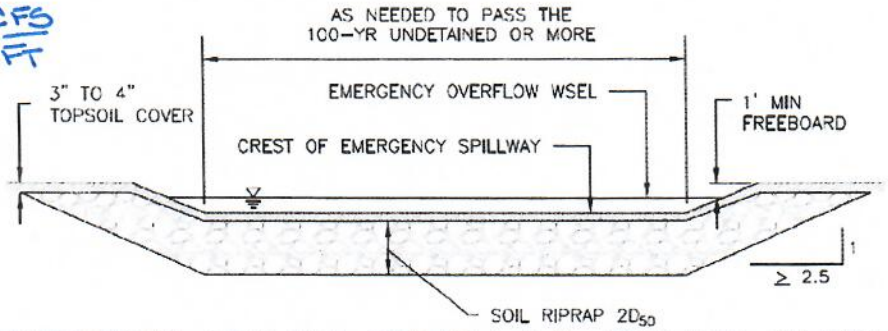
Depth (ft)	= 0.28
Q (cfs)	= 0.210
Area (sqft)	= 0.31
Velocity (ft/s)	= 0.67
Wetted Perim (ft)	= 2.31
Crit Depth, Yc (ft)	= 0.18
Top Width (ft)	= 2.24
EGL (ft)	= 0.29





EMERGENCY SPILLWAY PROFILE

Q_{100} = 10.1 CFS
WIER L = 20 FT
UNIT DISCHARGE = 0.5 CFS/FT



EMERGENCY SPILLWAY SECTION AND SPILLWAY CHANNEL

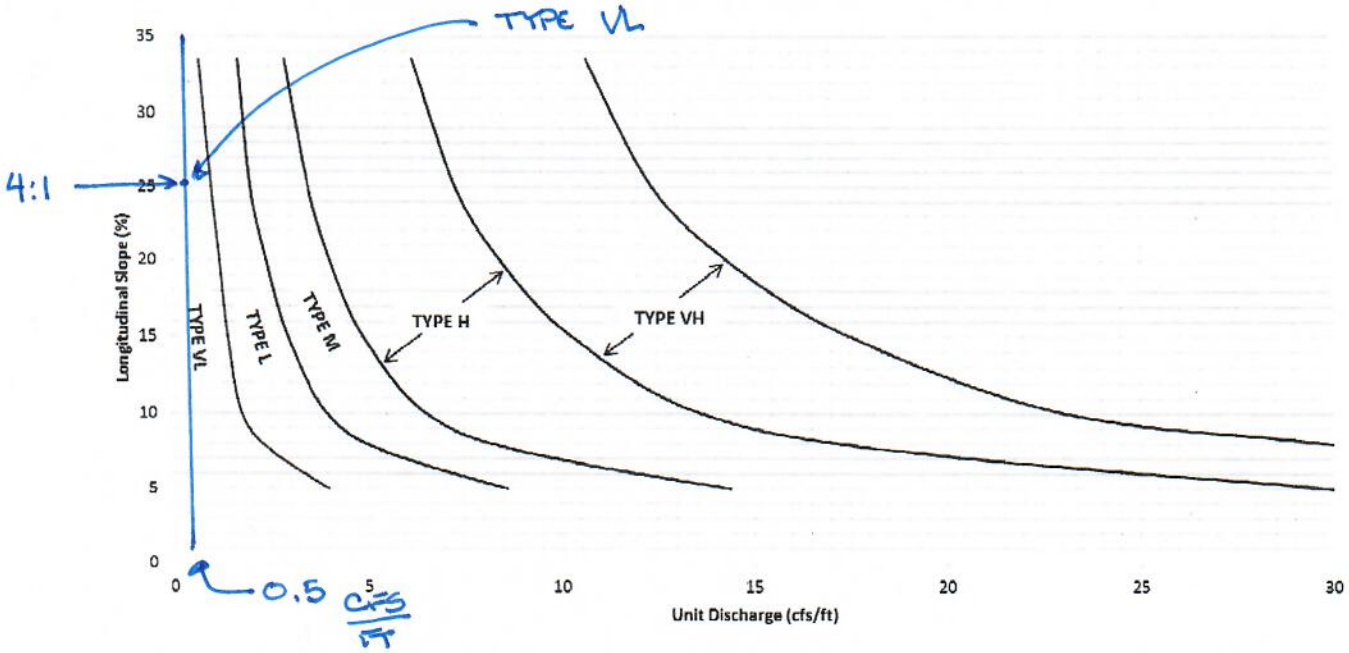
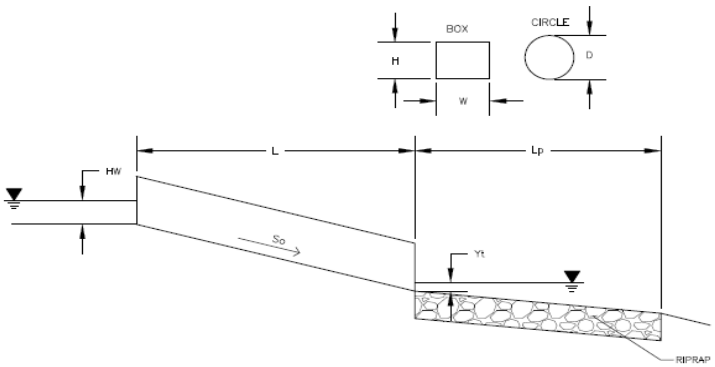


Figure 12-21. Embankment protection details and rock sizing chart (adapted from Arapahoe County)

Determination of Culvert Headwater and Outlet Protection

Project: VILLAS AT DRY CREEK
Basin ID: POND A OUTFALL



Soil Type:
Choose One:
(•) Sandy
( ) Non-Sandy

Supercritical Flow! Using Da to calculate protection type.

Design Information (Input):

Design Discharge	Q =	2.1	cfs
Circular Culvert:			
Barrel Diameter in Inches	D =	12	inches
Inlet Edge Type (Choose from pull-down list)		1.1 : 1 Beveled Edge	
Box Culvert:		**OR**	
Barrel Height (Rise) in Feet	Height (Rise) =		ft
Barrel Width (Span) in Feet	Width (Span) =		ft
Inlet Edge Type (Choose from pull-down list)			
Number of Barrels	No =	1	
Inlet Elevation	Elev IN =	100	ft
Outlet Elevation **OR** Slope	So =	0.05	ft/ft
Culvert Length	L =	38	ft
Manning's Roughness	n =	0.012	
Bend Loss Coefficient	k_b =	0	
Exit Loss Coefficient	k_x =	1	
Tailwater Surface Elevation	Elev Y_t =		ft
Max Allowable Channel Velocity	V =	5	ft/s

Required Protection (Output):

Tailwater Surface Height	Y_t =	0.40	ft
Flow Area at Max Channel Velocity	A_t =	0.42	ft^2
Culvert Cross Sectional Area Available	A =	0.79	ft^2
Entrance Loss Coefficient	k_e =	0.20	
Friction Loss Coefficient	k_f =	1.01	
Sum of All Losses Coefficients	k_s =	2.21	ft
Culvert Normal Depth	Y_n =	0.34	ft
Culvert Critical Depth	Y_c =	0.62	ft
Tailwater Depth for Design	d =	0.81	ft
Adjusted Diameter **OR** Adjusted Rise	D_a =	0.67	ft
Expansion Factor	1/(2*tan(Θ)) =	6.69	
Flow/Diameter$^{2.5}$ **OR** Flow/(Span * Rise$^{1.5}$)	Q/D^2.5 =	2.10	$ft^{0.5}/s$
Froude Number	Fr =	3.24	**Supercritical!**
Tailwater/Adjusted Diameter **OR** Tailwater/Adjusted Rise	Yt/D =	0.60	
Inlet Control Headwater	HW_I =	0.89	ft
Outlet Control Headwater	HW_O =	-0.85	
Design Headwater Elevation	**HW =**	**100.89**	**ft**
Headwater/Diameter OR Headwater/Rise Ratio	**HW/D =**	**0.89**	
Minimum Theoretical Riprap Size	d_{50} =	2	in
Nominal Riprap Size	d_{50} =	6	in
UDFCD Riprap Type	**Type =**	**VL**	
Length of Protection	**L_p =**	**3**	**ft**
Width of Protection	**T =**	**2**	**ft**

Design Procedure Form: Extended Detention Basin (EDB)

UD-BMP (Version 3.07, March 2018)

Designer: David Mijares
Company: Catamount Engineering
Date: October 27, 2022
Project: cottages at dry creek
Location: EDB C

1. Basin Storage Volume

A) Effective Imperviousness of Tributary Area, I_a — I_a = 62.2 %

B) Tributary Area's Imperviousness Ratio ($i = I_a / 100$) — i = 0.622

C) Contributing Watershed Area — Area = 2.600 ac

D) For Watersheds Outside of the Denver Region, Depth of Average Runoff Producing Storm — d_6 = in

E) Design Concept (Select EURV when also designing for flood control)

Choose One
- (●) Water Quality Capture Volume (WQCV)
- ( ) Excess Urban Runoff Volume (EURV)

F) Design Volume (WQCV) Based on 40-hour Drain Time
($V_{DESIGN} = (1.0 * (0.91 * i^3 - 1.19 * i^2 + 0.78 * i) / 12 * Area$)
— V_{DESIGN} = 0.053 ac-ft

G) For Watersheds Outside of the Denver Region, Water Quality Capture Volume (WQCV) Design Volume
($V_{WQCV\ OTHER} = (d_6 * (V_{DESIGN}/0.43))$)
— $V_{DESIGN\ OTHER}$ = ac-ft

H) User Input of Water Quality Capture Volume (WQCV) Design Volume (Only if a different WQCV Design Volume is desired)
— $V_{DESIGN\ USER}$ = ac-ft

I) NRCS Hydrologic Soil Groups of Tributary Watershed
- i) Percentage of Watershed consisting of Type A Soils — HSG_A = %
- ii) Percentage of Watershed consisting of Type B Soils — HSG_B = %
- iii) Percentage of Watershed consisting of Type C/D Soils — $HSG_{C/D}$ = %

J) Excess Urban Runoff Volume (EURV) Design Volume
For HSG A: $EURV_A = 1.68 * i^{1.28}$
For HSG B: $EURV_B = 1.36 * i^{1.08}$
For HSG C/D: $EURV_{C/D} = 1.20 * i^{1.08}$
— $EURV_{DESIGN}$ = ac-f t

K) User Input of Excess Urban Runoff Volume (EURV) Design Volume (Only if a different EURV Design Volume is desired)
— $EURV_{DESIGN\ USER}$ = ac-f t

2. Basin Shape: Length to Width Ratio
(A basin length to width ratio of at least 2:1 will improve TSS reduction.)
— L : W = 4.3 : 1

3. Basin Side Slopes

A) Basin Maximum Side Slopes (Horizontal distance per unit vertical, 4:1 or flatter preferred)
— Z = 4.00 ft / ft

4. Inlet

A) Describe means of providing energy dissipation at concentrated inflow locations:

5. Forebay

A) Minimum Forebay Volume (V_{FMIN} = 1% of the WQCV)
— V_{FMIN} = 0.001 ac-ft

B) Actual Forebay Volume
— V_F = 0.002 ac-ft

C) Forebay Depth (D_F = 12 inch maximum)
— D_F = 12.0 in

D) Forebay Discharge

i) Undetained 100-year Peak Discharge
— Q_{100} = 11.00 cfs

ii) Forebay Discharge Design Flow ($Q_F = 0.02 * Q_{100}$)
— Q_F = 0.22 cfs

E) Forebay Discharge Design

Choose One
- ( ) Berm With Pipe
- (●) Wall with Rect. Notch
- ( ) Wall with V-Notch Weir

Flow too small for berm w/ pipe

F) Discharge Pipe Size (minimum 8-inches)
— Calculated D_P = in

G) Rectangular Notch Width
— Calculated W_N = 3.2 in

Design Procedure Form: Extended Detention Basin (EDB)

Designer: David Mijares
Company: Catamount Engineering
Date: October 27, 2022
Project: cottages at dry creek
Location: EDB C

6. Trickle Channel	
A) Type of Trickle Channel	Choose One: (●) Concrete ( ) Soft Bottom
F) Slope of Trickle Channel	S = 0.0100 ft / ft
7. Micropool and Outlet Structure	
A) Depth of Micropool (2.5-feet minimum)	D_M = 2.5 ft
B) Surface Area of Micropool (10 ft^2 minimum)	A_M = 16 sq ft
C) Outlet Type	Choose One: (●) Orifice Plate ( ) Other (Describe):
	See UD-DETENTION FOR OUTFALL
D) Smallest Dimension of Orifice Opening Based on Hydrograph Routing (Use UD-Detention)	$D_{orifice}$ = inches
E) Total Outlet Area	A_{ot} = square inches
8. Initial Surcharge Volume	
A) Depth of Initial Surcharge Volume (Minimum recommended depth is 4 inches)	D_{IS} = 4 in
B) Minimum Initial Surcharge Volume (Minimum volume of 0.3% of the WQCV)	V_{IS} = cu ft
C) Initial Surcharge Provided Above Micropool	V_s = 5.3 cu ft
9. Trash Rack	
A) Water Quality Screen Open Area: $A_t = A_{ot} * 38.5*(e^{-0.095D})$	A_t = square inches
B) Type of Screen (If specifying an alternative to the materials recommended in the USDCM, indicate "other" and enter the ratio of the total open are to the total screen are for the material specified.)	
Other (Y/N): N	
C) Ratio of Total Open Area to Total Area (only for type 'Other')	User Ratio =
D) Total Water Quality Screen Area (based on screen type)	A_{total} = sq. in.
E) Depth of Design Volume (EURV or WQCV) (Based on design concept chosen under 1E)	H= feet
F) Height of Water Quality Screen (H_{TR})	H_{TR}= inches
G) Width of Water Quality Screen Opening ($W_{opening}$) (Minimum of 12 inches is recommended)	$W_{opening}$ = inches

Design Procedure Form: Extended Detention Basin (EDB)

Designer: David Mijares
Company: Catamount Engineering
Date: October 27, 2022
Project: cottages at dry creek
Location: EDB C

10. Overflow Embankment

A) Describe embankment protection for 100-year and greater overtopping:

B) Slope of Overflow Embankment
(Horizontal distance per unit vertical, 4:1 or flatter preferred)

Ze = 4.00 ft / ft

11. Vegetation

Choose One
- ○ Irrigated
- ○ Not Irrigated

12. Access

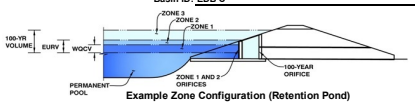
A) Describe Sediment Removal Procedures

Notes:

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

Project: COTTAGES AT DRY CREEK

Basin ID: EDB C



Example Zone Configuration (Retention Pond)

Required Volume Calculation

Selected BMP Type =	EDB	
Watershed Area =	2.60	acres
Watershed Length =	329	ft
Watershed Slope =	0.030	ft/ft
Watershed Imperviousness =	62.20%	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
Desired WQCV Drain Time =	40.0	hours
Location for 1-hr Rainfall Depths =	UDFCD Default	
Water Quality Capture Volume (WQCV) =	0.053	acre-feet
Excess Urban Runoff Volume (EURV) =	0.198	acre-feet
2-yr Runoff Volume (P1 = 1.19 in.) =	0.131	acre-feet
5-yr Runoff Volume (P1 = 1.5 in.) =	0.173	acre-feet
10-yr Runoff Volume (P1 = 1.75 in.) =	0.217	acre-feet
25-yr Runoff Volume (P1 = 2 in.) =	0.286	acre-feet
50-yr Runoff Volume (P1 = 2.25 in.) =	0.336	acre-feet
100-yr Runoff Volume (P1 = 2.52 in.) =	0.396	acre-feet
500-yr Runoff Volume (P1 = 3.29 in.) =	0.554	acre-feet
Approximate 2-yr Detention Volume =	0.125	acre-feet
Approximate 5-yr Detention Volume =	0.165	acre-feet
Approximate 10-yr Detention Volume =	0.207	acre-feet
Approximate 25-yr Detention Volume =	0.234	acre-feet
Approximate 50-yr Detention Volume =	0.253	acre-feet
Approximate 100-yr Detention Volume =	0.289	acre-feet

Optional User Input 1-hr Precipitation

1.19	inches
1.50	inches
1.75	inches
2.00	inches
2.25	inches
2.52	inches
	inches

Stage-Storage Calculation

Zone 1 Volume (User Defined) =	0.030	acre-feet
Zone 2 Volume (EURV - Zone 1) =	0.169	acre-feet
Zone 3 Volume (100-year - Zones 1 & 2) =	0.091	acre-feet
Total Detention Basin Volume =	0.289	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	

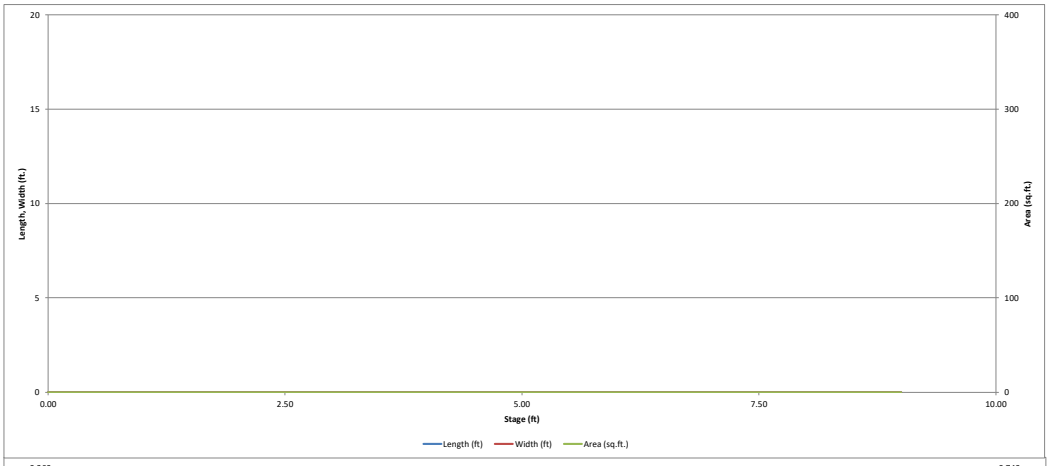
WQCV not provided!

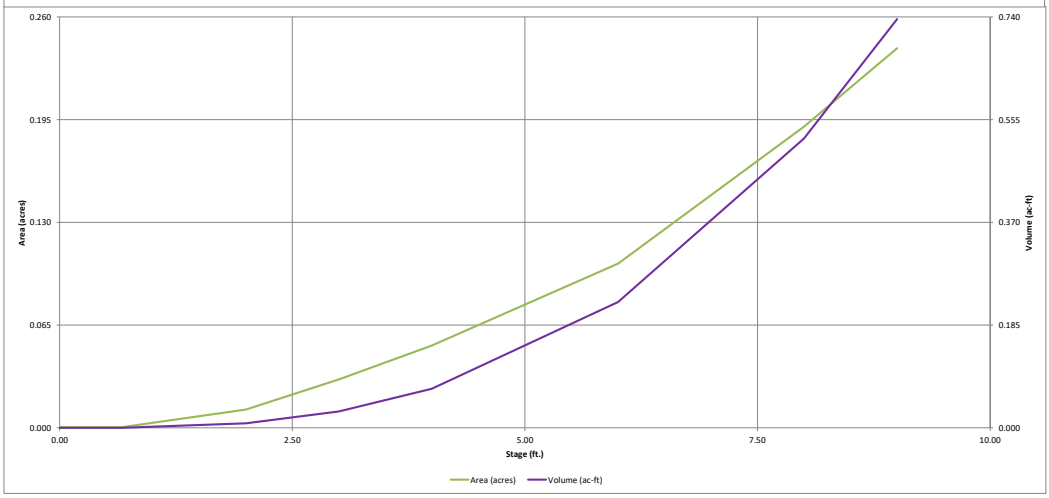
Initial Surcharge Area (A_{ISV}) =	user	ft^2
Surcharge Volume Length (L_{ISV}) =	user	ft
Surcharge Volume Width (W_{ISV}) =	user	ft
Depth of Basin Floor (H_{FLOOR}) =	user	ft
Length of Basin Floor (L_{FLOOR}) =	user	ft
Width of Basin Floor (W_{FLOOR}) =	user	ft
Area of Basin Floor (A_{FLOOR}) =	user	ft^2
Volume of Basin Floor (V_{FLOOR}) =	user	ft^3
Depth of Main Basin (H_{MAIN}) =	user	ft
Length of Main Basin (L_{MAIN}) =	user	ft
Width of Main Basin (W_{MAIN}) =	user	ft
Area of Main Basin (A_{MAIN}) =	user	ft^2
Volume of Main Basin (V_{MAIN}) =	user	ft^3
Calculated Total Basin Volume (V_{total}) =	user	acre-feet

Depth Increment = ft

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)
Micropool	--	0.00	--	--	--	16	0.000		
ISV	--	0.67	--	--	--	16	0.000	11	0.000
6250	--	2.00	--	--	--	501	0.012	350	0.008
6251	--	3.00	--	--	--	1,335	0.031	1,273	0.029
6252	--	4.00	--	--	--	2,267	0.052	3,074	0.071
6254	--	6.00	--	--	--	4,525	0.104	9,866	0.226
6256	--	8.00	--	--	--	8,295	0.190	22,686	0.521
6257	--	9.00	--	--	--	10,464	0.240	32,065	0.736

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

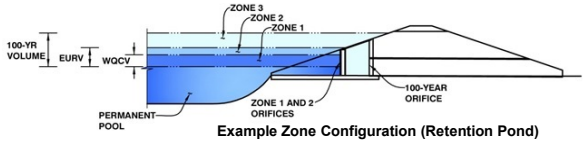




Detention Basin Outlet Structure Design

Project: COTTAGES AT DRY CREEK

Basin ID: EDB C



Example Zone Configuration (Retention Pond)

	Stage (ft)	Zone Volume (ac-ft)	Outlet Type
Zone 1 (User)	3.01	0.030	Orifice Plate
Zone 2 (EURV)	5.72	0.169	Orifice Plate
Zone 3 (100-year)	6.55	0.091	Weir&Pipe (Restrict)
		0.289	Total

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 =	6.11	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)	0.75	3.85						
Orifice Area (sq. inches)	0.35	1.23						

	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) and Grate (Flat or Sloped)

	Zone 3 Weir	Not Selected	
Overflow Weir Front Edge Height, Ho =	5.72	N/A	ft (relative to basin bottom at Stage = 0 ft)
Overflow Weir Front Edge Length =	4.00	N/A	feet
Overflow Weir Slope =	0.00	N/A	H:V (enter zero for flat grate)
Horiz. Length of Weir Sides =	4.00	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 =	5.72	N/A	feet
Over Flow Weir Slope Length =	4.00	N/A	feet
Grate Open Area / 100-yr Orifice Area =	72.94	N/A	should be ≥ 4
Overflow Grate Open Area w/o Debris =	11.20	N/A	ft^2
Overflow Grate Open Area w/ Debris =	5.60	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 =	1.00	N/A	ft (distance below basin bottom at Stage = 0 ft)
Outlet Pipe Diameter =	12.00	N/A	inches
Restrictor Plate Height Above Pipe Invert =	3.00		inches

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate

	Zone 3 Restrictor	Not Selected	
Outlet Orifice Area =	0.15	N/A	ft^2
Outlet Orifice Centroid =	0.15	N/A	feet
Half-Central Angle of Restrictor Plate on Pipe =	1.05	N/A	radians

User Input: Emergency Spillway (Rectangular or Trapezoidal)

Spillway Invert Stage=	6.55	ft (relative to basin bottom at Stage = 0 ft)
Spillway Crest Length =	20.00	feet
Spillway End Slopes =	4.00	H:V
Freeboard above Max Water Surface =	1.00	feet

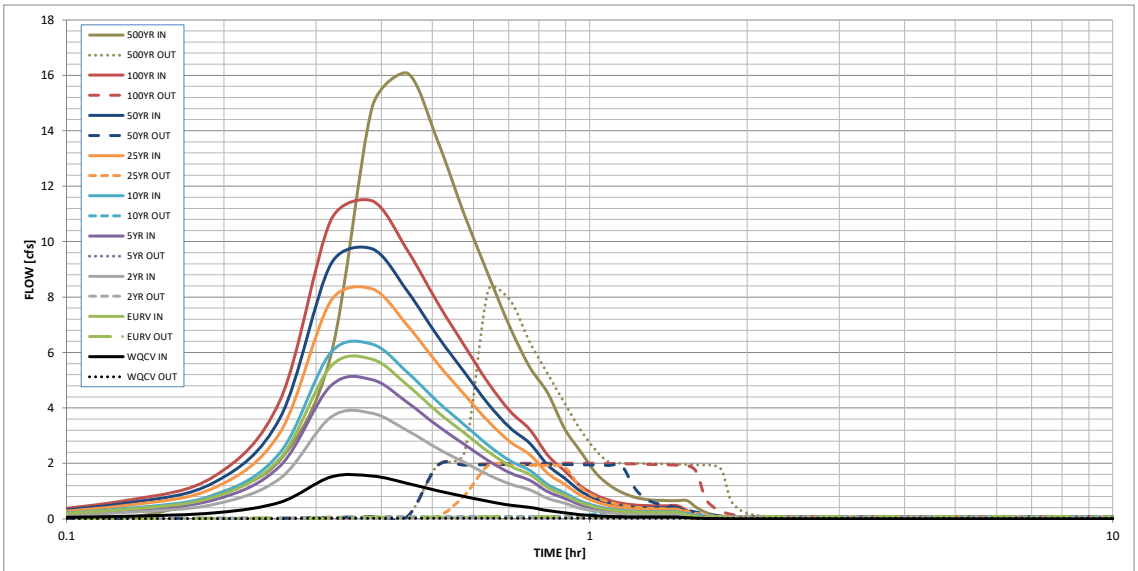
Calculated Parameters for Spillway

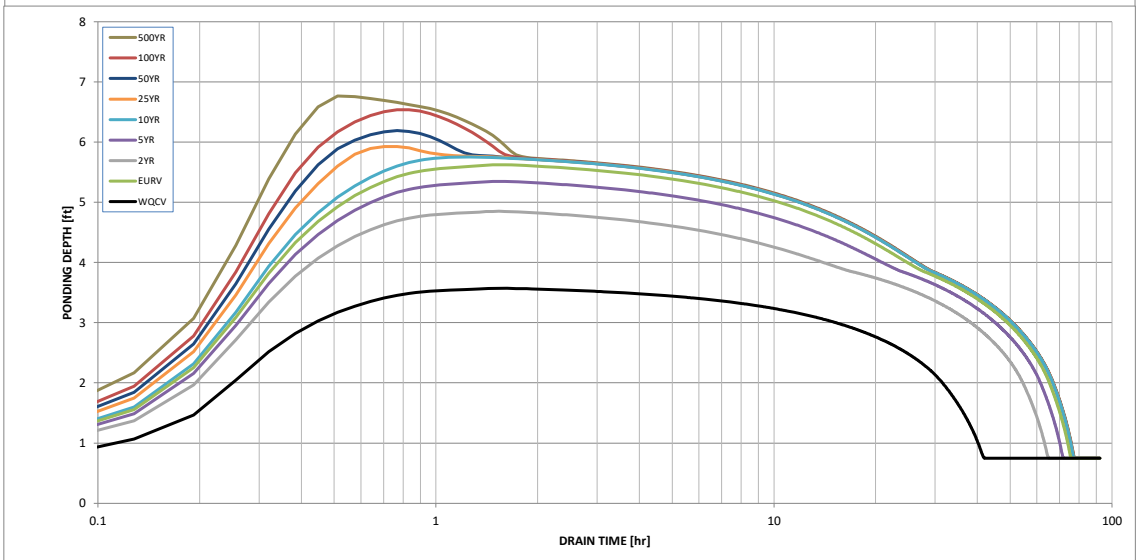
Spillway Design Flow Depth=	0.29	feet
Stage at Top of Freeboard =	7.84	feet
Basin Area at Top of Freeboard =	0.18	acres

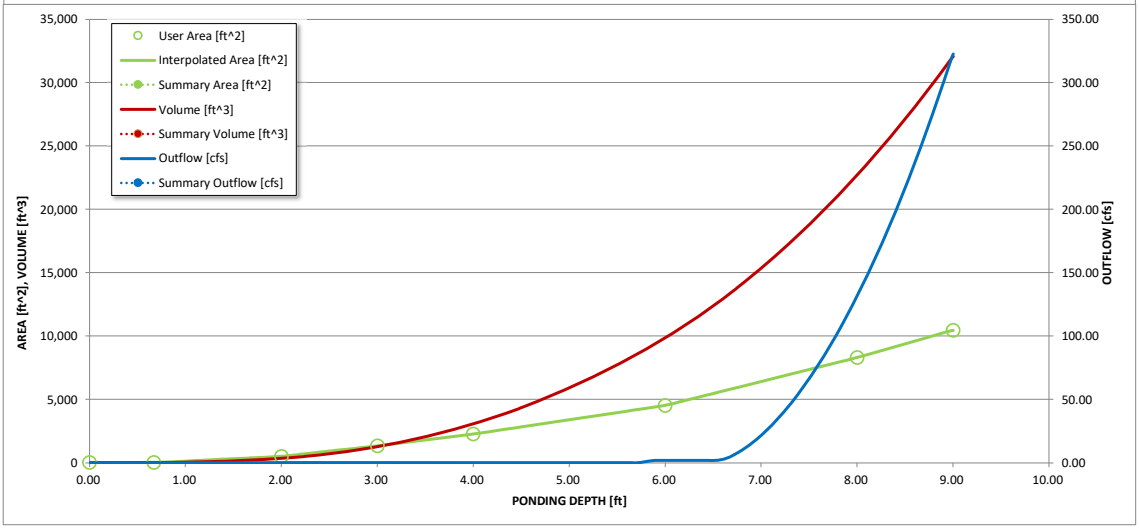
Routed Hydrograph Results

Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
One-Hour Rainfall Depth (in) =	0.53	1.07	1.19	1.50	1.75	2.00	2.25	2.52	3.29
Calculated Runoff Volume (acre-ft) =	0.053	0.198	0.131	0.173	0.217	0.286	0.336	0.396	0.554
OPTIONAL Override Runoff Volume (acre-ft) =									
Inflow Hydrograph Volume (acre-ft) =	0.052	0.198	0.131	0.172	0.216	0.286	0.336	0.396	0.554
Predevelopment Unit Peak Flow, q (cfs/acre) =	0.00	0.00	0.00	0.01	0.02	0.23	0.48	0.78	1.41
Predevelopment Peak Q (cfs) =	0.0	0.0	0.0	0.0	0.1	0.6	1.2	2.0	3.7
Peak Inflow Q (cfs) =	1.5	5.8	3.8	5.0	6.3	8.3	9.7	11.5	16.1
Peak Outflow Q (cfs) =	0.0	0.1	0.1	0.1	0.3	1.9	2.0	2.0	8.2
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	2.4	5.0	3.2	1.6	1.0	2.3
Structure Controlling Flow =	Plate	Plate	Plate	Plate	Overflow Grate 1	Outlet Plate 1	Outlet Plate 1	Outlet Plate 1	Spillway
Max Velocity through Grate 1 (fps) =	N/A	N/A	N/A	N/A	0.0	0.2	0.2	0.2	0.2
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) =	39	68	59	64	69	67	65	64	60
Time to Drain 99% of Inflow Volume (hours) =	**41**	72	62	69	73	73	72	71	70
Maximum Ponding Depth (ft) =	3.57	5.62	4.85	5.35	5.75	5.93	6.19	6.54	6.77
Area at Maximum Ponding Depth (acres) =	0.04	0.09	0.07	0.09	0.10	0.10	0.11	0.13	0.14
Maximum Volume Stored (acre-ft) =	0.050	0.189	0.123	0.164	0.200	0.218	0.246	0.288	0.318

Detention Basin Outlet Structure Design







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:

Storm Inflow Hydrographs

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

Time Interval	SOURCE	WORKBOOK	WORKBOOK	WORKBOOK	WORKBOOK	WORKBOOK	WORKBOOK	WORKBOOK	WORKBOOK	WORKBOOK
	TIME	WQCV [cfs]	EURV [cfs]	2 Year [cfs]	5 Year [cfs]	10 Year [cfs]	25 Year [cfs]	50 Year [cfs]	100 Year [cfs]	500 Year [cfs]
3.84 min	0:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:03:50	0.00	0.01	0.01	0.01	0.01	0.02	0.02	0.02	0.03
Hydrograph	0:07:41	0.09	0.33	0.22	0.29	0.36	0.47	0.55	0.64	0.88
Constant	0:11:31	0.22	0.79	0.53	0.69	0.86	1.13	1.32	1.55	2.13
1.303	0:15:22	0.60	2.19	1.46	1.91	2.39	3.13	3.66	4.29	5.90
	0:19:12	1.51	5.50	3.67	4.80	6.00	7.85	9.19	10.77	14.84
	0:23:02	1.54	5.76	3.81	5.01	6.30	8.29	9.74	11.48	16.08
	0:26:53	1.28	4.82	3.18	4.20	5.28	6.98	8.21	9.69	13.64
	0:30:43	1.01	3.86	2.53	3.35	4.23	5.59	6.59	7.79	10.98
	0:34:34	0.81	3.10	2.04	2.69	3.39	4.49	5.29	6.25	8.81
	0:38:24	0.63	2.42	1.59	2.10	2.65	3.51	4.14	4.90	6.91
	0:42:14	0.49	1.91	1.25	1.66	2.10	2.78	3.28	3.88	5.48
	0:46:05	0.42	1.60	1.05	1.39	1.75	2.32	2.73	3.22	4.53
	0:49:55	0.29	1.13	0.74	0.98	1.24	1.64	1.93	2.29	3.24
	0:53:46	0.22	0.85	0.56	0.74	0.93	1.24	1.46	1.73	2.43
	0:57:36	0.15	0.58	0.38	0.51	0.64	0.85	1.00	1.19	1.68
	1:01:26	0.11	0.43	0.28	0.37	0.47	0.62	0.74	0.87	1.23
	1:05:17	0.09	0.33	0.22	0.29	0.36	0.48	0.57	0.68	0.95
	1:09:07	0.07	0.28	0.18	0.24	0.30	0.40	0.47	0.56	0.79
	1:12:58	0.07	0.25	0.16	0.22	0.27	0.36	0.42	0.50	0.70
	1:16:48	0.06	0.24	0.16	0.21	0.26	0.34	0.41	0.48	0.67
	1:20:38	0.06	0.23	0.16	0.20	0.26	0.34	0.40	0.47	0.66
	1:24:29	0.06	0.23	0.16	0.20	0.26	0.34	0.40	0.47	0.66
	1:28:19	0.06	0.23	0.16	0.20	0.26	0.34	0.40	0.47	0.66
	1:32:10	0.04	0.14	0.09	0.12	0.16	0.21	0.25	0.29	0.42
	1:36:00	0.02	0.08	0.05	0.07	0.09	0.12	0.14	0.17	0.24
	1:39:50	0.01	0.05	0.03	0.04	0.05	0.07	0.08	0.10	0.14
	1:43:41	0.01	0.03	0.02	0.02	0.03	0.04	0.04	0.05	0.08
	1:47:31	0.00	0.01	0.01	0.01	0.01	0.02	0.02	0.02	0.04
	1:51:22	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.01
	1:55:12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	1:59:02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2:02:53	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2:06:43	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2:10:34	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2:14:24	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2:18:14	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2:22:05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2:25:55	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2:29:46	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2:33:36	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2:37:26	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2:41:17	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2:45:07	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2:48:58	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2:52:48	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2:56:38	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:00:29	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:04:19	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:08:10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:12:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:15:50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:19:41	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:23:31	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:27:22	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:31:12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:35:02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:38:53	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:42:43	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:46:34	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:50:24	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:54:14	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:58:05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:01:55	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:05:46	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:09:36	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:13:26	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:17:17	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:21:07	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:24:58	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:28:48	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:32:38	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:36:29	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Tuesday, Jan 3 2023

Trickle Channel EDB C

Triangular

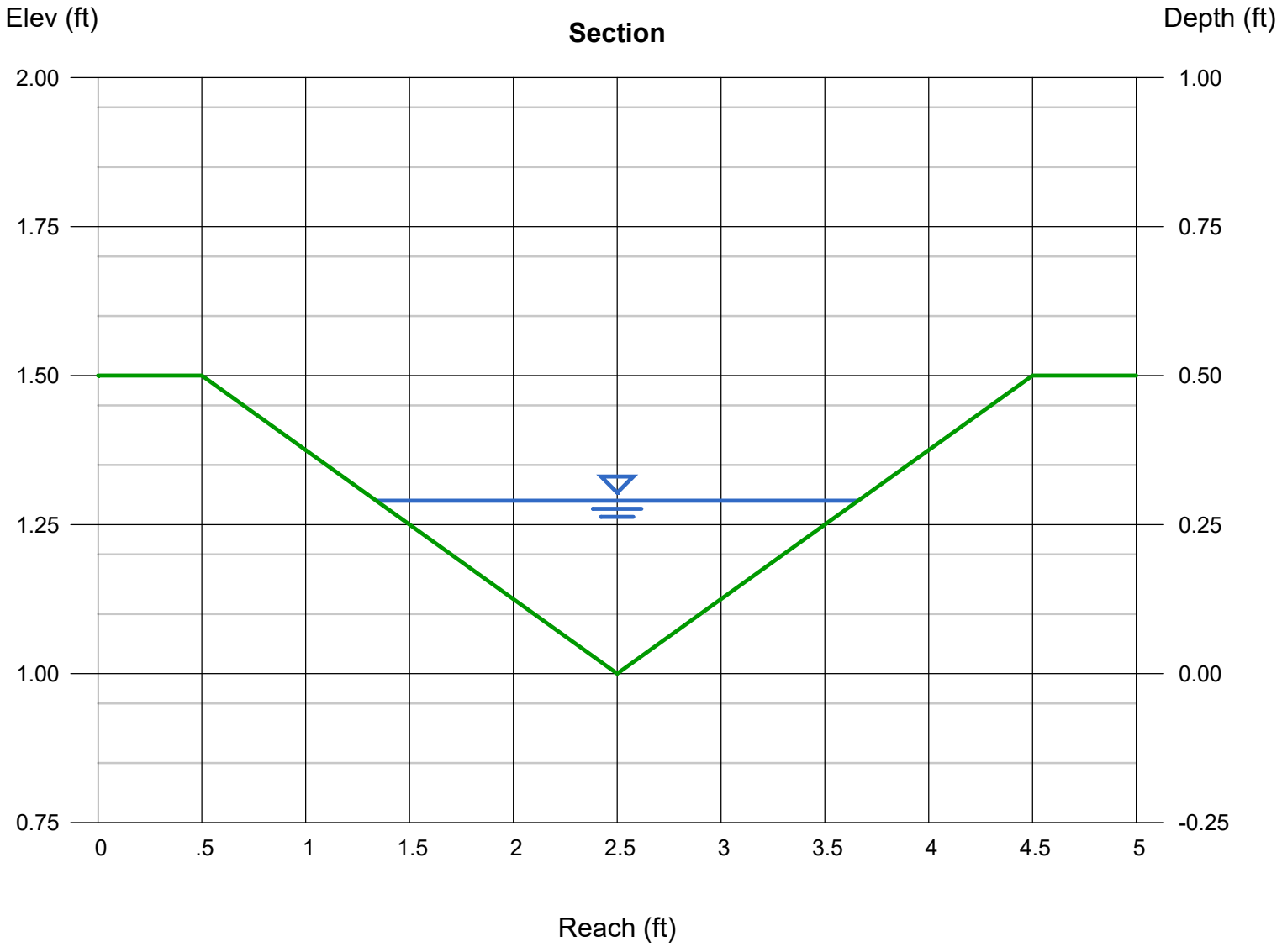
Side Slopes (z:1)	= 4.00, 4.00
Total Depth (ft)	= 0.50
Invert Elev (ft)	= 1.00
Slope (%)	= 0.05
N-Value	= 0.012

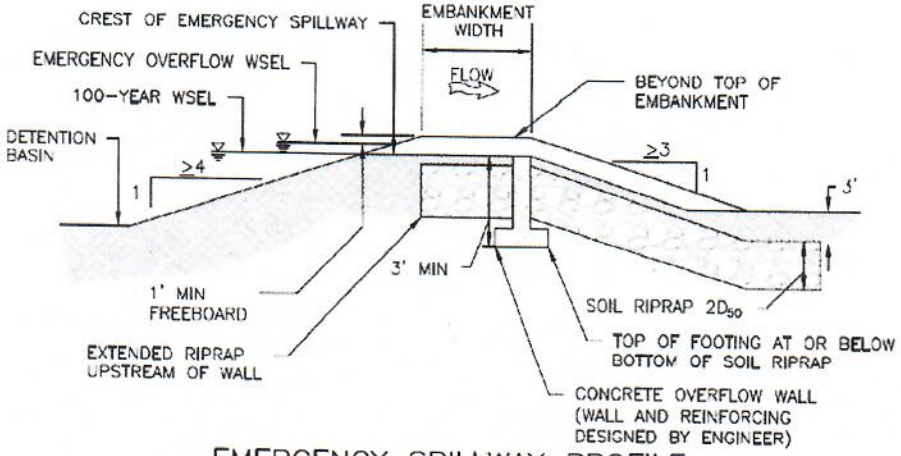
Calculations

Compute by:	Known Q
Known Q (cfs)	= 0.25

Highlighted

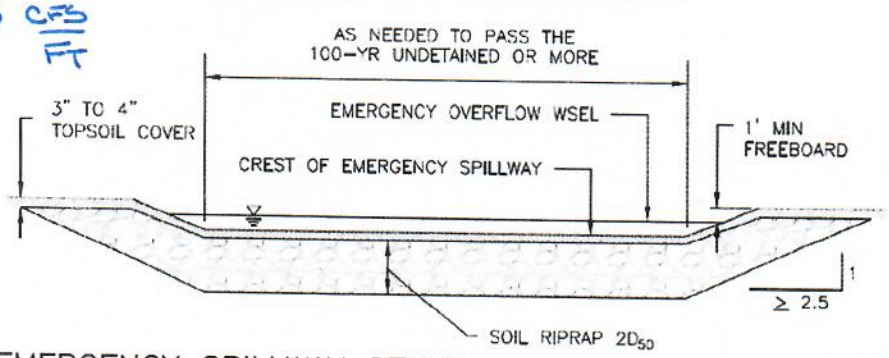
Depth (ft)	= 0.29
Q (cfs)	= 0.250
Area (sqft)	= 0.34
Velocity (ft/s)	= 0.74
Wetted Perim (ft)	= 2.39
Crit Depth, Yc (ft)	= 0.19
Top Width (ft)	= 2.32
EGL (ft)	= 0.30





EMERGENCY SPILLWAY PROFILE

Q_{100} = 11 CFS
WIER L = 20 FT
UNIT DISCHARGE = 0.55 CFS/FT



EMERGENCY SPILLWAY SECTION AND SPILLWAY CHANNEL

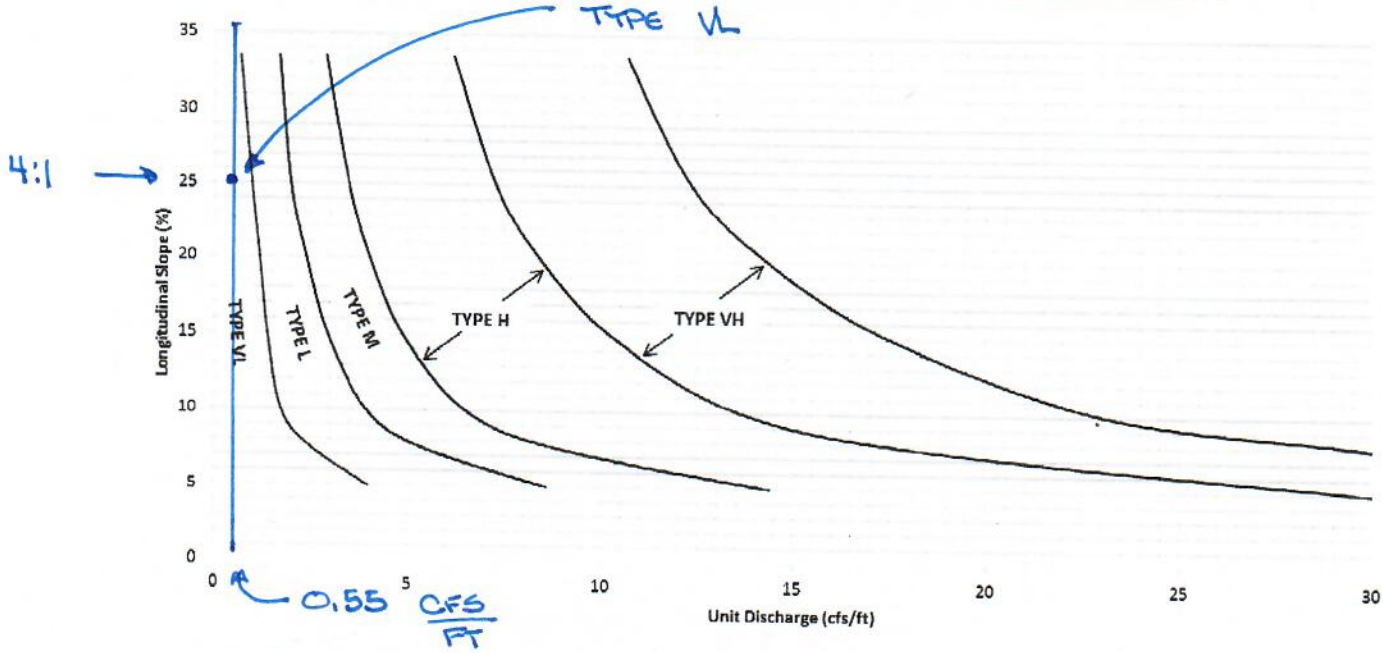


Figure 12-21. Embankment protection details and rock sizing chart (adapted from Arapahoe County)

Design Procedure Form: Runoff Reduction

UD-BMP (Version 3.07, March 2018) **Sheet 1 of 1**

Designer:	**David Mijares**
Company:	**Catamount Engineering**
Date:	**January 3, 2023**
Project:	**COTTAGES AT DRY CREEK**
Location:	**POND A**

SITE INFORMATION (User Input in Blue Cells)

WQCV Rainfall Depth = 0.60 inches

Depth of Average Runoff Producing Storm, d_6 = 0.43 inches (for Watersheds Outside of the Denver Region, Figure 3-1 in USDCM Vol. 3)

Area Type	DCIA	SPA	UIA:RPA									
Area ID	A1-IMP	A1-PERV	A1-DC/RPA									
Downstream Design Point ID	A	A	A									
Downstream BMP Type	EDB	EDB	EDB									
DCIA (ft^2)	67,712	--	--									
UIA (ft^2)	--	--	32,587									
RPA (ft^2)	--	--	24,587									
SPA (ft^2)	--	103,804	--									
HSG A (%)	--	100%	100%									
HSG B (%)	--	0%	0%									
HSG C/D (%)	--	0%	0%									
Average Slope of RPA (ft/ft)	--	--	0.020									
UIA:RPA Interface Width (ft)	--	--	15.00									

CALCULATED RUNOFF RESULTS

Area ID	A1-IMP	A1-PERV	A1-DC/RPA									
UIA:RPA Area (ft^2)	--	--	57,174									
L / W Ratio	--	--	16.00									
UIA / Area	--	--	0.5700									
Runoff (in)	0.50	0.00	0.00									
Runoff (ft^3)	2821	0	0									
Runoff Reduction (ft^3)	0	5190	1358									

CALCULATED WQCV RESULTS

Area ID	A1-IMP	A1-PERV	A1-DC/RPA									
WQCV (ft^3)	2821	0	1358									
WQCV Reduction (ft^3)	0	0	1358									
WQCV Reduction (%)	0%	0%	100%									
Untreated WQCV (ft^3)	2821	0	0									

CALCULATED DESIGN POINT RESULTS (sums results from all columns with the same Downstream Design Point ID)

Downstream Design Point ID	A											
DCIA (ft^2)	67,712											
UIA (ft^2)	32,587											
RPA (ft^2)	24,587											
SPA (ft^2)	103,804											
Total Area (ft^2)	228,690											
Total Impervious Area (ft^2)	100,299											
WQCV (ft^3)	4,179											
WQCV Reduction (ft^3)	1,358											
WQCV Reduction (%)	32%											
Untreated WQCV (ft^3)	2,821											

CALCULATED SITE RESULTS (sums results from all columns in worksheet)

Total Area (ft^2)	228,690
Total Impervious Area (ft^2)	100,299
WQCV (ft^3)	4,179
WQCV Reduction (ft^3)	1,358
WQCV Reduction (%)	32%
Untreated WQCV (ft^3)	2,821

Design Procedure Form: Runoff Reduction

UD-BMP (Version 3.07, March 2018)

Designer: David Mijares
Company: Catamount Engineering
Date: January 3, 2023
Project: COTTAGES AT DRY CREEK
Location: POND B

SITE INFORMATION (User Input in Blue Cells)

WQCV Rainfall Depth = 0.60 inches
Depth of Average Runoff Producing Storm, d_6 = 0.43 inches (for Watersheds Outside of the Denver Region, Figure 3-1 in USDCM Vol. 3)

Area Type	DCIA	SPA	UIA:RPA									
Area ID	B-IMP	B-PERV	B-DC/RPA									
Downstream Design Point ID	B	B	B									
Downstream BMP Type	EDB	EDB	EDB									
DCIA (ft^2)	28,361	--	--									
UIA (ft^2)	--	--	28,804									
RPA (ft^2)	--	--	10,376									
SPA (ft^2)	--	60,525	--									
HSG A (%)	--	100%	100%									
HSG B (%)	--	0%	0%									
HSG C/D (%)	--	0%	0%									
Average Slope of RPA (ft/ft)	--	--	0.020									
UIA:RPA Interface Width (ft)	--	--	15.00									

CALCULATED RUNOFF RESULTS

Area ID	B-IMP	B-PERV	B-DC/RPA									
UIA:RPA Area (ft^2)	--	--	39,180									
L / W Ratio	--	--	16.00									
UIA / Area	--	--	0.7352									
Runoff (in)	0.50	0.00	0.00									
Runoff (ft^3)	1182	0	0									
Runoff Reduction (ft^3)	0	3026	1200									

CALCULATED WQCV RESULTS

Area ID	B-IMP	B-PERV	B-DC/RPA									
WQCV (ft^3)	1182	0	1200									
WQCV Reduction (ft^3)	0	0	1200									
WQCV Reduction (%)	0%	0%	100%									
Untreated WQCV (ft^3)	1182	0	0									

CALCULATED DESIGN POINT RESULTS (sums results from all columns with the same Downstream Design Point ID)

Downstream Design Point ID	B											
DCIA (ft^2)	28,361											
UIA (ft^2)	28,804											
RPA (ft^2)	10,376											
SPA (ft^2)	60,525											
Total Area (ft^2)	128,066											
Total Impervious Area (ft^2)	57,165											
WQCV (ft^3)	2,382											
WQCV Reduction (ft^3)	1,200											
WQCV Reduction (%)	50%											
Untreated WQCV (ft^3)	1,182											

CALCULATED SITE RESULTS (sums results from all columns in worksheet)

Total Area (ft^2)	128,066
Total Impervious Area (ft^2)	57,165
WQCV (ft^3)	2,382
WQCV Reduction (ft^3)	1,200
WQCV Reduction (%)	50%
Untreated WQCV (ft^3)	1,182

Design Procedure Form: Runoff Reduction

UD-BMP (Version 3.07, March 2018)

Designer: David Mijares
Company: Catamount Engineering
Date: January 3, 2023
Project: COTTAGES AT DRY CREEK
Location: POND C

SITE INFORMATION (User Input in Blue Cells)

WQCV Rainfall Depth: 0.60 inches
Depth of Average Runoff Producing Storm, d_6 = 0.43 inches (for Watersheds Outside of the Denver Region, Figure 3-1 in USDCM Vol. 3)

Area Type		SPA	UIA:RPA	DCIA	SPA	UIA:RPA						
Area ID		C1-SPA	C1-UIA/RPA	C2-DCIA	C2-SPA	C2-UIA/RPA						
Downstream Design Point ID		C	C	C	C	C						
Downstream BMP Type		EDB	EDB	EDB	EDB	EDB						
DCIA (ft^2)		--	--	21,212	--	--						
UIA (ft^2)		--	21,738	--	--	25,318						
RPA (ft^2)		--	1,758	--	--	6,576						
SPA (ft^2)		5,350	--	--	29,392	--						
HSG A (%)		100%	100%	--	100%	100%						
HSG B (%)		0%	0%	--	0%	0%						
HSG C/D (%)		0%	0%	--	0%	0%						
Average Slope of RPA (ft/ft)		--	0.015	--	--	0.015						
UIA:RPA Interface Width (ft)		--	10.00	--	--	10.00						

CALCULATED RUNOFF RESULTS

Area ID		C1-SPA	C1-UIA/RPA	C2-DCIA	C2-SPA	C2-UIA/RPA						
UIA:RPA Area (ft^2)		--	23,496	--	--	31,894						
L / W Ratio		--	16.00	--	--	16.00						
UIA / Area		--	0.9252	--	--	0.7938						
Runoff (in)		0.00	0.22	0.50	0.00	0.00						
Runoff (ft^3)		0	433	884	0	0						
Runoff Reduction (ft^3)		268	473	0	1470	1055						

CALCULATED WQCV RESULTS

Area ID		C1-SPA	C1-UIA/RPA	C2-DCIA	C2-SPA	C2-UIA/RPA						
WQCV (ft^3)		0	906	884	0	1055						
WQCV Reduction (ft^3)		0	473	0	0	1055						
WQCV Reduction (%)		0%	52%	0%	0%	100%						
Untreated WQCV (ft^3)		0	433	884	0	0						

CALCULATED DESIGN POINT RESULTS (sums results from all columns with the same Downstream Design Point ID)

Downstream Design Point ID	C											
DCIA (ft^2)	21,212											
UIA (ft^2)	47,056											
RPA (ft^2)	8,334											
SPA (ft^2)	34,742											
Total Area (ft^2)	111,344											
Total Impervious Area (ft^2)	68,268											
WQCV (ft^3)	2,845											
WQCV Reduction (ft^3)	1,527											
WQCV Reduction (%)	54%											
Untreated WQCV (ft^3)	1,317											

CALCULATED SITE RESULTS (sums results from all columns in worksheet)

Total Area (ft^2)	111,344
Total Impervious Area (ft^2)	68,268
WQCV (ft^3)	2,845
WQCV Reduction (ft^3)	1,527
WQCV Reduction (%)	54%
Untreated WQCV (ft^3)	1,317

Design Procedure Form: Runoff Reduction

UD-BMP (Version 3.07, March 2018)

Designer: David Mijares
Company: Catamount Engineering
Date: January 3, 2023
Project: COTTAGES AT DRY CREEK
Location: TOTAL

SITE INFORMATION (User Input in Blue Cells)

WQCV Rainfall Depth = 0.60 inches
Depth of Average Runoff Producing Storm, d_6 = 0.43 inches (for Watersheds Outside of the Denver Region, Figure 3-1 in USDCM Vol. 3)

Area Type	DCIA	SPA	UIA:RPA	DCIA	SPA	UIA:RPA	DCIA	SPA	UIA:RPA			
Area ID	A-IMP	A-PERV	A-DC/RPA	B-IMP	B-PERV	B-DC/RPA	C-IMP	C-PERV	C-DC/RPA			
Downstream Design Point ID	A	A	A	B	B	B	C	C	C			
Downstream BMP Type	EDB	EDB	EDB	EDB	EDB	EDB	EDB	EDB	EDB			
DCIA (ft^2)	67,712	--	--	28,361	--	--	21,212	--	--			
UIA (ft^2)	--	--	32,587	--	--	28,804	--	--	47,056			
RPA (ft^2)	--	--	24,587	--	--	10,376	--	--	8,334			
SPA (ft^2)	--	103,804	--	--	60,525	--	--	34,742	--			
HSG A (%)	--	100%	100%	--	100%	100%	--	100%	100%			
HSG B (%)	--	0%	0%	--	0%	0%	--	0%	0%			
HSG C/D (%)	--	0%	0%	--	0%	0%	--	0%	0%			
Average Slope of RPA (ft/ft)	--	--	0.020	--	--	0.020	--	--	0.015			
UIA:RPA Interface Width (ft)	--	--	15.00	--	--	15.00	--	--	10.00			

CALCULATED RUNOFF RESULTS

Area ID	A-IMP	A-PERV	A-DC/RPA	B-IMP	B-PERV	B-DC/RPA	C-IMP	C-PERV	C-DC/RPA			
UIA:RPA Area (ft^2)	--	--	57,174	--	--	39,180	--	--	55,390			
L / W Ratio	--	--	16.00	--	--	16.00	--	--	16.00			
UIA / Area	--	--	0.5700	--	--	0.7352	--	--	0.8495			
Runoff (in)	0.50	0.00	0.00	0.50	0.00	0.00	0.50	0.00	0.05			
Runoff (ft^3)	2821	0	0	1182	0	0	884	0	209			
Runoff Reduction (ft^3)	0	5190	1358	0	3026	1200	0	1737	1752			

CALCULATED WQCV RESULTS

Area ID	A-IMP	A-PERV	A-DC/RPA	B-IMP	B-PERV	B-DC/RPA	C-IMP	C-PERV	C-DC/RPA			
WQCV (ft^3)	2821	0	1358	1182	0	1200	884	0	1961			
WQCV Reduction (ft^3)	0	0	1358	0	0	1200	0	0	1752			
WQCV Reduction (%)	0%	0%	100%	0%	0%	100%	0%	0%	89%			
Untreated WQCV (ft^3)	2821	0	0	1182	0	0	884	0	209			

CALCULATED DESIGN POINT RESULTS (sums results from all columns with the same Downstream Design Point ID)

Downstream Design Point ID	A	B	C									
DCIA (ft^2)	67,712	28,361	21,212									
UIA (ft^2)	32,587	28,804	47,056									
RPA (ft^2)	24,587	10,376	8,334									
SPA (ft^2)	103,804	60,525	34,742									
Total Area (ft^2)	228,690	128,066	111,344									
Total Impervious Area (ft^2)	100,299	57,165	68,268									
WQCV (ft^3)	4,179	2,382	2,845									
WQCV Reduction (ft^3)	1,358	1,200	1,752									
WQCV Reduction (%)	32%	50%	62%									
Untreated WQCV (ft^3)	2,821	1,182	1,093									

CALCULATED SITE RESULTS (sums results from all columns in worksheet)

Total Area (ft^2)	468,100
Total Impervious Area (ft^2)	225,732
WQCV (ft^3)	9,406
WQCV Reduction (ft^3)	4,310
WQCV Reduction (%)	46%
Untreated WQCV (ft^3)	5,096

Channel Lining Calculations for rip rap outfalls.

RIPRAP DESIGN
UDFCD VOLUME 1, CHAPTER 8

$$d_{50} \geq \left[\frac{VS^{0.17}}{4.5(G_s - 1)^{0.66}} \right]^2$$ Equation 8-11

Where:

V = mean channel velocity (ft/sec)

S = longitudinal channel slope (ft/ft)

d_{50} = mean rock size (ft)

Gs = specific gravity of stone (minimum = 2.50, typically 2.5 to 2.7). Note: In this equation (Gs -1) considers the buoyancy of the water, in that the specific gravity of water is subtracted from the specific gravity of the rock.

Taken from CSU Improvements - "Dry Creek Justification of No-Rise Condition" by ch2m dated May 21, 2018

River Station	Description	Velocity	Min Channel Elevation
501		8.13	6246.17
473		5.57	6245.62
452		6.69	6244.03
430	U/S Crest Drop 2	10.71	6247.47
425	D/S Crest Drop 2	10.95	6247.47
421	Toe Drop 2	11.46	6245.28
373		7.22	6246.19
335		9.08	6243.83
299		7.22	6243.5
268		9.2	6242.16
244		5.12	6241.47
238	U/S Crest Drop 1	4.37	6240.75
233	D/S Crest Drop 1	3.92	6240.74
221	Toe Drop 1	2.24	6234

CALCULATION

Begin	End	Velocity	Slope	Gs	d50	Recommendation
501	473	6.85	2%	2.5	5.0	Use Type VL=6"
473	452	6.13	8%	2.5	6.1	Use Type L=9"
452	430	8.7	-16%	2.5		Adverse Slope
430	425	10.83	0%	2.5	0.0	Use Type L=9"
425	421	11.205	55%	2.5	9.5	Use Type M=12"
421	373	9.34	-2%	2.5		Adverse Slope
373	335	8.15	6%	2.5	6.2	Use Type L=9"
335	299	8.15	1%	2.5	4.5	Use Type VL=6"
299	286	8.21	4%	2.5	5.8	Use Type VL=6"
286	244	7.16	3%	2.5	5.3	Use Type VL=6"
244	238	4.745	12%	2.5	6.3	Use Type L=9"
238	233	4.145	0%	2.5	3.1	Use Type VL=6"
233	221	3.08	56%	3.5	10.7	Use Type VL=6"

Use Type M (worst case) for outfalls through adjacent reach of Dry Creek

MEMORANDUM

Dry Creek Justification of No-Rise Condition

PREPARED FOR:	Keith Curtis, Pikes Peak Regional Building Department
COPY TO:	Kyle Hinton, PE CFM, Colorado Springs Utilities
DATE:	May 21, 2018
PROJECT NUMBER:	(CSU) - 201709348 (CH2M) - 694727
REVISION NO.:	1
APPROVED BY:	Troy Slocum, PE CFM

Introduction

This memorandum is prepared to provide a summary of the results of the hydrologic and hydraulic analyses of Dry Creek for the Dry Creek Stream Stabilization Project (Project) between Dawson Drive and Mark Dabling Boulevard in Colorado Springs, El Paso County, Colorado, and to provide justification for the results.

Project Description

The Project consists of preventing the continued degradation of the thalweg by constructing eight sculpted concrete drop structures (see Figure 1). The purpose of these improvements is to protect areas of a 12-inch Vitrified Clay Pipe (VCP) sanitary sewer owned by Colorado Springs Utilities. This sewer crosses the Dry Creek stream bed in several places; at these locations, the pipe is encased in concrete, but these encasements have become exposed as the channel degraded and are now in jeopardy of being washed out or damaged in an extreme flow event.

Soil lifts (see Figure 2) will be placed along steep banks as well to provide bank stabilization. These lifts will stabilize an eroded bank by replacing material that has been washed away during high flow events while also creating an area for vegetation to establish itself. These areas also have sanitary sewer manholes that are endangered due to erosion in the proximity and stabilizing these areas is a high priority.

Background

Hydrology

The hydrology for the Dry Creek Stream Stabilization project was selected by comparing the peak discharges two published reports:

Flood Insurance Study (FIS), El Paso County, Colorado and Incorporated Areas (Federal Emergency Management Agency, Revised August 23, 1999);

Monument Creek Watershed Restoration Master Plan, prepared by Matrix Design Group, October 31, 2016.

```
   99.95    6252  102.05 6252.46  103.55  6252.8  105.31 6253.31   106.7    6254
  109.47 6254.54  110.23 6255.31   110.9    6256  111.63 6257.12  112.14  6257.9
  112.42  6258.4  114.42 6259.34  114.97 6259.65  115.56 6260.95  115.91    6261
  116.59 6261.26  117.72 6262.16  119.52 6262.94  121.31 6264.31  122.04 6264.76
  126.62    6266  131.06  6267.9  132.05    6268  138.93 6268.87  144.33 6268.73
  148.59 6269.37

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
************************************************
       0    .045   61.19    .035  110.23    .045

Bank Sta: Left   Right    Coeff Contr.   Expan.
         61.19  110.23             .1       .3

Downstream  Deck/Roadway Coordinates
    num=      36
     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord
************************************************************************
       0    6274           3.403    6274           4.833    6274
    6.21    6274          10.278    6274          11.477    6274
  12.589    6274          19.1046275.475           20.666275.363
  20.8746275.456          21.3136275.598          21.9226275.777
  22.4536275.929            22.7    6276          22.919    6276
  23.424    6276          23.6246275.962          24.539 6275.79
  25.7196275.567          26.7956275.365          29.6516275.061
  30.8836274.875          31.788 6274.74          32.4546274.641
  32.9476274.568           38.676274.081          38.7496274.071
  38.8036274.064          38.839 6274.06           38.866274.058
  38.8826274.056           38.916274.055          39.612    6274
     76    6274    6269     158    6274    6269 204.453    6274

Downstream Bridge Cross Section Data
Station Elevation Data    num=      74
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
*********************************************************************************
       0 6263.01    4.25 6263.19    9.38 6262.98   16.26    6263   17.13 6263.03
   19.15    6264   23.13  6265.9   24.43    6266   29.24 6266.34   30.97    6266
   31.39 6265.67   34.64    6264   35.87 6263.04   37.23    6262    41.4 6261.79
   45.67 6261.71   50.67  6261.9   52.79 6261.96   53.74    6262   56.74 6262.14
   57.61 6262.29   61.85  6262.8   63.69    6262   67.41 6260.33   67.88    6260
   68.73 6259.73   71.23 6258.04   71.24 6257.78    75.1 6256.06    75.6  6255.7
   83.38    6254   90.34 6252.87    94.1 6252.14   94.82    6252  100.22 6250.11
  100.52    6250  100.59 6249.98  101.98  6249.2  104.14    6248  105.07 6247.54
  112.29 6246.17  116.33 6246.91  118.72 6247.13   119.3  6247.2  119.71    6248
  120.45 6248.51  121.55 6248.73  122.59    6250  123.44 6250.86  124.96    6252
  125.84  6253.9  125.95    6254  126.23 6254.16  128.67 6254.87  128.79    6256
  130.85 6256.05  130.86 6256.05   132.4 6256.06  135.14 6256.11  138.17 6256.11
  138.59 6256.11  141.39 6256.14  141.78 6256.15  142.11 6256.15   158.1 6257.16
  167.27 6257.54  169.01 6257.62  170.95 6257.68  172.44 6257.71  174.21 6257.74
  175.74 6257.75  176.82 6257.73  179.81 6257.61  203.67 6257.82

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
************************************************
       0    .045    94.1    .035  138.17    .045

Bank Sta: Left   Right    Coeff Contr.   Expan.
          94.1  138.17             .1       .3

Upstream Embankment side slope              =       0 horiz. to 1.0 vertical
Downstream Embankment side slope            =       0 horiz. to 1.0 vertical
Maximum allowable submergence for weir flow =     .98
Elevation at which weir flow begins         =
Energy head used in spillway design         =
Spillway height used in design              =
Weir crest shape                            = Broad Crested

Number of Abutments =  2

Abutment Data
Upstream     num=       5
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
*********************************************************************************
75.07019    6270 79.2196    626279.93875    625881.16893    625282.31493    6248
Downstream     num=       5
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
*********************************************************************************
74.19237    627088.84877    626690.98483    625892.37155    6252102.7727    6248

Abutment Data
Upstream     num=       5
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
*********************************************************************************
106.0858    6252107.9824    6254108.7302    6256112.0633    6262115.0919    6270
Downstream     num=       5
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
*********************************************************************************
134.1871    6256135.3065    6258136.1622    6262138.0318    6264158.0916    6270

Number of Bridge Coefficient Sets =  1

Low Flow Methods and Data
       Energy
Selected Low Flow Methods = Highest Energy Answer

High Flow Method
       Energy Only

Additional Bridge Parameters
       Add Friction component to Momentum
       Do not add Weight component to Momentum
       Class B flow critical depth computations use critical depth
           inside the bridge at the upstream end
       Criteria to check for pressure flow = Upstream energy grade line

CROSS SECTION


RIVER: Dry Creek
REACH: Dry Creek          RS: 501

INPUT
Description:
Station Elevation Data    num=      74
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
*********************************************************************************
       0 6263.01    4.25 6263.19    9.38 6262.98   16.26    6263   17.13 6263.03
   19.15    6264   23.13  6265.9   24.43    6266   29.24 6266.34   30.97    6266
   31.39 6265.67   34.64    6264   35.87 6263.04   37.23    6262    41.4 6261.79
   45.67 6261.71   50.67  6261.9   52.79 6261.96   53.74    6262   56.74 6262.14
   57.61 6262.29   61.85  6262.8   63.69    6262   67.41 6260.33   67.88    6260
   68.73 6259.73   71.23 6258.04   71.24 6257.78    75.1 6256.06    75.6  6255.7
   83.38    6254   90.34 6252.87    94.1 6252.14   94.82    6252  100.22 6250.11
  100.52    6250  100.59 6249.98  101.98  6249.2  104.14    6248  105.07 6247.54
  112.29 6246.17  116.33 6246.91  118.72 6247.13   119.3  6247.2  119.71    6248
  120.45 6248.51  121.55 6248.73  122.59    6250  123.44 6250.86  124.96    6252
  125.84  6253.9  125.95    6254  126.23 6254.16  128.67 6254.87  128.79    6256
  130.85 6256.05  130.86 6256.05   132.4 6256.06  135.14 6256.11  138.17 6256.11
  138.59 6256.11  141.39 6256.14  141.78 6256.15  142.11 6256.15   158.1 6257.16
```

```
  167.27 6257.54  169.01 6257.62  170.95 6257.68  172.44 6257.71  174.21 6257.74
  175.74 6257.75  176.82 6257.73  179.81 6257.61  203.67 6257.82

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
*********************************************
       0    .045    94.1    .035  138.17    .045

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
          94.1  138.17           7.8706  27.662 61.0882             .1       .3

CROSS SECTION OUTPUT  Profile #1700CFS
*************************************************************************************************
* E.G. Elev (ft)          * 6255.78  * Element               *  Left OB *  Channel * Right OB *
* Vel Head (ft)           *    1.13  * Wt. n-Val.            *   0.045  *   0.035  *          *
* W.S. Elev (ft)          * 6254.65  * Reach Len. (ft)       *    7.87  *   27.66  *   61.09  *
* Crit W.S. (ft)          *          * Flow Area (sq ft)     *   17.50  *  191.50  *          *
* E.G. Slope (ft/ft)      *0.004849  * Area (sq ft)          *   17.50  *  191.50  *          *
* Q Total (cfs)           * 1700.00  * Flow (cfs)            *   46.85  * 1653.15  *          *
* Top Width (ft)          *   47.51  * Top Width (ft)        *   13.70  *   33.82  *          *
* Vel Total (ft/s)        *    8.13  * Avg. Vel. (ft/s)      *    2.68  *    8.63  *          *
* Max Chl Dpth (ft)       *    8.48  * Hydr. Depth (ft)      *    1.28  *    5.66  *          *
* Conv. Total (cfs)       * 24412.8  * Conv. (cfs)           *   672.8  * 23740.0  *          *
* Length Wtd. (ft)        *   27.42  * Wetted Per. (ft)      *   13.93  *   38.38  *          *
* Min Ch El (ft)          * 6246.17  * Shear (lb/sq ft)      *    0.38  *    1.51  *          *
* Alpha                   *    1.10  * Stream Power (lb/ft s) *    1.02  *   13.04  *          *
* Frctn Loss (ft)         *    0.09  * Cum Volume (acre-ft)  *    0.14  *    1.65  *    0.32  *
* C & E Loss (ft)         *    0.18  * Cum SA (acres)        *    0.03  *    0.28  *    0.17  *
*************************************************************************************************

Warning: The velocity head has changed by more than 0.5 ft (0.15 m).  This may indicate the need for additional cross
         sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than
         1.4.  This may indicate the need for additional cross sections.

CROSS SECTION


RIVER: Dry Creek
REACH: Dry Creek          RS: 473

INPUT
Description:
Station Elevation Data    num=      69
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
*********************************************************************************
       0 6261.21    2.54 6260.95    5.94 6261.54   10.19 6261.22   13.49 6261.51
    16.3 6261.33   23.25 6260.64   26.27 6260.58   31.73 6260.07   32.02 6260.09
   32.12    6260   32.36 6259.91   36.15    6258    43.8 6256.66   44.98    6256
   58.24 6254.66   65.73    6254   66.29 6253.85   67.04 6253.66   67.51 6253.53
   73.01    6252   74.67 6251.63   75.22 6251.39   77.08 6251.01   78.76    6250
   82.89 6248.19   84.78    6248   85.36 6247.11   87.78    6246   90.45 6245.93
   90.97 6245.92   93.98 6245.62   94.91 6245.66   99.72 6245.79  102.37    6246
  103.15 6245.85  103.41 6246.29  104.06    6248  106.41 6249.78  106.59    6250
  106.83 6250.12  108.75    6252  111.48 6252.89  113.96 6253.35  116.32 6253.88
  116.59 6253.94  117.74    6254  119.39 6254.02  120.69 6254.03   122.6 6254.18
  123.19 6254.22  125.44 6254.36   126.9 6254.45  129.76 6254.45  132.97 6254.51
  153.35 6255.67   157.5 6255.91  158.19 6255.97  158.36 6255.97  160.01 6255.96
  162.54 6255.96  163.53 6255.97   165.8 6255.95  166.31 6255.95  168.31 6255.94
  169.96 6255.93  170.21 6255.91  177.07 6255.46  190.54 6255.75

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
*********************************************
       0    .045   66.29    .035  123.19    .045

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
          66.29  123.19           19.23   21.04 43.0578             .1       .3

CROSS SECTION OUTPUT  Profile #1700CFS
*************************************************************************************************
* E.G. Elev (ft)          * 6255.51  * Element               *  Left OB *  Channel * Right OB *
* Vel Head (ft)           *    0.52  * Wt. n-Val.            *   0.045  *   0.035  *   0.045  *
* W.S. Elev (ft)          * 6254.99  * Reach Len. (ft)       *   19.23  *   21.04  *   43.06  *
* Crit W.S. (ft)          *          * Flow Area (sq ft)     *    6.07  *  291.40  *    7.63  *
* E.G. Slope (ft/ft)      *0.002356  * Area (sq ft)          *    6.07  *  291.40  *    7.63  *
* Q Total (cfs)           * 1700.00  * Flow (cfs)            *    6.41  * 1686.75  *    6.84  *
* Top Width (ft)          *   86.42  * Top Width (ft)        *   11.31  *   56.90  *   18.21  *
* Vel Total (ft/s)        *    5.57  * Avg. Vel. (ft/s)      *    1.05  *    5.79  *    0.90  *
* Max Chl Dpth (ft)       *    9.37  * Hydr. Depth (ft)      *    0.54  *    5.12  *    0.42  *
* Conv. Total (cfs)       * 35021.5  * Conv. (cfs)           *   132.0  * 34748.5  *   141.0  *
* Length Wtd. (ft)        *   21.11  * Wetted Per. (ft)      *   11.38  *   61.90  *   18.23  *
* Min Ch El (ft)          * 6245.62  * Shear (lb/sq ft)      *    0.08  *    0.69  *    0.06  *
* Alpha                   *    1.07  * Stream Power (lb/ft s) *    0.08  *    4.01  *    0.06  *
* Frctn Loss (ft)         *    0.06  * Cum Volume (acre-ft)  *    0.14  *    1.50  *    0.31  *
* C & E Loss (ft)         *    0.02  * Cum SA (acres)        *    0.03  *    0.25  *    0.16  *
*************************************************************************************************

CROSS SECTION


RIVER: Dry Creek
REACH: Dry Creek          RS: 452

INPUT
Description:
Station Elevation Data    num=      48
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
*********************************************************************************
       0  6259.4     9.8 6259.27   11.43 6259.11      15 6258.39   19.22    6258
   20.11    6258   23.55 6257.85   43.48 6257.05   55.67 6256.73    60.3    6256
   63.89 6255.91   65.92 6255.74   73.77  6255.2    78.3 6255.18    79.8 6254.99
   86.87  6254.1   87.44    6254    92.7 6252.05   92.82    6252   96.15    6250
   97.57 6249.38  104.37 6248.71  104.72 6248.67  110.26    6248  111.88 6246.22
  111.95    6246  112.17 6245.81  112.46 6245.57  113.33    6246  115.85 6244.41
  116.64 6244.03  116.71 6244.16  118.47    6248  119.39 6248.83  121.43 6249.25
  122.81 6249.67  123.38 6249.85  124.22 6249.91  124.49 6249.93  125.07    6250
  127.19 6250.65  131.66    6252  136.78 6253.53   136.9 6253.58  137.98    6254
  159.24 6255.68  161.53 6255.79  162.76 6255.83

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
*********************************************
       0    .045    79.8    .035  136.9    .045

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
          79.8   136.9           30.6998   21.96    5.89             .1       .3

CROSS SECTION OUTPUT  Profile #1700CFS
*************************************************************************************************
* E.G. Elev (ft)          * 6255.42  * Element               *  Left OB *  Channel * Right OB *
* Vel Head (ft)           *    0.71  * Wt. n-Val.            *          *   0.035  *   0.045  *
* W.S. Elev (ft)          * 6254.71  * Reach Len. (ft)       *   30.70  *   21.96  *    5.89  *
* Crit W.S. (ft)          *          * Flow Area (sq ft)     *          *  250.00  *    4.20  *
* E.G. Slope (ft/ft)      *0.003918  * Area (sq ft)          *          *  250.00  *    4.20  *
* Q Total (cfs)           * 1700.00  * Flow (cfs)            *          * 1695.20  *    4.80  *
* Top Width (ft)          *   64.97  * Top Width (ft)        *          *   54.89  *   10.08  *
* Vel Total (ft/s)        *    6.69  * Avg. Vel. (ft/s)      *          *    6.78  *    1.14  *
* Max Chl Dpth (ft)       *   10.68  * Hydr. Depth (ft)      *          *    4.55  *    0.42  *
* Conv. Total (cfs)       * 27159.5  * Conv. (cfs)           *          * 27082.7  *    76.7  *
```

* Length Wtd. (ft)	* 21.93	* Wetted Per. (ft)	*	* 61.34	* 10.19 *
* Min Ch El (ft)	* 6244.03	* Shear (lb/sq ft)	*	* 1.00	* 0.10 *
* Alpha	* 1.03	* Stream Power (lb/ft s)	*	* 6.76	* 0.12 *
* Frctn Loss (ft)	* 0.12	* Cum Volume (acre-ft)	* 0.14	* 1.36	* 0.30 *
* C & E Loss (ft)	* 0.11	* Cum SA (acres)	* 0.03	* 0.23	* 0.15 *

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.

CROSS SECTION

RIVER: Dry Creek
REACH: Dry Creek RS: 430

INPUT
Description: U/S Face Drop Structure #2
Station Elevation Data num= 37

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	6257.99	.1	6257.99	15.86	6257.96	23.17	6257.96	30.02	6257.95
30.7	6257.95	32.07	6257.9	38.66	6257.73	58.58	6257.08	60.94	6256.99
65.27	6257.09	71.9	6256.69	75.65	6256.27	78.62	6256.18	84.91	6256
86.81	6255.34	88.51	6254	91.55	6252.88	94.67	6252	98.94	6250.3
100.76	6250	103.11	6249.51	108.81	6247.47	110.31	6247.47	111.81	6247.47
125.75	6249.6	126.25	6250	126.3	6250.02	128.15	6250.67	131.59	6252
134.04	6252.87	136.65	6253.79	137.54	6254	139.58	6254.02	140.38	6254.02
153.04	6254.71	160.88	6255.03						

Manning's n Values num= 5

Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
0	.045	78.62	.035	103.11	.025	125.75	.035	134.04	.045

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
78.62	134.04	5	5	.1	.3

CROSS SECTION OUTPUT Profile #1700CFS

* E.G. Elev (ft)	* 6255.19	* Element	* Left OB	* Channel * Right OB *
* Vel Head (ft)	* 1.79	* Wt. n-Val.	*	* 0.030 * 0.045 *
* W.S. Elev (ft)	* 6253.41	* Reach Len. (ft)	* 5.00	* 5.00 * 5.00 *
* Crit W.S. (ft)	* 6253.41	* Flow Area (sq ft)	*	* 158.36 * 0.41 *
* E.G. Slope (ft/ft)	*0.009037	* Area (sq ft)	*	* 158.36 * 0.41 *
* Q Total (cfs)	* 1700.00	* Flow (cfs)	*	* 1699.49 * 0.51 *
* Top Width (ft)	* 45.43	* Top Width (ft)	*	* 43.92 * 1.52 *
* Vel Total (ft/s)	* 10.71	* Avg. Vel. (ft/s)	*	* 10.73 * 1.25 *
* Max Chl Dpth (ft)	* 5.94	* Hydr. Depth (ft)	*	* 3.61 * 0.27 *
* Conv. Total (cfs)	* 17882.7	* Conv. (cfs)	*	* 17877.4 * 5.4 *
* Length Wtd. (ft)	* 5.00	* Wetted Per. (ft)	*	* 45.70 * 1.61 *
* Min Ch El (ft)	* 6247.47	* Shear (lb/sq ft)	*	* 1.96 * 0.14 *
* Alpha	* 1.00	* Stream Power (lb/ft s)	*	* 20.98 * 0.18 *
* Frctn Loss (ft)	* 0.05	* Cum Volume (acre-ft)	* 0.14	* 1.26 * 0.30 *
* C & E Loss (ft)	* 0.01	* Cum SA (acres)	* 0.03	* 0.20 * 0.15 *

Note: Manning's n values were composited to a single value in the main channel.

CROSS SECTION

RIVER: Dry Creek
REACH: Dry Creek RS: 425

INPUT
Description: D/S Crest Drop Structure #2
Station Elevation Data num= 44

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	6257.96	11.46	6257.96	20.01	6257.95	30.44	6257.95	38.34	6257.96
44.44	6257.8	58.97	6257.31	60.74	6257.25	66.19	6257.37	70.84	6257.08
79.07	6256.16	79.18	6256.16	84.62	6256	89.3	6254.39	89.8	6254
90.71	6253.66	96.62	6252	99.19	6250.97	100.77	6250	101.78	6249.52
103.79	6249.26	105.66	6248.82	105.83	6248.77	109.03	6248.06	109.32	6248.04
109.84	6248	117.36	6247.47	118.86	6247.47	120.36	6247.47	122.86	6247.65
126.46	6250	126.49	6250.01	127.06	6250.2	131.71	6252	133.23	6252.54
136.14	6253.57	137.45	6254	138.76	6254.03	140.35	6254.04	141.26	6254.05
142.45	6254.06	145.13	6254.08	149.64	6254.33	159.83	6254.74		

Manning's n Values num= 5

Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
0	.045	79.18	.035	109.32	.025	126.46	.035	133.23	.045

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
79.18	133.23	4.38	4.47	.1	.3

CROSS SECTION OUTPUT Profile #1700CFS

* E.G. Elev (ft)	* 6255.15	* Element	* Left OB	* Channel * Right OB *
* Vel Head (ft)	* 1.88	* Wt. n-Val.	*	* 0.031 * 0.045 *
* W.S. Elev (ft)	* 6253.27	* Reach Len. (ft)	* 4.38	* 4.47 * 4.38 *
* Crit W.S. (ft)	* 6253.27	* Flow Area (sq ft)	*	* 154.44 * 0.75 *
* E.G. Slope (ft/ft)	*0.009681	* Area (sq ft)	*	* 154.44 * 0.75 *
* Q Total (cfs)	* 1700.00	* Flow (cfs)	*	* 1698.80 * 1.20 *
* Top Width (ft)	* 43.19	* Top Width (ft)	*	* 41.13 * 2.06 *
* Vel Total (ft/s)	* 10.95	* Avg. Vel. (ft/s)	*	* 11.00 * 1.59 *
* Max Chl Dpth (ft)	* 5.80	* Hydr. Depth (ft)	*	* 3.76 * 0.36 *
* Conv. Total (cfs)	* 17277.6	* Conv. (cfs)	*	* 17265.4 * 12.2 *
* Length Wtd. (ft)	* 4.47	* Wetted Per. (ft)	*	* 43.23 * 2.19 *
* Min Ch El (ft)	* 6247.47	* Shear (lb/sq ft)	*	* 2.16 * 0.21 *
* Alpha	* 1.01	* Stream Power (lb/ft s)	*	* 23.75 * 0.33 *
* Frctn Loss (ft)	* 0.04	* Cum Volume (acre-ft)	* 0.14	* 1.24 * 0.30 *
* C & E Loss (ft)	* 0.02	* Cum SA (acres)	* 0.03	* 0.20 * 0.14 *

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.
Note: Manning's n values were composited to a single value in the main channel.

CROSS SECTION

RIVER: Dry Creek
REACH: Dry Creek RS: 421

INPUT
Description: D/S Toe Drops Structure #2; B0=3.0 Ft; LHS Z:1 =2.9; RHS z:1=1.58
Station Elevation Data num= 46

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	6257.93	21.11	6257.94	23.1	6257.94	25.52	6257.93	35.12	6257.96
40.72	6257.97	46.28	6257.98	49.83	6257.89	58.13	6257.61	59.12	6257.57
66.01	6257.73	67.96	6257.61	78.47	6256.44	82.4	6256.01	82.61	6256

```
    82.9  6255.9   86.29 6255.26   92.63    6254   92.78 6253.92   96.71    6252
    97.6 6251.74  100.43    6250  103.54 6248.52  104.69 6248.37  107.29    6248
  107.82 6247.86   115.3 6245.28   116.8 6245.28   118.3 6245.28  125.49 6249.84
  125.71    6250  127.88 6250.72  131.19    6252  131.96 6252.27  134.34 6253.12
  137.02    6254  139.51 6254.06   139.7 6254.06  141.61 6254.08  142.96 6254.08
  143.25 6254.09  144.38 6254.08  147.52  6254.1   148.1  6254.1  148.73 6254.09
  158.26 6254.48

Manning's n Values        num=       5
     Sta   n Val     Sta   n Val     Sta   n Val     Sta   n Val     Sta   n Val
*********************************************************************************
       0    .045   78.47    .035  107.82    .025  125.49    .035  131.96    .045

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         78.47  131.96          63.5818   48.23 28.4697             .1       .3

CROSS SECTION OUTPUT  Profile #1700CFS
*********************************************************************************************
* E.G. Elev (ft)          * 6254.64  * Element                *  Left OB *  Channel * Right OB *
* Vel Head (ft)           *    2.05  * Wt. n-Val.             *          *   0.030  *   0.045  *
* W.S. Elev (ft)          * 6252.60  * Reach Len. (ft)        *   63.58  *   48.23  *   28.47  *
* Crit W.S. (ft)          * 6252.60  * Flow Area (sq ft)      *          *  148.17  *    0.15  *
* E.G. Slope (ft/ft)      *0.009479  * Area (sq ft)           *          *  148.17  *    0.15  *
* Q Total (cfs)           * 1700.00  * Flow (cfs)             *          * 1699.86  *    0.14  *
* Top Width (ft)          *   37.39  * Top Width (ft)         *          *   36.47  *    0.92  *
* Vel Total (ft/s)        *   11.46  * Avg. Vel. (ft/s)       *          *   11.47  *    0.92  *
* Max Chl Dpth (ft)       *    7.32  * Hydr. Depth (ft)       *          *    4.06  *    0.16  *
* Conv. Total (cfs)       * 17461.4  * Conv. (cfs)            *          * 17459.9  *     1.4  *
* Length Wtd. (ft)        *   45.92  * Wetted Per. (ft)       *          *   39.74  *    0.97  *
* Min Ch El (ft)          * 6245.28  * Shear (lb/sq ft)       *          *    2.21  *    0.09  *
* Alpha                   *    1.00  * Stream Power (lb/ft s) *          *   25.31  *    0.08  *
* Frctn Loss (ft)         *    0.34  * Cum Volume (acre-ft)   *    0.14  *    1.23  *    0.30  *
* C & E Loss (ft)         *    0.32  * Cum SA (acres)         *    0.03  *    0.19  *    0.14  *
*********************************************************************************************

Warning: The energy equation could not be balanced within the specified number of iterations.  The program used critical
         depth for the water surface and continued on with the calculations.
Warning: The velocity head has changed by more than 0.5 ft (0.15 m).  This may indicate the need for additional cross
         sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated
         water surface came back below critical depth.  This indicates that there is not a valid subcritical answer.  The
         program defaulted to critical depth.
Note:    Manning's n values were composited to a single value in the main channel.

CROSS SECTION


RIVER: Dry Creek
REACH: Dry Creek          RS: 373

INPUT
Description:
Station Elevation Data    num=      63
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
*********************************************************************************
       0 6257.46   15.43 6257.18   19.41 6257.14   23.58 6257.09   41.11 6256.99
   60.22 6257.19   66.19 6256.97   77.54 6256.19   80.17 6256.01   80.63    6256
   82.81 6255.69    91.9    6254   93.72 6253.58   95.49    6252    96.8 6250.79
   98.22    6250  100.25 6248.89  100.59 6248.82  104.38 6248.05  104.47    6248
  104.82 6247.81  104.92 6247.78  109.57 6246.61  110.98 6246.19  117.07  6247.8
  117.24 6247.77  117.72    6248  120.06 6248.01   120.6 6248.02  122.61 6248.05
  124.27 6248.09  127.36 6248.04  129.62    6248  131.92 6247.95  132.35 6247.95
  132.61 6247.93   134.2 6247.71  134.78 6247.76  136.05 6247.78  136.17  6247.8
  136.26  6247.8  137.89    6248  141.52 6249.64  142.44    6250  142.82 6250.07
  144.37 6250.09  147.09 6251.25  148.39    6252   150.6    6252  151.41 6252.01
  151.51 6252.01  160.74 6252.73  165.57 6253.05  169.73 6253.02  174.37 6252.94
  176.73 6252.88  182.01 6252.91  188.32 6253.05  190.57  6253.1     196 6253.46
  198.91 6253.81  201.24 6253.99   212.1 6253.99

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
*************************************************
       0    .045   77.54    .035  127.36    .045

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         77.54  127.36          49.6747 37.5127 26.5659             .1       .3

CROSS SECTION OUTPUT  Profile #1700CFS
*********************************************************************************************
* E.G. Elev (ft)          * 6253.70  * Element                *  Left OB *  Channel * Right OB *
* Vel Head (ft)           *    0.97  * Wt. n-Val.             *          *   0.035  *   0.045  *
* W.S. Elev (ft)          * 6252.73  * Reach Len. (ft)        *   49.67  *   37.51  *   26.57  *
* Crit W.S. (ft)          *          * Flow Area (sq ft)      *          *  150.15  *   85.40  *
* E.G. Slope (ft/ft)      *0.005887  * Area (sq ft)           *          *  150.15  *   85.40  *
* Q Total (cfs)           * 1700.00  * Flow (cfs)             *          * 1302.51  *  397.49  *
* Top Width (ft)          *   66.05  * Top Width (ft)         *          *   32.69  *   33.37  *
* Vel Total (ft/s)        *    7.22  * Avg. Vel. (ft/s)       *          *    8.67  *    4.65  *
* Max Chl Dpth (ft)       *    6.54  * Hydr. Depth (ft)       *          *    4.59  *    2.56  *
* Conv. Total (cfs)       * 22157.3  * Conv. (cfs)            *          * 16976.5  *  5180.8  *
* Length Wtd. (ft)        *   35.02  * Wetted Per. (ft)       *          *   34.55  *   34.29  *
* Min Ch El (ft)          * 6246.19  * Shear (lb/sq ft)       *          *    1.60  *    0.92  *
* Alpha                   *    1.20  * Stream Power (lb/ft s) *          *   13.86  *    4.26  *
* Frctn Loss (ft)         *    0.29  * Cum Volume (acre-ft)   *    0.14  *    1.06  *    0.28  *
* C & E Loss (ft)         *    0.06  * Cum SA (acres)         *    0.03  *    0.15  *    0.13  *
*********************************************************************************************

Warning: The velocity head has changed by more than 0.5 ft (0.15 m).  This may indicate the need for additional cross
         sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than
         1.4.  This may indicate the need for additional cross sections.

CROSS SECTION


RIVER: Dry Creek
REACH: Dry Creek          RS: 335

INPUT
Description:
Station Elevation Data    num=      66
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
*********************************************************************************
       0 6256.71   45.36    6256   47.15    6256   53.67 6255.99    59.4 6255.99
   61.25    6256    69.4 6256.14   70.44 6256.15   77.85 6256.02      78 6256.02
   78.39 6256.02   80.64 6256.01   85.37 6256.01   89.21 6256.02   90.26 6256.01
   93.01    6256   95.65 6254.71    97.4    6254   98.01  6253.7  100.43    6252
    101 6251.79  101.14 6251.74  104.85  6250.2  105.23    6250  105.27 6249.97
  108.39    6248  108.76 6247.34  112.17 6245.08  112.25    6246  112.83 6244.95
  114.07 6245.03     115 6244.07   116.1 6243.83  118.31    6246  120.54 6247.33
  121.96 6247.51  125.27 6247.94  125.39 6247.96  125.85 6247.99  126.44    6248
  128.59 6248.02  129.63 6248.03  131.01 6248.03  133.57 6248.24  135.17 6248.48
  143.35 6249.93  145.37    6250  146.52 6250.02  148.36 6250.05  152.13 6250.34
  168.77    6252  171.28 6252.03  171.84 6252.03  174.23 6252.01  174.96    6252
  176.19    6252  186.35 6251.97  188.87 6251.97  198.27    6252  199.53    6252
  200.78 6252.03  202.11 6252.05  203.67 6252.06  206.36 6252.24  211.95 6252.47
   213.1 6252.41

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
*************************************************
```

```
       0    .045      78    .035  128.59    .045

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
            78  128.59          65.0492   36.47 14.7695             .1      .3

CROSS SECTION OUTPUT  Profile #1700CFS
*************************************************************************************************
* E.G. Elev (ft)          * 6253.35  * Element                *  Left OB *  Channel * Right OB *
* Vel Head (ft)           *    1.61  * Wt. n-Val.             *          *   0.035  *   0.045  *
* W.S. Elev (ft)          * 6251.74  * Reach Len. (ft)        *   65.05  *   36.47  *   14.77  *
* Crit W.S. (ft)          * 6251.74  * Flow Area (sq ft)      *          *  118.48  *   68.69  *
* E.G. Slope (ft/ft)      *0.012415  * Area (sq ft)           *          *  118.48  *   68.69  *
* Q Total (cfs)           * 1700.00  * Flow (cfs)             *          * 1323.68  *  376.32  *
* Top Width (ft)          *   65.01  * Top Width (ft)         *          *   27.45  *   37.57  *
* Vel Total (ft/s)        *    9.08  * Avg. Vel. (ft/s)       *          *   11.17  *    5.48  *
* Max Chl Dpth (ft)       *    7.91  * Hydr. Depth (ft)       *          *    4.32  *    1.83  *
* Conv. Total (cfs)       * 15257.5  * Conv. (cfs)            *          * 11880.0  *  3377.5  *
* Length Wtd. (ft)        *   31.69  * Wetted Per. (ft)       *          *   32.64  *   37.80  *
* Min Ch El (ft)          * 6243.83  * Shear (lb/sq ft)       *          *    2.81  *    1.41  *
* Alpha                   *    1.26  * Stream Power (lb/ft s) *          *   31.43  *    7.72  *
* Frctn Loss (ft)         *    0.25  * Cum Volume (acre-ft)   *    0.14  *    0.95  *    0.23  *
* C & E Loss (ft)         *    0.19  * Cum SA (acres)         *    0.03  *    0.13  *    0.11  *
*************************************************************************************************

Warning: The energy equation could not be balanced within the specified number of iterations.  The program used critical
         depth for the water surface and continued on with the calculations.
Warning: The velocity head has changed by more than 0.5 ft (0.15 m).  This may indicate the need for additional cross
         sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than
         1.4.  This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section.  This may indicate
         the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated
         water surface came back below critical depth.  This indicates that there is not a valid subcritical answer.  The
         program defaulted to critical depth.

CROSS SECTION


RIVER: Dry Creek
REACH: Dry Creek          RS: 299

INPUT
Description:
Station Elevation Data    num=      73
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
*********************************************************************************
       0 6254.87     .83 6254.87    6.79 6254.86    9.72 6254.87   20.28 6255.38
   28.93  6255.9   32.04 6255.92   33.92 6255.94   41.37 6255.97    41.8    6256
   45.38 6256.02   49.94 6256.04   50.74 6256.04   55.81 6256.01   57.45    6256
   58.85 6255.94   62.71 6255.92    66.2 6255.96   67.32 6255.97   69.32 6255.88
   70.61 6255.76   73.88  6255.9   74.91  6255.7   82.23 6254.68   85.74    6254
    87.1 6252.58   87.21 6252.46   88.16    6252   89.13 6251.41   91.47    6250
   92.67 6248.91   92.96    6248   93.87 6246.77   94.41    6246    94.9 6245.25
   96.32    6244   99.47  6243.8   99.63 6243.77  102.16  6243.5  103.33    6244
  105.18 6245.16  108.06    6246  109.78 6246.02  111.19 6246.02  115.53 6246.05
   116.4 6246.05  116.99 6246.04  117.76    6246  118.69 6245.96  119.48 6245.92
  121.34 6245.87   122.2 6245.85  123.48 6245.89  126.81    6246  130.35 6247.08
   133.1    6248  134.98 6249.02  137.65    6250  139.65 6250.31  141.04 6250.39
   153.3 6251.35  160.17 6251.92  162.44 6251.92   165.1 6251.93  169.03 6251.92
  178.42 6251.95  187.02    6252  189.55 6252.07  189.57 6252.07  189.71 6252.06
  191.75 6252.02  192.35    6252  197.79    6252

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
***********************************************
       0    .045    66.2    .035  118.69    .045

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
          66.2  118.69          43.2428   30.37 13.6839             .1      .3

CROSS SECTION OUTPUT  Profile #1700CFS
*************************************************************************************************
* E.G. Elev (ft)          * 6252.04  * Element                *  Left OB *  Channel * Right OB *
* Vel Head (ft)           *    0.98  * Wt. n-Val.             *          *   0.035  *   0.045  *
* W.S. Elev (ft)          * 6251.06  * Reach Len. (ft)        *   43.24  *   30.37  *   13.68  *
* Crit W.S. (ft)          *          * Flow Area (sq ft)      *          *  153.51  *   81.94  *
* E.G. Slope (ft/ft)      *0.005312  * Area (sq ft)           *          *  153.51  *   81.94  *
* Q Total (cfs)           * 1700.00  * Flow (cfs)             *          * 1328.18  *  371.82  *
* Top Width (ft)          *   59.82  * Top Width (ft)         *          *   28.97  *   30.85  *
* Vel Total (ft/s)        *    7.22  * Avg. Vel. (ft/s)       *          *    8.65  *    4.54  *
* Max Chl Dpth (ft)       *    7.56  * Hydr. Depth (ft)       *          *    5.30  *    2.66  *
* Conv. Total (cfs)       * 23324.5  * Conv. (cfs)            *          * 18223.0  *  5101.5  *
* Length Wtd. (ft)        *   27.92  * Wetted Per. (ft)       *          *   32.83  *   31.65  *
* Min Ch El (ft)          * 6243.50  * Shear (lb/sq ft)       *          *    1.55  *    0.86  *
* Alpha                   *    1.21  * Stream Power (lb/ft s) *          *   13.42  *    3.90  *
* Frctn Loss (ft)         *    0.20  * Cum Volume (acre-ft)   *    0.14  *    0.83  *    0.20  *
* C & E Loss (ft)         *    0.06  * Cum SA (acres)         *    0.03  *    0.11  *    0.10  *
*************************************************************************************************

Warning: The velocity head has changed by more than 0.5 ft (0.15 m).  This may indicate the need for additional cross
         sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than
         1.4.  This may indicate the need for additional cross sections.

CROSS SECTION


RIVER: Dry Creek
REACH: Dry Creek          RS: 268

INPUT
Description:
Station Elevation Data    num=      57
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
*********************************************************************************
       0 6253.97    4.21    6254    4.26    6254   18.36 6255.79   19.22 6255.88
   19.94 6255.91   20.43 6255.92   21.07 6255.86   25.87 6255.78   28.93 6255.46
   30.37 6255.56   31.47 6255.59   53.29 6254.33   59.02    6254   59.65 6253.66
   63.96    6252    64.8 6251.76   67.18    6250   70.29 6248.87   71.92 6248.43
   73.41    6248   76.82 6247.17   78.18    6246    79.1 6242.46   80.52 6243.94
   80.56 6243.99   80.69 6243.88    82.7 6242.16   82.89 6242.18   85.42 6242.26
    85.9 6242.84   87.62    6244   92.99 6245.55   94.43    6246   95.28 6246.18
   101.7 6247.58  102.22 6247.66  103.15 6247.81  103.62 6247.86   104.3    6248
  114.88    6249  126.58  6249.8   127.6 6249.88  127.91    6250  132.26 6250.72
  140.76    6252  146.98    6252  148.75 6252.01  149.88 6252.01  152.76    6252
  154.05 6251.99  157.38    6252  172.64    6252   176.3 6252.03  177.06 6252.04
  177.19 6252.04  179.04 6252.02

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
***********************************************
       0    .045    53.29    .035  102.22    .045

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         53.29  102.22            2.33    24.6    13.6             .1      .3

CROSS SECTION OUTPUT  Profile #1700CFS
*************************************************************************************************
* E.G. Elev (ft)          * 6251.77  * Element                *  Left OB *  Channel * Right OB *
```

* Vel Head (ft)	* 1.56	* Wt. n-Val.	*	* 0.035	* 0.045	*	
* W.S. Elev (ft)	* 6250.21	* Reach Len. (ft)	* 2.33	* 24.60	* 13.60	*	
* Crit W.S. (ft)	* 6250.20	* Flow Area (sq ft)	*	* 151.62	* 33.07	*	
* E.G. Slope (ft/ft)	*0.010564	* Area (sq ft)	*	* 151.62	* 33.07	*	
* Q Total (cfs)	* 1700.00	* Flow (cfs)	*	* 1571.83	* 128.17	*	
* Top Width (ft)	* 62.26	* Top Width (ft)	*	* 35.32	* 26.94	*	
* Vel Total (ft/s)	* 9.20	* Avg. Vel. (ft/s)	*	* 10.37	* 3.88	*	
* Max Chl Dpth (ft)	* 8.05	* Hydr. Depth (ft)	*	* 4.29	* 1.23	*	
* Conv. Total (cfs)	* 16540.2	* Conv. (cfs)	*	* 15293.2	* 1247.0	*	
* Length Wtd. (ft)	* 23.96	* Wetted Per. (ft)	*	* 41.40	* 27.09	*	
* Min Ch El (ft)	* 6242.16	* Shear (lb/sq ft)	*	* 2.42	* 0.80	*	
* Alpha	* 1.19	* Stream Power (lb/ft s)	*	* 25.04	* 3.12	*	
* Frctn Loss (ft)	* 0.09	* Cum Volume (acre-ft)	* 0.14	* 0.73	* 0.19	*	
* C & E Loss (ft)	* 0.33	* Cum SA (acres)	* 0.03	* 0.08	* 0.09	*	

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.

CROSS SECTION

RIVER: Dry Creek
REACH: Dry Creek RS: 244

INPUT
Description:
Station Elevation Data num= 60

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	6253.98	2.6	6254	3.02	6254.04	11.3	6255.1	14.64	6255.48
17.77	6255.58	20.06	6255.62	23.34	6255.27	26.71	6255.19	28.77	6254.96
31.66	6255.12	33.95	6255.18	53.18	6254	53.35	6253.9	53.51	6253.81
55.51	6252.4	56.26	6252	59.93	6250.53	60.52	6250	62.19	6249.25
64.67	6248.39	65.97	6248	66.2	6247.91	73.26	6246	73.46	6245.9
74.56	6245.36	81.54	6244.74	86.79	6244.01	86.85	6244	87.88	6242.6
89.73	6241.64	91.3	6241.47	93.18	6241.65	96.86	6242.86	99.18	6244
102.69	6244.96	104.93	6245.64	105.11	6245.72	105.88	6245.79	106.83	6245.91
107.6	6246	107.72	6246.02	111.81	6247.08	115.38	6248	124.96	6249.9
125.5	6249.99	125.85	6250	126.66	6250.01	127.83	6250.08	128	6250.08
131.13	6250.1	139.59	6250.86	145.62	6251.23	150.53	6251.49	158.31	6252
159.33	6252	168.09	6252.02	170.61	6252.02	175.24	6252.01	179.85	6252.01

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.045	53.35	.035	111.81	.045

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
53.35	111.81	2.34	6.07	30.6	.1	.3

CROSS SECTION OUTPUT Profile #1700CFS

* E.G. Elev (ft)	* 6251.34	* Element	* Left OB	* Channel	* Right OB *
* Vel Head (ft)	* 0.46	* Wt. n-Val.	*	* 0.035	* 0.045 *
* W.S. Elev (ft)	* 6250.88	* Reach Len. (ft)	* 2.34	* 6.07	* 30.60 *
* Crit W.S. (ft)	*	* Flow Area (sq ft)	*	* 293.41	* 38.85 *
* E.G. Slope (ft/ft)	*0.001872	* Area (sq ft)	*	* 293.41	* 38.85 *
* Q Total (cfs)	* 1700.00	* Flow (cfs)	*	* 1631.64	* 68.36 *
* Top Width (ft)	* 80.82	* Top Width (ft)	*	* 52.75	* 28.07 *
* Vel Total (ft/s)	* 5.12	* Avg. Vel. (ft/s)	*	* 5.56	* 1.76 *
* Max Chl Dpth (ft)	* 9.41	* Hydr. Depth (ft)	*	* 5.56	* 1.38 *
* Conv. Total (cfs)	* 39293.1	* Conv. (cfs)	*	* 37713.0	* 1580.1 *
* Length Wtd. (ft)	* 7.04	* Wetted Per. (ft)	*	* 55.70	* 28.42 *
* Min Ch El (ft)	* 6241.47	* Shear (lb/sq ft)	*	* 0.62	* 0.16 *
* Alpha	* 1.14	* Stream Power (lb/ft s)	*	* 3.42	* 0.28 *
* Frctn Loss (ft)	* 0.01	* Cum Volume (acre-ft)	* 0.14	* 0.60	* 0.17 *
* C & E Loss (ft)	* 0.04	* Cum SA (acres)	* 0.03	* 0.06	* 0.08 *

CROSS SECTION

RIVER: Dry Creek
REACH: Dry Creek RS: 238

INPUT
Description: U/S Crest Face, Drop Structure #1; LHS Z:1 =1.94; RHS Z:1 = 2.84
Station Elevation Data num= 47

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	6253.98	2.83	6254	3.62	6254.07	7.28	6254.55	12.23	6255.11
17.47	6255.24	21.7	6255.28	28.51	6254.51	29.93	6254.46	30.75	6254.36
35.54	6254.58	39.55	6254.63	49.19	6254	49.48	6253.83	50.8	6252.89
52.92	6252	56.03	6250.63	57.77	6250.1	58.09	6250	59.61	6249.6
64.99	6248	67.01	6247.17	71.34	6246	73.75	6244.78	83.15	6244.05
83.97	6244	84	6244	90.28	6240.75	91.78	6240.75	93.28	6240.75
99.79	6243.04	101.72	6244	106.52	6245.33	109.18	6245.96	109.33	6246
113.95	6247.19	114.43	6247.31	116.03	6247.65	117.43	6248	118.73	6248.25
119.81	6248.34	121.38	6248.51	132.19	6250	145.86	6251.46	152.12	6252
162.61	6252	163	6251.79						

Manning's n Values num= 5

Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
0	.045	57.77	.035	83.97	.025	99.79	.035	113.95	.045

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
57.77	113.95	5.0023	5.03	5.03	.1	.3

CROSS SECTION OUTPUT Profile #1700CFS

* E.G. Elev (ft)	* 6251.29	* Element	* Left OB	* Channel	* Right OB *
* Vel Head (ft)	* 0.34	* Wt. n-Val.	* 0.045	* 0.032	* 0.045 *
* W.S. Elev (ft)	* 6250.95	* Reach Len. (ft)	* 5.00	* 5.03	* 5.03 *
* Crit W.S. (ft)	*	* Flow Area (sq ft)	* 1.14	* 343.13	* 44.87 *
* E.G. Slope (ft/ft)	*0.001021	* Area (sq ft)	* 1.14	* 343.13	* 44.87 *
* Q Total (cfs)	* 1700.00	* Flow (cfs)	* 0.69	* 1633.62	* 65.69 *
* Top Width (ft)	* 85.83	* Top Width (ft)	* 2.48	* 56.18	* 27.17 *
* Vel Total (ft/s)	* 4.37	* Avg. Vel. (ft/s)	* 0.61	* 4.76	* 1.46 *
* Max Chl Dpth (ft)	* 10.20	* Hydr. Depth (ft)	* 0.46	* 6.11	* 1.65 *
* Conv. Total (cfs)	* 53196.3	* Conv. (cfs)	* 21.7	* 51119.1	* 2055.5 *
* Length Wtd. (ft)	* 5.03	* Wetted Per. (ft)	* 2.62	* 58.94	* 27.46 *
* Min Ch El (ft)	* 6240.75	* Shear (lb/sq ft)	* 0.03	* 0.37	* 0.10 *
* Alpha	* 1.15	* Stream Power (lb/ft s)	* 0.02	* 1.77	* 0.15 *
* Frctn Loss (ft)	* 0.00	* Cum Volume (acre-ft)	* 0.14	* 0.56	* 0.14 *
* C & E Loss (ft)	* 0.02	* Cum SA (acres)	* 0.03	* 0.05	* 0.06 *

Note: Manning's n values were composited to a single value in the main channel.

CROSS SECTION

RIVER: Dry Creek
REACH: Dry Creek RS: 233

INPUT

Description: Crest D/S Face, Drop Structure #1; Elev = 6240.74; LHS Z:1 =
8.7:1; RHS Z:1 = 2:1
Station Elevation Data num= 47

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	6253.98	2.39	6254	3.47	6254.1	4.41	6254.22	10.44	6254.9
16.89	6255.06	22.16	6255.1	30.76	6254.13	31.11	6254.11	31.31	6254.09
36.94	6254.33	41.68	6254.39	44.33	6254.22	47.18	6254	47.36	6253.87
47.9	6253.49	51.47	6252	53.19	6251.25	57.25	6250	59.51	6249.41
60.14	6249.24	64.29	6248	66.97	6246.89	70.27	6246	73.08	6244.57
80.66	6244	80.87	6243.96	84.36	6243.11	85.18	6242.79	88.51	6241.62
96.17	6240.74	97.67	6240.74	99.17	6240.74	106.17	6244.42	112.38	6245.95
112.57	6246	116.17	6246.99	119.02	6247.77	119.55	6247.85	120.04	6247.97
120.2	6248	121.2	6248.22	134.1	6250	143.06	6250.95	155.19	6252
164	6252	164.42	6251.77						

Manning's n Values num= 5

Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
0	.045	59.51	.035	88.51	.025	106.17	.035	116.17	.045

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
59.51	116.17	5 12.0278	33.8549	.1	.3

CROSS SECTION OUTPUT Profile #1700CFS

* E.G. Elev (ft)	* 6251.27	* Element	* Left OB	* Channel	* Right OB *
* Vel Head (ft)	* 0.27	* Wt. n-Val.	* 0.045	* 0.032	* 0.045 *
* W.S. Elev (ft)	* 6251.00	* Reach Len. (ft)	* 5.00	* 12.03	* 33.85 *
* Crit W.S. (ft)	*	* Flow Area (sq ft)	* 4.52	* 383.81	* 45.86 *
* E.G. Slope (ft/ft)	*0.000702	* Area (sq ft)	* 4.52	* 383.81	* 45.86 *
* Q Total (cfs)	* 1700.00	* Flow (cfs)	* 3.39	* 1640.50	* 56.11 *
* Top Width (ft)	* 89.56	* Top Width (ft)	* 5.49	* 56.66	* 27.41 *
* Vel Total (ft/s)	* 3.92	* Avg. Vel. (ft/s)	* 0.75	* 4.27	* 1.22 *
* Max Chl Dpth (ft)	* 10.25	* Hydr. Depth (ft)	* 0.82	* 6.77	* 1.67 *
* Conv. Total (cfs)	* 64144.8	* Conv. (cfs)	* 127.8	* 61899.8	* 2117.2 *
* Length Wtd. (ft)	* 12.72	* Wetted Per. (ft)	* 5.72	* 59.22	* 27.74 *
* Min Ch El (ft)	* 6240.74	* Shear (lb/sq ft)	* 0.03	* 0.28	* 0.07 *
* Alpha	* 1.15	* Stream Power (lb/ft s)	* 0.03	* 1.21	* 0.09 *
* Frctn Loss (ft)	* 0.00	* Cum Volume (acre-ft)	* 0.14	* 0.52	* 0.14 *
* C & E Loss (ft)	* 0.05	* Cum SA (acres)	* 0.03	* 0.04	* 0.06 *

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than
1.4. This may indicate the need for additional cross sections.
Note: Manning's n values were composited to a single value in the main channel.

CROSS SECTION

RIVER: Dry Creek
REACH: Dry Creek RS: 221

INPUT
Description: D/S Toe - Drop Structure #1; Toe Elev = 6234.59; LHS Z:1 = 1.1;
RHS Z:1 = 4.2:1
Station Elevation Data num= 70

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	6253.99	.79	6254	2.66	6254.04	4.68	6254.26	14.57	6254.3
25	6254.16	26.3	6254	27.94	6253.96	38.64	6253.15	44.85	6252.8
48.29	6252	52.22	6250.53	53.81	6250.04	53.95	6250	58.66	6248.77
60.42	6248.15	64.22	6246	65.92	6245.4	67.9	6244.7	69.18	6244
71.67	6242.99	73.57	6242	75.01	6241.48	77.41	6241.09	78.06	6241.03
80.44	6240.95	80.69	6240.83	81.68	6240.55	82.44	6240	82.98	6238.19
83.15	6238	83.2	6238.15	83.41	6238.81	87.36	6236.75	88.31	6234
88.72	6234.59	89.9	6234.36	91.32	6234.36	95.29	6235.02	97.58	6235.27
98.2	6235.42	98.35	6235.46	99.1	6235.9	100.67	6235.68	105.17	6237.08
106.41	6238	107.46	6238.82	110.55	6239.24	110.87	6239.45	111.7	6240
112.12	6240.36	114.6	6241.27	115.53	6242	116.32	6243.55	117.25	6243.82
117.88	6244	120.16	6245.27	121.47	6246	122.72	6246.48	124.53	6248
126.45	6249.36	126.53	6249.39	128.4	6248.88	129.53	6248.66	134.52	6248.47
134.85	6248.21	139.9	6249.04	147.7	6249.86	155.98	6250.89	165.08	6252

Manning's n Values num= 5

Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
0	.045	65.92	.035	83.15	.025	107.46	.035	117.25	.045

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
65.92	117.25	49.3372	26.48 36.8922	.1	.3

CROSS SECTION OUTPUT Profile #1700CFS

* E.G. Elev (ft)	* 6251.21	* Element	* Left OB	* Channel	* Right OB *
* Vel Head (ft)	* 0.10	* Wt. n-Val.	* 0.045	* 0.030	* 0.045 *
* W.S. Elev (ft)	* 6251.12	* Reach Len. (ft)	* 49.34	* 26.48	* 36.89 *
* Crit W.S. (ft)	*	* Flow Area (sq ft)	* 39.31	* 623.85	* 96.29 *
* E.G. Slope (ft/ft)	*0.000124	* Area (sq ft)	* 39.31	* 623.85	* 96.29 *
* Q Total (cfs)	* 1700.00	* Flow (cfs)	* 25.88	* 1613.17	* 60.95 *
* Top Width (ft)	* 107.17	* Top Width (ft)	* 15.26	* 51.33	* 40.57 *
* Vel Total (ft/s)	* 2.24	* Avg. Vel. (ft/s)	* 0.66	* 2.59	* 0.63 *
* Max Chl Dpth (ft)	* 17.11	* Hydr. Depth (ft)	* 2.58	* 12.15	* 2.37 *
* Conv. Total (cfs)	*152819.4	* Conv. (cfs)	* 2326.2	*145014.2	* 5479.1 *
* Length Wtd. (ft)	* 28.49	* Wetted Per. (ft)	* 16.38	* 60.08	* 42.57 *
* Min Ch El (ft)	* 6234.00	* Shear (lb/sq ft)	* 0.02	* 0.08	* 0.02 *
* Alpha	* 1.27	* Stream Power (lb/ft s)	* 0.01	* 0.21	* 0.01 *
* Frctn Loss (ft)	* 0.00	* Cum Volume (acre-ft)	* 0.13	* 0.38	* 0.08 *
* C & E Loss (ft)	* 0.01	* Cum SA (acres)	* 0.03	* 0.03	* 0.03 *

Note: Manning's n values were composited to a single value in the main channel.

CROSS SECTION

RIVER: Dry Creek
REACH: Dry Creek RS: 194

INPUT
Description:
Station Elevation Data num= 55

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
-3.2	6252	0	6250.95	1.25	6250.53	2.25	6250.35	2.98	6250
3.71	6249.75	13.88	6244.45	14.6	6244	17.72	6242.49	18.92	6242.19
19.3	6242	19.98	6241.76	25.78	6240	29.55	6239.5	31.32	6239.27
41.61	6238.19	42.7	6238.08	43.39	6238	43.55	6238	48.53	6236.12
48.66	6236	48.74	6235.94	52.82	6234.57	52.86	6234.58	53.27	6235
54.06	6235	56.45	6234.8	59.7	6234.8	60.75	6235.57	61.33	6235.87
61.48	6236	61.86	6236.17	63.76	6237.14	66.66	6238.57	66.71	6237.92
68.21	6237.34	71.01	6237.7	71.28	6237.4	72.5	6237.38	72.62	6238.09
72.75	6238.97	72.78	6240	73.54	6240.48	75.28	6241.56	75.51	6242
78.21	6243.33	79.17	6244	81.34	6245.18	81.77	6246	83.04	6246.58
85.15	6248	87.6	6249.06	89.47	6250	95.64	6250.35	131.64	6252

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
-3.2	.045	29.55	.035	73.54	.045

U.S. Army Corps of Engineers (USACE)

NATIONWIDE PERMIT PRE-CONSTRUCTION NOTIFICATION (PCN)

33 CFR 330. The proponent agency is CECW-CO-R.

Form Approved - OMB No. 0710-0003 Expires: 02-28-2022

DATA REQUIRED BY THE PRIVACY ACT OF 1974

Authority Rivers and Harbors Act, Section 10, 33 USC 403; Clean Water Act, Section 404, 33 USC 1344; Regulatory Program of the Corps of Engineers (Corps); Final Rule 33 CFR 320-332.

Principal Purpose Information provided on this form will be used in evaluating the nationwide permit pre-construction notification.

Routine Uses This information may be shared with the Department of Justice and other federal, state, and local government agencies, and the public and may be made available as part of the agency coordination process.

Disclosure Submission of requested information is voluntary, however, if information is not provided the permit application cannot be evaluated nor can a permit be issued.

The public reporting burden for this collection of information, 0710-0003, is estimated to average 11 hours per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding the burden estimate or burden reduction suggestions to the Department of Defense, Washington Headquarters Services, at whs.mc-alex.esd.mbx.dd-dod-information-collections@mail.mil. Respondents should be aware that notwithstanding any other provision of law, no person shall be subject to any penalty for failing to comply with a collection of information if it does not display a currently valid OMB control number.

PLEASE DO NOT RETURN YOUR RESPONSE TO THE ABOVE EMAIL.

One set of original drawings or good reproducible copies which show the location and character of the proposed activity must be attached to this application (*see sample drawings and/or instructions*) and be submitted to the district engineer having jurisdiction over the location of the proposed activity. An application that is not completed in full will be returned.

(ITEMS 1 THRU 4 TO BE FILLED BY THE CORPS)

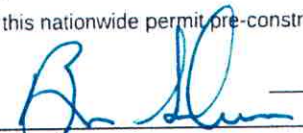
1. APPLICATION NO.	2. FIELD OFFICE CODE	3. DATE RECEIVED	4. DATE APPLICATION COMPLETE

(ITEMS BELOW TO BE FILLED BY APPLICANT)

5. APPLICANT'S NAME	8. AUTHORIZED AGENT'S NAME AND TITLE (*agent is not required*)
First - Brian Middle - Last - Schumannn	First - David Middle - L Last - Mijares
Company - BCC Management, LLC	Company - Catamount Engineering
Company Title - Manager	E-mail Address - David@Catamounteng.com
E-mail Address - schumanncom@comcast.net	
6. APPLICANT'S ADDRESS	**9. AGENT'S ADDRESS**
Address- 150 Wuthering Heights	Address- 321 West Henrietta Ave, Suite A
City - Colorado Springs State - CO Zip - 80921 Country - USA	City - Woodland Park State - CO Zip - 80863 Country - USA
7. APPLICANT'S PHONE NOs. with AREA CODE	**10. AGENT'S PHONE NOs. with AREA CODE**
a. Residence b. Business c. Fax d. Mobile	a. Residence b. Business c. Fax d. Mobile
719 484-0480	NA 719 426-2124 NA 719 337-8351

STATEMENT OF AUTHORIZATION

11. I hereby authorize, David Mijares to act in my behalf as my agent in the processing of this nationwide permit pre-construction notification and to furnish, upon request, supplemental information in support of this nationwide permit pre-construction notification.



3-30-23
DATE

NAME, LOCATION, AND DESCRIPTION OF PROJECT OR ACTIVITY

12. PROJECT NAME or TITLE (*see instructions*)
Cottages at Dry Creek

NAME, LOCATION, AND DESCRIPTION OF PROJECT OR ACTIVITY

13. NAME OF WATERBODY, IF KNOWN (*if applicable*)
Dry Creek

14. PROPOSED ACTIVITY STREET ADDRESS (*if applicable*)
6550 Mark Dabbling Blvd

15. LOCATION OF PROPOSED ACTIVITY (*see instructions*)

Latitude	°N	Longitude	°W
38.926805	N	-104.816754	W

City: Colorado Springs
State: CO
Zip: 80919

16. OTHER LOCATION DESCRIPTIONS, IF KNOWN (*see instructions*)

State Tax Parcel ID
6307405007 & 6307405008

Municipality
Colorado Springs

Section	Township	Range
7	13 South	66 West

17. DIRECTIONS TO THE SITE
Located at 6550 Mark Dabbling Blvd. The applicable reach of Dry creek resides in a drainage between two private parcels (6307405007 & 6307405008). From Interstate 25 and East Woodmen Road; 0.1 miles east to Commerce Center Drive (turn south), 0.1 miles follow Commerce Center Drive turn rights (east) onto Mark Dabbling Blvd. Travel 0.4 miles south to Dry creek crossing.

18. IDENTIFY THE SPECIFIC NATIONWIDE PERMIT(S) YOU PROPOSE TO USE
Nationwide Permit 7
Outfall Structures and Associated Intake Structures

19. DESCRIPTION OF PROPOSED NATIONWIDE PERMIT ACTIVITY (*see instructions*)
(4) 12"/18" RCP storm sewer outfalls and the associated rip-rap dissipation pads (33.45 sq. ft, each); depositing directly to Dry Creek at existing sculpted concrete drops. Buried Soil Rip Rap emergency overflow rundowns from proposed adjacent water quality ponds. Directional boring of water mains below creek. No proposed dredging or filling of the reach with proposed improvements.

20. DESCRIPTION OF PROPOSED MITIGATION MEASURES (*see instructions*)
Work being completed under City of Colorado Springs Grading and Erosion Control Plan. Permanent disturbance only composed of riprap outfalls from storm sewer (total exposed outfall (133.8 sf). Temporary disturbance of 1,426 sf from pipe installation and buried soil rip rap to be covered with minimum of 6" topsoil and revegetated.

21. PURPOSE OF NATIONWIDE PERMIT ACTIVITY (*Describe the reason or purpose of the project, see instructions*)
Outfall construction of drainage and water quality features supporting upstream residential development. No additional channel reconstruction proposed as the reach was recently improved (2002) by the City of Colorado Springs.

22. QUANTITY OF WETLANDS, STREAMS, OR OTHER TYPES OF WATERS DIRECTLY AFFECTED BY PROPOSED NATIONWIDE PERMIT ACTIVITY (*see instructions*)

Acres	Linear Feet	Cubic Yards Dredged or Discharged
0.03 temporary	63.60	105.8 CY excavated and replaced for spillway

Each PCN must include a delineation of wetlands, other special aquatic sites, and other waters, such as lakes and ponds, and perennial, intermittent, and ephemeral streams, on the project site.

23. List any other NWP(s), regional general permit(s), or individual permit(s) used or intended to be used to authorize any part of the proposed project or any related activity. (*see instructions*)
No other permits

24. If the proposed activity will result in the loss of greater than 1/10-acre of wetlands and requires pre-construction notification, explain how the compensatory mitigation requirement in paragraph (c) of general condition 23 will be satisfied, or explain why the adverse environmental effects are no more than minimal and why compensatory mitigation should not be required for the proposed activity.
Total disturbance of 0.03 acres

25. Is any portion of the nationwide permit activity already complete? ☐ Yes ☑ No If Yes, describe the completed work:

26. List the name(s) of any species listed as endangered or threatened under the Endangered Species Act that might be affected by the proposed NWP activity or utilize the designated critical habitat that might be affected by the proposed NWP activity. (*see instructions*)

Preble's Meadow Jumping Mouse, Gray Wolf

27. List any historic properties that have the potential to be affected by the proposed NWP activity or include a vicinity map indicating the location of the historic property or properties. (*see instructions*)

No historic properties will be affected.

28. For a proposed NWP activity that will occur in a component of the National Wild and Scenic River System, or in a river officially designated by Congress as a "study river" for possible inclusion in the system while the river is in an official study status, identify the Wild and Scenic River or the "study river":

Not a listed or study river.

29. If the proposed NWP activity also requires permission from the Corps pursuant to 33 U.S.C. 408 because it will alter or temporarily or permanently occupy or use a U.S. Army Corps of Engineers federally authorized civil works project, have you submitted a written request for section 408 permission from the Corps district having jurisdiction over that project? ☐ Yes ☒ No

If "yes", please provide the date your request was submitted to the Corps district:

30. If the terms of the NWP(s) you want to use require additional information to be included in the PCN, please include that information in this space or provide it on an additional sheet of paper marked Block 30. (*see instructions*)

Nationwide Permit 7.

31. Pre-construction notification is hereby made for one or more nationwide permit(s) to authorize the work described in this notification. I certify that the information in this pre-construction notification is complete and accurate. I further certify that I possess the authority to undertake the work described herein or am acting as the duly authorized agent of the applicant.

3-30-23
DATE

3.30.23
DATE

The pre-construction notification must be signed by the person who desires to undertake the proposed activity (applicant) and, if the statement in Block 11 has been filled out and signed, the authorized agent.

18 U.S.C. Section 1001 provides that: Whoever, in any manner within the jurisdiction of any department or agency of the United States knowingly and willfully falsifies, conceals, or covers up any trick, scheme, or disguises a material fact or makes any false, fictitious or fraudulent statements or representations or makes or uses any false writing or document knowing same to contain any false, fictitious or fraudulent statements or entry, shall be fined not more than $10,000 or imprisoned not more than five years or both.

DRAINAGE MAP

SUMMARY OF PEAK FLOWS @ MAJOR DESIGN POINTS

TABLE 4

	EXISTING PEAK FLOWS (CFS)			DEVELOPED PEAK FLOWS (CFS)		
DESIGN POINT	5-YEAR	100-YEAR	500-YEAR	5-YEAR	100-YEAR	500-YEAR
32	462	1724	2519	653	2032	3059
40	107	228	292	694	2158	3232
43	465	1818	2686	721	2274	157
45	466	1927	2847	711	2479	3538
51	235	529	687	239	536	695
52	483	1920	2840	776	2509	3560
54	462	1921	2827	789	2528	3725
57	453	1956	2938	784	2586	3761
62	27	113	200	76	246	351
64	80	373	594	107	458	711
66	45	192	289	58	224	329
67	17	80	122	22	93	138
68	26	145	229	35	172	265
69	30	95	135	30	95	135

UNITED STATES AIR FORCE ACADEMY

EL PASO COUNTY

NORTH BASIN

DRY CREEK BASIN

NORTH ROCKRIMMON BASIN

SCHOOL

DP 32 DP 40 DP 41 DP 42 DP 43 DP 44 DP 45 DP 46 DP 47 DP 48 DP 49 DP 50 DP 51 DP 52 DP 53 DP 54 DP 55 DP 56 DP 57 DP 58 DP 59 DP 61 DP 62 DP 63 DP 64 DP 65 DP 66 DP 67 DP 68 DP 69

E 18,000 E 20,000 E 22,000 E 24,000 E 26,000 E 28,000 E 30,000 E 32,000

N 32,000 N 30,000 N 28,000 N 26,000 N 22 N 20,000

MASTER DRAINAGE MAP

4A

DATE	REV	BY

KKBNA
Incorporated
Consulting Engineers

DRY CREEK BASIN STUDY

JOB NO 7819.01 | SCALES 1"= 400' | SHT . OF 6

ORTHOPHOTO PREPARED BY
ANALYTICAL SURVEYS INC.
COLORADO SPRINGS, CO.

SCALE 1"=400' C.I. 5'

LEGEND

- DRY CREEK BASIN BOUNDARY
- SUB-BASIN BOUNDARY
- DESIGN POINT
- CITY LIMITS BOUNDARY
- AIR FORCE BOUNDARY
- FLOWLINE

MP 68+2429'
MP 68+2183'
2-EXIST. 18" STEEL PIPES UNDER 48" CMP
EXIST. 48" CMP 80'
EXIST. 18" STEEL PIPE
EXIST. 36" CMP 52'
DENVER & RIO GRANDE WESTERN RAILROAD
EXTEND EXIST. 18" STEEL PIPE 4.45' TO JUNCTION B-2
S 33°28' 20" W
M.H. B3
238.84' - 36" RCP @ 1.15%
JUNCTION B2
M.H. B1
9.20' - 36" RCP @ 1.20%
92.00' - 48" RCP @ 1.03%
M.H. B4
M.H. 25
EXISTING 8" GAS
96.0' - 48" RCP @ 25.70%
PROPOSED 48" SAN. SEWER (BY OTHERS)
EXISTING 18" SAN. SEWER
GASCADE
AVENUE
6238.0 TOP OF CRIB-LOCK SLOPE 1/4:1
6218.0 TOE OF CRIBLOCK
5' THICK RIPRAP BLANKET (D_{50} = 30") TO EXTEND OUT FROM PIPE 25'.
M.H. 26
·PLAN VIEW·
·STORM SEWER·
SCALE 1" = 20'
PROJECT AREA
CORPORATE CENTRE SITE
CASCADE AVE
CORPORATE DRIVE
·KEY MAP·
N.T.S.
M.H. B1
JUNCTION B-2
M.H. B3
M.H. B-4
EXTEND EXIST. 18" STEEL PIPE 4.45' TO JUNCTION B-2
238.84' - 36" CL. III R.C.P. @ 1.15%
92.00' - 48" CL. III R.C.P. @ 1.03%
9.20' - 36" CL. III R.C.P. @ 1.20%
M.H. B4
℄ ROAD
96.0' - 48" Ø CL. III R.C.P. @ 25.70%
TOP OF CRIB-LOCK - 6238.0
VERIFY LOCATION & PROTECT EXIST. 8" GAS LINE
PROTECT PROPOSED 48" Ø SAN. SEWER (BY OTHERS), VERIFY LOC.
VERIFY & PROTECT EXIST. 18" SAN. SEWER
CONCRETE BULKHEAD, SEE DETAIL ON SHEET 4.
5' THICK LAYER OF RIP RAP
BOTTOM OF BULKHEAD - 6218.0

MERRICK — Merrick & Company, 10855 East Bethany Drive, Denver, CO 303-751-0741

SCALE — PLAN: 1" = 20'; PROFILE: 1" = 20' HORIZ., 1" = 5' VERT.

THE ROCKRIMMON CLIFFS JOINT VENTURE

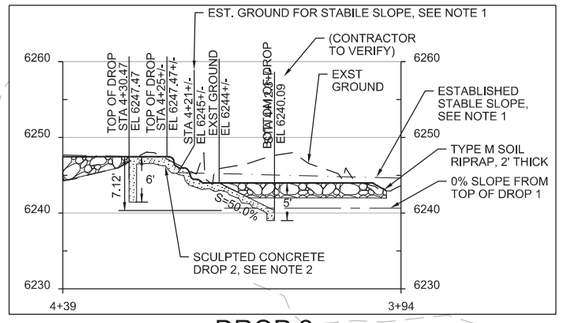
THE CORPORATE CENTRE

REVISION	DATE	REVISION	DATE

DESIGNED MWG/BRR
DRAWN BRR
CHECKED MWG
JOB NO. 286-4390
DATE 11/11/82

STORM SEWER PLAN & PROFILE

SHEET 1 OF 4



DROP 2

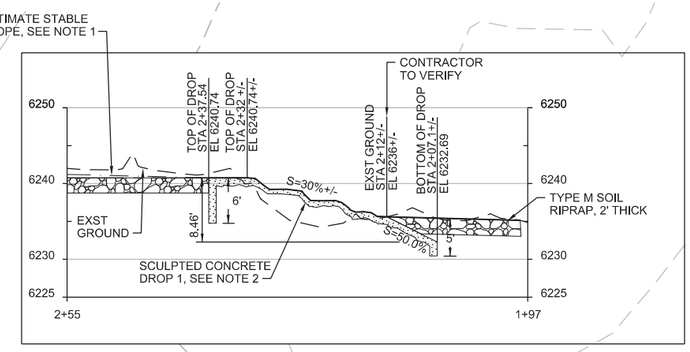
H:1"=10'-0"
V:1"=10'-0"

DROP #2 COGO TABLE

POINT NAME	NORTHING	EASTING	ELEVATION
11	1398974.85	3194354.66	6249.1
12	1398975.88	3194365.95	6249.1
13	1398975.19	3194376.39	6248.8
14	1398968.71	3194376.94	6244.0
15	1398968.50	3194374.22	6244.0
16	1398968.81	3194367.96	6244.0
17	1398966.84	3194367.93	6244.0
18	1398966.35	3194374.06	6244.0
19	1398966.49	3194376.90	6244.0
20	1398960.08	3194375.92	6249.2
21	1398960.42	3194366.11	6249.1
22	1398960.16	3194356.77	6248.8
502	1398970.61	3194354.93	6247.5
503	1398962.85	3194356.46	6247.5

NOTE:

POINTS ARE GIVEN FOR PRELIMINARY STAKING. CONTRACTOR TO WORK WITH OWNER'S REPRESENTATIVE TO FIELD FIT DROP STRUCTURE, SEE NOTE 2. POINTS ARE TO FINISHED GRADE.



DROP 1

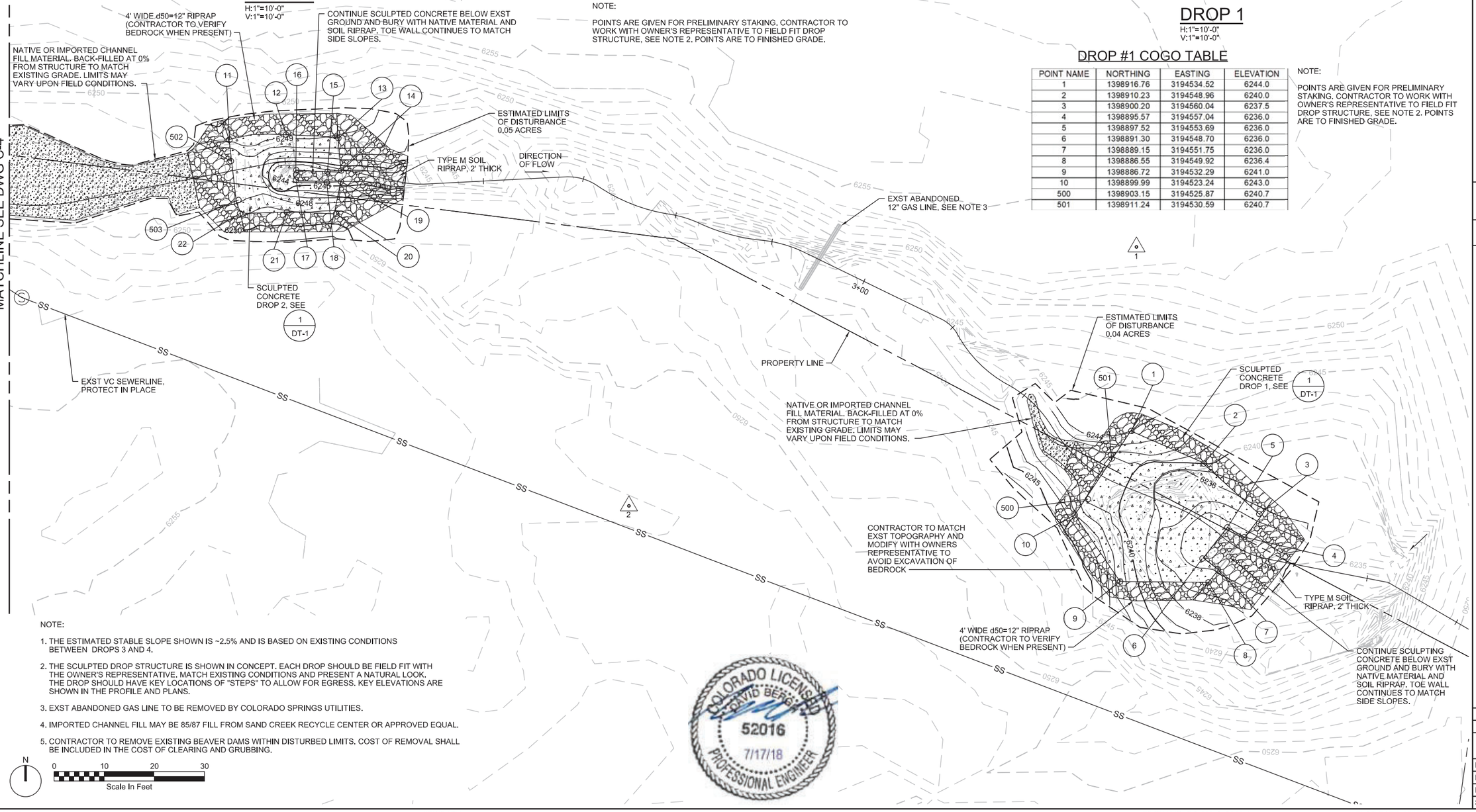
H:1"=10'-0"
V:1"=10'-0"

DROP #1 COGO TABLE

POINT NAME	NORTHING	EASTING	ELEVATION
1	1398916.76	3194534.52	6244.0
2	1398910.23	3194548.96	6240.0
3	1398900.20	3194560.04	6237.5
4	1398895.57	3194557.04	6236.0
5	1398897.52	3194553.69	6236.0
6	1398891.30	3194548.70	6236.0
7	1398889.15	3194551.75	6236.0
8	1398886.55	3194549.92	6236.4
9	1398886.72	3194532.29	6241.0
10	1398899.99	3194523.24	6243.0
500	1398903.15	3194525.87	6240.7
501	1398911.24	3194530.59	6240.7

NOTE:

POINTS ARE GIVEN FOR PRELIMINARY STAKING, CONTRACTOR TO WORK WITH OWNER'S REPRESENTATIVE TO FIELD FIT DROP STRUCTURE, SEE NOTE 2. POINTS ARE TO FINISHED GRADE.



NOTE:

1. THE ESTIMATED STABLE SLOPE SHOWN IS ~2.5% AND IS BASED ON EXISTING CONDITIONS BETWEEN DROPS 3 AND 4.
2. THE SCULPTED DROP STRUCTURE IS SHOWN IN CONCEPT. EACH DROP SHOULD BE FIELD FIT WITH THE OWNER'S REPRESENTATIVE. MATCH EXISTING CONDITIONS AND PRESENT A NATURAL LOOK. THE DROP SHOULD HAVE KEY LOCATIONS OF "STEPS" TO ALLOW FOR EGRESS. KEY ELEVATIONS ARE SHOWN IN THE PROFILE AND PLANS.
3. EXST ABANDONED GAS LINE TO BE REMOVED BY COLORADO SPRINGS UTILITIES.
4. IMPORTED CHANNEL FILL MAY BE 85/87 FILL FROM SAND CREEK RECYCLE CENTER OR APPROVED EQUAL.
5. CONTRACTOR TO REMOVE EXISTING BEAVER DAMS WITHIN DISTURBED LIMITS. COST OF REMOVAL SHALL BE INCLUDED IN THE COST OF CLEARING AND GRUBBING.

N

0 10 20 30
Scale In Feet

COLORADO LICENSED
DAVID BERG
52016
7/17/18
PROFESSIONAL ENGINEER

NO.	DATE	REVISION	DR	BS	CHK	DH	APVD	BY	APVD
DSGN							DB		TS

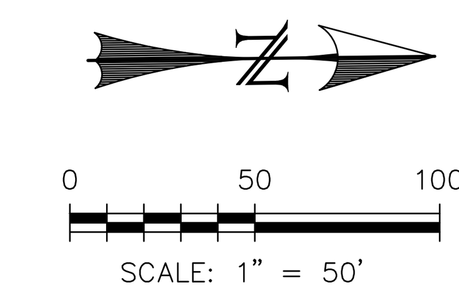
9189 SOUTH JAMAICA ST
ENGLEWOOD, CO 80112
ch2m.
Colorado Springs Utilities
It's how we're all connected

DRY CREEK STREAM STABILIZATION
CIVIL
DROP 1 & 2

VERIFY SCALE
BAR IS ONE INCH ON ORIGINAL DRAWING.
0 1"

DATE	JULY 2018
PROJ	694727
DWG	C-3
SHEET	9 of 24

Final DOCUMENT



AREA CALCULATIONS						
AREA ID	TOTAL AREA (SQ FT)	DCIA AREA (SQ FT)	SPA AREA (SQ FT)	UIA AREA (SQ FT)	RPA AREA (SQ FT)	WQCV REDUCTION
A	228690	67712	103804	32587	24587	32%
B	128066	28361	60525	28804	10376	50%
C1	28846	0	5350	21738	1758	52%
C2	75922	21212	29392	25318	6576	55%
TOTAL	468100	117285	199071	108447	43297	46%

RUNOFF REDUCTION LEGEND

AREA ID
SURFACE SHEET FLOW DIRECTION
PROPERTY BOUNDARY
RIGHT-OF-WAY
LOT LINE
(E) STORM SEWER, INLET, MH
(P) STORM SEWER, INLET, MH
DRAINAGE BASIN BOUNDARY
(P) DRAINAGE SWALE
(E) STREAMSIDE OVERLAY OUTER
(E) STREAMSIDE OVERLAY INNER
(E) FLOODPLAIN ZONE – AE
(E) FLOODPLAIN ZONE – X

REV.	DESCRIPTION	DATE

Know what's below. Call 72 hours before you dig. For more details visit: www.call811.com

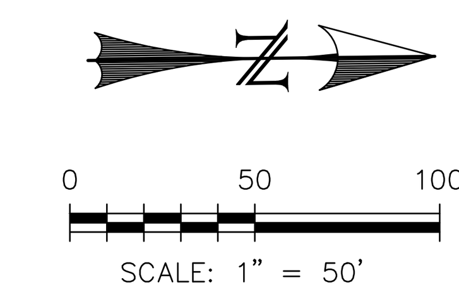
PREPARED FOR:
BCC MANAGEMENT, LLC
150 WUTHERING HEIGHTS DRIVE
COLORADO SPRINGS, CO 80921

CATAMOUNT ENGINEERING
321 W. HENRIETTA AVE WOODLAND PARK, CO 80866
PO BOX 221 (719)426-2124

MARK DRABLING COTTAGES
NORTH PORTION

RUNOFF REDUCTION

DESIGNED BY: DLM
DRAWN BY: DLM
SCALE: 1" = 100'
DATE: 12/20/22
JOB NUMBER: 20–270
SHEET: 1 OF 1



AREA CALCULATIONS						
AREA ID	TOTAL AREA (SQ FT)	DCIA AREA (SQ FT)	SPA AREA (SQ FT)	UIA AREA (SQ FT)	RPA AREA (SQ FT)	WQCV REDUCTION
A	228690	67712	103804	32587	24587	32%
B	128066	28361	60525	28804	10376	50%
C1	28846	0	5350	21738	1758	52%
C2	75922	21212	29392	25318	6576	55%
TOTAL	468100	117285	199071	108447	43297	46%

RUNOFF REDUCTION LEGEND

- AREA ID (3)
- SURFACE SHEET FLOW DIRECTION
- PROPERTY BOUNDARY
- RIGHT-OF-WAY
- LOT LINE
- (E) STORM SEWER, INLET, MH
- (P) STORM SEWER, INLET, MH
- DRAINAGE BASIN BOUNDARY
- (P) DRAINAGE SWALE
- (E) STREAMSIDE OVERLAY OUTER (SS-O)
- (E) STREAMSIDE OVERLAY INNER (SS-I)
- (E) FLOODPLAIN ZONE – AE (Z-AE)
- (E) FLOODPLAIN ZONE – X (Z-X)

REV.	DESCRIPTION	DATE

811 Know what's below. Call 72 hours before you dig. For more details visit: www.call811.com

PREPARED FOR:

BCC MANAGEMENT, LLC

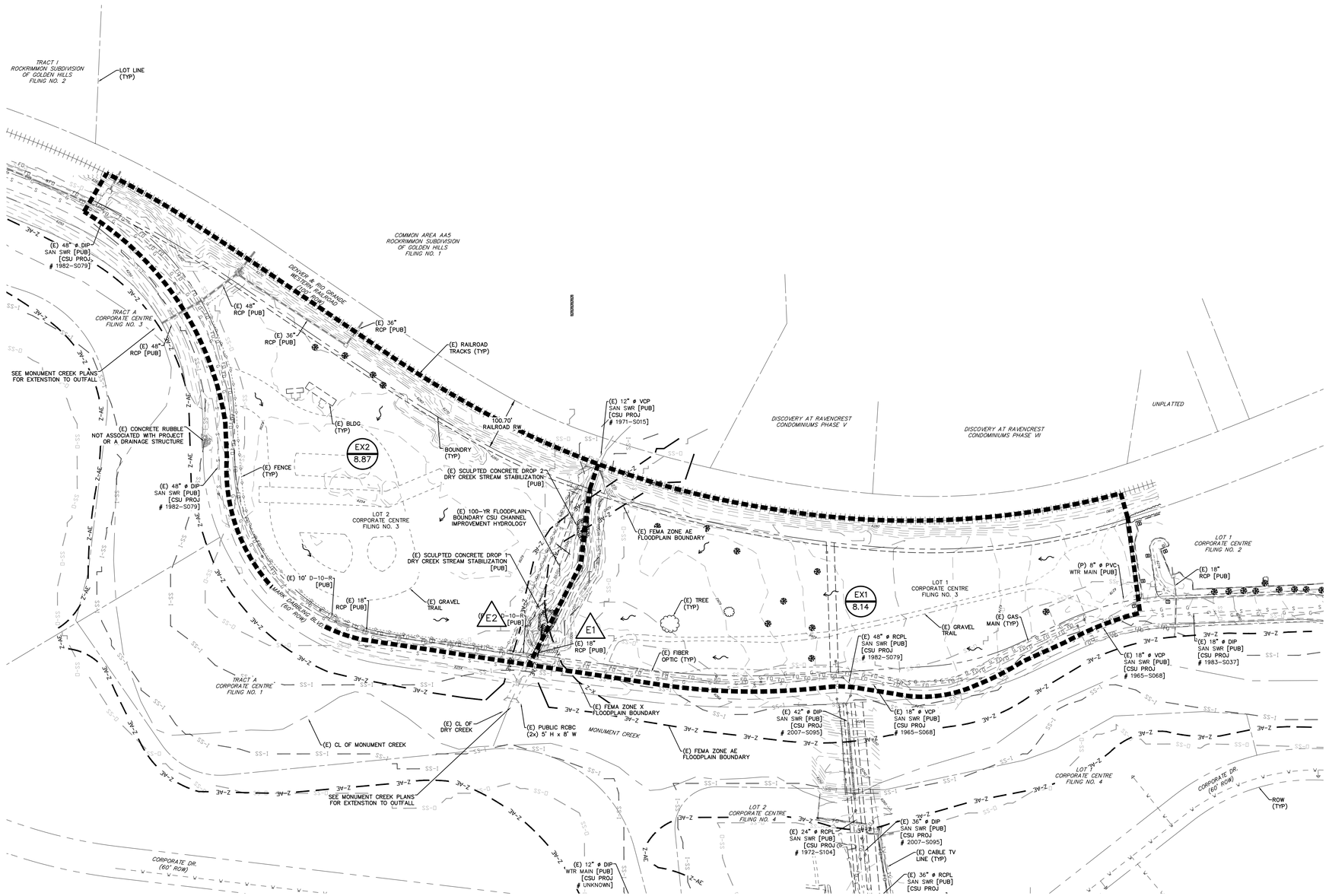
150 WUTHERING HEIGHTS DRIVE
COLORADO SPRINGS, CO 80921

CATAMOUNT ENGINEERING
321 W. HENRIETTA AVE WOODLAND PARK, CO 80866
PO BOX 221 (719)426-2124

MARK DRABLING COTTAGES
SOUTH PORTION

RUNOFF REDUCTION

DESIGNED BY: DLM	DRAWN BY: DLM
SCALE: 1" = 100'	DATE: 12/20/22
JOB NUMBER	SHEET
20-270	1 OF 1



DRAINAGE BASINS			
BASIN	AREA (ACRES)	Q5 (CFS)	Q100 (CFS)
EX1	8.14	4.5	16.2
EX2	8.87	18.1	37.7

DESIGN POINTS			
DESIGN POINT	DESCRIPTION	Q5 (CFS)	Q100 (CFS)
E1	DISCHARGE TO CREEK	4.5	16.2
E2	DISCHARGE TO CREEK	18.1	37.7

DRAINAGE LEGEND

BASIN IDENTIFIER / BASIN AREA [AC]: F / 0.36

DESIGN POINT IDENTIFIERS: 3

PIPE DESIGN POINT: P2

EXISTING	(E)
PROPOSED	(P)
CURB AND GUTTER	C&G
EASEMENT	ESMT
PUBLIC	PUB
PRIVATE	PVT
FUTURE	(F)
SLOPE/DIRECTION	1.00%
SURFACE SHEET FLOW DIRECTION	
PROPERTY BOUNDARY	
RIGHT-OF-WAY	
LOT LINE	
(E) CONTOUR, INDEX	5960
(E) CONTOUR	
(P) CONTOUR, INDEX	5960
(P) CONTOUR	
(E) UG ELECTRIC	E
(E) FIBER OPTIC	FO
(E) GAS MAIN	G
(E) UG TELEPHONE	T
(E) SANITARY MAIN, MH	S
(E) STORM SEWER, INLET, MH	
(E) WATER MAIN, VALVE, FH	W
(P) STORM SEWER, INLET, MH	
DRAINAGE BASIN BOUNDARY	
(P) DRAINAGE SWALE	
(E) STREAMSIDE OVERLAY OUTER	SS-O
(E) STREAMSIDE OVERLAY INNER	SS-I
(E) FLOODPLAIN ZONE – AE	Z-AE
(E) FLOODPLAIN ZONE – X	Z-X
(E) GRAVEL TRAIL AND PARKING	

REV.	DESCRIPTION	DATE

811 Know what's below. Call 72 hours before you dig.
For more details visit: www.call811.com

PREPARED FOR:
BUCHER DESIGN STUDIO
12325 ORACLE BOULEVARD
SUITE 111
COLORADO SPRINGS, CO 80921
(719) 484-0480

PREPARED UNDER MY DIRECT SUPERVISION FOR AND BEHALF OF CATAMOUNT ENGINEERING.

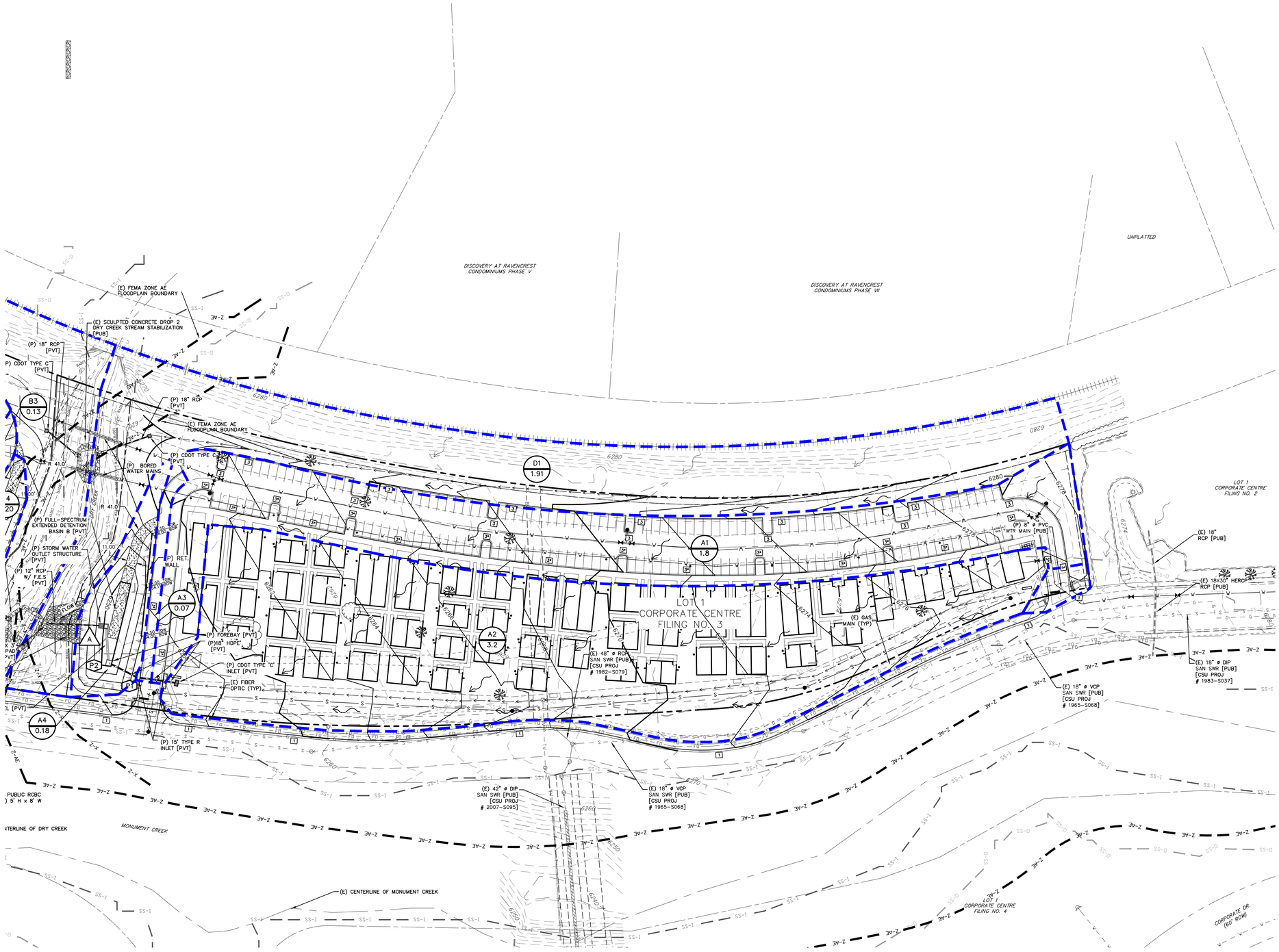
DAVID L. MIJARES, COLORADO PE #40510 — DATE

CATAMOUNT ENGINEERING
321 W. HENRIETTA AVE WOODLAND PARK, CO 80866
PO BOX 221 (719)428-2124

LOTS 1 & 2
CORPORATE CENTRE FILING NO. 3
EXISTING DRAINAGE PLAN

DESIGNED BY:	DLM	DRAWN BY:	DLM
SCALE:	1" = 100'	DATE:	2/11/21
JOB NUMBER		SHEET	
20-270		1 OF 1	

W:\Catamount Dropbox\Projects\20-270 Work Underway\[ARCDRAWING]\20-270 FDR.mx - Tuesday, January 3, 2023 9:13:18 AM - dlmid



0 50 100

SCALE: 1" = 50'

PROPOSED DRAINAGE BASINS

BASIN	AREA (ACRES)	Q5 (CFS)	Q100 (CFS)
A1	1.80	5.9	11.1
A2	3.20	2.8	7.3
A3	0.07	0.3	0.5
A4	0.18	0.2	0.7
B1	0.69	2.5	4.7
B2	1.92	2.4	5.9
B3	0.13	0.5	0.9
B4	0.20	0.1	0.7
C1	0.60	2.4	4.4
C2	1.42	1.9	4.9
C3	0.58	2.0	3.7
D1	1.91	0.6	3.4
D2	1.17	0.5	2.5
D3	1.19	0.5	2.7
D4	0.06	0.1	0.3

PROPOSED DESIGN POINTS

BASIN	Q5 (CFS)	Q100 (CFS)
1	3.5	7.9
P1	6.2	13.8
P2	6.3	14.0
P3	4.1	9.1
P4	4.4	9.7
POND A	6.4	14.3
POND B	4.5	10.1
POND C	5.3	11.0

DRAINAGE LEGEND

BASIN IDENTIFIER
BASIN AREA [AC] — F / 0.36
DESIGN POINT IDENTIFIERS — 3
PIPE DESIGN POINT — P2

EXISTING (E)
PROPOSED (P)
CURB AND GUTTER
TYPE 1
TYPE 3 SPILL
TYPE 3 CARRY

EASEMENT ESMT
PUBLIC PUB
PRIVATE PVT
FUTURE (F)

SLOPE/DIRECTION 1.00%
SURFACE SHEET FLOW DIRECTION
PROPERTY BOUNDARY
RIGHT-OF-WAY
LOT LINE
(E) CONTOUR, INDEX 5960
(E) CONTOUR
(P) CONTOUR, INDEX 5960
(P) CONTOUR
(E) UG ELECTRIC
(E) FIBER OPTIC
(E) GAS MAIN
(E) UG TELEPHONE
(E) SANITARY MAIN, MH
(E) STORM SEWER, INLET, MH
(E) WATER MAIN, VALVE, FH
(P) STORM SEWER, INLET, MH
DRAINAGE BASIN BOUNDARY
(P) DRAINAGE SWALE
(E) STREAMSIDE OVERLAY OUTER
(E) STREAMSIDE OVERLAY INNER
(E) FLOODPLAIN ZONE – AE
(E) FLOODPLAIN ZONE – X

REV.	DESCRIPTION	DATE

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PREPARED FOR:
BCC MANAGEMENT, LLC
150 WUTHERING HEIGHTS DRIVE
COLORADO SPRINGS, CO 80921

CATAMOUNT ENGINEERING
321 W. HENRIETTA AVE WOODLAND PARK, CO 80866
PO BOX 221 (719)426-2124

MARK DRABLING COTTAGES NORTH PORTION

PROPOSED DRAINAGE PLAN

DESIGNED BY:	DLM	DRAWN BY:	DLM
SCALE:	1" = 50'	DATE:	2/11/21
JOB NUMBER		SHEET	
20-270		1 OF 1	

M:\Catamount Projects\Projects\20-270 Mark Drabling\DRAINAGE\20-270 FDR - Final Drainage Plan.MDPX - Tuesday, January 3, 2023 11:39:00 AM - dlord

M:\Catamount Projects\Projects\20-270 Mark Drabling\DRAINAGE

PROPOSED DRAINAGE BASINS			
BASIN	AREA (ACRES)	Q5 (CFS)	Q100 (CFS)
A1	1.80	5.9	11.1
A2	3.20	2.8	7.3
A3	0.07	0.3	0.5
A4	0.18	0.2	0.7
B1	0.69	2.5	4.7
B2	1.92	2.4	5.9
B3	0.13	0.5	0.9
B4	0.20	0.1	0.7
C1	0.60	2.4	4.4
C2	1.42	1.9	4.9
C3	0.58	2.0	3.7
D1	1.91	0.6	3.4
D2	1.17	0.5	2.5
D3	1.19	0.5	2.7
D4	0.06	0.1	0.3

PROPOSED DESIGN POINTS		
BASIN	Q5 (CFS)	Q100 (CFS)
1	3.5	7.9
P1	6.2	13.8
P2	6.3	14.0
P3	4.1	9.1
P4	4.4	9.7
POND A	6.4	14.3
POND B	4.5	10.1
POND C	5.3	11.0

DRAINAGE LEGEND

BASIN IDENTIFIER — F / 0.36
BASIN AREA [AC]
DESIGN POINT IDENTIFIERS — 3
PIPE DESIGN POINT — P2

EXISTING — (E)
PROPOSED — (P)
CURB AND GUTTER — C&G
TYPE 1 — 1
TYPE 3 SPILL — 3
TYPE 3 CARRY — 3

EASEMENT — ESMT
PUBLIC — PUB
PRIVATE — PVT
FUTURE — (F)

SLOPE/DIRECTION — 1.00%
SURFACE SHEET FLOW DIRECTION
PROPERTY BOUNDARY
RIGHT-OF-WAY
LOT LINE
(E) CONTOUR, INDEX — 5960
(E) CONTOUR
(P) CONTOUR, INDEX — 5960
(P) CONTOUR
(E) UG ELECTRIC
(E) FIBER OPTIC
(E) GAS MAIN
(E) UG TELEPHONE
(E) SANITARY MAIN, MH
(E) STORM SEWER, INLET, MH
(E) WATER MAIN, VALVE, FH
(P) STORM SEWER, INLET, MH
DRAINAGE BASIN BOUNDARY
(P) DRAINAGE SWALE
(E) STREAMSIDE OVERLAY OUTER
(E) STREAMSIDE OVERLAY INNER
(E) FLOODPLAIN ZONE - AE
(E) FLOODPLAIN ZONE - X

REV.	DESCRIPTION	DATE

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PREPARED FOR:
BCC MANAGEMENT, LLC
150 WUTHERING HEIGHTS DRIVE
COLORADO SPRINGS, CO 80921

CATAMOUNT ENGINEERING
321 W. HENRIETTA AVE PO BOX 221 WOODLAND PARK, CO 80866 (719)428-2124

MARK DRABLING COTTAGES
SOUTH PORTION

PROPOSED DRAINAGE PLAN

DESIGNED BY:	DLM	DRAWN BY:	DLM
SCALE:	1" = 100'	DATE:	2/11/21
JOB NUMBER		SHEET	
20-270		1 OF 1	

W:\Catamount Projects\Projects\20-270 Mark Drabling\DRAWINGS\20-270 - Prop Drainage Plan.dgn\Pln - Tuesday, January 5, 2021 11:09:05 AM - dlmill