PRELIMINARY/FINAL DRAINAGE REPORT
FOR
LODGE 2 AT BLACK FOREST
AND
AMENDMENT TO THE MDDP FOR THE WOODMEN TOWNE CENTER

September 30, 2017
Revised November 17, 2017
Revised March 9, 2018
Revised September 7, 2018
Revised November 28, 2018

Prepared for:

Cedarwood Development, Inc.
1765 Merriman Road
Akron, OH 44313

WestWorks Job #91614

1023 W. COLORADO AVENUE COLORADO SPRINGS, CO 80904 • (719) 685-1670 • WESTWORKSENGINEERING.COM

PRELIMINARY/FINAL DRAINAGE REPORT FOR LODGE 2 AT BLACK FOREST

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

Certification Statement
"This report and plan for the final drainage design of Lodge 2 at Black Forest was prepared by me (or under my direct supervision) in accordance with the provisions of the City of Colorado Springs Drainage Criteria Manual Volumes 1 & 2 Drainage Design and Technical Criteria for the owners thereof. I understand that the City Colorado Springs does not and will not assume liability for drainage facilities designed by others."

SIGNATURE: _____ 11/30/18 (affix seal)
Registered Professional Engineer State of Colorado No. 35751

Developer's Statement
I, the developer have read and will comply with all of the requirements specified in this drainage report and plan.

Woodmen Land Development, L.L.C. hereby certifies that the drainage facilities for Lodge 2 at Black Forest shall be constructed according to the design presented in this report. I understand that the City Colorado Springs does not and will not assume liability for the drainage facilities designed and/or certified by my engineer and that the City of Colorado Springs reviews drainage plans pursuant to Colorado Revised Statutes, Title 30, Article 28; but cannot, on behalf of Lodge 2 at Black Forest, guarantee that final drainage design review will absolve Woodmen Land Development, L.L.C. 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."

Woodmen Land Development, L.L.C
Name of Developer
By: _____
Its: _____
Authorized Signature

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.

_____ 12/20/18
For the City Engineer Date

Conditions:

PRELIMINARY/FINAL DRAINAGE REPORT FOR LODGE 2 AT BLACK FOREST

PURPOSE

The purpose of this final drainage report (FDR) is to identify specific solutions to drainage problems on site and off-site resulting from the development and platting of this subdivision.

GENERAL LOCATION AND DESCRIPTION

Lodge 2 at Black Forest includes 25.5 acres located in a portion of the Southeast ¼ of Section 6, Township 13 South, Range 65 West of the 6th P.M. in the City of Colorado Springs, El Paso County, Colorado. More specifically, the site is located near the northwest corner of Woodmen Road and Black Forest Road. The site is bounded by unplatted land to the east and west, Woodmen Road to the south, and The Lodge at Black Forest Subdivision Filing No. 1 (apartments) and unplatted rural residential to the north.

The site is currently undeveloped and drains from west to east over gentle to moderate slopes. Proposed development includes a multi-family apartment complex. Existing soils in the study area consist mostly of Stapleton-Bernal sandy loams (SCS Map Unit Symbol 85). This soil group has the designation of Hydrologic Soil Group 'B' as determined by the USDA NRCS. The site is located in the Sand Creek Drainage Basin.

DRAINAGE BASINS AND SUB-BASINS

The site is part of the overall Woodmen Town Center master development. This site has been previously studied in the "Master Development Drainage Plan for The Woodmen Towne Center," prepared by Matrix Design Group, dated October 2008 (MDDP). The apartment use for the Lodge II site is different than the commercial uses assumed in the MDDP. The apartment use is a reduction in assumed imperviousness. Per the MDDP the area of the Lodge II site is to drain through a stormwater quality and detention facility prior to passing under Black Forest Road through a 48" RCP culvert. This FDR will confirm compliance with the MDDP.

Existing Drainage Characteristics:

The existing site is undeveloped and drains from west to east over gentle to moderate slopes. Existing flows pass under Black Forest Road through an existing 48" RCP culvert. The existing basin and flows were analyzed in the MDDP. Existing flows at the culvert under Black Forest Road are Q_5 = 20.5 cfs and Q_{100} = 52.5 cfs. See Previous Drainage Study Maps in the Appendix.

The existing inlets in Center Ridge Drive currently outfall into a temporary sediment basin. This basin will be removed with the development of the site and the inlets routed to a permanent stormwater quality facility.

Developed Drainage Characteristics:

Development of the site is a multi-family residential apartment complex with clubhouse, park space, pool and amenity areas, garages, paved parking and drive aisles, and landscaping. Development of this site also includes adjacent public roadway construction - the extension of Center Ridge Drive and a new access between Woodmen Road and Center Ridge Drive.

Developed drainage overview:

On site drainage basins A through L, OS-K, OS-L, OS-1, and OS-2 are collected by proposed sump inlets and routed via RCP storm drain to the proposed full spectrum stormwater quality facility, Pond A. All basins, design points, and storm drain sizes are shown and summarized on the Drainage Map in the Appendix. Supporting calculations are also included in the Appendix. Pond A is a full spectrum extended detention basin (EDB). Pond A shall be privately owned and maintained. The 2 discharge points into Pond A (SD9 & SD12) shall into a concrete energy dissipater in the forebay. A 2' tall concrete wall with a 3" wide vertical slot will serve as the limits of the forebay. A 2' wide by 6" deep concrete trickle channel will carry flows from the forebay wall to the outfall structure. The proposed outfall structure is a modified CDOT Type C inlet box with a micro-pool, trash screen, orifice plate, mesh top grate, and restrictor plate on the 18" RCP outfall pipe. The discharge point from the outfall pipe shall be protected by a D_{50} = 24" riprap pad. This outfall pipe may be extended with future development to the east. It is recommended that the discharge from Pond A not be routed through a future stormwater facility to the east. A 2' high by 18' wide emergency overflow weir shall be constructed 9' above the pond bottom and will be lined with buried D_{50} = 14" diameter riprap. A compacted gravel access road to the pond bottom shall be installed for maintenance.

Basins M and N are perimeter landscape or undeveloped areas that do not drain through Pond A. Future development to the east shall account properly for the flows from these basins.

Basins O, P, and Q will be collected by pipe and inlets and routed to proposed full spectrum stormwater quality facility, Pond B. The inlets for Basins O and P (DP-28 & DP-29) are at-grade inlets. There is no flow-by for the 5-year storm and only 0.1 and 0.2 CFS flow-by respectively for the 100-year storm. Flow-by will continue into Woodmen Road at DP-22. All basins, design points, and storm drain sizes are shown and summarized on the Drainage Map in the Appendix. Supporting calculations are also included in the Appendix. Pond B is a full spectrum sand filter basin (SFB). Pond B shall be privately owned and maintained. The proposed outfall structure include underdrain tied to a CDOT Type C inlet box with mesh top grate and restrictor plate on the 18" RCP outfall pipe. The outfall will be to Woodmen Road. With the relatively low flows and very flat pipes into and out of the pond, no riprap protection is required. A 1.1' high by 5' wide emergency overflow shall be constructed with buried D_{50} = 3" diameter riprap.

Basin OS-3 is an area of undeveloped ground that will drain south into Woodmen Road. Basin OS-3 is largely undisturbed ground.

Basins OS-1 and OS-2 include a portion of undeveloped land to the west of and portions of Sky Ridge Drive. Most of the flows from these basins will be collected by 2 - 10' wide at-grade inlets at the intersection with Center Ridge Drive (DP-20 & DP-21). A small amount of

combined flow-by (Q_5 = 0 cfs and Q_{100} = 1.0 cfs) will continue into Center Ridge Drive to a pair of existing sump inlets (DP-26 & DP-27). The street capacity is more than adequate in Center Ridge Drive and Sky Ridge Drive. The major storm event will pond over the crown of Center Ridge Drive at the sump, however the existing sump inlets will have adequate capacity to capture the flows. Flows from these 4 public roadway inlets will be combined via 30" RCP storm drain (SD23) and route them through the site and into Pond A. Future development of the land adjacent to the southwest corner of Center Ridge Drive and Sky Ridge Drive will need to restrict flow totals into Center Ridge and Sky Ridge Drives to the amounts shown in the FDR (portions of Basins OS-1 and OS-L).

Basins OS-4, OS-5, and OS-6 represent the extension of Center Ridge Drive. The temporary end of the Center Ridge Drive shall be protected by riprap pads at the end of the curbs. Runoff from the end of Center Ridge Drive (DP-26) will be directed to an existing erosion control basin, Pond C. While Pond C is a temporary facility, it has the adequate volume equivalent to provide full spectrum detention and water quality for the area tributary to it. Per City policy, a permanent facility shall be provided within 5 years of completion of construction for this project. The undeveloped property to the east is the same property owner as Lodge 2. Future development to the east will need to account for these flows in a future permanent stormwater quality facility. The future phase extension of Center Ridge Drive to Black Forest Road will also require drainage analysis and permanent stormwater quality.

Developed Drainage Design Point Descriptions:

Design Point 26 (DP-26) [Q_5 = 3 CFS/Q_{100} = 8 CFS]

DP-26 is an existing 4' sump inlet in Center Ridge Drive accepting the runoff from off-site Basin OS-K. Flows intercepted by this inlet travel to DP-27 via storm drain design point SD20.

DP-27 [Q_5 = 1 CFS/Q_{100} = 12 CFS]

DP-27 is an existing 8' sump inlet in Center Ridge Drive accepting runoff from Basin OS-L and flow-by from the at grade inlets of DP-20 and DP-21. Basin OS-L includes a portion of Center Ridge Drive and undeveloped area planned for future development. Flows intercepted by this inlet travel to DP-20 via SD21.

DP-20 [Q_5 = 1 CFS/Q_{100} = 5 CFS]

DP-20 is a proposed 10' at-grade inlet in accepting runoff from Basin OS-1. Flows intercepted by this inlet (Q_5 = 1.0 CFS/Q_{100} = 4.1 CFS) travel to DP-21 via SD22. Flow-by of Q_5 = 0 CFS/Q_{100} = 0.9 CFS continue to DP-27.

DP-21 [Q_5 = 1 CFS/Q_{100} = 3 CFS]

DP-21 is a proposed 10' at-grade inlet in accepting runoff from Basin OS-2. Flows intercepted by this inlet (Q_5 = 1.0 CFS/Q_{100} = 2.9 CFS) travel to DP-1 via SD23. Flow-by of Q_5 = 0 CFS/Q_{100} = 0.1 CFS continue to DP-27.

DP-1 [Q_5 = 2 CFS/Q_{100} = 5 CFS]

DP-1 is a proposed 5' sump inlet in accepting runoff from Basin A. Flows intercepted by this inlet continue to DP-2 via SD1.

DP-2 [Q_5 = 2 CFS/Q_{100} = 4 CFS]
DP-2 is a proposed 5' sump inlet in accepting runoff from Basin B. Flows intercepted by this inlet continue to DP-3 via SD2.

DP-3 [Q_5 = 1 CFS/Q_{100} = 3 CFS]
DP-3 is a proposed grate inlet in accepting runoff from Basin C. Flows intercepted by this inlet continue to DP-4 via SD3.

DP-4 [Q_5 = 7 CFS/Q_{100} = 14 CFS]
DP-4 is a proposed 10' sump inlet in accepting runoff from Basin D. Flows intercepted by this inlet continue to DP-5 via SD4

DP-5 [Q_5 = 1 CFS/Q_{100} = 2 CFS]
DP-5 is a proposed 5' sump inlet in accepting runoff from Basin E. Flows intercepted by this inlet continue to DP-6 via SD5.

DP-6 [Q_5 = 4 CFS/Q_{100} = 10 CFS]
DP-6 is a proposed 10' sump inlet in accepting runoff from Basin F. Flows intercepted by this inlet continue to SD9 via SD6.

DP-7 [Q_5 = 4 CFS/Q_{100} = 9 CFS]
DP-7 is a proposed 10' sump inlet in accepting runoff from Basin G. Flows intercepted by this inlet continue to DP-8 via SD7.

DP-8 [Q_5 = 7 CFS/Q_{100} = 13 CFS]
DP-8 is a proposed 10' sump inlet in accepting runoff from Basin H. Flows intercepted by this inlet continue to SD9 via SD8. SD9 (Q_5 = 29 CFS/Q_{100} = 67 CFS) outfalls directly into the forebay of Pond A. This discharge point shall be protected by a D_{50} = 24" diameter riprap pad.

DP-9 [Q_5 = 2 CFS/Q_{100} = 5 CFS]
DP-9 is a proposed 5' sump inlet in accepting runoff from Basin I. Flows intercepted by this inlet continue to DP-10 via SD10.

DP-10 [Q_5 = 3 CFS/Q_{100} = 7 CFS]
DP-10 is a proposed 5' sump inlet in accepting runoff from Basin J. Flows intercepted by this inlet continue to DP-11 via SD11.

DP-11 [Q_5 = 2 CFS/Q_{100} = 5 CFS]
DP-11 is a proposed 5' sump inlet in accepting runoff from Basin K. Flows intercepted by this inlet outfall directly into the forebay of Pond A via SD12 (Q_5 = 7 CFS/Q_{100} = 16 CFS). This discharge point shall be protected by a D_{50} = 24" diameter riprap pad.

DP-12 [Q_5 = 0.4 CFS/Q_{100} = 3 CFS]
DP-12 represents the sheet flow of the area Pond A, Basin L.

DP-13 [Q_5 = 1 CFS/Q_{100} = 6 CFS]

DP-13 represents the sheet flow from Basin M. Basin M is mostly undeveloped area within the CSU electric easement along Woodmen Road. These flows will continue east and will need to be accounted for with future development to the east.

DP-14 [Q_5 = 0.2 CFS/Q_{100} = 2 CFS]
DP-14 represents the sheet flow from Basin N. Basin N is mostly perimeter landscape and catch slope. These flows will continue east and will need to be accounted for with future development to the east.

DP-22 [Q_5 = 0.6 CFS/Q_{100} = 2 CFS]
DP-22 represents the runoff from Basin OS-3 that will travel to the existing roadside ditch along the north side of Woodmen Road. Basin OS-3 is a small portion of largely undeveloped area within the CSU electric easement along Woodmen Road.

DP-23 [Q_5 = 1 CFS/Q_{100} = 4 CFS]
DP-23 is the flow in the curb & gutter of Center Ridge Drive at the site entrance. Basin OS-4 is a portion of Center Ridge Drive and undeveloped slope to the north of Center Ridge Drive.

DP-24 [Q_5 = 2 CFS/Q_{100} = 5 CFS]
DP-24 is the flow in the curb & gutter of Center Ridge Drive at the site entrance. Basin OS-5 is a portion of Center Ridge Drive and perimeter landscape from the site.

DP-25 [Q_5 = 5 CFS/Q_{100} = 13 CFS]
DP-25 is the east end of the extension of Center Ridge Drive to the east boundary of the site. DP-25 is the combined flow from DP-23, DP-24, and Basin OS-6. Basin OS-6 is the area of Center Ridge Drive and perimeter landscape of the site. Runoff from DP-25 shall be diverted to the existing temporary basin, Pond C. Future development to the east shall provide stormwater quality for area draining to the DP-25 per City requirements.

DP-A [Q_5 = 2 CFS/Q_{100} = 11 CFS]
DP-A represents the total flow to the adjacent site between Lodge 2 and Black Forest Road. Per the MDDP future development of the land between Lodge 2 and Black Forest Road will require 1 or more stormwater detention facilities such that the total discharge to the existing 48" RCP culvert under Black Forest Road does not exceed Q_5 = 20.5 cfs and Q_{100} = 52.5 cfs.

DP-28 [Q_5 = 0.9 CFS/Q_{100} = 1.6 CFS]
DP-28 is a proposed 5' Type R at-grade inlet collecting runoff from Basin O. Flow-by of Q_5 = 0 CFS/Q_{100} = 0.1 CFS will continue into Woodmen Road as part of DP-22. Collected flows are routed in SD-24 toward DP-29.

DP-29 [Q_5 = 0.8 CFS/Q_{100} = 1.9 CFS]
DP-29 is a proposed 5' Type R at-grade inlet collecting runoff from Basin P. Flow-by of Q_5 = 0 CFS/Q_{100} = 0.2 CFS will continue into Woodmen Road as part of DP-22. Collected flows are routed in SD-25 into proposed SFB Pond B.

DP-30 [Q_5 = 0.1 CFS/Q_{100} = 1 CFS]
DP-30 represents the largely undeveloped Basin Q that sheet flows into proposed SFB Pond B.

4-Step Process Discussion:
Step 1. Employ Runoff Reduction Practices.
The site layout was done to minimize paving and includes park and amenity areas. Site impervious area calculations are shown in the IRF spreadsheet in the Appendix.

Step 2. Implement BMPs That Provide WQCV with Slow Release.
Development of this site includes a full-spectrum detention facility providing WQCV and an outfall structure with a 40-hour drain time.

Step 3. Stabilize Drainageways.
There are no natural drainageways associated with this site. Per the MDDP, "The Woodmen Towne Center straddles the base line between the Cottonwood Creek and the Sand Creek Drainage Basins. Stormwater detention is necessary in both basins to release at historical rates. The site is removed from both channels so no channel improvements are required for this development." Drainage fees will be paid with the platting of this subdivision. These fees contribute to any necessary channel improvements within both major drainage basins.

Step 4. Implement Site Specific and Other Source Control BMPs.
All materials to be used with this project will be stored indoors. There is no outside storage associated with this site.

Summary:
Drainage related to the development of Lodge 2 at Black Forest will not adversely impact downstream and surrounding developments. This report is in general conformance with previous studies on this site.

DRAINAGE DESIGN CRITERIA

This drainage report was prepared in accordance to the criteria established in the City of Colorado Springs Drainage Criteria Manual, updated in May 2014.

WestWorks Engineering uses the rational method for drainage basin study areas of less than 90 acres. This methodology is implemented in accordance with the City Drainage Criteria Manual Guidelines.

For the Rational Method, flows are calculated for the 5-year 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. Detention volume is calculated in accordance with the City Drainage Criteria Manual Guidelines.

DRAINAGE FACILITY DESIGN

All inlets, storm drains, culverts, and open channels are sized using the procedures outlined in the City Drainage Criteria Manual. All of the drainage systems, including the streets, are designed to safely route the 5-year and 100-year storm flows. Hydraulic grade line calculations for the proposed storm drain design will be included with the storm drain constructions drawings.

FLOODPLAIN STATEMENT

No portion of this site is within a F.E.M.A. designated floodplain per Flood Insurance Rate Map Community Panel No. 08041C0529 F, effective March 17th, 1997.

EROSION CONTROL PLAN

The City of Colorado Springs Drainage Criteria Manual specifies that an Erosion Control Plan and associated cost estimate be submitted in conjunction with the Final Drainage Report. WestWorks Engineering respectfully requests the Erosion Control Plan be submitted in conjunction with the Overlot Grading Plan and construction assurances posted prior to obtaining a grading permit.

OPINION OF PROBABLE COST

Private Drainage Facilities (non-reimbursable):

Item	Quantity	Unit Cost	Total Cost
18" RCP Storm Drain	475 LF	$53/LF	$ 25,175
24" RCP Storm Drain	1,140 LF	$58/LF	$ 66,120
30" RCP Storm Drain	700 LF	$77/LF	$ 53,900
36" RCP Storm Drain	950 LF	$95/LF	$ 90,250
5' Type R Inlet	6 EA	$4,000/EA	$ 24,000
10' Type R Inlet	4 EA	$5,500/EA	$ 22,000
CDOT Type C Inlet	1 EA	$3,300/EA	$ 3,300
Storm Manhole	3 EA	$4,600/EA	$ 13,800
Riprap	10 CY	$75/CY	$ 750
		Sub-Total	$299,295
		20% Contingency	$ 59,859
		TOTAL	$359,154

Three Private Stormwater Quality Facilities (non-reimbursable):

Item	Quantity	Unit Cost	Total Cost
Seeding	0.8 AC	$525/AC	$ 420
Road Base	380 TONS	$17/TON	$ 6,460
Concrete	60 SY	$38/SY	$ 2,280
18" RCP Storm Drain	294 LF	$53/LF	$ 15,582
Sand Filter Media	210 TONS	$17/TON	$ 3,570
4" Perforated PVC Pipe	110 LF	$25/LF	$ 2,750
12" PVC Pipe	100 LF	$35/LF	$ 3,500
Pond Outfall Structure	2 EA	$7,500/EA	$ 15,000
Riprap	197 CY	$75/CY	$ 14,775
		Sub-Total	$ 64,337
		20% Contingency	$ 12,867
		TOTAL	$ 77,204

Public Drainage Facilities (non-reimbursable):

Item	Quantity	Unit Cost	Total Cost
18" RCP Storm Drain	112 LF	$53/LF	$ 5,936
24" RCP Storm Drain	107 LF	$58/LF	$ 6,206
5' Type R Inlet	2 EA	$4,000/EA	$ 8,000
10' Type R Inlet	2 EA	$5,500/EA	$ 11,000
		Sub-Total	$ 31,142
		20% Contingency	$ 6,228
		TOTAL	$ 37,370

This opinion of probable cost is made on the basis of experience and qualifications and represents WestWorks Engineering's best judgment as an experienced and qualified professional firm, familiar with the construction industry. WestWorks Engineering cannot and will not guarantee that actual construction costs will not vary from this opinion of probable cost.

DRAINAGE FEES

The study area is in the Sand Creek Drainage Basin (27.00 AC) with a small portion in the Cottonwood Creek Drainage Basin (0.36 AC). This subdivision includes 27.36-acres to be platted. 2018 Drainage, Bridge, and Pond Fees are due at the time of plat recordation as follows:

Sand Creek Drainage Basin Fees:

Drainage Fee:	(27.00-ac) x ($11,851/ac)	=	$319,977.00
Bridge Fee:	(27.00-ac) x ($713/ac)	=	$ 19,251.00
Pond Land Fee:	(27.00-ac) x ($1,070/ac)	=	$ 28,890.00
Pond Facility Fee:	(27.00-ac) x ($3,445/ac)	=	$ 93,015.00
SUB-TOTAL		=	$461,133.00

Cottonwood Creek Drainage Basin Fees:			
Drainage Fee:	(0.36-ac) x ($13,241/ac)	=	$ 4,766.76
Bridge Fee:	(0.36-ac) x ($1,059/ac)	=	$ 381.24
Surcharge Fee:	(0.36-ac) x ($678/ac)	=	$ 244.08
SUB-TOTAL		=	$ 5,392.08
TOTAL		=	**$466,525.08**

REFERENCE LIST

"Soil Survey of El Paso County Area, Colorado," prepared by United States Department of Agriculture Soil Conservation Service, issued June 1981

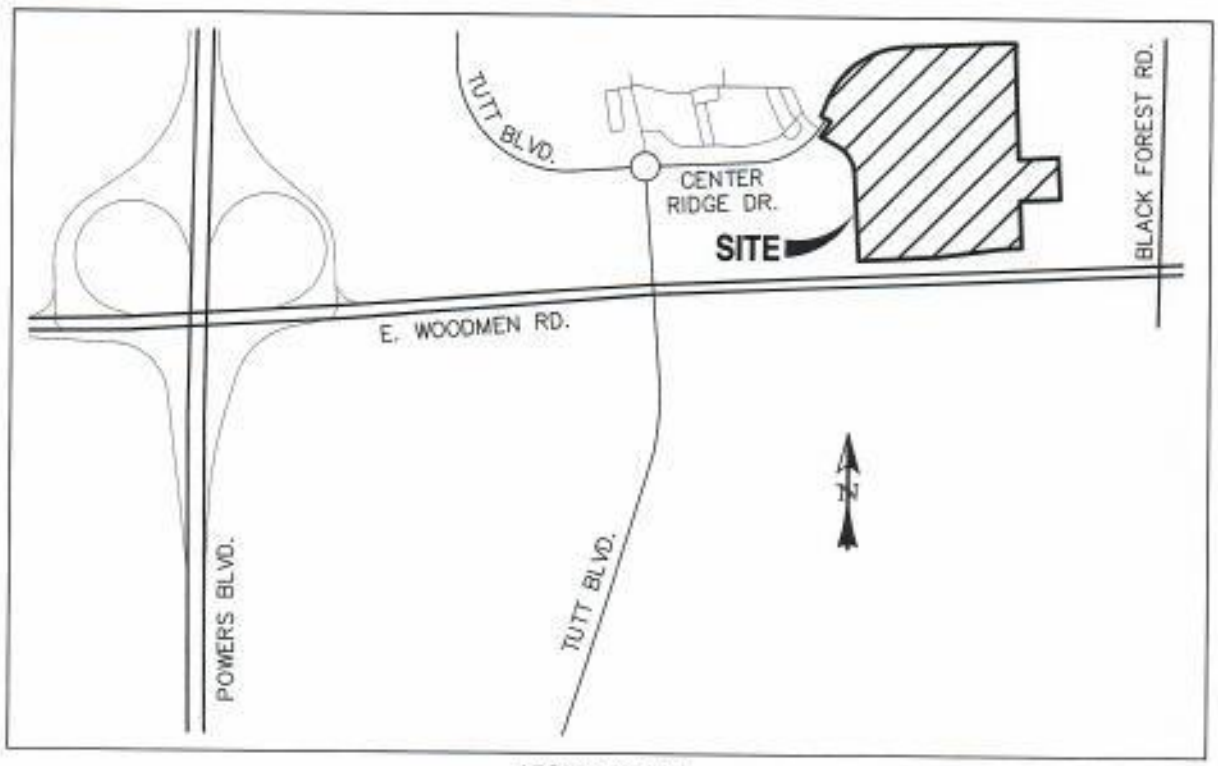
"FIRM Flood Insurance Rate Map," prepared by Federal Emergency Management Agency, effective date March 17, 1997

City of Colorado Springs Drainage Criteria Manual, updated May 2014

"Master Development Drainage Plan for The Woodmen Towne Center," prepared by Matrix Design Group, dated October 2008 (MDDP)

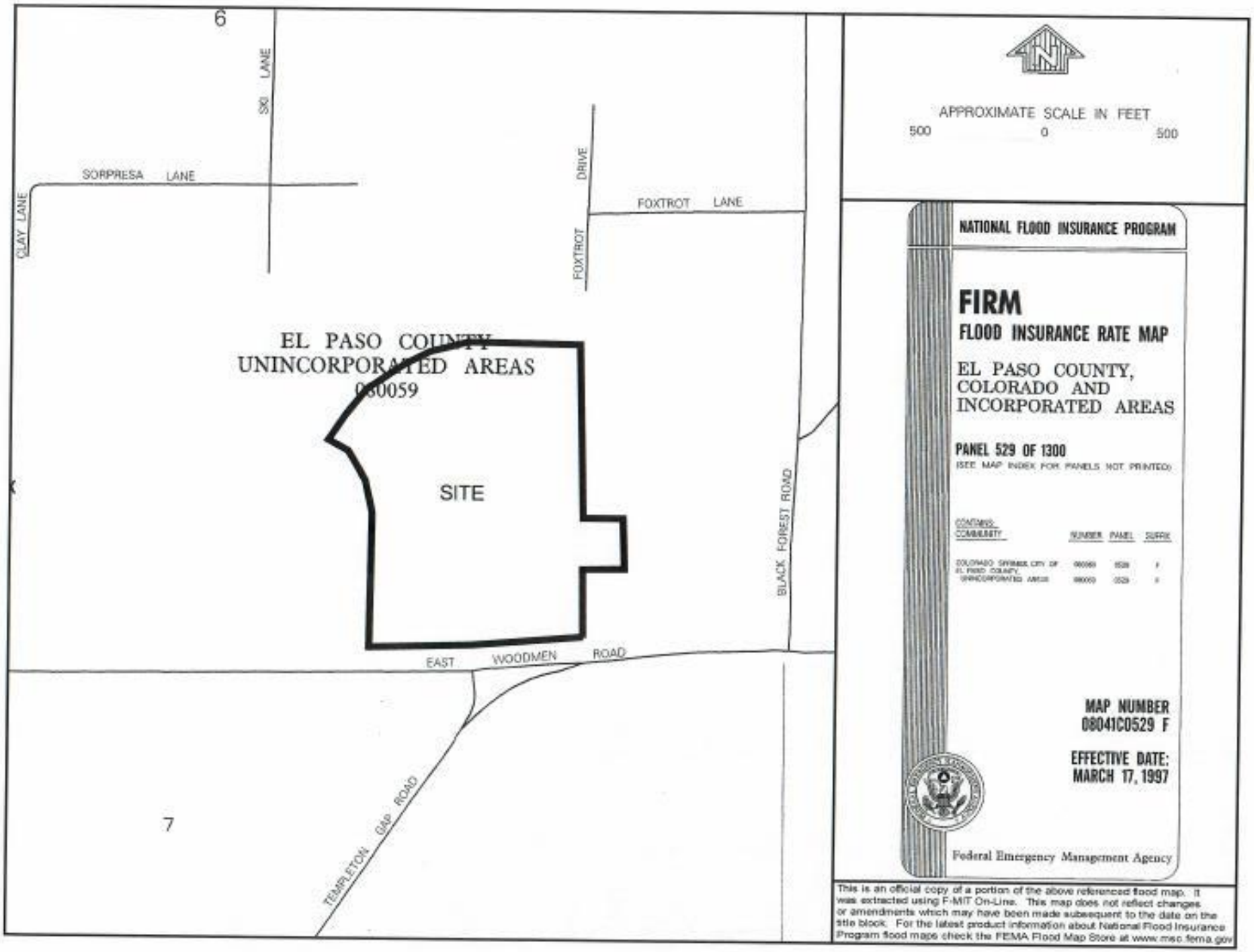
"Final Drainage Report for The Lodge at Black Forest," prepared by Matrix Design Group, dated January 2009

APPENDIX



VICINITY MAP

SCALE: N.T.S.


6
SKI LANE
SORPRESA LANE
CLAY LANE
DRIVE
FOXTROT
FOXTROT LANE
EL PASO COUNTY
UNINCORPORATED AREAS
080059
SITE
BLACK FOREST ROAD
EAST WOODMEN ROAD
TEMPLETON GAP ROAD
7
APPROXIMATE SCALE IN FEET
500 0 500
NATIONAL FLOOD INSURANCE PROGRAM
FIRM
FLOOD INSURANCE RATE MAP
EL PASO COUNTY, COLORADO AND INCORPORATED AREAS
PANEL 529 OF 1300
(SEE MAP INDEX FOR PANELS NOT PRINTED)
CONTAINS:
COMMUNITY
NUMBER
PANEL
SUFFIX
COLORADO SPRINGS, CITY OF
EL PASO COUNTY
UNINCORPORATED AREAS
080060
080059
0529
0529
F
F
MAP NUMBER
08041C0529 F
EFFECTIVE DATE:
MARCH 17, 1997
Federal Emergency Management Agency
This is an official copy of a portion of the above referenced flood map. It was extracted using F-MIT On-Line. This map does not reflect changes or amendments which may have been made subsequent to the date on the title block. For the latest product information about National Flood Insurance Program flood maps check the FEMA Flood Map Store at www.msc.fema.gov

Hydrologic Soil Group—El Paso County Area, Colorado
(LODGE II AT BLACK FOREST)

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 14, Sep 23, 2016

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

Date(s) aerial images were photographed: Jun 3, 2014—Jun 17, 2014

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

Hydrologic Soil Group— Summary by Map Unit — El Paso County Area, Colorado (CO625)				
Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
85	Stapleton-Bernal sandy loams, 3 to 20 percent slopes	B	24.1	100.0%
Totals for Area of Interest			24.1	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

HYDROLOGIC CALCULATIONS

Time of Concentration Calcuations

Sub-Basin	Time of Concentration, **Tc** [min.]				
	Flowline	L [ft.]	H [ft.]	v [ft/s]	**Tc [min.]**
OS-L	overland	180	8.0		13.0
	channel	490	24.0	8	1.1
				Total Tc =	**14**
OS-1	overland	340	18.0		16.8
	channel	170	3.0	5	0.6
				Total Tc =	**17**
OS-2	overland	50	2.0		7.1
	channel	150	3.0	5	0.5
				Total Tc =	**8**
OS-3	overland	140	6.0		11.6
	channel	75	2.0	6	0.2
				Total Tc =	**12**
OS-4	overland	180	7.0		13.6
	channel	280	11.0	7	0.7
				Total Tc =	**14**

Sub-Basin	Time of Concentration, **Tc** [min.]				
	Flowline	L [ft.]	H [ft.]	v [ft/s]	**Tc [min.]**
OS-5	overland	50	1.0		8.9
	channel	590	14.0	5	1.8
				Total Tc =	**11**
OS-6	overland	40	2.0		5.9
	channel	400	18.0	7	0.9
				Total Tc =	**7**
A	overland	70	2.0		9.4
	channel	200	3.0	4	0.8
				Total Tc =	**10**
B	overland	20	0.5		5.2
	channel	70	2.0	6	0.2
				Total Tc =	**5**
C	overland	20	0.5		5.2
	channel	30	0.5	5	0.1
				Total Tc =	**5**

Sub-Basin	Time of Concentration, **Tc** [min.]				
	Flowline	L [ft.]	H [ft.]	v [ft/s]	**Tc [min.]**
D	overland	220	5.0		17.9
	channel	280	4.0	4	1.1
				Total Tc =	**19**
E	overland	40	1.0		7.4
	channel	1	0.5	25	0.0
				Total Tc =	**7**
F	overland	100	2.0		12.6
	channel	200	5.0	6	0.6
				Total Tc =	**13**
G	overland	130	5.0		11.6
	channel	80	1.0	4	0.3
				Total Tc =	**12**
H	overland	30	0.5		7.3
	channel	440	7.0	4	1.7
				Total Tc =	**9**

WESTWORKS™ ENGINEERING

Project: LODGE 2 AT BLACK FOREST

Job No.: 91614
Engineer: Chad Kuzbek, PE
Date: 9/30/2017

Time of Concentration Calcuations

Sub-Basin	Time of Concentration, **Tc** [min.]				
	Flowline	L [ft.]	H [ft.]	v [ft/s]	**Tc [min.]**
I	overland	50	2.0		7.1
	channel	180	2.0	4	0.8
				Total Tc =	**8**
J	overland	120	10.0		8.6
	channel	100	2.0	5	0.3
				Total Tc =	**9**
K	overland	300	10.0		18.4
	channel	130	2.0	4	0.5
				Total Tc =	**19**
L	overland	220	44.0		8.7
	channel	1	1.0	35	0.0
				Total Tc =	**9**
M	overland	300	30.0		12.8
	channel	70	4.0	8	0.1
				Total Tc =	**13**

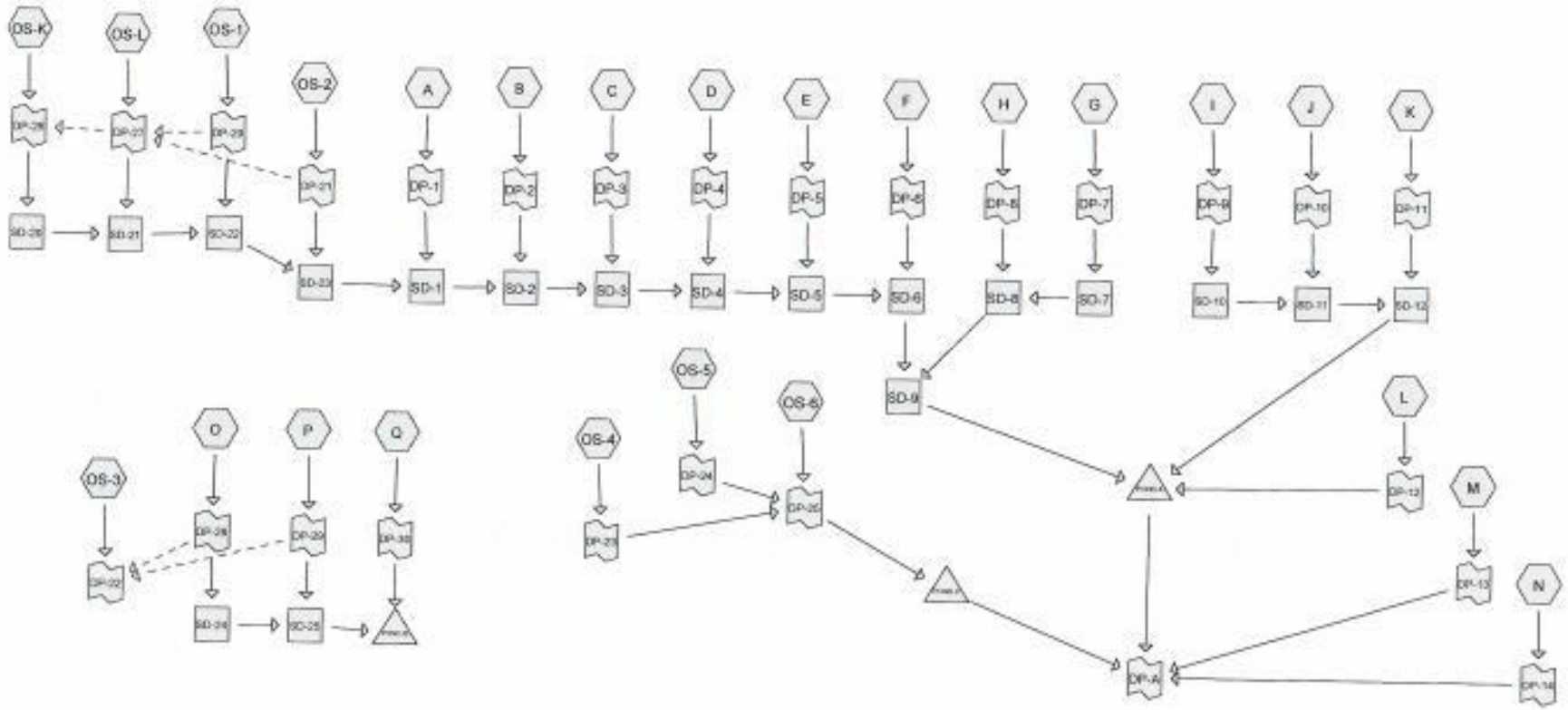
Sub-Basin	Time of Concentration, **Tc** [min.]				
	Flowline	L [ft.]	H [ft.]	v [ft/s]	**Tc [min.]**
N	overland	60	12.0		4.5
	channel	1	1.0	35	0.0
				Total Tc =	**5**
O	overland	1	1.0		0.3
	channel	230	6.0	6	0.7
				Total Tc =	**5**
P	overland	140	6.0		11.6
	channel	30	1.0	6	0.1
				Total Tc =	**12**
Q	overland	80	3.0		9.2
	channel	80	10.0	12	0.1
				Total Tc =	**9**

Sub-Basin	Time of Concentration, **Tc** [min.]				
	Flowline	L [ft.]	H [ft.]	v [ft/s]	**Tc [min.]**

WESTWORKS™ ENGINEERING

Project: LODGE 2 AT BLACK FOREST

Job No.: 91614
Engineer: Chad Kuzbek, PE
Date: 9/12/2018



Subcat Reach Pond Link

Drainage Diagram for 100YR-DEVELOPED
Prepared by WestWorks Engineering 9/12/2018
HydroCAD® 7.00 s/n 002053 © 1986-2003 Applied Microcomputer Systems

Subcatchment B:

Runoff = 2.03 cfs @ 0.08 hrs, Volume= 0.014 af, Depth= 0.35"

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
El Paso County 5-Year Duration=5 min, Inten=5.10 in/hr

Area (ac)	C	Description
0.450	0.90	PAVEMENT & ROOF
0.050	0.08	LANDSCAPE
0.500	0.82	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment C:

Runoff = 1.34 cfs @ 0.08 hrs, Volume= 0.010 af, Depth= 0.38"

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
El Paso County 5-Year Duration=5 min, Inten=5.10 in/hr

Area (ac)	C	Description
0.300	0.90	PAVEMENT & ROOF

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment N:

Runoff = 0.24 cfs @ 0.08 hrs, Volume= 0.002 af, Depth= 0.03"

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
El Paso County 5-Year Duration=5 min, Inten=5.10 in/hr

Area (ac)	C	Description
0.600	0.08	LANDSCAPE

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Link DP-14:

Inflow Area = 0.600 ac, Inflow Depth = 0.03" for 5-Year event
Inflow = 0.24 cfs @ 0.08 hrs, Volume= 0.002 af
Primary = 0.24 cfs @ 0.08 hrs, Volume= 0.002 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs

Link DP-2:

Inflow Area = 0.500 ac, Inflow Depth = 0.35" for 5-Year event
Inflow = 2.03 cfs @ 0.08 hrs, Volume= 0.014 af
Primary = 2.03 cfs @ 0.08 hrs, Volume= 0.014 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs

Link DP-3:

Inflow Area = 0.300 ac, Inflow Depth = 0.38" for 5-Year event
Inflow = 1.34 cfs @ 0.08 hrs, Volume= 0.010 af
Primary = 1.34 cfs @ 0.08 hrs, Volume= 0.010 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs

Subcatchment O:

Runoff = 0.91 cfs @ 0.08 hrs, Volume= 0.006 af, Depth= 0.39"

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
El Paso County 5-Year Duration=5 min, Inten=5.17 in/hr

Area (ac)	C	Description
0.200	0.90	ROADWAY

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Reach SD-24:

[52] Hint: Inlet conditions not evaluated

Inflow Area = 0.200 ac, Inflow Depth = 0.39" for 5-Year event
Inflow = 0.91 cfs @ 0.08 hrs, Volume= 0.006 af
Outflow = 0.88 cfs @ 0.09 hrs, Volume= 0.006 af, Atten= 3%, Lag= 0.5 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
Max. Velocity= 2.9 fps, Min. Travel Time= 0.3 min
Avg. Velocity = 1.4 fps, Avg. Travel Time= 0.5 min

Peak Depth= 0.35' @ 0.09 hrs
Capacity at bank full= 7.51 cfs
Inlet Invert= 6,990.77', Outlet Invert= 6,990.55'
18.0" Diameter Pipe n= 0.013 Length= 43.0' Slope= 0.0051 '/'

Link DP-28:

Inflow Area = 0.200 ac, Inflow Depth = 0.39" for 5-Year event
Inflow = 0.91 cfs @ 0.08 hrs, Volume= 0.006 af
Primary = 0.91 cfs @ 0.08 hrs, Volume= 0.006 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs

Subcatchment E:

Runoff = 0.86 cfs @ 0.12 hrs, Volume= 0.009 af, Depth= 0.34"

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
El Paso County 5-Year Duration=7 min, Inten=4.64 in/hr

Area (ac)	C	Description
0.200	0.90	PAVEMENT & ROOF
0.100	0.08	LANDSCAPE
0.300	0.63	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.0					**Direct Entry,**

Subcatchment OS-6:

Runoff = 1.47 cfs @ 0.12 hrs, Volume= 0.015 af, Depth= 0.12"

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
El Paso County 5-Year Duration=7 min, Inten=4.64 in/hr

Area (ac)	C	Description
0.400	0.59	GRAVEL DRIVE
1.000	0.08	LANDSCAPE
1.400	0.23	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.0					**Direct Entry,**

Link DP-5:

Inflow Area = 0.300 ac, Inflow Depth = 0.34" for 5-Year event
Inflow = 0.86 cfs @ 0.12 hrs, Volume= 0.009 af
Primary = 0.86 cfs @ 0.12 hrs, Volume= 0.009 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs

Subcatchment I:

Runoff = 2.45 cfs @ 0.13 hrs, Volume= 0.028 af, Depth= 0.41"

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
El Paso County 5-Year Duration=8 min, Inten=4.44 in/hr

Area (ac)	C	Description
0.600	0.90	PAVEMENT & ROOF
0.200	0.08	LANDSCAPE
0.800	0.70	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.0					**Direct Entry,**

Subcatchment OS-2:

Runoff = 1.25 cfs @ 0.13 hrs, Volume= 0.014 af, Depth= 0.34"

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
El Paso County 5-Year Duration=8 min, Inten=4.44 in/hr

Area (ac)	C	Description
0.300	0.90	ROADWAY
0.200	0.08	LANDSCAPE
0.500	0.57	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.0					**Direct Entry,**

Link DP-21:

Inflow Area = 0.500 ac, Inflow Depth = 0.34" for 5-Year event
Inflow = 1.25 cfs @ 0.13 hrs, Volume= 0.014 af
Primary = 1.15 cfs @ 0.13 hrs, Volume= 0.012 af, Atten= 8%, Lag= 0.0 min
Secondary = 0.10 cfs @ 0.12 hrs, Volume= 0.002 af

Primary outflow = Inflow above 0.10 cfs, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs

Link DP-9:

Inflow Area = 0.800 ac, Inflow Depth = 0.41" for 5-Year event
Inflow = 2.45 cfs @ 0.13 hrs, Volume= 0.028 af
Primary = 2.45 cfs @ 0.13 hrs, Volume= 0.028 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs

Subcatchment H:

Runoff = 6.72 cfs @ 0.15 hrs, Volume= 0.083 af, Depth= 0.50"

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
El Paso County 5-Year Duration=9 min, Inten=4.27 in/hr

Area (ac)	C	Description
1.700	0.90	PAVEMENT & ROOF
0.300	0.08	LANDSCAPE
2.000	0.78	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.0					**Direct Entry,**

Subcatchment J:

Runoff = 2.95 cfs @ 0.15 hrs, Volume= 0.037 af, Depth= 0.31"

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
El Paso County 5-Year Duration=9 min, Inten=4.27 in/hr

Area (ac)	C	Description
0.700	0.90	PAVEMENT & ROOF
0.700	0.08	LANDSCAPE
1.400	0.49	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.0					**Direct Entry,**

Subcatchment L:

Runoff = 0.41 cfs @ 0.15 hrs, Volume= 0.005 af, Depth= 0.05"

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
El Paso County 5-Year Duration=9 min, Inten=4.27 in/hr

Area (ac)	C	Description
1.200	0.08	LANDSCAPE

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.0					**Direct Entry,**

Link DP-10:

Inflow Area = 1.400 ac, Inflow Depth = 0.31" for 5-Year event
Inflow = 2.95 cfs @ 0.15 hrs, Volume= 0.037 af
Primary = 2.95 cfs @ 0.15 hrs, Volume= 0.037 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs

Link DP-12:

Inflow Area = 1.200 ac, Inflow Depth = 0.05" for 5-Year event
Inflow = 0.41 cfs @ 0.15 hrs, Volume= 0.005 af
Primary = 0.41 cfs @ 0.15 hrs, Volume= 0.005 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs

Link DP-8:

Inflow Area = 2.000 ac, Inflow Depth = 0.50" for 5-Year event
Inflow = 6.72 cfs @ 0.15 hrs, Volume= 0.083 af
Primary = 6.72 cfs @ 0.15 hrs, Volume= 0.083 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs

Subcatchment Q:

Runoff = 0.14 cfs @ 0.15 hrs, Volume= 0.002 af, Depth= 0.05"

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
El Paso County 5-Year Duration=9 min, Inten=4.29 in/hr

Area (ac)	C	Description
0.400	0.08	LANDSCAPE

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.0					**Direct Entry,**

Link DP-30:

Inflow Area = 0.400 ac, Inflow Depth = 0.05" for 5-Year event
Inflow = 0.14 cfs @ 0.15 hrs, Volume= 0.002 af
Primary = 0.14 cfs @ 0.15 hrs, Volume= 0.002 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs

Subcatchment A:

Runoff = 2.27 cfs @ 0.17 hrs, Volume= 0.032 af, Depth= 0.48"

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
El Paso County 5-Year Duration=10 min, Inten=4.10 in/hr

Area (ac)	C	Description
0.600	0.90	PAVEMENT & ROOF
0.200	0.08	LANDSCAPE
0.800	0.70	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.0					**Direct Entry,**

Link DP-1:

Inflow Area = 0.800 ac, Inflow Depth = 0.48" for 5-Year event
Inflow = 2.27 cfs @ 0.17 hrs, Volume= 0.032 af
Primary = 2.27 cfs @ 0.17 hrs, Volume= 0.032 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs

Subcatchment OS-5:

Runoff = 2.29 cfs @ 0.18 hrs, Volume= 0.035 af, Depth= 0.38"

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
El Paso County 5-Year Duration=11 min, Inten=3.95 in/hr

Area (ac)	C	Description
0.600	0.90	ROADWAY
0.500	0.08	LANDSCAPE
1.100	0.53	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.0					**Direct Entry,**

Subcatchment OS-K:

Runoff = 3.06 cfs @ 0.18 hrs, Volume= 0.047 af, Depth= 0.43"

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
El Paso County 5-Year Duration=11 min, Inten=3.95 in/hr

Area (ac)	C	Description
1.300	0.60	FROM LODGE I FDR

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.0					**Direct Entry,**

Link DP-24:

Inflow Area = 1.100 ac, Inflow Depth = 0.38" for 5-Year event
Inflow = 2.29 cfs @ 0.18 hrs, Volume= 0.035 af
Primary = 2.29 cfs @ 0.18 hrs, Volume= 0.035 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs

Subcatchment G:

Runoff = 4.37 cfs @ 0.20 hrs, Volume= 0.072 af, Depth= 0.51"

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
El Paso County 5-Year Duration=12 min, Inten=3.86 in/hr

Area (ac)	C	Description
1.200	0.90	PAVEMENT & ROOF
0.500	0.08	LANDSCAPE
1.700	0.66	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.0					**Direct Entry,**

Subcatchment OS-3:

Runoff = 0.56 cfs @ 0.20 hrs, Volume= 0.009 af, Depth= 0.14"

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
El Paso County 5-Year Duration=12 min, Inten=3.86 in/hr

Area (ac)	C	Description
0.100	0.90	ROADWAY
0.700	0.08	LANDSCAPE
0.800	0.18	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.0					**Direct Entry,**

Subcatchment P:

Runoff = 0.80 cfs @ 0.20 hrs, Volume= 0.013 af, Depth= 0.32"

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
El Paso County 5-Year Duration=12 min, Inten=3.86 in/hr

Area (ac)	C	Description
0.200	0.90	ROADWAY
0.300	0.08	LANDSCAPE
0.500	0.41	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.0					**Direct Entry,**

Reach SD-25:

[52] Hint: Inlet conditions not evaluated
[62] Warning: Submerged 2% of Reach SD-24 inlet

Inflow Area = 0.700 ac, Inflow Depth = 0.42" for 5-Year event
Inflow = 1.50 cfs @ 0.20 hrs, Volume= 0.025 af
Outflow = 1.48 cfs @ 0.21 hrs, Volume= 0.025 af, Atten= 2%, Lag= 0.5 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
Max. Velocity= 3.3 fps, Min. Travel Time= 0.4 min
Avg. Velocity = 1.7 fps, Avg. Travel Time= 0.7 min

Peak Depth= 0.45' @ 0.20 hrs
Capacity at bank full= 7.43 cfs
Inlet Invert= 6,990.35', Outlet Invert= 6,990.00'
18.0" Diameter Pipe n= 0.013 Length= 70.0' Slope= 0.0050 '/'

Reach SD-7:

[52] Hint: Inlet conditions not evaluated

Inflow Area = 1.700 ac, Inflow Depth = 0.51" for 5-Year event
Inflow = 4.37 cfs @ 0.20 hrs, Volume= 0.072 af
Outflow = 4.26 cfs @ 0.21 hrs, Volume= 0.072 af, Atten= 2%, Lag= 0.8 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
Max. Velocity= 6.1 fps, Min. Travel Time= 0.4 min
Avg. Velocity = 2.9 fps, Avg. Travel Time= 0.9 min

Peak Depth= 0.63' @ 0.21 hrs
Capacity at bank full= 11.74 cfs
Inlet Invert= 6,975.00', Outlet Invert= 6,973.00'
18.0" Diameter Pipe n= 0.013 Length= 160.0' Slope= 0.0125 '/'

Reach SD-8:

[52] Hint: Inlet conditions not evaluated
[88] Warning: Qout>Qin may require Finer Routing>1
[61] Hint: Submerged 21% of Reach SD-7 bottom

Inflow Area = 3.700 ac, Inflow Depth = 0.56" for 5-Year event
Inflow = 10.16 cfs @ 0.20 hrs, Volume= 0.173 af
Outflow = 10.16 cfs @ 0.20 hrs, Volume= 0.173 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
Max. Velocity= 25.9 fps, Min. Travel Time= 0.0 min
Avg. Velocity = 13.6 fps, Avg. Travel Time= 0.0 min

Peak Depth= 0.41' @ 0.20 hrs
Capacity at bank full= 62.14 cfs
Inlet Invert= 6,973.00', Outlet Invert= 6,966.00'
18.0" Diameter Pipe n= 0.013 Length= 20.0' Slope= 0.3500 '/'

Link DP-22:

Inflow Area = 0.800 ac, Inflow Depth = 0.14" for 5-Year event
Inflow = 0.56 cfs @ 0.20 hrs, Volume= 0.009 af
Primary = 0.56 cfs @ 0.20 hrs, Volume= 0.009 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs

Link DP-29:

Inflow Area = 0.500 ac, Inflow Depth = 0.32" for 5-Year event
Inflow = 0.80 cfs @ 0.20 hrs, Volume= 0.013 af
Primary = 0.80 cfs @ 0.20 hrs, Volume= 0.013 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs

Link DP-7:

Inflow Area = 1.700 ac, Inflow Depth = 0.51" for 5-Year event
Inflow = 4.37 cfs @ 0.20 hrs, Volume= 0.072 af
Primary = 4.37 cfs @ 0.20 hrs, Volume= 0.072 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs

Subcatchment F:

Runoff = 4.46 cfs @ 0.22 hrs, Volume= 0.081 af, Depth= 0.51"

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
El Paso County 5-Year Duration=13 min, Inten=3.69 in/hr

Area (ac)	C	Description
1.300	0.90	PAVEMENT & ROOF
0.600	0.08	LANDSCAPE
1.900	0.64	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.0					**Direct Entry,**

Subcatchment M:

Runoff = 0.92 cfs @ 0.22 hrs, Volume= 0.017 af, Depth= 0.08"

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
El Paso County 5-Year Duration=13 min, Inten=3.69 in/hr

Area (ac)	C	Description
0.100	0.59	GRAVEL ROAD
2.400	0.08	LANDSCAPE
2.500	0.10	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.0					**Direct Entry,**

Link DP-13:

Inflow Area = 2.500 ac, Inflow Depth = 0.08" for 5-Year event
Inflow = 0.92 cfs @ 0.22 hrs, Volume= 0.017 af
Primary = 0.92 cfs @ 0.22 hrs, Volume= 0.017 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs

Link DP-6:

Inflow Area = 1.900 ac, Inflow Depth = 0.51" for 5-Year event
Inflow = 4.46 cfs @ 0.22 hrs, Volume= 0.081 af
Primary = 4.46 cfs @ 0.22 hrs, Volume= 0.081 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs

Subcatchment OS-4:

Runoff = 1.29 cfs @ 0.23 hrs, Volume= 0.025 af, Depth= 0.22"

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
El Paso County 5-Year Duration=14 min, Inten=3.57 in/hr

Area (ac)	C	Description
0.300	0.90	ROADWAY
1.100	0.08	LANDSCAPE
1.400	0.26	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.0					**Direct Entry,**

Subcatchment OS-L:

Runoff = 3.13 cfs @ 0.23 hrs, Volume= 0.061 af, Depth= 0.18"

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
El Paso County 5-Year Duration=14 min, Inten=3.57 in/hr

Area (ac)	C	Description
0.700	0.90	ROADWAY
3.300	0.08	UNDEV. PASTURE
4.000	0.22	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.0					**Direct Entry,**

Link DP-23:

Inflow Area = 1.400 ac, Inflow Depth = 0.22" for 5-Year event
Inflow = 1.29 cfs @ 0.23 hrs, Volume= 0.025 af
Primary = 1.29 cfs @ 0.23 hrs, Volume= 0.025 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs

Link DP-25:

Inflow Area = 3.900 ac, Inflow Depth = 0.27" for 5-Year event
Inflow = 4.56 cfs @ 0.23 hrs, Volume= 0.088 af
Primary = 4.56 cfs @ 0.23 hrs, Volume= 0.088 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs

Subcatchment OS-1:

Runoff = 1.22 cfs @ 0.28 hrs, Volume= 0.029 af, Depth= 0.20"

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
El Paso County 5-Year Duration=17 min, Inten=3.27 in/hr

Area (ac)	C	Description
0.300	0.90	ROADWAY
1.400	0.08	UNDEV. PASTURE
1.700	0.22	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
17.0					**Direct Entry,**

Reach SD-1:

[52] Hint: Inlet conditions not evaluated
[61] Hint: Submerged 71% of Reach SD-23 bottom

Inflow Area = 8.300 ac, Inflow Depth = 0.32" for 5-Year event
Inflow = 9.32 cfs @ 0.28 hrs, Volume= 0.222 af
Outflow = 9.29 cfs @ 0.30 hrs, Volume= 0.222 af, Atten= 0%, Lag= 1.2 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
Max. Velocity= 5.2 fps, Min. Travel Time= 0.7 min
Avg. Velocity = 1.8 fps, Avg. Travel Time= 1.9 min

Peak Depth= 0.97' @ 0.29 hrs
Capacity at bank full= 28.93 cfs
Inlet Invert= 6,979.28', Outlet Invert= 6,978.26'
30.0" Diameter Pipe n= 0.013 Length= 205.0' Slope= 0.0050 '/'

Reach SD-2:

[52] Hint: Inlet conditions not evaluated
[62] Warning: Submerged 1% of Reach SD-1 inlet

Inflow Area = 8.800 ac, Inflow Depth = 0.35" for 5-Year event
Inflow = 10.48 cfs @ 0.29 hrs, Volume= 0.254 af
Outflow = 10.47 cfs @ 0.29 hrs, Volume= 0.254 af, Atten= 0%, Lag= 0.3 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
Max. Velocity= 5.4 fps, Min. Travel Time= 0.2 min
Avg. Velocity = 1.9 fps, Avg. Travel Time= 0.4 min

Peak Depth= 1.05' @ 0.29 hrs
Capacity at bank full= 28.71 cfs
Inlet Invert= 6,978.26', Outlet Invert= 6,978.02'
30.0" Diameter Pipe n= 0.013 Length= 49.0' Slope= 0.0049 '/'

Reach SD-20:

[52] Hint: Inlet conditions not evaluated

Inflow Area = 1.300 ac, Inflow Depth = 1.38" for 5-Year event
Inflow = 5.57 cfs @ 0.19 hrs, Volume= 0.149 af
Outflow = 5.57 cfs @ 0.20 hrs, Volume= 0.149 af, Atten= 0%, Lag= 0.6 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
Max. Velocity= 6.1 fps, Min. Travel Time= 0.1 min
Avg. Velocity = 4.3 fps, Avg. Travel Time= 0.2 min

Peak Depth= 0.77' @ 0.20 hrs
Capacity at bank full= 10.76 cfs
Inlet Invert= 6,982.46', Outlet Invert= 6,982.04'
18.0" Diameter Pipe n= 0.013 Length= 40.0' Slope= 0.0105 '/'

Reach SD-21:

[52] Hint: Inlet conditions not evaluated
[62] Warning: Submerged 1% of Reach SD-20 inlet

Inflow Area = 5.300 ac, Inflow Depth = 0.36" for 5-Year event
Inflow = 6.47 cfs @ 0.24 hrs, Volume= 0.158 af
Outflow = 6.47 cfs @ 0.26 hrs, Volume= 0.158 af, Atten= 0%, Lag= 1.2 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
Max. Velocity= 6.2 fps, Min. Travel Time= 0.2 min
Avg. Velocity = 3.7 fps, Avg. Travel Time= 0.4 min

Peak Depth= 0.73' @ 0.25 hrs
Capacity at bank full= 22.62 cfs
Inlet Invert= 6,981.74', Outlet Invert= 6,980.95'
24.0" Diameter Pipe n= 0.013 Length= 79.0' Slope= 0.0100 '/'

Reach SD-22:

[52] Hint: Inlet conditions not evaluated
[61] Hint: Submerged 92% of Reach SD-21 bottom

Inflow Area = 7.000 ac, Inflow Depth = 0.27" for 5-Year event
Inflow = 6.79 cfs @ 0.28 hrs, Volume= 0.160 af
Outflow = 6.77 cfs @ 0.28 hrs, Volume= 0.160 af, Atten= 0%, Lag= 0.2 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
Max. Velocity= 4.8 fps, Min. Travel Time= 0.1 min
Avg. Velocity = 2.7 fps, Avg. Travel Time= 0.3 min

Peak Depth= 0.83' @ 0.28 hrs
Capacity at bank full= 28.65 cfs
Inlet Invert= 6,980.85', Outlet Invert= 6,980.65'
30.0" Diameter Pipe n= 0.013 Length= 41.0' Slope= 0.0049 '/'

Reach SD-23:

[52] Hint: Inlet conditions not evaluated
[62] Warning: Submerged 27% of Reach SD-22 inlet

Inflow Area = 7.500 ac, Inflow Depth = 0.29" for 5-Year event
Inflow = 7.61 cfs @ 0.28 hrs, Volume= 0.179 af
Outflow = 7.56 cfs @ 0.30 hrs, Volume= 0.179 af, Atten= 1%, Lag= 1.3 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
Max. Velocity= 5.0 fps, Min. Travel Time= 0.9 min
Avg. Velocity = 1.8 fps, Avg. Travel Time= 2.5 min

Peak Depth= 0.87' @ 0.29 hrs
Capacity at bank full= 28.95 cfs
Inlet Invert= 6,980.65', Outlet Invert= 6,979.28'
30.0" Diameter Pipe n= 0.013 Length= 275.0' Slope= 0.0050 '/'

Reach SD-3:

[52] Hint: Inlet conditions not evaluated
[62] Warning: Submerged 21% of Reach SD-2 inlet

Inflow Area = 9.100 ac, Inflow Depth = 0.36" for 5-Year event
Inflow = 11.30 cfs @ 0.29 hrs, Volume= 0.275 af
Outflow = 11.27 cfs @ 0.30 hrs, Volume= 0.275 af, Atten= 0%, Lag= 0.6 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
Max. Velocity= 8.7 fps, Min. Travel Time= 0.3 min
Avg. Velocity = 3.1 fps, Avg. Travel Time= 0.9 min

Peak Depth= 0.78' @ 0.29 hrs
Capacity at bank full= 53.88 cfs
Inlet Invert= 6,978.02', Outlet Invert= 6,975.00'
30.0" Diameter Pipe n= 0.013 Length= 175.0' Slope= 0.0173 '/'

Link DP-20:

Inflow Area =	1.700 ac,	Inflow Depth =	0.20"	for	5-Year event
Inflow =	1.22 cfs @	0.28 hrs,	Volume=	0.029 af	
Primary =	0.32 cfs @	0.28 hrs,	Volume=	0.002 af,	Atten= 74%, Lag= 0.0 min
Secondary =	0.90 cfs @	0.21 hrs,	Volume=	0.027 af	

Primary outflow = Inflow above 0.90 cfs, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs

Link DP-26:

Inflow Area =	1.300 ac,	Inflow Depth =	1.38"	for	5-Year event
Inflow =	5.57 cfs @	0.19 hrs,	Volume=	0.149 af	
Primary =	5.57 cfs @	0.19 hrs,	Volume=	0.149 af,	Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs

Link DP-27:

Inflow Area =	4.000 ac,	Inflow Depth =	0.29"	for	5-Year event
Inflow =	3.90 cfs @	0.24 hrs,	Volume=	0.098 af	
Primary =	0.90 cfs @	0.24 hrs,	Volume=	0.009 af,	Atten= 77%, Lag= 0.0 min
Secondary =	3.00 cfs @	0.18 hrs,	Volume=	0.089 af	

Primary outflow = Inflow above 3.00 cfs, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs

Subcatchment D:

Runoff = 6.87 cfs @ 0.32 hrs, Volume= 0.182 af, Depth= 0.62"

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
El Paso County 5-Year Duration=19 min, Inten=3.17 in/hr

Area (ac)	C	Description
2.300	0.90	PAVEMENT & ROOF
1.200	0.08	LANDSCAPE
3.500	0.62	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
19.0					**Direct Entry,**

Subcatchment K:

Runoff = 2.93 cfs @ 0.32 hrs, Volume= 0.077 af, Depth= 0.42"

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
El Paso County 5-Year Duration=19 min, Inten=3.17 in/hr

Area (ac)	C	Description
0.900	0.90	PAVEMENT & ROOF
1.300	0.08	LANDSCAPE
2.200	0.42	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
19.0					**Direct Entry,**

Reach SD-10:

[52] Hint: Inlet conditions not evaluated

Inflow Area = 0.800 ac, Inflow Depth = 0.70" for 5-Year event
Inflow = 1.79 cfs @ 0.14 hrs, Volume= 0.047 af
Outflow = 1.79 cfs @ 0.32 hrs, Volume= 0.047 af, Atten= 0%, Lag= 10.8 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
Max. Velocity= 4.4 fps, Min. Travel Time= 0.7 min
Avg. Velocity = 2.2 fps, Avg. Travel Time= 1.5 min

Peak Depth= 0.42' @ 0.31 hrs
Capacity at bank full= 10.50 cfs
Inlet Invert= 6,986.00', Outlet Invert= 6,984.10'
18.0" Diameter Pipe n= 0.013 Length= 190.0' Slope= 0.0100 '/'

Reach SD-11:

[52] Hint: Inlet conditions not evaluated
[61] Hint: Submerged 30% of Reach SD-10 bottom

Inflow Area = 2.200 ac, Inflow Depth = 0.57" for 5-Year event
Inflow = 3.98 cfs @ 0.31 hrs, Volume= 0.104 af
Outflow = 3.98 cfs @ 0.32 hrs, Volume= 0.104 af, Atten= 0%, Lag= 0.6 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
Max. Velocity= 5.4 fps, Min. Travel Time= 0.8 min
Avg. Velocity = 2.3 fps, Avg. Travel Time= 2.0 min

Peak Depth= 0.57' @ 0.31 hrs
Capacity at bank full= 22.62 cfs
Inlet Invert= 6,984.10', Outlet Invert= 6,981.40'
24.0" Diameter Pipe n= 0.013 Length= 270.0' Slope= 0.0100 '/'

Reach SD-12:

[52] Hint: Inlet conditions not evaluated
[61] Hint: Submerged 19% of Reach SD-11 bottom

Inflow Area = 4.400 ac, Inflow Depth = 0.49" for 5-Year event
Inflow = 6.91 cfs @ 0.32 hrs, Volume= 0.181 af
Outflow = 6.87 cfs @ 0.33 hrs, Volume= 0.181 af, Atten= 1%, Lag= 1.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
Max. Velocity= 10.8 fps, Min. Travel Time= 0.7 min
Avg. Velocity = 4.7 fps, Avg. Travel Time= 1.5 min

Peak Depth= 0.51' @ 0.32 hrs
Capacity at bank full= 47.43 cfs
Inlet Invert= 6,981.40', Outlet Invert= 6,962.50'
24.0" Diameter Pipe n= 0.013 Length= 430.0' Slope= 0.0440 '/'

Reach SD-4:

[52] Hint: Inlet conditions not evaluated
[61] Hint: Submerged 35% of Reach SD-3 bottom

Inflow Area = 12.600 ac, Inflow Depth = 0.46" for 5-Year event
Inflow = 18.09 cfs @ 0.32 hrs, Volume= 0.479 af
Outflow = 17.99 cfs @ 0.33 hrs, Volume= 0.479 af, Atten= 1%, Lag= 0.7 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
Max. Velocity= 8.0 fps, Min. Travel Time= 0.5 min
Avg. Velocity = 2.8 fps, Avg. Travel Time= 1.3 min

Peak Depth= 1.07' @ 0.32 hrs
Capacity at bank full= 66.70 cfs
Inlet Invert= 6,975.00', Outlet Invert= 6,972.83'
36.0" Diameter Pipe n= 0.013 Length= 217.0' Slope= 0.0100 '/'

Reach SD-5:

[52] Hint: Inlet conditions not evaluated
[61] Hint: Submerged 50% of Reach SD-4 bottom

Inflow Area = 12.900 ac, Inflow Depth = 0.46" for 5-Year event
Inflow = 18.53 cfs @ 0.33 hrs, Volume= 0.495 af
Outflow = 18.47 cfs @ 0.34 hrs, Volume= 0.495 af, Atten= 0%, Lag= 0.6 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
Max. Velocity= 8.1 fps, Min. Travel Time= 0.4 min
Avg. Velocity = 2.8 fps, Avg. Travel Time= 1.1 min

Peak Depth= 1.08' @ 0.33 hrs
Capacity at bank full= 66.70 cfs
Inlet Invert= 6,972.83', Outlet Invert= 6,970.96'
36.0" Diameter Pipe n= 0.013 Length= 187.0' Slope= 0.0100 '/'

Reach SD-6:

[52] Hint: Inlet conditions not evaluated
[61] Hint: Submerged 53% of Reach SD-5 bottom

Inflow Area = 14.800 ac, Inflow Depth = 0.48" for 5-Year event
Inflow = 22.00 cfs @ 0.33 hrs, Volume= 0.597 af
Outflow = 21.96 cfs @ 0.34 hrs, Volume= 0.597 af, Atten= 0%, Lag= 0.8 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
Max. Velocity= 10.9 fps, Min. Travel Time= 0.5 min
Avg. Velocity = 3.8 fps, Avg. Travel Time= 1.4 min

Peak Depth= 0.99' @ 0.34 hrs
Capacity at bank full= 94.33 cfs
Inlet Invert= 6,970.96', Outlet Invert= 6,964.56'
36.0" Diameter Pipe n= 0.013 Length= 320.0' Slope= 0.0200 '/'

Reach SD-9:

[52] Hint: Inlet conditions not evaluated
[61] Hint: Submerged 23% of Reach SD-6 bottom

Inflow Area = 18.500 ac, Inflow Depth = 0.53" for 5-Year event
Inflow = 29.91 cfs @ 0.32 hrs, Volume= 0.821 af
Outflow = 29.83 cfs @ 0.34 hrs, Volume= 0.821 af, Atten= 0%, Lag= 0.8 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
Max. Velocity= 8.9 fps, Min. Travel Time= 0.4 min
Avg. Velocity = 2.9 fps, Avg. Travel Time= 1.3 min

Peak Depth= 1.44' @ 0.33 hrs
Capacity at bank full= 63.82 cfs
Inlet Invert= 6,964.56', Outlet Invert= 6,962.50'
36.0" Diameter Pipe n= 0.013 Length= 225.0' Slope= 0.0092 '/'

Link DP-11:

Inflow Area = 2.200 ac, Inflow Depth = 0.42" for 5-Year event
Inflow = 2.93 cfs @ 0.32 hrs, Volume= 0.077 af
Primary = 2.93 cfs @ 0.32 hrs, Volume= 0.077 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs

Link DP-4:

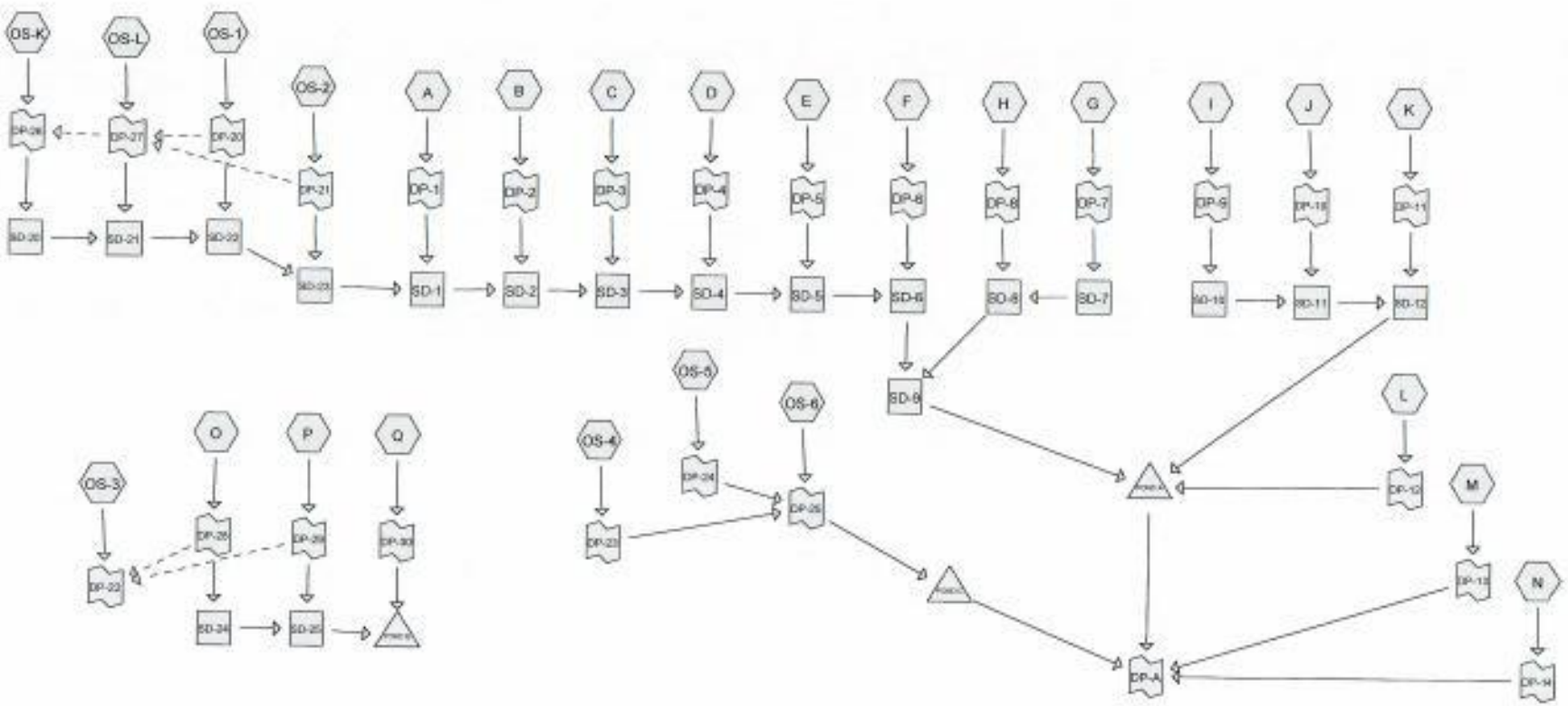
Inflow Area = 3.500 ac, Inflow Depth = 0.62" for 5-Year event
Inflow = 6.87 cfs @ 0.32 hrs, Volume= 0.182 af
Primary = 6.87 cfs @ 0.32 hrs, Volume= 0.182 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs

Link DP-A:

Inflow Area = 31.100 ac, Inflow Depth = 0.08" for 5-Year event
Inflow = 1.72 cfs @ 0.32 hrs, Volume= 0.200 af
Primary = 1.72 cfs @ 0.32 hrs, Volume= 0.200 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs



Drainage Diagram for 100YR-DEVELOPED

Prepared by WestWorks Engineering 9/12/2018

HydroCAD® 7.00 s/n 002053 © 1986-2003 Applied Microcomputer Systems

Subcatchment B:

Runoff = 3.98 cfs @ 0.08 hrs, Volume= 0.028 af, Depth= 0.68"

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
El Paso County 100-Year Duration=5 min, Inten=9.09 in/hr

Area (ac)	C	Description
0.450	0.96	PAVEMENT & ROOF
0.050	0.35	LANDSCAPE
0.500	0.90	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment C:

Runoff = 2.55 cfs @ 0.08 hrs, Volume= 0.018 af, Depth= 0.73"

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
El Paso County 100-Year Duration=5 min, Inten=9.09 in/hr

Area (ac)	C	Description
0.300	0.96	PAVEMENT & ROOF

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment N:

Runoff = 1.86 cfs @ 0.08 hrs, Volume= 0.013 af, Depth= 0.26"

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
El Paso County 100-Year Duration=5 min, Inten=9.09 in/hr

Area (ac)	C	Description
0.600	0.35	LANDSCAPE

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Link DP-14:

Inflow Area = 0.600 ac, Inflow Depth = 0.26" for 100-Year event
Inflow = 1.86 cfs @ 0.08 hrs, Volume= 0.013 af
Primary = 1.86 cfs @ 0.08 hrs, Volume= 0.013 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs

Link DP-2:

Inflow Area = 0.500 ac, Inflow Depth = 0.68" for 100-Year event
Inflow = 3.98 cfs @ 0.08 hrs, Volume= 0.028 af
Primary = 3.98 cfs @ 0.08 hrs, Volume= 0.028 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs

Link DP-3:

Inflow Area = 0.300 ac, Inflow Depth = 0.73" for 100-Year event
Inflow = 2.55 cfs @ 0.08 hrs, Volume= 0.018 af
Primary = 2.55 cfs @ 0.08 hrs, Volume= 0.018 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs

Subcatchment O:

Runoff = 1.62 cfs @ 0.08 hrs, Volume= 0.012 af, Depth= 0.69"

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
El Paso County 100-Year Duration=5 min, Inten=8.68 in/hr

Area (ac)	C	Description
0.200	0.96	ROADWAY

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Reach SD-24:

[52] Hint: Inlet conditions not evaluated

Inflow Area = 0.200 ac, Inflow Depth = 0.69" for 100-Year event
Inflow = 1.51 cfs @ 0.08 hrs, Volume= 0.011 af
Outflow = 1.50 cfs @ 0.09 hrs, Volume= 0.011 af, Atten= 1%, Lag= 0.3 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
Max. Velocity= 3.3 fps, Min. Travel Time= 0.2 min
Avg. Velocity = 1.6 fps, Avg. Travel Time= 0.4 min

Peak Depth= 0.46' @ 0.09 hrs
Capacity at bank full= 7.51 cfs
Inlet Invert= 6,990.77', Outlet Invert= 6,990.55'
18.0" Diameter Pipe n= 0.013 Length= 43.0' Slope= 0.0051 '/'

Link DP-28:

Inflow Area = 0.200 ac, Inflow Depth = 0.69" for 100-Year event
Inflow = 1.62 cfs @ 0.08 hrs, Volume= 0.012 af
Primary = 1.51 cfs @ 0.08 hrs, Volume= 0.011 af, Atten= 7%, Lag= 0.1 min
Secondary = 0.11 cfs @ 0.08 hrs, Volume= 0.000 af

Primary outflow = Inflow below 1.50 cfs, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs

Subcatchment E:

Runoff = 1.85 cfs @ 0.12 hrs, Volume= 0.018 af, Depth= 0.73"

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
El Paso County 100-Year Duration=7 min, Inten=8.26 in/hr

Area (ac)	C	Description
0.200	0.96	PAVEMENT & ROOF
0.100	0.35	LANDSCAPE
0.300	0.76	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.0					**Direct Entry,**

Subcatchment OS-6:

Runoff = 5.12 cfs @ 0.12 hrs, Volume= 0.051 af, Depth= 0.43"

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
El Paso County 100-Year Duration=7 min, Inten=8.26 in/hr

Area (ac)	C	Description
0.400	0.70	GRAVEL DRIVE
1.000	0.35	LANDSCAPE
1.400	0.45	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.0					**Direct Entry,**

Link DP-5:

Inflow Area = 0.300 ac, Inflow Depth = 0.73" for 100-Year event
Inflow = 1.85 cfs @ 0.12 hrs, Volume= 0.018 af
Primary = 1.85 cfs @ 0.12 hrs, Volume= 0.018 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs

Subcatchment I:

Runoff = 5.06 cfs @ 0.13 hrs, Volume= 0.057 af, Depth= 0.85"

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
El Paso County 100-Year Duration=8 min, Inten=7.91 in/hr

Area (ac)	C	Description
0.600	0.96	PAVEMENT & ROOF
0.200	0.35	LANDSCAPE
0.800	0.81	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.0					**Direct Entry,**

Subcatchment OS-2:

Runoff = 2.81 cfs @ 0.13 hrs, Volume= 0.032 af, Depth= 0.76"

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
El Paso County 100-Year Duration=8 min, Inten=7.91 in/hr

Area (ac)	C	Description
0.300	0.96	ROADWAY
0.200	0.35	LANDSCAPE
0.500	0.72	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.0					**Direct Entry,**

Link DP-21:

Inflow Area = 0.500 ac, Inflow Depth = 0.76" for 100-Year event
Inflow = 2.81 cfs @ 0.13 hrs, Volume= 0.032 af
Primary = 2.71 cfs @ 0.13 hrs, Volume= 0.029 af, Atten= 4%, Lag= 0.0 min
Secondary = 0.10 cfs @ 0.06 hrs, Volume= 0.002 af

Primary outflow = Inflow above 0.10 cfs, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs

Link DP-9:

Inflow Area = 0.800 ac, Inflow Depth = 0.85" for 100-Year event
Inflow = 5.06 cfs @ 0.13 hrs, Volume= 0.057 af
Primary = 5.06 cfs @ 0.13 hrs, Volume= 0.057 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs

Subcatchment H:

Runoff = 13.32 cfs @ 0.15 hrs, Volume= 0.165 af, Depth= 0.99"

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
El Paso County 100-Year Duration=9 min, Inten=7.59 in/hr

Area (ac)	C	Description
1.700	0.96	PAVEMENT & ROOF
0.300	0.35	LANDSCAPE
2.000	0.87	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.0					**Direct Entry,**

Subcatchment J:

Runoff = 6.96 cfs @ 0.15 hrs, Volume= 0.086 af, Depth= 0.74"

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
El Paso County 100-Year Duration=9 min, Inten=7.59 in/hr

Area (ac)	C	Description
0.700	0.96	PAVEMENT & ROOF
0.700	0.35	LANDSCAPE
1.400	0.65	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.0					**Direct Entry,**

Subcatchment L:

Runoff = 3.21 cfs @ 0.15 hrs, Volume= 0.040 af, Depth= 0.40"

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
El Paso County 100-Year Duration=9 min, Inten=7.59 in/hr

Area (ac)	C	Description
1.200	0.35	LANDSCAPE

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.0					**Direct Entry,**

Link DP-10:

Inflow Area = 1.400 ac, Inflow Depth = 0.74" for 100-Year event
Inflow = 6.96 cfs @ 0.15 hrs, Volume= 0.086 af
Primary = 6.96 cfs @ 0.15 hrs, Volume= 0.086 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs

Link DP-12:

Inflow Area = 1.200 ac, Inflow Depth = 0.40" for 100-Year event
Inflow = 3.21 cfs @ 0.15 hrs, Volume= 0.040 af
Primary = 3.21 cfs @ 0.15 hrs, Volume= 0.040 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs

Link DP-8:

Inflow Area = 2.000 ac, Inflow Depth = 0.99" for 100-Year event
Inflow = 13.32 cfs @ 0.15 hrs, Volume= 0.165 af
Primary = 13.32 cfs @ 0.15 hrs, Volume= 0.165 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs

Subcatchment Q:

Runoff = 1.02 cfs @ 0.15 hrs, Volume= 0.013 af, Depth= 0.38"

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
El Paso County 100-Year Duration=9 min, Inten=7.20 in/hr

Area (ac)	C	Description
0.400	0.35	LANDSCAPE

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.0					**Direct Entry,**

Link DP-30:

Inflow Area = 0.400 ac, Inflow Depth = 0.38" for 100-Year event
Inflow = 1.02 cfs @ 0.15 hrs, Volume= 0.013 af
Primary = 1.02 cfs @ 0.15 hrs, Volume= 0.013 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs

Subcatchment A:

Runoff = 4.69 cfs @ 0.17 hrs, Volume= 0.066 af, Depth= 0.99"

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
El Paso County 100-Year Duration=10 min, Inten=7.30 in/hr

Area (ac)	C	Description
0.600	0.96	PAVEMENT & ROOF
0.200	0.35	LANDSCAPE
0.800	0.81	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.0					**Direct Entry,**

Link DP-1:

Inflow Area = 0.800 ac, Inflow Depth = 0.99" for 100-Year event
Inflow = 4.69 cfs @ 0.17 hrs, Volume= 0.066 af
Primary = 4.69 cfs @ 0.17 hrs, Volume= 0.066 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs

Subcatchment OS-5:

Runoff = 5.23 cfs @ 0.18 hrs, Volume= 0.080 af, Depth= 0.88"

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
El Paso County 100-Year Duration=11 min, Inten=7.04 in/hr

Area (ac)	C	Description
0.600	0.96	ROADWAY
0.500	0.35	LANDSCAPE
1.100	0.68	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.0					**Direct Entry,**

Subcatchment OS-K:

Runoff = 6.08 cfs @ 0.18 hrs, Volume= 0.094 af, Depth= 0.86"

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
El Paso County 100-Year Duration=11 min, Inten=7.04 in/hr

Area (ac)	C	Description
1.300	0.67	FROM LODGE I FDR

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.0					**Direct Entry,**

Link DP-24:

Inflow Area = 1.100 ac, Inflow Depth = 0.88" for 100-Year event
Inflow = 5.23 cfs @ 0.18 hrs, Volume= 0.080 af
Primary = 5.23 cfs @ 0.18 hrs, Volume= 0.080 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs

Subcatchment G:

Runoff = 8.65 cfs @ 0.20 hrs, Volume= 0.143 af, Depth= 1.01"

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
El Paso County 100-Year Duration=12 min, Inten=6.47 in/hr

Area (ac)	C	Description
1.200	0.96	PAVEMENT & ROOF
0.500	0.35	LANDSCAPE
1.700	0.78	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.0					**Direct Entry,**

Subcatchment OS-3:

Runoff = 2.24 cfs @ 0.20 hrs, Volume= 0.037 af, Depth= 0.56"

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
El Paso County 100-Year Duration=12 min, Inten=6.47 in/hr

Area (ac)	C	Description
0.100	0.96	ROADWAY
0.700	0.35	LANDSCAPE
0.800	0.43	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.0					**Direct Entry,**

Subcatchment P:

Runoff = 1.92 cfs @ 0.20 hrs, Volume= 0.032 af, Depth= 0.76"

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
El Paso County 100-Year Duration=12 min, Inten=6.47 in/hr

Area (ac)	C	Description
0.200	0.96	ROADWAY
0.300	0.35	LANDSCAPE
0.500	0.59	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.0					**Direct Entry,**

Reach SD-25:

[52] Hint: Inlet conditions not evaluated
[88] Warning: Qout>Qin may require Finer Routing>1
[62] Warning: Submerged 16% of Reach SD-24 inlet

Inflow Area = 0.700 ac, Inflow Depth = 0.89" for 100-Year event
Inflow = 2.95 cfs @ 0.19 hrs, Volume= 0.052 af
Outflow = 2.95 cfs @ 0.20 hrs, Volume= 0.052 af, Atten= 0%, Lag= 0.3 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
Max. Velocity= 4.0 fps, Min. Travel Time= 0.3 min
Avg. Velocity = 2.1 fps, Avg. Travel Time= 0.6 min

Peak Depth= 0.66' @ 0.19 hrs
Capacity at bank full= 7.43 cfs
Inlet Invert= 6,990.35', Outlet Invert= 6,990.00'
18.0" Diameter Pipe n= 0.013 Length= 70.0' Slope= 0.0050 '/'

Reach SD-7:

[52] Hint: Inlet conditions not evaluated

Inflow Area = 1.700 ac, Inflow Depth = 1.01" for 100-Year event
Inflow = 8.65 cfs @ 0.20 hrs, Volume= 0.143 af
Outflow = 8.44 cfs @ 0.21 hrs, Volume= 0.143 af, Atten= 2%, Lag= 0.7 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
Max. Velocity= 7.2 fps, Min. Travel Time= 0.4 min
Avg. Velocity = 3.3 fps, Avg. Travel Time= 0.8 min

Peak Depth= 0.95' @ 0.20 hrs
Capacity at bank full= 11.74 cfs
Inlet Invert= 6,975.00', Outlet Invert= 6,973.00'
18.0" Diameter Pipe n= 0.013 Length= 160.0' Slope= 0.0125 '/'

Reach SD-8:

[52] Hint: Inlet conditions not evaluated
[88] Warning: Qout>Qin may require Finer Routing>1
[61] Hint: Submerged 29% of Reach SD-7 bottom

Inflow Area = 3.700 ac, Inflow Depth = 1.07" for 100-Year event
Inflow = 19.53 cfs @ 0.20 hrs, Volume= 0.331 af
Outflow = 19.53 cfs @ 0.20 hrs, Volume= 0.331 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
Max. Velocity= 31.1 fps, Min. Travel Time= 0.0 min
Avg. Velocity = 16.1 fps, Avg. Travel Time= 0.0 min

Peak Depth= 0.58' @ 0.20 hrs
Capacity at bank full= 62.14 cfs
Inlet Invert= 6,973.00', Outlet Invert= 6,966.00'
18.0" Diameter Pipe n= 0.013 Length= 20.0' Slope= 0.3500 '/'

Link DP-22:

Inflow Area =	0.800 ac,	Inflow Depth =	0.56"	for	100-Year event
Inflow =	2.47 cfs @	0.20 hrs,	Volume=	0.038 af	
Primary =	2.47 cfs @	0.20 hrs,	Volume=	0.038 af,	Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs

Link DP-29:

Inflow Area =	0.500 ac,	Inflow Depth =	0.76"	for	100-Year event
Inflow =	1.92 cfs @	0.20 hrs,	Volume=	0.032 af	
Primary =	1.70 cfs @	0.18 hrs,	Volume=	0.031 af,	Atten= 12%, Lag= 0.0 min
Secondary =	0.22 cfs @	0.20 hrs,	Volume=	0.000 af	

Primary outflow = Inflow below 1.70 cfs, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs

Link DP-7:

Inflow Area =	1.700 ac,	Inflow Depth =	1.01"	for	100-Year event
Inflow =	8.65 cfs @	0.20 hrs,	Volume=	0.143 af	
Primary =	8.65 cfs @	0.20 hrs,	Volume=	0.143 af,	Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs

Subcatchment F:

Runoff = 9.56 cfs @ 0.22 hrs, Volume= 0.174 af, Depth= 1.10"

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
El Paso County 100-Year Duration=13 min, Inten=6.57 in/hr

Area (ac)	C	Description
1.300	0.96	PAVEMENT & ROOF
0.600	0.35	LANDSCAPE
1.900	0.77	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.0					**Direct Entry,**

Subcatchment M:

Runoff = 5.88 cfs @ 0.22 hrs, Volume= 0.107 af, Depth= 0.51"

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
El Paso County 100-Year Duration=13 min, Inten=6.57 in/hr

Area (ac)	C	Description
0.100	0.70	GRAVEL ROAD
2.400	0.35	LANDSCAPE
2.500	0.36	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.0					**Direct Entry,**

Link DP-13:

Inflow Area = 2.500 ac, Inflow Depth = 0.51" for 100-Year event
Inflow = 5.88 cfs @ 0.22 hrs, Volume= 0.107 af
Primary = 5.88 cfs @ 0.22 hrs, Volume= 0.107 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs

Link DP-6:

Inflow Area = 1.900 ac, Inflow Depth = 1.10" for 100-Year event
Inflow = 9.56 cfs @ 0.22 hrs, Volume= 0.174 af
Primary = 9.56 cfs @ 0.22 hrs, Volume= 0.174 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs

Subcatchment OS-4:

Runoff = 4.26 cfs @ 0.23 hrs, Volume= 0.083 af, Depth= 0.71"

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
El Paso County 100-Year Duration=14 min, Inten=6.36 in/hr

Area (ac)	C	Description
0.300	0.96	ROADWAY
1.100	0.35	LANDSCAPE
1.400	0.48	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.0					**Direct Entry,**

Subcatchment OS-L:

Runoff = 11.65 cfs @ 0.23 hrs, Volume= 0.228 af, Depth= 0.68"

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
El Paso County 100-Year Duration=14 min, Inten=6.36 in/hr

Area (ac)	C	Description
0.700	0.96	ROADWAY
3.300	0.35	UNDEV. PASTURE
4.000	0.46	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.0					**Direct Entry,**

Link DP-23:

Inflow Area = 1.400 ac, Inflow Depth = 0.71" for 100-Year event
Inflow = 4.26 cfs @ 0.23 hrs, Volume= 0.083 af
Primary = 4.26 cfs @ 0.23 hrs, Volume= 0.083 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs

Link DP-25:

Inflow Area = 3.900 ac, Inflow Depth = 0.78" for 100-Year event
Inflow = 13.10 cfs @ 0.23 hrs, Volume= 0.253 af
Primary = 13.10 cfs @ 0.23 hrs, Volume= 0.253 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs

Subcatchment OS-1:

Runoff = 4.53 cfs @ 0.28 hrs, Volume= 0.107 af, Depth= 0.76"

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
El Paso County 100-Year Duration=17 min, Inten=5.81 in/hr

Area (ac)	C	Description
0.300	0.96	ROADWAY
1.400	0.35	UNDEV. PASTURE
1.700	0.46	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
17.0					**Direct Entry,**

Reach SD-1:

[52] Hint: Inlet conditions not evaluated
[62] Warning: Submerged 19% of Reach SD-23 inlet

Inflow Area = 8.300 ac, Inflow Depth = 0.89" for 100-Year event
Inflow = 25.93 cfs @ 0.29 hrs, Volume= 0.617 af
Outflow = 25.86 cfs @ 0.30 hrs, Volume= 0.617 af, Atten= 0%, Lag= 0.9 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
Max. Velocity= 6.7 fps, Min. Travel Time= 0.5 min
Avg. Velocity = 2.3 fps, Avg. Travel Time= 1.5 min

Peak Depth= 1.84' @ 0.29 hrs
Capacity at bank full= 28.93 cfs
Inlet Invert= 6,979.28', Outlet Invert= 6,978.26'
30.0" Diameter Pipe n= 0.013 Length= 205.0' Slope= 0.0050 '/'

Reach SD-2:

[52] Hint: Inlet conditions not evaluated
[62] Warning: Submerged 39% of Reach SD-1 inlet

Inflow Area = 8.800 ac, Inflow Depth = 0.93" for 100-Year event
Inflow = 28.15 cfs @ 0.29 hrs, Volume= 0.679 af
Outflow = 28.13 cfs @ 0.29 hrs, Volume= 0.679 af, Atten= 0%, Lag= 0.3 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
Max. Velocity= 6.7 fps, Min. Travel Time= 0.1 min
Avg. Velocity = 2.3 fps, Avg. Travel Time= 0.4 min

Peak Depth= 2.01' @ 0.29 hrs
Capacity at bank full= 28.71 cfs
Inlet Invert= 6,978.26', Outlet Invert= 6,978.02'
30.0" Diameter Pipe n= 0.013 Length= 49.0' Slope= 0.0049 '/'

Reach SD-20:

[52] Hint: Inlet conditions not evaluated

Inflow Area = 1.300 ac, Inflow Depth = 2.21" for 100-Year event
Inflow = 8.10 cfs @ 0.19 hrs, Volume= 0.240 af
Outflow = 8.10 cfs @ 0.21 hrs, Volume= 0.240 af, Atten= 0%, Lag= 1.2 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
Max. Velocity= 6.7 fps, Min. Travel Time= 0.1 min
Avg. Velocity = 5.0 fps, Avg. Travel Time= 0.1 min

Peak Depth= 0.97" @ 0.19 hrs
Capacity at bank full= 10.76 cfs
Inlet Invert= 6,982.46', Outlet Invert= 6,982.04'
18.0" Diameter Pipe n= 0.013 Length= 40.0' Slope= 0.0105 '/'

Reach SD-21:

[52] Hint: Inlet conditions not evaluated
[62] Warning: Submerged 38% of Reach SD-20 inlet

Inflow Area = 5.300 ac, Inflow Depth = 0.94" for 100-Year event
Inflow = 16.88 cfs @ 0.25 hrs, Volume= 0.413 af
Outflow = 16.88 cfs @ 0.26 hrs, Volume= 0.413 af, Atten= 0%, Lag= 0.6 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
Max. Velocity= 7.9 fps, Min. Travel Time= 0.2 min
Avg. Velocity = 4.8 fps, Avg. Travel Time= 0.3 min

Peak Depth= 1.29' @ 0.25 hrs
Capacity at bank full= 22.62 cfs
Inlet Invert= 6,981.74', Outlet Invert= 6,980.95'
24.0" Diameter Pipe n= 0.013 Length= 79.0' Slope= 0.0100 '/'

Reach SD-22:

[52] Hint: Inlet conditions not evaluated
[62] Warning: Submerged 34% of Reach SD-21 inlet

Inflow Area = 7.000 ac, Inflow Depth = 0.83" for 100-Year event
Inflow = 20.51 cfs @ 0.28 hrs, Volume= 0.482 af
Outflow = 20.46 cfs @ 0.28 hrs, Volume= 0.482 af, Atten= 0%, Lag= 0.1 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
Max. Velocity= 6.3 fps, Min. Travel Time= 0.1 min
Avg. Velocity = 3.6 fps, Avg. Travel Time= 0.2 min

Peak Depth= 1.56' @ 0.28 hrs
Capacity at bank full= 28.65 cfs
Inlet Invert= 6,980.85', Outlet Invert= 6,980.65'
30.0" Diameter Pipe n= 0.013 Length= 41.0' Slope= 0.0049 '/'

Reach SD-23:

[52] Hint: Inlet conditions not evaluated
[62] Warning: Submerged 58% of Reach SD-22 inlet

Inflow Area = 7.500 ac, Inflow Depth = 0.85" for 100-Year event
Inflow = 22.47 cfs @ 0.28 hrs, Volume= 0.528 af
Outflow = 22.35 cfs @ 0.30 hrs, Volume= 0.528 af, Atten= 1%, Lag= 1.1 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
Max. Velocity= 6.5 fps, Min. Travel Time= 0.7 min
Avg. Velocity = 2.4 fps, Avg. Travel Time= 1.9 min

Peak Depth= 1.65' @ 0.29 hrs
Capacity at bank full= 28.95 cfs
Inlet Invert= 6,980.65', Outlet Invert= 6,979.28'
30.0" Diameter Pipe n= 0.013 Length= 275.0' Slope= 0.0050 '/'

Reach SD-3:

[52] Hint: Inlet conditions not evaluated
[62] Warning: Submerged 43% of Reach SD-2 inlet

Inflow Area = 9.100 ac, Inflow Depth = 0.95" for 100-Year event
Inflow = 29.68 cfs @ 0.29 hrs, Volume= 0.719 af
Outflow = 29.61 cfs @ 0.30 hrs, Volume= 0.719 af, Atten= 0%, Lag= 0.5 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
Max. Velocity= 11.2 fps, Min. Travel Time= 0.3 min
Avg. Velocity = 3.9 fps, Avg. Travel Time= 0.8 min

Peak Depth= 1.32' @ 0.29 hrs
Capacity at bank full= 53.88 cfs
Inlet Invert= 6,978.02', Outlet Invert= 6,975.00'
30.0" Diameter Pipe n= 0.013 Length= 175.0' Slope= 0.0173 '/'

Link DP-20:

Inflow Area =	1.700 ac,	Inflow Depth =	0.76"	for	100-Year event
Inflow =	4.53 cfs @	0.28 hrs,	Volume=	0.107 af	
Primary =	3.63 cfs @	0.28 hrs,	Volume=	0.069 af,	Atten= 20%, Lag= 0.0 min
Secondary =	0.90 cfs @	0.12 hrs,	Volume=	0.038 af	

Primary outflow = Inflow above 0.90 cfs, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs

Link DP-26:

Inflow Area =	1.300 ac,	Inflow Depth =	2.21"	for	100-Year event
Inflow =	8.10 cfs @	0.19 hrs,	Volume=	0.240 af	
Primary =	8.10 cfs @	0.19 hrs,	Volume=	0.240 af,	Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs

Link DP-27:

Inflow Area =	4.000 ac,	Inflow Depth =	0.88"	for	100-Year event
Inflow =	11.78 cfs @	0.24 hrs,	Volume=	0.294 af	
Primary =	8.78 cfs @	0.24 hrs,	Volume=	0.174 af,	Atten= 25%, Lag= 0.0 min
Secondary =	3.00 cfs @	0.05 hrs,	Volume=	0.120 af	

Primary outflow = Inflow above 3.00 cfs, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs

Subcatchment D:

Runoff = 13.95 cfs @ 0.32 hrs, Volume= 0.368 af, Depth= 1.26"

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
El Paso County 100-Year Duration=19 min, Inten=5.32 in/hr

Area (ac)	C	Description
2.300	0.96	PAVEMENT & ROOF
1.200	0.35	LANDSCAPE
3.500	0.75	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
19.0					**Direct Entry,**

Subcatchment K:

Runoff = 7.02 cfs @ 0.32 hrs, Volume= 0.185 af, Depth= 1.01"

Runoff by Rational method, Rise/Fall=1.0/1.0 xTc, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
El Paso County 100-Year Duration=19 min, Inten=5.32 in/hr

Area (ac)	C	Description
0.900	0.96	PAVEMENT & ROOF
1.300	0.35	LANDSCAPE
2.200	0.60	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
19.0					**Direct Entry,**

Reach SD-10:

[52] Hint: Inlet conditions not evaluated

Inflow Area = 0.800 ac, Inflow Depth = 1.36" for 100-Year event
Inflow = 3.48 cfs @ 0.14 hrs, Volume= 0.091 af
Outflow = 3.48 cfs @ 0.31 hrs, Volume= 0.091 af, Atten= 0%, Lag= 10.2 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
Max. Velocity= 5.3 fps, Min. Travel Time= 0.6 min
Avg. Velocity = 2.5 fps, Avg. Travel Time= 1.2 min

Peak Depth= 0.59' @ 0.29 hrs
Capacity at bank full= 10.50 cfs
Inlet Invert= 6,986.00', Outlet Invert= 6,984.10'
18.0" Diameter Pipe n= 0.013 Length= 190.0' Slope= 0.0100 '/'

Reach SD-11:

[52] Hint: Inlet conditions not evaluated
[61] Hint: Submerged 44% of Reach SD-10 bottom

Inflow Area = 2.200 ac, Inflow Depth = 1.19" for 100-Year event
Inflow = 8.36 cfs @ 0.31 hrs, Volume= 0.219 af
Outflow = 8.36 cfs @ 0.32 hrs, Volume= 0.219 af, Atten= 0%, Lag= 0.6 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
Max. Velocity= 6.7 fps, Min. Travel Time= 0.7 min
Avg. Velocity = 2.7 fps, Avg. Travel Time= 1.7 min

Peak Depth= 0.84' @ 0.31 hrs
Capacity at bank full= 22.62 cfs
Inlet Invert= 6,984.10', Outlet Invert= 6,981.40'
24.0" Diameter Pipe n= 0.013 Length= 270.0' Slope= 0.0100 '/'

Reach SD-12:

[52] Hint: Inlet conditions not evaluated
[61] Hint: Submerged 24% of Reach SD-11 bottom

Inflow Area = 4.400 ac, Inflow Depth = 1.10" for 100-Year event
Inflow = 15.38 cfs @ 0.32 hrs, Volume= 0.404 af
Outflow = 15.30 cfs @ 0.33 hrs, Volume= 0.404 af, Atten= 0%, Lag= 0.7 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
Max. Velocity= 17.2 fps, Min. Travel Time= 0.4 min
Avg. Velocity = 7.8 fps, Avg. Travel Time= 0.9 min

Peak Depth= 0.65' @ 0.32 hrs
Capacity at bank full= 66.72 cfs
Inlet Invert= 6,981.40', Outlet Invert= 6,944.00'
24.0" Diameter Pipe n= 0.013 Length= 430.0' Slope= 0.0870 '/'

Reach SD-4:

[52] Hint: Inlet conditions not evaluated
[61] Hint: Submerged 57% of Reach SD-3 bottom

Inflow Area = 12.600 ac, Inflow Depth = 1.05" for 100-Year event
Inflow = 41.75 cfs @ 0.32 hrs, Volume= 1.104 af
Outflow = 41.56 cfs @ 0.33 hrs, Volume= 1.104 af, Atten= 0%, Lag= 0.6 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
Max. Velocity= 10.0 fps, Min. Travel Time= 0.4 min
Avg. Velocity = 3.4 fps, Avg. Travel Time= 1.1 min

Peak Depth= 1.72' @ 0.32 hrs
Capacity at bank full= 66.70 cfs
Inlet Invert= 6,975.00', Outlet Invert= 6,972.83'
36.0" Diameter Pipe n= 0.013 Length= 217.0' Slope= 0.0100 '/'

Reach SD-5:

[52] Hint: Inlet conditions not evaluated
[61] Hint: Submerged 80% of Reach SD-4 bottom

Inflow Area = 12.900 ac, Inflow Depth = 1.06" for 100-Year event
Inflow = 42.67 cfs @ 0.33 hrs, Volume= 1.136 af
Outflow = 42.54 cfs @ 0.34 hrs, Volume= 1.136 af, Atten= 0%, Lag= 0.5 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
Max. Velocity= 10.0 fps, Min. Travel Time= 0.3 min
Avg. Velocity = 3.3 fps, Avg. Travel Time= 0.9 min

Peak Depth= 1.74' @ 0.33 hrs
Capacity at bank full= 66.70 cfs
Inlet Invert= 6,972.83', Outlet Invert= 6,970.96'
36.0" Diameter Pipe n= 0.013 Length= 187.0' Slope= 0.0100 '/'

Reach SD-6:

[52] Hint: Inlet conditions not evaluated
[61] Hint: Submerged 83% of Reach SD-5 bottom

Inflow Area = 14.800 ac, Inflow Depth = 1.09" for 100-Year event
Inflow = 49.82 cfs @ 0.33 hrs, Volume= 1.341 af
Outflow = 49.72 cfs @ 0.34 hrs, Volume= 1.341 af, Atten= 0%, Lag= 0.7 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
Max. Velocity= 13.5 fps, Min. Travel Time= 0.4 min
Avg. Velocity = 4.5 fps, Avg. Travel Time= 1.2 min

Peak Depth= 1.55' @ 0.33 hrs
Capacity at bank full= 94.33 cfs
Inlet Invert= 6,970.96', Outlet Invert= 6,964.56'
36.0" Diameter Pipe n= 0.013 Length= 320.0' Slope= 0.0200 '/'

Reach SD-9:

[52] Hint: Inlet conditions not evaluated
[61] Hint: Submerged 18% of Reach SD-6 bottom

Inflow Area = 18.500 ac, Inflow Depth = 1.15" for 100-Year event
Inflow = 65.18 cfs @ 0.32 hrs, Volume= 1.771 af
Outflow = 65.09 cfs @ 0.33 hrs, Volume= 1.771 af, Atten= 0%, Lag= 0.3 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
Max. Velocity= 25.4 fps, Min. Travel Time= 0.1 min
Avg. Velocity = 8.8 fps, Avg. Travel Time= 0.4 min

Peak Depth= 1.17' @ 0.33 hrs
Capacity at bank full= 201.62 cfs
Inlet Invert= 6,964.56', Outlet Invert= 6,944.00'
36.0" Diameter Pipe n= 0.013 Length= 225.0' Slope= 0.0914 '/'

Link DP-11:

Inflow Area = 2.200 ac, Inflow Depth = 1.01" for 100-Year event
Inflow = 7.02 cfs @ 0.32 hrs, Volume= 0.185 af
Primary = 7.02 cfs @ 0.32 hrs, Volume= 0.185 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs

Link DP-4:

Inflow Area = 3.500 ac, Inflow Depth = 1.26" for 100-Year event
Inflow = 13.95 cfs @ 0.32 hrs, Volume= 0.368 af
Primary = 13.95 cfs @ 0.32 hrs, Volume= 0.368 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs

Link DP-A:

Inflow Area = 31.100 ac, Inflow Depth = 0.46" for 100-Year event
Inflow = 11.16 cfs @ 0.39 hrs, Volume= 1.198 af
Primary = 11.16 cfs @ 0.39 hrs, Volume= 1.198 af, Atten= 0%, Lag= 0.0 min

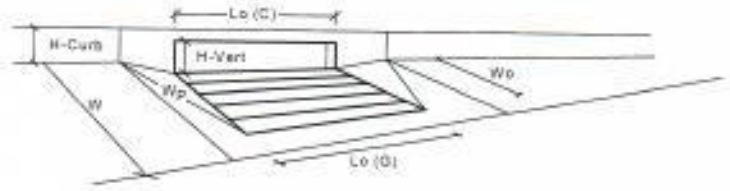
Primary outflow = Inflow, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs

HYDRAULIC CALCULATIONS

INLET IN A SUMP OR SAG LOCATION

Version 4.05 Released March 2017

DP-1

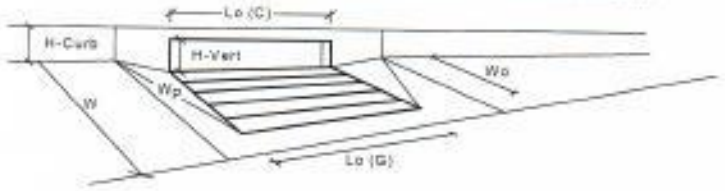


Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from above)	a_{local} =	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	1	1	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	6.0	6.0	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 =	2.00	2.00	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} =	0.33	0.33	ft
Combination Inlet Performance Reduction Factor for Long Inlets	$RF_{Combination}$ =	0.77	0.77	
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 =	5.4	5.4	cfs
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)	$Q_{PEAK\ REQUIRED}$ =	2.0	5.0	cfs

INLET IN A SUMP OR SAG LOCATION

Version 4.05 Released March 2017

DP-2

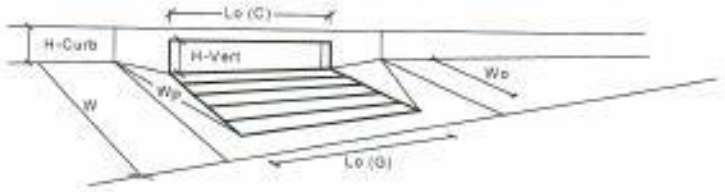


Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from above)	a_{local} =	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	1	1	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	6.0	6.0	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 =	2.00	2.00	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} =	0.33	0.33	ft
Combination Inlet Performance Reduction Factor for Long Inlets	$RF_{Combination}$ =	0.77	0.77	
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 =	5.4	5.4	cfs
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)	$Q_{PEAK\ REQUIRED}$ =	2.0	4.0	cfs

INLET IN A SUMP OR SAG LOCATION

Version 4.05 Released March 2017

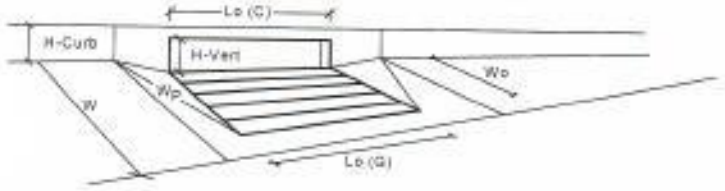
DP-3



Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type C Grate		
Local Depression (additional to continuous gutter depression 'a' from above)	a_{local} =	0.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	1	1	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	6.0	6.0	inches
Grate Information		MINOR	MAJOR	Override Depths
Length of a Unit Grate	L_o (G) =	2.92	2.92	feet
Width of a Unit Grate	W_o =	2.92	2.92	feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)	A_{ratio} =	0.85	0.85	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	C_f (G) =	0.50	0.50	
Grate Weir Coefficient (typical value 2.15 - 3.60)	C_w (G) =	2.41	2.41	
Grate Orifice Coefficient (typical value 0.60 - 0.80)	C_o (G) =	0.67	0.67	
Curb Opening Information		MINOR	MAJOR	
Length of a Unit Curb Opening	L_o (C) =	N/A	N/A	feet
Height of Vertical Curb Opening in Inches	H_{vert} =	N/A	N/A	inches
Height of Curb Orifice Throat in Inches	H_{throat} =	N/A	N/A	inches
Angle of Throat (see USDCM Figure ST-5)	Theta =	N/A	N/A	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)	W_p =	N/A	N/A	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)	C_f (C) =	N/A	N/A	
Curb Opening Weir Coefficient (typical value 2.3-3.7)	C_w (C) =	N/A	N/A	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	C_o (C) =	N/A	N/A	
Low Head Performance Reduction (Calculated)		MINOR	MAJOR	
Depth for Grate Midwidth	d_{Grate} =	0.379	0.545	ft
Depth for Curb Opening Weir Equation	d_{Curb} =	N/A	N/A	ft
Combination Inlet Performance Reduction Factor for Long Inlets	$RF_{Combination}$ =	N/A	N/A	
Curb Opening Performance Reduction Factor for Long Inlets	RF_{Curb} =	N/A	N/A	
Grated Inlet Performance Reduction Factor for Long Inlets	RF_{Grate} =	0.95	1.00	
		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	Q_a =	2.0	3.6	cfs
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)	$Q_{PEAK\ REQUIRED}$ =	1.0	3.0	cfs

INLET IN A SUMP OR SAG LOCATION

Version 4.05 Released March 2017



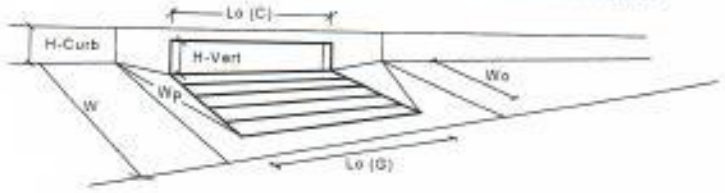
DP-4

Design Information (Input)		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 =	6.0	6.0	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) =	10.00	10.00	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 =	2.00	2.00	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} =	0.33	0.50	ft
Combination Inlet Performance Reduction Factor for Long Inlets	$RF_{Combination}$ =	0.57	0.75	
Curb Opening Performance Reduction Factor for Long Inlets	RF_{Curb} =	0.93	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 =	8.3	16.3	cfs
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)	$Q_{PEAK\ REQUIRED}$ =	7.0	14.9	cfs

INLET IN A SUMP OR SAG LOCATION

Version 4.05 Released March 2017

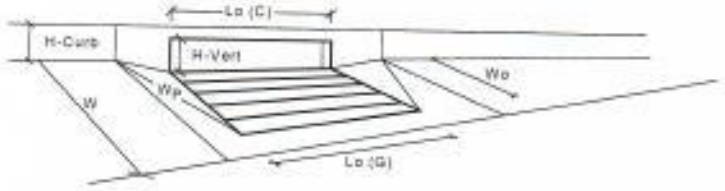
DP-5



Design Information (Input)		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 =	6.0	6.0	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 =	2.00	2.00	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} =	0.33	0.33	ft
Combination Inlet Performance Reduction Factor for Long Inlets	$RF_{Combination}$ =	0.77	0.77	
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	
Total Inlet Interception Capacity (assumes clogged condition)		MINOR	MAJOR	
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)	Q_a =	5.4	5.4	cfs
	$Q_{PEAK\ REQUIRED}$ =	1.0	2.0	cfs

INLET IN A SUMP OR SAG LOCATION

Version 4.05 Released March 2017



DP-6

Design Information (Input)

		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 =	6.0	7.0	inches

Override Depths

Grate Information

	MINOR	MAJOR	
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) =	10.00	10.00	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 =	2.00	2.00	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} =	0.33	0.42	ft
Combination Inlet Performance Reduction Factor for Long Inlets	$RF_{Combination}$ =	0.57	0.65	
Curb Opening Performance Reduction Factor for Long Inlets	RF_{Curb} =	0.93	0.99	
Grated Inlet Performance Reduction Factor for Long Inlets	RF_{Grate} =	N/A	N/A	

Total Inlet Interception Capacity (assumes clogged condition)

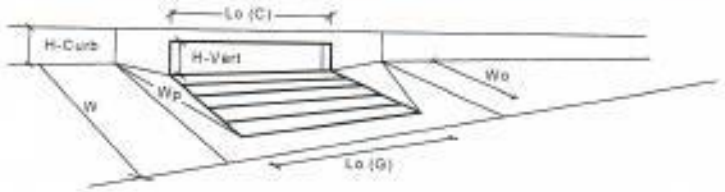
	MINOR	MAJOR	
Q_a =	8.3	12.2	cfs
$Q_{(Max\ Allowed)}$ =	4.0	10.0	cfs

Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)

INLET IN A SUMP OR SAG LOCATION

Version 4.05 Released March 2017

DP-7

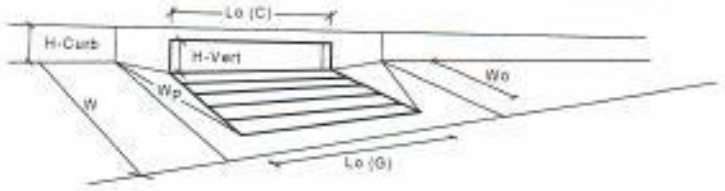


Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from above)	a_{local} =	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	1	1	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	6.0	7.0	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) =	10.00	10.00	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 =	2.00	2.00	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} =	0.33	0.42	ft
Combination Inlet Performance Reduction Factor for Long Inlets	$RF_{Combination}$ =	0.57	0.66	
Curb Opening Performance Reduction Factor for Long Inlets	RF_{Curb} =	0.93	0.99	
Grated Inlet Performance Reduction Factor for Long Inlets	RF_{Grate} =	N/A	N/A	
Total Inlet Interception Capacity (assumes clogged condition)		MINOR	MAJOR	
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)	Q_a =	8.3	12.2	cfs
	$Q_{PEAK\ REQUIRED}$ =	4.0	9.0	cfs

INLET IN A SUMP OR SAG LOCATION

Version 4.05 Released March 2017

DP-8

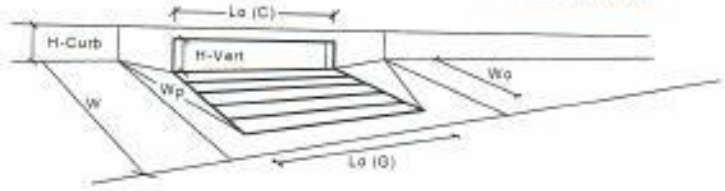


Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from above)	a_{local} =	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	1	1	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	6.0	8.0	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) =	10.00	10.00	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 =	2.00	2.00	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} =	0.50	0.50	ft
Combination Inlet Performance Reduction Factor for Long Inlets	$RF_{Combination}$ =	0.57	0.75	
Curb Opening Performance Reduction Factor for Long Inlets	RF_{Curb} =	0.65	1.00	
Grated Inlet Performance Reduction Factor for Long Inlets	RF_{Grate} =	N/A	N/A	
Total Inlet Interception Capacity (assumes clogged condition)		MINOR	MAJOR	
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)	Q_a =	8.3	16.3	cfs
	$Q_{PEAK\ REQUIRED}$ =	7.0	13.0	cfs

INLET IN A SUMP OR SAG LOCATION

Version 4.05 Released March 2017

DP-9

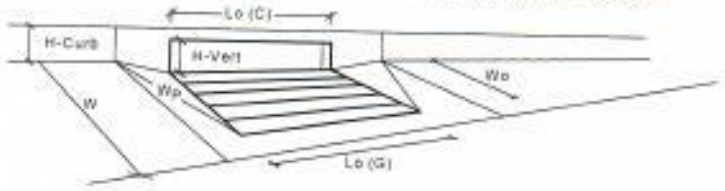


Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from above)	a_{local} =	3.00	2.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	1	1	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	6.0	6.0	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 =	2.00	2.00	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} =	0.33	0.33	ft
Combination Inlet Performance Reduction Factor for Long Inlets	$RF_{Combination}$ =	0.77	0.77	
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	
Total Inlet Interception Capacity (assumes clogged condition)		MINOR	MAJOR	
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)	Q_a =	6.4	6.4	cfs
	$Q_{PEAK\ REQUIRED}$ =	2.0	5.0	cfs

INLET IN A SUMP OR SAG LOCATION

Version 4.05 Released March 2017

DP-10



Design Information (Input)

	MINOR	MAJOR	
Type of Inlet	COOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from above)	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)	1	1	
Water Depth at Flowline (outside of local depression)	6.0	6.0	inches

Override Depths

Grate Information

	MINOR	MAJOR	
Length of a Unit Grate	N/A	N/A	feet
Width of a Unit Grate	N/A	N/A	feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)	N/A	N/A	

Curb Opening Information

	MINOR	MAJOR	
Length of a Unit Curb Opening	6.00	6.00	feet
Height of Vertical Curb Opening in Inches	6.00	6.00	inches
Height of Curb Orifice Throat in Inches	6.00	6.00	inches
Angle of Throat (see USDCM Figure ST-5)	63.40	63.40	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)	2.00	2.00	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	0.67	0.67	

Low Head Performance Reduction (Calculated)

	MINOR	MAJOR	
Depth for Grate Midwidth	N/A	N/A	ft
Depth for Curb Opening Weir Equation	0.33	0.50	ft
Combination Inlet Performance Reduction Factor for Long Inlets	0.77	1.00	
Curb Opening Performance Reduction Factor for Long Inlets	1.00	1.00	
Grated Inlet Performance Reduction Factor for Long Inlets	N/A	N/A	

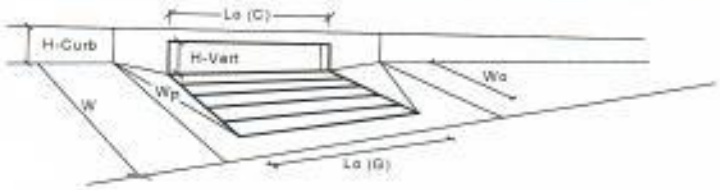
Total Inlet Interception Capacity (assumes clogged condition)

	MINOR	MAJOR	
Q_o =	5.4	9.3	cfs
$Q_{PEAK\ REQUIRED}$ =	3.9	7.0	cfs

Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)

INLET IN A SUMP OR SAG LOCATION

Version 4.05 Released March 2017



DP-11

Design Information (Input)		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 =	6.0	7.0	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 =	2.00	2.00	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} =	0.33	0.42	ft
Combination Inlet Performance Reduction Factor for Long Inlets	$RF_{Combination}$ =	0.77	0.90	
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	
Total Inlet Interception Capacity (assumes clogged condition)		MINOR	MAJOR	
Inlet Capacity IS GOOD for Minor and Major Storms(>Q PEAK)	Q_a =	5.4	7.8	cfs
	$Q_{PEAK\ REQUIRED}$ =	3.0	7.0	cfs

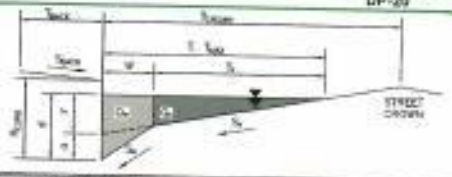
Version 4.05 Released March 2017

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

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

Project: LODGE II AT BLACK FOREST

Inlet ID: DP-20



Gutter Geometry (Enter data in the blue cells)

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	12.0 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} =	0.020
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00 inches
Distance from Curb Face to Street Crown	T_{CROWN} =	20.0 ft
Gutter Width	W =	3.00 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 =	0.020 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} =	20.0	20.0	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 Allowable Capacity is based on Depth Criterion

MAJOR STORM Allowable Capacity is based on Spread Criterion

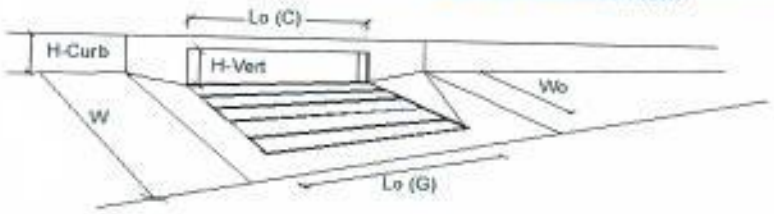
	Minor Storm	Major Storm	
Q_{allow} =	18.8	33.5	cfs

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} =	1.0	1.0	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 =	1.8	4.1	cfs
Total Inlet Carry-Over Flow (flow bypassing inlet)	Q_b =	0.0	0.9	cfs
Capture Percentage = Q_a/Q_o =	C% =	100	83	%

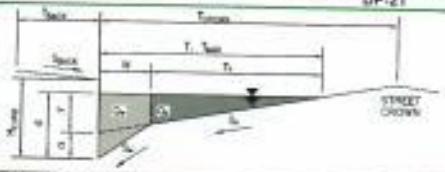
Version 4.05 Released March 2017

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

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

Project: LODGE II AT BLACK FOREST

Inlet ID: DP-21



Gutter Geometry (Enter data in the blue cells)

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	12.0	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} =	0.020	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	20.0	ft
Gutter Width	W =	3.00	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 =	0.020	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} =	20.0	20.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	8.0	8.0	inches
Allow Flow Depth at Street Crown (leave blank for no)				check = yes

MINOR STORM Allowable Capacity is based on Depth Criterion

MAJOR STORM Allowable Capacity is based on Spread Criterion

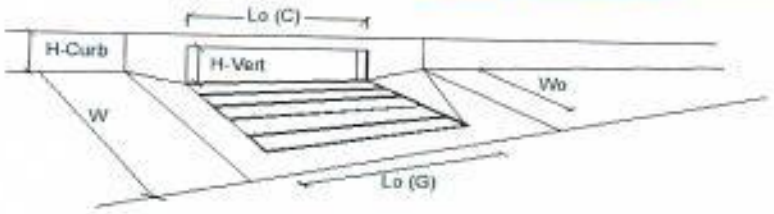
	Minor Storm	Major Storm	
Q_{allow} =	18.8	33.5	cfs

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} =	1.0	1.0	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 =	1.8	2.9	cfs
Total Inlet Carry-Over Flow (flow bypassing inlet)	Q_b =	0.0	0.1	cfs
Capture Percentage = Q_a/Q_o =	C% =	100	96	%

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: LODGE II AT BLACK FOREST

Inlet ID: DP-27

Gutter Geometry (Enter data in the blue cells)

Maximum Allowable Width for Spread Behind Curb	T_{BACK} = 12.0	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} = 0.020	
Height of Curb at Gutter Flow Line	H_{CURB} = 6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} = 20.0	ft
Gutter Width	W = 3.00	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} = 20.0	20.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} = 6.0	12.0	inches
Check boxes are not applicable in SUMP conditions	☐	☐	

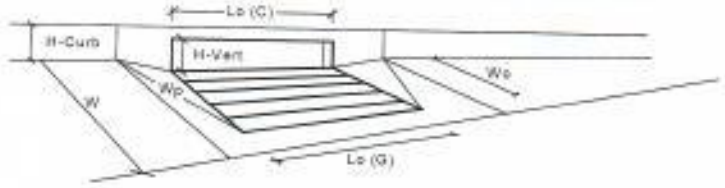
MINOR STORM Allowable Capacity is based on Depth Criterion

MAJOR STORM Allowable Capacity is based on Depth Criterion

	Minor Storm	Major Storm	
Q_{allow} =	SUMP	SUMP	cfs

INLET IN A SUMP OR SAG LOCATION

Version 4.05 Released March 2017



Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	Colorado Springs D-10-R		
Local Depression (additional to continuous gutter depression 'a' from above)	a_{local} =	4.00	4.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	1	1	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	6.0	7.1	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) =	8.00	8.00	feet
Height of Vertical Curb Opening in Inches	H_{vert} =	8.00	8.00	inches
Height of Curb Orifice Throat in Inches	H_{throat} =	8.00	8.00	inches
Angle of Throat (see USDCM Figure ST-5)	Theta =	81.00	81.00	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)	W_p =	3.00	3.00	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} =	0.25	0.34	ft
Combination Inlet Performance Reduction Factor for Long Inlets	$RF_{Combination}$ =	0.61	0.71	
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	
Total Inlet Interception Capacity (assumes clogged condition)		MINOR	MAJOR	
	Q_a =	5.7	9.6	cfs
WARNING: Inlet Capacity less than Q Peak for Major Storm	$Q_{PEAK\ REQUIRED}$ =	1.0	12.0	cfs

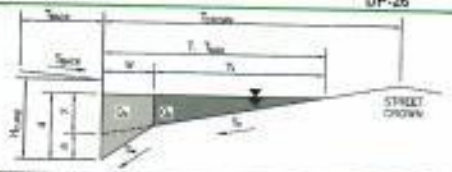
Version 4.05 Released March 2017

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

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

Project: LODGE II AT BLACK FOREST

Inlet ID: DP-26



Gutter Geometry (Enter data in the blue cells)

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	12.0 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} =	0.020
Height of Curb at Gutter Flow Line	H_{CURB} =	8.00 inches
Distance from Curb Face to Street Crown	T_{CROWN} =	20.0 ft
Gutter Width	W =	3.00 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

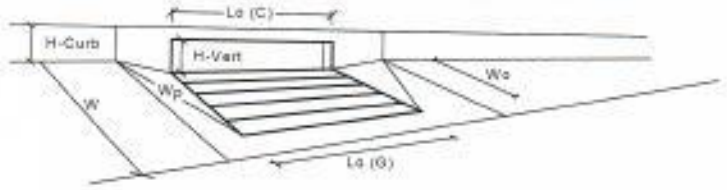
		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	20.0	20.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	12.0	inches
Check boxes are not applicable in SUMP conditions		☐	☐	

MINOR STORM Allowable Capacity is based on Depth Criterion
MAJOR STORM Allowable Capacity is based on Depth Criterion

	Minor Storm	Major Storm	
Q_{allow} =	SUMP	SUMP	cfs

INLET IN A SUMP OR SAG LOCATION

Version 4.05 Released March 2017



Design Information (Input)

	MINOR	MAJOR	
Type of Inlet	Colorado Springs D-10-R		
Local Depression (additional to continuous gutter depression 'a' from above)	4.00	4.00	inches
Number of Unit Inlets (Grate or Curb Opening)	1	1	
Water Depth at Flowline (outside of local depression)	6.0	7.1	inches

Grate Information

	MINOR	MAJOR	
Length of a Unit Grate	N/A	N/A	feet
Width of a Unit Grate	N/A	N/A	feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)	N/A	N/A	

Curb Opening Information

	MINOR	MAJOR	
Length of a Unit Curb Opening	4.00	4.00	feet
Height of Vertical Curb Opening in Inches	8.00	8.00	inches
Height of Curb Orifice Throat in Inches	8.00	8.00	inches
Angle of Throat (see USDCM Figure ST-5)	91.00	91.00	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)	3.00	3.00	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	0.67	0.67	

Low Head Performance Reduction (Calculated)

	MINOR	MAJOR	
Depth for Grate Midwidth	N/A	N/A	ft
Depth for Curb Opening Weir Equation	0.25	0.34	ft
Combination Inlet Performance Reduction Factor for Long Inlets	0.85	1.00	
Curb Opening Performance Reduction Factor for Long Inlets	1.00	1.00	
Grated Inlet Performance Reduction Factor for Long Inlets	N/A	N/A	

Total Inlet Interception Capacity (assumes clogged condition)

	MINOR	MAJOR	
Q_a =	3.7	5.9	cfs
$Q_{PEAK\ REQUIRED}$ =	3.0	8.0	cfs

WARNING: Inlet Capacity less than Q Peak for Major Storm

(**) Override Depths

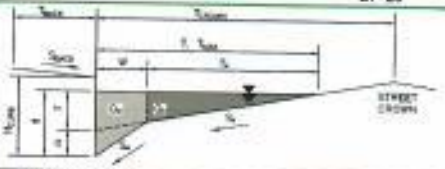
Version 4.05 Released March 2017

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

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

Project: LODGE II AT BLACK FOREST

Inlet ID: DP-28



Gutter Geometry (Enter data in the blue cells)

Maximum Allowable Width for Spread Behind Curb	T_{BACK} = 10.0	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} = 0.020	
Height of Curb at Gutter Flow Line	H_{CURB} = 6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} = 21.0	ft
Gutter Width	W = 3.00	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 = 0.030	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} = 0.020	

	Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} = 10.0	21.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} = 6.0	6.0	inches
Allow Flow Depth at Street Crown (leave blank for no)	☐	☐	check = yes

MINOR STORM Allowable Capacity is based on Spread Criterion

MAJOR STORM Allowable Capacity is based on Depth Criterion

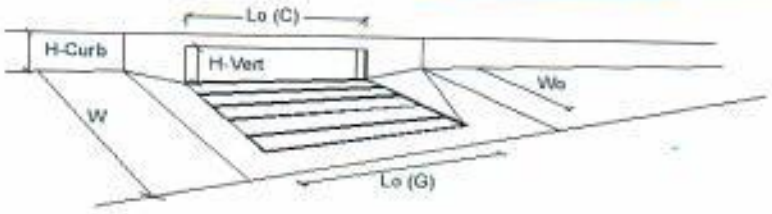
	Minor Storm	Major Storm	
Q_{allow} =	5.7	10.3	cfs

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 =	5.00	5.00	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 =	0.9	1.5	cfs
Total Inlet Carry-Over Flow (flow bypassing inlet)	Q_b =	0.0	0.1	cfs
Capture Percentage = Q_a/Q_o =	C% =	100	94	%

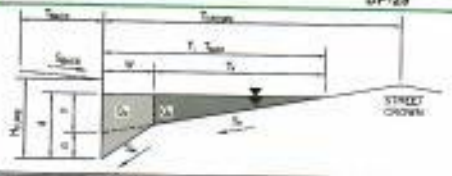
Version 4.05 Released March 2017

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

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

Project: LODGE II AT BLACK FOREST

Inlet ID: DP-29



Gutter Geometry (Enter data in the blue cells)

Maximum Allowable Width for Spread Behind Curb	T_{BACK} = 10.0	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} = 0.020	
Height of Curb at Gutter Flow Line	H_{CURB} = 6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} = 21.0	ft
Gutter Width	W = 3.00	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 = 0.030	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} = 0.020	

	Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} = 10.0	21.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} = 6.0	6.0	inches
Allow Flow Depth at Street Crown (leave blank for no)			check = yes

MINOR STORM Allowable Capacity is based on Spread Criterion

MAJOR STORM Allowable Capacity is based on Depth Criterion

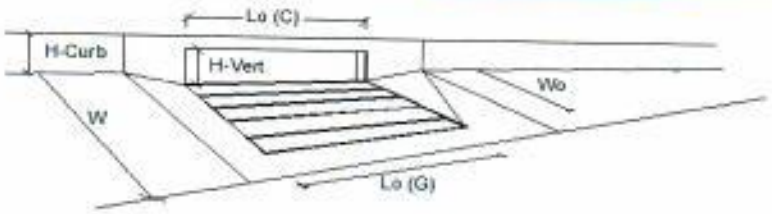
	Minor Storm	Major Storm	
Q_{allow} =	5.7	10.3	cfs

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'

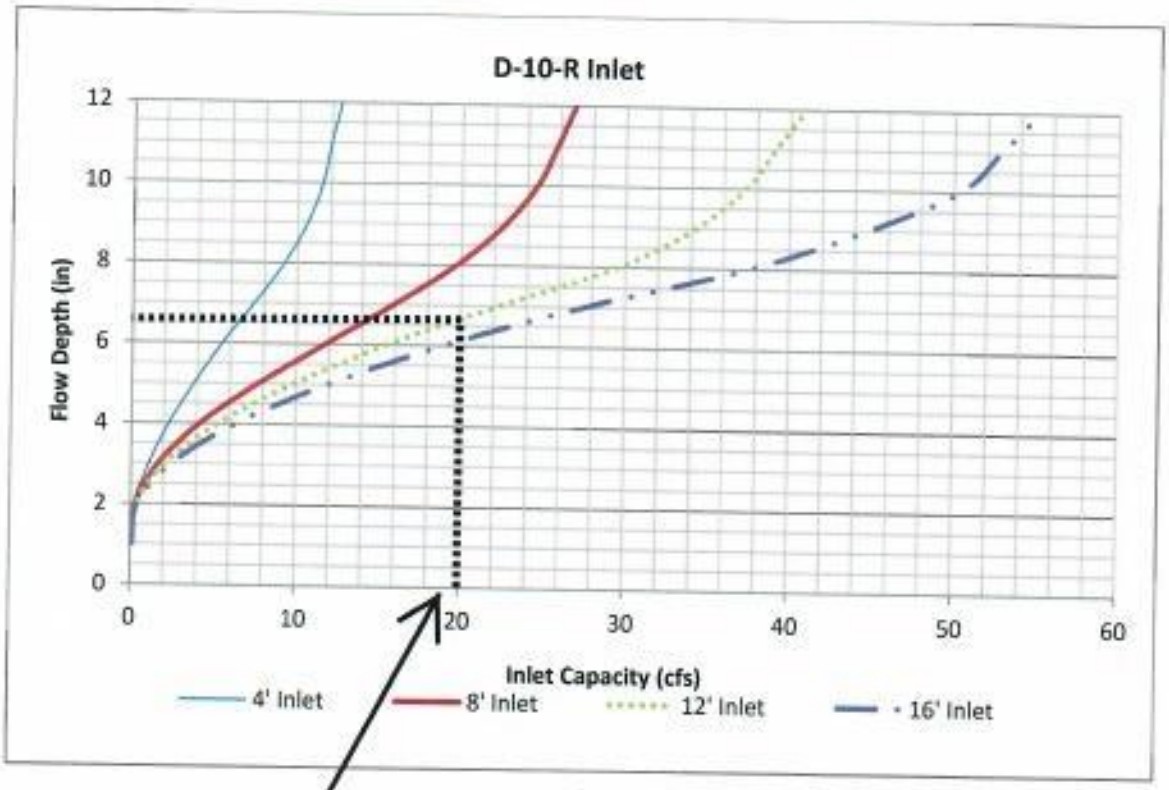
INLET ON A CONTINUOUS GRADE

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 =	5.00	5.00	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 =	0.8	1.7	cfs
Total Inlet Carry-Over Flow (flow bypassing inlet)	Q_b =	0.0	0.2	cfs
Capture Percentage = Q_a/Q_o =	C% =	100	92	%

Figure 8-12. Inlet Capacity Chart Sump Conditions, Curb Opening (D-10-R) Inlet



Ccmbined flow at DP-26 & DP-27, 20 cfs, can be captured by combined 12' of sump inlet.

RIPRAP SIZING

Channel Section Description	Velocity V [ft/s]	Slope, S [ft/ft]	Specific Gravity	*Channel/Riprap Relationship	Rock Type	Mean Particle Size [in]
Pond A Outfall	12.6	15.0%	2.5	6.98	M	***12***
SD25	4	0.5%	2.5	1.24	N/A	***none req'd***
Pond B Outfall	2	0.5%	2.5	0.62	N/A	***none req'd***
Pond C Outfall	2.3	6.2%	2.5	1.10	N/A	***none req'd***

*Channel/Riprap Relationship = $\frac{V*S^{0.17}}{(S_S - 1)^{0.66}}$

*taken from Urban Storm Drainage Criteria Manual Equation 9-7.

where: V = mean channel flow velocity [ft/sec]
S = longitudinal channel slope [ft/ft]
S_S = specific gravity of stone (min = 2.5)

OVERFLOW WEIR RIPRAP SIZING

Overflow Description	Slope, S [ft/ft]	Concetration factory C_f	Overflow Qty [cfs]	Overflow Crest Width [ft]	Unity Discharge q [cfs/ft]	D_{50} Size [in]
Pond A	0.33	2	85	18.0	4.72	***14***
Pond B	0.10	2	4	5.0	0.80	***3***
Pond C	0.33	2	7	5.0	1.40	***7***

$D_{50} = 5.23*S^{0.43}(1.35*C_f*q)^{0.56}$

*Taken from DCM Ch. 13 Section 5.12 (Equation 13-9)

where: D_{50} = median rock size [in]
S = longitudinal slope [ft/ft]
Cf = concentration factor [1.0 to 3.0]
q = unit discharge [cfs/ft]

STORMWATER FACILITY CALCULATIONS

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

LID Credit by Impervious Reduction Factor (IRF) Method

UD-BMP (Version 3.08, November 2016)

User Input

Calculated cells

Designer:	Chad Kudzak, PE		
Company:	WestWorks Engineering		
Date:	October 11, 2018		
Project:	LODGE 2 AT BLACK FOREST		
Location:	POND A		

Design Storm: 1-Hour Rain Depth	WQCV Event	0.60	inches
Minor Storm: 1-Hour Rain Depth	10-Year Event	1.75	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	2.52	

Max Intensity for Optional User-Defined Storm: 2.52496

SITE INFORMATION (USER-INPUT)

Sub-Basin Identifier	A-H	I-L	OSL-2	OSH-L										
Receiving Pervious Area Soil Type	Sandy Loam	Sandy Loam	Sandy Loam	Sandy Loam	Sandy Loam	Sandy Loam	Sandy Loam	Sandy Loam	Sandy Loam	Sandy Loam	Sandy Loam	Sandy Loam	Sandy Loam	Sandy Loam
Total Area (ac., Sum of DCIA, UIA, RPA, & SPA)	11.000	5.600	2.200	5.300										
Directly Connected Impervious Area (DCIA, acres)	2.850	3.400	1.600	4.300										
Unconnected Impervious Area (UIA, acres)	0.000	0.000	0.000	0.000										
Receiving Pervious Area (RPA, acres)	0.000	0.000	0.000	0.000										
Separate Pervious Area (SPA, acres)	8.050	2.200	0.600	1.000										
RPA Treatment Type: Conveyance (C), Volume (V), or Permeable Pavement (PP)	V	V	V	V										

CALCULATED RESULTS (OUTPUT)

Total Calculated Area (ac, check against input)	11.000	5.600	2.200	5.300									
Directly Connected Impervious Area (DCIA, %)	25.9%	60.7%	72.7%	81.1%									
Unconnected Impervious Area (UIA, %)	0.0%	0.0%	0.0%	0.0%									
Receiving Pervious Area (RPA, %)	0.0%	0.0%	0.0%	0.0%									
Separate Pervious Area (SPA, %)	73.2%	39.3%	27.3%	18.9%									
A_R (RPA / UIA)	0.000	0.000	0.000	0.000									
I_a Check	1.000	1.000	1.000	1.000									
F / I for WQCV Event:	1.7	1.7	1.7	1.7									
F / I for 10-Year Event:	0.5	0.5	0.5	0.5									
F / I for 100-Year Event:	0.3	0.3	0.3	0.3									
F / I for Optional User-Defined Storm CUHP:	0.31	0.31	0.31	0.31									
IRF for WQCV Event:	0.00	0.00	0.00	0.00									
IRF for 10-Year Event:	1.00	1.00	1.00	1.00									
IRF for 100-Year Event:	1.00	1.00	1.00	1.00									
IRF for Optional User-Defined Storm CUHP:	1.00	1.00	1.00	1.00									
Total Site Imperviousness: I_{Total}	25.9%	60.7%	72.7%	81.1%									
Effective Imperviousness for WQCV Event:	25.9%	60.7%	72.7%	81.1%									
Effective Imperviousness for 10-Year Event:	25.9%	60.7%	72.7%	81.1%									
Effective Imperviousness for 100-Year Event:	25.9%	60.7%	72.7%	81.1%									
Effective Imperviousness for Optional User-Defined Storm CUHP:	25.9%	60.7%	72.7%	81.1%									

LID / EFFECTIVE IMPERVIOUSNESS CREDITS

WQCV Event CREDIT: Reduce Detention By:	N/A	N/A	N/A	N/A									
10-Year Event CREDIT**: Reduce Detention By:	0.0%	0.0%	0.0%	0.0%									
100-Year Event CREDIT**: Reduce Detention By:	0.0%	0.0%	0.0%	0.0%									
User-Defined CUHP CREDIT: Reduce Detention By:	0.0%	0.0%	0.0%	0.0%									

Total Site Imperviousness:	**81.1%**
Total Site Effective Imperviousness for WQCV Event:	**81.1%**
Total Site Effective Imperviousness for 10-Year Event:	**81.1%**
Total Site Effective Imperviousness for 100-Year Event:	**81.1%**
Total Site Effective Imperviousness for Optional User-Defined Storm CUHP:	**81.1%**

Notes:

* Use Green-Ampt average infiltration rate values from Table 3-4.

** 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 purposes.

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

UD-Detention, Version 3.07 (February 2017)

Project: LODGE 2 AT BLACK FOREST

Basin ID: POND A

Example Zone Configuration (Retention Pond)

Required Volume Calculation

Selected BMP Type =	EDB	
Watershed Area =	24.10	acres
Watershed Length =	1,600	ft
Watershed Slope =	0.018	ft/ft
Watershed Imperviousness =	50.00%	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 =	User Input	
Water Quality Capture Volume (WQCV) =	0.418	acre-feet
Excess Urban Runoff Volume (EURV) =	1.418	acre-feet
2-yr Runoff Volume (P1 = 1.19 in.) =	0.968	acre-feet
5-yr Runoff Volume (P1 = 1.5 in.) =	1.272	acre-feet
10-yr Runoff Volume (P1 = 1.75 in.) =	1.565	acre-feet
25-yr Runoff Volume (P1 = 2 in.) =	1.947	acre-feet
50-yr Runoff Volume (P1 = 2.25 in.) =	2.422	acre-feet
100-yr Runoff Volume (P1 = 2.52 in.) =	2.865	acre-feet
500-yr Runoff Volume (P1 = 0 in.) =	0.000	acre-feet
Approximate 2-yr Detention Volume =	0.812	acre-feet
Approximate 5-yr Detention Volume =	1.201	acre-feet
Approximate 10-yr Detention Volume =	1.464	acre-feet
Approximate 25-yr Detention Volume =	1.759	acre-feet
Approximate 50-yr Detention Volume =	1.895	acre-feet
Approximate 100-yr Detention Volume =	2.244	acre-feet

Optional User Override 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 (WQCV) =	0.418	acre-feet
Zone 2 Volume (EURV - Zone 1) =	0.999	acre-feet
Zone 3 Volume (100-year - Zones 1 & 2) =	0.826	acre-feet
Total Detention Basin Volume =	2.244	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 = 2 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)
Top of Micropool	--	0.00	--	--	--	3,300	0.076		
	--	2.00	--	--	--	6,400	0.147	9,739	0.224
	--	4.00	--	--	--	10,000	0.230	26,200	0.601
	--	6.00	--	--	--	14,100	0.324	50,300	1.155
	--	8.00	--	--	--	18,700	0.429	83,100	1.908
	--	10.00	--	--	--	40,500	0.930	144,300	3.313
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				
	--		--	--	--				

Detention Basin Outlet Structure Design

UD-Detention, Version 3.07 (February 2017)

Project: LODGE 2 AT BLACK FOREST

Basin ID: POND A

Example Zone Configuration (Retention Pond)

	Stage (ft)	Zone Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	3.14	0.419	Orifice Plate
Zone 2 (EURV)	6.77	0.999	Orifice Plate
Zone 3 (100-year)	8.65	0.826	Weir&Pipe (Restrict)
		2.244	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	ft²
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 =	6.89	ft (relative to basin bottom at Stage = 0 ft)
Orifice Plate: Orifice Vertical Spacing =	27.60	inches
Orifice Plate: Orifice Area per Row =	2.90	sq. inches (diameter = 1-15/16 inches)

Calculated Parameters for Plate

WQ Orifice Area per Row =	2.014E-02	ft²
Elliptical Half-Width =	N/A	feet
Elliptical Slot Centroid =	N/A	feet
Elliptical Slot Area =	N/A	ft²

User Input: Stage and Total Area of Each Orifice Row (numbered from lowest to highest)

	Row 1 (required)	Row 2 (optional)	Row 3 (optional)	Row 4 (optional)	Row 5 (optional)	Row 6 (optional)	Row 7 (optional)	Row 8 (optional)
Stage of Orifice Centroid (ft)	0.00	2.30	4.59					
Orifice Area (sq. inches)	2.90	2.90	2.90					

	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	ft²
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 =	6.77	N/A	ft (relative to basin bottom at Stage = 0 ft)
Overflow Weir Front Edge Length =	3.00	N/A	feet
Overflow Weir Slope =	0.00	N/A	H:V (enter zero for flat grate)
Horiz. Length of Weir Sides =	3.00	N/A	feet
Overflow Grate Open Area % =	85%	N/A	%, grate open area/total area
Debris Clogging % =	50%	N/A	%

Calculated Parameters for Overflow Weir

	Zone 3 Weir	Not Selected	
Height of Grate Upper Edge, H_t =	6.77	N/A	feet
Over Flow Weir Slope Length =	3.00	N/A	feet
Grate Open Area / 100-yr Orifice Area =	15.18	N/A	should be ≥ 4
Overflow Grate Open Area w/o Debris =	7.65	N/A	ft²
Overflow Grate Open Area w/ Debris =	3.83	N/A	ft²

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

	Zone 3 Restrictor	Not Selected	
Depth to Invert of Outlet Pipe =	2.50	N/A	ft (distance below basin bottom at Stage = 0 ft)
Outlet Pipe Diameter =	18.00	N/A	inches
Restrictor Plate Height Above Pipe Invert =	5.90		inches

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate

	Zone 3 Restrictor	Not Selected	
Outlet Orifice Area =	0.53	N/A	ft²
Outlet Orifice Centroid =	0.29	N/A	feet
Half-Central Angle of Restrictor Plate on Pipe =	1.22	N/A	radians

User Input: Emergency Spillway (Rectangular or Trapezoidal)

Spillway Invert Stage=	9.00	ft (relative to basin bottom at Stage = 0 ft)
Spillway Crest Length =	25.00	feet
Spillway End Slopes =	4.00	H:V
Freeboard above Max Water Surface =	1.00	feet

Calculated Parameters for Spillway

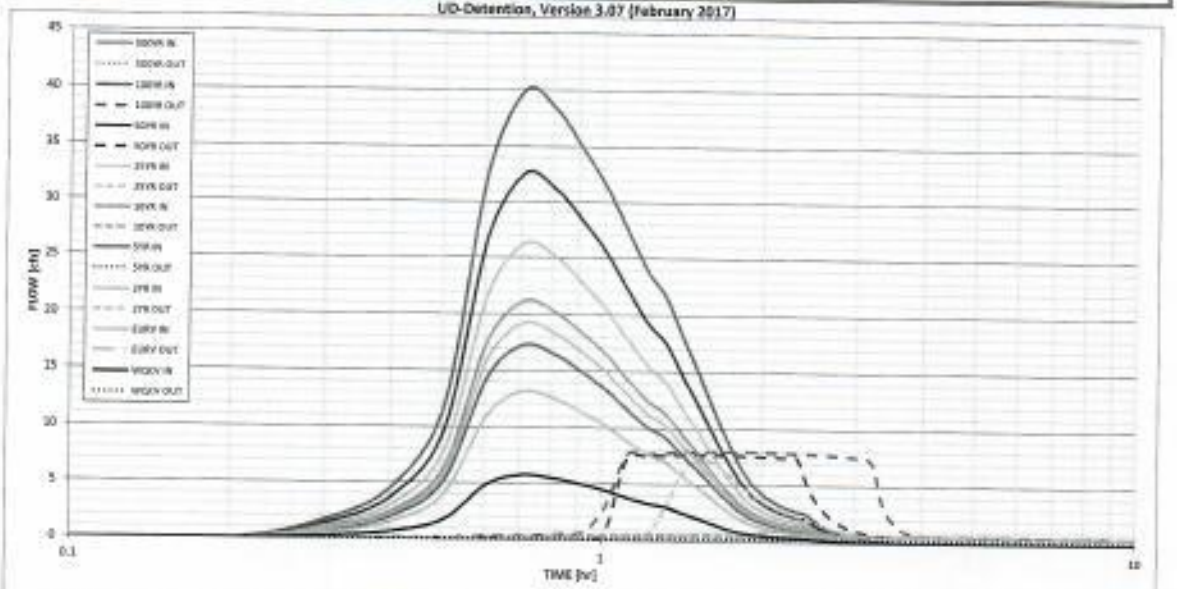
Spillway Design Flow Depth=	0.63	feet
Stage at Top of Freeboard =	10.63	feet
Basin Area at Top of Freeboard =	0.98	acres

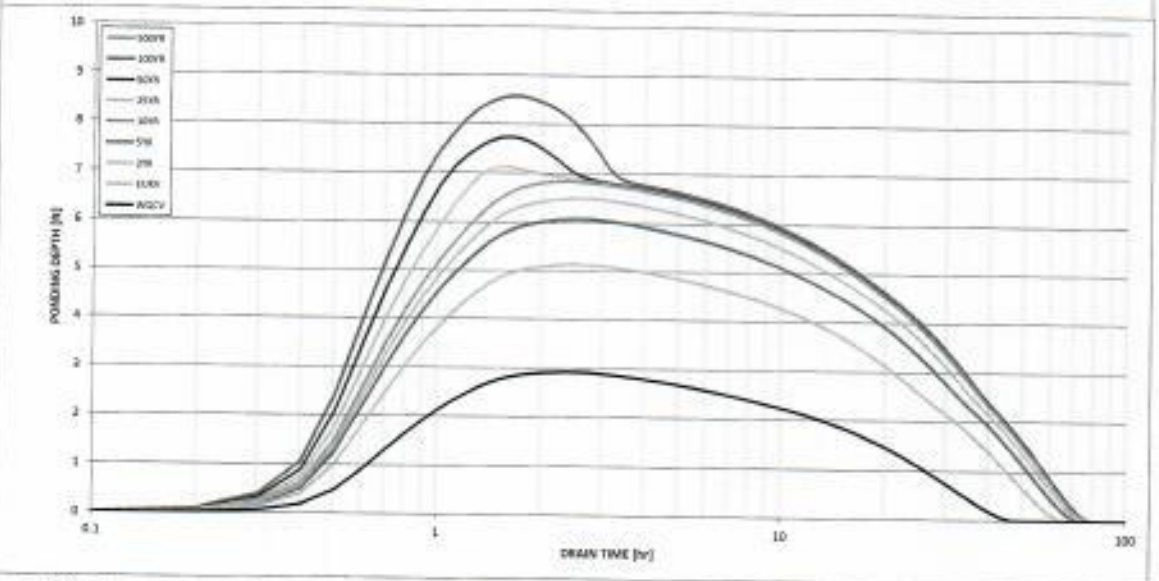
Routed Hydrograph Results

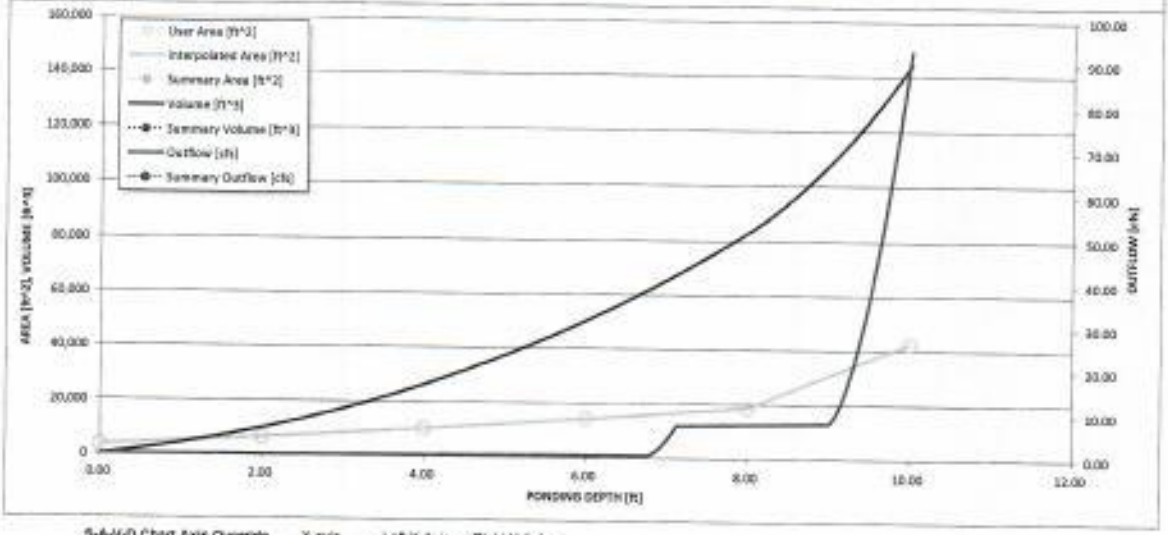
Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
One-Hour Rainfall Depth (in) =	0.53	1.07	1.19	1.50	1.75	2.00	2.25	2.52	0.00
Calculated Runoff Volume (acre-ft) =	0.419	1.418	0.968	1.272	1.565	1.947	2.422	2.983	0.000
OPTIONAL Override Runoff Volume (acre-ft) =									
Inflow Hydrograph Volume (acre-ft) =	0.418	1.419	0.968	1.272	1.566	1.948	2.423	2.984	#N/A
Predevelopment Unit Peak Flow, q (cfs/acre) =	0.00	0.00	0.00	0.00	0.01	0.02	0.15	0.36	0.00
Predevelopment Peak Q (cfs) =	0.0	0.0	0.0	0.1	0.2	0.5	3.6	8.8	0.0
Peak Inflow Q (cfs) =	5.7	19.2	13.2	17.2	21.2	26.3	32.6	40.0	#N/A
Peak Outflow Q (cfs) =	0.2	0.6	0.5	0.5	1.2	7.2	7.7	8.0	#N/A
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	5.9	5.3	14.9	2.1	0.9	#N/A
Structure Controlling Flow =	Plate	Plate	Plate	Plate	Overflow Grate 1	Overflow Grate 1	Outlet Plate 1	Outlet Plate 1	#N/A
Max Velocity through Grate 1 (fps) =	N/A	N/A	N/A	N/A	0.1	0.9	0.9	0.9	#N/A
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) =	41	63	56	61	65	69	61	59	#N/A
Time to Drain 99% of Inflow Volume (hours) =	44	69	61	67	71	70	69	69	#N/A
Maximum Ponding Depth (ft) =	2.93	6.49	5.15	6.08	6.84	7.12	7.74	8.57	#N/A
Area at Maximum Ponding Depth (acres) =	0.15	0.35	0.28	0.33	0.37	0.38	0.42	0.59	#N/A
Maximum Volume Stored (acre-ft) =	0.279	1.320	0.894	1.181	1.442	1.550	1.794	2.197	#N/A

Detention Basin Outlet Structure Design

UD-Detention, Version 3.07 (February 2017)







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

Pond POND A:

[61] Hint: Submerged 14% of Reach SD-12 bottom
[61] Hint: Submerged 26% of Reach SD-9 bottom

Inflow Area =	24.100 ac,	Inflow Depth =	0.49"	for	5-Year event
Inflow =	36.06 cfs @	0.33 hrs,	Volume=	0.985 af	
Outflow =	0.45 cfs @	0.74 hrs,	Volume=	0.099 af,	Atten= 99%, Lag= 24.5 min
Primary =	0.45 cfs @	0.74 hrs,	Volume=	0.099 af	
Secondary =	0.00 cfs @	0.00 hrs,	Volume=	0.000 af	

Routing by Stor-Ind method, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
Peak Elev= 6,949.31' @ 0.74 hrs Surf.Area= 0.292 ac Storage= 0.965 af
Plug-Flow detention time= 90.4 min calculated for 0.098 af (10% of inflow)
Center-of-Mass det. time= 78.3 min (97.8 - 19.4)

#	Invert	Avail.Storage	Storage Description
1	6,944.00'	2.884 af	**Custom Stage Data (Prismatic)** Listed below

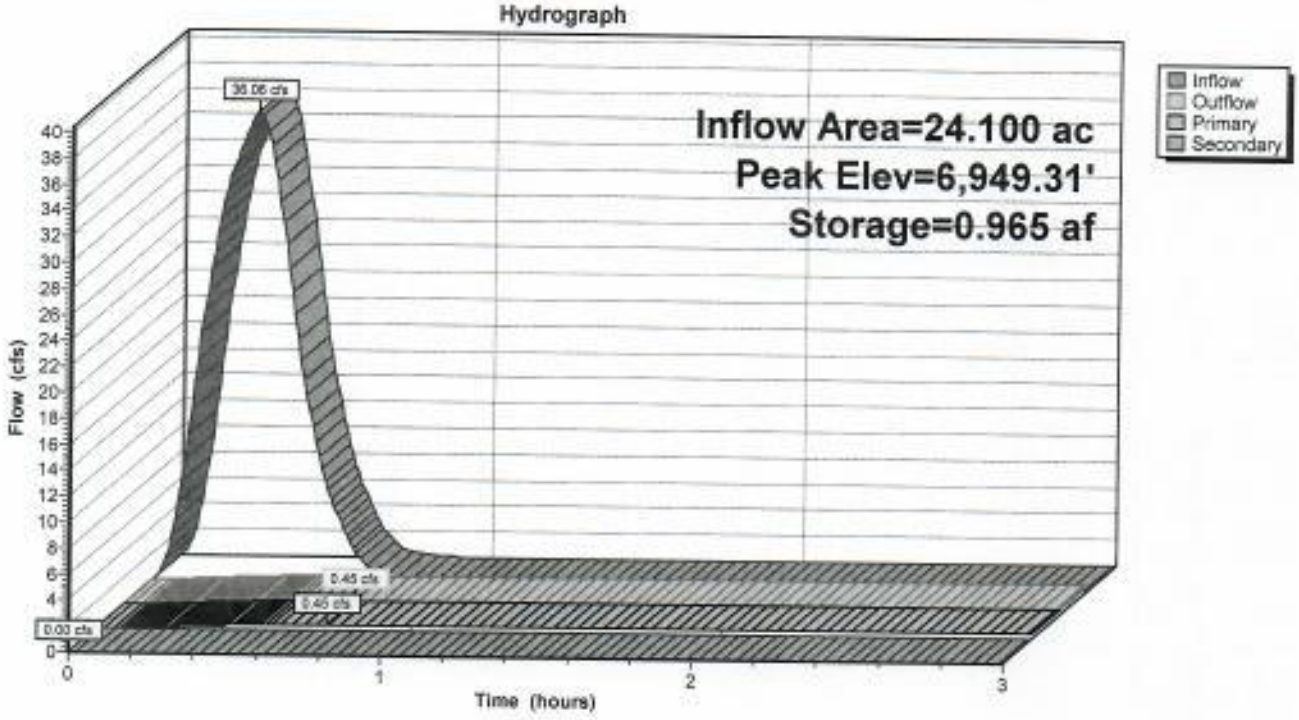
Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
6,944.00	0.078	0.000	0.000
6,946.00	0.147	0.225	0.225
6,948.00	0.230	0.377	0.602
6,950.00	0.324	0.554	1.156
6,952.00	0.429	0.753	1.909
6,954.00	0.546	0.975	2.884

#	Routing	Invert	Outlet Devices
1	Primary	6,941.50'	**9.6" x 110.0' long 18" OUTFALL PIPE W/ RESTRICTOR PLATE** RCP, square edge headwall, Ke= 0.500 Outlet Invert= 6,940.00' S= 0.0136 '/' n= 0.013 Cc= 0.900
2	Device 1	6,944.00'	**1.9" Vert. WQ ORIFICE** C= 0.600
3	Device 1	6,946.30'	**1.9" Vert. WQ ORIFICE** C= 0.600
4	Device 1	6,948.60'	**1.9" Vert. WQ ORIFICE** C= 0.600
5	Device 1	6,950.80'	**2.70' x 2.70' Horiz. CDOT TYPE 'C' INLET W/ MESH GRATE** Limited to weir flow C= 0.600
6	Secondary	6,953.00'	**25.0' long x 18.0' breadth EMERGENCY OVERFLOW WEIR** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63

Primary OutFlow Max=0.45 cfs @ 0.74 hrs HW=6,949.31' (Free Discharge)
└**1=18" OUTFALL PIPE W/ RESTRICTOR PLATE** (Passes 0.45 cfs of 4.75 cfs potential flow)
  ├**2=WQ ORIFICE** (Orifice Controls 0.22 cfs @ 11.0 fps)
  ├**3=WQ ORIFICE** (Orifice Controls 0.16 cfs @ 8.2 fps)
  ├**4=WQ ORIFICE** (Orifice Controls 0.08 cfs @ 3.8 fps)
  └**5=CDOT TYPE 'C' INLET W/ MESH GRATE** (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=6,944.00' (Free Discharge)
└**6=EMERGENCY OVERFLOW WEIR** (Controls 0.00 cfs)

Pond POND A:


Hydrograph
Inflow Area=24.100 ac
Peak Elev=6,949.31'
Storage=0.965 af
36.06 cfs
0.45 cfs
0.45 cfs
0.00 cfs
Inflow
Outflow
Primary
Secondary
Flow (cfs)
Time (hours)
0
1
2
3
40
38
36
34
32
30
28
26
24
22
20
18
16
14
12
10
8
6
4
0

Pond POND A:

[61] Hint: Submerged 23% of Reach SD-12 bottom
[61] Hint: Submerged 41% of Reach SD-9 bottom

Inflow Area =	24.100 ac,	Inflow Depth =	1.15"	for	100-Year event
Inflow =	85.45 cfs @	0.33 hrs,	Volume=	2.314 af	
Outflow =	5.57 cfs @	0.63 hrs,	Volume=	0.871 af,	Atten= 93%, Lag= 18.4 min
Primary =	5.57 cfs @	0.63 hrs,	Volume=	0.871 af	
Secondary =	0.00 cfs @	0.00 hrs,	Volume=	0.000 af	

Routing by Stor-Ind method, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
Peak Elev= 6,952.52' @ 0.63 hrs Surf.Area= 0.459 ac Storage= 2.163 af
Plug-Flow detention time= 68.8 min calculated for 0.871 af (38% of inflow)
Center-of-Mass det. time= 61.2 min (80.1 - 18.9)

#	Invert	Avail.Storage	Storage Description
1	6,944.00'	2.884 af	**Custom Stage Data (Prismatic)** Listed below

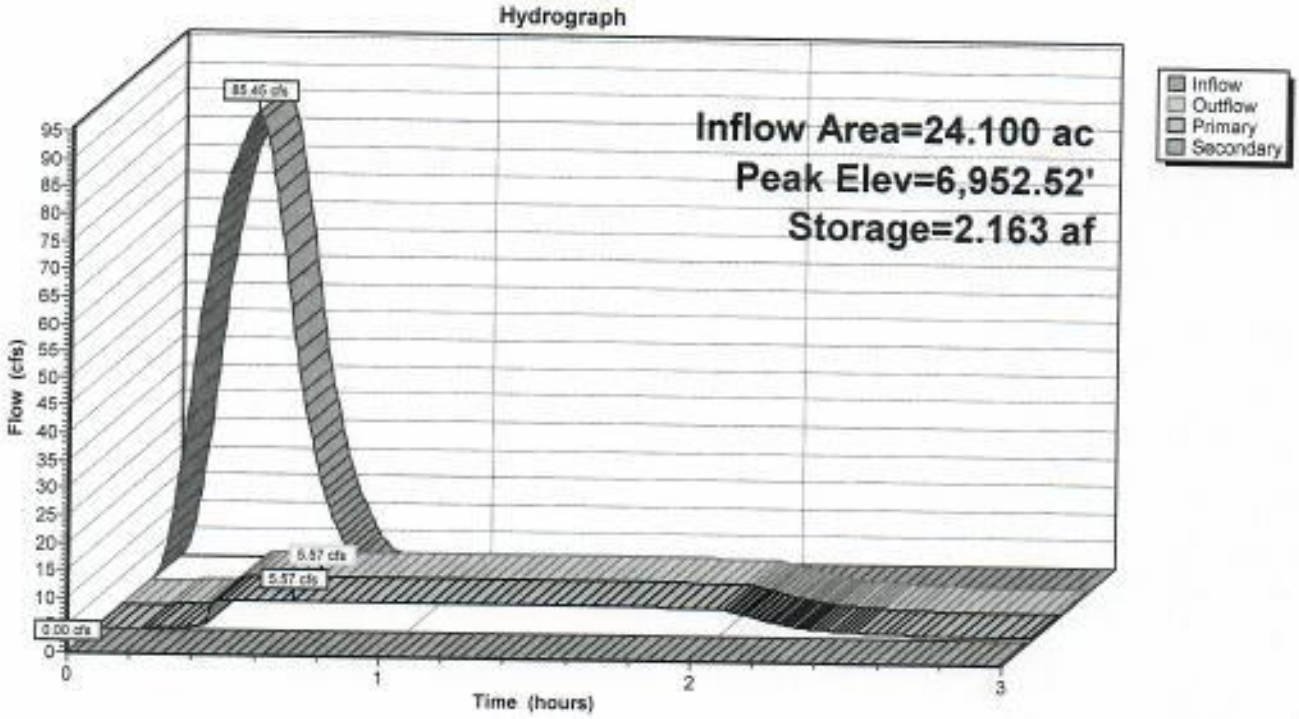
Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
6,944.00	0.078	0.000	0.000
6,946.00	0.147	0.225	0.225
6,948.00	0.230	0.377	0.602
6,950.00	0.324	0.554	1.156
6,952.00	0.429	0.753	1.909
6,954.00	0.546	0.975	2.884

#	Routing	Invert	Outlet Devices
1	Primary	6,941.50'	**9.6" x 110.0' long 18" OUTFALL PIPE W/ RESTRICTOR PLATE** RCP, square edge headwall, Ke= 0.500 Outlet Invert= 6,940.00' S= 0.0136 '/' n= 0.013 Cc= 0.900
2	Device 1	6,944.00'	**1.9" Vert. WQ ORIFICE** C= 0.600
3	Device 1	6,946.30'	**1.9" Vert. WQ ORIFICE** C= 0.600
4	Device 1	6,948.60'	**1.9" Vert. WQ ORIFICE** C= 0.600
5	Device 1	6,950.80'	**2.70' x 2.70' Horiz. CDOT TYPE 'C' INLET W/ MESH GRATE** Limited to weir flow C= 0.600
6	Secondary	6,953.00'	**25.0' long x 18.0' breadth EMERGENCY OVERFLOW WEIR** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63

Primary OutFlow Max=5.57 cfs @ 0.63 hrs HW=6,952.52' (Free Discharge)
- **1=18" OUTFALL PIPE W/ RESTRICTOR PLATE** (Barrel Controls 5.57 cfs @ 11.1 fps)
  - **2=WQ ORIFICE** (Passes < 0.28 cfs potential flow)
  - **3=WQ ORIFICE** (Passes < 0.23 cfs potential flow)
  - **4=WQ ORIFICE** (Passes < 0.19 cfs potential flow)
  - **5=CDOT TYPE 'C' INLET W/ MESH GRATE** (Passes < 46.03 cfs potential flow)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=6,944.00' (Free Discharge)
- **6=EMERGENCY OVERFLOW WEIR** (Controls 0.00 cfs)

Pond POND A:


Hydrograph
Inflow Area=24.100 ac
Peak Elev=6,952.52'
Storage=2.163 af
Inflow
Outflow
Primary
Secondary
85.40 cfs
5.57 cfs
5.57 cfs
0.00 cfs
Flow (cfs)
Time (hours)
0
1
2
3

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

LID Credit by Impervious Reduction Factor (IRF) Method

UD-BMP (Version 3.06, November 2016)

User Input

Calculated cells

Designer:	Chad Kuzbek, PE			
Company:	WestWorks Engineering			
Date:	October 11, 2018			
Project:	LODGE 2 AT BLACK FOREST			
Location:	POND B			

**Design Storm: 1-Hour Rain Depth	WQCV Event:	0.60	inches
**Minor Storm: 1-Hour Rain Depth	10-Year Event:	1.75	inches
**Major Storm: 1-Hour Rain Depth	100-Year Event:	2.82	inches
Optional User Defined Storm	Cust:		
(CUHP/NOAA) 1-Hour Rainfall Depth and Frequency for User Defined Storm	100-Year Event	3.51	
Max Intensity for Optional User Defined Storm	3.51(in)		

SITE INFORMATION (USER-INPUT)

Sub-Basin Identifier	OS-3													
Receiving Pervious Area Soil Type	Sandy Loam	Sandy Loam	Sandy Loam	Sandy Loam	Sandy Loam	Sandy Loam	Sandy Loam	Sandy Loam	Sandy Loam	Sandy Loam	Sandy Loam	Sandy Loam	Sandy Loam	Sandy Loam
Total Area (ac, Sum of DCIA, UIA, RPA, & SPA)	1.000													
Directly Connected Impervious Area (DCIA, acres)	0.700													
Unconnected Impervious Area (UIA, acres)	0.000													
Receiving Pervious Area (RPA, acres)	0.000													
Separate Pervious Area (SPA, acres)	0.300													
SPA Treatment Type: Conveyance (C), Volume (V), or Permeable Pavement (PP)	V													
	MISSING INPUT	MISSING INPUT	MISSING INPUT	MISSING INPUT	MISSING INPUT	MISSING INPUT	MISSING INPUT	MISSING INPUT	MISSING INPUT	MISSING INPUT	MISSING INPUT	MISSING INPUT	MISSING INPUT	MISSING INPUT

CALCULATED RESULTS (OUTPUT)

Total Calculated Area (ac, check against input)	1.000													
Directly Connected Impervious Area (DCIA, %)	70.0%													
Unconnected Impervious Area (UIA, %)	0.0%													
Receiving Pervious Area (RPA, %)	0.0%													
Separate Pervious Area (SPA, %)	30.0%													
R_V (RPA / UIA)	0.000													
i_a Check	1.000													
I_a / i for WQCV Event:	1.7													
I_a / i for 10-Year Event:	0.5													
I_a / i for 100-Year Event:	0.3													
I_a / i for Optional User Defined Storm (Cust):	0.31													
IRF for WQCV Event:	0.00													
IRF for 10-Year Event:	1.00													
IRF for 100-Year Event:	1.00													
IRF for Optional User Defined Storm (Cust):	1.00													
Total Site Imperviousness: I_{total}	70.0%													
Effective Imperviousness for WQCV Event:	70.0%													
Effective Imperviousness for 10-Year Event:	70.0%													
Effective Imperviousness for 100-Year Event:	70.0%													
Effective Imperviousness for Optional User Defined Storm (Cust):	70.0%													

LID / EFFECTIVE IMPERVIOUSNESS CREDITS

WQCV Event CREDIT: Reduce Detention By:	N/A													
10-Year Event CREDIT**: Reduce Detention By:	0.0%													
100-Year Event CREDIT**: Reduce Detention By:	0.0%													
User Defined Cust CREDIT: Reduce Detention By:	0.0%													

Total Site Imperviousness:	70.0%
Total Site Effective Imperviousness for WQCV Event:	70.0%
Total Site Effective Imperviousness for 10-Year Event:	70.0%
Total Site Effective Imperviousness for 100-Year Event:	70.0%
Total Site Effective Imperviousness for Optional User Defined Storm (Cust):	70.0%

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.

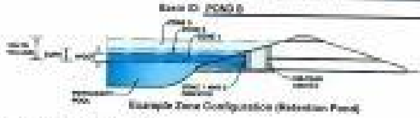
*** Method assumes that 1-hour rainfall depth is equivalent to 1-hour intensity for calculation purposes

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

UD-Detention, Version 3.07 (February 2017)

Project: LODGE 2 AT BLACK FOREST

Basin ID: POND B



Example Zone Configuration (Retention Pond)

Required Volume Calculation

Selected BMP Type =	EDB	
Watershed Area =	1.00	acres
Watershed Length =	270	ft
Watershed Slope =	0.033	ft/ft
Watershed Imperviousness =	70.00%	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 =	12.0	hours
Location for 1-hr Rainfall Depths =	User Input	
Water Quality Capture Volume (WQCV) =	0.018	acre-feet
Excess Urban Runoff Volume (EURV) =	0.088	acre-feet
2-yr Runoff Volume (P1 = 1.19 in.) =	0.061	acre-feet
5-yr Runoff Volume (P1 = 1.5 in.) =	0.080	acre-feet
10-yr Runoff Volume (P1 = 1.75 in.) =	0.097	acre-feet
25-yr Runoff Volume (P1 = 2 in.) =	0.110	acre-feet
50-yr Runoff Volume (P1 = 2.25 in.) =	0.137	acre-feet
100-yr Runoff Volume (P1 = 2.52 in.) =	0.161	acre-feet
500-yr Runoff Volume (P1 = 0 in.) =	0.000	acre-feet
Approximate 2-yr Detention Volume =	0.058	acre-feet
Approximate 5-yr Detention Volume =	0.076	acre-feet
Approximate 10-yr Detention Volume =	0.091	acre-feet
Approximate 25-yr Detention Volume =	0.100	acre-feet
Approximate 50-yr Detention Volume =	0.119	acre-feet
Approximate 100-yr Detention Volume =	0.130	acre-feet

Optional User Override 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 (WQCV) =	0.018	acre-feet
Zone 2 Volume (EURV - Zone 1) =	0.070	acre-feet
Zone 3 Volume (100-year - Zones 1 & 2) =	0.041	acre-feet
Total Detention Basin Volume =	0.130	acre-feet
Initial Surcharge Volume (ISV) =	N/A	ft^3
Initial Surcharge Depth (ISD) =	N/A	ft
Total Available Detention Depth (H_{total}) =	user	ft
Depth of Trickle Channel (H_{TC}) =	N/A	ft
Slope of Trickle Channel (S_{TC}) =	N/A	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 = 1 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)
Media Surface	--	0.00	--	--	--	3,000	0.069		
	--	2.00	--	--	--	3,800	0.087	5,702	0.133
	--	3.00	--	--	--	4,650	0.106	10,005	0.230

UD-Detention_v3.07 - Pond B Hdr. Basin

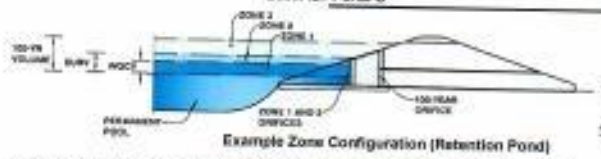
9/12/2018, 2:03 PM

Detention Basin Outlet Structure Design

UD-Detention, Version 3.07 (February 2017)

Project: LODGE 2 AT BLACK FOREST

Basin ID: POND B



Example Zone Configuration (Retention Pond)

	Stage (ft)	Zone Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	0.37	0.018	Filtration Media
Zone 2 (EURV)	1.46	0.070	Circular Orifice
Zone 3 (100-year)	1.97	0.041	Weir&Pipe (Restrict)
		0.130	Total

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

Underdrain Orifice Invert Depth =	2.00	ft (distance below the filtration media surface)
Underdrain Orifice Diameter =	0.33	inches

Calculated Parameters for Underdrain

Underdrain Orifice Area =	0.0	ft²
Underdrain Orifice Centroid =	0.01	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 =	N/A	ft (relative to basin bottom at Stage = 0 ft)
Depth at top of Zone using Orifice Plate =	N/A	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	ft²
Elliptical Half-Width =	N/A	feet
Elliptical Slot Centroid =	N/A	feet
Elliptical Slot Area =	N/A	ft²

User Input: Stage and Total Area of Each Orifice Row (numbered from lowest to highest)

	Row 1 (optional)	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)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Orifice Area (sq. inches)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

	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)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Orifice Area (sq. inches)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

User Input: Vertical Orifice (Circular or Rectangular)

	Zone 2 Circular	Not Selected	
Invert of Vertical Orifice =	0.37	N/A	ft (relative to basin bottom at Stage = 0 ft)
Depth at top of Zone using Vertical Orifice =	1.46	N/A	ft (relative to basin bottom at Stage = 0 ft)
Vertical Orifice Diameter =	2.00	N/A	inches

Calculated Parameters for Vertical Orifice

	Zone 2 Circular	Not Selected	
Vertical Orifice Area =	0.02	N/A	ft²
Vertical Orifice Centroid =	0.08	N/A	feet

User Input: Overflow Weir (Dropbox) and Grate (Flat or Sloped)

	Zone 3 Weir	Not Selected	
Overflow Weir Front Edge Height, Ho =	1.46	N/A	ft (relative to basin bottom at Stage = 0 ft)
Overflow Weir Front Edge Length =	2.92	N/A	feet
Overflow Weir Slope =	0.00	N/A	H:V (enter zero for flat grate)
Horiz. Length of Weir Sides =	2.92	N/A	feet
Overflow Grate Open Area % =	70%	N/A	%, grate open area/total area
Debris Clogging % =	50%	N/A	%

Calculated Parameters for Overflow Weir

	Zone 3 Weir	Not Selected	
Height of Grate Upper Edge, H_t =	1.46	N/A	feet
Over Flow Weir Slope Length =	2.92	N/A	feet
Grate Open Area / 100-yr Orifice Area =	117.97	N/A	should be ≥ 4
Overflow Grate Open Area w/o Debris =	5.97	N/A	ft²
Overflow Grate Open Area w/ Debris =	2.98	N/A	ft²

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

	Zone 3 Restrictor	Not Selected	
Depth to Invert of Outlet Pipe =	2.00	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 =	1.29		inches

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate

	Zone 3 Restrictor	Not Selected	
Outlet Orifice Area =	0.05	N/A	ft²
Outlet Orifice Centroid =	0.06	N/A	feet
Half-Central Angle of Restrictor Plate on Pipe =	0.52	N/A	radians

User Input: Emergency Spillway (Rectangular or Trapezoidal)

Spillway Invert Stage=	1.90	ft (relative to basin bottom at Stage = 0 ft)
Spillway Crest Length =	1.00	feet
Spillway End Slopes =	4.00	H:V
Freeboard above Max Water Surface =	1.00	feet

Calculated Parameters for Spillway

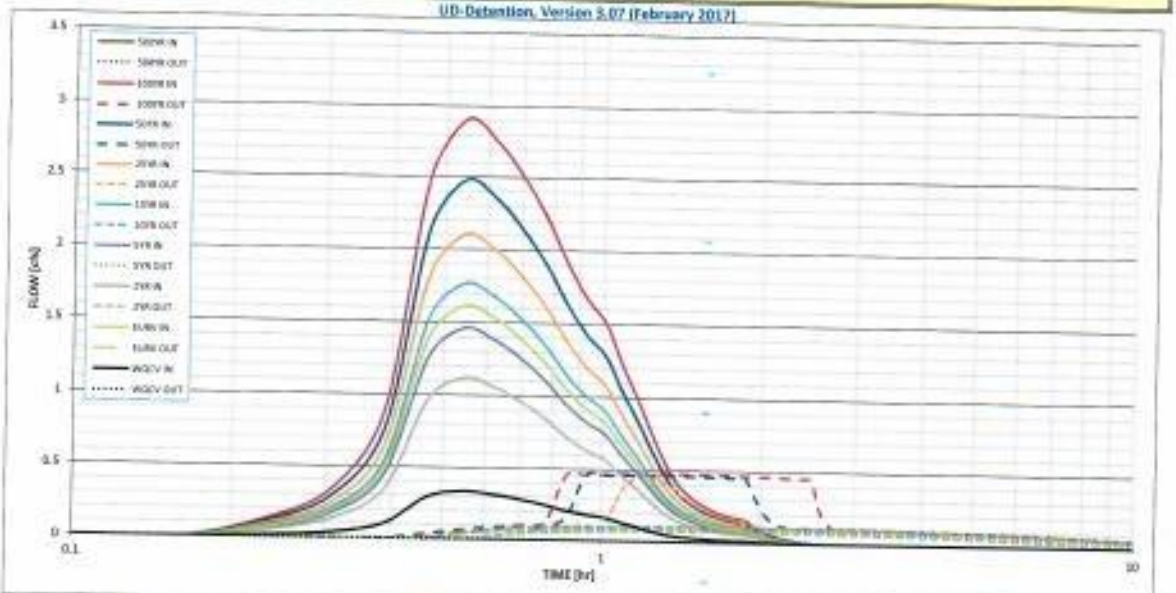
Spillway Design Flow Depth=	0.51	feet
Stage at Top of Freeboard =	3.41	feet
Basin Area at Top of Freeboard =	0.11	acres

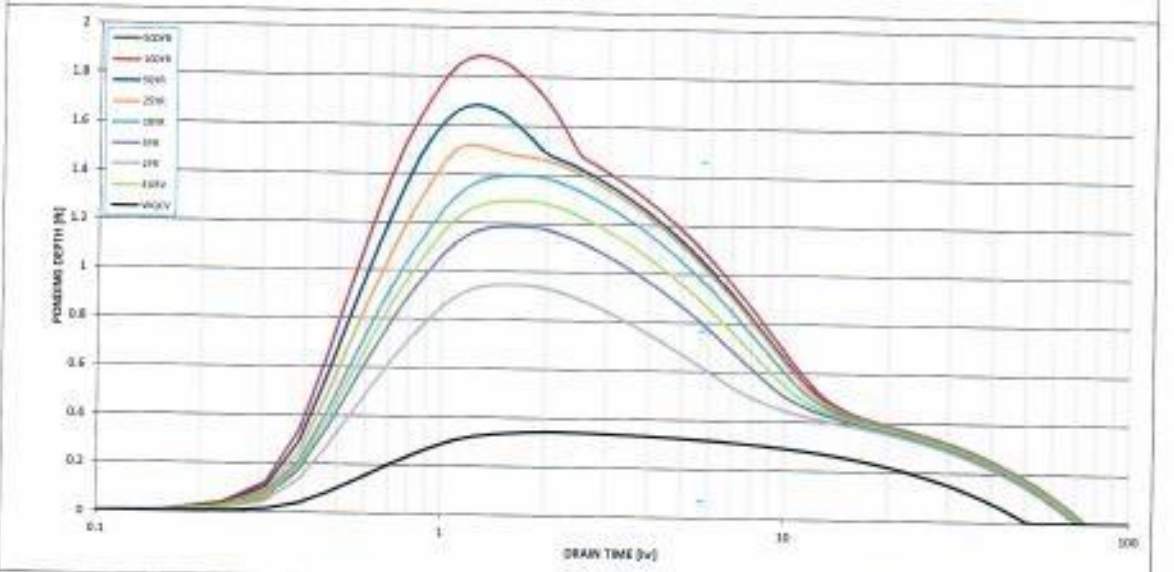
Routed Hydrograph Results

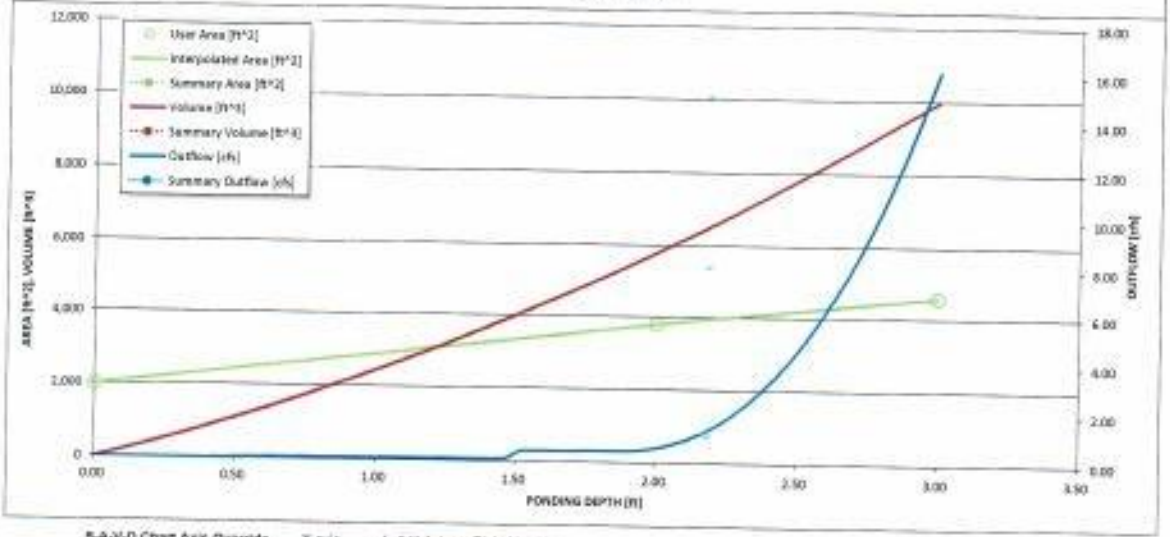
Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
One-Hour Rainfall Depth (in) =	0.53	1.07	1.19	1.50	1.75	2.08	2.25	2.52	0.00
Calculated Runoff Volume (acre-ft) =	0.018	0.089	0.061	0.080	0.097	0.116	0.137	0.161	0.000
OPTIONAL Override Runoff Volume (acre-ft) =									
Inflow Hydrograph Volume (acre-ft) =	0.018	0.088	0.061	0.080	0.097	0.116	0.137	0.161	#N/A
Predevelopment Unit Peak Flow, q (cfs/acre) =	0.00	0.00	0.00	0.01	0.01	0.03	0.22	0.53	0.00
Predevelopment Peak Q (cfs) =	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.5	0.0
Peak Inflow Q (cfs) =	0.3	1.8	1.1	1.5	1.8	2.1	2.5	2.9	#N/A
Peak Outflow Q (cfs) =	0.0	0.1	0.1	0.1	0.1	0.5	0.5	0.5	#N/A
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	17.3	8.4	15.4	2.1	0.9	#N/A
Structure Controlling Flow =	Filtration Media	Vertical Orifice 1	Vertical Orifice 1	Vertical Orifice 1	Vertical Orifice 1	Outlet Plate 1	Outlet Plate 1	Outlet Plate 1	#N/A
Max Velocity through Grate 1 (fps) =	N/A	N/A	N/A	N/A	N/A	0.0	0.1	0.1	#N/A
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) =	50	66	65	66	66	65	63	62	#N/A
Time to Drain 99% of Inflow Volume (hours) =	51	71	69	71	72	72	72	71	#N/A
Maximum Ponding Depth (ft) =	0.34	1.30	0.95	1.19	1.40	1.52	1.68	1.89	#N/A
Area at Maximum Ponding Depth (acres) =	0.05	0.07	0.07	0.07	0.07	0.08	0.08	0.08	#N/A
Maximum Volume Stored (acre-ft) =	0.017	0.076	0.053	0.069	0.084	0.094	0.106	0.123	#N/A

Detention Basin Outlet Structure Design

UD-Detention, Version 3.07 (February 2017)







S-A-V-D Chart Axis Override

	X-axis	Left Y-Axis	Right Y-Axis
Minimum bound			
Maximum bound			

Pond POND B:

Inflow Area = 1.100 ac, Inflow Depth = 0.29" for 5-Year event
Inflow = 1.59 cfs @ 0.21 hrs, Volume= 0.027 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 100%, Lag= 0.0 min
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
Peak Elev= 6,960.40' @ 1.53 hrs Surf.Area= 2,363 sf Storage= 1,169 cf
Plug-Flow detention time= (not calculated)
Center-of-Mass det. time= (not calculated)

#	Invert	Avail.Storage	Storage Description
1	6,960.00'	10,000 cf	**Custom Stage Data (Prismatic)** Listed below

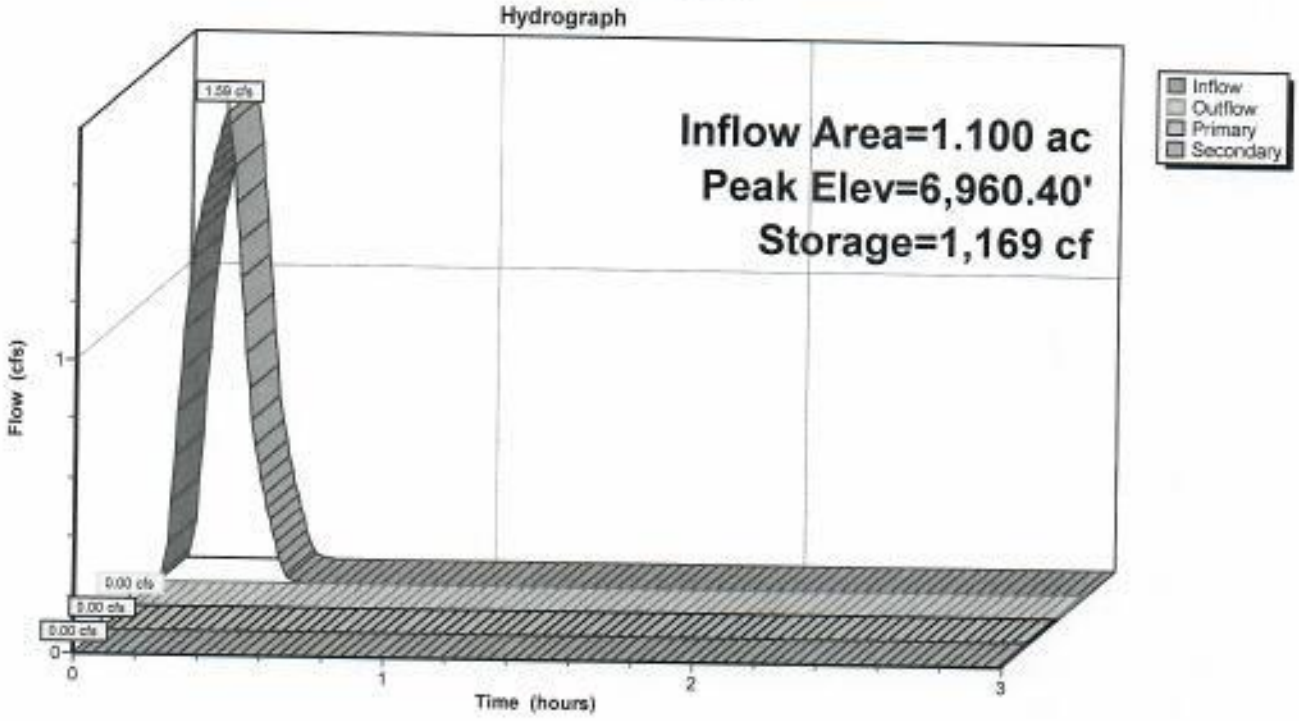
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
6,960.00	2,000	0	0
6,962.00	3,800	5,800	5,800
6,963.00	4,600	4,200	10,000

#	Routing	Invert	Outlet Devices
1	Primary	6,958.00'	**3.0" x 106.0' long CULVERT W/ RESTRICTOR PLATE** RCP, square edge headwall, Ke= 0.500 Outlet Invert= 6,957.50' S= 0.0047 '/' n= 0.013 Cc= 0.900
2	Device 1	6,961.50'	**2.70' x 2.70' Horiz. CDOT TYPE C INLET W/ MESH GRATE** Limited to weir flow C= 0.600
3	Secondary	6,961.90'	**5.0' long x 8.0' breadth EMERGENCY OVERFLOW** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.43 2.54 2.70 2.69 2.68 2.68 2.66 2.64 2.64 2.64 2.65 2.65 2.66 2.66 2.68 2.70 2.74

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=6,960.00' (Free Discharge)
↑—**1=CULVERT W/ RESTRICTOR PLATE** (Passes 0.00 cfs of 0.12 cfs potential flow)
↑—**2=CDOT TYPE C INLET W/ MESH GRATE** (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=6,960.00' (Free Discharge)
↑—**3=EMERGENCY OVERFLOW** (Controls 0.00 cfs)

Pond POND B:


Hydrograph
Inflow Area=1.100 ac
Peak Elev=6,960.40'
Storage=1,169 cf
Inflow
Outflow
Primary
Secondary
1.59 cfs
0.00 cfs
0.00 cfs
0.00 cfs
Flow (cfs)
Time (hours)
0
1
2
3

Pond POND B:

Inflow Area =	1.100 ac,	Inflow Depth =	0.73"	for	100-Year event
Inflow =	3.87 cfs @	0.20 hrs,	Volume=	0.067 af	
Outflow =	0.00 cfs @	0.00 hrs,	Volume=	0.000 af,	Atten= 100%, Lag= 0.0 min
Primary =	0.00 cfs @	0.00 hrs,	Volume=	0.000 af	
Secondary =	0.00 cfs @	0.00 hrs,	Volume=	0.000 af	

Routing by Stor-Ind method, Time Span= 0.00-3.00 hrs, dt= 0.01 hrs
Peak Elev= 6,961.01' @ 1.47 hrs Surf.Area= 2,908 sf Storage= 2,926 cf
Plug-Flow detention time= (not calculated)
Center-of-Mass det. time= (not calculated)

#	Invert	Avail.Storage	Storage Description
1	6,960.00'	10,000 cf	**Custom Stage Data (Prismatic)** Listed below

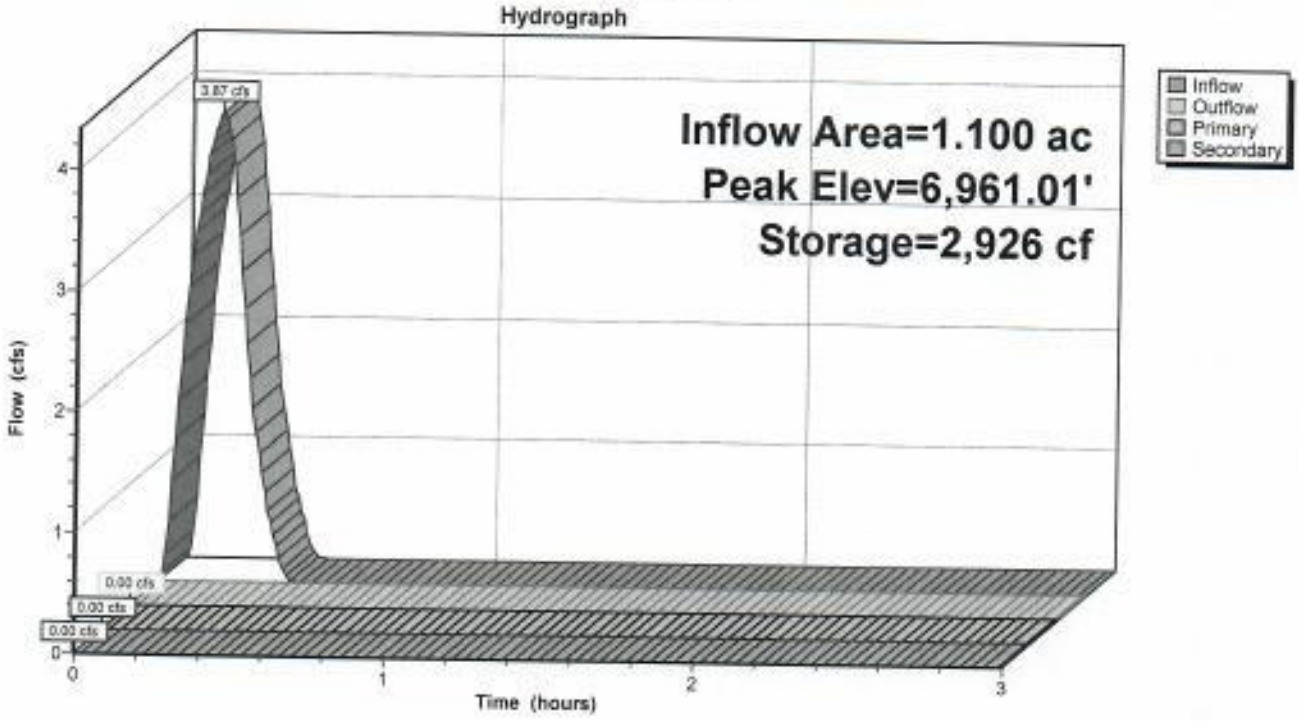
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
6,960.00	2,000	0	0
6,962.00	3,800	5,800	5,800
6,963.00	4,600	4,200	10,000

#	Routing	Invert	Outlet Devices
1	Primary	6,958.00'	**3.0" x 106.0' long CULVERT W/ RESTRICTOR PLATE** RCP, square edge headwall, Ke= 0.500 Outlet Invert= 6,957.50' S= 0.0047 '/' n= 0.013 Cc= 0.900
2	Device 1	6,961.50'	**2.70' x 2.70' Horiz. CDOT TYPE C INLET W/ MESH GRATE** Limited to weir flow C= 0.600
3	Secondary	6,961.90'	**5.0' long x 8.0' breadth EMERGENCY OVERFLOW** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.43 2.54 2.70 2.69 2.68 2.68 2.66 2.64 2.64 2.64 2.65 2.65 2.66 2.66 2.68 2.70 2.74

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=6,960.00' (Free Discharge)
↑—**1=CULVERT W/ RESTRICTOR PLATE** (Passes 0.00 cfs of 0.12 cfs potential flow)
↑—**2=CDOT TYPE C INLET W/ MESH GRATE** (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=6,960.00' (Free Discharge)
↑—**3=EMERGENCY OVERFLOW** (Controls 0.00 cfs)

Pond POND B:


Hydrograph
Inflow Area=1.100 ac
Peak Elev=6,961.01'
Storage=2,926 cf
Inflow
Outflow
Primary
Secondary
3.87 cfs
0.00 cfs
0.00 cfs
0.00 cfs
Flow (cfs)
Time (hours)
0
1
2
3
4

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

LID Credit by Impervious Reduction Factor (IRF) Method

LID-EIAPP (Version 4.04, November 2018)

User Input

Calculated cells

Designer:	Chad Kutbek, PE		
Company:	WestWorks Engineering		
Date:	September 12, 2018		
Project:	LODGE 2 AT BLACK FOREST		
Location:	POND C		

**Design Storm: 1-Hour Rain Depth	WQCV Event:	0.60	inches
**Minor Storm: 1-Hour Rain Depth	10-Year Event:	1.75	inches
**Major Storm: 1-Hour Rain Depth	100-Year Event:	2.82	inches
Optional User Defined Storm	CUHP		
(CUHP) NOAA 1-Hour Rainfall Depth and Frequency for User Defined Storm	100-Year Event	2.82	

Max Intensity for Optional User Defined Storm: 2.51486

SITE INFORMATION (USER INPUT)

Sub-basin Identifier:	OS6	OS5	OS8											
Receiving Pervious Area Soil Type	Sandy Loam	Sandy Loam	Sandy Loam	Sandy Loam	Sandy Loam	Sandy Loam	Sandy Loam	Sandy Loam	Sandy Loam	Sandy Loam	Sandy Loam	Sandy Loam	Sandy Loam	Sandy Loam
Total Area (ac., Sum of DCIA, UIA, RPA, & SPA)	1.400	1.100	1.400											
Directly Connected Impervious Area (DCIA, acres)	0.000	0.000	0.000											
Unconnected Impervious Area (UIA, acres)	1.100	0.500	1.000											
Receiving Pervious Area (RPA, acres)	0.000	0.000	0.000											
Separate Pervious Area (SPA, acres)	0.300	0.600	0.400											
RPA Treatment Type: Conveyance (C), Volume (V), or Permeable Pavement (PP)	V	V	V											
	MISSING INPUT	MISSING INPUT	MISSING INPUT	MISSING INPUT	MISSING INPUT	MISSING INPUT	MISSING INPUT	MISSING INPUT	MISSING INPUT	MISSING INPUT	MISSING INPUT	MISSING INPUT	MISSING INPUT	MISSING INPUT

CALCULATED RESULTS (OUTPUT)

Total Calculated Area (ac, check against input)	1.400	1.100	1.400											
Directly Connected Impervious Area (DCIA, %)	0.0%	0.0%	0.0%											
Unconnected Impervious Area (UIA, %)	78.6%	45.5%	71.4%											
Receiving Pervious Area (RPA, %)	0.0%	0.0%	0.0%											
Separate Pervious Area (SPA, %)	21.4%	54.5%	28.6%											
R_a (RPA / UIA)	0.000	0.000	0.000											
I_a Check	1.000	1.000	1.000											
I / I for WQCV Event:	1.7	1.7	1.7											
I / I for 10-Year Event:	0.5	0.5	0.5											
I / I for 100-Year Event:	0.3	0.3	0.3											
I / I for Optional User Defined Storm CUHP:	0.31	0.31	0.31											
IRF for WQCV Event:	0.00	0.00	0.00											
IRF for 10-Year Event:	1.00	1.00	1.00											
IRF for 100-Year Event:	1.00	1.00	1.00											
IRF for Optional User Defined Storm CUHP:	1.00	1.00	1.00											
Total Site Imperviousness: I_{total}	78.6%	45.5%	71.4%											
Effective Imperviousness for WQCV Event:	0.0%	0.0%	0.0%											
Effective Imperviousness for 10-Year Event:	78.6%	45.5%	71.4%											
Effective Imperviousness for 100-Year Event:	78.6%	45.5%	71.4%											
Effective Imperviousness for Optional User Defined Storm CUHP:	78.6%	45.5%	71.4%											

LID / EFFECTIVE IMPERVIOUSNESS CREDITS

WQCV Event CREDIT: Reduce Detention By:	N/A	N/A	N/A											
10-Year Event CREDIT**: Reduce Detention By:	0.0%	0.1%	0.0%											
100-Year Event CREDIT**: Reduce Detention By:	0.0%	0.0%	0.0%											
User Defined CUHP CREDIT: Reduce Detention By:	0.0%	0.0%	0.0%											

Total Site Imperviousness:	66.7%
Total Site Effective Imperviousness for WQCV Event:	0.0%
Total Site Effective Imperviousness for 10-Year Event:	66.7%
Total Site Effective Imperviousness for 100-Year Event:	66.7%
Total Site Effective Imperviousness for Optional User Defined Storm CUHP:	66.7%

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 purposes.

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

UD-Detention, Version 3.07 (February 2017)

Project: LODGE 2 AT BLACK FOREST

Basin ID: POND 2 (TEMPORARY)

Example Zone Configuration (Retention Pond)

Required Volume Calculation

Selected BMP Type =	EDB	
Watershed Area =	3.90	acres
Watershed Length =	1,100	ft
Watershed Slope =	0.029	ft/ft
Watershed Imperviousness =	66.10%	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 =	User Input	
Water Quality Capture Volume (WQCV) =	0.088	acre-feet
Excess Urban Runoff Volume (EURV) =	0.329	acre-feet
2-yr Runoff Volume (P1 = 1.19 in.) =	0.224	acre-feet
5-yr Runoff Volume (P1 = 1.5 in.) =	0.390	acre-feet
10-yr Runoff Volume (P1 = 1.75 in.) =	0.555	acre-feet
25-yr Runoff Volume (P1 = 2 in.) =	0.630	acre-feet
50-yr Runoff Volume (P1 = 2.25 in.) =	0.900	acre-feet
100-yr Runoff Volume (P1 = 2.52 in.) =	0.803	acre-feet
500-yr Runoff Volume (P1 = 0 in.) =	0.000	acre-feet
Approximate 2-yr Detention Volume =	0.213	acre-feet
Approximate 5-yr Detention Volume =	0.277	acre-feet
Approximate 10-yr Detention Volume =	0.333	acre-feet
Approximate 25-yr Detention Volume =	0.400	acre-feet
Approximate 50-yr Detention Volume =	0.448	acre-feet
Approximate 100-yr Detention Volume =	0.482	acre-feet

Optional User Override 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 (WQCV) =	0.088	acre-feet
Zone 2 Volume (EURV - Zone 1) =	0.240	acre-feet
Zone 3 Volume (100-year - Zones 1 & 2) =	0.157	acre-feet
Total Detention Basin Volume =	0.482	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 = 1 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)
Top of Micropool	--	0.00	--	--	--	5,800	0.133		
	--	2.00	--	--	--	9,800	0.225	15,602	0.358
	--	4.00	--	--	--	14,400	0.331	39,802	0.914

UD-Detention_v3.07 - Pond 2.xlsm, Basin

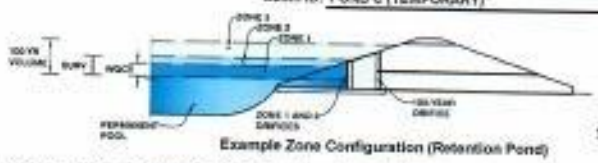
11/21/2018, 1:49 PM

Detention Basin Outlet Structure Design

UD-Detention, Version 3.07 (February 2017)

Project: LODGE 2 AT BLACK FOREST

Basin ID: POND C (TEMPORARY)



Example Zone Configuration (Retention Pond)

	Stage (ft)	Zone Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	0.58	0.085	Orifice Plate
Zone 2 (EURV)	1.85	0.240	Orifice Plate
Zone 3 (100-year)	2.51	0.157	Weir&Pipe (Circular)
		0.482	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	ft²
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 =	1.85	ft (relative to basin bottom at Stage = 0 ft)
Orifice Plate: Orifice Vertical Spacing =	7.40	inches
Orifice Plate: Orifice Area per Row =	1.55	sq. inches (diameter = 1-5/8 inches)

Calculated Parameters for Plate

WQ Orifice Area per Row =	1.07E-02	ft²
Elliptical Half-Width =	N/A	feet
Elliptical Slot Centroid =	N/A	feet
Elliptical Slot Area =	N/A	ft²

User Input: Stage and Total Area of Each Orifice Row (numbered from lowest to highest)

	Row 1 (required)	Row 2 (optional)	Row 3 (optional)	Row 4 (optional)	Row 5 (optional)	Row 6 (optional)	Row 7 (optional)	Row 8 (optional)
Stage of Orifice Centroid (ft)	0.00	0.62	1.23					
Orifice Area (sq. inches)	1.55	1.55	1.55					

	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	ft²
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 =	1.85	N/A	ft (relative to basin bottom at Stage = 0 ft)
Overflow Weir Front Edge Length =	0.89	N/A	feet
Overflow Weir Slope =	0.00	N/A	H:V (enter zero for flat grate)
Horiz. Length of Weir Sides =	0.89	N/A	feet
Overflow Grate Open Area % =	100%	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 =	1.85	N/A	feet
Over Flow Weir Slope Length =	0.89	N/A	feet
Grate Open Area / 100-yr Orifice Area =	1.01	N/A	should be ≥ 4
Overflow Grate Open Area w/o Debris =	0.79	N/A	ft²
Overflow Grate Open Area w/ Debris =	0.40	N/A	ft²

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

	Zone 3 Circular	Not Selected	
Depth to Invert of Outlet Pipe =	0.00	N/A	ft (distance below basin bottom at Stage = 0 ft)
Circular Orifice Diameter =	12.00	N/A	inches

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate

	Zone 3 Circular	Not Selected	
Outlet Orifice Area =	0.79	N/A	ft²
Outlet Orifice Centroid =	0.50	N/A	feet
Half-Central Angle of Restrictor Plate on Pipe =	N/A	N/A	radians

User Input: Emergency Spillway (Rectangular or Trapezoidal)

Spillway Invert Stage=	2.60	ft (relative to basin bottom at Stage = 0 ft)
Spillway Crest Length =	5.00	feet
Spillway End Slopes =	4.00	H:V
Freeboard above Max Water Surface =	1.00	feet

Calculated Parameters for Spillway

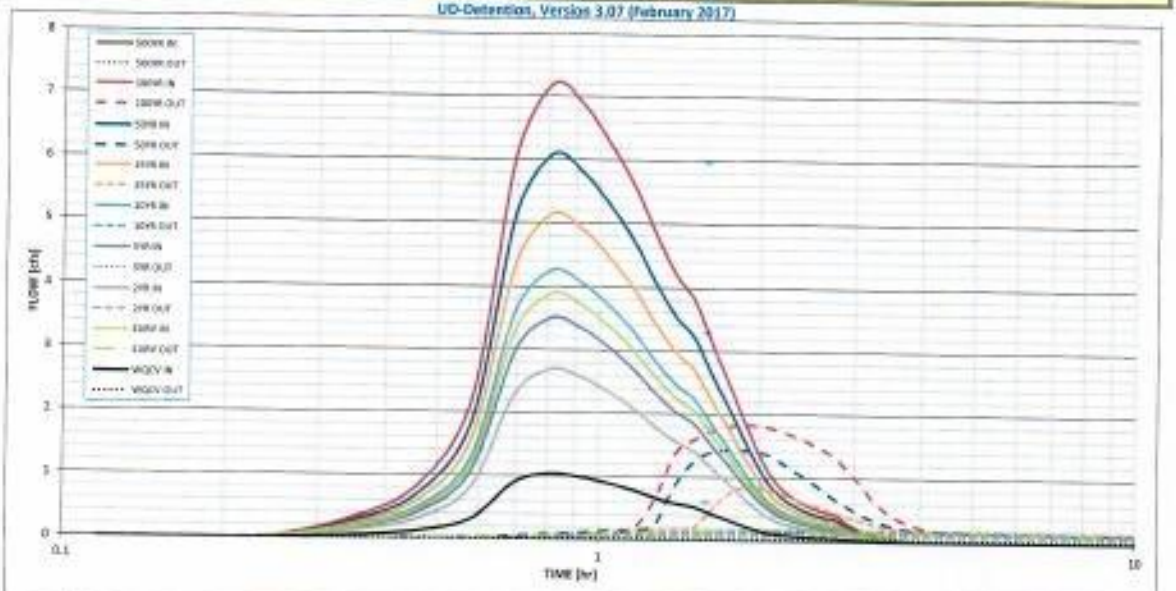
Spillway Design Flow Depth=	0.50	feet
Stage at Top of Freeboard =	4.10	feet
Basin Area at Top of Freeboard =	0.33	acres

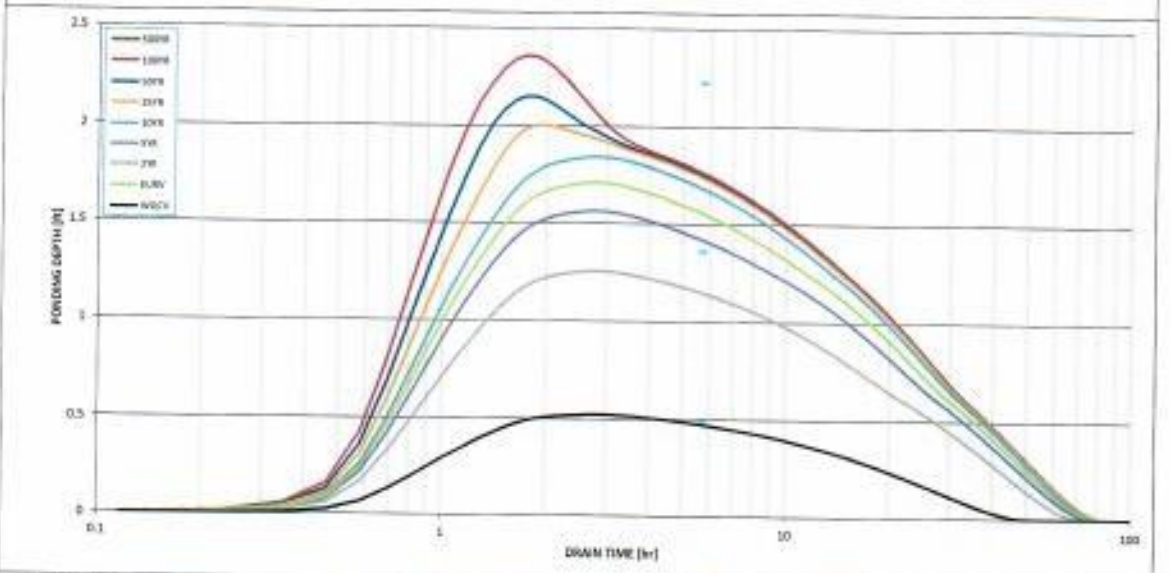
Routed Hydrograph Results

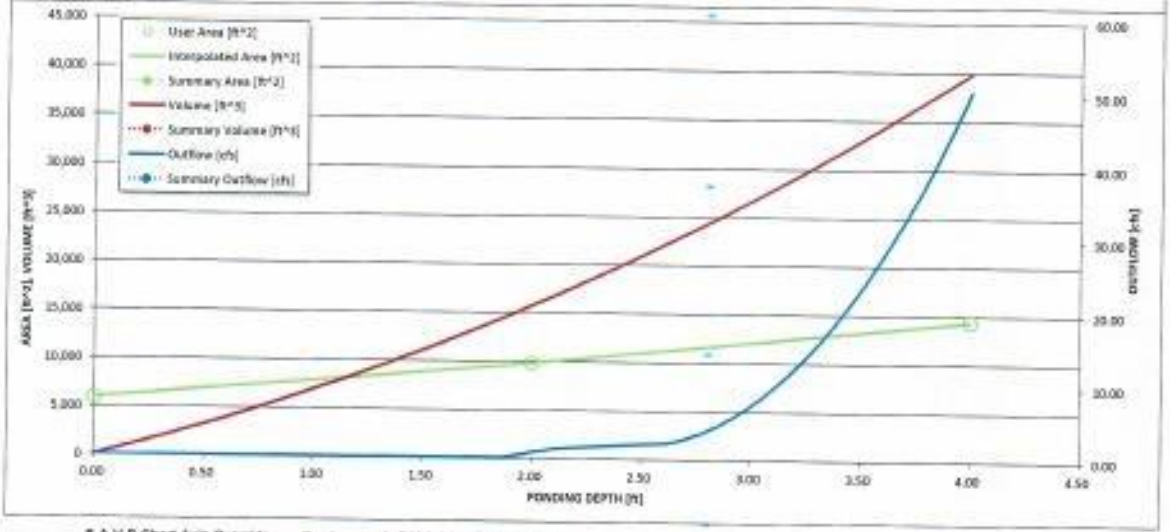
Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
One-Hour Rainfall Depth (in) =	0.53	1.07	1.19	1.50	1.75	2.00	2.25	2.52	3.00
Calculated Runoff Volume (acre-ft) =	0.085	0.325	0.224	0.292	0.355	0.429	0.509	0.603	0.000
OPTIONAL Override Runoff Volume (acre-ft) =									
Inflow Hydrograph Volume (acre-ft) =	0.084	0.325	0.224	0.292	0.355	0.429	0.509	0.603	#N/A
Predevelopment Unit Peak Flow, q (cfs/acre) =	0.00	0.00	0.00	0.00	0.01	0.02	0.13	0.32	0.00
Predevelopment Peak Q (cfs) =	0.0	0.0	0.0	0.0	0.0	0.1	0.5	1.3	0.0
Peak Inflow Q (cfs) =	1.0	3.9	2.7	3.5	4.3	5.1	6.1	7.2	#N/A
Peak Outflow Q (cfs) =	0.0	0.2	0.1	0.1	0.2	0.8	1.4	1.8	#N/A
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	11.0	5.5	12.0	2.8	1.5	#N/A
Structure Controlling Flow =	Plate	Plate	Plate	Plate	Plate	Overflow Grate 1	Overflow Grate 1	Overflow Grate 1	#N/A
Max Velocity through Grate 1 (fps) =	N/A	N/A	N/A	N/A	N/A	0.7	1.0	2.0	#N/A
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) =	43	66	60	64	67	68	65	63	#N/A
Time to Drain 99% of Inflow Volume (hours) =	47	73	66	71	75	75	74	73	#N/A
Maximum Ponding Depth (ft) =	0.52	1.71	1.25	1.56	1.84	2.00	2.15	2.36	#N/A
Area at Maximum Ponding Depth (acres) =	0.16	0.23	0.19	0.21	0.22	0.22	0.23	0.24	#N/A
Maximum Volume Stored (acre-ft) =	0.076	0.295	0.204	0.266	0.325	0.360	0.395	0.442	#N/A

Detention Basin Outlet Structure Design

UD-Detention, Version 3.07 (February 2017)

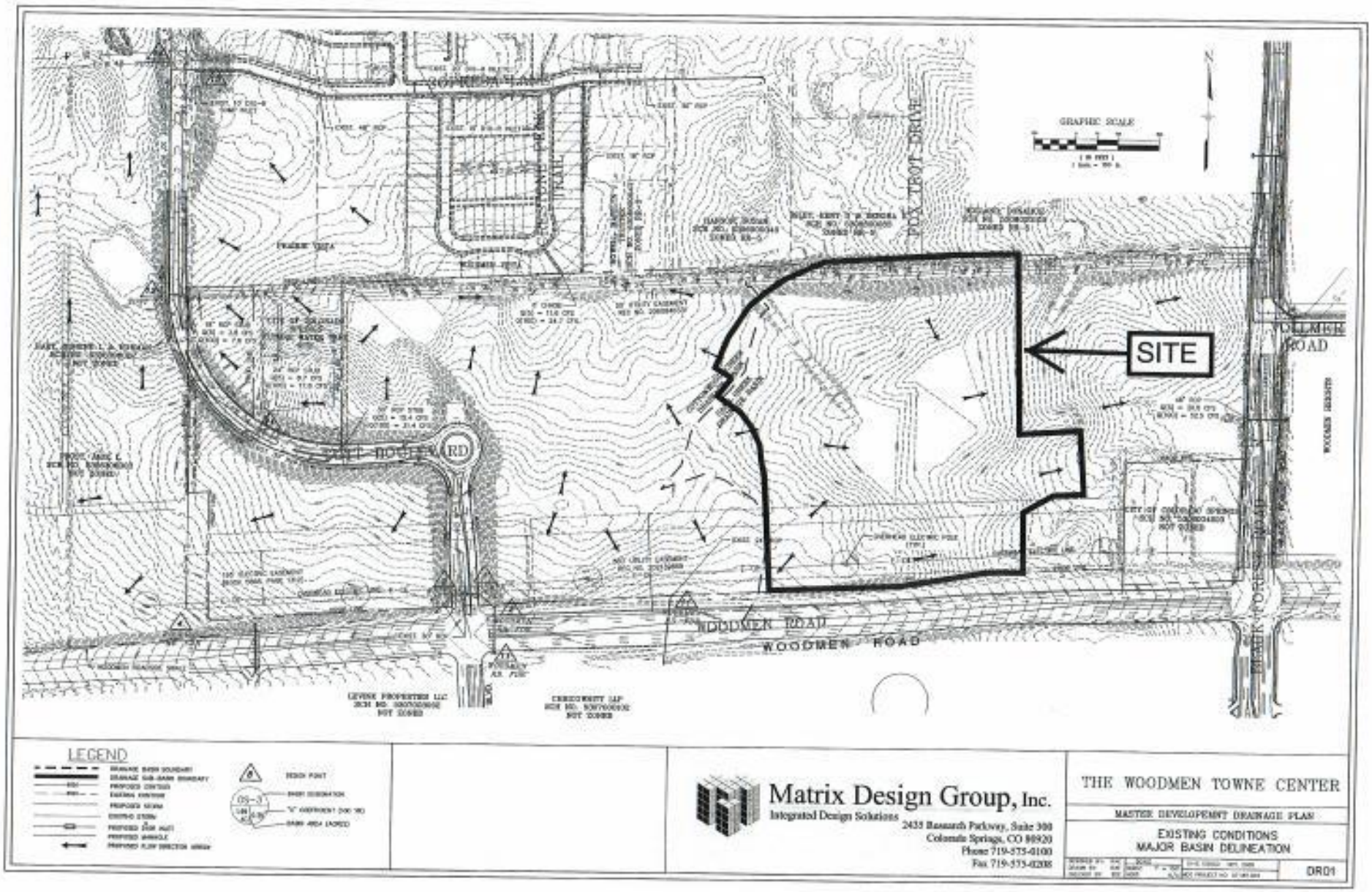






S-A-V-D Chart Axis Override	X-axis	Left Y-Axis	Right Y-Axis
minimum bound			
maximum bound			

PREVIOUS DRAINAGE STUDY MAPS



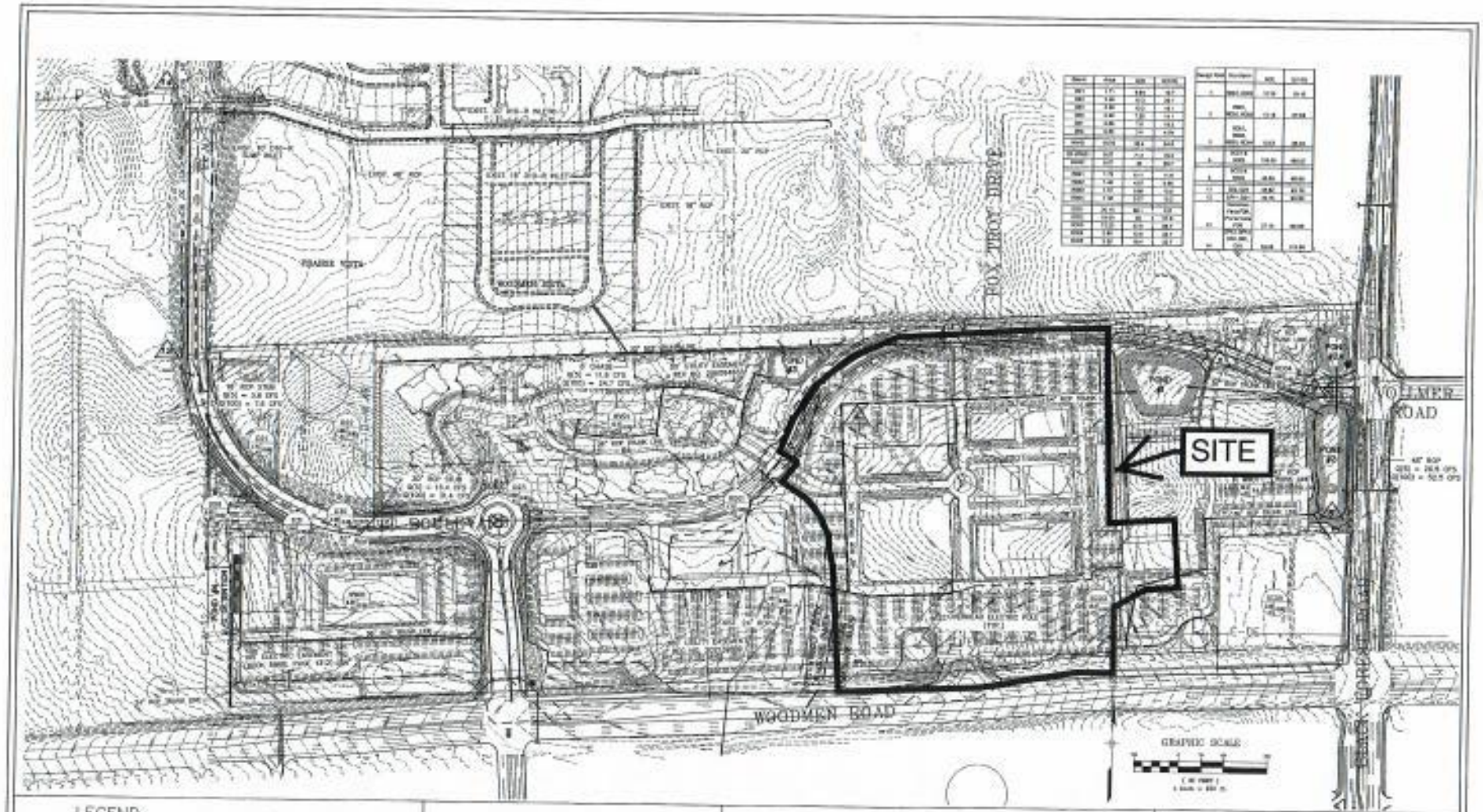
Matrix Design Group, Inc.
Integrated Design Solutions
2435 Research Parkway, Suite 300
Colorado Springs, CO 80920
Phone 719-575-0100
Fax 719-575-0208

THE WOODMEN TOWNE CENTER

MASTER DEVELOPMENT DRAINAGE PLAN

EXISTING CONDITIONS
MAJOR BASIN DELINEATION

DR01



LEGEND

Matrix Design Group, Inc.
Integrated Design Solutions
2435 Research Parkway, Suite 300
Colorado Springs, CO 80920
Phone 719-575-0100
Fax 719-575-0208

THE WOODMEN TOWNE CENTER

MASTER DEVELOPMENT DRAINAGE PLAN

PROPOSED CONDITIONS
PROPOSED MAJOR BASIN DELINEATION

DR02

DRAINAGE MAP

DESIGN POINT	Q_5 [CFS]	Q_{100} [CFS]	DESCRIPTION
1	2	5	(P) 5' TYPE R SUMP INLET
2	2	4	(P) 5' TYPE R SUMP INLET
3	1	3	(P) CDOT TYPE C GRATE INLET
4	7	14	(P) 10' TYPE R SUMP INLET
5	1	2	(P) 5' TYPE R SUMP INLET
6	4	10	(P) 10' TYPE R SUMP INLET
7	4	9	(P) 10' TYPE R SUMP INLET
8	7	13	(P) 10' TYPE R SUMP INLET
9	2	5	(P) 5' TYPE R SUMP INLET
10	3	7	(P) 5' TYPE R SUMP INLET
11	3	7	(P) 5' TYPE R SUMP INLET
12	0.4	3	(P) SHEET FLOW INTO POND A
13	1	6	(P) SHEET FLOW TO ADJACENT PROPERTY
14	0.2	2	(P) SHEET FLOW TO ADJACENT PROPERTY
20	1	5	(P) 10' TYPE R AT-GRADE INLET
21	1	3	(P) 10' TYPE R AT-GRADE INLET
22	0.6	2	(P) FLOW TO WOODMEN ROAD
23	1	4	(P) FLOW AT TEMP. END OF CENTER RIDGE DRIVE
24	2	5	(P) FLOW AT TEMP. END OF CENTER RIDGE DRIVE
25	5	13	(P) COMBINED FLOW TO ADJACENT PROPERTY
26	3	8	(E) 4' D-10R SUMP INLET
27	1	12	(E) 8' D-10R SUMP INLET
28	1	2	(P) 5' TYPE R AT-GRADE INLET
29	1	2	(P) 5' TYPE R AT-GRADE INLET
30	0.1	1	(P) SHEET FLOW INTO POND B
A	2	11	TOTAL FLOW EAST TO ADJACENT PROPERTY
SD1	9	26	(P) 30" RCP – PRIVATE
SD2	10	28	(P) 30" RCP – PRIVATE
SD3	11	30	(P) 30" RCP – PRIVATE
SD4	18	43	(P) 36" RCP – PRIVATE
SD5	18	44	(P) 36" RCP – PRIVATE
SD6	21	52	(P) 36" RCP – PRIVATE
SD7	4	9	(P) 18" RCP – PRIVATE
SD8	10	20	(P) 18" RCP – PRIVATE
SD9	29	68	(P) 36" RCP – PRIVATE
SD10	2	4	(P) 18" RCP – PRIVATE
SD11	4	9	(P) 24" RCP – PRIVATE
SD12	7	16	(P) 24" RCP – PRIVATE
SD20	6	8	(E) 18" RCP – PUBLIC
SD21	6	17	(P) 24" RCP – PUBLIC
SD22	7	20	(P) 24" RCP – PUBLIC
SD23	8	22	(P) 30" RCP – PRIVATE
SD24	1	2	(P) 18" RCP – PUBLIC
SD25	2	3	(P) 18" RCP – PUBLIC

DRAINAGE BASIN	Q_5 [CFS]	Q_{100} [CFS]
A	2	5
B	2	4
C	1	3
D	7	14
E	1	2
F	4	10
G	4	9
H	7	13
I	2	5
J	3	7
K	3	7
L	0.4	3
M	1	6
N	0.2	2
O	1	2
P	1	2
Q	0.1	1
OS-1	1	5
OS-2	1	3
OS-3	0.6	2
OS-4	1	4
OS-5	2	5
OS-6	1	5
OS-K	3	6
OS-L	1	12

EDB WQ/FULL SPECTRUM POND A			
DESCRIPTION	5_{YR}	100_{YR}	UNITS
INFLOW	36	85	[CFS]
OUTFLOW	0.5	6	[CFS]
WATER SURFACE ELEV.	6,949.3	6,952.5	[FT]
OVERFLOW WEIR ELEV.	6,953.0	6,953.0	[FT]
STORAGE VOLUME	0.97	2.16	[AF]

SFB WQ/FULL SPECTRUM POND B			
DESCRIPTION	5_{YR}	100_{YR}	UNITS
INFLOW	2	4	[CFS]
OUTFLOW	0.1	0.1	[CFS]
WATER SURFACE ELEV.	6,960.4	6,961.0	[FT]
OVERFLOW WEIR ELEV.	6,961.9	6,961.9	[FT]
STORAGE VOLUME	0.03	0.07	[AF]

DRAINAGE LEGEND

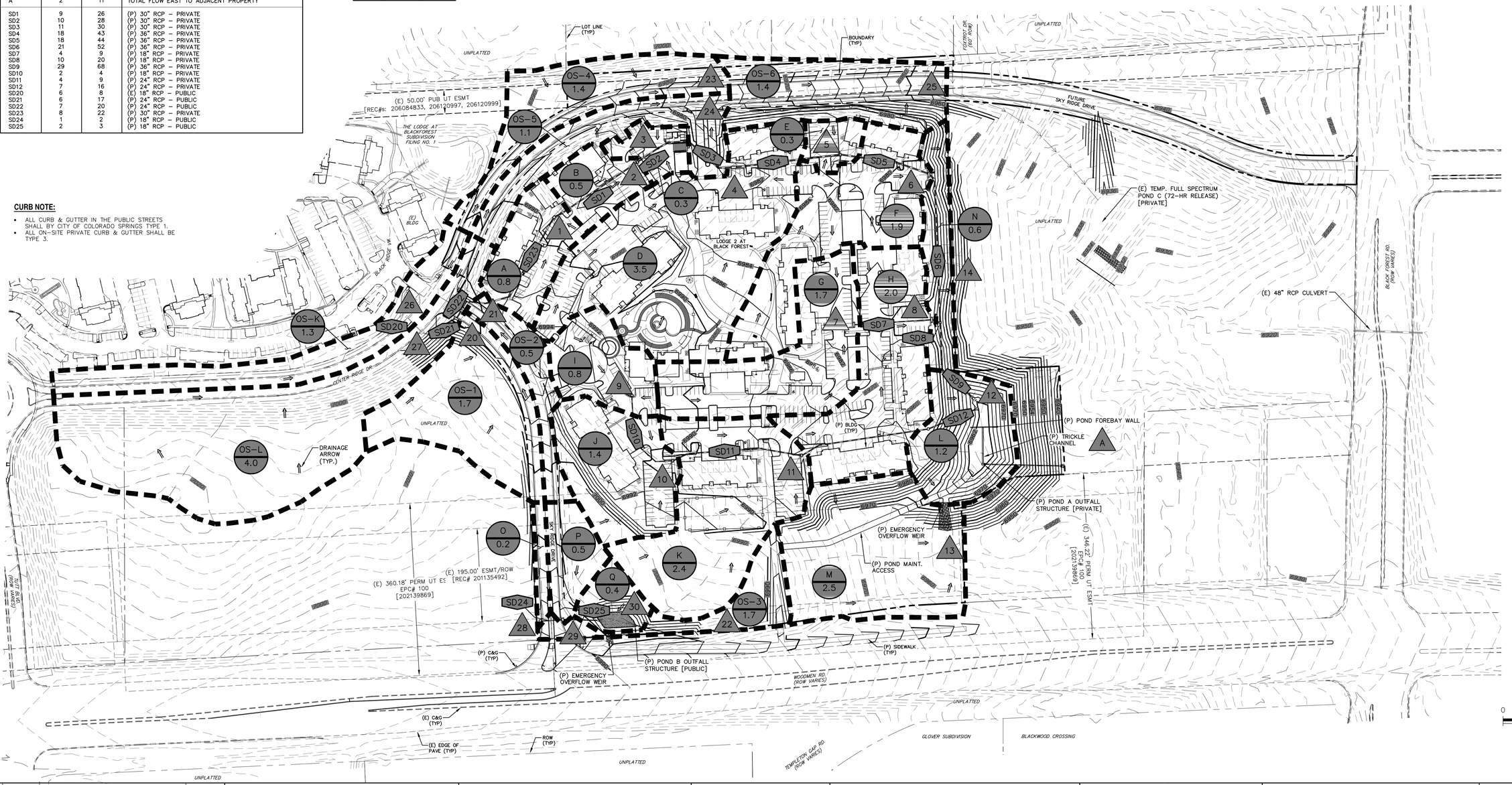
BASIN IDENTIFIER
BASIN AREA [AC]
SURFACE DESIGN POINT IDENTIFIER
STORM DRAIN DESIGN POINT IDENTIFIER
DRAINAGE BASIN BOUNDARY

LEGEND

EXISTING	(E)
PROPOSED	(P)
FUTURE	(F)
CURB AND GUTTER	C&G
EASEMENT	ESMT
RIGHT-OF-WAY	ROW
BOUNDARY	
RIGHT-OF-WAY	
LOT LINE	
EASEMENT	
(E) CONTOUR, INDEX	6940
(E) CONTOUR	
(P) CONTOUR, INDEX	6940
(P) CONTOUR	
(E) STORM SEWER, INLET, MH	
(P) STORM SEWER, INLET, MH	

CURB NOTE:

- ALL CURB & GUTTER IN THE PUBLIC STREETS SHALL BY CITY OF COLORADO SPRINGS TYPE 1.
- ALL ON-SITE PRIVATE CURB & GUTTER SHALL BE TYPE 3.



REV.	- DESCRIPTION	DATE
1	ADDRESS CITY COMMENTS	11/17/17
2	ADDRESS CITY COMMENTS	03/09/18
3	ADDRESS CITY COMMENTS	08/30/18

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

PREPARED FOR:
CEDARWOOD DEVELOPMENT, INC.
1765 MERRIMAN ROAD
AKRON, OH 44313
(321) 704-3015

WESTWORKS ENGINEERING
1023 W. COLORADO COLORADO SPRINGS, CO 80904 (719) 685-1670

LODGE 2 AT BLACK FOREST

DRAINAGE MAP DEVELOPED CONDITIONS

DESIGNED BY:	CDK	DRAWN BY:	CDK
SCALE:	1"=100'	DATE:	09/12/18
JOB NUMBER		SHEET	
91614		1 OF 1	

K:\Projects\91614 - EPC - Lodge 2 Amd_SUBMITTAL\DR\91614-DR-DEV - 09/24/2018 3:55:10 PM - Matthew Pond