CVL CONSULTANTS

10333 E Dry Creek Road, Ste 240
Englewood, Colorado 80112
www.cvlci.com

720.482.9526

TRAILS AT CROWFOOT
PHASE I & II
PRELIMINARY DRAINAGE REPORT

Prepared for:
E5X Management Inc
Englewood, CO 80112
Phone (303) -440-9111
Contact: Chris Elliott

Prepared by:
CVL Consultants of Colorado, Inc.
10333 E. Dry Creek Road, Suite 240
Englewood, CO 80112
Phone (720) 482-9526
Contact: Mark Scheurer, P.E.

CVL PROJECT NO. 8130283701
November 2016
Revised Feb 2017
Revised April 2017
Revised June 2017

*This report for the preliminary design of **Trails at Crowfoot** was prepared by me or under my direct supervision in accordance with the provisions of the Town of Parker Storm Drainage and Enviromental Criteria Manual. I understand that the Town of Parker and its designated town authority do not and will not assume liability for drainage facilities designed by other.*

____
Signature

____
Colorado P.E. License No.

____
Seal and Date

TABLE OF CONTENTS

The following narrative and supporting calculations provide the drainage design associated with the *Trails at Crowfoot Phase I & II Preliminary Drainage Report*. The report primarily addresses drainage concepts related to Pond and storm system infrastructure sizing.

I. INTRODUCTION

1. Location

The Trails at Crowfoot Development is located within the Town of Parker, Douglas County, Colorado. The boundary of the development spans several sections, all of which are located within Township 7 South, Range 66 west of the 5th principal meridian.

More specifically, the southwest quarter, and majority of the north half, of Section 4, the south half, and majority of the north half, of Section 5, the east half of Section 6, a small portion along the east edge of Section 8, the north half, and the north half of the southwest quarter, of Section 9.

On a broader scale, the site is bounded by Rueter-Hess Reservoir to the northwest, Stroh Road to the north, Lemon Gulch Way to the south and east, and Cherry Creek to the east. More easily put, a majority of the site itself is bounded by the city limits of Parker.

2. Proposed Development

The proposed site spans roughly 400 acres along the southwest edge of the Parker city limits. The topography of the site generally slopes from southwest to northeast and west to east for the Lemon Gulch Basin, with many ravines, valleys, rolling hills, and channels conveying stormwater runoff to the northeast, where it will ultimately converge with Cherry Creek. The site itself is situated on five, previously studied, regional sub catchment basins, Oak Gulch, West Stroh, North Crowfoot Valley, Scott Gulch, and Lemon Gulch. Oak Gulch and Lemon Gulch drainage basins encompass the majority of the site.

Little exists in terms of drainage or utility infrastructure in the area. Drainage wise, there are several CMP culvert crossings along North Crowfoot Valley Road to the east, Lemon Gulch Way to the west, and Stroh Road to the North. Utility wise, raw water and potable water lines run down Stroh Road along the northern boundary of the site. Water mains cross the western half of the site, of which they generally follow a connection road between Lemon Gulch Way and Stroh Road.

Existing vegetation on site is comprised of native grasses, shrubs, trees, and weedy species indigenous to the area.

The site in its current state contains Soil Groups B, C, and D with the following breakdown: 49.8% B, 38% C, and 12.2% D. [Ref 3]

3. Previous Studies

The regional sub catchment basins within the area have been analyzed extensively by the Urban Drainage and Flood Control District (UDFCD). The foundation of this conceptual report was based upon, and compared against, the following Outfall Systems Planning (OSP) and Master Drainage studies:

1. Oak Gulch and Stroh Ranch Area Outfall Systems Planning – Preliminary Design Report by Knight Piesold Consulting
2. Master Drainage Plan for Anthology by Harris Kocher Smith (HKS)
3. Scott Gulch and Lemon Gulch Watershed Outfall systems Planning – Preliminary Design Report by CH2M Hill
4. Cherry Creek Corridor – Reservoir to Scott Road Major Drainageway Planning – Preliminary Design Report by URS
5. Conceptual Drainage Report for Hess Ranch Development by Manhard Consulting

The previous OSPs provide detailed CUHP/ SWMM analyses regarding the regional sub catchment flows, recommendations for erosion mitigation, regional detention pond system sizing, and design alternatives, with cost breakdowns, for the various channels in the area.

The HKS master drainage report provides a master drainage plan, for what was at the time, the latest proposed land use plan within the area. It makes use of previous UDFCD studies to compile a master drainage plan for all of Anthology

4. Proposed Development

Trails at Crowfoot development consists of approximately 890 single family residential lots. The site also comprise of school, multi-family development, parks and mixed use. The intent of this preliminary drainage report is to size storm infrastructure for Trails at Crowfoot Development. The report addresses land use and the relevant percentage imperviousness for the site.

Ponds and major drainage infrastructure were designed using the CUHP/SWMM hydrologic and routing methodology. The rational method SF-1, SF-2, SF-3 presented in the UDFCD criteria was used for the interior street capacity, inlet, and storm sewer design.

II. HISTORIC DRAINAGE

1. Major Basin and Sub Basin Description

The Trails at Crowfoot Development site encompasses a fraction of five much larger major basins: Oak Gulch, West Stroh, North Crowfoot Valley, Scott Gulch, and Lemon Gulch. The Trails at Crowfoot Development is mostly in the Lemon Gulch Basin and OS-2 basin with a portion in the Scott Gulch Basin. The sub basins in this section are taken from the Hess Ranch Conceptual Design [Ref. 4].

1. Scott Gulch

Scott Gulch is located along the southernmost point of the development boundary and is adjacent to the Lemon Gulch and OS-2 drainage basins. The latest development plan indicates that Scott Gulch will primarily consist of single family residential and open space **Note:** *A detention/water quality pond will be required for that portion of Basin 406 situated onsite. Coordination with the adjacent landowner will be required to discuss routing of historic release flows.*

2. Lemon Gulch

As a part of the Scott Gulch and Lemon Gulch OSP, Lemon Gulch makes up a large portion of the Trails at Crowfoot Development site. Lemon Gulch is centrally located within the development and is substantially larger than the other major basins that are contributed by the development area. The latest development plan indicates that Lemon Gulch will consist of single family residential and mixed use property, park space, open space, roadways, and a commercial development. A regional pond will capture runoff from the Trails development and release directly to Lemon Gulch.

3. Cherry Creek

The drainage Basin OS-2 conveys runoff to the east and into Cherry Creek. Cherry Creek parallels the east border of the property. The development plan for this area is single family residential and mixed us property, a large park space, roadways, and a school. A regional pond will capture runoff from the Trails development and release directly to Cherry Creek.

2. Floodplain

According to the *Federal Emergency Management Agencies (FEMA) Flood Emergency Rate Map (FIRM)* [Ref. 5], proposed development area lies within “Zone X” which is described as an area determined to be outside the 500 year floodplain limits or shallow flooding areas with average depths of less than one foot or drainage areas less than one square mile.

There are no existing major irrigation facilities such as ditches and canals on the property or within 100-feet of the property.

III. DESIGN CRITERIA

1. List of References

This preliminary drainage report is in accordance with the *Storm Drainage and Environmental Criteria Manual* [Ref. 2] and *Urban Storm Drainage Criteria Manual, VOL 1, 2 &3* [Ref. 1 - UDFCD].

Along with these criteria manuals, this report also adheres to the general guidelines set forth by the *Hess Ranch Conceptual Drainage Report* [Ref. 4].

2. Hydrologic Criteria

For Trails at Crowfoot, the Rational Method was used to establish the peak flow rate at design points throughout the development. Per the SDECM [Ref. 2], rainfall intensity is determined using the one-hour rainfall depth, P_1, in the USDCM [Ref. 1] Equation RA-3 as shown below:

$$I = \frac{28.5\, P_1}{(10 + T_c)^{0.786}} \qquad \text{(RA-3)}$$

The 2-year storm event was determined to have a 0.99-inch 1-hour rainfall depth, and the 100-year storm event was determined to have a 2.60-inch 1-hour rainfall depth.

3. Hydraulic Criteria

The *"Urban Storm Drainage Criteria Manual, Volumes 1, 2, and 3"* (USDCM) [Ref. 1] and the *"Storm Drainage and Environmental Criteria Manual"* (SDECM) [Ref. 2] are the design guidelines for the design and analyses provided in this report. Inlets, street, and pipes are designed in this report, which utilizes the 2-year and 100-year design storm events respectively as the basis of the minor and major storm events. Urban Drainage and Flood Control District's UD-Inlet.xls software is employed to evaluate the streets and inlets capacity. UDFCD's UD-Sewer software will be utilized to determine the Hydraulic Grade Line for the storm sewer networks in the Final Drainage Report. The four proposed detention ponds, regional channel, and major conveyance infrastructures were sized using the CUHP/SWMM methodology. CUHP v2.0.0 and SWMM 5.1 were used for the analysis. The CUHP/SWMM analysis is located in the appendix.

This report assumes on-grade inlets will be sized to intercept the 2-year design peak flow, and sump inlets will be sized to intercept up-to the 100-year design peak flow. The site inlets and street capacities are evaluated with UD-Inlet.xls in this report.

Storm pipe sizes will be finalized and hydraulic grade lines evaluated in the Final Drainage Report with UD-Sewer software.

IV. DRAINAGE PLAN

1. General Concept

Trails at Crowfoot is delineated into 87 sub-basins and 6 off-site basins. Sub-basins with designations “A”, “B” and “C” drain to Pond A. Sub-basins D1, D2, D6, D7, D8, D10 & D12 drain to Pond B. Sub-basins with designation “E” and sub-basins F6 and F8 drains to Pond D. Sub-basins D3, D4, D5, D9, D11 and designation “F” (F6 & F8 excluded) drain to Pond D.

2. Specific Details

Trails at Crowfoot is delineated into 87 sub-basins and 6 off-site basins that discharge to four detention ponds. On-grade inlets are sized to capture minor storm event unless mentioned otherwise.

All ponds are designed to meet the UDFCD full spectrum detention criteria. And will be Town of Parker’s Stormwater Utility maintenance eligible. They will have forebays, trickle channels, micropools, and staged outlet structures. These features are conceptually shown in this report. The detail design will be completed in the Final Drainage Report.

<u>Pond A (Interim)</u> is a Town of Parker maintenance eligible regional facility with a drainage area of 151 acres. The weighted average imperviousness for the area is 40.7%. The pond provides full spectrum detention per UDFCD requirements. The UD-Detention spreadsheet was utilized to determine the WQCV and EURV. The CUHP/SWMM with calculated allowable release rates was utilized to determine the 100-year volume. The outlet discharges into Lemon Gulch. The overflow for Pond A is sized for the peak inflow of 269 cfs and discharges directly into Lemon Gulch.

The table on the following page summarizes the Pond A design. Calculations for the design of Pond A are included in the appendix. Detailed Design of the pond will be completed for the Final Report.

POND A (Interim)	
Description	
Drainage Area	151.23
Percent Imperviousness	40.74
WQCV	2.29
EURV Volume (including WQVC)	6.11
EURV Water Surface*	5999.96
100-YR Volume (including EURV)	11.36
100-yar water surface elevation*	6002.05
Emergency Spillway Crest Elevation*	6002.05
100-year Peak Inflow (cfs)	268.86
100-year Peak Outflow (cfs)	177.21

Pond B is a sub-regional facility with a drainage area of 23 acres. The weighted average imperviousness for the area is 47.4%. The pond provides full spectrum detention per UDFCD requirements. The UD-Detention spreadsheet was utilized to determine the WQCV and EURV. The CUHP/SWMM with calculated allowable release rates was utilized to determine the 100-year volume. The outlet discharges into a pipe provided by the downstream development. Which ultimately discharges into Scott Gulch. The overflow for Pond B conveys the peak inflow of 105 cfs and discharges southeast into the future Bayou Gulch Road.

The table below summarizes the Pond B design. Calculations for the design of Pond B are included in the appendix. Detailed Design of the pond will be completed for the Final Report.

POND B	
Description	
Drainage Area	23.2
Percent Imperviousness	47.36
WQCV	0.39
EURV Volume (including WQVC)	1.10
EURV Water Surface*	6092.92
100-YR Volume (including EURV)	2.41
100-yar water surface elevation*	6094.57
Emergency Spillway Crest Elevation*	6094.57
100-year Peak Inflow (cfs)	105.30
100-year Peak Outflow (cfs)	30.56

Pond C is a maintenance eligible regional facility with a drainage area of 153 acres. The weighted average imperviousness for the area is 49.29%. The pond provides full spectrum detention per UDFCD requirements. The UD-Detention spreadsheet was utilized to determine the WQCV and EURV. The CUHP/SWMM with calculated allowable release rates was utilized to determine the 100-year volume. The outlet discharges to Cherry Creek and will comply with Cherry Creek Reservoir Control Regulations. Detailed Design of the pond will be completed for the Final Report.

POND C	
Description	
Drainage Area	97.79
Percent Imperviousness	45.93
WQCV	1.59
EURV Volume (including WQVC)	4.49
EURV Water Surface	5976.36
100-YR Volume (including EURV)	9.40
100-yar water surface elevation	5979.06
Emergency Spillway Crest Elevation*	-
100-year Peak Inflow (cfs)	299.05
100-year Peak Outflow (cfs)	106.71
*To be provided with Final Drainage	

Pond D is a maintenance eligible regional facility with a drainage area of 53 acres. The weighted average imperviousness for the area is 55.15%. The pond provides full spectrum detention per UDFCD requirements. The UD-Detention spreadsheet was utilized to determine the WQCV and EURV. The CUHP/SWMM with calculated allowable release rates was utilized to determine the 100-year volume. The outlet discharges to Cherry Creek and will comply with Cherry Creek Reservoir Control Regulations. Detailed Design of the pond will be completed for the Final Report.

POND D	
Description	
Drainage Area	52.76
Percent Imperviousness	55.15
WQCV	0.97
EURV Volume (including WQVC)	2.954
EURV Water Surface	5991.65
100-YR Volume (including EURV)	4.99
100-yar water surface elevation*	5993.62
Emergency Spillway Crest Elevation*	-
100-year Peak Inflow (cfs)	163.82
100-year Peak Outflow (cfs)	58.28
*To be provided with Final Drainage	

Sub-basins are described in detail as follows.

Sub-basin A1 primarily consists of the lots along Street H. Surface runoff generally drains to the curb and gutter, which continues northerly to the on-grade inlet at Design Point 1A where it is piped to DP 1. 100-year storm street flows to sump inlet DP 1B. Emergency flow from DP 1B will overland to west channel.

Sub-basin A2 primarily consists of the lots along Street F and G. Surface runoff generally drains to the curb and gutter to sump inlet at Design Point 1B where it is piped west channel. Emergency flow from DP 1B will overland to west channel.

Sub-basin A3 primarily consists of the lots along Street F. Surface runoff generally drains to the curb and gutter to sump inlet at Design Point 1C where it is piped west channel. Emergency flow from DP 1C will overland to west channel.

Sub-basin A4 primarily consists of the lots along Street A and D. Surface runoff generally drains to the curb and gutter to sump inlet at Design Point 1D where it is piped west channel. Emergency flow from DP 1D will overland to west channel.

Sub-basin A5 primarily consists of the lots along Street A and D. Surface runoff generally drains to the curb and gutter to sump inlet at Design Point 1E where it is piped west channel. Emergency flow from DP 1E will overland to west channel.

Sub-basin A6 primarily consists of the lots along Street A and B. Surface runoff generally drains to the curb and gutter, which continues westerly to the on-grade inlet at Design Point 1F where it is piped to sump inlet at DP 1N. 100-year storm street flows to sump inlet at DP 1N. Emergency flow from DP 1N will overland to west channel.

Sub-basin A7 primarily consists of the lots along Street D and E. Surface runoff generally drains to the curb and gutter to on-grade inlet at design point 1G where it is piped to sump inlet at design point 1E. 100-year storm street flows to sump inlet at DP 1E. Emergency flow from DP 1E will overland to west channel.

Sub-basin A8 primarily consists of the lots along Street A. Surface runoff generally drains to the curb and gutter to the sump inlet at DP 1H. Emergency flow from DP 1H will overland to west channel.

Sub-basin A9 is located along Bayou Gulch Rd. Surface runoff generally drains to the curb and gutter to DP 1I where it runs westerly to Design Point IJ. Emergency flow from DP 1J will overland to west channel.

Sub-basin A10 is located along Bayou Gulch Rd. Surface runoff generally drains to the curb and gutter to sump inlet at DP 1J. Emergency flow from DP 1J will overland to west channel.

Sub-basin A11 primarily consists of the lots along Street G and H. Surface runoff generally drains to the curb and gutter to on grade inlet at Design Point 1K. 100 Year flow from 1K will overland to sump inlet at Design Point 1B where it is piped west channel. Emergency flow from DP 1B will overland to west channel.

Sub-basin A12 primarily consists of the lots along Street A and C. Surface runoff generally drains to the curb and gutter to on grade inlet at Design Point 1L. 100 Year flow from 1L will street flow to sump inlet at Design Point 1N where it is piped west channel. Emergency flow from DP 1N will overland to west channel.

Sub-basin A13 primarily consists of the lots along Street C and E. Surface runoff generally drains to the curb and gutter to on grade inlet at Design Point 1M. 100 Year flow from 1M will street flow to sump inlet at Design Point 1E where it is piped west channel. Emergency flow from DP 1E will overland to west channel.

Sub-basin A14 primarily consists of the lots along Street A. Surface runoff generally drains to the curb and gutter to the sump inlet at DP 1N. Emergency flow from DP 1N will overland to west channel.

Sub-basin A15 is located along Bayou Gulch Rd. Surface runoff generally drains to the curb and gutter to on-grade Inlet at DP 1O. Emergency flow from DP 1O will overland to west channel.

Sub-basin A16 is located along N. Pinery Parkway. Surface runoff generally drains to the curb and gutter, which continues northerly to the on-grade inlet at Design Point 1P where it is piped to DP 1. 100-year storm street flows to sump inlet at DP 1B. Emergency flow from DP 1B will overland to west channel.

Sub-basin A17 primarily consists of the lots along Street F and H. Surface runoff generally drains to the curb and gutter to on grade inlet at Design Point 1Q. 100 Year flow from 1Q will street to sump inlet at Design Point 1B where it is piped west channel. Emergency flow from DP 1B will overland to west channel.

Sub-basin A18 primarily consists of the lots along Street F and G. Surface runoff generally drains to the curb and gutter to on grade inlet at Design Point 1R. 100 Year flow from 1R will street to sump inlet at Design Point 1B where it is piped west channel. Emergency flow from DP 1B will overland to west channel.

Sub-basin A19 primarily consists of the lots along Street A and C. Surface runoff generally drains to the curb and gutter to on grade inlet at Design Point 1S. 100 Year flow from 1S will street to sump inlet at Design Point 1E where it is piped west channel. Emergency flow from DP 1E will overland to west channel.

Sub-basin A20 primarily consists of the lots along Street C and E. Surface runoff generally drains to the curb and gutter to on grade inlet at Design Point 1T. 100 Year flow from 1T will street to sump inlet at Design Point 1E where it is piped west channel. Emergency flow from DP 1E will overland to west channel.

Sub-basin A21 primarily consists of the lots along Street A and B. Surface runoff generally drains to the curb and gutter to on grade inlet at Design Point 1U. 100 Year flow from 1U will street flow to sump inlet at Design Point 1N where it is piped west channel. Emergency flow from DP 1N will overland to west channel.

Note:
1) 0% slope indicates sump inlet.

BASIN SUMMARY						
BASIN ID	AREA	Imperviousness	Q2	Q100	Street Type	Slope
	(AC)	%	(CFS)	(CFS)		%
A1	4.11	43.77	3.84	17.73	Local	2.00
A2	1.84	52.16	2.22	9.10	Local	0.00
A3	3.23	48.80	3.16	13.54	Local	0.00
A4	4.07	34.03	2.78	15.39	Local	0.00
A5	2.04	49.08	2.27	9.70	Local	0.00
A6	4.96	35.28	3.58	19.32	Local	1.50
A7	4.33	51.70	5.01	20.65	Local	4.00
A8	2.86	52.68	3.45	14.07	Local	0.00
A9	3.44	50.33	3.75	15.73	Arterial	2.00
A10	0.72	61.44	1.12	4.14	Arterial	0.00
A11	2.39	53.79	2.92	11.75	Local	2.00
A12	2.96	48.02	3.22	13.95	Local	1.50
A13	7.08	46.42	6.77	29.97	Local	5.00
A14	1.43	54.86	1.94	7.68	Local	0.00
A15	7.15	26.55	3.58	23.96	Arterial	0.00
A16	0.75	76.70	1.39	4.52	Local	2.00
A17	3.76	52.91	4.19	17.02	Local	2.00
A18	2.54	52.87	2.95	11.99	Local	2.00
A19	2.09	51.95	2.51	10.32	Local	4.00
A20	2.04	49.09	2.28	9.72	Local	2.00
A21	3.02	52.59	3.69	15.04	Local	1.50

Sub-basin B1 is located south west of the project along Street J. Surface runoff generally overland flows to on-grade inlet at DP 2A. Emergency flow from 2A will street flow to sump inlet to DP to 2K.

Sub-basin B2 is located along Street N and D. Surface runoff street flows to on-grade inlet at DP 2B. 100 Year flow from 2B will street flow to on-grade inlet at Design Point 2A Emergency flow from 2A will street flow to sump inlet to DP 2K.

Sub-basin B3 is located along Street D. Surface runoff generally drains to the curb and gutter to on-grade inlet at DP 2C. 100-year flow from 2C runs northerly to N. Pinery Parkway to sump inlet at DP 2J. Emergency flow from DP 2J will overland to west channel.

Sub-basin B4 primarily consists of the lots located along Street D. Surface runoff generally drains to on grade inlet at Design Point 2D. 100 year and Emergency flow from DP 2D will street flow to sump inlet to DP 2J.

Sub-basin B5 primarily consists of the lots located along Street L and J. Surface runoff generally drains to on grade inlet at Design Point 2E. Emergency flow from DP 2E will street flow to sump inlet to DP 2K.

Sub-basin B6 primarily consists of the lots located along Street K and J. Surface runoff generally drains to on grade inlet at Design Point 2F. Emergency flow from DP 2F will street flow to sump inlet to DP 2K.

Sub-basin B7 primarily consists of the lots located along Street I and J. Surface runoff generally drains to Design Point 2G. Flow from DP 2G will street flow to local sump inlet at Design Point 2I. Emergency flow from DP 2I will street flow to sump inlet to DP 2J.

Sub-basin B8 primarily consists of the lots located along Street D and J. Surface runoff generally drains to local sump inlet at Design Point 2H. Emergency flow from DP 2H will street flow to sump inlet to DP 2J.

Sub-basin B9 primarily consists of the lots located along Street D and J. Surface runoff generally drains to local sump inlet at Design Point 2I. Emergency flow from DP 2I will overland to sump inlet to DP 2J.

Sub-basin B10 is located along N Pinery Parkway. Surface runoff generally drains to sump inlet at Design Point 2J. Emergency flow from 2J will overland to west channel.

Sub-basin B11 is located along N Pinery Parkway. Surface runoff generally drains to sump inlet at Design Point 2K. Emergency flow from 2K will overland to west channel.

Sub-basin B12 is located along Street D. Surface runoff generally drains to the curb and gutter to on-grade inlet at DP 2D. 100-year flow from 2D runs northerly to N. Pinery Parkway to sump inlet at DP 2J. Emergency flow from DP 2J will overland to west channel.

Sub-basin B13 primarily consists of the lots located along Street K and J. Surface runoff generally drains to on grade inlet at Design Point 2M. Emergency flow from DP 2M will street flow to sump inlet to DP 2K.

Sub-basin B14 primarily consists of the lots located along Street L and J. Surface runoff generally drains to on grade inlet at Design Point 2N. Emergency flow from DP 2E will street flow to sump inlet to DP 2K.

Sub-basin B15 is located along Street L and O. Surface runoff generally drains to the curb and gutter to on-grade inlet at DP 2O. 100-year flow from 2O runs northerly to N. Pinery Parkway to sump inlet at DP 2J. Emergency flow from DP 2J will overland to west channel.

Note:
1) 0% slope indicates sump inlet.

BASIN SUMMARY

BASIN ID	AREA	Imperviousness	Q2	Q100	Street Type	Slope
	(AC)	%	(CFS)	(CFS)		%
B1	21.00	23.33	8.48	62.92	Local	7.00
B2	3.13	51.76	3.82	15.75	Local	3.00
B3	4.92	50.31	5.58	23.45	Local	3.00
B4	1.50	91.11	4.10	12.16	Local	5.00
B5	3.19	53.20	3.88	15.72	Local	6.00
B6	3.19	53.20	3.88	15.72	Local	6.00
B7	5.76	49.66	5.79	24.54	Local	6.00
B8	4.93	46.94	4.95	21.81	Res. Blvd	0.00
B9	2.81	49.17	2.94	12.55	Local	0.00
B10	0.65	76.70	1.28	4.14	Res. Blvd	0.00
B11	0.84	76.70	1.59	5.15	Res. Blvd	0.00
B12	2.53	88.00	5.86	17.68	Local	3.00
B13	3.19	53.20	3.88	15.72	Local	2.00
B14	3.19	53.20	3.88	15.72	Local	2.00
B15	2.01	53.11	2.50	10.13	Local	1.00

Sub-basin C1 primarily consists of the lots located along Street J. Surface runoff generally drains to sump inlet at Design Point 3A. Emergency flow from DP 3A overland flow to west channel.

Sub-basin D1 primarily consists of the lots located along Street J. Surface runoff generally drains to sump inlet at Design Point 4A. Emergency flow from DP 4A will overland Pond B.

Sub-basin D2 primarily consists of the lots located along Street N and J. Surface runoff generally drains to Design Point 4B. Flow from DP 4B street flows to sump inlet at Design Point 4J. Emergency flow from DP 4J will overland to Pond B.

Sub-basin D3 primarily consists of the lots located along Street D. Surface runoff generally drains to Design Point 4C. Flow from DP 4C street flows to sump inlet at Design Point 4E. Emergency flow from DP 4E will street flow on N Pinery Parkway to Pond D.

Sub-basin D3 primarily consists of the lots located along Street D. Surface runoff generally drains to Design Point 4C. Flow from DP 4C street flows to sump inlet at Design Point 4E. Emergency flow from DP 4E will street flow on N Pinery Parkway to Pond D.

Sub-basin D4 primarily consists of the lots located along Street K. Surface runoff generally drains to Design Point 4D. Flow from DP 4D street flows to sump inlet at Design Point 4E. Emergency flow from DP 4E will street flow on N Pinery Parkway to Pond D.

Sub-basin D5 primarily consists of the lots located along Bayou Gulch Rd and N Pinery Parkway. Surface runoff generally drains to sump inlet at Design Point 4E. Emergency flow from DP 4E will street flow on N Pinery Parkway to Pond D.

Sub-basin D6 is located along Bayou Gulch Rd. Surface runoff generally drains to sump inlet at Design Point 4F. Emergency flow from DP 4F will overland flow to Pond B.

Sub-basin D7 is located along Street D. Surface runoff generally drains to on-grade inlet at Design Point 4G. Emergency flow from DP 4G will street flow to Pond B.

Sub-basin D8 primarily consists of the lots located along Street K. Surface runoff generally drains to Design Point 4H. Flow from DP 4H street flows to sump inlet at Design Point 4F. Emergency flow from DP 4F will overland to Pond B.

Sub-basin D9 primarily consists of the lots located along N. Pinery Parkway. Surface runoff generally drains to sump inlet at Design Point 4I. Emergency flow from DP 4I street flow to Pond C via N Pinery Parkway.

Sub-basin D10 primarily consists of the lots located along Street P and J. Surface runoff generally drains to sump inlet at Design Point 4J. Emergency flow from DP 4J will overland to Pond B.

Sub-basin D11 is located along N. Pinery Parkway. Surface runoff generally drains to sump inlet at Design Point 4K. Emergency flow from DP 4K will street flow on N. Pinery Parkway.

Sub-basin D12 is located along Bayou Gulch. Surface runoff generally drains to on-grade inlet at Design Point 4L. Emergency flow from DP 4L will overland to Pond B.

Note:						
1) 0% slope indicates sump inlet.						
BASIN SUMMARY						
BASIN ID	AREA	Imperviousness	Q_2	Q_{100}	Street Type	Slope
	(AC)	%	(CFS)	(CFS)		%
C1	7.47	43.49	6.21	28.78	Local	0.00
D1	5.94	42.41	5.34	25.23	Local	0.00
D2	5.33	46.14	5.58	24.83	Local	5.00
D3	3.66	43.82	3.28	15.11	Local	5.00
D4	2.91	42.33	2.45	11.57	Local	3.00
D5	9.10	61.93	11.25	41.49	Arterial	0.00
D6	2.57	42.99	2.30	10.74	Arterial	6.00
D7	2.58	42.09	2.48	11.76	Local	4.00
D8	0.85	51.73	1.06	4.38	Local	5.00
D9	4.62	45.07	4.34	19.61	Arterial	0.00
D10	4.80	50.52	5.60	23.45	Local	0.00
D11	3.29	84.30	6.19	19.00	Arterial	0.00
D12	1.13	84.30	2.13	6.53	Arterial	1.50

<u>Sub-basin E1</u> is located along Street 1. Surface runoff generally drains to on-grade inlet at Design Point 5A. Emergency flow from DP 5A street flow to Pond C via Street R.

<u>Sub-basin E2</u> primarily consists of lots located along Street R. Surface runoff generally drains to sump inlet at Design Point 5B. A swale formed between the sidewalk and the backyard portions of Basin E2 directs flow to Pond C. Emergency flow from DP 5B overland flows to Pond C.

<u>Sub-basin E3</u> primarily consists of lots located along Street R and S. Surface runoff generally drains to on-grade inlet at Design Point 5C. 100 Year and Emergency flow from DP 5C street flows to sump inlet at Design Point 5E.

<u>Sub-basin E4</u> primarily consists of lots located along Street S and T. Surface runoff generally drains to Design Point 5D where it street flows southerly sump inlet at Design Point 5E. Emergency flow from DP 5E overland flows to Pond C.

<u>Sub-basin E5</u> primarily consists of lots located along Street R. Surface runoff generally drains to sump inlet at Design Point 5E. Emergency flow from DP 5E overland flows to Pond C.

<u>Sub-basin E6</u> primarily consists of lots located along Street V and 2. Surface runoff generally drains to on-grade inlet at Design Point 5F. 100 Year flow street flows to sump inlet at Design Point 5G. Emergency flow from DP 5G overland flows to Pond C.

<u>Sub-basin E7</u> primarily consists of lots located along Street X and R. Surface runoff generally drains to sump inlet to Design Point 5G. Emergency flow from DP 5G overland flows to Pond C.

Sub-basin E8 primarily consists of lots located along Street E and Y. Surface runoff generally drains to on-grade inlet at Design Point 5H. 100 Year discharge street flows to sump inlet at Design Point 5G. Emergency flow from DP 5G overland flows to Pond C.

Sub-basin E9 primarily consists of lots located along Street R and X. Surface runoff generally drains to on-grade inlet at Design Point 5I. 100 Year discharge street flows to sump inlet at Design Point 5G. Emergency flow from DP 5G overland flows to Pond C.

Sub-basin E10 primarily consists of lots located along Street R. Surface runoff generally drains to Design Point 5J. Flow from 5J street flows to sump inlet at Design Point 5B. Emergency flow from DP 5B overland flows to Pond C.

Sub-basin E11 primarily consists of open space along Street E. Surface runoff generally drains to Design Point 5K. Flow from 5K street flows to on-grade inlet at Design Point 5P. 100 year flows from 5P will street flow to Design Point 5G. Emergency flow from DP 5G overland flows to Pond C.

Sub-basin E12 primarily consists of open space along Street E. Surface runoff generally drains to Design Point 5L. Flow from 5L street flows to on-grade inlet at Design Point 5P. 100 year flows from 5P will street flow to Design Point 5G. Emergency flow from DP 5G overland flows to Pond C.

Sub-basin E13 primarily consists of open space along N. Pinery Parkway. Surface runoff generally drains to Design Point 5M. Flow from 5M street flows to on-grade inlet at Design Point 5Q. 100 year flows from 5Q will street flow to Design Point 6H via pipe and swale through basin F8. Emergency flow from DP 6H overland flows to Pond C.

Sub-basin E14 primarily consists of lots located along Street 1. Surface runoff generally drains to sump inlet at Design Point 5N. Emergency flow from DP 5N will street flow on Street E.

Sub-basin E15 primarily consists of lots located along Street W and T. Surface runoff generally drains to on-grade inlet at DP 5O. Flow from 5O street flows to sump inlet at Design Point 5G. Emergency flow from DP 5G overland flows to Pond C.

Sub-basin E16 is located along Street E. Surface runoff generally drains to on-grade inlet at Design Point 5P. Flow from 5P street flows to sump inlet at Design Point 5G. Emergency flow from DP 5G overland flows to Pond C.

Sub-basin E17 is located along N. Pinery Parkway. Surface runoff generally drains to on-grade inlet at Design Point 5Q. Flow from 5Q street flows to sump inlet at Design Point 6H. Emergency flow from DP 6H overland flows to Pond C.

Sub-basin E18 primarily consists of open space along Street U. Surface runoff generally drains to on-grade inlet at Design Point 5R. 100 year flows from 5R will street flow to sump inlet at DP 5E. Emergency flow from DP 5E overland flows to Pond C.

Sub-basin E19 primarily consists of lots located along Street 2. Surface runoff generally drains to on-grade inlet at Design Point 5S. 100 Year flow street flows to sump inlet at Design Point 5G. Emergency flow from DP 5G overland flows to Pond C.

Sub-basin E20 primarily consists of lots located along Street X and R. Surface runoff generally drains to sump inlet to Design Point 5G. Emergency flow from DP 5G overland flows to Pond C.

Sub-basin E21 primarily consists of lots located along Street E and Y. Surface runoff generally drains to on-grade inlet at Design Point 5U. 100 Year discharge street flows to sump inlet at Design Point 5G. Emergency flow from DP 5G overland flows to Pond C.

Sub-basin E22 is located along Street 1. Surface runoff generally drains to on-grade inlet at Design Point 5V. Emergency flow from DP 5V street flow to Pond C via Street R.

Sub-basin E23 is located along Street 1. Surface runoff generally drains to on-grade inlet at Design Point 5W. Emergency flow from DP 5W street flow to Pond C via Street R.

Sub-basin E24 primarily consists of open space along Street E. Surface runoff generally drains to Design Point 5X. Flow from 5X street flows to on-grade inlet at Design Point 5L. 100 year flows from 5X will street flow to Design Point 5G. Emergency flow from DP 5G overland flows to Pond C.

Sub-basin E25 primarily consists of lots located along Street 1. Surface runoff generally drains to on grade inlet at DP 5Y. 100-year street flows from 5Y to sump inlet at Design Point 5N. Emergency flow from DP 5N will street flow on Street E.

Sub-basin E26 primarily consists of lots located along Street 1. Surface runoff generally drains to on grade inlet at DP 5Z. 100-year street flows from 5Z to sump inlet at Design Point 5N. Emergency flow from DP 5N will street flow on Street E.

Note:
1) 0% slope indicates sump inlet.

BASIN SUMMARY						
BASIN ID	AREA	Imperviousness	Q_2	Q_{100}	Street Type	Slope
	(AC)	%	(CFS)	(CFS)		%
E1	4.04	52.65	4.95	20.19	Local	2.70
E2	5.27	52.02	4.71	19.36	Local	0.00
E3	4.77	52.31	5.64	23.07	Local	3.00
E4	3.20	52.07	3.78	14.69	Local	4.00
E5	2.76	53.77	3.09	12.43	Local	0.00
E6	2.63	53.59	3.06	12.34	Local	1.00
E7	2.77	51.99	3.21	13.17	Local	0.00
E8	2.68	53.33	3.13	12.64	Local	2.00
E9	4.84	39.52	3.92	19.46	Local	2.00
E10	0.70	56.03	0.85	3.31	Local	1.00
E11	3.99	30.00	2.48	14.96	Local	1.00
E12	3.28	30.00	2.04	12.33	Local	6.00
E13	4.45	30.00	2.76	16.67	Local	1.00
E14	5.58	56.35	7.00	27.28	Local	0.00
E15	1.89	51.97	2.08	8.55	Local	2.00
E16	1.57	73.60	2.68	8.89	Local	6.00
E17	1.55	73.60	2.64	8.76	Local	1.00
E18	2.72	52.96	3.45	14.00	Local	1.50
E19	2.91	53.40	3.58	14.46	Local	1.20
E20	2.75	53.49	3.12	12.57	Local	2.00
E21	2.05	54.72	2.56	10.18	Local	2.00
E22	4.41	53.09	5.39	21.86	Local	2.70
E23	4.11	51.69	4.81	19.86	Local	2.70
E24	4.23	30.00	2.63	15.87	Local	2.00
E25	3.62	52.58	4.65	18.92	Local	2.00
E26	2.88	59.79	4.24	15.89	Local	2.00

Sub-basin F1 is located along Street 1 and N. Pinery Parkway. Surface runoff generally drains to on-grade inlet at Design Point 6A. 100 Year discharge from 6A street flows to sump inlet at Design Point 6I. Emergency flow from DP 6I overland flows to Pond D.

Sub-basin F2 is located along 1. Surface runoff generally drains to on-grade inlet at Design Point 6B. 100 Year discharge from 6B street flows to sump inlet at Design Point 6I. Emergency flow from DP 6I overland flows to Pond D.

Sub-basin F3 is located along Street E. Surface runoff generally drains to on-grade inlet at Design Point 6C. 100 Year discharge from 6C street flows to sump inlet at Design Point 6I. Emergency flow from DP 6I overland flows to Pond D.

Sub-basin F4 primarily consists of lots located along Street 8. Surface runoff generally drains to Design Point 6D. 2 Year discharge from 6D street flows Design Point 6C. 100 Year discharge from 6D street flows to sump inlet at Design Point 6I. Emergency flow from DP 6I overland flows to Pond D.

Sub-basin F5 primarily consists of lots located along N. Pinery Parkway. Surface runoff generally drains to on-grade inlet at Design Point 6E. 100 Year discharge from 6E street flows to sump inlet at Design Point 6I. Emergency flow from DP 6I overland flows to Pond D.

Sub-basin F6 primarily consists of lots located along Street Z. Surface runoff generally drains to sump inlet at Design Point 6F. Emergency flow from DP 6F overland flows to Pond C.

Sub-basin F7 is located along N. Pinery Parkway. Surface runoff generally drains to sump inlet at Design Point 6G. Emergency flow from DP 6G overland flows to Pond D.

Sub-basin F8 primarily consists of lots located along Street Y. Surface runoff generally drains to sump inlet at Design Point 6H. Emergency flow from DP 6H overland flows to Pond C.

Sub-basin F9 is located along street E and N. Pinery Parkway. Surface runoff generally drains to sump inlet at Design Point 6I. Emergency flow from DP 6I overland flows to Pond D.

Sub-basin F10 is located along Street 1. Surface runoff generally drains to on-grade inlet at Design Point 6J. 100 Year discharge from 6J street flows to sump inlet at Design Point 6I. Emergency flow from DP 6I overland flows to Pond D.

Sub-basin F11 is located along Street 1. Surface runoff generally drains to on-grade inlet at Design Point 6K. 100 Year discharge from 6K street flows to sump inlet at Design Point 6I. Emergency flow from DP 6I overland flows to Pond D.

Sub-basin F12 is located along Street 1. Surface runoff generally drains to on-grade inlet at Design Point 6L. 100 Year discharge from 6L street flows to sump inlet at Design Point 6I. Emergency flow from DP 6I overland flows to Pond D.

Sub-basin F13 primarily consists of lots located along Street 10. Surface runoff generally drains to Design Point 6M. 2 Year discharge from 6M street flows Design Point 6C. 100 Year discharge from 6M street flows to sump inlet at Design Point 6I. Emergency flow from DP 6I overland flows to Pond D.

Note:
1) 0% slope indicates sump inlet.

BASIN SUMMARY						
BASIN ID	**AREA**	**Imperviousness**	**Q_2**	**Q_{100}**	**Street Type**	**Slope**
	(AC)	**%**	**(CFS)**	**(CFS)**		**%**
F1	1.71	90.64	4.59	13.55	Local	2.50
F2	1.77	93.50	4.96	14.53	Local	2.50
F3	3.60	19.77	1.47	12.47	Local	1.00
F4	3.79	53.06	4.56	18.47	Local	4.00
F5	4.58	46.86	4.46	19.66	Res. Blvd	4.00
F6	4.93	38.37	3.70	18.75	Local	0.00
F7	4.51	18.05	1.68	15.41	Res. Blvd	0.00
F8	7.23	31.60	4.53	26.49	Local	0.00
F9	1.28	66.27	1.75	6.18	Res. Blvd	0.00
F10	1.93	92.20	5.30	15.64	Local	2.50
F11	1.50	91.79	4.07	12.03	Local	2.50
F12	1.22	93.17	3.39	9.95	Local	2.50
F13	3.58	52.91	4.36	17.70	Local	4.00

Sub-basin OS 1 is located south west of the site. Surface runoff overland flows to Design Point A. Flow from DP A and is conveyed via pipe into the West Channel. This point was evaluated in the SWMM model. The Q100 peak flow for OS 1 is 19 cfs.

Sub-basin OS 2 is located south west of the site. . Surface runoff overland flows to the West Channel. This point was evaluated in the SWMM model. The Q100 peak flow for OS 2 is 9.06 cfs.

Sub-basin OS 8 is located south west of the site. . Surface runoff overland flows to the West Channel. This point was evaluated in the SWMM model. The Q100 peak flow for OS 8 is 8.04 cfs.

Sub-basin OS 3 is located south west of the site. Surface runoff overland flows to the West Channel. This point was evaluated in the SWMM model. The Q100 peak flow for OS 3 is 5.77 cfs.

Sub-basins OS 9 and OS11 are undeveloped and drain along their historic drainage pathways.

OS 9's surface runoff is conveyed to an existing culvert under Crowfoot Road. From there it enters Lemon Gulch.

OS 11 is located in the South west of the site. Surface runoff overland flows to the defunct irrigation ditch which acts as a berm. Flow that overtops this berm will fill the irrigation ditch. In the event the irrigation ditch becomes full and overtops, the runoff will flow to existing culvert downstream.

V. ENVIRONMENTAL PROTECTION CRITERIA

1. Erosion and Sediment Control Concept

Where possible native open space area will be maintained around the perimeter of the site and along/within the natural drainage ways. As planning areas develop, BMP erosion control plans shall be developed to control erosion and sediment at the construction site.

VI. CONCLUSIONS

1. Compliance with Standards

This Preliminary Drainage Report for Trails at Crowfoot is prepared in general conformance with the *"Storm Drainage and Environmental Criteria Manual"* [Ref. 2] and the *"Urban Storm Drainage Criteria Manual, Volumes 1, 2, and 3"* [Ref. 1].

2. Summary of Concept

The report addresses drainage concepts related to pond and storm system infrastructure sizing. The site drains to three major basins. Surface flow is intercepted by on-grade and sump inlets and are piped to three separate ponds. The three ponds will capture and detain developed runoff before exiting the site, respective to the drainage basin.

VI. REFERENCES

1. **Urban Storm Drainage Criteria Manual, Volumes 1,2,3**, Urban Drainage and Flood Control District, prepared by Urban Drainage and Flood Control District, Latest Revisions.

2. **Web Soil Survey**, http://websoilsurvey.nrcs.usda.gov/app/WebSoilSurvey.aspx, United States Department of Agriculture – Natural Resources Conservation Service.

3. **First Creek Major Drainageway Plan Conceptual Design Report**, Moser and Associates Engineering, August 2010.

4. **Hess Ranch Conceptual Drainage Report**, Manhard Consulting, June 23, 2015.

5. **FIRM, Flood Insurance Rate Map**, Douglas County, Colorado, map number 08035CO181G, 08035CO182G, 08035CO183G, and 08035CO184G Federal Emergency Management Agency, March 16, 2016.

6. **Scott and Lemon Gulch Watersheds**, Outfall systems Planning**,** CH2MHILL, July 2006.

Checklist of Drainage Report Requirements

Project Name: ____________________

____ **Conceptual** ____ **Preliminary** ____ **Final**

Initial or N/A	Item No.	Description	Conceptual Drainage Report (CDR)	Preliminary Drainage Report (PDR)	Final Drainage Report (FDR)
[ ]		COVER SHEET with title, date, applicant, preparer	X	X	X
[ ]		TABLE OF CONTENTS	X	X	X
[ ]		PE Certification and Seal		X	X
GENERAL LOCATION & DESCRIPTION					
[ ]	1	Township, range, section, quarter section	X	X	X
[ ]	2	Local streets within and adjacent to the subdivision	X	X	X
[ ]	3	Major drainageway and facilities	X	X	X
[ ]	4	Names of surrounding subdivisions	X	X	X
[ ]	5	Area in acres (verify with plat if available)	X	X	X
[ ]	6	Existing ground cover (trees, scrubs, etc.)	X	X	X
[ ]	7	Existing soil conditions	X	X	X
[ ]	8	Proposed land use	X	X	X
DRAINAGE BASINS AND SUB-BASINS					
		Major Basin Description			
[ ]	9	Reference major drainageway planning study	X	X	X
[ ]	10	Reference flood hazard delineation report	X	X	X
[ ]	11	Reference FEMA flood insurance study	X	X	X
[ ]	12	Identify presence of regulatory floodplains/floodways at site. Discuss any proposed disturbance to floodplain.	X	X	X
[ ]	13	Supporting and labeled FEMA flood insurance map included (if applicable)		X	X
[ ]	14	Will a FEMA LOMR be required?		X	X
[ ]	15	Reference previous drainage studies affecting the site	X	X	X
[ ]	16	Coordination with surrounding subdivision plans	X	X	X
[ ]	17	Basin drainage characteristics - existing and planned land uses affecting the site	X	X	X
		Site Sub-Basin Description			
[ ]	18.19	Discussion of historic drainage pattern of the property	X	X	X
[ ]	19	Discussion of off-site drainage flow patterns onto the site	X	X	X
[ ]	20	Supporting off-site delineation map included		X	X
[ ]	21	Identify presence or absence of any major drainageways on the site with total tributary area >130 acres	X	X	X
[ ]	22	Discussion of development of off-site basins and impact on site	X	X	X
DRAINAGE DESIGN CRITERIA					
		Regulations			
[ ]	23	Discussion of compliance with the Town's floodplain ordinance	X	X	X
		Discussion of compliance with Town's Stream Preservation Standards			
[ ]	24	Stream Buffers in project area	X	X	X
[ ]	25	Permitted uses planned, if any	X	X	X
[ ]	26	Discussion of Minor or Major Modification requested	X	X	X
[ ]	27	Discussion of compliance with UD&FCD maintenance eligibility review	X	X	X
		Development Criteria Reference and Constraints			
[ ]	28	Discussion of previous drainage studies for the site	X	X	X

Checklist of Drainage Report Requirements

Project Name: ______________________

____ **Conceptual** ____ **Preliminary** ____ **Final**

Initial or N/A	Item No.	Description	Conceptual Drainage Report (CDR)	Preliminary Drainage Report (PDR)	Final Drainage Report (FDR)
[ ]	29	Complies with previous study/Does not comply (Discussion on changes from the previous study)	X	X	X
[ ]	30	Discussion of coordination with adjacent drainage studies	X	X	X
[ ]	31	Discussion of site drainage constraints (such as streets, utilities, existing structures, etc.)	X	X	X
		Hydrology Criteria			
[ ]	32	Identify design rainfall event, frequency, and duration	X	X	X
[ ]	33	Identify runoff calculation method used	X	X	X
[ ]	34	Identify calculation method for detention storage requirement	X	X	X
[ ]	35	Identify calculation method for detention discharge	X	X	X
[ ]	36	Discussion and justification of criteria or methods not referenced by SDECM	X	X	X
		Hydraulic Criteria			
[ ]	37	Identify street capacity references		X	X
[ ]	38	Identify other capacity references		X	X
[ ]	39	Identify detention pond outlet design method		X	X
[ ]	40	Identify check/ drop structure criteria used		X	X
[ ]	41	Discussion of drainage facility design criteria not referenced by SDECM		X	X
		Variance from Criteria			
[ ]	42	Identify provision by section number for which a variance is requested	X	X	X
[ ]	43	Provide justification and discussion for each variance requested	X	X	X
DRAINAGE FACILITY DESIGN					
		General Concept			
[ ]	44	Discussion of concept and proposed drainage patterns of the site	X	X	X
[ ]	45	Discussion of off-site runoff impacting the site	X	X	X
[ ]	46	Discussion of runoff impacting downstream properties		X	X
[ ]	47	Discussion of tables, charts, figures, drawing, etc. presented in the appendix	X	X	X
[ ]	48	Discussion of proposed drainage patterns	X	X	X
		Specific Details			
[ ]	49	Discussion of drainage problems of the site	X	X	X
[ ]	50	Underdrains allowed in ROW only with Public Works Director approval		X	X
[ ]	51	Discussion of specific solutions at design points	X	X	X
		Discussion of detention storage required for full-spectrum detention			
[ ]	52	Supporting labeled calculations for adequate storage volume requirement	X	X	X
[ ]	53	Supporting labeled calculations that detention pond will accommodate volume required	X	X	X
[ ]	54	Supporting labeled calculations for water surface elevations		X	X
[ ]	55	Supporting labeled calculations for minimum of one foot freeboard requirement		X	X
		Discussion of outlet requirements			
[ ]	56	Water quality requirements are met - per SDECM Section 8.3		X	X
[ ]	57	Supporting labeled calculations for water quality orifice plate geometry and perforation sizing.			X
[ ]	58	Supporting labeled calculations for detention pond outlet staged release structure		X	X
[ ]	59	Supporting labeled calculations for detention pond outlet pipe capacity		X	X
[ ]	60	Supporting labeled calculations for sewer pipe outfall, design of riprap (match with grades, and downstream flowpath)			X
[ ]	61	Supporting labeled calculations for emergency overflow conditions		X	X
		Discussion of storm sewer configuration			

Checklist of Drainage Report Requirements

Project Name: ______________________________

____ **Conceptual** ____ **Preliminary** ____ **Final**

Initial or N/A	Item No.	Description	Conceptual Drainage Report (CDR)	Preliminary Drainage Report (PDR)	Final Drainage Report (FDR)
[ ]	62	Supporting labeled calculations for storm sewer capacity, type of flow, calculated pipe losses, and hydraulic grade line calculations		X	X
[ ]	63	Supporting labeled calculations for storm sewer inlet type and sizing calculations		X	X
[ ]	64	Supporting labeled calculations for storm sewer outlet conditions			X
[ ]	65	Supporting labeled calculations for conduit outlet protection design			X
		Discussion on channel design and soil erodibility within channel			
[ ]	66	Supporting labeled calculations for type of flow and velocity of flow		X	X
[ ]	67	Discussion on proposed channel lining/bank protection		X	X
[ ]	68	Supporting labeled calculations for freeboard requirement		X	X
[ ]	69	Supporting labeled calculations for water surface elevations		X	X
[ ]	70	Supporting labeled calculations for backwater analysis		X	X
[ ]	71	Supporting labeled calculations for sizing calculation for check structures			X
[ ]	72	Supporting labeled calculations for sizing calculation for drop structures			X
[ ]	73	Discussion of easements and tracts dedicated for drainage & maintenance purposes	X	X	X
[ ]	74	Discussion of maintenance and access aspects of the design		X	X
		Stormwater Utility Eligible Facilities			
[ ]	75	Identify stormwater facilities proposed for acceptance into the Stormwater Utility		X	X
ENVIRONMENTAL PROTECTION CRITERIA					
		General			
[ ]	76	Identify wetland areas, jurisdictional status, and other "Waters of the U.S."	X	X	X
[ ]	77	Identify potential impacts to T & E species and presence of Habitat Protection Areas and Stream Restoration Areas	X	X	X
[ ]	78	Discuss compliance with State and Federal environmental permitting regulations	X	X	X
		Construction BMP Plan			
[ ]	79	Discussion of Construction BMP Requirements (per SDECM Section 8.2)	X	X	X
		Permanent BMP Plan			
[ ]	80	Discussion of Permanent BMP requirements (per SDECM Section 8.3)	X	X	X
[ ]	81	Supporting labeled calculations for WQCV requirements		X	X
[ ]	82	Supporting labeled calculations for storage volume requirements		X	X
[ ]	83	Supporting labeled calculations for outlet structure design		X	X
[ ]	84	Discussion of landscaping considerations for PBMP		X	X
[ ]	85	Discussion of maintenance and access aspects of the design		X	X
CONCLUSIONS					
		Compliance with Standards			
[ ]	86	Town Ordinances	X	X	X
[ ]	87	Town SDECM	X	X	X
[ ]	88	Major drainageway plans (UDFCD Outfall Systems Plan)	X	X	X
[ ]	89	Town floodplain regulations	X	X	X
[ ]	90	Stream Preservation Standards	X	X	X
		Drainage Concept			
[ ]	91	Effectiveness of design to control storm runoff	X	X	X
[ ]	92	Discussion of maintenance responsibility for public and private drainage facilities		X	X
[ ]	93	Discuss impact of proposed development on the Major Drainageway Planning Studies recommendations		X	X

Checklist of Drainage Report Requirements

Project Name: ____________________

____ **Conceptual** ____ **Preliminary** ____ **Final**

Initial or N/A	Item No.	Description	Conceptual Drainage Report (CDR)	Preliminary Drainage Report (PDR)	Final Drainage Report (FDR)
		Sediment and Erosion Control Concept			
[ ]	94	Effectiveness of erosion control plan		X	X
[ ]	95	Suitability of site soils for development		X	X
[ ]	96	Certification statement and PE seal and signature		X	X
REFERENCES					
[ ]	97	List all drainage reports and technical information used	X	X	X
[ ]	98	List all computer software used in analysis	X	X	X
APPENDICES					
		Hydrologic Computations (Historic)			
[ ]	99	Historic basin delineation, onsite and offsite	X	X	X
[ ]	100	Runoff coefficient determination, including composite "C" calculation	X	X	X
[ ]	101	Rational Method analysis for each basin, initial and major storm	X	X	X
[ ]	102	Rational method analysis for each design point (i.e., routed cumulative flow), initial and major storm	X	X	X
[ ]	103	Schematic figure illustrating routing for basins and design points	X	X	X
[ ]	104	CUHP/UDSWM input and output data	X	X	X
[ ]	105	Schematic figure illustrating routing of CUHP basins and UDSWM elements	X	X	X
		Hydrologic Computations (Developed)			
[ ]	106	Developed basin delineation, onsite and offsite	X	X	X
[ ]	107	Runoff coefficient determination, including composite "C" calculation	X	X	X
[ ]	108	Rational Method analysis for each basin, initial and major storm	X	X	X
[ ]	109	Rational method analysis for each design point (i.e., routed cumulative flow), initial and major storm	X	X	X
[ ]	110	Schematic figure illustrating routing for basins and design points	X	X	X
[ ]	111	CUHP/UDSWM input and output data	X	X	X
[ ]	112	Schematic figure illustrating routing of CUHP basins and UDSWM elements	X	X	X
		Hydraulic Computations (Extended Detention Basin)			
[ ]	113	Volume of storage required (WQCV, EURV and 100-year event)	X	X	X
[ ]	114	Volume of designed detention pond (maximum volume)	X	X	X
[ ]	115	Does maximum water surface elevation allow for one foot minimum freeboard requirement (may require profile of pond)		X	X
[ ]	116	Inflow(s) energy dissipater (see hydraulic computations for storm sewer)		X	X
[ ]	117	Forebay - volume and drain pipe/weir		X	X
		Hydraulic Computation (EDB Outlet Structure)			
[ ]	118	Calculation of Historic release rates based on UDFCD Volume 2, Storage Chapter	X	X	X
[ ]	119	Calculation of allowable 100-year release rate based on UDFCD Volume 2, Storage Chapter	X	X	X
[ ]	120	Water quality orifice plate geometry		X	X
[ ]	121	Water quality trash rack/screen geometry and open area			X
[ ]	122	Orifice or weir sizing for 100-year release rate			X
[ ]	123	Orifice or weir placement for 100-year water surface elevation		X	X
[ ]	124	Trash Rack (overflow) sizing calculation			X
[ ]	125	Calculations for emergency overflow		X	X
[ ]	126	Capacity, velocity, and Froude number calculations for outlet structure storm sewer pipe		X	X
[ ]	127	Calculations for outlet protection for outlet structure pipe			X

Checklist of Drainage Report Requirements

Project Name: ____________________

____ Conceptual ____ Preliminary ____ Final

Initial or N/A	Item No.	Description	Conceptual Drainage Report (CDR)	Preliminary Drainage Report (PDR)	Final Drainage Report (FDR)
[ ]	128	Invert locations, slope, diameter (18-inch minimum), material (RCP only) and pipe classification for outlet structure storm sewer pipe			X
[ ]	129	Does the invert out of the outlet structure storm sewer pipe match grade and have a logical downstream flowpath		X	X
[ ]	130	Profile of outlet structure and outlet storm sewer pipe (may be included with profile of pond)			X
[ ]	131	Design procedure form included			X
		Hydraulic Computation (Storm Sewer Configuration)			
[ ]	132	Minimum pipe size 18-inch (RCP only) for lateral and main line		X	X
[ ]	133	Capacity calculations		X	X
[ ]	134	Pipe loss calculations		X	X
[ ]	135	Initial and Major Storm hydraulic grade line calculations (minor storm cannot surcharge storm sewer system)		X	X
[ ]	136	Inlet (or entrance condition) sizing and capacity calculations			X
[ ]	137	Velocity and Froude number calculation at pipe outlet		X	X
[ ]	138	Outlet protection design calculations			X
[ ]	139	Discharge of a storm sewer onto streets is prohibited		X	X
		Hydraulic Computation (Culverts)			
[ ]	140	Calculations for flow through structure		X	X
[ ]	141	Calculations for controlling condition (entrance or outlet)		X	X
[ ]	142	Capacity calculations (minimum 24-inch CMP or RCP within ROW or 18-inch minimum RCP or CMP for swales at driveways, trails and sidewalks)		X	X
[ ]	143	Velocity calculations (minimum of 3 fps during initial storm is recommended)		X	X
[ ]	144	Water surface or overtopping elevations calculated and compared to allowable overtopping (see SDECM Table 2.7)		X	X
		Hydraulic Computation (Bridges)			
[ ]	145	See UDFCD Volume 2, Hydraulic Structures Chapter		X	X
		Hydraulic Computation (Open Channels)			
[ ]	146	Calculation of developed flow through the channel		X	X
[ ]	147	Investigation of erodibility of soils in channel is required		X	X
[ ]	148	Calculations to document 100-year discharge flow parameters		X	X
[ ]	149	Backwater calculations		X	X
[ ]	150	Check structure design calculations		X	X
[ ]	151	Drop structure design calculations		X	X
[ ]	152	Riprap design calculations		X	X
[ ]	153	Calculations for all other proposed channel lining			
		Hydraulic Computation (Streets)			
[ ]	154	Street classification			X
[ ]	155	Street capacity major and initial storm (see SDECM Section 2.5)			X
		Permanent BMP Calculations			
[ ]	156	Calculations for WQCV requirements		X	X
[ ]	157	Calculations for storage volume requirements		X	X
[ ]	158	Supporting labeled calculations for outlet structure design		X	X
[ ]	159	All other design calculations necessary for design of Permanent BMP		X	X
HISTORIC CONDITIONS DRAINAGE DRAWING					
[ ]	160	24"x 36" drawing - scale of 1"=100' to 1"=400'	X	X	X

Checklist of Drainage Report Requirements

Project Name: ______________________________

____ **Conceptual** ____ **Preliminary** ____ **Final**

Initial or N/A	Item No.	Description	Conceptual Drainage Report (CDR)	Preliminary Drainage Report (PDR)	Final Drainage Report (FDR)
[ ]	161	General location or vicinity map	X	X	X
[ ]	162	North arrow and scale	X	X	X
[ ]	163	Legend to define map symbols	X	X	X
[ ]	164	Title block in lower right hand corner	X	X	X
[ ]	165	Existing contours at appropriate contour interval	X	X	X
[ ]	166	Delineation of onsite basins and offsite basins impacting site	X	X	X
[ ]	167	Drainage flow paths and design points for accumulated flow	X	X	X
[ ]	168	Table showing routing and accumulation of flow at design points for initial and major event	X	X	X
[ ]	169	Existing drainage facilities	X	X	X
[ ]	170	Existing 100-year floodplains	X	X	X
[ ]	171	Stream Buffer areas	X	X	X
DRAINAGE DRAWING CONTENTS					
[ ]	172	24"x 36" drawing - scale of 1"=20' to 1"=200'	X	X	X
[ ]	173	General location or vicinity map	X	X	X
[ ]	174	North arrow and scale	X	X	X
[ ]	175	Legend to define map symbols	X	X	X
[ ]	176	Title block in lower right hand corner	X	X	X
[ ]	177	Existing contours at minimum 2 foot contour interval (dashed-shaded) extending minimum of 100' beyond property lines	X	X	X
[ ]	178	Proposed contours at minimum 2 foot contour interval (solid) extending minimum of 100' beyond property lines	X	X	X
[ ]	179	All property and lots lines shown	X	X	X
[ ]	180	All easements and tracts shown and labeled with purpose	X	X	X
[ ]	181	Streets shown (with ROW width, flowline, sidewalk, etc. for PDR and FDR)	X	X	X
[ ]	182	Existing drainage facilities shown with structures, ditches, drainageways, gutter flow, culverts, etc.	X	X	X
[ ]	183	Existing drainage facilities labeled with material, size, shape, slope, and location	X	X	X
[ ]	184	Stream Buffer areas	X	X	X
[ ]	185	Overall drainage area boundary shown (including any off-site basins)	X	X	X
[ ]	186	Drainage area sub-boundary shown	X	X	X
[ ]	187	Basin and sub-basin descriptor (which includes identification, area, runoff coefficients or flows)	X	X	X
[ ]	188	Directional flow arrows	X	X	X
[ ]	189	Table showing routing and accumulation of flow at design points for major & initial event	X	X	X
[ ]	190	Proposed type of street flow (detail if necessary)		X	X
[ ]	191	Drainage ditches, swales, gutter, and cross pans shown (Generally shown for CDR)	X	X	X
[ ]	192	Proposed storm sewer shown including size and type of pipe, inlets, manholes, outfall, riprap, etc. shown (Generally shown for CDR)	X	X	X
[ ]	193	Existing storm sewer shown including size and type of pipe, inlets, manholes, outfall, riprap, etc. labeled (if any)		X	X
[ ]	194	Proposed open drainage channels shown including drop and check structures, riprap, channel lining, side slope, channel slope, etc. shown (Generally shown for CDR)	X	X	X
[ ]	195	Existing open drainage channels shown including drop and check structures, riprap, channel lining, side slope, channel slope, etc.		X	X
[ ]	196	Detention pond with extent of pond delineated	X	X	X
[ ]	197	Shaded area of 100-year water surface shown for detention pond		X	X
[ ]	198	Table of volumes and release rates for water quality/detention facilities	X	X	X

Checklist of Drainage Report Requirements

Project Name: ______________________________

____ **Conceptual** ____ **Preliminary** ____ **Final**

Initial or N/A	Item No.	Description	Conceptual Drainage Report (CDR)	Preliminary Drainage Report (PDR)	Final Drainage Report (FDR)
[ ]	199	Detail information on EDB outlet structure			X
[ ]	200	Profile of EDB outlet structure showing water surface elevations, outlet pipe, water quality orifice plate, and discharge orifices			X
[ ]	201	Detail of water quality orifice plate showing size of perforations, number of rows, and spacing			X
[ ]	202	Detail information on Permanent BMPs			X
[ ]	203	Profile of Permanent BMP outlet structure showing water surface elevations, outlet pipe, water quality orifice plate, and discharge orifices			X
[ ]	204	Location and elevation (if known) for all existing and proposed utilities by of affecting the drainage design	X	X	X
[ ]	205	Routing of off-site flows thru the development (around detention basins, not through)	X	X	X
[ ]	206	Definition of flow path leaving the development through downstream properties to a major drainageway (if applicable)	X	X	X
[ ]	207	Location of all FEMA floodplains affecting the site (both existing and proposed)	X	X	X

Appendix

I. Vicinity Map

II. Hydrologic Computations

A. Land use assumptions
B. Minor and major storm runoff computations for historic and developed runoff conditions
C. EURV and water quality volume required (UD-Detention) and allowable release rates
D. CUHP Analysis

III. Hydraulic Computations

A. SWMM analysis
B. Inlet and Street Capacity (UD-Inlet)
C. Pipe Hydraulics (UD-Sewer)
D. Culvert and Outlet Design (UD-Culvert)
E. Pond A and B Design
F. Composite Channel Section (UD-Channel)
G. Channel Analysis (HEC-RAS)
H. Hydraulic Structures

IV. Copies of graphs, tables, and nomographs

A. FIRM
B. Soils Report
C. 1-Hour Rainfall Graph
D. Excerpts from Adjacent Studies
   - Piney Creek MDP

V. Sub-basin Exhibit

Appendix

I. Vicinity Map

II. Hydrologic Computations

A. Land use assumptions
B. Minor and major storm runoff computations for historic and developed runoff conditions
C. Pond Calculations

III. Hydraulic Computations

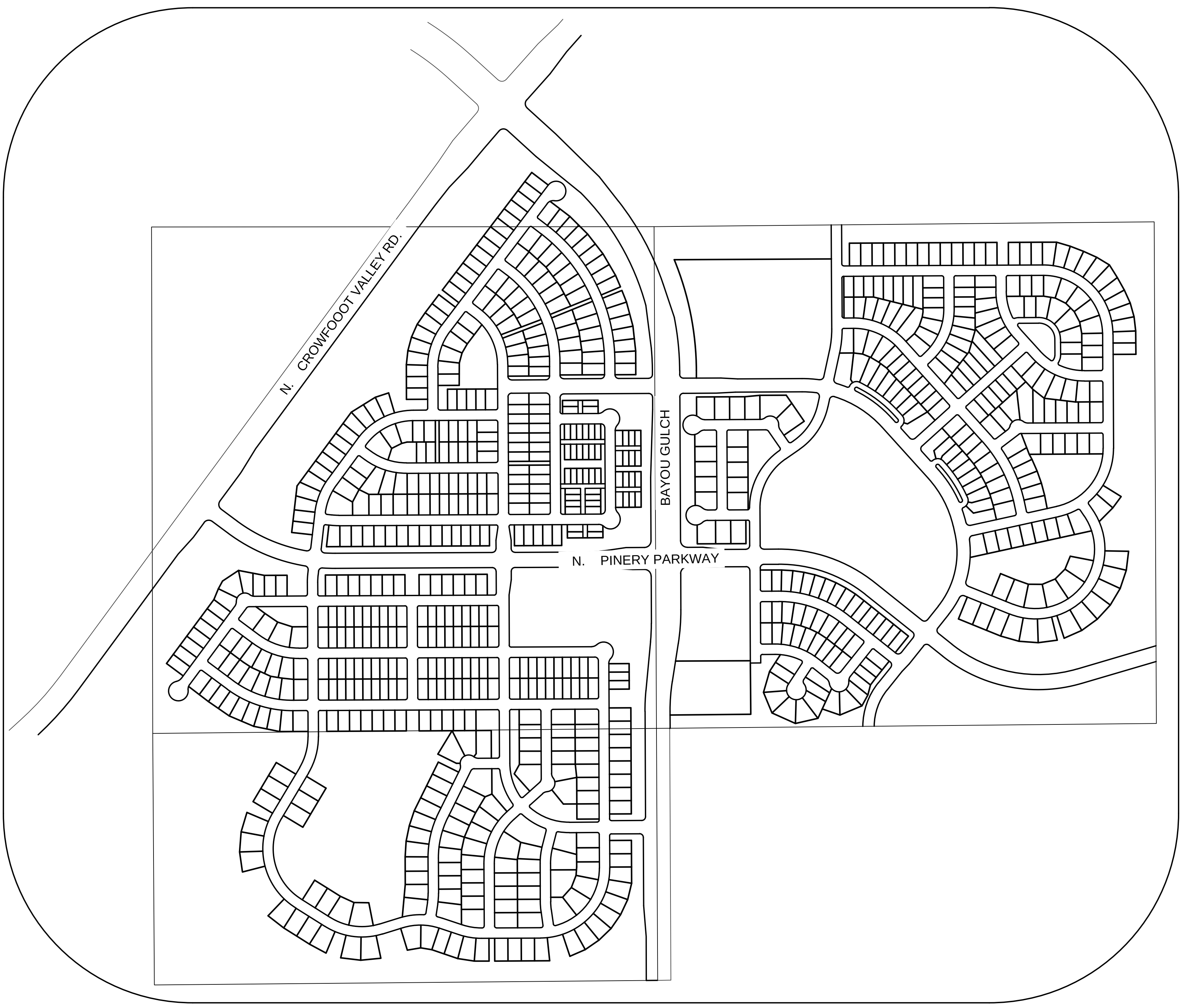
A. CUHP & SWMM
B. UD-Inlet
C. UD-Sewer
D. UD-Channel
E. UD-Culvert

IV. Copies of graphs, tables, and nomographs

A. FIRM
B. Soils Report
C. 1-Hour Rainfall Data
D. Excerpts from Adjacent Studies

V. Sub-basin Exhibit

I. Vicinity Map



VICINITY MAP

N.T.S.

II. Hydrologic Computations

A. Land use assumptions
    1. Imperviousness & Composite C Calculations
    2. SF-1-Time of Concentrations
B. Minor and major storm runoff computations for historic and developed runoff conditions
    1. SF-2 2-Year Sub-Basin Rational Method Calculations
    2. SF-2 100-Year Sub-Basin Ration Method Calculations
C. Pond Calculations

COMPOSITE BASIN COEFFICIENTS

Subdivision Trails at Crowfoot

Soil Type B/C/D

Project Name: Trails at Crowfoot
Project No. 254103
Calculated By: MRS
Date: 4/19/2017

Soil Type B **49.80%**

Land Use	Imp.	C_2	C_5	C_{100}
Residential (Single Family)	45%	0.40	0.42	0.67
School	55%	0.49	0.51	0.72
Business	95%	0.85	0.88	0.92
Residential (Multi Family)	75%	0.67	0.70	0.82
Streets	100%	0.89	0.93	0.94
Paved	90%	0.80	0.84	0.90
Parks	10%	0.09	0.09	0.50
Open Space / Lawns	2%	0.02	0.02	0.46
Mixed Use	30%	0.27	0.28	0.60

Soil Type C/D **50.20%**

Land Use	Imp.	C_2	C_5	C_{100}
Residential (Single Family)	45%	0.40	0.44	0.71
School	55%	0.49	0.53	0.76
Business	95%	0.85	0.88	0.96
Residential (Multi Family)	75%	0.67	0.70	0.85
Streets	100%	0.89	0.92	0.96
Paved	90%	0.80	0.83	0.91
Parks	10%	0.09	0.14	0.55
Open Space / Lawns	2%	0.02	0.07	0.52
Mixed Use	30%	0.27	0.31	0.64

Composite Runoff Co-eff

Land Use	Imp.	C_2	C_5	C_{100}
Residential (Single Family)	45%	0.40	0.43	0.69
School	55%	0.49	0.52	0.74
Business	95%	0.85	0.88	0.94
Residential (Multi Family)	75%	0.67	0.70	0.84
Streets	100%	0.89	0.92	0.95
Paved	90%	0.80	0.83	0.91
Parks	10%	0.09	0.12	0.53
Open Space / Lawns	2%	0.02	0.05	0.49
Mixed Use	30%	0.27	0.30	0.62

R.O.W. Imperviousness Average Imperviousness Calculation for R.O.W. (Bayou Gulch Road)

Total Area **120.00 Sq.ft** Composite Calculations

Land Use	Imp.	C_2	C_5	C_{100}	Area	Imp%	% C_2	% C_5	% C_{100}
Lawns, Sandy Soil (2-7%)	2	0.02	0.05	0.49	16	0.3	0.00	0.01	0.07
Walks	90	0.80	0.83	0.91	32	24.0	0.21	0.22	0.24
Street	100	0.89	0.92	0.95	72	60.0	0.53	0.55	0.57
TOTAL					**120.00**	**84.3**	**0.75**	**0.78**	**0.88**

R.O.W. Imperviousness Average Imperviousness Calculation for R.O.W. (N Pinery Parkway)

Total Area **80.00 Sq.ft** Composite Calculations

Land Use	Imp.	C_2	C_5	C_{100}	Area	Imp%	% C_2	% C_5	% C_{100}
Lawns, Sandy Soil (2-7%)	2	0.02	0.05	0.49	16	0.4	0.00	0.01	0.10
Walks	90	0.80	0.83	0.91	30	33.8	0.30	0.31	0.34
Street	100	0.89	0.92	0.95	34	42.5	0.38	0.39	0.40
TOTAL					**80.00**	**76.7**	**0.68**	**0.72**	**0.84**

R.O.W. Imperviousness Average Imperviousness Calculation for R.O.W. (Residential Local)

Total Area **65.00 Sq.ft** Composite Calculations

Land Use	Imp.	C_2	C_5	C_{100}	Area	Imp%	% C_2	% C_5	% C_{100}
Lawns, Sandy Soil (2-7%)	2	0.02	0.05	0.49	16	0.5	0.00	0.01	0.12
Walks	90	0.80	0.83	0.91	15	20.8	0.18	0.19	0.21
Street	100	0.89	0.92	0.95	34	52.3	0.47	0.48	0.50
TOTAL					**65.00**	**73.6**	**0.66**	**0.69**	**0.83**

A1

Total Area **4.11 acres** Composite Calculations

Land Use	Imp.	C_2	C_5	C_{100}	Area	Imp%	C_2	C_5	C_{100}
Residential (Single Family)	45%	0.40	0.43	0.69	2.22	24.3	0.22	0.23	0.37
Business	95%	0.85	0.88	0.94	0.00	0.0	0.00	0.00	0.00
Residential (Multi Family)	75%	0.67	0.70	0.84	0.00	0.0	0.00	0.00	0.00
ROW	77%	0.68	0.72	0.84	1.02	19.1	0.17	0.18	0.21
Open Space / Lawns	2%	0.02	0.05	0.49	0.87	0.4	0.00	0.01	0.10
TOTAL					**4.11**	**43.8**	**0.39**	**0.42**	**0.69**

A2

Total Area **1.84 acres** Composite Calculations

Land Use	Imp.	C_2	C_5	C_{100}	Area	Imp%	C_2	C_5	C_{100}
Residential (Single Family)	45%	0.40	0.43	0.69	1.38	33.7	0.30	0.32	0.52
Business	95%	0.85	0.88	0.94	0.00	0.0	0.00	0.00	0.00
Residential (Multi Family)	75%	0.67	0.70	0.84	0.00	0.0	0.00	0.00	0.00
ROW	74%	0.66	0.69	0.83	0.46	18.4	0.16	0.17	0.21
Open Space / Lawns	2%	0.02	0.05	0.49	0.00	0.0	0.00	0.00	0.00
TOTAL					**1.84**	**52.2**	**0.46**	**0.49**	**0.72**

A3

Total Area **3.23 acres** Composite Calculations

Land Use	Imp.	C_2	C_5	C_{100}	Area	Imp%	C_2	C_5	C_{100}
Residential (Single Family)	45%	0.40	0.43	0.69	2.28	31.8	0.28	0.30	0.49
Business	95%	0.85	0.88	0.94	0.00	0.0	0.00	0.00	0.00
Residential (Multi Family)	75%	0.67	0.70	0.84	0.00	0.0	0.00	0.00	0.00
ROW	74%	0.66	0.69	0.83	0.74	16.9	0.15	0.16	0.19
Open Space / Lawns	2%	0.02	0.05	0.49	0.21	0.1	0.00	0.00	0.03
TOTAL					**3.23**	**48.8**	**0.43**	**0.46**	**0.71**

A4

Total Area **4.07 acres** Composite Calculations

Land Use	Imp.	C_2	C_5	C_{100}	Area	Imp%	C_2	C_5	C_{100}
Residential (Single Family)	45%	0.40	0.43	0.69	1.50	16.6	0.15	0.16	0.25
Business	95%	0.85	0.88	0.94	0.00	0.0	0.00	0.00	0.00
Residential (Multi Family)	75%	0.67	0.70	0.84	0.00	0.0	0.00	0.00	0.00
ROW	74%	0.66	0.69	0.83	0.92	16.6	0.15	0.16	0.19
Open Space / Lawns	2%	0.02	0.05	0.49	1.65	0.8	0.01	0.02	0.20
TOTAL					**4.07**	**34.0**	**0.30**	**0.33**	**0.64**

A5

Total Area **2.04 acres** Composite Calculations

Land Use	Imp.	C_2	C_5	C_{100}	Area	Imp%	C_2	C_5	C_{100}
Residential (Single Family)	45%	0.40	0.43	0.69	1.25	27.5	0.24	0.26	0.42
Business	95%	0.85	0.88	0.94	0.00	0.0	0.00	0.00	0.00
Residential (Multi Family)	75%	0.67	0.70	0.84	0.00	0.0	0.00	0.00	0.00
ROW	74%	0.66	0.69	0.83	0.59	21.3	0.19	0.20	0.24
Open Space / Lawns	2%	0.02	0.05	0.49	0.20	0.2	0.00	0.00	0.05
TOTAL					**2.04**	**49.1**	**0.44**	**0.47**	**0.71**

A6

Total Area **4.96 acres** Composite Calculations

Land Use	Imp.	C_2	C_5	C_{100}	Area	Imp%	C_2	C_5	C_{100}
Residential (Single Family)	45%	0.40	0.43	0.69	2.44	22.1	0.20	0.21	0.34
Business	95%	0.85	0.88	0.94	0.00	0.0	0.00	0.00	0.00
Residential (Multi Family)	75%	0.67	0.70	0.84	0.00	0.0	0.00	0.00	0.00
ROW	74%	0.66	0.69	0.83	0.84	12.5	0.11	0.12	0.14
Open Space / Lawns	2%	0.02	0.05	0.49	1.68	0.7	0.01	0.02	0.17
TOTAL					**4.96**	**35.3**	**0.31**	**0.34**	**0.65**

A7

Total Area **4.33 acres** Composite Calculations

Land Use	Imp.	C_2	C_5	C_{100}	Area	Imp%	C_2	C_5	C_{100}
Residential (Single Family)	45%	0.40	0.43	0.69	2.63	27.3	0.24	0.26	0.42
Business	95%	0.85	0.88	0.94	0.00	0.0	0.00	0.00	0.00
Residential (Multi Family)	75%	0.67	0.70	0.84	0.00	0.0	0.00	0.00	0.00
ROW	74%	0.66	0.69	0.83	1.43	24.2	0.22	0.23	0.27
Open Space / Lawns	2%	0.02	0.05	0.49	0.27	0.1	0.00	0.00	0.03
TOTAL					**4.33**	**51.7**	**0.46**	**0.49**	**0.72**

A8

Total Area **2.86 acres** Composite Calculations

Land Use	Imp.	C_2	C_5	C_{100}	Area	Imp%	C_2	C_5	C_{100}
Residential (Single Family)	45%	0.40	0.43	0.69	2.09	32.9	0.29	0.31	0.50
Business	95%	0.85	0.88	0.94	0.00	0.0	0.00	0.00	0.00
Residential (Multi Family)	75%	0.67	0.70	0.84	0.00	0.0	0.00	0.00	0.00
ROW	74%	0.66	0.69	0.83	0.77	19.8	0.18	0.18	0.22
Open Space / Lawns	2%	0.02	0.05	0.49	0.00	0.0	0.00	0.00	0.00
TOTAL					**2.86**	**52.7**	**0.47**	**0.50**	**0.73**

A9

Total Area **3.44 acres** Composite Calculations

Land Use	Imp.	C_2	C_5	C_{100}	Area	Imp%	C_2	C_5	C_{100}
Residential (Single Family)	45%	0.40	0.43	0.69	0.00	0.0	0.00	0.00	0.00
Business	95%	0.85	0.88	0.94	0.00	0.0	0.00	0.00	0.00
Residential (Multi Family)	75%	0.67	0.70	0.84	0.00	0.0	0.00	0.00	0.00
ROW	84%	0.75	0.78	0.88	2.02	49.5	0.44	0.46	0.51
Open Space / Lawns	2%	0.02	0.05	0.49	1.42	0.8	0.01	0.02	0.20
TOTAL					**3.44**	**50.3**	**0.45**	**0.48**	**0.72**

A10

Total Area **0.72 acres** Composite Calculations

Land Use	Imp.	C_2	C_5	C_{100}	Area	Imp%	C_2	C_5	C_{100}
Residential (Single Family)	45%	0.40	0.43	0.69	0.00	0.0	0.00	0.00	0.00
Business	95%	0.85	0.88	0.94	0.00	0.0	0.00	0.00	0.00
Residential (Multi Family)	75%	0.67	0.70	0.84	0.00	0.0	0.00	0.00	0.00
ROW	84%	0.75	0.78	0.88	0.52	60.9	0.54	0.57	0.63
Open Space / Lawns	2%	0.02	0.05	0.49	0.20	0.6	0.01	0.01	0.14
TOTAL					**0.72**	**61.4**	**0.55**	**0.58**	**0.77**

A11

Total Area **2.39 acres** Composite Calculations

Land Use	Imp.	C_2	C_5	C_{100}	Area	Imp%	C_2	C_5	C_{100}
Residential (Single Family)	45%	0.40	0.43	0.69	1.66	31.2	0.28	0.30	0.48
Business	95%	0.85	0.88	0.94	0.00	0.0	0.00	0.00	0.00
Residential (Multi Family)	75%	0.67	0.70	0.84	0.00	0.0	0.00	0.00	0.00
ROW	74%	0.66	0.69	0.83	0.74	22.6	0.20	0.21	0.25
Open Space / Lawns	2%	0.02	0.05	0.49	0.00	0.0	0.00	0.00	0.00
TOTAL					**2.39**	**53.8**	**0.48**	**0.51**	**0.73**

A12

Total Area **2.96 acres** Composite Calculations

Land Use	Imp.	C_2	C_5	C_{100}	Area	Imp%	C_2	C_5	C_{100}
Residential (Single Family)	45%	0.40	0.43	0.69	2.01	30.5	0.27	0.29	0.47
Business	95%	0.85	0.88	0.94	0.00	0.0	0.00	0.00	0.00
Residential (Multi Family)	75%	0.67	0.70	0.84	0.00	0.0	0.00	0.00	0.00
ROW	74%	0.66	0.69	0.83	0.70	17.3	0.15	0.16	0.19
Open Space / Lawns	2%	0.02	0.05	0.49	0.26	0.2	0.00	0.00	0.04
TOTAL					**2.96**	**48.0**	**0.43**	**0.46**	**0.70**

A13

Total Area **7.08 acres** Composite Calculations

Land Use	Imp.	C_2	C_5	C_{100}	Area	Imp%	C_2	C_5	C_{100}
Residential (Single Family)	45%	0.40	0.43	0.69	0.00	0.0	0.00	0.00	0.00
Business	95%	0.85	0.88	0.94	0.00	0.0	0.00	0.00	0.00
Residential (Multi Family)	75%	0.67	0.70	0.84	2.45	26.0	0.23	0.24	0.29
ROW	74%	0.66	0.69	0.83	1.89	19.7	0.18	0.18	0.22
Open Space / Lawns	2%	0.02	0.05	0.49	2.74	0.8	0.01	0.02	0.19
TOTAL					**7.08**	**46.4**	**0.41**	**0.44**	**0.70**

A14

Total Area **1.43 acres** Composite Calculations

Land Use	Imp.	C_2	C_5	C_{100}	Area	Imp%	C_2	C_5	C_{100}
Residential (Single Family)	45%	0.40	0.43	0.69	1.07	33.7	0.30	0.32	0.52
Business	95%	0.85	0.88	0.94	0.00	0.0	0.00	0.00	0.00
Residential (Multi Family)	75%	0.67	0.70	0.84	0.00	0.0	0.00	0.00	0.00
ROW	84%	0.75	0.78	0.88	0.36	21.1	0.19	0.20	0.22
Open Space / Lawns	2%	0.02	0.05	0.49	0.00	0.0	0.00	0.00	0.00
TOTAL					**1.43**	**54.9**	**0.49**	**0.52**	**0.74**

A15

Total Area **7.15 acres** Composite Calculations

Land Use	Imp.	C_2	C_5	C_{100}	Area	Imp%	C_2	C_5	C_{100}
Residential (Single Family)	45%	0.40	0.43	0.69	0.00	0.0	0.00	0.00	0.00
Business	95%	0.85	0.88	0.94	0.00	0.0	0.00	0.00	0.00
Residential (Multi Family)	75%	0.67	0.70	0.84	0.00	0.0	0.00	0.00	0.00
ROW	74%	0.66	0.69	0.83	2.45	25.2	0.22	0.24	0.28
Open Space / Lawns	2%	0.02	0.05	0.49	4.70	1.3	0.01	0.03	0.32
TOTAL					**7.15**	**26.5**	**0.24**	**0.27**	**0.61**

A16

Total Area **0.75 acres** Composite Calculations

Land Use	Imp.	C_2	C_5	C_{100}	Area	Imp%	C_2	C_5	C_{100}
Residential (Single Family)	45%	0.40	0.43	0.69	0.00	0.0	0.00	0.00	0.00
Business	95%	0.85	0.88	0.94	0.00	0.0	0.00	0.00	0.00
Residential (Multi Family)	75%	0.67	0.70	0.84	0.00	0.0	0.00	0.00	0.00
ROW	77%	0.68	0.72	0.84	0.75	76.7	0.68	0.72	0.84
Open Space / Lawns	2%	0.02	0.05	0.49	0.00	0.0	0.00	0.00	0.00
TOTAL					**0.75**	**76.7**	**0.68**	**0.72**	**0.84**

A17

Total Area **3.76 acres** Composite Calculations

Land Use	Imp.	C_2	C_5	C_{100}	Area	Imp%	C_2	C_5	C_{100}
Residential (Single Family)	45%	0.40	0.43	0.69	2.82	33.8	0.30	0.32	0.52
Business	95%	0.85	0.88	0.94	0.00	0.0	0.00	0.00	0.00
Residential (Multi Family)	75%	0.67	0.70	0.84	0.00	0.0	0.00	0.00	0.00
ROW	77%	0.68	0.72	0.84	0.94	19.1	0.17	0.18	0.21
Open Space / Lawns	2%	0.02	0.05	0.49	0.00	0.0	0.00	0.00	0.00
TOTAL					**3.76**	**52.9**	**0.47**	**0.50**	**0.73**

A18

Total Area **2.54 acres** Composite Calculations

Land Use	Imp.	C_2	C_5	C_{100}	Area	Imp%	C_2	C_5	C_{100}
Residential (Single Family)	45%	0.40	0.43	0.69	1.84	32.6	0.29	0.31	0.50
Business	95%	0.85	0.88	0.94	0.00	0.0	0.00	0.00	0.00
Residential (Multi Family)	75%	0.67	0.70	0.84	0.00	0.0	0.00	0.00	0.00
ROW	74%	0.66	0.69	0.83	0.70	20.2	0.18	0.19	0.23
Open Space / Lawns	2%	0.02	0.05	0.49	0.00	0.0	0.00	0.00	0.00
TOTAL					**2.54**	**52.9**	**0.47**	**0.50**	**0.73**

A19

Total Area **2.09 acres** Composite Calculations

Land Use	Imp.	C_2	C_5	C_{100}	Area	Imp%	C_2	C_5	C_{100}
Residential (Single Family)	45%	0.40	0.43	0.69	1.58	34.1	0.30	0.33	0.52
Business	95%	0.85	0.88	0.94	0.00	0.0	0.00	0.00	0.00
Residential (Multi Family)	75%	0.67	0.70	0.84	0.00	0.0	0.00	0.00	0.00
ROW	74%	0.66	0.69	0.83	0.51	17.9	0.16	0.17	0.20
Open Space / Lawns	2%	0.02	0.05	0.49	0.00	0.0	0.00	0.00	0.00
TOTAL					**2.09**	**51.9**	**0.46**	**0.49**	**0.72**

A20

Total Area **2.04 acres** Composite Calculations

Land Use	Imp.	C_2	C_5	C_{100}	Area	Imp%	C_2	C_5	C_{100}
Residential (Single Family)	45%	0.40	0.43	0.69	1.15	25.3	0.22	0.24	0.39
Business	95%	0.85	0.88	0.94	0.00	0.0	0.00	0.00	0.00
Residential (Multi Family)	75%	0.67	0.70	0.84	0.00	0.0	0.00	0.00	0.00
ROW	74%	0.66	0.69	0.83	0.65	23.5	0.21	0.22	0.26
Open Space / Lawns	2%	0.02	0.05	0.49	0.24	0.2	0.00	0.01	0.06
TOTAL					**2.04**	**49.1**	**0.44**	**0.47**	**0.71**

A21

Total Area **3.02 acres** Composite Calculations

Land Use	Imp.	C_2	C_5	C_{100}	Area	Imp%	C_2	C_5	C_{100}
Residential (Single Family)	45%	0.40	0.43	0.69	2.22	33.0	0.29	0.32	0.51
Business	95%	0.85	0.88	0.94	0.00	0.0	0.00	0.00	0.00
Residential (Multi Family)	75%	0.67	0.70	0.84	0.00	0.0	0.00	0.00	0.00
ROW	74%	0.66	0.69	0.83	0.80	19.5	0.17	0.18	0.22
Open Space / Lawns	2%	0.02	0.05	0.49	0.00	0.0	0.00	0.00	0.00
TOTAL					**3.02**	**52.6**	**0.47**	**0.50**	**0.73**

B1

Total Area **21.00 acres** Composite Calculations

Land Use	Imp.	C_2	C_5	C_{100}	Area	Imp%	C_2	C_5	C_{100}
Residential (Single Family)	45%	0.40	0.43	0.69	5.62	12.0	0.11	0.12	0.18
Business	95%	0.85	0.88	0.94	0.00	0.0	0.00	0.00	0.00
Residential (Multi Family)	75%	0.67	0.70	0.84	0.00	0.0	0.00	0.00	0.00
ROW	74%	0.66	0.69	0.83	2.88	10.1	0.09	0.09	0.11
Open Space / Lawns	2%	0.02	0.05	0.49	12.50	1.2	0.01	0.03	0.29
TOTAL					**21.00**	**23.3**	**0.21**	**0.24**	**0.59**

B2

Total Area **3.13 acres** Composite Calculations

Land Use	Imp.	C_2	C_5	C_{100}	Area	Imp%	C_2	C_5	C_{100}
Residential (Single Family)	45%	0.40	0.43	0.69	2.39	34.4	0.31	0.33	0.53
Business	95%	0.85	0.88	0.94	0.00	0.0	0.00	0.00	0.00
Residential (Multi Family)	75%	0.67	0.70	0.84	0.00	0.0	0.00	0.00	0.00
ROW	74%	0.66	0.69	0.83	0.74	17.4	0.15	0.16	0.20
Open Space / Lawns	2%	0.02	0.05	0.49	0.00	0.0	0.00	0.00	0.00
TOTAL					**3.13**	**51.8**	**0.46**	**0.49**	**0.72**

B3

Total Area **4.92 acres** Composite Calculations

Land Use	Imp.	C_2	C_5	C_{100}	Area	Imp%	C_2	C_5	C_{100}
Residential (Single Family)	45%	0.40	0.43	0.69	2.93	26.8	0.24	0.26	0.41
Business	95%	0.85	0.88	0.94	0.00	0.0	0.00	0.00	0.00
Residential (Multi Family)	75%	0.67	0.70	0.84	0.00	0.0	0.00	0.00	0.00
ROW	74%	0.66	0.69	0.83	1.56	23.3	0.21	0.22	0.26
Open Space / Lawns	2%	0.02	0.05	0.49	0.43	0.2	0.00	0.00	0.04
TOTAL					**4.92**	**50.3**	**0.45**	**0.48**	**0.72**

B4

Total Area **1.50 acres** Composite Calculations

Land Use	Imp.	C_2	C_5	C_{100}	Area	Imp%	C_2	C_5	C_{100}
Residential (Single Family)	45%	0.40	0.43	0.69	0.00	0.0	0.00	0.00	0.00
Business	95%	0.85	0.88	0.94	1.18	74.8	0.67	0.69	0.74
Residential (Multi Family)	75%	0.67	0.70	0.84	0.00	0.0	0.00	0.00	0.00
ROW	77%	0.68	0.72	0.84	0.32	16.3	0.14	0.15	0.18
Open Space / Lawns	2%	0.02	0.05	0.49	0.00	0.0	0.00	0.00	0.00
TOTAL					**1.50**	**91.1**	**0.81**	**0.84**	**0.92**

B5

Total Area **3.19 acres** Composite Calculations

Land Use	Imp.	C_2	C_5	C_{100}	Area	Imp%	C_2	C_5	C_{100}
Residential (Single Family)	45%	0.40	0.43	0.69	2.28	32.1	0.29	0.31	0.49
Business	95%	0.85	0.88	0.94	0.00	0.0	0.00	0.00	0.00
Residential (Multi Family)	75%	0.67	0.70	0.84	0.00	0.0	0.00	0.00	0.00
ROW	74%	0.66	0.69	0.83	0.92	21.1	0.19	0.20	0.24
Open Space / Lawns	2%	0.02	0.05	0.49	0.00	0.0	0.00	0.00	0.00
TOTAL					**3.19**	**53.2**	**0.47**	**0.50**	**0.73**

B6

Total Area **3.19 acres** Composite Calculations

Land Use	Imp.	C_2	C_5	C_{100}	Area	Imp%	C_2	C_5	C_{100}
Residential (Single Family)	45%	0.40	0.43	0.69	2.28	32.1	0.29	0.31	0.49
Business	95%	0.85	0.88	0.94	0.00	0.0	0.00	0.00	0.00
Residential (Multi Family)	75%	0.67	0.70	0.84	0.00	0.0	0.00	0.00	0.00
ROW	74%	0.66	0.69	0.83	0.92	21.1	0.19	0.20	0.24
Open Space / Lawns	2%	0.02	0.05	0.49	0.00	0.0	0.00	0.00	0.00
TOTAL					**3.19**	**53.2**	**0.47**	**0.50**	**0.73**

B7

Total Area **5.76 acres** Composite Calculations

Land Use	Imp.	C_2	C_5	C_{100}	Area	Imp%	C_2	C_5	C_{100}
Residential (Single Family)	45%	0.40	0.43	0.69	3.57	27.9	0.25	0.27	0.43
Business	95%	0.85	0.88	0.94	0.00	0.0	0.00	0.00	0.00
Residential (Multi Family)	75%	0.67	0.70	0.84	0.00	0.0	0.00	0.00	0.00
ROW	74%	0.66	0.69	0.83	1.69	21.6	0.19	0.20	0.24
Open Space / Lawns	2%	0.02	0.05	0.49	0.50	0.2	0.00	0.00	0.04
TOTAL					**5.76**	**49.7**	**0.44**	**0.47**	**0.71**

B8

Total Area **4.93 acres** Composite Calculations

Land Use	.	C_2	C_5	C_{100}	Area	Imp%	C_2	C_5	C_{100}
Residential (Single Family)	45%	0.40	0.43	0.69	2.13	19.4	0.17	0.19	0.30
Business	95%	0.85	0.88	0.94	0.00	0.0	0.00	0.00	0.00
Residential (Multi Family)	75%	0.67	0.70	0.84	0.00	0.0	0.00	0.00	0.00
ROW	77%	0.68	0.72	0.84	1.74	27.1	0.24	0.25	0.30
Open Space / Lawns	2%	0.02	0.05	0.49	1.06	0.4	0.00	0.01	0.11
TOTAL					**4.93**	**46.9**	**0.42**	**0.45**	**0.70**

B9

Total Area **2.81 acres** Composite Calculations

Land Use	Imp.	C_2	C_5	C_{100}	Area	Imp%	C_2	C_5	C_{100}
Residential (Single Family)	45%	0.40	0.43	0.69	2.00	32.0	0.28	0.31	0.49
Business	95%	0.85	0.88	0.94	0.00	0.0	0.00	0.00	0.00
Residential (Multi Family)	75%	0.67	0.70	0.84	0.00	0.0	0.00	0.00	0.00
ROW	74%	0.66	0.69	0.83	0.65	17.0	0.15	0.16	0.19
Open Space / Lawns	2%	0.02	0.05	0.49	0.16	0.1	0.00	0.00	0.03
TOTAL					**2.81**	**49.2**	**0.44**	**0.47**	**0.71**

B10

Total Area **0.65 acres** Composite Calculations

Land Use	Imp.	C_2	C_5	C_{100}	Area	Imp%	C_2	C_5	C_{100}
Residential (Single Family)	45%	0.40	0.43	0.69	0.00	0.0	0.00	0.00	0.00
Business	95%	0.85	0.88	0.94	0.00	0.0	0.00	0.00	0.00
Residential (Multi Family)	75%	0.67	0.70	0.84	0.00	0.0	0.00	0.00	0.00
ROW	77%	0.68	0.72	0.84	0.65	76.7	0.68	0.72	0.84
Open Space / Lawns	2%	0.02	0.05	0.49	0.00	0.0	0.00	0.00	0.00
TOTAL					**0.65**	**76.7**	**0.68**	**0.72**	**0.84**

B11

Total Area **0.84 acres** Composite Calculations

Land Use	Imp.	C_2	C_5	C_{100}	Area	Imp%	C_2	C_5	C_{100}
Residential (Single Family)	45%	0.40	0.43	0.69	0.00	0.0	0.00	0.00	0.00
Business	95%	0.85	0.88	0.94	0.00	0.0	0.00	0.00	0.00
Residential (Multi Family)	75%	0.67	0.70	0.84	0.00	0.0	0.00	0.00	0.00
ROW	77%	0.68	0.72	0.84	0.84	76.7	0.68	0.72	0.84
Open Space / Lawns	2%	0.02	0.05	0.49	0.00	0.0	0.00	0.00	0.00
TOTAL					**0.84**	**76.7**	**0.68**	**0.72**	**0.84**

B12

Total Area **2.53 acres** Composite Calculations

Land Use	Imp.	C_2	C_5	C_{100}	Area	Imp%	C_2	C_5	C_{100}
Residential (Single Family)	45%	0.40	0.43	0.69	0.00	0.0	0.00	0.00	0.00
Business	95%	0.85	0.88	0.94	1.56	58.7	0.52	0.54	0.58
Residential (Multi Family)	75%	0.67	0.70	0.84	0.00	0.0	0.00	0.00	0.00
ROW	77%	0.68	0.72	0.84	0.97	29.3	0.26	0.27	0.32
Open Space / Lawns	2%	0.02	0.05	0.49	0.00	0.0	0.00	0.00	0.00
TOTAL					**2.53**	**88.0**	**0.79**	**0.82**	**0.90**

B13

Total Area **3.19 acres** Composite Calculations

Land Use	Imp.	C_2	C_5	C_{100}	Area	Imp%	C_2	C_5	C_{100}
Residential (Single Family)	45%	0.40	0.43	0.69	2.28	32.1	0.29	0.31	0.49
Business	95%	0.85	0.88	0.94	0.00	0.0	0.00	0.00	0.00
Residential (Multi Family)	75%	0.67	0.70	0.84	0.00	0.0	0.00	0.00	0.00
ROW	74%	0.66	0.69	0.83	0.92	21.1	0.19	0.20	0.24
Open Space / Lawns	2%	0.02	0.05	0.49	0.00	0.0	0.00	0.00	0.00
TOTAL					**3.19**	**53.2**	**0.47**	**0.50**	**0.73**

B14

Total Area **3.19 acres** Composite Calculations

Land Use	Imp.	C_2	C_5	C_{100}	Area	Imp%	C_2	C_5	C_{100}
Residential (Single Family)	45%	0.40	0.43	0.69	2.28	32.1	0.29	0.31	0.49
Business	95%	0.85	0.88	0.94	0.00	0.0	0.00	0.00	0.00
Residential (Multi Family)	75%	0.67	0.70	0.84	0.00	0.0	0.00	0.00	0.00
ROW	74%	0.66	0.69	0.83	0.92	21.1	0.19	0.20	0.24
Open Space / Lawns	2%	0.02	0.05	0.49	0.00	0.0	0.00	0.00	0.00
TOTAL					**3.19**	**53.2**	**0.47**	**0.50**	**0.73**

B15

Total Area **2.01 acres** Composite Calculations

Land Use	Imp.	C_2	C_5	C_{100}	Area	Imp%	C_2	C_5	C_{100}
Residential (Single Family)	45%	0.40	0.43	0.69	1.44	32.2	0.29	0.31	0.49
Business	95%	0.85	0.88	0.94	0.00	0.0	0.00	0.00	0.00
Residential (Multi Family)	75%	0.67	0.70	0.84	0.00	0.0	0.00	0.00	0.00
ROW	74%	0.66	0.69	0.83	0.57	20.9	0.19	0.19	0.23
Open Space / Lawns	2%	0.02	0.05	0.49	0.00	0.0	0.00	0.00	0.00
TOTAL					**2.01**	**53.1**	**0.47**	**0.50**	**0.73**

C1

Total Area **7.47 acres** Composite Calculations

Land Use	Imp.	C_2	C_5	C_{100}	Area	Imp%	C_2	C_5	C_{100}
Residential (Single Family)	45%	0.40	0.43	0.69	4.41	26.6	0.24	0.25	0.41
Business	95%	0.85	0.88	0.94	0.00	0.0	0.00	0.00	0.00
Residential (Multi Family)	75%	0.67	0.70	0.84	0.00	0.0	0.00	0.00	0.00
ROW	74%	0.66	0.69	0.83	1.68	16.6	0.15	0.15	0.19
Open Space / Lawns	2%	0.02	0.05	0.49	1.38	0.4	0.00	0.01	0.09
TOTAL					**7.47**	**43.5**	**0.39**	**0.42**	**0.68**

D1

Total Area **5.94 acres** Composite Calculations

Land Use	Imp.	C_2	C_5	C_{100}	Area	Imp%	C_2	C_5	C_{100}
Residential (Single Family)	45%	0.40	0.43	0.69	4.20	31.8	0.28	0.30	0.49
Business	95%	0.85	0.88	0.94	0.00	0.0	0.00	0.00	0.00
Residential (Multi Family)	75%	0.67	0.70	0.84	0.00	0.0	0.00	0.00	0.00
ROW	74%	0.66	0.69	0.83	0.83	10.3	0.09	0.10	0.12
Open Space / Lawns	2%	0.02	0.05	0.49	0.91	0.3	0.00	0.01	0.08
TOTAL					**5.94**	**42.4**	**0.38**	**0.41**	**0.68**

D2

Total Area **5.33 acres** Composite Calculations

Land Use	Imp.	C_2	C_5	C_{100}	Area	Imp%	C_2	C_5	C_{100}
Residential (Single Family)	45%	0.40	0.43	0.69	3.34	28.2	0.25	0.27	0.43
Business	95%	0.85	0.88	0.94	0.00	0.0	0.00	0.00	0.00
Residential (Multi Family)	75%	0.67	0.70	0.84	0.00	0.0	0.00	0.00	0.00
ROW	74%	0.66	0.69	0.83	1.28	17.7	0.16	0.16	0.20
Open Space / Lawns	2%	0.02	0.05	0.49	0.71	0.3	0.00	0.01	0.07
TOTAL					**5.33**	**46.1**	**0.41**	**0.44**	**0.70**

D3

Total Area **3.66 acres** Composite Calculations

Land Use	Imp.	C_2	C_5	C_{100}	Area	Imp%	C_2	C_5	C_{100}
Residential (Single Family)	45%	0.40	0.43	0.69	2.05	25.2	0.22	0.24	0.39
Business	95%	0.85	0.88	0.94	0.00	0.0	0.00	0.00	0.00
Residential (Multi Family)	75%	0.67	0.70	0.84	0.00	0.0	0.00	0.00	0.00
ROW	74%	0.66	0.69	0.83	0.90	18.2	0.16	0.17	0.20
Open Space / Lawns	2%	0.02	0.05	0.49	0.70	0.4	0.00	0.01	0.09
TOTAL					**3.66**	**43.8**	**0.39**	**0.42**	**0.69**

D4

Total Area **2.91 acres** Composite Calculations

Land Use	Imp.	C_2	C_5	C_{100}	Area	Imp%	C_2	C_5	C_{100}
Residential (Single Family)	45%	0.40	0.43	0.69	1.83	28.3	0.25	0.27	0.43
Business	95%	0.85	0.88	0.94	0.00	0.0	0.00	0.00	0.00
Residential (Multi Family)	75%	0.67	0.70	0.84	0.00	0.0	0.00	0.00	0.00
ROW	74%	0.66	0.69	0.83	0.54	13.7	0.12	0.13	0.15
Open Space / Lawns	2%	0.02	0.05	0.49	0.54	0.4	0.00	0.01	0.09
TOTAL					**2.91**	**42.3**	**0.38**	**0.41**	**0.68**

D5

Total Area **9.10 acres** Composite Calculations

Land Use	Imp.	C_2	C_5	C_{100}	Area	Imp%	C_2	C_5	C_{100}
Residential (Single Family)	45%	0.40	0.43	0.69	0.00	0.0	0.00	0.00	0.00
Business	95%	0.85	0.88	0.94	4.05	42.3	0.38	0.39	0.42
Residential (Multi Family)	75%	0.67	0.70	0.84	0.00	0.0	0.00	0.00	0.00
ROW	84%	0.75	0.78	0.88	2.05	19.0	0.17	0.18	0.20
Open Space / Lawns	2%	0.02	0.05	0.49	3.00	0.7	0.01	0.01	0.16
TOTAL					**9.10**	**61.9**	**0.55**	**0.58**	**0.78**

D6

Total Area **2.57 acres** Composite Calculations

Land Use	Imp.	C_2	C_5	C_{100}	Area	Imp%	C_2	C_5	C_{100}
Residential (Single Family)	45%	0.40	0.43	0.69	0.00	0.0	0.00	0.00	0.00
Business	95%	0.85	0.88	0.94	0.00	0.0	0.00	0.00	0.00
Residential (Multi Family)	75%	0.67	0.70	0.84	0.00	0.0	0.00	0.00	0.00
ROW	84%	0.75	0.78	0.88	1.28	42.0	0.37	0.39	0.44
Open Space / Lawns	2%	0.02	0.05	0.49	1.29	1.0	0.01	0.02	0.25
TOTAL					**2.57**	**43.0**	**0.38**	**0.41**	**0.68**

D7

Total Area **2.58 acres** Composite Calculations

Land Use	Imp.	C_2	C_5	C_{100}	Area	Imp%	C_2	C_5	C_{100}
Residential (Single Family)	45%	0.40	0.43	0.69	1.29	22.5	0.20	0.22	0.35
Business	95%	0.85	0.88	0.94	0.00	0.0	0.00	0.00	0.00
Residential (Multi Family)	75%	0.67	0.70	0.84	0.00	0.0	0.00	0.00	0.00
ROW	74%	0.66	0.69	0.83	0.67	19.1	0.17	0.18	0.21
Open Space / Lawns	2%	0.02	0.05	0.49	0.62	0.5	0.00	0.01	0.12
TOTAL					**2.58**	**42.1**	**0.37**	**0.40**	**0.68**

D8

Total Area **0.85 acres** Composite Calculations

Land Use	Imp.	C_2	C_5	C_{100}	Area	Imp%	C_2	C_5	C_{100}
Residential (Single Family)	45%	0.40	0.43	0.69	0.65	34.4	0.31	0.33	0.53
Business	95%	0.85	0.88	0.94	0.00	0.0	0.00	0.00	0.00
Residential (Multi Family)	75%	0.67	0.70	0.84	0.00	0.0	0.00	0.00	0.00
ROW	74%	0.66	0.69	0.83	0.20	17.3	0.15	0.16	0.19
Open Space / Lawns	2%	0.02	0.05	0.49	0.00	0.0	0.00	0.00	0.00
TOTAL					**0.85**	**51.7**	**0.46**	**0.49**	**0.72**

D9

Total Area **4.62 acres** Composite Calculations

Land Use	Imp.	C_2	C_5	C_{100}	Area	Imp%	C_2	C_5	C_{100}
Residential (Single Family)	45%	0.40	0.43	0.69	0.00	0.0	0.00	0.00	0.00
Business	95%	0.85	0.88	0.94	0.00	0.0	0.00	0.00	0.00
Residential (Multi Family)	75%	0.67	0.70	0.84	0.73	11.9	0.11	0.11	0.13
ROW	84%	0.75	0.78	0.88	1.77	32.3	0.29	0.30	0.34
Open Space / Lawns	2%	0.02	0.05	0.49	2.12	0.9	0.01	0.02	0.22
TOTAL					**4.62**	**45.1**	**0.40**	**0.43**	**0.69**

D10

Total Area **4.80 acres** Composite Calculations

Land Use	Imp.	C_2	C_5	C_{100}	Area	Imp%	C_2	C_5	C_{100}
Residential (Single Family)	45%	0.40	0.43	0.69	3.87	36.3	0.32	0.35	0.56
Business	95%	0.85	0.88	0.94	0.00	0.0	0.00	0.00	0.00
Residential (Multi Family)	75%	0.67	0.70	0.84	0.00	0.0	0.00	0.00	0.00
ROW	74%	0.66	0.69	0.83	0.93	14.2	0.13	0.13	0.16
Open Space / Lawns	2%	0.02	0.05	0.49	0.00	0.0	0.00	0.00	0.00
TOTAL					**4.80**	**50.5**	**0.45**	**0.48**	**0.72**

D11

Total Area **3.29 acres** Composite Calculations

Land Use	Imp.	C_2	C_5	C_{100}	Area	Imp%	C_2	C_5	C_{100}
Residential (Single Family)	45%	0.40	0.43	0.69	0.00	0.0	0.00	0.00	0.00
Business	95%	0.85	0.88	0.94	0.00	0.0	0.00	0.00	0.00
Residential (Multi Family)	75%	0.67	0.70	0.84	0.00	0.0	0.00	0.00	0.00
ROW	84%	0.75	0.78	0.88	3.29	84.3	0.75	0.78	0.88
Open Space / Lawns	2%	0.02	0.05	0.49	0.00	0.0	0.00	0.00	0.00
TOTAL					**3.29**	**84.3**	**0.75**	**0.78**	**0.88**

D12

Total Area **1.13 acres** Composite Calculations

Land Use	Imp.	C_2	C_5	C_{100}	Area	Imp%	C_2	C_5	C_{100}
Residential (Single Family)	45%	0.40	0.43	0.69	0.00	0.0	0.00	0.00	0.00
Business	95%	0.85	0.88	0.94	0.00	0.0	0.00	0.00	0.00
Residential (Multi Family)	75%	0.67	0.70	0.84	0.00	0.0	0.00	0.00	0.00
ROW	84%	0.75	0.78	0.88	1.13	84.3	0.75	0.78	0.88
Open Space / Lawns	2%	0.02	0.05	0.49	0.00	0.0	0.00	0.00	0.00
TOTAL					**1.13**	**84.3**	**0.75**	**0.78**	**0.88**

E1

Total Area **4.04 acres** Composite Calculations

Land Use	Imp.	C_2	C_5	C_{100}	Area	Imp%	C_2	C_5	C_{100}
School	55%	0.49	0.52	0.74	3.51	47.8	0.43	0.45	0.64
Business	95%	0.85	0.88	0.94	0.00	0.0	0.00	0.00	0.00
Residential (Multi Family)	75%	0.67	0.70	0.84	0.00	0.0	0.00	0.00	0.00
ROW	74%	0.66	0.69	0.83	0.26	4.7	0.04	0.04	0.05
Open Space / Lawns	2%	0.02	0.05	0.49	0.27	0.1	0.00	0.00	0.03
TOTAL					**4.04**	**52.7**	**0.47**	**0.50**	**0.73**

E2

Total Area **5.27 acres** Composite Calculations

Land Use	Imp.	C_2	C_5	C_{100}	Area	Imp%	C_2	C_5	C_{100}
Residential (Single Family)	45%	0.40	0.43	0.69	3.75	32.0	0.28	0.31	0.49
Business	95%	0.85	0.88	0.94	0.00	0.0	0.00	0.00	0.00
Residential (Multi Family)	75%	0.67	0.70	0.84	0.00	0.0	0.00	0.00	0.00
ROW	74%	0.66	0.69	0.83	1.43	20.0	0.18	0.19	0.22
Open Space / Lawns	2%	0.02	0.05	0.49	0.09	0.0	0.00	0.00	0.01
TOTAL					**5.27**	**52.0**	**0.46**	**0.49**	**0.72**

E3

Total Area **4.77 acres** Composite Calculations

Land Use	Imp.	C_2	C_5	C_{100}	Area	Imp%	C_2	C_5	C_{100}
Residential (Single Family)	45%	0.40	0.43	0.69	3.55	33.5	0.30	0.32	0.51
Business	95%	0.85	0.88	0.94	0.00	0.0	0.00	0.00	0.00
Residential (Multi Family)	75%	0.67	0.70	0.84	0.00	0.0	0.00	0.00	0.00
ROW	74%	0.66	0.69	0.83	1.22	18.8	0.17	0.18	0.21
Open Space / Lawns	2%	0.02	0.05	0.49	0.00	0.0	0.00	0.00	0.00
TOTAL					**4.77**	**52.3**	**0.47**	**0.50**	**0.72**

E4

Total Area **3.20 acres** Composite Calculations

Land Use	Imp.	C_2	C_5	C_{100}	Area	Imp%	C_2	C_5	C_{100}
Residential (Single Family)	45%	0.40	0.43	0.69	2.41	33.9	0.30	0.32	0.52
Business	95%	0.85	0.88	0.94	0.00	0.0	0.00	0.00	0.00
Residential (Multi Family)	75%	0.67	0.70	0.84	0.00	0.0	0.00	0.00	0.00
ROW	74%	0.66	0.69	0.83	0.79	18.2	0.16	0.17	0.20
Open Space / Lawns	2%	0.02	0.05	0.49	0.00	0.0	0.00	0.00	0.00
TOTAL					**3.20**	**52.1**	**0.46**	**0.49**	**0.72**

E5

Total Area **2.76 acres** Composite Calculations

Land Use	Imp.	C_2	C_5	C_{100}	Area	Imp%	C_2	C_5	C_{100}
Residential (Single Family)	45%	0.40	0.43	0.69	1.91	31.2	0.28	0.30	0.48
Business	95%	0.85	0.88	0.94	0.00	0.0	0.00	0.00	0.00
Residential (Multi Family)	75%	0.67	0.70	0.84	0.00	0.0	0.00	0.00	0.00
ROW	74%	0.66	0.69	0.83	0.85	22.6	0.20	0.21	0.25
Open Space / Lawns	2%	0.02	0.05	0.49	0.00	0.0	0.00	0.00	0.00
TOTAL					**2.76**	**53.8**	**0.48**	**0.51**	**0.73**

E6

Total Area **2.63 acres** Composite Calculations

Land Use	Imp.	C_2	C_5	C_{100}	Area	Imp%	C_2	C_5	C_{100}
Residential (Single Family)	45%	0.40	0.43	0.69	1.84	31.5	0.28	0.30	0.48
Business	95%	0.85	0.88	0.94	0.00	0.0	0.00	0.00	0.00
Residential (Multi Family)	75%	0.67	0.70	0.84	0.00	0.0	0.00	0.00	0.00
ROW	74%	0.66	0.69	0.83	0.79	22.1	0.20	0.21	0.25
Open Space / Lawns	2%	0.02	0.05	0.49	0.00	0.0	0.00	0.00	0.00
TOTAL					**2.63**	**53.6**	**0.48**	**0.51**	**0.73**

E7

Total Area **2.77 acres** Composite Calculations

Land Use	Imp.	C_2	C_5	C_{100}	Area	Imp%	C_2	C_5	C_{100}
Residential (Single Family)	45%	0.40	0.43	0.69	2.10	34.0	0.30	0.32	0.52
Business	95%	0.85	0.88	0.94	0.00	0.0	0.00	0.00	0.00
Residential (Multi Family)	75%	0.67	0.70	0.84	0.00	0.0	0.00	0.00	0.00
ROW	74%	0.66	0.69	0.83	0.68	18.0	0.16	0.17	0.20
Open Space / Lawns	2%	0.02	0.05	0.49	0.00	0.0	0.00	0.00	0.00
TOTAL					**2.77**	**52.0**	**0.46**	**0.49**	**0.72**

E8

Total Area **2.68 acres** Composite Calculations

Land Use	Imp.	C_2	C_5	C_{100}	Area	Imp%	C_2	C_5	C_{100}
Residential (Single Family)	45%	0.40	0.43	0.69	1.90	31.9	0.28	0.30	0.49
Business	95%	0.85	0.88	0.94	0.00	0.0	0.00	0.00	0.00
Residential (Multi Family)	75%	0.67	0.70	0.84	0.00	0.0	0.00	0.00	0.00
ROW	74%	0.66	0.69	0.83	0.78	21.4	0.19	0.20	0.24
Open Space / Lawns	2%	0.02	0.05	0.49	0.00	0.0	0.00	0.00	0.00
TOTAL					**2.68**	**53.3**	**0.47**	**0.51**	**0.73**

E9

Total Area **4.84 acres** Composite Calculations

Land Use	Imp.	C_2	C_5	C_{100}	Area	Imp%	C_2	C_5	C_{100}
Residential (Single Family)	45%	0.40	0.43	0.69	2.04	19.0	0.17	0.18	0.29
Business	95%	0.85	0.88	0.94	0.00	0.0	0.00	0.00	0.00
Residential (Multi Family)	75%	0.67	0.70	0.84	0.00	0.0	0.00	0.00	0.00
ROW	74%	0.66	0.69	0.83	1.12	17.1	0.15	0.16	0.19
Parks	10%	0.09	0.12	0.53	1.67	3.5	0.03	0.04	0.18
TOTAL					**4.84**	**39.5**	**0.35**	**0.38**	**0.66**

E10

Total Area **0.70 acres** Composite Calculations

Land Use	Imp.	C_2	C_5	C_{100}	Area	Imp%	C_2	C_5	C_{100}
Residential (Single Family)	45%	0.40	0.43	0.69	0.43	27.6	0.25	0.26	0.42
Business	95%	0.85	0.88	0.94	0.00	0.0	0.00	0.00	0.00
Residential (Multi Family)	75%	0.67	0.70	0.84	0.00	0.0	0.00	0.00	0.00
ROW	74%	0.66	0.69	0.83	0.27	28.4	0.25	0.27	0.32
Open Space / Lawns	2%	0.02	0.05	0.49	0.00	0.0	0.00	0.00	0.00
TOTAL					**0.70**	**56.0**	**0.50**	**0.53**	**0.74**

E11

Total Area **3.99 acres** Composite Calculations

Land Use	Imp.	C_2	C_5	C_{100}	Area	Imp%	C_2	C_5	C_{100}
Residential (Single Family)	45%	0.40	0.43	0.69	0.00	0.0	0.00	0.00	0.00
Business	95%	0.85	0.88	0.94	0.00	0.0	0.00	0.00	0.00
Residential (Multi Family)	75%	0.67	0.70	0.84	0.00	0.0	0.00	0.00	0.00
ROW	74%	0.66	0.69	0.83	0.00	0.0	0.00	0.00	0.00
Mixed Use	30%	0.27	0.30	0.62	3.99	30.0	0.27	0.30	0.62
TOTAL					**3.99**	**30.0**	**0.27**	**0.30**	**0.62**

E12

Total Area **3.28 acres** Composite Calculations

Land Use	Imp.	C_2	C_5	C_{100}	Area	Imp%	C_2	C_5	C_{100}
Residential (Single Family)	45%	0.40	0.43	0.69	0.00	0.0	0.00	0.00	0.00
Business	95%	0.85	0.88	0.94	0.00	0.0	0.00	0.00	0.00
Residential (Multi Family)	75%	0.67	0.70	0.84	0.00	0.0	0.00	0.00	0.00
ROW	74%	0.66	0.69	0.83	0.00	0.0	0.00	0.00	0.00
Mixed Use	30%	0.27	0.30	0.62	3.28	30.0	0.27	0.30	0.62
TOTAL					**3.28**	**30.0**	**0.27**	**0.30**	**0.62**

E13

Total Area **4.45 acres** Composite Calculations

Land Use	Imp.	C_2	C_5	C_{100}	Area	Imp%	C_2	C_5	C_{100}
Residential (Single Family)	45%	0.40	0.43	0.69	0.00	0.0	0.00	0.00	0.00
Business	95%	0.85	0.88	0.94	0.00	0.0	0.00	0.00	0.00
Residential (Multi Family)	75%	0.67	0.70	0.84	0.00	0.0	0.00	0.00	0.00
ROW	74%	0.66	0.69	0.83	0.00	0.0	0.00	0.00	0.00
Mixed Use	30%	0.27	0.30	0.62	4.45	30.0	0.27	0.30	0.62
TOTAL					**4.45**	**30.0**	**0.27**	**0.30**	**0.62**

E14

Total Area **5.58 acres** Composite Calculations

Land Use	Imp.	C_2	C_5	C_{100}	Area	Imp%	C_2	C_5	C_{100}
Residential (Single Family)	45%	0.40	0.43	0.69	0.00	0.0	0.00	0.00	0.00
Business	95%	0.85	0.88	0.94	0.00	0.0	0.00	0.00	0.00
Residential (Multi Family)	75%	0.67	0.70	0.84	2.34	31.4	0.28	0.29	0.35
ROW	74%	0.66	0.69	0.83	1.85	24.4	0.22	0.23	0.27
Open Space / Lawns	2%	0.02	0.05	0.49	1.39	0.5	0.00	0.01	0.12
TOTAL					**5.58**	**56.4**	**0.50**	**0.53**	**0.75**

E15

Total Area **1.89 acres** Composite Calculations

Land Use	Imp.	C_2	C_5	C_{100}	Area	Imp%	C_2	C_5	C_{100}
Residential (Single Family)	45%	0.40	0.43	0.69	1.43	34.0	0.30	0.33	0.52
Business	95%	0.85	0.88	0.94	0.00	0.0	0.00	0.00	0.00
Residential (Multi Family)	75%	0.67	0.70	0.84	0.00	0.0	0.00	0.00	0.00
ROW	74%	0.66	0.69	0.83	0.46	17.9	0.16	0.17	0.20
Open Space / Lawns	2%	0.02	0.05	0.49	0.00	0.0	0.00	0.00	0.00
TOTAL					**1.89**	**52.0**	**0.46**	**0.49**	**0.72**

E16

Total Area **1.57 acres** Composite Calculations

Land Use	Imp.	C_2	C_5	C_{100}	Area	Imp%	C_2	C_5	C_{100}
Residential (Single Family)	45%	0.40	0.43	0.69	0.00	0.0	0.00	0.00	0.00
Business	95%	0.85	0.88	0.94	0.00	0.0	0.00	0.00	0.00
Residential (Multi Family)	75%	0.67	0.70	0.84	0.00	0.0	0.00	0.00	0.00
ROW	74%	0.66	0.69	0.83	1.57	73.6	0.66	0.69	0.83
Open Space / Lawns	2%	0.02	0.05	0.49	0.00	0.0	0.00	0.00	0.00
TOTAL					**1.57**	**73.6**	**0.66**	**0.69**	**0.83**

E17

Total Area **1.55 acres** Composite Calculations

Land Use	Imp.	C_2	C_5	C_{100}	Area	Imp%	C_2	C_5	C_{100}
Residential (Single Family)	45%	0.40	0.43	0.69	0.00	0.0	0.00	0.00	0.00
Business	95%	0.85	0.88	0.94	0.00	0.0	0.00	0.00	0.00
Residential (Multi Family)	75%	0.67	0.70	0.84	0.00	0.0	0.00	0.00	0.00
ROW	74%	0.66	0.69	0.83	1.55	73.6	0.66	0.69	0.83
Open Space / Lawns	2%	0.02	0.05	0.49	0.00	0.0	0.00	0.00	0.00
TOTAL					**1.55**	**73.6**	**0.66**	**0.69**	**0.83**

E18

Total Area **2.72 acres** Composite Calculations

Land Use	Imp.	C_2	C_5	C_{100}	Area	Imp%	C_2	C_5	C_{100}
Residential (Single Family)	45%	0.40	0.43	0.69	1.97	32.5	0.29	0.31	0.50
Business	95%	0.85	0.88	0.94	0.00	0.0	0.00	0.00	0.00
Residential (Multi Family)	75%	0.67	0.70	0.84	0.00	0.0	0.00	0.00	0.00
ROW	74%	0.66	0.69	0.83	0.76	20.5	0.18	0.19	0.23
Open Space / Lawns	2%	0.02	0.05	0.49	0.00	0.0	0.00	0.00	0.00
TOTAL					**2.72**	**53.0**	**0.47**	**0.50**	**0.73**

E19

Total Area **2.91 acres** Composite Calculations

Land Use	Imp.	C_2	C_5	C_{100}	Area	Imp%	C_2	C_5	C_{100}
Residential (Single Family)	45%	0.40	0.43	0.69	2.06	31.8	0.28	0.30	0.49
Business	95%	0.85	0.88	0.94	0.00	0.0	0.00	0.00	0.00
Residential (Multi Family)	75%	0.67	0.70	0.84	0.00	0.0	0.00	0.00	0.00
ROW	74%	0.66	0.69	0.83	0.85	21.6	0.19	0.20	0.24
Open Space / Lawns	2%	0.02	0.05	0.49	0.00	0.0	0.00	0.00	0.00
TOTAL					**2.91**	**53.4**	**0.47**	**0.51**	**0.73**

E20

Total Area **2.75 acres** Composite Calculations

Land Use	Imp.	C_2	C_5	C_{100}	Area	Imp%	C_2	C_5	C_{100}
Residential (Single Family)	45%	0.40	0.43	0.69	1.94	31.6	0.28	0.30	0.49
Business	95%	0.85	0.88	0.94	0.00	0.0	0.00	0.00	0.00
Residential (Multi Family)	75%	0.67	0.70	0.84	0.00	0.0	0.00	0.00	0.00
ROW	74%	0.66	0.69	0.83	0.82	21.8	0.19	0.20	0.25
Open Space / Lawns	2%	0.02	0.05	0.49	0.00	0.0	0.00	0.00	0.00
TOTAL					**2.75**	**53.5**	**0.48**	**0.51**	**0.73**

E21

Total Area **2.05 acres** Composite Calculations

Land Use	Imp.	C_2	C_5	C_{100}	Area	Imp%	C_2	C_5	C_{100}
Residential (Single Family)	45%	0.40	0.43	0.69	1.35	29.7	0.26	0.28	0.46
Business	95%	0.85	0.88	0.94	0.00	0.0	0.00	0.00	0.00
Residential (Multi Family)	75%	0.67	0.70	0.84	0.00	0.0	0.00	0.00	0.00
ROW	74%	0.66	0.69	0.83	0.70	25.0	0.22	0.23	0.28
Open Space / Lawns	2%	0.02	0.05	0.49	0.00	0.0	0.00	0.00	0.00
TOTAL					**2.05**	**54.7**	**0.49**	**0.52**	**0.74**

E22

Total Area **4.41 acres** Composite Calculations

Land Use	Imp.	C_2	C_5	C_{100}	Area	Imp%	C_2	C_5	C_{100}
School	55%	0.49	0.52	0.74	3.90	48.6	0.43	0.46	0.65
Business	95%	0.85	0.88	0.94	0.00	0.0	0.00	0.00	0.00
Residential (Multi Family)	75%	0.67	0.70	0.84	0.00	0.0	0.00	0.00	0.00
ROW	74%	0.66	0.69	0.83	0.26	4.3	0.04	0.04	0.05
Open Space / Lawns	2%	0.02	0.05	0.49	0.25	0.1	0.00	0.00	0.03
TOTAL					**4.41**	**53.1**	**0.47**	**0.50**	**0.73**

E23

Total Area **4.11 acres** Composite Calculations

Land Use	Imp.	C_2	C_5	C_{100}	Area	Imp%	C_2	C_5	C_{100}
School	55%	0.49	0.52	0.74	2.84	38.0	0.34	0.36	0.51
Business	95%	0.85	0.88	0.94	0.00	0.0	0.00	0.00	0.00
Residential (Multi Family)	75%	0.67	0.70	0.84	0.00	0.0	0.00	0.00	0.00
ROW	74%	0.66	0.69	0.83	0.75	13.4	0.12	0.13	0.15
Open Space / Lawns	2%	0.02	0.05	0.49	0.52	0.3	0.00	0.01	0.06
TOTAL					**4.11**	**51.7**	**0.46**	**0.49**	**0.72**

E24

Total Area **4.23 acres** Composite Calculations

Land Use	Imp.	C_2	C_5	C_{100}	Area	Imp%	C_2	C_5	C_{100}
Residential (Single Family)	45%	0.40	0.43	0.69	0.00	0.0	0.00	0.00	0.00
Business	95%	0.85	0.88	0.94	0.00	0.0	0.00	0.00	0.00
Residential (Multi Family)	75%	0.67	0.70	0.84	0.00	0.0	0.00	0.00	0.00
ROW	74%	0.66	0.69	0.83	0.00	0.0	0.00	0.00	0.00
Mixed Use	30%	0.27	0.30	0.62	4.23	30.0	0.27	0.30	0.62
TOTAL					**4.23**	**30.0**	**0.27**	**0.30**	**0.62**

E25

Total Area **3.62 acres** Composite Calculations

Land Use	Imp.	C_2	C_5	C_{100}	Area	Imp%	C_2	C_5	C_{100}
Residential (Single Family)	45%	0.40	0.43	0.69	0.00	0.0	0.00	0.00	0.00
Business	95%	0.85	0.88	0.94	0.00	0.0	0.00	0.00	0.00
Residential (Multi Family)	75%	0.67	0.70	0.84	2.30	47.7	0.43	0.45	0.53
ROW	74%	0.66	0.69	0.83	0.21	4.2	0.04	0.04	0.05
Open Space / Lawns	2%	0.02	0.05	0.49	1.11	0.6	0.01	0.01	0.15
TOTAL					**3.62**	**52.6**	**0.47**	**0.50**	**0.73**

E26

Total Area **2.88 acres** Composite Calculations

Land Use	Imp.	C_2	C_5	C_{100}	Area	Imp%	C_2	C_5	C_{100}
Residential (Single Family)	45%	0.40	0.43	0.69	0.00	0.0	0.00	0.00	0.00
Business	95%	0.85	0.88	0.94	0.00	0.0	0.00	0.00	0.00
Residential (Multi Family)	75%	0.67	0.70	0.84	1.84	47.7	0.43	0.45	0.53
ROW	74%	0.66	0.69	0.83	0.46	11.6	0.10	0.11	0.13
Open Space / Lawns	2%	0.02	0.05	0.49	0.59	0.4	0.00	0.01	0.10
TOTAL					**2.88**	**59.8**	**0.53**	**0.56**	**0.76**

F1

Total Area **1.73 acres** Composite Calculations

Land Use	Imp.	C_2	C_5	C_{100}	Area	Imp%	C_2	C_5	C_{100}
Residential (Single Family)	45%	0.40	0.43	0.69	0.00	0.0	0.00	0.00	0.00
Business	95%	0.85	0.88	0.94	1.42	77.9	0.70	0.72	0.77
Residential (Multi Family)	75%	0.67	0.70	0.84	0.00	0.0	0.00	0.00	0.00
ROW	77%	0.68	0.72	0.84	0.29	12.7	0.11	0.12	0.14
Open Space / Lawns	2%	0.02	0.05	0.49	0.00	0.0	0.00	0.00	0.00
TOTAL					**1.71**	**90.6**	**0.81**	**0.84**	**0.91**

F2

Total Area **1.77 acres** Composite Calculations

Land Use	Imp.	C_2	C_5	C_{100}	Area	Imp%	C_2	C_5	C_{100}
Residential (Single Family)	45%	0.40	0.43	0.69	0.00	0.0	0.00	0.00	0.00
Business	95%	0.85	0.88	0.94	1.65	88.3	0.79	0.82	0.87
Residential (Multi Family)	75%	0.67	0.70	0.84	0.00	0.0	0.00	0.00	0.00
ROW	74%	0.66	0.69	0.83	0.12	5.2	0.05	0.05	0.06
Open Space / Lawns	2%	0.02	0.05	0.49	0.00	0.0	0.00	0.00	0.00
TOTAL					**1.77**	**93.5**	**0.84**	**0.87**	**0.93**

F3

Total Area **3.60 acres** Composite Calculations

Land Use	Imp.	C_2	C_5	C_{100}	Area	Imp%	C_2	C_5	C_{100}
Residential (Single Family)	45%	0.40	0.43	0.69	0.00	0.0	0.00	0.00	0.00
Business	95%	0.85	0.88	0.94	0.00	0.0	0.00	0.00	0.00
Residential (Multi Family)	75%	0.67	0.70	0.84	0.00	0.0	0.00	0.00	0.00
ROW	74%	0.66	0.69	0.83	0.89	18.3	0.16	0.17	0.21
Open Space / Lawns	2%	0.02	0.05	0.49	2.70	1.5	0.02	0.03	0.37
TOTAL					**3.60**	**19.8**	**0.18**	**0.20**	**0.57**

F4

Total Area **3.79 acres** Composite Calculations

Land Use	.	C_2	C_5	C_{100}	Area	Imp%	C_2	C_5	C_{100}
Residential (Single Family)	45%	0.40	0.43	0.69	2.57	30.6	0.27	0.29	0.47
Business	95%	0.85	0.88	0.94	0.00	0.0	0.00	0.00	0.00
Residential (Multi Family)	75%	0.67	0.70	0.84	0.00	0.0	0.00	0.00	0.00
ROW	74%	0.66	0.69	0.83	1.15	22.4	0.20	0.21	0.25
Open Space / Lawns	2%	0.02	0.05	0.49	0.06	0.0	0.00	0.00	0.01
TOTAL					**3.79**	**53.1**	**0.47**	**0.50**	**0.73**

F5

Total Area **4.58 acres** Composite Calculations

Land Use	Imp.	C_2	C_5	C_{100}	Area	Imp%	C_2	C_5	C_{100}
Residential (Single Family)	45%	0.40	0.43	0.69	2.18	21.4	0.19	0.20	0.33
Business	95%	0.85	0.88	0.94	0.00	0.0	0.00	0.00	0.00
Residential (Multi Family)	75%	0.67	0.70	0.84	0.00	0.0	0.00	0.00	0.00
ROW	77%	0.68	0.72	0.84	1.49	25.1	0.22	0.23	0.27
Open Space / Lawns	2%	0.02	0.05	0.49	0.90	0.4	0.00	0.01	0.10
TOTAL					**4.58**	**46.9**	**0.42**	**0.45**	**0.70**

F6

Total Area **4.93 acres** Composite Calculations

Land Use	Imp.	C_2	C_5	C_{100}	Area	Imp%	C_2	C_5	C_{100}
Residential (Single Family)	45%	0.40	0.43	0.69	2.25	20.5	0.18	0.20	0.31
Business	95%	0.85	0.88	0.94	0.00	0.0	0.00	0.00	0.00
Residential (Multi Family)	75%	0.67	0.70	0.84	0.00	0.0	0.00	0.00	0.00
ROW	77%	0.68	0.72	0.84	1.11	17.2	0.15	0.16	0.19
Open Space / Lawns	2%	0.02	0.05	0.49	1.58	0.6	0.01	0.01	0.16
TOTAL					**4.93**	**38.4**	**0.34**	**0.37**	**0.66**

F7

Total Area **4.51 acres** Composite Calculations

Land Use	Imp.	C_2	C_5	C_{100}	Area	Imp%	C_2	C_5	C_{100}
Residential (Single Family)	45%	0.40	0.43	0.69	0.00	0.0	0.00	0.00	0.00
Business	95%	0.85	0.88	0.94	0.00	0.0	0.00	0.00	0.00
Residential (Multi Family)	75%	0.67	0.70	0.84	0.00	0.0	0.00	0.00	0.00
ROW	77%	0.68	0.72	0.84	0.97	16.5	0.15	0.15	0.18
Open Space / Lawns	2%	0.02	0.05	0.49	3.54	1.6	0.02	0.04	0.38
TOTAL					**4.51**	**18.0**	**0.16**	**0.19**	**0.57**

F8

Total Area **7.93 acres** Composite Calculations

Land Use	Imp.	C_2	C_5	C_{100}	Area	Imp%	C_2	C_5	C_{100}
Residential (Single Family)	45%	0.40	0.43	0.69	2.60	14.8	0.13	0.14	0.23
Business	95%	0.85	0.88	0.94	0.00	0.0	0.00	0.00	0.00
Residential (Multi Family)	75%	0.67	0.70	0.84	0.00	0.0	0.00	0.00	0.00
ROW	74%	0.66	0.69	0.83	2.09	19.4	0.17	0.18	0.22
Open Space / Lawns	2%	0.02	0.05	0.49	3.24	0.8	0.01	0.02	0.20
TOTAL					**7.93**	**35.0**	**0.31**	**0.34**	**0.64**

F9

Total Area **1.28 acres** Composite Calculations

Land Use	Imp.	C_2	C_5	C_{100}	Area	Imp%	C_2	C_5	C_{100}
Residential (Single Family)	45%	0.40	0.43	0.69	0.00	0.0	0.00	0.00	0.00
Business	95%	0.85	0.88	0.94	0.00	0.0	0.00	0.00	0.00
Residential (Multi Family)	75%	0.67	0.70	0.84	0.00	0.0	0.00	0.00	0.00
ROW	77%	0.68	0.72	0.84	1.10	66.0	0.59	0.62	0.72
Open Space / Lawns	2%	0.02	0.05	0.49	0.18	0.3	0.00	0.01	0.07
TOTAL					**1.28**	**66.3**	**0.59**	**0.62**	**0.79**

F10

Total Area **1.93 acres** Composite Calculations

Land Use	Imp.	C_2	C_5	C_{100}	Area	Imp%	C_2	C_5	C_{100}
Residential (Single Family)	45%	0.40	0.43	0.69	0.00	0.0	0.00	0.00	0.00
Business	95%	0.85	0.88	0.94	1.61	79.2	0.71	0.73	0.78
Residential (Multi Family)	75%	0.67	0.70	0.84	0.00	0.0	0.00	0.00	0.00
ROW	77%	0.68	0.72	0.84	0.33	12.9	0.12	0.12	0.14
Open Space / Lawns	2%	0.02	0.05	0.49	0.00	0.0	0.00	0.00	0.00
TOTAL					**1.93**	**92.2**	**0.82**	**0.85**	**0.93**

F11

Total Area **1.50 acres** Composite Calculations

Land Use	Imp.	C_2	C_5	C_{100}	Area	Imp%	C_2	C_5	C_{100}
Residential (Single Family)	45%	0.40	0.43	0.69	0.00	0.0	0.00	0.00	0.00
Business	95%	0.85	0.88	0.94	1.24	78.3	0.70	0.73	0.78
Residential (Multi Family)	75%	0.67	0.70	0.84	0.00	0.0	0.00	0.00	0.00
ROW	77%	0.68	0.72	0.84	0.26	13.5	0.12	0.13	0.15
Open Space / Lawns	2%	0.02	0.05	0.49	0.00	0.0	0.00	0.00	0.00
TOTAL					**1.50**	**91.8**	**0.82**	**0.85**	**0.92**

F12

Total Area **1.22 acres** Composite Calculations

Land Use	Imp.	C_2	C_5	C_{100}	Area	Imp%	C_2	C_5	C_{100}
Residential (Single Family)	45%	0.40	0.43	0.69	0.00	0.0	0.00	0.00	0.00
Business	95%	0.85	0.88	0.94	1.11	86.9	0.78	0.80	0.86
Residential (Multi Family)	75%	0.67	0.70	0.84	0.00	0.0	0.00	0.00	0.00
ROW	74%	0.66	0.69	0.83	0.10	6.3	0.06	0.06	0.07
Open Space / Lawns	2%	0.02	0.05	0.49	0.00	0.0	0.00	0.00	0.00
TOTAL					**1.22**	**93.2**	**0.83**	**0.86**	**0.93**

F13

Total Area **3.58 acres** Composite Calculations

Land Use	.	C_2	C_5	C_{100}	Area	Imp%	C_2	C_5	C_{100}
Residential (Single Family)	45%	0.40	0.43	0.69	2.43	30.5	0.27	0.29	0.47
Business	95%	0.85	0.88	0.94	0.00	0.0	0.00	0.00	0.00
Residential (Multi Family)	75%	0.67	0.70	0.84	0.00	0.0	0.00	0.00	0.00
ROW	74%	0.66	0.69	0.83	1.09	22.4	0.20	0.21	0.25
Open Space / Lawns	2%	0.02	0.05	0.49	0.06	0.0	0.00	0.00	0.01
TOTAL					**3.58**	**52.9**	**0.47**	**0.50**	**0.73**

OS1

Total Area **56.02 acres** Composite Calculations

Land Use	Imp.	C_2	C_5	C_{100}	Area	Imp%	C_2	C_5	C_{100}
Residential (Single Family)	45%	0.40	0.43	0.69	0.00	0.0	0.00	0.00	0.00
Business	95%	0.85	0.88	0.94	0.00	0.0	0.00	0.00	0.00
Residential (Multi Family)	75%	0.67	0.70	0.84	0.00	0.0	0.00	0.00	0.00
ROW	74%	0.66	0.69	0.83	0.00	0.0	0.00	0.00	0.00
Open Space / Lawns	2%	0.02	0.05	0.49	56.02	2.0	0.02	0.05	0.49
TOTAL					**56.02**	**2.0**	**0.02**	**0.05**	**0.49**

OS2

Total Area **10.95 acres** Composite Calculations

Land Use	Imp.	C_2	C_5	C_{100}	Area	Imp%	C_2	C_5	C_{100}
Residential (Single Family)	45%	0.40	0.43	0.69	0.00	0.0	0.00	0.00	0.00
Business	95%	0.85	0.88	0.94	0.00	0.0	0.00	0.00	0.00
Residential (Multi Family)	75%	0.67	0.70	0.84	0.00	0.0	0.00	0.00	0.00
ROW	74%	0.66	0.69	0.83	0.00	0.0	0.00	0.00	0.00
Open Space / Lawns	2%	0.02	0.05	0.49	10.95	2.0	0.02	0.05	0.49
TOTAL					**10.95**	**2.0**	**0.02**	**0.05**	**0.49**

OS3

Total Area **5.32 acres** Composite Calculations

Land Use	Imp.	C_2	C_5	C_{100}	Area	Imp%	C_2	C_5	C_{100}
Residential (Single Family)	45%	0.40	0.43	0.69	0.00	0.0	0.00	0.00	0.00
Business	95%	0.85	0.88	0.94	0.00	0.0	0.00	0.00	0.00
Residential (Multi Family)	75%	0.67	0.70	0.84	0.00	0.0	0.00	0.00	0.00
ROW	74%	0.66	0.69	0.83	0.00	0.0	0.00	0.00	0.00
Open Space / Lawns	2%	0.02	0.05	0.49	5.32	2.0	0.02	0.05	0.49
TOTAL					**5.32**	**2.0**	**0.02**	**0.05**	**0.49**

OS4

Total Area **2.22 acres** Composite Calculations

Land Use	Imp.	C_2	C_5	C_{100}	Area	Imp%	C_2	C_5	C_{100}
Residential (Single Family)	45%	0.40	0.43	0.69	0.00	0.0	0.00	0.00	0.00
Business	95%	0.85	0.88	0.94	0.00	0.0	0.00	0.00	0.00
Residential (Multi Family)	75%	0.67	0.70	0.84	0.00	0.0	0.00	0.00	0.00
ROW	74%	0.66	0.69	0.83	0.00	0.0	0.00	0.00	0.00
Open Space / Lawns	2%	0.02	0.05	0.49	2.22	2.0	0.02	0.05	0.49
TOTAL					**2.22**	**2.0**	**0.02**	**0.05**	**0.49**

OS5

Total Area **19.19 acres** Composite Calculations

Land Use	Imp.	C_2	C_5	C_{100}	Area	Imp%	C_2	C_5	C_{100}
Future Landuse (OSP)	36%	0.31	0.36	0.67	19.19	36.1	0.31	0.36	0.67
TOTAL					**19.19**	**36.1**	**0.31**	**0.36**	**0.67**

OS6

Total Area **17.33 acres** Composite Calculations

Land Use	Imp.	C_2	C_5	C_{100}	Area	Imp%	C_2	C_5	C_{100}
Future Landuse (OSP)	34%	0.31	0.36	0.67	17.33	34.0	0.31	0.36	0.67
TOTAL					**17.33**	**34.0**	**0.31**	**0.36**	**0.67**

OS7

Total Area **29.69 acres** Composite Calculations

Land Use	Imp.	C_2	C_5	C_{100}	Area	Imp%	C_2	C_5	C_{100}
Open Space / Lawns	2%	0.02	0.05	0.49	29.69	2.0	0.02	0.05	0.49
TOTAL					**29.69**	**2.0**	**0.02**	**0.05**	**0.49**

OS8

Total Area **5.02 acres** Composite Calculations

Land Use	Imp.	C_2	C_5	C_{100}	Area	Imp%	C_2	C_5	C_{100}
Open Space / Lawns	2%	0.02	0.05	0.49	5.02	2.0	0.02	0.05	0.49
TOTAL					**5.02**	**2.0**	**0.02**	**0.05**	**0.49**

OS10

Total Area **5.37 acres** Composite Calculations

Land Use	Imp.	C_2	C_5	C_{100}	Area	Imp%	C_2	C_5	C_{100}
Open Space / Lawns	2%	0.02	0.05	0.49	5.37	2.0	0.02	0.05	0.49
TOTAL					**5.37**	**2.0**	**0.02**	**0.05**	**0.49**

II-B. MINOR AND MAJOR STORM RUNOFF COMPUTATIONS FOR DEVELOPED RUNOFF CONDITIONS

1. SF-2 2-Year Sub-Basin Rational Method Calculations
2. SF-2 100-Year Sub-Basin Rational Method Calculations
3. Pond Calculation

STANDARD FORM SF-2
TIME OF CONCENTRATION

Subdivision: Trails at Crowfoot

Project Name: Trails at Crowfoot
Project No. 254103
Calculated By: MRS
Date: 4/19/2017

SUB-BASIN DATA			INITIAL/OVERLAND (T_i)			TRAVEL TIME (T_t)				Tc CHECK (URBANIZED BASINS)			FINAL
BASIN ID	D.A. (AC)	C_5	L (FT)	S (%)	T_i (MIN)	L (FT)	S (%)	VEL. (FPS)	T_t (MIN)	COMP. T_c (MIN)	TOTAL LENGTH(FT)	MIN. T_c (MIN)	T_c (MIN)
A1	4.11	0.42	50	1.0	8.7	1050	4.0	4.0	4.4	13.0	1100.0	16.1	13.0
A2	1.84	0.49	50	1.0	7.7	750	4.4	4.1	3.0	10.7	800.0	14.4	10.7
A3	3.23	0.46	50	1.0	8.1	900	1.2	2.2	6.8	14.9	950.0	15.3	14.9
A4	4.07	0.33	50	1.0	9.8	880	2.0	2.8	5.2	15.0	930.0	15.2	15.0
A5	2.04	0.47	50	1.0	8.1	700	3.4	3.7	3.2	11.2	750.0	14.2	11.2
A6	4.96	0.34	50	1.0	9.6	1178	4.5	4.2	4.7	14.3	1228.0	16.8	14.3
A7	4.33	0.49	50	1.0	7.8	1000	4.5	4.2	3.9	11.7	1050.0	15.8	11.7
A8	2.86	0.50	50	1.0	7.6	540	1.9	2.7	3.4	11.0	590.0	13.3	11.0
A9	3.44	0.48	50	1.0	7.9	1300	5.2	4.6	4.8	12.7	1350.0	17.5	12.7
A10	0.72	0.58	50	1.0	6.6	427	3.5	3.7	1.9	8.5	477.0	12.7	8.5
A11	2.39	0.51	50	1.0	7.5	950	4.5	4.2	3.7	11.3	1000.0	15.6	11.3
A12	2.96	0.46	50	1.0	8.2	700	3.4	3.7	3.2	11.3	750.0	14.2	11.3
A13	7.08	0.44	50	1.0	8.4	890	1.7	2.5	5.9	14.2	940.0	15.2	14.2
A14	1.43	0.52	50	1.0	7.4	430	4.4	4.2	1.7	9.1	480.0	12.7	9.1
A15	7.15	0.27	50	1.0	10.6	1669	4.7	4.3	6.5	17.1	1719.0	19.6	17.1
A16	0.75	0.72	50	1.0	4.9	1100	3.8	3.9	4.7	9.6	1150.0	16.4	9.6
A17	3.76	0.50	50	1.0	7.6	1250	3.4	3.6	5.7	13.4	1300.0	17.2	13.4
A18	2.54	0.50	50	1.0	7.6	980	3.4	3.6	4.5	12.1	1030.0	15.7	12.1
A19	2.09	0.49	50	1.0	7.7	650	3.2	3.6	3.0	10.8	700.0	13.9	10.8
A20	2.04	0.47	50	1.0	8.1	830	4.8	4.4	3.2	11.2	880.0	14.9	11.2
A21	3.02	0.50	50	1.0	7.7	650	3.2	3.6	3.0	10.7	700.0	13.9	10.7

STANDARD FORM SF-2
TIME OF CONCENTRATION

Subdivision: Trails at Crowfoot

Project Name: Trails at Crowfoot
Project No. 254103
Calculated By: MRS
Date: 4/19/2017

SUB-BASIN DATA			INITIAL/OVERLAND (T_i)			TRAVEL TIME (T_t)				Tc CHECK (URBANIZED BASINS)			FINAL
BASIN ID	D.A. (AC)	C_5	L (FT)	S (%)	T_i (MIN)	L (FT)	S (%)	VEL. (FPS)	T_t (MIN)	COMP. T_c (MIN)	TOTAL LENGTH(FT)	MIN. T_c (MIN)	T_c (MIN)
B1	21.00	0.24	50	1.0	11.0	1925	3.0	3.5	9.3	20.3	1975.0	21.0	20.3
B2	3.13	0.49	50	1.0	7.8	650	4.8	4.3	2.5	10.3	700.0	13.9	10.3
B3	4.92	0.48	50	1.0	7.9	770	3.4	3.6	3.5	11.4	820.0	14.6	11.4
B4	1.50	0.84	50	1.0	3.2	300	3.0	3.5	1.4	4.7	350.0	11.9	5.0
B5	3.19	0.50	50	1.0	7.6	720	3.1	3.5	3.5	11.1	770.0	14.3	11.1
B6	3.19	0.50	50	1.0	7.6	720	3.1	3.5	3.5	11.1	770.0	14.3	11.1
B7	5.76	0.47	50	1.0	8.0	1280	2.7	3.2	6.6	14.6	1330.0	17.4	14.6
B8	4.93	0.45	50	1.0	8.3	1100	3.9	3.9	4.6	12.9	1150.0	16.4	12.9
B9	2.81	0.47	50	1.0	8.0	850	2.0	2.8	5.0	13.1	900.0	15.0	13.1
B10	0.65	0.72	50	1.0	4.9	630	2.5	3.2	3.3	8.2	680.0	13.8	8.2
B11	0.84	0.72	50	1.0	4.9	750	2.3	3.0	4.2	9.1	800.0	14.4	9.1
B12	2.53	0.82	50	1.0	3.6	670	1.9	2.8	4.1	7.7	720.0	14.0	7.7
B13	3.19	0.50	50	1.0	7.6	720	3.1	3.5	3.5	11.1	770.0	14.3	11.1
B14	3.19	0.50	50	1.0	7.6	720	3.1	3.5	3.5	11.1	770.0	14.3	11.1
B15	2.01	0.50	50	1.0	7.6	530	2.5	3.1	2.9	10.4	580.0	13.2	10.4
C1	7.47	0.42	50	1.0	8.7	2100	5.0	4.5	7.8	16.5	2150.0	21.9	16.5

STANDARD FORM SF-2
TIME OF CONCENTRATION

Subdivision: Trails at Crowfoot

Project Name: Trails at Crowfoot
Project No. 254103
Calculated By: MRS
Date: 4/19/2017

SUB-BASIN DATA			INITIAL/OVERLAND (T_i)			TRAVEL TIME (T_t)				Tc CHECK (URBANIZED BASINS)			FINAL
BASIN ID	**D.A. (AC)**	**C_5**	**L (FT)**	**S (%)**	**T_i (MIN)**	**L (FT)**	**S (%)**	**VEL. (FPS)**	**T_t (MIN)**	**COMP. T_c (MIN)**	**TOTAL LENGTH(FT)**	**MIN. T_c (MIN)**	**T_c (MIN)**
D1	5.94	0.41	50	1.0	8.8	1150	4.9	4.4	4.4	13.2	1200.0	16.7	13.2
D2	5.33	0.44	50	1.0	8.4	800	5.3	4.6	2.9	11.3	850.0	14.7	11.3
D3	3.66	0.42	50	1.0	8.7	730	1.1	2.0	6.1	14.7	780.0	14.3	14.3
D4	2.91	0.41	50	1.0	8.8	890	1.0	2.0	7.4	16.2	940.0	15.2	15.2
D5	9.10	0.58	50	1.0	6.6	1570	2.4	3.0	8.6	15.2	1620.0	19.0	15.2
D6	2.57	0.41	50	1.0	8.7	950	2.4	3.1	5.1	13.9	1000.0	15.6	13.9
D7	2.58	0.40	50	1.0	8.9	620	5.0	4.5	2.3	11.2	670.0	13.7	11.2
D8	0.85	0.49	50	1.0	7.8	250	1.2	2.2	1.9	9.7	300.0	11.7	9.7
D9	4.62	0.43	50	1.0	8.5	700	1.3	2.2	5.3	13.8	750.0	14.2	13.8
D10	4.80	0.48	50	1.0	7.9	680	3.8	3.9	2.9	10.8	730.0	14.1	10.8
D11	3.29	0.78	50	1.0	4.0	1375	2.3	3.0	7.7	11.8	1425.0	17.9	11.8
D12	1.13	0.78	50	1.0	4.0	1376	2.3	3.0	7.7	11.8	1426.0	17.9	11.8
E1	4.04	0.50	50	1.0	7.6	870	5.9	4.8	3.0	10.7	920.0	15.1	10.7
E2	5.27	0.49	50	1.0	7.7	1800	0.5	1.4	21.2	28.9	1850.0	20.3	20.3
E3	4.77	0.50	50	1.0	7.7	750	2.9	3.4	3.7	11.4	800.0	14.4	11.4
E4	3.20	0.49	50	1.0	7.7	710	2.8	3.3	3.5	11.3	760.0	14.2	11.3
E5	2.76	0.51	50	1.0	7.5	1050	2.1	2.8	6.2	13.7	1100.0	16.1	13.7
E6	2.63	0.51	50	1.0	7.5	1020	3.0	3.5	4.9	12.4	1070.0	15.9	12.4
E7	2.77	0.49	50	1.0	7.7	870	3.1	3.5	4.1	11.8	920.0	15.1	11.8
E8	2.68	0.51	50	1.0	7.6	870	2.4	3.1	4.7	12.3	920.0	15.1	12.3
E9	4.84	0.38	50	1.0	9.2	709	1.3	2.2	5.4	14.5	759.0	14.2	14.2
E10	0.70	0.53	50	1.0	7.3	710	1.3	2.2	5.4	12.7	760.0	14.2	12.7
E11	3.99	0.30	50	1.0	10.2	711	1.3	2.2	5.4	15.7	761.0	14.2	14.2
E12	3.28	0.30	50	1.0	10.2	900	3.7	3.8	4.0	14.2	950.0	15.3	14.2
E13	4.45	0.30	50	1.0	10.2	713	1.3	2.2	5.4	15.7	763.0	14.2	14.2
E14	5.58	0.53	50	1.0	7.2	1080	3.7	3.8	4.7	11.9	1130.0	16.3	11.9
E15	1.89	0.49	50	1.0	7.7	715	1.3	2.2	5.4	13.2	765.0	14.3	13.2
E16	1.57	0.69	50	1.0	5.2	716	1.3	2.2	5.4	10.7	766.0	14.3	10.7
E17	1.55	0.69	50	1.0	5.2	717	1.3	2.2	5.5	10.7	767.0	14.3	10.7
E18	2.72	0.50	50	1.0	7.6	530	3.8	3.8	2.3	9.9	580.0	13.2	9.9
E19	2.91	0.51	50	1.0	7.6	770	3.9	3.9	3.3	10.9	820.0	14.6	10.9
E20	2.75	0.51	50	1.0	7.6	1080	2.5	3.2	5.7	13.2	1130.0	16.3	13.2
E21	2.05	0.52	50	1.0	7.4	721	2.6	3.2	3.7	11.1	771.0	14.3	11.1
E22	4.41	0.50	50	1.0	7.6	950	5.7	4.7	3.3	10.9	1000.0	15.6	10.9
E23	4.11	0.49	50	1.0	7.8	920	4.5	4.2	3.7	11.4	970.0	15.4	11.4
E24	4.23	0.30	50	1.0	10.2	900	3.7	3.8	4.0	14.2	950.0	15.3	14.2
E25	3.62	0.50	50	1.0	7.7	560	6.3	5.0	1.9	9.5	610.0	13.4	9.5
E26	2.88	0.56	50	1.0	6.8	580	3.8	3.8	2.5	9.3	630.0	13.5	9.3

STANDARD FORM SF-2
TIME OF CONCENTRATION

Subdivision: Trails at Crowfoot

Project Name: Trails at Crowfoot
Project No. 254103
Calculated By: MRS
Date: 4/19/2017

SUB-BASIN DATA			INITIAL/OVERLAND (T_i)			TRAVEL TIME (T_t)				Tc CHECK (URBANIZED BASINS)			FINAL
BASIN ID	D.A. (AC)	C_5	L (FT)	S (%)	T_i (MIN)	L (FT)	S (%)	VEL. (FPS)	T_t (MIN)	COMP. T_c (MIN)	TOTAL LENGTH(FT)	MIN. T_c (MIN)	T_c (MIN)
F1	1.71	0.84	50	1.0	3.3	400	3.0	3.5	1.9	5.2	450.0	12.5	5.2
F2	1.77	0.87	50	1.0	3.0	510	4.3	4.1	2.0	5.0	560.0	13.1	5.0
F3	3.60	0.20	50	1.0	11.4	717	1.3	2.2	5.5	16.9	767.0	14.3	14.3
F4	3.79	0.50	50	1.0	7.6	850	3.8	3.8	3.7	11.3	900.0	15.0	11.3
F5	4.58	0.45	50	1.0	8.3	719	1.3	2.2	5.5	13.8	769.0	14.3	13.8
F6	4.93	0.37	50	1.0	9.3	1234	2.6	3.2	6.5	15.8	1284.0	17.1	15.8
F7	4.51	0.19	50	1.0	11.6	721	1.2	2.2	5.5	17.1	771.0	14.3	14.3
F8	7.93	0.34	50	1.0	9.7	1070	2.8	3.3	5.3	15.0	1120.0	16.2	15.0
F9	1.28	0.62	50	1.0	6.1	1708	3.2	3.6	8.0	14.0	1758.0	19.8	14.0
F10	1.93	0.85	50	1.0	3.1	520	4.4	4.2	2.1	5.2	570.0	13.2	5.2
F11	1.50	0.85	50	1.0	3.2	520	4.0	4.0	2.2	5.3	570.0	13.2	5.3
F12	1.22	0.86	50	1.0	3.0	510	4.3	4.1	2.0	5.1	560.0	13.1	5.1
F13	3.58	0.50	50	1.0	7.6	850	4.7	4.3	3.3	10.9	900.0	15.0	10.9
OS1	56.02	0.05	300	3.1	22.7	2240	5.5	4.7	8.0	30.6	2540.0	24.1	24.1
OS2	10.95	0.05	300	1.2	30.8	1334	1.2	2.2	10.1	40.9	1634.0	19.1	19.1
OS3	5.32	0.05	300	2.9	23.2	1037	2.9	3.3	5.2	28.4	1337.0	17.4	17.4
OS4	2.22	0.05	300	3.5	21.7	730	3.5	3.7	3.3	24.9	1030.0	15.7	15.7
OS10	5.37	0.05	300	4.2	20.4	305	4.2	4.1	1.2	21.6	605.0	13.4	13.4

NOTES:

T_i = (1.8*(1.1 - C_5)*(L)^0.5)/(S^0.33)

T_t=L/60V (Velocity From Fig. 3-2)

Tc Check = 10+L/180

STANDARD FORM SF-3
STORM DRAINAGE SYSTEM DESIGN
(RATIONAL METHOD PROCEDURE)

Subdivision Trails at Crowfoot

Design Storm 2 Yr
2-Year P1 = 0.99 in.

Project Name: Trails at Crowfoot
Project No. 254103
Calculated By: MRS
Date: 4/19/2017

	DIRECT RUNOFF								TOTAL RUNOFF							STREET		PIPE			TRAVEL TIME			
COMBINED BASINS	Design Point	Area Design.	Area (Ac)	Runoff Coeff.	Tc (min)	C*A (Ac)	I (in/hr)	Q (cfs)	Inlet Type	Q (Intercept)	Q (Carry-On)	Tc (min)	C*A (Ac)	I (in/hr)	Q (cfs)	Slope (%)	Street Flow (cfs)	Design Flow (cfs)	Slope (%)	Pipe Size (inches)	Length (ft)	Velocity (fps)	Tt (min)	REMARKS
A1	1A	A1	4.11	0.39	13.0	1.60	2.4	3.8	1 @ 10' Type R On-Grade Inlet	3.8	0.0	13.0	1.60	2.4	3.8			3.8	1.00	18.00	30.0	5.35	0.1	Piped to 1P
A1, 16	1P	A16	0.75	0.68	9.6	0.51	2.7	1.4	1 @ 5' Type R On-Grade Inlet	0.0	0.0	13.1	2.11	2.4	5.1			5.1	1.00	18.00	420.0	5.85	1.2	Piped to DP 1
A11	1K	A11	2.39	0.48	11.3	1.15	2.6	2.9	1 @ 10' Type R On-Grade Inlet	2.9	0.0	11.3	1.15	2.6	2.9			2.9	1.00	18.00	30.0	5.04	0.1	Piped to 1Q
A11, 17	1Q	A17	3.76	0.47	13.4	1.77	2.4	4.2	1 @ 10' Type R On-Grade Inlet	4.2	0.0	13.4	2.91	2.4	6.9			6.9	1.00	18.00	30.0	6.31	0.1	Piped to DP 1
A1,11,16,17	1											14.3	5.03	2.3	11.5			11.5	1.00	24.00	340.0	7.20	0.8	Piped to DP 2
A18	1R	A18	2.54	0.47	12.1	1.19	2.5	3.0	1 @ 10' Type R On-Grade Inlet	3.0	0.0	12.1	1.19	2.5	3.0			3.0	1.00	1.50	40.0	5.07	0.1	Piped to 1B
A2, 18	1B	A2	1.84	0.46	10.7	0.85	2.6	2.2	1 @ 15' Type R Sump Inlet	2.2	0.0	12.3	2.04	2.5	5.0			5.0	1.00	30.00	40.0	5.65	0.1	Piped to DP 2
A1,2,11,16,17,18	2											15.1	7.07	2.2	15.8			15.8	1.00	30.00	30.0	7.77	0.1	Piped to 1C
A1,2,3,11,16,17,18	1C	A3	3.23	0.43	14.9	1.40	2.3	3.2	1 @ 15' Type R Sump Inlet	3.2	0.0	15.2	8.47	2.2	18.9			18.9	1.00	42.00	500.0	7.94	1.0	Piped to West Channel
A13	1M	A13	7.08	0.41	14.2	2.94	2.3	6.8	1 @ 15' Type R On-Grade Inlet	6.8	0.0	14.2	2.94	2.3	6.8			6.8	1.00	18.00	250.0	6.28	0.7	Piped to DP 3
A7	1G	A7	4.33	0.46	11.7	1.99	2.5	5.0	1 @ 10' Type R On-Grade Inlet	5.0	0.0	11.7	1.99	2.5	5.0			5.0	1.00	18.00	40.0	5.85	0.1	Piped to 1T
A7, 20	1T	A20	2.04	0.44	11.2	0.89	2.6	2.3	1 @ 10' Type R On-Grade Inlet	2.3	0.0	11.8	2.88	2.5	7.2			7.2	1.00	18.00	25.0	6.31	0.1	Piped to DP 3
A7,13,20	3											14.9	5.82	2.3	13.1			13.1	1.00	24.00	572.0	7.45	1.3	Piped to DP 4
A19	1S	A19	2.09	0.46	10.8	0.97	2.6	2.5	1 @ 10' Type R On-Grade Inlet	2.5	0.0	10.8	0.97	2.6	2.5			2.5	1.00	18.00	225.0	5.00	0.8	Piped to 1E
A5, 19	1E	A5	2.04	0.44	11.2	0.89	2.6	2.3	2 @ 15' Type R Sump Inlet	2.3	0.0	11.5	1.85	2.5	4.7			4.7	1.00	30.00	50.0	5.52	0.2	Piped to 1D
A5,7,13,19,20	4											16.2	7.67	2.2	16.6			16.6	1.00	30.00	50.0	7.87	0.1	Piped to 1D
A4,5,7,13,19,20	1D	A4	4.07	0.30	15.0	1.24	2.3	2.8	1 @ 10' Type R Sump Inlet	2.8	0.0	16.3	8.91	2.2	19.3			19.3	1.00	42.00	40.0	8.02	0.1	Piped to 1H
A4,5,7,8,13,19,20	1H	A8	2.86	0.47	11.0	1.34	2.6	3.5	1 @ 10' Type R Sump Inlet	3.5	0.0	16.3	10.25	2.2	22.1			22.1	1.00	42.00	140.0	8.37	0.3	Piped to West Channel
A12	1L	A12	2.96	0.43	11.3	1.26	2.5	3.2	1 @ 10' Type R On-Grade Inlet	3.2	0.0	11.3	1.26	2.5	3.2			3.2	1.00	18.00	130.0	5.18	0.4	Piped to 1U
A12, 21	1U	A21	3.02	0.47	10.7	1.41	2.6	3.7	1 @ 10' Type R On-Grade Inlet	3.7	0.0	11.8	2.68	2.5	6.7			6.7	1.00	18.00	90.0	6.28	0.2	Piped to 1F
A6,12, 21	1F	A6	4.96	0.31	14.3	1.56	2.3	3.6	1 @ 10' Type R On-Grade Inlet	3.6	0.0	14.3	4.24	2.3	9.7			9.7	1.00	18.00	160.0	6.72	0.4	Piped to 1N
A6,12,14,21	1N	A14	1.43	0.49	9.1	0.70	2.8	1.9	2 @ 10' Type R Sump Inlet	1.9	0.0	14.7	4.94	2.3	11.2			11.2	1.00	36.00	150.0	6.99	0.4	Piped to West Channel
A15	1O	A15	7.15	0.24	17.1	1.70	2.1	3.6	1 @ 10' Type R Sump Inlet	4.9	0.0	17.1	1.70	2.1	3.6			3.6	1.00	24.00	100.0	5.23	0.3	Piped to 1J
A9	1I	A9	3.44	0.45	12.7	1.54	2.4	3.7				12.7	1.54	2.4	3.7									
									1 @ 10' Type R			14.199	1.94	2.3	4.5	4.0	3.7				370.0	4.00	1.5	Street Flow to 1J
A9,10,15	1J	A10	0.72	0.55	8.5	0.39	2.8	1.1	Sump Inlet	4.5	0.0	17.4	3.64	2.1	7.6			7.6	1.00	24.00	10.0	6.47	0.0	Piped to West Channel

STANDARD FORM SF-3
STORM DRAINAGE SYSTEM DESIGN
(RATIONAL METHOD PROCEDURE)

Subdivision Trails at Crowfoot

Design Storm 2 Yr
2-Year P1 = 0.99 in.

Project Name: Trails at Crowfoot
Project No. 254103
Calculated By: MRS
Date: 4/19/2017

	DIRECT RUNOFF								TOTAL RUNOFF							STREET		PIPE			TRAVEL TIME			
COMBINED BASINS	Design Point	Area Design.	Area (Ac)	Runoff Coeff.	Tc (min)	C*A (Ac)	I (in/hr)	Q (cfs)	Inlet Type	Q (Intercept)	Q (Carry-On)	Tc (min)	C*A (Ac)	I (in/hr)	Q (cfs)	Slope (%)	Street Flow (cfs)	Design Flow (cfs)	Slope (%)	Pipe Size (inches)	Length (ft)	Velocity (fps)	Tt (min)	REMARKS
OS10	O10	OS10	5.37	0.02	13.4	0.11	2.4	0.3				13.4	0.11	2.4	0.3	2.0	0.3				30.0	2.83	0.2	Street Flow to 3A
OS10, C1	3A	C1	7.47	0.39	16.5	2.89	2.1	6.2	1 @ 15' Type R Sump Inlet	2.5	0.0	16.5	3.00	2.1	6.4			6.4	1.00	18.00	285.0	6.00	0.8	Piped to DP 19
B15	2O	B15	2.01	0.47	10.4	0.95	2.6	2.5	1 @ 10' Type R On-Grade Inlet	2.5	0.0	10.4	0.95	2.6	2.5			2.5	1.00	18.00	225.0	6.00	0.6	Piped to 2A
B3	2C	B3	4.92	0.45	11.4	2.20	2.5	5.6	1 @ 15' Type R On-Grade Inlet	5.6	0.0	11.4	2.20	2.5	5.6			5.6	1.00	18.00	225.0	6.00	0.6	Piped to 2L
B3,12	2L	B12	2.53	0.79	7.7	1.98	3.0	5.9	1 @ 15' Type R On-Grade Inlet	5.9	0.0	12.1	4.19	2.5	10.4			10.4	1.00	18.00	225.0	6.75	0.6	Piped to 2D
B3,4,12	2D	B4	1.50	0.81	5.0	1.22	3.4	4.1	1 @ 10' Type R On-Grade Inlet	4.1	0.0	12.6	5.41	2.4	13.1			13.1	1.00	24.00	1037.0	7.45	2.3	Piped to DP 10
B2	2B	B2	3.13	0.46	10.3	1.44	2.7	3.8	1 @ 10' Type R On-Grade Inlet	3.8	0.0	11.1	2.39	2.6	6.1			6.1	2.00	18.00	1290.0	6.97	3.1	Piped to 2A
B1, B2	2A	B1	21.00	0.21	20.3	4.38	1.9	8.5	2 @ 10' Type R On-Grade Inlet	8.5	0.0	20.3	6.78	1.9	13.1			13.1	2.00	30.00	245.0	9.11	0.4	Piped to DP 5
B14	2N	B14	3.19	0.47	11.1	1.51	2.6	3.9	1 @ 10' Type R On-Grade Inlet	3.9	0.0	11.1	1.51	2.6	3.9			3.9	1.00	18.00	500.0	6.96	1.2	Piped to DP 6
B5, 14	2E	B5	3.19	0.47	11.1	1.51	2.6	3.9	2 @ 15' Type R On-Grade Inlet	8.5	0.0	11.1	1.51	2.6	3.9			3.9	2.00	36.00	50.0	6.50	0.1	Piped to DP 6
B5,14	6											12.2	3.02	2.5	7.4			7.4	1.00	18.00	80.0	6.42	0.2	Piped to DP 6
B1,2,3,4,5,12,14,15	5											20.7	9.79	1.9	18.7			18.7	2.00	36.00	300.0	10.00	0.5	Piped to DP 19
B1,2,3,4,5,12,14,15, OS10, C1	19											21.2	12.79	1.9	24.2			24.2	2.00	36.00	385.0	10.00	0.6	Piped to DP 2J
B13	2M	B13	3.19	0.47	11.1	1.51	2.6	3.9	1 @ 10' Type R On-Grade Inlet	3.9	0.0	11.1	1.51	2.6	3.9			3.9	1.00	18.00	510.0	6.96	1.2	Piped to DP 7
B6, 13	2F	B6	3.19	0.47	11.1	1.51	2.6	3.9	2 @ 15' Type R On-Grade Inlet	3.9	0.0	11.1	1.51	2.6	3.9			3.9	2.00	36.00	40.0	6.50	0.1	Piped to DP 7
B6,13	7											12.4	3.02	2.5	7.4			7.4	1.00	18.00	80.0	8.33	0.2	Piped to DP 8
B6,13	8											12.5	3.02	2.4	7.4			7.4	2.00	36.00	200.0	10.78	0.3	Piped to DP 9
B7	2G	B7	5.76	0.44	14.6	2.55	2.3	5.8	1 @ 15' Type R On-Grade Inlet	5.8	0.0	14.6	2.55	2.3	5.8			5.8	1.00	18.00	200.0	6.00	0.6	Piped to DP 9
B9	2I	B9	2.81	0.44	13.1	1.23	2.4	2.9	2 @ 15' Type R Sump Inlet	2.9	0.0	13.1	1.23	2.4	2.9			2.9	0.50	36.00	50.0	4.60	0.2	Piped to DP 9
B8	2H	B8	4.93	0.42	12.9	2.06	2.4	5.0	2 @ 10' Type R Sump Inlet	5.0	0.0	12.9	2.06	2.4	5.0			5.0	0.50	30.00	50.0	6.50	0.1	Piped to DP 9
B6,7,8,9,13	9											15.2	8.85	2.2	19.8			19.8	1.00	48.00	40.0	9.25	0.1	Piped to DP 10
B6,7,8,9,13,3,4,12	10											15.2	14.26	2.2	31.8			31.8	1.00	48.00	580.0	9.92	1.0	Piped to West Channel
B1,2,5,14,15, OS10, C1 B6,7,8,9,10,13	2J	B10	0.65	0.68	8.2	0.44	2.9	1.3	2 @ 10' Type R Sump Inlet	1.3	0.0	21.8	13.24	1.9	24.6			24.6	1.00	54.00	30.0	9.90	0.1	Piped to 2K
B1,2,5,14,15, OS10, C1 B6,7,8,9,10,13	2K	B11	0.84	0.68	9.1	0.57	2.8	1.6	1 @ 5' Type R Sump Inlet	1.6	0.0	21.9	13.81	1.9	25.6			25.6	1.00	54.00	50.0	10.00	0.1	Piped to West Channel

STANDARD FORM SF-3
STORM DRAINAGE SYSTEM DESIGN
(RATIONAL METHOD PROCEDURE)

Subdivision Trails at Crowfoot

Design Storm 2 Yr
2-Year P1 = 0.99 in.

Project Name: Trails at Crowfoot
Project No. 254103
Calculated By: MRS
Date: 4/19/2017

	DIRECT RUNOFF								TOTAL RUNOFF							STREET		PIPE			TRAVEL TIME			
COMBINED BASINS	Design Point	Area Design.	Area (Ac)	Runoff Coeff.	Tc (min)	C*A (Ac)	I (in/hr)	Q (cfs)	Inlet Type	Q (Intercept)	Q (Carry-On)	Tc (min)	C*A (Ac)	I (in/hr)	Q (cfs)	Slope (%)	Street Flow (cfs)	Design Flow (cfs)	Slope (%)	Pipe Size (inches)	Length (ft)	Velocity (fps)	Tt (min)	REMARKS
D2	4B	D2	5.33	0.41	11.3	2.19	2.5	5.6	1 @ 10' Type R On-Grade Inlet	5.6	0.0	11.3	2.19	2.5	5.6			5.6	1.00	18.00	375.0	6.00	1.0	Piped to 4J
D2, D10	4J	D10	4.80	0.45	10.8	2.16	2.6	5.6	2 @ 10' Type R Sump Inlet	5.6	0.0	12.4	4.35	2.5	10.7			10.7	1.00	36.00	20.0	6.70	0.0	Piped to DP 11
D7	4G	D7	2.58	0.37	11.2	0.97	2.6	2.5	2 @ 10' Type R On-Grade Inlet	3.0	0.0	11.2	0.97	2.6	2.5			2.5	1.50	18.00	630.0	5.30	2.0	Piped to DP 11
D2,7,10	11											13.1	5.31	2.4	12.7			12.7	1.50	36.00	20.0	6.80	0.0	Piped to 4A
D1,2,7,10	4A	D1	5.94	0.38	13.2	2.24	2.4	5.3	1 @ 15' Type R Sump Inlet	5.9	0.0	13.2	7.55	2.4	18.0			18.0	1.50	36.00	30.0	7.00	0.1	Piped to Pond B
D8	4H	D8	0.85	0.46	9.7	0.39	2.7	1.1				9.7	0.39	2.7	1.1	5.00	1.1				980.0	4.47	3.7	Street Flow to 4F
D12	4L	D12	1.13	0.75	11.8	0.85	2.5	2.1	2 @ 10' Type R On-Grade Inlet	2.9	0.0	13.3	1.24	2.4	2.9			2.9	1.50	18.00	100.0	5.10	0.3	Piped to 4F
D6,8,12	4F	D6	2.57	0.38	13.9	0.99	2.3	2.3	2 @ 10' Type R On-Grade Inlet	3.0	0.0	13.9	2.23	2.3	5.2			5.2	0.50	30.00	200.0	6.90	0.5	Piped to Pond B
D3	4C	D3	3.66	0.39	14.3	1.43	2.3	3.3				14.3	1.43	2.3	3.3	5.0	3.3				40.0	4.47	0.1	Street Flow to 4D
D3,4	4D	D4	2.91	0.38	15.2	1.10	2.2	2.4				15.2	2.52	2.2	5.6	3.0	5.6				1668.0	3.46	8.0	Street Flow to 4E
D3,4,5	4E	D5	9.10	0.55	15.2	5.04	2.2	11.3	2 @ 10' Type R Sump Inlet	13.6	0.0	23.2	7.56	1.8	13.6			13.6	1.00	36.00	30.0	7.80	0.1	Piped to DP 2
D9	4I	D9	4.62	0.40	13.8	1.86	2.3	4.3	1 @ 10' Type R Sump Inlet	4.3	0.0	13.8	1.86	2.3	4.3			4.3	1.00	24.00	30.0	5.20	0.1	Piped to DP 2
D3,4,5,9	12											23.3	9.42	1.8	16.9			16.9	2.00	36.00	204.0	8.10	0.4	Piped to DP 13
D11	4K	D11	3.29	0.75	11.8	2.47	2.5	6.2	1 @ 10' Type R Sump Inlet	6.2	0.0	11.8	2.47	2.5	6.2									

STANDARD FORM SF-3

STORM DRAINAGE SYSTEM DESIGN

(RATIONAL METHOD PROCEDURE)

Subdivision Trails at Crowfoot

Design Storm 2 Yr
2-Year P1 = 0.99 in.

Project Name: Trails at Crowfoot
Project No. 254103
Calculated By: MRS
Date: 4/19/2017

	DIRECT RUNOFF								TOTAL RUNOFF							STREET		PIPE			TRAVEL TIME			
COMBINED BASINS	Design Point	Area Design.	Area (Ac)	Runoff Coeff.	Tc (min)	C*A (Ac)	I (in/hr)	Q (cfs)	Inlet Type	Q (Intercept)	Q (Carry-On)	Tc (min)	C*A (Ac)	I (in/hr)	Q (cfs)	Slope (%)	Street Flow (cfs)	Design Flow (cfs)	Slope (%)	Pipe Size (inches)	Length (ft)	Velocity (fps)	Tt (min)	REMARKS
																		6.2	1.00	24.00	30.0	5.20	0.1	Piped to DP 13
D3,4,5,9,11	13											23.7	11.89	1.8	21.1			21.1	2.00	36.00	550.0	8.32	1.1	Piped to 16
E23	5W	E23	4.11	0.46	11.4	1.90	2.5	4.8	1 @ 10' Type R On-Grade Inlet	4.8	0.6	11.4	1.90	2.5	4.8			4.8	1.00	18.00	250.0	5.80	0.7	Piped to 5V
E22, 23	5V	E22	4.41	0.47	10.9	2.09	2.6	5.4	1 @ 15' Type R On-Grade Inlet	5.4	0.6	12.1	3.98	2.5	9.8			9.8	1.00	18.00	200.0	6.70	0.5	Piped to 5A
E1,22,23	5A	E1	4.04	0.47	10.7	1.90	2.6	4.9	2 @ 15' Type R On-Grade Inlet	4.9	0.6	12.6	5.88	2.4	14.3			14.3	1.00	24.00	570.0	7.50	1.3	Piped to 5C
E1,3, 22,23	5C	E3	4.77	0.47	11.4	2.22	2.5	5.6	1 @ 15' Type R On-Grade Inlet	5.6	0.0	13.9	8.09	2.3	18.8			18.8	1.00	24.00	270.0	8.05	0.6	Piped to 5D
E1,3,4, 22,23	5D	E4	3.20	0.46	11.3	1.48	2.6	3.8	1 @ 10' Type R On-Grade Inlet	3.8	0.6	14.5	9.57	2.3	21.9			21.9	1.00	24.00	956.0	8.16	2.0	Piped to 5E
E18	5R	E18	2.72	0.47	9.9	1.28	2.7	3.4	1 @ 10' Type R On-Grade Inlet	3.4	0.0	9.9	1.28	2.7	3.4			3.4	1.00	18.00	30.0	5.23	0.1	Piped to 5E
E1,3,4,5,18,22,23	5E	E5	2.76	0.48	13.7	1.32	2.3	3.1	2 @ 15' Type R Sump Inlet	3.1	0.0	16.4	12.18	2.2	26.2			26.2	0.50	48.00	30.0	5.30	0.1	Piped to DP 15
E26	5Z	E26	2.88	0.53	9.3	1.54	2.7	4.2	1 @ 10' Type R On-Grade Inlet	4.2	0.0	9.3	1.54	2.7	4.2			4.2	1.00	18.00	220.0	5.60	0.7	Piped to 5Y
E25, 26	5Y	E25	3.62	0.47	9.5	1.70	2.7	4.6	1 @ 10' Type R On-Grade Inlet	4.6	0.0	10.0	3.24	2.7	8.7			8.7	1.00	18.00	220.0	6.60	0.6	Piped to 5N
E14,25,26	5N	E14	5.58	0.50	11.9	2.81	2.5	7.0	2 @ 10' Type R Sump Inlet	13.7	0.0	11.9	6.05	2.5	15.1			15.1	0.50	42.00	970.0	14.70	1.1	Piped to 5P
E24	5X	E24	4.23	0.27	14.2	1.14	2.3	2.6				14.2	1.14	2.3	2.6	6.0	2.6				150.0	4.90	0.5	Overland to 5L
E12,24	5L	E12	3.28	0.27	14.2	0.89	2.3	2.0	1 @ 10' Type R On-Grade Inlet	4.6	0.0	14.7	2.03	2.3	4.6			4.6	1.00	18.00	50.0	5.70	0.1	Piped to 5P
E11	5K	E11	3.99	0.27	14.2	1.08	2.3	2.5				14.2	1.08	2.3	2.5	1.0	2.5				10.0	2.00	0.1	Overland to 5P
E11,12,14,16,24,25,26	5P	E16	1.57	0.66	10.7	1.03	2.6	2.7	1 @ 15' Type R On-Grade Inlet	4.8	0.0	14.3 14.9	2.11 10.18	2.3 2.3	4.8 23.0			23.0	1.00	24.00	329.0	8.10	0.7	Piped to 5S
E6	5F	E6	2.63	0.48	12.4	1.25	2.4	3.1	1 @ 10' Type R On-Grade Inlet	3.1	0.0	12.4	1.25	2.4	3.1			3.1	1.00	18.00	50.0	5.10	0.2	Piped to 5S
E6,11,12,14,16,24,25,26,19	5S	E19	2.91	0.47	10.9	1.38	2.6	3.6	1 @ 15' Type R On-Grade Inlet	3.6	0.0	15.5	12.82	2.2	28.3			28.3	1.00	30.00	288.0	9.00	0.5	Piped to 5H
E21	5U	E21	2.05	0.49	11.1	1.00	2.6	2.6	1 @ 10' Type R On-Grade Inlet	2.6	0.0	11.1	1.00	2.6	2.6			2.6	1.00	18.00	50.0	4.90	0.2	Piped to 5H
E6,8,11,12,14,16,21,24,25,26,19	5H	E8	2.68	0.47	12.3	1.27	2.5	3.1	1 @ 15' Type R On-Grade Inlet	3.1	0.0	16.1	15.09	2.2	32.8			32.8	1.00	30.00	660.0	9.26	1.2	Piped to DP 14
E9	5I	E9	4.84	0.35	14.2	1.70	2.3	3.9	1 @ 15' Type R On-Grade Inlet	3.9	0.0	14.2	1.70	2.3	3.9			3.9	1.00	18.00	30.0	5.50	0.1	Piped to DP 14
E6,8,11,12,14,16,21,24,9,19 E25,26	14											17.3	16.79	2.1	35.3			35.3	1.00	30.00	280.0	9.40	0.5	Piped to DP 15
E15	5O	E15	1.89	0.46	13.2	0.87	2.4	2.1	1 @ 10' Type R On-Grade Inlet	2.1	0.0	13.2	0.87	2.4	2.1			2.1	1.00	18.00	500.0	4.90	1.7	Piped to 5T
E20	5T	E20	2.75	0.48	13.2	1.31	2.4	3.1				13.2	1.31	2.4	3.1	2.0	3.1				10.0	2.83	0.1	Overland to 5T
E7,15,20	5G	E7	2.77	0.46	11.8	1.28	2.5	3.2	2 @ 15' Type R Sump Inlet	6.2	0.0	13.3 14.9	2.59 3.46	2.4 2.3	6.2 7.8			7.8	0.50	48.00	30.0	6.60	0.1	Piped to DP 15
E1,3-10,11,12,14-16,18-26	15											17.7	32.43	2.1	67.1			67.1	0.50	60.00	280.0	5.30	0.9	Piped to 5B
E10	5J	E10	0.70	0.50	12.7	0.35	2.4	0.8				12.7	0.35	2.4	0.8									

STANDARD FORM SF-3
STORM DRAINAGE SYSTEM DESIGN
(RATIONAL METHOD PROCEDURE)

Project Name: Trails at Crowfoot
Project No. 254103
Calculated By: MRS
Date: 4/19/2017

Subdivision Trails at Crowfoot

Design Storm 2 Yr
2-Year P1 = 0.99 in.

	DIRECT RUNOFF								TOTAL RUNOFF							STREET		PIPE			TRAVEL TIME			
COMBINED BASINS	Design Point	Area Design.	Area (Ac)	Runoff Coeff.	Tc (min)	C*A (Ac)	I (in/hr)	Q (cfs)	Inlet Type	Q (Intercept)	Q (Carry-On)	Tc (min)	C*A (Ac)	I (in/hr)	Q (cfs)	Slope (%)	Street Flow (cfs)	Design Flow (cfs)	Slope (%)	Pipe Size (inches)	Length (ft)	Velocity (fps)	Tt (min)	REMARKS
E1-12,14-16,18-26	5B	E2	5.27	0.46	20.3	2.44	1.9	4.7	1 @ 10' Type R Sump Inlet	5.4	0.0	20.3	35.22	1.9	68.1	1.0	0.8				300.0	2.00	2.5	Street Flow to 5B
																		68.1	0.60	60.00	30.0	5.30	0.1	Piped to Pond C
F12	6L	F12	1.22	0.83	5.1	1.01	3.3	3.4	1 @ 10' Type R On-Grade Inlet	3.4	0.0	5.1	1.01	3.3	3.4			3.4	1.00	18.00	50.0	5.30	0.2	Piped to 6B
F2	6B	F2	1.77	0.84	5.0	1.48	3.4	5.0	1 @ 10' Type R On-Grade Inlet	5.0	0.0	5.2	2.49	3.3	8.3			8.3	1.00	18.00	130.0	6.90	0.3	Piped to 6K
F2,11,12	6K	F11	1.50	0.82	5.3	1.23	3.3	4.1	1 @ 10' Type R On-Grade Inlet	4.1	0.0	5.5	3.73	3.3	12.2			8.3	1.00	18.00	100.0	6.90	0.2	Piped to 6J
F2,10,11,12	6J	F10	1.93	0.82	5.2	1.59	3.3	5.3	1 @ 15' Type R On-Grade Inlet	5.3	0.0	5.8	5.32	3.2	17.2			12.2	1.00	24.00	100.0	7.30	0.2	Piped to 6A
F1,2,10,11,12	6A	F1	1.71	0.81	5.2	1.38	3.3	4.6	2 @ 15' Type R On-Grade Inlet	4.6	0.0	6.0	6.70	3.2	21.4			21.4	1.00	24.00	100.0	8.20	0.2	Piped to DP 16
D3,4,5,9,11 F1,2,10,11,12	16											24.8	18.60	1.7	32.2			32.2	1.00	30.00	1025.0	9.20	1.9	Piped to 6E
F4	6D	F4	3.79	0.47	11.3	1.79	2.6	4.6	1 @ 10' Type R On-Grade Inlet	4.6	0.0	11.3	1.79	2.6	4.6			4.6	1.00	18.00	50.0	5.80	0.1	Piped to 6M
F4,13	6M	F13	3.58	0.47	10.9	1.68	2.6	4.4	1 @ 10' Type R On-Grade Inlet	4.4	0.0	11.4	3.47	2.5	8.8			8.8	1.00	18.00	50.0	6.70	0.1	Piped to 6C
F3,4,13	6C	F3	3.60	0.18	14.3	0.64	2.3	1.5	1 @ 10' Type R On-Grade Inlet	1.5	0.0	14.3	4.11	2.3	9.5			9.5	1.00	18.00	200.0	6.70	0.5	Piped to DP 17
D3,4,5,9,11 F1,2,5,10,11,12	6E	F5	4.58	0.42	13.8	1.91	2.3	4.5	1 @ 15' Type R On-Grade Inlet	4.5	0.0	26.7	20.50	1.7	34.1			34.1	1.00	30.00	100.0	9.33	0.2	Piped to DP 17
D3,4,5,9,11 F1,2,3,4,5,10,11,12,13	17											26.9	24.61	1.7	40.8			40.8	1.00	30.00	1200.0	9.50	2.1	Piped to 6I
D3,4,5,9,11 F1,2,3,4,5,9,10,11,12,13	6I	F9	1.28	0.59	14.0	0.76	2.3	1.8	2 @ 15' Type R Sump Inlet	2.5	0.0	29.0	25.37	1.6	40.2			40.2	0.50	48.00	200.0	6.50	0.5	Piped to 6G
D3,4,5,9,11 F1,2,3,4,5,7,9,10,11,12,13	6G	F7	4.51	0.16	14.3	0.73	2.3	1.7	1 @ 10' Type R Sump Inlet	2.3	0.0	29.5	26.10	1.6	41.0			41.0	0.50	48.00	200.0	6.50	0.5	Piped to Pond
E13	5M	E13	4.45	0.27	14.2	1.20	2.3	2.8	1 @ 10' Type R On-Grade Inlet	2.8	0.0	14.2	1.20	2.3	2.8			2.8	1.00	18.00	70.0	5.10	0.2	Piped to 5Q
E17	5Q	E17	1.55	0.66	10.7	1.01	2.6	2.6	1 @ 10' Type R On-Grade Inlet	2.6	0.0	14.5	2.21	2.3	5.1			5.1	0.50	30.00	780.0	6.50	2.0	Piped/Overland Flow to 6H
F8	6H	F8	7.93	0.31	15.0	2.48	2.2	5.6	1 @ 10' Type R Sump Inlet	4.5	0.0	16.5	4.69	2.1	10.1									

STANDARD FORM SF-3
STORM DRAINAGE SYSTEM DESIGN
(RATIONAL METHOD PROCEDURE)

Subdivision Trails at Crowfoot

Design Storm 100 Yr
100-Year P1 = 2.6 in.

Project Name: Trails at Crowfoot
Project No. 254103
Calculated By: MRS
Date: 4/19/2017

	DIRECT RUNOFF								TOTAL RUNOFF							STREET		PIPE			TRAVEL TIME			
COMBINED BASINS	Design Point	Area Design.	Area (Ac)	Runoff Coeff.	Tc (min)	C*A (Ac)	I (in/hr)	Q (cfs)	Inlet Type	Q (Intercept)	Q (Carry-On)	Tc (min)	C*A (Ac)	I (in/hr)	Q (cfs)	Slope (%)	Street Flow (cfs)	Design Flow (cfs)	Slope (%)	Pipe Size (inches)	Length (ft)	Velocity (fps)	Tt (min)	REMARKS
A1	1A	A1	4.11	0.69	13.0	2.82	6.3	17.7				13.0	2.82	6.3	17.7	2.0	17.7				40.0	2.83	0.2	Street Flow to 1P
A1, 16	1P	A16	0.75	0.84	9.6	0.63	7.1	4.5				13.3	3.45	6.2	21.5	2.0	21.5				400.0	2.83	2.4	Street Flow to DP 1
A11	1K	A11	2.39	0.73	11.3	1.75	6.7	11.7				11.3	1.75	6.7	11.7	2.0	11.7				40.0	2.83	0.2	Street Flow to 1Q
A11, 17	1Q	A17	3.76	0.73	13.4	2.73	6.2	17.0				13.4	4.49	6.2	27.9	2.0	27.9				40.0	2.83	0.2	Street Flow to DP 1
A1,11,16,17	1											15.6	7.93	5.8	45.9	2.0	45.9				340.0	2.83	2.0	Street Flow to 1B
A18	1R	A18	2.54	0.73	12.1	1.85	6.5	12.0				12.1	1.85	6.5	12.0	2.0	12.0				40.0	2.83	0.2	Street Flow to 1B
A2, 18	1B	A2	1.84	0.72	10.7	1.33	6.8	9.1	1 @ 15' Type R Sump Inlet	42.1	18.5	17.6 17.6	7.72 11.11	5.5 5.5	42.1 60.6			42.1	1.00	30.00	40.0	9.47	0.1	Piped to DP 2
A1,2,11,16,17,18	2											17.7	7.72	5.4	42.0			42.0	1.00	30.00	30.0	9.40	0.1	Piped to 1C
A1,2,3,11,16,17,18	1C	A3	3.23	0.71	14.9	2.29	5.9	13.5	1 @ 15' Type R Sump Inlet	32.0	0.0	17.7	13.40	5.4	73.0			73.0	1.00	42.00	500.0	11.37	0.7	Piped to West Channel
A13	1M	A13	7.08	0.70	14.2	4.95	6.1	30.0				14.2	4.95	6.1	30.0	5.0	30.0				250.0	4.47	0.9	Street Flow to 1T
A13,20	1T	A20	2.04	0.71	11.2	1.45	6.7	9.7				15.1	6.40	5.9	37.6	5.0	37.6				60.0	4.47	0.2	Street Flow to 1G
A7,13,20	1G	A7	4.33	0.72	11.7	3.13	6.6	20.6				15.4	9.53	5.8	55.6	5.0	55.6				520.0	4.47	1.9	Street Flow to 1E
A7,13,20	3	*(Not Relavent in 100 Year Storm)*																						
A19	1S	A19	2.09	0.72	10.8	1.51	6.8	10.3				10.8	1.51	6.8	10.3	1.5	10.3				225.0	2.45	1.5	Street Flow to 1E
A5,7,13,19,20	1E	A5	2.04	0.71	11.2	1.45	6.7	9.7	1 @ 15' Type R Sump Inlet	42.1	26.7	17.3 17.3	7.65 12.48	5.5 5.5	42.1 68.7			42.1	1.00	30.00	50.0	9.47	0.1	Piped to DP 4
A5,7,13,19,20	4											17.4	7.65	5.5	42.0			42.0	1.00	30.00	50.0	9.40	0.1	Piped to 1D
A4,5,7,13,19,20	1D	A4	4.07	0.64	15.0	2.60	5.9	15.4	1 @ 15' Type R Sump Inlet	42.1	0.0	17.4	15.09	5.5	82.9			82.9	1.00	42.00	40.0	11.67	0.1	Piped to 1H
A4,5,7,8,13,19,20	1H	A8	2.86	0.73	11.0	2.08	6.8	14.1	1 @ 10' Type R Sump Inlet	14.1	0.0	17.5	17.17	5.5	94.1			94.1	1.00	42.00	140.0	11.88	0.2	Piped to West Channel
A12	1L	A12	2.96	0.70	11.3	2.09	6.7	13.9				11.3	2.09	6.7	13.9	1.5	13.9				130.0	2.45	0.9	Street Flow to 1U
A12, 21	1U	A21	3.02	0.73	10.7	2.20	6.9	15.0				12.2	4.28	6.5	27.7	1.5	27.7				90.0	2.45	0.6	Street Flow to 1F
A6,12, 21	1F	A6	4.96	0.65	14.3	3.20	6.0	19.3				14.3	7.48	6.0	45.2	1.5	45.2				160.0	2.45	1.1	Street Flow to 1N
A6,12,14,21	1N	A14	1.43	0.74	9.1	1.05	7.3	7.7	2 @ 10' Type R Sump Inlet	49.8	0.0	15.4	8.54	5.8	49.8			49.8	1.00	36.00	150.0	10.33	0.2	Piped to West Channel
A15	1O	A15	7.15	0.61	17.1	4.33	5.5	24.0	1 @ 10' Type R Sump Inlet	24.0	0.0	17.1	4.33	5.5	24.0			24.0	1.00	24.00	100.0	8.12	0.2	Piped to 1J
A9	1I	A9	3.44	0.72	12.7	2.47	6.4	15.7				12.7	2.47	6.4	15.7	4.0	15.7				370.0	4.00	1.5	Street Flow to 1J
A9,10,15	1J	A10	0.72	0.77	8.5	0.55	7.5	4.1	1 @ 10' Type R Sump Inlet	18.3	0.0	14.199 17.3	3.02 7.35	6.1 5.5	18.3 40.5			40.5	1.00	24.00	10.0	9.49	0.0	Piped to West Channel

STANDARD FORM SF-3
STORM DRAINAGE SYSTEM DESIGN
(RATIONAL METHOD PROCEDURE)

Project Name: Trails at Crowfoot
Project No. 254103
Calculated By: MRS
Date: 4/19/2017

Subdivision Trails at Crowfoot

Design Storm 100 Yr
100-Year P1 = 2.6 in.

	DIRECT RUNOFF								TOTAL RUNOFF							STREET		PIPE			TRAVEL TIME			
COMBINED BASINS	Design Point	Area Design.	Area (Ac)	Runoff Coeff.	Tc (min)	C*A (Ac)	I (in/hr)	Q (cfs)	Inlet Type	Q (Intercept)	Q (Carry-On)	Tc (min)	C*A (Ac)	I (in/hr)	Q (cfs)	Slope (%)	Street Flow (cfs)	Design Flow (cfs)	Slope (%)	Pipe Size (inches)	Length (ft)	Velocity (fps)	Tt (min)	REMARKS
OS10	O10	OS10	5.37	0.49	13.4	2.63	6.2	16.4				13.4	2.63	6.2	16.4	2.0	16.4				30.0	2.83	0.2	Street Flow to 3A
C1	3A	C1	7.47	0.68	16.5	5.11	5.6	28.8	1 @ 15' Type R Sump Inlet	28.8	0.0	16.5	7.74	5.6	43.6			43.6	1.00	30.00	285.0	7.00	0.7	Piped to DP 19
B15	2O	B15	2.01	0.73	10.4	1.47	6.9	10.1				10.4	1.47	6.9	10.1	5.0	10.1				225.0	4.47	0.8	Street Flow to 2L
B3	2C	B3	4.92	0.72	11.4	3.52	6.7	23.4				11.4	4.99	6.7	33.2	5.0	33.2				225.0	4.47	0.8	Street Flow to 2C
B3,12	2L	B12	2.53	0.90	7.7	2.28	7.8	17.7				12.3	7.27	6.5	46.9	5.0	46.9				225.0	4.47	0.8	Street Flow to 2D
B3,4,12	2D	B4	1.50	0.92	5.0	1.38	8.8	12.2				13.1	8.65	6.3	54.3	3.5	54.3				1605.0	3.74	7.1	Street Flow to 2J
B2	2B	B2	3.13	0.72	10.3	2.26	7.0	15.7				10.3	2.26	7.0	15.7	4.0	15.7				1230.0	4.00	5.1	Street Flow to 2A
B1, B2	2A	B1	21.00	0.59	20.3	12.38	5.1	62.9	2 @ 15' Type R On-Grade Inlet	48.0	26.5	20.3 20.3	9.44 14.65	5.1 5.1	48.0 74.4			48.0	2.00	30.00	245.0	13.15	0.3	Piped to DP 5
B14	2N	B14	3.19	0.73	11.1	2.33	6.8	15.7				11.1	2.33	6.8	15.7	2.0	15.7				500.0	2.83	2.9	Street Flow to 2E
B5, 14	*50% of carryover flow from 2A ~ 26.5/2 = 13.25 CFS* 2E	B5	3.19	0.73	11.1	2.33	6.8	15.7	2 @ 15' Type R On-Grade Inlet	34.8	6.8	14.0 14.0 20.6	5.71 4.65 15.15	6.1 6.1 5.0	34.8 28.4 76.4			76.4	2.00	36.00	50.0	14.80	0.1	Piped to DP 5
B5,14	6	*(Not Relavent in 100 Year Storm)*																						
B1,5,14,15	5											20.6	15.15	5.0	76.2			76.2	2.00	36.00	900.0	14.78	1.0	Piped to DP 19
B1,2,5,14,15,C1,OS10	19											21.6	22.89	4.9	112.3			112.3	2.00	42.00	385.0	14.78	0.4	Piped to DP 2J
B13	2M	B13	3.19	0.73	11.1	2.33	6.8	15.7				11.1	2.33	6.8	15.7	2.0	15.7				500.0	2.83	2.9	Street Flow to 2F
B6, 13	*50% of carryover flow from 2A ~ 6.8/2 = 3.4 CFS* 2F	B6	3.19	0.73	11.1	2.33	6.8	15.7	2 @ 15' Type R On-Grade Inlet	29.1	2.7	14.0 14.0 14.0	4.77 4.65 4.77	6.1 6.1 6.1	29.1 28.4 29.1			29.1	2.00	36.00	40.0	9.50	0.1	Piped to DP 7
B6	7	*(Not Relavent in 100 Year Storm)*																						
B6,13	8											14.1	4.77	6.1	29.0			29.0	2.00	36.00	200.0	15.08	0.2	Piped to DP 9
B7	2G	B7	5.76	0.71	14.6	4.11	6.0	24.5				14.6	4.11	6.0	24.5	6.0	24.5				200.0	4.90	0.7	Street Flow to 2I
B9	2I	B9	2.81	0.71	13.1	2.00	6.3	12.6	2 @ 15' Type R Sump Inlet	35.7	0.0	15.3	6.10	5.8	35.7			35.7	0.50	36.00	50.0	7.31	0.1	Piped to DP 9
B8	*50% of carryover flow from 2F ~ 2.7/2 = 1.35 CFS* 2H	B8	4.93	0.70	12.9	3.45	6.3	21.8	2 @ 10' Type R Sump Inlet	23.2	0.0	12.9 12.9	3.67 3.45	6.3 6.3	23.2 21.8			23.2	0.50	30.00	50.0	6.55	0.1	Piped to DP 9
B6,7,8,9	9											15.4	14.54	5.8	84.8			84.8	1.00	48.00	40.0	13.00	0.1	Piped to DP 10
B6,7,8,9,13	10											15.5	14.54	5.8	84.6			84.6	1.00	48.00	10.0	12.98	0.0	Piped to West Channel
B3,4,12 B1,2,5,14,15,C1,OS10,B10	2J	B10	0.65	0.84	8.2	0.55	7.6	4.1	2 @ 10' Type R Sump Inlet	46.7	0.0	20.3 22.1	9.19 32.08	5.1 4.9	46.7 155.7			155.7	1.00	54.00	30.0	14.03	0.0	Piped to 18
B3,4,12 B1,2,5,14,15,C1,OS10,B10	18											22.1	32.08	4.8	155.6			155.6	1.00	54.00	30.0	14.03	0.0	Piped to 2K
B3,4,12,11 B1,2,5,14,15,C1,OS10,B10	2K	B11	0.84	0.84	9.1	0.71	7.3	5.2	1 @ 5' Type R Sump Inlet	5.2	0.0	22.1	32.79	4.8	159.0			159.0	1.00	54.00	50.0	14.00	0.1	Piped to West Channel

STANDARD FORM SF-3
STORM DRAINAGE SYSTEM DESIGN
(RATIONAL METHOD PROCEDURE)

Project Name: Trails at Crowfoot
Project No. 254103
Calculated By: MRS
Date: 4/19/2017

Subdivision Trails at Crowfoot

Design Storm 100 Yr
100-Year P1 = 2.6 in.

	DIRECT RUNOFF								TOTAL RUNOFF							STREET		PIPE			TRAVEL TIME			
COMBINED BASINS	Design Point	Area Design.	Area (Ac)	Runoff Coeff.	Tc (min)	C*A (Ac)	I (in/hr)	Q (cfs)	Inlet Type	Q (Intercept)	Q (Carry-On)	Tc (min)	C*A (Ac)	I (in/hr)	Q (cfs)	Slope (%)	Street Flow (cfs)	Design Flow (cfs)	Slope (%)	Pipe Size (inches)	Length (ft)	Velocity (fps)	Tt (min)	REMARKS
D2	4B	D2	5.33	0.70	11.3	3.71	6.7	24.8				11.3	3.71	6.7	24.8	6.00	24.8				375.0	4.90	1.3	Street Flow to 4J
D2, D10	4J	D10	4.80	0.72	10.8	3.44	6.8	23.5	2 @ 10' Type R Sump Inlet	45.7	0.0	12.6	7.15	6.4	45.7			45.7	1.00	36.00	20.0	10.14	0.0	Piped to DP 11
D7	4G	D7	2.58	0.68	11.2	1.75	6.7	11.8	2 @ 10' Type R On-Grade Inlet	11.8	0.0	11.2	1.75	6.7	11.8			11.8	1.50	18.00	630.0	8.25	1.3	Piped to DP 11
D2,7,10	11											12.6	8.90	6.4	56.8			56.8	1.50	36.00	20.0	12.37	0.0	Piped to 4A
D1,2,7,10	4A	D1	5.94	0.68	13.2	4.03	6.3	25.2	1 @ 10' Type R Sump Inlet	25.2	0.0	13.2	12.93	6.3	80.9			80.9	1.50	36.00	30.0	13.13	0.0	Piped to Pond B
D8	4H	D8	0.85	0.72	9.7	0.61	7.1	4.4				9.7	0.61	7.1	4.4	5.00	4.4				980.0	4.47	3.7	Street Flow to 4F
D12	4L	D12	1.13	0.88	11.8	0.99	6.6	6.5	2 @ 10' Type R On-Grade Inlet	2.9	0.0	13.3	1.61	6.2	10.0			10.0	1.50	18.00	100.0	7.96	0.2	Piped to 4F
D6,8,12	4F	D6	2.57	0.68	13.9	1.75	6.1	10.7	2 @ 15' Type R On-Grade Inlet	14.5	0.0	13.9 13.9	2.37 3.97	6.1 6.1	14.5 24.3			24.3	0.50	30.00	200.0	6.64	0.5	Piped to Pond B
D3	4C	D3	3.66	0.69	14.3	2.51	6.0	15.1				14.3	2.51	6.0	15.1	5.0	15.1				40.0	4.47	0.1	Street Flow to 4D
D3,4	4D	D4	2.91	0.68	15.2	1.97	5.9	11.6				15.2	4.48	5.9	26.3	3.0	26.3				1668.0	3.46	8.0	Street Flow to 4E
D3,4,5	4E	D5	9.10	0.78	15.2	7.07	5.9	41.5	2 @ 10' Type R Sump Inlet	54.5	0.0	23.2	11.56	4.7	54.5			54.5	1.00	36.00	30.0	10.52	0.0	Piped to DP 2
D9	4I	D9	4.62	0.69	13.8	3.20	6.1	19.6	1 @ 10' Type R Sump Inlet	19.6	0.0	13.8	3.20	6.1	19.6			19.6	1.00	24.00	30.0	8.07	0.1	Piped to DP 2
D3,4,5,9	12											23.3	14.76	4.7	69.5			69.5	2.00	36.00	204.0	14.54	0.2	Piped to DP 3
D11	4K	D11	3.29	0.88	11.8	2.89	6.6	19.0	1 @ 10' Type R Sump Inlet	19.0	0.0	11.8	2.89	6.6	19.0			19.0	1.00	24.00	30.0	8.02	0.1	Piped to DP 3
D3,4,5,9,11	13											23.5	17.64	4.7	82.7			82.7	2.00	36.00	2650.0	9.00	4.9	Piped to 6G

STANDARD FORM SF-3
STORM DRAINAGE SYSTEM DESIGN
(RATIONAL METHOD PROCEDURE)

Project Name: Trails at Crowfoot
Project No. 254103
Calculated By: MRS
Date: 4/19/2017

Subdivision Trails at Crowfoot

Design Storm 100 Yr
100-Year P1 = 2.6 in.

	DIRECT RUNOFF								TOTAL RUNOFF							STREET		PIPE			TRAVEL TIME			
COMBINED BASINS	Design Point	Area Design.	Area (Ac)	Runoff Coeff.	Tc (min)	C*A (Ac)	I (in/hr)	Q (cfs)	Inlet Type	Q (Intercept)	Q (Carry-On)	Tc (min)	C*A (Ac)	I (in/hr)	Q (cfs)	Slope (%)	Street Flow (cfs)	Design Flow (cfs)	Slope (%)	Pipe Size (inches)	Length (ft)	Velocity (fps)	Tt (min)	REMARKS
E23	5W	E23	4.11	0.72	11.4	2.98	6.7	19.9				11.4	2.98	6.7	19.9	2.7	19.9				250.0	3.29	1.3	Street Flow to 5V
E22, 23	5V	E22	4.41	0.73	10.9	3.22	6.8	21.9				12.7	6.20	6.4	39.5	2.7	39.5				200.0	3.29	1.0	Street Flow to 5A
E1,22,23	5A	E1	4.04	0.73	10.7	2.94	6.9	20.2				13.7	9.15	6.2	56.3	2.7	56.3				570.0	3.29	2.9	Street Flow to 5C
E1,3, 22,23	5C	E3	4.77	0.72	11.4	3.45	6.7	23.1				16.6	12.60	5.6	70.9	2.7	70.9				270.0	3.29	1.4	Street Flow to 5D
E1,3,4, 22,23	5D	E4	3.20	0.69	11.3	2.19	6.7	14.7				18.0	14.79	5.4	80.0	1.0	80.0				956.0	2.00	8.0	Street Flow to 5E
E18	5R	E18	2.72	0.73	9.9	1.98	7.1	14.0				9.9	1.98	7.1	14.0	1.0	14.0				30.0	2.00	0.3	Street Flow to 5E
E1,3,4,5,18,22,23	5E	E5	2.76	0.73	13.7	2.02	6.2	12.4	2 @ 15' Type R Sump Inlet	83.4	0.0	25.9	18.79	4.4	83.4			83.4	0.50	48.00	30.0	9.00	0.1	Piped to Pond C
E26	5Z	E26	2.88	0.76	9.3	2.20	7.2	15.9				9.3	2.20	7.2	15.9	3.5	15.9				220.0	3.74	1.0	Street Flow to 5Y
E25, 26	5Y	E25	3.62	0.73	9.5	2.64	7.2	18.9				10.3	4.84	6.9	33.6	3.5	33.6				220.0	3.74	1.0	Street Flow to 5N
E14,25,26	5N	E14	5.58	0.75	11.9	4.16	6.6	27.3	2 @ 15' Type R Sump Inlet	59.0	0.0	11.9	9.00	6.6	59.0			59.0	0.50	42.00	2400.0	8.22	4.9	Piped to DP 14
E24	5X	E24	4.23	0.62	14.2	2.62	6.1	15.9				14.2	2.62	6.1	15.9	6.0	15.9				150.0	4.90	0.5	Street Flow to 5L
E12,24	5L	E12	3.28	0.62	14.2	2.04	6.1	12.3				14.7	4.66	6.0	27.7	6.0	27.7				50.0	4.90	0.2	Street Flow to 5P
E11	5K	E11	3.99	0.62	14.2	2.47	6.0	15.0				14.2	2.47	6.0	15.0	1.0	15.0				10.0	2.00	0.1	Overland to 5P
E11,12,14,16,24,25,26	5P	E16	1.57	0.83	10.7	1.30	6.8	8.9				14.9	8.43	5.9	49.9	1.0	49.9				340.0	2.00	2.8	Street Flow to 5S
E6	5F	E6	2.63	0.73	12.4	1.92	6.4	12.3				12.4	1.92	6.4	12.3	1.0	12.3				50.0	2.00	0.4	Street Flow to 5S
E6,11,12,14,16,24,25,26,19	5S	E19	2.91	0.73	10.9	2.12	6.8	14.5				17.7	12.47	5.4	67.9	1.0	67.9				288.0	2.00	2.4	Street Flow to 5H
E21	5U	E21	2.05	0.74	11.1	1.51	6.7	10.2				11.1	1.51	6.7	10.2	1.0	10.2				50.0	2.00	0.4	Street Flow to 5H
E6,8,11,12,14,16,21,24,25,26,19	5H	E8	2.68	0.73	12.3	1.95	6.5	12.6				20.1	15.94	5.1	81.3	1.0	81.3				660.0	2.00	5.5	Street Flow to DP 14
E9	5I	E9	4.84	0.66	14.2	3.22	6.1	19.5				14.2	3.22	6.1	19.5	1.0	19.5				30.0	2.00	0.3	Street Flow to DP 14
E10	5J	E10	0.70	0.74	12.7	0.52	6.4	3.3				12.7	0.52	6.4	3.3	1.0	3.3				300.0	2.00	2.5	Street Flow to DP 14
E6,8,10,11,12,14,16,21,24,9,19 E25,26	14											25.6	28.68	4.5	128.2	1.0	128.2				230.0	2.00	1.9	Street Flow to 5G
E15	5O	E15	1.89	0.72	13.2	1.37	6.3	8.6				13.2	1.37	6.3	8.6	1.0	8.6				500.0	2.00	4.2	Street Flow to 5G
E20	5T	E20	2.75	0.73	13.2	2.01	6.2	12.6				13.2	2.01	6.2	12.6	2.0	12.6				10.0	2.83	0.1	Street Flow to 5G
E7,15,20	5G	E7	2.77	0.72	11.8	2.01	6.6	13.2	2 @ 15' Type R Sump Inlet	86.1	21.4	17.3 27.5	5.38 34.06	5.5 4.3	29.6 146.1			146.1	0.50	48.00	30.0	9.11	0.1	Piped to Pond C
E1,3-10,11,12,14-16,18-26	15											27.6	34.06	4.3	145.9			145.9	0.50	60.00	280.0	10.66	0.4	Piped to Pond C
E1-12,14-16,18-26	5B	E2	5.27	0.72	20.3	*21.4 CFS from 5G* 3.81	5.1	19.4	1 @ 15' Type R Sump Inlet	40.8	0.0	20.3	3.81	5.1	19.4			19.4	0.60	60.00	30.0	11.70	0.0	Piped to Pond C

STANDARD FORM SF-3
STORM DRAINAGE SYSTEM DESIGN
(RATIONAL METHOD PROCEDURE)

Project Name: Trails at Crowfoot
Project No. 254103
Calculated By: MRS
Date: 4/19/2017

Subdivision Trails at Crowfoot

Design Storm 100 Yr
100-Year P1 = 2.6 in.

	DIRECT RUNOFF								TOTAL RUNOFF							STREET		PIPE			TRAVEL TIME			
COMBINED BASINS	Design Point	Area Design.	Area (Ac)	Runoff Coeff.	Tc (min)	C*A (Ac)	I (in/hr)	Q (cfs)	Inlet Type	Q (Intercept)	Q (Carry-On)	Tc (min)	C*A (Ac)	I (in/hr)	Q (cfs)	Slope (%)	Street Flow (cfs)	Design Flow (cfs)	Slope (%)	Pipe Size (inches)	Length (ft)	Velocity (fps)	Tt (min)	REMARKS
F12	6L	F12	1.22	0.93	5.1	1.13	8.8	9.9				5.1	1.13	8.8	9.9	1.0	9.9				50.0	2.00	0.4	Street Flow to 6B
F2	6B	F2	1.77	0.93	5.0	1.65	8.8	14.5				5.5	2.78	8.6	23.9	1.0	23.9				130.0	2.00	1.1	Street Flow to 6K
F2,11,12	6K	F11	1.50	0.92	5.3	1.39	8.7	12.0				6.6	4.17	8.2	34.0	1.0	34.0				100.0	2.00	0.8	Street Flow to 6J
F2,10,11,12	6J	F10	1.93	0.93	5.2	1.79	8.7	15.6				7.4	5.96	7.9	46.8	1.0	46.8				100.0	2.00	0.8	Street Flow to 6A
F1,2,10,11,12	6A	F1	1.71	0.91	5.2	1.55	8.7	13.5				8.2	7.51	7.6	56.9	1.0	56.9				80.0	2.00	0.7	Street Flow to DP 16
D3,4,5,9,11 F1,2,10,11,12	16											8.9	7.51	7.4	55.3	1.0	55.3				1025.0	2.00	8.5	Street Flow to 6E
F4	6D	F4	3.79	0.73	11.3	2.76	6.7	18.5				11.3	2.76	6.7	18.5	1.0	18.5				50.0	2.00	0.4	Street Flow to 6M
F4,13	6M	F13	3.58	0.73	10.9	2.60	6.8	17.7				11.7	5.36	6.6	35.4	1.0	35.4				50.0	2.00	0.4	Street Flow to 6C
F3,4,13	6C	F3	3.60	0.57	14.3	2.06	6.0	12.5				14.3	7.42	6.0	44.9	1.0	44.9				200.0	2.00	1.7	Street Flow to DP 17
D3,4,5,9,11 F1,2,5,10,11,12	6E	F5	4.58	0.70	13.8	3.20	6.1	19.7				17.4	10.72	5.5	58.8	1.0	58.8				100.0	2.00	0.8	Street Flow to DP 17
D3,4,5,9,11 F1,2,3,4,5,10,11,12,13	17											18.3	18.14	5.4	97.2	5.0	97.2				1200.0	4.47	4.5	Street Flow to 6I
D3,4,5,9,11 F1,2,3,4,5,9,10,11,12,13	6I	F9	1.28	0.79	14.0	1.02	6.1	6.2	2 @ 15' Type R Sump Inlet	86.1	5.4	28.4	36.80	4.2	154.9			154.9	0.50	48.00	200.0	9.10	0.4	Piped to 6G
D3,4,5,9,11 F1,2,3,4,5,7,9,10,11,12,13	6G	F7	4.51	0.57	14.3	2.55	6.0	15.4	1 @ 10' Type R Sump Inlet	20.8	0.0	28.8	39.35	4.2	164.4			164.4	0.50	48.00	200.0	9.20	0.4	Piped to East Channel
E13	5M	E13	29.46 4.45	0.62	14.2	2.76	6.0	16.7				14.2	2.76	6.0	16.7	1.0	16.7				70.0	2.00	0.6	Street Flow to 5Q
E17	5Q	E17	1.55	0.83	10.7	1.28	6.8	8.8				14.8	4.04	5.9	24.0			24.0	0.50	30.00	780.0	6.60	2.0	Piped/Overland Flow to 6H
F8	6H	F8	7.93	0.64	15.0	5.11	5.9	30.2	1 @ 15' Type R Sump Inlet	42.1	6.3	16.8	9.15	5.6	51.1			51.1	0.50	36.00	30.0	7.60	0.1	Piped to 6F
F6	6F	F6	4.93	0.66	15.8	3.25	5.8	18.7	1 @ 10' Type R Sump Inlet	25.0	0.0	16.9	12.40	5.6	69.2			69.2	0.50	42.00	102.0	8.40	0.2	Piped to East Channel

POND RELEASE RATES

Subdivision: Trails at Crowfoot

Project Name: Trails at Crowfoot
Project No. 254103
Calculated By: MRS
Date: 4/19/2017

POND A

Area (a)	151.23	acres			
Slope	3.4	%			
L² / Area	5.03				
Unit Discharge @ 3% Slope for Type B Soil	1.24	/acre	Unit Discharge @ 3% Slope for Type C/D Soil	1.35	/acre
Unit Discharge @ 4% Slope for Type B Soil	1.31	/acre	Unit Discharge @ 4% Slope for Type C/D Soil	1.42	/acre
Interpolated Unit Discharge	1.25	/acre	Interpolated Unit Discharge	1.36	/acre
Total Interpolated Unit Discharge	1.30				
Release Rate	177.21	CFS			

POND B

Area (a)	22.49	acres			
Slope	5.7	%			
L² / Area	2.34				
Unit Discharge > 4% Slope for Type B Soil	1.45	/acre	Unit Discharge > 4% Slope for Type C/D Soil	1.57	/acre
Total Interpolated Unit Discharge	1.51				
Release Rate	30.56	CFS			

POND C:

Area (a)	97.79	acres			
Slope	2.8	%			
L² / Area	2.53				
Unit Discharge @ 2% Slope for Type B Soil	1.16	/acre	Unit Discharge @ 2% Slope for Type C/D Soil	1.26	/acre
Unit Discharge @ 3% Slope for Type B Soil	1.24	/acre	Unit Discharge @ 3% Slope for Type C/D Soil	1.35	/acre
Interpolated Unit Discharge	1.22	/acre	Interpolated Unit Discharge	1.33	/acre
Total Interpolated Unit Discharge	1.28				
Release Rate	107.73	CFS			

POND D:

Area (a)	53.04	acres			
Slope	2.8	%			
L² / Area	4.29				
Unit Discharge @ 2% Slope for Type B Soil	1.16	/acre	Unit Discharge @ 2% Slope for Type C/D Soil	1.26	/acre
Unit Discharge @ 3% Slope for Type B Soil	1.24	/acre	Unit Discharge @ 3% Slope for Type C/D Soil	1.35	/acre
Interpolated Unit Discharge	1.22	/acre	Interpolated Unit Discharge	1.33	/acre
Total Interpolated Unit Discharge	1.28				
Release Rate	58.42	CFS			

DETENTION POND SIZING

Subdivisi Trails at Crowfoot

Project Name: Trails at Crowfoot
Project No. 254103
Calculated By: MRS

Volume=1/3 x Depth x (A+B+(A*B)^0.5)
A - Upper Surface
B - Lower Surface

Pond A (Interim)

SWMM 100 Year Volume (AC-FT)	EURV(AC-FT)	WQCV	Release Rate (CFS)
V100			
11.36	6.11	2.29	177.2

Storage Curve							
STAGE	SURFACE AREA	$A+B+(A*B)^{.5}$	1/3	ΔH	VOLUME	CUMULATIVE VOLUME	CUMULATIVE VOLUME
ft	ft^2	ft^2	ft^2	ft	ft^3	ft^3	ac-ft
5996	5352.00	0	0	0	0	0	0
5997	42275	62,669	20,890	1	20,890	20,890	0.48
5998	98703	205,574	68,525	1	68,525	89,414	2.05
5999	134751	348,781	116,260	1	116,260	205,675	4.72
6000	140981	413,563	137,854	1	137,854	343,529	7.89
6001	147299	432,385	144,128	1	144,128	487,657	11.20
6002	153693	451,454	150,485	1	150,485	638,142	14.65
6003	160036	470,561	156,854	1	156,854	794,996	18.25
6004	166398	489,620	163,207	1	163,207	958,203	22.00

WQ ELEV	5998.09	FT	**WQ** VOLUME	2.29	AC-FT
EURV ELEV	5999.44	FT	**EURV**VOLUME	6.11	AC-FT
100YEAR ELEV	6001.09	FT	**100**YEAR VOLUME	11.36	AC-FT

DETENTION POND SIZING

Subdivisi Trails at Crowfoot

Project Name: Trails at Crowfoot
Project No. 254103
Calculated By: MRS

Pond B

SWMM 100 Year Volume (AC-FT)	EURV(AC-FT)	WQCV	Release Rate (CFS)
V100			
2.41	1.10	0.39	30.6

Storage Curve							
STAGE	**SURFACE AREA**	**$A+B+(A*B)^{.5}$**	**1⁄3**	**ΔH**	**VOLUME**	**CUMULATIVE VOLUME**	**CUMULATIVE VOLUME**
ft	**ft^2**	**ft^2**	**ft^2**	**ft**	**ft^3**	**ft^3**	**ac-ft**
6089	88.00	0	0	0	0	0	0
6090	3892	4,565	1,522	1	1,522	1,522	0.03
6091	12287	23,094	7,698	1	7,698	9,220	0.21
6092	21470	49,999	16,666	1	16,666	25,886	0.59
6093	26933	72,450	24,150	1	24,150	50,036	1.15
6094	31290	87,253	29,084	1	29,084	79,120	1.82
6095	35405	99,979	33,326	1	33,326	112,447	2.58
6096	39867	112,842	37,614	1	37,614	150,061	3.44
6097	45397	127,806	42,602	1	42,602	192,663	4.42

WQ ELEV	6091.45	FT	**WQ VOLUME**	0.39	AC-FT
EURV ELEV	6092.92	FT	**EURVVOLUME**	1.10	AC-FT
100YEAR ELEV	6094.89	FT	**100YEAR VOLUME**	2.41	AC-FT

DETENTION POND SIZING

Subdivisi Trails at Crowfoot

Project Name: Trails at Crowfoot
Project No. 254103
Calculated By: MRS

Pond C

SWMM 100 Year Volume (AC-FT)	EURV(AC-FT)	WQCV	Release Rate (CFS)
V100			
9.40	4.49	1.59	106.7

Storage Curve							
STAGE	SURFACE AREA	A+B+(A*B)$^{.5}$	1⁄3	ΔH	VOLUME	CUMULATIVE VOLUME	CUMULATIVE VOLUME
ft	ft^2	ft^2	ft^2	ft	ft^3	ft^3	ac-ft
5970	81.00	0	0	0	0	0	0
5971	10352	11,349	3,783	1	3,783	3,783	0.09
5972	29478	57,299	19,100	1	19,100	22,882	0.53
5973	41945	106,586	35,529	1	35,529	58,411	1.34
5974	5974	63,749	21,250	1	21,250	79,661	1.83
5975	58274	82,906	27,635	1	27,635	107,296	2.46
5976	67198	188,049	62,683	1	62,683	169,979	3.90
5977	74199	212,009	70,670	1	70,670	240,649	5.52
5978	81363	233,260	77,753	1	77,753	318,402	7.31
5979	88920	255,341	85,114	1	85,114	403,516	9.26
5980	96372	277,863	92,621	1	92,621	496,137	11.39

WQ ELEV	5974.43	FT	WQ VOLUME	1.59	AC-FT
EURV ELEV	5976.36	FT	EURV VOLUME	4.49	AC-FT
100YEAR ELEV	5979.06	FT	100YEAR VOLUME	9.40	AC-FT

DETENTION POND SIZING

Subdivisi Trails at Crowfoot

Project Name: Trails at Crowfoot
Project No. 254103
Calculated By: MRS

Pond D

SWMM 100 Year Volume (AC-FT)	EURV(AC-FT)	WQCV	Release Rate (CFS)
V100			
4.99	2.95	0.97	58.3

Storage Curve							
STAGE	SURFACE AREA	$A+B+(A*B)^{.5}$	1⁄3	ΔH	VOLUME	CUMULATIVE VOLUME	CUMULATIVE VOLUME
ft	ft^2	ft^2	ft^2	ft	ft^3	ft^3	ac-ft
5986	77.00	0	0	0	0	0	0
5987	5948	6,702	2,234	1	2,234	2,234	0.05
5988	22697	40,264	13,421	1	13,421	15,655	0.36
5989	28487	76,612	25,537	1	25,537	41,193	0.95
5990	31739	90,295	30,098	1	30,098	71,291	1.64
5991	35091	100,203	33,401	1	33,401	104,692	2.40
5992	38544	110,412	36,804	1	36,804	141,496	3.25
5993	49506	131,732	43,911	1	43,911	185,407	4.26
5994	53361	154,264	51,421	1	51,421	236,828	5.44

WQ ELEV	5989.04	FT	**WQ** VOLUME	0.97	AC-FT
EURV ELEV	5991.65	FT	**EURV**VOLUME	2.95	AC-FT
100YEAR ELEV	5993.62	FT	**100**YEAR VOLUME	4.99	AC-FT

LOW TAILWATER BASIN

Project Name: Trails at Crowfoot

Low Tailwater Basin 1:

Inputs:

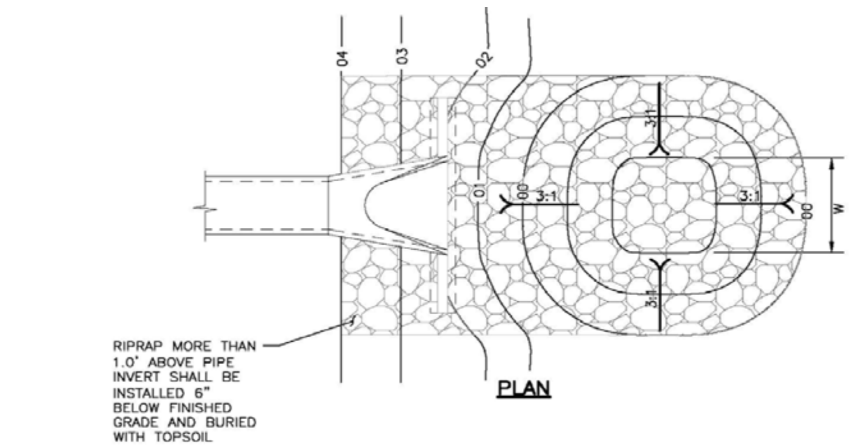
Q =	73 CFS
Y_t =	1 FT
D_c =	3 FT

Output:

L =	20 FT
W =	6 FT
D =	1.5 FT
D_{50} =	1.21
T=	2.42
Riprap	Type H

$$y_t \le \frac{D}{3} \quad \text{or} \quad y_t \le \frac{H}{3}$$

$$T = 2D_{50}$$



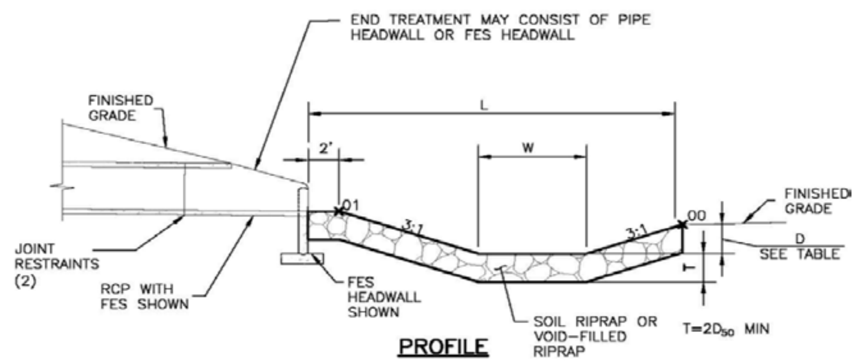
Low Tailwater Basin 2:

Inputs:

Q =	49.8 CFS
Y_t =	0.83 FT
D_c =	2.5 FT

Output:

L =	20 FT
W =	6 FT
D =	1.5 FT
D_{50} =	1.08
T=	2.16
Riprap	Type H

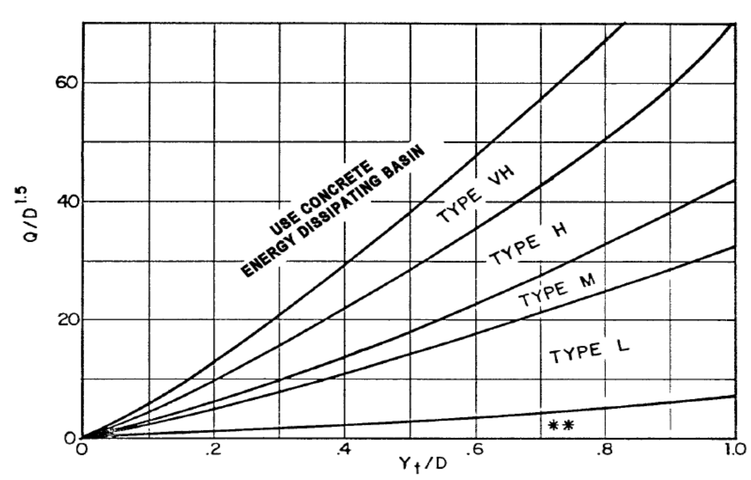


PIPE SIZE OR BOX HEIGHT	D	W*	L
18" – 24"	1'-0"	4'	15'
30" – 36"	1'-6"	6'	20'
42" – 48"	2'-0"	7'	24'
54" – 60"	2'-6"	8'	28'
66" – 72"	3'-0"	9'	32'

* IF OUTLET PIPE IS A BOX CULVERT WITH A WIDTH GREATER THAN W, THEN W = CULVERT WIDTH

Circular culvert:

$$d_{50} = \frac{0.023Q}{Y_t^{1.2} D_c^{0.3}} \qquad \text{Equation 9-16}$$



LOW TAILWATER BASIN

III. Hydraulic Computations

A. CUHP & SWMM

B. UD-Inlet

C. UD-Sewer

D. UD-Channel

E. UD-Culvert

III. Hydraulic Computations

A. CUHP/SWMM Analysis

Summary of Unit Hydrograph Parameters Used By Program and Calculated Results (Version 2.0.0)

5-Year

		Unit Hydrograph Parameters and Results									Excess Precip.		Storm Hydrograph			
Catchment Name/ID	User Comment for Catchment	CT	Cp	W50 (min.)	W50 Before Peak	W75 (min.)	W75 Before Peak	Time to Peak (min.)	Peak (cfs)	Volume (c.f)	Excess (inches)	Excess (c.f.)	Time to Peak (min.)	Peak Flow (cfs)	Total Volume (c.f.)	Runoff per Unit Area (cfs/acre)
A-1		0.088	0.110	37.0	4.62	19.2	3.27	7.7	23	67,228	0.82	55,256	35.0	12	55,111	0.64
A-2		0.091	0.119	30.3	4.28	15.8	3.02	7.1	38	89,008	0.77	68,525	35.0	17	68,228	0.71
A-3		0.092	0.086	34.9	3.80	18.2	2.68	6.3	17	45,041	0.74	33,504	35.0	8	33,412	0.62
A-4		0.097	0.071	45.4	3.97	23.6	2.80	6.6	12	40,571	0.63	25,740	40.0	5	25,689	0.44
B-1		0.098	0.120	39.4	5.15	20.5	3.64	8.6	46	140,004	0.62	86,452	40.0	19	86,263	0.49
B-2		0.087	0.145	32.1	5.07	16.7	3.59	8.5	47	117,093	0.86	100,261	35.0	24	100,020	0.74
C-1		0.090	0.115	37.8	4.85	19.7	3.42	8.1	28	81,636	0.77	63,267	35.0	13	63,097	0.60
D-1		0.086	0.128	25.6	4.01	13.3	2.83	6.7	43	84,381	0.89	74,921	35.0	21	74,697	0.89
E-1		0.089	0.208	27.0	5.82	14.1	4.11	9.7	137	286,904	0.80	230,270	35.0	64	229,665	0.81
F-1		0.087	0.139	32.2	4.94	16.7	3.49	8.2	43	107,166	0.86	91,861	35.0	22	91,625	0.74
F-2		0.096	0.089	32.5	3.73	16.9	2.63	6.2	26	65,882	0.64	42,318	35.0	11	42,128	0.58
OS-1		0.157	0.084	37.3	3.89	19.4	2.75	6.5	17	50,021	0.24	11,915	35.0	4	11,882	0.26
OS-2		0.157	0.067	52.8	4.23	27.5	2.99	7.0	8	30,863	0.24	7,351	40.0	2	7,339	0.19
OS-3		0.157	0.054	51.3	3.64	26.7	2.58	6.1	5	19,288	0.24	4,593	40.0	1	4,580	0.20
OS-4		0.157	0.041	94.8	4.45	49.3	3.15	7.4	1	10,028	0.24	2,388	45.0	0	2,386	0.11
OS-5		0.157	0.053	29.6	2.71	15.4	1.91	4.5	8	18,213	0.24	4,337	35.0	2	4,272	0.32

Summary of CUHP Input Parameters (Version 2.0.0)

5-Year

								Depression Storage		Horton's Infiltration Parameters			DCIA Level and Fractions			
Catchment Name/ID	SWMM Node/ID	Raingage Name/ID	Area (sq.mi.)	Dist. to Centroid (miles)	Length (miles)	Slope (ft./ft.)	Percent Imperv.	Pervious (inches)	Imperv. (inches)	Initial Rate (in./hr.)	Final Rate (in.hr.)	Decay Coeff. (1/sec.)	DCIA Level	Dir. Con'ct Imperv. Fraction	Receiv. Perv. Fraction	Percent Eff. Imperv.
A-1	A-1	R100	0.029	0.252	0.466	0.015	51.2	0.35	0.10	3.75	0.55	0.0018	0.00	0.86	0.23	49.42
A-2	A-2	R100	0.038	0.238	0.369	0.015	46.9	0.35	0.10	3.75	0.55	0.0018	0.00	0.83	0.22	45.11
A-3	A-3	R100	0.019	0.192	0.299	0.015	44.8	0.35	0.10	3.75	0.55	0.0018	0.00	0.82	0.21	42.96
A-4	A-4	R100	0.017	0.177	0.338	0.015	36.0	0.35	0.10	3.75	0.55	0.0018	0.00	0.72	0.19	33.78
B-1	B-1	R100	0.060	0.285	0.464	0.015	34.7	0.35	0.10	3.75	0.55	0.0018	0.00	0.69	0.18	32.34
B-2	B-2	R100	0.050	0.289	0.556	0.015	54.0	0.35	0.10	3.75	0.55	0.0018	0.00	0.87	0.25	52.28
C-1	C-1	R100	0.035	0.303	0.429	0.015	47.4	0.35	0.10	3.75	0.55	0.0018	0.00	0.84	0.22	45.54
D-1	D-1	R100	0.036	0.204	0.387	0.015	56.5	0.35	0.10	3.75	0.55	0.0018	0.00	0.88	0.26	54.91
E-1	E-1	R100	0.123	0.365	0.621	0.015	49.6	0.35	0.10	3.75	0.55	0.0018	0.00	0.85	0.23	47.82
F-1	F-1	R100	0.046	0.292	0.509	0.015	54.0	0.35	0.10	3.75	0.55	0.0018	0.00	0.87	0.25	52.36
F-2	F-2	R100	0.028	0.169	0.290	0.015	36.6	0.35	0.10	3.75	0.55	0.0018	0.00	0.73	0.19	34.45
OS-1	OS-1	R100	0.022	0.110	0.215	0.020	2.0	0.35	0.10	3.75	0.55	0.0018	0.00	0.04	0.02	1.60
OS-2	OS-2	R100	0.013	0.130	0.237	0.020	2.0	0.35	0.10	3.75	0.55	0.0018	0.00	0.04	0.02	1.60
OS-3	OS-3	R100	0.008	0.106	0.177	0.020	2.0	0.35	0.10	3.75	0.55	0.0018	0.00	0.00	0.02	1.58
OS-4	OS-4	R100	0.004	0.157	0.233	0.020	2.0	0.35	0.10	3.75	0.55	0.0018	0.00	0.00	0.02	1.58
OS-5	OS-5	R100	0.008	0.056	0.101	0.020	2.0	0.35	0.10	3.75	0.55	0.0018	0.00	0.00	0.02	1.58

Summary of Unit Hydrograph Parameters Used By Program and Calculated Results (Version 2.0.0) 100-Year

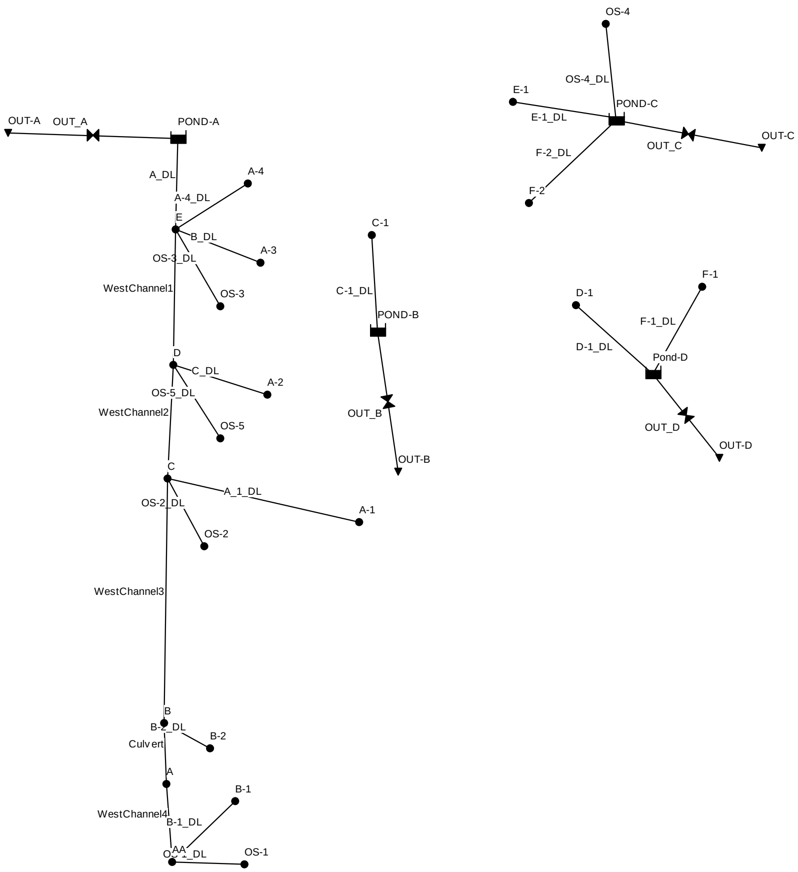
		Unit Hydrograph Parameters and Results									Excess Precip.		Storm Hydrograph			
Catchment Name/ID	User Comment for Catchment	CT	Cp	W50 (min.)	W50 Before Peak	W75 (min.)	W75 Before Peak	Time to Peak (min.)	Peak (cfs)	Volume (c.f)	Excess (inches)	Excess (c.f.)	Time to Peak (min.)	Peak Flow (cfs)	Total Volume (c.f.)	Runoff per Unit Area (cfs/acre)
A-1		0.088	0.111	36.6	4.61	19.0	3.26	7.7	24	67,228	2.13	143,277	45.0	32	142,942	1.75
A-2		0.090	0.120	30.0	4.27	15.6	3.02	7.1	38	89,008	2.08	184,928	40.0	48	184,183	1.97
A-3		0.091	0.086	34.5	3.79	17.9	2.67	6.3	17	45,041	2.05	92,371	45.0	22	92,109	1.76
A-4		0.096	0.072	44.4	3.95	23.1	2.79	6.6	12	40,571	1.94	78,696	45.0	16	78,545	1.42
B-1		0.097	0.123	38.5	5.12	20.0	3.62	8.5	47	140,004	1.92	269,185	45.0	61	268,509	1.58
B-2		0.087	0.146	31.8	5.06	16.5	3.58	8.4	48	117,093	2.17	253,675	45.0	63	253,010	1.95
C-1		0.090	0.116	37.3	4.83	19.4	3.41	8.1	28	81,636	2.08	170,042	45.0	38	169,608	1.70
D-1		0.086	0.128	25.3	4.00	13.2	2.83	6.7	43	84,381	2.20	185,542	40.0	54	184,931	2.30
E-1		0.089	0.210	26.7	5.80	13.9	4.10	9.7	139	286,904	2.11	605,759	40.0	174	604,289	2.20
F-1		0.087	0.140	31.9	4.93	16.6	3.48	8.2	43	107,166	2.17	232,271	45.0	57	231,631	1.94
F-2		0.096	0.090	31.8	3.71	16.6	2.62	6.2	27	65,882	1.95	128,310	40.0	33	127,722	1.80
OS-1		0.156	0.083	37.3	3.88	19.4	2.74	6.5	17	50,021	1.53	76,325	45.0	19	76,113	1.38
OS-2		0.156	0.067	52.8	4.22	27.5	2.98	7.0	8	30,863	1.53	47,093	50.0	9	47,011	1.07
OS-3		0.156	0.054	51.3	3.64	26.7	2.57	6.1	5	19,288	1.53	29,430	50.0	6	29,349	1.09
OS-4		0.156	0.040	94.8	4.44	49.3	3.14	7.4	1	10,028	1.53	15,301	65.0	2	15,287	0.68
OS-5		0.156	0.053	29.6	2.70	15.4	1.91	4.5	8	18,213	1.53	27,790	40.0	8	27,371	1.60

Summary of CUHP Input Parameters (Version 2.0.0) **100-Year**

								Depression Storage		Horton's Infiltration Parameters			DCIA Level and Fractions			
Catchment Name/ID	SWMM Node/ID	Raingage Name/ID	Area (sq.mi.)	Dist. to Centroid (miles)	Length (miles)	Slope (ft./ft.)	Percent Imperv.	Pervious (inches)	Imperv. (inches)	Initial Rate (in./hr.)	Final Rate (in.hr.)	Decay Coeff. (1/sec.)	DCIA Level	Dir. Con'ct Imperv. Fraction	Receiv. Perv. Fraction	Percent Eff. Imperv.
A-1	A-1	R100	0.029	0.252	0.466	0.015	51.2	0.35	0.10	3.75	0.55	0.0018	0.00	0.86	0.23	50.15
A-2	A-2	R100	0.038	0.238	0.369	0.015	46.9	0.35	0.10	3.75	0.55	0.0018	0.00	0.83	0.22	45.88
A-3	A-3	R100	0.019	0.192	0.299	0.015	44.8	0.35	0.10	3.75	0.55	0.0018	0.00	0.82	0.21	43.74
A-4	A-4	R100	0.017	0.177	0.338	0.015	36.0	0.35	0.10	3.75	0.55	0.0018	0.00	0.72	0.19	34.73
B-1	B-1	R100	0.060	0.285	0.464	0.015	34.7	0.35	0.10	3.75	0.55	0.0018	0.00	0.69	0.18	33.33
B-2	B-2	R100	0.050	0.289	0.556	0.015	54.0	0.35	0.10	3.75	0.55	0.0018	0.00	0.87	0.25	52.98
C-1	C-1	R100	0.035	0.303	0.429	0.015	47.4	0.35	0.10	3.75	0.55	0.0018	0.00	0.84	0.22	46.30
D-1	D-1	R100	0.036	0.204	0.387	0.015	56.5	0.35	0.10	3.75	0.55	0.0018	0.00	0.88	0.26	55.58
E-1	E-1	R100	0.123	0.365	0.621	0.015	49.6	0.35	0.10	3.75	0.55	0.0018	0.00	0.85	0.23	48.57
F-1	F-1	R100	0.046	0.292	0.509	0.015	54.0	0.35	0.10	3.75	0.55	0.0018	0.00	0.87	0.25	53.06
F-2	F-2	R100	0.028	0.169	0.290	0.015	36.6	0.35	0.10	3.75	0.55	0.0018	0.00	0.73	0.19	35.38
OS-1	OS-1	R100	0.022	0.110	0.215	0.020	2.0	0.35	0.10	3.75	0.55	0.0018	0.00	0.04	0.02	1.77
OS-2	OS-2	R100	0.013	0.130	0.237	0.020	2.0	0.35	0.10	3.75	0.55	0.0018	0.00	0.04	0.02	1.77
OS-3	OS-3	R100	0.008	0.106	0.177	0.020	2.0	0.35	0.10	3.75	0.55	0.0018	0.00	0.00	0.02	1.76
OS-4	OS-4	R100	0.004	0.157	0.233	0.020	2.0	0.35	0.10	3.75	0.55	0.0018	0.00	0.00	0.02	1.76
OS-5	OS-5	R100	0.008	0.056	0.101	0.020	2.0	0.35	0.10	3.75	0.55	0.0018	0.00	0.00	0.02	1.76

Trails 100 and 5 Year

01/01/2005 00:15:00



Trails 100-Year

```
EPA STORM WATER MANAGEMENT MODEL - VERSION 5.1 (Build 5.1.009)
--------------------------------------------------------------

WARNING 04: minimum elevation drop used for Conduit C-1_DL
WARNING 04: minimum elevation drop used for Conduit F-1_DL
WARNING 04: minimum elevation drop used for Conduit C_DL
WARNING 04: minimum elevation drop used for Conduit B_DL
WARNING 04: minimum elevation drop used for Conduit B-2_DL
WARNING 04: minimum elevation drop used for Conduit B-1_DL
WARNING 04: minimum elevation drop used for Conduit OS-1_DL
WARNING 04: minimum elevation drop used for Conduit A_1_DL
WARNING 04: minimum elevation drop used for Conduit OS-2_DL
WARNING 04: minimum elevation drop used for Conduit OS-3_DL
WARNING 04: minimum elevation drop used for Conduit A-4_DL
WARNING 04: minimum elevation drop used for Conduit OS-5_DL
WARNING 04: minimum elevation drop used for Conduit D-1_DL
WARNING 02: maximum depth increased for Node E
WARNING 02: maximum depth increased for Node D
WARNING 02: maximum depth increased for Node C
WARNING 02: maximum depth increased for Node B
WARNING 02: maximum depth increased for Node A
WARNING 02: maximum depth increased for Node AA

*********************************************************
NOTE: The summary statistics displayed in this report are
based on results found at every computational time step,
not just on results from each reporting time step.
*********************************************************

****************
Analysis Options
****************
Flow Units ............... CFS
Process Models:
  Rainfall/Runoff ........ NO
  RDII ................... NO
  Snowmelt ............... NO
  Groundwater ............ NO
  Flow Routing ........... YES
```

Trails 100-Year

```
  Ponding Allowed ........ NO
  Water Quality .......... NO
Flow Routing Method ...... KINWAVE
Starting Date ............ JAN-01-2005 00:00:00
Ending Date .............. JAN-02-2005 06:00:00
Antecedent Dry Days ...... 0.0
Report Time Step ......... 00:15:00
Routing Time Step ........ 30.00 sec


**************************        Volume         Volume
Flow Routing Continuity        acre-feet      10^6 gal
**************************     ---------      ---------
Dry Weather Inflow .......         0.000          0.000
Wet Weather Inflow .......         0.000          0.000
Groundwater Inflow .......         0.000          0.000
RDII Inflow ..............         0.000          0.000
External Inflow ..........        58.139         18.945
External Outflow .........        54.098         17.629
Flooding Loss ............         0.000          0.000
Evaporation Loss .........         0.000          0.000
Exfiltration Loss ........         0.000          0.000
Initial Stored Volume ....         0.000          0.000
Final Stored Volume ......         4.101          1.336
Continuity Error (%) .....        -0.105


********************************
Highest Flow Instability Indexes
********************************
All links are stable.


*************************
Routing Time Step Summary
*************************
Minimum Time Step           :     30.00 sec
Average Time Step           :     30.00 sec
Maximum Time Step           :     30.00 sec
Percent in Steady State     :      0.00
```

Trails 100-Year

```
Average Iterations per Step :     1.00
Percent Not Converging      :     0.00
```

```
******************
Node Depth Summary
******************
```

Node	Type	Average Depth Feet	Maximum Depth Feet	Maximum HGL Feet	Time of Max Occurrence days	Time of Max Occurrence hr:min	Reported Max Depth Feet
E	JUNCTION	0.21	2.96	6004.96	0	00:57	2.95
A-1	JUNCTION	0.00	0.00	6004.74	0	00:00	0.00
A-4	JUNCTION	0.00	0.00	6002.00	0	00:00	0.00
A-3	JUNCTION	0.00	0.00	6002.00	0	00:00	0.00
B-1	JUNCTION	0.00	0.00	6007.80	0	00:00	0.00
B-2	JUNCTION	0.00	0.00	6007.00	0	00:00	0.00
A-2	JUNCTION	0.00	0.00	6003.40	0	00:00	0.00
D	JUNCTION	0.20	2.96	6006.36	0	00:54	2.93
C-1	JUNCTION	0.00	0.00	6095.00	0	00:00	0.00
C	JUNCTION	0.18	2.68	6007.42	0	00:52	2.64
E-1	JUNCTION	0.00	0.00	5980.00	0	00:00	0.00
F-1	JUNCTION	0.00	0.00	6010.00	0	00:00	0.00
B	JUNCTION	0.15	2.43	6009.44	0	00:46	2.43
A	JUNCTION	0.12	1.94	6009.45	0	00:46	1.94
AA	JUNCTION	0.12	1.95	6009.75	0	00:45	1.94
OS-1	JUNCTION	0.00	0.00	6007.80	0	00:00	0.00
OS-2	JUNCTION	0.00	0.00	6004.74	0	00:00	0.00
OS-3	JUNCTION	0.00	0.00	6002.00	0	00:00	0.00
OS-5	JUNCTION	0.00	0.00	6003.40	0	00:00	0.00
D-1	JUNCTION	0.00	0.00	6010.00	0	00:00	0.00
F-2	JUNCTION	0.00	0.00	5980.00	0	00:00	0.00
OS-4	JUNCTION	0.00	0.00	5980.00	0	00:00	0.00
OUT-A	OUTFALL	0.00	0.00	0.00	0	00:00	0.00
OUT-B	OUTFALL	0.00	0.00	0.00	0	00:00	0.00
OUT-C	OUTFALL	0.00	0.00	0.00	0	00:00	0.00
OUT-D	OUTFALL	0.00	0.00	0.00	0	00:00	0.00
POND-A	STORAGE	4.26	7.01	6003.01	0	01:33	7.00

Trails 100-Year

POND-B	STORAGE	0.28	4.06	6099.06	0	01:25	4.04
POND-C	STORAGE	2.69	5.78	5976.78	0	01:25	5.76
Pond-D	STORAGE	0.64	8.13	6018.13	0	01:27	8.12

****
Node Inflow Summary
****

Node	Type	Maximum Lateral Inflow CFS	Maximum Total Inflow CFS	Time of Max Occurrence days	hr:min	Lateral Inflow Volume 10^6 gal	Total Inflow Volume 10^6 gal	Flow Balance Error Percent
E	JUNCTION	0.00	268.86	0	00:57	0	9	0.000
A-1	JUNCTION	32.38	32.38	0	00:45	1.07	1.07	0.000
A-4	JUNCTION	15.86	15.86	0	00:45	0.588	0.588	0.000
A-3	JUNCTION	21.84	21.84	0	00:45	0.689	0.689	0.000
B-1	JUNCTION	61.05	61.05	0	00:45	2.01	2.01	0.000
B-2	JUNCTION	62.79	62.79	0	00:45	1.89	1.89	0.000
A-2	JUNCTION	48.39	48.39	0	00:40	1.38	1.38	0.000
D	JUNCTION	0.00	229.25	0	00:54	0	7.5	0.000
C-1	JUNCTION	38.25	38.25	0	00:45	1.27	1.27	0.000
C	JUNCTION	0.00	179.59	0	00:52	0	5.92	-0.000
E-1	JUNCTION	173.68	173.68	0	00:40	4.52	4.52	0.000
F-1	JUNCTION	57.30	57.30	0	00:45	1.73	1.73	0.000
B	JUNCTION	0.00	142.42	0	00:46	0	4.47	0.000
A	JUNCTION	0.00	79.96	0	00:46	0	2.58	0.000
AA	JUNCTION	0.00	80.13	0	00:45	0	2.58	0.000
OS-1	JUNCTION	19.08	19.08	0	00:45	0.569	0.569	0.000
OS-2	JUNCTION	9.06	9.06	0	00:50	0.352	0.352	0.000
OS-3	JUNCTION	5.77	5.77	0	00:50	0.22	0.22	0.000
OS-5	JUNCTION	8.04	8.04	0	00:40	0.205	0.205	0.000
D-1	JUNCTION	53.51	53.51	0	00:40	1.38	1.38	0.000
F-2	JUNCTION	32.70	32.70	0	00:40	0.955	0.955	0.000
OS-4	JUNCTION	1.87	1.87	0	01:05	0.114	0.114	0.000
OUT-A	OUTFALL	0.00	166.91	0	01:33	0	7.98	0.000
OUT-B	OUTFALL	0.00	23.43	0	01:25	0	1.27	0.000
OUT-C	OUTFALL	0.00	95.45	0	01:25	0	5.27	0.000

OUT-D	OUTFALL	0.00	50.88	0	01:27	0	3.12	0.000
POND-A	STORAGE	0.00	268.86	0	00:57	0	9	0.089
POND-B	STORAGE	0.00	38.25	0	00:45	0	1.27	0.051
POND-C	STORAGE	0.00	207.89	0	00:40	0	5.59	0.058
Pond-D	STORAGE	0.00	110.81	0	00:40	0	3.12	0.025

****
Node Surcharge Summary
****

Surcharging occurs when water rises above the top of the highest conduit.

Node	Type	Hours Surcharged	Max. Height Above Crown Feet	Min. Depth Below Rim Feet
E	JUNCTION	30.00	2.959	1.891
A-1	JUNCTION	30.00	0.000	0.000
A-4	JUNCTION	30.00	0.000	0.000
A-3	JUNCTION	30.00	0.000	0.000
B-1	JUNCTION	30.00	0.000	0.000
B-2	JUNCTION	30.00	0.000	0.000
A-2	JUNCTION	30.00	0.000	0.000
D	JUNCTION	30.00	2.964	1.886
C-1	JUNCTION	30.00	0.000	0.000
C	JUNCTION	30.00	2.682	2.168
E-1	JUNCTION	30.00	0.000	0.000
F-1	JUNCTION	30.00	0.000	0.000
B	JUNCTION	30.00	2.434	2.416
A	JUNCTION	30.00	1.944	2.906
AA	JUNCTION	30.00	1.946	2.904
OS-1	JUNCTION	30.00	0.000	0.000
OS-2	JUNCTION	30.00	0.000	0.000
OS-3	JUNCTION	30.00	0.000	0.000
OS-5	JUNCTION	30.00	0.000	0.000
D-1	JUNCTION	30.00	0.000	0.000
F-2	JUNCTION	30.00	0.000	0.000
OS-4	JUNCTION	30.00	0.000	0.000
POND-A	STORAGE	30.00	7.010	1.990

Trails 100-Year

POND-B	STORAGE	30.00	4.057	4.943
POND-C	STORAGE	30.00	5.775	3.225
Pond-D	STORAGE	30.00	8.126	0.874

****
Node Flooding Summary
****

No nodes were flooded.

****
Storage Volume Summary
****

Storage Unit	Average Volume 1000 ft3	Avg Pcnt Full	Evap Pcnt Loss	Exfil Pcnt Loss	Maximum Volume 1000 ft3	Max Pcnt Full	Time of Max Occurrence days hr:min	Maximum Outflow CFS
POND-A	212.623	31	0	0	470.197	68	0 01:33	166.91
POND-B	3.639	2	0	0	56.957	32	0 01:25	23.43
POND-C	84.167	12	0	0	345.848	48	0 01:24	95.45
Pond-D	11.607	5	0	0	181.062	83	0 01:26	50.88

****
Outfall Loading Summary
****

Outfall Node	Flow Freq Pcnt	Avg Flow CFS	Max Flow CFS	Total Volume 10^6 gal
OUT-A	99.67	9.91	166.91	7.979
OUT-B	28.53	5.50	23.43	1.268
OUT-C	99.67	6.54	95.45	5.265
OUT-D	30.81	12.52	50.88	3.115

Trails 100-Year

System	64.67	34.47	335.71	17.627

****
Link Flow Summary
****

Link	Type	Maximum |Flow| CFS	Time of Max Occurrence days	Time of Max Occurrence hr:min	Maximum |Veloc| ft/sec	Max/ Full Flow	Max/ Full Depth
A_DL	DUMMY	268.86	0	00:57			
C-1_DL	DUMMY	38.25	0	00:45			
E-1_DL	DUMMY	173.68	0	00:40			
F-1_DL	DUMMY	57.30	0	00:45			
WestChannel4	CHANNEL	79.96	0	00:46	1.75	0.12	0.40
Culvert	CONDUIT	79.98	0	00:46	8.32	0.37	0.40
WestChannel2	CHANNEL	178.85	0	00:55	2.29	0.26	0.55
C_DL	DUMMY	48.39	0	00:40			
B_DL	DUMMY	21.84	0	00:45			
B-2_DL	DUMMY	62.79	0	00:45			
B-1_DL	DUMMY	61.05	0	00:45			
OS-1_DL	DUMMY	19.08	0	00:45			
A_1_DL	DUMMY	32.38	0	00:45			
OS-2_DL	DUMMY	9.06	0	00:50			
OS-3_DL	DUMMY	5.77	0	00:50			
A-4_DL	DUMMY	15.86	0	00:45			
WestChannel1	CHANNEL	228.36	0	00:57	2.49	0.33	0.61
OS-5_DL	DUMMY	8.04	0	00:40			
WestChannel3	CHANNEL	139.55	0	00:53	2.14	0.20	0.50
D-1_DL	DUMMY	53.51	0	00:40			
F-2_DL	DUMMY	32.70	0	00:40			
OS-4_DL	DUMMY	1.87	0	01:05			
OUT_A	DUMMY	166.91	0	01:33			
OUT_B	DUMMY	23.43	0	01:25			
OUT_C	DUMMY	95.45	0	01:25			
OUT_D	DUMMY	50.88	0	01:27			

Trails 100-Year

```
*************************
Conduit Surcharge Summary
*************************

No conduits were surcharged.


Analysis begun on:  Mon Apr 17 07:56:26 2017
Analysis ended on:  Mon Apr 17 07:56:26 2017
Total elapsed time: < 1 sec
```

Trails 5-Year

EPA STORM WATER MANAGEMENT MODEL - VERSION 5.1 (Build 5.1.009)

WARNING 04: minimum elevation drop used for Conduit C-1_DL
WARNING 04: minimum elevation drop used for Conduit F-1_DL
WARNING 04: minimum elevation drop used for Conduit C_DL
WARNING 04: minimum elevation drop used for Conduit B_DL
WARNING 04: minimum elevation drop used for Conduit B-2_DL
WARNING 04: minimum elevation drop used for Conduit B-1_DL
WARNING 04: minimum elevation drop used for Conduit OS-1_DL
WARNING 04: minimum elevation drop used for Conduit A_1_DL
WARNING 04: minimum elevation drop used for Conduit OS-2_DL
WARNING 04: minimum elevation drop used for Conduit OS-3_DL
WARNING 04: minimum elevation drop used for Conduit A-4_DL
WARNING 04: minimum elevation drop used for Conduit OS-5_DL
WARNING 04: minimum elevation drop used for Conduit D-1_DL
WARNING 02: maximum depth increased for Node E
WARNING 02: maximum depth increased for Node D
WARNING 02: maximum depth increased for Node C
WARNING 02: maximum depth increased for Node B
WARNING 02: maximum depth increased for Node A
WARNING 02: maximum depth increased for Node AA

****
NOTE: The summary statistics displayed in this report are
based on results found at every computational time step,
not just on results from each reporting time step.
****

****
Analysis Options
****
Flow Units .... CFS

Trails 5-Year

Process Models:
  Rainfall/Runoff .... NO
  RDII .... NO
  Snowmelt .... NO
  Groundwater .... NO
  Flow Routing .... YES
  Ponding Allowed .... NO
  Water Quality .... NO
Flow Routing Method ...... KINWAVE
Starting Date JAN-01-2005 00:00:00
Ending Date JAN-02-2005 06:00:00
Antecedent Dry Days 0.0
Report Time Step 00:15:00
Routing Time Step .... 30.00 sec

**************************	Volume	Volume
Flow Routing Continuity	acre-feet	10^6 gal
**************************	---------	---------
Dry Weather Inflow	0.000	0.000
Wet Weather Inflow	0.000	0.000
Groundwater Inflow	0.000	0.000
RDII Inflow	0.000	0.000
External Inflow	20.669	6.735
External Outflow	16.708	5.444
Flooding Loss	0.000	0.000
Evaporation Loss	0.000	0.000
Exfiltration Loss	0.000	0.000
Initial Stored Volume	0.000	0.000
Final Stored Volume	4.044	1.318
Continuity Error (%)	-0.399	

****

Trails 5-Year

Highest Flow Instability Indexes
****
Link WestChannel1 (1)
Link A_DL (1)

****
Routing Time Step Summary
****
Minimum Time Step : 30.00 sec
Average Time Step : 30.00 sec
Maximum Time Step : 30.00 sec
Percent in Steady State : 0.00
Average Iterations per Step : 1.00
Percent Not Converging : 0.00

****
Node Depth Summary
****

Node	Type	Average Depth Feet	Maximum Depth Feet	Maximum HGL Feet	Time of Max Occurrence days hr:min	Reported Max Depth Feet
E	JUNCTION	0.14	1.83	6003.83	0 00:59	1.83
A-1	JUNCTION	0.00	0.00	6004.74	0 00:00	0.00
A-4	JUNCTION	0.00	0.00	6002.00	0 00:00	0.00
A-3	JUNCTION	0.00	0.00	6002.00	0 00:00	0.00
B-1	JUNCTION	0.00	0.00	6007.80	0 00:00	0.00
B-2	JUNCTION	0.00	0.00	6007.00	0 00:00	0.00
A-2	JUNCTION	0.00	0.00	6003.40	0 00:00	0.00
D	JUNCTION	0.13	1.83	6005.23	0 00:54	1.81

Trails 5-Year

C-1	JUNCTION	0.00	0.00	6095.00	0	00:00	0.00
C	JUNCTION	0.12	1.70	6006.44	0	00:50	1.67
E-1	JUNCTION	0.00	0.00	5980.00	0	00:00	0.00
F-1	JUNCTION	0.00	0.00	6010.00	0	00:00	0.00
B	JUNCTION	0.09	1.60	6008.60	0	00:37	1.57
A	JUNCTION	0.06	1.16	6008.66	0	00:47	1.06
AA	JUNCTION	0.06	1.29	6009.09	0	00:40	1.27
OS-1	JUNCTION	0.00	0.00	6007.80	0	00:00	0.00
OS-2	JUNCTION	0.00	0.00	6004.74	0	00:00	0.00
OS-3	JUNCTION	0.00	0.00	6002.00	0	00:00	0.00
OS-5	JUNCTION	0.00	0.00	6003.40	0	00:00	0.00
D-1	JUNCTION	0.00	0.00	6010.00	0	00:00	0.00
F-2	JUNCTION	0.00	0.00	5980.00	0	00:00	0.00
OS-4	JUNCTION	0.00	0.00	5980.00	0	00:00	0.00
OUT-A	OUTFALL	0.00	0.00	0.00	0	00:00	0.00
OUT-B	OUTFALL	0.00	0.00	0.00	0	00:00	0.00
OUT-C	OUTFALL	0.00	0.00	0.00	0	00:00	0.00
OUT-D	OUTFALL	0.00	0.00	0.00	0	00:00	0.00
POND-A	STORAGE	4.13	5.14	6001.14	0	02:08	5.13
POND-B	STORAGE	0.12	1.65	6096.65	0	01:21	1.64
POND-C	STORAGE	2.53	3.39	5974.39	0	01:14	3.39
Pond-D	STORAGE	0.28	3.96	6013.96	0	01:16	3.96

****
Node Inflow Summary
****

Node	Type	Maximum Lateral Inflow CFS	Maximum Total Inflow CFS	Time of Max Occurrence days hr:min	Lateral Inflow Volume 10^6 gal	Total Inflow Volume 10^6 gal	Flow Balance Error Percent

----

Trails 5-Year

E	JUNCTION	0.00	78.47	0 00:58	0	3	0.000
A-1	JUNCTION	11.78	11.78	0 00:35	0.412	0.412	0.000
A-4	JUNCTION	4.94	4.94	0 00:40	0.192	0.192	0.000
A-3	JUNCTION	7.63	7.63	0 00:35	0.25	0.25	0.000
B-1	JUNCTION	18.85	18.85	0 00:40	0.645	0.645	0.000
B-2	JUNCTION	23.86	23.86	0 00:35	0.748	0.748	0.000
A-2	JUNCTION	17.35	17.35	0 00:35	0.51	0.51	0.000
D	JUNCTION	0.00	68.34	0 00:54	0	2.52	0.000
C-1	JUNCTION	13.41	13.41	0 00:35	0.472	0.472	0.000
C	JUNCTION	0.00	55.04	0 00:50	0	1.97	0.000
E-1	JUNCTION	64.15	64.15	0 00:35	1.72	1.72	0.000
F-1	JUNCTION	21.80	21.80	0 00:35	0.685	0.685	0.000
B	JUNCTION	0.00	45.82	0 00:37	0	1.48	0.000
A	JUNCTION	0.00	25.46	0 00:47	0	0.734	-0.000
AA	JUNCTION	0.00	22.45	0 00:40	0	0.734	0.000
OS-1	JUNCTION	3.61	3.61	0 00:35	0.0889	0.0889	0.000
OS-2	JUNCTION	1.65	1.65	0 00:40	0.0549	0.0549	0.000
OS-3	JUNCTION	1.06	1.06	0 00:40	0.0343	0.0343	0.000
OS-5	JUNCTION	1.60	1.60	0 00:35	0.032	0.032	0.000
D-1	JUNCTION	20.73	20.73	0 00:35	0.559	0.559	0.000
F-2	JUNCTION	10.61	10.61	0 00:35	0.315	0.315	0.000
OS-4	JUNCTION	0.31	0.31	0 00:45	0.0178	0.0178	0.000
OUT-A	OUTFALL	0.00	35.58	0 02:08	0	1.99	0.000
OUT-B	OUTFALL	0.00	8.32	0 01:21	0	0.471	0.000
OUT-C	OUTFALL	0.00	38.97	0 01:14	0	1.74	0.000
OUT-D	OUTFALL	0.00	22.99	0 01:16	0	1.24	0.000
POND-A	STORAGE	0.00	78.47	0 00:58	0	3	0.048
POND-B	STORAGE	0.00	13.41	0 00:35	0	0.472	0.101
POND-C	STORAGE	0.00	75.04	0 00:35	0	2.05	0.152
Pond-D	STORAGE	0.00	42.53	0 00:35	0	1.24	0.052

****
Node Surcharge Summary

Trails 5-Year

****

Surcharging occurs when water rises above the top of the highest conduit.

Node	Type	Hours Surcharged	Max. Height Above Crown Feet	Min. Depth Below Rim Feet
E	JUNCTION	30.00	1.826	3.024
A-1	JUNCTION	30.00	0.000	0.000
A-4	JUNCTION	30.00	0.000	0.000
A-3	JUNCTION	30.00	0.000	0.000
B-1	JUNCTION	30.00	0.000	0.000
B-2	JUNCTION	30.00	0.000	0.000
A-2	JUNCTION	30.00	0.000	0.000
D	JUNCTION	30.00	1.833	3.017
C-1	JUNCTION	30.00	0.000	0.000
C	JUNCTION	30.00	1.703	3.147
E-1	JUNCTION	30.00	0.000	0.000
F-1	JUNCTION	30.00	0.000	0.000
B	JUNCTION	30.00	1.599	3.251
A	JUNCTION	30.00	1.156	3.694
AA	JUNCTION	30.00	1.289	3.561
OS-1	JUNCTION	30.00	0.000	0.000
OS-2	JUNCTION	30.00	0.000	0.000
OS-3	JUNCTION	30.00	0.000	0.000
OS-5	JUNCTION	30.00	0.000	0.000
D-1	JUNCTION	30.00	0.000	0.000
F-2	JUNCTION	30.00	0.000	0.000
OS-4	JUNCTION	30.00	0.000	0.000
POND-A	STORAGE	30.00	5.136	3.864
POND-B	STORAGE	30.00	1.652	7.348
POND-C	STORAGE	30.00	3.388	5.612
Pond-D	STORAGE	30.00	3.962	5.038

Trails 5-Year

****
Node Flooding Summary
****

No nodes were flooded.

****
Storage Volume Summary
****

Storage Unit	Average Volume 1000 ft3	Avg Pcnt Full	Evap Pcnt Loss	Exfil Pcnt Loss	Maximum Volume 1000 ft3	Max Pcnt Full	Time of Max Occurrence days hr:min	Maximum Outflow CFS
POND-A	201.055	29	0	0	286.859	42	0 02:08	35.58
POND-B	1.379	1	0	0	19.386	11	0 01:21	8.32
POND-C	71.198	10	0	0	128.891	18	0 01:14	38.97
Pond-D	3.559	2	0	0	55.254	25	0 01:15	22.99

****
Outfall Loading Summary
****

Outfall Node	Flow Freq Pcnt	Avg Flow CFS	Max Flow CFS	Total Volume 10^6 gal
OUT-A	99.42	2.48	35.58	1.990

OUT-B	26.61	2.19	8.32	0.471
OUT-C	99.42	2.17	38.97	1.739
OUT-D	27.89	5.52	22.99	1.243
System	63.33	12.36	78.41	5.444

****
Link Flow Summary
****

Link	Type	Maximum |Flow| CFS	Time of Max Occurrence days hr:min	Maximum |Veloc| ft/sec	Max/ Full Flow	Max/ Full Depth
A_DL	DUMMY	78.47	0 00:58			
C-1_DL	DUMMY	13.41	0 00:35			
E-1_DL	DUMMY	64.15	0 00:35			
F-1_DL	DUMMY	21.80	0 00:35			
WestChannel4	CHANNEL	25.46	0 00:47	1.62	0.04	0.24
Culvert	CONDUIT	24.61	0 00:48	5.77	0.11	0.18
WestChannel2	CHANNEL	54.02	0 00:55	1.75	0.08	0.35
C_DL	DUMMY	17.35	0 00:35			
B_DL	DUMMY	7.63	0 00:35			
B-2_DL	DUMMY	23.86	0 00:35			
B-1_DL	DUMMY	18.85	0 00:40			
OS-1_DL	DUMMY	3.61	0 00:35			
A_1_DL	DUMMY	11.78	0 00:35			
OS-2_DL	DUMMY	1.65	0 00:40			
OS-3_DL	DUMMY	1.06	0 00:40			
A-4_DL	DUMMY	4.94	0 00:40			
WestChannel1	CHANNEL	67.60	0 00:59	1.82	0.10	0.38
OS-5_DL	DUMMY	1.60	0 00:35			

Trails 5-Year

WestChannel3	CHANNEL	43.04	0	00:50	1.75	0.06	0.32
D-1_DL	DUMMY	20.73	0	00:35			
F-2_DL	DUMMY	10.61	0	00:35			
OS-4_DL	DUMMY	0.31	0	00:45			
OUT_A	DUMMY	35.58	0	02:08			
OUT_B	DUMMY	8.32	0	01:21			
OUT_C	DUMMY	38.97	0	01:14			
OUT_D	DUMMY	22.99	0	01:16			

****
Conduit Surcharge Summary
****

No conduits were surcharged.

Analysis begun on: Mon Apr 17 08:02:52 2017
Analysis ended on: Mon Apr 17 08:02:52 2017
Total elapsed time: < 1 sec

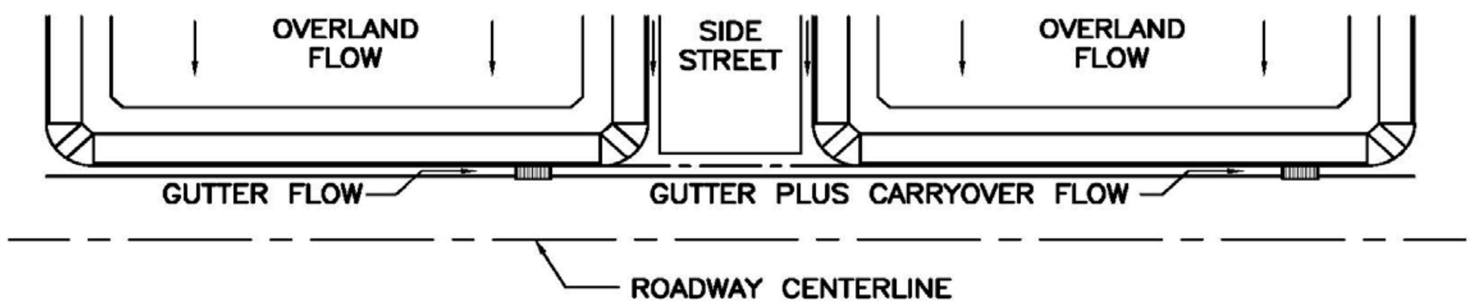
III. Hydraulic Computations

B. INLET AND STREET CAPACITY

Worksheet Protected

DESIGN PEAK FLOW FOR ONE-HALF OF STREET
OR GRASS-LINED CHANNEL BY THE RATIONAL METHOD

Project: **Trails at Crowfoot**
Inlet ID: **DP 1A**



Show Details

Design Flow: ONLY if already determined through other methods:
(local peak flow for 1/2 of street OR grass-lined channel):

	Minor Storm	Major Storm	
*Q_{Known} =	3.8	17.7	cfs

*** If you enter values in Row 14, skip the rest of this sheet and proceed to sheet Q-Allow or Area Inlet.**

<--- FILL IN THIS SECTION OR…

FILL IN THE SECTIONS BELOW. <---

Geographic Information: (Enter data in the blue cells):

Subcatchment Area =		Acres
Percent Imperviousness =		%
NRCS Soil Type =		A, B, C, or D

Site Type:
- ◯ Site is Urban
- ◯ Site is Non-Urban

Flows Developed For:
- ◯ Street Inlets
- ◯ Area Inlets in a Median

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

Rainfall Information: Intensity I (inch/hr) = $C_1 * P_1 / (C_2 + T_c)^{\wedge} C_3$

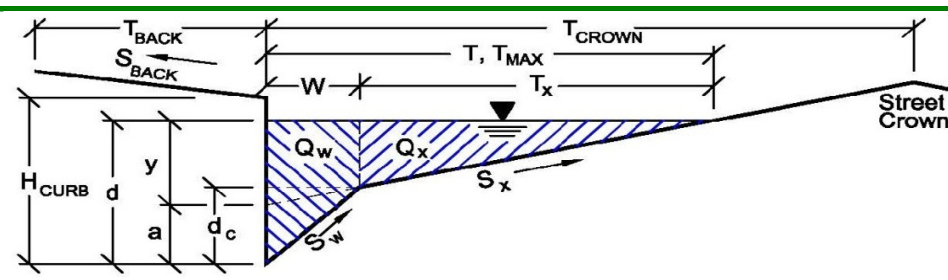
	Minor Storm	Major Storm	
Design Storm Return Period, T_r =			years
Return Period One-Hour Precipitation, P_1 =			inches
C_1 =			
C_2 =			
C_3 =			
User-Defined Storm Runoff Coefficient (leave this blank to accept a calculated value), C =			
User-Defined 5-yr. Runoff Coefficient (leave this blank to accept a calculated value), C_5 =			
Bypass (Carry-Over) Flow from upstream Subcatchments, Q_b =	**0.0**	**0.0**	**cfs**
Total Design Peak Flow, Q =	**3.8**	**17.7**	**cfs**

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

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

Project: Trails at Crowfoot

Inlet ID: DP 1A



Gutter Geometry (Enter data in the blue cells)

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	18.0	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} =	4.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	17.0	ft
Gutter Width	W =	2.00	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} =	0.016	

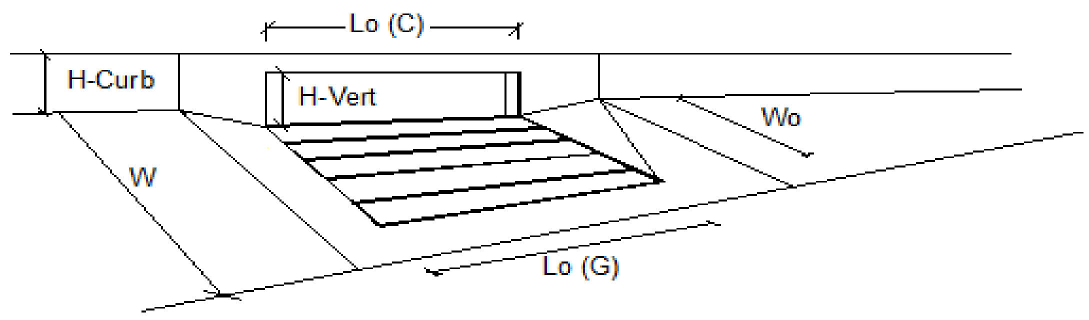
		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	17.0	17.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	4.0	12.0	inches
Allow Flow Depth at Street Crown (leave blank for no)		☐	☑	check = yes

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	**Q_{allow} =**	**4.8**	**156.5**	**cfs**

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

INLET ON A CONTINUOUS GRADE

Project: Trails at Crowfoot
Inlet ID: DP 1A

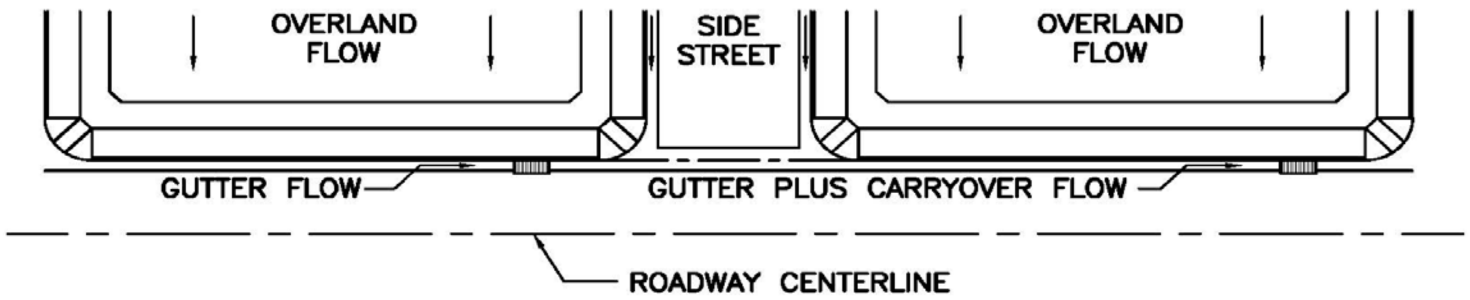


Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from 'Q-Allow')	a_{LOCAL} =	5.0	5.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)	No =	1	1	
Length of a Single Unit Inlet (Grate or Curb Opening)	L_o =	10.00	10.00	ft
Width of a Unit Grate (cannot be greater than W from Q-Allow)	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 < maximum allowable from sheet 'Q-Allow'		MINOR	MAJOR	
Total Inlet Interception Capacity	**Q =**	**3.84**	**10.14**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**0.0**	**7.6**	**cfs**
Capture Percentage = Q_a/Q_o =	**C% =**	**100**	**57**	**%**

Worksheet Protected

DESIGN PEAK FLOW FOR ONE-HALF OF STREET
OR GRASS-LINED CHANNEL BY THE RATIONAL METHOD

Project: **Trails at Crowfoot**
Inlet ID: **DP 1B**



Show Details

Design Flow: ONLY if already determined through other methods:

(local peak flow for 1/2 of street OR grass-lined channel):

	Minor Storm	Major Storm	
*Q_{Known} =	2.2	60.6	cfs

*** If you enter values in Row 14, skip the rest of this sheet and proceed to sheet Q-Allow or Area Inlet.**

<--- FILL IN THIS SECTION OR…

FILL IN THE SECTIONS BELOW. <---

Geographic Information: (Enter data in the blue cells):

Subcatchment Area =		Acres
Percent Imperviousness =		%
NRCS Soil Type =		A, B, C, or D

Site Type:
- ○ Site is Urban
- ○ Site is Non-Urban

Flows Developed For:
- ○ Street Inlets
- ○ Area Inlets in a Median

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

Rainfall Information: Intensity I (inch/hr) = $C_1 * P_1 / (C_2 + T_c)^{C_3}$

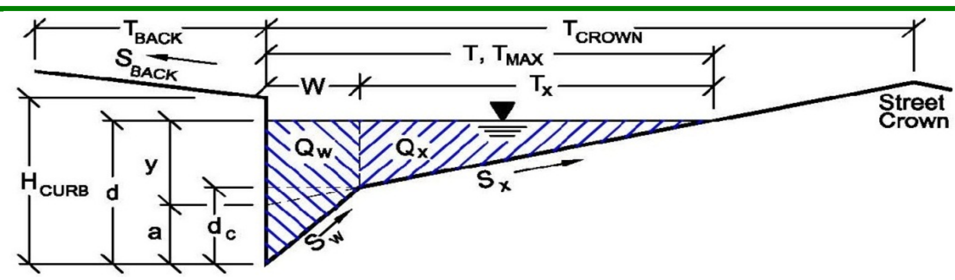
	Minor Storm	Major Storm	
Design Storm Return Period, T_r =			years
Return Period One-Hour Precipitation, P_1 =			inches
C_1 =			
C_2 =			
C_3 =			
User-Defined Storm Runoff Coefficient (leave this blank to accept a calculated value), C =			
User-Defined 5-yr. Runoff Coefficient (leave this blank to accept a calculated value), C_5 =			
Bypass (Carry-Over) Flow from upstream Subcatchments, Q_b =	**0.0**	**0.0**	**cfs**
Total Design Peak Flow, Q =	**2.2**	**60.6**	**cfs**

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

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

Project: Trails at Crowfoot

Inlet ID: DP 1B



Gutter Geometry (Enter data in the blue cells)

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	18.0	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} =	4.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	17.0	ft
Gutter Width	W =	2.00	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} =	0.016	

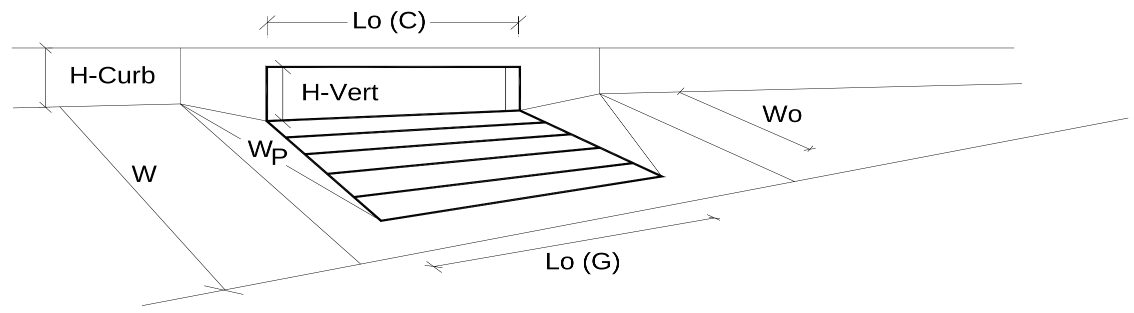
		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	17.0	17.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	4.0	12.0	inches
Allow Flow Depth at Street Crown (leave blank for no)		☐	☑	check = yes

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

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

INLET IN A SUMP OR SAG LOCATION

Project = Trails at Crowfoot
Inlet ID = DP 1B

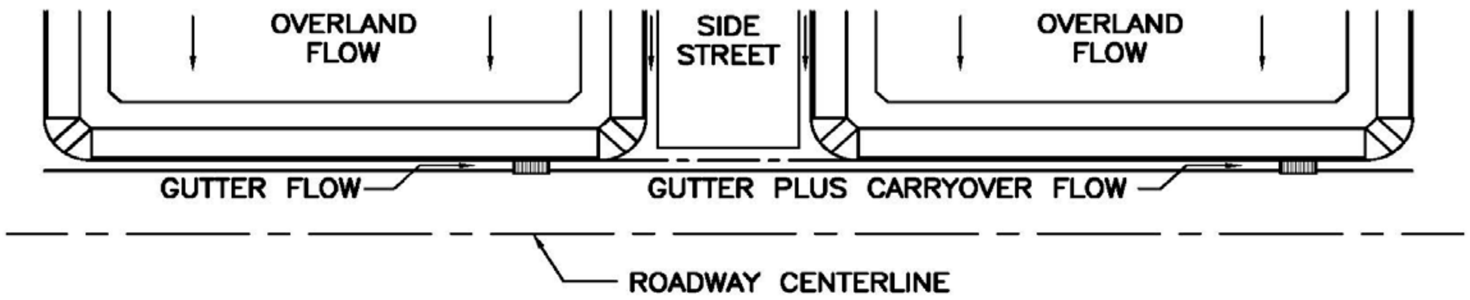


Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Inlet Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from 'Q-Allow')	a_{local} =	5.00	5.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	1	1	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	6.0	12.0	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) =	15.00	15.00	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	
		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	Q_a =	**9.7**	**42.1**	**cfs**
WARNING: Inlet Capacity less than Q Peak for MAJOR Storm	$Q_{PEAK\ REQUIRED}$ =	2.2	60.6	cfs

Worksheet Protected

DESIGN PEAK FLOW FOR ONE-HALF OF STREET OR GRASS-LINED CHANNEL BY THE RATIONAL METHOD

Project: Trails at Crowfoot
Inlet ID: DP 1C



Show Details

Design Flow: ONLY if already determined through other methods:
(local peak flow for 1/2 of street OR grass-lined channel):

	Minor Storm	Major Storm	
$^{*}Q_{Known}$ =	3.2	13.5	cfs

*** If you enter values in Row 14, skip the rest of this sheet and proceed to sheet Q-Allow or Area Inlet.**

<--- FILL IN THIS SECTION OR… FILL IN THE SECTIONS BELOW. <---

Geographic Information: (Enter data in the blue cells):

Subcatchment Area =		Acres
Percent Imperviousness =		%
NRCS Soil Type =		A, B, C, or D

Site Type:
- ○ Site is Urban
- ○ Site is Non-Urban

Flows Developed For:
- ○ Street Inlets
- ○ Area Inlets in a Median

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

Rainfall Information: Intensity I (inch/hr) = $C_1 * P_1 / (C_2 + T_c) ^{\wedge} C_3$

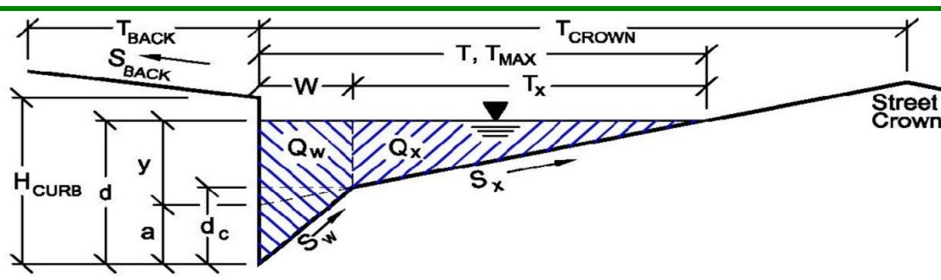
	Minor Storm	Major Storm	
Design Storm Return Period, T_r =			years
Return Period One-Hour Precipitation, P_1 =			inches
C_1 =			
C_2 =			
C_3 =			
User-Defined Storm Runoff Coefficient (leave this blank to accept a calculated value), C =			
User-Defined 5-yr. Runoff Coefficient (leave this blank to accept a calculated value), C_5 =			
Bypass (Carry-Over) Flow from upstream Subcatchments, Q_b =	**0.0**	**18.5**	**cfs**
Total Design Peak Flow, Q =	**3.2**	**32.0**	**cfs**

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

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

Project: Trails at Crowfoot

Inlet ID: DP 1C



Gutter Geometry (Enter data in the blue cells)

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	18.0	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} =	4.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	17.0	ft
Gutter Width	W =	2.00	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} =	0.016	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	17.0	17.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	4.0	12.0	inches
Allow Flow Depth at Street Crown (leave blank for no)		☐	☑	check = yes

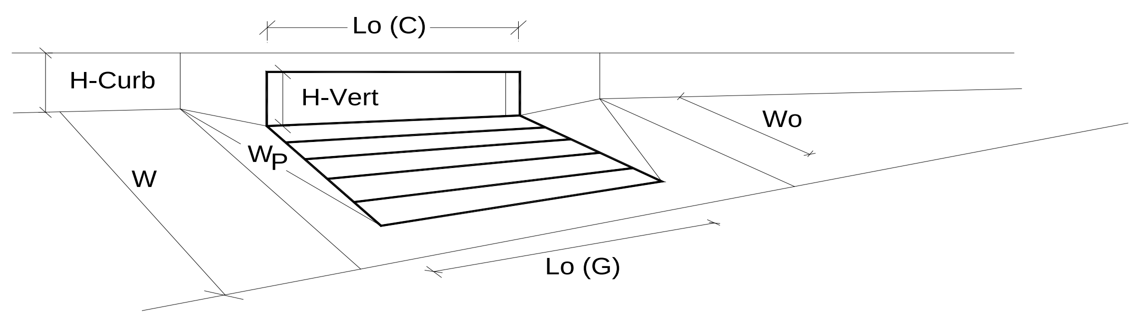
		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	**Q_{allow} =**	**SUMP**	**SUMP**	**cfs**

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

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

INLET IN A SUMP OR SAG LOCATION

Project = **Trails at Crowfoot**
Inlet ID = **DP 1C**

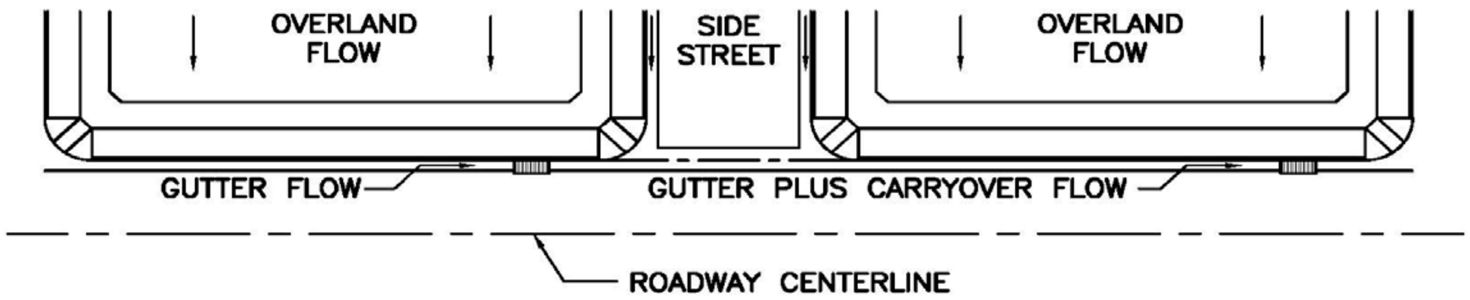


Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Inlet Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from 'Q-Allow')	a_{local} =	5.00	5.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	1	1	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	6.0	12.0	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) =	15.00	15.00	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	
		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	**Q_a =**	**9.7**	**42.1**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms (>Q PEAK)	$Q_{PEAK\ REQUIRED}$ =	3.2	32.0	cfs

Worksheet Protected

DESIGN PEAK FLOW FOR ONE-HALF OF STREET
OR GRASS-LINED CHANNEL BY THE RATIONAL METHOD

Project: **Trails at Crowfoot**
Inlet ID: **DP 1D**



Show Details

Design Flow: ONLY if already determined through other methods:

(local peak flow for 1/2 of street OR grass-lined channel):

	Minor Storm	Major Storm	
$*Q_{Known}$ =	2.8	15.4	cfs

*** If you enter values in Row 14, skip the rest of this sheet and proceed to sheet Q-Allow or Area Inlet.**

<--- FILL IN THIS SECTION OR… FILL IN THE SECTIONS BELOW. <---

Geographic Information: (Enter data in the blue cells):

Subcatchment Area =		Acres
Percent Imperviousness =		%
NRCS Soil Type =		A, B, C, or D

Site Type:
- ○ Site is Urban
- ○ Site is Non-Urban

Flows Developed For:
- ○ Street Inlets
- ○ Area Inlets in a Median

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

Rainfall Information: Intensity I (inch/hr) = $C_1 * P_1 / (C_2 + T_c)^{\wedge} C_3$

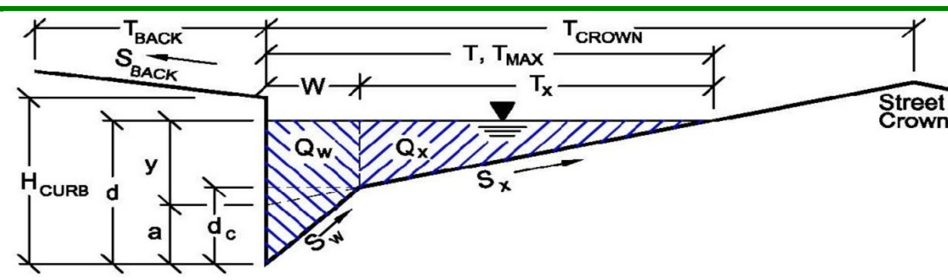
	Minor Storm	Major Storm	
Design Storm Return Period, T_r =			years
Return Period One-Hour Precipitation, P_1 =			inches
C_1 =			
C_2 =			
C_3 =			
User-Defined Storm Runoff Coefficient (leave this blank to accept a calculated value), C =			
User-Defined 5-yr. Runoff Coefficient (leave this blank to accept a calculated value), C_5 =			
Bypass (Carry-Over) Flow from upstream Subcatchments, Q_b =	**0.0**	**26.7**	**cfs**
Total Design Peak Flow, Q =	**2.8**	**42.1**	**cfs**

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

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

Project: Trails at Crowfoot

Inlet ID: DP 1D



Gutter Geometry (Enter data in the blue cells)

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	18.0	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} =	4.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	17.0	ft
Gutter Width	W =	2.00	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} =	0.016	

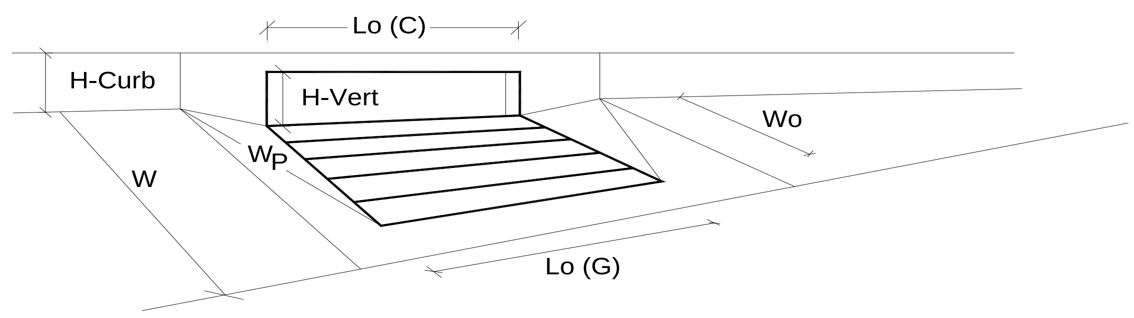
		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	17.0	17.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	4.0	12.0	inches
Allow Flow Depth at Street Crown (leave blank for no)		☐	☑	check = yes

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

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

INLET IN A SUMP OR SAG LOCATION

Project = **Trails at Crowfoot**
Inlet ID = **DP 1D**

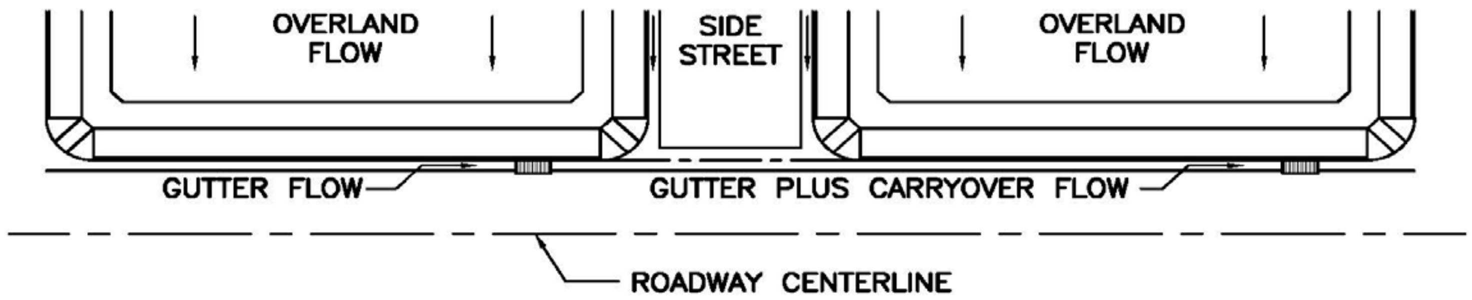


Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Inlet Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from 'Q-Allow')	a_{local} =	5.00	5.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	1	1	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	6.0	12.0	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) =	15.00	15.00	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	
		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	Q_a =	**9.7**	**42.1**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms (>Q PEAK)	$Q_{PEAK\ REQUIRED}$ =	2.8	42.1	cfs

Worksheet Protected

DESIGN PEAK FLOW FOR ONE-HALF OF STREET OR GRASS-LINED CHANNEL BY THE RATIONAL METHOD

Project: Trails at Crowfoot
Inlet ID: DP 1E



Show Details

Design Flow: ONLY if already determined through other methods:

		Minor Storm	Major Storm	
(local peak flow for 1/2 of street OR grass-lined channel):	*Q_{Known} =	2.3	68.7	cfs

*** If you enter values in Row 14, skip the rest of this sheet and proceed to sheet Q-Allow or Area Inlet.**

<--- FILL IN THIS SECTION OR…

FILL IN THE SECTIONS BELOW. <---

Geographic Information: (Enter data in the blue cells):

Subcatchment Area =		Acres
Percent Imperviousness =		%
NRCS Soil Type =		A, B, C, or D

Site Type:
- ○ Site is Urban
- ○ Site is Non-Urban

Flows Developed For:
- ○ Street Inlets
- ○ Area Inlets in a Median

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

Rainfall Information: Intensity I (inch/hr) = $C_1 * P_1 / (C_2 + T_c)$ ^ C_3

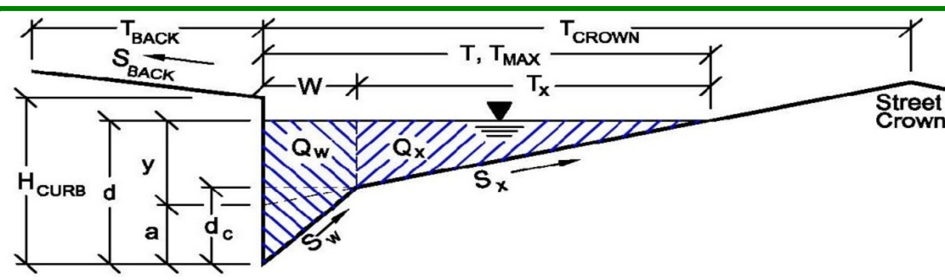
	Minor Storm	Major Storm	
Design Storm Return Period, T_r =			years
Return Period One-Hour Precipitation, P_1 =			inches
C_1 =			
C_2 =			
C_3 =			
User-Defined Storm Runoff Coefficient (leave this blank to accept a calculated value), C =			
User-Defined 5-yr. Runoff Coefficient (leave this blank to accept a calculated value), C_5 =			
Bypass (Carry-Over) Flow from upstream Subcatchments, Q_b =	0.0	0.0	cfs
Total Design Peak Flow, Q =	2.3	68.7	cfs

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

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

Project: Trails at Crowfoot

Inlet ID: DP 1E



Gutter Geometry (Enter data in the blue cells)

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	18.0	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} =	4.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	17.0	ft
Gutter Width	W =	2.00	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} =	0.016	

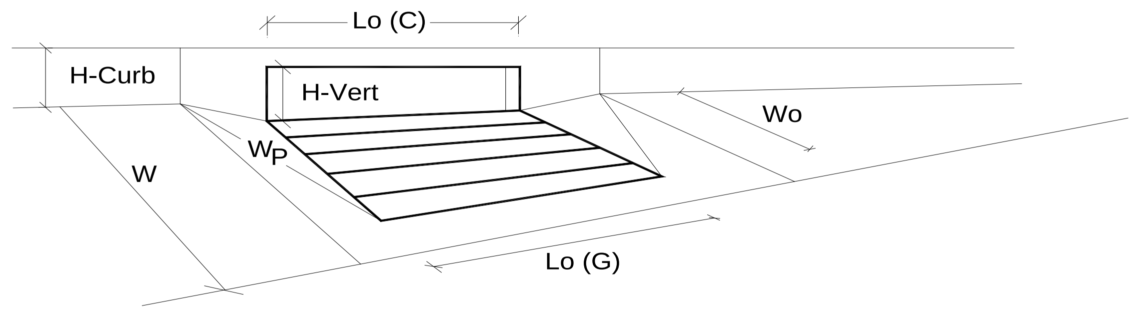
		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	17.0	17.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	4.0	12.0	inches
Allow Flow Depth at Street Crown (leave blank for no)		☐	☑	check = yes

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

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

INLET IN A SUMP OR SAG LOCATION

Project = **Trails at Crowfoot**
Inlet ID = **DP 1E**

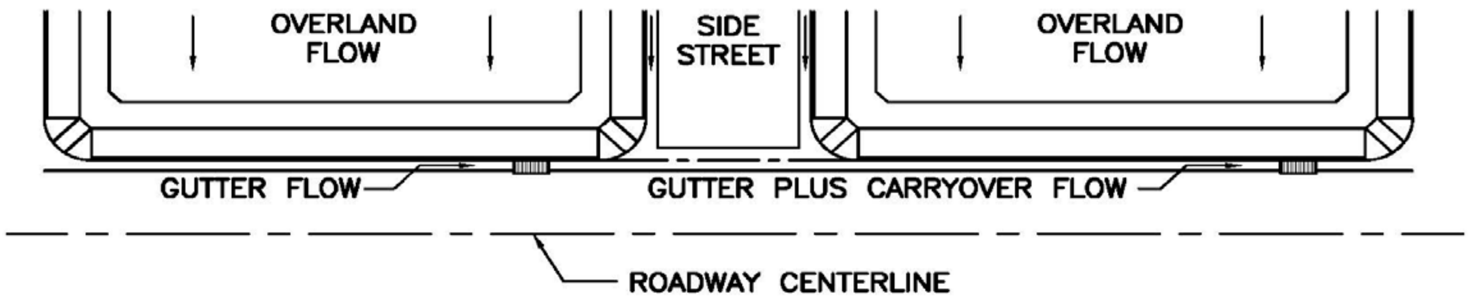


Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Inlet Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from 'Q-Allow')	a_{local} =	5.00	5.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	1	1	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	6.0	12.0	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) =	15.00	15.00	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	
		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	Q_a =	**9.7**	**42.1**	**cfs**
WARNING: Inlet Capacity less than Q Peak for MAJOR Storm	$Q_{PEAK\ REQUIRED}$ =	2.3	68.7	cfs

Worksheet Protected

DESIGN PEAK FLOW FOR ONE-HALF OF STREET
OR GRASS-LINED CHANNEL BY THE RATIONAL METHOD

Project: Trails at Crowfoot
Inlet ID: DP 1F



Show Details

Design Flow: ONLY if already determined through other methods:
(local peak flow for 1/2 of street OR grass-lined channel):

	Minor Storm	Major Storm	
*Q_{Known} =	3.6	45.2	cfs

*** If you enter values in Row 14, skip the rest of this sheet and proceed to sheet Q-Allow or Area Inlet.**

<--- FILL IN THIS SECTION OR…

FILL IN THE SECTIONS BELOW. <---

Geographic Information: (Enter data in the blue cells):

Subcatchment Area =		Acres
Percent Imperviousness =		%
NRCS Soil Type =		A, B, C, or D

Site Type:
○ Site is Urban
○ Site is Non-Urban

Flows Developed For:
○ Street Inlets
○ Area Inlets in a Median

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

Rainfall Information: Intensity I (inch/hr) = $C_1 * P_1 / (C_2 + T_c)$ ^ C_3

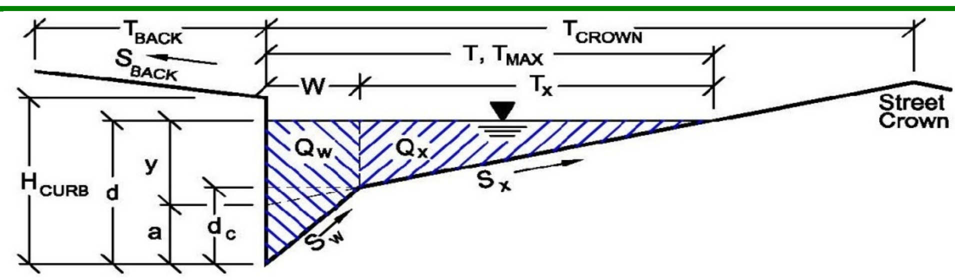
	Minor Storm	Major Storm	
Design Storm Return Period, T_r =			years
Return Period One-Hour Precipitation, P_1 =			inches
C_1 =			
C_2 =			
C_3 =			
User-Defined Storm Runoff Coefficient (leave this blank to accept a calculated value), C =			
User-Defined 5-yr. Runoff Coefficient (leave this blank to accept a calculated value), C_5 =			
Bypass (Carry-Over) Flow from upstream Subcatchments, Q_b =	**0.0**	**0.0**	**cfs**
Total Design Peak Flow, Q =	**3.6**	**45.2**	**cfs**

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

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

Project: Trails at Crowfoot

Inlet ID: DP 1F



Gutter Geometry (Enter data in the blue cells)

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	18.0	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} =	4.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	17.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.015	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	17.0	17.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	4.0	12.0	inches
Allow Flow Depth at Street Crown (leave blank for no)		☐	☑	check = yes

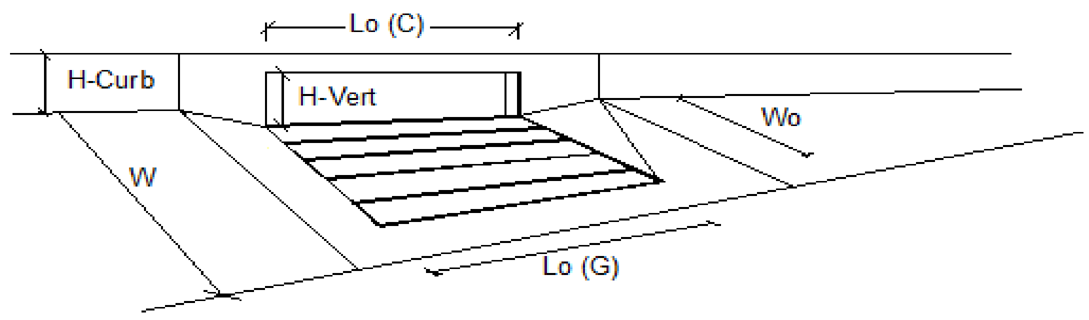
		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	**Q_{allow} =**	**4.1**	**162.5**	**cfs**

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

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

INLET ON A CONTINUOUS GRADE

Project: Trails at Crowfoot
Inlet ID: DP 1F

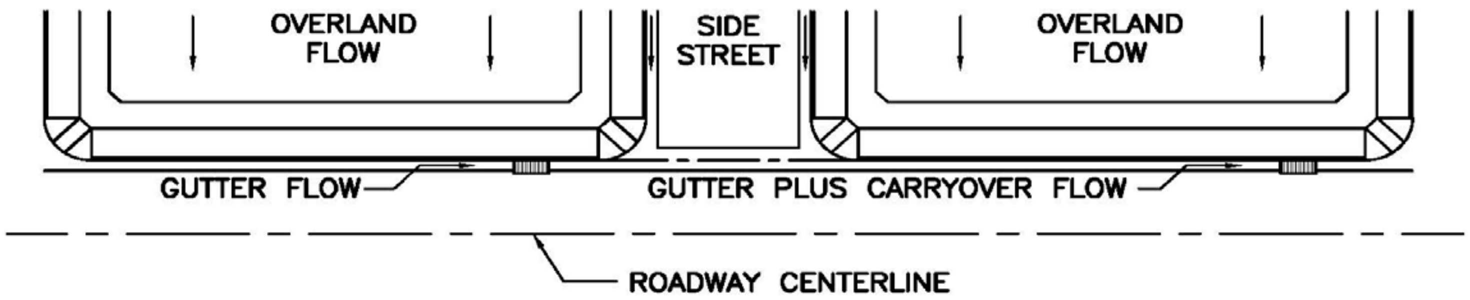


Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from 'Q-Allow')	a_{LOCAL} =	5.0	5.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)	No =	1	1	
Length of a Single Unit Inlet (Grate or Curb Opening)	L_o =	10.00	10.00	ft
Width of a Unit Grate (cannot be greater than W from Q-Allow)	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 < maximum allowable from sheet 'Q-Allow'		MINOR	MAJOR	
Total Inlet Interception Capacity	**Q =**	**3.60**	**14.60**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**0.0**	**30.5**	**cfs**
Capture Percentage = Q_a/Q_o =	**C% =**	**100**	**32**	**%**

Worksheet Protected

DESIGN PEAK FLOW FOR ONE-HALF OF STREET OR GRASS-LINED CHANNEL BY THE RATIONAL METHOD

Project: Trails at Crowfoot
Inlet ID: DP 1G



Show Details

Design Flow: ONLY if already determined through other methods:

		Minor Storm	Major Storm	
(local peak flow for 1/2 of street OR grass-lined channel):	*Q_{Known} =	5.0	55.6	cfs

*** If you enter values in Row 14, skip the rest of this sheet and proceed to sheet Q-Allow or Area Inlet.**

<--- FILL IN THIS SECTION OR…

FILL IN THE SECTIONS BELOW. <---

Geographic Information: (Enter data in the blue cells):

Subcatchment Area =		Acres
Percent Imperviousness =		%
NRCS Soil Type =		A, B, C, or D

Site Type:
- ○ Site is Urban
- ○ Site is Non-Urban

Flows Developed For:
- ○ Street Inlets
- ○ Area Inlets in a Median

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

Rainfall Information: Intensity I (inch/hr) = $C_1 * P_1 / (C_2 + T_c) ^ C_3$

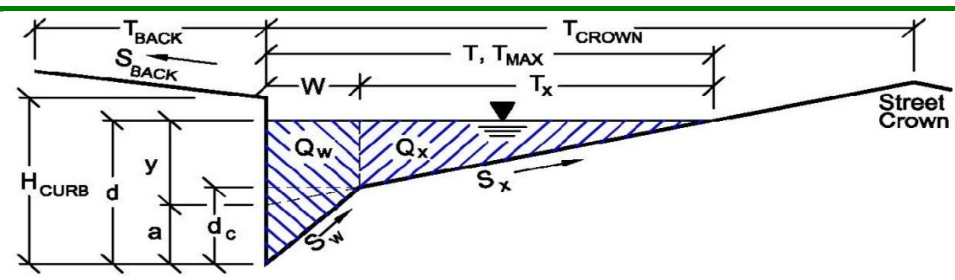
	Minor Storm	Major Storm	
Design Storm Return Period, T_r =			years
Return Period One-Hour Precipitation, P_1 =			inches
C_1 =			
C_2 =			
C_3 =			
User-Defined Storm Runoff Coefficient (leave this blank to accept a calculated value), C =			
User-Defined 5-yr. Runoff Coefficient (leave this blank to accept a calculated value), C_5 =			
Bypass (Carry-Over) Flow from upstream Subcatchments, Q_b =	0.0	0.0	cfs
Total Design Peak Flow, Q =	5.0	55.6	cfs

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

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

Project: Trails at Crowfoot

Inlet ID: DP 1G



Gutter Geometry (Enter data in the blue cells)

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	18.0	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} =	4.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	17.0	ft
Gutter Width	W =	2.00	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 =	0.040	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016	

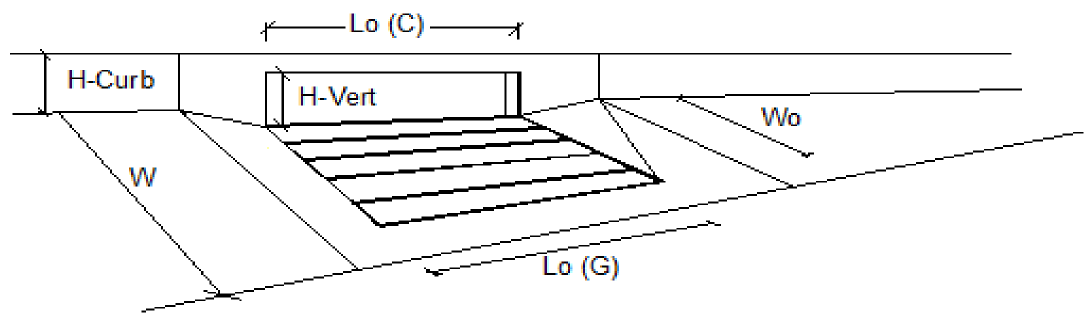
		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	17.0	17.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	4.0	12.0	inches
Allow Flow Depth at Street Crown (leave blank for no)		☐	☑	check = yes

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	**Q_{allow} =**	**6.8**	**127.1**	**cfs**

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

INLET ON A CONTINUOUS GRADE

Project: **Trails at Crowfoot**
Inlet ID: **DP 1G**

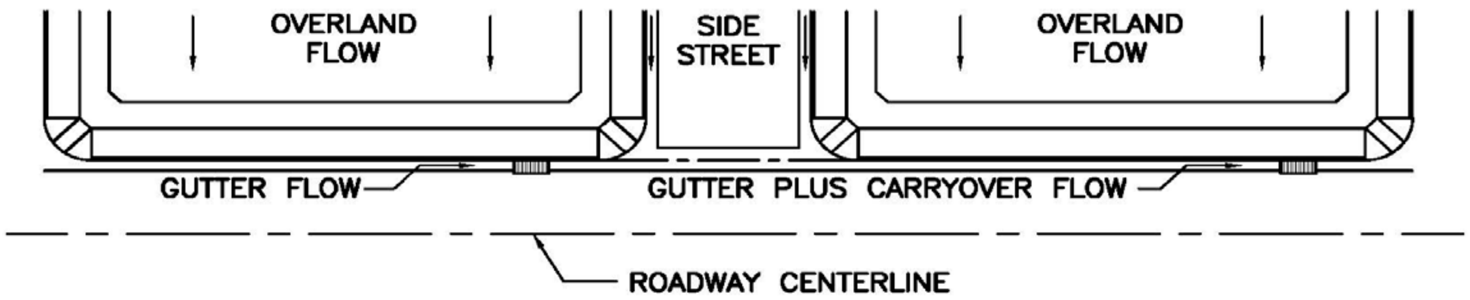


Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from 'Q-Allow')	a_{LOCAL} =	5.0	5.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)	No =	1	1	
Length of a Single Unit Inlet (Grate or Curb Opening)	L_o =	10.00	10.00	ft
Width of a Unit Grate (cannot be greater than W from Q-Allow)	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 < maximum allowable from sheet 'Q-Allow'		MINOR	MAJOR	
Total Inlet Interception Capacity	**Q =**	**4.95**	**16.28**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**0.0**	**39.3**	**cfs**
Capture Percentage = Q_a/Q_o =	**C% =**	**99**	**29**	**%**

Worksheet Protected

DESIGN PEAK FLOW FOR ONE-HALF OF STREET
OR GRASS-LINED CHANNEL BY THE RATIONAL METHOD

Project: Trails at Crowfoot
Inlet ID: DP 1H



Show Details

Design Flow: ONLY if already determined through other methods:
(local peak flow for 1/2 of street OR grass-lined channel):

	Minor Storm	Major Storm	
$^*Q_{Known}$ =	3.5	94.1	cfs

*** If you enter values in Row 14, skip the rest of this sheet and proceed to sheet Q-Allow or Area Inlet.**

<--- FILL IN THIS SECTION OR…

FILL IN THE SECTIONS BELOW. <---

Geographic Information: (Enter data in the blue cells):

Subcatchment Area =		Acres
Percent Imperviousness =		%
NRCS Soil Type =		A, B, C, or D

Site Type:
- Site is Urban
- Site is Non-Urban

Flows Developed For:
- Street Inlets
- Area Inlets in a Median

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

Rainfall Information: Intensity I (inch/hr) = $C_1 * P_1 / (C_2 + T_c)^{C_3}$

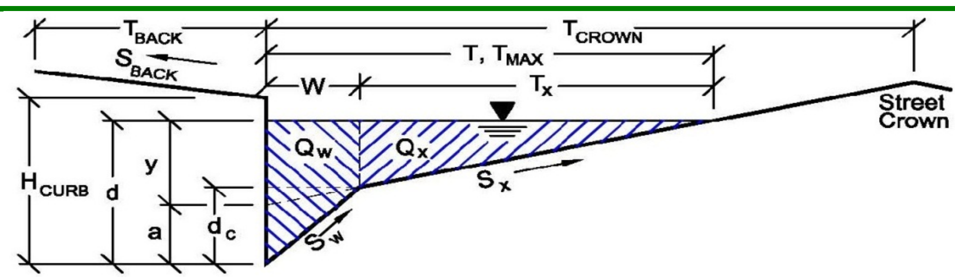
	Minor Storm	Major Storm	
Design Storm Return Period, T_r =			years
Return Period One-Hour Precipitation, P_1 =			inches
C_1 =			
C_2 =			
C_3 =			
User-Defined Storm Runoff Coefficient (leave this blank to accept a calculated value), C =			
User-Defined 5-yr. Runoff Coefficient (leave this blank to accept a calculated value), C_5 =			
Bypass (Carry-Over) Flow from upstream Subcatchments, Q_b =	0.0	0.0	cfs
Total Design Peak Flow, Q =	3.5	94.1	cfs

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

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

Project: Trails at Crowfoot

Inlet ID: DP 1H



Gutter Geometry (Enter data in the blue cells)

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	18.0	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} =	4.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	17.0	ft
Gutter Width	W =	2.00	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} =	0.016	

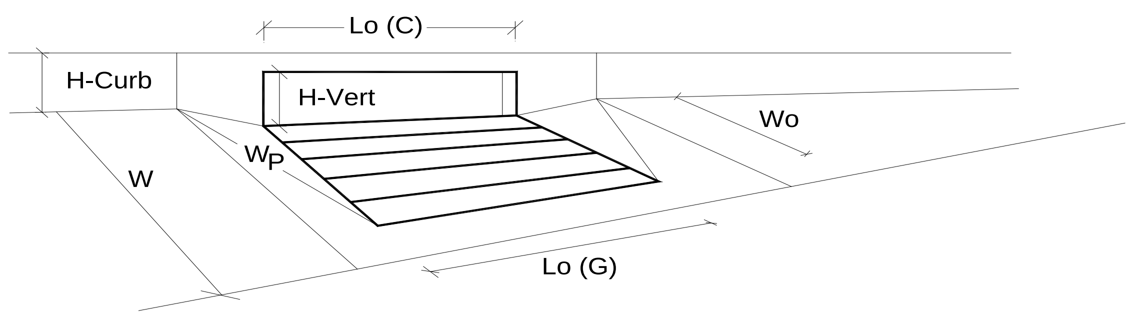
		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	17.0	17.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	4.0	12.0	inches
Allow Flow Depth at Street Crown (leave blank for no)		☐	☑	check = yes

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

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

INLET IN A SUMP OR SAG LOCATION

Project = **Trails at Crowfoot**
Inlet ID = **DP 1H**

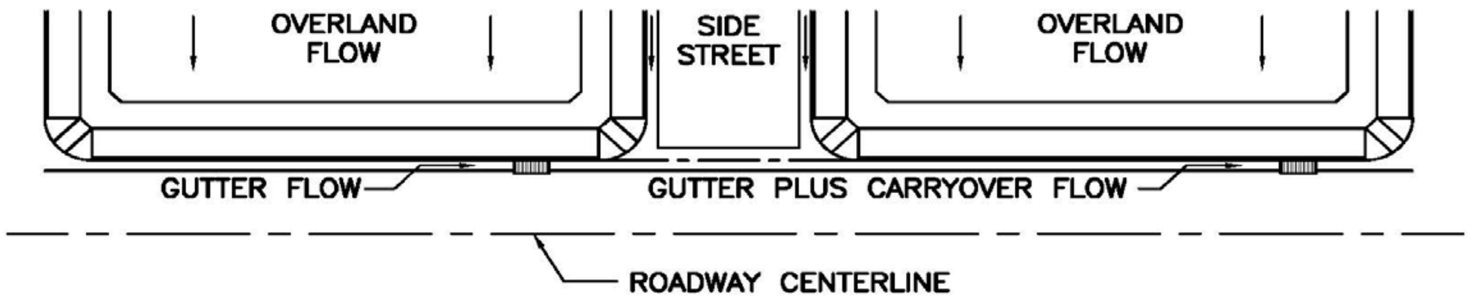


Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Inlet Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from 'Q-Allow')	a_{local} =	5.00	5.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	1	1	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	6.0	12.0	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	
		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	**Q_a =**	**8.3**	**27.5**	**cfs**
WARNING: Inlet Capacity less than Q Peak for MAJOR Storm	$Q_{PEAK\ REQUIRED}$ =	3.5	94.1	cfs

Worksheet Protected

DESIGN PEAK FLOW FOR ONE-HALF OF STREET
OR GRASS-LINED CHANNEL BY THE RATIONAL METHOD

Project: Trails at Crowfoot
Inlet ID: 1J



Show Details

Design Flow: ONLY if already determined through other methods:

		Minor Storm	Major Storm	
(local peak flow for 1/2 of street OR grass-lined channel):	*Q_{Known} =	4.5	18.3	cfs

*** If you enter values in Row 14, skip the rest of this sheet and proceed to sheet Q-Allow or Area Inlet.**

<--- FILL IN THIS SECTION OR… FILL IN THE SECTIONS BELOW. <---

Geographic Information: (Enter data in the blue cells):

Subcatchment Area =		Acres
Percent Imperviousness =		%
NRCS Soil Type =		A, B, C, or D

Site Type:
- ○ Site is Urban
- ○ Site is Non-Urban

Flows Developed For:
- ○ Street Inlets
- ○ Area Inlets in a Median

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

Rainfall Information: Intensity I (inch/hr) = $C_1 * P_1 / (C_2 + T_c)$ ^ C_3

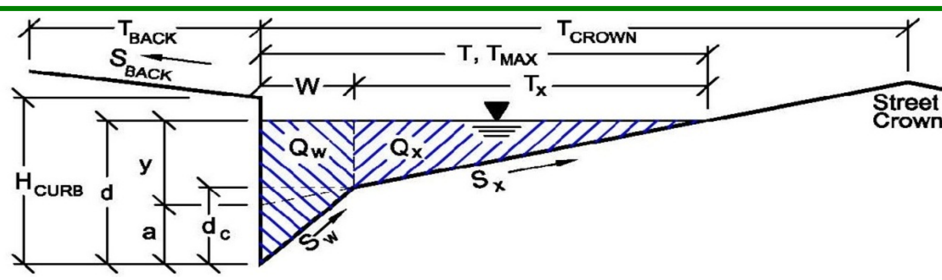
	Minor Storm	Major Storm	
Design Storm Return Period, T_r =			years
Return Period One-Hour Precipitation, P_1 =			inches
C_1 =			
C_2 =			
C_3 =			
User-Defined Storm Runoff Coefficient (leave this blank to accept a calculated value), C =			
User-Defined 5-yr. Runoff Coefficient (leave this blank to accept a calculated value), C_5 =			
Bypass (Carry-Over) Flow from upstream Subcatchments, Q_b =	**0.0**	**0.0**	**cfs**
Total Design Peak Flow, Q =	**4.5**	**18.3**	**cfs**

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

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

Project: Trails at Crowfoot

Inlet ID: 1J



Gutter Geometry (Enter data in the blue cells)

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	19.0	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} =	17.0	ft
Gutter Width	W =	2.50	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} =	0.016	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	17.0	17.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	12.0	inches
Allow Flow Depth at Street Crown (leave blank for no)		☐	☑	check = yes

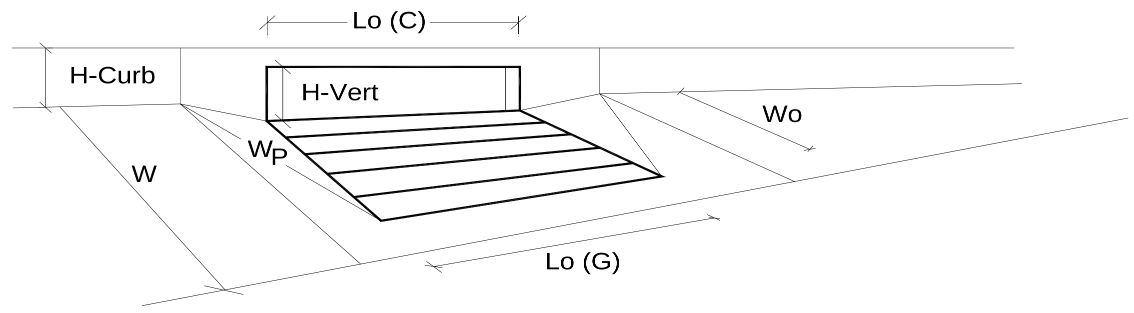
		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	Q_{allow} =	**SUMP**	**SUMP**	**cfs**

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

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

INLET IN A SUMP OR SAG LOCATION

Project = **Trails at Crowfoot**
Inlet ID = **1J**

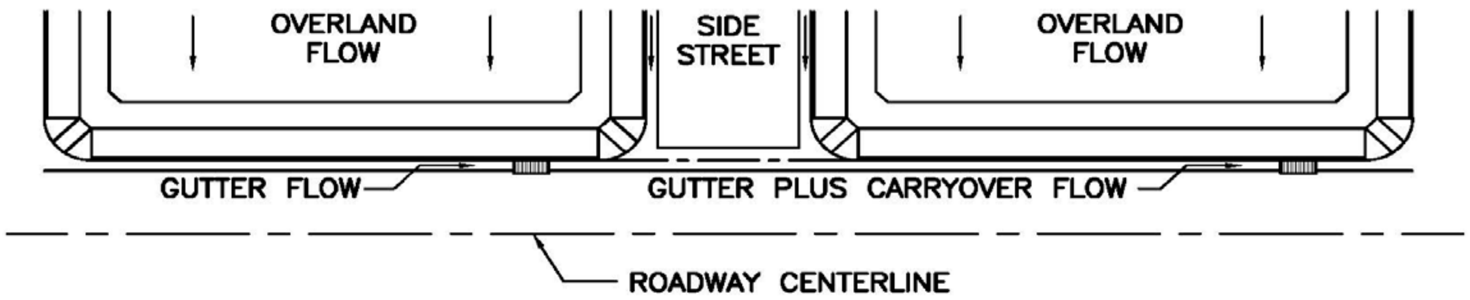


Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Inlet Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from 'Q-Allow')	a_{local} =	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	1	1	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	6.0	12.0	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 =	2.50	2.50	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	
		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	Q_a =	**7.2**	**25.5**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms (>Q PEAK)	$Q_{PEAK\ REQUIRED}$ =	4.5	18.3	cfs

Worksheet Protected

DESIGN PEAK FLOW FOR ONE-HALF OF STREET OR GRASS-LINED CHANNEL BY THE RATIONAL METHOD

Project: Trails at Crowfoot
Inlet ID: DP 1K



Show Details

Design Flow: ONLY if already determined through other methods:

	Minor Storm	Major Storm	
(local peak flow for 1/2 of street OR grass-lined channel): *Q_{Known} =	2.9	11.8	cfs

*** If you enter values in Row 14, skip the rest of this sheet and proceed to sheet Q-Allow or Area Inlet.**

<--- FILL IN THIS SECTION OR…

FILL IN THE SECTIONS BELOW. <---

Geographic Information: (Enter data in the blue cells):

Subcatchment Area =		Acres
Percent Imperviousness =		%
NRCS Soil Type =		A, B, C, or D

Site Type:
- ○ Site is Urban
- ○ Site is Non-Urban

Flows Developed For:
- ○ Street Inlets
- ○ Area Inlets in a Median

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

Rainfall Information: Intensity I (inch/hr) = $C_1 * P_1 / (C_2 + T_c)^{C_3}$

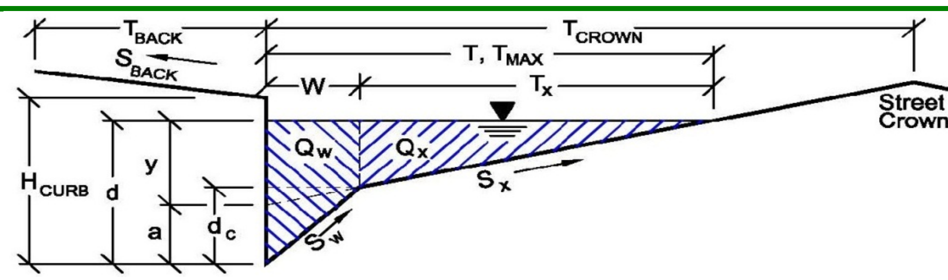
	Minor Storm	Major Storm	
Design Storm Return Period, T_r =			years
Return Period One-Hour Precipitation, P_1 =			inches
C_1 =			
C_2 =			
C_3 =			
User-Defined Storm Runoff Coefficient (leave this blank to accept a calculated value), C =			
User-Defined 5-yr. Runoff Coefficient (leave this blank to accept a calculated value), C_5 =			
Bypass (Carry-Over) Flow from upstream Subcatchments, Q_b =	0.0	0.0	cfs
Total Design Peak Flow, Q =	2.9	11.8	cfs

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

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

Project: **Trails at Crowfoot**

Inlet ID: **DP 1K**



Gutter Geometry (Enter data in the blue cells)

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	18.0	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} =	4.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	17.0	ft
Gutter Width	W =	2.00	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} =	0.016	

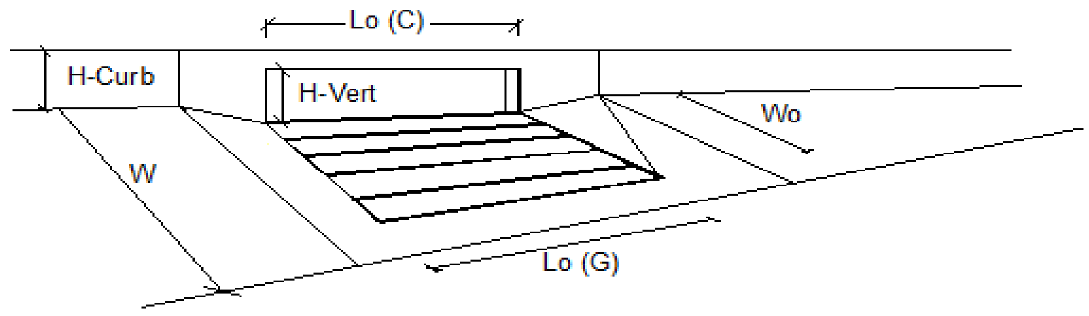
		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	17.0	17.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	4.0	12.0	inches
Allow Flow Depth at Street Crown (leave blank for no)		☐	☑	check = yes

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	Q_{allow} =	**4.8**	**156.5**	**cfs**

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

INLET ON A CONTINUOUS GRADE

Project: **Trails at Crowfoot**
Inlet ID: **DP 1K**

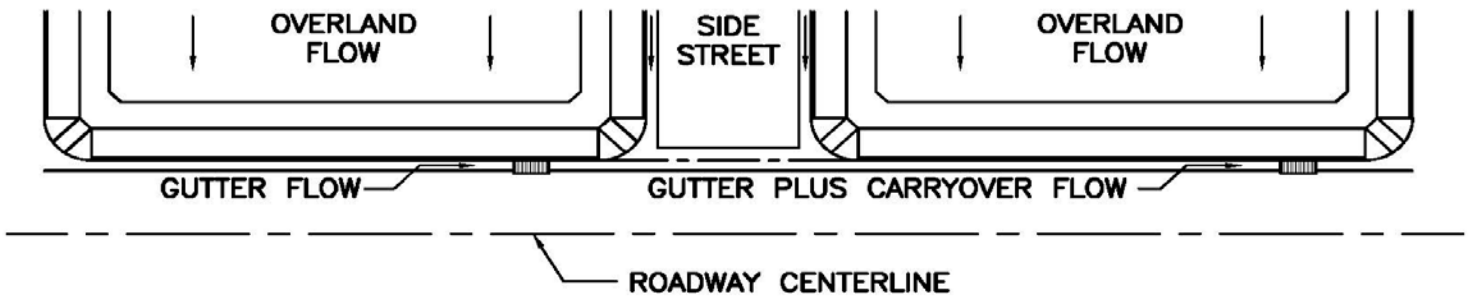


Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from 'Q-Allow')	a_{LOCAL} =	5.0	5.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)	No =	1	1	
Length of a Single Unit Inlet (Grate or Curb Opening)	L_o =	10.00	10.00	ft
Width of a Unit Grate (cannot be greater than W from Q-Allow)	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 < maximum allowable from sheet 'Q-Allow'		MINOR	MAJOR	
Total Inlet Interception Capacity	**Q =**	**2.90**	**8.40**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**0.0**	**3.3**	**cfs**
Capture Percentage = Q_a/Q_o =	**C% =**	**100**	**72**	**%**

Worksheet Protected

DESIGN PEAK FLOW FOR ONE-HALF OF STREET OR GRASS-LINED CHANNEL BY THE RATIONAL METHOD

Project: Trails at Crowfoot
Inlet ID: DP 1L



Show Details

Design Flow: ONLY if already determined through other methods:

		Minor Storm	Major Storm	
(local peak flow for 1/2 of street OR grass-lined channel):	*Q_{Known} =	3.2	14.0	cfs

*** If you enter values in Row 14, skip the rest of this sheet and proceed to sheet Q-Allow or Area Inlet.**

<--- FILL IN THIS SECTION OR…

FILL IN THE SECTIONS BELOW. <---

Geographic Information: (Enter data in the blue cells):

Subcatchment Area =		Acres
Percent Imperviousness =		%
NRCS Soil Type =		A, B, C, or D

Site Type:
- Site is Urban
- Site is Non-Urban

Flows Developed For:
- Street Inlets
- Area Inlets in a Median

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

Rainfall Information: Intensity I (inch/hr) = $C_1 * P_1 / (C_2 + T_c)^{C_3}$

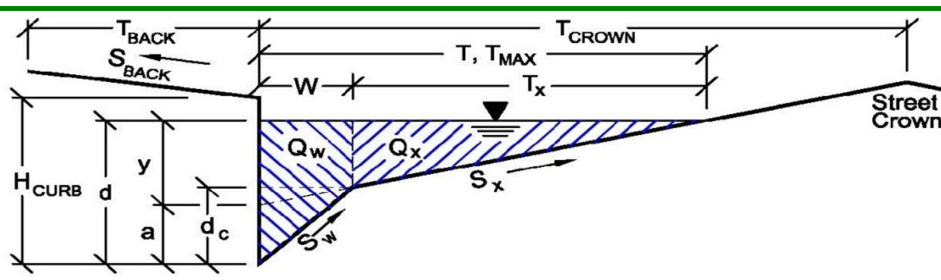
	Minor Storm	Major Storm	
Design Storm Return Period, T_r =			years
Return Period One-Hour Precipitation, P_1 =			inches
C_1 =			
C_2 =			
C_3 =			
User-Defined Storm Runoff Coefficient (leave this blank to accept a calculated value), C =			
User-Defined 5-yr. Runoff Coefficient (leave this blank to accept a calculated value), C_5 =			
Bypass (Carry-Over) Flow from upstream Subcatchments, Q_b =	**0.0**	**0.0**	**cfs**
Total Design Peak Flow, Q =	**3.2**	**14.0**	**cfs**

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

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

Project: Trails at Crowfoot

Inlet ID: DP 1L



Gutter Geometry (Enter data in the blue cells)

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	18.0	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} =	4.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	17.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.015	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016	

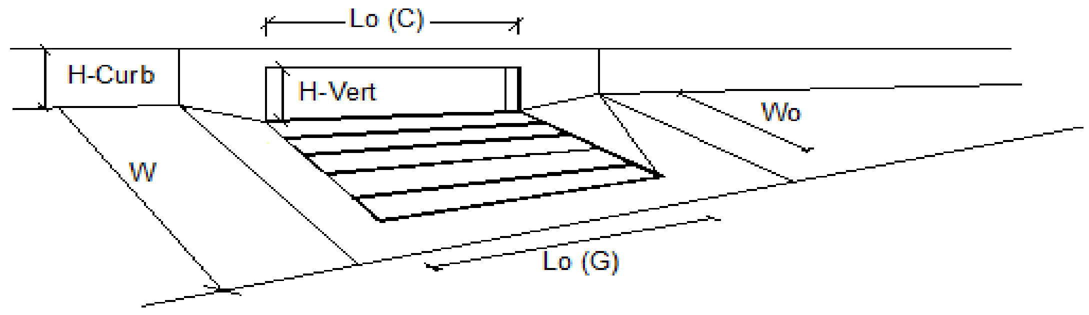
		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	17.0	17.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	4.0	12.0	inches
Allow Flow Depth at Street Crown (leave blank for no)		☐	☑	check = yes

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	Q_{allow} =	**4.1**	**162.5**	**cfs**

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

INLET ON A CONTINUOUS GRADE

Project: **Trails at Crowfoot**
Inlet ID: **DP 1L**

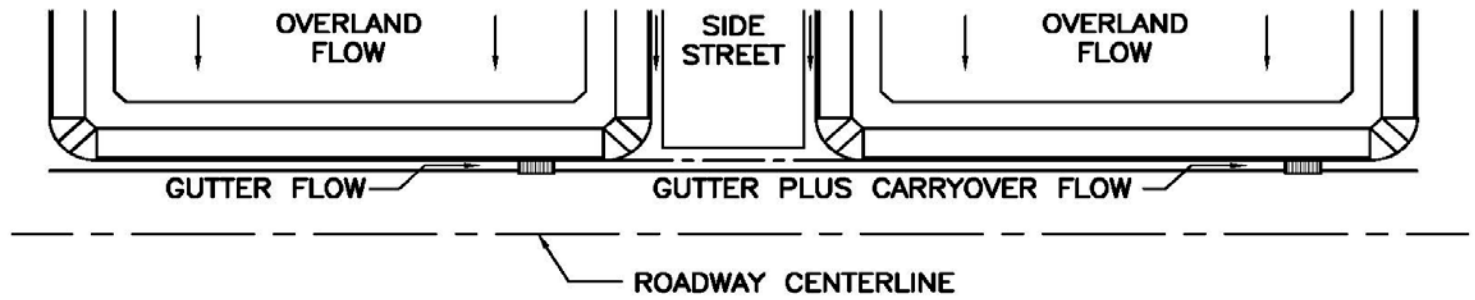


Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from 'Q-Allow')	a_{LOCAL} =	5.0	5.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)	No =	1	1	
Length of a Single Unit Inlet (Grate or Curb Opening)	L_o =	10.00	10.00	ft
Width of a Unit Grate (cannot be greater than W from Q-Allow)	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 < maximum allowable from sheet 'Q-Allow'		MINOR	MAJOR	
Total Inlet Interception Capacity	**Q =**	**3.20**	**9.02**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**0.0**	**4.9**	**cfs**
Capture Percentage = Q_a/Q_o =	**C% =**	**100**	**65**	**%**

Worksheet Protected

DESIGN PEAK FLOW FOR ONE-HALF OF STREET OR GRASS-LINED CHANNEL BY THE RATIONAL METHOD

Project: Trails at Crowfoot
Inlet ID: DP 1M



Show Details

Design Flow: ONLY if already determined through other methods:

		Minor Storm	Major Storm	
(local peak flow for 1/2 of street OR grass-lined channel):	$^*Q_{Known}$ =	6.8	30.0	cfs

*** If you enter values in Row 14, skip the rest of this sheet and proceed to sheet Q-Allow or Area Inlet.**

<--- FILL IN THIS SECTION OR…

FILL IN THE SECTIONS BELOW. <---

Geographic Information: (Enter data in the blue cells):

Subcatchment Area =		Acres
Percent Imperviousness =		%
NRCS Soil Type =		A, B, C, or D

Site Type:
- Site is Urban
- Site is Non-Urban

Flows Developed For:
- Street Inlets
- Area Inlets in a Median

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

Rainfall Information: Intensity I (inch/hr) = $C_1 * P_1 / (C_2 + T_c)$ ^ C_3

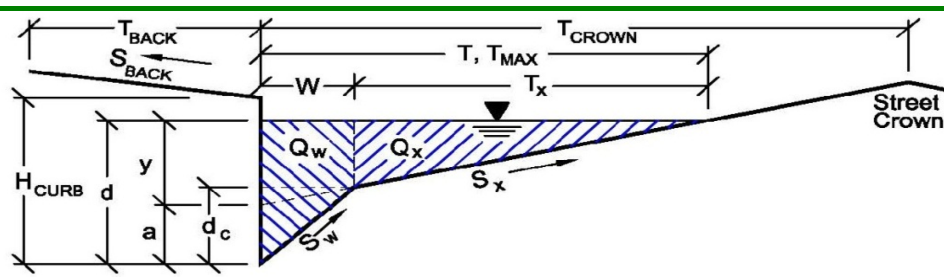
	Minor Storm	Major Storm	
Design Storm Return Period, T_r =			years
Return Period One-Hour Precipitation, P_1 =			inches
C_1 =			
C_2 =			
C_3 =			
User-Defined Storm Runoff Coefficient (leave this blank to accept a calculated value), C =			
User-Defined 5-yr. Runoff Coefficient (leave this blank to accept a calculated value), C_5 =			
Bypass (Carry-Over) Flow from upstream Subcatchments, Q_b =	0.0	0.0	cfs
Total Design Peak Flow, Q =	6.8	30.0	cfs

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

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

Project: Trails at Crowfoot

Inlet ID: DP 1M



Gutter Geometry (Enter data in the blue cells)

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	18.0	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} =	4.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	17.0	ft
Gutter Width	W =	2.00	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 =	0.050	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016	

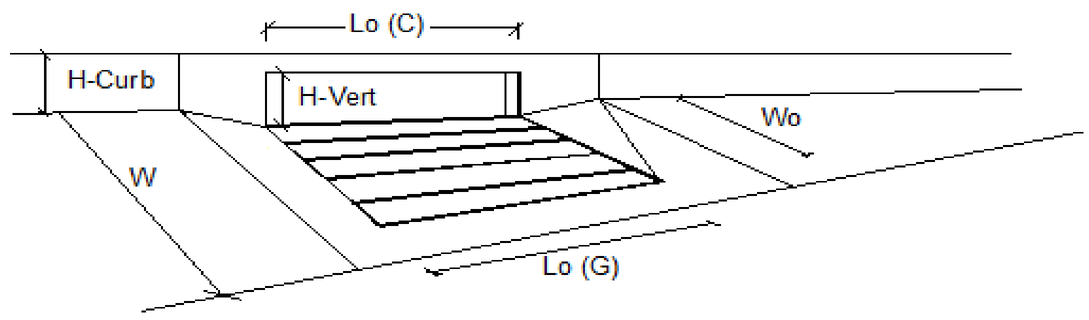
		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	17.0	17.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	4.0	12.0	inches
Allow Flow Depth at Street Crown (leave blank for no)		☐	☑	check = yes

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	**Q_{allow} =**	**7.6**	**118.9**	**cfs**

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

INLET ON A CONTINUOUS GRADE

Project: **Trails at Crowfoot**
Inlet ID: **DP 1M**

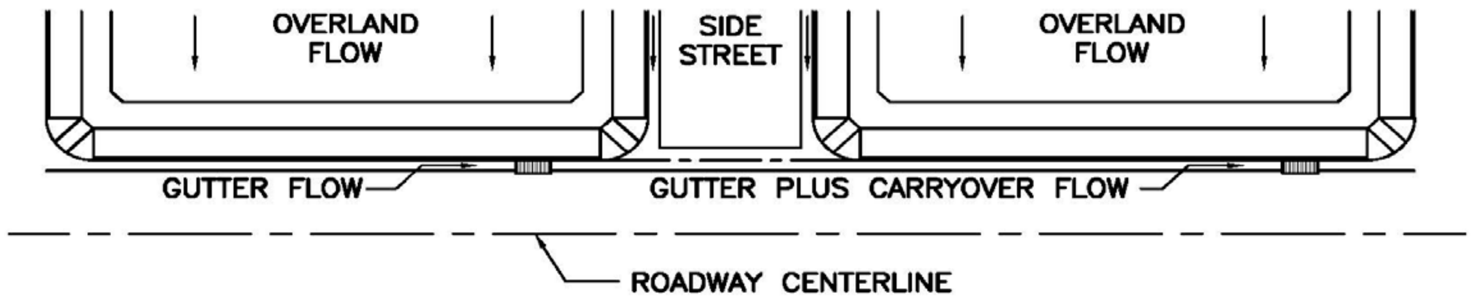


Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from 'Q-Allow')	a_{LOCAL} =	5.0	5.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)	No =	2	2	
Length of a Single Unit Inlet (Grate or Curb Opening)	L_o =	15.00	15.00	ft
Width of a Unit Grate (cannot be greater than W from Q-Allow)	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 < maximum allowable from sheet 'Q-Allow'		MINOR	MAJOR	
Total Inlet Interception Capacity	**Q =**	**6.80**	**27.59**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**0.0**	**2.4**	**cfs**
Capture Percentage = Q_a/Q_o =	**C% =**	**100**	**92**	**%**

Worksheet Protected

DESIGN PEAK FLOW FOR ONE-HALF OF STREET OR GRASS-LINED CHANNEL BY THE RATIONAL METHOD

Project: Trails at Crowfoot
Inlet ID: DP 1N



Show Details

Design Flow: ONLY if already determined through other methods:

		Minor Storm	Major Storm	
(local peak flow for 1/2 of street OR grass-lined channel):	*Q_{Known} =	1.9	49.8	cfs

*** If you enter values in Row 14, skip the rest of this sheet and proceed to sheet Q-Allow or Area Inlet.**

<--- FILL IN THIS SECTION OR… FILL IN THE SECTIONS BELOW. <---

Geographic Information: (Enter data in the blue cells):

Subcatchment Area =		Acres
Percent Imperviousness =		%
NRCS Soil Type =		A, B, C, or D

Site Type:
- ○ Site is Urban
- ○ Site is Non-Urban

Flows Developed For:
- ○ Street Inlets
- ○ Area Inlets in a Median

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

Rainfall Information: Intensity I (inch/hr) = $C_1 * P_1 / (C_2 + T_c)$ ^ C_3

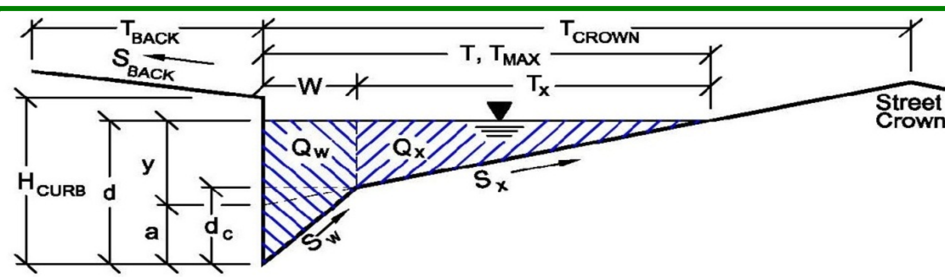
	Minor Storm	Major Storm	
Design Storm Return Period, T_r =			years
Return Period One-Hour Precipitation, P_1 =			inches
C_1 =			
C_2 =			
C_3 =			
User-Defined Storm Runoff Coefficient (leave this blank to accept a calculated value), C =			
User-Defined 5-yr. Runoff Coefficient (leave this blank to accept a calculated value), C_5 =			
Bypass (Carry-Over) Flow from upstream Subcatchments, Q_b =	0.0	0.0	cfs
Total Design Peak Flow, Q =	1.9	49.8	cfs

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

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

Project: **Trails at Crowfoot**

Inlet ID: **DP 1N**



Gutter Geometry (Enter data in the blue cells)

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	18.0	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} =	4.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	17.0	ft
Gutter Width	W =	2.00	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} =	0.016	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	17.0	17.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	4.0	12.0	inches
Allow Flow Depth at Street Crown (leave blank for no)		☐	☑	check = yes

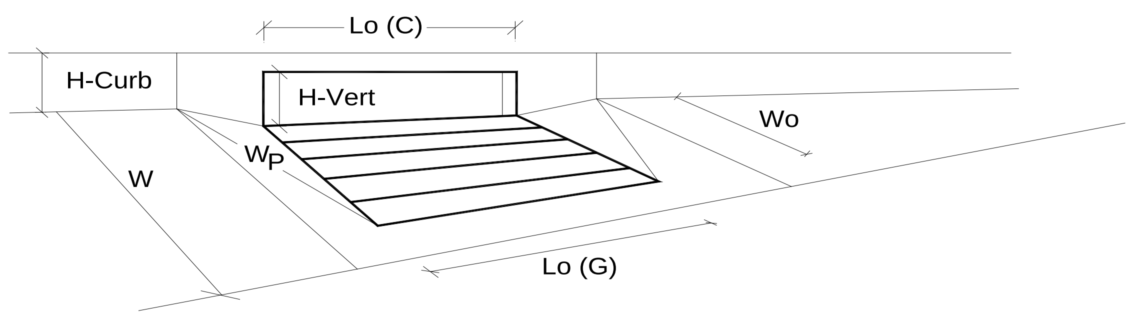
		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	Q_{allow} =	**SUMP**	**SUMP**	**cfs**

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

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

INLET IN A SUMP OR SAG LOCATION

Project = **Trails at Crowfoot**
Inlet ID = **DP 1N**

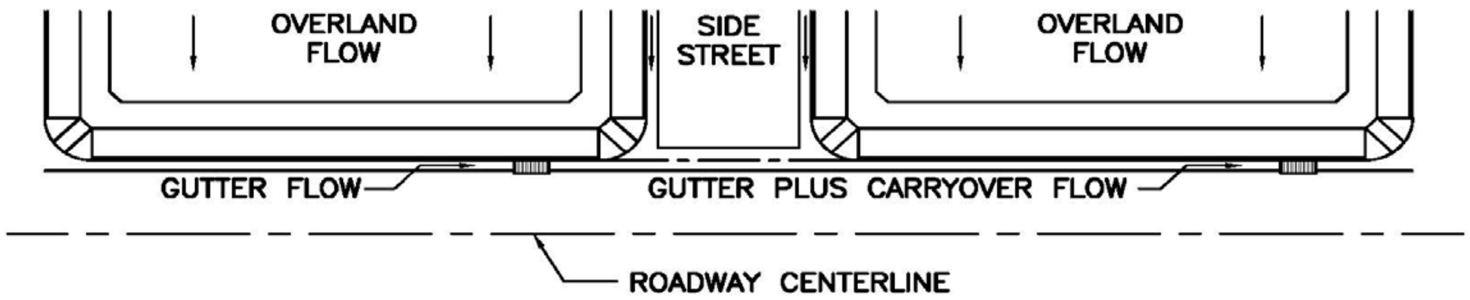


Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Inlet Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from 'Q-Allow')	a_{local} =	5.00	5.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	2	2	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	6.0	12.0	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	
		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	**Q_a =**	**14.4**	**56.8**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms (>Q PEAK)	$Q_{PEAK\ REQUIRED}$ =	1.9	49.8	cfs

Worksheet Protected

DESIGN PEAK FLOW FOR ONE-HALF OF STREET OR GRASS-LINED CHANNEL BY THE RATIONAL METHOD

Project: Trails at Crowfoot
Inlet ID: DP 1O



Show Details

Design Flow: ONLY if already determined through other methods:
(local peak flow for 1/2 of street OR grass-lined channel):

	Minor Storm	Major Storm	
*Q_{Known} =	3.6	24.0	cfs

*** If you enter values in Row 14, skip the rest of this sheet and proceed to sheet Q-Allow or Area Inlet.**

<--- FILL IN THIS SECTION OR…
FILL IN THE SECTIONS BELOW. <---

Geographic Information: (Enter data in the blue cells):

Subcatchment Area =		Acres
Percent Imperviousness =		%
NRCS Soil Type =		A, B, C, or D

Site Type:
- ○ Site is Urban
- ○ Site is Non-Urban

Flows Developed For:
- ○ Street Inlets
- ○ Area Inlets in a Median

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

Rainfall Information: Intensity I (inch/hr) = $C_1 * P_1 / (C_2 + T_c)^{C_3}$

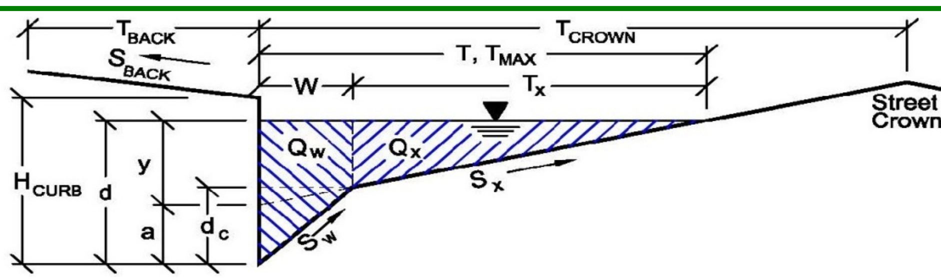
	Minor Storm	Major Storm	
Design Storm Return Period, T_r =			years
Return Period One-Hour Precipitation, P_1 =			inches
C_1 =			
C_2 =			
C_3 =			
User-Defined Storm Runoff Coefficient (leave this blank to accept a calculated value), C =			
User-Defined 5-yr. Runoff Coefficient (leave this blank to accept a calculated value), C_5 =			
Bypass (Carry-Over) Flow from upstream Subcatchments, Q_b =	**0.0**	**0.0**	**cfs**
Total Design Peak Flow, Q =	**3.6**	**24.0**	**cfs**

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

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

Project: **Trails at Crowfoot**

Inlet ID: **DP 1O**



Gutter Geometry (Enter data in the blue cells)

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	18.0	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} =	4.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	17.0	ft
Gutter Width	W =	2.00	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} =	0.016	

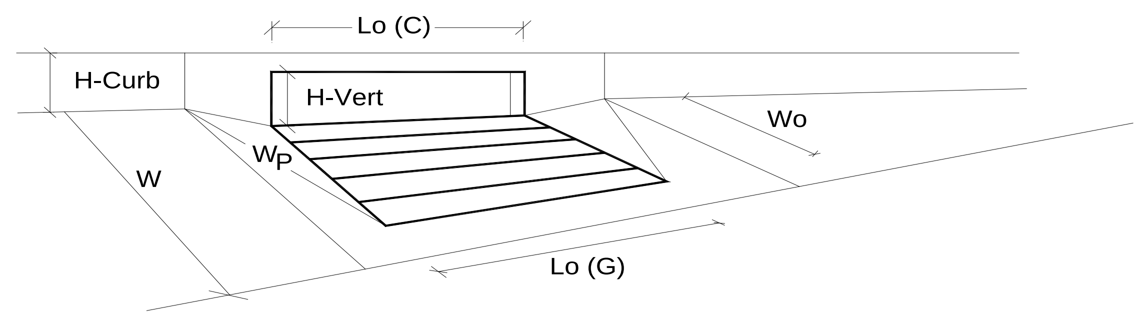
		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	17.0	17.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	4.0	12.0	inches
Allow Flow Depth at Street Crown (leave blank for no)		☐	☑	check = yes

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

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

INLET IN A SUMP OR SAG LOCATION

Project = **Trails at Crowfoot**
Inlet ID = **DP 1O**

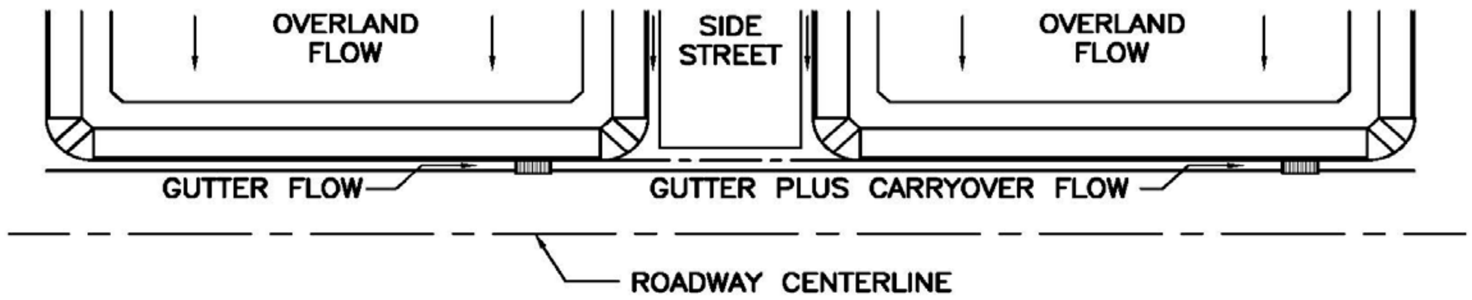


Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Inlet Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from 'Q-Allow')	a_{local} =	5.00	5.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	1	1	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	6.0	12.0	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	
		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	Q_a =	**8.3**	**27.5**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms (>Q PEAK)	Q PEAK REQUIRED =	3.6	24.0	cfs

Worksheet Protected

DESIGN PEAK FLOW FOR ONE-HALF OF STREET OR GRASS-LINED CHANNEL BY THE RATIONAL METHOD

Project: Trails at Crowfoot
Inlet ID: DP 1P



Show Details

Design Flow: ONLY if already determined through other methods:

(local peak flow for 1/2 of street OR grass-lined channel):

	Minor Storm	Major Storm	
*Q_{Known} =	1.4	21.5	cfs

*** If you enter values in Row 14, skip the rest of this sheet and proceed to sheet Q-Allow or Area Inlet.**

<--- FILL IN THIS SECTION OR…

FILL IN THE SECTIONS BELOW. <---

Geographic Information: (Enter data in the blue cells):

Subcatchment Area =		Acres
Percent Imperviousness =		%
NRCS Soil Type =		A, B, C, or D

Site Type:
- ○ Site is Urban
- ○ Site is Non-Urban

Flows Developed For:
- ○ Street Inlets
- ○ Area Inlets in a Median

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

Rainfall Information: Intensity I (inch/hr) = $C_1 * P_1 / (C_2 + T_c)$ ^ C_3

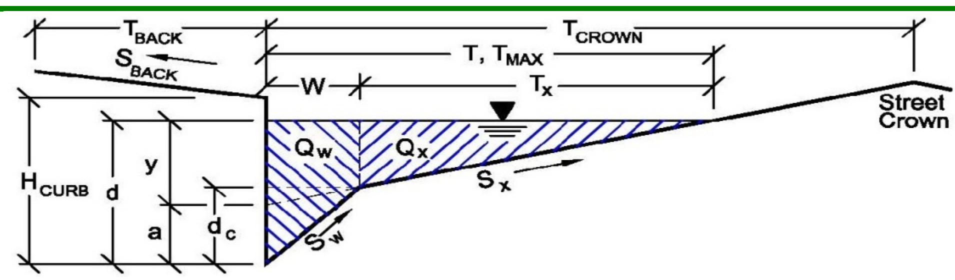
	Minor Storm	Major Storm	
Design Storm Return Period, T_r =			years
Return Period One-Hour Precipitation, P_1 =			inches
C_1 =			
C_2 =			
C_3 =			
User-Defined Storm Runoff Coefficient (leave this blank to accept a calculated value), C =			
User-Defined 5-yr. Runoff Coefficient (leave this blank to accept a calculated value), C_5 =			
Bypass (Carry-Over) Flow from upstream Subcatchments, Q_b =	0.0	0.0	cfs
Total Design Peak Flow, Q =	1.4	21.5	cfs

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

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

Project: Trails at Crowfoot

Inlet ID: DP 1P



Gutter Geometry (Enter data in the blue cells)

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	18.0	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} =	4.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	17.0	ft
Gutter Width	W =	2.00	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} =	0.016	

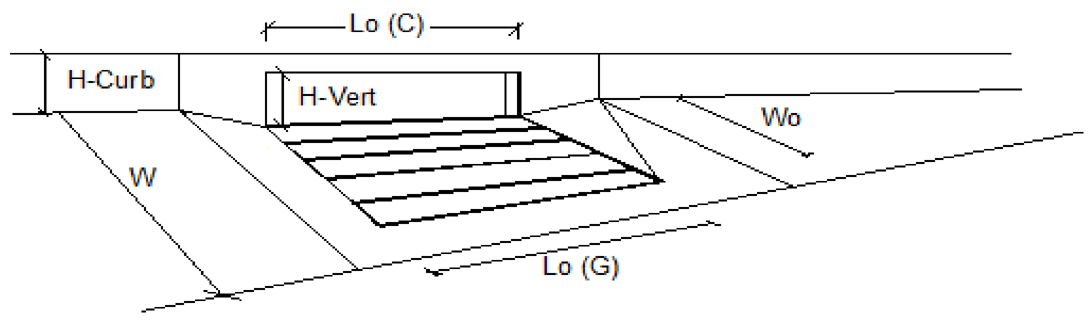
		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	17.0	17.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	4.0	12.0	inches
Allow Flow Depth at Street Crown (leave blank for no)		☐	☑	check = yes

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	Q_{allow} =	**4.8**	**156.5**	**cfs**

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

INLET ON A CONTINUOUS GRADE

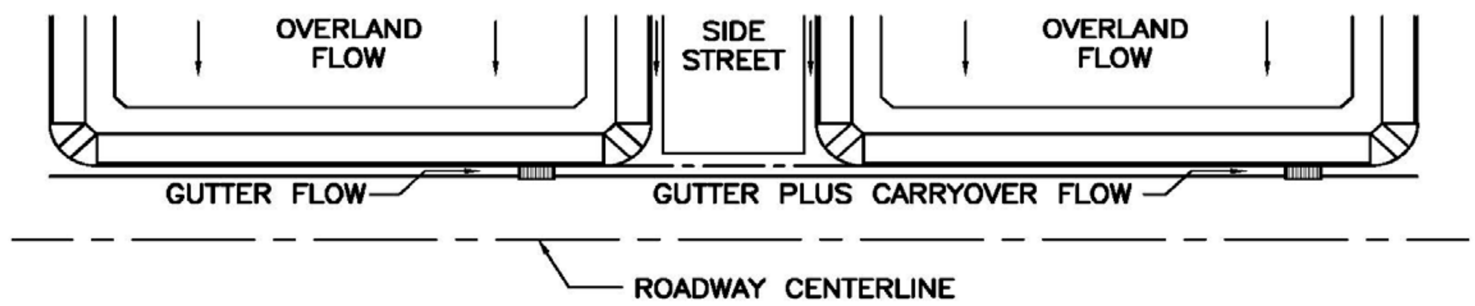
Project: **Trails at Crowfoot**
Inlet ID: **DP 1P**



Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from 'Q-Allow')	a_{LOCAL} =	5.0	5.0	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 from Q-Allow)	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 < maximum allowable from sheet 'Q-Allow'		MINOR	MAJOR	
Total Inlet Interception Capacity	**Q =**	**1.40**	**5.70**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**0.0**	**15.8**	**cfs**
Capture Percentage = Q_a/Q_o =	**C% =**	**100**	**26**	**%**

DESIGN PEAK FLOW FOR ONE-HALF OF STREET OR GRASS-LINED CHANNEL BY THE RATIONAL METHOD

Project: Trails at Crowfoot
Inlet ID: DP 1Q



Show Details

Design Flow: ONLY if already determined through other methods:

(local peak flow for 1/2 of street OR grass-lined channel):

	Minor Storm	Major Storm	
*Q_{Known} =	4.2	27.9	cfs

*** If you enter values in Row 14, skip the rest of this sheet and proceed to sheet Q-Allow or Area Inlet.**

<--- FILL IN THIS SECTION OR… FILL IN THE SECTIONS BELOW. <---

Geographic Information: (Enter data in the blue cells):

Subcatchment Area =		Acres
Percent Imperviousness =		%
NRCS Soil Type =		A, B, C, or D

Site Type:
- ○ Site is Urban
- ○ Site is Non-Urban

Flows Developed For:
- ○ Street Inlets
- ○ Area Inlets in a Median

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

Rainfall Information: Intensity I (inch/hr) = $C_1 * P_1 / (C_2 + T_c)$ ^ C_3

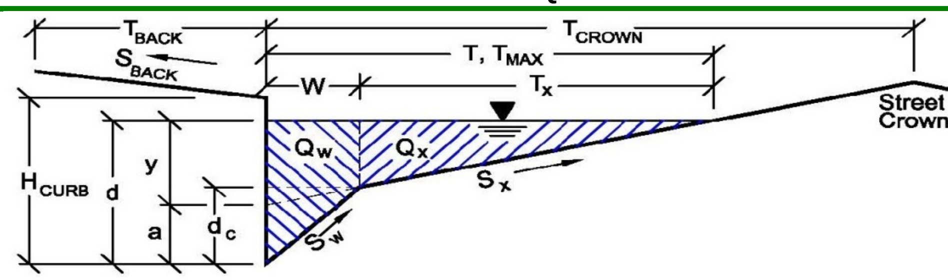
	Minor Storm	Major Storm	
Design Storm Return Period, T_r =			years
Return Period One-Hour Precipitation, P_1 =			inches
C_1 =			
C_2 =			
C_3 =			
User-Defined Storm Runoff Coefficient (leave this blank to accept a calculated value), C =			
User-Defined 5-yr. Runoff Coefficient (leave this blank to accept a calculated value), C_5 =			
Bypass (Carry-Over) Flow from upstream Subcatchments, Q_b =	0.0	0.0	cfs
Total Design Peak Flow, Q =	4.2	27.9	cfs

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

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

Project: **Trails at Crowfoot**

Inlet ID: **DP 1Q**



Gutter Geometry (Enter data in the blue cells)			
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	18.0	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} =	4.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	17.0	ft
Gutter Width	W =	2.00	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} =	0.016	

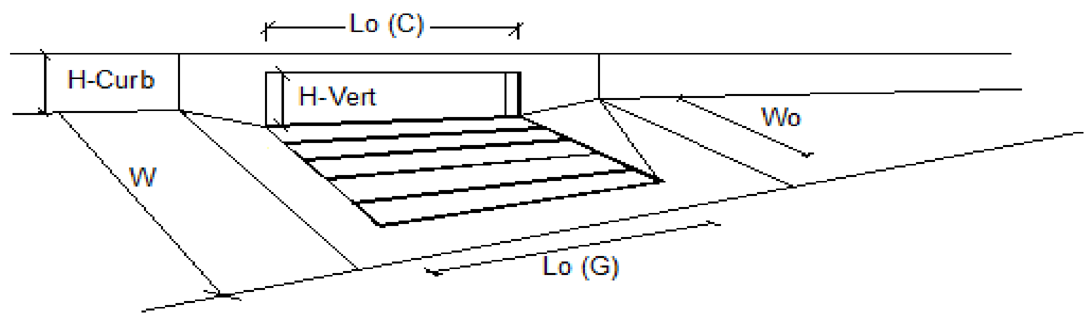
		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	17.0	17.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	4.0	12.0	inches
Allow Flow Depth at Street Crown (leave blank for no)		☐	☑	check = yes

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	Q_{allow} =	**4.8**	**156.5**	**cfs**

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

INLET ON A CONTINUOUS GRADE

Project: Trails at Crowfoot
Inlet ID: DP 1Q

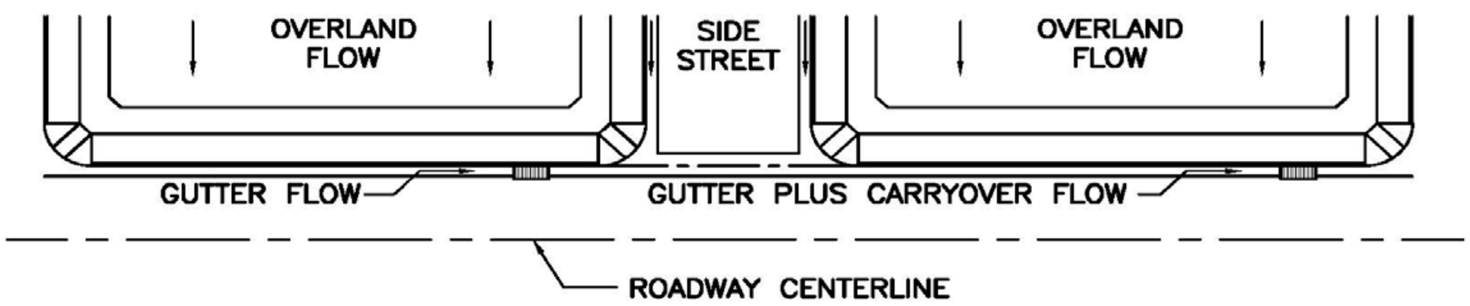


Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from 'Q-Allow')	a_{LOCAL} =	5.0	5.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)	No =	1	1	
Length of a Single Unit Inlet (Grate or Curb Opening)	L_o =	10.00	10.00	ft
Width of a Unit Grate (cannot be greater than W from Q-Allow)	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 < maximum allowable from sheet 'Q-Allow'		MINOR	MAJOR	
Total Inlet Interception Capacity	**Q =**	**4.20**	**12.23**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**0.0**	**15.7**	**cfs**
Capture Percentage = Q_a/Q_o =	**C% =**	**100**	**44**	**%**

Worksheet Protected

DESIGN PEAK FLOW FOR ONE-HALF OF STREET
OR GRASS-LINED CHANNEL BY THE RATIONAL METHOD

Project: Trails at Crowfoot
Inlet ID: DP 1R



Show Details

Design Flow: ONLY if already determined through other methods:

		Minor Storm	Major Storm	
(local peak flow for 1/2 of street OR grass-lined channel):	$^*Q_{Known}$ =	3.0	12.0	cfs

*** If you enter values in Row 14, skip the rest of this sheet and proceed to sheet Q-Allow or Area Inlet.**

<--- FILL IN THIS SECTION OR…

FILL IN THE SECTIONS BELOW. <---

Geographic Information: (Enter data in the blue cells):

Subcatchment Area =		Acres
Percent Imperviousness =		%
NRCS Soil Type =		A, B, C, or D

Site Type:
- Site is Urban
- Site is Non-Urban

Flows Developed For:
- Street Inlets
- Area Inlets in a Median

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

Rainfall Information: Intensity I (inch/hr) = $C_1 * P_1 / (C_2 + T_c)^{\wedge} C_3$

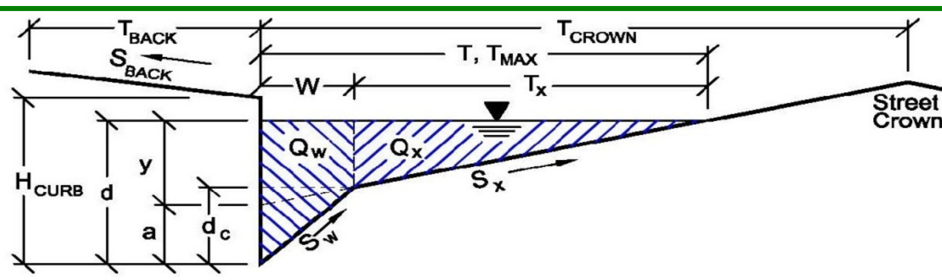
	Minor Storm	Major Storm	
Design Storm Return Period, T_r =			years
Return Period One-Hour Precipitation, P_1 =			inches
C_1 =			
C_2 =			
C_3 =			
User-Defined Storm Runoff Coefficient (leave this blank to accept a calculated value), C =			
User-Defined 5-yr. Runoff Coefficient (leave this blank to accept a calculated value), C_5 =			
Bypass (Carry-Over) Flow from upstream Subcatchments, Q_b =	0.0	0.0	cfs
Total Design Peak Flow, Q =	3.0	12.0	cfs

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

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

Project: Trails at Crowfoot

Inlet ID: DP 1R



Gutter Geometry (Enter data in the blue cells)

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	18.0	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} =	4.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	17.0	ft
Gutter Width	W =	2.00	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} =	0.016	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	17.0	17.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	4.0	12.0	inches
Allow Flow Depth at Street Crown (leave blank for no)		☐	☑	check = yes

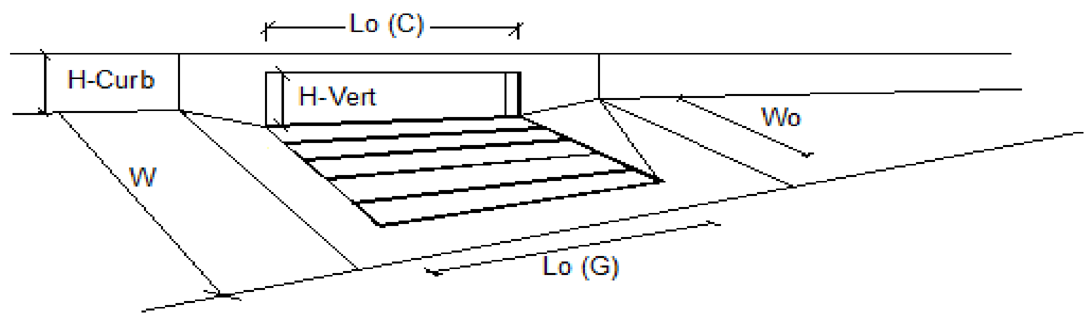
		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	Q_{allow} =	**4.8**	**156.5**	**cfs**

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

INLET ON A CONTINUOUS GRADE

Project: **Trails at Crowfoot**

Inlet ID: **DP 1R**

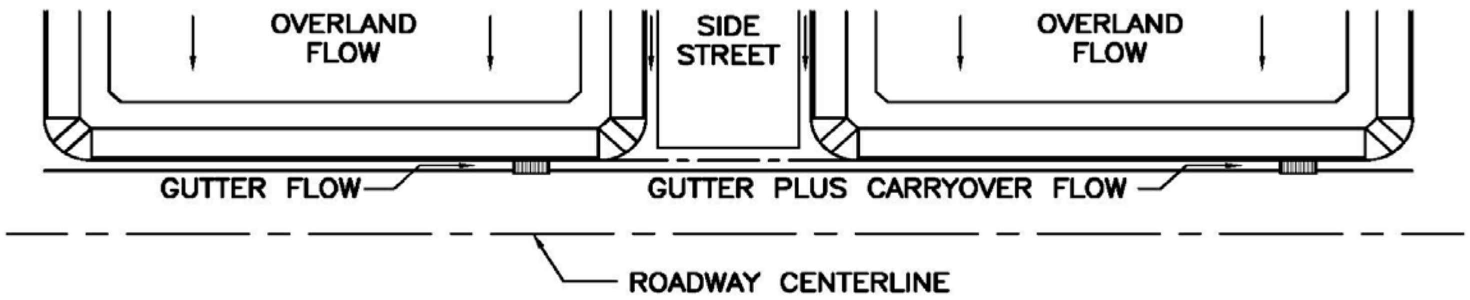


Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from 'Q-Allow')	a_{LOCAL} =	5.0	5.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)	No =	1	1	
Length of a Single Unit Inlet (Grate or Curb Opening)	L_o =	10.00	10.00	ft
Width of a Unit Grate (cannot be greater than W from Q-Allow)	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 < maximum allowable from sheet 'Q-Allow'		MINOR	MAJOR	
Total Inlet Interception Capacity	**Q =**	**3.00**	**8.49**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**0.0**	**3.5**	**cfs**
Capture Percentage = Q_a/Q_o =	**C% =**	**100**	**71**	**%**

Worksheet Protected

DESIGN PEAK FLOW FOR ONE-HALF OF STREET OR GRASS-LINED CHANNEL BY THE RATIONAL METHOD

Project: **Trails at Crowfoot**
Inlet ID: **DP 1S**



Show Details

Design Flow: ONLY if already determined through other methods:

		Minor Storm	Major Storm	
(local peak flow for 1/2 of street OR grass-lined channel):	*Q_{Known} =	2.5	10.3	cfs

*** If you enter values in Row 14, skip the rest of this sheet and proceed to sheet Q-Allow or Area Inlet.**

<--- FILL IN THIS SECTION OR…

FILL IN THE SECTIONS BELOW. <---

Geographic Information: (Enter data in the blue cells):

Subcatchment Area =		Acres
Percent Imperviousness =		%
NRCS Soil Type =		A, B, C, or D

Site Type:
- ○ Site is Urban
- ○ Site is Non-Urban

Flows Developed For:
- ○ Street Inlets
- ○ Area Inlets in a Median

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

Rainfall Information: Intensity I (inch/hr) = $C_1 * P_1 / (C_2 + T_c)$ ^ C_3

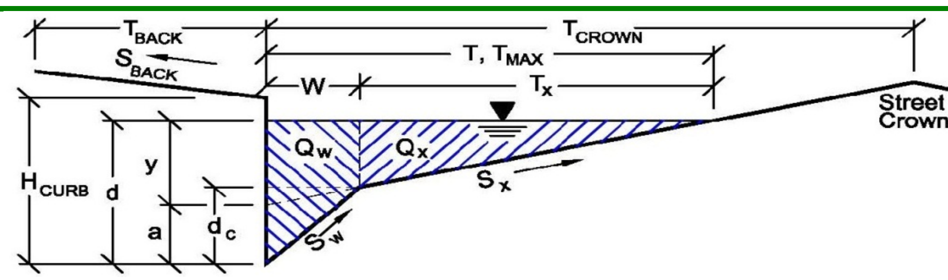
	Minor Storm	Major Storm	
Design Storm Return Period, T_r =			years
Return Period One-Hour Precipitation, P_1 =			inches
C_1 =			
C_2 =			
C_3 =			
User-Defined Storm Runoff Coefficient (leave this blank to accept a calculated value), C =			
User-Defined 5-yr. Runoff Coefficient (leave this blank to accept a calculated value), C_5 =			
Bypass (Carry-Over) Flow from upstream Subcatchments, Q_b =	0.0	0.0	cfs
Total Design Peak Flow, Q =	2.5	10.3	cfs

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

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

Project: Trails at Crowfoot

Inlet ID: DP 1S



Gutter Geometry (Enter data in the blue cells)

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	18.0	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} =	4.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	17.0	ft
Gutter Width	W =	2.00	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 =	0.040	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016	

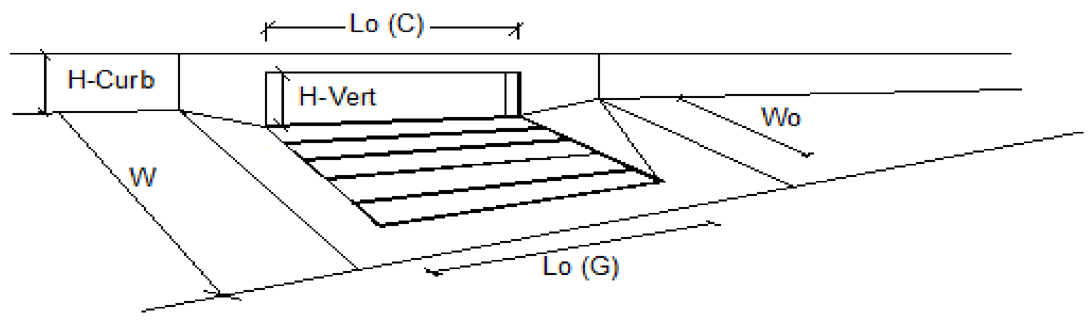
		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	17.0	17.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	4.0	12.0	inches
Allow Flow Depth at Street Crown (leave blank for no)		☐	☑	check = yes

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	Q_{allow} =	**6.8**	**127.1**	**cfs**

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

INLET ON A CONTINUOUS GRADE

Project: **Trails at Crowfoot**
Inlet ID: **DP 1S**

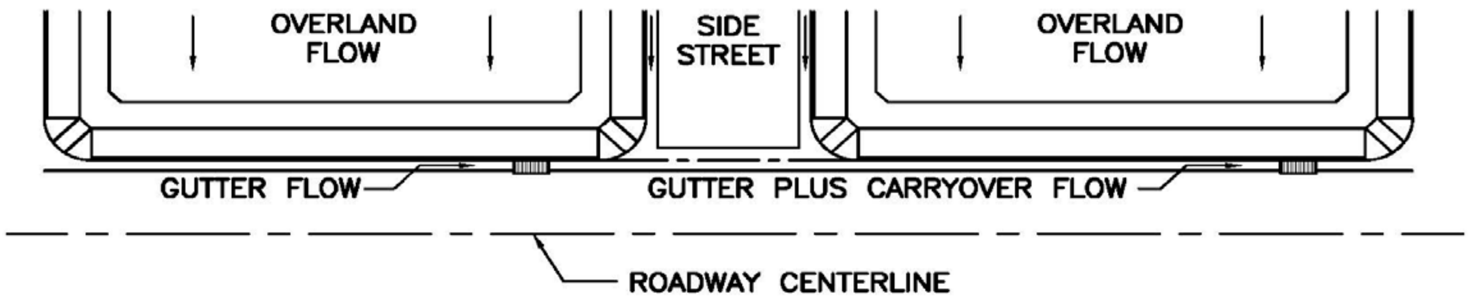


Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from 'Q-Allow')	a_{LOCAL} =	5.0	5.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)	No =	1	1	
Length of a Single Unit Inlet (Grate or Curb Opening)	L_o =	10.00	10.00	ft
Width of a Unit Grate (cannot be greater than W from Q-Allow)	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 < maximum allowable from sheet 'Q-Allow'		MINOR	MAJOR	
Total Inlet Interception Capacity	**Q =**	**2.50**	**13.26**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**0.0**	**-2.9**	**cfs**
Capture Percentage = Q_a/Q_o =	**C% =**	**100**	**128**	**%**

Worksheet Protected

DESIGN PEAK FLOW FOR ONE-HALF OF STREET
OR GRASS-LINED CHANNEL BY THE RATIONAL METHOD

Project: Trails at Crowfoot
Inlet ID: DP 1T



Show Details

Design Flow: ONLY if already determined through other methods:

		Minor Storm	Major Storm	
(local peak flow for 1/2 of street OR grass-lined channel):	*Q_{Known} =	2.3	37.6	cfs

*** If you enter values in Row 14, skip the rest of this sheet and proceed to sheet Q-Allow or Area Inlet.**

<--- FILL IN THIS SECTION OR…

FILL IN THE SECTIONS BELOW. <---

Geographic Information: (Enter data in the blue cells):

Subcatchment Area =		Acres
Percent Imperviousness =		%
NRCS Soil Type =		A, B, C, or D

Site Type:
- ○ Site is Urban
- ○ Site is Non-Urban

Flows Developed For:
- ○ Street Inlets
- ○ Area Inlets in a Median

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

Rainfall Information: Intensity I (inch/hr) = $C_1 * P_1 / (C_2 + T_c)^{C_3}$

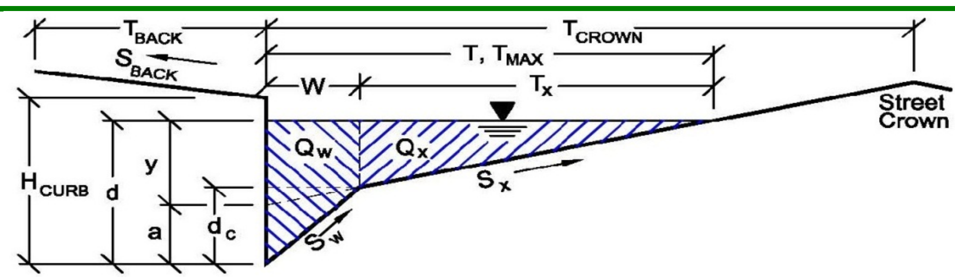
	Minor Storm	Major Storm	
Design Storm Return Period, T_r =			years
Return Period One-Hour Precipitation, P_1 =			inches
C_1 =			
C_2 =			
C_3 =			
User-Defined Storm Runoff Coefficient (leave this blank to accept a calculated value), C =			
User-Defined 5-yr. Runoff Coefficient (leave this blank to accept a calculated value), C_5 =			
Bypass (Carry-Over) Flow from upstream Subcatchments, Q_b =	**0.0**	**0.0**	**cfs**
Total Design Peak Flow, Q =	**2.3**	**37.6**	**cfs**

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

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

Project: **Trails at Crowfoot**

Inlet ID: **DP 1T**



Gutter Geometry (Enter data in the blue cells)

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	18.0	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} =	4.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	17.0	ft
Gutter Width	W =	2.00	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} =	0.016	

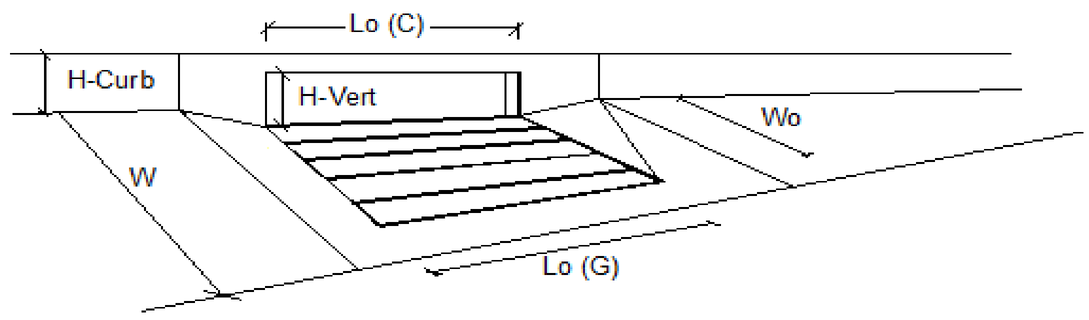
		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	17.0	17.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	4.0	12.0	inches
Allow Flow Depth at Street Crown (leave blank for no)		☐	☑	check = yes

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	Q_{allow} =	**4.8**	**156.5**	**cfs**

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

INLET ON A CONTINUOUS GRADE

Project: **Trails at Crowfoot**
Inlet ID: **DP 1T**



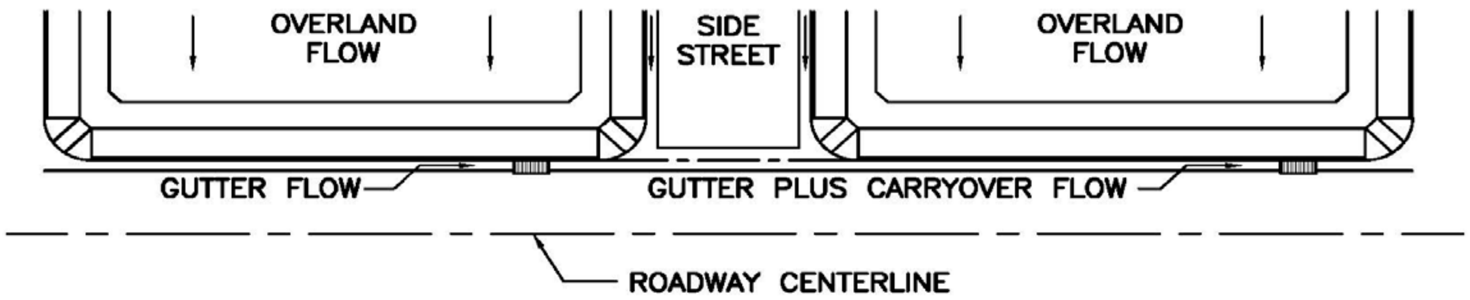
Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from 'Q-Allow')	a_{LOCAL} =	5.0	5.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)	No =	1	1	
Length of a Single Unit Inlet (Grate or Curb Opening)	L_o =	10.00	10.00	ft
Width of a Unit Grate (cannot be greater than W from Q-Allow)	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 < maximum allowable from sheet 'Q-Allow'		MINOR	MAJOR	
Total Inlet Interception Capacity	**Q =**	**2.30**	**13.74**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**0.0**	**23.9**	**cfs**
Capture Percentage = Q_a/Q_o =	**C% =**	**100**	**37**	**%**

Worksheet Protected

DESIGN PEAK FLOW FOR ONE-HALF OF STREET OR GRASS-LINED CHANNEL BY THE RATIONAL METHOD

Project: **Trails at Crowfoot**
Inlet ID: **DP 1U**



Show Details

Design Flow: ONLY if already determined through other methods:

(local peak flow for 1/2 of street OR grass-lined channel):

	Minor Storm	Major Storm	
***Q_{Known} =**	3.7	27.7	cfs

*** If you enter values in Row 14, skip the rest of this sheet and proceed to sheet Q-Allow or Area Inlet.**

<--- FILL IN THIS SECTION OR…

FILL IN THE SECTIONS BELOW. <---

Geographic Information: (Enter data in the blue cells):

Subcatchment Area =		Acres
Percent Imperviousness =		%
NRCS Soil Type =		A, B, C, or D

Site Type:
- ○ Site is Urban
- ○ Site is Non-Urban

Flows Developed For:
- ○ Street Inlets
- ○ Area Inlets in a Median

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

Rainfall Information: Intensity I (inch/hr) = $C_1 * P_1 / (C_2 + T_c) ^ C_3$

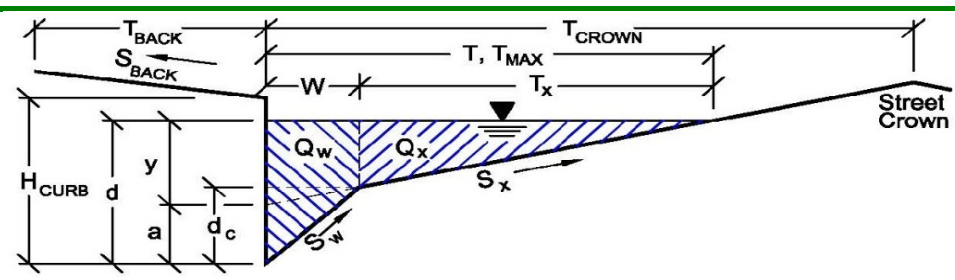
	Minor Storm	Major Storm	
Design Storm Return Period, T_r =			years
Return Period One-Hour Precipitation, P_1 =			inches
C_1 =			
C_2 =			
C_3 =			
User-Defined Storm Runoff Coefficient (leave this blank to accept a calculated value), C =			
User-Defined 5-yr. Runoff Coefficient (leave this blank to accept a calculated value), C_5 =			
Bypass (Carry-Over) Flow from upstream Subcatchments, Q_b =	**0.0**	**0.0**	**cfs**
Total Design Peak Flow, Q =	**3.7**	**27.7**	**cfs**

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

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

Project: Trails at Crowfoot

Inlet ID: DP 1U



Gutter Geometry (Enter data in the blue cells)

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	18.0	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} =	4.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	17.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.015	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016	

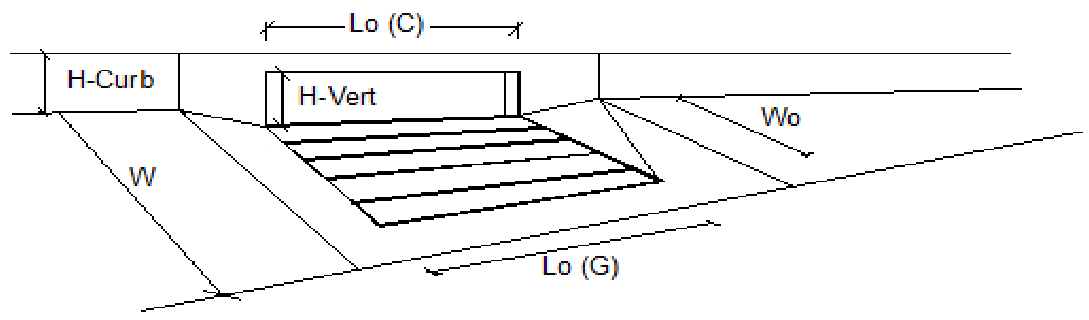
		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	17.0	17.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	4.0	12.0	inches
Allow Flow Depth at Street Crown (leave blank for no)		☐	☑	check = yes

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	**Q_{allow} =**	**4.1**	**162.5**	**cfs**

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

INLET ON A CONTINUOUS GRADE

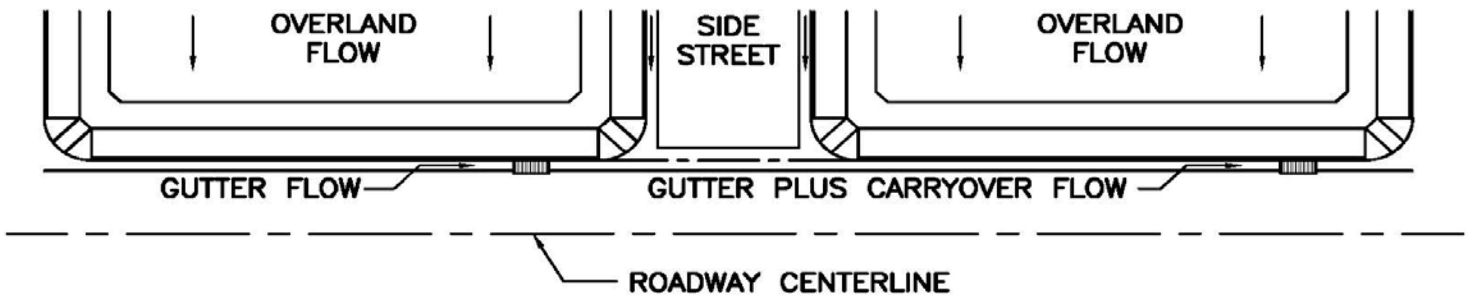
Project: **Trails at Crowfoot**
Inlet ID: **DP 1U**



Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from 'Q-Allow')	a_{LOCAL} =	5.0	5.0	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 from Q-Allow)	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 < maximum allowable from sheet 'Q-Allow'		MINOR	MAJOR	
Total Inlet Interception Capacity	**Q =**	**3.70**	**12.07**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**0.0**	**15.6**	**cfs**
Capture Percentage = Q_a/Q_o =	**C% =**	**100**	**44**	**%**

DESIGN PEAK FLOW FOR ONE-HALF OF STREET OR GRASS-LINED CHANNEL BY THE RATIONAL METHOD

Project: Trails at Crowfoot
Inlet ID: 2A



Show Details

Design Flow: ONLY if already determined through other methods:

		Minor Storm	Major Storm	
(local peak flow for 1/2 of street OR grass-lined channel):	*Q_{Known} =	8.5	74.4	cfs

*** If you enter values in Row 14, skip the rest of this sheet and proceed to sheet Q-Allow or Area Inlet.**

<--- FILL IN THIS SECTION OR…

FILL IN THE SECTIONS BELOW. <---

Geographic Information: (Enter data in the blue cells):

Subcatchment Area =		Acres
Percent Imperviousness =		%
NRCS Soil Type =		A, B, C, or D

Site Type:
- ○ Site is Urban
- ○ Site is Non-Urban

Flows Developed For:
- ○ Street Inlets
- ○ Area Inlets in a Median

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

Rainfall Information: Intensity I (inch/hr) = $C_1 * P_1 / (C_2 + T_c)^{C_3}$

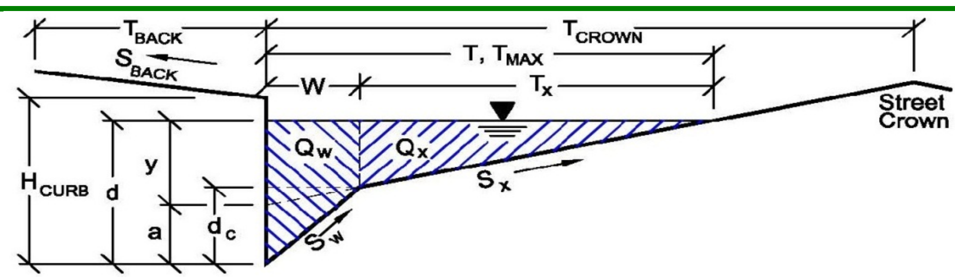
	Minor Storm	Major Storm	
Design Storm Return Period, T_r =			years
Return Period One-Hour Precipitation, P_1 =			inches
C_1 =			
C_2 =			
C_3 =			
User-Defined Storm Runoff Coefficient (leave this blank to accept a calculated value), C =			
User-Defined 5-yr. Runoff Coefficient (leave this blank to accept a calculated value), C_5 =			
Bypass (Carry-Over) Flow from upstream Subcatchments, Q_b =	0.0	0.0	cfs
Total Design Peak Flow, Q =	8.5	74.4	cfs

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

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

Project: **Trails at Crowfoot**

Inlet ID: **2A**



Gutter Geometry (Enter data in the blue cells)

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	18.0	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} =	4.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	17.0	ft
Gutter Width	W =	2.00	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 =	0.070	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016	

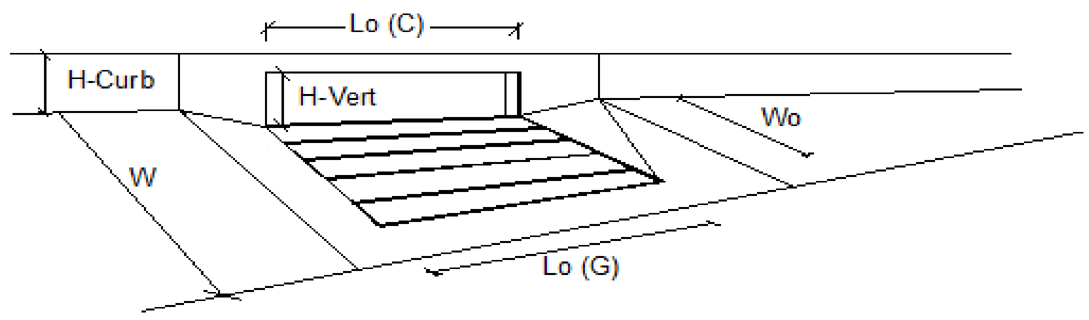
		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	17.0	17.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	4.0	12.0	inches
Allow Flow Depth at Street Crown (leave blank for no)		☐	☑	check = yes

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	**Q_{allow} =**	**9.0**	**107.5**	**cfs**

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

INLET ON A CONTINUOUS GRADE

Project: **Trails at Crowfoot**
Inlet ID: **2A**

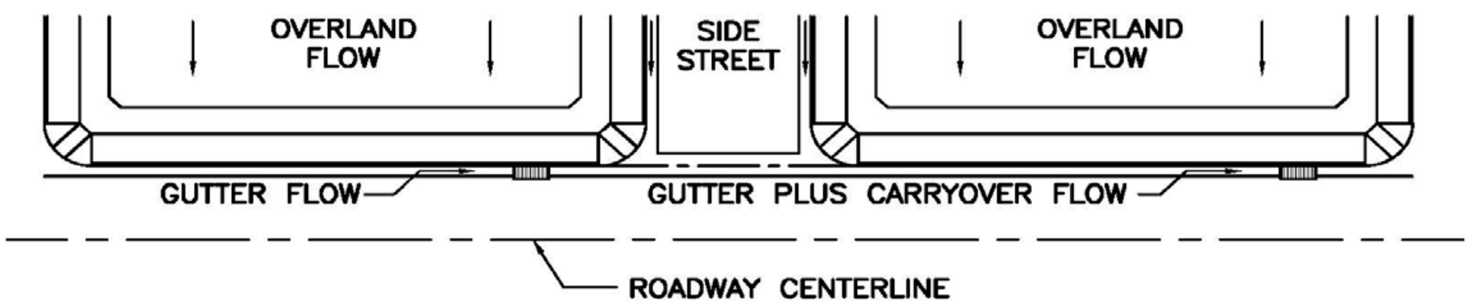


Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from 'Q-Allow')	a_{LOCAL} =	5.0	5.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)	No =	2	2	
Length of a Single Unit Inlet (Grate or Curb Opening)	L_o =	15.00	15.00	ft
Width of a Unit Grate (cannot be greater than W from Q-Allow)	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 < maximum allowable from sheet 'Q-Allow'		MINOR	MAJOR	
Total Inlet Interception Capacity	**Q =**	**8.50**	**47.95**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**0.0**	**26.5**	**cfs**
Capture Percentage = Q_a/Q_o =	**C% =**	**100**	**64**	**%**

Worksheet Protected

DESIGN PEAK FLOW FOR ONE-HALF OF STREET OR GRASS-LINED CHANNEL BY THE RATIONAL METHOD

Project: Trails at Crowfoot
Inlet ID: 2B



Show Details

Design Flow: ONLY if already determined through other methods:

(local peak flow for 1/2 of street OR grass-lined channel):

	Minor Storm	Major Storm	
*Q_{Known} =	3.8	15.8	cfs

*** If you enter values in Row 14, skip the rest of this sheet and proceed to sheet Q-Allow or Area Inlet.**

<--- FILL IN THIS SECTION OR…

FILL IN THE SECTIONS BELOW. <---

Geographic Information: (Enter data in the blue cells):

Subcatchment Area =		Acres
Percent Imperviousness =		%
NRCS Soil Type =		A, B, C, or D

Site Type:
- ○ Site is Urban
- ○ Site is Non-Urban

Flows Developed For:
- ○ Street Inlets
- ○ Area Inlets in a Median

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

Rainfall Information: Intensity I (inch/hr) = $C_1 * P_1 / (C_2 + T_c) ^{\wedge} C_3$

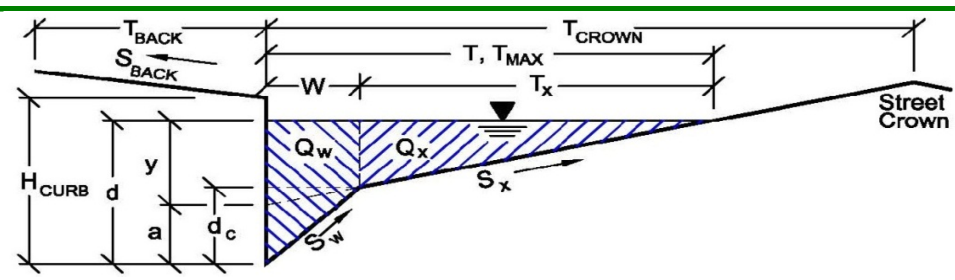
	Minor Storm	Major Storm	
Design Storm Return Period, T_r =			years
Return Period One-Hour Precipitation, P_1 =			inches
C_1 =			
C_2 =			
C_3 =			
User-Defined Storm Runoff Coefficient (leave this blank to accept a calculated value), C =			
User-Defined 5-yr. Runoff Coefficient (leave this blank to accept a calculated value), C_5 =			
Bypass (Carry-Over) Flow from upstream Subcatchments, Q_b =	0.0	0.0	cfs
Total Design Peak Flow, Q =	3.8	15.8	cfs

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

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

Project: **Trails at Crowfoot**

Inlet ID: **2B**



Gutter Geometry (Enter data in the blue cells)

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	18.0	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} =	4.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	17.0	ft
Gutter Width	W =	2.00	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} =	0.016	

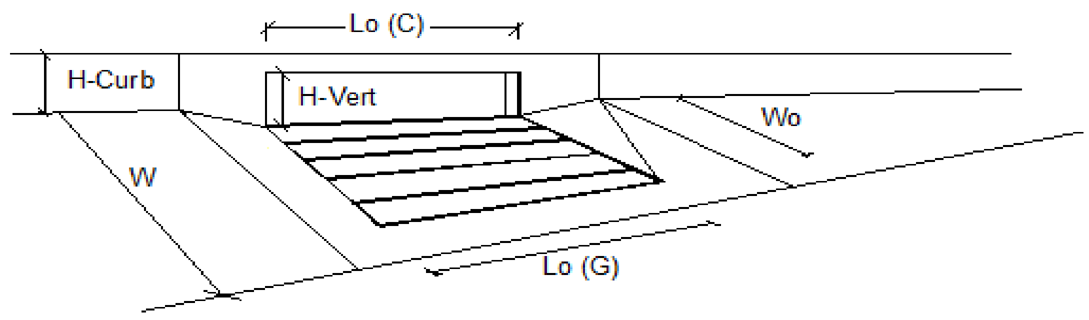
		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	17.0	17.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	4.0	12.0	inches
Allow Flow Depth at Street Crown (leave blank for no)		☐	☑	check = yes

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	Q_{allow} =	**5.9**	**138.6**	**cfs**

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

INLET ON A CONTINUOUS GRADE

Project: **Trails at Crowfoot**
Inlet ID: **2B**

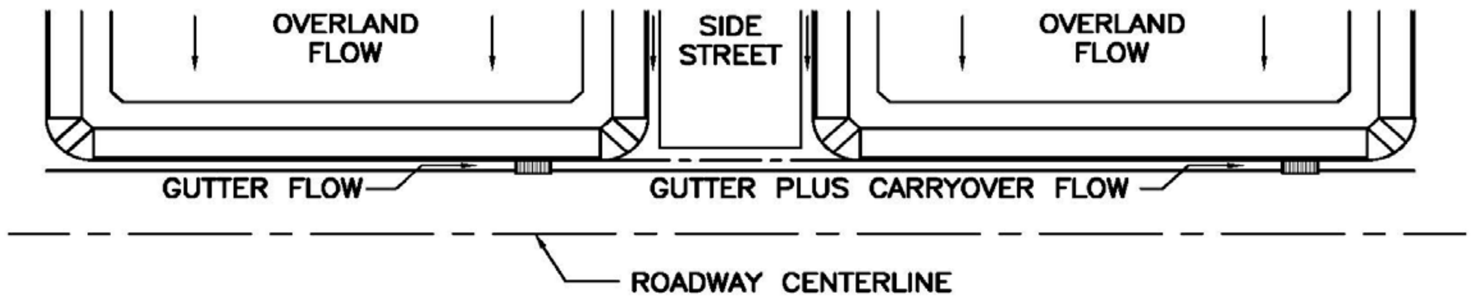


		MINOR	MAJOR	
Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from 'Q-Allow')	a_{LOCAL} =	5.0	5.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)	No =	1	1	
Length of a Single Unit Inlet (Grate or Curb Opening)	L_o =	10.00	10.00	ft
Width of a Unit Grate (cannot be greater than W from Q-Allow)	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 < maximum allowable from sheet 'Q-Allow'		MINOR	MAJOR	
Total Inlet Interception Capacity	**Q =**	**3.80**	**9.77**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**0.0**	**6.0**	**cfs**
Capture Percentage = Q_a/Q_o =	**C% =**	**100**	**62**	**%**

Worksheet Protected

DESIGN PEAK FLOW FOR ONE-HALF OF STREET OR GRASS-LINED CHANNEL BY THE RATIONAL METHOD

Project: Trails at Crowfoot
Inlet ID: 2C



Show Details

Design Flow: ONLY if already determined through other methods:

		Minor Storm	Major Storm	
(local peak flow for 1/2 of street OR grass-lined channel):	*Q_{Known} =	5.6	33.2	cfs

*** If you enter values in Row 14, skip the rest of this sheet and proceed to sheet Q-Allow or Area Inlet.**

<--- FILL IN THIS SECTION OR…

FILL IN THE SECTIONS BELOW. <---

Geographic Information: (Enter data in the blue cells):

Subcatchment Area =		Acres
Percent Imperviousness =		%
NRCS Soil Type =		A, B, C, or D

Site Type:
- Site is Urban
- Site is Non-Urban

Flows Developed For:
- Street Inlets
- Area Inlets in a Median

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

Rainfall Information: Intensity I (inch/hr) = $C_1 * P_1 / (C_2 + T_c)$ ^ C_3

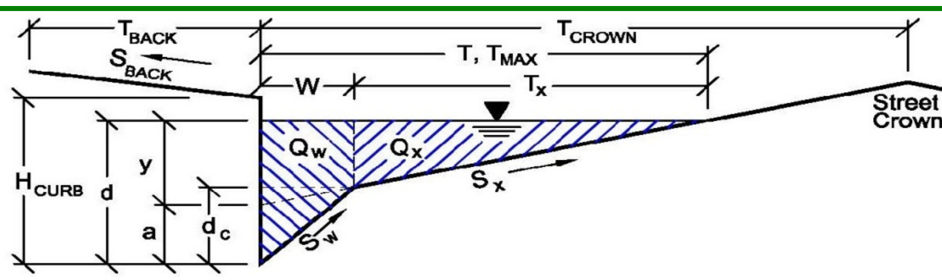
	Minor Storm	Major Storm	
Design Storm Return Period, T_r =			years
Return Period One-Hour Precipitation, P_1 =			inches
C_1 =			
C_2 =			
C_3 =			
User-Defined Storm Runoff Coefficient (leave this blank to accept a calculated value), C =			
User-Defined 5-yr. Runoff Coefficient (leave this blank to accept a calculated value), C_5 =			
Bypass (Carry-Over) Flow from upstream Subcatchments, Q_b =	**0.0**	**0.0**	**cfs**
Total Design Peak Flow, Q =	**5.6**	**33.2**	**cfs**

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

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

Project: Trails at Crowfoot

Inlet ID: 2C



Gutter Geometry (Enter data in the blue cells)

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	18.0	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} =	4.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	17.0	ft
Gutter Width	W =	2.00	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} =	0.016	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	17.0	17.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	4.0	12.0	inches
Allow Flow Depth at Street Crown (leave blank for no)		☐	☑	check = yes

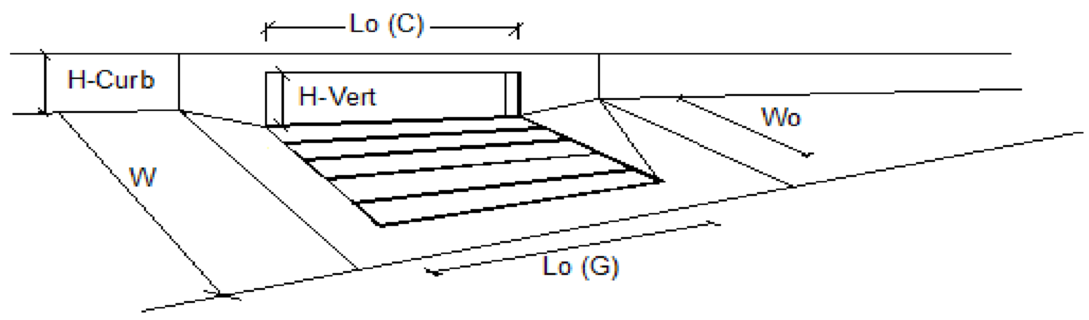
		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	Q_{allow} =	**5.9**	**138.6**	**cfs**

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

INLET ON A CONTINUOUS GRADE

Project: Trails at Crowfoot

Inlet ID: 2C

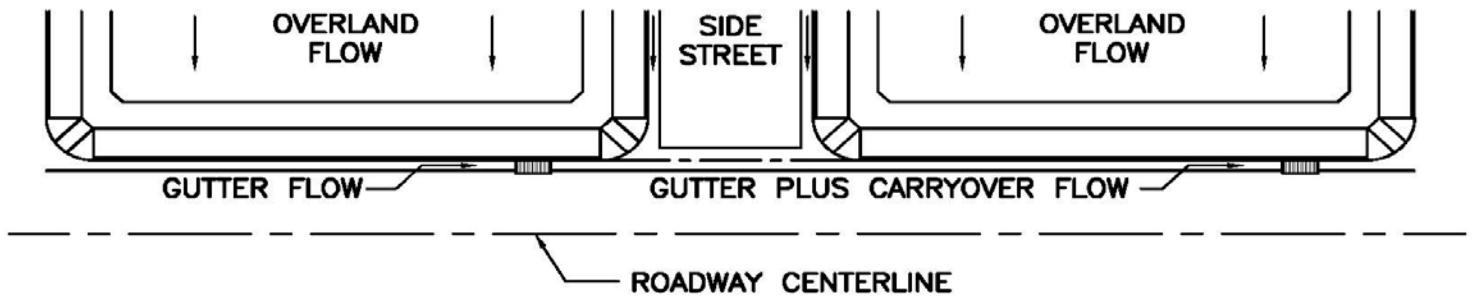


Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from 'Q-Allow')	a_{LOCAL} =	5.0	5.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)	No =	1	1	
Length of a Single Unit Inlet (Grate or Curb Opening)	L_o =	15.00	15.00	ft
Width of a Unit Grate (cannot be greater than W from Q-Allow)	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 < maximum allowable from sheet 'Q-Allow'		MINOR	MAJOR	
Total Inlet Interception Capacity	**Q =**	**5.60**	**18.84**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**0.0**	**14.4**	**cfs**
Capture Percentage = Q_a/Q_o =	**C% =**	**100**	**57**	**%**

Worksheet Protected

DESIGN PEAK FLOW FOR ONE-HALF OF STREET
OR GRASS-LINED CHANNEL BY THE RATIONAL METHOD

Project: **Trails at Crowfoot**
Inlet ID: **2D**



Show Details

Design Flow: ONLY if already determined through other methods:
(local peak flow for 1/2 of street OR grass-lined channel):

	Minor Storm	Major Storm	
***Q_{Known} =**	**4.1**	**54.3**	**cfs**

*** If you enter values in Row 14, skip the rest of this sheet and proceed to sheet Q-Allow or Area Inlet.**

<--- FILL IN THIS SECTION OR…
FILL IN THE SECTIONS BELOW. <---

Geographic Information: (Enter data in the blue cells):

Subcatchment Area =		Acres
Percent Imperviousness =		%
NRCS Soil Type =		A, B, C, or D

Site Type:
○ Site is Urban
○ Site is Non-Urban

Flows Developed For:
○ Street Inlets
○ Area Inlets in a Median

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

Rainfall Information: Intensity I (inch/hr) = $C_1 * P_1 / (C_2 + T_c) ^{\wedge} C_3$

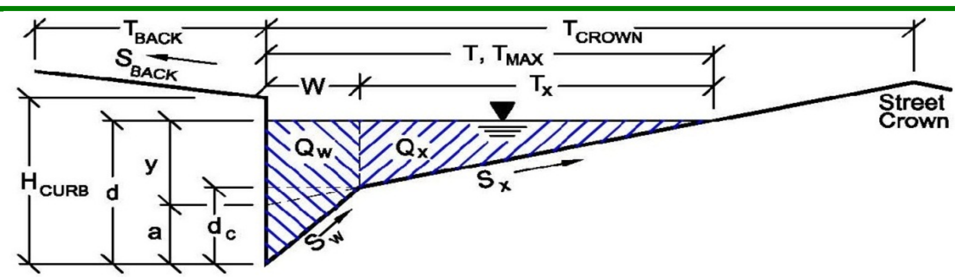
	Minor Storm	Major Storm	
Design Storm Return Period, T_r =			years
Return Period One-Hour Precipitation, P_1 =			inches
C_1 =			
C_2 =			
C_3 =			
User-Defined Storm Runoff Coefficient (leave this blank to accept a calculated value), C =			
User-Defined 5-yr. Runoff Coefficient (leave this blank to accept a calculated value), C_5 =			
Bypass (Carry-Over) Flow from upstream Subcatchments, Q_b =	**0.0**	**0.0**	**cfs**
Total Design Peak Flow, Q =	**4.1**	**54.3**	**cfs**

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

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

Project: **Trails at Crowfoot**

Inlet ID: **2D**



Gutter Geometry (Enter data in the blue cells)

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	18.0	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} =	4.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	17.0	ft
Gutter Width	W =	2.00	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 =	0.050	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016	

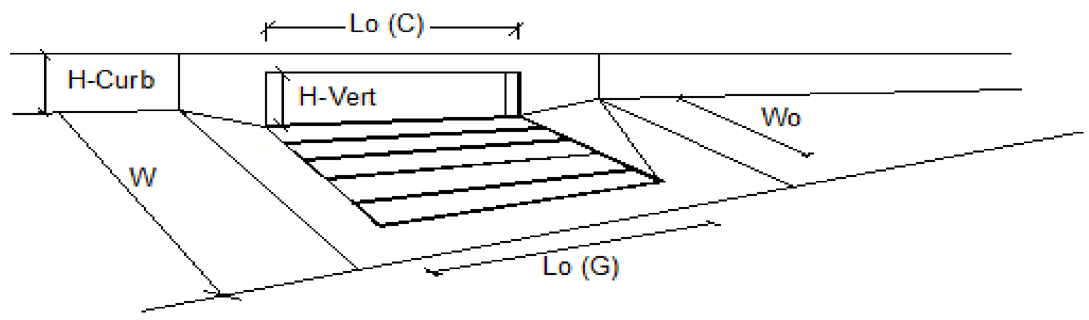
		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	17.0	17.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	4.0	12.0	inches
Allow Flow Depth at Street Crown (leave blank for no)		☐	☑	check = yes

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	Q_{allow} =	**7.6**	**118.9**	**cfs**

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

INLET ON A CONTINUOUS GRADE

Project: **Trails at Crowfoot**
Inlet ID: **2D**

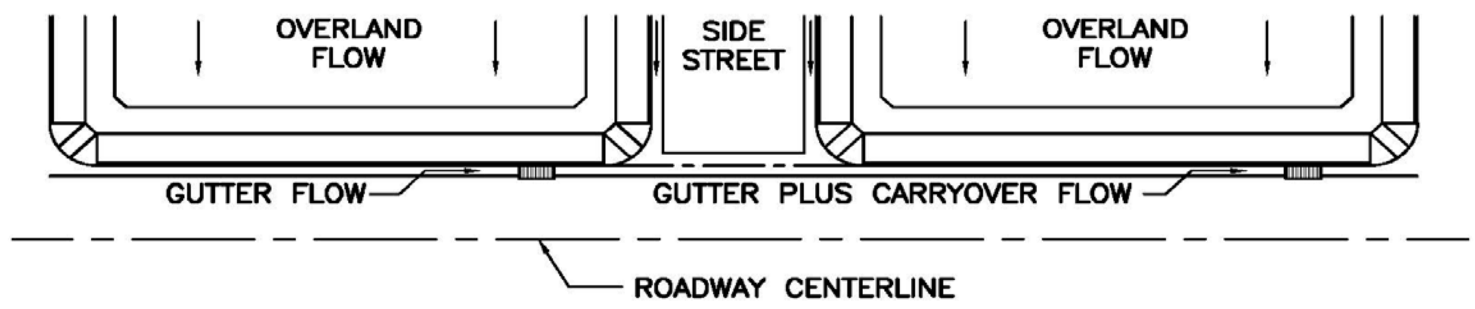


Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from 'Q-Allow')	a_{LOCAL} =	5.0	5.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)	No =	1	1	
Length of a Single Unit Inlet (Grate or Curb Opening)	L_o =	10.00	10.00	ft
Width of a Unit Grate (cannot be greater than W from Q-Allow)	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 < maximum allowable from sheet 'Q-Allow'		MINOR	MAJOR	
Total Inlet Interception Capacity	**Q =**	**4.10**	**16.26**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**0.0**	**38.0**	**cfs**
Capture Percentage = Q_a/Q_o =	**C% =**	**100**	**30**	**%**

Worksheet Protected

DESIGN PEAK FLOW FOR ONE-HALF OF STREET OR GRASS-LINED CHANNEL BY THE RATIONAL METHOD

Project: Trails at Crowfoot
Inlet ID: 2E



Show Details

Design Flow: ONLY if already determined through other methods:
(local peak flow for 1/2 of street OR grass-lined channel):

	Minor Storm	Major Storm	
*Q_{Known} =	3.9	28.4	cfs

*** If you enter values in Row 14, skip the rest of this sheet and proceed to sheet Q-Allow or Area Inlet.**

<--- FILL IN THIS SECTION OR…

FILL IN THE SECTIONS BELOW. <---

Geographic Information: (Enter data in the blue cells):

Subcatchment Area =		Acres
Percent Imperviousness =		%
NRCS Soil Type =		A, B, C, or D

Site Type:
- Site is Urban
- Site is Non-Urban

Flows Developed For:
- Street Inlets
- Area Inlets in a Median

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

Rainfall Information: Intensity I (inch/hr) = $C_1 * P_1 / (C_2 + T_c)$ ^ C_3

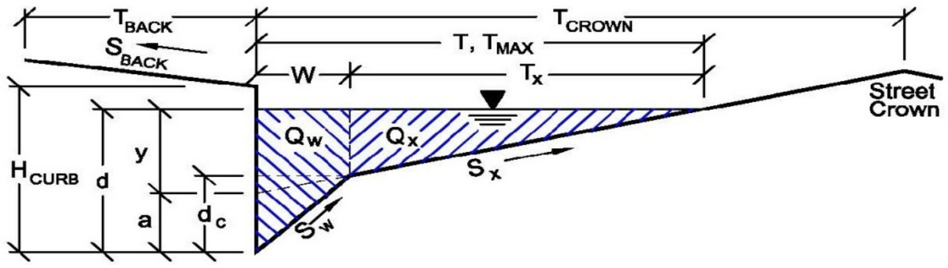
	Minor Storm	Major Storm	
Design Storm Return Period, T_r =			years
Return Period One-Hour Precipitation, P_1 =			inches
C_1 =			
C_2 =			
C_3 =			
User-Defined Storm Runoff Coefficient (leave this blank to accept a calculated value), C =			
User-Defined 5-yr. Runoff Coefficient (leave this blank to accept a calculated value), C_5 =			
Bypass (Carry-Over) Flow from upstream Subcatchments, Q_b =	**0.0**	**13.3**	**cfs**
Total Design Peak Flow, Q =	**3.9**	**41.7**	**cfs**

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

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

Project: Trails at Crowfoot

Inlet ID: 2E



Gutter Geometry (Enter data in the blue cells)

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	18.0	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} =	4.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	17.0	ft
Gutter Width	W =	2.00	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 =	0.060	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016	

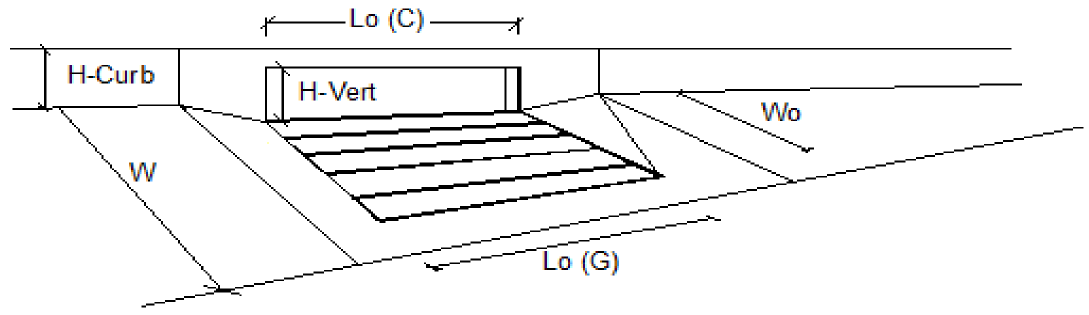
		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	17.0	17.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	4.0	12.0	inches
Allow Flow Depth at Street Crown (leave blank for no)		☐	☑	check = yes

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	Q_{allow} =	**8.3**	**112.6**	**cfs**

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

INLET ON A CONTINUOUS GRADE

Project: **Trails at Crowfoot**
Inlet ID: **2E**

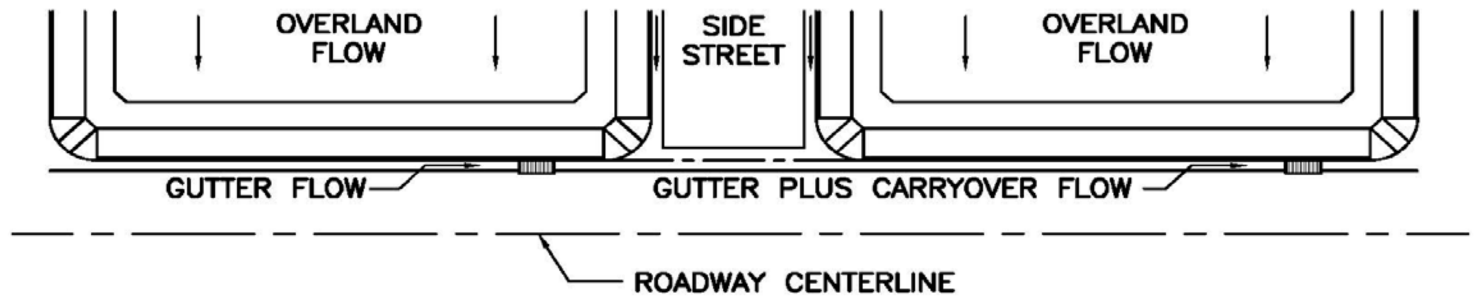


Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from 'Q-Allow')	a_{LOCAL} =	5.0	5.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)	No =	2	2	
Length of a Single Unit Inlet (Grate or Curb Opening)	L_o =	15.00	15.00	ft
Width of a Unit Grate (cannot be greater than W from Q-Allow)	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 < maximum allowable from sheet 'Q-Allow'		MINOR	MAJOR	
Total Inlet Interception Capacity	**Q =**	**3.90**	**34.82**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**0.0**	**6.8**	**cfs**
Capture Percentage = Q_a/Q_o =	**C% =**	**100**	**84**	**%**

Worksheet Protected

DESIGN PEAK FLOW FOR ONE-HALF OF STREET OR GRASS-LINED CHANNEL BY THE RATIONAL METHOD

Project: Trails at Crowfoot
Inlet ID: 2F



Show Details

Design Flow: ONLY if already determined through other methods:

(local peak flow for 1/2 of street OR grass-lined channel):

	Minor Storm	Major Storm	
*Q_{Known} =	3.9	28.4	cfs

*** If you enter values in Row 14, skip the rest of this sheet and proceed to sheet Q-Allow or Area Inlet.**

<--- FILL IN THIS SECTION OR…

FILL IN THE SECTIONS BELOW. <---

Geographic Information: (Enter data in the blue cells):

Subcatchment Area =		Acres
Percent Imperviousness =		%
NRCS Soil Type =		A, B, C, or D

Site Type:
- ○ Site is Urban
- ○ Site is Non-Urban

Flows Developed For:
- ○ Street Inlets
- ○ Area Inlets in a Median

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

Rainfall Information: Intensity I (inch/hr) = $C_1 * P_1 / (C_2 + T_c) ^ C_3$

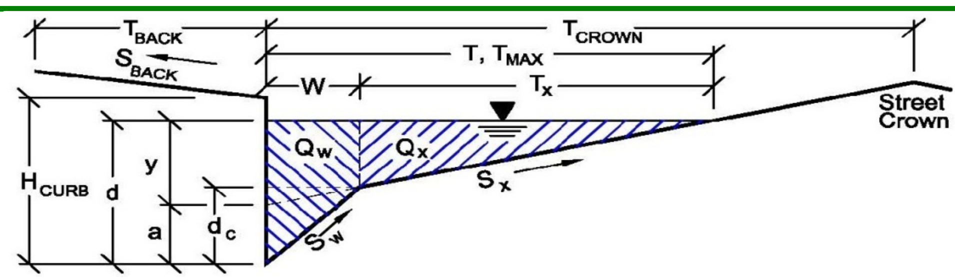
	Minor Storm	Major Storm	
Design Storm Return Period, T_r =			years
Return Period One-Hour Precipitation, P_1 =			inches
C_1 =			
C_2 =			
C_3 =			
User-Defined Storm Runoff Coefficient (leave this blank to accept a calculated value), C =			
User-Defined 5-yr. Runoff Coefficient (leave this blank to accept a calculated value), C_5 =			
Bypass (Carry-Over) Flow from upstream Subcatchments, Q_b =	0.0	3.4	cfs
Total Design Peak Flow, Q =	3.9	31.8	cfs

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

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

Project: Trails at Crowfoot

Inlet ID: 2F



Gutter Geometry (Enter data in the blue cells)

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	18.0	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} =	4.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	17.0	ft
Gutter Width	W =	2.00	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 =	0.060	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016	

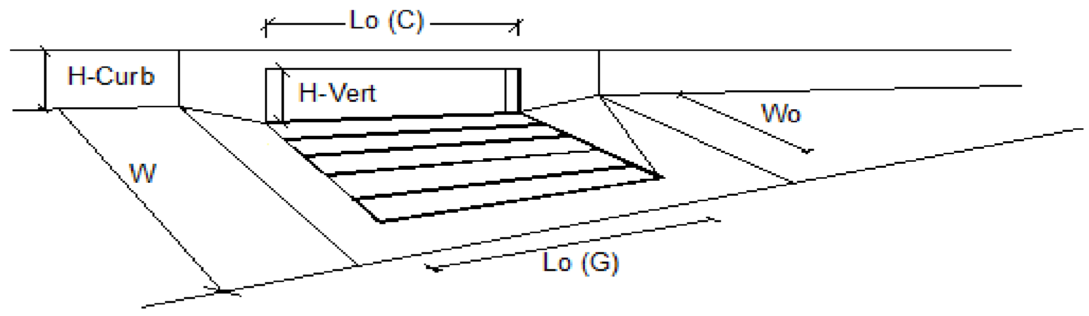
		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	17.0	17.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	4.0	12.0	inches
Allow Flow Depth at Street Crown (leave blank for no)		☐	☑	check = yes

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	**Q_{allow} =**	**8.3**	**112.6**	**cfs**

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

INLET ON A CONTINUOUS GRADE

Project: **Trails at Crowfoot**
Inlet ID: **2F**

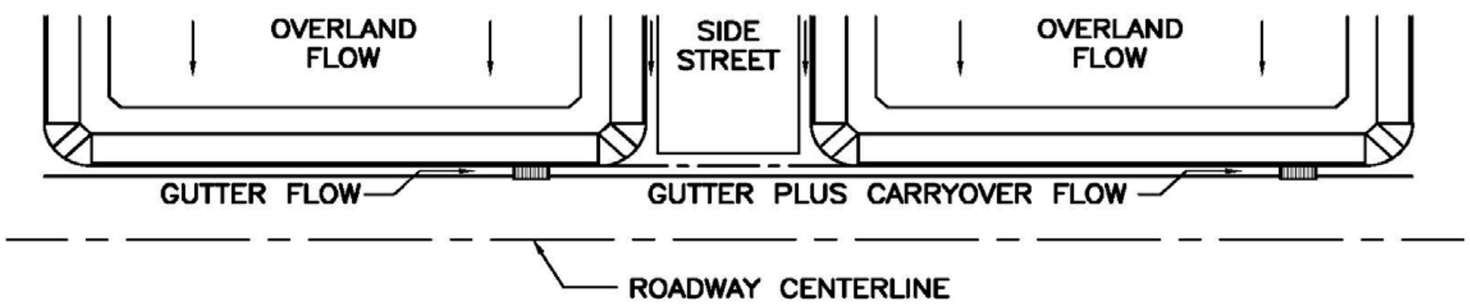


Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from 'Q-Allow')	a_{LOCAL} =	5.0	5.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)	No =	2	2	
Length of a Single Unit Inlet (Grate or Curb Opening)	L_o =	15.00	15.00	ft
Width of a Unit Grate (cannot be greater than W from Q-Allow)	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 < maximum allowable from sheet 'Q-Allow'		MINOR	MAJOR	
Total Inlet Interception Capacity	**Q =**	**3.90**	**29.09**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**0.0**	**2.7**	**cfs**
Capture Percentage = Q_a/Q_o =	**C% =**	**100**	**91**	**%**

Worksheet Protected

DESIGN PEAK FLOW FOR ONE-HALF OF STREET
OR GRASS-LINED CHANNEL BY THE RATIONAL METHOD

Project: Trails at Crowfoot
Inlet ID: 2G



Show Details

Design Flow: ONLY if already determined through other methods:

		Minor Storm	Major Storm	
(local peak flow for 1/2 of street OR grass-lined channel):	*Q_{Known} =	5.8	24.5	cfs

*** If you enter values in Row 14, skip the rest of this sheet and proceed to sheet Q-Allow or Area Inlet.**

<--- FILL IN THIS SECTION OR…

FILL IN THE SECTIONS BELOW. <---

Geographic Information: (Enter data in the blue cells):

Subcatchment Area =		Acres
Percent Imperviousness =		%
NRCS Soil Type =		A, B, C, or D

Site Type:
- ○ Site is Urban
- ○ Site is Non-Urban

Flows Developed For:
- ○ Street Inlets
- ○ Area Inlets in a Median

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

Rainfall Information: Intensity I (inch/hr) = $C_1 * P_1 / (C_2 + T_c)^{C_3}$

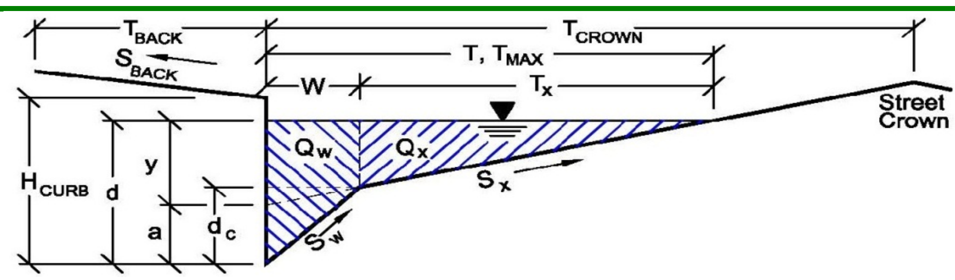
	Minor Storm	Major Storm	
Design Storm Return Period, T_r =			years
Return Period One-Hour Precipitation, P_1 =			inches
C_1 =			
C_2 =			
C_3 =			
User-Defined Storm Runoff Coefficient (leave this blank to accept a calculated value), C =			
User-Defined 5-yr. Runoff Coefficient (leave this blank to accept a calculated value), C_5 =			
Bypass (Carry-Over) Flow from upstream Subcatchments, Q_b =	**0.0**	**0.0**	**cfs**
Total Design Peak Flow, Q =	**5.8**	**24.5**	**cfs**

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

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

Project: Trails at Crowfoot

Inlet ID: 2G



Gutter Geometry (Enter data in the blue cells)

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	18.0	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} =	4.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	17.0	ft
Gutter Width	W =	2.00	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 =	0.060	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016	

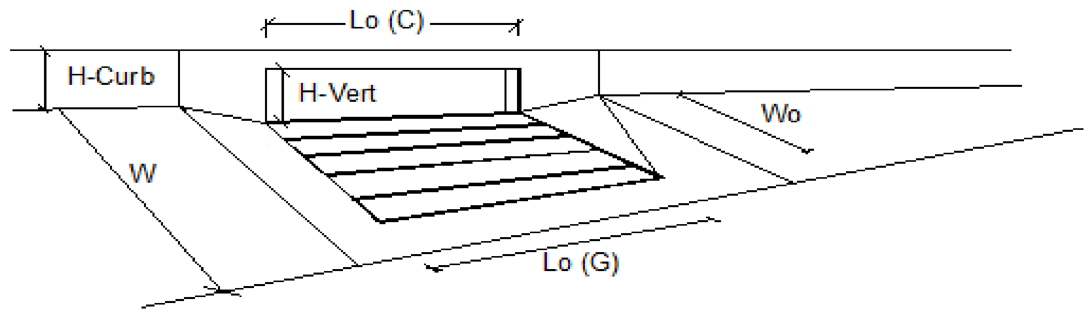
		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	17.0	17.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	4.0	12.0	inches
Allow Flow Depth at Street Crown (leave blank for no)		☐	☑	check = yes

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	Q_{allow} =	**8.3**	**112.6**	**cfs**

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

INLET ON A CONTINUOUS GRADE

Project: **Trails at Crowfoot**
Inlet ID: **2G**

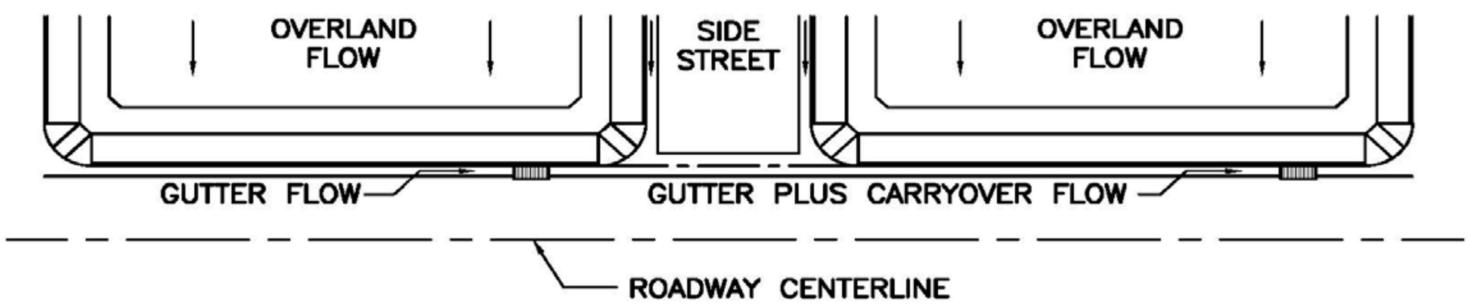


Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from 'Q-Allow')	a_{LOCAL} =	5.0	5.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)	No =	1	1	
Length of a Single Unit Inlet (Grate or Curb Opening)	L_o =	15.00	15.00	ft
Width of a Unit Grate (cannot be greater than W from Q-Allow)	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 < maximum allowable from sheet 'Q-Allow'		MINOR	MAJOR	
Total Inlet Interception Capacity	**Q =**	**5.80**	**16.85**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**0.0**	**7.7**	**cfs**
Capture Percentage = Q_a/Q_o =	**C% =**	**100**	**69**	**%**

Worksheet Protected

DESIGN PEAK FLOW FOR ONE-HALF OF STREET OR GRASS-LINED CHANNEL BY THE RATIONAL METHOD

Project: Trails at Crowfoot
Inlet ID: 2H



Show Details

Design Flow: ONLY if already determined through other methods:

	Minor Storm	Major Storm	
(local peak flow for 1/2 of street OR grass-lined channel): *Q_{Known} =	5.0	21.8	cfs

*** If you enter values in Row 14, skip the rest of this sheet and proceed to sheet Q-Allow or Area Inlet.**

<--- FILL IN THIS SECTION OR…

FILL IN THE SECTIONS BELOW. <---

Geographic Information: (Enter data in the blue cells):

Subcatchment Area =		Acres
Percent Imperviousness =		%
NRCS Soil Type =		A, B, C, or D

Site Type:
- ○ Site is Urban
- ○ Site is Non-Urban

Flows Developed For:
- ○ Street Inlets
- ○ Area Inlets in a Median

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

Rainfall Information: Intensity I (inch/hr) = $C_1 * P_1 / (C_2 + T_c)$ ^ C_3

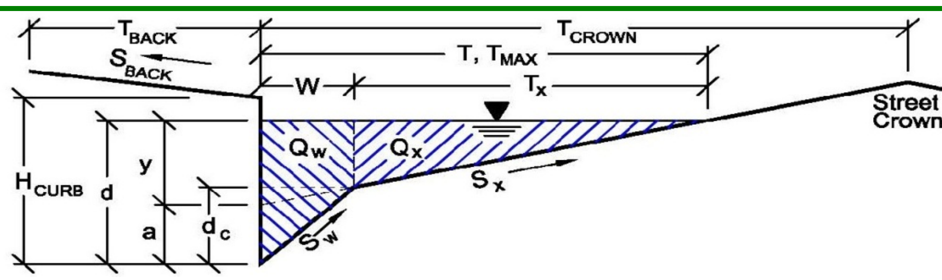
	Minor Storm	Major Storm	
Design Storm Return Period, T_r =			years
Return Period One-Hour Precipitation, P_1 =			inches
C_1 =			
C_2 =			
C_3 =			
User-Defined Storm Runoff Coefficient (leave this blank to accept a calculated value), C =			
User-Defined 5-yr. Runoff Coefficient (leave this blank to accept a calculated value), C_5 =			
Bypass (Carry-Over) Flow from upstream Subcatchments, Q_b =	0.0	1.4	cfs
Total Design Peak Flow, Q =	5.0	23.2	cfs

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

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

Project: Trails at Crowfoot

Inlet ID: 2H



Gutter Geometry (Enter data in the blue cells)

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	18.0	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} =	4.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	17.0	ft
Gutter Width	W =	2.00	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} =	0.016	

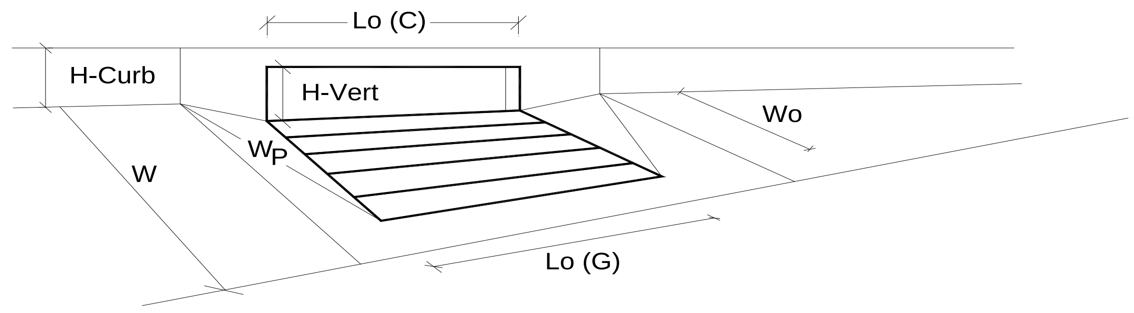
		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	17.0	17.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	4.0	12.0	inches
Allow Flow Depth at Street Crown (leave blank for no)		☐	☑	check = yes

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

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

INLET IN A SUMP OR SAG LOCATION

Project = **Trails at Crowfoot**
Inlet ID = **2H**

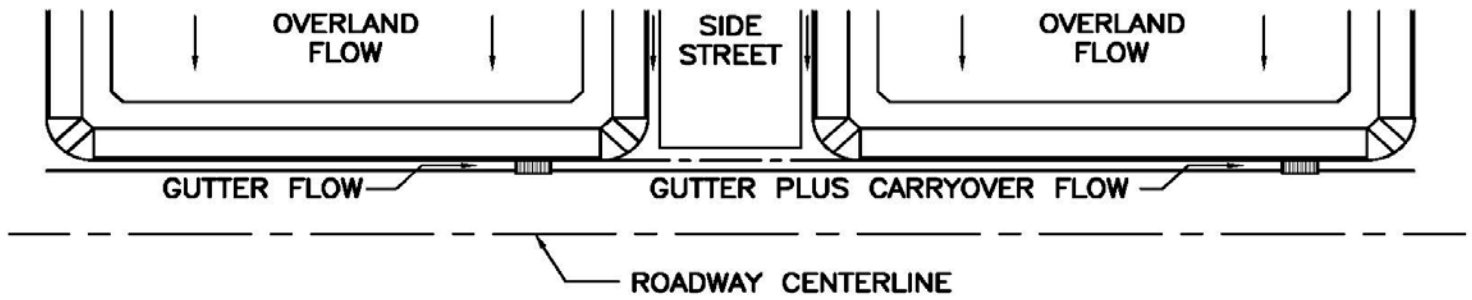


Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Inlet Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from 'Q-Allow')	a_{local} =	5.00	5.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	2	2	
Water Depth at Flowline (outside of local 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	
		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	Q_a =	**14.4**	**29.9**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms (>Q PEAK)	$Q_{PEAK\ REQUIRED}$ =	5.0	23.2	cfs

Worksheet Protected

DESIGN PEAK FLOW FOR ONE-HALF OF STREET OR GRASS-LINED CHANNEL BY THE RATIONAL METHOD

Project: Trails at Crowfoot
Inlet ID: 2I



Show Details

Design Flow: ONLY if already determined through other methods:

	Minor Storm	Major Storm	
(local peak flow for 1/2 of street OR grass-lined channel): *Q_{Known} =	2.9	35.7	cfs

*** If you enter values in Row 14, skip the rest of this sheet and proceed to sheet Q-Allow or Area Inlet.**

<--- FILL IN THIS SECTION OR…

FILL IN THE SECTIONS BELOW. <---

Geographic Information: (Enter data in the blue cells):

Subcatchment Area =		Acres
Percent Imperviousness =		%
NRCS Soil Type =		A, B, C, or D

Site Type:
- ○ Site is Urban
- ○ Site is Non-Urban

Flows Developed For:
- ○ Street Inlets
- ○ Area Inlets in a Median

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

Rainfall Information: Intensity I (inch/hr) = $C_1 * P_1 / (C_2 + T_c)^{C_3}$

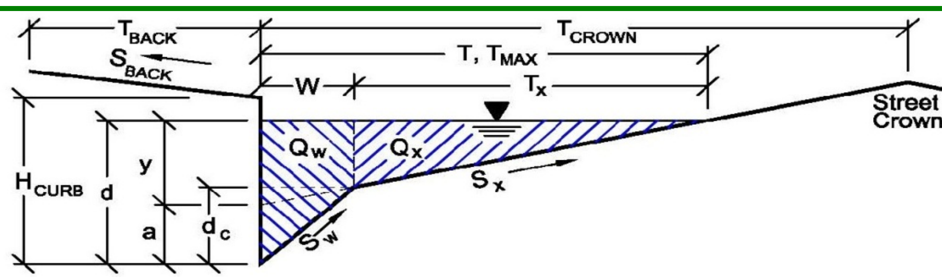
	Minor Storm	Major Storm	
Design Storm Return Period, T_r =			years
Return Period One-Hour Precipitation, P_1 =			inches
C_1 =			
C_2 =			
C_3 =			
User-Defined Storm Runoff Coefficient (leave this blank to accept a calculated value), C =			
User-Defined 5-yr. Runoff Coefficient (leave this blank to accept a calculated value), C_5 =			
Bypass (Carry-Over) Flow from upstream Subcatchments, Q_b =	0.0	0.0	cfs
Total Design Peak Flow, Q =	2.9	35.7	cfs

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

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

Project: **Trails at Crowfoot**

Inlet ID: **2I**



Gutter Geometry (Enter data in the blue cells)			
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	18.0	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} =	4.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	17.0	ft
Gutter Width	W =	2.00	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} =	0.016	

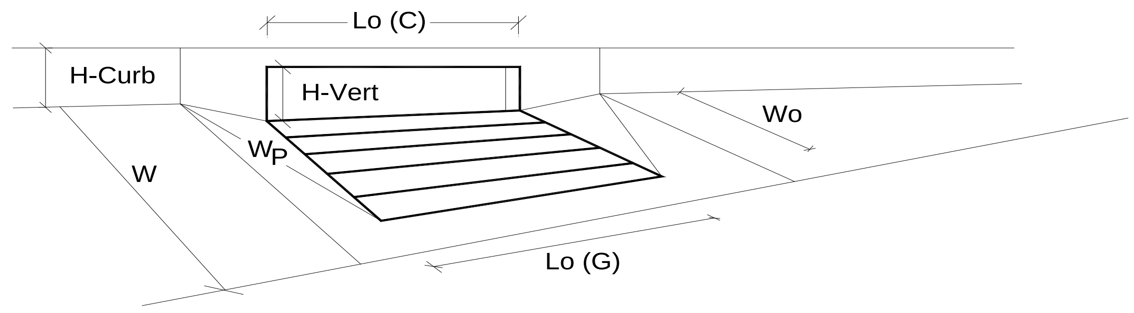
		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	17.0	17.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	4.0	12.0	inches
Allow Flow Depth at Street Crown (leave blank for no)		☐	☑	check = yes

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

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

INLET IN A SUMP OR SAG LOCATION

Project = **Trails at Crowfoot**
Inlet ID = **2I**

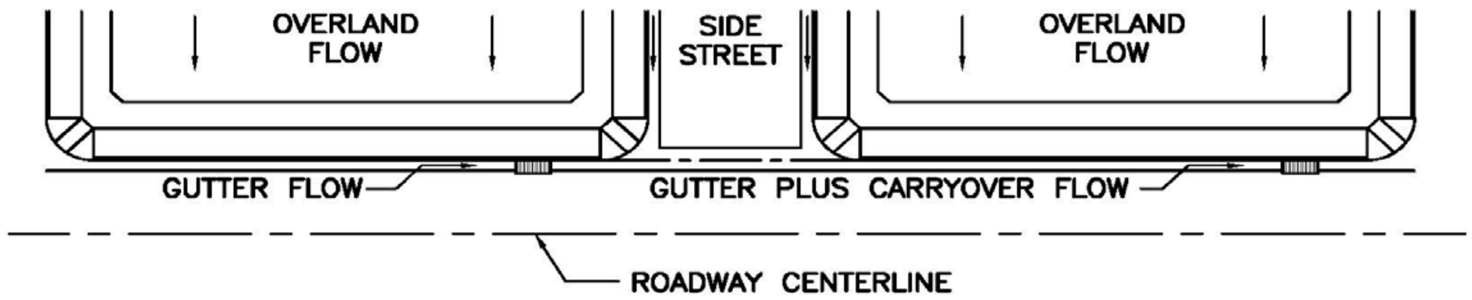


Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Inlet Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from 'Q-Allow')	a_{local} =	5.00	5.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	2	2	
Water Depth at Flowline (outside of local 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) =	15.00	15.00	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	
		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	Q_a =	**19.9**	**41.4**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms (>Q PEAK)	$Q_{PEAK\ REQUIRED}$ =	2.9	35.7	cfs

Worksheet Protected

DESIGN PEAK FLOW FOR ONE-HALF OF STREET OR GRASS-LINED CHANNEL BY THE RATIONAL METHOD

Project: Trails at Crowfoot
Inlet ID: 2J



Show Details

Design Flow: ONLY if already determined through other methods:

(local peak flow for 1/2 of street OR grass-lined channel):

	Minor Storm	Major Storm	
*Q_{Known} =	1.3	46.7	cfs

*** If you enter values in Row 14, skip the rest of this sheet and proceed to sheet Q-Allow or Area Inlet.**

<--- FILL IN THIS SECTION OR… FILL IN THE SECTIONS BELOW. <---

Geographic Information: (Enter data in the blue cells):

Subcatchment Area =		Acres
Percent Imperviousness =		%
NRCS Soil Type =		A, B, C, or D

Site Type:
- ○ Site is Urban
- ○ Site is Non-Urban

Flows Developed For:
- ○ Street Inlets
- ○ Area Inlets in a Median

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

Rainfall Information: Intensity I (inch/hr) = $C_1 * P_1 / (C_2 + T_c) ^ C_3$

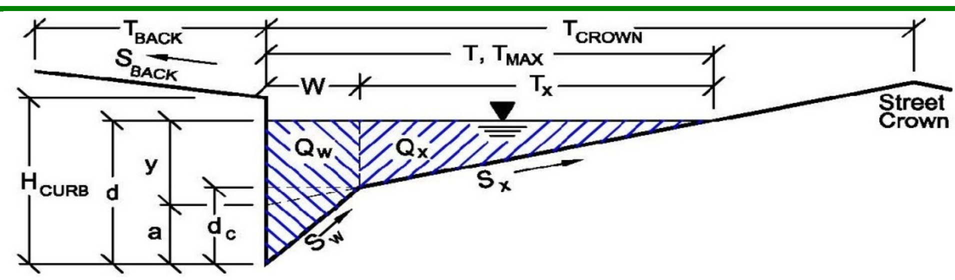
	Minor Storm	Major Storm	
Design Storm Return Period, T_r =			years
Return Period One-Hour Precipitation, P_1 =			inches
C_1 =			
C_2 =			
C_3 =			
User-Defined Storm Runoff Coefficient (leave this blank to accept a calculated value), C =			
User-Defined 5-yr. Runoff Coefficient (leave this blank to accept a calculated value), C_5 =			
Bypass (Carry-Over) Flow from upstream Subcatchments, Q_b =	0.0	0.0	cfs
Total Design Peak Flow, Q =	1.3	46.7	cfs

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

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

Project: Trails at Crowfoot

Inlet ID: 2J



Gutter Geometry (Enter data in the blue cells)

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	18.0	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} =	4.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	17.0	ft
Gutter Width	W =	2.00	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} =	0.016	

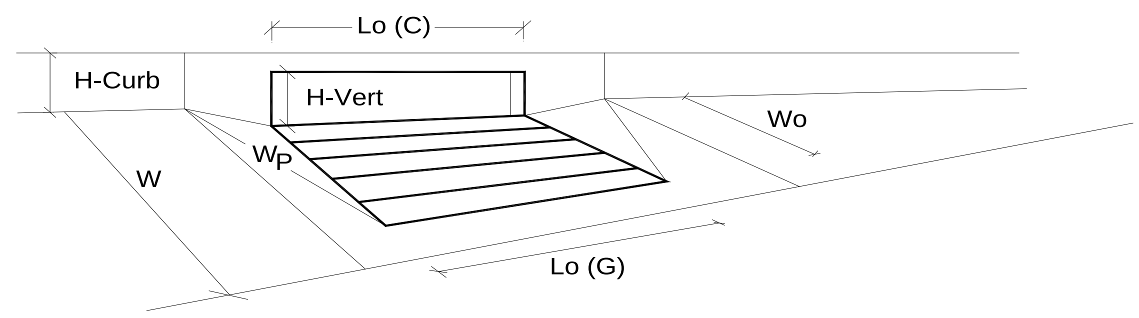
		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	17.0	17.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	4.0	12.0	inches
Allow Flow Depth at Street Crown (leave blank for no)		☐	☑	check = yes

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

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

INLET IN A SUMP OR SAG LOCATION

Project = **Trails at Crowfoot**
Inlet ID = **2J**

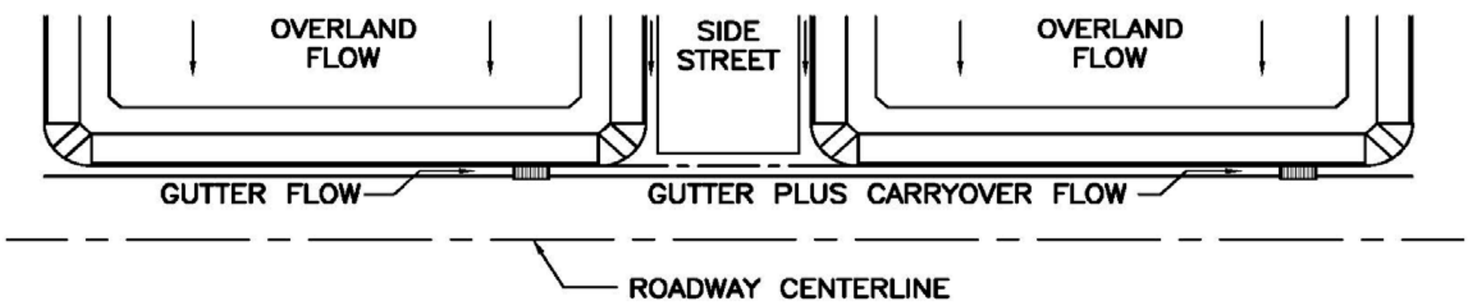


Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Inlet Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from 'Q-Allow')	a_{local} =	5.00	5.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	2	2	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	6.0	12.0	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	
		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	Q_a =	**14.4**	**56.8**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms (>Q PEAK)	Q PEAK REQUIRED =	1.3	46.7	cfs

Worksheet Protected

DESIGN PEAK FLOW FOR ONE-HALF OF STREET
OR GRASS-LINED CHANNEL BY THE RATIONAL METHOD

Project: **Trails at Crowfoot**
Inlet ID: **2K**



Show Details

Design Flow: ONLY if already determined through other methods:

		Minor Storm	Major Storm	
(local peak flow for 1/2 of street OR grass-lined channel):	***Q_{Known} =**	**1.6**	**5.2**	**cfs**

*** If you enter values in Row 14, skip the rest of this sheet and proceed to sheet Q-Allow or Area Inlet.**

<--- FILL IN THIS SECTION OR…

FILL IN THE SECTIONS BELOW. <---

Geographic Information: (Enter data in the blue cells):

Subcatchment Area =		Acres
Percent Imperviousness =		%
NRCS Soil Type =		A, B, C, or D

Site Type:
- ○ Site is Urban
- ○ Site is Non-Urban

Flows Developed For:
- ○ Street Inlets
- ○ Area Inlets in a Median

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

Rainfall Information: Intensity I (inch/hr) = $C_1 * P_1 / (C_2 + T_c)$ ^ C_3

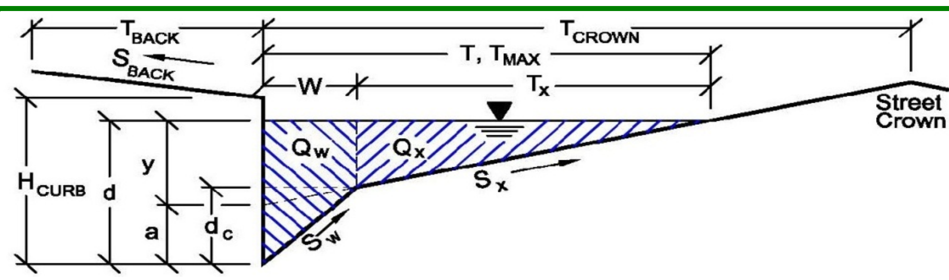
	Minor Storm	Major Storm	
Design Storm Return Period, T_r =			years
Return Period One-Hour Precipitation, P_1 =			inches
C_1 =			
C_2 =			
C_3 =			
User-Defined Storm Runoff Coefficient (leave this blank to accept a calculated value), C =			
User-Defined 5-yr. Runoff Coefficient (leave this blank to accept a calculated value), C_5 =			
Bypass (Carry-Over) Flow from upstream Subcatchments, Q_b =	**0.0**	**0.0**	**cfs**
Total Design Peak Flow, Q =	**1.6**	**5.2**	**cfs**

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

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

Project: Trails at Crowfoot

Inlet ID: 2K



Gutter Geometry (Enter data in the blue cells)

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	18.0	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} =	4.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	17.0	ft
Gutter Width	W =	2.00	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} =	0.016	

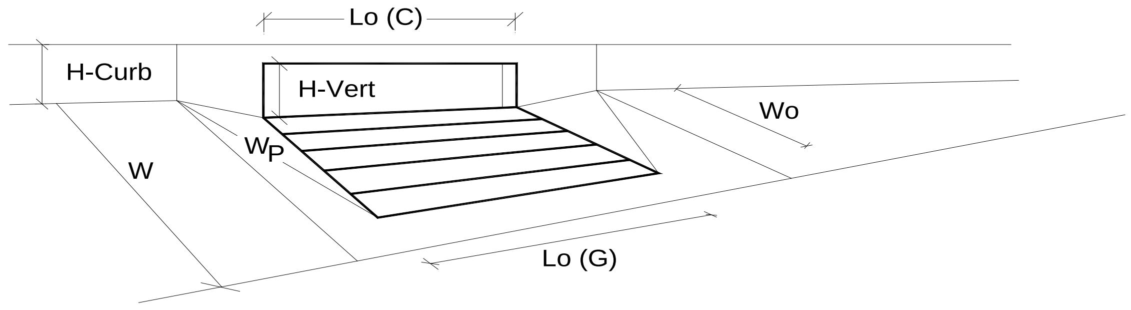
		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	17.0	17.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	4.0	12.0	inches
Allow Flow Depth at Street Crown (leave blank for no)		☐	☑	check = yes

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

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

INLET IN A SUMP OR SAG LOCATION

Project = **Trails at Crowfoot**
Inlet ID = **2K**

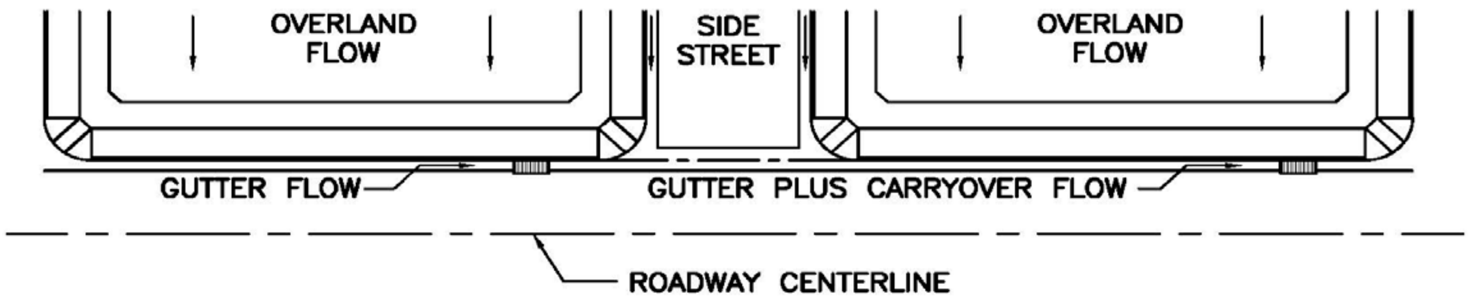


Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Inlet Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from 'Q-Allow')	a_{local} =	5.00	5.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	1	1	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	6.0	12.0	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	
		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	Q_a =	**5.4**	**13.2**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms (>Q PEAK)	$Q_{PEAK\ REQUIRED}$ =	1.6	5.2	cfs

Worksheet Protected

DESIGN PEAK FLOW FOR ONE-HALF OF STREET OR GRASS-LINED CHANNEL BY THE RATIONAL METHOD

Project: Trails at Crowfoot
Inlet ID: 2L



Show Details

Design Flow: ONLY if already determined through other methods:

(local peak flow for 1/2 of street OR grass-lined channel):

	Minor Storm	Major Storm	
*Q_{Known} =	5.9	46.9	cfs

*** If you enter values in Row 14, skip the rest of this sheet and proceed to sheet Q-Allow or Area Inlet.**

<--- FILL IN THIS SECTION OR…

FILL IN THE SECTIONS BELOW. <---

Geographic Information: (Enter data in the blue cells):

Subcatchment Area =		Acres
Percent Imperviousness =		%
NRCS Soil Type =		A, B, C, or D

Site Type:
- ○ Site is Urban
- ○ Site is Non-Urban

Flows Developed For:
- ○ Street Inlets
- ○ Area Inlets in a Median

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

Rainfall Information: Intensity I (inch/hr) = $C_1 * P_1 / (C_2 + T_c) ^{\wedge} C_3$

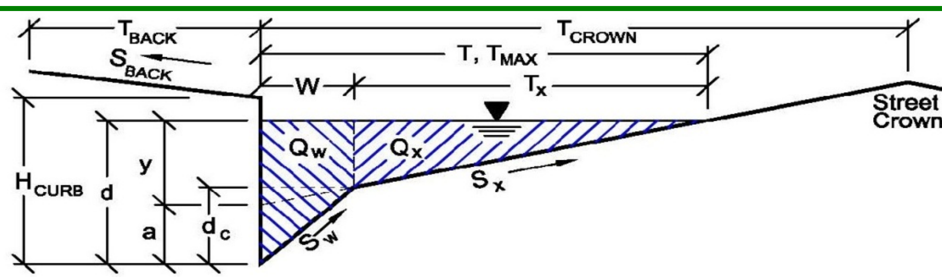
	Minor Storm	Major Storm	
Design Storm Return Period, T_r =			years
Return Period One-Hour Precipitation, P_1 =			inches
C_1 =			
C_2 =			
C_3 =			
User-Defined Storm Runoff Coefficient (leave this blank to accept a calculated value), C =			
User-Defined 5-yr. Runoff Coefficient (leave this blank to accept a calculated value), C_5 =			
Bypass (Carry-Over) Flow from upstream Subcatchments, Q_b =	0.0	0.0	cfs
Total Design Peak Flow, Q =	5.9	46.9	cfs

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

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

Project: Trails at Crowfoot

Inlet ID: 2L



Gutter Geometry (Enter data in the blue cells)

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	18.0	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} =	4.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	17.0	ft
Gutter Width	W =	2.00	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} =	0.016	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	17.0	17.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	4.0	12.0	inches
Allow Flow Depth at Street Crown (leave blank for no)		☐	☑	check = yes

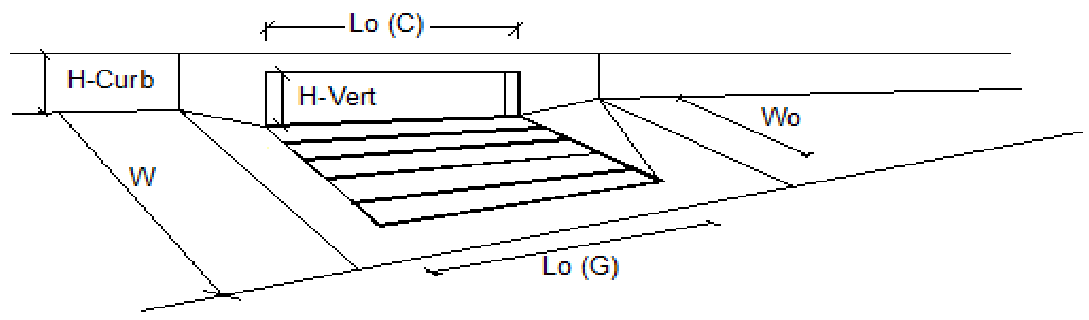
		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	**Q_{allow} =**	**5.9**	**138.6**	**cfs**

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

INLET ON A CONTINUOUS GRADE

Project: Trails at Crowfoot

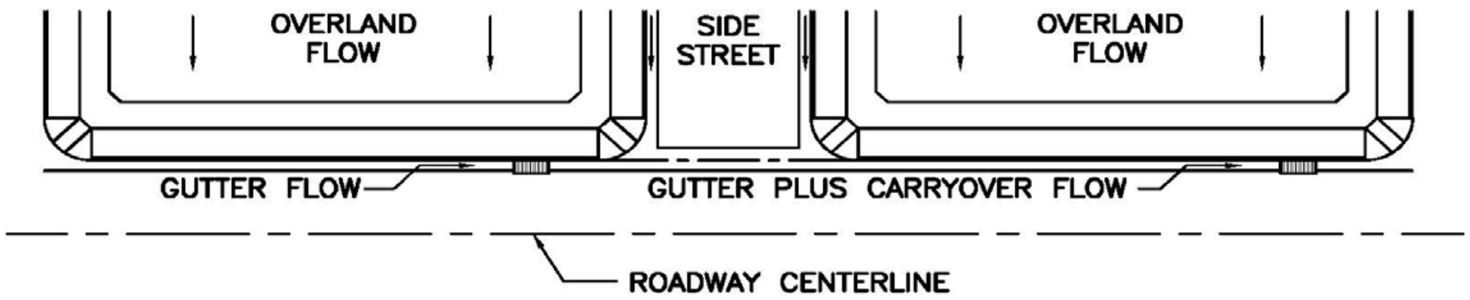
Inlet ID: 2L



Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from 'Q-Allow')	a_{LOCAL} =	5.0	5.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)	No =	1	1	
Length of a Single Unit Inlet (Grate or Curb Opening)	L_o =	15.00	15.00	ft
Width of a Unit Grate (cannot be greater than W from Q-Allow)	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 < maximum allowable from sheet 'Q-Allow'		MINOR	MAJOR	
Total Inlet Interception Capacity	**Q =**	**5.85**	**21.82**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**0.0**	**25.1**	**cfs**
Capture Percentage = Q_a/Q_o =	**C% =**	**100**	**47**	**%**

DESIGN PEAK FLOW FOR ONE-HALF OF STREET OR GRASS-LINED CHANNEL BY THE RATIONAL METHOD

Project: Trails at Crowfoot
Inlet ID: 2M



Show Details

Design Flow: ONLY if already determined through other methods:
(local peak flow for 1/2 of street OR grass-lined channel):

	Minor Storm	Major Storm	
*Q_{Known} =	3.9	15.7	cfs

*** If you enter values in Row 14, skip the rest of this sheet and proceed to sheet Q-Allow or Area Inlet.**

<--- FILL IN THIS SECTION OR…

FILL IN THE SECTIONS BELOW. <---

Geographic Information: (Enter data in the blue cells):

Subcatchment Area =		Acres
Percent Imperviousness =		%
NRCS Soil Type =		A, B, C, or D

Site Type:
- ○ Site is Urban
- ○ Site is Non-Urban

Flows Developed For:
- ○ Street Inlets
- ○ Area Inlets in a Median

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

Rainfall Information: Intensity I (inch/hr) = $C_1 * P_1 / (C_2 + T_c) ^{\wedge} C_3$

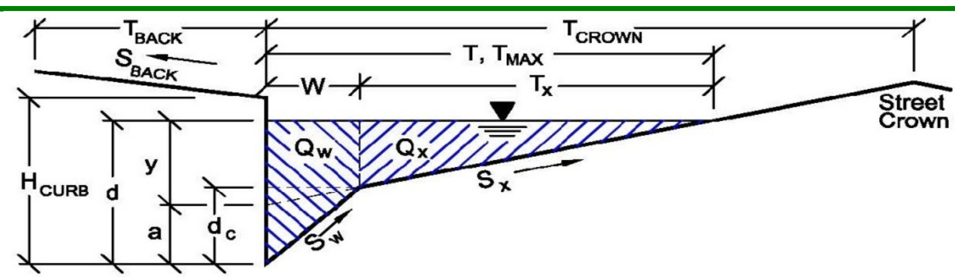
	Minor Storm	Major Storm	
Design Storm Return Period, T_r =			years
Return Period One-Hour Precipitation, P_1 =			inches
C_1 =			
C_2 =			
C_3 =			
User-Defined Storm Runoff Coefficient (leave this blank to accept a calculated value), C =			
User-Defined 5-yr. Runoff Coefficient (leave this blank to accept a calculated value), C_5 =			
Bypass (Carry-Over) Flow from upstream Subcatchments, Q_b =	0.0	0.0	cfs
Total Design Peak Flow, Q =	3.9	15.7	cfs

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

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

Project: Trails at Crowfoot

Inlet ID: 2M



Gutter Geometry (Enter data in the blue cells)

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	18.0	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} =	4.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	17.0	ft
Gutter Width	W =	2.00	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} =	0.016	

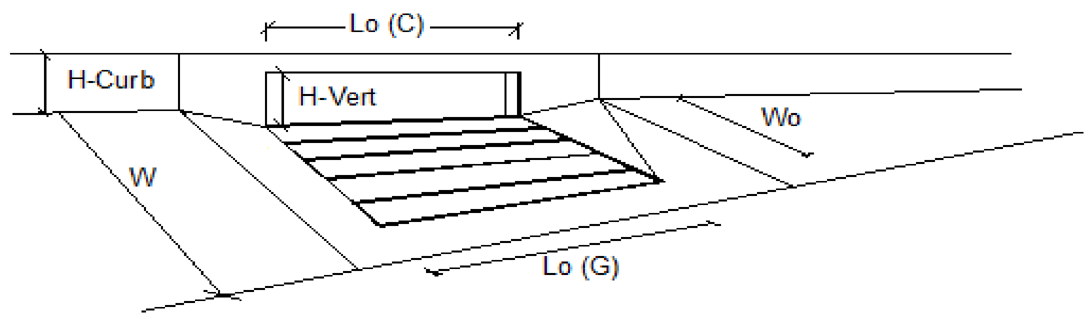
		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	17.0	17.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	4.0	12.0	inches
Allow Flow Depth at Street Crown (leave blank for no)		☐	☑	check = yes

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	Q_{allow} =	**4.8**	**156.5**	**cfs**

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

INLET ON A CONTINUOUS GRADE

Project: **Trails at Crowfoot**
Inlet ID: **2M**

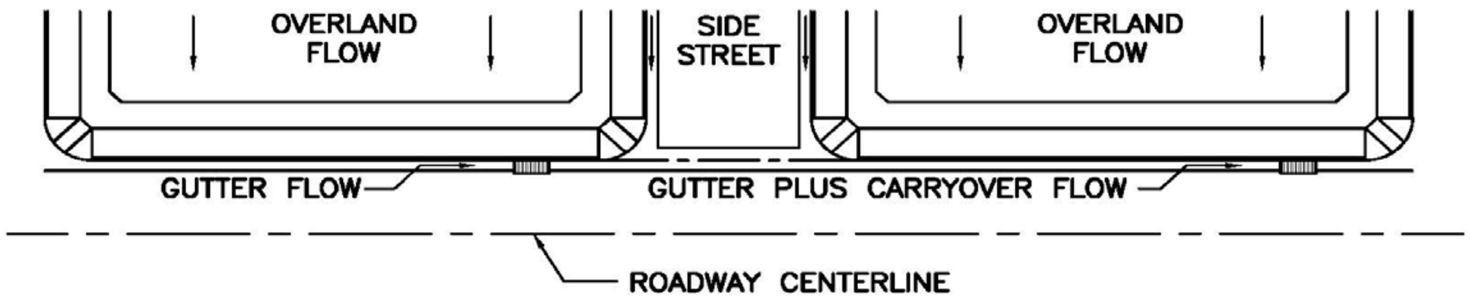


Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from 'Q-Allow')	a_{LOCAL} =	5.0	5.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)	No =	1	1	
Length of a Single Unit Inlet (Grate or Curb Opening)	L_o =	10.00	10.00	ft
Width of a Unit Grate (cannot be greater than W from Q-Allow)	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 < maximum allowable from sheet 'Q-Allow'		MINOR	MAJOR	
Total Inlet Interception Capacity	**Q =**	**3.90**	**9.62**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**0.0**	**6.1**	**cfs**
Capture Percentage = Q_a/Q_o =	**C% =**	**100**	**61**	**%**

Worksheet Protected

DESIGN PEAK FLOW FOR ONE-HALF OF STREET OR GRASS-LINED CHANNEL BY THE RATIONAL METHOD

Project: Trails at Crowfoot
Inlet ID: 2N



Show Details

Design Flow: ONLY if already determined through other methods:

		Minor Storm	Major Storm	
(local peak flow for 1/2 of street OR grass-lined channel):	*Q_{Known} =	3.9	15.7	cfs

*** If you enter values in Row 14, skip the rest of this sheet and proceed to sheet Q-Allow or Area Inlet.**

<--- FILL IN THIS SECTION OR…

FILL IN THE SECTIONS BELOW. <---

Geographic Information: (Enter data in the blue cells):

Subcatchment Area =		Acres
Percent Imperviousness =		%
NRCS Soil Type =		A, B, C, or D

Site Type:
- ○ Site is Urban
- ○ Site is Non-Urban

Flows Developed For:
- ○ Street Inlets
- ○ Area Inlets in a Median

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

Rainfall Information: Intensity I (inch/hr) = $C_1 * P_1 / (C_2 + T_c) ^ C_3$

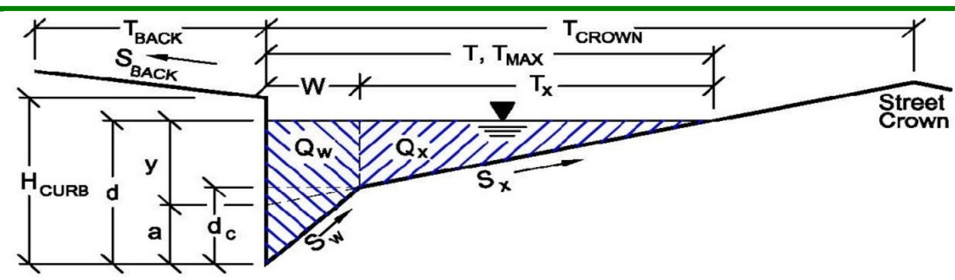
	Minor Storm	Major Storm	
Design Storm Return Period, T_r =			years
Return Period One-Hour Precipitation, P_1 =			inches
C_1 =			
C_2 =			
C_3 =			
User-Defined Storm Runoff Coefficient (leave this blank to accept a calculated value), C =			
User-Defined 5-yr. Runoff Coefficient (leave this blank to accept a calculated value), C_5 =			
Bypass (Carry-Over) Flow from upstream Subcatchments, Q_b =	0.0	0.0	cfs
Total Design Peak Flow, Q =	3.9	15.7	cfs

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

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

Project: Trails at Crowfoot

Inlet ID: 2N



Gutter Geometry (Enter data in the blue cells)

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	18.0	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} =	4.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	17.0	ft
Gutter Width	W =	2.00	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} =	0.016	

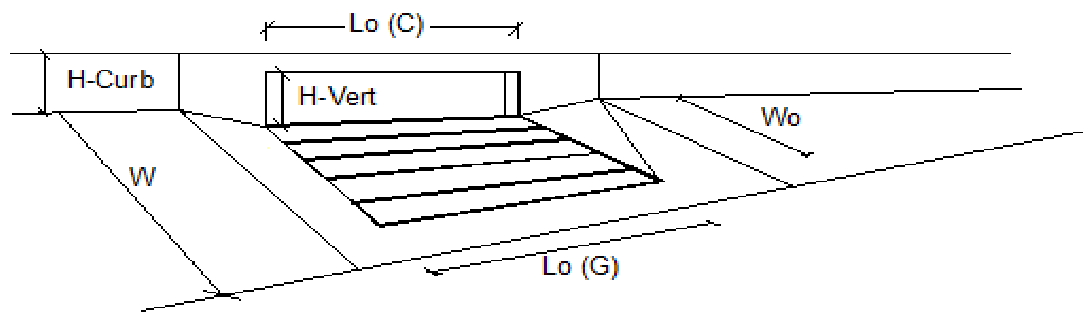
		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	17.0	17.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	4.0	12.0	inches
Allow Flow Depth at Street Crown (leave blank for no)		☐	☑	check = yes

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	Q_{allow} =	**4.8**	**156.5**	**cfs**

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

INLET ON A CONTINUOUS GRADE

Project: **Trails at Crowfoot**
Inlet ID: **2N**

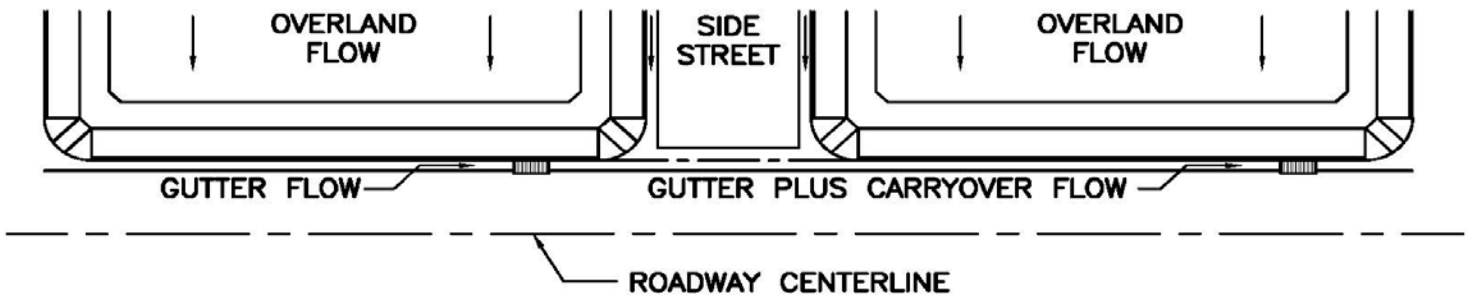


Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from 'Q-Allow')	a_{LOCAL} =	5.0	5.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)	No =	1	1	
Length of a Single Unit Inlet (Grate or Curb Opening)	L_o =	10.00	10.00	ft
Width of a Unit Grate (cannot be greater than W from Q-Allow)	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 < maximum allowable from sheet 'Q-Allow'		MINOR	MAJOR	
Total Inlet Interception Capacity	**Q =**	**3.90**	**9.62**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**0.0**	**6.1**	**cfs**
Capture Percentage = Q_a/Q_o =	**C% =**	**100**	**61**	**%**

Worksheet Protected

DESIGN PEAK FLOW FOR ONE-HALF OF STREET OR GRASS-LINED CHANNEL BY THE RATIONAL METHOD

Project: Trails at Crowfoot
Inlet ID: 2O



Show Details

Design Flow: ONLY if already determined through other methods:
(local peak flow for 1/2 of street OR grass-lined channel):

	Minor Storm	Major Storm	
$^{*}Q_{Known}$ =	2.5	10.1	cfs

*** If you enter values in Row 14, skip the rest of this sheet and proceed to sheet Q-Allow or Area Inlet.**

<--- FILL IN THIS SECTION OR…

FILL IN THE SECTIONS BELOW. <---

Geographic Information: (Enter data in the blue cells):

Subcatchment Area =		Acres
Percent Imperviousness =		%
NRCS Soil Type =		A, B, C, or D

Site Type:
○ Site is Urban
○ Site is Non-Urban

Flows Developed For:
○ Street Inlets
○ Area Inlets in a Median

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

Rainfall Information: Intensity I (inch/hr) = $C_1 * P_1 / (C_2 + T_c) ^ C_3$

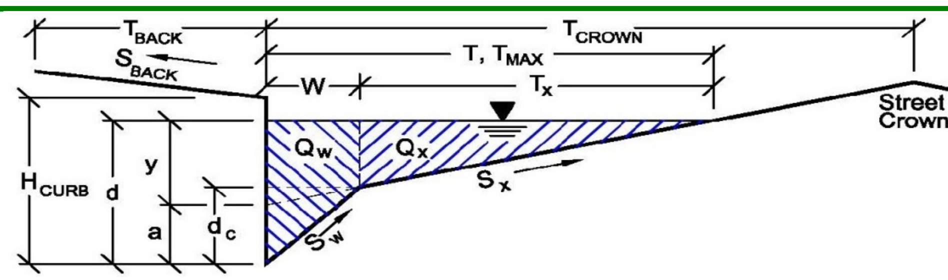
	Minor Storm	Major Storm	
Design Storm Return Period, T_r =			years
Return Period One-Hour Precipitation, P_1 =			inches
C_1 =			
C_2 =			
C_3 =			
User-Defined Storm Runoff Coefficient (leave this blank to accept a calculated value), C =			
User-Defined 5-yr. Runoff Coefficient (leave this blank to accept a calculated value), C_5 =			
Bypass (Carry-Over) Flow from upstream Subcatchments, Q_b =	0.0	0.0	cfs
Total Design Peak Flow, Q =	2.5	10.1	cfs

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

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

Project: Trails at Crowfoot

Inlet ID: 2O



Gutter Geometry (Enter data in the blue cells)

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	18.0	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} =	4.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	17.0	ft
Gutter Width	W =	2.00	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 =	0.010	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016	

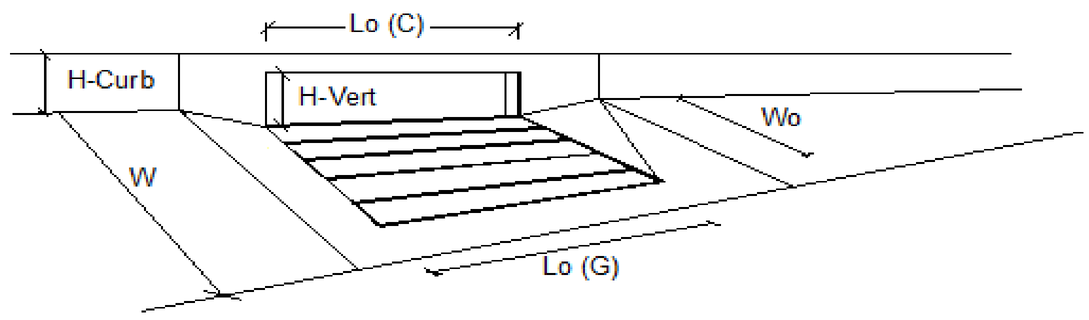
		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	17.0	17.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	4.0	12.0	inches
Allow Flow Depth at Street Crown (leave blank for no)		☐	☑	check = yes

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	Q_{allow} =	**3.4**	**132.7**	**cfs**

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

INLET ON A CONTINUOUS GRADE

Project: **Trails at Crowfoot**
Inlet ID: **2O**

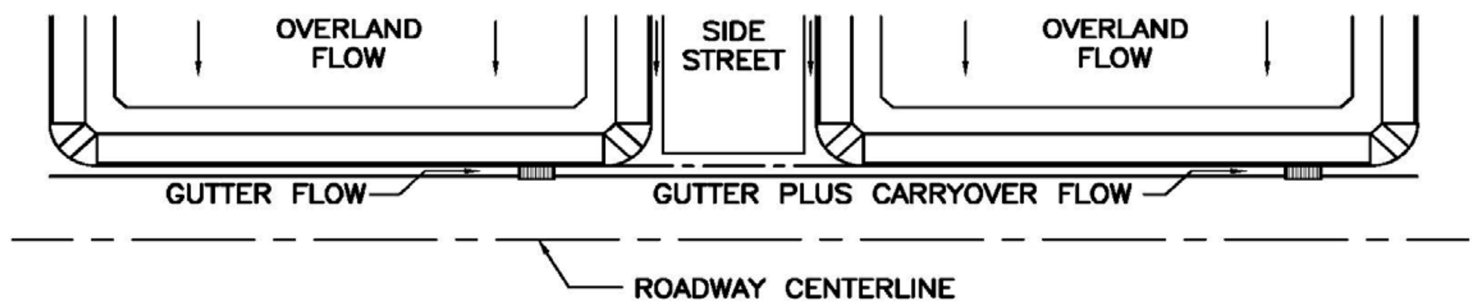


Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from 'Q-Allow')	a_{LOCAL} =	5.0	5.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)	No =	1	1	
Length of a Single Unit Inlet (Grate or Curb Opening)	L_o =	10.00	10.00	ft
Width of a Unit Grate (cannot be greater than W from Q-Allow)	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 < maximum allowable from sheet 'Q-Allow'		MINOR	MAJOR	
Total Inlet Interception Capacity	**Q =**	**2.50**	**7.61**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**0.0**	**2.5**	**cfs**
Capture Percentage = Q_a/Q_o =	**C% =**	**100**	**75**	**%**

Worksheet Protected

DESIGN PEAK FLOW FOR ONE-HALF OF STREET
OR GRASS-LINED CHANNEL BY THE RATIONAL METHOD

Project: Trails at Crowfoot
Inlet ID: 4A



Show Details

Design Flow: ONLY if already determined through other methods:

		Minor Storm	Major Storm	
(local peak flow for 1/2 of street OR grass-lined channel):	*Q_{Known} =	5.3	25.2	cfs

*** If you enter values in Row 14, skip the rest of this sheet and proceed to sheet Q-Allow or Area Inlet.**

<--- FILL IN THIS SECTION OR…

FILL IN THE SECTIONS BELOW. <---

Geographic Information: (Enter data in the blue cells):

Subcatchment Area =		Acres
Percent Imperviousness =		%
NRCS Soil Type =		A, B, C, or D

Site Type:
- ○ Site is Urban
- ○ Site is Non-Urban

Flows Developed For:
- ○ Street Inlets
- ○ Area Inlets in a Median

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

Rainfall Information: Intensity I (inch/hr) = $C_1 * P_1 / (C_2 + T_c) \wedge C_3$

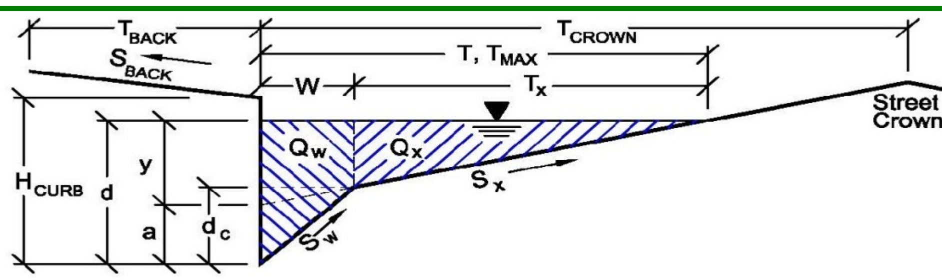
	Minor Storm	Major Storm	
Design Storm Return Period, T_r =			years
Return Period One-Hour Precipitation, P_1 =			inches
C_1 =			
C_2 =			
C_3 =			
User-Defined Storm Runoff Coefficient (leave this blank to accept a calculated value), C =			
User-Defined 5-yr. Runoff Coefficient (leave this blank to accept a calculated value), C_5 =			
Bypass (Carry-Over) Flow from upstream Subcatchments, Q_b =	**0.0**	**0.0**	**cfs**
Total Design Peak Flow, Q =	**5.3**	**25.2**	**cfs**

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

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

Project: Trails at Crowfoot

Inlet ID: 4A



Gutter Geometry (Enter data in the blue cells)

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	18.0	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} =	4.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	17.0	ft
Gutter Width	W =	2.00	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} =	0.016	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	17.0	17.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	4.0	12.0	inches
Allow Flow Depth at Street Crown (leave blank for no)		☐	☑	check = yes

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

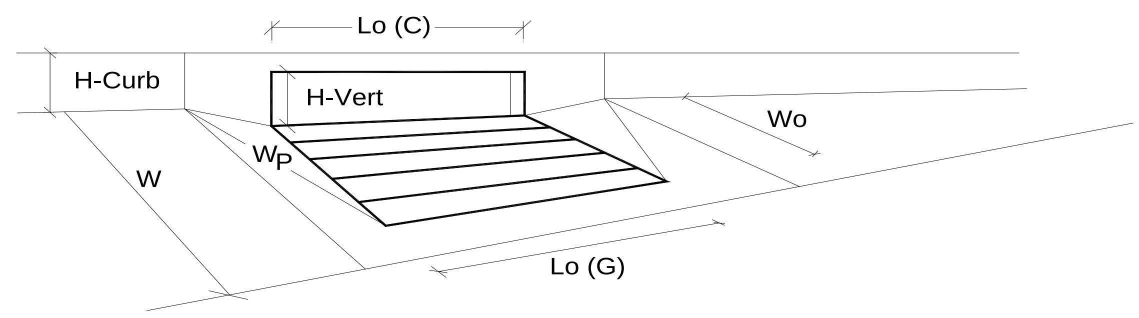
Minor storm max. allowable capacity GOOD - greater than flow given on sheet 'Q-Peak'

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

INLET IN A SUMP OR SAG LOCATION

Project = **Trails at Crowfoot**

Inlet ID = **4A**

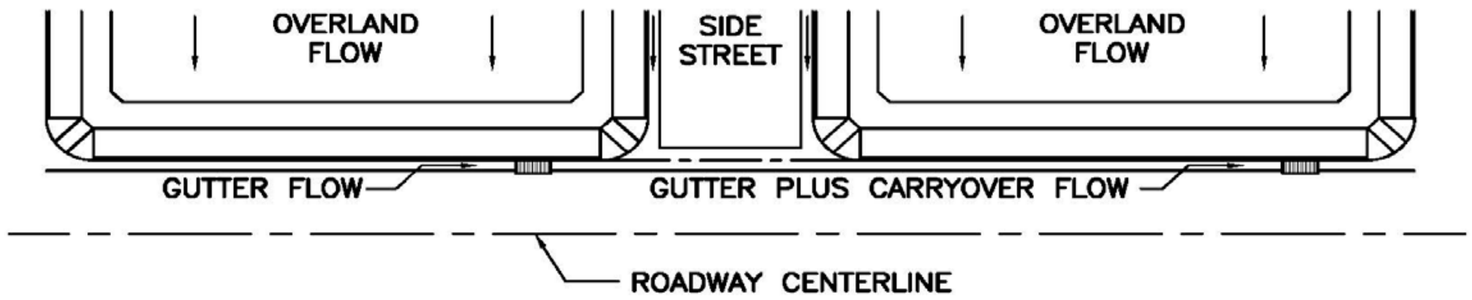


Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Inlet Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from 'Q-Allow')	a_{local} =	5.00	5.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	1	1	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	6.0	12.0	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	
		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	Q_a =	**8.3**	**27.5**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms (>Q PEAK)	$Q_{PEAK\ REQUIRED}$ =	5.3	25.2	cfs

Worksheet Protected

DESIGN PEAK FLOW FOR ONE-HALF OF STREET OR GRASS-LINED CHANNEL BY THE RATIONAL METHOD

Project: Trails at Crowfoot
Inlet ID: 4B



Show Details

Design Flow: ONLY if already determined through other methods:

(local peak flow for 1/2 of street OR grass-lined channel):

	Minor Storm	Major Storm	
* Q_{Known} =	5.6	24.8	cfs

*** If you enter values in Row 14, skip the rest of this sheet and proceed to sheet Q-Allow or Area Inlet.**

<--- FILL IN THIS SECTION OR…

FILL IN THE SECTIONS BELOW. <---

Geographic Information: (Enter data in the blue cells):

Subcatchment Area =		Acres
Percent Imperviousness =		%
NRCS Soil Type =		A, B, C, or D

Site Type:
- ○ Site is Urban
- ○ Site is Non-Urban

Flows Developed For:
- ○ Street Inlets
- ○ Area Inlets in a Median

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

Rainfall Information: Intensity I (inch/hr) = $C_1 * P_1 / (C_2 + T_c)^{C_3}$

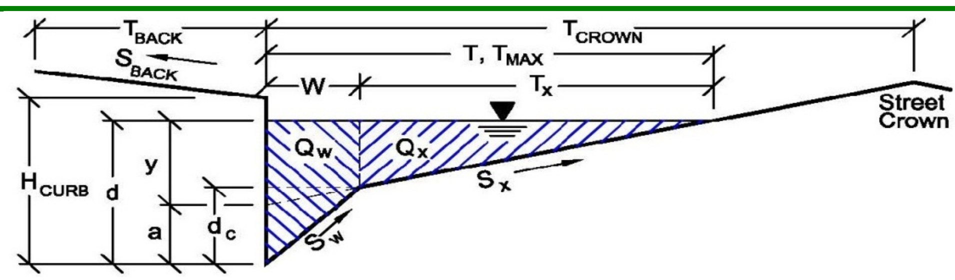
	Minor Storm	Major Storm	
Design Storm Return Period, T_r =			years
Return Period One-Hour Precipitation, P_1 =			inches
C_1 =			
C_2 =			
C_3 =			
User-Defined Storm Runoff Coefficient (leave this blank to accept a calculated value), C =			
User-Defined 5-yr. Runoff Coefficient (leave this blank to accept a calculated value), C_5 =			
Bypass (Carry-Over) Flow from upstream Subcatchments, Q_b =	**0.0**	**0.0**	**cfs**
Total Design Peak Flow, Q =	**5.6**	**24.8**	**cfs**

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

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

Project: Trails at Crowfoot

Inlet ID: 4B



Gutter Geometry (Enter data in the blue cells)

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	18.0	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} =	4.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	17.0	ft
Gutter Width	W =	2.00	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 =	0.060	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016	

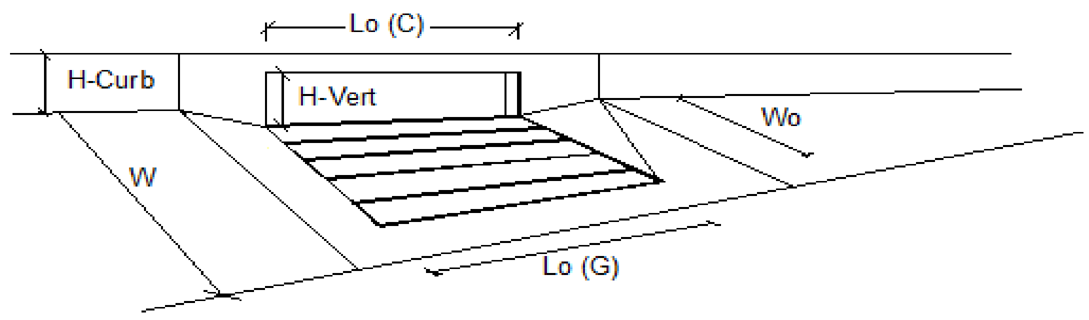
		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	17.0	17.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	4.0	12.0	inches
Allow Flow Depth at Street Crown (leave blank for no)		☐	☑	check = yes

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	Q_{allow} =	**8.3**	**112.6**	**cfs**

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

INLET ON A CONTINUOUS GRADE

Project: **Trails at Crowfoot**
Inlet ID: **4B**

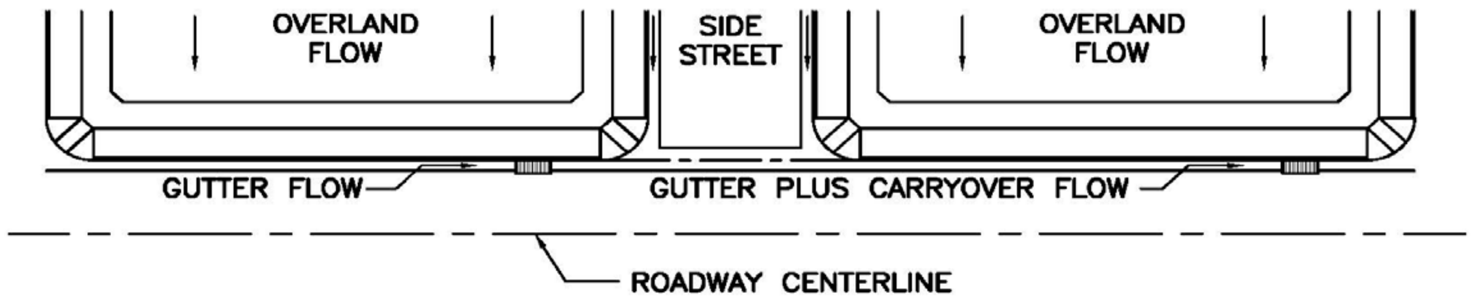


Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from 'Q-Allow')	a_{LOCAL} =	5.0	5.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)	No =	1	1	
Length of a Single Unit Inlet (Grate or Curb Opening)	L_o =	15.00	15.00	ft
Width of a Unit Grate (cannot be greater than W from Q-Allow)	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	
Warning 1 Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)	C_f-C =	0.20	0.20	
Street Hydraulics: OK - Q < maximum allowable from sheet 'Q-Allow'		MINOR	MAJOR	
Total Inlet Interception Capacity	**Q =**	**5.60**	**16.52**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**0.0**	**8.3**	**cfs**
Capture Percentage = Q_a/Q_o =	**C% =**	**100**	**67**	**%**

Worksheet Protected

DESIGN PEAK FLOW FOR ONE-HALF OF STREET OR GRASS-LINED CHANNEL BY THE RATIONAL METHOD

Project: Trails at Crowfoot
Inlet ID: 4E



Show Details

Design Flow: ONLY if already determined through other methods:
(local peak flow for 1/2 of street OR grass-lined channel):

	Minor Storm	Major Storm	
*Q_{Known} =	13.6	54.5	cfs

*** If you enter values in Row 14, skip the rest of this sheet and proceed to sheet Q-Allow or Area Inlet.**

<--- FILL IN THIS SECTION OR…

FILL IN THE SECTIONS BELOW. <---

Geographic Information: (Enter data in the blue cells):

Subcatchment Area =		Acres
Percent Imperviousness =		%
NRCS Soil Type =		A, B, C, or D

Site Type:
○ Site is Urban
○ Site is Non-Urban

Flows Developed For:
○ Street Inlets
○ Area Inlets in a Median

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

Rainfall Information: Intensity I (inch/hr) = $C_1 * P_1 / (C_2 + T_c) ^ C_3$

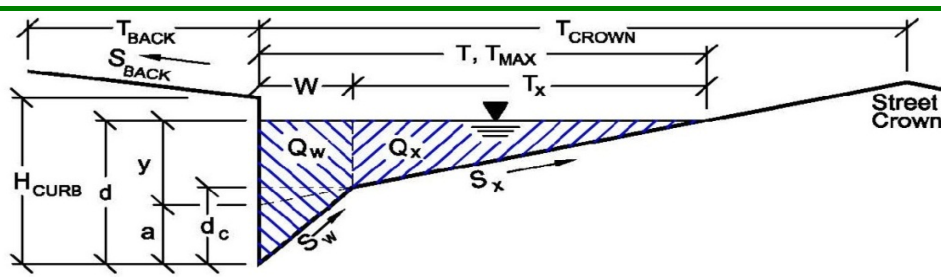
	Minor Storm	Major Storm	
Design Storm Return Period, T_r =			years
Return Period One-Hour Precipitation, P_1 =			inches
C_1 =			
C_2 =			
C_3 =			
User-Defined Storm Runoff Coefficient (leave this blank to accept a calculated value), C =			
User-Defined 5-yr. Runoff Coefficient (leave this blank to accept a calculated value), C_5 =			
Bypass (Carry-Over) Flow from upstream Subcatchments, Q_b =	0.0	0.0	cfs
Total Design Peak Flow, Q =	13.6	54.5	cfs

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

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

Project: Trails at Crowfoot

Inlet ID: 4E



Gutter Geometry (Enter data in the blue cells)

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	18.0	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} =	4.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	17.0	ft
Gutter Width	W =	2.00	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} =	0.016	

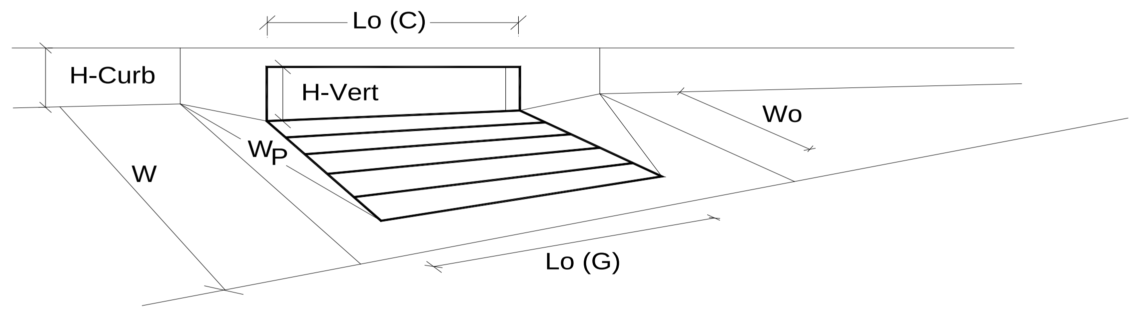
		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	17.0	17.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	4.0	12.0	inches
Allow Flow Depth at Street Crown (leave blank for no)		☐	☑	check = yes

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

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

INLET IN A SUMP OR SAG LOCATION

Project = **Trails at Crowfoot**
Inlet ID = **4E**

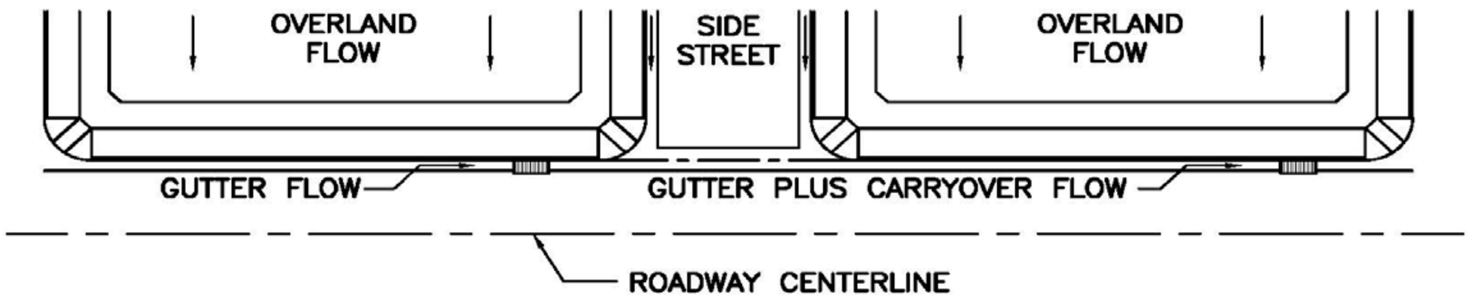


Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Inlet Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from 'Q-Allow')	a_{local} =	5.00	5.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	2	2	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	6.0	12.0	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	
		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	**Q_a =**	**14.4**	**56.8**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms (>Q PEAK)	Q PEAK REQUIRED =	13.6	54.5	cfs

Worksheet Protected

DESIGN PEAK FLOW FOR ONE-HALF OF STREET
OR GRASS-LINED CHANNEL BY THE RATIONAL METHOD

Project: Trails at Crowfoot
Inlet ID: 4F



Show Details

Design Flow: ONLY if already determined through other methods:

(local peak flow for 1/2 of street OR grass-lined channel):

	Minor Storm	Major Storm	
*Q_{Known} =	2.9	24.3	cfs

*** If you enter values in Row 14, skip the rest of this sheet and proceed to sheet Q-Allow or Area Inlet.**

<--- FILL IN THIS SECTION OR… FILL IN THE SECTIONS BELOW. <---

Geographic Information: (Enter data in the blue cells):

Subcatchment Area =		Acres
Percent Imperviousness =		%
NRCS Soil Type =		A, B, C, or D

Site Type:
- Site is Urban
- Site is Non-Urban

Flows Developed For:
- Street Inlets
- Area Inlets in a Median

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

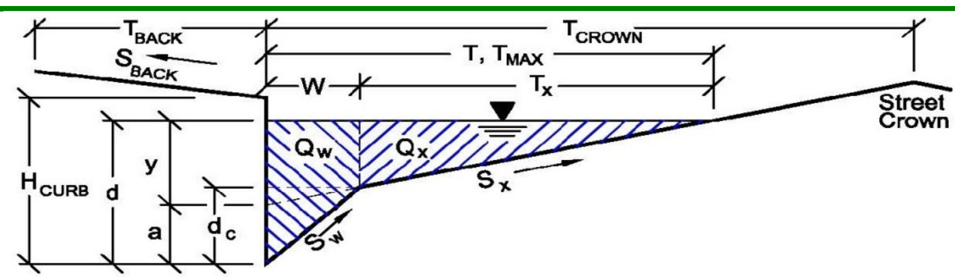
Rainfall Information: Intensity I (inch/hr) = $C_1 * P_1 / (C_2 + T_c)$ ^ C_3

	Minor Storm	Major Storm	
Design Storm Return Period, T_r =			years
Return Period One-Hour Precipitation, P_1 =			inches
C_1 =			
C_2 =			
C_3 =			
User-Defined Storm Runoff Coefficient (leave this blank to accept a calculated value), C =			
User-Defined 5-yr. Runoff Coefficient (leave this blank to accept a calculated value), C_5 =			
Bypass (Carry-Over) Flow from upstream Subcatchments, Q_b =	0.0	0.0	cfs
Total Design Peak Flow, Q =	2.9	24.3	cfs

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

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

Project: Trails at Crowfoot
Inlet ID: 4F



Gutter Geometry (Enter data in the blue cells)

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	19.0	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} =	17.0	ft
Gutter Width	W =	2.50	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 =	0.060	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016	

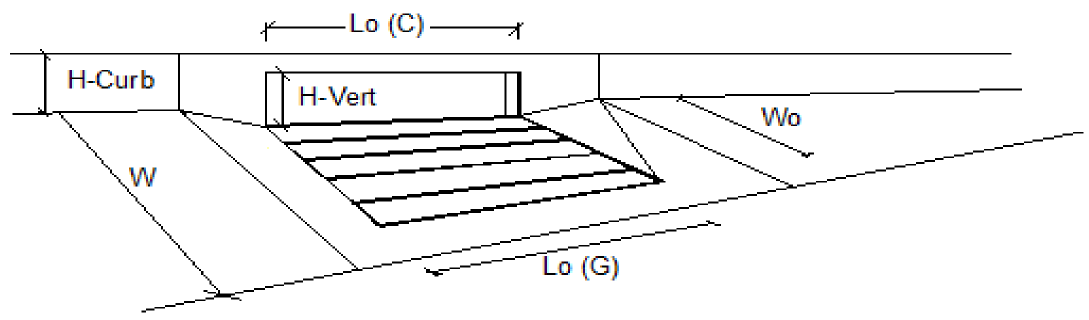
		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	17.0	17.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	6.0	12.0	inches
Allow Flow Depth at Street Crown (leave blank for no)		☐	☑	check = yes

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	Q_{allow} =	**12.2**	**91.0**	**cfs**

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

INLET ON A CONTINUOUS GRADE

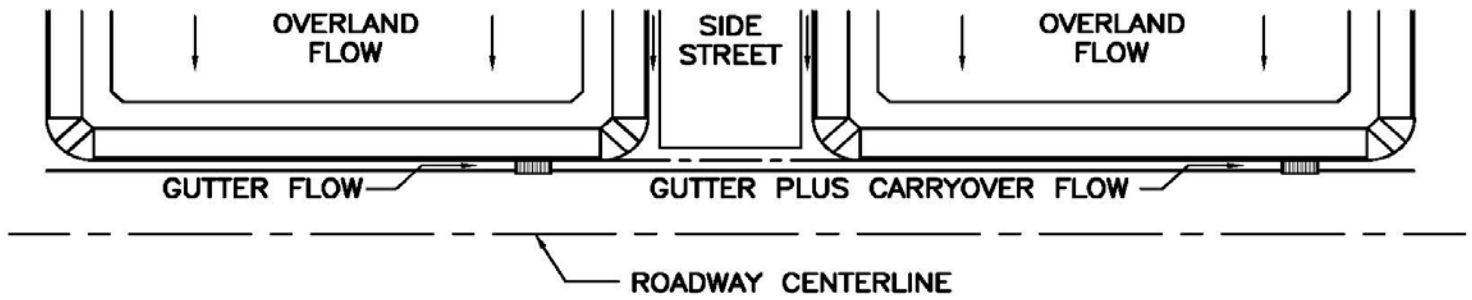
Project: **Trails at Crowfoot**
Inlet ID: **4F**



Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from 'Q-Allow')	a_{LOCAL} =	3.0	3.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)	No =	2	2	
Length of a Single Unit Inlet (Grate or Curb Opening)	L_o =	15.00	15.00	ft
Width of a Unit Grate (cannot be greater than W from Q-Allow)	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 < maximum allowable from sheet 'Q-Allow'		MINOR	MAJOR	
Total Inlet Interception Capacity	**Q =**	**2.90**	**24.05**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**0.0**	**0.3**	**cfs**
Capture Percentage = Q_a/Q_o =	**C% =**	**100**	**99**	**%**

DESIGN PEAK FLOW FOR ONE-HALF OF STREET OR GRASS-LINED CHANNEL BY THE RATIONAL METHOD

Project: Trails at Crowfoot
Inlet ID: DP 4G



Show Details

Design Flow: ONLY if already determined through other methods:

		Minor Storm	Major Storm	
(local peak flow for 1/2 of street OR grass-lined channel):	*Q_{Known} =	2.5	11.8	cfs

*** If you enter values in Row 14, skip the rest of this sheet and proceed to sheet Q-Allow or Area Inlet.**

<--- FILL IN THIS SECTION OR…

FILL IN THE SECTIONS BELOW. <---

Geographic Information: (Enter data in the blue cells):

Subcatchment Area =		Acres
Percent Imperviousness =		%
NRCS Soil Type =		A, B, C, or D

Site Type:
- ○ Site is Urban
- ○ Site is Non-Urban

Flows Developed For:
- ○ Street Inlets
- ○ Area Inlets in a Median

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

Rainfall Information: Intensity I (inch/hr) = $C_1 * P_1 / (C_2 + T_c) ^ C_3$

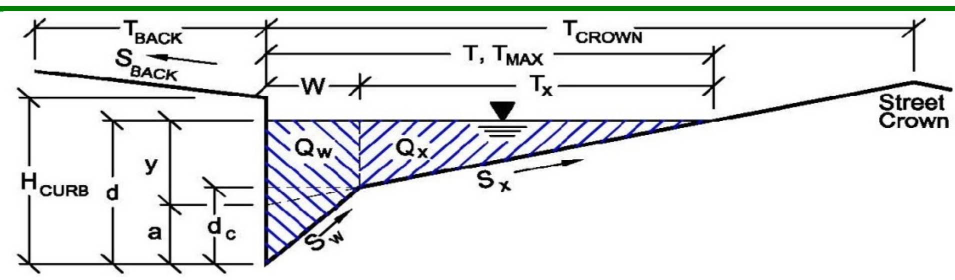
	Minor Storm	Major Storm	
Design Storm Return Period, T_r =			years
Return Period One-Hour Precipitation, P_1 =			inches
C_1 =			
C_2 =			
C_3 =			
User-Defined Storm Runoff Coefficient (leave this blank to accept a calculated value), C =			
User-Defined 5-yr. Runoff Coefficient (leave this blank to accept a calculated value), C_5 =			
Bypass (Carry-Over) Flow from upstream Subcatchments, Q_b =	**0.0**	**0.0**	**cfs**
Total Design Peak Flow, Q =	**2.5**	**11.8**	**cfs**

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

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

Project: Trails at Crowfoot

Inlet ID: DP 4G



Gutter Geometry (Enter data in the blue cells)

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	18.0	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} =	4.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	17.0	ft
Gutter Width	W =	2.00	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 =	0.040	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016	

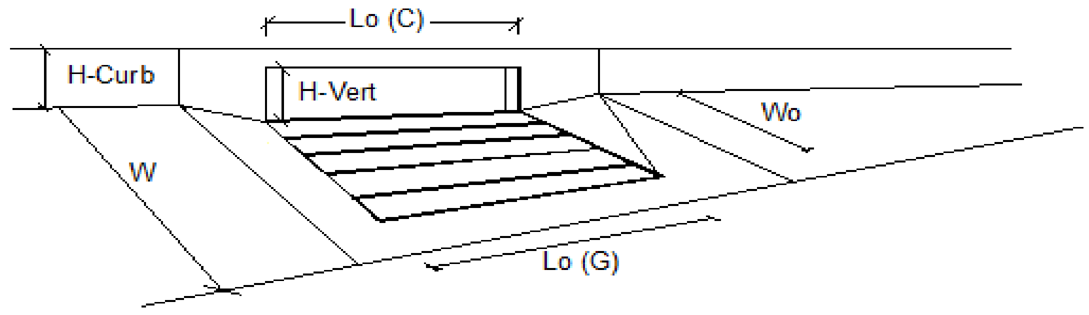
		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	17.0	17.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	4.0	12.0	inches
Allow Flow Depth at Street Crown (leave blank for no)		☐	☑	check = yes

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	Q_{allow} =	**6.8**	**127.1**	**cfs**

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

INLET ON A CONTINUOUS GRADE

Project: Trails at Crowfoot
Inlet ID: DP 4G

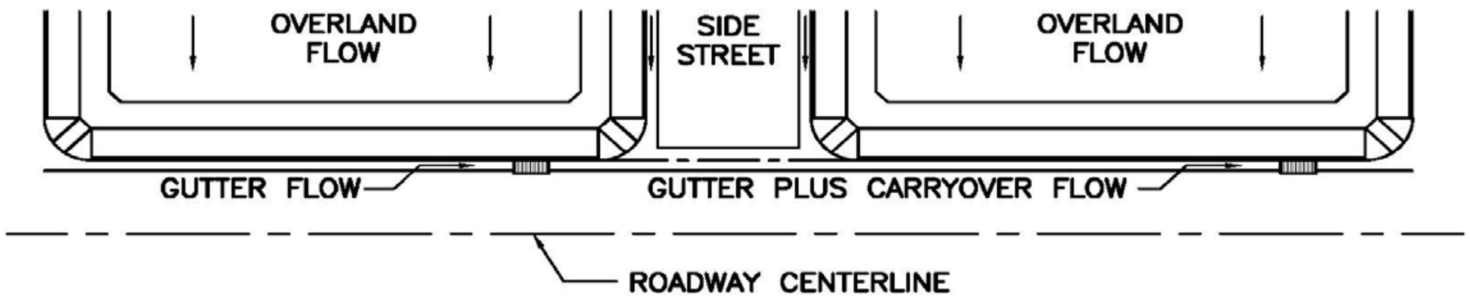


Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from 'Q-Allow')	a_{LOCAL} =	5.0	5.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)	No =	2	2	
Length of a Single Unit Inlet (Grate or Curb Opening)	L_o =	10.00	10.00	ft
Width of a Unit Grate (cannot be greater than W from Q-Allow)	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 < maximum allowable from sheet 'Q-Allow'		MINOR	MAJOR	
Total Inlet Interception Capacity	**Q =**	**2.50**	**11.63**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**0.0**	**0.1**	**cfs**
Capture Percentage = Q_a/Q_o =	**C% =**	**100**	**99**	**%**

Worksheet Protected

DESIGN PEAK FLOW FOR ONE-HALF OF STREET OR GRASS-LINED CHANNEL BY THE RATIONAL METHOD

Project: Trails at Crowfoot
Inlet ID: 4I



Show Details

Design Flow: ONLY if already determined through other methods:

		Minor Storm	Major Storm	
(local peak flow for 1/2 of street OR grass-lined channel):	$^{*}Q_{Known}$ =	4.3	19.6	cfs

*** If you enter values in Row 14, skip the rest of this sheet and proceed to sheet Q-Allow or Area Inlet.**

<--- FILL IN THIS SECTION OR…

FILL IN THE SECTIONS BELOW. <---

Geographic Information: (Enter data in the blue cells):

Subcatchment Area =		Acres
Percent Imperviousness =		%
NRCS Soil Type =		A, B, C, or D

Site Type:
- Site is Urban
- Site is Non-Urban

Flows Developed For:
- Street Inlets
- Area Inlets in a Median

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

Rainfall Information: Intensity I (inch/hr) = $C_1 * P_1 / (C_2 + T_c)^{\wedge} C_3$

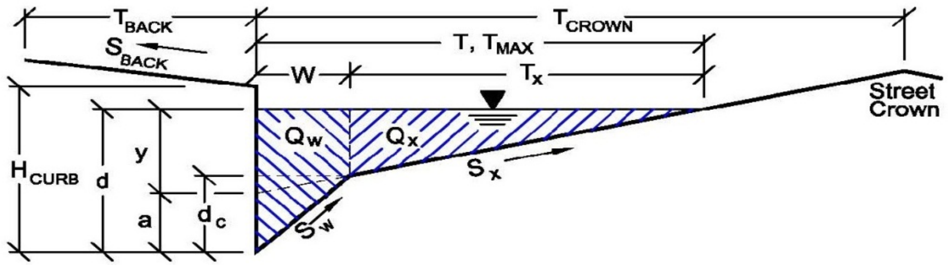
	Minor Storm	Major Storm	
Design Storm Return Period, T_r =			years
Return Period One-Hour Precipitation, P_1 =			inches
C_1 =			
C_2 =			
C_3 =			
User-Defined Storm Runoff Coefficient (leave this blank to accept a calculated value), C =			
User-Defined 5-yr. Runoff Coefficient (leave this blank to accept a calculated value), C_5 =			
Bypass (Carry-Over) Flow from upstream Subcatchments, Q_b =	**0.0**	**0.0**	**cfs**
Total Design Peak Flow, Q =	**4.3**	**19.6**	**cfs**

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

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

Project: Trails at Crowfoot

Inlet ID: 4I



Gutter Geometry (Enter data in the blue cells)

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	18.0	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} =	4.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	17.0	ft
Gutter Width	W =	2.00	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} =	0.016	

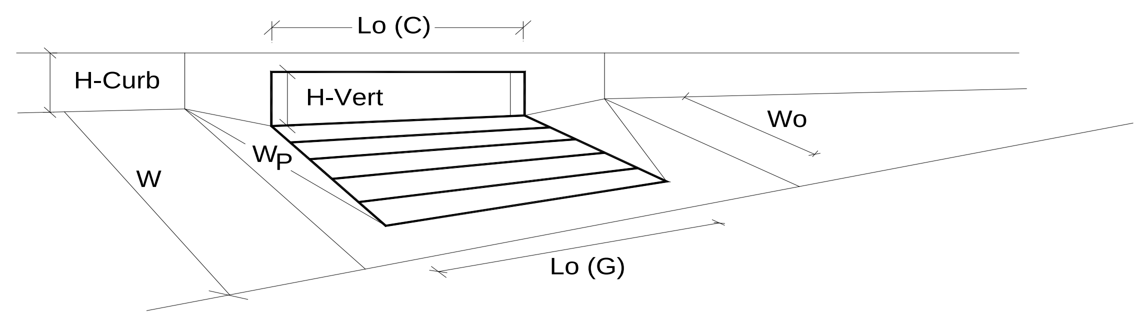
		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	17.0	17.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	4.0	12.0	inches
Allow Flow Depth at Street Crown (leave blank for no)		☐	☑	check = yes

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

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

INLET IN A SUMP OR SAG LOCATION

Project = **Trails at Crowfoot**
Inlet ID = **4I**

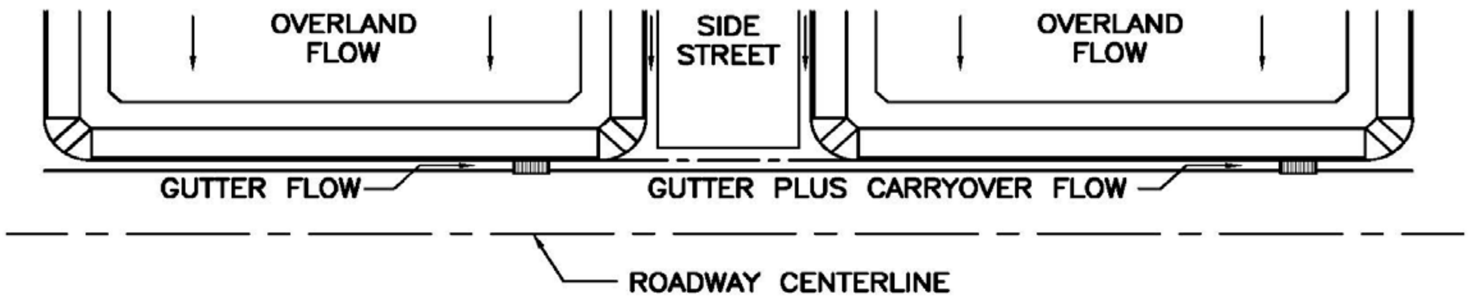


		MINOR	MAJOR	
Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Inlet Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from 'Q-Allow')	a_{local} =	5.00	5.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	1	1	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	6.0	12.0	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	
		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	Q_a =	**8.3**	**27.5**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms (>Q PEAK)	$Q_{PEAK\ REQUIRED}$ =	4.3	19.6	cfs

Worksheet Protected

DESIGN PEAK FLOW FOR ONE-HALF OF STREET
OR GRASS-LINED CHANNEL BY THE RATIONAL METHOD

Project: Trails at Crowfoot
Inlet ID: 4J



Show Details

Design Flow: ONLY if already determined through other methods:

		Minor Storm	Major Storm	
(local peak flow for 1/2 of street OR grass-lined channel):	$^{*}Q_{Known}$ =	5.6	45.7	cfs

*** If you enter values in Row 14, skip the rest of this sheet and proceed to sheet Q-Allow or Area Inlet.**

<--- FILL IN THIS SECTION OR… FILL IN THE SECTIONS BELOW. <---

Geographic Information: (Enter data in the blue cells):

Subcatchment Area =		Acres
Percent Imperviousness =		%
NRCS Soil Type =		A, B, C, or D

Site Type:
- ○ Site is Urban
- ○ Site is Non-Urban

Flows Developed For:
- ○ Street Inlets
- ○ Area Inlets in a Median

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

Rainfall Information: Intensity I (inch/hr) = $C_1 * P_1 / (C_2 + T_c)$ ^ C_3

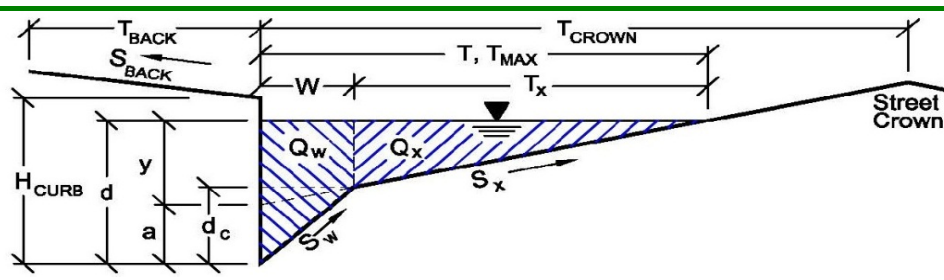
	Minor Storm	Major Storm	
Design Storm Return Period, T_r =			years
Return Period One-Hour Precipitation, P_1 =			inches
C_1 =			
C_2 =			
C_3 =			
User-Defined Storm Runoff Coefficient (leave this blank to accept a calculated value), C =			
User-Defined 5-yr. Runoff Coefficient (leave this blank to accept a calculated value), C_5 =			
Bypass (Carry-Over) Flow from upstream Subcatchments, Q_b =	**0.0**	**0.0**	**cfs**
Total Design Peak Flow, Q =	**5.6**	**45.7**	**cfs**

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

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

Project: Trails at Crowfoot

Inlet ID: 4J



Gutter Geometry (Enter data in the blue cells)

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	18.0	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} =	4.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	17.0	ft
Gutter Width	W =	2.00	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} =	0.016	

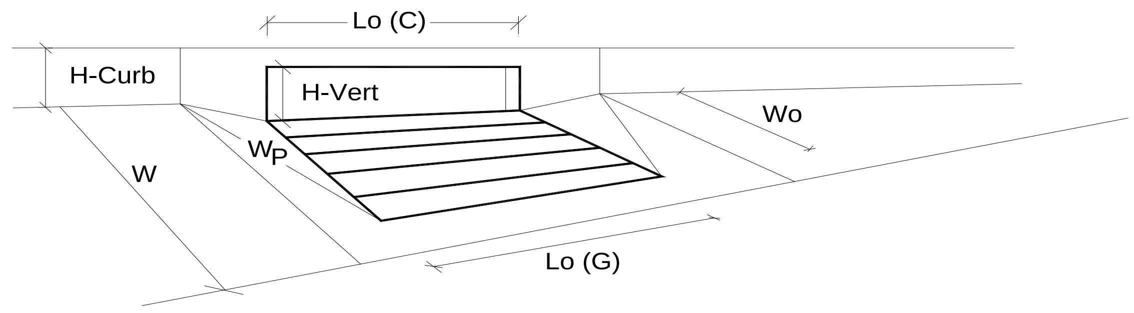
		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	17.0	17.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	4.0	12.0	inches
Allow Flow Depth at Street Crown (leave blank for no)		☐	☑	check = yes

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

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

INLET IN A SUMP OR SAG LOCATION

Project = **Trails at Crowfoot**
Inlet ID = **4J**

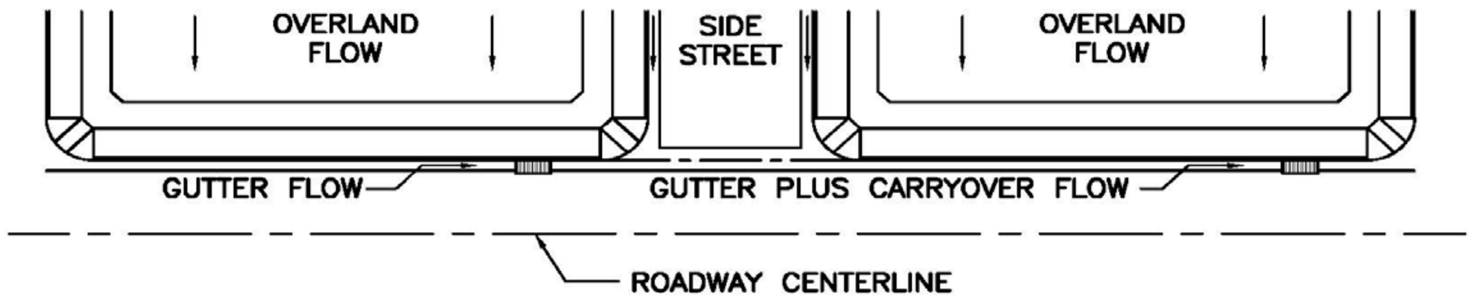


Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Inlet Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from 'Q-Allow')	a_{local} =	5.00	5.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	2	2	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	6.0	12.0	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	
		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	Q_a =	**14.4**	**56.8**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms (>Q PEAK)	$Q_{PEAK\ REQUIRED}$ =	5.6	45.7	cfs

Worksheet Protected

DESIGN PEAK FLOW FOR ONE-HALF OF STREET OR GRASS-LINED CHANNEL BY THE RATIONAL METHOD

Project: Trails at Crowfoot
Inlet ID: 4K



Show Details

Design Flow: ONLY if already determined through other methods:

(local peak flow for 1/2 of street OR grass-lined channel):

	Minor Storm	Major Storm	
*Q_{Known} =	6.2	19.0	cfs

*** If you enter values in Row 14, skip the rest of this sheet and proceed to sheet Q-Allow or Area Inlet.**

<--- FILL IN THIS SECTION OR…

FILL IN THE SECTIONS BELOW. <---

Geographic Information: (Enter data in the blue cells):

Subcatchment Area =		Acres
Percent Imperviousness =		%
NRCS Soil Type =		A, B, C, or D

Site Type:
- Site is Urban
- Site is Non-Urban

Flows Developed For:
- Street Inlets
- Area Inlets in a Median

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

Rainfall Information: Intensity I (inch/hr) = $C_1 * P_1 / (C_2 + T_c)^{C_3}$

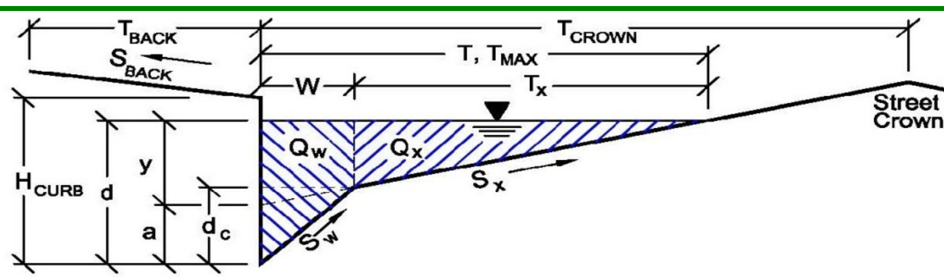
	Minor Storm	Major Storm	
Design Storm Return Period, T_r =			years
Return Period One-Hour Precipitation, P_1 =			inches
C_1 =			
C_2 =			
C_3 =			
User-Defined Storm Runoff Coefficient (leave this blank to accept a calculated value), C =			
User-Defined 5-yr. Runoff Coefficient (leave this blank to accept a calculated value), C_5 =			
Bypass (Carry-Over) Flow from upstream Subcatchments, Q_b =	0.0	0.0	cfs
Total Design Peak Flow, Q =	6.2	19.0	cfs

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

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

Project: **Trails at Crowfoot**

Inlet ID: **4K**



Gutter Geometry (Enter data in the blue cells)

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	18.0	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} =	4.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	17.0	ft
Gutter Width	W =	2.00	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} =	0.016	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	17.0	17.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	4.0	12.0	inches
Allow Flow Depth at Street Crown (leave blank for no)		☐	☑	check = yes

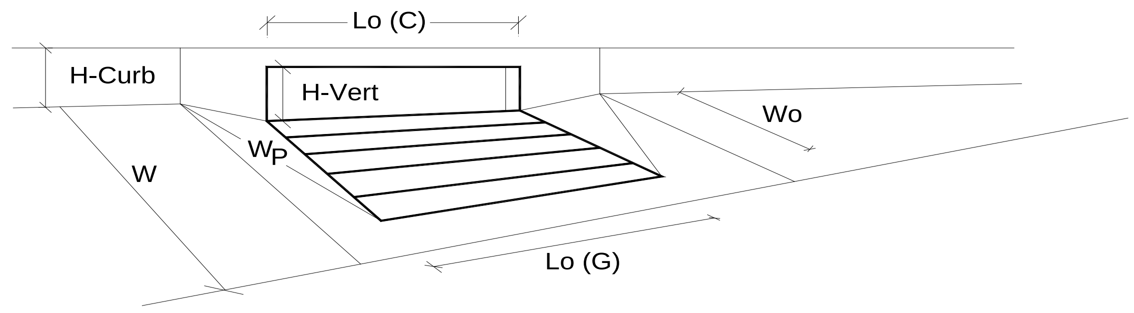
		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	Q_{allow} =	**SUMP**	**SUMP**	**cfs**

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

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

INLET IN A SUMP OR SAG LOCATION

Project = Trails at Crowfoot
Inlet ID = 4K

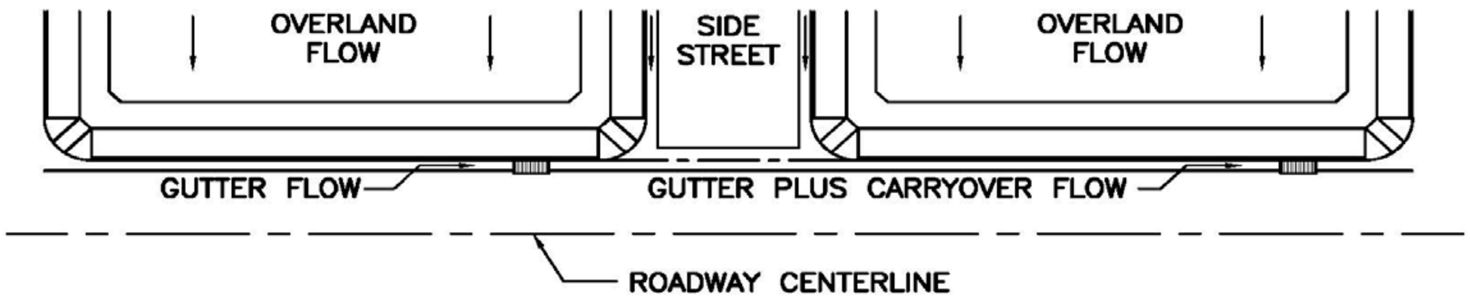


Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Inlet Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from 'Q-Allow')	a_{local} =	5.00	5.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	1	1	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	6.0	12.0	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	
		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	**Q_a =**	**8.3**	**27.5**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms (>Q PEAK)	$Q_{PEAK\ REQUIRED}$ =	6.2	19.0	cfs

Worksheet Protected

DESIGN PEAK FLOW FOR ONE-HALF OF STREET OR GRASS-LINED CHANNEL BY THE RATIONAL METHOD

Project: Trails at Crowfoot
Inlet ID: 4L



Show Details

Design Flow: ONLY if already determined through other methods:
(local peak flow for 1/2 of street OR grass-lined channel):

	Minor Storm	Major Storm	
$^*Q_{Known}$ =	2.1	10.0	cfs

*** If you enter values in Row 14, skip the rest of this sheet and proceed to sheet Q-Allow or Area Inlet.**

<--- FILL IN THIS SECTION OR… FILL IN THE SECTIONS BELOW. <---

Geographic Information: (Enter data in the blue cells):

Subcatchment Area =		Acres
Percent Imperviousness =		%
NRCS Soil Type =		A, B, C, or D

Site Type:
- ○ Site is Urban
- ○ Site is Non-Urban

Flows Developed For:
- ○ Street Inlets
- ○ Area Inlets in a Median

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

Rainfall Information: Intensity I (inch/hr) = $C_1 * P_1 / (C_2 + T_c)$ ^ C_3

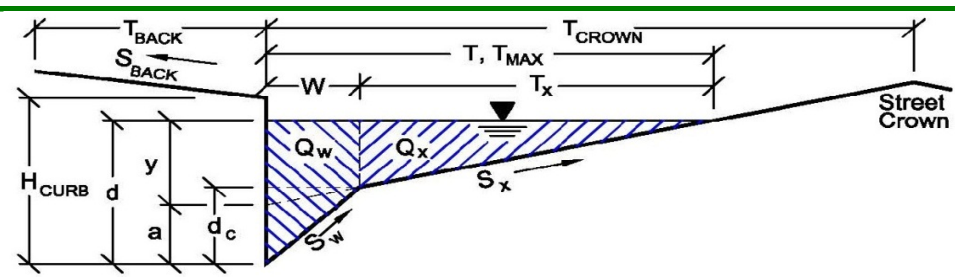
	Minor Storm	Major Storm	
Design Storm Return Period, T_r =			years
Return Period One-Hour Precipitation, P_1 =			inches
C_1 =			
C_2 =			
C_3 =			
User-Defined Storm Runoff Coefficient (leave this blank to accept a calculated value), C =			
User-Defined 5-yr. Runoff Coefficient (leave this blank to accept a calculated value), C_5 =			
Bypass (Carry-Over) Flow from upstream Subcatchments, Q_b =	0.0	0.0	cfs
Total Design Peak Flow, Q =	2.1	10.0	cfs

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

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

Project: **Trails at Crowfoot**

Inlet ID: **4L**



Gutter Geometry (Enter data in the blue cells)

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	18.0	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} =	17.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.015	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	17.0	17.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	4.0	12.0	inches
Allow Flow Depth at Street Crown (leave blank for no)		☐	☑	check = yes

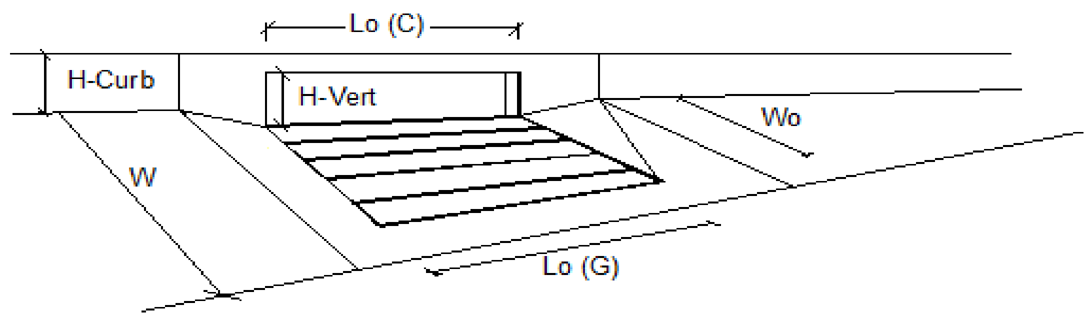
		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	**Q_{allow} =**	**4.1**	**137.8**	**cfs**

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

INLET ON A CONTINUOUS GRADE

Project: **Trails at Crowfoot**

Inlet ID: **4L**

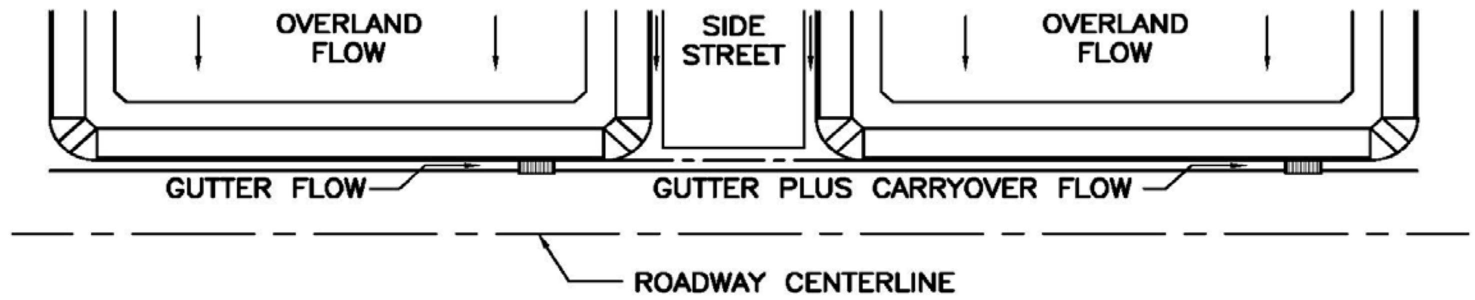


	Design Information (Input)		MINOR	MAJOR	
	Type of Inlet	Type =	CDOT Type R Curb Opening		
	Local Depression (additional to continuous gutter depression 'a' from 'Q-Allow')	a_{LOCAL} =	3.0	3.0	inches
	Total Number of Units in the Inlet (Grate or Curb Opening)	No =	2	2	
	Length of a Single Unit Inlet (Grate or Curb Opening)	L_o =	10.00	10.00	ft
	Width of a Unit Grate (cannot be greater than W from Q-Allow)	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	
Warning 1	Clogging Factor for a Single Unit Curb Opening (typical min. value = 0.1)	C_f-C =	0.20	0.20	
	Street Hydraulics: OK - Q < maximum allowable from sheet 'Q-Allow'		MINOR	MAJOR	
	Total Inlet Interception Capacity	**Q =**	**2.10**	**10.00**	**cfs**
	Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**0.0**	**0.0**	**cfs**
	Capture Percentage = Q_a/Q_o =	**C% =**	**100**	**100**	**%**

Worksheet Protected

DESIGN PEAK FLOW FOR ONE-HALF OF STREET OR GRASS-LINED CHANNEL BY THE RATIONAL METHOD

Project: Trails at Crowfoot
Inlet ID: 3A



Show Details

Design Flow: ONLY if already determined through other methods:

	Minor Storm	Major Storm	
(local peak flow for 1/2 of street OR grass-lined channel): *Q_{Known} =	6.4	43.6	cfs

*** If you enter values in Row 14, skip the rest of this sheet and proceed to sheet Q-Allow or Area Inlet.**

<--- FILL IN THIS SECTION OR…

FILL IN THE SECTIONS BELOW. <---

Geographic Information: (Enter data in the blue cells):

Subcatchment Area =		Acres
Percent Imperviousness =		%
NRCS Soil Type =		A, B, C, or D

Site Type:
- ○ Site is Urban
- ○ Site is Non-Urban

Flows Developed For:
- ○ Street Inlets
- ○ Area Inlets in a Median

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

Rainfall Information: Intensity I (inch/hr) = $C_1 * P_1 / (C_2 + T_c) \wedge C_3$

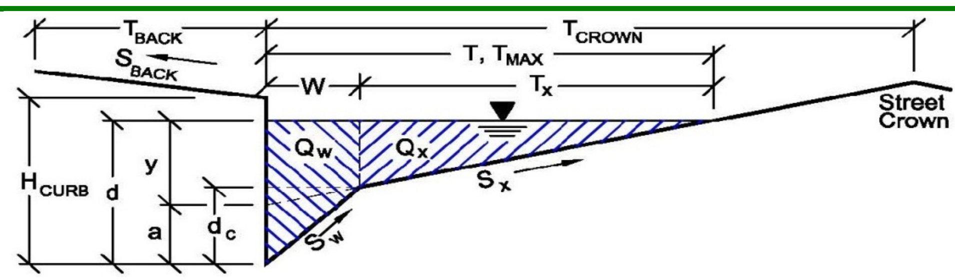
	Minor Storm	Major Storm	
Design Storm Return Period, T_r =			years
Return Period One-Hour Precipitation, P_1 =			inches
C_1 =			
C_2 =			
C_3 =			
User-Defined Storm Runoff Coefficient (leave this blank to accept a calculated value), C =			
User-Defined 5-yr. Runoff Coefficient (leave this blank to accept a calculated value), C_5 =			
Bypass (Carry-Over) Flow from upstream Subcatchments, Q_b =	**0.0**	**0.0**	**cfs**
Total Design Peak Flow, Q =	**6.4**	**43.6**	**cfs**

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

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

Project: **Trails at Crowfoot**

Inlet ID: **3A**



Gutter Geometry (Enter data in the blue cells)

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	18.0	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} =	4.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	17.0	ft
Gutter Width	W =	2.00	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} =	0.016	

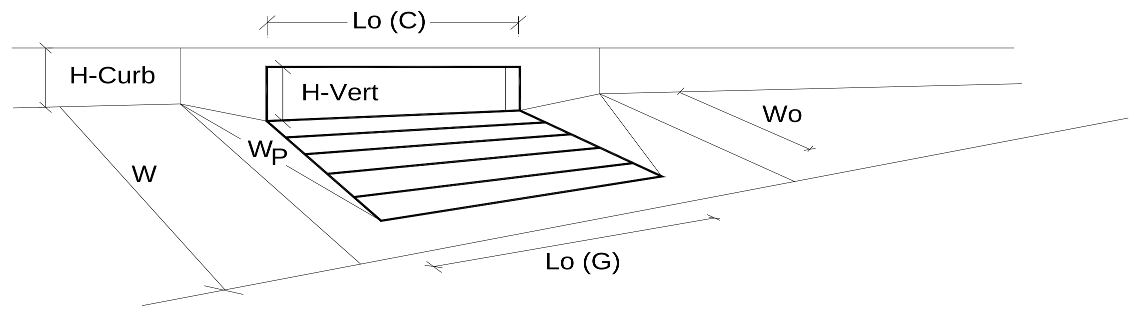
		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	17.0	17.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	4.0	12.0	inches
Allow Flow Depth at Street Crown (leave blank for no)		☐	☑	check = yes

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

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

INLET IN A SUMP OR SAG LOCATION

Project = **Trails at Crowfoot**
Inlet ID = **3A**

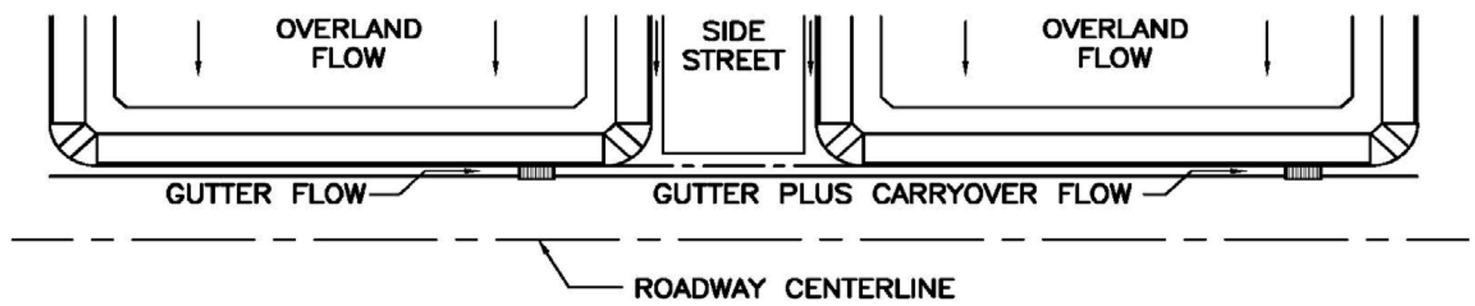


Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Inlet Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from 'Q-Allow')	a_{local} =	5.00	5.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	2	2	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	6.0	12.0	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	
		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	Q_a =	**14.4**	**56.8**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms (>Q PEAK)	$Q_{PEAK\ REQUIRED}$ =	6.4	43.6	cfs

Worksheet Protected

DESIGN PEAK FLOW FOR ONE-HALF OF STREET
OR GRASS-LINED CHANNEL BY THE RATIONAL METHOD

Project: Trails at Crowfoot
Inlet ID: DP 5A



Show Details

Design Flow: ONLY if already determined through other methods:

	Minor Storm	Major Storm	
(local peak flow for 1/2 of street OR grass-lined channel): *Q_{Known} =	4.9	56.3	cfs

*** If you enter values in Row 14, skip the rest of this sheet and proceed to sheet Q-Allow or Area Inlet.**

<--- FILL IN THIS SECTION OR… FILL IN THE SECTIONS BELOW. <---

Geographic Information: (Enter data in the blue cells):

Subcatchment Area =		Acres
Percent Imperviousness =		%
NRCS Soil Type =		A, B, C, or D

Site Type:
- ○ Site is Urban
- ○ Site is Non-Urban

Flows Developed For:
- ○ Street Inlets
- ○ Area Inlets in a Median

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

Rainfall Information: Intensity I (inch/hr) = $C_1 * P_1 / (C_2 + T_c) \wedge C_3$

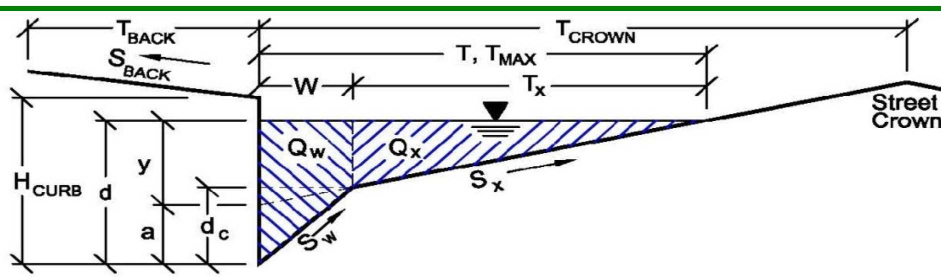
	Minor Storm	Major Storm	
Design Storm Return Period, T_r =			years
Return Period One-Hour Precipitation, P_1 =			inches
C_1 =			
C_2 =			
C_3 =			
User-Defined Storm Runoff Coefficient (leave this blank to accept a calculated value), C =			
User-Defined 5-yr. Runoff Coefficient (leave this blank to accept a calculated value), C_5 =			
Bypass (Carry-Over) Flow from upstream Subcatchments, Q_b =	**0.0**	**0.0**	**cfs**
Total Design Peak Flow, Q =	**4.9**	**56.3**	**cfs**

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

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

Project: **Trails at Crowfoot**

Inlet ID: **DP 5A**



Gutter Geometry (Enter data in the blue cells)

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	18.0	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} =	4.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	17.0	ft
Gutter Width	W =	2.00	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 =	0.027	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016	

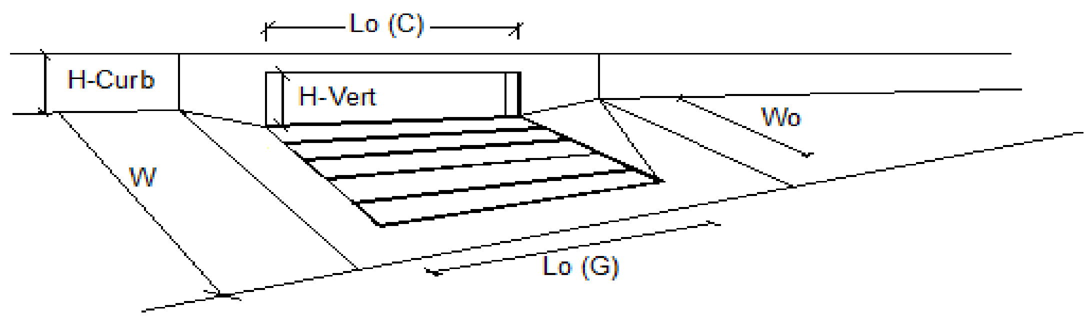
		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	17.0	17.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	4.0	12.0	inches
Allow Flow Depth at Street Crown (leave blank for no)		☐	☑	check = yes

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	Q_{allow} =	**5.6**	**142.4**	**cfs**

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

INLET ON A CONTINUOUS GRADE

Project: **Trails at Crowfoot**
Inlet ID: **DP 5A**

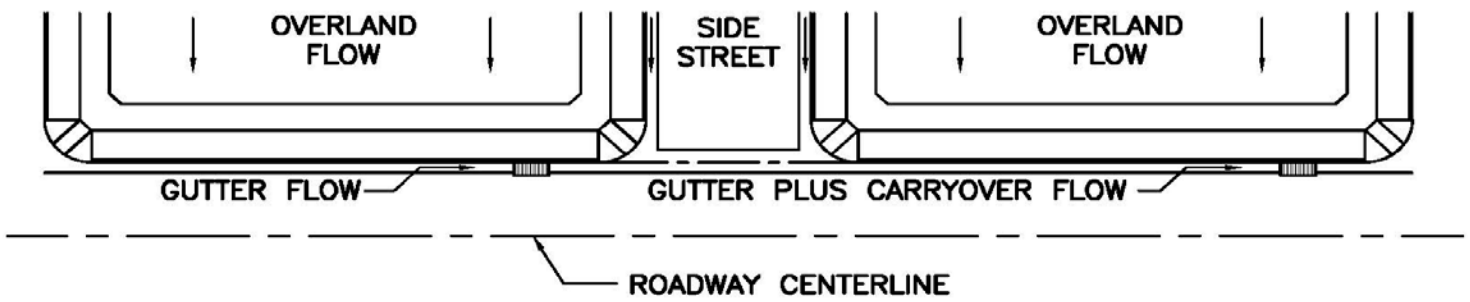


Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from 'Q-Allow')	a_{LOCAL} =	5.0	5.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)	No =	2	2	
Length of a Single Unit Inlet (Grate or Curb Opening)	L_o =	15.00	15.00	ft
Width of a Unit Grate (cannot be greater than W from Q-Allow)	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 < maximum allowable from sheet 'Q-Allow'		MINOR	MAJOR	
Total Inlet Interception Capacity	**Q =**	**4.90**	**39.98**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**0.0**	**16.3**	**cfs**
Capture Percentage = Q_a/Q_o =	**C% =**	**100**	**71**	**%**

Worksheet Protected

DESIGN PEAK FLOW FOR ONE-HALF OF STREET OR GRASS-LINED CHANNEL BY THE RATIONAL METHOD

Project: Trails at Crowfoot
Inlet ID: 5B



Show Details

Design Flow: ONLY if already determined through other methods:

		Minor Storm	Major Storm	
(local peak flow for 1/2 of street OR grass-lined channel):	*Q_{Known} =	5.4	19.4	cfs

*** If you enter values in Row 14, skip the rest of this sheet and proceed to sheet Q-Allow or Area Inlet.**

<--- FILL IN THIS SECTION OR…

FILL IN THE SECTIONS BELOW. <---

Geographic Information: (Enter data in the blue cells):

Subcatchment Area =		Acres
Percent Imperviousness =		%
NRCS Soil Type =		A, B, C, or D

Site Type:
- ○ Site is Urban
- ○ Site is Non-Urban

Flows Developed For:
- ○ Street Inlets
- ○ Area Inlets in a Median

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

Rainfall Information: Intensity I (inch/hr) = $C_1 * P_1 / (C_2 + T_c)^{C_3}$

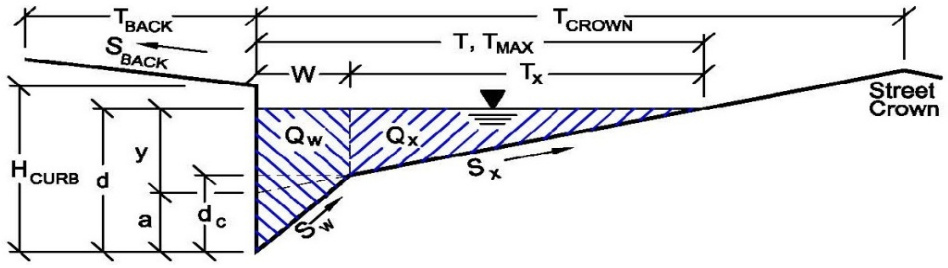
	Minor Storm	Major Storm	
Design Storm Return Period, T_r =			years
Return Period One-Hour Precipitation, P_1 =			inches
C_1 =			
C_2 =			
C_3 =			
User-Defined Storm Runoff Coefficient (leave this blank to accept a calculated value), C =			
User-Defined 5-yr. Runoff Coefficient (leave this blank to accept a calculated value), C_5 =			
Bypass (Carry-Over) Flow from upstream Subcatchments, Q_b =	**0.0**	**21.4**	**cfs**
Total Design Peak Flow, Q =	**5.4**	**40.8**	**cfs**

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

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

Project: Trails at Crowfoot

Inlet ID: 5B



Gutter Geometry (Enter data in the blue cells)

Description	Symbol	Value	Unit
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	18.0	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} =	4.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	17.0	ft
Gutter Width	W =	2.00	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} =	0.016	

Description	Symbol	Minor Storm	Major Storm	Unit
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	17.0	17.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	4.0	12.0	inches
Allow Flow Depth at Street Crown (leave blank for no)		☐	☑	check = yes

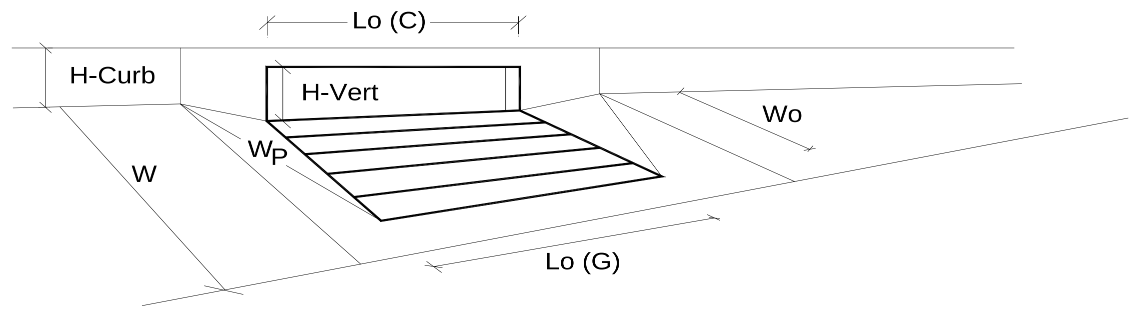
	Symbol	Minor Storm	Major Storm	Unit
MINOR STORM Allowable Capacity is based on Depth Criterion **MAJOR STORM Allowable Capacity is based on Depth Criterion**	Q_{allow} =	**SUMP**	**SUMP**	**cfs**

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

INLET IN A SUMP OR SAG LOCATION

Project = **Trails at Crowfoot**

Inlet ID = **5B**

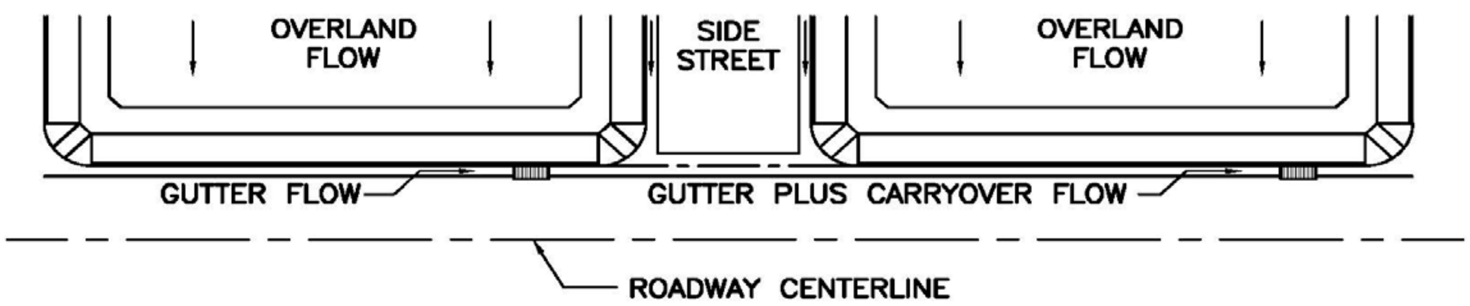


Design Information (Input)		MINOR	MAJOR		
Type of Inlet	Inlet Type =	CDOT Type R Curb Opening			
Local Depression (additional to continuous gutter depression 'a' from 'Q-Allow')	a_{local} =	5.00	5.00	inches	
Number of Unit Inlets (Grate or Curb Opening)	No =	1	1		
Water Depth at Flowline (outside of local depression)	Ponding Depth =	6.0	12.0	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) =	15.00	15.00	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		
		MINOR	MAJOR		
Total Inlet Interception Capacity (assumes clogged condition)	Q_a =	**9.7**	**42.1**	**cfs**	
Inlet Capacity IS GOOD for Minor and Major Storms (>Q PEAK)	$Q_{PEAK\ REQUIRED}$ =	5.4	40.8	cfs	

Worksheet Protected

DESIGN PEAK FLOW FOR ONE-HALF OF STREET OR GRASS-LINED CHANNEL BY THE RATIONAL METHOD

Project: Trails at Crowfoot
Inlet ID: DP 5C



Show Details

Design Flow: ONLY if already determined through other methods:

		Minor Storm	Major Storm	
(local peak flow for 1/2 of street OR grass-lined channel):	***Q**$_{Known}$ =	5.6	70.9	cfs

*** If you enter values in Row 14, skip the rest of this sheet and proceed to sheet Q-Allow or Area Inlet.**

<--- FILL IN THIS SECTION OR… FILL IN THE SECTIONS BELOW. <---

Geographic Information: (Enter data in the blue cells):

Subcatchment Area =		Acres
Percent Imperviousness =		%
NRCS Soil Type =		A, B, C, or D

Site Type:
- ○ Site is Urban
- ○ Site is Non-Urban

Flows Developed For:
- ○ Street Inlets
- ○ Area Inlets in a Median

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

Rainfall Information: Intensity I (inch/hr) = $C_1 * P_1 / (C_2 + T_c)^{C_3}$

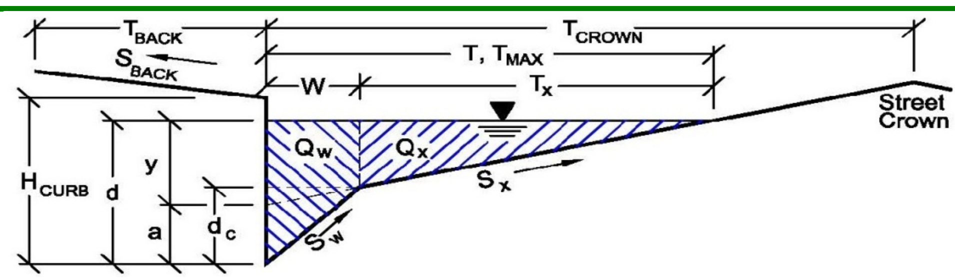
	Minor Storm	Major Storm	
Design Storm Return Period, T_r =			years
Return Period One-Hour Precipitation, P_1 =			inches
C_1 =			
C_2 =			
C_3 =			
User-Defined Storm Runoff Coefficient (leave this blank to accept a calculated value), C =			
User-Defined 5-yr. Runoff Coefficient (leave this blank to accept a calculated value), C_5 =			
Bypass (Carry-Over) Flow from upstream Subcatchments, Q_b =	**0.0**	**0.0**	**cfs**
Total Design Peak Flow, Q =	**5.6**	**70.9**	**cfs**

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

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

Project: **Trails at Crowfoot**

Inlet ID: **DP 5C**



Gutter Geometry (Enter data in the blue cells)

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	18.0	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} =	4.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	17.0	ft
Gutter Width	W =	2.00	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} =	0.016	

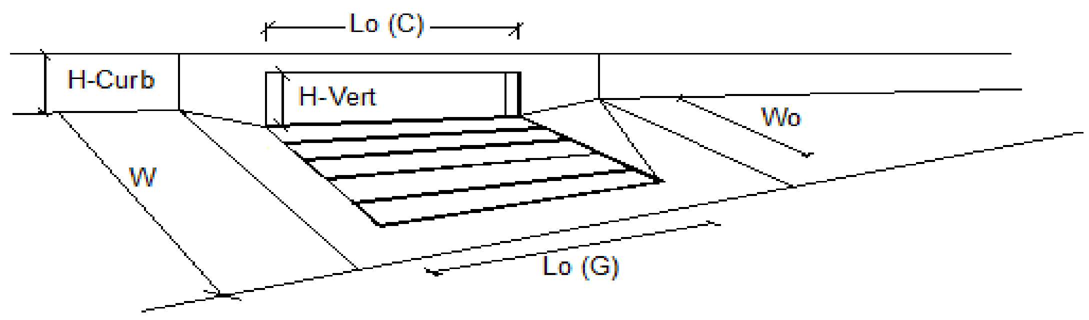
		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	17.0	17.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	4.0	12.0	inches
Allow Flow Depth at Street Crown (leave blank for no)		☐	☑	check = yes

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	**Q_{allow} =**	**5.9**	**138.6**	**cfs**

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

INLET ON A CONTINUOUS GRADE

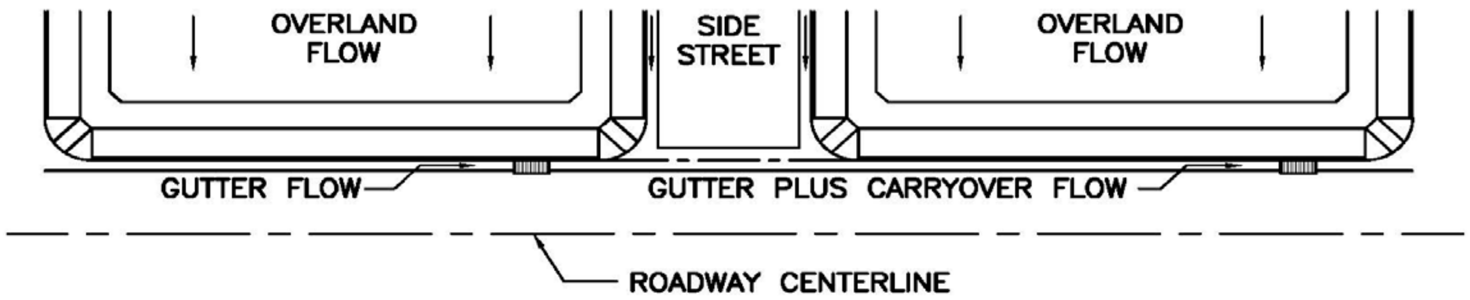
Project: Trails at Crowfoot
Inlet ID: DP 5C



Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from 'Q-Allow')	a_{LOCAL} =	5.0	5.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)	No =	1	1	
Length of a Single Unit Inlet (Grate or Curb Opening)	L_o =	15.00	15.00	ft
Width of a Unit Grate (cannot be greater than W from Q-Allow)	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 < maximum allowable from sheet 'Q-Allow'		MINOR	MAJOR	
Total Inlet Interception Capacity	**Q =**	**5.60**	**25.77**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**0.0**	**45.1**	**cfs**
Capture Percentage = Q_a/Q_o =	**C% =**	**100**	**36**	**%**

DESIGN PEAK FLOW FOR ONE-HALF OF STREET OR GRASS-LINED CHANNEL BY THE RATIONAL METHOD

Project: Trails at Crowfoot
Inlet ID: DP 5D



Show Details

Design Flow: ONLY if already determined through other methods:

		Minor Storm	Major Storm	
(local peak flow for 1/2 of street OR grass-lined channel):	*Q_{Known} =	3.8	80.0	cfs

*** If you enter values in Row 14, skip the rest of this sheet and proceed to sheet Q-Allow or Area Inlet.**

<--- FILL IN THIS SECTION OR…

FILL IN THE SECTIONS BELOW. <---

Geographic Information: (Enter data in the blue cells):

Subcatchment Area =		Acres
Percent Imperviousness =		%
NRCS Soil Type =		A, B, C, or D

Site Type:
- ○ Site is Urban
- ○ Site is Non-Urban

Flows Developed For:
- ○ Street Inlets
- ○ Area Inlets in a Median

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

Rainfall Information: Intensity I (inch/hr) = $C_1 * P_1 / (C_2 + T_c)^{C_3}$

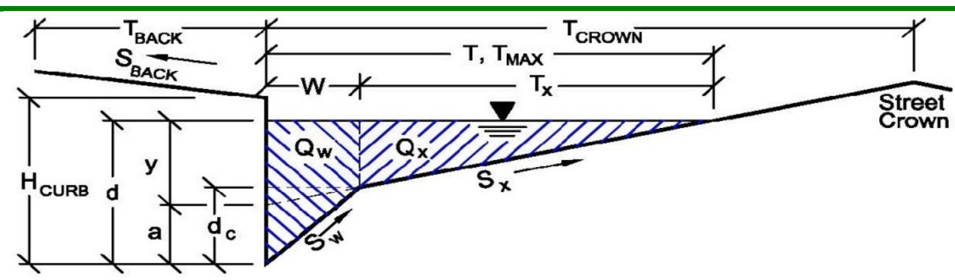
	Minor Storm	Major Storm	
Design Storm Return Period, T_r =			years
Return Period One-Hour Precipitation, P_1 =			inches
C_1 =			
C_2 =			
C_3 =			
User-Defined Storm Runoff Coefficient (leave this blank to accept a calculated value), C =			
User-Defined 5-yr. Runoff Coefficient (leave this blank to accept a calculated value), C_5 =			
Bypass (Carry-Over) Flow from upstream Subcatchments, Q_b =	**0.0**	**0.0**	**cfs**
Total Design Peak Flow, Q =	**3.8**	**80.0**	**cfs**

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

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

Project: Trails at Crowfoot

Inlet ID: DP 5D



Gutter Geometry (Enter data in the blue cells)

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	18.0	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} =	4.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	17.0	ft
Gutter Width	W =	2.00	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 =	0.040	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016	

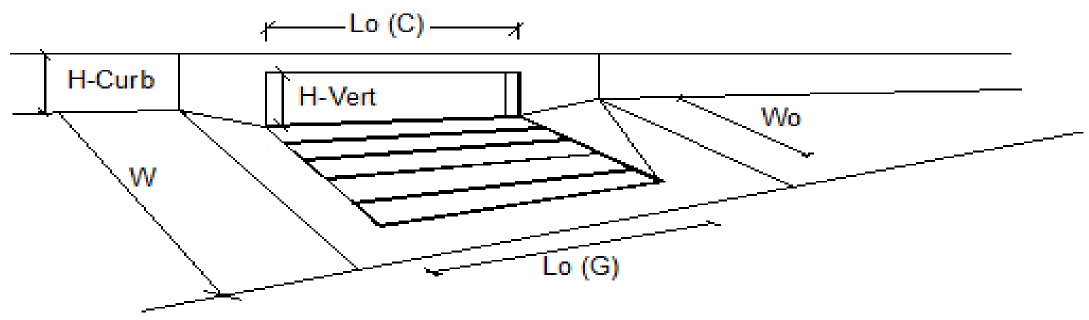
		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	17.0	17.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	4.0	12.0	inches
Allow Flow Depth at Street Crown (leave blank for no)		☐	☑	check = yes

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	Q_{allow} =	**6.8**	**127.1**	**cfs**

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

INLET ON A CONTINUOUS GRADE

Project: **Trails at Crowfoot**
Inlet ID: **DP 5D**

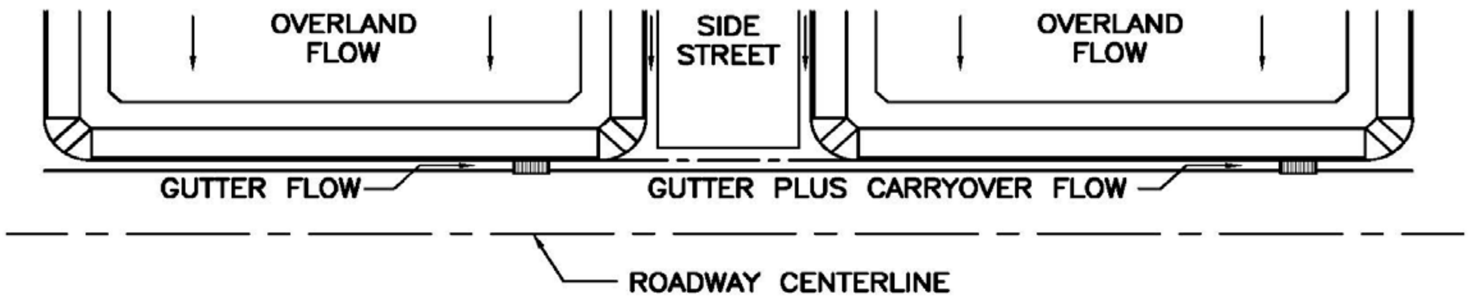


Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from 'Q-Allow')	a_{LOCAL} =	5.0	5.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)	No =	1	1	
Length of a Single Unit Inlet (Grate or Curb Opening)	L_o =	10.00	10.00	ft
Width of a Unit Grate (cannot be greater than W from Q-Allow)	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 < maximum allowable from sheet 'Q-Allow'		MINOR	MAJOR	
Total Inlet Interception Capacity	**Q =**	**3.80**	**18.60**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**0.0**	**61.4**	**cfs**
Capture Percentage = Q_a/Q_o =	**C% =**	**100**	**23**	**%**

Worksheet Protected

DESIGN PEAK FLOW FOR ONE-HALF OF STREET
OR GRASS-LINED CHANNEL BY THE RATIONAL METHOD

Project: **Trails at Crowfoot**
Inlet ID: **5E**



Show Details

Design Flow: ONLY if already determined through other methods:

		Minor Storm	Major Storm	
(local peak flow for 1/2 of street OR grass-lined channel):	*Q_{Known} =	3.1	83.4	cfs

*** If you enter values in Row 14, skip the rest of this sheet and proceed to sheet Q-Allow or Area Inlet.**

<--- FILL IN THIS SECTION OR…

FILL IN THE SECTIONS BELOW. <---

Geographic Information: (Enter data in the blue cells):

Subcatchment Area =		Acres
Percent Imperviousness =		%
NRCS Soil Type =		A, B, C, or D

Site Type:
- Site is Urban
- Site is Non-Urban

Flows Developed For:
- Street Inlets
- Area Inlets in a Median

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

Rainfall Information: Intensity I (inch/hr) = $C_1 * P_1 / (C_2 + T_c) ^{\wedge} C_3$

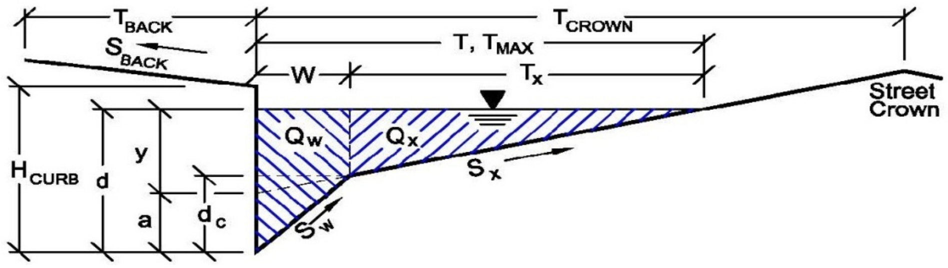
	Minor Storm	Major Storm	
Design Storm Return Period, T_r =			years
Return Period One-Hour Precipitation, P_1 =			inches
C_1 =			
C_2 =			
C_3 =			
User-Defined Storm Runoff Coefficient (leave this blank to accept a calculated value), C =			
User-Defined 5-yr. Runoff Coefficient (leave this blank to accept a calculated value), C_5 =			
Bypass (Carry-Over) Flow from upstream Subcatchments, Q_b =	0.0	0.0	cfs
Total Design Peak Flow, Q =	3.1	83.4	cfs

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

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

Project: Trails at Crowfoot

Inlet ID: 5E



Gutter Geometry (Enter data in the blue cells)

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	18.0	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} =	4.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	17.0	ft
Gutter Width	W =	2.00	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} =	0.016	

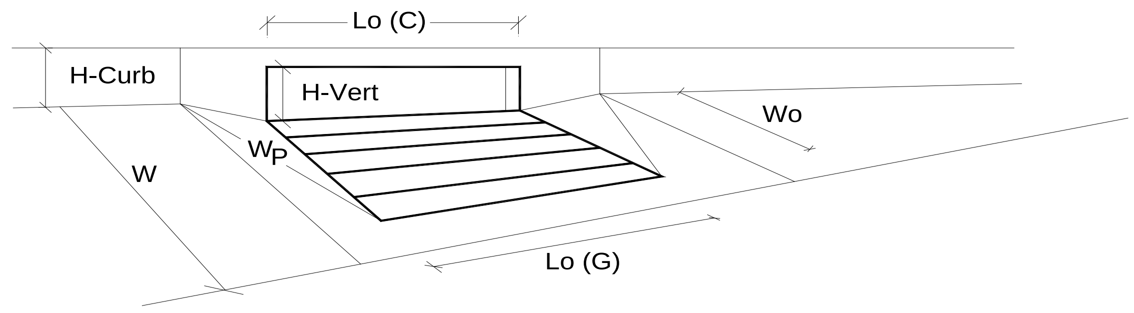
		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	17.0	17.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	4.0	12.0	inches
Allow Flow Depth at Street Crown (leave blank for no)		☐	☑	check = yes

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

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

INLET IN A SUMP OR SAG LOCATION

Project = **Trails at Crowfoot**
Inlet ID = **5E**

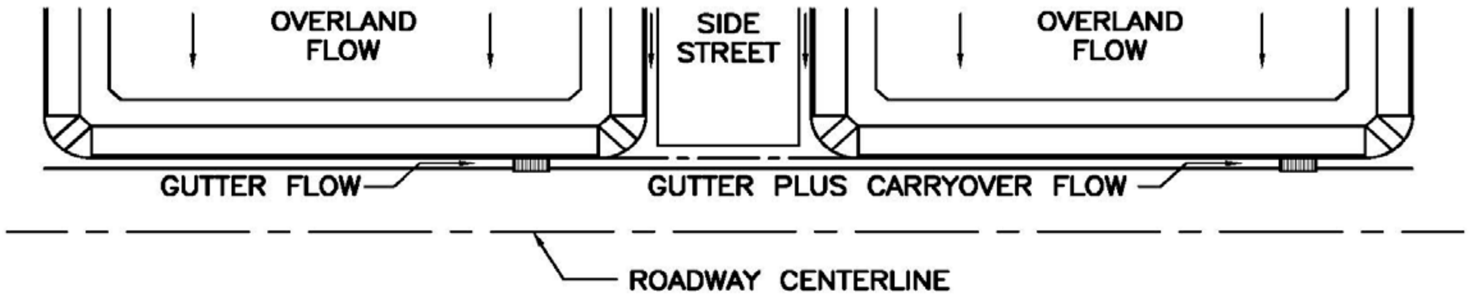


Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Inlet Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from 'Q-Allow')	a_{local} =	5.00	5.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	2	2	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	6.0	12.0	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) =	15.00	15.00	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	
		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	Q_a =	**19.9**	**86.1**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms (>Q PEAK)	$Q_{PEAK\ REQUIRED}$ =	3.1	83.4	cfs

Worksheet Protected

DESIGN PEAK FLOW FOR ONE-HALF OF STREET
OR GRASS-LINED CHANNEL BY THE RATIONAL METHOD

Project: Trails at Crowfoot
Inlet ID: DP 5F



Show Details

Design Flow: ONLY if already determined through other methods:

	Minor Storm	Major Storm	
(local peak flow for 1/2 of street OR grass-lined channel): *Q_{Known} =	3.1	12.3	cfs

*** If you enter values in Row 14, skip the rest of this sheet and proceed to sheet Q-Allow or Area Inlet.**

<--- FILL IN THIS SECTION OR…

FILL IN THE SECTIONS BELOW. <---

Geographic Information: (Enter data in the blue cells):

Subcatchment Area =		Acres
Percent Imperviousness =		%
NRCS Soil Type =		A, B, C, or D

Site Type:
- Site is Urban
- Site is Non-Urban

Flows Developed For:
- Street Inlets
- Area Inlets in a Median

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

Rainfall Information: Intensity I (inch/hr) = $C_1 * P_1 / (C_2 + T_c)$ ^ C_3

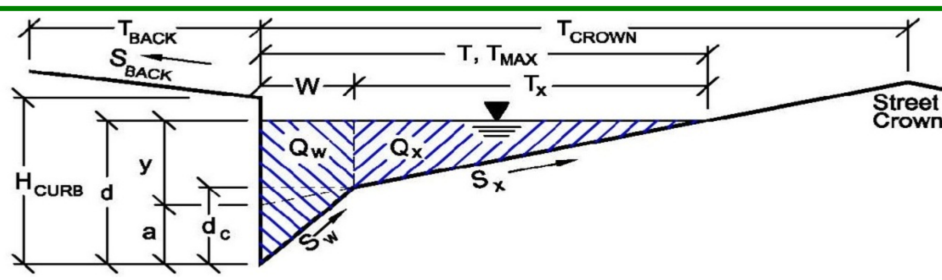
	Minor Storm	Major Storm	
Design Storm Return Period, T_r =			years
Return Period One-Hour Precipitation, P_1 =			inches
C_1 =			
C_2 =			
C_3 =			
User-Defined Storm Runoff Coefficient (leave this blank to accept a calculated value), C =			
User-Defined 5-yr. Runoff Coefficient (leave this blank to accept a calculated value), C_5 =			
Bypass (Carry-Over) Flow from upstream Subcatchments, Q_b =	**0.0**	**0.0**	**cfs**
Total Design Peak Flow, Q =	**3.1**	**12.3**	**cfs**

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

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

Project: **Trails at Crowfoot**

Inlet ID: **DP 5F**



Gutter Geometry (Enter data in the blue cells)

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	18.0	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} =	4.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	17.0	ft
Gutter Width	W =	2.00	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 =	0.010	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016	

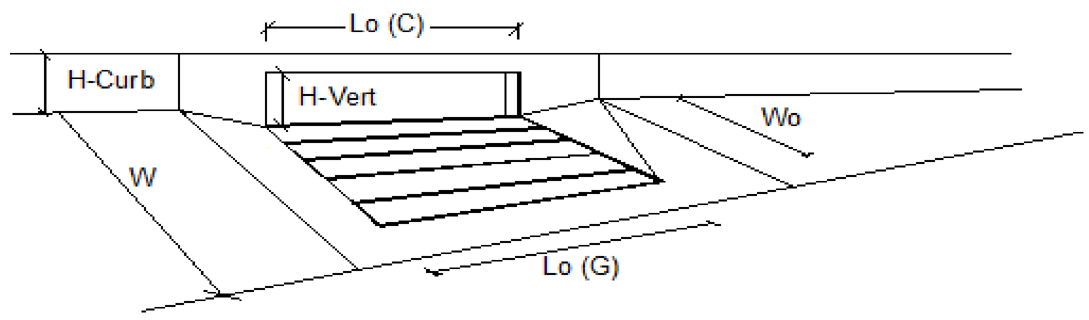
		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	17.0	17.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	4.0	12.0	inches
Allow Flow Depth at Street Crown (leave blank for no)		☐	☑	check = yes

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	Q_{allow} =	**3.4**	**132.7**	**cfs**

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

INLET ON A CONTINUOUS GRADE

Project: **Trails at Crowfoot**
Inlet ID: **DP 5F**

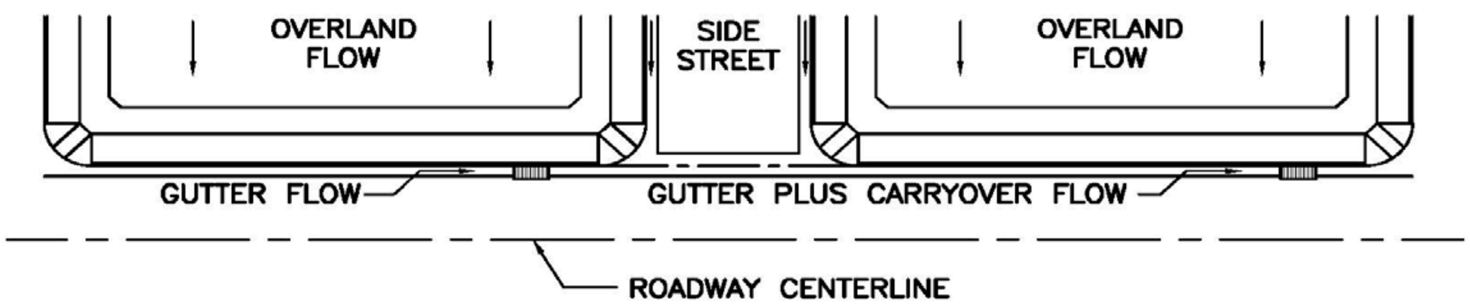


Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from 'Q-Allow')	a_{LOCAL} =	5.0	5.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)	No =	1	1	
Length of a Single Unit Inlet (Grate or Curb Opening)	L_o =	10.00	10.00	ft
Width of a Unit Grate (cannot be greater than W from Q-Allow)	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 < maximum allowable from sheet 'Q-Allow'		MINOR	MAJOR	
Total Inlet Interception Capacity	**Q =**	**3.10**	**8.39**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**0.0**	**4.0**	**cfs**
Capture Percentage = Q_a/Q_o =	**C% =**	**100**	**68**	**%**

Worksheet Protected

DESIGN PEAK FLOW FOR ONE-HALF OF STREET
OR GRASS-LINED CHANNEL BY THE RATIONAL METHOD

Project: Trails at Crowfoot
Inlet ID: 5G



Show Details

Design Flow: ONLY if already determined through other methods:

	Minor Storm	Major Storm	
(local peak flow for 1/2 of street OR grass-lined channel): $^*Q_{Known}$ =	6.2	107.5	cfs

*** If you enter values in Row 14, skip the rest of this sheet and proceed to sheet Q-Allow or Area Inlet.**

<--- FILL IN THIS SECTION OR…

FILL IN THE SECTIONS BELOW. <---

Geographic Information: (Enter data in the blue cells):

Subcatchment Area =		Acres
Percent Imperviousness =		%
NRCS Soil Type =		A, B, C, or D

Site Type:
- ○ Site is Urban
- ○ Site is Non-Urban

Flows Developed For:
- ○ Street Inlets
- ○ Area Inlets in a Median

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

Rainfall Information: Intensity I (inch/hr) = $C_1 * P_1 / (C_2 + T_c)$ ^ C_3

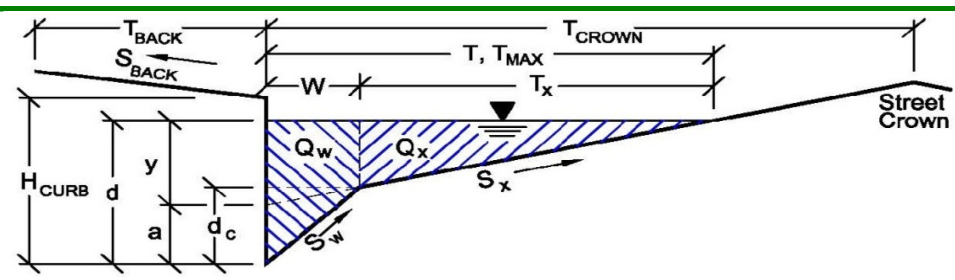
	Minor Storm	Major Storm	
Design Storm Return Period, T_r =			years
Return Period One-Hour Precipitation, P_1 =			inches
C_1 =			
C_2 =			
C_3 =			
User-Defined Storm Runoff Coefficient (leave this blank to accept a calculated value), C =			
User-Defined 5-yr. Runoff Coefficient (leave this blank to accept a calculated value), C_5 =			
Bypass (Carry-Over) Flow from upstream Subcatchments, Q_b =	0.0	0.0	cfs
Total Design Peak Flow, Q =	6.2	107.5	cfs

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

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

Project: **Trails at Crowfoot**

Inlet ID: **5G**



Gutter Geometry (Enter data in the blue cells)

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	18.0	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} =	4.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	17.0	ft
Gutter Width	W =	2.00	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} =	0.016	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	17.0	17.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	4.0	12.0	inches
Allow Flow Depth at Street Crown (leave blank for no)		☐	☑	check = yes

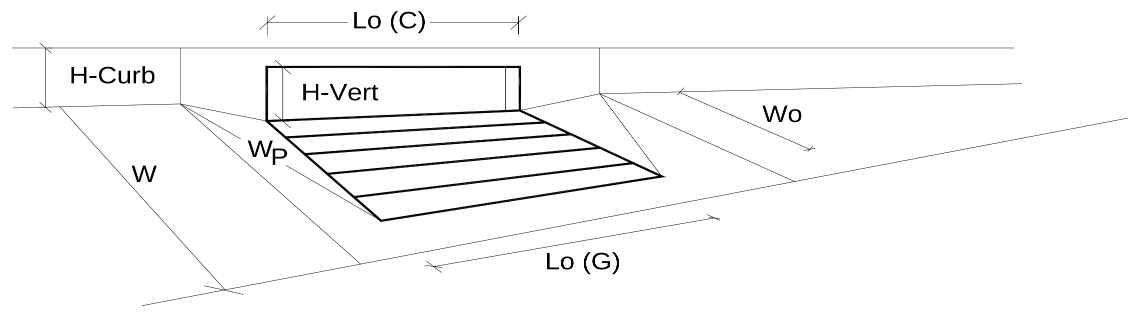
		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	Q_{allow} =	**SUMP**	**SUMP**	**cfs**

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

INLET IN A SUMP OR SAG LOCATION

Project = **Trails at Crowfoot**

Inlet ID = **5G**

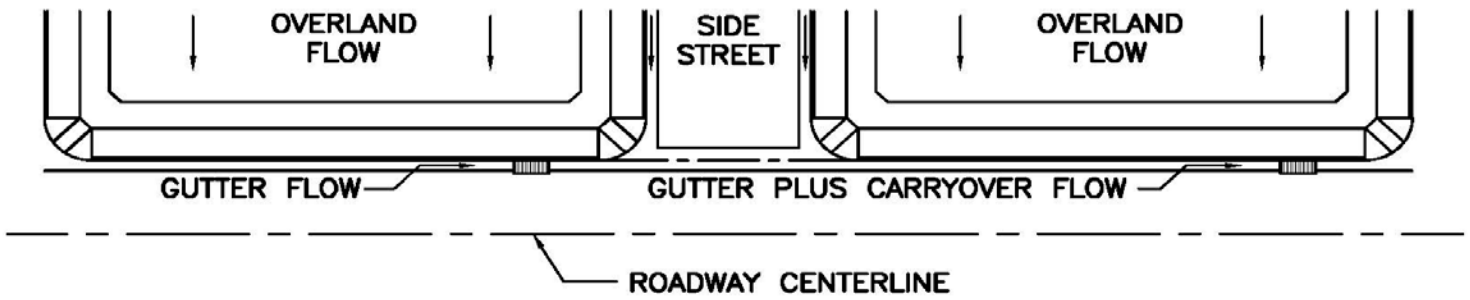


Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Inlet Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from 'Q-Allow')	a_{local} =	5.00	5.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	2	2	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	6.0	12.0	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) =	15.00	15.00	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	
		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	Q_a =	**19.9**	**86.1**	**cfs**
WARNING: Inlet Capacity less than Q Peak for MAJOR Storm	Q PEAK REQUIRED =	6.2	107.5	cfs

Worksheet Protected

DESIGN PEAK FLOW FOR ONE-HALF OF STREET
OR GRASS-LINED CHANNEL BY THE RATIONAL METHOD

Project: **Trails at Crowfoot**
Inlet ID: **DP 5H**



Show Details

Design Flow: ONLY if already determined through other methods:

	Minor Storm	Major Storm	
(local peak flow for 1/2 of street OR grass-lined channel): *Q_{Known} =	3.1	81.3	cfs

*** If you enter values in Row 14, skip the rest of this sheet and proceed to sheet Q-Allow or Area Inlet.**

<--- FILL IN THIS SECTION OR… FILL IN THE SECTIONS BELOW. <---

Geographic Information: (Enter data in the blue cells):

Subcatchment Area =		Acres
Percent Imperviousness =		%
NRCS Soil Type =		A, B, C, or D

Site Type:
- ○ Site is Urban
- ○ Site is Non-Urban

Flows Developed For:
- ○ Street Inlets
- ○ Area Inlets in a Median

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

Rainfall Information: Intensity I (inch/hr) = $C_1 * P_1 / (C_2 + T_c)^{C_3}$

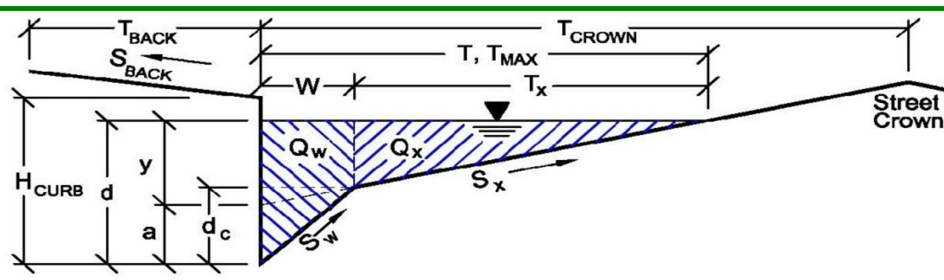
	Minor Storm	Major Storm	
Design Storm Return Period, T_r =			years
Return Period One-Hour Precipitation, P_1 =			inches
C_1 =			
C_2 =			
C_3 =			
User-Defined Storm Runoff Coefficient (leave this blank to accept a calculated value), C =			
User-Defined 5-yr. Runoff Coefficient (leave this blank to accept a calculated value), C_5 =			
Bypass (Carry-Over) Flow from upstream Subcatchments, Q_b =	**0.0**	**0.0**	**cfs**
Total Design Peak Flow, Q =	**3.1**	**81.3**	**cfs**

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

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

Project: Trails at Crowfoot

Inlet ID: DP 5H



Gutter Geometry (Enter data in the blue cells)

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	18.0	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} =	4.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	17.0	ft
Gutter Width	W =	2.00	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} =	0.016	

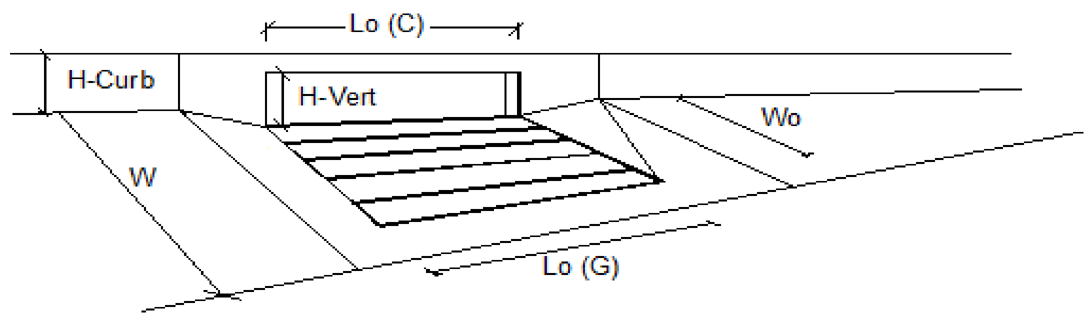
		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	17.0	17.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	4.0	12.0	inches
Allow Flow Depth at Street Crown (leave blank for no)		☐	☑	check = yes

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	Q_{allow} =	**4.8**	**156.5**	**cfs**

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

INLET ON A CONTINUOUS GRADE

Project: Trails at Crowfoot
Inlet ID: DP 5H

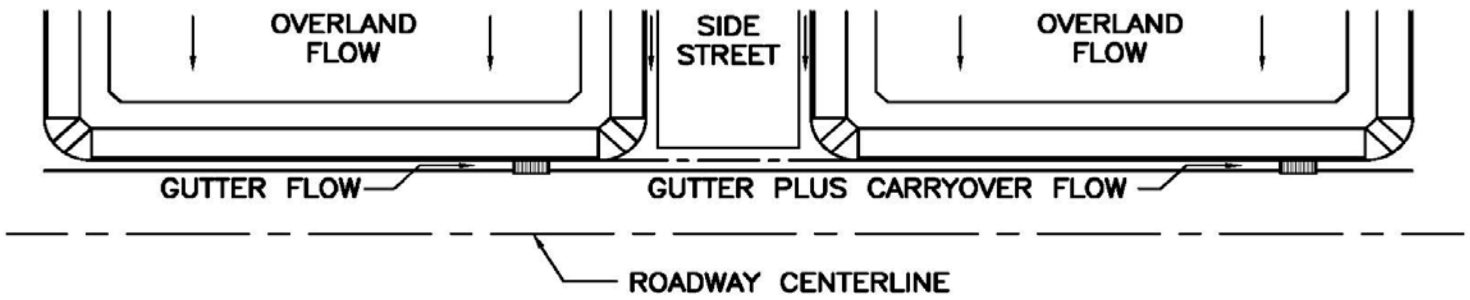


Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from 'Q-Allow')	a_{LOCAL} =	5.0	5.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)	No =	1	1	
Length of a Single Unit Inlet (Grate or Curb Opening)	L_o =	15.00	15.00	ft
Width of a Unit Grate (cannot be greater than W from Q-Allow)	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 < maximum allowable from sheet 'Q-Allow'		MINOR	MAJOR	
Total Inlet Interception Capacity	**Q =**	**3.10**	**26.87**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**0.0**	**54.4**	**cfs**
Capture Percentage = Q_a/Q_o =	**C% =**	**100**	**33**	**%**

Worksheet Protected

DESIGN PEAK FLOW FOR ONE-HALF OF STREET OR GRASS-LINED CHANNEL BY THE RATIONAL METHOD

Project: Trails at Crowfoot
Inlet ID: DP 5I



Show Details

Design Flow: ONLY if already determined through other methods:
(local peak flow for 1/2 of street OR grass-lined channel):

	Minor Storm	Major Storm	
*Q_{Known} =	3.9	19.5	cfs

*** If you enter values in Row 14, skip the rest of this sheet and proceed to sheet Q-Allow or Area Inlet.**

<--- FILL IN THIS SECTION OR…

FILL IN THE SECTIONS BELOW. <---

Geographic Information: (Enter data in the blue cells):

Subcatchment Area =		Acres
Percent Imperviousness =		%
NRCS Soil Type =		A, B, C, or D

Site Type:
- Site is Urban
- Site is Non-Urban

Flows Developed For:
- Street Inlets
- Area Inlets in a Median

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

Rainfall Information: Intensity I (inch/hr) = $C_1 * P_1 / (C_2 + T_c)$ ^ C_3

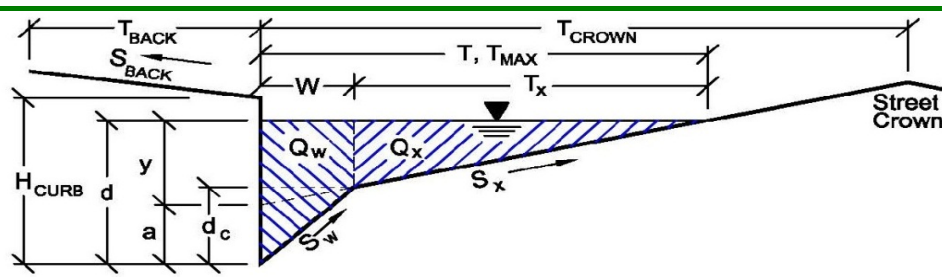
	Minor Storm	Major Storm	
Design Storm Return Period, T_r =			years
Return Period One-Hour Precipitation, P_1 =			inches
C_1 =			
C_2 =			
C_3 =			
User-Defined Storm Runoff Coefficient (leave this blank to accept a calculated value), C =			
User-Defined 5-yr. Runoff Coefficient (leave this blank to accept a calculated value), C_5 =			
Bypass (Carry-Over) Flow from upstream Subcatchments, Q_b =	0.0	0.0	cfs
Total Design Peak Flow, Q =	3.9	19.5	cfs

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

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

Project: **Trails at Crowfoot**

Inlet ID: **DP 5I**



Gutter Geometry (Enter data in the blue cells)

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	18.0	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} =	4.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	17.0	ft
Gutter Width	W =	2.00	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} =	0.016	

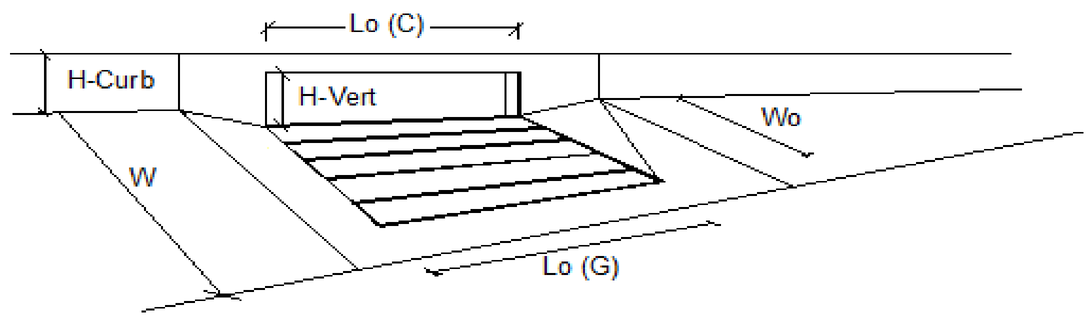
		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	17.0	17.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	4.0	12.0	inches
Allow Flow Depth at Street Crown (leave blank for no)		☐	☑	check = yes

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	**Q_{allow}** =	**4.8**	**156.5**	**cfs**

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

INLET ON A CONTINUOUS GRADE

Project: **Trails at Crowfoot**
Inlet ID: **DP 5I**

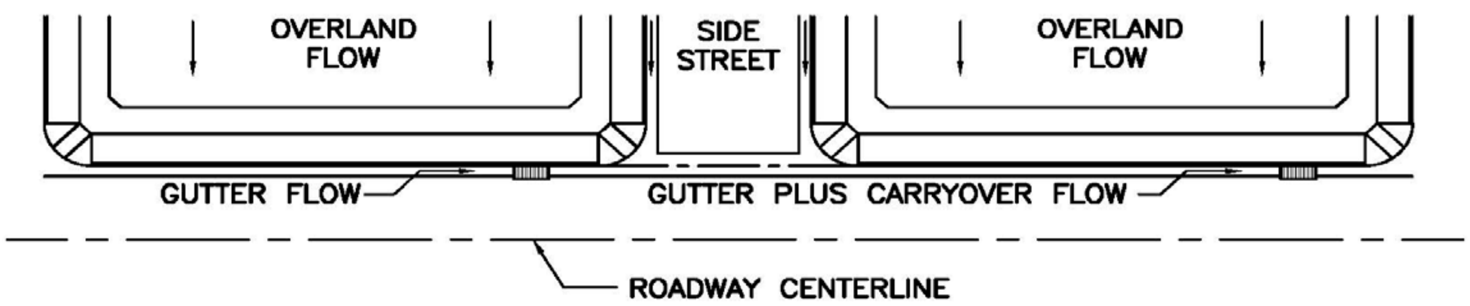


Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from 'Q-Allow')	a_{LOCAL} =	5.0	5.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)	No =	1	1	
Length of a Single Unit Inlet (Grate or Curb Opening)	L_o =	15.00	15.00	ft
Width of a Unit Grate (cannot be greater than W from Q-Allow)	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 < maximum allowable from sheet 'Q-Allow'		MINOR	MAJOR	
Total Inlet Interception Capacity	**Q =**	**3.90**	**14.42**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**0.0**	**5.0**	**cfs**
Capture Percentage = Q_a/Q_o =	**C% =**	**100**	**74**	**%**

Worksheet Protected

DESIGN PEAK FLOW FOR ONE-HALF OF STREET
OR GRASS-LINED CHANNEL BY THE RATIONAL METHOD

Project: Trails at Crowfoot
Inlet ID: DP 5L



Show Details

Design Flow: ONLY if already determined through other methods:

	Minor Storm	Major Storm	
(local peak flow for 1/2 of street OR grass-lined channel): *Q_{Known} =	4.6	27.7	cfs

*** If you enter values in Row 14, skip the rest of this sheet and proceed to sheet Q-Allow or Area Inlet.**

<--- FILL IN THIS SECTION OR…

FILL IN THE SECTIONS BELOW. <---

Geographic Information: (Enter data in the blue cells):

Subcatchment Area =		Acres
Percent Imperviousness =		%
NRCS Soil Type =		A, B, C, or D

Site Type:
- ○ Site is Urban
- ○ Site is Non-Urban

Flows Developed For:
- ○ Street Inlets
- ○ Area Inlets in a Median

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

Rainfall Information: Intensity I (inch/hr) = $C_1 * P_1 / (C_2 + T_c)$ ^ C_3

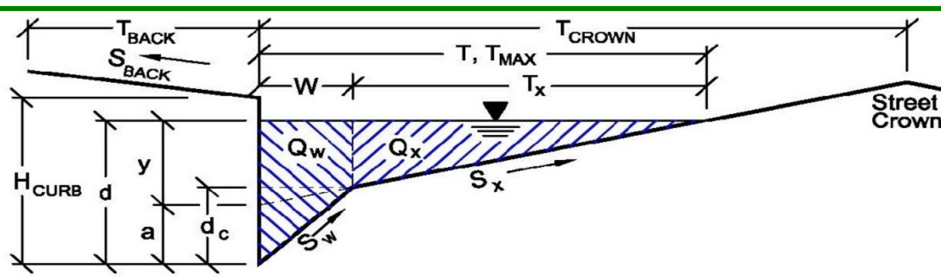
	Minor Storm	Major Storm	
Design Storm Return Period, T_r =			years
Return Period One-Hour Precipitation, P_1 =			inches
C_1 =			
C_2 =			
C_3 =			
User-Defined Storm Runoff Coefficient (leave this blank to accept a calculated value), C =			
User-Defined 5-yr. Runoff Coefficient (leave this blank to accept a calculated value), C_5 =			
Bypass (Carry-Over) Flow from upstream Subcatchments, Q_b =	**0.0**	**0.0**	**cfs**
Total Design Peak Flow, Q =	**4.6**	**27.7**	**cfs**

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

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

Project: **Trails at Crowfoot**

Inlet ID: **DP 5L**



Gutter Geometry (Enter data in the blue cells)

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	18.0	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} =	4.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	17.0	ft
Gutter Width	W =	2.00	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 =	0.060	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016	

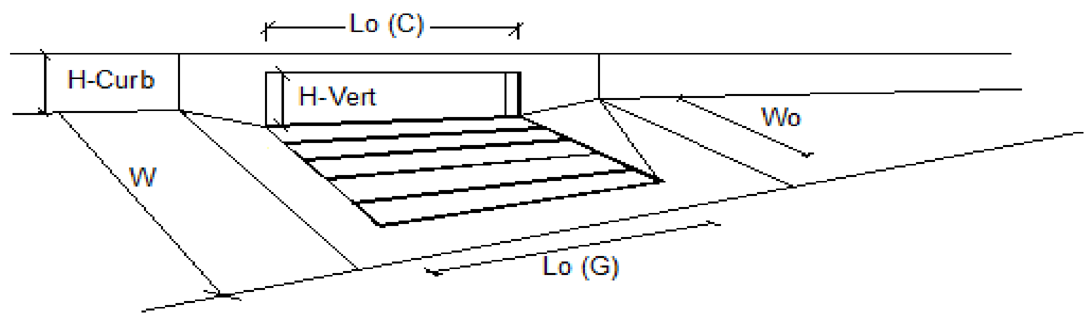
		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	17.0	17.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	4.0	12.0	inches
Allow Flow Depth at Street Crown (leave blank for no)		☐	☑	check = yes

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	Q_{allow} =	**8.3**	**112.6**	**cfs**

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

INLET ON A CONTINUOUS GRADE

Project: **Trails at Crowfoot**
Inlet ID: **DP 5L**

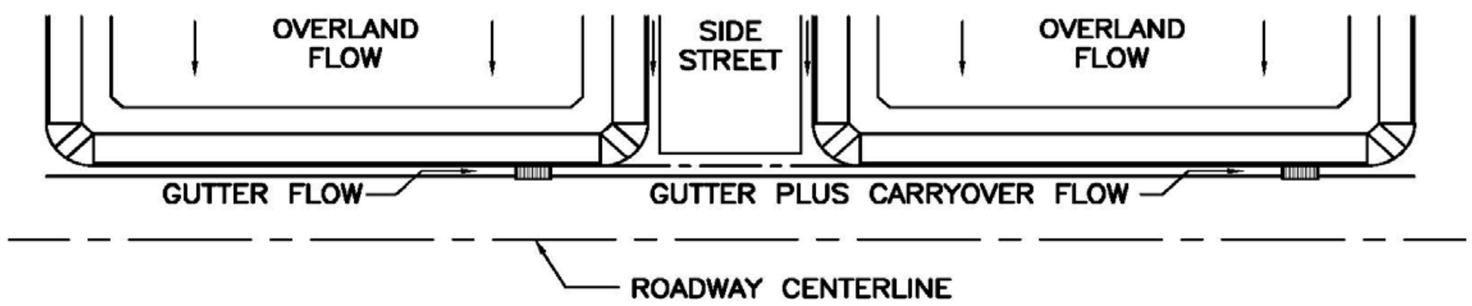


Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from 'Q-Allow')	a_{LOCAL} =	5.0	5.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)	No =	2	2	
Length of a Single Unit Inlet (Grate or Curb Opening)	L_o =	15.00	15.00	ft
Width of a Unit Grate (cannot be greater than W from Q-Allow)	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 < maximum allowable from sheet 'Q-Allow'		MINOR	MAJOR	
Total Inlet Interception Capacity	**Q =**	**4.60**	**26.12**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**0.0**	**1.6**	**cfs**
Capture Percentage = Q_a/Q_o =	**C% =**	**100**	**94**	**%**

Worksheet Protected

DESIGN PEAK FLOW FOR ONE-HALF OF STREET OR GRASS-LINED CHANNEL BY THE RATIONAL METHOD

Project: Trails at Crowfoot
Inlet ID: 5N



Show Details

Design Flow: ONLY if already determined through other methods:
(local peak flow for 1/2 of street OR grass-lined channel):

	Minor Storm	Major Storm	
* Q_{Known} =	7.0	59.0	cfs

*** If you enter values in Row 14, skip the rest of this sheet and proceed to sheet Q-Allow or Area Inlet.**

<--- FILL IN THIS SECTION OR…
FILL IN THE SECTIONS BELOW. <---

Geographic Information: (Enter data in the blue cells):

Subcatchment Area =		Acres
Percent Imperviousness =		%
NRCS Soil Type =		A, B, C, or D

Site Type:
- ○ Site is Urban
- ○ Site is Non-Urban

Flows Developed For:
- ○ Street Inlets
- ○ Area Inlets in a Median

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

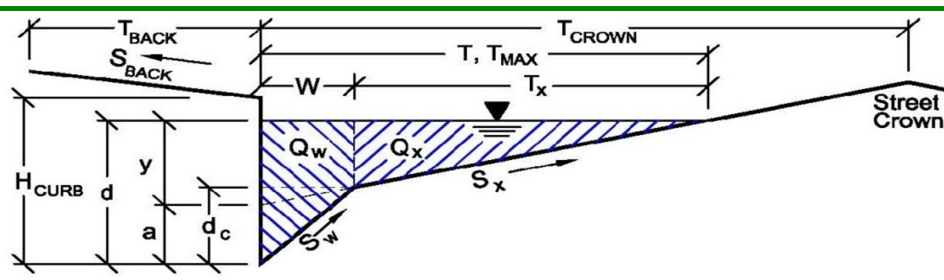
Rainfall Information: Intensity I (inch/hr) = $C_1 * P_1 / (C_2 + T_c) ^{\wedge} C_3$

	Minor Storm	Major Storm	
Design Storm Return Period, T_r =			years
Return Period One-Hour Precipitation, P_1 =			inches
C_1 =			
C_2 =			
C_3 =			
User-Defined Storm Runoff Coefficient (leave this blank to accept a calculated value), C =			
User-Defined 5-yr. Runoff Coefficient (leave this blank to accept a calculated value), C_5 =			
Bypass (Carry-Over) Flow from upstream Subcatchments, Q_b =	0.0	0.0	cfs
Total Design Peak Flow, Q =	7.0	59.0	cfs

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

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

Project: Trails at Crowfoot
Inlet ID: 5N



Gutter Geometry (Enter data in the blue cells)

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	18.0	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} =	4.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	17.0	ft
Gutter Width	W =	2.00	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} =	0.016	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	17.0	17.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	4.0	12.0	inches
Allow Flow Depth at Street Crown (leave blank for no)		☐	☑	check = yes

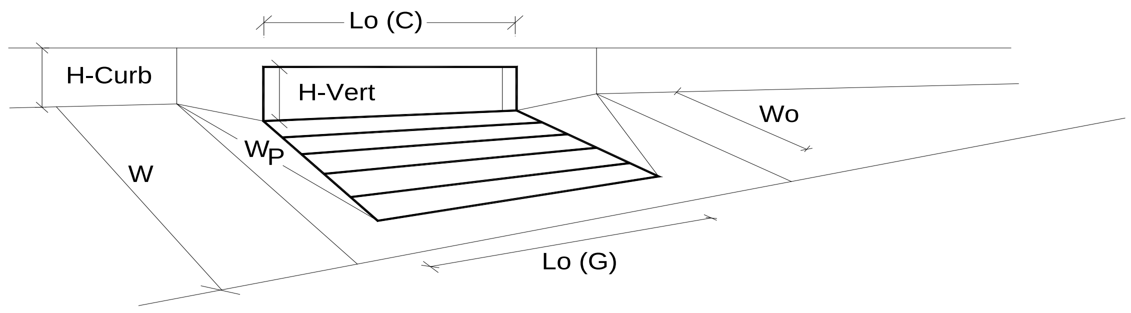
		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	**Q_{allow} =**	**SUMP**	**SUMP**	**cfs**

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

INLET IN A SUMP OR SAG LOCATION

Project = **Trails at Crowfoot**

Inlet ID = **5N**

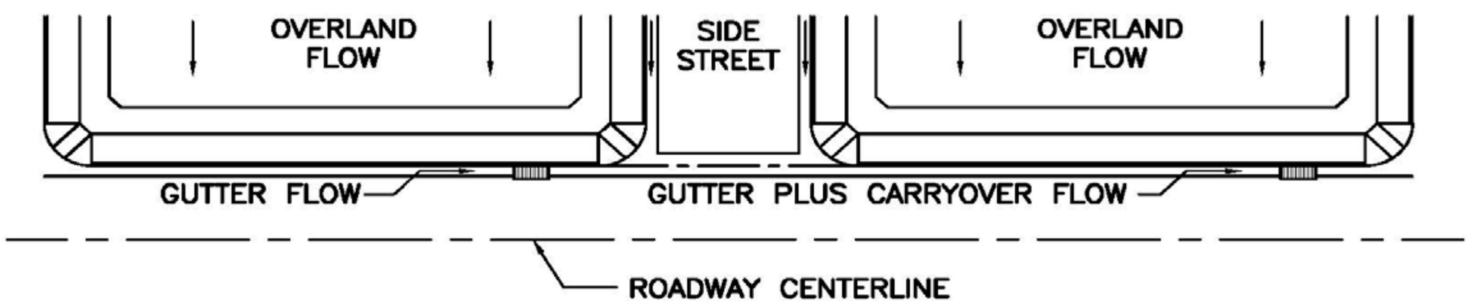


Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Inlet Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from 'Q-Allow')	a_{local} =	5.00	5.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	2	2	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	6.0	12.0	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) =	15.00	15.00	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	
		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	Q_a =	**19.9**	**86.1**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms (>Q PEAK)	Q PEAK REQUIRED =	7.0	59.0	cfs

Worksheet Protected

DESIGN PEAK FLOW FOR ONE-HALF OF STREET
OR GRASS-LINED CHANNEL BY THE RATIONAL METHOD

Project: Trails at Crowfoot
Inlet ID: DP 5O



Show Details

Design Flow: ONLY if already determined through other methods:
(local peak flow for 1/2 of street OR grass-lined channel):

	Minor Storm	Major Storm	
***Q**$_{Known}$ =	2.1	8.6	cfs

*** If you enter values in Row 14, skip the rest of this sheet and proceed to sheet Q-Allow or Area Inlet.**

<--- FILL IN THIS SECTION OR…
FILL IN THE SECTIONS BELOW. <---

Geographic Information: (Enter data in the blue cells):

Subcatchment Area =		Acres
Percent Imperviousness =		%
NRCS Soil Type =		A, B, C, or D

Site Type:
- ○ Site is Urban
- ○ Site is Non-Urban

Flows Developed For:
- ○ Street Inlets
- ○ Area Inlets in a Median

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

Rainfall Information: Intensity I (inch/hr) = $C_1 * P_1 / (C_2 + T_c)$ ^ C_3

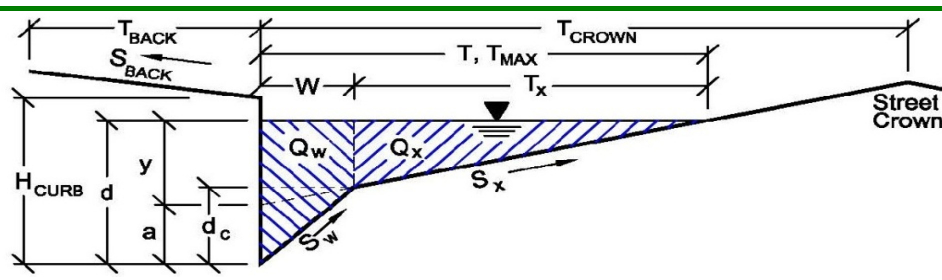
	Minor Storm	Major Storm	
Design Storm Return Period, T_r =			years
Return Period One-Hour Precipitation, P_1 =			inches
C_1 =			
C_2 =			
C_3 =			
User-Defined Storm Runoff Coefficient (leave this blank to accept a calculated value), C =			
User-Defined 5-yr. Runoff Coefficient (leave this blank to accept a calculated value), C_5 =			
Bypass (Carry-Over) Flow from upstream Subcatchments, Q_b =	**0.0**	**0.0**	**cfs**
Total Design Peak Flow, Q =	**2.1**	**8.6**	**cfs**

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

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

Project: Trails at Crowfoot

Inlet ID: DP 5O



Gutter Geometry (Enter data in the blue cells)

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	18.0	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} =	4.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	17.0	ft
Gutter Width	W =	2.00	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} =	0.016	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	17.0	17.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	4.0	12.0	inches
Allow Flow Depth at Street Crown (leave blank for no)		☐	☑	check = yes

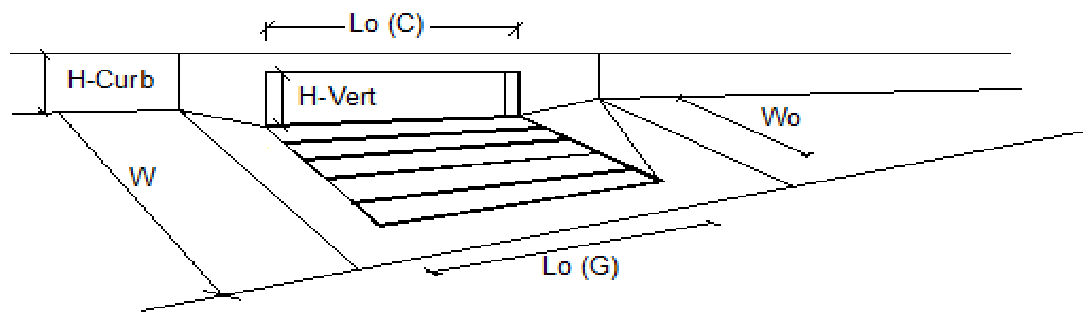
		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	**Q_{allow} =**	**4.8**	**156.5**	**cfs**

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

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

INLET ON A CONTINUOUS GRADE

Project: **Trails at Crowfoot**
Inlet ID: **DP 5O**

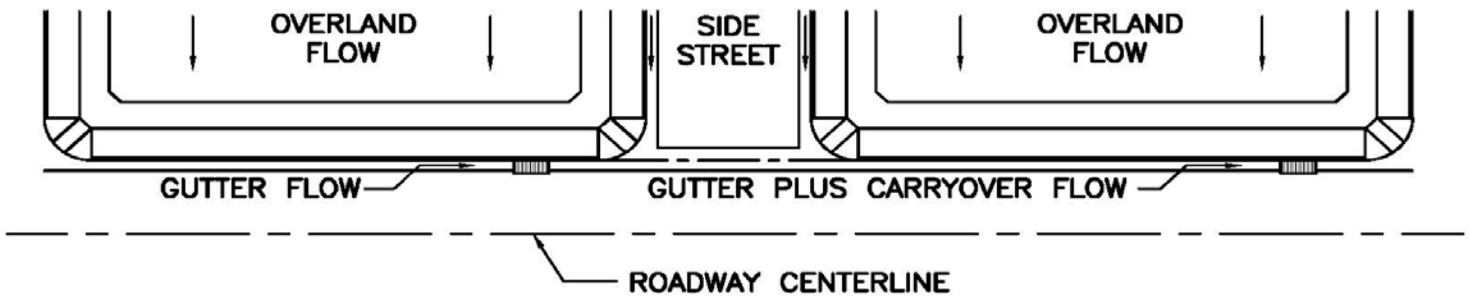


Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from 'Q-Allow')	a_{LOCAL} =	5.0	5.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)	No =	1	1	
Length of a Single Unit Inlet (Grate or Curb Opening)	L_o =	10.00	10.00	ft
Width of a Unit Grate (cannot be greater than W from Q-Allow)	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 < maximum allowable from sheet 'Q-Allow'		MINOR	MAJOR	
Total Inlet Interception Capacity	**Q =**	**2.10**	**7.11**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**0.0**	**1.4**	**cfs**
Capture Percentage = Q_a/Q_o =	**C% =**	**100**	**83**	**%**

Worksheet Protected

DESIGN PEAK FLOW FOR ONE-HALF OF STREET OR GRASS-LINED CHANNEL BY THE RATIONAL METHOD

Project: Trails at Crowfoot
Inlet ID: DP 5P



Show Details

Design Flow: ONLY if already determined through other methods:

		Minor Storm	Major Storm	
(local peak flow for 1/2 of street OR grass-lined channel):	*Q_{Known} =	4.8	49.9	cfs

*** If you enter values in Row 14, skip the rest of this sheet and proceed to sheet Q-Allow or Area Inlet.**

<--- FILL IN THIS SECTION OR…

FILL IN THE SECTIONS BELOW. <---

Geographic Information: (Enter data in the blue cells):

Subcatchment Area =		Acres
Percent Imperviousness =		%
NRCS Soil Type =		A, B, C, or D

Site Type:
- ○ Site is Urban
- ○ Site is Non-Urban

Flows Developed For:
- ○ Street Inlets
- ○ Area Inlets in a Median

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

Rainfall Information: Intensity I (inch/hr) = $C_1 * P_1 / (C_2 + T_c)^{\wedge} C_3$

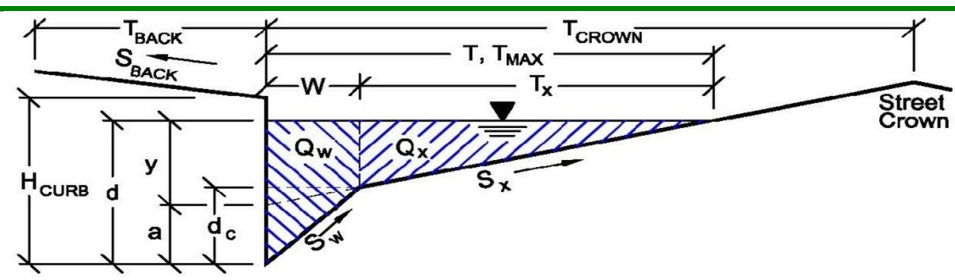
	Minor Storm	Major Storm	
Design Storm Return Period, T_r =			years
Return Period One-Hour Precipitation, P_1 =			inches
C_1 =			
C_2 =			
C_3 =			
User-Defined Storm Runoff Coefficient (leave this blank to accept a calculated value), C =			
User-Defined 5-yr. Runoff Coefficient (leave this blank to accept a calculated value), C_5 =			
Bypass (Carry-Over) Flow from upstream Subcatchments, Q_b =	0.0	0.0	cfs
Total Design Peak Flow, Q =	4.8	49.9	cfs

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

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

Project: **Trails at Crowfoot**

Inlet ID: **DP 5P**



Gutter Geometry (Enter data in the blue cells)

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	18.0	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} =	4.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	17.0	ft
Gutter Width	W =	2.00	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 =	0.060	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016	

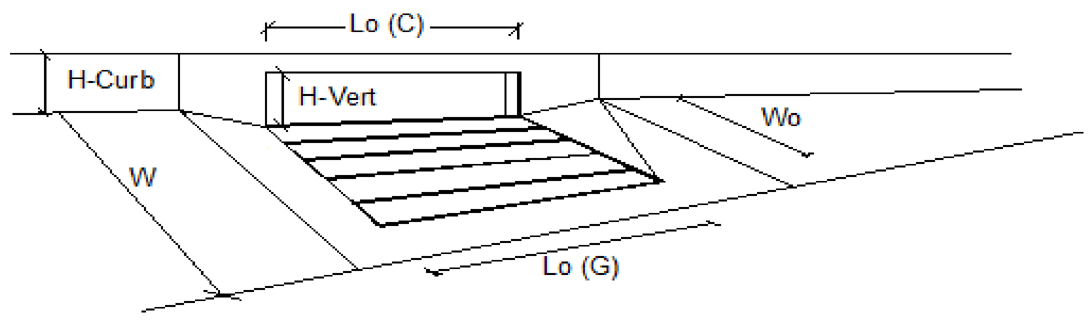
		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	17.0	17.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	4.0	12.0	inches
Allow Flow Depth at Street Crown (leave blank for no)		☐	☑	check = yes

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	**Q_{allow} =**	**8.3**	**112.6**	**cfs**

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

INLET ON A CONTINUOUS GRADE

Project: **Trails at Crowfoot**
Inlet ID: **DP 5P**

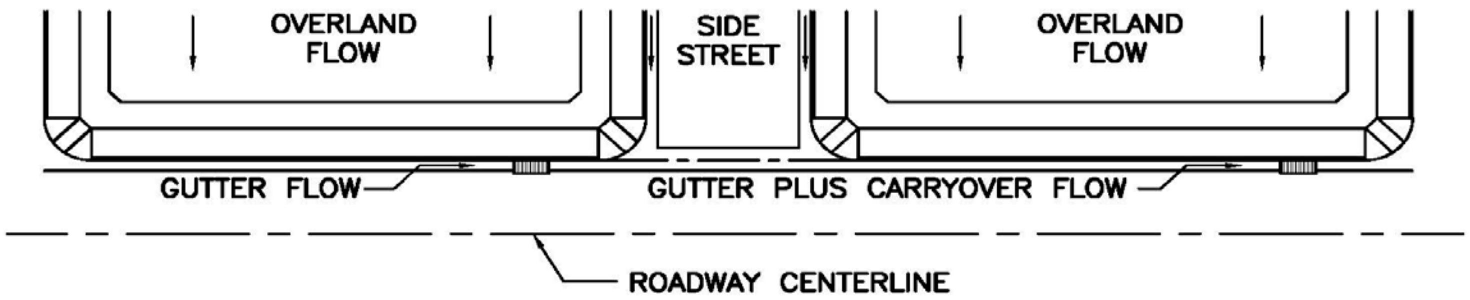


Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from 'Q-Allow')	a_{LOCAL} =	5.0	5.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)	No =	2	2	
Length of a Single Unit Inlet (Grate or Curb Opening)	L_o =	15.00	15.00	ft
Width of a Unit Grate (cannot be greater than W from Q-Allow)	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 < maximum allowable from sheet 'Q-Allow'		MINOR	MAJOR	
Total Inlet Interception Capacity	**Q =**	**4.80**	**38.71**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**0.0**	**11.2**	**cfs**
Capture Percentage = Q_a/Q_o =	**C% =**	**100**	**78**	**%**

Worksheet Protected

DESIGN PEAK FLOW FOR ONE-HALF OF STREET OR GRASS-LINED CHANNEL BY THE RATIONAL METHOD

Project: Trails at Crowfoot
Inlet ID: 5R



Show Details

Design Flow: ONLY if already determined through other methods:

		Minor Storm	Major Storm	
(local peak flow for 1/2 of street OR grass-lined channel):	*Q_{Known} =	3.4	14.0	cfs

*** If you enter values in Row 14, skip the rest of this sheet and proceed to sheet Q-Allow or Area Inlet.**

<--- FILL IN THIS SECTION OR…

FILL IN THE SECTIONS BELOW. <---

Geographic Information: (Enter data in the blue cells):

Subcatchment Area =		Acres
Percent Imperviousness =		%
NRCS Soil Type =		A, B, C, or D

Site Type:
- ○ Site is Urban
- ○ Site is Non-Urban

Flows Developed For:
- ○ Street Inlets
- ○ Area Inlets in a Median

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

Rainfall Information: Intensity I (inch/hr) = $C_1 * P_1 / (C_2 + T_c) ^ C_3$

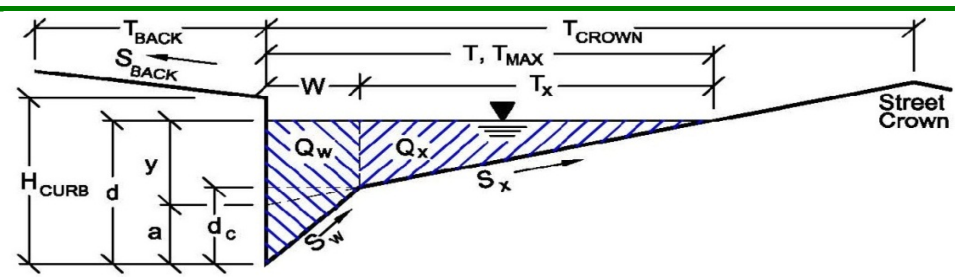
	Minor Storm	Major Storm	
Design Storm Return Period, T_r =			years
Return Period One-Hour Precipitation, P_1 =			inches
C_1 =			
C_2 =			
C_3 =			
User-Defined Storm Runoff Coefficient (leave this blank to accept a calculated value), C =			
User-Defined 5-yr. Runoff Coefficient (leave this blank to accept a calculated value), C_5 =			
Bypass (Carry-Over) Flow from upstream Subcatchments, Q_b =	0.0	0.0	cfs
Total Design Peak Flow, Q =	3.4	14.0	cfs

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

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

Project: Trails at Crowfoot

Inlet ID: 5R



Gutter Geometry (Enter data in the blue cells)

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	18.0	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} =	4.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	17.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.015	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016	

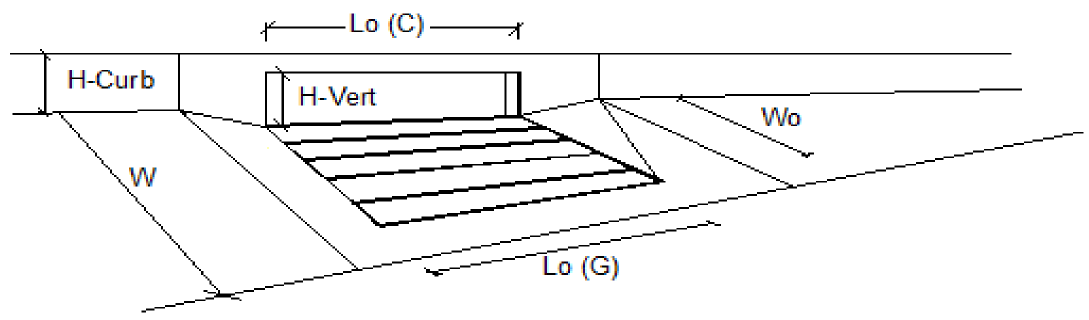
		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	17.0	17.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	4.0	12.0	inches
Allow Flow Depth at Street Crown (leave blank for no)		☐	☑	check = yes

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	Q_{allow} =	**4.1**	**162.5**	**cfs**

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

INLET ON A CONTINUOUS GRADE

Project: **Trails at Crowfoot**
Inlet ID: **5R**

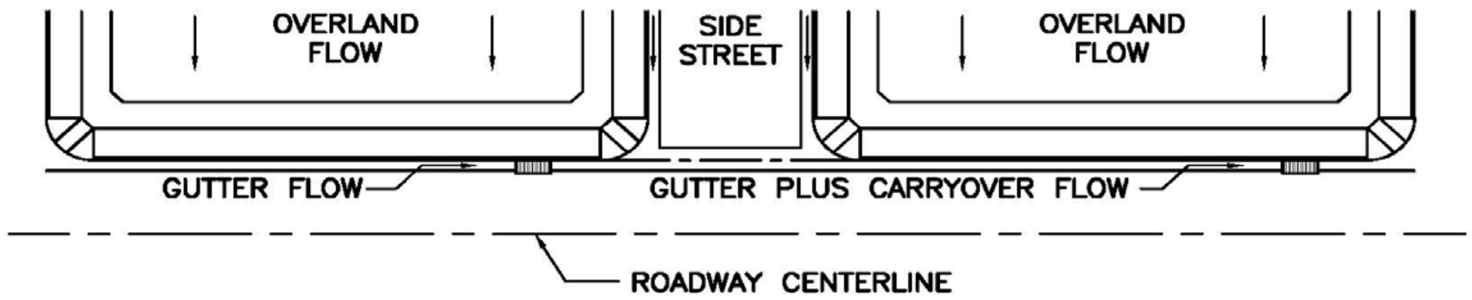


Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from 'Q-Allow')	a_{LOCAL} =	5.0	5.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)	No =	1	1	
Length of a Single Unit Inlet (Grate or Curb Opening)	L_o =	10.00	10.00	ft
Width of a Unit Grate (cannot be greater than W from Q-Allow)	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 < maximum allowable from sheet 'Q-Allow'		MINOR	MAJOR	
Total Inlet Interception Capacity	**Q =**	**3.40**	**9.04**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**0.0**	**5.0**	**cfs**
Capture Percentage = Q_a/Q_o =	**C% =**	**100**	**65**	**%**

Worksheet Protected

DESIGN PEAK FLOW FOR ONE-HALF OF STREET OR GRASS-LINED CHANNEL BY THE RATIONAL METHOD

Project: Trails at Crowfoot
Inlet ID: DP 5S



Show Details

Design Flow: ONLY if already determined through other methods:
(local peak flow for 1/2 of street OR grass-lined channel):

	Minor Storm	Major Storm	
*Q_{Known} =	3.6	67.9	cfs

*** If you enter values in Row 14, skip the rest of this sheet and proceed to sheet Q-Allow or Area Inlet.**

<--- FILL IN THIS SECTION OR…

FILL IN THE SECTIONS BELOW. <---

Geographic Information: (Enter data in the blue cells):

Subcatchment Area =		Acres
Percent Imperviousness =		%
NRCS Soil Type =		A, B, C, or D

Site Type:
- ○ Site is Urban
- ○ Site is Non-Urban

Flows Developed For:
- ○ Street Inlets
- ○ Area Inlets in a Median

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

Rainfall Information: Intensity I (inch/hr) = $C_1 * P_1 / (C_2 + T_c)^{C_3}$

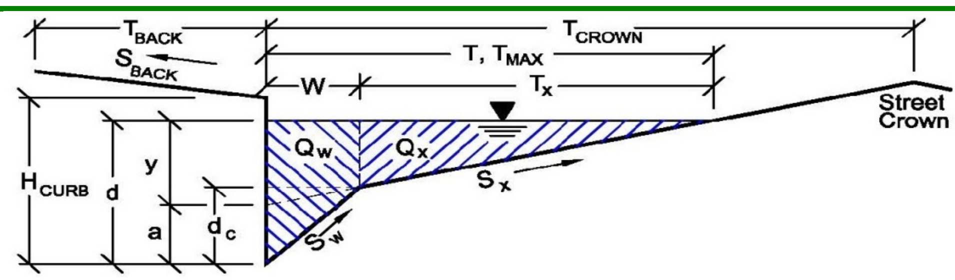
	Minor Storm	Major Storm	
Design Storm Return Period, T_r =			years
Return Period One-Hour Precipitation, P_1 =			inches
C_1 =			
C_2 =			
C_3 =			
User-Defined Storm Runoff Coefficient (leave this blank to accept a calculated value), C =			
User-Defined 5-yr. Runoff Coefficient (leave this blank to accept a calculated value), C_5 =			
Bypass (Carry-Over) Flow from upstream Subcatchments, Q_b =	0.0	0.0	cfs
Total Design Peak Flow, Q =	3.6	67.9	cfs

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

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

Project: Trails at Crowfoot

Inlet ID: DP 5S



Gutter Geometry (Enter data in the blue cells)

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	18.0	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} =	4.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	17.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.012	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016	

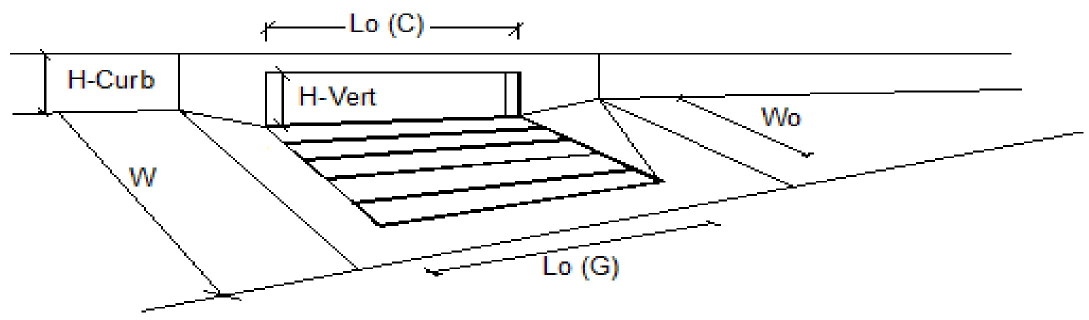
		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	17.0	17.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	4.0	12.0	inches
Allow Flow Depth at Street Crown (leave blank for no)		☐	☑	check = yes

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	**Q_{allow} =**	**3.7**	**145.3**	**cfs**

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

INLET ON A CONTINUOUS GRADE

Project: Trails at Crowfoot
Inlet ID: DP 5S

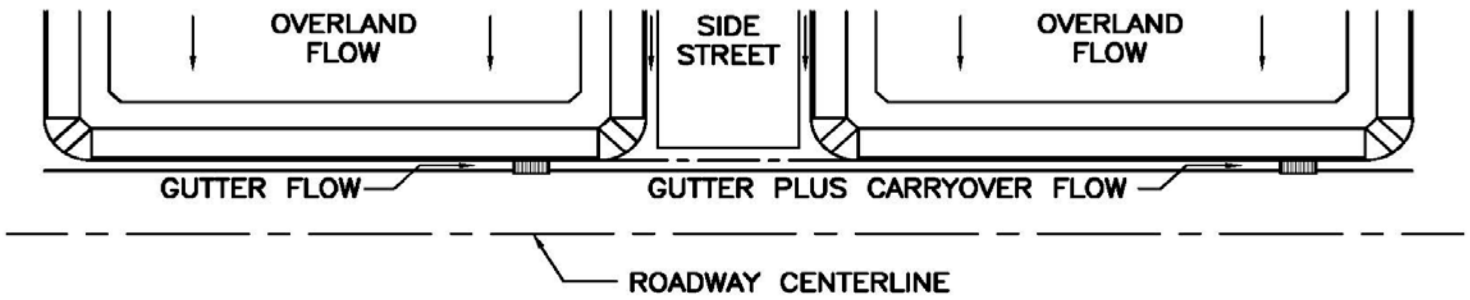


Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from 'Q-Allow')	a_{LOCAL} =	5.0	5.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)	No =	1	1	
Length of a Single Unit Inlet (Grate or Curb Opening)	L_o =	10.00	10.00	ft
Width of a Unit Grate (cannot be greater than W from Q-Allow)	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 < maximum allowable from sheet 'Q-Allow'		MINOR	MAJOR	
Total Inlet Interception Capacity	**Q =**	**3.60**	**16.94**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**0.0**	**51.0**	**cfs**
Capture Percentage = Q_a/Q_o =	**C% =**	**100**	**25**	**%**

Worksheet Protected

DESIGN PEAK FLOW FOR ONE-HALF OF STREET
OR GRASS-LINED CHANNEL BY THE RATIONAL METHOD

Project: Trails at Crowfoot
Inlet ID: DP 5U



Show Details

Design Flow: ONLY if already determined through other methods:

		Minor Storm	Major Storm	
(local peak flow for 1/2 of street OR grass-lined channel):	*Q_{Known} =	2.6	10.2	cfs

*** If you enter values in Row 14, skip the rest of this sheet and proceed to sheet Q-Allow or Area Inlet.**

<--- FILL IN THIS SECTION OR…

FILL IN THE SECTIONS BELOW. <---

Geographic Information: (Enter data in the blue cells):

Subcatchment Area =		Acres
Percent Imperviousness =		%
NRCS Soil Type =		A, B, C, or D

Site Type:
- ○ Site is Urban
- ○ Site is Non-Urban

Flows Developed For:
- ○ Street Inlets
- ○ Area Inlets in a Median

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

Rainfall Information: Intensity I (inch/hr) = $C_1 * P_1 / (C_2 + T_c)^{C_3}$

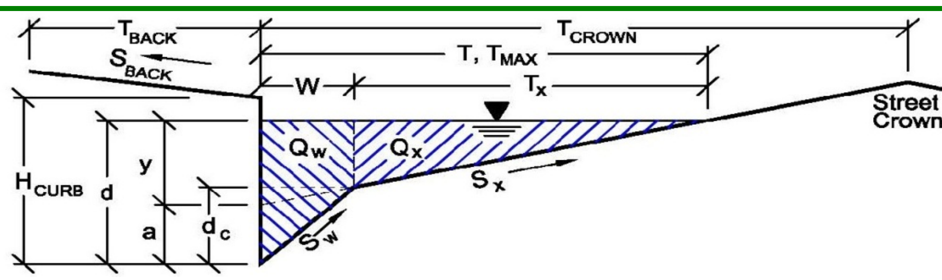
	Minor Storm	Major Storm	
Design Storm Return Period, T_r =			years
Return Period One-Hour Precipitation, P_1 =			inches
C_1 =			
C_2 =			
C_3 =			
User-Defined Storm Runoff Coefficient (leave this blank to accept a calculated value), C =			
User-Defined 5-yr. Runoff Coefficient (leave this blank to accept a calculated value), C_5 =			
Bypass (Carry-Over) Flow from upstream Subcatchments, Q_b =	0.0	0.0	cfs
Total Design Peak Flow, Q =	2.6	10.2	cfs

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

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

Project: **Trails at Crowfoot**

Inlet ID: **DP 5U**



Gutter Geometry (Enter data in the blue cells)

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	18.0	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} =	4.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	17.0	ft
Gutter Width	W =	2.00	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} =	0.016	

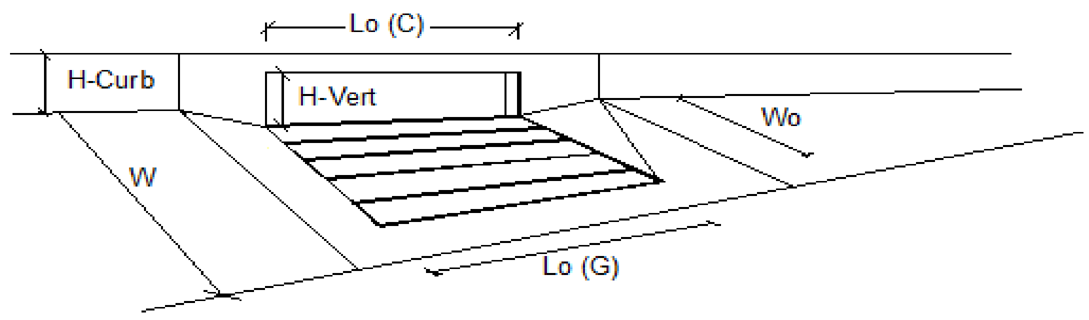
		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	17.0	17.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	4.0	12.0	inches
Allow Flow Depth at Street Crown (leave blank for no)		☐	☑	check = yes

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	Q_{allow} =	**4.8**	**156.5**	**cfs**

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

INLET ON A CONTINUOUS GRADE

Project: Trails at Crowfoot
Inlet ID: DP 5U

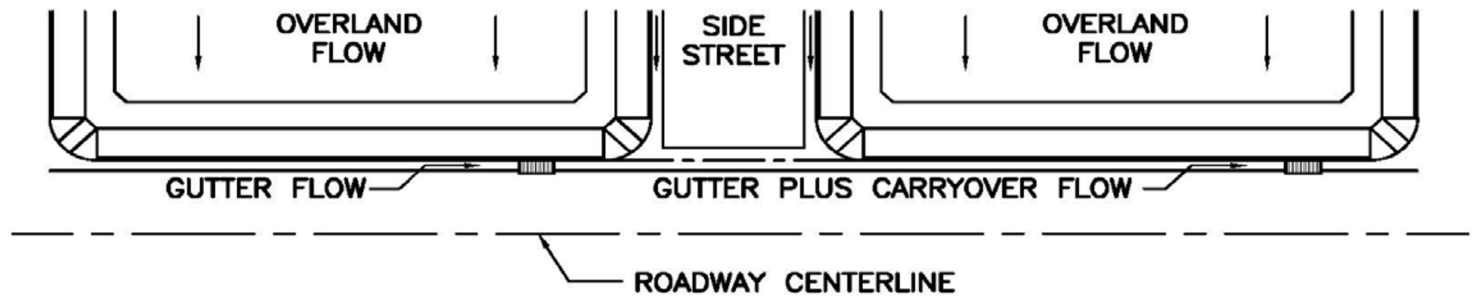


Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from 'Q-Allow')	a_{LOCAL} =	5.0	5.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)	No =	1	1	
Length of a Single Unit Inlet (Grate or Curb Opening)	L_o =	10.00	10.00	ft
Width of a Unit Grate (cannot be greater than W from Q-Allow)	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 < maximum allowable from sheet 'Q-Allow'		MINOR	MAJOR	
Total Inlet Interception Capacity	**Q =**	**2.60**	**7.82**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**0.0**	**2.4**	**cfs**
Capture Percentage = Q_a/Q_o =	**C% =**	**100**	**77**	**%**

Worksheet Protected

DESIGN PEAK FLOW FOR ONE-HALF OF STREET OR GRASS-LINED CHANNEL BY THE RATIONAL METHOD

Project: Trails at Crowfoot
Inlet ID: DP 5V



Show Details

Design Flow: ONLY if already determined through other methods:

(local peak flow for 1/2 of street OR grass-lined channel):

	Minor Storm	Major Storm	
*Q_{Known} =	5.4	39.5	cfs

*** If you enter values in Row 14, skip the rest of this sheet and proceed to sheet Q-Allow or Area Inlet.**

<--- FILL IN THIS SECTION OR…

FILL IN THE SECTIONS BELOW. <---

Geographic Information: (Enter data in the blue cells):

Subcatchment Area =		Acres
Percent Imperviousness =		%
NRCS Soil Type =		A, B, C, or D

Site Type:
- ○ Site is Urban
- ○ Site is Non-Urban

Flows Developed For:
- ○ Street Inlets
- ○ Area Inlets in a Median

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

Rainfall Information: Intensity I (inch/hr) = $C_1 * P_1 / (C_2 + T_c)$ ^ C_3

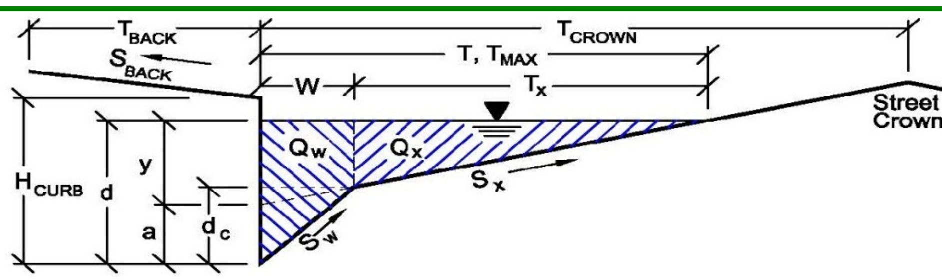
	Minor Storm	Major Storm	
Design Storm Return Period, T_r =			years
Return Period One-Hour Precipitation, P_1 =			inches
C_1 =			
C_2 =			
C_3 =			
User-Defined Storm Runoff Coefficient (leave this blank to accept a calculated value), C =			
User-Defined 5-yr. Runoff Coefficient (leave this blank to accept a calculated value), C_5 =			
Bypass (Carry-Over) Flow from upstream Subcatchments, Q_b =	0.0	0.0	cfs
Total Design Peak Flow, Q =	5.4	39.5	cfs

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

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

Project: Trails at Crowfoot

Inlet ID: DP 5V



Gutter Geometry (Enter data in the blue cells)

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	18.0	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} =	4.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	17.0	ft
Gutter Width	W =	2.00	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 =	0.027	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	17.0	17.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	4.0	12.0	inches
Allow Flow Depth at Street Crown (leave blank for no)		☐	☑	check = yes

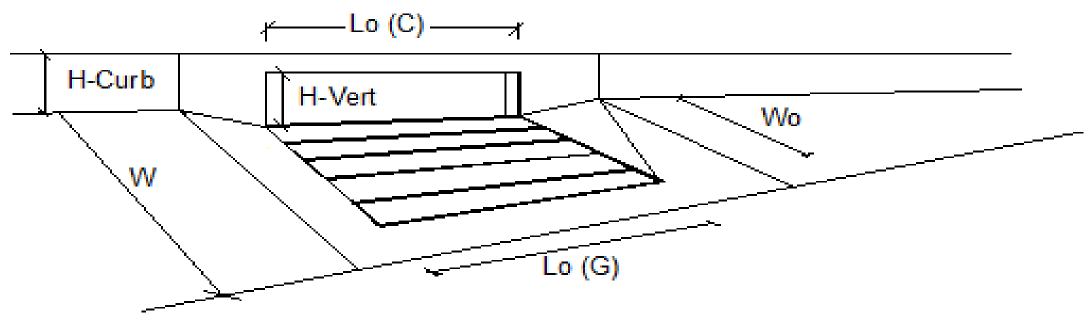
		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	Q_{allow} =	**5.6**	**142.4**	**cfs**

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

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

INLET ON A CONTINUOUS GRADE

Project: **Trails at Crowfoot**
Inlet ID: **DP 5V**

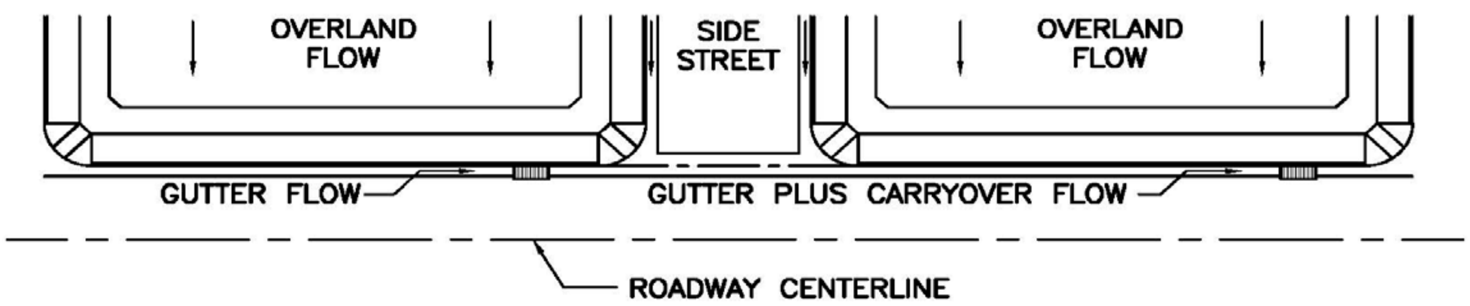


Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from 'Q-Allow')	a_{LOCAL} =	5.0	5.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)	No =	1	1	
Length of a Single Unit Inlet (Grate or Curb Opening)	L_o =	15.00	15.00	ft
Width of a Unit Grate (cannot be greater than W from Q-Allow)	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 < maximum allowable from sheet 'Q-Allow'		MINOR	MAJOR	
Total Inlet Interception Capacity	**Q =**	**5.40**	**20.25**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**0.0**	**19.3**	**cfs**
Capture Percentage = Q_a/Q_o =	**C% =**	**100**	**51**	**%**

Worksheet Protected

DESIGN PEAK FLOW FOR ONE-HALF OF STREET
OR GRASS-LINED CHANNEL BY THE RATIONAL METHOD

Project: **Trails at Crowfoot**
Inlet ID: **DP 5W**



Show Details

Design Flow: ONLY if already determined through other methods:
(local peak flow for 1/2 of street OR grass-lined channel):

	Minor Storm	Major Storm	
*Q_{Known} =	4.8	19.9	cfs

*** If you enter values in Row 14, skip the rest of this sheet and proceed to sheet Q-Allow or Area Inlet.**

<--- FILL IN THIS SECTION OR…

FILL IN THE SECTIONS BELOW. <---

Geographic Information: (Enter data in the blue cells):

Subcatchment Area =		Acres
Percent Imperviousness =		%
NRCS Soil Type =		A, B, C, or D

Site Type:
- ○ Site is Urban
- ○ Site is Non-Urban

Flows Developed For:
- ○ Street Inlets
- ○ Area Inlets in a Median

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

Rainfall Information: Intensity I (inch/hr) = $C_1 * P_1 / (C_2 + T_c)^{C_3}$

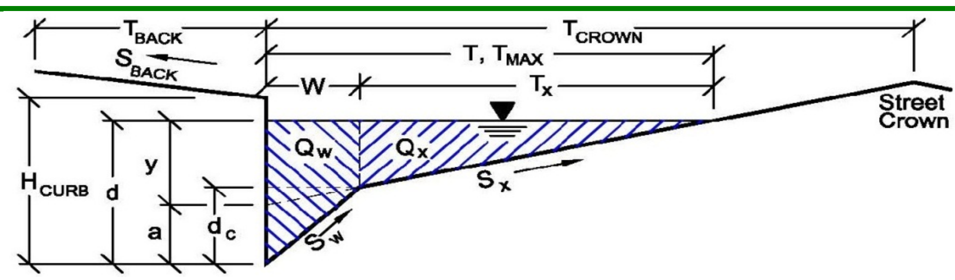
	Minor Storm	Major Storm	
Design Storm Return Period, T_r =			years
Return Period One-Hour Precipitation, P_1 =			inches
C_1 =			
C_2 =			
C_3 =			
User-Defined Storm Runoff Coefficient (leave this blank to accept a calculated value), C =			
User-Defined 5-yr. Runoff Coefficient (leave this blank to accept a calculated value), C_5 =			
Bypass (Carry-Over) Flow from upstream Subcatchments, Q_b =	**0.0**	**0.0**	**cfs**
Total Design Peak Flow, Q =	**4.8**	**19.9**	**cfs**

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

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

Project: **Trails at Crowfoot**

Inlet ID: **DP 5W**



Gutter Geometry (Enter data in the blue cells)

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	18.0	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} =	4.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	17.0	ft
Gutter Width	W =	2.00	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 =	0.027	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016	

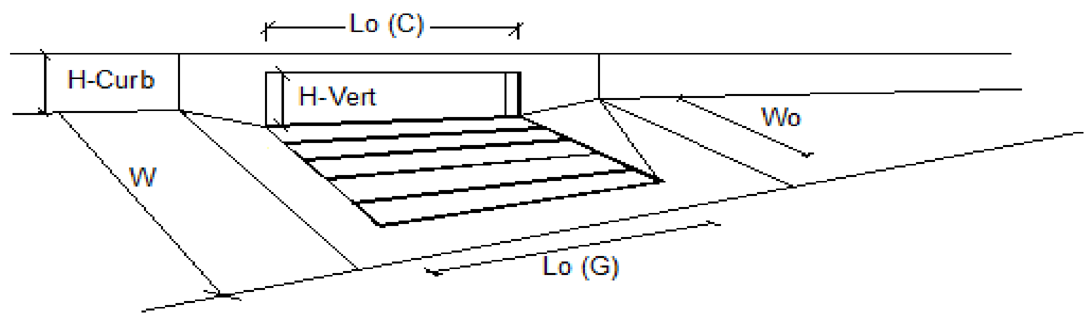
		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	17.0	17.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	4.0	12.0	inches
Allow Flow Depth at Street Crown (leave blank for no)		☐	☑	check = yes

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	Q_{allow} =	**5.6**	**142.4**	**cfs**

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

INLET ON A CONTINUOUS GRADE

Project: Trails at Crowfoot
Inlet ID: DP 5W

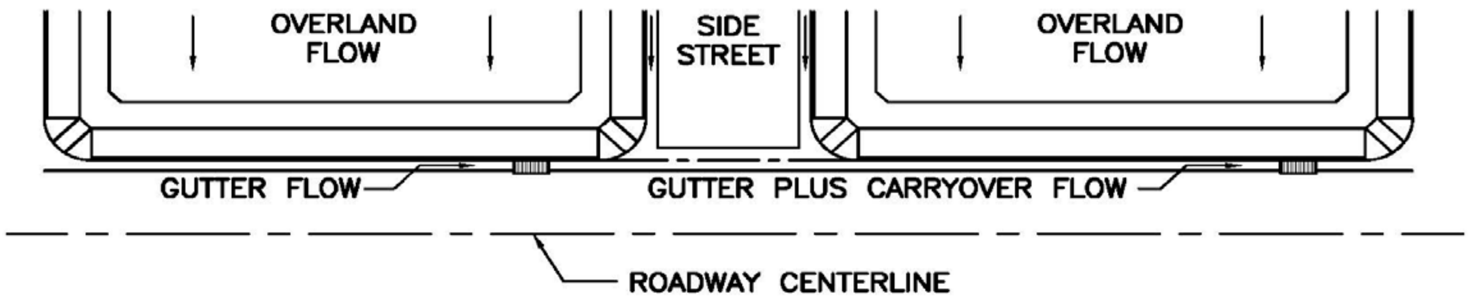


Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from 'Q-Allow')	a_{LOCAL} =	5.0	5.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)	No =	1	1	
Length of a Single Unit Inlet (Grate or Curb Opening)	L_o =	10.00	10.00	ft
Width of a Unit Grate (cannot be greater than W from Q-Allow)	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 < maximum allowable from sheet 'Q-Allow'		MINOR	MAJOR	
Total Inlet Interception Capacity	**Q =**	**4.77**	**10.77**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**0.0**	**9.1**	**cfs**
Capture Percentage = Q_a/Q_o =	**C% =**	**99**	**54**	**%**

Worksheet Protected

DESIGN PEAK FLOW FOR ONE-HALF OF STREET OR GRASS-LINED CHANNEL BY THE RATIONAL METHOD

Project: Trails at Crowfoot
Inlet ID: DP 5Y



Show Details

Design Flow: ONLY if already determined through other methods:
(local peak flow for 1/2 of street OR grass-lined channel):

	Minor Storm	Major Storm	
*Q_{Known} =	4.6	33.6	cfs

*** If you enter values in Row 14, skip the rest of this sheet and proceed to sheet Q-Allow or Area Inlet.**

<--- FILL IN THIS SECTION OR…

FILL IN THE SECTIONS BELOW. <---

Geographic Information: (Enter data in the blue cells):

Subcatchment Area =		Acres
Percent Imperviousness =		%
NRCS Soil Type =		A, B, C, or D

Site Type:
- Site is Urban
- Site is Non-Urban

Flows Developed For:
- Street Inlets
- Area Inlets in a Median

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

Rainfall Information: Intensity I (inch/hr) = $C_1 * P_1 / (C_2 + T_c)$ ^ C_3

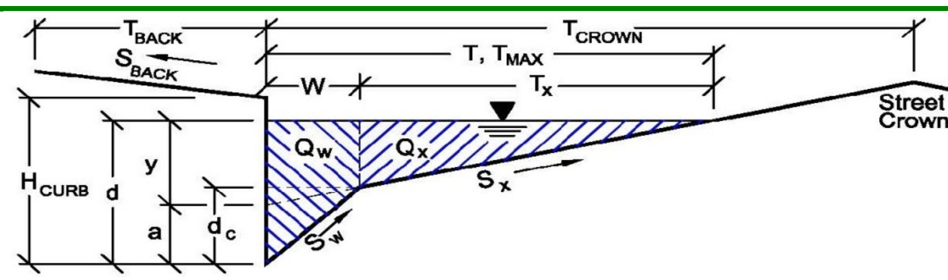
	Minor Storm	Major Storm	
Design Storm Return Period, T_r =			years
Return Period One-Hour Precipitation, P_1 =			inches
C_1 =			
C_2 =			
C_3 =			
User-Defined Storm Runoff Coefficient (leave this blank to accept a calculated value), C =			
User-Defined 5-yr. Runoff Coefficient (leave this blank to accept a calculated value), C_5 =			
Bypass (Carry-Over) Flow from upstream Subcatchments, Q_b =	**0.0**	**0.0**	**cfs**
Total Design Peak Flow, Q =	**4.6**	**33.6**	**cfs**

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

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

Project: **Trails at Crowfoot**

Inlet ID: **DP 5Y**



Gutter Geometry (Enter data in the blue cells)

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	18.0	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} =	4.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	17.0	ft
Gutter Width	W =	2.00	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} =	0.016	

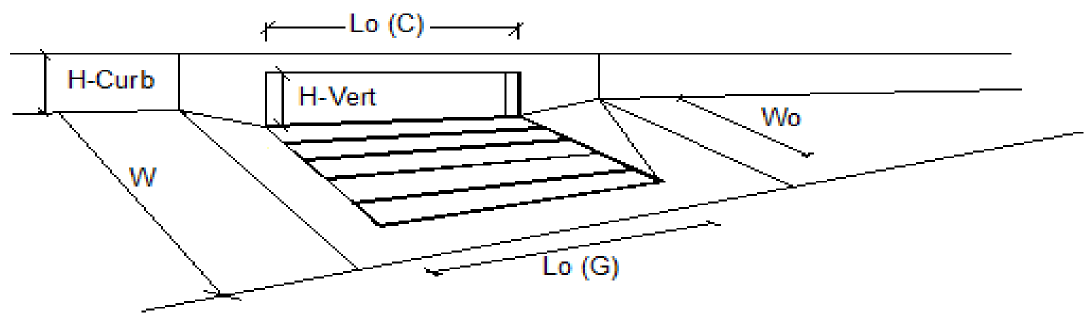
		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	17.0	17.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	4.0	12.0	inches
Allow Flow Depth at Street Crown (leave blank for no)		☐	☑	check = yes

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	Q_{allow} =	**4.8**	**156.5**	**cfs**

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

INLET ON A CONTINUOUS GRADE

Project: **Trails at Crowfoot**
Inlet ID: **DP 5Y**

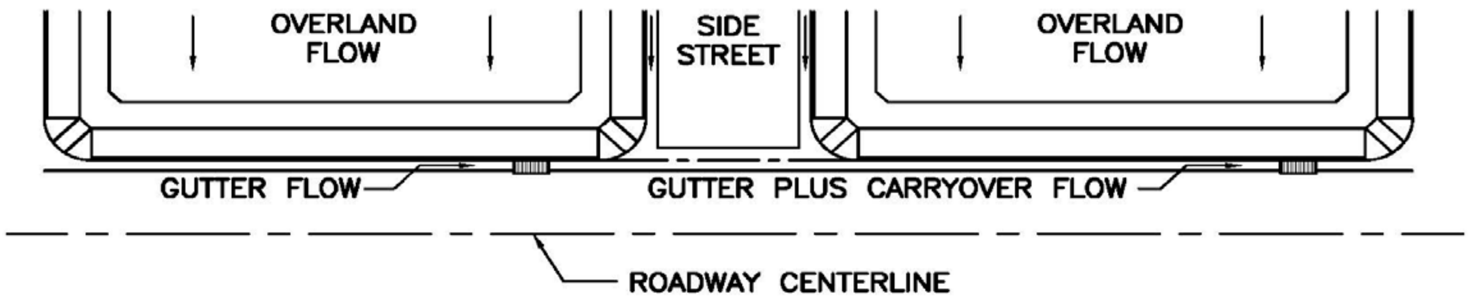


Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from 'Q-Allow')	a_{LOCAL} =	5.0	5.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)	No =	1	1	
Length of a Single Unit Inlet (Grate or Curb Opening)	L_o =	10.00	10.00	ft
Width of a Unit Grate (cannot be greater than W from Q-Allow)	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 < maximum allowable from sheet 'Q-Allow'		MINOR	MAJOR	
Total Inlet Interception Capacity	**Q =**	**4.59**	**13.16**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**0.0**	**20.5**	**cfs**
Capture Percentage = Q_a/Q_o =	**C% =**	**100**	**39**	**%**

Worksheet Protected

DESIGN PEAK FLOW FOR ONE-HALF OF STREET OR GRASS-LINED CHANNEL BY THE RATIONAL METHOD

Project: Trails at Crowfoot
Inlet ID: DP 5Z



Show Details

Design Flow: ONLY if already determined through other methods:

	Minor Storm	Major Storm	
(local peak flow for 1/2 of street OR grass-lined channel): *Q_{Known} =	4.2	15.9	cfs

*** If you enter values in Row 14, skip the rest of this sheet and proceed to sheet Q-Allow or Area Inlet.**

<--- FILL IN THIS SECTION OR…

FILL IN THE SECTIONS BELOW. <---

Geographic Information: (Enter data in the blue cells):

Subcatchment Area =		Acres
Percent Imperviousness =		%
NRCS Soil Type =		A, B, C, or D

Site Type:
- ○ Site is Urban
- ○ Site is Non-Urban

Flows Developed For:
- ○ Street Inlets
- ○ Area Inlets in a Median

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

Rainfall Information: Intensity I (inch/hr) = $C_1 * P_1 / (C_2 + T_c)^{\wedge} C_3$

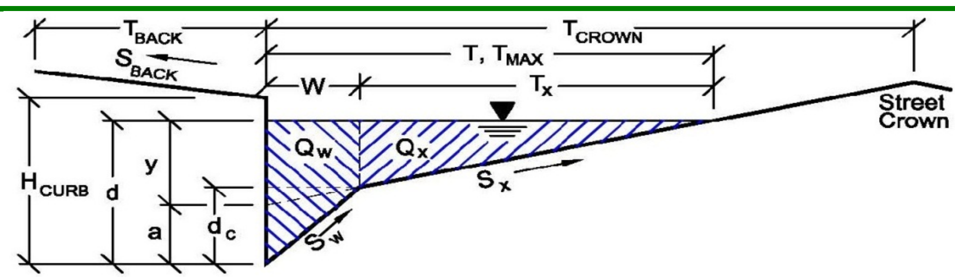
	Minor Storm	Major Storm	
Design Storm Return Period, T_r =			years
Return Period One-Hour Precipitation, P_1 =			inches
C_1 =			
C_2 =			
C_3 =			
User-Defined Storm Runoff Coefficient (leave this blank to accept a calculated value), C =			
User-Defined 5-yr. Runoff Coefficient (leave this blank to accept a calculated value), C_5 =			
Bypass (Carry-Over) Flow from upstream Subcatchments, Q_b =	**0.0**	**0.0**	**cfs**
Total Design Peak Flow, Q =	**4.2**	**15.9**	**cfs**

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

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

Project: Trails at Crowfoot

Inlet ID: DP 5Z



Gutter Geometry (Enter data in the blue cells)

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	18.0	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} =	4.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	17.0	ft
Gutter Width	W =	2.00	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} =	0.016	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	17.0	17.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	4.0	12.0	inches
Allow Flow Depth at Street Crown (leave blank for no)		☐	☑	check = yes

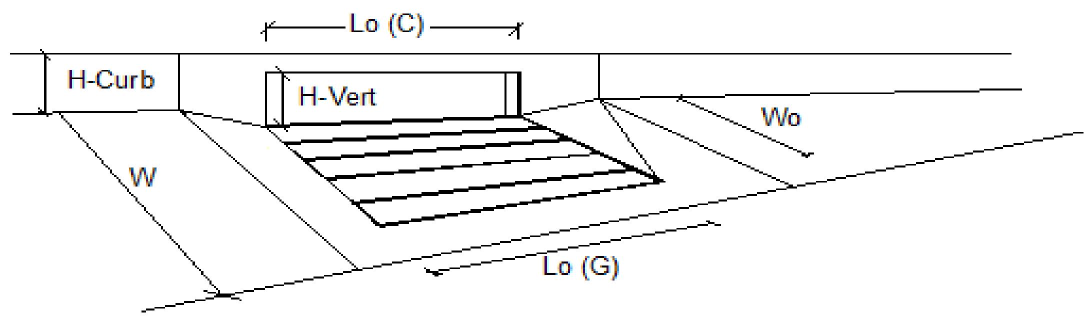
		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	Q_{allow} =	**4.8**	**156.5**	**cfs**

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

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

INLET ON A CONTINUOUS GRADE

Project: **Trails at Crowfoot**
Inlet ID: **DP 5Z**

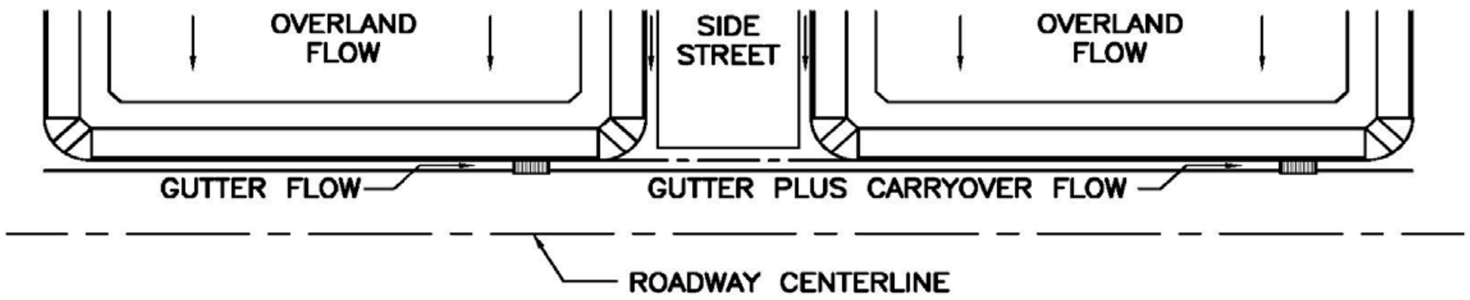


Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from 'Q-Allow')	a_{LOCAL} =	5.0	5.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)	No =	1	1	
Length of a Single Unit Inlet (Grate or Curb Opening)	L_o =	10.00	10.00	ft
Width of a Unit Grate (cannot be greater than W from Q-Allow)	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 < maximum allowable from sheet 'Q-Allow'		MINOR	MAJOR	
Total Inlet Interception Capacity	**Q =**	**4.24**	**9.67**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**0.0**	**6.2**	**cfs**
Capture Percentage = Q_a/Q_o =	**C% =**	**100**	**61**	**%**

Worksheet Protected

DESIGN PEAK FLOW FOR ONE-HALF OF STREET OR GRASS-LINED CHANNEL BY THE RATIONAL METHOD

Project: Trails at Crowfoot
Inlet ID: DP 6M



Show Details

Design Flow: ONLY if already determined through other methods:
(local peak flow for 1/2 of street OR grass-lined channel):

	Minor Storm	Major Storm	
* Q_{Known} =	2.8	16.7	cfs

*** If you enter values in Row 14, skip the rest of this sheet and proceed to sheet Q-Allow or Area Inlet.**

<--- FILL IN THIS SECTION OR…
FILL IN THE SECTIONS BELOW. <---

Geographic Information: (Enter data in the blue cells):

Subcatchment Area =		Acres
Percent Imperviousness =		%
NRCS Soil Type =		A, B, C, or D

Site Type:
- Site is Urban
- Site is Non-Urban

Flows Developed For:
- Street Inlets
- Area Inlets in a Median

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

Rainfall Information: Intensity I (inch/hr) = $C_1 * P_1 / (C_2 + T_c) ^{\wedge} C_3$

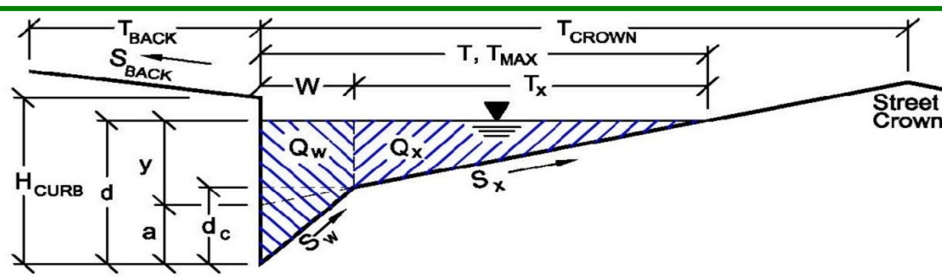
	Minor Storm	Major Storm	
Design Storm Return Period, T_r =			years
Return Period One-Hour Precipitation, P_1 =			inches
C_1 =			
C_2 =			
C_3 =			
User-Defined Storm Runoff Coefficient (leave this blank to accept a calculated value), C =			
User-Defined 5-yr. Runoff Coefficient (leave this blank to accept a calculated value), C_5 =			
Bypass (Carry-Over) Flow from upstream Subcatchments, Q_b =	0.0	0.0	cfs
Total Design Peak Flow, Q =	2.8	16.7	cfs

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

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

Project: Trails at Crowfoot

Inlet ID: DP 6M



Gutter Geometry (Enter data in the blue cells)

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	18.0	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} =	4.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	17.0	ft
Gutter Width	W =	2.00	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 =	0.010	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016	

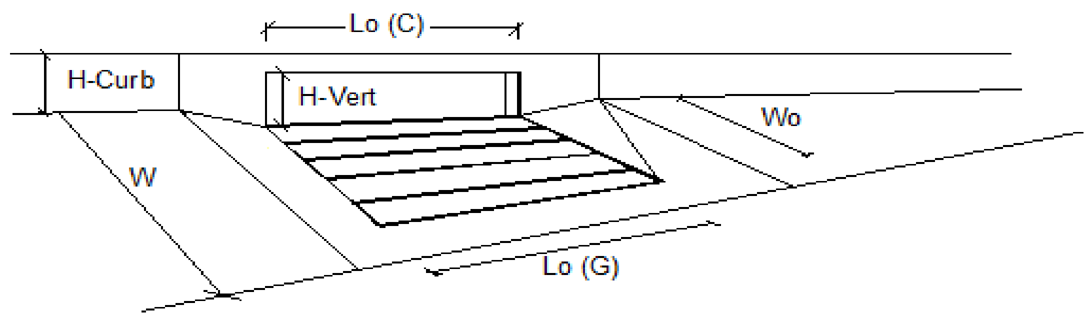
		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	17.0	17.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	4.0	12.0	inches
Allow Flow Depth at Street Crown (leave blank for no)		☐	☑	check = yes

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	**Q_{allow} =**	**3.4**	**132.7**	**cfs**

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

INLET ON A CONTINUOUS GRADE

Project: Trails at Crowfoot
Inlet ID: DP 6M

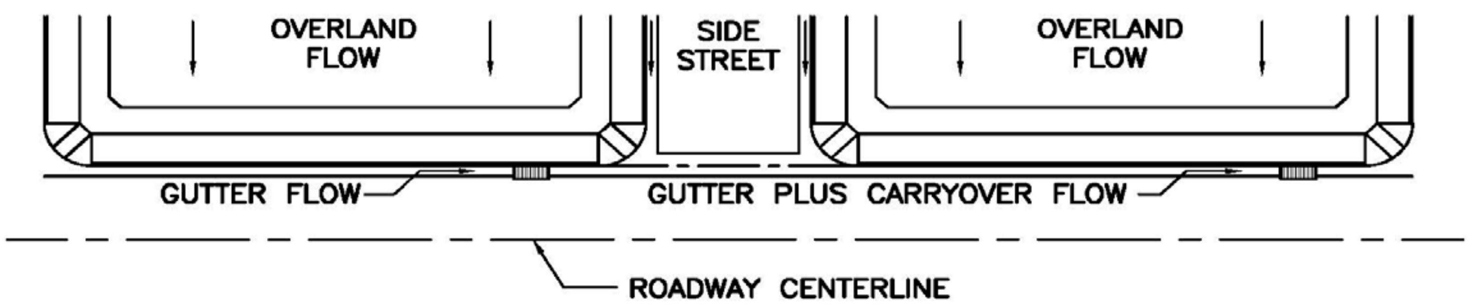


Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from 'Q-Allow')	a_{LOCAL} =	5.0	5.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)	No =	1	1	
Length of a Single Unit Inlet (Grate or Curb Opening)	L_o =	10.00	10.00	ft
Width of a Unit Grate (cannot be greater than W from Q-Allow)	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 < maximum allowable from sheet 'Q-Allow'		MINOR	MAJOR	
Total Inlet Interception Capacity	**Q =**	**2.80**	**9.62**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**0.0**	**7.0**	**cfs**
Capture Percentage = Q_a/Q_o =	**C% =**	**100**	**58**	**%**

Worksheet Protected

DESIGN PEAK FLOW FOR ONE-HALF OF STREET
OR GRASS-LINED CHANNEL BY THE RATIONAL METHOD

Project: **Trails at Crowfoot**
Inlet ID: **DP 5Q**



Show Details

Design Flow: ONLY if already determined through other methods:
(local peak flow for 1/2 of street OR grass-lined channel):

	Minor Storm	Major Storm	
*Q_{Known} =	2.6	24.0	cfs

*** If you enter values in Row 14, skip the rest of this sheet and proceed to sheet Q-Allow or Area Inlet.**

<--- FILL IN THIS SECTION OR…

FILL IN THE SECTIONS BELOW. <---

Geographic Information: (Enter data in the blue cells):

Subcatchment Area =		Acres
Percent Imperviousness =		%
NRCS Soil Type =		A, B, C, or D

Site Type:
- ○ Site is Urban
- ○ Site is Non-Urban

Flows Developed For:
- ○ Street Inlets
- ○ Area Inlets in a Median

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

Rainfall Information: Intensity I (inch/hr) = $C_1 * P_1 / (C_2 + T_c)$ ^ C_3

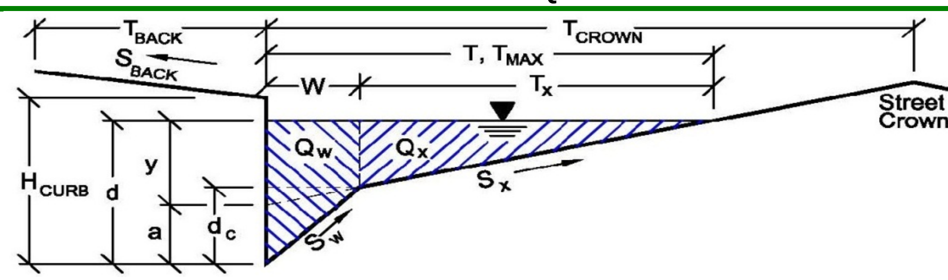
	Minor Storm	Major Storm	
Design Storm Return Period, T_r =			years
Return Period One-Hour Precipitation, P_1 =			inches
C_1 =			
C_2 =			
C_3 =			
User-Defined Storm Runoff Coefficient (leave this blank to accept a calculated value), C =			
User-Defined 5-yr. Runoff Coefficient (leave this blank to accept a calculated value), C_5 =			
Bypass (Carry-Over) Flow from upstream Subcatchments, Q_b =	0.0	0.0	cfs
Total Design Peak Flow, Q =	2.6	24.0	cfs

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

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

Project: Trails at Crowfoot

Inlet ID: DP 5Q



Gutter Geometry (Enter data in the blue cells)

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	18.0	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} =	4.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	17.0	ft
Gutter Width	W =	2.00	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 =	0.010	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016	

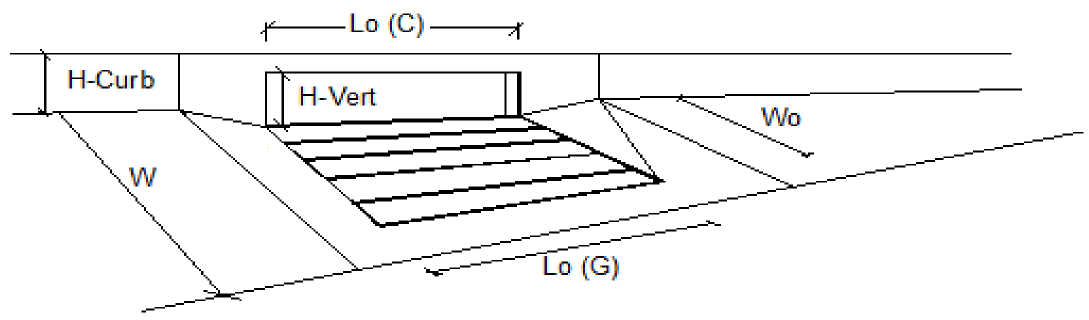
		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	17.0	17.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	4.0	12.0	inches
Allow Flow Depth at Street Crown (leave blank for no)		☐	☑	check = yes

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	Q_{allow} =	**3.4**	**132.7**	**cfs**

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

INLET ON A CONTINUOUS GRADE

Project: **Trails at Crowfoot**
Inlet ID: **DP 5Q**

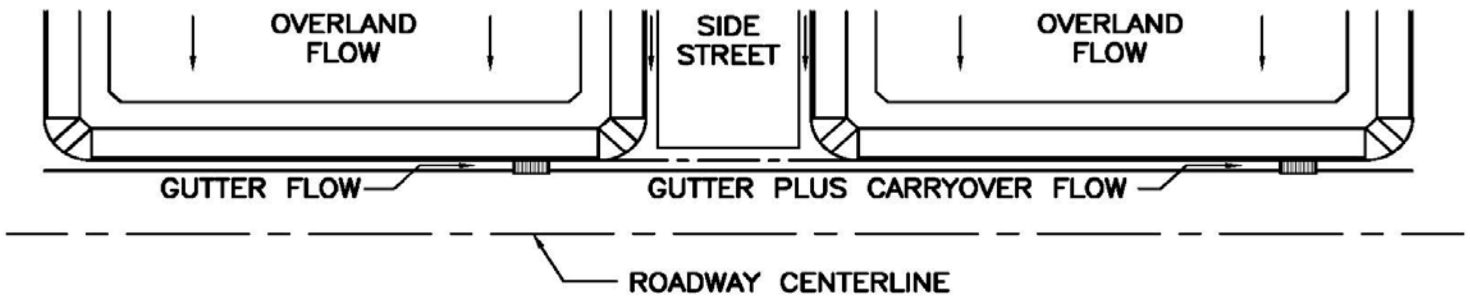


Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from 'Q-Allow')	a_{LOCAL} =	5.0	5.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)	No =	1	1	
Length of a Single Unit Inlet (Grate or Curb Opening)	L_o =	10.00	10.00	ft
Width of a Unit Grate (cannot be greater than W from Q-Allow)	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 < maximum allowable from sheet 'Q-Allow'		MINOR	MAJOR	
Total Inlet Interception Capacity	**Q =**	**2.60**	**11.22**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**0.0**	**12.7**	**cfs**
Capture Percentage = Q_a/Q_o =	**C% =**	**100**	**47**	**%**

Worksheet Protected

DESIGN PEAK FLOW FOR ONE-HALF OF STREET OR GRASS-LINED CHANNEL BY THE RATIONAL METHOD

Project: **Trails at Crowfoot**
Inlet ID: **DP 6A**



Show Details

Design Flow: ONLY if already determined through other methods:
(local peak flow for 1/2 of street OR grass-lined channel):

	Minor Storm	Major Storm	
*Q_{Known} =	4.6	58.9	cfs

*** If you enter values in Row 14, skip the rest of this sheet and proceed to sheet Q-Allow or Area Inlet.**

<--- FILL IN THIS SECTION OR…
FILL IN THE SECTIONS BELOW. <---

Geographic Information: (Enter data in the blue cells):

Subcatchment Area =		Acres
Percent Imperviousness =		%
NRCS Soil Type =		A, B, C, or D

Site Type:
- ○ Site is Urban
- ○ Site is Non-Urban

Flows Developed For:
- ○ Street Inlets
- ○ Area Inlets in a Median

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

Rainfall Information: Intensity I (inch/hr) = $C_1 * P_1 / (C_2 + T_c) ^ C_3$

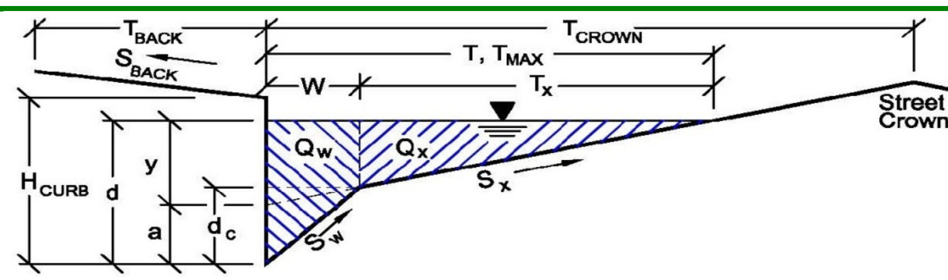
	Minor Storm	Major Storm	
Design Storm Return Period, T_r =			years
Return Period One-Hour Precipitation, P_1 =			inches
C_1 =			
C_2 =			
C_3 =			
User-Defined Storm Runoff Coefficient (leave this blank to accept a calculated value), C =			
User-Defined 5-yr. Runoff Coefficient (leave this blank to accept a calculated value), C_5 =			
Bypass (Carry-Over) Flow from upstream Subcatchments, Q_b =	0.0	0.0	cfs
Total Design Peak Flow, Q =	4.6	58.9	cfs

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

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

Project: **Trails at Crowfoot**

Inlet ID: **DP 6A**



Gutter Geometry (Enter data in the blue cells)

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	18.0	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} =	4.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	17.0	ft
Gutter Width	W =	2.00	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 =	0.025	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016	

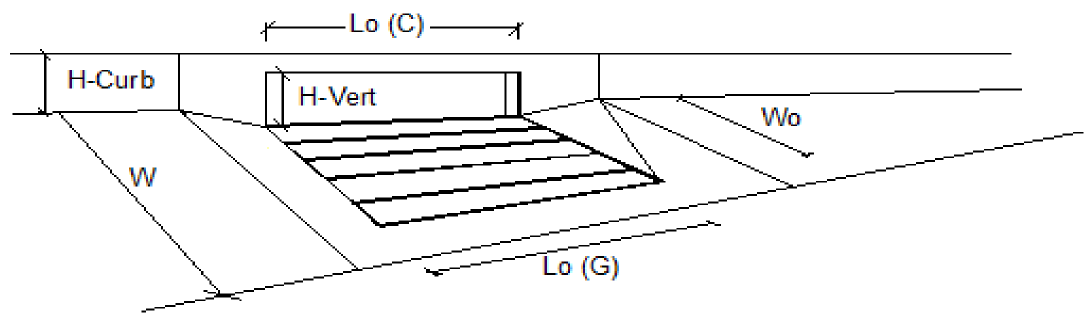
		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	17.0	17.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	4.0	12.0	inches
Allow Flow Depth at Street Crown (leave blank for no)		☐	☑	check = yes

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	Q_{allow} =	**5.4**	**146.4**	**cfs**

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

INLET ON A CONTINUOUS GRADE

Project: **Trails at Crowfoot**
Inlet ID: **DP 6A**

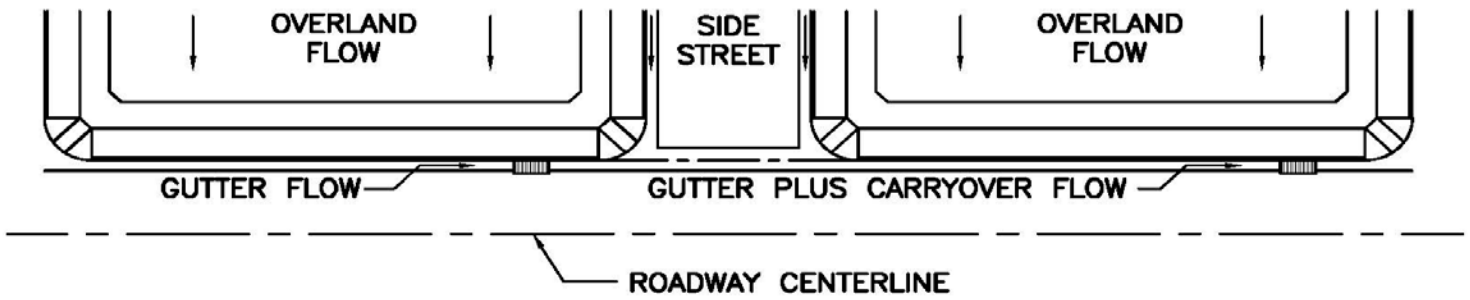


Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from 'Q-Allow')	a_{LOCAL} =	5.0	5.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)	No =	2	2	
Length of a Single Unit Inlet (Grate or Curb Opening)	L_o =	15.00	15.00	ft
Width of a Unit Grate (cannot be greater than W from Q-Allow)	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 < maximum allowable from sheet 'Q-Allow'		MINOR	MAJOR	
Total Inlet Interception Capacity	**Q =**	**4.60**	**40.78**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**0.0**	**18.1**	**cfs**
Capture Percentage = Q_a/Q_o =	**C% =**	**100**	**69**	**%**

Worksheet Protected

DESIGN PEAK FLOW FOR ONE-HALF OF STREET
OR GRASS-LINED CHANNEL BY THE RATIONAL METHOD

Project: Trails at Crowfoot
Inlet ID: DP 6B



Show Details

Design Flow: ONLY if already determined through other methods:

		Minor Storm	Major Storm	
(local peak flow for 1/2 of street OR grass-lined channel):	*Q_{Known} =	5.0	23.9	cfs

*** If you enter values in Row 14, skip the rest of this sheet and proceed to sheet Q-Allow or Area Inlet.**

<--- FILL IN THIS SECTION OR…

FILL IN THE SECTIONS BELOW. <---

Geographic Information: (Enter data in the blue cells):

Subcatchment Area =		Acres
Percent Imperviousness =		%
NRCS Soil Type =		A, B, C, or D

Site Type:
- ○ Site is Urban
- ○ Site is Non-Urban

Flows Developed For:
- ○ Street Inlets
- ○ Area Inlets in a Median

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

Rainfall Information: Intensity I (inch/hr) = $C_1 * P_1 / (C_2 + T_c)$ ^ C_3

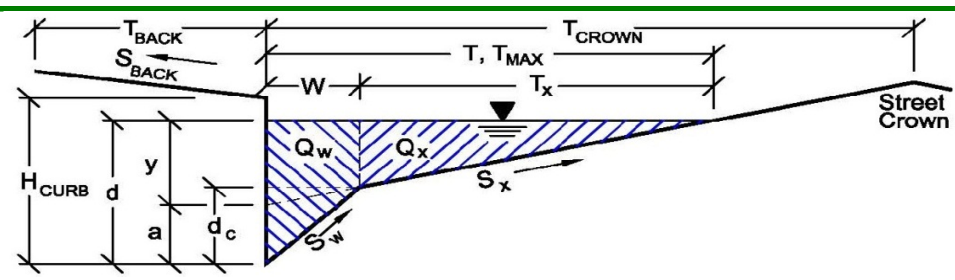
	Minor Storm	Major Storm	
Design Storm Return Period, T_r =			years
Return Period One-Hour Precipitation, P_1 =			inches
C_1 =			
C_2 =			
C_3 =			
User-Defined Storm Runoff Coefficient (leave this blank to accept a calculated value), C =			
User-Defined 5-yr. Runoff Coefficient (leave this blank to accept a calculated value), C_5 =			
Bypass (Carry-Over) Flow from upstream Subcatchments, Q_b =	0.0	0.0	cfs
Total Design Peak Flow, Q =	5.0	23.9	cfs

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

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

Project: Trails at Crowfoot

Inlet ID: DP 6B



Gutter Geometry (Enter data in the blue cells)

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	18.0	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} =	4.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	17.0	ft
Gutter Width	W =	2.00	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 =	0.025	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016	

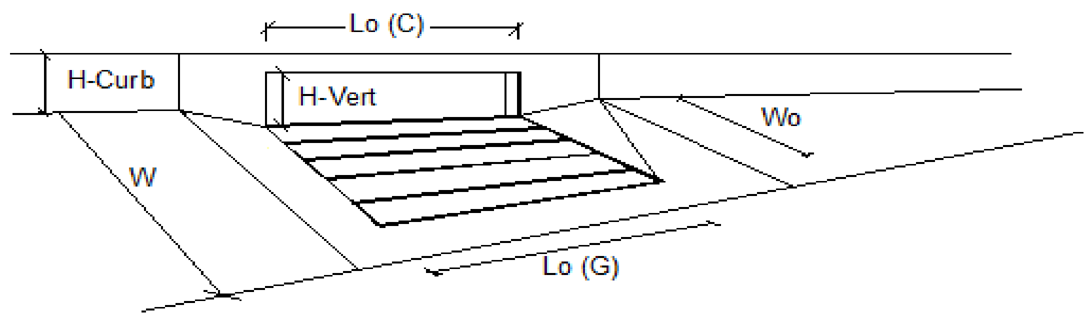
		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	17.0	17.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	4.0	12.0	inches
Allow Flow Depth at Street Crown (leave blank for no)		☐	☑	check = yes

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	Q_{allow} =	**5.4**	**146.4**	**cfs**

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

INLET ON A CONTINUOUS GRADE

Project: **Trails at Crowfoot**
Inlet ID: **DP 6B**

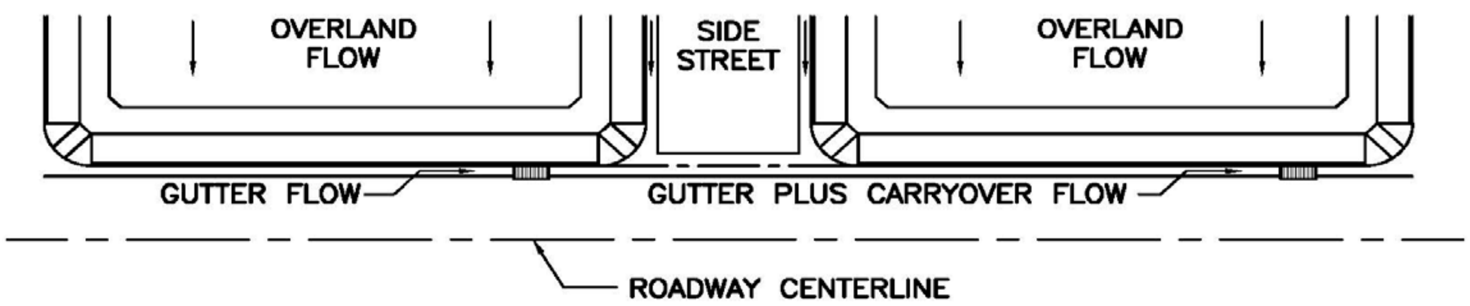


Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from 'Q-Allow')	a_{LOCAL} =	5.0	5.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)	No =	1	1	
Length of a Single Unit Inlet (Grate or Curb Opening)	L_o =	10.00	10.00	ft
Width of a Unit Grate (cannot be greater than W from Q-Allow)	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 < maximum allowable from sheet 'Q-Allow'		MINOR	MAJOR	
Total Inlet Interception Capacity	**Q =**	**4.94**	**11.59**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**0.1**	**12.3**	**cfs**
Capture Percentage = Q_a/Q_o =	**C% =**	**99**	**48**	**%**

Worksheet Protected

DESIGN PEAK FLOW FOR ONE-HALF OF STREET
OR GRASS-LINED CHANNEL BY THE RATIONAL METHOD

Project: **Trails at Crowfoot**
Inlet ID: **DP 6C**



Show Details

Design Flow: ONLY if already determined through other methods:
(local peak flow for 1/2 of street OR grass-lined channel):

	Minor Storm	Major Storm	
***Q_{Known} =**	1.5	44.9	cfs

*** If you enter values in Row 14, skip the rest of this sheet and proceed to sheet Q-Allow or Area Inlet.**

<--- FILL IN THIS SECTION OR…

FILL IN THE SECTIONS BELOW. <---

Geographic Information: (Enter data in the blue cells):

Subcatchment Area =		Acres
Percent Imperviousness =		%
NRCS Soil Type =		A, B, C, or D

Site Type:
- ◯ Site is Urban
- ◯ Site is Non-Urban

Flows Developed For:
- ◯ Street Inlets
- ◯ Area Inlets in a Median

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

Rainfall Information: Intensity I (inch/hr) = $C_1 * P_1 / (C_2 + T_c)^{\wedge} C_3$

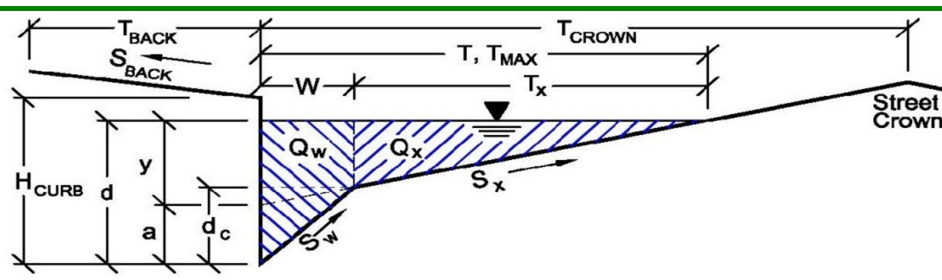
	Minor Storm	Major Storm	
Design Storm Return Period, T_r =			years
Return Period One-Hour Precipitation, P_1 =			inches
C_1 =			
C_2 =			
C_3 =			
User-Defined Storm Runoff Coefficient (leave this blank to accept a calculated value), C =			
User-Defined 5-yr. Runoff Coefficient (leave this blank to accept a calculated value), C_5 =			
Bypass (Carry-Over) Flow from upstream Subcatchments, Q_b =	0.0	0.0	cfs
Total Design Peak Flow, Q =	1.5	44.9	cfs

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

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

Project: Trails at Crowfoot

Inlet ID: DP 6C



Gutter Geometry (Enter data in the blue cells)

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	18.0	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} =	4.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	17.0	ft
Gutter Width	W =	2.00	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 =	0.010	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016	

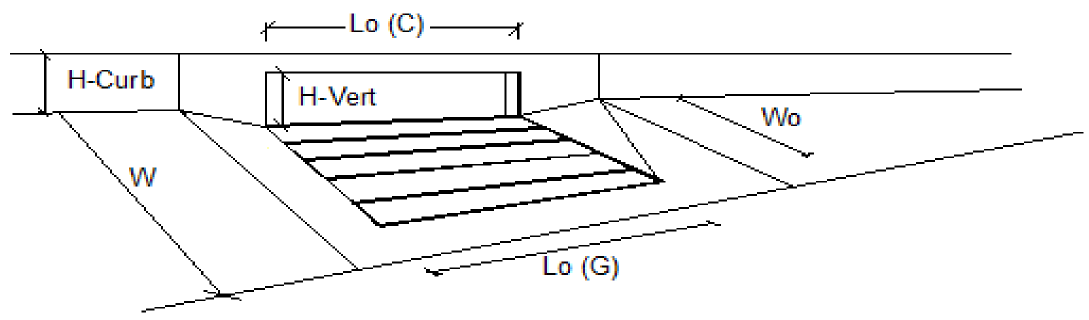
		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	17.0	17.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	4.0	12.0	inches
Allow Flow Depth at Street Crown (leave blank for no)		☐	☑	check = yes

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	**Q_{allow} =**	**3.4**	**132.7**	**cfs**

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

INLET ON A CONTINUOUS GRADE

Project: Trails at Crowfoot
Inlet ID: DP 6C

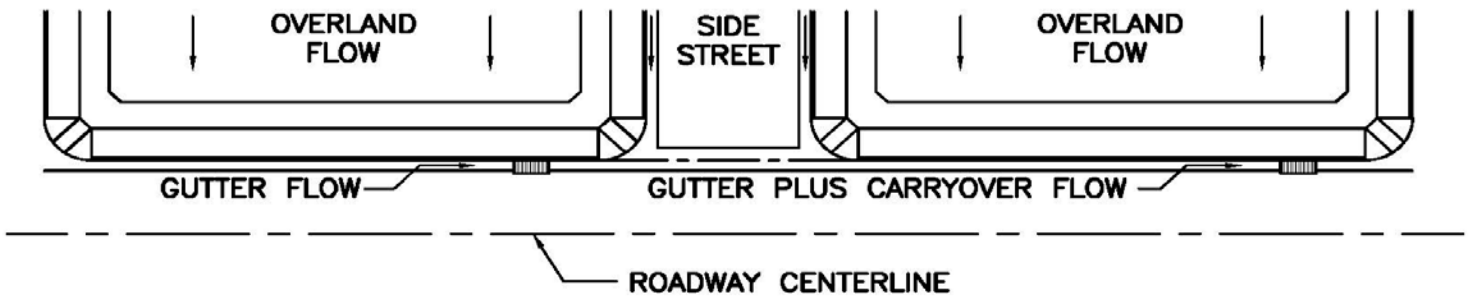


Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from 'Q-Allow')	a_{LOCAL} =	5.0	5.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)	No =	1	1	
Length of a Single Unit Inlet (Grate or Curb Opening)	L_o =	10.00	10.00	ft
Width of a Unit Grate (cannot be greater than W from Q-Allow)	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 < maximum allowable from sheet 'Q-Allow'		MINOR	MAJOR	
Total Inlet Interception Capacity	**Q =**	**1.50**	**14.39**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**0.0**	**30.5**	**cfs**
Capture Percentage = Q_a/Q_o =	**C% =**	**100**	**32**	**%**

Worksheet Protected

DESIGN PEAK FLOW FOR ONE-HALF OF STREET OR GRASS-LINED CHANNEL BY THE RATIONAL METHOD

Project: Trails at Crowfoot
Inlet ID: DP 6D



Show Details

Design Flow: ONLY if already determined through other methods:

		Minor Storm	Major Storm	
(local peak flow for 1/2 of street OR grass-lined channel):	*Q_{Known} =	4.6	18.5	cfs

*** If you enter values in Row 14, skip the rest of this sheet and proceed to sheet Q-Allow or Area Inlet.**

<--- FILL IN THIS SECTION OR…

FILL IN THE SECTIONS BELOW. <---

Geographic Information: (Enter data in the blue cells):

Subcatchment Area =		Acres
Percent Imperviousness =		%
NRCS Soil Type =		A, B, C, or D

Site Type:
- ○ Site is Urban
- ○ Site is Non-Urban

Flows Developed For:
- ○ Street Inlets
- ○ Area Inlets in a Median

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

Rainfall Information: Intensity I (inch/hr) = $C_1 * P_1 / (C_2 + T_c)^{C_3}$

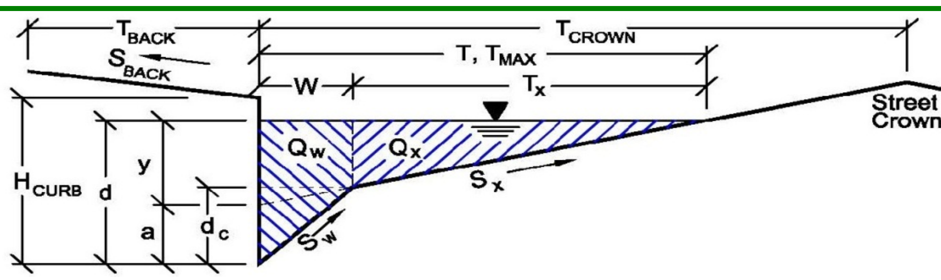
	Minor Storm	Major Storm	
Design Storm Return Period, T_r =			years
Return Period One-Hour Precipitation, P_1 =			inches
C_1 =			
C_2 =			
C_3 =			
User-Defined Storm Runoff Coefficient (leave this blank to accept a calculated value), C =			
User-Defined 5-yr. Runoff Coefficient (leave this blank to accept a calculated value), C_5 =			
Bypass (Carry-Over) Flow from upstream Subcatchments, Q_b =	**0.0**	**0.0**	**cfs**
Total Design Peak Flow, Q =	**4.6**	**18.5**	**cfs**

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

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

Project: Trails at Crowfoot

Inlet ID: DP 6D



Gutter Geometry (Enter data in the blue cells)

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	18.0	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} =	4.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	17.0	ft
Gutter Width	W =	2.00	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 =	0.040	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016	

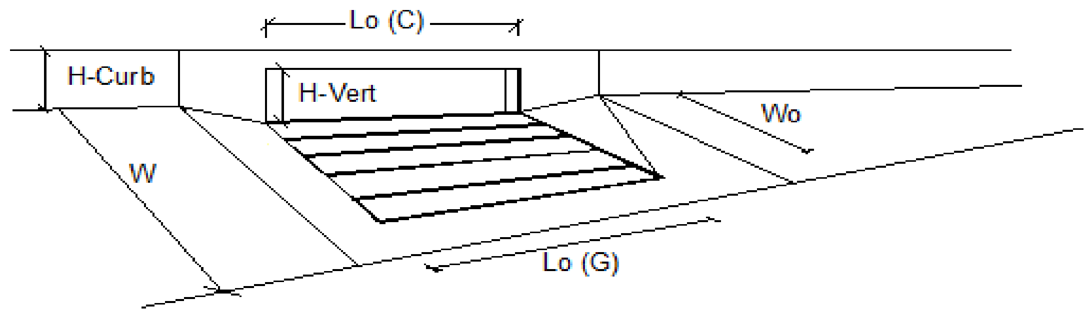
		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	17.0	17.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	4.0	12.0	inches
Allow Flow Depth at Street Crown (leave blank for no)		☐	☑	check = yes

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	**Q_{allow} =**	**6.8**	**127.1**	**cfs**

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

INLET ON A CONTINUOUS GRADE

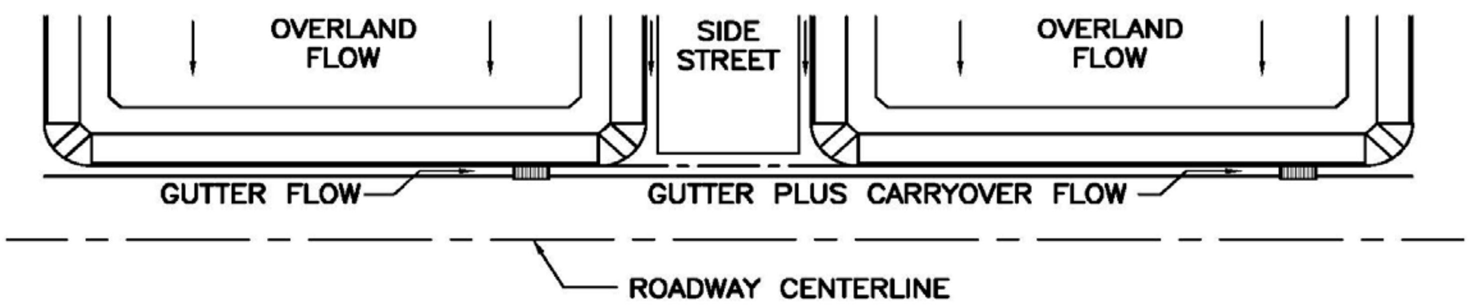
Project: **Trails at Crowfoot**
Inlet ID: **DP 6D**



Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from 'Q-Allow')	a_{LOCAL} =	5.0	5.0	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 from Q-Allow)	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 < maximum allowable from sheet 'Q-Allow'		MINOR	MAJOR	
Total Inlet Interception Capacity	**Q =**	**4.59**	**10.59**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**0.0**	**7.9**	**cfs**
Capture Percentage = Q_a/Q_o =	**C% =**	**100**	**57**	**%**

DESIGN PEAK FLOW FOR ONE-HALF OF STREET OR GRASS-LINED CHANNEL BY THE RATIONAL METHOD

Project: Trails at Crowfoot
Inlet ID: DP 6E



Show Details

Design Flow: ONLY if already determined through other methods:
(local peak flow for 1/2 of street OR grass-lined channel):

	Minor Storm	Major Storm	
$*Q_{Known}$ =	4.5	58.8	cfs

*** If you enter values in Row 14, skip the rest of this sheet and proceed to sheet Q-Allow or Area Inlet.**

<--- FILL IN THIS SECTION OR… FILL IN THE SECTIONS BELOW. <---

Geographic Information: (Enter data in the blue cells):

Subcatchment Area =		Acres
Percent Imperviousness =		%
NRCS Soil Type =		A, B, C, or D

Site Type:
- ○ Site is Urban
- ○ Site is Non-Urban

Flows Developed For:
- ○ Street Inlets
- ○ Area Inlets in a Median

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

Rainfall Information: Intensity I (inch/hr) = $C_1 * P_1 / (C_2 + T_c)^{C_3}$

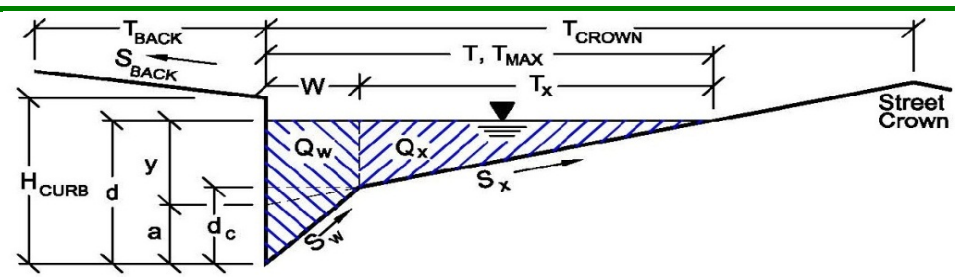
	Minor Storm	Major Storm	
Design Storm Return Period, T_r =			years
Return Period One-Hour Precipitation, P_1 =			inches
C_1 =			
C_2 =			
C_3 =			
User-Defined Storm Runoff Coefficient (leave this blank to accept a calculated value), C =			
User-Defined 5-yr. Runoff Coefficient (leave this blank to accept a calculated value), C_5 =			
Bypass (Carry-Over) Flow from upstream Subcatchments, Q_b =	0.0	0.0	cfs
Total Design Peak Flow, Q =	4.5	58.8	cfs

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

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

Project: Trails at Crowfoot

Inlet ID: DP 6E



Gutter Geometry (Enter data in the blue cells)

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	18.0	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} =	4.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	17.0	ft
Gutter Width	W =	2.00	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 =	0.040	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016	

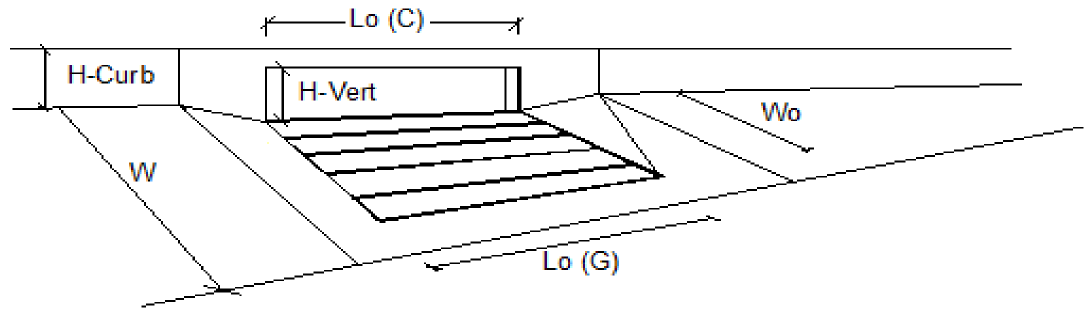
		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	17.0	17.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	4.0	12.0	inches
Allow Flow Depth at Street Crown (leave blank for no)		☐	☑	check = yes

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	**Q_{allow} =**	**6.8**	**127.1**	**cfs**

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

INLET ON A CONTINUOUS GRADE

Project: Trails at Crowfoot
Inlet ID: DP 6E

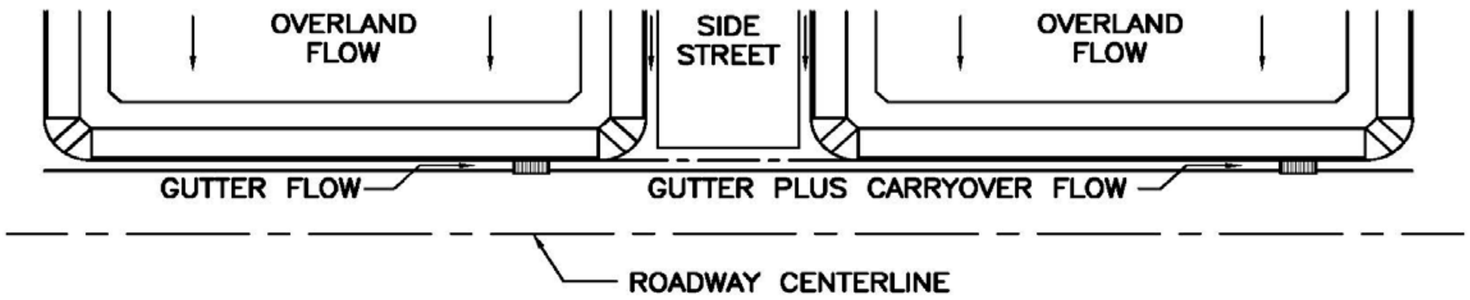


Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from 'Q-Allow')	a_{LOCAL} =	5.0	5.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)	No =	1	1	
Length of a Single Unit Inlet (Grate or Curb Opening)	L_o =	10.00	10.00	ft
Width of a Unit Grate (cannot be greater than W from Q-Allow)	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 < maximum allowable from sheet 'Q-Allow'		MINOR	MAJOR	
Total Inlet Interception Capacity	**Q =**	**4.50**	**16.62**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**0.0**	**42.2**	**cfs**
Capture Percentage = Q_a/Q_o =	**C% =**	**100**	**28**	**%**

Worksheet Protected

DESIGN PEAK FLOW FOR ONE-HALF OF STREET OR GRASS-LINED CHANNEL BY THE RATIONAL METHOD

Project: Trails at Crowfoot
Inlet ID: 6F



Show Details

Design Flow: ONLY if already determined through other methods:
(local peak flow for 1/2 of street OR grass-lined channel):

	Minor Storm	Major Storm	
$^*Q_{Known}$ =	3.7	18.7	cfs

*** If you enter values in Row 14, skip the rest of this sheet and proceed to sheet Q-Allow or Area Inlet.**

<--- FILL IN THIS SECTION OR…
FILL IN THE SECTIONS BELOW. <---

Geographic Information: (Enter data in the blue cells):

Subcatchment Area =		Acres
Percent Imperviousness =		%
NRCS Soil Type =		A, B, C, or D

Site Type:
- ○ Site is Urban
- ○ Site is Non-Urban

Flows Developed For:
- ○ Street Inlets
- ○ Area Inlets in a Median

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

Rainfall Information: Intensity I (inch/hr) = $C_1 * P_1 / (C_2 + T_c)$ ^ C_3

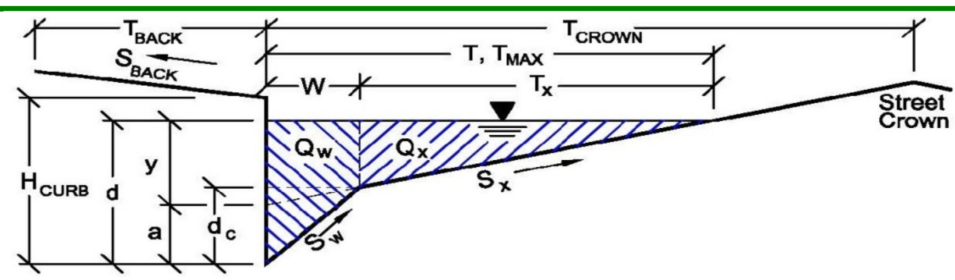
	Minor Storm	Major Storm	
Design Storm Return Period, T_r =			years
Return Period One-Hour Precipitation, P_1 =			inches
C_1 =			
C_2 =			
C_3 =			
User-Defined Storm Runoff Coefficient (leave this blank to accept a calculated value), C =			
User-Defined 5-yr. Runoff Coefficient (leave this blank to accept a calculated value), C_5 =			
Bypass (Carry-Over) Flow from upstream Subcatchments, Q_b =	0.0	6.3	cfs
Total Design Peak Flow, Q =	3.7	25.0	cfs

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

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

Project: Trails at Crowfoot

Inlet ID: 6F



Gutter Geometry (Enter data in the blue cells)

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	18.0	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} =	4.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	17.0	ft
Gutter Width	W =	2.00	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} =	0.016	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	17.0	17.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	4.0	12.0	inches
Allow Flow Depth at Street Crown (leave blank for no)		☐	☑	check = yes

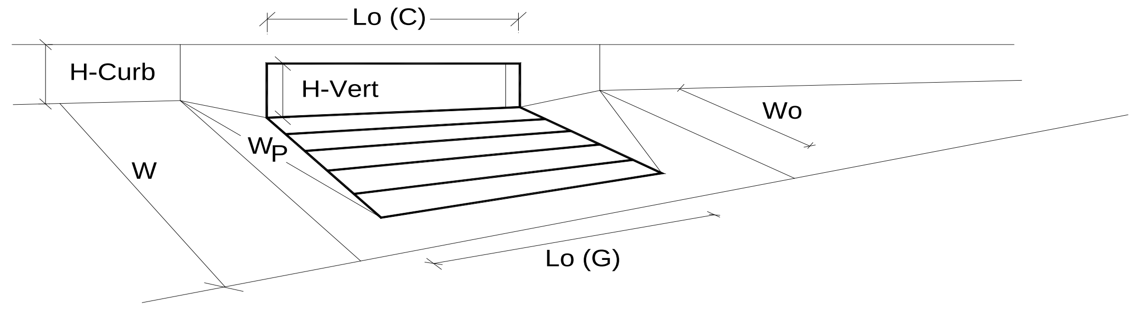
		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	**Q_{allow} =**	**SUMP**	**SUMP**	**cfs**

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

INLET IN A SUMP OR SAG LOCATION

Project = **Trails at Crowfoot**

Inlet ID = **6F**

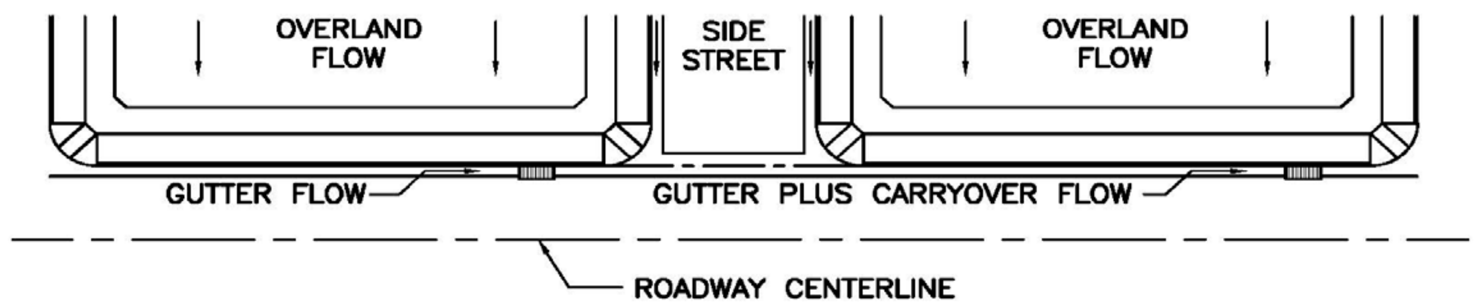


Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Inlet Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from 'Q-Allow')	a_{local} =	5.00	5.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	1	1	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	6.0	12.0	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	
		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	**Q_a =**	**8.3**	**27.5**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms (>Q PEAK)	$Q_{PEAK\ REQUIRED}$ =	3.7	25.0	cfs

Worksheet Protected

DESIGN PEAK FLOW FOR ONE-HALF OF STREET OR GRASS-LINED CHANNEL BY THE RATIONAL METHOD

Project: Trails at Crowfoot
Inlet ID: 6G



Show Details

Design Flow: ONLY if already determined through other methods:

		Minor Storm	Major Storm	
(local peak flow for 1/2 of street OR grass-lined channel):	*Q_{Known} =	1.7	15.4	cfs

*** If you enter values in Row 14, skip the rest of this sheet and proceed to sheet Q-Allow or Area Inlet.**

<--- FILL IN THIS SECTION OR…

FILL IN THE SECTIONS BELOW. <---

Geographic Information: (Enter data in the blue cells):

Subcatchment Area =		Acres
Percent Imperviousness =		%
NRCS Soil Type =		A, B, C, or D

Site Type:
- ○ Site is Urban
- ○ Site is Non-Urban

Flows Developed For:
- ○ Street Inlets
- ○ Area Inlets in a Median

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

Rainfall Information: Intensity I (inch/hr) = $C_1 * P_1 / (C_2 + T_c)^{C_3}$

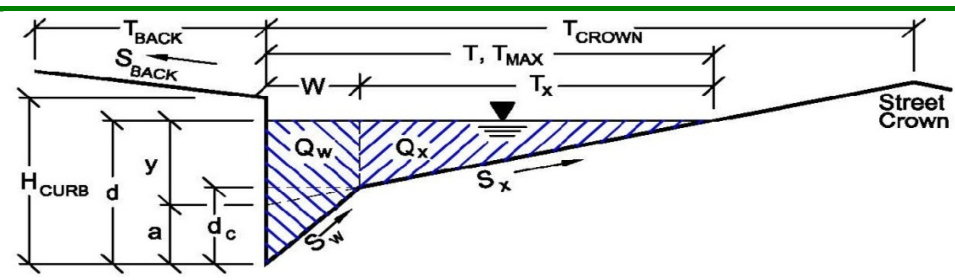
	Minor Storm	Major Storm	
Design Storm Return Period, T_r =			years
Return Period One-Hour Precipitation, P_1 =			inches
C_1 =			
C_2 =			
C_3 =			
User-Defined Storm Runoff Coefficient (leave this blank to accept a calculated value), C =			
User-Defined 5-yr. Runoff Coefficient (leave this blank to accept a calculated value), C_5 =			
Bypass (Carry-Over) Flow from upstream Subcatchments, Q_b =	**0.0**	**5.4**	**cfs**
Total Design Peak Flow, Q =	**1.7**	**20.8**	**cfs**

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

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

Project: Trails at Crowfoot

Inlet ID: 6G



Gutter Geometry (Enter data in the blue cells)

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	18.0	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} =	4.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	17.0	ft
Gutter Width	W =	2.00	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} =	0.016	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	17.0	17.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	4.0	12.0	inches
Allow Flow Depth at Street Crown (leave blank for no)		☐	☑	check = yes

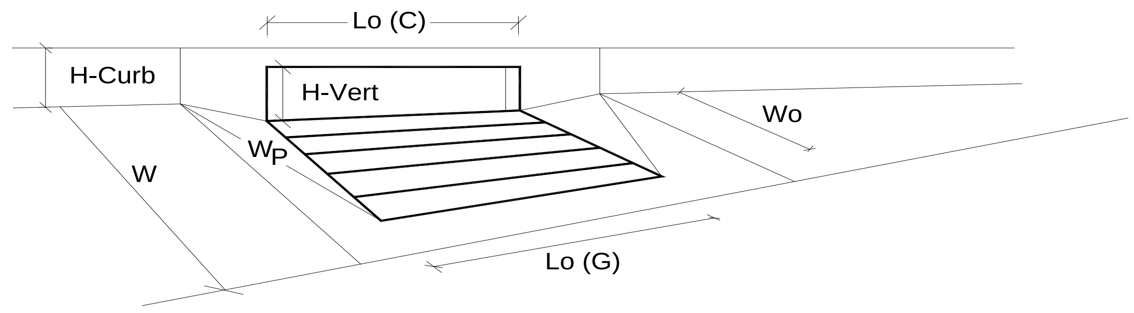
		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	Q_{allow} =	**SUMP**	**SUMP**	**cfs**

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

INLET IN A SUMP OR SAG LOCATION

Project = **Trails at Crowfoot**

Inlet ID = **6G**

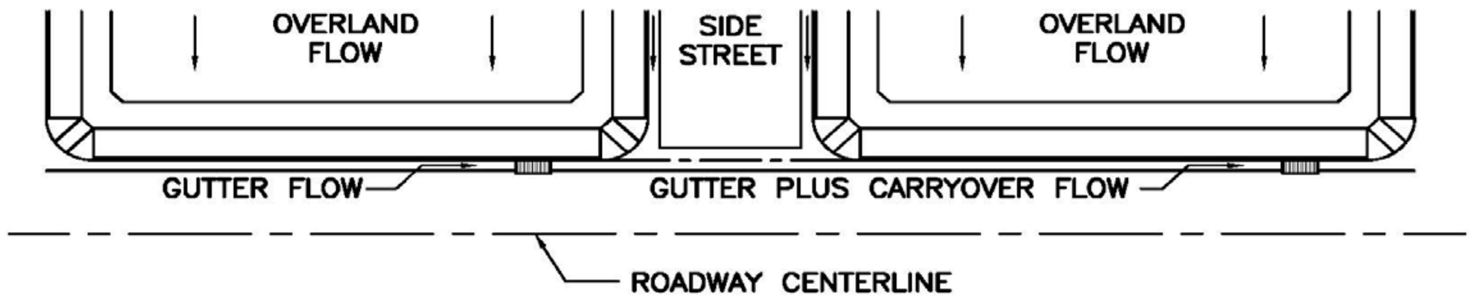


Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Inlet Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from 'Q-Allow')	a_{local} =	5.00	5.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	1	1	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	6.0	12.0	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	
		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	**Q_a =**	**8.3**	**27.5**	**cfs**
Inlet Capacity IS GOOD for Minor and Major Storms (>Q PEAK)	$Q_{PEAK\ REQUIRED}$ =	1.7	20.8	cfs

Worksheet Protected

DESIGN PEAK FLOW FOR ONE-HALF OF STREET OR GRASS-LINED CHANNEL BY THE RATIONAL METHOD

Project: Trails at Crowfoot
Inlet ID: 6H



Show Details

Design Flow: ONLY if already determined through other methods:

(local peak flow for 1/2 of street OR grass-lined channel):

	Minor Storm	Major Storm	
$^*Q_{Known}$ =	4.5	48.4	cfs

*** If you enter values in Row 14, skip the rest of this sheet and proceed to sheet Q-Allow or Area Inlet.**

<--- FILL IN THIS SECTION OR…

FILL IN THE SECTIONS BELOW. <---

Geographic Information: (Enter data in the blue cells):

Subcatchment Area =		Acres
Percent Imperviousness =		%
NRCS Soil Type =		A, B, C, or D

Site Type:
- ○ Site is Urban
- ○ Site is Non-Urban

Flows Developed For:
- ○ Street Inlets
- ○ Area Inlets in a Median

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

Rainfall Information: Intensity I (inch/hr) = $C_1 * P_1 / (C_2 + T_c)$ ^ C_3

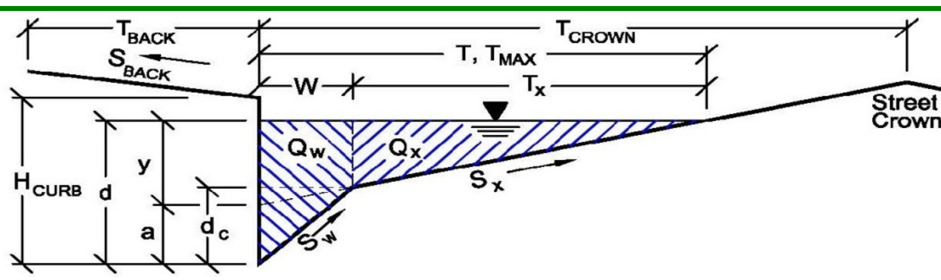
	Minor Storm	Major Storm	
Design Storm Return Period, T_r =			years
Return Period One-Hour Precipitation, P_1 =			inches
C_1 =			
C_2 =			
C_3 =			
User-Defined Storm Runoff Coefficient (leave this blank to accept a calculated value), C =			
User-Defined 5-yr. Runoff Coefficient (leave this blank to accept a calculated value), C_5 =			
Bypass (Carry-Over) Flow from upstream Subcatchments, Q_b =	**0.0**	**0.0**	**cfs**
Total Design Peak Flow, Q =	**4.5**	**48.4**	**cfs**

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

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

Project: Trails at Crowfoot

Inlet ID: 6H



Gutter Geometry (Enter data in the blue cells)

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	18.0	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} =	4.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	17.0	ft
Gutter Width	W =	2.00	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} =	0.016	

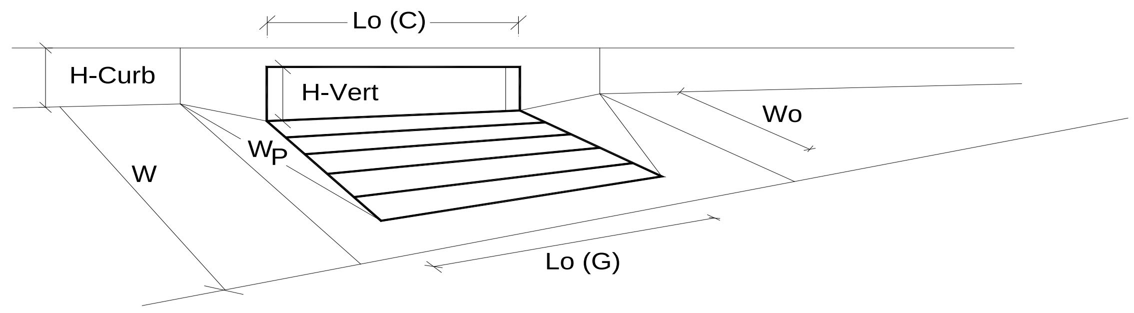
		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	17.0	17.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	4.0	12.0	inches
Allow Flow Depth at Street Crown (leave blank for no)		☐	☑	check = yes

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

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

INLET IN A SUMP OR SAG LOCATION

Project = **Trails at Crowfoot**
Inlet ID = **6H**

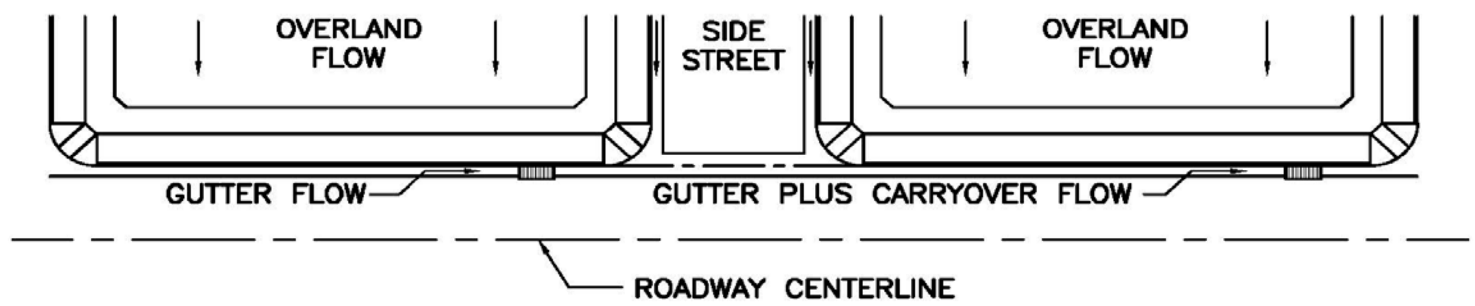


Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Inlet Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from 'Q-Allow')	a_{local} =	5.00	5.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	1	1	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	6.0	12.0	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) =	15.00	15.00	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	
		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	Q_a =	**9.7**	**42.1**	**cfs**
WARNING: Inlet Capacity less than Q Peak for MAJOR Storm	$Q_{PEAK\ REQUIRED}$ =	4.5	48.4	cfs

Worksheet Protected

DESIGN PEAK FLOW FOR ONE-HALF OF STREET OR GRASS-LINED CHANNEL BY THE RATIONAL METHOD

Project: Trails at Crowfoot
Inlet ID: 6I



Show Details

Design Flow: ONLY if already determined through other methods:
(local peak flow for 1/2 of street OR grass-lined channel):

	Minor Storm	Major Storm	
$*Q_{Known}$ =	1.8	91.5	cfs

*** If you enter values in Row 14, skip the rest of this sheet and proceed to sheet Q-Allow or Area Inlet.**

<--- FILL IN THIS SECTION OR…
FILL IN THE SECTIONS BELOW. <---

Geographic Information: (Enter data in the blue cells):

Subcatchment Area =		Acres
Percent Imperviousness =		%
NRCS Soil Type =		A, B, C, or D

Site Type:
○ Site is Urban
○ Site is Non-Urban

Flows Developed For:
○ Street Inlets
○ Area Inlets in a Median

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

Rainfall Information: Intensity I (inch/hr) = $C_1 * P_1 / (C_2 + T_c) ^ C_3$

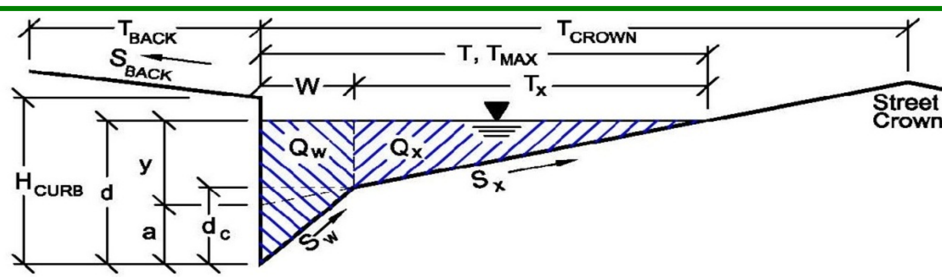
	Minor Storm	Major Storm	
Design Storm Return Period, T_r =			years
Return Period One-Hour Precipitation, P_1 =			inches
C_1 =			
C_2 =			
C_3 =			
User-Defined Storm Runoff Coefficient (leave this blank to accept a calculated value), C =			
User-Defined 5-yr. Runoff Coefficient (leave this blank to accept a calculated value), C_5 =			
Bypass (Carry-Over) Flow from upstream Subcatchments, Q_b =	0.0	0.0	cfs
Total Design Peak Flow, Q =	1.8	91.5	cfs

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

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

Project: Trails at Crowfoot

Inlet ID: 6I



Gutter Geometry (Enter data in the blue cells)

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	18.0	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} =	4.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	17.0	ft
Gutter Width	W =	2.00	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} =	0.016	

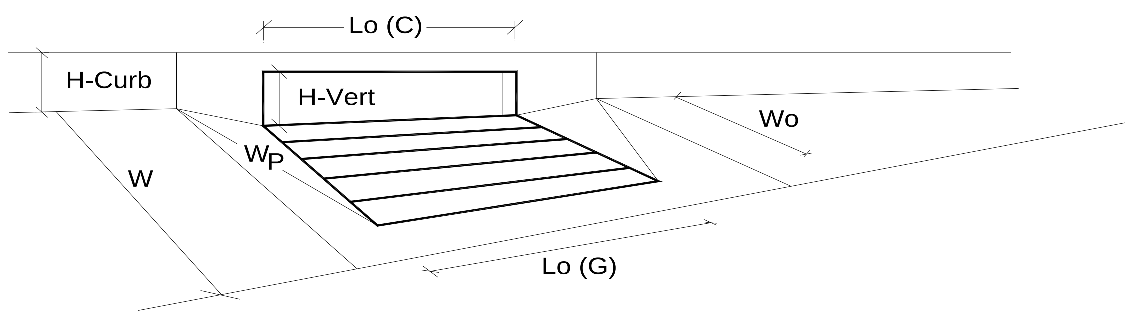
		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	17.0	17.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	4.0	12.0	inches
Allow Flow Depth at Street Crown (leave blank for no)		☐	☑	check = yes

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

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

INLET IN A SUMP OR SAG LOCATION

Project = **Trails at Crowfoot**
Inlet ID = **6I**

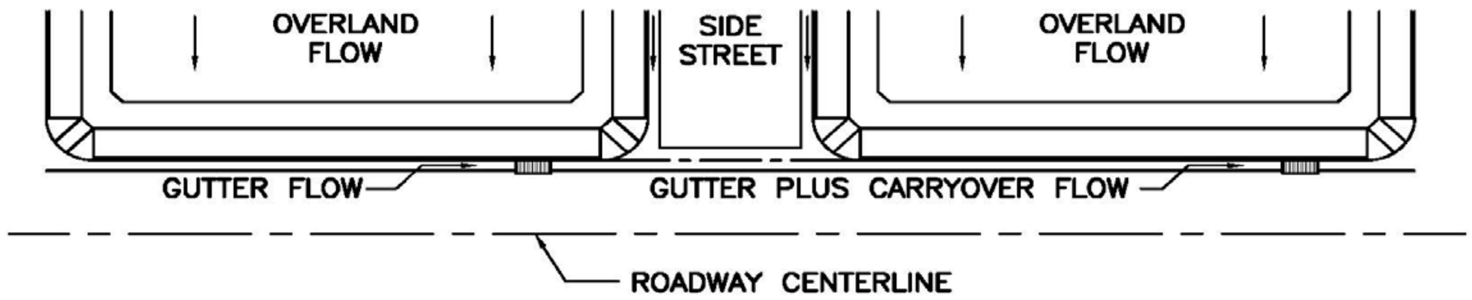


Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Inlet Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from 'Q-Allow')	a_{local} =	5.00	5.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	2	2	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	6.0	12.0	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) =	15.00	15.00	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	
		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	**Q_a =**	**19.9**	**86.1**	**cfs**
WARNING: Inlet Capacity less than Q Peak for MAJOR Storm	$Q_{\text{PEAK REQUIRED}}$ =	1.8	91.5	cfs

Worksheet Protected

DESIGN PEAK FLOW FOR ONE-HALF OF STREET OR GRASS-LINED CHANNEL BY THE RATIONAL METHOD

Project: **Trails at Crowfoot**
Inlet ID: **DP 6J**



Show Details

Design Flow: ONLY if already determined through other methods:

		Minor Storm	Major Storm	
(local peak flow for 1/2 of street OR grass-lined channel):	$^{*}Q_{Known}$ =	5.3	46.8	cfs

*** If you enter values in Row 14, skip the rest of this sheet and proceed to sheet Q-Allow or Area Inlet.**

<--- FILL IN THIS SECTION OR…

FILL IN THE SECTIONS BELOW. <---

Geographic Information: (Enter data in the blue cells):

Subcatchment Area =		Acres
Percent Imperviousness =		%
NRCS Soil Type =		A, B, C, or D

Site Type:
- ○ Site is Urban
- ○ Site is Non-Urban

Flows Developed For:
- ○ Street Inlets
- ○ Area Inlets in a Median

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

Rainfall Information: Intensity I (inch/hr) = $C_1 * P_1 / (C_2 + T_c)^{\wedge} C_3$

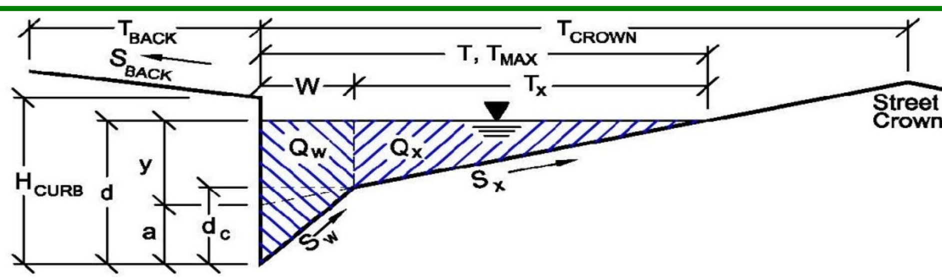
	Minor Storm	Major Storm	
Design Storm Return Period, T_r =			years
Return Period One-Hour Precipitation, P_1 =			inches
C_1 =			
C_2 =			
C_3 =			
User-Defined Storm Runoff Coefficient (leave this blank to accept a calculated value), C =			
User-Defined 5-yr. Runoff Coefficient (leave this blank to accept a calculated value), C_5 =			
Bypass (Carry-Over) Flow from upstream Subcatchments, Q_b =	**0.0**	**0.0**	**cfs**
Total Design Peak Flow, Q =	**5.3**	**46.8**	**cfs**

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

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

Project: Trails at Crowfoot

Inlet ID: DP 6J



Gutter Geometry (Enter data in the blue cells)

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	18.0	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} =	4.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	17.0	ft
Gutter Width	W =	2.00	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 =	0.025	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016	

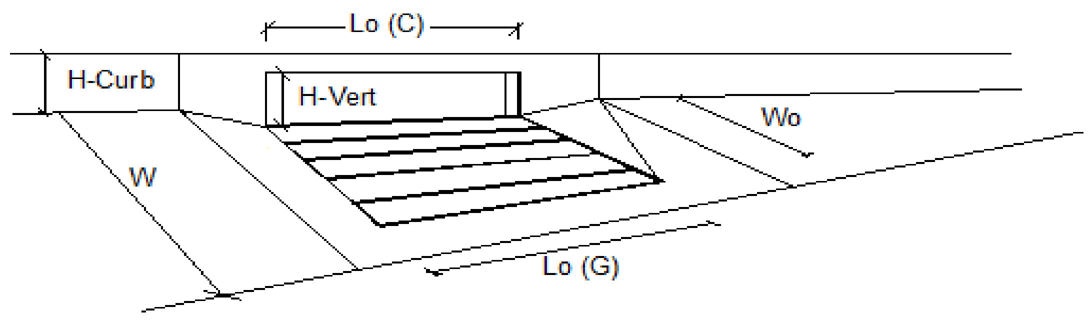
		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	17.0	17.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	4.0	12.0	inches
Allow Flow Depth at Street Crown (leave blank for no)		☐	☑	check = yes

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	Q_{allow} =	**5.4**	**146.4**	**cfs**

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

INLET ON A CONTINUOUS GRADE

Project: Trails at Crowfoot
Inlet ID: DP 6J

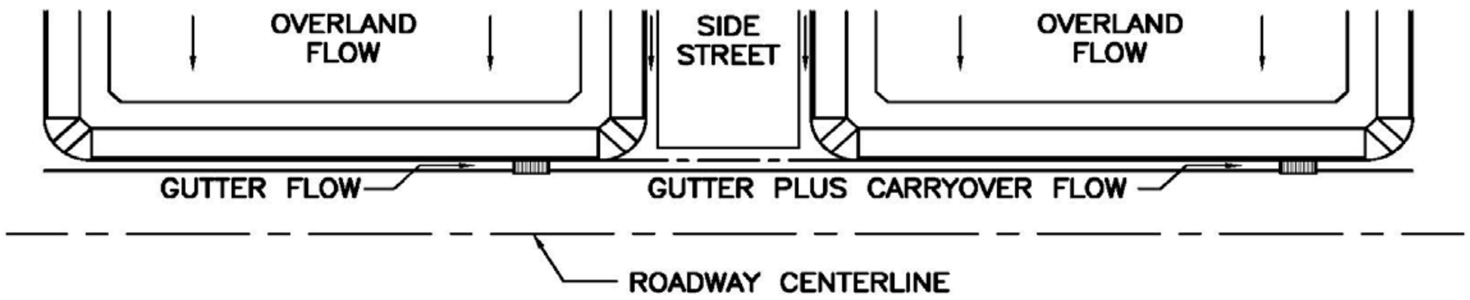


Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from 'Q-Allow')	a_{LOCAL} =	5.0	5.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)	No =	1	1	
Length of a Single Unit Inlet (Grate or Curb Opening)	L_o =	15.00	15.00	ft
Width of a Unit Grate (cannot be greater than W from Q-Allow)	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 < maximum allowable from sheet 'Q-Allow'		MINOR	MAJOR	
Total Inlet Interception Capacity	**Q =**	**5.30**	**21.67**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**0.0**	**25.1**	**cfs**
Capture Percentage = Q_a/Q_o =	**C% =**	**100**	**46**	**%**

Worksheet Protected

DESIGN PEAK FLOW FOR ONE-HALF OF STREET OR GRASS-LINED CHANNEL BY THE RATIONAL METHOD

Project: Trails at Crowfoot
Inlet ID: DP 6K



Show Details

Design Flow: ONLY if already determined through other methods:

(local peak flow for 1/2 of street OR grass-lined channel):

	Minor Storm	Major Storm	
$^*Q_{Known}$ =	4.1	34.0	cfs

*** If you enter values in Row 14, skip the rest of this sheet and proceed to sheet Q-Allow or Area Inlet.**

<--- FILL IN THIS SECTION OR…

FILL IN THE SECTIONS BELOW. <---

Geographic Information: (Enter data in the blue cells):

Subcatchment Area =		Acres
Percent Imperviousness =		%
NRCS Soil Type =		A, B, C, or D

Site Type:
- Site is Urban
- Site is Non-Urban

Flows Developed For:
- Street Inlets
- Area Inlets in a Median

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

Rainfall Information: Intensity I (inch/hr) = $C_1 * P_1 / (C_2 + T_c)$ ^ C_3

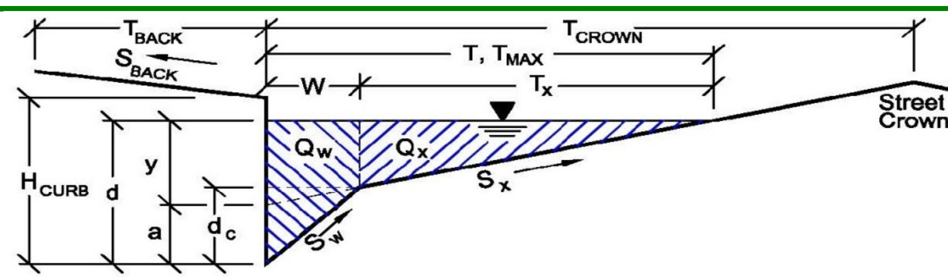
	Minor Storm	Major Storm	
Design Storm Return Period, T_r =			years
Return Period One-Hour Precipitation, P_1 =			inches
C_1 =			
C_2 =			
C_3 =			
User-Defined Storm Runoff Coefficient (leave this blank to accept a calculated value), C =			
User-Defined 5-yr. Runoff Coefficient (leave this blank to accept a calculated value), C_5 =			
Bypass (Carry-Over) Flow from upstream Subcatchments, Q_b =	0.0	0.0	cfs
Total Design Peak Flow, Q =	4.1	34.0	cfs

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

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

Project: Trails at Crowfoot

Inlet ID: DP 6K



Gutter Geometry (Enter data in the blue cells)

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	18.0	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} =	4.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	17.0	ft
Gutter Width	W =	2.00	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 =	0.025	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016	

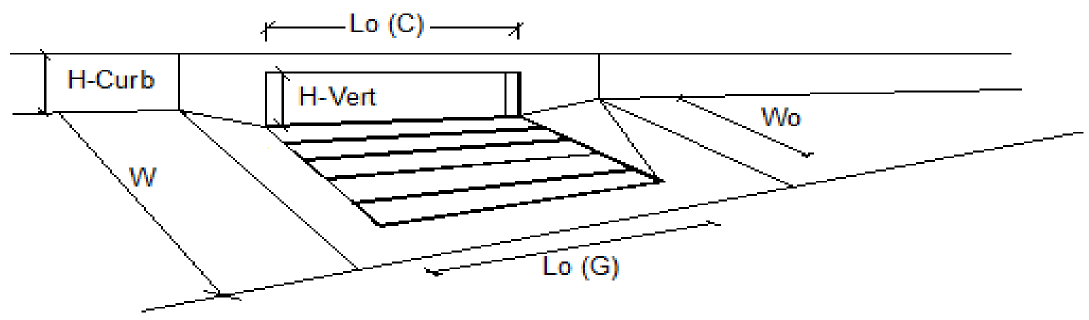
		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	17.0	17.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	4.0	12.0	inches
Allow Flow Depth at Street Crown (leave blank for no)		☐	☑	check = yes

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	**Q_{allow} =**	**5.4**	**146.4**	**cfs**

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

INLET ON A CONTINUOUS GRADE

Project: **Trails at Crowfoot**
Inlet ID: **DP 6K**

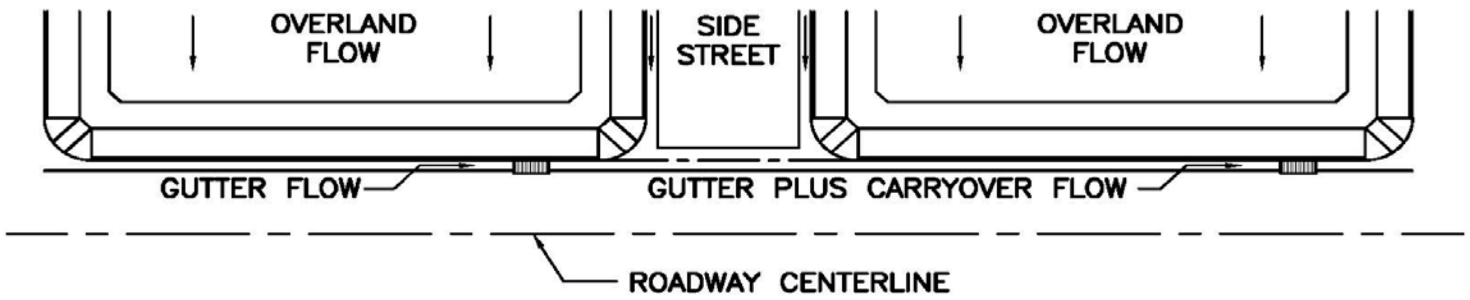


Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from 'Q-Allow')	a_{LOCAL} =	5.0	5.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)	No =	1	1	
Length of a Single Unit Inlet (Grate or Curb Opening)	L_o =	10.00	10.00	ft
Width of a Unit Grate (cannot be greater than W from Q-Allow)	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 < maximum allowable from sheet 'Q-Allow'		MINOR	MAJOR	
Total Inlet Interception Capacity	**Q =**	**4.10**	**13.32**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**0.0**	**20.7**	**cfs**
Capture Percentage = Q_a/Q_o =	**C% =**	**100**	**39**	**%**

Worksheet Protected

DESIGN PEAK FLOW FOR ONE-HALF OF STREET
OR GRASS-LINED CHANNEL BY THE RATIONAL METHOD

Project: **Trails at Crowfoot**
Inlet ID: **DP 6L**



Show Details

Design Flow: ONLY if already determined through other methods:

(local peak flow for 1/2 of street OR grass-lined channel):

	Minor Storm	Major Storm	
*Q_{Known} =	3.4	10.0	cfs

*** If you enter values in Row 14, skip the rest of this sheet and proceed to sheet Q-Allow or Area Inlet.**

<--- FILL IN THIS SECTION OR…

FILL IN THE SECTIONS BELOW. <---

Geographic Information: (Enter data in the blue cells):

Subcatchment Area =		Acres
Percent Imperviousness =		%
NRCS Soil Type =		A, B, C, or D

Site Type:
- ○ Site is Urban
- ○ Site is Non-Urban

Flows Developed For:
- ○ Street Inlets
- ○ Area Inlets in a Median

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

Rainfall Information: Intensity I (inch/hr) = $C_1 * P_1 / (C_2 + T_c) \wedge C_3$

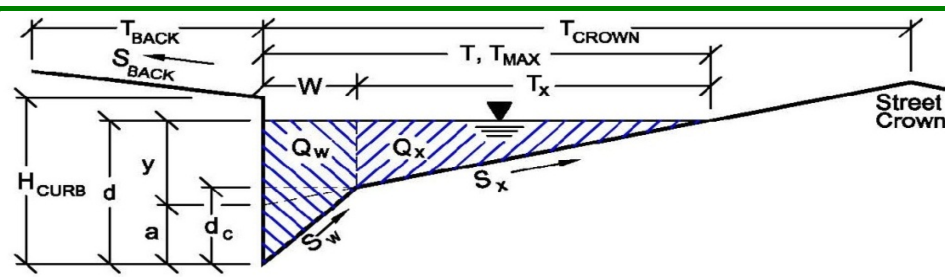
	Minor Storm	Major Storm	
Design Storm Return Period, T_r =			years
Return Period One-Hour Precipitation, P_1 =			inches
C_1 =			
C_2 =			
C_3 =			
User-Defined Storm Runoff Coefficient (leave this blank to accept a calculated value), C =			
User-Defined 5-yr. Runoff Coefficient (leave this blank to accept a calculated value), C_5 =			
Bypass (Carry-Over) Flow from upstream Subcatchments, Q_b =	**0.0**	**0.0**	**cfs**
Total Design Peak Flow, Q =	**3.4**	**10.0**	**cfs**

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

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

Project: **Trails at Crowfoot**

Inlet ID: **DP 6L**



Gutter Geometry (Enter data in the blue cells)

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	18.0	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} =	4.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	17.0	ft
Gutter Width	W =	2.00	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 =	0.025	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016	

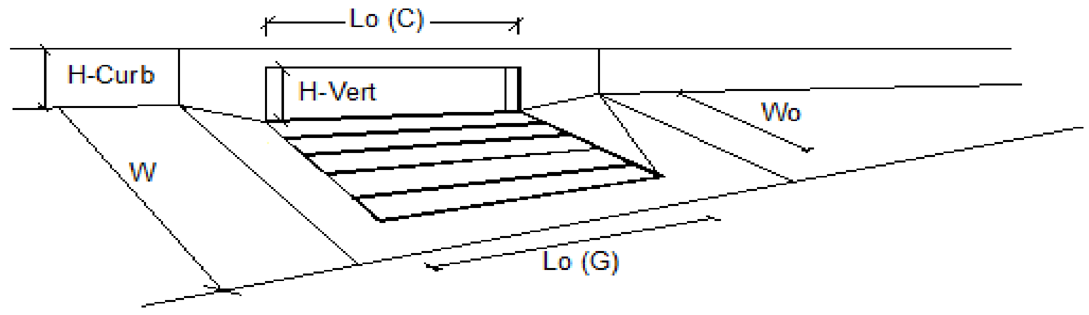
		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	17.0	17.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	4.0	12.0	inches
Allow Flow Depth at Street Crown (leave blank for no)		☐	☑	check = yes

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	Q_{allow} =	**5.4**	**146.4**	**cfs**

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

INLET ON A CONTINUOUS GRADE

Project: **Trails at Crowfoot**
Inlet ID: **DP 6L**

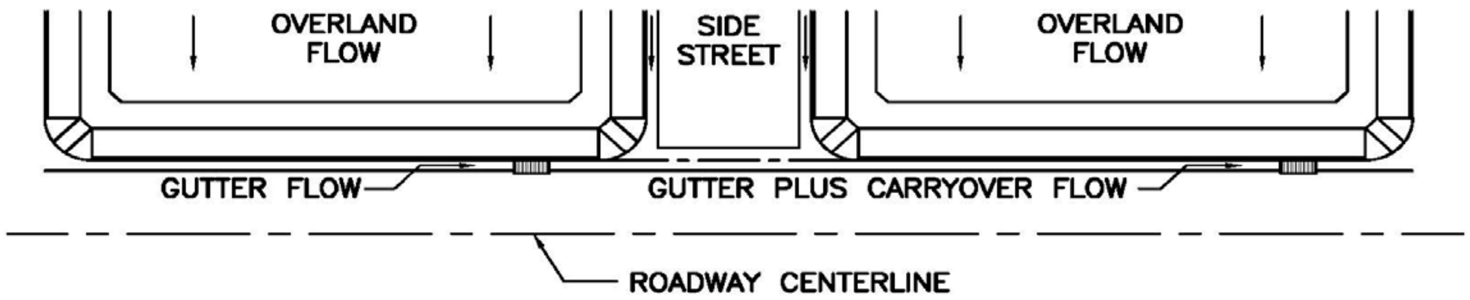


Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from 'Q-Allow')	a_{LOCAL} =	5.0	5.0	inches
Total Number of Units in the Inlet (Grate or Curb Opening)	No =	1	1	
Length of a Single Unit Inlet (Grate or Curb Opening)	L_o =	10.00	10.00	ft
Width of a Unit Grate (cannot be greater than W from Q-Allow)	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 < maximum allowable from sheet 'Q-Allow'		MINOR	MAJOR	
Total Inlet Interception Capacity	**Q =**	**3.40**	**7.77**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**0.0**	**2.2**	**cfs**
Capture Percentage = Q_a/Q_o =	**C% =**	**100**	**78**	**%**

Worksheet Protected

DESIGN PEAK FLOW FOR ONE-HALF OF STREET
OR GRASS-LINED CHANNEL BY THE RATIONAL METHOD

Project: **Trails at Crowfoot**
Inlet ID: **DP 6M**



Show Details

Design Flow: ONLY if already determined through other methods:

(local peak flow for 1/2 of street OR grass-lined channel):

	Minor Storm	Major Storm	
$^{*}Q_{Known}$ =	4.4	35.4	cfs

*** If you enter values in Row 14, skip the rest of this sheet and proceed to sheet Q-Allow or Area Inlet.**

<--- FILL IN THIS SECTION OR…

FILL IN THE SECTIONS BELOW. <---

Geographic Information: (Enter data in the blue cells):

Subcatchment Area =		Acres
Percent Imperviousness =		%
NRCS Soil Type =		A, B, C, or D

Site Type:
- ○ Site is Urban
- ○ Site is Non-Urban

Flows Developed For:
- ○ Street Inlets
- ○ Area Inlets in a Median

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

Rainfall Information: Intensity I (inch/hr) = $C_1 * P_1 / (C_2 + T_c)^{\wedge} C_3$

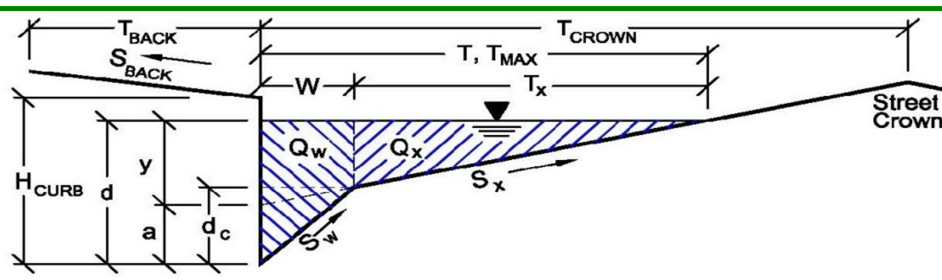
	Minor Storm	Major Storm	
Design Storm Return Period, T_r =			years
Return Period One-Hour Precipitation, P_1 =			inches
C_1 =			
C_2 =			
C_3 =			
User-Defined Storm Runoff Coefficient (leave this blank to accept a calculated value), C =			
User-Defined 5-yr. Runoff Coefficient (leave this blank to accept a calculated value), C_5 =			
Bypass (Carry-Over) Flow from upstream Subcatchments, Q_b =	0.0	0.0	cfs
Total Design Peak Flow, Q =	4.4	35.4	cfs

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

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

Project: Trails at Crowfoot

Inlet ID: DP 6M



Gutter Geometry (Enter data in the blue cells)

Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	18.0	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} =	4.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	17.0	ft
Gutter Width	W =	2.00	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 =	0.040	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016	

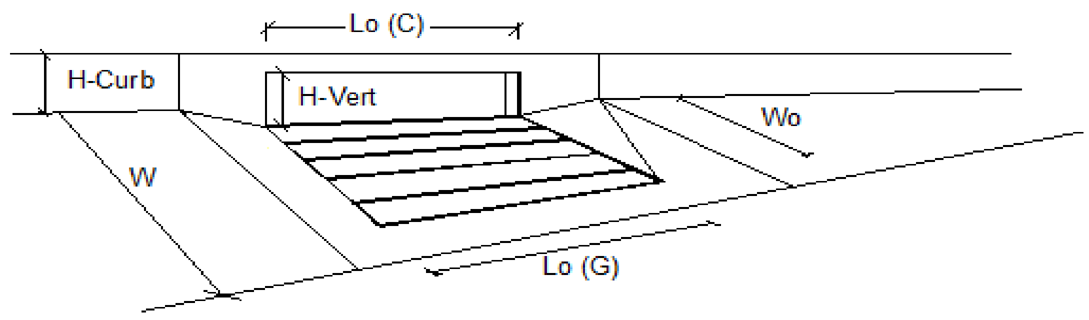
		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	17.0	17.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	4.0	12.0	inches
Allow Flow Depth at Street Crown (leave blank for no)		☐	☑	check = yes

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	Q_{allow} =	**6.8**	**127.1**	**cfs**

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

INLET ON A CONTINUOUS GRADE

Project: **Trails at Crowfoot**
Inlet ID: **DP 6M**



Design Information (Input)		MINOR	MAJOR	
Type of Inlet	Type =	CDOT Type R Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from 'Q-Allow')	a_{LOCAL} =	5.0	5.0	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 from Q-Allow)	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 < maximum allowable from sheet 'Q-Allow'		MINOR	MAJOR	
Total Inlet Interception Capacity	**Q =**	**4.40**	**13.74**	**cfs**
Total Inlet Carry-Over Flow (flow bypassing inlet)	**Q_b =**	**0.0**	**21.6**	**cfs**
Capture Percentage = Q_a/Q_o =	**C% =**	**100**	**39**	**%**

III. Hydraulic Computations

C. UD-SEWER

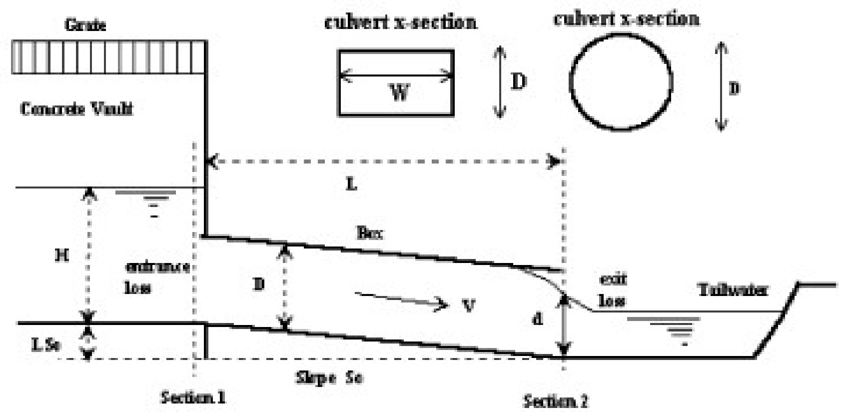
(To be provided with Final Drainage)

III. Hydraulic Computations

D. UD CHANNEL / CULVERT

CULVERT STAGE-DISCHARGE SIZING (INLET vs. OUTLET CONTROL WITH TAILWATER EFFECTS)

Project: Trails at Crowfooot
Basin ID: 6'x6' RCB (Q_{100} = 268 CFS)
Status:



Design Information (Input):

Circular Culvert:	Barrel Diameter in Inches	D =		inches
	Inlet Edge Type (choose from pull-down list)		Grooved End with Headwall	
OR:				
Box Culvert:	Barrel Height (Rise) in Feet	Height (Rise) =	6.00	ft.
	Barrel Width (Span) in Feet	Width (Span) =	6.00	ft.
	Inlet Edge Type (choose from pull-down list)		1.5 : 1 Bevel w/ 90 Deg. Headwall	
	Number of Barrels	No =	1	
	Inlet Elevation at Culvert Invert	Inlet Elev =	6001	ft. elev.
	Outlet Elevation at Culvert Invert **OR** Slope of Culvert (ft v./ft h.)	Outlet Elev =	5994	ft. elev.
	Culvert Length in Feet	L =	700	ft.
	Manning's Roughness	n =	0.013	
	Bend Loss Coefficient	K_b =	0	
	Exit Loss Coefficient	K_x =	1	

Design Information (calculated):

Entrance Loss Coefficient	K_e =	0.20
Friction Loss Coefficient	K_f =	2.00
Sum of All Loss Coefficients	K_s =	3.20
Orifice Inlet Condition Coefficient	C_d =	1.03
Minimum Energy Condition Coefficient	KE_{low} =	0.0380

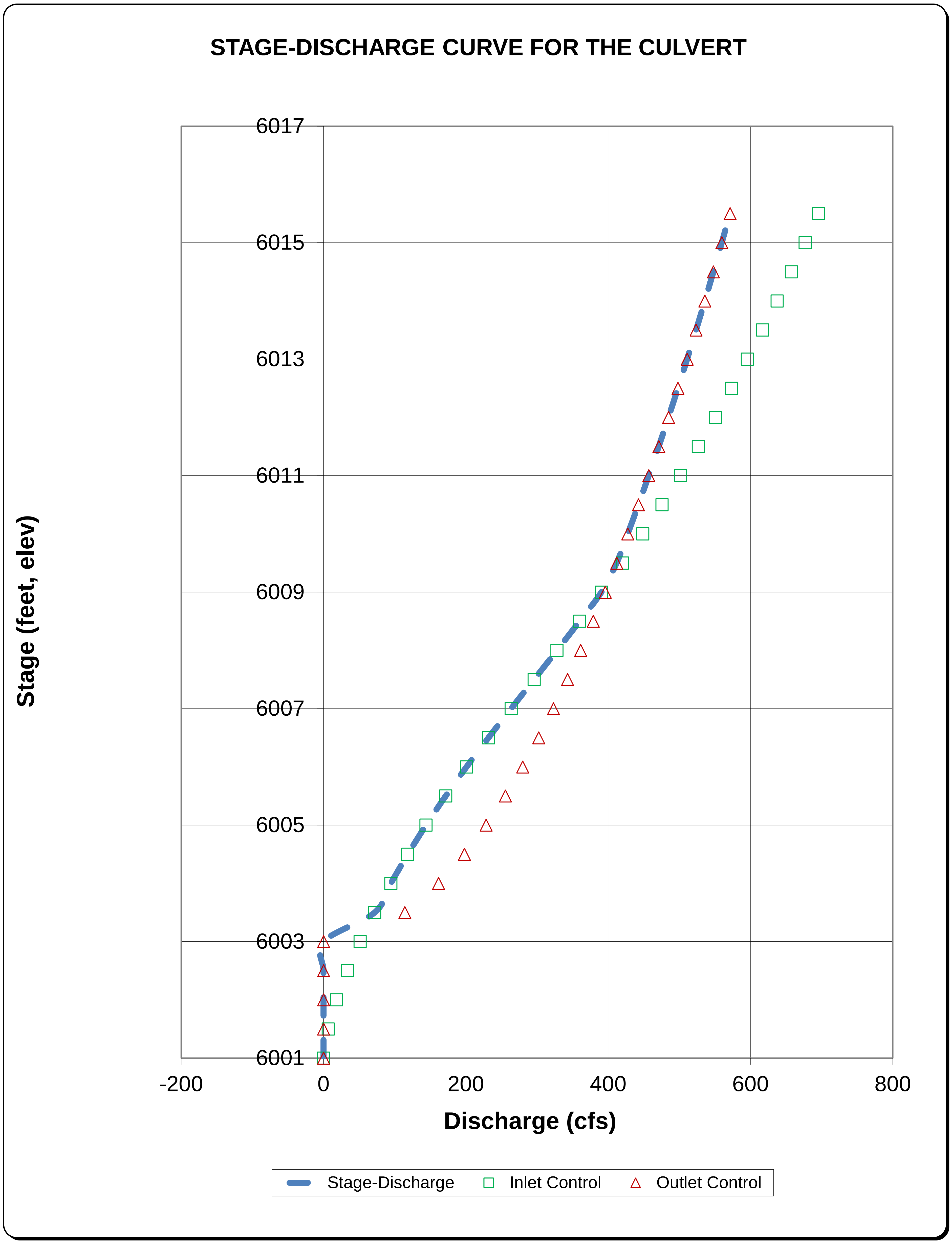
Calculations of Culvert Capacity (output):

Water Surface Elevation (ft., linked)	Tailwater Surface Elevation ft	Culvert Inlet-Control Flowrate cfs	Culvert Outlet-Control Flowrate cfs	Controlling Culvert Flowrate cfs (output)	Inlet Equation Used:	Flow Control Used
6001.00	6003.00	0.00	0.00	**0.00**	No Flow (WS < inlet)	N/A
6001.50	6003.00	6.50	0.00	**0.00**	Min. Energy. Eqn.	N/A
6002.00	6003.00	18.20	0.00	**0.00**	Min. Energy. Eqn.	N/A
6002.50	6003.00	33.50	0.00	**0.00**	Min. Energy. Eqn.	N/A
6003.00	6003.00	51.50	0.00	**0.00**	Min. Energy. Eqn.	N/A
6003.50	6003.00	71.90	114.26	**71.90**	Min. Energy. Eqn.	INLET
6004.00	6003.00	94.60	161.58	**94.60**	Min. Energy. Eqn.	INLET
6004.50	6003.00	118.40	197.90	**118.40**	Regression Eqn.	INLET
6005.00	6003.00	144.10	228.50	**144.10**	Regression Eqn.	INLET
6005.50	6003.00	171.70	255.46	**171.70**	Regression Eqn.	INLET
6006.00	6003.00	201.00	279.83	**201.00**	Regression Eqn.	INLET
6006.50	6003.00	231.80	302.26	**231.80**	Regression Eqn.	INLET
6007.00	6003.00	263.60	323.13	**263.60**	Regression Eqn.	INLET
6007.50	6003.00	295.90	342.73	**295.90**	Regression Eqn.	INLET
6008.00	6003.00	328.10	361.28	**328.10**	Regression Eqn.	INLET
6008.50	6003.00	359.80	378.92	**359.80**	Regression Eqn.	INLET
6009.00	6003.00	390.50	395.77	**390.50**	Regression Eqn.	INLET
6009.50	6003.00	420.20	411.92	**411.92**	Regression Eqn.	OUTLET
6010.00	6003.00	448.60	427.47	**427.47**	Regression Eqn.	OUTLET
6010.50	6003.00	475.80	442.46	**442.46**	Regression Eqn.	OUTLET
6011.00	6003.00	501.80	456.97	**456.97**	Regression Eqn.	OUTLET
6011.50	6003.00	526.70	471.04	**471.04**	Regression Eqn.	OUTLET
6012.00	6003.00	550.60	484.68	**484.68**	Regression Eqn.	OUTLET
6012.50	6003.00	573.50	497.98	**497.98**	Regression Eqn.	OUTLET
6013.00	6003.00	595.60	510.92	**510.92**	Regression Eqn.	OUTLET
6013.50	6003.00	616.90	523.54	**523.54**	Regression Eqn.	OUTLET
6014.00	6003.00	637.40	535.86	**535.86**	Regression Eqn.	OUTLET
6014.50	6003.00	657.40	547.88	**547.88**	Regression Eqn.	OUTLET
6015.00	6003.00	676.70	559.66	**559.66**	Regression Eqn.	OUTLET
6015.50	6003.00	695.40	571.20	**571.20**	Regression Eqn.	OUTLET

Processing Time: 00.93 Seconds

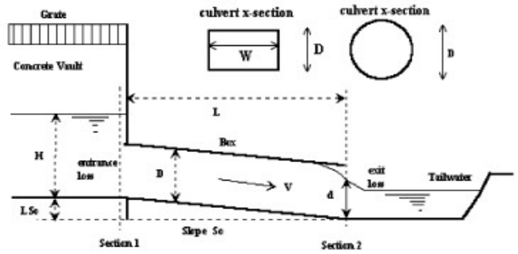
CULVERT STAGE-DISCHARGE SIZING (INLET vs. OUTLET CONTROL WITH TAILWATER EFFECTS)

Project: Trails at Crowfooot
Basin ID: 6'x6' RCB (Q100 = 268 CFS)



CULVERT STAGE-DISCHARGE SIZING (INLET vs. OUTLET CONTROL WITH TAILWATER EFFECTS)

Project: **Trails at Crowfoot**
Basin ID: **Pond B**
Status:



Design Information (Input):

Circular Culvert:	Barrel Diameter in Inches	D =	30	inches
	Inlet Edge Type (choose from pull-down list)		Square End with Headwall	
OR:				
Box Culvert:	Barrel Height (Rise) in Feet	Height (Rise) =		ft.
	Barrel Width (Span) in Feet	Width (Span) =		ft.
	Inlet Edge Type (choose from pull-down list)		Square Edge w/ 30-78 deg. Flared Wingwall	
	Number of Barrels	No =	1	
	Inlet Elevation at Culvert Invert	Inlet Elev =	6089	ft. elev.
	Outlet Elevation at Culvert Invert **OR** Slope of Culvert (ft v./ft h.)	Outlet Elev =	6088	ft. elev.
	Culvert Length in Feet	L =	200	ft.
	Manning's Roughness	n =	0.013	
	Bend Loss Coefficient	K_b =	0	
	Exit Loss Coefficient	K_x =	1	

Design Information (calculated):

Entrance Loss Coefficient	K_e =	0.50
Friction Loss Coefficient	K_f =	1.83
Sum of All Loss Coefficients	K_s =	3.33
Orifice Inlet Condition Coefficient	C_d =	0.85
Minimum Energy Condition Coefficient	KE_{low} =	0.0152

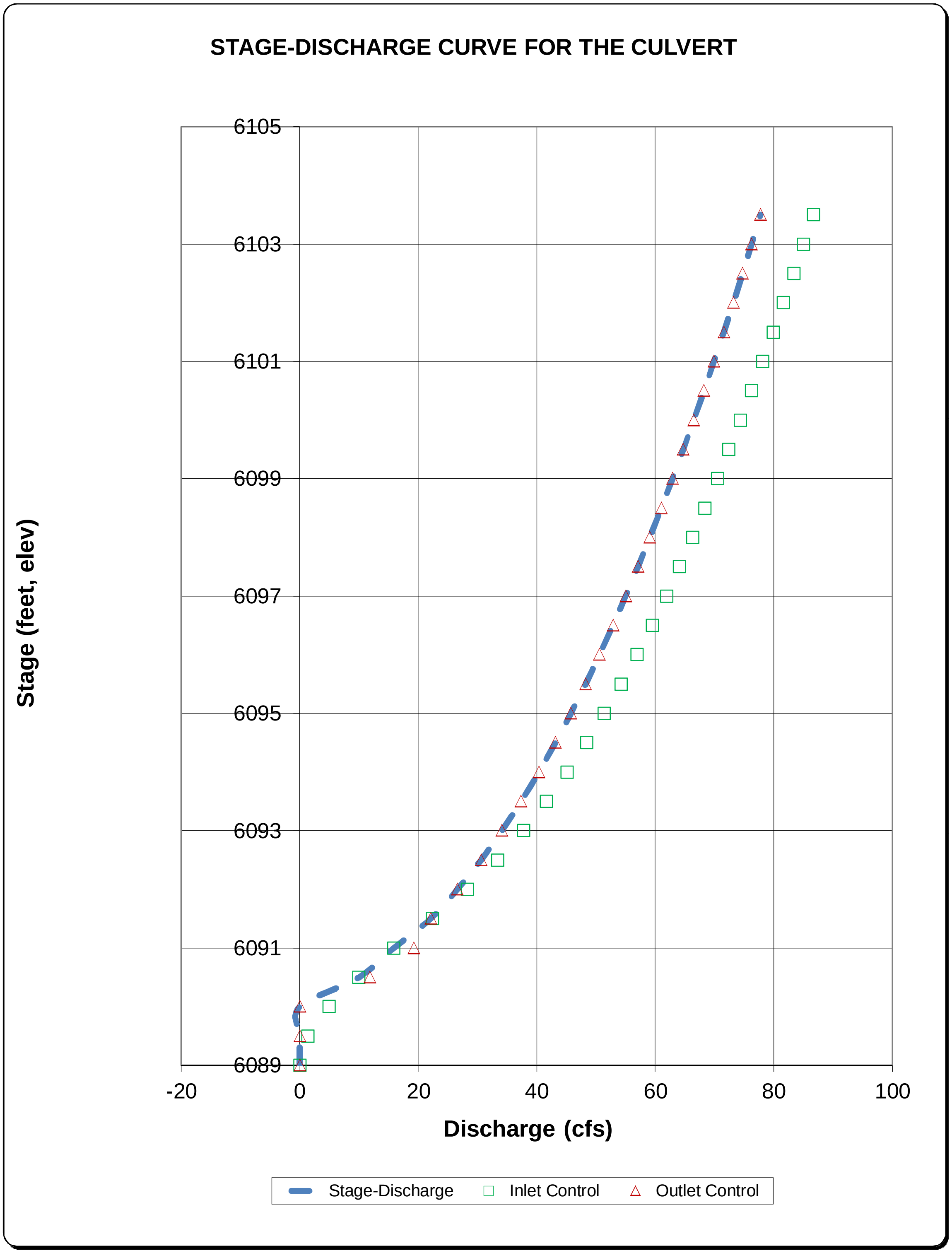
Calculations of Culvert Capacity (output):

Water Surface Elevation (ft., linked)	Tailwater Surface Elevation ft	Culvert Inlet-Control Flowrate cfs	Culvert Outlet-Control Flowrate cfs	Controlling Culvert Flowrate cfs (output)	Inlet Equation Used:	Flow Control Used
6089.00	6090.20	0.00	0.00	**0.00**	No Flow (WS < inlet)	N/A
6089.50	6090.20	1.40	0.00	**0.00**	Min. Energy. Eqn.	N/A
6090.00	6090.20	5.00	0.00	**0.00**	Min. Energy. Eqn.	N/A
6090.50	6090.20	10.00	11.82	**10.00**	Regression Eqn.	INLET
6091.00	6090.20	15.90	19.30	**15.90**	Regression Eqn.	INLET
6091.50	6090.20	22.40	22.10	**22.10**	Regression Eqn.	OUTLET
6092.00	6090.20	28.30	26.63	**26.63**	Regression Eqn.	OUTLET
6092.50	6090.20	33.40	30.61	**30.61**	Regression Eqn.	OUTLET
6093.00	6090.20	37.80	34.12	**34.12**	Regression Eqn.	OUTLET
6093.50	6090.20	41.60	37.37	**37.37**	Regression Eqn.	OUTLET
6094.00	6090.20	45.10	40.37	**40.37**	Regression Eqn.	OUTLET
6094.50	6090.20	48.40	43.16	**43.16**	Regression Eqn.	OUTLET
6095.00	6090.20	51.40	45.77	**45.77**	Regression Eqn.	OUTLET
6095.50	6090.20	54.20	48.25	**48.25**	Regression Eqn.	OUTLET
6096.00	6090.20	56.90	50.60	**50.60**	Regression Eqn.	OUTLET
6096.50	6090.20	59.50	52.86	**52.86**	Regression Eqn.	OUTLET
6097.00	6090.20	61.90	55.01	**55.01**	Orifice Eqn.	OUTLET
6097.50	6090.20	64.10	57.09	**57.09**	Orifice Eqn.	OUTLET
6098.00	6090.20	66.30	59.09	**59.09**	Orifice Eqn.	OUTLET
6098.50	6090.20	68.40	61.02	**61.02**	Orifice Eqn.	OUTLET
6099.00	6090.20	70.50	62.91	**62.91**	Orifice Eqn.	OUTLET
6099.50	6090.20	72.40	64.74	**64.74**	Orifice Eqn.	OUTLET
6100.00	6090.20	74.40	66.51	**66.51**	Orifice Eqn.	OUTLET
6100.50	6090.20	76.20	68.23	**68.23**	Orifice Eqn.	OUTLET
6101.00	6090.20	78.10	69.91	**69.91**	Orifice Eqn.	OUTLET
6101.50	6090.20	79.90	71.57	**71.57**	Orifice Eqn.	OUTLET
6102.00	6090.20	81.60	73.18	**73.18**	Orifice Eqn.	OUTLET
6102.50	6090.20	83.40	74.74	**74.74**	Orifice Eqn.	OUTLET
6103.00	6090.20	85.00	76.28	**76.28**	Orifice Eqn.	OUTLET
6103.50	6090.20	86.70	77.79	**77.79**	Orifice Eqn.	OUTLET

Processing Time: 49.36 Seconds

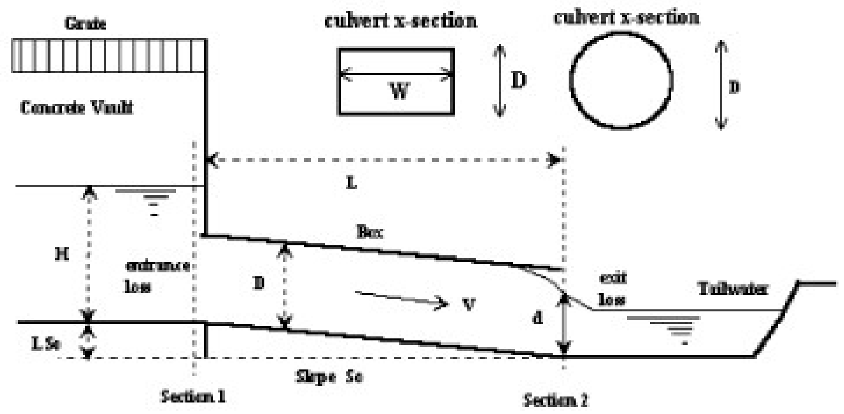
CULVERT STAGE-DISCHARGE SIZING (INLET vs. OUTLET CONTROL WITH TAILWATER EFFECTS)

Project: Trails at Crowfoot
Basin ID: Pond B



CULVERT STAGE-DISCHARGE SIZING (INLET vs. OUTLET CONTROL WITH TAILWATER EFFECTS)

Project: Trails at Crowfoot
Basin ID: Pond C
Status:



Design Information (Input):

Circular Culvert:	Barrel Diameter in Inches	D =	48	inches
	Inlet Edge Type (choose from pull-down list)		Grooved End with Headwall	
OR:				
Box Culvert:	Barrel Height (Rise) in Feet	Height (Rise) =		ft.
	Barrel Width (Span) in Feet	Width (Span) =		ft.
	Inlet Edge Type (choose from pull-down list)		Square Edge w/ 30-78 deg. Flared Wingwall	
	Number of Barrels	No =	1	
	Inlet Elevation at Culvert Invert	Inlet Elev =	5970	ft. elev.
	Outlet Elevation at Culvert Invert **OR** Slope of Culvert (ft v./ft h.)	Outlet Elev =	5969.5	ft. elev.
	Culvert Length in Feet	L =	100	ft.
	Manning's Roughness	n =	0.013	
	Bend Loss Coefficient	K_b =	0	
	Exit Loss Coefficient	K_x =	1	

Design Information (calculated):

Entrance Loss Coefficient	K_e =	0.20
Friction Loss Coefficient	K_f =	0.49
Sum of All Loss Coefficients	K_s =	1.69
Orifice Inlet Condition Coefficient	C_d =	0.99
Minimum Energy Condition Coefficient	KE_{low} =	-0.0105

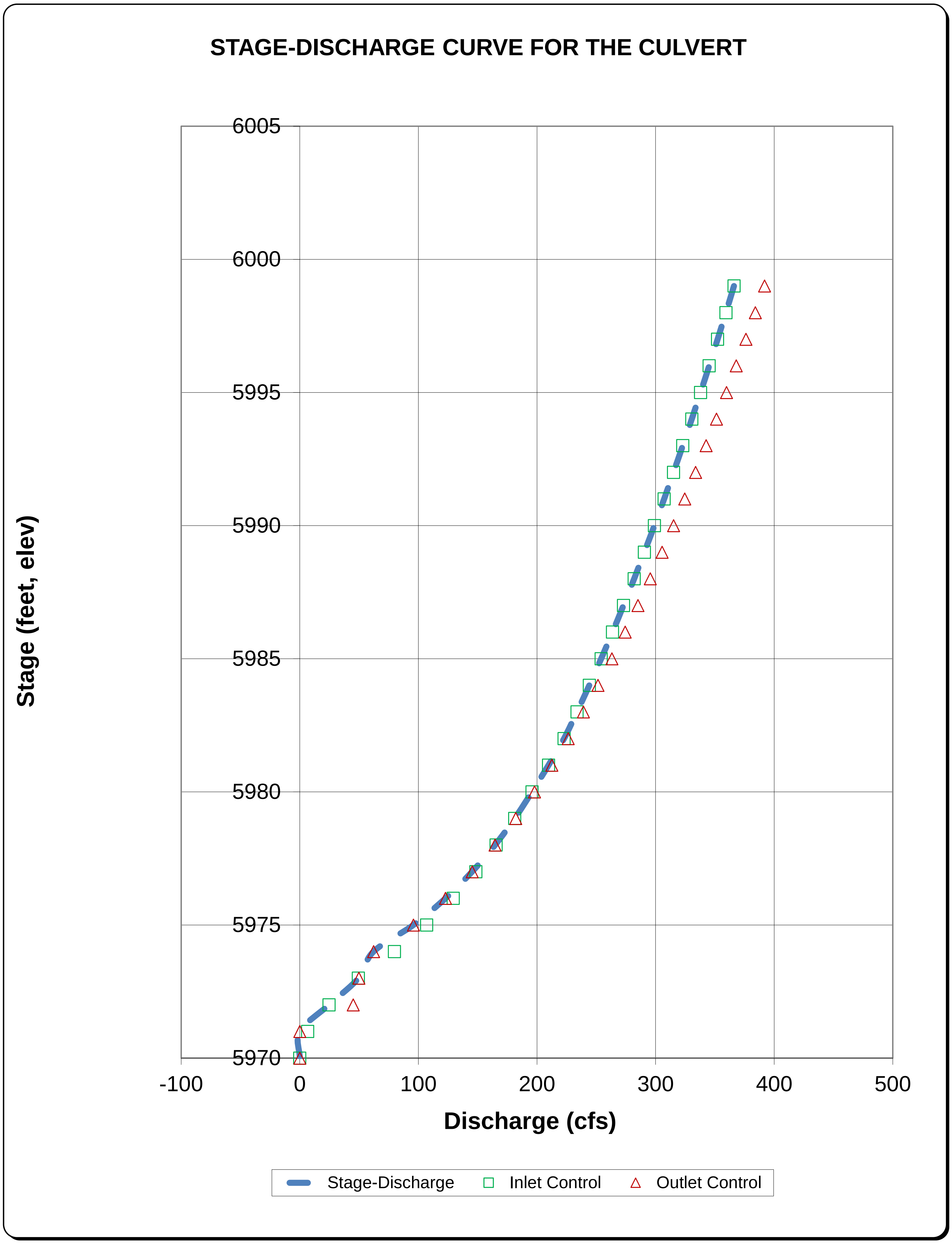
Calculations of Culvert Capacity (output):

Water Surface Elevation (ft., linked)	Tailwater Surface Elevation ft	Culvert Inlet-Control Flowrate cfs	Culvert Outlet-Control Flowrate cfs	Controlling Culvert Flowrate cfs (output)	Inlet Equation Used:	Flow Control Used
5970.00	5971.33	0.00	0.00	**0.00**	No Flow (WS < inlet)	N/A
5971.00	5971.33	6.60	0.00	**0.00**	Min. Energy. Eqn.	N/A
5972.00	5971.33	24.60	45.00	**24.60**	Min. Energy. Eqn.	INLET
5973.00	5971.33	49.40	49.72	**49.40**	Regression Eqn.	INLET
5974.00	5971.33	79.80	62.16	**62.16**	Regression Eqn.	OUTLET
5975.00	5971.33	107.00	95.78	**95.78**	Regression Eqn.	OUTLET
5976.00	5971.33	129.30	122.85	**122.85**	Regression Eqn.	OUTLET
5977.00	5971.33	148.50	145.25	**145.25**	Regression Eqn.	OUTLET
5978.00	5971.33	165.50	164.60	**164.60**	Regression Eqn.	OUTLET
5979.00	5971.33	181.20	181.96	**181.20**	Regression Eqn.	INLET
5980.00	5971.33	195.80	197.81	**195.80**	Regression Eqn.	INLET
5981.00	5971.33	209.70	212.49	**209.70**	Regression Eqn.	INLET
5982.00	5971.33	222.80	226.20	**222.80**	Regression Eqn.	INLET
5983.00	5971.33	233.70	239.10	**233.70**	Orifice Eqn.	INLET
5984.00	5971.33	244.10	251.39	**244.10**	Orifice Eqn.	INLET
5985.00	5971.33	254.10	263.07	**254.10**	Orifice Eqn.	INLET
5986.00	5971.33	263.70	274.29	**263.70**	Orifice Eqn.	INLET
5987.00	5971.33	272.90	285.06	**272.90**	Orifice Eqn.	INLET
5988.00	5971.33	281.90	295.42	**281.90**	Orifice Eqn.	INLET
5989.00	5971.33	290.50	305.42	**290.50**	Orifice Eqn.	INLET
5990.00	5971.33	299.00	315.12	**299.00**	Orifice Eqn.	INLET
5991.00	5971.33	307.20	324.52	**307.20**	Orifice Eqn.	INLET
5992.00	5971.33	315.10	333.66	**315.10**	Orifice Eqn.	INLET
5993.00	5971.33	322.90	342.60	**322.90**	Orifice Eqn.	INLET
5994.00	5971.33	330.50	351.23	**330.50**	Orifice Eqn.	INLET
5995.00	5971.33	337.90	359.71	**337.90**	Orifice Eqn.	INLET
5996.00	5971.33	345.20	367.99	**345.20**	Orifice Eqn.	INLET
5997.00	5971.33	352.30	376.07	**352.30**	Orifice Eqn.	INLET
5998.00	5971.33	359.30	383.99	**359.30**	Orifice Eqn.	INLET
5999.00	5971.33	366.10	391.76	**366.10**	Orifice Eqn.	INLET

Processing Time: 00.46 Seconds

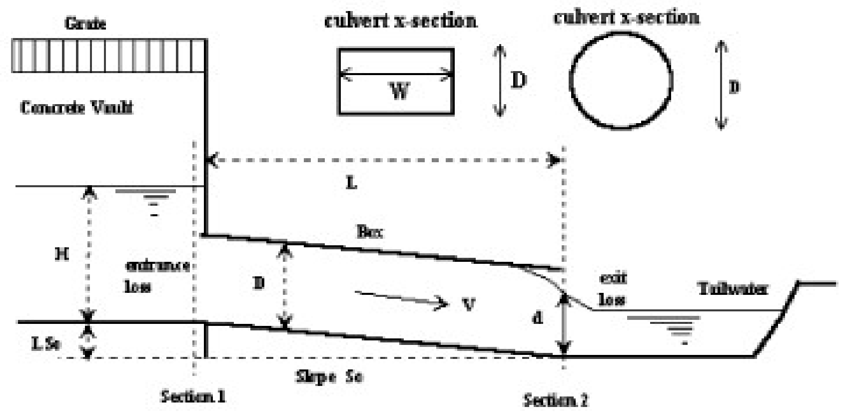
CULVERT STAGE-DISCHARGE SIZING (INLET vs. OUTLET CONTROL WITH TAILWATER EFFECTS)

Project: Trails at Crowfoot
Basin ID: Pond C



CULVERT STAGE-DISCHARGE SIZING (INLET vs. OUTLET CONTROL WITH TAILWATER EFFECTS)

Project: Trails at Crowfoot
Basin ID: Pond D
Status:



Design Information (Input):

Circular Culvert:	Barrel Diameter in Inches	D =	36	inches
	Inlet Edge Type (choose from pull-down list)		Grooved End with Headwall	
OR:				
Box Culvert:	Barrel Height (Rise) in Feet	Height (Rise) =		ft.
	Barrel Width (Span) in Feet	Width (Span) =		ft.
	Inlet Edge Type (choose from pull-down list)		Square Edge w/ 30-78 deg. Flared Wingwall	
	Number of Barrels	No =	1	
	Inlet Elevation at Culvert Invert	Inlet Elev =	5986	ft. elev.
	Outlet Elevation at Culvert Invert **OR** Slope of Culvert (ft v./ft h.)	Outlet Elev =	5985.4	ft. elev.
	Culvert Length in Feet	L =	100	ft.
	Manning's Roughness	n =	0.013	
	Bend Loss Coefficient	K_b =	0	
	Exit Loss Coefficient	K_x =	1	

Design Information (calculated):

Entrance Loss Coefficient	K_e =	0.20
Friction Loss Coefficient	K_f =	0.72
Sum of All Loss Coefficients	K_s =	1.92
Orifice Inlet Condition Coefficient	C_d =	0.99
Minimum Energy Condition Coefficient	KE_{low} =	-0.0132

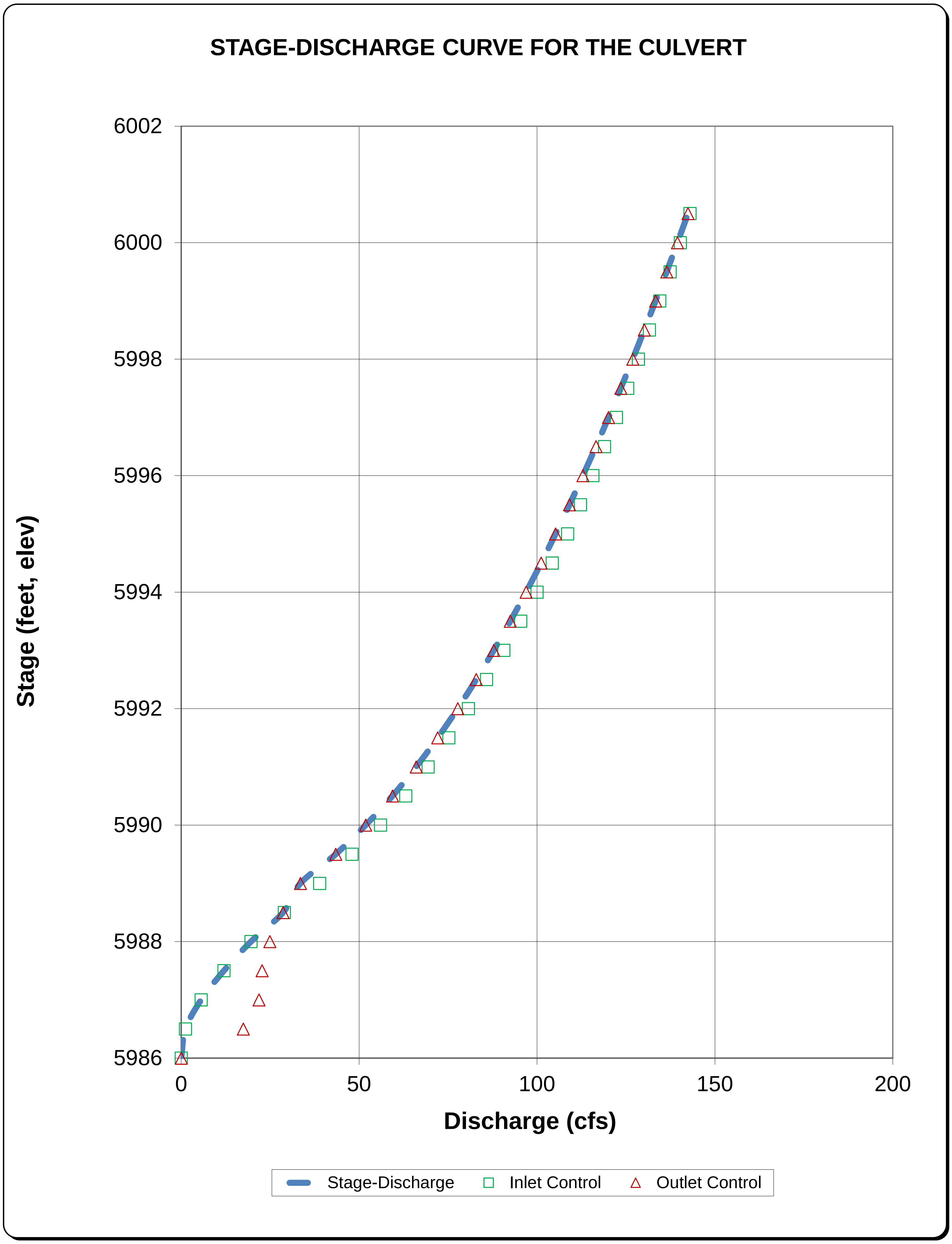
Calculations of Culvert Capacity (output):

Water Surface Elevation (ft., linked)	Tailwater Surface Elevation ft	Culvert Inlet-Control Flowrate cfs	Culvert Outlet-Control Flowrate cfs	Controlling Culvert Flowrate cfs (output)	Inlet Equation Used:	Flow Control Used
5986.00	5971.33	0.00	0.00	**0.00**	No Flow (WS < inlet)	N/A
5986.50	5971.33	1.20	17.44	**1.20**	Min. Energy. Eqn.	INLET
5987.00	5971.33	5.60	21.83	**5.60**	Min. Energy. Eqn.	INLET
5987.50	5971.33	12.00	22.71	**12.00**	Min. Energy. Eqn.	INLET
5988.00	5971.33	19.60	24.88	**19.60**	Regression Eqn.	INLET
5988.50	5971.33	29.00	28.62	**28.62**	Regression Eqn.	OUTLET
5989.00	5971.33	38.90	33.50	**33.50**	Regression Eqn.	OUTLET
5989.50	5971.33	48.00	43.42	**43.42**	Regression Eqn.	OUTLET
5990.00	5971.33	56.00	51.82	**51.82**	Regression Eqn.	OUTLET
5990.50	5971.33	63.10	59.36	**59.36**	Regression Eqn.	OUTLET
5991.00	5971.33	69.40	66.03	**66.03**	Regression Eqn.	OUTLET
5991.50	5971.33	75.20	72.10	**72.10**	Regression Eqn.	OUTLET
5992.00	5971.33	80.70	77.70	**77.70**	Regression Eqn.	OUTLET
5992.50	5971.33	85.80	82.92	**82.92**	Regression Eqn.	OUTLET
5993.00	5971.33	90.70	87.83	**87.83**	Regression Eqn.	OUTLET
5993.50	5971.33	95.40	92.48	**92.48**	Regression Eqn.	OUTLET
5994.00	5971.33	100.00	96.92	**96.92**	Regression Eqn.	OUTLET
5994.50	5971.33	104.30	101.16	**101.16**	Regression Eqn.	OUTLET
5995.00	5971.33	108.60	105.21	**105.21**	Regression Eqn.	OUTLET
5995.50	5971.33	112.20	109.12	**109.12**	Orifice Eqn.	OUTLET
5996.00	5971.33	115.70	112.89	**112.89**	Orifice Eqn.	OUTLET
5996.50	5971.33	119.00	116.55	**116.55**	Orifice Eqn.	OUTLET
5997.00	5971.33	122.30	120.09	**120.09**	Orifice Eqn.	OUTLET
5997.50	5971.33	125.50	123.53	**123.53**	Orifice Eqn.	OUTLET
5998.00	5971.33	128.50	126.89	**126.89**	Orifice Eqn.	OUTLET
5998.50	5971.33	131.60	130.14	**130.14**	Orifice Eqn.	OUTLET
5999.00	5971.33	134.50	133.32	**133.32**	Orifice Eqn.	OUTLET
5999.50	5971.33	137.40	136.45	**136.45**	Orifice Eqn.	OUTLET
6000.00	5971.33	140.30	139.47	**139.47**	Orifice Eqn.	OUTLET
6000.50	5971.33	143.00	142.44	**142.44**	Orifice Eqn.	OUTLET

Processing Time: 00.43 Seconds

CULVERT STAGE-DISCHARGE SIZING (INLET vs. OUTLET CONTROL WITH TAILWATER EFFECTS)

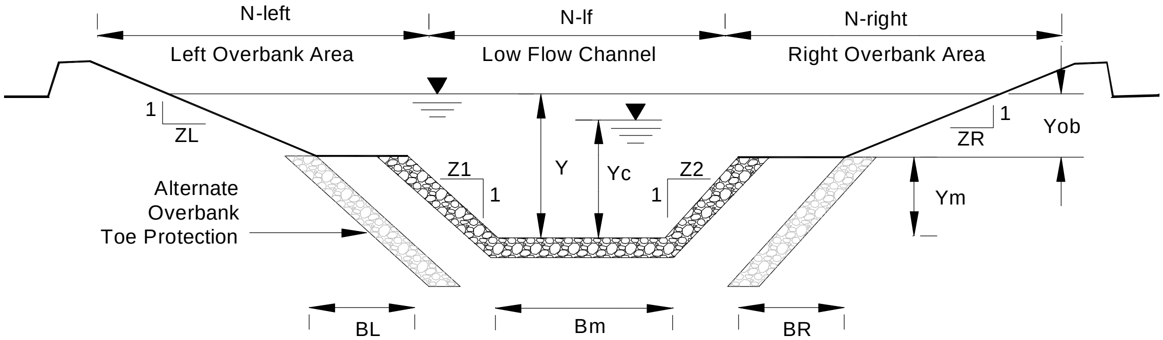
Project: Trails at Crowfoot
Basin ID: Pond D



Capacity Analysis of Composite Channel

Project: Trails at Crowfoot

Channel ID: West Channel (100-YR 268 CFS/70% of 2-YR 39 CFS)



Design Information (Input)

Channel Invert Slope	So =	0.00200 ft/ft	Left Overbank Bottom Width	BL =	8.00 ft
			Left Overbank Side Slope	ZL =	4.00 ft/ft
Low Flow Channel Bottom Width	Bm =	10.00 ft	Left Overbank Manning's n	n-left =	0.0400
Low Flow Channel Left Side Slope	Z1 =	4.00 ft/ft	Right Overbank Bottom Width	BR =	8.00 ft
Low Flow Channel Right Side Slope	Z2 =	4.00 ft/ft	Right Overbank Side Slope	ZR =	4.00 ft/ft
Low Flow Channel Manning's Nn for Qd	n-lf =	0.0250	Right Overbank Manning's n	n-right =	0.0400
Low Flow Channel Manning's Nn for Q100	n-m-Q100 =	0.0250			
(See USDCM Vol. II, n vs. Depth Graph)					
Low Flow Channel Bank-full depth	**Ym =**	**1.15 ft**	**Overbank Flow Depth Yob (Y - Ym)**	**Yob =**	**1.50 ft**

Low Flow Channel Condition for Qd			**Low Flow Channel Flow Condition for Q100**		
Top width	Tlf =	19.2 ft	Top width	Tm =	19.2 ft
Flow area	Alf =	16.8 sq ft	Flow area	Am =	45.6 sq ft
Wetted perimeter	Plf =	19.5 ft	Wetted perimeter	Pm =	19.5 ft
Discharge (Calculated)	**Qlf =**	**40.5 cfs**	**Discharge**	**Qm =**	**214.2 cfs**
Velocity	**Vlf=**	**2.4 fps**	**Velocity**	**Vm =**	**4.7 fps**
Froude number	**Fr-lf =**	**0.45**	**Froude number**	**Frm =**	**0.54**
Qd Critical Velocity	Vlfc =	4.36 fps	100-Yr. Critical Velocity	Vmc =	7.1 fps
Qd Critical Depth	Ylfc =	0.72 ft	100-Yr. Critical Depth	Ymc =	1.8 ft
Left Overbank Flow Condition for Q100			**Right Overbank Flow Condition for Q100**		
Top width	TL =	14.0 ft	Top width	TR =	14.0 ft
Flow area	AL =	16.5000 sq ft	Flow area	AR =	16.5000 sq ft
Wetted perimeter	PL =	14.1800 ft	Wetted perimeter	PR =	14.1800 ft
Discharge	**QL =**	**30.4 cfs**	**Discharge**	**QR =**	**30.4 cfs**
Velocity	**VL =**	**1.8 fps**	**Velocity**	**VR =**	**1.8 fps**
Froude number	**FrL =**	**0.30**	**Froude number**	**FrR =**	**0.30**
100-Yr. Critical Velocity	VLc =	4.5 fps	100-Yr. Critical Velocity	VRc =	4.5 fps
100-Yr. Critical Depth in Overbanks	YLc =	0.7 ft	100-Yr. Critical Depth in Overbanks	YRc =	0.7 ft

Composite Cross-Section Flow Condition for Q100

Top width	**T =**	**47.2 ft**	**Discharge**	**Q =**	**275.0 cfs**
Channel Depth Y	**Y =**	**2.65 ft**	**Velocity**	**V =**	**3.5 fps**
Flow area	A =	78.6 sq ft	**Froude number**	**Fr =**	**0.48**
Wetted perimeter	P =	47.9 ft	100-Yr. Critical Velocity	Vc =	6.0 fps
Cross-Sectional Manning's n (Calculated)	n =	0.0265	100-Yr. Critical Depth in Overbanks	Yc =	0.76 ft

IV. Copies of graphs, tables, and nomographs used

A. FIRM
B. Soils
C. 1-Hour Rainfall Data
D. Excerpts from adjacent Studies

NOTES TO USERS

This map is for use in administering the National Flood Insurance Program. It does not necessarily identify all areas subject to flooding, particularly from local drainage sources of small size. The **community map repository** should be consulted for possible updated or additional flood hazard information.

To obtain more detailed information in areas where **Base Flood Elevations** (BFEs) and/or **floodways** have been determined, users are encouraged to consult the Flood Profiles and Floodway Data and/or Summary of Stillwater Elevations tables shown on this FIRM. Users should be aware that BFEs shown on the FIRM represent rounded whole-foot elevations. These BFEs are intended for flood insurance rating purposes only and should not be used as the sole source of flood elevation information. Accordingly, flood elevation data presented in the Flood Profiles and Floodway Data and/or Summary of Stillwater Elevations tables should be utilized in conjunction with the FIRM for purposes of construction and/or floodplain management.

Boundaries of the **floodways** were computed at cross sections and interpolated between cross sections. The floodways were based on hydraulic considerations with regard to requirements of the National Flood Insurance Program. Floodway widths and other pertinent floodway data are provided in the Floodway Data table shown on this FIRM.

The **projection** used in the preparation of this map was Universal Transverse Mercator (UTM) zone 13. The **horizontal datum** was NAD 83, GRS 1980 spheroid. Differences in datum, spheroid, projection or UTM zones used in the production of FIRMs for adjacent jurisdictions may result in slight positional differences in map features across jurisdiction boundaries. These differences do not affect the accuracy of this FIRM.

Flood elevations on this map are referenced to the North American Vertical Datum of 1988. These flood elevations must be compared to structure and ground elevations referenced to the same **vertical datum**. For information regarding conversion between the National Geodetic Vertical Datum of 1929 and the North American Vertical Datum of 1988, visit the National Geodetic Survey website at http://www.ngs.noaa.gov or contact the National Geodetic Survey at the following address:

NGS Information Services
NOAA, N/NGS12
National Geodetic Survey
SSMC-3, #9202
1315 East-West Highway
Silver Spring, Maryland 20910-3282
(301) 713-3242

To obtain current elevation, description, and/or location information for **bench marks** shown on this map, please contact the Information Services Branch of the National Geodetic Survey at **(301) 713- 3242**, or visit its website at http://www.ngs.noaa.gov.

Base map information shown on this FIRM was provided by the Douglas County GIS Department and the Town of Castle Rock GIS Department. Additional input was provided by the City of Lone Tree and Town of Parker. These data are current as of 2010.

Certain areas not in Special Flood Hazard Areas may be protected by **flood control structures**. Refer to Section 2.4 "Flood Protection Measures" of the Flood Insurance Study report for information on flood control structures for this jurisdiction.

The **profile baselines** depicted on this map represent the hydraulic modeling baselines that match the flood profiles in the FIS report. As a result of improved topographic data, the **profile baseline**, in some cases, may deviate significantly from the channel centerline or appear outside the SFHA.

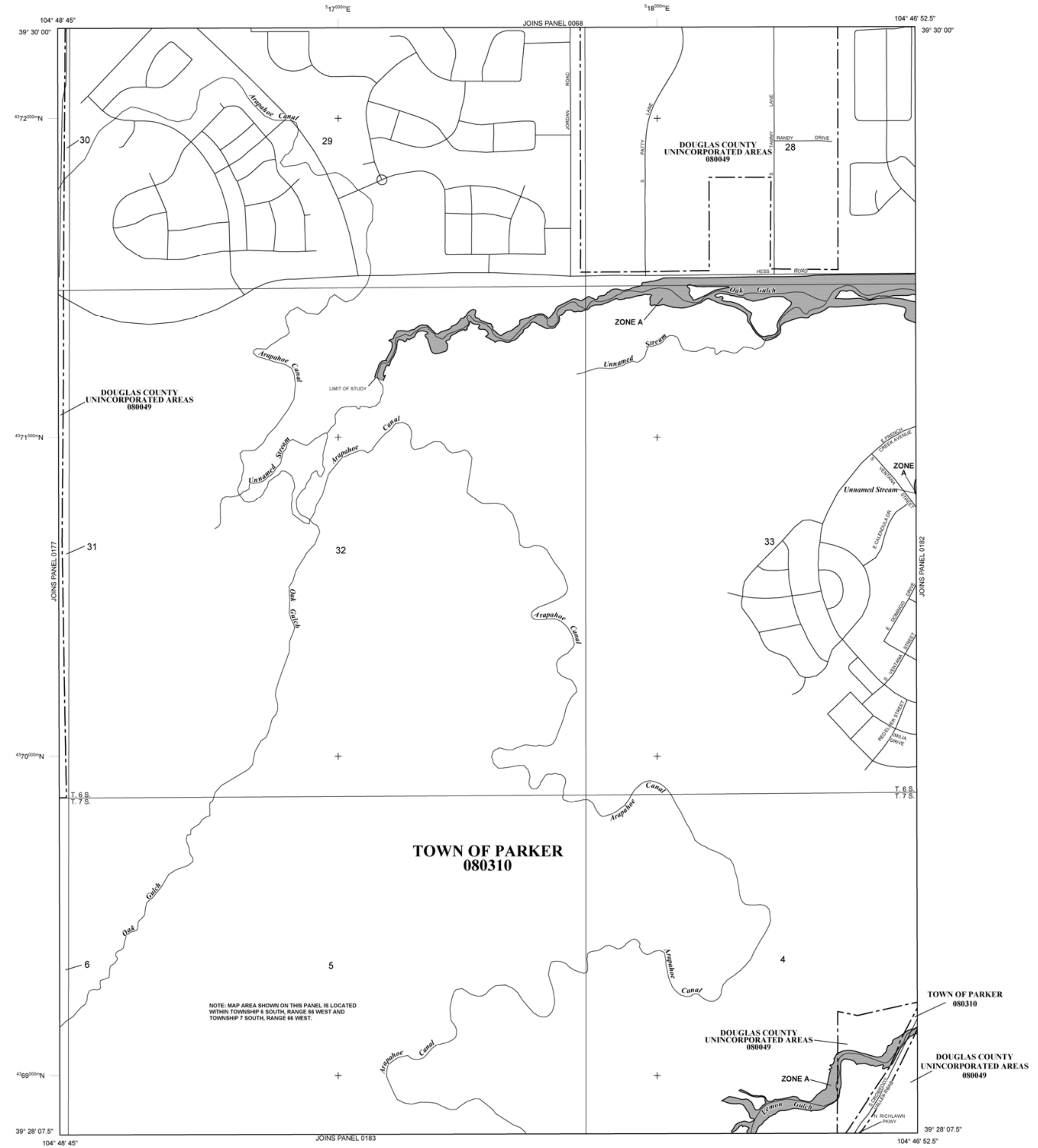
Based on updated topographic information, this map reflects more detailed and up-to-date **stream channel configurations and floodplain delineations** than those shown on the previous FIRM for this jurisdiction. As a result, the Flood Profiles and Floodway Data tables for multiple streams in the Flood Insurance Study Report (which contains authoritative hydraulic data) may reflect stream channel distances that differ from what is shown on the map. Also, the road to floodplain relationships for unrevised streams may differ from what is shown on previous maps.

Corporate limits shown on this map are based on the best data available at the time of publication. Because changes due to annexations or de-annexations may have occurred after this map was published, map users should contact appropriate community officials to verify current corporate limit locations.

Please refer to the separately printed **Map Index** for an overview map of the county showing the layout of map panels; community map repository addresses; and a Listing of Communities table containing National Flood Insurance Program dates for each community as well as a listing of the panels on which each community is located.

For information on available products associated with this FIRM visit the **Map Service Center (MSC)** website at http://msc.fema.gov. Available products may include previously issued Letters of Map Change, a Flood Insurance Study Report, and/or digital versions of this map. Many of these products can be ordered or obtained directly from the MSC website.

If you have **questions about this map,** how to order products, or the National Flood Insurance Program in general, please call the **FEMA Map Information eXchange (FMIX)** at **1-877-FEMA-MAP** (1-877-336-2627) or visit the FEMA website at http://www.fema.gov/business/nfip.



LEGEND

SPECIAL FLOOD HAZARD AREAS (SFHAs) SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD

The 1% annual chance flood (100-year flood), also known as the base flood, is the flood that has a 1% chance of being equaled or exceeded in any given year. The Special Flood Hazard Area is the area subject to flooding by the 1% annual chance flood. Areas of Special Flood Hazard include Zones A, AE, AH, AO, AR, A99, V, and VE. The Base Flood Elevation is the water-surface elevation of the 1% annual chance flood.

ZONE A No Base Flood Elevations determined.

ZONE AE Base Flood Elevations determined.

ZONE AH Flood depths of 1 to 3 feet (usually areas of ponding); Base Flood Elevations determined.

ZONE AO Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.

ZONE AR Special Flood Hazard Areas formerly protected from the 1% annual chance flood by a flood control system that was subsequently decertified. Zone AR indicates that the former flood control system is being restored to provide protection from the 1% annual chance or greater flood.

ZONE A99 Area to be protected from 1% annual chance flood by a Federal flood protection system under construction; no Base Flood Elevations determined.

ZONE V Coastal flood zone with velocity hazard (wave action); no Base Flood Elevations determined.

ZONE VE Coastal flood zone with velocity hazard (wave action); Base Flood Elevations determined.

FLOODWAY AREAS IN ZONE AE

The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without substantial increases in flood heights.

OTHER FLOOD AREAS

ZONE X Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.

OTHER AREAS

ZONE X Areas determined to be outside the 0.2% annual chance floodplain.

ZONE D Areas in which flood hazards are undetermined, but possible.

COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS

OTHERWISE PROTECTED AREAS (OPAs)

CBRS areas and OPAs are normally located within or adjacent to Special Flood Hazard Areas.

1% Annual Chance Floodplain Boundary

0.2% Annual Chance Floodplain Boundary

Floodway boundary

Zone D boundary

CBRS and OPA boundary

Boundary dividing Special Flood Hazard Area Zones and boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths, or flood velocities.

~~~ 513 ~~~ Base Flood Elevation line and value; elevation in feet*

(EL 987) Base Flood Elevation value where uniform within zone; elevation in feet*

*Referenced to the North American Vertical Datum of 1988

A — A Cross section line

23 - - - - 23 Transect line

45° 02' 08", 93° 02' 12" Geographic coordinates referenced to the North American Datum of 1983 (NAD 83) Western Hemisphere

$^{48}89^{000m}$ N 1000-meter Universal Transverse Mercator grid values, zone 13

DX5510 × Bench mark (see explanation in Notes to Users section of this FIRM panel)

• M1.5 River Mile

MAP REPOSITORIES
Refer to Map Repositories list on Map Index

EFFECTIVE DATE OF COUNTYWIDE
FLOOD INSURANCE RATE MAP

SEPTEMBER 30, 2005

EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL

MARCH 16, 2016: to update corporate limits, to change base flood elevations, to add base flood elevations, to add special flood hazard areas, to update map format, to add roads and road names, to reflect updated topographic information, to incorporate previously issued letters of map revision.

For community map revision history prior to countywide mapping, refer to the Community Map History table located in the Flood Insurance Study report for this jurisdiction.

To determine if flood insurance is available in this community, contact your insurance agent or call the National Flood Insurance Program at 1-800-638-6620.

N

MAP SCALE 1" = 500'

250 0 500 1000 FEET
150 0 150 300 METERS

NFIP

NATIONAL FLOOD INSURANCE PROGRAM

PANEL 0181G

FIRM

FLOOD INSURANCE RATE MAP

DOUGLAS COUNTY, COLORADO
AND INCORPORATED AREAS

PANEL 181 OF 495
(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
DOUGLAS COUNTY	080049	0181	G
PARKER, TOWN OF	080310	0181	G

Notice to User: The **Map Number** shown below should be used when placing map orders; the **Community Number** shown above should be used on insurance applications for the subject community.

MAP NUMBER
08035C0181G
MAP REVISED
MARCH 16, 2016

Federal Emergency Management Agency
~~~

NOTES TO USERS

This map is for use in administering the National Flood Insurance Program. It does not necessarily identify all areas subject to flooding, particularly from local drainage sources of small size. The **community map repository** should be consulted for possible updated or additional flood hazard information.

To obtain more detailed information in areas where **Base Flood Elevations** (BFEs) and/or **floodways** have been determined, users are encouraged to consult the Flood Profiles and Floodway Data and/or Summary of Stillwater Elevations tables shown on this FIRM. Users should be aware that BFEs shown on the FIRM represent rounded whole-foot elevations. These BFEs are intended for flood insurance rating purposes only and should not be used as the sole source of flood elevation information. Accordingly, flood elevation data presented in the Flood Profiles and Floodway Data and/or Summary of Stillwater Elevations tables should be utilized in conjunction with the FIRM for purposes of construction and/or floodplain management.

Boundaries of the **floodways** were computed at cross sections and interpolated between cross sections. The floodways were based on hydraulic considerations with regard to requirements of the National Flood Insurance Program. Floodway widths and other pertinent floodway data are provided in the Floodway Data table shown on this FIRM.

The **projection** used in the preparation of this map was Universal Transverse Mercator (UTM) zone 13. The **horizontal datum** was NAD 83, GRS 1980 spheroid. Differences in datum, spheroid, projection or UTM zones used in the production of FIRMs for adjacent jurisdictions may result in slight positional differences in map features across jurisdiction boundaries. These differences do not affect the accuracy of this FIRM.

Flood elevations on this map are referenced to the North American Vertical Datum of 1988. These flood elevations must be compared to structure and ground elevations referenced to the same **vertical datum**. For information regarding conversion between the National Geodetic Vertical Datum of 1929 and the North American Vertical Datum of 1988, visit the National Geodetic Survey website at http://www.ngs.noaa.gov or contact the National Geodetic Survey at the following address:

NGS Information Services
NOAA, N/NGS12
National Geodetic Survey
SSMC-3, #9202
1315 East-West Highway
Silver Spring, Maryland 20910-3282
(301) 713-3242

To obtain current elevation, description, and/or location information for **bench marks** shown on this map, please contact the Information Services Branch of the National Geodetic Survey at **(301) 713- 3242**, or visit its website at http://www.ngs.noaa.gov.

Base map information shown on this FIRM was provided by the Douglas County GIS Department and the Town of Castle Rock GIS Department. Additional input was provided by the City of Lone Tree and Town of Parker. These data are current as of 2010.

Certain areas not in Special Flood Hazard Areas may be protected by **flood control structures**. Refer to Section 2.4 "Flood Protection Measures" of the Flood Insurance Study report for information on flood control structures for this jurisdiction.

The **profile baselines** depicted on this map represent the hydraulic modeling baselines that match the flood profiles in the FIS report. As a result of improved topographic data, the **profile baseline**, in some cases, may deviate significantly from the channel centerline or appear outside the SFHA.

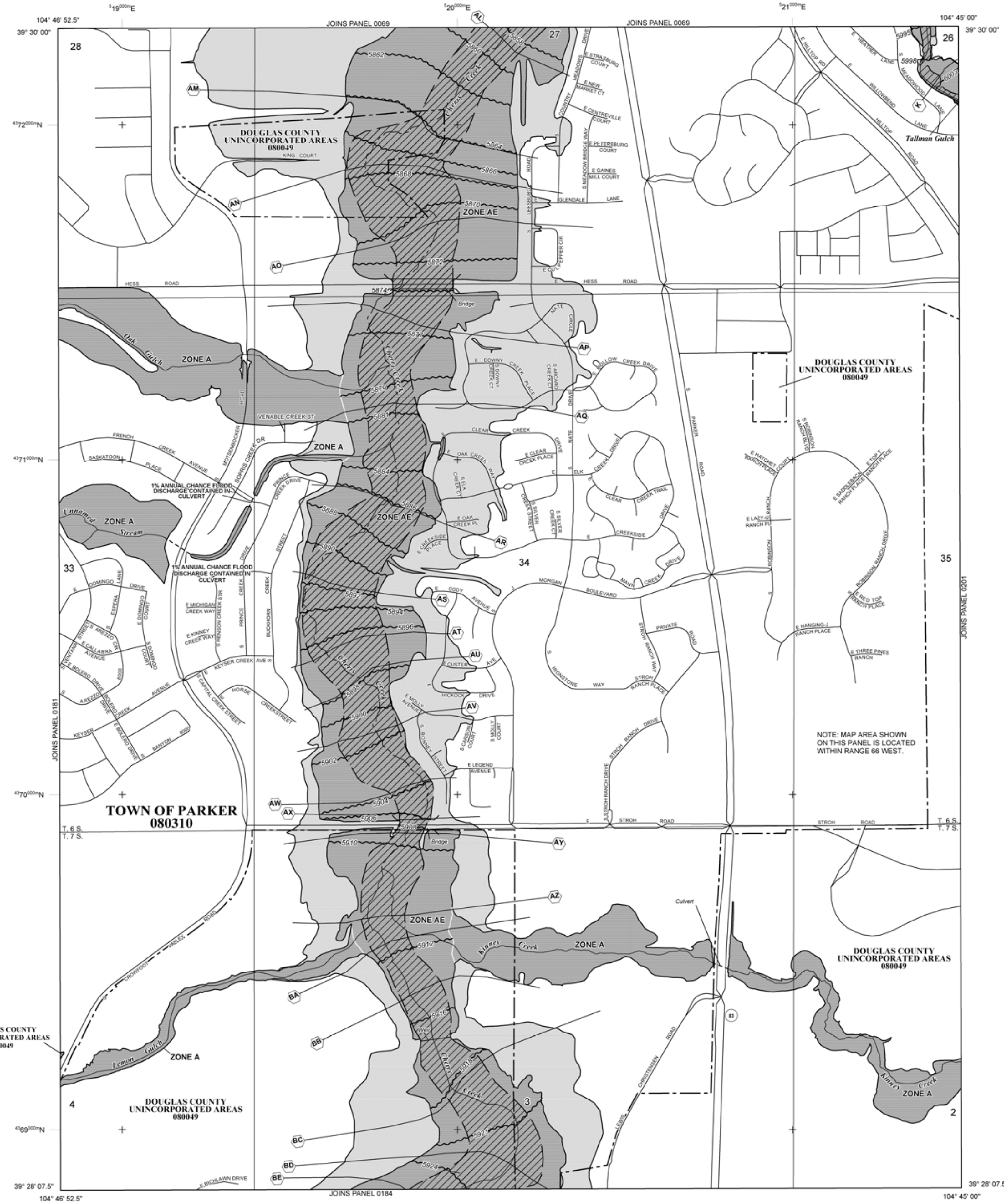
Based on updated topographic information, this map reflects more detailed and up-to-date **stream channel configurations and floodplain delineations** than those shown on the previous FIRM for this jurisdiction. As a result, the Flood Profiles and Floodway Data tables for multiple streams in the Flood Insurance Study Report (which contains authoritative hydraulic data) may reflect stream channel distances that differ from what is shown on the map. Also, the road to floodplain relationships for unrevised streams may differ from what is shown on previous maps.

Corporate limits shown on this map are based on the best data available at the time of publication. Because changes due to annexations or de-annexations may have occurred after this map was published, map users should contact appropriate community officials to verify current corporate limit locations.

Please refer to the separately printed **Map Index** for an overview map of the county showing the layout of map panels; community map repository addresses; and a Listing of Communities table containing National Flood Insurance Program dates for each community as well as a listing of the panels on which each community is located.

For information on available products associated with this FIRM visit the **Map Service Center (MSC)** website at http://msc.fema.gov. Available products may include previously issued Letters of Map Change, a Flood Insurance Study Report, and/or digital versions of this map. Many of these products can be ordered or obtained directly from the MSC website.

If you have **questions about this map,** how to order products, or the National Flood Insurance Program in general, please call the **FEMA Map Information eXchange (FMIX)** at **1-877-FEMA-MAP** (1-877-336-2627) or visit the FEMA website at http://www.fema.gov/business/nfip.



LEGEND

SPECIAL FLOOD HAZARD AREAS (SFHAs) SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD

The 1% annual chance flood (100-year flood), also known as the base flood, is the flood that has a 1% chance of being equaled or exceeded in any given year. The Special Flood Hazard Area is the area subject to flooding by the 1% annual chance flood. Areas of Special Flood Hazard include Zones A, AE, AH, AO, AR, A99, V, and VE. The Base Flood Elevation is the water-surface elevation of the 1% annual chance flood.

ZONE A	No Base Flood Elevations determined.
ZONE AE	Base Flood Elevations determined.
ZONE AH	Flood depths of 1 to 3 feet (usually areas of ponding); Base Flood Elevations determined.
ZONE AO	Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.
ZONE AR	Special Flood Hazard Areas formerly protected from the 1% annual chance flood by a flood control system that was subsequently decertified. Zone AR indicates that the former flood control system is being restored to provide protection from the 1% annual chance or greater flood.
ZONE A99	Area to be protected from 1% annual chance flood by a Federal flood protection system under construction; no Base Flood Elevations determined.
ZONE V	Coastal flood zone with velocity hazard (wave action); no Base Flood Elevations determined.
ZONE VE	Coastal flood zone with velocity hazard (wave action); Base Flood Elevations determined.

FLOODWAY AREAS IN ZONE AE

The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without substantial increases in flood heights.

OTHER FLOOD AREAS

ZONE X Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.

OTHER AREAS

ZONE X Areas determined to be outside the 0.2% annual chance floodplain.

ZONE D Areas in which flood hazards are undetermined, but possible.

COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS

OTHERWISE PROTECTED AREAS (OPAs)

CBRS areas and OPAs are normally located within or adjacent to Special Flood Hazard Areas.

1% Annual Chance Floodplain Boundary

0.2% Annual Chance Floodplain Boundary

Floodway boundary

Zone D boundary

CBRS and OPA boundary

Boundary dividing Special Flood Hazard Area Zones and boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths, or flood velocities.

513 — Base Flood Elevation line and value; elevation in feet*

(EL 987) — Base Flood Elevation value where uniform within zone; elevation in feet*

*Referenced to the North American Vertical Datum of 1988

A — A Cross section line

23 - - - 23 Transect line

45° 02' 08", 93° 02' 12" — Geographic coordinates referenced to the North American Datum of 1983 (NAD 83) Western Hemisphere

4889000m N — 1000-meter Universal Transverse Mercator grid values, zone 13

DX5510 × — Bench mark (see explanation in Notes to Users section of this FIRM panel)

• M1.5 — River Mile

MAP REPOSITORIES
Refer to Map Repositories list on Map Index

EFFECTIVE DATE OF COUNTYWIDE
FLOOD INSURANCE RATE MAP

SEPTEMBER 30, 2005

EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL

MARCH 16, 2016: to update corporate limits, to change base flood elevations, to add base flood elevations, to add special flood hazard areas, to update map format, to add roads and road names, to reflect updated topographic information, to incorporate previously issued letters of map revision.

For community map revision history prior to countywide mapping, refer to the Community Map History table located in the Flood Insurance Study report for this jurisdiction.

To determine if flood insurance is available in this community, contact your insurance agent or call the National Flood Insurance Program at 1-800-638-6620.

MAP SCALE 1" = 500'

250 0 500 1000 FEET

150 0 150 300 METERS

NFIP

NATIONAL FLOOD INSURANCE PROGRAM

PANEL 0182G

FIRM

FLOOD INSURANCE RATE MAP

DOUGLAS COUNTY, COLORADO
AND INCORPORATED AREAS

PANEL 182 OF 495
(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
DOUGLAS COUNTY	080049	0182	G
PARKER, TOWN OF	080310	0182	G

Notice to User: The **Map Number** shown below should be used when placing map orders; the **Community Number** shown above should be used on insurance applications for the subject community.

MAP NUMBER
08035C0182G

MAP REVISED
MARCH 16, 2016

Federal Emergency Management Agency

NOTES TO USERS

This map is for use in administering the National Flood Insurance Program. It does not necessarily identify all areas subject to flooding, particularly from local drainage sources of small size. The **community map repository** should be consulted for possible updated or additional flood hazard information.

To obtain more detailed information in areas where **Base Flood Elevations** (BFEs) and/or **floodways** have been determined, users are encouraged to consult the Flood Profiles and Floodway Data and/or Summary of Stillwater Elevations tables shown on this FIRM. Users should be aware that BFEs shown on the FIRM represent rounded whole-foot elevations. These BFEs are intended for flood insurance rating purposes only and should not be used as the sole source of flood elevation information. Accordingly, flood elevation data presented in the Flood Profiles and Floodway Data and/or Summary of Stillwater Elevations tables should be utilized in conjunction with the FIRM for purposes of construction and/or floodplain management.

Boundaries of the **floodways** were computed at cross sections and interpolated between cross sections. The floodways were based on hydraulic considerations with regard to requirements of the National Flood Insurance Program. Floodway widths and other pertinent floodway data are provided in the Floodway Data table shown on this FIRM.

The **projection** used in the preparation of this map was Universal Transverse Mercator (UTM) zone 13. The **horizontal datum** was NAD 83, GRS 1980 spheroid. Differences in datum, spheroid, projection or UTM zones used in the production of FIRMs for adjacent jurisdictions may result in slight positional differences in map features across jurisdiction boundaries. These differences do not affect the accuracy of this FIRM.

Flood elevations on this map are referenced to the North American Vertical Datum of 1988. These flood elevations must be compared to structure and ground elevations referenced to the same **vertical datum**. For information regarding conversion between the National Geodetic Vertical Datum of 1929 and the North American Vertical Datum of 1988, visit the National Geodetic Survey website at http://www.ngs.noaa.gov or contact the National Geodetic Survey at the following address:

NGS Information Services
NOAA, N/NGS12
National Geodetic Survey
SSMC-3, #9202
1315 East-West Highway
Silver Spring, Maryland 20910-3282
(301) 713-3242

To obtain current elevation, description, and/or location information for **bench marks** shown on this map, please contact the Information Services Branch of the National Geodetic Survey at **(301) 713- 3242**, or visit its website at http://www.ngs.noaa.gov.

Base map information shown on this FIRM was provided by the Douglas County GIS Department and the Town of Castle Rock GIS Department. Additional input was provided by the City of Lone Tree and Town of Parker. These data are current as of 2010.

Certain areas not in Special Flood Hazard Areas may be protected by **flood control structures**. Refer to Section 2.4 "Flood Protection Measures" of the Flood Insurance Study report for information on flood control structures for this jurisdiction.

The **profile baselines** depicted on this map represent the hydraulic modeling baselines that match the flood profiles in the FIS report. As a result of improved topographic data, the **profile baseline**, in some cases, may deviate significantly from the channel centerline or appear outside the SFHA.

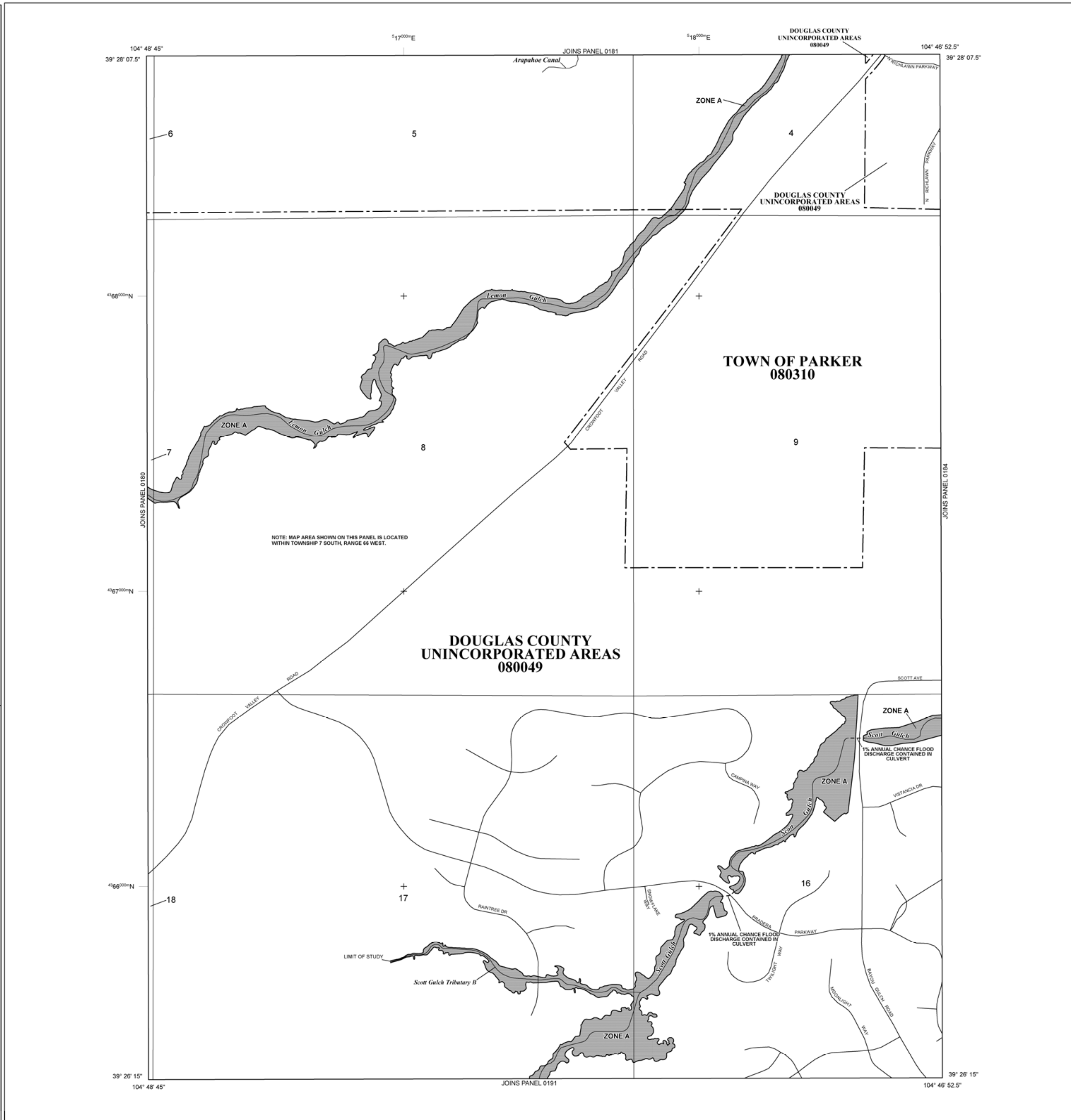
Based on updated topographic information, this map reflects more detailed and up-to-date **stream channel configurations and floodplain delineations** than those shown on the previous FIRM for this jurisdiction. As a result, the Flood Profiles and Floodway Data tables for multiple streams in the Flood Insurance Study Report (which contains authoritative hydraulic data) may reflect stream channel distances that differ from what is shown on the map. Also, the road to floodplain relationships for unrevised streams may differ from what is shown on previous maps.

Corporate limits shown on this map are based on the best data available at the time of publication. Because changes due to annexations or de-annexations may have occurred after this map was published, map users should contact appropriate community officials to verify current corporate limit locations.

Please refer to the separately printed **Map Index** for an overview map of the county showing the layout of map panels; community map repository addresses; and a Listing of Communities table containing National Flood Insurance Program dates for each community as well as a listing of the panels on which each community is located.

For information on available products associated with this FIRM visit the **Map Service Center (MSC)** website at http://msc.fema.gov. Available products may include previously issued Letters of Map Change, a Flood Insurance Study Report, and/or digital versions of this map. Many of these products can be ordered or obtained directly from the MSC website.

If you have **questions about this map,** how to order products, or the National Flood Insurance Program in general, please call the **FEMA Map Information eXchange (FMIX)** at **1-877-FEMA-MAP** (1-877-336-2627) or visit the FEMA website at http://www.fema.gov/business/nfip.



LEGEND

SPECIAL FLOOD HAZARD AREAS (SFHAs) SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD

The 1% annual chance flood (100-year flood), also known as the base flood, is the flood that has a 1% chance of being equaled or exceeded in any given year. The Special Flood Hazard Area is the area subject to flooding by the 1% annual chance flood. Areas of Special Flood Hazard include Zones A, AE, AH, AO, AR, A99, V, and VE. The Base Flood Elevation is the water-surface elevation of the 1% annual chance flood.

ZONE A	No Base Flood Elevations determined.
ZONE AE	Base Flood Elevations determined.
ZONE AH	Flood depths of 1 to 3 feet (usually areas of ponding); Base Flood Elevations determined.
ZONE AO	Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.
ZONE AR	Special Flood Hazard Areas formerly protected from the 1% annual chance flood by a flood control system that was subsequently decertified. Zone AR indicates that the former flood control system is being restored to provide protection from the 1% annual chance or greater flood.
ZONE A99	Area to be protected from 1% annual chance flood by a Federal flood protection system under construction; no Base Flood Elevations determined.
ZONE V	Coastal flood zone with velocity hazard (wave action); no Base Flood Elevations determined.
ZONE VE	Coastal flood zone with velocity hazard (wave action); Base Flood Elevations determined.

FLOODWAY AREAS IN ZONE AE

The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without substantial increases in flood heights.

OTHER FLOOD AREAS

ZONE X	Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.

OTHER AREAS

ZONE X	Areas determined to be outside the 0.2% annual chance floodplain.
ZONE D	Areas in which flood hazards are undetermined, but possible.

COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS

OTHERWISE PROTECTED AREAS (OPAs)

CBRS areas and OPAs are normally located within or adjacent to Special Flood Hazard Areas.

	1% Annual Chance Floodplain Boundary
	0.2% Annual Chance Floodplain Boundary
	Floodway boundary
	Zone D boundary
	CBRS and OPA boundary
	Boundary dividing Special Flood Hazard Area Zones and boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths, or flood velocities.
513	Base Flood Elevation line and value; elevation in feet*
(EL 987)	Base Flood Elevation value where uniform within zone; elevation in feet*

*Referenced to the North American Vertical Datum of 1988

A — A	Cross section line
23 - - - - 23	Transect line
45° 02' 08", 93° 02' 12"	Geographic coordinates referenced to the North American Datum of 1983 (NAD 83) Western Hemisphere
$^{48}89^{000m}$ N	1000-meter Universal Transverse Mercator grid values, zone 13
DX5510 ×	Bench mark (see explanation in Notes to Users section of this FIRM panel)
• M1.5	River Mile

MAP REPOSITORIES
Refer to Map Repositories list on Map Index

EFFECTIVE DATE OF COUNTYWIDE
FLOOD INSURANCE RATE MAP

SEPTEMBER 30, 2005

EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL

MARCH 16, 2016: to update corporate limits, to change base flood elevations, to add base flood elevations, to add special flood hazard areas, to update map format, to add roads and road names, to reflect updated topographic information, to incorporate previously issued letters of map revision.

For community map revision history prior to countywide mapping, refer to the Community Map History table located in the Flood Insurance Study report for this jurisdiction.

To determine if flood insurance is available in this community, contact your insurance agent or call the National Flood Insurance Program at 1-800-638-6620.

N

MAP SCALE 1" = 500'

250 0 500 1000 FEET

150 0 150 300 METERS

NFIP

NATIONAL FLOOD INSURANCE PROGRAM

PANEL 0183G

FIRM

FLOOD INSURANCE RATE MAP

DOUGLAS COUNTY, COLORADO
AND INCORPORATED AREAS

PANEL 183 OF 495
(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
DOUGLAS COUNTY	080049	0183	G
PARKER, TOWN OF	080310	0183	G

Notice to User: The **Map Number** shown below should be used when placing map orders; the **Community Number** shown above should be used on insurance applications for the subject community.

MAP NUMBER
08035C0183G
MAP REVISED
MARCH 16, 2016

Federal Emergency Management Agency

NOTES TO USERS

This map is for use in administering the National Flood Insurance Program. It does not necessarily identify all areas subject to flooding, particularly from local drainage sources of small size. The **community map repository** should be consulted for possible updated or additional flood hazard information.

To obtain more detailed information in areas where **Base Flood Elevations** (BFEs) and/or **floodways** have been determined, users are encouraged to consult the Flood Profiles and Floodway Data and/or Summary of Stillwater Elevations tables shown on this FIRM. Users should be aware that BFEs shown on the FIRM represent rounded whole-foot elevations. These BFEs are intended for flood insurance rating purposes only and should not be used as the sole source of flood elevation information. Accordingly, flood elevation data presented in the Flood Profiles and Floodway Data and/or Summary of Stillwater Elevations tables should be utilized in conjunction with the FIRM for purposes of construction and/or floodplain management.

Boundaries of the **floodways** were computed at cross sections and interpolated between cross sections. The floodways were based on hydraulic considerations with regard to requirements of the National Flood Insurance Program. Floodway widths and other pertinent floodway data are provided in the Floodway Data table shown on this FIRM.

The **projection** used in the preparation of this map was Universal Transverse Mercator (UTM) zone 13. The **horizontal datum** was NAD 83, GRS 1980 spheroid. Differences in datum, spheroid, projection or UTM zones used in the production of FIRMs for adjacent jurisdictions may result in slight positional differences in map features across jurisdiction boundaries. These differences do not affect the accuracy of this FIRM.

Flood elevations on this map are referenced to the North American Vertical Datum of 1988. These flood elevations must be compared to structure and ground elevations referenced to the same **vertical datum**. For information regarding conversion between the National Geodetic Vertical Datum of 1929 and the North American Vertical Datum of 1988, visit the National Geodetic Survey website at http://www.ngs.noaa.gov or contact the National Geodetic Survey at the following address:

NGS Information Services
NOAA, N/NGS12
National Geodetic Survey
SSMC-3, #9202
1315 East-West Highway
Silver Spring, Maryland 20910-3282
(301) 713-3242

To obtain current elevation, description, and/or location information for **bench marks** shown on this map, please contact the Information Services Branch of the National Geodetic Survey at **(301) 713- 3242**, or visit its website at http://www.ngs.noaa.gov.

Base map information shown on this FIRM was provided by the Douglas County GIS Department and the Town of Castle Rock GIS Department. Additional input was provided by the City of Lone Tree and Town of Parker. These data are current as of 2010.

Certain areas not in Special Flood Hazard Areas may be protected by **flood control structures**. Refer to Section 2.4 "Flood Protection Measures" of the Flood Insurance Study report for information on flood control structures for this jurisdiction.

The **profile baselines** depicted on this map represent the hydraulic modeling baselines that match the flood profiles in the FIS report. As a result of improved topographic data, the **profile baseline**, in some cases, may deviate significantly from the channel centerline or appear outside the SFHA.

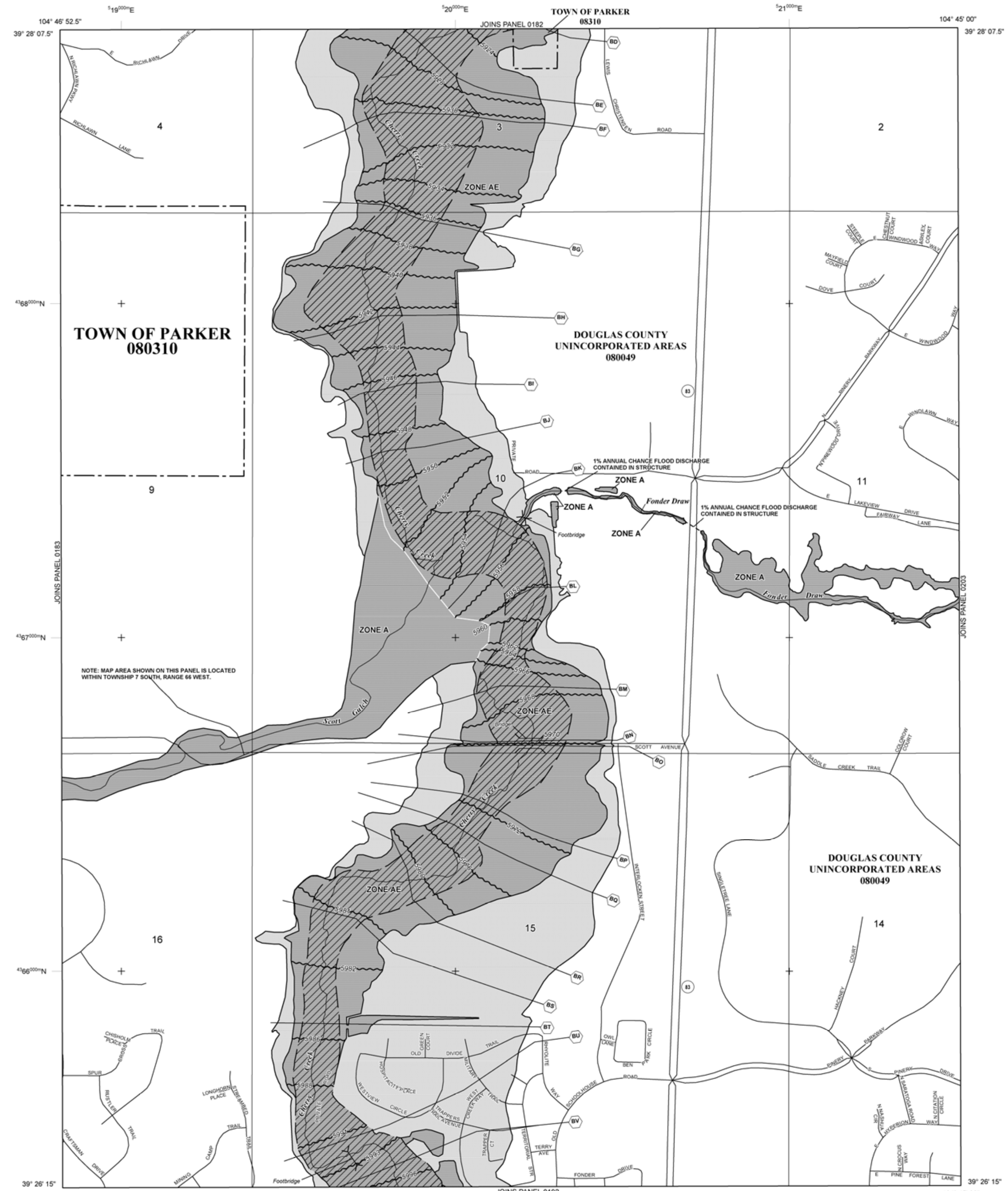
Based on updated topographic information, this map reflects more detailed and up-to-date **stream channel configurations and floodplain delineations** than those shown on the previous FIRM for this jurisdiction. As a result, the Flood Profiles and Floodway Data tables for multiple streams in the Flood Insurance Study Report (which contains authoritative hydraulic data) may reflect stream channel distances that differ from what is shown on the map. Also, the road to floodplain relationships for unrevised streams may differ from what is shown on previous maps.

Corporate limits shown on this map are based on the best data available at the time of publication. Because changes due to annexations or de-annexations may have occurred after this map was published, map users should contact appropriate community officials to verify current corporate limit locations.

Please refer to the separately printed **Map Index** for an overview map of the county showing the layout of map panels; community map repository addresses; and a Listing of Communities table containing National Flood Insurance Program dates for each community as well as a listing of the panels on which each community is located.

For information on available products associated with this FIRM visit the **Map Service Center (MSC)** website at http://msc.fema.gov. Available products may include previously issued Letters of Map Change, a Flood Insurance Study Report, and/or digital versions of this map. Many of these products can be ordered or obtained directly from the MSC website.

If you have **questions about this map,** how to order products, or the National Flood Insurance Program in general, please call the **FEMA Map Information eXchange (FMIX)** at **1-877-FEMA-MAP** (1-877-336-2627) or visit the FEMA website at http://www.fema.gov/business/nfip.



LEGEND

SPECIAL FLOOD HAZARD AREAS (SFHAs) SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD

The 1% annual chance flood (100-year flood), also known as the base flood, is the flood that has a 1% chance of being equaled or exceeded in any given year. The Special Flood Hazard Area is the area subject to flooding by the 1% annual chance flood. Areas of Special Flood Hazard include Zones A, AE, AH, AO, AR, A99, V, and VE. The Base Flood Elevation is the water-surface elevation of the 1% annual chance flood.

ZONE A	No Base Flood Elevations determined.
ZONE AE	Base Flood Elevations determined.
ZONE AH	Flood depths of 1 to 3 feet (usually areas of ponding); Base Flood Elevations determined.
ZONE AO	Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.
ZONE AR	Special Flood Hazard Areas formerly protected from the 1% annual chance flood by a flood control system that was subsequently decertified. Zone AR indicates that the former flood control system is being restored to provide protection from the 1% annual chance or greater flood.
ZONE A99	Area to be protected from 1% annual chance flood by a Federal flood protection system under construction; no Base Flood Elevations determined.
ZONE V	Coastal flood zone with velocity hazard (wave action); no Base Flood Elevations determined.
ZONE VE	Coastal flood zone with velocity hazard (wave action); Base Flood Elevations determined.

FLOODWAY AREAS IN ZONE AE

The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without substantial increases in flood heights.

OTHER FLOOD AREAS

ZONE X Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.

OTHER AREAS

ZONE X Areas determined to be outside the 0.2% annual chance floodplain.

ZONE D Areas in which flood hazards are undetermined, but possible.

COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS

OTHERWISE PROTECTED AREAS (OPAs)

CBRS areas and OPAs are normally located within or adjacent to Special Flood Hazard Areas.

1% Annual Chance Floodplain Boundary

0.2% Annual Chance Floodplain Boundary

Floodway boundary

Zone D boundary

CBRS and OPA boundary

Boundary dividing Special Flood Hazard Area Zones and boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths, or flood velocities.

513 — Base Flood Elevation line and value; elevation in feet*

(EL 987) — Base Flood Elevation value where uniform within zone; elevation in feet*

*Referenced to the North American Vertical Datum of 1988

A — A Cross section line

23 - - - 23 Transect line

45° 02' 08", 93° 02' 12" — Geographic coordinates referenced to the North American Datum of 1983 (NAD 83) Western Hemisphere

4989000m N — 1000-meter Universal Transverse Mercator grid values, zone 13

DX5510 × — Bench mark (see explanation in Notes to Users section of this FIRM panel)

• M1.5 — River Mile

MAP REPOSITORIES
Refer to Map Repositories list on Map Index

EFFECTIVE DATE OF COUNTYWIDE
FLOOD INSURANCE RATE MAP

SEPTEMBER 30, 2005

EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL

MARCH 16, 2016: to update corporate limits, to change base flood elevations, to add base flood elevations, to add special flood hazard areas, to update map format, to add roads and road names, to reflect updated topographic information, to incorporate previously issued letters of map revision.

For community map revision history prior to countywide mapping, refer to the Community Map History table located in the Flood Insurance Study report for this jurisdiction.

To determine if flood insurance is available in this community, contact your insurance agent or call the National Flood Insurance Program at 1-800-638-6620.

MAP SCALE 1" = 500'

250 0 500 1000 FEET

150 0 150 300 METERS

NFIP

NATIONAL FLOOD INSURANCE PROGRAM

PANEL 0184G

FIRM

FLOOD INSURANCE RATE MAP

DOUGLAS COUNTY, COLORADO

AND INCORPORATED AREAS

PANEL 184 OF 495

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
DOUGLAS COUNTY	080049	0184	G
PARKER, TOWN OF	080310	0184	G

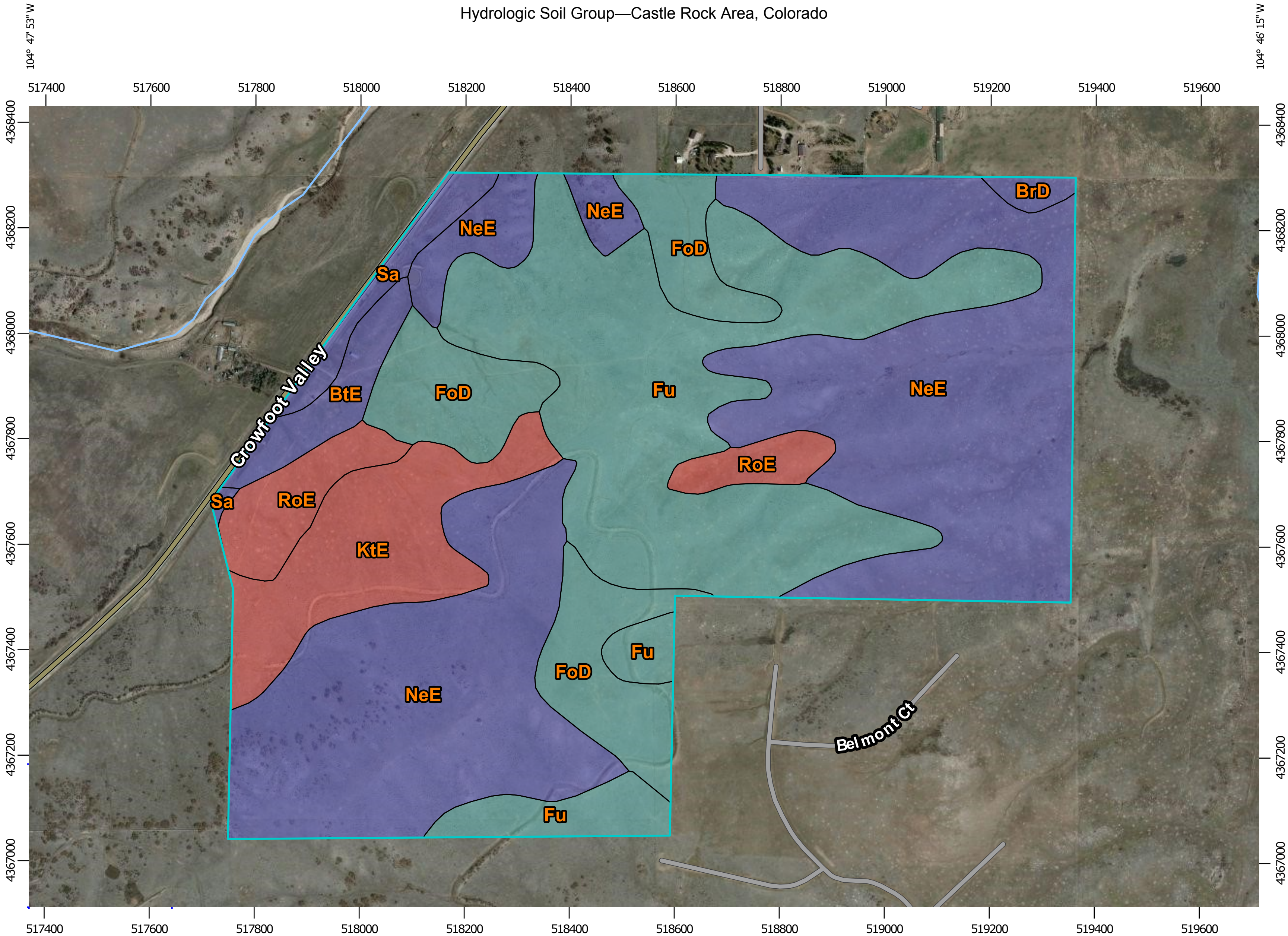
Notice to User: The **Map Number** shown below should be used when placing map orders; the **Community Number** shown above should be used on insurance applications for the subject community.

MAP NUMBER
08035C0184G

MAP REVISED
MARCH 16, 2016

Federal Emergency Management Agency

Hydrologic Soil Group—Castle Rock Area, Colorado



Map Scale: 1:10,700 if printed on A landscape (11" x 8.5") sheet.

N

Meters: 0, 150, 300, 600, 900

Feet: 0, 500, 1000, 2000, 3000

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

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils

Soil Rating Polygons
- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Lines
- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Points
- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Water Features
- Streams and Canals

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

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:20,000.

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: http://websoilsurvey.nrcs.usda.gov
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: Castle Rock Area, Colorado
Survey Area Data: Version 8, Sep 23, 2014

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

Date(s) aerial images were photographed: Mar 16, 2012—Apr 13, 2012

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 — Castle Rock Area, Colorado (CO622)				
Map unit symbol	**Map unit name**	**Rating**	**Acres in AOI**	**Percent of AOI**
BrD	Bresser sandy loam, 3 to 9 percent slopes	B	2.1	0.5%
BtE	Bresser-Truckton sandy loams, 5 to 25 percent slopes	B	9.1	2.4%
FoD	Fondis clay loam, 3 to 9 percent slopes	C	41.3	10.7%
Fu	Fondis-Kutch association	C	105.5	27.3%
KtE	Kutch sandy loam, 5 to 20 percent slopes	D	30.5	7.9%
NeE	Newlin gravelly sandy loam, 8 to 30 percent slopes	B	174.1	45.0%
RoE	Renohill sandy loam, reddish variant, 5 to 20 percent slopes	D	16.5	4.3%
Sa	Sampson loam	B	7.5	1.9%
Totals for Area of Interest			**386.5**	**100.0%**

Description

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

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

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

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

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

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

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

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: *None Specified*

Tie-break Rule: Higher

TABLE 5.1
ONE-HOUR POINT RAINFALL

Frequency of Design Event (yr)	One-hour Point Rainfall, P_1 (in)
2	0.99
5	1.39
10	1.64
25	1.98
50	2.31
100	2.60

5.3 FLOOD HYDROLOGY OVERVIEW

Various methods exist to determine appropriate flood peaks or hydrographs for storm drainage planning and design. Methods for determining flood peaks or hydrographs are the Rational Method, the Colorado Urban Hydrograph Procedure (CUHP), and Urban Drainage Stormwater Management (UDSWM) model. The Town of Parker discourages the use of computer models other than CUHP and UDSWM since these programs are preferred, if not required, by UDFCD for studies involving major drainageways where UDFCD approval is sought or where maintenance eligibility is requested.

The three methods are briefly described in this section, and a discussion of their applicability to the Town of Parker is discussed. UDSWM is mostly used to combine and route the hydrographs generated using CUHP.

In general, the Rational Method is the most widely used and accepted technique for determining peak flows in urban areas for small basins. Within the constraints outlined in the MANUAL, use of the Rational Method provides a relatively simple but effective way to analyze storm runoff.

CUHP is somewhat more complicated than the Rational Method. It allows a manual computation of a runoff hydrograph which may be used for further hydraulic routing through channels and/or detention ponds. Historically, CUHP is best used in urban areas for which runoff coefficients have been derived. However, recent improvements by UDFCD include consideration for different soil types, thus CUHP is now more applicable to rural areas. The reader is referred to UDFCD for the latest version of CUHP.

UDSWM is a computer model that generates runoff hydrographs and routes and combines these hydrographs. UDSWM is a modified version of the Runoff Block of the Environmental Protection Agency's Storm Water Management Model (SWMM). It has been modified to be used in conjunction with CUHP. Table 5.2 herein provides guidance on selecting the appropriate method for a given project.

Conceptual Drainage Report

Hess Ranch Development
Parker, Colorado

CODE: SRD01

Prepared For:
SDI Inc.
5105 DTC Parkway, Suite 240
Greenwood Village, Colorado 80111
Contact: Gary Hunter
720-482-7707

Prepared By:

Manhard
CONSULTING

7442 South Tucson Way, Suite 190-A
Centennial, Colorado 80112
Contact: Russell Burrows, P.E.
303-708-0500

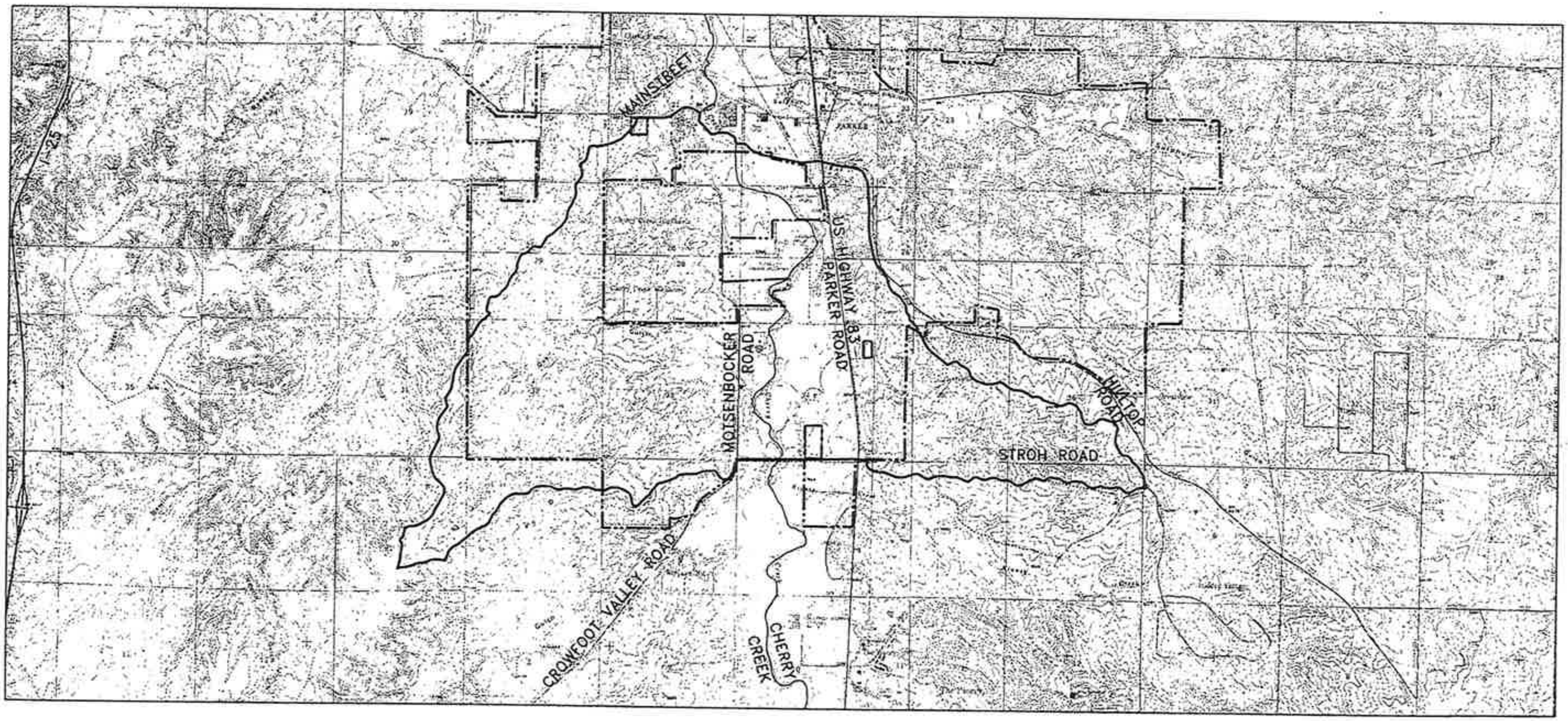
Initially Submitted: November 25, 2014
Revised: February 15, 2015
Updated: June 1, 2015

APPENDIX D

Excerpts from Oak Gulch & Stroh Ranch Area Outfall Systems Planning

OAK GULCH AND STROH RANCH AREA OUTFALL SYSTEMS PLANNING

PRELIMINARY DESIGN REPORT



TOWN OF PARKER DOUGLAS COUNTY
URBAN DRAINAGE AND FLOOD CONTROL DISTRICT
FEBRUARY 2003

Prepared by:
Knight Piésold
CONSULTING
1050 17th Street, Suite 500
Denver, Colorado 80265-0500

II. STUDY AREA DESCRIPTION

A. General

The Oak Gulch and Stroh Ranch study area is located in Douglas County and partially within the southern portion of the Town of Parker. It encompasses the tributary areas on both the east and west sides of Cherry Creek between Main street on the north and Stroh Road on the south. The area contains several major drainageways, including Oak Gulch, smaller unnamed drainageways, and direct flow areas that discharge along a 3.6-mile reach of Cherry Creek. Cherry Creek flows from south to north through the study area. Figures II-1 and II-2 show the general location of the study area and existing facilities in the study area, respectively.

Presently, a portion of the 7.7-mi^2 (4 955-acre) study area lies within the corporate limits of the Town of Parker; those areas that are not within the corporate limits are under the jurisdiction of Douglas County. It should be noted that in the future much of the study area might eventually be annexed into the Town of Parker.

At the time of this study, the area comprised a mixture of residential, commercial, and open areas. The residential areas range from low-density with several acres per residence to high-density with as many as six units per acre. The open areas include native open space, undeveloped land, parks, greenbelts, sod farms (agricultural), and the Cherry Creek floodplain. There are also many areas that are presently being developed for various residential densities and commercial sites and several more areas have already been proposed for development.

The major arterial roads through the study area include Parker Road (State Highway 83), Motsenbocker Road, and Stroh Road. Several other collector and local roads, both paved and unpaved, are also within the study area.

B. Topography

The study area generally slopes toward Cherry Creek from both the east and west sides. West of Cherry Creek, slopes typically range from 2 to 4 percent in the upper reaches of the catchments, from 1 to 2 percent in the middle reaches, and are generally less than 1 percent in the lower reaches near the Cherry Creek floodplain. East of Cherry Creek, slopes are typically 3 to 6 percent in the upper reaches, 1 to 3 percent in the middle reaches, and less than 1 percent in the lower reaches. The topography, represented by 25-foot contour intervals, is shown on Figure II-3.

C. Soil Characteristics

Soil classifications throughout the study area were determined from the Soil Survey of Castle Rock Area, Colorado (Reference 1). Areas with common hydrologic soil properties were delineated based on their Hydrologic Soils Group classifications; these areas are shown on Figure II-4. The study area contains all four Hydrologic Soils Group classifications but primarily comprises Type B (moderately high infiltration and moderately low runoff potential) and Type C (moderately low infiltration and moderately high runoff potential) soils. There are, however, small areas of Type A (high infiltration and low runoff potential) and Type D (low infiltration and high runoff potential) soils. In general, those areas west of Cherry Creek have predominantly Type C soils while those areas east of Cherry Creek have predominantly Type B soils.

D. Catchment Imperviousness

The study area was divided into regions of similar hydrologic response based on the existing and proposed future imperviousness. For purposes of this study, four categories of imperviousness were used to generalize the entire study area. Areas with similar imperviousness under existing conditions were outlined from aerial photography of the project area; these areas are shown on Figure II-5. Areas with similar imperviousness for the proposed future conditions were outlined based on information from submitted drainage reports for various developments as well as from discussions with representatives of Parker and the County; these areas are shown on Figure II-6. The imperviousness values used to represent the four distinct areas were developed from Table RO-3 and Figures RO-3 through RO-5 of the Manual. The following values were used:

- 95 percent impervious for areas with many structures, buildings, large paved areas such as parking lots, or other impervious structures; typical for commercial or industrial-type developments
- 45 percent impervious for areas intermixed with pervious and impervious features; typical for residential or business areas with open space, lawns, or greenbelts situated among buildings, houses, or other structures
- 40 percent for the West Stroh and North Crowfoot Valley catchments, due to Town of Parker accepted plats in this area
- 18 percent impervious for areas with fewer structures and more open space, typical for rural residential areas with large lots, few houses, roadways or other structures
- 2 percent impervious for generally open areas; typical for open space, parks, or undeveloped land with only an occasional roadway, rock outcropping, or other impervious feature.

E. Sub-Catchment Descriptions

The study area was divided into eight major catchments, which were further divided into 91 sub-catchments. The catchment and sub-catchment boundaries are shown on Figures II-3 through II-6. These boundaries were developed based on topography, existing drainage facilities, aerial photography, and field observations. The sub-catchment delineation of Oak Gulch and the two unnamed tributaries immediately south of Oak Gulch were obtained from the Flood Hazard Area Delineation (FHAD) for Oak Gulch and Lemon Gulch (Reference 7). Since Oak Gulch is the only previously named tributary in the study area, the major catchments were assigned convenient names for identification in this report.

Oak Gulch Catchment

The Oak Gulch Catchment is located on the west side of Cherry Creek in the southwest portion of the study area. The 1.8-mi^2 (1,142-acre) tributary area comprises 16 sub-catchments. Presently, this area is in a relatively native condition and generally undeveloped. However, the Master Drainage Plan for Stroh Ranch provides extensive development plans that primarily include residential developments, a golf course, and some commercial sites (Reference 8 and 43). This master drainage plan calls for six detention basins and channel improvements. Runoff generated from this catchment culminates at an 11-foot-wide by 8-foot-high reinforced concrete box (RCB) culvert that passes under Motsenbocker Road. From Motsenbocker Road to the outfall into Cherry Creek, there is an improved drainageway with existing check structures and an on-site retention pond.

West Stroh Catchment

The West Stroh Catchment is located on the west side of Cherry Creek immediately south of Oak Gulch. The 1.0-mi^2 (664-acre) tributary area comprises 13 sub-catchments. This area is presently in a relatively native condition and undeveloped. However, development plans for the portion between Motsenbocker Road and Cherry Creek have been prepared through Stroh Ranch Filing No. 9 (Reference 9). Additionally, development plans for the area west of Motsenbocker Road have been prepared through Stroh Ranch Filing No. 12 (Reference 10), Stroh Ranch Filing No. 13 (Reference 11), and Stroh Ranch Filing Nos. 17, 18, and 19 (Reference 12). An existing regional detention basin is located adjacent to Motsenbocker Road. This pond has a maximum storage capacity of 80.90 acre-feet, which includes 11.48 acre-feet for water quality and discharges at a peak rate of 516 cfs for the 100-year storm event (References 13 and 14). The discharge from the detention basin passes under Motsenbocker Road through a 48-inch reinforced concrete pipe (RCP) culvert that carries the frequent low flows and a 10-foot by 10-foot RCB culvert for additional flows. The RCB culvert is also intended to be used as a pedestrian crossing. Although not constructed at the time of this report, improvements to the drainageway between Motsenbocker Road and Cherry Creek have been designed through Stroh Ranch Filing No. 9.

North Crowfoot Valley Catchment

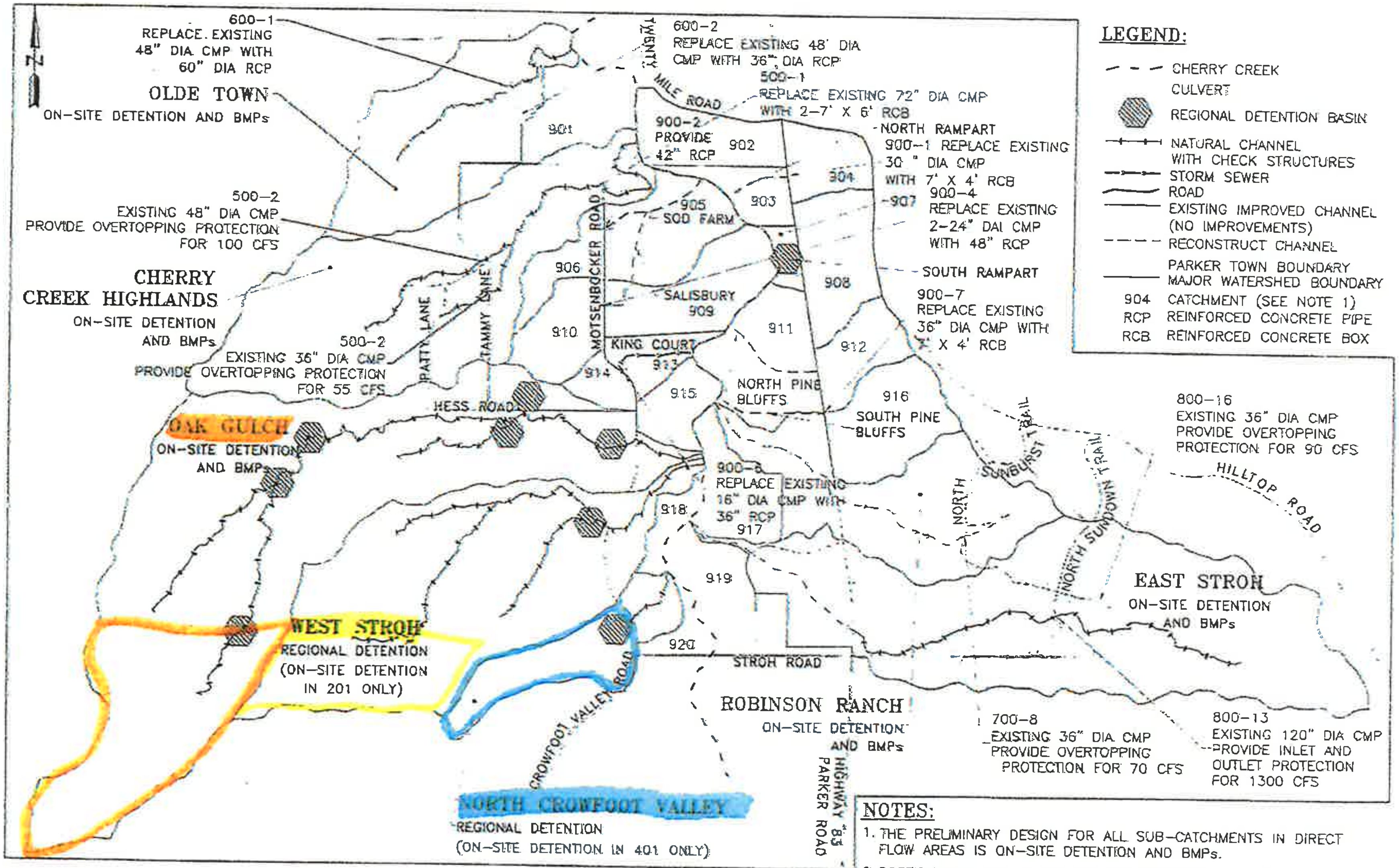
The North Crowfoot Valley Catchment is located on the west side of Cherry Creek immediately south of the West Stroh Catchment. The 0.2-mi^2 (132-acre) tributary area comprises two sub-catchments. This area is presently in a relatively native condition and undeveloped. However, development plans for the portion between Motsenbocker Road and Cherry Creek have been prepared through Stroh Ranch Filing No. 9 (Reference 9). Additionally, development plans for the area west of Motsenbocker Road have been prepared through Stroh Ranch Filing No. 13 (Reference 11) and Stroh Ranch Filing Nos. 17, 18, and 19 (Reference 12). An existing regional detention basin is located immediately adjacent to Motsenbocker Road. This pond has a maximum storage capacity of 12.15 acre-feet, which includes 1.54 acre-feet for water quality, and discharges at a rate 72 cfs for the 100-year storm event (References 13 and 14). The discharge from the detention basin passes under Motsenbocker Road through a 30-inch RCP culvert. Although not constructed at the time of this report, improvements to the drainageway between Motsenbocker Road and Cherry Creek have been designed through Stroh Ranch Filing No. 9.

Cherry Creek Highlands Catchment

The Cherry Creek Highlands Catchment is located on the west side of Cherry Creek immediately north of Oak Gulch. The 0.9-mi^2 (601-acre) tributary area comprises 11 sub-catchments. A portion of this area comprises the Cherry Creek Highlands development, which is an existing residential neighborhood in which each residence occupies several acres of land. The remaining portion is primarily in a native condition and undeveloped. At the time of this study, no further development plans existed. However, development is expected to continue in a manner similar to the Cherry Creek Highlands development for the upper portion of the catchment and may include a small area of commercial or light industrial development adjacent to Motsenbocker Road. Two distinct drainageways convey runoff from the upper reaches of the catchment. Runoff from the south reach passes under Patty Lane through a 36-inch corrugated metal pipe (CMP) culvert and then under Tammy Lane through another 36-inch CMP culvert. Runoff from the north reach passes under Tammy Lane through a 48-inch CMP culvert. Discharge from these two reaches merges into a single drainageway that passes under Motsenbocker Road through a 72-inch CMP culvert and finally discharges into Cherry Creek.

Olde Town Catchment

The Olde Town Catchment is located on the west side of Cherry Creek immediately north of the Cherry Creek Highlands Catchment. The 0.5-mi^2 (306-acre) tributary comprises four sub-catchments. A small portion of this catchment comprises the Cherry Creek Highlands neighborhood. The remaining area is primarily in a native condition and undeveloped. MMcEngineering, Inc. has prepared drainage plans for the portion west of Motsenbocker Road (Reference 15). This portion of the catchment includes high-density residential neighborhoods. Two distinct drainageways convey runoff from the upper portions of the catchment. Runoff from these areas passes under Motsenbocker Road separately through two 48-inch CMP



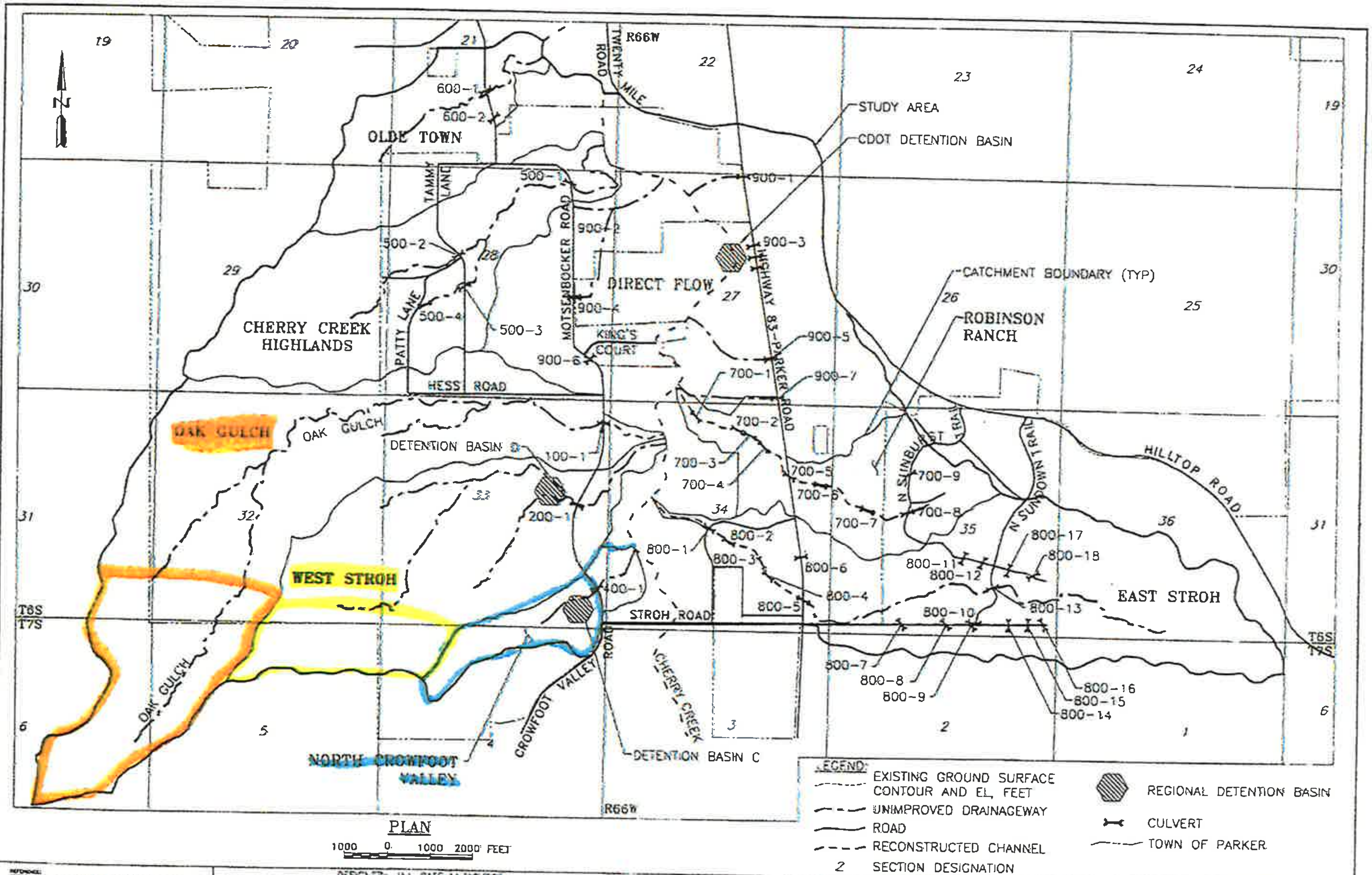
NOTES:

1. THE PRELIMINARY DESIGN FOR ALL SUB-CATCHMENTS IN DIRECT FLOW AREAS IS ON-SITE DETENTION AND BMPs.
2. PORTIONS OF OAK GULCH WILL BE RECONSTUCTED CHANNEL.
3. SEE DETAILED PRELIMINARY PLAN SHEETS FOR LOCATIONS OF CHANNEL STRUCTURES.

PLAN

1000 0 1000 2000 FEET

Knight Piésold CONSULTING	DESIGNED: JAJ DATE: 11/02/03 DRAWN: JAJ DATE: 11/02/03 CHECKED: JRK DATE: 11/02/03 REVISED: DJA DATE: 7/23/03	TOWN OF PARKER * DOUGLAS COUNTY URBAN DRAINAGE & FLOOD CONTROL DISTRICT	OAK GULCH AND STROH RANCH OUTFALL SYSTEMS PLANNING	RECOMMENDED PRELIMINARY PLAN	FIGURE ES-2



Knight Piésold CONSULTING

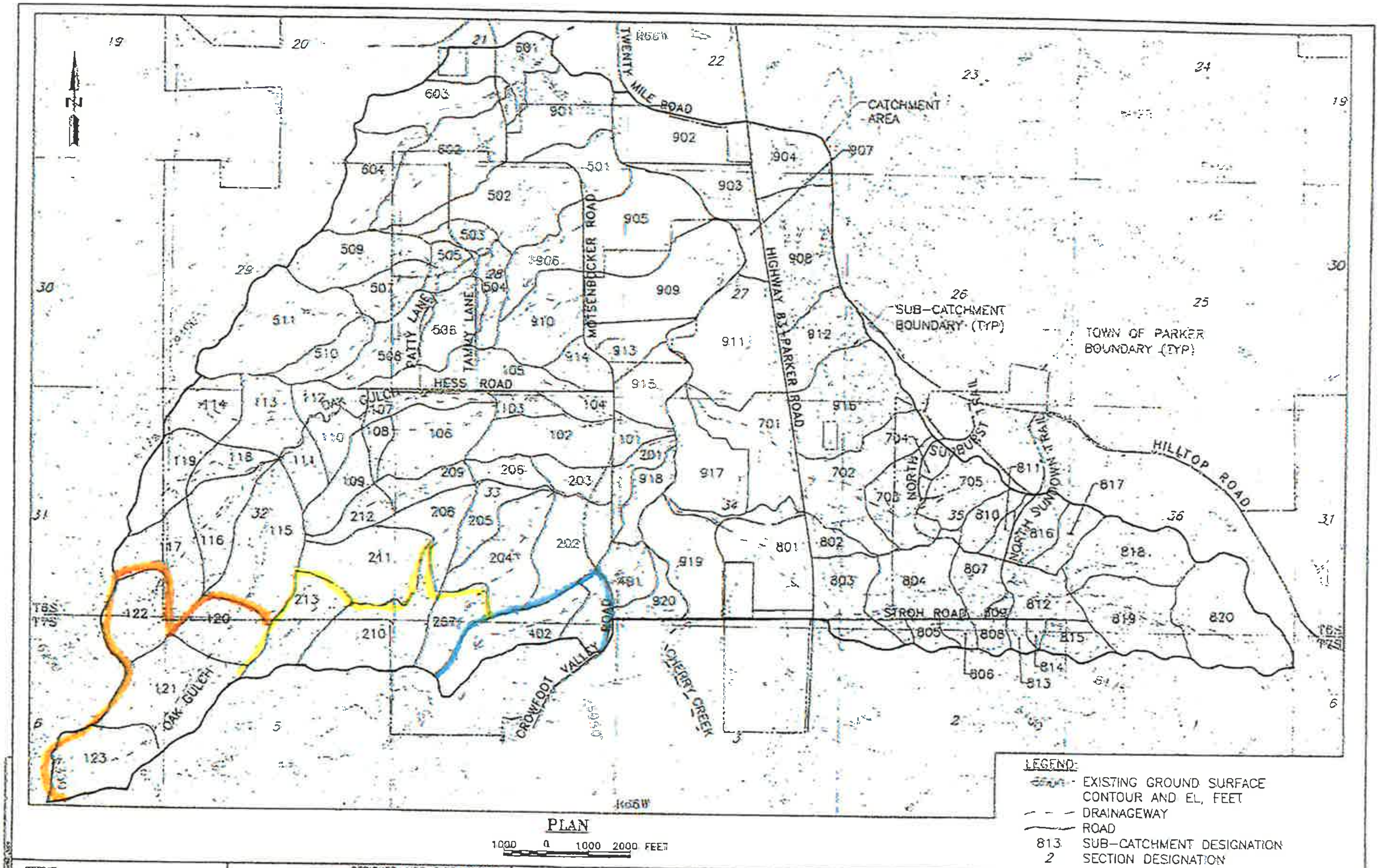
DESIGNED:	JAJ	DATE:	11/12/02
DRAWN:	JAJ	DATE:	11/12/02
CHECKED:	JRK	DATE:	11/12/02
REVISED:	DJA	DATE:	2/27/03

TOWN OF PARKER * DOUGLAS COUNTY
URBAN DRAINAGE & FLOOD CONTROL DISTRICT

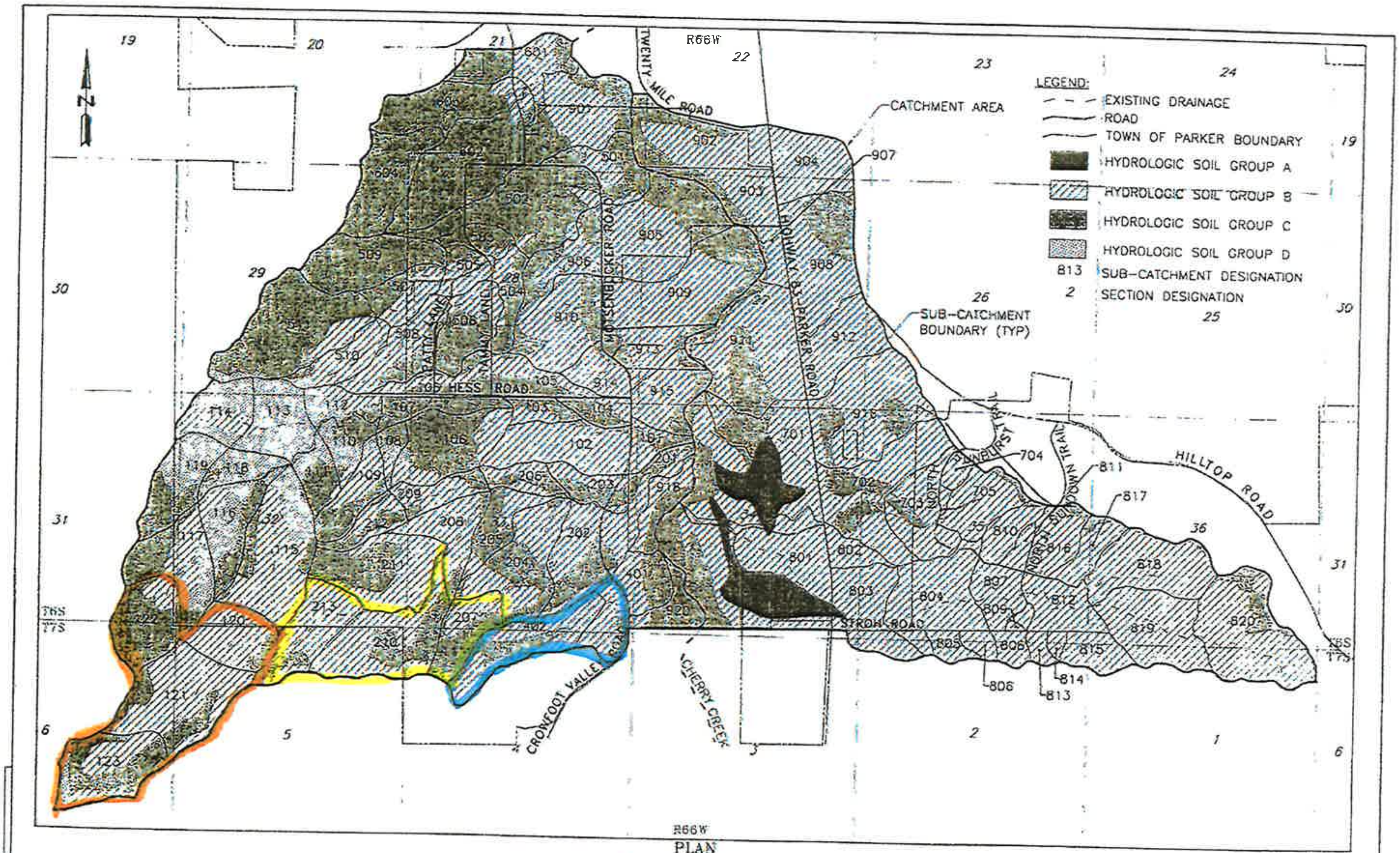
OAK GULCH AND STROH RANCH
OUTFALL SYSTEMS PLANNING

EXISTING FACILITIES MAP

FIGURE II-2



Knight Piésold CONSULTING	DESIGNED: MDS DATE: 9/25/01 DRAWN: DS DATE: 8/25/01 CHECKED: DTW DATE: 9/25/01 REVISED: DJA DATE: 2/27/03	TOWN OF PARKER * DOUGLAS COUNTY URBAN DRAINAGE & FLOOD CONTROL DISTRICT	OAK GULCH AND STROH RANCH OUTFALL SYSTEMS PLANNING	SUB-CATCHMENT AND TOPGRAPHY MAP	FIGURE II-3



REFERENCE
U.S. DEPARTMENT OF AGRICULTURE SOIL CONSERVATION SERVICE "SOIL SURVEY OF CASTLEROCK AREA, COLORADO" 1974

Knight Piésold CONSULTING

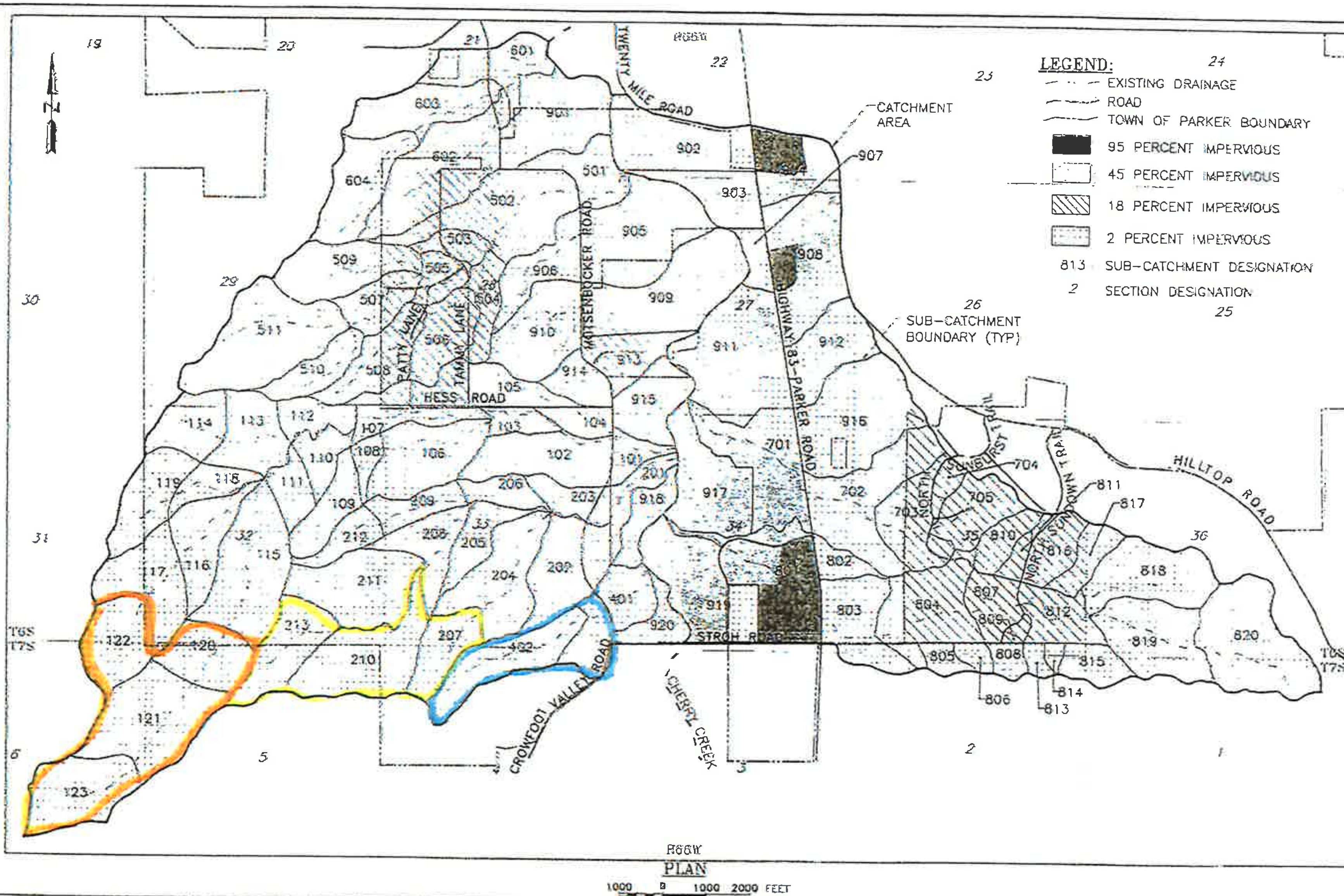
DESIGNED: JRJ DATE: 11/12/02
DRAWN: JRJ DATE: 11/12/02
CHECKED: JAJ DATE: 11/12/02
REVISED: DJA DATE: 2/27/03

TOWN OF PARKER * DOUGLAS COUNTY URBAN DRAINAGE & FLOOD CONTROL DISTRICT

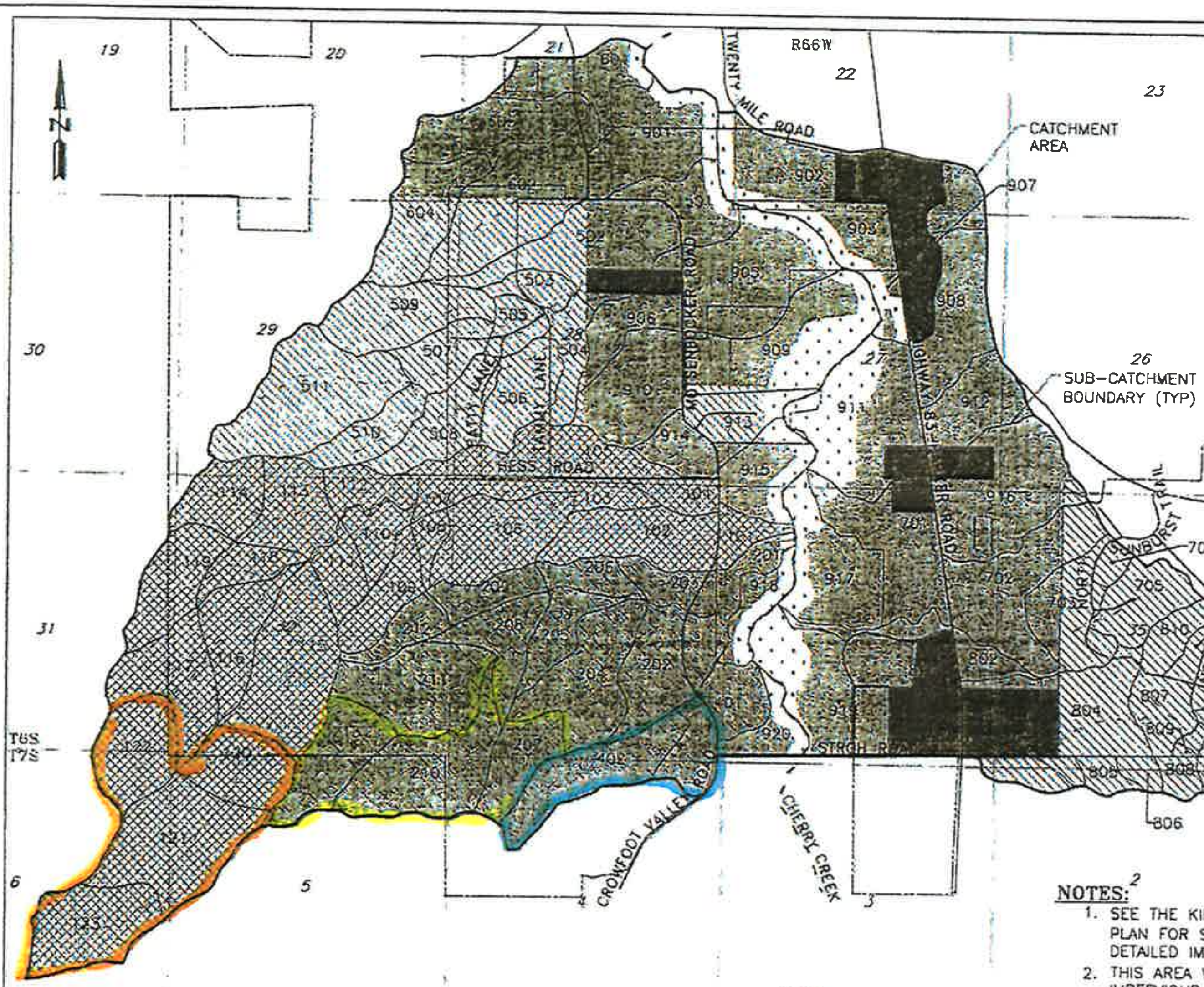
OAK GULCH AND STROH RANCH OUTFALL SYSTEMS PLANNING

HYDROLOGIC SOILS GROUP

FIGURE II-4



Knight Piésold CONSULTING	DESIGNED: JAJ DATE: 11/12/02 DRAWN: JAJ DATE: 11/12/02 CHECKED: JRM DATE: 11/12/02 REVISED: DJA DATE: 2/27/03	TOWN OF PARKER * DOUGLAS COUNTY URBAN DRAINAGE & FLOOD CONTROL DISTRICT	OAK GULCH AND STROH RANCH OUTFALL SYSTEMS PLANNING	EXISTING IMPERVIOUSNESS	FIGURE II-5



LEGEND:

- EXISTING DRAINAGE
- ROAD
- TOWN OF PARKER BOUNDARY
- 95 PERCENT IMPERVIOUS
- 45 PERCENT IMPERVIOUS
- 40 PERCENT IMPERVIOUS, SEE NOTE 2
- 18 PERCENT IMPERVIOUS
- 2 PERCENT IMPERVIOUS
- SEE NOTE 1
- 813 SUB-CATCHMENT DESIGNATION
- 2 SECTION DESIGNATION

NOTES:

1. SEE THE KIRKHAM MICHAEL REPORT "MASTER DRAINAGE PLAN FOR STROH RANCH" VOL. 1 FEB. 25, 2002, FOR DETAILED IMPERVIOUSNESS TABLES FOR THIS AREA.
2. THIS AREA WAS PREVIOUSLY ACCEPTED AS 40% IMPERVIOUS BY THE TOWN OF PARKER.

R66W

PLAN

1000 0 1000 2000 FEET

Knight Piésold CONSULTING	DESIGNED: JAJ DATE: 11/12/02 DRAWN: JAJ DATE: 11/12/02 CHECKED: JRK DATE: 11/12/02 REVISED: DJA DATE: 2/27/03	TOWN OF PARKER = DOUGLAS COUNTY URBAN DRAINAGE & FLOOD CONTROL DISTRICT	OAK GULCH AND STROH RANCH OUTFALL SYSTEMS PLANNING	FUTURE IMPERVIOUSNESS	FIGURE II-6

TABLE III-1

CUHP SUB-CATCHMENT PARAMETERS
EXISTING IMPERVIOUS CONDITIONS

Catchment ID	Area (acres)	Area (mi^2)	Length (mi)	Centroid Length (mi)	Percent Imperv (%)	Slope (ft/ft)	t_c (min)	Pervious Depression Storage (in)	Impervious Depression Storage (in)	Initial Rate (in/hr)	Decay Coef. (1/sec)	Final Rate (in/hr)
[illegible] (parameters from Stroh Master Plan, see Reference 43, except existing imperviousness)												
101	16.1	0.0252	NOTE 1	NOTE 1	2 0	NOTE 1	18.70	0.35	0 05	4 06	0 0018	0.57
102	72.4	0 1131	NOTE 1	NOTE 1	2.0	NOTE 1	31.70	0 35	0 05	4 26	0.0018	0 56
103	19.0	0.0297	NOTE 1	NOTE 1	2.0	NOTE 1	23 00	0 35	0 05	3 41	0 0018	0 53
104	17.2	0 0269	NOTE 1	NOTE 1	2 0	NOTE 1	16.50	0 35	0.05	4 05	0.0018	0.57
105	73.7	0.1152	NOTE 1	NOTE 1	17.8	NOTE 1	31.80	0.35	0.05	4 05	0.0018	0 57
106	72.2	0.1128	NOTE 1	NOTE 1	2.0	NOTE 1	32.30	0.35	0 05	3 26	0.0018	0 52
107	34.3	0 0536	NOTE 1	NOTE 1	2 0	NOTE 1	35 20	0 35	0.05	3.36	0.0018	0.52
108	13.0	0.0203	NOTE 1	NOTE 1	2.0	NOTE 1	18.00	0 35	0.05	3 60	0.0018	0.54
109	37.6	0.0588	NOTE 1	NOTE 1	2.0	NOTE 1	24 20	0.35	0 05	3 60	0.0018	0 54
110	28.0	0.0438	NOTE 1	NOTE 1	2 0	NOTE 1	21 60	0.35	0 05	3 03	0.0018	0.50
111	26.0	0.0406	NOTE 1	NOTE 1	2.0	NOTE 1	21.40	0.35	0.05	3 03	0.0018	0.50
112	24.6	0.0384	NOTE 1	NOTE 1	2 0	NOTE 1	25.60	0.35	0 05	3 15	0.0018	0 51
113	57.3	0.0895	NOTE 1	NOTE 1	2.0	NOTE 1	21.40	0.35	0 05	3 15	0.0018	0.51
114	42.7	0 0667	NOTE 1	NOTE 1	2 0	NOTE 1	20 40	0.35	0 05	3 15	0 0018	0.51
115	108.5	0 1695	0 650	0 350	2 0	0.024	33.90	0 35	0.05	3.64	0.0018	0 54
116	58.6	0 0916	NOTE 1	NOTE 1	2 0	NOTE 1	34 20	0 35	0 05	3 39	0.0018	0 53
117	77 7	0.1214	NOTE 1	NOTE 1	2.0	NOTE 1	23.70	0.35	0 05	3 39	0.0018	0.53
118	21.9	0 0342	NOTE 1	NOTE 1	2 0	NOTE 1	21.30	0 35	0.05	3 00	0.0018	0.50
119	57.5	0 0898	NOTE 1	NOTE 1	2.0	NOTE 1	22.30	0 35	0 05	3 00	0.0018	0 50
[illegible]	56.3	0.0880	NOTE 1	NOTE 1	2 0	NOTE 1	20.80	0.35	0.05	4.22	0.0018	0 58
[illegible]	109.1	0.1705	0.69	0.28	2.0	0 029	28.30	0.35	0 05	3 96	0 0018	0 56
[illegible]	51.4	0 0803	NOTE 1	NOTE 1	2.0	NOTE 1	221.10	0.35	0.05	3.30	0.0018	0 52
[illegible]	68.4	0 1069	NOTE 1	NOTE 1	2 0	NOTE 1	51.70	0.35	0.05	3 54	0.0018	0.54
WEST STROH												
201	25.0	0.0390	0 626	0.304	2.0	0 017	112.16	0.40	0.05	3.86	0.0018	0.56
202	72.4	0.1131	0.623	0.284	2.0	0.030	75.33	0 40	0.05	3.59	0.0018	0.57
203	32.2	0 0503	0.424	0.202	2.0	0.022	46 65	0.40	0.05	3.99	0.0018	0.57
204	84.8	0.1325	0.740	0.362	2.0	0.028	92.40	0.40	0.05	3.86	0.0018	0.56
205	36.0	0.0562	0.693	0.384	2.0	0.029	88 25	0 40	0.05	3.66	0.0018	0 54
206	23.3	0.0364	0.426	0.202	2.0	0.015	73 34	0 40	0.05	3.89	0.0018	0.56
207	44.0	0.0687	0.472	0.227	2.0	0.048	56 46	0 40	0.05	3.67	0 0018	0.54
208	47.2	0.0738	0.514	0.241	2.0	0 040	61.46	0 40	0.05	4.31	0.0018	0.59
209	29.8	0.0466	0.472	0.237	2.0	0 042	54.49	0 40	0.05	3.99	0 0018	0.57
210	93.8	0.1466	0 920	0.460	2.0	0.032	N/A	0 40	0.05	4.11	0 0018	0 57
211	89.6	0.1400	0.663	0 349	2.0	0.044	75 16	0.40	0.05	3.72	0.0018	0 55
212	23.5	0.0367	0.380	0 146	2.0	0 046	47.88	0.40	0.05	3.69	0.0018	0 55
213	62.1	0.0971	0.586	0 252	2.0	0.039	67 39	0.40	0.05	4.23	0 0018	0.58

NOTE 1 This information was not supplied with the Kirkham Micheal Report. Runoff was calculated by CUHP using the rational method for these areas, so this information is not strictly necessary

TABLE III-1 (CONTINUED)

CUHP SUB-CATCHMENT PARAMETERS
EXISTING IMPERVIOUS CONDITIONS

Catchment ID	Area (acres)	Area (mi^2)	Length (mi)	Centroid Length (mi)	Percent Imperv. (%)	Slope (ft/ft)	t_c (min)	Pervious Depression Storage (in)	Impervious Depression Storage (in)	Initial Rate (in/hr)	Decay Coef. (1/sec)	Final Rate (in/hr)
[illegible]												
[illegible]	59.5	0.0929	0.544	0.271	2 0	0 036	50 79	0 40	0.05	4 07	0.0018	0.57
[illegible]	72 9	0 1139	0.838	0 402	2 0	0.039	53.72	0.40	0 05	3.85	0.0018	0 56
CHERRY CREEK HIGHLANDS												
501	44.6	0.0698	0.426	0.123	2.0	0.032	56.14	0.40	0.05	3.53	0 0018	0.54
502	105.4	0.1646	0.778	0.309	8 4	0 028	N/A	0.40	0 05	3.15	0 0018	0 51
503	20.0	0.0312	0.337	0.134	18.0	0.040	41.61	0.40	0 05	3.15	0 0018	0.51
504	30.4	0 0475	0.477	0.248	18.0	0.032	61.73	0 40	0 05	3 45	0 0018	0.53
505	23.9	0.0374	0 284	0 136	18.0	0 050	33 18	0.40	0 05	4.05	0 0018	0.57
506	49.9	0.0780	0 466	0.239	18 0	0 039	57.36	0.40	0 05	3 60	0 0018	0.54
507	37.4	0.0584	0.398	0.206	10 0	0.044	48.85	0.40	0.05	3 90	0.0018	0.56
508	56.1	0 0877	0.581	0.252	10 0	0 036	68.68	0 40	0.05	4 05	0 0018	0.57
509	71 3	0 1114	0.665	0 383	6 8	0 061	59.70	0.40	0 05	3 00	0 0018	0 50
510	37.4	0.0585	0.536	0.258	2 0	0.048	57.53	0.40	0 05	4 20	0.0018	0.58
511	124.4	0 1944	0.803	0.339	2 0	0 044	N/A	0.40	0 05	3 15	0.0018	0 51
OLDE TOWN												
601	57.5	0.0899	0.555	0.208	2.0	0 040	69.91	0.40	0 05	3.60	0.0018	0.54
602	113.9	0.1779	0.869	0.388	6 8	0 028	N/A	0.40	0 05	3 08	0 0018	0.51
603	66.5	0 1039	0.689	0.341	2.0	0 025	93 45	0 40	0.05	3 15	0 0018	0 51
604	68.2	0 1060	0 606	0.290	2 0	0.041	67 94	0.40	0.05	3 00	0.0018	0.50
ROBINSON RANCH												
701	95.0	0.1485	0 754	0.458	36 4	0.021	N/A	0.36	0 05	4.30	0 00158	0.66
702	102 3	0.1599	0.672	0.259	5 2	0 054	N/A	0 40	0.05	4 13	0 0018	0.58
703	59.6	0.0931	0.443	0.150	13.2	0 071	43 26	0.40	0.05	4 35	0 0018	0.59
704	10 1	0.0157	0 163	0.078	18.0	0.056	24.39	0 40	0 05	4.50	0 0018	0.60

TABLE III-2

CUHP SUB-CATCHMENT PARAMETERS
FUTURE IMPERVIOUS CONDITIONS

Catchment ID	Area (acres)	Area (mi^2)	Length (mi)	Centroid Length (mi)	Percent Imperv. (%)	Slope (ft/ft)	t_c (min)	Pervious Depression Storage (in)	Impervious Depression Storage (in)	Initial Rate (in/hr)	Decay Coef. (1/sec)	Final Rate (in/hr)
[illegible] (parameters from Stroh Master Plan, see Reference 43)												
101	16.1	0.0252	NOTE 1	Note 1	21.0	NOTE 1	18.70	0.35	0.05	4.06	0.0018	0.57
102	72.4	0.1131	NOTE 1	Note 1	20.7	NOTE 1	31.70	0.35	0.05	4.26	0.0018	0.58
103	19.0	0.0297	NOTE 1	Note 1	2.0	NOTE 1	23.00	0.35	0.05	3.41	0.0018	0.53
104	17.2	0.0269	NOTE 1	Note 1	55.0	NOTE 1	16.50	0.35	0.05	4.05	0.0018	0.57
105	73.7	0.1152	NOTE 1	Note 1	29.2	NOTE 1	31.80	0.35	0.05	4.05	0.0018	0.57
106	72.2	0.1128	NOTE 1	Note 1	24.5	NOTE 1	32.30	0.35	0.05	3.26	0.0018	0.52
107	34.3	0.0536	NOTE 1	Note 1	9.1	NOTE 1	35.20	0.35	0.05	3.36	0.0018	0.52
108	13.0	0.0203	NOTE 1	Note 1	20.6	NOTE 1	18.00	0.35	0.05	3.60	0.0018	0.54
109	37.6	0.0588	NOTE 1	Note 1	24.2	NOTE 1	24.20	0.35	0.05	3.60	0.0018	0.54
110	28.0	0.0438	NOTE 1	Note 1	26.3	NOTE 1	21.60	0.35	0.05	3.03	0.0018	0.50
111	26.0	0.0406	NOTE 1	Note 1	27.0	NOTE 1	21.40	0.35	0.05	3.03	0.0018	0.50
112	24.6	0.0384	NOTE 1	Note 1	30.0	NOTE 1	25.60	0.35	0.05	3.15	0.0018	0.51
113	57.3	0.0895	NOTE 1	Note 1	40.7	NOTE 1	21.40	0.35	0.05	3.15	0.0018	0.51
114	42.7	0.0667	NOTE 1	Note 1	30.0	NOTE 1	20.40	0.35	0.05	3.15	0.0018	0.51
115	108.5	0.1695	0.650	0.350	27.3	0.024	33.90	0.35	0.05	3.64	0.0018	0.54
116	58.6	0.0916	NOTE 1	Note 1	19.3	NOTE 1	34.20	0.35	0.05	3.39	0.0018	0.53
117	77.7	0.1214	NOTE 1	Note 1	24.8	NOTE 1	23.70	0.35	0.05	3.39	0.0018	0.53
118	21.9	0.0342	NOTE 1	Note 1	32.7	NOTE 1	21.30	0.35	0.05	3.00	0.0018	0.50
119	57.5	0.0898	NOTE 1	Note 1	24.9	NOTE 1	22.30	0.35	0.05	3.00	0.0018	0.50
120	56.3	0.0880	NOTE 1	Note 1	32	NOTE 1	20.80	0.35	0.05	4.22	0.0018	0.58
121	109.1	0.1705	0.69	0.28	24.5	0.029	26.30	0.35	0.05	3.96	0.0018	0.56
[illegible]	51.4	0.0803	NOTE 1	Note 1	21.5	NOTE 1	221.10	0.35	0.05	3.30	0.0018	0.52
[illegible]	68.4	0.1069	NOTE 1	Note 1	19.5	NOTE 1	51.70	0.35	0.05	3.45	0.0018	0.54
WEST STROH												
201	25.0	0.0390	0.626	0.304	40.0*	0.017	28.40	0.35	0.05	3.86	0.0018	0.56
202	72.4	0.1131	0.623	0.284	40.0	0.030	28.30	0.35	0.05	3.99	0.0018	0.57
203	32.2	0.0503	0.424	0.202	40.0	0.022	22.40	0.35	0.05	3.99	0.0018	0.57
204	84.8	0.1325	0.740	0.362	40.0	0.028	31.70	0.35	0.05	3.88	0.0018	0.56
205	36.0	0.0562	0.693	0.384	40.0	0.029	30.30	0.35	0.05	3.56	0.0018	0.54
206	23.3	0.0364	0.426	0.202	40.0	0.015	22.50	0.35	0.05	3.89	0.0018	0.56
207	44.0	0.0687	0.472	0.227	40.0	0.048	23.80	0.35	0.05	3.67	0.0018	0.54
208	47.2	0.0738	0.514	0.241	40.0	0.040	25.10	0.35	0.05	4.31	0.0018	0.59
209	29.8	0.0466	0.472	0.237	40.0	0.042	23.90	0.35	0.05	3.99	0.0018	0.57
210	93.8	0.1466	0.920	0.460	40.0	0.032	N/A	0.35	0.05	4.11	0.0018	0.57
211	89.6	0.1400	0.663	0.349	40.0	0.044	29.40	0.35	0.05	3.72	0.0018	0.55
212	23.5	0.0367	0.380	0.148	40.0	0.046	21.20	0.35	0.05	3.69	0.0018	0.55
213	62.1	0.0971	0.586	0.252	40.0	0.039	27.20	0.35	0.05	4.23	0.0018	0.58

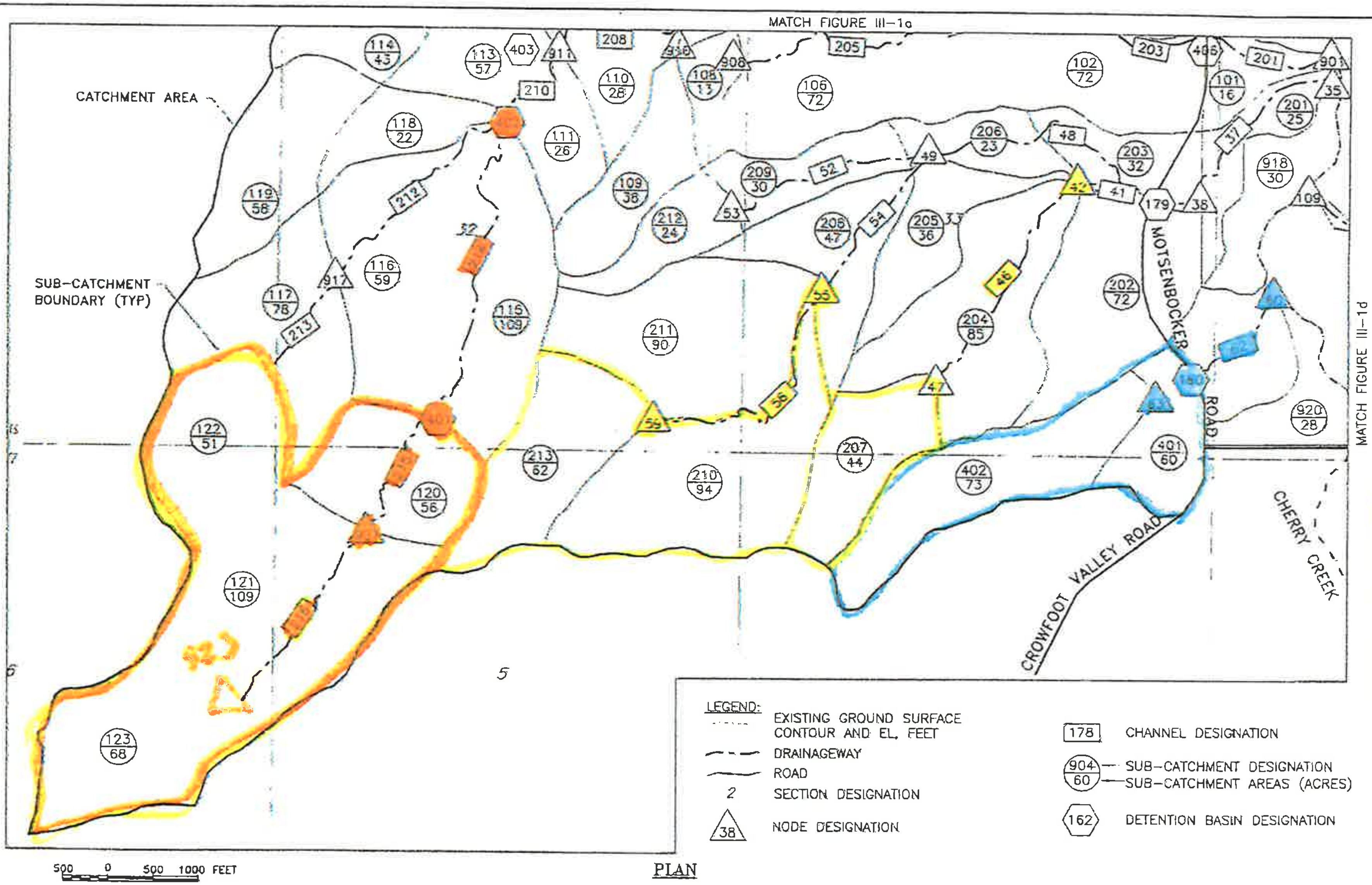
NOTE 1 This information was not supplied with the Kirkham Micheal Report. Runoff was calculated by CUHP using the rational method for these areas, so this information is not strictly necessary.

TABLE III-2 (CONTINUED)

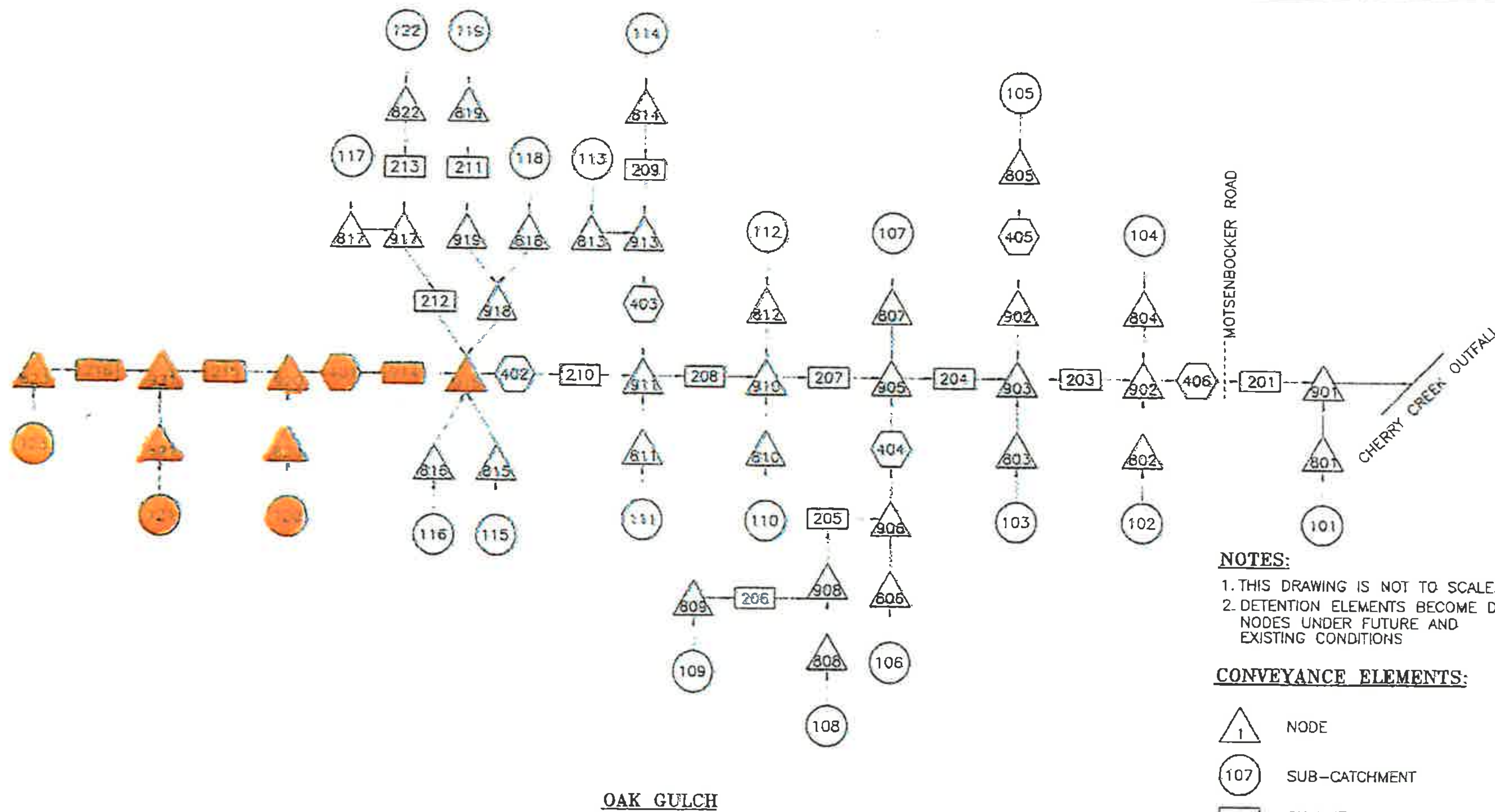
CUHP SUB-CATCHMENT PARAMETERS
FUTURE IMPERVIOUS CONDITIONS

Catchment ID	Area (acres)	Area (mi^2)	Length (mi)	Centroid Length (mi)	Percent Imperv. (%)	Slope (ft/ft)	t_c (min)	Pervious Depression Storage (in)	Impervious Depression Storage (in)	Initial Rate (in/hr)	Decay Coef. (1/sec)	Final Rate (in/hr)
NORTH CROWFOOT VALLEY												
[illegible]	59.5	0.0929	0.544	0.271	40.0*	0.038	25.90	0.35	0.05	4.07	0.0018	0.57
802	72.9	0.1139	0.838	0.402	40.0	0.039	34.60	0.35	0.05	3.85	0.0018	0.56
CHERRY CREEK HIGHLANDS												
501	44.6	0.0696	0.426	0.123	36.4	0.032	22.50	0.36	0.05	3.53	0.0018	0.54
502	105.4	0.1646	0.778	0.309	44.2	0.028	N/A	0.37	0.06	3.15	0.0018	0.51
503	20.0	0.0312	0.337	0.134	18.0	0.040	28.83	0.40	0.05	3.15	0.0018	0.51
504	30.4	0.0475	0.477	0.248	18.0	0.032	39.27	0.40	0.05	3.45	0.0018	0.53
505	23.9	0.0374	0.284	0.136	18.0	0.050	24.27	0.40	0.05	4.05	0.0018	0.57
506	49.9	0.0780	0.466	0.239	18.0	0.039	37.47	0.40	0.05	3.60	0.0018	0.54
507	37.4	0.0584	0.398	0.206	18.0	0.044	32.60	0.40	0.05	3.90	0.0018	0.56
508	56.1	0.0877	0.581	0.252	18.0	0.036	40.57	0.40	0.06	4.05	0.0018	0.57
509	71.3	0.1114	0.655	0.383	18.0	0.061	34.72	0.40	0.05	3.00	0.0018	0.50
510	37.4	0.0585	0.536	0.258	18.0	0.048	34.36	0.40	0.05	4.20	0.0018	0.58
511	124.4	0.1944	0.803	0.339	18.0	0.044	N/A	0.40	0.05	3.15	0.0018	0.51
OLDE TOWN												
601	57.5	0.0899	0.555	0.208	36.4	0.040	26.28	0.36	0.05	3.60	0.0018	0.54
602	113.9	0.1779	0.869	0.388	31.5	0.028	N/A	0.38	0.05	3.08	0.0018	0.51
603	66.5	0.1039	0.689	0.341	45.0	0.025	30.22	0.35	0.05	3.15	0.0018	0.51
604	68.2	0.1066	0.606	0.290	28.8	0.041	35.61	0.38	0.05	3.00	0.0018	0.50
ROBINSON RANCH												
701	95.0	0.1485	0.754	0.458	45.7	0.021	N/A	0.36	0.06	4.30	0.00158	0.66
702	102.3	0.1599	0.672	0.259	39.6	0.054	N/A	0.36	0.05	4.13	0.0018	0.58
703	59.6	0.0931	0.443	0.150	26.1	0.071	26.72	0.39	0.05	4.35	0.0018	0.59
704	10.1	0.0157	0.153	0.078	18.0	0.056	20.77	0.40	0.05	4.50	0.0018	0.60
705	47.8	0.0747	0.409	0.186	18.0	0.060	28.70	0.40	0.05	4.35	0.0018	0.59

* 40.0% imperviousness used for West Stroh and North Crowfoot Valley catchments per previously platted and accepted drainage designs



Knight Piésold CONSULTING	DESIGNED: JAJ DATE: 11/05/02 DRAWN: JAJ DATE: 11/05/02 CHECKED: JRK DATE: 11/05/02 REVISED: DJA DATE: 2/27/03	TOWN OF PARKER * DOUGLAS COUNTY URBAN DRAINAGE & FLOOD CONTROL DISTRICT	OAK GULCH AND STROH RANCH OUTFALL SYSTEMS PLANNING	UDSWM CONVEYANCE MAP SHEET 3 OF 4	FIGURE III-1c



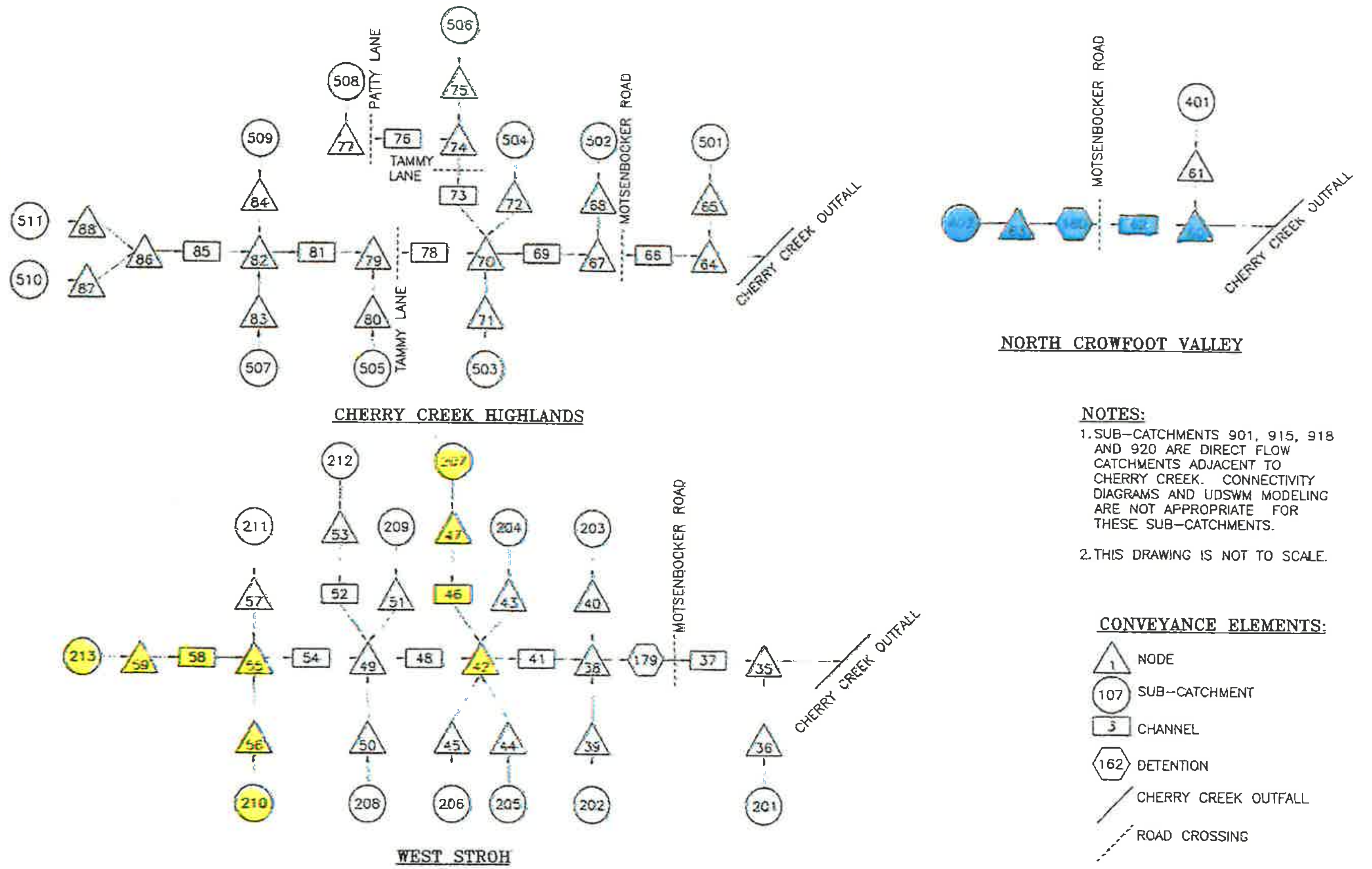
NOTES:

1. THIS DRAWING IS NOT TO SCALE.
2. DETENTION ELEMENTS BECOME DESIGN NODES UNDER FUTURE AND EXISTING CONDITIONS

CONVEYANCE ELEMENTS:

1	NODE
107	SUB-CATCHMENT
3	CHANNEL
162	DETENTION
	CHERRY CREEK OUTFALL
	ROAD CROSSING

Knight Piésold CONSULTING DESIGNED: JAJ DATE: 11/12/02 DRAWN: JAJ DATE: 11/12/02 CHECKED: JRK DATE: 11/12/02 REVISED: DJA DATE: 2/27/03	TOWN OF PARKER * DOUGLAS COUNTY URBAN DRAINAGE & FLOOD CONTROL DISTRICT	OAK GULCH AND STROH RANCH OUTFALL SYSTEMS PLANNING	CONNECTIVITY SHEET 1 OF 4	FIGURE III-2a



NOTES:

1. SUB-CATCHMENTS 901, 915, 918 AND 920 ARE DIRECT FLOW CATCHMENTS ADJACENT TO CHERRY CREEK. CONNECTIVITY DIAGRAMS AND UDSWM MODELING ARE NOT APPROPRIATE FOR THESE SUB-CATCHMENTS.
2. THIS DRAWING IS NOT TO SCALE.

CONVEYANCE ELEMENTS:

- 1 NODE
- 107 SUB-CATCHMENT
- 3 CHANNEL
- 162 DETENTION
- CHERRY CREEK OUTFALL
- ROAD CROSSING

Knight Piésold CONSULTING	DESIGNED: JAJ DATE: 11/12/02 DRAWN: JAJ DATE: 11/12/02 CHECKED: JRK DATE: 11/12/02 REVISED: DJA DATE: 2/27/03	TOWN OF PARKER • DOUGLAS COUNTY URBAN DRAINAGE & FLOOD CONTROL DISTRICT	OAK GULCH AND STROH RANCH OUTFALL SYSTEMS PLANNING	CONNECTIVITY SHEET 2 OF 4	FIGURE III-2b

FIGURE III-3a

PEAK FLOW PROFILES
4616 OAK GULCH

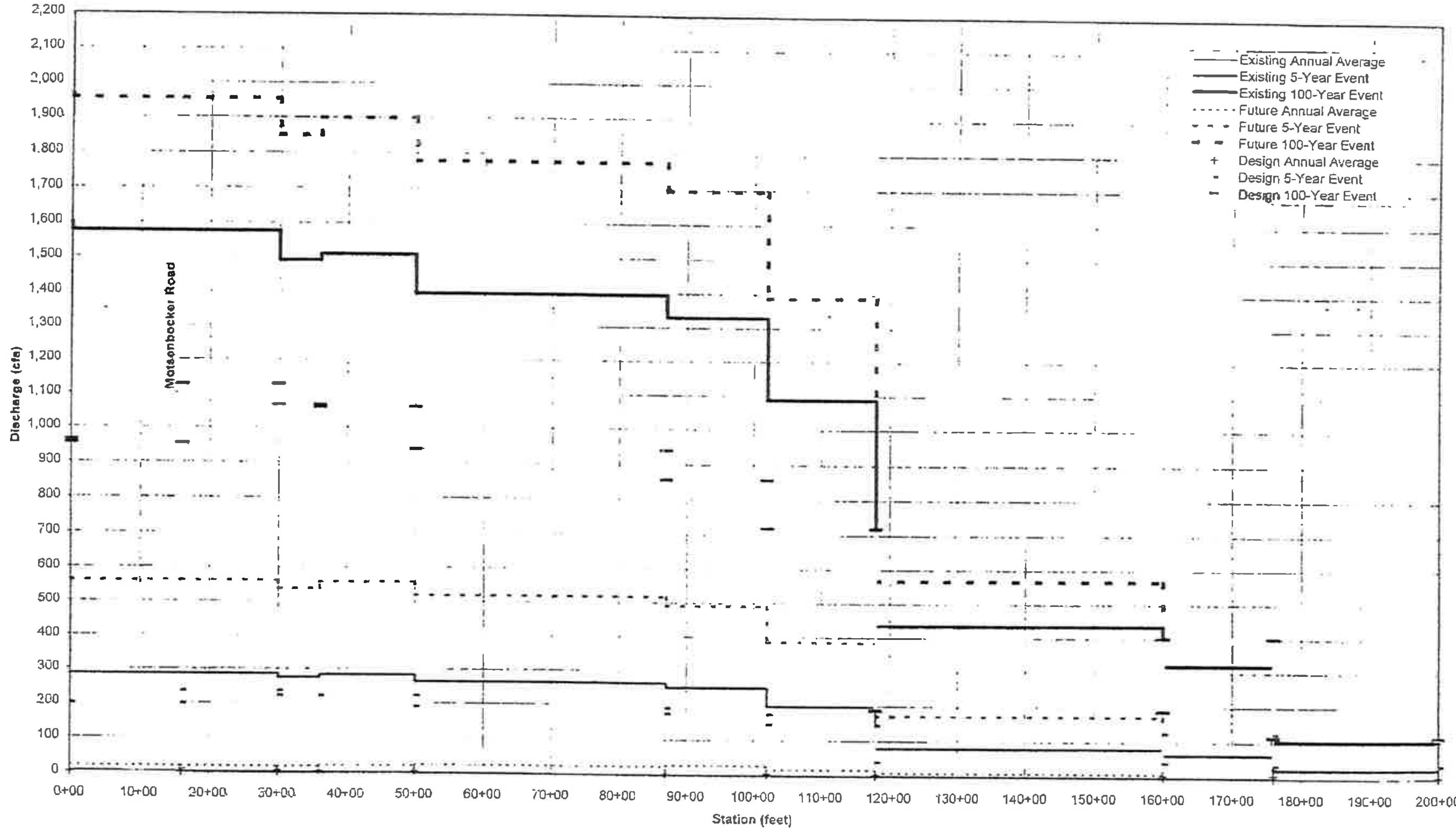


FIGURE III-3b

PEAK FLOW PROFILES
4616.1 WEST STROH

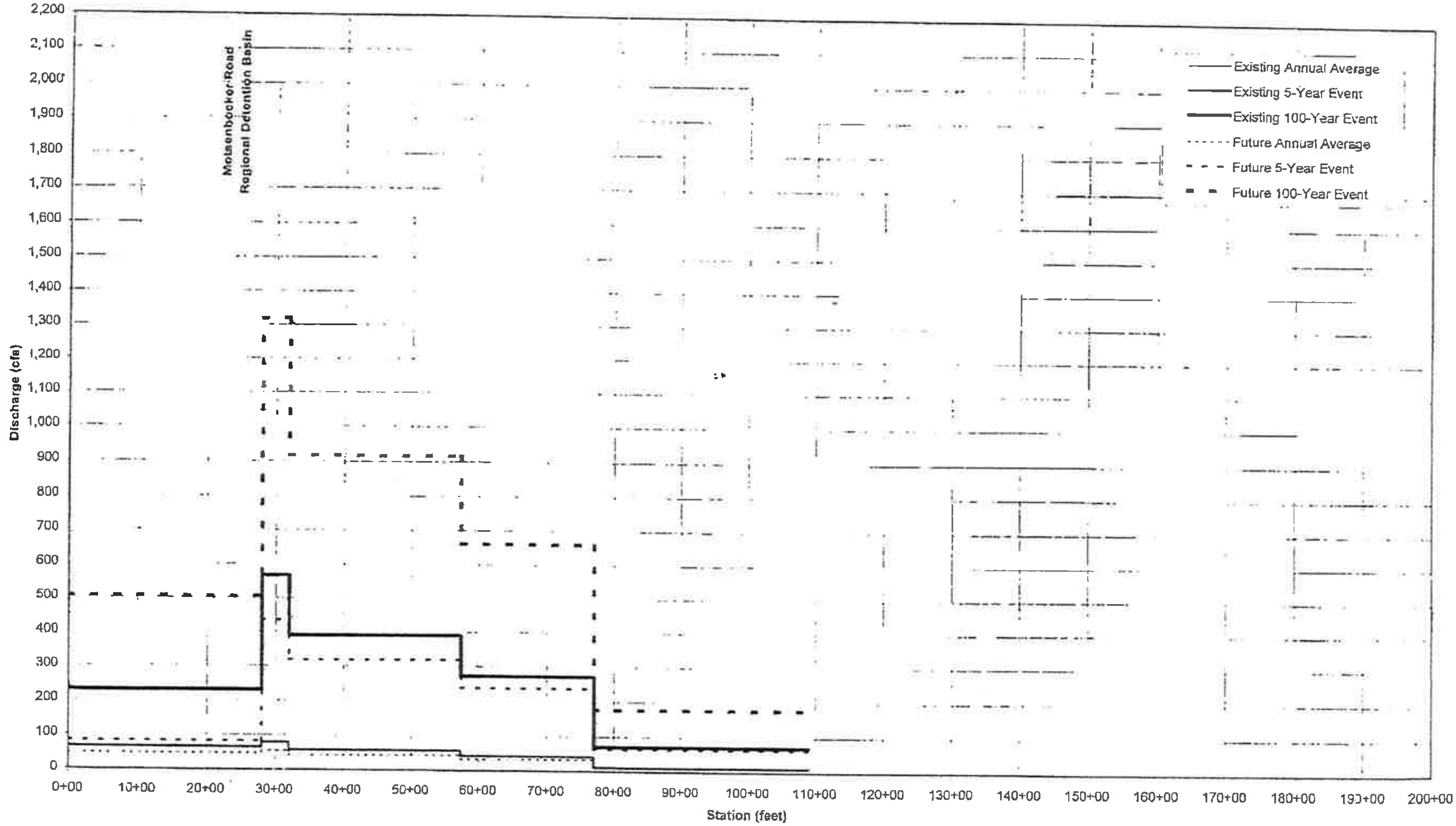


FIGURE III-3c

PEAK FLOW PROFILES
4600-11.3 NORTH CROWFOOT VALLEY

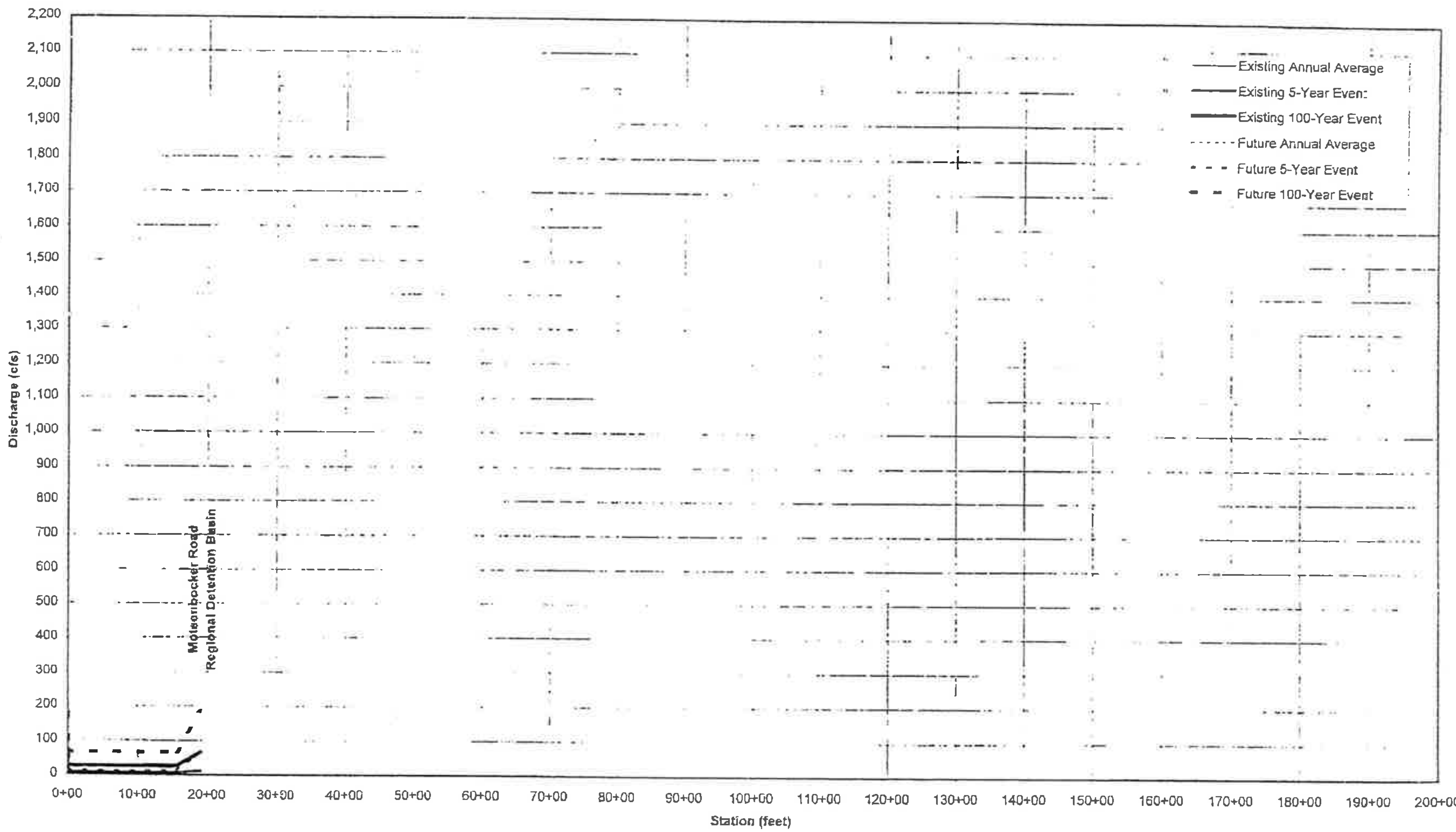


FIGURE III-4a

RUNOFF HYDROGRAPH DRAINAGEWAY 4616
UDSWM ELEMENT NO. 406
OAK GULCH AT MOTSENBOCKER ROAD

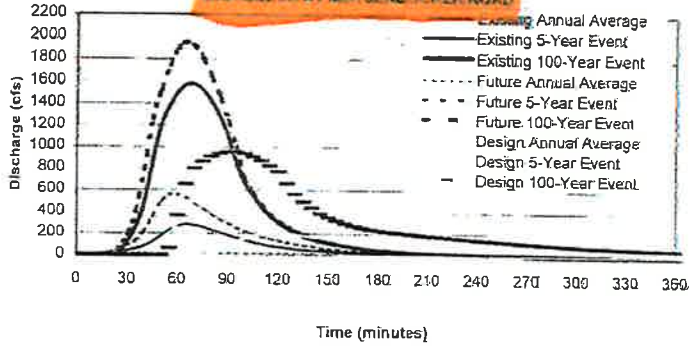


FIGURE III-4b

RUNOFF HYDROGRAPH DRAINAGEWAY 4616.1
UDSWM ELEMENT NO. 38
W. STROH AT INLET TO EXG. REG. DETENTION

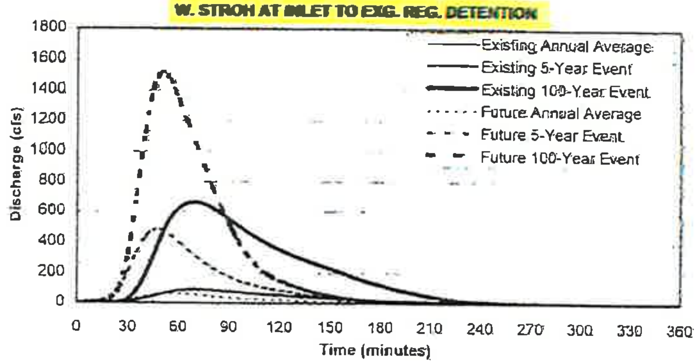


FIGURE III-4c

RUNOFF HYDROGRAPH DRAINAGEWAY 4600-11.3
UDSWM ELEMENT NO. 60
N. CROWFOOT VALLEY AT INLET TO EXG. REG. DETENTION

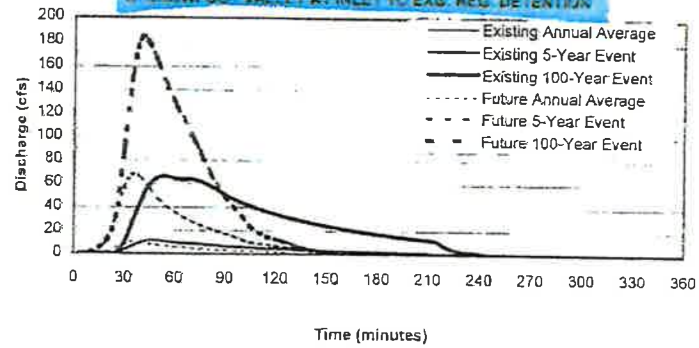
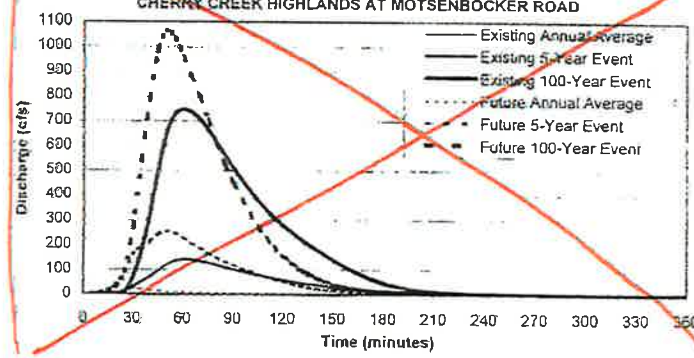


FIGURE III-4d

RUNOFF HYDROGRAPH DRAINAGEWAY 4600-10.4
UDSWM ELEMENT NO. 67
CHERRY CREEK HIGHLANDS AT MOTSENBOCKER ROAD

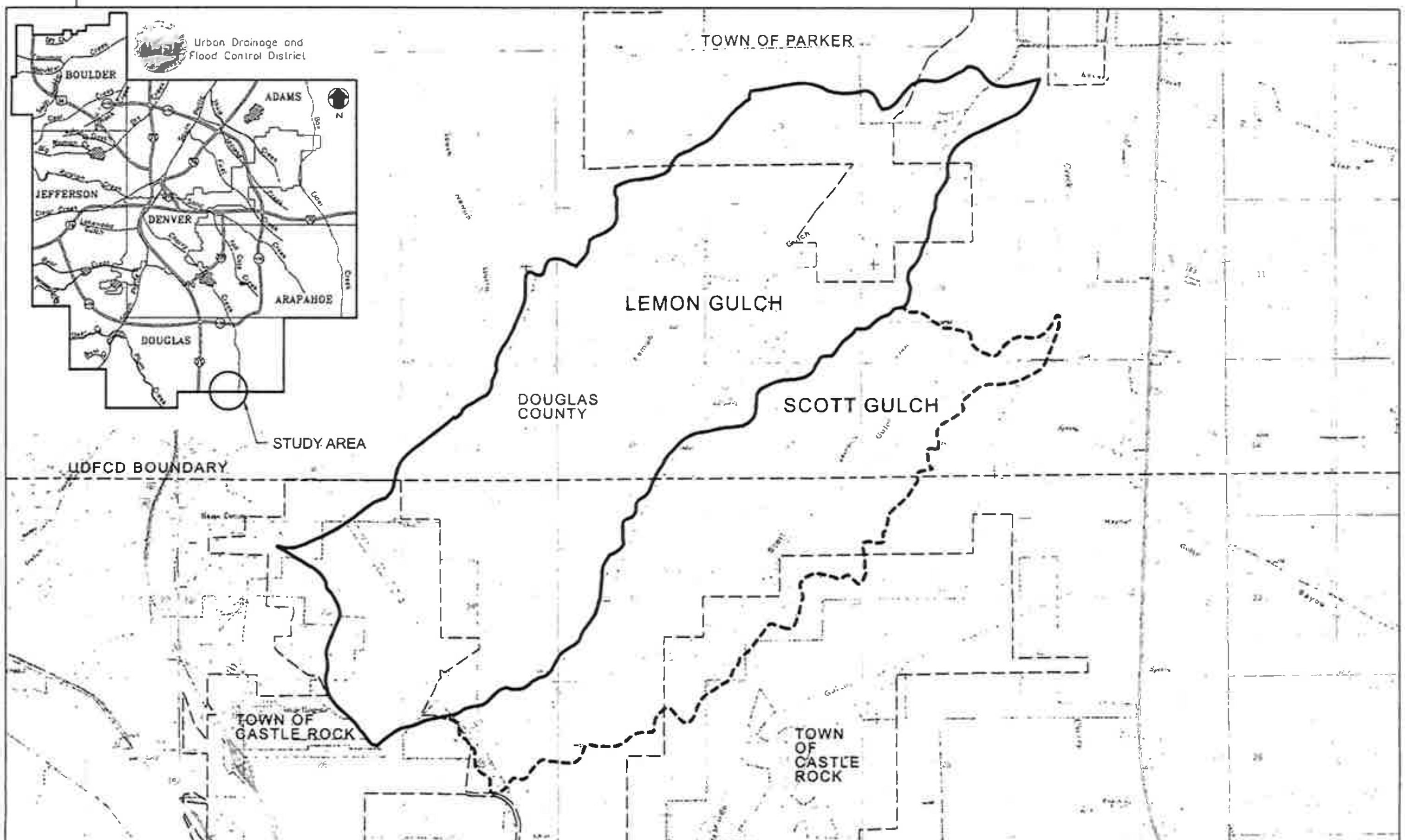


APPENDIX E

Excerpts from Scott & Lemon Gulch Watersheds Outfall Systems Planning

OUTFALL SYSTEMS PLANNING-PRELIMINARY DESIGN REPORT

SCOTT AND LEMON GULCH WATERSHEDS



PREPARED FOR:

URBAN DRAINAGE AND FLOOD CONTROL DISTRICT

DOUGLAS COUNTY

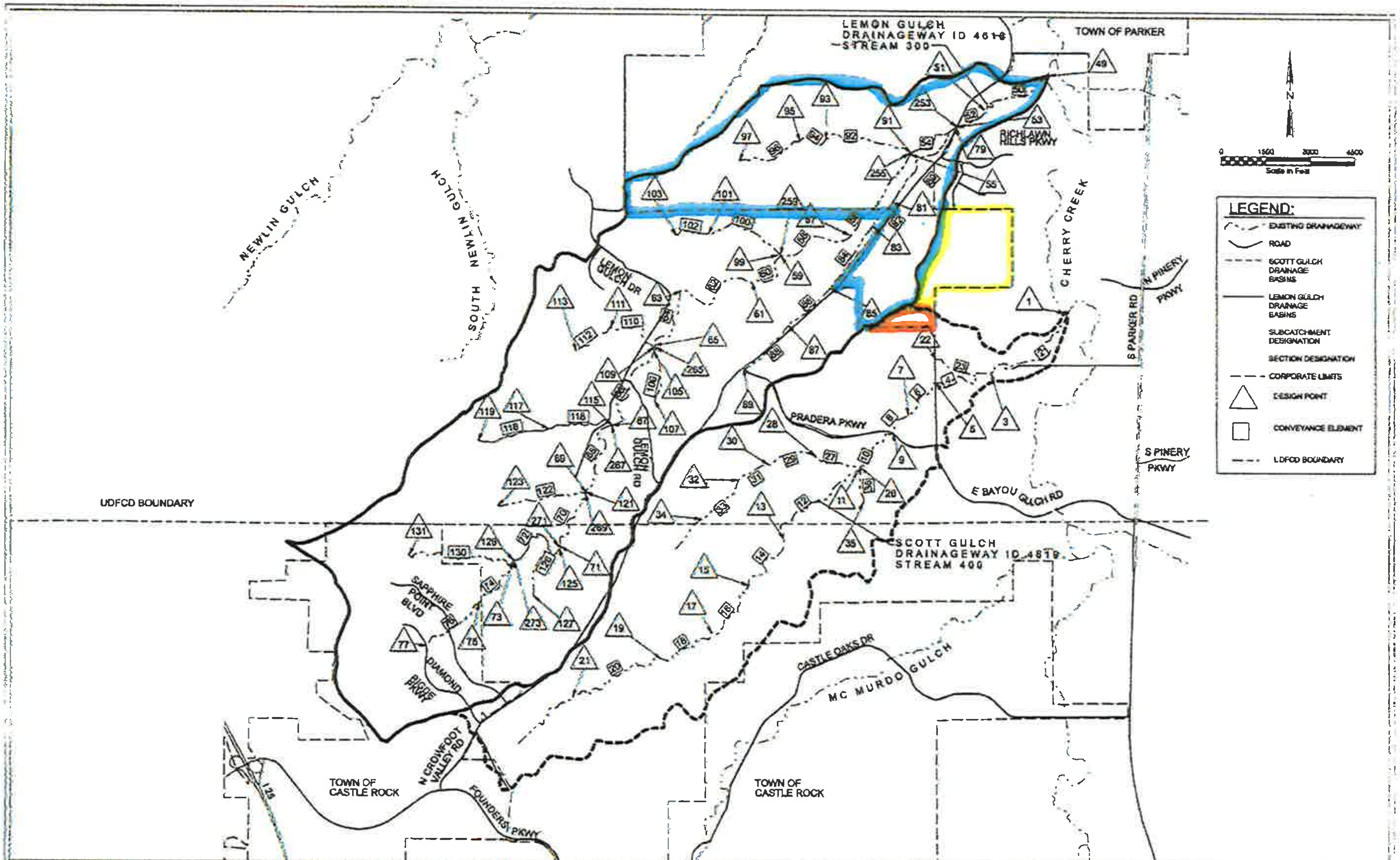
PREPARED BY

CH2MHILL

DENVER, CO

JULY 2006

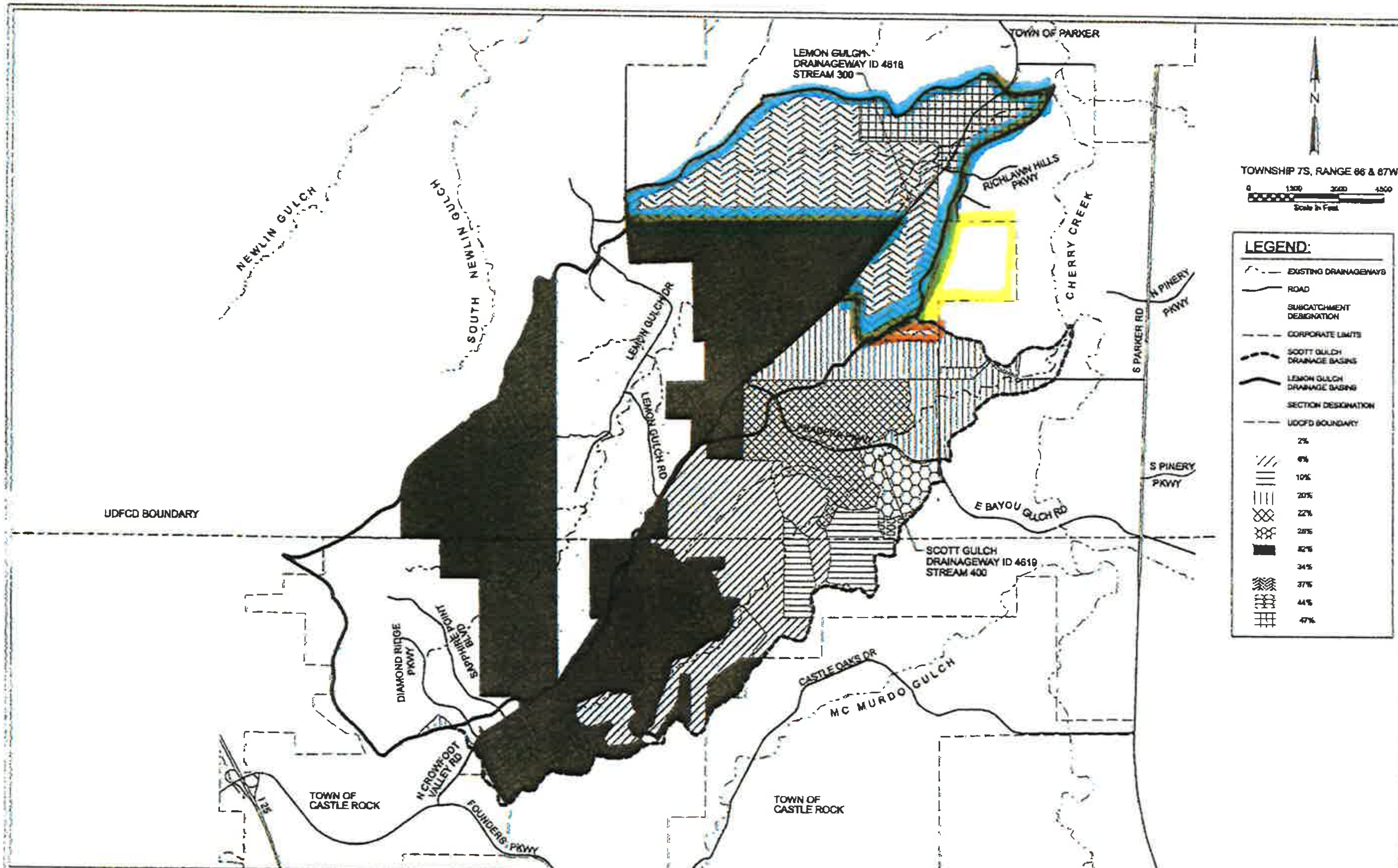
lgflgcv.dlv



MAPPING PRODUCED BY: DOUGLAS COUNTY (DATE 2003) HORIZONTAL DATUM: NAD 83 FEET STATE PLANE COLORADO CENTRAL VERTICAL DATUM: NAVD 88	CH2M HILL 9193 SOUTH JAMAICA STREET ENGLEWOOD, CO 80112	DOUGLAS COUNTY URBAN DRAINAGE AND FLOOD CONTROL DISTRICT	SCOTT GULCH AND LEMON GULCH WATERSHEDS OUTFALL SYSTEM PLANNING	FIGURE ES-3 SCOTT GULCH AND LEMON GULCH HYDROLOGIC SUMMARY MAP	PAGE ES-v

course, and a single family community averaging just over one dwelling unit per acre. Much of the infrastructure planned for Pradera development has been constructed including a regional detention facility and stream stabilization measures.

The Canyons development is planned for the upper portion of the watershed and is not yet under construction. Density for the development will consist of one home per acre. The lower portion of the watershed is zoned as a Community Separator Area and open space. The Douglas County Master Plan indicates that there is potential for development in the community separator area, however, the allowed density will be restricted.



MAPPING PRODUCED BY DOUGLAS COUNTY (DATE 2003)
HORIZONTAL DATUM: NAD 83 FEET
STATE PLANE COLORADO CENTRAL
VERTICAL DATUM: NAVD 88

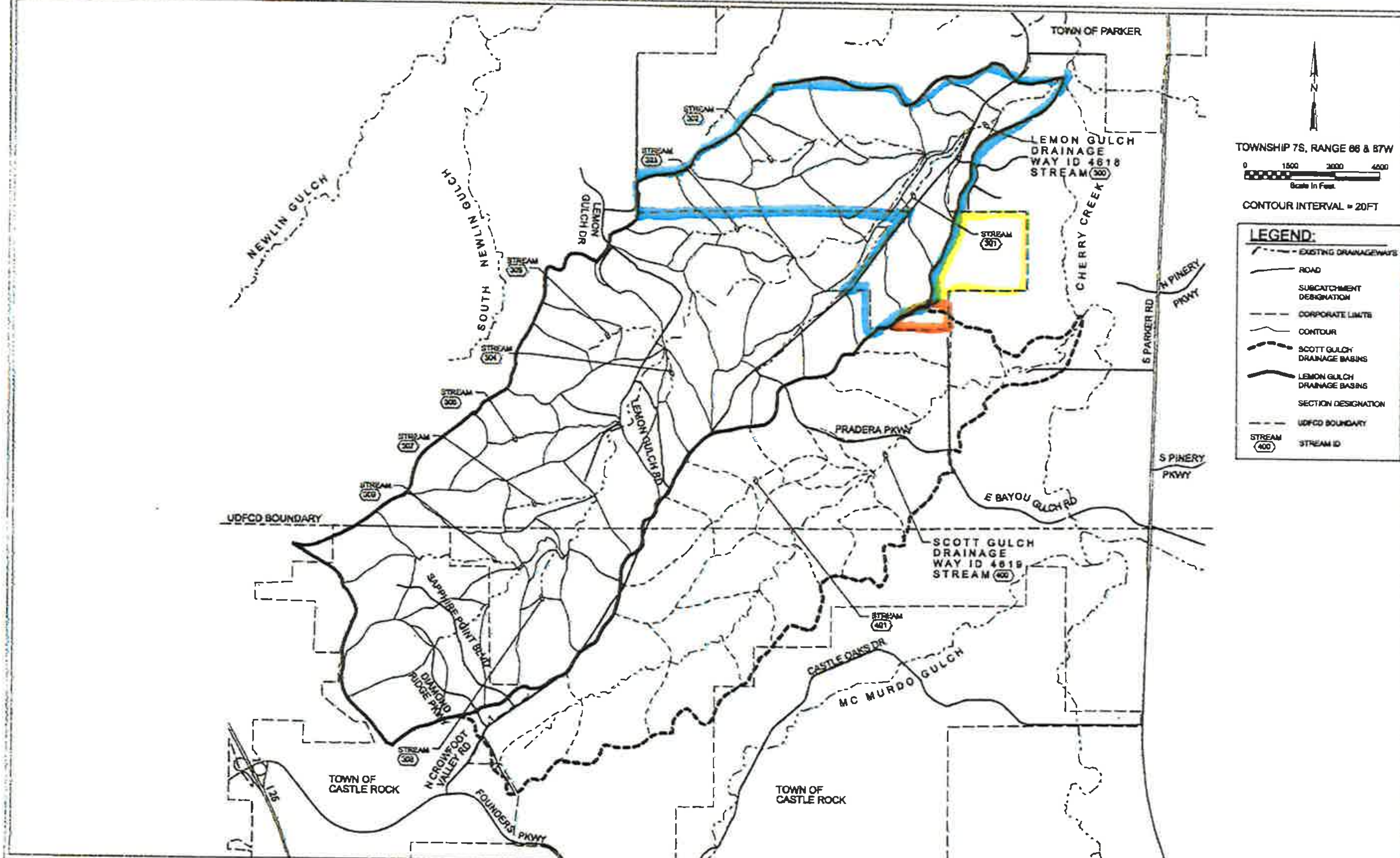
CH2M HILL
9193 SOUTH JAMAICA STREET
ENGLEWOOD, CO 80112

DOUGLAS COUNTY
URBAN DRAINAGE AND FLOOD CONTROL DISTRICT

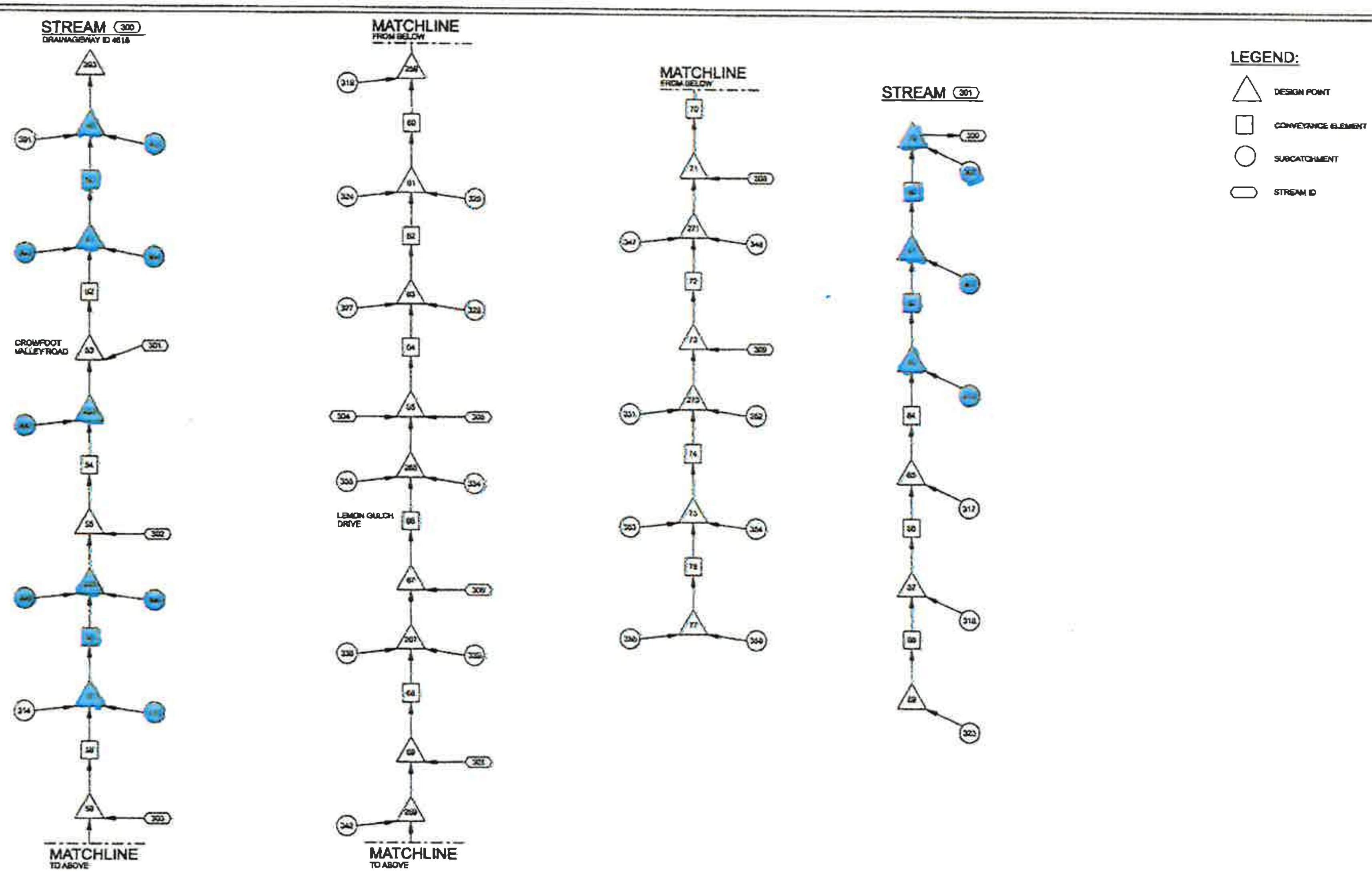
SCOTT GULCH AND LEMON GULCH WATERSHEDS
OUTFALL SYSTEM PLANNING

FIGURE 2-3
SCOTT GULCH AND LEMON GULCH FUTURE IMPERVIOUSNESS

PAGE 2-5



MAPPING PRODUCED BY DOUGLAS COUNTY (DATE 2003) HORIZONTAL DATUM NAD 83 FEET STATE PLANE COLORADO CENTRAL VERTICAL DATUM NAVD 88	CH2M HILL 9193 SOUTH JAMAICA STREET ENGLEWOOD, CO 80112	DESIGNED DRAWN CHECKED REVISED / DATE	DOUGLAS COUNTY URBAN DRAINAGE AND FLOOD CONTROL DISTRICT	SCOTT GULCH AND LEMON GULCH WATERSHEDS OUTFALL SYSTEM PLANNING	FIGURE 3-1 SCOTT GULCH AND LEMON GULCH DRAINAGE BASIN DELINEATION	PAGE 3-4



MAPPING PRODUCED BY DOUGLAS COUNTY (DATE 2003)
HORIZONTAL DATUM: NAD 83 FEET
STATE PLANE COLORADO CENTRAL
VERTICAL DATUM: NAVD 88

CH2M HILL
9193 SOUTH JAMAICA STREET
ENGLEWOOD, CO 80112

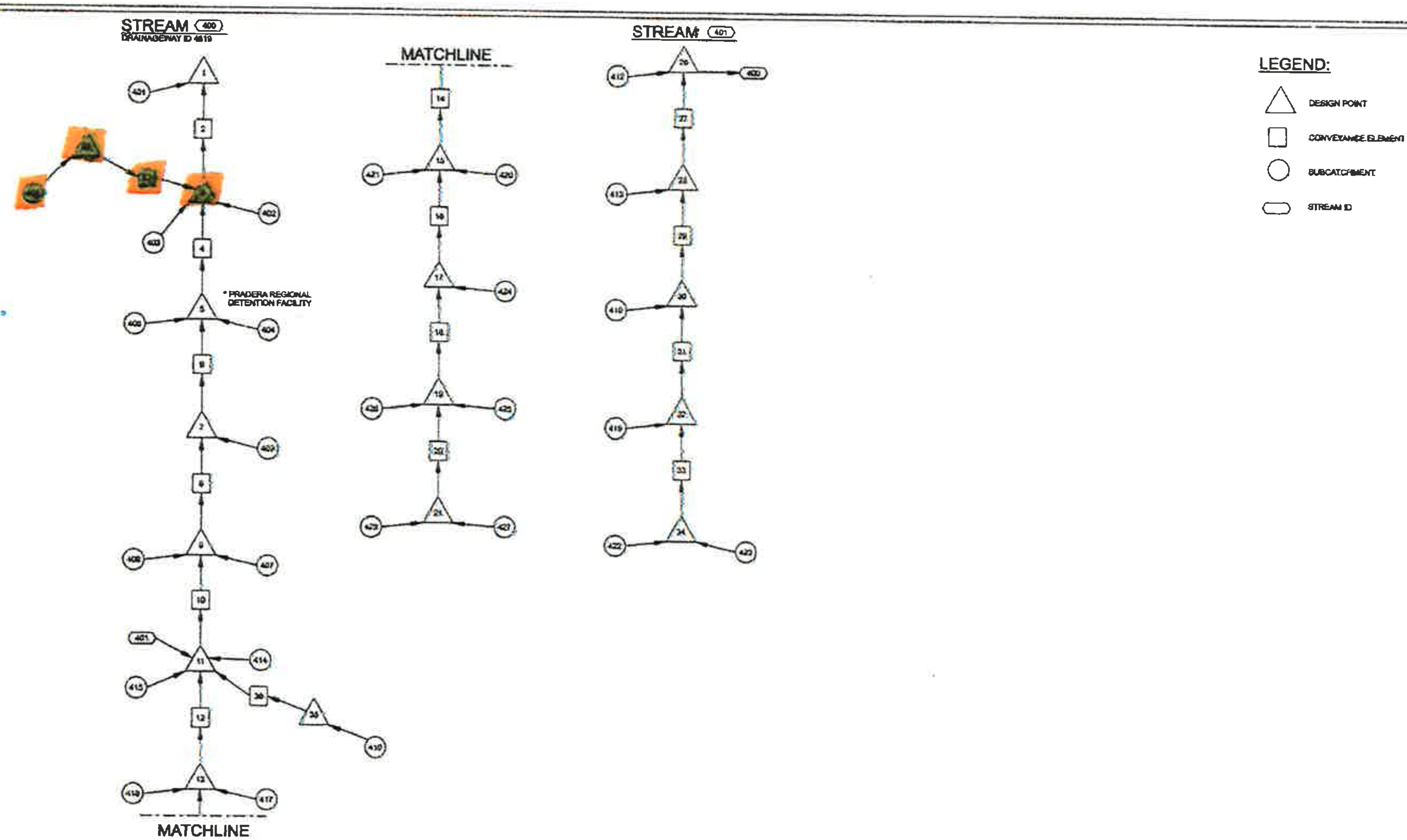
DESIGNED	[illegible]	DATE	[illegible]
DRAWN	[illegible]	DATE	[illegible]
CHECKED	[illegible]	DATE	[illegible]
REVISED	[illegible]	DATE	[illegible]

DOUGLAS COUNTY
URBAN DRAINAGE AND FLOOD CONTROL DISTRICT

SCOTT GULCH AND LEMON GULCH WATERSHEDS
OUTFALL SYSTEM PLANNING

FIGURE 3-3
LEMON GULCH
UDSWM MODEL CONNECTIVITY

PAGE
3-6



MAPPING PRODUCED BY: DOUGLAS COUNTY (DATE 2003)
HORIZONTAL DATUM: NAD 83 FEET
STATE PLANE COLORADO CENTRAL
VERTICAL DATUM: NAVD 88

CH2M HILL
9193 SOUTH JAMAICA STREET
ENGLEWOOD, CO 80112

DESIGNED	CH	DATE	4/06
DRAWN	MH	DATE	4/06
CHECKED	BC	DATE	4/06
REVISED	MM	DATE	6/06

DOUGLAS COUNTY
URBAN DRAINAGE AND FLOOD CONTROL DISTRICT

SCOTT GULCH AND LEMON GULCH WATERSHEDS
OUTFALL SYSTEM PLANNING

FIGURE 3-5
SCOTT GULCH
UDSWM MODEL CONNECTIVITY

PAGE
3-8

TABLE A-2

CUHP SUBWATERSHED CHARACTERISTICS
FUTURE IMPERVIOUS CONDITION

[1]Subcatchment ID	Area (acres)	Area (mi^2)	Length (mi)	Centroid Length (mi)	Percent Imperv. (%)	Slope (ft/ft)	t_c (min)	Pervious Depression Storage (in)	Impervious Depression Storage (in)	Initial Rate (in/hr)	Decay Coef. (1/sec)	Final Rate (in/hr)
LEMON GULCH (DRAINAGEWAY ID 4618)												
301	33	0.051	0.61	0.32	30.4%	0.015	27.8	0.35	0.05	4.41	0.0018	0.59
[illegible]	59	0.092	0.81	0.43	43.0%	0.035	29.0	0.35	0.05	4.30	0.0018	0.59
[illegible]	39	0.061	0.73	0.37	19.1%	0.031	70.3	0.40	0.05	4.31	0.0018	0.59
[illegible]	49	0.077	0.53	0.32	45.0%	0.049	18.3	0.35	0.05	4.29	0.0016	0.59
[illegible]	101	0.158	1.04	0.43	36.1%	0.020		0.35	0.05	4.03	0.0016	0.62
[illegible]	53	0.083	0.65	0.46	41.9%	0.025	28.9	0.35	0.05	4.39	0.0018	0.59
[illegible]	98	0.153	0.78	0.46	34.0%	0.033		0.35	0.05	3.88	0.0017	0.59
[illegible]	43	0.067	0.81	0.42	37.0%	0.016	33.8	0.35	0.05	4.58	0.0016	0.69
[illegible]	105	0.166	0.84	0.47	37.0%	0.031		0.35	0.05	3.62	0.0018	0.54
[illegible]	163	0.255	0.94	0.50	41.0%	0.038		0.35	0.05	4.34	0.0018	0.59
[illegible]	30	0.047	0.41	0.07	37.0%	0.045	22.0	0.35	0.05	3.51	0.0018	0.53
[illegible]	72	0.112	0.62	0.35	37.0%	0.040	21.9	0.35	0.05	4.42	0.0018	0.59
[illegible]	97	0.152	0.82	0.49	28.9%	0.029		0.35	0.05	3.90	0.0018	0.57
314	57	0.088	0.53	0.29	37.0%	0.012	25.5	0.35	0.05	4.29	0.0018	0.59
[illegible]	124	0.194	0.83	0.48	37.0%	0.026		0.35	0.05	3.96	0.0018	0.56
[illegible]	88	0.137	0.62	0.32	37.0%	0.036	28.5	0.35	0.05	4.38	0.0018	0.59
317	98	0.153	0.62	0.30	20.3%	0.044		0.35	0.05	3.95	0.0018	0.56
318	87	0.136	0.78	0.36	8.7%	0.037	68.5	0.40	0.05	3.15	0.0018	0.51
319	121	0.189	0.75	0.38	25.9%	0.031		0.35	0.05	4.06	0.0018	0.57
320	37	0.057	0.56	0.24	35.7%	0.032	26.5	0.35	0.05	3.09	0.0018	0.51
[illegible]	91	0.142	0.95	0.56	28.4%	0.039		0.35	0.05	4.32	0.0018	0.59
[illegible]	54	0.084	0.41	0.18	29.6%	0.049	22.0	0.35	0.05	3.88	0.0018	0.56
323	67	0.105	0.49	0.22	19.6%	0.046	45.7	0.40	0.05	3.00	0.0018	0.50
324	84	0.131	0.75	0.40	18.4%	0.049	58.8	0.40	0.05	3.81	0.0018	0.55
325	73	0.114	0.60	0.41	18.1%	0.030	62.3	0.40	0.05	3.99	0.0018	0.57
[illegible]	107	0.168	0.68	0.37	17.3%	0.043		0.40	0.05	3.49	0.0018	0.53
327	74	0.116	1.04	0.57	7.6%	0.016	124.4	0.40	0.05	3.09	0.0018	0.51
328	116	0.181	0.71	0.32	2.0%	0.050		0.40	0.05	3.51	0.0018	0.53
329	51	0.080	0.51	0.24	10.0%	0.051	45.0	0.40	0.05	3.00	0.0018	0.50
330	67	0.105	0.64	0.38	5.0%	0.044	55.1	0.40	0.05	3.00	0.0018	0.50
331	30	0.047	0.38	0.19	2.0%	0.056	36.1	0.40	0.05	3.64	0.0018	0.54
332	124	0.195	1.01	0.63	7.5%	0.031		0.40	0.05	3.08	0.0018	0.51
333	65	0.102	0.61	0.30	2.6%	0.046	53.1	0.40	0.05	3.00	0.0018	0.50
334	49	0.076	0.80	0.37	2.0%	0.014	107.0	0.40	0.05	3.23	0.0018	0.52
335	89	0.139	0.88	0.55	2.2%	0.027	86.9	0.40	0.05	3.40	0.0018	0.53
336	19	0.030	0.36	0.19	2.0%	0.041	40.0	0.40	0.05	3.00	0.0018	0.50
337	60	0.094	0.60	0.35	13.8%	0.043	53.7	0.40	0.05	3.00	0.0018	0.50
338	116	0.182	0.98	0.61	4.3%	0.021		0.40	0.05	3.03	0.0018	0.50

TABLE A-2 (CONTINUED)

CUHP SUBWATERSHED CHARACTERISTICS
FUTURE IMPERVIOUS CONDITION

[1]Subcatchment ID	Area (acres)	Area (mi^2)	Length (mi)	Centroid Length (mi)	Percent Imperv. (%)	Slope (ft/ft)	t_c (min)	Pervious Depression Storage (in)	Impervious Depression Storage (in)	Initial Rate (in/hr)	Decay Coef. (1/sec)	Final Rate (in/hr)
LEMON GULCH (CONTINUED)												
339	44	0.069	0.70	0.37	2.1%	0.022	79.9	0.40	0.05	3.04	0.0018	0.50
340	63	0.099	0.66	0.33	13.3%	0.030	66.9	0.40	0.05	3.01	0.0018	0.50
341	106	0.166	0.59	0.30	25.9%	0.043		0.35	0.05	3.00	0.0018	0.50
342	99	0.155	0.64	0.31	12.7%	0.039		0.40	0.05	3.00	0.0018	0.50
343	95	0.149	0.62	0.35	27.0%	0.035		0.35	0.05	3.00	0.0018	0.50
344	82	0.128	0.83	0.46	32.0%	0.030	34.3	0.35	0.05	3.00	0.0018	0.50
345	76	0.119	0.62	0.38	32.0%	0.038	23.7	0.35	0.05	3.00	0.0018	0.50
346	85	0.132	0.60	0.26	31.8%	0.041	27.7	0.35	0.05	3.00	0.0018	0.50
347	102	0.159	0.61	0.33	9.4%	0.038		0.40	0.05	3.00	0.0018	0.50
348	41	0.064	0.58	0.33	31.7%	0.048	20.7	0.35	0.05	3.00	0.0018	0.50
349	45	0.071	0.58	0.38	31.8%	0.040	22.9	0.35	0.05	3.00	0.0018	0.50
350	108	0.169	0.66	0.30	30.7%	0.033		0.35	0.05	3.00	0.0018	0.50
351	109	0.170	1.04	0.61	30.7%	0.028		0.35	0.05	3.00	0.0018	0.50
352	28	0.043	0.49	0.34	32.6%	0.039	18.6	0.35	0.05	3.00	0.0018	0.50
353	92	0.143	0.85	0.47	33.4%	0.036		0.35	0.05	3.00	0.0018	0.50
354	55	0.086	0.68	0.47	34.0%	0.039	32.2	0.35	0.05	3.00	0.0018	0.50
355	91	0.143	1.01	0.65	33.1%	0.027		0.35	0.05	3.00	0.0018	0.50
356	123	0.192	1.16	0.74	27.7%	0.025		0.35	0.05	3.00	0.0018	0.50
357	86	0.134	0.61	0.23	32.0%	0.040	28.0	0.35	0.05	3.00	0.0018	0.50
358	125	0.196	0.69	0.39	33.7%	0.040		0.35	0.05	3.00	0.0018	0.50
359	110	0.173	0.67	0.36	34.0%	0.046		0.35	0.05	3.00	0.0018	0.50
360	96	0.150	0.93	0.50	34.0%	0.037		0.35	0.05	3.00	0.0018	0.50
361	94	0.146	0.86	0.46	35.0%	0.035		0.35	0.05	3.00	0.0018	0.50
SCOTT GULCH (DRAINAGEWAY ID 4618)												
401	70	0.110	0.82	0.52	9.9%	0.016	25.9	0.40	0.05	4.59	0.0014	0.73
402	47	0.074	0.63	0.33	20.1%	0.030	21.2	0.35	0.05	4.29	0.0016	0.65
403	70	0.110	0.62	0.25	20.0%	0.035	24.2	0.35	0.05	4.16	0.0016	0.63
404	44	0.069	0.53	0.26	20.2%	0.021	23.9	0.35	0.05	3.83	0.0017	0.59
405	134	0.210	0.67	0.53	21.0%	0.047		0.35	0.05	4.04	0.0018	0.58
[illegible]	90	0.140	0.67	0.27	24.9%	0.046	23.3	0.35	0.05	3.87	0.0018	0.56
407	102	0.160	0.68	0.32	28.7%	0.040		0.35	0.05	3.70	0.0018	0.55
408	31	0.048	0.52	0.31	24.6%	0.057	21.2	0.35	0.05	3.79	0.0018	0.55
409	134	0.210	1.10	0.63	21.9%	0.045		0.35	0.05	3.61	0.0018	0.55
410	90	0.140	0.57	0.28	11.9%	0.045	20.7	0.40	0.05	3.86	0.0018	0.56
412	51	0.079	0.58	0.26	18.4%	0.039	22.0	0.40	0.05	3.32	0.0018	0.52
413	90	0.141	0.55	0.29	18.0%	0.049		0.40	0.05	3.44	0.0018	0.53
414	102	0.160	0.99	0.49	10.7%	0.036		0.40	0.05	3.82	0.0018	0.55

Italicized Subcatchment IDs indicate all values were adopted from the FHAD. The values for depression storage, initial and final infiltration, and decay rate were adopted from the FHAD for all subcatchments.

FIGURE A-4

PEAK FLOW PROFILES
LEMON GULCH
STREAM [illegible]
(DRAINAGEWAY ID 4618)

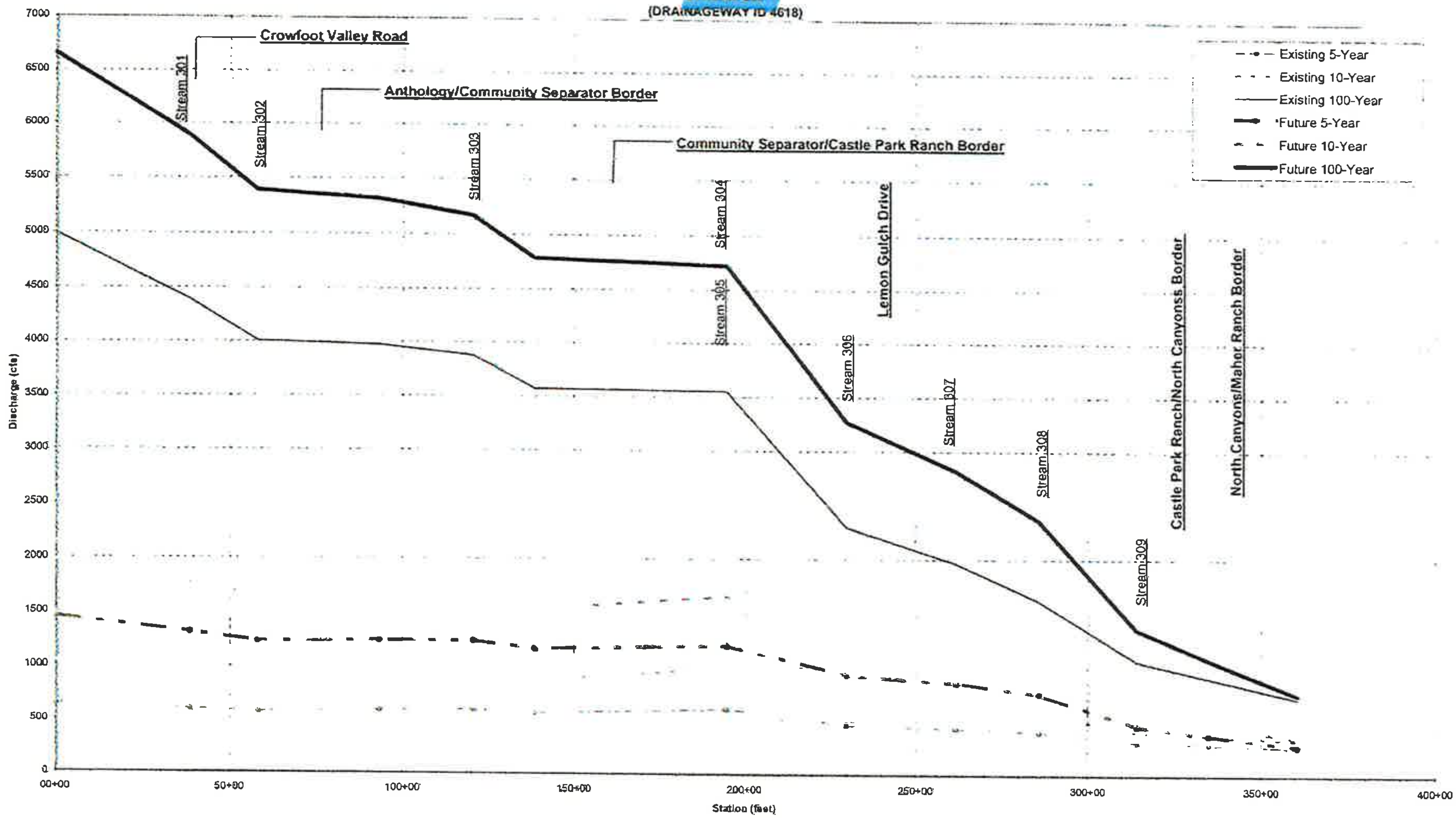
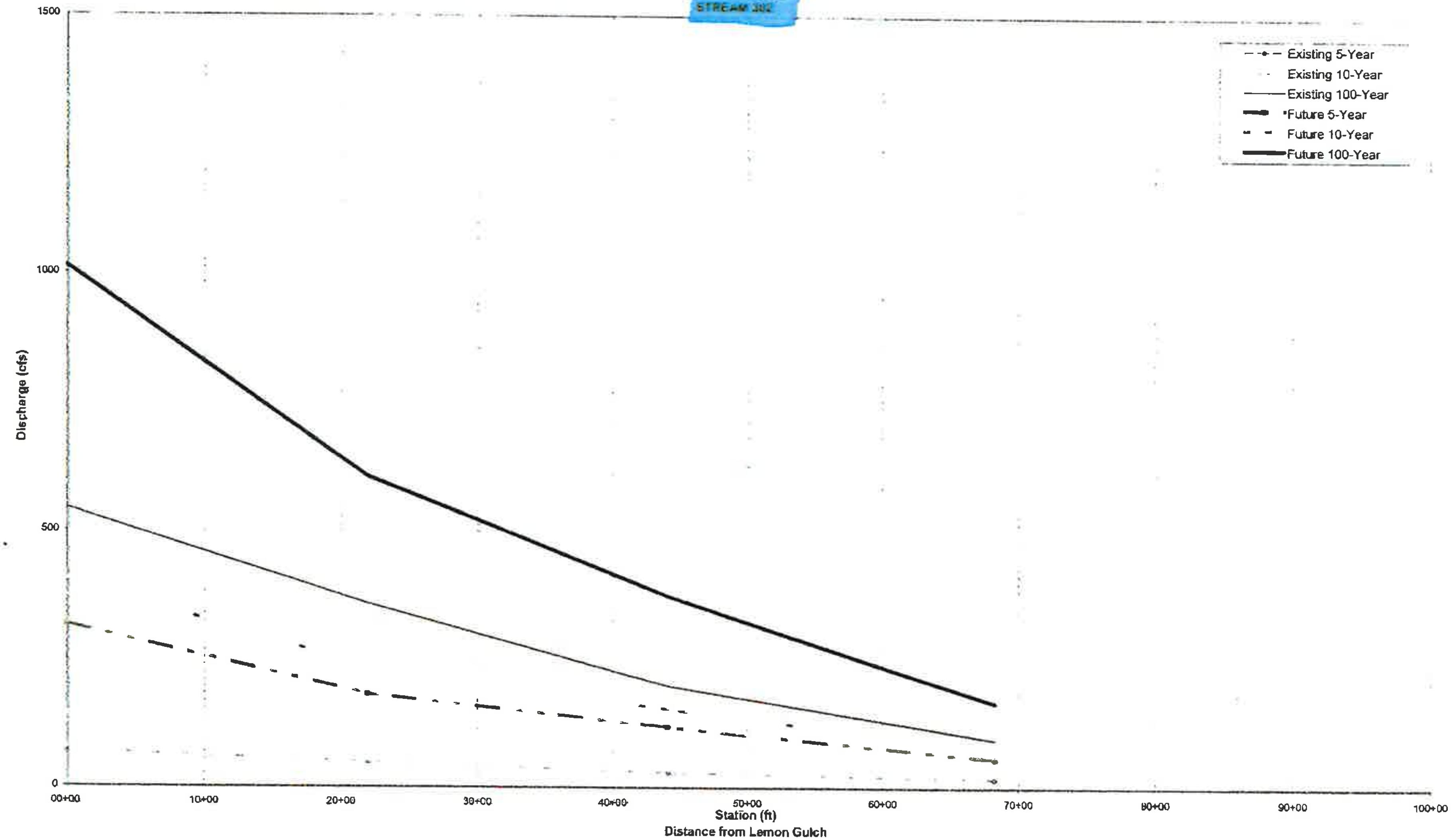


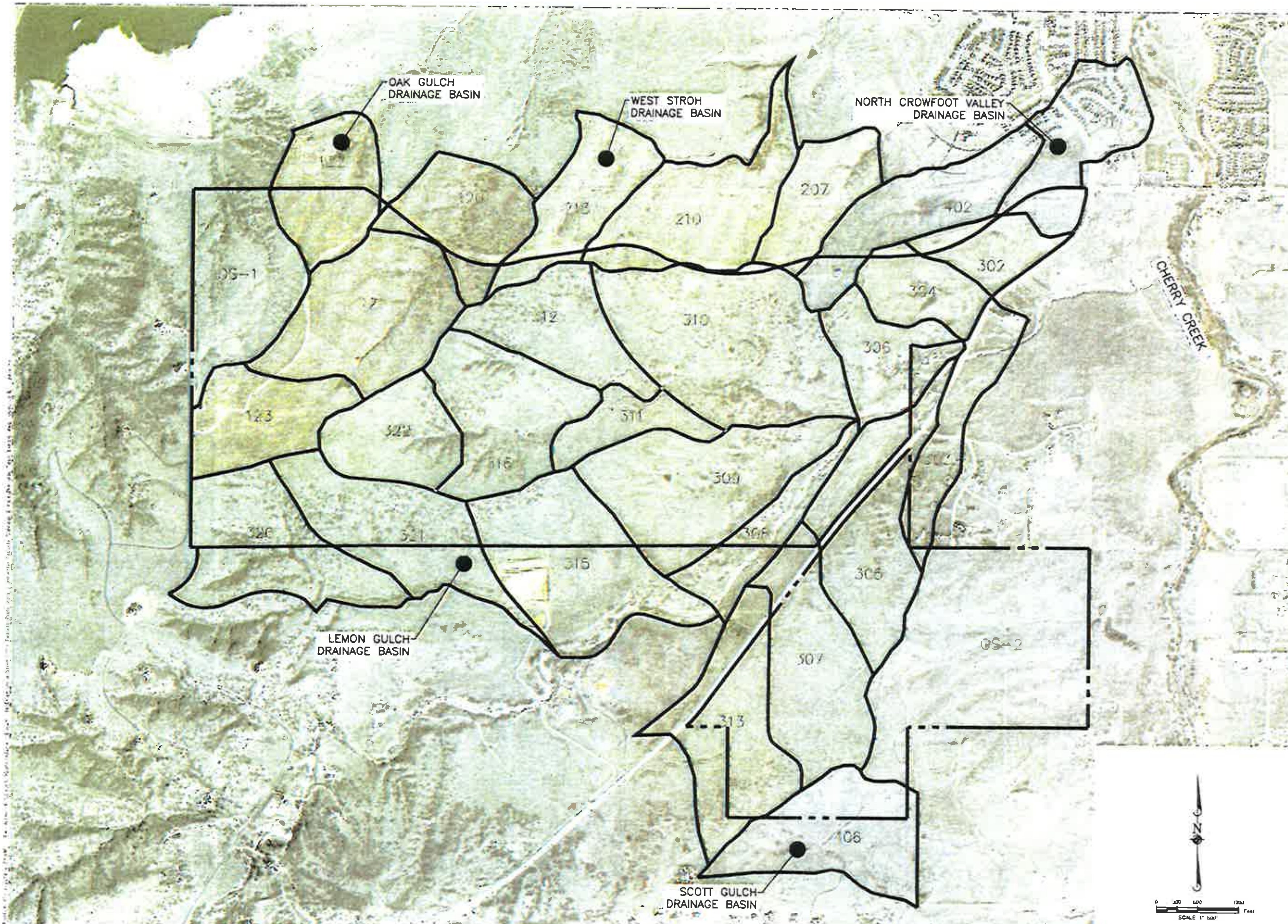
FIGURE A-6

PEAK FLOW PROFILES
LEMON GULCH
STREAM 302



APPENDIX F

Basin Maps



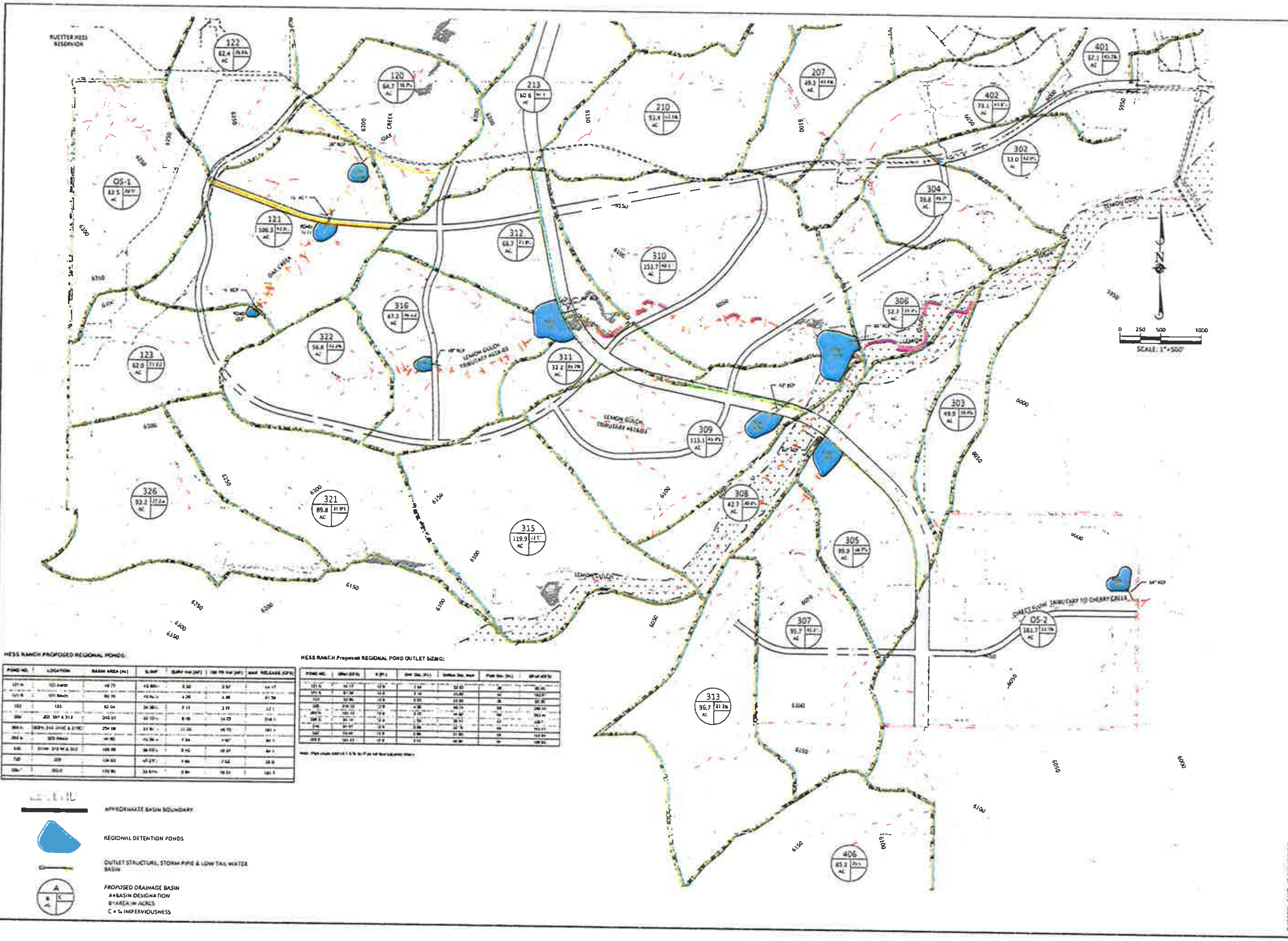
Manhard CONSULTING

HESS RANCH DEVELOPMENT

TOWN OF PARKER, COLORADO

MAJOR DRAINAGE BASIN MAP

SHEET 1 OF 2



HESS RANCH PROPOSED REGIONAL PONDS:

POND NO.	LOCATION	BASIN AREA (Ac)	% IMP	[illegible] VOL (AF)	100 YR Vol (AF)	MAX. RELEASE (CFS)
[illegible]	121 North	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	121 South	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	123	62.04	[illegible]	2.17	[illegible]	[illegible]
[illegible]	303, 307 & 313	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	OS-2	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

HESS RANCH Proposed REGIONAL POND OUTLET SIZING:

POND NO.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

LEGEND

APPROXIMATE BASIN BOUNDARY

REGIONAL DETENTION PONDS

OUTLET STRUCTURE, STORM PIPE & LOW TAIL WATER BASIN

PROPOSED DRAINAGE BASIN
A=BASIN DESIGNATION
B=AREA IN ACRES
C = % IMPERVIOUSNESS

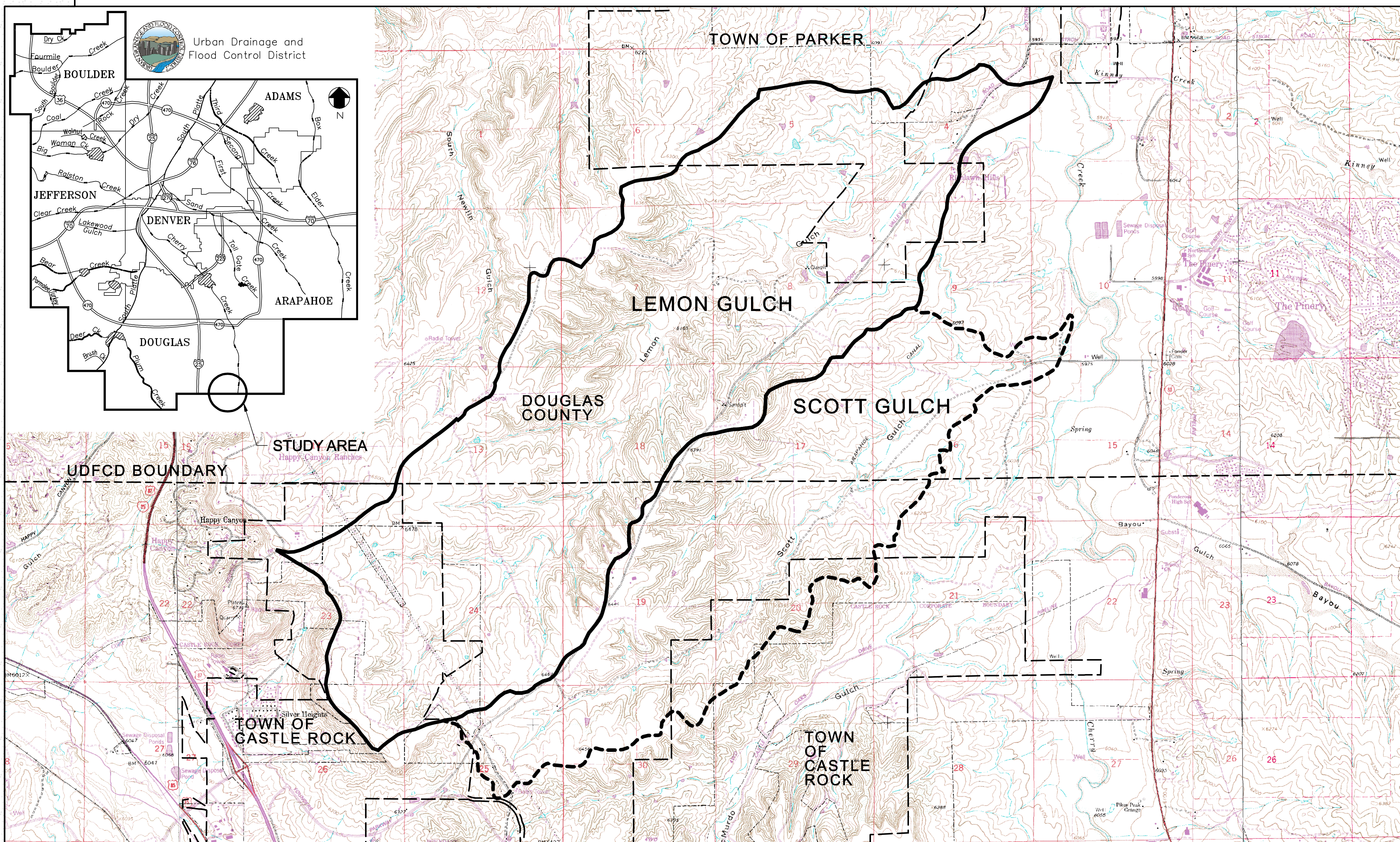
Manhard CONSULTING

HESS RANCH DEVELOPMENT
TOWN OF PARKER, COLORADO
DRAINAGE BASIN MAP

SHEET 2 OF 2
SR001

OUTFALL SYSTEMS PLANNING-PRELIMINARY DESIGN REPORT

SCOTT AND LEMON GULCH WATERSHEDS



PREPARED FOR:

URBAN DRAINAGE AND FLOOD CONTROL DISTRICT

DOUGLAS COUNTY

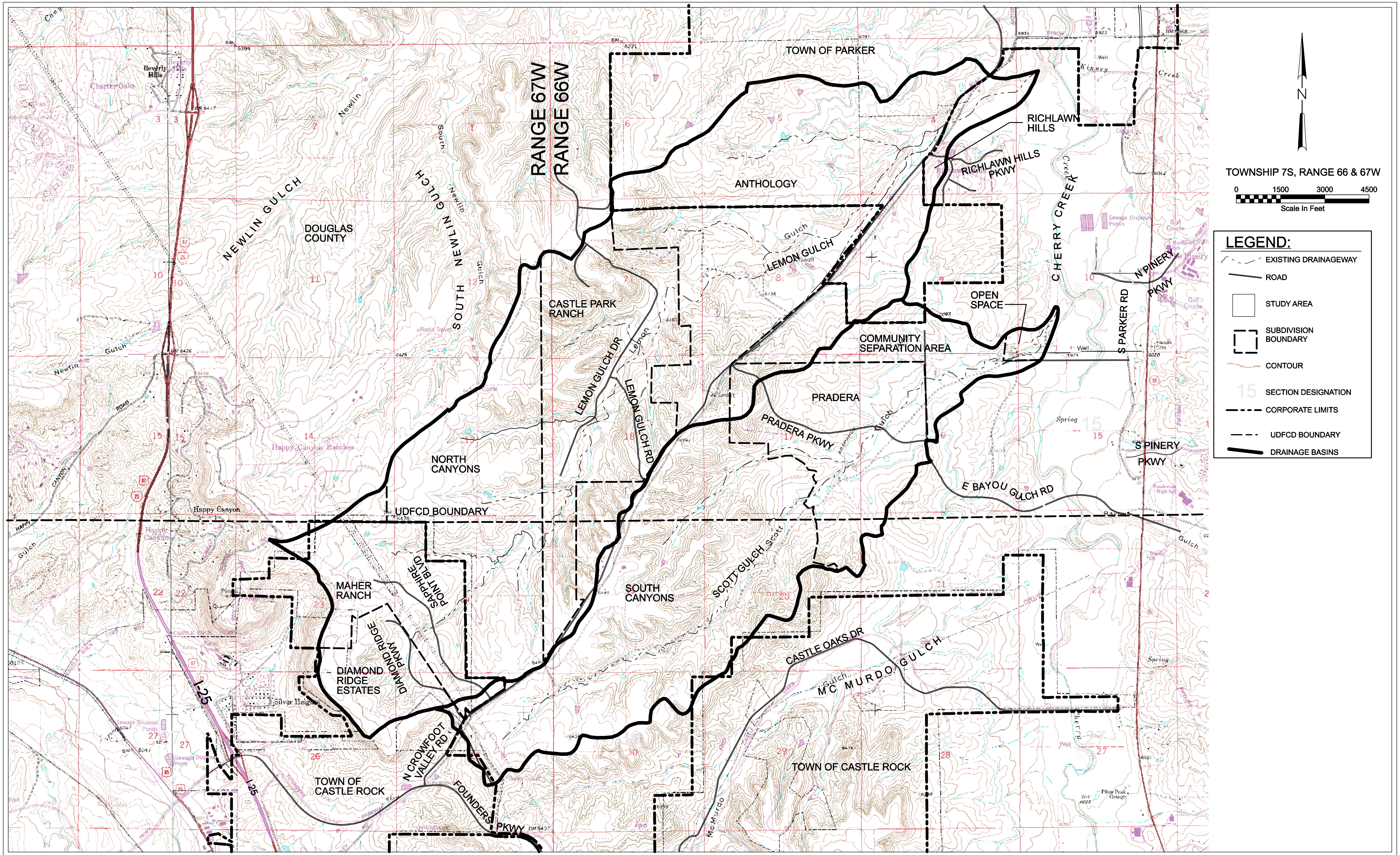
PREPARED BY

CH2MHILL

DENVER, CO

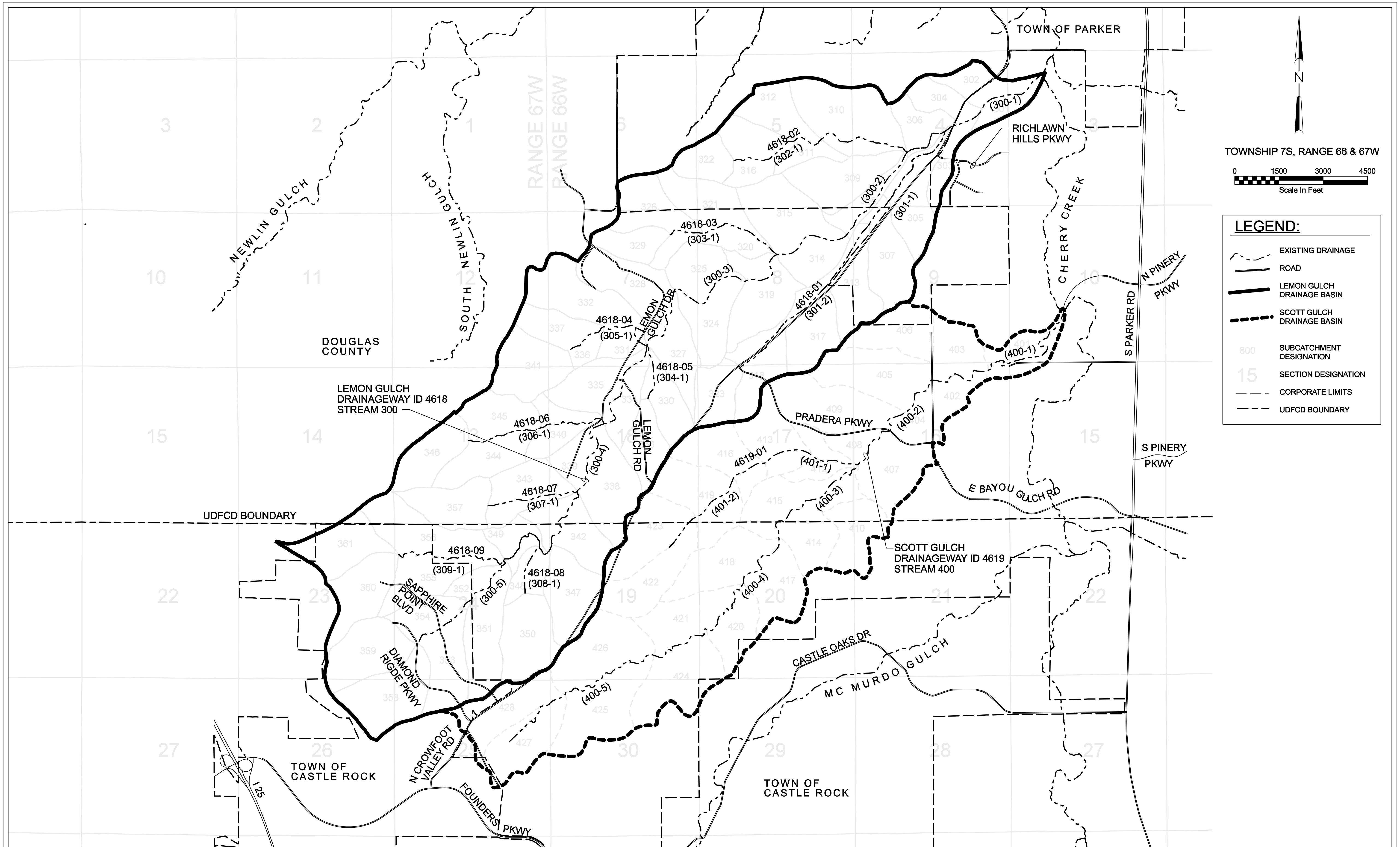
JULY 2006

lgfigcv.dlv



MAPPING PRODUCED BY: DOUGLAS COUNTY (DATE 2003) HORIZONTAL DATUM: NAD 83 FEET STATE PLANE COLORADO CENTRAL VERTICAL DATUM: NAVD 88	CH2M HILL 9193 SOUTH JAMAICA STREET ENGLEWOOD, CO 80112	DESIGNED CH DATE 4/06 DRAWN MM DATE 4/06 CHECKED BC DATE 4/06 REVISED MM DATE 6/06	DOUGLAS COUNTY URBAN DRAINAGE AND FLOOD CONTROL DISTRICT	SCOTT GULCH AND LEMON GULCH WATERSHEDS OUTFALL SYSTEM PLANNING	FIGURE ES-1 SCOTT GULCH AND LEMON GULCH VICINITY MAP

aelgfigvm.dlv



MAPPING PRODUCED BY:DOUGLAS COUNTY (DATE 2003)
HORIZONTAL DATUM: NAD 83 FEET
STATE PLANE COLORADO CENTRAL
VERTICAL DATUM: NAVD 88

CH2M HILL
9193 SOUTH JAMAICA STREET
ENGLEWOOD, CO 80112

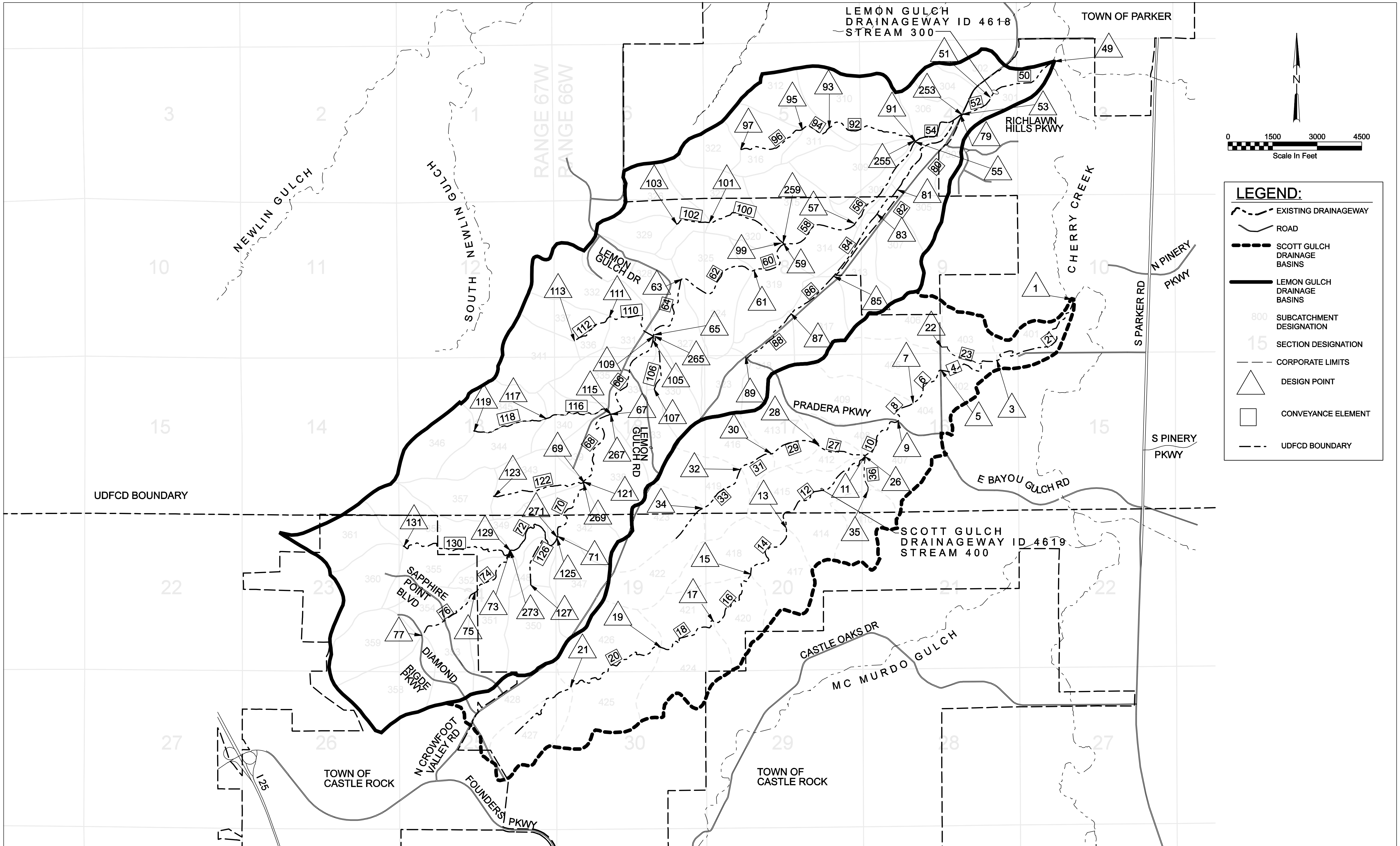
DESIGNED	CH	DATE	4/06
DRAWN	MM	DATE	4/06
CHECKED	BC	DATE	4/06
REVISED	MM	DATE	6/06

DOUGLAS COUNTY
URBAN DRAINAGE AND FLOOD CONTROL DISTRICT

SCOTT GULCH AND LEMON GULCH WATERSHEDS
OUTFALL SYSTEM PLANNING

FIGURE 2-1
SCOTT GULCH AND LEMON GULCH STUDY AREA AND REACHES

aelgfigeia.dlv



MAPPING PRODUCED BY:DOUGLAS COUNTY (DATE 2003)
HORIZONTAL DATUM: NAD 83 FEET
STATE PLANE COLORADO CENTRAL
VERTICAL DATUM: NAVD 88

CH2M HILL
9193 SOUTH JAMAICA STREET
ENGLEWOOD, CO 80112

DESIGNED	CH	DATE	4/06
DRAWN	MM	DATE	4/06
CHECKED	BC	DATE	4/06
REVISED	MM	DATE	6/06

DOUGLAS COUNTY
URBAN DRAINAGE AND FLOOD CONTROL DISTRICT

SCOTT GULCH AND LEMON GULCH
WATERSHEDS
OUTFALL SYSTEM PLANNING

FIGURE 3-2
SCOTT GULCH AND LEMON GULCH
UDSWM CONVEYANCE MAP

aefigconveyancea.dlv

TABLE A-1

CUHP SUBWATERSHED CHARACTERISTICS
EXISTING IMPERVIOUS CONDITION

Area (mi^2)	Length (mi)	Centroid Length (mi)	Percent Imperv. (%)	Slope (ft/ft)	t_c (min)	Pervious Depression Storage (in)	Impervious Depression Storage (in)	Initial Rate (in/hr)	Decay Coef. (1/sec)	Final Rate (in/hr)
0.051	0.61	0.32	2.0%	0.015	84.8	0.40	0.05	4.41	0.0018	0.59
0.092	0.81	0.43	2.0%	0.035	31.5	0.40	0.05	4.30	0.0018	0.59
0.061	0.73	0.37	2.0%	0.031	70.3	0.40	0.05	4.31	0.0018	0.59
0.077	0.53	0.32	2.0%	0.049	21.0	0.40	0.05	4.29	0.0018	0.59
0.158	1.04	0.43	2.0%	0.020		0.40	0.05	4.03	0.0016	0.62
0.083	0.65	0.46	2.0%	0.025	70.9	0.40	0.05	4.39	0.0018	0.59
0.153	0.78	0.46	2.0%	0.033		0.40	0.05	3.88	0.0017	0.59
0.067	0.81	0.42	2.0%	0.016	105.0	0.40	0.05	4.58	0.0016	0.69
0.166	0.84	0.47	2.0%	0.031		0.40	0.05	3.62	0.0018	0.54
0.255	0.94	0.50	2.0%	0.038		0.40	0.05	4.34	0.0018	0.59
0.047	0.41	0.07	2.0%	0.045	18.1	0.40	0.05	3.51	0.0018	0.53
0.112	0.62	0.35	2.0%	0.040	24.0	0.40	0.05	4.42	0.0018	0.59
0.152	0.82	0.49	2.0%	0.029		0.40	0.05	3.90	0.0018	0.57
0.088	0.53	0.29	2.0%	0.012	83.8	0.40	0.05	4.29	0.0018	0.59
0.194	0.83	0.48	2.0%	0.026		0.40	0.05	3.96	0.0018	0.56
0.137	0.62	0.32	2.0%	0.036	59.6	0.40	0.05	4.38	0.0018	0.59
0.153	0.62	0.30	2.0%	0.044		0.40	0.05	3.95	0.0018	0.56
0.136	0.78	0.36	2.0%	0.037	68.5	0.40	0.05	3.15	0.0018	0.51
0.189	0.75	0.38	2.0%	0.031		0.40	0.05	4.06	0.0018	0.57
0.057	0.56	0.24	2.0%	0.032	58.2	0.40	0.05	3.09	0.0018	0.51
0.142	0.95	0.56	2.0%	0.039		0.40	0.05	4.32	0.0018	0.59
0.084	0.41	0.18	2.0%	0.049	40.0	0.40	0.05	3.88	0.0018	0.56
0.105	0.49	0.22	2.0%	0.046	45.7	0.40	0.05	3.00	0.0018	0.50
0.131	0.75	0.40	2.0%	0.049	58.8	0.40	0.05	3.81	0.0018	0.55
0.114	0.60	0.41	2.0%	0.030	62.3	0.40	0.05	3.99	0.0018	0.57
0.168	0.68	0.37	2.0%	0.043		0.40	0.05	3.49	0.0018	0.53
0.116	1.04	0.57	2.0%	0.016	124.0	0.40	0.05	3.09	0.0018	0.51
0.181	0.71	0.32	2.0%	0.050		0.40	0.05	3.51	0.0018	0.53
0.080	0.51	0.24	2.0%	0.051	45.0	0.40	0.05	3.00	0.0018	0.50
0.105	0.64	0.38	2.0%	0.044	55.1	0.40	0.05	3.00	0.0018	0.50
0.047	0.38	0.19	2.0%	0.056	36.1	0.40	0.05	3.64	0.0018	0.54
0.195	1.01	0.63	2.0%	0.031		0.40	0.05	3.08	0.0018	0.51
0.102	0.61	0.30	2.0%	0.046	53.1	0.40	0.05	3.00	0.0018	0.50
0.076	0.80	0.37	2.0%	0.014	107.0	0.40	0.05	3.23	0.0018	0.52
0.139	0.88	0.55	2.0%	0.027	86.9	0.40	0.05	3.40	0.0018	0.53
0.030	0.36	0.19	2.0%	0.041	40.0	0.40	0.05	3.00	0.0018	0.50
0.094	0.60	0.35	2.0%	0.043	53.7	0.40	0.05	3.00	0.0018	0.50
0.182	0.98	0.61	2.0%	0.021		0.40	0.05	3.03	0.0018	0.50

TABLE A-1 (CONTINUED)

CUHP SUBWATERSHED CHARACTERISTICS
EXISTING IMPERVIOUS CONDITION

[1]Subcatchment ID	Area (acres)	Area (mi^2)	Length (mi)	Centroid Length (mi)	Percent Imperv. (%)	Slope (ft/ft)	t_c (min)	Pervious Depression Storage (in)	Impervious Depression Storage (in)	Initial Rate (in/hr)	Decay Coef. (1/sec)	Final Rate (in/hr)
LEMON GULCH (CONTINUED)												
339	44	0.069	0.70	0.37	2.0%	0.022	79.9	0.40	0.05	3.04	0.0018	0.50
340	63	0.099	0.66	0.33	2.0%	0.030	66.9	0.40	0.05	3.01	0.0018	0.50
341	106	0.166	0.59	0.30	2.0%	0.043		0.40	0.05	3.00	0.0018	0.50
342	99	0.155	0.64	0.31	2.0%	0.039		0.40	0.05	3.00	0.0018	0.50
343	95	0.149	0.62	0.35	2.0%	0.035		0.40	0.05	3.00	0.0018	0.50
344	82	0.128	0.83	0.46	2.0%	0.030	78.9	0.40	0.05	3.00	0.0018	0.50
345	76	0.119	0.62	0.38	2.0%	0.038	25.7	0.40	0.05	3.00	0.0018	0.50
346	85	0.132	0.60	0.26	2.3%	0.041	55.3	0.40	0.05	3.00	0.0018	0.50
347	102	0.159	0.61	0.33	2.0%	0.038		0.40	0.05	3.00	0.0018	0.50
348	41	0.064	0.58	0.33	2.0%	0.048	22.8	0.40	0.05	3.00	0.0018	0.50
349	45	0.071	0.58	0.38	2.0%	0.040	24.0	0.40	0.05	3.00	0.0018	0.50
350	108	0.169	0.66	0.30	2.0%	0.033		0.40	0.05	3.00	0.0018	0.50
351	109	0.170	1.04	0.61	2.0%	0.028		0.40	0.05	3.00	0.0018	0.50
352	28	0.043	0.49	0.34	2.0%	0.039	20.9	0.40	0.05	3.00	0.0018	0.50
353	92	0.143	0.85	0.47	10.2%	0.036		0.40	0.05	3.00	0.0018	0.50
354	55	0.086	0.68	0.47	8.1%	0.039	25.7	0.40	0.05	3.00	0.0018	0.50
355	91	0.143	1.01	0.65	3.1%	0.027		0.40	0.05	3.00	0.0018	0.50
356	123	0.192	1.16	0.74	8.6%	0.025		0.40	0.05	3.00	0.0018	0.50
357	86	0.134	0.61	0.23	2.0%	0.040	56.4	0.40	0.05	3.00	0.0018	0.50
358	125	0.196	0.69	0.39	33.5%	0.040		0.35	0.05	3.00	0.0018	0.50
359	110	0.173	0.67	0.36	30.7%	0.046		0.35	0.05	3.00	0.0018	0.50
360	96	0.150	0.93	0.50	2.5%	0.037		0.40	0.05	3.00	0.0018	0.50
361	94	0.146	0.86	0.46	10.2%	0.035		0.40	0.05	3.00	0.0018	0.50
SCOTT GULCH (DRAINAGEWAY ID 4619)												
401	70	0.110	0.82	0.52	2.0%	0.016	26.4	0.40	0.05	4.59	0.0014	0.73
402	47	0.074	0.63	0.33	2.0%	0.030	23.2	0.40	0.05	4.29	0.0016	0.65
403	70	0.110	0.62	0.25	2.0%	0.035	25.0	0.40	0.05	4.16	0.0016	0.63
404	44	0.069	0.53	0.26	2.0%	0.021	24.8	0.40	0.05	3.83	0.0017	0.59
405	134	0.210	0.97	0.53	2.0%	0.047		0.40	0.05	4.04	0.0018	0.58
406	90	0.140	0.67	0.27	2.0%	0.046	25.3	0.40	0.05	3.87	0.0018	0.56
407	102	0.160	0.68	0.32	2.0%	0.040		0.40	0.05	3.70	0.0018	0.55
408	31	0.049	0.52	0.31	2.0%	0.057	23.0	0.40	0.05	3.79	0.0018	0.55
409	134	0.210	1.10	0.63	2.0%	0.045		0.40	0.05	3.61	0.0018	0.55
410	90	0.140	0.57	0.28	2.0%	0.045	21.1	0.40	0.05	3.86	0.0018	0.56
412	51	0.079	0.58	0.26	2.0%	0.039	22.8	0.40	0.05	3.32	0.0018	0.52
413	90	0.141	0.55	0.29	2.0%	0.049		0.40	0.05	3.44	0.0018	0.53
414	102	0.160	0.99	0.49	2.0%	0.036		0.40	0.05	3.82	0.0018	0.55

TABLE A-2

CUHP SUBWATERSHED CHARACTERISTICS
FUTURE IMPERVIOUS CONDITION

[1]Subcatchment ID	Area (acres)	Area (mi^2)	Length (mi)	Centroid Length (mi)	Percent Imperv. (%)	Slope (ft/ft)	t_c (min)	Pervious Depression Storage (in)	Impervious Depression Storage (in)	Initial Rate (in/hr)	Decay Coef. (1/sec)	Final Rate (in/hr)
LEMON GULCH (DRAINAGEWAY ID 4618)												
301	33	0.051	0.61	0.32	30.4%	0.015	27.8	0.35	0.05	4.41	0.0018	0.59
302	59	0.092	0.81	0.43	43.0%	0.035	29.0	0.35	0.05	4.30	0.0018	0.59
303	39	0.061	0.73	0.37	19.1%	0.031	70.3	0.40	0.05	4.31	0.0018	0.59
304	49	0.077	0.53	0.32	45.0%	0.049	18.3	0.35	0.05	4.29	0.0018	0.59
305	101	0.158	1.04	0.43	36.1%	0.020		0.35	0.05	4.03	0.0016	0.62
306	53	0.083	0.65	0.46	41.9%	0.025	28.9	0.35	0.05	4.39	0.0018	0.59
307	98	0.153	0.78	0.46	34.0%	0.033		0.35	0.05	3.88	0.0017	0.59
308	43	0.067	0.81	0.42	37.0%	0.016	33.8	0.35	0.05	4.58	0.0016	0.69
309	106	0.166	0.84	0.47	37.0%	0.031		0.35	0.05	3.62	0.0018	0.54
310	163	0.255	0.94	0.50	41.0%	0.038		0.35	0.05	4.34	0.0018	0.59
311	30	0.047	0.41	0.07	37.0%	0.045	22.0	0.35	0.05	3.51	0.0018	0.53
312	72	0.112	0.62	0.35	37.0%	0.040	21.9	0.35	0.05	4.42	0.0018	0.59
313	97	0.152	0.82	0.49	28.9%	0.029		0.35	0.05	3.90	0.0018	0.57
314	57	0.088	0.53	0.29	37.0%	0.012	25.5	0.35	0.05	4.29	0.0018	0.59
315	124	0.194	0.83	0.48	37.0%	0.026		0.35	0.05	3.96	0.0018	0.56
316	88	0.137	0.62	0.32	37.0%	0.036	28.5	0.35	0.05	4.38	0.0018	0.59
317	98	0.153	0.62	0.30	20.3%	0.044		0.35	0.05	3.95	0.0018	0.56
318	87	0.136	0.78	0.36	8.7%	0.037	68.5	0.40	0.05	3.15	0.0018	0.51
319	121	0.189	0.75	0.38	25.9%	0.031		0.35	0.05	4.06	0.0018	0.57
320	37	0.057	0.56	0.24	35.7%	0.032	26.5	0.35	0.05	3.09	0.0018	0.51
321	91	0.142	0.95	0.56	28.4%	0.039		0.35	0.05	4.32	0.0018	0.59
322	54	0.084	0.41	0.18	29.6%	0.049	22.0	0.35	0.05	3.88	0.0018	0.56
323	67	0.105	0.49	0.22	19.6%	0.046	45.7	0.40	0.05	3.00	0.0018	0.50
324	84	0.131	0.75	0.40	18.4%	0.049	58.8	0.40	0.05	3.81	0.0018	0.55
325	73	0.114	0.60	0.41	18.1%	0.030	62.3	0.40	0.05	3.99	0.0018	0.57
326	107	0.168	0.68	0.37	17.3%	0.043		0.40	0.05	3.49	0.0018	0.53
327	74	0.116	1.04	0.57	7.6%	0.016	124.4	0.40	0.05	3.09	0.0018	0.51
328	116	0.181	0.71	0.32	2.0%	0.050		0.40	0.05	3.51	0.0018	0.53
329	51	0.080	0.51	0.24	10.0%	0.051	45.0	0.40	0.05	3.00	0.0018	0.50
330	67	0.105	0.64	0.38	5.0%	0.044	55.1	0.40	0.05	3.00	0.0018	0.50
331	30	0.047	0.38	0.19	2.0%	0.056	36.1	0.40	0.05	3.64	0.0018	0.54
332	124	0.195	1.01	0.63	7.5%	0.031		0.40	0.05	3.08	0.0018	0.51
333	65	0.102	0.61	0.30	2.6%	0.046	53.1	0.40	0.05	3.00	0.0018	0.50
334	49	0.076	0.80	0.37	2.0%	0.014	107.0	0.40	0.05	3.23	0.0018	0.52
335	89	0.139	0.88	0.55	2.2%	0.027	86.9	0.40	0.05	3.40	0.0018	0.53
336	19	0.030	0.36	0.19	2.0%	0.041	40.0	0.40	0.05	3.00	0.0018	0.50
337	60	0.094	0.60	0.35	13.8%	0.043	53.7	0.40	0.05	3.00	0.0018	0.50
338	116	0.182	0.98	0.61	4.3%	0.021		0.40	0.05	3.03	0.0018	0.50

TABLE A-2 (CONTINUED)

CUHP SUBWATERSHED CHARACTERISTICS
FUTURE IMPERVIOUS CONDITION

[1]Subcatchment ID	Area (acres)	Area (mi^2)	Length (mi)	Centroid Length (mi)	Percent Imperv. (%)	Slope (ft/ft)	t_c (min)	Pervious Depression Storage (in)	Impervious Depression Storage (in)	Initial Rate (in/hr)	Decay Coef. (1/sec)	Final Rate (in/hr)
LEMON GULCH (CONTINUED)												
339	44	0.069	0.70	0.37	2.1%	0.022	79.9	0.40	0.05	3.04	0.0018	0.50
340	63	0.099	0.66	0.33	13.3%	0.030	66.9	0.40	0.05	3.01	0.0018	0.50
341	106	0.166	0.59	0.30	25.9%	0.043		0.35	0.05	3.00	0.0018	0.50
342	99	0.155	0.64	0.31	12.7%	0.039		0.40	0.05	3.00	0.0018	0.50
343	95	0.149	0.62	0.35	27.0%	0.035		0.35	0.05	3.00	0.0018	0.50
344	82	0.128	0.83	0.46	32.0%	0.030	34.3	0.35	0.05	3.00	0.0018	0.50
345	76	0.119	0.62	0.38	32.0%	0.038	23.7	0.35	0.05	3.00	0.0018	0.50
346	85	0.132	0.60	0.26	31.8%	0.041	27.7	0.35	0.05	3.00	0.0018	0.50
347	102	0.159	0.61	0.33	9.4%	0.038		0.40	0.05	3.00	0.0018	0.50
348	41	0.064	0.58	0.33	31.7%	0.048	20.7	0.35	0.05	3.00	0.0018	0.50
349	45	0.071	0.58	0.38	31.8%	0.040	22.9	0.35	0.05	3.00	0.0018	0.50
350	108	0.169	0.66	0.30	30.7%	0.033		0.35	0.05	3.00	0.0018	0.50
351	109	0.170	1.04	0.61	30.7%	0.028		0.35	0.05	3.00	0.0018	0.50
352	28	0.043	0.49	0.34	32.6%	0.039	18.6	0.35	0.05	3.00	0.0018	0.50
353	92	0.143	0.85	0.47	33.4%	0.036		0.35	0.05	3.00	0.0018	0.50
354	55	0.086	0.68	0.47	34.0%	0.039	32.2	0.35	0.05	3.00	0.0018	0.50
355	91	0.143	1.01	0.65	33.1%	0.027		0.35	0.05	3.00	0.0018	0.50
356	123	0.192	1.16	0.74	27.7%	0.025		0.35	0.05	3.00	0.0018	0.50
357	86	0.134	0.61	0.23	32.0%	0.040	28.0	0.35	0.05	3.00	0.0018	0.50
358	125	0.196	0.69	0.39	33.7%	0.040		0.35	0.05	3.00	0.0018	0.50
359	110	0.173	0.67	0.36	34.0%	0.046		0.35	0.05	3.00	0.0018	0.50
360	96	0.150	0.93	0.50	34.0%	0.037		0.35	0.05	3.00	0.0018	0.50
361	94	0.146	0.86	0.46	35.0%	0.035		0.35	0.05	3.00	0.0018	0.50
SCOTT GULCH (DRAINAGEWAY ID 4618)												
401	70	0.110	0.82	0.52	9.9%	0.016	25.9	0.40	0.05	4.59	0.0014	0.73
402	47	0.074	0.63	0.33	20.1%	0.030	21.2	0.35	0.05	4.29	0.0016	0.65
403	70	0.110	0.62	0.25	20.0%	0.035	24.2	0.35	0.05	4.16	0.0016	0.63
404	44	0.069	0.53	0.26	20.2%	0.021	23.9	0.35	0.05	3.83	0.0017	0.59
405	134	0.210	0.97	0.53	21.0%	0.047		0.35	0.05	4.04	0.0018	0.58
406	90	0.140	0.67	0.27	24.9%	0.046	23.3	0.35	0.05	3.87	0.0018	0.56
407	102	0.160	0.68	0.32	28.7%	0.040		0.35	0.05	3.70	0.0018	0.55
408	31	0.049	0.52	0.31	24.6%	0.057	21.2	0.35	0.05	3.79	0.0018	0.55
409	134	0.210	1.10	0.63	21.9%	0.045		0.35	0.05	3.61	0.0018	0.55
410	90	0.140	0.57	0.28	11.9%	0.045	20.7	0.40	0.05	3.86	0.0018	0.56
412	51	0.079	0.58	0.26	18.4%	0.039	22.0	0.40	0.05	3.32	0.0018	0.52
413	90	0.141	0.55	0.29	18.0%	0.049		0.40	0.05	3.44	0.0018	0.53
414	102	0.160	0.99	0.49	10.7%	0.036		0.40	0.05	3.82	0.0018	0.55

Italicized Subcatchment IDs indicate all values were adopted from the FHAD. The values for depression storage, initial and final infiltration, and decay rate were adopted from the FHAD for all subcatchments.